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Bravo/Brava

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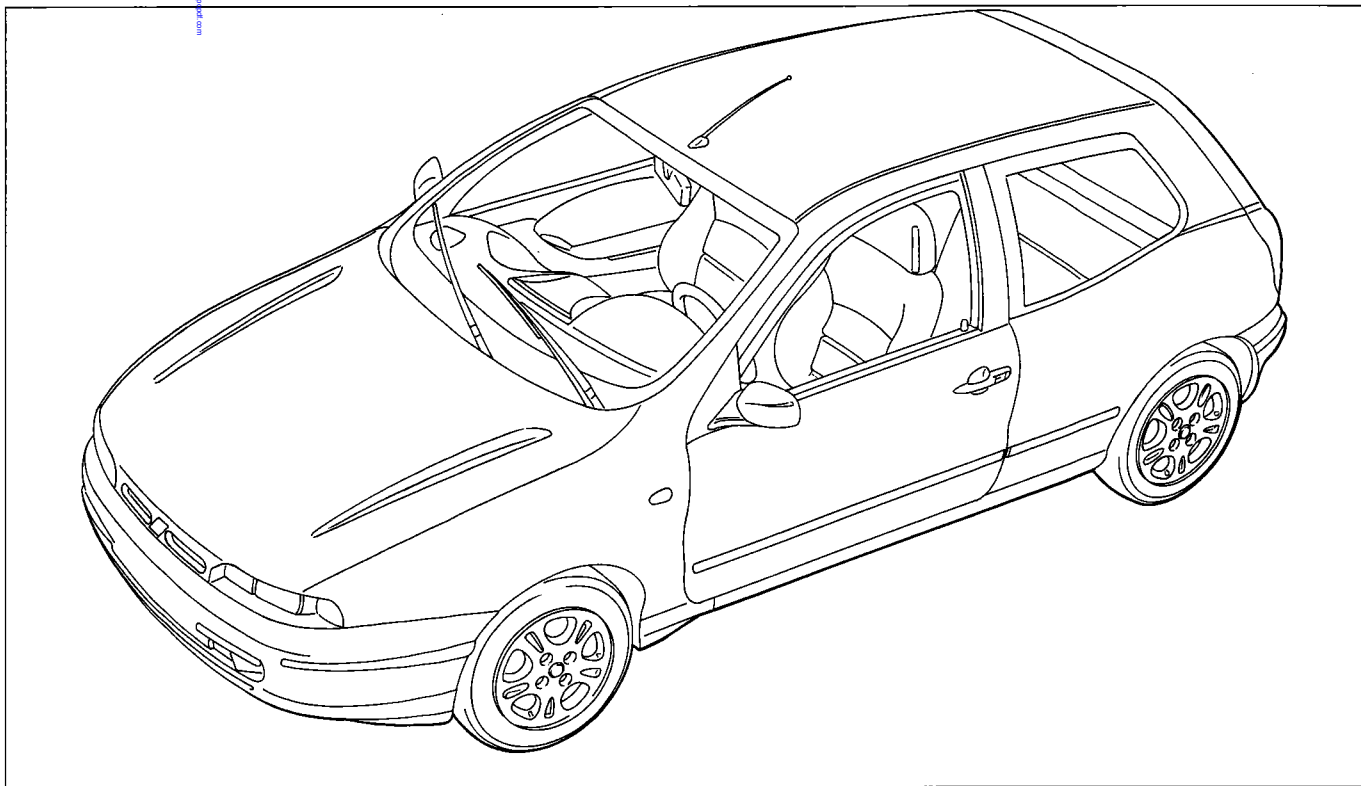
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N.D. Data not available at the time of printing

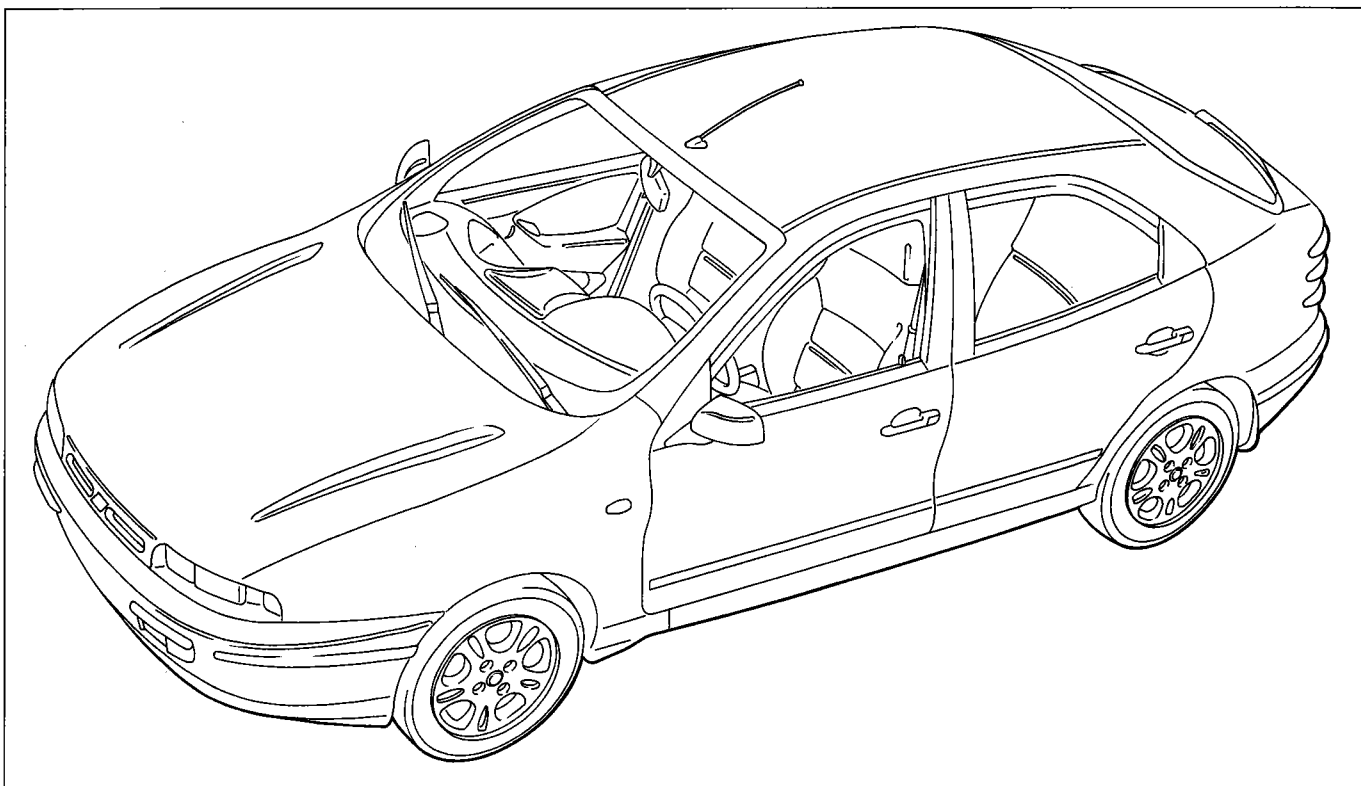
The missing data for the Diesel and 1581 versions with automatic transmission are contained in the 3rd Volume.

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3/4 front view - Bravo



P4A001A02

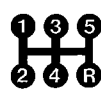
3/4 front view - Brava

Introduction

Identification data

Bravo-Brava

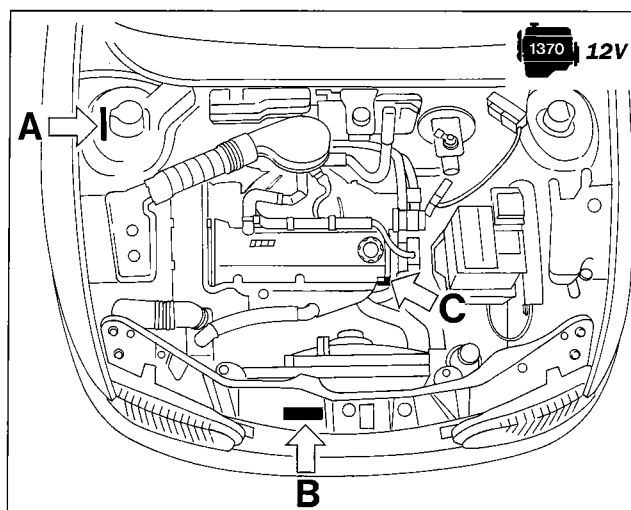
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	CHASSIS	ENGINE	VERSION	3 Door	5 Door	GEARBOX
						
	ZFA 182 000	182 A3.000	182 AA 1AA 00 182 BA 1AA 10	●		●
		182 A5.000 (●)	182 AG 1AA 07 (●) 182 BG 1AA 16 (●)	●	●	
		182 A4.000	182 AB 1AA 01 182 AB 1AA 01 B (▲) 182 BB 1AA 11 182 BB 1AA 11B (▲)	● ●	 ● ●	●
		182 A6.000 (●)	182 AH 1AA 08 (●) 182 BH 1AA 17 (●)	● ●	 ●	
		182 A2.000	182 AC 1AA 03 182 AC 1AA 03B (▲) 182 BC 1AA 13 182 BC 1AA 13B (▲) 182 AC 1BA 04 (*) 182 BC 1BA 14 (*)	● ●	 ● ● ●	●
		182 A1.000	182 AD 1AA 05 182 AD 1AA 05B (▲)	● ●	 	●
	160 A7.000	182 AE 1AA 182 BE 1AA	● 	 ●	●	
		N.D.	N.D.	●	●	●

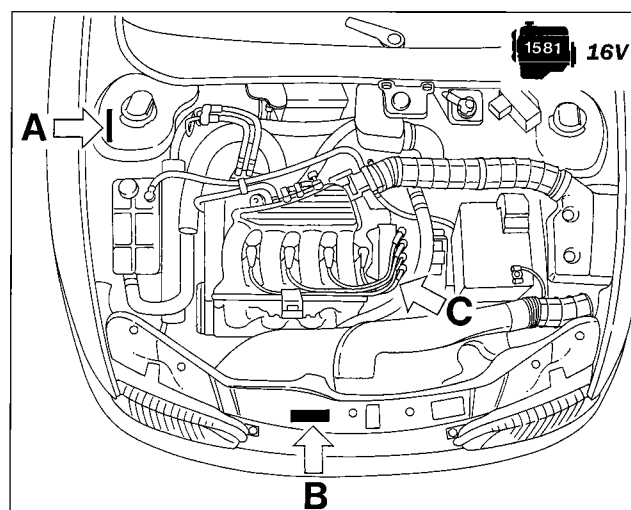
(●) Versions for specific markets (Germany)

(▲) Voluntary - Germany

(*) Versions for specific markets (France)

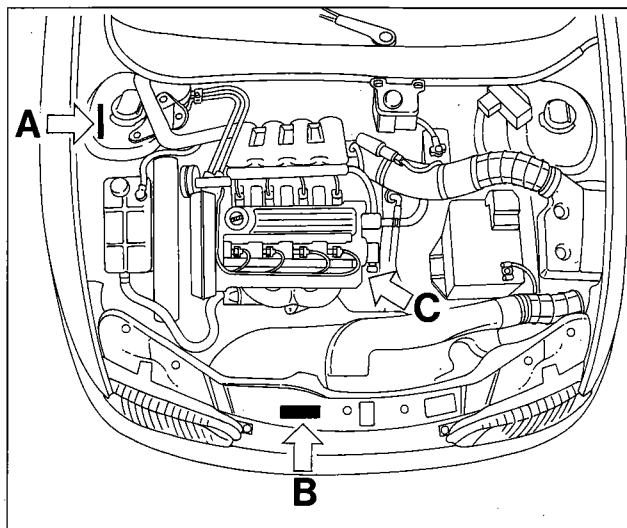


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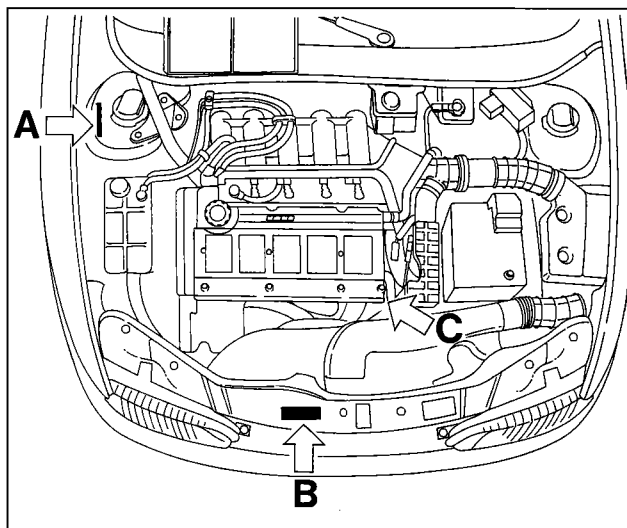
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1747 16V



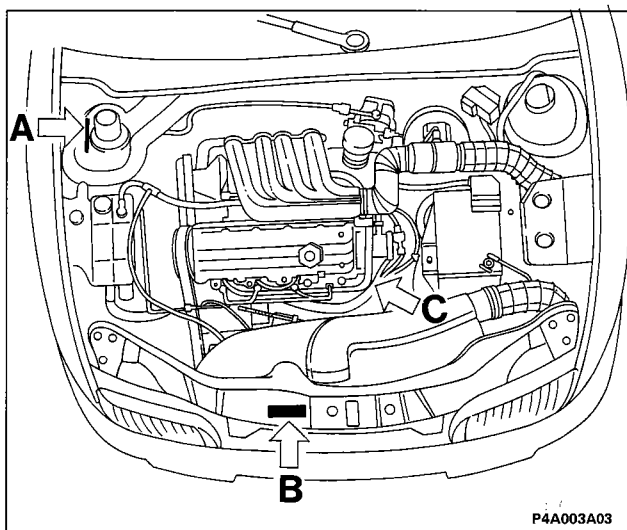
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1998 20V



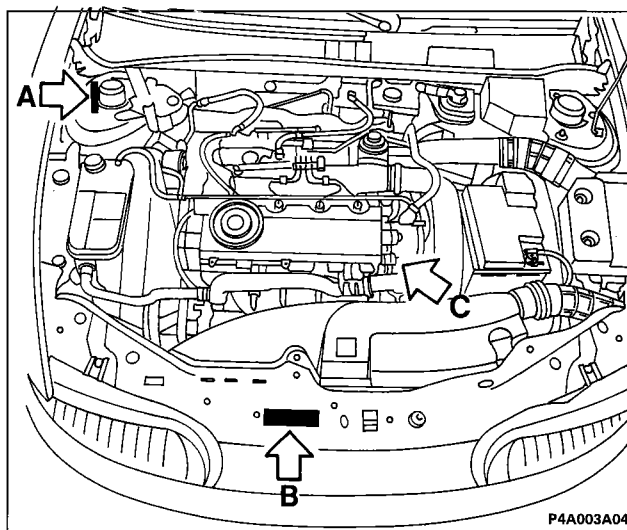
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1929 D



P4A003A03

1910 TD



P4A003A04

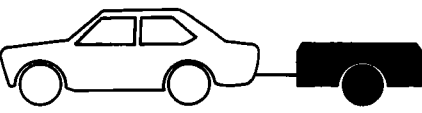
1. Vehicle type identification code and chassis manufacture number
2. Engine type and number.
3. V.I.N. Plate (EEC regulations)

	A	
	B	
C	☆	D
	E	Kg
	F	Kg
1-	G	Kg
2-	H	Kg
MOTORE-ENGINE		
VERSIONE-VERSION		
N° PER RICAMBI-N° FOR SPARES		
		N

F4A003A01

- A. Name of manufacturer
- B. Homologation number
- C. Vehicle type identification code
- D. Chassis manufacture number
- E. Maximum authorized weight of vehicle fully laden
- F. Maximum authorized weight of vehicle fully laden plus tow
- G. Maximum authorized weight on first axle (front)
- H. Maximum authorized weight on second axle (rear)
- I. Engine type
- L. Bodywork version code
- M. Spares number
- N. Correct value of smoke absorption coefficient (Diesel engines only)

WEIGHTS (in kg)

ENGINE TYPE		 12V	 16V	 16V	 20V	 D	 TD
  +500 = 	3 door	1010	1050	1100	1190	1100	N.D.
	5 door	1040	1090	1130	-	1130	N.D.
	3 door	1510	1550	1600	1690	1600	N.D.
	5 door	1570	1630	1680	-	1650	N.D.
Maximum permissible loads on the axles ■	3 door 	850	850	900	970	850	N.D.
	5 door	850	850	900	-	850	N.D.
	3 door 	850	850	900	900	850	N.D.
	5 door	850	850	900	-	850	N.D.
Maximum permissible load on the roof		80	80	80	80	80	N.D.
Load on the tow hook (trailer with braking system)	Minimum	-	-	-	-	-	N.D.
	Maximum	70	70	70	70	70	N.D.
	Without braking system	400	400	400	400	400	N.D.
	With braking system	1000	1100	1200	1300	1200	N.D.

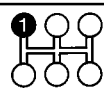
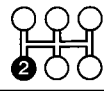
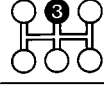
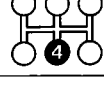
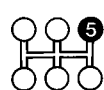
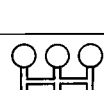
■ Loads which must never be exceeded

NOTE FOR VERSIONS WITH ACCESSORIES: If special equipment is fitted (non standard air conditioner, sun roof, trailer towing device), the empty weight increases and therefore the carrying capacity may decrease, in relation to the maximum permissible loads.

The fuel consumption figures according to the 80/1268/EEC standards given overleaf have been defined in the course of official tests and in accordance with procedures laid down by EEC regulations. In particular the bench tests measure simulated urban cycle figures whilst consumption at constant speeds of 90 and 120 kph are measured directly on a flat, dry road and in equivalent bench tests. The fuel consumption figures according to the 93/116E standards have been defined in the course of homologation tests involving:

- an urban cycle which includes cold starting followed by a varied urban cycle simulation.
- an extra-urban cycle which includes frequent acceleration in all gears simulating normal extra-urban usage of the vehicle. The speed varies between 0 and 120 kph.
- The average combined consumption is obtained from 37% of the urban cycle and 63% of the extra-urban cycle. The type of journey, traffic conditions, driving styles, atmospheric conditions, trim level/equipment/accessories, whether a roof rack is fitted, the presence of special equipment and the general state of the vehicle can lead to fuel consumption figures which differ from those obtained through the above mentioned procedures. The CO₂ exhaust emissions (in g/km) are obtained from the average combined cycle

(●) For French versions

		ENGINE TYPE	 12V	 16V	 16V	 20V	 D	 TD	
Speed kph (average load) 				45 (46▲)	52	50 (55●)	56	35	N.D.
				82 (80▲)	90	87 (95●)	89	61	N.D.
				120 (118▲)	132	128 (140●)	131	94	N.D.
				158 (155▲)	175	169 (191●)	172	132	N.D.
				170 (168■)	184 (180■)	193 (190●)	210	155	N.D.
				180 (177■)	190 (190●)				
%  Maximum climable gradient				46	53	50 (55●)	55	35	N.D.
				37 (36▲) (35▲)	37				
Fuel consumption according to 80/1268/CEE stand. (litres/100 km) (*) 		Urban cycle (A)	9	9,3	9,8 (9,5●)	11	6,5	N.D.	
		Constant speed 90 kph (B)	5,2	5,5	5,8 (5,6●)	7,1	4,9	N.D.	
		Constant speed 120 kph (C)	7	7,5	7,6 (6,9●)	8,7	6,9	N.D.	
		Av. consumption (CCMC proposal) A + B + C 3	7,1	7,4	7,7 (7,3●)	8,9	6,1	N.D.	
Fuel consumption according to 93/116/CE standards (litri/100 km) (*)		Urban	11,3	11,0	11,3(11●)	13,8	-	-	
			11,4	11,3	11,5(11,2●)	-	-	-	
		Extra-urban	6,0	6,5	6,5(6,3●)	7,2	-	-	
			6,1	6,6	6,6(6,3●)	-	-	-	
		Combined	7,9	8,2	8,3(8,0●)	9,6	-	-	
			8,0	8,3	8,4(8,1●)	-	-	-	
CO2 exhaust emissions (g/km)			188	194	197(191●)	228	-	-	
			191	197	199(193●)	-	-	-	

(●) Versions for specific markets (France)

(*) See specifications on previous page

(■) Versions for specific markets (Germany)

(▲) Versions with C513 gearbox

NOTE The figures with the shaded background refer to the Fiat Brava

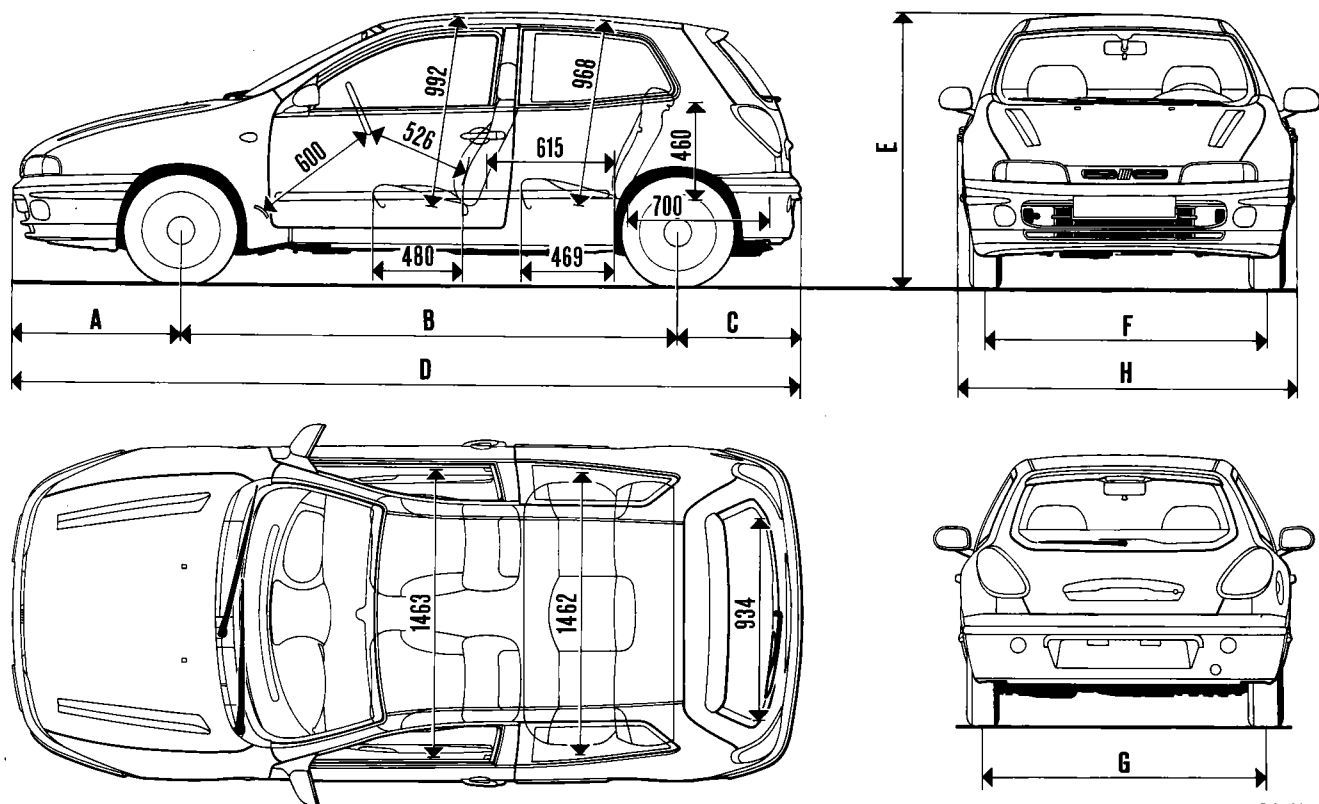
Introduction

Dimensions

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3 DOOR VERSIONS

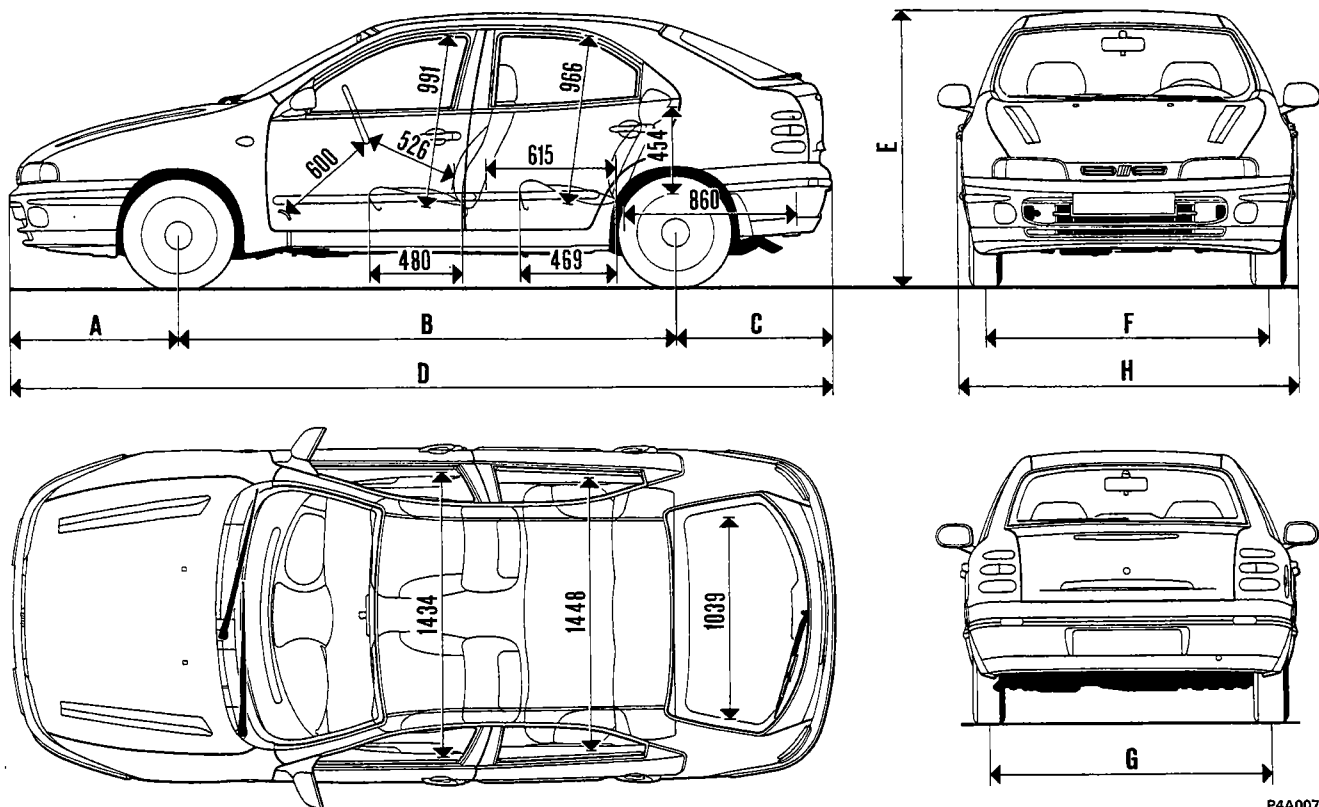
Bravo-Brava



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Engine type	Wheel rim	DIMENSIONS (mm)							
		A	B	C	D	E	F	G	H
1370 12V	5½J×14"-32 5½J×14"-37	858	2540	627	4025	1416	1461 1451	1463 1453	1755
1581 16V	6J×14"-43	858	2540	627	4025	1416	1439	1441	1755
1747 16V	6J×14"-43 6J×15"-40	858	2540	627	4025	1416	1439 1442	1441 1447	1755
1998 20V	6J×15"-49 6½×15"-49	864	2540	627	4025	1416	1471	1430	1755
1929 D	5½×14"-37	858	2540	627	4025	1416	1451	1453	1755
1910 TD	5½×14"-37 6J×14"-43	858	2540	627	4025	1411	1439	1441	1755

5 DOOR VERSIONS



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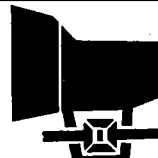
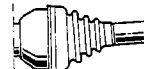
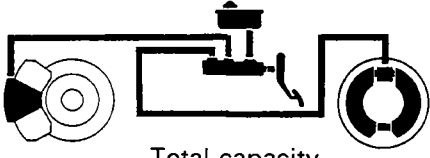
Engine type	Wheel rim	DIMENSIONS (mm)							
		A	B	C	D	E	F	G	H
1370 12V	5½J×14"-32	858	2540	789	4187	1413	1461	1463	1741
	5½J×14"-37						1451	1453	
1581 16V	5½J×14"-37	858	2540	789	4187	1413	1451	1453	1771
	6J×14"-43						1439	1441	
1747 16V	5½J×14"-37	858	2540	789	4187	1413	1451	1453	1741
	6J×14"-43						1439	1441	
1929 D	5½J×14"-37	858	2540	789	4187	1143	1451	1453	1741
1910 TD	5½J×14"-37	858	2540	789	4187	1408	1451	1453	1741
	6J×14"-43						1439	1441	

Technical data

Capacities

Bravo-Brava

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Capacities		Unit		Quantity	
				dm ³ (l)	(kg)
	Petrol ≥ O.R. 95 Unleaded	 	1370-1581	50	—
	Diesel		1747-1998	60	—
			1910 TD-1929 D	60	—
 50% +  (▲) 	 	   	1370	6(5,6■)	—
			1581	7(6,7■)	—
			1747	6,7(6,2■)	—
			1998	7,4(7,3■)	—
			1929 D	7,6(7,4■)	—
Petrol engines:  SELENIA 20K (SAE 10 W/40) Diesel engines SELENIA Turbo Diesel (SAE 15 W/40)		Total capacity 	1370	4,3	3,8
			1581	4,5	4
			1747	4,9	4,4
			1998	5,5	4,9
			1929 D	5,5	4,9
		Partial capacity (periodic replacement)  	1370	4,1(3,9●)	3,7(3,5●)
			1581	3,8(3,5●)	3,4(3,1●)
			1747	4,3(3,9●)	3,9(3,5●)
			1998	5(4,5●)	4,45(4●)
			1929 D	4,9(4,2●)	4,4(3,8●)
 a = TUTELA ZC 75 Synt  b = TUTELA GI/A 	 	1370	a	1,7	1,5
		1581-1747 1998-1929 D		2	1,8
			b	—	—
 a = TUTELA GI/A  b = K 854  b = TUTELA MRM2	a		a	—	0,8
	b		b	—	0,08
	c		c	—	0,003
 TUTELA TOP 4 (270°C)	 Total capacity	w/out ABS	0,40	—	
		with ABS	0,455 (0,54)* (0,43)**	—	
 +  AREXONS	 	3%	 	2,5÷5 (6,4 with headlamp washer)	—
		~ - 10°C		50%	
		~ - 20°C		100%	

- (▲) Distilled water
- (●) Engine sump only
- (■) For versions with air conditioning
- (*) For 1998 20V versions
- (**) For 1929 D versions



Service News

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10/97

FIAT

Fiat Auto S.p.A

D.M.C. - M.P.S. - Servizi Post Vendita

Tecnologie Assistenziali

Various models

models: Fiat Bravo-Fiat Brava - Fiat Marea - Fiat barchetta - Coupé Fiat

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15.97

0010 T 120 AA

CHANGING ENGINE OIL

Service literature update with new oil capacity figures



Cancels and replaces the subject in question published in Service News 4/97 through the variation of the figures for the Fiat Bravo TD, Fiat Brava TD and Fiat Marea TD

TYPE OF PROBLEM

The oil capacity figures in the "Owner's Handbook" and the Service Manuals are not consistent with actual capacities of the engine.

OPERATIONS IN THE NETWORK

When changing the engine oil stick to the figures given below which update the corresponding ones in the Service Manual and the Owner's Handbook.
Provide the Customer with appropriate information on the subject, as necessary.

Model/version	Engine sump, filter and pipes (1st filling)		Engine sump		Engine sump and oil filter	
	dm ³	Kg	dm ³	Kg	dm ³	Kg
Fiat Bravo 1.6	4,5	4,0	3,5	3,1	3,8	3,4
Fiat Brava 1.6	4,5	4,0	3,5	3,1	3,8	3,4
Fiat Marea 1.6	4,5	4,0	3,5	3,1	3,8	3,4
Fiat Bravo 1.8	4,6	4,1	3,9	3,5	4,3	3,85
Fiat Brava 1.8	4,6	4,1	3,9	3,5	4,3	3,85
Fiat Marea 1.8	4,6	4,1	3,9	3,5	4,3	3,85
Fiat barchetta	4,7	4,2	3,7	3,3	4,0	3,6
Coupé Fiat 1.8	5,0	4,5	4,0	3,6	4,4	3,9

Model/version	Engine sump, filter and pipes (1st filling)		Engine sump		Engine sump and oil filter	
	dm ³	Kg	dm ³	Kg	dm ³	Kg
Fiat Bravo TD 75 and TD 100	5	4,35	4,2	3,75	4,5	4,0
Fiat Brava TD 75 and TD 100	5	4,35	4,2	3,75	4,5	4,0
Fiat Marea TD 75	4,7	4,2	4,2	3,75	4,5	4,0
Fiat Marea TD 100	5	4,35	4,2	3,75	4,5	4,0
 Fiat Marea TD 125	 5,8	 5,1	 5,0	 4,4	 5,3	 4,7



Service News

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4/97

FIAT

Fiat Auto S.p.A
D.M.C. - M.P.S. - Servizi Post Vendita
Tecnologie Assistenziali

Various models

models: Fiat Bravo-Fiat Brava - Fiat Marea - Fiat barchetta - Coupé Fiat

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15.97

0010 T 120 AA

CHANGING ENGINE OIL

service literature update with new oil figures.



TYPE OF PROBLEM

The oil figures given in the "Owner's Handbooks" and the Service Manuals are not consistent with the actual engine capacities

OPERATIONS IN THE NETWORK

When changing the engine oil, refer to the figures given below which update the corresponding figures given in the Service Manual and the Owner's Handbook.

Please provide the Customer with suitable information on this subject, as appropriate.

Model/version	Engine sump, filter and pipes (1st filling)		Engine sump		Engine sump and oil filter	
	dm ³	Kg	dm ³	Kg	dm ³	Kg
Fiat Bravo 1.6	4,5	4,0	3,5	3,1	3,8	3,4
Fiat Brava 1.6	4,5	4,0	3,5	3,1	3,8	3,4
Fiat Marea 1.6	4,5	4,0	3,5	3,1	3,8	3,4
Fiat Bravo 1.8	4,6	4,1	3,9	3,5	4,3	3,85
Fiat Brava 1.8	4,6	4,1	3,9	3,5	4,3	3,85
Fiat Marea 1.8	4,6	4,1	3,9	3,5	4,3	3,85
Fiat barchetta	4,7	4,2	3,7	3,3	4,0	3,6
Coupé Fiat 1.8	5,0	4,5	4,0	3,6	4,4	3,9

Model/version	Engine sump, filter and pipes (1st filling)		Engine sump		Engine sump and oil filter	
	dm ³	Kg	dm ³	Kg	dm ³	Kg
Fiat Bravo TD 75 and TD 100	4,7	4,2	4,2	3,75	4,5	4,0
Fiat Brava TD 75 and TD 100	4,7	4,2	4,2	3,75	4,5	4,0
Fiat Marea TD 75 and TD 100	4,7	4,2	4,2	3,75	4,5	4,0
Fiat Marea TD 125	5,9	5,2	5,0	4,4	5,3	4,7

Name of product	Description International designation	Application
SELENIA SAE 15 W/40	Semi-synthetic multigrade engine oil. Exceeds specifications API SH, CCMC-G5 and UNI 20153	Temperature - 25°C ÷ 40°C
VS MAX SAE 15 W/40	Mineral based multigrade engine oil. Exceeds specifications API SG, CCMC-G4 and UNI 20153	Temperature - 15°C ÷ 40°C
SELENIA Turbo Diesel SAE 15 W/40	Semisynthetic, multigrade engine oil. Exceeds specifications API CD, CCMC-PD2, UNI 20153	Temperature - 15°C ÷ 40°C
VS MAX Diesel SAE 15 W/40	Multigrade mineral based engine oil. Exceeds specifications API CD, CCMC and UNI 20153	Temperature - 15°C ÷ 40°C
TUTELA ZC 80S	SAE 80W EP oil. Satisfies standards MIL-L-2105 and API GL4	Manual gearboxes and differentials
TUTELA ZC 90	Non EP SAE 80 W/90 oil, for manual gearboxes, containing anti-wear additives.	Gearboxes and non hypoid differentials
TUTELA W 90/M DA	Special SAE 80 W/90 EP oil for normal and self-locking differentials. Satisfies standards MIL-L-2105 D and API GL5	Hypoid differentials Self-locking differentials. Steering boxes
TUTELA GI/A	"DEXRON II" type oil for automatic transmissions	Automatic gearboxes. Power assisted steering
TUTELA CVT Universal	Oil for continuous variation automatic transmissions.	Continuous variation automatic transmissions
TUTELA JOTA 1	Lithium soap based grease, consistency NLGI = 1	Greasing the vehicle except for components particularly exposed to water requiring special greases
TUTELA MRM2	Water-repellant, lithium soap based grease containing molybdenum disulphide, consistency NLGI = 2	Constant velocity joints
TUTELA MR3	Lithium soap based grease, consistency NLGI= 3	Wheel hub bearings, st. rod, various components
TUTELA PLUS 3 (240 °C)	Synthetic fluid, F.M.V.S.S. n° 116 DOT 3 ISO 4925, CUNA NC 956-01	Hyd. brakes and hydraulically op. clutches
TUTELA TOP 4 (270 °C)	Synthetic fluid, F.M.V.S.S. n° 116 DOT 4 ISO 4925, CUNA NC 956-01	Hyd. brakes & hydraulically op. clutches
K 854	Lithium soap based grease, consistency NLGI = 000, containing molybdenum disulphide	Rack and pinion steering boxes
SP 349	Special grease compatible with brake fluid	Load proportioning valve Load proportioning valve rod bush
Arexons DP1	Mix. of alcohol, H2O & surf. act. agents CUNA NC 956-11	To be used neat or diluted in windscreen washer systems
ParafluTM	Mono-ethylene glycol based anti-freeze for cooling system, CUNA NC 596 - 16	Cooling circuits. Percentage to be used 50% up to - 35°C
Diesel Mix Arexons	Additive for diesel fuel with protective action for diesel engines	To be mixed with diesel fuel (25 cc per 10 litres)

Technical data

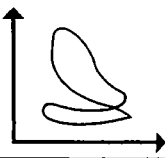
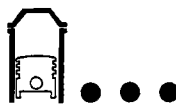
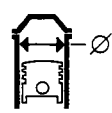
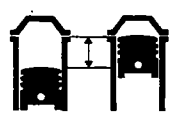
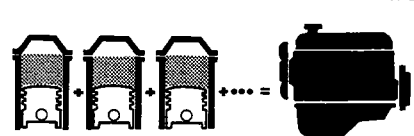
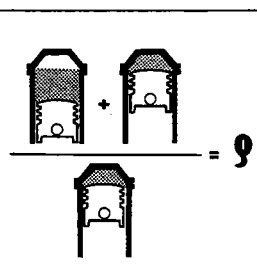
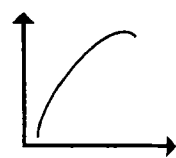
Bravo-Brava

Engine

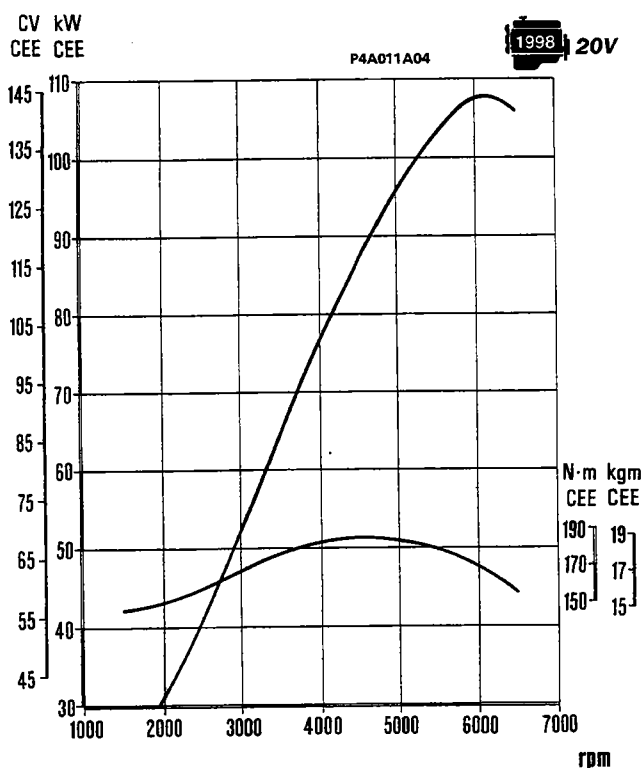
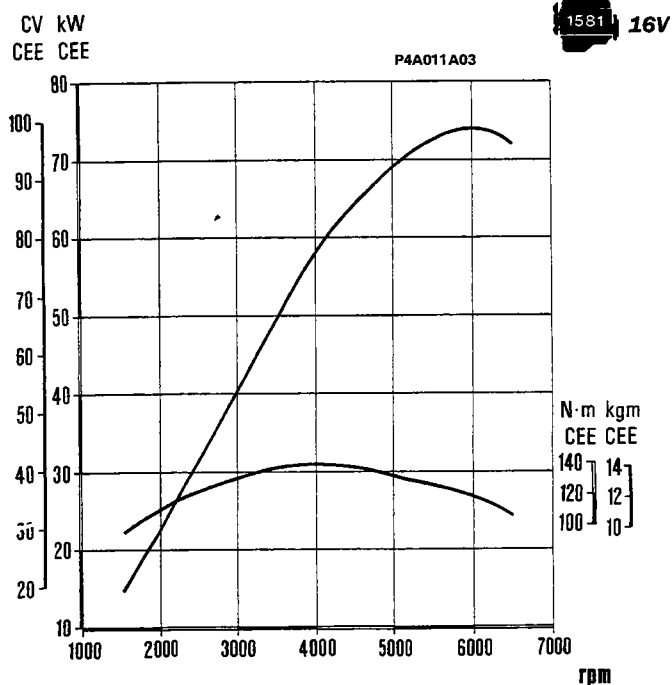
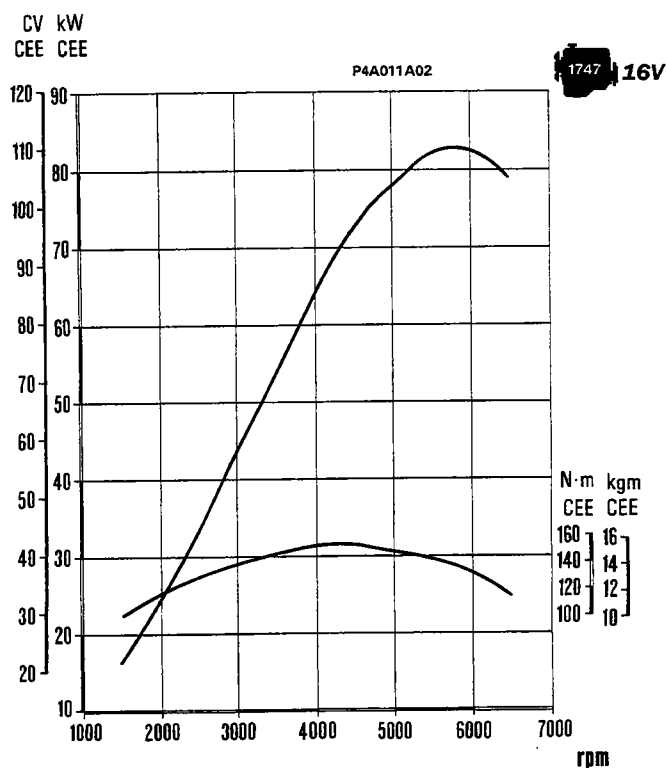
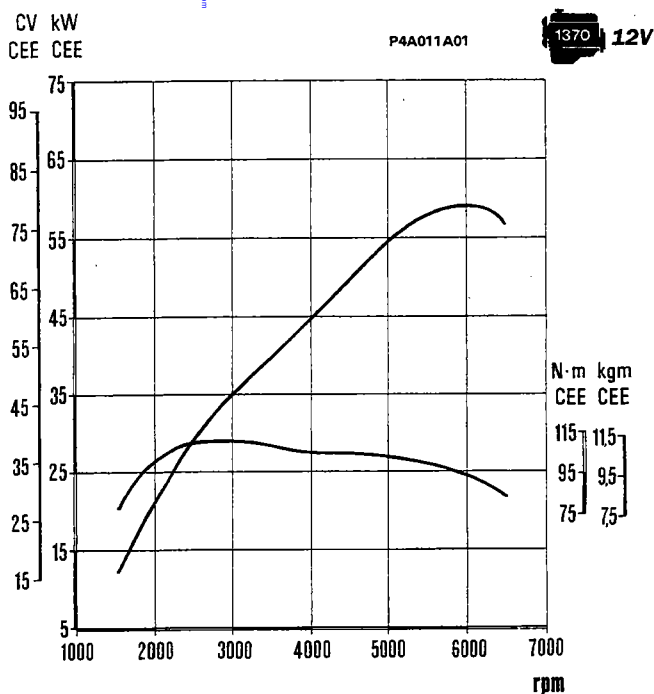
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 12V	 16V	 16V	 20V
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CHARACTERISTICS

	Cycle	OTTO 4 stroke			
	Timing	single overhead camshaft	twin overhead camshaft		
	Type of fuel system	integrated electronic injection/ignition			
 Number of cylinders		4			5
 Cylinder liner (bore)	mm	82	86,4	82	82
 Stroke	mm	64,87	67,4	82,7	75,65
 Capacity	cc	1370	1581	1747	1998
 Compression ratio		9,85±0,15	10,15±0,15	10,3±0,15	10±0,15
 Max power EEC	kW (CV)	59 (80)	59(*) (75)(*) 76 (103) 66(*) (90)(*)	83 (113)	108 (147)
	rpm	6000	5750 6000(*)	5800	6100
 Max torque EEC	daNm (kgm)	11,2 (11,4)	14,4 (14,7) 14(*) (14,3)(*)	15,4 (15,7)	18,6 (19)
	rpm	2750	4000	4400	4500

(*) For specific markets



Engine power curves obtained by EEC method

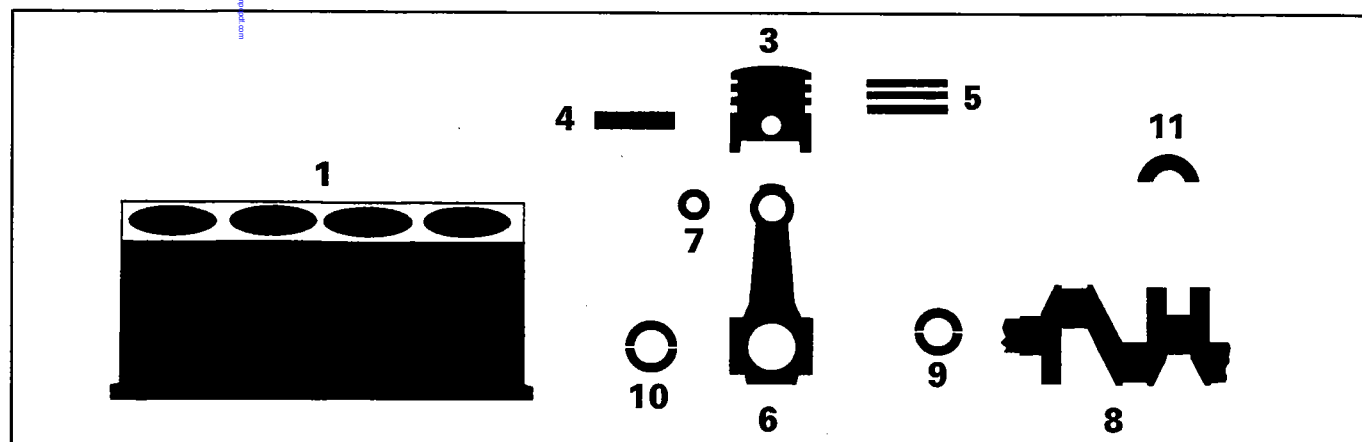
The power curves illustrated can be obtained with the engine overhauled and run in, without a fan and with a silencer and air filter fitted at sea level.

Technical data

Bravo-Brava

Engine: cylinder block/crankcase, crankshaft and associated components

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DESCRIPTION

Values in mm

	L	21,72÷21,80	-	21,72÷21,80
	L1	-	22,14÷22,20	-
Main bearing supports	Ø	56,705÷56,718	54,507÷54,520	56,705÷56,718 63,705÷63,718
	Ø1	-	38,700÷38,730	-
	Ø2	-	35,036÷35,066	-
Auxiliary shaft bush housings				
	A	82,000÷82,010	86,400÷86,410	82,000÷82,010
	B	82,010÷82,020	86,410÷86,420	82,010÷82,020
	C	82,020÷82,030	86,420÷86,430	82,020÷82,030
Cylinder bore	Ø			



Service News

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Fiat Bravo-Fiat Brava 1581 16v

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1028 C 301 AA

ENGINE PISTONS

rectifying diameter value indicated in the Service Manual



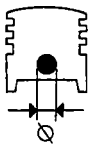
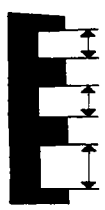
With reference to what is stated on page 13 of section 00 in the Service Manual Print no. 506.670, we wish to point out that the exact values for the engine piston diameters for the model in question are as follows:

A	86,352 ÷ 86,362
B	86,359 ÷ 86,371
C	86,368 ÷ 86,378

Please make a note, by hand, of the correct figures in the above mentioned publication.

 12V	 16V	 16V	 20V
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DESCRIPTION

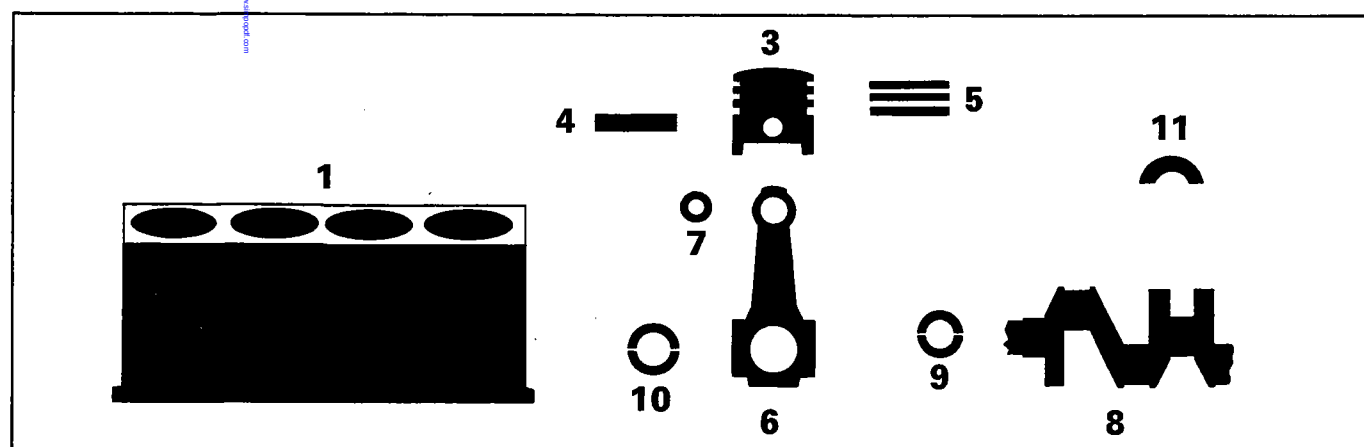
DESCRIPTION		Values in mm					
3 	X	12,5	13,2	12,5			
		A	81,952÷81,962	83,352 ⁸⁶ 83,352÷ 83,362 ⁸⁶ 83,362	81,952÷81,962		
		B	81,959÷81,971	83,359 ⁸⁶ 83,359÷ 83,371 ⁸⁶ 83,371	81,959÷81,971		
		C	81,968÷81,978	83,368 ⁸⁶ 83,368÷ 83,378 ⁸⁶ 83,378	81,968÷81,978		
		Piston	Ø FIA T >	0,4			
3 	Difference in weight between pistons		±5 g				
3-1 	Piston Cylinder bore	Ø	A	0,038 ÷ 0,058			
			B	0,039 ÷ 0,061			
			C	0,042 ÷ 0,062			
3 	Gudgeon pin housing	Ø	20,002÷20,007	21,997÷22,001	20,002÷20,007		
4 	Gudgeon pin	Ø	19,996÷20,000	21,990÷21,995	19,996÷20,000		
		Ø FIA T >	0,2				
4-3 	Gudgeon pin - Housing		0,002 ÷ 0,011				
3 	Piston ring grooves		1	1,540÷1,560	1,525÷1,545	1,540÷1,560	1,520÷1,540
			2	1,530÷1,550	1,510÷1,530	1,530÷1,550	1,510÷1,530
			3	3,020÷3,040	3,010÷3,030	3,020÷3,040	3,010÷3,030

Technical data

Bravo-Brava

Engine: cylinder block/crankcase, crankshaft and associated components

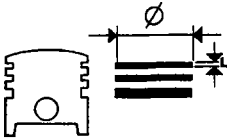
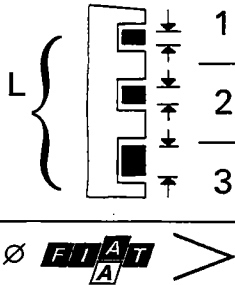
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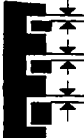


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DESCRIPTION

Values in mm

5		Piston rings		1	1,470÷1,490		1,475÷1,490	
				2	1,475÷1,490	1,470÷1,490	1,475÷1,490	
				3	2,935÷2,945		2,975÷2,990	
				0,4				

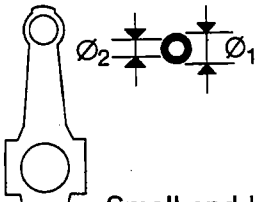
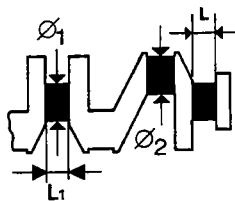
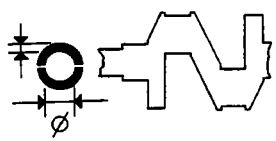
5-3		Piston rings Piston ring grooves		1	0,050÷0,090	0,035÷0,075	0,050÷0,085	0,030÷0,065
				2	0,040÷0,075	0,020÷0,060	0,040÷0,075	0,020÷0,055
				3	0,075÷0,105	0,065÷0,095	0,030÷0,065	0,020÷0,055

5-1		Opening at end of piston rings in cylinder bore		1	0,250÷0,500	0,200÷0,450	0,300÷0,500	
				2	0,300÷0,500	0,250÷0,500	0,300÷0,500	
				3	0,400÷1,400	0,400÷1,400	0,250÷0,450	0,250÷0,500

6		Small end bush or pin housing	Ø1	22,939÷22,972	23,939÷23,972	22,939÷22,972	
		Big end bearing housing	Ø2	44,000÷44,012	48,630÷48,646	53,897÷53,909	51,354÷51,366

 1370 12V	 1581 16V	 1747 16V	 1998 20V
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DESCRIPTION

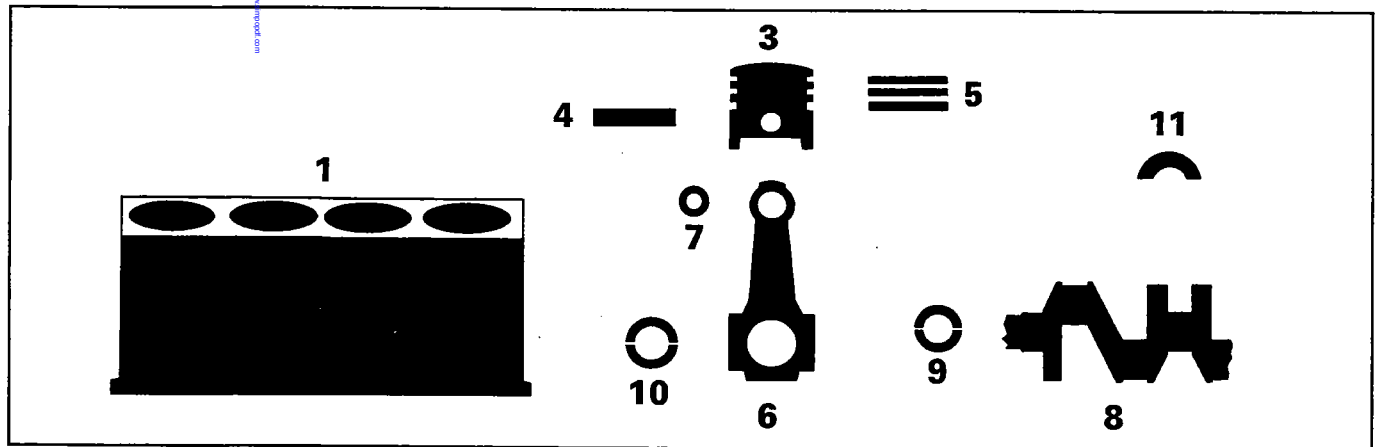
DESCRIPTION			Values in mm					
7		Small end bush	Ø1	23,007÷23,027	24,016÷24,041	23,007÷23,027		
			Ø2 	20,006÷20,012	22,004÷22,010	20,006÷20,012		
4-7		Gudgeon pin Small end bush		0,006÷0,016	0,009÷0,020	0,006÷0,020		
7-6		Small end bush Bush housing		0,035÷0,088	0,044÷0,102	0,035÷0,088		
8		Main journals	Ø1 {	1	52,994÷53,000	50,790÷50,800	52,994÷53,000	59,994÷60,000
				2	52,988÷52,994	50,780÷50,790	52,988÷52,994	59,988÷59,994
				3	52,982÷52,988	-	52,982÷52,988	59,982÷59,988
		Crank pins	Ø2 {	A	40,884÷40,890	45,513÷45,523	50,799÷50,805	48,238÷48,244
				B	40,878÷40,884	45,503÷45,513	50,793÷50,799	48,232÷48,238
				C	40,872÷40,878	-	50,787÷50,793	48,226÷48,232
		L	-	26,975÷27,025	-			
L1	26,575÷26,625	-	26,575÷26,625					
9		Crankshaft bearings	L { 	1	1,836÷1,840	1,840÷1,844	1,836÷1,840	
				2	1,839÷1,843	1,845÷1,849	1,839÷1,843	
				3	1,842÷1,846	-	1,842÷1,846	
				Ø  				0,254 - 0,508
9-8		Crankshaft bearing - Main journals		0,025÷0,052	0,019÷0,050	0,025÷0,052		

Technical data

Bravo-Brava

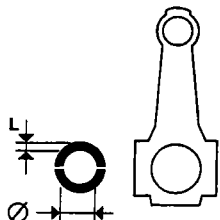
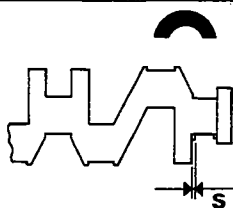
Engine: cylinder block/crankcase, crankshaft and associated components

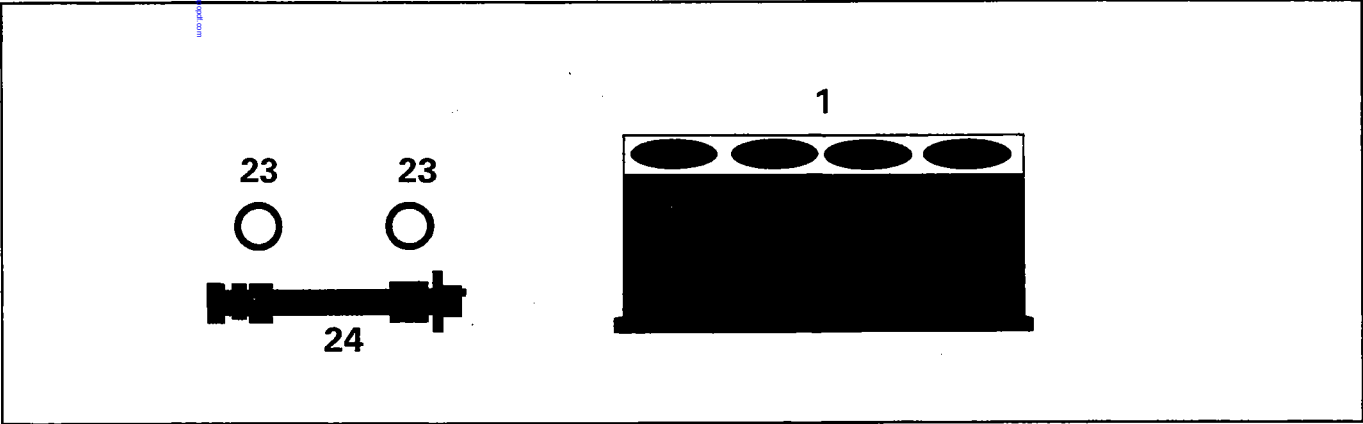
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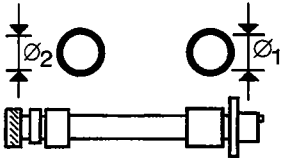
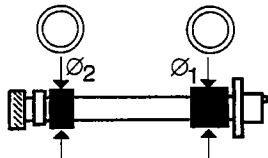


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DESCRIPTION

10		Crankshaft bearings L		A	1,536÷1,540	1,535÷1,541	1,527÷1,531	1,536÷1,540
				B	1,539÷1,543	1,540÷1,546	1,530÷1,534	1,539÷1,543
				C	1,542÷1,546	-	1,533÷1,537	1,542÷1,54
								
					0,254 - 0,508			
10-8		Big end bearings - Main journals		0,030÷0,056	0,025÷0,063	0,030÷0,056		
11		Thrust washers S	S		2,342÷2,358	2,310÷2,360	2,342÷2,358	
					0,127			
11-8		Crankshaft end float		0,059÷0,161	0,055÷0,265	0,059÷0,161		



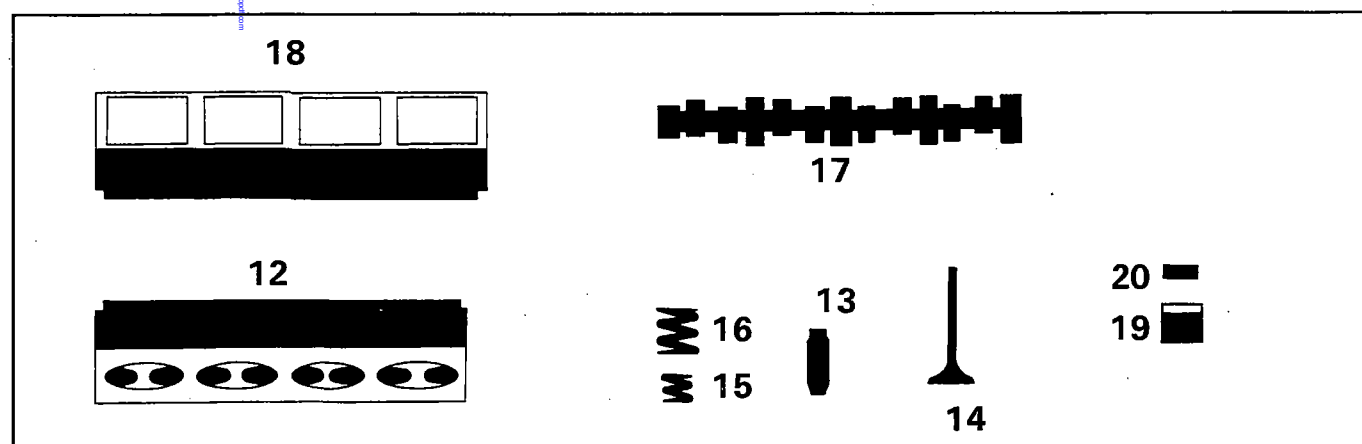
				
DESCRIPTION			Values in mm	
23			35,664 ÷ 35,684	
			32,000 ÷ 32,020	
Bushes for auxiliary shaft in housing				
24			35,593 ÷ 35,618	
			31,940 ÷ 31,960	
Auxiliary shaft bearings				
23-1		Bushes for shaft Cylinder block seats		must be an interference fit
24-23			0,046 ÷ 0,091	
			0,040 ÷ 0,080	
Shaft bushes Bushes				

Technical data

Bravo-Brava

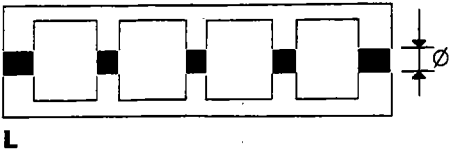
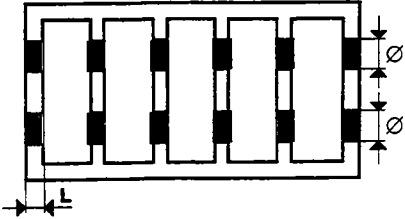
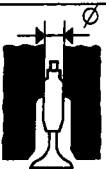
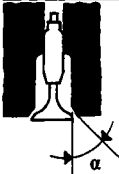
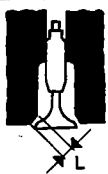
Engine: cylinder head assembly and valve gear components

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1370 12V	1581 16V	1747 16V	1998 20V
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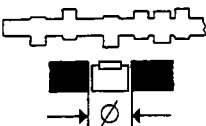
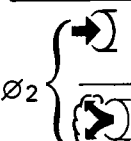
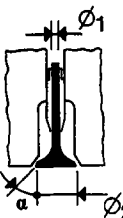
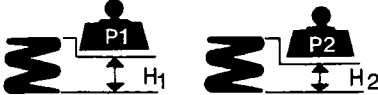
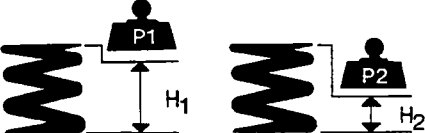
DESCRIPTION

Camshaft supports in cylinder head							
12b		$\varnothing$	26,045÷26,070	-	26,045÷26,070		
	12c		L (*)	19,100÷19,150	-	19,100÷19,150	
12		Valve guide bore in cylinder head	$\varnothing$	12,950 ÷ 12,977			
		Valve bore	α	45° ± 5'			
				45° ± 5'			
				L	about 2		
		Volume of combustion chamber in cylinder head	cm ³	-	37	-	39

(*) Measurement of cap

 1370 12V	 1581 16V	 1747 16V	 1998 20V
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DESCRIPTION

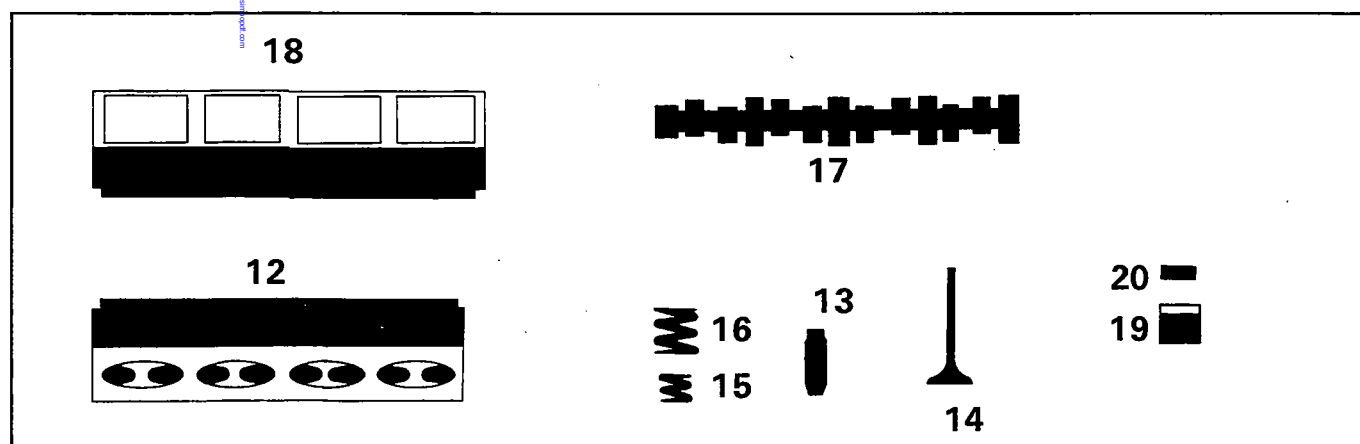
DESCRIPTION			Values in mm					
12		Tap. housing in cyl. head	Ø	14,000÷14,027	-	33,000÷33,025		
13		Valve guide	 	7,022 ÷ 7,040				
				13,010 ÷ 13,030				
				0,05 - 0,10 - 0,25				
13-12		Valve guide Bore in cylinder head	 	0,033 ÷ 0,080				
14		Valve	 	Ø ₁	6,982÷7,000	6,975÷6,990		
				Ø ₂	30,200÷34,500	33,400÷37,700	29,900÷30,200	
				α	45°30' ± 5'			
				Ø ₁	6,982÷7,000	6,974÷6,992	6,960÷6,975	
				Ø ₂	34,500÷35,700	29,750÷30,050	27,900÷28,200	25,900÷26,200
				α	45°30' ± 5'			
14-13		Valve Valve guide	 	0,022÷0,058		0,032÷0,065		
				0,022 - 0,058	0,030 - 0,066	0,047 - 0,080		
15		Internal valve spring	P ₁	-	9,61÷10,6 daN	11,08÷12,07daN		
			H ₁	-	29,5	29,5		
			P ₂	-	20,11÷22,07daN	21,58÷23,54daN		
			H ₂	-	20	20		
16		External valve spring	P ₁	33,35÷37,28 daN	23,54÷25,7 daN	27,07÷29,43 daN		
			H ₁	37	32	34		
			P ₂	55,42÷60,53 daN	46÷49,93 daN	48,46÷52,38 daN		
			H ₂	28,1	23,5	24,5		

Technical data

Bravo-Brava

Engine: cylinder head assembly and valve gear components

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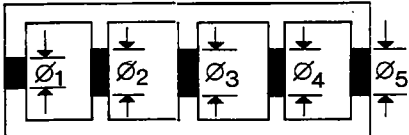
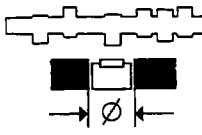
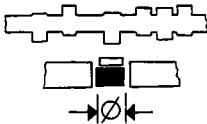
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DESCRIPTION

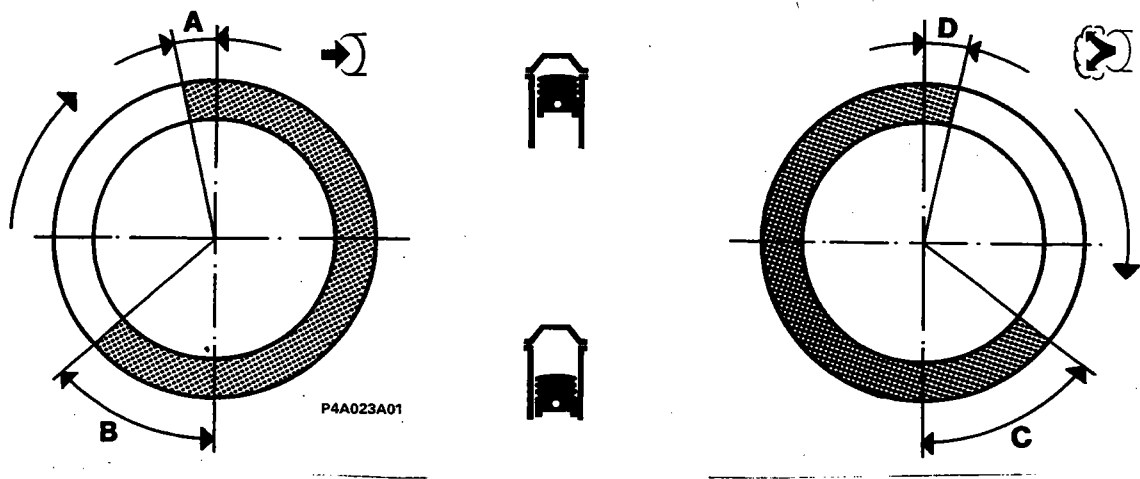
Camshaft bearings		Values in mm					
17a		Ø1	-	29,944÷29,960	-		
		Ø2	-	52,400÷52,415	-		
		Ø3	-	52,800÷52,815	-		
		Ø4	-	53,200÷53,215	-		
		Ø5	-	53,600÷53,615	-		
17b		Ø	26,000÷26,015	-	26,000÷26,015		
17c		L	19,250÷19,330	-	19,250÷19,330		
17a 17b		Cam lift		8,9	8,5	7	9
						7,5	8
12b-c 17b-c		Camshaft bushes Cylinder head supports	radial	0,030÷0,070	-	0,030÷0,070	
			axial	0,100÷0,230	-	0,100 ÷ 0,230	

 12V	 16V	 16V	 20V
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DESCRIPTION

		Values in mm		
18  Camshaft bearings in camshaft housing	Ø1	—	29,989÷30,014	—
	Ø2	—	52,445÷52,470	—
	Ø3	—	52,845÷52,870	—
	Ø4	—	53,245÷53,270	—
	Ø5	—	53,645÷53,670	—
	 Tappet housings Ø	—	30,000÷33,025	—
17-18	 Camshaft bearings Camshaft housing supports	—	0,030÷0,070	—
19	 Tappet Ø	13,972÷13,984	32,959÷32,975	
19-12	 Tappet Housing in cylinder head	0,016÷0,055	—	0,025 ÷ 0,066
19-18	 Tappet - Housing in camshaft housing	—	0,025÷0,066	—
17-20  clearance for timing check  operational clearance 		0,45		
		0,45		
		Hydraulic tappets		

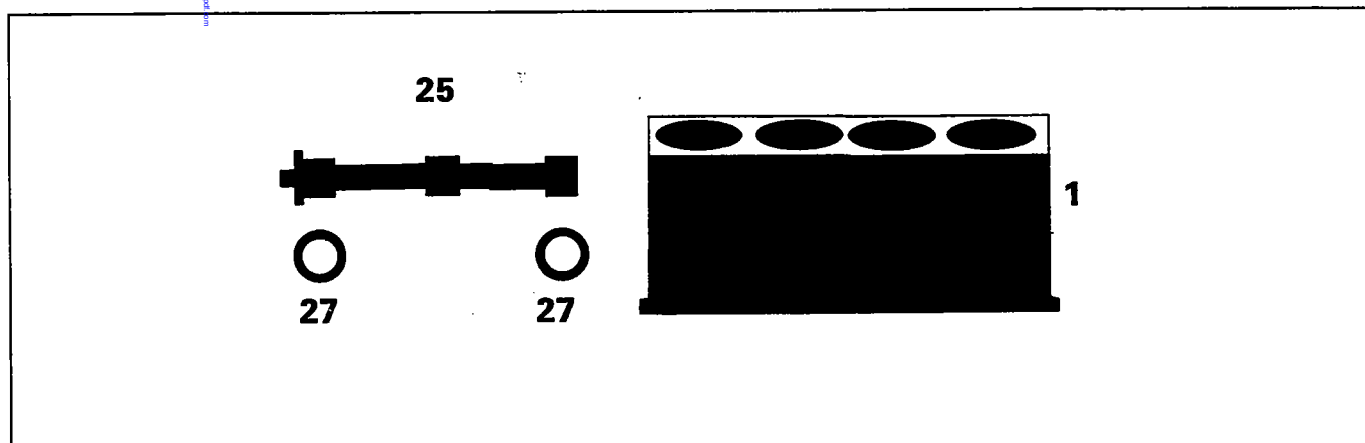
TIMING DIAGRAMS



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Timing angles

A	Inlet		opens before TDC	8°	4°	0°	9° after TDC
B			closes after BDC	25°	34°	27°	49°
C	Exhaust		opens before BDC	29°	36°	29°	27°
D			closes after TDC	7°	2°	2°	2°



DESCRIPTION

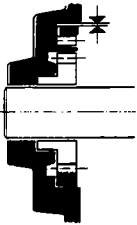
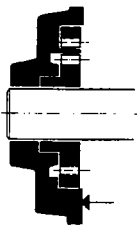
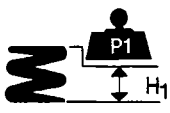
		Values in mm
25	Counter-balance shaft operation	through oil pump driven gear
27	 Ball bearings for counter-balance shaft	Ø1 19,900 ÷ 20,000
		Ø2 46,989 ÷ 47,000
25	 Counter-balance shaft bearings	Ø 19,980 ÷ 19,993
1	Bear. seats in cyl. block-cr/case	Ø 46,975 ÷ 47,000
27-1	 Ball bearings Cylinder block seats	+0,011 ÷ - 0,025
25-27	 Shaft bushes Ball bearings	+0,020 ÷ - 0,003

Technical data

Engine: lubrication

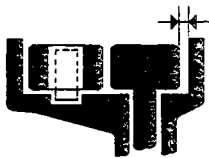
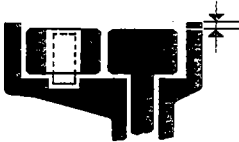
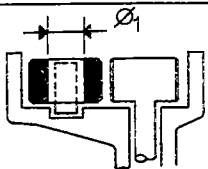
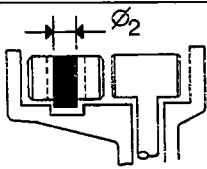
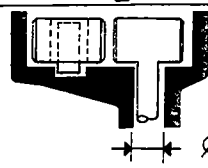
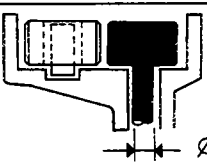
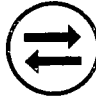
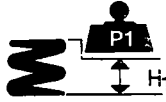
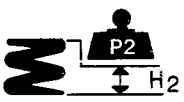
Bravo-Brava

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		 12V	 16V
LUBRICATION - Description		Values in mm	
Engine lubrication system		forced feed via lobe gear pump with cartridge filter in series	
Oil pump		lobe gears	
Pump operated		through crankshaft	
Oil pressure relief valve		incorporated in crankshaft front cover	
	between pump casing housing and driven gear	0,080 ÷ 0,186	
	between the upper side of the gears and the pump cover	0,025 ÷ 0,061	0,025 ÷ 0,070
Full flow filter		cartridge	
Insufficient oil pressure sender unit		electrical	
   Operating pressure at a temperature of 100°C		idling 1 bar at 4000 rpm 4 bar	3,43 ÷ 4,93 bar
 Oil pressure relief valve spring	P ₁	6,28 ÷ 7,03 daN	
	H ₁	36	



LUBRICATION – Description

Engine lubrication system	forced feed via geared pump with cartridge oil filter in series	
Oil pump: type	gears	
Pump operated	through auxiliary shaft	
Oil pressure relief valve	incorporated in oil pump	
Full flow filter	cartridge	
insufficient oil pressure sender unit	electrical	
 between the edge of the gears and the pump cover	0,110 ÷ 0,180	
 between the upper side of the gears and the pump cover	0,040 ÷ 0,106	
   $\varnothing_1$ $\varnothing_2$ $\varnothing_1 - \varnothing_2$	0,015 ÷ 0,048	
   $\varnothing_1$ $\varnothing_2$ $\varnothing_1 - \varnothing_2$	0,016 ÷ 0,048	
 between the drive gear and the driven gear	0,30	
   Operating pressure at a temperature of 100°C	idling > 1 bar at 4000 rpm > 3,7 bar	
 	P ₁	6,52 ÷ 6,82 daN
	H ₁	22,5
	P ₂	6,92 ÷ 7,21 daN
	H ₂	21

Technical data

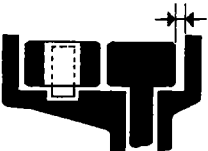
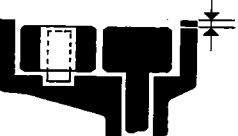
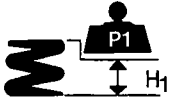
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Engine: lubrication

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LUBRICATION

		Values in mm
Engine lubrication system		forced feed, via lobe geared pump with cartridge oil filter in series
Oil pump		gears, located in the crankshaft front cover
Pump operated		through chain operated by crankshaft
Oil pressure relief valve		incorporated in crankshaft front cover
Full flow filter		cartridge
Insufficient oil pressure sender unit		electrical
 between the edge of the gears and the pump casing		0,110 ÷ 0,180
 between the upper edge of the gears and the pump cover		0,016 ÷ 0,086
 between the drive gear and the driven gear		0,30
   Operating pressure at a temperature of 100°C		idling 1 bar at 4000 rpm 4 bar
	P ₁	11,73 ÷ 12,51
Oil pressure relief valve spring	H ₁	35

 1370 12V	 1581 16V	 1747 16V	 1998 20V
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COOLING SYSTEM

Cooling circuit	coolant circulation via centi, radiator, expansion tank and electric fan operated by thermostatic switch				
Water pump operation	through belt				
 Thermal switch to engage fan (*)		1st stage	90° ÷ 94°C		
		2nd stage	95° ÷ 99°C (●)		
		1st stage	85° ÷ 89°C		
		2nd stage	90° ÷ 94°C (●)		
Engine coolant thermostat	opening	81° ÷ 85°C			
	max opening	101°÷105°C	99°÷103°C	98°÷102°C	101°÷105°C
	valve travel	9,5 mm		≥7,5 mm	9,5 mm
Fitting clearance between impeller vanes and pump casing		-	0,3÷1,1 mm	-	-
Press. for checking rad. water tightness	0,98 bar				
Pressure for checking calibration of exhaust spring on expansion tank cap	0,98 bar				

(●) For versions with air conditioning

(*) For the 1747 16v version the electric fan is operated by the control unit

FUEL SYSTEM

Type	Bosch Monomotronic SPI integrated electronic injection/ignition	Weber-Marelli I.A.W MPI integrated electronic injection/ignition	HITACHI MPI integrated electronic injection/ignition	Bosch Motronic integrated electronic injection/ignition Motronic
Pump	Electrical, immersed in tank			
Capacity	≥ 120 l/h			
Fuel pressure regulator setting	1 bar	3 bar		

CHECKING IDLE CONCENTRATION OF POLLUTANT EMISSIONS

	CO (%)	HC (p.p.m.)	CO ₂ (%)
Upstream of the catalytic converter	0,4 ÷ 1	≤ 600	≥ 12
Downstream of the catalytic converter	≤ 0,35	≤ 90	≥ 13

INTEGRATED ELECTRONIC INJECTION/IGNITION SYSTEM COMPONENTS



Electronic control unit	Bosch 0.261.203.868
Butterfly casing	Bosch 0.438.201.523
TDC and rpm sensor	Bosch 0.281.002.102
Fuel vapour solenoid valve	Bosch 0.280.142.300
Detonation sensor	Bosch 0.261.231.007
Coolant temperature sensor	Bosch 0.280.130.026
Electric fuel pump	Bosch 0.580.453.514
Lambda sensor	Bosch 0.258.008.688
Fuel filter	Bosch

COMPONENTS OF INTEGRATED ELECTRONIC INJECTION-IGNITION SYSTEM



Electronic control unit	I.A.W. – IAF.13 I.A.W. – IAF.17 (*) I.A.W. – IAF.23 (●)
Absolute pressure sender unit (barometric capsule)	M.Marelli PRT 03/02
Fuel vapour control solenoid	M.Marelli/SIEMENS EC1
Throttle case	M.Marelli 54 CFA 26
Idle adjustment actuator	B02/01
Injector	M.Marelli IWP 001
Air temperature sender unit	JAEGER ATS-04/01
Fuel pressure regulator	M.Marelli RPM 40
Coolant temperature sender unit	JAEGER 401930-01
Top dead centre and rpm sensor	JAEGER CVM 01
Throttle valve position sensor (potentiometer)	M.Marelli PF 1C
Dual relay activating fuel pump and injection-ignition control unit	BITRON NDRS 240 103/00
Electric fuel pump	WALBRO MSS 071/03
Lambda probe	NTK OZA112-A1
Fuel filter	Bosch A.450.024.262
Timing sensor	JAEGER SFA 200
Ignition coils	COOPER BAE 92 OA

(*) For specific markets

(●) For version with automatic transmission



COMPONENTS OF INTEGRATED ELECTRONIC INJECTION-IGNITION SYSTEM

Electronic control unit	HITACHI MFI-0
Air flow meter (hot wire)	HITACHI BX 106833
Injector	HITACHI GL 212264
Fuel pressure regulator	RPM 40/3 bar
Coolant temperature sensor	Bosch 0.280.130.055
Electric fuel pump	WALBRO MSS 071/01
Lambda probe	NTK 0ZA112-A2
Fuel filter	G.M. 25121074
Idle actuator	HITACHI GL 326716
Throttle valve position sensor (potentiometer)	HITACHI GL 326686
Fuel vapour control solenoid	DELCO REMY 1997199
Power module	HITACHI GE 107765
Top dead centre and rpm sensor	HITACHI GE 108101
Knock sensor	NGK KUE-03
Timing sensor	Bosch B.232.070.023
Throttle case	HITACHI GL 007582

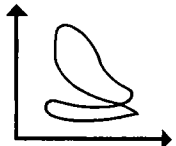
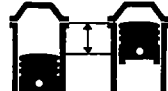
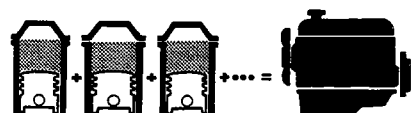
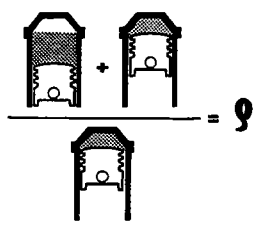
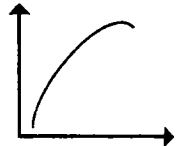
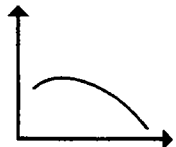
**INTEGRATED ELECTRONIC INJECTION/IGNITION
SYSTEM COMPONENTS**



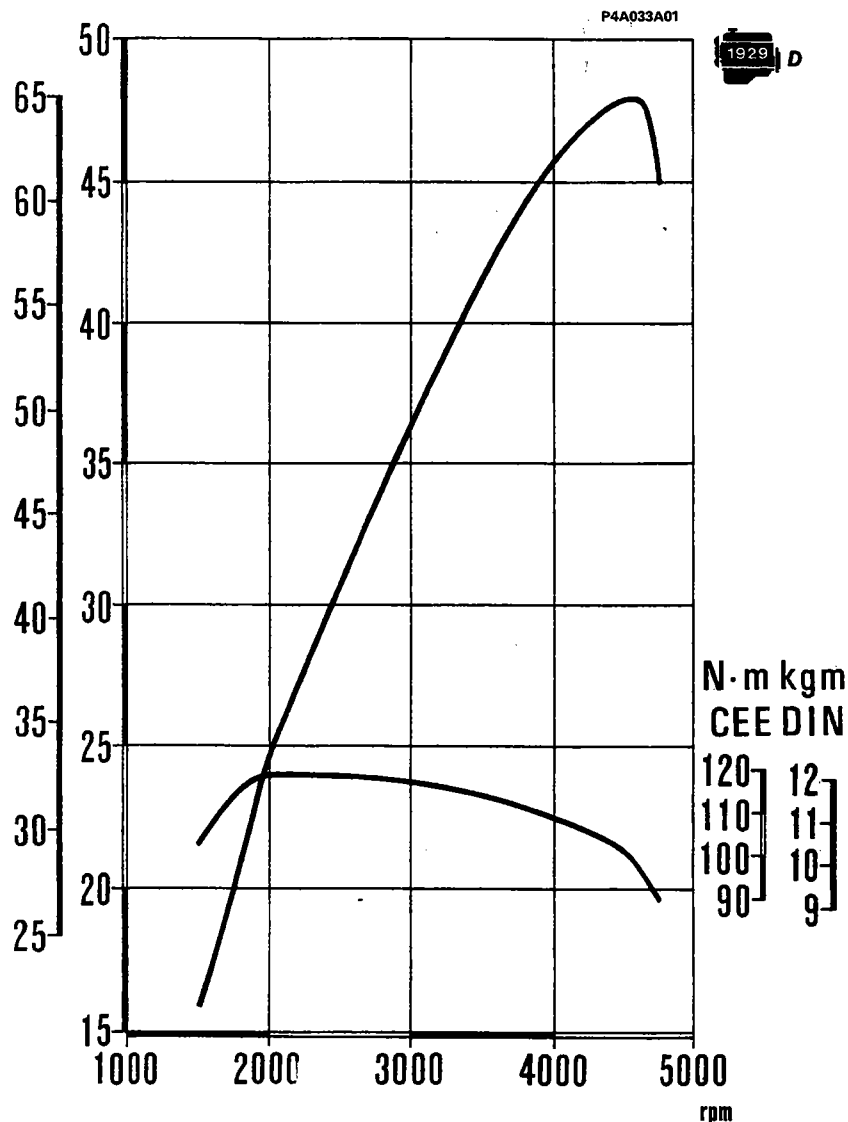
Injection/ignition system electronic control unit	Bosch 0.261.203.994
Butterfly casing	N.D.
Fuel pressure regulator	Bosch 0.280.160.515
Injector	Bosch 0.280.150.443
Idle adjustment actuator	Bosch 0.280.140.553
Electric fuel pump	Bosch 0.580.453.408
Air flow meter	Bosch 0.280.217.111
Fuel filter	Bosch A.450.024.262
Butterfly valve position sensor (potentiometer)	Bosch 0.280.122.001
Coolant temperature sensor	Bosch 0.280.130.026
Lambda sensor	Bosch 0.258.003.466
Fuel vapour solenoid valve	Bosch 0.280.142.300
Detonation sensor	Bosch 0.261.231.095
Hall effect injection timing sensor	Bosch 0.232.101.026
Intake air temperature sender unit	Bosch 0.280.130.073
TDC and rpm sensor	Bosch 0.281.002.102



CHARACTERISTICS

	Cycle	DIESEL 4 stroke	
	Timing	single overhead camshaft	
	Type of fuel system	Indirect mechanical injection	
 	Number of cylinders	4	
	Cylinder liner (bore) mm	82,6	N.D.
	Stroke mm	90	N.D.
	Capacity cc	1929	N.D.
	Compression ratio	21 ± 0,5	N.D.
Total volume of combustion chamber cc		24,11	N.D.
	Max power EEC	kW (CV) 48 (65)	N.D.
	rpm	4600	N.D.
 	Max torque EEC	daNm (kgm) 11,9 (12,1)	N.D.
	rpm	2000	N.D.

CV kW
 DIN CEE



Test speed (rpm)	Time in minutes	Load on the brakes
800÷1000	10'	no load
1500	10'	no load
2000	10'	no load

Test bench cycles of overhauled engines

During the bench test of the overhauled engine it is not advisable to run the engine at maximum speed, but to stick to the figures given in the table; complete the running in of the engine in the vehicle.

Engine power curves obtained by EEC method

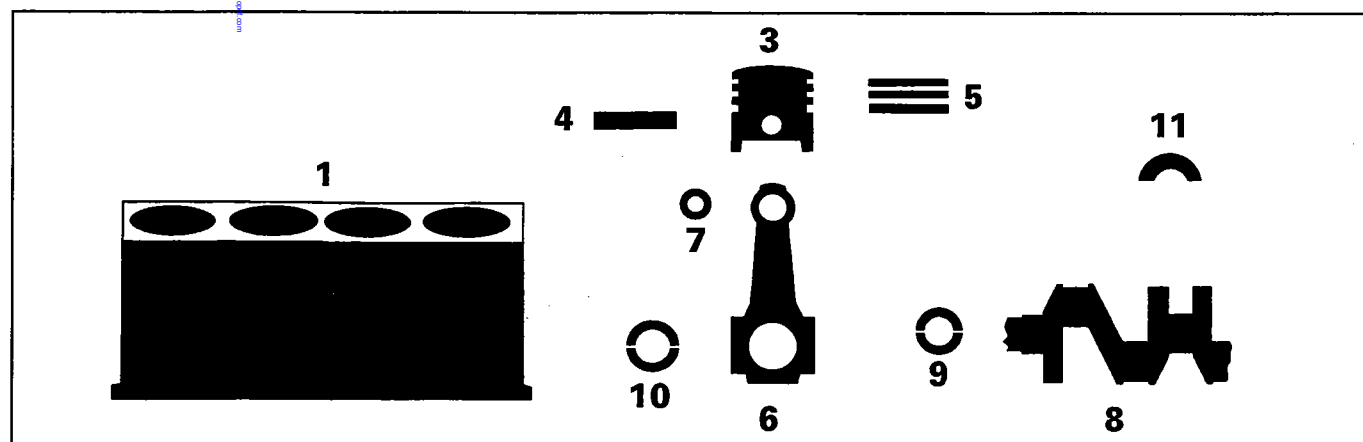
The power curves illustrated can be obtained with the engine overhauled and run in, without a fan and with a silencer and air filter fitted at sea level.

Technical data

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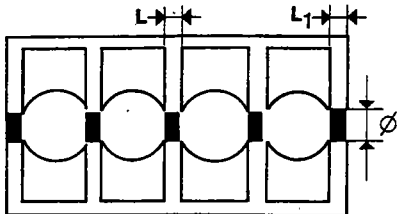
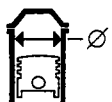
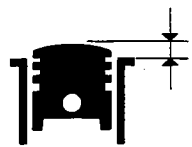
Engine: cylinder block/crankcase, crankshaft and associated components

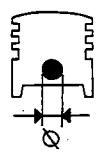
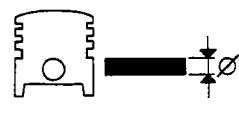
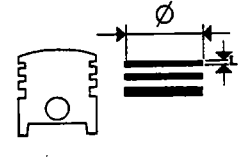
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DESCRIPTION

Values in mm

1  Main bearing supports	L	-	21,720 ÷ 21,800
	L1	23,100 ÷ 23,200	-
	Ø	56,717 ÷ 56,735	56,705 ÷ 56,718
 Cylinder bore Ø {	A	82,600 ÷ 82,610	82,000 ÷ 82,010
	B	82,610 ÷ 82,620	82,010 ÷ 82,020
	C	82,620 ÷ 82,630	82,020 ÷ 82,030
3  Piston Ø { Ø F I A T >	X	15	10
	A	82,520 ÷ 82,555	81,930 ÷ 81,940
	C	82,530 ÷ 82,540	81,940 ÷ 81,950
	E	82,540 ÷ 82,550	81,950 ÷ 81,960
	0,4		
3-1  Piston projection	0,367 ÷ 0,832		
3  Diff. in weight between pistons	± 5 g		
3-1  Piston Cylinder bore	0,070 ÷ 0,090		
		0,060 ÷ 0,080	

		 	
DESCRIPTION		Values in mm	
3	 Gudgeon pin housing	$24,994 \div 24,999$	$25,991 \div 25,996$
3	 Piston ring grooves	1 $2,175 \div 2,205$	$2,675 \div 2,705 (*)$
		2 $2,010 \div 2,030$	
		3 $3,020 \div 3,040$	
4	 Gudgeon pin	$24,987 \div 24,991$	$25,982 \div 25,987$
	$\varnothing$  $>$	0,2	
4-3	 Gudgeon pin - Housing	$0,003 \div 0,012$	$0,004 \div 0,014$
5	 Piston rings	1 $2,075 \div 2,095$	$2,575 \div 2,595 (**)$
		2 $1,978 \div 1,990$	$1,970 \div 1,990$
		3 $2,975 \div 2,990$	$2,975 \div 3,010$
	$\varnothing$  $>$	0,4	
5-3	 Piston rings Piston ring grooves	1 $0,080 \div 0,130 (**)$	
		2 $0,020 \div 0,052$	$0,020 \div 0,060$
		3 $0,030 \div 0,065$	$0,010 \div 0,065$
5-1	 Opening at end of piston rings in cylinder bore	1 $0,300 \div 0,500$	$0,200 \div 0,400$
		2 $0,300 \div 0,500$	$0,250 \div 0,500$
		3 $0,250 \div 0,500$	$0,250 \div 0,500$

(*) Measured at the 79.6 mm diameter

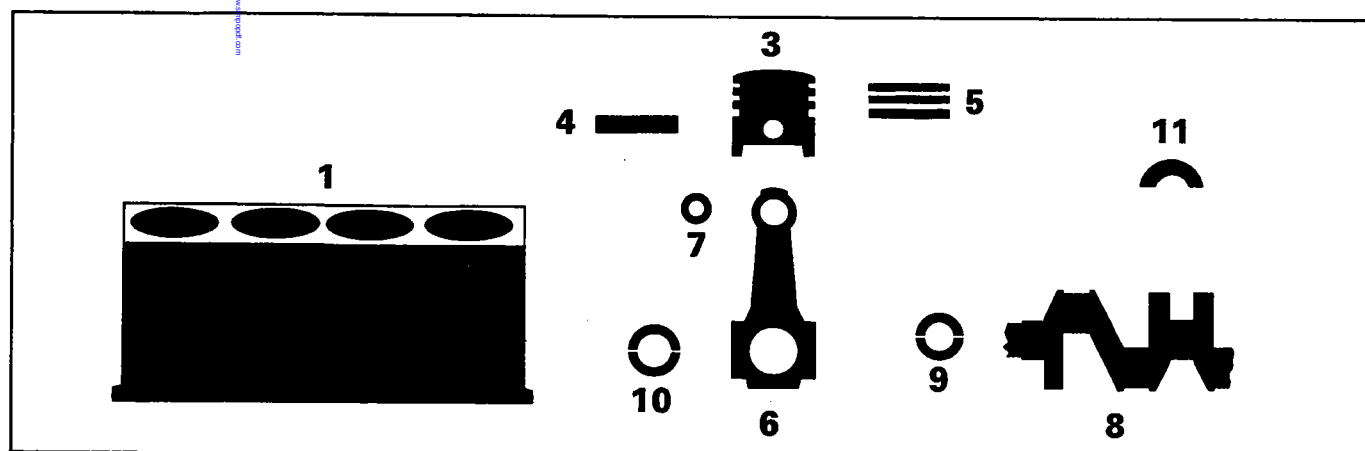
(**) Measured 1.5 mm from outside edge

Technical data

Bravo-Brava

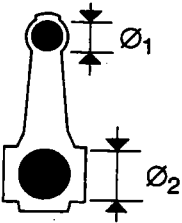
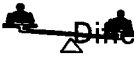
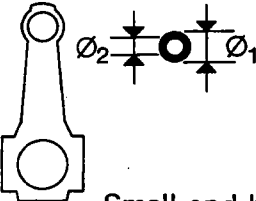
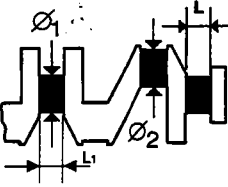
Engine: cylinder block/crankcase, crankshaft and associated components

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DESCRIPTION

Values in mm

Values in mm						
6		Small end bush or pin housing	Ø1	26,939 ÷ 26,972	28,939 ÷ 28,972	
		Big end bearing housing	Ø2	53,897 ÷ 53,913	53,897 ÷ 53,909	
6	 Difference in weight between con rods			± 2,5 g		
7			Ø1	27,020 ÷ 27,060	29,018 ÷ 29,038	
		Small end bush	Ø2 	25,004 ÷ 25,009	26,006 ÷ 26,012	
4-7		Gudgeon pin Small end bush		0,013 ÷ 0,022	0,019 ÷ 0,030	
7-6		Small end bush Bush housing		0,048 ÷ 0,121	0,046 ÷ 0,099	
8		Main journals	Ø1	1	52,995 ÷ 53,004	52,994 ÷ 53,000
				2	52,986 ÷ 52,995	52,988 ÷ 52,994
				3	-	52,982 ÷ 52,988
		Crank pins	Ø2	A	50,796 ÷ 50,805	50,799 ÷ 50,805
				B	50,787 ÷ 50,796	50,793 ÷ 50,799
				C	-	50,787 ÷ 50,793
				L	27,975 ÷ 28,025	-
				L1	-	26 575 ÷ 26 625

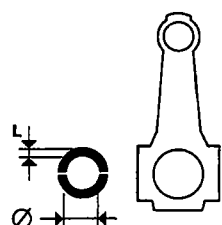
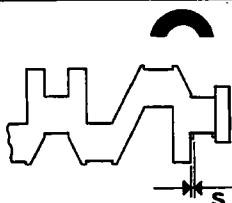
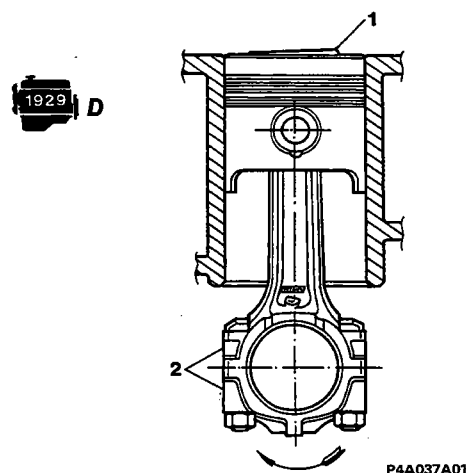
					
DESCRIPTION			Values in mm		
9		Crankshaft bearings 	L { 1	1,839 ÷ 1,843	1,836 ÷ 1,840
			2	1,843 ÷ 1,847	1,839 ÷ 1,843
			3	-	1,842 ÷ 1,846
			Ø  <		0,254 - 0,508
9-8		Crankshaft bearings - Main journals	0,027 ÷ 0,062		0,025 ÷ 0,052
10		Big end bearings 	L { A	1,528 ÷ 1,532	1,527 ÷ 1,531
			B	1,533 ÷ 1,537	1,530 ÷ 1,534
			C	-	1,533 ÷ 1,537
			Ø  <		0,254 - 0,508
10-8		Big end bearings - Main journals	0,028 ÷ 0,061		0,030 ÷ 0,056
11		Thrust washers 	S	2,310 ÷ 2,360	2,342 ÷ 2,358
			S  >		0,127
11-8		Crankshaft end float	0,055 ÷ 0,305		0,059 ÷ 0,179

Diagram showing fitting of connecting rod-piston assembly and direction of rotation in engine

1. Projection on piston crown
2. Area where matching number of cylinder bore to which connecting rod belongs is stamped

The arrow shows the direction of rotation of the engine as seen from the timing side



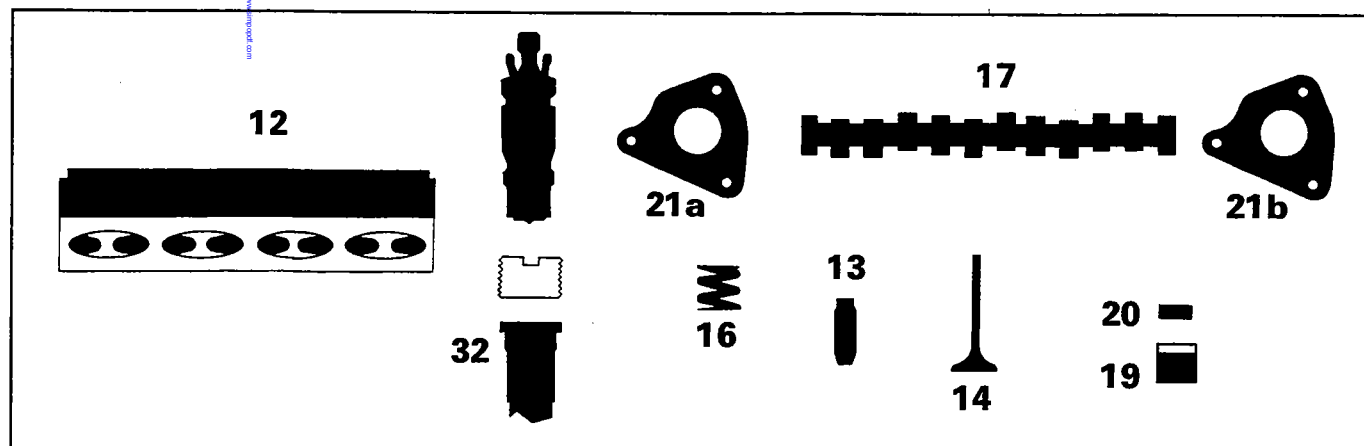
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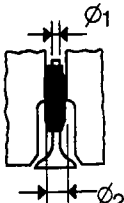
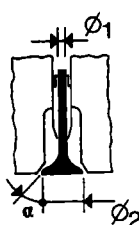
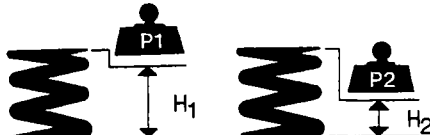
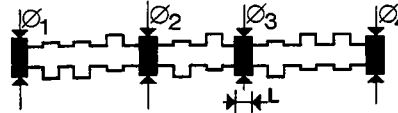
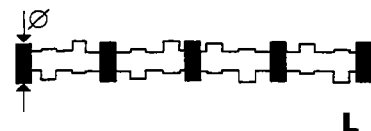
Engine: cylinder head assembly and valve gear components

00.10



DESCRIPTION		Values in mm	
Valve guide bore in cylinder head	$\varnothing$	13,950 ÷ 13,977	
Valve seats	α	45° ± 5'	
	L	about 2.7	
Camshaft bearing housings in cylinder head	$\varnothing_1$	43,020 ÷ 43,040	-
	$\varnothing_2$	25,545 ÷ 25,570	-
	$\varnothing_3$	24,045 ÷ 24,070	-
	$\varnothing_4$	43,020 ÷ 43,040	-
	L^*	18,950 ÷ 19,030	-
Camshaft supports	$\varnothing$	-	26,045 ÷ 26,070
	L^*	-	19,100 ÷ 19,150
Tap. housing	$\varnothing$	37,000 ÷ 37,025	

(*) Measurement of cap

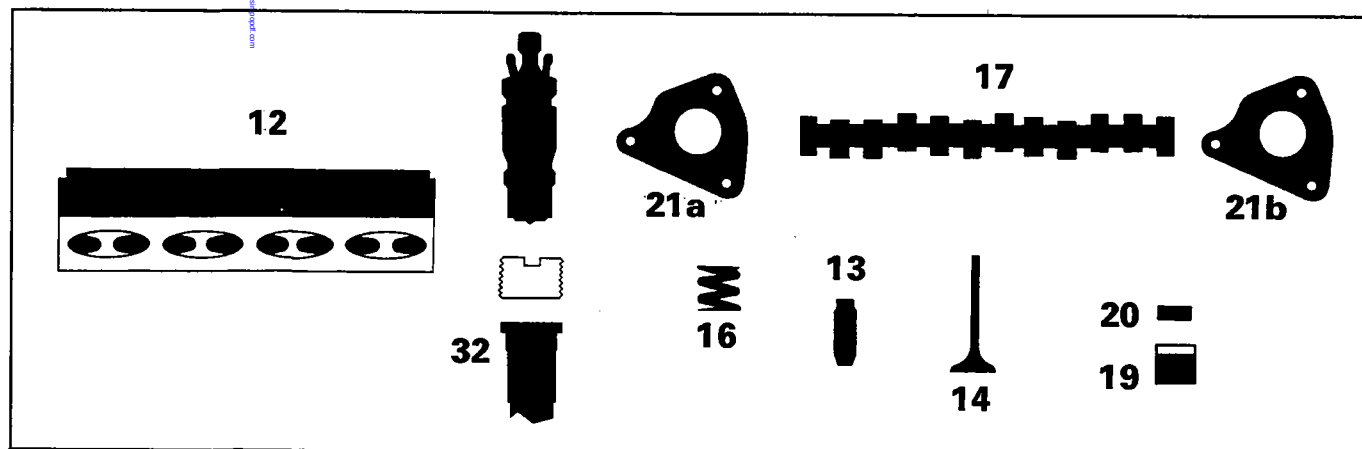
		 1929 D		 1910 TD	
DESCRIPTION		Values in mm			
13 	Valve guide 	ϕ_1 ϕ_2 	8,022 ÷ 8,040		
			14,040 ÷ 14,058	14,010 ÷ 14,030	
			0,05 - 0,10 - 0,25		
13-12 	Valve guide Bore in cylinder head		0,061 ÷ 0,108	0,033 ÷ 0,080	
14 	Valve  	ϕ_1 ϕ_2 α	7,974 ÷ 7,992		
			37,300 ÷ 37,600		
			45°30' ± 7'		
		ϕ_1 ϕ_2 α	7,974 ÷ 7,992		
			33,300 ÷ 33,600	30,900 ÷ 31,200	
			45°30' ± 7'		
14-13	Valve - Valve guide		0,030 ÷ 0,066		
16 	Valve spring	P ₁	36,69 ÷ 39,63 daN		
		H ₁	36		
		P ₂	55,91 ÷ 60,82 daN		
		H ₂	26,5		
17 	Camshaft bearings	ϕ_1	29,945 ÷ 29,960	-	
		ϕ_2	25,500 ÷ 25,515	-	
		ϕ_3	24,000 ÷ 24,015	-	
		ϕ_4	23,945 ÷ 23,960	-	
		L	19,100 ÷ 19,200	-	
			ϕ	-	26,000 ÷ 26,015
	L	-	19,250 ÷ 19,330		

Technical data

Bravo-Brava

Engine: cylinder head assembly and valve gear components

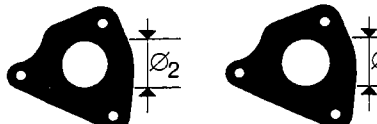
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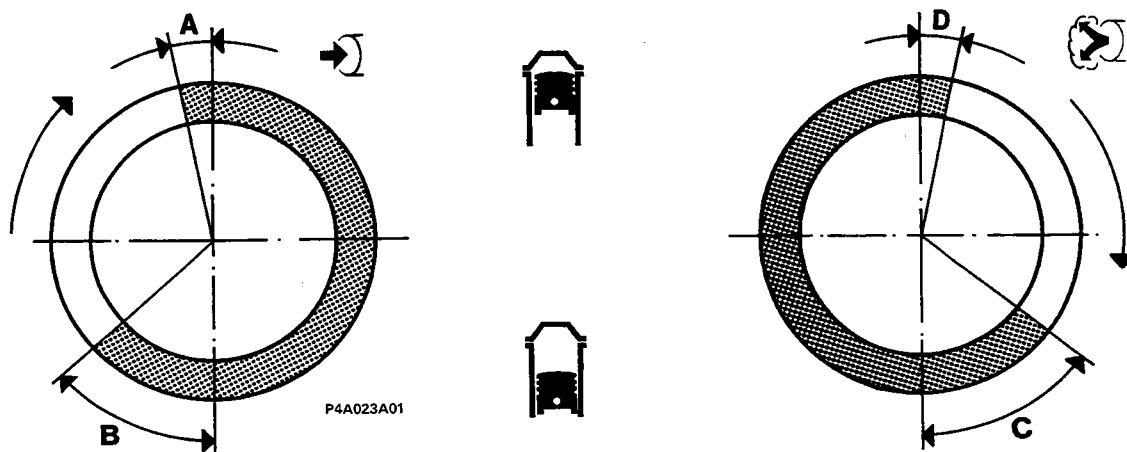
				1929 D	1910 TD
DESCRIPTION				Values in mm	
17-12		radial		0,030 ÷ 0,070	
		axial		0,070 ÷ 0,250	0,100 ÷ 0,230
17		Cam lift		9,7	8,5
				9,7	8,5
19		Tappet	Ø	36,975 ÷ 36,995	
19-12		Tappet - Cylinder head		0,005 ÷ 0,050	
20		Shim	S (0,05)	3,25 ÷ 4,70	
17-20		clearance for timing check		0,50	
				0,50	
		operational clearance		0,30 ± 0,05	
				0,35 ± 0,05	

	
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DESCRIPTION

		Values in mm	
21a-21b Camshaft supports  	$\varnothing_1$	23,990 ÷ 24,015	-
	$\varnothing_2$	29,990 ÷ 30,015	-
17-21a 17-21b	 	Camshaft Supports	0,030 ÷ 0,070
32-12 	Variation between ante-chamber plane and cylinder head plane	- 0,765 ÷ 0,055	- 0,150 ÷ -0,3

TIMING DIAGRAMS



Timing angles

A Inlet		opens before TDC	10°	N.D.
		closes after BDC	42°	N.D.
C Exhaust		opens before BDC	50°	N.D.
		closes after TDC	2°	N.D.

Technical data

Bravo-Brava

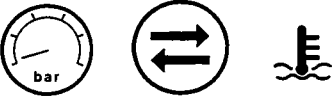
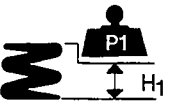
Engine: lubrication - cooling system

00.10



LUBRICATION

Values in mm

Engine lubrication system	forced circulation via lobe gear pump with cartridge filter in series	
Oil pump	lobe gears	
Pump operated	through crankshaft	
Oil pressure relief valve	incorporated in crankshaft front cover	
 between pump casing housing and driven gear	0,080 ÷ 0,186	
 between the upper side of the gears and the pump cover	0,025 ÷ 0,056	
Full flow filter	cartridge	
Insufficient oil pressure sender unit	electrical	
 Operating pressure at a temperature of 100°C	3,43 ÷ 4,9 bar	
 Oil pressure relief valve spring	P ₁	6,27 ÷ 7,06 daN
	H ₁	36

COOLING SYSTEM

Cooling circuit		coolant circulation via centrifugal pump, radiator and two speed electrical fan operated by two speed thermostatic switch	
Water pump operation		through belt	
 Thermal switch to engage fan		1st speed	2nd speed
		86°÷90°C	90°÷94°C
		81°÷85°C	85°÷89°C
Engine coolant thermostat	opening	78°÷82°C	
	max opening	86°÷90°C	
	valve travel	≥7,5 mm	
Fitting clearance between impeller vanes and pump casing		0,53÷1,37 mm	
Press. for checking rad. water tightness		0,78 bar	
Pressure for checking calibration of exhaust valve on expansion tank cap		0,78 bar	

FUEL SYSTEM

Firing order	1 - 3 - 4 - 2		
Rotary type injection pump	LUCAS	FT 05	N.D.
Injector	LUCAS	LCR 6734 202D or LRC 6734 202D	N.D.
Nozzle holder type	LUCAS	LCR 67342 or LRC 67342	N.D.
Nozzle type	LUCAS	RDN OSDC 6888D or BDN OSDC 6888D	N.D.
Injector setting pressure		124÷131 bar (new) 116÷123 bar (run in)	N.D.
Injection pump operation: with cylinder no. 1 piston at TDC (compression stroke)		0°±1° at TDC	N.D.
Engine idle speed		780÷820 rpm	N.D.
Maximum free running engine speed		5100÷5200 rpm	N.D.

DATA FOR CHECKING LUCAS FT05 INJECTION PUMP FOR 1929 TD ENGINE

GENERAL TEST CONDITIONS

- Test oil: ISO 4113 (SHELL S-9365)
- Temperature of test oil: $40^{\circ} \pm 2^{\circ}\text{C}$
- Injectors ISO 40 10
- Injector setting 125÷128 bar

N.B. If when measuring the advance the instrument is used with the reading directly in ($^{\circ}$) then it is necessary to divide the values in the table by 0.75

- Supply pressure: 0.1 bar
- Direction of rot.: clockwise (seen from cntrl side)
- Injection piping: $2 \times 6 \times 600\text{mm}$

- Max engine speed no load 5150 ± 50 rpm
- Engine idle speed 800 ± 20 rpm
- Correction: $0 \pm 1^{\circ}$ with cyl. n° 1 at TDC

Type of check or adjustment	Op. No.	Adjustment lever pos.	Rotation speed rpm	Supply voltage V	Advance check mm	Transfer pressure bar	Av. capacity per cyl. mm ³ /cycle	Max. disc. btwn 4 flow rates mm ³ /cycle	Operations or checks to be carried out
Before starting the tests, remove the cold starting rod and move the valve lever parallel to the pump axis towards the hydraulic head									
Filling and bleeding	1	Max	100÷1250	12	-	-	-	-	Check that the supply to the injectors is regular, recovery without air
Pre-adjust. transfer pressure	2	Max	1250	12	-	$4,75 \pm 0,2$	-	-	
Stop the bench for at least 10 secs and until the internal pressure goes down to $< 0,1\text{bar}$									
Advance instrument calibration	3	Min	0	12	- 2,6	-	-	-	Adjust the instrument to this value
Enrichment exclusion pre-adjust.	4	Min	125	12	$0 \pm 0,5$	-	-	-	Measure the reflux flow rate which should be 3-12 l/h if $>$ enrichment off
Zeroing advance instrument	5	Max	270	12	0	-	-	-	Zero the advance check instrument
Checking metering valve closure	6	Min	400	12	-	-	$\leq 5,0$	-	
Stop of supply	7	Min	400	0	-	-	$\leq 2,0$	-	Remove the electrostop supply
Stop the bench for at least 10 secs and until the internal pressure goes down to $\leq 0,1\text{bar}$									
Transfer pump inlet	8	Min	100	12	-	- 0,5	-	-	Inlet pipe closed, in less than 60 secs
Transfer pump pressure	9	Min	70	12	-	$\geq 0,35$	-	-	
Calib. of ad. & trans. press.	10	Max	1750	12	3,8	$5,3 \div 6,5$	-	-	
No load advance check	11	Min	1750	12	$4,1 \div 5,6$	-	-	-	
Full load advance check	12	Max	2200	12	$4,8 \div 6,2$	-	-	-	
Checking casing pressure	13	Min	2000	12	-	-	-	-	The pressure of the casing should be 0.6-0.9 bar
Checking recirc. flow rate	14	Min	2000	12	-	-	-	-	The recirc. capacity should be 21.6-42 l/h
Max capacity cal.	15	Max	1750	12	-	-	$35,0 \pm 1$	$\leq 3,0$	

Cont'

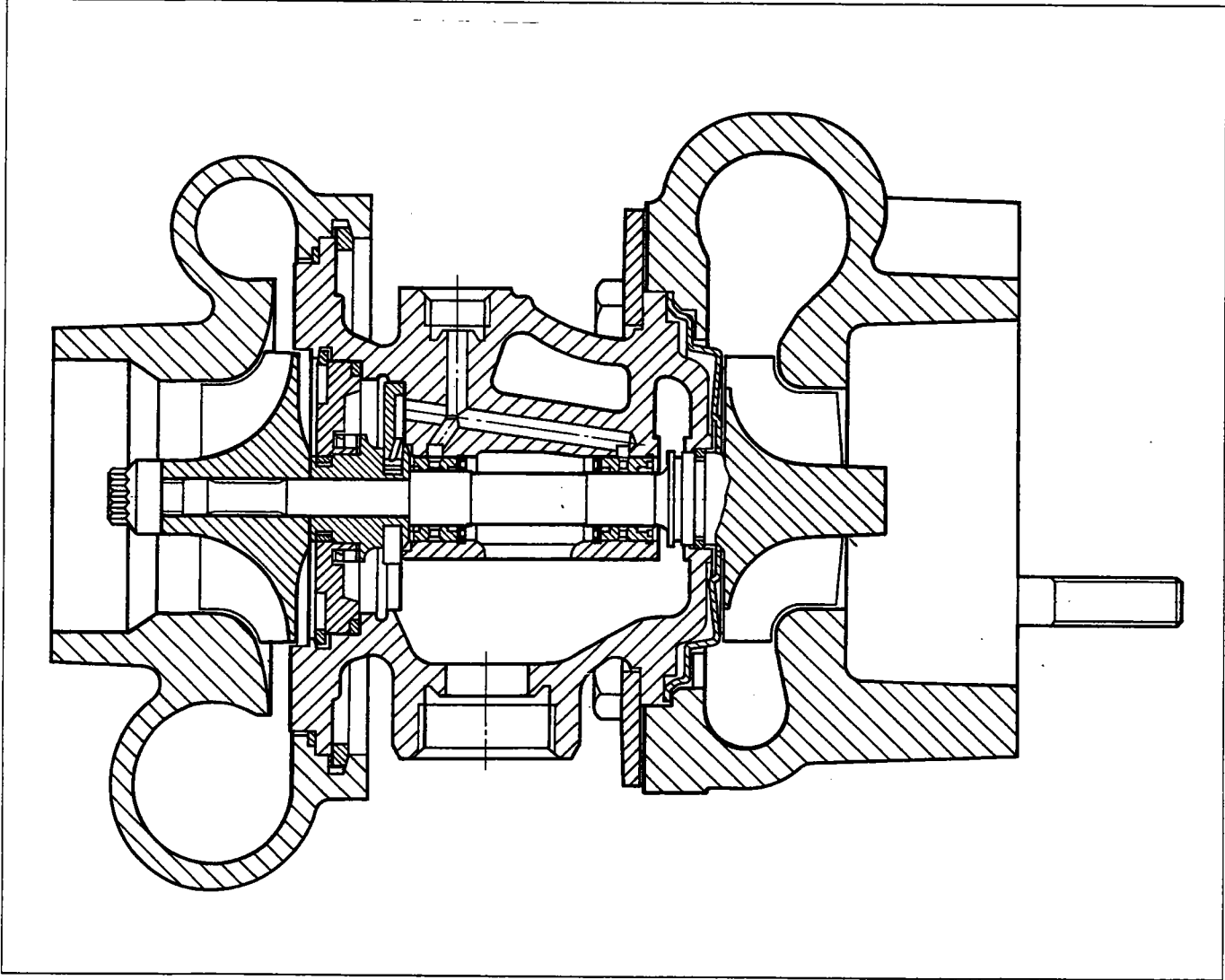
Type of check or adjustment	Op. No.	Adjust. lever position	Rotation speed rpm	Supply voltage V	Advance check mm	Transfer pressure bar	Av. capacity per cyl. mm ³ /cycle	Max. disc. btwn 4 flow rates mm ³ /cycle	Operations or checks to be carried out
Anti-stall setting	16	Min	400	12			7 ÷ 9		MIN lever in stop position place a 1.2 mm shim between the max lever/stop
Idle setting	17	Min	400	12			8 ÷ 10	≤ 3,0	Remove the anti-stop shim (1.2 mm)
Regulator check	18	Max	2250	12					Make a note of the capacity
Reg. start of int. setting	19	Max	2400	12			23,0 ÷ 25,0		
Max no load check	20	Max	2800	12			≤ 10		No supply above 11 mm ³ /cycle
Full load advance check	21	Max	2800	12	5,6 ÷ 6,2				
Regulator check	22	Max	2250	12					Check that the capacity is ≥ that measured at point 18
Stop the bench for at least 10 secs and until the internal pressure has gone down to 0 bar									
Delay during starting check	23	Max	0	12	-1,9 ÷ 2,6				
Enrichment capacity	24	Max	100	12			32,0 ÷ 48,0		
End of enrichment	25	Max	110 ÷ 270	12	0 ÷ 0,4				Accelerator lever released
Max. capacity check	26	Max	270	12			≤ 35,0		
Max. capacity check	27	Max	1350	12			31,0 ÷ 35,0		
Full load advance check	28	Max	1350	12	0,6 ÷ 1,8				
Max. capacity check	29	Max	2200	12			35,5 ÷ 39,5		
Check and/or adjust the length of the cold advance control rod at 65 mm and reconnect it to the valve lever									
Advance when cold check	30	Min	400	12	1,3 ÷ 1,7				Insert a 4 mm shim between the Min lever and stop
Advance when cold check	31	Min	400	12	0 ÷ 0,1				Insert a 2 mm shim between the Min lever and stop
Determine "V" outlet internal stage	32	Apply a pressure of 80 bar simultaneously to the 4 high pressure outlets and 2 bar (compressed air) to the diesel inlet union. Fit the special instrument and rotate the pump shaft with a torque of 0,16 N/m until a hardening is obtained, then measure the distance on the dial gauge							
Determine engine timing	33	Add 4 mm to the figure measured (point 32) and note the resulting value on the introduction adjustment access hole sealing cap. This value should be set for the engine when cylinder no. 1 is at TDC							

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SUPERCHARGING Turbocharger operated by exhaust gases with waste gate valve and air/air heat exchanger (intercooler)



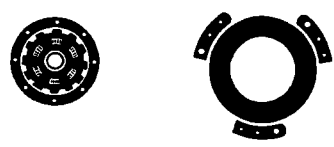
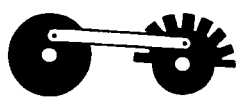
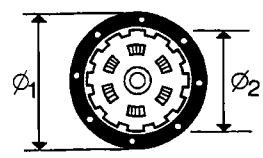
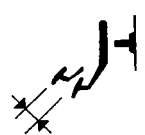
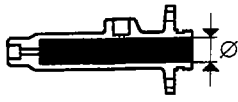
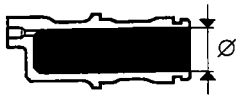
Turbocharger type	Garrett
Maximum supercharging pressure	N.D.



P4A046A01

CROSS SECTION OF TURBOCHARGER

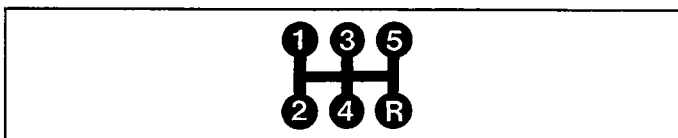
 12V	 16V	 16V	 20V	 D	 TD
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		Values in mm					
Type		 dry, single plate with bearing					
Operating mechanism		 diaphragm spring					
Spring loading	daN	400	450	500	525	420	485
Lining	 $\varnothing_1$	190	200	215	230	200	215
	$\varnothing_2$	130	137	145	155	137	145
	Distance between pedal in end of travel position and rest position	155±10	170±10				
Clutch release		mechanical			hydraulic	mechanical	
	Clutch pump operation $\varnothing$	—			19,05 (3/4")	—	
	Operating cylinder $\varnothing$	—			25,4 (1")	—	

00.21-27

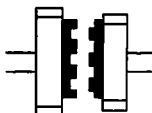
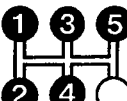
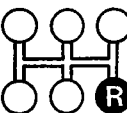
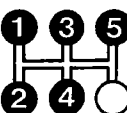
www.porsche.com/italy - 02.67.61.11.11 - 02.67.61.11.12

 12V	 16V	 16V	 20V
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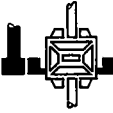
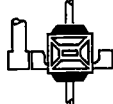
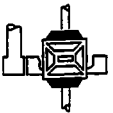
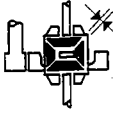
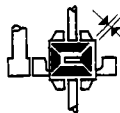


Type	C.514.5.13	C.513.5.13	C.510.5.17	C.510.5.21
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GEARBOX

 Synchronizers	spring ring (Porsche type) 	—		
	baulk ring type 			
 Gears	straight toothed 			
	helical toothed 			
 Gear ratios		3,909		3,545
		2,158	2,238	
		1,480	1,520	
		1,121	1,156	
		0,902	0,971	0,946
		3,818	3,909	

DIFFERENTIAL

		 1370 12V	 1581 16V	 1747 16V	 1998 20V
DIFFERENTIAL					
	 Ratio wheel & crown pinion reduc.	3,886 (15/58)	3,353 (17/57)	3,353(3,053●) (17/57) (19/58●)	3,562 (16/57)
  Ratio at the wheels		15,112	13,107	13,107 (11,934●)	12,627
		8,343	7,504	7,504 (6,833●)	7,971
		5,722	5,096	5,096 (4,640●)	5,414
		4,334	3,876	3,876 (3,529●)	4,118
		3,487	3,256	3,256 (2,964●)	3,476
		14,760	13,107	13,107 (11,934●)	13,924
 Differential internal casing bearing	 conical roller bearings				
 Adjustment of bearing pre-loading	 by shims				
 Thickness of shims	  mm	0,05 0,10	– 2,00 ÷ 3,00	1,70 ÷ 2,60 –	
 Interference to obtain exact bearing pre-loading	mm	bearings not pre-loaded = 0,12 bearings pre-loaded (350 daN) = 0,08			
 Clearnce btwn planet and satellite gears	mm	≤ 0,10			
 Adjust. of clrnce btwn planet/satellite gears		do not carry out any adjustment	 by shims	do not carry out any adjustment	
 Thickness of shims	  mm		0,80 ÷ 1,25	–	

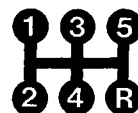
● French versions

Technical data

Gearbox and differential

Bravo-Brava

00.21-27



Type

C.513.5.13

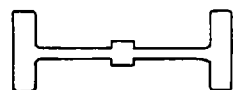
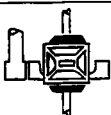
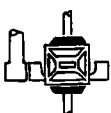
C.510.5.17

GEARBOX

Synchronizers	spring ring (Porsche type)	-	
	baulk ring type		
Gears	straight toothed		
	helical toothed		
Gear ratios		3,909	N.D.
		2,238	N.D.
		1,444	N.D.
		1,029	N.D.
		0,816	N.D.
		3,909	N.D.



DIFFERENTIAL

 	Ratio crown wheel & pinion reduction		16/57 (3,562)	ND
 	Ratio at the wheels		13,923	ND
			7,972	ND
			5,143	ND
			3,665	ND
			2,906	ND
			13,923	ND
	Differential internal casing bearing	 conical roller bearings		
  	Adjustment of bearing pre-loading	 by shims		
 	Thickness of shims	 mm 0,05 mm 0,07	1,70÷2,60	-
			-	1,70÷2,89
	Interference to obtain exact bearing pre-loading	mm	Bearings not pre-loaded = 0,12 bearings pre-loaded (350 daN) = 0,08	
	Clearance btwn planet/satellite gears	mm	≤ 0,10	
 	Adjustment of clrnce btwn planet/sat. gears		 by shims	no adjustment is carried out
 	Thickness of shims	 0,05 mm	0,80÷1,25	-

Technical data

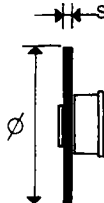
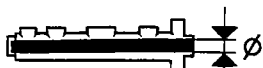
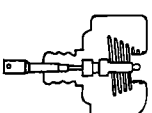
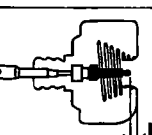
Braking system

00.33

Bravo-Brava

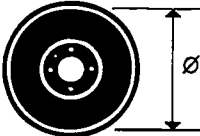
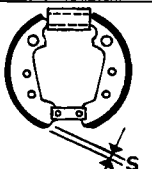
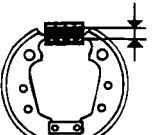
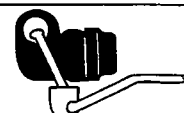
 12V	 16V	 16V (●)
 D	 TD 75	 TD 100

FRONT BRAKES

			Values in mm	
	Discor	s {  allowed	$\varnothing$ 257	
			11,80 ÷ 12,10	19,80 ÷ 20,10
			11,10	18,55
			10,20	18,20
	Brake pads	s < allowed	1,5	
	Caliper	$\varnothing$	54	
	Master cylinder (pump)	$\varnothing$	22,225 (7/8")	
	Brake servo		Iso-Vac 8" pneumatic vacuum servo acting on all four wheels	
	Distance of hydraulic piston push rod from master cylinder support plate	L	22,45 ÷ 22,65	

(●) With automatic transmission

REAR BRAKES

	Drum	$\varnothing$ {  allowed	180,00 ÷ 180,25	203,10 ÷ 203,40
			180,95	204,10
			181,35	204,70
	Shoes	s < allowed	1,5	
	Wheel cylinders	$\varnothing$	22,00	
	Load proportioning valve		acting on rear wheels	
	Ratio (reduction)		0,36	

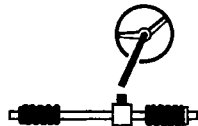
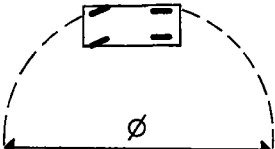
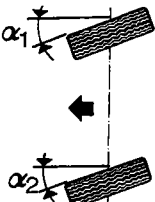
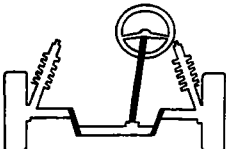


FRONT BRAKES

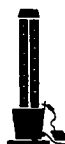
Values in mm			
	Disc		$283,800 \pm 284,200$
			$21,900 \div 22,100$
			20,55
			20,20
	Brake pads	$s < \text{allowed}$	1,5
	Caliper	$\varnothing$	54
	Master cylinder (pump)	$\varnothing$	23,81 (15/16")
	Servo brake		ISO-VAC 8" + 7" pneumatic vacuum servo acting on all four wheels
	Distance of hydraulic piston push rod from master cylinder support plate	L	$22,45 \div 22,65$

REAR BRAKES

	Disc		240
			$10,80 \div 11,10$
			10,10
			9,20
	Brake pads	$s < \text{allowed}$	1,5
	Caliper	$\varnothing$	34
	Load proportioning valve		acting on rear wheels
	Ratio (reduction)		0,36

ENGINE TYPE		 12V	 12V  16V  16V  20V  D  TD
Type		 rack and pinion	 rack and pinion power assisted
Ratio	  no. of turns lock to lock	3,5	3
	 rack travel	142 ±0,8 mm	142 ±1,5 mm
 Turning circle	10,4 m		
 Steering angle	outer wheel α_1 inner wheel α_2	31° ± 30'	31° 30' ± 30'
		37° 20' ± 30'	38° 15' ± 30'
 Steering col.	 with 2 universal joints		

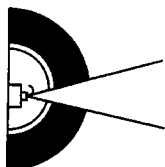
(*) Hydraulic power steering available on request

ENGINE TYPE	 Wheel rim type	 Radial, tubeless type tyre	  Tyre inflation pressure in bar			
			Front		Rear	
			average load	heavy load	average load	heavy load
 12V	5½J×14"- 32 5½J×14"- 37	165/65 R14 78T (●) 175/65 R14 82T	2,2	2,3	2,2	2,5
 16V	Brava 5½J×14"- 37 6J×14"- 43 5½J×14"- 37	175/65 R14 82T 185/60 R14 82H 185/60 R14 82H	2,2	2,3	2,2	2,5
	Bravo 6J×14"- 43	185/60 R14 82H	2,2	2,3	2,2	2,5
 16V	Brava 5½J×14"- 37 6J×14"- 43	175/65 R14 82H 185/60 R14 82H	2,2	2,3	2,2	2,5
	Bravo 6J×14"- 43 6J×15"- 40 6J×15"- 40	185/60 R14 82H 185/55 R15 81V (■) 195/50 R15 82V (■)				
 20V	Bravo 6J×15"- 49 6J×15"- 49	195/55 R15 84V 205/50 ZR15 (■)	2,5	2,7	2,2	2,4
 D	5½J×14"- 37	175/65 R14 82T	2,3	2,3	2,2	2,5
 TD	Brava 5½J×14"- 37 5½J×14"- 37 6J×14"- 43	175/65 R14 82T 185/60 R14 82H 185/60 R14 82H	2,3	2,3	2,2	2,5
	Bravo 5½J×14"- 37 6J×14"- 43	175/65 R14 82T 185/60 R14 82H				
SPARE WHEEL (*)	4B×14"- 43 4B×15"- 35	105/70 R14 84M 115/70 R15 90M	4,2			

(*) Speed limit: 80 km/h

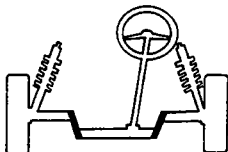
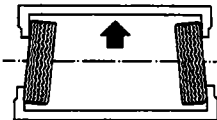
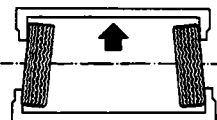
(●) Only for versions with mechanical steering

(■) Not to be used with chains because it could interfere with the wheel arch



unladen car (■)

WHEEL GEOMETRY

 Front suspension	camber (**) 	$-7' \pm 30'$ $-33' \pm 30'$ (only for Bravo 1998) $-9' \pm 30'$ (●●)
	caster (**) 	$3^{\circ}30' \pm 30'$ $2^{\circ}50' \pm 30'$ (●) $2^{\circ}18' \pm 30'$ (●●)
	toe in 	$-1 \div 1 \text{ mm}$
	front wheel offset ▲	0°
 Rear suspension	camber (**) 	$-1^{\circ} \pm 0^{\circ}30'$ $-0^{\circ}46' \pm 30'$ (from chassis no. 4.050.320)
	toe in (**) 	$-2,5 \div 1,5 \text{ mm}$ $0 \div 4$ (from chassis no. 4.050.320)
	rear wheel thrust angle ▲	0°

(**) Angles cannot be adjusted

(■) With tyres inflated to the correct pressure and vehicle in running order with 5 litres of fuel

(▲) Angular values which cannot be adjusted, used for the correct alignment of the vehicle

(●) Versions with power assisted steering and for Bravo 1998

(●●) For versions with 1910 TD 75 engine

Front suspension independent, Mac Pherson type with steel track control arms anchored to an auxiliary cross member. Offset coil springs and double acting telescopic shock absorbers. Anti-roll torsion bar.

ENGINE TYPE	 12V	 (●) 16V	 16V	 20V
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Coil springs

Diameter of wire	mm	12,2±0,05	12,5 ± 0,05 (12,7±0,05)*	13,2 ± 0,05
Number of turns		3,75		
Direction of coil		clockwise		
Height of spring released	mm	449,2 (461)*	461 (454)*	404,5 (419,6)*
Height of spring under a load of:	$\left\{ \begin{array}{l} 303 \div 335 \text{ daN} \\ (320,5 \div 346,5 \text{ daN})^* \end{array} \right.$ mm	192		–
	$\left\{ \begin{array}{l} 340 \div 368 \text{ daN} \\ (352 \div 382 \text{ daN})^* \end{array} \right.$ mm	–	192	–
	$\left\{ \begin{array}{l} 344 \text{ daN} \\ (369 \text{ daN})^* \end{array} \right.$ mm	–		192
The springs are subdivided into two categories, identifiable by a mark				
yellow (1) for those under a load of:	$\left\{ \begin{array}{l} 319 \text{ daN} \\ (333,5 \text{ daN})^* \end{array} \right.$ height of mm	>192	–	–
	$\left\{ \begin{array}{l} 354 \text{ daN} \\ (367 \text{ daN})^* \end{array} \right.$ height of mm	–	>192	–
	$\left\{ \begin{array}{l} 344 \text{ daN} \\ (369,2 \text{ daN})^* \end{array} \right.$ height of mm	–	–	>192
green (1) for those under a load of:	$\left\{ \begin{array}{l} 319 \text{ daN} \\ (333,5 \text{ daN})^* \end{array} \right.$ height of mm	≤192	–	–
	$\left\{ \begin{array}{l} 354 \text{ daN} \\ (367 \text{ daN})^* \end{array} \right.$ height of mm	–	≤192	–
	$\left\{ \begin{array}{l} 344 \text{ daN} \\ (369 \text{ daN})^* \end{array} \right.$ height of mm	–	–	≤192

(1) Springs of the same category must be fitted.

(*) For vehicles with air conditioning.

(●) For versions with automatic transmission, see the third volume.

Shock absorbers

Type: telescopic, double acting (low pressure gas)		WAY-ASSAUTO	
Open (start of damping action)	mm	518 ± 2,5	511 ± 2,5
Closed (metal against metal)	mm	361 ± 2,5	354 ± 2,5
Travel	mm	157	157

Stabilizer bar

Diameter of stabilizer bar	mm	22	23
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Coil springs

Coil springs				
Diameter of wire	mm		12,5±0,05(12,7±0,05)*	12,7±0,05(12,9±0,05)*
Number of turns			3,75	3,75
Direction of coil			clockwise	
Height of spring released	mm		461 (454)*	454 (449)*
Height of spring under a load of:	$\left\{ \begin{array}{l} 340 \pm 368 \text{ daN} \\ (352 \pm 382 \text{ daN})^* \end{array} \right.$	mm	192	-
	$\left\{ \begin{array}{l} 352 \pm 382 \text{ daN} \\ (366 \pm 396 \text{ daN})^* \end{array} \right.$	mm	-	192
The springs are subdivided into two categories, identifiable by a mark				
yellow (1) for those under a load of:	$\left\{ \begin{array}{l} 354 \text{ daN} \\ (367 \text{ daN})^* \end{array} \right.$	height in mm	> 192	-
	$\left\{ \begin{array}{l} 367 \text{ daN} \\ (381 \text{ daN})^* \end{array} \right.$	height in mm	-	> 192
green (1) for those under a load of:	$\left\{ \begin{array}{l} 354 \text{ daN} \\ (367 \text{ daN})^* \end{array} \right.$	height in mm	≤ 192	-
	$\left\{ \begin{array}{l} 367 \text{ daN} \\ (381 \text{ daN})^* \end{array} \right.$	height in mm	-	≤ 192

(1) Springs of the same category must be fitted.

(*) For vehicles with air conditioning

Shock absorbers

Type: telescopic, double acting (low pressure gas)		WAY-ASSAUTO
Open (start of damping action)	mm	518 ± 2,5
Closed (metal against metal)	mm	361 ± 2,5
Travel	mm	157

Stabilizer bar

Diameter of stabilizer bar	mm	23
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Rear suspension independent with cast iron track control arms. Coil springs and shock absorbers with vulcanized bushes. Anti-roll torsion bar. Rigid H shaped auxiliary frame made up of a transverse tubular element and two pressed side members connected to it.

VERSIONS	BRAVO	BRAVO 	BRAVA
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Coil spring

Diameter of wire	mm	11,5±0,05 (11,9±0,05)*	11,6±0,05	11,9±0,05
Number of turns		4,75(5)*	4,25	5
Direction of coil		clockwise		
Height of spring released	mm	311 (309)*	291	309
Height of spring under a load of:	$270 \div 298 \text{ daN}$ (286 ÷ 316 daN)*	mm	194	-
	$258,4 \div 285,6 \text{ daN}$	mm	-	194
	$286 \div 316 \text{ daN}$	mm	-	194
The springs are subdivided into two categories, identifiable by a mark				
yellow (1) for those under a load of:	284 daN (301 da)*	height of mm	> 194	-
	272 daN	height of mm	-	> 194
	301 daN	height of mm	-	> 194
green (1) for those under a load of:	284 daN (301 da)*	height of mm	≤ 194	-
	272 daN	height of mm	-	≤ 194
	301 daN	height of mm	-	≤ 194

(1) Springs of the same category must be fitted.

(*) For 1910 TD vehicles with air conditioning and 1581 16v vehicles with automatic transmission, air conditioning and ABS.

Shock absorbers

Type: telescopic, double acting (low pressure gas)		WAY-ASSAUTO		
Open (start of damping action)	mm	322,5 ± 2	312 ± 2	322,5 ± 2
Closed (metal against metal)	mm	223 ± 2	223 ± 2	223 ± 2
Travel	mm	99,5	89	99,5

Anti-roll bar

Diameter of anti-roll bar	mm	17	19	17
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 12V	 16V	 16V	 20V
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STARTER MOTOR	M. Marelli E80E-12V-0,9KW (M. Marelli E80E-12V-1 KW)*		M. Marelli M70R-12V-1,4kW (with reduction gear) Bosch (■) ø 74,5-1,1/1,2	M. Marelli M70R-12V-1,4kW (with reduction gear)
ALTERNATOR	M. Marelli A115I-14V-38/65A M. Marelli A115I-14V-45/85A(●)	M. Marelli A115I-14V-40/75A M. Marelli A127IR-14V-50/85A(●)		M. Marelli A127I-14V-50/85A
VOLTAGE REGULATOR	BUILT IN ELECTRONIC			
BATTERY	12V-40Ah-200A	12V-50Ah-250A		12V-60Ah-380A
IGNITION SYSTEM	Bosch SPI Monomotronic integrated electronic injection/ignition	Weber-Marelli I.A.W. MPI integrated electronic injection/ignition	HITACHI MPI integrated electronic injection/ignition system	Bosch MPI Motronic integrated electronic injection/ignition
IGNITION COIL	Bosch 0.221.503.407	Cooper BAE 920	HITACHI GE 212331	Bosch 0.221.504.006
SPARK PLUGS	NGK BKR 6EKC GOLDEN LODGE 2HLDR CHAMPION RC8BYC		NGK BKR 6EHC CHAMPION RC7BMC GOLDEN LODGE 2HLDR CHAMPION RC8BYC	CHAMPION RC7BMC

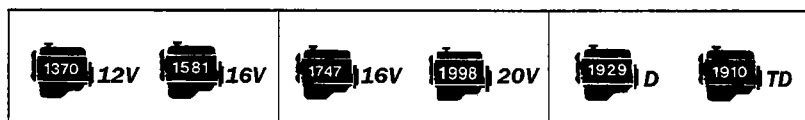
(●) For vehicles equipped with air conditioning

(*) For 1581 16v version with automatic transmission

(■) From chassis no. 4366551 and n° 6051091

	 1929 D	 1910 TD
STARTER MOTOR	M. Marelli E 95RL - 12V - 2,2 kW (with reduction gear)	M. Marelli E 95RL - 12V - 2,2 kW (with reduction gear) Bosch ø78,5-2,00/12 (●●)
ALTERNATOR	M. Marelli A 115I - 14V - 38/65A M. Marelli A 115I - 14V - 45/65A(●)	M. Marelli A 115I - 14V - 40/75A M. Marelli A 127IR - 14V - 50/85A(●)
VOLTAGE REGULATOR	Built in electronic	
BATTERY	12V - 60 Ah - 380A	
PRE-HEATING ELECTRONIC CONTROL UNIT	SIPEA 2961 BITRON CCD 48C	(Bosch 0.281.003.004) ■ SIPEA 2904 BITRON CCD 47μP/F2
INJECTION ADVANCE ELECTRONIC CONTROL UNIT (■)	-	LUCAS 41000087 - 101
EGR ELECTRONIC CONTROL UNIT (▲)	-	MARELLI MCR 108A MARELLI MCR 109A (●)
HEATER PLUGS	CHAMPION CH 68 BERU 0.100.221.145 BOSCH 0.250.201.005 M. Marelli UX 2A	BERU 0.100.226.249

- (●) For vehicles equipped with air conditioning
- (■) For vehicles with 1910 TD 100 engine
- (▲) For vehicles with 1910 TD 75 engine
- (●●) From chassis no. 4364699



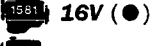
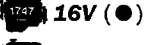
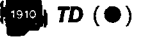
STARTER MOTOR

Type		M. Marelli E80-12V-0,9 kW (E80E-12V-1kW)	M. Marelli M70R-12V-1,4 kW (with reduction gear)	M. Marelli E95RL-12V-2,2 kW
Voltage	V	12		
Nominal power	kW	0,9 (1)	1,4	2,2
Rotation, pinion side		clockwise		
No. of poles		4		4
Field coil		series		series - parallel
Engagement		free wheel		
Operation		solenoid		
End float of armature shaft	mm	0,1 ÷ 0,5 (0,15 ÷ 0,45)		0,15 ÷ 0,45
Data for bench test				
Operating test (*):				
current	A	180 (200)	360 ÷ 380	600
speed	rpm	1720 (2200)	1150	1400
voltage	V	9,5 (9,8÷10)	8,15	7,9
torque developed	daNm	0,37 (0,38)	1,30	1,6
Engagement test (*):				
current	A	324 (440)	680 ÷ 700	1110 ÷ 1150
voltage	V	7,1 (7,6)	4,9	4,4 ÷ 4,6
torque developed	daNm	≥0,97 (≥1,25)	3,11	≥3,9
Free running test (*):				
current	A	40 (44÷48)	60 ÷ 80	120 ÷ 140
voltage	V	11,4 (11,4÷11,5)	4,9	11
speed	rpm	8500 ÷ 9000 (11400÷12300)	4040	4500 ÷ 4750
Relay				
Winding resistance (*)	{ pull in Ω hold in Ω	0,30 ÷ 0,32 (0,32)	0,33 ÷ 0,37	0,23 ÷ 0,27
		1,2÷1,3 (1,09)	1,13 ÷ 1,27	0,93 ÷ 1,07
Lubrication				
Internal splines and shaft bushes		VS ⁺ SAE 10 W		
Sleeve and intermediate disc		TUTELA MR3		

(*) Data obtained at an ambient temperature of 20°C.

The data in brackets refers to the starter motor fitted on the 1581 version with automatic transmission.

NOTE When overhauling it is not necessary to under the insulator between the commutator bars

 		  	   
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ALTERNATOR

Type	M.Marelli A115I-14V-38/65A	M.Marelli A115I-14V-40/65A	M. Marelli A115I-14V-40/75A	M.Marelli A127IR-14V-50/85A
Nominal voltage V	14			
Maximum current A	65	65	75	85
Nominal current at 1800 rpm rpm	38	45	40	50
Nominal current at 6000 rpm A	65	65	75	85
Field winding resistance between the slip rings (*) Ω	2,4		2,587 ÷ 2,613	
Direction of rotation (seen from control side)	clockwise			
Diode rectifiers	bridge			

(*) Data obtained at an ambient temperature of 20°C.

(●) For vehicles equipped with air conditioning

VOLTAGE REGULATOR

		Built in electronic	
Type		RTM 151 A	RTM 151 B
Alternator speed for test rpm		7000	
Thermal stabilization current A		-	
Test current A		-	
Regulation voltage (*) V		14,3 ÷ 14,6	

(*) Data obtained at an ambient temperature of 23°C.

Technical data

Bravo-Brava

Electrical equipment: electronic injection/ignition

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INTEGRATED ELECTRONIC INJECTION/IGNITION CONTROL MODULE



Make	Bosch 0.261.203.868
Firing order	1 – 3 – 4 – 2

IGNITION COIL WITH 4 HIGH TENSION SOCKETS

Make	Bosch
Type	0.221.503.407
Ohmic resistance of primary winding at 20°C Ω	0,45 ÷ 0,55
Ohmic resistance of secondary winding at 20°C Ω	12000 ÷ 14600

TDC AND RPM SENSOR

Make and type	Bosch 0.281.002.102
Sensor winding resistance at 20° C Ω	486 ÷ 594
Distance (gap) between the sensor and the crankshaft pulley teeth mm	0,8 ÷ 1,5

ADVANCE ON ENGINE

With engine idling (850 ± 50 rpm)	N.D.
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SPARK PLUGS

Make and type	NGK BKR6EKC GOLDEN LODGE 2HLDR
Thread	M 14×1,25
Electrode gap mm	0,8

**INTEGRATED ELECTRONIC
INJECTION-IGNITION SYSTEM**


Type	I.A.W. M.P.I WEBER - MARELLI
Firing order	1-3-4-2

INJECTION-IGNITION CONTROL UNIT

Make and type	I.A.W. - 1AF.13
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COIL WITH 4 HIGH TENSION OUTLETS

Type	M. Marelli
Code	BAE 920 A
Resistance of primary winding at 20°C Ω	0.580
Resistance of secondary winding at 20°C Ω	9100

SPARK PLUGS

Make and type	NGK BKR6EKC GOLDEN LODGE 2HLDR
Thread	M 14 x 1.25
Electrode gap mm	0.8

TOP DEAD CENTRE AND RPM SENSOR

Type	JAEGER
Code	CVM 01
Sensor winding resistance Ω	575 - 750
Gap between sensor and crankshaft pulley teeth mm	0.5-1.5

ADVANCE ON ENGINE

With engine idling 800 $\pm$ 30 rpm	10°
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INTEGRATED ELECTRONIC INJECTION-IGNITION SYSTEM

Type	HITACHI MFI-O
Firing order	1 - 3 - 4 - 2

IGNITION COIL (1 FOR SPARK PLUG)

Type	HITACHI
Code	GE 212331
Ohmic resistance of primary winding at 20°C Ω	0.495 - 0.605
Ohmic resistance of secondary winding at 20°C Ω	-

RPM AND TOP DEAD CENTRE SENSOR

Make and type	HITACHI GE 108101
Sensor winding resistance Ω	513 - 627
Distance (gap) between sensor and crankshaft pulley tooth mm	0.4 - 1.2

KNOCK SENSOR

Make and type	NGK KUE-03
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TIMING AND CYLINDER RECOGNITION SENSOR

Make and type	Bosch B 232.070.023
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ADVANCE ON ENGINE

With engine idling (850±50/min)	10° ± 5°
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SPARK PLUGS

Make and type	NGK BKR6EKC Champion RC7BMC Golden Lodge 2HLDR
Thread	M 14×1.25
Electrode gap mm	0.8

INTEGRATED ELECTRONIC INJECTION/IGNITION SYSTEM


Make	Bosch 0.261.203.994
Firing order	1 - 2 - 4 - 5 - 3

IGNITION COIL (1 PER SPARK PLUG)

Make	Bosch
Type	0.221.504.006
Ohmic resistance of primary winding at 20°C Ω	0,4
Ohmic resistance of secondary winding at 20°C Ω	8500

TDC AND RPM SENSOR

Make and type	Bosch 0.281.002.102
Sensor winding resistance at 20 °C Ω	774 ÷ 946
Distance (gap) between the sensor and the crankshaft pulley teeth mm	0,8 ÷ 1,5

DETONATION SENSOR

Make	Bosch
Type	0.261.231.095

SPARK PLUGS

Make and type	CHAMPION RC7BMC
Thread	M 14×1,25
Electrode gap mm	0,8

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Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
							

ENGINE

1850132000	Spanner (13 mm), with 1/2" socket, for removing inlet manifold fixings				●		
1850167000	Spanner (13 mm) for fuel injection pump securing screws					●	
1850184000	Spanner for removing and refitting spark plugs	●	●	●	●		
1852128000	Tool for removing and refitting injectors					●	●
1852138000	Spanner for adjusting injector pipe pressure connectors					●	●
1852147000	Spanner for removing cylinder head					●	
1852154000	Spanner, 1/2" socket, for cylinder head fixing bolts	●		●	●		●
1852157000	Spanner, 1/2" socket, for cylinder head fixing bolts		●				
1852159000	Spanner for removing-refitting belt tensioner				●		
1852161000	Spanner for phase transformer				●		
1852162000	Spanner for alternator pulley				●		
1860054000	Drift (∅ 22 mm) for removing and refitting connecting rod pin bush		●				
1860183000	Pliers (∅ 75-110 mm) for removing and refitting piston circlips	●	●	●	●	●	●
1860251000	Drift for removing gudgeon pin from piston		●				
1860303000	Tool for fitting gudgeon pin circlips on piston		●				
1860313000	Drift for fitting oil seal on valve guide	●	●	●	●	●	●
1860395000	Drift for removing valve guide	●	●	●	●	●	●
1860443000	Pressure lever for inserting tool for retaining tappets whilst adjusting valve clearance					●	●

Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
		 12V	 16V	 16V	 20V	 D	 TD

1860443000	Tool for tensioning timing belt	●					
1860454000	Drift for fitting oil seal on valve guide		●	●			
1860460000	Drift for fitting valve guides		●				
1860470000	Tool for supporting cylinder head whilst overhauling	●	●	●	●	●	●
1860486000	Drift for fitting valve guides					●	
1860490000	Tool for retaining valve leakage test equipment 1895868000 (to be used with 1860470000)						●
1860644000	Tool, valve removal and refitting (to be used with 1860877000 and 1860804000)	●					
1860644000	Tool for removing and refitting valves (to be used with 1860322000)					●	
1860644000	Tool for removing and refitting valves (to be used with 1860749000)						●
1860647000	Flywheel lock (at the bench)					●	
1860650000	Drift (∅ 25 mm) for removing and refitting small end bush					●	
1860662000	Tool for removing cartridge oil filter or fuel filter					●	
1860666000	Tool for retaining camshaft whilst removing and refitting side supports					●	
1860700000	Band (∅ 60-125 mm) for introducing normal and oversize pistons in cylinders	●	●	●	●	●	●
1860724000	Tool for retaining tappets whilst replacing shims					●	●
1860745100	Tool for tensioning toothed belts (to be used with specific tools)					●	
1860745200	Tool for timing system toothed belt tensioning (to be used with 1860745100)					●	

Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
		 12V	 16V	 16V	 20V	 D	 TD

1860749000	Support for cylinder head whilst removing and refitting valves						●
1860757000	Tool for removing cartridge oil filter						●
1860758000	Tool for removing cartridge oil filter	●	●	●			
1860765000	Tool for retaining toothed pullies and injection pump drive pulley		●			●	
1860766000	Flywheel lock					●	
1860771000	Flywheel lock		●				
1860790000	Lever for removing and refitting valves (to be used with 1860786000-1860787000-1860788000-1860789000)		●	●			
1860810000	Dummy spark plug for ante-chamber (to be used when refitting ante-chamber fixing bush)						●
1860812000	Tool for refitting valve guides	●		●	●		●
1860813000	Guide for fitting oil seal on valve guides	●	●	●	●		
1860814000	Drift for fitting oil seal on valve guides						●
1860815000	Adaptor for rotating crankshaft	●	●	●	●	●	●
1860816000	Drift for fitting oil pump gasket	●		●	●	●	●
1860817000	Tool for centering crankshaft cover gasket	●		●	●		●
1860818000	Tools for camshaft timing				●		
1860821000	Tool for removing small end bush	●		●	●		●
1860822000	Tool for timing oil pump				●		

Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
		 12V	 16V	 16V	 20V	 D	 TD

1860824000	Tool for introducing camshaft gasket				●		●
1860831000	Spanner for rotating timing pullies	●					●
1860833000	Spanner for removing-refitting oil sump				●		●
1860834000	Spanner for removing-refitting oil sump				●		●
1860835000	Tool for extracting oil seal on valve guide	●	●	●	●		●
1860836000	Tool for locking rotation of crankshaft			●	●		
1860844000	Tool for fitting gasket for camshaft, inlet side			●			
1860845000	Spanner for tensioning timing belt			●			
1860846000	Flywheel lock (operations at the bench)	●	●	●			●
1860848000	Spanner for camshaft pulley, exhaust side			●			
1860856000	Spanner for timing pulley, inlet side			●			
1860859000	Supports for removing-refitting power unit (to be used with 1860860000)		●	●			●
1860859001	Connecting bracket for removing-refitting power unit (to be used with 1860859000 and 1860860000)	●					
1860859002	Adaptor for removing-refitting power unit (to be used with 1860859000 and 1860860000)				●		
1860859003	Adaptor for removing-refitting power unit (to be used with 1860859000)					●	
1860860000	Support for removing-refitting power unit	●	●	●	●	●	●
1860874000	Tools for camshaft timing		●				

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Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
							

1860875000	Tools for camshaft timing			●			
1860876000	Tool for tensioning timing belt		●				
1860877000	Tool for removing valves	●					
1860878000	Tool for fitting crankshaft front cover gasket		●				
1860879000	Grip for tool for fitting crankshaft rear cover gasket		●			●	
1860880000	Tool for fitting crankshaft rear cover gasket (to be used with 1860879000)		●				
1860881000	Tool for fitting crankshaft rear cover gasket (to be used with 1860879000)					●	
1860882000	Tool for fitting camshaft cover gasket and auxiliary shaft cover		●				
1860883000	Pin for centering ante-chamber					●	
1860884000	Spanner for removing-refitting combustion ante-chamber					●	●
1860885000	Spanner for rotating camshaft pulleys (to be used with 1860831001)		●				
1860886000	Tool for extracting injection pump pulley					●	
1860887000	Tool for positioning rpm sensor		●				
1860892000	Tool for timing camshafts				●		
1860893000	Spanner for fuel pump cover	●	●	●	●		
1860895000	Vertical support for dial gauge for detecting T.D.C.		●				
1860896000	Graduated disc for engine timing		●				
1860898000	Flywheel lock (on vehicle)			●	●		

Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
		 12V	 16V	 16V	 20V	 D	 TD

1860899000	Tool for timing camshaft	●					
1860901000	Tool for positioning T.D.C.	●					
1860905000	Tool for positioning T.D.C.						●
1861001011	Pair of brackets for fixing engine to rotating stand					●	
1861001039	Pair of brackets for fixing engine to rotating stand				●		●
1861001041	Pair of brackets for fixing engine to rotating stand			●			
1861001042	Pair of brackets for fixing engine to rotating stand		●				
1865091000	Tool for checking injection pump advance					●	
1867019000	Drift for removing and refitting bush in crankcase for oil pump drive gear		●				
1867029000	Flywheel lock				●		
1867030000	Flywheel lock (on vehicle)	●					
1870404000	Support for dial gauge for measuring cylinder liner recesses or projections				●		●
1890385000	Reamer for valve guide openings	●	●	●	●		
1895762000	Dynamometer for checking auxiliary shaft drive belt tension	●	●	●	●	●	●
1895868000	Valve leakage test equipment	●	●	●	●	●	●
1895890000	Fuel pump delivery pressure gauge with unions	●	●	●	●		
1895897000	Graduated disc for angular tightening of cylinder head fixing nuts	●	●	●	●	●	●

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Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
		 12V	 16V	 16V	 20V	 D	 TD

1895942000	Graduated disc for angular tightening of cylinder head fixing nuts						●
1896245000	Gauge to check valve stem height after valve seat grinding					●	

CLUTCH

1870081000	Guide pin for centering clutch disc					●	
1870447000	Guide pin for centering clutch disc		●				
1875086000	Guide pin for centering clutch disc	●		●	●		

GEARBOX-DIFFERENTIAL

1842133000	Tool for removing differential bearing and gearbox gear	●					
1842134000	Tool for removing gearbox gears and hubs	●					
1845028000	Reaction tool for removing differential bearings	●					
1845057000	Tool for removing bush for lay shaft 5'h speed gear	●					
1845062000	Tool for removing constant velocity joint from front wheel drive shaft (to be used with 1847017001)		●	●	●	●	
1847017001	Mass (to be used with 1860889000)	●	●(*)	●	●	●	●
1847017004	Plate for extracting flanged shaft from planet gear (to be used with 1847017001)		●	●	●	●	
1847056000	Tool for extracting differential output shafts	●					
1850132000	Spanner for bolts fixing differential casing cover				●		
1850113000	Spanner (12 mm) for gearbox oil drain plug	●	●	●	●	●	

(*) Tools for Aisin automatic gearbox

Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
							

1855035000	Spanner (19 mm) for removing and refitting gearbox	●	●	●	●	●	
1860691000	Drift for removing and refitting gear hardening ball plug	●					
1860851000	Cross member for removing-refitting gearbox	●	●(*)	●	●	●	●
1860851001	Transverse adaptor for removing-refitting gearbox (to be used with 1860851000)	●	●(*)	●	●	●	●
1860870000	Connector for checking line pressure		●(*)				
1860873000	Bracket for removing-refitting gearbox	●	● ●(*)	●	●		
1860889000	Two-way connector for mass (to be used with 1847017001)	●	● ●(*)	●	●	●	●
1870007000	Universal handle	●	●	●	●	●	
1870152000	Drift for fitting hubs and gears on main and lay shafts	●	●				
1870419000	Tool for fitting main shaft gasket on bell housing (to be used with 1870007000)	●	●	●	●	●	
1870448000	Tool for fitting front bearing inner race		●	●	●	●	
1870469000	Tool for fitting differential bearing (to be used with 1870007000)	●					
1870478000	Tool for fitting 4'h speed gear bush and rear bearing		●	●	●	●	
1870629000	Drift for fitting differential casing cover gasket (to be used with 1870007000)	●	● ●(*)				
1870630000	Drift for fitting differential casing gasket (to be used with 1870007000)	●					
1870631000	Drift for fitting main and lay shaft bearings and gears	●					
1870632000	Drift for fitting bearings	●					

(*) Tools for Aisin automatic gearbox

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Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
		 12V	 16V	 16V	 20V	 D	 TD

1870633000	Drift for fitting clutch release shaft bush	●					
1871001014	Support for gearbox-differential unit whilst overhauling (to be fitted to 1861000000 or 1871000000)	●					
1874140005	Pair of tools for staking gearbox shaft nuts (to be used with 1874140001)	●					
1874541000	Tool for fitting differential bearing outer race				●		
1875016000	Drift to fit gasket on axle shaft flange		●	●	●	●	
1875017000	Tool to remove and refit differential bearing rings (to be used with 1840005003)		●	●	●	●	
1875088000	Drift for fitting main and lay shaft bearings	●					
1881124000	Pliers for adjusting main and lay shaft rear bearing circlips	●					
1895411000	Pipe and 1/4" connectors for checking automatic gearbox oil pressure		● (*)				
1895424000	Pressure gauge (0÷25 bar) for checking automatic gearbox oil pressure		● (*)				
1895655000	Tool to select differential bearing adjusting shims (to be used with 1895884000)	●					

BRAKES

1856132000	Spanner (10-11 mm) for adjusting brake fluid pipe unions	●	●	●	●	●	●
1856133000	Spanner for adjusting rear brake caliper self-adjusting device				●		
1872273000	Set of tools to hold cylinder pistons when installing brake shoes	●	●	●		●	●
1895899000	Vacuum gauge with connectors for checking operation on vehicle of vacuum pump					●	
1895901000	Tool for adjusting position of load proportioning valve	●	●	●	●	●	

(*) Tools for Aisin automatic gearbox

Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
							

STEERING

1847035000	Puller for steering rod ball pins	●	●	●	●	●	●
1860888000	Tool for removing-refitting bearing for power steering pump support		●				

SUSPENSION

1845028000	Tool for removing front hub bearing inner race from flange (to be used with 1840005003, 1840005302 and 1840005400)	●	●	●	●	●	●
1847014000	Percussion extractor for wheel hub caps	●	●	●	●	●	●
1874551000	Tool for retaining front shock absorber stem whilst adjusting fixing nut	●	●	●	●	●	●
1874555000	Pneumatic tool for compressing suspension springs when removing shock absorber	●	●	●	●	●	●
1875055000	Drift to fit front wheel hub bearings (to be used with 1870007000)	●	●	●	●	●	●
1875059000	Drift for fitting rear wheel hub caps	●	●	●	●	●	●

ELECTRICAL EQUIPMENT

1860893000	Tool for removing fuel gauge ring nut	●	●	●	●		
1860897000	Tool for extracting radio	●	●	●	●	●	●

BODYWORK

1860890000	Spanner for removing-refitting door hinges	●	●	●	●	●	●
1878034000	Tool for removing window opening handles	●	●	●	●	●	●
1878077000	Tool for removing door panel or fixing buttons	●	●	●	●	●	●
1878080000	Tool for positioning door check strap whilst refitting flexible retaining pin (to be used with 1878081000)	●	●	●	●	●	●
1878081000	Pliers for removing-refitting door check strap flexible retaining pin (to be used with 1878080000 whilst refitting)	●	●	●	●	●	●

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Tool number	DESCRIPTION OF TOOL	ENGINE TYPE					
		 12V	 16V	 16V	 20V	 D	 TD

ORDINARY TOOLS

1840005000	Universal extractor	●	●	●	●	●	●
1840206000	Percussion extractor (to be used with specific tools)	●	●	●	●	●	●
1846017000	Base for puller half-rings	●	●	●	●	●	●
1847017001	Percussion extractor (to be used with specific tools)	●	●	●	●	●	●
1861000000	Rotating stand for overhauling engine (also used for gear-boxes and differentials)	●	●	●	●	●	●
1861000001	Pair of sections for brackets supporting the engine on rotating stand 1861000000	●	●	●	●	●	●
1870007000	Universal handle	●	●	●	●	●	●
1870404000	Support for measuring recesses and projections (to be used with 1895881000)	●	●	●	●	●	●
1871000000	Rotating column for overhauling gearboxes and differentials	●	●	●	●	●	●
1876048000	Extractor for MINI HYLOK CONTACT (MHF) Ø 2,15 mm type terminals	●	●	●	●	●	●
1881138000	Adjustable pliers for pipe restricting bands and tabs	●	●	●	●	●	●
1882002010	Tool panel to be fixed to wall or stand 1882003000 (with hooks)	●	●	●	●	●	●
1882003000	Stand to hold two tool panels	●	●	●	●	●	●
1882011000	Set of additional hooks (50) for tool panel	●	●	●	●	●	●
1895113000	Dial gauge (0,05-0,10...0,80 mm) for checking various clearances	●	●	●	●	●	✓
1895881000	Dial gauge to be used with specific tools (measuring capacity mm 10; shank length mm 16,7)	●	●	●	●	●	●
1895882000	Dial gauge to be used with specific tools (measuring capacity mm 10; shank length mm 88)	●	●	●	●	●	●
1895884000	Dial gauge to be used with specific tools (measuring capacity mm 5; shank length mm 16,5)	●	●	●	●	●	●

DESCRIPTION	Thread size	Tightening torques	ENGINE TYPE					
			 12V	 16V	 16V	 20V	 D	 TD

ENGINE

Main bearing caps fixing, flanged blot	M10	8		●				
	M12	2+100°	●		●	●	●	●
	M12×1,25	2,5+100°			●			
(Dust) shield fixing, bolt	M6	0,9	●		●	●		●
Sump oil drain plug	M14	2,5	●					
	M18	2			●	●		●
	M22	5		●				
Oil sump fixing, bolt	M6	0,9	●	●	●	●		●
	M8	2,5	●		●	●		●
Flywheel side and timing side cover fixing, bolt	M6	0,7		●				
		0,9	●		●	●		●
Timing belt shields fixing, bolt	M6	0,9	●	●	●	●		●
	M8	2,5		●				
	M10×1,25	5		●				
Cylinder head to crankcase fixing, bolt	M10×1,25	4+ 90°+90°	●	●				
Cylinder head to crankcase fixing, bolt	M10	4+ 90°+90°+90°			●	●		
Cylinder head to crankcase fixing, bolt	M10	5+ 90°+90°+90°					●	
Cylinder head to crankcase fixing, bolt	M10	6,5+ 90°+90°+90°						●
Engine support to crankcase fixing, bolt	M10	5				●		
	M10×1,25	7	●	●	●			
	M8	2,5		●				
Camshaft cap fixing, bolt and nut	M8	1,9					●	
	M7	1,5	●		●	●		●
Tappet cover to cylinder head fixing, bolt	M6	0,9	●		●	●		●
Inlet manifold to cylinder head fixing, nut	M8	2,5	●		●		●	●
		3		●				
Exhaust manifold to cylinder head fixing, nut	M8	2,5	●		●	●	●	●
		3		●				
Flywheel to crankshaft fixing, bolt	M6	0,9	●		●	●		
Bearing caps fixing, bolt	M8	2+40°	●					
	M8	2+60°				●		●
	M10	2,5+50°					●	
	M9×1	2,5+60°			●			

Technical data

Tightening torques

Bravo-Brava

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DESCRIPTION	Thread size	Tightening torques	ENGINE TYPE					
		daNm	 12V	 16V	 16V	 20V	 D	 TD

Engine flywheel fixing, bolt	M10	8,3		●				
	M12×1,25	16	●		●	●		●
	M12×1,25	14,2					●	
Crankshaft gear fixing, bolt (*)	M16 left	36	●		●	●		●
Auxiliary pulley to crankshaft gear fixing, bolt	M8	2,5	●					●
		3,2			●			
Gear to camshaft fixing, bolt (inlet and/or exhaust)	M12	12	●	●	●	●	●	●
Butterfly casing to inlet manifold fixing, bolt	M6	0,9	●					
Accelerator bracket to inlet manifold fixing, bolt	M6	0,9	●					
Sensors to cylinder block/crankcase and cylinder head fixing, bolt	M6	0,9	●		●	●		●
Detonation sensor to cylinder block/crankcase fixing, bolt	M8	2,5	●		●	●		
Coils support to cylinder head fixing, bolt	M6	0,9	●					
Connector mounting bracket to inlet manifold and coils support fixing, bolt	M6	0,9	●					
Oil pump to crankcase fixing, bolt	M6	0,9	●		●	●		●
	M8	2,5		●				
Oil dipstick fixing, bolt and nut	M6	0,9	●			●		●
Water pump fixing, bolt	M8	2,5	●	●	●	●	●	●
Water inlet pipe to cylinder head fixing, bolt	M6	0,9	●		●	●		
	M8	2,5	●	●				
	M10	5				●		
Thermostat to cylinder head fixing, bolt	M8	2,5	●	●	●	●	●	●
Air conditioning compressor support to crankcase fixing, bolt	M10×1,25	5	●		●			
Alternator mounting to crankcase fixing, bolt	M8	2,5	●					
	M10×1,25	7	●					
	M10×1,25	5		●				

(*) The bolt should not be lubricated

DESCRIPTION	Thread size	Tightening torques daNm	ENGINE					
			 12V	 16V	 16V	 20V	 D	 TD
Cover and bracket to water pump casing fixing, bolt	M8	2,3					✓	
Water pump to cylinder head fixing, nut with flange	M8	2	●		●	●		●
Oil pump drive shaft driven gear fixing, bolt	M10×1,25	8		●				
Thermostat to cylinder head fixing, nut	M8	2	●	●	●	●	●	●
Driven gear to oil pump drive gear fixing, bolt	M10×1,25 left	7				●		
Butterfly casing to inlet manifold fixing, bolt	M8	2,5	●			●		
Ante-chamber fixing, ring nut	M32×1,5	11,8					●	●
Injection pump fixing, nut for stud	M8	2,5					●	
Injection pump fixing, bolt	M8	2,5					●	●
Flexible mounting to water pump casing fixing, nut	M12×1,25	8					●	
Injection pump drive gear fixing, nut	M12×1,25	4,9					●	
	M14×1,5	5						●
Reaction bracket to oil filter support and injection pump fixing, bolt	M8	2,9					●	
Injection pump mounting to crankcase and inlet manifold fixing, bolt	M8	2,5						●
Oil filter and injection pump mounting fixing, upper bolt or nut	M12×1,25	9,8					●	
Oil filter and injection pump mounting fixing, lower bolt	M10×1,25	7,1					●	
Complete injector	M24×2	5,5					●	●
Heater plugs	M12×1,25	1,5					●	✓
Fuel supply pipe on injection pump and on injector, nuts	M12×1,25	2,9					●	

Technical data

Tightening torques

Bravo-Brava

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DESCRIPTION	Thread size	Tightening torques	ENGINE					
		daNm	 12V	 16V	 16V	 20V	 D	 TD

Union on injection pump	M12×1,5	3,2					●	
Oil filter mounting union	M20×1,5	5					●	
Alternator to bracket fixing, bolt	M10×1,25	4,3					●	
Alternator to mounting fixing, bolt	M12×1,25	8,5		●				
	M10×1,25	5	●					
Alternator to mounting fixing, nut	M12×1,25	6					●	
Alternator mounting to crankcase fixing, bolt	M10×1,25	5	●	●	●	●		
Alternator mounting fixing, nut	M10×1,25	4,3					●	
Alternator to mounting fixing, nut	M12×1,25	7	●		●			●
Turbocharger to exhaust union fixing, nut	M8	2,5						●
Bolt for bracket strengthening exhaust manifold complete with turbocharger to crankcase	M10×1,25	4						●
Turbocharger to exhaust manifold fixing, nut	M8	2,5						●
Power steering pump to support fixing, bolt	M8	2,5	●	●	●			●
Pulley to power steering pump fixing, bolt	M8	2,5	●		●			●
Power steering pump to support fixing, nut	M10×1,25	4,8		●				
Power steering pump after tensioning belt fixing, bolt	M10×1,25	4,8		●				
Air conditioner to support fixing, bolt with flange	M10×1,5	5	●		●	●		●
Reaction bracket to support fixing, bolt with flange	M10×1,5	5	●		●	●		●

DESCRIPTION	Thread size	Tightening torques	ENGINE					
		daNm	 12V	 16V	 16V	 20V	 D	 TD

Reaction bracket to air conditioner fixing, bolt with flange	M8	2,5	●		●	●		●
Drive shaft bracket to oil sump fixing, bolt	M8	2	●		●	●		●
Drive shaft to crankcase connecting support fixing, bolt	M10×1,25	4,9	●		●	●		●
E.G.R. valve to exhaust manifold fixing, nut	M8	2,5						●
Pipe to E.G.R. valve fixing, bolt	M8	2,5						●
Engine oil pressure sender unit	M14×1,5	3	●		●	●		●
Engine oil pressure switch	M14×1,5	3,2	●	●	●	●	●	●
Thermal switch for pollution control	M14×1,5	1,5			●	●		
		3						●
Engine coolant temperature sender unit	M16×1,5 tapered	3,4					●	
	M14×1,5	3	●	●	●	●		●
Engine coolant temperature sender unit for injection electrical components	M12×1,5	2,5	●					
	M14×1,5	3			●	●		●
Air pressure switch	M12×1,5	3						●
Spark plugs	M14×1,25	2,5	●		●	●		
		3,7		●				

Tightening torques

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DESCRIPTION	Thread size	Tightening torques
		daNm

ENGINE EXHAUST

Front section of exhaust pipe with differential side bracket fixing, bolt	M8	1,8
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POWER UNIT MOUNTING

Bracket, differential side, to gearbox fixing, bolt (1370)	M12×1,25	9
Bracket, differential side and engine side, to gearbox, fixing bolt (1370)	M10×1,25	4,5
Mounting, engine side, to engine support, fixing nut (1998)	M12×1,25	8
Support, differential side, to gearbox, fixing, bolt	M12×1,25	8,5
Engine to bodyshell fixing, bolt with flange	M8	3,2
Differential support to gearbox fixing, nut	M12×1,25	8
Bracket, differential side, to gearbox fixing, bolt (1929 D-1910 TD)	M10×1,25	5
Support to gearbox fixing, bolt with flange (1370)	M10×1,25	5
Connecting rod support to bodyshell fixing, bolt with flat tapered washer (1747-1998)	M8	3,8
		2,8
Reaction rod to bracket and engine support fixing, bolt (1747-1998)	M10×1,25	5
Mounting, engine side, to support fixing, bolt (1581)	M12×1,25	8
Mounting to engine oil sump, differential side fixing, bolt (1747-1998)	M12×1,25	8
Counter-pulley to support, differential side fixing, bolt (1747-1998)	M12×1,25	8
Flexible mounting to differential cross member fixing, bolt	M8	3,8
Bracket, gearbox side, to gearbox fixing, bolt (1581-1747-1998-1929D-1910TD)	M10×1,25	5

DESCRIPTION	Thread size	Tightening torque
		daNm

PEDALS

Brake pedal and clutch pedal to pedals fixing, self-locking nut with polyamide ring for hinging bolt	M8	3
Complete support for brake pedal and clutch pedal to body-work fixing, nut with border	M8	1,5
Pedals to dashboard fixing, bolt with flange	M8	2,6

EXTERNAL GEARBOX CONTROLS

Gear lever support to floor panel fixing, bolt	M6	0,74
Lower gear selection and engagement rod to gear lever fixing, bolt	M8	2,8
Intermediate idler fixing pin, nut	M8	1,5
Heads to levers fixing, nut	M8	1,5
Idler selector to gearbox fixing, nut for bolt	M8	1,5
Reverse gear pipe to gearbox fixing, bolt	M8	1,5
Spherical tubes to selector lever fixing, nut	M8	1
Reaction bracket to gearbox fixing, bolt	M8	2,5

GEARBOX AND DIFFERENTIAL

Gear control lever spring fixing, nut	M14×1,4	3
Plate to gearbox casing fixing, bolt	M8	2,5
Gearbox casing cover and plate fixing, bolt	M8	2,5
Cover on gearbox casing fixing, bolt	M8	2,5
Gearbox casing to bell housing fixing, bolt	M6	1
	M8	2

00.

DESCRIPTION	Thread size	Tightening torques
		daNm

Reverse shaft fixing, bolt	M8	3,4
Ring nut for main and lay shaft fixing 5th speed gear	M20×1,5	11,8
Gear selector forks fixing, bolt	M6	1,8
Lever to gear selector and engagement control shaft fixing, bolt	M8	2,5
Reverse control lever support fixing, bolt	M6	1
Bush for gear control shaft fixing, bolt	M6	1
Front axle reduction ring gear fixing, bolt	M10×1,25	8,8
Flange retaining differential casing to gearbox casing fixing, bolt	M10×1,25	4,9
	M8	2,5
Speedometer mounting fixing, bolt	M6	1,2
Tapered, threaded gearbox oil drain plug	M22×1,5	4,6
Tapered, threaded gearbox oil filler plug	M22×1,5	4,6
Right differential shaft support fixing, bolt	M6	1
Tapered threaded plug for 1 st - 2 nd speed rod housing in gearbox casing	M18×1,5	2
Gear selector lever support fixing, bolt	M8	1,5
Switch for reversing light	M14×1,25	3

POWER ASSISTED STEERING

Power steering box to chassis fixing, bolt	M10×1,25	7
Power steering bracket fixing, nut	M6	0,4

DESCRIPTION	Thread size	Tightening torque
		daNm

Power steering bracket fixing, bolt	M8	1,5
Power steering bracket fixing, bolt	M6	1,5
Power steering bracket fixing, nut	M8	1,5
Filler for return union from power steering to reservoir	M12×1,5	2
Filler for oil supply union from pump to power steering, on power steering	M14×1,5	3
Air Bag control unit fixing, bolt	M6	0,8
Air Bag module to steering wheel fixing, bolt	M6	0,8
Passenger module to dashboard cross member fixing, bolt	M6	0,7

FRONT SUSPENSION

Front cross member to bodyshell front fixing, bolt with wide flange	M12×1,25	10,8
Front cross member to bodyshell rear fixing, bolt with normal flange for nut	M10×1,25	8
Bolt with flat and tapered washer for fixing front and rear external U bolts securing track control arm to cross member	M10×1,25	6,9
Bolt with flat and tapered washer fixing and rear internal U bolt securing track control arm to cross member	M10×1,25	6,9
Upper shock absorber to mounting fixing, flanged nut	M12×1,25	10
Upper shock absorber mounting to bodyshell fixing, bolt with wide flange	M8	4
Shock absorber to steering knuckle fixing, nut	M10×1,25	7
Track control arm to steering knuckle fixing, nut for bolt	M10×1,25	7
U bolt supporting anti-roll bar to cross member fixing, bolt with flat and tapered unlosable washer	M8	4

00.

DESCRIPTION	Thread size	Tightening torques
		daNm

Ends of anti-roll bar to connecting rod fixing, nut	M10×1,25	7
Connecting rod to front suspension arm fixing, nut	M10×1,25	3,1
Front wheel hub to joint fixing, nut	M22×1,5	24
	M24×1,5	28
Wheel bolts/nuts	M12×1,25	8,6

REAR SUSPENSION

Front flexible mounting to rear frame and bodyshell fixing, bolt with wide flange	M12×1,25	10,8
Rear flexible mounting to bodyshell fixing, bolt with wide flange	M12×1,25	10,8
Rear suspension track control arm to frame fixing, nut for bolt	M16×1,5	15
Lower shock absorber to suspension fixing, nut for bolt	M12×1,25	8,8
Upper shock absorber to mounting fixing, bolt	M10×1,25	6
Rear hub stub axle fixing, nut	M22×1,5	28
Anti-roll bar to rear suspension arm fixing, bolt	M10×1,25	5,6
U bolts supporting anti-roll bar to rear suspension arm fixing, bolt	M8	2,8
Wheel bolts/nuts	M12×1,25	8,6
Lever to track control arm fixing, nut for bolt	M8	1,5

DESCRIPTION	Thread size	Tightening torques
		daNm

BODYWORK

Luggage compartment retaining hook fixing, bolt	M8	2
Side door lock fixing, bolt with tapered washer	M6	0,75
Rear door fixed hinge fixing, bolt	M10×1,25	4,5
Front bumper fixing, bolt with flange	M8	2

00.

Lubrication service

The engine oil should be changed, on petrol engines, every 20,000 km or, irrespective of the mileage, every 12 months and for diesel engines every 10,000 km.

The oil filter should be replaced at the same time as the oil is changed.

For the correct and optimum operation of the engine, it is advisable to use the type of oil recommended in the table on page 8.



If the vehicle is constantly subjected to heavy usage conditions (mainly town driving, journeys in dusty areas, constant mountain driving, towing a trailer or caravan, particularly harsh climatic conditions, constant motorway driving at high speed etc.) the "Lubrication service" should be carried out at more frequent intervals. In the above mentioned conditions it is also advisable to carry out the "Planned maintenance programme" and the "Intermediate checks" at more frequent intervals.

PLANNED MAINTENANCE OPERATIONS

	INTERVALS IN THOUSANDS OF KM				
	20	40	60	80	100
Check condition and wear of tyres	☆	☆	☆	☆	☆
Check condition and wear of front brake pads	☆	☆	☆	☆	☆
Check condition and wear of rear brake discs (only for 1998 20v)		☆		☆	
Check condition and wear of rear brake linings (drum brakes)			☆		
Visually inspect condition of exterior bodywork and underbody protection	☆	☆	☆	☆	☆
Check condition of pipes (exhaust, fuel system, braking system)	☆	☆	☆	☆	☆
Check condition of rubber elements, boots, hoses, etc	☆	☆	☆	☆	☆
Check condition of various drive belts	☆		☆		☆
Check and adjust clutch pedal height (excluding version with hydraulic operation)		☆		☆	
Check anti-evaporation system			☆		
Check and adjust tappet clearance (only for diesel engines)	☆		☆		☆
Check exhaust gas emissions (petrol engines, using CO tester)	☆	☆	☆	☆	☆
Check crankcase ventilation system					☆
Replace fuel filter (petrol engines)		☆		☆	
Replace fuel filter (diesel engines)	☆	☆	☆	☆	☆
Sostituzione cartuccia filtro aria (motori benzina)		☆		☆	
Replace air filter cartridge (diesel engines)	☆	☆	☆	☆	☆
Top up fluid levels (engine coolant, braking system, windscreen washer, power assisted steering, hydraulically operated clutch)	☆	☆	☆	☆	☆
Check gearbox differential oil level			☆		
Replace gearbox differential oil					☆
Replace pollen filter	☆	☆	☆	☆	☆
Replace engine coolant			☆		
Change automatic gearbox oil and (filter)		☆		☆	

INTERVALS IN THOUSANDS OF KM				
20	40	60	80	100

PLANNED MAINTENANCE OPERATIONS

Replace spark plugs, check high tension leads		☆		☆	
Replace brake fluid			☆		
Check injection/ignition system (petrol engines, using autodiagnostic socket)		☆		☆	
Change engine oil and oil filter (every 10,000 Km for diesel engines)	☆	☆	☆	☆	☆

Additional operations

In addition to what is laid down in the "Planned maintenance" programme, the following checks should also be carried out:

Every 500 km or before long journeys check	- engine oil level - engine coolant level - brake fluid level/hydraulic clutch operation - power steering fluid level - pressure and condition of tyres - windscreen washer fluid level
Every 500 km check (only for diesel engines)	- bleed condensation water from fuel filter
Replace every 2 years	- engine coolant - brake/clutch fluid
Replace every 120,000 km	- timing belt

Engine 1370 12v

Engine 1581 16v

Engine 1747 16v

Engine 1929 Diesel

Engine 1998 20v

Removing-Refitting

Engine 1370 12v removing-refitting

Engine 1581 16v removing-refitting

Engine 1747 16v removing-refitting

Engine 1929 Diesel removing-refitting

Engine 1998 20v removing-refitting

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BOSCH MONOMOTRONIC SPI INTEGRATED INJECTION-IGNITION SYSTEM

Introduction

The BOSCH MONOMOTRONIC SPI control system is an integrated system and thus governs engine injection and ignition by means of a single electronic control unit.

This is an S.P.I. system, in other words only one injector controls fuel injection point and pulse duration upstream of the throttle and the instant when a spark is triggered in the combustion chamber of each cylinder (advance angle).

The MONOMOTRONIC engine control system works on the basis of engine load information determined by throttle angle/rpm (α/n). In other words, fuel requirements and advance settings are calculated on the basis of throttle opening angle of throttle and engine rpm.

This system is equipped with a LAMBDA probe. The system corrects injection pulse constant according to whether the lambda probe indicates a rich or lean mixture. A closed-loop control system is therefore set up.

SYSTEM OPERATING STRATEGIES

The management software resident in the ECU memory comprises a set of strategies. Each of these controls a specific system control function.

Each strategy uses the various inputs listed above to process a set of parameters, using data maps saved in specific areas of the ECU. The resulting data output is used to control system actuators, in other words the devices used to operate the engine.

The management strategies control the moment of ignition and temperature/pressure of intake air at different engine speeds in order to ensure even engine running regardless of changes in environmental conditions and applied loads. They must also control and manage injection so that the stoichiometric ratio (air/fuel) is maintained within optimal levels.

System management strategies are essentially as follows:

1. injection management;
2. ignition management;
3. engine idle control;
4. fuel vapour recirculation management;
5. controlling knock;
6. heating/ventilation system management;
7. system self-adaption;
8. Fiat CODE lock management;
9. test management.

INJECTION MANAGEMENT

The ECU receives information on rpm (n) and throttle valve opening (α) and is then able to identify base pulse constant (t_i) within a specific map.

Under various different engine service conditions, injector opening times are optimised by correcting times (in accordance with changing conditions) of: coolant temperature (1), air temperature (2) and signal received from lambda probe (3). Injection is synchronous at all times, i.e. timed to coincide with the moment of ignition.

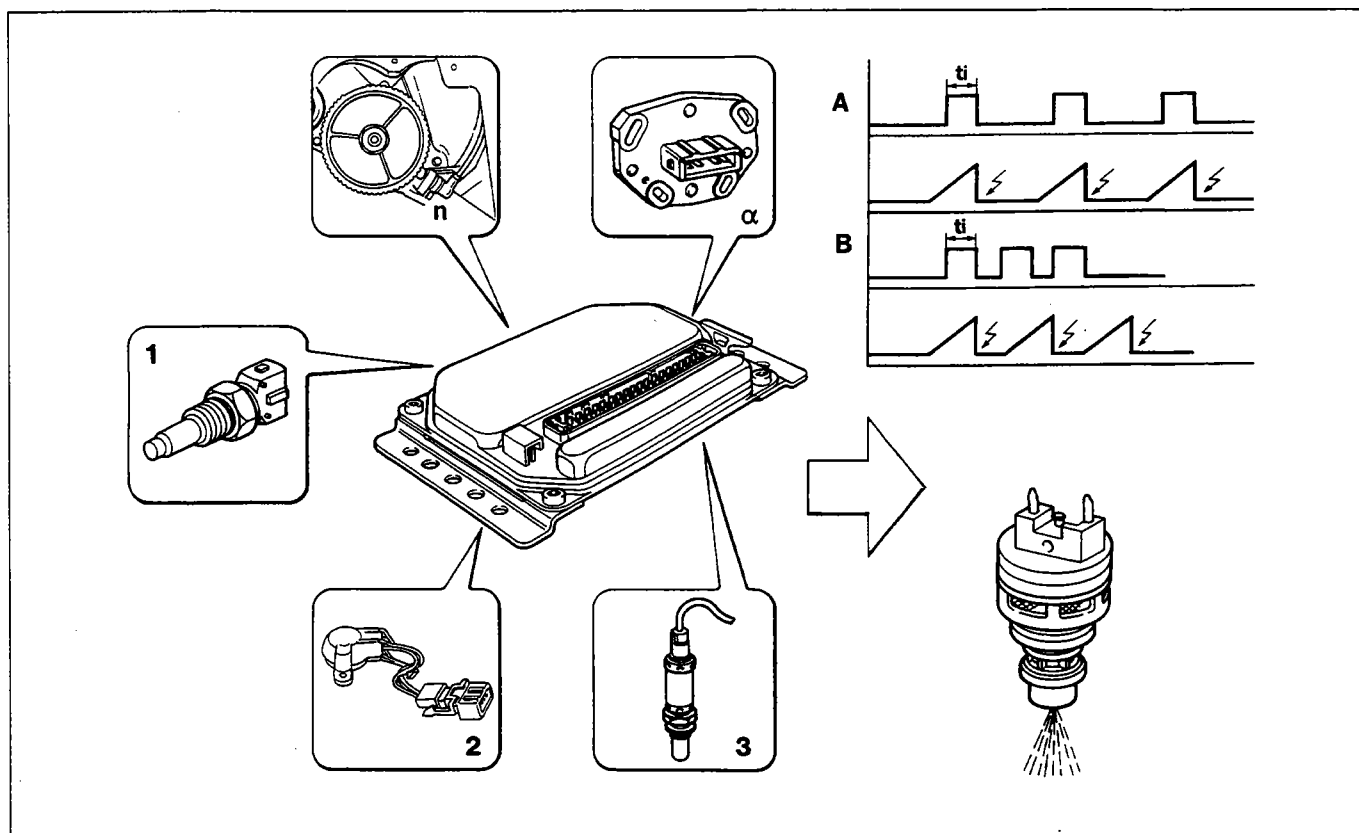
The ECU uses specially selected maps to keep fuel mixture concentration close to stoichiometric levels (14.7 parts air to 1 part petrol).

To maintain this ratio constant, **the ECU uses two different modes for the control of injector opening.**

The first mode is **synchronous operation**, where the injector is opened whenever a high tension pulse is sent to the spark plugs (graph A).

The second control mode is **asynchronous operation**, where the ECU controls injector opening regardless of the number of high tension pulses sent to the spark plugs (graph B).

This occurs because under certain conditions (with base pulse constants too short, ≥ 1.4 milliseconds) mechanical inertia characteristics (hysteresis) of the injector do not permit proper opening and closure. For this reason, a specific strategy must be adopted to suit mechanical injector properties.



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Controlling supply to fuel pump

Control of fuel pump (A) is through the ECU which is responsible for turning on pump, by means of relay (B), during start-up and normal engine operation.

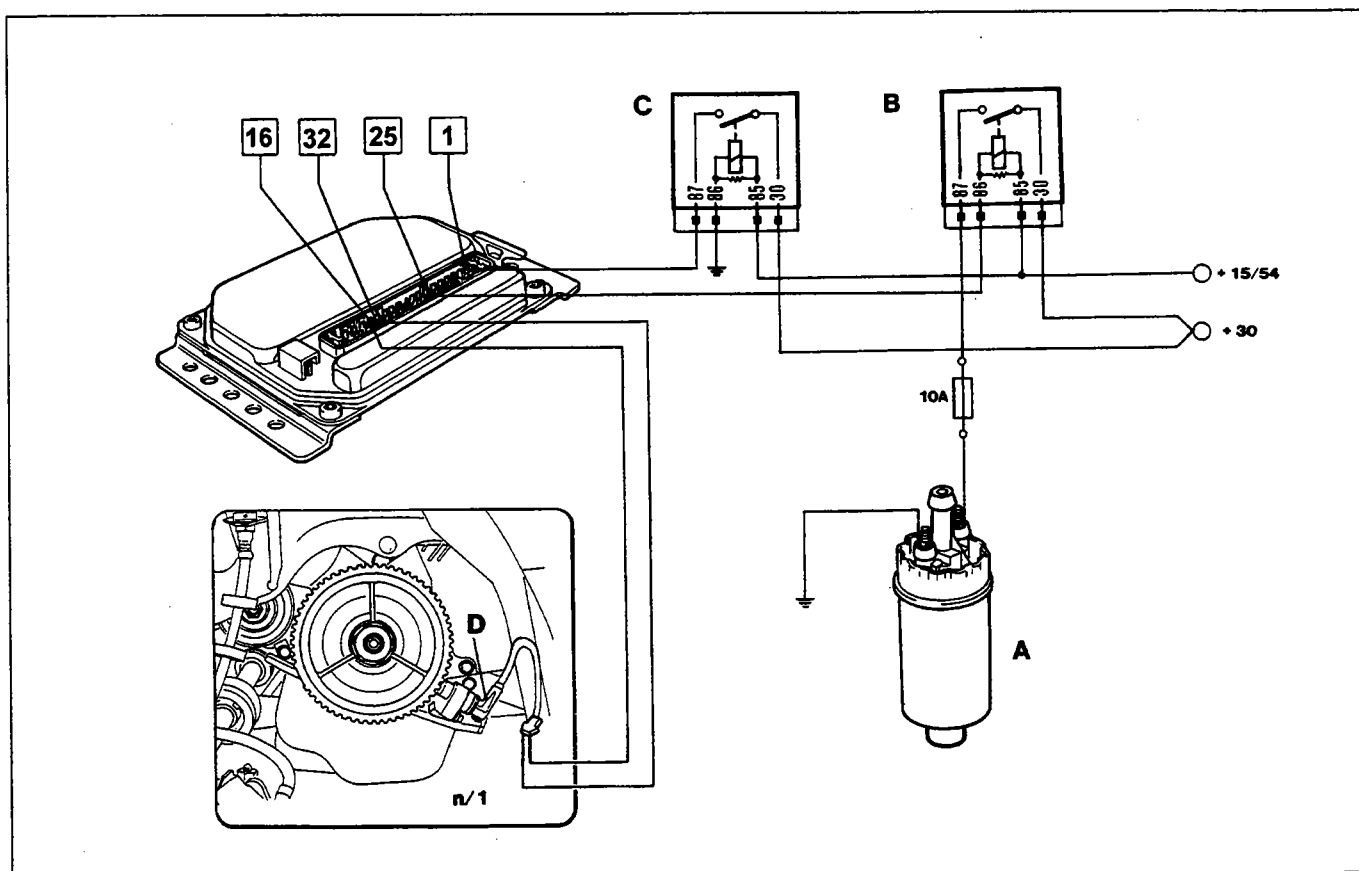
With ignition switch in MAR position (15/54), power is supplied simultaneously to pump relay (B) and main relay (C), which closes to provide power to the ECU (terminal 1).

A special circuit in the ECU earths pump relay (B) through terminal (25), which in turn supplies fuel pump (A) with power through a 10 A fuse. The pump puts the fuel system under pressure for about 1 - 2 seconds.

When the engine is started up, an rpm signal from rpm and TDC sensor (D) reaches terminals (16 and 32) of the ECU. After about 1 second, relay (B) is activated and the pump thus stops (for safety reasons) even with the ignition switch in MAR position.

If battery voltage drops below rated level (e.g. during cold starting), the fuel feed pressure tends to drop.

To overcome this drawback, the ECU increases injection time proportionally in accordance with a correction factor to ensure accurate fuel metering at all times.



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Starting

With the ignition key in MAR position, the ECU activates the electric pump for a few moments and obtains data from the various sensors.

According to information from coolant temperature sensor, the ECU commands throttle valve opening via direct current motor. **The control unit recognises the start-up phase when the rpm value reading from sensor (3) exceeds 30/min.**

At very low temperatures, base pulse constants increase: the injector stays open longer and a richer mixture is formed.

At very high temperatures, pulse constants are reduced to move closer to a stoichiometric ratio.

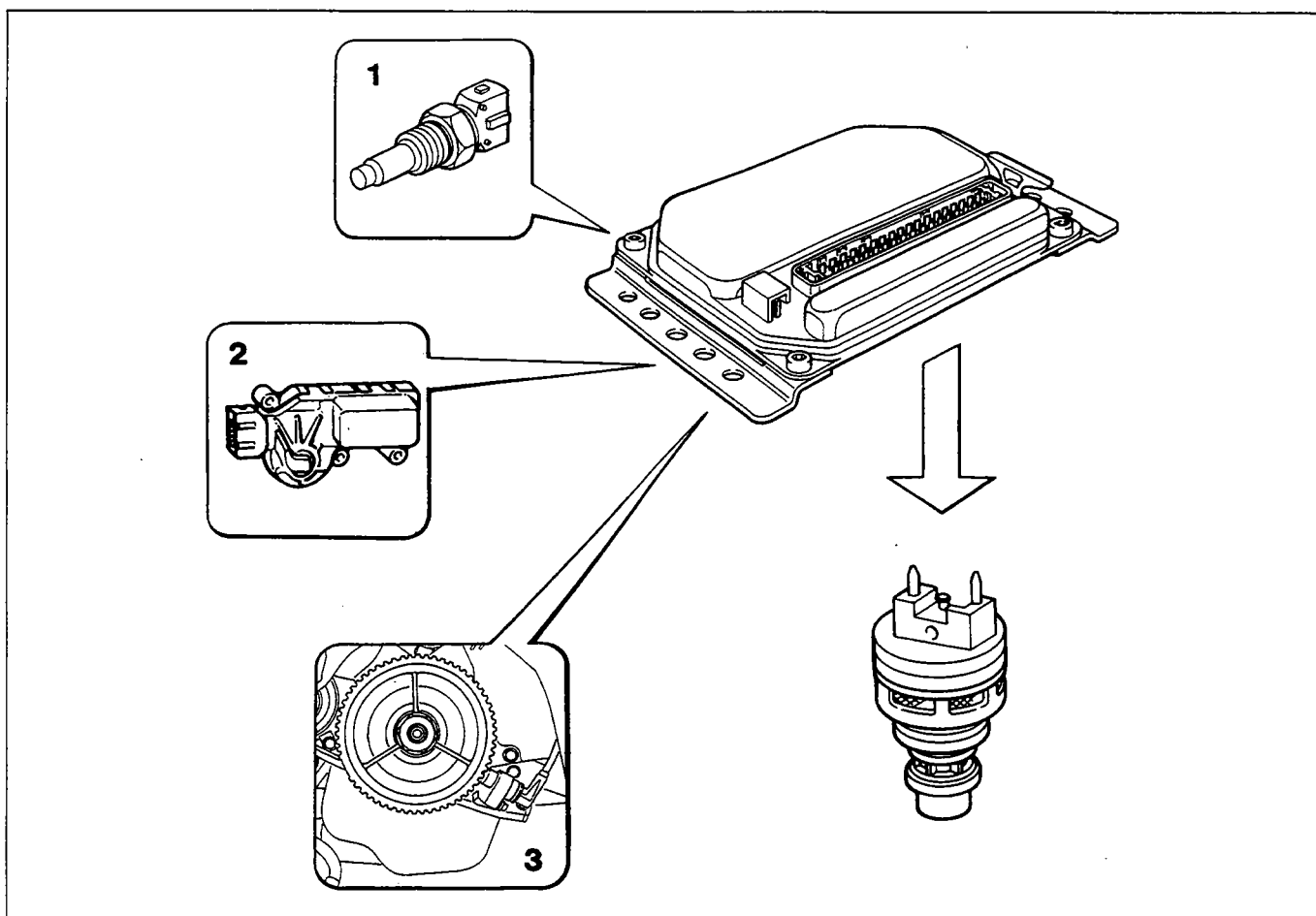
The control unit also contains an anti-flood function controlled by an internal timer that gradually reduces mixture enrichment when the engine fails to start for some reason.

During the stage following start-up, base pulse constants (ti) selected by the control unit are enriched by a function that varies according to coolant temperature and is cancelled with time.

This constant does not remain the same throughout the activation period but is reduced gradually (by a timer in the control unit)

During engine warm-up a further untimed coolant temperature-dependent enrichment takes place in addition to the enrichment that occurs after starting:

This enrichment falls gradually in inverse proportion to engine temperature.



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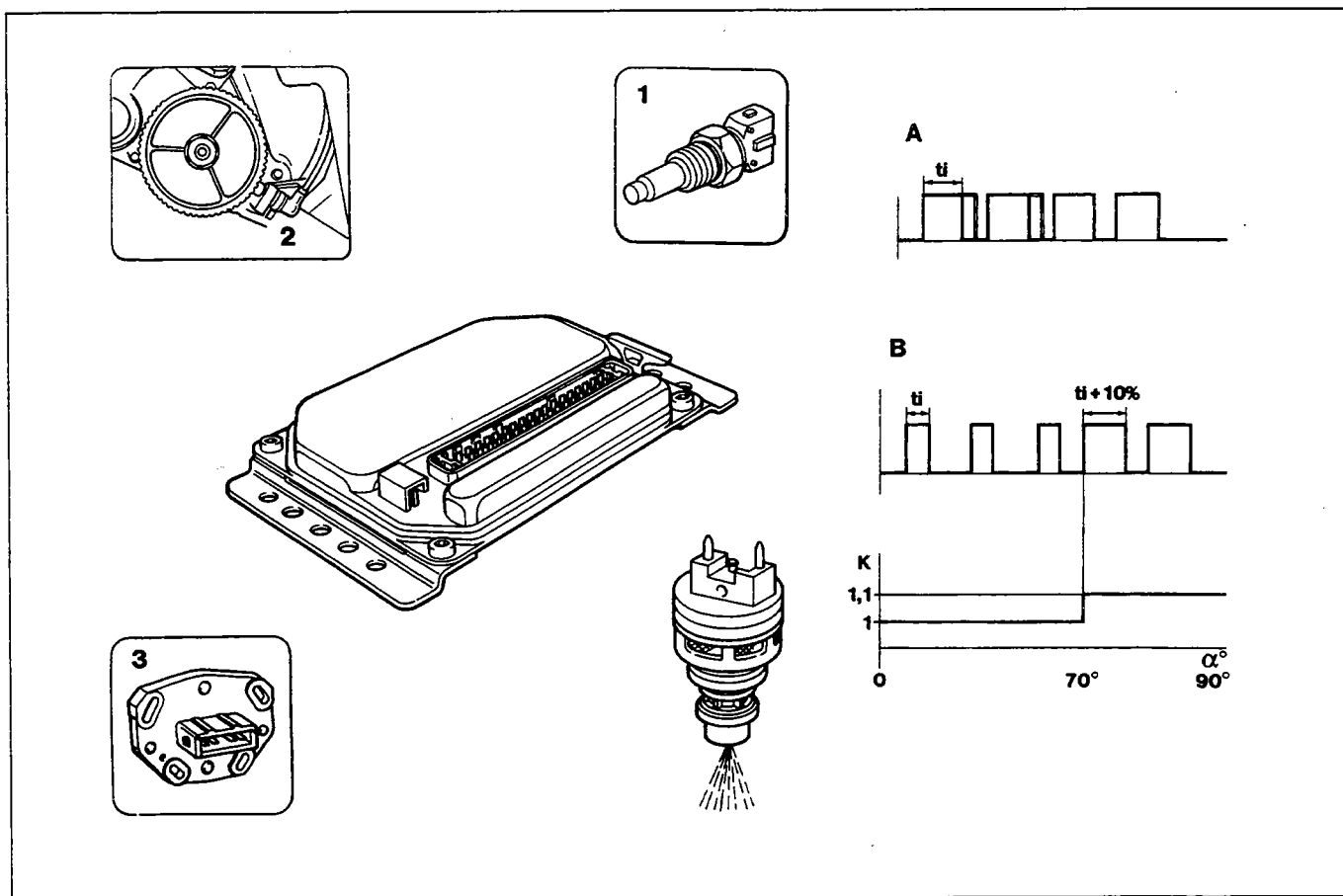
Acceleration and full power

During acceleration, the electronic control unit brings about enrichment of the mixture concentration (graph A) as a function of signals from the coolant temperature sensor (1), rpm sensor (2) and throttle valve angular position sensor (3).

When the engine is working at full power, base pulse constants (t_i) are increased by a factor (K) according to opening angle (α) of throttle valve (3).

When the butterfly valve opening angle exceeds 70° (graph B), fuel power enrichment comes into operation and increases base pulse constant by about 10%.

When rpm exceeds 6000/min, the control unit restricts maximum rpm (suppressing injection pulses by cutting off the fuel supply).



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10.

Over-run and cut-off

During over-run, the mixture must be made more lean to reduce fuel consumption and polluting emission levels (HC + CO).

To achieve this aim, the control unit contains a function known as fuel CUT-OFF that is dependent upon the closure of contact (1) in the idle control motor at a given coolant temperature and rpm. The first two conditions necessary for activating the CUT-OFF function are:

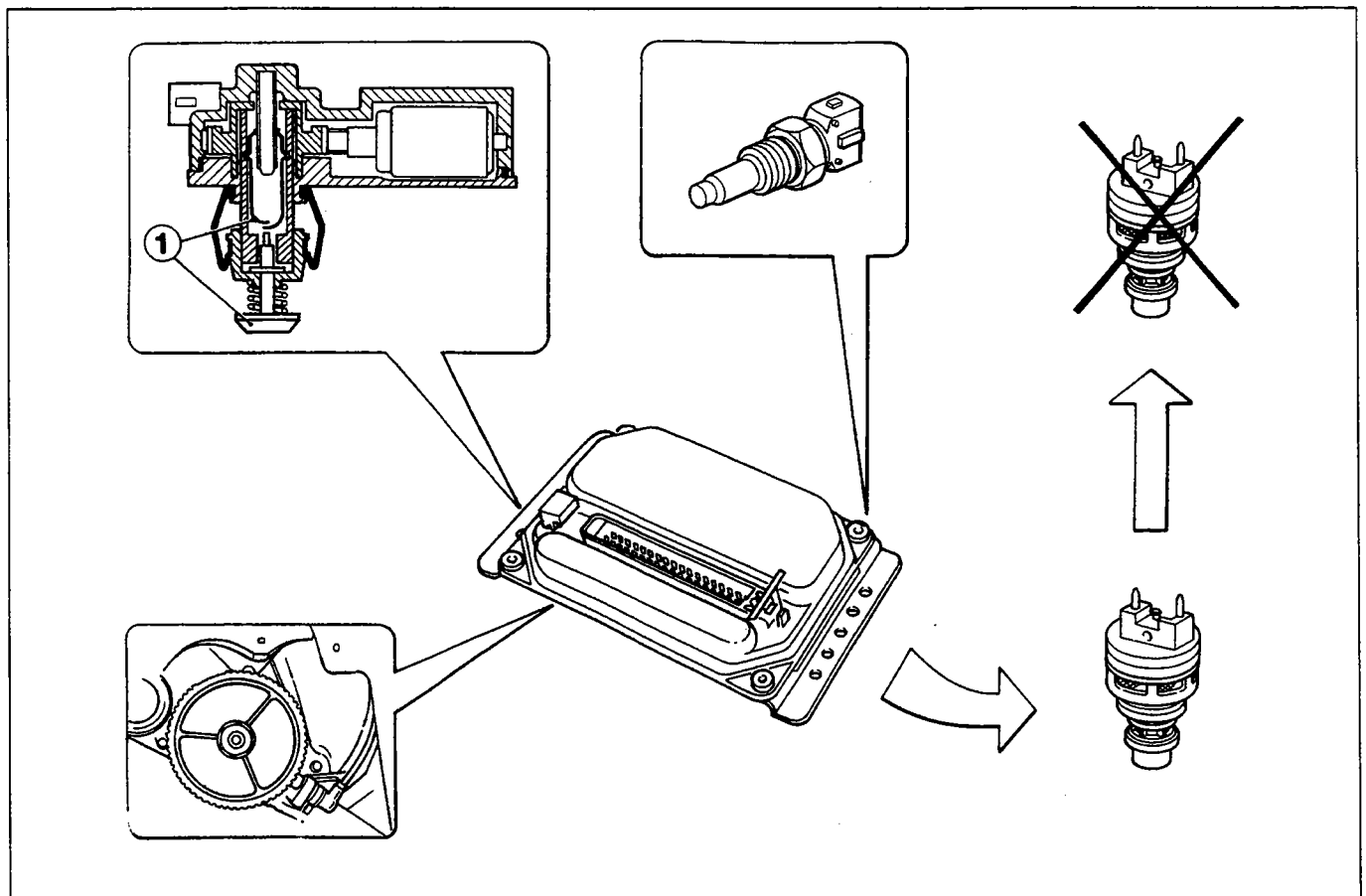
- coolant temperature in excess of 40° C,
- engine rpm in excess of 1800/min.

If the above over-run conditions exist, idle contact (1 - throttle closed) earths terminal 3 of the control unit, which cuts off fuel injection via terminal 21.

In addition to fuel cut-off, the control unit activates a specific ignition curve with "over-run" advance settings.

Fuel injection cut-off and specific advance curves remain in operation until the engine reaches a speed of 1500/min. Below this speed, injection pulses are activated to prevent the engine stalling.

When injection is restored, the control unit implements a fuel enrichment strategy in order to re-form the fuel film on the manifold and thus optimise engine efficiency.



P4A06AJ01

Lambda adjustment

The LAMBDA probe controls mixture concentration by measuring the residual oxygen content of exhaust emissions.

Because the ceramic is not active below 300° C, the LAMBDA probe is heated electrically by a resistance (inside the probe) that is continually supplied by a locked positive and protected by a 10 A fuse.

This heating is necessary during cold starts to maintain sensor efficiency if the engine idles for long periods.

With temperatures in excess of 300° C, the ceramic becomes a conductor of oxygen ions. If the percentages of oxygen present on either side of the sensor differ, a voltage difference is set up across the two end poles.

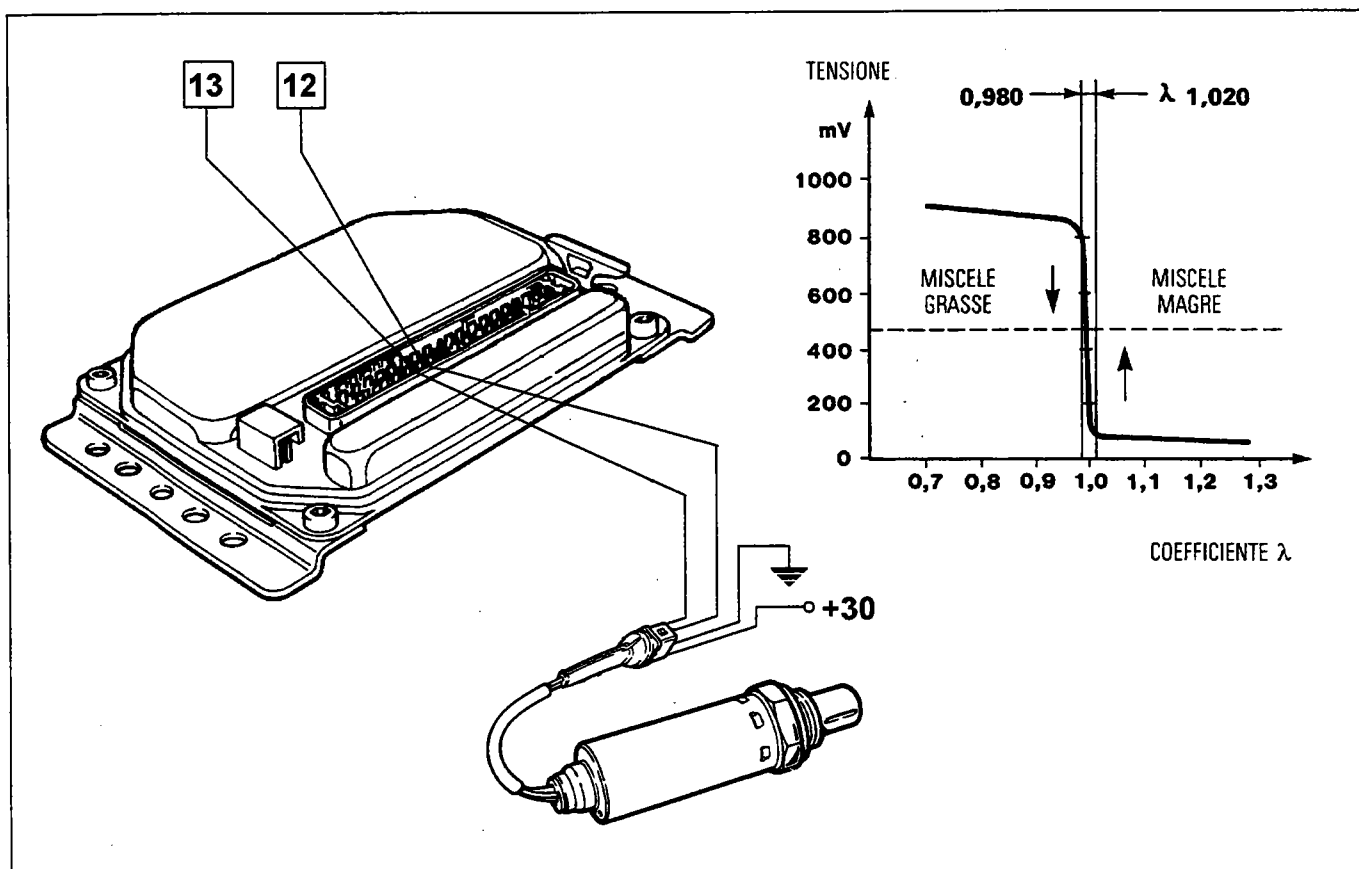
The LAMBDA probe sends a voltage difference signal to the control unit through terminals (12) and (13).

LAMBDA probe measurements of exhaust gas composition allow the control unit to correct the mixture concentration continually on-line (leaner/richer) in order to maintain it close to a stoichiometric ratio. Efficient catalytic converter operation and low exhaust gas toxicity are dependent on an exact mixture composition.

During the above stages, injection pulse changes made by the control unit on the basis of the LAMBDA probe signal are excluded because they would be at odds with the required driving conditions; the engine thus operates in OPEN LOOP.



With both LAMBDA probe and control unit circuit working properly, the percentages of polluting exhaust gases are self-regulated by the system without the possibility of external regulation.



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10.

IGNITION MANAGEMENT

The ignition system is solid-state distribution type. In other words, moving parts are eliminated by doing away with a high tension distributor (case-brush-cap).

Coil (B) is fitted with four high tension outlets connected directly to the spark plugs. Their operation is managed entirely by control unit (A).

The control unit contains (in addition to fuel metering control parameters) a memory map (C) containing a set of optimal advance angles that can be used by the engine according to service conditions: engine load (α) and rpm (n).

The mapped values are obtained experimentally on a bench taking into account power, fuel consumption and polluting emissions.

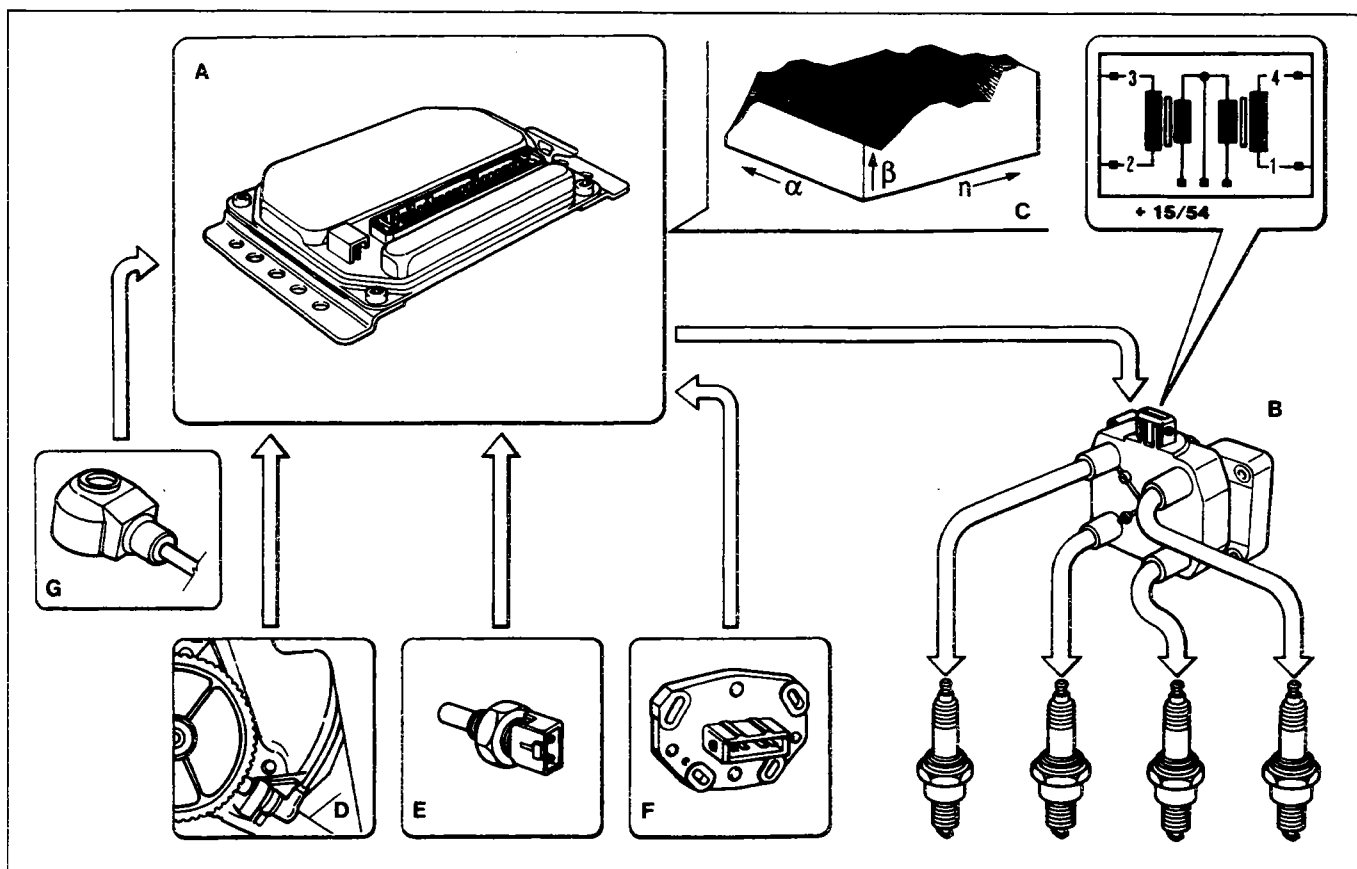
The control unit selects the appropriate advance value according to the memory maps, rpm (D), coolant temperature (E) and engine load (F), knock (G) and governs the ignition unit power module accordingly.

The control unit contains three different base advance angle maps to cater for changing engine service conditions:

- full load, settings mapped according to rpm and engine load.
- partial load, settings again mapped according to rpm and engine load.
- idling, where settings are mapped according to rpm.

The full load and partial load advance angle may also be subject to further corrections on the basis of engine temperature and air temperature. The idle advance angle is corrected only on the basis of engine temperature (non-constant value is about 7°).

The control unit contains an algorithm that computes the advance on the basis of rpm and battery voltage at which current begins to flow into the coil primary winding.



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The ignition coil consists of two primary windings connected to control unit (A) via terminals 34 and 35 supplied by battery voltage, and two high tension secondary windings whose outputs are connected directly to the spark plugs of cylinders 1-4 and 3-2.

The two spark plug pairs are supplied with high voltage whenever current is cut off in the primary winding by the power module. The high tension solid state distribution exploits the different pressure conditions existing simultaneously in cylinder pairs 1-4 and 3-2.

In practice, if an air/fuel mixture is present, the compression phase of one cylinder corresponds to the exhaust phase of the other.

If, under these conditions, the voltages required to set off a spark between the electrodes of a spark plug are examined, it may be noted that the voltage is very high during the compression stage (10 - 15 kV), but extremely low during the exhaust stage (in the order of 500 V).

Two sparks therefore cross the secondary circuit of each coil. One of these generates about 500 V and is in essence a wasted spark because it is triggered in the cylinder in exhaust phase, the other generates 10 - 15 or more kV in the cylinder in compression-exhaust stage in order to burn the air fuel mixture in the cylinder.

ENGINE IDLE CONTROL

The main aim of this strategy is to maintain engine speed at around the mapped setting (warm engine: 850 rpm): the position assumed by the actuator is dependent on engine conditions/rpm and vehicle speed.

Start-up stage

When the key is inserted, the actuator takes up a position dependent on engine temperature and battery voltage (open-loop position).

Warming-up stage

The rpm is mainly corrected on the basis of coolant temperature.

With the engine warm, idle management is dependent upon the signal from the rpm sensor. The ECU introduces sustained idle when external loads are activated.

Over-run

When the accelerator is released when the car is not idling, the ECU governs the actuator (step motor) by means of special delivery curve (dash-pot curve), i.e. delays the return of the plunger to its housing to bring about a reduction in engine braking effect.

FUEL VAPOUR RECIRCULATION MANAGEMENT

Fuel vapours (legally recognised pollutants) are directed to an active carbon filter and then on to the engine where they are burnt. This is achieved by means of a solenoid controlled by the ECU only when engine load conditions are appropriate for permitting effective combustion without operation being impaired. The ECU compensates for the extra fuel by reducing fuel flow to the injectors.

CONTROLLING KNOCK

This function detects the presence of knock by processing a signal from a knock sensor. The ECU continually compares signals from the sensor with threshold values, which are in turn continually updated to take into account background noise levels and engine age.

The ECU is therefore able to detect the presence of knock (or incipient knock) and reduce the ignition advance until the effect disappears. The advance is then gradually restored to baseline levels.

10.

When the car is accelerating, a higher threshold is used in order to take into account the increased engine noise under these conditions. The knock control strategy is also equipped with a self-adaptive facility which memorises advance reductions which are repeated regularly. In this way, the maps are adapted to the different conditions the engine encounters.

HEATING/VENTILATION SYSTEM MANAGEMENT

When the air conditioner comes on, the compressor takes up power from the engine which tends to stall when idling. To avoid this problem, the ECU adjusts air flow to the new power requirements by driving the relevant actuator (adjustment also takes place when the car is running in order to maintain optimum driveability). Another system function is to cut off the power supply to the compressor temporarily in the case of high power demands on the engine (powerful acceleration).

SYSTEM SELF-ADAPTION

The ECU comprises a self-adaptive function which recognises changes occurring in the engine due to settling and wear (this applies to the components and the engine itself).

Such changes are memorised in the form of changes to the baseline maps and serve the purpose of adapting system function to gradual changes in the engine and its components as the engine grows older.

This function also compensates for inevitable differences between original parts and new parts (due to production tolerances. Maximum performance is therefore achieved for all vehicles without the need for specific adjustment and test operations.

Self-adaptive parameters are lost if the ECU is disconnected.

FIAT CODE IGNITION LOCK FUNCTION MANAGEMENT

The system features an ignition lock function. This is implemented through a special FIAT CODE control unit able to dialogue with the engine control unit, and an electronic key with a specific sender unit designed for sending an identification code.

Once the key has been turned to STOP, the FIAT CODE system de-activates the engine control unit completely.

When the key is turned to MAR, the following operations take place in sequence:

1. the engine control unit (whose memory contains a secret code) sends the FIAT CODE a request demanding that a secret code be sent to de-activate the function lock;
2. the FIAT CODE control unit responds by sending the secret code only after receiving a recognition code sent by the ignition key;
3. recognition of the secret code allows the engine control unit lock to be de-activated and normal operation to proceed.

NOTE *When the FIAT CODE anti-theft system is present, it is extremely inadvisable to test the vehicle using another engine control unit. In this case, the FIAT CODE control unit would transfer the recognition code (unknown) to the test control unit, which would thus be rendered completely unserviceable on other vehicles.*

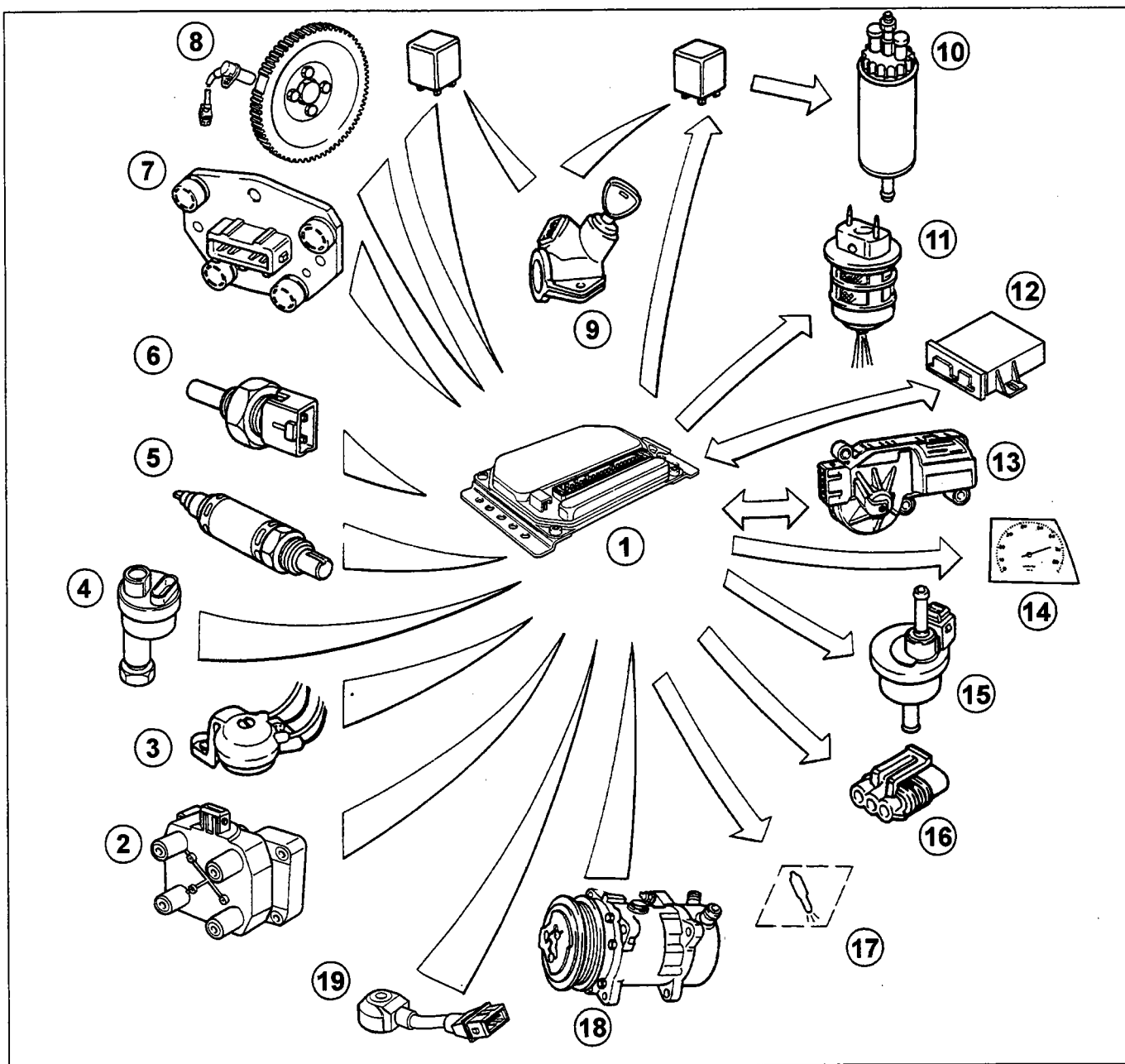
TEST MANAGEMENT

Full injection-ignition system electronic testing can be achieved by connecting a FIAT/LANCIA TESTER to the test socket.

The system is also equipped with a self-diagnostic function which recognises, memorises and indicates any faults.

If sensors or actuators are found to be faulty, signal reconstruction strategies are immediately activated (recovery) so that the engine is able to operate at an acceptable level without affecting function. The car can then be driven to a service point for the necessary repairs.

DIAGRAM SHOWING INPUT/OUTPUT BETWEEN ECU AND SENSORS/ACTUATORS OF THE BOSCH MONOMOTRONIC SPI INJECTION-IGNITION SYSTEM



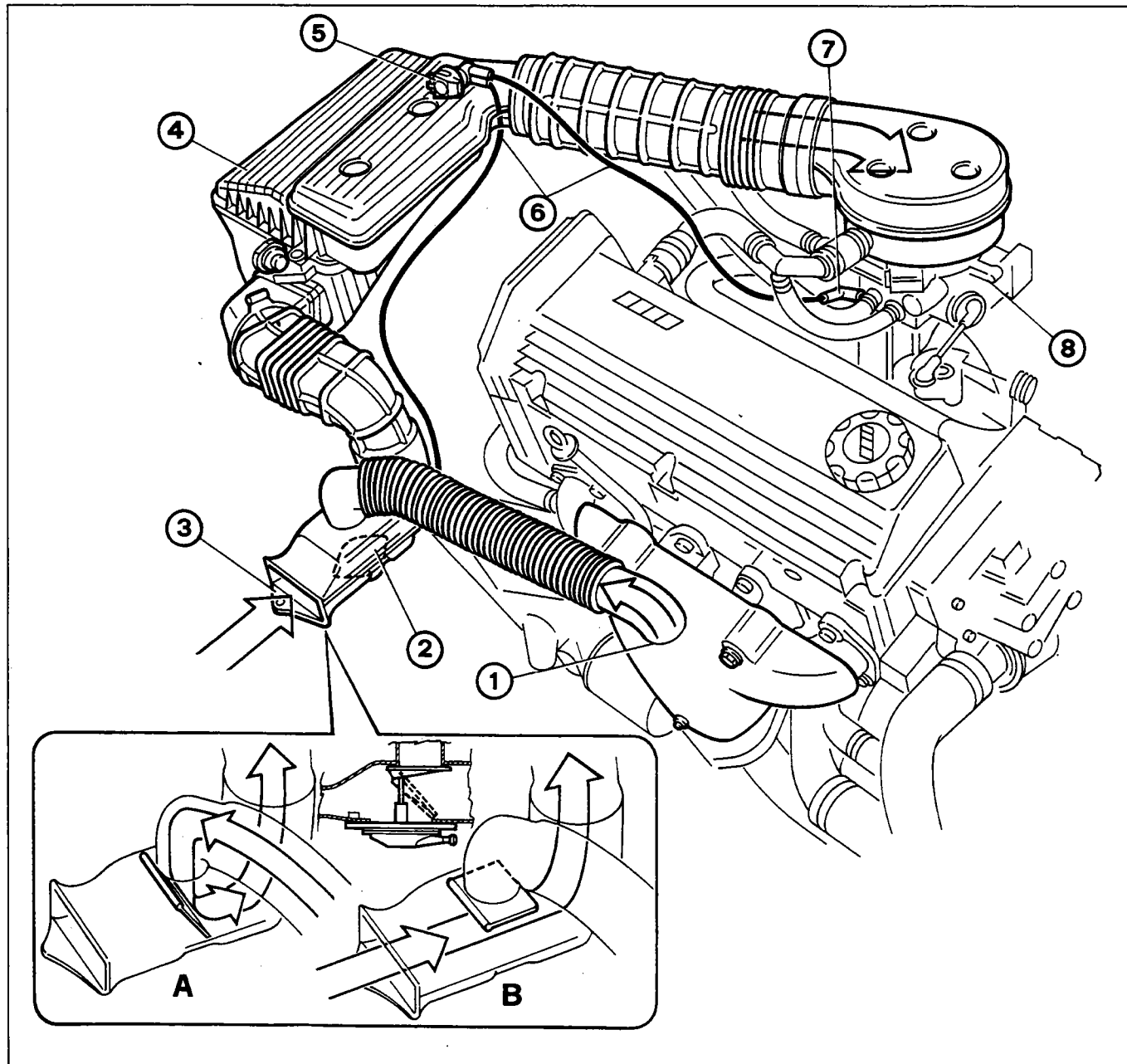
P4A11AJ01

Key to components

- | | |
|-----------------------------|----------------------------------|
| 1. Electronic control unit | 11. Injector |
| 2. Coil | 12. FIAT CODE control unit |
| 3. Air temperature sensor | 13. Engine idle speed actuator |
| 4. Speedometer sensor | 14. Rev counter |
| 5. Lambda probe | 15. Fuel vapour cut-off solenoid |
| 6. Coolant sensor | 16. Diagnostic socket |
| 7. Throttle position sensor | 17. Injection warning light |
| 8. Rpm and TDC sensor | 18. Air conditioner compressor |
| 9. Ignition switch | 19. Knock sensor |
| 10. Electric fuel pump | |

10.

AIR INTAKE CIRCUIT DIAGRAM



P4A12AJ01

1. Warm air intake on exhaust manifold
2. Actuator for warm/cold air deflector
3. Cold air intake fitting
4. Air cleaner

5. Thermostatic valve
6. Vacuum ducts
7. Vacuum socket
8. Throttle case

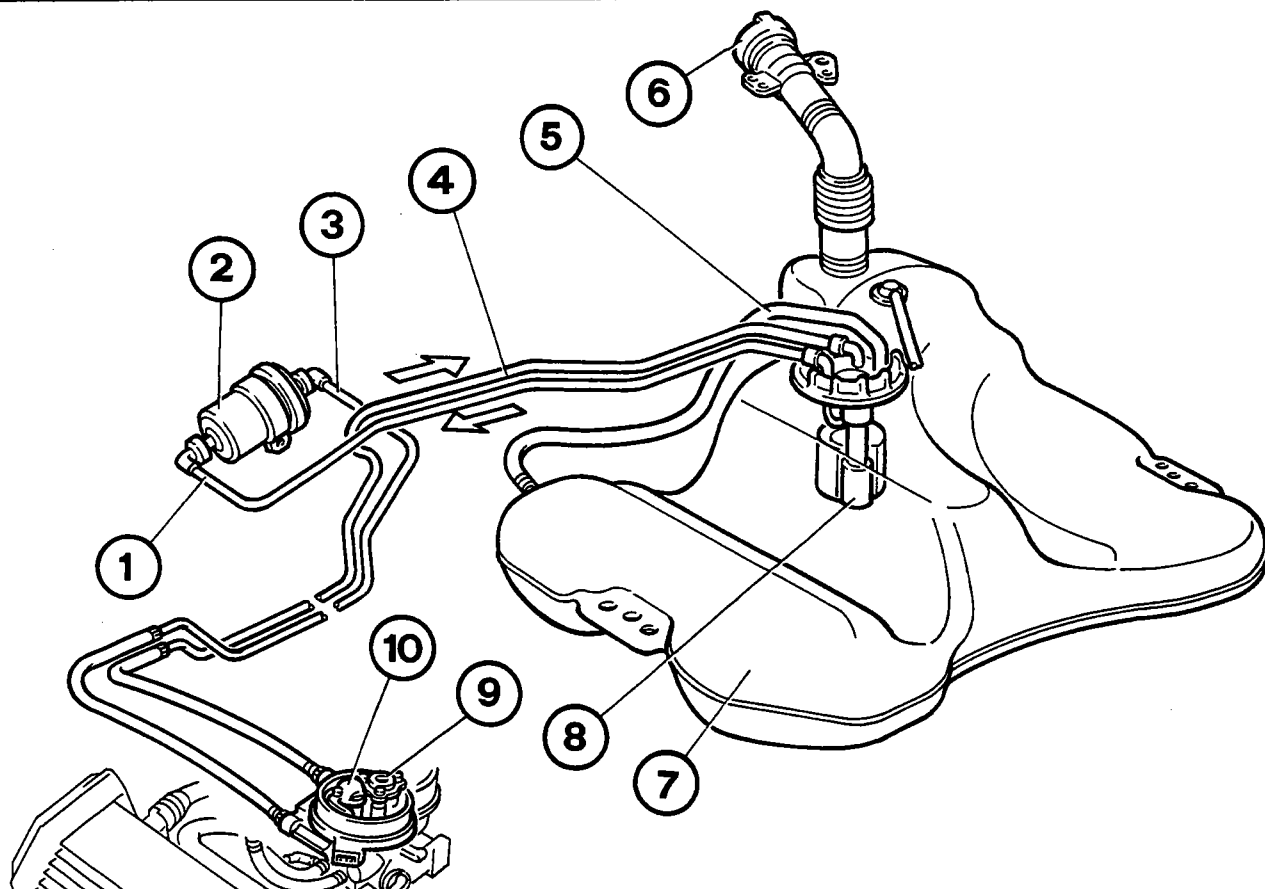
The air intake circuits comprises various components which ensure sufficient air is carried to the engine under different service conditions.

The intake of warm or cold air is selected by deflector (2) which may or may not be affected by the vacuum in the intake manifold according to position of thermostatic valve (5).

More specifically, when intake air temperature exceeds 9°C, thermostatic valve (5) stays closed and does not allow the vacuum to reach actuator (2) (position B).

Viceversa, when intake air temperature drops below 9°C, the thermostatic valve (5) opens to allow a vacuum through to actuator (2) (position A).

FUEL SUPPLY CIRCUIT DIAGRAM



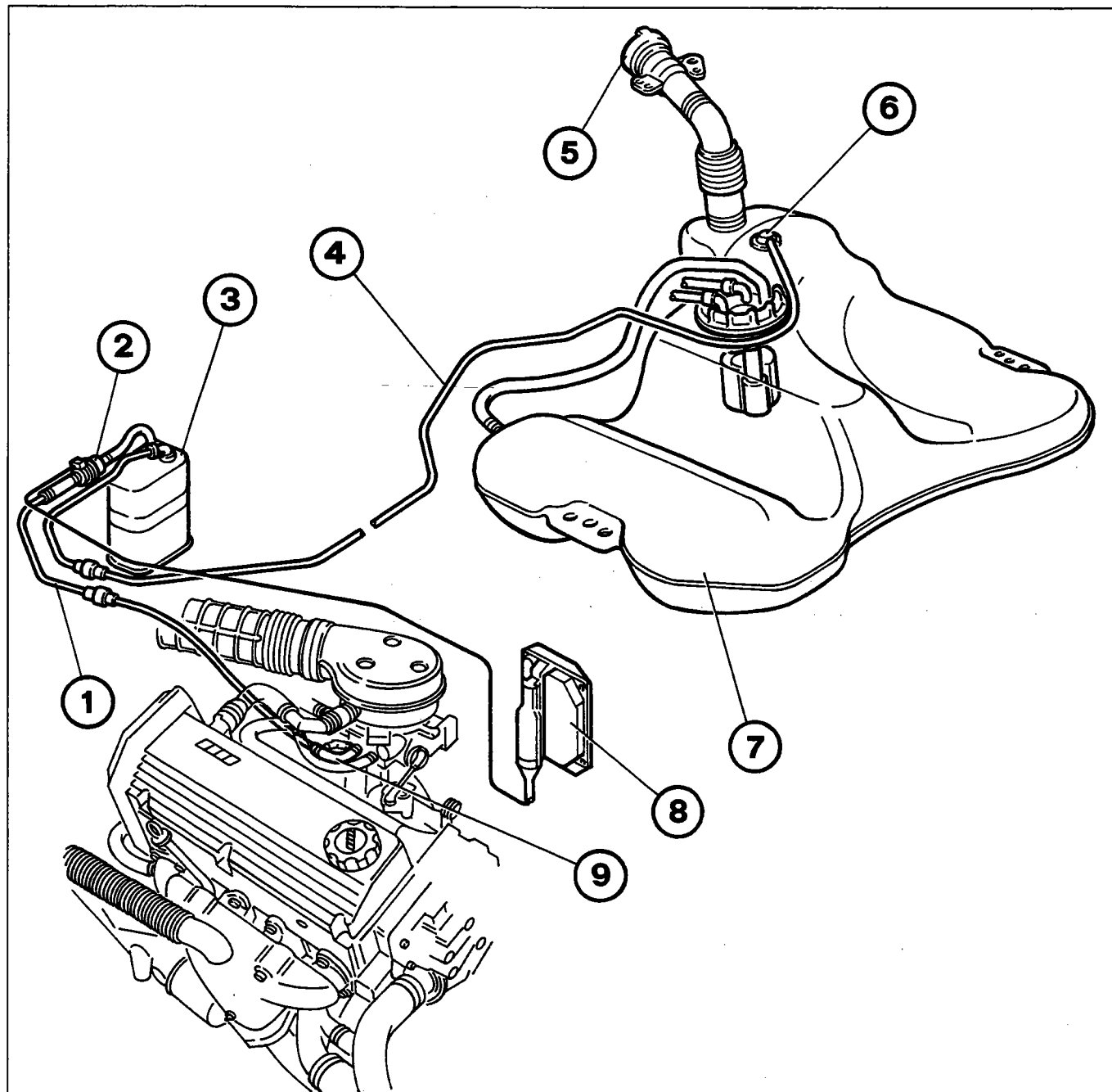
P4A13AJ01

1. Delivery line from tank to filter
2. Fuel filter
3. Delivery line from filter to injector
4. Return line
5. Vent pipe
6. Union with vent and pressure relief valve
7. Tank
8. Electric pump
9. Pressure regulator
10. Injector

NOTE Due to the specific shape of the tank, when fuel is added, an air lock may build up at the bottom which could prevent complete filling. Pipe (6) allows air to flow from the lower part so that the tank can be filled completely.

10.

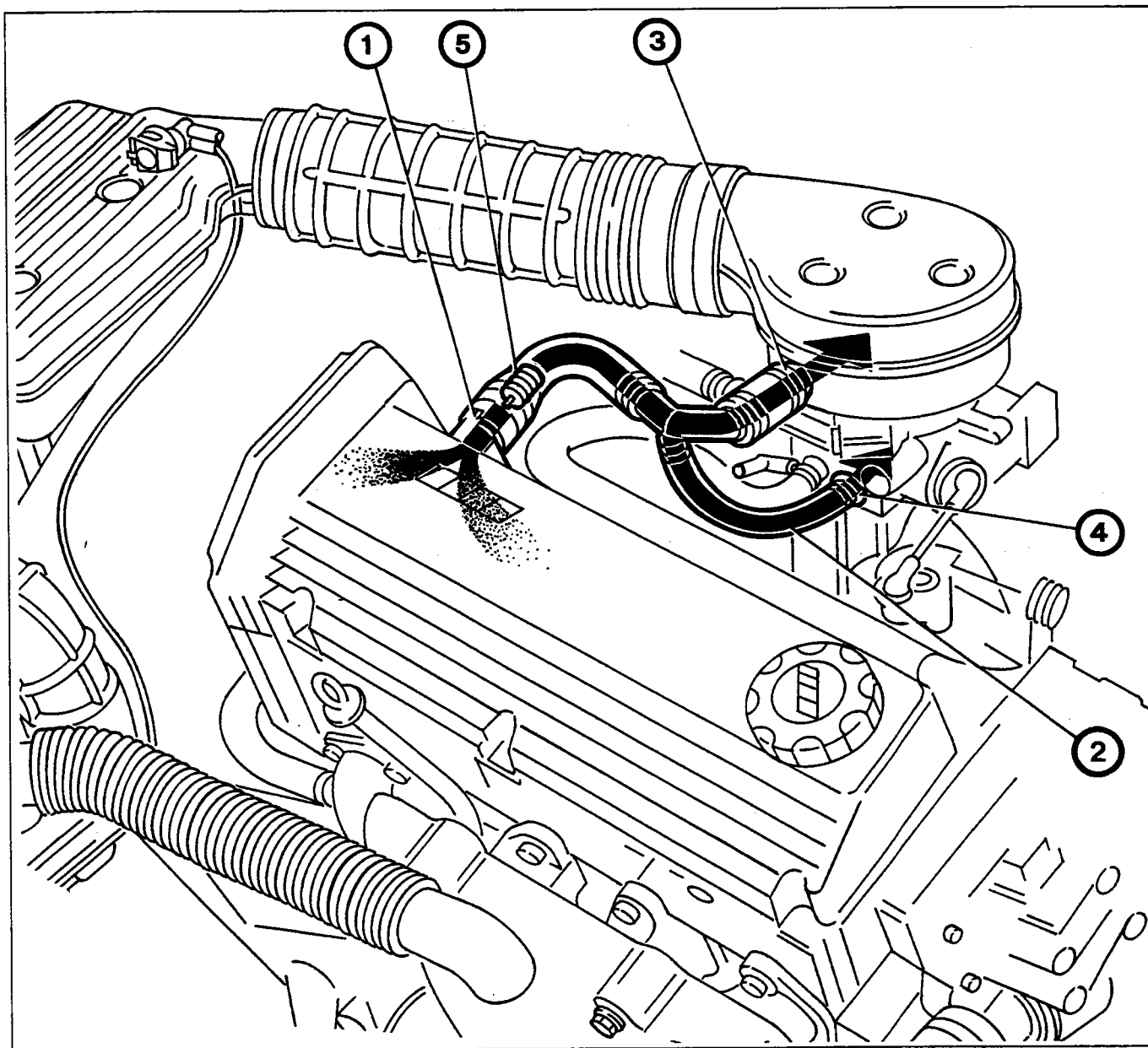
FUEL EVAPORATION CONTROL CIRCUIT DIAGRAM



P4A14AJ01

The fuel evaporation system prevents fuel vapour, mainly comprising lighter hydrocarbon fractions formed in the tank, to escape into the atmosphere.

- | | |
|---|--|
| 1. Pipe carrying fuel vapour to butterfly valve case | 5. Safety and ventilation valve |
| 2. Fuel vapour cut-off solenoid | 6. Multifunction valve |
| 3. Carbon filter | 7. Tank |
| 4. Pipe carrying fuel vapour from tank to carbon filter | 8. Injection-ignition ECU |
| | 9. Fuel vapour intake fitting in intake manifold |

BLOW-BY GAS RECIRCULATION DIAGRAM

P4A15AJ01

The system controls emission, from the engine block, of vent gases made up of air-fuel mixtures, burnt gases which leak through piston rings and lubricant oil vapours by recirculating them to the intake.

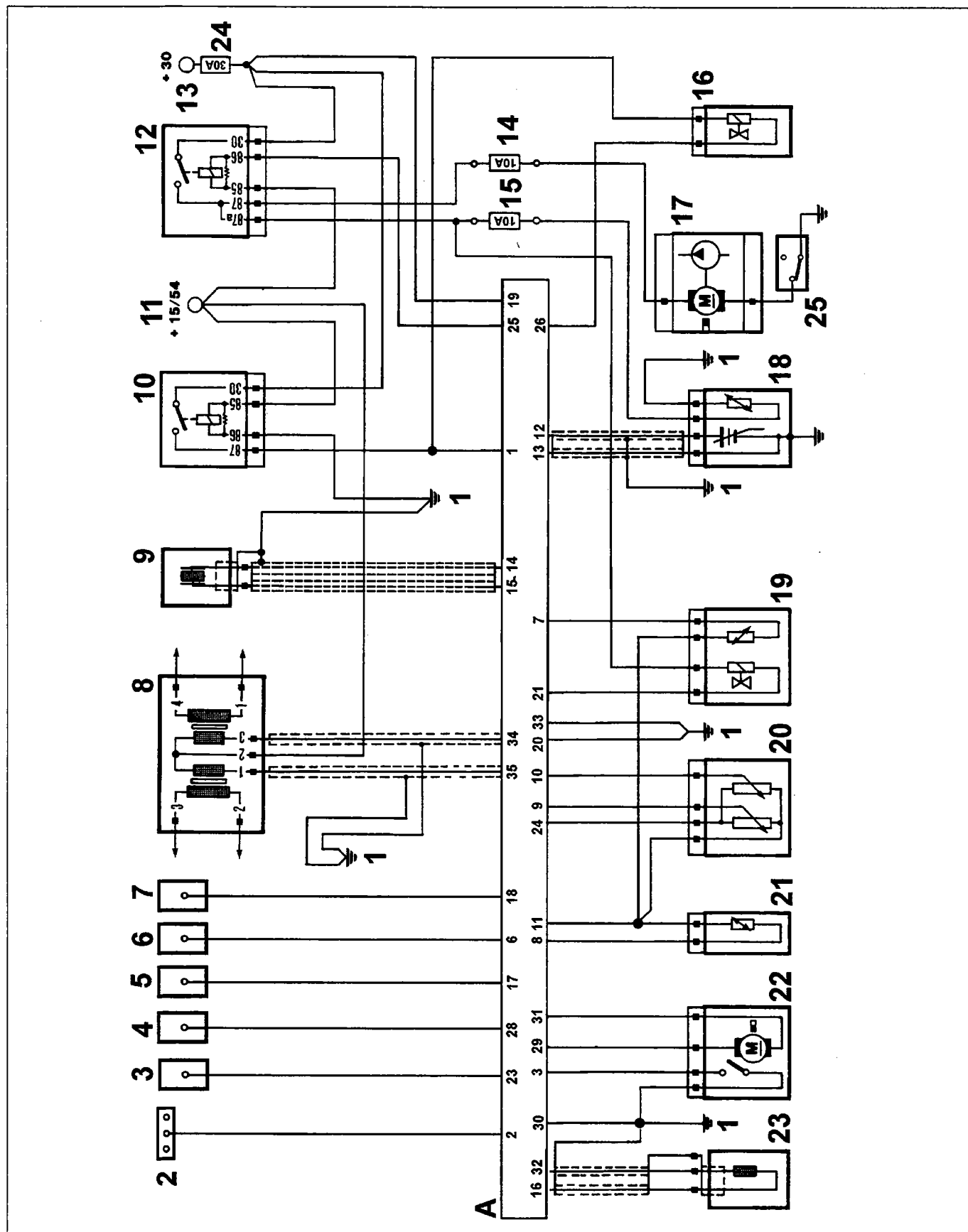
Gases emerge from outlet (1), which contains a flame trap (5) designed to prevent combustion caused by flame flashing back from the butterfly valve case.

With the accelerator throttle open, gases are taken in upstream of the throttle through intake (3) located on the air shroud to the butterfly valve case.

With the throttle closed (engine idling), the vacuum in the intake manifold takes up gas (in limited quantities) directly through the pipe (2) and calibrated hole (4).

10.

INJECTION-IGNITION SYSTEM WIRING DIAGRAM



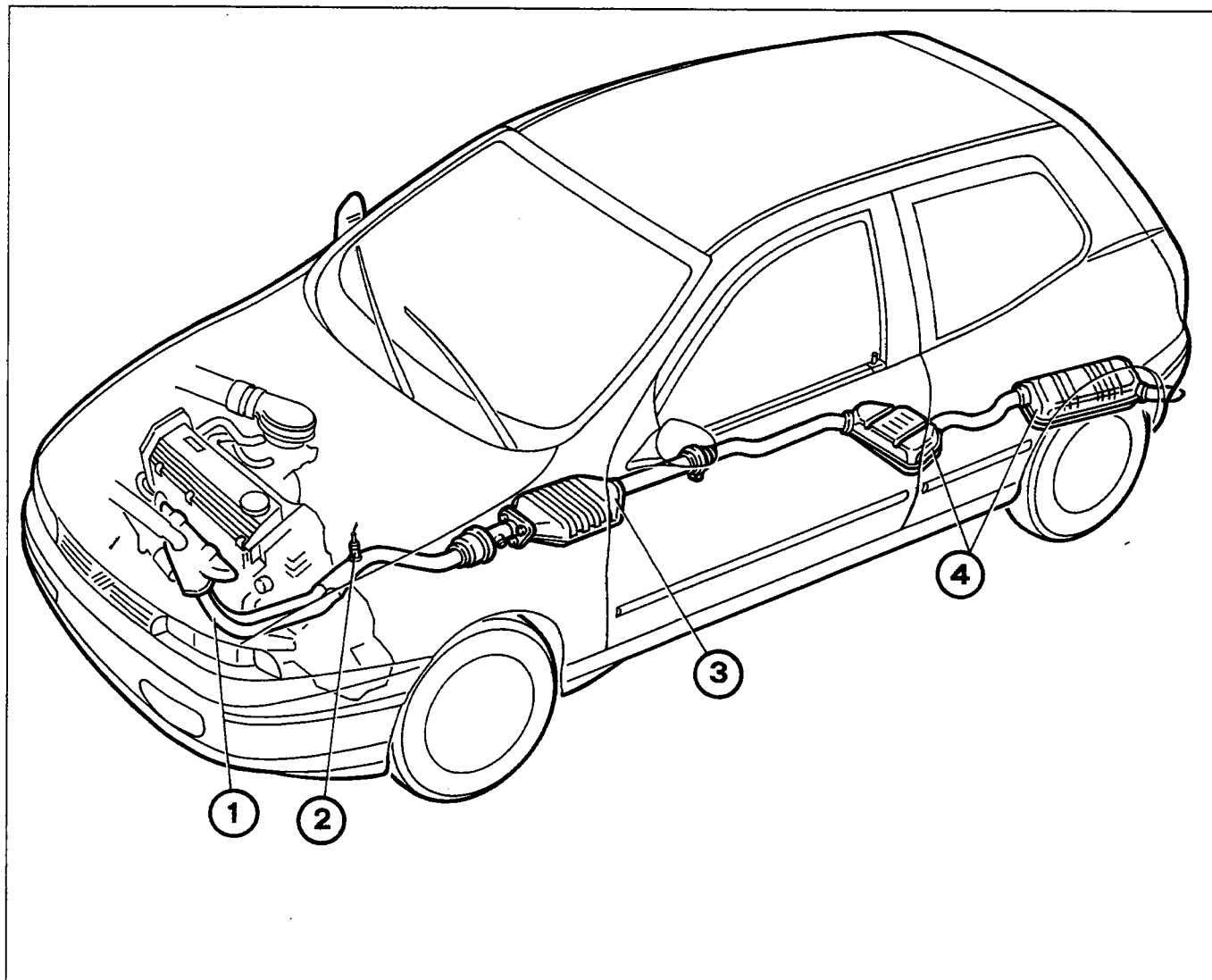
P4A16AJ01

Key to components in injection-ignition system wiring diagram

- A. I.e. electronic control unit.
- 1. Earth
- 2. Diagnostic socket
- 3. Air conditioning system connection
- 4. System warning light
- 5. Rev counter
- 6. FIAT CODE control unit
- 7. Speedometer signal
- 8. Ignition coil
- 9. Knock sensor
- 10. I.e. system supply relay.
- 11. Ignition switch
- 12. Fuel pump and lambda probe relay
- 13. Battery positive (+30)
- 14. 10A fuse for fuel pump
- 15. 10A fuse for lambda probe heating coil
- 16. Fuel vapour cut-off solenoid
- 17. Electric fuel pump
- 18. Hot Lambda probe
- 19. Injector and intake air temperature sensor
- 20. Throttle valve position sensor
- 21. Coolant temperature sensor
- 22. Engine idle speed actuator
- 23. Rpm and TDC sensor
- 24. 30A master fuse for injection-ignition system
- 25. Inertia switch

10.

ENGINE EXHAUST ASSEMBLY DIAGRAM

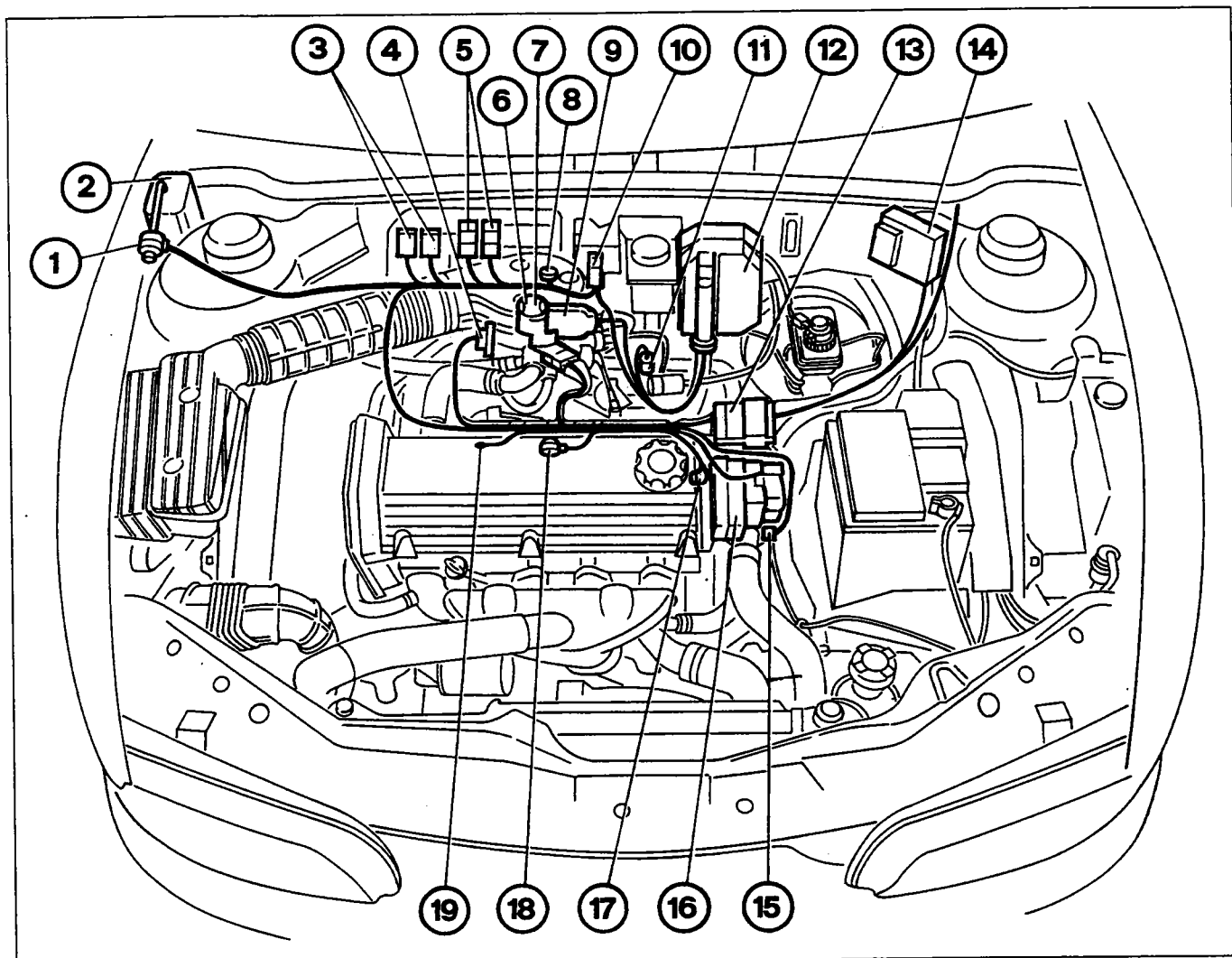


P4A18AJ01

Key

1. Exhaust manifold
2. Lambda probe
3. Catalytic converter
4. Silencers

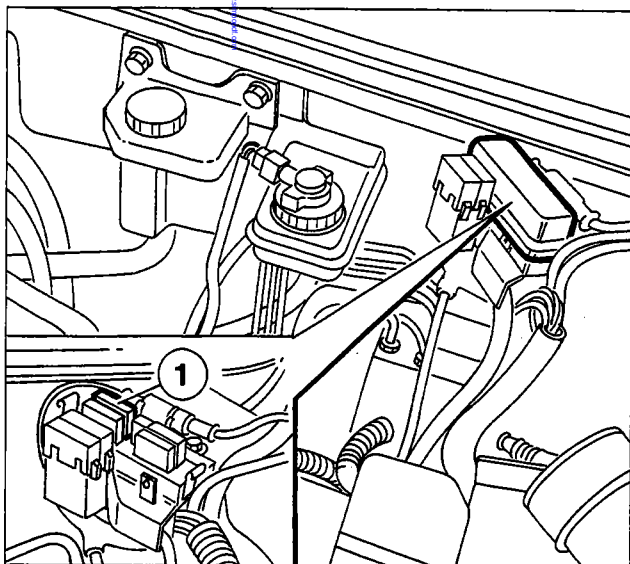
LOCATION OF INJECTION-IGNITION SYSTEM COMPONENTS IN ENGINE BAY



P4A19AJ01

Key to components

- | | |
|--|---|
| 1. Fuel vapour cut-off solenoid | 10. Diagnostic socket |
| 2. Carbon filter | 11. Lambda probe |
| 3. 10A fuse for pump and injection-ignition system | 12. Injection-ignition ECU |
| 4. Throttle position sensor | 13. Joint between injection lead and front lead |
| 5. Pump and injection-ignition system relays | 14. General 30A system fuse |
| 6. Injector | 15. Coolant temperature sensor |
| 7. Air temperature sensor | 16. Ignition coil |
| 8. Fuel pressure regulator | 17. Rpm and TDC sensor |
| 9. Engine idle speed actuator | 18. Knock sensor |
| | 19. Earth |

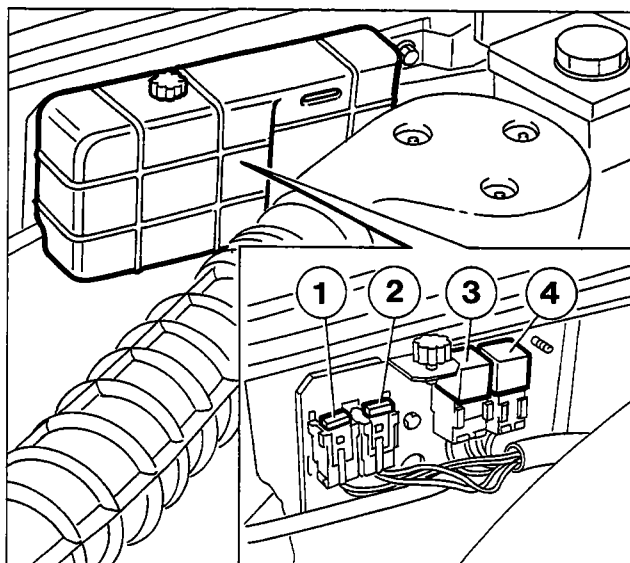


P4A23CJ01

INJECTION SYSTEM FUSES AND RELAYS

General system protection fuse

The general fuse (EFI-30A) protecting the injection-ignition system (1) is housed inside a container; to gain access to the fuse, undo side clips and lift lid.



P4A20AJ02

Fuses and relays

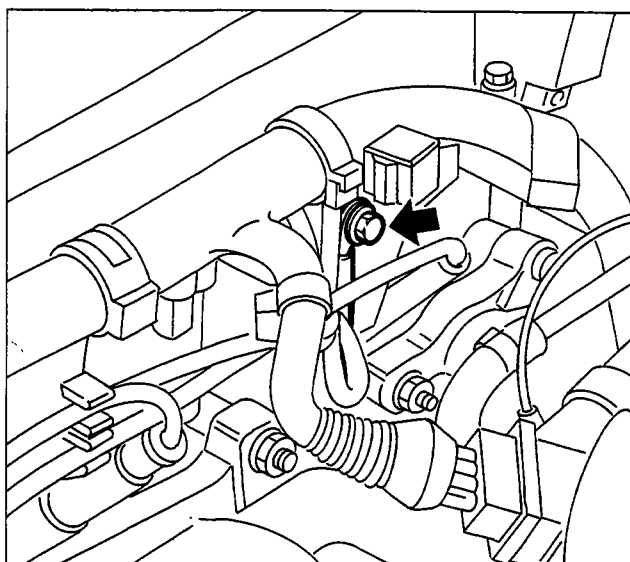
The following components are housed on a bracket located against the rear wall of the engine bay:

1. 10A fuse for fuel pump
2. 10A injection-ignition system fuse
3. Injection-ignition system relay
4. Fuel pump relay

Unscrew ring nut and remove cover to gain access to the above components.

EARTH POINT

The earth of the injection-ignition system is fixed at the right rear of the engine, close to the first cylinder spark plug.



P4A20AJ03

COMPONENTS OF INJECTION-IGNITION SYSTEM

The injection-ignition system consists mainly of wiring, an electronic control unit (i.e. ECU) and the following sensors and actuators:

Sensors

- Speedometer sensor
- Rpm and TDC sensor.
- Knock sensor
- Coolant temperature sensor
- Throttle position sensor
- Intake air temperature sensor
- Lambda probe sensor

Actuators

- Engine idle speed actuator
- Fuel vapour cut-off solenoid
- Electric fuel pump
- Injector
- Ignition coil
- Spark plugs

INJECTION-IGNITION SYSTEM WIRING

The various system components are connected by a single wiring system fitted with connectors of various types. These are grouped in special ducts fitted to the engine (prewiring).

INJECTION-IGNITION ECU (0.261.203.868)

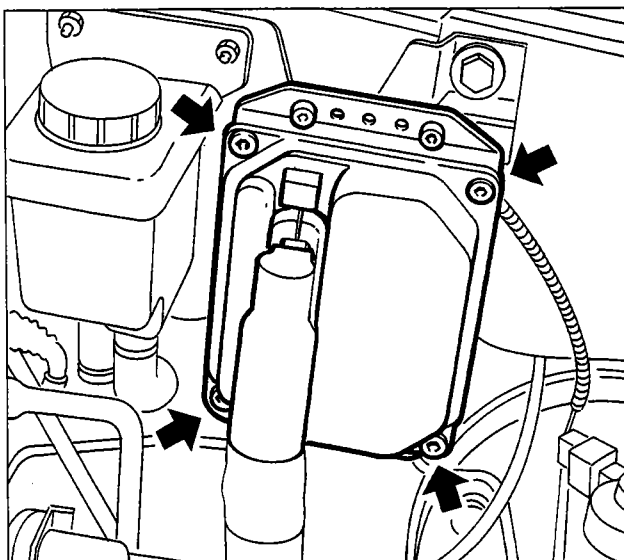
The ECU analyses data on engine service conditions transmitted by the sensors. Input signals from peripheral sensors are processed and injector/ignition timing pulses are governed with the aid of programmed typical curves.

The ECU is connected to the system by means of a 35 pin connector and protected by false polarities and circuit-breakers.

The ECU is able to detect when sensors are not working efficiently and replace incorrect or missing data with data taken from certain areas of its memory in order to ensure engine operation even under emergency conditions. It is also equipped with a full SELF-DIAGNOSTIC strategy for both input and output sensors. It also contains a special memory able to record any faults received during testing.

When a Fiat/Lancia TESTER is connected to the system it is therefore possible to test or display any errors stored in the memory.

Another important feature of the ECU is self-adaption. This function allows the system to recognise various changes (ranging from atmospheric changes to changes due to component wear) which could impair efficient engine operation and adjust to them by implementing appropriate strategies.



P4A21AJ01

**Removing-refitting control unit**

Disconnect electrical connection. Undo retaining nuts and remove ECU.



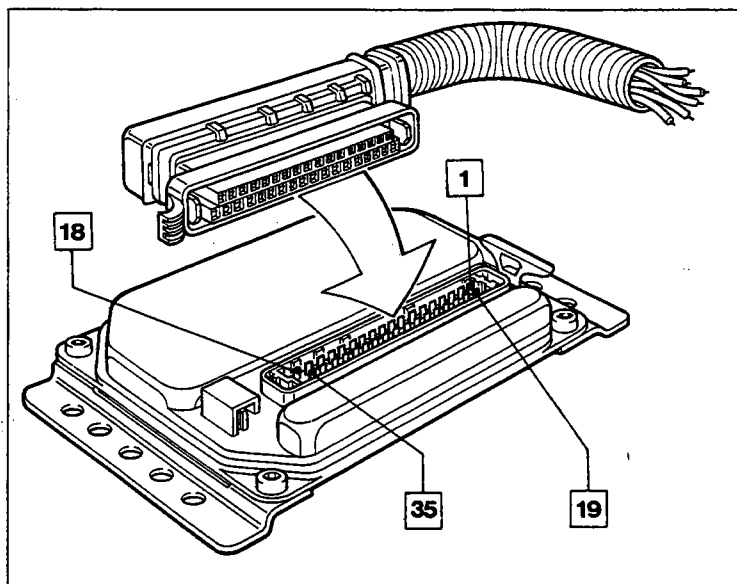
It is absolutely prohibited to exchange injection control units between different vehicles in order to check their efficiency.



Before replacing an ECU as a result of testing, ensure it is really faulty because when a new ECU is activated, the secret Fiat CODE system code is memorised and this makes the unit completely unusable on other vehicles.

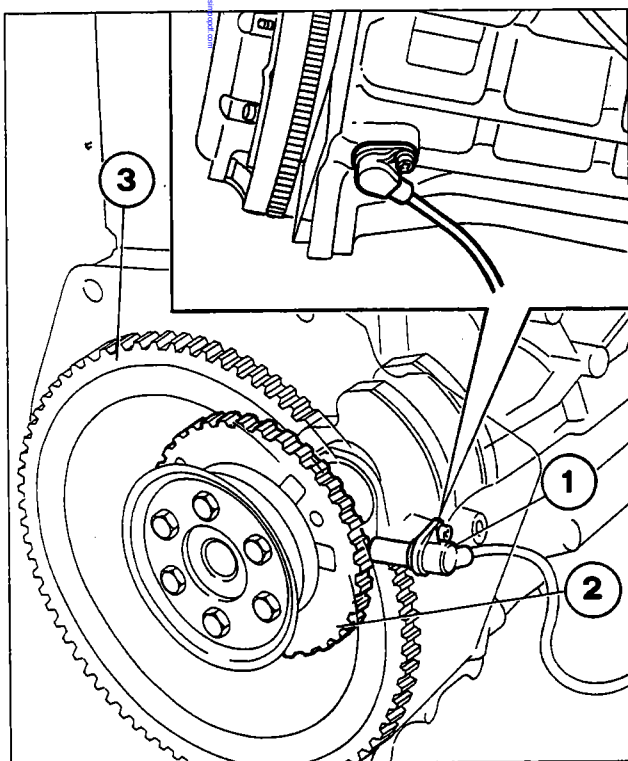
10.

IDENTIFYING CONNECTIONS ON CONTROL UNIT (PIN-OUT)



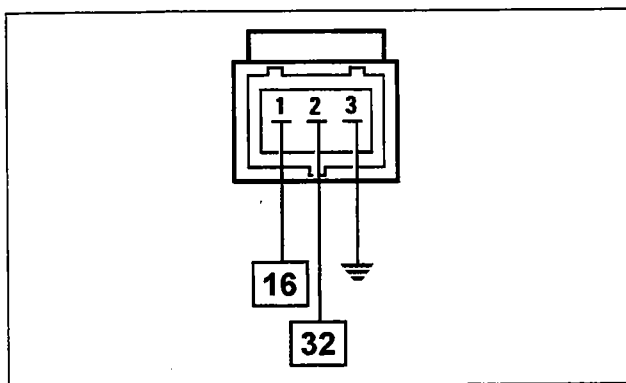
P4A22AJ01

- | | |
|---|--|
| 1. I.e. system supply relay. | 18. Speedometer sensor |
| 2. Diagnostic socket | 19. Power supply (+30) |
| 3. Engine idle speed actuator | 20. Engine earth |
| 4. Not connected | 21. Injector |
| 5. Not connected | 22. Not connected |
| 6. FIAT CODE control unit | 23. Air conditioning system connection |
| 7. Intake air temperature sensor | 24. Throttle position sensor |
| 8. Coolant temperature sensor | 25. Fuel pump and lambda probe relay |
| 9. Throttle position sensor | 26. Fuel vapour cut-off solenoid |
| 10. Throttle position sensor | 27. Not connected |
| 11. Power source for coolant temperature sensor, throttle position sensor and intake air temperature sensor | 28. Injection system failure warning light |
| 12. Lambda probe | 29. Engine idle speed actuator |
| 13. Lambda probe | 30. Engine earth |
| 14. Knock sensor | 31. Engine idle speed actuator |
| 15. Knock sensor | 32. RPM and TDC sensor |
| 16. Rpm and TDC sensor | 33. Engine earth |
| 17. Rev counter signal | 34. Ignition coil |
| | 35. Ignition coil |

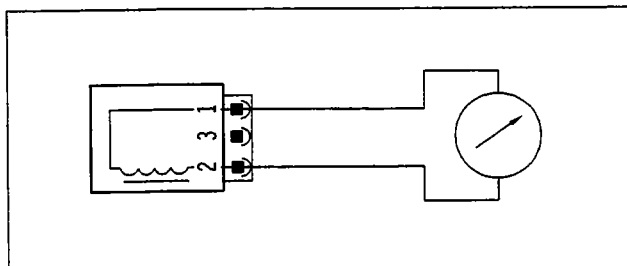


P4A23AJ01

1. Rpm sensor
2. Toothed pulley
3. Engine flywheel



P4A23AJ02



P4A23AJ03

RPM AND TDC SENSOR (0.281.002.102)

The sensor responsible for measuring rpm and TDC is inductive, in other words it works by means of changes in a magnetic field generated by teeth passing in front of a toothed pulley (phonic wheel) situated inside the engine block. The sensor is thus fastened to the engine block and it is no longer necessary to check and adjust gap or angular position.

The passage of teeth in front of the sensor alters the gap between pulley and sensor. The dispersed flow alters as a result to set up an alternating voltage with amplitude dependent on rpm.

The phonic wheel consists of 58 teeth plus a space equivalent to the gap left by two missing teeth.

The reference point defined by the gap left by two missing teeth is used as a basis for recording synchronism point (TDC).

Refer to Fuel System section for the 1581 16v engine for a more detailed description of sensor operation.

Removing-refitting

Position vehicle on a lift, then work from below the vehicle and proceed as follows:

- Disconnect electrical connection;
- unscrew screw retaining sensor and withdraw from housing.

Wiring connector

The sensor is connected to the ECU (pin 16 e 32) by means of twisted wires covered by an earthed interference-proof shielded sheath.

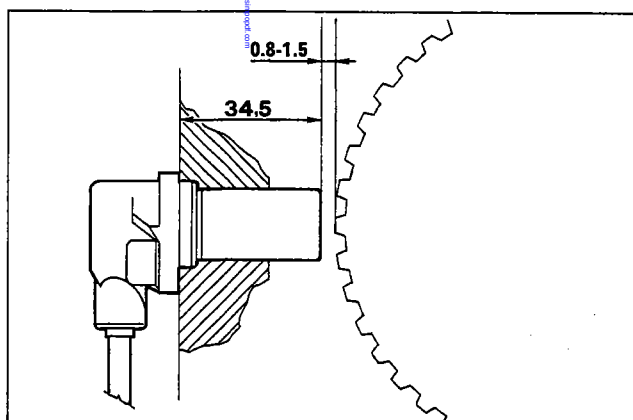
NOTE The numbers in boxes indicate the corresponding control unit pins.

Checking resistance

Sensor resistance may be measured by disconnecting the connector and connecting an ohmmeter to the sensor terminals.

Resistance: 774-946 ohm at 20°C

10.



P4A24AJ01



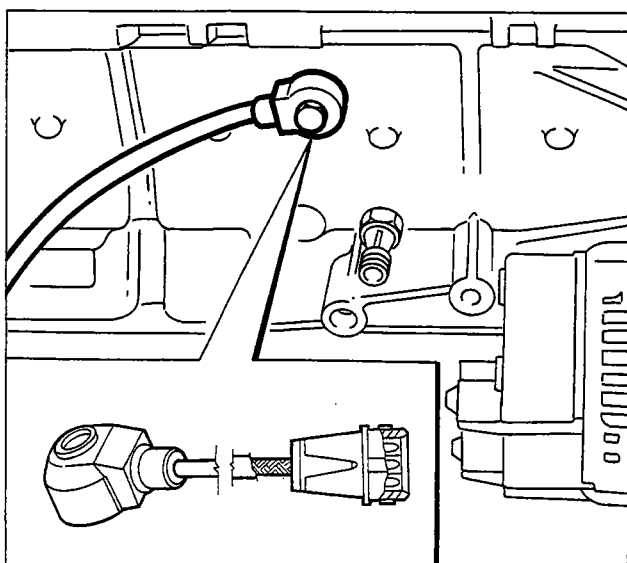
Be sure to take the measurement at right angles to the phonic wheel and at the point of a tooth, not a depression.



Checking gap

Because the rpm and TDC sensor is secured directly to the engine block, gap and angular position do not require adjustment. If a fault is suspected, the gap can be checked as follows:

- remove the rpm and TDC sensor;
- check that the distance between the sensor contact surface and phonic wheel tooth corresponds to the sum of sensor probe length (34.5 mm) and gap (0.8 - 1.5 mm).



P4A24AJ02

KNOCK SENSOR (0.261.231.007)

The knock sensor is located on the rear of then engine block, between cylinders 2 and 3.

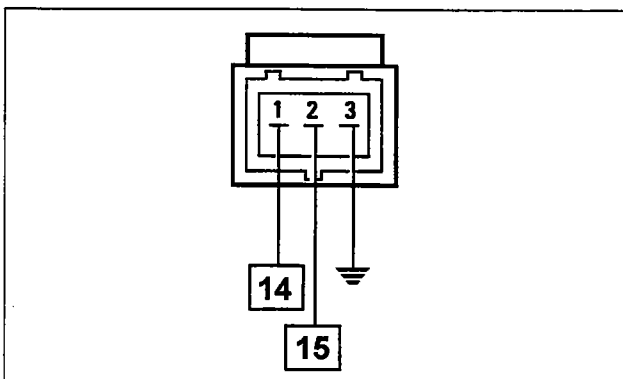
Refer to the fuel system section for the 1998 20V engine for a more detailed description of operation.

Recovery

Ignition advance delay: 8° - 9° according to engine speed.

Knock control deactivation

If the fault relates to the sensor interface circuit, the ECU assumes an ignition advance delay of 10°.



P4A24AJ03

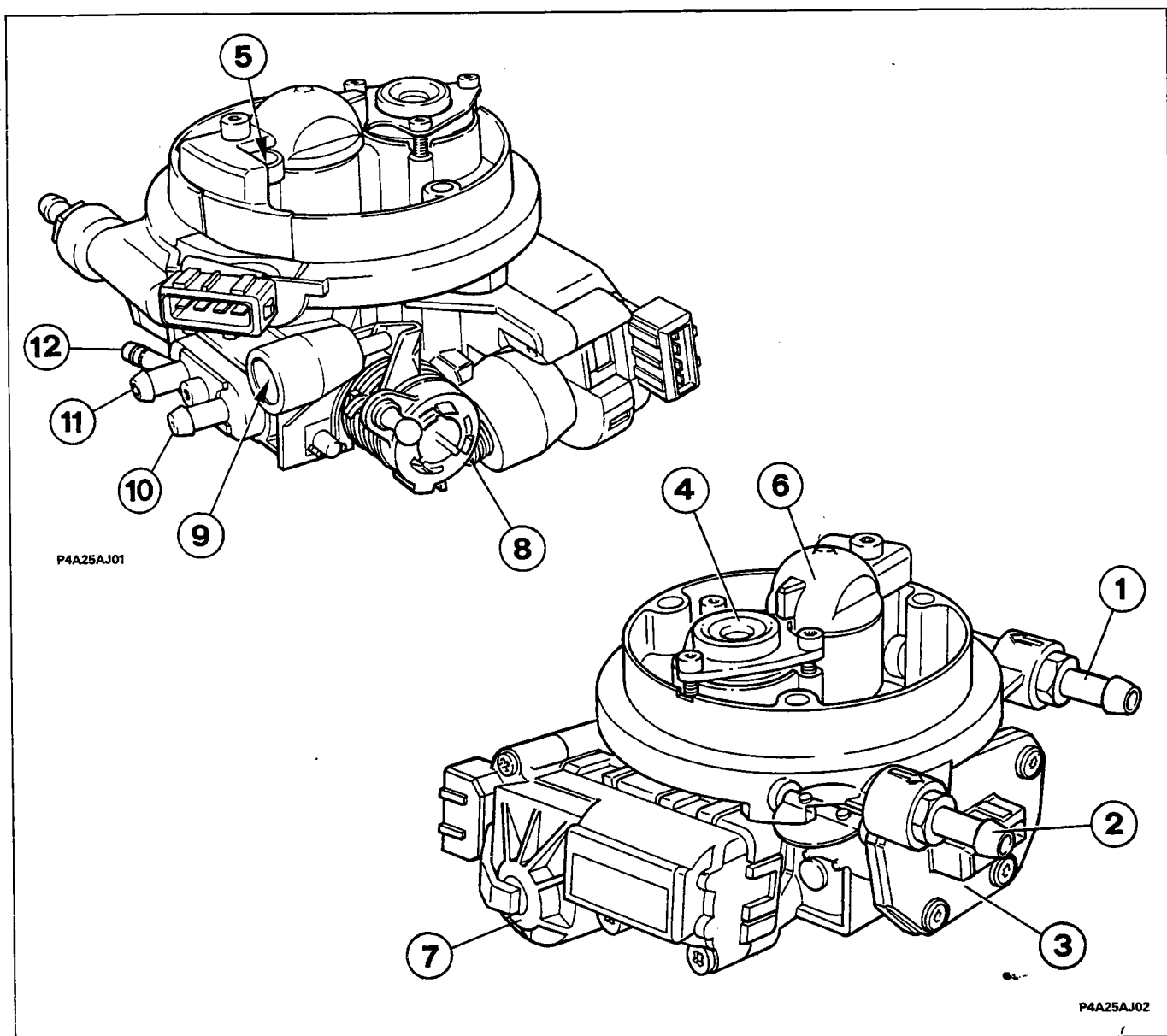
Wiring connector

The numbers in boxes indicate the corresponding control unit pins.

THROTTLE CASE (0.438.201.523)

All the components of the aluminium butterfly valve case or injector turret are highly miniaturised and the unit is extremely compact. Most system sensors and actuators are fitted to this unit:

1. Fuel intake fitting
2. Fuel return fitting
3. Accelerator throttle position sensor (potentiometer)
4. Fuel pressure regulator
5. Intake air temperature sensor
4. Injector
7. Director current motor for idle speed control
8. Throttle closed recognition microswitch incorporated in motor (7)
9. Throttle position adjustment screw (do not touch)
10. Crankcase oil vapour recirculation fitting (BLOW-BY)
11. Fitting for intake of fuel vapour from carbon filter through cut-off valve
12. Fitting for thermal valve control vacuum on air cleaner



10.

Throttle angular opening sensor

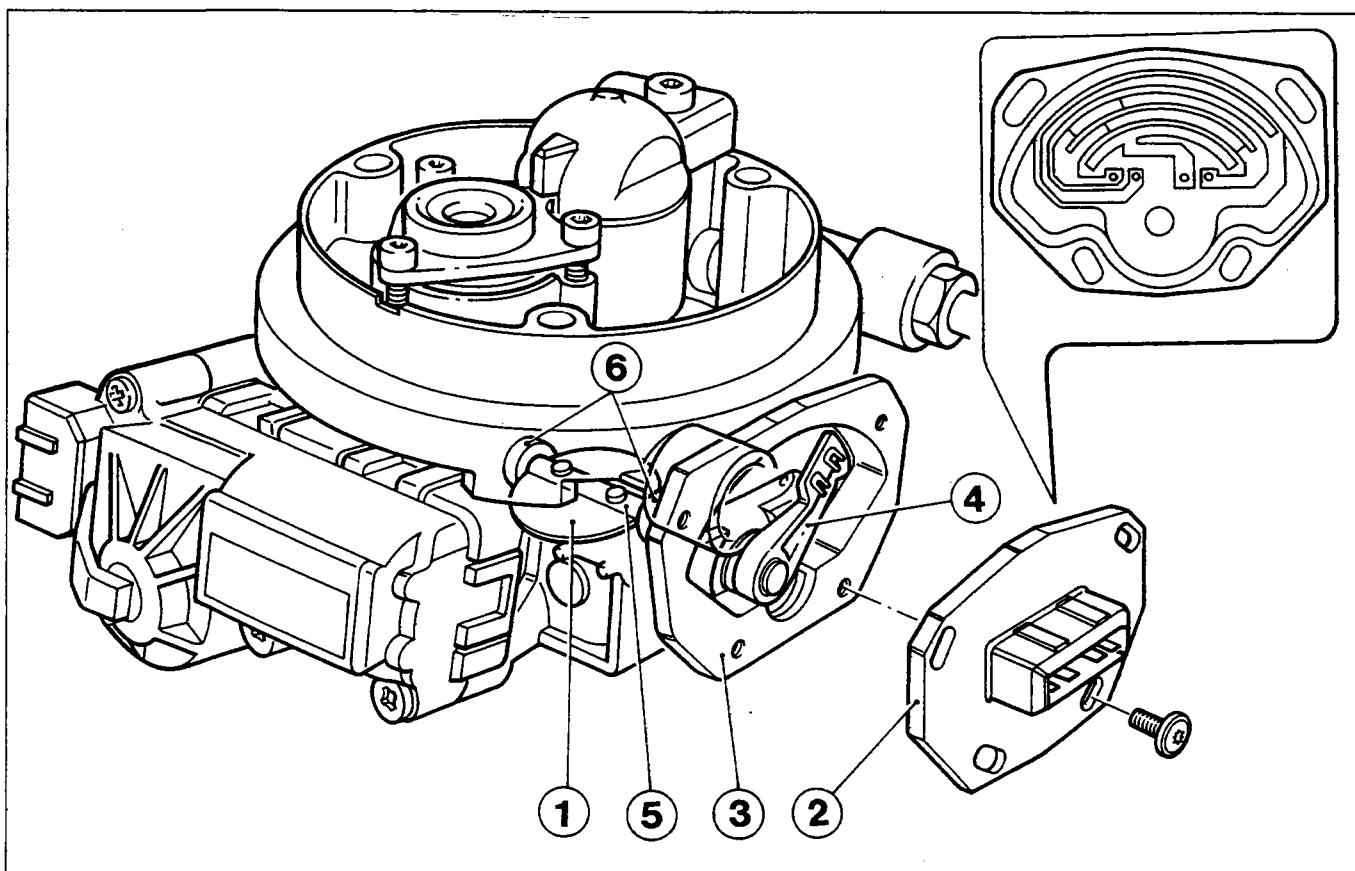
The angular position signal (α) from throttle (1) plays a fundamental role in determining base pulse constant.

This signal is recorded by a dual-race potentiometer (2) fitted to butterfly valve case by means of a brush with two double rows (4) integral with the throttle valve spindle (5).

The throttle sprindle is fitted on two ball bearings (6) to prevent binding or errors when measuring angle α .



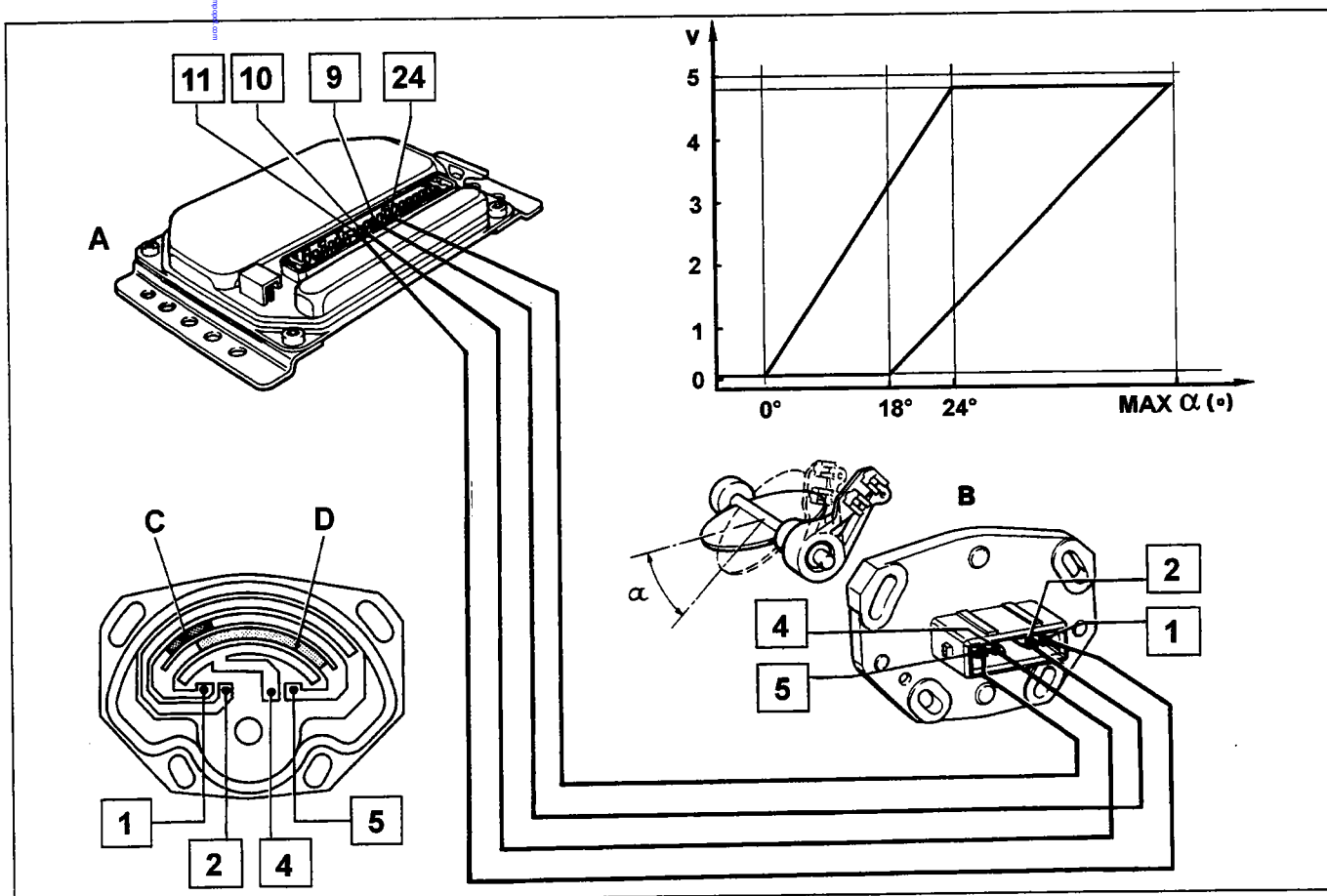
The position of potentiometer (2) is adjusted in relation to the butterfly valve in the factory and should never be removed for any reason. Replace butterfly valve case assembly if found to be faulty.



P4A26AJ01

The ECU (A - see figure overleaf), supplies terminal 5 of the throttle angular opening sensor (B) with a stabilised reference voltage of 5 V (constant) through terminal 24.

A voltage signal measured on the first race (C) is sent to terminal 9 of the ECU from terminal 2 of the potentiometer. This is proportional to the positions taken up by the throttle during the first 24° (0° - 24°) of opening.



P4A27AJ01

The signal therefore assumes a value close to 0 Volt when the throttle is completely closed, and a value close to 5 Volt for an opening of 24° in relation to rest position.

The throttle opening range from 0° - 24° corresponds to ten reference points in the ECU map (α). These represent the ten main positions taken up by the throttle valve. In this way, the ECU may recognise small angular changes in the order of 2°25'.

This high degree of sensitivity allows the ECU to select base pulse constant from the specific maps with greater precision under critical engine service conditions, i.e. when idling and under partial load.

From 18° of throttle opening up to full opening (about 90°), a signal is produced by terminal 4 of potentiometer (B), i.e. terminal of second race (D).

This signal is sent to terminal 10 of the ECU and relates to engine service conditions at medium and full loads.

The field of the second race is divided into ECU maps α with lower resolution than the first race, i.e. into 5 points corresponding to angular throttle changes of about 13°. The entire opening range of the throttle valve therefore corresponds to 15 significant points or openings (alpha). These are identified by the ECU by means of two potentiometer races.

With throttle valve opening angles between 18° and 24°, both voltage signals present simultaneously at terminals 2 and 4, first and second race respectively, should respect a certain ratio.

Under the above conditions, the ECU runs a plausibility check to test signals from the first race (C - minimum/partial load) are perfectly synchronised with those of the second (D - medium/full load).

Terminal 1 of the potentiometer is earthed through terminal 11 of the ECU.

10.

Recovery

The potentiometer emergency/safety function is activated when faults prevent the ECU from measuring the actual throttle opening angle (α).

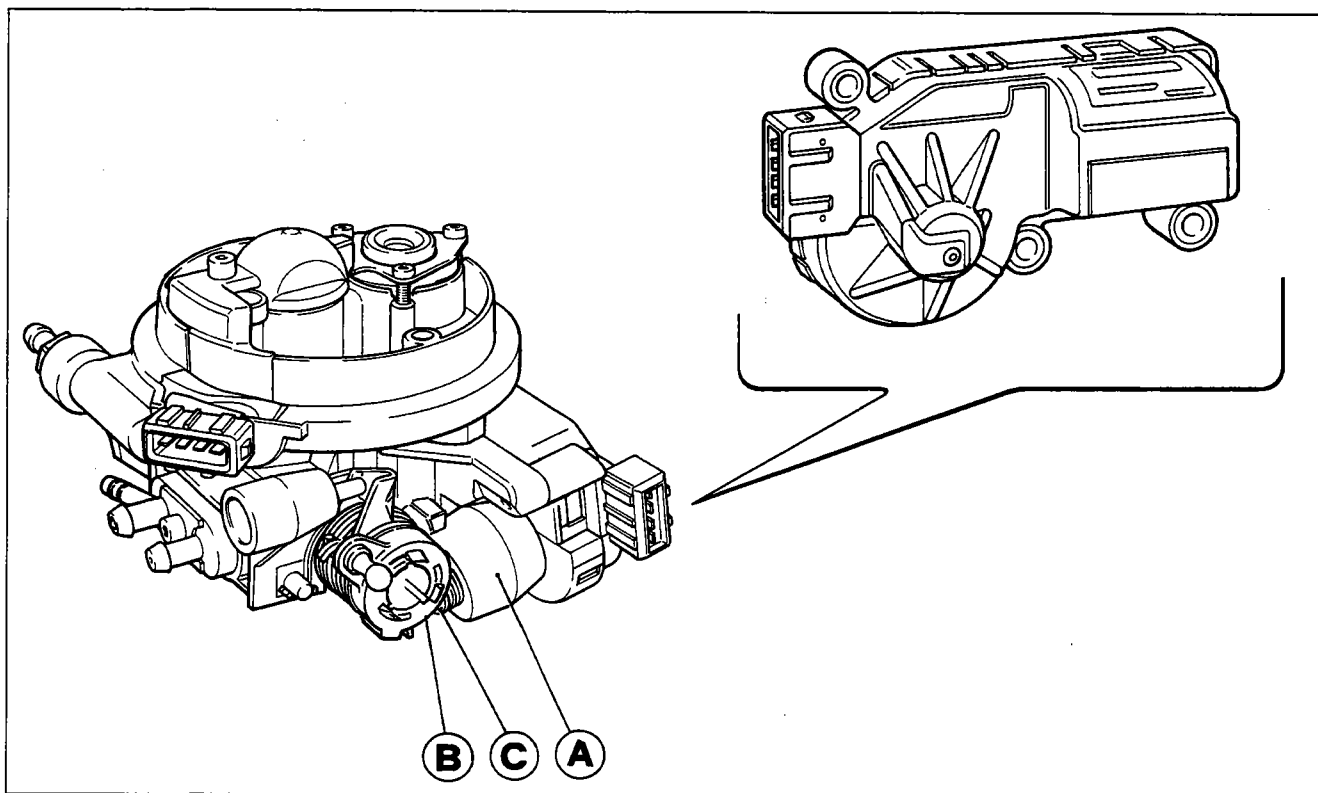
- when race 1 of the potentiometer is faulty, predefined safety injection times and ignition advances are set. The idle regulation motor is set to an emergency position.
- when race 2 is faulty, only a safety injection time and a safety ignition time are set.
- when synchronisation is faulty, the last data item saved is set as the offset between both races.

Direct current motor for idle speed control

Idling rpm level is adjusted automatically by the ECU through a 12 V direct current electric motor (A). This acts directly on linkage (B) of the throttle control valve through a reduction system.

The throttle opening motor incorporates a microswitch (C), which is closed when the accelerator pedal is at rest (released).

Contact closure activates the two-fold CUT-OFF function during over-run and automatic idle adjustment.



P4A28AJ01

Injection pulses are restored after a period of CUT-OFF and idle speed regulation is activated by the ECU (A see figure overleaf), mainly on the basis of rpm and coolant temperature.

The electronic system is also able to take into account other parameters, namely: engine in start-up or warm-up mode, air conditioner activated.

The idle control function is activated by closure of contact (C see figure overleaf) which connects terminal 3 of the ECU to earth through terminals 3 and 4 of the connector of motor (B) at point (I). Whenever necessary, the ECU supplies regulation motor (D) through terminals 29 and 31 so that the throttle valve opens and closes to correct idle speed.

An electronic switch inside the ECU reverses motor polarity in order to produce two directions of rotation (clockwise and anticlockwise).

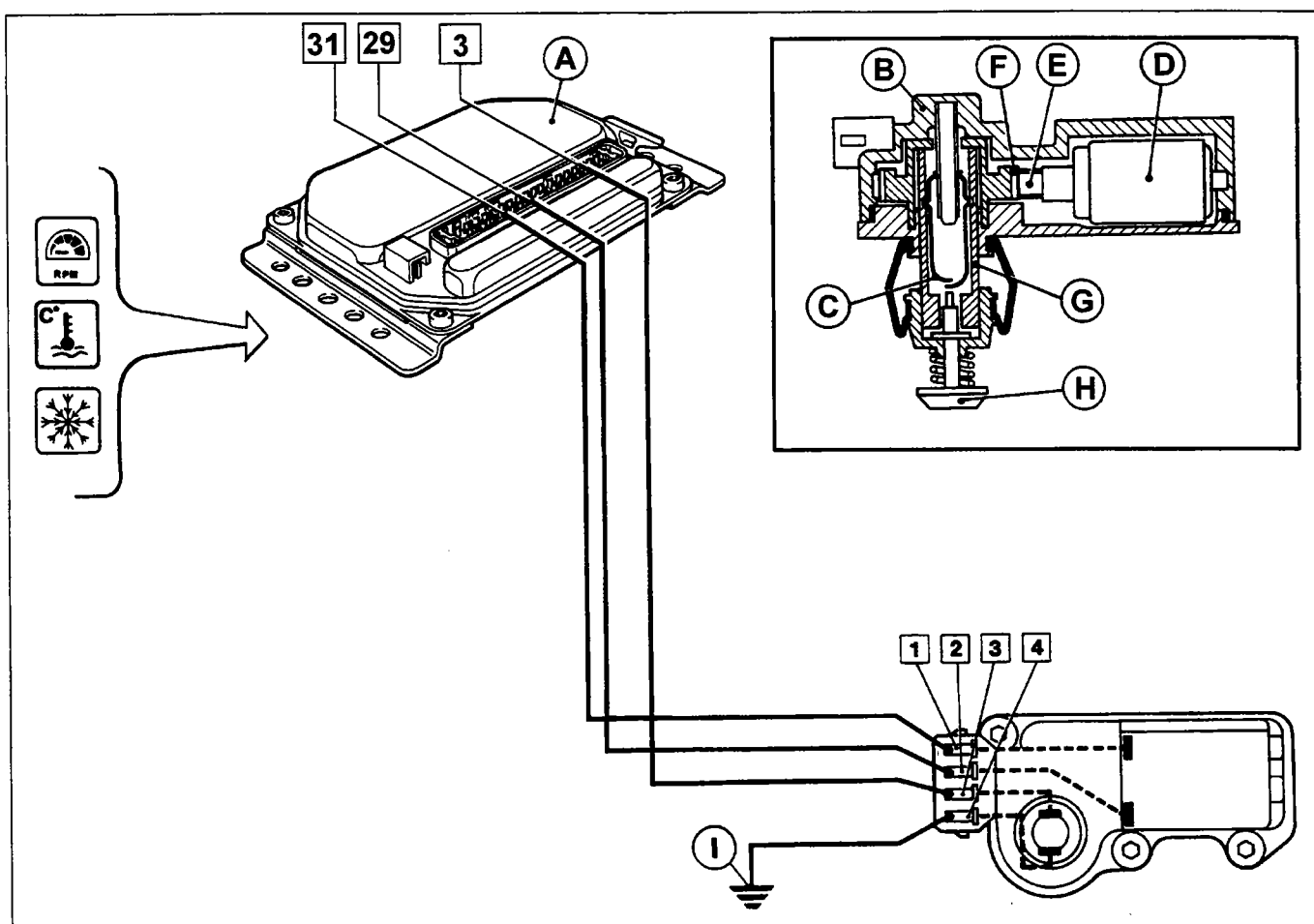
When motor (D) is activated, the reduction unit is set in rotation. This consists of a worm screw (E) and helical gear (F).

The helical gear contains a worm screw which microswitch case (G) moves along in both directions so that the case can move in and out according to wheel rotation direction.

At the end of its travel, plunger (H) acting on throttle valve linkage can bring about a maximum opening of about 18°.



If a fault has been established, the idle control motor can be obtained as an individual part.



P4A29AJ01

Recovery

In the case of an error on the idle contact (short circuit or circuit open) the ECU implements one of two strategies according to time of recognition:

- recognition (circuit open) when key is positioned on MAR, no recovery value obtained (ignored);
- recognition (short circuit or circuit open) with key set to MAR, the ECU drives the d.c. motor to a safety position (throttle in idling position).

In the case of an error on the motor (locked or defective, drive stage broken or defective), revealed by a comparison between drive value and actual position under actual idling contact conditions, the ECU activates an rpm limitation, which ranges from 1400 to 2000 rpm.

10.

Injector

The injector performs the function of nebulizing the fuel necessary for forming the fuel mixture. It is made out of stainless steel for more effective resistance to any impurities present in the fuel. It is connected in a central position on the injector turret above the butterfly valve.

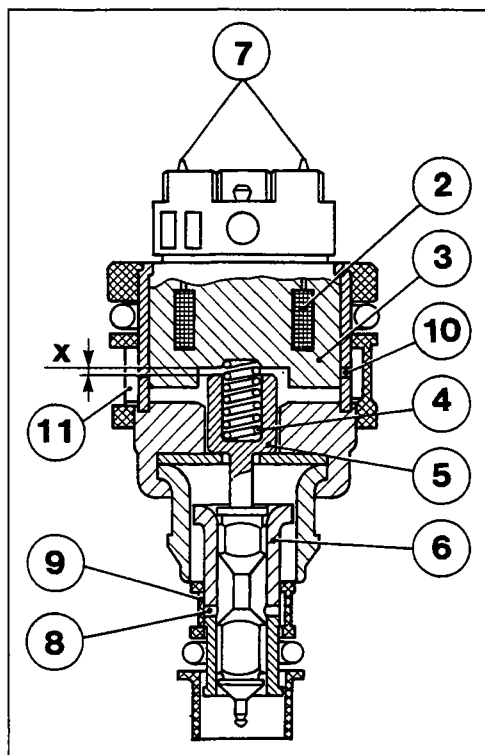
It consists of an outer case (1) containing coil (2) with a ferromagnetic core (3) and spring (4), which performs the task of holding plunger (5) closed against the seat on base (6). The assembly is completed by other parts: electrical contacts (7), fuel intake channel (8) with filter (9), fuel outlet channel (10) and filter (11).

Control pulses from the ECU reach the injector through electrical contacts (7) to set up a magnetic field about core (3) through winding (2). Plunger (5) then lifts from its seat to overcome the load of counter-spring (4) and bring about injector opening.

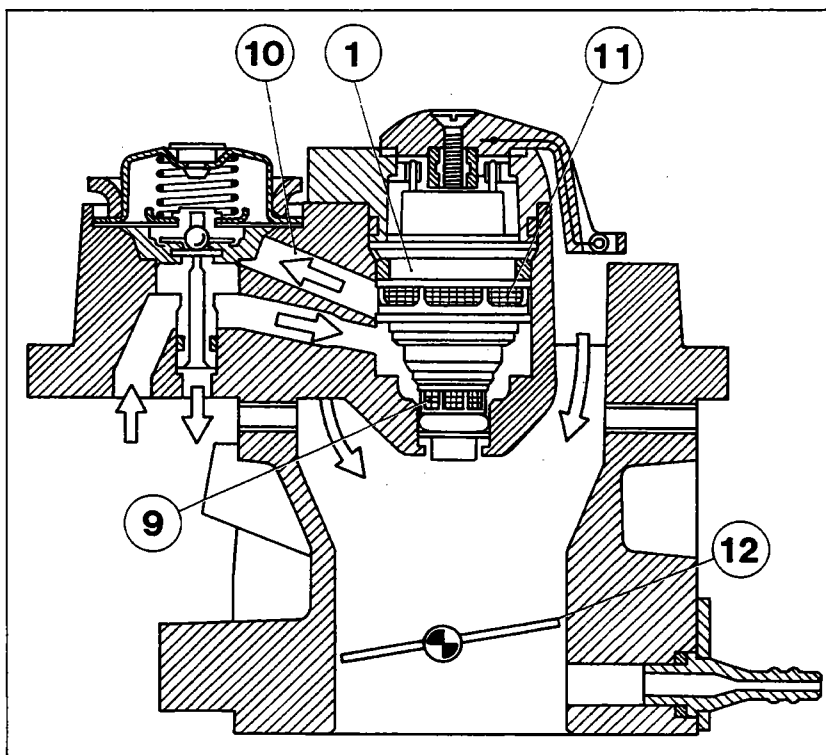
Plunger height is 0.06 mm (height x); If physical fuel properties are constant, the amount injected depends solely on injector opening time (injection time), which is established by the ECU according to engine service conditions.

The fuel jet leaves the injector at a pressure of about 1 bar, is immediately nebulized to form a cone of 30° - 90° and injected upstream of the accelerator throttle. Injector control is synchronous, i.e. one injection per ignition command.

A hole (12) on the accelerator throttle is designed to optimise mixture distribution within the intake manifold while the engine is warming up.

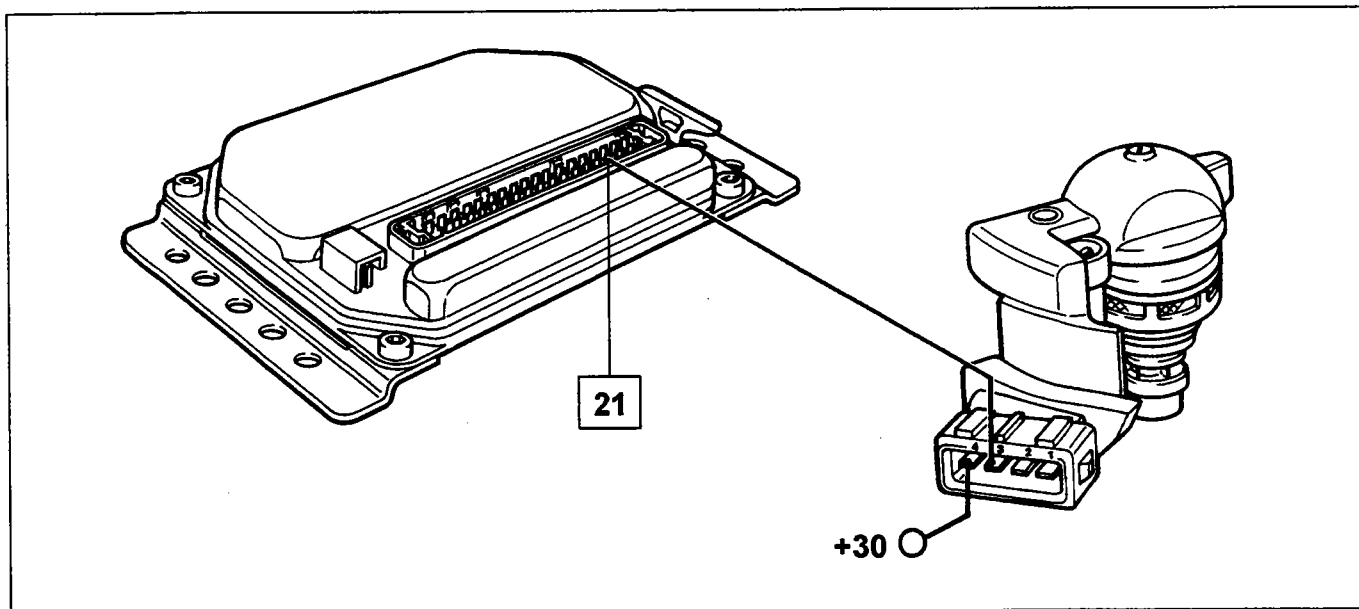


P4A30AJ01



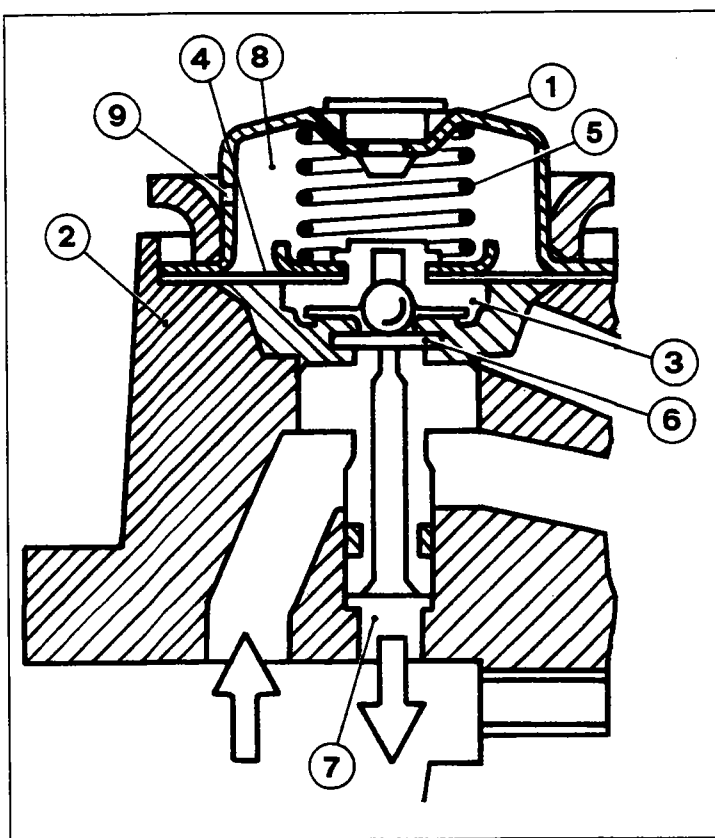
P4A30AJ02

A positive injector supply current is supplied through the fuel pump relay; the circuit is earthed in the control unit via terminal 21.



P4A31AJ01

Fuel pressure regulator



P4A31AJ02

The mechanical diaphragm regulator (1) is fitted in the injector turret (2).

The function of the fuel pressure regulator is to maintain fuel feed pressure to the injector at a level of about 1 bar.

Fuel under pressure from the electric pump reaches hydraulic chamber (3) of the pressure regulator.

If pressure on membrane (4) exceeds a level of 1 bar, it overcomes the load on counter-spring (5), and moves plate (6) to allow fuel to flow out through a channel (7) in the tank.

Hole (9) in the top chamber (8) of the regulator brings chamber 8 into communication with the outside so that a vacuum does not build up inside the chamber.

When the engine stops, fuel feed is also shut off. The pump check valve and injector close. In this way, feed pressure is maintained for a certain period in the hydraulic section.

This form of operation prevents the formation of vapour bubbles as a result of fuel in the system being heated by the engine to ensure trouble-free starting at all times.

10.

Intake air temperature sensor

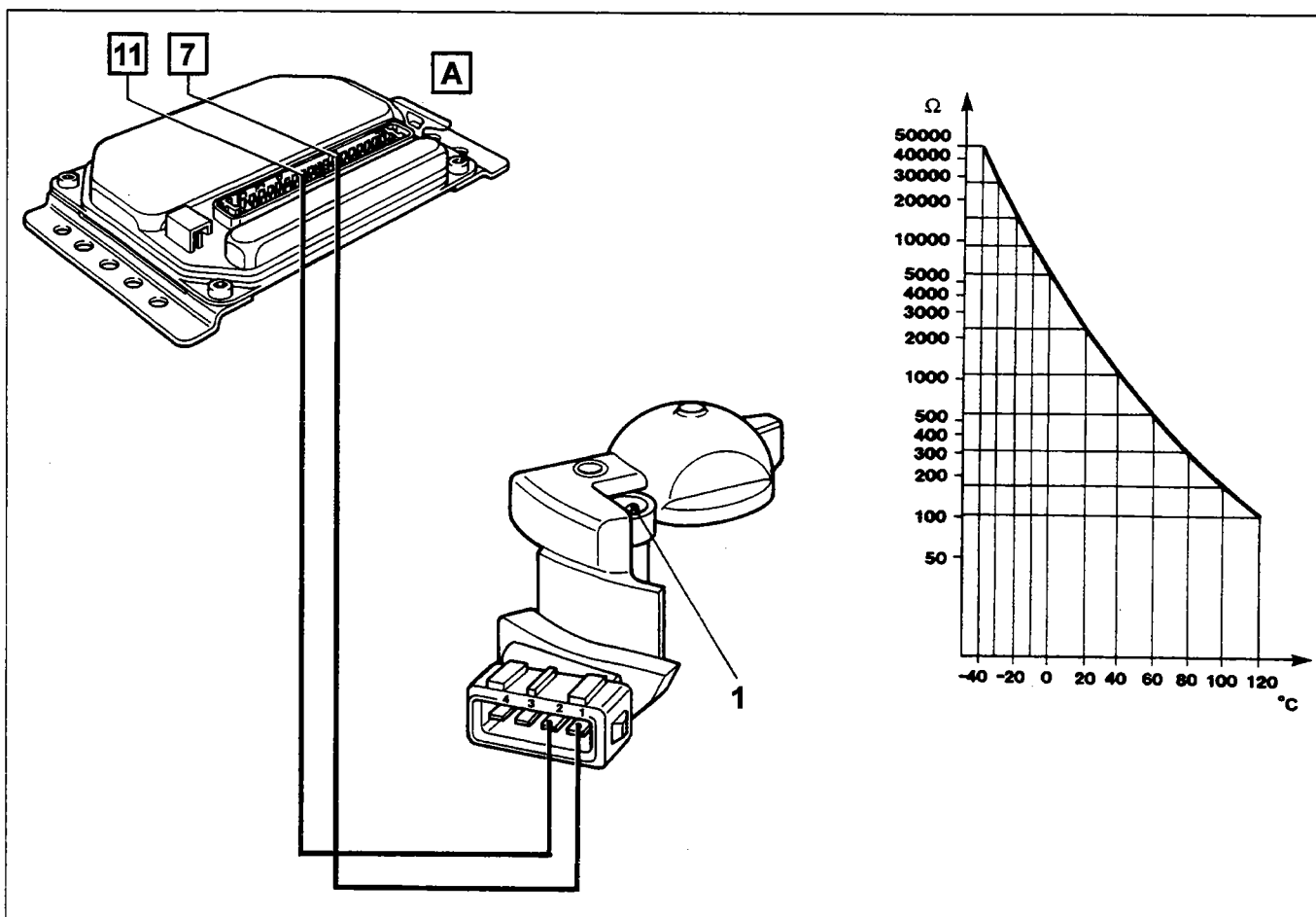
Intake air temperature is measured by temperature sensor (B) located on the butterfly valve case.

This sensor consists of a plastic case on which is located the reactive element (1), which consists of a resistance (N.T.C.) that varies in inverse proportion to temperature.

If temperature is between 15° C - 30° C, resistance is 3.3 - 1.5 k Ω . If temperature is about 80° C, the resistance is 0.280 - 0.360 Ω .

Terminal 13 of the ECU (A) supplies terminal 1 of sensor (B); the circuit is earthed from terminal 2 of the sensor to terminal 27 of the ECU.

When the sensor is disconnected, the ECU supplies a voltage of 5 V. With the sensor connected, the supply voltage alters according to temperature (internal sensor resistance).



P4A32AJ01

Recovery

When the air temperature sensor is short-circuited (d.c.) or circuit is open (a.c.), the ECU receives implausible signals, i.e.:

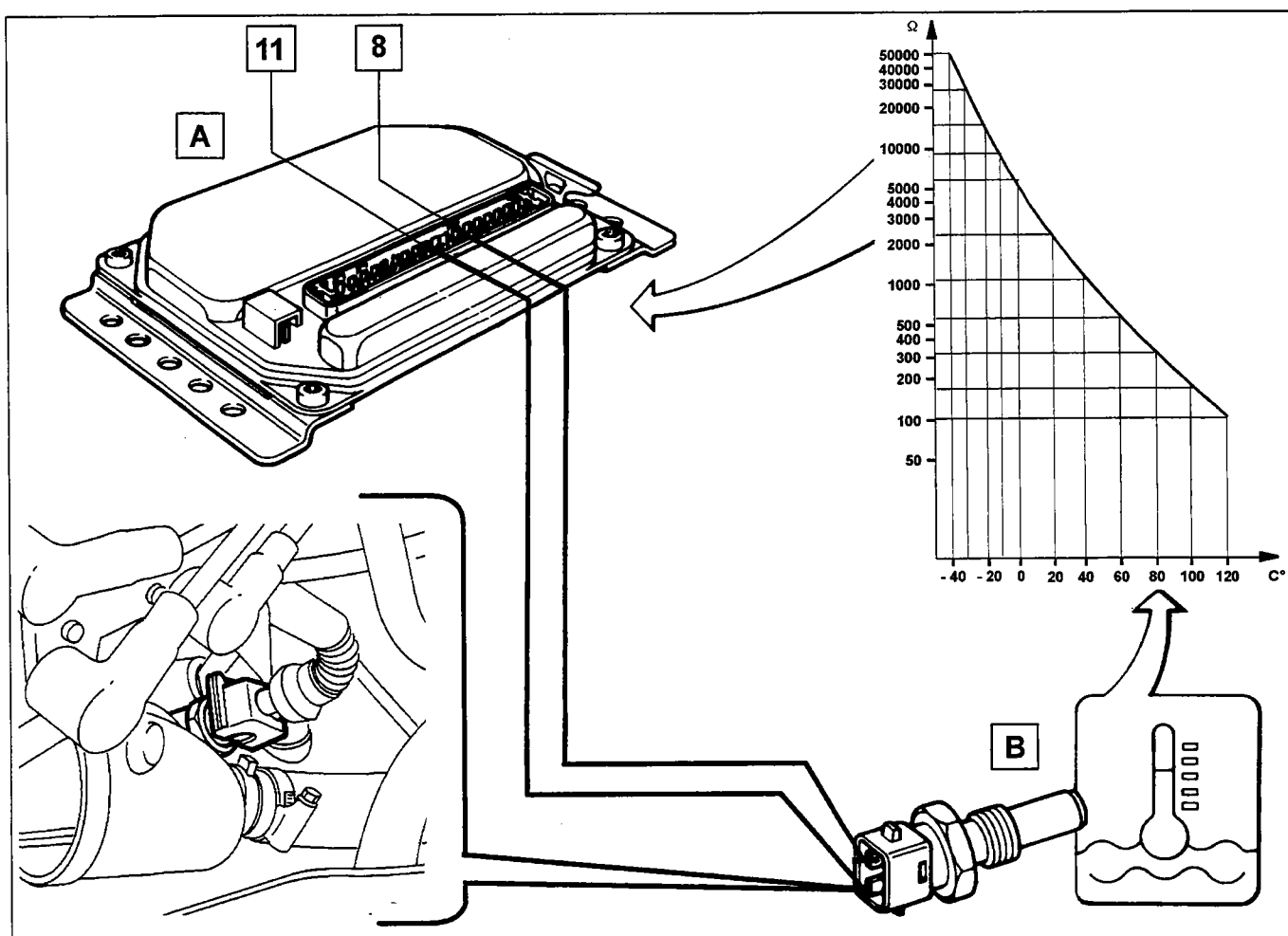
- d.c. sensor: air temperature $> 128^{\circ}\text{C}$
- a.c. sensor: air temperature $< -50^{\circ}\text{C}$

In these cases, the ECU implements a Recovery strategy which takes an air temperature of 20° C as a reference.

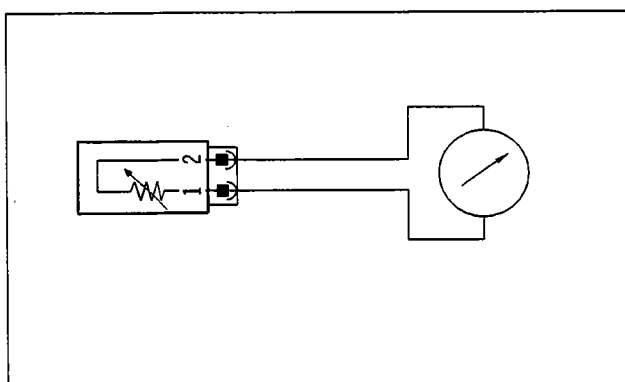
COOLANT TEMPERATURE SENSOR (0.280.130.026)

The coolant temperature sensor (B) consists of a variable N.T.C. resistance. It is fitted on the thermostat case and works in a similar way to the intake air temperature sensor.

Terminal 8 of ECU (A) supplies sensor (B). The circuit is earthed through the sensor terminal to terminal 11 of the ECU.



P4A33AJ01



P4A33AJ02

Checking resistance

The graph in the figure shows the sensor resistance curve, which may be measured by disconnecting the connector and connecting an ohmmeter to the sensor terminals.

Removing-refitting

Disconnect the electrical connection and remove the sensor.



Tightening torque 2.4 daNm.

10.

Recovery

- with coolant temperature sensor disconnected, short circuited (d.c.) or with circuit open (a.c.), implausible signals reach the ECU, i.e.:
 - d.c.: coolant temperature $> 96.5^{\circ}\text{C}$
 - a.c.: coolant temperature $< 96.5^{\circ}\text{C}$
- false contact: when temperature drops occur between two successive temperature samples and the deviation is too great.
- implausible signal: with coolant temperature $< +60^{\circ}\text{C}$, and engine running, sensor output signal does not change.

If the ECU records one or more signals as above, the RECOVERY strategy is implemented:

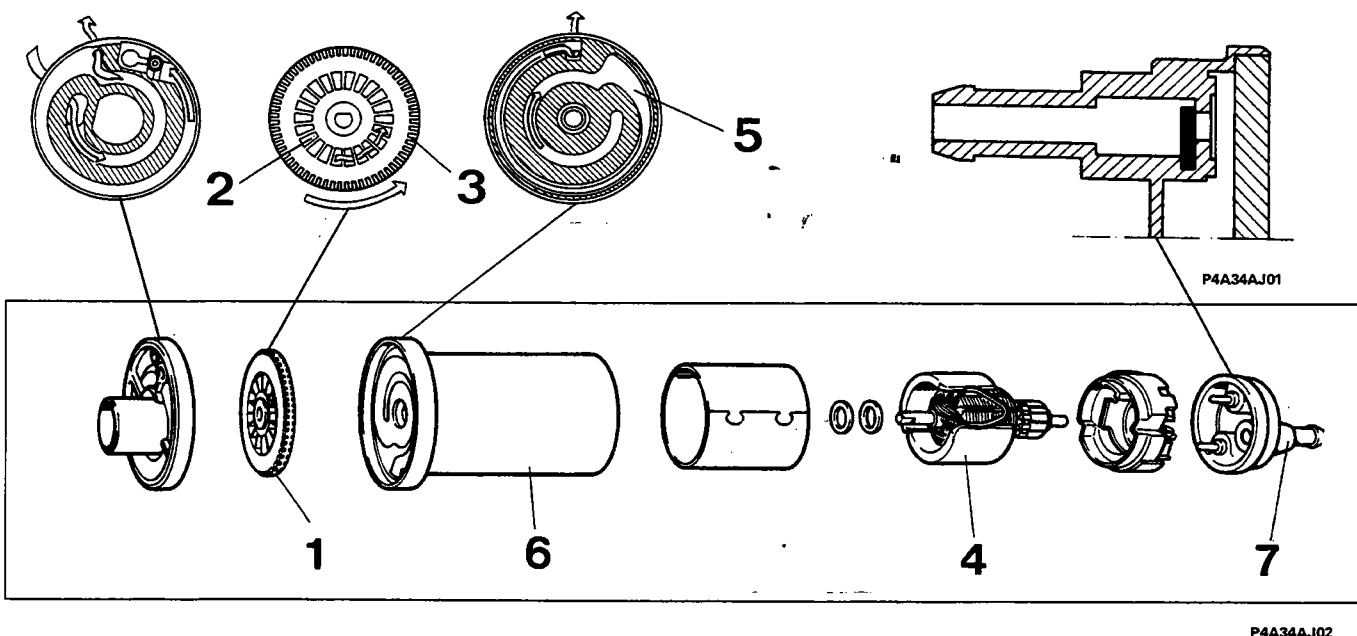
- with air temperature $< 24^{\circ}\text{C}$, the ECU considers coolant temperature to be equal to air temperature for about 4 minutes. After this, coolant temperature is assumed to be 100°C ;
- with air temperature $\geq 24^{\circ}\text{C}$, the ECU considers coolant temperature to be 100°C .

ELECTRIC FUEL PUMP (0.580.453.514)

The fuel pump, submerged in the tank, is a two-stage turbo pump and integral with the fuel level gauge assembly.

The pump is designed to work with a 12 V supply, at a nominal pressure of 1.1 ± 0.1 bar providing an output of 100 litres/hour.

The advantages of low pressure turbo pumps compared to high pressure pumps (2.5 bar), are: small size, reduced weights and low noise levels.



The electric pump contains an impeller (1) that turns two sets of blades: an inner set (2) with lateral profile and an outer set (3) with peripheral profile.

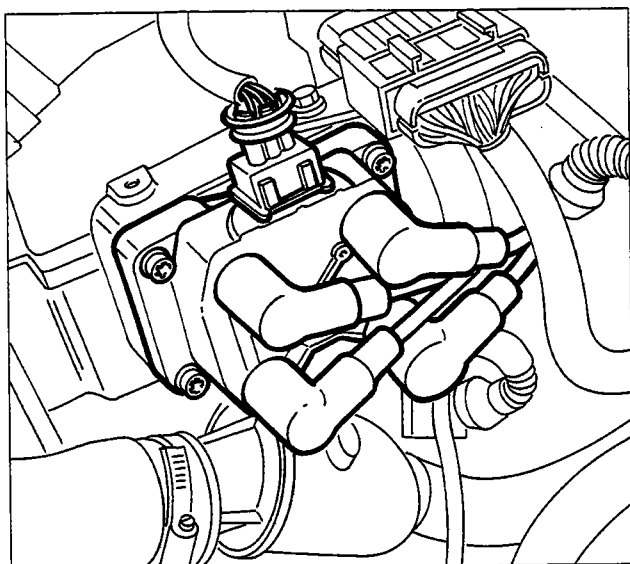
When field coil (4) turns, fuel is taken into the first stage with lateral profile. It then flows through a channel in intake disc (5) to the second stage where it picks up speed and is sent on to the injector turret through outlet case (6) and antireflux valve (7).

The electric pump is supplied by the electronic control unit via a relay and 10A fuse.

NOTE Refer to fuel system section for the 1581 16V for location and removal-refitting procedure.

FUEL FILTER (A.450.024.262)

The fuel filter is fitted under the floor pan, along the fuel delivery line. Refer to fuel system section in 1581 16V manual for location and removal-refitting procedure.



P4A35AJ01

IGNITION COIL (0.221.503.407)

The closed magnetic loop coil is fastened to the left hand side of the cylinder head cover.

1. HT socket for cylinder no. 1 spark plug
2. HT socket for cylinder no. 2 spark plug
3. HT socket for cylinder no. 3 spark plug
4. HT socket for cylinder no. 4 spark plug
5. LT socket for ECU connection

Checking winding resistance

Primary circuit (A cylinders 2-3, B cylinders 1-4)

Bring the terminals of an ohmmeter into contact with positive strip (central pin) and negative strip (pin 1 for circuit A and pin 2 for circuit B) respectively.

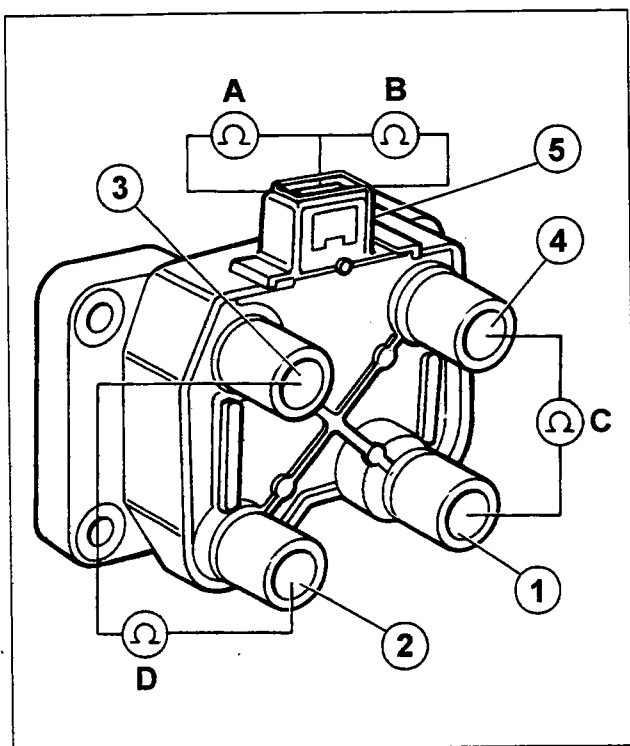
The primary circuit resistance reading on the gauge should be between 0.45 and 0.55 ohm at 23 °C.

Secondary circuit (C cylinders 1-4, D cylinders 2-3)

Bring the terminals of an ohmmeter into contact between the two high tension outlet terminals. The secondary circuit resistance reading on the gauge should be between 12000 and 14600 ohm at 23 °C.

Removing refitting

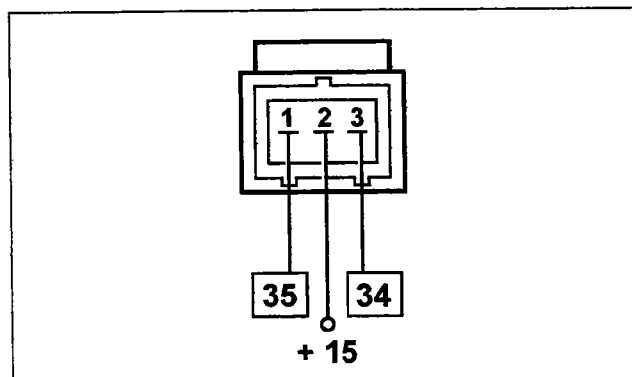
Disconnect HT and LT connections, then unscrew retaining screws and remove the coil.



P4A35AJ02

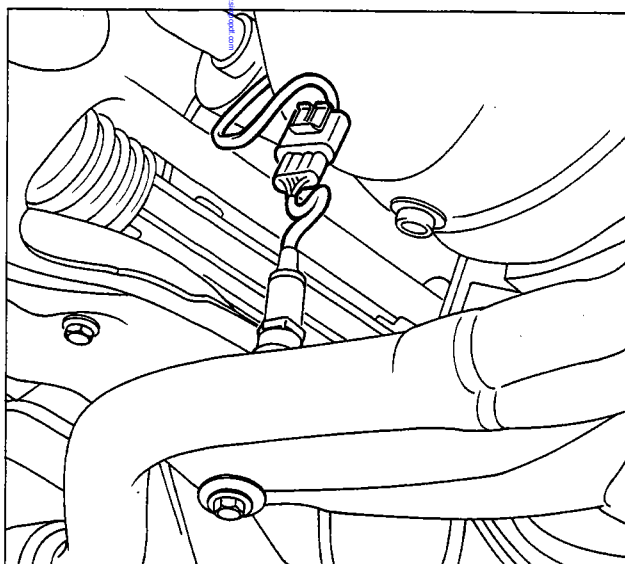
Connector wiring

NOTE The numbers in boxes indicate the corresponding control unit pins.



P4A35AJ03

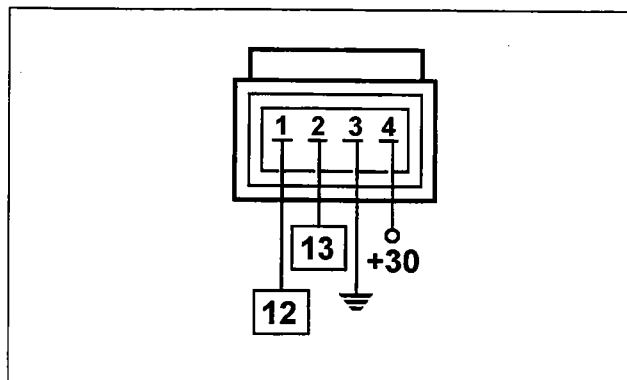
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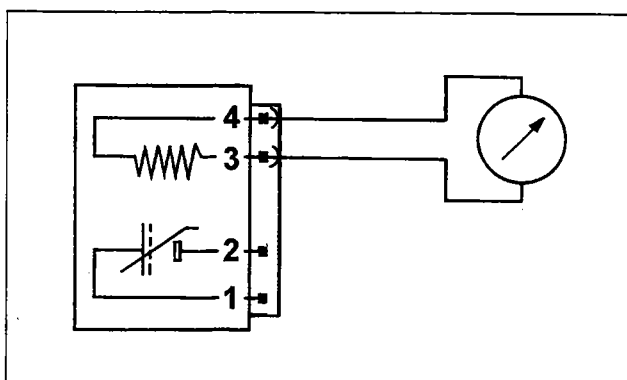
P4A004B02

Wiring connector

The numbers in boxes indicate the corresponding control unit pins.



P4A36AJ02



P4A36FJ01



LAMBDA PROBE (0.258.003.466)

The vehicle is fitted with a four channel hot lambda probe which measures exhaust gas oxygen content. Refer to Fuel System section in the 1581 16V manual for a full description of the lambda probe



The probe may be swiftly put out of service by the presence of even slight amounts of lead in the fuel.

Removing-refitting

- Place the vehicle on a lift.
- Disconnect battery negative lead.
- Raise the vehicle
- Disconnect electrical connection
- Remove the lambda probe from its seat.
- When tightening, do not force the component or it could be irreparably damaged.



If fitting a new lambda probe, spread threaded part with anti-seize graphite grease (e.g. Bosch VS 14016- FT).



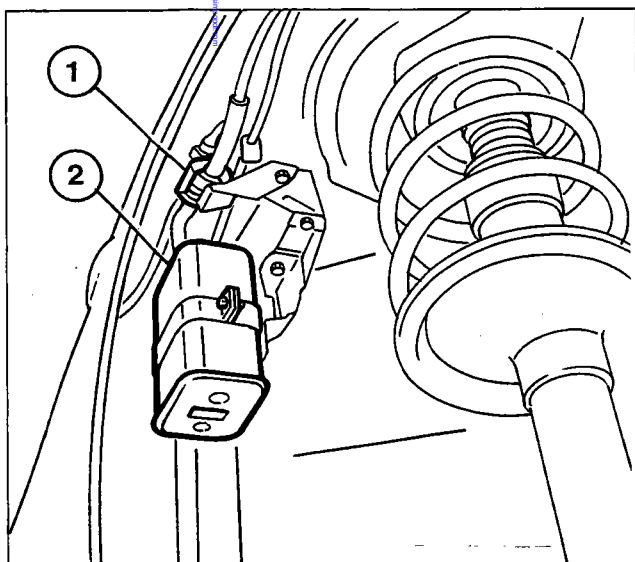
Tightening torque 5 - 6 daNm



Checking resistance

Probe heater resistance may be measured by disconnecting connector and connecting an ohmmeter as shown in the figure.

Resistance: 4.5 ± 0.5 ohm at 20°C



P4A36FJ02

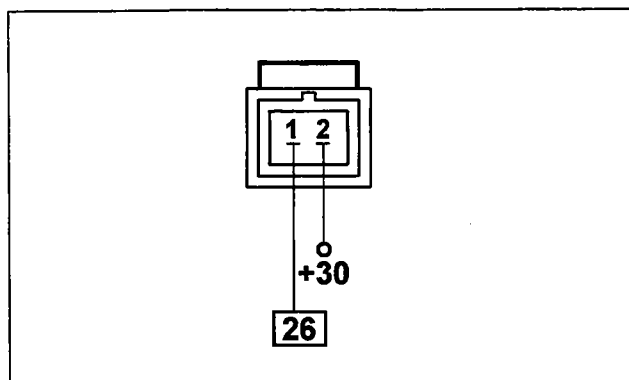
CARBON FILTER AND FUEL VAPOUR CUT-OFF SOLENOID

The carbon filter and solenoid are located in the right hand wheel arch compartment.

For a description of the carbon filter refer to Fuel System section of the 1581 16V manual.

For a description of the fuel vapour cut-off solenoid and removal-refitting procedures for filter and cut-off solenoid, refer to Fuel System section of 1998 20V manual.

1. Vapour cut-off solenoid
2. Carbon filter

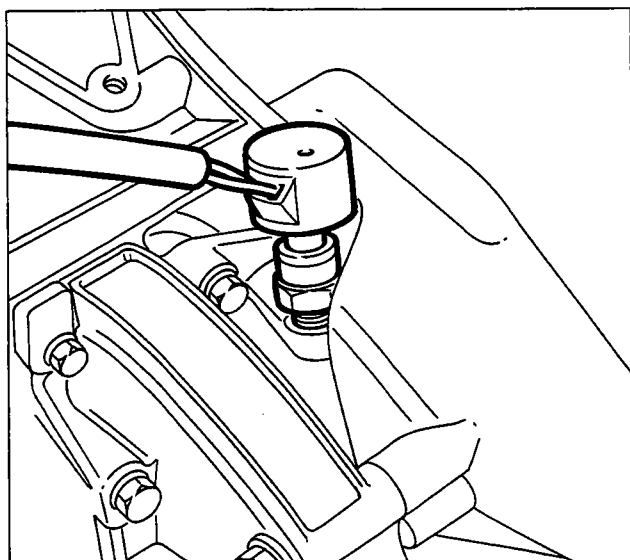


P4A37AJ02

Vapour cut-off solenoid (0.280.142.300)

Wiring connector

NOTE *The numbers in boxes indicate the corresponding control unit pins.*



P4A37AJ03

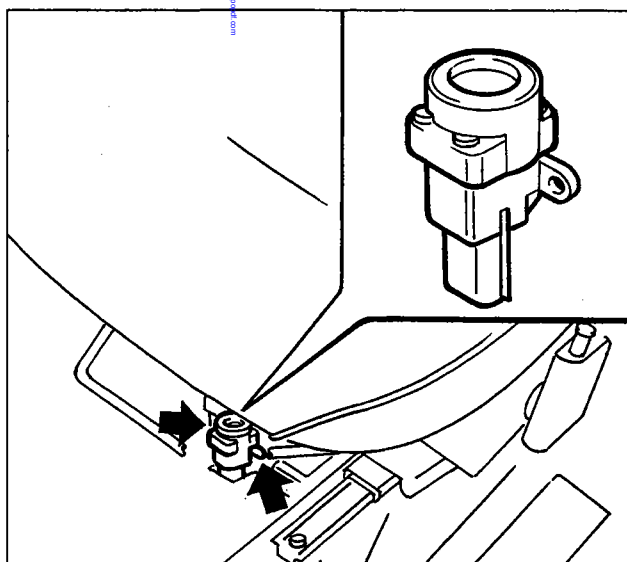
SPEEDOMETER SENSOR

The speedometer sensor (vehicle speed sensor) consists of a Hall-effect sensor located on the differential output.

The sensor sends the ECU a signal, whose frequency alters according to vehicle speed.

The ECU uses this information for more effective idle adjustment actuator management.

10.



P4A48CJ02

INERTIA SWITCH

The vehicle is equipped with an inertia switch located inside the passenger compartment beneath the driver's seat.

This sensor reduces the possibility of fire (caused by fuel emerging from the injection system) by de-activating the fuel feed pump.

For a full description and removal-refitting procedure, refer to Fuel System section of the 1581 16V manual.



After even an apparently light collision, if a smell of petrol is noted or fuel leaks are seen, do not activate the switch again until the fault has been found and corrected in order to avoid the risk of fire.

MULTIFUNCTION VALVE AND SAFETY AND VENTILATION VALVE

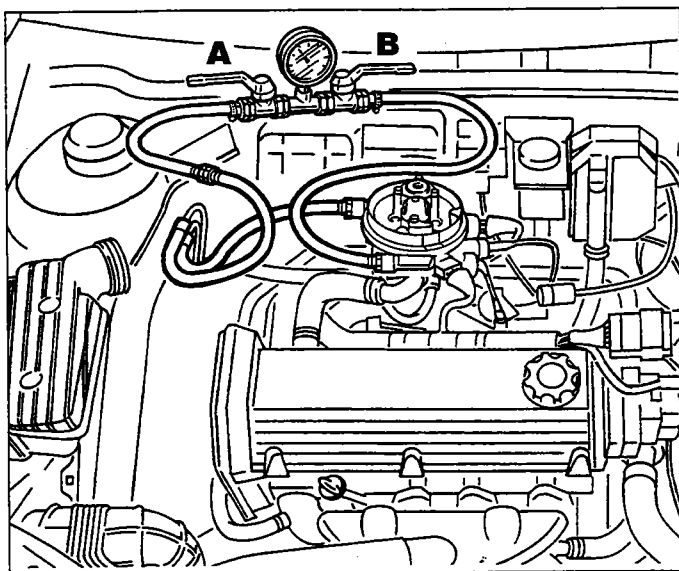
These valves belong to the evaporation control and fuel vapour recirculation system. For a description of operation, refer to Fuel System section of the 1581 16V manual.

CHECKS, ADJUSTMENTS AND REPAIRS TO BOSCH MONOMOTRONIC SYSTEM



OBSERVE THE FOLLOWING PRECAUTIONS WHEN WORKING ON VEHICLES WITH BOSCH MONOMOTRONIC INJECTION-IGNITION SYSTEMS:

- never start the engine when the electrical terminals are poorly connected or loose on the battery poles;
- never use a quick battery charger to start the engine;
- never disconnect the battery from the car circuit with the engine running;
- when charging the battery quickly, first disconnect the battery from the vehicle circuit;
- if the vehicle is placed in a drying oven after painting at a temperature of more than 80° C, first remove the injection/ignition ECU;
- never connect or disconnect the ECU multiple connector with the ignition key in MARCIA position;
- always disconnect battery negative lead before carrying out electrical welding on vehicle.
- Note that the memory of this system is active at all times (memory on stand-by), and contains all learnt self-adaptive parameters. Because all this information would be lost if the battery were disconnected, this operation should only be carried out when absolutely essential.



CHECKING FUEL SUPPLY CIRCUIT

Test 1

Check **fuel regulation pressure** as follows:

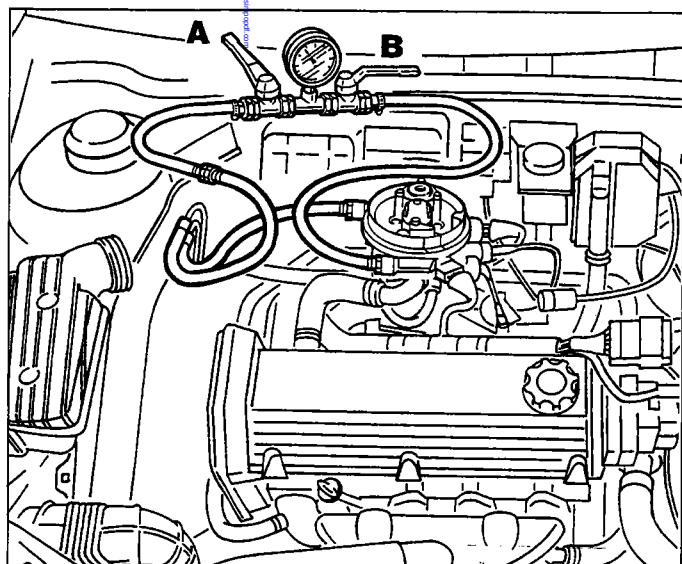
- Disconnect fuel delivery line to injector turret (from fuel filter) from inlet duct;
- Interpose pressure gauge 1895890000 between the disconnected pipe end and the fuel manifold with cocks (A) and (B) open.
- Activate fuel pump with engine off.

The last operation is carried out by selecting "fuel pump" test on a Fiat/Lancia tester.

Under these conditions, the pressure gauge reading should stabilise at 1.1 ± 0.1 bars.

If pressure is insufficient, carry out the test 2.

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Test 2

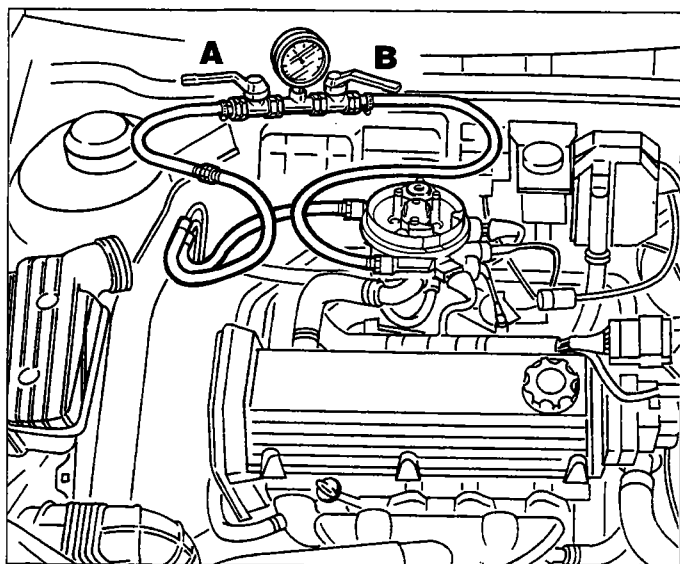
Testing maximum fuel feed pressure (or pump efficiency)

Same connections as previous test.

- Close fuel cock lever (A);
- operate the pump with the engine off, as described previously: pressure should not exceed 5 bar (pump pressure relief valve setting). Otherwise, replace the pump because it is defective.

If pressure measured in test 1 (see previous page) exceeds 1.1 ± 0.1 bar proceed as follows:

- disconnect fuel return pipe (at point (1) for connection to rigid fuel return line to pump) and place in a container suitable for collecting the fuel.
- operate the fuel pump with engine idling, then take pressure reading off pressure gauge:
 - a) if it reaches 1.1 ± 0.1 bar replace the fuel return pipe to the tank because it is blocked or kinked;
 - b) if it exceeds 1.1 ± 0.1 bar replace the pressure regulator because it is defective.



P4A40AJ02

Test 3

Checking injector seal

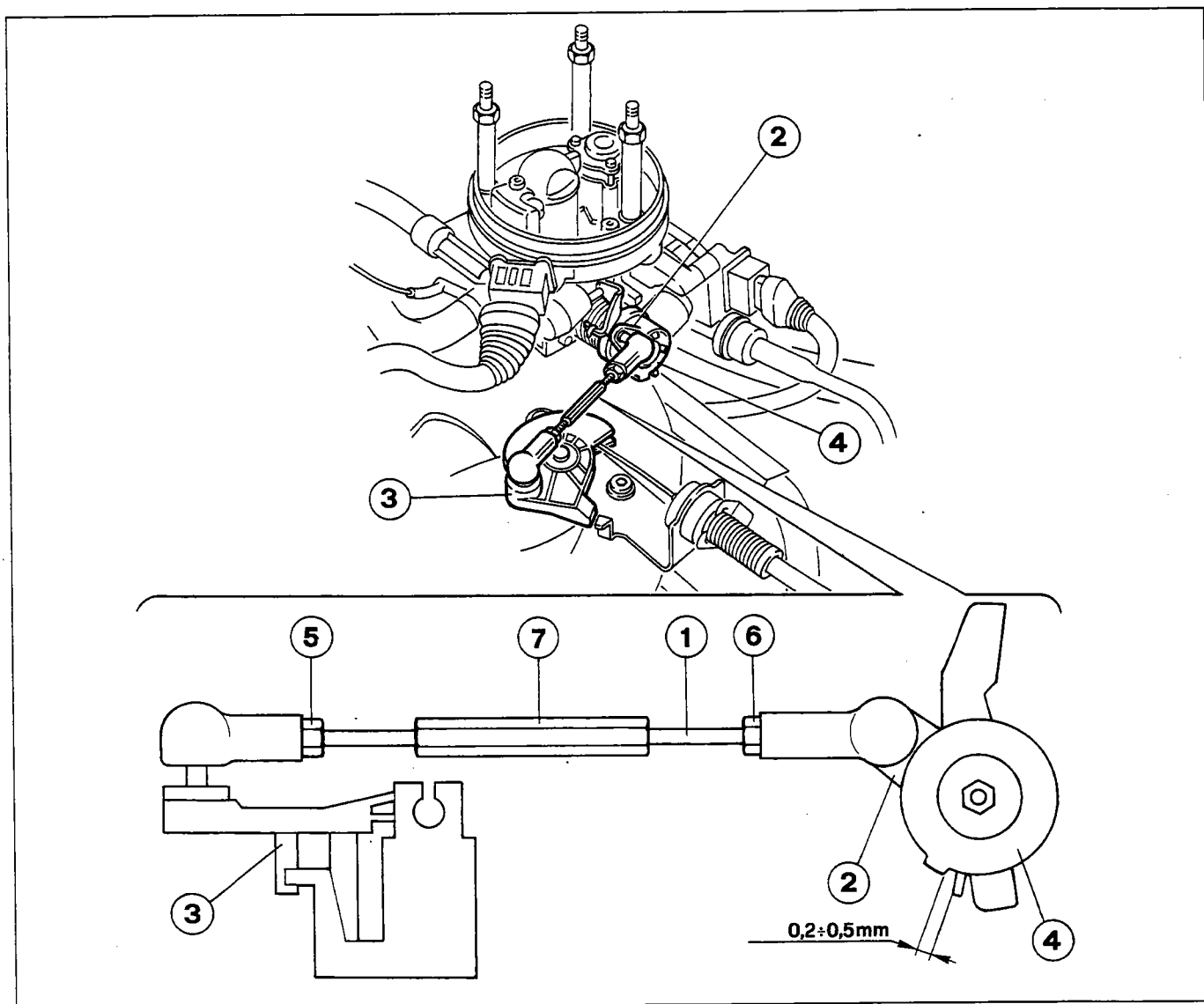
To check for drips from the injectors, connect as described in first test (regulation pressure check) and then operate the pump with the engine off. When the regulation pressure is reached, close control lever B so that fuel pressure and injection pressure is the same.

Then:

- turn off the pump;
- see whether pressure remains constant for 60 seconds after stabilising (i.e. dropping slightly).
- After supplying the pump with the engine off, look to see whether any of the injectors or connection sections are dripping.

Replace any dripping injectors and/or repair the defective seal in the leaking joint.

ADJUSTING BUTTERFLY VALVE OPENING CONTROL



P4A41AJ01

The butterfly valve opening linkage must be adjusted properly for the Monomotronic injection system to work properly.

Check that block (3) is fully home with link (1) disconnected from lever (2). **Under these conditions the accelerator control cable should never be taut or excessively slack so that accelerator pedal free travel is taken up.** If pedal shows free travel, adjust accelerator control cable nut and lock-nut.

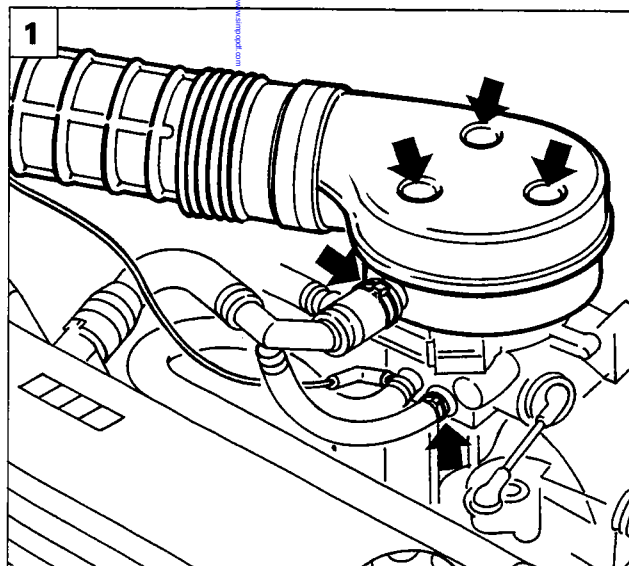
Connect link (1) to head of lever (2) and warm up engine.

With accelerator pedal released (butterfly valve closed) check clearance between levers (2) and (4) is 0.2 - 0.5 mm.

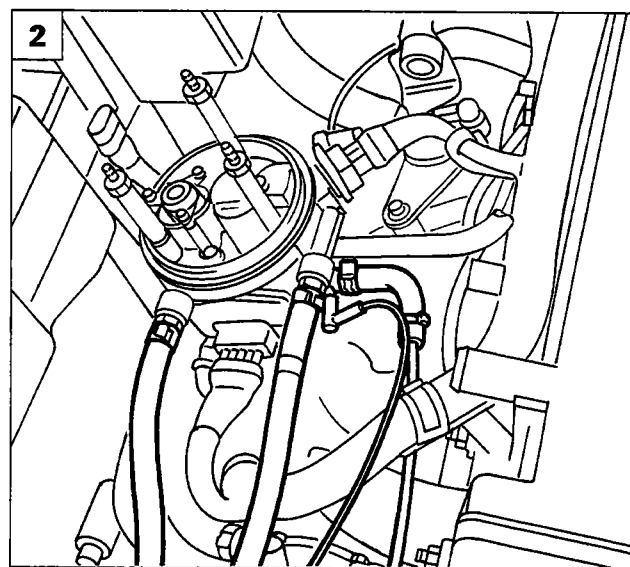
If the above clearance is not as specified, loosen nuts (5) and (6) and tighten/loosen gauge (7) on link (1).

After adjustment, check that butterfly valve is fully open with accelerator pedal pressed fully down.

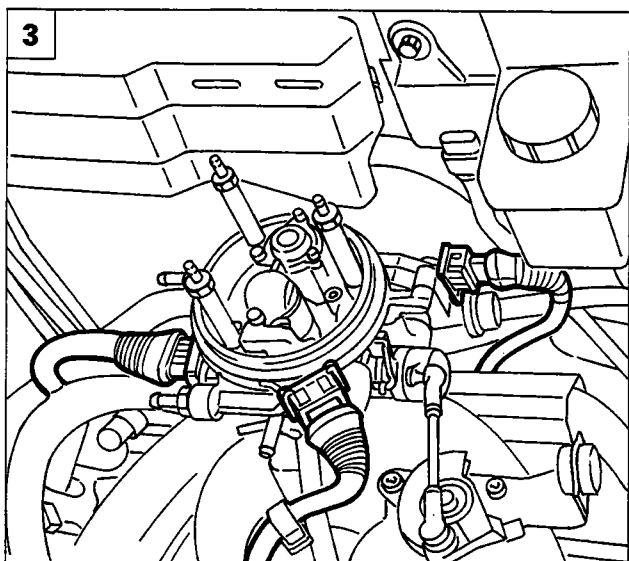
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P4A18AX01



P4A19AX04



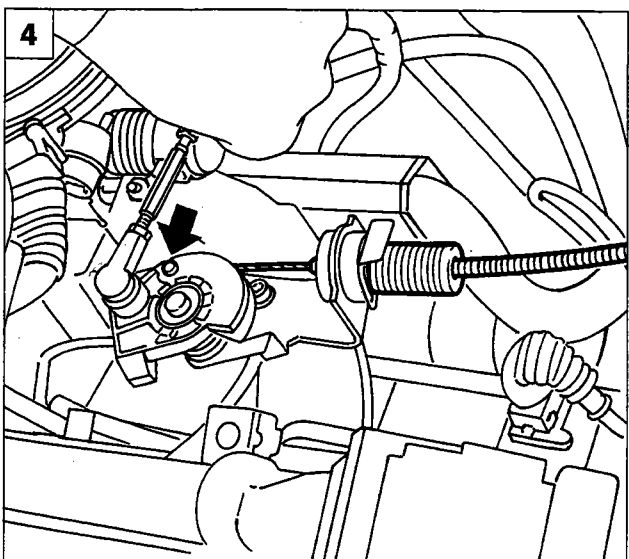
REMOVING-REFITTING

BUTTERFLY

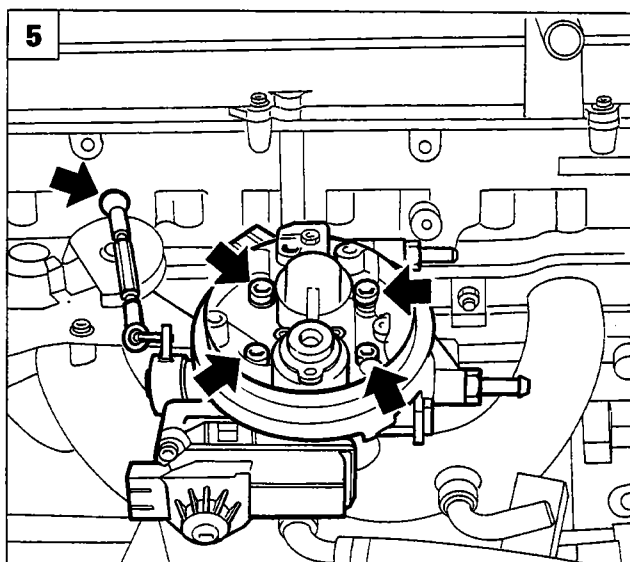
VALVE CASE



1. Disconnect the air shroud and blow-by gas recirculation lines by unfastening at the points indicated.
2. Disconnect fuel lines, evaporation control line and vacuum duct
3. Disconnect electrical connections
- 4-5 Release accelerator link by unscrewing the screws indicated and remove the butterfly valve case.



P4A18AX03



P4A42AJ02

CHECKING ENGINE IDLE SPEED

If engine speed is not 850 ± 50 rpm, because the injection-ignition system is self-regulating, no adjustment can be carried out. It is therefore necessary to check that the accelerator linkage is properly adjusted and then search for the fault through full diagnosis using a Fiat/Lancia Tester.

CHECKING LEVELS OF POLLUTING EMISSIONS

The Monomotronic system is self-adaptive and thus constantly monitors idle speed and CO levels. Therefore there is no need for manual adjustment (adjustment screws are no longer fitted). However, checking exhaust contents downstream of the catalytic converter can provide useful information about the injection-ignition system condition, engine and catalytic converter parameters

Checking CO and HC levels when idling

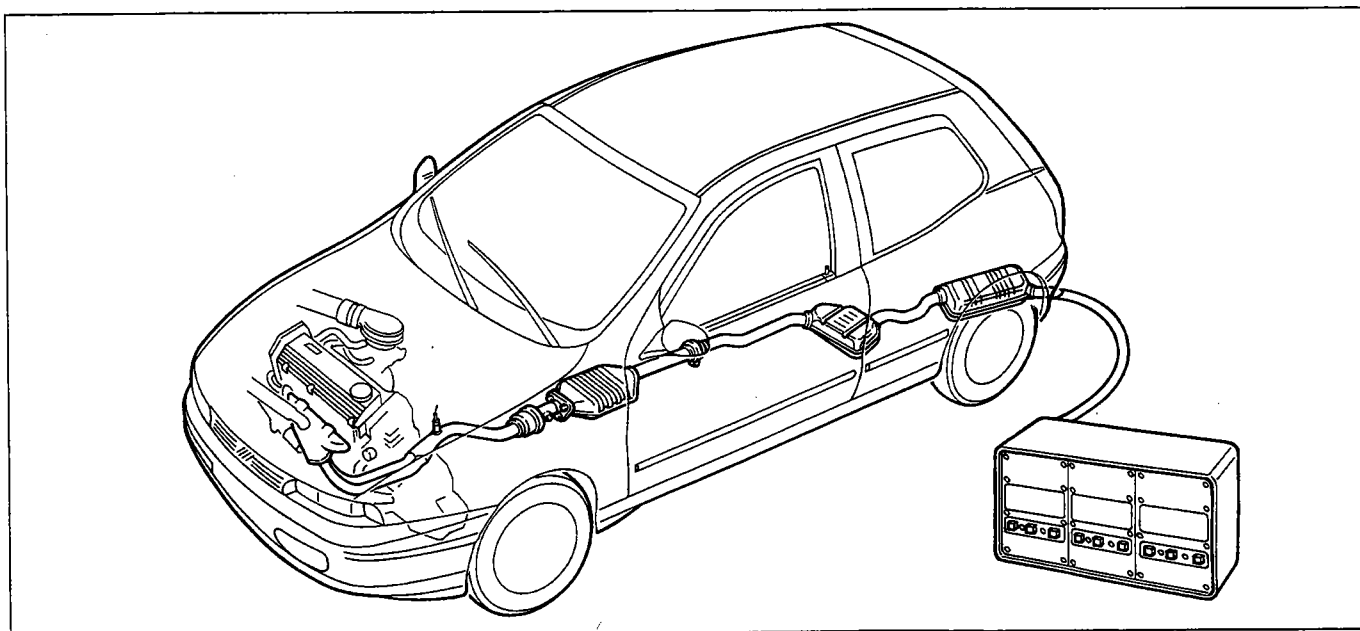
Measure levels of carbon monoxide (CO) and unburnt hydrocarbons (HC) with the catalytic converter hot ($300 - 350^{\circ}\text{C}$) (it is advisable to push the car engine on the road for about 5-10 minutes to ensure that the catalytic converter reaches service temperature), Then fit the probe of a suitably calibrated tester to at least 30 cm as indicated in the figure.

If the shape of the exhaust tail pipe will not allow the probe to be fully inserted, add an extension pipe designed to ensure a seal in the joint area.

1. Check that CO and HC levels are as specified in the table;
2. If CO level is not as specified, check that:
 - Lambda probe is working properly, with the aid of a Fiat/Lancia Tester;
 - for air leaks in the area surrounding the lambda probe seat
 - the injection and ignition system (**particularly for spark plug wear**).
3. If HC level is not as specified, the engine is not properly tuned or the catalytic converter is not efficient.

CO (%)	HC (p.p.m.)	CO ₂ (%)
≤ 0.35	≤ 90	≥ 13

Summary table showing emission level tolerances downstream of converter



P4A43AJ01

10.

DIAGNOSIS

Full system diagnosis can be carried out by means of active diagnosis using a Fiat/Lancia Tester

If a sensor fault is recorded, the ECU replaces the input from the faulty sensor with information from its memory (**recovery**) to allow the engine to continue running. When a fault is recorded, it is saved permanently and the sensor excluded from the system until the signal is again compatible.

The same procedure is applied if the fault affects an actuator or an actuator control port. When a fault is recorded and the signal replaced by a recovery input, the fault is indicated by a warning light coming on on the control panel.

The ECU is able to manage the following parameters in the case of failure: idle adjustment actuator, coolant temperature sensor, butterfly valve position sensor, air temperature sensor and knock sensor. If required by an operator, anomalies may be read off the ECU using a Fiat/Lancia Tester.

Recording faults

This is carried out while running the basic function used to manage the sensor/actuator.

Memorising error and structure of error memory

Errors are memorised in the ECU in the order in which they occur in the RAM. Location and a frequency counter are memorised for each one.

Defect classification

If a defect is recognised for the first time and the error status persists for the recognition time, the defect is memorised as "permanent". If this defect then disappears, it is memorised as "intermittent". If it reappears, it again becomes "permanent".

Classification of a fault as "permanent" activates recovery functions: when the fault disappears, normal reading or activation function is restored.

Some fault types are classified as "important", i.e. significant as far as emission control regulations are concerned. A warning light comes on on the control panel when these faults occur.

Frequency counter

A frequency counter is allocated to each error to determine the moment at which a fault no longer present was memorised. When the fault is first detected, the frequency counter memorises a value of 10. If the fault disappears it is memorised as intermittent and the counter is decreased whenever the car is started without the fault reappearing; if the counter reaches 0, the fault is deleted automatically from the memory.

If the fault reappears after the counter has been reduced, the counter is always reset to 10 (or remains unchanged if already greater than 10).

Fault notification

A warning light comes on when a defect is saved as "present" and "important".

The delay between recording of the fault and the warning light coming on is 2.5 seconds; the delay between the fault disappearing from the memory and the warning light going off is 0 seconds.

The warning light comes on whenever the ignition key is turned to MAR. The warning light goes off after 4 seconds unless "important" faults are present.

Deleting errors

When the frequency counter reaches 0, the fault and associated parameters are deleted.

The entire error memory is cleared immediately in the following cases:

- by means of a "clear error memory" command sent by the tester;
- by interrupting ECU supply (by disconnecting the battery or ECU connector).

Diagnosis using Fiat/Lancia tester

Connect the Fiat/Lancia Tester (F.L.T.) to a socket beside the ECU.

Information is exchanged between ECU and Tester via a two-way serial line (line K) using standard Bosch communication Protocol.

The Tester is able to perform the following functions:

- Error display;
- Engine parameter display;
- Active diagnosis

List of errors

RPM sensor	Incorrect signal (circuit open) Loss of synchronism (implausible signal)
Throttle potentiometer	Race 1 defective - Race 2 defective - Synchronisation error between races
Air temperature sensor	A.C.-D.C.
Coolant temperature sensor	A.C.-D.C.- False contact - Implausible signal
Lambda probe	A.C.-D.C.- Limit reached for lambda reconstruction and self-adaptive factor
Idle speed actuator	A.C.-D.C.
Control unit	ECU memory anomalies indicated
Detonation sensor	A.C.-D.C.
Fiat CODE	Code not recognised or not received

Displayed parameters

Engine rpm
Injection time
Inlet air temperature
Coolant temperature
Throttle valve opening angle (race 1 angle, race 2 angle, standard angle and relationship between races)
Lambda probe (status, reconstruction value, self-adaptive value and probe signal activated)
Fiat CODE (status byte)

Active diagnosis

The Fiat/Lancia Tester can be used to run the following tests:

- Injector
- Fuel vapour cut-off solenoid
- Rev counter
- Idle speed actuator
- Error deletion.

Recovery

In the event of sensor malfunction, the ECU replaces the value transmitted by the sensor with a 'Recovery' value. This is stored in the ECU for use in the case of certain faults or may be reconstructed approximately on the basis of other available information, thus allowing the vehicle to be driven to a service centre.

The value is also relayed to the Fiat/Lancia tester, and therefore it should be noted, when diagnosing, that in the event of a malfunction, the Fiat/Lancia tester indicates an error in the affected sensor and displays the recovery value.

Permanent memory

The control unit has a permanent memory, which keeps a record of the error even after its cause has been eliminated, or after the key has been turned to STOP; and a temporary, volatile memory (RAM), which loses error details as soon as the underlying cause has been removed.

This will allow more effective identification of occasional errors.

Before completing tests on «permanent» memory content, delete using a Fiat/Lancia Tester in Active diagnosis mode.

Otherwise, when reconnected, the tester will still display errors from a previous diagnosis.



Disconnecting the control unit from the system, even for a long period, does not delete the "permanent" memory.

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M.MARELLI-WEBER I.A.W.-1AF.13 INTEGRATED INJECTION-IGNITION SYSTEM

Introduction

The I.A.W.-1AF.13 system (I.A.W.-1AF.23 for versions with automatic transmission) The Hitachi system fitted to the 1581 i.e. 16v engine belongs to the category of digital electronic ignition systems with static advance and timing, integrated with a phased, multipoint, intermittent electronic fuel injection system.

This system therefore adopts a single ECU, single wiring system and a set of sensors common to both systems.

Its function is therefore to inject an exact quantity of fuel into the engine intake duct upstream of the intake valves in order to obtain the correct mixture concentration.

The I.A.W.-1AF.13 system ensures efficient operation and optimisation of performance and fuel consumption. Harmful emission levels are reduced through real time response to the various engine operating conditions.

The system may be divided schematically into the following subsystems:

- Electric/electronic circuit
- Air intake circuit
- Fuel feed circuit
- Emission control devices

The system is able to monitor the following parameters by means of dedicated sensors:

1. instantaneous engine rpm;
2. position of each piston pair in relation to TDC of cylinder 1;
3. intake air temperature;
4. throttle valve angular position;
5. coolant temperature;
6. actual mixture concentration (by means of lambda probe signal);
7. intake manifold pressure;
8. vehicle speed;
9. battery voltage;
10. air conditioner compressor activation (if fitted).

This data, generally analogue, is converted into digital signals by analogue/digital (A/D) converters so that it may be used by the ECU.

Note that this I.A.W.-1AF.13 injection-ignition system does not require adjustment because it is self-adjusting and self-adaptive.

SYSTEM OPERATING STRATEGIES

The management software resident in the ECU memory comprises a set of strategies. Each of these controls a specific system control function.

Each strategy uses the various inputs listed above to process a set of parameters, using data maps saved in specific areas of the ECU. The resulting data output is used to control system actuators, in other words the devices used to operate the engine, namely:

1. injectors;
2. ignition coils;
3. solenoids of various types;
4. electric fuel pump;
5. engine idle speed actuator;
6. control relays.

10.

The management strategies must not only control the moment of ignition and intake air temperature/-pressure at various engine speeds in order to allow the engine to work properly as environmental parameters change, but also control and manage injection in order to maintain an optimal stoichiometric ratio (air/fuel) at all times.

System management strategies are essentially as follows:

- signal management;
- injection management;
- Fiat CODE ignition lock function management);
- ignition management;
- engine idle control;
- fuel vapour recirculation management;
- test management
- heating/ventilation system management

SIGNAL MANAGEMENT

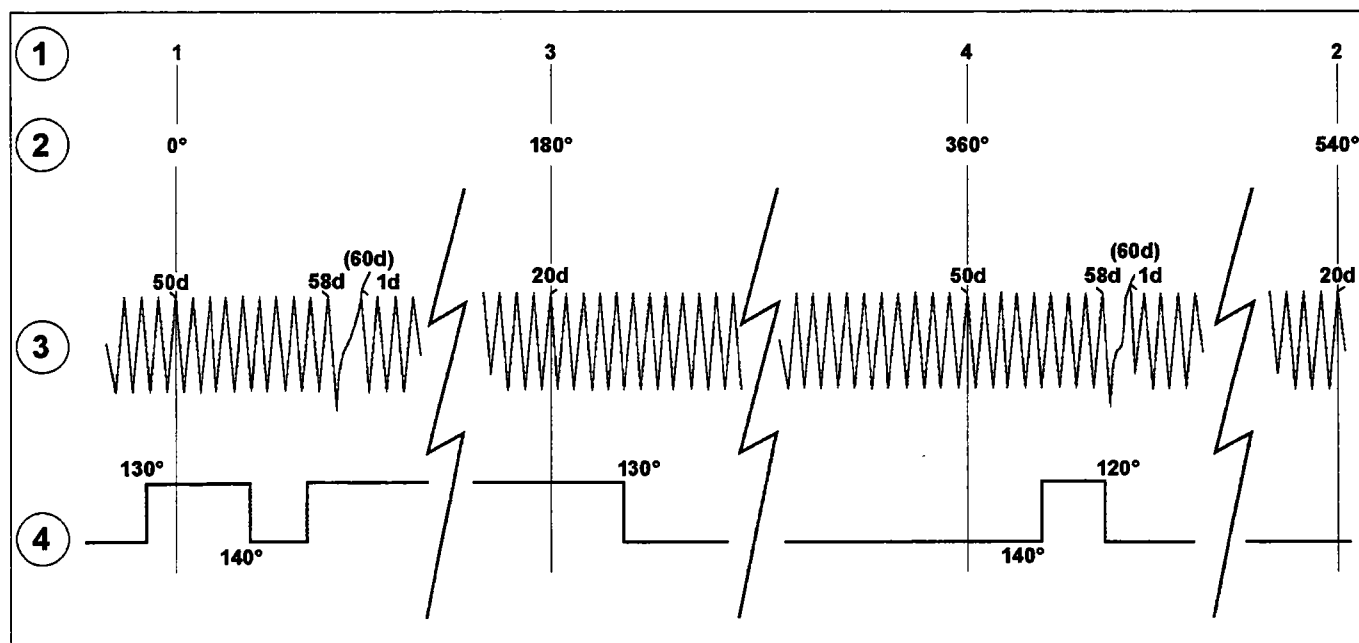
Upon starting, the ECU identifies injection and ignition timing, because these parameters are essential to ensure subsequent successful implementation of all strategies.

Timing is identified by interpreting a series of signals from an rpm sensor located on the crankshaft pulley and a timing sensor located on the camshaft pulley, intake side.

NOTE The term "signal framework" denotes the set of signals produced by a sensor on the crankshaft and a sensor on the camshaft. Because these are located in specific reciprocal positions, they provide the ECU with a synchronised sequence of signals that the ECU is able to identify.

The signal framework is produced as follows:

- phonic wheel on the crankshaft pulley, equipped with (60-2) 58 teeth and an angular gap of 18° (equivalent to two missing teeth) for TDC recognition.
- wheel on camshaft pulley, intake side, comprises two long slots and one short slot, with width and arrangement designed to provide the signal indicated in the figure.



P4A02CJ01

1. Cylinder TDC
2. Crankshaft angles
3. Crankshaft phonic wheel signal (rpm sensor)
4. Camshaft wheel signal (engine timing sensor)

NOTE Numbers allocated to signals indicate crankshaft angles ahead of subsequent TDC.

INJECTION MANAGEMENT

The ignition management strategies are designed to provide the engine with the correct amount of fuel at the right time in accordance with engine service conditions.

The Marelli I.A.W.-IAF.13 injection-ignition system uses an indirect measurement system known as «SPEED DENSITY - LAMBDA», i.e. angular speed of rotation, intake air density, retro-active concentration check.

In practice this system uses ENGINE SPEED (revs per minute) and AIR DENSITY (pressure and temperature) to measure the amount of air taken in by the engine.

The amount of air taken in by each cylinder upon each engine stroke depends on intake air density and also on standard displacement and volumetric efficiency.

Air density is taken to be the density of air taken in by the engine and calculated as a function of absolute pressure and temperature - both measured in the inlet manifold.

Volumetric efficiency is a parameter relating to the cylinder filling coefficient. It is calculated on the basis of experimental tests carried out on the engine throughout its service range and then memorized in the ECU.

Once the amount of air taken in has been established, the system must provide sufficient fuel to make up the required fuel mixture concentration.

The injection trigger pulse or time at which fuel delivery begins is mapped in a control unit and alters according to engine speed and intake manifold pressure. In practice, the ECU performs calculations in order to control sequential, phased opening of the four injectors, one per cylinder for the length of time strictly necessary to form an air-fuel mixture as close as possible to a stoichiometric ratio.

Fuel is injected directly into the manifold close to the intake valves at a differential pressure of some 3 bar.

Speed (no. of revolutions per minute) and air density (pressure and temperature) are used to measure intake air quantity, which is used in turn to calculate the amount of fuel needed to achieve the required mixture proportions. The other sensors in the system (coolant temperature, throttle valve position, battery voltage, etc.) allow the ECU to correct the baseline strategy for each specific engine service condition.

This specification is fitted with a catalytic converter to abate polluting emissions. In order to keep this working efficiently, the air-fuel ratio must be maintained at near stoichiometric levels.

A stoichiometric ratio is achieved by using a hot lambda probe. This probe continually monitors the amount of oxygen in the exhaust gas and then informs the ECU. This unit in turn uses mapped data to correct the fuel air mixture on-line if proportions are no longer stoichiometric.

Idle speed, exhaust gas CO level and butterfly valve sensor position are not adjusted on this system.

Control of mixture concentration (retro-active control)

NOTE Mixture ratio is defined and indicated by the Greek letter α (alfa) as follows:

$$\alpha = \frac{\text{quantity of air taken in by engine}}{\text{quantity of fuel injected}}$$

10.

Stoichiometric ratio is defined and indicated by the symbol α_{st} as follows

$$\alpha_{st} = \frac{\text{theoretical quantity of air required to burn all the fuel injected}}{\text{quantity of fuel injected}}$$

Mixture concentration is defined and indicated by the Greek letter λ as the ratio::

$$\lambda = \frac{\text{quantity of air taken in by engine}}{\text{theoretical quantity of air required to burn all the fuel injected}}$$

Thus we easily find that $\alpha/\alpha_{st} = \lambda$.

Stoichiometric ratio depends on fuel type. For unleaded fuels in current use, this figure is 14.7 - 14.8, which corresponds to $\lambda = 1$. (a ratio of 14.8:1 means that 14.8 parts of air are required to burn 1 part of fuel).

The mixture is termed rich (or heavy) when the quantity of air is less than the stoichiometric level. In this case, $\lambda \leq 1$;

the mixture is termed lean (or light) when the quantity of air exceeds the stoichiometric level. In this case, $\lambda \geq 1$;

The strategy is designed to correct base pulse constants so that mixture concentration oscillates continually and at a high rate between 0.98 and 1.02.

This oscillation rate varies according to engine load and speed. It is in the order of tens of Hertz.

NOTE

1 Hz = 1 oscillation per second

Under conditions of:

- cut-off,
- throttle opening greater than 70%
- engine temperature less than 25 °C

the strategy is de-activated.

Self-adaptability

The control unit features a self-adaptive function able to memorise deviations between basic maps and corrections imposed by the lambda probe that occur persistently during operation. Such deviations (due to system and engine component ageing) are saved permanently so that system operation can be adapted to gradual changes in engine and components with regard to original specifications.

The strategy is de-activated while the carbon filter flushing solenoid is open. If the ECU is replaced, carry out a road test to enable the engine to warm up and the ECU autoadaptive strategy to come into play (particularly important when idling at a standstill).

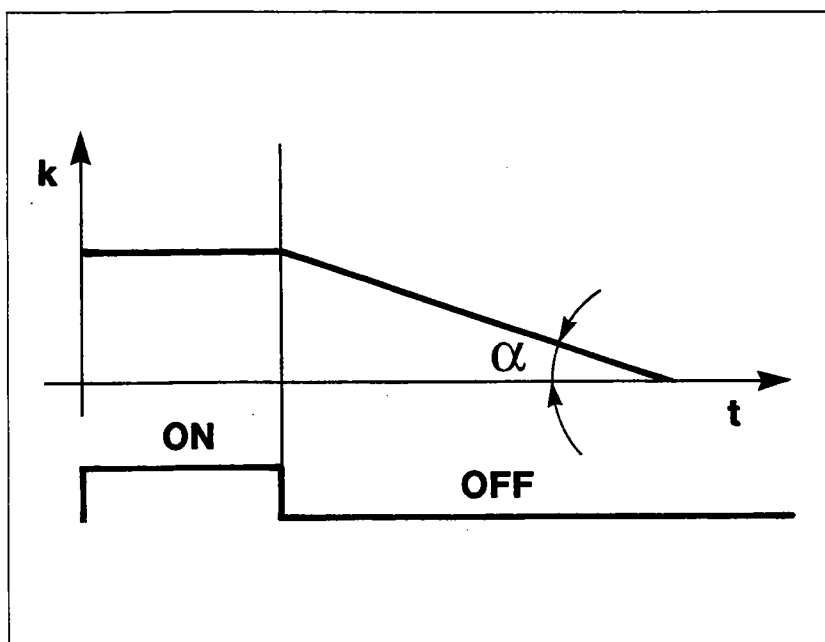
Starting and post-starting

During start-up, engine phase cannot be identified and phased injection cannot therefore be implemented.

An initial simultaneous injection is carried out during the first few engine revolutions (full group) because the considerable fluctuations in rotation speed do not permit injection time to be calculated correctly. Only subsequently does injection become phased.

The base pulse constant is increased by a certain factor throughout the period when the engine is cranked by the starter motor.

Once start-up has taken place, the factor is gradually reduced to zero within a given time period, which is in inverse proportion to engine temperature.



k : enrichment factor

t : time

α : decrease proportional to engine temperature

ON: engine cranked

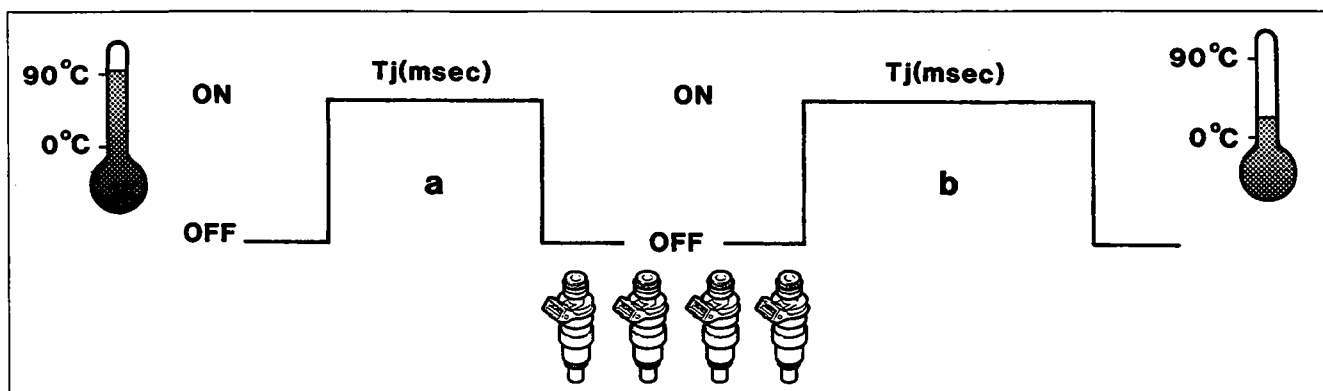
OFF: engine running

P4A05CJ01

Cold operation

Under these conditions, the mixture becomes naturally leaner due to reduced evaporation and heavy fuel condensation on the intake manifold internal walls. The greater viscosity of the lubrication oil also brings about an increase in the rolling resistance of internal engine components which also serves to exacerbate matters.

The electronic control unit recognises this condition and corrects injection time on the basis of the coolant temperature signal.



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10.

As a result:

- At very low temperatures the injector stays open longer (T_j) graph (b) for a low air fuel ratio (rich mixtures);
- As engine temperature increases, injector opening time becomes shorter (t_j) graph (a) and the air/fuel ratio becomes correspondingly higher (lean mixture).

While the engine is warming up, the ECU also governs a step motor which is responsible for calculating the amount of air necessary to ensure the engine does not stall.

Rpm is decreased as the temperature rises until the rated level is reached (850 ± 30 Rpm) when the engine is warm. The ECU governs the step motor to maintain idle speed constant even if electrical and mechanical loads vary.

Full-load

Under full load conditions, base pulse constant must be increased to obtain maximum engine power output.

The ECU detects a full load condition as a result of parameters supplied by the throttle position and absolute pressure sensors.

On the basis of this information, the ECU implements the appropriate correction strategy by increasing base pulse constant.

Over-run

Two strategies are superimposed during this stage:

1. Transitory negative strategy to reduce the amount of fuel required by the engine (lower emissions).

This stage is recognized by the ECU when the potentiometer signal changes from a higher voltage level to a lower value.

2. A dash-pot strategy to lessen changes in torque delivery (lower engine brake).
This strategy is implemented when the potentiometer signal indicates that the throttle is closed and rpm is high. The step motor gradually decreases the flow of air through the by-pass.

Connection to automatic transmission

The ECU adjusts engine idle speed on the basis of the load input when the selector lever is moved to a given position and transmits information to the automatic transmission ECU on engine coolant temperature (pin 5) and throttle valve position (pin 44).

Barometric correction

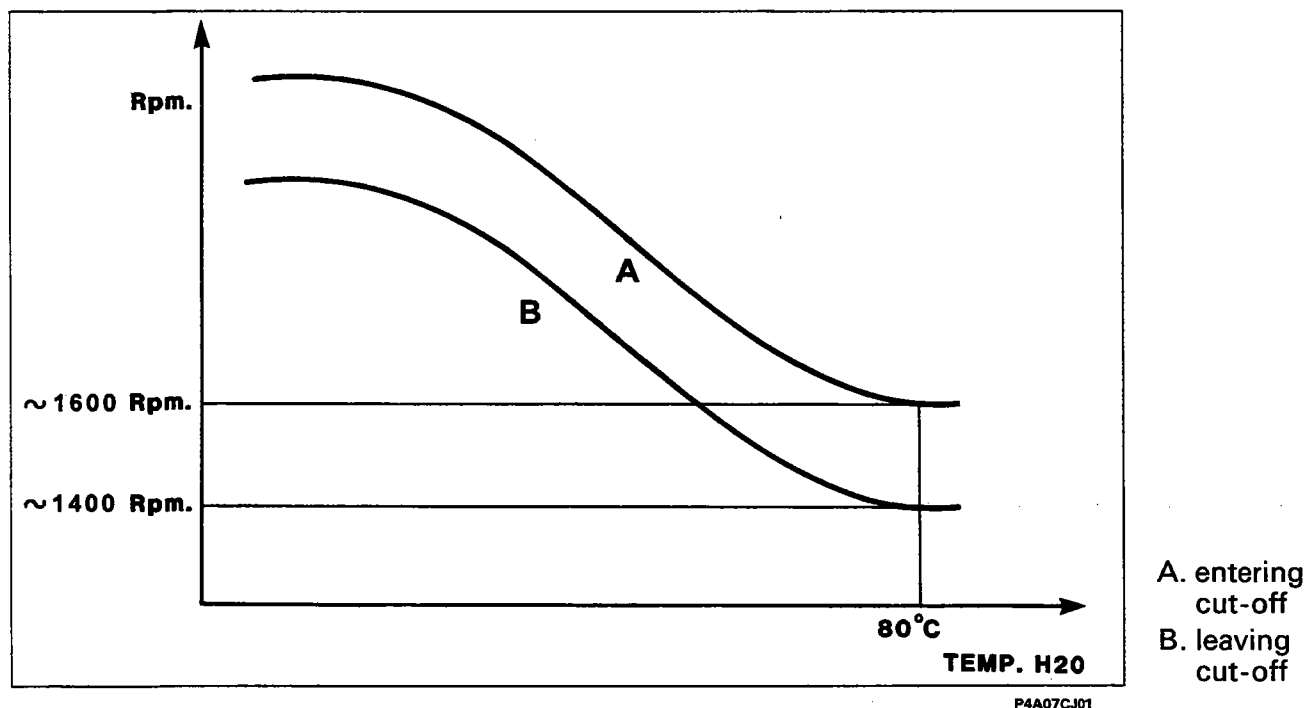
Atmospheric pressure varies with altitude to bring about changes in volumetric efficiency of sufficient entity to require a correction to baseline concentration (injection time).

Injection time is corrected according to changes in altitude and updated automatically by the ECU whenever the engine is started up and under certain conditions of throttle position and rpm (dynamic adjustment of barometric correction)

Cut-off

The fuel cut-off strategy is activated when the ECU recognises that the throttle is in closed position (throttle potentiometer signal) and engine speed exceeds 2000 rpm. The ECU activates cut-off only when engine temperature exceeds 0° C.

The fuel supply is restored when the throttle is no longer closed.



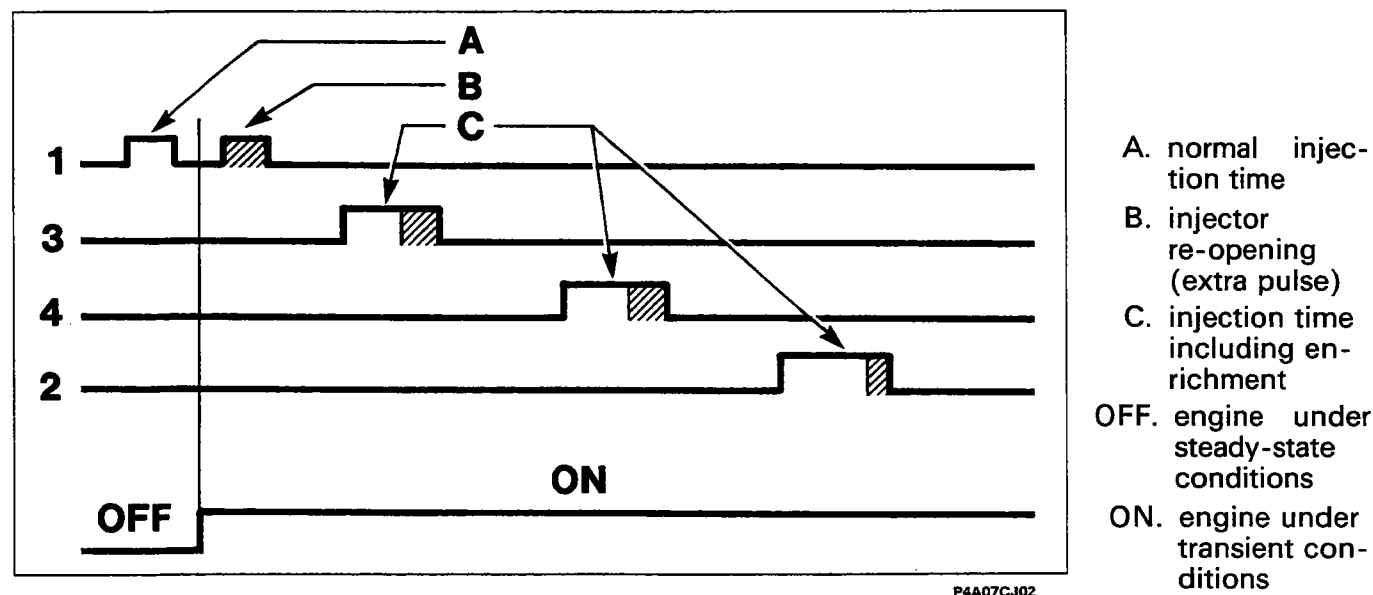
Acceleration

During this stage, the ECU increases the amount of fuel required by the engine (to achieve maximum torque) on the basis of signals from the following sensors:

- throttle potentiometer;
- absolute pressure sensor;
- rpm and TDC sensor.

The base pulse constant is multiplied by a factor according to coolant temperature and accelerator throttle opening speed.

If an abrupt change in injection time is calculated when the injector is already closed, the ECU reopens the injector (extra pulse), in order to make the concentration up to the required level as quickly as possible. Subsequent injections are automatically increased as described previously.



10.

Protection against excess rpm

When engine rpm exceeds an upper threshold of 6900 rpm imposed by the manufacturer, engine operating conditions are critical.

When the ECU recognises that this threshold rpm level has been exceeded, it reduces injector control time.

When rpm drops to non-critical levels, control is restored.

Electric fuel pump drive

The fuel pump is governed by the ECU through a dual relay.
The pump stops when:

- engine rpm drops below 50 rpm;
- starting does not occur with key in «Marcia» position (timed enablement).
- if the inertia switch is activated.

Injector control

Injectors are controlled in sequential, phased manner. During start-up, however, all injectors are initially all controlled in parallel (full-group).

Injector control timing varies according to engine speed and intake air pressure in order to improve cylinder filling because this makes for better fuel economy, good handling and lower emission levels.

FIAT CODE IGNITION LOCK FUNCTION MANAGEMENT

The system features an anti-theft function. This is implemented through a special FIAT CODE control unit able to dialogue with the engine control unit, and an electronic key with a specific sender unit designed for sending an identification code.

Once the key has been turned to STOP, the FIAT CODE system de-activates the engine control unit completely.

When the key is turned to MAR, the following operations take place in sequence:

- 1 - the engine control unit (whose memory contains a secret code) sends the FIAT CODE a request demanding that a secret code be sent to de-activate the function lock;
- 2 - the FIAT CODE control unit responds by sending the secret code only after receiving a recognition code sent by the ignition key;
- 3 - recognition of the secret code allows the engine control unit lock to be de-activated and normal operation to proceed.

NOTE *When the FIAT CODE anti-theft system is present, it is extremely inadvisable to test the vehicle using another engine control unit. In this case, the FIAT CODE control unit would transfer the recognition code (unknown) to the test control unit, which would thus be rendered completely unserviceable on other vehicles.*

IGNITION MANAGEMENT

The ignition circuit is static inductive discharge type, i.e. a high tension distributor with power modules located inside the injection-ignition control unit.

The system comprises two high tension twin outlet coils combined in a single container and connected directly to the spark plugs.

The primary winding of each coil is connected to the power relay (i.e. supplied by battery voltage) and pins of the ECU for connection to earth.

Once the start-up stage is over, the I.A.W. - 1AF -13 ECU implements a base pulse constant taken from a specific map in accordance with the following input parameters:

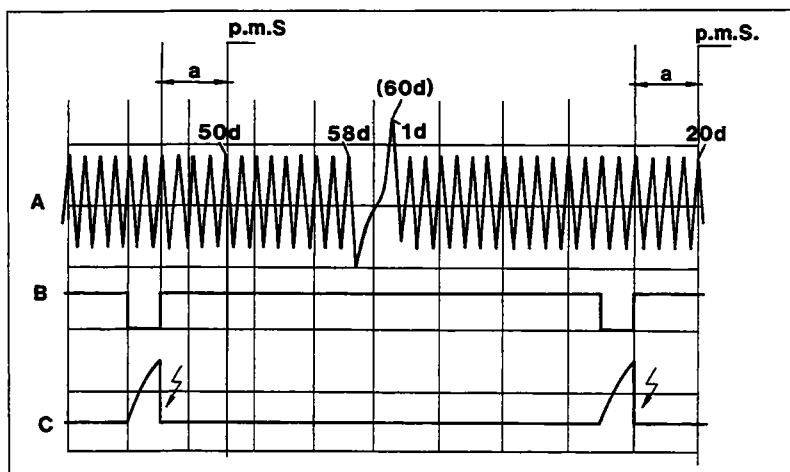
- engine rotating speed (rpm),
- absolute pressure reading (mmhg) obtained in intake manifold.

This advance setting is corrected according to temperature.

The advance angle is also subject to correction under the following conditions:

- during start-up;
- during transitory stages of acceleration and over-run.
- during cut-off.
- when rpm is excessive.

For the ignition system to work efficiently, the ECU must recognise signal configuration (3).



P4A09CJ01

- A. Rpm sensor signal
- B. Power control
- C. Current running through coil primary winding
- a. Ignition advance with reference to cylinder TDC

The gap or change in signal generated by the lack of two teeth on the phonic wheel, more specifically between the 58th and 1st tooth (known also as the synchronism tooth) which occurs each time the crankshaft pulley turns is a reference signal which allows the ECU recognition 114° in advance of TDC of piston pair 1-4 in correspondence to falling front of 20th tooth.

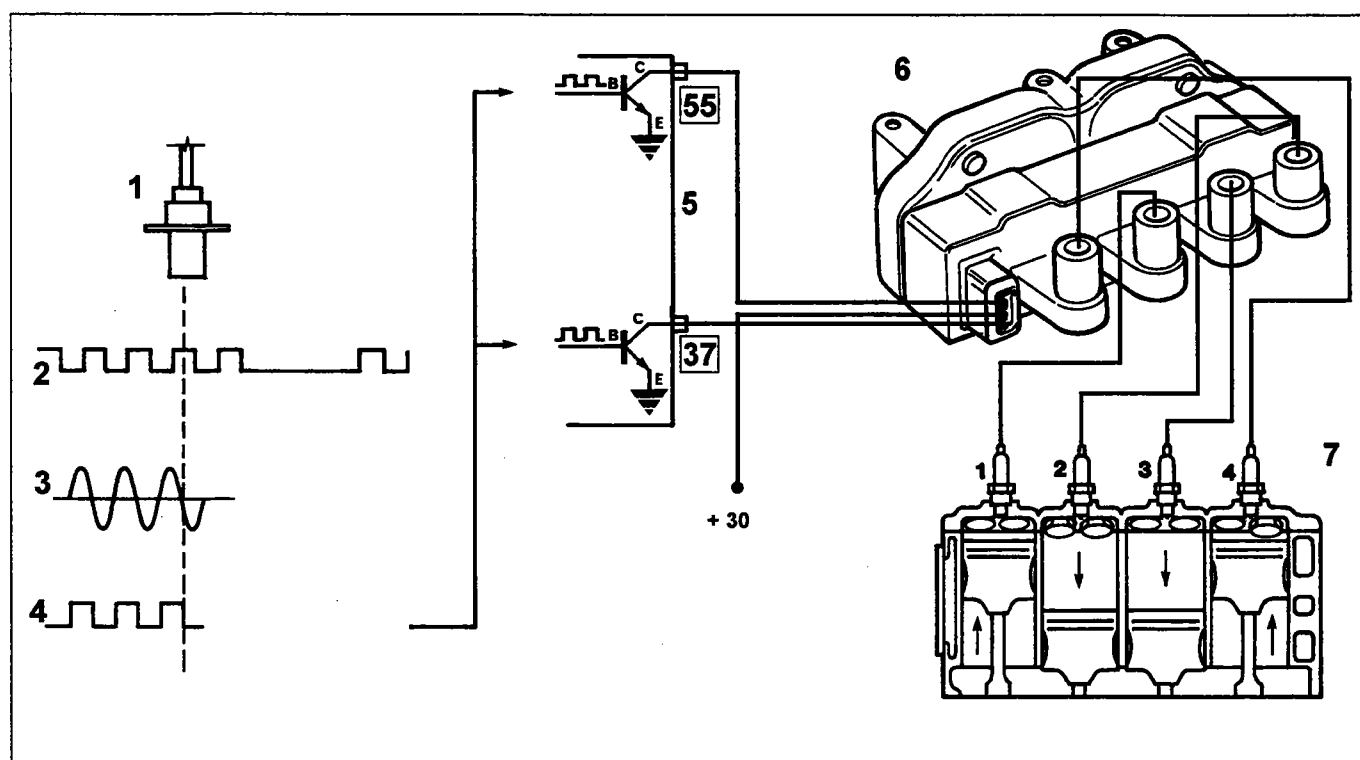
Once the ECU (see following page) has received the correct T.D.C. signal configuration, it establishes the point at which conduction (supply) to primary circuits of coils (6) begins and makes internal power module (5) conductive.

10.

The rising side of signal (graph B in figure on previous page) therefore represents a moment within which alternative primary winding conduction could take place. This point can be established only by the control unit power module. The conduction time the H.T. coil needs in order to store sufficient energy is also defined by DWELL management strategies. This depends on the time taken by the current to reach about 6A in the coil primary winding and also on the calculation algorithm run by the microprocessor which uses factors saved in a special memory, obviously based on engine rpm

With reference to the figure on the previous page, the falling side of the signal, (B) conduction end point (or current drop to zero), is a categorical order to cut-off the current flowing in the primary winding and represents the ignition advance point (a) processed by the computer (advance - (a) - varies according to rpm).

The control unit (ECU) then controls spark advance in the different cylinders in relation to top dead centre and conduction time necessary for the coil to store energy by controlling the two power stages (corresponding to ECU pins 55 and 37). These in turn permit current to flow through primary windings of coils (6) for long enough to ensure the specified 6A current rating.



P4A10CJ01

Ignition operating diagram

1. RPM and TDC sensor.
2. Phonic wheel.
3. Signal pattern taken from phonic wheel (60-2) teeth.
TDCs correspond to teeth 20 and 50.
4. Succession of rectangular square wave signals of constant amplitude
5. Ignition power module (inside control unit).
6. Ignition coils.
7. Spark plugs

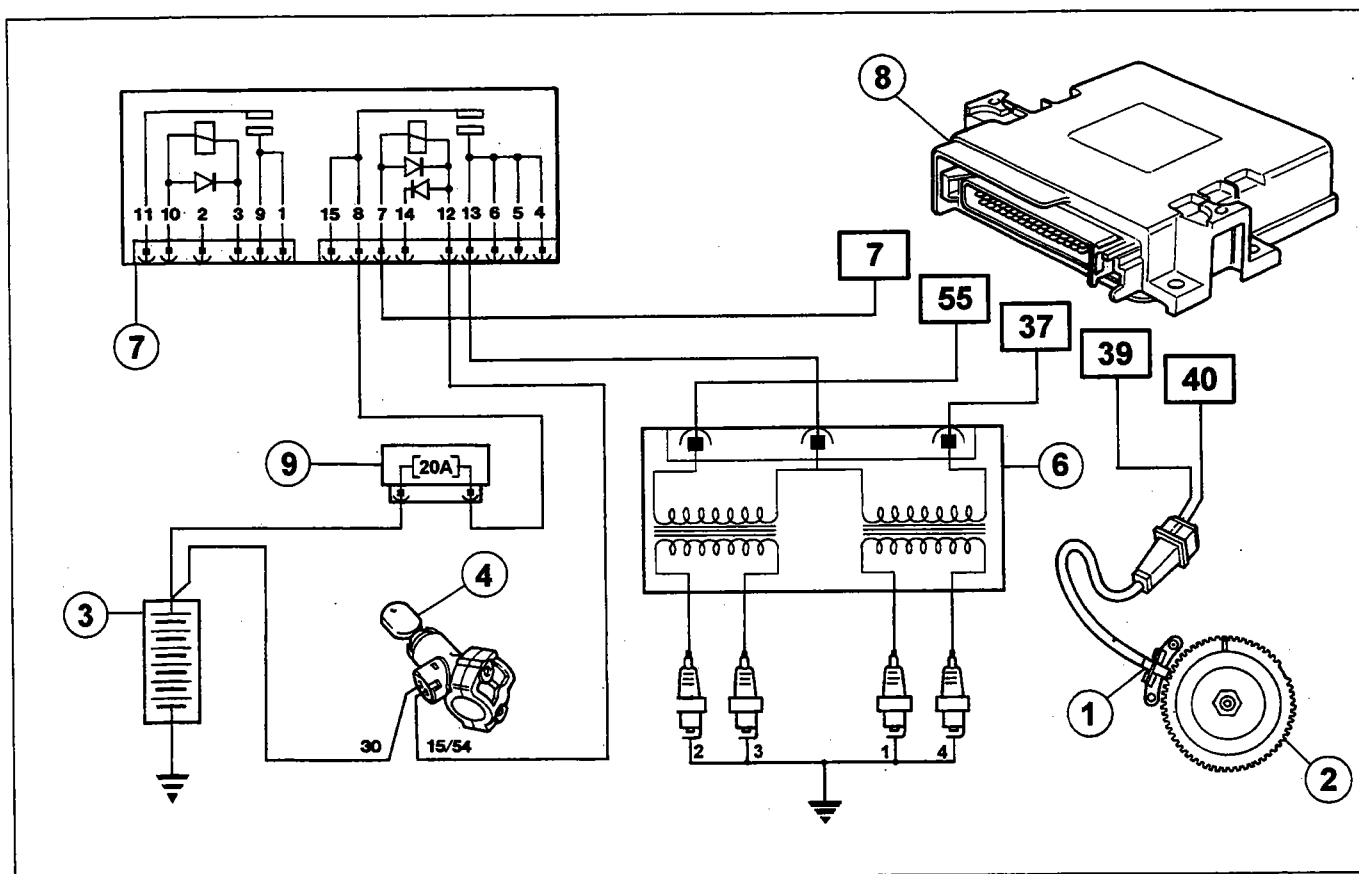
NOTE The numbers in boxes indicate the corresponding control unit pins

At the moment when the ECU de-activates one of the two power stages, current flow is cut off. This generates a voltage by induction (up to 30kV without loads) in the secondary winding.

When the voltage required for triggering an arc between the spark plug electrodes is examined, we note that voltage is high in the cylinder undergoing compression (about 10kV) while it is reduced (about 5kV) in the cylinder undergoing exhaust.

High tension distribution is static, i.e. takes place without a rotary brush and cap. This system effectively does away with a distributor. This gives the system a considerable advantage because it is known that brush and cap insulation properties play an important role. Any loss of insulation to earth may impair ignition: particularly during winter or periods of heavy rain.

The spark plugs of cylinders 1-4 and 2-3 are connected directly (in pairs) by means of high tension leads to coil secondary winding terminals and may be considered to be connected in series, because the cylinder head joins them all. This solution is also known as a "lost spark" system because the energy built up by the coil discharges almost exclusively on the electrodes of the spark plug located in the cylinder under compression to allow mixture ignition. The other spark is obviously unused because the cylinder does not contain mixture for ignition - solely exhaust gas ready for venting.



P4A11CJ01

- | | |
|--|-----------------------------------|
| 1. Rpm and TDC sensor | 6. Ignition coils |
| 2. Crankshaft pulley with phonic wheel | 7. Dual relay |
| 3. Battery | 8. Injection-ignition ECU |
| 4. Ignition switch | 9. Injection-ignition system fuse |
| 5. Spark plugs | |

10.

ENGINE IDLE CONTROL

The main aim of this strategy is to maintain engine speed at around the mapped setting (warm engine: 850 rpm): the position assumed by the actuator is dependent on engine conditions/rpm and vehicle speed.

Start-up stage

When the key is inserted, the actuator takes up a position dependent on engine temperature and battery voltage (open-loop position).

Warming-up stage

The rpm is mainly corrected on the basis of coolant temperature.

With the engine warm, idle management is dependent upon the signal from the rpm sensor. The ECU introduces sustained idle when external loads are activated.

Deceleration stage

When the accelerator is released when the car is not idling, the ECU governs the actuator (step motor) by means of special delivery curve (dash-pot curve), i.e. delays the return of the plunger to its housing to bring about a reduction in engine braking effect.

FUEL VAPOUR RECIRCULATION MANAGEMENT

The strategy controls vapour cut-off solenoid position as follows:

- during start-up, the solenoid remains closed to prevent fuel vapours enriching the mixture excessively. This condition persists until coolant temperature reaches 65° C;
- with the engine warm, the ECU sends the solenoid a square wave signal (duty-cycle control) which modulates opening.

In this way, the ECU controls the amount of fuel vapour directed to the intake, thus avoiding substantial changes in mixture concentration.

Under the following operation conditions:

- throttle valve closed
- speed less than 1500 rpm
- intake manifold pressure less than a lower threshold calculated by the ECU in accordance with rpm level

solenoid control is inhibited with the same closure position maintained. This makes engine operation more efficient.

TEST MANAGEMENT

Full injection-ignition system electronic testing can be achieved by connecting a FIAT/LANCIA TESTER to the test socket.

The system is also equipped with a self-diagnostic function which recognises, memorises and indicates any faults.

If sensors or actuators are found to be faulty, signal reconstruction strategies are immediately activated (recovery) so that the engine is able to operate at an acceptable level without affecting function. The car can then be driven to a service point for the necessary repairs.

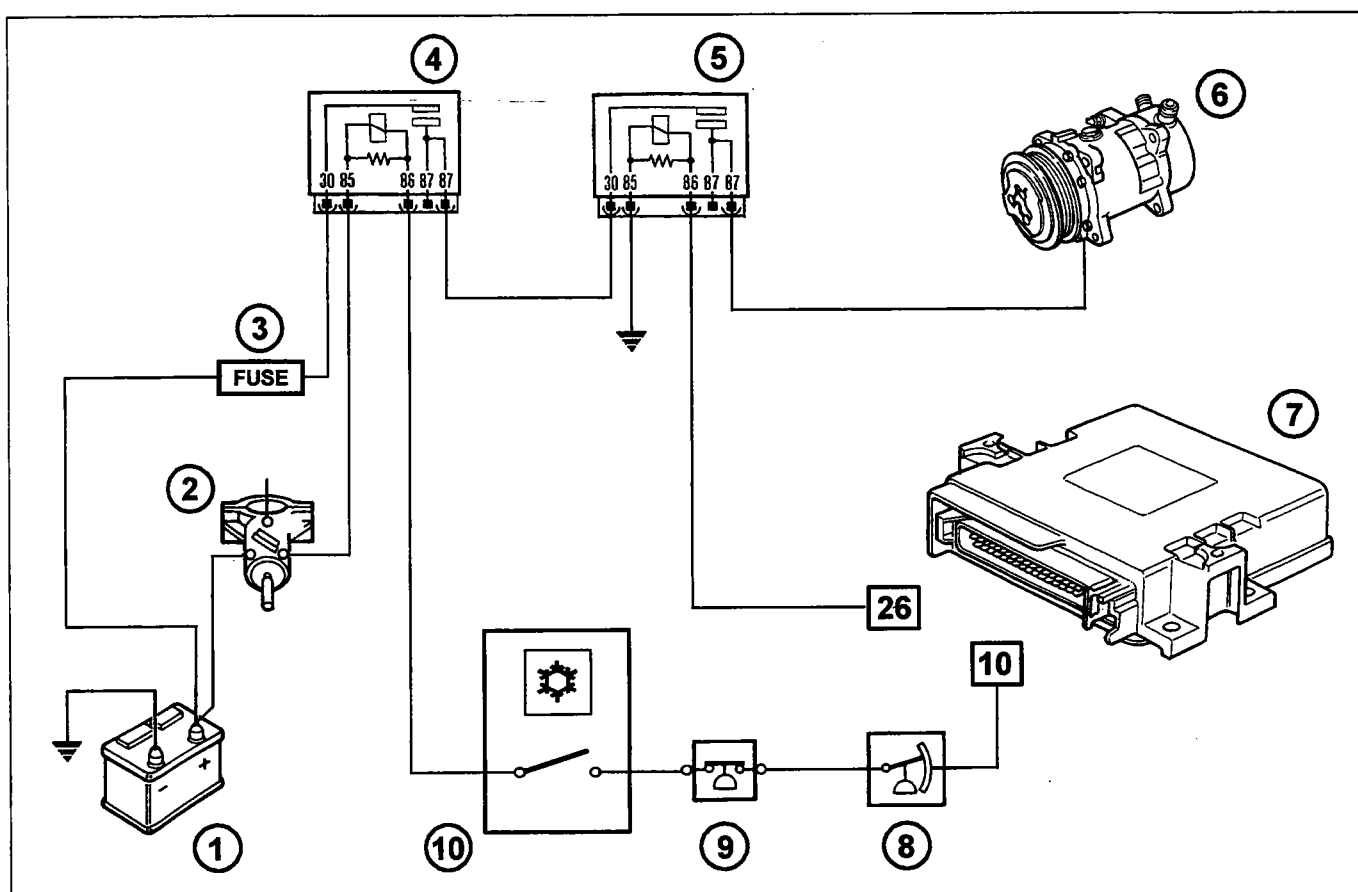
HEATING/VENTILATION SYSTEM MANAGEMENT

Rpm decreases when the air conditioner is turned on because the system compressor takes up power.

This involves a drop in rpm, which is particularly evident during idling.

To overcome this drawback, when the ECU is informed of air conditioner activation (pin 10) ahead of compressor activation (pin 26), it increases the speed by adjusting the air flow by means of the step motor.

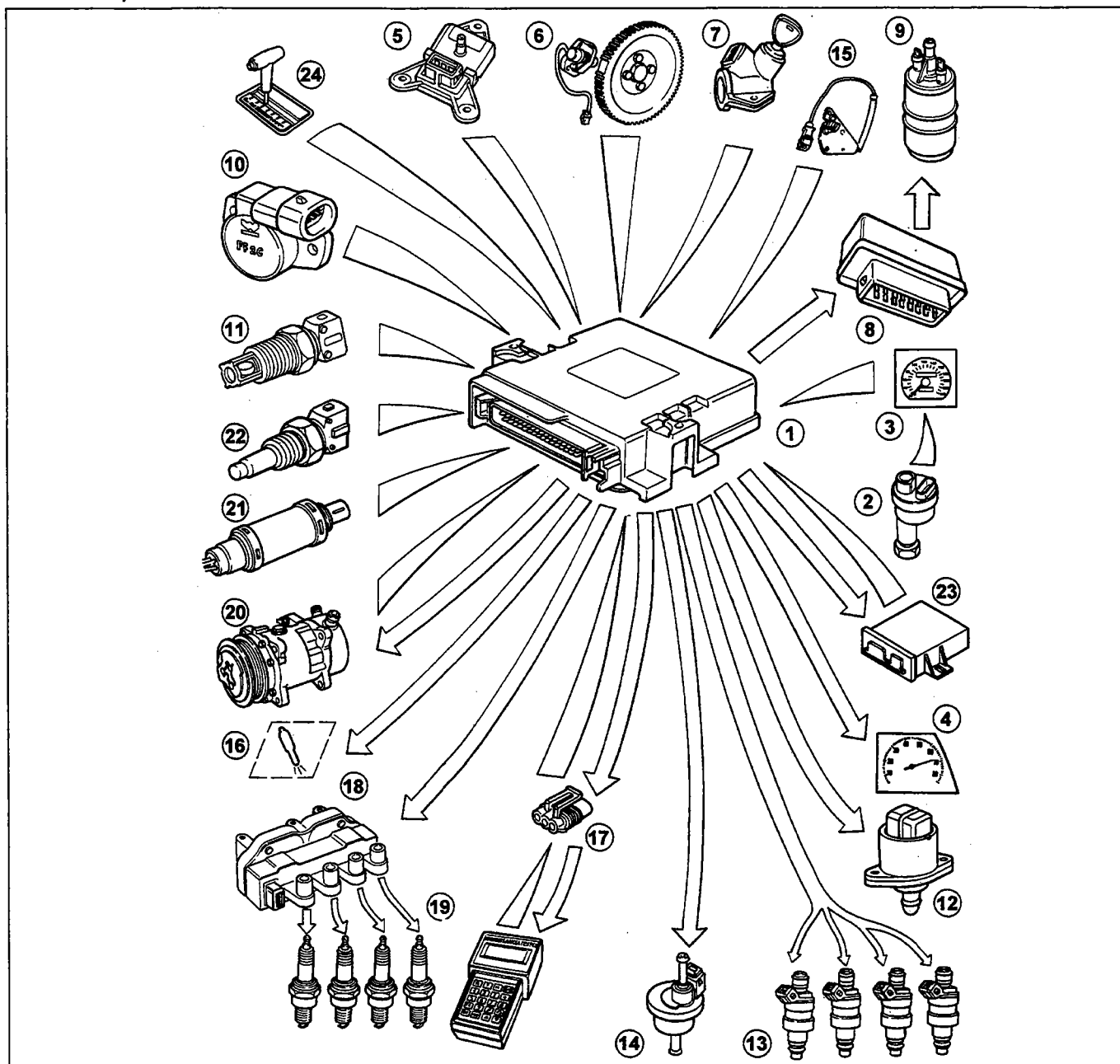
When a power requirement is identified (throttle position higher than a given threshold) the ECU inhibits air conditioner operation for a memorized time interval.



P4A13CJ01

- | | |
|---|---|
| 1. Battery | 6. Compressor |
| 2. Ignition switch | 7. Electronic injection-ignition control unit |
| 3. Fuse | 8. Three stage pressure switch |
| 4. Air conditioning system enablement relay | 9. Defrosting sensor |
| 5. Compressor electromagnetic coupling supply relay | 10. Air conditioner activation switch |

DIAGRAM SHOWING INPUT/OUTPUT BETWEEN INJECTION-IGNITION SYSTEM ECU AND SENSORS/ACTUATORS

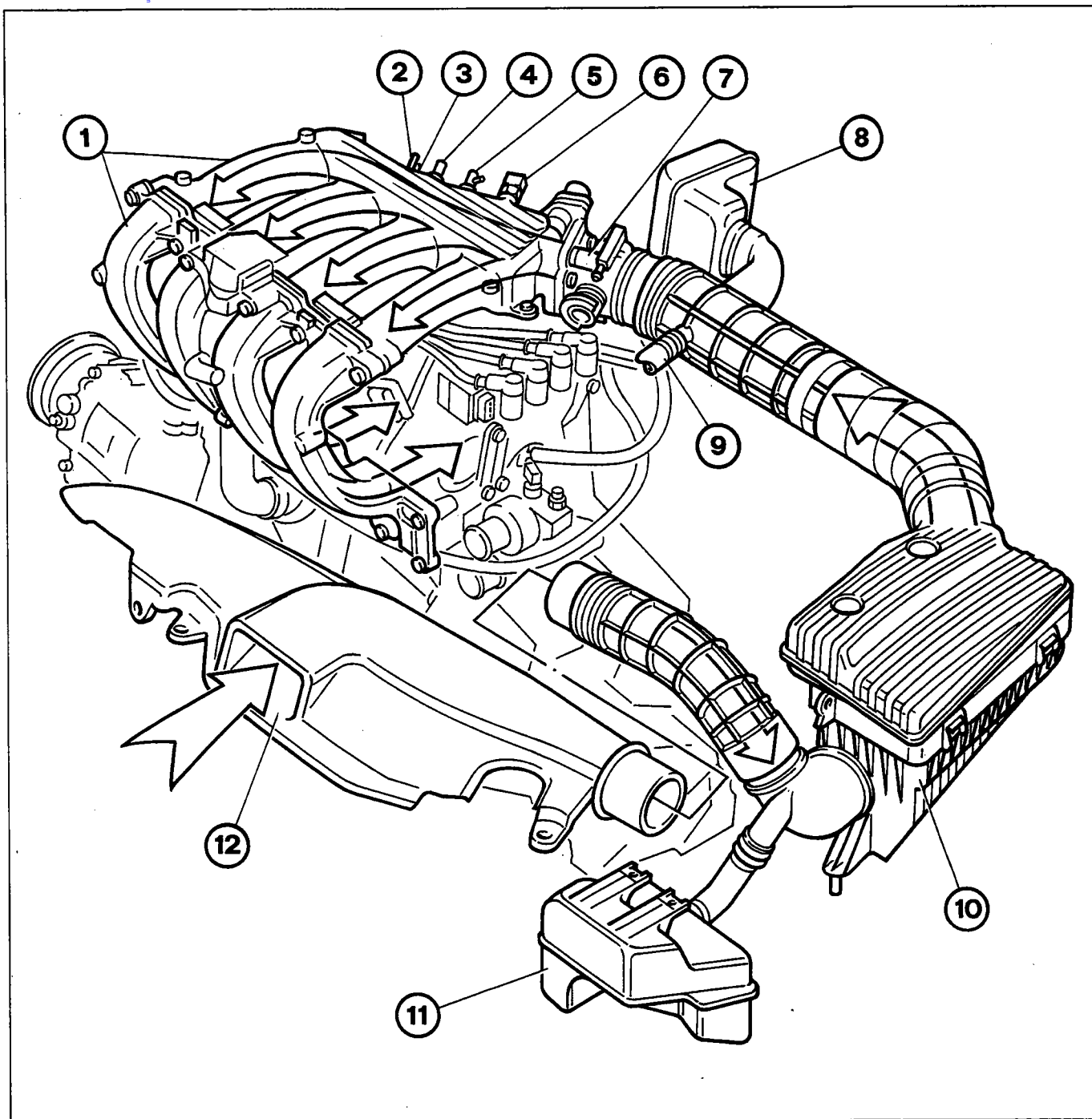


Key to components

- | | |
|--------------------------------|----------------------------------|
| 1. Electronic control unit | 14. Fuel vapour cut-off solenoid |
| 2. Speedometer sensor | 15. Timing sensor |
| 3. Speedometer/mileometer | 16. Injection warning light |
| 4. Rev counter | 17. Diagnostic socket |
| 5. Absolute pressure sensor | 18. Coils |
| 6. Rpm and TDC sensor | 19. Spark plugs |
| 7. Ignition switch | 20. Air conditioner compressor |
| 8. Dual relay | 21. Lambda probe |
| 9. Electric fuel pump | 22. Coolant temperature sensor |
| 10. Throttle position sensor | 23. FIAT CODE control unit |
| 11. Air temperature sensor | 24. Automatic transmission |
| 12. Engine idle speed actuator | |
| 13. Injectors | |

P4A14CJ01

AIR INTAKE CIRCUIT MANAGEMENT

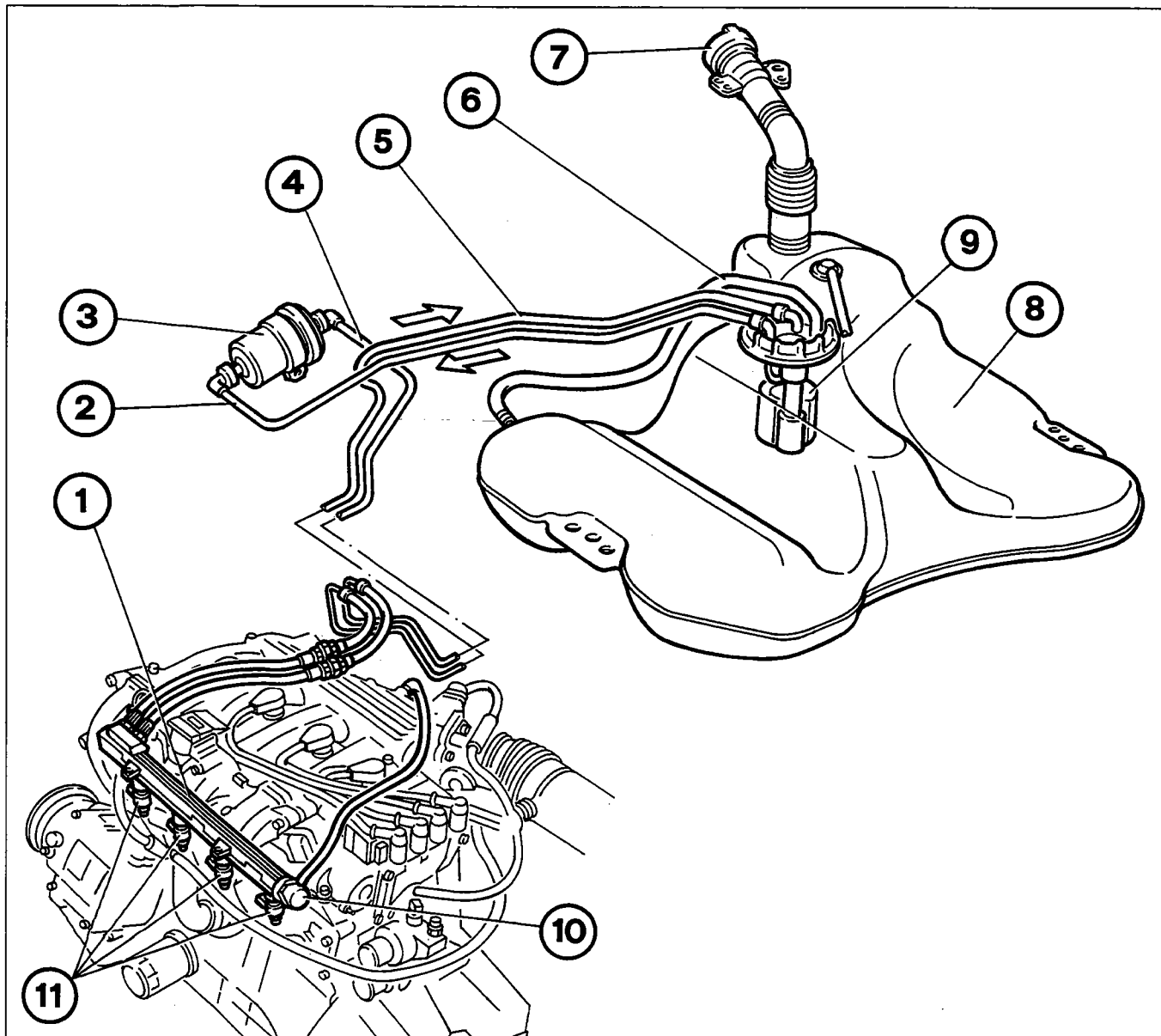


P4A15CJ01

- | | |
|--|------------------------------|
| 1. Inlet manifold | 7. Throttle case |
| 2. Evaporation control system socket | 8. Upper resonator |
| 3. Socket for absolute pressure sensor | 9. Gas uptake from crankcase |
| 4. Socket for servo brake | 10. Air cleaner |
| 5. Socket for fuel pressure regulator | 11. Lower resonator |
| 6. Air temperature sensor | 12. Inlet fitting |

10.

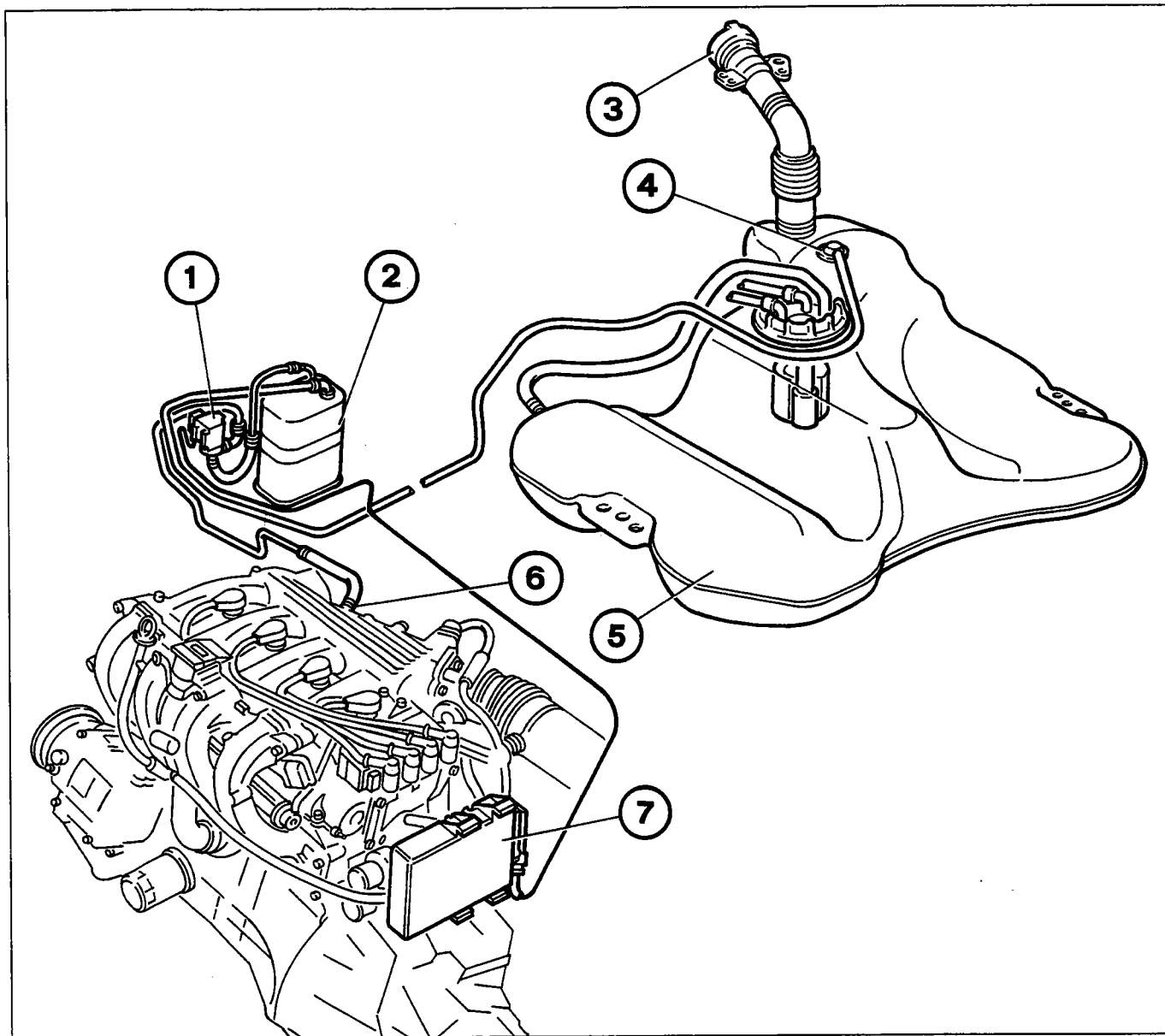
FUEL SUPPLY CIRCUIT DIAGRAM



P4A16CJ01

1. Fuel supply manifold
2. Delivery line from tank to filter
3. Fuel filter
4. Delivery line from filter to injectors
5. Return line
6. Vent pipe
7. Union with vent and pressure relief valve
8. Tank
9. Fuel pump
10. Pressure regulator
11. Injectors

NOTE Due to the specific shape of the tank, when fuel is added, an air lock may build up at the bottom which could prevent complete filling. Pipe (6) allows air to flow from the lower part so that the tank can be filled completely.

FUEL EVAPORATION CONTROL CIRCUIT DIAGRAM

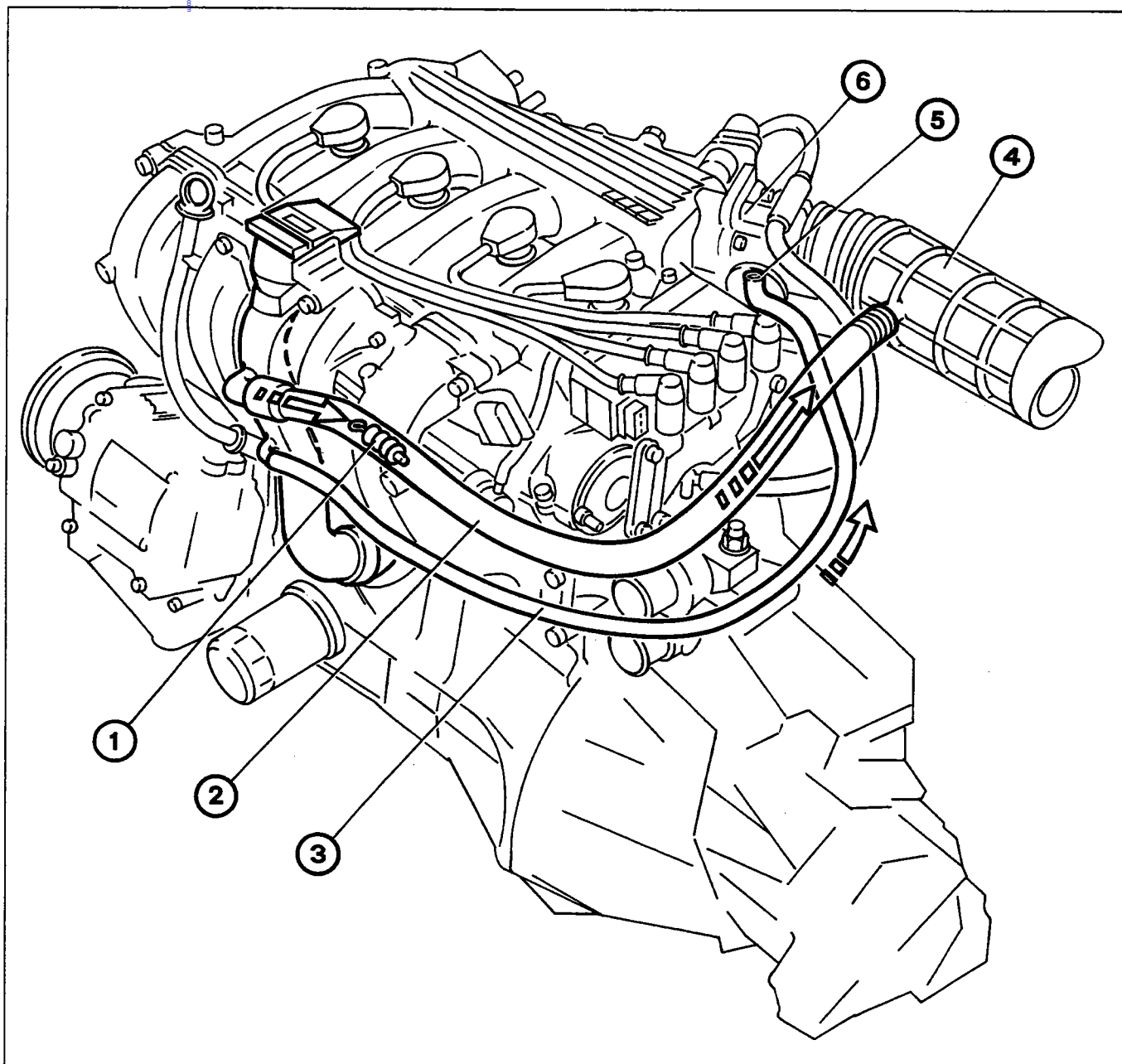
P4A17CJ01

The fuel evaporation system prevents fuel vapour, mainly comprising lighter hydrocarbon fractions formed in the tank, to escape into the atmosphere.

- | | |
|---------------------------------|--|
| 1. Fuel vapour cut-off valve | 5. Reservoir |
| 2. Active carbon trap filter | 6. Fuel vapour intake fitting in intake manifold |
| 3. Safety and ventilation valve | 7. Injection-ignition ECU |
| 4. Multifunction valve | |

10.

BLOW-BY GAS RECIRCULATION DIAGRAM



P4A18CJ01

The system controls emission, from the engine block, of vent gases made up of air-fuel mixtures, burnt gases which leak through piston rings and lubricant oil vapours by recirculating them to the intake.

With the accelerator throttle open, vent gases from the engine block reach the sleeve connecting the air cleaner-butterfly valve case (4) through pipe (2). This contains a flame trap (1) which prevents combustion caused by flame flashing back from the butterfly valve case (6).

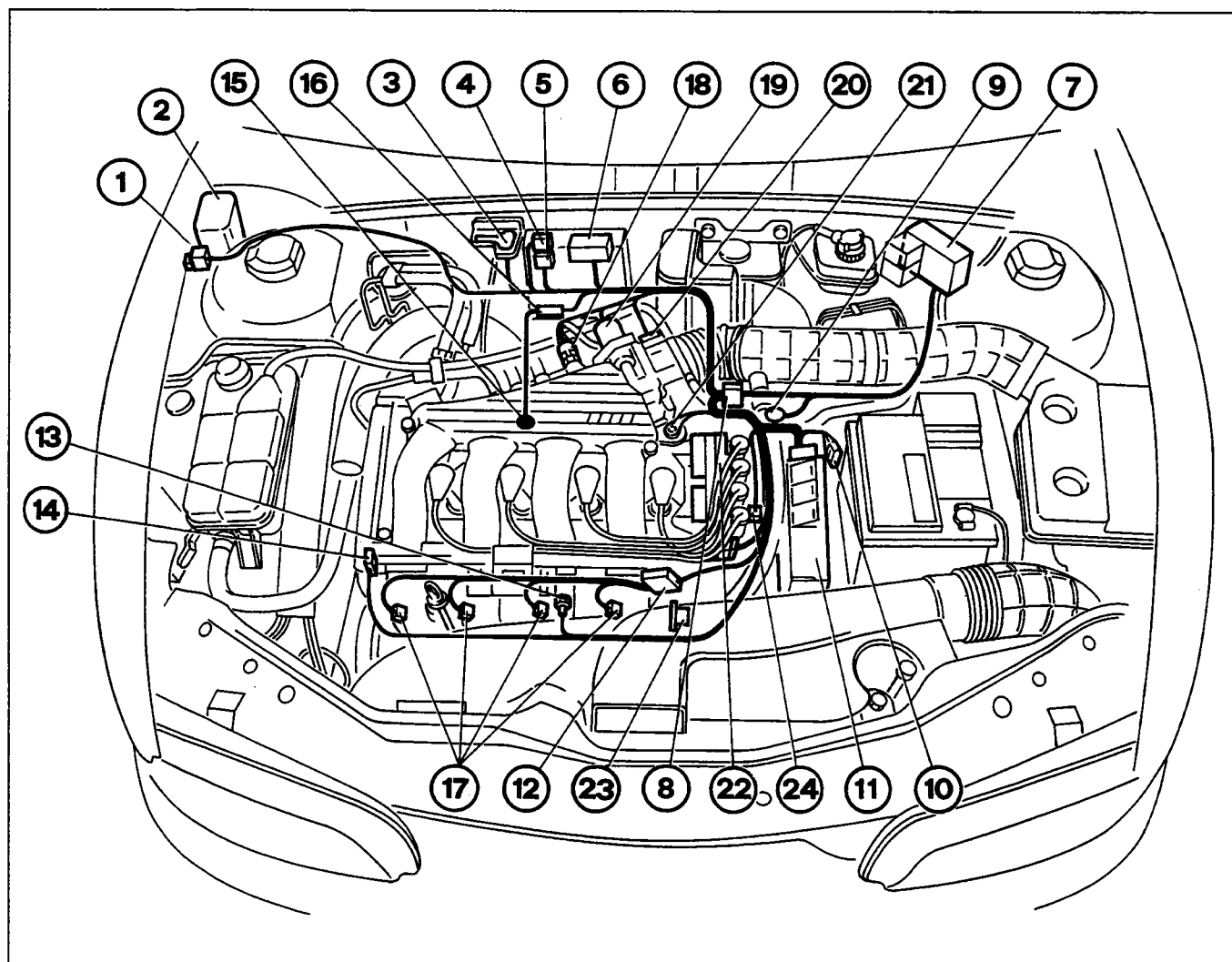
With the throttle closed (engine idling), the vacuum in the intake manifold takes up gas (in limited quantities) directly through the pipe (3) and calibrated hole (6).

Key to components in injection-ignition system wiring diagram

1. General 40A fuse for users beneath ignition switch
2. General 30A fuse for injection-ignition system
3. Ignition switch
4. 20A fuse for components supplied through dual relay (electric pump, lambda probe, injectors and fuel vapour cut-off solenoid)
5. 5A fuse for injection-ignition ECU
6. Dual relay
7. Lambda probe
8. Inertia switch
9. Electric fuel pump
10. Rev counter
11. Ignition coils
12. Spark plugs
13. Earth on body shell
14. Fuel vapour cut-off solenoid
15. Earth on engine
16. Injectors
17. System warning light
18. Automatic transmission ECU
19. FIAT CODE control unit
20. Speedometer signal
21. Air conditioner compressor
22. Three stage pressure switch
23. Engine idle speed actuator
24. Timing sensor
25. Throttle valve position sensor
26. Absolute pressure sensor
27. Coolant temperature sensor
28. Air temperature sensor
29. Rpm and TDC sensor
30. Diagnostic socket

10.

LOCATION OF INJECTION-IGNITION SYSTEM COMPONENTS IN ENGINE BAY



P4A22CJ01

Key to components

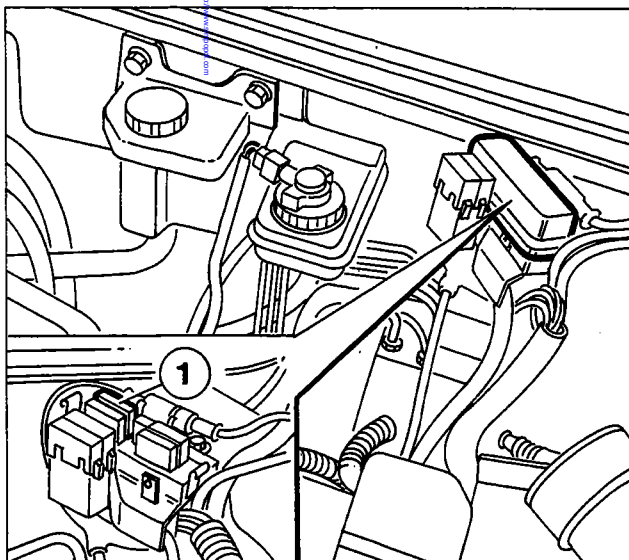
- | | |
|--|--------------------------------|
| 1. Fuel vapour cut-off solenoid | 11. Injection-ignition ECU |
| 2. Carbon filter | 12. Injector lead coupling |
| 3. Absolute pressure sensor | 13. Rpm and TDC sensor |
| 4. 5A fuse for injection-ignition ECU | 14. Timing sensor |
| 5. 20A fuse for components supplied through dual relay (electric pump, lambda probe, injectors and fuel vapour solenoid) | 15. Lambda probe |
| 6. Dual relay | 16. Lambda probe coupling |
| 7. General 30A system fuse | 17. Injectors |
| 8. Injection lead coupling with front lead | 18. Air temperature sensor |
| 9. Vehicle speed sensor | 19. Engine idle speed actuator |
| 10. Diagnostic socket | 20. Throttle position sensor |
| | 21. Earth |
| | 22. Ignition coils |
| | 23. Fuel pressure regulator |
| | 24. Coolant temperature sensor |

10.

INJECTION SYSTEM FUSES AND RELAYS

General system protection fuse

The general fuse (EFI-30A) protecting the injection-ignition system (1) is housed inside a container; to gain access to the fuse, undo side clips and lift lid.



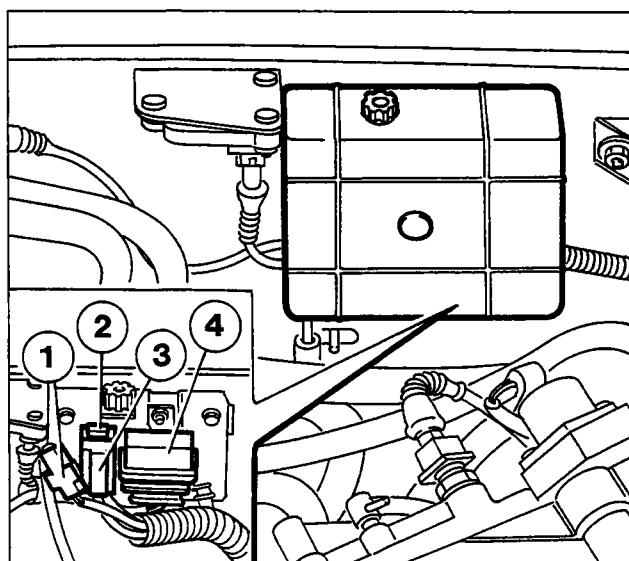
P4A23CJ01

Fuses and relays

The following components are housed on a bracket located against the rear wall of the engine bay:

1. Lambda probe lead junction
2. 5A ECU fuse
3. 20A fuse for components supplied through dual relay (electric pump, lambda probe, injectors and fuel vapour cut-off solenoid)
4. Dual relay

Unscrew ring nut and remove cover to gain access to the above components.

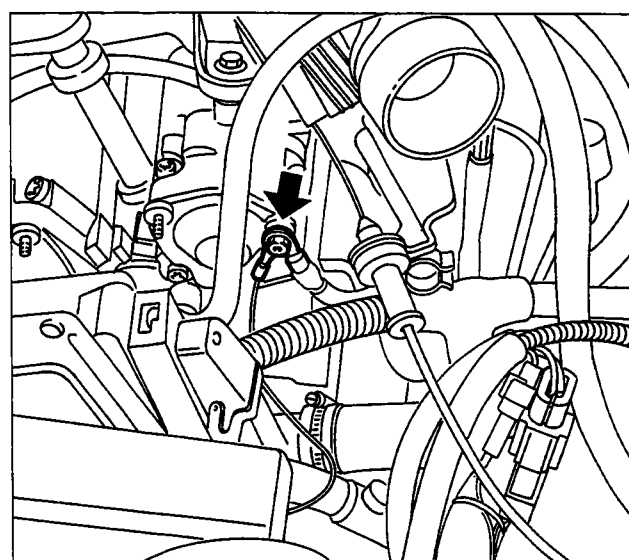


P4A23CJ02

EARTH POINTS

The earth of the injection-ignition system and earth of the electronic control unit are both fixed to the left hand side of the engine, close to the exhaust valves cover.

NOTE The air cleaner-butterfly valve case connecting sleeve and ignition coils are not shown in the figure alongside in order to illustrate the position of the earth points more clearly. No components require removal in order to gain access to the earths.



P4A23CJ03

10.

COMPONENTS OF INJECTION-IGNITION SYSTEM

The injection-ignition system consists mainly of wiring, an electronic control unit (ECU) and the following sensors and actuators:

Sensors

- Rpm and TDC sensor
- Timing sensor
- Throttle position sensor
- Coolant temperature sensor
- Intake air temperature sensor
- Absolute pressure sensor
- Vehicle speed sensor
- Lambda probe

Actuators

- Engine idle speed actuator
- Electric fuel pump
- Fuel vapour cut-off valve
- Injectors
- Ignition coils
- Dual relay

INJECTION-IGNITION SYSTEM WIRING

The various system components are connected by a single wiring system fitted with connectors of various types. These are grouped in special ducts fitted to the engine (prewiring).

INJECTION-IGNITION ECU

The I.A.W. -1AF.13 (I.A.W. -1AF.23 for vehicles with automatic transmission) injection-ignition system ECU adopted is specific to this version.

It consists of hybrid thick film circuits connected to the electrical system by a 55 pin multiple connector.

The ECU's task is to process signals from the various sensors through the application of software algorithms and control the actuators in order to achieve optimal engine performance.

Essential features of the electronic control unit are as follows:

a. Data acquisition and coding section

This consists of a set of electronic components designed to receive data in the form of analogue electrical signals. Inside, the signals are converted into digital signals, processed and stored.

b. Microprocessor

This electronic component is responsible for computing and managing acquired data. It is thus a true computer and its main tasks include: consulting memories, comparing data input with sample data, managing actuator control circuits.

c. ROM memory (Read Only Memory-memoria di sola lettura)

This contains all programs necessary for microprocessor operation. Because the unit is programmed permanently prior to installation, data may be read but not modified.

The ROM memory is conservative; commands are saved even when the battery leads are disconnected.

d. RAM memory (Random Access Memory)

The RAM memory is a transitional memory where data can be read and saved.

This memory is actually used to save input data temporarily so that they are available for processing and also to memorize signals for coding operating anomalies that may occur within sensors, actuators or ECU functions.

The RAM memory is divided into sections: the first volatile part, for data memorization, is enabled with ignition key in MARCIA position and deleted in STOP position.

The second non-volatile part, (RAM STAND-BY) saves engine parameters and adapts them in time. In other words, the ECU uses the Lambda probe signal to modify and store an injection time correction factor that influences mixture concentration; this ECU is therefore defined SELF-ADAPTIVE.

These values require a continual supply from the battery in order to be maintained (memory in STAND-BY). If the battery, dual relay or terminals are disconnected, the parameters are zeroed. Normal vehicle use resets the adaptation process and new parameters are memorized.

The presence of a non volatile memory allows data relating to system anomalies to be saved even if the battery is disconnected and anomalies to be indicated even once they have been absent for 5 consecutive start-ups (one start-up +20' engine operation).

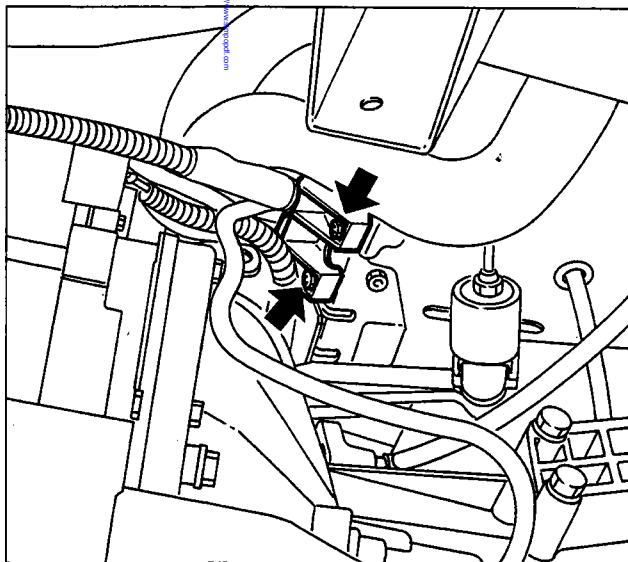
e. EEPROM memory (Electrical Erasable Programmable Read Only Memory)

This is a special type of memory that can be deleted electrically and reprogrammed again and again. One of its functions is to receive from the RAM STAND-BY recordings of anomalies that have arisen during engine operation and send these through the diagnostic socket to a Fiat-Lancia Tester. A Fiat-Lancia Tester must be used in active diagnosis in order to delete the anomalies.

f. Drivers (final power stages for actuator control)

These circuits are driven directly by the microprocessor and the relevant integrated circuit. They are used to supply actuators such as: injectors, step motor for idle control, carbon filter flushing valve, fuel pump relay, ignition coil main relay.

10.

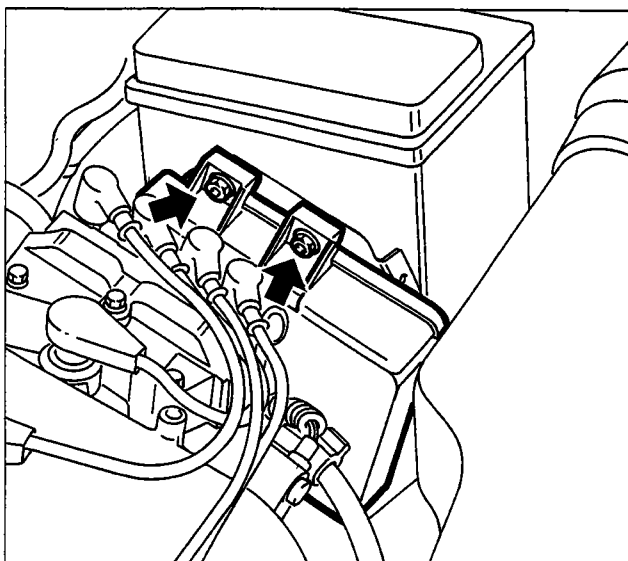


P4A26CJ01



Removing-refitting

Position the vehicle on a lift and unscrew the lower retaining bolts.



P4A26CJ02



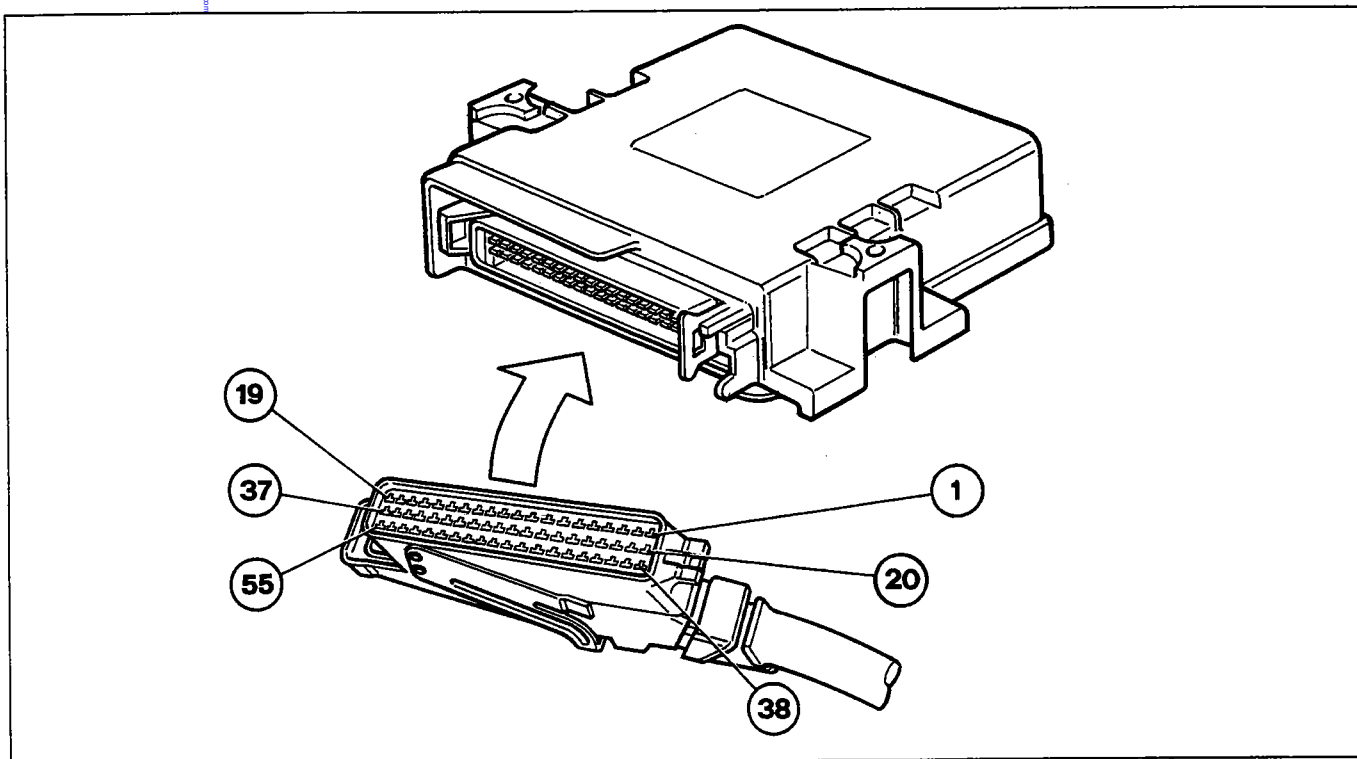
Disconnect electrical connection and the earth connection. Unscrew upper retaining bolts and remove the control unit.



It is absolutely prohibited to exchange injection control units between different vehicles in order to check their efficiency.



Before replacing an ECU as a result of testing, ensure it is really faulty because when a new ECU is activated, the secret Fiat CODE system code is memorised and this makes the unit completely unusable on other vehicles.

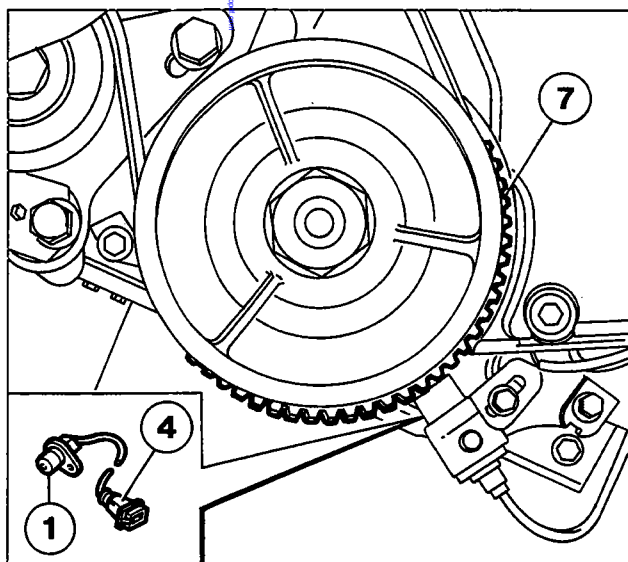


P4A27CJ01

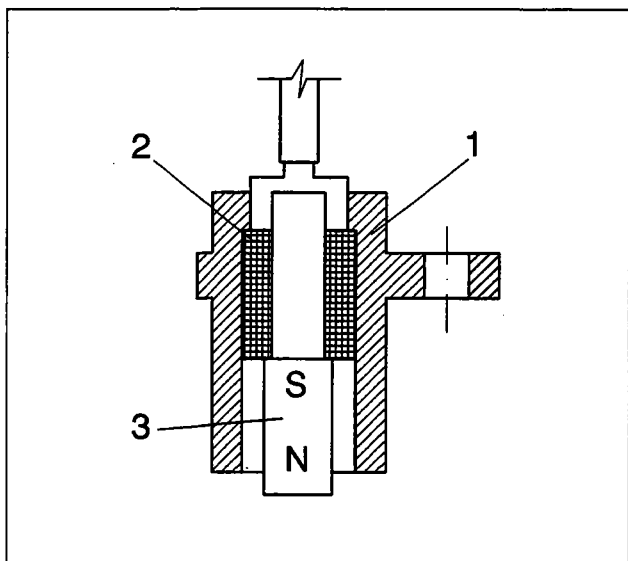
Identifying connections on control unit (pin-out)

- | | |
|--|--|
| 1. Cylinder no. 3 injector | 30. Rpm and TDC sensor earth |
| 2. Cylinder no. 1 injector | 31. Diagnostic socket (K line) |
| 3. Engine idle speed actuator (stage 2) | 32. Automatic transmission ECU (transmission ratio change) |
| 4. Lambda probe earth | 33. N. C. |
| 5. Automatic transmission ECU (coolant temperature signal) | 34. Absolute pressure sensor power supply |
| 6. N. C. | 35. Power supply (+30) |
| 7. Dual relay (activate sect. B) | 36. Earth on engine |
| 8. N. C. | 37. Ignition coil (cylinders 1-4) |
| 9. IE system failure warning light. | 38. Cylinder no. 4 injector |
| 10. 3-stage pressure switch | 39. Cylinder no. 2 injector |
| 11. Timing sensor signal | 40. Engine idle speed actuator (stage 1) |
| 12. Diagnostic socket (line L) | 41. N. C. |
| 13. Power supply (+15/54) | 42. Rev counter output |
| 14. Absolute pressure sensor signal | 43. N. C. |
| 15. N. C. | 44. Automatic transmission ECU (throttle valve angle) |
| 16. Throttle valve position and timing sensor power supply | 45. N. C. |
| 17. Electronic earth | 46. N. C. |
| 18. N. C. | 47. Coolant temperature sensor signal |
| 19. N. C. | 48. FIAT CODE control unit |
| 20. Engine idle speed actuator (stage 2) | 49. Rpm and TDC sensor signal |
| 21. Engine idle speed actuator (stage 2) | 50. Automatic transmission ECU (neutral/-drive signal) |
| 22. Lambda probe signal | 51. N. C. |
| 23. Throttle valve position sensor signal | 52. Dual relay (activate sect. A) |
| 24. Fuel vapour solenoid | 53. Throttle valve position and timing sensor earth |
| 25. N. C. | 54. Earth on engine |
| 26. Air conditioner compressor | 55. Ignition coils (cylinders 2-3) |
| 27. N. C. | |
| 28. Speedometer signal | |
| 29. Intake air temperature sensor | |

10.



P4A28CJ01



P4A28CJ02

RPM AND TDC SENSOR (Jeager CVM01)

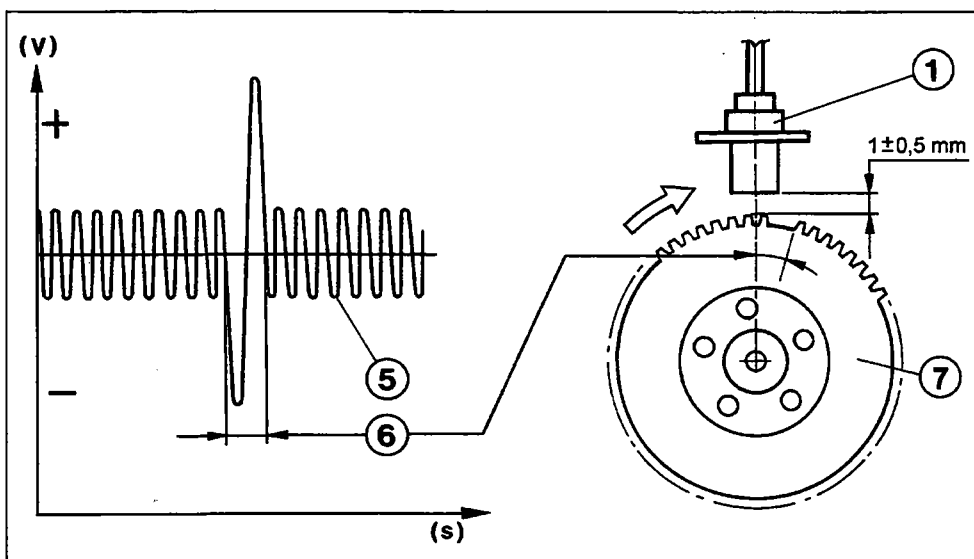
RPM and crankshaft angular position reference (TDC indicator) sensor (1) is secured to the engine block facing phonic wheel (7) located on the crankshaft pulley.

Principle of operation

This consists of a tubular case containing a permanent magnet (3) and an electrical coil (2). The magnetic flux set up by magnet (3) undergoes fluctuations due to changes in the gap as the teeth pass in front of the phonic wheel.

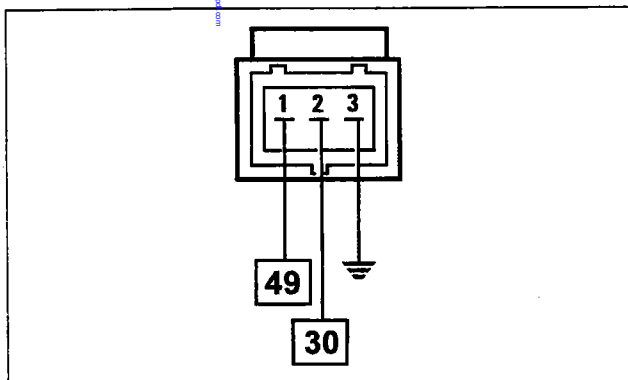
These magnetic flux changes set up an electromotive force in coil (2). An alternating positive (teeth facing sensor) and negative (gap facing sensor) voltage is set up at coil terminals. The sensor output voltage peak value depends on the gap between sensor and phonic wheel teeth if all other factors are equal.

Two of the sixty teeth on the phonic wheel are removed to create a reference gap. Gear pitch therefore corresponds to an angle of 6° (360° divided by 60 teeth). The synchronism point is recognised at the end of the first tooth following the space left by the two missing teeth. When this gap passes beneath the sensor, engine piston pair 1-4 is located at 114° before TDC.



P4A28CJ03

1. Sensor
2. Winding
3. Permanent magnet
4. Sensor connector
5. Output signal
6. Signal corresponding to the two missing teeth
7. Crankshaft pulley with phonic wheel

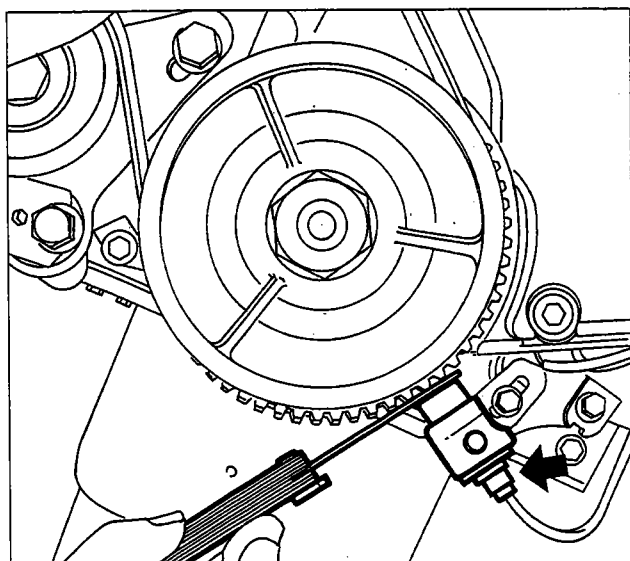


P4A29CJ01

Wiring connector

The sensor is connected to the ECU (pin 30 and 49) by means of twisted wires covered by a shielded, interference-proof sheath connected to earth.

NOTE The numbers in boxes indicate the corresponding control unit pins.



P4A29CJ02



Removing-refitting

Disconnect electrical connection.



Unscrew the screw indicated and remove the sensor.

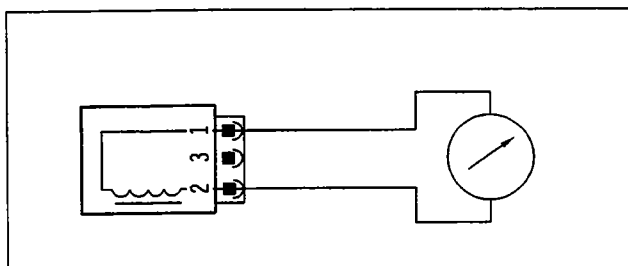


Checking gap

Check gap between sensor and phonic wheel teeth.

Gap: 0.5 - 1.5 mm

NOTE Whenever repairs to the rpm and TDC sensor mount are necessary (e.g. gap not as specified, sensor not aligned etc.), the sensor must be positioned and aligned with the mount as described in the engine service manual (publication no. 504.589/20).



P4A29CJ03

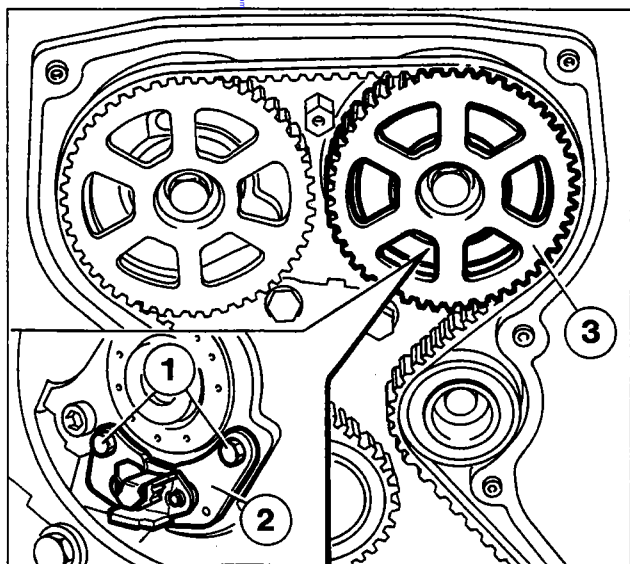


Checking resistance

Sensor resistance may be measured by disconnecting the connector and connecting an ohmmeter to the sensor terminals.

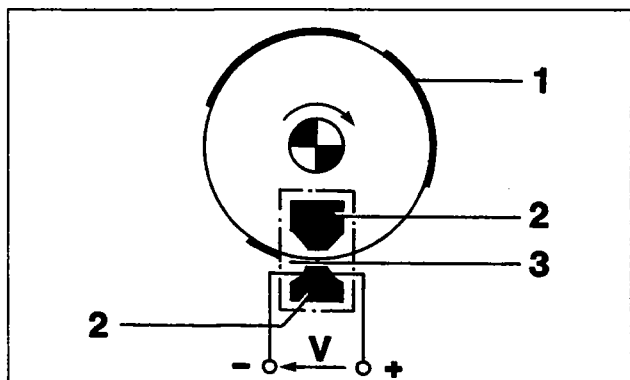
Resistance 575 - 750 ohm at 20 °C

10.



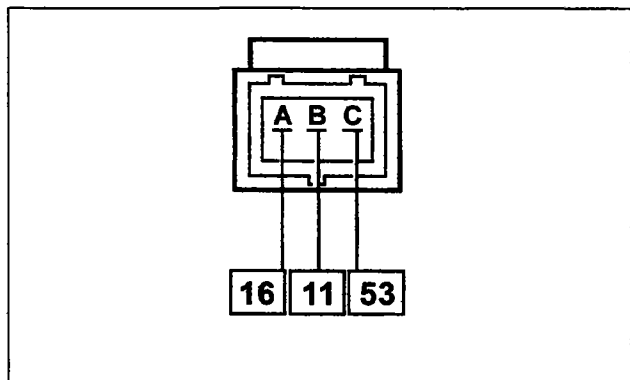
P4A30CJ01

NOTE Sensor angular position may not be adjusted in any way.



P4A30CJ02

1. Deflector
2. Magnetic material
3. Gap



P4A30CJ03

Wiring connector

The numbers in boxes indicate the corresponding control unit pins

TIMING SENSOR (SFA 200)

The I.A.W.-1AF.13 system adopts a phased, sequential injection system. In other words, fuel is injected into each cylinder in sequence during the intake phase.

To achieve this, the ECU uses a timing signal together with the rpm and TDC signal to determine the point of injection.

This signal is generated by a Hall sensor fitted on the exhaust camshaft pulley.

Principle of operation

A semi-conducting layer with current flowing through it is placed in a normal magnetic field (force lines at right angles to current direction). A potential difference known as a HALL voltage is set up at its terminals.

If current intensity remains constant, the voltage generated depends solely on the intensity of the magnetic field; magnetic field intensity need therefore only vary periodically to set up a modulated electrical signal with frequency proportional to the speed with which the magnetic field changes.

To achieve this change, the sensor is crossed by a metal ring (internal part of pulley) with an opening. The moving metal part of the ring covers the sensor and blocks the magnetic field to produce a low output signal. The sensor generates a high signal when aligned with the opening, i.e. with magnetic field present.

The alternation of signals is therefore dependent on the succession of openings (see chapter on "signal management").

Removing-refitting

To gain access to the timing sensor, remove the intake side camshaft pulley (3) (refer to engine service manual, publication no. 504.589/20).

Disconnect electrical connection of sensor.

Unscrew both screws (1) and remove timing sensor (2) with retaining plate.

BUTTERFLY VALVE CASE (54 CFA 26)

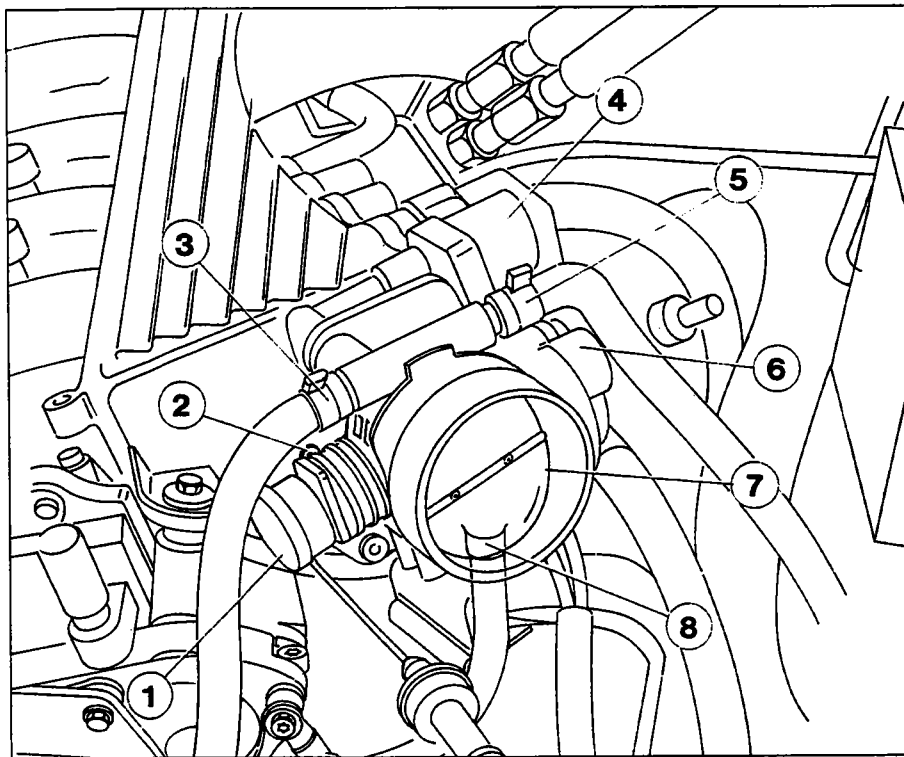
The butterfly valve case is responsible for metering the quantity of air supplied to the engine (and thus controlling engine power output) according to accelerator position determined by the driver.

The butterfly valve case is fastened to the intake manifold by four screws. The throttle is opened by a linkage with configuration designed to open the throttle by a small amount when the pedal is hardly pressed (provided pedal travel remains the same) and open it by large amounts when the pedal is pressed down further.

With the pedal fully released (engine in over-run or idling), the additional air required is supplied by an engine idle adjustment solenoid. Under these conditions, the throttle opening lever comes into contact with an anti-bind screw, which prevents the throttle becoming locked in closed position.

To prevent the build-up of ice around the throttle and the hole leading to the PCV valve, the butterfly valve case is heated by directing a small amount of coolant from the engine thermostat around a chamber inside the case.

The oil vapour recirculation system PCV valve and throttle position sensor are also fitted on the butterfly valve case.

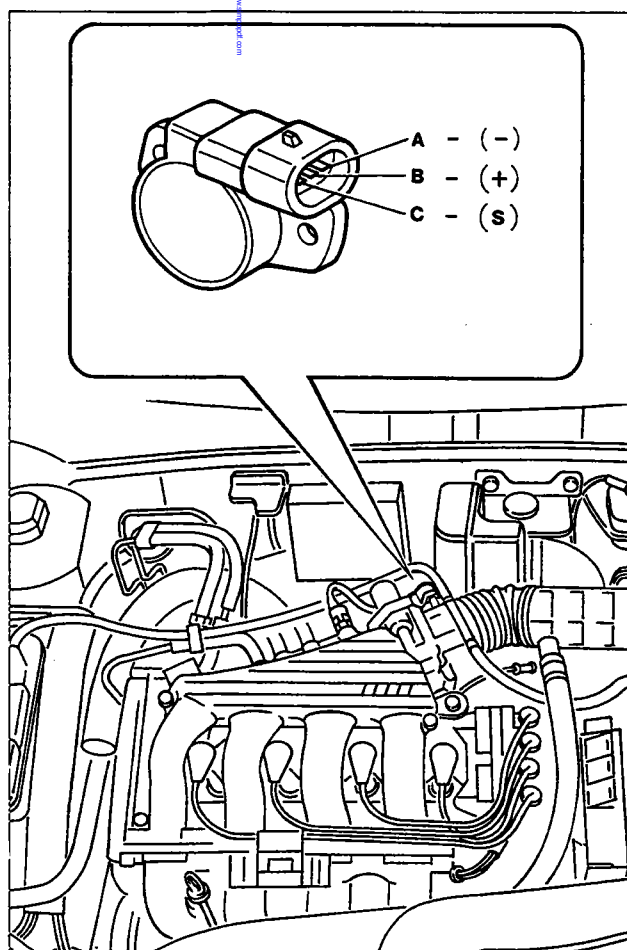


The anti-bind screw is set by flushing in the factory and should never be tampered with.

P4A31CJ01

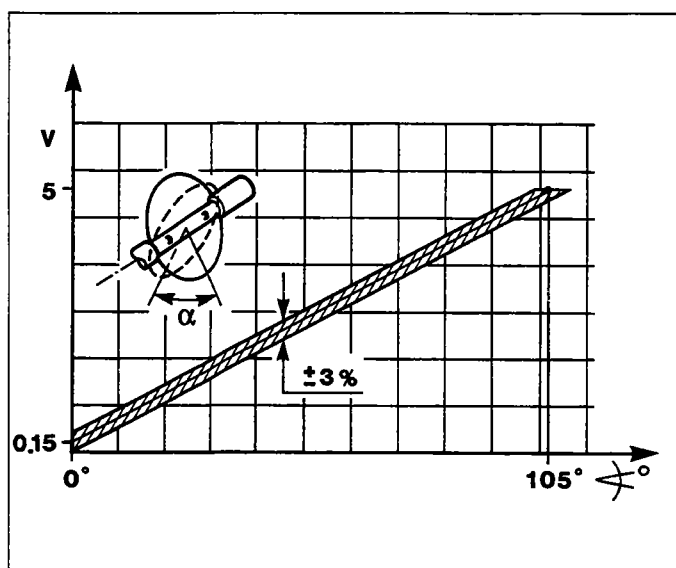
1. Throttle linkage
2. Butterfly valve adjustment and antibind screw (do not touch)
3. Attachment for engine coolant delivery hose
4. Engine idle speed actuator
5. Attachment for engine coolant return hose
6. Throttle position sensor
7. Throttle valve
8. Attachment for engine block vapour recirculation and recovery line

10.



P4A32CJ01

The following graph indicates the voltage level supplied by the sensor as a function of throttle opening angle.



P4A32CJ02

THROTTLE VALVE POSITION SENSOR (WEBER PF-1C)

This takes the form of a potentiometer whose mobile part is controlled by the butterfly valve spindle.

The potentiometer is fitted inside a plastic container equipped with two tabs containing two UNSLOTTED holes. These anchor the sensor and ensure it is positioned correctly in relation to the throttle valve. A three-pin socket (ABC) on the container provides an electrical connection with the injection-ignition ECU.

During operation, the ECU supplies the potentiometer at a voltage of 5 Volt. The parameter measured is throttle position from idle to full opening for injection control management.

The ECU recognises throttle valve opening status on the basis of outlet voltage and corrects mixture concentration accordingly. When the throttle is closed, an electric voltage signal is sent to the ECU, which recognises idle and cut-off status (discerning between them on the basis of rpm level).

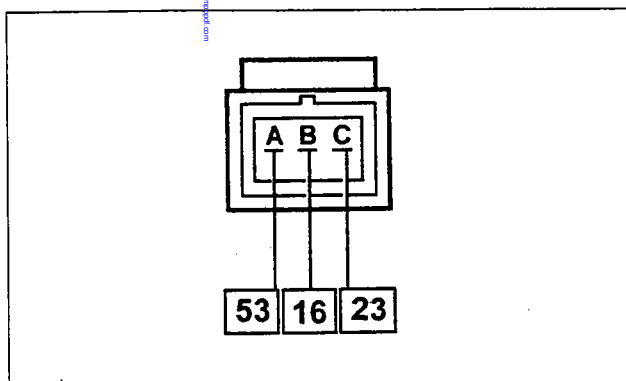
The potentiometer is single-ramp: its main specifications are as follows:

Effective electrical angle: $90^\circ \pm 2^\circ$

Mechanical angle: $105^\circ \pm 4^\circ$

Total mechanical travel: $110^\circ \pm 8^\circ$

Temperature service range: $-30^\circ\text{C} \div +125^\circ\text{C}$



P4A33CJ04

Wiring connector

The numbers in squares indicate the corresponding control unit pins.

Checking resistance

The sensor's resistance can be measured by connecting an ohmmeter between pins A and C of the sensor.

Resistance: 0 - 1200 ohm $\pm$ 20% at 23 °C

Recovery

A value is assumed which is calculated in accordance with the pressure present in the inlet manifold; if the pressure sensor is also faulty, a throttle aperture angle of about 50° is established as a fixed value.

The strategies of gradual reduction of rpm at idling speed (dashpot) are inhibited.

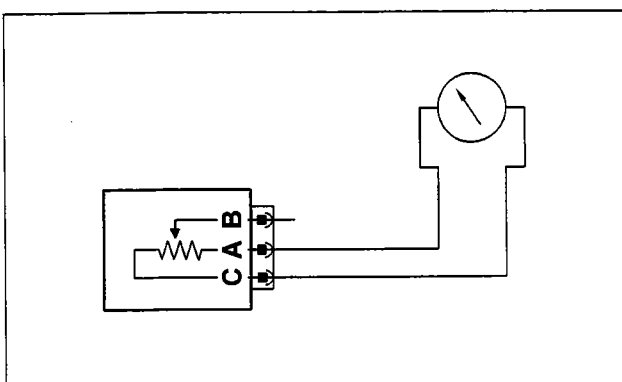
Self-adaptivity of idle speed is inhibited.

Self-adaptivity of the mixture strength is inhibited.

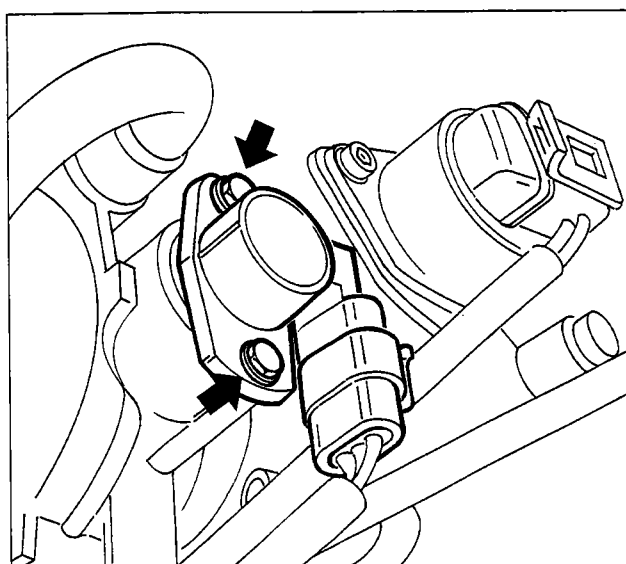
Removing-refitting

Undo the two bolts and remove the sensor.

NOTE The sensor is secured to the throttle body by means of two lugs in which there are two non-slotted holes; it is therefore not necessary to make any adjustment to its angle position as the control unit itself, by means of appropriate self-adaptive algorithms, recognizes the fully closed or fully open position of the throttle.



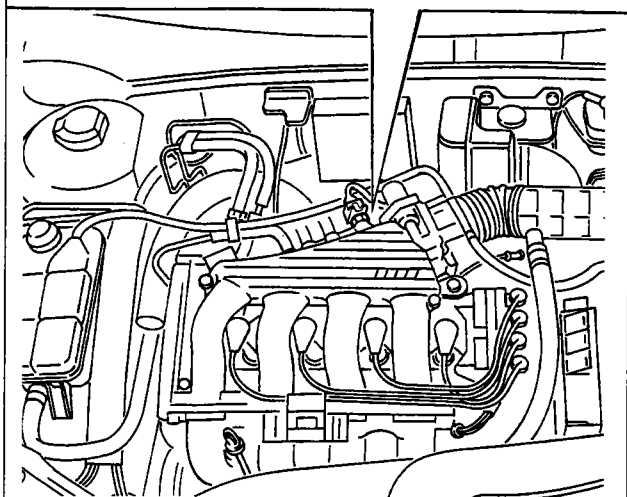
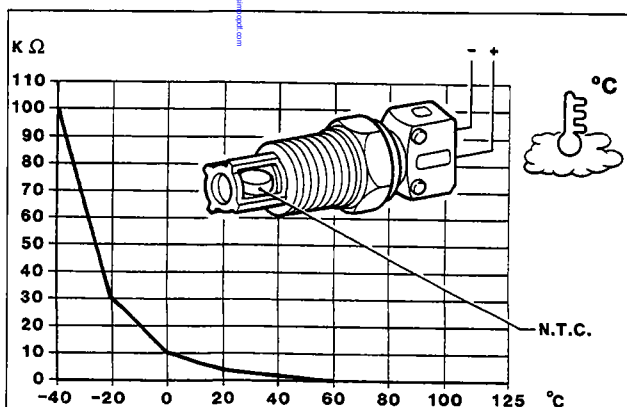
P4A33CJ02



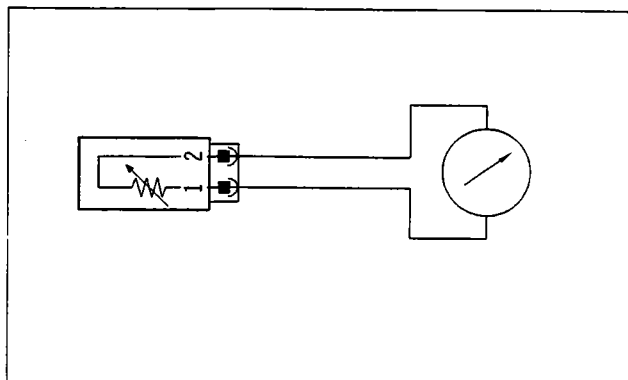
P4A33CJ03

NOTE Whenever the potentiometer bolts are slackened or removed, they must be replaced as the thread is coated with a thin layer of Loctite which ensures only once that they lock.

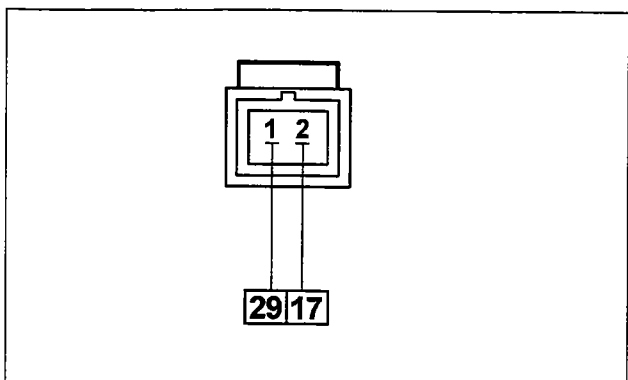
10.



P4A34CJ01



P4A34CJ02



P4A34CJ03

INTAKE AIR TEMPERATURE SENSOR (Jaeger ATS-04)

The sensor is installed on the inlet port.

It consists of a brass body, from which a plastic cage emerges. This protects the actual resistive element, which is an NTC ("Negative Temperature Coefficient") thermistor; the electrical resistance of the sensor decreases as the temperature increases.

Depending on the temperature of the air drawn in by the manifold, the NTC thermistor varies its resistance in accordance with the diagram in the figure.

The reference voltage for the air sensor is 5V; as this circuit is designed as a voltage divider, this voltage is shared between a resistor present in the electronic control unit and the air sensor's N.T.C. resistor. The electronic control unit is thus able to assess the variations in the sensor's resistance via changes in the voltage, and thus obtain information concerning the intake air temperature.

Together with the absolute pressure information, this information is used by the electronic control unit to establish the "AIR DENSITY" which is essential information for ascertaining the quantity of air drawn in by the engine, in accordance with which the computer will have to work out the injection time, i.e. the exact quantity of petrol to be delivered.

Checking resistance

The diagram shows the trend of the sensor's characteristic curve, which can be measured by disconnecting the connector and connecting an ohmmeter to the sensor's terminals.

Removing-refitting

Disconnect the electrical connection and remove the sensor screwed in the inlet port.

Tightening torque: 2.4 daNm

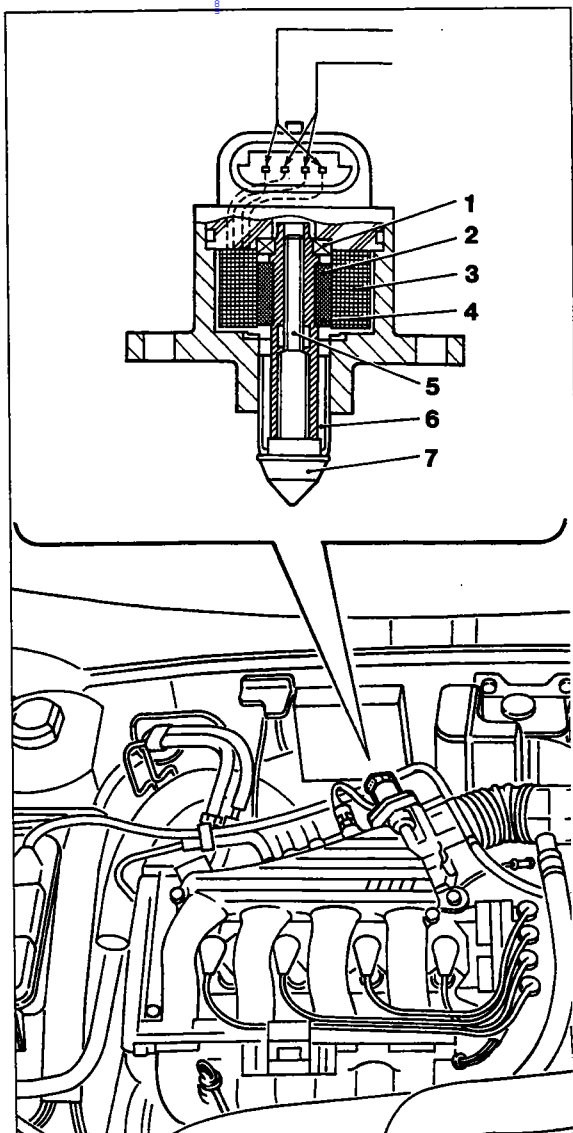
Recovery

An air $T = 54^{\circ}\text{C}$ is assumed.

Self-adaptivity during idling is inhibited.

Wiring connector

The numbers in squares indicate the corresponding control unit pins.



P4A35CJ01

**ENGINE IDLE SPEED ACTUATOR
(step motor) (WEBER B02)**

- | | |
|---------------|--------------------------|
| 1. Bearing | 5. Screw |
| 2. Lead screw | 6. Anti-rotation grooves |
| 3. Coils | 7. Plunger |
| 4. Magnets | |

The actuator is fitted to the butterfly valve case and consists of:

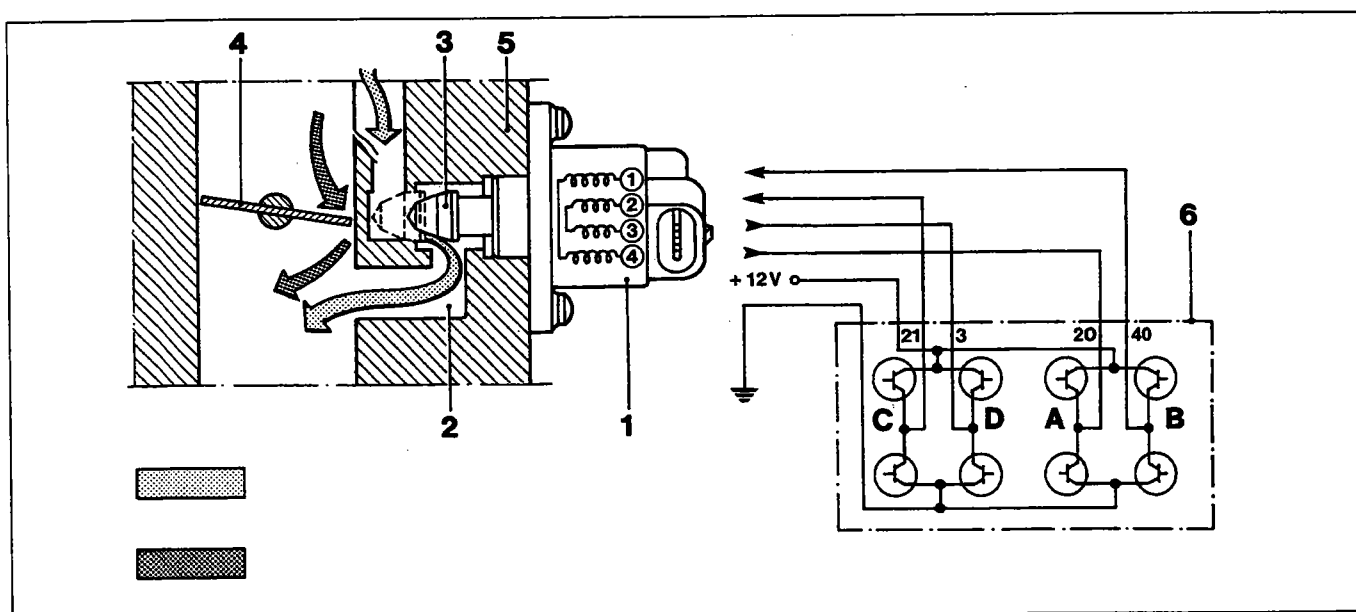
- An electric step motor with two windings in the stator and a rotor that contains a certain number of permanent magnet pairs.
- A worm and screw reduction unit that converts rotary motion into linear motion.

In order to idle, i.e. with throttle (4) fully closed, the engine needs a certain amount of air (Q_0) and fuel to overcome internal friction and maintain rpm levels.

To the quantity of air Q_0 that leaks through the closed butterfly valve (4) during idling, an additional quantity of air Q must be added to allow the engine to maintain rpm levels constant, particularly during warm up and when electrical users or external loads are activated (air conditioner, automatic transmission, etc).

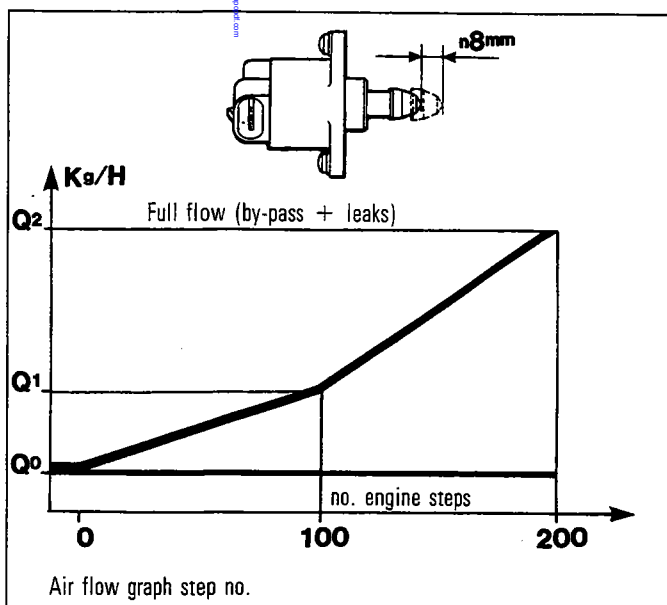
To achieve this result, the system uses a step motor (1) fastened to butterfly valve case (5) controlled by ECU (6) which moves a rod fitted with a plunger (3) during operation. This alters the cross-section of by-pass duct (2) and thus the amount of air ($Q_0 + Q$) taken in by the engine.

In order to govern this type of action, the ECU uses angular engine speed and coolant temperature input from the relevant sensors.



P4A35CJ02

10.



P4A36CJ01

The electric step motor features extremely high accuracy and resolution (about 20 rpm). Pulses sent from the ECU to the engine are converted from rotary motion into straight-line motion (about 0.04 mm/step) through a worm and screw mechanism. This operates a plunger which in turn moves to alter the by-pass duct cross-section.

The constant idle air flow Q_0 arises as a result of leakage through the butterfly valve. This is regulated during production and protected by a cap. Maximum flow Q_2 arises when the plunger is fully retracted (about 200 steps corresponding to 8 mm). Between these two levels, air flow follows the graph shown alongside.

Motor strategy

The number of working steps is dependent upon engine conditions:

- Start-up stage
When the key is inserted, the ECU controls step motor position according to engine coolant temperature and battery voltage.
- Warming-up stage
Rpm levels are corrected according to engine coolant temperature.
- With engine warm:
Idle control is dependent on a signal from the rpm sensor. When external users are activated, the ECU governs sustained idle.
- Over-run:
The ECU recognises over-run status from the throttle potentiometer position. It controls step motor position by means of the idle flow law (DASH-POT laws). In other words, it slows the return of plunger (3) to its seat so that a quantity of air by-passing hole (2) reaches the engine and reduces levels of pollutants in the exhaust gas.

Recovery

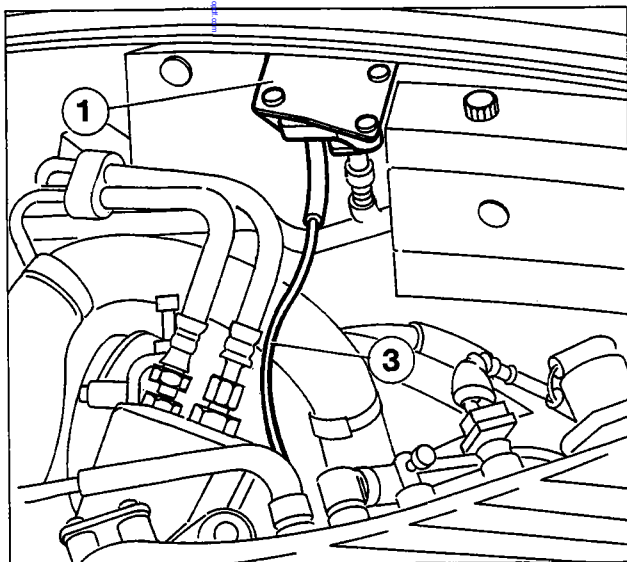
Actuator operation disabled and self-adaption of idling fuel mixture level blocked.

Removing-refitting engine idle control actuator (step motor)

- disconnect battery negative terminal;
- unscrew both retaining screws and withdraw the actuator;
- check condition of thoroid seal and remove any impurities from the case seat;
- refit the actuator, checking that the plunger fits easily without forcing. To do this, fit the actuator and replace screws but do not tighten. Operate the step motor using a Fiat-Lancia/Tester until it has moved through its entire travel. Tighten screws only after checking plunger is correctly aligned in its seat and electrical connector is positioned correctly.

NOTE It is advisable to leave the battery negative terminal disconnected for about 20 minutes. Provided the above procedure is carried out as described, the ECU will position the idle speed actuator correctly the first time the engine is started up.
Fit new step motor retaining screws whenever they are loosened or removed because the threads are covered with a light layer of loctyte, which guarantees a seal only once.

Tightening torque of step motor screws 0.36 - 0.44 da Nm.



P4A37CJ01

ABSOLUTE PRESSURE SENSOR WEBER PRT 03

The sensitive element is enclosed within a plastic container (1) and consists of a Wheatstone bridge screen printed to a very fine circular ceramic plate (diaphragm) fitted to the underside of a ring mount.

The diaphragm separates two chambers: a vacuum is set up in the bottom sealed chamber while the top chamber communicates with the intake manifold indirectly through a rubber pipe (3).

When the engine is off, the diaphragm bends according to atmospheric pressure level. Exact information on altitude is therefore provided when the key is inserted.

When running, the engine sets up a vacuum that gives rise to a mechanical effect on the sensor diaphragm, which bends to alter the resistance level.

Because the electrical supply is maintained constant (5 V) by the control unit, when the resistance is altered, the output voltage changes in proportion to the vacuum in the intake manifold.

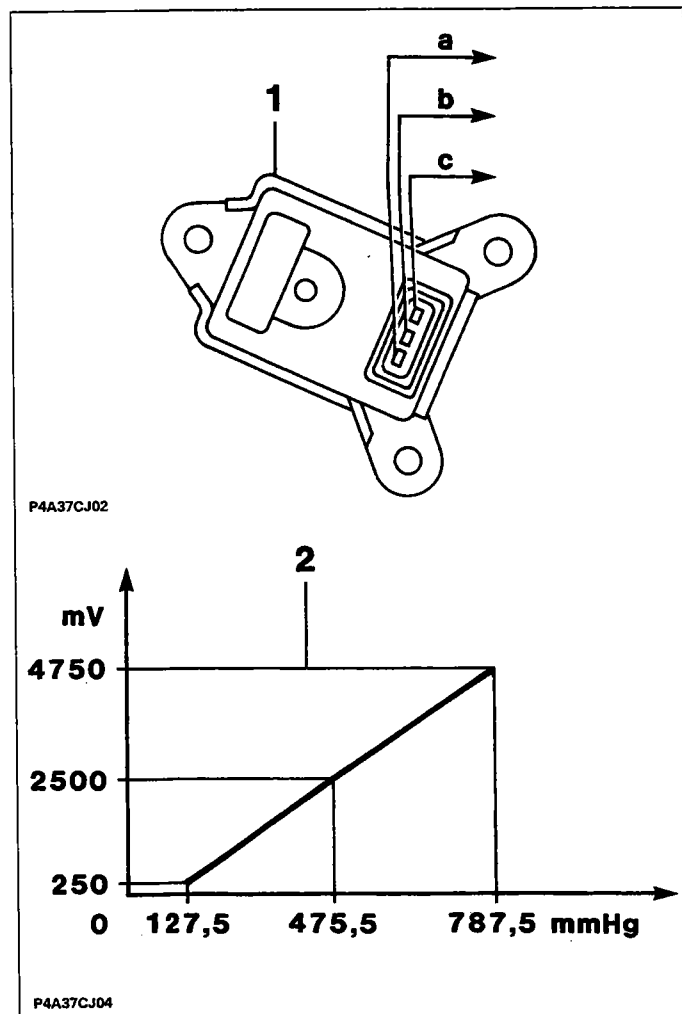
Recovery

The pressure is calculated according to throttle angle and rpm level.

If the butterfly valve position sensor is faulty, a fixed calibration value is assigned.

Mixture self-adaption is inhibited.

Lambda probe test is inhibited.

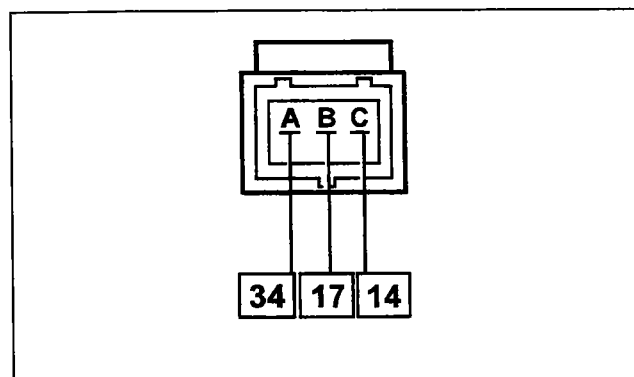


P4A37CJ02

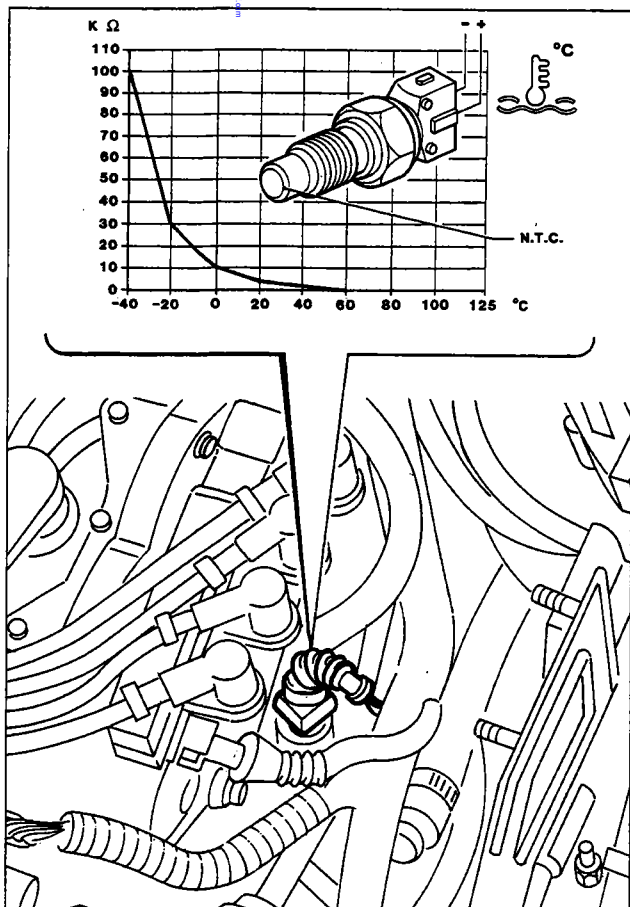
P4A37CJ04

Wiring connector

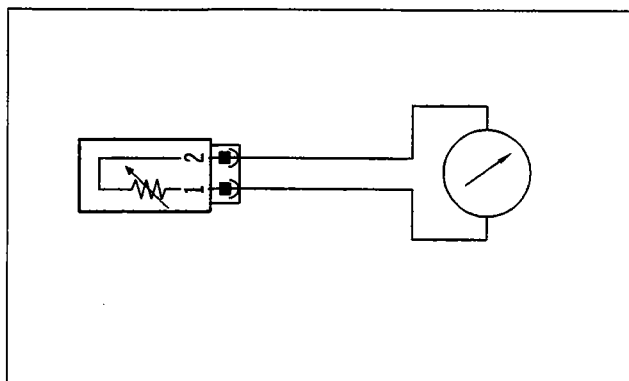
The numbers in boxes indicate the corresponding control unit pins



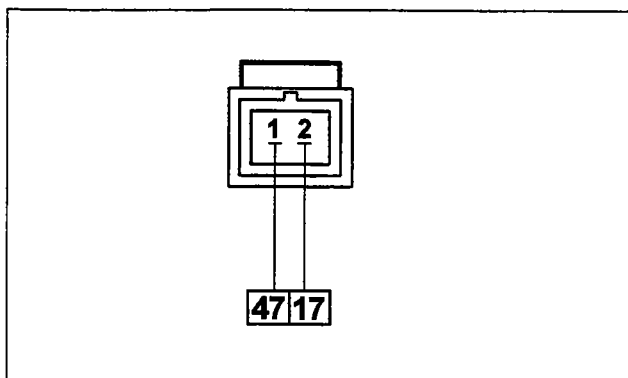
P4A37CJ03



P4A38CJ01



P4A34CJ02



P4A38CJ03

COOLANT TEMPERATURE SENSOR (Jeager 401930.01)

The sensor is fitted to the thermostat case. It consists of a brass case, which protects the actual resistance element: an NTC thermistor (standing for Negative Temperature Coefficient because sensor electrical resistance decreases in inverse proportion to temperature).

The reference voltage is 5V; since this circuit is designed as a voltage divider, the voltage is distributed between a resistance present in the ECU and the sensor N.T.C. resistance. The ECU is therefore able at any moment to assess sensor resistance changes through voltage changes and thus obtain information on intake air temperature.

Recovery

The last reading is adopted. If the temperature does not correspond to steady state levels, this is gradually increased with time following start-up and corrected on the basis of intake air temperature.

Mixture concentration self-adaption is inhibited.

Idle self-adaption is inhibited.

Checking resistance

The graph plots sensor resistance values. These may be measured by disconnecting the connector and connecting an ohmmeter to the sensor terminals.

Removing-refitting

Disconnect electrical connection and remove the sensor



Before refitting apply MR/B anaerobic sealant to the tapered threads.



Tightening torque 2.4 daNm.

Wiring connector

The numbers in boxes indicate the corresponding control unit pins

ELECTRIC FUEL PUMP (Walbro-Marwal MSS071)

The pump is housed inside the fuel tank in a holder, together with the fuel level indicator. It is fitted with a mesh filter on the pump intake.

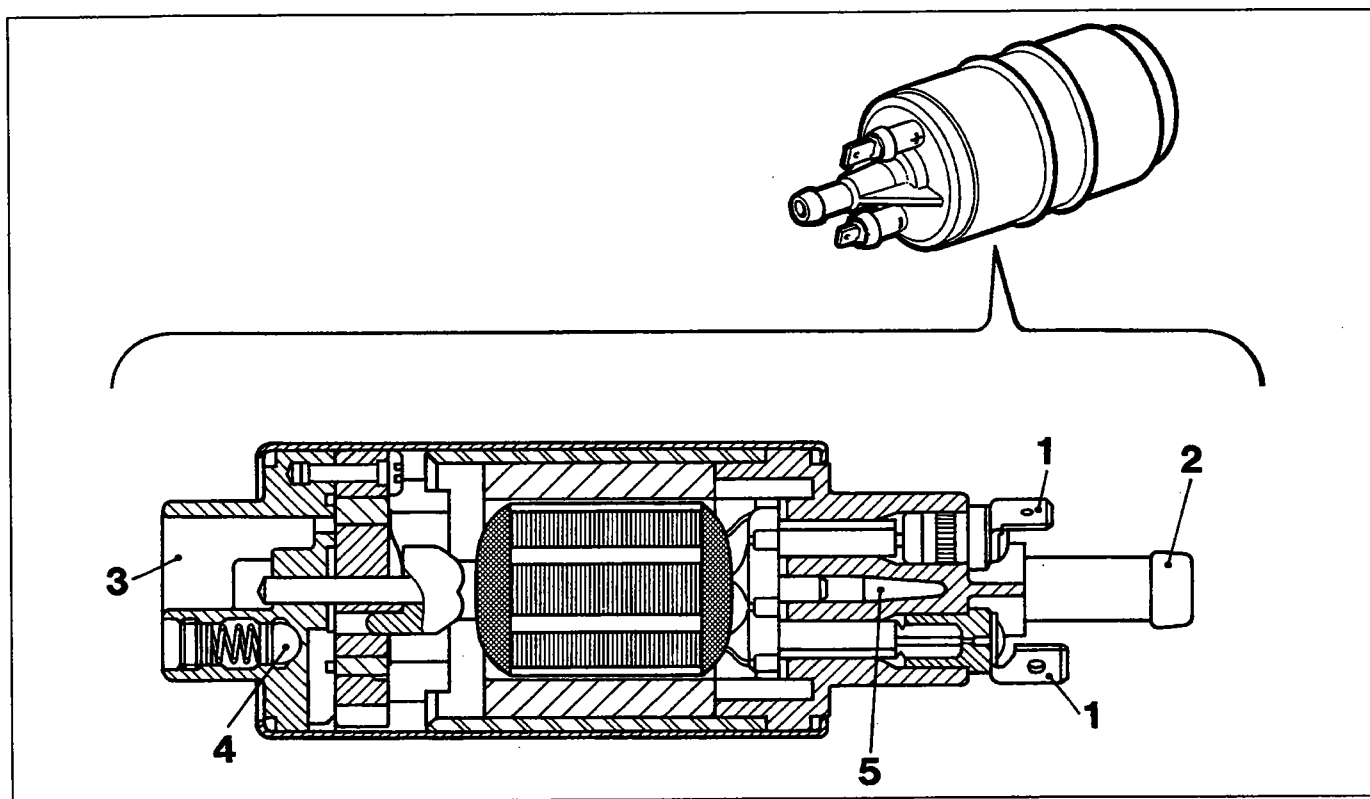
The pump is volumetric type and designed to work with unleaded fuel. The rotor is turned by an electric d.c. motor supplied at battery voltage directly through the dual relay, controlled in turn by the ECU.

The motor is submerged in the fuel in order to clean and cool the brushes and commutator.

The pump is fitted with a pressure relief valve, which short-circuits delivery to intake if inlet circuit pressure exceeds 5 bar. This prevents the electric motor overheating.

A check valve fitted in the delivery line prevents the entire fuel circuit emptying when the pump is not working.

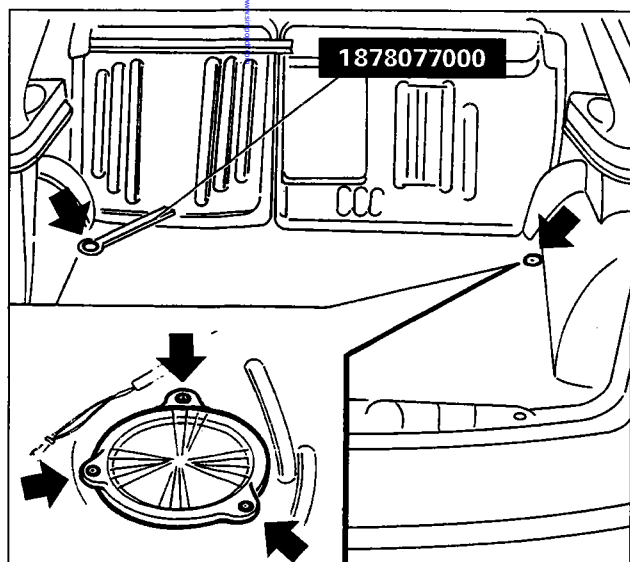
Rated pump output varies according to angular rotor speed and hence supply voltage: it is about 140 l/h at a voltage of 12 V.



P4A39CJ01

1. Electrical connectors
2. Delivery port
3. Inlet port
4. Pressure relief valve
5. Check valve

10.



P4A40CJ01



Removing-refitting electric fuel pump

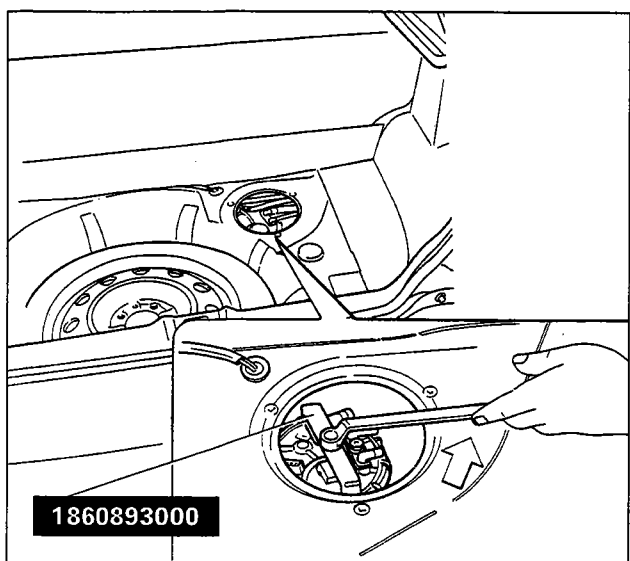


The pump is located in the tank: proceed as follows to remove:

Undo retaining buttons indicated using tool 1878077000.

Lift load compartment mat.

Remove dust cover.



P4A40CJ02



Disconnect electrical connections from pump and from fuel level sending unit.



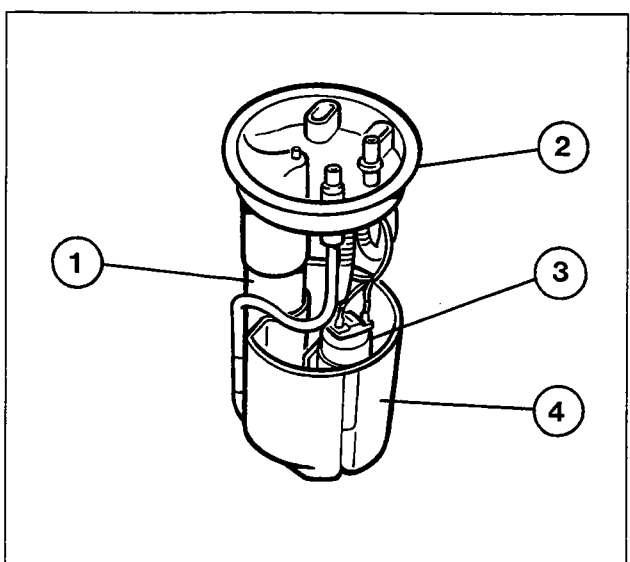
Disconnect fuel lines (inlet, outlet and breather).

Unscrew lock-ring retaining pump to tank using tool 1860893000 and a box wrench.

Remove fuel pump assembly.



When refitting, electrical connections and fuel lines cannot be fitted the wrong way round because the respective terminals are of different diameter.

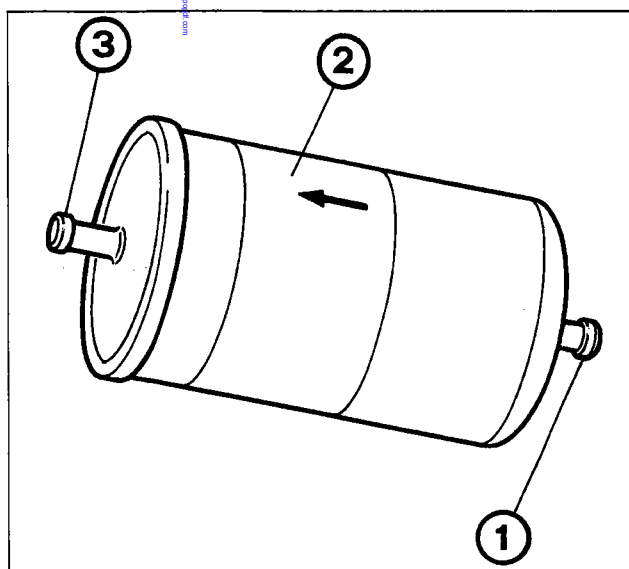


P4A40CJ03



Components of fuel pump assembly

1. Fuel level gauge
2. Retaining plate
3. Electric pump
4. Reservoir with mesh prefilter



P4A41CJ01

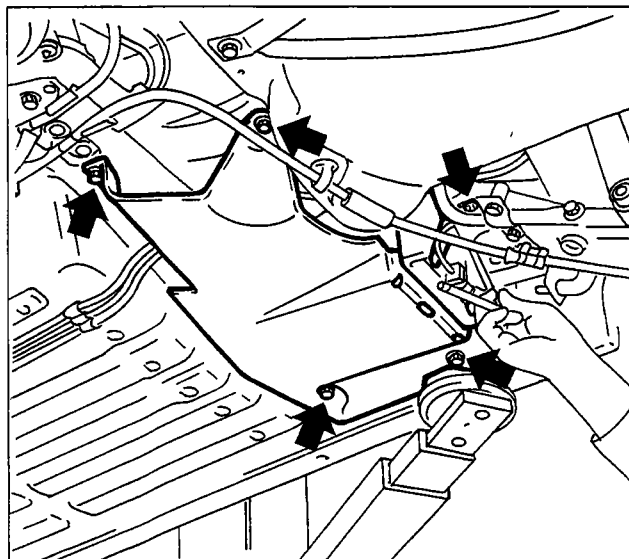


FUEL FILTER (Bosch A 450.024.262)

The filter is inserted in the fuel delivery pipe; it consists of a steel plate casing and an internal polyurethane mounting on which an element with high-filtration capacity is wound.

NOTE On the outer casing, there is an arrow which indicates the direction of fuel flow and so correct assembly.

1. Fuel inlet
2. Arrow position
3. Fuel outlet



P4A41CJ02



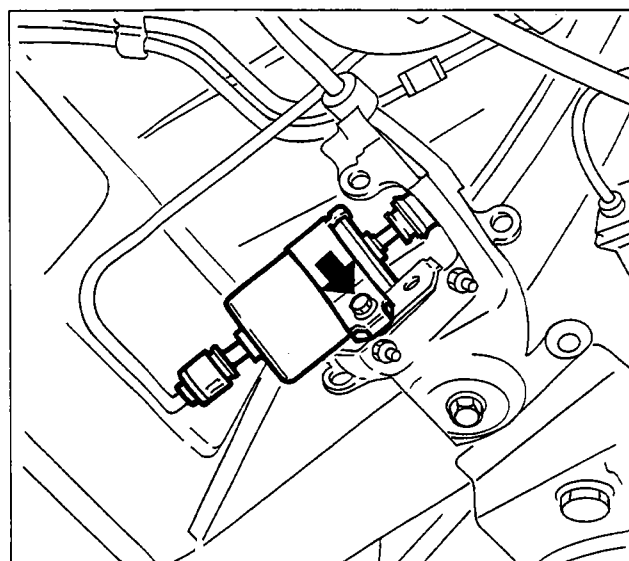
Removing-refitting



To remove the fuel filter, proceed as follows:

Raise the vehicle.

Undo the bolts indicated and remove the protective cover.



P4A41CJ03



Disconnect the fuel inlet and outlet quick-fit connectors from the filter, collecting in a suitable container the fuel which leaks during the operation.



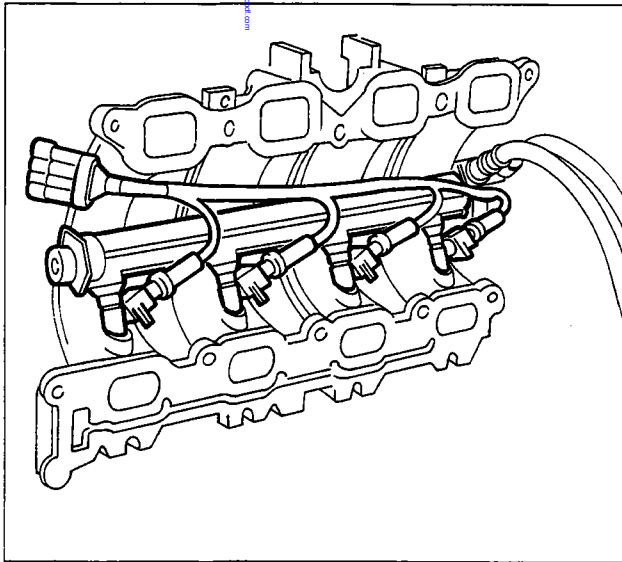
Undo the bolt and remove the filter.



The fuel filter must be replaced every 40000 km.

After replacing the filter, start the engine and check that there are no fuel leaks from the connections.

10.



P4A42CJ01

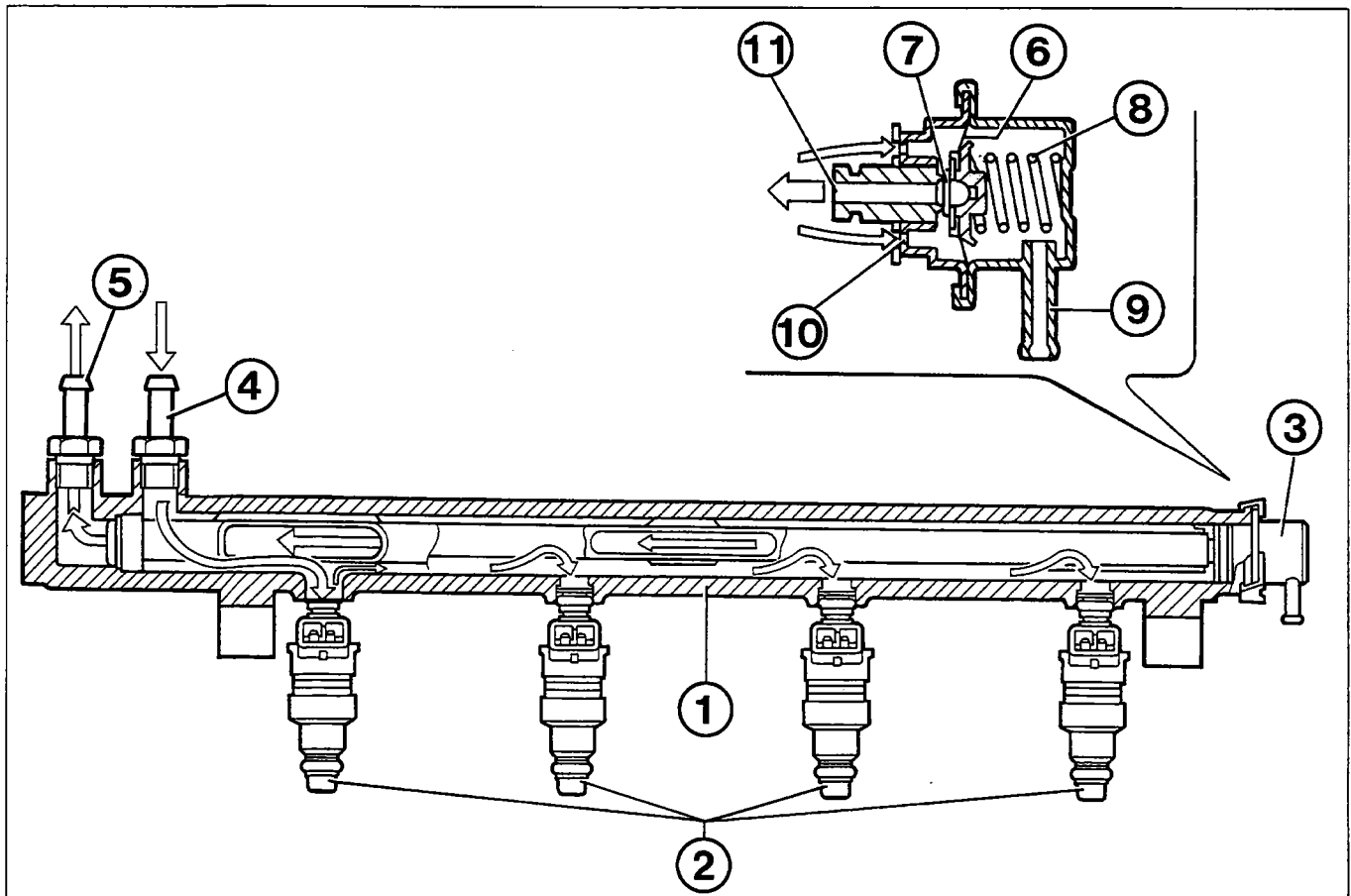
FUEL MANIFOLD (CB 104)

The fuel manifold is secured to the inside of the inlet manifold, and its function is to send fuel to the fuel injectors.

The fuel manifold consists of an aluminium casting and it incorporates the seats for the fuel injectors and pressure regulator.

The fuel inlet comprises an attachment with tapered sealing screw.

The fuel is recirculated by means of a pipe contained in the manifold and connected at one end to the regulator, and at the other end to the external fuel return pipe to the tank.



P4A42CJ02

- | | |
|---------------------------------------|----------------------|
| 1. Fuel manifold | 7. Backflow valve |
| 2. Fuel injectors | 8. Adjustment spring |
| 3. Pressure regulator | 9. Vacuum connection |
| 4. Fuel inlet connection | 10. Fuel inlet |
| 5. Connection for fuel return to tank | 11. Fuel return |
| 6. Diaphragm | |

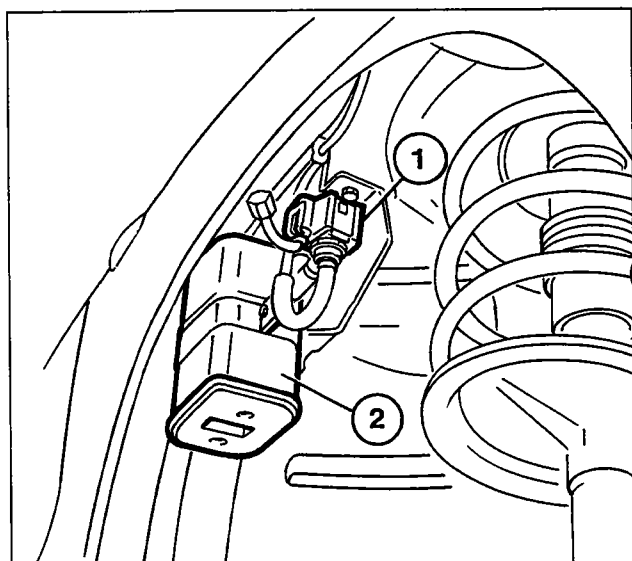
FUEL PRESSURE REGULATOR (RPM 40)

This differential diaphragm device is set to a pressure of 3.00 ± 0.05 bar in the factory.

Pressurised fuel from the pump exercises thrust on reflux valve (7) countered by calibrated spring (8). When pressure setting is exceeded, reflux valve opens and excess fuel returns to the tank in order to stabilise pressure in the circuit. The vacuum in the intake manifold (acting also on injector nozzle) acts on regulator diaphragm through intake (9) in order to reduce the load on the calibration spring.

The pressure differential between the fuel and the injector's surroundings (intake manifold) is therefore maintained constant under all engine service conditions. The injector flow (for a given supply voltage) thus depends solely on injection time established by the ECU.

NOTE *The ECU assumes pressure as a fixed parameter. The regulator should never therefore be tampered with; otherwise the mixture concentration specified for the engine will be altered.*



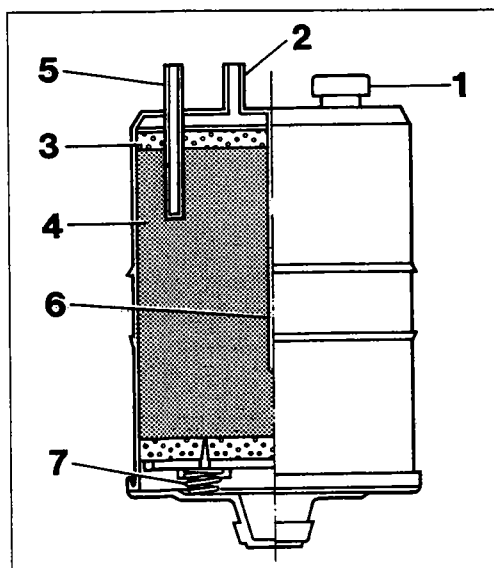
P4A43CJ01

CARBON FILTER AND FUEL VAPOUR CUT-OFF VALVE

These components form part of the fuel evaporation control and vapour recovery system. They are located in the right wheel arch compartment and can be reached by removing the rear part of the right front wheel arch compartment trim.

1. Fuel vapour cut-off solenoid

2. Carbon filter



P4A43CJ02

Carbon filter

This consists of carbon granules (4) that trap fuel vapour entering intake (5).

Warm flushing air enters intake (1), through paper filter (3) and flows over the carbon granules to remove fuel vapours and carry them toward the outlet (2) and then on toward the cut-off valve.

Air entering through intake (5) may also be pulled back by a vacuum in the tank, when it serves to ventilate the tank. Partition (6) ensures that the flushing air flows over all the carbon granules and promotes the release of fuel vapour toward the inlet manifold.

Two springs (7) allow the mass of granules to expand when the pressure increases.

10.

Fuel vapour cut-off solenoid (Siemens EC1)

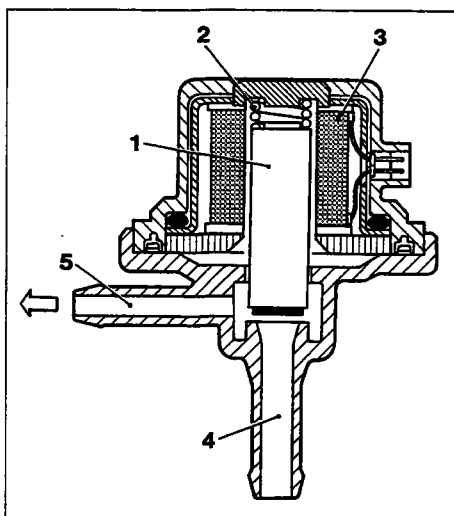
The function of this valve is to control the quantity of fuel taken up by the active carbon filter and directed to the intake manifold (via the injection-ignition control unit).

The valve is closed when de-activated to prevent fuel vapours enriching the mixture excessively.

The injection-ignition control unit controls operation as follows:

- during start-up, the solenoid remains closed to prevent fuel vapour from enriching the mixture excessively. This condition persists until the coolant temperature reaches a pre-established threshold.
- with engine warm, the ECU sends the solenoid a square wave signal, which modulates opening in accordance with the signal empty/full pattern.

In this way, the ECU controls the quantity of fuel vapour sent to the intake to prevent significant changes in mixture concentration.



P4A44CJ01

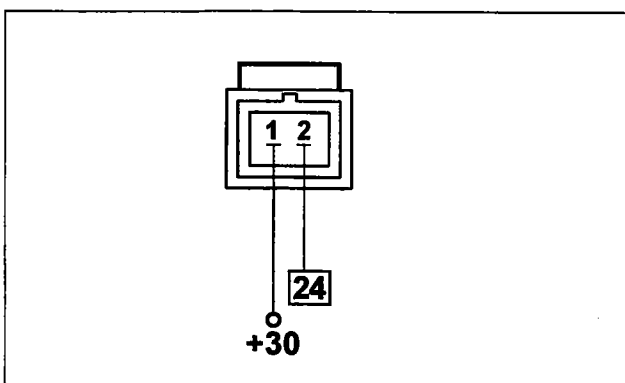
Under the service conditions listed below:

- throttle in idle position
- speed less than 1500 rpm
- intake manifold pressure less than a limit setting computed by the ECU according to rpm level

solenoid activation is inhibited to maintain the unit closed in order to improve engine operation.

Longitudinal section through fuel vapour cut-off valve

1. Valve core.
2. Reaction spring.
3. Magnetic winding.
4. Pipe connected to air intake manifold
5. Pipe connected to active carbon filter.



P4A44CJ02

Wiring connector

The numbers in boxes indicate the corresponding control unit pins

Recovery

Mixture self-adaption is inhibited.

Mixture concentration test is inhibited.

Lambda probe test is inhibited.

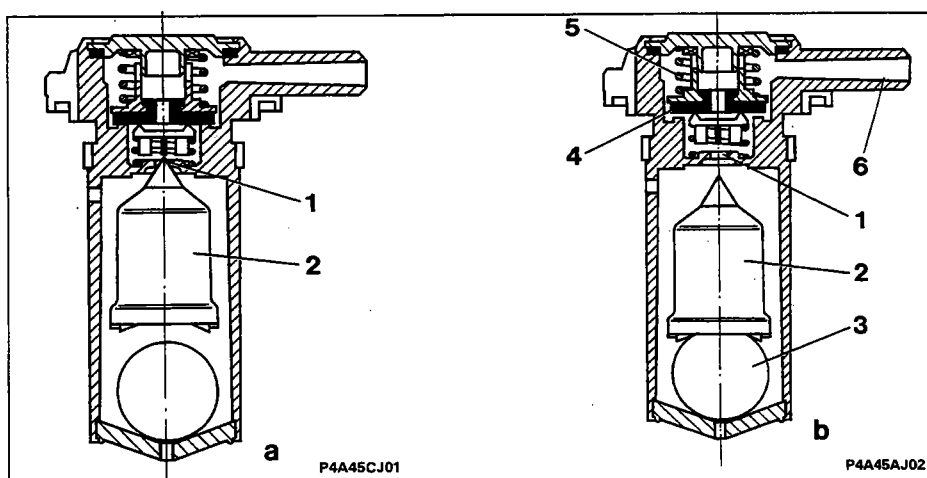
MULTIFUNCTION VALVE (SIRIO 0175.00)

This valve performs the following functions:

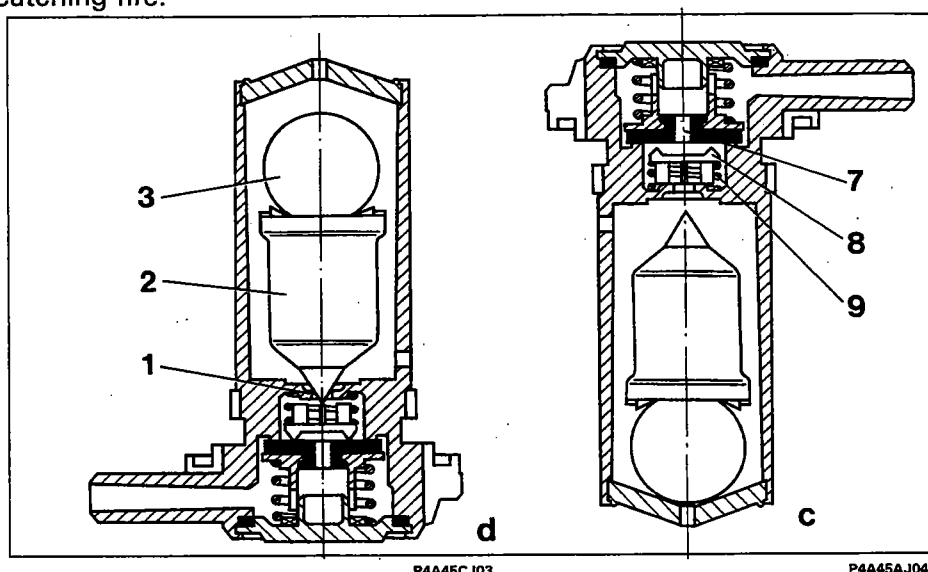
- prevents fuel flowing out when tank is over-filled or in case the vehicle overturns in an accident;
- vents fuel vapours from tank to the active carbon trap filter;
- ventilates the tank if a vacuum builds up inside.

This valve consists of: a float (2); a heavy ball (3); a plate (4), pushed against valve case of spring (5) and plate (8), pushed against plate (4) of spring (9). Multifunctional valve operation may be summarised as follows and depends on fuel tank level:

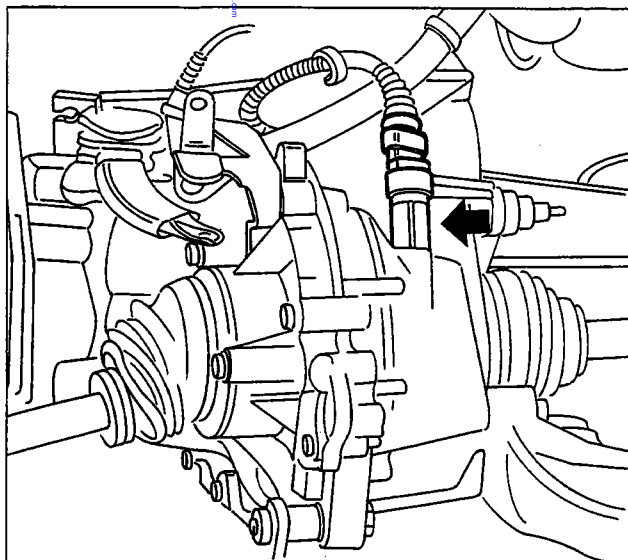
- a. if the tank is full float (2) blocks hole (1) to prevent liquid fuel from reaching active carbon filter and hence damage to the filter;
- b. the tank fuel level drops, float (2) is lowered and rests upon ball (3) to open hole (1). When the pressure exercised by fuel vapours on plate (4) overcomes load of spring (5), a ring opening between plate and valve case opens to allow fuel vapours to emerge from the duct (6) and reach the active carbon filter.



- c. if the drop in tank fuel level is sufficient to set up a vacuum, this acts on plate (8) and overcomes load of spring (9) so that this moves down to allow tank ventilation through hole (7).
- d. if the vehicle overturns, however full the tank, the weight of ball (3) acts on float (2) to push the float against hole (1) and prevent a dangerous flow of fuel to the intake manifold with the attendant risk of the vehicle catching fire.



10.



P4A46CJ01

VEHICLE SPEED SENSOR

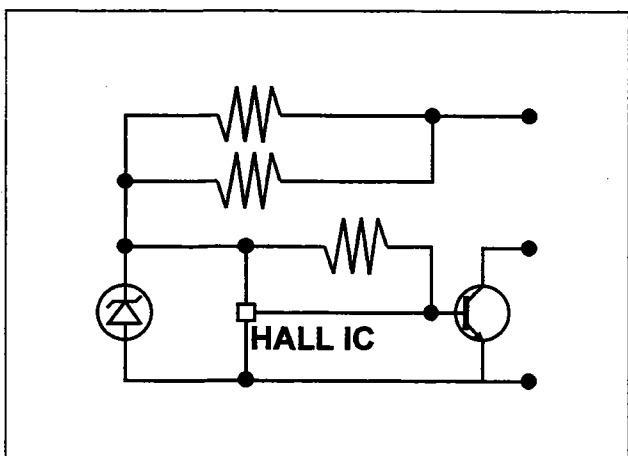
SWF B451

BORLETTI TKG

SO.GE.MI.

The sensor is located on the differential output, near the left half-axle joint. It sends information on vehicle speed to the control unit: the signal is also used to operate the speedometer.

The sensor operates on the principle of the Hall effect (see section on "engine timing sensor") and transmits 16 pulses/revolution. Vehicle speed can therefore be calculated from pulse frequency.



P4A46CJ02



Removing - refitting

Disconnect electrical connection and remove the sensor.



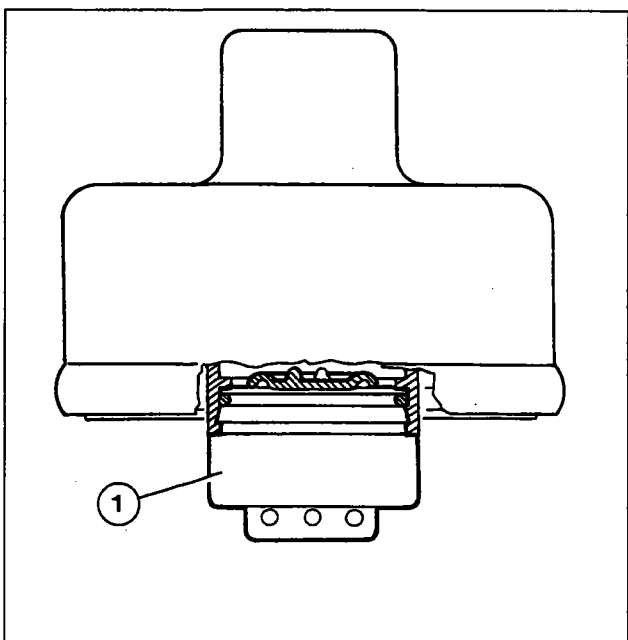
Tightening torque 0.8 daNm

Wiring diagram

SAFETY AND VENTILATION VALVE

This valve is located in the fuel filler cap and performs the following functions according to the pressure level in the tank:

- When the pressure inside the tank exceeds 0.13 - 0.18 bar, excess fuel vapours are vented to the outside (pressure-relief function).
- If, on the other hand, a vacuum builds up inside the tank, equivalent to 0.020 - 0.030 bar, air is taken into the tank (ventilation function).



P4A46CJ03

INJECTORS (WEBER IWP 001)

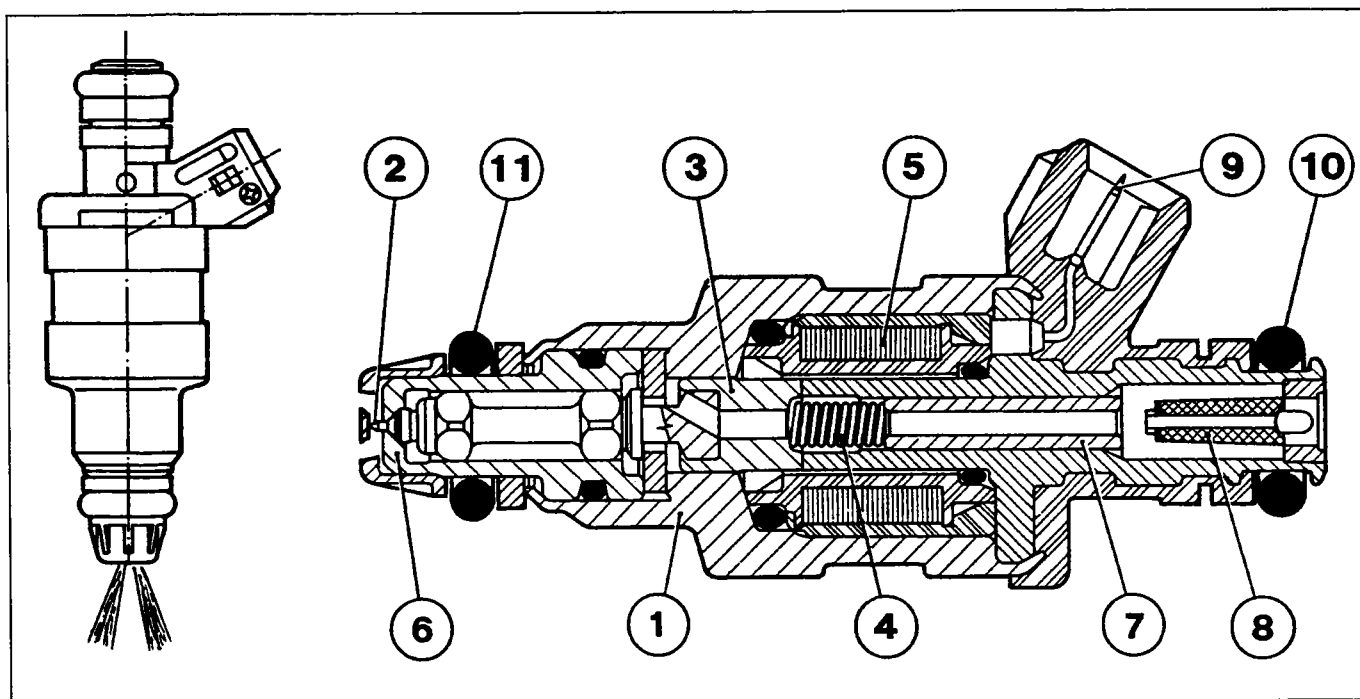
The twin jet injectors are used specifically on engines with four valves per cylinder because they allow the jets to be directed against the two intake valves.

The fuel jet leaves the injector nozzle with a pressure differential of 3 bars and nebulises immediately to form two cones.

Injector control is «sequential, staged», i.e all four injectors are controlled in accordance with the cylinder intake sequence. The supply to each cylinder may begin during the expansion stage up to a time when intake has already begun.

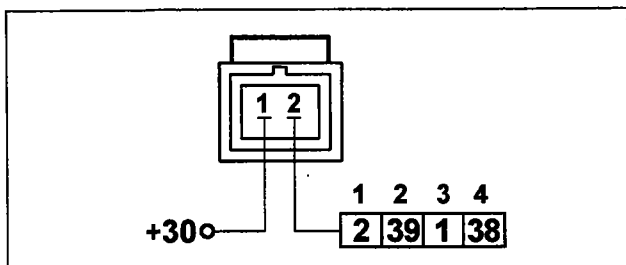
The fuel manifold presses against the injectors to fasten them into the seats on the intake ducts. They are also anchored to the fuel manifold by means of «safety clips». Two rubber rings (10) and (11) ensure a seal to the intake duct and fuel manifold.

The injectors are top-feed type and supplied with fuel from the rear of the case, which houses coil (5) connected to electrical connector (9).



P4A47CJ01

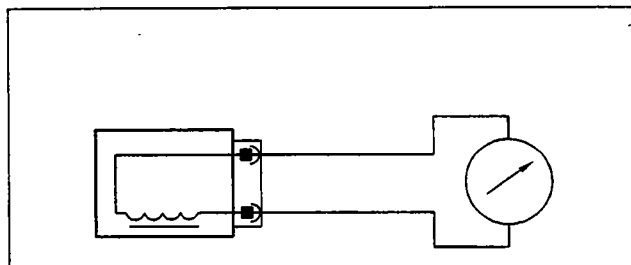
Wiring connector



P4A47CJ02

NOTE The numbers in boxes indicate ECU pin no. in order of cylinder number.

Checking resistance



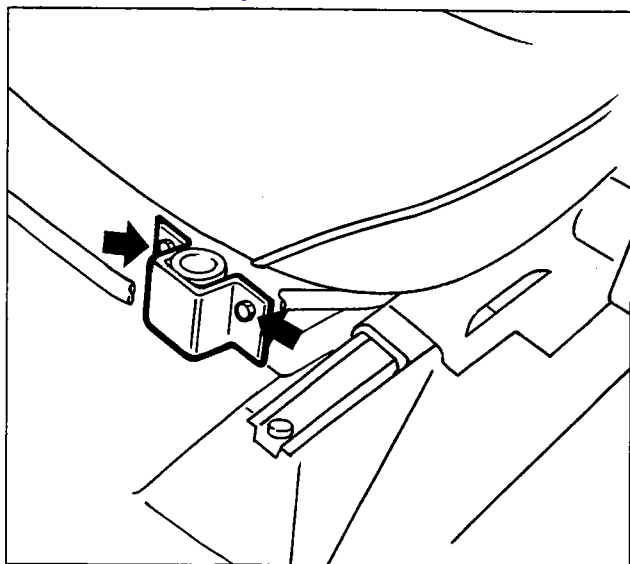
P4A47CJ03

Injector resistance may be measured by disconnecting the connector and connecting an ohmmeter as shown in the figure.

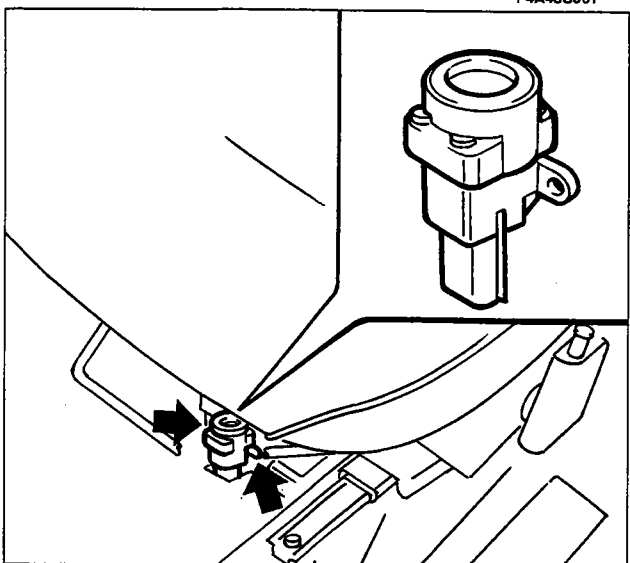
Resistance value 16.2 ohm

10.

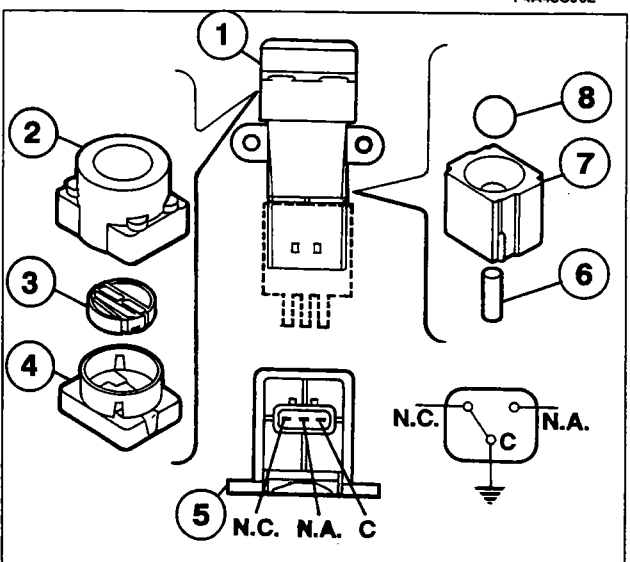
INERTIA SAFETY SWITCH



P4A48CJ01



P4A48CJ02



P4A48CJ03



The vehicle is equipped with an inertia switch located inside the passenger compartment beneath the driver's seat.



This sensor reduces the possibility of fire (caused by fuel emerging from the injection system) by de-activating the fuel feed pump.

The switch consists of a steel ball fitted inside a tapered housing. It is held in position through the attractive force of an permanent magnet.

The ball is released from the magnetic force in the case of violent impact, when it opens the normally closed (NC) electrical circuit to cut off the fuel pump earth connection and thus the fuel supply to the injection system.

To restore the pump earth connection, push the seat back and press the switch until it clicks on.



Removing-refitting

1. Move driver's seat back fully, unscrew the bolts indicated and remove the plastic protection.
2. Unscrew the bolts indicated, disconnect electrical connection and remove the switch.

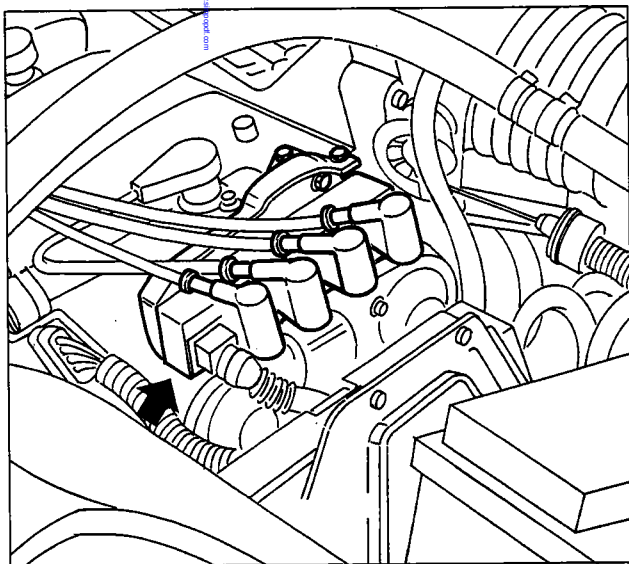


After even an apparently light collision, if a smell of petrol is noted or fuel leaks are seen, do not activate the switch again until the fault has been found and corrected in order to avoid the risk of fire.

Inertia switch components

1. Inertia switch assembly
2. Sheath
3. Button
4. Upper end
5. Fitting end
6. Permanent magnet
7. Permanent magnet seat
8. Steel ball

C= Common terminal
N.C. Normally closed
N.A. Normally open

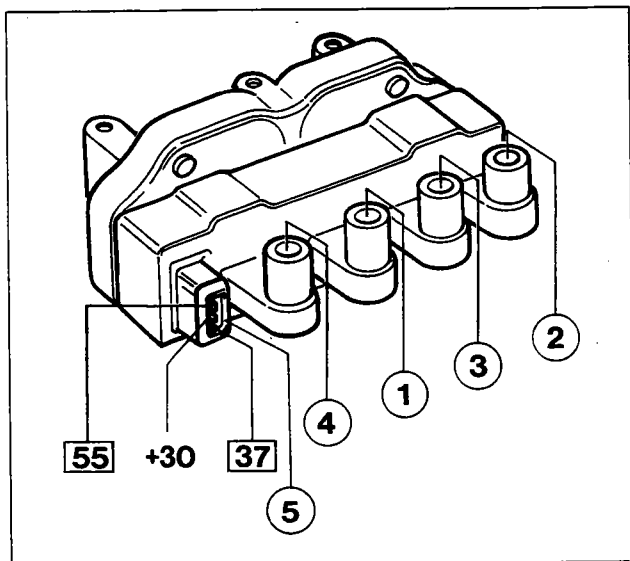


P4A49CJ01

**IGNITION COILS
(Marelli Bae 920A)**

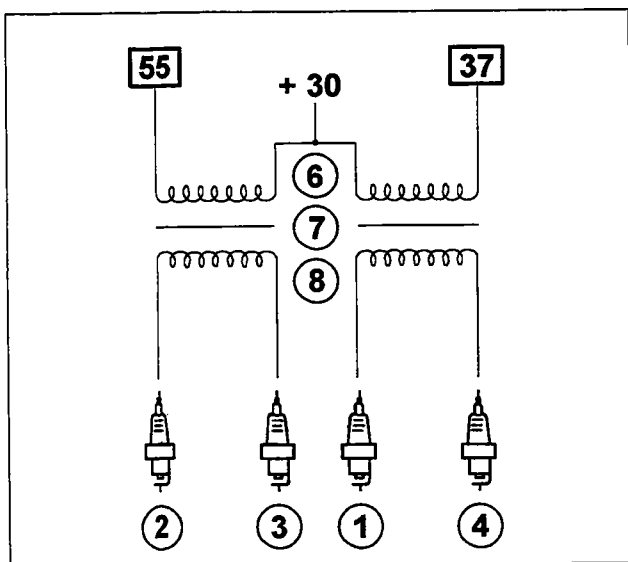
The coils are fastened by means of a bracket to the camshaft covers and are closed magnetic loop type. They are formed from a layered pack, whose central core (broken by a narrow gap) carries both windings.

The windings are placed in a moulded plastic container embedded in epoxy resin, which gives them exceptional dielectric properties. Because the primary winding is so close to the magnetic core, little magnetic flux is lost and coupling with the secondary winding is maximised.



P4A49CJ02

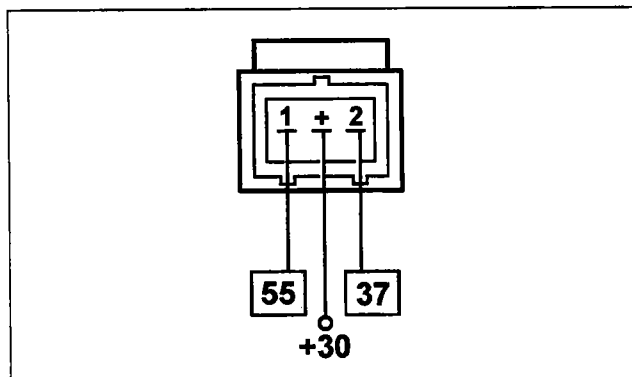
1. HT socket for cylinder no. 1 spark plug
2. HT socket for cylinder no. 2 spark plug
3. HT socket for cylinder no. 3 spark plug
4. HT socket for cylinder no. 4 spark plug
5. LT socket for ECU connection
6. Primary circuit
7. Gap
8. Secondary circuit



P4A49CJ03

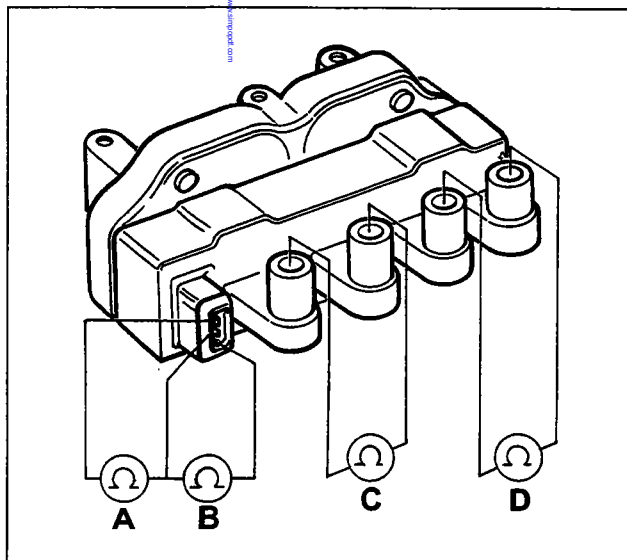
Wiring connector

NOTE The numbers in boxes indicate the corresponding control unit pins.

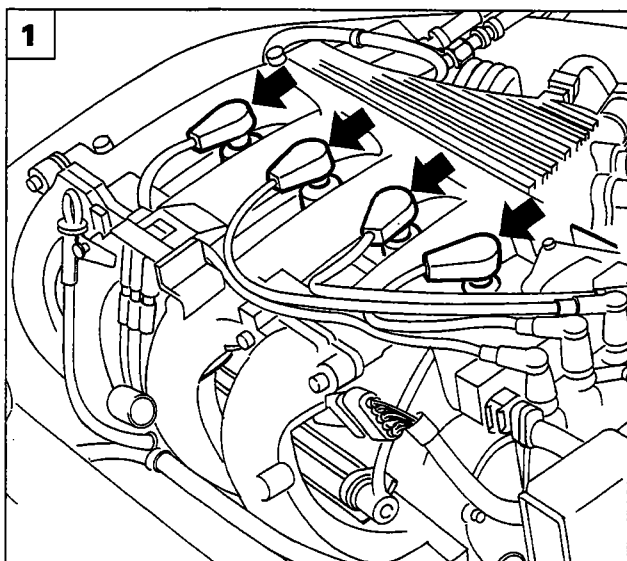


P4A49CJ04

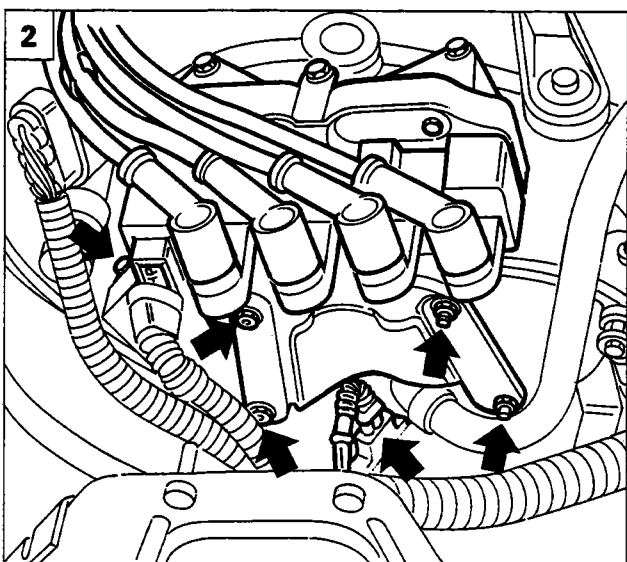
10.



P4A50CJ01



P4A50CJ02



P4A50CJ03



Checking winding resistance

Primary circuit (A cylinders 2-3, B cylinders 1-4)

Bring the probes of an ohmmeter into contact with the positive strip (central pin) and the negative strip (pin 1 for circuit A and pin 2 for circuit B).

The primary circuit resistance reading on the gauge should be between 0.55 and 0.61 ohm at 23 °C.

Secondary circuit (C cylinders 1-4, D cylinders 2-3)

Bring the probes of an ohmmeter into contact between the two high tension outlet terminals.

The secondary winding resistance reading on the gauge must be between 8645 and 9555 ohm at 23 °C.



Recovery

Inhibition of injectors for cylinders in which ignition is not taking place.

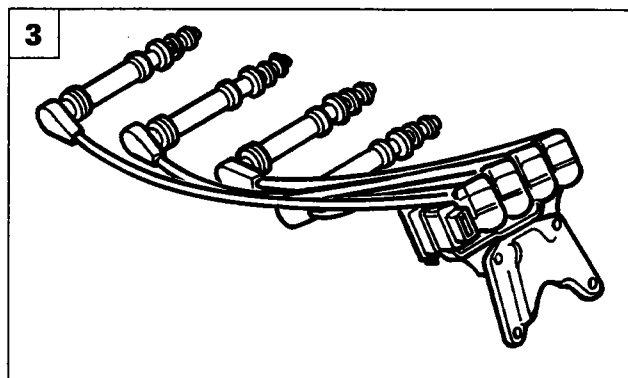
Open-loop concentration control

Current command is de-activated when battery d.c. is applied in order to try again later. If circuit is broken, or GND under d.c., charge time assumed to be dependent upon battery voltage.



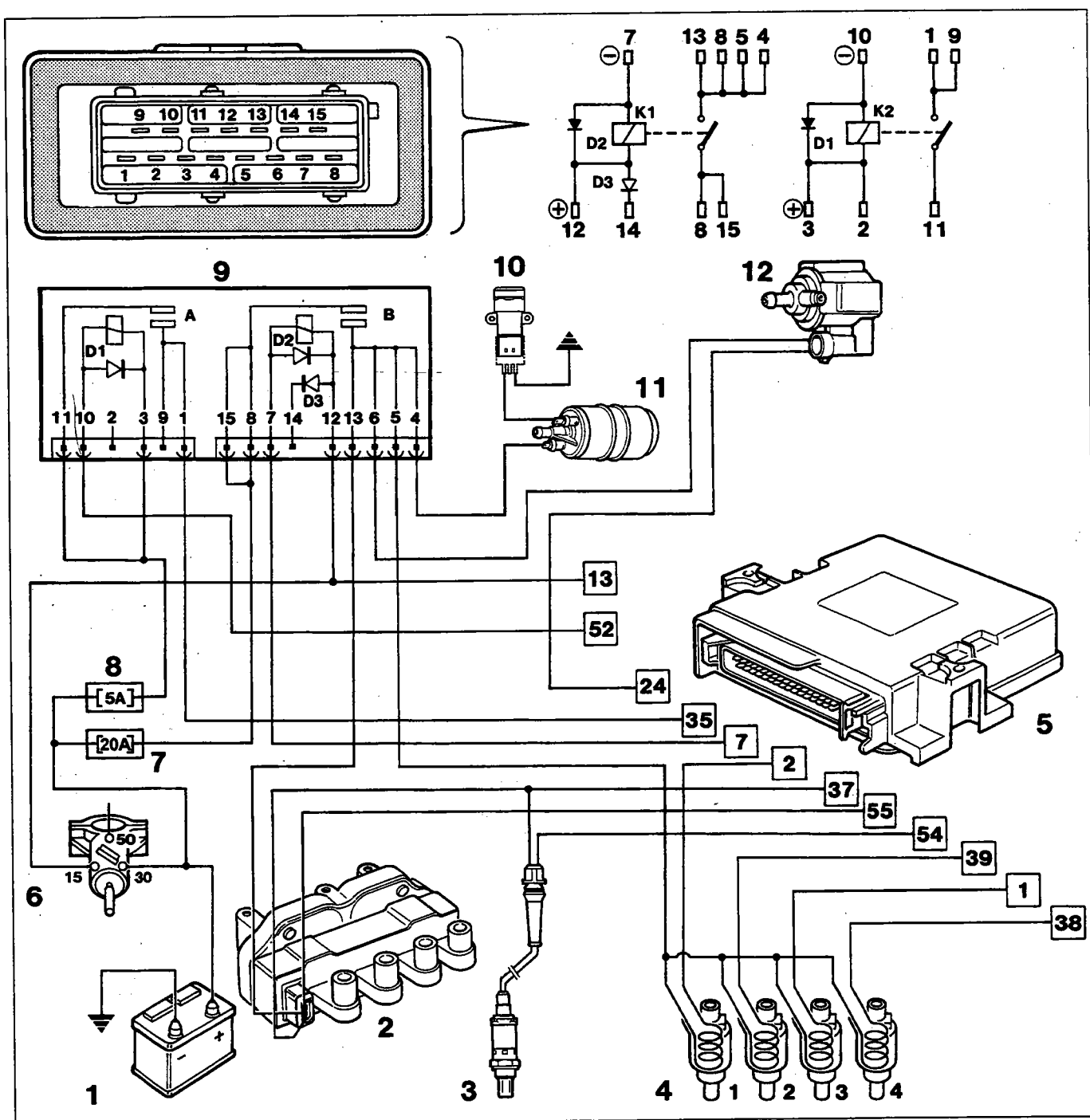
Removing refitting

1. Disconnect HT leads from spark plugs.
2. Disconnect electrical connections from the coils and the coolant temperature sensor; unscrew the nuts indicated and remove the coil/HT lead/support bracket assembly.
3. Disconnect the mount bracket and HT leads from the coils.



P4A50CJ04

DUAL RELAY (NDRS 240103)



P4A51CJ01

- | | |
|----------------------------|---|
| 1. Battery | 8. 5A control unit fuse |
| 2. Ignition coils | 9. Dual relay (A-Control unit B-Electric fuel pump) |
| 3. Lambda probe | 10. Inertia safety switch |
| 4. Injectors | 11. Electric fuel pump |
| 5. Electronic control unit | 12. Fuel vapour cut-off solenoid |
| 6. Ignition switch | |
| 7. 20A system fuse | |

10.

A dual relay specifically for automotive applications ensures the battery voltage reaches the system. This electrical device consists of a single container containing two special normally open relays whose task is to supply the electronic control unit (section A, control unit supply) and main injection-ignition power circuits (pump, coils etc.) (section B).

When ignition key is in MAR position "Services 15/54", excitation winding of relay (9) on pin 12 and ECU on pin 13 are activated.

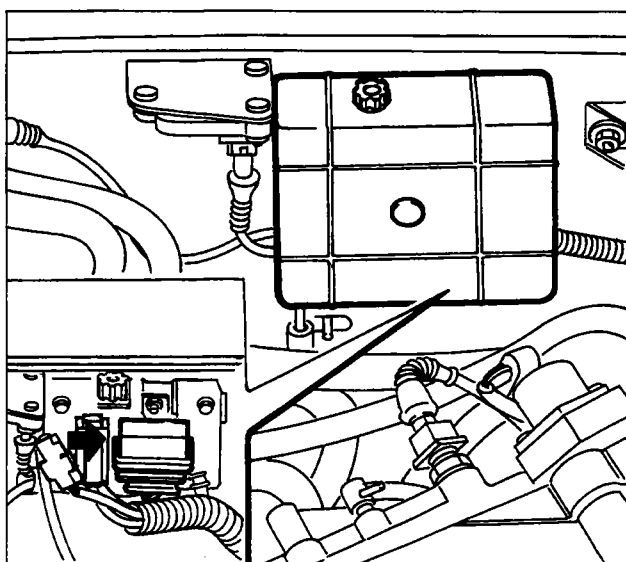
As soon as ECU (5) receives voltage at pin 13 through pin 52 (internal earth), it enables closure of power contacts of relay A (ECU POWER SUPPLY section) to ensure the battery is supplied at pin 35 through fuse (8); it then enables closure of power contacts of relay B in order to earth pin 7 and ensure a power supply to pump (11) and the other sensors and actuators making up the injection system.

The fuel pump must be activated before starting up the engine to ensure that the fuel system is already under a pressure of 3 ± 0.5 bar. If starting does not take place with the ignition key in MAR position, the electronic control unit (5) deactivates section of relay (9) pin 7 (pump-components) and automatically stops the pump (11). Timed enablement lasts about 10 sec.

For safety reasons, the ECU (5) activates a control strategy for pump (11) based on engine rpm. In practice, the ECU (5) deactivates section of relay (9) pin 7 in order to cut off supply to the pump (11) when engine rpm drops below a minimum memorised threshold, if the engine stalls with the ignition on or if the start-up code is not recognised by the Fiat CODE system.

When the ignition key is returned to STOP position, the electronic control unit maintains section A of the dual relay excited for about 90 seconds before cutting off its power supply (time taken to transfer data from RAM STAND-BY memory to the EEPROM).

NOTE Diodes D1 and D2 reduce voltage surges in the respective relays. Diode D3 acts against the voltage from the low alternator charge warning light.



P4A52CJ01



Removing-refitting

The dual relay is fitted on a bracket against the rear wall of the engine bay. Proceed as follows to remove-refit:

Remove the protective cover.
Disconnect electrical connection and remove the dual relay.

LAMBDA PROBE (NTK 0ZA112-A1)

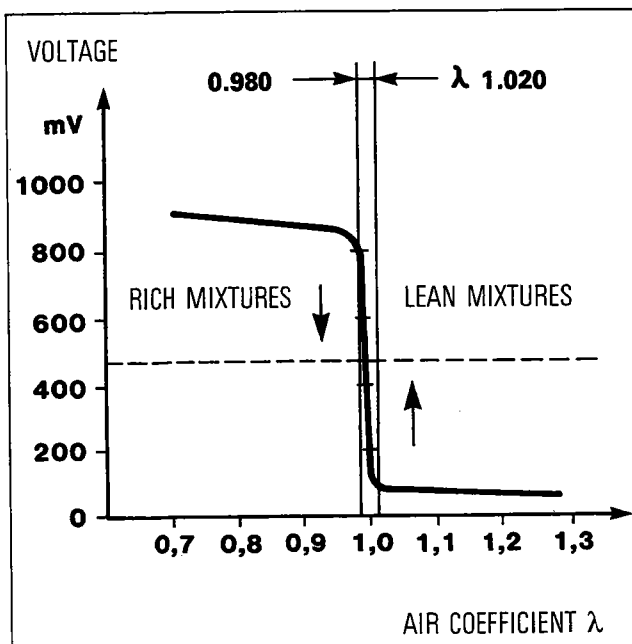
This sensor measures exhaust gas oxygen content.

The sensor output signal is sent to the electronic control unit to adjust the air-fuel mixture in order to maintain the ratio as close as possible to stoichiometric levels.

To obtain an optimum mixture, the quantity of fuel injected must be as close as possible to a theoretical quantity that could be fully burnt for a given amount of air taken in by the engine.

In this case, Lambda factor (λ) is said to be equal to 1; in fact:

$$\lambda = \frac{\text{INTAKE AIR QUANTITY}}{\text{THEORETICAL QUANTITY OF AIR NECESSARY TO BURN ALL THE FUEL INJECTED}}$$



P4A53CJ01

- $\lambda = 1$ Ideal mixture
CO levels are within legal limits
- $\lambda \geq 1$ Lean mixture
Excess air; CO levels tend to be low
- $\lambda \leq 1$ Rich mixture
Lack of air; CO levels tend to be high

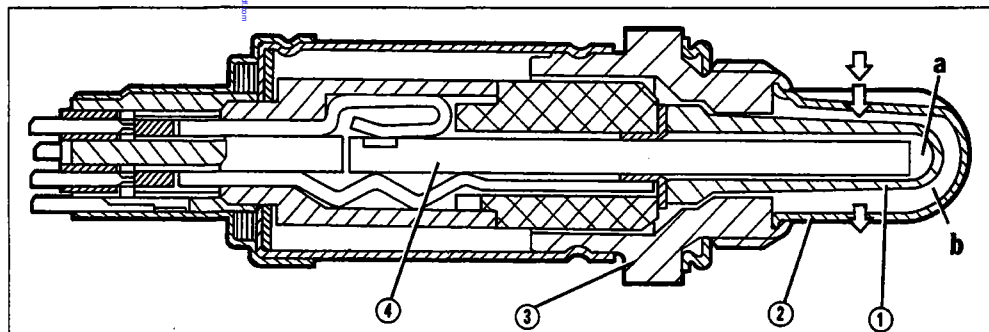
NOTE While the coefficient λ expresses an excess or lack of air supplied to the engine in relation to the theoretical required level, the air-fuel mixture is a ratio between these two substances that react chemically when combined. The stoichiometric proportions depend on fuel type used: this ratio is 14.7-14.8 for present-day engines, which means they require 14.7 parts of air to burn 1 part of petrol fully.

The probe is fastened upstream of the converter.

It consists of a ceramic case (1) made up of a zirconium dioxide base covered by a light layer of platinum. It is sealed at one end, enclosed in protective pipe (2), and housed in metal case (3) that provides further protection and permits installation to the exhaust manifold. The outer part (B) of the ceramic case is exposed to the exhaust gas flow while inner part (A) communicates with the outside air.

The probe works on the principle that when the temperature exceeds 300 °C, the ceramic material used begins to conduct oxygen ions. Under these conditions, if the levels of oxygen at both ends (a and b) of the probe are different, a voltage variation is set up between the two ends. This signal notifies the ECU that the oxygen residues in the exhaust gas are not in proportions that will ensure lean burning of harmful residues.

10.



- a. Electrode (+) in contact with outside air
- b. Electrode (-) in contact with exhaust gas
- 1. Ceramic case
- 2. Protective pipe
- 3. Metal case
- 4. Electrical resistance

When the probe supplies a low voltage level (less than 200 mV) the ECU recognises that the mixture is lean ($\lambda \gg 1$) and takes steps to increase the amount of fuel injected. When the probe supplies a high voltage level (greater than 800 mV) the control unit recognises that the mixture is rich ($\lambda \ll 1$) and decreases the quantity of fuel injected.

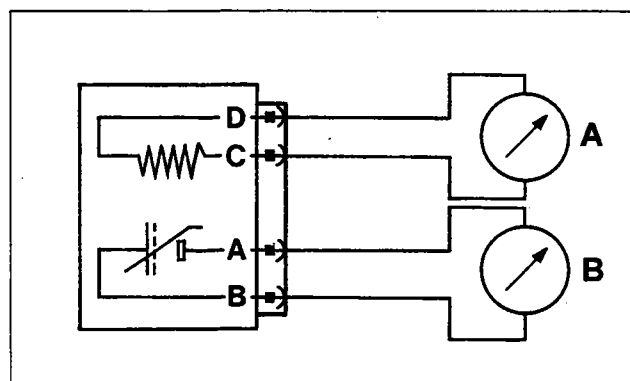
The lambda probe therefore alters injection times to ensure that the engine operates with a lambda factor continually fluctuating between 0.980 and 1.020.

Below 300 °C the ceramic material is not active and the probe does not send usable signals. A special circuit in the control unit blocks loop mixture regulation while the probe is warming up.

To ensure service temperature is reached quickly, the probe is equipped with electrical resistance (4) supplied by the battery



The probe may be swiftly put out of service by even slight traces of lead in the fuel. Operation should be checked at 45,000 and 90,000 km in accordance with the programmed maintenance plan.



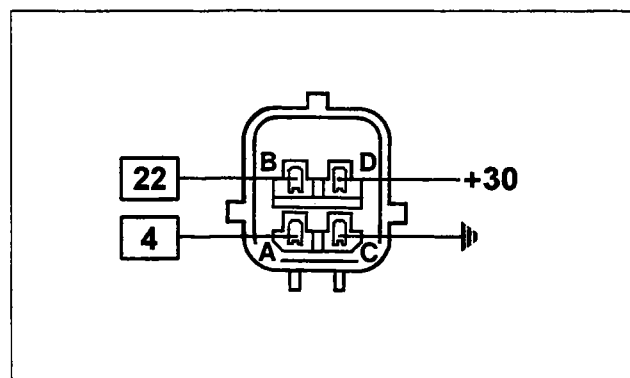
P4A54CJ02

Checking resistance

The heater and probe resistance may be measured by disconnecting the connector and connecting an ohmmeter as indicated in the figure.

Heater resistance (A) = 4.3 - 4.7 ohm

Probe resistance (B) = 5000 ohm (max)



P4A54CJ03

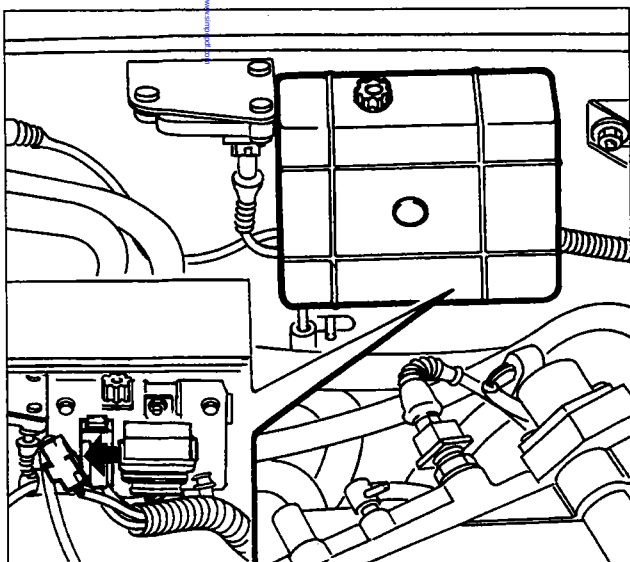
Recovery

Lambda data are ignored (open loop).

Wiring connector

The numbers in boxes indicate the corresponding control unit pins.

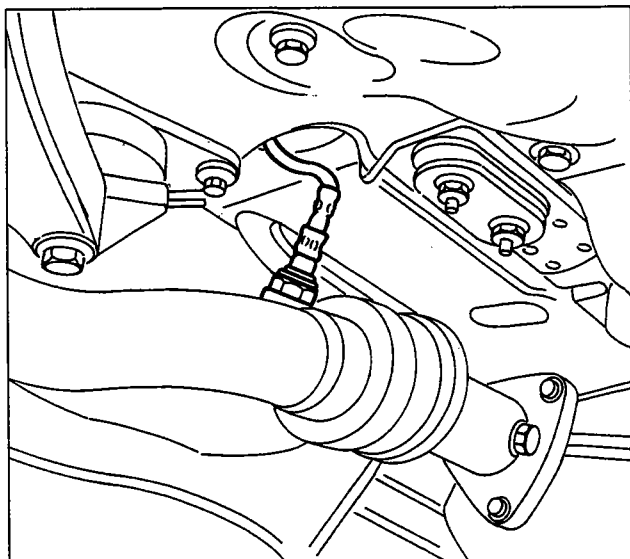
10.



P4A55CJ01

**REMOVING - REFITTING LAMBDA PROBE**

- Position vehicle on lift
- Disconnect battery negative lead
- Disconnect electrical connection located against the rear wall of the engine bay and protected by a cover.



P4A55CJ02



Remove the lambda probe from its seat on the exhaust pipe.



*When refitting, spread the threaded part with **ANTISEIZE MATERIAL-A-BORON NITRIDE N.G.K.** grease from **SPARK PLUG CO-LTD.***



Tightening torque 3.5 - 4.5 daNm

10.

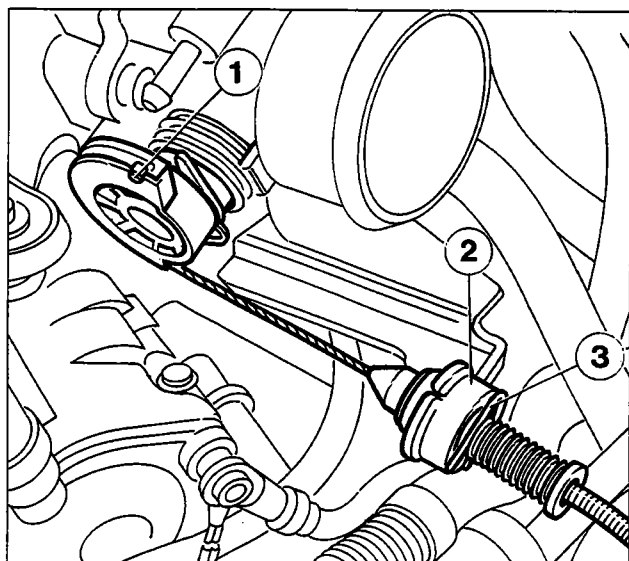
CHECKS, ADJUSTMENTS AND REPAIRS TO I.A.W. INJECTION-IGNITION SYSTEM.



OBSERVE THE FOLLOWING PRECAUTIONS WHEN WORKING ON VEHICLES WITH IAW INJECTION-IGNITION SYSTEMS:

- never start the engine when the electrical terminals are poorly connected or loose on the battery poles;
- never use a quick battery charger to start the engine;
- never disconnect the battery from the car circuit with the engine running;
- when charging the battery quickly, first disconnect the battery from the vehicle circuit;
- if the vehicle is placed in a drying oven after painting at a temperature of more than 80° C, first remove the injection/ignition ECU;
- never connect or disconnect the ECU multiple connector with the ignition key in MARCIA position;
- always disconnect battery negative lead before carrying out electrical welding on vehicle.

Note that the memory of this system is active at all times (memory on stand-by), and contains all learnt self-adaptive parameters. Because all this information would be lost if the battery were disconnected, this operation should only be carried out when absolutely essential.



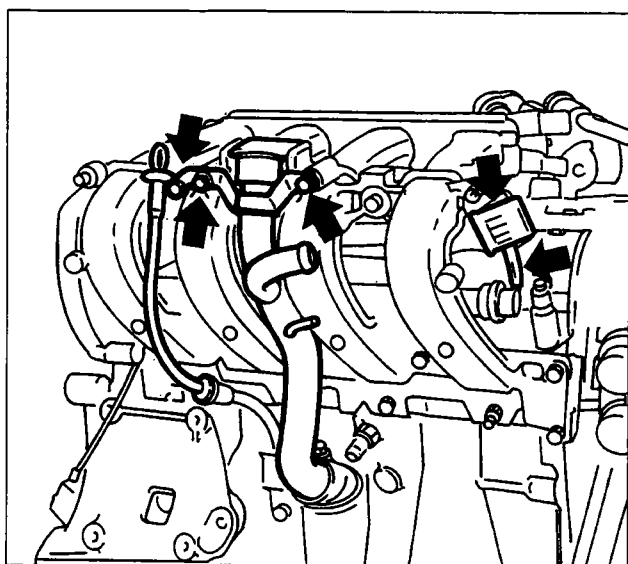
P4A56CJ01



ADJUSTING THROTTLE CABLE

The accelerator cable is adjusted by moving clip (3) along the grooves on bush (2).

Position the clip so that head (1) of the accelerator cable fits freely into the slot without altering idle speed.



P4A56CJ02

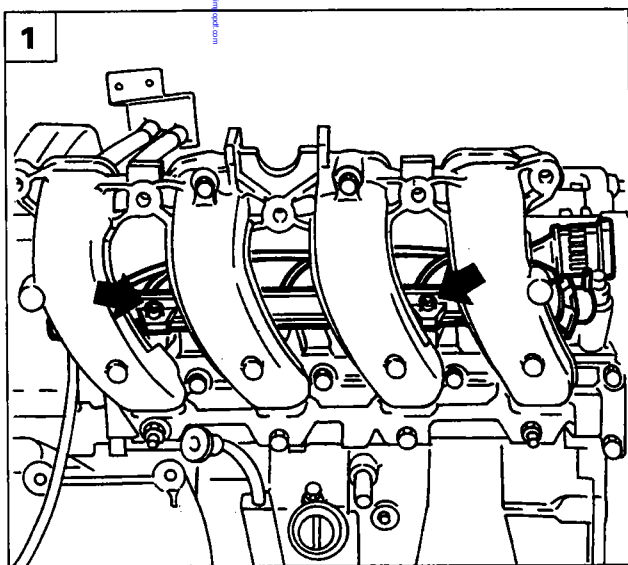


REMOVING-REFITTING FUEL MANIFOLD TOGETHER WITH INJECTORS AND PRESSURE REGULATOR

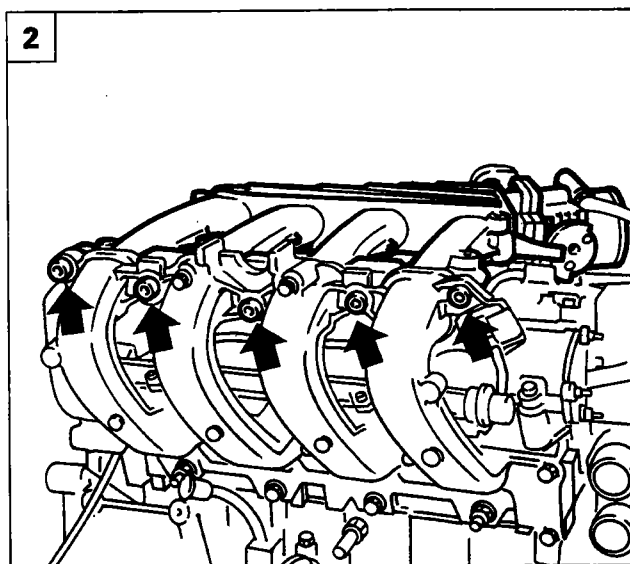


Disconnect the first section of the oil dipstick mount, disconnect the oil filler pipe, disconnect the injector lead coupling and the pipe connecting the regulator to the vacuum point.

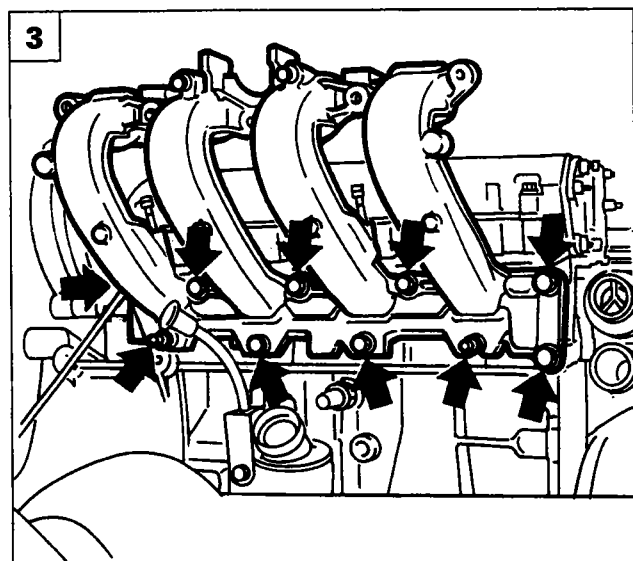
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P4A57CJ01



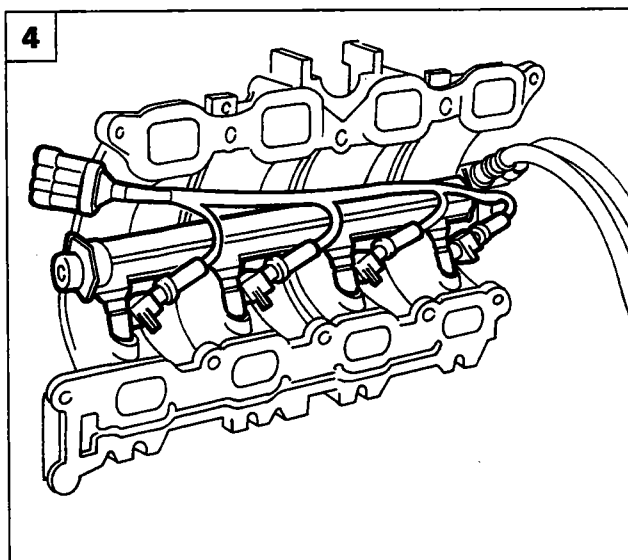
P4A57CJ02



P4A57CJ03



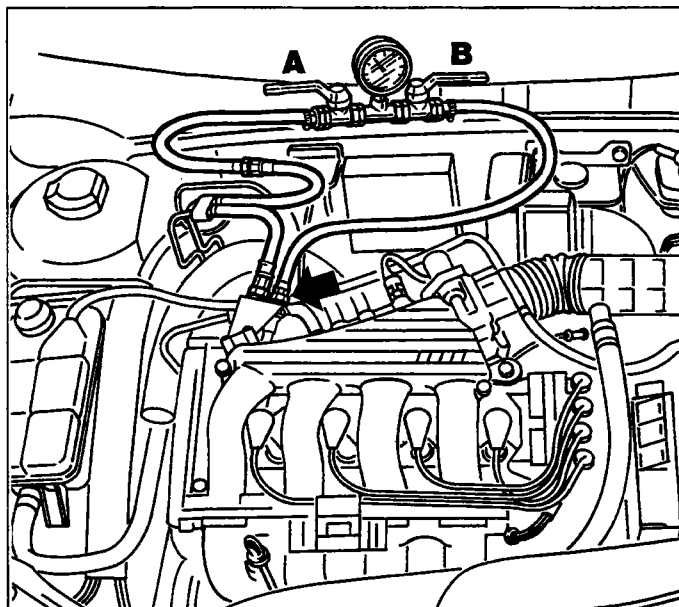
1. Unscrew the bolts fastening the fuel supply manifold.
2. Unscrew the bolts fastening both sections of the intake manifold together.
3. Unscrew screws fastening the second section of the intake manifold to the engine block and remove.
4. Disconnect the fuel lines and remove the manifold together with regulator and injectors.



P4A42CJ01

10.

CHECKING FUEL SUPPLY CIRCUIT



P4A58CJ01

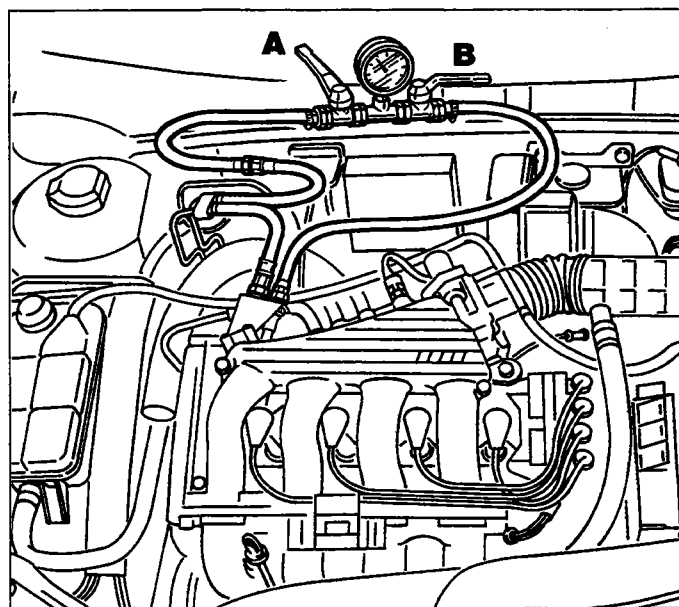


Test 1

Testing fuel regulation pressure

- Disconnect fuel delivery line to manifold from arrowed fitting.
- Interpose pressure gauge 1895890000 between the disconnected pipe end and the fuel manifold with cocks (A) and (B) open.
- Activate fuel pump with engine off.

The last operation is carried out by selecting "fuel pump" test on a Fiat/Lancia tester. Under these conditions, the pressure gauge reading should stabilise at 3.0 bar. If pressure is insufficient, carry out the test 2.



P4A58CJ02

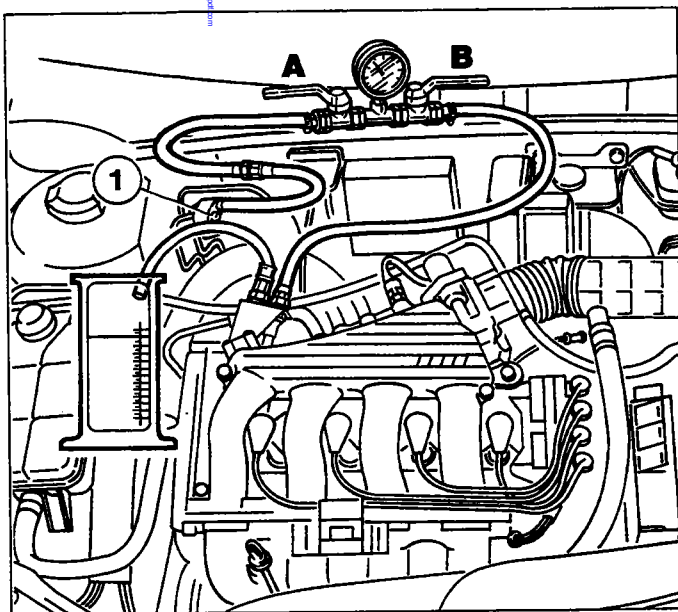


Test 2

Testing maximum fuel feed pressure (or pump efficiency)

Same connections as previous test.

- Close fuel cock lever (A);
- operate the pump with the engine off, as described previously: pressure should not exceed 7 bar (pump pressure relief valve setting). Otherwise, replace the pump because it is defective.

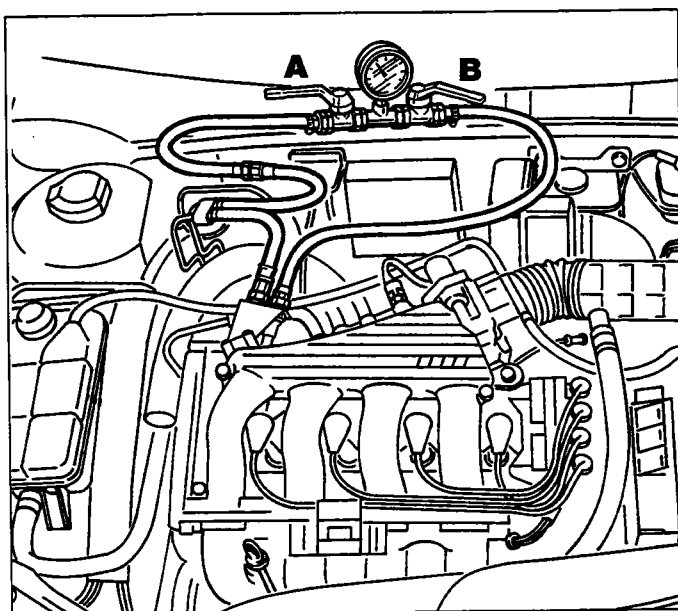


P4A59CJ01



If pressure measured in test 1 (see previous page) exceeds 3 bars proceed as follows:

- disconnect fuel return pipe (at point (1) for connection to rigid fuel return line to pump) and place in a container suitable for collecting the fuel.
- open cocks A and B;
- operate the fuel pump with engine off as described on previous page, then take pressure reading off pressure gauge:
 - a. if it reaches 3 bars replace the fuel return pipe to the tank because it is blocked or kinked;
 - b. if it exceeds 3 bars replace the pressure regulator because it is defective.



P4A59CJ02



Test 3

Checking injector seal

To check for drips from the injectors, connect as described in first test (regulation pressure check) and then operate the pump with the engine off. When the regulation pressure is reached, close control lever B and simultaneously constrict fuel return line to tank; use pliers for this purpose and avoid damaging the pipe.

This operation is necessary to discriminate between true loss from the injectors and a faulty seal on the fuel pressure regulator runout valve.

Then:

- turn off the pump;
- see whether pressure remains constant for 60 seconds after stabilising (i.e. dropping slightly).

If it does not, one or more injectors or a fitting are leaking.

- In this case, disconnect the fuel manifold from the intake manifold and keep the pressure gauge connected.
- Repeat the previous test but leave the pressure gauge cock open.
- After supplying the pump with the engine off, look to see whether any of the injectors or connection sections are dripping.

Replace any dripping injectors and/or repair the defective seal in the leaking joint.

10.

CHECKING ENGINE IDLE SPEED

If engine speed is not 850 ± 50 rpm, because the injection-ignition system is self-regulating, no adjustment can be carried out. It is therefore necessary to check that the accelerator linkage is properly adjusted and then search for the fault through full diagnosis using a Fiat/Lancia Tester.

CHECKING LEVELS OF POLLUTING EMISSIONS

The IAW - 1AF.13 system is self-adaptive and thus constantly monitors idle speed and CO levels. Therefore there is no need for manual adjustment (adjustment screws are no longer fitted). However, checking exhaust contents downstream of the catalytic converter can provide useful information about the injection-ignition system condition, engine and catalytic converter parameters

Checking CO and HC levels when idling

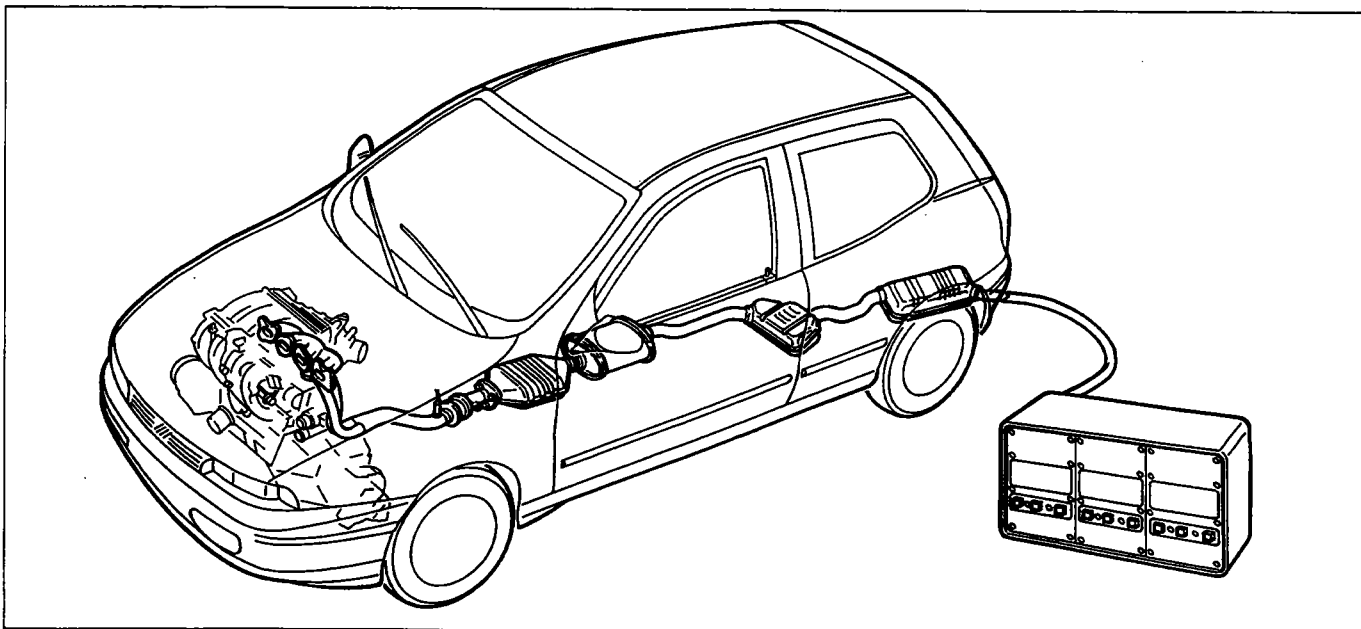
Measure levels of carbon monoxide (CO) and unburnt hydrocarbons (HC) with the catalytic converter hot ($300 - 350^{\circ}\text{C}$) (it is advisable to push the car engine on the road for about 5-10 minutes to ensure that the catalytic converter reaches service temperature), Then fit the probe of a suitably calibrated tester to at least 30 cm as indicated in the figure.

If the shape of the exhaust tail pipe will not allow the probe to be fully inserted, add an extension pipe designed to ensure a seal in the joint area.

1. Check that CO and HC levels are as specified in the table;
2. If CO level is not as specified, check that:
 - Lambda probe is working properly, with the aid of a Fiat/Lancia Tester;
 - for air leaks in the area surrounding the lambda probe seat
 - the injection and ignition system (**particularly for spark plug wear**).
3. If HC level is not as specified, the engine is not properly tuned or the catalytic converter is not efficient.

CO (%)	HC (p.p.m.)	CO ₂ (%)
≤ 0.35	≤ 90	≥ 13

Summary table showing emission level tolerances downstream of converter



P4A60CJ01

DIAGNOSIS

System self-diagnosis

Self-diagnosis aims to reveal faults in the following components:

Actuators

- Injectors
- Idle speed actuator
- Ignition coils
- Vapour recirculation solenoid
- Fiat CODE

SENSORS

- Rpm and TDC sensor.
- Absolute pressure sensor
- Coolant temperature sensor
- Intake air temperature sensor
- Throttle position sensor
- Lambda probe
- Timing sensor

A warning light on the control panel will not necessarily come on if a fault occurs.

If sensors are not working, the system implements signal reconstruction strategies (recovery) in order that engine and catalytic converter can function adequately but without experiencing further damage

In this condition, the vehicle can be driven to a service centre for the necessary repairs.

Once the fault has been corrected, the warning light will go off

Any fault that occurs is memorised temporarily by the system control unit in order to facilitate repairs. When the ignition key is removed, these are transferred to the permanent memory where they can be read by a Fiat/Lancia Tester.

Diagnosis using Fiat/Lancia tester

Connect the Fiat/Lancia Tester (F.L.T.) to a socket beside the ECU.

Information is exchanged between ECU and Tester via two test lines (K e L); the communication protocol follows ISO 8 standards. Line K is two-way while line L is one-directional (from Tester at control unit).

The protocol is Master-Slave type sustained at 4800 baud on K line; dialogue is activated by directing to 5 bits on line L.

The Tester is connected to the ECU as follows:

1. Connect the Fiat-Lancia Tester using «ADAPTER ADT 101 A»
2. Activate TESTER either through the cigar lighter or by connecting directly to the battery (a special extra lead is provided for this purpose).
3. Connect the Tester socket to the test socket.

The Tester is able to perform the following functions:

- Engine parameter display
- Error display
- Active diagnosis

10.

DISPLAYED PARAMETERS

Engine rpm
Injection time
Absolute pressure to inlet manifold
Air temperature
Coolant temperature
Throttle opening angle
Battery voltage
Voltage LAMBDA probe status
Engine idle speed actuator
Self-adaptability
Vehicle speed
Mixture level
Petrol vapour solenoid
Fiat CODE

List of errors

RPM sensor	A.C-D.C.
Throttle potentiometer	A.C-D.C.
Absolute pressure sensor	A.C-D.C.
Air temperature sensor	A.C-D.C.
Coolant temperature sensor	A.C-D.C.
Battery	Power supply > 15.5V Power supply < 5V Status not plausible (probe disconnected or faulty)
Lambda probe	D.C.
Injector	A.C-D.C.
Ignition coils	A.C-D.C.
Idle speed actuator	No. of subsequent steps
Fuel vapour solenoid	A.C-D.C.
Actuator relays	A.C-D.C.
Control unit	Microprocessor or ECU memory faults are indicated.
Self-adaptive parameters	Indication displayed when ECU self-adaptive limits reached. This indication means that engine conditions are much too far from specified levels and mechanical causes should also be investigated.
Timing sensor	A.C-D.C.
Speed sensor	Signal absent
Signal framework	Tooth count incorrect - Space between two missing teeth not recognised
Mixture level	Greater than maximum threshold Lower than minimum threshold
Fiat CODE	Code not recognised or not received

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HITACHI INTEGRATED INJECTION/IGNITION SYSTEM**Introduction**

The Hitachi system fitted on the Bravo-Brava with the 1747 i.e. 16v engine belongs to the category of static advance digital electronic ignition systems integrated with multiple phased type intermittent electronic fuel injection systems.

This system therefore has only one control unit, one set of wiring and one set of common sensors for both systems.

The integrated system can be summarized in the following systems:

ELECTRICAL/ELECTRONIC CIRCUIT**AIR INTAKE CIRCUIT****FUEL SUPPLY CIRCUIT****EMISSION CONTROL DEVICES**

The system is capable of detecting the following parameters via special sensors:

1. the engine rotation speed;
2. the position of each pair of pistons in relation to TDC for cylinder 1;
3. the engine intake air flow rate;
4. the position and the speed of the variation of the position of the accelerator butterfly;
5. the temperature of the engine coolant;
6. the effective strength of the mixture (through the Lambda sensor signal);
7. the presence of detonation;
8. the speed of the vehicle;
9. the battery voltage;
10. whether the climate control compressor is switched on.

This information, usually of an analogue type, is converted into digital signals by analogue/digital (A/D) converters in order to be able to be used by the control unit.

In particular, any engine operating point is detected, moment by moment, by two parameters:

- the engine rotation speed, measured in revolutions per minute (rpm);
- the engine load, which is constituted by the quantity of air drawn in by each cylinder.
This quantity is calculated on the basis of the flow rate of the air drawn in and is represented by the parameter TP, measured in milliseconds (ms).

Inside the control unit memory there is a management programme (software) which comprises a series of strategies, each of which manages a precise system control function.

By using the (input) information listed previously, each strategy processes a series of parameters, based on the data maps stored in the control unit memories and then controls the system (output) actuators which are the devices which allow the engine to operate, namely:

1. injectors;
2. ignition coils;
3. solenoid valves implementing various functions;
4. fuel pump;
5. control relays.

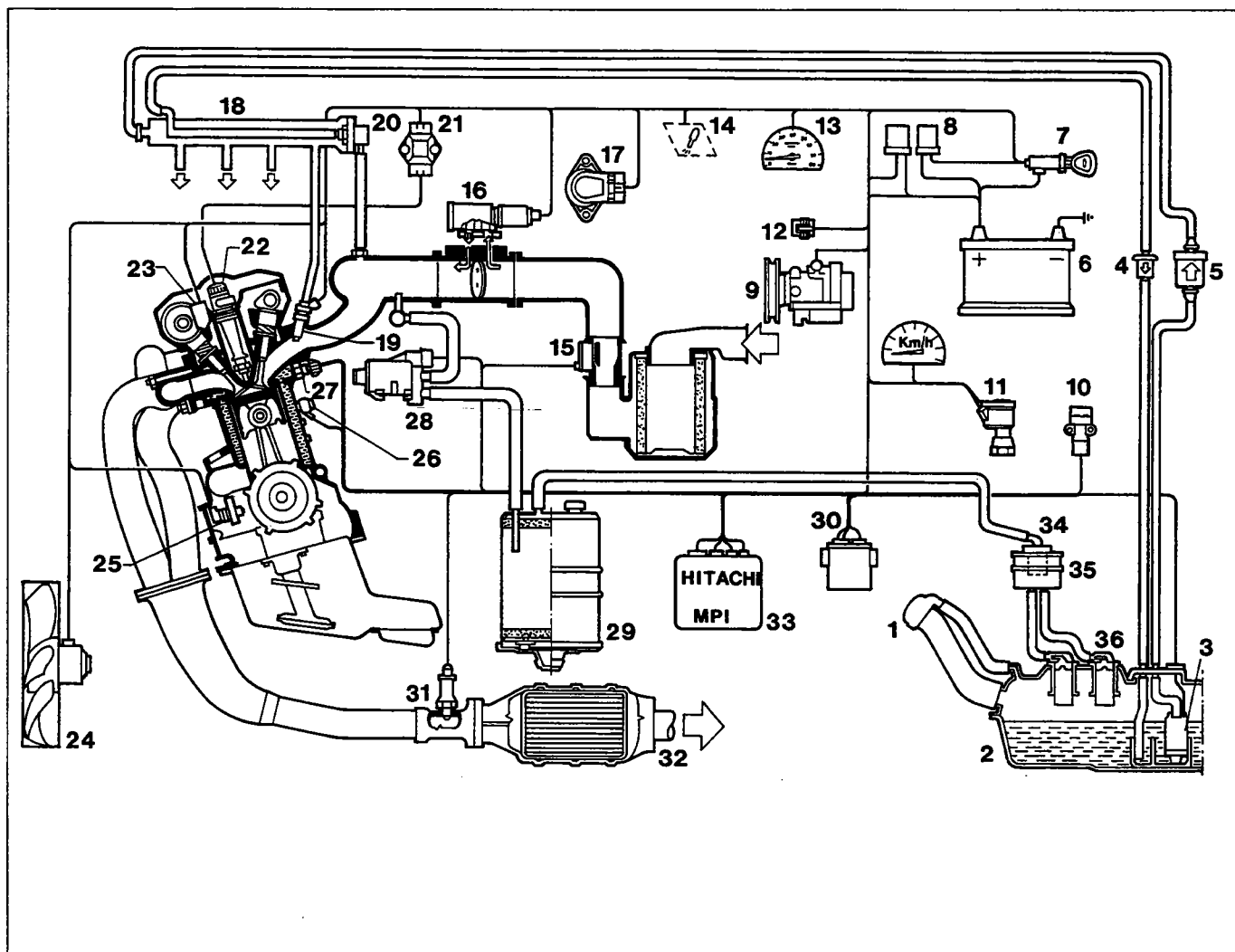
NOTE *The HITACHI injection/ignition system does not require any adjustment as it is self-regulating and self-adjusting.*

NOTE *In the diagrams, the numbers indicate the corresponding HITACHI engine control unit pins.*

NOTE *All the connectors are seen from the side opposite the cable input.*

10.

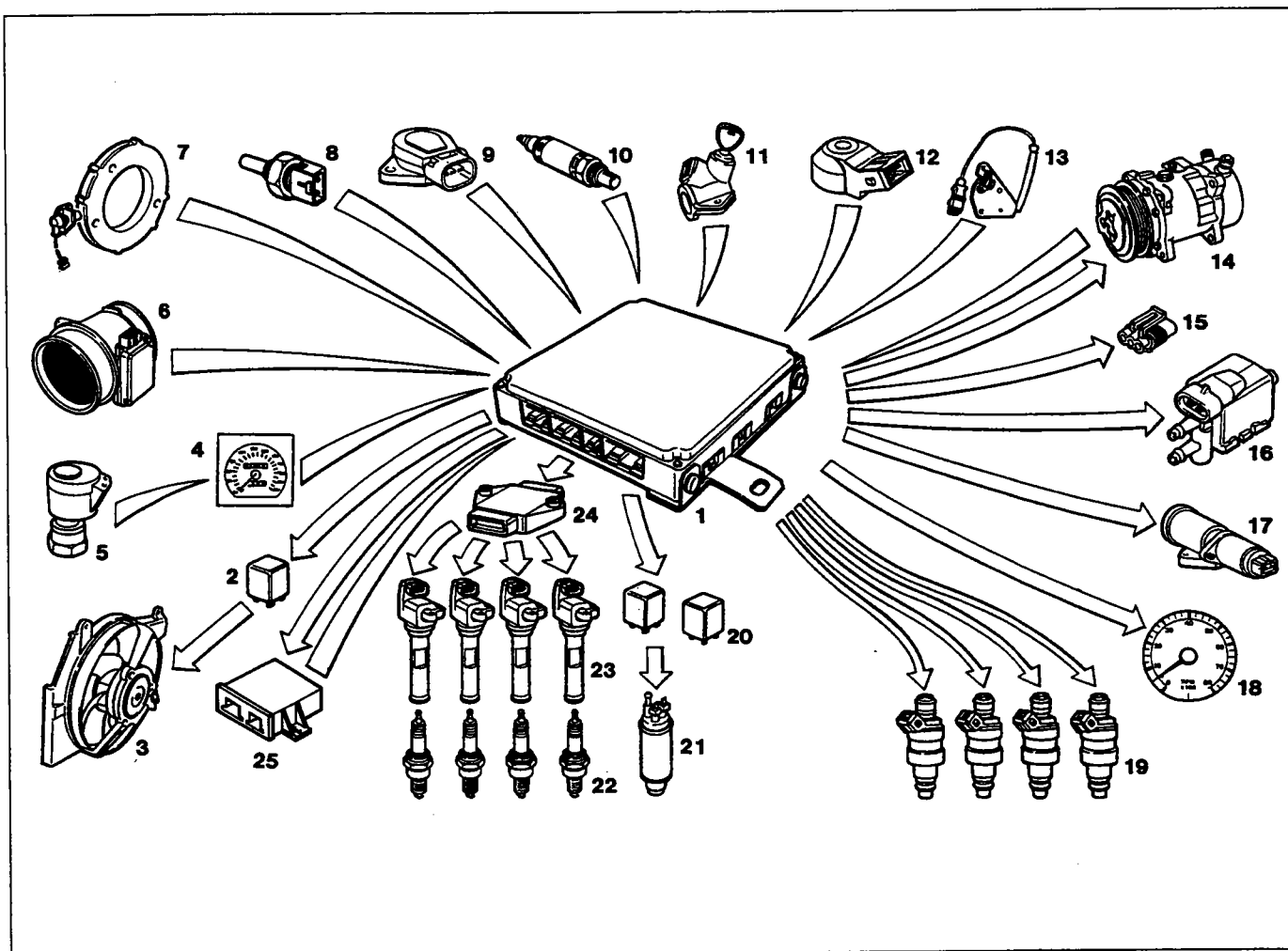
DIAGRAM SHOWING OPERATION OF HITACHI INJECTION/IGNITION SYSTEM



P4A02BJ01

1. Cap with safety valve
2. Fuel tank
3. Electric fuel pump
4. Anti-flow valve
5. Fuel filter
6. Battery
7. Ignition switch
8. System relays
9. Climate control compressor
10. Inertia switch
11. Vehicle speed sensor
12. F/L Tester connector (diagnostic socket)
13. Rev counter
14. System failure light
15. Air flow meter
16. Engine idle adjustment solenoid valve
17. Butterfly position sensor
18. Fuel manifold with integrated pressure regulator
19. Injector
20. Fuel pressure regulator
21. Ignition power module
22. Ignition coil
23. Engine timing sensor
24. Radiator fan
25. Engine rpm sensor
26. Detonation sensor
27. Coolant temperature sensor
28. Charcoal filter solenoid valve
29. Charcoal filter
30. Fiat CODE control unit
31. Lambda sensor
32. Catalytic silencer
33. HITACHI engine control unit
34. Multi-purpose valve
35. Fuel vapour separator
36. Float valve

DIAGRAM SHOWING INFORMATION ARRIVING AT/LEAVING CONTROL UNIT AND HITACHI INJECTION/IGNITION SYSTEM SENSORS/ACTUATORS



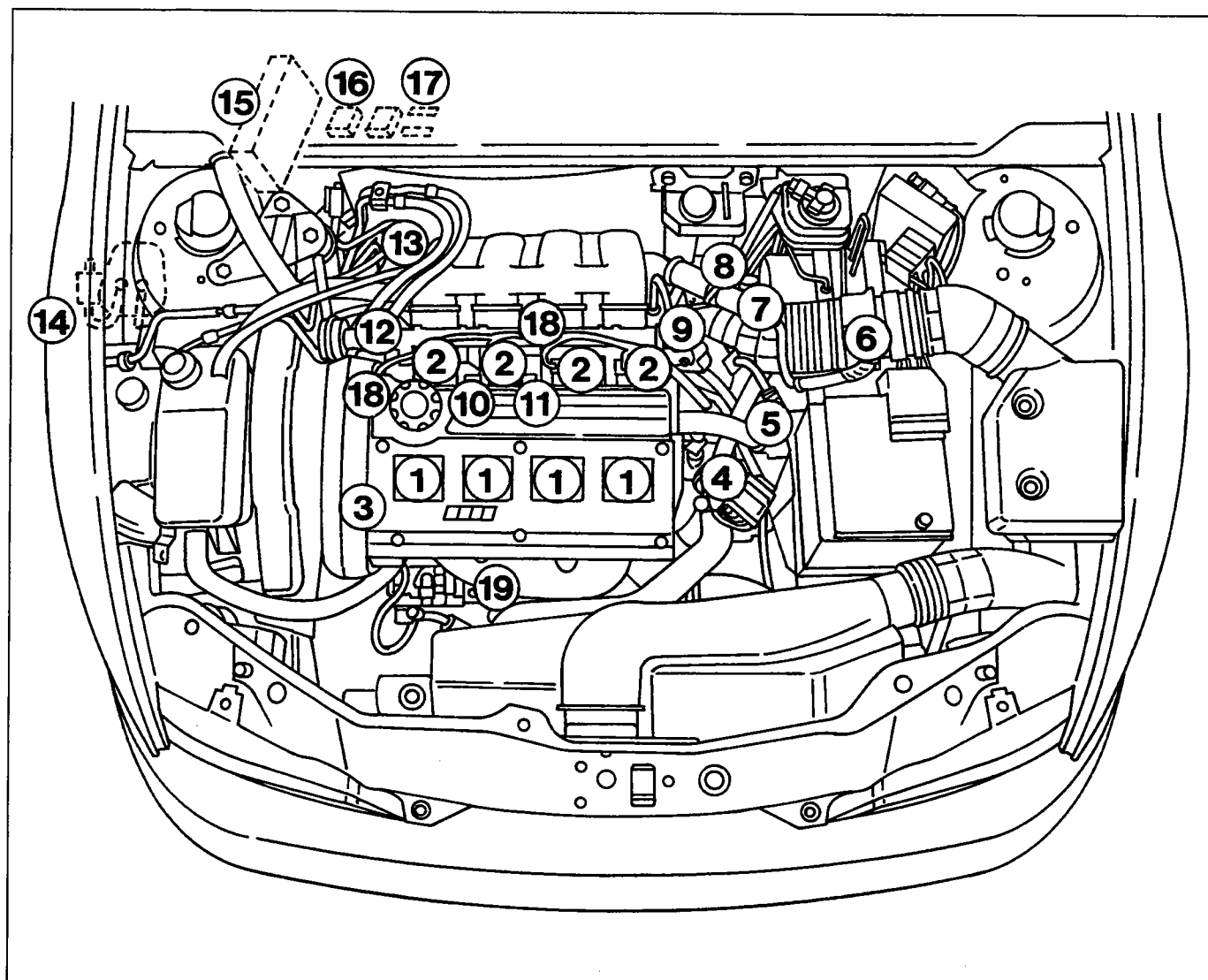
P4A03BJ01

1. HITACHI engine control unit
2. Radiator fan solenoid valve
3. Radiator fan
4. Speedometer
5. Vehicle speed sensor
6. Air flow meter
7. Engine rpm sensor
8. Coolant temperature sensor
9. Butterfly position sensor
10. Lambda sensor
11. Ignition switch
12. Detonation sensor
13. Engine timing sensor

14. Climate control compressor
15. F/L Tester connector (diagnostic socket)
16. Charcoal filter solenoid valve
17. Engine idle adjustment solenoid valve
18. Rev counter
19. Injectors
20. System relays
21. Electric fuel pump
22. Spark plugs
23. Ignition coils
24. Ignition power module
25. Fiat CODE control unit

10.

LOCATION OF HITACHI INJECTION/IGNITION SYSTEM COMPONENTS IN ENGINE COMPARTMENT



P4A04BJ01

- | | |
|--|--------------------------------------|
| 1. Ignition coils | 10. Engine rpm sensor |
| 2. Injectors | 11. Detonation sensor |
| 3. Engine timing sensor | 12. Fuel manifold |
| 4. Coolant temperature sensor | 13. Ignition power module |
| 5. Vehicle speed sensor | 14. Charcoal filter solenoid valve |
| 6. Air flow meter | 15. HITACHI engine control unit |
| 7. Engine idle speed adjustment solenoid valve | 16. Relays |
| 8. Butterfly position sensor | 17. Fuses |
| 9. Fuel pressure regulator | 18. Injection/ignition system earths |
| | 19. Lambda sensor |

SYSTEM MANAGEMENT STRATEGIES

SIGNAL MANAGEMENT

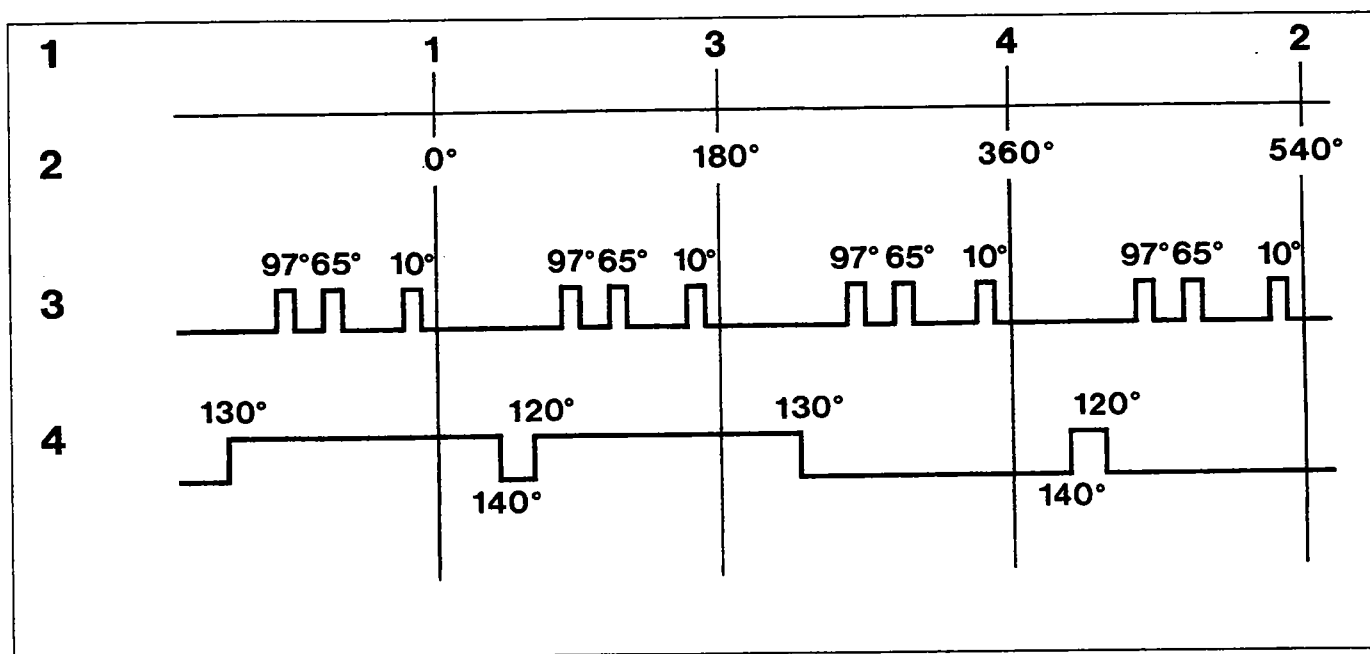
During starting, the control unit recognizes the injection and ignition timing which are fundamental for the subsequent operation of all strategies.

This recognition is implemented on the basis of the interpretation of the succession of signals coming from the flywheel sensor on the crankshaft and from the engine timing sensor on the camshaft.

NOTE *The end of the signals refers to the collection of signals coming from the sensor on the crankshaft and the one on the camshaft which, featuring a precise reciprocal position, supply the control unit with a synchronized sequence of signals which the control unit is capable of recognizing.*

In particular, the signals are made up as follows:

- flywheel on the crankshaft: equipped with two symmetrical sets of teeth, located at 10°, 65° and 97°, respectively in advance of each TDC;
- flywheel on the camshaft: equipped with two long windows and a short one, wide enough and positioned in such a way as to supply the signal as shown in the diagram.



P4A05BJ01

1. cylinder TDC
2. Crankshaft angles
3. Crankshaft flywheel signal (engine rpm sensor)
4. Camshaft flywheel (engine timing sensor)

NOTE *The numerical values relating to the signals indicate the crankshaft angles in advance of TDC.*

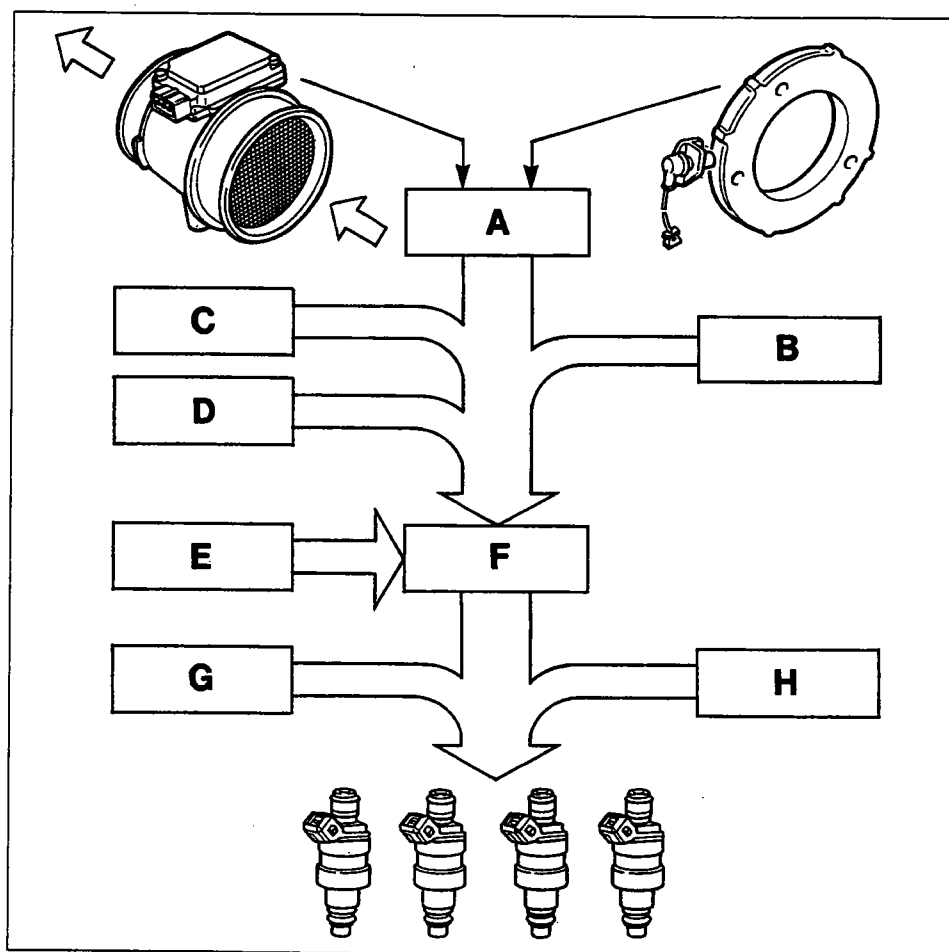
10.

INJECTION MANAGEMENT

The injection management strategies have the aim of supplying the engine with the correct quantity of fuel at the desired moment according to the engine operating conditions.

NOTE *The presence of the air flow meter makes it possible to directly measure the mass of intake air, making the presence of the intake air temperature sensor superfluous.*

The management of the injection consists essentially in the calculation of the injection time, the determining of the injection timing and the subsequent implementation by operating the injector. The "basic" injection time depends on the characteristics of the injector and corresponds to the quantity of fuel to be injected into each cylinder. The latter, in turn, multiplies the quantity of air drawn in by each cylinder (calculated on the basis of the quantity of intake air and on the engine rotation speed) for the desired mixture strength in relation to the engine operating point. The final injection time is determined through a calculation algorithm in which the "basic" injection time is corrected by a series of coefficients which take into account the different engine operating conditions which are shown by the various sensors present in the system.



P4A06BJ01

A: "basic" injection time

B: corrective coefficients:

low engine temperature
high engine temperature
starting and post-starting
butterfly fully open
deceleration
acceleration

C: checking mixture strength

D: self-adjustment

E: cut-off

F: intermediate injection time

G: extra-pulse

H: management not timed by injection

Checking mixture strength

NOTE The following ratio is defined as the mixture ratio and is denoted by the Greek letter α (alfa):

$$\frac{\text{quantity of air drawn in by the engine}}{\text{quantity of fuel injected}}$$

The following ratio is defined as the stoichiometric mixture and is denoted by α_{st} :

$$\frac{\text{theoretical quantity of air to burn all the fuel injected}}{\text{quantity of fuel injected}}$$

The following ratio is defined as the mixture strength and is denoted by the Greek letter λ (lambda):

$$\frac{\text{quantity of air drawn in by the engine}}{\text{theoretical quantity of air to burn all the fuel injected}}$$

It can easily be deduced that $\alpha / \alpha_{st} = \lambda$.

The stoichiometric ratio depends on the type of fuel: for current unleaded petrols it is around 14.7 - 14.8 which corresponds to a Lambda strength of 1.

We talk of a mixture being *rich* when the quantity of air is lower than the stoichiometric ratio in which case the Lambda < 1:

we talk of a mixture being *poor* (or *lean*) when the quantity of air is higher than the stoichiometric ratio in which case the Lambda > 1,

The strategy has the function of correcting the "basic" injection times so that the mixture strength constantly oscillates at a high frequency between 0.98 and 1.02.
The oscillation frequency varies according to the engine load and speed: it is in the order of tens of Hertz.

NOTE 1 Hz = 1 oscillation per second

In conditions of:

- cut-off,
 - butterfly opening above 70°,
 - engine temperature below 25°C,
- the strategy is disabled.

Self-adjustment

The control unit is equipped with a self-adjustment function which has the task of memorizing any differences between the basic map and the corrections set by the Lambda sensor which may occur during operation. These differences (due to the ageing of the system and engine components) are memorized permanently, allowing the adaption of the operation of the system to gradual alterations of the engine and the components in relation to the characteristics when new.

The strategy is disabled when the charcoal filter solenoid valve is open.

If the control unit is replaced it is necessary to carry out a road test which allows the engine to reach operating temperature and the control unit (above all during idling stops) to operate in the self-adjustment mode.

10.

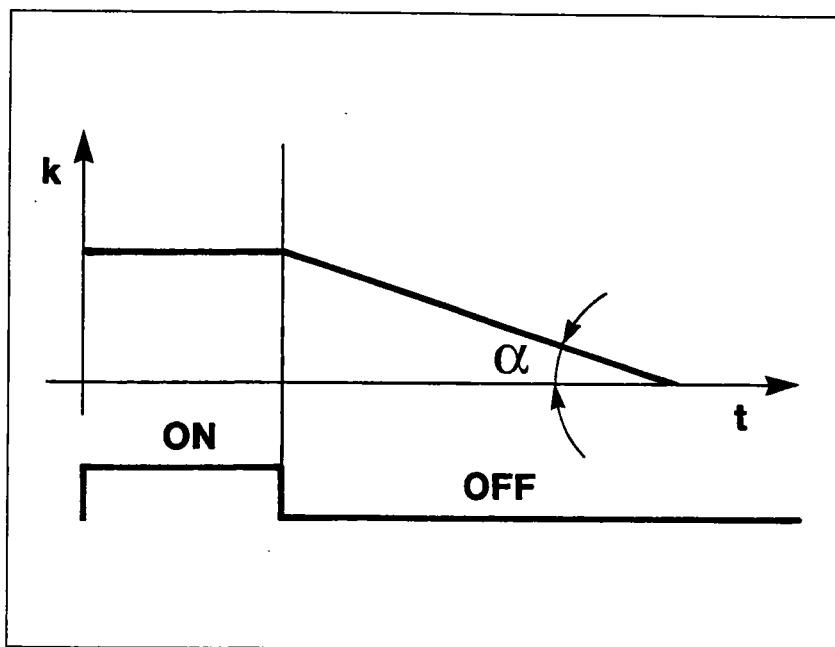
Starting and post-starting

During starting it is not possible to recognize the engine timing and consequently it is not possible to implement the timed injection.

During the first revolutions of the engine an initial simultaneous injection is carried out (also because the considerable fluctuations in the rotation speed do not allow the correct calculation of the injection timing) and subsequently the injection is the timed type.

The "basic" injection time "is increased by a multiplication coefficient for the entire time the engine is driven by the starter motor.

After starting has taken place the coefficient is gradually reduced until it disappears within a given time which the lower the engine temperature the longer the time taken.



P4A08BJ01

k : enrichment coefficient
 t : time
 α : decrease depending on the engine temperature
ON : engine driven (crank)
OFF : engine started (run)

Operation when cold

In these conditions there is a natural weakening of the mixture as a result of the reduced evaporation and the strong condensation of the fuel on the inner walls of the inlet manifold: in addition, the increased viscosity of the lubrication oil causes an increase in the passive resistance of the engine.

The "basic" injection time is corrected by a multiplication coefficient which depends on the temperature and the speed of the engine.

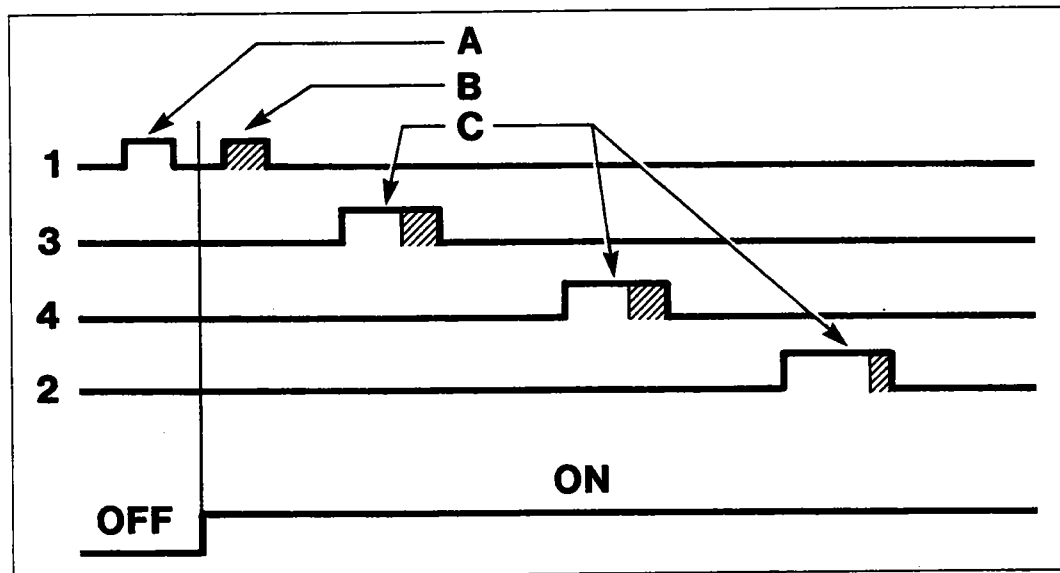
Operation in full load conditions

The strategy is enabled when the butterfly opening exceeds 70° .

The "basic" injection time is multiplied by a coefficient (dependent on the engine speed) equal to around 1.1.

Operation during acceleration

During this stage the control unit increases the quantity of fuel supplied. The "basic" injection time is multiplied by a coefficient depending on the temperature of the engine and the speed of the opening of the accelerator butterfly (average value 1.2). If the brisk variation in the injection time is calculated when the injector is already closed, the control unit reopens the injector (extra pulse), in order to compensate the mixture strength with increased speed; the subsequent injectors are, on the other hand, increase on the basis of the previously mentioned coefficients.



P4A09BJ01

- A: normal injection time
- B: injector re-opening (extra-pulse)
- C: injection time including enrichment
- OFF: engine at stationary speed
- ON: engine in transition

Operation during deceleration

During this stage a negative transit strategy is implemented to decrease the quantity of fuel supplied: the "basic" injection time is multiplied by a coefficient which depends on the temperature of the engine, the speed and the load conditions at the moment immediately prior to the start of the deceleration.

Operation during cut-off

The cut-off strategy is implemented when the control unit recognizes the butterfly in the idle position (signal from butterfly potentiometer) and the engine speed is above 1600 rpm (with the engine warm). The supply to the engine is re-enabled with the recognition of the butterfly in the not closed position or when the speed goes below 1200 rpm (with the engine warm).

10.

Rotation speed limiter

The strategy restricts the maximum speed which can be reached by the engine enabling the cut-off gradually, as shown in the table.
Maximum speed: 6550 rpm

method \ cylinders	cylinders			
	1	2	3	4
1 cilindro	●			
2 cilindri	●			●
3 cilindri	●		●	●
4 cilindri	●	●	●	●

Electric fuel pump operation

The electric fuel pump is operated by the engine control unit via a relay.
The pump cut out takes place:

- if the engine speed goes below 50 rpm;
- after a certain time (about 5 seconds) with the ignition switch in the ON position without the engine being started up (timed inhibitor);
- if the inertia switch has intervened.

Injector operation

The operation of the injectors is the sequential timed type. However, during starting the injectors are operated once in parallel.

The timing of the operation of the injectors is variable according to the engine speed.

FIAT CODE ANTI-THEFT SYSTEM MANAGEMENT

The system is equipped with an anti-theft function. This function is achieved thanks to the presence of a special control unit (FIAT CODE), capable of dialogue with the engine control unit and an electronic key, equipped with a special transmitter for sending a recognition code.

Each time the key is turned to the OFF position, the Fiat CODE system completely deactivates the engine control unit.

If the key is turned to the ON position, the following operations take place in the order given:

1. the engine control unit (whose memory contains a secret code) sends the FIAT CODE memory a request so that the latter sends the secret code to deactivate the locking of the functions;
2. the Fiat CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key;
3. the recognition of the secret code allows the de-activation of the locking of the engine control unit and its normal operation.

NOTE *The presence of the FIAT CODE anti-theft system makes it strongly inadvisable, during diagnosis, to proceed with the test using another engine control unit. In effect, in such a case, the Fiat CODE control unit would transfer the (unrecognized) recognition code to the test control unit which would then make it unusable on other vehicles.*

IGNITION MANAGEMENT

The ignition management strategies have the objective of striking the spark with the desired advance according to the engine operating conditions.

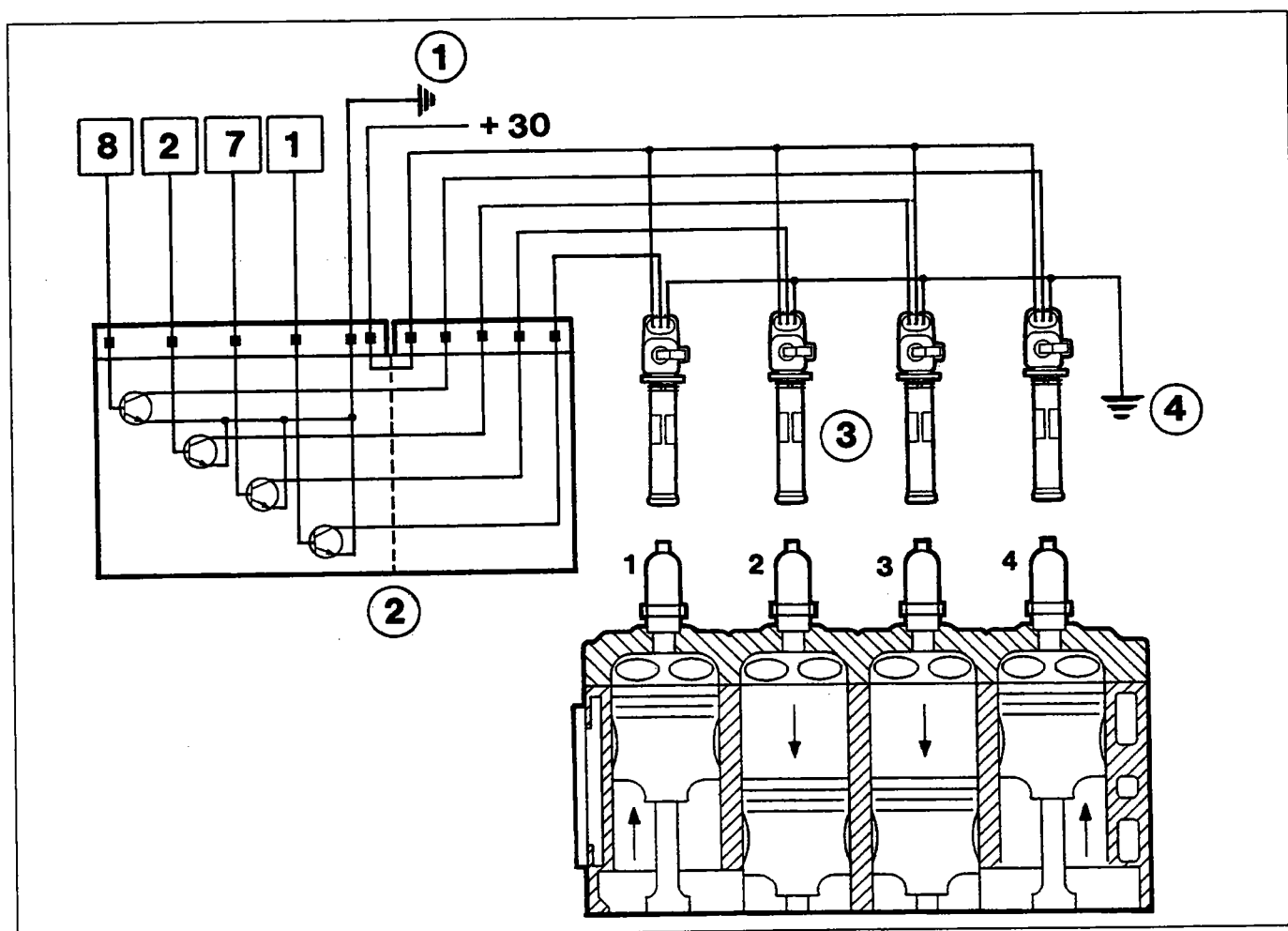
The management of the ignition basically consists of determining the ignition advance and its implementation by controlling the power module, connected externally to the control unit.

The value of the "basic" advance, calculated on the basis of the intake air flow rate and the engine speed, is then corrected depending on the different engine operating conditions.

The control unit determines the moment of the start of the conduction of the current in the coil primary winding on the basis of the engine rotation speed.

This moment obviously varies in relation to explosion TDC for each cylinder and the greater the engine rotation speed, the greater the advance because the time (*dwell*) required to saturate the current in the coil primary winding is more or less constant.

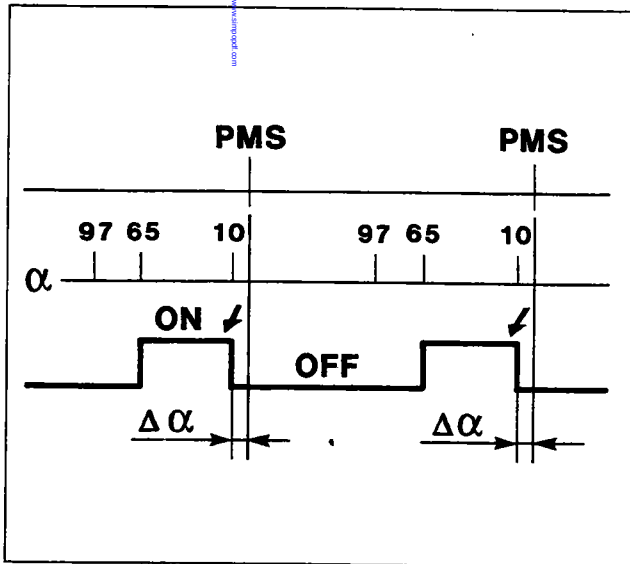
The moment of the start of conduction is corrected according to the battery voltage.



P4A11BJ01

1. Ignition power module earth
2. Ignition power module
3. Single ignition coil (plug-top)
4. Secondary coil earth

10.



α : crankshaft flywheel signal
 $\Delta \alpha$: fixed ignition advance (10° engine)
 ON: activated coil conduction
 OFF: de-activated coil conduction

Starting

During starting it is not possible to carry out the normal management of the advance because the considerable fluctuations in the rotation speed do not allow the correct calculation of the dwell and the advance.

The advance is therefore managed by taking the following as a reference:

- for the start of conduction, the tooth at 65° ;
- for the ignition advance, the tooth at 10° .

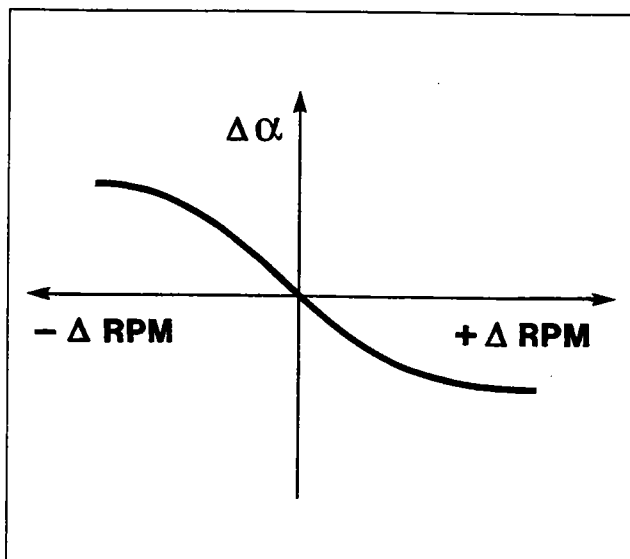
As a result there is a fixed advance at 10° for the entire time the engine is driven by the starter motor.

Operation when cold

During operation when cold an additional correction of the advance is implemented: the increase in the advance in relation to the one in the memory is inversely proportional to the temperature of the engine.

Operation during cut-off

The ignition advance is increased at the entry into cut-off: from the moment the supply of fuel is re-enabled the advance is gradually restored to the "base" value.



$\Delta \alpha$: correction of ignition advance during idling
 $+\Delta \text{ RPM}$: the idle speed exceeds the nominal value
 $-\Delta \text{ RPM}$: the idle speed is lower than the nominal value

Operation with engine idling

When the engine is idling, the management of the advance is implemented independently of the "basic" advance.

The value of the advance during idling, which varies according to the temperature of the coolant (10° with the engine warm) is corrected in accordance with the variation of the speed in relation to the pre-set speed, which also depends on the temperature.

In particular, the advance is increased if the speed decreases and is reduced if the speed increases, in order to ensure the stability of the actual speed.

Checking detonation

The strategy has the task of detecting the presence of the phenomenon of detonation, by processing the signal coming from the appropriate sensor. The strategy constantly compares the signal coming from the sensor with a level which, in turn, is constantly updated to take into account the background noise and the ageing of the engine.

If the system recognizes the presence of detonation, the strategy reduces the ignition advance, producing a step of 2° up to a maximum of 6°, until the phenomenon disappears. As a result, the advance is gradually restored until the basic value or until the phenomenon arises again. In particular, the advance increases are gradually implemented, whilst the reductions are introduced immediately.

During acceleration conditions, the strategy uses a higher level, to take into account the increased engine noise under these circumstances.

The strategy is also equipped with a self-adjustment function which permanently memorizes the advance reductions which must be continuously repeated in order to adapt the advance to the different conditions in which the engine finds itself (for example, the use of a low octane rating fuel). The strategy is capable of restoring the advance to the value in the memory if the conditions which have caused the reduction no longer exist.

ENGINE IDLE CONTROL MANAGEMENT

The general objective of the strategy is to maintain the engine speed around the memorized value (engine warm: 850 rpm): the position assumed by the actuator depends on the engine speed and conditions and the speed of the vehicle.

Starting stage

When the key is inserted the actuator assumes a position which depends on the temperature of the engine and the battery voltage (open-loop position).

Engine started with accelerator pedal released

The engine speed varies according to the temperature of the engine and is constantly maintained close to this value modifying the position of the shutter to compensate for any oscillations in the speed. This takes place in particular when external loads are applied (power assisted steering, heated rear windscreen, etc).

If the electric fans and the air conditioning are switched on, both of which are managed by the control unit, the strategy manages the advance actuator as appropriate.

Normal operation

In these conditions the actuator is in the open-loop position.

During deceleration

In deceleration conditions outside of idling, the control unit operates the position of the actuator through a special curve (*dash-pot curve*), or it slows down the return of the shutter towards its housing, achieving a reduction in the engine braking effect.

CHARCOAL FILTER MANAGEMENT

The strategy controls the position of the charcoal filter solenoid valve as follows:

- during the starting stage the solenoid valve remains closed, preventing the fuel vapours from enriching the mixture; this condition persists until the engine coolant reaches 25°C;
- with the engine at operating temperature, the control unit causes the solenoid valve to operate in duty-cycle to control the quantity of fuel vapours sent to the inlet, according to the engine speed and load conditions.

In the following operating conditions:

- butterfly in closed position,
- speed below 1250 rpm,
- engine load TP < 1 ms,

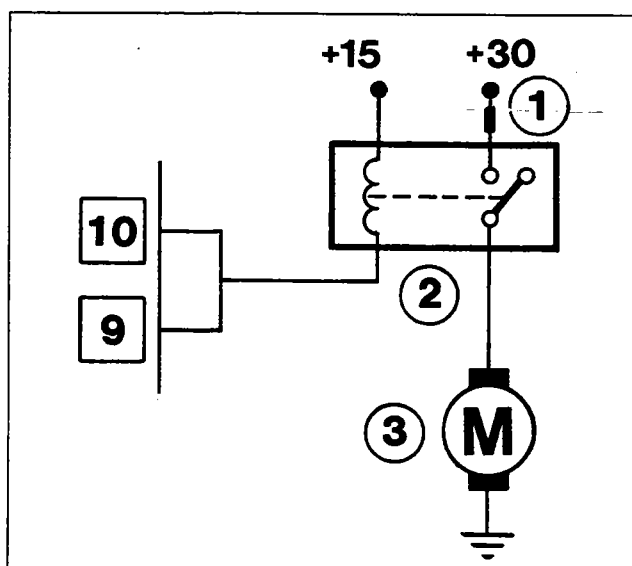
the operation of the solenoid valve is disabled, keeping it in the closed position.

10.

RADIATOR FAN MANAGEMENT

The control unit directly controls the operation of the radiator fan depending on the coolant temperature and whether or not there is a climate control system.

NOTE *Since the temperature of the engine is measured by the appropriate sensor there is no longer a thermal contact on the radiator.*

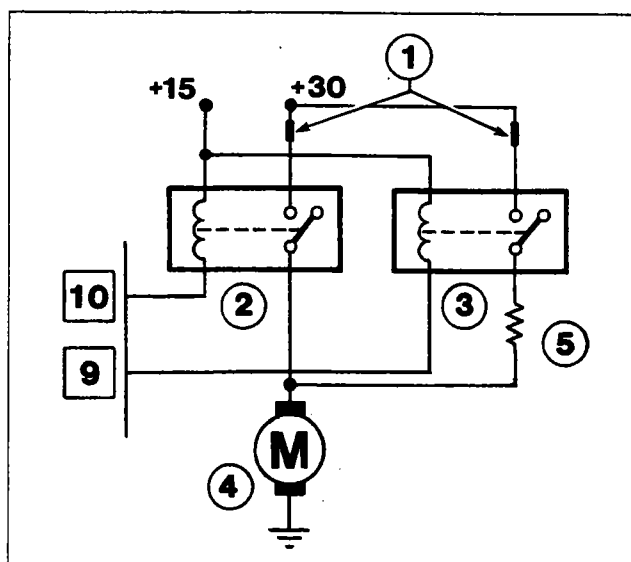


P4A14BJ01

Version without climate control

There is an electric fan which switches on when the temperature of the coolant exceeds 95°C. It switches off with a hysteresis of 2°C around the temperature level.

1. Fuse
2. Fan relay
3. Electric fan



P4A14BJ02

Version with climate control

There is an electric fan with two operating modes:

- low speed,
- high speed.

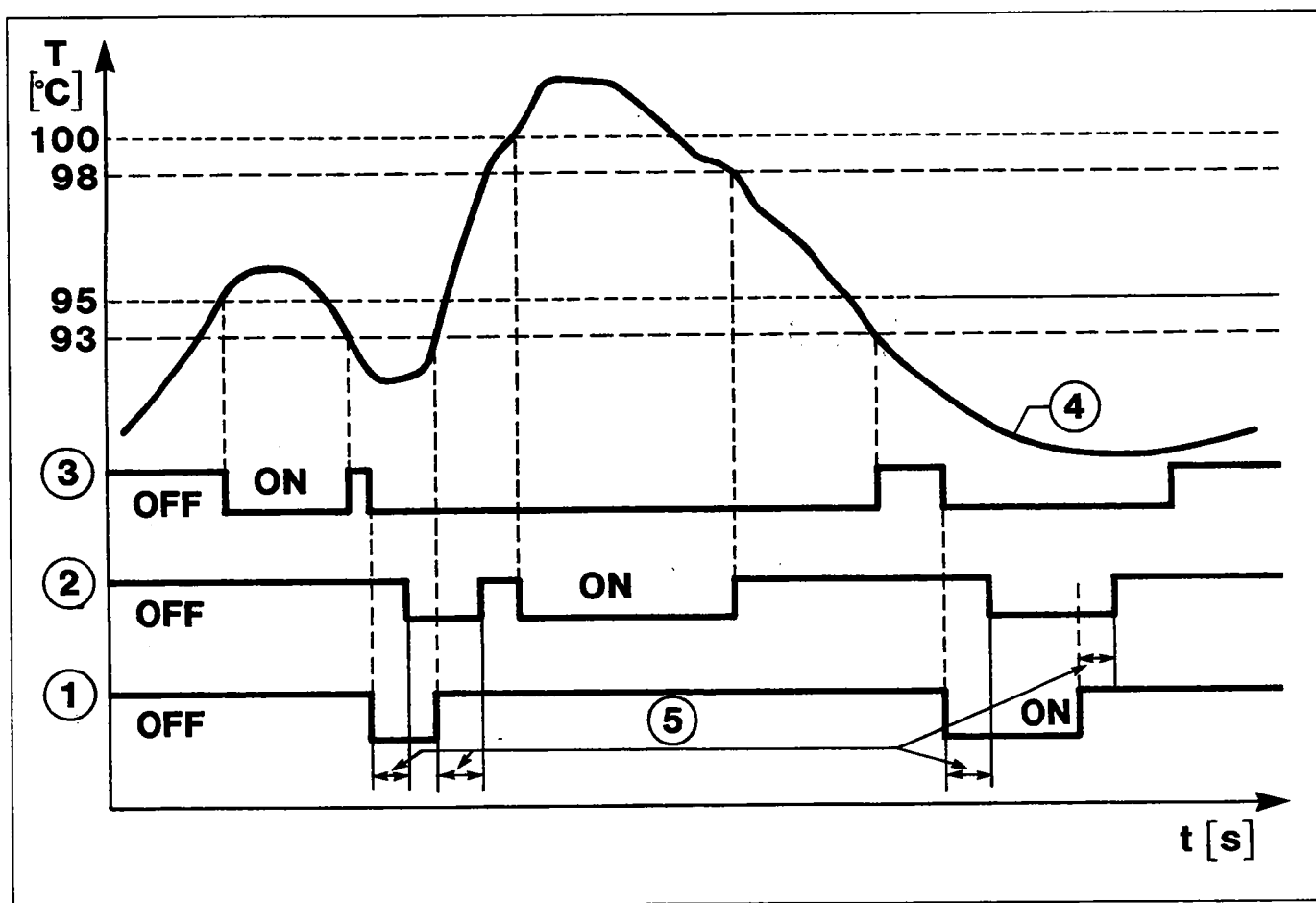
1. Fuse
2. High speed relay
3. Low speed relay
4. Electric fan
5. Resistance

Diagram showing operation of electric fan for version with air conditioning

Low speed: it switches on when the temperature of the coolant reaches 95°C.

High speed: it switches on when the temperature of the coolant reaches 100°C.

The speed of the electric fan also depends on the state of the three stage pressure switch for the climate control system which determines the engagement of the first speed and, with a certain delay, that of the second and the subsequent switching off.



P4A15BJ01

1. State of the three stage pressure switch
2. High speed operating condition
3. Low speed operating condition
4. Coolant temperature trend
5. Three stage pressure switch attachment/detachment delay

ON: speed/pressure switch activated
OFF: speed/pressure switch deactivated

10.

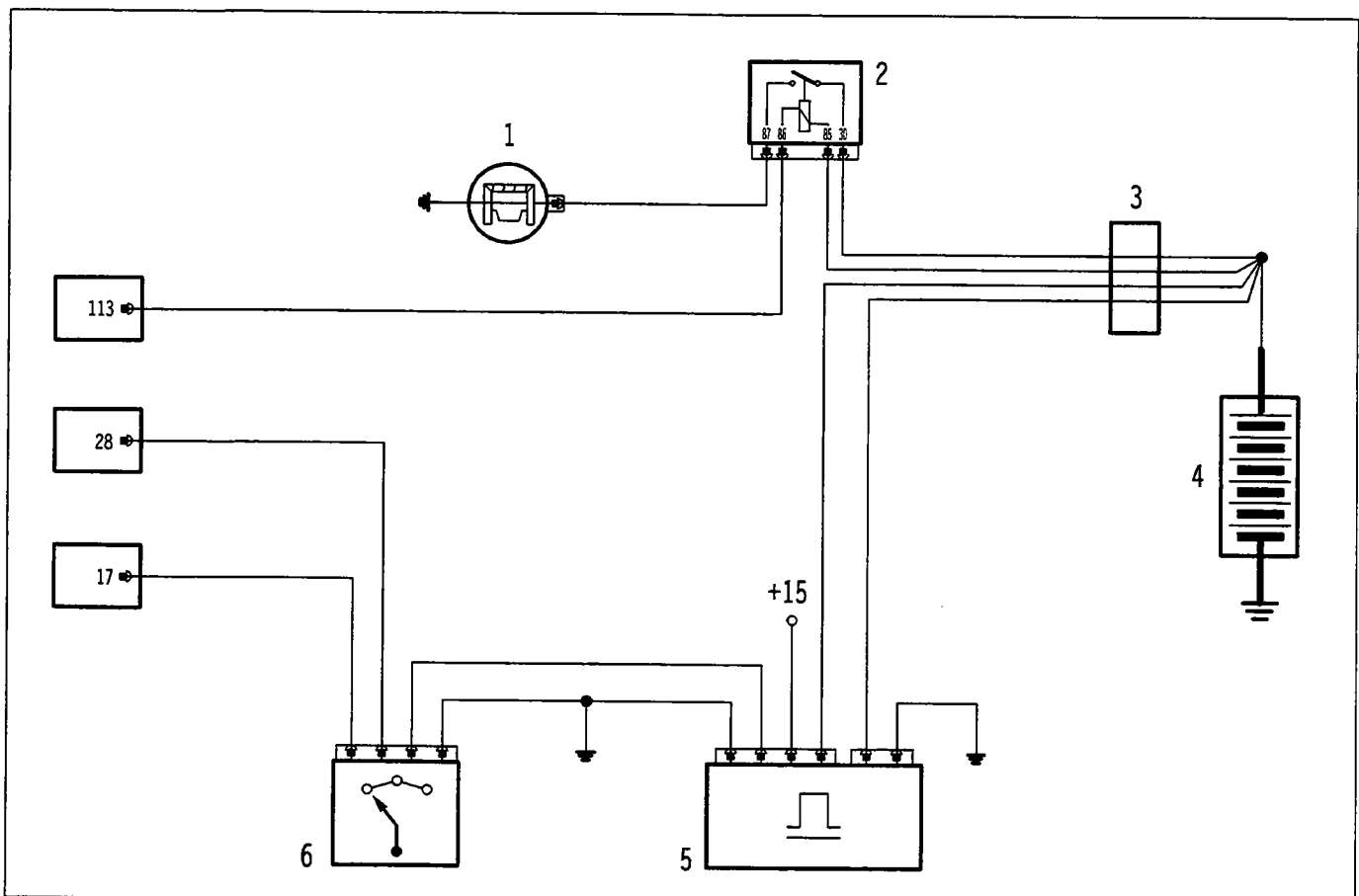
CLIMATE CONTROL SYSTEM MANAGEMENT

The Hitachi engine control unit is operationally connected to the climate control system and:

1. receives the request to switch on the compressor from the climate control system control unit via pin 28 and operate the relevant functions (additional air);
2. gives the go ahead to switch on the compressor via pin 113 when the conditions laid down by the strategies are confirmed;
3. receives information concerning the state of the three stage pressure switch from pin 17 and operates the relevant functions (radiator fan operation).

As far as point 1 is concerned, if the engine is idling, the control unit increases the air flow rate which goes from the idle actuator in advance of the switching on of the compressor and viceversa places the actuator in the normal position in delay in relation to the switching off of the compressor. On the other hand, as far as point 2 is concerned, the control unit automatically operates the switching off of the compressor:

- a) for a time of 6 s (timed switching off):
 - in butterfly opening conditions of more than 70°,
 - when the vehicle is accelerating;
- b) when the following critical conditions persist:
 - at coolant temperatures conditions above 114°C,
 - when the engine idle speed is below 750 rpm.



P4A16BJ01

- | | |
|---------------------|--------------------------------|
| 1. Compressor | 4. Battery |
| 2. Compressor relay | 5. Climate control unit |
| 3. Fuse box | 6. Three stage pressure switch |

DIAGNOSIS

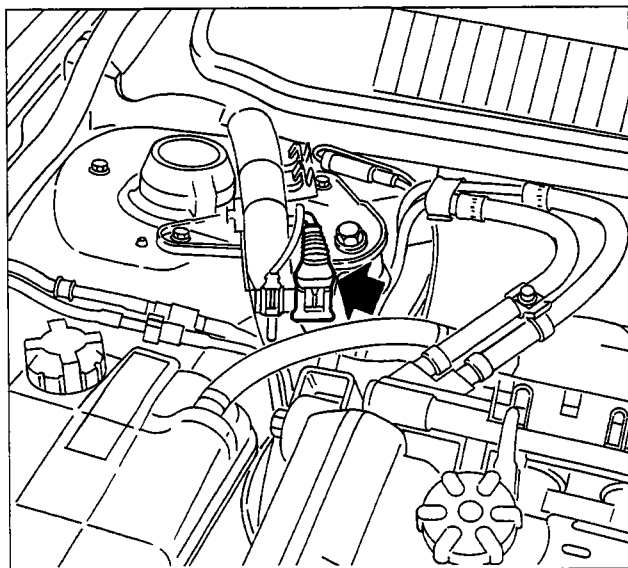
The system is equipped with an autodiagnostic function which checks for any irregular state in the following components:

Actuators

injectors
coils
charcoal filter solenoid valve
engine idle adjustment solenoid valve
electric fuel pump relay
climate control compressor relay (if fitted)
electric fan low speed relay
electric fan high speed relay (if fitted)

Sensors

engine rpm sensor
engine timing sensor
air flow meter
Lambda sensor
coolant temperature sensor
butterfly position sensor
vehicle speed sensor
detonation sensor

Location of F/L Tester connector

P4A17BJ02

The detection of a fault, if confirmed, involves it being permanently memorized, as well as excluding the relevant sensor from the system until it is repaired.

The detection of a confirmed fault usually involves the warning light in the dashboard coming on: the warning light goes out when the fault is repaired.

Working with the Fiat Lancia Tester it is possible to carry out a complete fault diagnosis of the system which consists of three stages:

1. displaying a series of functional parameters (with the engine running);
2. displaying errors and cancelling them;
3. activating certain actuators (active diagnosis).

1. Parameters displayed

The following engine parameters are displayed:

- air flow rate,
- coolant temperature,
- butterfly sensor position,
- Lambda sensor voltage,
- battery voltage,
- Lambda sensor state,
- vehicle speed,
- engine rpm,
- air flow rate/maximum flow rate,
- ignition advance,
- charcoal filter solenoid valve duty cycle,
- injection time,
- engine load (TP),
- objective engine idle speed,
- engine idle speed adjustment solenoid valve duty cycle,
- FIAT CODE state,
- errors present.

10.

2. Detecting and cancelling faults

Detecting faults

This is carried out during the basic functions through which the sensor/actuator is managed.

Memorizing the error and the structure of the errors memory

The errors are memorized in the control unit in the order in which they occur.

The following is memorized for each of them:

- the error code (component and type of error),
- the error counter,
- the time elapsed since the error was detected,
- two environmental conditions (specific for each type of fault) at the time the fault was detected.

Classification of the fault

If a fault is recognized for the first time and the error state persists for a certain length of time, the fault is memorized as "permanent". If this fault later disappears, then it is memorized as "not present". The classification of a fault as "permanent" activates the recovery functions: when the fault disappears, normal operation is restored.

The presence of a "permanent" fault also involves the system failure warning light in the dashboard coming on.

Frequency counter

The counter, which goes from 0 to 127 and which is activated in the case of a fault, is decreased each time the engine is started up without the fault reappearing: when the counter reaches zero, the fault is automatically cancelled from the memory.

Failure warning light

The failure warning light comes on when there is at least one "permanent" fault in the memory.

NOTE During starting, the warning light is:

- on for 4 seconds,
- off for 0.15 seconds,
- kept on/off according to whether or not there are "permanent" errors.

Cancelling of the errors

When the frequency counter reaches zero, the fault and the parameters associated with it are cancelled. The immediate cancelling of the entire errors memory takes place in the following cases:

- through the "cancel errors memory" command sent by the F/L Tester;
- by interrupting the electrical supply for the control unit (disconnecting the battery or the control unit connectors) for at least 60 seconds.

3. Activating the actuators (active diagnosis)

The following actuators are activated with the engine switched off via a command from the F/L Tester:

- injectors (in the order cyls. 1, 2, 3 and 4),
- coils (in the order cyls. 1, 2, 3 and 4),
- electric fuel pump relay,
- charcoal filter solenoid valve,
- engine idle adjustment solenoid valve,
- system failure light,
- rev counter signal,
- climate control compressor relay (if fitted),
- electric fan low speed relay,
- electric fan high speed relay (if fitted).

RECOVERY STRATEGIES

If a problem is detected with the sensors/ actuators the control unit, where possible, replaces the missing data, reconstructing it using software (recovery) to allow the operation of the engine.
For the sensors/actuators not mentioned in the list below, there is not type of recovery.

Engine timing sensor

recovery: the engine cannot be started up, however if the problem occurs with the engine started up, it stays operating.

Air flow meter

recovery: the air flow rate is calculated on the basis of the butterfly position and rotation speed values.
additional provisions: self-adjustment of the mixture strength and idle disabled; charcoal filter solenoid valve disabled.

Coolant temperature sensor

recovery: during starting $T = 20^{\circ}\text{C}$; otherwise $T = 20^{\circ}\text{C}$ increased by 1°C every 6 seconds until reaching 80°C ; during starting or with the key in the OFF position the radiator fan is off, otherwise it is activated.
additional provisions: self-adjustment of mixture strength and idle disabled.

Butterfly position sensor

recovery: fixed butterfly angle = 7° ; if the engine load (TP) is below 1.75 ms and the speed is below 1000 rpm, then the engine is idling, otherwise it is outside of idling.
additional provisions: self-adjustment of idling disabled.

Vehicle speed sensor

recovery: speed = 0.
additional provisions: self-adjustment of idling disabled.

Lambda sensor

recovery: the reading of the sensor voltage is disabled (open-loop).

Detonation sensor

recovery: the "basic" advance is reduced by an average of 5° if the engine load TP is above 2.5 ms.

Engine idle speed adjustment solenoid valve

recovery: the valve is kept open at a pre-set value.

10.

ELECTRICAL/ELECTRONIC CIRCUIT

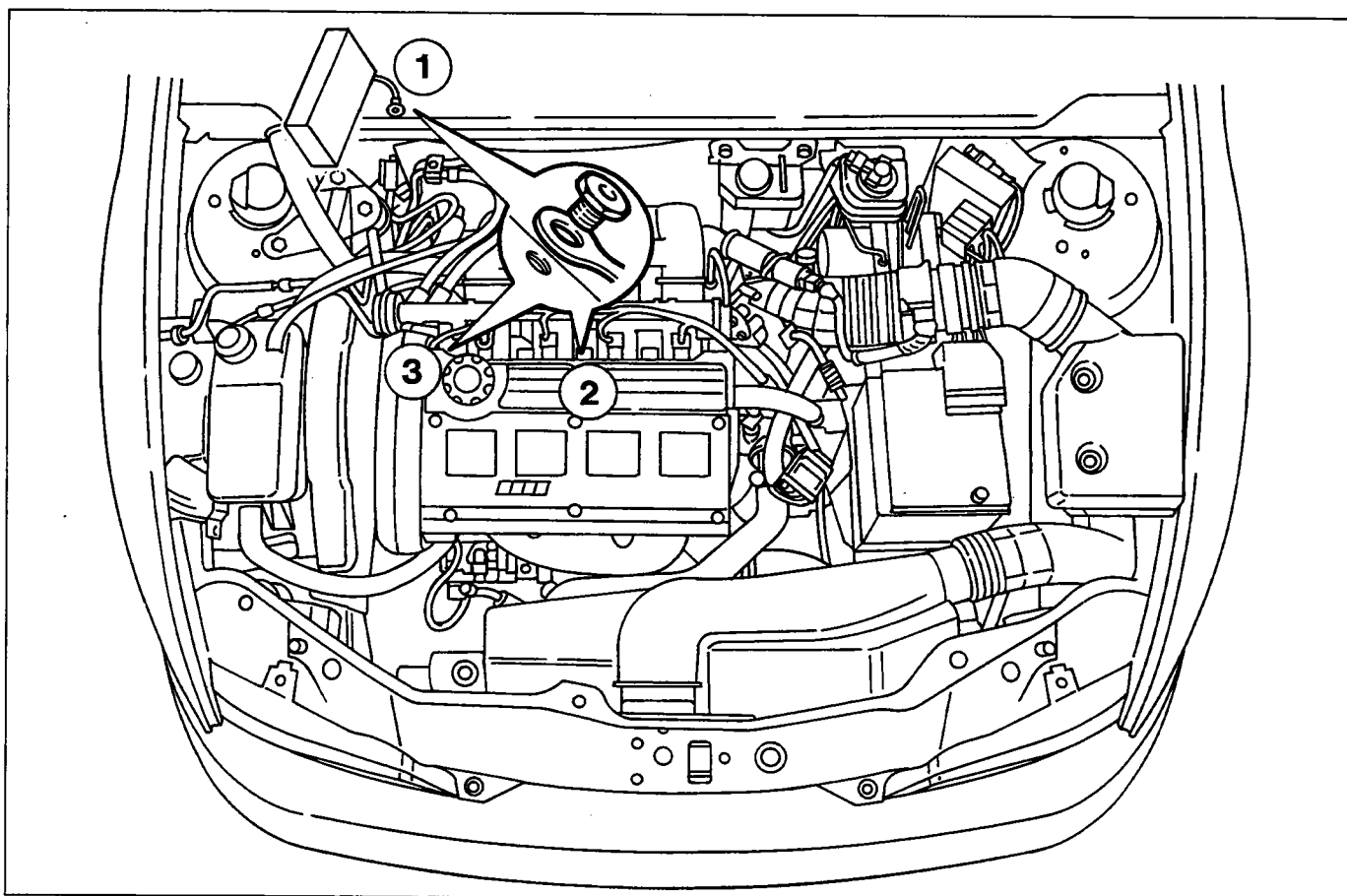
This circuit electrically connects all the components of the system and is made up of the following components:

- wiring with fuses;
- HITACHI engine control unit;
- system and pump relay;
- sensors:
 - butterfly position sensor,
 - coolant temperature sensor,
 - air flow meter,
 - engine rpm sensor,
 - engine timing sensor,
 - Lambda sensor,
 - vehicle speed sensor,
 - detonation sensor;
- actuators:
 - electric fuel pump,
 - injectors,
 - engine idle speed adjustment solenoid valve,
 - charcoal filter solenoid valve,
 - electric pump cut out inertia switch,
 - ignition power module,
 - ignition coils;
- devices connected to the control unit:
 - radiator fan relays,
 - climate control compressor relay (if fitted),
 - Fiat CODE control unit.

Layout of system earth points

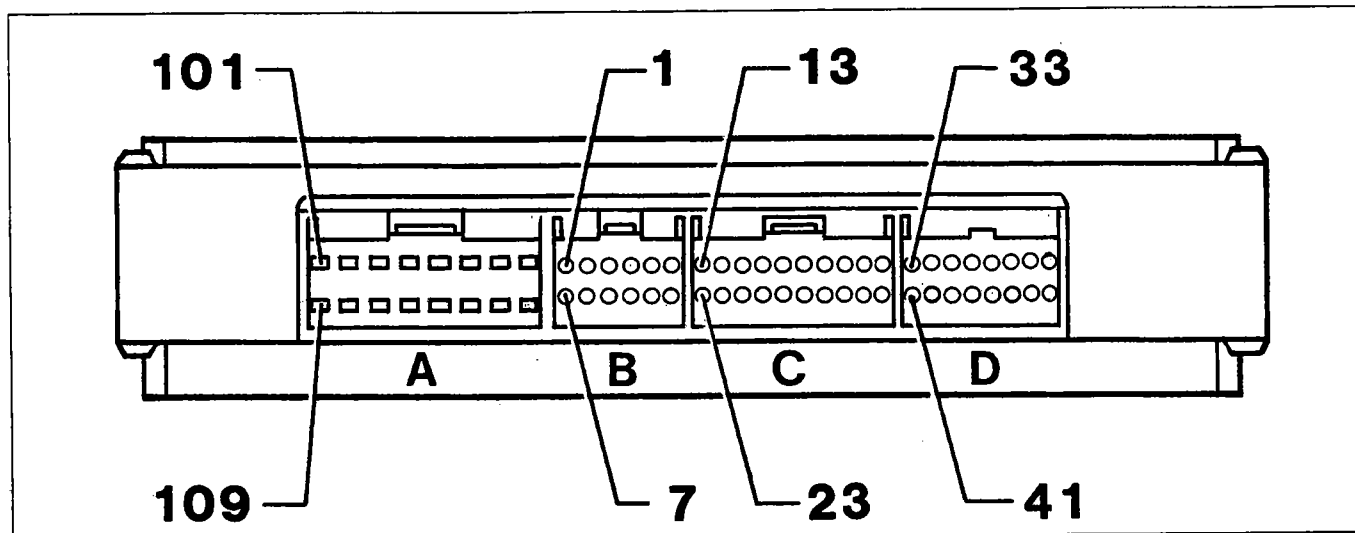
In order to increase the electro-magnetic compatibility and the operational reliability special care has been taken over the layout of the earth points, as shown in the diagram below:

1. control unit casing, connected to the vehicle bodyshell;
2. secondary coils connected under the cylinder head cover;
3. control unit internal earths (pins 6, 12, 107, 108, 116, 40, 48), Lambda sensor heater earth, relay earths, ignition power module earth connected to the engine cylinder block/crankcase.



P4A20BJ01

HITACHI SYSTEM CONTROL UNIT PIN-OUT



P4A21BJ01

Connector A

- 101. Operation of injector for cylinder 1
- 102. N.C.
- 103. Operation of injector for cylinder 2
- 104. Pump relay operation
- 105. Operation of injector for cylinder 3
- 106. Negative for charcoal filter solenoid valve
- 107. Earth
- 108. Earth

Connector B

- 1. Operation of coil for cylinder 1
- 2. Operation of coil for cylinder 3
- 3. Operation of rev counter
- 4. N.C.
- 5. N.C.
- 6. Earth

Connector C

- 13. N.C.
- 14. Positive for air flow meter
- 15. Positive for coolant temperature sensor
- 16. Positive for Lambda sensor
- 17. Signal for three stage pressure switch (if fitted)
- 18. N.C.
- 19. N.C.
- 20. Connection with FIAT CODE
- 21. Positive for detonation sensor
- 22. Negative for air flow meter
- 23. Line K

Connector D

- 33. Positive for engine rpm sensor
- 34. Positive for engine timing sensor
- 35. Earth for engine rpm sensor
- 36. Signal for vehicle speed sensor
- 37. Positive for butterfly position sensor
- 38. N.C.
- 39. Control unit supply
- 40. Earth
- 41. Negative for engine rpm sensor

- 109. Negative for engine idle adjustment solenoid valve
- 110. Operation of injector for cylinder 4
- 111. Positive for engine idle adjustment solenoid valve
- 112. Control unit supply
- 113. Climate control compressor relay feed (if fitted)

- 114. N.C.
- 115. N.C.
- 116. Earth

- 7. Operation of coil for cylinder 3
- 8. Operation of coil for cylinder 4
- 9. Operation of electric fan low speed relay
- 10. Operation of electric fan high speed relay *
- 11. Operation of system failure light
- 12. Earth

- 24. N.C.
- 25. Signal for butterfly position sensor
- 26. Negative for lambda sensor
- 27. N.C.
- 28. Signal for engaging compressor (if fitted)
- 29. AVV signal from ignition switch (+50)
- 30. N.C.
- 31. Earth for detonation sensor
- 32. Negative for coolant temperature and butterfly position

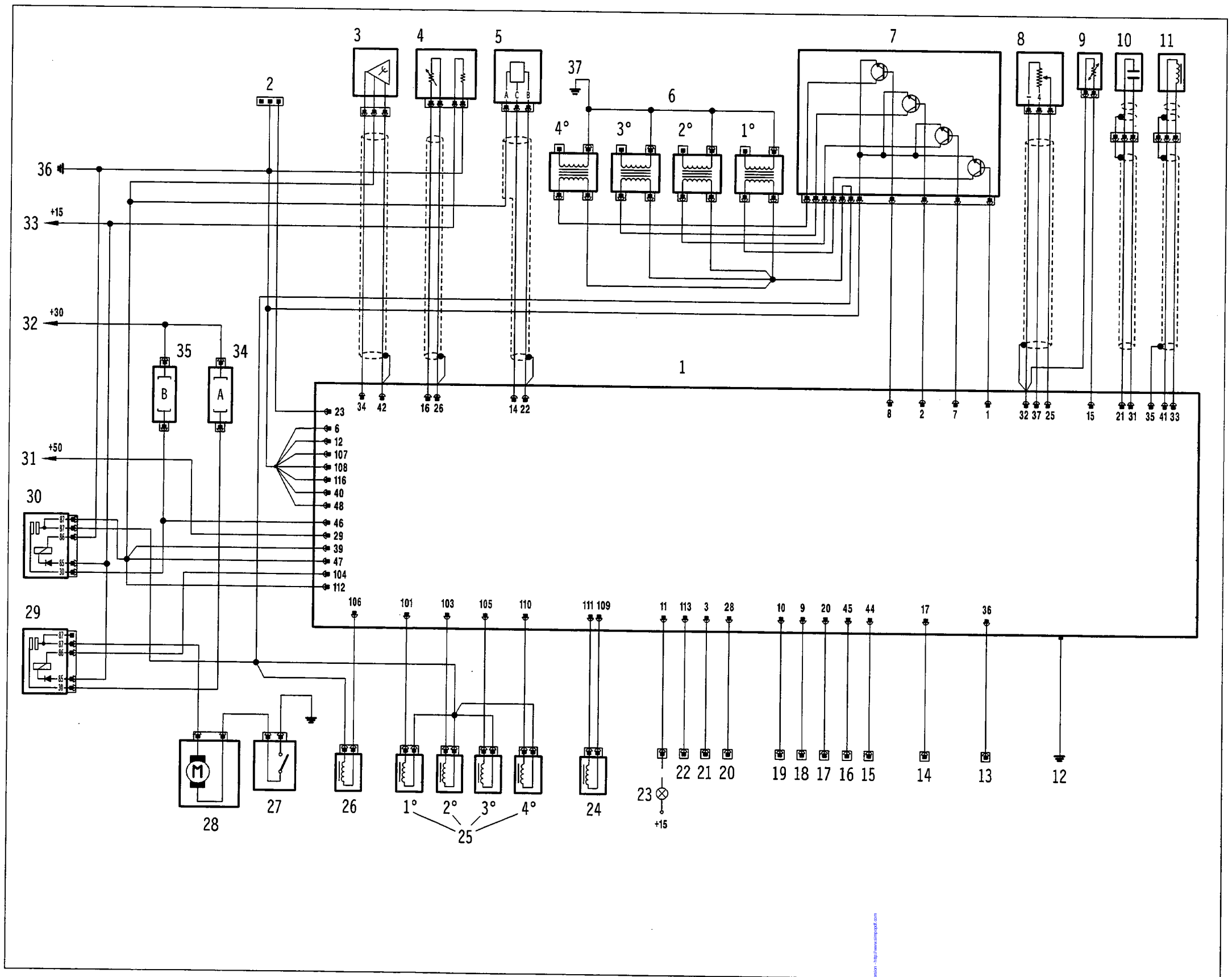
- 42. Negative for engine timing sensor
- 43. N.C.
- 44. Calibration selection
- 45. Trim level selection (to earth for versions without climate control)
- 46. Control unit supply
- 47. Control unit supply
- 48. Earth

* Short circuited at pin 9 for versions without climate control

Engine Fuel system 10.

Bravo-Brava 1747 16v

HITACHI SYSTEM WIRING DIAGRAM



P4A22BJ01

Hitachi system wiring diagram key

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Engine control unit 2. F/L Tester (line K) 3. Engine timing sensor 4. Lambda sensor 5. Air flow meter 6. Ignition coils 7. Ignition power module 8. Butterfly position sensor 9. Coolant temperature sensor 10. Detonation sensor 11. Engine rpm sensor 12. Control unit casing earth on vehicle bodysell 13. Vehicle speed inlet 14. Intake from three stage pressure switch (climate control if fitted) 15. Calibration selection 16. Trim level selection (to earth for versions without climate control) 17. Connection with Fiat CODE control unit 18. Operation of electric fan low speed relay | <ol style="list-style-type: none"> 19. Operation of electric fan high speed relay (short circuited at pin 9 for versions without climate control) 20. Intake for request to engage climate control compressor (if fitted) 21. Operation of rev counter 22. Climate control compressor relay feed (if fitted) 23. Operation of system failure light 24. Engine idle speed adjustment sol. valve 25. Injectors 26. Charcoal filter solenoid valve 27. Inertia switch 28. Electric fuel pump 29. Electric fuel pump relay 30. System relay feed 31. AVV signal from ignition key (+50) 32. Supply from battery (+30) 33. Supply from ignition key (+15) 34. Pump fuse (30 A) 35. System fuse (15 A) 36. Earth (on engine block) 37. Earth (under cylinder head cover) |
|---|---|

SYSTEM RELAYS

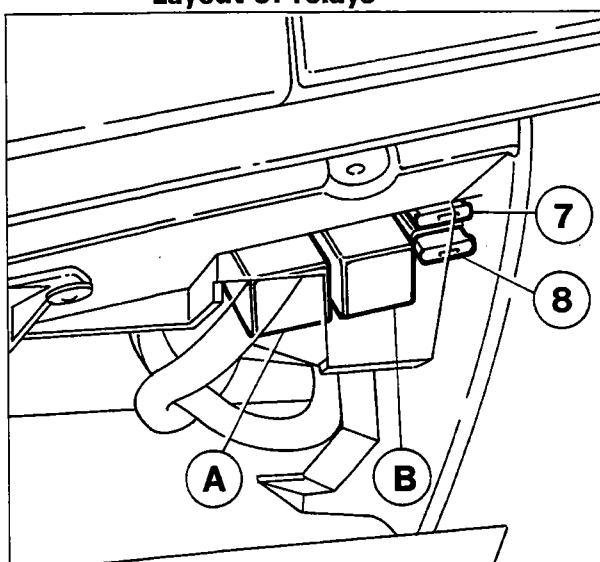
With the ignition key in the ON position (+15) the energizing coils for both relays are supplied, which close the respective power contacts.

Relay (A) supplies the electric fuel pump, receiving voltage directly from the battery.

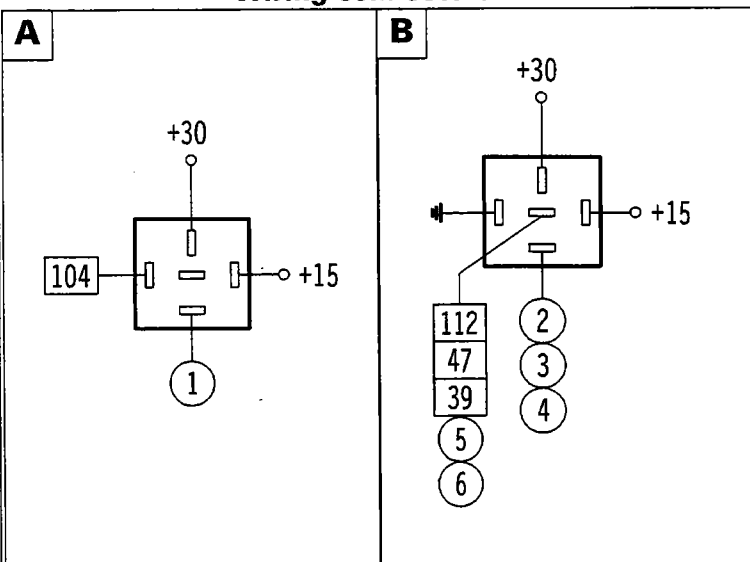
Relay (B) ensures the multiple supply of the control unit and the various system sensors and actuators, both directly and via the connectors.

NOTE The layout of relays (A) and (B) and fuses (7) and (8) can vary through production requirements. They should be recognized on the basis of the electrical connections.

Layout of relays



Wiring connectors

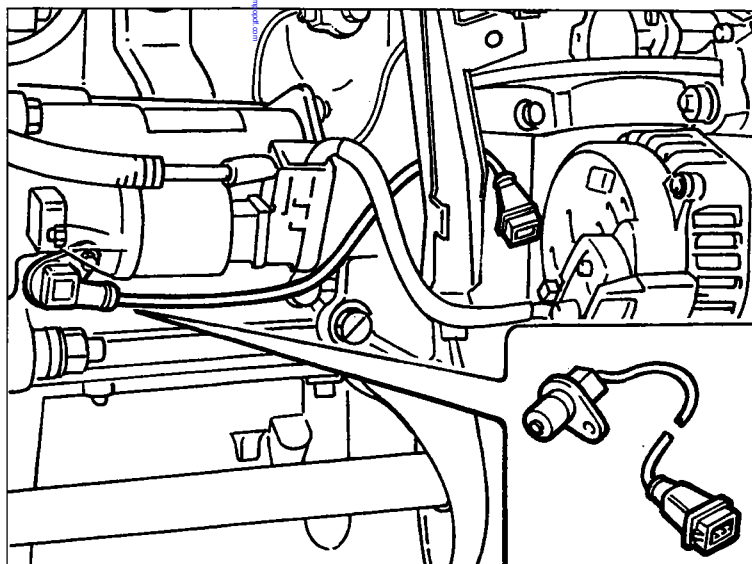


1. Electric fuel pump
2. Injectors
3. Charcoal filter solenoid valve
4. Ignition power module

5. Air flow meter
6. Butterfly position sensor
7. Fuse
8. Fuse

- A. Electric fuel pump relay
B. System relay feed

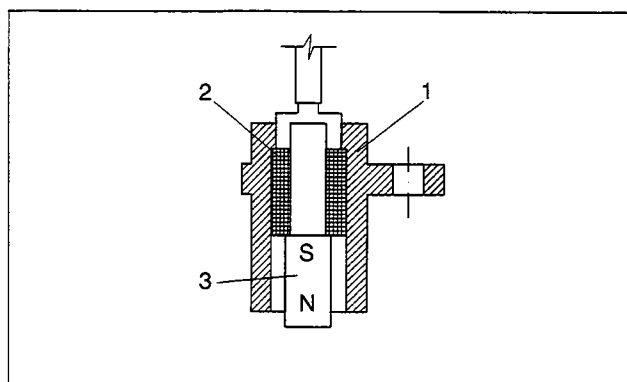
10.



P4A24BJ01

ENGINE RPM SENSOR

The sensor is fixed to the cylinder block/crankcase: the flywheel is fixed with a crankshaft crank.



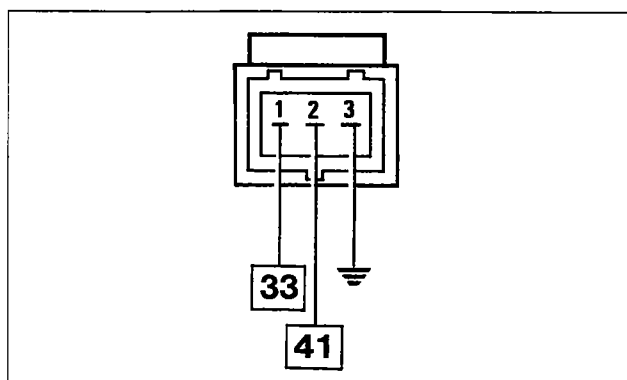
P4A24BJ02

Operating principle

The sensor is made up of a tubular casing (1) which houses a permanent magnet (3) and an electrical winding (2).

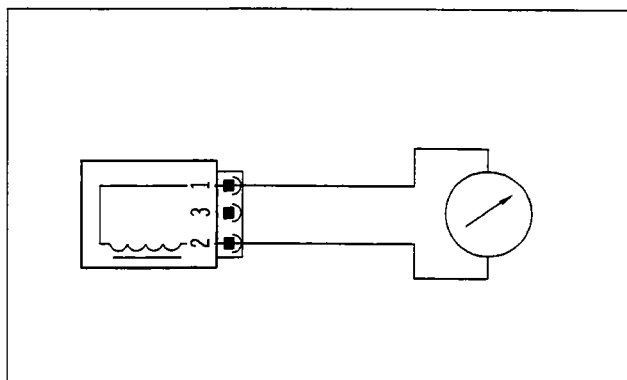
As a result of the flywheel teeth passing by, the magnetic flow produced by the magnet (3) undergoes oscillations resulting from the variation of the gap.

These oscillations create an electro-motive force in the winding (2) which produces a voltage which is alternatively positive (tooth facing the sensor) and negative (gap facing the sensor): see paragraph on "signal management". The peak sensor output voltage depends, with other factors being equal, on the distance between the sensor and the tooth (gap).



P4A24BJ03

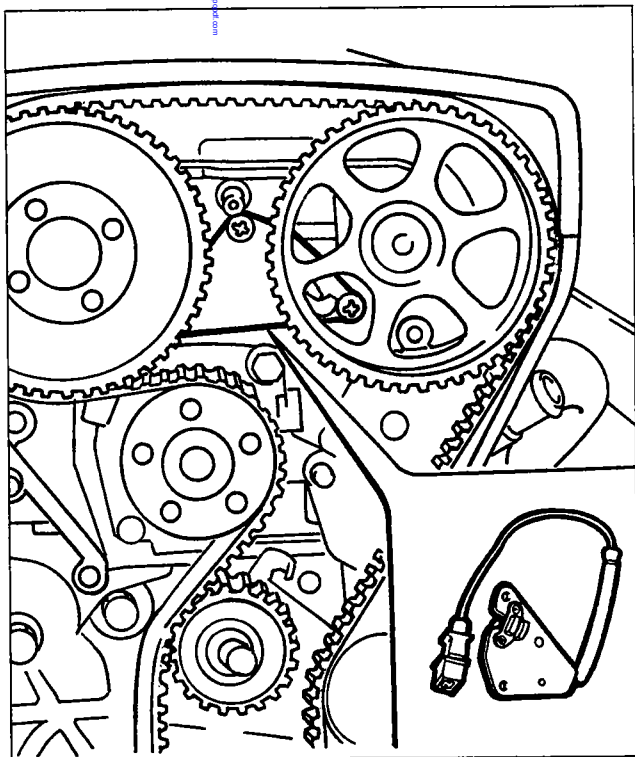
Wiring connector



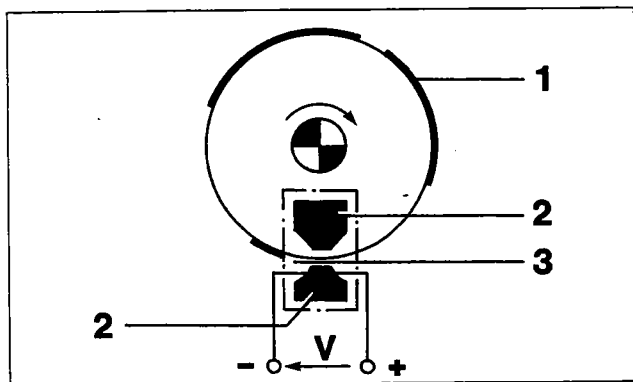
P4A24BJ04

The resistance of the sensor can be measured by disconnecting the connector and connecting an ohmmeter to the sensor

Resistance: 570 ± 57 ohm at 20°C



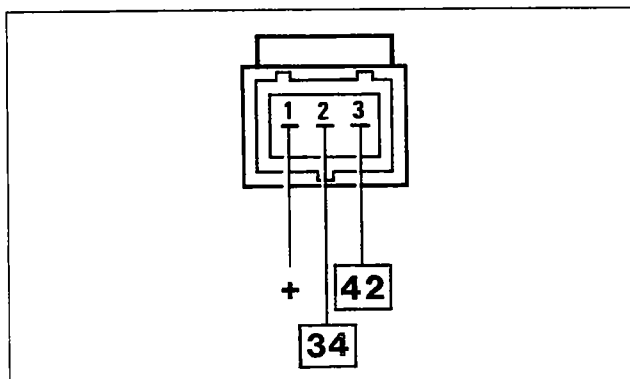
P4A25BJ01



P4A25BJ02

1. Deflector
2. Magnetic material
3. Gap

Wiring connector



P4A25BJ03

ENGINE TIMING SENSOR

The engine timing signal, together with the engine rpm and TDC signal, allows the control unit to recognize the succession of cylinders to implement the injection timing. This signal is generated by a Hall effect sensor, fitted by the exhaust camshaft drive pulley.

NOTE *It is not possible to carry out any adjustments to the angular position of the sensor.*

Operating principle

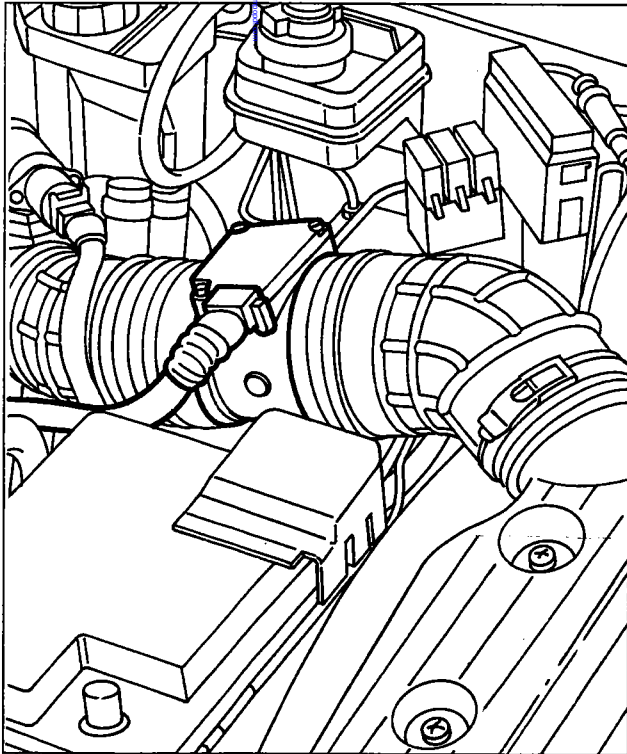
A semi-conductor layer through which the current flows, immersed in a normal magnetic field (lines of force perpendicular to the direction of the current) generates a difference in power, known as Hall effect voltage.

If the intensity of the current remains constant, the voltage generated only depends on the intensity of the magnetic field. It is therefore sufficient if the intensity of the field varies periodically to obtain a modulated electrical signal.

In practice, to obtain this change, the sensor has a metal ring passed through it (fixed to the inner part of the timing pulley) equipped with a series of openings: as it moves, when the ring covers the sensor, it blocks the magnetic field and the signal remains low, whilst as it passes the openings, the field closes and the signal becomes high.

The alternating of the signals therefore depends on the succession of the openings (see "signal management" chapter).

10.



P4A26BJ01

AIR FLOW METER

The air flow meter is the hot wire type where the flow rate is measured at source.

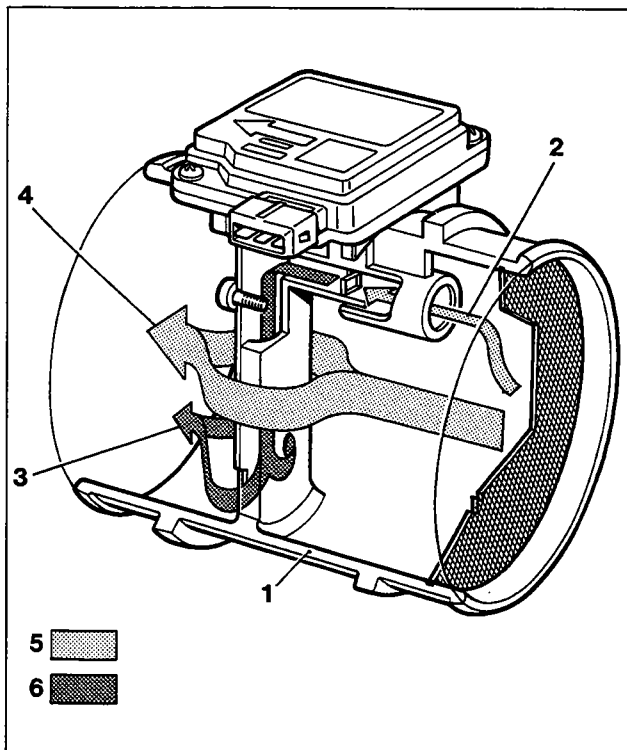
The upper part has a duct parallel to the main flow inside of which there is the heated wire. One part of the intake air flow is introduced into the duct and, after having passed through it, it flows out of the opposite part, returning to the main flow.

Consequently, only part of the mass of air which passes through the flow meter is measured: this quantity is, however, proportional to the total mass in the flow meter.

The electrical voltage leaving the flow meter is therefore representative of the total flow rate which is calculated by applying suitable proportional parameters.

This type of flow meter has two advantages compared with the full flow type:

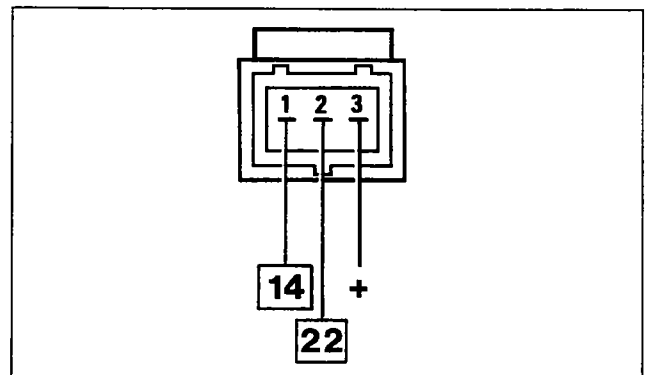
- considerable insensitivity to the phenomenon of air column pulses, particularly present at low speeds and heavy loads;
- less fouling of the wire, thanks to the reduced mass of air coming into contact with it; in effect the control unit does not have any wire cleaning strategy (*burn-in*).



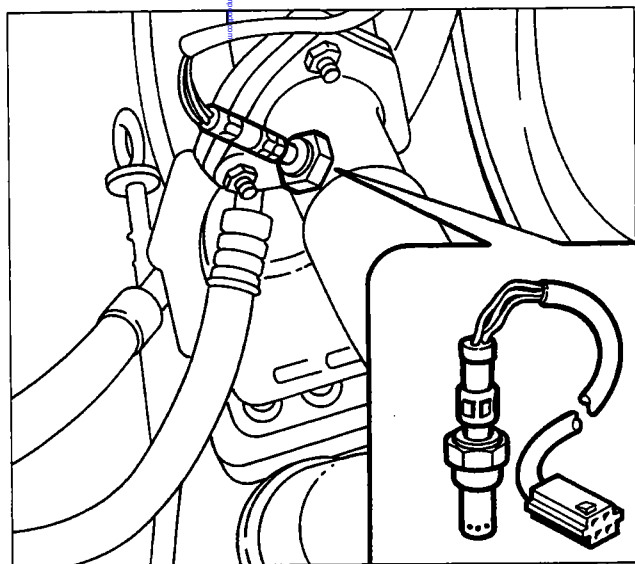
P4A26BJ02

1. Flow meter casing
2. Air intake into the duct
3. Air outlet from the duct
4. Outlet air
5. Intake air
6. Air measured

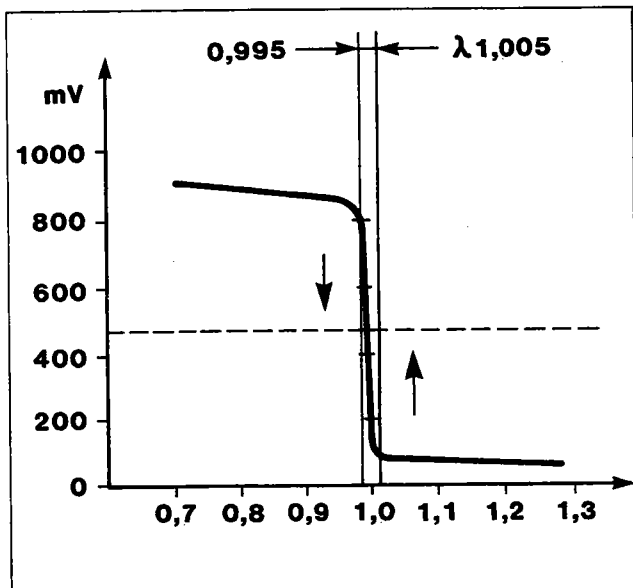
Wiring connector



P4A26BJ03



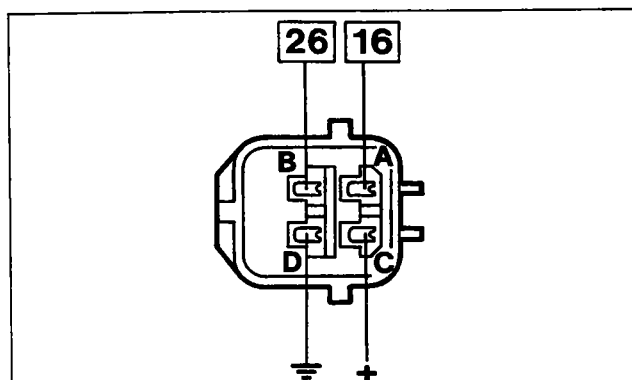
P4A27BJ01



P4A27BJ02

lambda = 1: stoichiometric mixture
lambda < 1: rich mixture, the CO values tend to be high
lambda > 1: lean mixture, the CO values tend to be low

Wiring connector



P4A27BJ03

LAMBDA SENSOR

The Lambda sensor measures the oxygen content in the exhaust gases: it is fitted on the exhaust pipe upstream of the catalytic silencer.

The sensor output signal is sent to the control unit to correct (*feed-back*) the mixture strength.

When the sensor supplies a low signal (voltage below 200 mV) the control unit recognizes a lean mixture and increases the injection time; subsequently, when the sensor signal is high (voltage above 800 mV), the control unit recognizes a rich mixture and decreases the injection time.

This sequence of operations is repeated with a frequency in the order of tens of Hertz, so that the engine operates with a mixture strength constantly oscillating around the stoichiometric value.

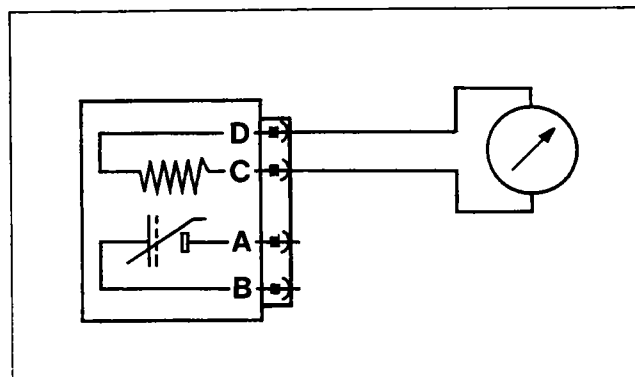
At temperatures below 300°C the ceramic material is not activated, therefore the sensor does not send reliable signals: to ensure rapid heating during starting and to maintain the temperature during idling, the sensor is equipped with a heater where the electrical resistance is always on.



The sensor can be rapidly put out of action by the presence of even the smallest amounts of lead in the fuel.

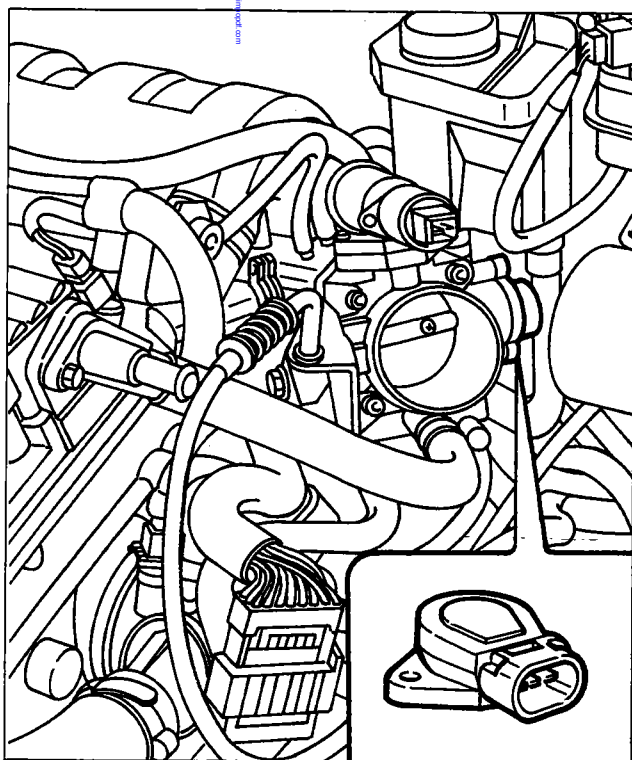
The resistance of the sensor heater can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Resistance: 4,5 ± 0,5 ohm at 20°C



P4A27BJ04

10.

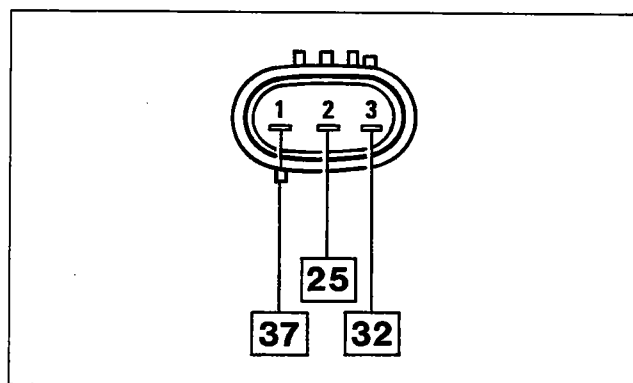


P4A28BJ01

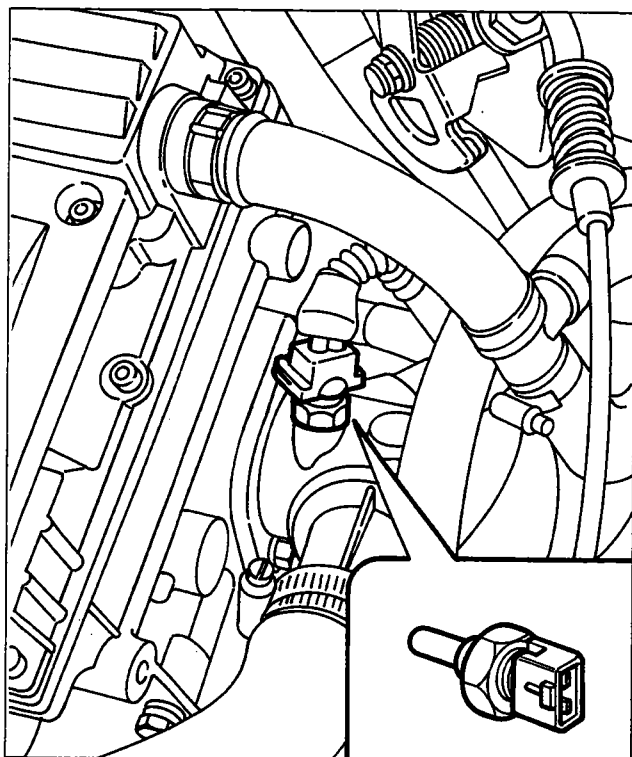
BUTTERFLY POSITION SENSOR

It is made up of a single track potentiometer where the moving part is rotated by the accelerator butterfly shaft.

Wiring connector



P4A28BJ02



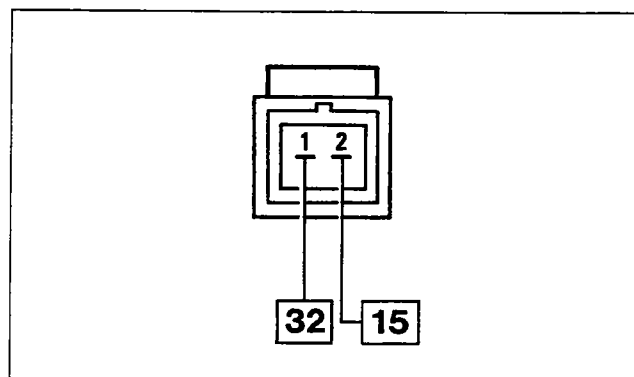
P4A28BJ03

COOLANT TEMPERATURE SENSOR

The sensor is fitted on the thermostat. It is made up of a brass casing which protects the resistive element made up of an NTC (Negative Temperature Coefficient) thermistor where the electrical resistance decreases as the temperature increases.

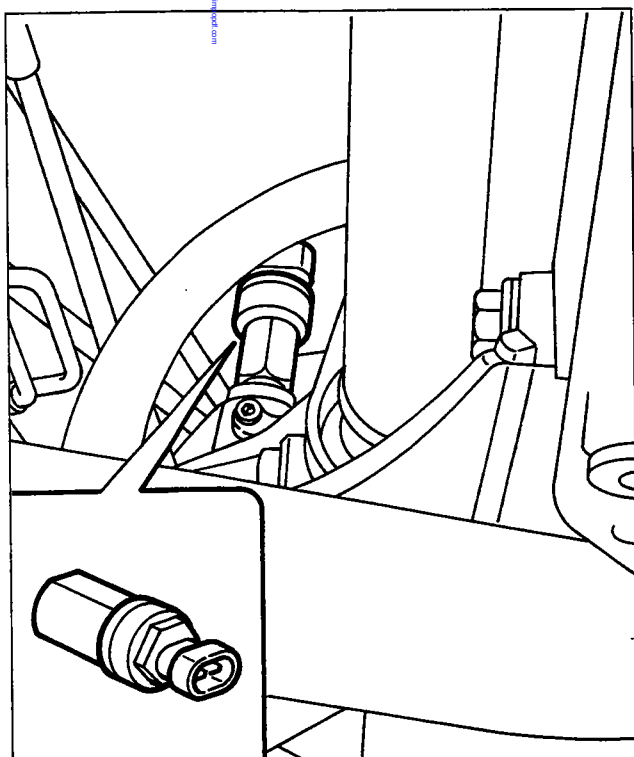
The reference voltage is 5 Volt: since the control unit input circuit is designed as a voltage divider, the reference voltage is shared between a resistance in the control unit and the actual sensor.

As a result the control unit is capable of evaluating the variations in the sensor resistance through the changes in voltage.



P4A28BJ04

Wiring connector

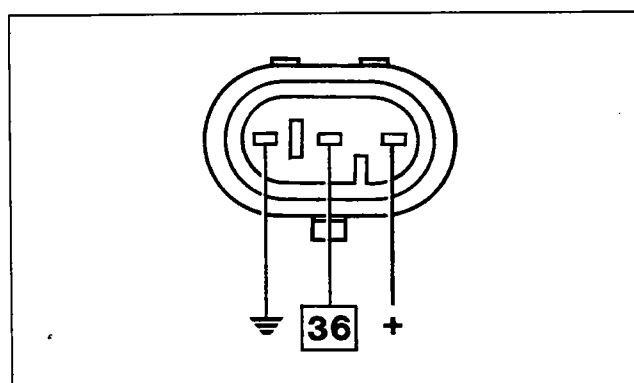


P4A29BJ03

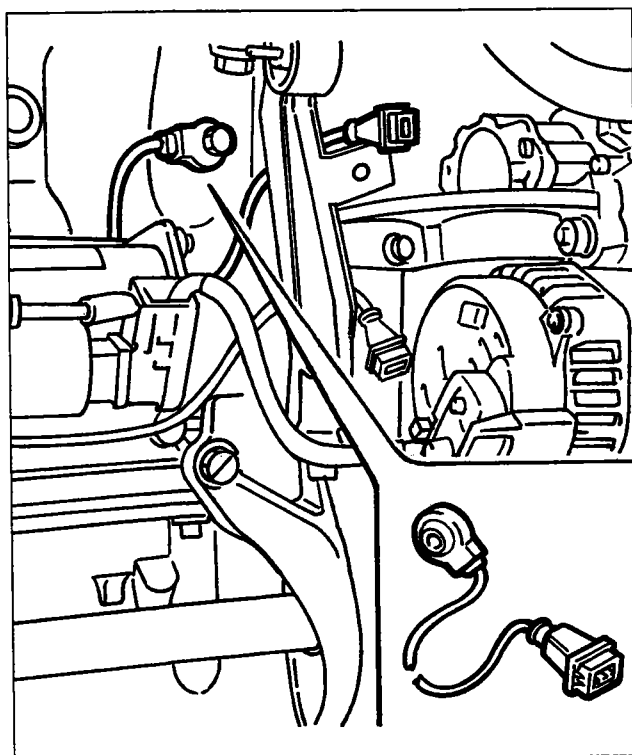
Wiring connector

VEHICLE SPEED SENSOR

The sensor is positioned on the differential outlet, by the left drive shaft coupling and transmits the information relating to the vehicle speed to the control unit: the signal is also used for the operation of the speedometer. The sensor is the Hall effect type (see "engine timing sensor" paragraph) and it is calibrated so that for each impulse there is a corresponding travel of one metre: on the basis of the frequency of the impulses it is therefore possible to know the speed of the vehicle.



P4A29BJ01



P4A29BJ04

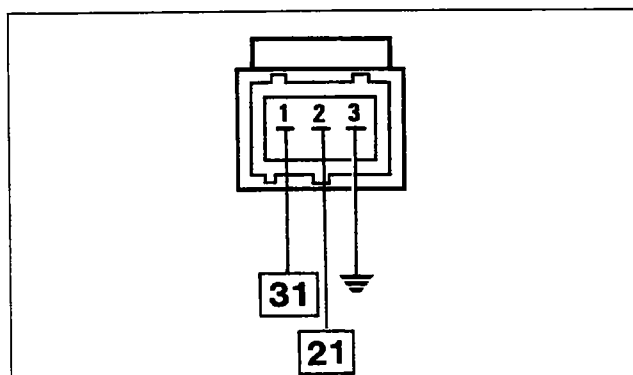
Wiring connector

DETONATION SENSOR

This sensor is the piezoelectric type and is fitted on the engine crankcase in a symmetrical position in relation to the pairs of cylinders 1-2 and 3-4.

This position is determined by the need to detect the start of detonation similarly for all cylinders.

When there is detonation, vibrations of a particular frequency are created in the crankcase which are transformed by the sensor into a signal whose voltage is proportional to their intensity.



P4A29BJ02

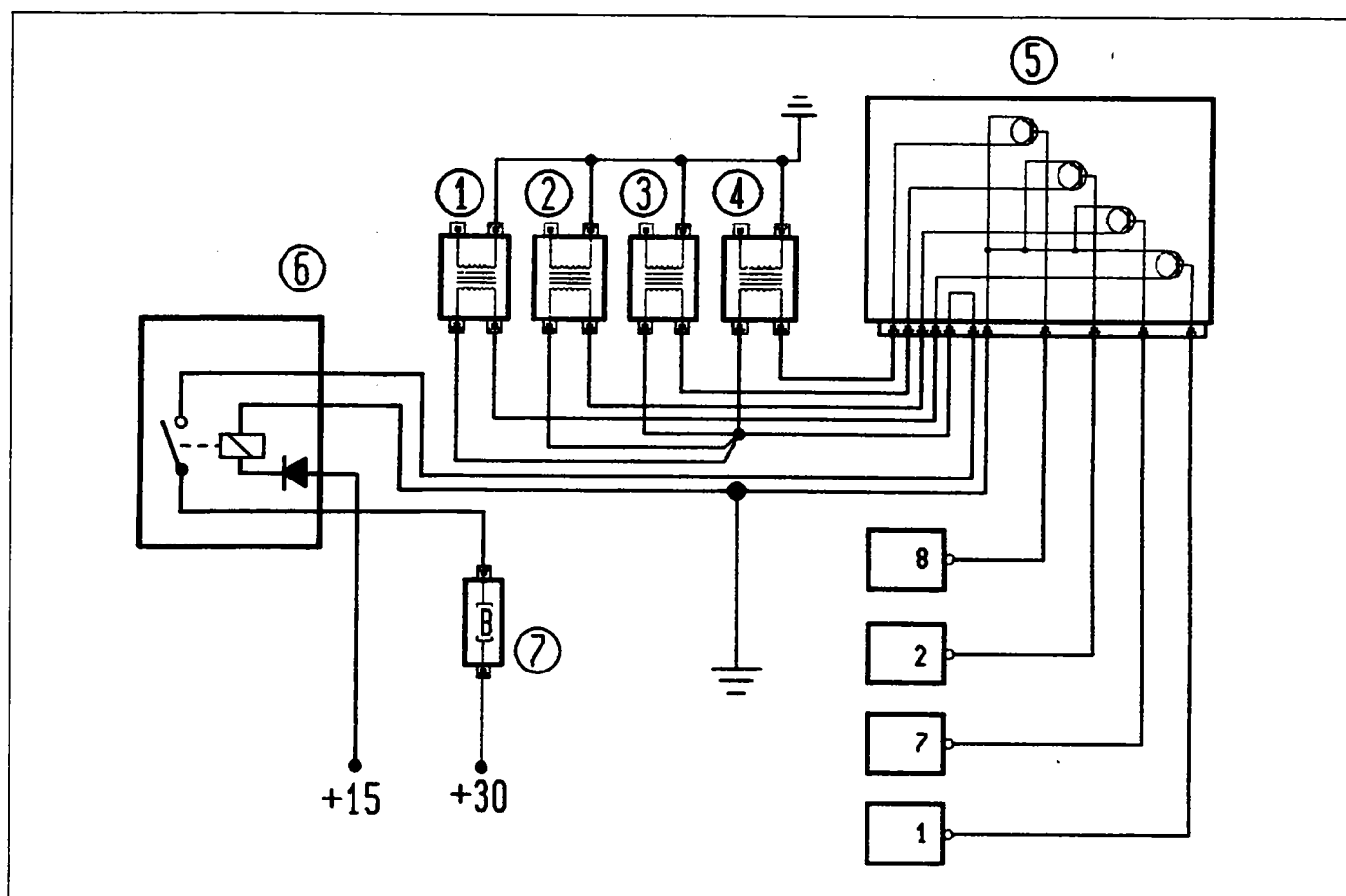
10.

IGNITION SYSTEM

The ignition circuit is the static advance inductive discharge type. The power module is outside of the control unit, whilst the high tension is supplied by four ignition coils fitted directly on the spark plugs (top-plug type coils).

The primary winding for each coil is supplied by the battery voltage via the system relay and is connected to the control module for connection to earth.

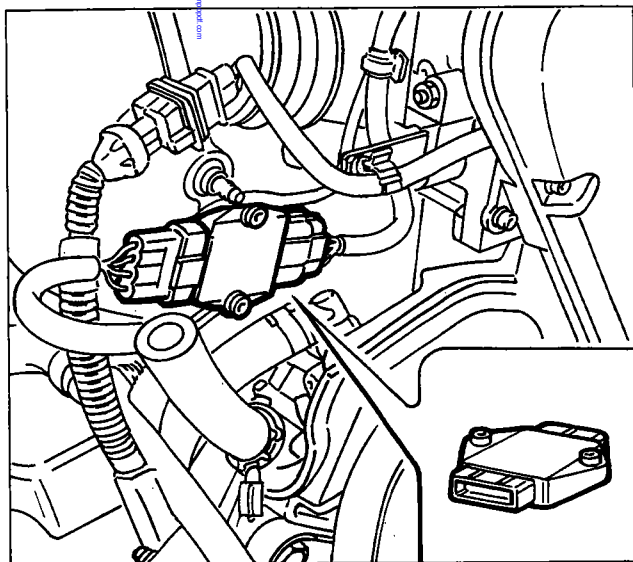
The optimum ignition advance is calculated by the control unit depending on the engine speed and load and is implemented in the form of the time between the moment in which the primary circuit supply is interrupted and the explosion stroke TDC.



P4A30BJ01

1. Coil for cylinder 1
2. Coil for cylinder 2
3. Coil for cylinder 3
4. Coil for cylinder 4

5. Ignition power module
6. System relay
7. Fuse



P4A31BJ01

IGNITION POWER MODULE

The power module, located on the side of the inlet manifold, is basically an electronic switch which, by means of the impulses coming from the control unit, controls the current in the ignition coil primary winding. Through a particular circuit it limits the current which circulates in the coil primary winding when the maximum value is reached in order to reduce the heating of the actual module.

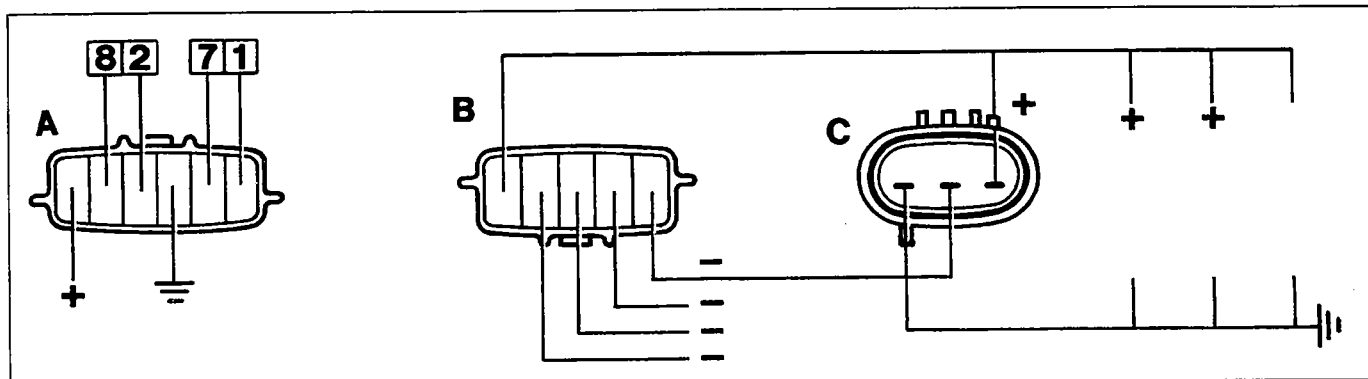
To prevent the overheating of the coil if the ignition takes place with the engine switched off, the module has a rest closing device when the ignition impulses cease arriving from the control unit.

Wiring connector

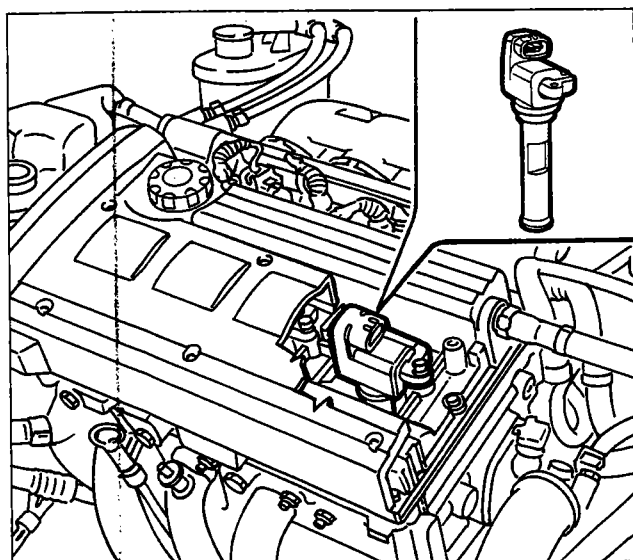
A: module input

B: module output

C: ignition coil



P4A31BJ02



P4A31BJ03

IGNITION COIL

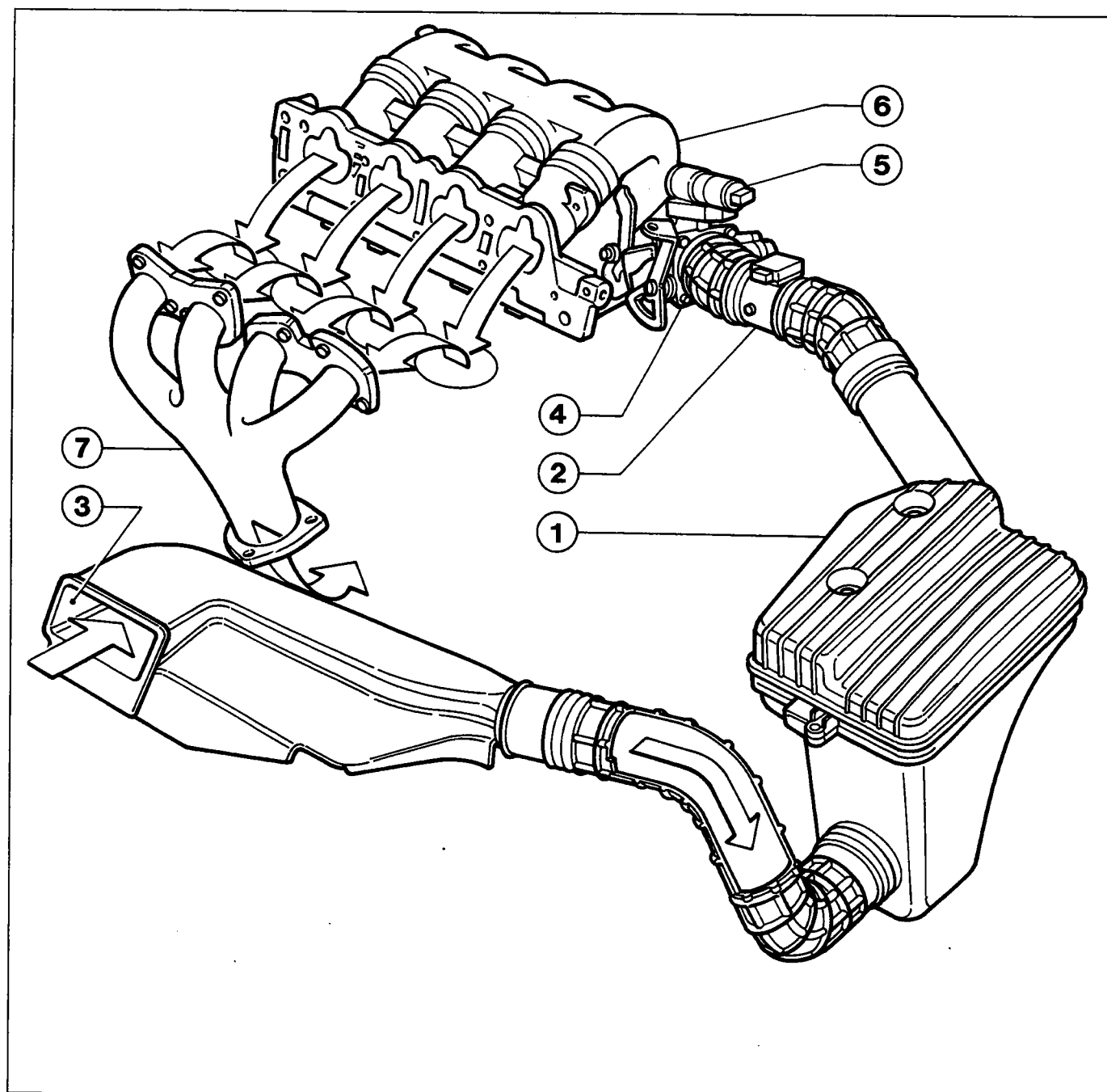
The coil used is the closed magnetic circuit type with the windings in a plastic container immersed in epoxide resin.

The coil is connected directly to the spark plug by a silicon material extension which has high dielectric characteristics.

The earth for the secondary circuit is obtained with a special cable as the coil is insulated by the cylinder head.

10.

DIAGRAM SHOWING INTAKE CIRCUIT



P4A32BJ01

1. Air filter
2. Air flow meter
3. Inlet
4. Butterfly casing
5. Engine idle adjustment solenoid valve
6. Inlet manifold
7. Exhaust manifold

INTAKE CIRCUIT

The intake circuit is made up of the following components:

- air filter with relevant sleeves;
- acoustic resonator fitted in parallel to the inlet sleeve;
- inlet manifold, on which the fuel manifold is fitted;
- butterfly casing, where the butterfly position sensor, the PCV valve (*Positive Crank Ventilation*) for the oil vapour recirculation circuit and the engine idle adjustment solenoid valve are fitted.

BUTTERFLY CASING

The butterfly casing has the task of metering the quantity of air supplied to the engine (and therefore the power developed) according to the driver's request via the accelerator control.

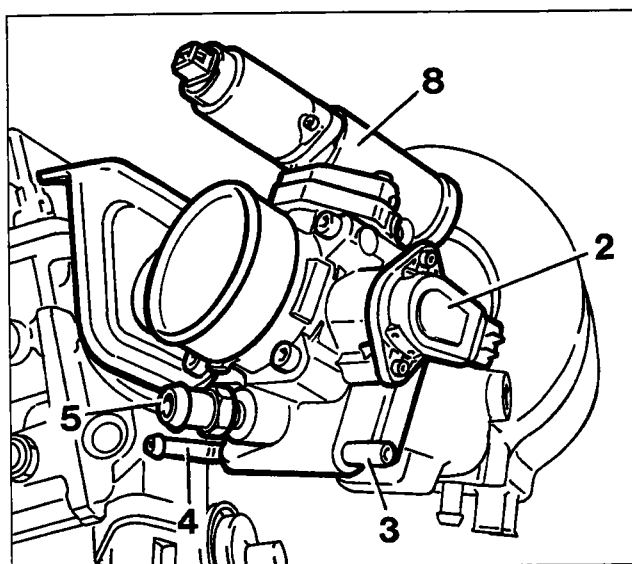
The butterfly casing is fixed to the inlet manifold by four bolts: the butterfly is opened by means of levers which create a small opening which, consistent with the pedal travel, produce small butterfly openings with the pedal gently pressed and viceversa large angle openings with the pedal strongly pressed. With the pedal completely released (engine decelerating or idling) the additional air required is supplied by the engine idle adjustment solenoid valve: under these circumstances the butterfly opening lever is in contact with screw which prevents the butterfly from being locked in the closed position.

To prevent the formation of ice in the butterfly and the port connected to the PCV valve, the butterfly casing is heated with a small amount of coolant coming from the engine thermostat circulating in a chamber inside the actual casing.

The PCV valve for the oil vapour recirculation system and the butterfly position sensor are also fitted on the butterfly casing.

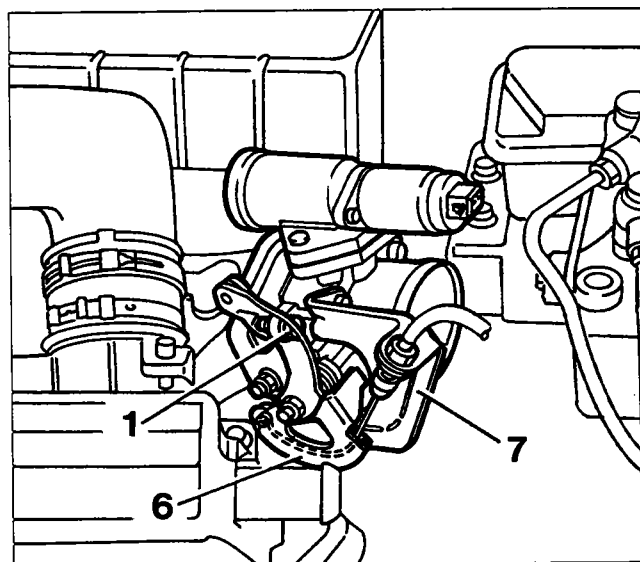


The screw is adjusted during operation by fluxing in the factory and should never be tampered with.



P4A33B.J01

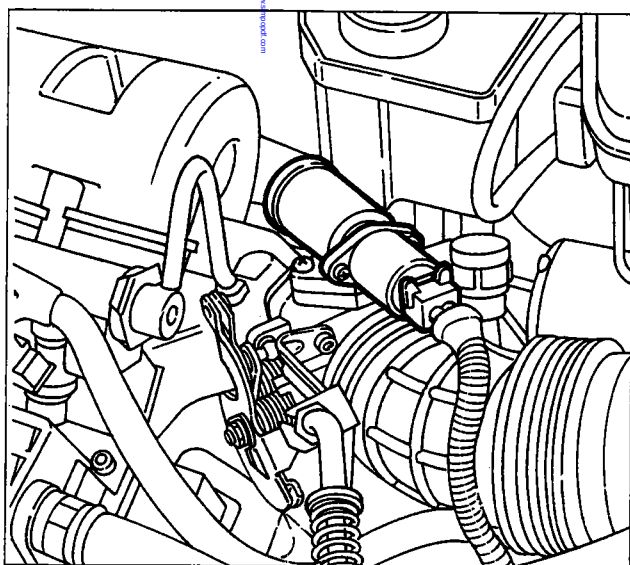
1. Screw
2. Butterfly position sensor
3. Engine coolant inlet
4. Engine coolant outlet



P4A33B.J02

5. PCV valve
6. Accelerator control lever
7. Accelerator cable adjustment bracket
8. Engine idle speed adjustment solenoid valve

10.

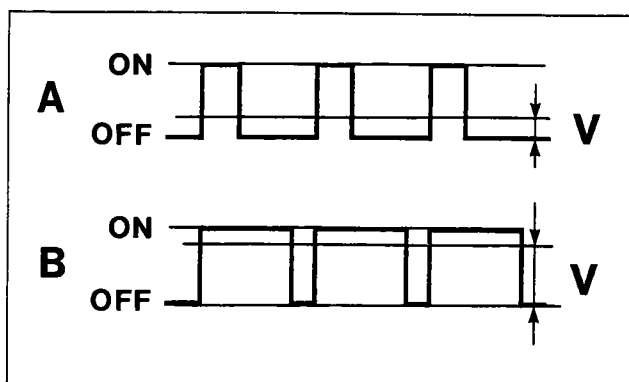


P4A34BJ01

ENGINE IDLE SPEED ADJUSTMENT SOLENOID VALVE

The solenoid valve, fitted on the butterfly casing, intercepts the flow of air which, coming from the air upstream of the butterfly, returns it downstream: it has the task of ensuring the additional air for the engine with the butterfly closed, in all conditions where it is required (idle, deceleration).

The valve is the proportional type where the shutter is fixed to a metal core surrounded by an electrical winding.



P4A34BJ02

Operation in duty-cycle

A: mainly OFF signal = low effective value
mainly ON signal = high effective value
B: effective value

V:

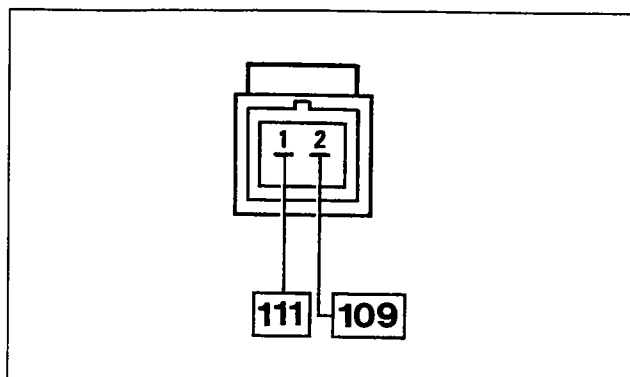
Operating principle

The position of the shutter depends on the intensity of the effective value of the current passing through the winding which creates a magnetic field which attracts the core.

The variation in the effective value is obtained by modulating the winding electrical supply (operation in duty-cycle).

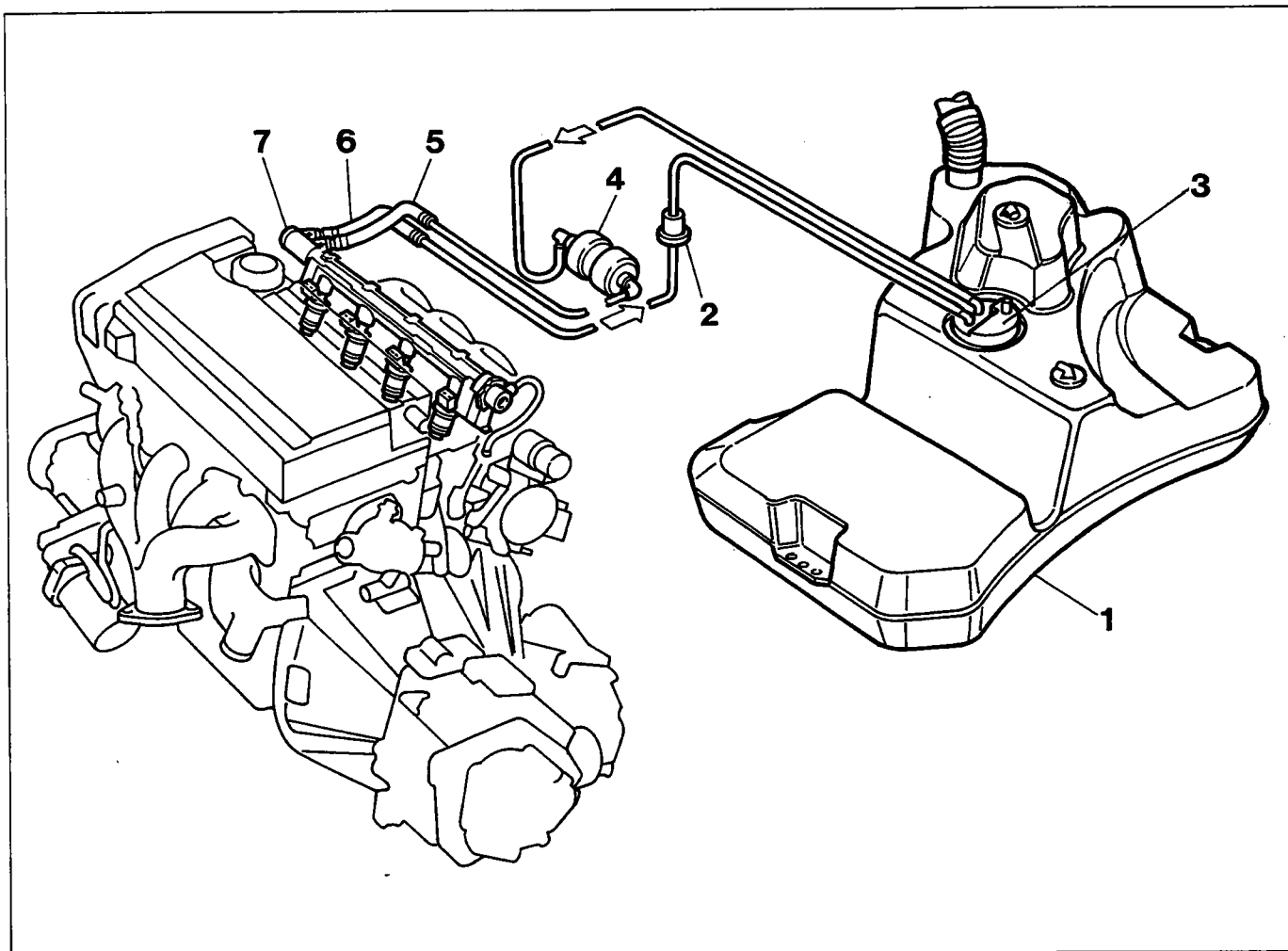
This operation consists of varying the battery voltage value (12 Volt nominal) until zero at a frequency where the shutter is not capable of moving following the instant voltage value, but reaches an intermediate position which depends on the proportion between the voltage presence time and the absence time.

Wiring connector



P4A34BJ03

DIAGRAM SHOWING FUEL SUPPLY CIRCUIT



P4A35BJ01

1. Fuel tank
2. Anti-flow valve
3. Electric fuel pump
4. Fuel filter

5. Fuel supply
6. Fuel return
7. Fuel manifold

FUEL SUPPLY CIRCUIT

The fuel supply circuit is made up of the following components:

- fuel tank;
- electric pump immersed in the tank, equipped with gauze pre-filter;
- fuel filter;
- supply line;
- injectors;
- fuel pressure regulator;
- return line;
- anti-flow valve.

10.

ELECTRIC FUEL PUMP

The pump is housed inside the fuel tank on a special tray which also supports the fuel level gauge and is fitted with a gauze filter at the pump inlet.

The pump is the volumetric type (G-Rotor) and is designed to run on unleaded fuel.

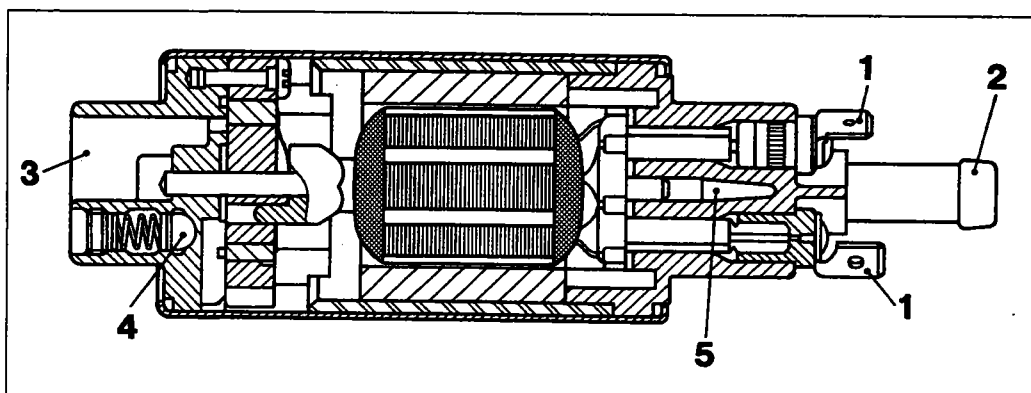
The rotor is moved by a direct current motor supplied at the battery voltage directly by the appropriate relay operated by the control unit.

The motor is immersed in the fuel which has a detergent and cooling effect on the blades and the manifold.

The pump is equipped with an excess pressure valve, which short circuits the supply with the inlet if the pressure in the supply circuit exceeds 5 bar, to prevent the electric motor from overheating.

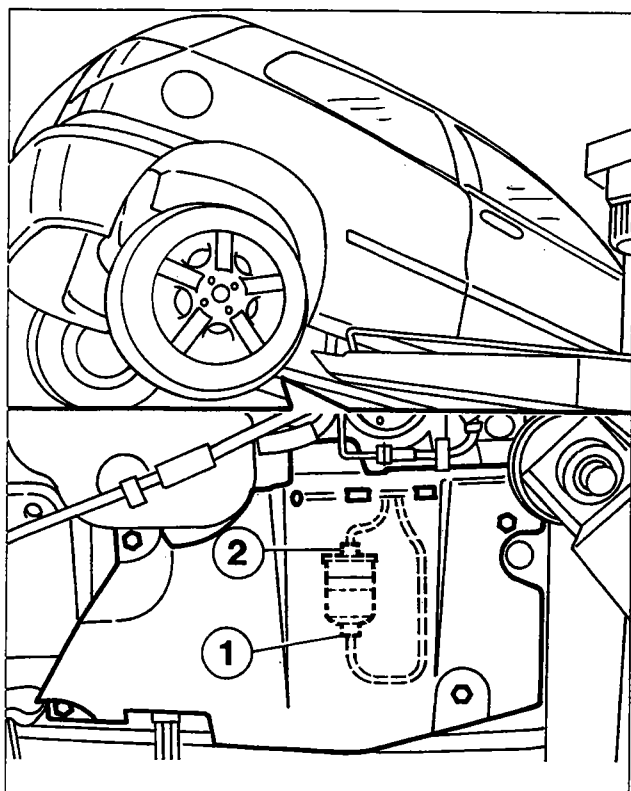
In addition, a one-way valve on the supply prevents the draining of the entire fuel circuit when the pump is not working.

The nominal capacity of the pump varies according to the angular speed of the rotor and therefore the supply voltage: with a voltage of 12 V it is around 140 l/h.



P4A36BJ01

1. electrical connectors
2. supply port
3. inlet port
4. excess pressure valve
5. one-way valve



P4A36BJ02

FUEL FILTER

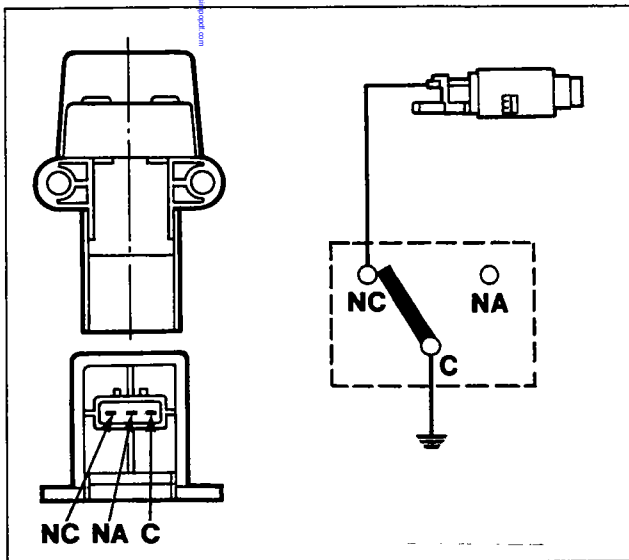
The filter, protected by a shield fixed under the bodyshell, is inserted along the fuel supply pipe. It is made up of a steel casing and a polyurethane internal support which has a high filtering capacity element.

NOTE There is an arrow on the outer casing which indicates the direction of the flow of the fuel and the correct fitting position.

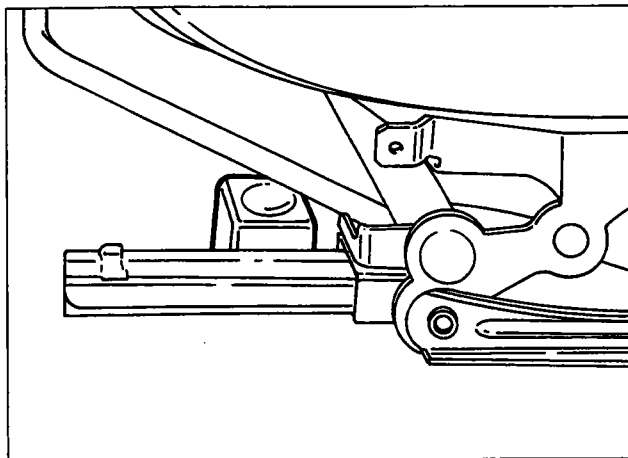


The fuel filter should be changed at intervals of 30,000 Km.

1. Fuel inlet
2. Fuel outlet



P4A37BJ01

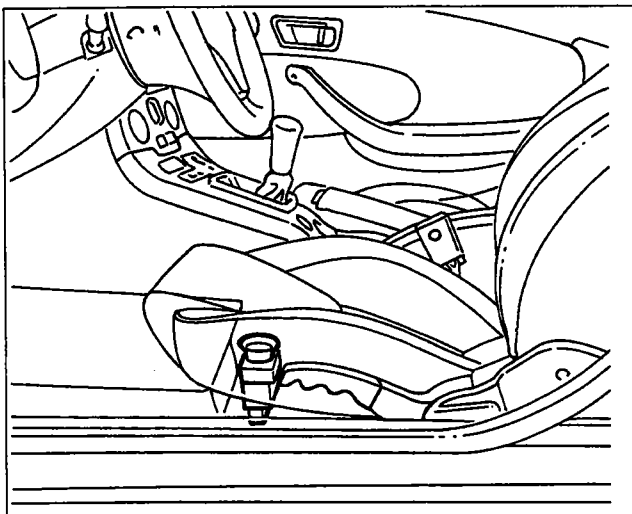


P4A37BJ02



After an apparently slight impact, if there is a smell of fuel or there are leaks from the fuel system, do not turn the switch back on, but search for the problem and eliminate it to prevent the risk of fire.

If this is not the case and there are no leaks and the vehicle can be driven again, press the button to reactivate the electric pump.



P4A37BJ03

INERTIA SAFETY SWITCH

The inertia switch has the task of interrupting the electrical supply for the electric fuel pump if the vehicle undergoes violent deceleration (impact) to prevent fuel from escaping and creating a fire hazard if the fuel manifold or the supply pipe are damaged.

The switch is made up of a steel ball in a conical shaped housing kept in position by the attraction force of a permanent magnet. Under the action of the acceleration due to the inertia force the ball can be released from the magnetic clip and gradually come out of the conical housing with an upwards movement depending on the angle of the cone.

Above the ball there is a rapid attachment mechanism which forms a normally closed (NC) circuit. When struck by the ball, the mechanism changes position to the normally open (NA) circuit, thereby interrupting the electrical supply to the electric pump causing it to cut out.

The calibration of the switch causes its operation at acceleration above 1.2 g (about 11.7 m/s², corresponding to an impact at a speed of around 25 Km/h).

The switch can be restored by pushing the upper button protected by a flexible cover.

SINGLE-ACTING ANTI-FLOW VALVE

This is a safety valve fitted in the fuel return pipe near the tank.

The valve allows the return of fuel to the tank preventing it, however, from flowing out in the opposite direction if the pipe breaks.

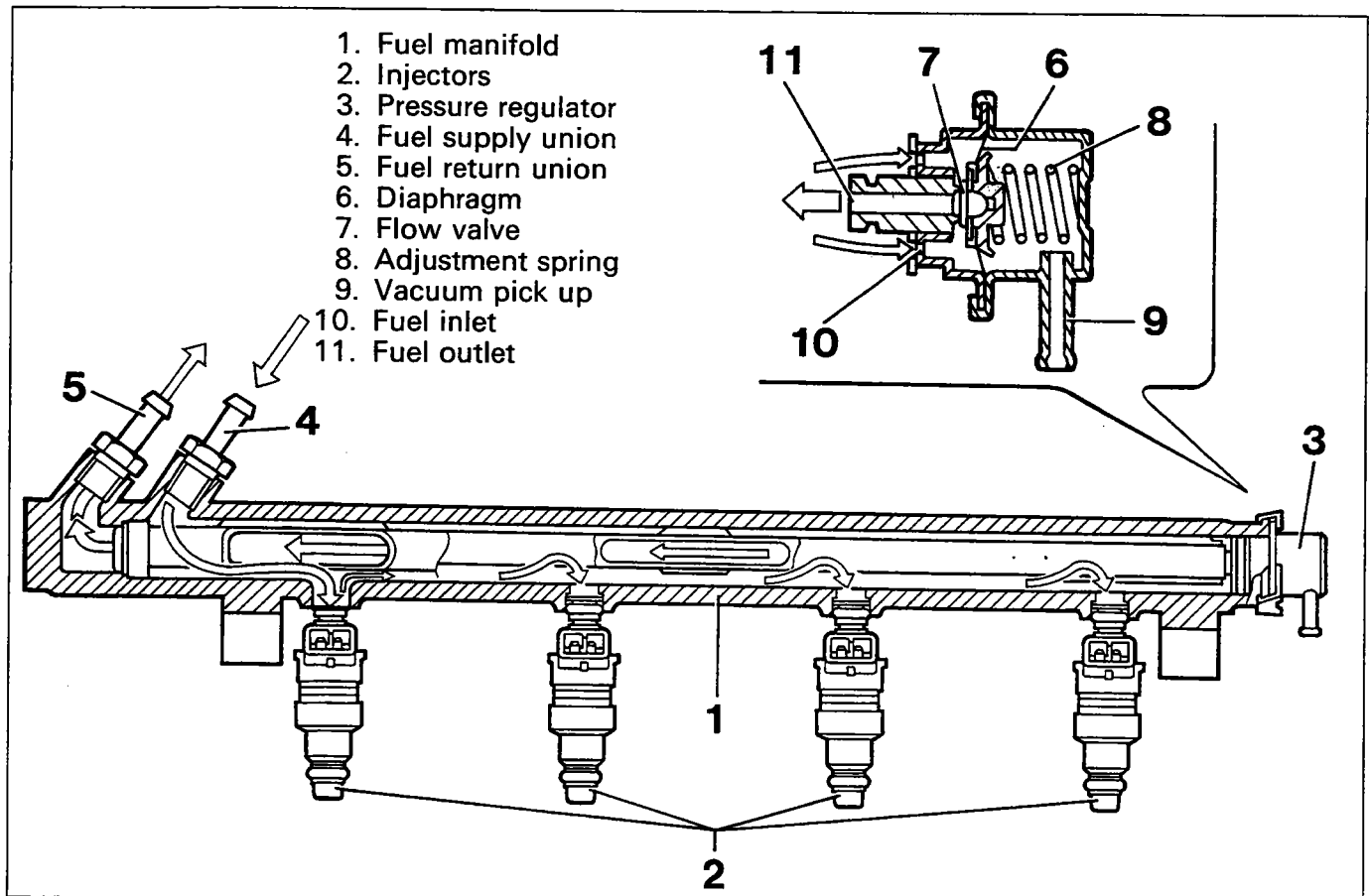
10.

FUEL MANIFOLD

The fuel manifold, which has the function of distributing the fuel to the injectors, is made from die-cast aluminium and incorporates the housings for the injectors and for the pressure regulator.

The fuel inlet is achieved with a sealed fixing bolt.

The fuel recirculation is obtained by means of a pipe inside the manifold connected at one end to the regulator and at the other end to the outer fuel return pipe to the tank.



P4A38BJ01

FUEL PRESSURE REGULATOR

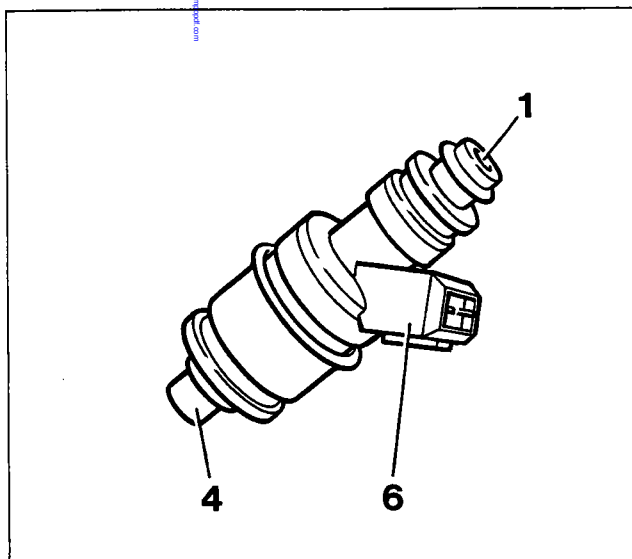
This is a differential diaphragm device, adjusted during manufacture to a pressure of 3.00 ± 0.05 bar. The fuel under pressure, coming from the pump, exerts a force on the flow valve (7) opposed by the calibrated spring (8). When the calibration pressure is exceeded, the flow valve opens and the excess fuel returns to the tank, thereby stabilizing the pressure in the circuit.

In addition, via the pick up (9), the vacuum in the inlet manifold (at which the *nose* of the injector) also finds itself, acts on the regulator diaphragm, reducing the load exerted by the calibration spring.

In this way the differential in pressure between the fuel and the environment (inlet manifold) in which the injector finds itself in all engine operating conditions is kept constant.

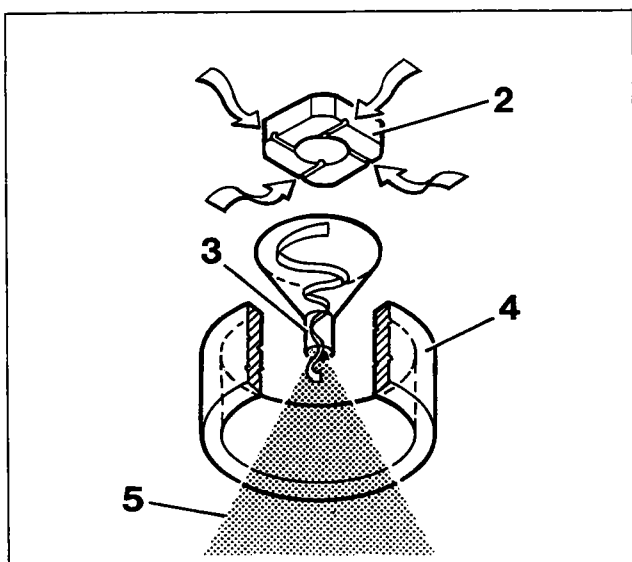
Consequently, the injector flow rate (for a certain supply voltage) depends only on the injection time established by the control unit.

NOTE *The pressure is assumed by the control unit as a fixed parameter: as a result the regulator should never be tampered with so as not to alter the mixture strength for the engine.*



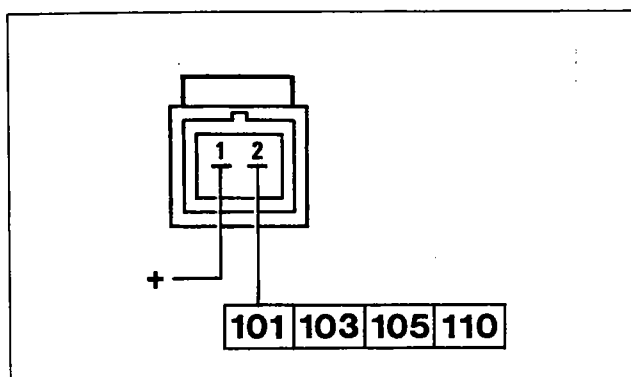
P4A39BJ01

1. Fuel inlet
2. Deflector
3. Jet
4. Nose
5. Jet of fuel
6. Electrical connector



P4A39BJ02

Wiring connector



P4A39BJ03

INJECTORS

The injectors have the task of supplying the quantity of fuel required for the operation of the engine: the fuel is injected into the inlet manifold, immediately upstream of the inlet valve.

The injector is the "top-feed" type, with the supply of the fuel from the rear of the casing, where the electrical winding connected to the connector (6) is also housed.

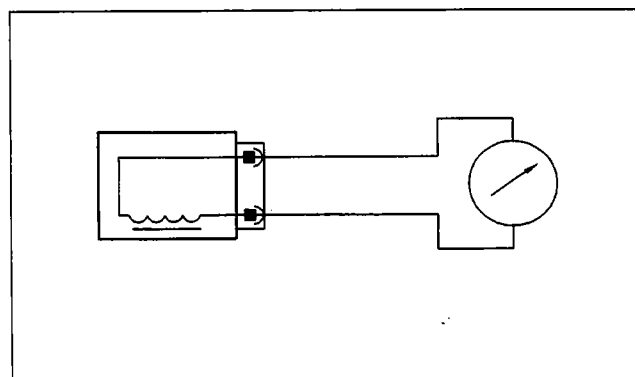
When the current passes through the winding, the magnetic field produced attracts the shutter causing the opening of the injector and the flow of fuel.

As the pressure differential between the inside and the outside of the injector is constant (thanks to the presence of the regulator), the quantity of fuel supplied, like the electrical voltage, only depends on the opening time, established by the control unit.

The end section of the injector or *nose* (4) is fitted with a jet (3) which gives the fuel a rotary motion, thanks to a deflector (2) fitted with four tangentially positioned flow ports.

The resistance of the injector can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Value of the resistance: $12 \pm 1,2$ ohm.



P4A39BJ04

10.

EMISSION CONTROL DEVICES

The devices used have two objectives:

- to keep down the pollutant substances present in the exhaust, via the catalytic silencer;
- to eliminate the dispersion towards the outside of the unburnt hydrocarbons, via the (fuel) anti-evaporation system and the (lubrication) oil vapour recirculation system.

CATALYTIC SILENCER

The catalytic silencer is a device which makes it possible to simultaneously keep down the three main pollutant compounds present in the exhaust: unburnt hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx).

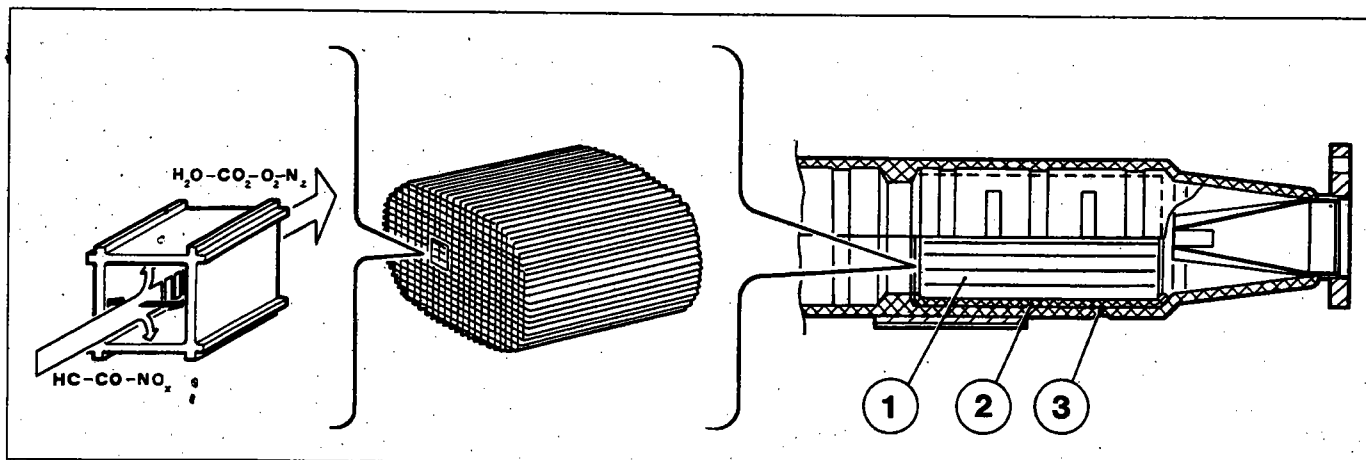
Two types of chemical reaction take place inside the catalyzer:

- oxidation of the CO and the HC, converted into carbon dioxide (CO₂) and water (H₂O);
- reduction of the NOx, converted into Nitrogen (N₂).

These reactions can take place in extremely short periods of time thanks to the presence inside the catalyzer structure (ceramic support) of a layer of active substances (platinum and rhodium) which greatly accelerate the conversion speed of the harmful substances.

The effectiveness of this conversion process is conditioned by the fact that the mixture strength at which the engine operates is constantly oscillating around the stoichiometric value, which is achieved thanks to the feed-back control carried out by the control unit on the basis of the Lambda sensor signals.

Lastly, the conversion processes are activated at temperatures in excess of 300 - 350°C: it is therefore vital that the catalyzer reaches this temperature as soon as possible in order to work properly.



P4A40BJ01

1. Ceramic monolith
2. Metal support
3. Steel outer casing

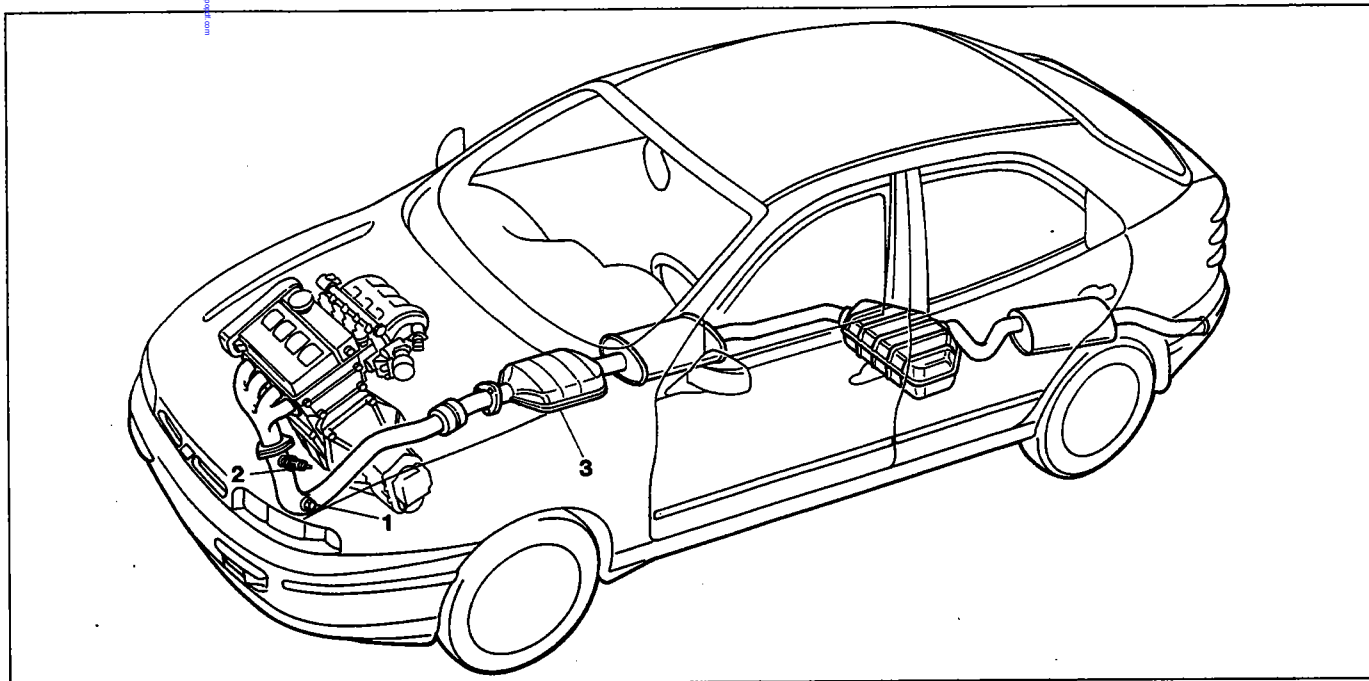


When it is necessary to operate near the catalytic silencer, it is necessary to leave the vehicle to rest for some time, since the (internal) operating temperature of the catalyzer is between 500 and 850°C.



There are basically two causes of the destruction of the inside of the catalyzer:

- *the presence of lead in the fuel which lowers the degree of conversion at levels of practically nil ("lead poisoning") and which also irreparably damages the Lambda sensor;*
- *the presence of totally unburnt fuel in the exhaust gases, due to failed ignition, which causes an increase in the temperature which involves the fusion of the ceramic support. As a result, the connector for the coils should never be disconnected with the engine running: in the case of tests, the silencer should be replaced first with an equivalent section of pipe.*



P4A41BJ01

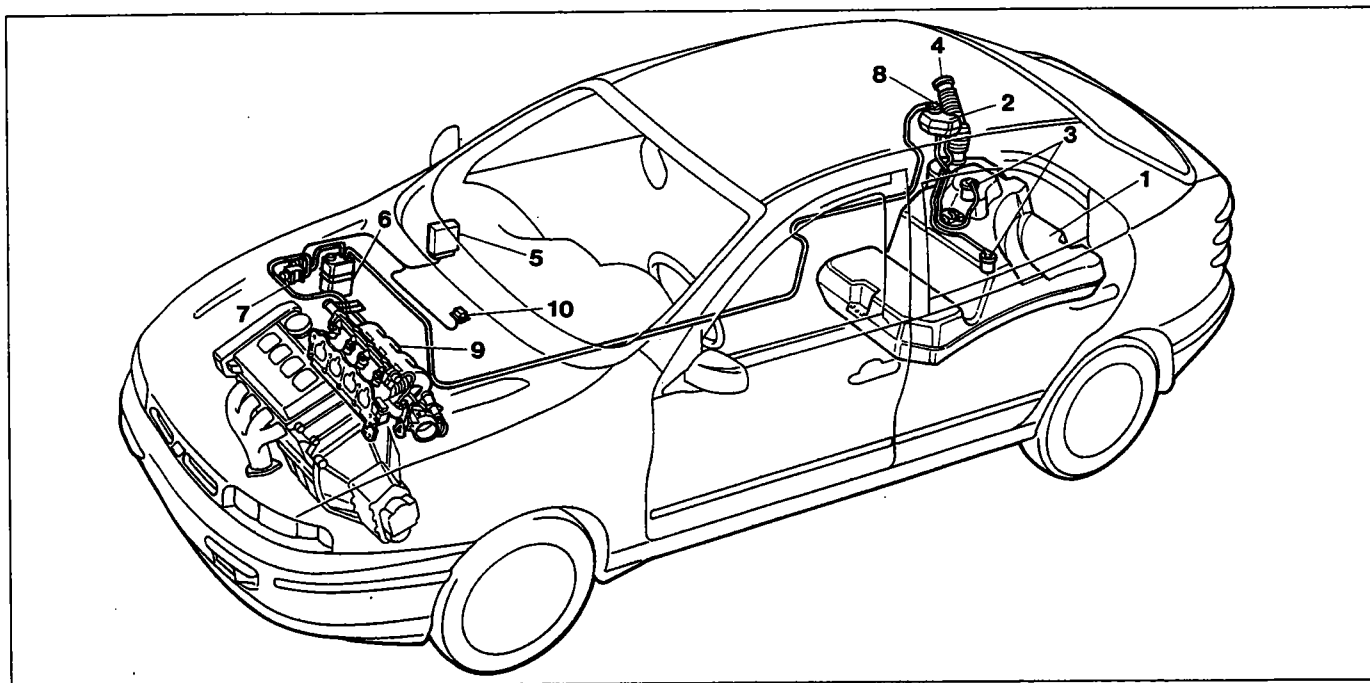
Exhaust system with catalytic converter

1. CO socket

2. Lambda sensor

3. Catalytic silencer

FUEL ANTI-EVAPORATION SYSTEM



P4A41BJ02

Location of anti-evaporation system components

1. Fuel tank

2. Vapour separator

3. Float valve

4. Cap with safety valve

5. Engine control unit

6. Charcoal filter

7. Charcoal filter solenoid valve

8. Multi-purpose valve

9. Inlet manifold

10. Relay

10.

Operating principle

The anti-evaporation system has the aim of preventing the fuel vapours, made up of the lightest parts of the hydrocarbons which basically form in the tank, from being discharged into the atmosphere.

The system operates, above all at high outside temperatures when the temperature of the fuel increases and consequently the tendency towards evaporation increases: in this situation there is an increase in the pressure inside the tank.

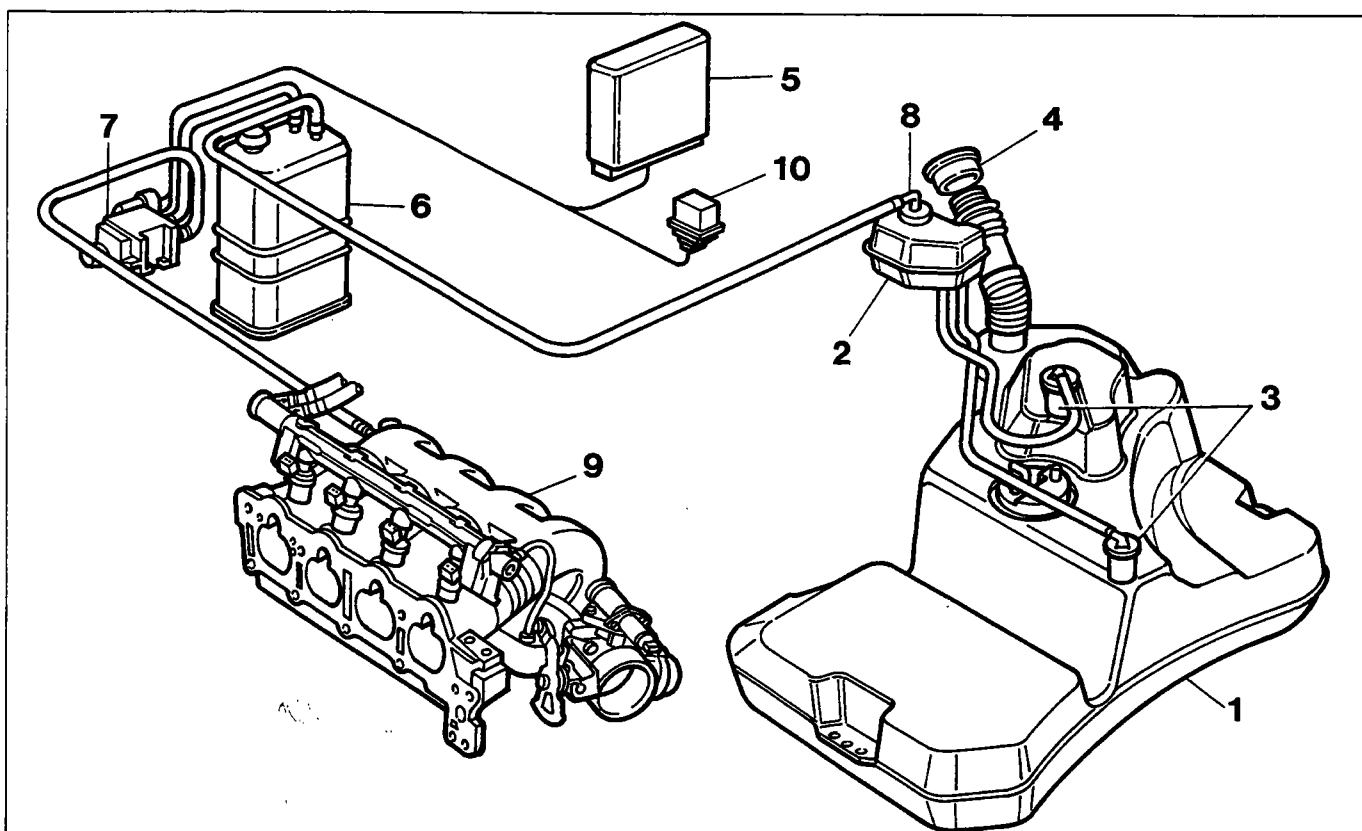
In particular, even with the tank (1) full, with the vehicle stationary the two float valves (3) remain open as they are located higher than the breather pipe and therefore they allow the vapours to reach the separator (2) from where they mainly return to the tank as they condense.

If, on the other hand, there is strong splashing when the vehicle is driving or it overturns, the valves (3) close preventing fuel from escaping.

When the pressure inside the tank reaches about 30-40 mbar, the multi-purpose valve (8) opens and the fuel vapours reach the charcoal filter (6). The valve (8) also allows an intake of air into the tank through the charcoal filter if necessary following the lowering of the level of fuel and the consequent vacuum which is created inside the tank.

When the engine is running, the control unit operates the charcoal filter solenoid valve which allows the intake of vapours by the engine and the consequent scavenging of the charcoal filter.

If as a result of the malfunction of one of the components, the pressure inside the tank increases to dangerous levels, the safety valve located in the cap (4) allows the pressure to be discharged outwards. If necessary, this valve can open in the opposite direction, to ventilate the tank and prevent the vacuum reaching excessive values.



P4A42BJ01

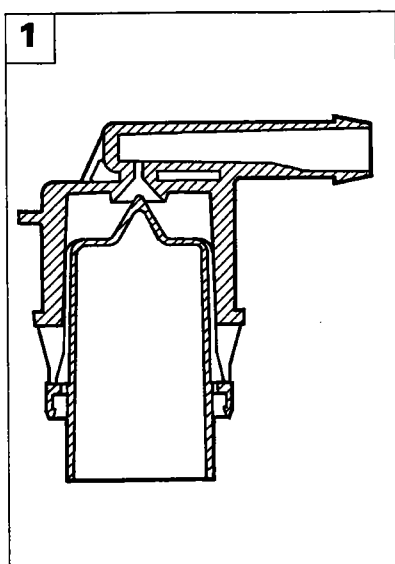
- | | |
|--------------------------|-----------------------------------|
| 1. Fuel tank | 6. Charcoal filter |
| 2. Vapour separator | 7. Charcoal filter solenoid valve |
| 3. Float valve | 8. Multi-purpose valve |
| 4. Cap with safety valve | 9. Inlet manifold |
| 5. Engine control unit | 10. Relay |

Float valve

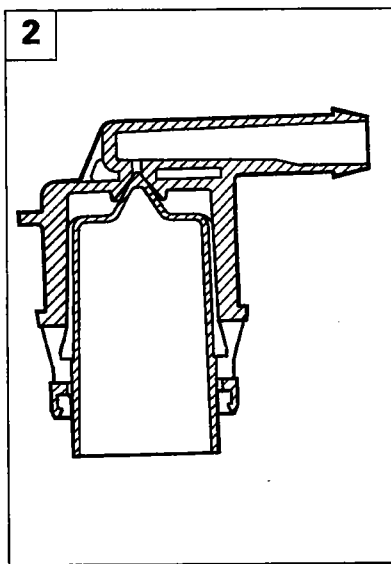
The float valve has the task of allowing the flow of vapours towards the separator, without, however, allowing the escape of liquid fuel.

The valve contains a float, one end of which closes the valve outlet port in the following conditions:

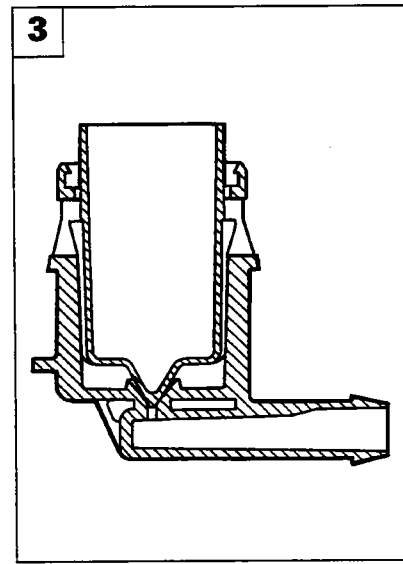
- strong side acceleration (vehicle taking a bend) or longitudinal acceleration (vehicle braking) with the relevant movement of the mass of fuel as a result of the inertia force;
- overturning of the vehicle.



P4A43BJ01

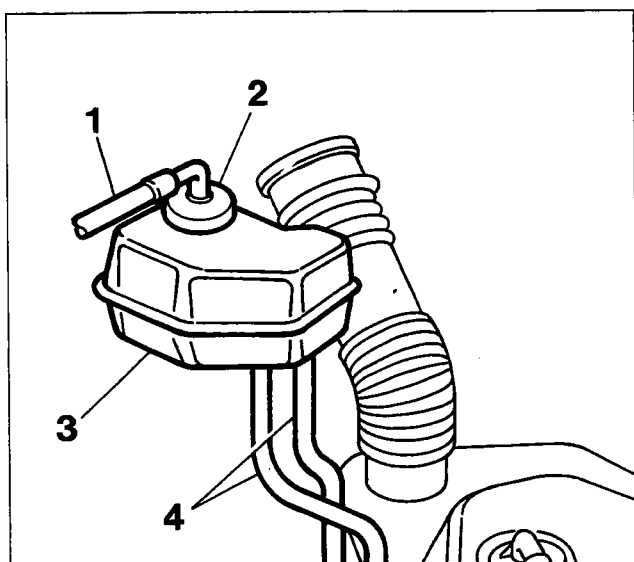


P4A43BJ02



P4A43BJ03

1. Normal operating conditions: valve open
2. The fuel pushes the float upwards as a result of strong acceleration: valve closed
3. Vehicle overturned: valve closed



P4A43BJ04

Fuel vapour separator and multi-purpose valve

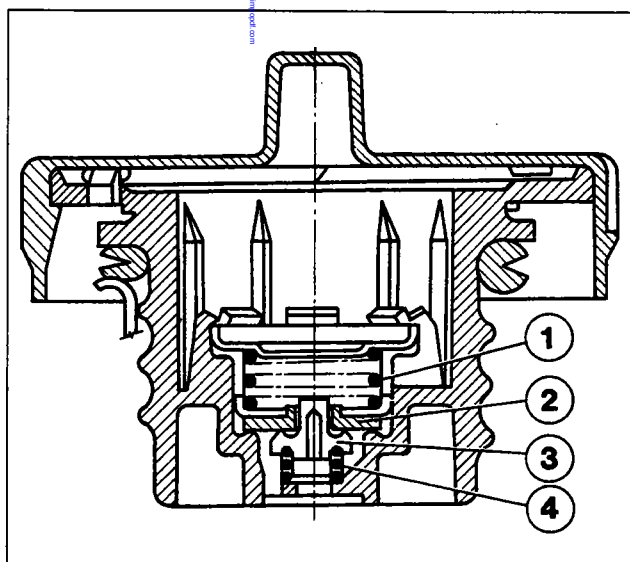
The fuel vapours coming from the tank reach the vapour separator (3), located at the side of the fuel filler, via the pipes (4).

Part of the vapours condense and return to the tank via the same pipes (4), whilst the remaining vapours escape from the separator through the multi-purpose valve (2) and are directed to the active charcoal filter via the pipe (1).

1. Pipe connecting fuel vapour separator to the active charcoal filter
2. Multi-purpose valve

3. Fuel vapour separator
4. Pipes connecting vapour separator to the fuel tank

10.

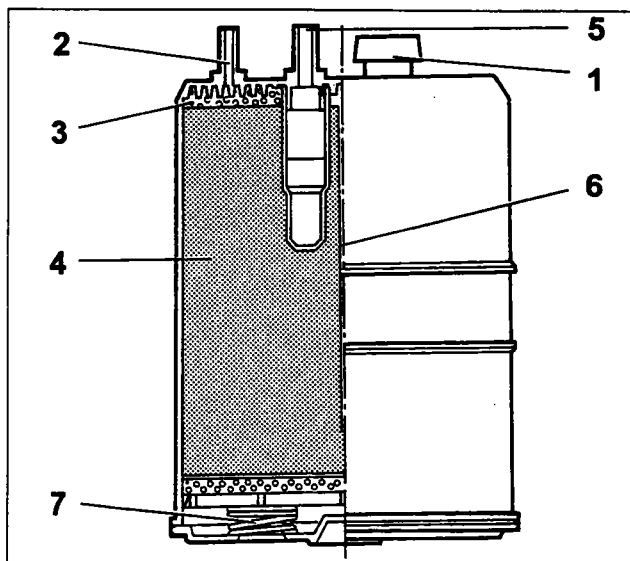


P4A44BJ01

Safety and ventilation valve

This valve is located in the fuel filler cap and carries out the following functions:

- discharging the excess pressure outwards which forms inside the tank (safety function); the pressure acts on the plate (2) and, overcoming the spring (1) loading, allows the excess vapours to be discharged outwards;
- allowing the flow of outside air in the tank when an excessive vacuum is formed inside the tank through the effect of the fuel consumption (ventilation function): when the vacuum exceeds the loading of the spring (4), it moves the valve (3), allowing the intake of air.



P4A44BJ02

Active charcoal filter

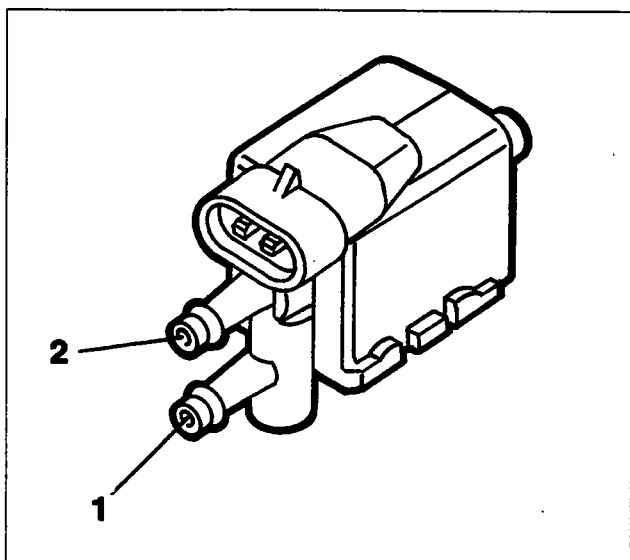
This is made up of granules of charcoal (4) which trap the vapours entering through the inlet (5).

The scavenging air which enters through the inlet (1), passes through the paper filter (3), comes into contact with the charcoal granules removing the vapours and directs them towards the outlet (2) and from there towards the filter valve.

The air, having entered through the inlet (5) can also be sent by the vacuum into the tank for ventilation.

The partition (6) ensures that the warm scavenging air drawn in comes into contact with all the granules of charcoal.

There are also two springs (7) which allow the expansion of the mass of granules when the pressure increases.



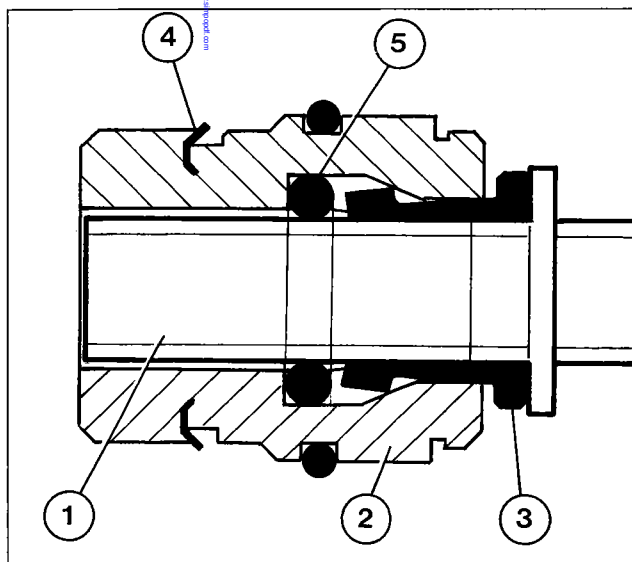
P4A44BJ03

Charcoal filter solenoid valve

This valve, of the normally closed type, controls the flow of vapours reaching the inlet manifold and is operated by the control unit with duty-cycle operation.

NOTE The inlet which has the word CAN (canister) written on it should be connected to the charcoal filter.

1. From the charcoal filter
2. To the inlet manifold

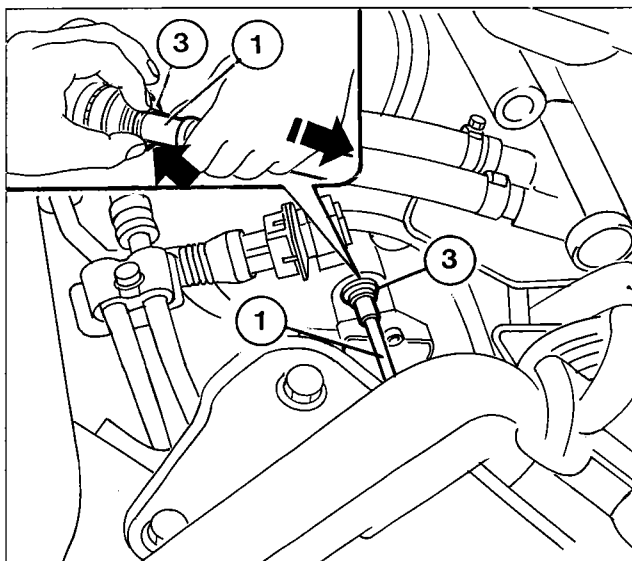


P4A44BJ04

PROCEDURE FOR DISMANTLING THE RAPID ATTACHMENT PIPE FOR THE ANTI-EVAPORATION SYSTEM FROM THE INLET MANIFOLD

The pipe for the anti-evaporation system (1) is held in place on the inlet manifold cartridge (2) by the small clamp (3). A flexible washer (4) keeps the cartridge (2) in its housing preventing any fuel vapours from escaping by means of an O ring (5).

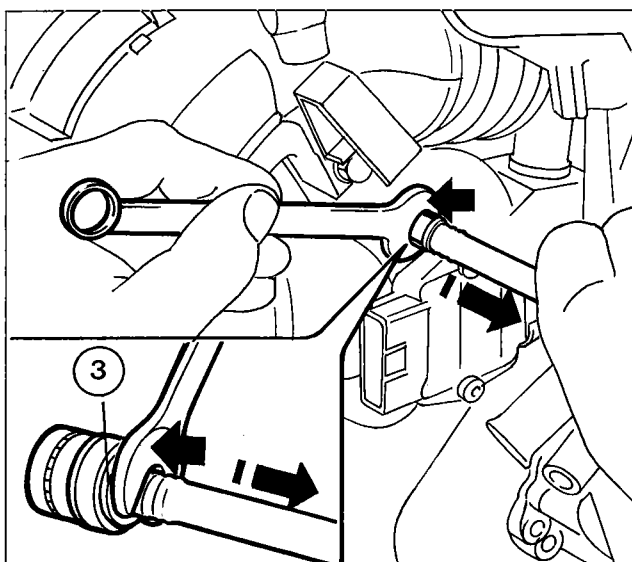
1. Anti-evaporation system rapid attachment pipe
2. Cartridge
3. Pipe retaining clamp
4. Flexible washer
5. O-ring



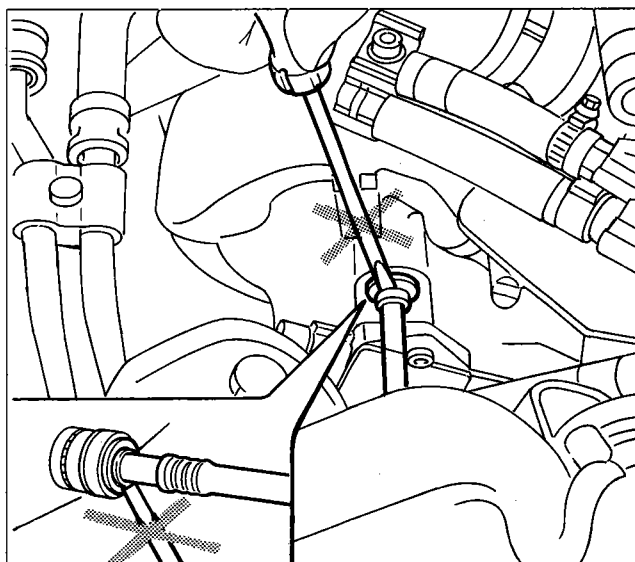
P4A44BJ05



Do not use tools to extract the pipe which could damage the system.

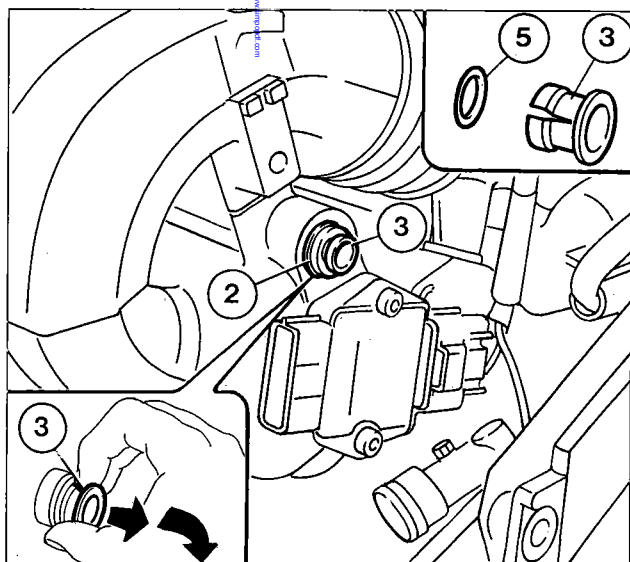


P4A44BJ06



P4A44BJ07

10.

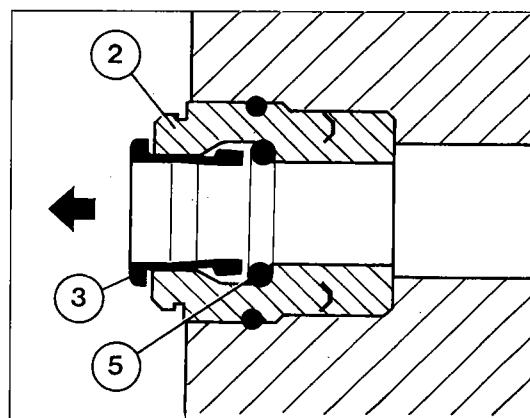


P4A44BJ08

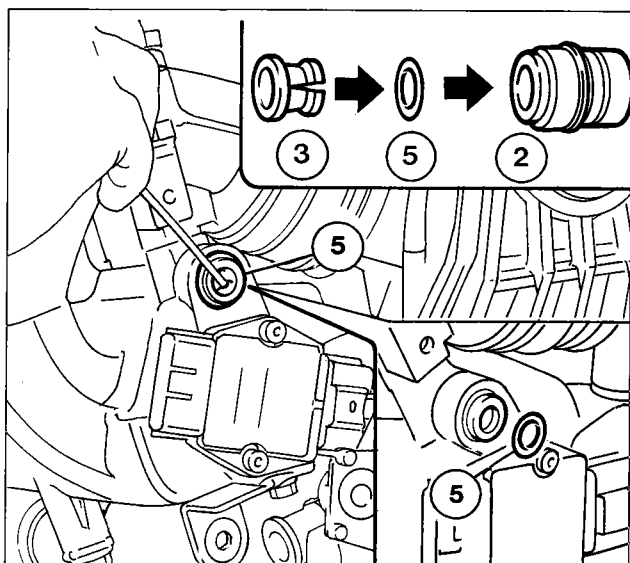
Replacing clamp

A kit is available for replacing the clamp which comprises an O-ring (5) and a clamp (3).

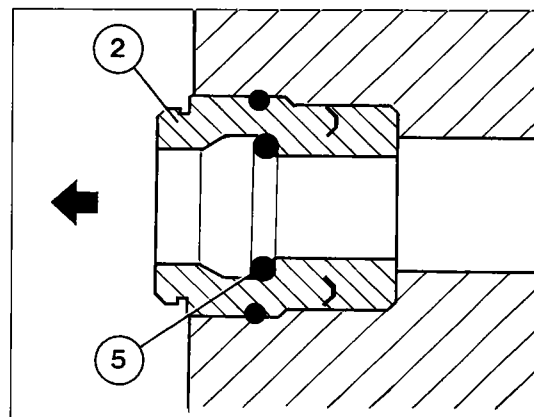
After having removed the pipe for the anti-evaporation system, insert your fingers between the clamp (3) and the cartridge casing (2) (to facilitate the operation, move the clamp aside using a screwdriver, working very carefully). Pull outwards and rotate the actual clamp.



P4A44BJ11



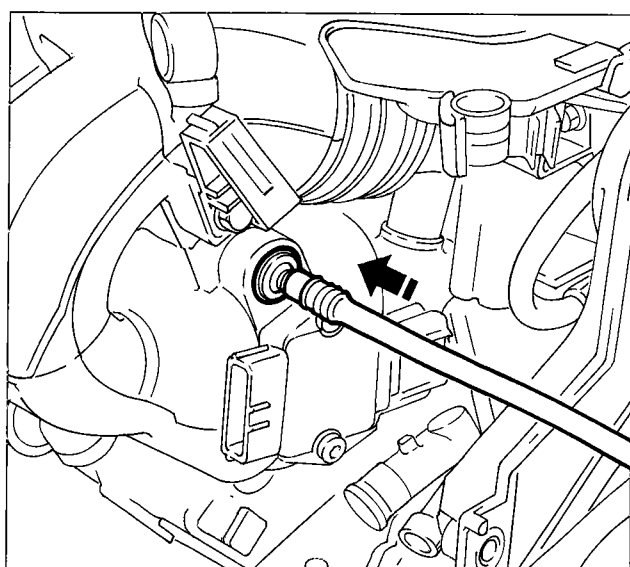
P4A44BJ09



P4A44BJ12

Extract the O-ring (5) inside the cartridge. Clean the interior of the cartridge with an air jet and insert the new O-ring in its housing; then insert the new clamp.

Clean all impurities from the end section of the pipe before it is inserted inside the cartridge. Insert the pipe pushing it into the end of travel position.



P4A44BJ10

SYSTEM FOR RECIRCULATING GASES COMING FROM THE CRANKCASE (BLOW-BY)

This system controls the emissions from the crankcase of breather gases, made up of mixtures of air, fuel vapours and burnt gases which escape through the piston seals and of lubricant oil vapours, drawing them in again and burning them in the engine.

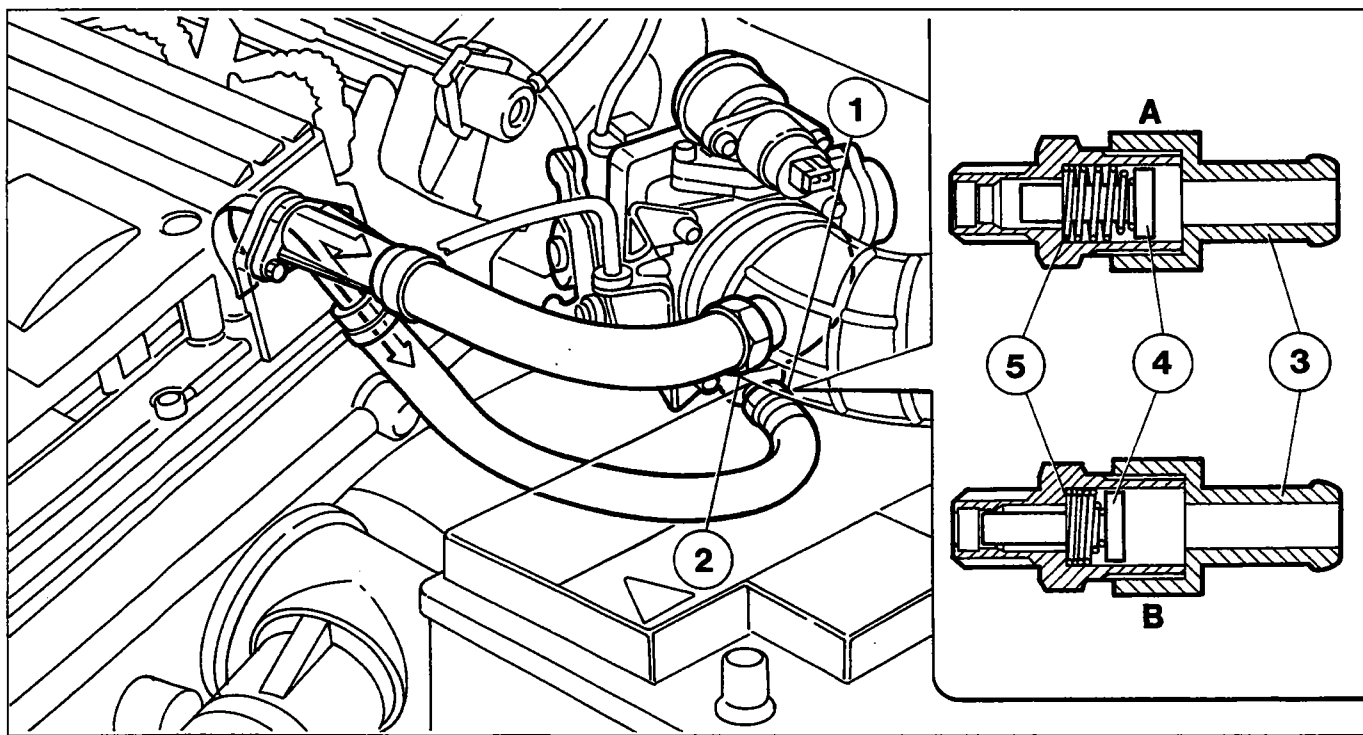
The breather gases coming from the crankcase reach the cylinder head and are directed into two different inlets (1) and (2).

With the butterfly open, the gases flow through the inlets (1) and (2) to be drawn into the manifold. With the butterfly closed the vacuum in the inlet manifold draws in the gases through the intake (1) in which there is a PCV limiting valve (3) (*Positive Crank Ventilation*) which shutters the intake.

The PCV valve, in effect, can be modulated and the quantity of gases which pass through is proportional to the vacuum in the inlet manifold.

When the butterfly valve is completely open (condition A), the vacuum inside the inlet manifold is minimal, the spring (5) is completely extended and the PCV valve allows the maximum flow of breather gases.

Viceversa, with the butterfly completely closed (condition B), the vacuum inside the manifold is maximum, this causes the movement of the piston (4) which shutters the opening for the flow of breather gases inside the PCV valve and thereby restricts the intake into the manifold of the actual gases.

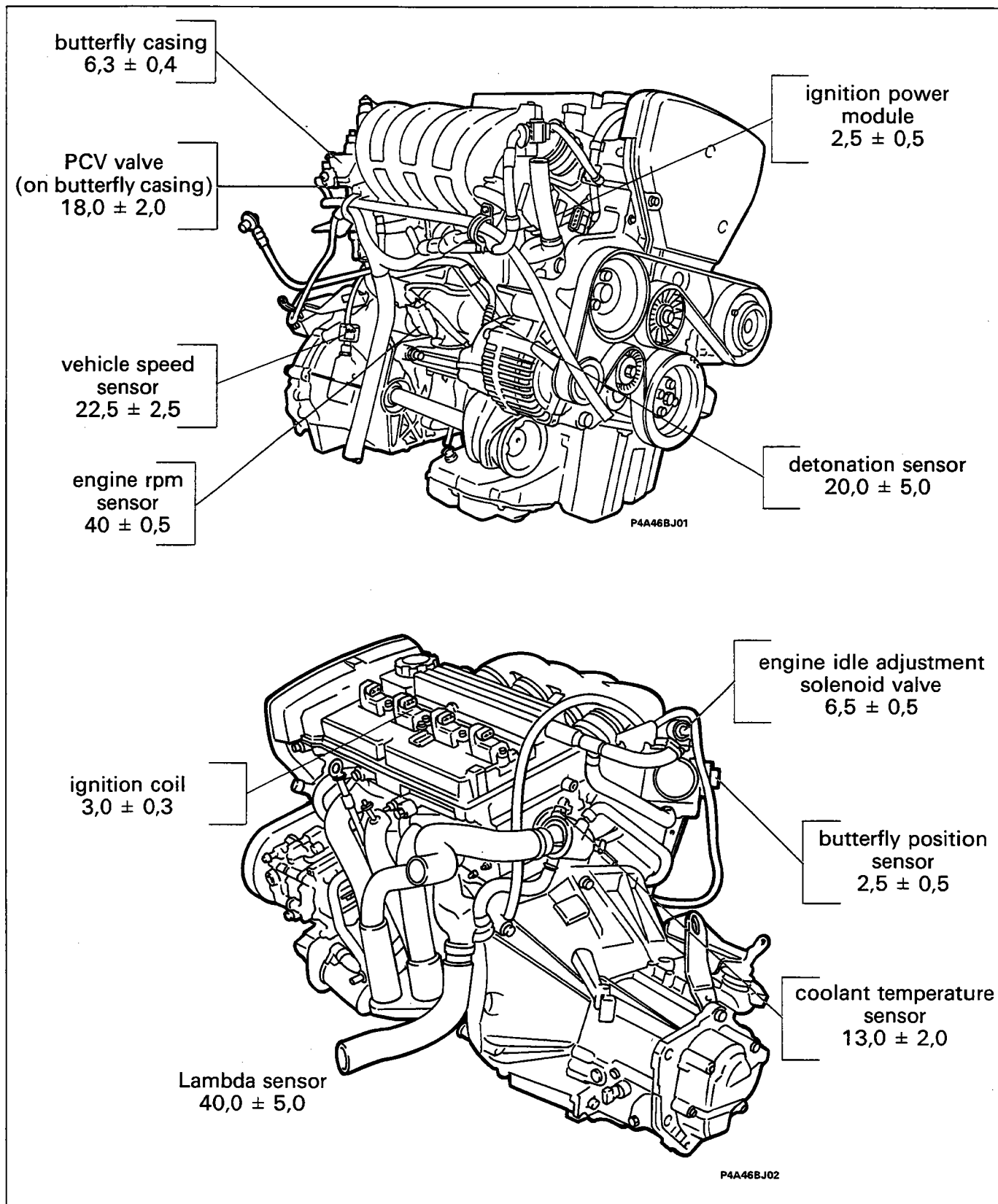


P4A45BJ01

1. Inlet on butterfly casing with PCV
2. Inlet on sleeve
3. PCV valve
4. Piston
5. Spring

TIGHTENING TORQUES

The main tightening torques for the HITACHI injection/ignition system components are given below (values in Nm).



CHECKS, ADJUSTMENTS AND REPAIR OPERATIONS ON HITACHI MPI SYSTEM



When working on a vehicle equipped with a Hitachi MPI system, the following precautions should be observed:

- do not start up the engine with the electrical connection terminals not properly connected or slack at the battery poles;
- do not use a rapid battery charger to start the engine;
- never disconnect the battery from the electrical system with the engine running;
- for the rapid charging of the battery, disconnect it first from the electrical system;
- if the vehicle is going in a drying oven after painting where the temperatures will be in excess of 80°C, it is necessary to remove the engine control unit from the vehicle;
- do not connect/disconnect the multiple connector for the control unit with the ignition switch in the ON position;
- always disconnect the negative battery lead before carrying out electrical welding on the vehicle.



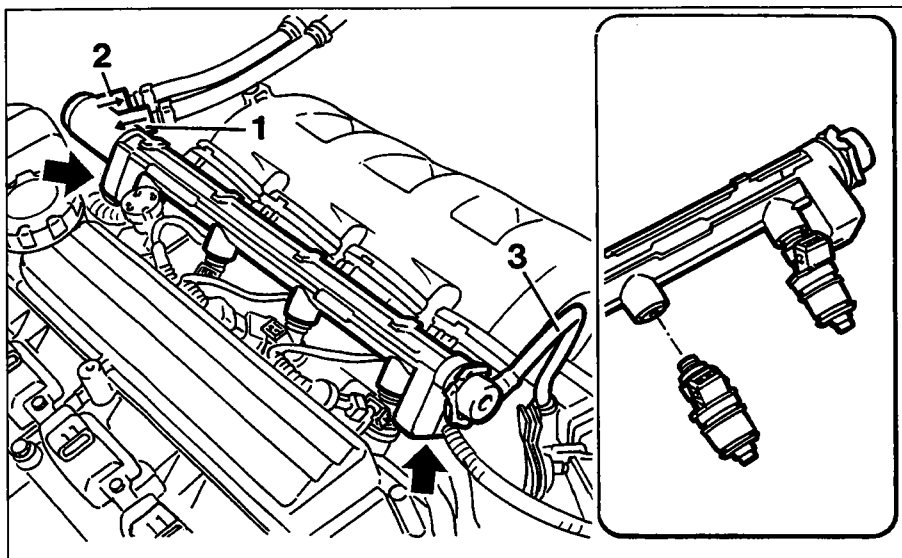
The system has a memory which is directly supplied by the battery, even with the ignition switched off, where the values obtained during self-adjustment are stored. The operation of disconnecting the battery causes the loss of this data which can only be obtained again after a certain distance: therefore this operation should be restricted as far as possible.

FUEL SUPPLY CIRCUIT

NOTE Before working on the supply circuit, it is advisable to drain the pressure for the circuit by disconnecting the vacuum pick up pipe between the pressure regulator and the inlet manifold and applying a slight vacuum.

Removing-refitting fuel manifold

Remove the fuel manifold complete with injectors by carrying out the following operations:

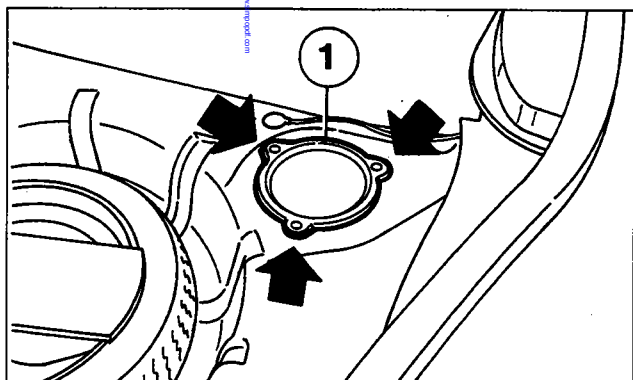


- disconnect the fuel supply pipe (1) and the return pipe (2) from the respective unions at the fuel manifold;
- disconnect the vacuum pick up pipe (3) from the pressure regulator;
- disconnect the electrical connectors from the injectors;
- undo the two bolts fixing (arrow) the fuel manifold and remove it complete with injectors and pressure regulator.

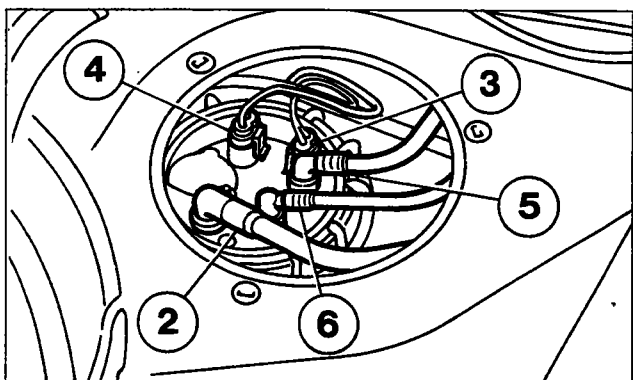
The injectors do not have a clip: to remove them therefore simply release them from their housing (see detail).

P4A47BJ01

10.



P4A48BJ01



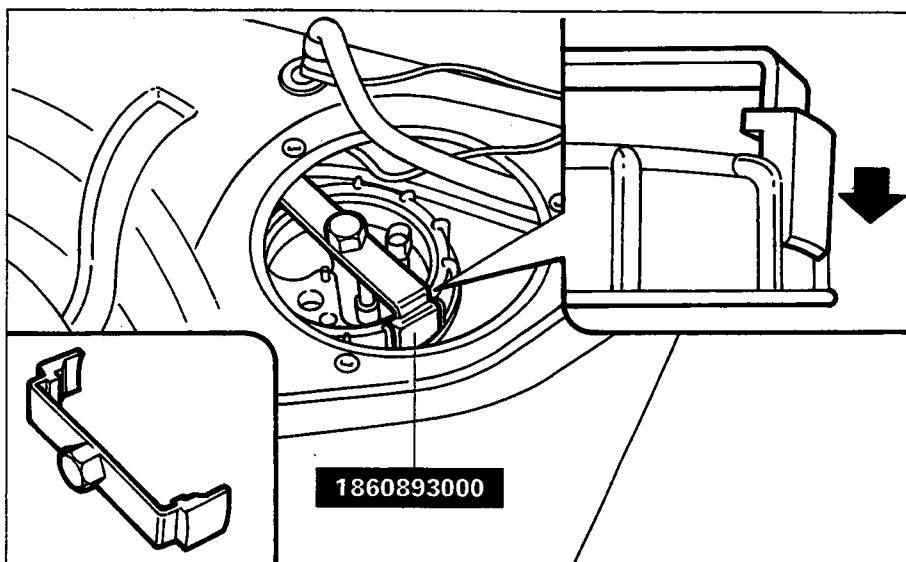
P4A48BJ02

Removing-refitting electric fuel pump

Proceed with the removal of the pump as follows:

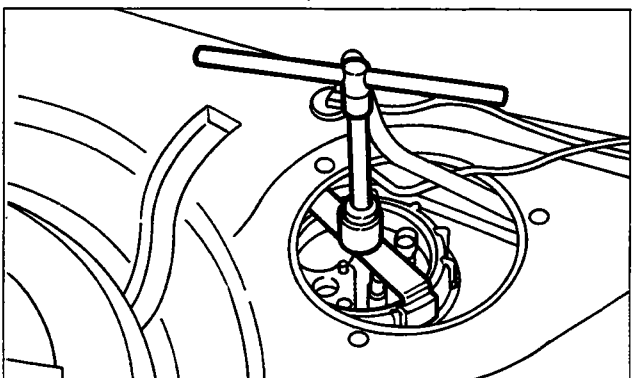
- working from the luggage compartment, remove the cover to gain access to the pump housing cover;
- undo the three fixing bolts (arrow) and remove the cover (1);
- undo the union (2) fixing the breather pipe and remove the pipe;
- disconnect the electrical connector for the fuel level gauge (3) and the one for the pump (4) supply;
- remove the rapid attachment fuel supply (5) and return (6) unions from the tray;

NOTE When removing and refitting the rapid unions, refer to the procedures given in the service notes.



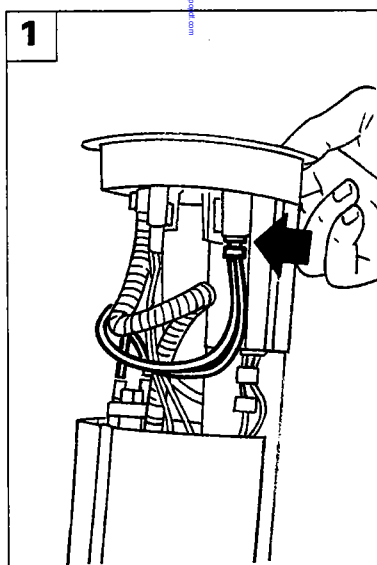
P4A48BJ03

- fit tool 1860893000 on the tray fixing flange, taking care to insert it correctly between the projections on the flange, as shown in the diagram;

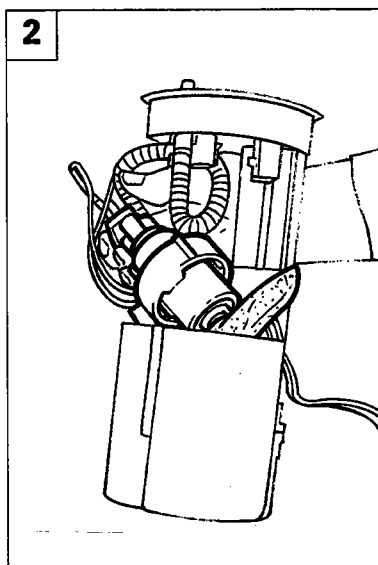


P4A48BJ04

- undo the flange and remove it together with the tool, then carefully remove the tray complete with seal.



P4A49BJ02

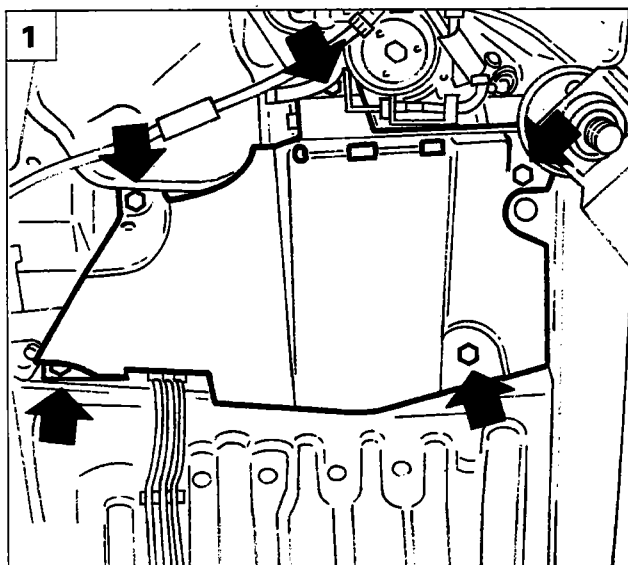


P4A49BJ01

With the drip tray removed, proceed as follows:

1. disconnect the pump supply connector from the drip tray;
2. lift up the pump and extract it by bending it sideways, as shown in the diagram.

Then open the band fixing the supply pipe and remove the pipe from the pump.
Lastly, remove the gauze filter from the pump.

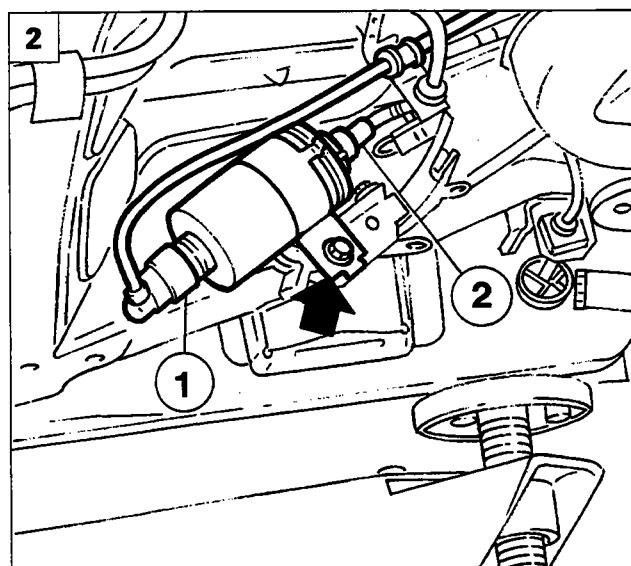


P4A49BJ04

Removing-refitting fuel filter

Raise the vehicle, then proceed as follows:

1. undo the four bolts and the nut (arrow) fixing the shield and remove the shield;
2. disconnect the fuel rapid inlet (1) and outlet (2) connectors from the filter and collect the fuel which comes out during the operation in a suitable container, then seal the connectors without either bending or twisting the pipes; lastly, undo the fixing bolt (arrow) and remove the filter.



P4A49BJ03

NOTE When removing and refitting the rapid connectors, refer to the procedures described in the service notes.



The fuel filter should be replaced every 40,000 km.

After replacing the filter, start up the engine and check that no fuel is leaking from the connectors.

10.

FUEL CIRCUIT PRESSURE CHECKS

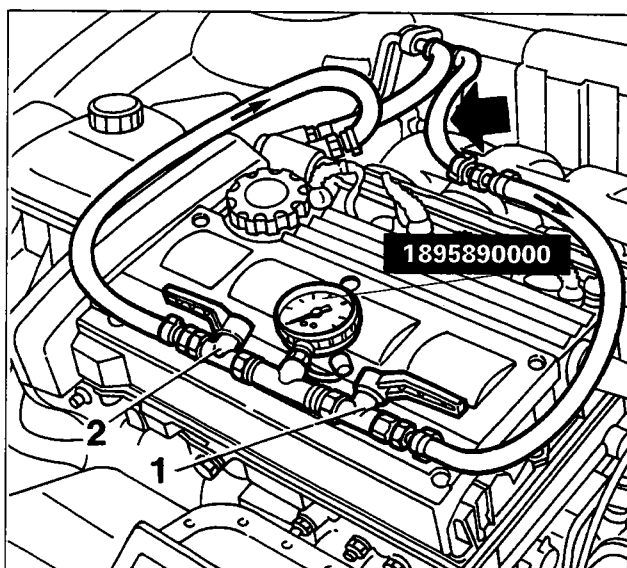
Checking fuel regulation pressure

Disconnect the pipe coming from the filter (shown by the arrow) from the injector fuel manifold. Place pressure gauge 1895890000 and two taps (1) and (2) between the end of the disconnected pipe and the fuel manifold, as illustrated in the diagram.

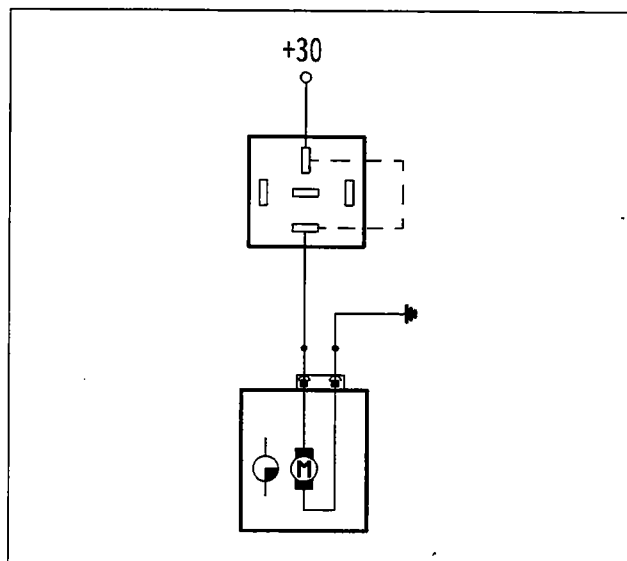
Supply the electric pump with the engine switched off through the "active diagnosis" function of the F/L Tester.

Alternatively, proceed as follows:

- extract the pump relay from the socket
 - make a connection as shown in the diagram using a suitable bridge for this purpose.
- The pressure reading on the gauge should stabilize, in these conditions, at $3.0 \text{ bar} \pm 0.2 \text{ bar}$.
If the pressure is too low, carry out the next test.



P4A50BJ01

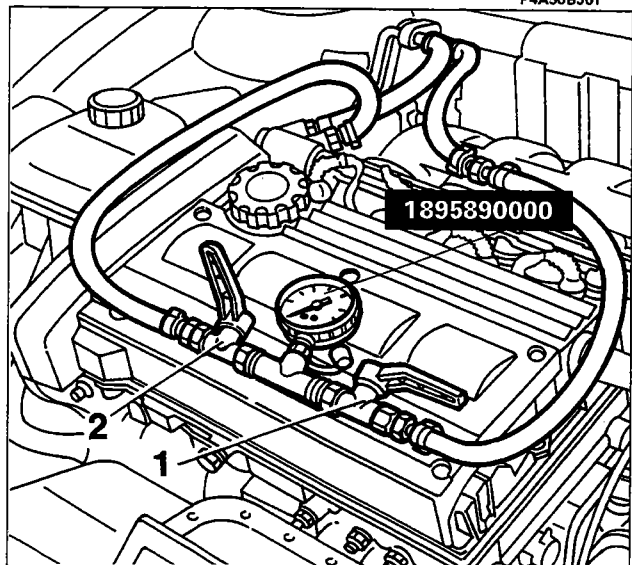


P4A50BJ02



Checking maximum fuel supply pressure (or efficiency of electric pump)

Keeping the same connections as for the previous test, close the tap (2) located downstream of the pressure gauge, operate the electric pump with the engine switched off, as described for the previous test: the pressure should reach 5 bar and not exceed 7 bar (pump safety valve setting). If this is not the case, replace the electric pump because it is defective.



P4A50BJ03

If the pressure value in the previous test was higher than 3.0 bar it is necessary to:

- disconnect the fuel return pipe from the pressure regulator and replace it, temporarily, with a pipe which, inserted on the filler, allows the return of fuel to the tank.
- supply the electric pump with the engine switched off as described in the previous test, then read off the pressure value on the gauge:
 1. if it reaches 3.0 bar then the fuel return pipe to the tank must be replaced because it is obstructed or bent;
 2. if it exceeds 3.0 bar then the pressure regulator must be replaced because it is defective.

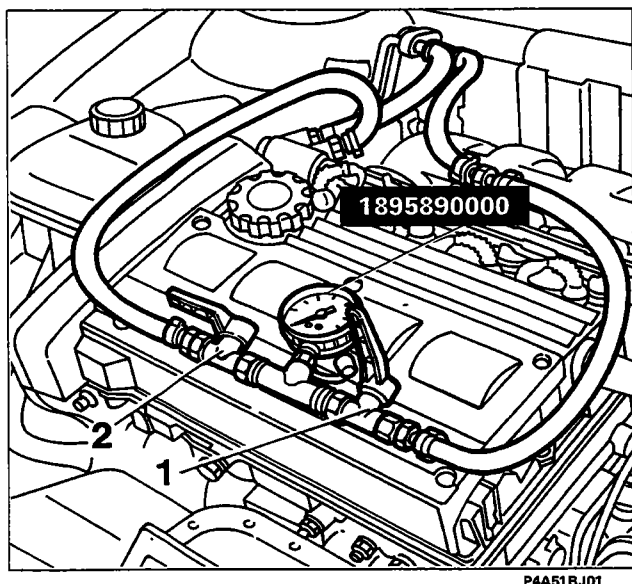
NOTE At the end of the tests refit the pump relay in its housing if it has been removed.

Checking pneumatic part of pressure regulator

Start up the engine and let it idle.

The reading on the pressure gauge should be around 2.5 bar.

If this is not the case, the air connecting pipe between the pressure regulator and the inlet manifold is damaged or the regulator itself is defective and should be replaced.



Checking injector seal

In order to check if the injectors are dripping, make the connection as described for the regulation pressure test. Then proceed as follows:

- supply the electric pump with the engine switched off;
- fully close the tap (1) Upstream of the pressure gauge once the regulation pressure has been reached: in this way the pressure in the fuel manifold and the injectors will be the same;
- switch off the electric pump and observe whether as soon as the pressure stabilizes (i.e. decreases slightly) it remains constant for around 60 secs; if this is not the case, there is a leak from one or more of the injectors or from a union.

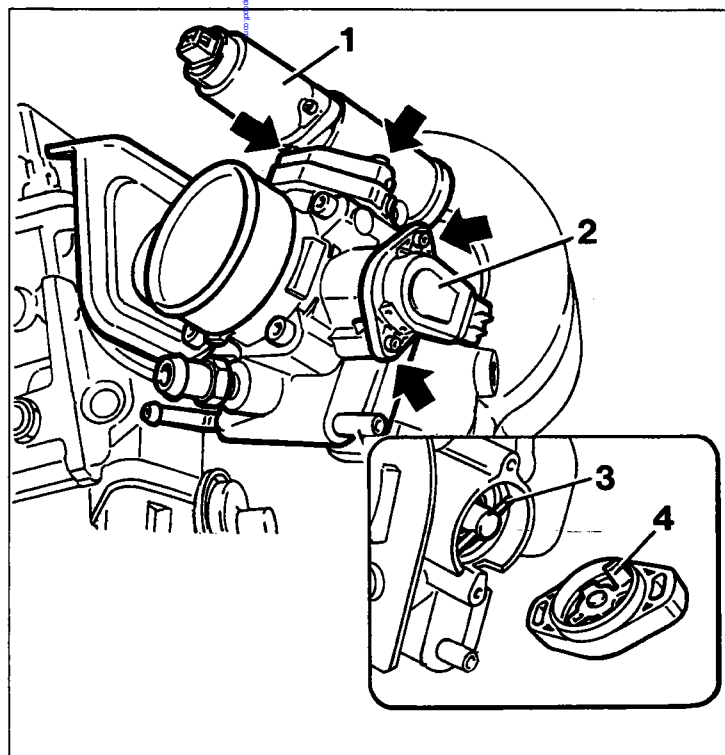
In this case, remove the injectors and the fuel manifold from the inlet manifold, keeping the connection with the pressure gauge.

Repeat the previous test leaving the tap (1) open.

When supplying the electric pump with the engine switched off, observe whether there is dripping from any connecting sections.

Replace any dripping injectors and/or renew any defective seals where there are leaks.

10.



P4A52BJ01

INTAKE CIRCUIT

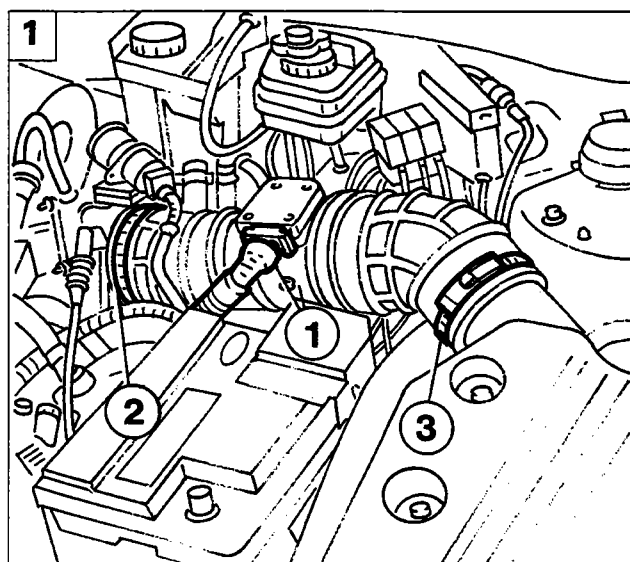
Removing-refitting engine idle adjustment solenoid valve and butterfly position sensor

- Undo the fixing bolts (arrow) to remove the engine idle adjustment solenoid valve (1);
- undo the fixing bolts (arrow) to remove the butterfly position sensor (2).

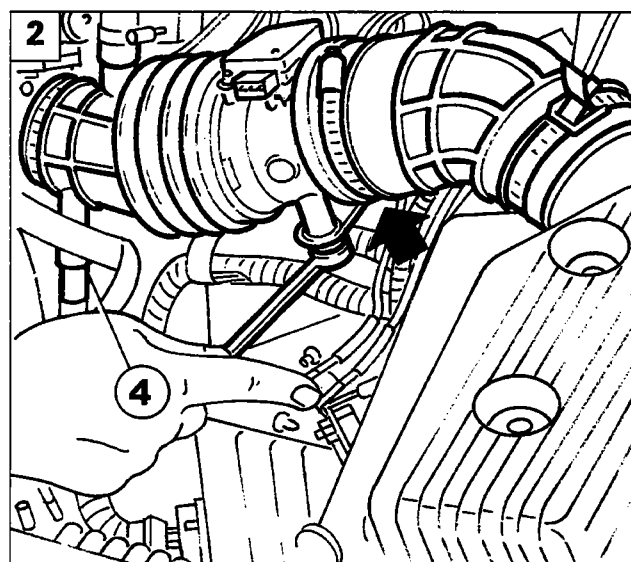
NOTE When refitting the butterfly position sensor, take care that the operating lever fitted on the butterfly shaft (3) is above the sensor driving element (4), as shown in the diagram.

Removing-refitting air flow meter

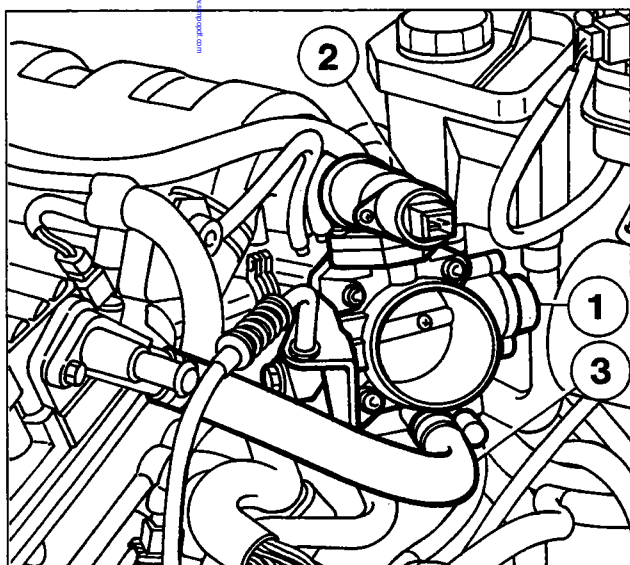
1. Remove the battery, disconnect the electrical connector (1) from the meter, loosen the bands (2) and (3) fixing the inlet sleeve;
2. disconnect the blow-by sleeve (4) from the inlet sleeve, undo the two bolts (arrow) fixing the flow meter mounting bracket and remove the assembly; then loosen the bands at the flow meter and remove the two sleeves.



P4A52BJ02



P4A52BJ03



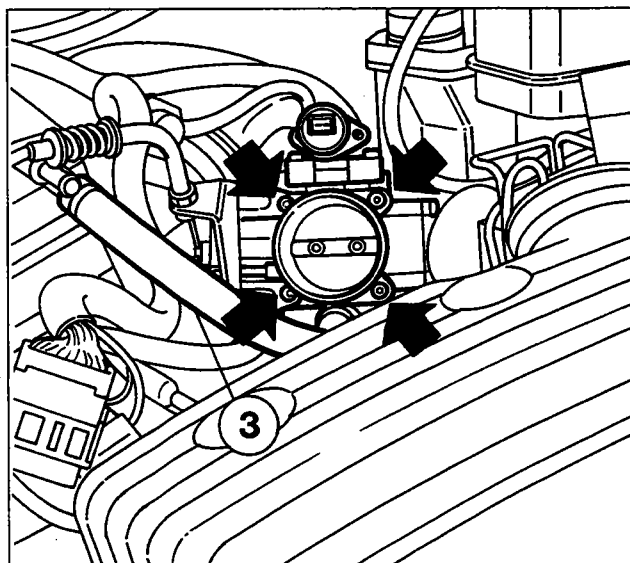
P4A53BJ01

Removing-refitting butterfly casing

Proceed as described for the removal of the air flow meter, removing the meter complete with the two sleeves.

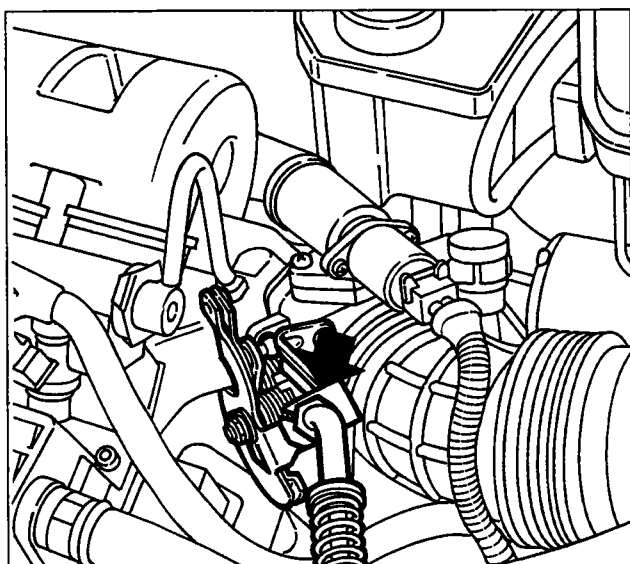
Then, proceed as follows:

- disconnect the electrical connectors from the butterfly position sensor (1) and from the engine idle adjustment solenoid valve (2);
- remove the band fixing the blow-by pipe (3), cylinder head cover side and remove the pipe;



P4A53BJ02

- undo the four bolts fixing the butterfly casing (arrow) to the inlet manifold;
- release the end of the accelerator cable from the control lever;
- remove the coolant connecting pipes from the inlet and outlet pipes, sealing them as appropriate;
- lastly, remove the blow-by pipe (3) from the butterfly casing.



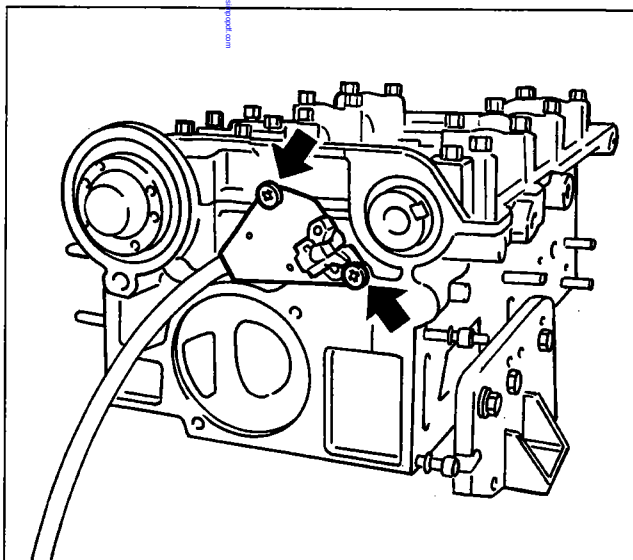
P4A53BJ03

Adjusting accelerator control cable

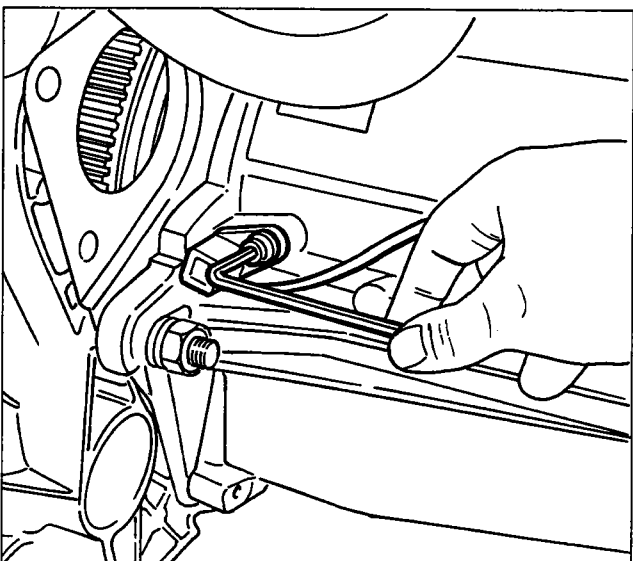
Adjust the accelerator control cable by carrying out the following operations:

- loosen the lock nut at the bottom of the bracket;
- acting on the adjustment nut (arrow), adjust the accelerator cable clearance;
tighten to reduce the clearance,
loosen to increase the clearance;
- when the adjustment is complete, lock the lock nut.

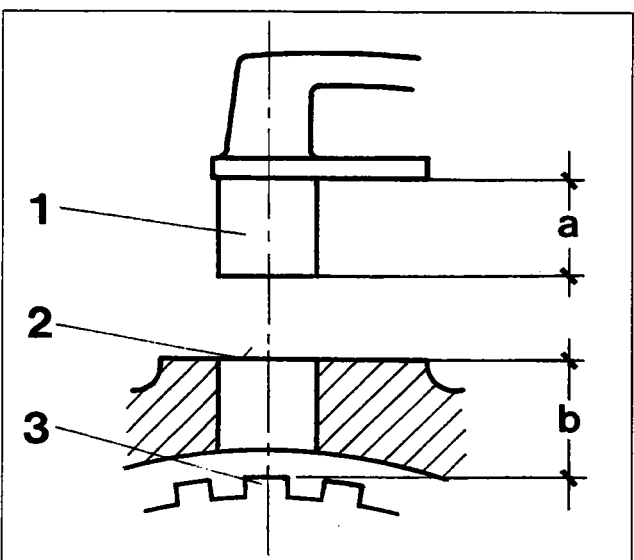
10.



P4A54BJ01



P4A54BJ02



P4A54BJ03

ELECTRICAL CIRCUIT

Removing-refitting engine timing sensor

This operation involves removing the timing belt and the camshaft toothed pulley, exhaust side.

Having carried out these operations, it is necessary to:

- disconnect the electrical connector;
- undo the two fixing bolts (arrow) and remove the sensor.

When refitting carry out the procedure in the reverse order, following the instructions for fitting and tensioning the toothed belt.

NOTE *The sensor does not require any type of adjustment.*

Removing-refitting engine rpm sensor

Position the vehicle on a lift, then, working from underneath the vehicle:

- disconnect the electrical connector;
- undo the bolt fixing the sensor and remove it from its housing.

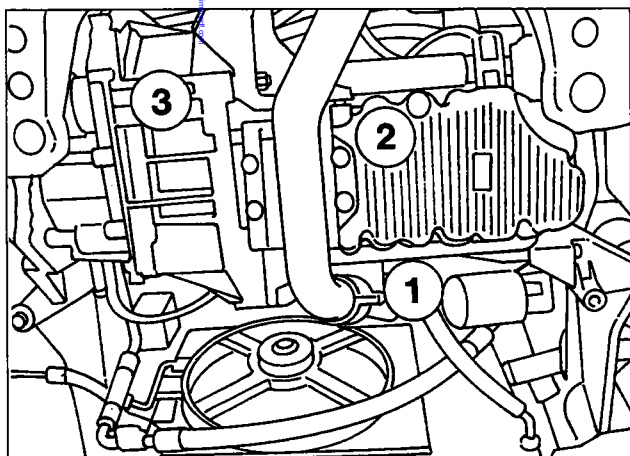
NOTE *The sensor is fitted in production with tolerances which ensure a gap of 0.8 ± 0.4 mm without requiring further adjustments. This gap is also ensured if the sensor is replaced with a replacement one.*

If you wish to check the gap between the sensor and the flywheel, proceed as follows:

- measure the distance between the end of the sensor and the lower part of the sensor bracket (distance "a");
- measure the distance between the fitting element on the cylinder block/crankcase and the upper part of the tooth (distance "b"), repeating the measurement for at least two opposite teeth.

The gap ($t = b - a$) should be between 0.4 and 1.2 mm.

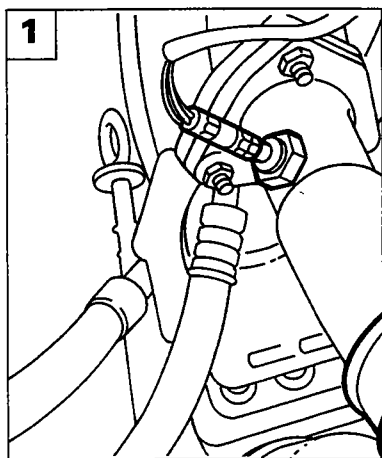
1. Sensor
2. Fitting element
3. Flywheel tooth



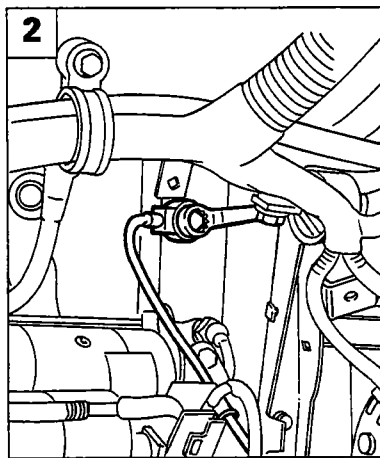
P4A55BJ01

Removing-refitting:

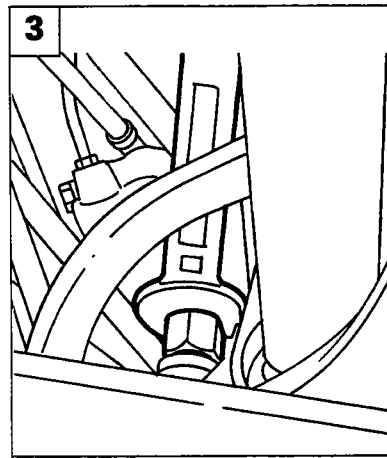
1. Lambda sensor
2. Detonation sensor
3. Vehicle speed sensor



P4A55BJ02

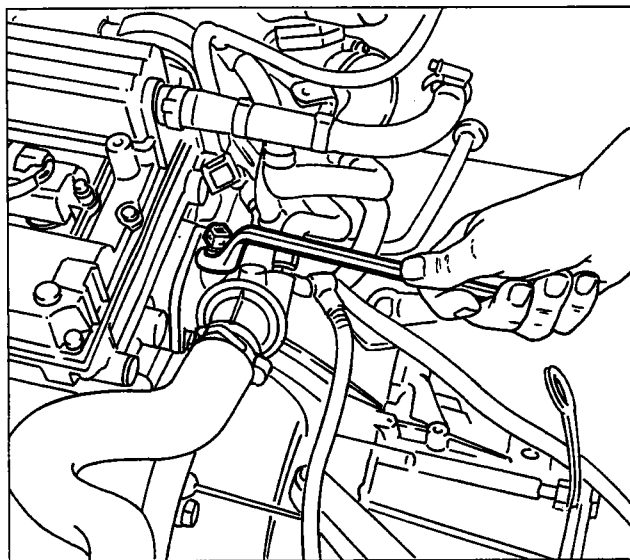


P4A55BJ03



P4A55BJ04

1. Disconnect the electrical connector, then undo the Lambda sensor and remove it from its housing.
2. Disconnect the electrical connector, undo the bolt fixing the detonation sensor and remove it.
3. Disconnect the electrical connector and undo the casing for the vehicle speed sensor, removing it from its housing.



P4A55BJ05

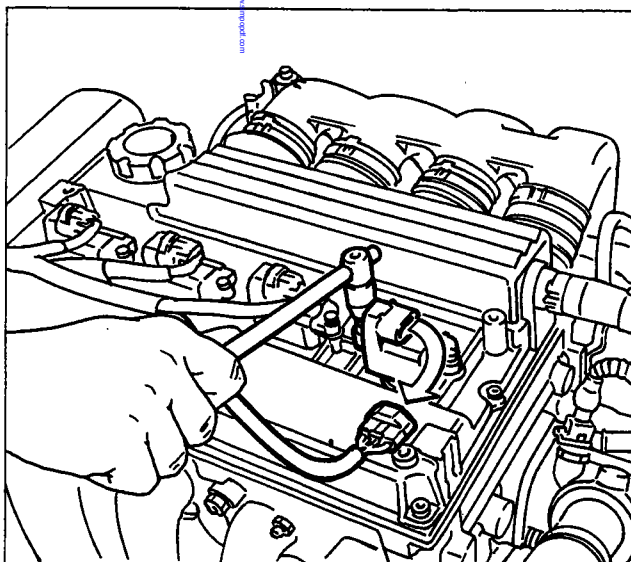
Removing-refitting coolant temperature sensor

- Disconnect the electrical connector from the sensor;
- undo the sensor removing it from its housing.



Take great care that the sensor is correctly refitted and over the electrical connection, since the information sent by the sensor is also used by the control unit for operating the radiator fan.

10.



P4A56BJ01

Removing-refitting ignition coils

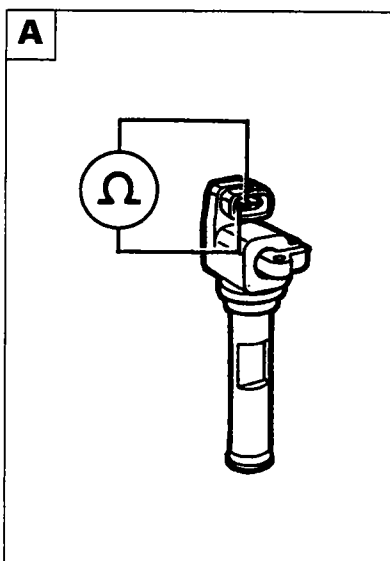
Proceed with the removal of the ignition coils by carrying out the following operations:

- disconnect the electrical connector;
- undo the two fixing bolts and remove the coil, extracting it from the housing.

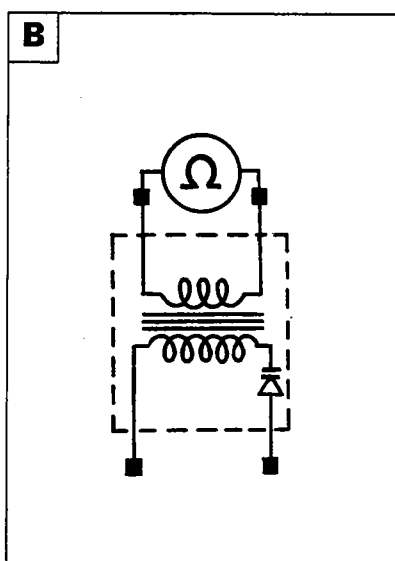
NOTE The coil is fitted with an extension made from a silicon material with a high dielectric power inside of which there is a pressure switch with a spring loading.

Do not dismantle the two components so as not to risk losing the internal contact or getting it dirty.

In the case of replacement, it is not necessary to separate the coil from the extension because the complete coil/extension assembly is available as spares.



P4A56BJ02

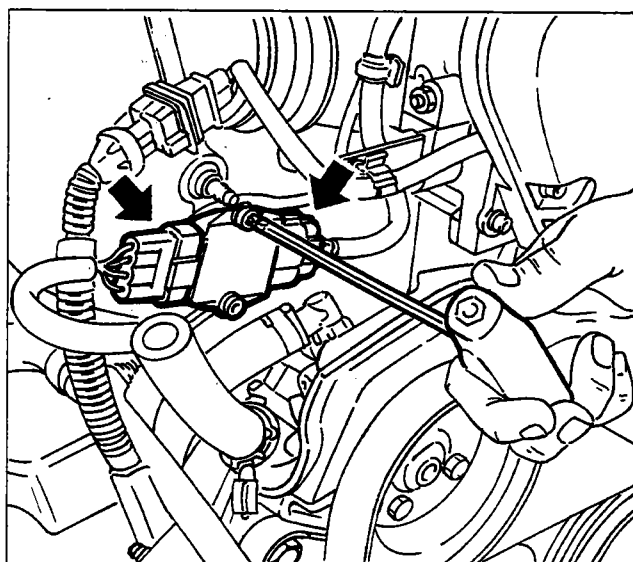


P4A56BJ03

Checking primary circuit coil resistance

The resistance is checked by following the diagram.

Primary resistance: 0.6 ± 0.06 ohm

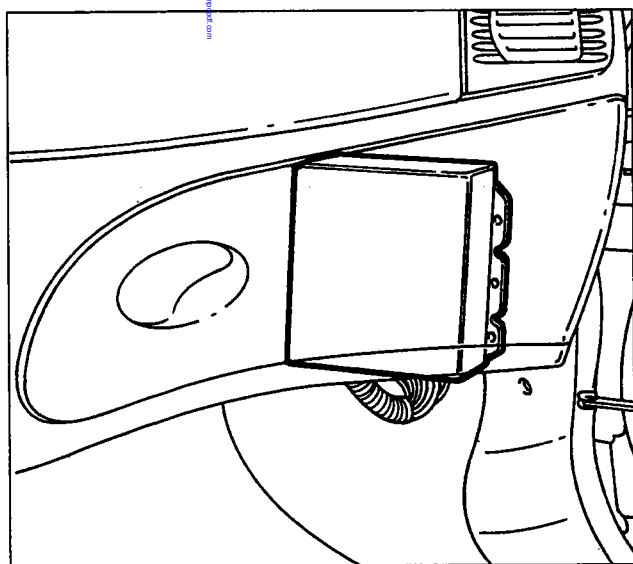


P4A56BJ04

Removing-refitting ignition power module

Remove the ignition power module carrying out the following operations:

- disconnect the electrical input and output connectors (arrow);
- undo the two fixing bolts and remove the module.



Removing-refitting engine control unit

The control unit is located under the glove compartment.

Proceed with removing the control unit by carrying out the following operations:

- remove the glove compartment;
- undo the bolt fixing the mounting bracket and rest the control unit on the floor of the vehicle;
- undo the bolt fixing the earth cable to the bodyshell;
- disconnect the electrical connectors, one by one;
- remove the bracket from the control unit.

CHECKING EMISSION CONCENTRATION

This system manages the content of carbon monoxide (CO) and the idle air flow rate which cannot, however, be manually adjusted.

However, checking the content of the exhaust gases upstream and downstream of the catalyzer can provide a useful indication of the injection/ignition system operating conditions, the engine parameters and the catalyzer.

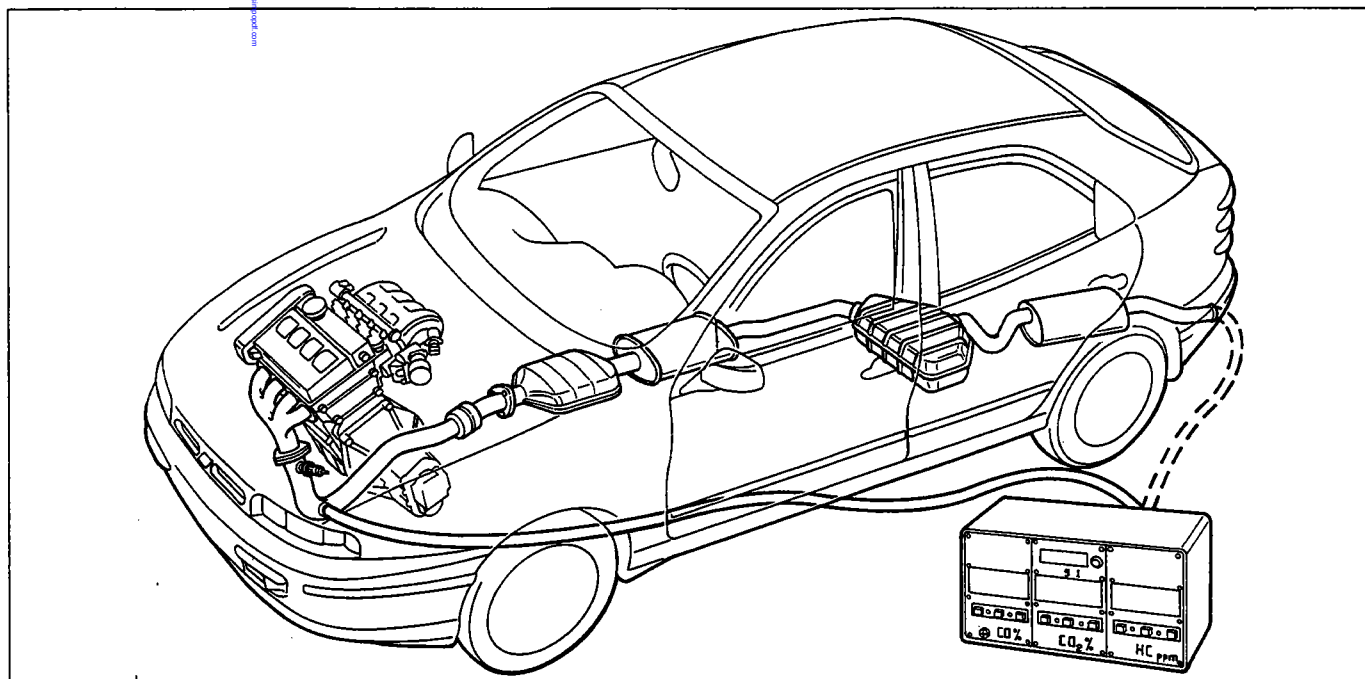
Checking idle concentration of CO and HC upstream of the catalytic silencer

In order to check the concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) upstream of the catalyzer, proceed as follows:

1. Undo the cap located in the exhaust pipe, upstream of the catalyzer, and tighten the tool in its place.
2. Connect a suitably calibrated CO-tester sensor to the tool.
3. Start up the engine and let it reach operating temperature.
4. Check that the speed is correct.
5. Check that the idle concentration of CO is within the recommended limits (see table); if this is not the case, it is necessary to check:
 - that the Lambda sensor is working properly, using the F/L Tester;
 - for the presence of air penetration in the area surrounding the Lambda sensor housing;
 - the injection and ignition system (**in particular the state of wear of the spark plugs**).
6. In the same conditions, check that the concentration of HC is less than 500 p.p.m.
7. If these values are not found, proceed with checking the engine, paying particular attention to:
 - the timing;
 - the engine compression.

NOTE The engine is fitted with hydraulic tappets for the automatic recovery of the clearances.

10.



P4A58BJ01

Table summarizing pollutant emission tolerance values

	CO(%)	HC (p.p.m.)	CO ₂ (%)
Upstream of the catalyzer	0,4 ÷ 1	< 500	> 12
Downstream of the catalyzer	< 0,35	< 90	> 13

Checking exhaust concentration of CO and HC

The concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) at the exhaust is measured by inserting a suitably calibrated sensor probe at least 30 cm into the end section of the exhaust pipe.

1. Check that the idle CO and HC concentration values are as recommended (see table).
2. If the HC value is outside of the recommended limits, whilst that previously measured upstream of the catalyzer was okay, then the engine parameters are taken to be correct and the cause of the problem should be sought in the decreased efficiency of the catalyzer.

CHECKING ENGINE IDLE SPEED

If the engine idle speed is not correct as the system is the self-adjusting type it is not possible to carry out any adjustment: therefore it is necessary to check that the accelerator linkage is correctly adjusted and therefore the problem should be sought by means of a complete fault diagnosis using the F/L Tester.

CHECKING IGNITION ADVANCE

In order to check the ignition advance values at different speeds it is necessary to use the F/L Tester diagnostic equipment.

COMPOSITION AND OPERATION

- Clutch with mechanical release mechanism 1
- Clutch with hydraulic release mechanism 2

REMOVING - REFITTING

- Removing 4
- Driven disc - pressure plate 4
- Refitting 4

CLUTCH OPERATION

- Thrust bearing 5
- Fork control shaft 5
- Thrust bearing sleeve 6
- Clutch pedal 6
- Clutch pedal position adjustment 7
- Removing-refitting cable clutch control cable 7
- Removing - refitting hydraulically operated clutch components 8
- Clutch pump 8
- Operating cylinder 11
- Bleeding 11

CLUTCH WITH MECHANICAL RELEASE MECHANISM (1370 - 1581 - 1747 - 1929 D engines)

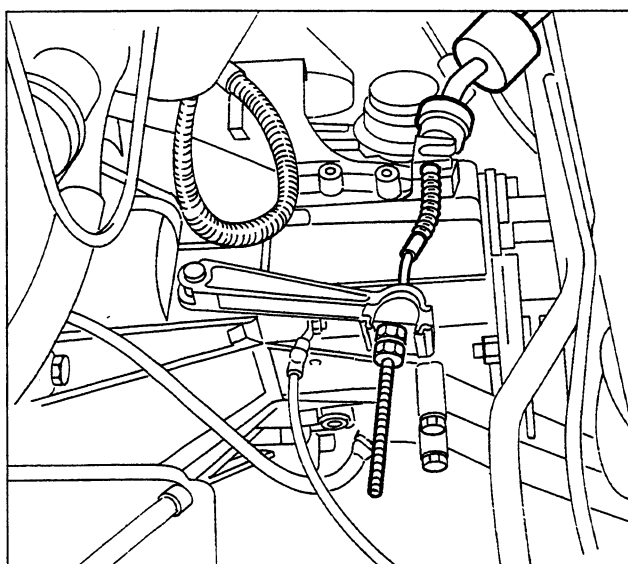
The clutch is the dry, single plate type, with the thrust bearing always in contact with the pressure plate spring.

The driven disc is driven by the pressure exerted by a diaphragm spring.

The clutch release is obtained by means of a cable mechanically operated by the pedal.

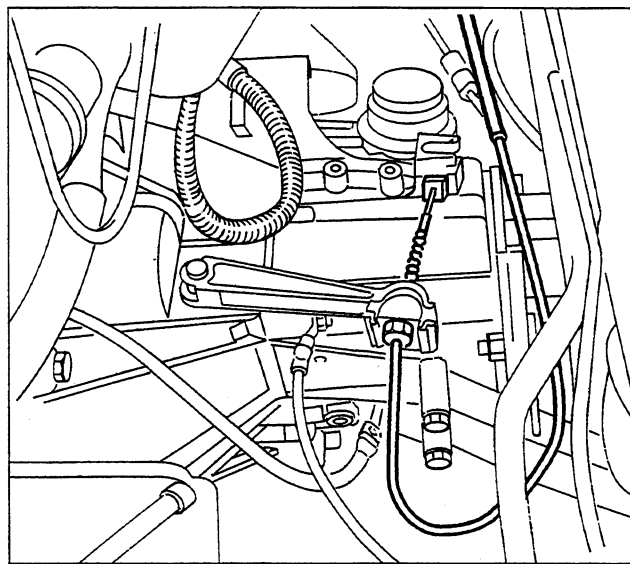
The mechanical clutches adopted are all the "Thrust" type (see section which follows).

Technical data		1370	1581	1747	1929 D
Spring loading	daN	465	450	500	420
External diameter	mm	190	200	215	200
Internal diameter	mm	130	137	145	137
Pedal travel	mm	163	163	163	163



P4A001C02

Clutch release cable "drawn type cable" (for 1370 12v)



P4A001C03

Clutch release cable "pushing outer cable type" (for 1581, 1747, 1929 D)

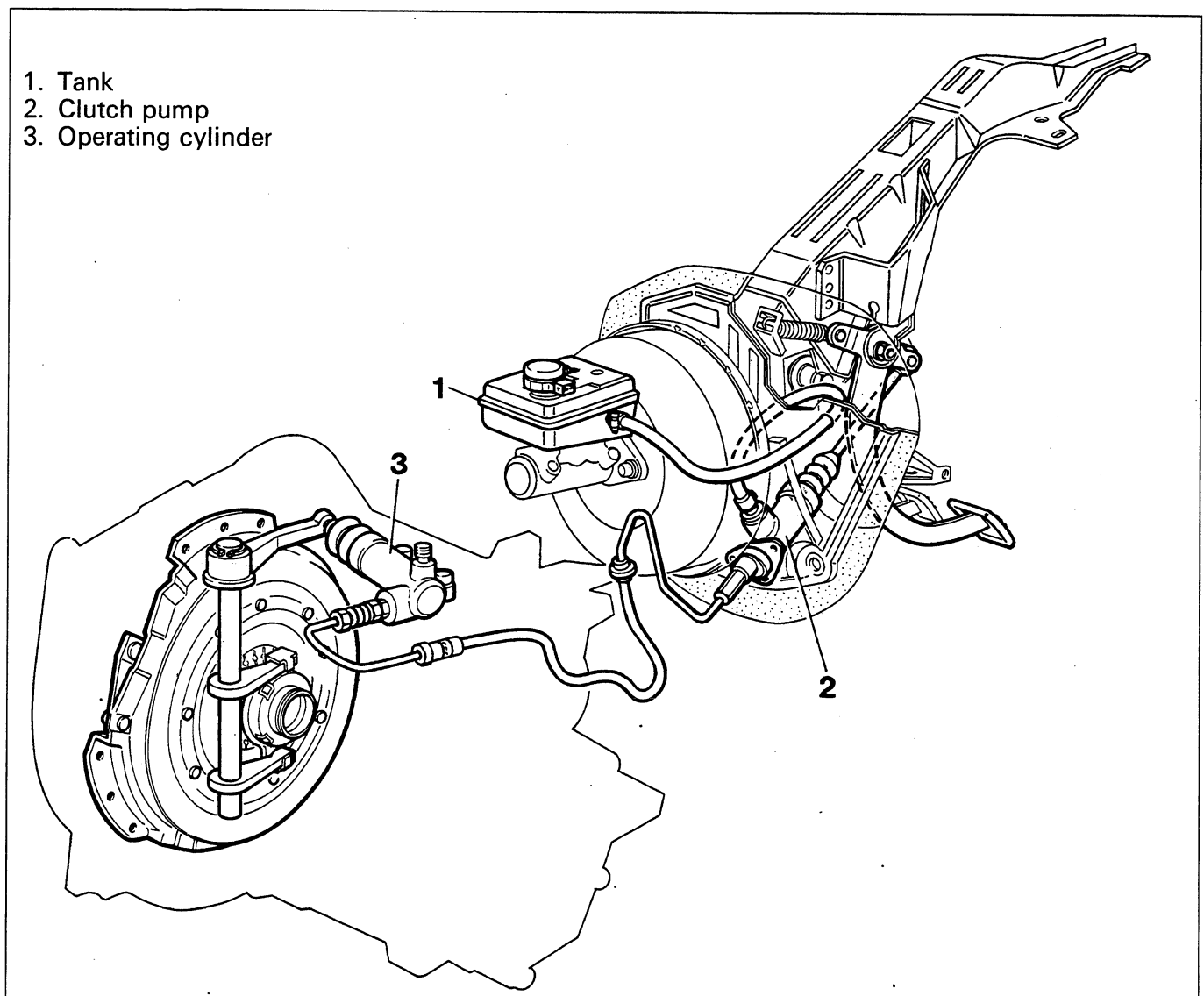
CLUTCH WITH HYDRAULIC RELEASE MECHANISM (1998 20v)

Composition

In order to improve quietness levels and performance, a hydraulic device has been fitted on the 1998 20v version. This device is made up of a reservoir, common to the braking system (1), a pump (2) fixed to the pedals assembly and an operating cylinder (3) fixed to the bell housing.

Driving the vehicle will be more comfortable because there will be a reduction in the vibrations transmitted by the power unit due to the damping effect of the hydraulic system.

The adoption of this device dispenses with the need for periodic adjustment because any clearance and the recovery of the wear of the driven disc take place automatically.

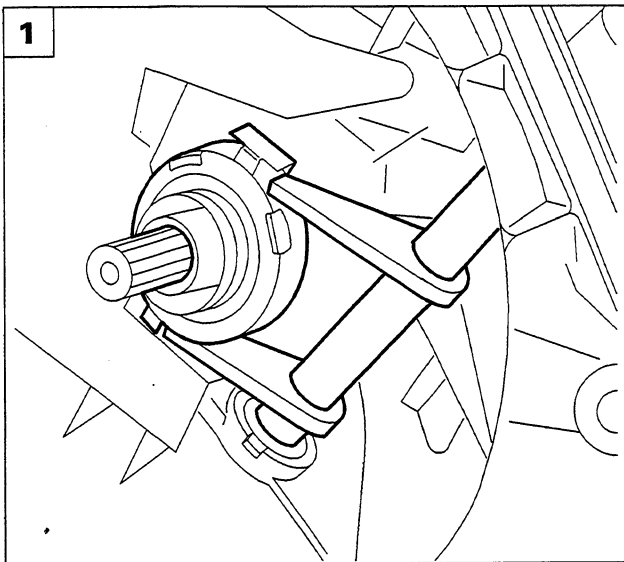


P4A002C01

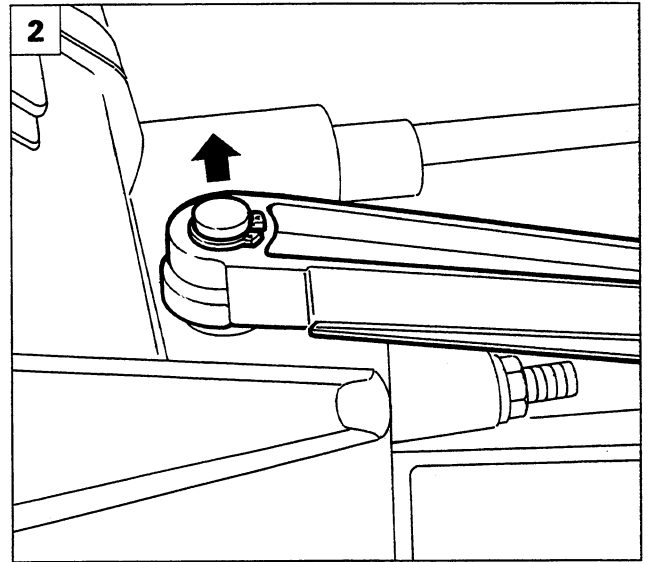
Operation

The clutch is the dry, single plate type, with a hydraulic release mechanism and a thrust bearing always in contact with the spring. The driven disc is driven by means of the pressure exerted by a diaphragm spring.

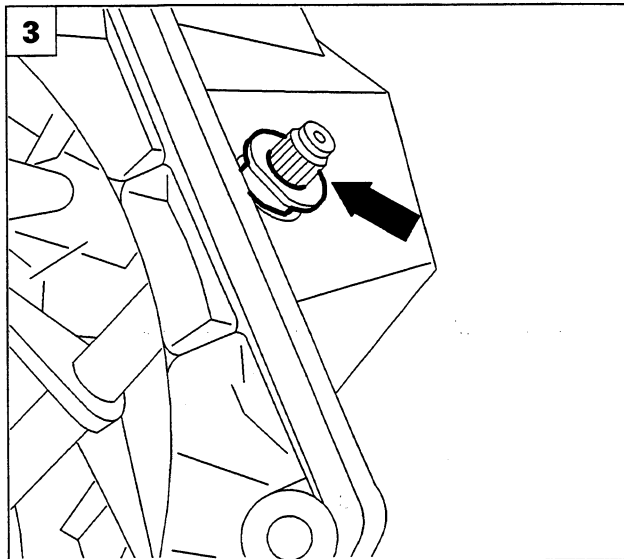
IF56G5



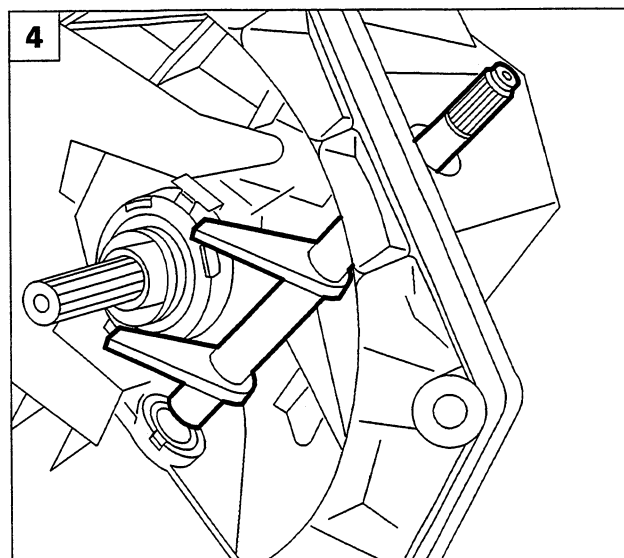
P4A005C01



P4A005C02



P4A005C03



P4A005C04



THRUST BEARING

1. The thrust bearing should not show signs of sticking or noise during rotation or else it must be replaced.

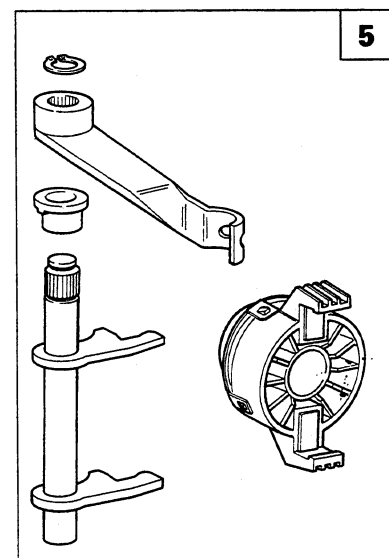
FORK CONTROL SHAFT

Removing - refitting

2. Remove the circlip for the release lever and remove the actual lever.
3. Remove the upper bush.

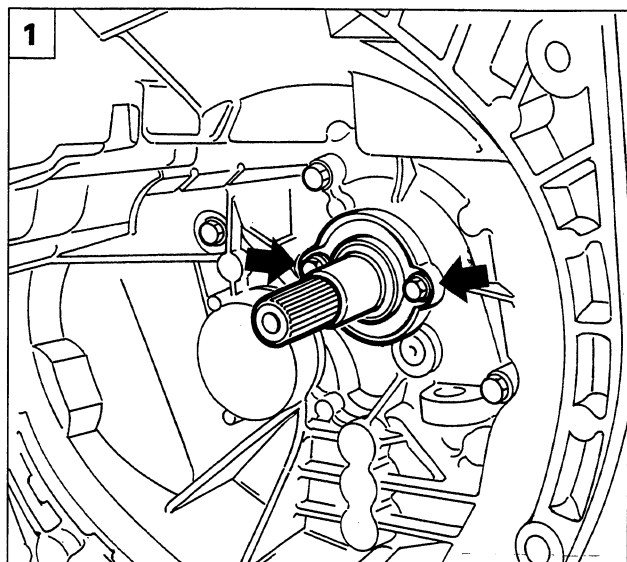
NOTE *The bush in question is replaced eachtime the clearance for the fork control shaft is too great.*

4. Remove the fork control shaft, releasing it from the lower housing.
5. View of components removed



P4A005C05

18.



P4A006C01



THRUST BEARING SLEEVE (only for 1581 - 1747 - 1998 - 1929 D versions)

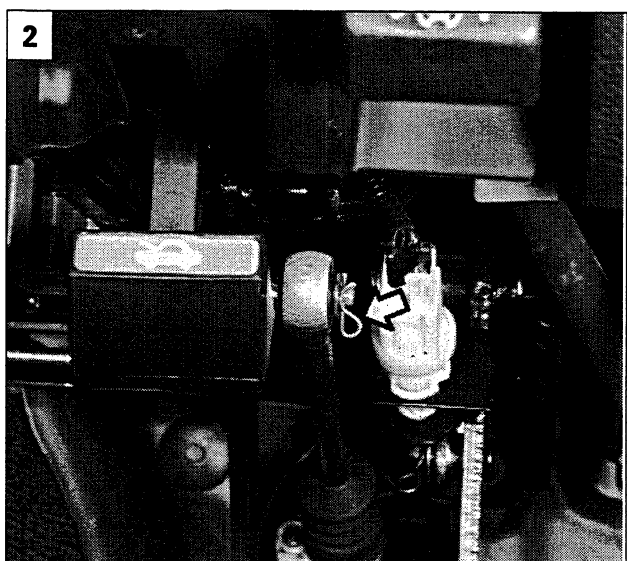


NOTE *The 1370 M.P.I. version is not fitted with a thrust bearing sleeve.*

Removing - refitting

1. Undo the bolts shown and remove the sleeve.

NOTE *The seal is replaced each time leaks of gearbox oil are noticed. When re-fitting, smear the contact surfaces with silicon sealant which will act as a seal.*



P4A006C02

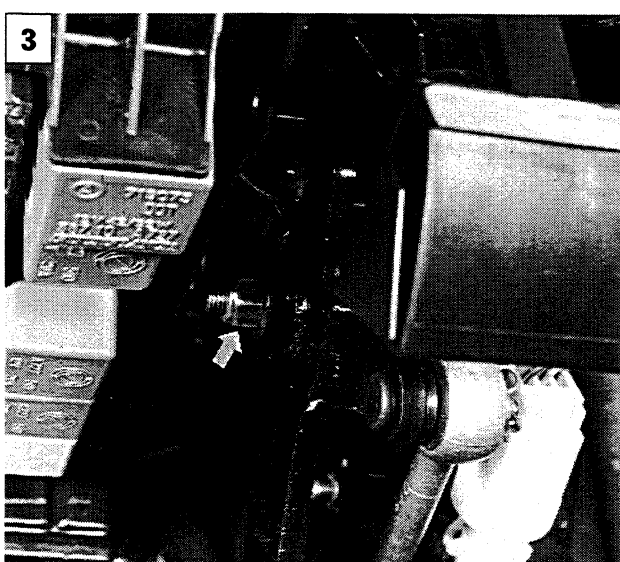


CLUTCH PEDAL



P4A006C03

2. Remove the clip fixing the clutch pump to the pedal (only for versions fitted with hydraulic mechanism - 1998 20v)



P4A006C04



Removing-refitting clutch pedal

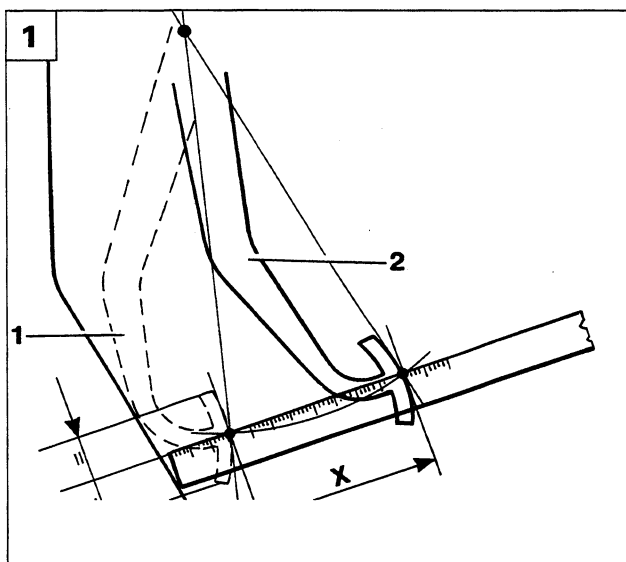
3. Remove the clutch pedal acting at the point shown by the arrow and also disconnect the end of the clutch cable (value for all versions).



the parts concerned before fitting.



For the 1998 20v versions do not lubricate the rubber bush (Silent-block) connecting the pump - pedal as this will cause the material to deteriorate.



CLUTCH PEDAL POSITION ADJUSTMENT (for vehicles with mechanical release mechanism)

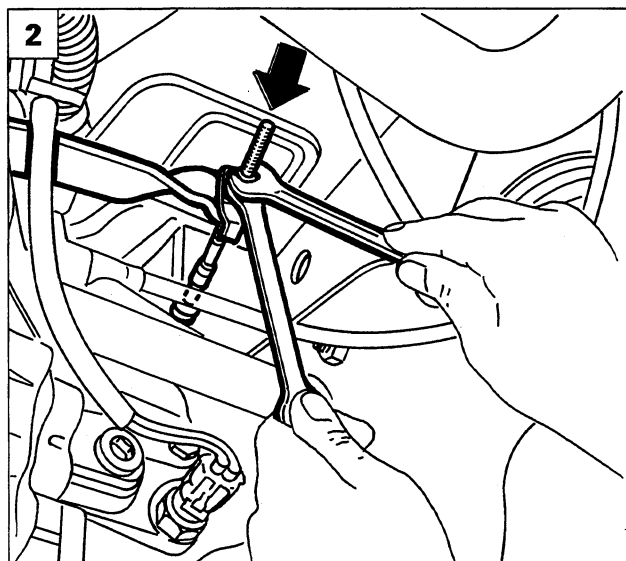
1. Measure the clutch pedal travel:

1. Pedal in end of travel position
2. Pedal in rest position
- X. Pedal travel:

163 mm for 1370-1581-1747-1929 D



Carefully measure the pedal travel to ensure the correct clutch release (± 5 mm).



2. In order to adjust the clutch pedal in the rest position, it is necessary: to bed in the clutch release mechanism by fully depressing the pedal at least 5 times. Check that the travel "X" is within the values given above. The travel is measured with a rule by the centre line of the pedal and corresponds to the distance between the position in the end of travel position (pedal in contact with the dashboard bulkhead) and that of the pedal in the rest position.

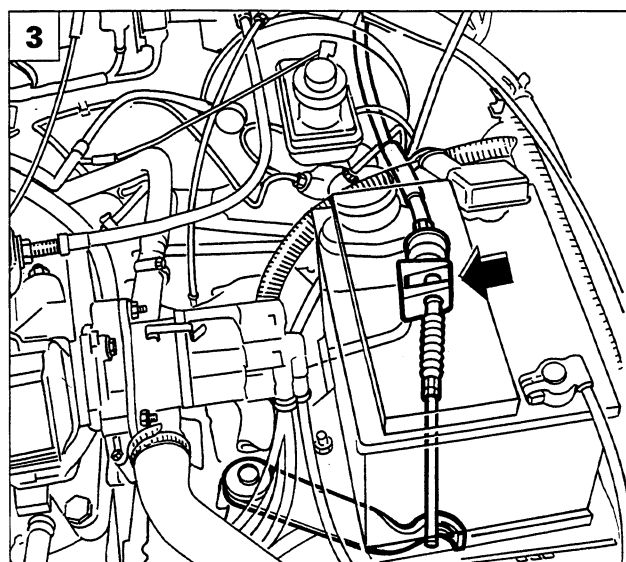
Any adjustment of the travel is carried out acting on the nut and, where present, the lock nut for the clutch cable, gearbox side.

REMOVING-REFITTING CLUTCH CABLE



In order to be able to release the clutch cable it is necessary to remove the:

- Battery
- Relay holder casing
- Battery drip tray

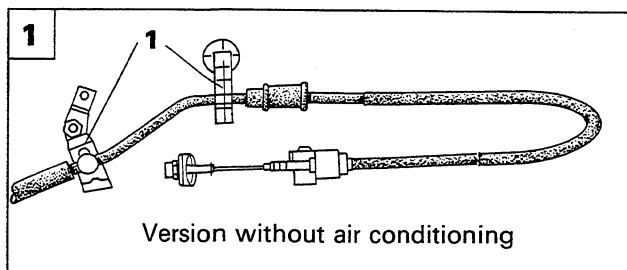


3. Remove the nut and the lock nut, which fix the clutch cable to the control lever (for the 1370 version). For the 1581 - 1747 - 1929 versions, release the cable from the anchorage on the gearbox - differential.

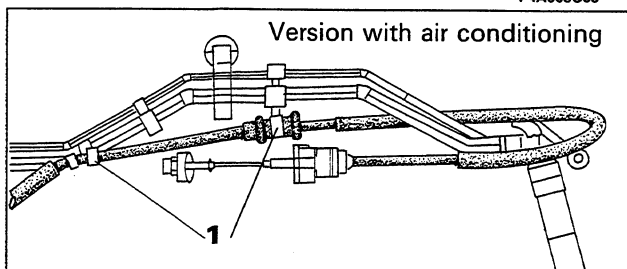
The diagram shows the clutch cable fitted on the 1370 version.

P4A007C03 P4A007C02

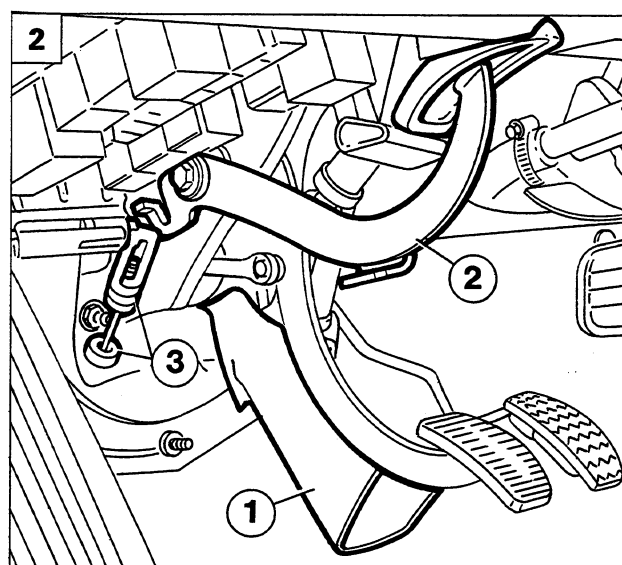
P4A007C05 P4A007C04



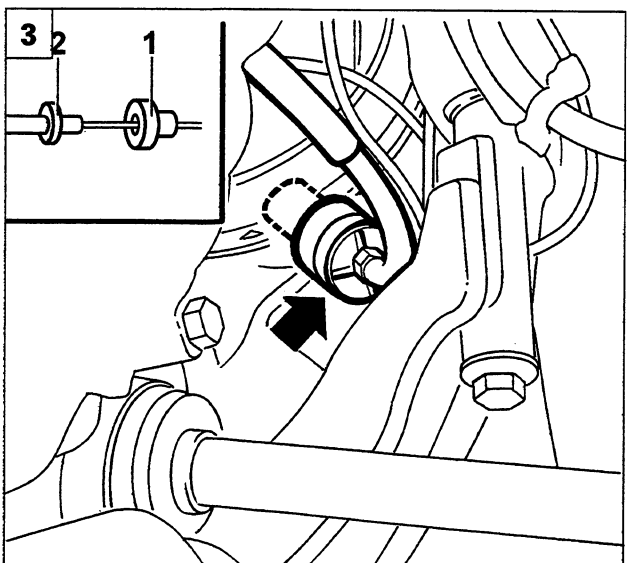
P4A008C08



P4A008C09



P4A007C06



P4A008C07



1. Release the clutch cable from the anchorages (1) on the bodyside as illustrated in the diagrams above at the side (for 1581 - 1747 - 1929 D versions only).
2. Lift up the carpet (1) near the clutch pedal.
Disconnect the end (3) of the clutch cable from the pedal (2) (for all versions).
3. From inside the engine compartment, remove the flexible buffer from the anchorage hole in the dashboard bulkhead and extract the complete clutch cable (for all versions).

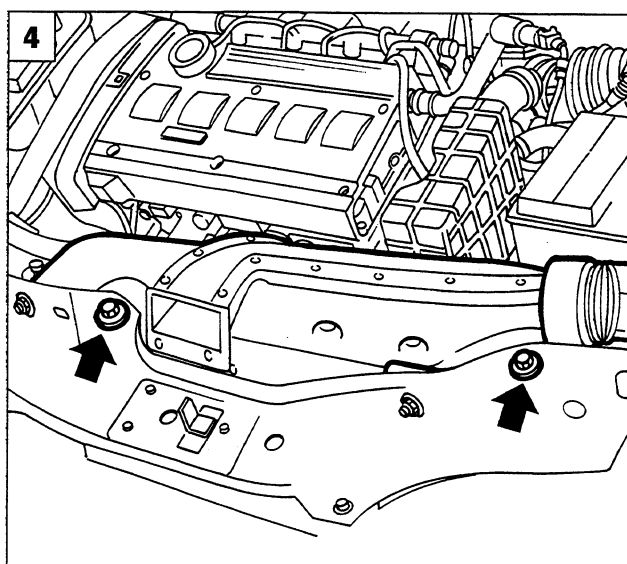


When refitting the clutch cable it is necessary to position the flexible rubber buffer (1) on the dashboard bulkhead and then insert the rigid buffer (2) in the opening in the flexible buffer. When the operation is completed, check and adjust the pedal travel as described previously. For the 1581-1747 -1929 D versions, take care when refitting the cable in the mountings on the gearbox or else the cable will deteriorate.

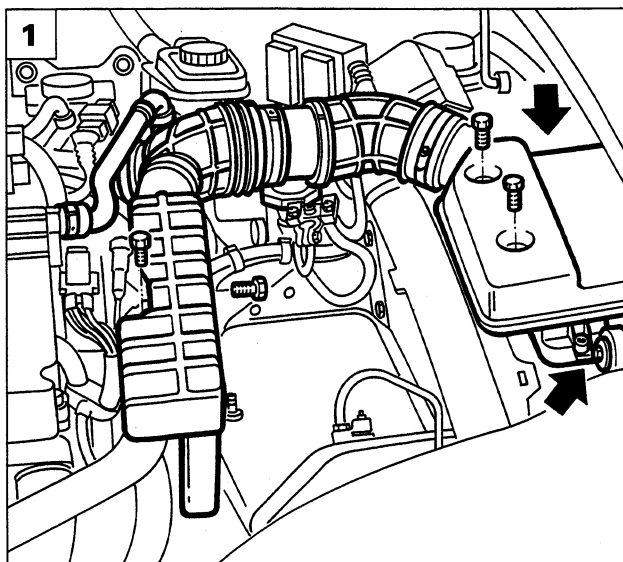
REMOVING-REFITTING HYDRAULICAL- LY OPERATED CLUTCH COMPONENTS (1998 20v)

CLUTCH PUMP

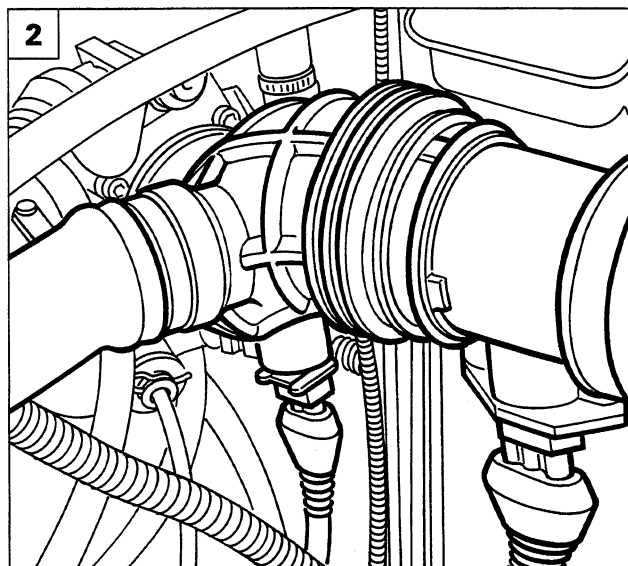
4. Remove the air intake duct acting on the bolts shown in the diagram.
Disconnect the positive battery pole and remove the battery from the engine compartment working on the nut fixing the retaining bracket.



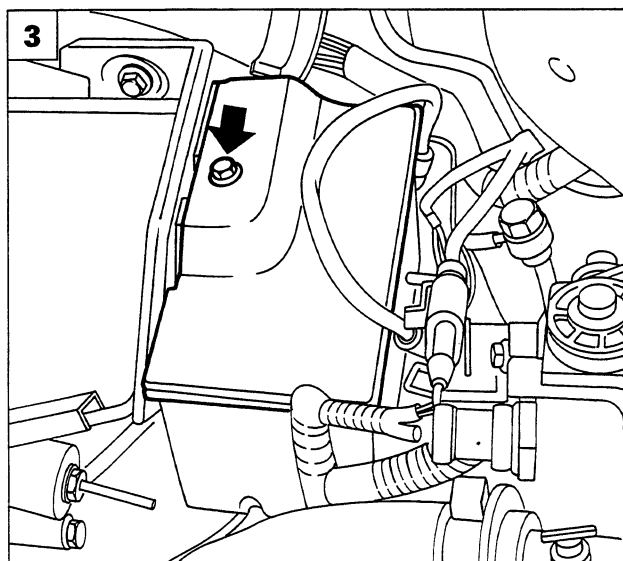
P4A008C03



P4A008C05



P4A008C06



P4A009C01

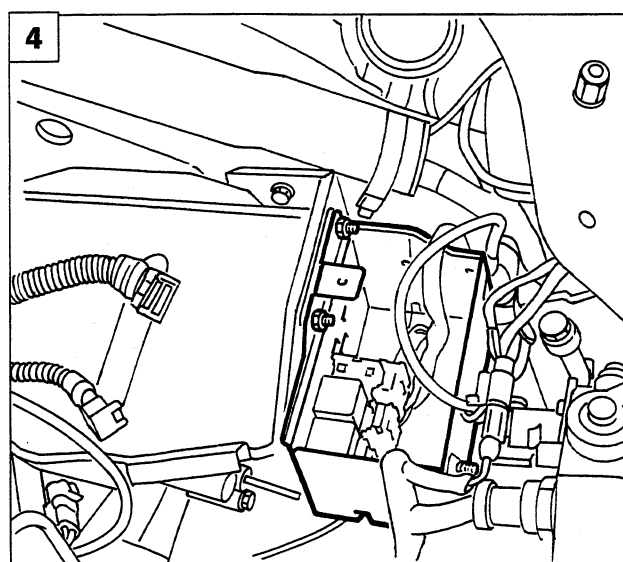


1.2. Disconnect the pipe connecting the air filter to the butterfly casing acting as illustrated in the diagram also removing the resonator.

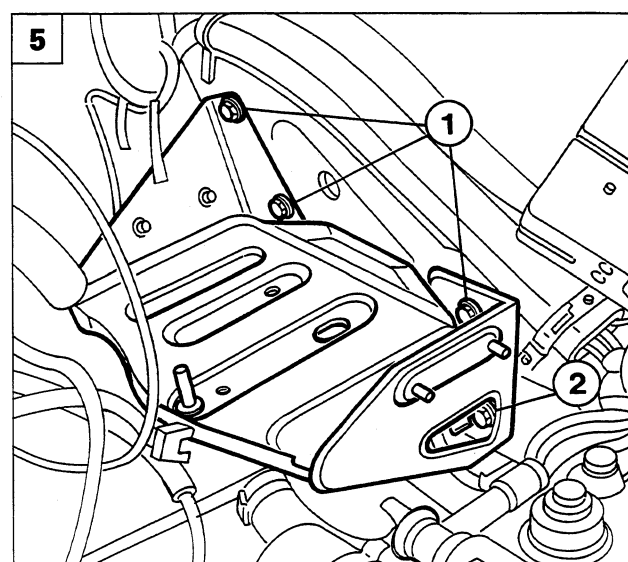
3. Remove the relay box cover.

4. Remove the nuts fixing the relay box to the battery drip tray, then place it at the side.

5. Remove the bolts (1) and loosen the bolt (2) fixing the battery drip tray to the bodyshell. Before removing the battery drip tray, disconnect the band underneath retaining the cables.

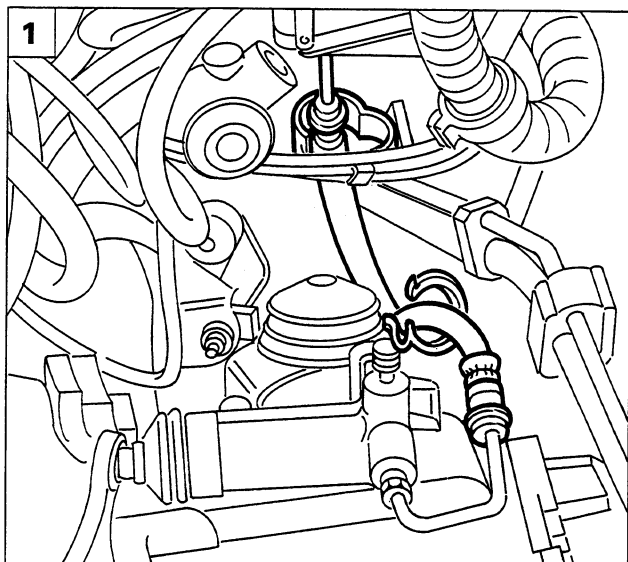


P4A009C02

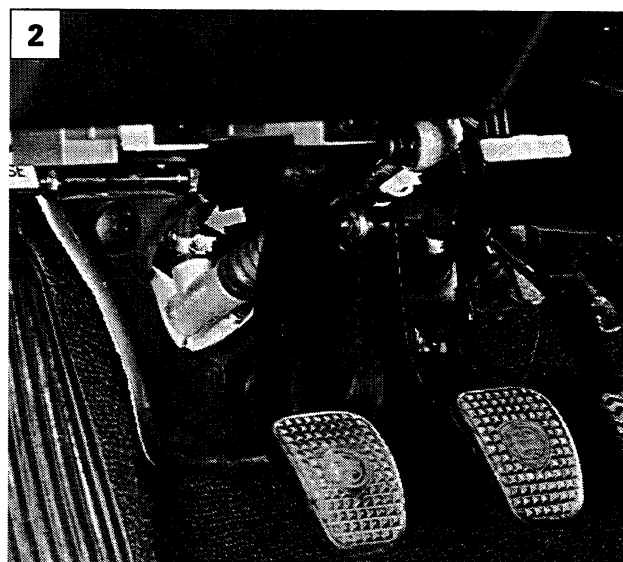


P4A009C03

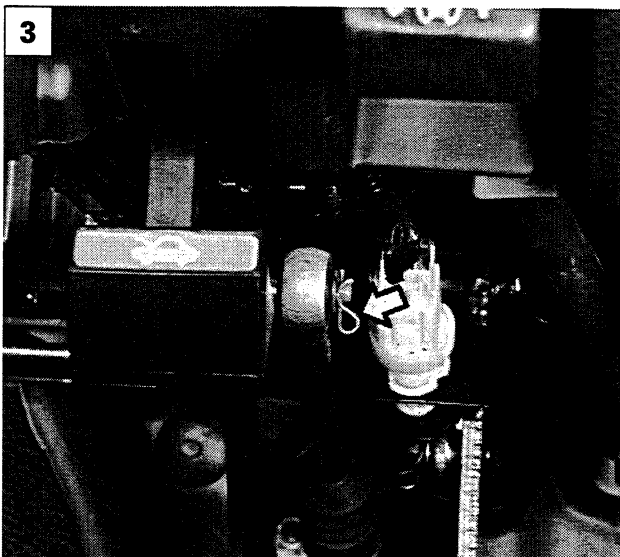
18.



P4A009C04



P4A009C05



P4A006C02



1. Release the pipe connecting the operating cylinder to the retaining bands.



2. Disconnect the pipe for the hydraulic system from the clutch pump.

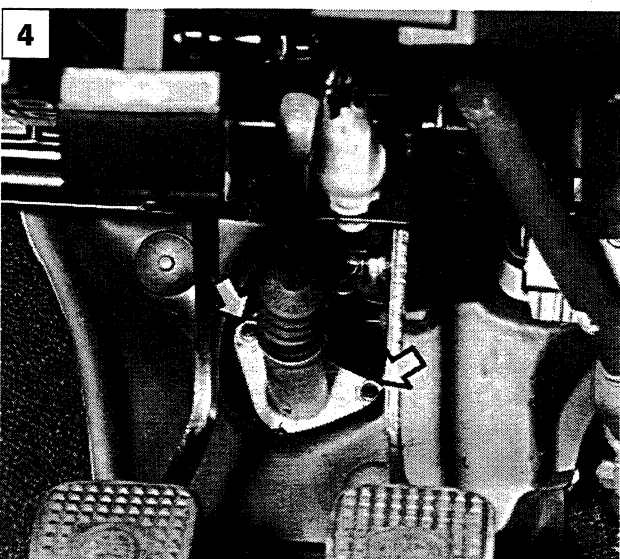


Before disconnecting the pipe it is necessary to drain the hydraulic system.

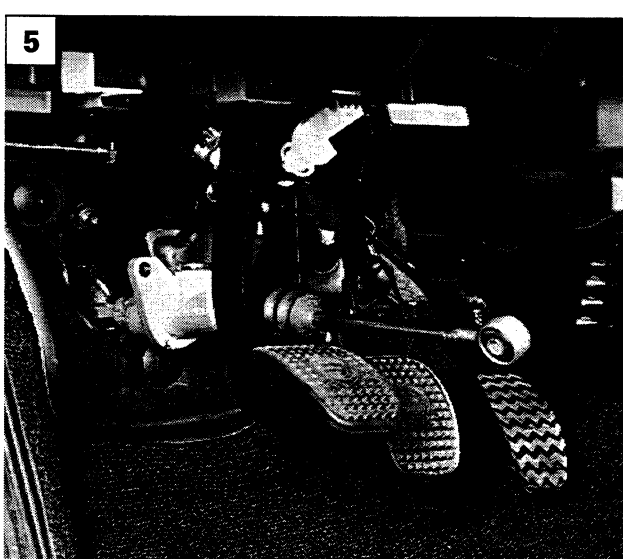
3. Remove the clip fixing the clutch pump to the pedal.

4. Undo the nuts fixing the clutch pump to the bodyshell.

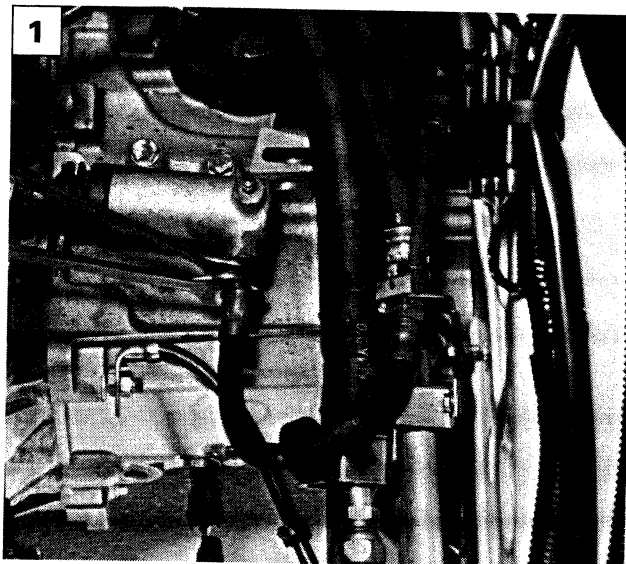
5. Disconnect the brake fluid supply union from the clutch pump, then remove it.



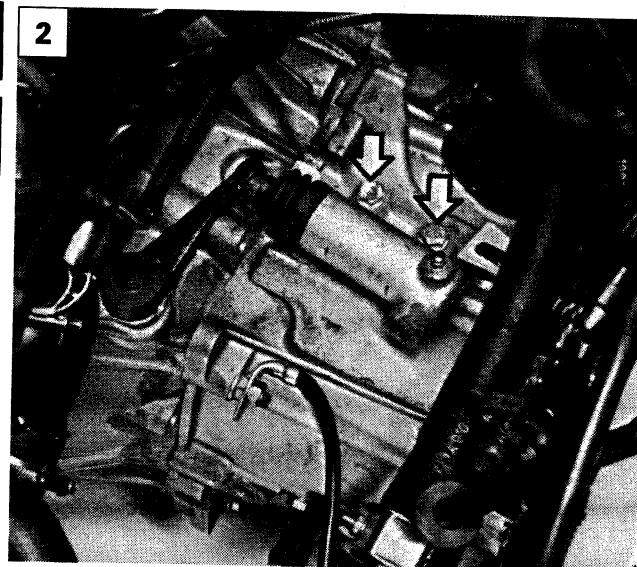
P4A010C01



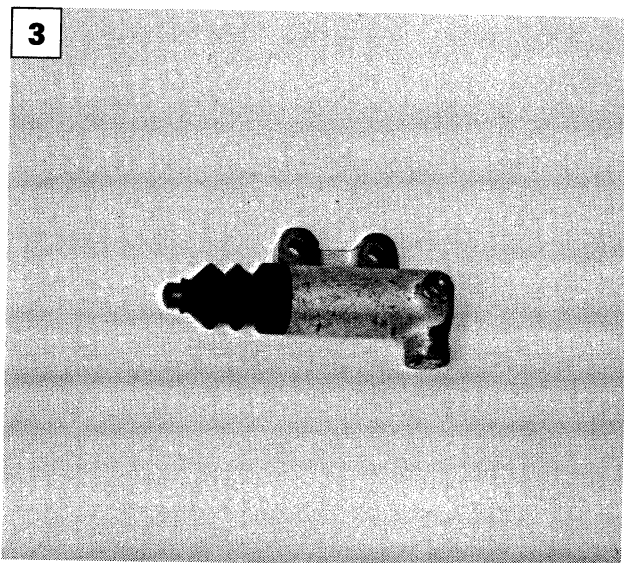
P4A010C02



P4A012C01

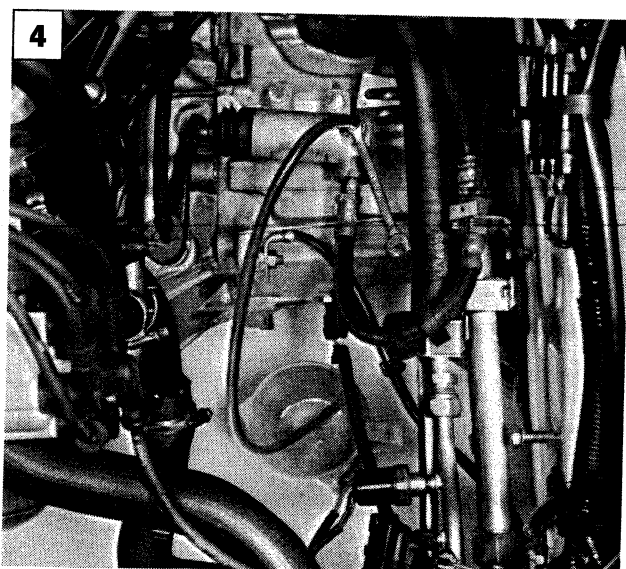


P4A012C02



OPERATING CYLINDER (1998 20v)

1. Disconnect the flexible pipe from the operating cylinder.
2. Undo the nuts shown and remove the clutch operating cylinder.
3. View of clutch operating cylinder assembly.

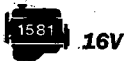


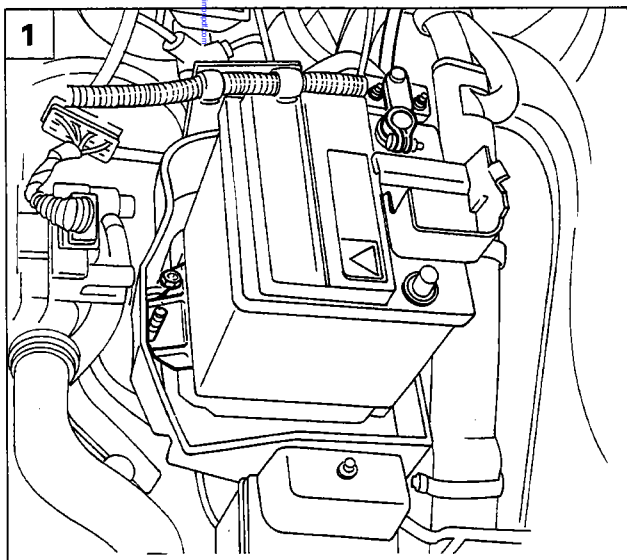
P4A013C03



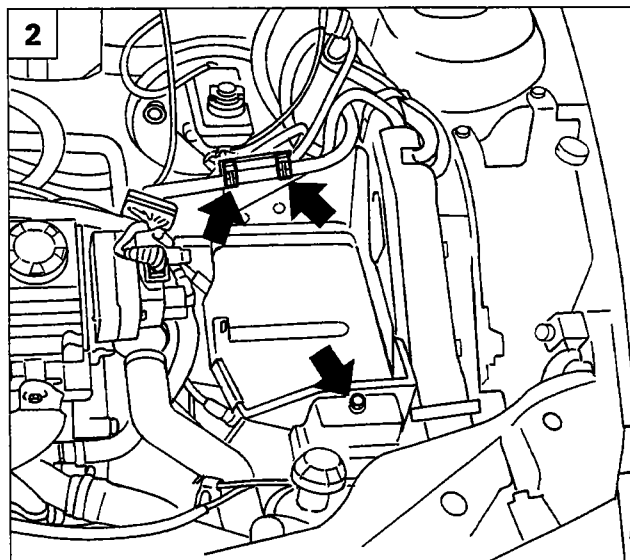
BLEEDING (1998 20v)

4. Do not, under any circumstances, reuse the fluid recovered. The level should be topped up with new brake fluid.

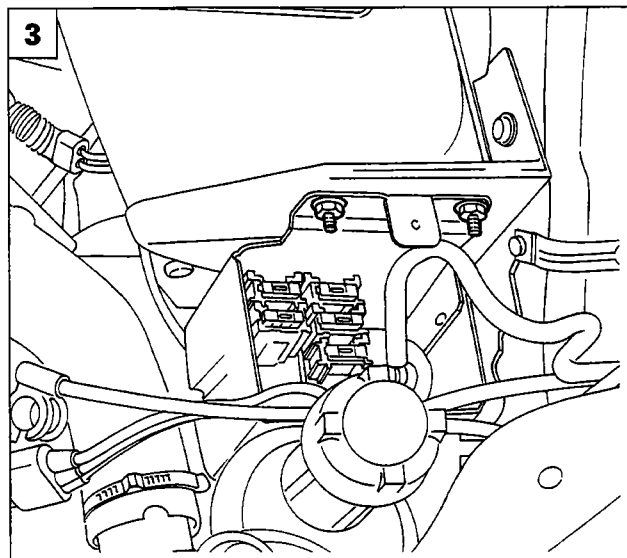
	page		page
 1370 12V		 1998 20V	
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DRIVE SHAFTS		DRIVE SHAFTS - REM. CONTROL ASSY	
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- Dismantling	44		
- Refitting	45		
INTERMEDIATE SHAFT - REMOTE CONTROL ASSEMBLY			
- Removing-refitting	48		
- Remote control assembly	48		



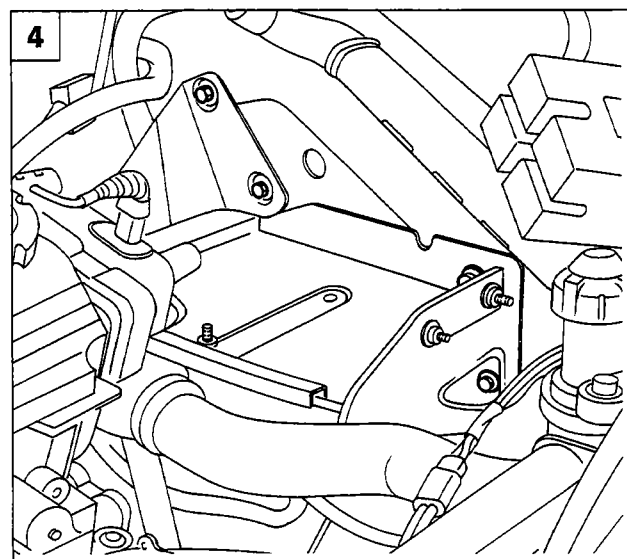
P4A001B01



P4A001B02



P4A001B03



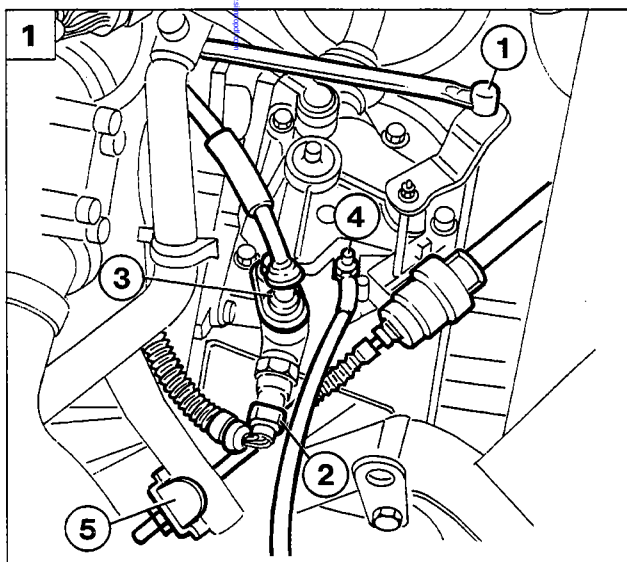
P4A001B04

REMOVING - REFITTING

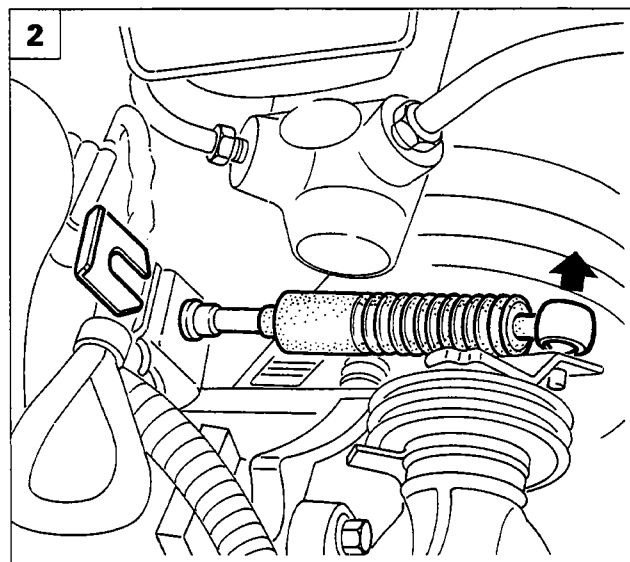
Removing

Place the car on ramps, remove the front wheels, then proceed as described below:

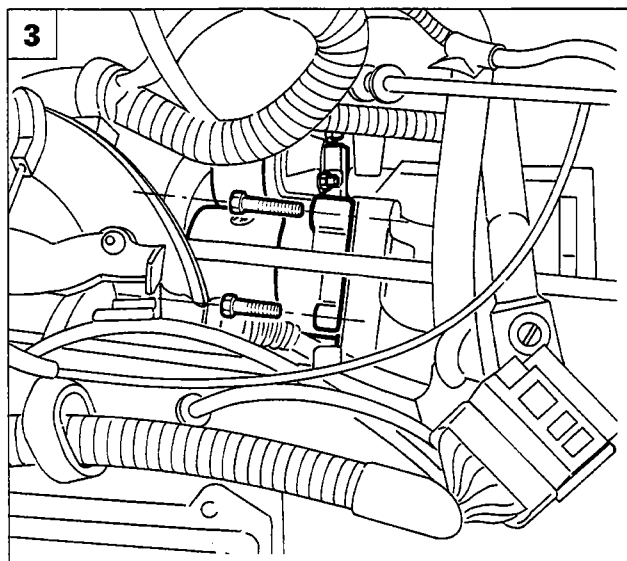
1. Disconnect the battery's negative terminal, lift the protective cover from the positive terminal and disconnect the latter; undo the nut securing the battery mounting bracket to the battery cage and remove the battery.
2. Release the electrical cables shown in the figure from their clamps, then undo the bolts securing the relay box cover.
3. Remove the nuts securing the relay box to the battery cage, then move the box over to one side.
4. Undo the bolts shown in the figure and remove the battery cage from the engine compartment.



P4A002B01



P4A002B02



P4A002B03

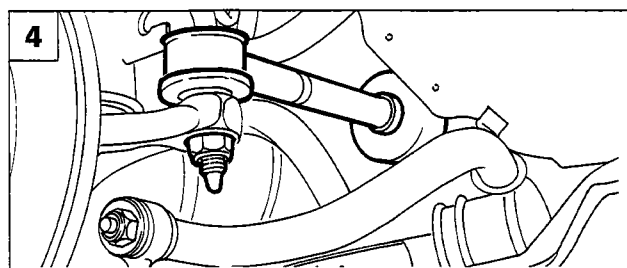


1. Disconnect the gear selector rod (1), disconnect the reversing lights switch (2), inhibition cable (3), earth cable (4) and clutch cable (5).

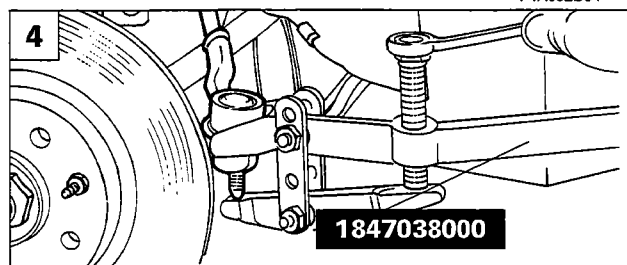
2. Disconnect the head of the gear engagement flexible transmission cable, disconnect the odometer connection then move the assembly aside in the engine compartment.

3. Undo the top bolts securing the starter motor to the gearbox.

4. Raise the ramps, undo the nut securing the steering tie-rod end, then using tool 1847038000 disconnect it from the vertical link. Repeat the procedure for the tie-rod end on the other side.



P4A002B04

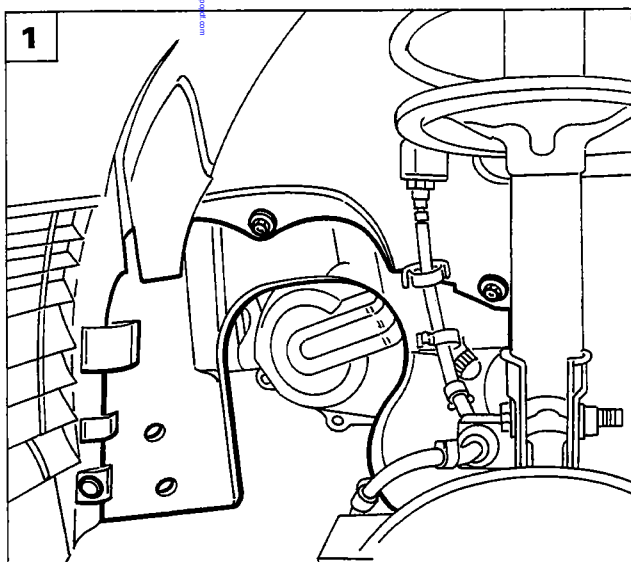


P4A002B05

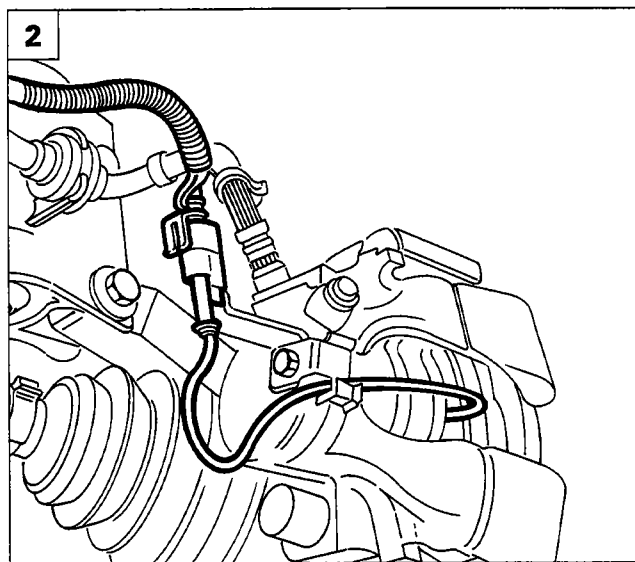
Gearbox and differential

Removing - refitting

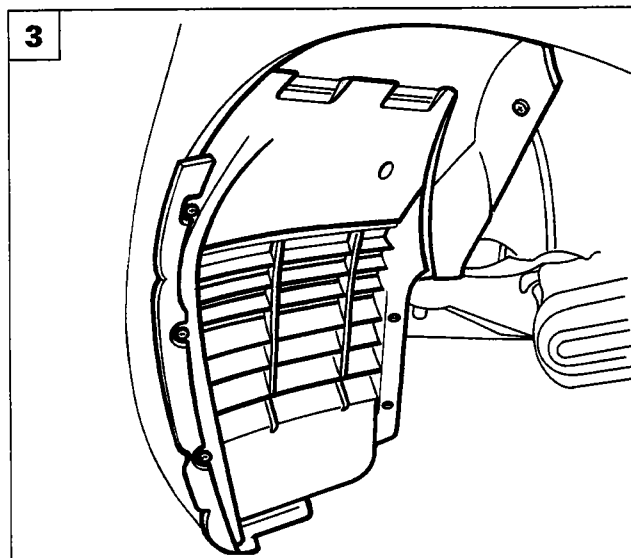
21-27.



P4A003B01



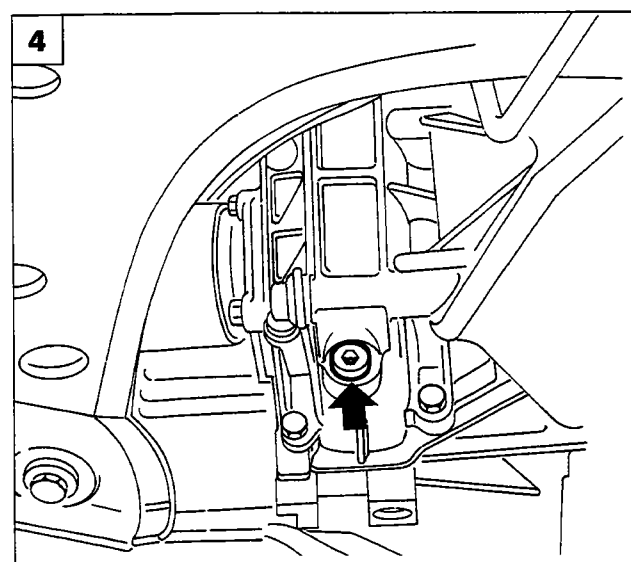
P4A003B02



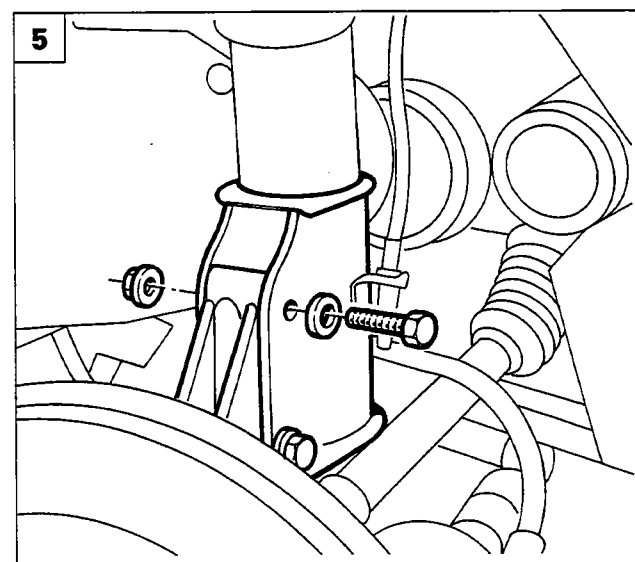
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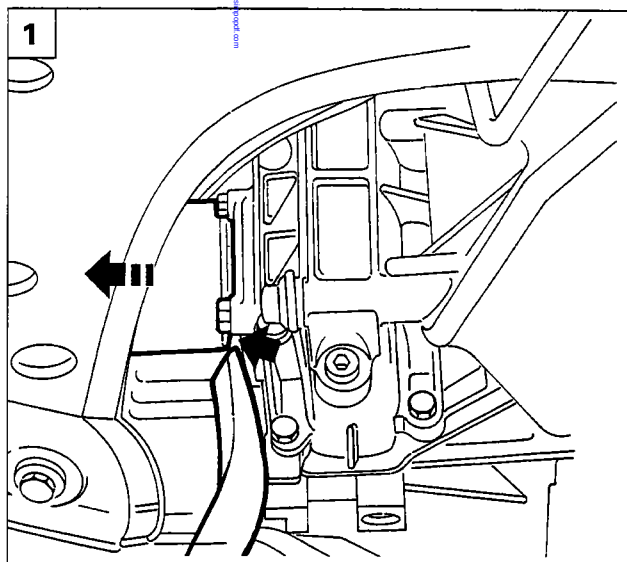
1. Using tool 1878077000, remove the button securing the dust guard to the body shell, then undo the bolts and release the guard from its seating. Repeat the procedure on the dust guard on the other side.
2. Disconnect the brake pad connector then withdraw the central dust guard from the car. Repeat the procedure on the right side.
3. Remove the front dust guard by undoing the attachments illustrated.
4. Prepare a tray to collect the gearbox oil, then undo the plug (arrowed) and drain the gearbox oil.
5. Remove the bolts securing the damper to the vertical link and turn the vertical link inwards, releasing the brake pipe from the damper.



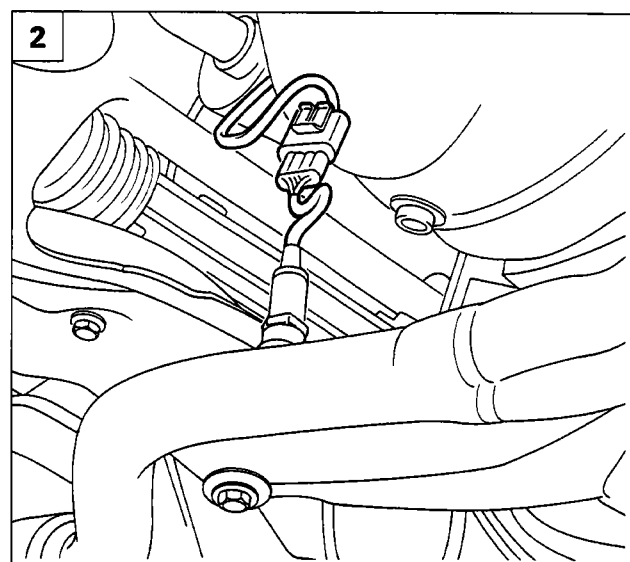
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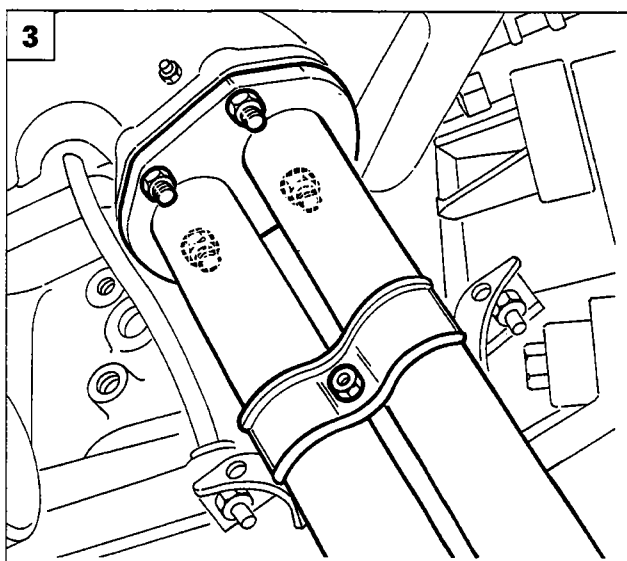
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P4A004B01



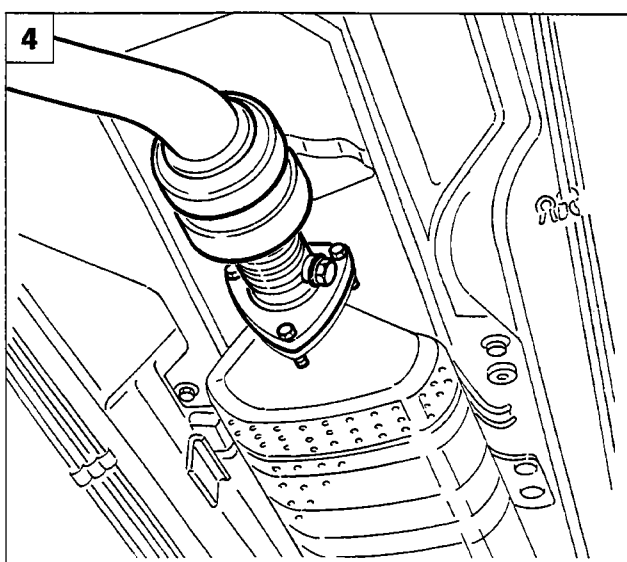
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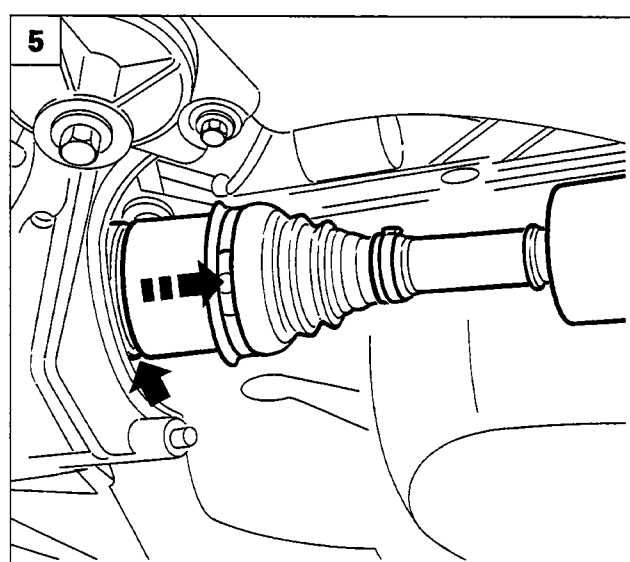
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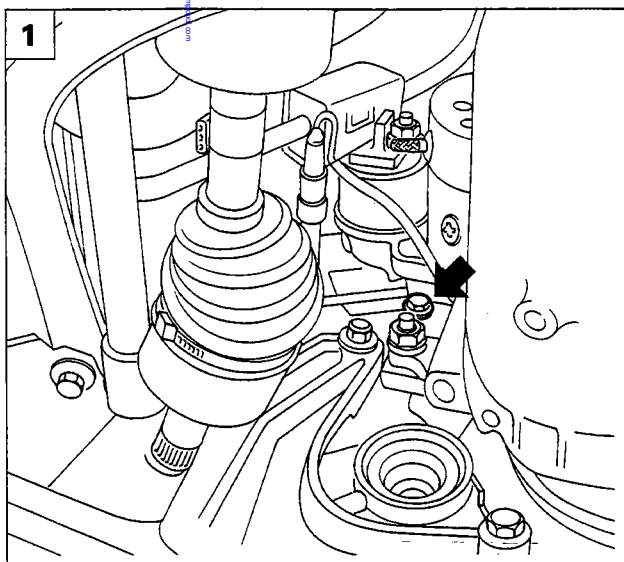
1. Disconnect the drive shaft, gearbox side, from the differential, levering on the engagement point, and move it away from the working area.
2. Disconnect the Lambda probe wiring connector.
3. Undo the nuts securing the first section of the exhaust pipe to the manifold.
4. Undo the rear attachments and remove the first section of the exhaust pipe from the car.
5. Disconnect the drive shaft, intermediate shaft side, from the differential, levering on the engagement point.



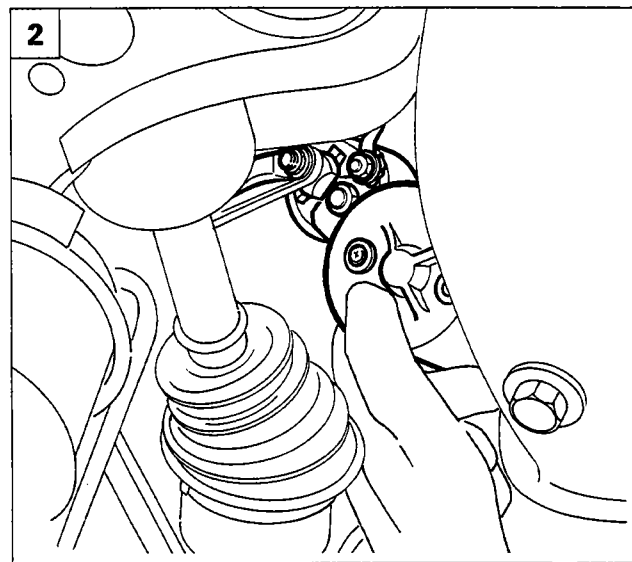
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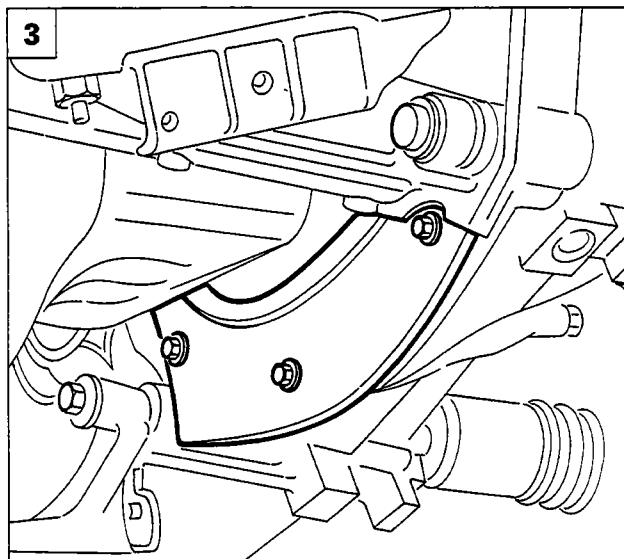
P4A004B05



P4A005B01



P4A005B02



P4A005B03



1. Undo the bottom bolt securing the starter motor.

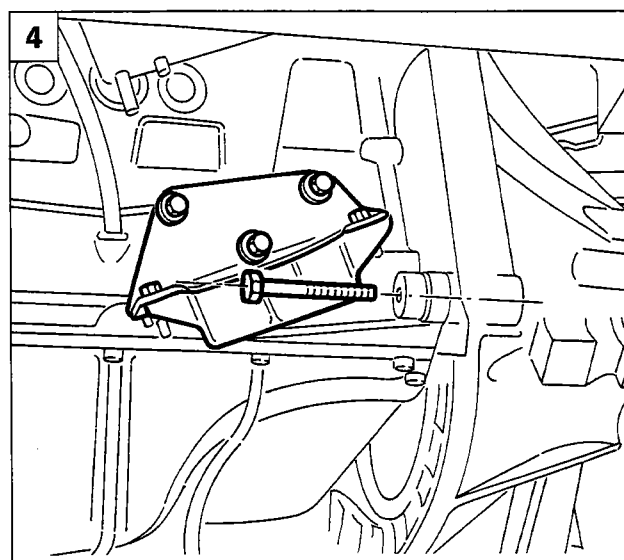


2. Disconnect the starter motor cables and disconnect the starter motor.

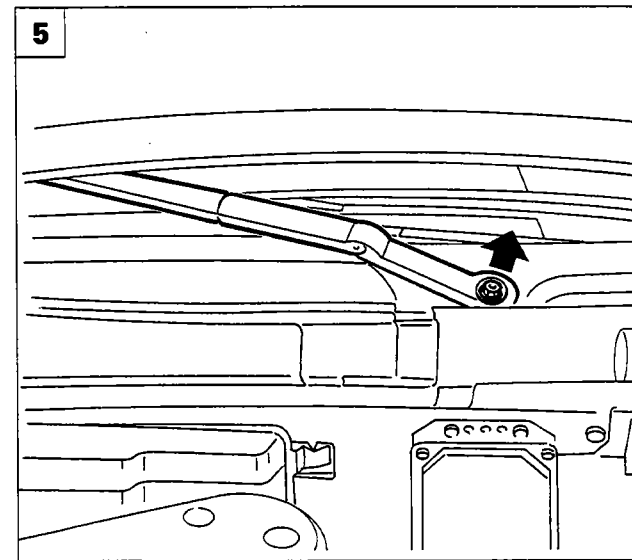
3. Remove the flywheel cover by undoing the bolts illustrated.

4. Remove the mounting bracket securing the first section of the exhaust pipe, to enable a spanner to be inserted to remove the bolt securing the gearbox to the engine.

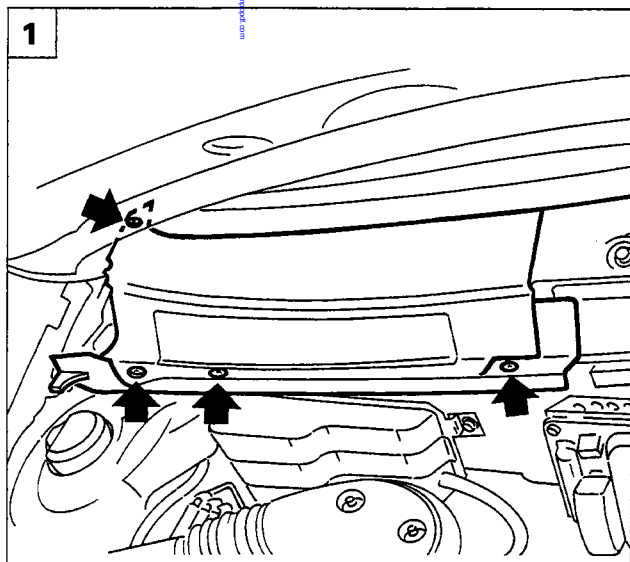
5. Lower the ramps and remove the left windscreen wiper arm.



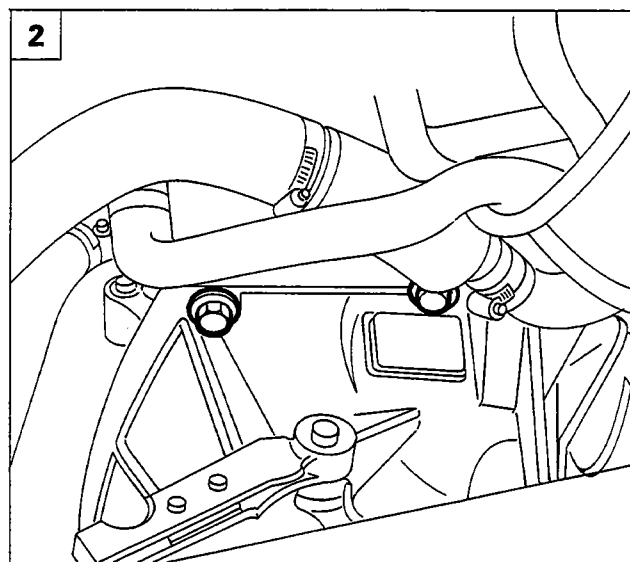
P4A005B04



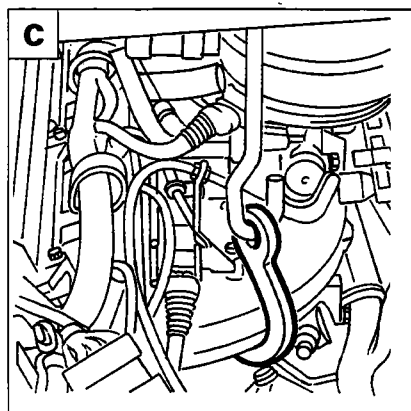
P4A005B05



P4A006B01



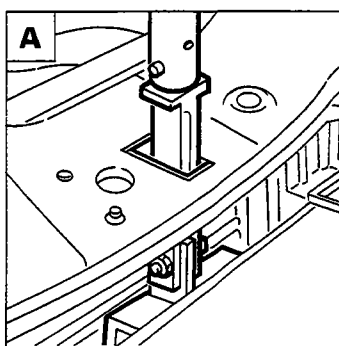
P4A006B02



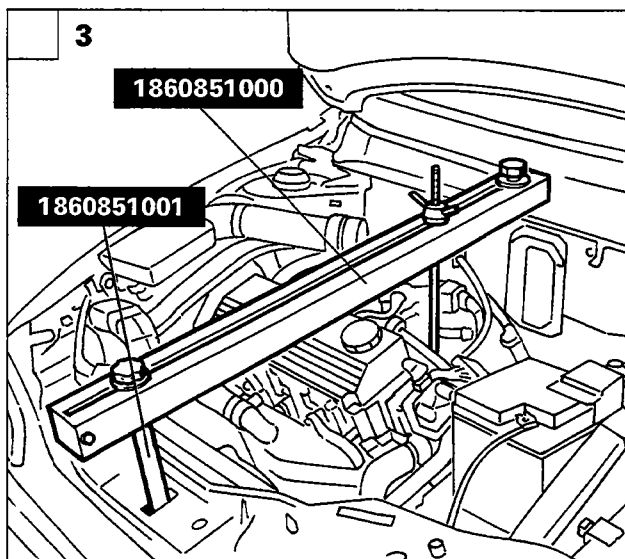
P4A006B04



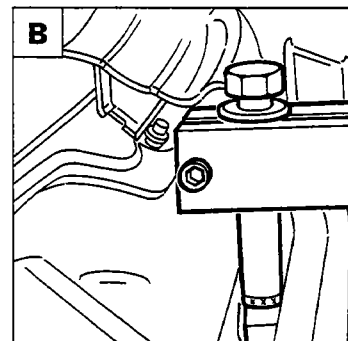
1. Remove the plastic cover from the anti-pollen filter by undoing the screws illustrated.
2. Undo the top bolts securing the gearbox to the engine.
3. Fit the engine support stand 1860851000 on its mounting points.
 - a. Front mounting: insert the tool in the seat of the safety catch so that it rests on the front crossframe.
 - b. Rear mounting: position the tool level with the central reinforcement of the fire-proof bulkhead.
 - c. Secure the hook of the support stand to the inlet manifold so that it supports the power unit centrally.



P4A006B05



P4A006B03

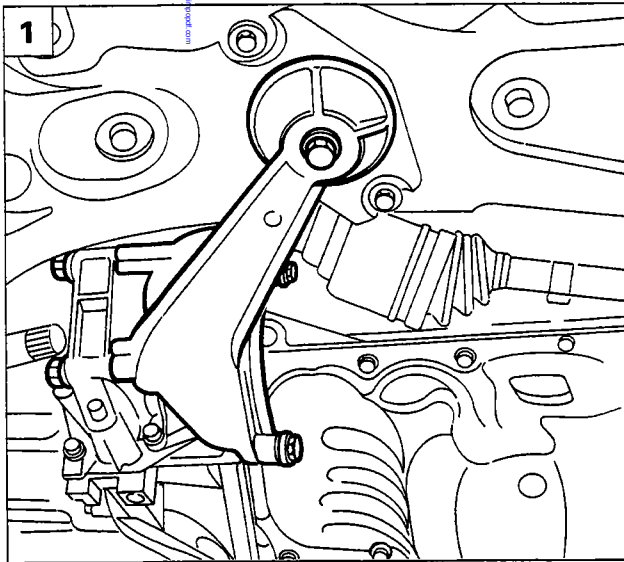


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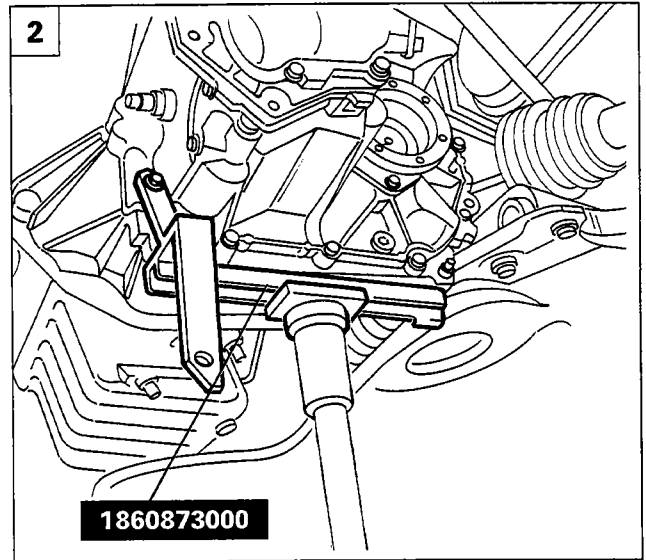
Gearbox and differential

Removing - refitting

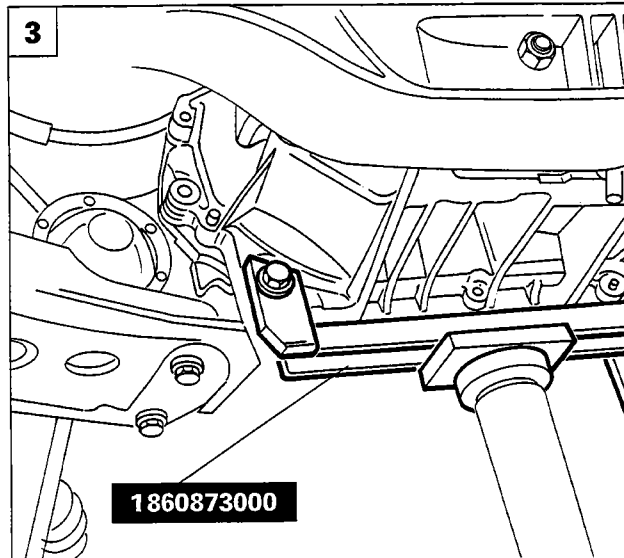
21-27.



P4A007B01



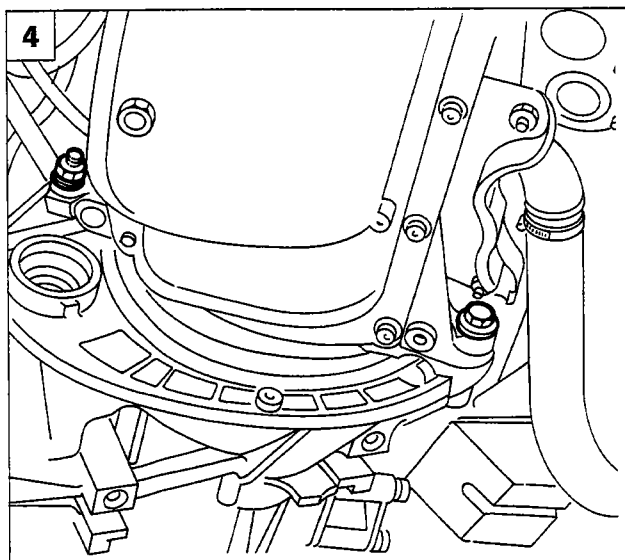
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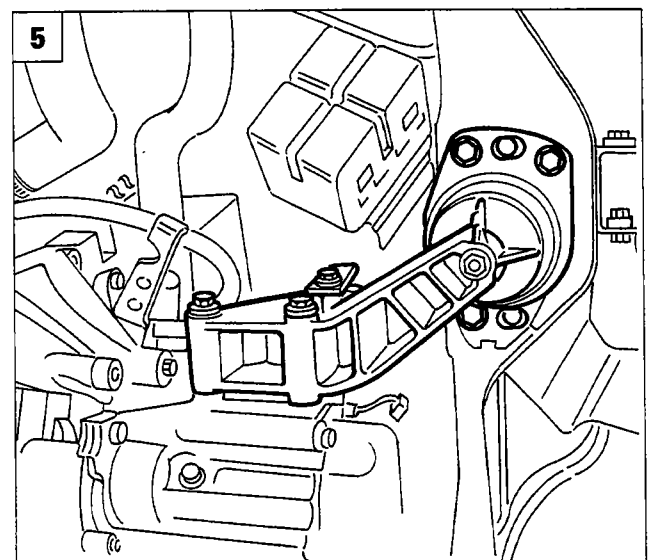
P4A026B03



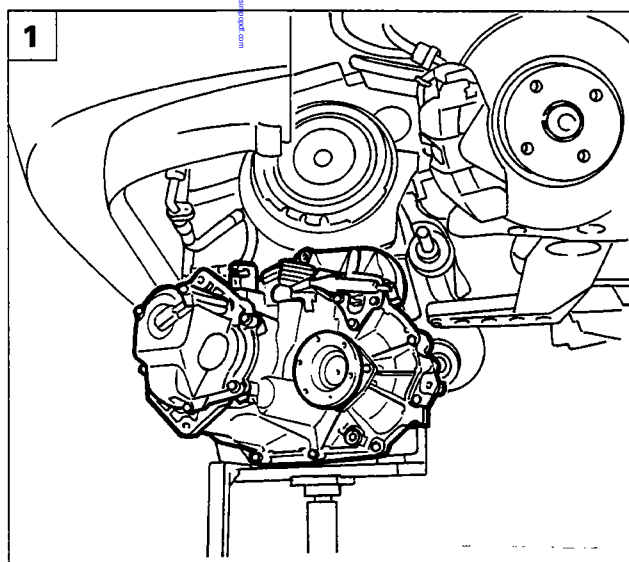
1. Raise the car and disconnect the central power unit mounting from the bodywork and the gearbox.
- 2.3 Install the tool illustrated to support the gearbox during the removal operation.
4. Undo the remaining bolts securing the gearbox to the engine.
5. Remove the front power unit mounting, gearbox side, from the bodywork and the gearbox.



P4A007B04



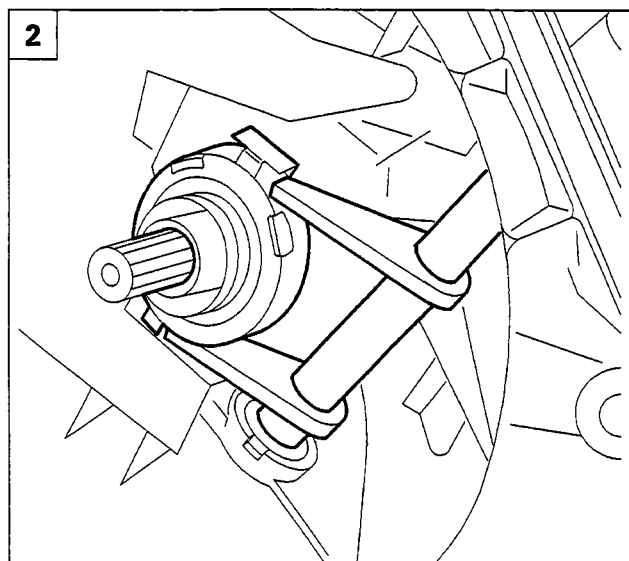
P4A007B05



P4A008B01



1. Manoeuvre the jack as appropriate to release the gearbox from the centring studs, then remove the gearbox from the engine compartment by slowly lowering the hydraulic jack.



P4A008B02

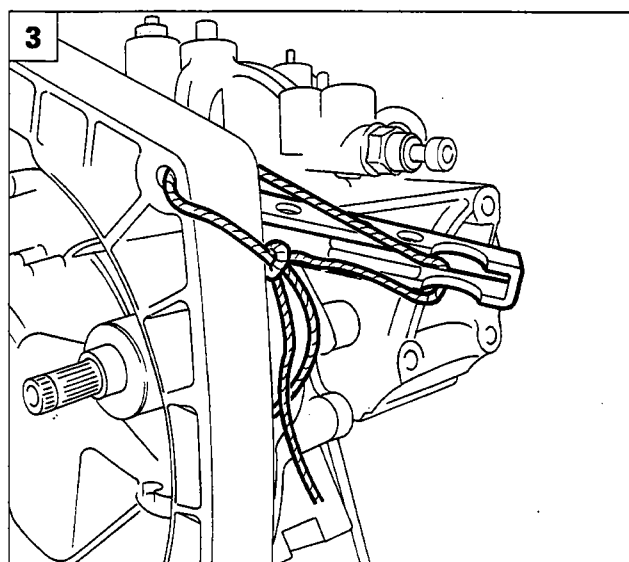


Refitting



Before refitting the gearbox-differential unit, check that the clutch release bearing has remained in the bellhousing and has not engaged with the clutch. Carry out the operations below:

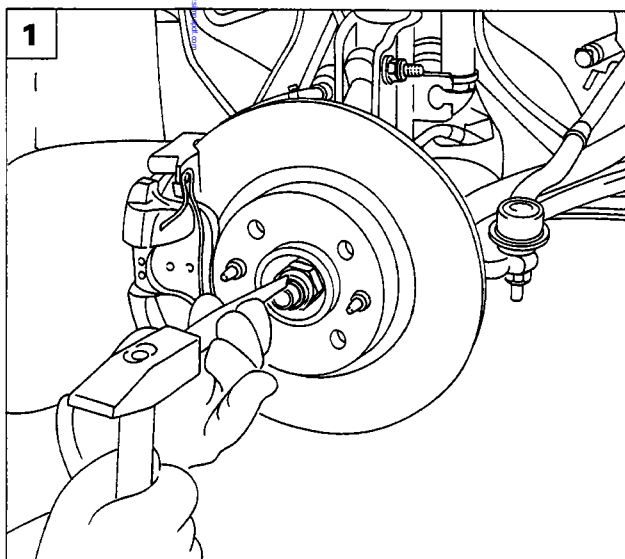
2. Check that the clutch release bearing is positioned correctly on the gearbox main shaft.



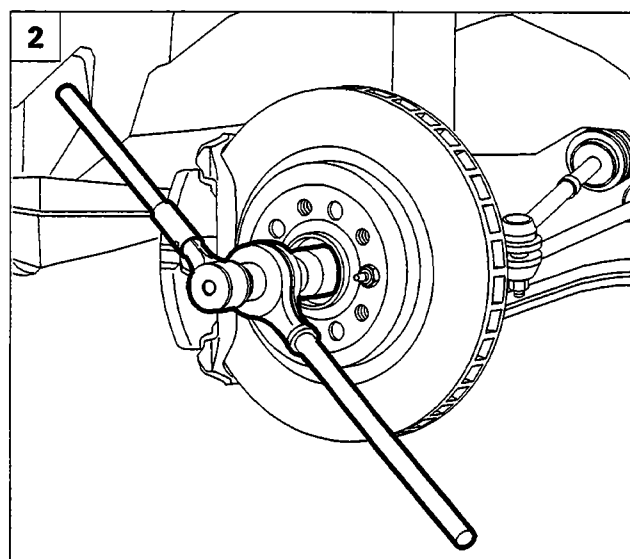
P4A008B03



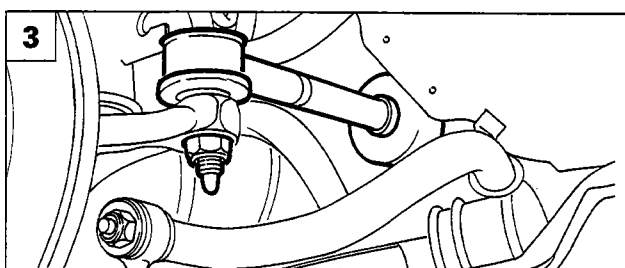
3. Secure the clutch release lever, in the fully back position, to the bellhousing, then using the hydraulic jack bring the gearbox-differential unit to the clutch, centre it in its references and secure it to the engine. For the subsequent operations, reverse the procedure for removal.



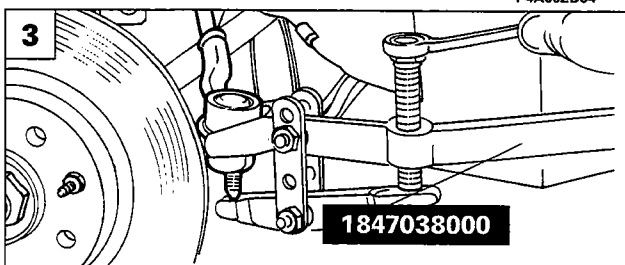
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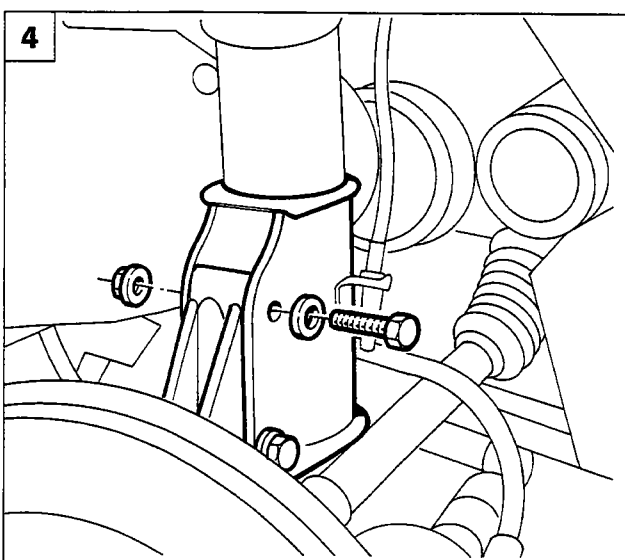
P4A009B02



P4A002B04



P4A002B05



P4A003B05

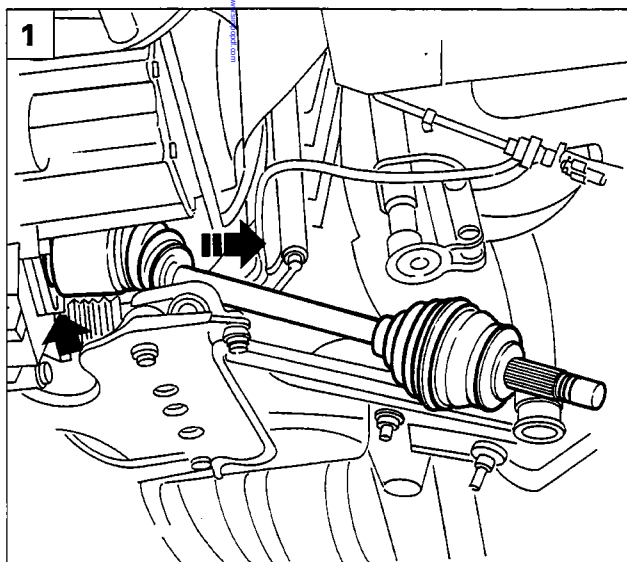


REMOVING - REFITTING

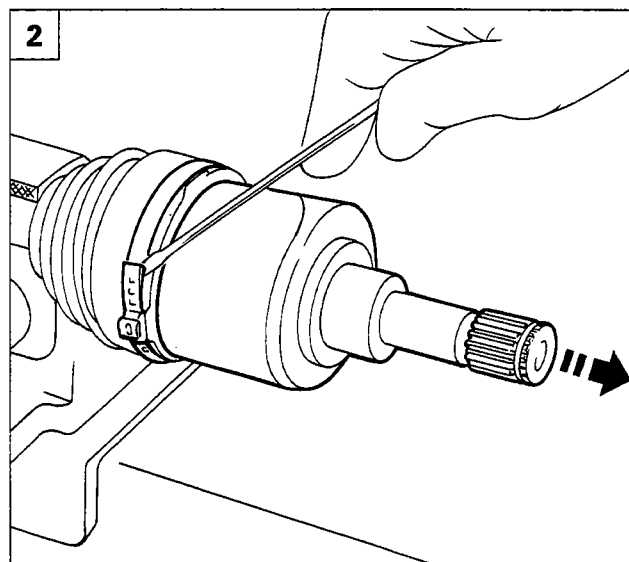


Place the car on ramps, disconnect the battery's negative terminal, remove the front wheels and then proceed as follows:

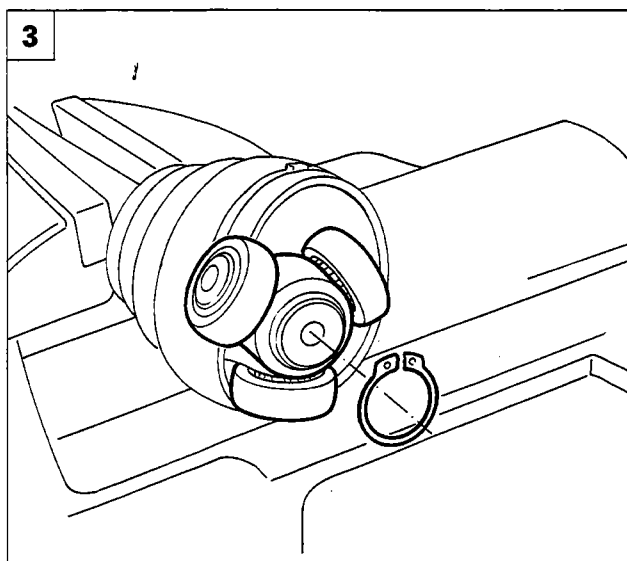
1. Using a hammer and chisel, relieve the staking on the hub nut.
2. Unscrew the hub nut.
3. Undo the bolt on the tie-rod end then use tool 1847038000 to disconnect the tie-rod.
4. Undo the bolts securing the vertical link to the damper, and angle the vertical link to release the shaft.



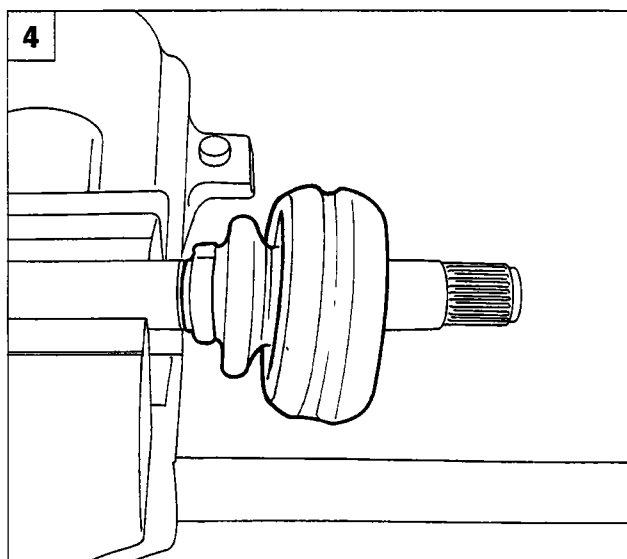
P4A010B01



P4A010B02



P4A010B03



P4A010B04



1. Disconnect the drive shaft from the differential levering on the engagement point, then withdraw it from the car.

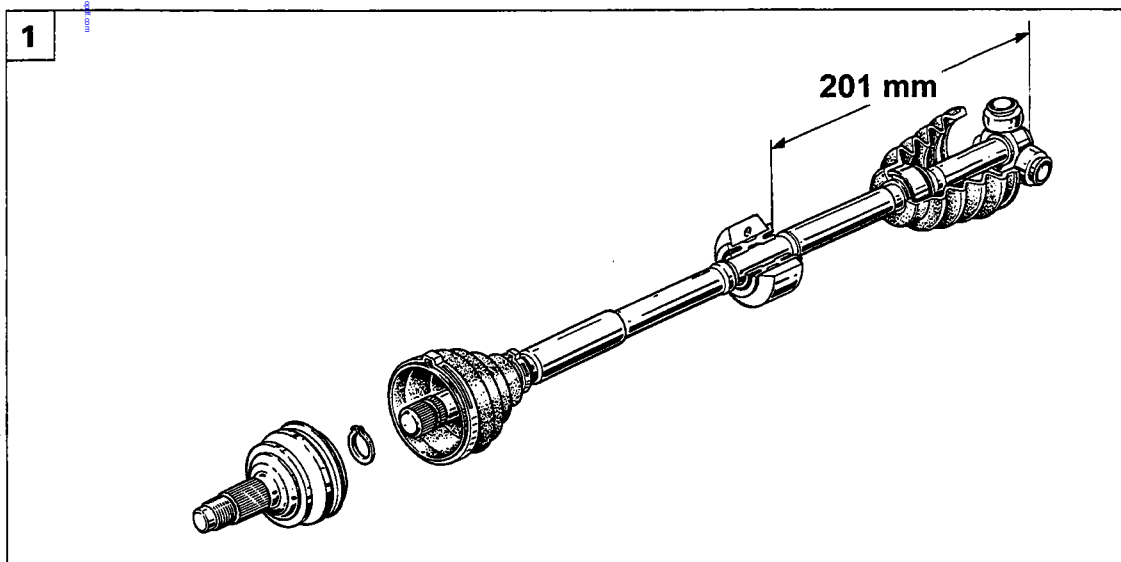
NOTE To refit, reverse the procedure for removal, tightening the hub nut to the specified torque.

DISMANTLING

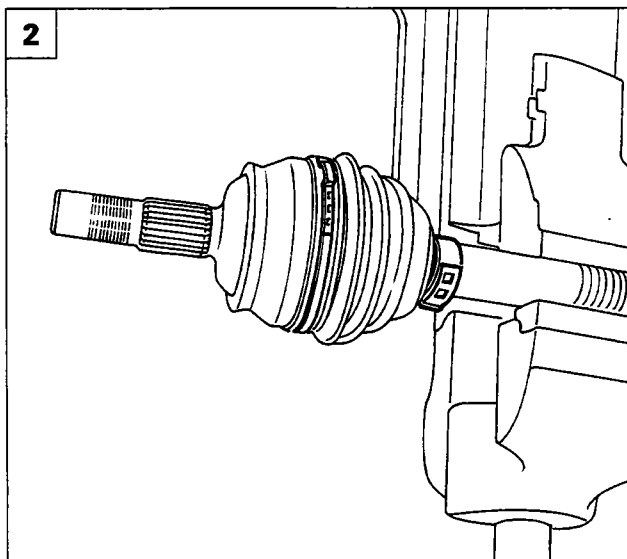
2. Place the drive shaft in a vice, remove the protective gaiter from the joint on the gearbox side, then remove the joint.
3. Remove the circlip from the tripod joint and withdraw the joint from the drive shaft.

NOTE If the joint is damaged, it should be renewed.

4. Undo the clip on the protective gaiter on the gearbox side, then withdraw it from the drive shaft.



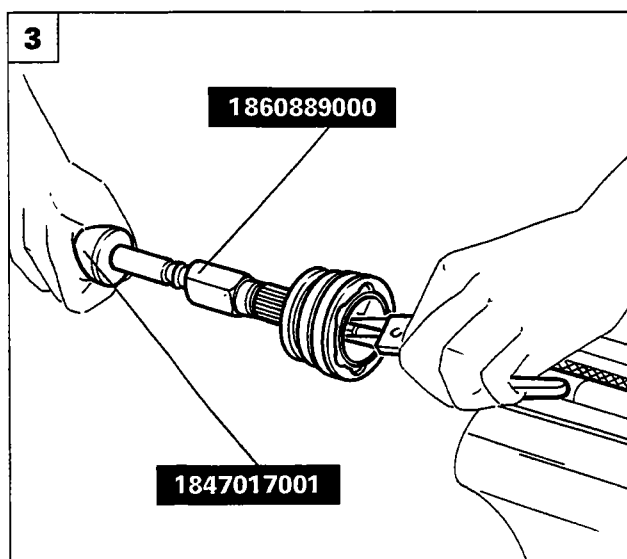
P4A011B01



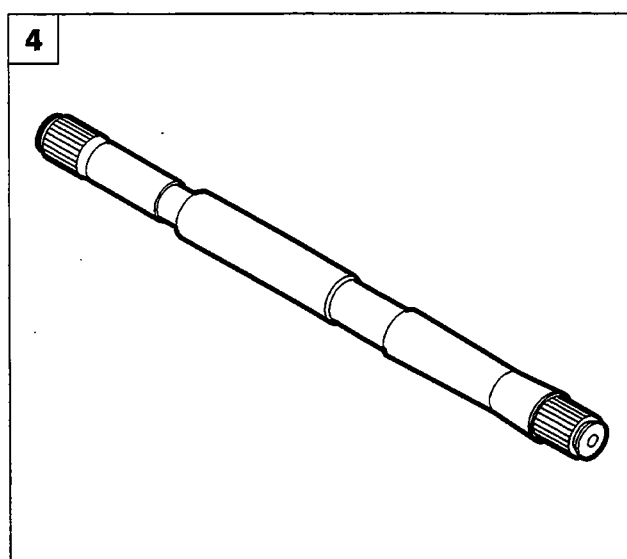
P4A011B02



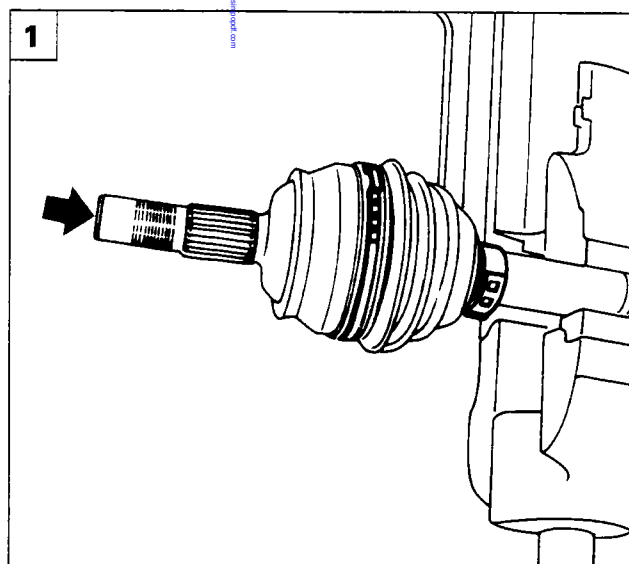
1. If interventions on the right drive shaft involve dismantling the damping weight, during reassembly refit the weight at the distance specified in the figure.
2. Undo the clips securing the protective gaiter on the constant velocity joint, wheel side, then withdraw it from the side opposite the drive shaft.
3. Clean the grease off the inside of the constant velocity joint, and using tools 1847017001 and 1860889000 simultaneously on the circlip inside the joint, remove the joint from the drive shaft.
4. Check that the drive shaft is not deformed or out of true, and that the seal contact surface is not worn.



P4A011B03



P4A011B04



P4A012B01



REFITTING

1. Refit the protective gaiter on the wheel side and fit the constant velocity joint, applying appropriate pressure.

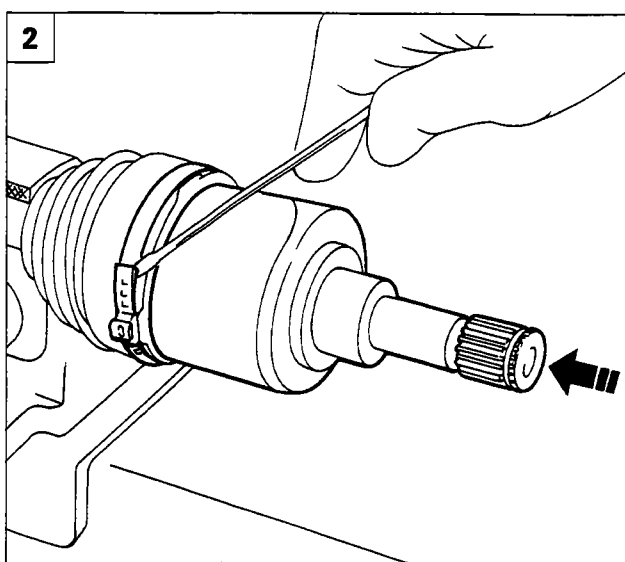


It is advisable to replace the protective gaiters whenever they are removed, and it is important to fill both constant velocity joint and gaiter with TUTELA MRM2 grease.

Shaft-joint coupling on wheel side			
Shaft classification		Joint classification	
Categ.	Colour	Categ.	Colour
A	Blue	A	Blue
		B	White
B	Red	C	Red



When refitting, the constant velocity joints must be coupled to the shaft as shown in the table. Category B joints are coupled with both categories of drive shaft; conduct a further check on the joint to make sure there are no signs of seizure or scoring.



P4A012B02

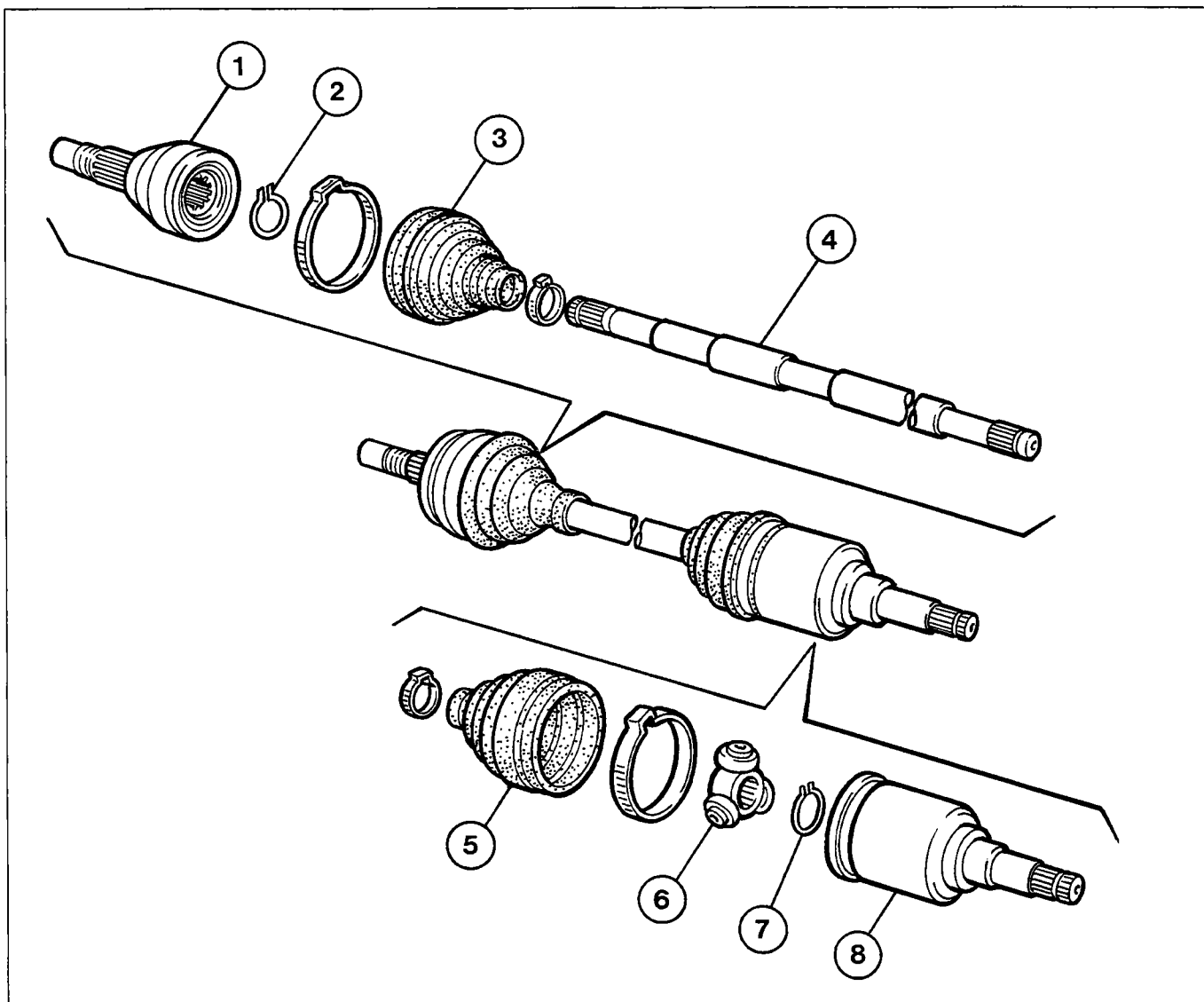


2. Refit the protective gaiter on the gearbox side, fit the tripod joint securing it with the circlip, and then fit the joint on the gearbox side and secure the gaiter with its clips.



It is advisable to replace the protective gaiters whenever they are removed, and it is important to fill both joint and gaiter with TUTELA MRM2 grease.

DRIVE TRANSMISSION COMPONENTS



P4A013B01

Key

- | | |
|---|--|
| 1. Constant velocity joint wheel side | 5. Protective gaiter |
| 2. Circlip securing constant velocity joint | 6. Tripod joint |
| 3. Protective gaiter | 7. Circlip securing tripod joint |
| 4. Drive shaft | 8. Joint, gearbox side (part not present on 1581 16V engine) |

21-27.

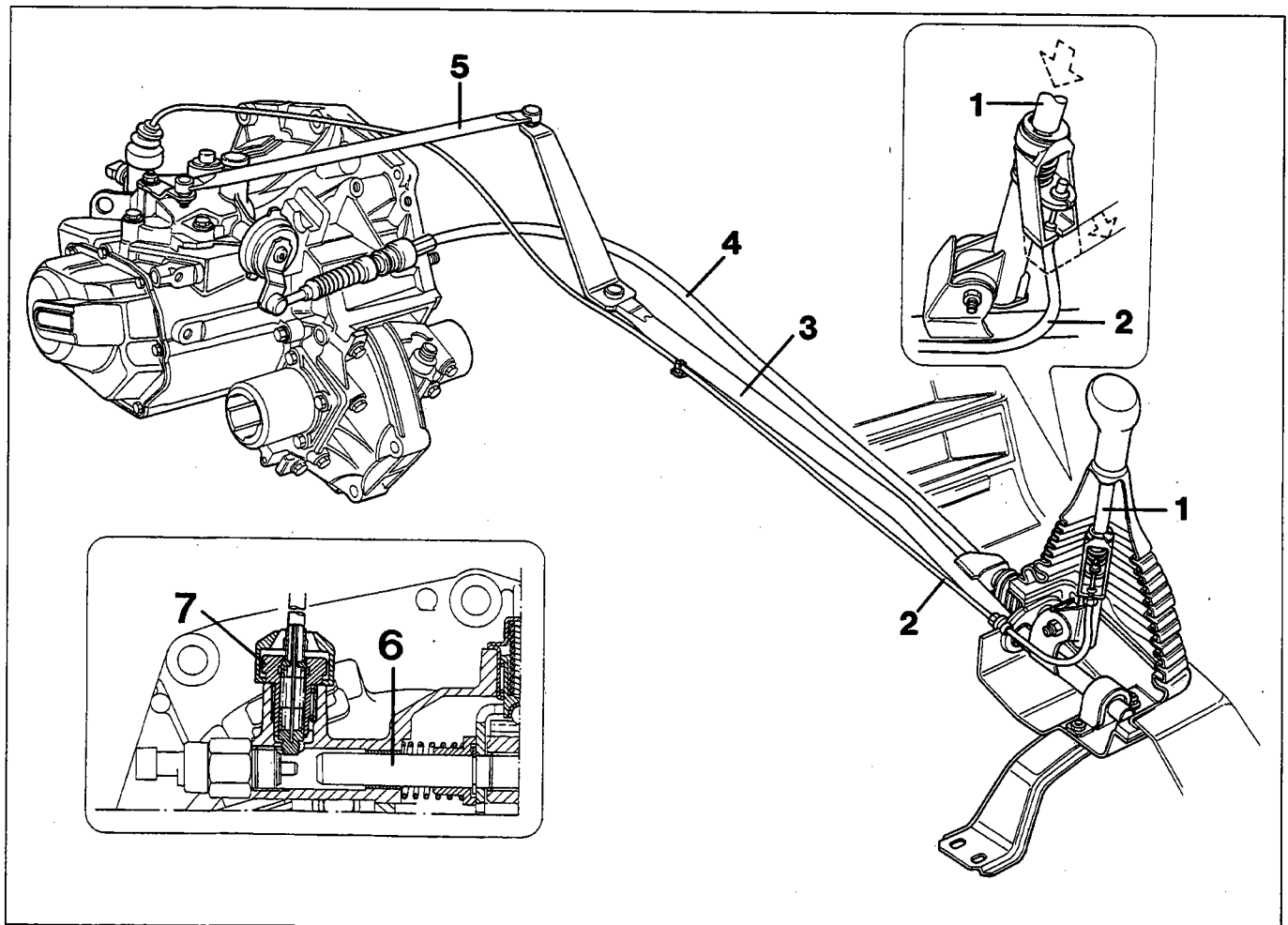
DIAGRAM OF REMOTE CONTROL ASSEMBLY

The Bravo-Brava with 1370 12v engine has a remote control assembly system consisting of a rigid rod (3) and a flexible cable (4).

The rigid rod (3) controls gear selection by means of a relay link (5); the flexible cable (4) instead controls gear engagement.

There is also a safety device (7) for preventing accidental selection of reverse gear.

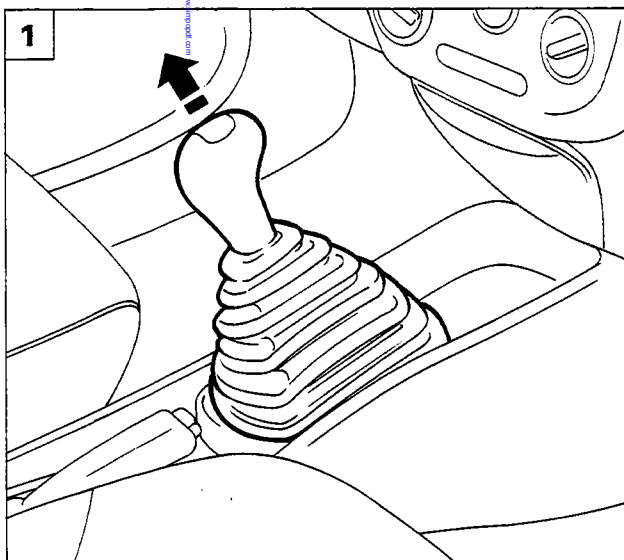
To operate this device, press the knob (1) of the gearlever downwards; this, by means of the flexible cable (2), lifts the pushrod of the device (7) which in turn permits the travel of the control shaft (6) for selecting reverse gear.



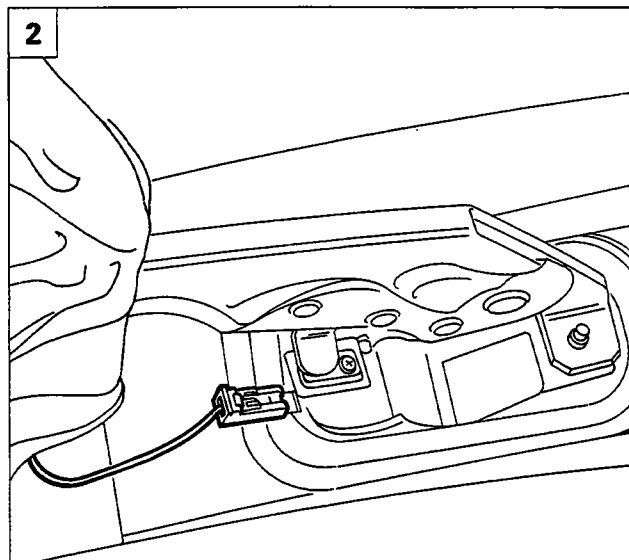
P4A014B01

Perspective view of remote control assembly with device for inhibiting accidental selection of reverse gear

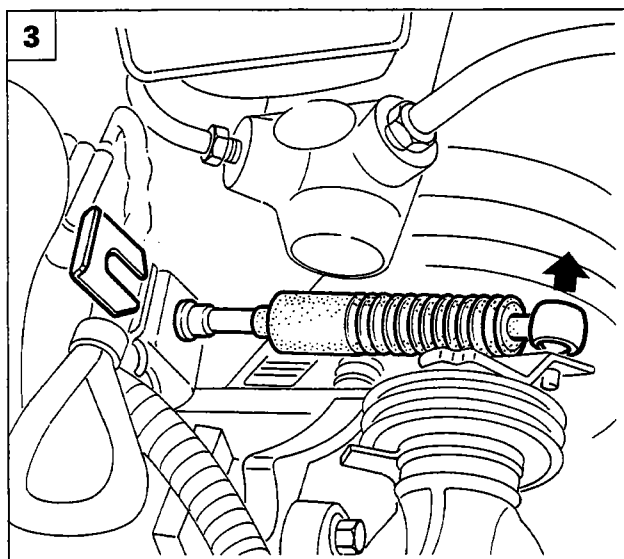
1. Sliding part of gearlever
2. Flexible cable controlling device for inhibiting accidental selection of reverse gear
3. Rigid rod controlling gear selector link
4. Gear engagement flexible cable
5. Gear selector control link
6. Gear selector and engagement shaft
7. Device for inhibiting accidental selection of reverse gear



P4A015B01



P4A015B02



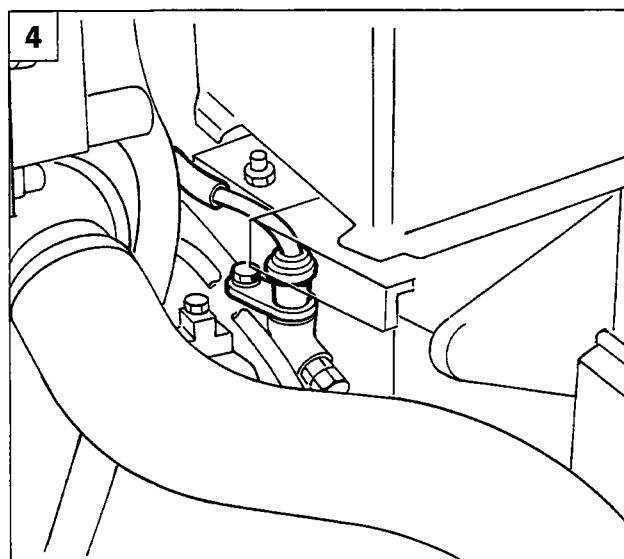
P4A002B02



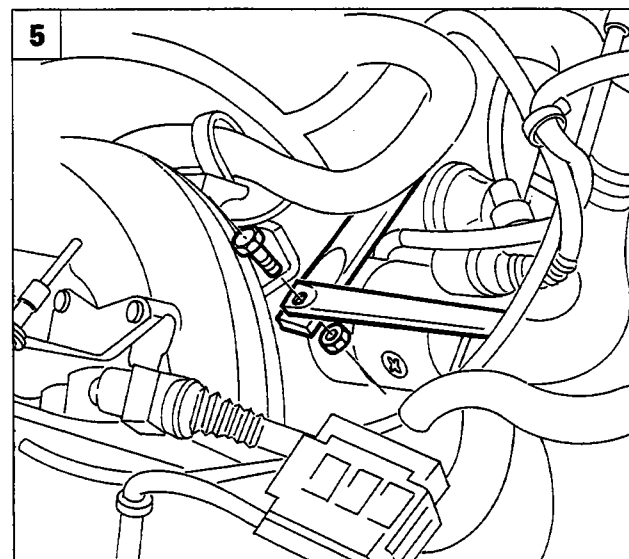
REMOVING - REFITTING

Disconnect the battery's negative terminal, and remove the remote control assembly as described below:

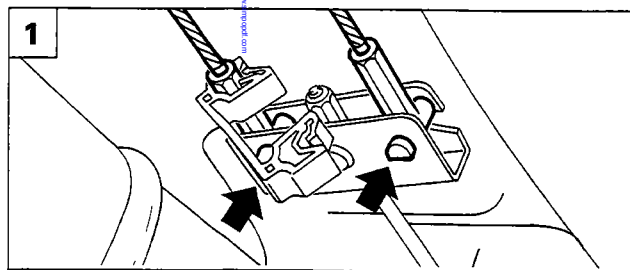
1. From inside the car, remove the gearlever trim.
2. Remove the protective boot from the handbrake, then disconnect the electrical connection underneath.
3. Disconnect the gear engagement flexible transmission cable from the gearbox.
4. Disconnect the reverse gear inhibitor from the gearbox.
5. Remove the reaction and gear selector link from the gearbox.



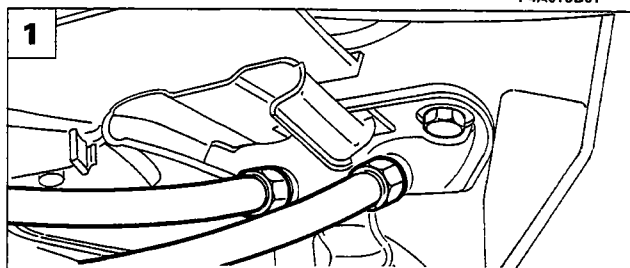
P4A015B04



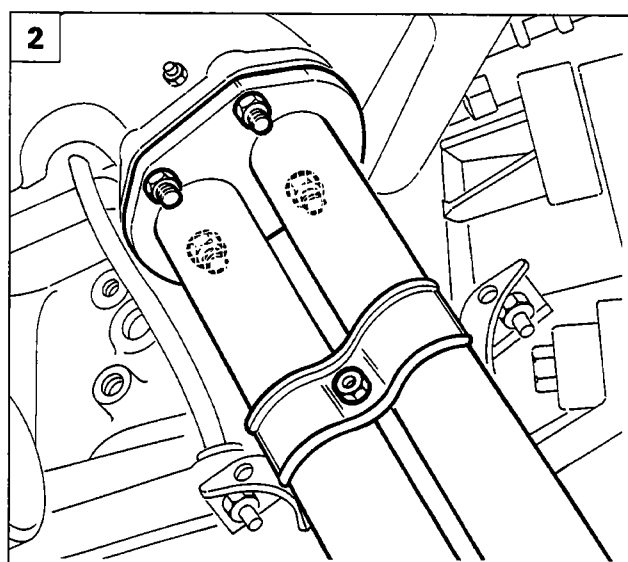
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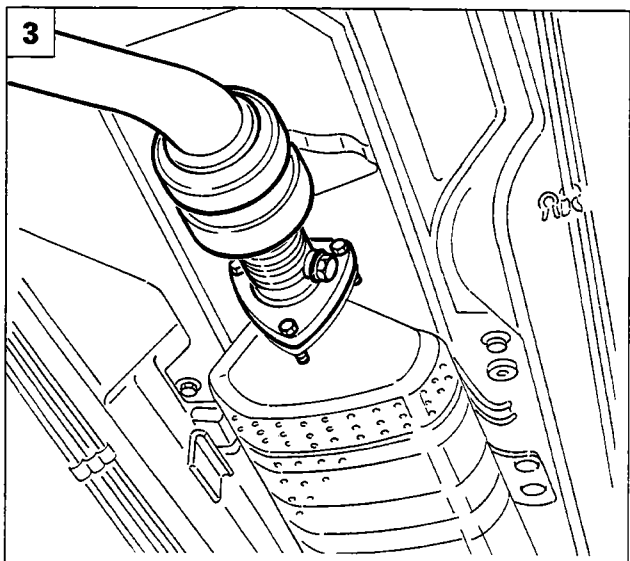
P4A016B01



P4A016B02



P4A004B03



P4A004B04



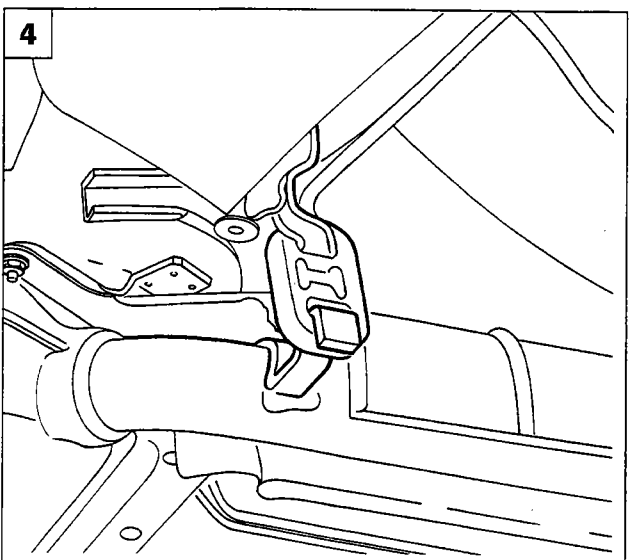
1. Raise the car, then disconnect the hand-brake cables from the mounting and release them from the bracket.

2. After disconnecting the Lambda probe electrical connection, undo the bolts securing the first section of the exhaust pipe to the manifold.

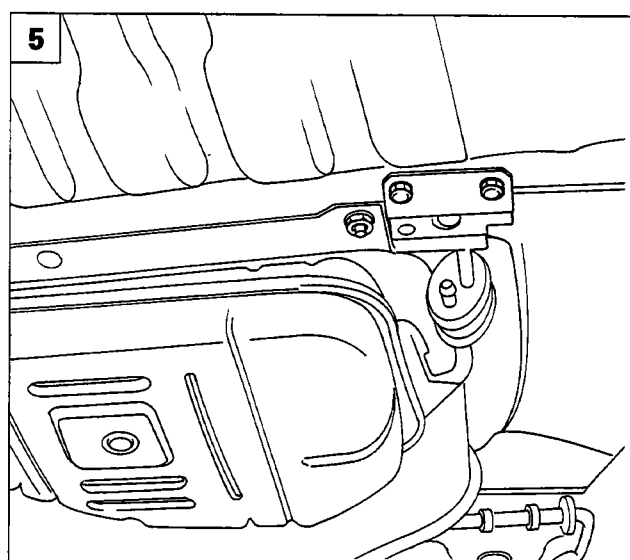
3. Disconnect the first section of the exhaust pipe from the rear mountings.

4. Release the exhaust pipe from the rubber mount indicated.

5. Undo the bolts securing the exhaust pipe front mounting bracket.



P4A016B05

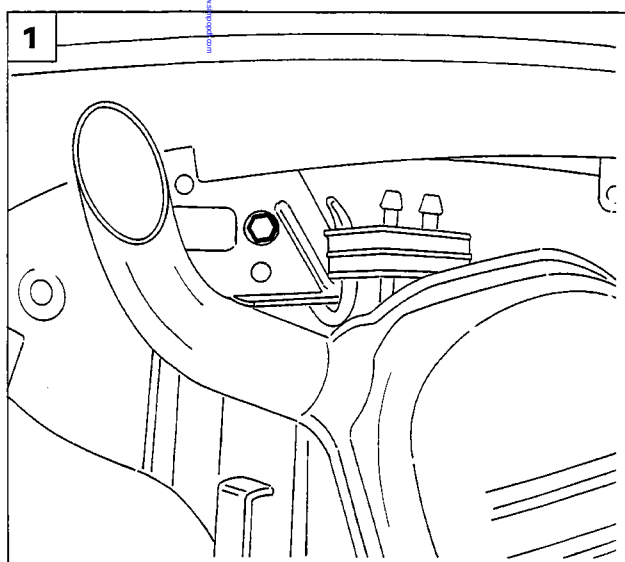


P4A016B06

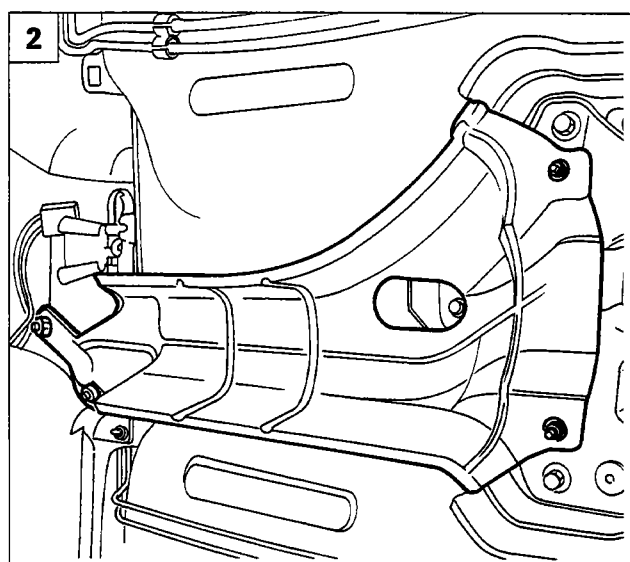
Gearbox and differential

Remote control assembly

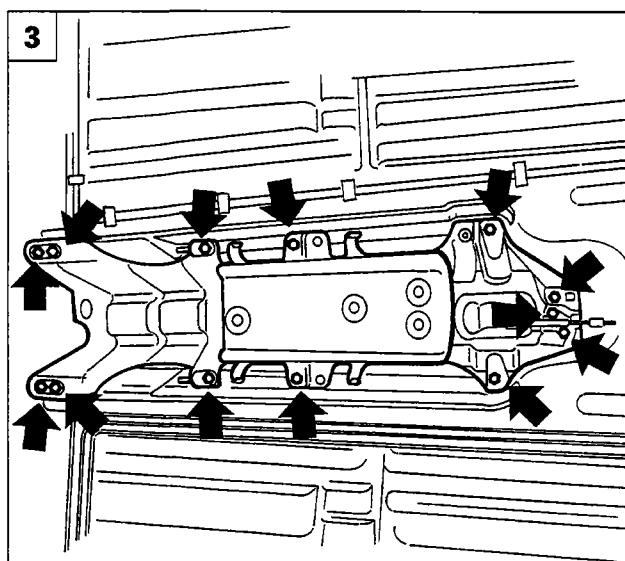
21-27.



P4A017B01



P4A017B02

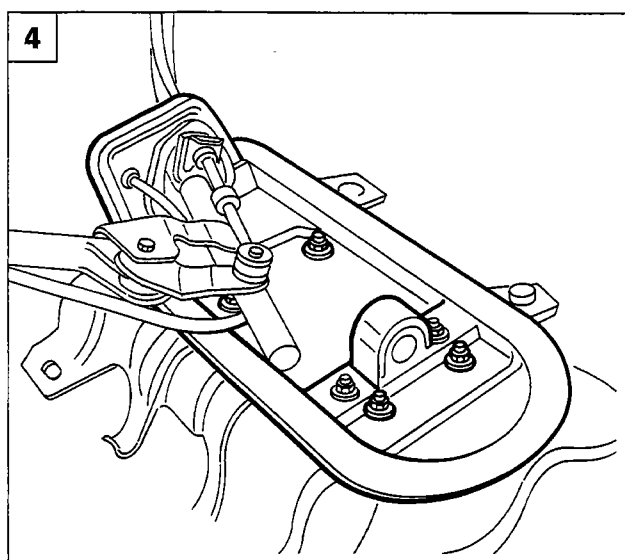


P4A017B03



1. Undo the bolt securing the exhaust pipe rear bracket, then withdraw it from the car.
2. Remove the heat shield by undoing the bolts indicated.
3. Undo the front and rear bolts of the hand-brake and remote control assembly mounting.
4. Carefully lower the assembly from its seating, and undo the nuts securing the remote control assembly to the gearlever mounting and remove it from the car.

Withdraw the cables and reaction rod from the engine compartment and withdraw the assembly from the car.



P4A017B04

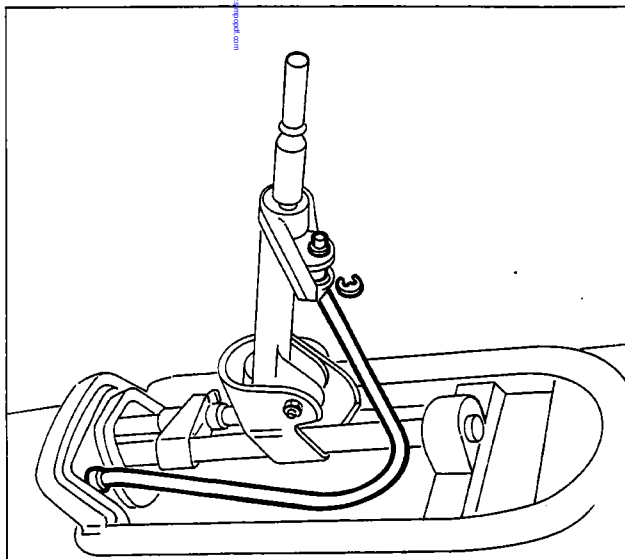
Gearbox and differential

Remote control assembly

21-27.

Bravo-Brava

1370 12v



P4A018B01

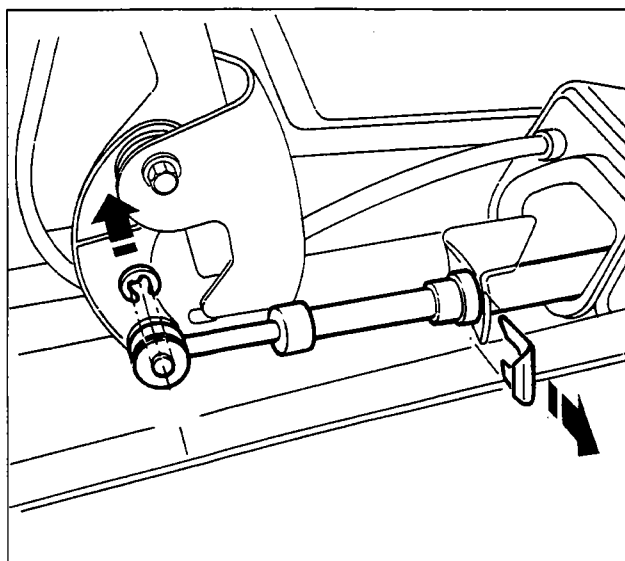


DISMANTLING AT THE BENCH



Dismantling - refitting reverse gear engagement inhibitor

- Remove the circlip, withdraw the cable from the plastic mounting, then withdraw it from the assembly.

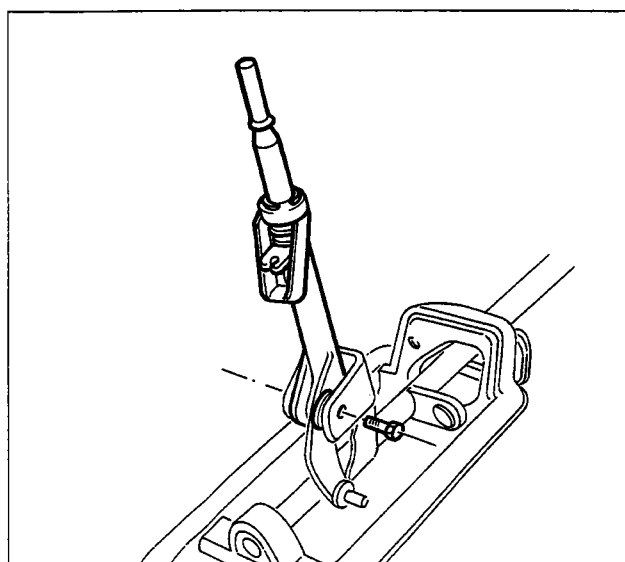


P4A018B02



Dismantling - refitting gear engagement flexible transmission cable

- Remove the gearlever circlip and clip from the gearlever, then withdraw the flexible cable after releasing it from its clamp.



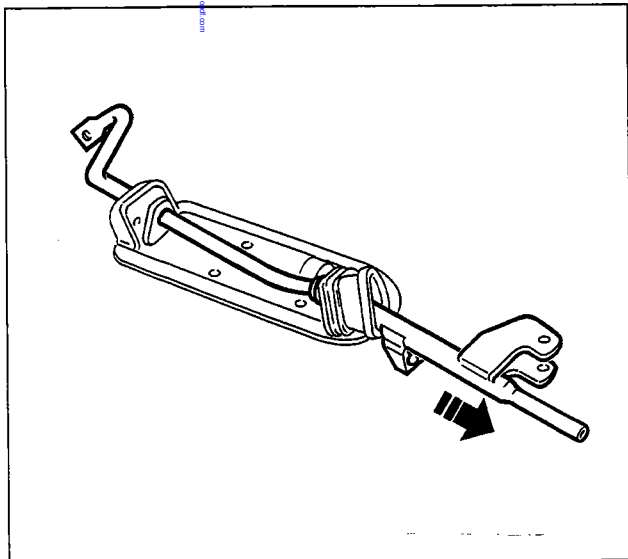
P4A018B03



Dismantling - refitting gearlever

- Disconnect the reverse inhibitor and gear engagement flexible transmission cable;
- undo the bolt securing the lever to the mounting, then remove the lever.

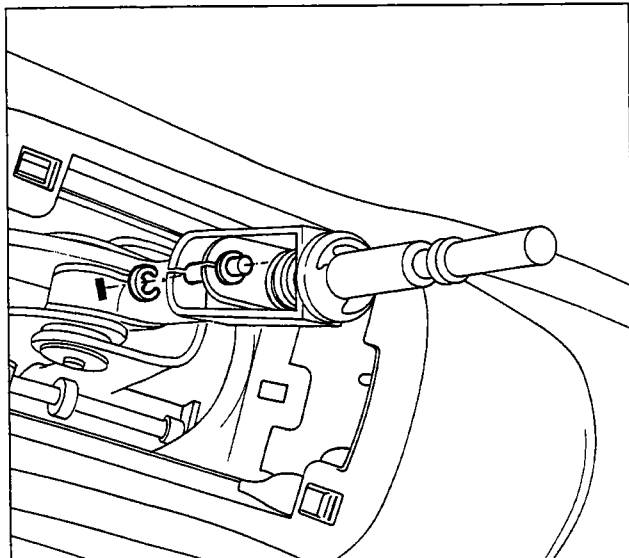




P4A019B01

Dismantling - refitting reaction link

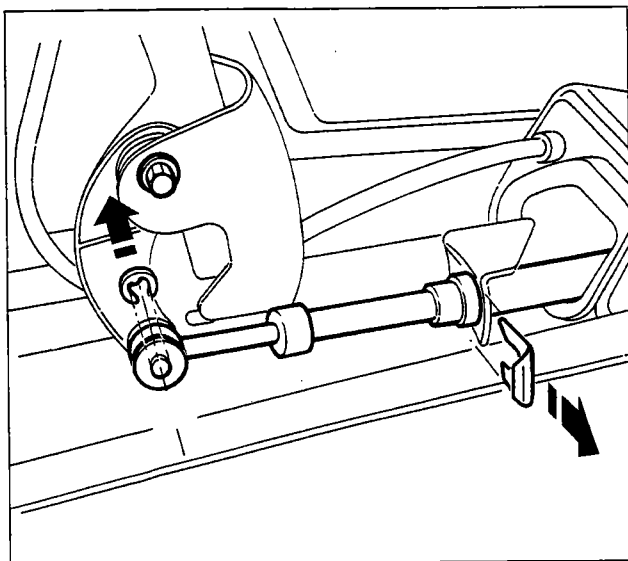
- Remove the reverse gear inhibitor cable, the gear engagement flexible transmission cable and gearlever, then withdraw the reaction link.



P4A019B02

REMOVING - REFITTING GEARLEVER ON CAR

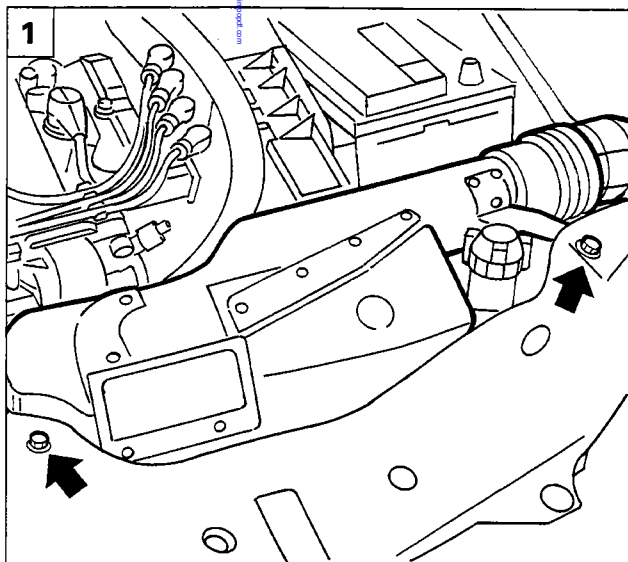
- Remove the gearlever trim;
- disconnect the reverse gear inhibitor cable from the gearlever, after withdrawing the circlip.



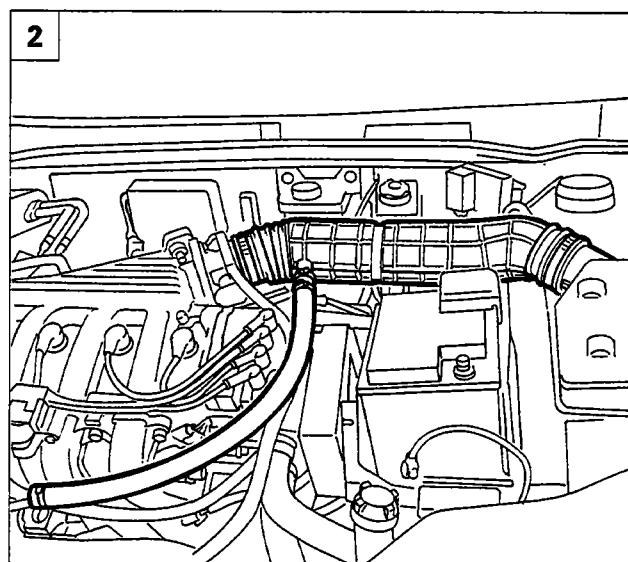
P4A019B03

- disconnect the flexible cable from the lever mounting, after removing the circlip;
- undo the bolt securing the lever to the mounting, then remove it from the car.
- To refit, reverse the procedure for removal.

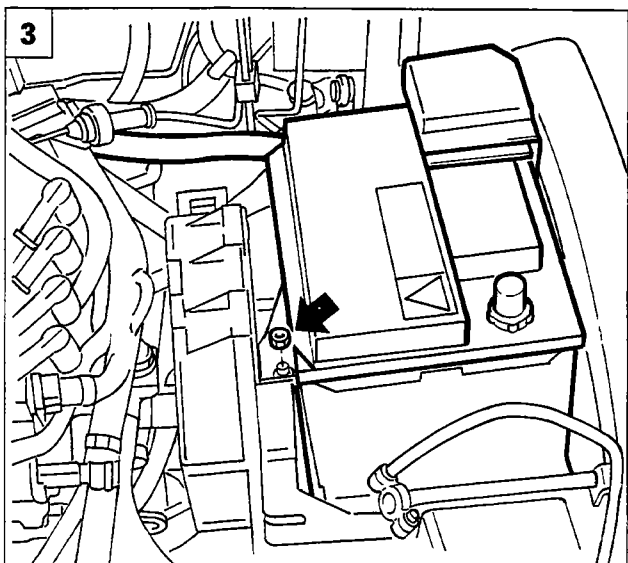
21-27.



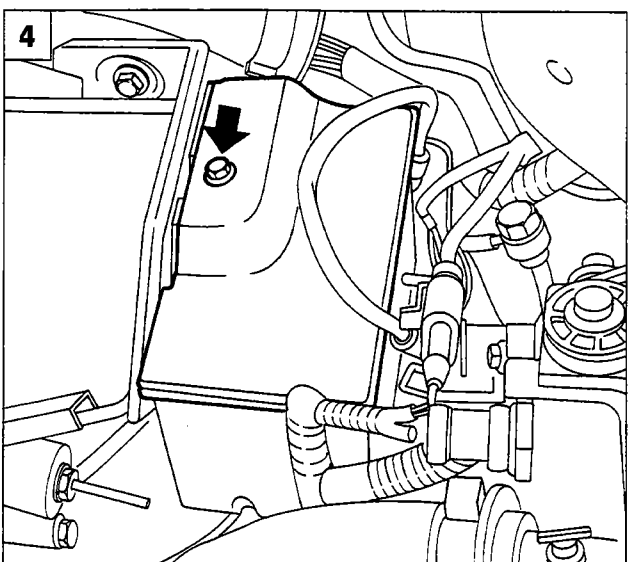
P4A01CX01



P4A01CX03



P4A01CX04



P4A035B03



REMOVING-REFITTING

Removing

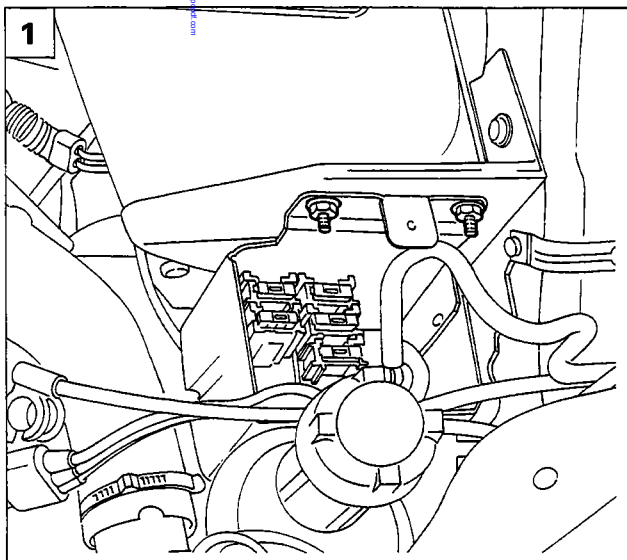
Place the car on ramps, disconnect the battery's negative terminal and remove the front wheels, then proceed as described below:

1. Remove the air intake duct by undoing the bolts shown in the figure, securing it to the front crossframe.
2. Remove the air intake duct by undoing the clips shown in the figure, then remove it from the engine compartment complete with oil vapour recovery pipe.
3. Lift the protective cover of the battery's positive terminal and disconnect the relevant cable; undo the nut securing the battery to the cage, then remove it from the engine compartment.
4. Remove the fuse and relay box cover by undoing the bolt indicated.

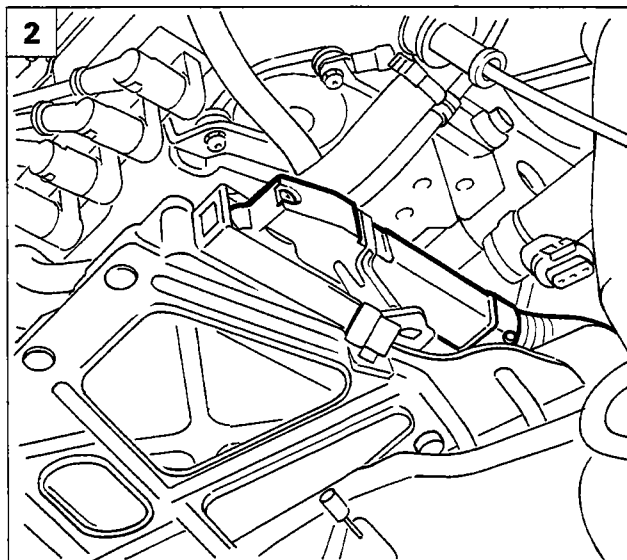
Gearbox and differential

Removing - refitting

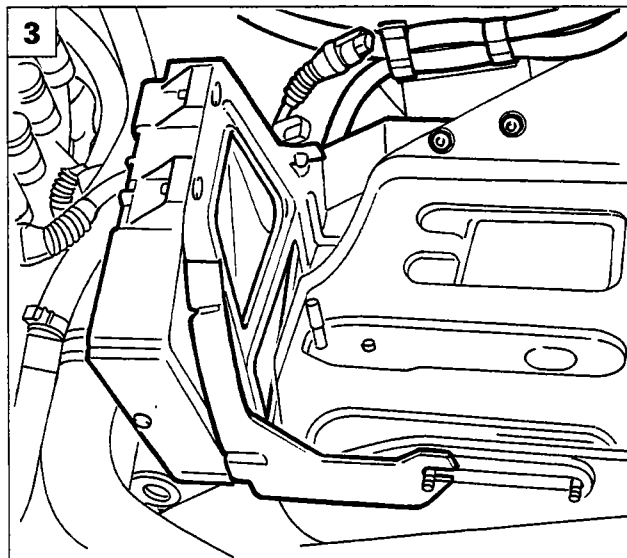
21-27.



P4A001B03



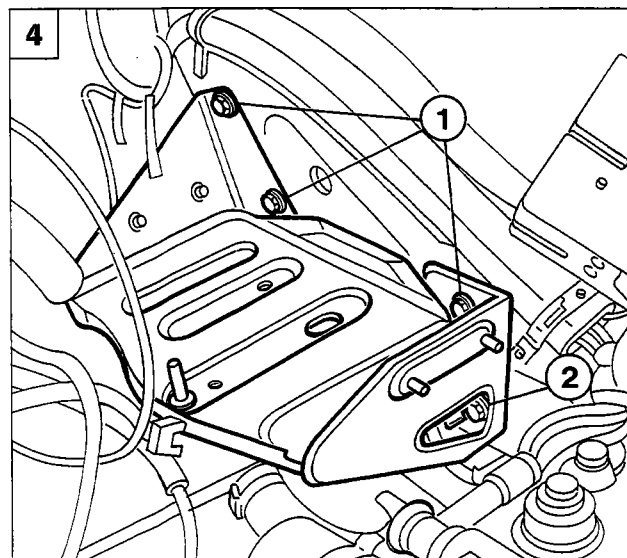
P4A02CX03



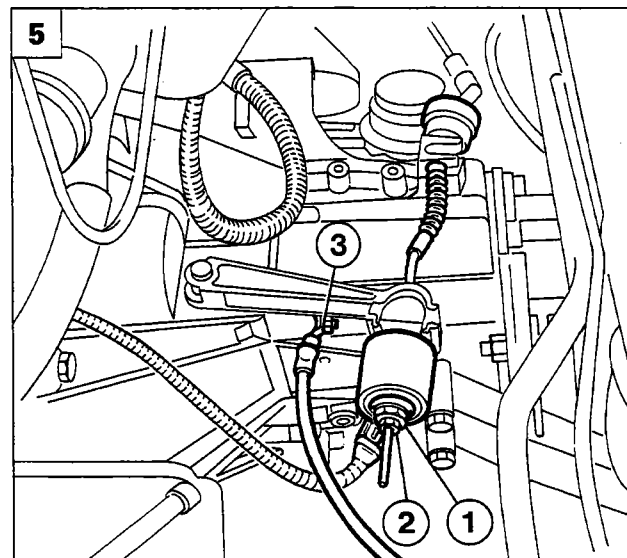
P4A02CX04



1. Remove the nuts securing the fuse and relay box to the battery cage, then move the box over to one side.
2. Disconnect the i.e. control unit supply connector.
3. Remove the nuts securing the i.e. control unit mounting bracket, then remove the control unit from the engine compartment. The nuts indicated also secure the starter motor supply wiring and connection between the front cable and fuel injection cable.
4. Remove the bolts (1) and slacken the bolt (2) securing the battery cage to the bodywork. Before removing the cage, disconnect the cable clip underneath.
5. Disconnect the clutch cable by undoing the nut (1) and lock nut (2) shown in the figure. Also disconnect the earth cable (3) from the gearbox.



P4A021B01



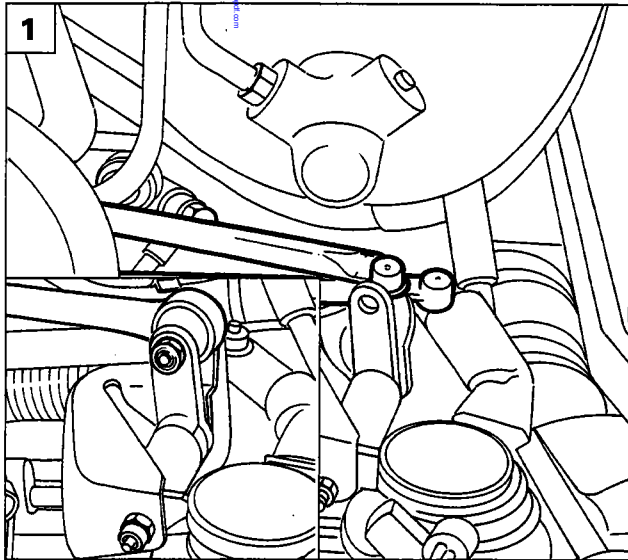
P4A021B02

Gearbox and differential

Removing - refitting

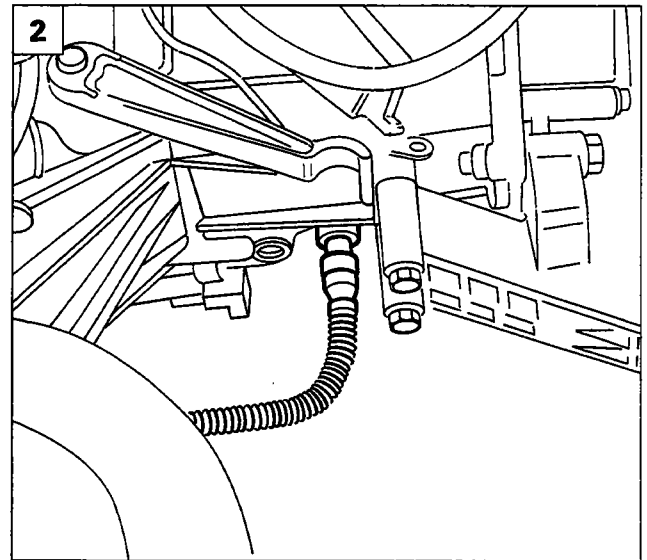
21-27.

Bravo-Brava  16v

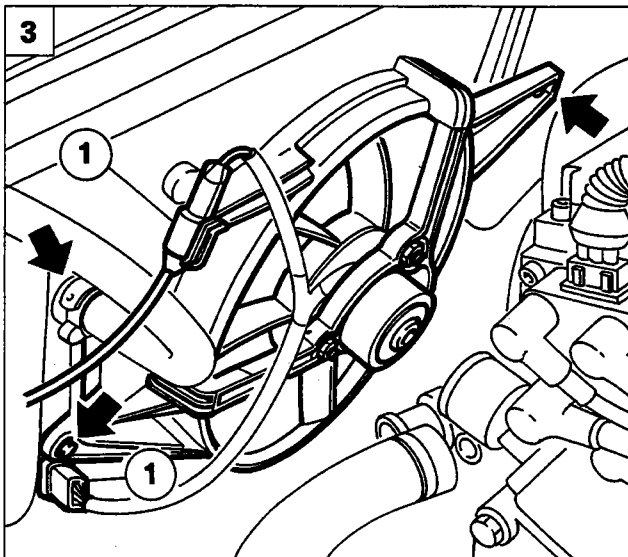


P4A03EX05

P4A040B02



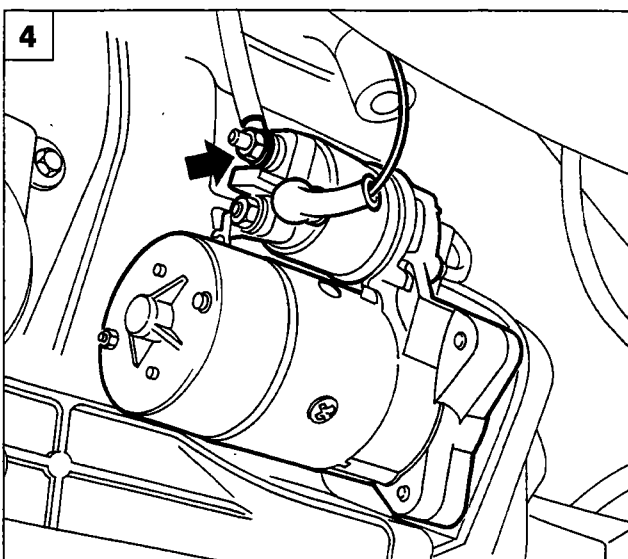
P4A022B01



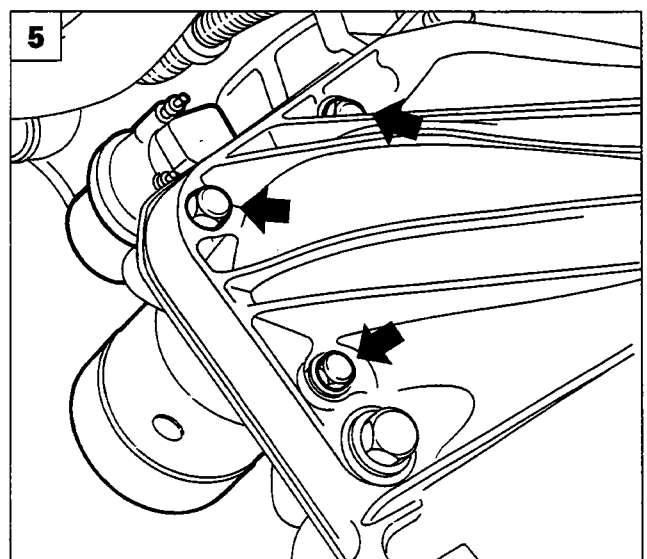
P4A03AX05



1. Disconnect the reaction link shown in the detail and the gear selector and engagement rods from the gearbox; also disconnect the speedometer sensor wiring connector.
2. Disconnect the reversing lights switch connector from the gearbox.
3. Remove the fan by undoing its attachment bolts, making sure to disconnect the supply connections (1).
4. Disconnect the starter motor supply cables.
5. Remove the starter motor by undoing the bolts shown in the figure.



P4A022B02

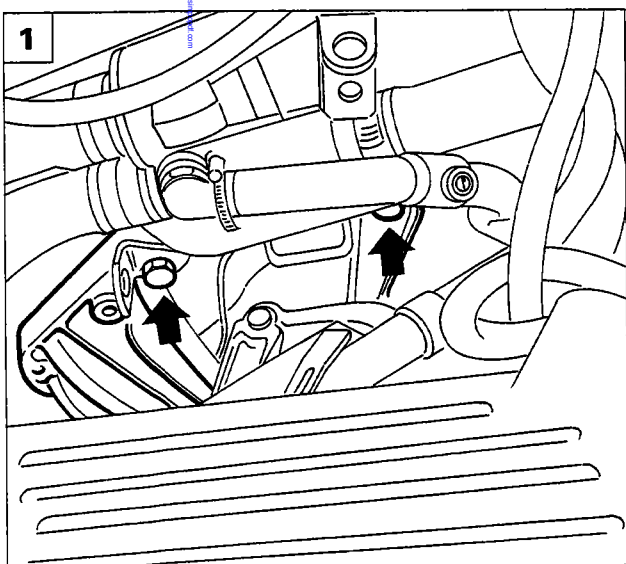


P4A022B03

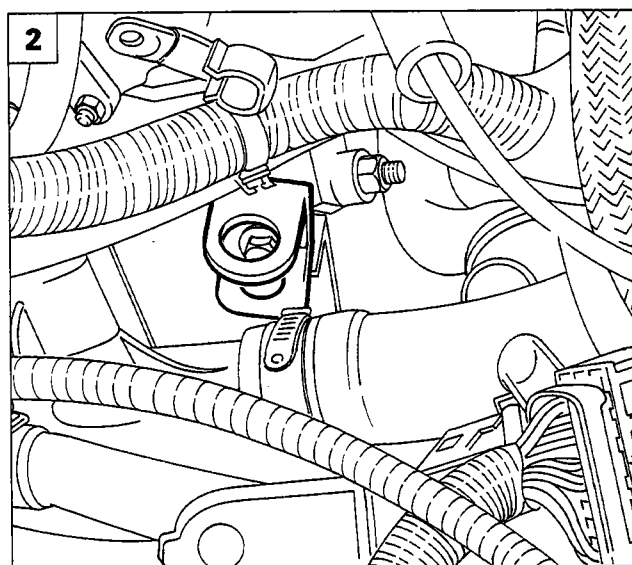
Gearbox and differential

Removing - refitting

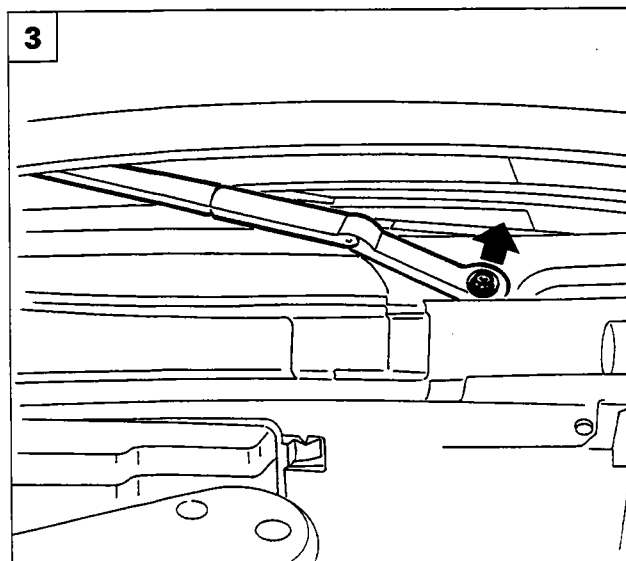
21-27.



P4A023B01



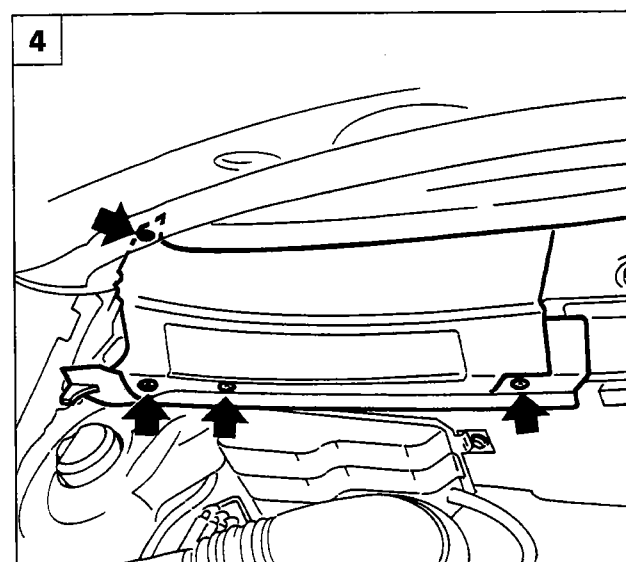
P4A023B02



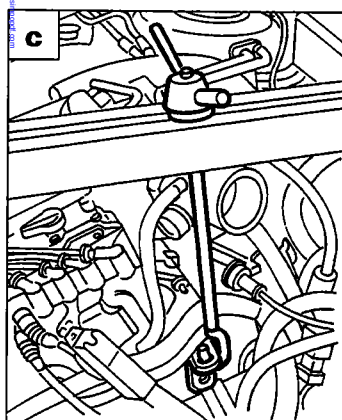
P4A023B03



1. Remove the gearbox top bolts.
2. Fit an appropriate support eyelet at the point shown in the figure, to hook the power unit onto during removal of the gearbox.
3. Undo the nut securing the right windscreen wiper arm after removing the protective cap.
4. Remove the right side cover of the anti-pollen filter by undoing the bolts indicated, while the bolts securing the left cover must be slackened to allow the power unit support stand to be fitted.



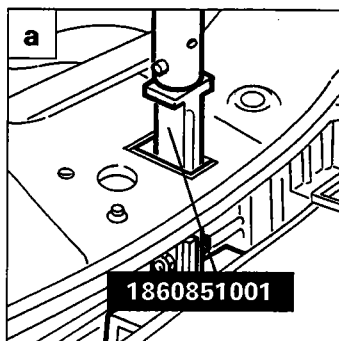
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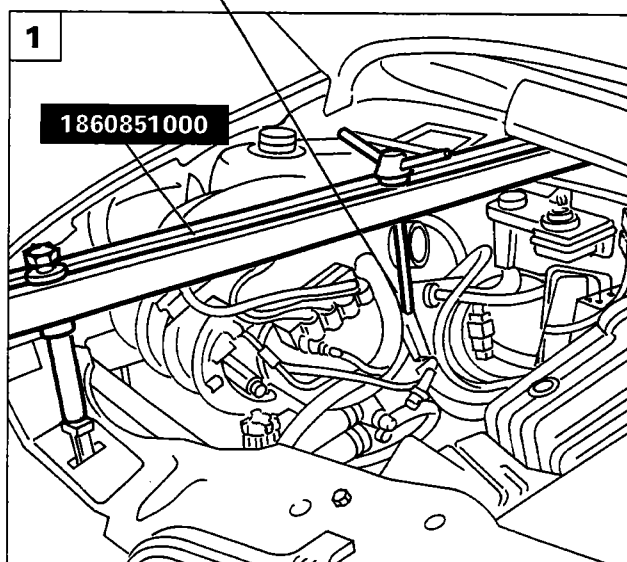
P4A024B02



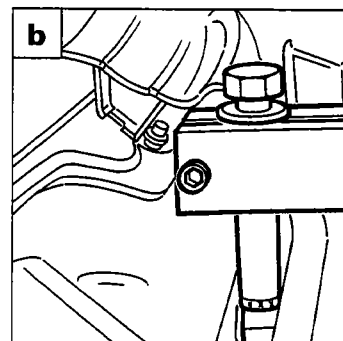
1. Fit the engine support stand 1860851000 and the adaptor 1860851001 in the appropriate mountings.
 - a. Front mounting: insert the tool in the seat of the bonnet catch so that it rests on the front crossframe.
 - b. Rear mounting: fit the tool level with the central reinforcement of the fire-proof bulkhead.
 - c. Secure the hook of the stand to the eyelet previously positioned near the thermostat.



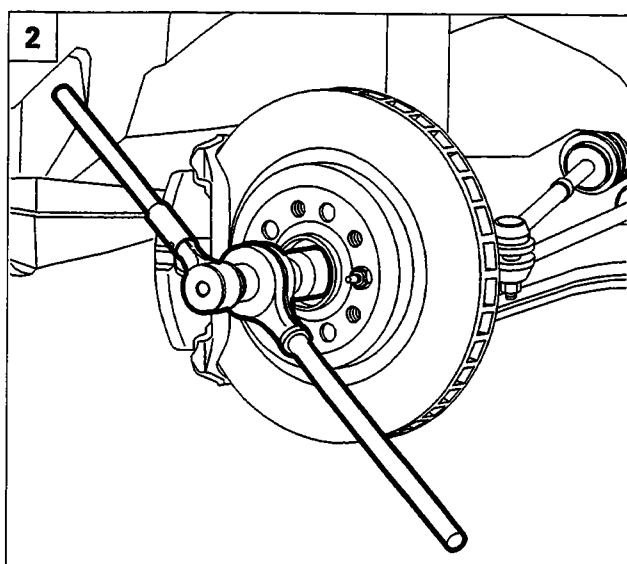
P4A006B05



P4A024B01



P4A006B06



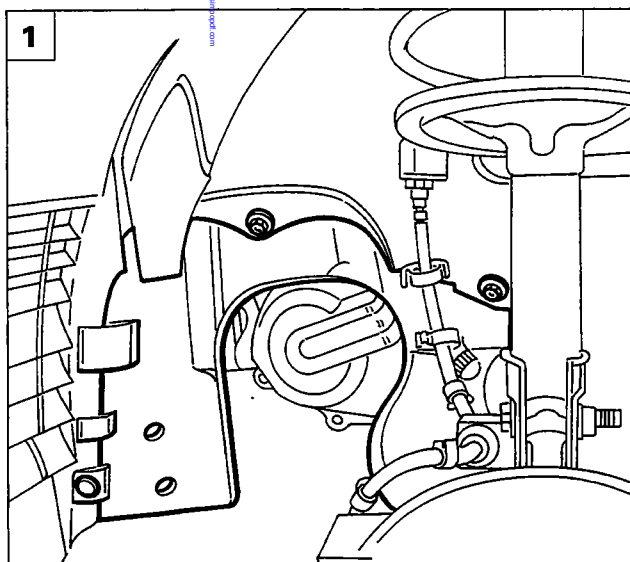
P4A009B02

2. Relieve the staking and then remove the hub nut (gearbox side and timing side).

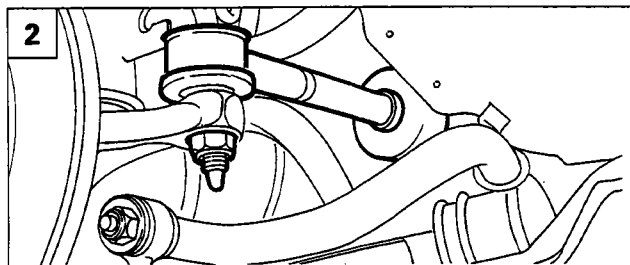
Gearbox and differential

Removing - refitting

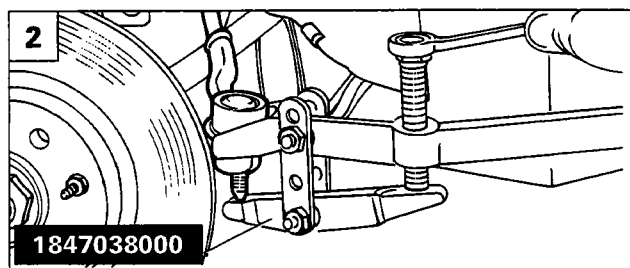
21-27.



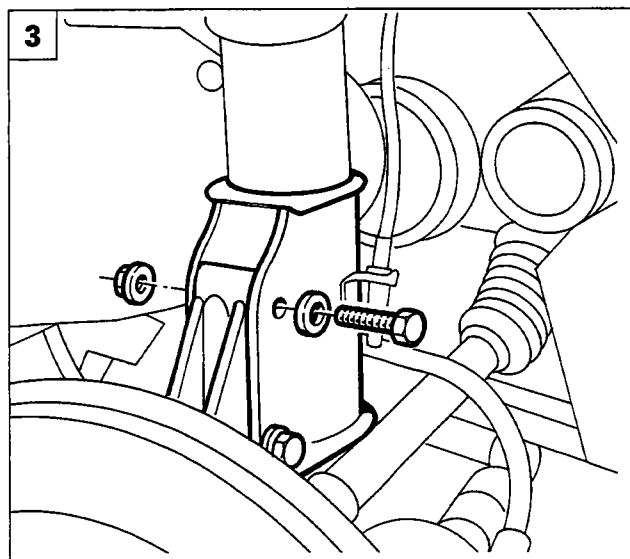
P4A003B01



P4A002B04



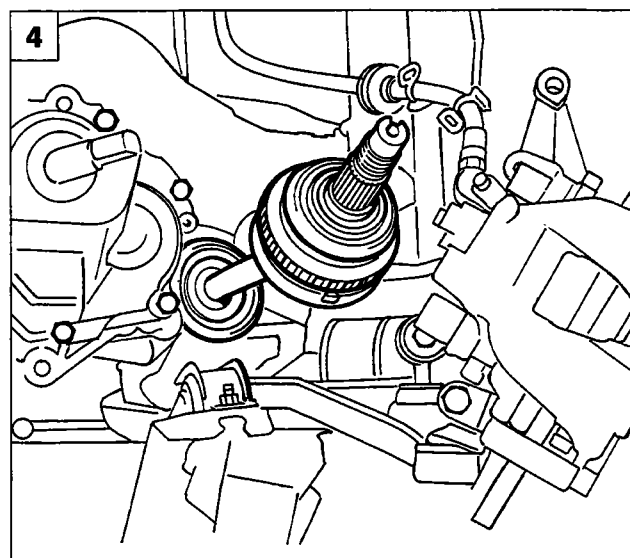
P4A002B05



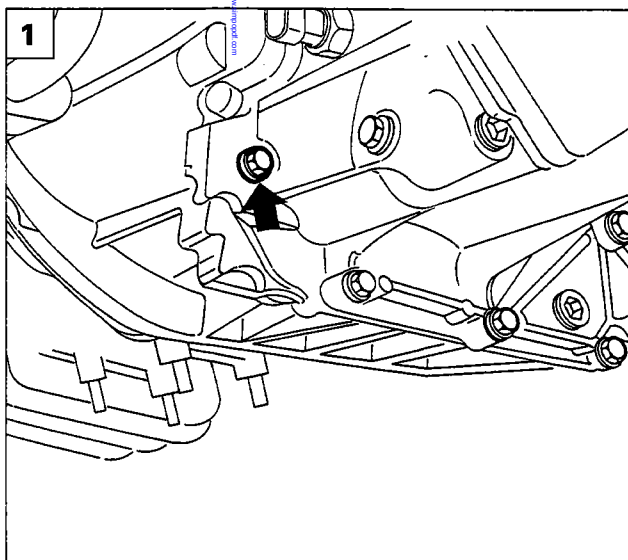
P4A003B05



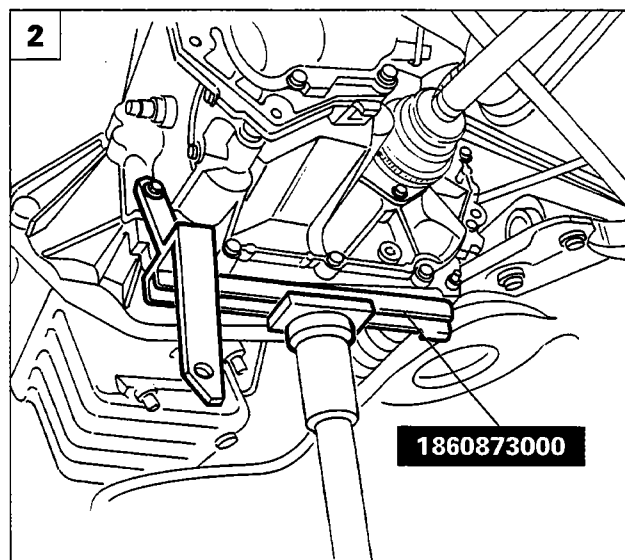
1. Remove the plastic wheelarch protection on the gearbox by undoing the bolts and retaining button shown in the figure. To withdraw the protection, it is also necessary to disconnect the brake pad wear sensor connector (repeat the procedure on the other side).
2. Remove the nut securing the steering tie-rod end, then withdraw the latter from the vertical link arm using the puller 1847038000 (repeat the procedure for the other tie-rod end).
3. Remove the nuts securing the vertical link (gearbox and timing side) to the damper.
4. Rotate the vertical link as appropriate so as to withdraw the drive shaft from the wheel hub (repeat the operation for the other drive shaft).



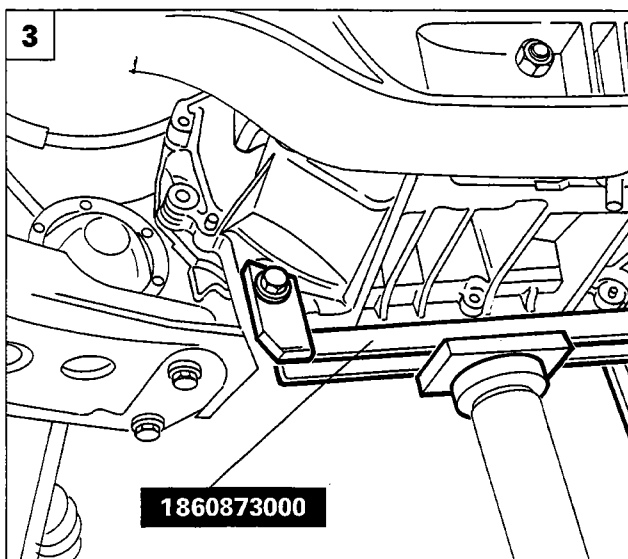
P4A06CX02



P4A026B01



P4A026B02



P4A026B03

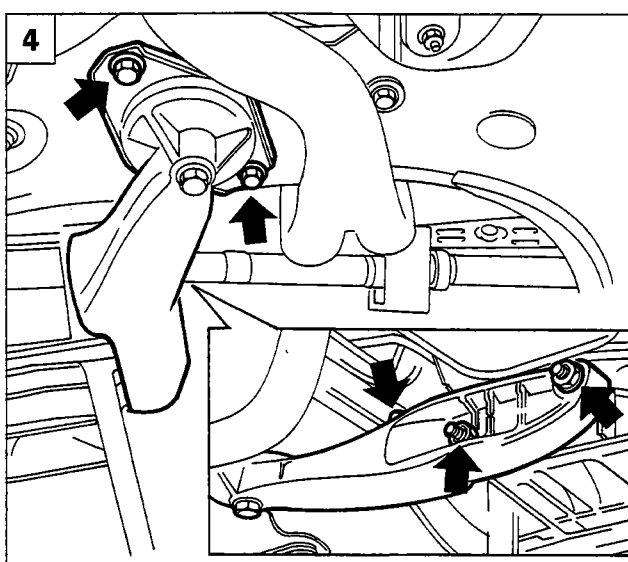


1. Undo the bolt (arrowed) on the bellhousing so that the gearbox support tool can be installed.

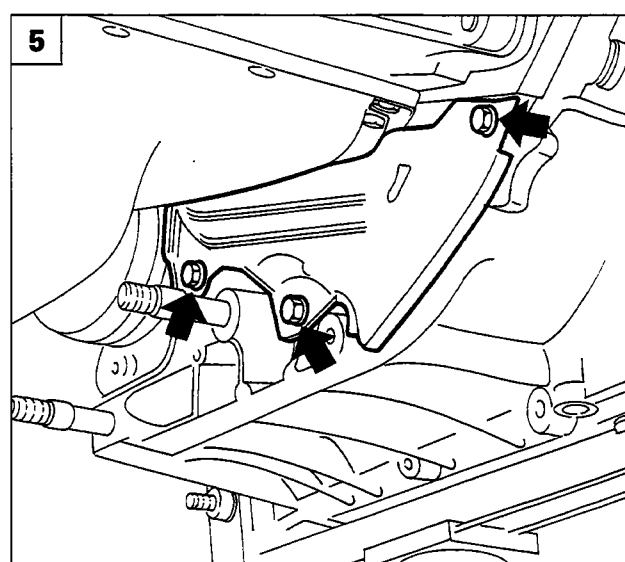
2-3. Place the gearbox support tool 1860873000 on a hydraulic jack, then secure it to the gearbox at the points indicated in the figure.

4. Remove the central power unit mounting by undoing the bolts shown in the figure.

5. Remove the cover shown in the figure from the bottom of the gearbox.

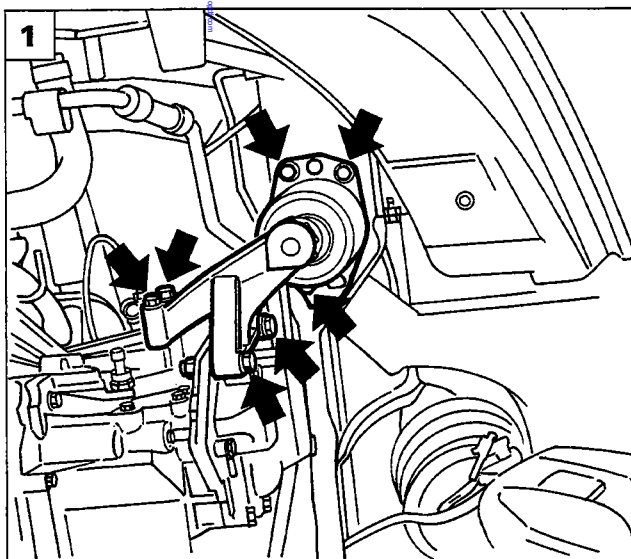


P4A026B04

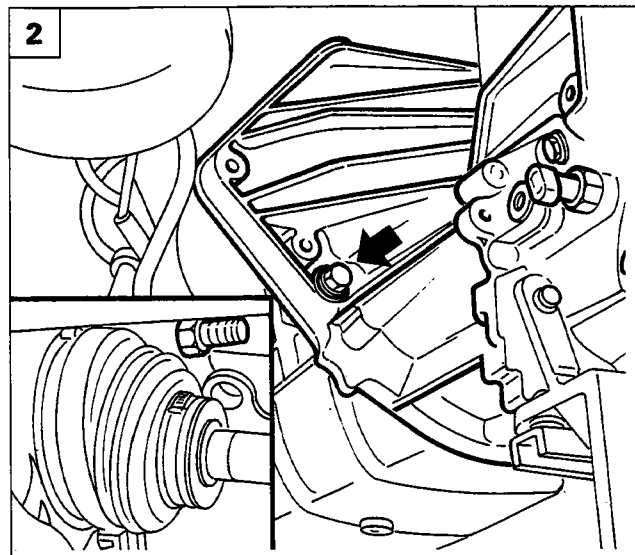


P4A026B05

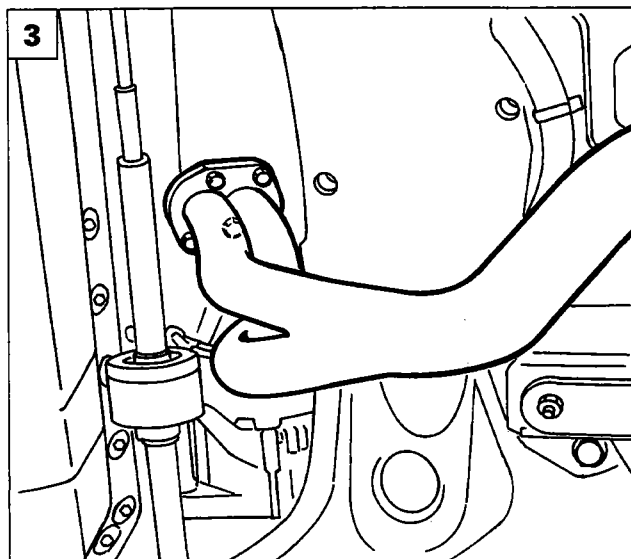
Gearbox and differential Removing - refitting **21-27.**



P4A041B04



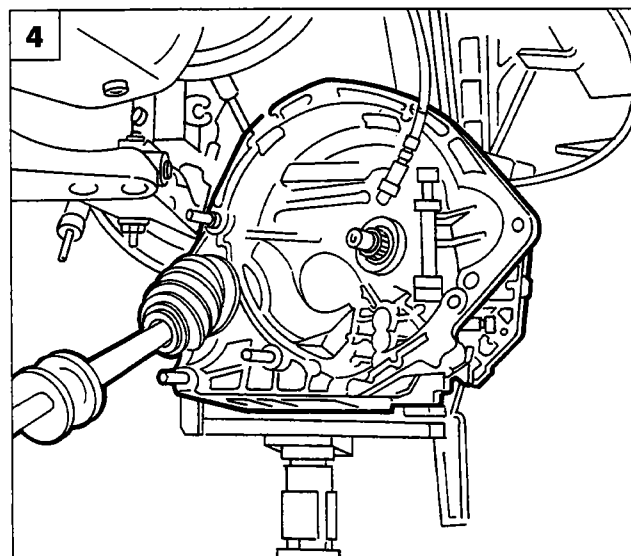
P4A027B01



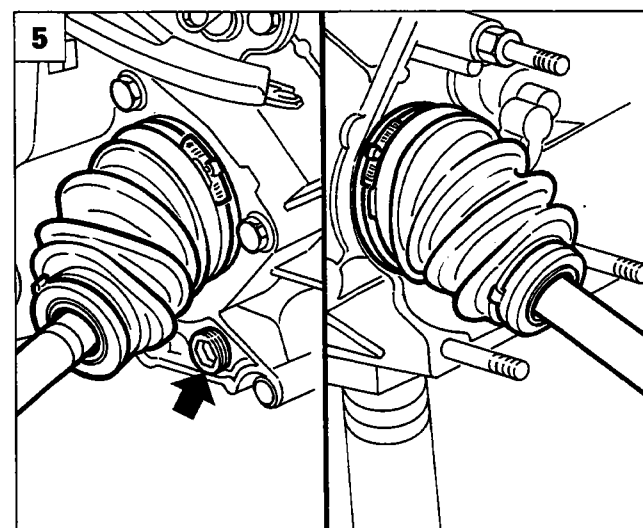
P4A027B02



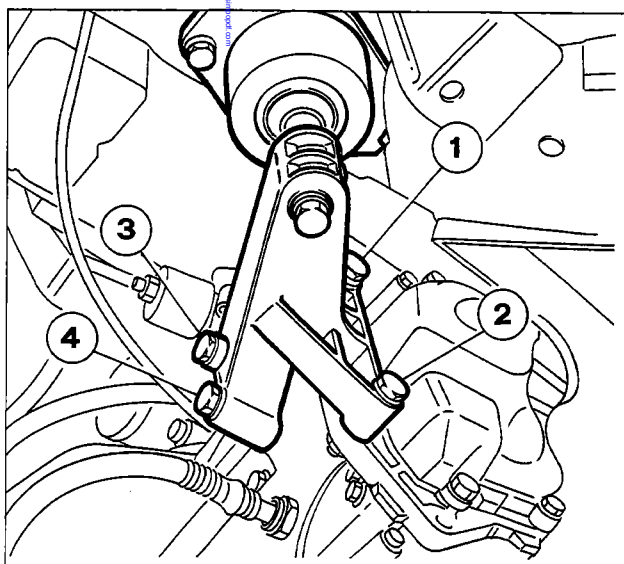
1. Remove the engine mounting, gearbox side.
2. Remove the bottom bolts securing the bellhousing to the engine block.
3. Remove the nuts securing the first section of the exhaust pipe to the manifold, to enable the power unit to be moved forwards and so facilitate withdrawal of the gearbox. If this is still not sufficient, disconnect the coolant inlet and outlet pipes from the heater.
4. Manoeuvre the hydraulic jack as appropriate to disengage the gearbox from its attachment studs and the surrounding components. Gradually lower the jack and withdraw the gearbox complete with drive shafts.
5. If the gearbox is to be overhauled, drain the oil by undoing the plug (arrowed) and disconnect the two drive shafts, removing the gaiter retaining clips.



P4A027B03



P4A027B04



P4A043B01

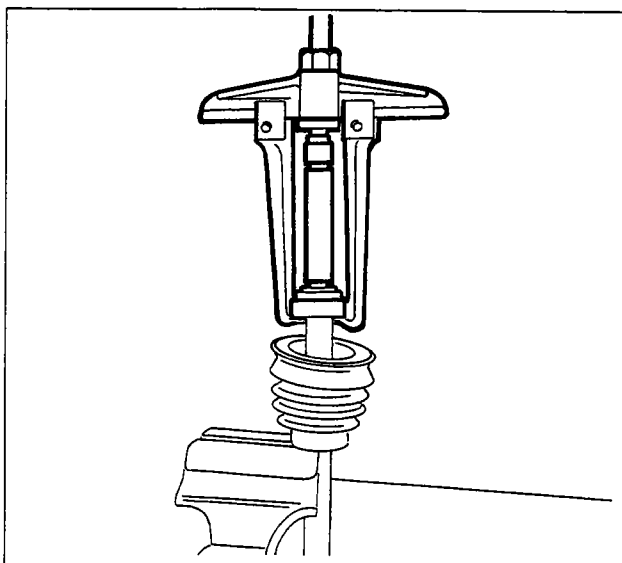


Refitting

When refitting the engine mounting on the gearbox side, to avoid creating stresses on the gearbox sealing surfaces resulting in deformation and oil leaks, strictly observe the following tightening sequence for the attachment bolts:

- Lightly tighten bolts (1) and (2) to an initial torque of 0.5 daNm;
- Lightly tighten bolts (3) and (4) to an initial torque of 0.5 daNm, then tighten to the specified torque;
- Tighten bolts (1) and (2) to the specified torque.

For the remaining refitting operations, reverse the procedure described for removal. For fitting the clutch release bearing and the bell-housing in the car, refer to the procedure for refitting the gearbox of the 1370 12v engine.



P4A028B02



REMOVING-REFITTING DRIVE SHAFTS

To remove and refit the drive shafts, refer to the procedure described for the 1370 12v engine, with the difference that the drive shafts are secured to the gearbox-differential unit by means of retaining clamps and the tripod joint is inserted directly in the differential.

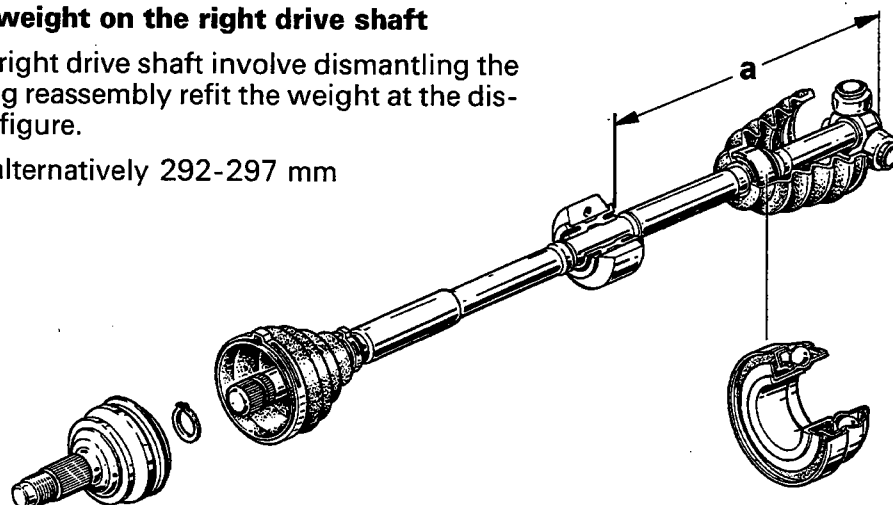
DISMANTLING

Refer to the dismantling of the drive shaft described for the 1370 12v engine, with the difference that on the 1581 engine, to minimise oil leaks, fluid-tight ball bearings have been fitted in the gaiters on the gearbox side. These are installed directly on the drive shafts. Use the general purpose puller to remove these bearings.

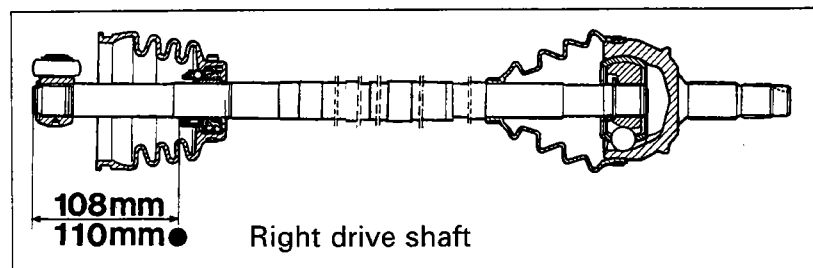
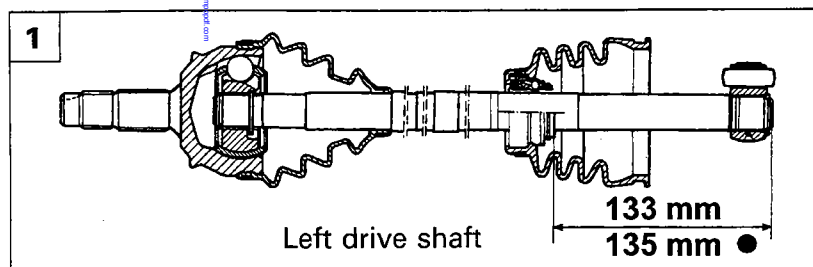
Position of damping weight on the right drive shaft

If interventions on the right drive shaft involve dismantling the damping weight, during reassembly refit the weight at the distance specified in the figure.

a = 290-295 mm or alternatively 292-297 mm



P4A028B03

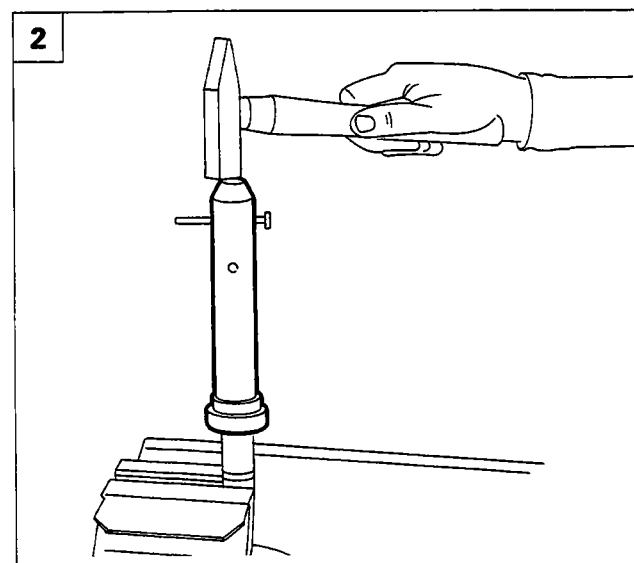


REFITTING

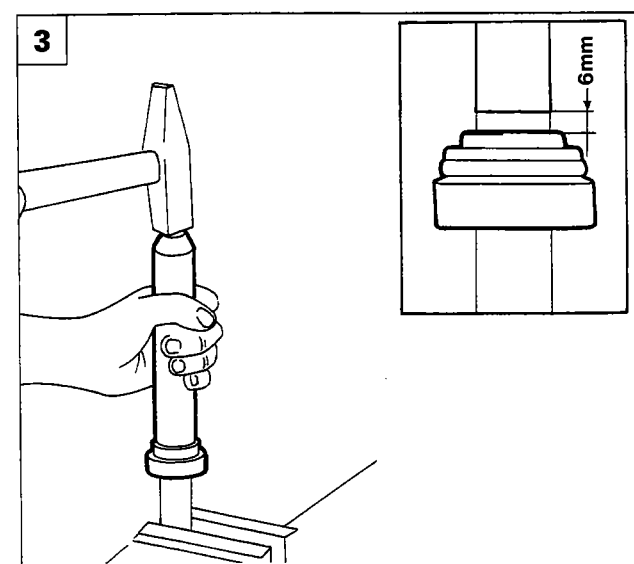
Reverse the procedure described for removal. To refit the differential casing oil seal bearing, refer to the instructions below.

1. Refitting differential casing oil seal bearing.

● Alternative.

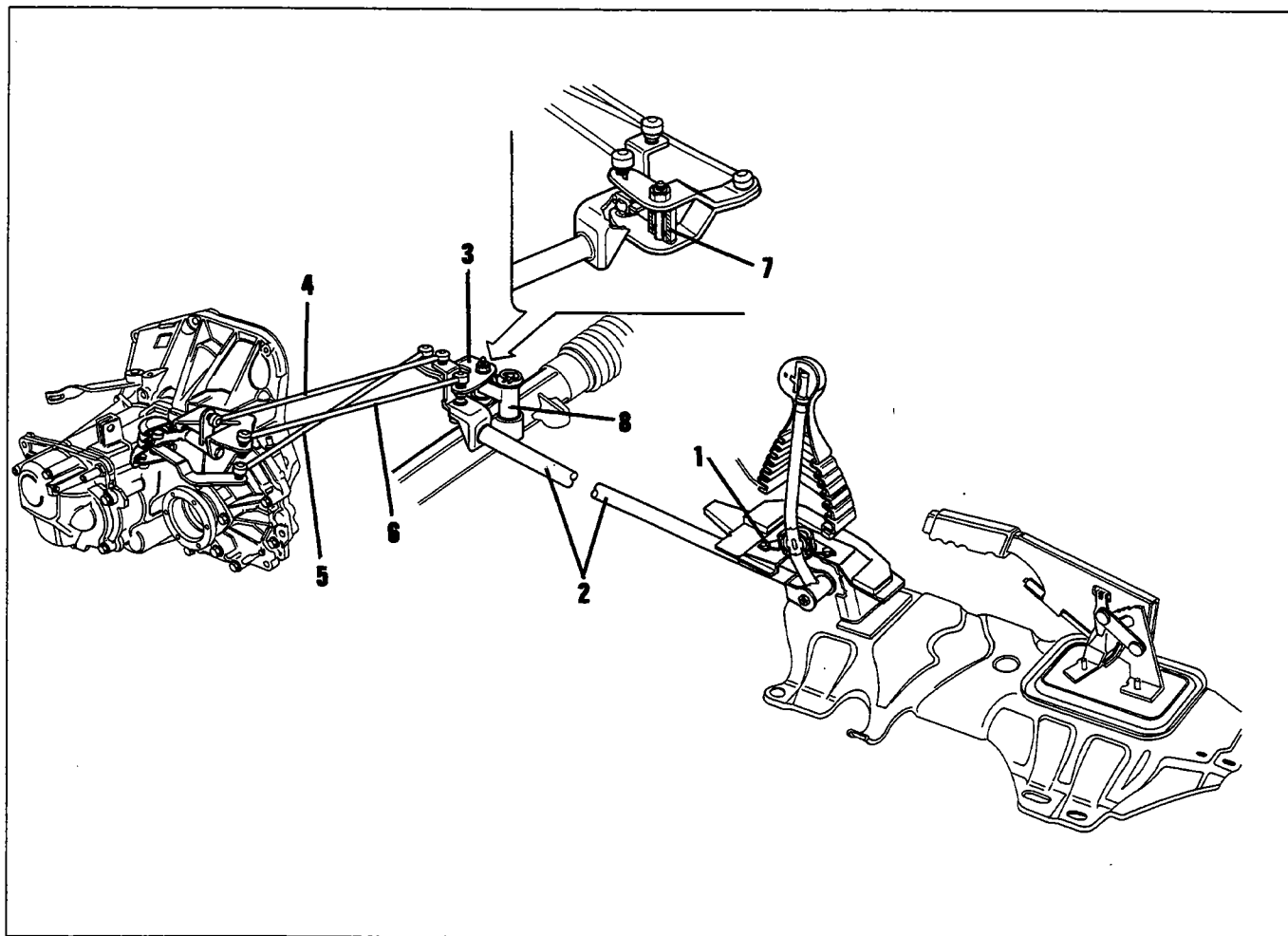


2. Fit and install the INA seal bearing, for the differential casing oil seal gaiter, using the appropriate drift.



3. Fit and install the NARDELLA seal bearing, for the differential casing oil seal gaiter, using the appropriate drift. After assembly, the bearing should be in the position shown in the figure.

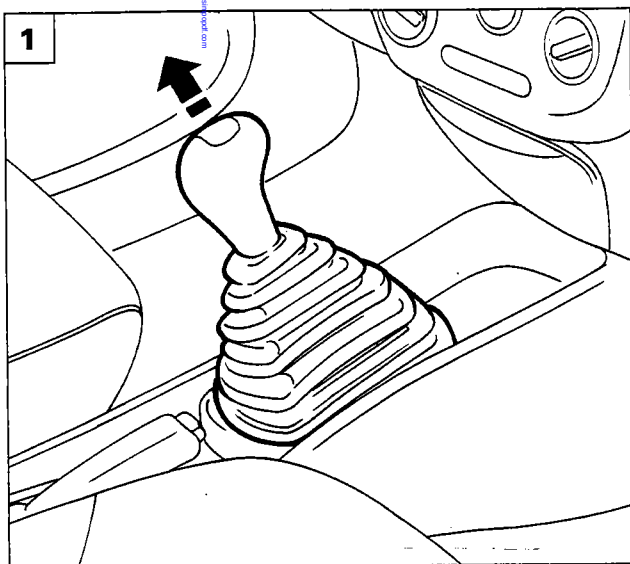
DIAGRAM OF REMOTE CONTROL ASSEMBLY



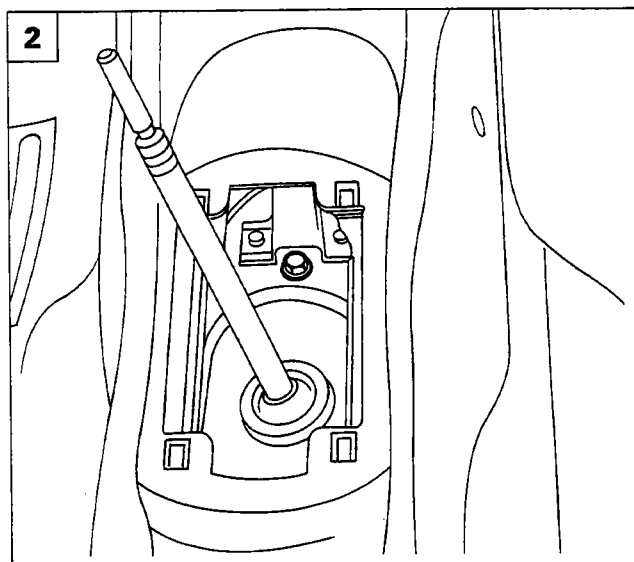
P4A030B01

Gear engagement and selector linkage

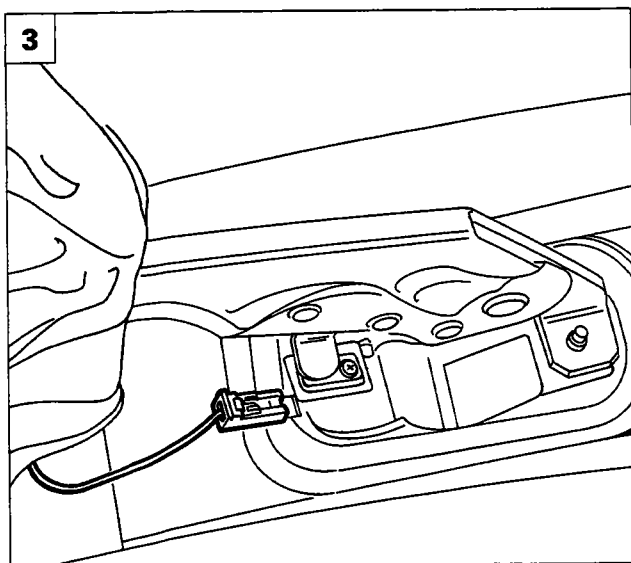
1. Gear selector rod mounting
2. Control rod
3. Relay mounting supporting gear engagement and selector linkage
4. Gear selector rod linkage
5. Gear engagement rod linkage
6. Reaction link
7. Bearings
8. Pin securing relay mounting supporting gear engagement and selector linkage



P4A015B01



P4A031B01



P4A015B02

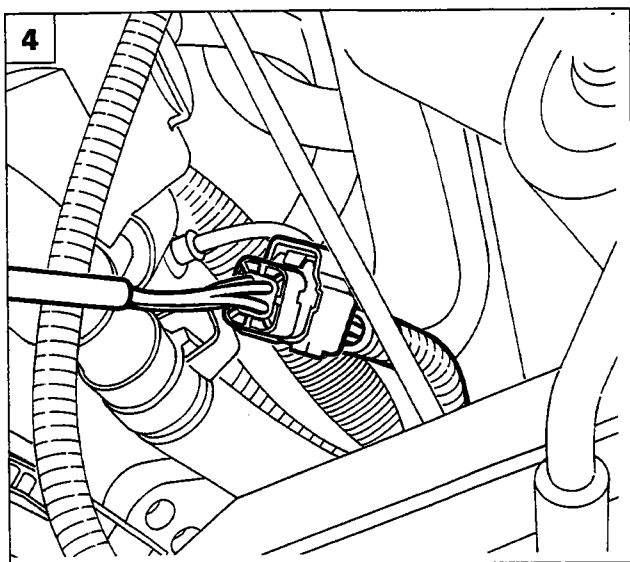


REMOVING - REFITTING

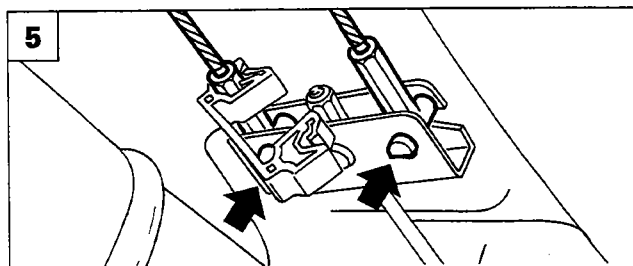


Disconnect the battery's negative terminal, and dismantle the remote control assembly as described below:

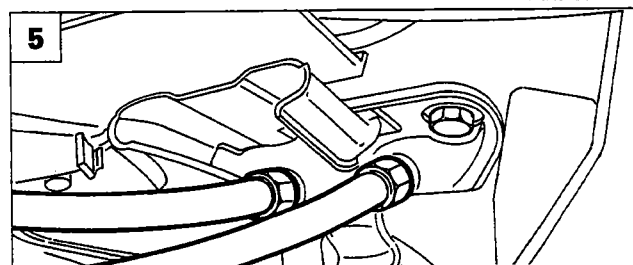
1. Remove the gearlever trim from inside the car.
2. Undo the bolt securing the remote control assembly mounting to the bodywork.
3. Remove the handbrake lever trim and disconnect the electrical connection underneath.
4. Raise the ramps and disconnect the Lambda probe electrical connector.
5. Disconnect the handbrake cables from the mounting and release them from the bracket.



P4A031B02



P4A016B01



P4A016B02

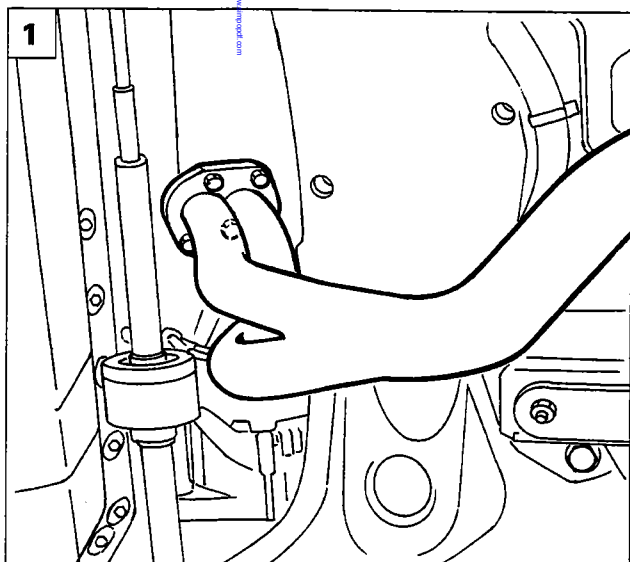
Gearbox and differential

Remote control assembly

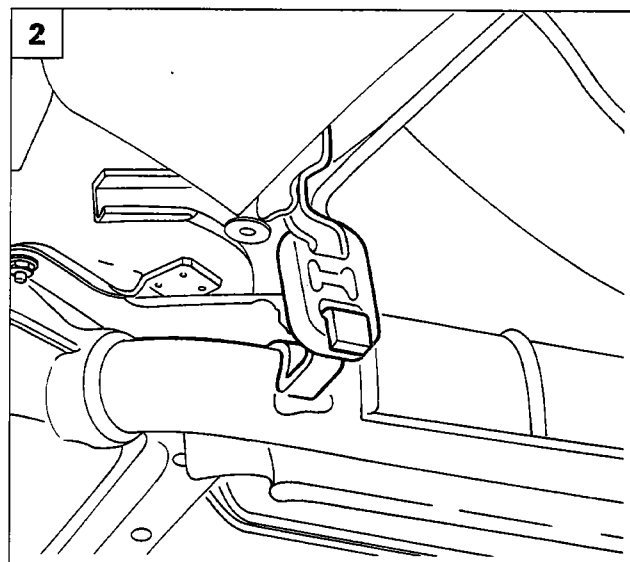
21-27.

Bravo-Brava

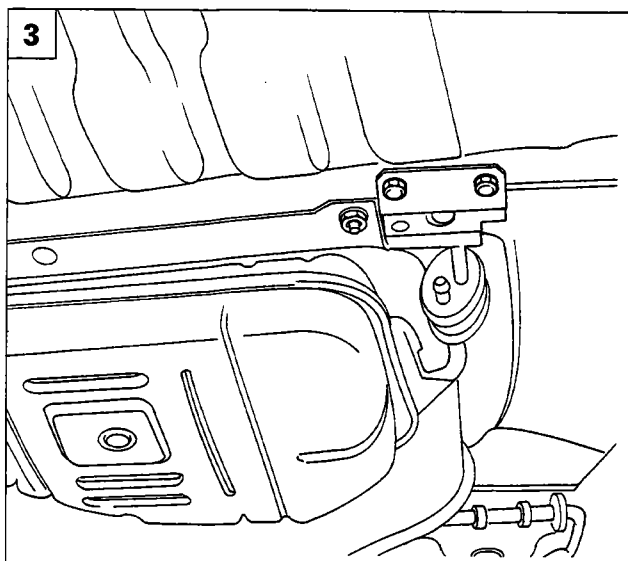
1581 16v



P4A027B02



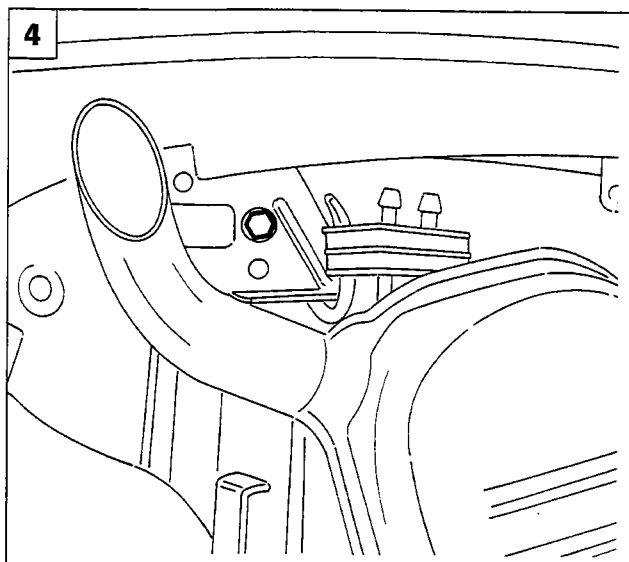
P4A016B05



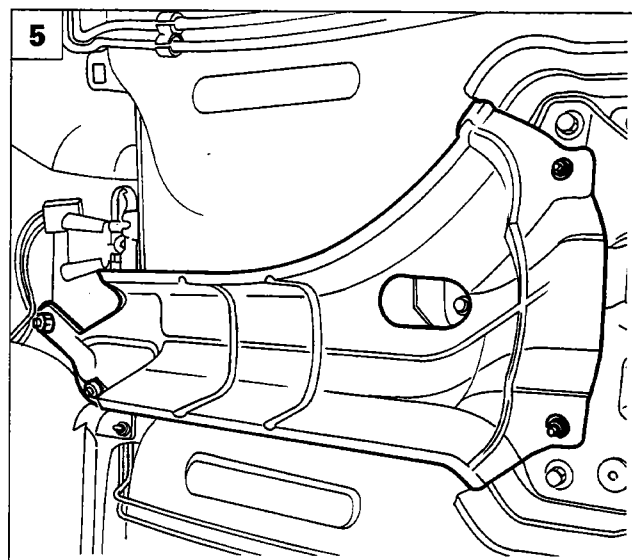
P4A016B06



1. Disconnect the Lambda probe electrical connection and disconnect the first section of the exhaust pipe from the front mountings.
2. Release the exhaust pipe from the rubber mount indicated.
3. Undo the bolts securing the exhaust pipe front mounting.
4. Undo the bolts securing the exhaust pipe rear mounting, then withdraw it from the car.
5. Remove the heat shield by undoing the bolts illustrated.



P4A017B01

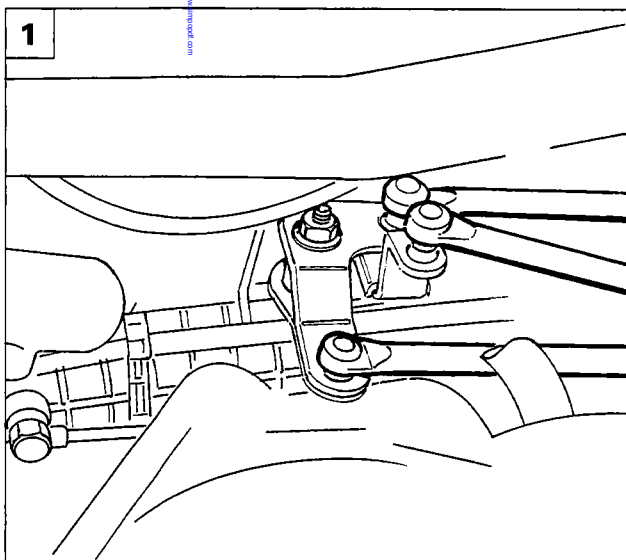


P4A017B02

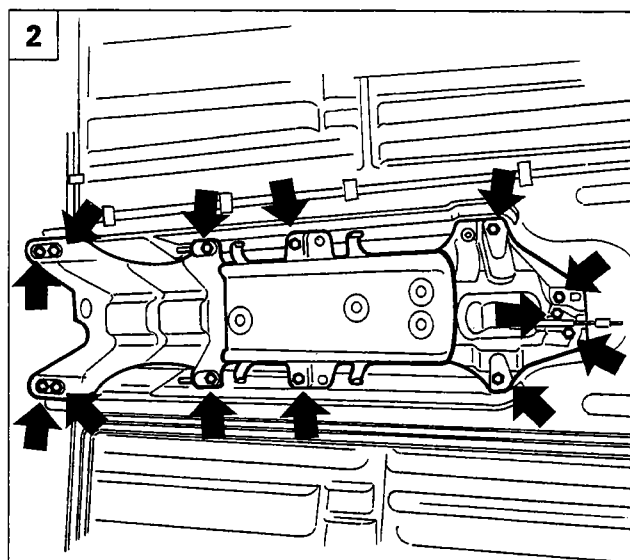
Gearbox and differential

Remote control assembly

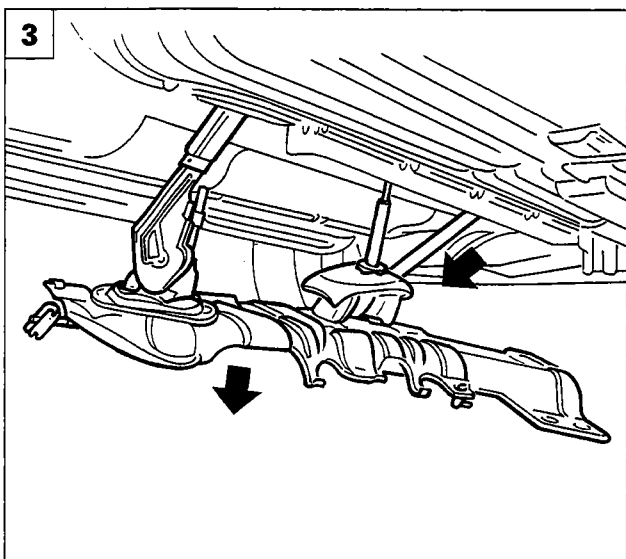
21-27.



P4A033B01



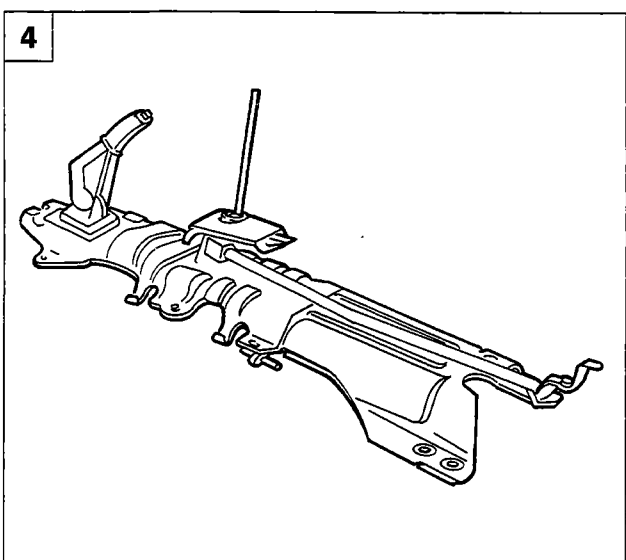
P4A017B03



P4A033B02

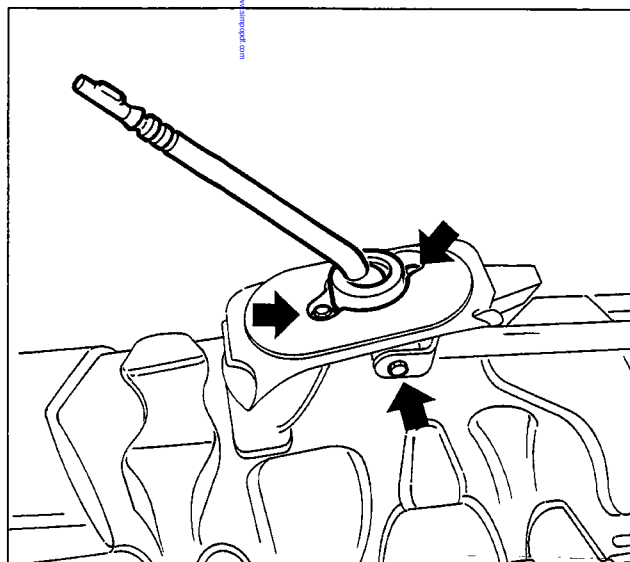


1. Disconnect the gear engagement and selector rods and the reaction link, then undo the nut and disconnect the relay assembly from the control rod.
2. Undo the bolts securing the remote control assembly mounting and handbrake to the bodywork.
3. Withdraw the control rod from the engine compartment, then remove the gearbox remote control assembly.
4. Internal control assembly



P4A033B03

21-27.



P4A034B01

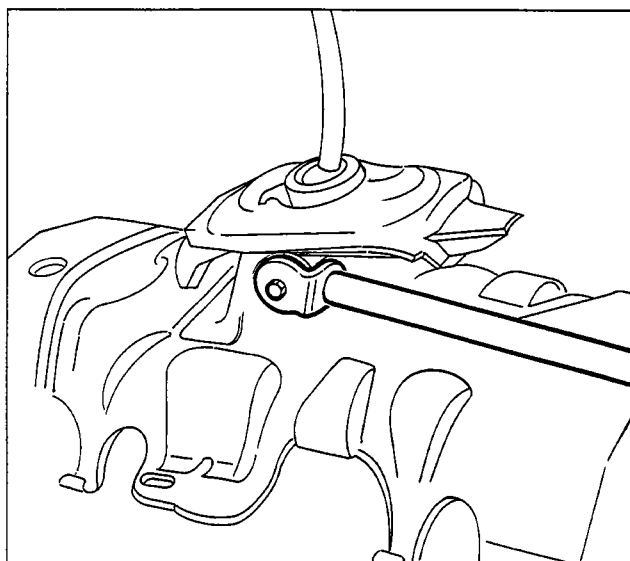


DISMANTLING AT THE BENCH



Dismantling - refitting gearlever

- Undo the bolts securing the gearlever to the mounting and the bolt securing the control rod to the gearlever, then disconnect it from the assembly.



P4A034B02



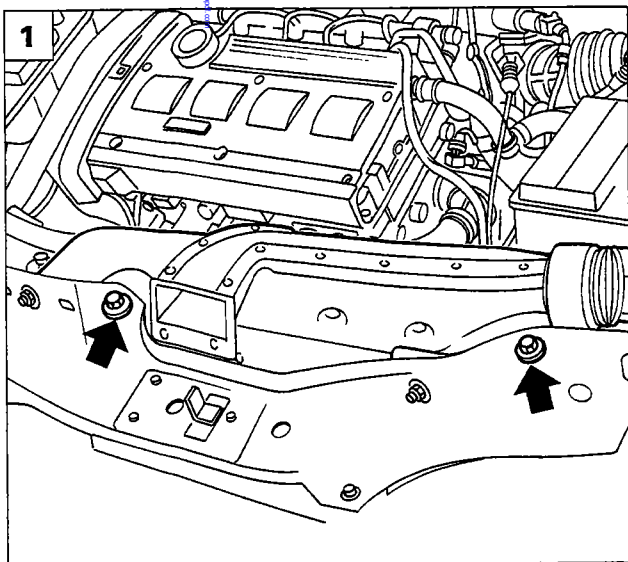
Dismantling - refitting control rod

- Undo the bolt securing it to the gearlever, then disconnect the control rod from the assembly.

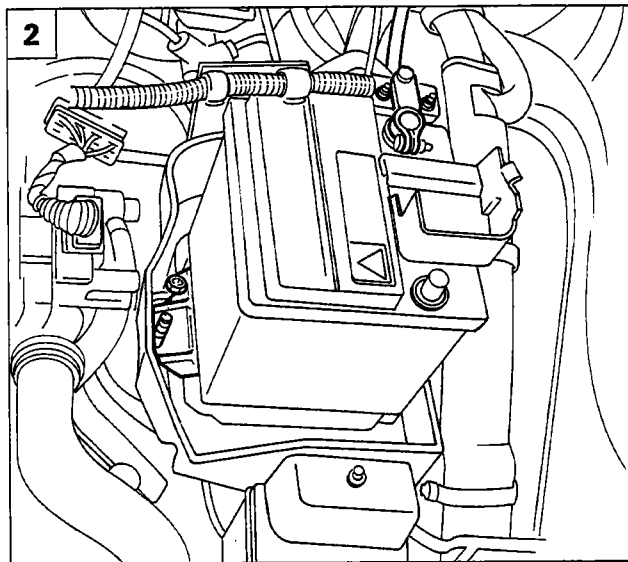
Gearbox and differential

Removing - refitting

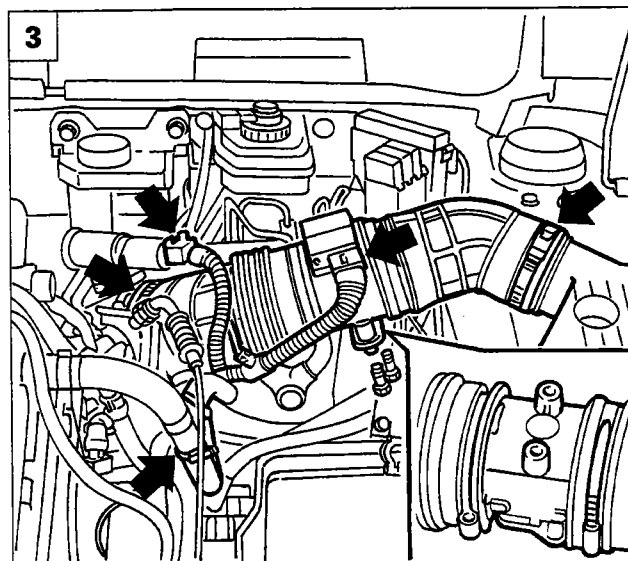
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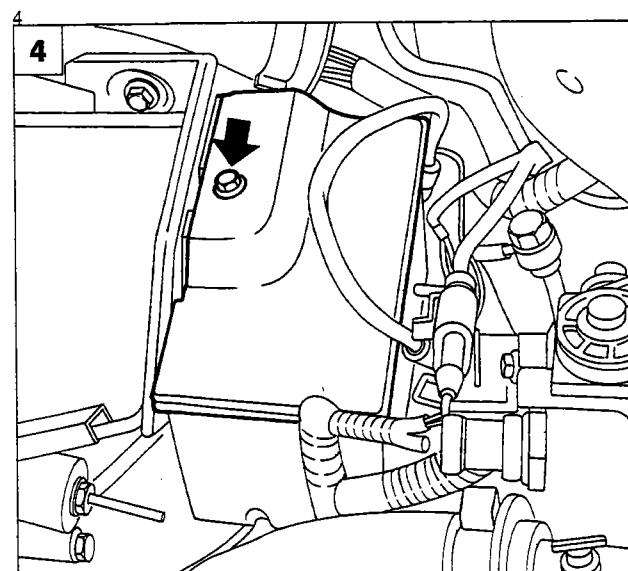
P4A035B01



P4A001B01



P4A035B02



P4A035B03



REMOVING - REFITTING

Removing



Place the car on ramps, disconnect the battery's negative terminal and remove the front wheels.

1. Remove the air inlet duct by undoing the bolts illustrated.
2. Lift the protective cover on the positive terminal, disconnect the positive terminal, then undo the nut securing the battery to the cage and remove the battery.
3. Disconnect the electrical connections indicated, unscrew the bolts from the bracket, then remove the complete inlet duct.
4. Undo the bolt indicated and remove the cover of the relay box.

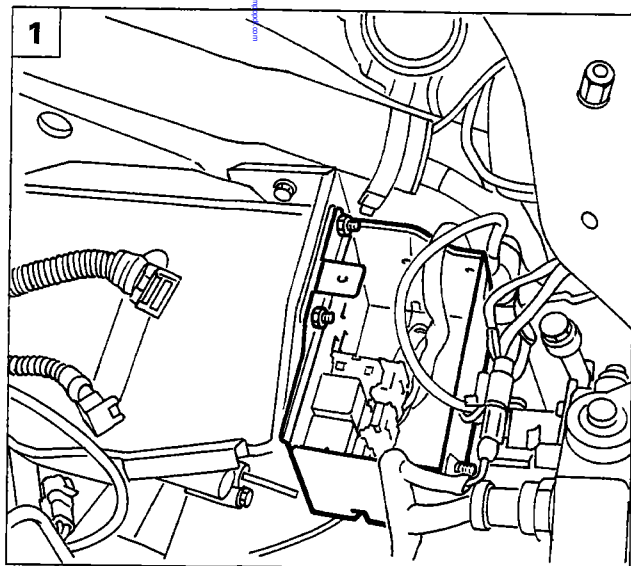
Gearbox and differential

Removing - refitting

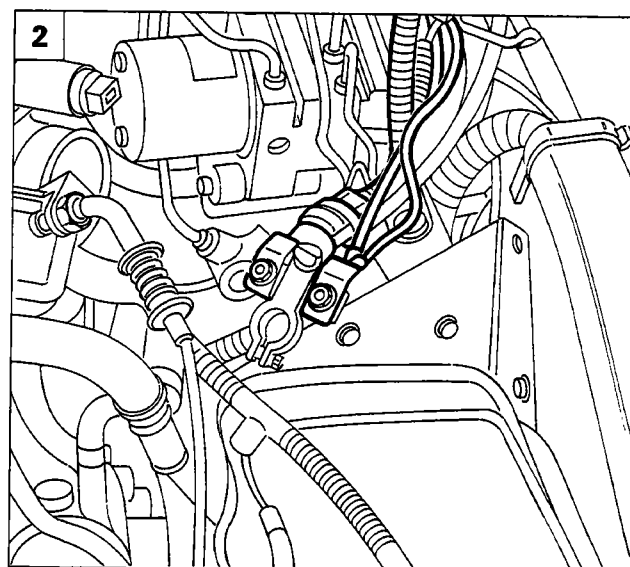
21-27.

Bravo-Brava

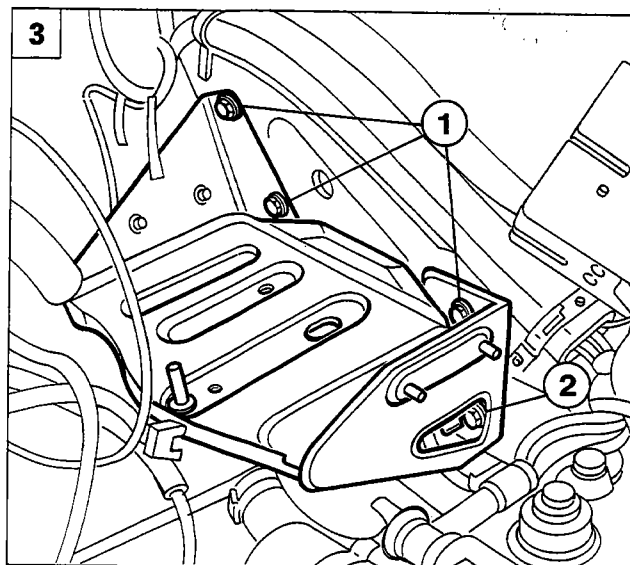
1747 16v



P4A036B01



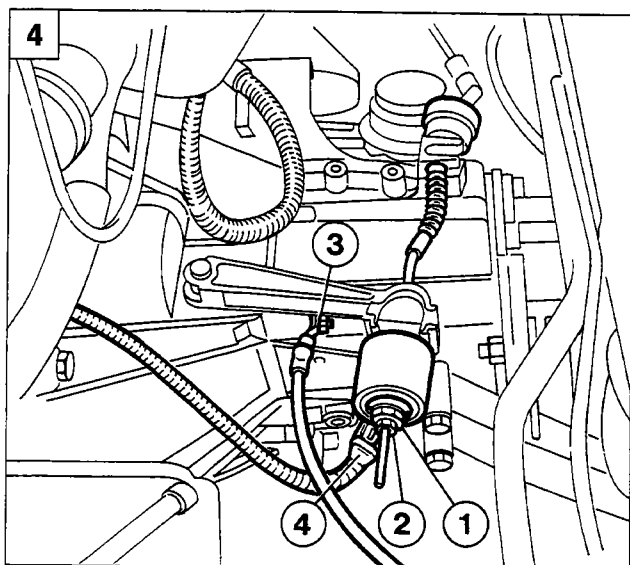
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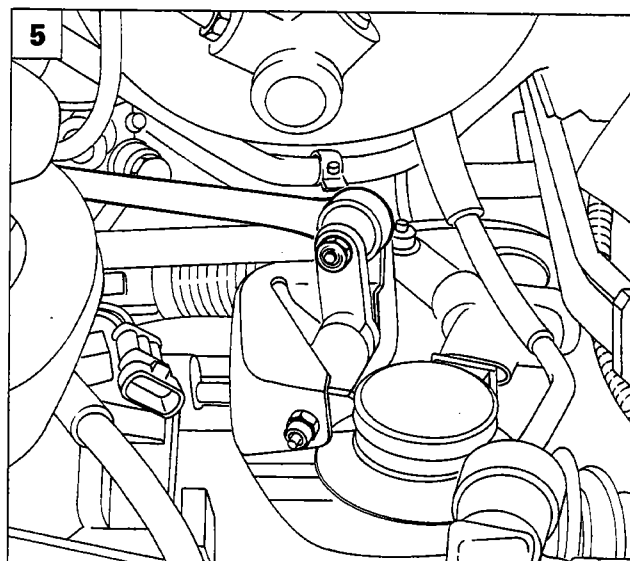
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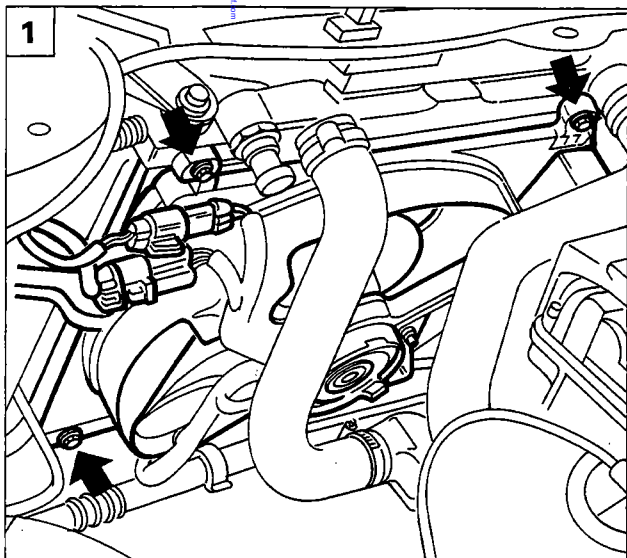
1. Undo the bolts securing the relay box to the battery cage, then move it over to one side.
2. Disconnect the cables indicated from the wiring on the battery's positive terminal.
3. Remove the screws (1) and slacken the bolt (2) securing the battery cage to the bodywork. Before removing the cage, disconnect the cable clip underneath.
4. Disconnect the clutch cable by undoing the nut (1) and locknut (2) shown in the figure. Also disconnect the earth cable (3) from the gearbox and the electrical connector for the reversing lights switch (4).
5. Disconnect the reaction link.



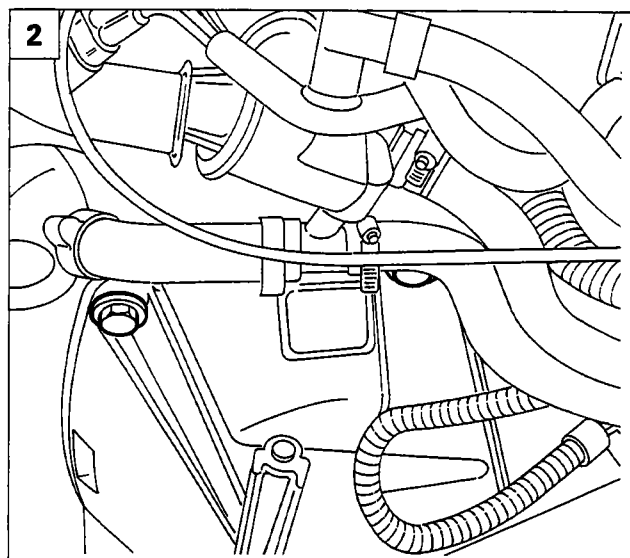
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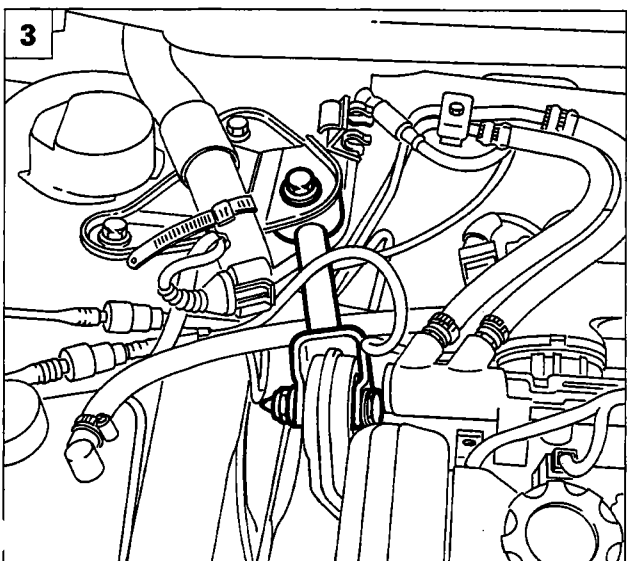
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P4A037B01



P4A037B02



P4A037B03



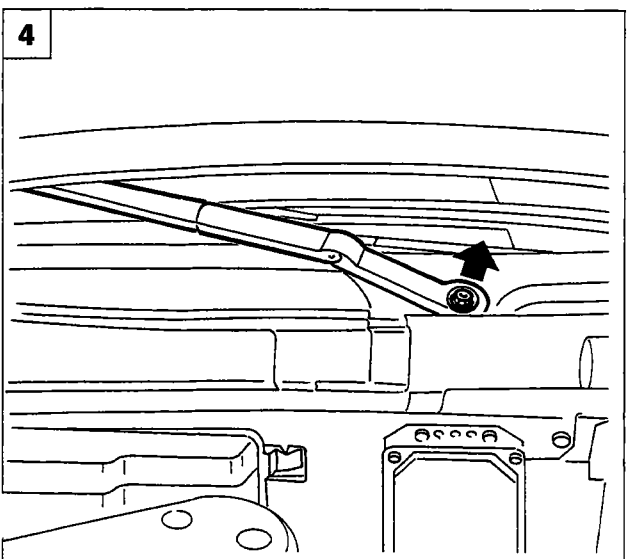
1. Disconnect the fan's supply connections. Undo the bolts securing it to the radiator, then remove it from the car.

2. Undo the top bolts securing the gearbox to the power unit.

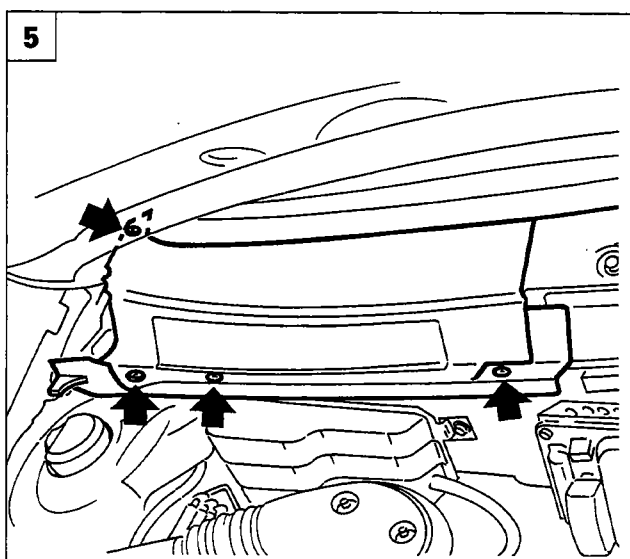
3. Remove the engine reaction link.

4. Remove the left windscreen wiper arm by undoing the nut.

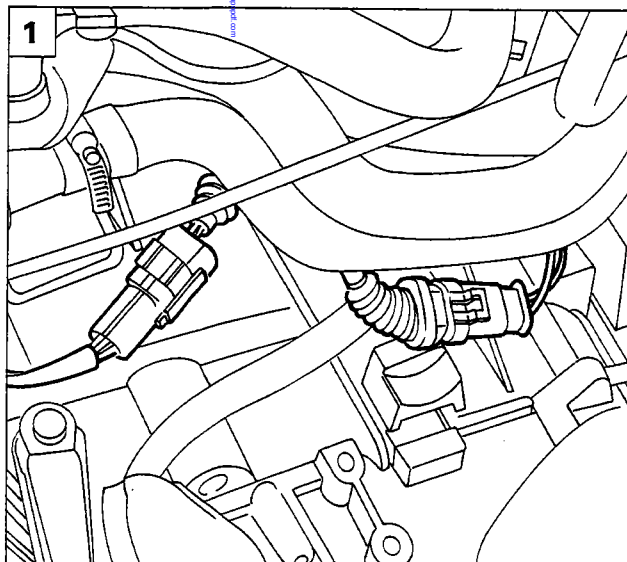
5. Remove the left side cover from the anti-pollen filter.



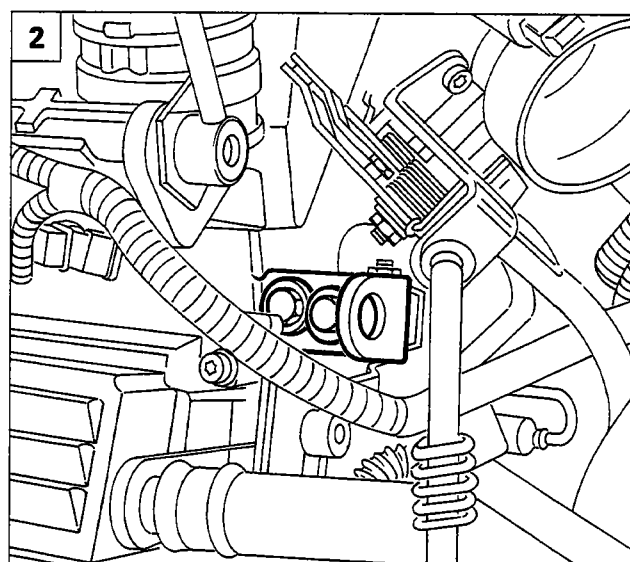
P4A005B05



P4A006B01



P4A038B01



P4A038B02



1. Disconnect the electrical connector of the odometer signal and the Lambda probe connector.



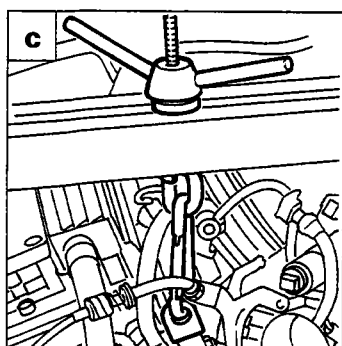
2. Using two ordinary bolts, install a suitable supporting eyelet for hooking the power unit support stand.

3. Fit the engine support stand 1860851000 and adaptor 1860851001 in the appropriate mountings.

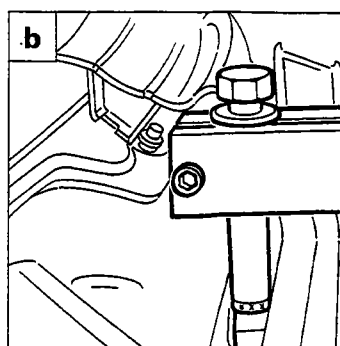
a. Front mounting: place the tool in the seat of the safety catch so that it rests on the front crossframe.

b. Rear mounting: fit the tool level with the central reinforcement of the fire-proof bulkhead.

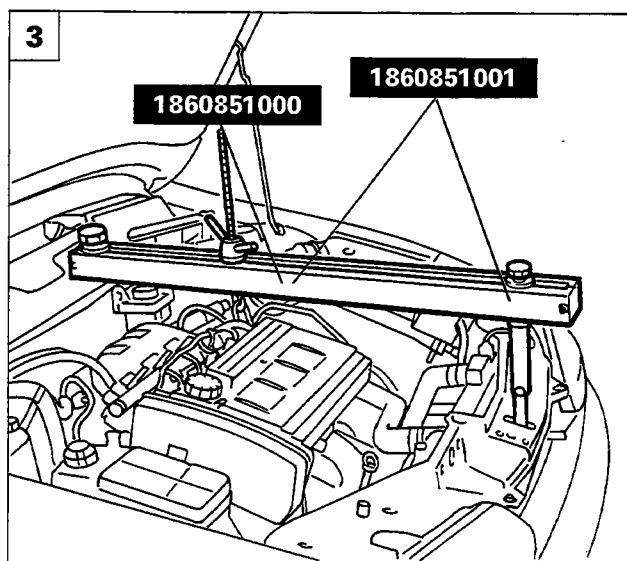
c. secure the hook of the crossbeam to the previously secured bracket.



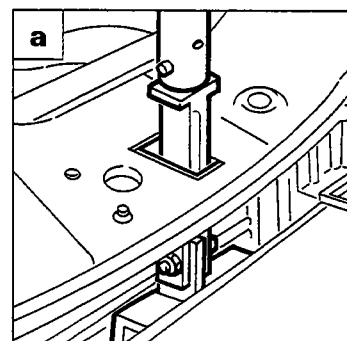
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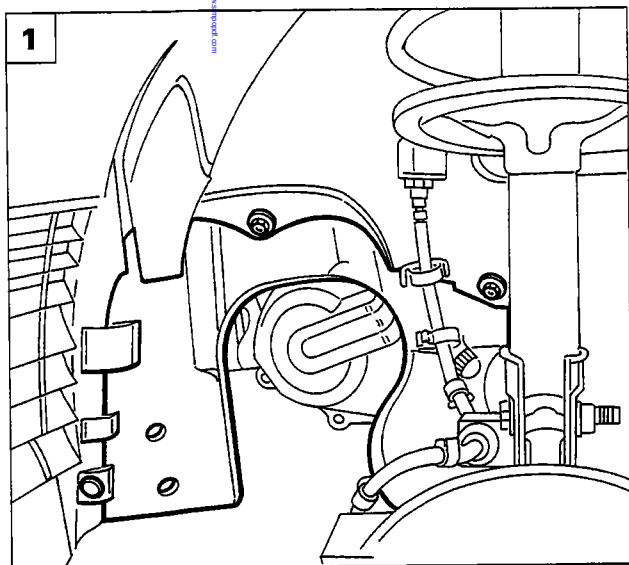
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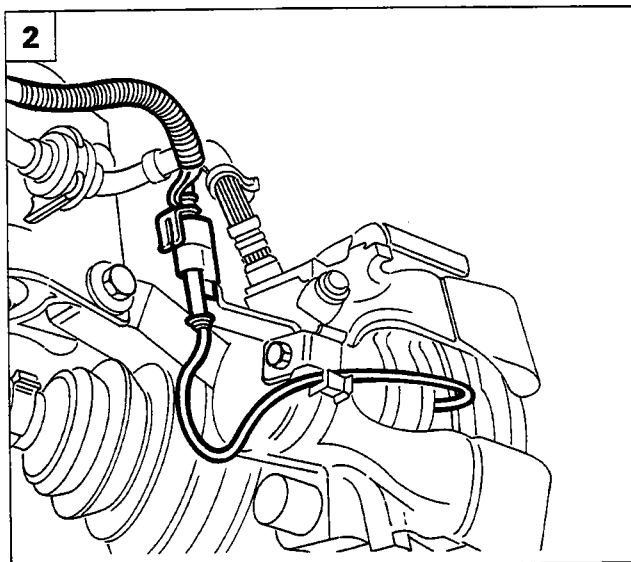
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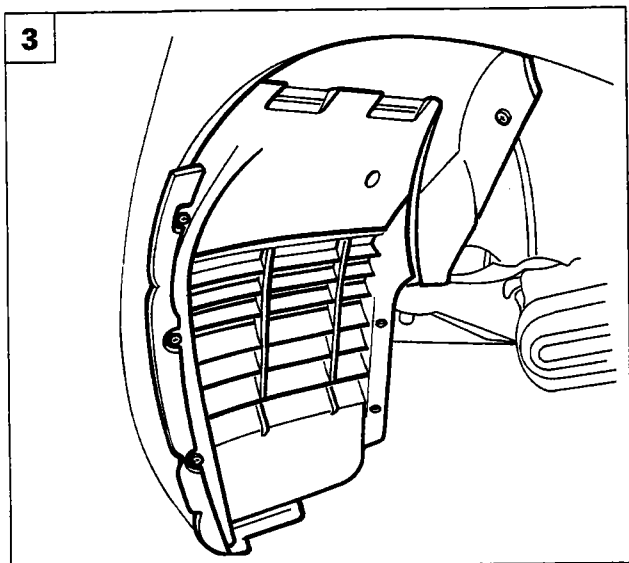
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P4A003B01



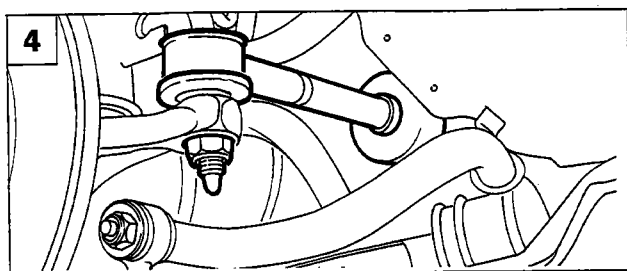
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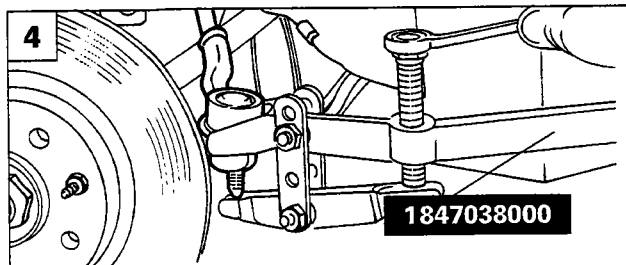
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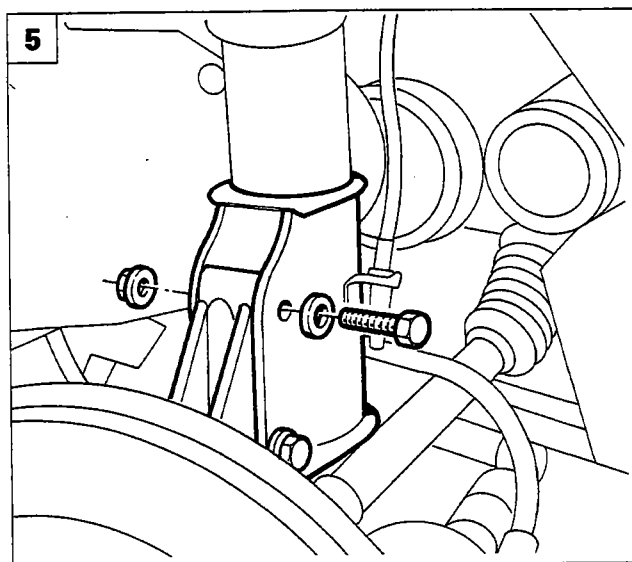
1. Using tool 1878077000, remove the button securing the dust guard to the bodywork, then undo the bolts and release the dust guard from its seating.
2. Disconnect the brake pad connection then withdraw the central dust guard from the car.
3. Remove the front dust guard by undoing the screws illustrated.
4. Undo the nut securing the tie-rod end, then using tool 1847038000 disconnect the latter from the vertical link.
5. Undo the vertical link bolts, then remove it.



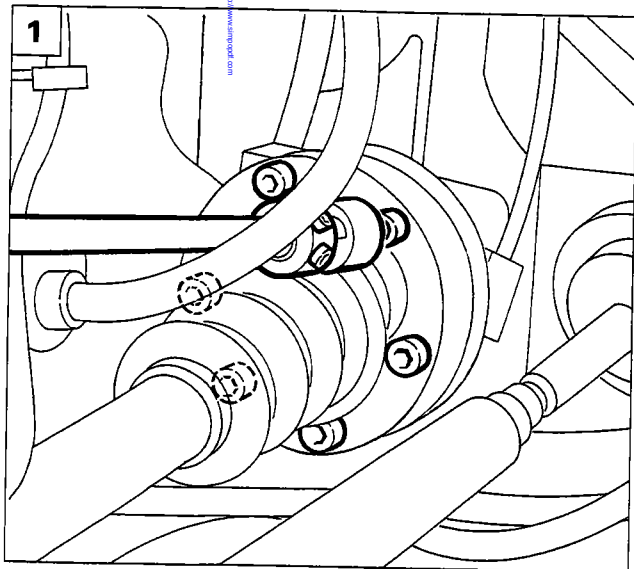
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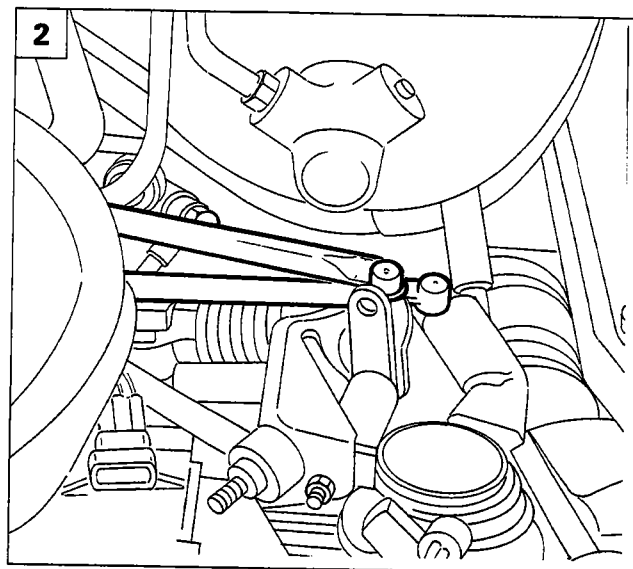
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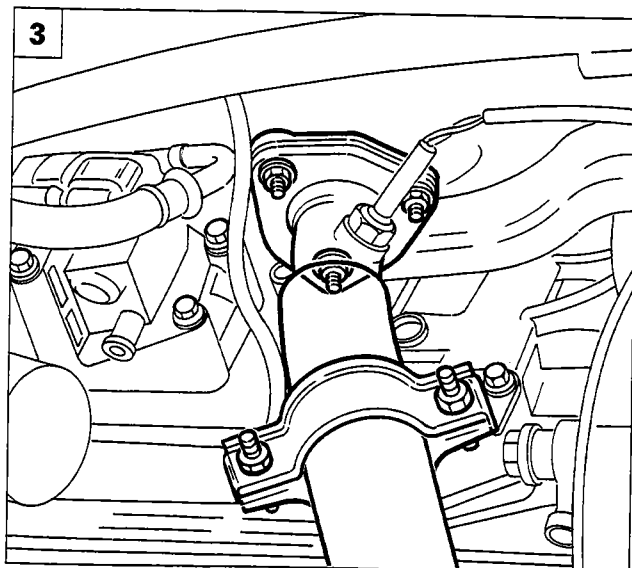
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P4A043B02



P4A040B02



P4A040B03

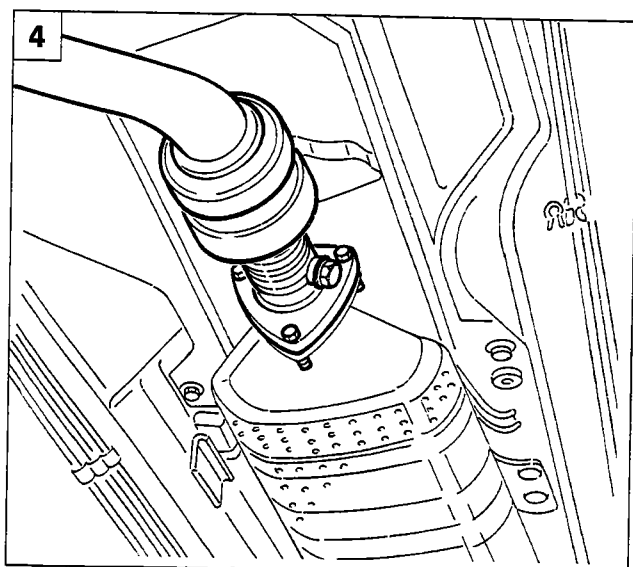


1. Disconnect the drive shaft by undoing the bolts securing the constant velocity joint to the gearbox flange.

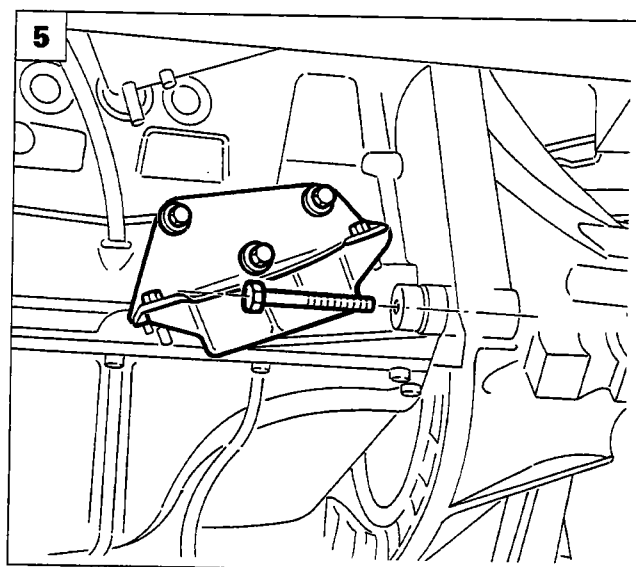


Operations to be repeated on the other side

2. Disconnect the gear engagement and sector rods from the gearbox.
3. Raise the car and remove the front bolts securing the first section of the exhaust pipe.
4. Remove the rear bolts and remove the first section of the exhaust pipe from the car.
5. Remove the bracket indicated to permit insertion of a spanner to remove the bolt securing the gearbox to the power unit.



P4A004B04

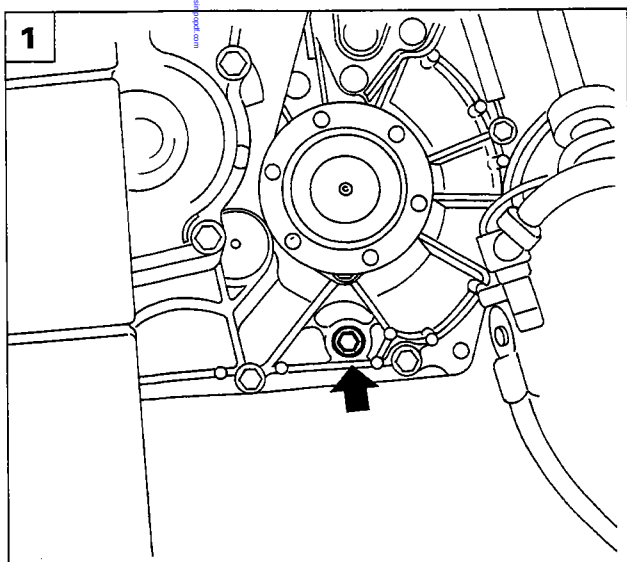


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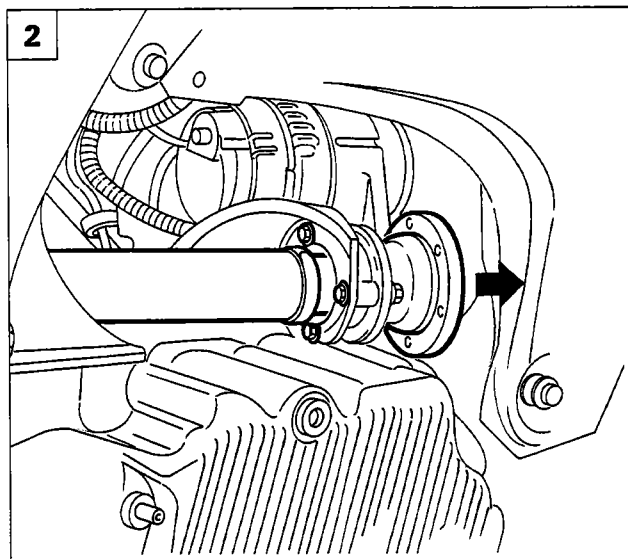
Gearbox and differential

Removing - refitting

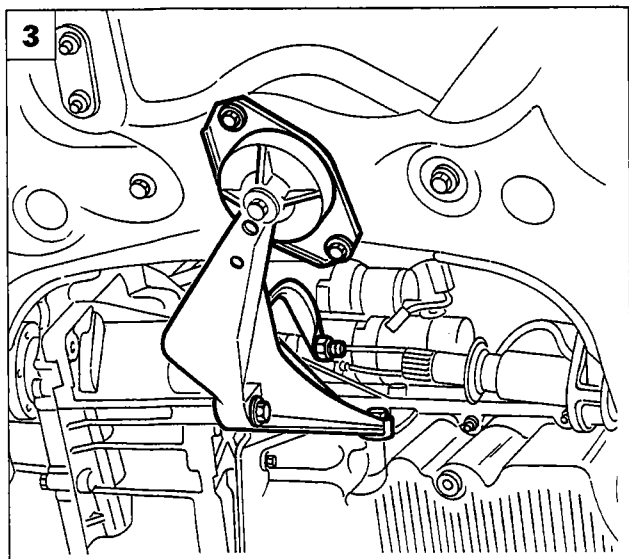
21-27.



P4A041B01



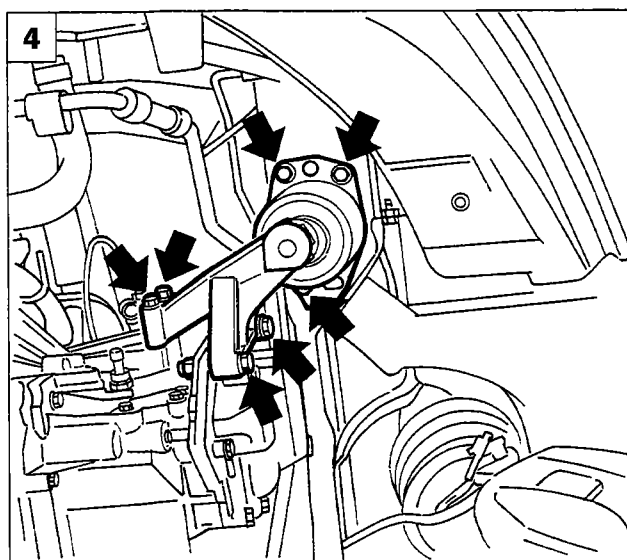
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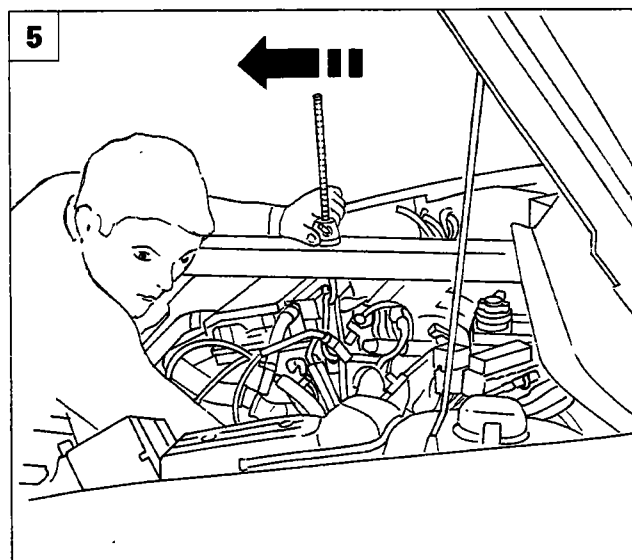
P4A041B03



1. Drain the gearbox oil, undoing the bolt indicated.
2. Undo the bolts securing the intermediate shaft to the engine, release it from the gearbox and move it away from the working area, securing it in an appropriate manner.
3. Remove the power unit's central mounting.
4. Remove the power unit mounting on the gearbox side.
5. Lower the car and manoeuvre the power unit as appropriate to make it perform the maximum permissible travel towards the front of the engine compartment.



P4A041B04



P4A041B05

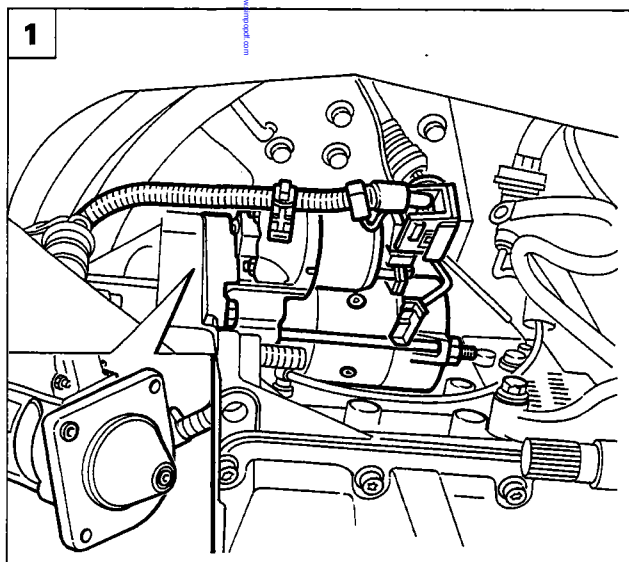
Gearbox and differential

Removing - refitting

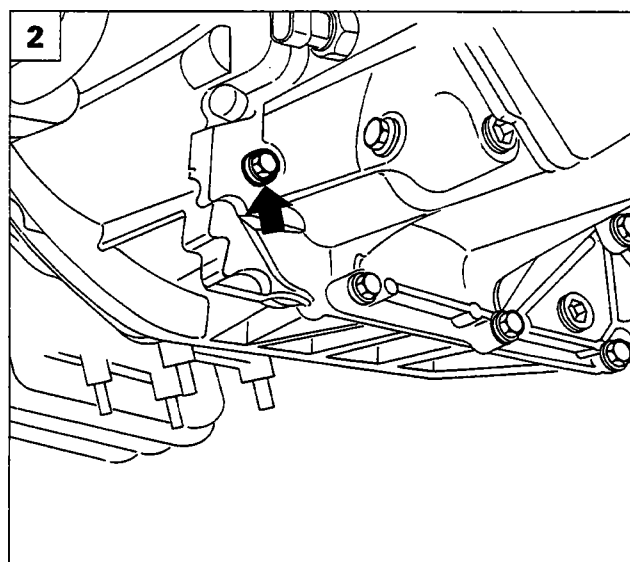
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Bravo-Brava

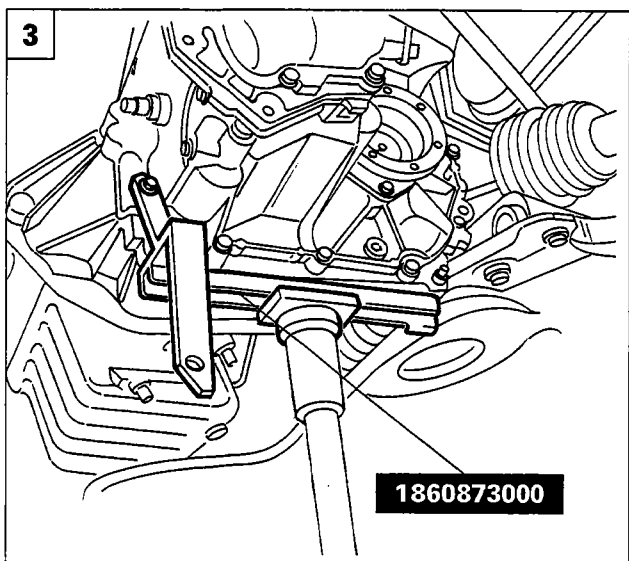
1747 16v



P4A042B01



P4A026B01



P4A007B02



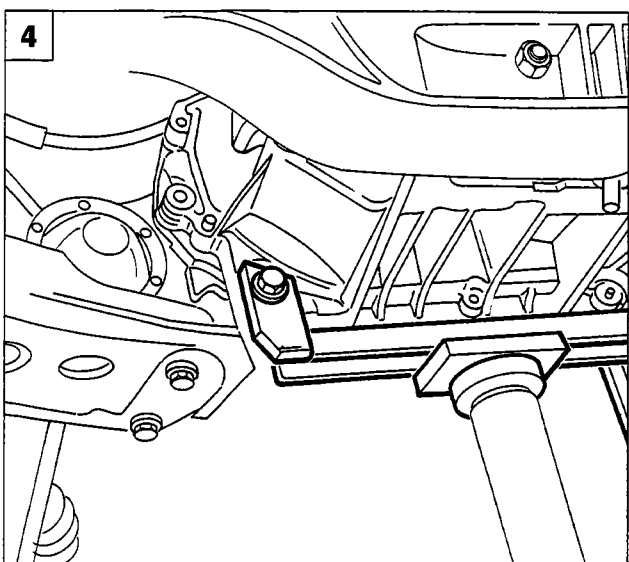
1. Raise the ramps and remove the starter motor complete with wiring.



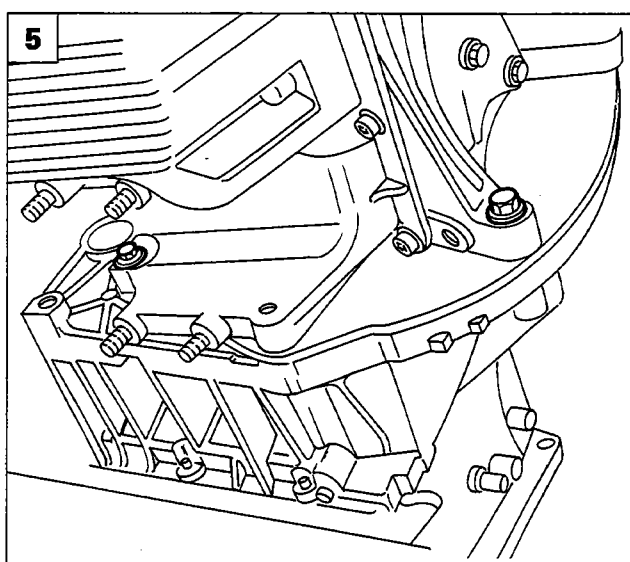
2. Undo the bolt illustrated securing the gearbox to the power unit, and unscrew the gearbox bolt illustrated in order to then be able to secure the supporting tool for removing the gearbox-differential unit.

3.4 Fit the tool 1860873000 for manoeuvring the gearbox-differential unit.

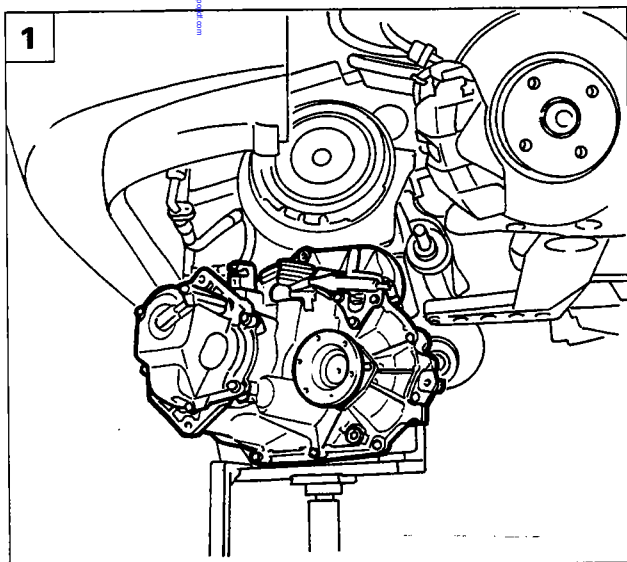
5. Undo the rear bolts securing the gearbox to the power unit.



P4A026B03



P4A042B03



P4A008B01



1. Manoeuvre the hydraulic jack as appropriate to withdraw the gearbox from the centring studs, then withdraw the gearbox from the engine compartment, slowly lowering the jack.

Refitting

2. When refitting the engine mounting on the gearbox side, in order to avoid creating stresses on the gearbox sealing surfaces resulting in deformation and oil leaks, strictly observe the following tightening sequence for the bolts:
 - Lightly tighten bolts (1) and (2) to a torque of 0.5 daNm;
 - Lightly tighten bolts (3) and (4) to a torque of 0.5 daNm, then tighten them to the specified torque;
 - Tighten bolts (1) and (2) to the specified torque.

To refit, reverse the procedure described for removal.

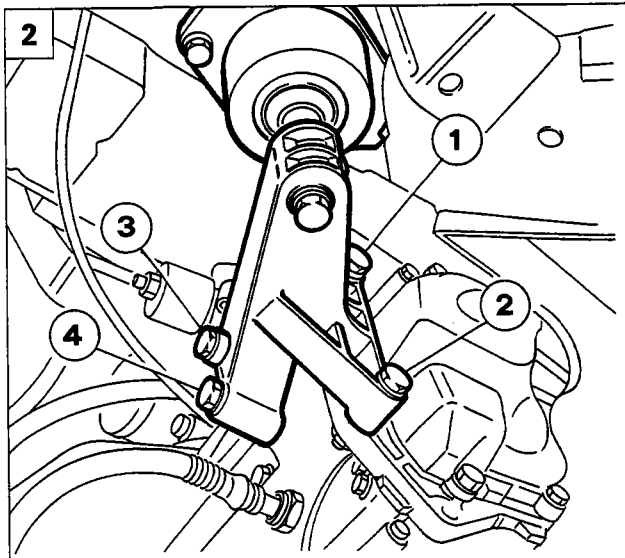


REMOVING - REFITTING DRIVE SHAFTS

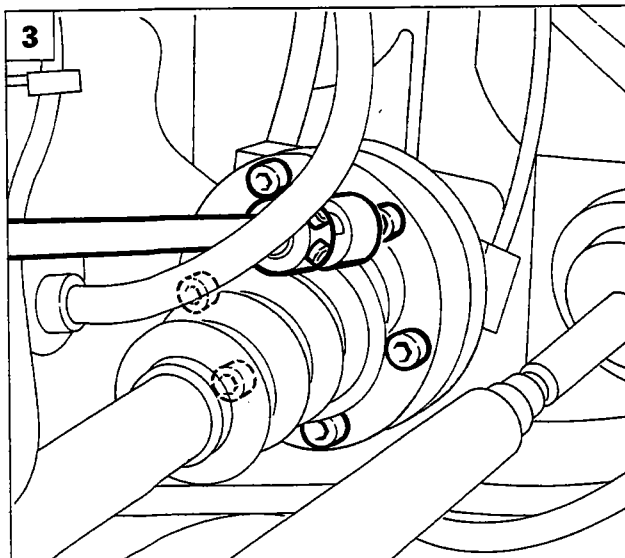
Place the car on ramps, disconnect the battery's positive terminal and remove the front wheels, then carry out the operations described below:

3. Disconnect the drive shaft by undoing the screws illustrated.
4. Withdraw the drive shaft from the wheel hub and withdraw it from the engine compartment.

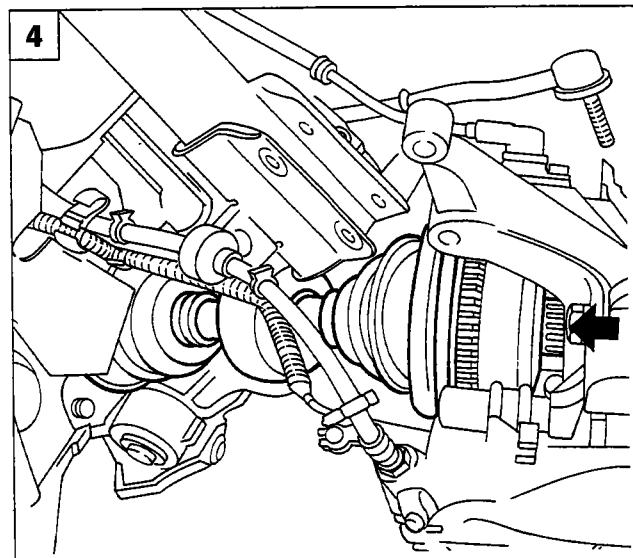
NOTE To refit, reverse the procedure for removal, tightening the hub nut to the specified torque.



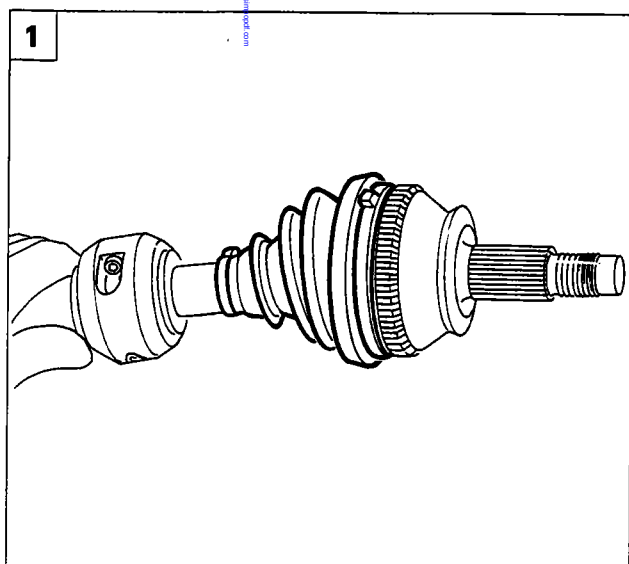
P4A043B01



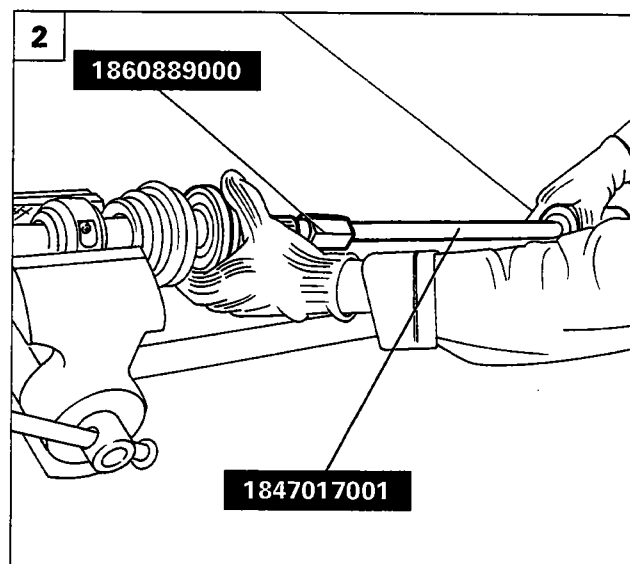
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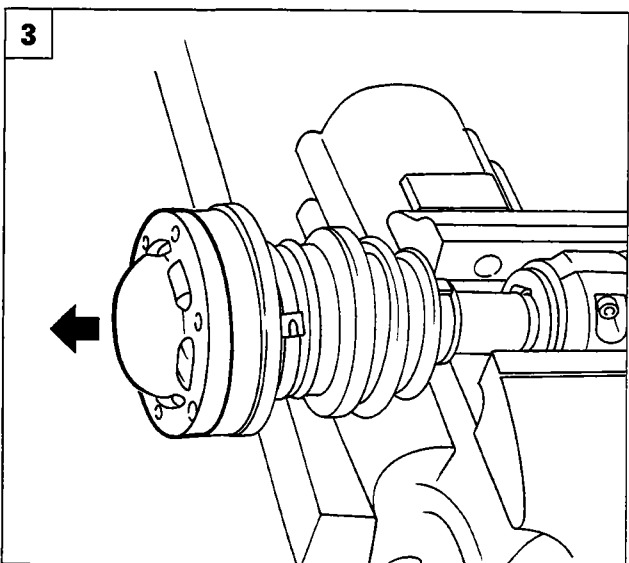
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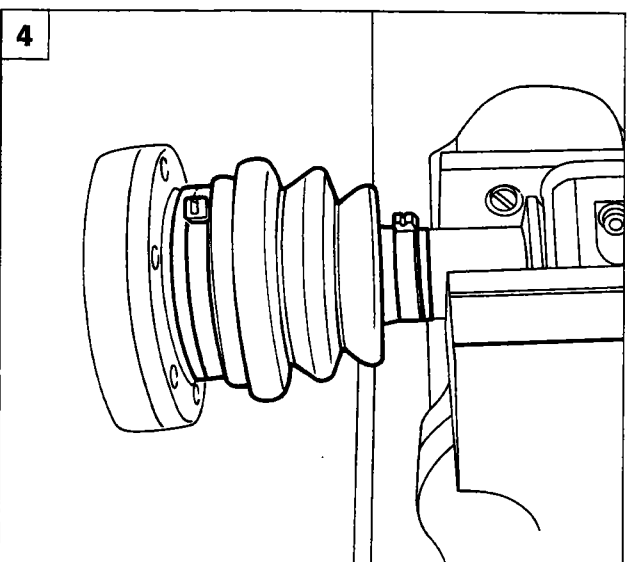
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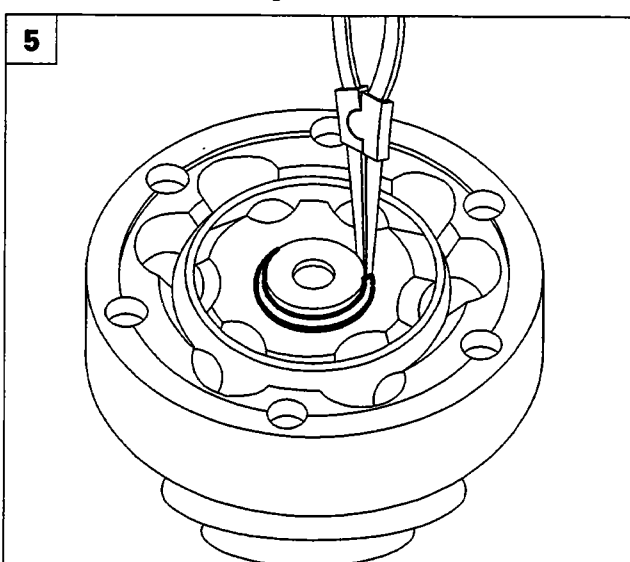
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P4A044B03



P4A044B04



P4A044B05

DISMANTLING

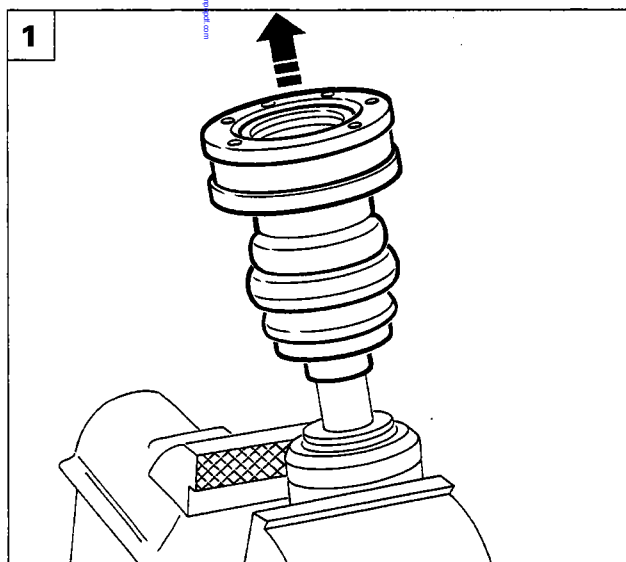


1. Remove the clip and the protective gaiter on the constant velocity joint, wheel side.



During assembly, it is advisable to replace the protective gaiter.

2. Clean the grease off the inside of the constant velocity joint and, using tools 1847017001 and 1860889000, remove the constant velocity joint and then withdraw the protective gaiter, previously moved aside, from the drive shaft.
3. Remove the protective cover from the constant velocity joint, gearbox side.
4. Remove the two clips securing the protective gaiter on the gearbox side, then remove it.
5. Clean the grease off the inside of the constant velocity joint and remove the circlip from its seating.



P4A045B01

1. Withdraw the joint from the drive shaft and then withdraw the protective gaiter.

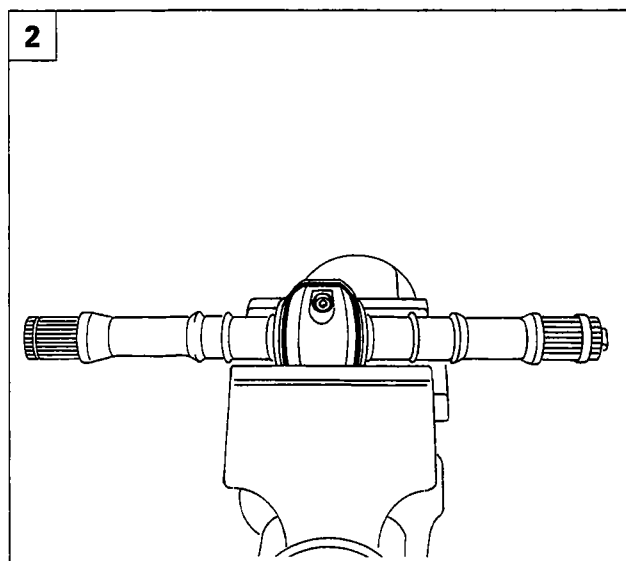


It is advisable to renew the protective gaiter whenever it is removed.

2. Undo the two screws, one of which is not in view, and remove the two half shells and the rubber buffer which constitute the damping weight.



When refitting, the damping weight must be returned to the same seating, recognizable on the shaft by a marked reduction of the outer diameter and by two thrust washers which define the outside dimensions of the damping weight.

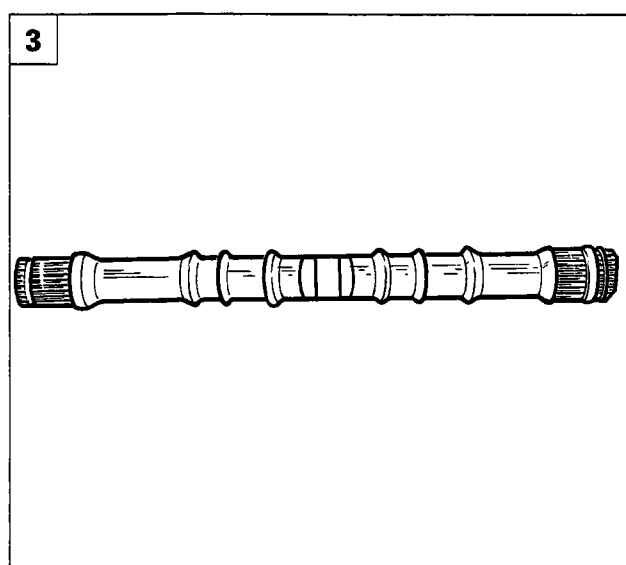


P4A045B02

3. Check that the drive shaft is not deformed or out of true, and that the surface in contact with the seal is not worn.

REFITTING

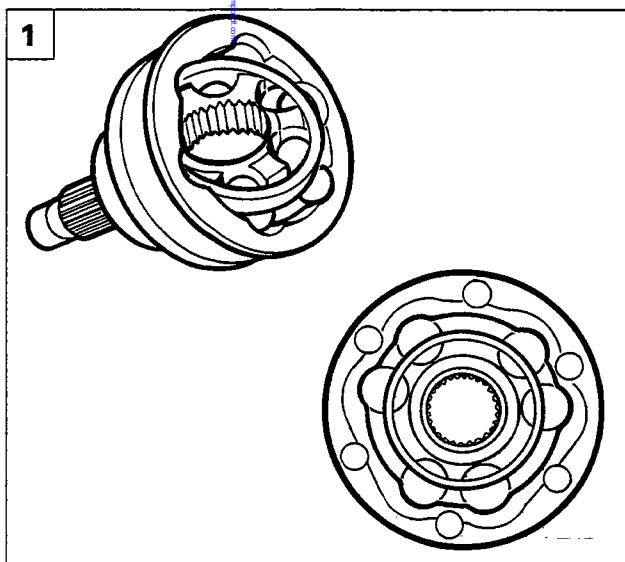
During reassembly, the constant velocity joints must be coupled to the shaft in accordance with the table. Category B joints match both categories of drive shaft; carry out a further check on the joint to make sure that there are no signs of seizure or scoring.



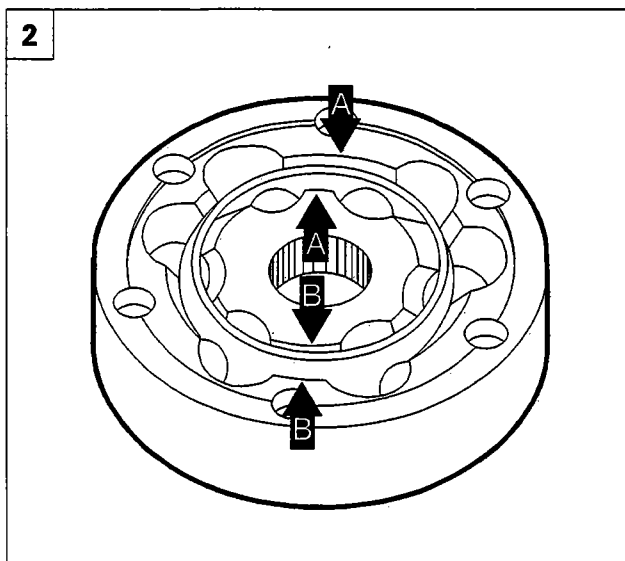
P4A045B03

Shaft-joint coupling, wheel side

Shaft classification		Joint classification	
Category	Colour	Category	Colour
A	Blue	A	Blue
		B	White
B	Red	C	Red



P4A046B01



P4A046B02



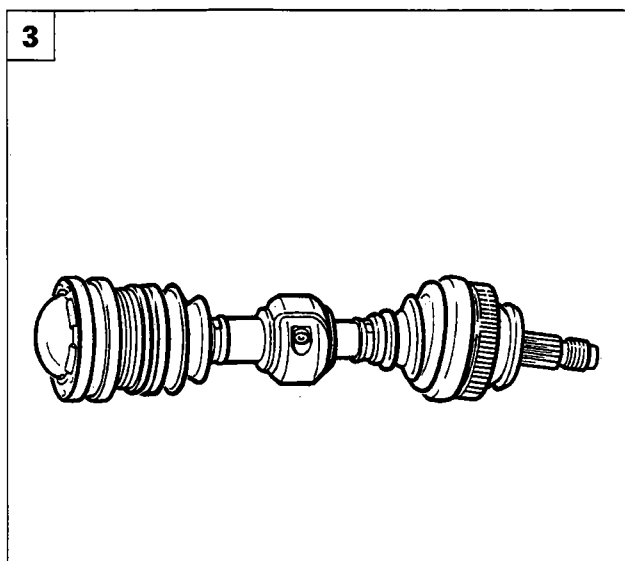
1. Wash the constant velocity joints thoroughly with naphtha or petrol, and visually check that the balls and their seatings mirror each other perfectly and have no signs of seizure or scoring.
2. If the balls fall out of their seatings during withdrawal of the joints, for correct re-assembly, follow the references given in the figure, i.e. "A" must line up with "A" and "B" with "B", otherwise the joint will remain jammed.

3. After carrying out the following checks, refit the parts reversing the procedure for removal, bearing in mind that the bolts securing the two half shells of the damping weight must first be tightened lightly and then tightened to a torque of no more than 0.7 daNm.

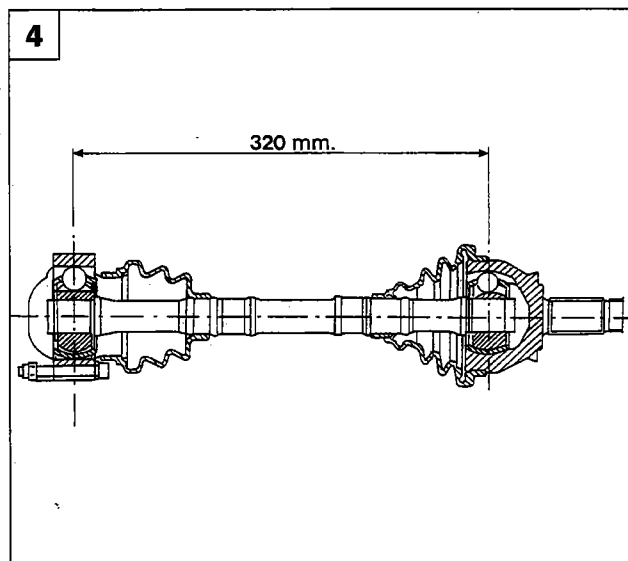


it is advisable to renew the protective gaiters whenever they are removed, and it is important to fill both constant velocity joint and gaiter with TUTELA MRM2 grease.

4. General view of drive shaft-constant velocity joint couplings.

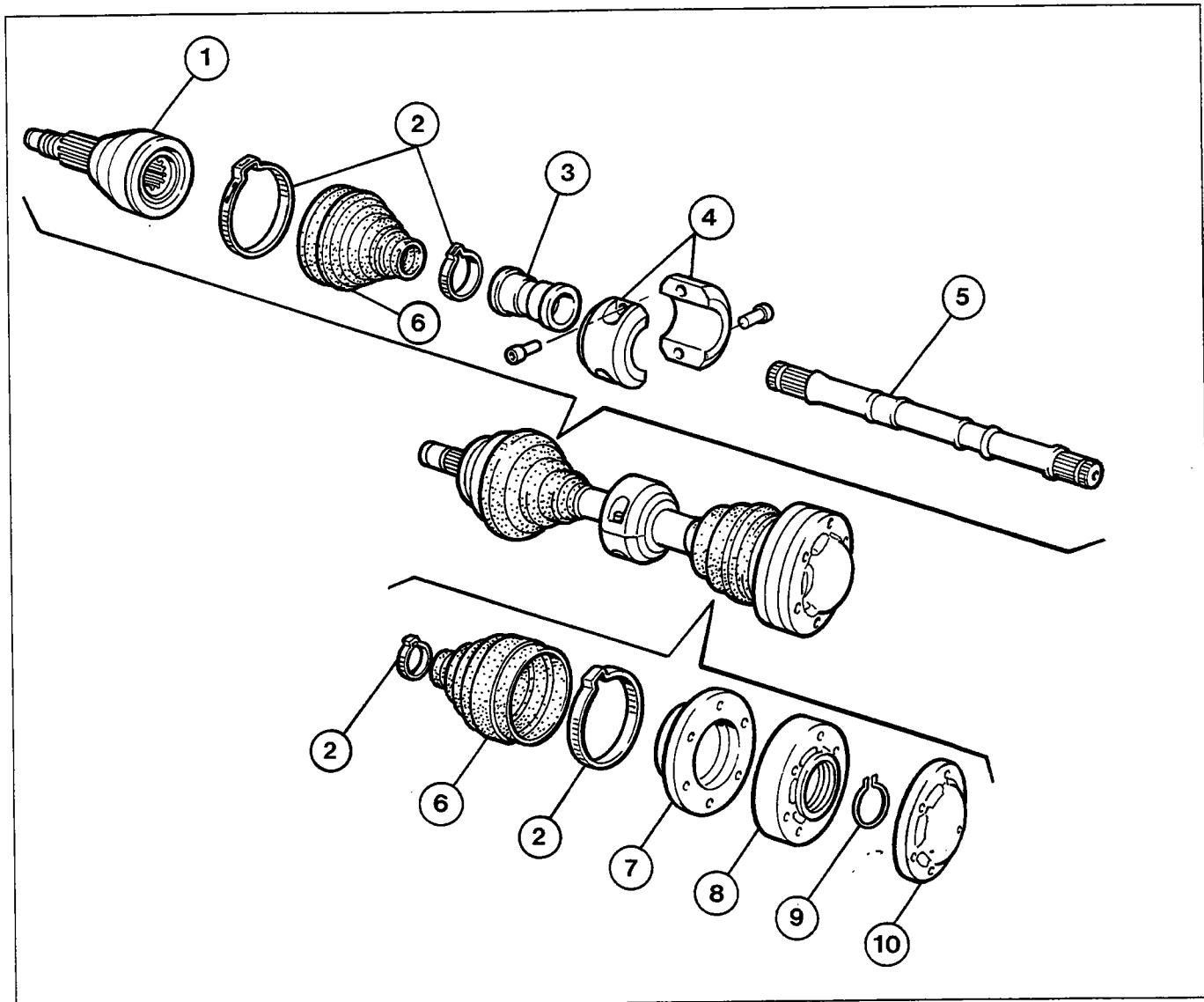


P4A046B03



P4A046B04

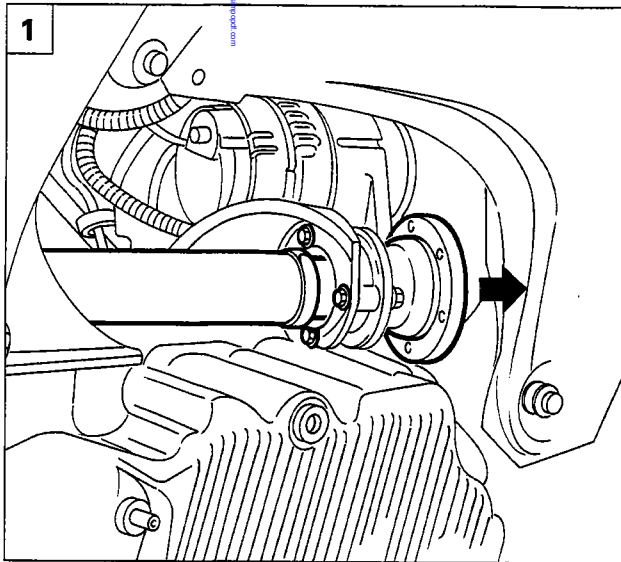
Drive transmission components



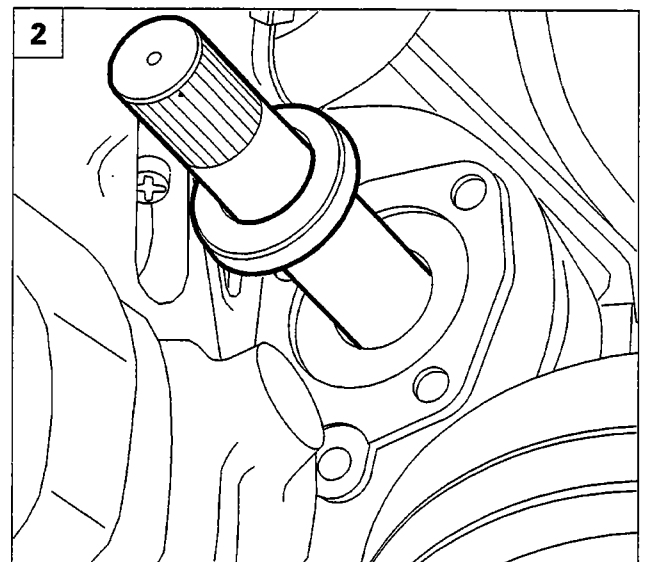
P4A047B01

1. Constant velocity joint, wheel side
2. Retaining clips
3. Rubber buffer
4. Damping half shells
5. Drive shaft

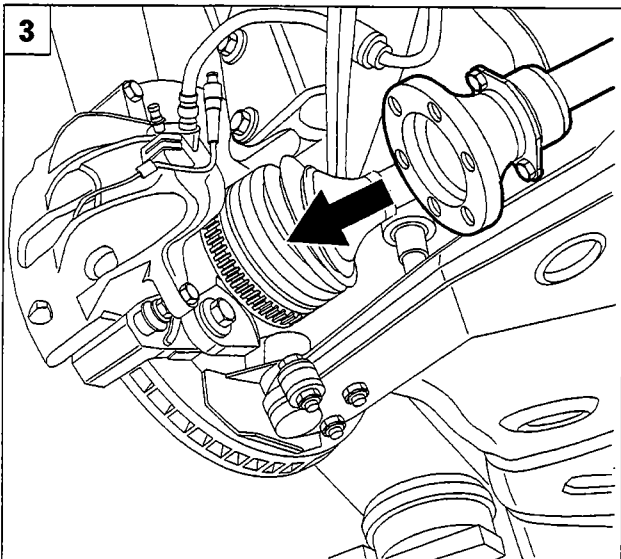
6. Protective gaiter
7. Flange for constant velocity joint, gearbox side
8. Constant velocity joint, gearbox side
9. Circlip
10. Protective cover



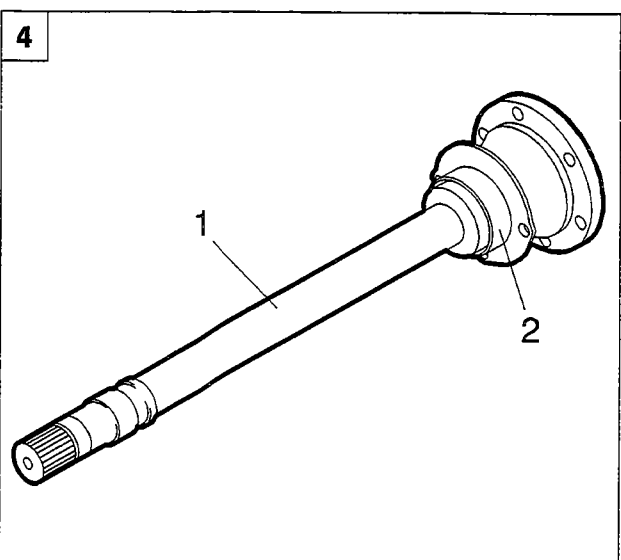
P4A041B02



P4A048B01



P4A048B02



P4A048B03



REMOVING - REFITTING

Place the car on ramps, remove the front right wheel, drain the gearbox oil and carry out the operations listed below, which have already been described above:

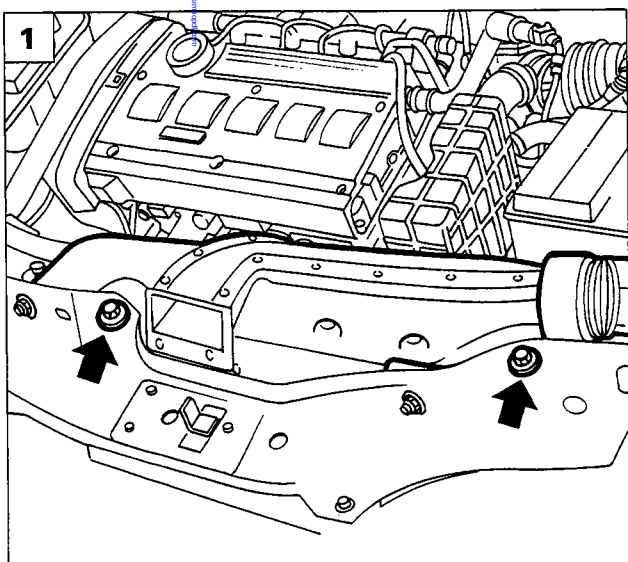
- Remove the right wheelarch cover
- Disconnect the right tie-rod end
- Disconnect the vertical link and drive shaft from the joint.

1. Undo the bolts securing the intermediate shaft to the mounting.
2. Withdraw the intermediate shaft from its seating, then remove the dust excluder.
3. Withdraw the intermediate shaft from the engine compartment.
4. Check that the intermediate shaft (1) is not deformed or out of true; check that the bearing (2) does not show signs of overheating, scoring or excessive wear.

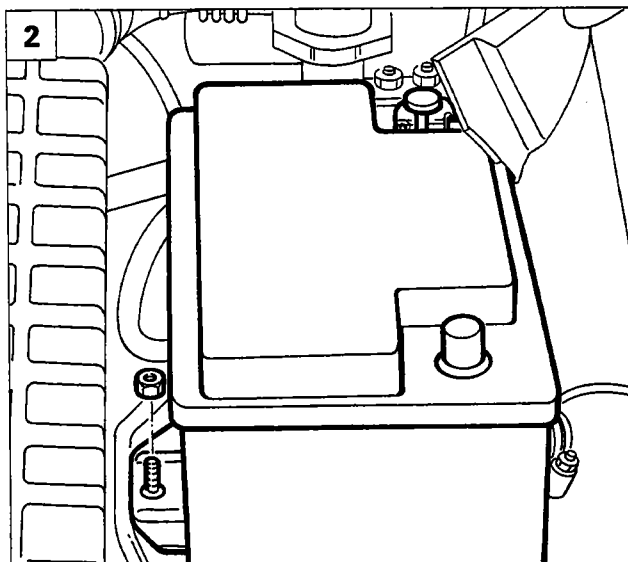
NOTE *The bearing is not supplied as a spare part, so if it is faulty, the complete intermediate shaft must be replaced.*

REMOTE CONTROL ASSEMBLY

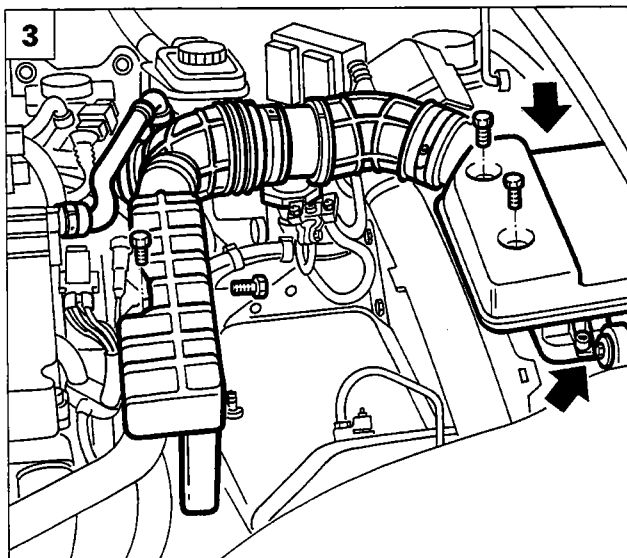
To remove and refit the remote control assembly, refer to the "Remote control assembly" section for the 1581 16v engine.



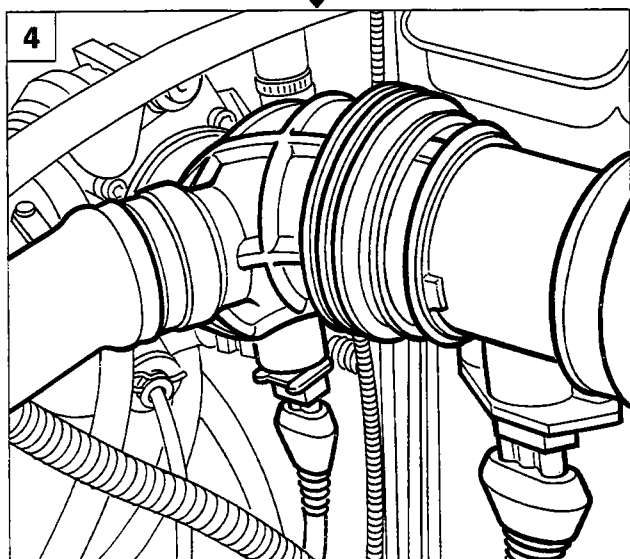
P4A01DX01



P4A01DX03



P4A01DX04



P4A02DX01

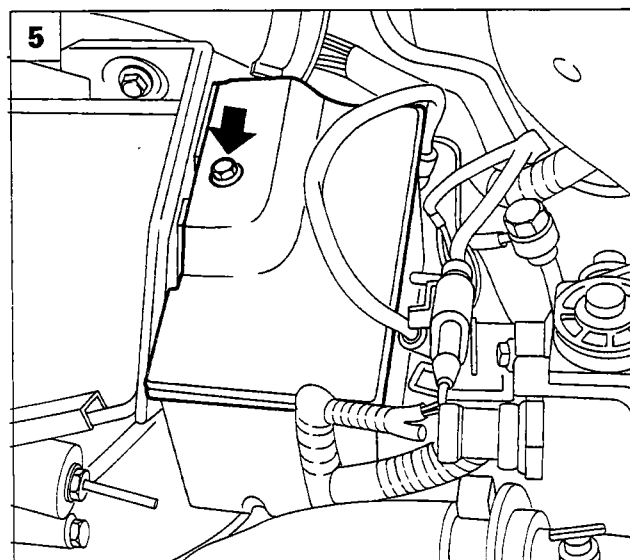


REMOVING-REFITTING

Removing

Place the car on ramps, disconnect the battery's negative terminal and the front wheels, then proceed as described below:

1. Remove the air intake duct by undoing the bolts shown in the figure.
2. Disconnect the battery's positive terminal, then remove the battery from the engine compartment by undoing the nut securing the retaining bracket.
- 3-4. Disconnect the pipe connecting the air cleaner to the throttle body by undoing the clips indicated, and disconnect the connections under the pipe; also remove the resonator.
5. Remove the relay box cover.



P4A035B03

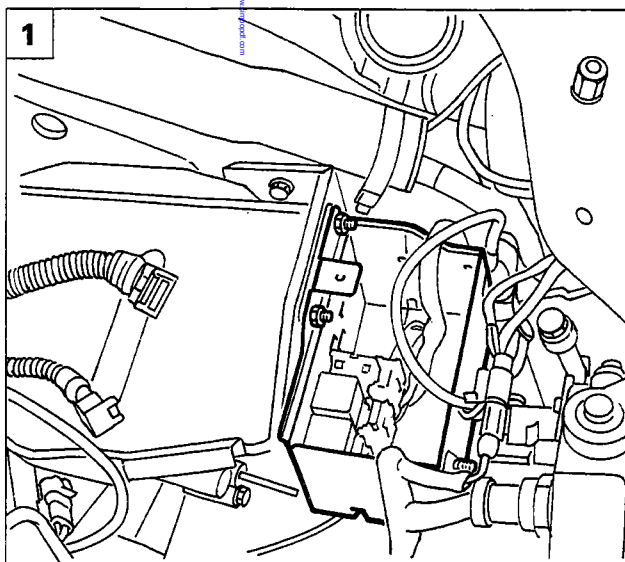
Gearbox and differential

Removing-refitting

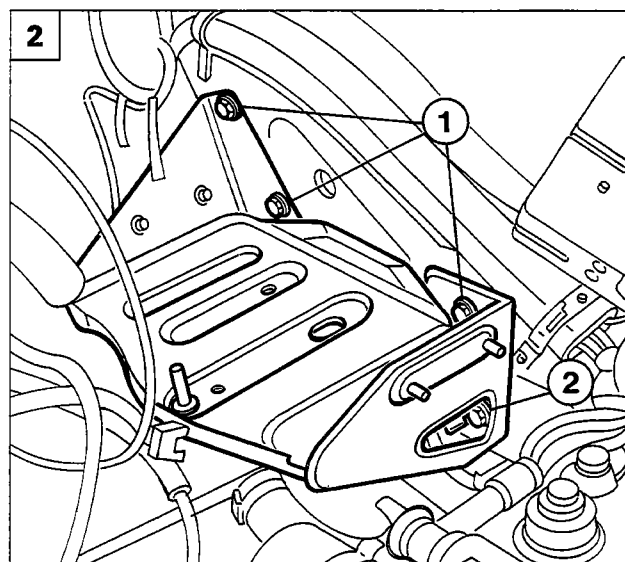
21-27.

Bravo-Brava

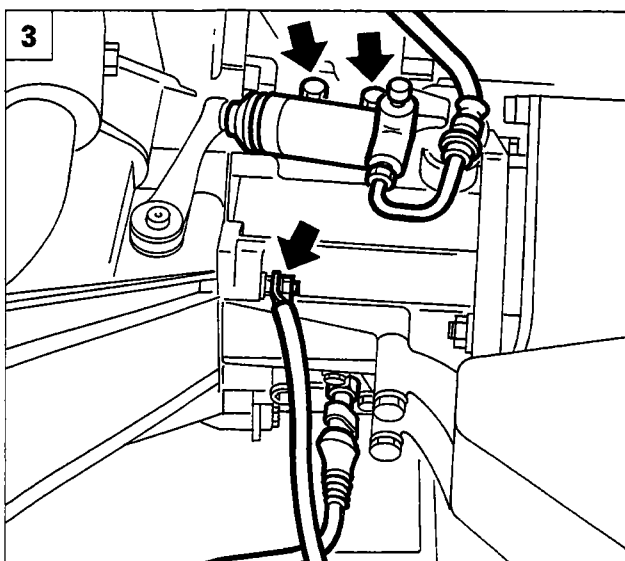
1998 20v



P4A036B01



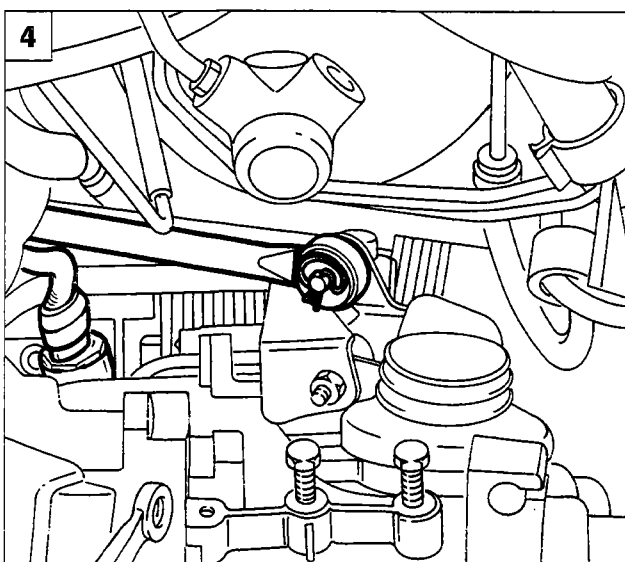
P4A021B01



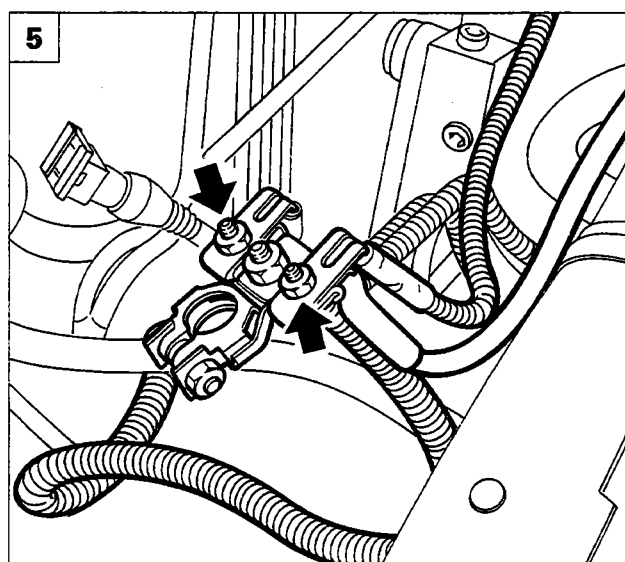
P4A050B01



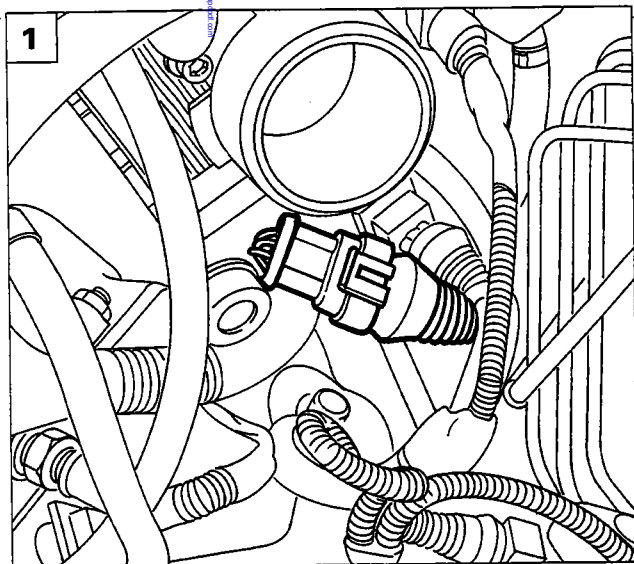
1. Remove the nuts securing the relay box to the battery cage, then move it over to one side.
2. Remove the battery cage by undoing the bolts shown in the figure; also disconnect the electrical wiring clips indicated.
3. Disconnect the hydraulic clutch actuating cylinder from the gearbox, the earth cable and reversing lights switch.
4. Disconnect the gear selector rod by removing the split pin shown in the figure. Also disconnect the speedometer sensor connection.
5. Undo the nuts securing the cables shown in the figure to the battery's positive terminals.



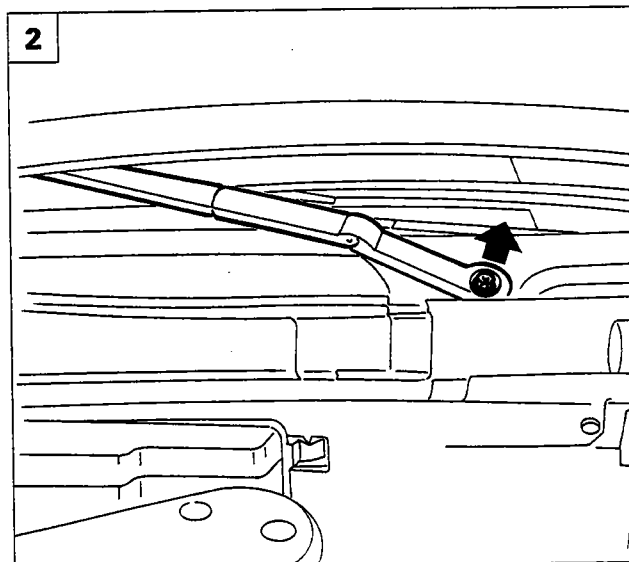
P4A050B02



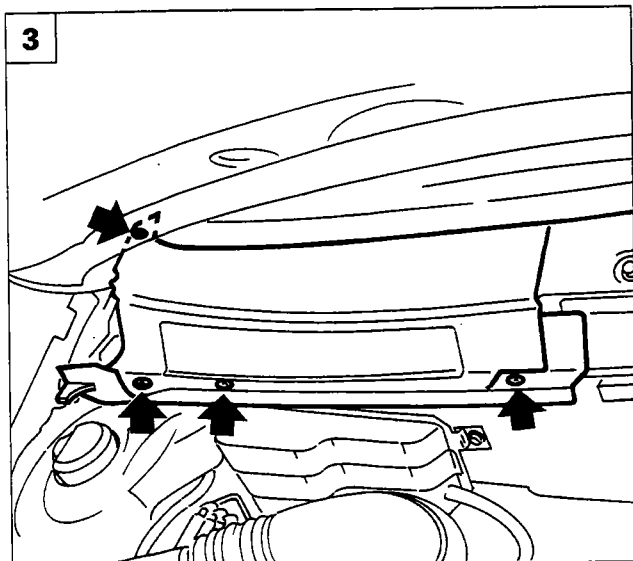
P4A03DX04



P4A05DX04



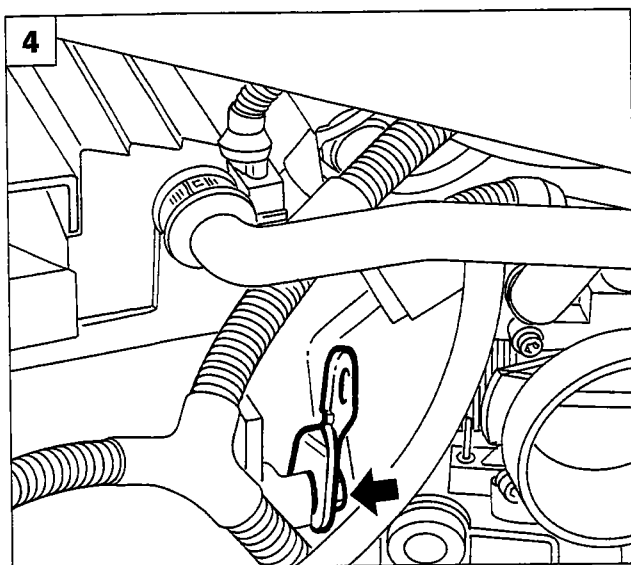
P4A023B03



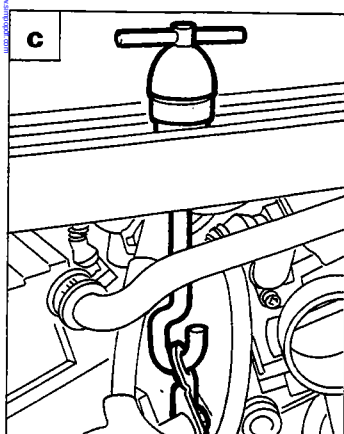
P4A023B04



1. Disconnect the Lambda probe connection.
2. Lift the protective cover, then remove the windscreen wiper arm by undoing its attachment nut.
3. Remove the right side cover from the anti-pollen filter; to facilitate removal, undo the screws of the left side cover.
4. Place a suitable supporting hook at the point shown in the figure, to hook the power unit on to during removal of the gearbox.



P4A051B01

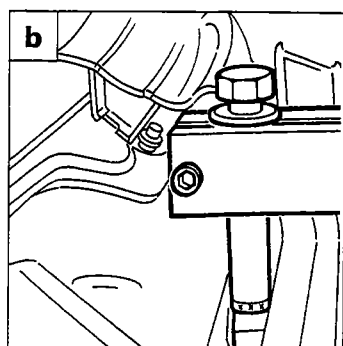


P4A052B02

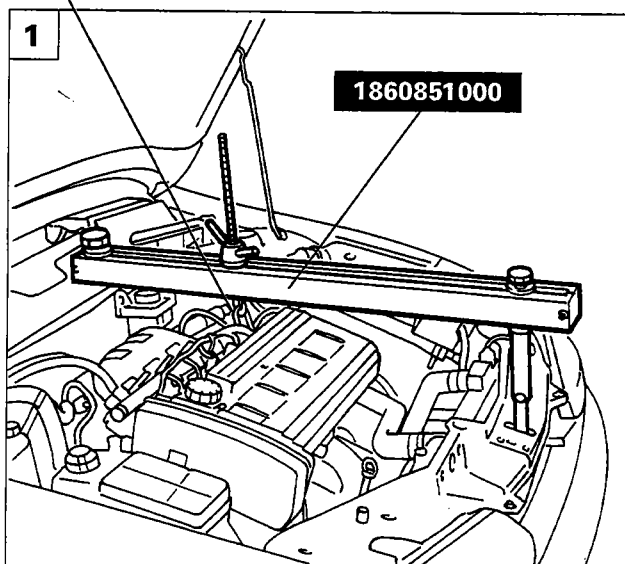


1. Position the engine support stand 1860851000 and adaptor 1860851001 in the mounting points.

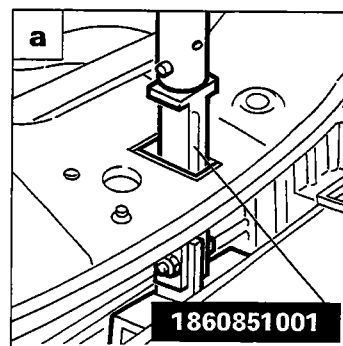
- a. Front mounting: insert the tool in the seat of the safety catch so that it rests on the front crossframe.
- b. Rear mounting: position the tool level with the central reinforcement of the fire-proof bulkhead.
- c. Secure the hook of the support stand to the eyelet previously fitted level with the thermostat.



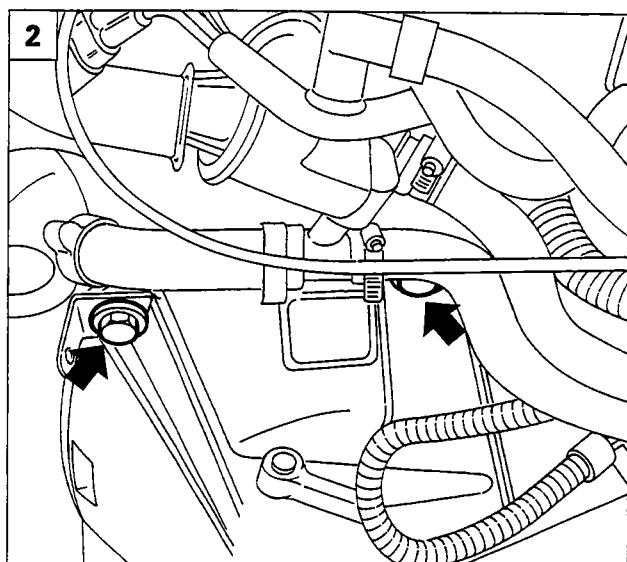
P4A006B06



P4A052B01



P4A006B05



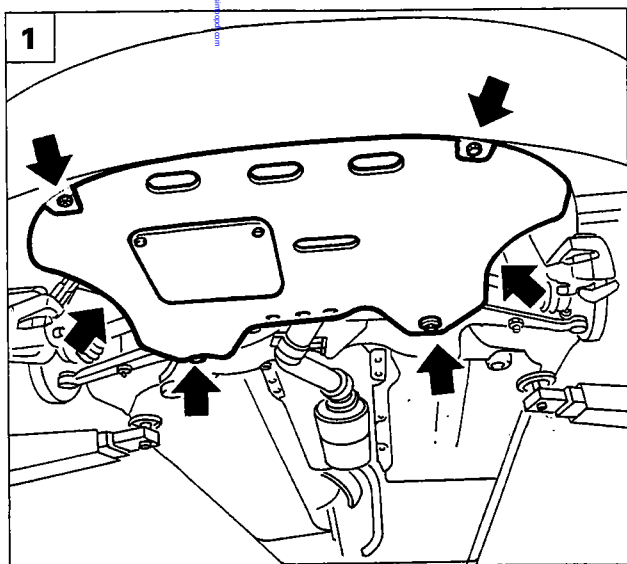
P4A052B03

2. Remove the gearbox top bolts.

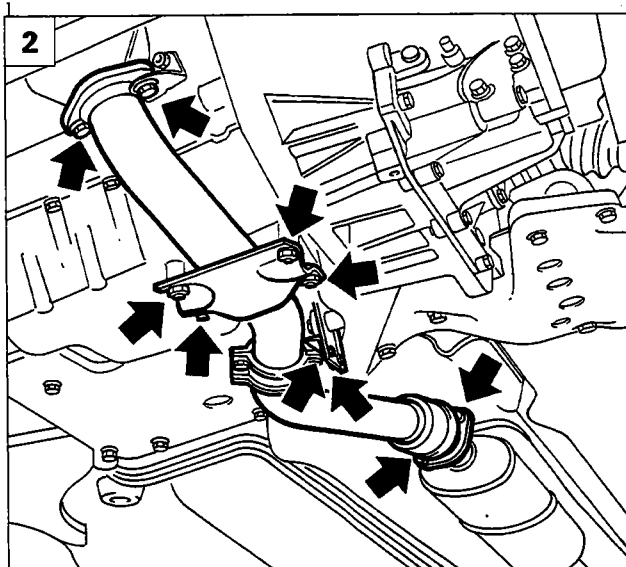
Gearbox and differential

Removing-refitting

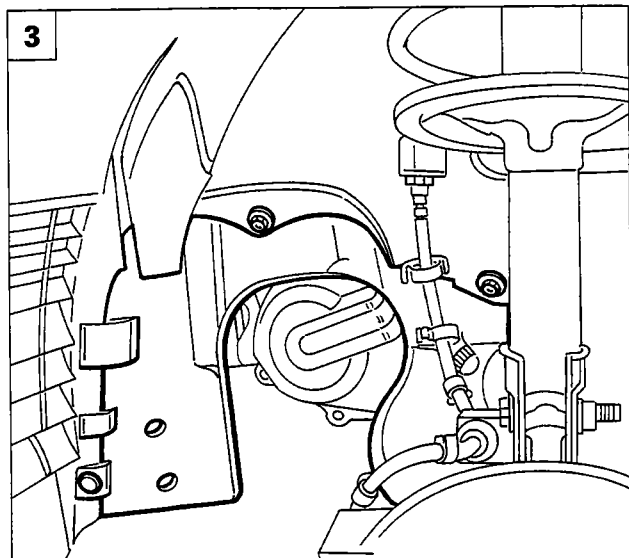
21-27.



P4A04DX03



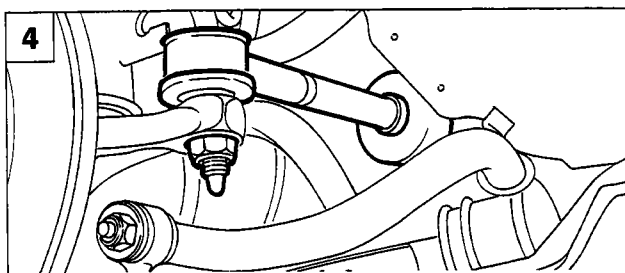
P4A07DX05



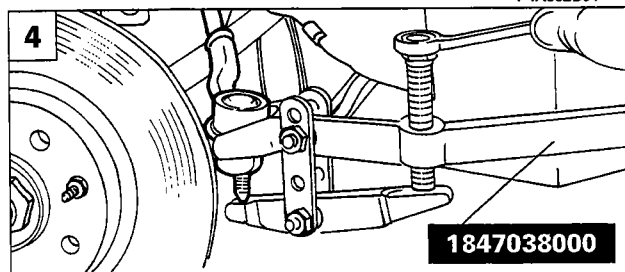
P4A003B01



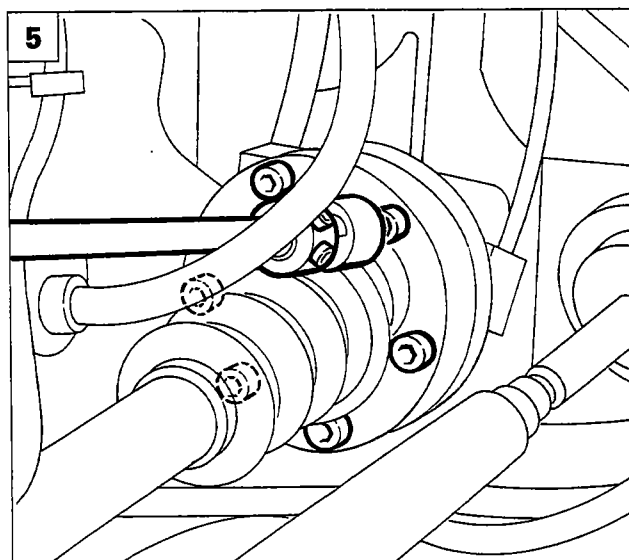
1. Remove the engine bay bottom guard.
2. Disconnect the first section of the exhaust pipe by undoing the attachments shown in the figure.
3. Remove the wheelarch trim on the gearbox side and timing gear side.
4. Disconnect the tie-rod end from the vertical link (gearbox side and timing gear side) using the puller 1847038000.
5. Undo the bolts securing the left drive shaft flange.



P4A002B04

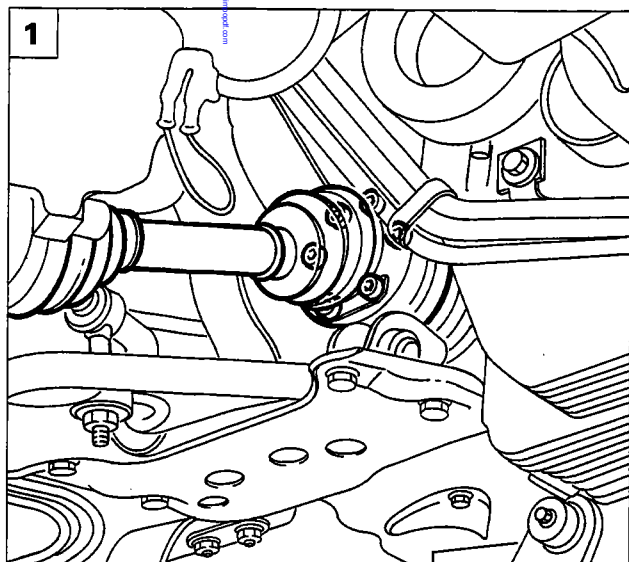


P4A002B05

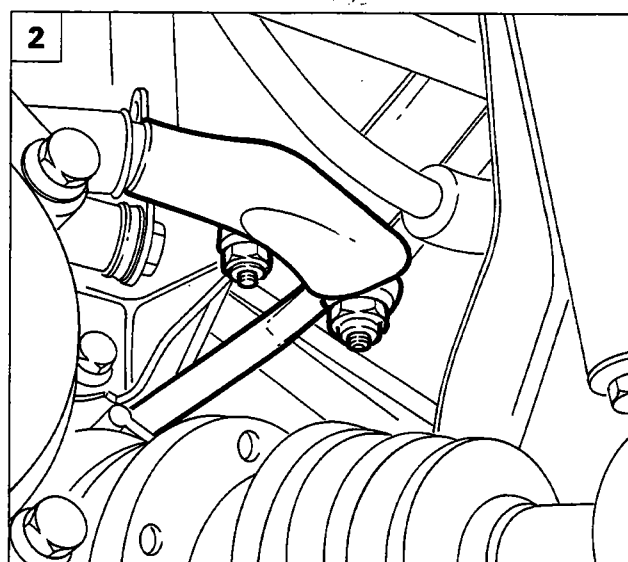


P3U053B01

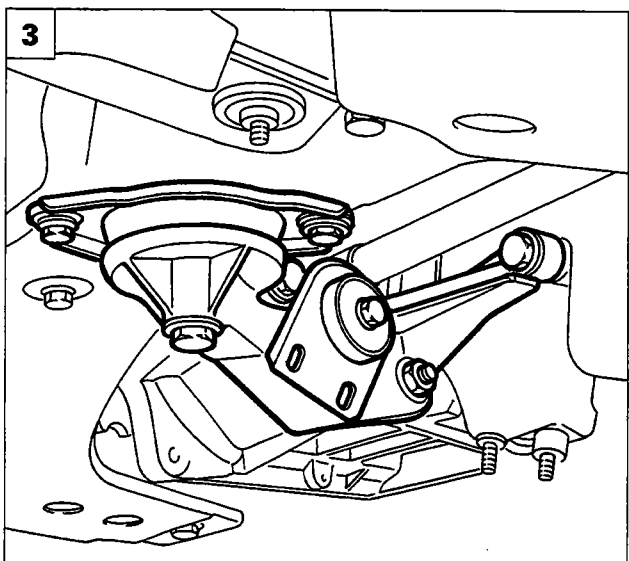
21-27.



P4A08DX04



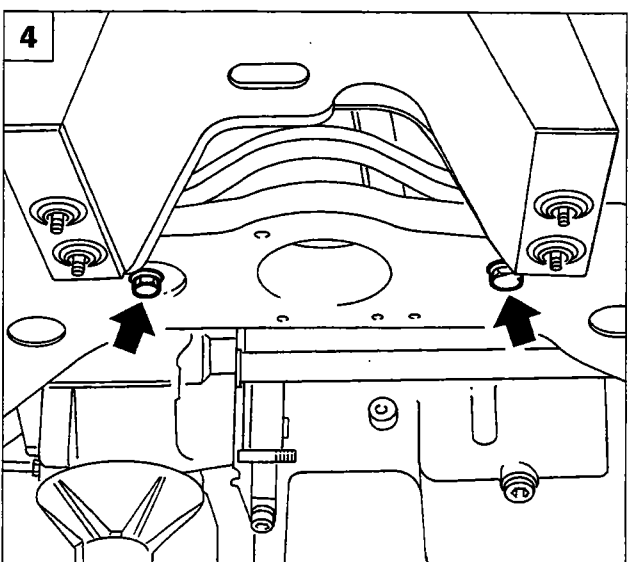
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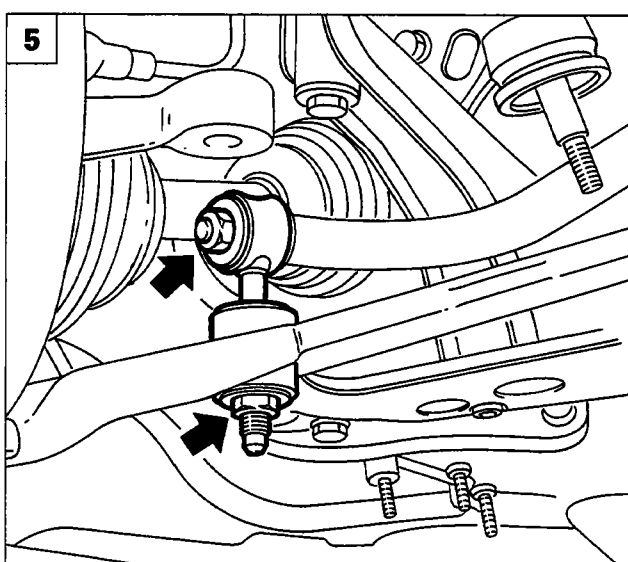
P4A09DX02



1. Undo the bolts securing the right drive shaft flange.
2. Disconnect the gear selector and engagement rods accessible from the wheelarch on the gearbox side.
3. Remove the power unit central mounting.
4. Remove the bolts securing the power steering gear to the crossframe. Secure the steering gear to the body shell.
5. Disconnect the links between the anti-roll bar and wishbone (left and right sides) to permit the subsequent removal of the front crossframe.



P4A09DX03

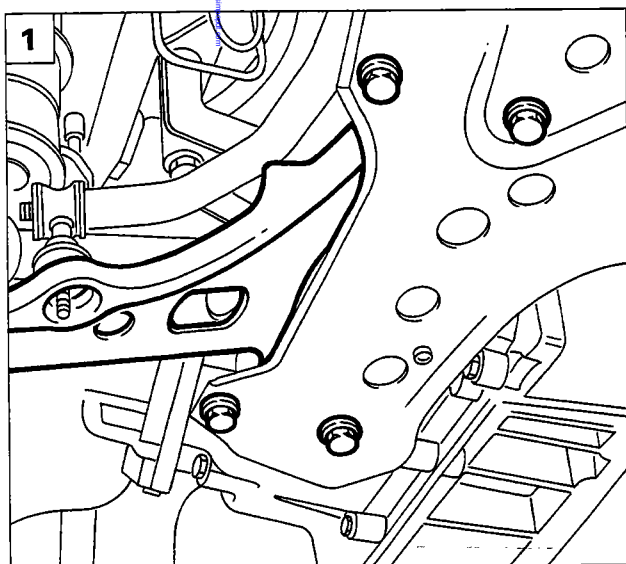


P4A09DX04

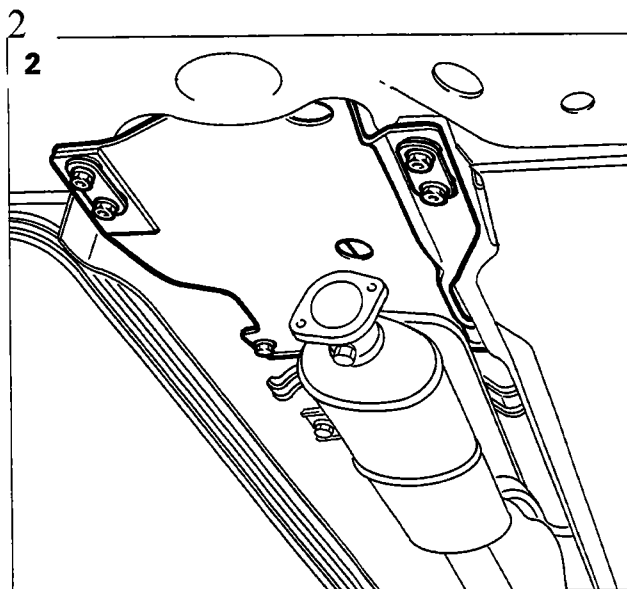
Gearbox and differential

Removing-refitting

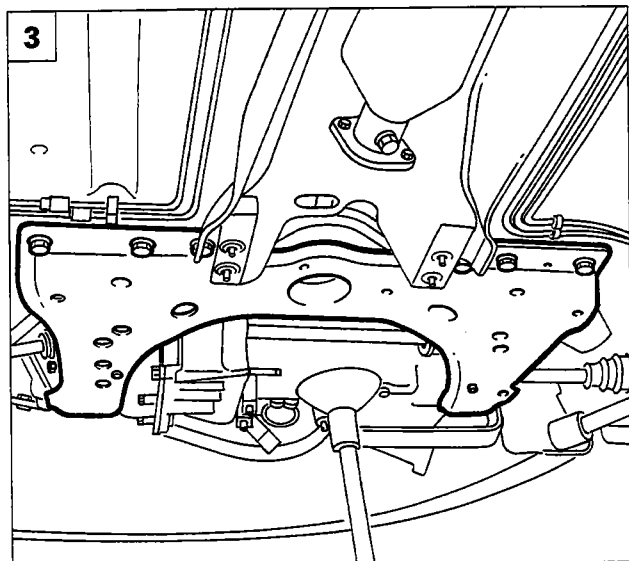
21-27.



P4A10DX01



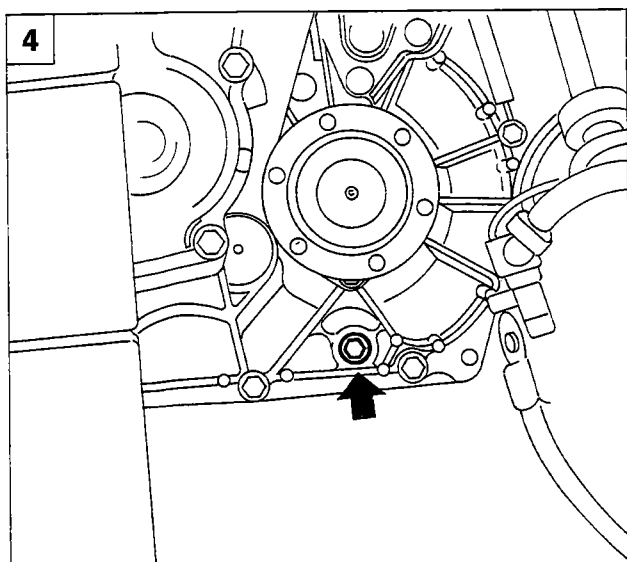
P4A10DX02



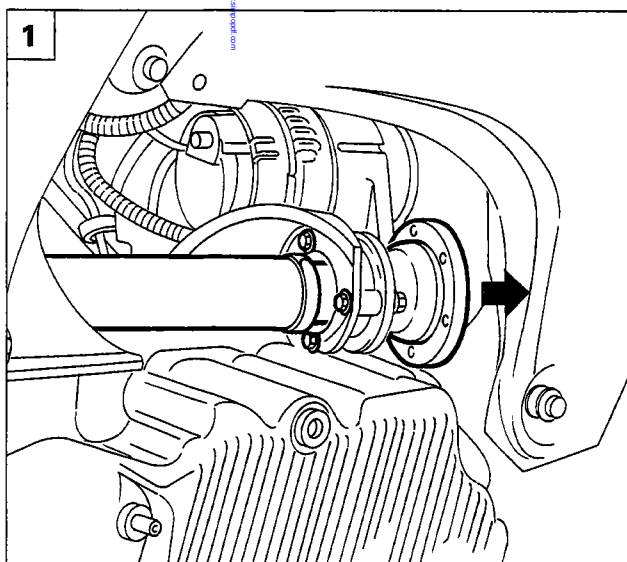
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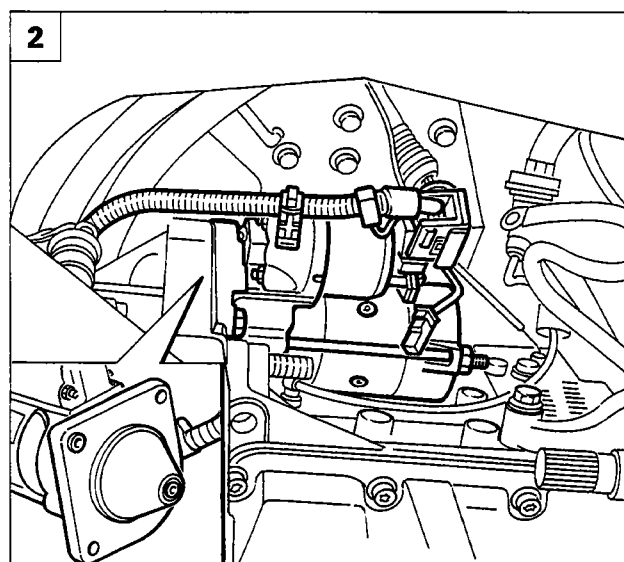
1. Undo the bolts securing the wishbone (right and left sides) to the front cross-frame; rotate the wishbone as appropriate to release it from the crossframe.
2. Remove the nuts shown in the figure on the heat shield to permit the subsequent withdrawal of the front crossframe. If necessary, shim the shield to keep it raised off the bodywork and so facilitate the withdrawal of the crossframe.
3. Undo the bolts securing the front cross-frame to the body shell; first remove the rear bolts and then the side bolts with the help of an assistant, and finally withdraw the crossframe complete with anti-roll bar.
4. Drain the gearbox oil then by undoing the plug shown in the figure.



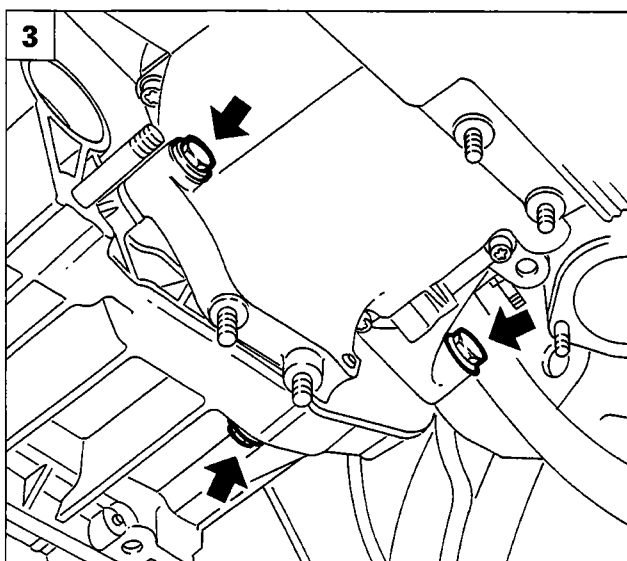
P4A041B01



P4A041B02



P4A042B01



P4A056B01



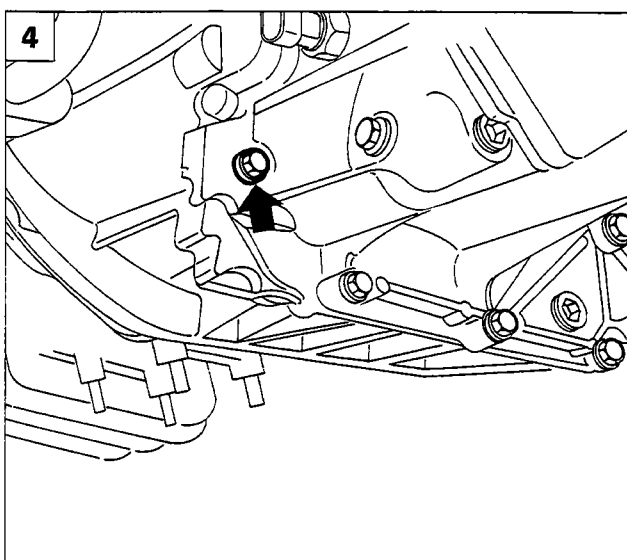
1. Undo the bolts securing the intermediate shaft to the engine, release it from the gearbox and move it away from the working area, securing it in an appropriate manner.

2. Remove the starter motor by undoing its bolts.

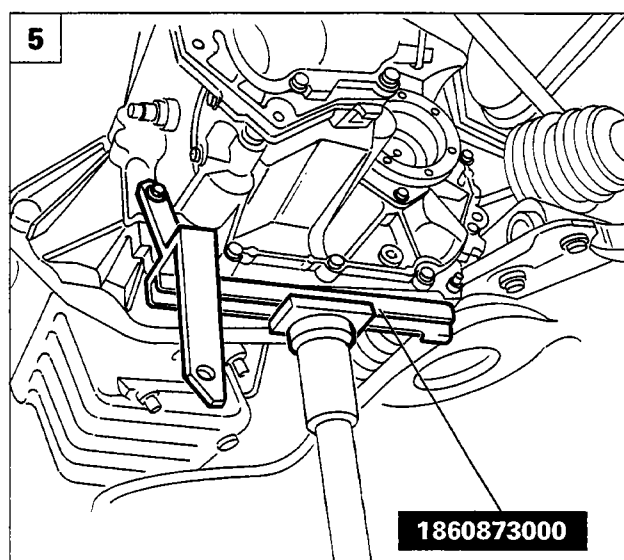
3. Remove the bottom bolts securing the gearbox to the power unit.

4. Undo the bolt shown in the figure from the bellhousing, to permit installation of the gearbox support tool.

5. Place the gearbox support tool 1860873000 on a hydraulic jack, then secure it to the gearbox as shown in the figure.



P4A026B01

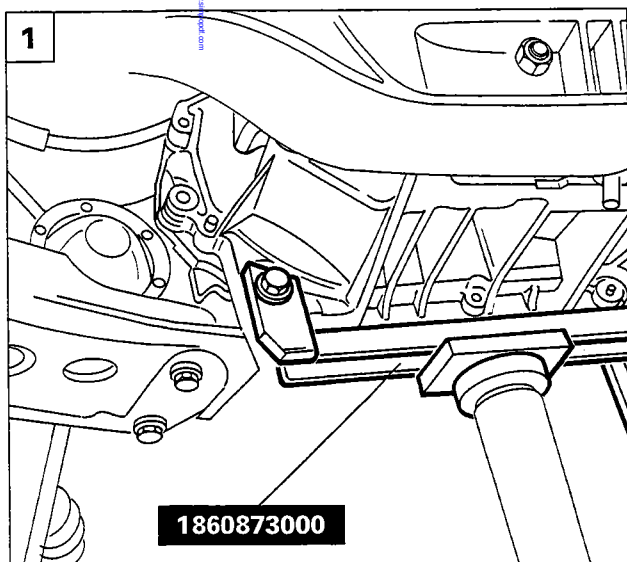


P4A007B02

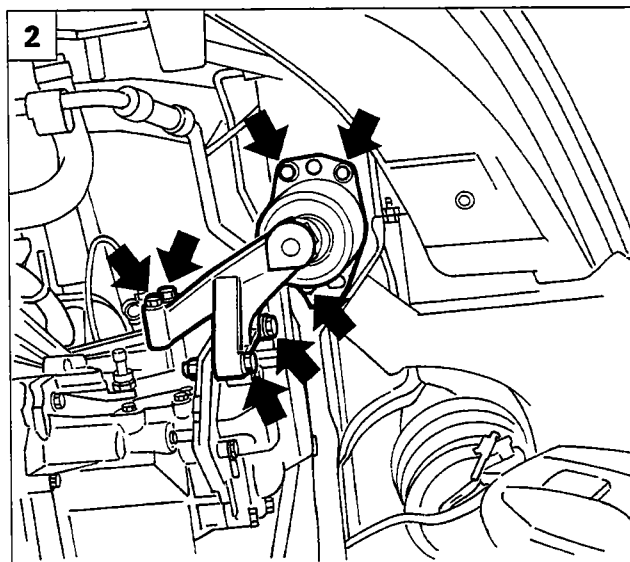
Gearbox and differential

Removing-refitting

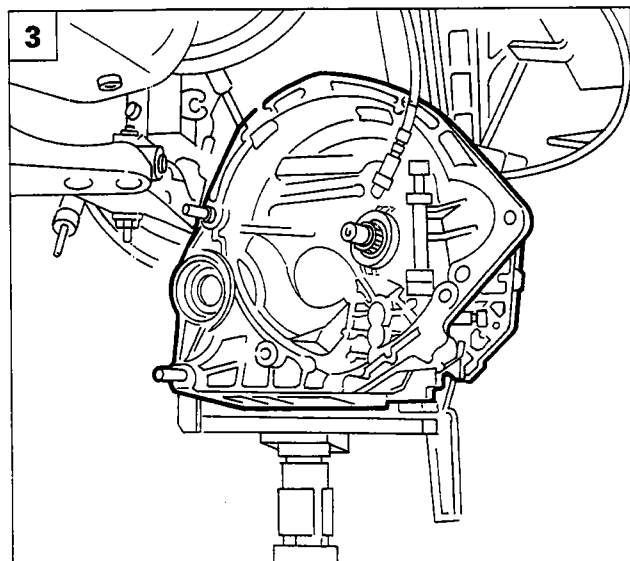
21-27.



P4A026B03



P4A041B04



P4A057B01



1. Rear attachment of gearbox support tool 1860873000.
2. Remove the engine mounting, gearbox side.
3. Manoeuvre the hydraulic jack as appropriate in order to disengage the gearbox from the attachment studs and surrounding parts. Gradually lower the jack and withdraw the gearbox.

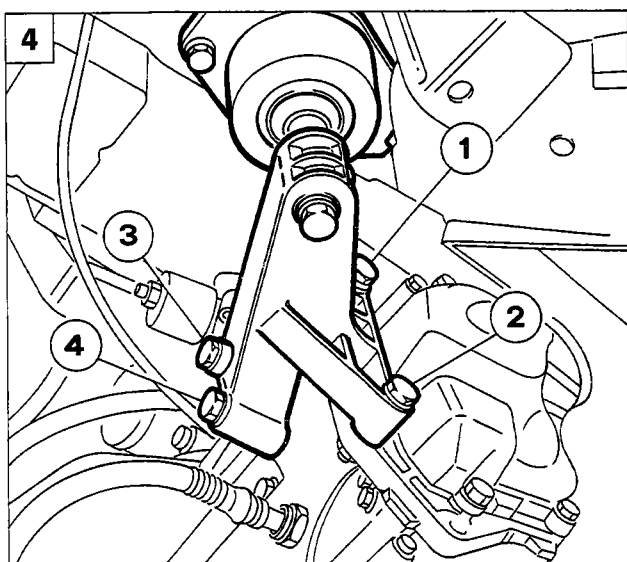
Refitting

4. When fitting the engine mounting, gearbox side, to avoid creating stresses on the sealing surfaces between the mounting and the gearbox, resulting in deformation and subsequent oil leak, closely follow the bolt tightening sequence below:
 - Tighten bolts (1) and (2) to a preliminary torque di 0.5 daNm;
 - Tighten bolts (3) and (4) to a preliminary torque of 0.5 daNm, then tighten to the specified torque;
 - Tighten the bolts (1) and (2) to the specified torque.

For the remaining refitting operations, reverse the procedure described for removal. Before fitting the bellhousing in the car, check that the clutch release bearing is positioned correctly on the gearbox mainshaft.



The oil level in the gearbox must be 9 mm below the oil filler plug hole.



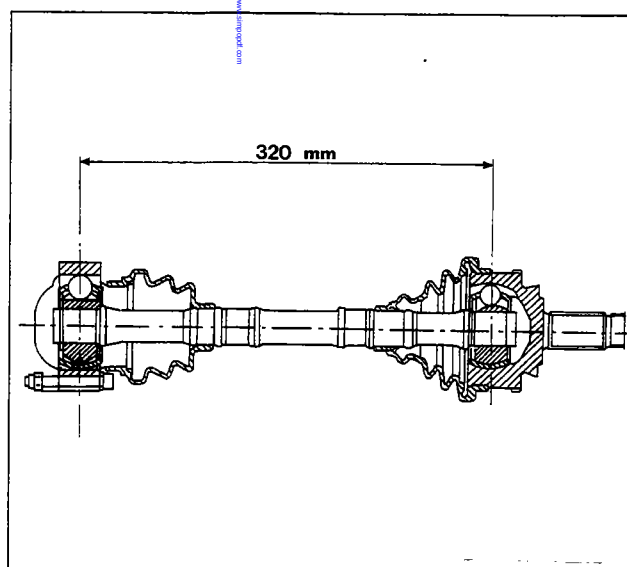
P4A043B01

Gearbox and differential

Drive shafts Remote control assembly

21-27.

Bravo-Brava



P4A058B01



REMOVING-REFITTING AND DISMANTLING DRIVE SHAFTS

To remove/refit and dismantle the drive shafts, refer to the procedure described for the 1747 16V engine, with the difference that drive shafts on the 1998 20V engine do not have the damping weight.

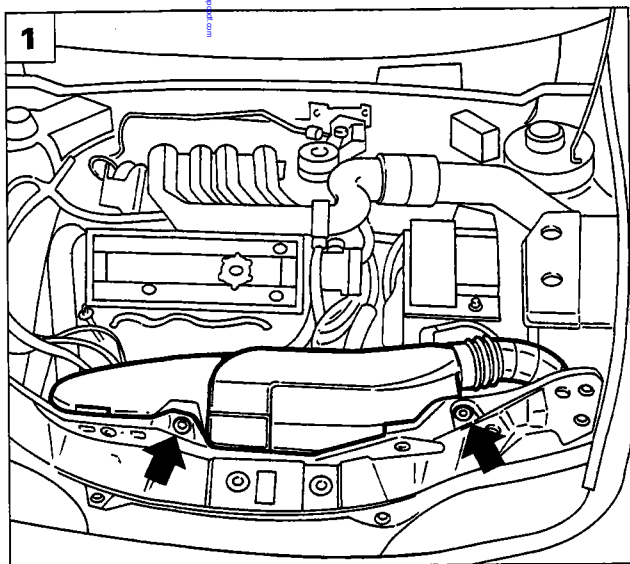
General view of drive shaft - constant velocity joint couplings and distance between the joint centres.

REMOVING-REFITTING INTERMEDIATE SHAFT

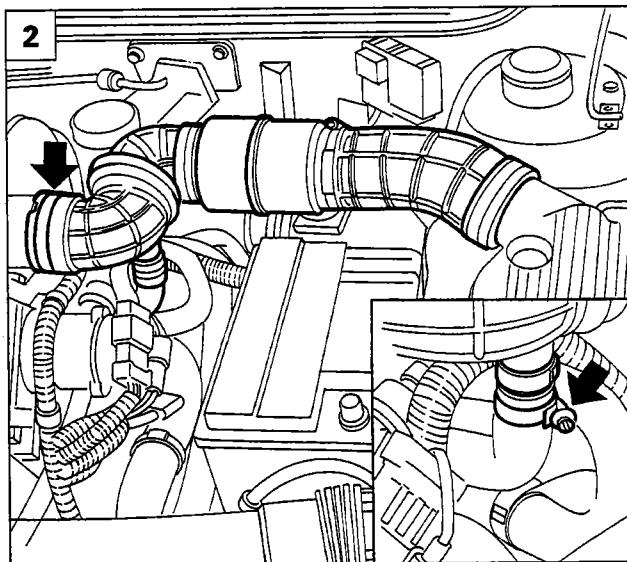
To remove and refit the intermediate shaft, refer to the instructions given for the 1747 16v engine.

REMOVING-REFITTING REMOTE CONTROL ASSEMBLY

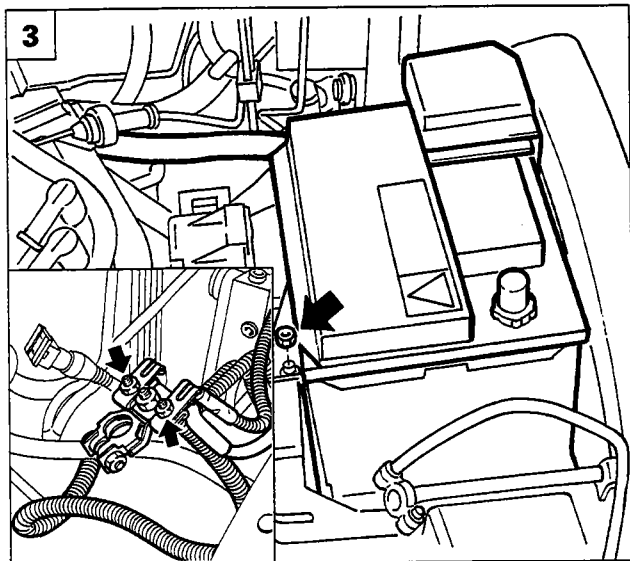
To remove and refit the gearbox remote control assembly, refer to the instructions given for the 1581 16V engine.



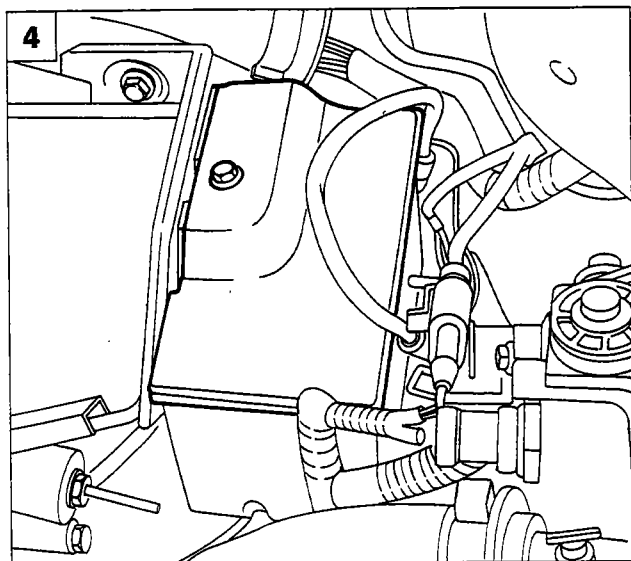
P4A01DJ01



P4A01EX02



P4A01CX04



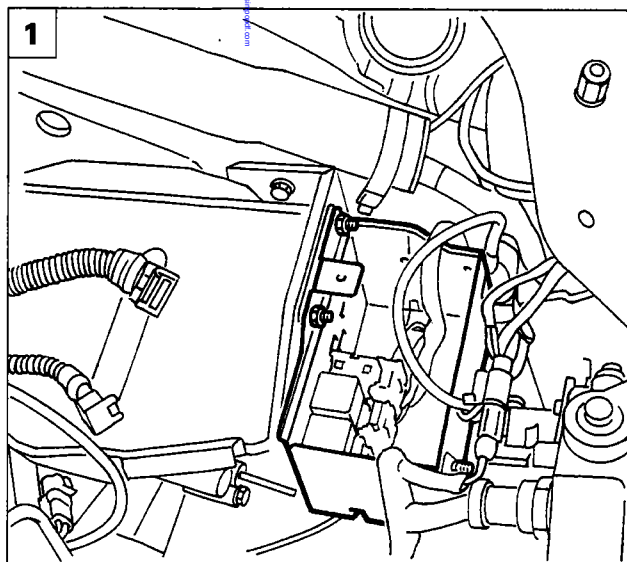
P4A01EX04

REMOVING-REFITTING

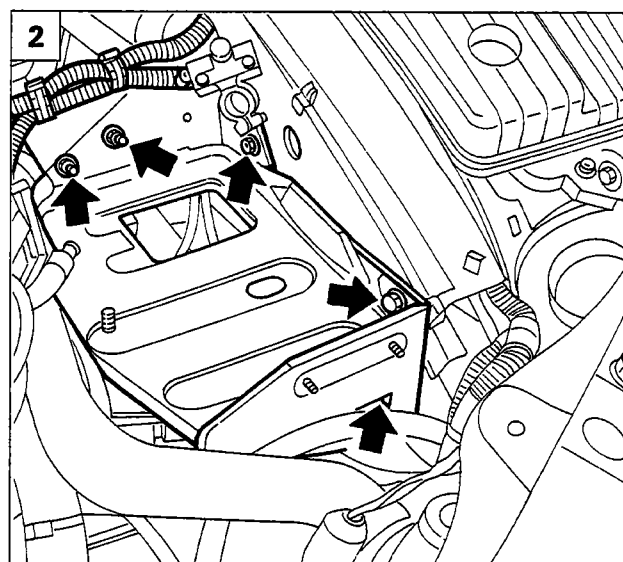
Place the car on ramps, disconnect the battery's negative terminal, remove the front wheels and then proceed as described below:

1. Disconnect air inlet duct by undoing the bolts shown in the figure, securing it to the front crossframe.
2. Remove the air inlet duct complete with resonator by undoing the clips shown in the figure, making sure to disconnect the pipe shown in the detail.
3. Lift the protective cover from the battery's positive pole and disconnect it, then remove the battery by undoing the nut and the attachment bracket shown in the figure. Also undo the nuts securing the cables shown in the detail, leading to the positive terminal.
4. Remove the fuse and relay box cover by undoing the bolt indicated.

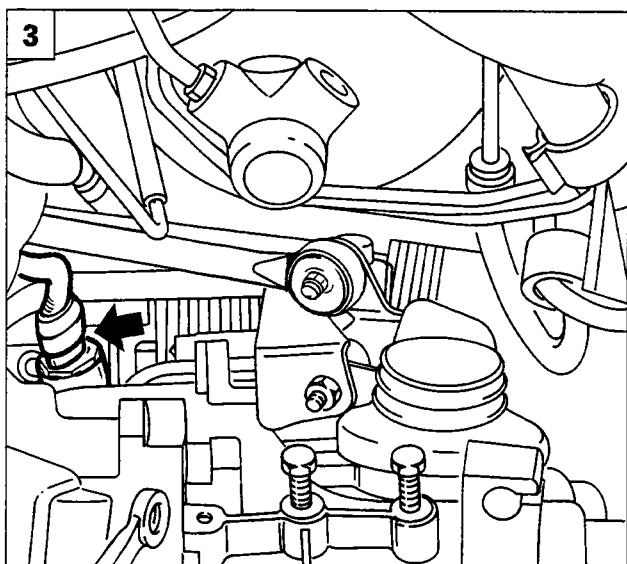
21-27.



P4A02EX01



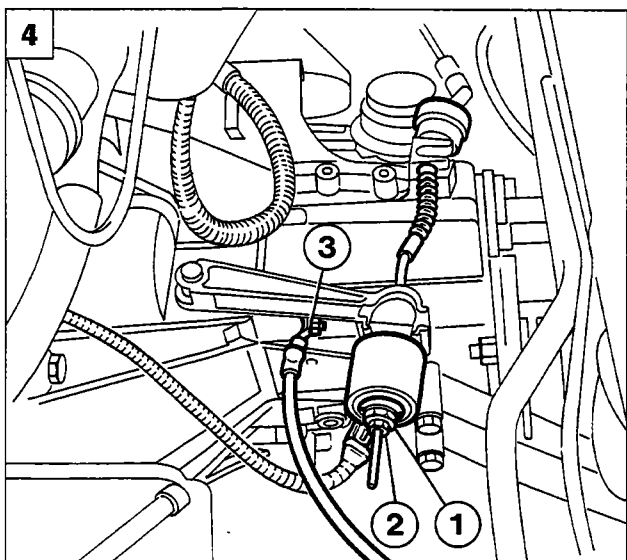
P4A02EX02



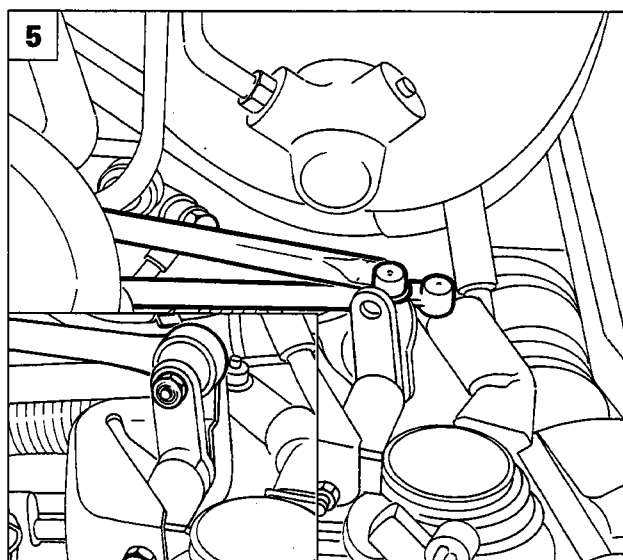
P4A060B01



1. Remove the nuts securing the fuse and relay box to the battery cage, then move the box over to one side.
2. Remove the battery cage by undoing the bolts shown in the figure; also undo the nuts securing the mounting bracket for the starter motor supply cables.
3. Disconnect the speedometer sensor connector.
4. Disconnect the clutch cable by undoing the nut (1) and locknut (2) shown in the figure. Also disconnect the earth lead (3) from the gearbox.
5. Disconnect the reaction link shown in the detail and the gear selector engagement rods from the gearbox.



P4A021B02

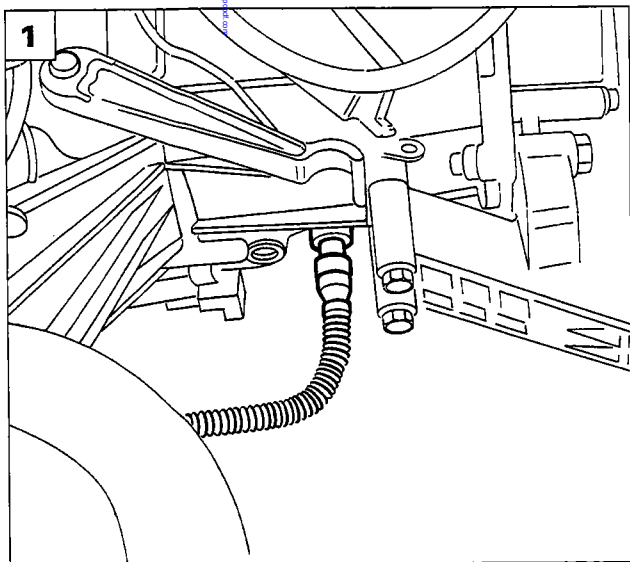


P4A040B02

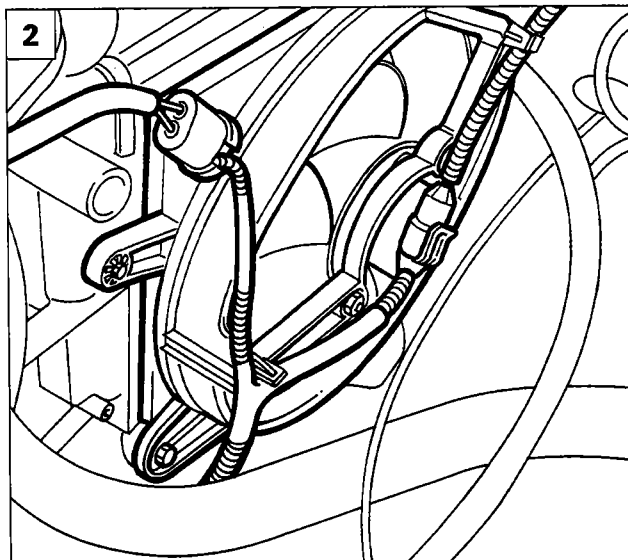
Gearbox and differential

Removing-refitting

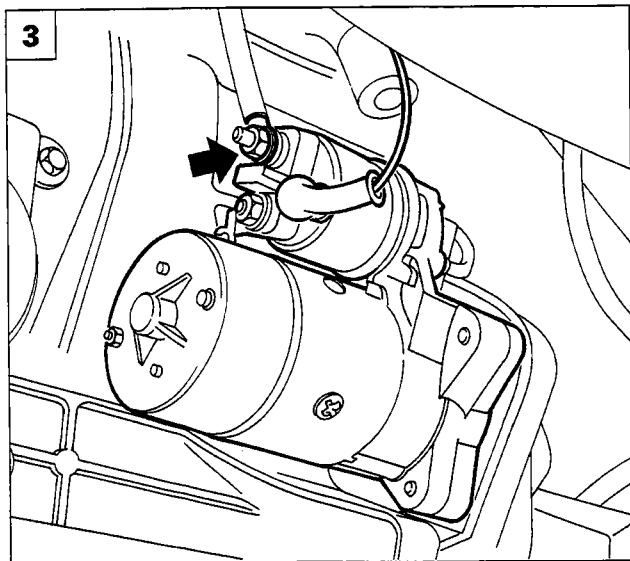
21-27.



P4A022B01



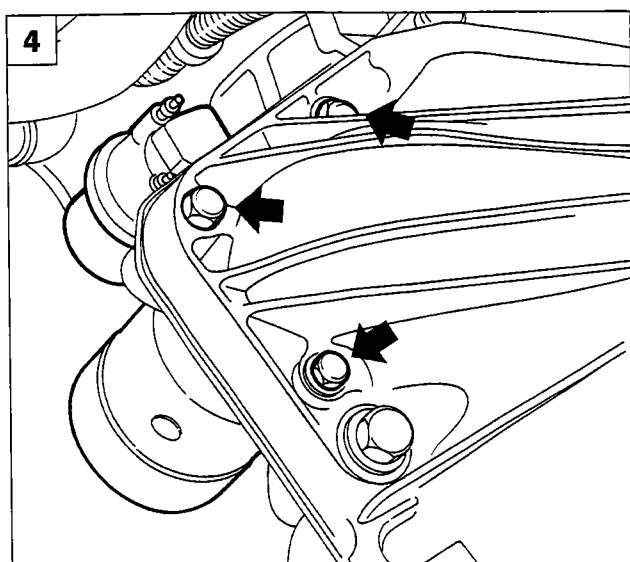
P4A04EX03



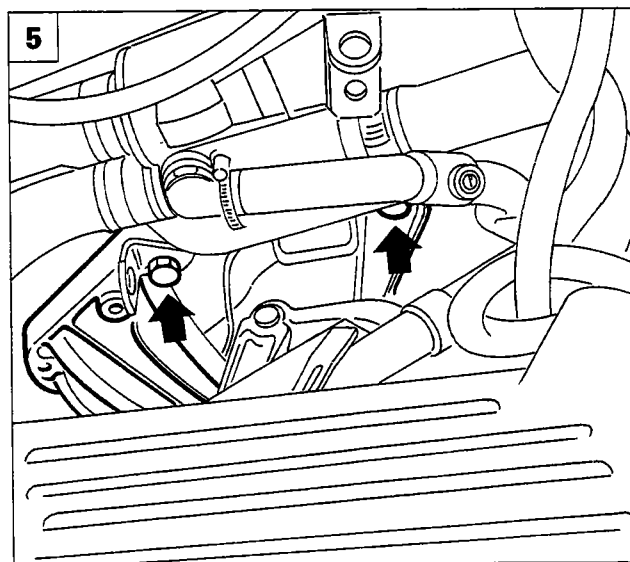
P4A022B02



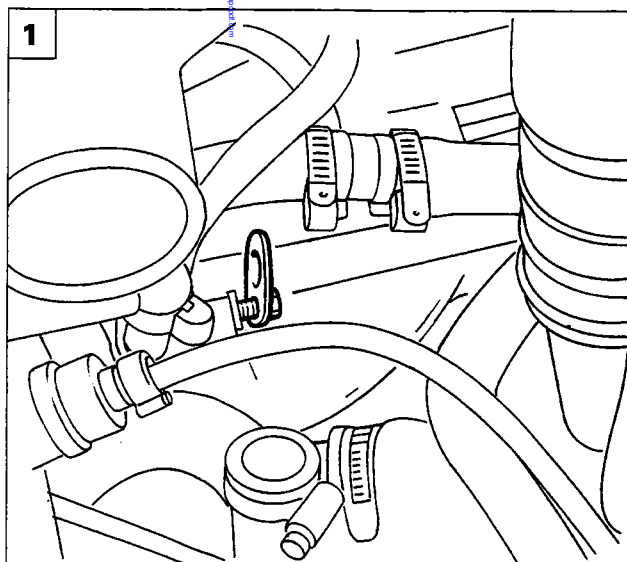
1. Disconnect the reversing lights switch connector from the gearbox.
2. Disconnect the fan supply connections, then remove the fan by undoing its attachment bolts.
3. Disconnect the starter motor supply cables.
4. Remove the starter motor by undoing the bolts shown in the figure.
5. Remove the gearbox top attachments.



P4A022B03

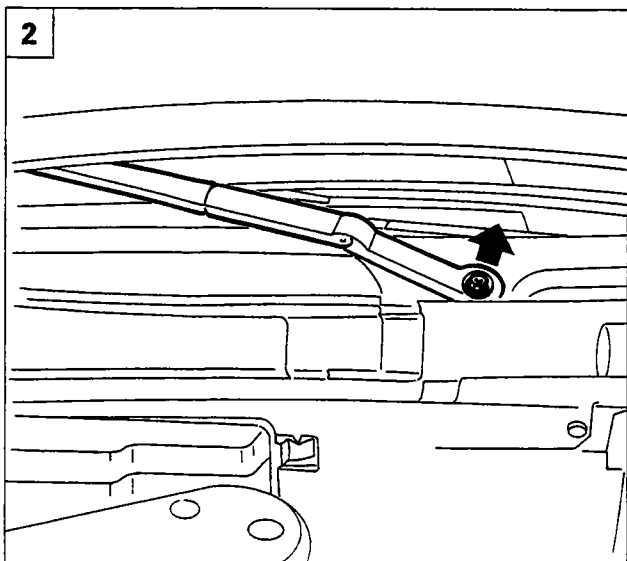


P4A023B01



P4A062B01

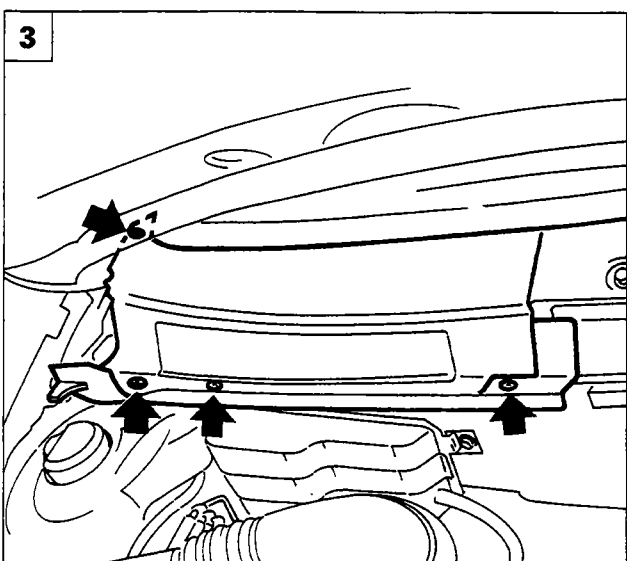
1. Remove one exhaust manifold nut and fit a suitable hook for supporting the power unit during removal of the gearbox.



P4A023B03



2. Remove the nut securing the right windscreen wiper arm after removing its protective cover.



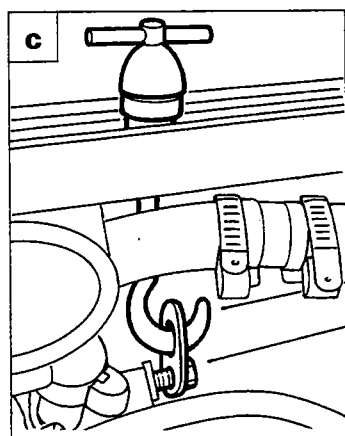
P4A023B04

3. Remove the right side cover from the anti-pollution filter by undoing the screws illustrated, and slacken the screws on the right side cover to allow the power unit support stand to be installed.

Gearbox and differential

Removing-refitting

21-27.



P4A063B01

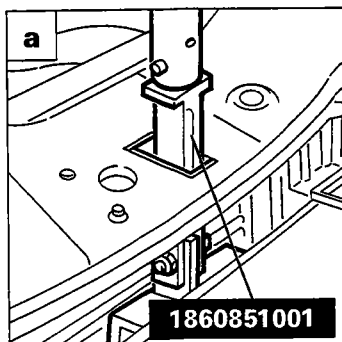


1. Position the power unit support stand 1860851000 and the special adaptor 1860851001 in the appropriate mounting points.

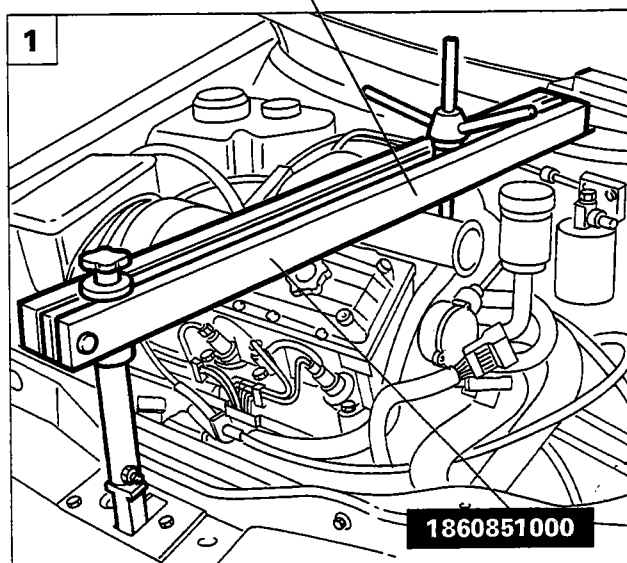
a. Front mounting: insert the tool in the seating of the bonnet catch, so that it rests on the front crossframe.

b. Rear mounting: position the tool level to the central reinforcement of the fire-proof bulkhead.

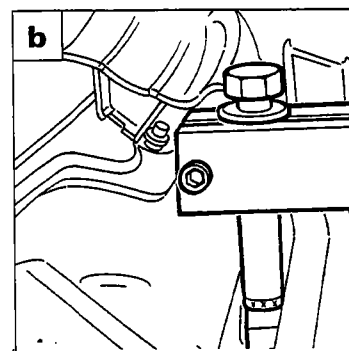
c. Secure the hook of the stand to the eyelet previously installed level with the exhaust manifold attachments.



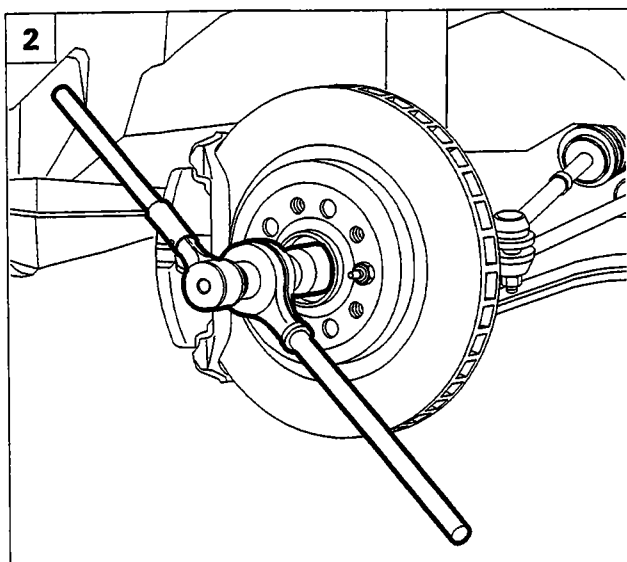
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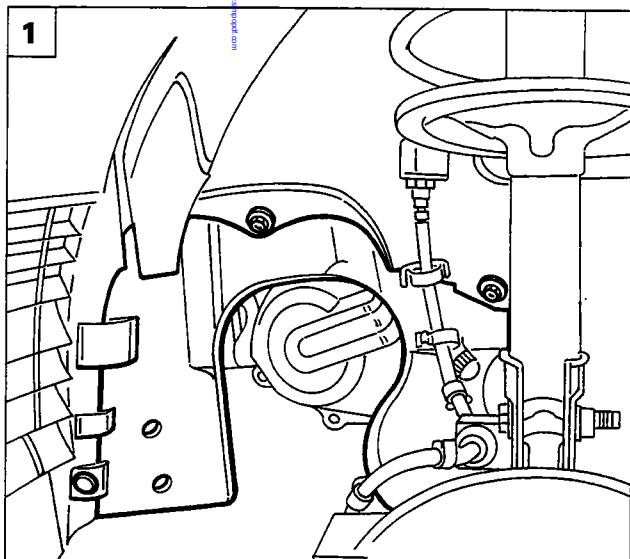


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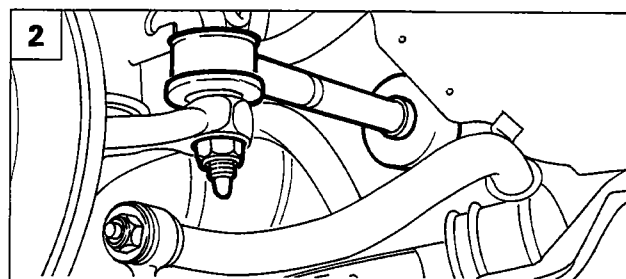


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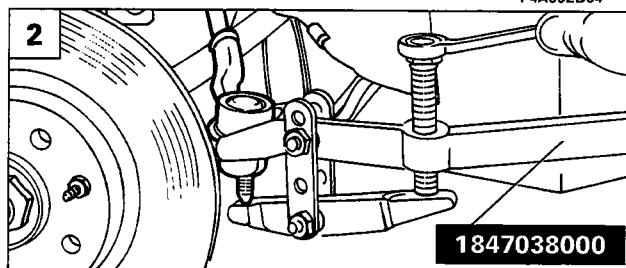
2. Relieve the staking and then remove the hub nut (gearbox side and timing gear side).



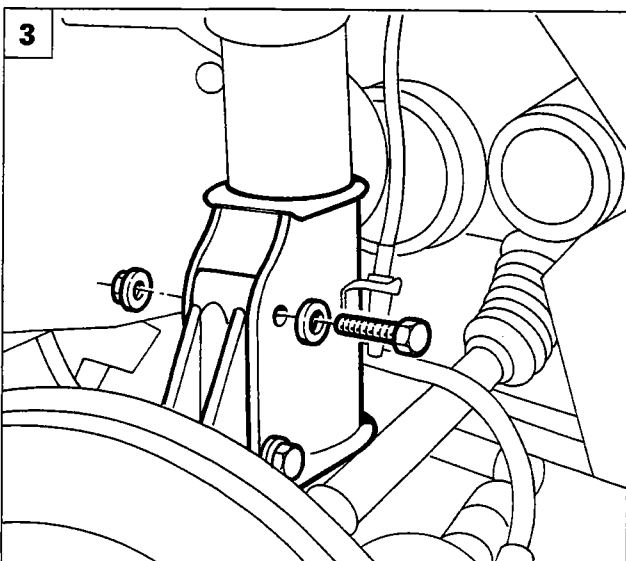
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P4A002B04



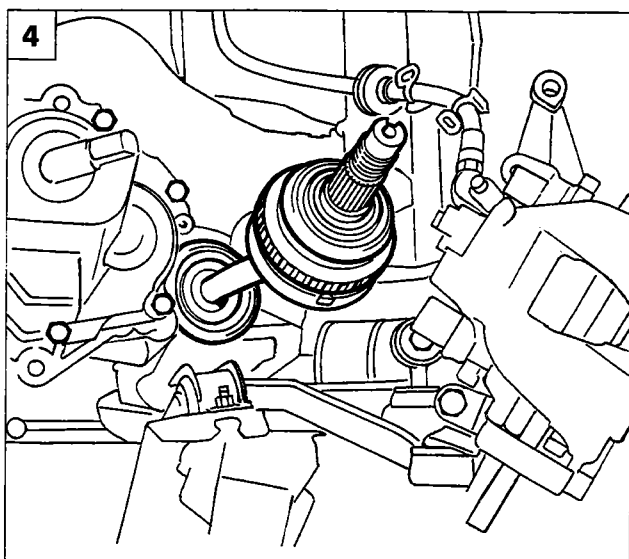
P4A002B05



P4A003B05



1. Remove the plastic protection from the wheelarch on the gearbox side by undoing the bolts and the button shown in the figure. To withdraw the protection, also disconnect the brake pad wear sensor connection (repeat the procedure on the other side).
2. Remove the nut securing the tie-rod end to the vertical link, then withdraw the tie-rod end from the vertical link arm using puller 1847038000 (repeat the procedure for the other tie-rod end).
3. Remove the bolts securing the vertical link (gearbox side and timing gear side) to the damper.
4. Rotate the vertical link as appropriate to withdraw the drive shaft from the wheel hub (repeat the procedure for the other drive shaft).

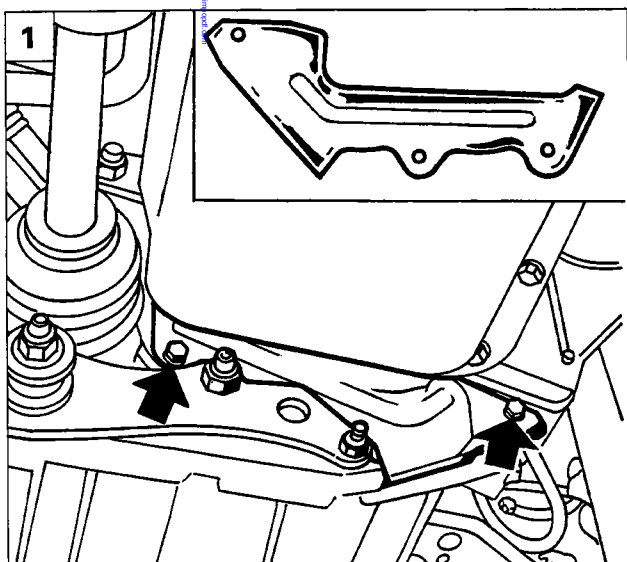


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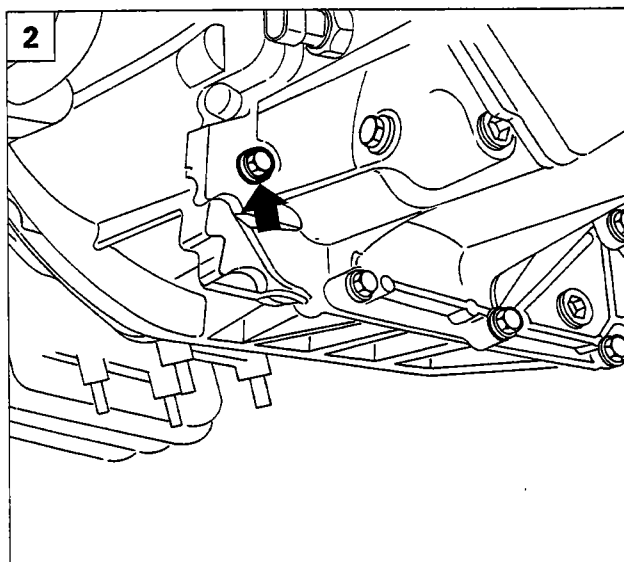
Gearbox and differential

Removing-refitting

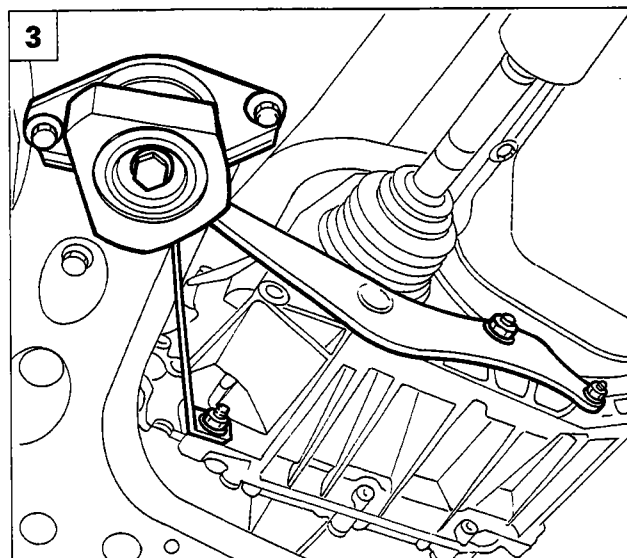
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P4A11EX04



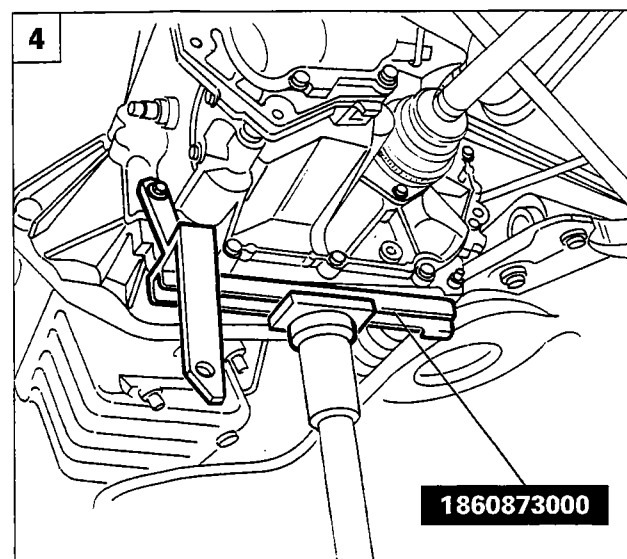
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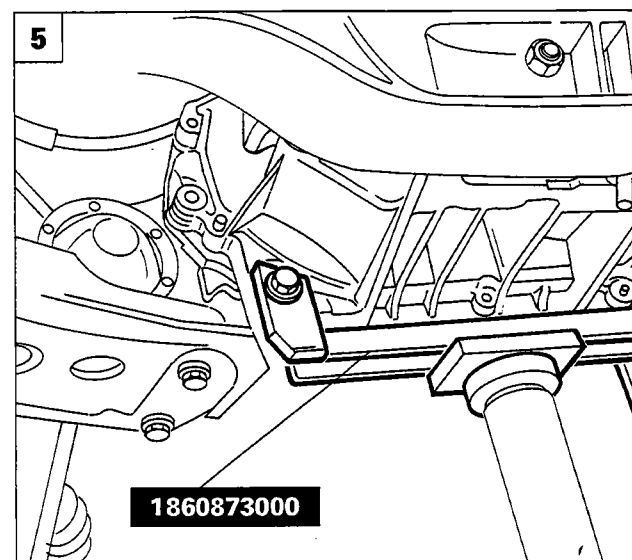
P4A07EX01



1. Remove the bottom flywheel guard from the bellhousing.
2. Undo the bolt shown in the figure on the bellhousing, to enable the gear support tool to be installed.
3. Remove the power unit central mounting to enable the gear support tool to be subsequently installed.
- 4-5. Place the gear support tool 1860873000 on the hydraulic jack, then secure it to the gearbox at the points shown in the figure (front view and rear view).



P4A026B02



P4A026B03

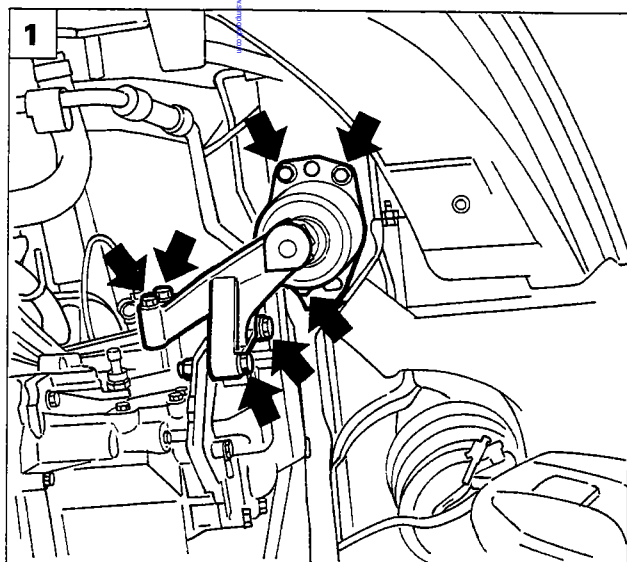
Gearbox and differential

Removing-refitting

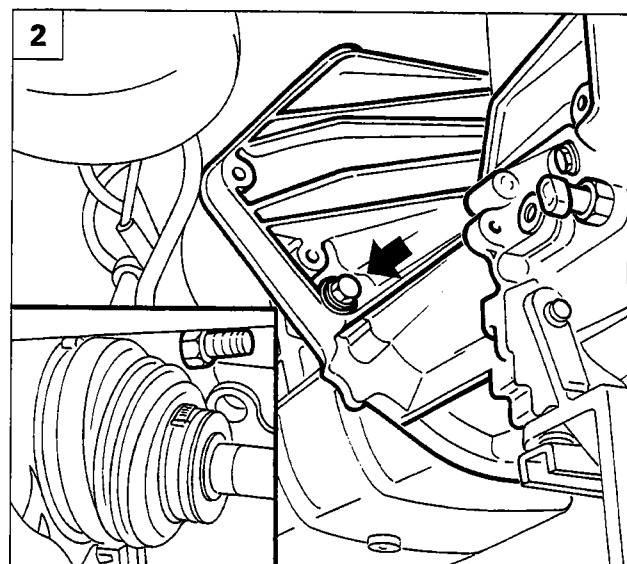
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Bravo-Brava

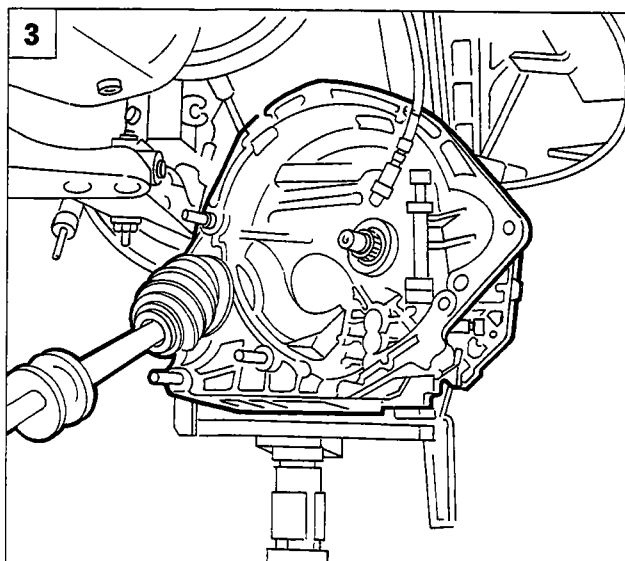
1929 D



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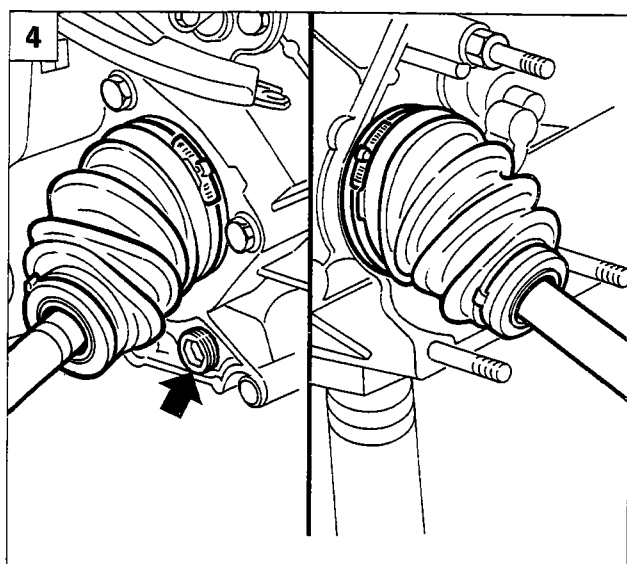
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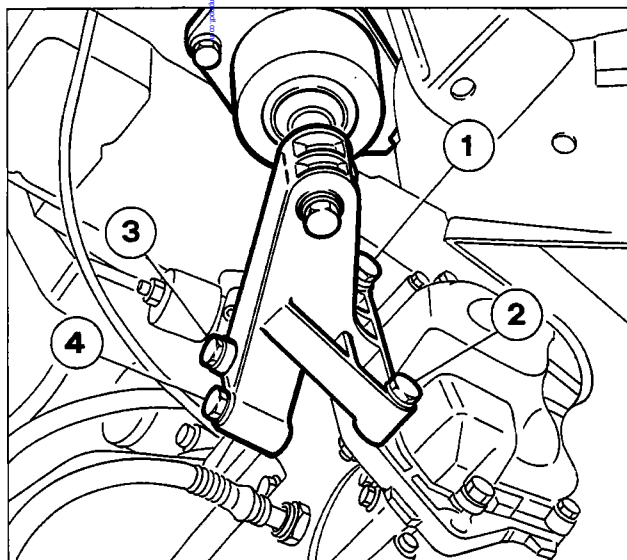
P4A027B03



1. Remove the engine mounting, gearbox side.
2. Remove the bottom bolts securing the bellhousing to the engine block.
3. Manoeuvre the hydraulic jack to disengage the gearbox from the attachment studs and surrounding components. Gradually lower the jack and withdraw the gearbox complete with drive shafts. If this operation proves difficult, remove the attachments securing the first section of the exhaust pipe to the manifold, to allow the engine to move forwards and so facilitate withdrawal of the gearbox.
4. If the gearbox has to be overhauled, drain the oil by undoing the plug indicated, and disconnect the two drive shafts by removing the gaiter clips.



P4A027B04



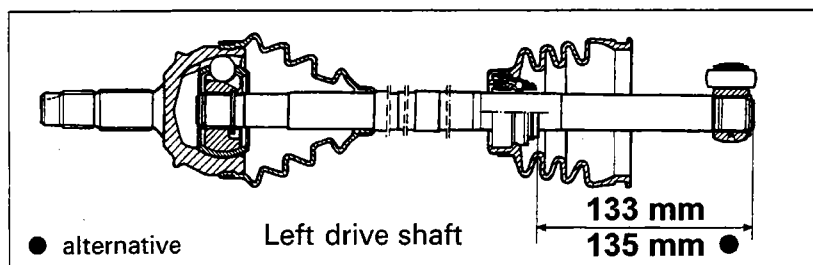
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Refitting

When refitting the engine mounting on the gearbox side, to avoid creating stresses on the gearbox sealing surfaces resulting in deformation and oil leaks, strictly observe the following tightening sequence of the attachment bolts:

- Lightly tighten bolts (1) and (2) to an initial torque of 0.5 daNm;
- Lightly tighten bolts (3) and (4) to an initial torque of 0.5 daNm, then tighten them to the specified torque;
- Tighten bolts (1) and (2) to the specified torque.

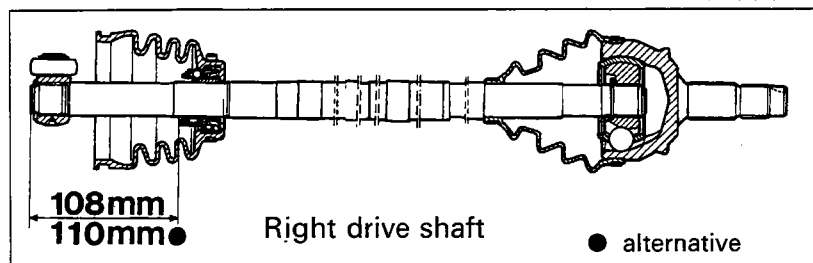
For the remaining refitting operations, reverse the procedure described for removal. To fit the clutch release bearing and bellhousing to the car, refer to the instructions for refitting the gearbox of the 1370 12V engine.



P4A029B01

REMOVING-REFITTING DRIVE SHAFTS

To remove and refit the drive shafts, refer to the procedure described for the 1370 12V engine, with the difference that the drive shafts are secured to the gearbox-differential unit by retaining clips and the tripod joint is inserted directly in the differential.



P4A067B01

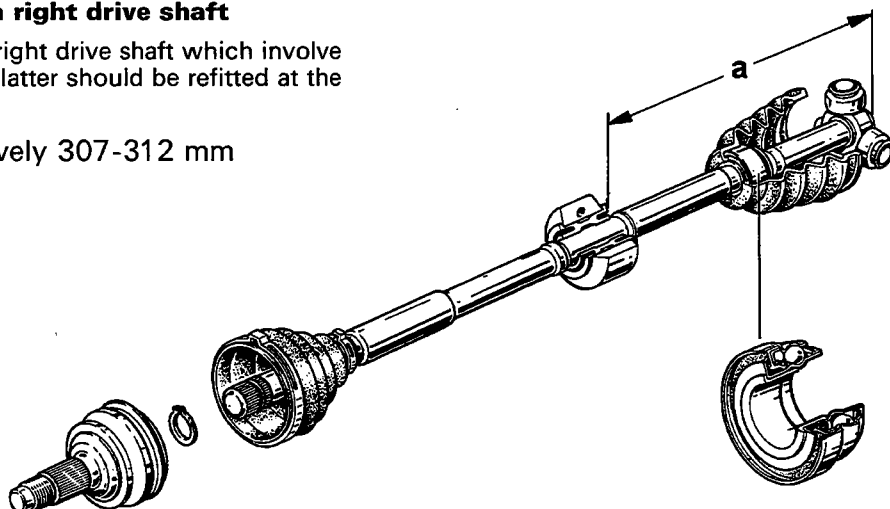
DISMANTLING-REASSEMBLY

Refer to the dismantling of the drive shaft described for the 1581 16V engine. To fit the differential casing oil sealing bearing, refer to the figure opposite.

Position of damping weight on right drive shaft

In the case of interventions on the right drive shaft which involve removing the damping weight, the latter should be refitted at the distance specified in the figure.

a = 305-310 mm or alternatively 307-312 mm



P4A028B03

BOSCH MOTRONIC M 2.10.4 M.P.I. INTEGRATED INJECTION/IGNITION SYSTEM

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Diagram showing information entering/leaving control unit and injection/ignition system sensors/actuators

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Diagram showing fuel anti-evaporation circuit

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Diagram showing engine exhaust assembly

Location of injection/ignition system components

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Connection of control unit/ignition coils and injectors

FUSES, RELAYS AND EARTH POINTS

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BOSCH MOTRONIC M 2.10.4 M.P.I. INTEGRATED INJECTION/IGNITION SYSTEM**Introduction**

The Bosch Motronic system fitted on the 1998 5 cylinder 20valve engine belongs to the category of digital, inductive discharge, static advance electronic ignition systems integrated with sequential, timed type electronic injection.

This system has only one electronic control unit, a single set of wiring and one set of common sensors. Its function is to inject the exact quantity of petrol into the engine inlet manifold, upstream of the inlet valves, to mix with the air introduced into the cylinder so that the correct mixture strength is obtained.

The Motronic M 2.10.4 system ensures efficient operation making it possible to achieve optimum performance and fuel consumption and to reduce harmful emissions through a response to the different engine operating conditions.

General description of the injection system

The essential conditions which always have to be satisfied in the preparation of the air/fuel mixture for the smooth running of ignition engines are basically two:

1. the metering (air/fuel ratio) should be kept as constant as possible and close to the stoichiometric value, in order to ensure the rapid combustion required to prevent unnecessary fuel consumption;
2. the mixture should be composed of petrol vapours atomized as finely and as uniformly as possible in the air.

In the Bosch Motronic M 2.10.4 system the injector nozzles carry out the task of atomizing the petrol into minute droplets.

Since the absolute pressure of the air drawn may vary, it is necessary to adjust the quantity of petrol to be injected so as not to alter the weight ratio between the air and the petrol.

The constancy of this ratio is obtained by varying the supply pressure of the fuel, by means of a regulator, according to the value of the vacuum of the air in the inlet manifold, so that the difference between the two pressures is constant at all engine operating conditions.

As far as the optimum metering, on the other hand, is concerned, it is calculated according to the following measurements:

- exact quantity of air drawn in by the flow meter (air flow meter);
- engine rotation speed by means of the rpm sensor;
- acceleration required by means of the butterfly valve position sensor;
- temperature of the engine coolant by means of the sensor on the thermostat mounting;
- measuring the oxygen content of the exhaust gases via the Lambda sensor.

This information is processed by a micro-processor in the injection/ignition electronic control unit which determines the basic injection time using values, obtained experimentally, which are stored in a special memory in the above mentioned control unit.

General description of the ignition system

The ignition system is the static advance, inductive discharge type (i.e. without a high tension distributor) with power modules inside the electronic control unit.

The system has a single coil for each spark plug; the advantages of this solution are:

- less electrical overloading
- guarantee of constant discharge at each spark plug

The electronic control unit memory contains the entire series of optimum advance values which the engine can adopt for its operating range according to the engine speed and load conditions.

10.

These values have been obtained experimentally, by means of a long series of practical tests carried out on prototypes at the engine test bench to identify the advances at which it is possible to achieve the best compromise between the conflicting requirements of maximum power and low consumption and harmful exhaust emissions.

The optimum advance values have then been memorized in the system control unit. During the operation of the engine, the control unit is constantly informed of the engine speed and load conditions and, on this basis, it "selects" the advance value from its memory to strike the spark at the spark plug for the cylinder during the explosion stroke with the optimum advance.

In addition the control unit corrects this value depending on further factors such as engine coolant temperature, intake air temperature, detonation and position of the butterfly valve, so that the ignition point is always optimum.

The information required by the control unit to operate the single coils is transmitted by means of electrical signals emitted by the following sensors:

- a. **An rpm sensor** which generates a single phase alternating signal, whose frequency indicates the engine rpm.
- b. **An air flow meter** which, on the basis of the quantity of air drawn in by the engine, transforms this value into an electrical signal, sending it to the electronic control unit.
- c. **An air temperature sensor** which transforms the value of the intake air temperature into an electrical signal, sending it to the electronic control unit.
- d. **Two detonation sensors** which are positioned in the upper part of the crankcase, one between cylinders 1 and 2 and the other between cylinders 4 and 5, allowing the control unit to recognize the cylinder which is detonating (or is in the early stages of detonation) and to correct the ignition advance for the spark plug for the cylinder involved only.
- e. **A butterfly valve position sensor** which transforms the angular value of the actual butterfly into an electrical signal allowing the control unit to recognize the conditions of minimum, partial or full load.

Functions of the system

In addition to electronically controlling the moment of ignition and the air flow rate during idling in order to allow the engine to run smoothly when the environment parameters and the load conditions vary, the control unit must also control and manage the injection in such a way that the stoichiometric ratio (air/fuel) is always within the optimum values.

The electronic control unit establishes the «time» for the injectors following a relatively simple rule which can be summed up as follows.

Taking the physical characteristics of the fuel (viscosity and density) and the difference in pressure between the fuel and the pressure in the inlet manifold as constant, the quantity of fuel injected depends only on the «opening time» of the injector.

The functions carried out by the injection/ignition system are basically as follows:

- | | |
|--|--|
| - adjusting the injection times; | - fuel vapour recovery; |
| - adjusting ignition advances; | - checking detonation |
| - checking cold starting; | - checking the phase transformer |
| - checking the enrichment during acceleration; | - connection with the climate control system (where fitted); |
| - fuel cut off during deceleration (Cut-off); | - self-adjustment of the system |
| - checking and managing engine idle speed; | - connection with the engine starting immobilizing device (Fiat CODE); |
| - limiting the maximum number of revs; | - autodiagnosis. |
| - checking combustion via the Lambda sensor; | |

SYSTEM MANAGEMENT STRATEGIES

Adjustment of the injection times

Digital technology has made it possible to obtain optimum fuel consumption and performance by using programmed maps, stored inside the electronic control unit memory, dependent on the engine speed and load conditions.

The control unit controls the injectors with extreme speed and precision, calculating the opening time on the basis of the load on the engine (number of revs and air flow rate) also taking into account the battery voltage and the temperature of the engine coolant.

The injection is sequential and timed for each cylinder (the moment of injection is not simultaneous for all the cylinders) and takes place corresponding to the optimum injection point.

Adjustment of ignition advances

Thanks to a map memorized inside the electronic control unit it is capable of calculating the advance according to the engine load (minimum, partial, full, on the basis of the number of revs and air flow rate), the temperature of the intake air and the temperature of the engine coolant.

It is possible to delay the ignition selectively for the cylinder requiring it, which can be recognized via the combination of the values recorded by the detonation and cam angle sensors.

Checking cold starting

Under these circumstances there is a natural weakening of the mixture as a result of the poor turbulence of the particles of fuel at low temperatures, reduced evaporation and condensation on the inner walls of the inlet manifold, all of it exacerbated by the increased viscosity of the lubrication oil.

The electronic control unit recognizes this condition and corrects the injection time on the basis of the coolant temperature signal, the temperature of the intake air, the battery voltage and the engine speed.

The ignition advance is only dependent on the number of revs and the temperature of the engine coolant.

During starting the control unit controls an initial simultaneous injection for all the injectors (full-group injection) and after the reference on the flywheel is recognized, it switches to the normal sequential timed operation.

Whilst the engine is warming up, the electronic control unit controls the idle speed actuator which determines the quantity of air required to ensure that the engine does not cut out.

The rotation speed is made to decrease proportionally as the temperature increases until the nominal value is obtained when the engine has reached operating temperature.

Checking acceleration enrichment

When there is a request for acceleration, if the air flow meter signal variation exceeds a pre-set increase, the control unit not only adjusts the injection to the new requirements, but also increases it further through rapidly reaching the speed required.

When approaching the pre-set speed, the injection increase is gradually eliminated.

NOTE *The request for acceleration is also detected by the potentiometer on the butterfly; this makes it possible to ensure optimum running if there is a failure in the air flow meter until a Service Dealer can be reached.*

Fuel cut off during deceleration

The fuel cut off during deceleration is the modified type.

When the closed butterfly condition is recognized and the engine speed is greater than 1700 rpm (for engine speeds below 1700 rpm the cut off function is not operational to maintain optimum "driveability") the injection of fuel is deactivated.

With no fuel supply, the engine speed starts to decrease more or less quickly depending on the vehicle driving conditions.

10.

Before the idle speed is reached the dynamics of the engine speed decrease are checked.

If they exceed a certain value, the fuel supply is partly reactivated on the basis of a logic which involves the "soft accompaniment" of the engine at idle speed.

When this condition is reached the normal idle functions are reactivated and the cut off during deceleration is only reactivated if the fuel cut off level is exceeded to ensure that the engine runs smoothly. The levels at which the fuel supply is restored and the cut off activated depend on the temperature of the engine.

Another fuel cut off logic is developed in the engine which intervenes during partial deceleration, i.e. when lower engine loads are required.

The function is only activated if the new condition persists for a pre-set time and after the ignition advance angle has been adjusted to the new situation.

Checking and managing engine idle speed

The adjustment of the idle speed is controlled in all operating conditions by means of the idle speed actuator which acts on the butterfly by-pass.

In addition to controlling the actual idle speed it also carries out the functions of a supplementary air valve and regulator for switching on the various consumers (e.g. the climate control compressor); with the butterfly in the end of travel position, in effect the actuator regulates the by-pass opening compensating for the power required by the consumers to ensure an engine idle speed of 750 rpm.

The actuator fitted on this version guarantees great responsiveness to adjustment because the opening and the closing of the by-pass are both operated by magnetic windings.

The correction of the idle is carried out not only by the actuator but also by the adjustment of the ignition (advance) angle because it has a more rapid effect.

NOTE *The self-adjustment function makes it possible to dispense with all idle speed adjustments with the butterfly casing sensor recognizing the "butterfly in the end of travel" position and correcting any wear which occurs in time and is detected by the butterfly closure position.*

Limiting maximum number of revs (protection outside of revs)

When the engine speed exceeds 6,800 rpm, the electronic control unit reduces the injector operating times so that this value is not exceeded.

If the engine speed exceeds 7,013 rpm, the control unit activates the "fuel cut off" strategy restoring the operation of the injectors when the speed goes below 6,800 rpm.

Checking combustion via the Lambda sensor

The Lambda sensor informs the control unit of the quantity of oxygen present at the exhaust and therefore the correct air/fuel metering.

The optimum mixture is obtained with a Lambda coefficient of 1 (optimum stoichiometric mixture). The electrical signal which the sensor sends to the control unit undergoes a sharp variation when the composition of the mixture differs from $\text{Lambda} = 1$. When the mixture is "lean" ($\lambda > 1$) the control unit increases the quantity of fuel, when the mixture is "rich" ($\lambda < 1$) it decreases it: in this way the engine operates as close as possible to the ideal Lambda value.

The Lambda sensor signal is processed, inside the control unit, by a special integrator which prevents sharp variations in the injection times to correct the mixture strength.

The sensor is heated by an electrical resistance in order to be able to reach the correct operating temperature of around 300 °C rapidly.

By using this sensor it is possible to regulate the engine carburation with precision. This makes it possible, amongst other things, to operate at the limits laid down for emissions.

Fuel vapour recovery

The (pollutant in terms of the regulations) fuel vapours are sent to an active charcoal filter and from there towards the engine where they are burnt; this takes place by means of a solenoid valve which is operated by the control unit only when the engine is in a load condition which allows the correct combustion without the operation of the engine being "disturbed": in effect, the control unit compensates for this quantity of petrol entering with a reduction of the supply to the injectors.

Checking detonation

The function has the task of detecting the presence of the phenomenon of detonation (engine knocking) by processing the signal coming from the relevant sensors. The control unit constantly compares the signals coming from the sensors with a threshold value which, in turn, is continuously updated, to take into account background noise and the ageing of the engine.

The control unit is therefore capable of detecting detonation (or the early stages of detonation) and makes provisions to reduce the ignition advance (from 3° up to maximum of 9.7°), until the phenomenon disappears. Afterwards the advance is gradually restored until the basic value is reached.

In acceleration conditions, a higher threshold is used, to take into account the greater noise produced by the engine in these circumstances. The detonation control strategy is also equipped with a self-adjustment function which ensures the memorizing of the advance reductions which should be constantly repeated to adapt to the different conditions in which the engine finds itself.

Checking phase transformer

The control unit controls the solenoid valve which controls the phase transformer depending on the engine load conditions. When the temperature of the coolant exceeds 40 °C and when the engine speed is higher than the idle speed and lower than 4,800 rpm with the butterfly angle greater than about 8°, the control unit sends a signal to the solenoid valve which is activated and allows the transformer to decrease the timing diagram for the inlet stage by 18° (torque operation).

When the engine is idling or the speed exceeds 4,800 rpm, the control unit deactivates the solenoid valve and the transformer restores the inlet timing to the previous basic values.

Obviously the control of the phase transformer operates with a hysteresis field, i.e. the activating level for the solenoid valve is always higher than the deactivating level; this is designed to prevent balance conditions and a consequent too rapid succession passing from one timing diagram to another with obvious operating problems.

Connection with the climate control system

When the climate control is switched on the compressor absorbs power from the engine which, when idling, tends to cut out. To prevent this problem the control unit adjusts the air flow rate to the new power requirements, controlled by the appropriate actuator (this adjustment also takes place during usage conditions to maintain optimum "driveability"). Another function of the system is that of momentarily interrupting the supply to the compressor in the case of high power requirements by the engine (strong acceleration).

System self-adjustment

The control unit is equipped with a self-adjustment function which has the task of recognizing the changes which take place in the engine due to the settling processes which take place over a period of time and the ageing of both the components and the engine itself.

These changes are stored in the memory in the form of modifications to the basic map and have the task of adapting the operation of the system to the gradual alterations to the engine and the components in relation to the characteristics when new.

10.

This self-adjustment function also makes it possible to compensate for the inevitable differences (due to production tolerances) of any components which may have been replaced. This allows the best possible results for all vehicles with special adjustment or checking operations.

The self-adjustment parameters are lost if the control unit is disconnected.

Connection with engine starting immobilizing device (Fiat CODE)

To increase protection against theft attempts, the vehicle has been equipped with an engine immobilizing device (Fiat CODE) which only allows the activation of the injection/ignition control unit by means of an electronic code.

Each time the key is turned to the OFF position, the Fiat CODE system completely deactivates the injection/ignition control unit.

When the ignition key is turned from the OFF position to the ON position the following operations take place in the order given:

1. The injection/ignition control unit sends the Fiat CODE control unit a request for the secret code in order to deactivate the functions lock.
2. The Fiat CODE control unit responds by sending the secret code only after it, in turn, has received the recognition code transmitted by the ignition key, which contains a special transponder inside.
3. The recognition of the secret code allows the de-activation of the functions lock and the injection/ignition control unit can activate the normal system management programme.

A special two directional serial line allows the exchange of information between the injection/ignition control unit and the Fiat CODE control unit.

If there is a failure in the Fiat CODE system it is, however, still possible to start the engine via an emergency procedure.



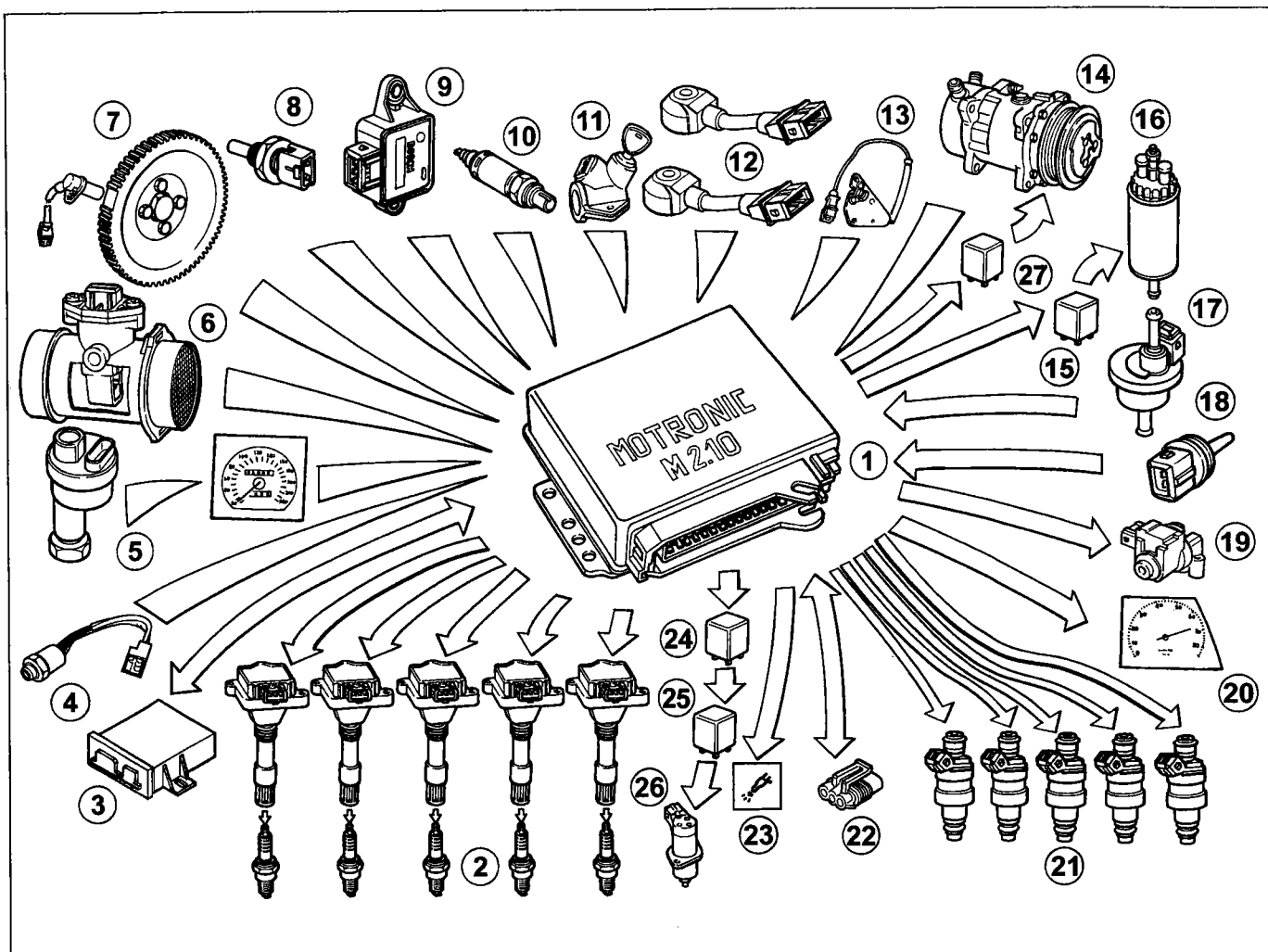
Control units must not, under any circumstances, be exchanged between different vehicles to check if they are working properly.

During the fault diagnosis, before replacing the control unit, make sure that it really is not working properly, because when a new control unit is supplied the secret code is memorized making it completely unusable on other vehicles.

Autodiagnosis

The Motronic M 2.10.4 injection/ignition system is also equipped with an "**autodiagnosis**" function which memorizes any problems with the sensors and actuators, making it easier to detect and correct them. Any problem is signalled by the appropriate warning light in the instrument panel.

DIAGRAM SHOWING INFORMATION ENTERING/LEAVING THE INJECTION/IGNITION SYSTEM CONTROL UNIT AND SENSORS/ACTUATORS



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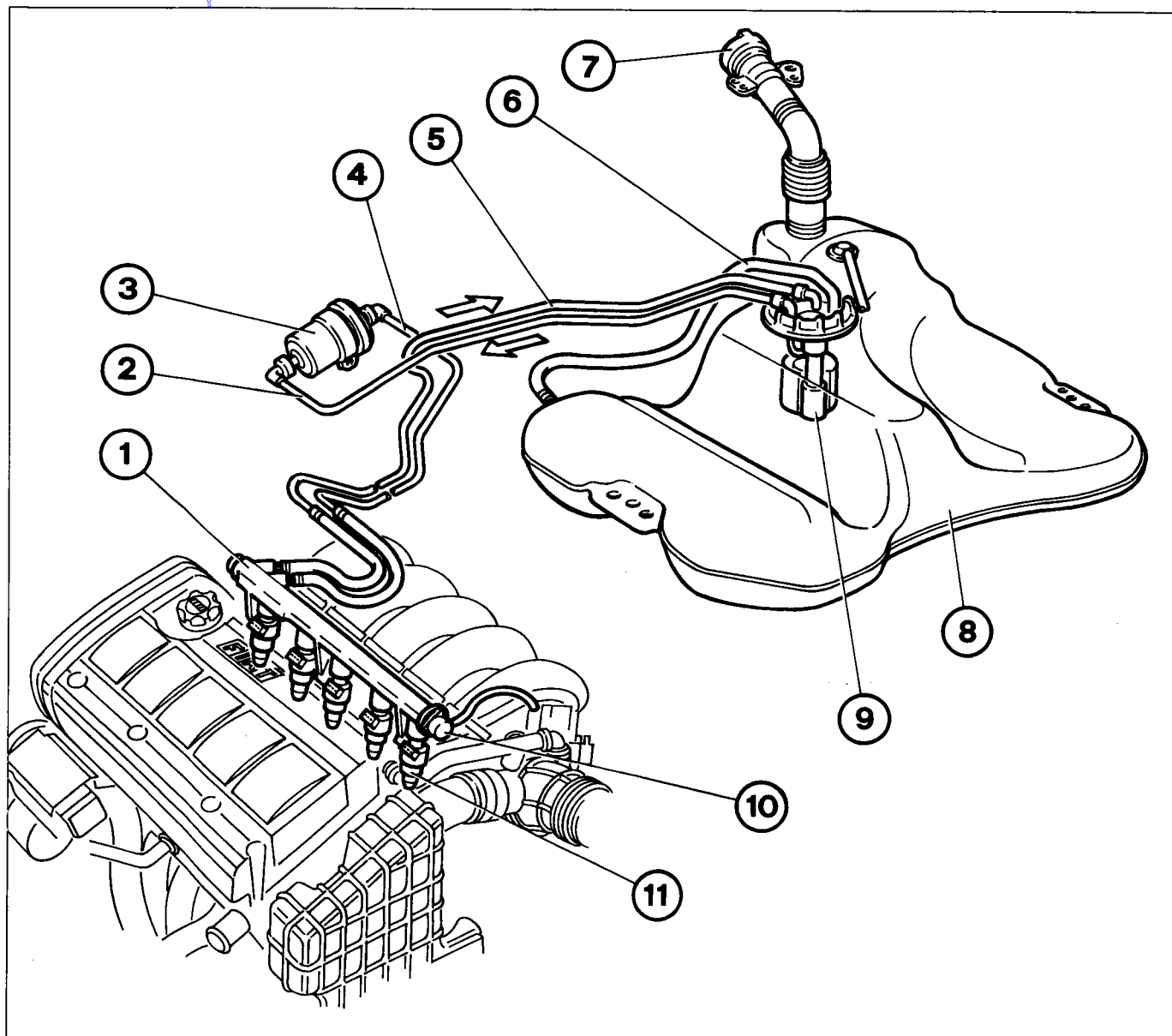
Components key

1. Electronic control unit
2. Coils and spark plugs
3. Fiat CODE control unit
4. Three stage pressure switch
5. Speedometer sensor
6. Flow meter
7. Rpm sensor
8. Coolant temperature sensor
9. Butterfly potentiometer
10. Lambda sensor
11. Ignition switch
12. Detonation sensors
13. Timing sensor
14. Climate control system signal

15. Electric fuel pump and Lambda sensor relay
16. Electric fuel pump
17. Petrol vapour inlet solenoid valve
18. Intake air temperature sensor
19. Engine idle speed actuator
20. Rev counter signal
21. Injectors
22. Diagnostic socket
23. I.E. system failure warning light
24. I.E. system relay.
25. Relay for phase transformer
26. Phase transformer solenoid valve
27. Air conditioning relay feed

10.

DIAGRAM SHOWING FUEL SUPPLY CIRCUIT

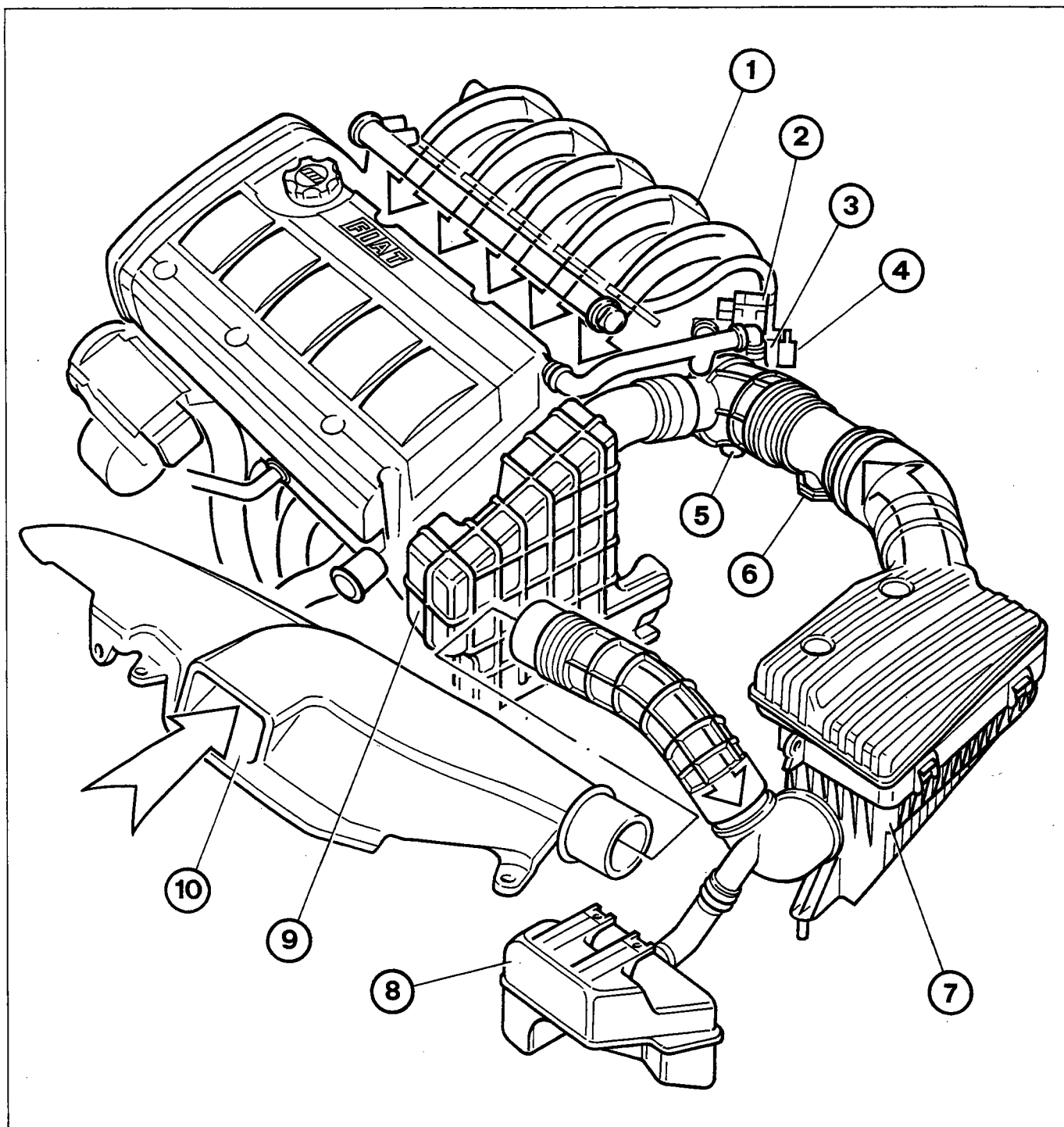


P4A08FJ01

1. Fuel supply manifold
2. Supply pipe from the tank to the filter
3. Filter
4. Supply pipe from filter to injectors
5. Return pipe
6. Breather pipe
7. Filler with ventilation and safety valve
8. Tank
9. Electric pump
10. Pressure regulator
11. Injectors

NOTE Given the special shape of the tank, when fuel is being introduced an air pocket tends to form in the lower part preventing it from being filled completely; the pipe (6) allows the air to flow from the bottom thereby enabling the tank to be filled completely.

DIAGRAM SHOWING AIR INTAKE CIRCUIT



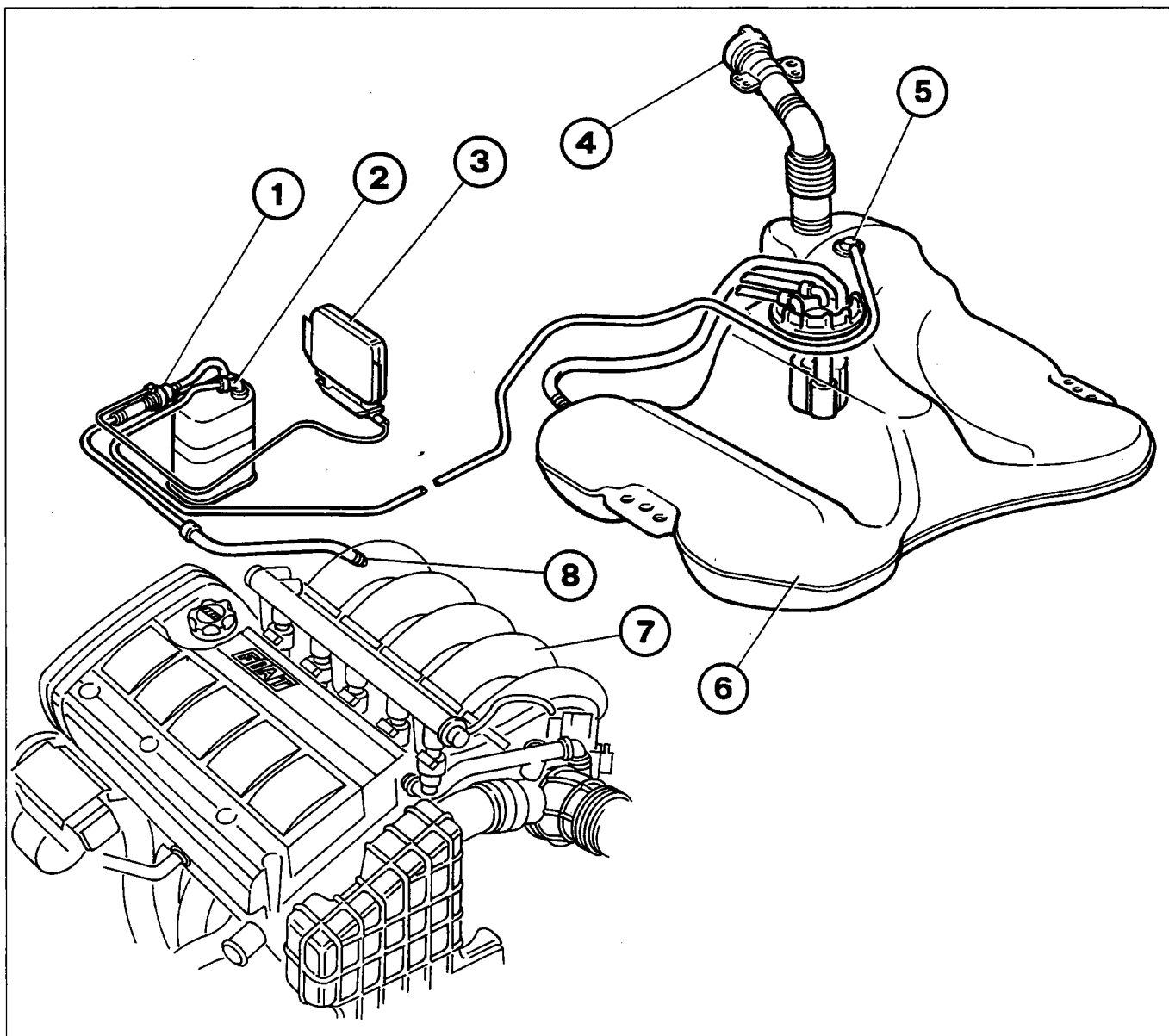
P4A09FJ01

1. Inlet manifold
2. Engine idle speed actuator
3. Butterfly casing
4. Butterfly valve position sensor
5. Air temperature sensor

6. Flow meter
7. Air filter
8. Lower resonator
9. Upper resonator
10. Inlet opening

10.

DIAGRAM SHOWING FUEL ANTI-EVAPORATION CIRCUIT



P4A10FJ01

The anti-evaporation system has the task of preventing the fuel vapours, made up of the lightest sections of hydrocarbons which form in the tank, from being discharged into the atmosphere.

1. Fuel vapour cut out valve
2. Charcoal filter
3. Injection/ignition control unit
4. Safety and ventilation valve
5. Multi-purpose valve
6. Tank
7. Inlet manifold
8. Fuel vapour intake

SYSTEM FOR RECIRCULATING GASES COMING FROM THE ENGINE CRANKCASE

This system controls the emissions, from the engine crankcase, of breather gases made up of air/petrol mixtures and burnt gases which escape from the piston seals, in addition to lubricant oil vapours, recirculating them to the inlet.

The breather gases, directed by special walls, rise by the engine oil filler and then pass through the labyrinth (7), under the tappet cover, where they lose part of the oil which they contain, in the form of droplets, falling on the camshafts through the pipe (6).

The siphon shape of the pipe (6) prevents the breather gases from escaping and only allows the recirculation of the droplets of oil.

The remaining gases escape from the intake (5) inside of which there is a spark out (4) (to prevent the phenomenon of combustion due to flame returns from the butterfly casing).

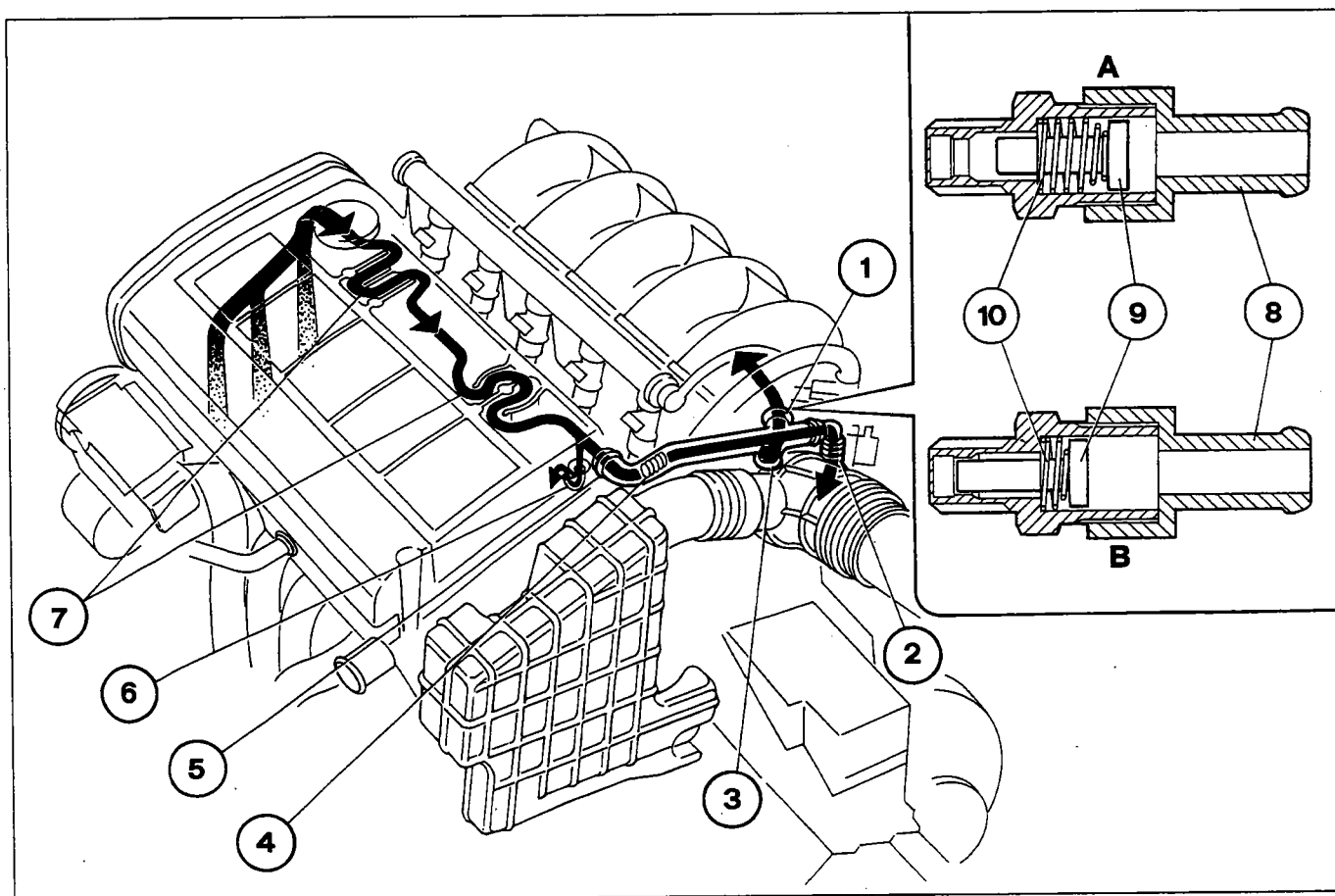
From the intake (5) the breather gases reach the T union (3).

With the butterfly open, the gases flow through the intakes (1) and (2) to be drawn into the manifold.

With the butterfly closed, the vacuum in the inlet manifold draws in the gases through the intake (1) which contains a PVC restricting valve (8) (Positive Crank Ventilation) which shutters the intake.

The PCV valve can, in effect, be modulated and the quantity of gas which passes through is proportional to the vacuum in the inlet manifold.

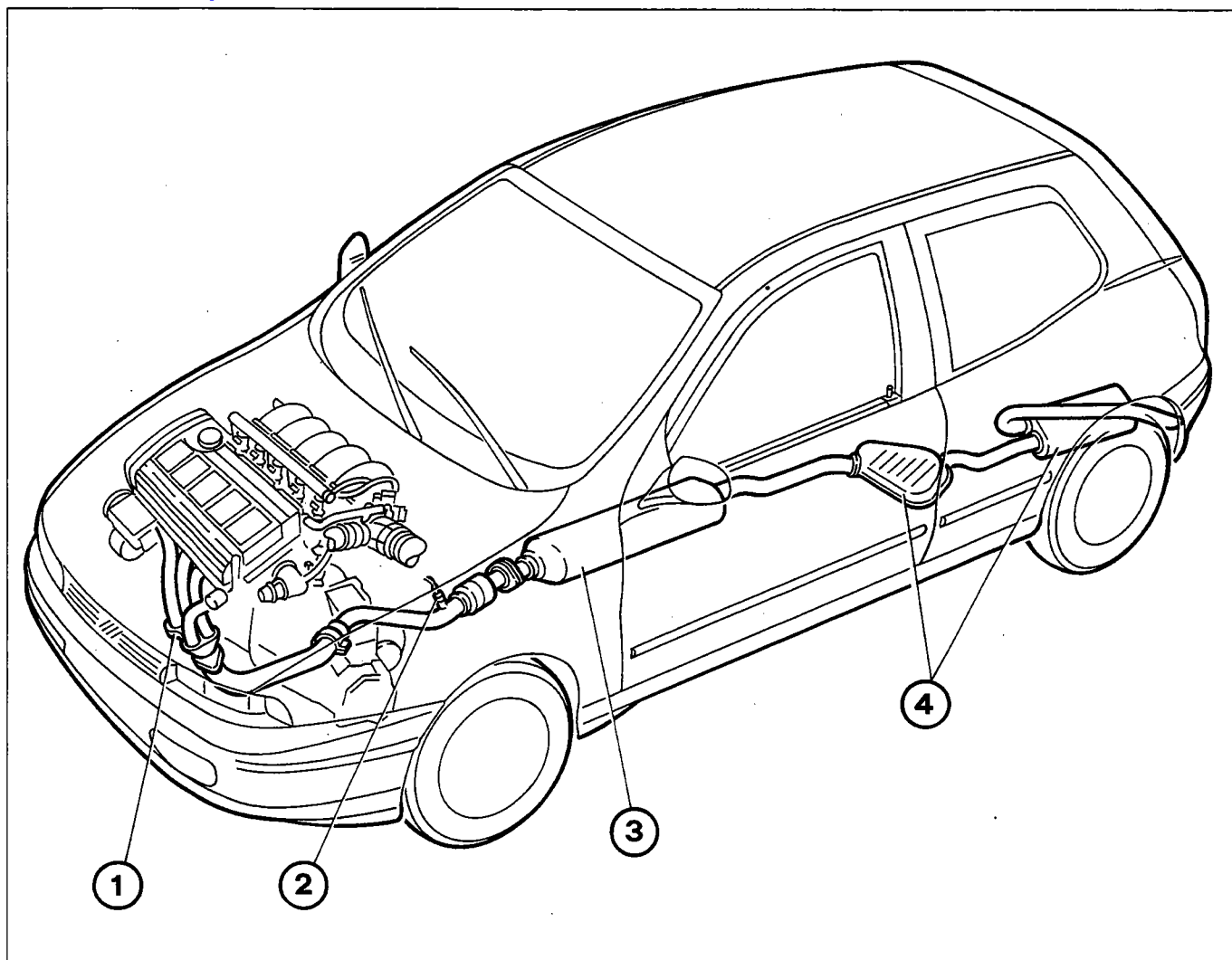
When the butterfly valve is completely open (condition A), the vacuum inside the inlet manifold is minimal, the spring (10) is fully extended and the PCV valve allows the maximum flow of breather gases. Viceversa, with the butterfly completely closed (condition B), the vacuum inside the manifold is maximum, this causes the movement of the piston (9) which shutters the section through which the breather gases flow inside the PCV valve thereby restricting the intake of the actual gases in the manifold.



P4A11FJ01

10.

DIAGRAM SHOWING ENGINE EXHAUST ASSEMBLY

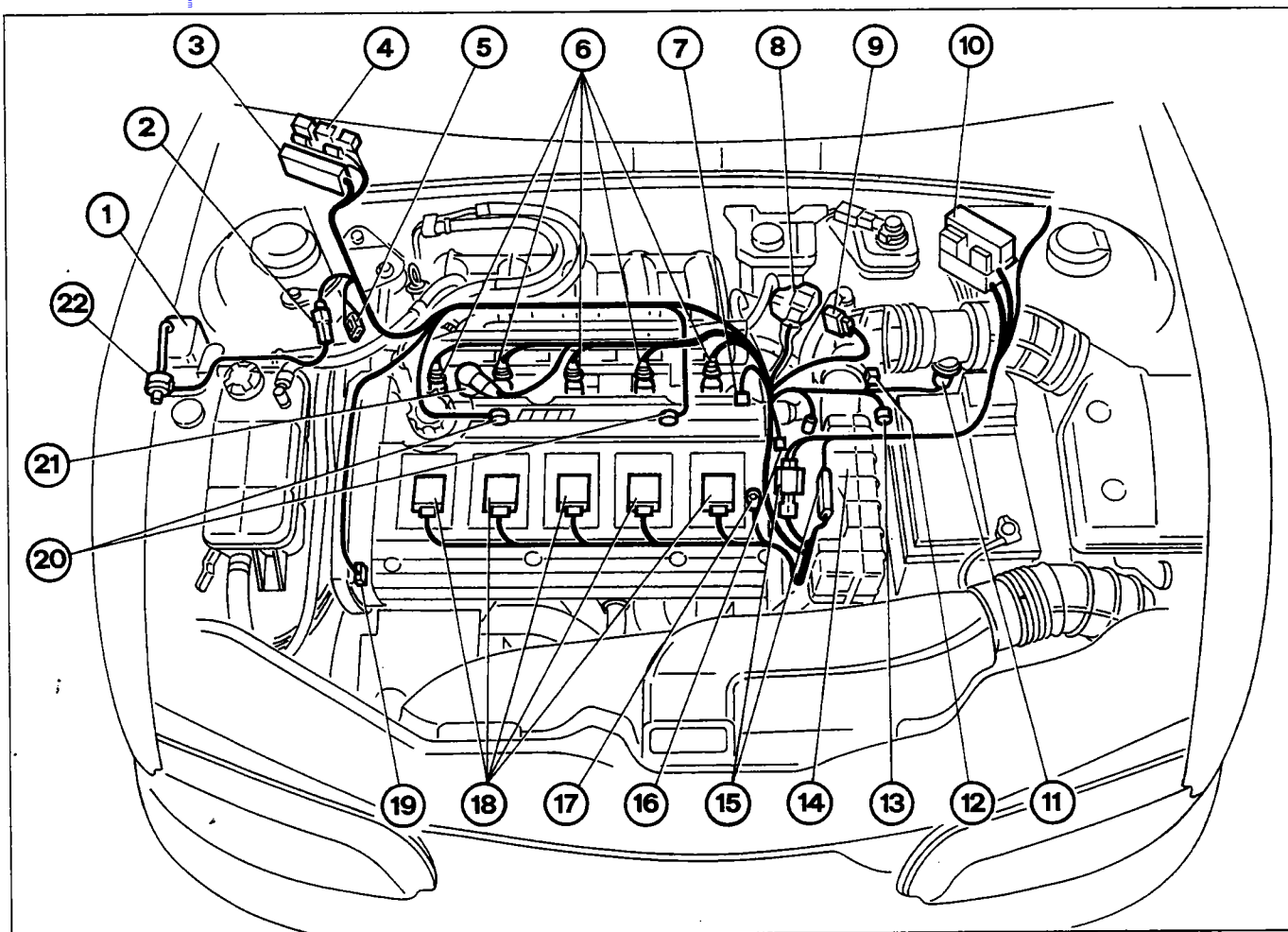


P4A12FJ01

Key

- 1. Exhaust manifold
- 2. Lambda sensor
- 3. Catalytic silencer
- 4. Silencers

LOCATION OF INJECTION/IGNITION SYSTEM COMPONENTS



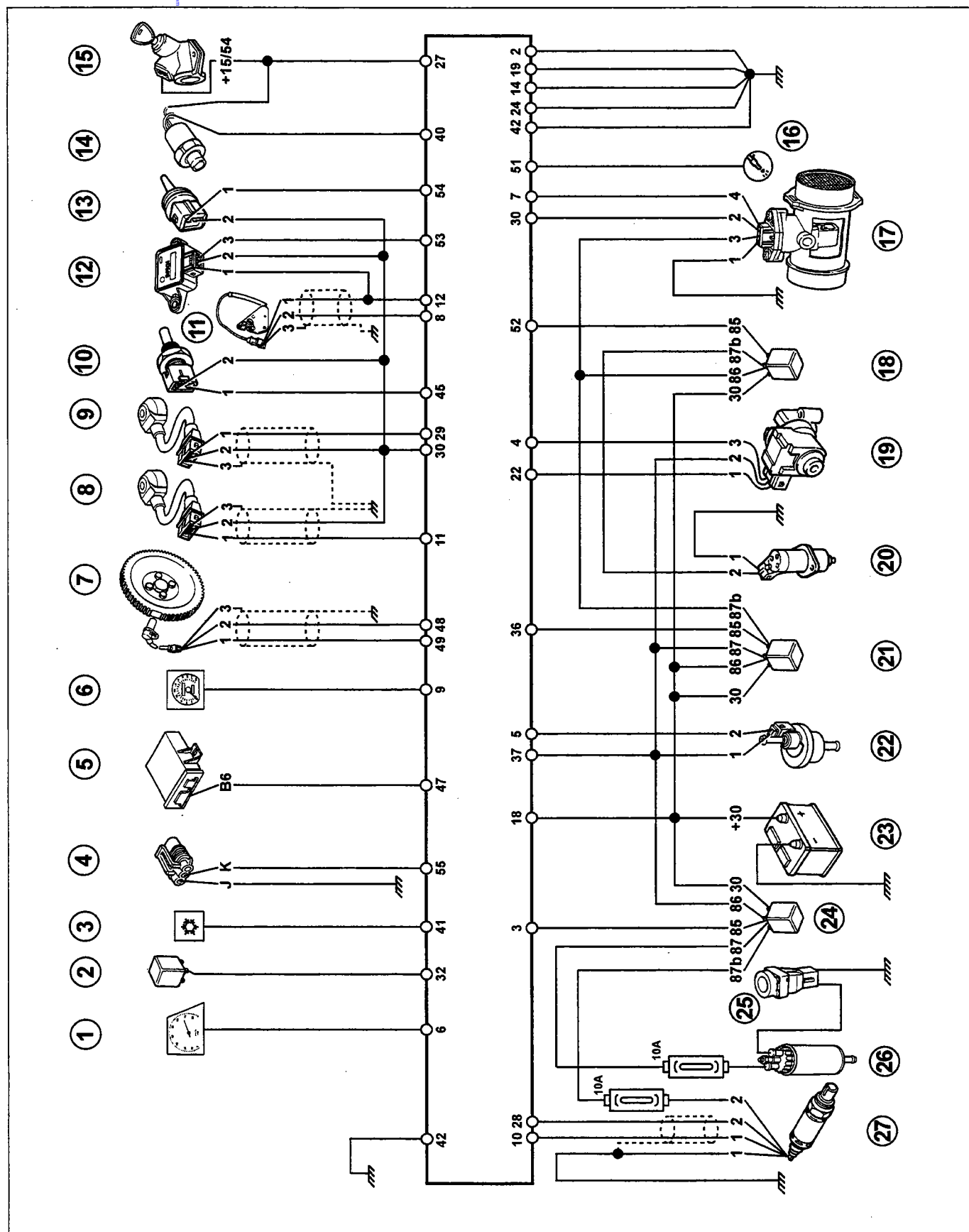
P4A13FJ01

Key

- | | |
|--|--|
| 1. Charcoal filter | 12. Air temperature sensor |
| 2. Fuel vapour solenoid valve connection | 13. Vehicle speed sensor |
| 3. Injection/ignition control unit | 14. Lambda sensor |
| 4. Fuses and relays | 15. Join between front cable and injection cable |
| 5. Diagnostic socket | 16. Coolant temperature sensor |
| 6. Injectors | 17. Earth connection |
| 7. Rpm sensor | 18. Ignition coils |
| 8. Engine idle speed actuator | 19. Timing sensor |
| 9. Butterfly valve position sensor | 20. Detonation sensor |
| 10. General system protective fuse | 21. Phase transformer solenoid valve |
| 11. Flow meter | 22. Fuel vapour solenoid valve |

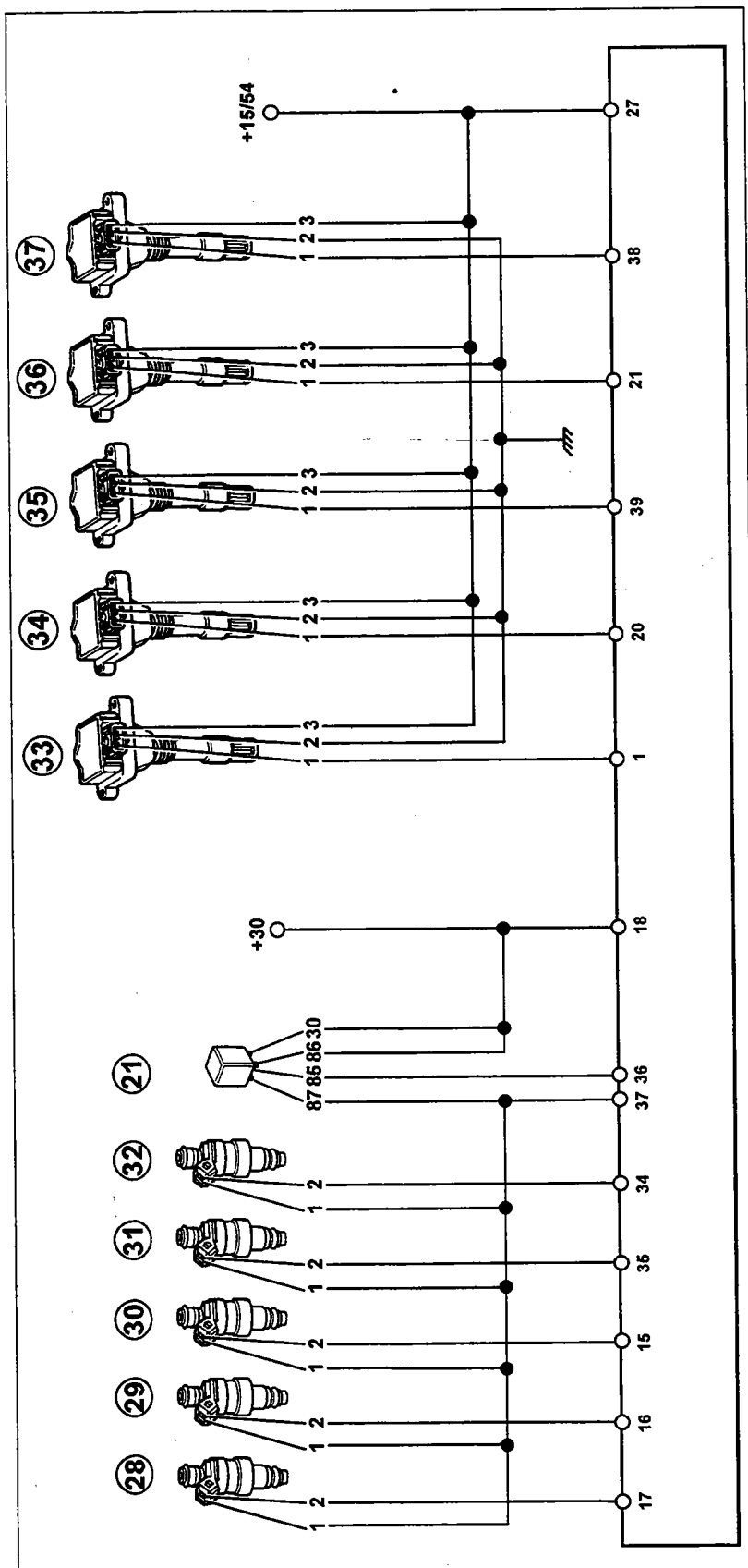
10.

WIRING DIAGRAM SHOWING INJECTION/IGNITION SYSTEM



P4A14FJ01

Connection of control unit/ignition coils and injectors

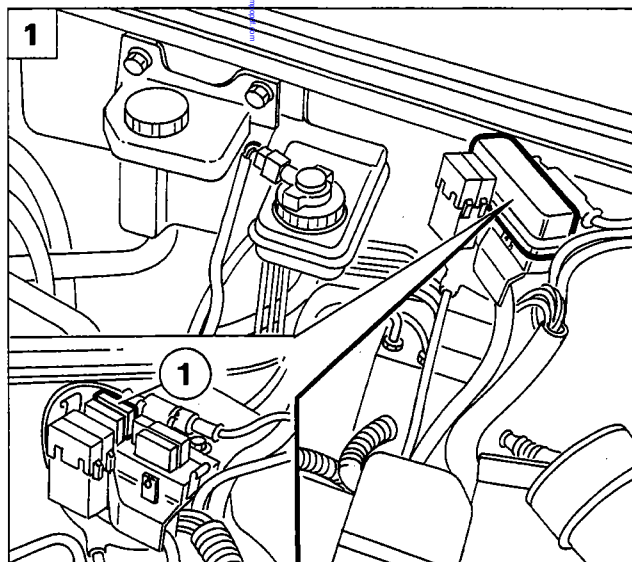


P4A15FJ01

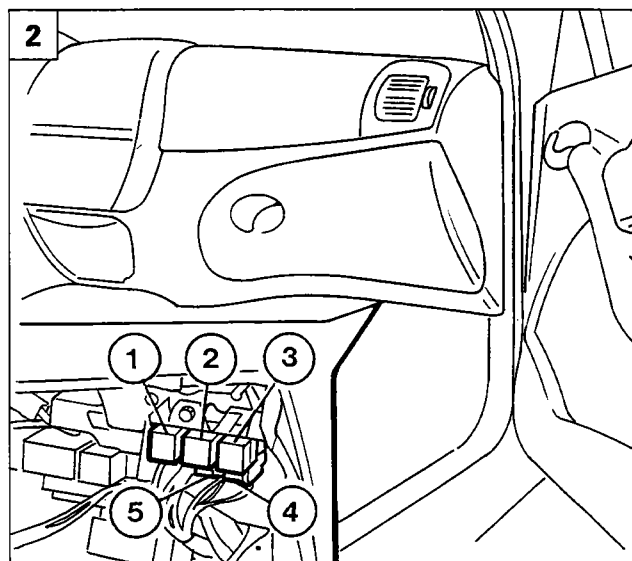
Key:

1. Rev counter signal
2. Climate control relay
3. Climate control on button
4. Fiat/Lancia Tester diagnostic socket
5. Fiat CODE control unit
6. Speedometer signal
7. Rpm and TDC sensor
8. Detonation sensor 1
9. Detonation sensor 2
10. Water temperature sensor
11. Timing sensor
12. Butterfly valve position sensor
13. Intake air temperature sensor
14. Three stage pressure switch
15. Ignition switch
16. I.E. system failure warning light
17. Flow meter
18. Phase transformer solenoid valve relay
19. Engine idle speed actuator
20. Phase transformer solenoid valve
21. I.E. system relay feed
22. Fuel vapour solenoid valve
23. Battery
24. Electric fuel pump relay and Lambda sensor
25. Inertia switch
26. Electric fuel pump
27. Lambda sensor
28. Injector for cylinder N°1
29. Injector for cylinder N°2
30. Injector for cylinder N°3
31. Injector for cylinder N°4
32. Injector for cylinder N°5
33. Ignition coil for cylinder N°1
34. Ignition coil for cylinder N°2
35. Ignition coil for cylinder N°3
36. Ignition coil for cylinder N°4
37. Ignition coil for cylinder N°5

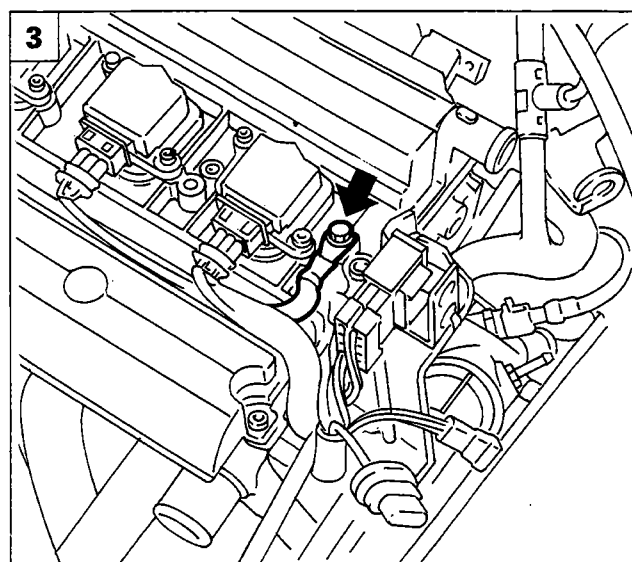
10.



P4A23CJ01



P4A16FJ02



P4A16FJ03

FUSES, RELAYS AND EARTH POINTS

1. General protective fuse

The general protective fuse (EFI-30A) for the injection/ignition system (1) is housed inside a container; to gain access to it, remove the cover releasing the side clips.

2. Fuses and relays

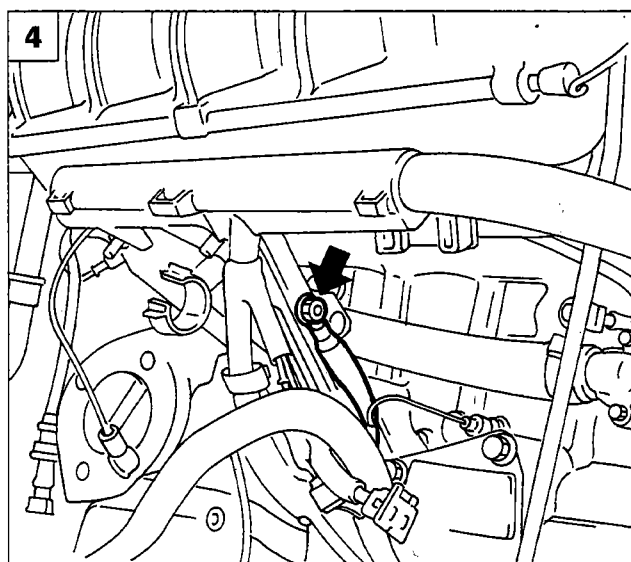
These are located under the glove compartment, in front of the electronic control unit.

1. Phase transformer solenoid valve relay
2. Injection system relay
3. Electric fuel pump relay
4. Lambda sensor fuse (10A)
5. Electric fuel pump fuse (10A)

3-4 Earth points

In order to improve electro-magnetic compatibility and operational reliability special care has been taken over the number and location of the earth points:

3. secondary coils connected below the cylinder head cover;
4. earth control unit (pin 2, 14, 19, 24,42), Lambda sensor heater, flow meter and phase transformer solenoid valve connected to the inlet manifold mounting bracket.



P4A16FJ04

INJECTION/IGNITION SYSTEM COMPONENTS

The injection/ignition system is basically made up of wiring, an electronic control unit (I.E. control unit) and the following sensors/actuators:

Sensors

- Speedometer sensor
- Rpm and T.D.C. sensor
- Detonation sensors
- Coolant temperature sensor
- Timing sensor
- Butterfly valve position sensor
- Intake air temperature sensor
- Intake air flow rate sensor (flow meter)
- Lambda sensor

Actuators

- Engine idle speed actuator
- Phase transformer solenoid valve
- Fuel vapour cut out solenoid valve
- Electric fuel pump
- Injectors
- Ignition coils
- Spark plugs

INJECTION/IGNITION SYSTEM WIRING

The connection between the different system components is achieved by means of a single set of wiring with various type connectors grouped together in special conduits fitted on the engine.

INJECTION/IGNITION ELECTRONIC CONTROL UNIT

It is made up of thick film hybrid circuits and is connected to the electrical wiring by means of a **55 way** (or pole) multiple connector.

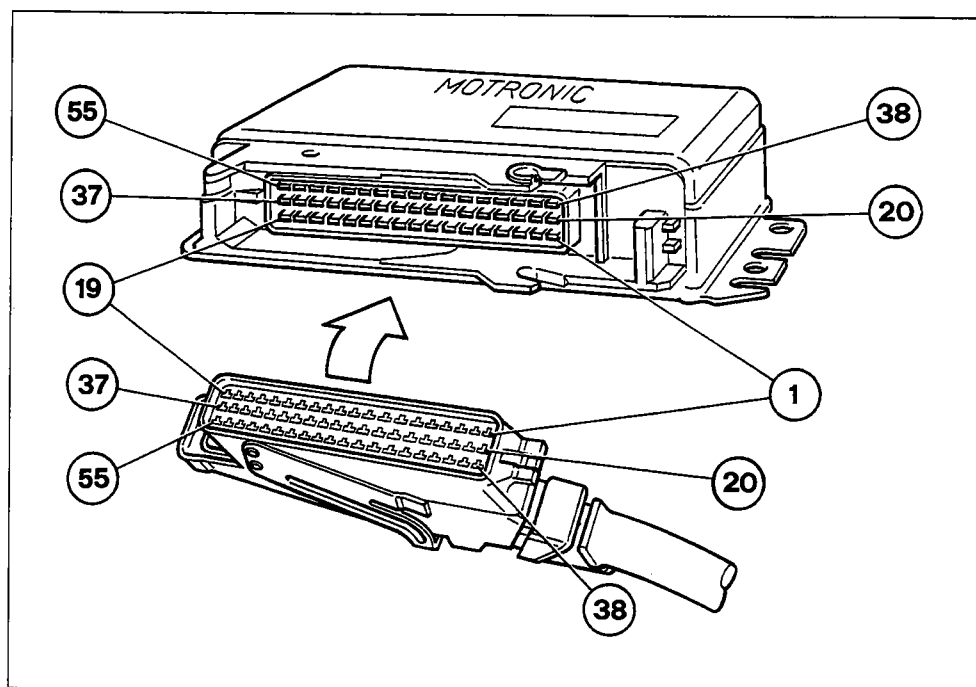
All the information on the engine operating conditions transmitted by the various sensors flows into the control unit.

By means of this data and with the aid of characteristic programmes written indelibly in its memory, the control unit is capable of achieving the following objectives:

1. Managing the injection time and frequency; in other words, it provides the quantity of fuel calculated for each cylinder with a sequential, timed operation (1-2-4-5-3).
In practice, the air/fuel ratio should always remain within the optimum value, defined during setting up, in order to limit fuel consumption, reduce harmful exhaust emissions and ensure optimum thermodynamic efficiency for the engine.
2. Electronically controlling the moment of ignition (ignition advance)
3. Controlling the air flow rate at the rotation speed through the specific sensor in order to allow the smooth running of the engine as the environmental parameters and loads applied vary.
4. Detecting, by carrying out the programmes, any operating defects for the different sensors recorded in the RAM and replacing the incorrect data or data not received with replacement values to ensure the operation of the engine even in emergency conditions (RECOVERY).
5. Supplying the Fiat/Lancia Tester, if connected, via the serial line (diagnostic socket) with the data relating to the operating defects detected and memorized.

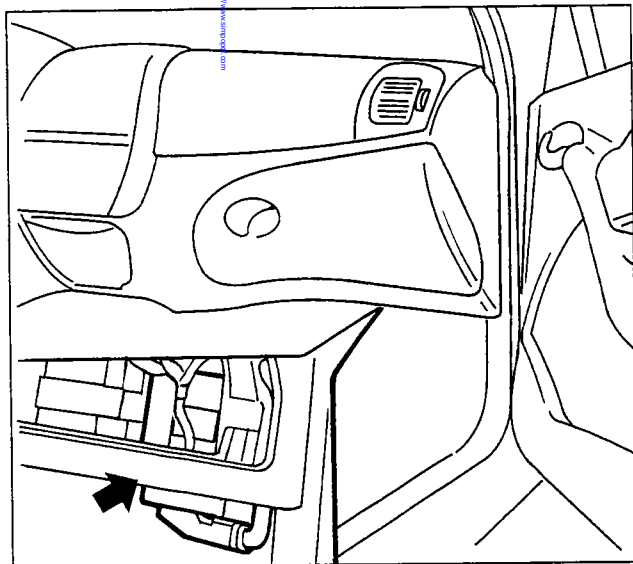
10.

IDENTIFICATION OF CONTROL UNIT CONNECTIONS (PIN-OUT)



P4A18FJ01

- | | |
|--|--|
| 1. Ignition coil for cylinder N°1 | 29. Detonation sensor |
| 2. Engine earth | 30. Supply for various sensors |
| 3. Electric fuel pump relay feed and Lambda sensor | 31. Not connected |
| 4. Engine idle speed actuator | 32. Climate control go ahead relay |
| 5. Fuel vapour solenoid valve | 33. Not connected |
| 6. Rev counter signal | 34. Injector for cylinder N°5 |
| 7. Intake air flow meter | 35. Injector for cylinder N°4 |
| 8. Timing sensor | 36. I.E. system relay |
| 9. Speedometer sensor | 37. Supply (+) |
| 10. Lambda sensor | 38. Ignition coil for cylinder N°5 |
| 11. Detonation sensor | 39. Ignition coil for cylinder N°3 |
| 12. Timing sensor | 40. Three stage pressure switch |
| 13. Not connected | 41. Air conditioning on signal |
| 14. Engine earth | 42. Engine earth |
| 15. Injector for cylinder N°3 | 43. Not connected |
| 16. Injector for cylinder N°2 | 44. Not connected |
| 17. Injector for cylinder N°1 | 45. Coolant temperature sensor |
| 18. Supply (+30) | 46. Not connected |
| 19. Engine earth | 47. Fiat CODE control unit |
| 20. Ignition coil for cylinder N°2 | 48. Rpm and TDC sensor |
| 21. Ignition coil for cylinder N°4 | 49. Rpm and TDC sensor |
| 22. Engine idle speed actuator | 50. Not connected |
| 23. Not connected | 51. I.E. system failure warning light |
| 24. Engine earth | 52. Phase transformer solenoid valve relay |
| 25. Not connected | 53. Butterfly valve position sensor |
| 26. Not connected | 54. Intake air temperature sensor |
| 27. Supply (+15/54) | 55. Diagnostic socket for Fiat/Lancia Tester |
| 28. Lambda sensor | |



P4A19FJ01



REMOVING-REFITTING ELECTRONIC CONTROL UNIT

The electronic control unit is located under the glove compartment (right hand side). To remove the control unit proceed as follows:

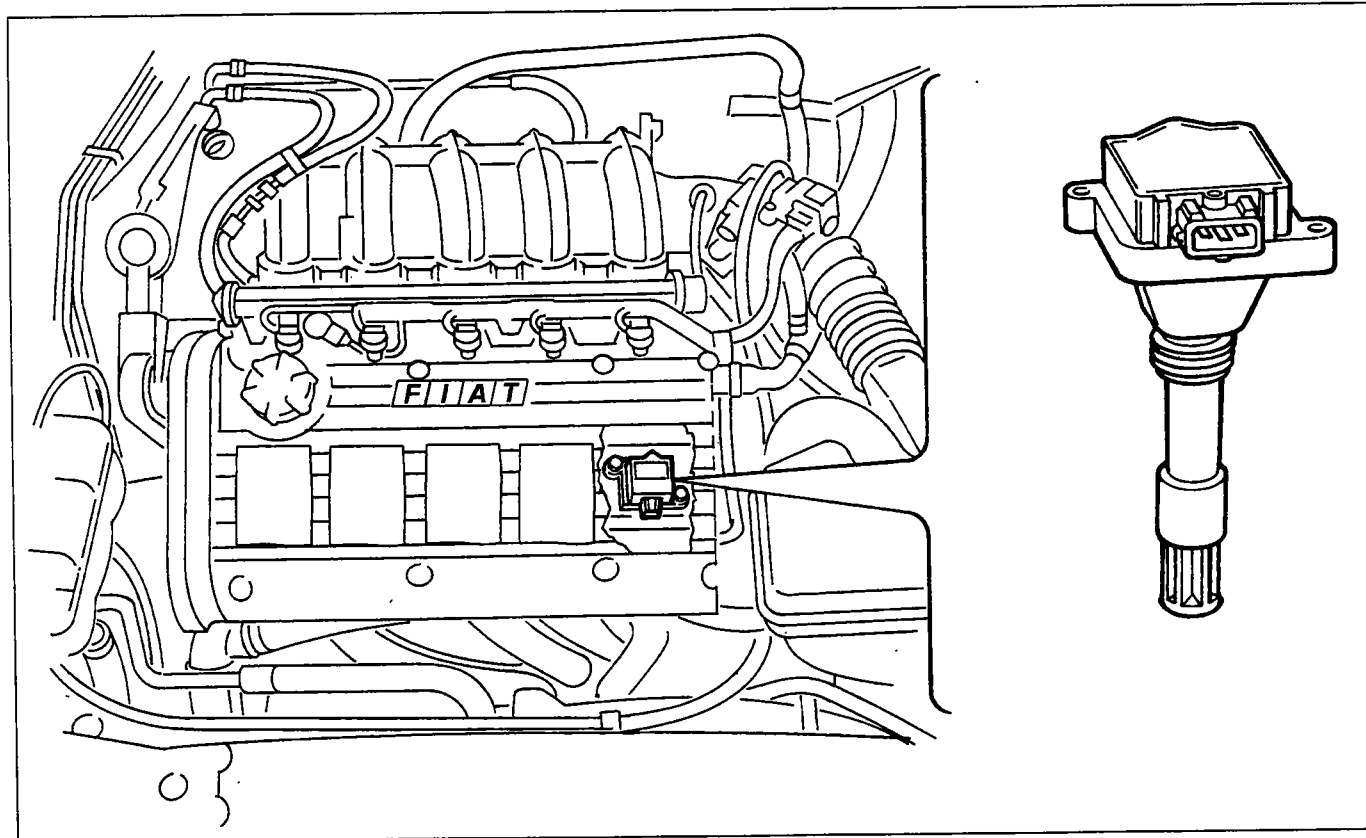
- Undo the bolts fixing the control unit to the mounting bracket.
- To remove the multiple connector, pull the connector clip upwards.



There could be tension at the terminals not connected therefore no connections should ever be made because there is the risk of a short circuit with damage to the control unit.

The operations of fitting and removing the multiple connector should be carried out with the ignition switched off.

IGNITION COILS (0 221 504 006)

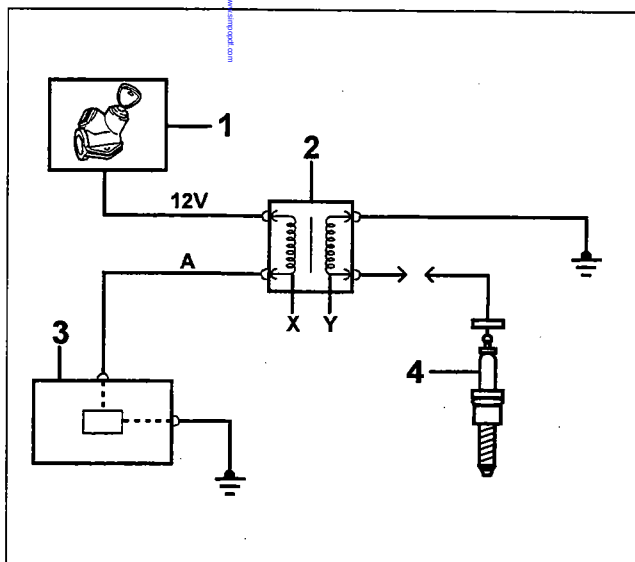


P4A19FJ02

The "static advance" electronic ignition has been improved with a single coil for each spark plug (SINGLE COIL); in addition, the power modules are contained inside the control unit; in practice this solution eliminates the H.T. circuit, further increasing reliability and safety and decreasing the risk of interference due to the high tension leads and connections.

They are normal coils which increase the tension of the impulse sent to the spark plugs: each individual coil, located on the cylinder head, directly supplies a spark plug without intermediate H.T. leads.

10.



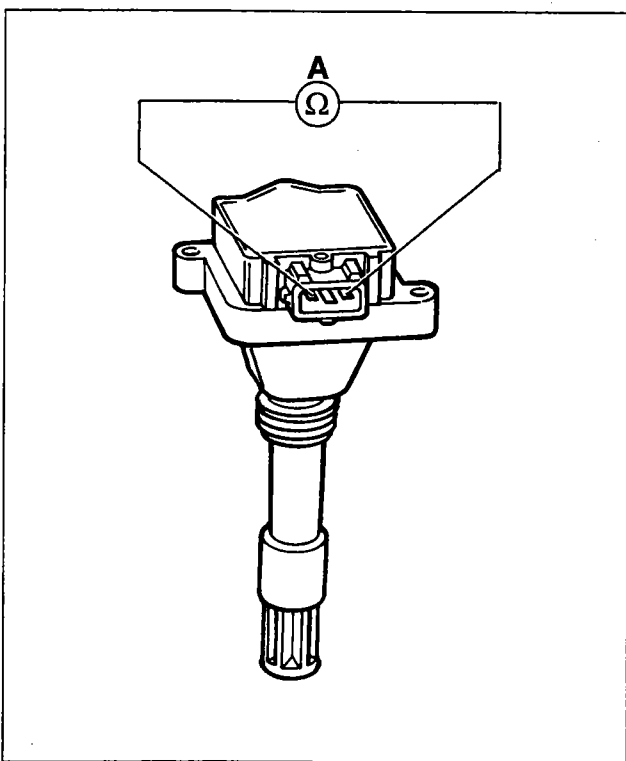
P4A20FJ01

Electrical features

Primary winding inductance 3 mH
Primary winding resistance 0,4 Ω
Interference resistance 1 K Ω

Diagram showing electrical connections

- A. Operating signal
- X. Primary winding
- Y. Secondary winding
- 1. Supply via ignition switch
- 2. Single coil
- 3. Electronic control unit
- 4. Spark plug



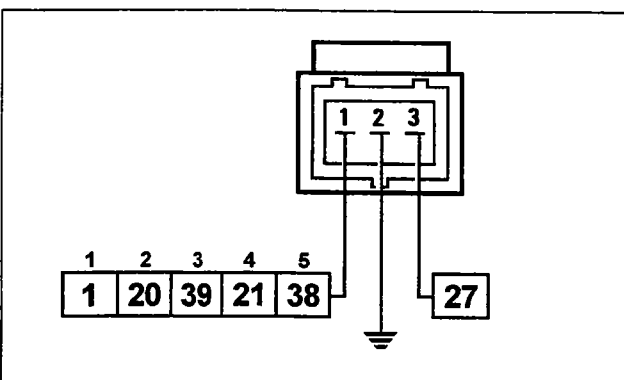
P4A20FJ02

Checking coil circuit resistance

A. Primary circuit

The resistance is checked by connecting an ohmmeter to the connector outer pins, as shown in the diagram.

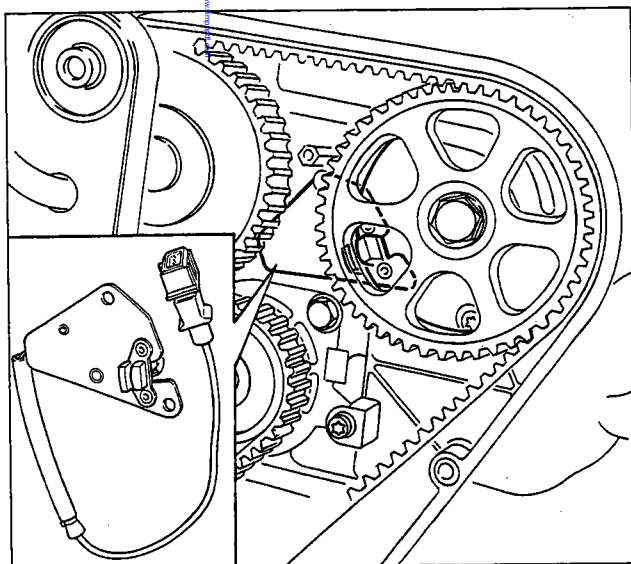
Primary resistance: 0.4 ohm



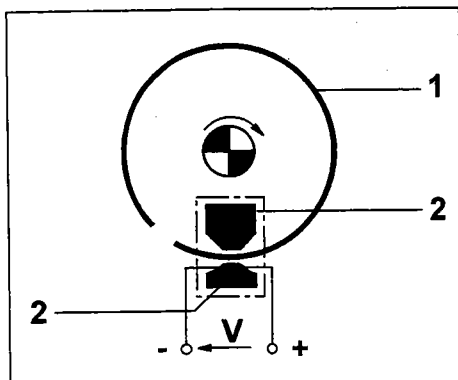
P4A20FJ03

Wiring connector

The numbers indicate the corresponding pins for the control unit arranged in the order of the number of cylinders.



P4A21FJ01



P4A21FJ02

1. Deflector (pulley seal)
2. Magnetic material

A semi-conductor layer with current passing through, immersed in a normal magnetic field (lines of force perpendicular to the direction of the current) generates a difference in power, known as "HALL" tension.

If the intensity of the current remains constant, the tension generated depends only on the intensity of the magnetic field; it is therefore sufficient for the intensity of the magnetic field to be varied periodically to obtain a modulated electrical signal where the frequency is proportional to the speed with which the magnetic field changes.

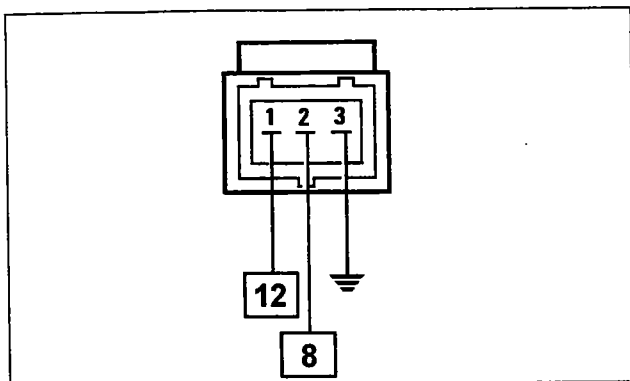
To obtain this change, a metal ring (inner part of the pulley) with an opening is made to pass through the sensor. When it moves the metal part of the ring covers the sensor blocking the magnetic field with the consequent low output signal; viceversa, by the opening and therefore where the magnetic field is present, the sensor generates a high signal.

As a result the high signal alternates with the low signal once every two revolutions of the engine and precisely when cylinder N°1 is 78° before TDC.

This signal, together with the rpm and TDC signal, allows the control unit to recognize the cylinders and determine the injection point. For each revolution of the engine the control unit checks that the timing signal is present; if this signal is lacking for two consecutive revolutions, the control unit signals the failure (warning light in the instrument panel comes on) and the engine cannot be started up.

Wiring connector

The numbers indicate the corresponding pins for the control unit



P4A21FJ03

TIMING SENSOR (0.232.101.036)

The Bosch Motronic M 2.10.4 system uses a sequential timed system, i.e. the injection of the fuel takes place in sequence for each cylinder during the inlet stroke.

To achieve this, the electronic control unit also uses a timing signal to determine the injection point in addition to the rpm and TDC signal.

The signal sent to the control unit is produced by a Hall effect sensor fitted by the camshaft drive pulley, exhaust side.

Operating principle

Removing-refitting

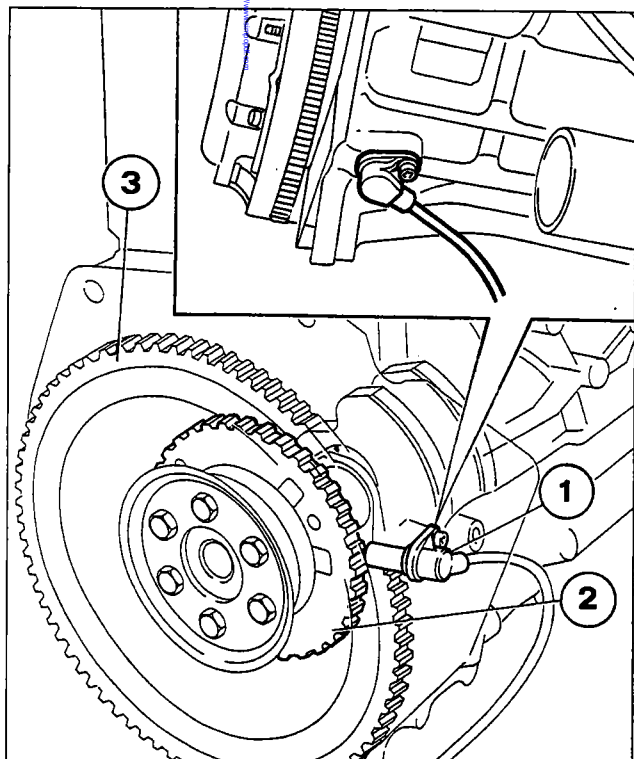
This operation involves removing the timing belt and the camshaft pulley, exhaust side. When these operations have been carried out it is necessary to:

- disconnect the electrical connector;
- Undo the fixing bolts and remove the sensor.

When refitting carry out the procedure in the reverse order, following the instructions for fitting and tensioning the toothed belt.

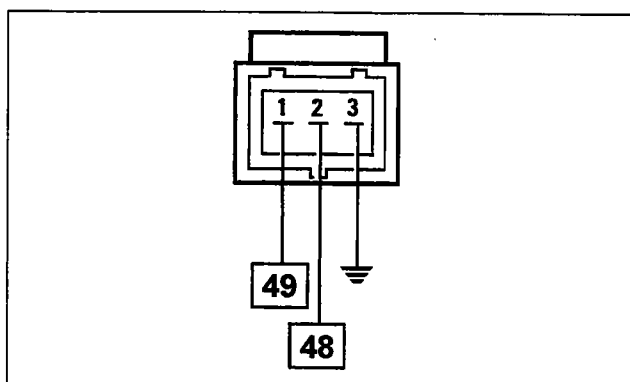
NOTE The sensor does not require any type of adjustment.

10.

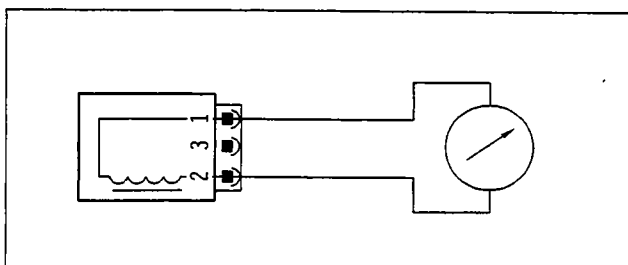


P4A22FJ01

1. Rpm sensor
2. Toothed pulley
3. Engine flywheel



P4A22FJ02



P4A22FJ03

RPM AND TDC SENSOR (0.281.002.102)

The sensor designed to detect the rpm and TDC is the inductive type, i.e. it operates by varying the magnetic field created by the teeth on a toothed pulley (flywheel) inside the crankcase and fixed to the rear counter-weight for the crankshaft. In this way the sensor is fixed to the crankcase and the checks and adjustments of the gap and the angular position are no longer necessary.

The teeth which pass in front of the sensor, alter the gap between the pulley and the sensor; the flow dispersed, which consequently varies, produces an alternating voltage which depends on the number of revs.

The flywheel has 58 teeth plus a space equivalent to the two missing teeth.

The reference defined by the space for the two missing teeth constitutes the basis for detecting the synchronism point (TDC).

For a more detailed description of the operating principle, refer to the Fuel System section for the 1581 16v engine.

Removing-refitting

Position the vehicle on a lift, then working from underneath the vehicle:

- Disconnect the electrical connector;
- undo the bolt fixing the sensor and remove it from its housing.

Wiring connector

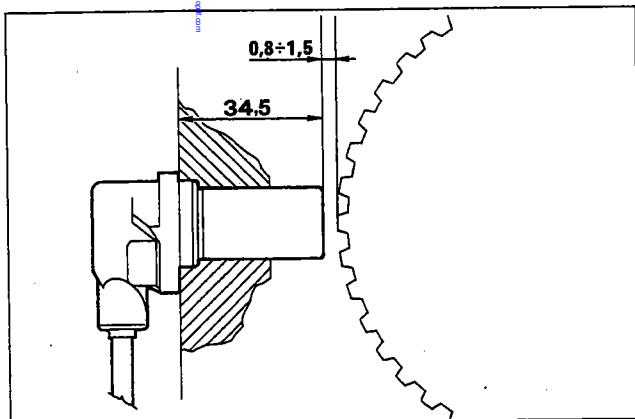
The sensor is connected to the electronic control unit (pins 48 and 49) by means of twisted cables covered by a screened anti-interference outer casing connected to earth.

NOTE The numbers indicate the corresponding control unit pins

Checking the resistance

The resistance of the sensor can be measured by disconnecting the connector and connecting an ohmmeter to the sensor.

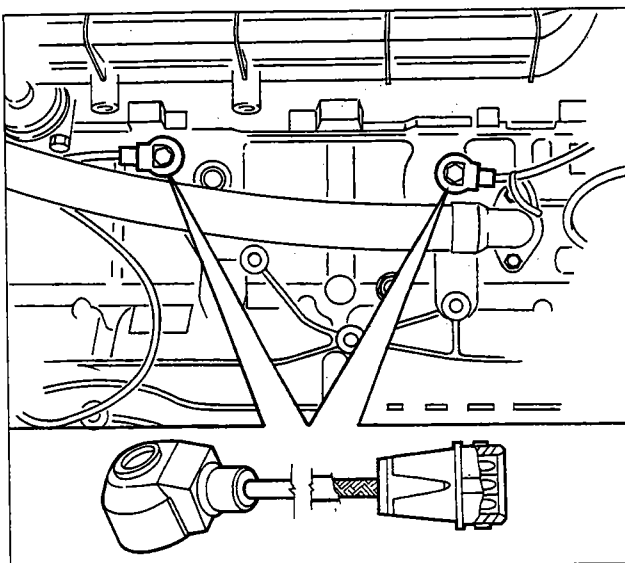
Resistance: 774-946 ohm at 20°C



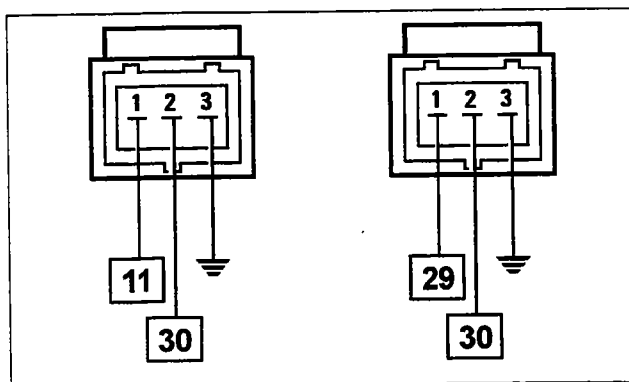
P4A23FJ01



When measuring the distance it is necessary to be sure that you are at right angles with the flywheel and by a tooth and not a hollow.



P4A23FJ02



P4A23FJ03

Checking the gap

The rpm and TDC sensor is fixed directly to the engine crankcase and therefore no adjustments of the gap or the angular position are required. If a problem is suspected it is possible to check the gap, proceeding as follows:

- remove the rpm and TDC sensor;
- check that the distance between the surface of the sensor and the flywheel tooth corresponds to the sum of the length of the sensor probe (34.5 mm) with the gap (0.8 - 1.5 mm).

DETONATION SENSORS (0.261.231.095)

The detonation sensors are located in the monobloc below the inlet manifolds and between cylinders 1-2 and 4-5, respectively.

These sensors have a bush to prevent incorrect torque wrench tightening. **If they are replaced, do not place washers or shims between the engine crankcase and sensor contact surfaces.**

When there is engine knocking (detonation) vibrations of a certain frequency are created in the cylinder block/crankcase.

The phenomenon creates mechanical repercussions on a piezoelectric crystal which sends a signal to the control unit which, on the basis of this signal, makes provisions to reduce the ignition advance (from 3° to a maximum of 9.7°) until the phenomenon disappears. Afterwards the advance is gradually restored to the basic value.

Wiring connector

The numbers indicate the corresponding control unit pins.

Recovery

The ignition advance is calculated according to the temperature of the engine coolant and the temperature of the intake air.

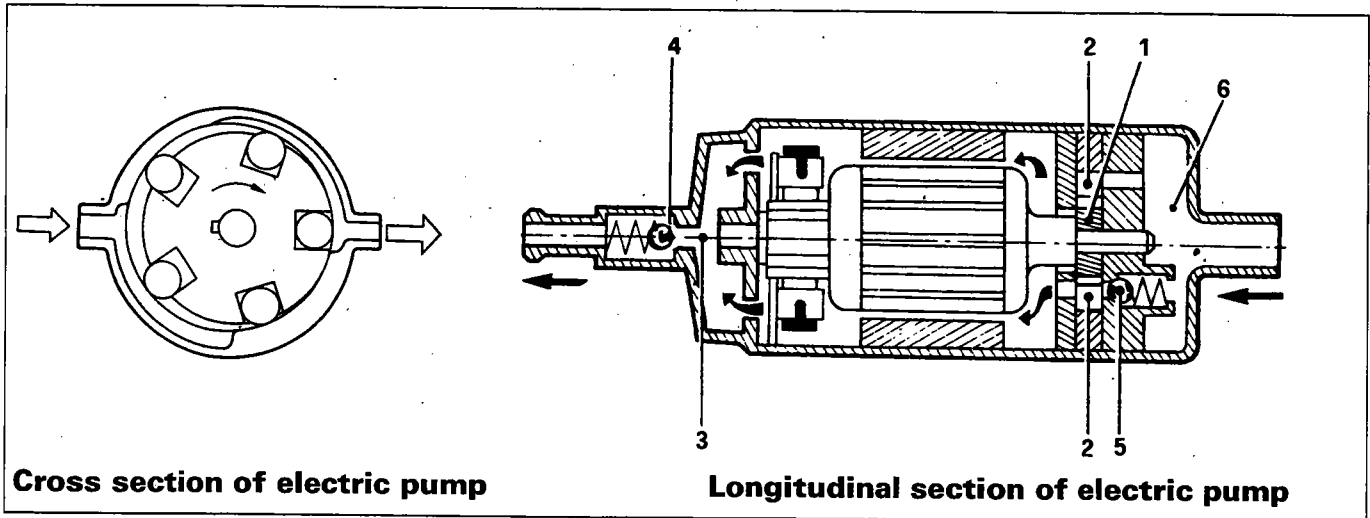
10.

ELECTRIC FUEL PUMP (0.580.453.408)

The submerged electric fuel pump is located inside the tank, housed in a mounting also containing the fuel gauge.

The electric pump is the cell type with rollers, operated by an electric motor with permanent magnet windings, immersed in the fuel.

A disc rotor (1) situated eccentrically in the pump casing contains the cells arranged along its circumference and metal rollers (2) which are thrust by centrifugal force against the outer race with the effect of ensuring the hydraulic seal.



P4A24FJ01

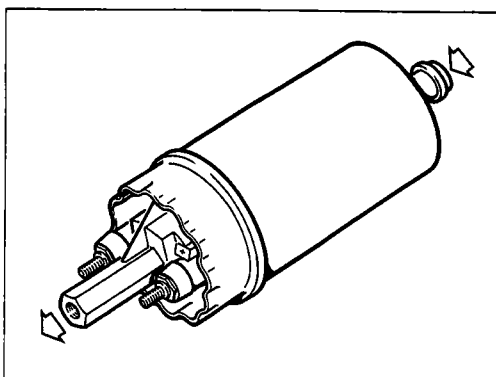
The fuel flows in the empty housings and is compressed in the supply duct (3). A one-way valve (4) prevents the supply pipe from being drained with the engine switched off.

An excess pressure valve (5) short circuits the supply in the inlet chamber (6) when the pressure exceeds 7.5 bar.

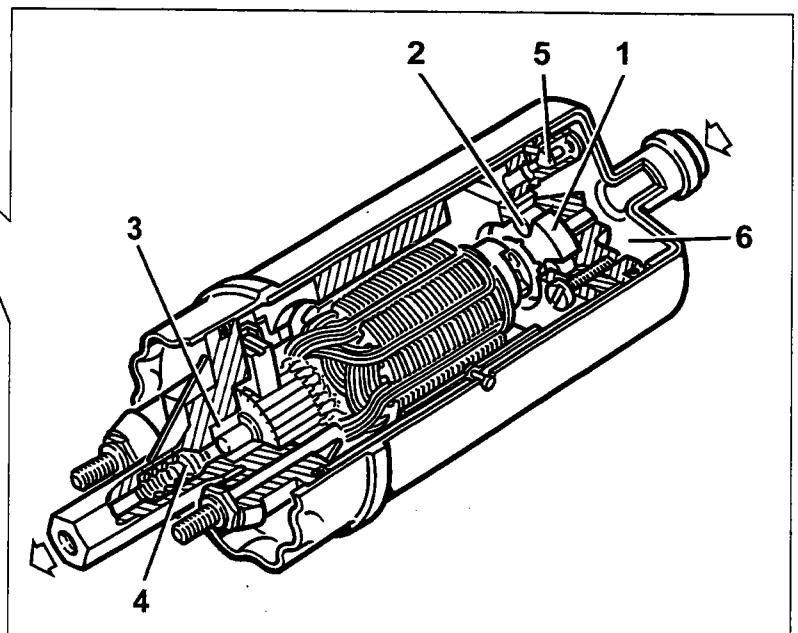
The electric pump starts to work when the ignition switch is turned to the starting position. When the starting stage is over, the electric pump continues to operate with the switch in the ON position, unless the engine speed goes below 225 rpm or the ignition switch is turned to the OFF position.

If the engine cuts out for any reason, with the ignition switch in the ON position, the operation of the pump is automatically interrupted, thereby creating a safety condition.

Diagram showing longitudinal cross section and external view of electric fuel pump



P4A24FJ02



P4A24FJ03

NOTE For the positioning and the re-moving-refitting procedures, refer to the fuel system section for the 1581 16v engine.

FUEL FILTER (A.450.024.262)

The fuel filter is fitted under the floor panel, on the fuel supply pipe. For the removing-refitting procedure, refer to the fuel system section for the 1581 16v engine.

FUEL SUPPLY MANIFOLD AND PRESSURE REGULATOR

The fuel supply manifold, which has the function of distributing the fuel to the injectors, is made from steel and is equipped with housings for the injectors and for the pressure regulator and the fuel inlet and outlet unions.

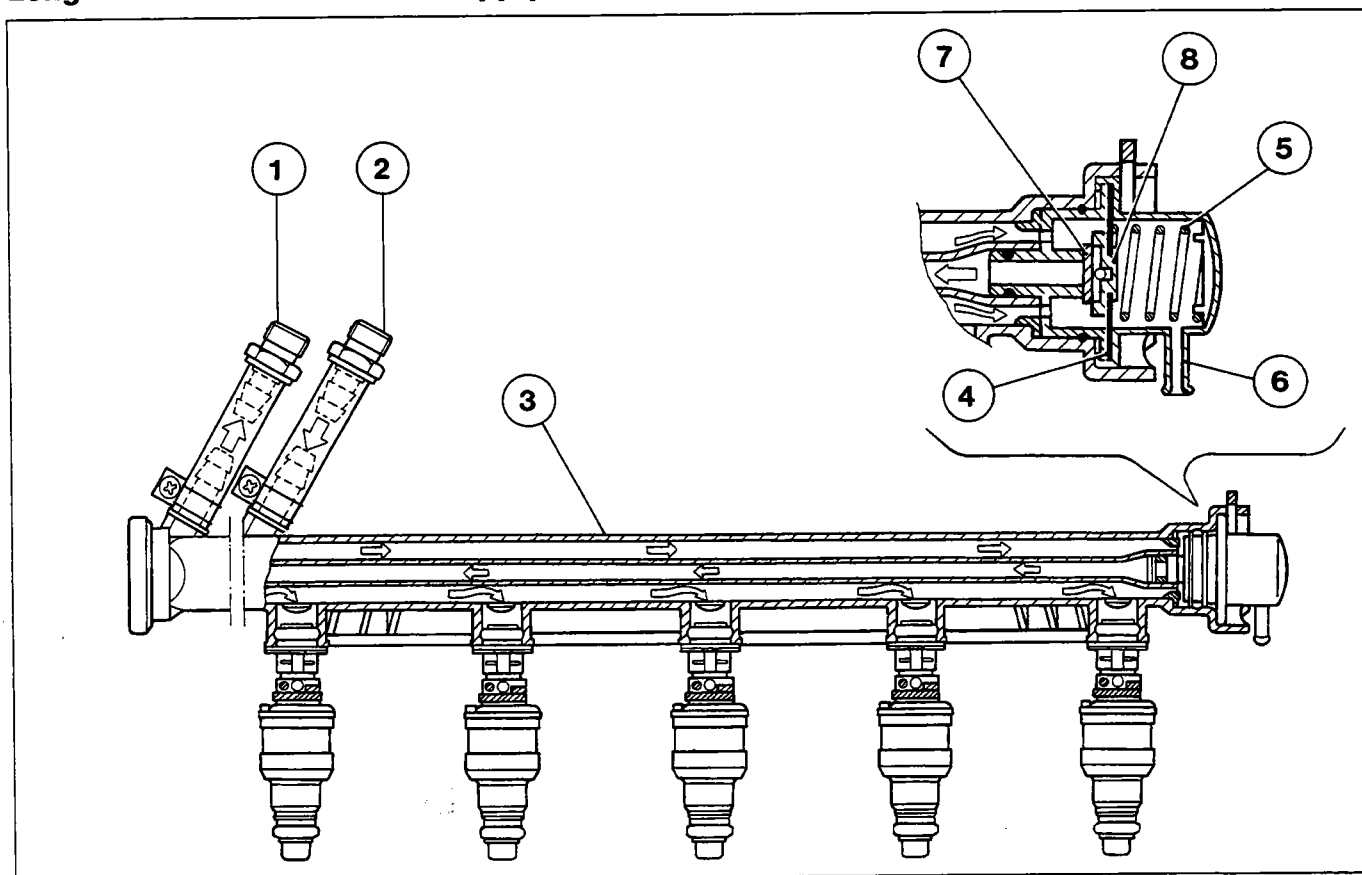
The fuel manifold is fixed to the inlet manifold by four brackets.

The pressure regulator is a necessary element in keeping the rise in pressure at the injectors constant. It is a differential diaphragm type device, regulated at a pressure of around 3 bar.

The pressure regulator is made up of a metal casing which houses a moving element comprising a metal casing (8) and a diaphragm (4) loaded by a spring (5). When the pre-set force, made up of the vacuum in the opposite part of the diaphragm and the spring (5) loading, is exceeded, the fuel thrust by the pump causes the opening of a valve (7) which allows the excess fuel to flow through the pipe to the tank (2).

The chamber housing the spring is in contact with the engine inlet manifold (6) (vacuum signal). The difference between the pressure of the fuel and the vacuum in the inlet manifold is kept constant for all engine operating conditions.

Longitudinal section of fuel supply manifold and pressure regulator



P4A25FJ01

1. Fuel return union
2. Fuel arrival union
3. Injectors mounting and fuel manifold
4. Diaphragm with flow valve

5. Adjustment spring
6. Connection to inlet manifold
7. Flow valve
8. Metal casing

10.

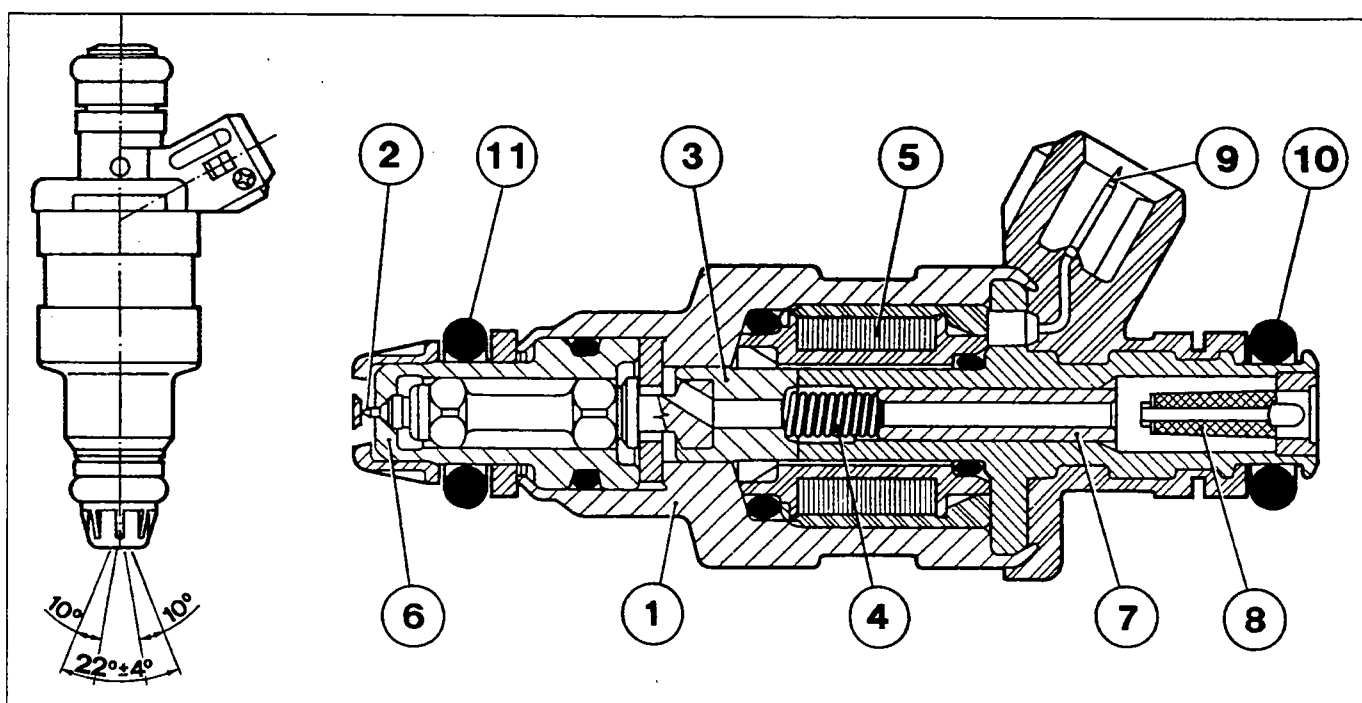
INJECTORS (0.280.150.443)

The double jet type injectors are fitted on the inlet manifolds, immediately before the inlet valve. These injectors are specifically for engines with 4 valves per cylinder, making it possible to direct the jets towards the two inlet valves.

The jets of fuel at a differential pressure of 3 bar which leave the injector are instantly atomized forming two cones of about 10° each.

The operation of the injectors is the «sequential timed» type, i.e. the five injectors are operated according to the engine cylinder inlet sequence, whilst the supply can already start for each cylinder during the expansion stroke until the inlet stroke has already begun.

The injectors are fixed by the fuel manifold which presses them into their housings in the inlet manifolds. In addition they are anchored to the fuel manifold by means of «safety clips». Two rubber seals (10) and (11) ensure the seal for the inlet manifold and the fuel manifold.

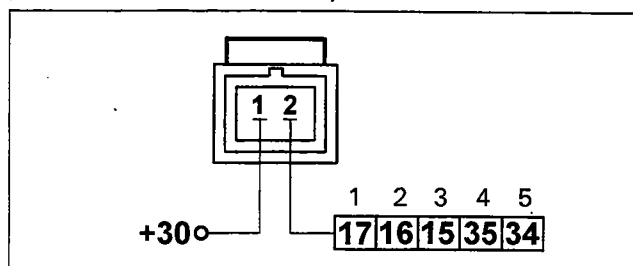


P4A26FJ01

- | | | |
|--------------------|-----------------------------|---------------------------------|
| 1. Injector casing | 5. Winding | 9. Electrical connection socket |
| 2. Needle | 6. Injector nose | 10. Fuel seal |
| 3. Magnetic core | 7. Adjustable spring pusher | 11. Vacuum seal |
| 4. Coil spring | 8. Fuel filter | |

Wiring connector

NOTE The numbers indicate the corresponding control unit pins arranged in the order of the number of cylinders.

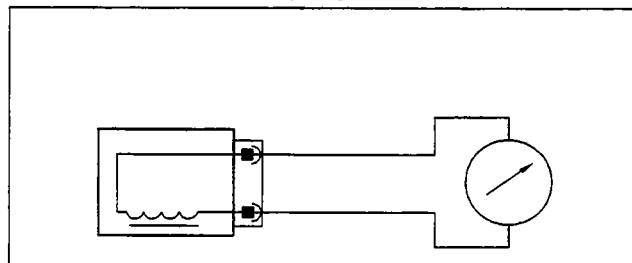


P4A26FJ02

Checking the resistance

The resistance of the injector can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Resistance value 16.2 ohm



P4A26FJ03

BUTTERFLY CASING

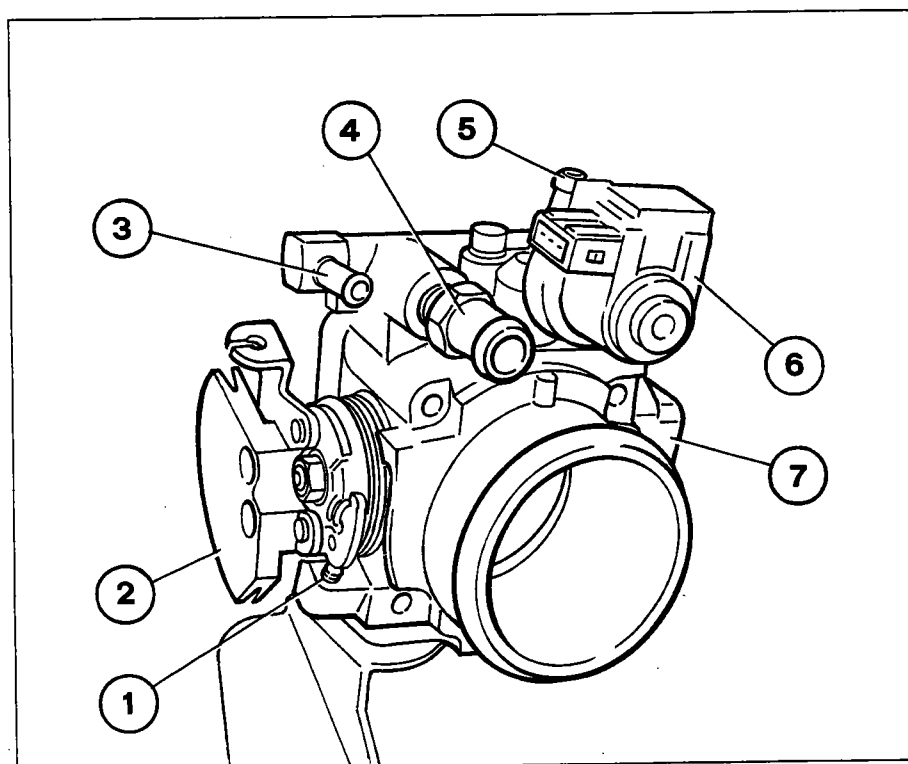
The quantity of air drawn in is determined by the opening of the butterfly located at the start of the inlet manifold. The butterfly casing is fixed to the inlet manifold by four bolts; the butterfly is operated by the accelerator pedal by means of linkage which produces an opening system where in relation to the pedal travel, small butterfly opening angles are produced with the pedal slightly pressed and greater opening angles are produced with the pedal more depressed.

The air required to support the engine during idling and in load conditions with the butterfly valve closed is regulated and by-passed exclusively by the engine idle speed actuator.

A special screw (1), makes it possible to adjust the butterfly closure to prevent interference with the surrounding duct; this screw is not used for adjusting the idle as it is adjusted by fluxing in production and should not be tampered with under any circumstances.

The flow of engine coolant arriving from the thermostat flows through the inlet and outlet ducts (3) and (5) in the area of the butterfly valve has the aim of preventing condensation and the formation of ice which could be produced in particular low external temperature and/or high humidity conditions.

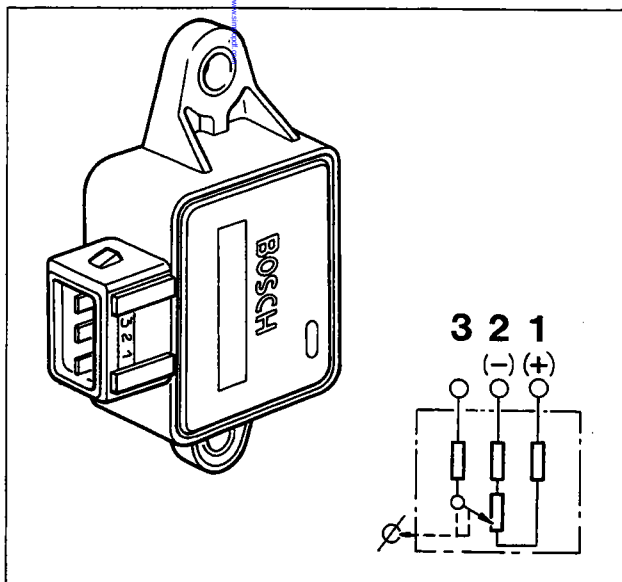
The gases which flow from the engine crankcase are drawn into the inlet manifold downstream of the butterfly through the PCV valve (4).



P4A27FJ01

1. Butterfly valve adjustment and anti-tamper screw (**not to be tampered with**)
2. Butterfly opening control levers
3. Attachment for engine coolant supply pipe
4. Attachment for engine crankcase vapour recovery and recirculation pipe
5. Attachment for engine coolant return pipe
6. Engine idle speed actuator
7. Butterfly valve position sensor

10.



P4A28FJ01

BUTTERFLY VALVE POSITION SENSOR (0.280.122.001)

The sensor is made up of a potentiometer inserted in a plastic container which has two fins, in which there are two openings WITHOUT SLOTS which have the function of ensuring the anchorage and the positioning of the sensor in relation to the butterfly valve. A three pin socket in the container guarantees the electrical connection with the electronic control unit.

During operation, the injection/ignition control unit provides the potentiometer with a supply of 5 Volts at pins (1) and (2).

There is a voltage at pin 3 which is inversely proportional to the opening position of the butterfly valve. According to the voltage sent by pin 3 the control unit recognizes the opening condition for the butterfly valve and suitably corrects the mixture strength.

With the butterfly closed an electrical voltage signal of around 0.5 Volts reaches the control unit which recognizes the idle and cut off conditions (distinguishing them on the basis of the engine speed).

The potentiometer automatically recognizes the butterfly idle position by means of a "self-adjustment" function. This eliminates the adjustment operations and makes it possible to allow for any wear which may occur for the butterfly closure position.

Recovery

If the sensor fails, the control unit establishes the following parameters:

Butterfly opening angle = 10°

idle state: air flow rate < 12.8 m³/h;

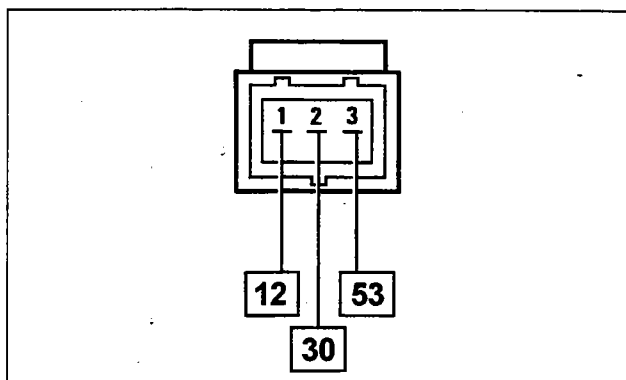
exit from idle state: air flow rate > 8 m³/h;

full load state: engine load > 6,5 ms and simultaneous speed > 2000 RPM;

exit from full load state: engine load < 6,5 ms or speed < 2000 RPM.

Additional provisions

The engine idle speed gradual decrease (dashpot) and idle self-adjustment strategies are stopped.



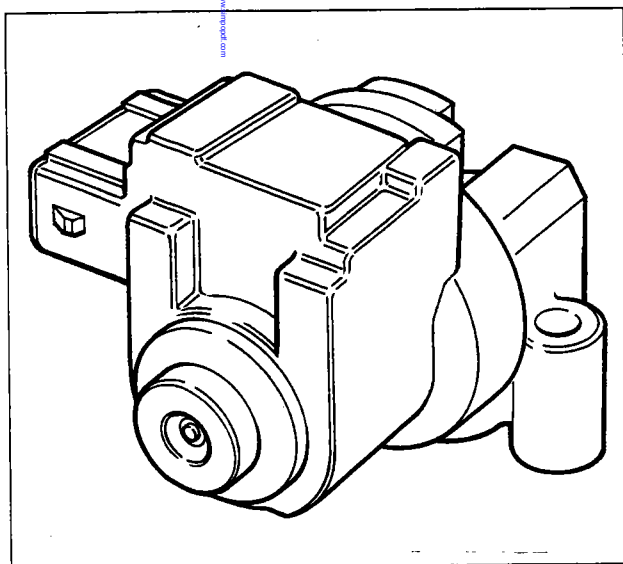
P4A28FJ02

Wiring connector

NOTE The numbers indicate the corresponding control unit pins

10.

ENGINE IDLE SPEED ACTUATOR (0.280.140.553)



P4A29FJ01

It is composed of an electric motor which, by opening the flow of supplementary air (in parallel to the flow from the butterfly with the accelerator released) in the butterfly casing more or less, automatically keeps the engine idle speed constant, irrespective of the load conditions (additional consumers switched on or not, engine hot or cold, etc.).

The opening caused by the rotation of the distributor is controlled by electrical impulses processed by a special section in the injection control unit which causes the distributor to rotate in one direction or the other depending on the speed at which the engine is rotating.

Recovery

If the actuator fails, the control unit activates different recovery strategies depending on the butterfly valve opening angle.

Recovery 1: valve in recovery position, near the idle air flow rate for:

- short circuit battery V at opening or closing winding or opening and closing winding;
- open circuit at opening or closing winding or at opening and closing winding
- short circuit battery V at opening winding and open circuit at opening winding
- short circuit battery V at closing winding and open circuit at opening winding.

Recovery 2: valve open 0% for:

- short circuit battery V at opening winding and short circuit to earth at closing winding;
- open circuit at opening winding and short circuit to earth at closing winding.

Recovery 3: valve open 50% for:

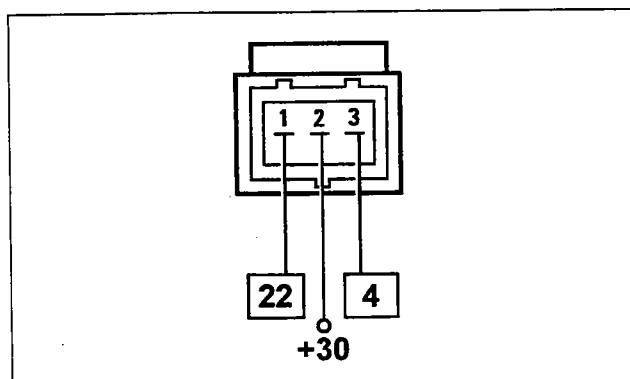
- short circuit to earth at opening winding or closing winding or opening and closing

Recovery 4: valve open 100% for:

- short circuit battery V at closing winding and short circuit to earth at opening winding;
- open circuit at closing winding and short circuit to earth at opening winding.

Additional provisions

Locking the idle self-adjustment at the current values and locking the idle control.

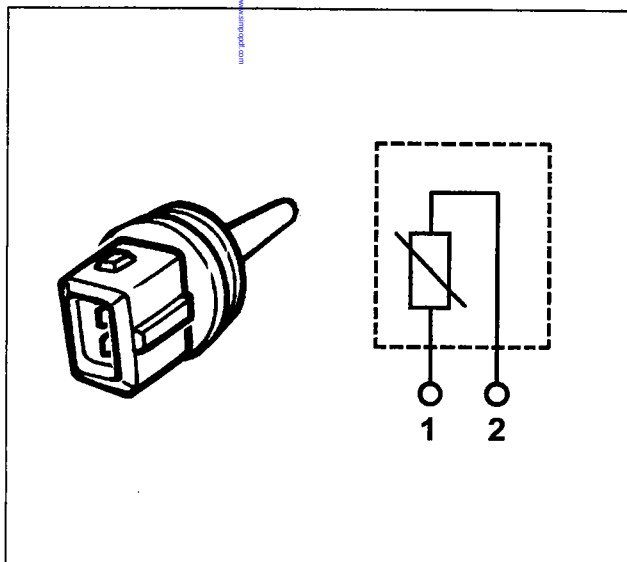


P4A29FJ02

Wiring connector

NOTE The numbers indicate the corresponding control unit pins.

10.

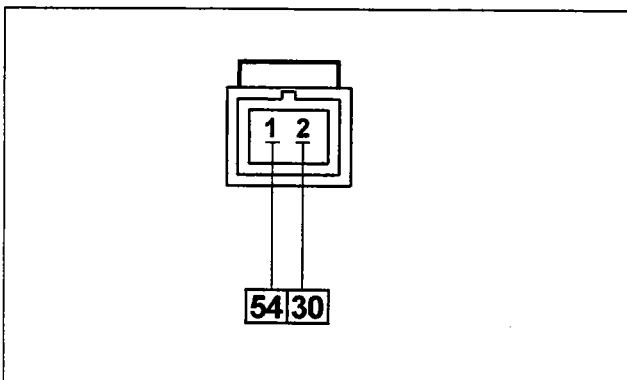


P4A30FJ01

AIR TEMPERATURE SENSOR (0.280.130.073)

The intake air temperature sensor is, in this version, separate from the air flow meter: it is made up of an NTC sensor (Negative Temperature Coefficient) where the electrical resistance decreases as the temperature increases.

Since the control unit input circuit is designed as a tension divider, this tension is divided between a resistance in the control unit and the sensor NTC resistance. As a result the control unit is capable of evaluating the variations in the resistance of the sensor through the changes in voltage and of thereby obtaining the temperature information.



P4A30FJ02

Recovery

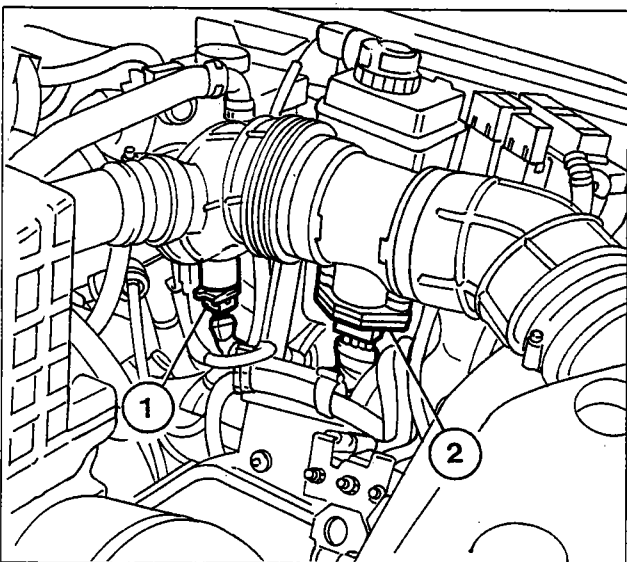
If, 3 minutes after starting, the control unit detects a temperature (air T) < -35 °C or > 130 °C for 30 seconds, it assumes air T=20.4 °C as a fixed parameter

Additional provisions

Locking the self-adjustment of the mixture strength at current values

Wiring connector

NOTE The numbers indicate the corresponding control unit pins.



P4A30FJ03

FLOW METER (0.280.217.111)

The air flow meter is the "heated film" type; the operating principle is based on a heated diaphragm which is placed in a measuring duct through which the intake air entering the engine flows.

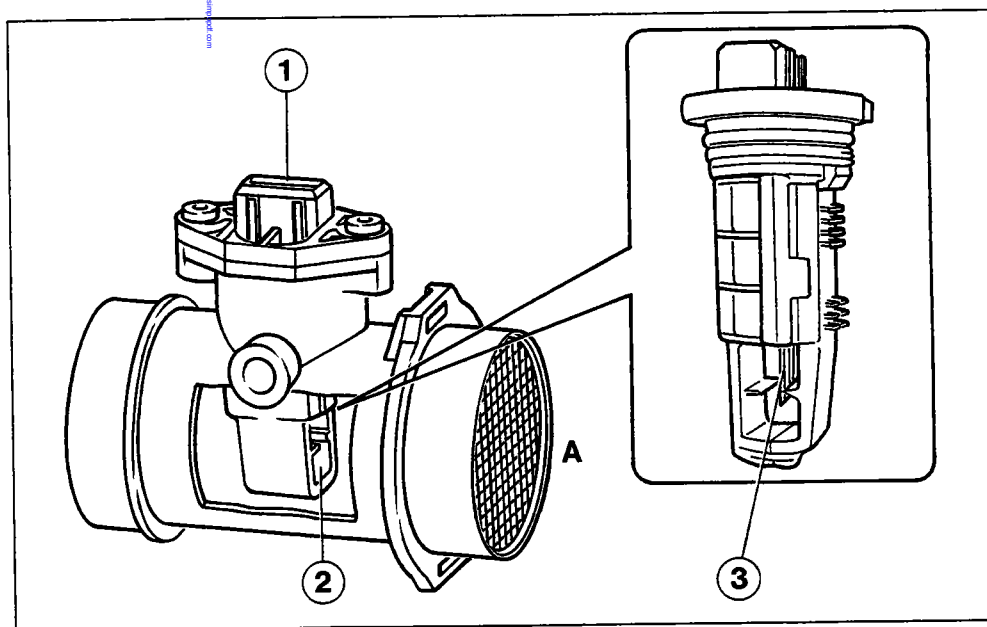
The film diaphragm is kept at a constant temperature (~120 °C above the temperature of the air) by the heating resistance in contact with it.

The mass of air which passes through the measuring duct tends to remove heat from the diaphragm therefore, to maintain the latter at a constant temperature, a current must flow through the heating resistance; this current is measured by a suitable Wheatstone bridge.

The current measured is therefore proportional to the mass of air flow.

1. Air temperature sensor

2. Flow meter



P4A31 FJ01

- 1. Connector
- 2. Measuring duct
- 3. Hot film sensor
- A= Air intake

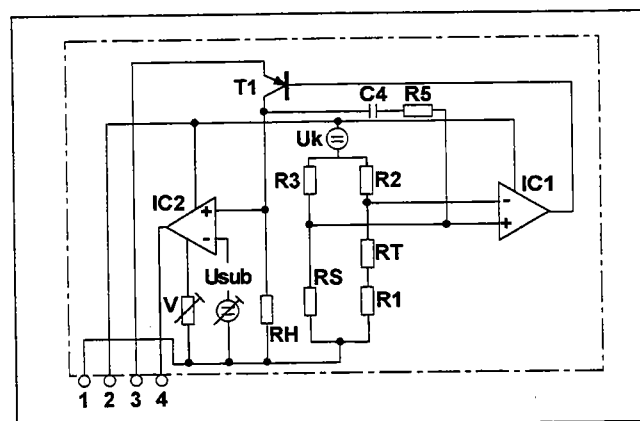
NOTE This flow meter directly measures the mass of air (and not the volume as on previous versions) thereby dispensing with the problems of temperature, altitude, pressure, etc.

Description of the operation

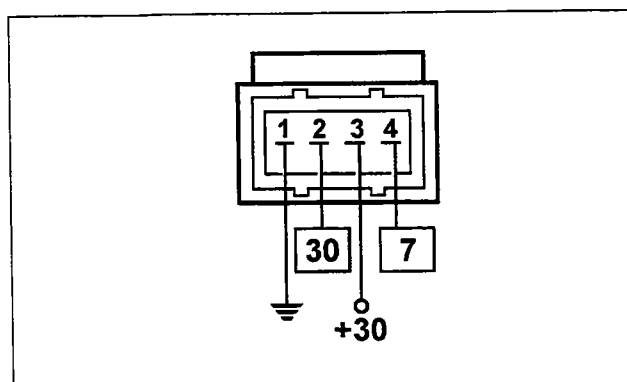
The Wheatstone bridge (made up of R_3 , R_2 , R_s , R_t+R_1) is balanced when the R_s is at about 120°C above the temperature of the air. The air which passes through the diaphragm removes heat from the R_s , therefore the bridge is unbalanced. This situation is detected by the circuit at IC1 which controls the transistor T1 in a manner which is proportional to the bridge imbalance and as a result more current is passed through R_h to heat R_s and therefore restore the balance for the bridge. The circuit IC2 measures the current which passes through R_h . This current makes it possible to keep the bridge balanced and therefore proportional to the mass of air which passes through the air flow meter.

Recovery

In the absence of a simultaneous error at the butterfly potentiometer, the idle engine load is calculated according to the speed if the engine is idling, otherwise a fixed engine load is allocated. If there is a simultaneous error at the butterfly potentiometer, the engine load and advance values are allocated according to a table depending on the number of revs.



P4A31 FJ02



P4A31 FJ03

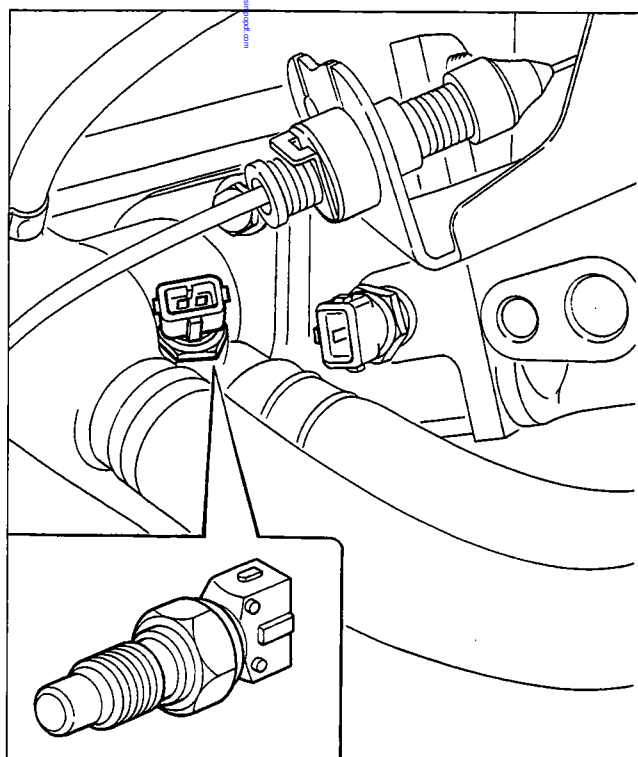
Additional provisions

Locking the self-adjustment of the mixture strength and idle at current values.

Wiring connector

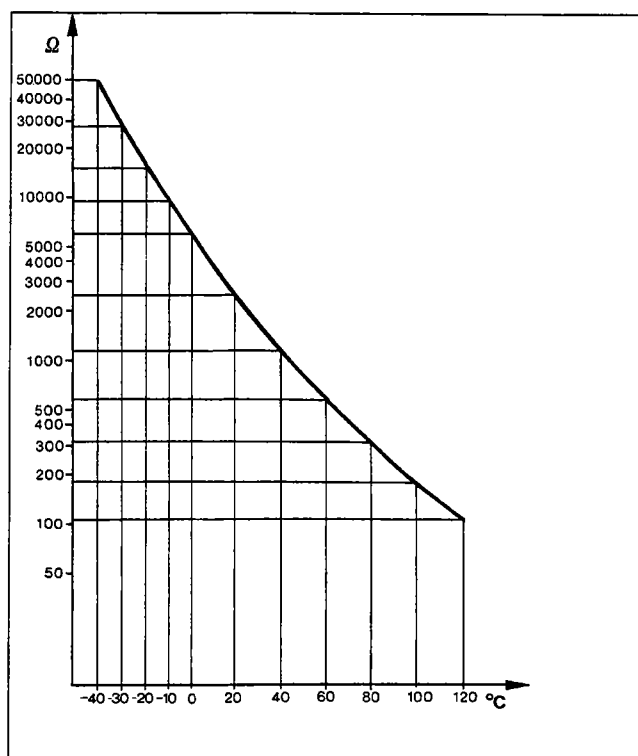
NOTE The numbers indicate the corresponding control unit pins.

10.



P4A32FJ01

The graph below shows the sensor characteristics which can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram at the side.

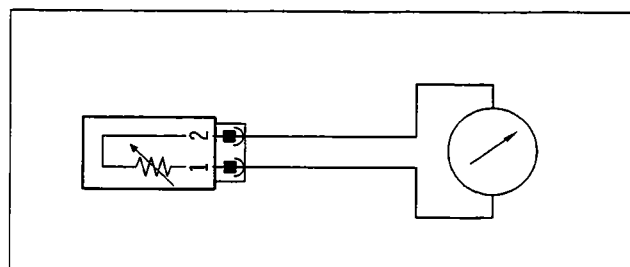


P4A32FJ03

COOLANT TEMPERATURE SENSOR (0.280.130.026)

The sensor is fitted near the thermostat casing with the sensitive part in contact with the coolant. It is made up of a brass casing which protects the actual resistive element comprising an NTC (Negative Temperature Coefficient) «thermistor», where the electrical resistance of the sensor decreases as the temperature increases).

It provides the control unit with a voltage which varies according to the temperature of the engine in order to correct the information concerning the air flow rate from the flow meter so that according to the signal received by the sensor the control unit can control the injection of the fuel for a greater length of time, providing the necessary enrichment when the engine is operating at temperatures below operating temperature.



P4A32FJ02

Recovery

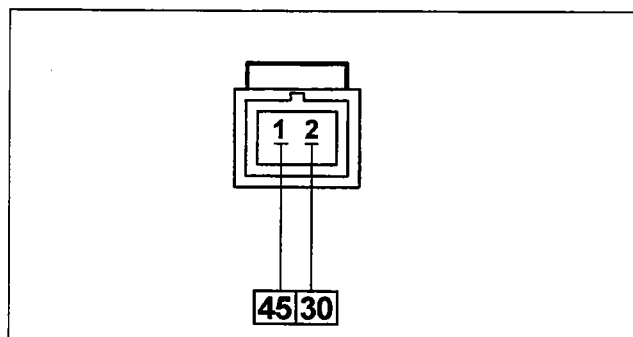
If air $T \leq 19.9^\circ\text{C}$, it is assumed that engine $T = \text{air } T$ for three minutes, then it is assumed that engine $T = 80^\circ\text{C}$. If air $T \geq 19.9^\circ\text{C}$, it is assumed that engine $T = 80^\circ\text{C}$ immediately.

Additional provisions

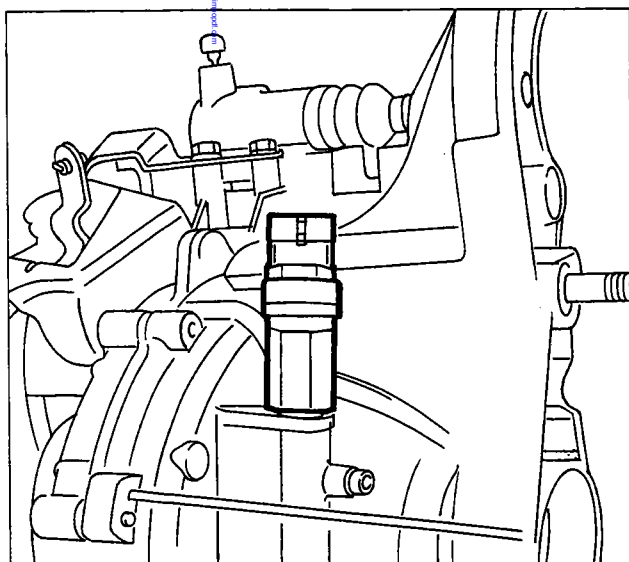
Locking the self-adjustment of the mixture strength and idling at current values.

Wiring connector

The numbers indicate the corresponding control unit pins



P4A32FJ04



P4A33FJ01

PHASE TRANSFORMER

In order to achieve a good compromise between the high performance in terms of power at high speeds and good torque at low speeds, a phase transformer (electronically and hydraulically operated) is fitted for the inlet camshaft.

This device makes it possible to alter the timing diagram (inlet phase) according to the engine load conditions; this parameter is processed by the MOTRONIC control unit on the basis of the electrical signals received by the air flow meter and the rpm sensor and sent to the phase transformer solenoid valve.

The construction of the device involves a main assembly fitted on the inlet camshaft which has the task of altering the angular position of the actual shaft in relation to the drive pulley.

In addition there is a valve, operated by an electro-magnet, both of which are on the inlet manifold and connected hydraulically to the main assembly by appropriate ducts.

The operating principle is as follows:

- with the temperature of the coolant below 40 °C and when the engine is idling or the speed exceeds 4800 rpm, the electro-magnet (1) is de-energized, therefore the valve (2) thrust by the opposing spring (3) remains raised not allowing the oil which is arriving from the duct (A) to reach the transformer.

In this case the timing of the inlet valves remains unaltered.

With the temperature of the coolant above 40 °C and with the engine speed above idle and below 4800 rpm with the butterfly angle greater than about 8°, the electro-magnet (1) is energized, thereby thrusting the valve (2) downwards. In this position the oil, coming from the duct (A), enters the piston chamber (B) and from here flows via a special opening into the duct (C) inside the latter.

The oil can only leave the above mentioned duct via the upper port (in contact with duct (D) supplying oil to the transformer) because with the valve (2) lowered, the lower port is not in contact with the discharge duct (E).

The oil reaches the chamber (G) through ducts (D) and (F) moving the piston (4) axially towards the engine; because this piston has helical teeth on the outside this axial movement causes it to rotate in a clockwise direction (as seen from the timing side).

This rotation is transmitted, by means of a straight toothed splined profile, to the pinion (5) which, bolted onto the threaded end of the camshaft (6), transmits the rotation to the shaft, thereby varying the timing of the inlet valves by an advance of 9°.

When the electro-magnet is de-energized, the valve (2) returns to the original position, interrupting the flow of oil under pressure to the chamber (G), but allowing the return of the oil to the exhaust, thanks to the force of the opposing spring (7).

SPEEDOMETER SENSOR

The speedometer sensor (vehicle speed sensor) it is composed of a Hall effect sensor and is located at the differential outlet.

The sensor transmits a signal to the control unit where the frequency varies according to the speed of the vehicle.

The control unit uses this information to improve the management of the engine idle adjustment actuator and for the CUT-OFF strategy.



The speedometer sensor signal is also processed to calculate and memorize the mileage travelled in the control unit; this information can be read using the Fiat/Lancia Tester.

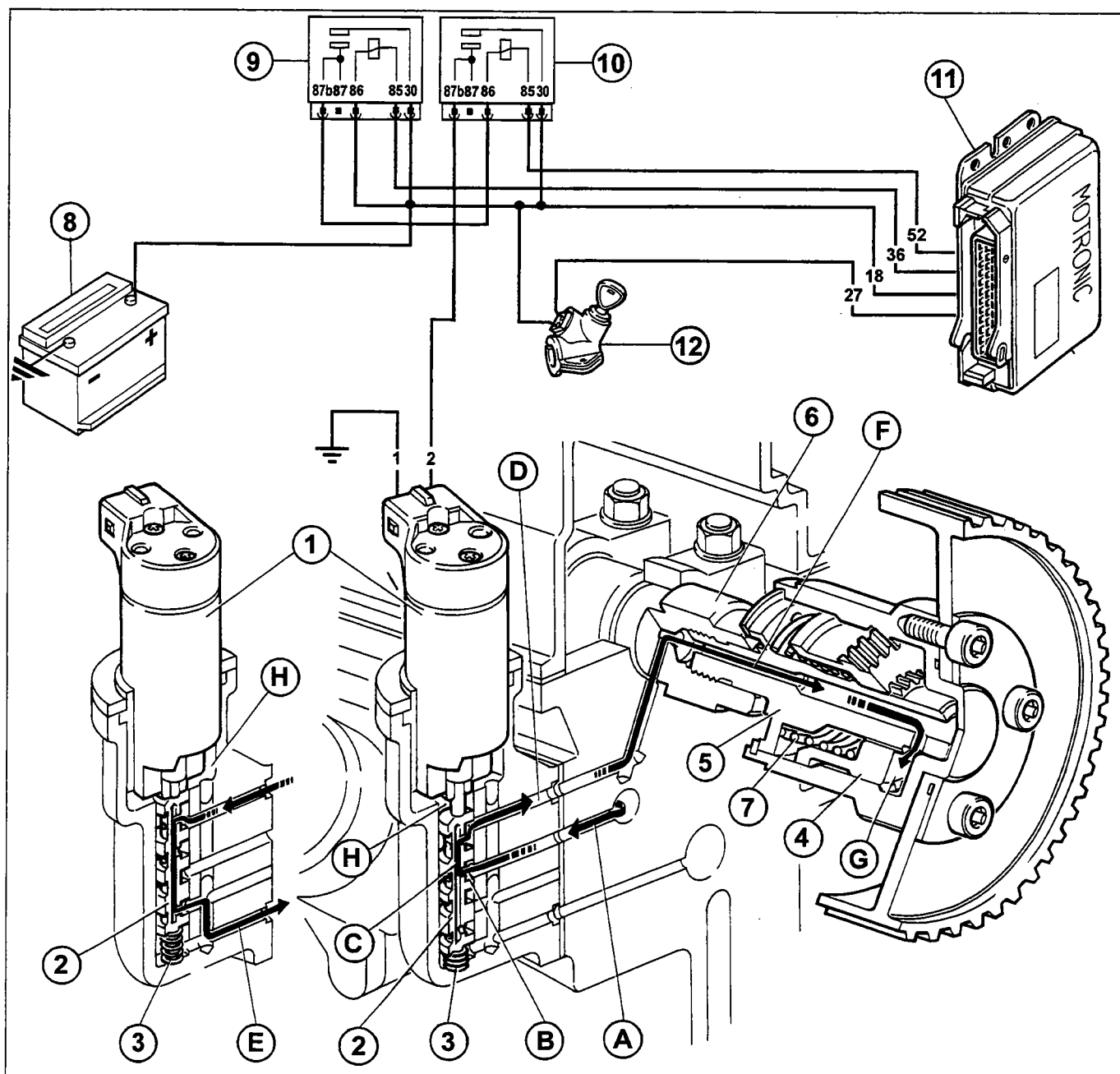
10.

An additional duct ensures the lubrication of the bearing on the camshaft even when the device is not activated.

The oil which reaches the chamber (H) for the electro-magnet is discharged through the drainage duct (E).

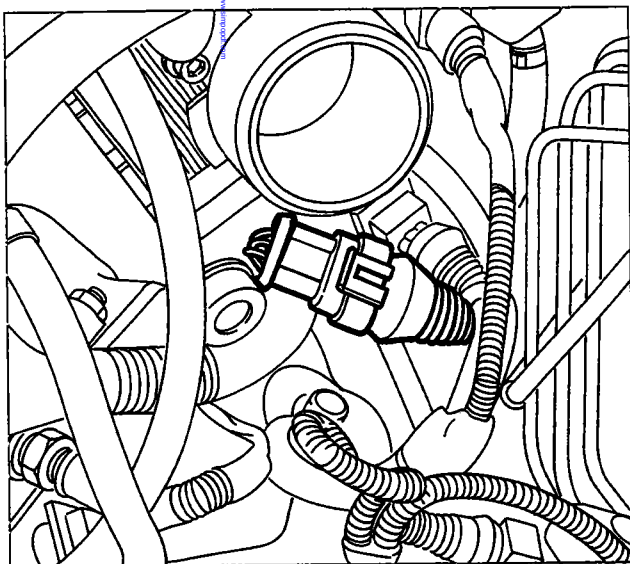
Recovery

If the solenoid valve fails, the final stage (driver) in the control unit is deactivated.



P4A34FJ01

- | | |
|-------------------------|---|
| 1. Solenoid valve | 8. Battery |
| 2. Valve | 9. Injection/ignition system relay |
| 3. Valve spring | 10. Phase transformer solenoid valve relay feed |
| 4. Piston | 11. Injection/ignition control unit |
| 5. Pinion | 12. Ignition switch |
| 6. Camshaft end section | |
| 7. Piston spring | |



P4A05DX04



LAMBDA SENSOR (0.258.003.466)

To meet the strict legislation governing the emission of harmful residues from internal combustion engines which require increasingly more precise metering of the air/fuel mixture, the vehicle has been equipped with a heated Lambda sensor with four wires which measures the oxygen content of the exhaust gases. For a complete description of the Lambda sensor, refer to the Fuel System section for the 1581 16V engine.



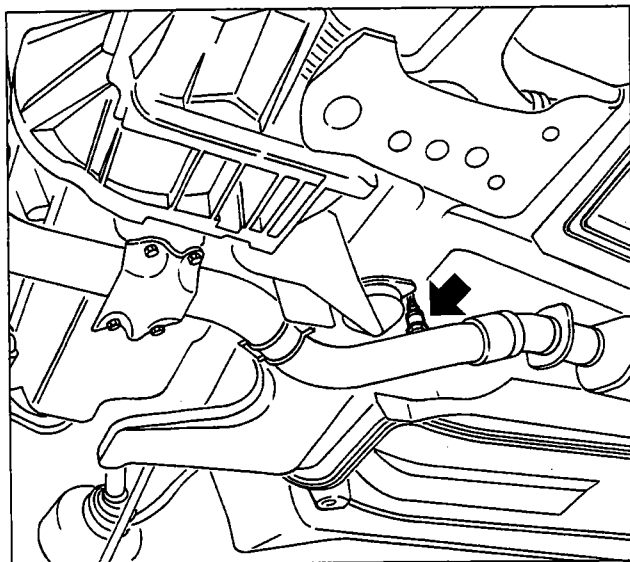
The sensor can be rapidly put out of action by even the slightest amounts of lead in the fuel.

Removing-refitting

- Position the vehicle on a lift.
- Disconnect the negative lead from the battery.
- Disconnect the electrical connection under the butterfly casing.
- Raise the vehicle.
- Remove the Lambda sensor from its housing.
- When tightening, do not exert force on the component or it will be irreparably damaged.



If the Lambda sensor is being replaced, when refitting smear anti-seize grease on the threaded part (e.g. Bosch VS 14016- FT).



P4A35FJ02



Tightening torque 5 - 6 daNm

Recovery

The Lambda data is ignored (open loop) if the sensor voltage is $> 1,099$ V or between 0.400 and 0.518 V for more than 2.55 s.

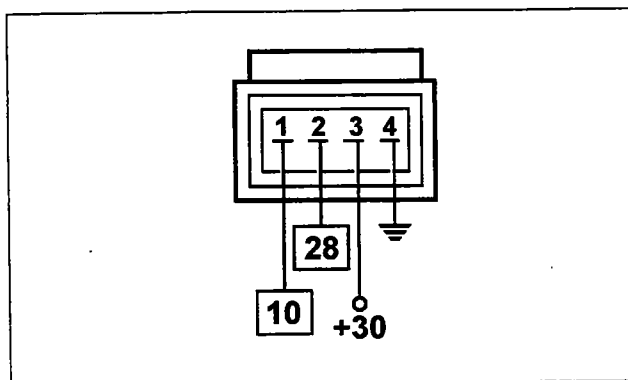
Locking of self-adjustment of mixture strength for sensor voltage $< 0,0879$ V for more than 2.55 s.

Open loop is considered the maximum Lambda integrator value (FR) for the last good sensor voltage reading $< 0,0879$ V and simultaneously $FR=1.4$.

Locking of FR at limit value reached for $FR > 1.25$ or < 0.75 for at least 15 s.

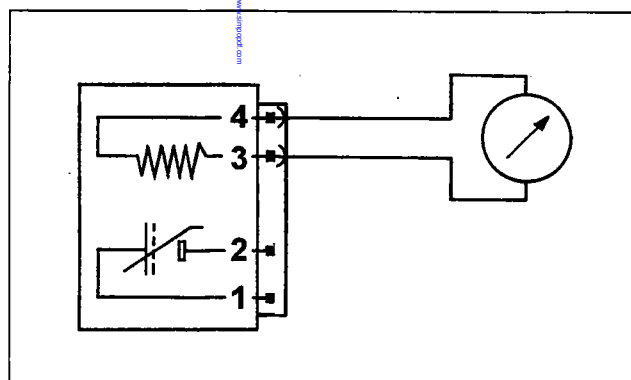
Wiring connector

The numbers indicate the corresponding control unit pins.



P4A35FJ03

10.



P4A36FJ01



Checking the resistance

The resistance of the sensor heater can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

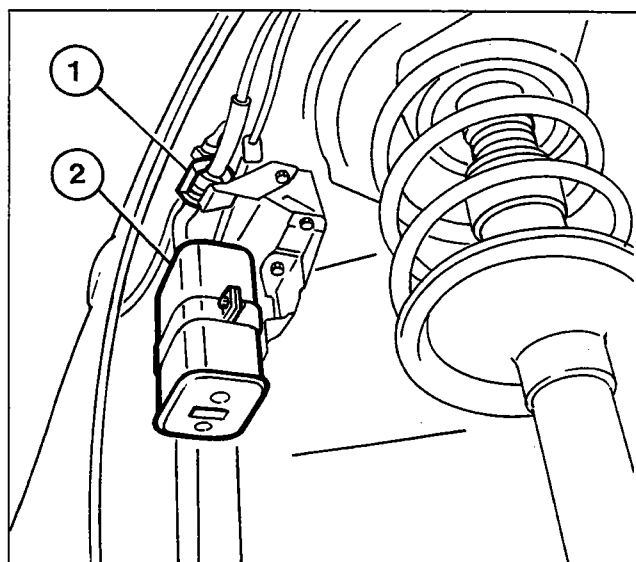
Resistance: 4.5 ± 0.5 ohm at 20°C

CHARCOAL FILTER AND FUEL VAPOUR CUT OUT SOLENOID VALVE

The charcoal filter and the solenoid valve are located in the right wheel arch.

For the description of the charcoal filter refer to the Fuel System section for the 1581 16V engine.

1. Vapour cut out solenoid valve
2. Charcoal filter



P4A36FJ02

Vapour cut out solenoid valve (0.280.142.300)

The function of this valve is to control the quantity of petrol vapours drawn in by the active charcoal filter and directed to the inlet manifold by means of the electronic control unit.

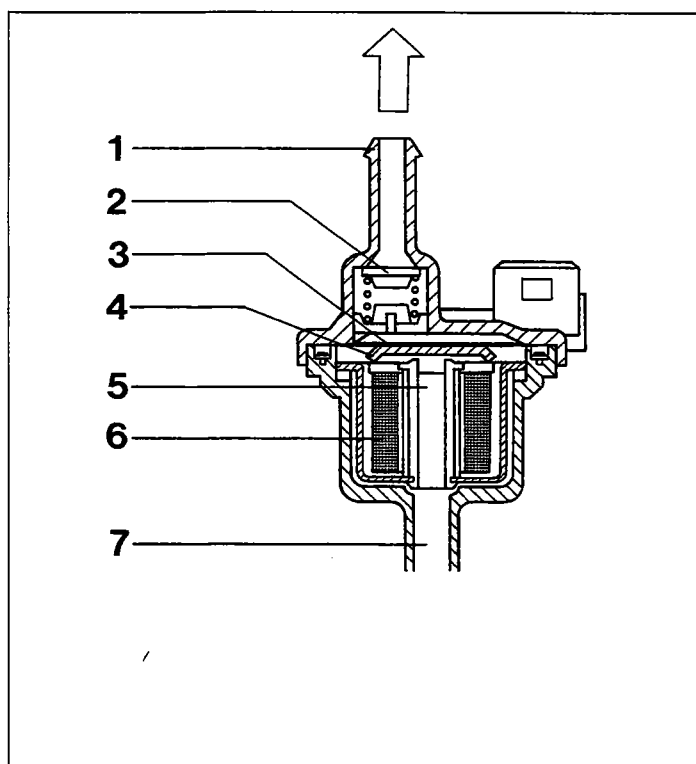
If this valve is not supplied it is in the open position; if the key is turned to the ON position, it closes preparing for operation. In effect, if energized the solenoid valve (6) attracts the shutter (4) which, overcoming the spring (3) loading, closes the port (5) preventing the flow of petrol vapours.

The operation is controlled by the electronic control unit as follows:

- during starting the solenoid valve remains closed, preventing the petrol vapours from excessively enriching the mixture;
- when the engine has been started up, the electronic control unit sends a signal to the solenoid valve which modulates the opening.

In this way the control unit controls the quantity of petrol vapours sent to the inlet, thereby preventing considerable variations (above all during idling) in the mixture strength.

NOTE *The solenoid valve must be fitted correctly: the arrow on its casing should be facing the vacuum inlet on the inlet manifold.*



P4A36FJ03

1. Inlet union
2. One-way valve
3. Spring
4. Shutter
5. Outlet port
6. Solenoid valve
7. Outlet union

Removing-refitting

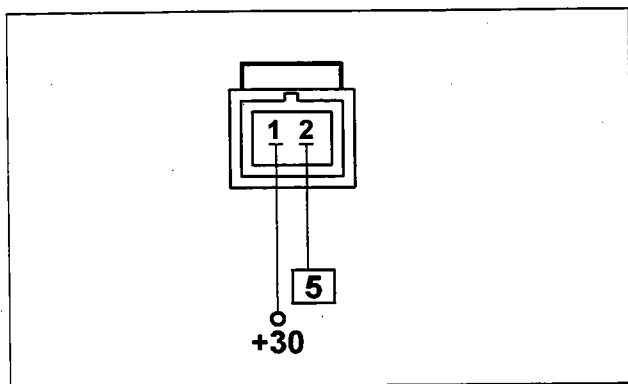
The procedure is valid for both the charcoal filter and the vapour cut out solenoid valve.

- Raise the vehicle;
- remove the right front wheel;
- remove the rear liner for the right front wheel arch;
- undo the bolt which fixes the component concerned to the mounting bracket;
- remove the electrical connection and the pipes connected;
- remove the component concerned.

Recovery

Locking self-adjustment of mixture strength.

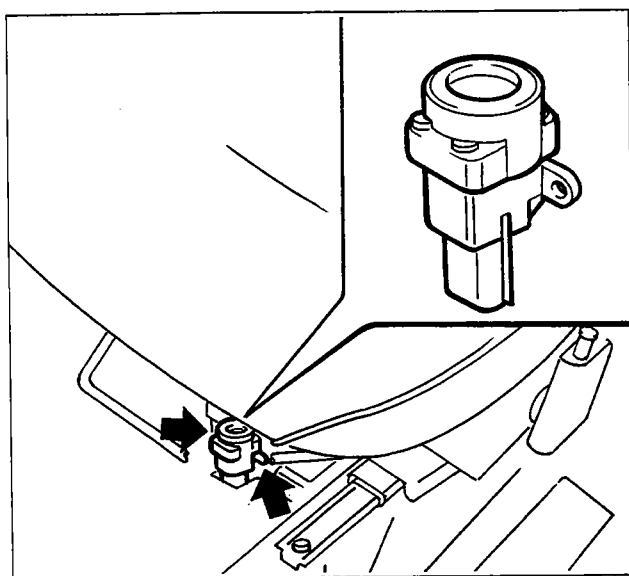
Locking the self-adjustment of the fuel anti-evaporation system.



P4A37FJ01

Wiring connector

NOTE The numbers indicate the corresponding control unit pins.



P4A48CJ02

INERTIA SWITCH

In order to increase the degree of safety for the occupants of the vehicle in the case of an impact, the vehicle is equipped with an inertia switch located inside the passenger compartment, under the driver's seat.

This sensor reduces the possibility of fire (as a result of fuel escaping from the injection system) by de-activating the electric pump which supplies the injection circuit.

For the complete description and the removing-refitting procedure, refer to the Fuel System section for the 1581 16V engine.



After even a slight impact, if there is a smell of fuel or there are leaks from the fuel system, do not turn the switch back on, but search for the problem and correct it to prevent the risk of fire.

10.

MULTI-PURPOSE VALVE AND SAFETY AND VENTILATION VALVE

These valves belong to the fuel vapour anti-evaporation and recirculation system. For their description refer to the Fuel System section for the 1581 16V engine.

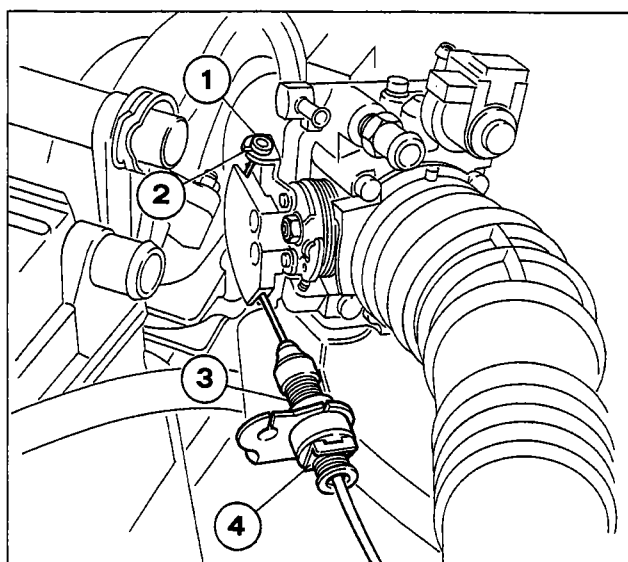
CHECKS/ADJUSTMENTS AND REPAIR OPERATIONS TO BOSCH MOTRONIC M 2.10.4 INJECTION/IGNITION SYSTEM APART FROM FAULT DIAGNOSIS WITH THE FI-AT/LANCIA TESTER



WHEN WORKING ON A VEHICLE EQUIPPED WITH A MOTRONIC INJECTION/IGNITION SYSTEM THE FOLLOWING PRECAUTIONS MUST BE OBSERVED:

- do not start up the engine with the electrical connection terminals not properly connected or slack at the battery poles;
- never use a rapid battery charger to start the engine;
- never disconnect the battery with the engine running;
- to rapidly charge the battery it must be disconnected first from the vehicle's electrical system;
- if the vehicle is going in a drying oven after painting where the temperatures are in excess of 80 °C, it is necessary to remove the injection/ignition electronic control unit;
- never attach or disconnect the electronic control unit multiple connector with the ignition switch in the ON position;
- always disconnect the negative battery lead before carrying out electrical welding on the vehicle.

Remember that this system has a memory which is always supplied (stand-by memory) where the self-adjustment values are memorized. The operation of disconnecting the battery results in this information being lost but it can be acquired again after a certain mileage; this operation should therefore be restricted.



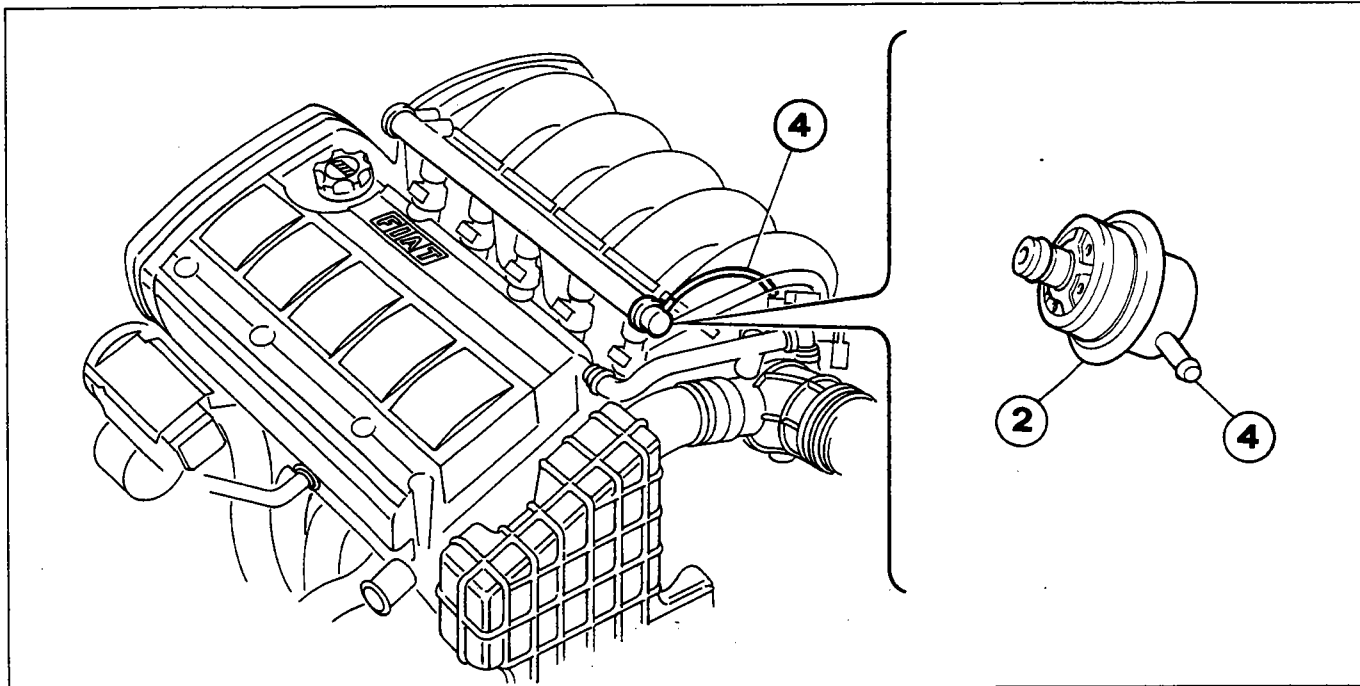
ADJUSTMENT OF ACCELERATOR CONTROL CABLE

The adjustment of the accelerator cable is obtained by moving the clip (4) in the different bush (3) splines.

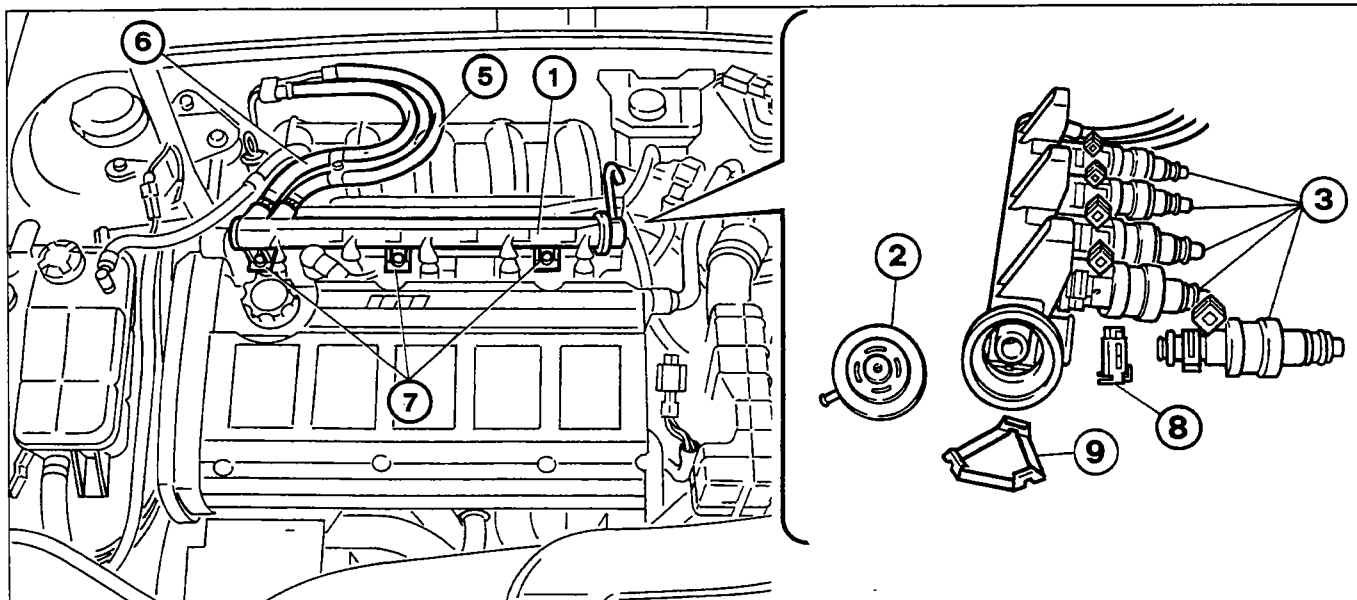
Position the clip in such a way that the head (1) of the accelerator cable freely enters the slot (2) without altering the engine idle speed.

10.

REMOVING-REFITTING FUEL MANIFOLD COMPLETE WITH INJECTORS AND PRESSURE REGULATOR



P4A39FJ01



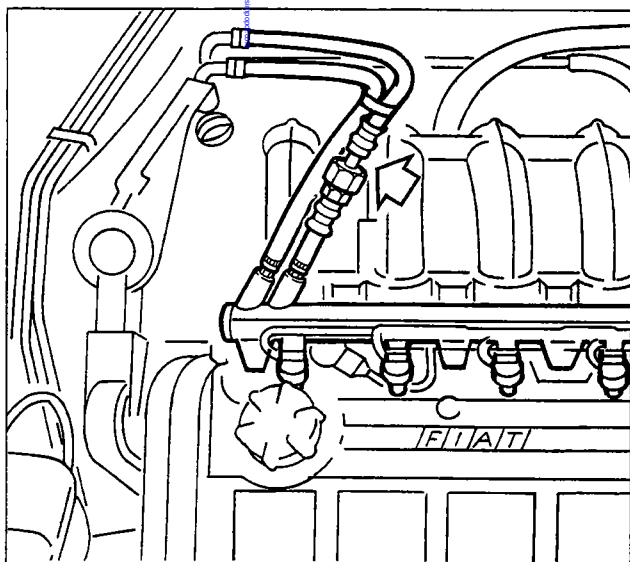
P4A39FJ02

Proceed as follows:

- Disconnect the fuel supply pipe (5) from the union.
- Loosen the band for the return pipe and disconnect the flexible rubber pipe from the rigid pipe.
- Disconnect the electrical connectors from the injectors.
- Undo the fixing bolts (7).
- Extract the injector manifold assembly..
- To remove the injectors from the fuel manifold, remove the clip (9).

1. Fuel manifold
2. Fuel pressure regulator
3. Injectors
4. Vacuum pick up from engine inlet manifold
5. Fuel supply pipe from the electric pump
6. Fuel return pipe to the tank
7. Bolts fixing fuel manifold and injectors
8. Pressure regulator clip on fuel manifold
9. Injector clip on fuel manifold

10.



P4A40FJ01

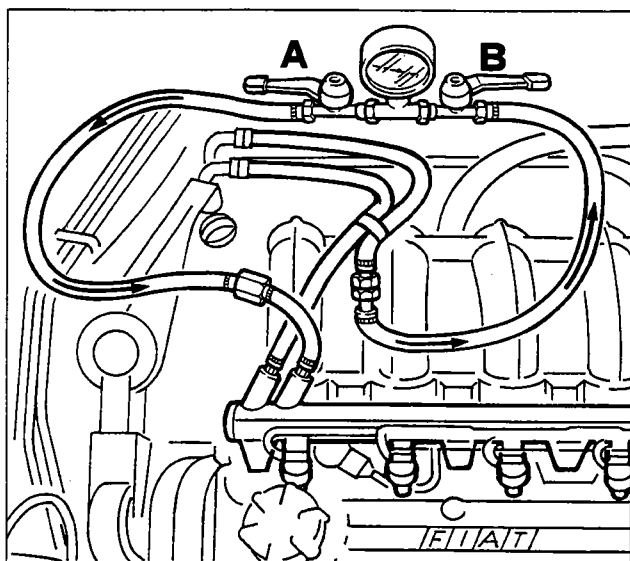


CHECKS ON FUEL SUPPLY CIRCUIT

1st Test

Checking fuel regulation pressure

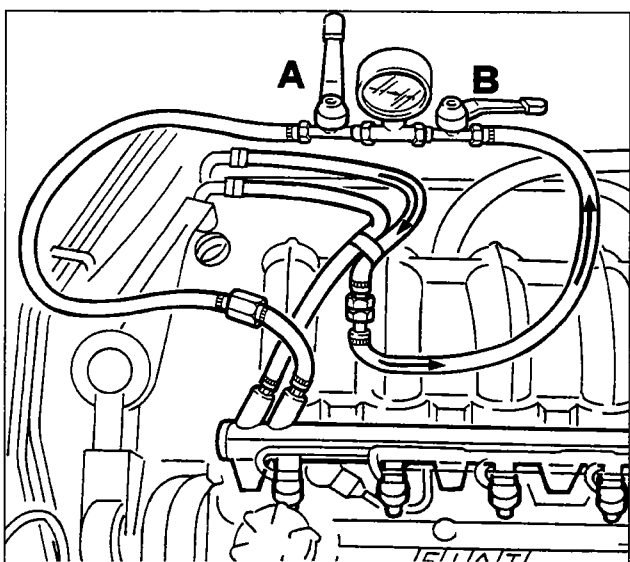
- Disconnect the fuel supply pipe to the manifold from the union shown by the arrow;
- Place pressure gauge 189589000 with both taps A and B in the open position between the end of the pipe disconnected and the fuel manifold;



P4A40FJ02



- operate the electric fuel pump with the engine switched off with the help of the Fiat/Lancia Tester activating the "fuel pump" test;
- the pressure reading on the pressure gauge should stabilize in these test conditions at around 3 bar. If the pressure is insufficient, carry out the 2nd test.



P4A40FJ03

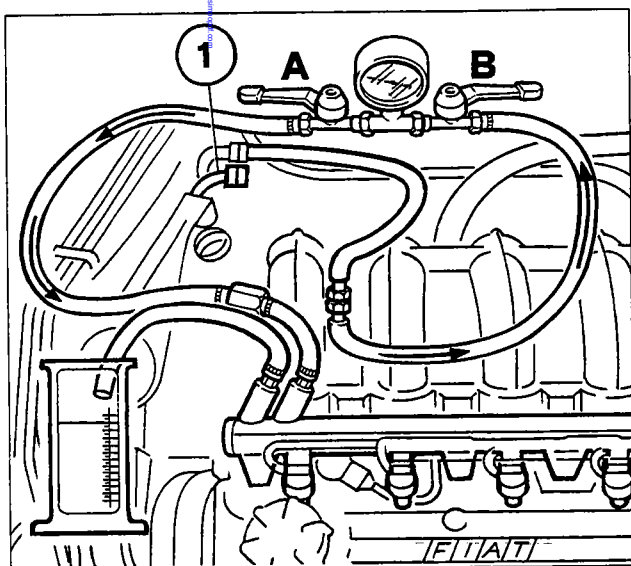


2nd Test

Checking maximum fuel supply pressure (or electric pump efficiency)

The same connections as for the previous test apply.

- Close lever A for the fuel tap (downstream of the pressure gauge);
- operate the electric pump with the engine switched off, as described in the previous test: the pressure should reach 6 bar and not exceed 7.5 bar (pump safety valve calibration). If this is not the case, replace the electric pump because it is defective.

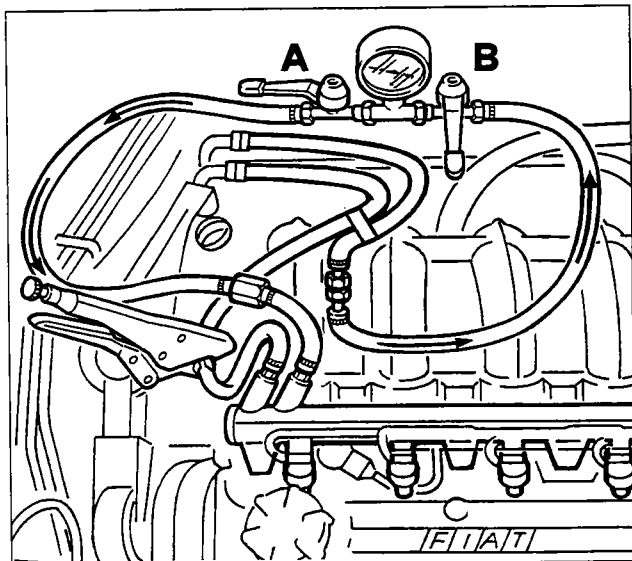


P4A41FJ01



If in the 1st test (see previous page) the pressure value was more than three bar it is necessary to:

- disconnect the fuel return pipe (at the connection point (1) with the rigid fuel return pipe to the electric pump) and place it in a suitable container for collecting the fuel.
- place both taps A and B in the open position;
- operate the electric pump with the engine switched off, as described on the previous page, then read off the value reached on the pressure gauge:
 - a. if it reaches 3 bar, check the fuel return pipe to the tank because it is obstructed or bent;
 - b. if it exceeds 3 bar, then the pressure regulator must be replaced because it is defective.



P4A41FJ02



3rd Test

Checking injectors seal

To check whether the injectors are dripping, simply implement the connections for the 1st test (checking regulation pressure), then operate the electric pump with the engine switched off. When the regulation pressure is reached, close the control lever B and, at the same time, restrict the fuel return pipe to the tank; a pair of pliers should be used so as not to damage the pipe.

This operation is necessary to distinguish between a real leak from the injectors and the imperfect seal of the fuel pressure regulator flow valve.

Then:

- switch off the electric pump;
- observe whether the pressure remains constant for around 60 seconds as soon as it stabilizes (i.e. decreases slightly).

If this is not the case, there is a leak from one or more injector or from a union.

- If this is the case, remove the fuel manifold from the inlet manifold, keeping the connection with the pressure gauge.
- Repeat the previous test leaving the pressure gauge tap open.
- After having operated the electric pump with the engine switched off, visually inspect for drips from the injectors or from any connecting sections.

Replace any injector which is dripping and/or renew the defective seal which is leaking.

10.

CHECKING ENGINE IDLE SPEED

If the engine idle speed is not 750 ± 50 rpm and the injection/ignition control unit is the self-adjusting type, it is not possible to adjust it, therefore it is necessary to check that the accelerator linkage is correctly adjusted and to then search for the cause of the problem by carrying out a complete fault diagnosis using the Fiat/Lancia Tester.

CHECKING CONCENTRATION OF POLLUTANT EMISSIONS

The Motronic M 2.10.4 system ensures a constant check on the idle speed and the CO percentage through the self-adjustment of the system, thereby making any outside adjustments superfluous (there are no adjustment screws). However, a check on the content of the exhaust gases downstream of the catalyzer can provide precious indications on the operation of the injection/ignition system, the engine parameters and the catalyzer.

Checking idle concentration of CO and HC

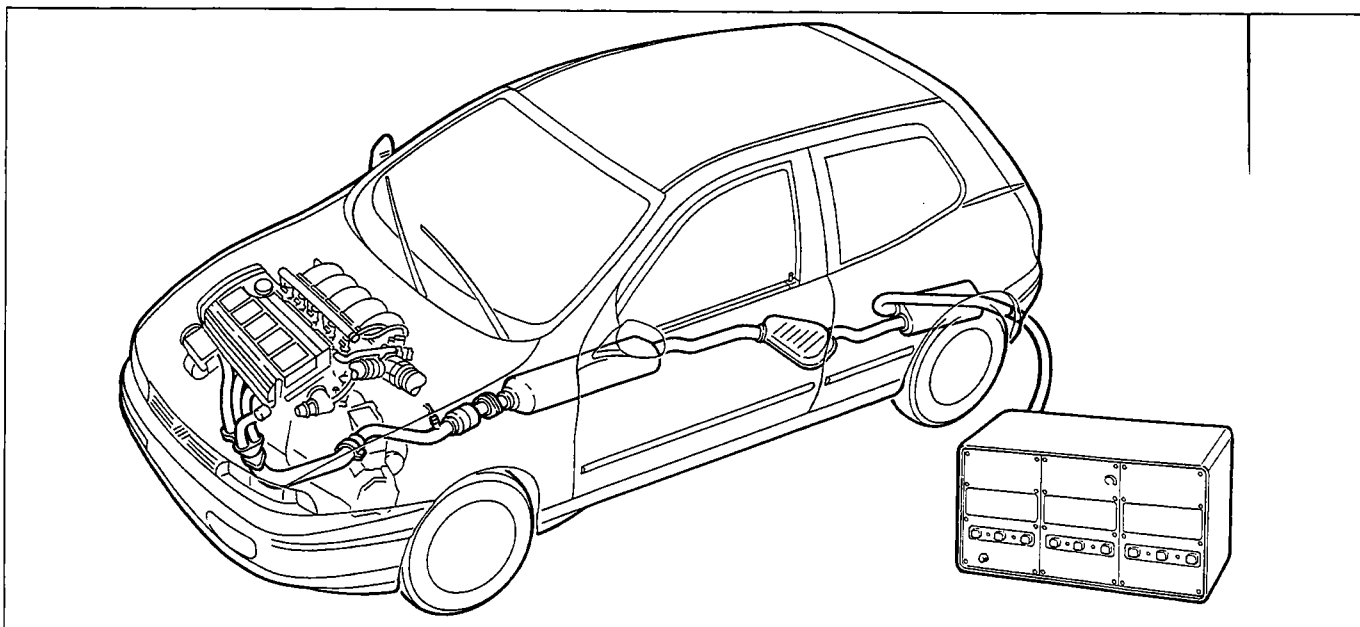
The concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) is measured with the catalyzer at operating temperature ($300 - 350^{\circ}\text{C}$) (it is advisable to drive "hard" for around 5 - 10 minutes to make sure that the catalyzer reaches operating temperature), then insert the suitably tester probe at least 30 cm into the end of the exhaust pipe as shown in the diagram.

If the shape of the end section of the exhaust pipe is such that the sensor cannot be completely introduced, a special extension pipe must be added which ensures the seal in the join area.

1. Check that the CO and HC concentrations are within the values given in the table;
2. If the CO value is not within the recommended figures, it is necessary to check:
 - the correct operation of the Lambda sensor, using the Fiat/Lancia Tester;
 - the presence of air penetration in the area surrounding the Lambda sensor housing;
 - the injection and ignition system (**in particular the state of wear of the spark plugs**).
3. If the HC value is outside of the recommended limits, the cause of the problem should be sought in the incorrect engine timing or the decreased efficiency of the catalyzer.

CO (%)	HC (p.p.m.)	CO ₂ (%)
$\leq 0,35$	≤ 90	≥ 13

Table summarizing pollutant emission tolerances downstream of the catalyzer



P4A42FJ01

DIAGNOSIS

The complete diagnosis of the system is possible through active dialogue with the Fiat/Lancia Tester.

If a failure is detected for the sensors the electronic control unit replaces the information coming from the faulty sensor with information memorized (**recovery**) so that the engine can still operate. The detection of the problem involves it being memorized permanently and the exclusion of the sensor from the system until the signal is compatible once again.

The same procedure is applied if the problem involves an actuator or its control holder. The detection of the problem and the replacement with recovery data involves signalling the problem by the special warning light in the instrument panel coming on.

The parameters which can, in the case of a breakdown, be managed by the control unit are: flow meter, idle adjustment actuator, coolant temperature sensor, butterfly valve position sensor, Lambda sensor, air temperature sensor, battery voltage and detonation sensors. If there are problems with the control unit, the timing sensor or the injectors, the system does not detect the problem and the vehicle breaks down. The problems can be read by an operator on the control unit using the Fiat/Lancia Tester.

Detecting problems

This is carried out during the basic function which manages the sensor/actuator.

Memorizing the error and the structure of the errors memory

The errors are memorized in the control unit in the order in which they occur in the RAMS. For each of them the location and type of error, 2 environmental conditions (specific to each type of problem) measured the moment in which the problem is detected and a frequency counter is memorized.

Classification of the defect

If a defect is recognized for the first time and the error state persists for a time $t > 0.5s$, the defect is memorized as "permanent". If this defect then disappears, it is memorized as "intermittent" and "not present". If it then reappears, it remains memorized as "intermittent", but becomes "present".

The classification of a problem as "permanent" activates the recovery functions; when the problem disappears the normal function of reading or implementation is restored.

Certain types of problem are classified as "important", i.e. in terms of anti-pollution regulations. The presence of these problems is signalled to the user by means of the failure warning light in the instrument panel coming on.

Frequency counter

For each error there is a frequency counter, which is used to determine the moment in which a problem which is no longer present has been memorized. The first time the problem is detected, the counter is set at 10. If the fault disappears, the counter remains at the current value. If it reappears, it is increased by 1 (to an upper limit of 50).

The counter is decreased each time the engine is started up without the fault reappearing. If the counter reaches zero then the fault is automatically cancelled from the memory.

If after having decreased the counter the fault should reappear, the counter returns to a value of 10 (if, however, it is greater than 10, it is not altered).

Signalling failures

The failure warning light comes on when there is a defect memorized as "present" and "important". The delay time between detecting the problem and the warning light coming on is 0.1 seconds; the delay time between the disappearance of the problem in the memory and the warning light going out is 4 seconds.

The warning light comes on each time the ignition key is turned to the ON position. If there are "important" problems already present, the warning light goes out after 4 seconds.

10.

Cancelling the error

When the frequency counter reaches the value 0, the error is cancelled and so are the parameters associated with it.

The immediate cancelling of the entire errors memory takes place in the following cases:

- by means of the "cancel errors memory" command sent by the tester;
- by interrupting the supply to the injectors control unit (disconnecting the battery or the connector for the control unit).

Fault diagnosis with the Fiat/Lancia Tester

On the right hand side of the engine compartment (near the engine oil dip stick) is the diagnostic socket to which the Fiat/Lancia Tester is connected.

The exchange of data between the control unit and the Tester takes place via a two direction serial line (line K) using the standard Bosch communication protocol.

The Tester can supply the following information:

- display of the errors;
- display of engine parameters;
- active diagnosis.

List of errors

Rpm sensor	Loss of signal
Butterfly potentiometer	C.C.
Air temperature sensor	C.C.
Coolant temperature sensor	C.A-C.C.
Battery	Supply > 16,01V.
	Supply < 10V.
Lambda sensor	C.A-C.C.- Incorrect CO value
Injector	C.C.
Idle speed actuator	C.C.
Petrol vapour solenoid valve	C.C.
Actuator relays	C.C.
Control unit	Operating problems for the micro-processor or control unit memories are signalled.
Flow meter	C.C.
Timing sensor	Signal missing or not plausible
Detonation sensor	Signal missing or not plausible
Speedometer sensor	Signal missing or not plausible
Phase transformer	C.C.
Electric fuel pump	C.C.
Fiat CODE	Code not recognized or not received

Parameters displayed

Engine rpm
Injection time
Advance
Intake air temperature
Coolant temperature
Butterfly valve opening angle
Battery voltage
Lambda sensor
Self-adjustment
Flow meter
Engine knocking (detonation)
Vehicle speed
Petrol vapour cut out solenoid valve
Fiat CODE
Mileage travelled

Active diagnosis

The following active tests can be carried out using the Fiat/Lancia Tester:

- Phase transformer
- Injector
- Failure warning light
- Petrol vapour solenoid valve
- Air conditioning
- Idle speed actuator
- Cancelling errors.

Recovery

If there are problems with the sensors, the control unit replaces the value transmitted by the sensor with a so called Recovery value which, depending on the different problems, is stored in the control unit memory or is specially reconstructed from the other information available, in order to allow the vehicle to reach a service centre.

This value is also transmitted to the Fiat/Lancia Tester, therefore, during the fault diagnosis it is worth bearing in mind that in the case of problems the Fiat/Lancia Tester will signal the error for the sensor concerned and the Recovery value will be displayed.

Permanent memory

The control unit is equipped with a «permanent» type errors memory (EEPROM), i.e. the error indication is preserved even if the cause of the problem no longer exists and the key has been turned to the OFF position; it also has a «volatile» type memory (RAM) which, on the other hand, loses the error information as soon as the cause disappears.

This also allows the more effective detection of errors of an occasional nature.

Before ending the fault diagnosis the contents of the «permanent» memory should be cancelled using the Fiat/Lancia Tester in Active Diagnosis.

The contents of the «permanent» errors memory can be cancelled in the following ways:

- 1 - Using the Fiat/Lancia Tester in active diagnosis.

If this is not the case, when the Fiat/Lancia Tester is reconnected the errors already examined are signalled.

- 2 - If the cause of the error is no longer present and the engine has been started up 5 times (working for at least 20 minutes) with a gap of at least 2 minutes between one starting and the next.

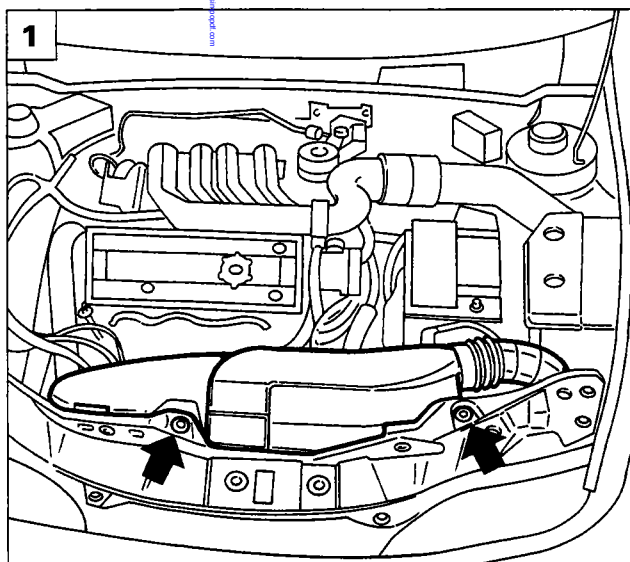


Disconnecting the control unit from the system, even for long periods of time, does not cancel the contents of the «permanent» memory.

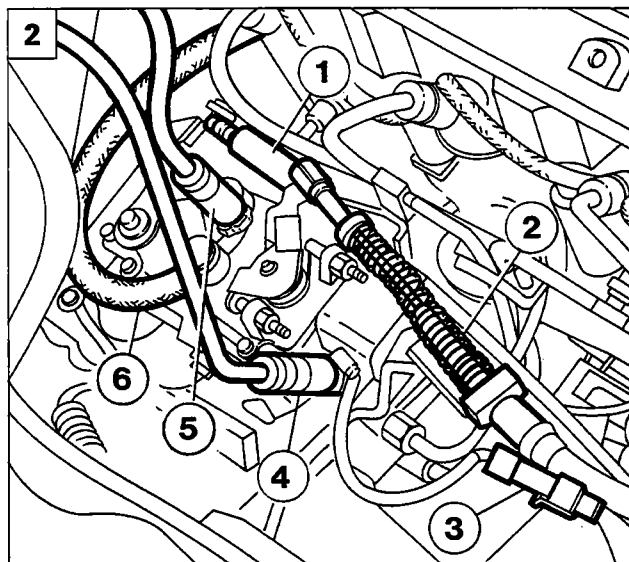
FUEL SYSTEM

page

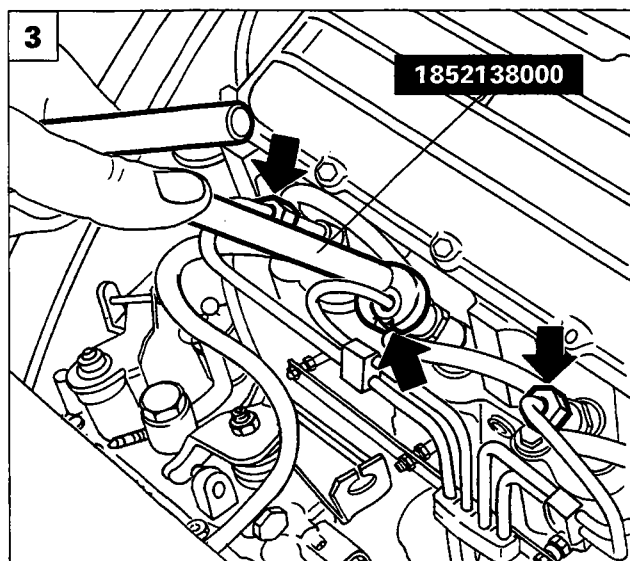
Removing-refitting injection pump on vehicle	1
- Removing injection pump	1
- Refitting injection pump	4
- LUCAS FT05 injection pump	5
Adjusting pump timing on engine	6
- Fitting pump and checking advance on engine	6
- Fitting injection pump	6
- Final check	7
Possible adjustments on injection pump fitted to engine	7
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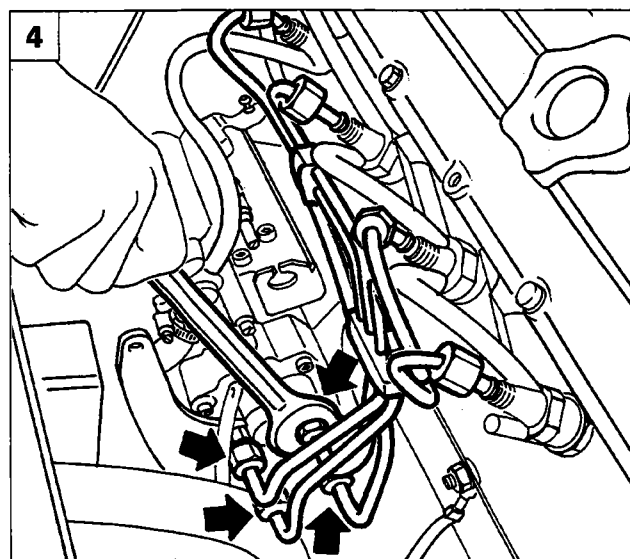
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P4A01DJ02



P4A01DJ03

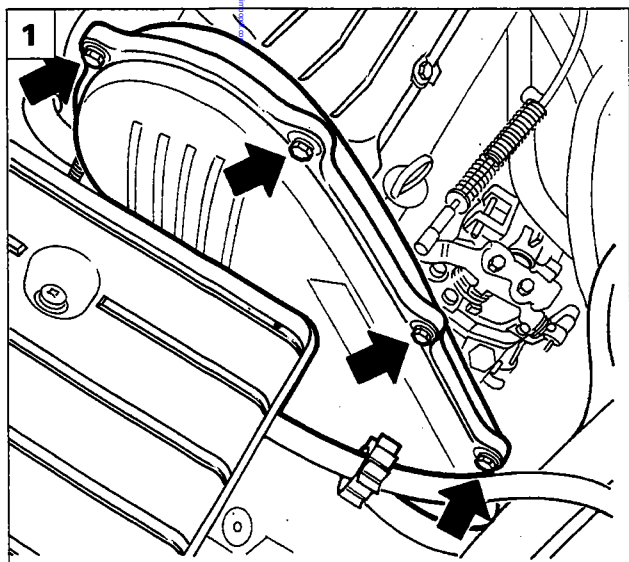


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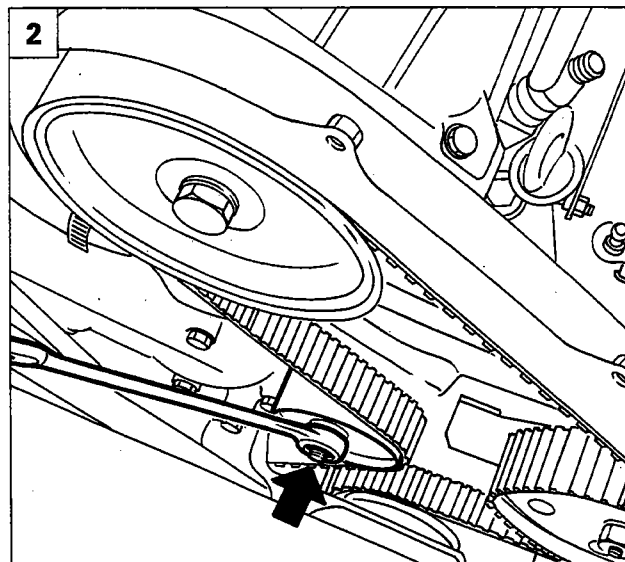
**REMOVING-REFITTING
PUMP ON VEHICLE****INJECTION****Removing injection pump**

1. Unscrew the bolts indicated and remove air intake assembly with connection sleeve to air cleaner container.
2. Remove the following parts from the pump:
 1. Fast idle cable.
 2. Accelerator cable.
 3. Electrical connection for engine stop solenoid (electrostop).
 4. Fuel delivery line.
 5. Fuel return line to tank.
 6. Fuel return line from injectors.
3. Disconnect fuel delivery lines from injectors using tool 1852138000.
4. Disconnect fuel delivery lines from injection pump to injectors.

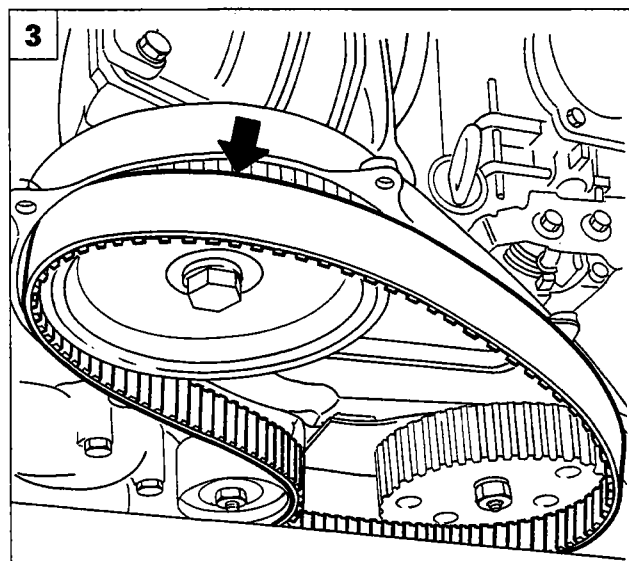
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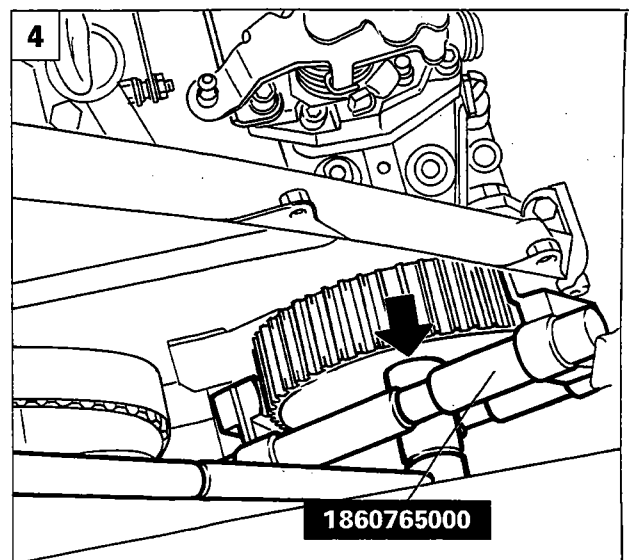
P4A02DJ03 P4A02DJ02



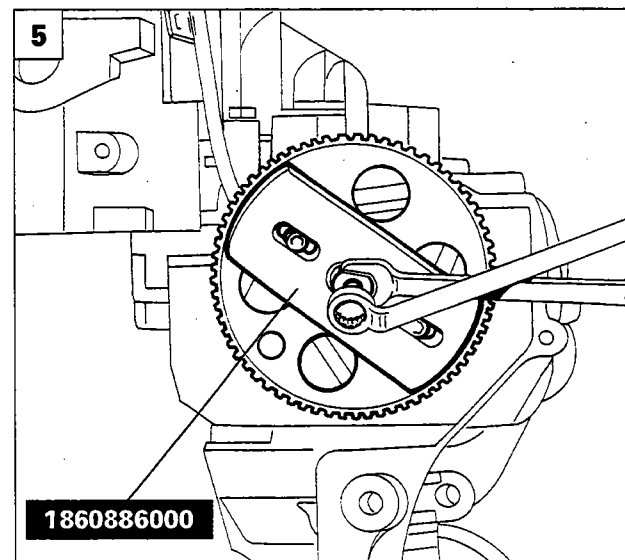
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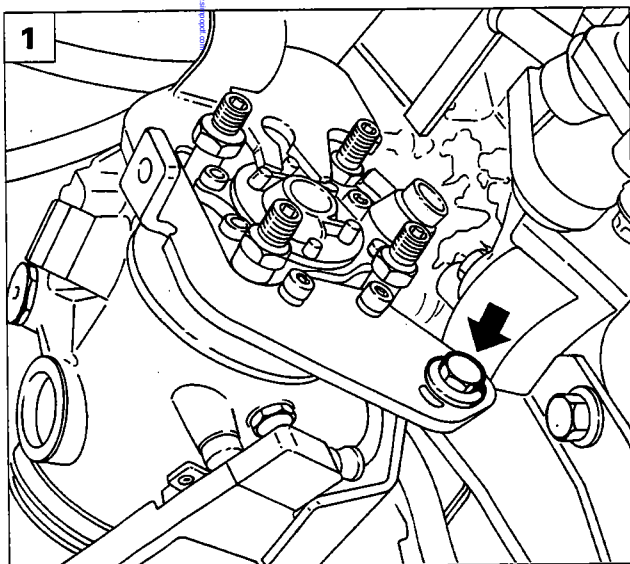
1. Remove timing belt by unscrewing the nuts indicated and the two retaining bolts and nuts located on the rear end.
2. Loosen the screw retaining the mobile belt tensioner.
3. Remove the timing belt.
4. Prevent injection pump pulley turning using tool 1860765000 and unscrew the pulley retaining bolt.
5. Use tool 1860886000 to remove the injection pump pulley from the tapered fitting.



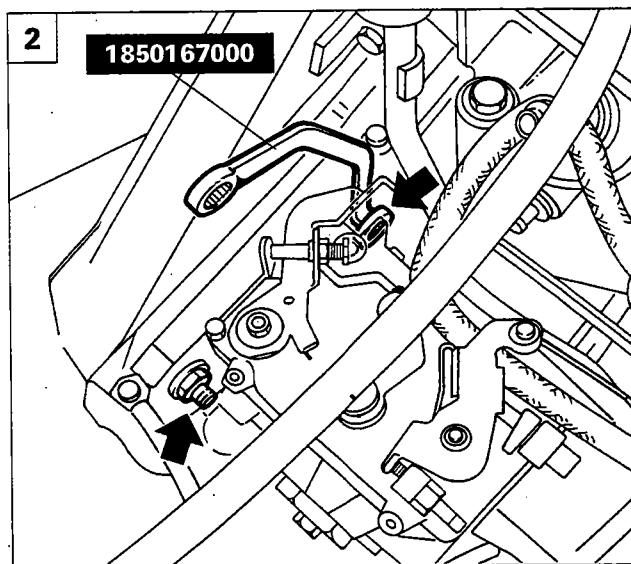
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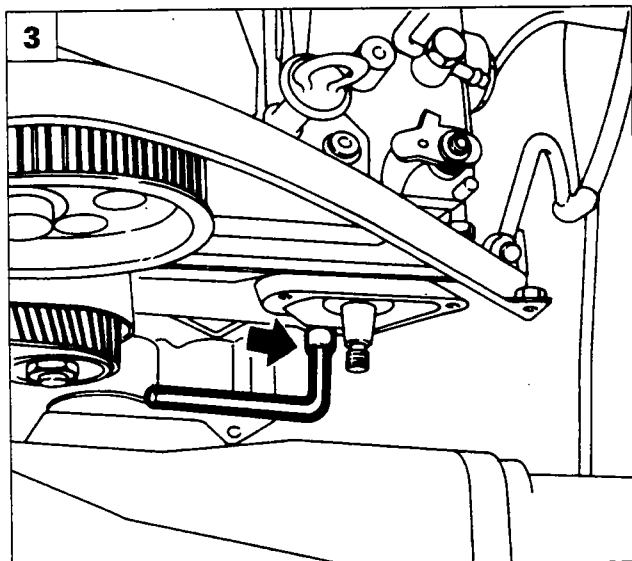
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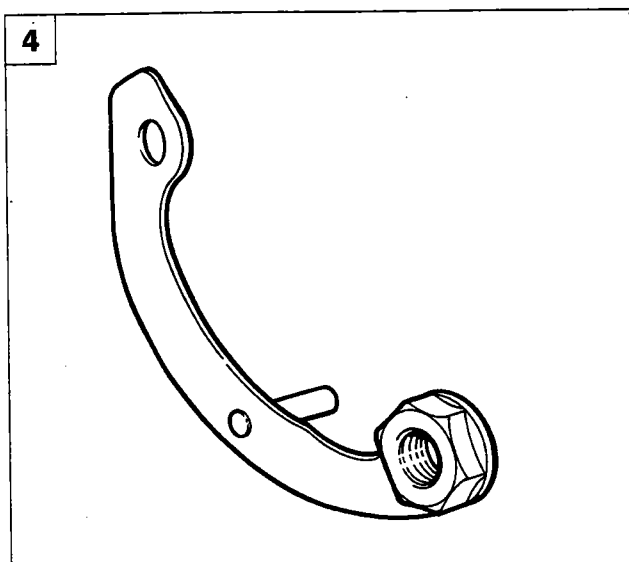
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P4A03DJ03

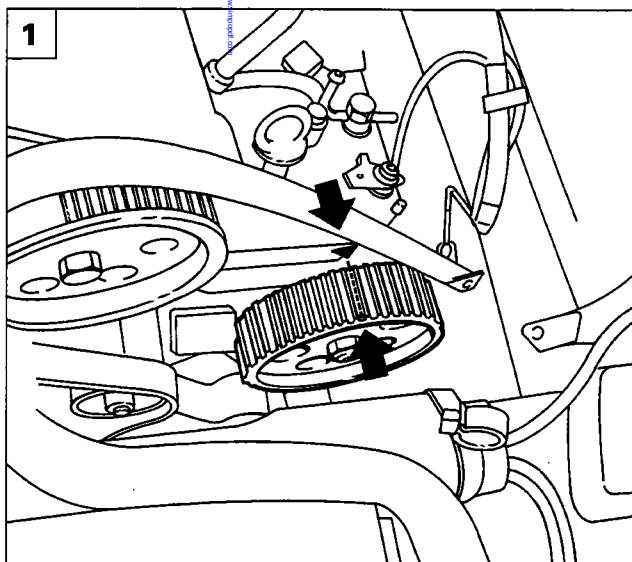


1. Unscrew the bolts indicated and disconnect the injection pump retaining bracket from the support beam fastened to the engine block
2. Use tool 1850167000 to unscrew the nuts shown.
3. Unscrew the socket screw retaining the injection pump to the mount.
4. Disconnect the rear retaining bracket and remove the pump from the engine bay.

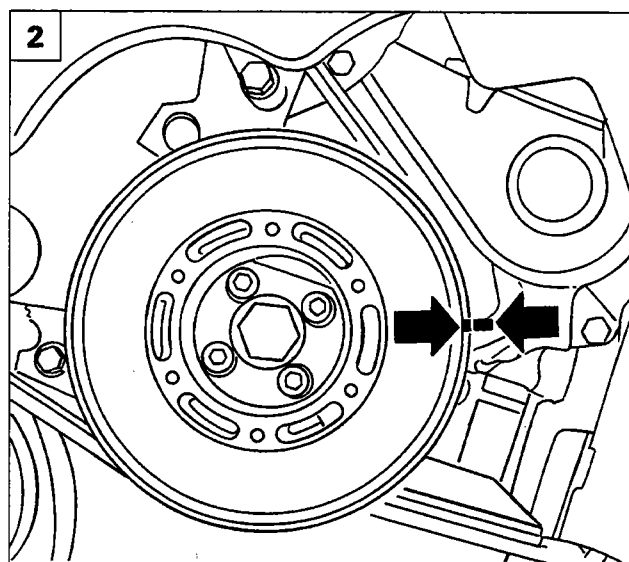


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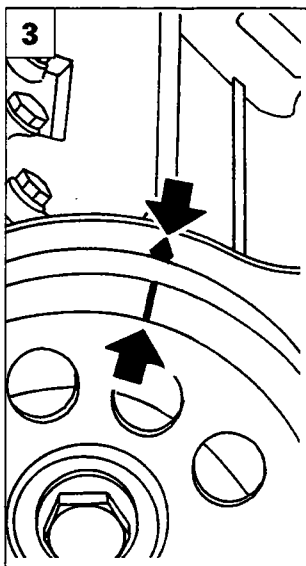
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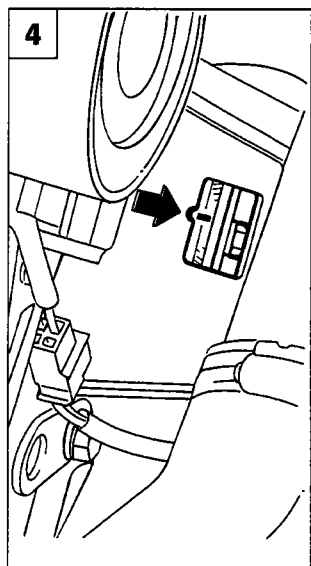
P4A04DJ01



P4A04DJ04



P4A04DJ02



P4A04DJ05 P4A04DJ03



Refitting injection pump



To refit the injection pump, reverse the order of removal operations and carry out the following checks:

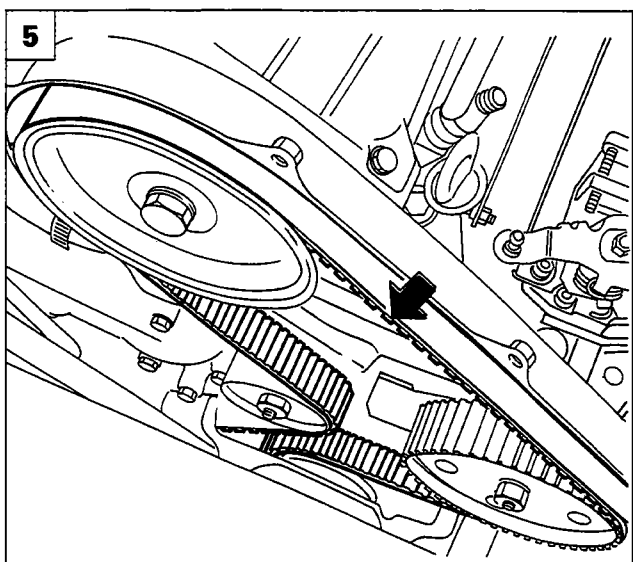
1. Position the injection pump drive pulley so that the reference mark on the gear is aligned with the reference mark on the rear timing belt cover.
2. Check notches on alternator pulley (damping flywheel) and coolant pump are properly aligned.
3. Check that the notch on the timing drive gear is aligned with the hole on the rear timing belt cover.
4. Also check that the notch on the gearbox bell housing corresponds with the notch on the flywheel.
5. Fit the timing belt.

Check belt condition every 60000 km and replace if:

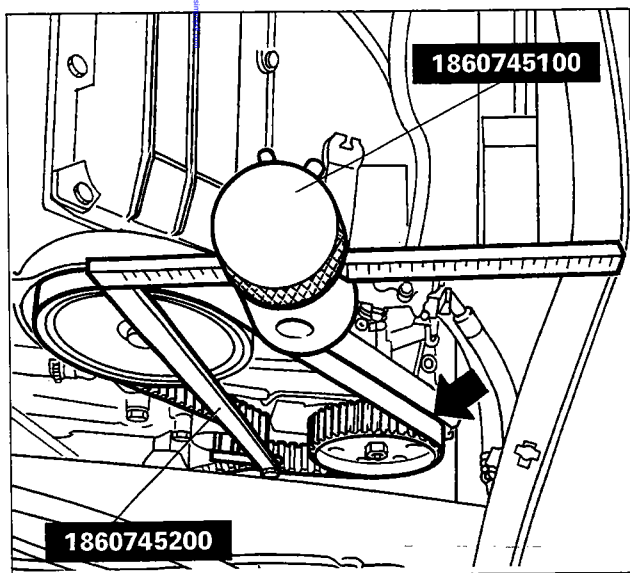
- it is soaked in oil or coolant;
- it shows signs of cracks or broken teeth;
- it is frayed or tooth profiles are worn.



Replace the toothed belt every 120,000 Km or during service operations involving removal at mileages in excess of 30,000 Km.



P4A04DJ07 P4A04DJ06



P4A05DJ01



Adjust toothed timing belt tension as follows:



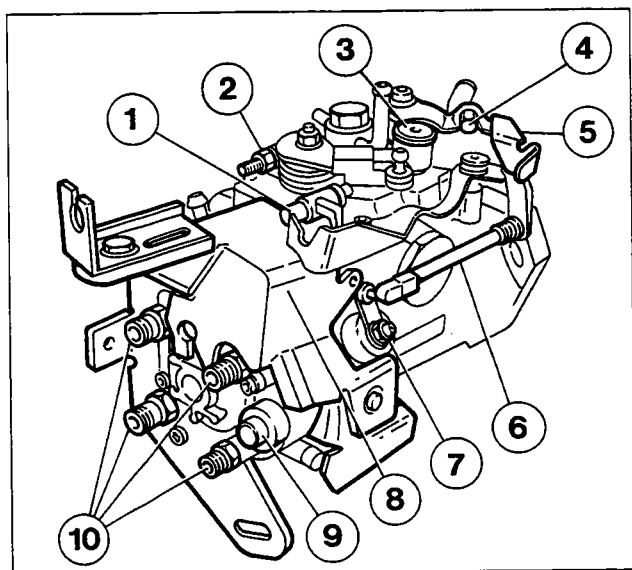
Fit part 1860745200 to tool 1860745100. Then position weight at a distance of 120 mm along the calibrated rod and secure.



Apply the resulting tool to the mobile belt tensioner as shown in figure. Adjust joint to move calibrated rod to a horizontal position. Then tighten joint retaining screw.

Settle the toothed belt by turning the crankshaft through two turns in the direction of rotation. Tighten mobile belt tensioner retaining screw.

The calibrated rod may move away from the horizontal during the final stage. In this case, adjust joint again to restore calibrated rod to its original position and repeat the operation.



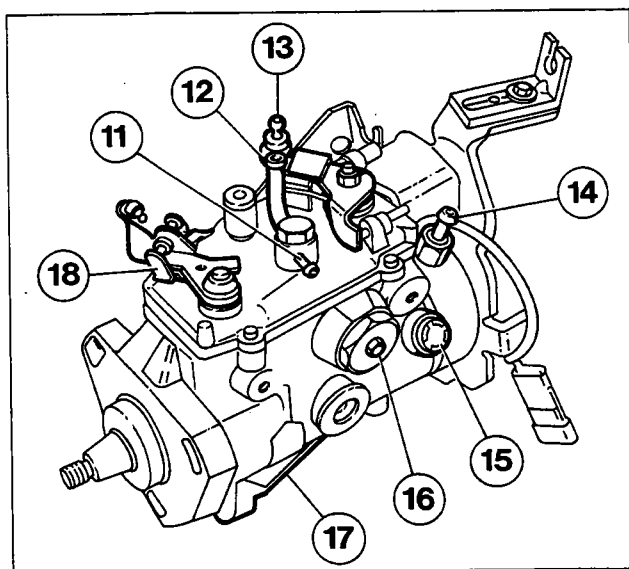
P4A05DJ02



Tighten mobile belt tensioner to the specified final torque.

LUCAS FT05 injection pump

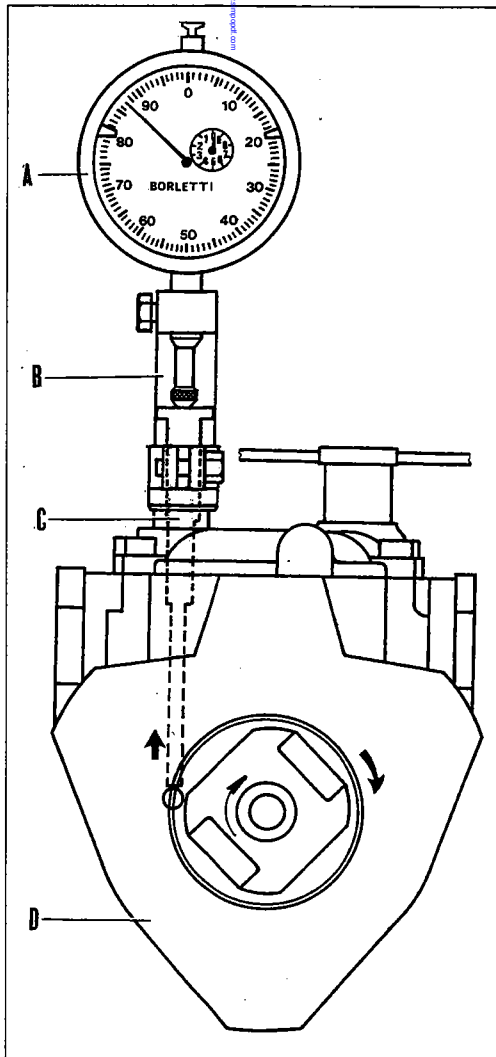
1. Maximum rpm adjustment screw.
 2. Anti-stall adjustment screw.
 3. Fitting for adjusting pump timing on engine.
 4. Fast idle adjustment screw.
 5. Fast idle control lever.
 6. Choke advance valve control rod.
 7. Choke advance valve.
 8. Engine stop solenoid protective cover.
 9. Transfer pressure valve (*).
 10. Fittings for diesel delivery lines to injectors.
 11. Fitting for diesel return line from injectors.
 12. Fitting for diesel return line to tank.
 13. Accelerator control lever.
 14. Fitting for diesel delivery line from filter.
 15. Enrichment flow cut-out or supplement valve.
 16. Automatic advance device.
 17. Fiat CODE system interface ECU.
- (*) This valve performs the following functions:
- a. Creates transfer pressure generated by vane pump.
 - b. Controls transfer pressure on the basis of engine rpm
 - c. Allows pump to fill with diesel during start-up (priming)



P4A05DJ03



10.



P4A06DJ01

INJECTION PUMP OPERATION ON ENGINE

Fitting pump and checking advance on engine



Tools required: n° 1865091000 comprising probe stylus (C), mount (B) and centesimal dial gauge (A) no. 1895885000.

Pump must also bear label (E) glued to the top. Above this is the installation gap in mm.

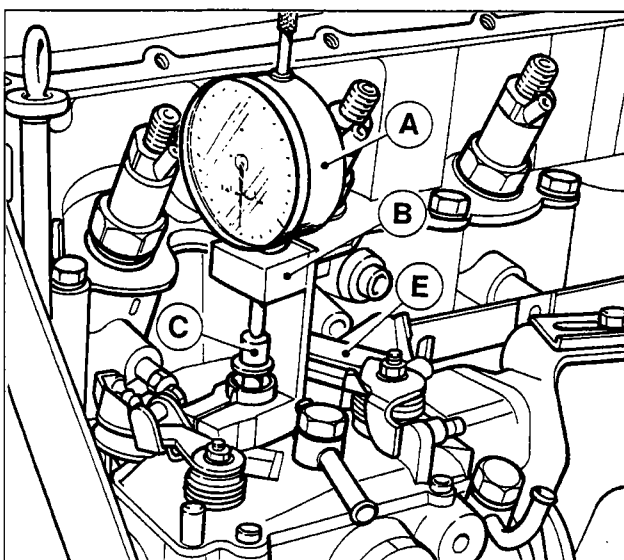
Fitting injection pump

First of all, check accuracy of timing as a precaution:

- Move piston of first cylinder to a position close to TDC.
- Fit injection pump (D) to its mount. Ensure ridge on pump gear is aligned with inner pump drive shaft splines but do not tighten nuts retaining pump to mount fully.
- Remove aluminium cap with fitting for socket wrench from fitting on top of pump.
- Turn crankshaft against direction of rotation through about 20°.
- Tighten tool (B) with probe (C) and dial gauge (A) into the threaded seat on top of the pump.

NOTE *In this position, probe (C) will come into contact with a seat in the pump and not against pump distributor (or rotor).*

The distance between pump seat and the position of a distributor (or rotor) drive dowel is used to achieve correct pump setting on engine: when pump is turned, probe touches drive dowel. The above fitting distance is indicated on label (E) attached to each pump.



P4A06DJ02

- A. Dial gauge.
- B. Tool 1865091000 for checking advance.
- C. Probe plunger.
- D. Injection pump.
- E. Label with fitting gap.

- Secure dial gauge (A) on plunger (C). Ensure that gauge is fitted with a preload of 10 - 15 mm, then zero.
- Turn pump in its slots to move top of pump away from the cylinder assembly (maximum delay position).
- Turn the crankshaft in its direction of rotation until piston no. 1 is turned exactly to TDC.



Never turn crankshaft against its direction of rotation. Otherwise tool or pump may be damaged.

- Read distance off dial gauge. Then turn pump slowly in its slots until dial gauge shows exact fitting distance indicated on pump label (e.g. 8.52 mm).
- Now tighten pump retaining screws fully.

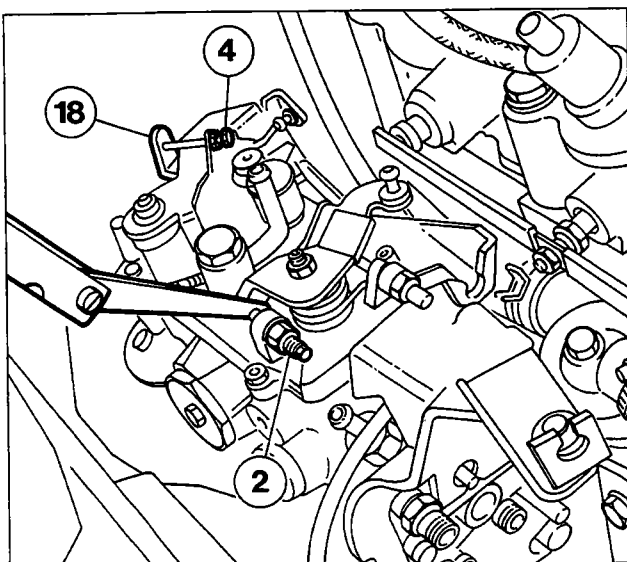
Final check

- Turn crankshaft in its direction of rotation by a few revolutions (at least 2) until piston no. 1 is exactly at TDC. The dial gauge reading should correspond to the reading printed on the pump label. Otherwise, repeat procedure described above with greater accuracy.

POSSIBLE ADJUSTMENTS ON INJECTION PUMP FITTED TO ENGINE



Before adjusting pump, engine must be at service temperature, i.e. radiator cooling fan must have come on at least twice.



P4A07DJ01



Anti-stall speed adjustment

1. Interpose a spacer measuring exactly 2 mm between anti-stall adjustment screw (2) (see figure on previous page) and accelerator control lever.
2. Turn on engine and adjust speed to 1600 ± 100 /min, using a socket wrench to turn anti-stall adjustment screw (2).
3. Remove 2 mm spacer.

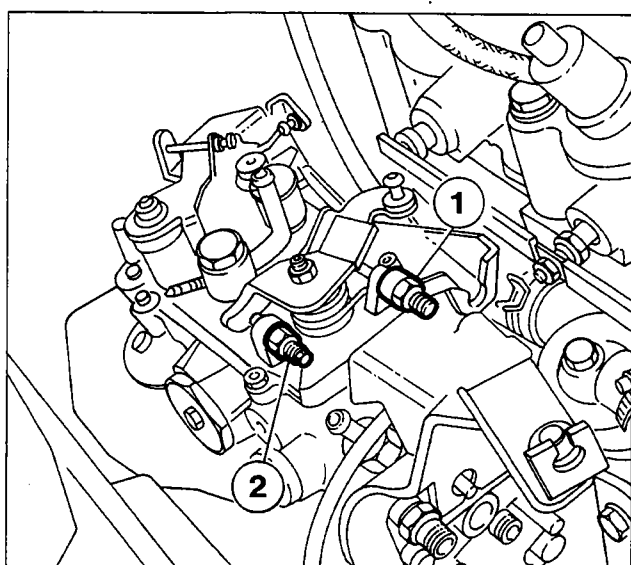
10.

4. Adjust idle speed to 780 ± 50 /min by means of idle adjustment screw (4) (see figure on page 7) after loosening locknut. After adjustment, tighten idle adjustment screw locknut.
5. Move idle control and fuel cut-off lever (18) by hand (see figure on page 7) toward cut-off position by 0.5 - 1 mm. The engine should tend to stall or at least speed should drop. If this does not occur, repeat the previous adjustments described at points 1 - 2 - 3 - 4 to obtain a new engine speed that still lies between 780 ± 50 rpm: then repeat test until a positive result is obtained.

Checking antistall screw setting

Accelerate engine to maximum speed, then release accelerator completely: speed should drop steadily to idle level without fluctuations or judder. Otherwise adjust anti-stall screw as follows:

- if deceleration is too slow, unscrew anti-stall adjustment screw (2) by 1/4 turn
- if deceleration is too fast, tighten anti-stall adjustment screw (2) by 1/4 turn.



P4A08DJ01

1. maximum rpm adjustment screw
2. anti-stall adjustment screw.

Adjusting engine top speed

Move accelerator control lever to end of its travel. If maximum speed of 5150 ± 50 rpm is exceeded, adjust maximum speed screw (1) by tightening until engine speed is as specified. Then tighten nut of screw (1) and apply a lead seal.

BLEEDING PUMP HYDRAULIC CIRCUIT

If engine stalls due to lack of fuel or if fuel low pressure lines have been disconnected or fuel filter has been changed, proceed as follows to facilitate pump self-priming:

- unscrew fittings fastening delivery lines to injectors (A);
- start engine and run until fluid emerges from open injector fittings;
- keep engine running and tighten injector fittings.

If engine will not start, check all fuel inlet pipe union points (D) and also fittings (E). Replace seal washers to eliminate the possibility of air leaks.

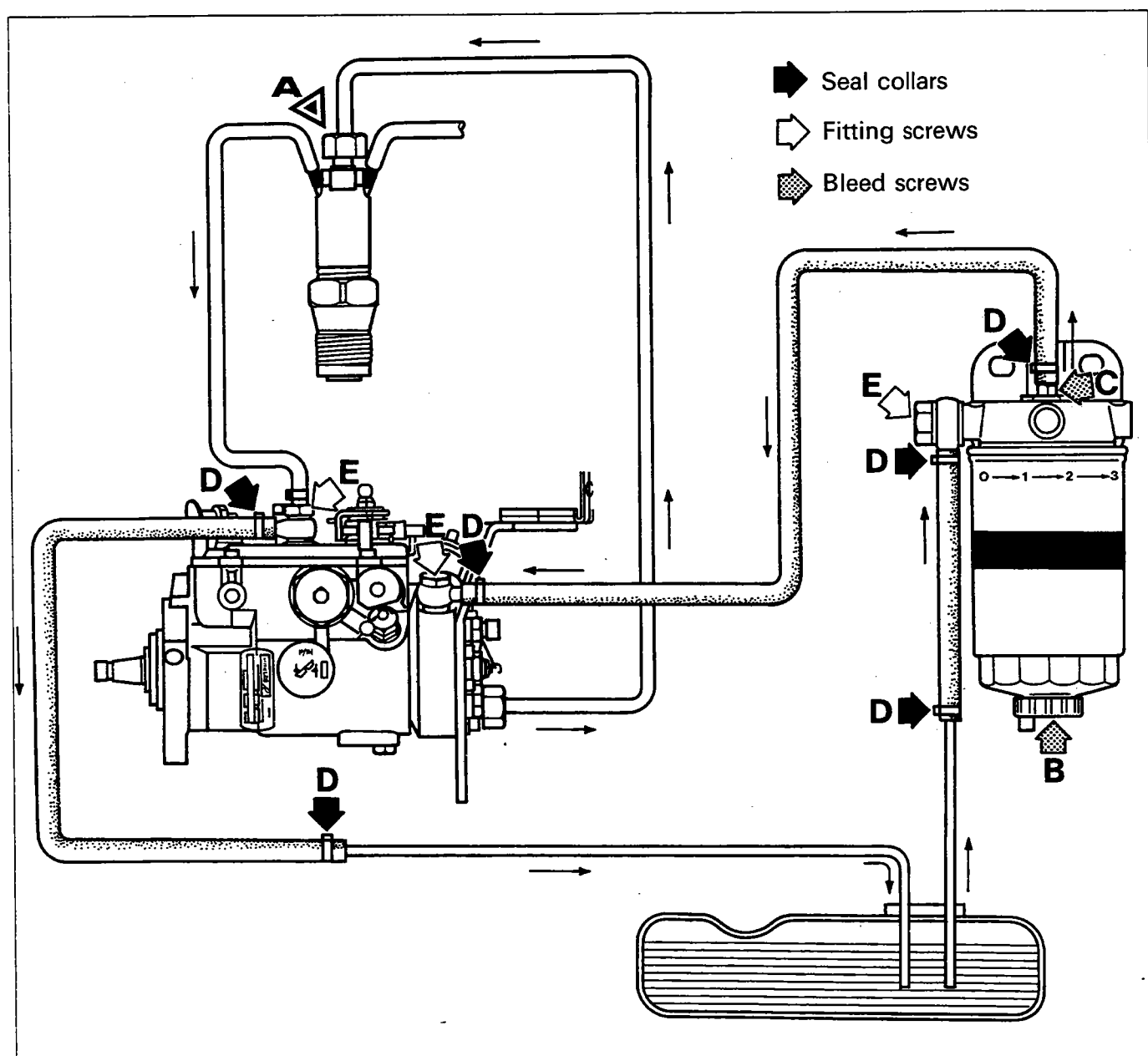


Diagram showing fuel system connections

P4A09DJ01

10.

Bleeding air from diesel (See illustration on previous page)

Each time the oil is changed, bleed off the water from the fuel filter as follows:

- unscrew water bleed screw (B) under filter,
- unscrew air bleed screw (C) above the filter.

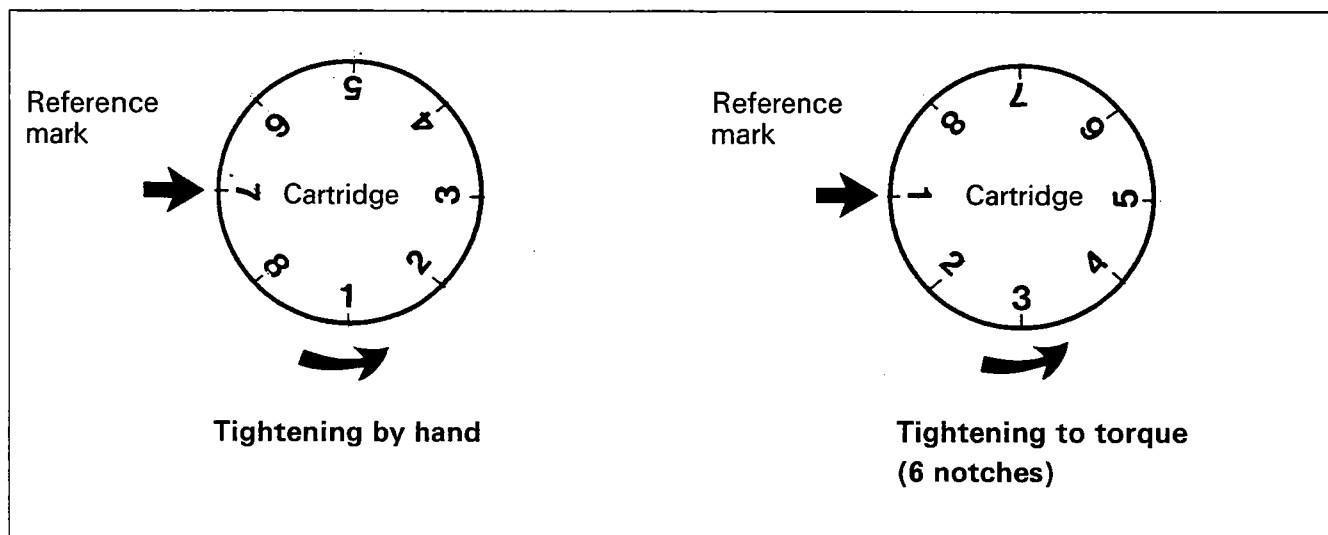
Start up engine and let water and fuel emerge until no more water is present, then tighten water bleed screw (B) beneath filter and air bleed screw (C) above filter.

Replacing cartridge fuel filter

Change diesel filter every 15,000 km. Proceed as follows to change:

- lubricate rubber cartridge seal,
- fill filter cartridge with diesel (in order to reduce self-bleeding period),
- tighten cartridge until it touches the mount,
- tighten cartridge by 6/8 turn (to obtain torque of 1.3 - 1.6 daNm).

This is achieved using numbered notches engraved on the cartridge. For example when the cartridge is moved into contact with the mount, make a mark on the mount against one of the notches engraved on the filter. Then tighten filter through 6 further notches after the reference notch.



P4A10DJ01

Method for tightening cartridge fuel filter to torque

FAULT DIAGNOSIS

Introduction

The main differences experienced when working on a Diesel engine, compared to a petrol engine, are as follows:

1) The diesel fuel system is driven by an injection pump and also comprises:

- a tank and two fuel feed and return lines;
- a fuel filter (with hand pump for bleeding fuel system);
- injectors with high pressure inlet lines;
- preheating device for starting engine when cold;
- an engine arrest device.



The injection pump is the most reliable part of the fuel system due to very low component wear and low likelihood of incorrect adjustment. Engine failure should not immediately be attributed to the injection pump but more probably to one of the other fuel system components.

2) The combustion process within a Diesel spontaneous fuel self-ignition engine produces very high temperatures. Coupled with the fact that the fuel inevitably contains traces of sulphur, this determines:

- greater tendency than petrol engines to produce sparks and thus greater wear on moving parts, particularly those close to the combustion chamber;
- greater tendency of piston rings to become bonded in their seats.



It is very important to change the fuel filter every 15,000 km. Use only specified lubricant oil grade. Engine oil must be changed every 7500 km. If vehicle is used under heavy conditions (mainly town driving, continuous mountain driving, towing of trailers or caravans, routes through dusty areas) change oil more frequently, particularly when the temperature exceeds 25°C. Make sure injectors are always efficient in order not to increase production of uncombusted products during engine operation.

3) The combustion process in spontaneous self-ignition diesel engines also gives rise to higher engine noise levels (*) with the production of combustion knock clearly discernible from outside. Although this phenomenon has been greatly reduced in present-day engines with prechambers, it is still present, particularly at low speed, but tends to diminish at medium-high speeds.

NOTE *If the injection pump is advanced only slightly in relation to correct timing setting, combustion knock is considerably accentuated.*

4) An indirect injection Diesel engine needs a prechamber preheating device (rapid glow plugs and ECU) to facilitate fuel self-ignition when the engine is cold and hence engine start-up. A special solenoid is used to turn off the engine (which occurs when the fuel supply to the injection pump ceases). This opens up fuel flow in the injection pump when the ignition key is in MARCIA position and turns it off when the ignition key is turned to STOP.

(*) Engine running noise: this is due to an excessive fuel pressure gradient, i.e. the ratio between pressure developed by combustion and corresponding crankshaft angles of rotation.

10.

Test tables



This fault diagnosis table is applicable only if the engine is efficient and the electrical equipment has been properly checked.

ANOMALY	CAUSE	REMEDY
When warm, the engine will not start or starts with difficulty	Tank empty, ventilate blocked tank Water in fuel Air in fuel system Injection order does not correspond to firing order Engine arrest solenoid short-circuited Fittings loose, leaks from pipes, pipes broken Injectors defective or excessively dirty Incorrect injection pump timing Incorrect injection pump setting	Drain water from filter, clean filter and bleed air Bleed and eliminate air leaks into system Fit pipes from pump to injectors in correct order Check electrical leads and/or replace solenoid Tighten fittings and eliminate leaks Clean injectors, check and/or replace Restore correct injection pump timing and adjust advance Check injection pump timing at bench
When cold, engine does not start or starts with difficulty	Tank empty, ventilate blocked tank Water in fuel Air in fuel system Heavy paraffin build-up in fuel filter Injection order does not correspond to combustion order Engine arrest solenoid short-circuited Fittings loose, leaks from pipes, pipes broken Pre-heating circuit defective Injectors defective or excessively dirty Incorrect injection pump timing Incorrect injection pump setting	Drain water from filter, clean and bleed Bleed air and eliminate leaks in system Replace filter and use winter-type fuel Fit injection pipes from pump to injector in the correct order Check electrical leads and/or replace solenoid Tighten fittings and eliminate leaks Check glow plugs and ECU Clean injectors, check and/or replace Restore correct injection pump timing and adjust advance Check injection pump timing at bench

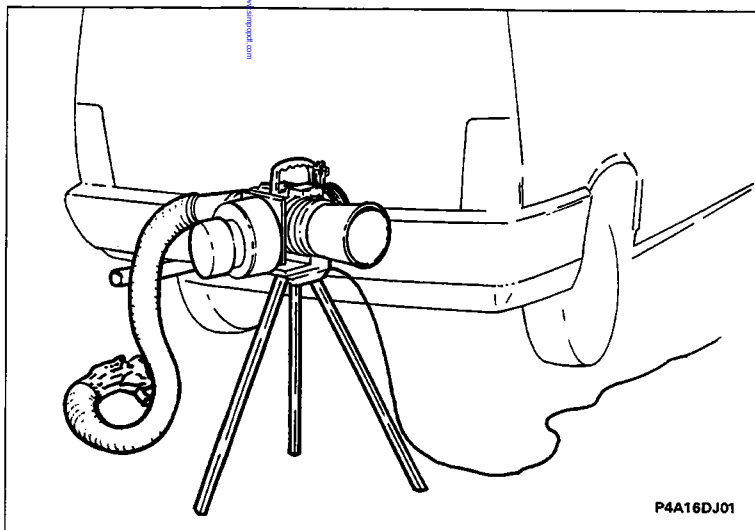
ANOMALY	CAUSE	REMEDY
Engine misses when idling	Fuel outlet and inlet fittings on injection pump exchanged Incorrect injection pump setting	Fit fittings correctly Check injection pump setting at test bench
Uneven idling with engine warm	Injection order does not correspond to combustion order Air in fuel system Fittings loose, leaks from pipes, pipes broken Injectors defective or excessively dirty Incorrect injection pump setting	Fit pipes from pump to injectors in correct order Bleed and eliminate air leaks into system Tighten fittings and eliminate leaks Clean injectors, check and/or replace Check injection pump setting at test bench
Engine runs irregularly or misses	Tank ventilation defective Fuel delivery and return lines on injection pump changed over Air in fuel system Fuel filter blocked Fittings loose, leaks from pipes, pipes broken Fuel and injection lines blocked or restricted Water in fuel Incorrect injection pump timing Injectors defective or excessively dirty Incorrect injection pump setting	Check tank ventilation Fit fittings correctly Bleed and eliminate air leaks into system Replace filter Tighten fittings and eliminate leaks Check lines: repair or replace Drain water from filter Restore correct injection pump timing on test bench Clean injectors, check and/or replace Check injection pump setting at test bench

10.

ANOMALY	CAUSE	REMEDY
Engine not efficient (road performance unsatisfactory)	Tank ventilation defective	Check tank ventilation
	Injection order does not correspond to combustion order	Fit pipes from pump to injectors in correct order
	Fuel delivery and return lines on injection pump changed over	Fit fittings correctly
	Air in fuel system	Bleed and eliminate air leaks into system
	Fuel filter blocked	Replace filter
	Fittings loose, leaks from pipes, pipes broken	Tighten fittings and eliminate leaks
	Fuel and injection lines blocked or restricted	Check lines, repair or replace
	Air cleaner blocked	Replace filter element
	Engine will not reach maximum rated speed	Adjust top speed by means of screw on injection pump
	Injectors defective	Check and/or replace injectors
Excessive fuel consumption	Incorrect injection pump timing (delayed)	Restore correct injection pump timing and adjust advance
	Incorrect injection pump setting	Check injection pump setting at test bench
	Injection order does not correspond to combustion order	Fit injection pump lines in correct order
	Fittings loose, leaks from pipes, pipes broken	Tighten fittings and eliminate leaks
	Idle speed too high	Adjust idle speed by means of screw on injection pump
Engine will not stop	Incorrect injection pump timing	Restore correct injection pump timing and adjust advance
	Incorrect injection pump setting	Check injection pump setting at test bench
Engine will not stop	Engine arrest solenoid short-circuited	Check electrical leads and/or replace solenoid

ANOMALY	CAUSE	REMEDY
Black smoke at exhaust	Injection order does not correspond to combustion order Air cleaner blocked Injectors defective Incorrect injection pump timing Incorrect injection pump setting	Fit pipes from pump to injectors in correct order Replace filter element Check and/or replace injectors Restore correct injection pump timing and adjust advance Check injection pump setting at test bench
White smoke at exhaust	Tank ventilation defective Fuel inlet and outlet lines changed over on injection pump Air in fuel system Fuel filter blocked Fuel and injection lines blocked or restricted Injectors defective Incorrect injection pump timing (delayed) Incorrect injection pump setting	Check tank ventilation Fit fittings correctly Bleed and eliminate air leaks into system Replace filter Check lines, repair or replace Check and/or replace injectors Restore correct injection pump timing and adjust advance Check injection pump setting at test bench
Engine will not reach maximum rated rpm	Air in fuel system Injectors defective Incorrect injection pump timing (delayed)	Bleed and eliminate air leaks into system Check and/or replace injectors Restore correct injection pump timing and adjust advance
Excessive engine noise	Injectors defective Incorrect injection pump timing (advance) Incorrect injection pump setting	Check and/or replace injectors Restore correct injection pump timing and adjust advance Check injection pump setting at test bench

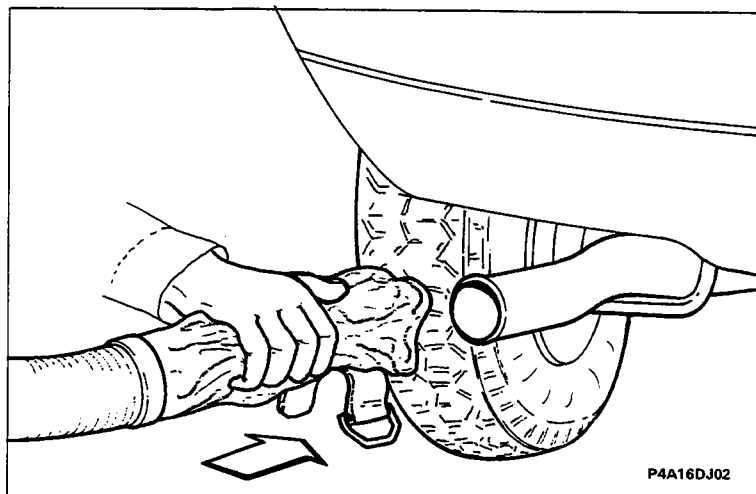
10.



CHECKING EXHAUST SMOKE USING OPACIMETER

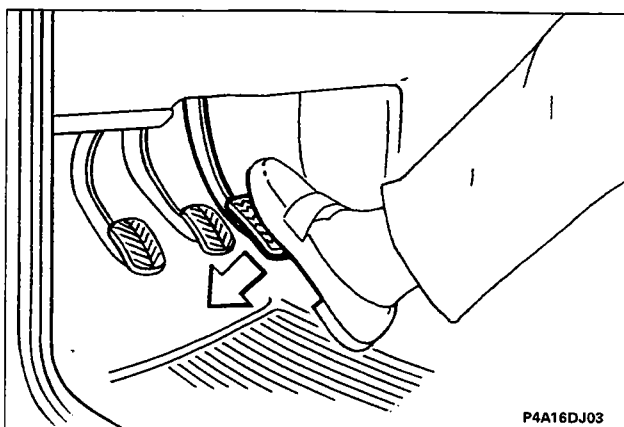
Start up vehicle engine and allow to warm up to service temperature (radiator cooling fan comes on twice).

Position opacimeter measurement unit firmly near the vehicle exhaust pipe (place opacimeter fume exhaust down wind)



Connect hose of measurement unit to vehicle exhaust pipe.

Connect and adjust equipment as instructed by the Manufacturer.



Pump accelerator pedal three times quickly to the floor until rpm limiter threshold speed is reached.

Carry out measurements over five successive full accelerator pedal pumps.

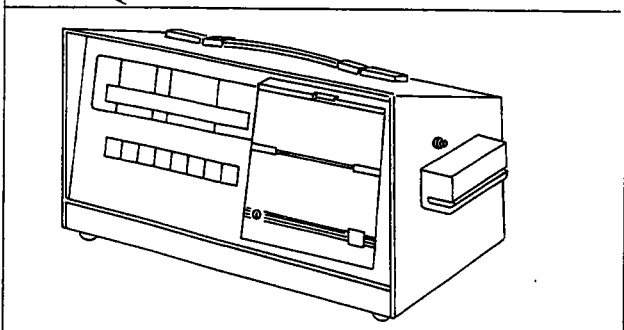
Note maximum values achieved.

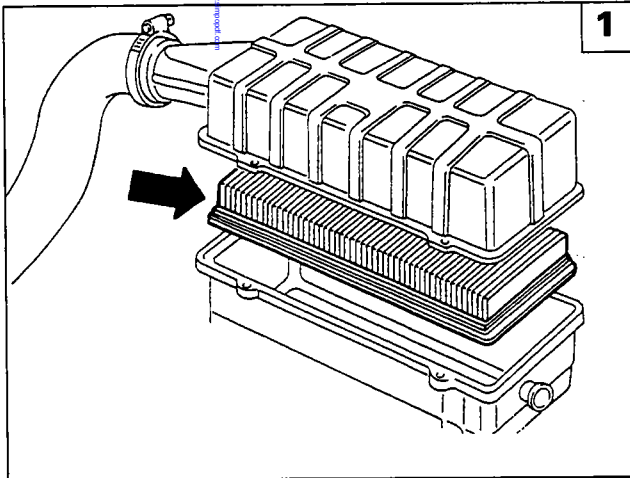
Take the arithmetic mean of the three closest readings to obtain the test result.

If more than one set of three readings is suitable, choose the one with the highest mean.



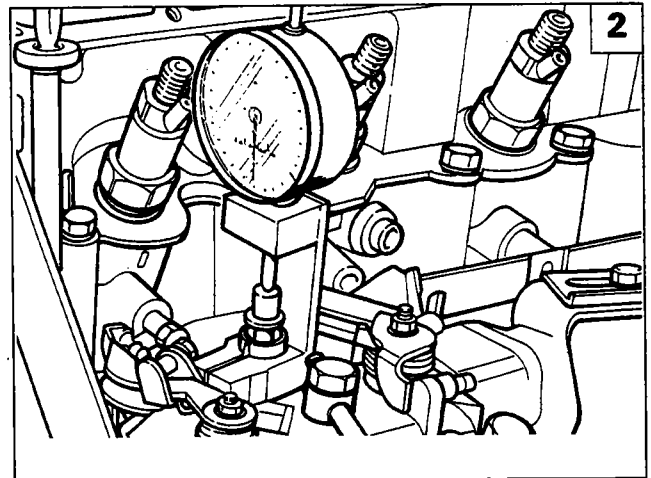
If exhaust smoke level exceeds 70%, carry out the tests described overleaf.





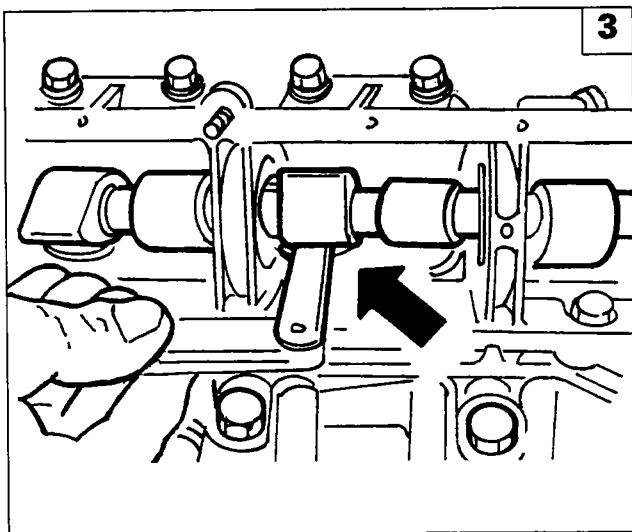
P4A17DJ01

Check air cleaner condition



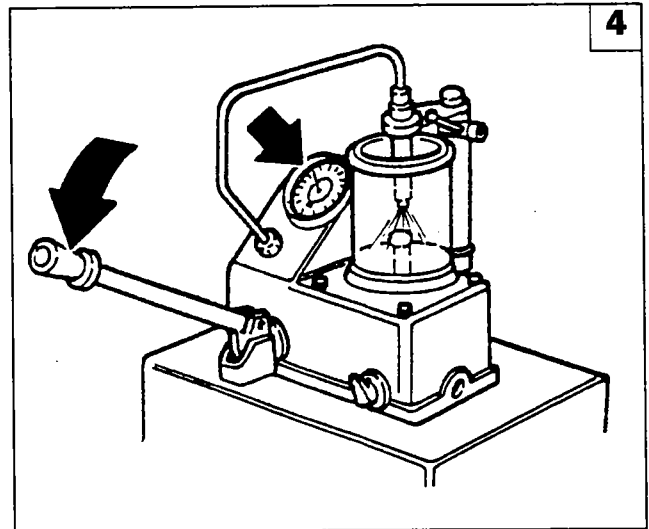
P4A17DJ02

Check injection pump timing and/or output



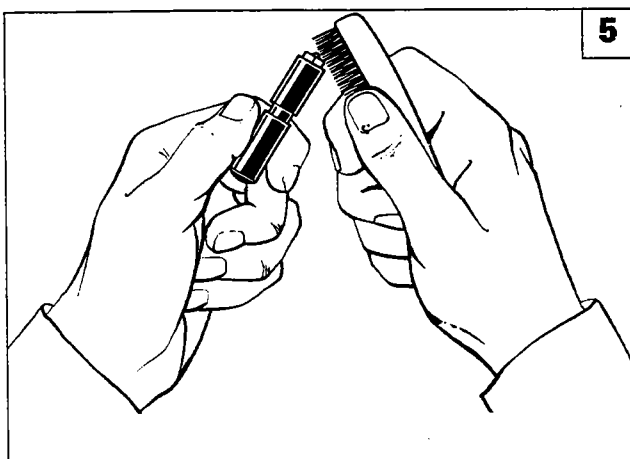
P4A17DJ03

Check valve clearance and/or timing



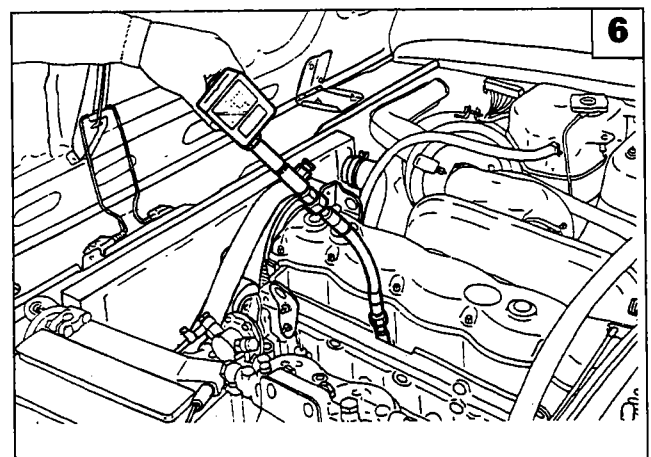
P4A17DJ04

Check injector setting



P4A17DJ05

Check injectors are perfectly clean



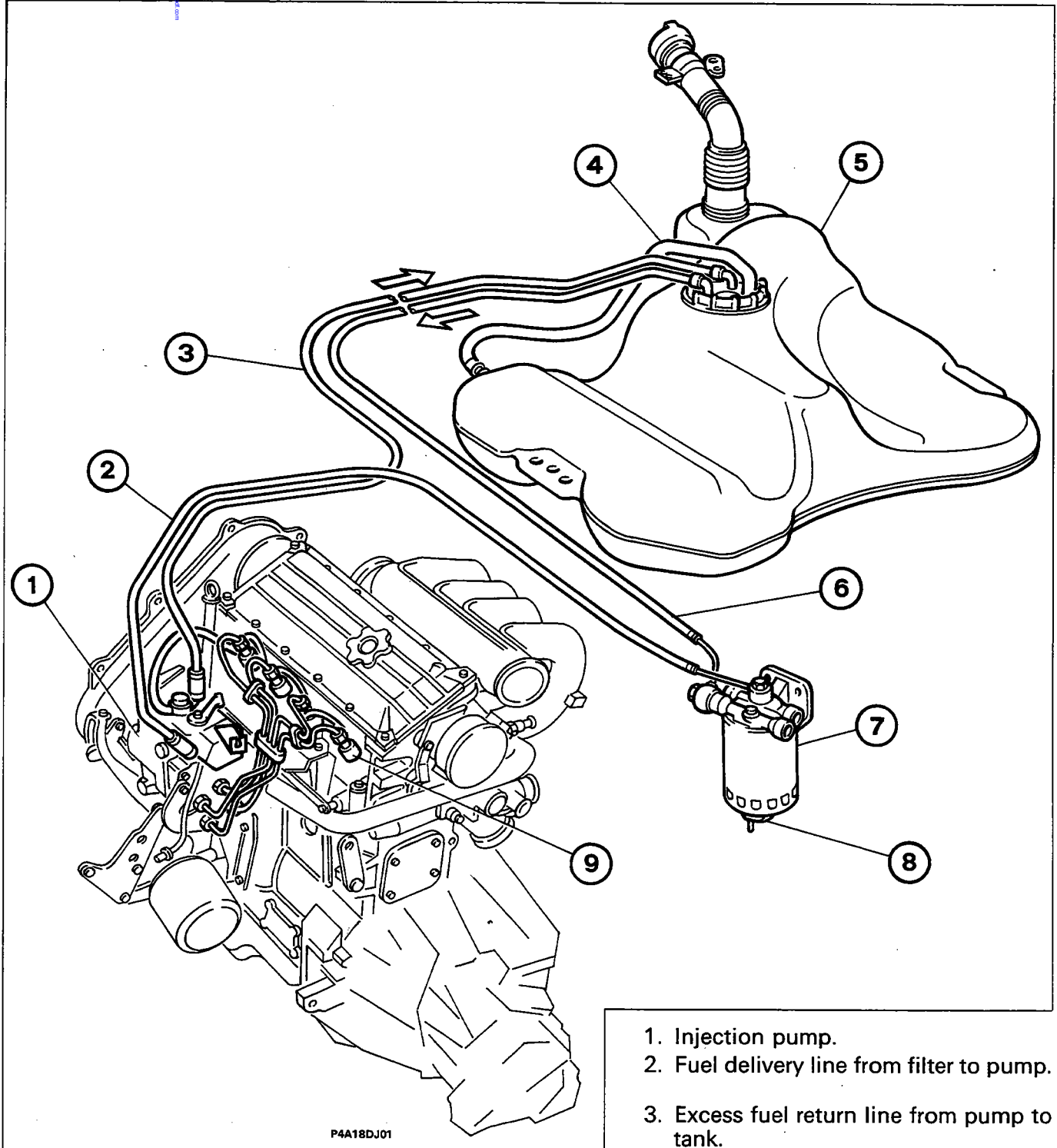
P4A17DJ06

Check compression ratio

Numbers at top of illustrations indicate order of operations.

10.

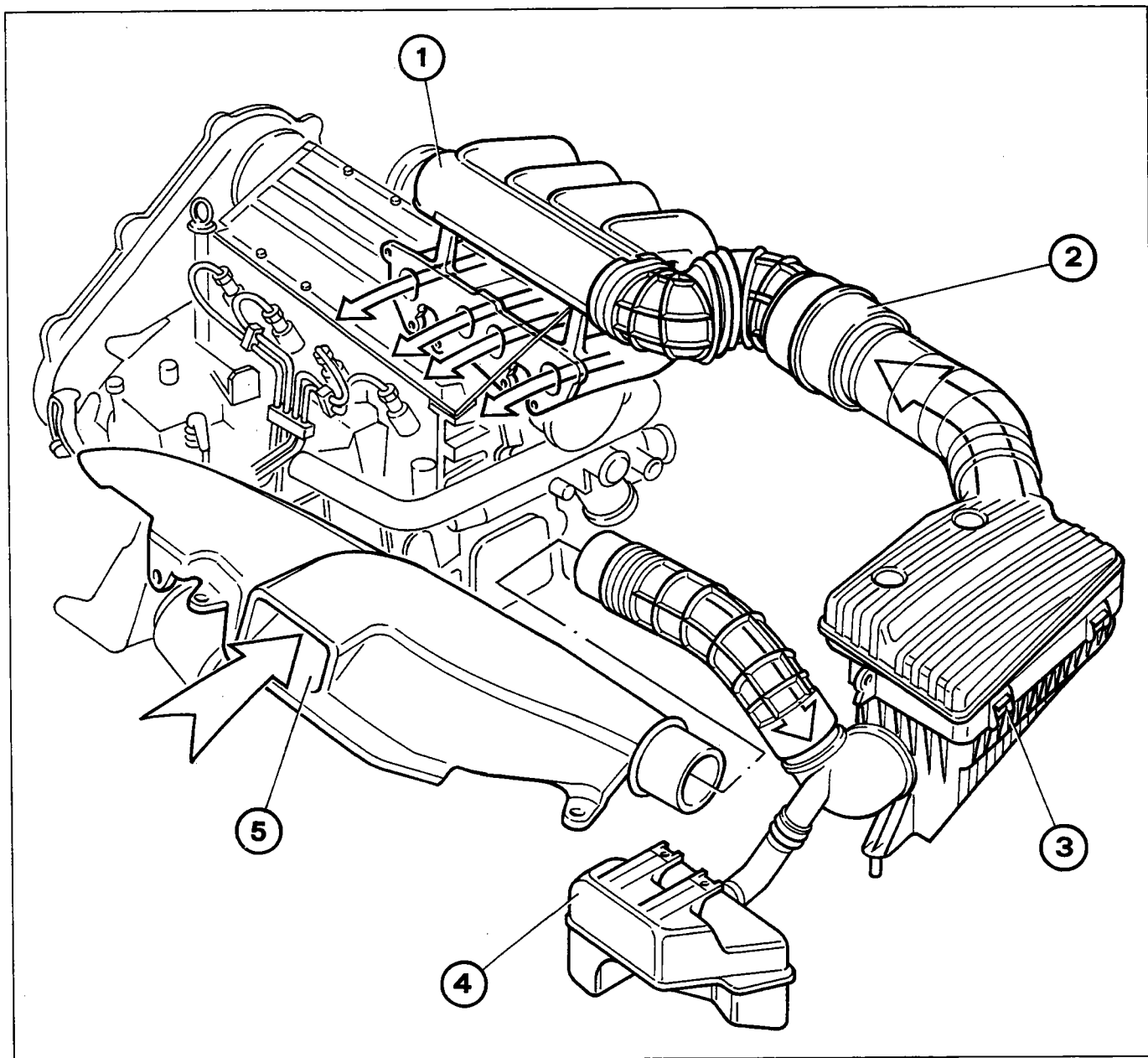
FUEL CIRCUIT DIAGRAM



NOTE Due to the specific shape of the tank, an air pocket will build up at the bottom fuel is added and prevent the tank being properly filled. Line (4) allows air to flow from the lower part to allow the tank to be completely filled.

1. Injection pump.
2. Fuel delivery line from filter to pump.
3. Excess fuel return line from pump to tank.
4. Air breather line.
5. Fuel tank.
6. Fuel delivery line from tank to filter.
7. Fuel filter.
8. Screw for draining water from fuel filter.
9. Injectors.

AIR INTAKE CIRCUIT DIAGRAM



P4A19DJ01

1. Inlet manifold.
2. Upper resonator.
3. Air cleaner.
4. Lower resonator.
5. Inlet fitting.

HYDRAULIC SYSTEM

- Diagram of hydraulic braking system (front disc brakes and rear drum brakes) and mechanical handbrake system	1
- Brake pedal	2
- Brake fluid reservoir	3
- Brake pump	4
- Servo unit	5
- Vacuum unit	10

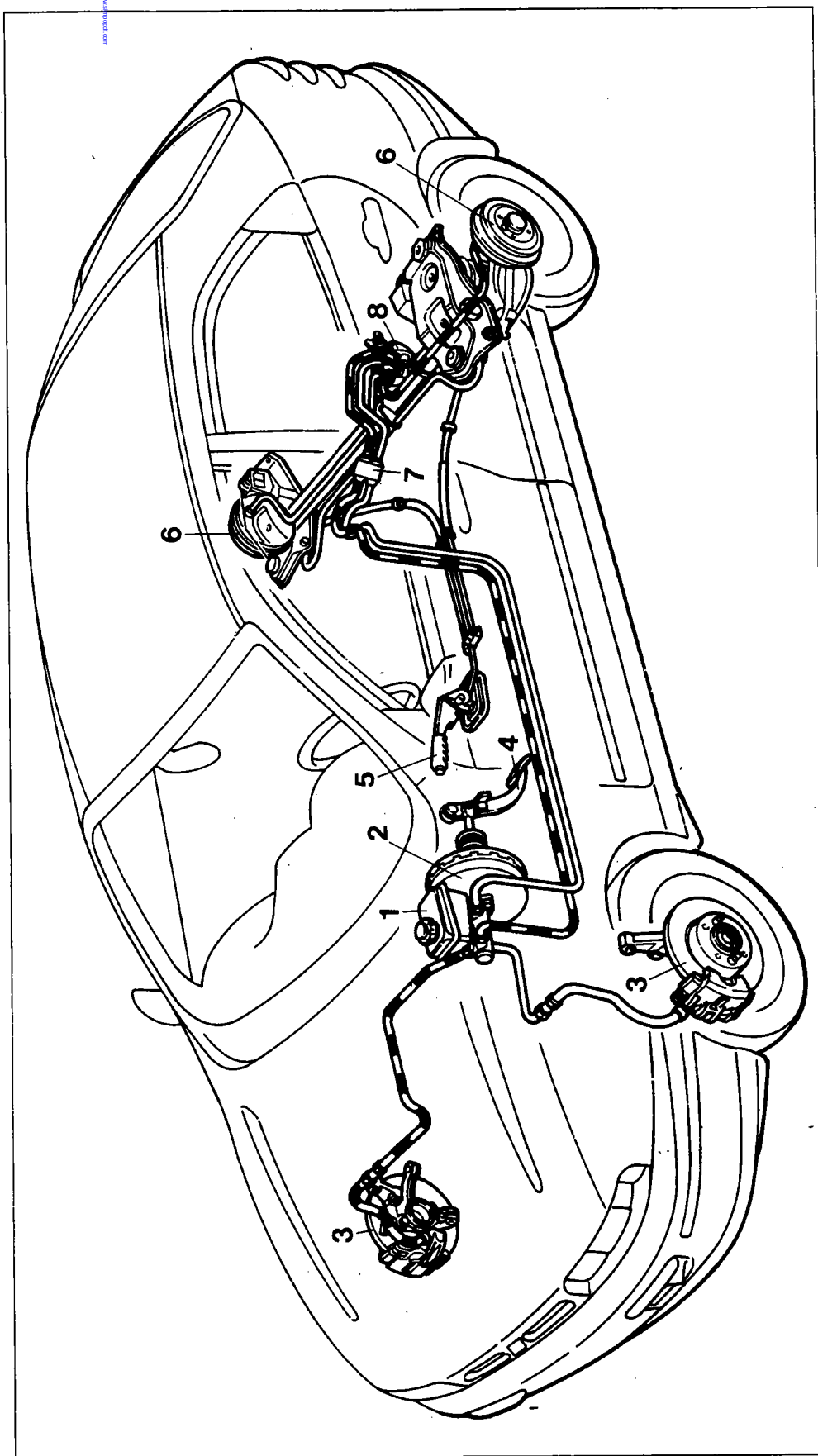
FRONT BRAKES

- Removing-refitting	11
- Brake caliper	12
- Brake discs	13
- Brake pads - Bleeding	14

REAR BRAKES

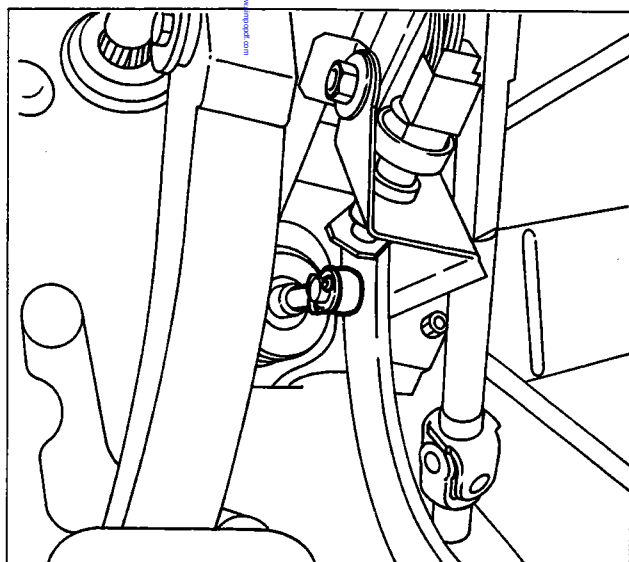
- Drum brakes	15
- Automatic adjuster assembly for recovering shoe-drum clearance	19
- Brake drums - Shoes	20
- Wheel cylinders - Bleeding	21
- Diagram of hydraulic braking system (front and rear disc brakes) and mechanical handbrake system	22
- Disc brakes	23
- Brake caliper	25
- Automatic adjuster assembly for recovering clearance between rear brake pads and discs and handbrake slack	27
- Brake discs	28
- Brake pads - Bleeding	29
- Brake pressure proportioning valve	31
- Handbrake	32

**D'AGRAM OF HYDRAULIC BRAKING SYSTEM (FRONT DISC BRAKES AND REAR DRUM BRAKES) AND MECHANICAL
HANDBRAKE SYSTEM**



1. Brake fluid reservoir and pump for independent brake circuits
2. Vacuum servo unit
3. Front disc brakes
4. Brake pedal
5. Handbrake lever
6. Rear drum brakes
7. Four-way distributor
8. Brake pressure proportioning valve

33.



P4A002D01

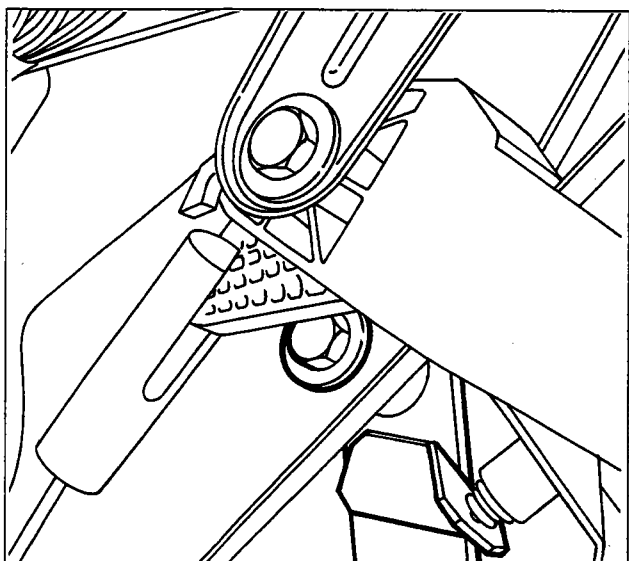


BRAKE PEDAL

Removing-refitting

To remove the brake pedal, proceed as follows:

- remove the split pin and withdraw the servo unit pushrod from the pin on the brake pedal;



P4A002D02



- raise the clutch pedal, undo the bolt and remove the brake pedal;



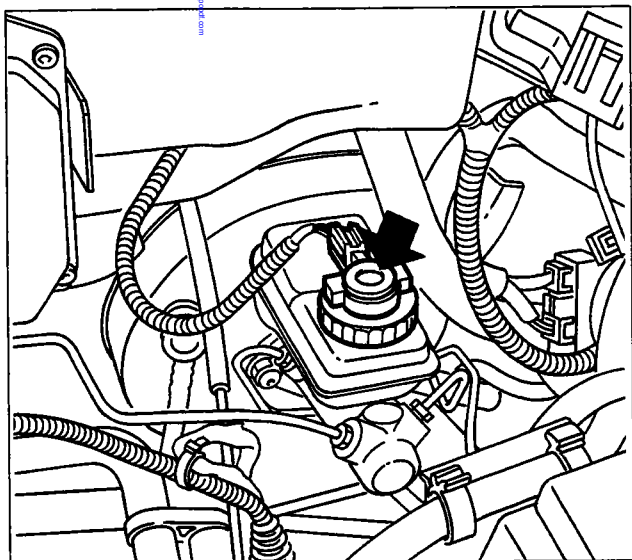
P4A002D03



NOTE To refit the brake pedal, reverse the procedure for removal.



Lubricate the parts concerned with grease before final assembly.



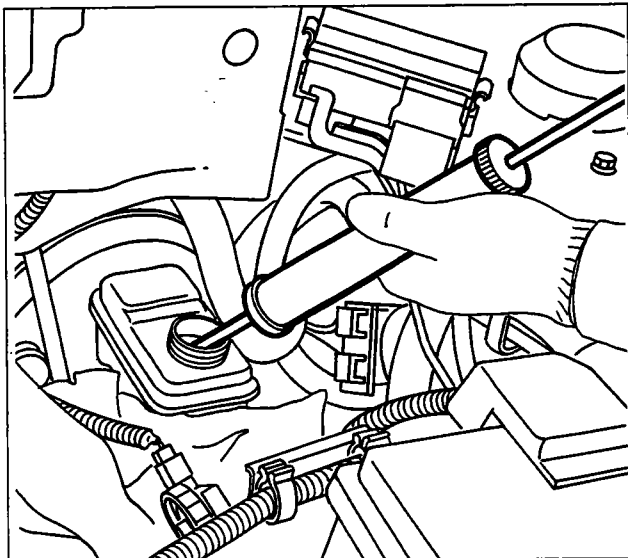
P4A003D01



BRAKE FLUID RESERVOIR

Checking low brake fluid level indicator

NOTE Periodically check the operation of the indicator by pressing on the top of the reservoir cover (as shown by the arrows); with the ignition ON, the braking system fault warning light should come on.



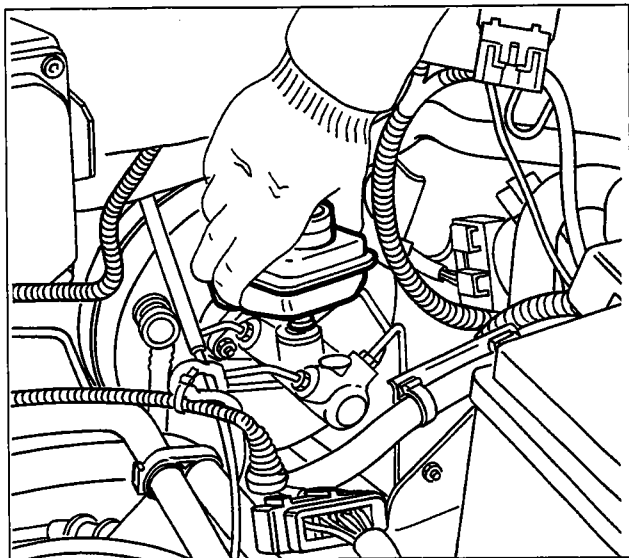
P4A003D02



Removing-refitting

To remove the brake fluid reservoir, proceed as follows:

- disconnect the sensor connector and undo the cap;
- remove the brake fluid from the reservoir, using the special syringe;



P4A003D03



- pull the reservoir upwards to remove it.



Take care should any residual fluid emerge from the reservoir.

NOTE To refit the brake fluid reservoir, reverse the procedure for removal.

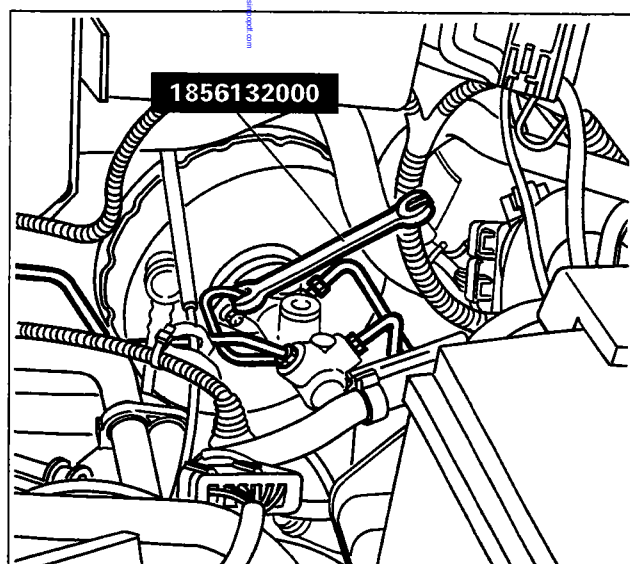


Before filling the reservoir, make sure that it is thoroughly clean.



Bleed the hydraulic system

33.



P4A004D01

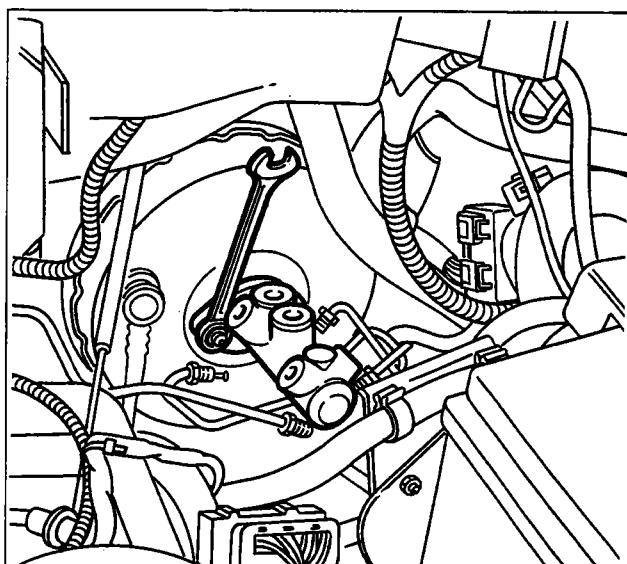


BRAKE PUMP

Removing-refitting

To remove the brake pump, proceed as follows:

- undo the brake pipe connectors using tool 1856132000, so as not to damage them;



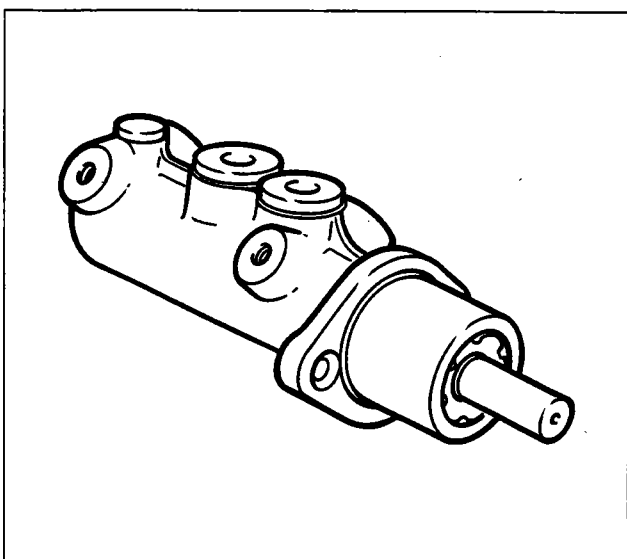
P4A004D02



- undo the nuts and remove the brake pump.



Bleed the braking system

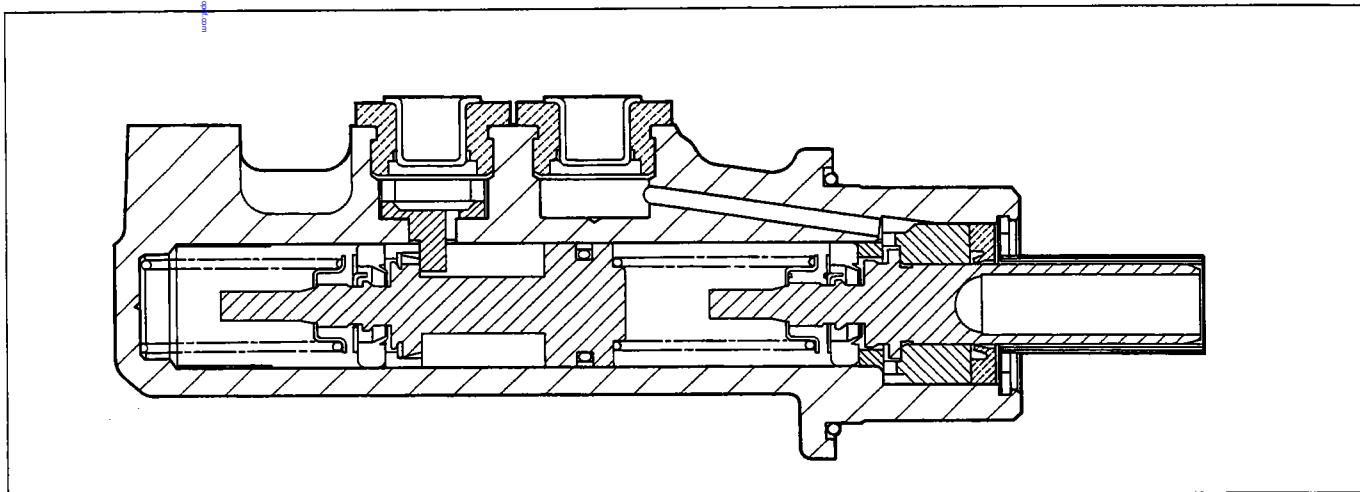


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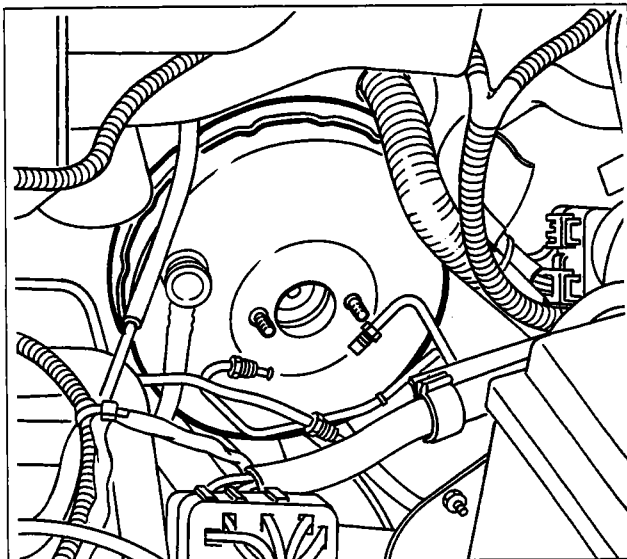
Dismantling-reassembly

When overhauling the brake pump, replace the sealing rings; if there are traces of friction or seizure on the pump casing, replace the complete brake pump.



P4A005D01

Longitudinal section of brake pump

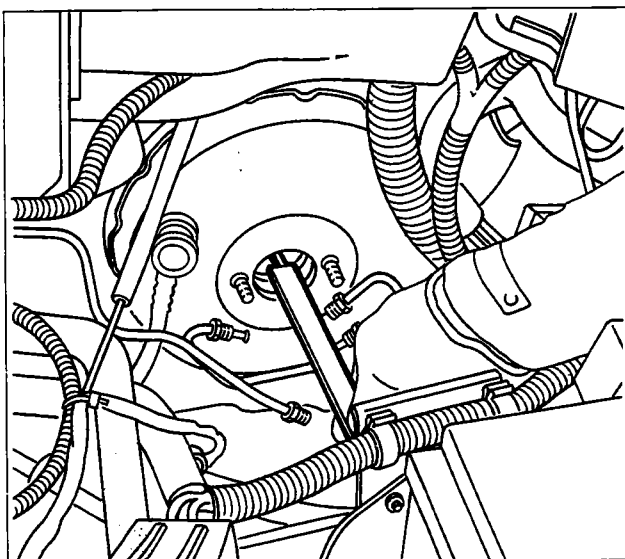


P4A005D02



SERVO UNIT

Servo unit mounted on the car



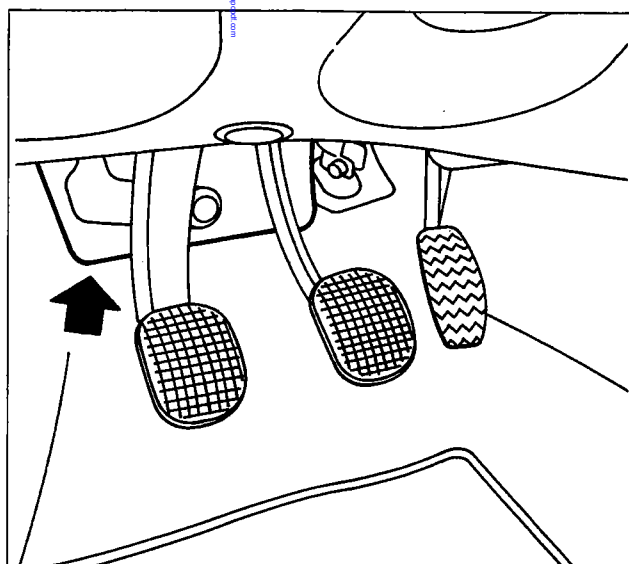
P4A005D03



Checking hydraulic pushrod recess using a depth gauge

NOTE The servo unit is adjusted using the adjustment screw located on the end of the rod.
At the rest position, the end of the adjustment screw should be recessed by 22.45 - 22.65 mm in relation to the plane of the front cover.

33.



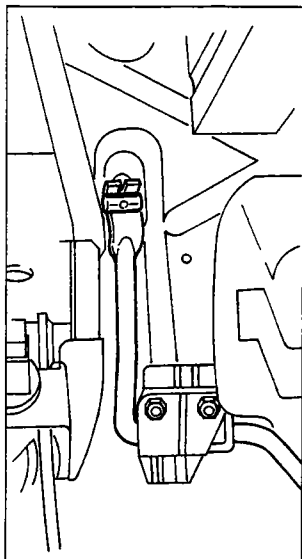
P4A006D01



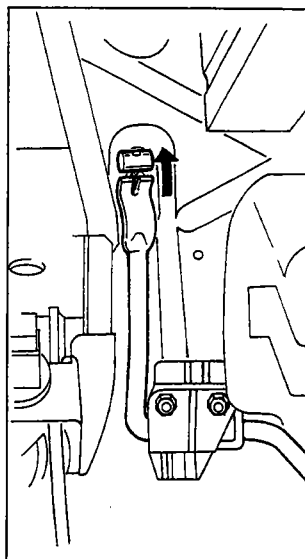
Removing-refitting

To remove the servo unit, proceed as follows:

NOTE The arrows shows the sound-proofing panel. To facilitate dismantling, remove the accelerator pedal, whose attachment plate rests on the sound-proofing panel.



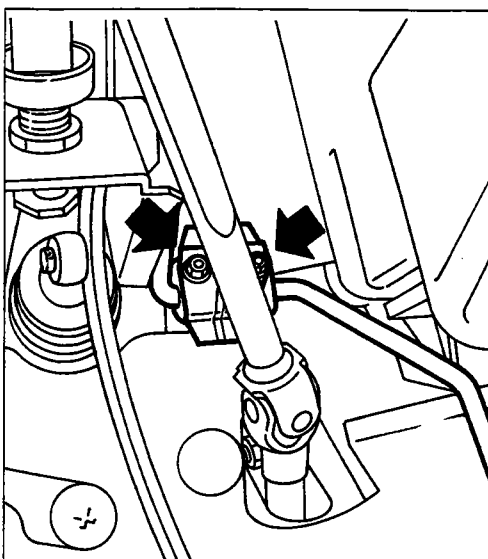
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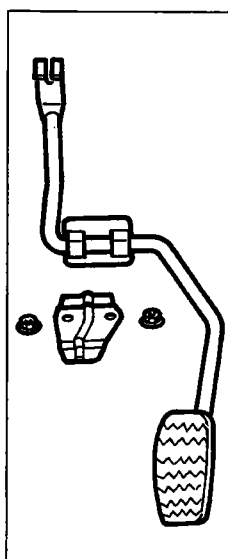
P4A006D03



- disconnect the accelerator cable from its pedal;



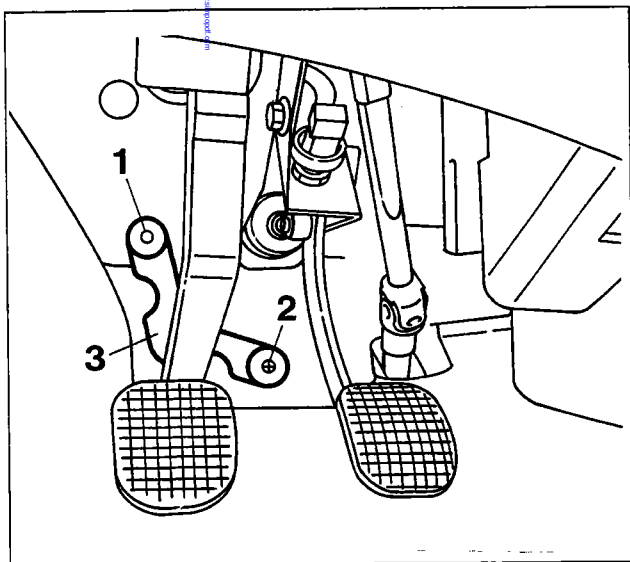
P4A006D04



P4A006D05



- undo the nuts and remove the attachment plate and the accelerator pedal;



P4A007D01

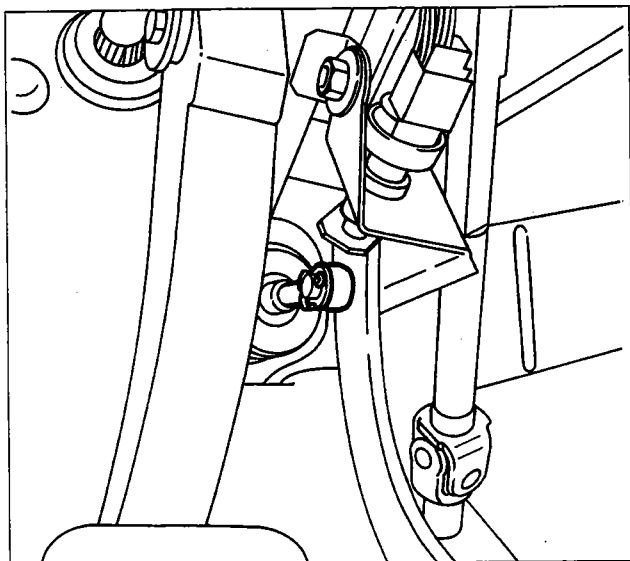


- remove the attachment buttons (1) and (2) on the sound-proofing panel;

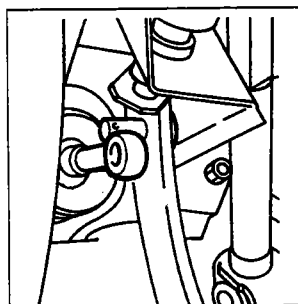
NOTE The button (1) cannot be reused, so during assembly, after fitting the plate (3), a new button should be fitted.



The sound-proofing panel need not be fully removed; it is sufficient to move it over to the right to permit access to the servo unit's attachment nuts.

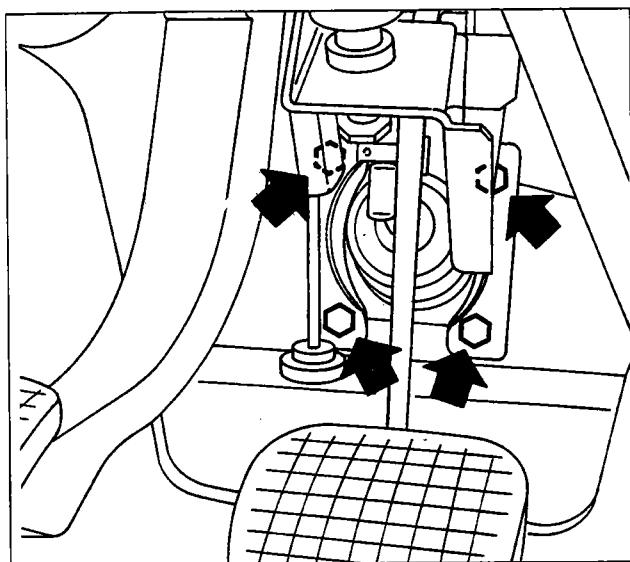


P4A007D02



P4A007D03

- withdraw the split pin to release the servo unit pushrod from the pin located on the pedal;

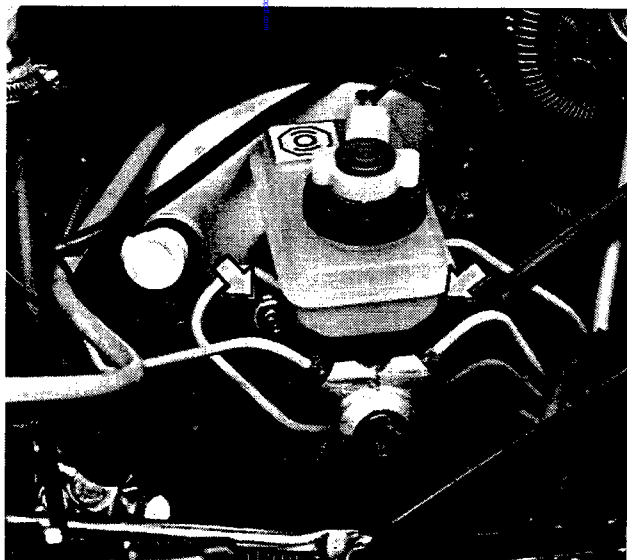


P4A007D04



- undo the servo unit nuts (arrowed) from the pedal assembly mounting;

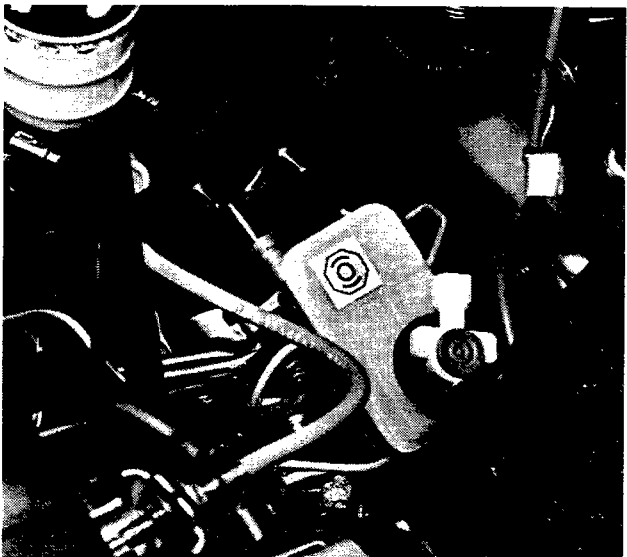
33.



P4A008D01



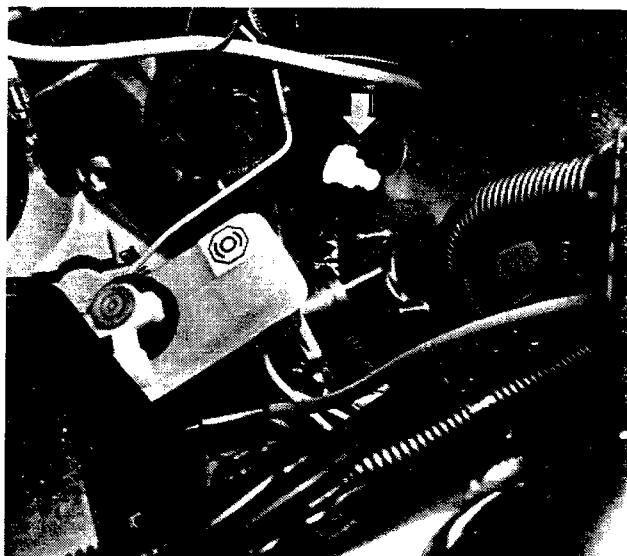
- undo the nuts securing the brake pump to the servo unit;



P4A008D02



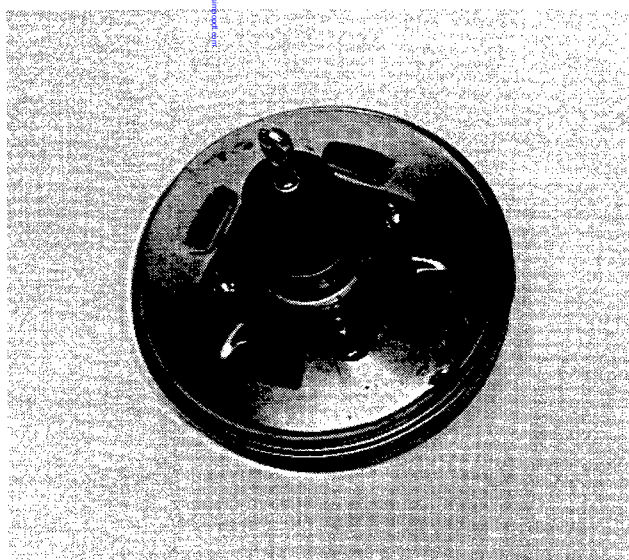
- withdraw the brake pump complete with reservoir from the servo unit and rest it in the engine compartment to facilitate the removal-refitting of the servo unit;



P4A008D03

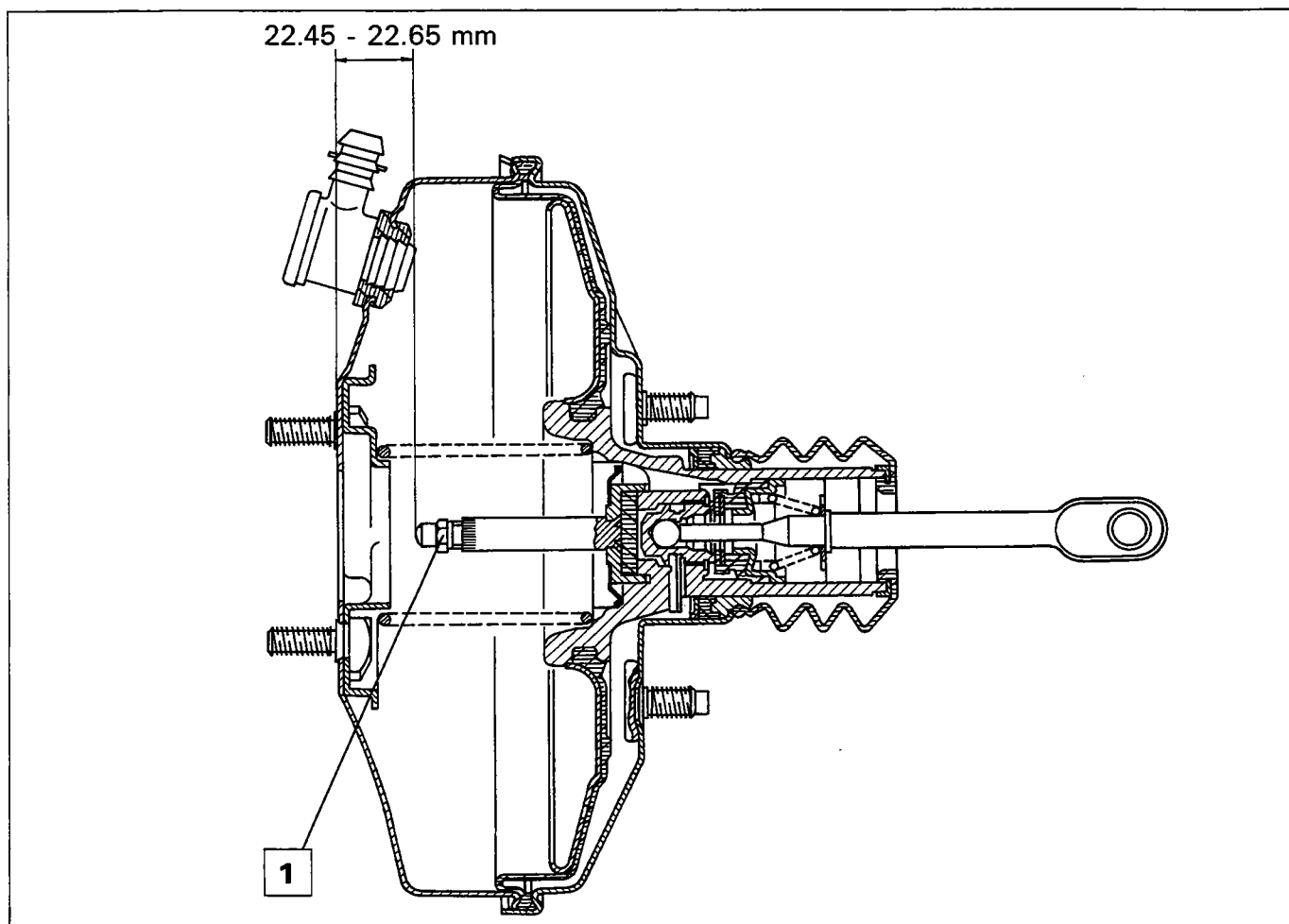


- disconnect the vacuum connection pipe (arrowed) and withdraw the servo unit from inside the engine compartment.



View of servo unit from attachment side to pedal assembly mounting

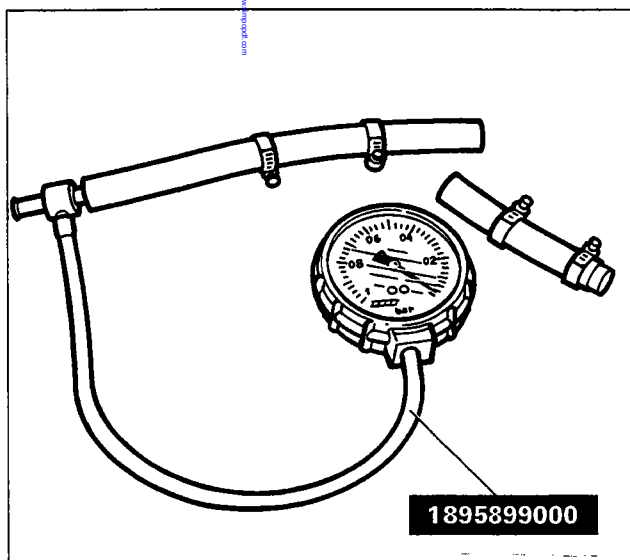
P4A009D01



P4A009D02

Longitudinal section of Iso-Vac 8" servo unit

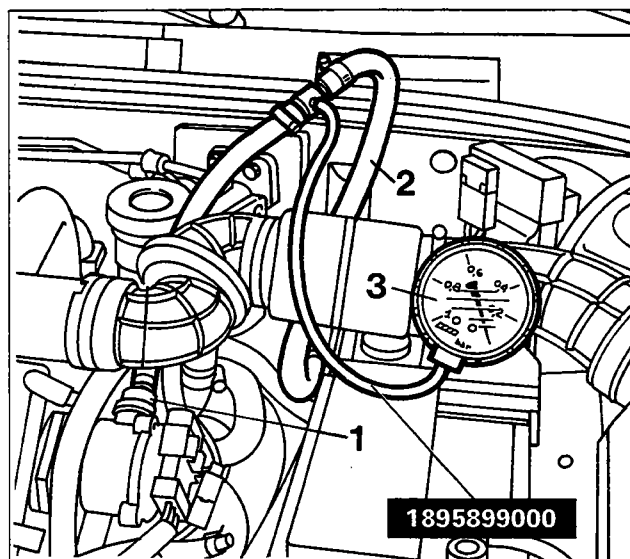
22.45 - 22.65 mm = Distance between hydraulic piston pushrod and brake pump contact plate. If necessary, adjust nut (1) to obtain correct adjustment of the servo unit.

33.

P4A010D01

VACUUM UNIT

Vacuum gauge with connections for checking operation of vane-type vacuum unit



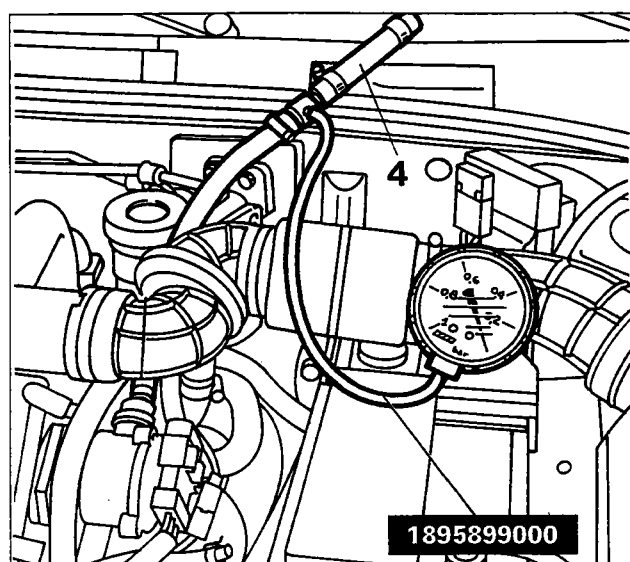
P4A010D02



Checking operating faults

If the braking system is faulty, before replacing the vacuum unit, the vacuum circuit should be checked completely in accordance with the following procedure:

- with the engine off, empty the brake vacuum circuit fully by pressing the brake pedal to the floor several times;
- fit the vacuum gauge 1895899000 (3) between the one-way valve located on the vacuum unit (1) and the servo unit connecting pipe (2) (as shown in the drawing opposite);
- start the engine; after running the engine at idling speed for 20 seconds, the vacuum reading on the vacuum gauge (3) should be over 0.6 bar.



P4A010D03

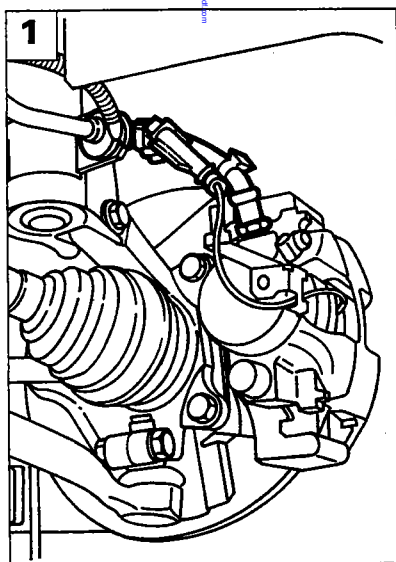


If the vacuum is under 0.6 bar, the servo unit connecting pipe (2) should be disconnected and the free end should be plugged with the special plug (4).

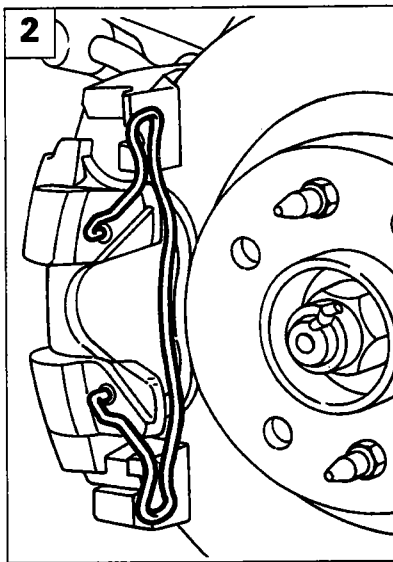
Re-start the engine; after running the engine at idling speed for 20 seconds, the vacuum reading on the vacuum gauge should be over 0.6 bar.

If it is, the fault should be sought in the air circuit or the servo unit.

If not, the vacuum unit is faulty and should be replaced.



P4A011D01



P4A011D02

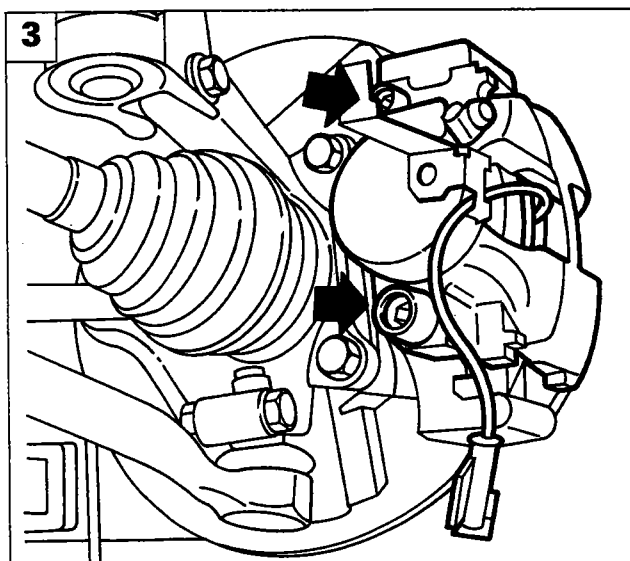
REMOVING-REFITTING

Dismantle the components of the braking system as described below:

1. disconnect the brake hose using tool 1856132000 on the connectors; disconnect the brake pad wear sensor wiring connector;

NOTE The hose must not be swollen or cracked, otherwise it must be replaced.

Wehn refitting the brake hose, check that the mounting rubber is positioned correctly to prevent the pipe coming into contact with the wheelarch or mechanical parts of the car, whatever the travel or turning angle of the wheels.



P4A011D03

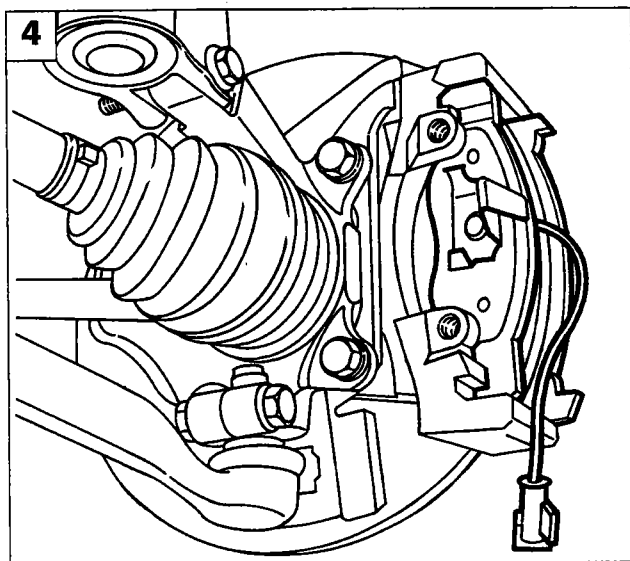


2. remove the retaining spring;
3. undo the bolts and remove the brake caliper;

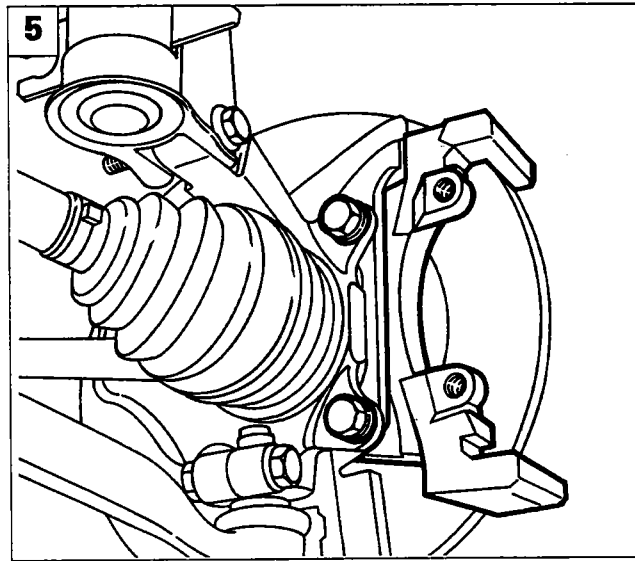


The caliper case attachment bolts are self-locking and should always be renewed whenever they are slackened or unscrewed.

4. remove the brake pads;
5. undo the bolts securing the caliper mounting bracket and remove the latter.

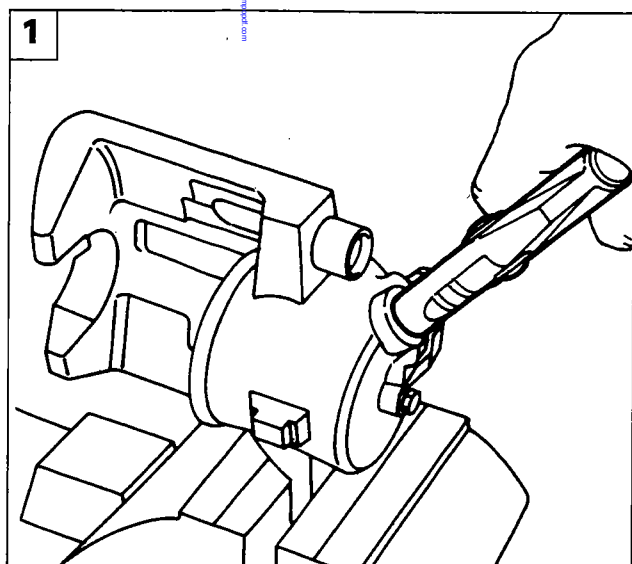


P4A011D04

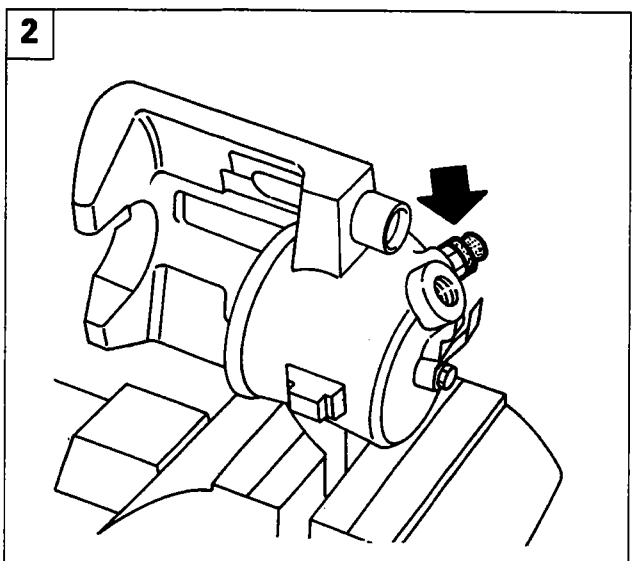


P4A011D05

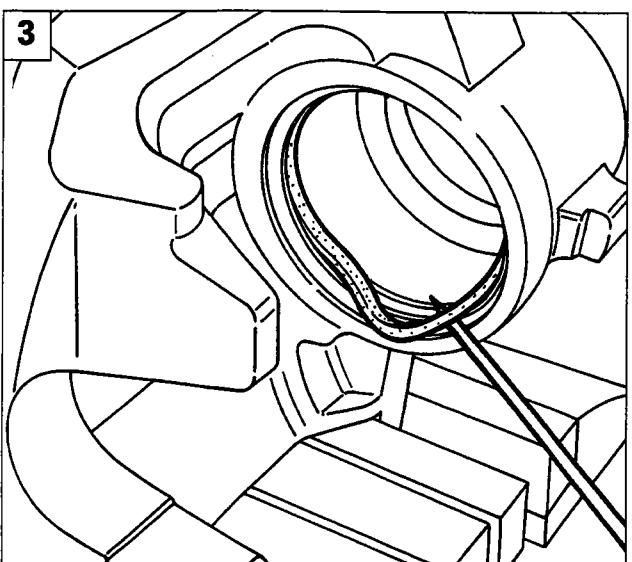
33.



P4A012D01



P4A012D02



P4A012D03

BRAKE CALIPER

Dismantling-reassembly

Place the caliper in a vice, fitting the protections, then proceed as described below:

1. direct a jet of compressed air into the brake fluid inlet hold in order to dismantle the piston from the caliper case;
2. undo the air bleed screw and remove it;
3. remove the seal;
4. check the components; the piston and caliper case must not show signs of friction or seizure; if they do, the caliper complete with piston should be replaced. It is nevertheless always necessary to replace the dust excluder (1) and seal (2), and to check that the bleed screw (3) is not blocked.



Use a solution of FIAT LDC detergent in hot water to wash the metal parts.

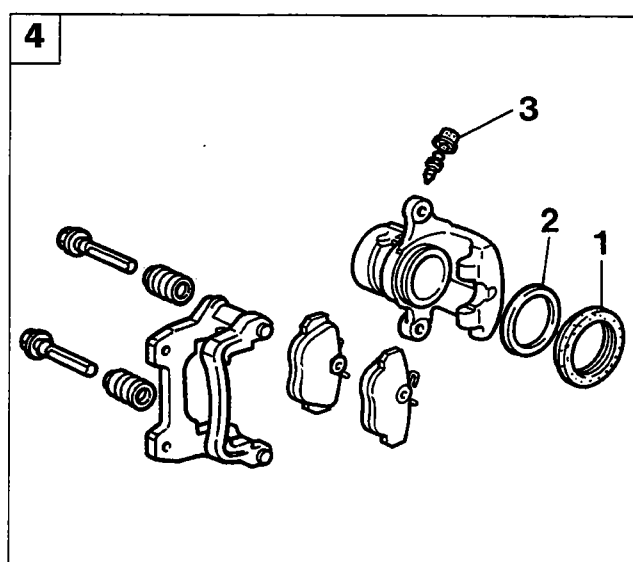
NOTE *To refit the brake caliper, reverse the procedure for removal.*



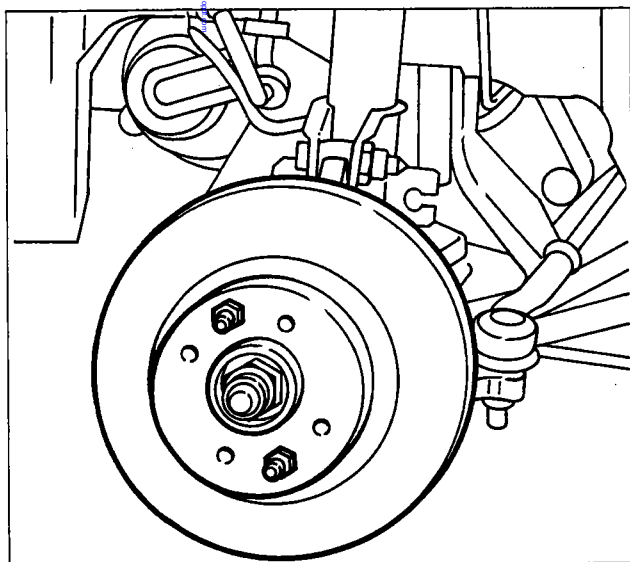
Lubricate the parts concerned with brake fluid before final assembly.



Before fitting the piston in the caliper case, fit the dust excluder on the rear end of the piston. Insert the piston gradually, taking care not to damage the dust excluder.



P4A012D04

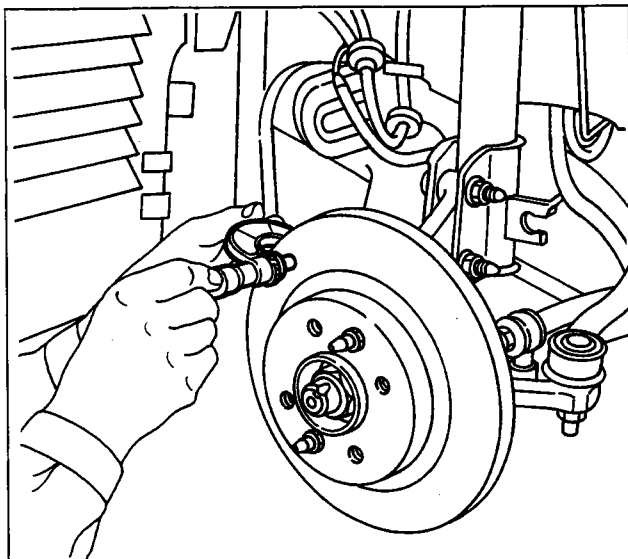


P4A013D01

BRAKE DISCS

Dismantling-reassembly

Undo the brake disc attachment bolts and remove the disc. When refitting, eliminate any traces of rust to ensure that the disc is perfectly perpendicular to the hub.



P4A013D02

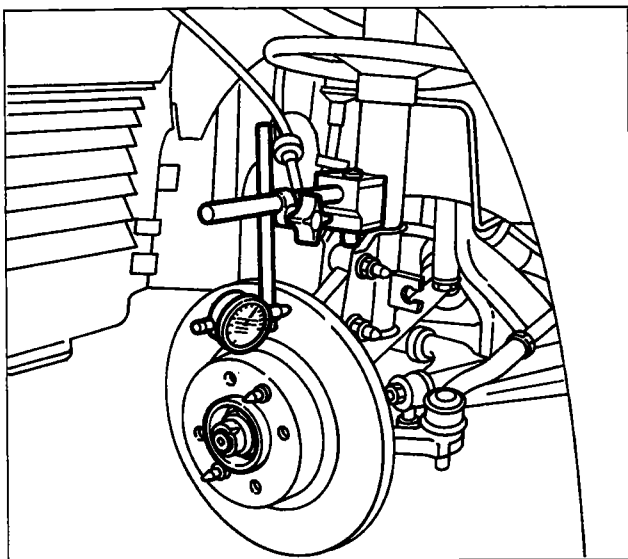
Checking and measuring disc thickness

The minimum permissible brake disc thickness after wear is indicated in the table; if the measured value is less than the value in the table, the disc should be renewed.

In the case of damage or deep scoring, the brake disc surfaces can be skimmed; after skimming, the brake disc thickness must not be less than the value stated in the table;

Brake disc thickness (values in mm)

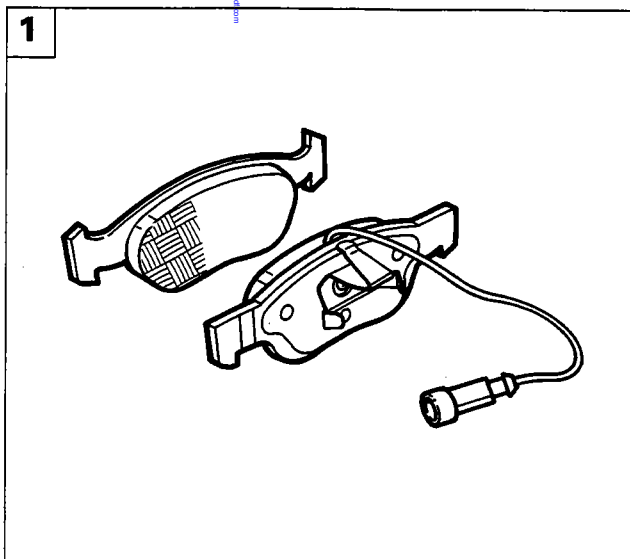
	1370 12v 1581 16v 1929 D	1747 16v 1998 20v 1910 TD
after wear	10.2	20.20
after skimming	11.1	20.55



P4A013D03

Checking brake disc run-out

Also check that the run-out does not exceed 0.15 mm; this should be checked 2 mm from the disc's outer diameter.



P4A014D01



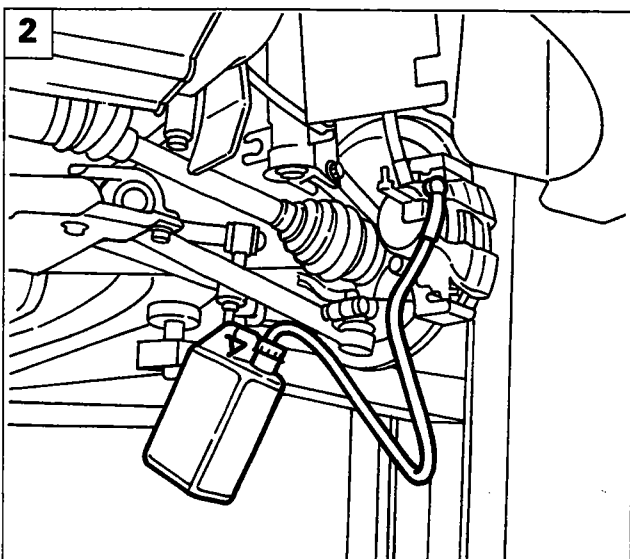
BRAKE PADS

Check

1. The brake pads must be renewed if the thickness of the friction material is less than 1.5 mm.



Check that brake pads of the same type are fitted to each pair of wheels.



P4A014D02



BLEEDING

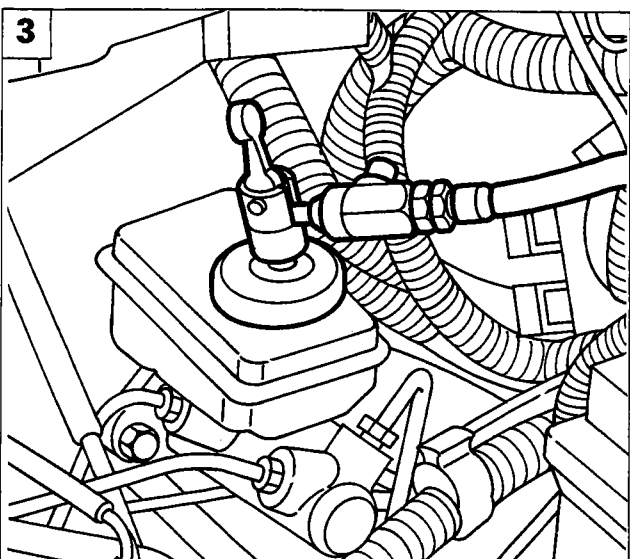
2. Manual bleeding.



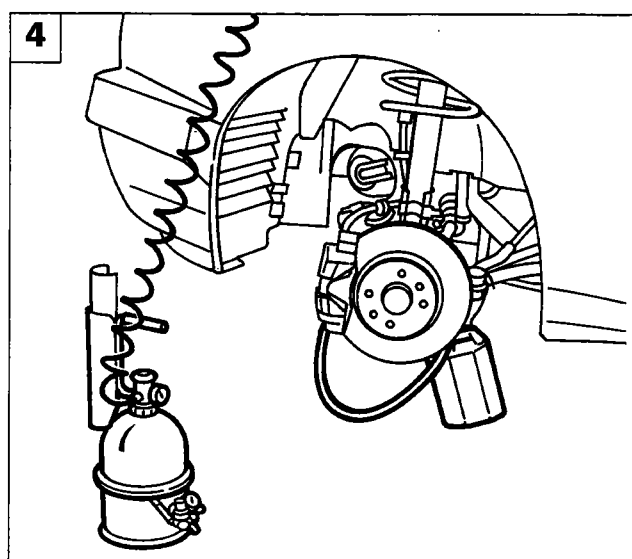
*The old brake fluid should not be reused.
Top up the level with fresh brake fluid.*

Bleeding with Jollyfren device

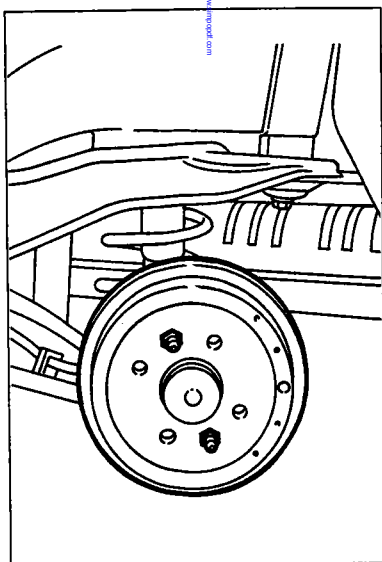
3. Connect the device's pipe to the brake fluid reservoir;
4. connect the device to the compressed air pipe and bleed the system as described in the device's instructions sheet.



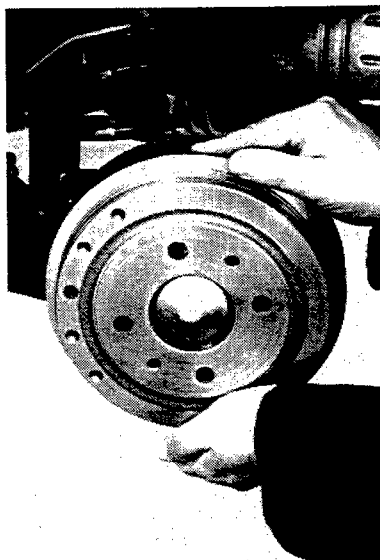
P4A014D03



P4A014D04



P4A015D01



P4A015D02



DRUM BRAKES

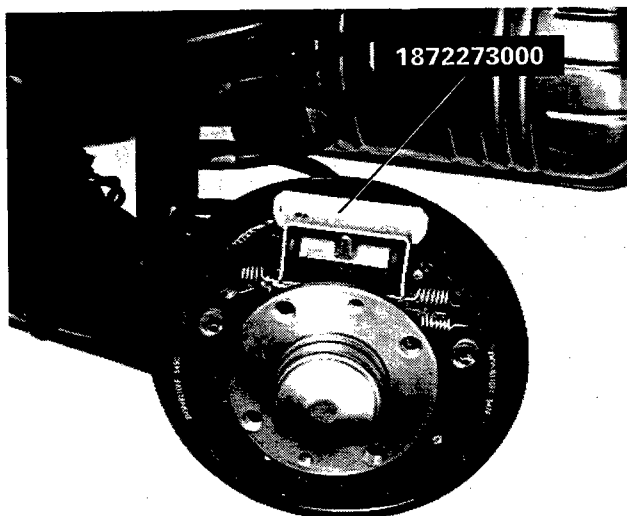


Removing-refitting

To dismantle the rear drum brakes, proceed as follows:

- undo the two bolts and remove the brake drum;

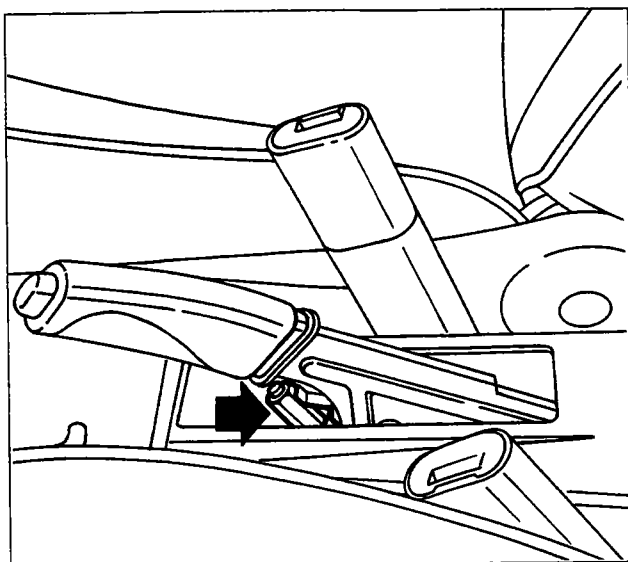
NOTE Before removing the brake drum, eliminate any traces of rust on the contact surfaces.



P4A015D03



- fit tool 1872273000 to lock the wheel cylinder, to enable the brake shoes to be removed and refitted;



P4A015D04



- slacken the handbrake cable;

33.



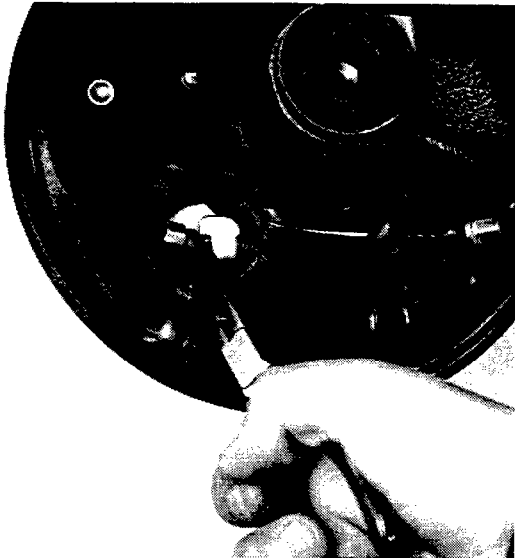
P4A016D01



P4A016D02



- dismantle the handbrake cable anchorage cover;



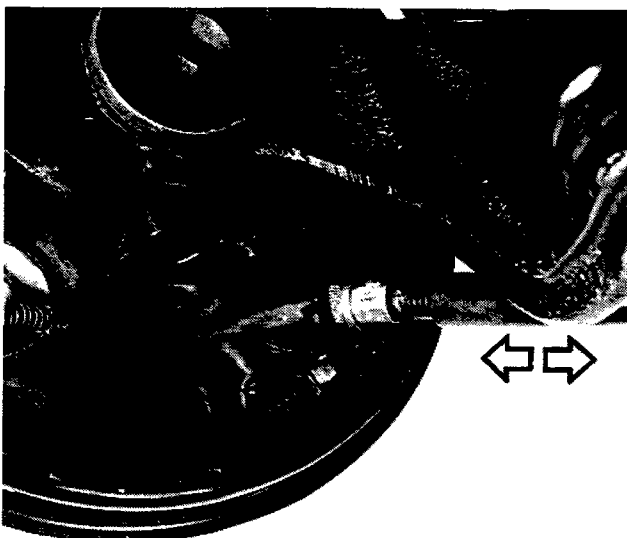
P4A016D03



P4A016D04



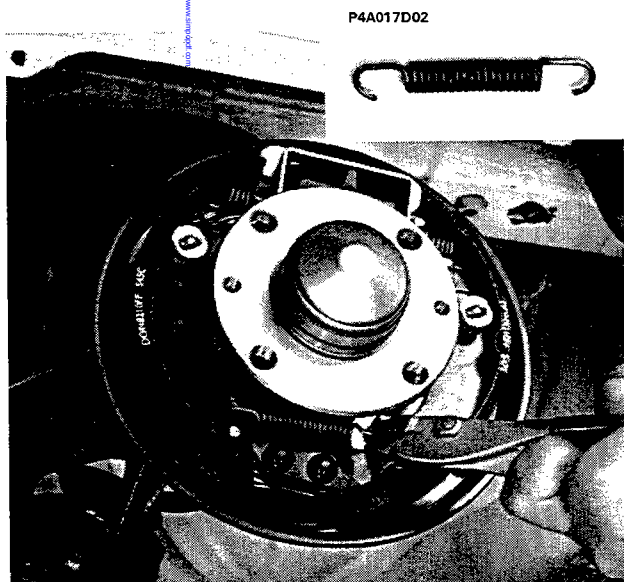
- release the handbrake cable from the anchorage on the handbrake lever;



P4A016D05



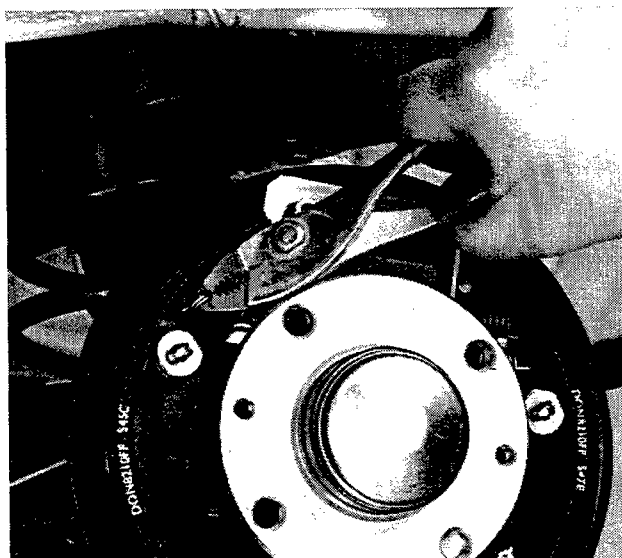
- disconnect the handbrake cable and sheath from the brake backplate;



P4A017D01



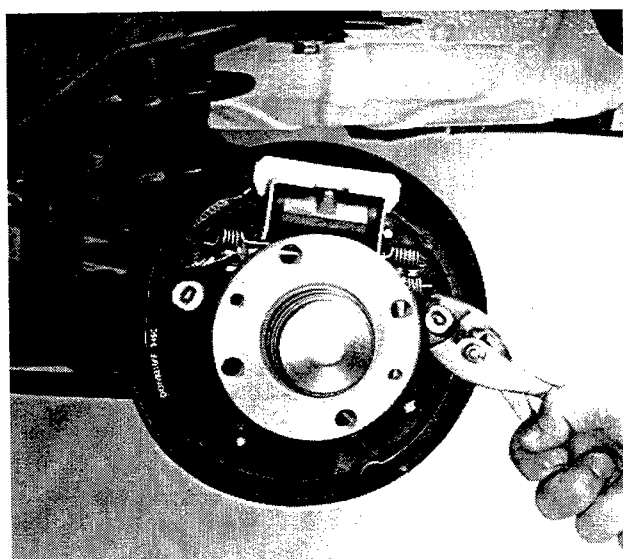
- remove the lower shoe return spring;



P4A017D03



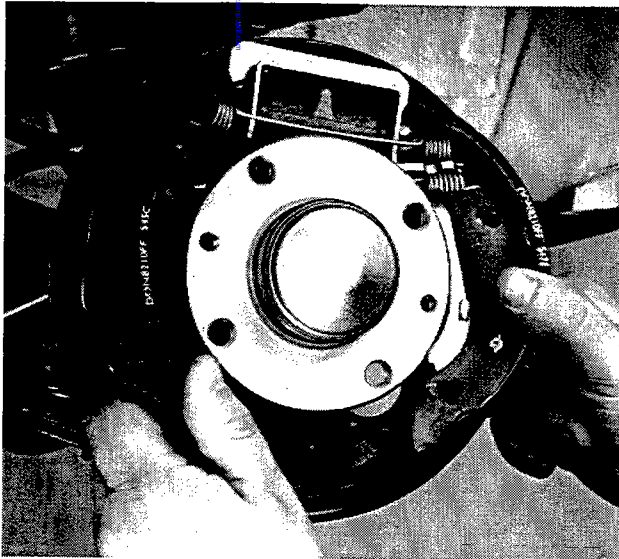
- remove the left self-adjuster spring;



P4A017D04



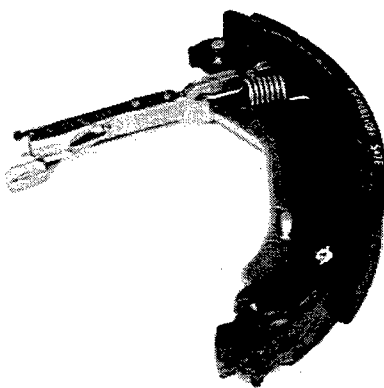
- withdraw the shoe hold-down pins;



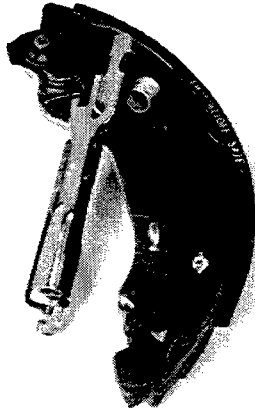
P4A018D01



- remove the shoes;



P4A018D02

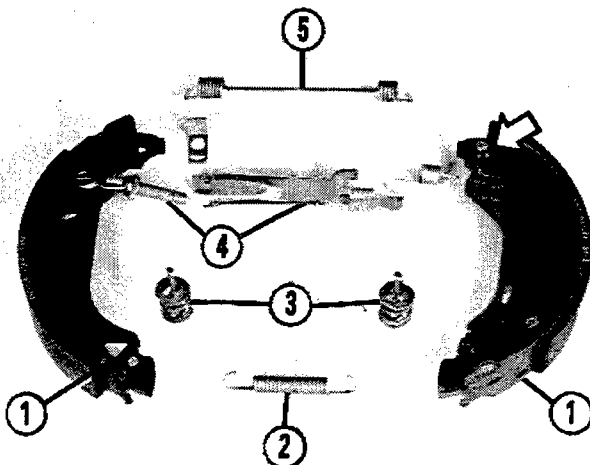


P4A018D03

- dismantle the self-adjuster from the right shoe.



After refitting, adjust the handbrake by following the procedure described on page 32.



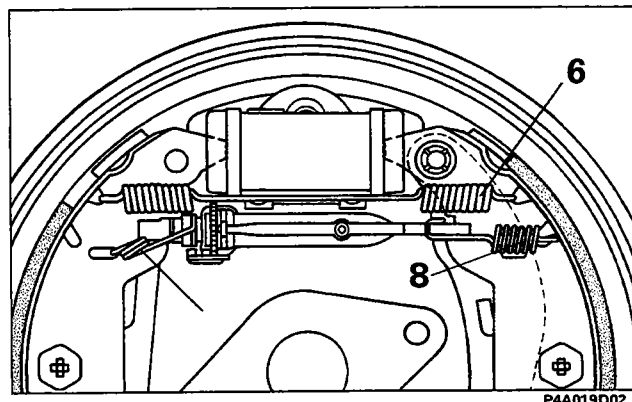
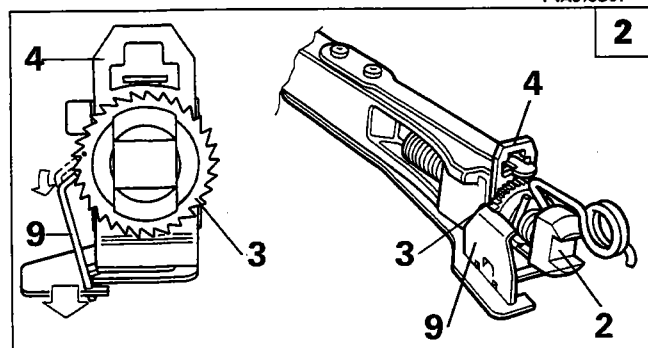
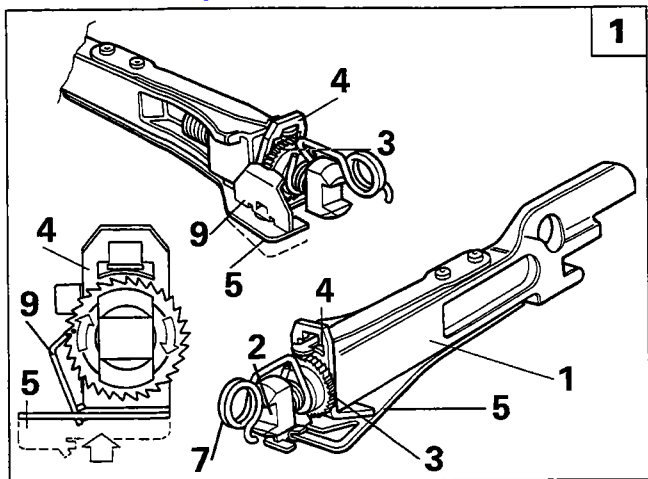
P4A018D04

Rear brake components

1. Shoes
2. Lower shoe return spring
3. Shoe hold-down pin
4. Self-adjuster
5. Upper shoe return spring

NOTE *The arrow shows the washer-clip which must be replaced whenever the shoes are replaced.*

AUTOMATIC ADJUSTER ASSEMBLY FOR RECOVERING SHOE-DRUM CLEARANCE



The distance between the shoes and drum is adjusted automatically by the self-adjuster assembly each time the brakes are operatee, should any adjustment be necessary at that moment.

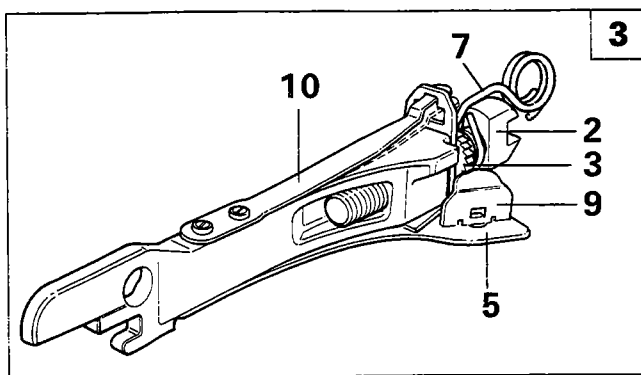
The device consists of a link rod (1) inside which an adjustment screw (2) freely slides. A ratchet wheel (3) is screwed onto this screw. In the rest position, the front shoe return spring (6) compresses the automatic adjuster assembly, so the ratchet wheel (3) pushes the frame (4) into contact with the end of the link rod (1).

The frame (4) is also subjected to a pushing force from the flexible blade (5). During the braking action the two shoes move apart and come into contact with the drum; the two ends of the adjuster assembly are held in contact with the shoes by means of the springs (7) and (8).

The frame (4) is pushed by the flexible blade (5) against the ratchet wheel (3), and by means of the pawl (9) (permanently in contact with the ratchet wheel), causes it to rotate [1].

During brake release, the automatic adjuster assembly is again compressed by the action of the upper shoe return spring (6); the ratchet wheel (3) stops at the angle assumed during braking. This stop during rotation is caused by the friction between the frame (4) and the ratchet wheel (3). With the ratchet wheel (3) locked during rotation, if the brake linings are sufficiently worn from previous use of the brakes, the pawl (9) slips onto and engages with the next tooth [2]. The maximum travel of the ratchet wheel (3) on the adjustment screw (2) is one tooth (0.020 - 0.025 mm). An exception to this is when the brakes bed in after dismantling, when the travel is two teeth (0.04 - 0.05 mm).

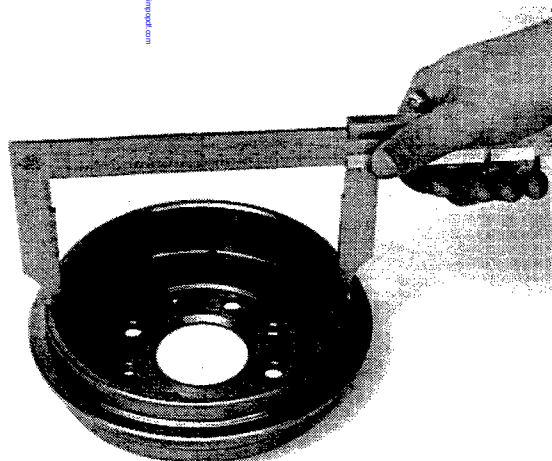
If after excessive braking the brakes overheat and the temperature reaches 100° - 110°C, the flexible blade (10) in the adjuster assembly comes into action by bending and locking the frame (4) in a neutral position [3].



During braking the ratchet wheel (3) is no longer subjected to the pushing action of the flexible blade (5), so the pawl (9) assumes the same angle as the ratchet wheel tooth, which will be free to slide with the adjustment screw (2) on the pawl (9) without compensating for the distance created by the expansion of the drum.

During overhaul, before fitting the brake linings, the ratchet wheel (3) of the adjuster assembly must be brought into contact with the spring (7) and then unscrewed by half a turn.

33.



P4A020D01

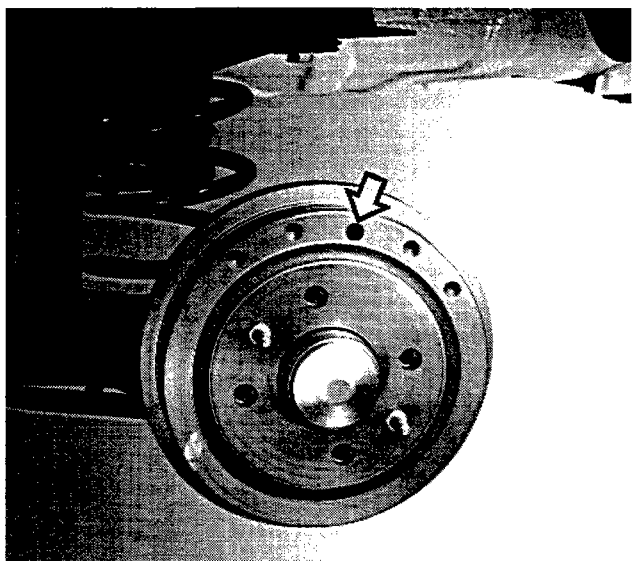


BRAKE DRUMS



Checking and measuring brake drums

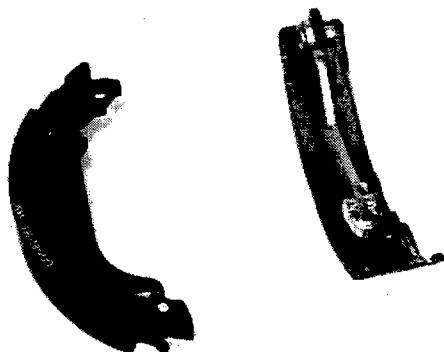
If the brake drums are deeply scored or are unevenly worn, they must be skimmed. The maximum permitted diameter increase on the brake drums is 0.8 mm.



P4A020D02



Location on brake drum of hole for inspecting thickness of shoe friction material



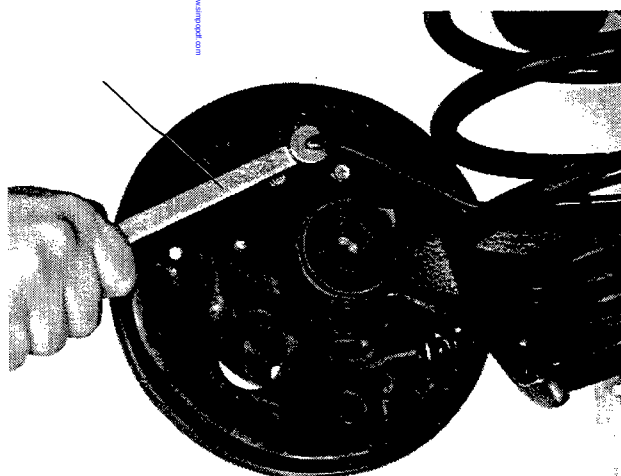
P4A020D03



SHOES

Checking shoe

The minimum permitted thickness of the brake lining is 1.5 mm.

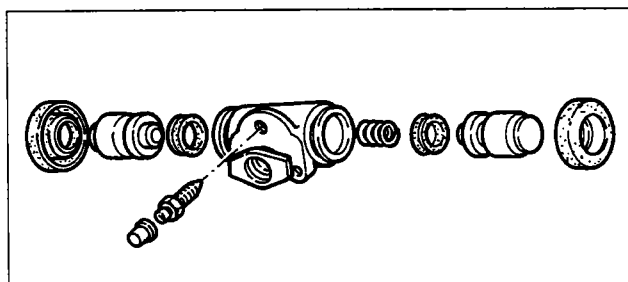


P4A021D01

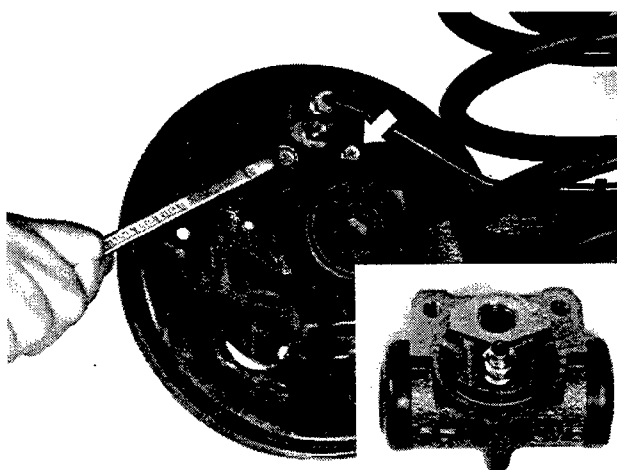
**WHEEL CYLINDER****Removing-refitting**

To remove the wheel cylinder, proceed as follows:

- using tool 1856132000, undo the brake pipe connection;
- undo the bolts and remove the wheel cylinder.



P4A021D04



P4A021D02

P4A021D03

Checking wheel cylinder components

During overhaul, always replace the seals and dust excluders; if the cylinder barrel or pistons show faults, replace the assembly. Make sure that the bleed screw is not blocked.

BLEEDING

Do not re-use the old fluid.

The level should be topped up with fresh brake fluid.

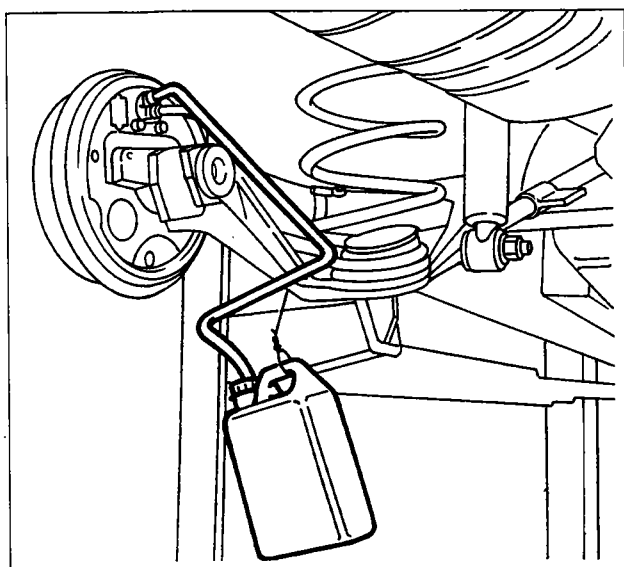


The rear brakes should be bled on a platform ramp with the rear suspension resting on the ground, so that the brake pressure proportioning valve enters into operation.

NOTE *The brakes can also be bled using the Jollyfren device, using the procedure described for the front brakes.*



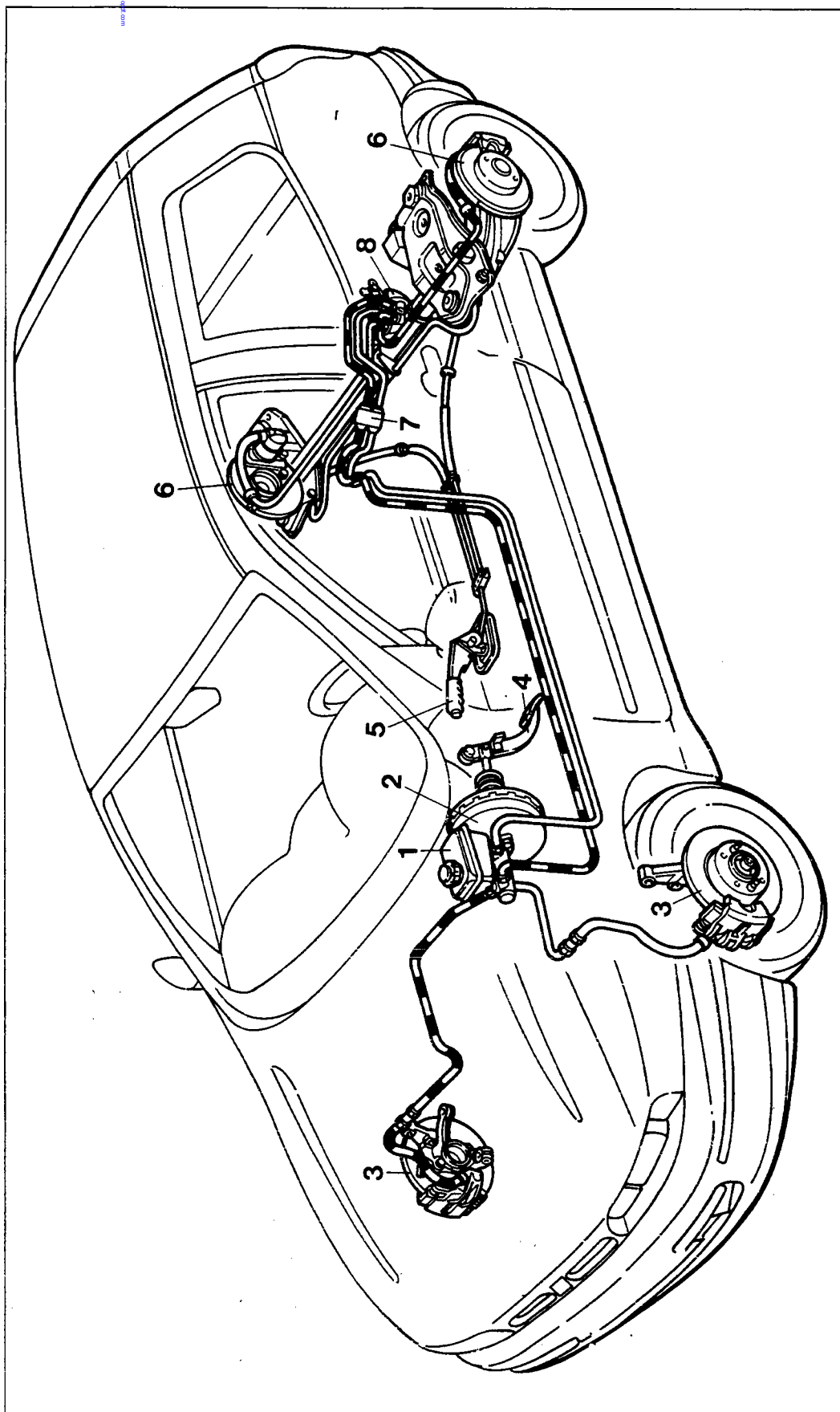
Adjust the handbrake as described on page 32.



P4A021D05

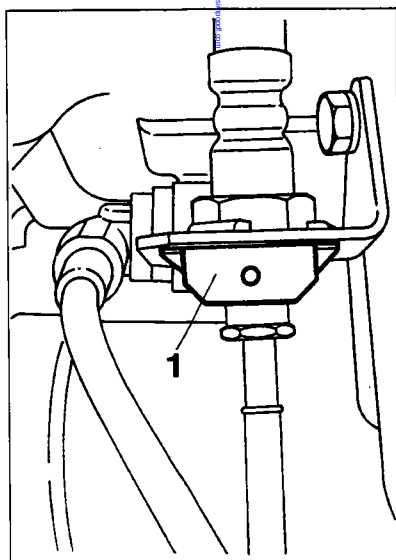
33.

DIAGRAM OF HYDRAULIC BRAKING SYSTEM (FRONT AND REAR DISC BRAKES) AND MECHANICAL HANDBRAKE

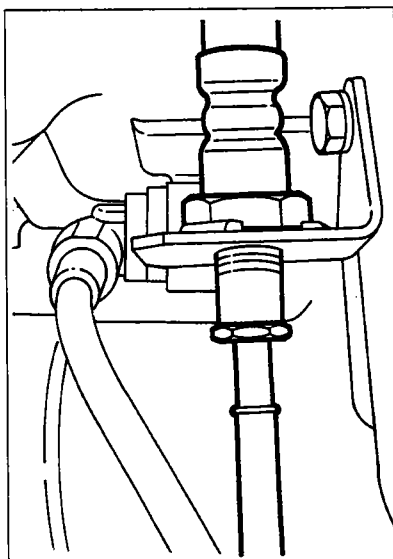


1. Brake fluid reservoir and pump for independent brake circuits
2. Vacuum servo unit
3. Self-ventilating front disc brakes
4. Brake pedal

5. Hand brake lever
6. Rear disc brakes
7. 4-way distributor
8. Brake pressure proportioning valve



P4A023D01



P4A023D02



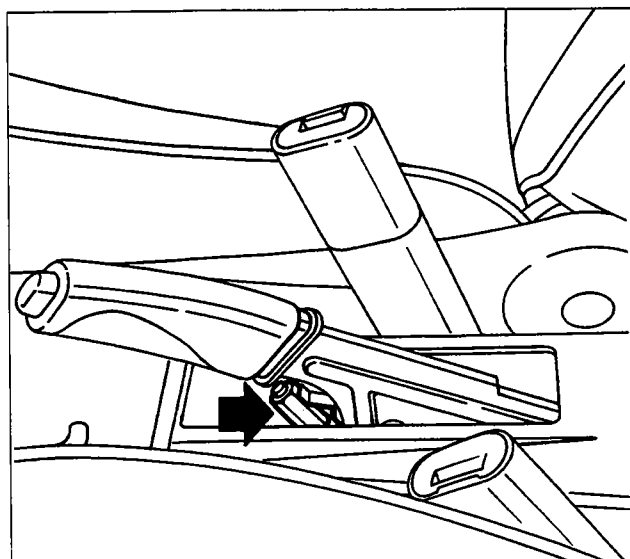
DISC BRAKES



Removing-refitting

To dismantle the rear disc brakes, proceed as follows:

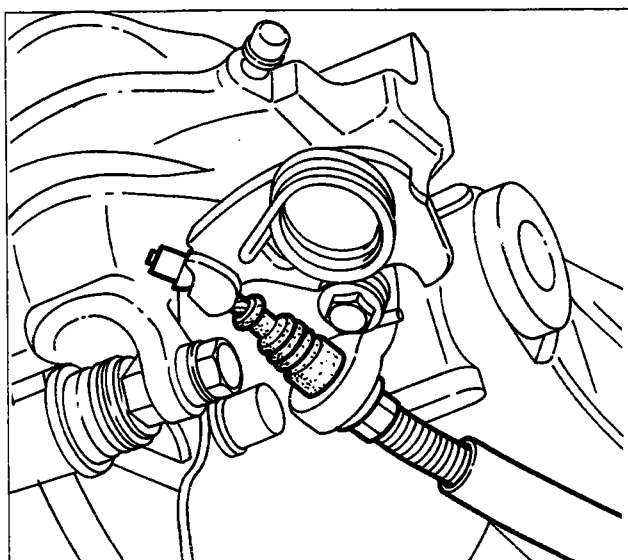
- withdraw the retaining clip (1);
- undo the hose connector using tool 1856132000;



P4A015D04



- undo the screw (arrowed) to slacken the tension on the handbrake cable, in order to facilitate its disengagement;

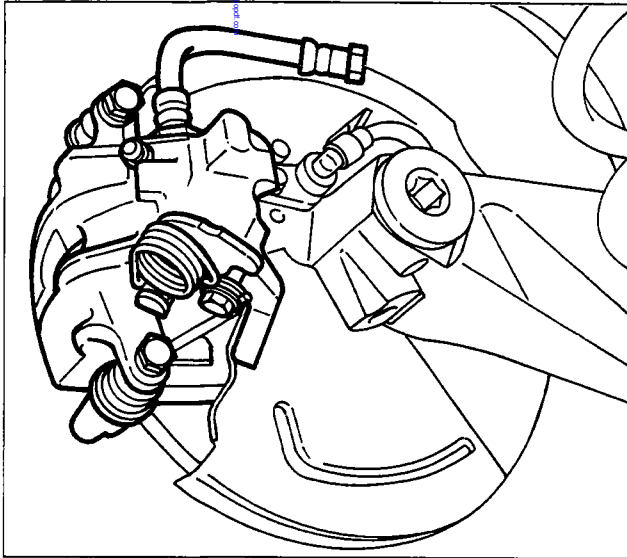


P4A023D03



- release the handbrake cable;

33.



P4A024D01

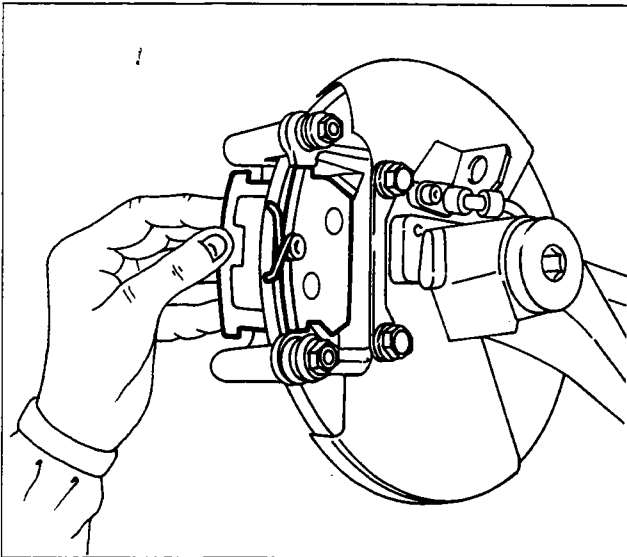


- undo the attachment bolts and remove the brake caliper;



The caliper case attachment bolts are self-locking and should be renewed whenever they are slackened or unscrewed.

NOTE *After replacing the brake calipers, adjust the handbrake.*

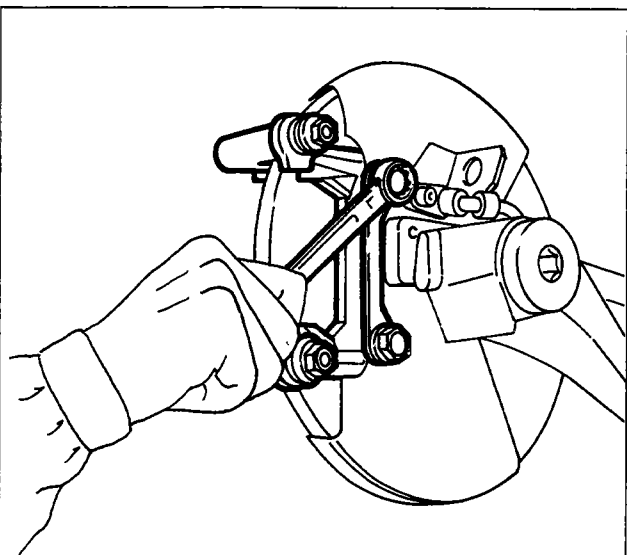


P4A024D02



- remove the brake pads;

NOTE *Before fitting the new brake pads, make the caliper piston go in fully by turning it clockwise using tool 1856133000. Also adjust the handbrake.*



P4A024D03



- undo the caliper support bracket bolts and remove the bracket.



Before refitting the caliper support bracket, check that the rubber gaiters are in good condition; if not, they should be replaced.



When refitting, remember to fit the shim between the bolts and support bracket.

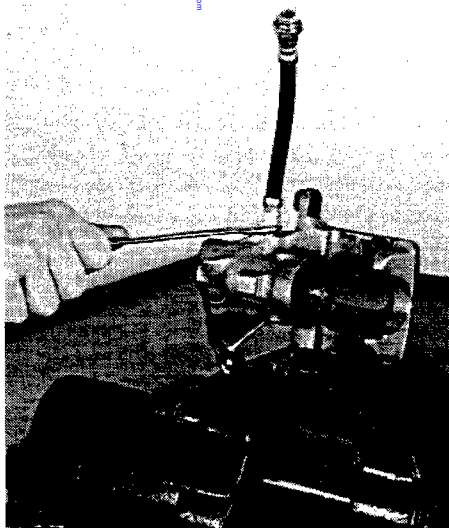
BRAKE CALIPER

Dismantling

Place the caliper in a vice, fitting the protections, then proceed as described below:

- undo the connector and remove the brake hose;
- undo the bleed screw and remove it;

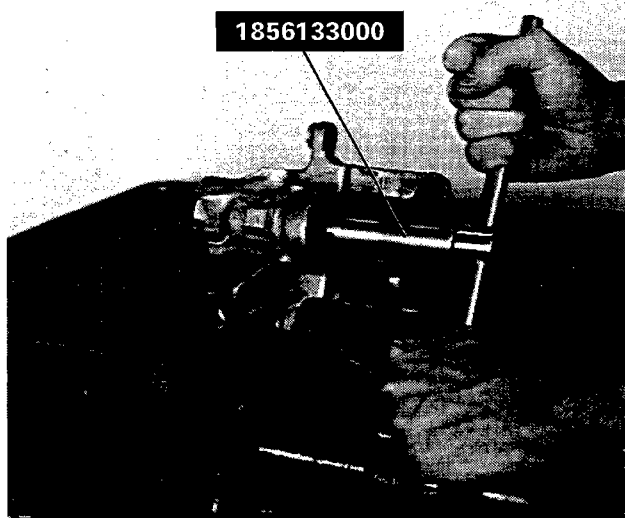
NOTE *The hose must not be swollen or cracked, otherwise it must be replaced. It is advisable to replace both hoses.*



P4A025D01

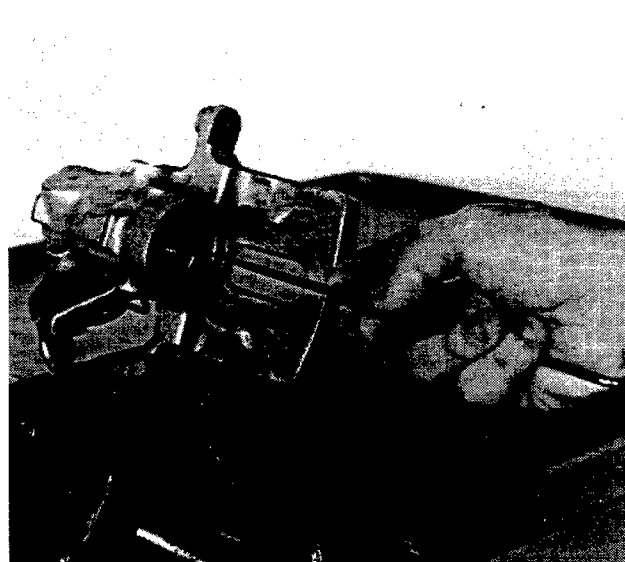


P4A025D02



1856133000

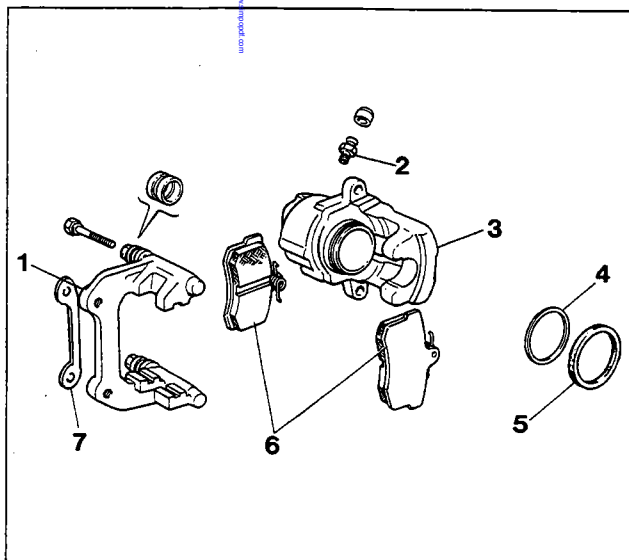
P4A025D03



P4A025D04

- remove the piston and dust excluder using tool 1856133000;

- remove the seal.



P4A026D01



Checking caliper assembly components

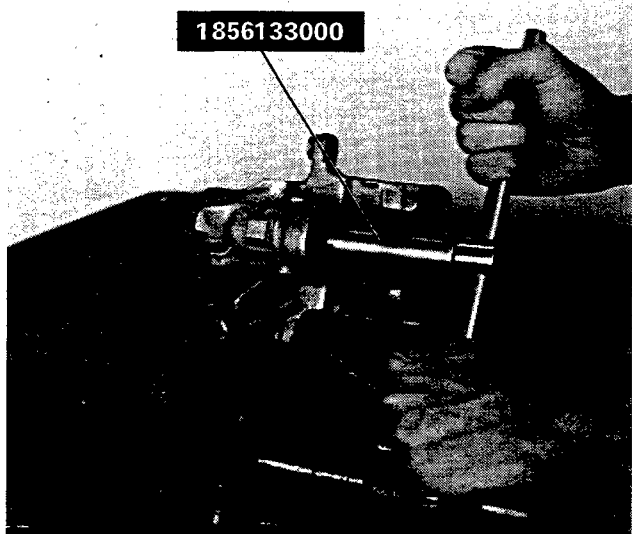
The piston and caliper case must not show signs of friction or seizure, otherwise the caliper complete with piston will need to be replaced.

The dust excluder and seal should always be replaced; also make sure that the bleed screw is not blocked.



Use a solution of FIAT LDC detergent with hot water to wash the metal parts.

1. Caliper mounting bracket
2. Bleed screw
3. Caliper case
4. Seal
5. Dust excluder
6. Brake pads
7. Shim



P4A025D03

Refitting

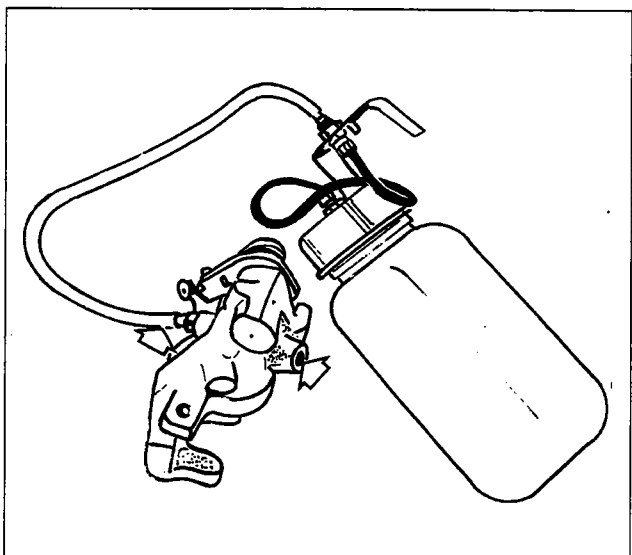
Fit the piston in the caliper case using tool 1856133000.



Before fitting the piston in the caliper case, fit the dust excluder on the rear end of the piston.



Lubricate the parts concerned with brake fluid before final assembly.



P4A026D02

Filling brake caliper

After overhauling the brake caliper and before fitting it to the car, it should be filled in accordance with the following procedure:

- undo the bleed screw;
- insert the end of a transparent tube in the bleed screw hole;
- using a normal container with brake fluid, fill the caliper with fluid until air bubbles emerge from the threaded hole where the brake hose pipe is connected;
- lock the bleed screw.

AUTOMATIC ADJUSTER ASSEMBLY FOR RECOVERING CLEARANCE BETWEEN REAR BRAKE PADS AND DISCS AND HANDBRAKE SLACK

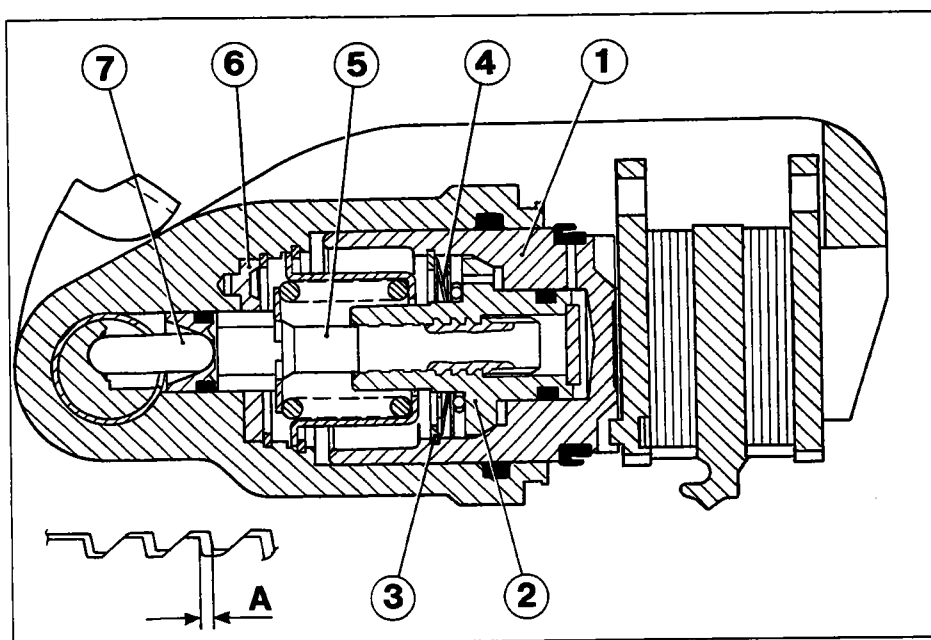
The rear brake caliper piston contains a device for automatically adjusting the distance between the disc and friction pads. This device consists of a nutscrew (2), which rotates on the shaft (5) only in the direction of advance because of the action of the Belleville washer (4) and a shaft (5), on which the nutscrew (2) is screwed. This shaft cannot rotate as it is secured to the caliper case by the retainer (6). The shaft and nutscrew are connected by a four-start threaded connection with a clearance (A) of a pre-established value.

During braking, the piston (1), pushed by hydraulic pressure, moves towards the brake pad with the nutscrew (2), the latter being secured to the piston by the retaining ring (3) and Belleville washer (4).

If the brake pads are excessively worn, the endfloat (A), even if recovered, is not sufficient to absorb by itself the entire travel of the piston (1). The nutscrew (2) then momentarily moves away from its point of contact with the piston (1), but the intervention of the Belleville washer (4) makes the nutscrew (2) rotate on the shaft (5) until it returns in contact with the piston (1).

When the handbrake is operated, the mechanical effort is transmitted from the lever to the link (7) and then, through the shaft-nutscrew connection, it reaches the piston (1) and from the latter to the brake pads.

The nutscrew (2), and thus the piston (1) joined to the latter, can rotate, since during the braking action the piston is engaged on the brake pad plate.



P4A027D01

Cross section of rear brake caliper cylinder

- 1. Piston
- 2. Nutscrew
- 3. Retaining ring
- 4. Belleville washer

- 5. Shaft
- 6. Retainer
- 7. Link
- A. Clearance between nutscrew and shaft

33.



P4A028D01



P4A028D02

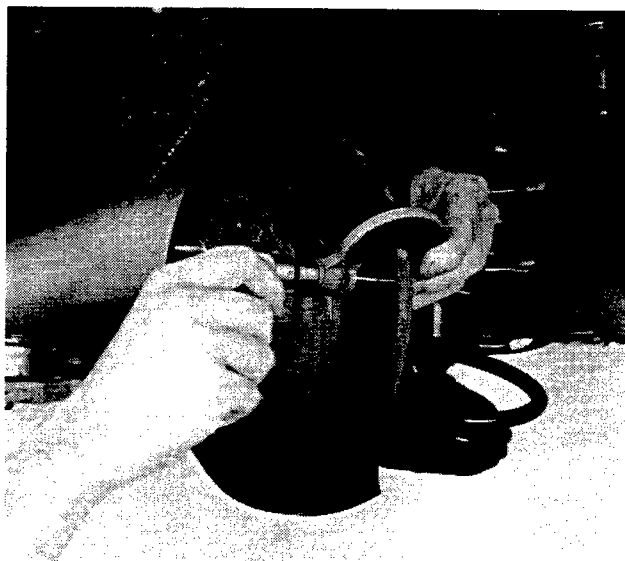


BRAKE DISCS



Dismantling-reassembly

Undo the the bolts securing the brake disc and remove it; when re-fitting, eliminate any traces of rust to ensure that the disc is perfectly perpendicular to the hub.



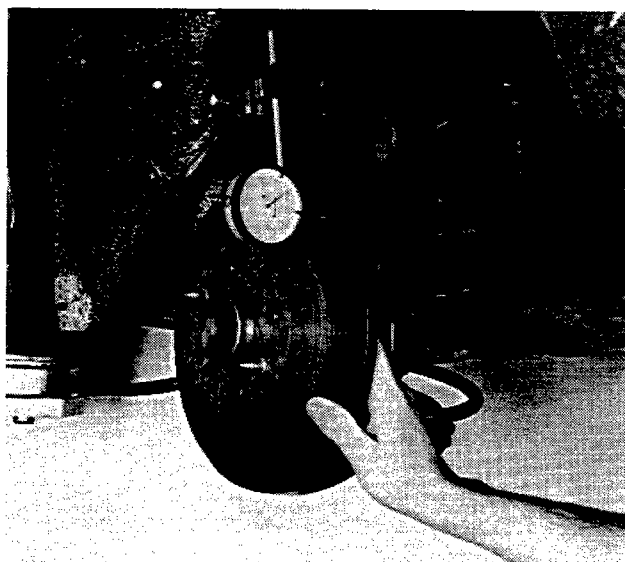
P4A028D03



Checking and measuring disc thickness

The minimum permissible brake disc thickness after wear is 9.20 mm; if the value is lower, the disc should be replaced.

In the case of damage or deep scoring the brake disc surfaces can be skimmed; after skimming, the brake disc thickness must not be less than 10.10 mm.

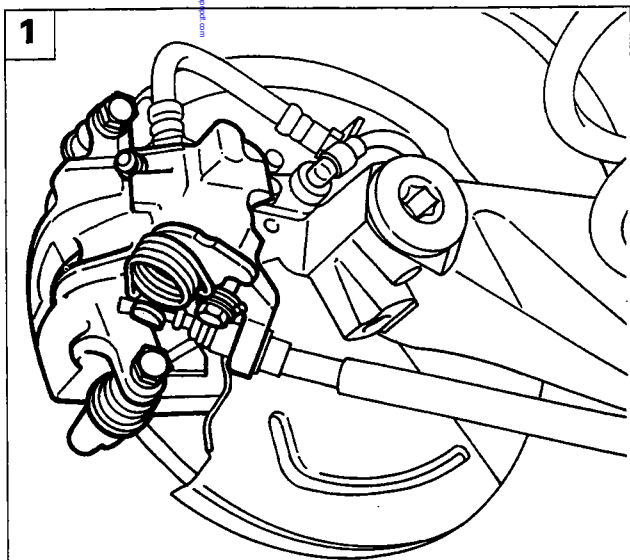


P4A028D04

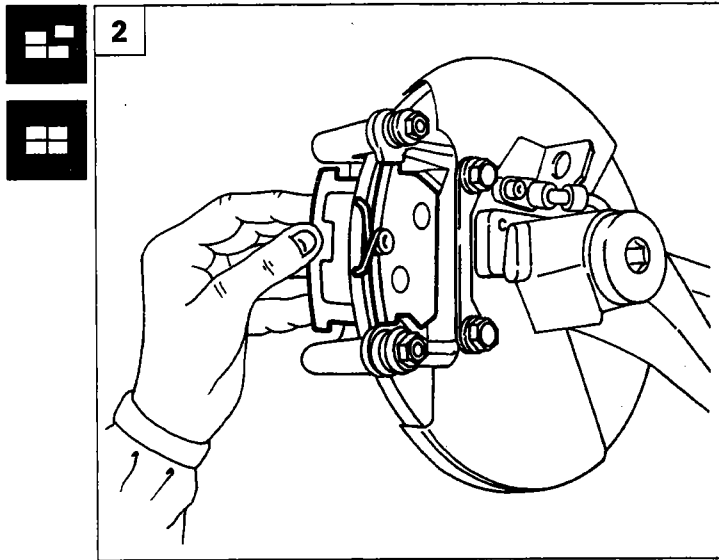


Checking brake disc run-out

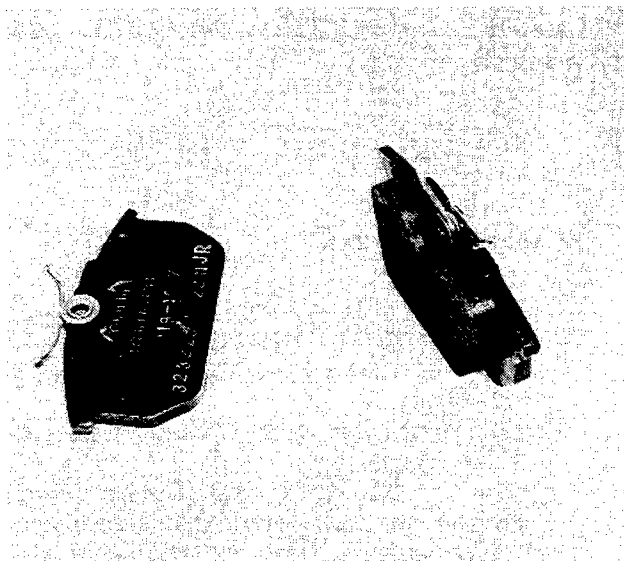
Also check that the disc run-out does not exceed 0.15 mm. This value should be measured 2 mm from the disc's outer diameter.



P4A029D01



P4A024D02



P4A029D02

**BRAKE PADS****Dismantling-reassembly**

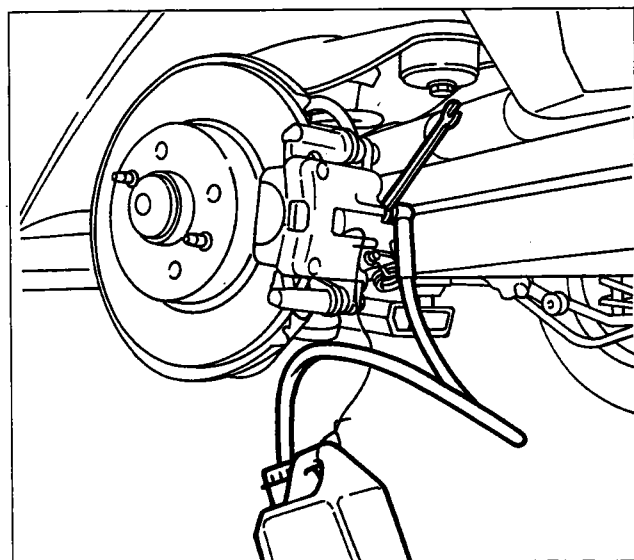
To replace the brake pads, proceed as follows:

1. undo the bolts securing the brake caliper to the mounting bracket and secure the brake caliper in an appropriate manner;
2. remove the brake pads.



The caliper case attachment bolts are self-locking and should be renewed whenever they are slackened or unscrewed.

NOTE When refitting, make the caliper piston go back in before fitting the brake caliper.



P4A029D03

**Checking brake pads**

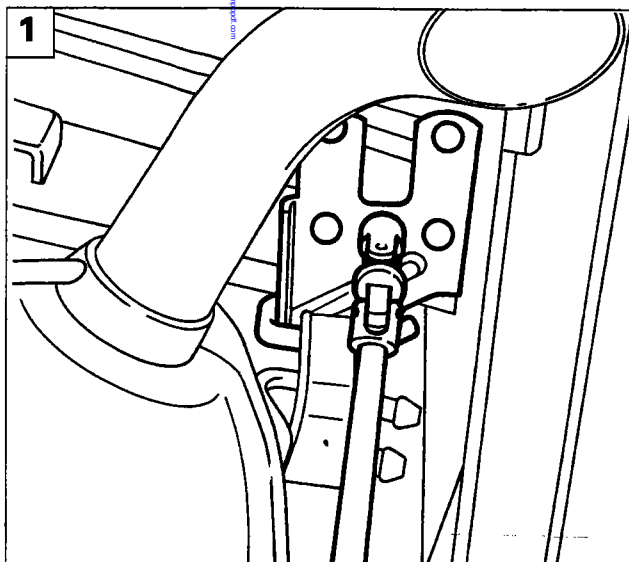
The brake pads must be renewed when the thickness of the friction material is less than 1.5 mm.

Check that brake pads of the same type are fitted on each pair of wheels.

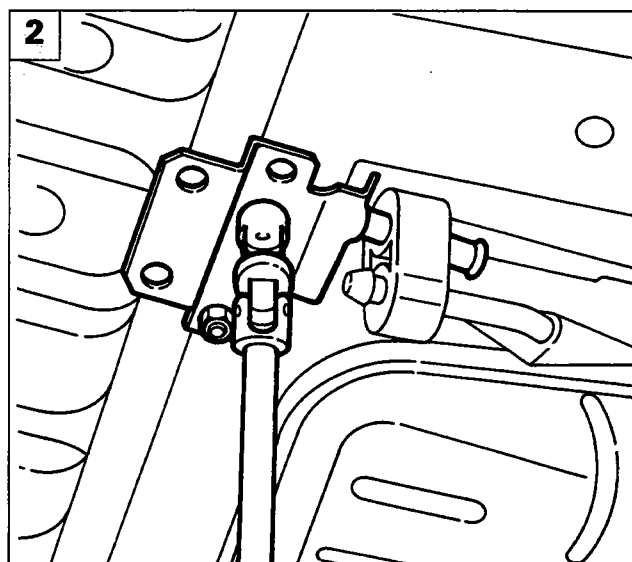
Bleeding

The old fluid should not be reused. Top up the level with new brake fluid.

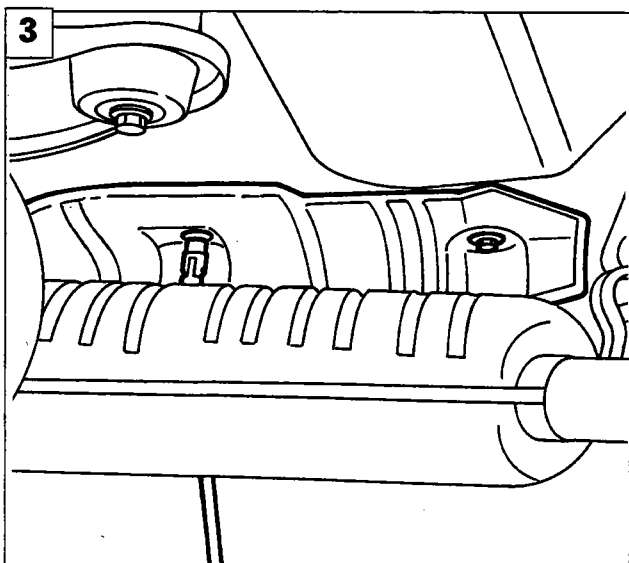
The brakes can also be bled using the Jolylfren device, following the procedure described for the front brakes.



P4A030D01



P4A030D02



P4A030D03



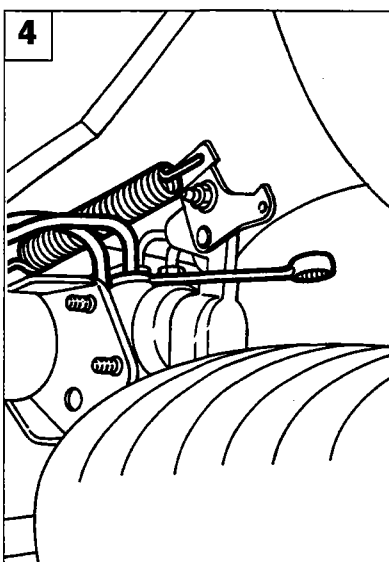
BRAKE PRESSURE PROPORTIONING VALVE



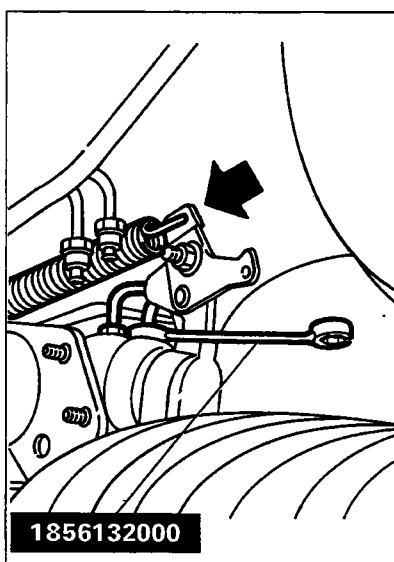
Removing-refitting

To remove the brake pressure proportioning valve, proceed as follows:

1. disconnect the exhaust pipe end section mounting;
2. disconnect the exhaust pipe intermediate section mounting;
3. undo the bolts and remove the heat shield from the exhaust pipe to facilitate access to the brake pressure proportioning valve;



P4A030D04



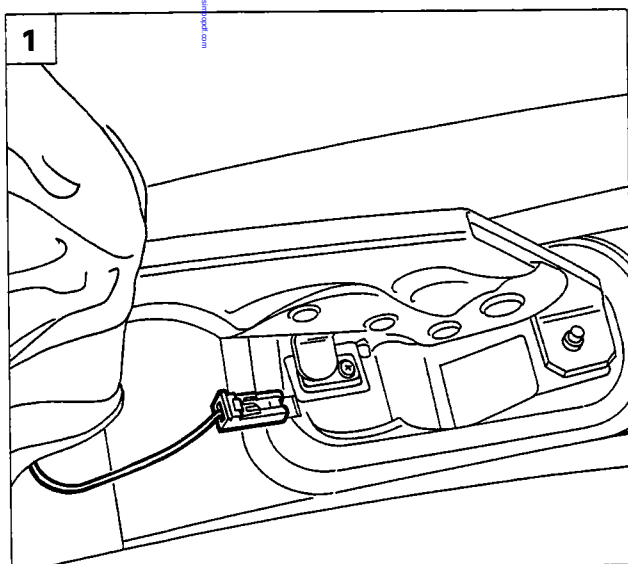
P4A030D05

4. uncrew the brake hose connections and disconnect the spring indicated;

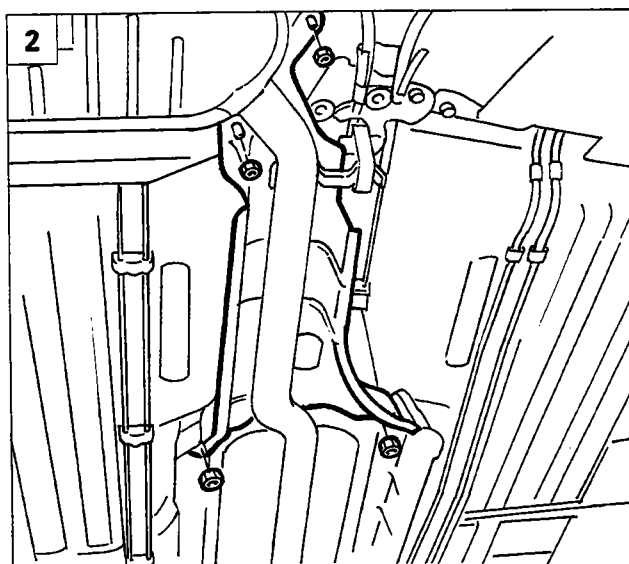


The connectors fitted on the brake pressure proportioning valve are 11 and 13 mm; use the spanner 1856132000 for the 11 mm ones, and for the 13 mm ones use an open spanner taking care not to damage the connectors.

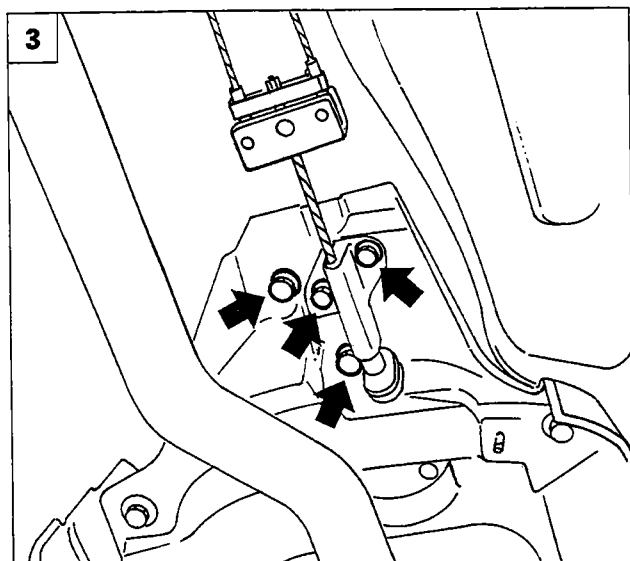
1856132000



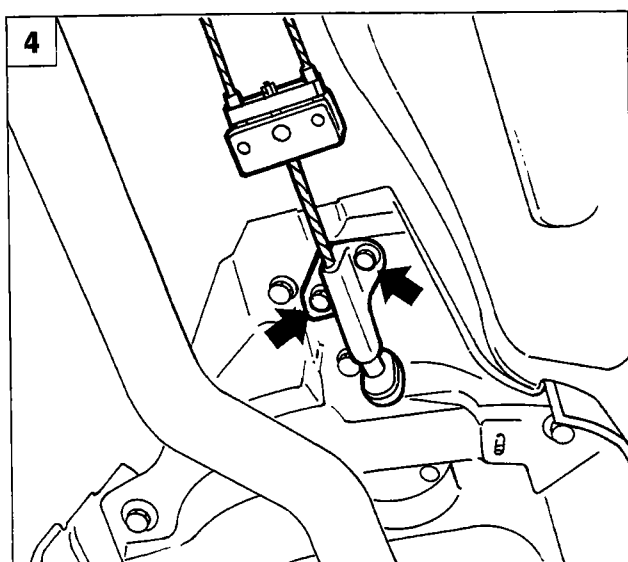
P4A032D03



P4A032D04



P4A032D05



P4A032D06



Handbrake lever



Removing - refitting

1. Working as illustrated on the preceding page, remove the lever cover and undo the adjustment nut underneath, then disconnect the wiring connector for the handbrake warning light switch.
2. Raise the car on the ramps and remove the heat shield illustrated.
3. Undo the bolts (arrowed), lower the car and remove the lever from its seating.

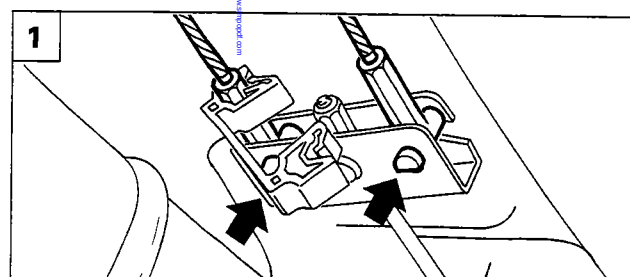


Refit the dismantled parts in reverse order to removal, and then adjust the handbrake.

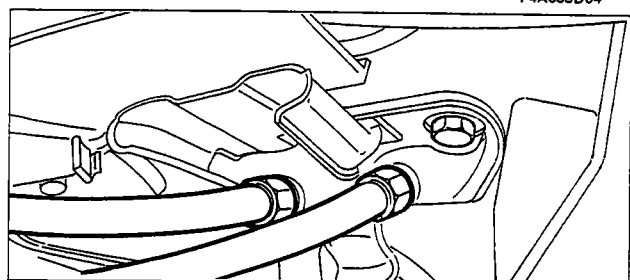
Handbrake cables

Removing - refitting

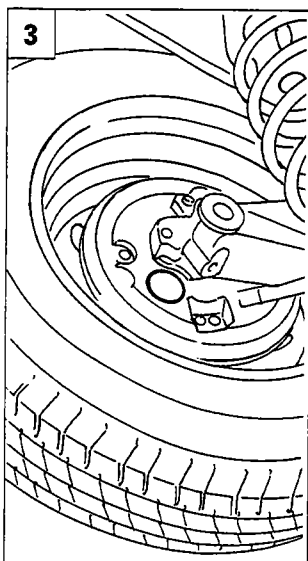
4. Working as described above, remove the lever cover, undo the adjustment nut, raise the ramps and remove the heat shield, then undo the bolts securing the handbrake cable to the bodyshell.



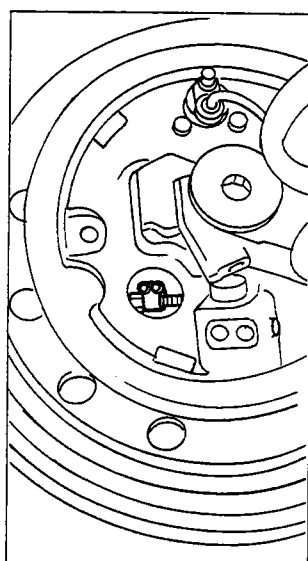
P4A033D04



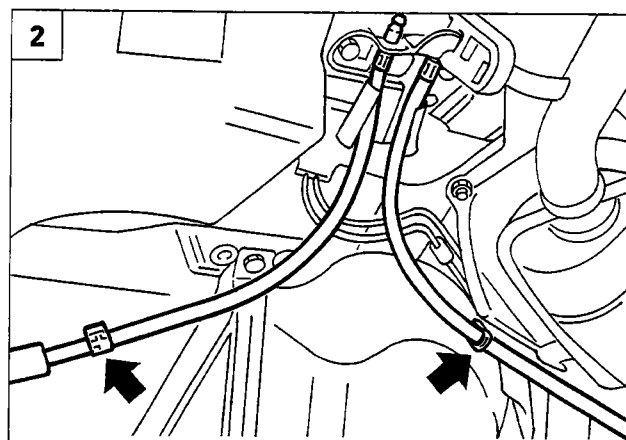
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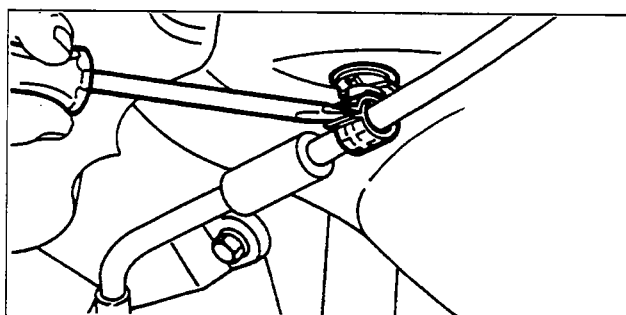
P4A033D06



P4A033D07



P4A033D08



P4A033D09

1.2. Detach the cables from the handbrake control by undoing the points illustrated.

3. Remove the protective cover illustrated and release the handbrake cable from the anchor on the lever, then withdraw the sheath with the handbrake cable and remove it.



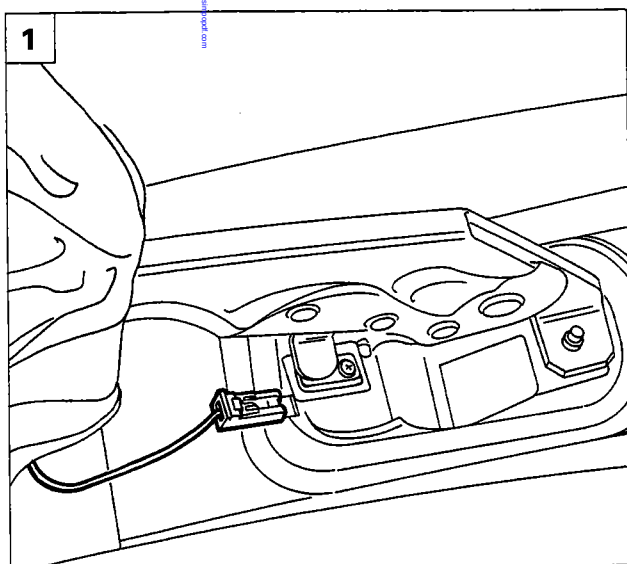
Refit the dismantled parts in reverse order to removal, and then adjust the handbrake.

Adjusting handbrake

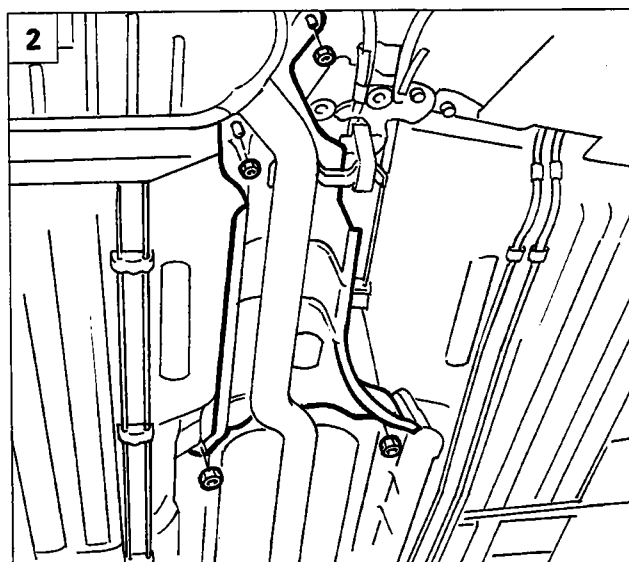
The handbrake cables are connected to a bracket which acts directly on the automatic adjuster. Whenever repairs are carried out on the rear brake which involve dismantling the cables, the cables must be adjusted to ensure the correct operation of the automatic adjuster.

Proceed as follows:

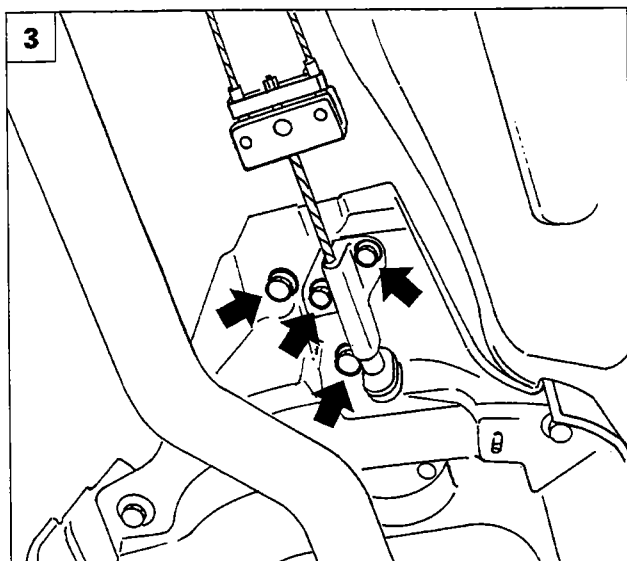
- Undo the handbrake cable adjustment nut two or three turns, to make sure that the cable is fully slack.
- Start the car with the gear lever in neutral, and with the engine idling, depress the brake pedal fully at least 30 times.
- Retighten the cable adjustment nut previously unscrewed, making sure that the rear wheels turn freely when the handbrake lever is at rest.
- Check that the braking action starts from the first or second notch, and then at the end of adjustment the lever does not engage more than five notches on the sector gear.



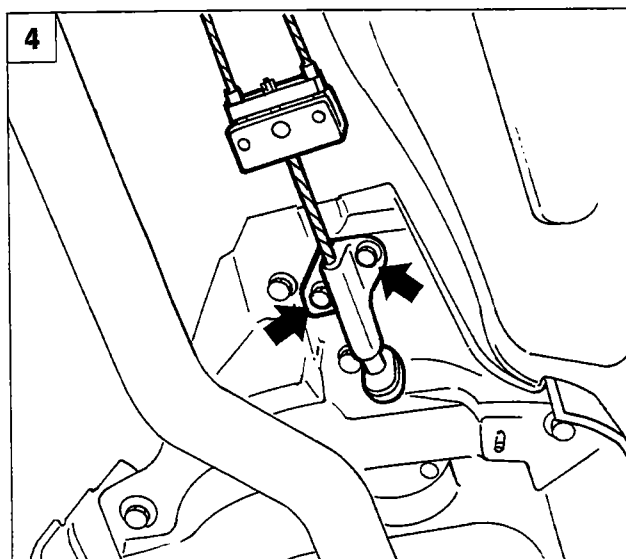
P4A032D03



P4A032D04



P4A032D05



P4A032D06



Handbrake lever



Removing - refitting

1. Working as illustrated on the preceding page, remove the lever cover and undo the adjustment nut underneath, then disconnect the wiring connector for the handbrake warning light switch.
2. Raise the car on the ramps and remove the heat shield illustrated.
3. Undo the bolts (arrowed), lower the car and remove the lever from its seating.



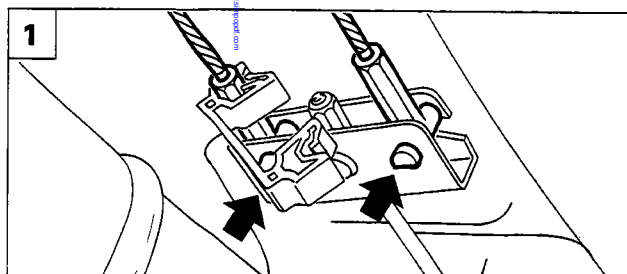
Refit the dismantled parts in reverse order to removal, and then adjust the handbrake.

Handbrake cables

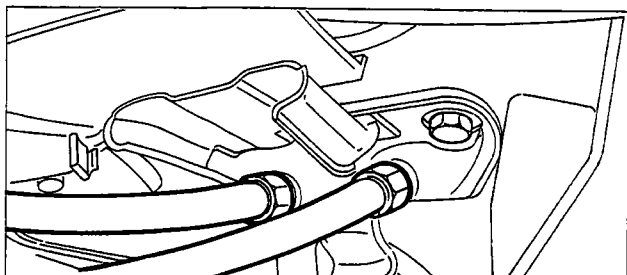
Removing - refitting

4. Working as described above, remove the lever cover, undo the adjustment nut, raise the ramps and remove the heat shield, then undo the bolts securing the handbrake cable to the bodyshell.

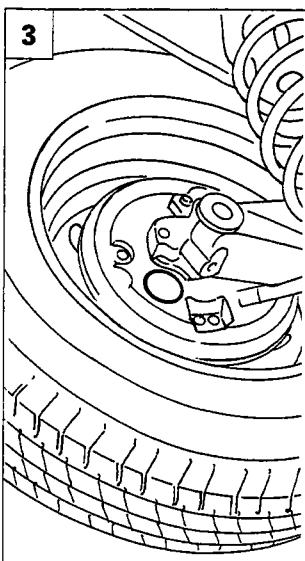
33.



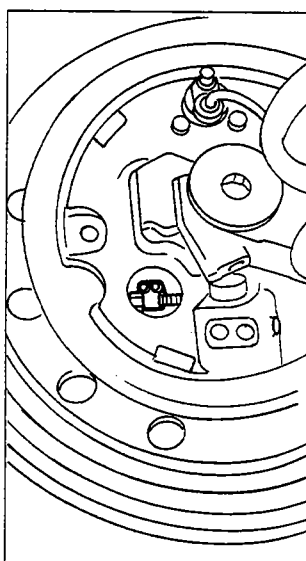
P4A033D04



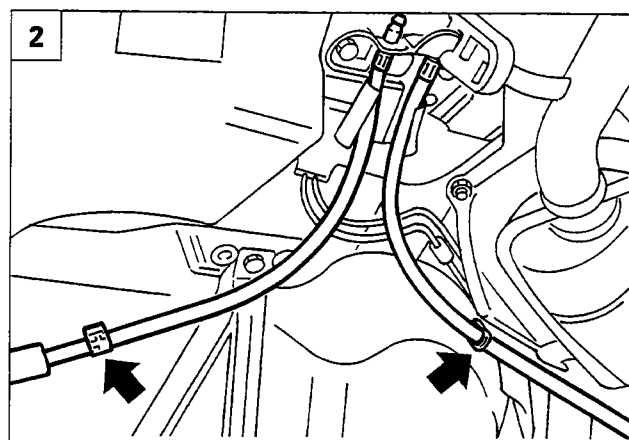
P4A033D05



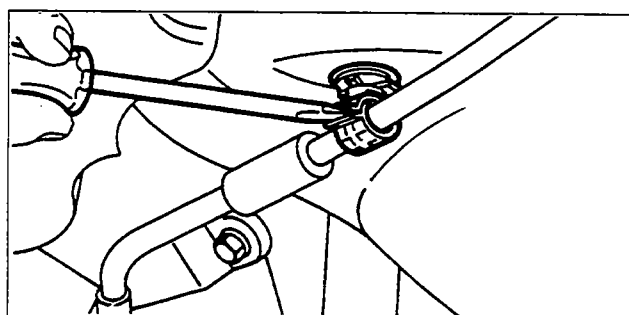
P4A033D06



P4A033D07



P4A033D08



P4A033D09

- 1.2. Detach the cables from the handbrake control by undoing the points illustrated.
3. Remove the protective cover illustrated and release the handbrake cable from the anchor on the lever, then withdraw the sheath with the handbrake cable and remove it.



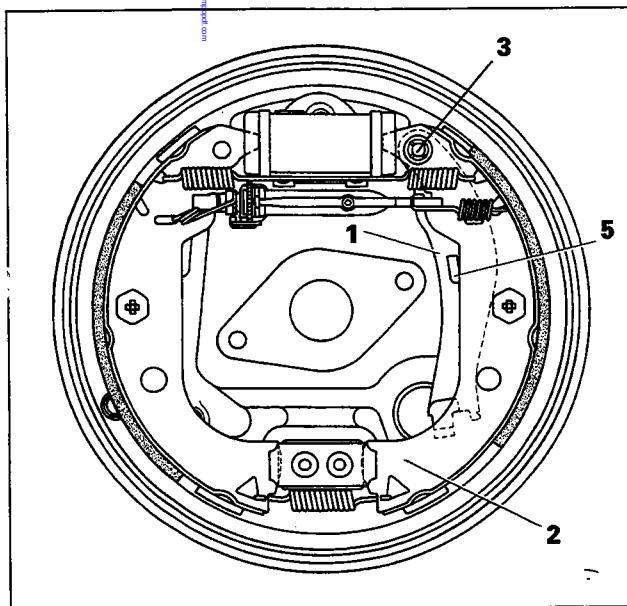
Refit the dismantled parts in reverse order to removal, and then adjust the handbrake.

Adjusting handbrake

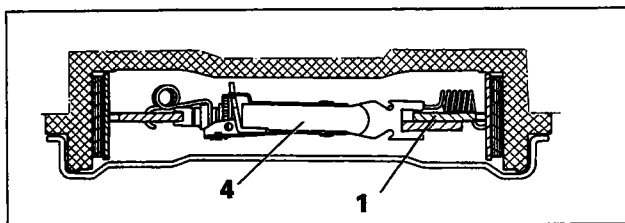
The handbrake cables are connected to a bracket which acts directly on the automatic adjuster. Whenever repairs are carried out on the rear brake which involve dismantling the cables, the cables must be adjusted to ensure the correct operation of the automatic adjuster.

Proceed as follows:

- Undo the handbrake cable adjustment nut two or three turns, to make sure that the cable is fully slack.
- Start the car with the gear lever in neutral, and with the engine idling, depress the brake pedal fully at least 30 times.
- Retighten the cable adjustment nut previously unscrewed, making sure that the rear wheels turn freely when the handbrake lever is at rest.
- Check that the braking action starts from the first or second notch, and then at the end of adjustment the lever does not engage more than five notches on the sector gear.



P4A033D01



P4A033D02

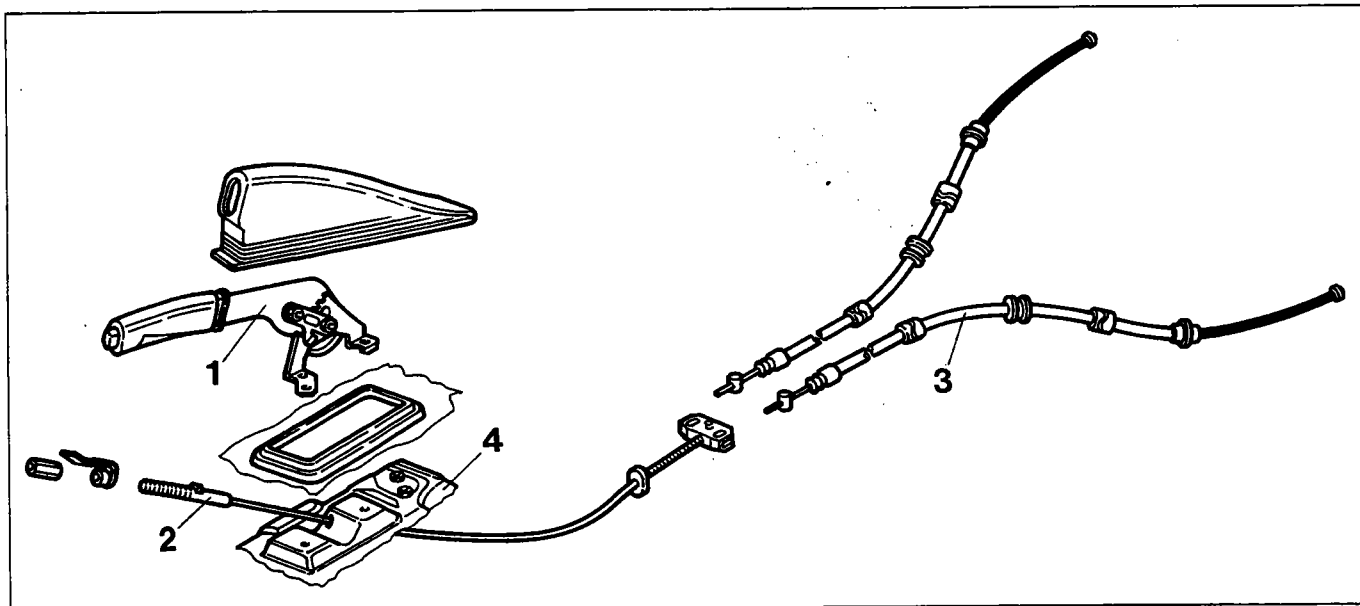
Operation

The handbrake operates by means of a cable on the rear brakes.

At the bottom, this cable is attached to the bracket (1), the top of which is hinged onto the shoe (2) by the retaining washer (3) (this should be replaced whenever the rear brakes are overhauled).

The top of the bracket (1) is also connected to the automatic adjuster assembly for recovering the clearance caused by shoe wear, so the handbrake does not require adjustment. The bracket (1) homes on the shoe (2) via the lug (5).

Handbrake components



P4A033D03

1. Handbrake lever complete with sector gear
2. Handbrake cable complete with anchorage
3. Sheath with cable
4. Mounting plate

NOTE Check the operation of each component and that the cable slides freely in its seating. If wear or tight spots are found, replace the parts concerned.

ANTI-LOCK BRAKING SYSTEM

- Introduction	1
- Method of operation of the TEVES MK20 anti-lock braking system (A.B.S.)	1
- Components of the TEVES MK20 A.B.S.	4
- Diagram of braking system with anti-lock braking system	4
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- Fault diagnosis	8
- Wheel rpm sensor	10
- Stop lights switch	11
- A.B.S. fault warning light	12
- Electrohydraulic control unit	12
- Hydraulic diagram of TEVES MK20 A.B.S.	13
- Description of hydraulic operation of TEVES MK20 A.B.S.	14
- Requirements to be observed on cars fitted with anti-lock braking system	19
- Precautions to be observed during repairs involving components of the anti-lock braking system	19
- Removing-refitting components of the anti-lock braking system	20

INTRODUCTION

The braking system must be rated to take account of the weight of the vehicle when fully laden and the maximum tyre/ground grip coefficient that may be achieved, in order to bring about efficient slowing down or stopping in the shortest possible distance and under any driving condition.

However, this is over-rated for the most common conditions of partial load and reduced grip.

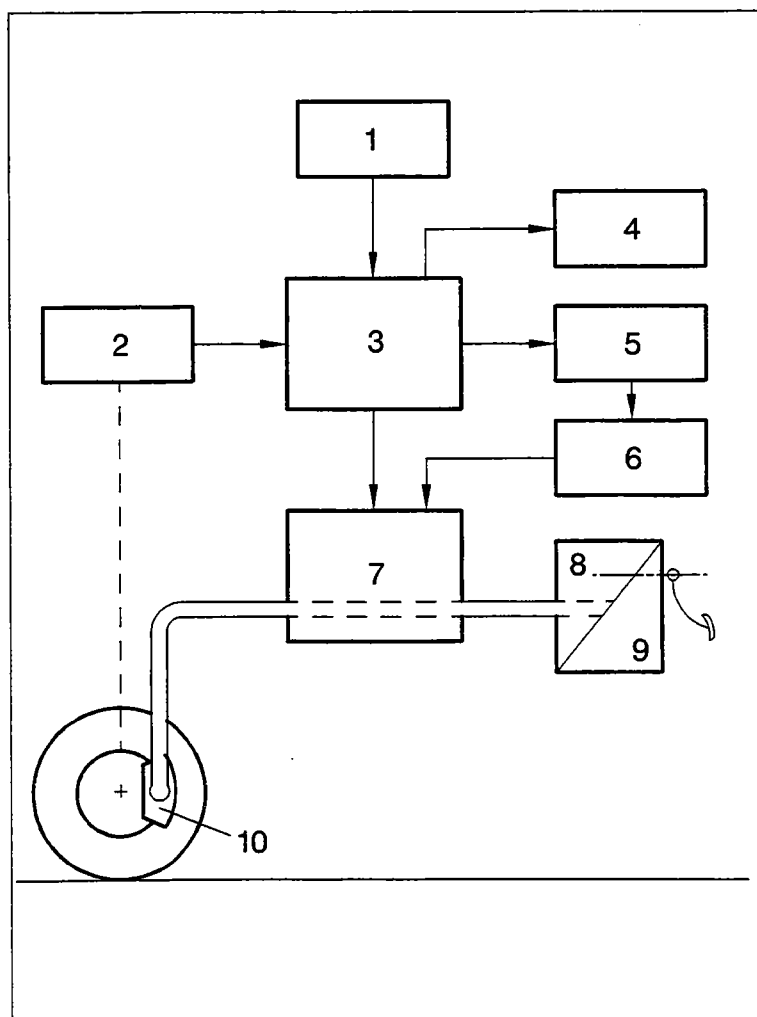
Applying the maximum braking force under those circumstances leads to the wheels locking immediately, resulting in a reduction in the grip-friction coefficient and deterioration of braking efficiency.

In order to arrest the forward motion of a vehicle quickly and efficiently under any contingent situation, it is necessary to maintain the rolling state of the tyres, despite the fact that, because of design requirements, the braking force applied on the friction linings is often excessive in relation to the driving weight and normal grip coefficients.

It is therefore necessary to prevent the wheels locking by means of an electronically-controlled anti-lock braking system which is incorporated in the vehicle's braking system.

Since it is not possible to assess the grip conditions in advance, the braking efficiency has to be controlled only after the detection of any effects of initial skidding of the tyre caused by excessive braking force in relation to the grip coefficient present.

This detection by special sensors leads to the modulation of the braking force by the action of a set of solenoids and recycling pumps which, driven by a control unit, act on the braking circuit.



P4A01AD01

METHOD OF OPERATION OF THE TEVES MK20 ANTI-SKID SYSTEM (A.B.S.)

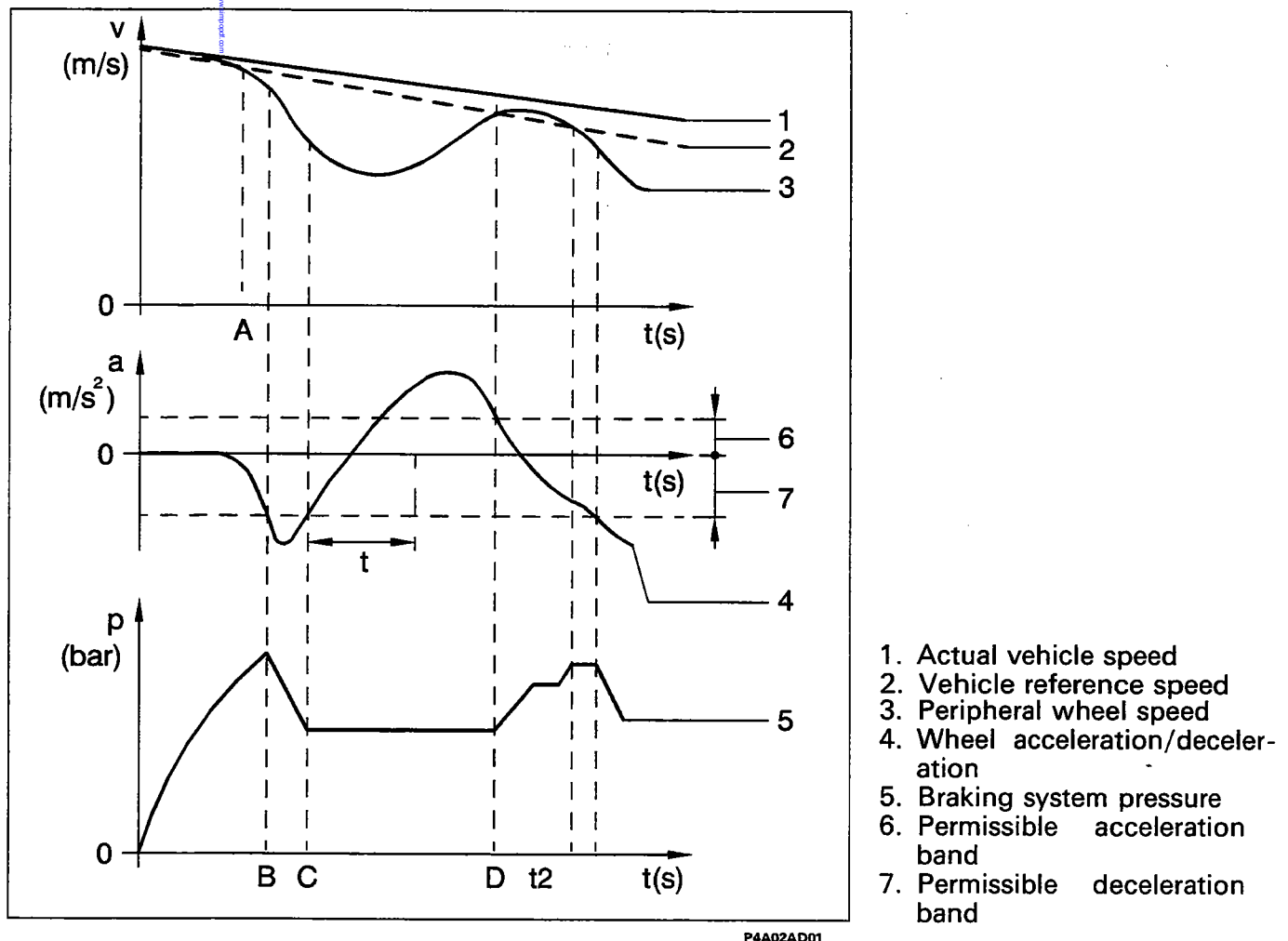
The TEVES MK20 anti-lock braking system is incorporated in the vehicle's ordinary braking system in order to prevent the wheels locking during braking.

Its operation is described briefly below.

Block diagram of Teves MK20 A.B.S.

1. Battery
2. Rpm sensor
3. Control unit
4. Diagnosis warning light
5. Relays
6. Recycling pump
7. Modulator
8. Brake pump
9. Servo unit
10. Brake calipers

33.



The signals (alternating or analogue) sent by the rpm sensors to the electronic control unit are converted by the input amplifier into square-wave (or digital) signals. The frequency of these signals provides the control unit with the corresponding speed (3) and acceleration/deceleration (4) of the individual wheels. From the combination of the individual peripheral speeds of the wheels, a reference speed (2) is worked out which, constantly updated, provides an indication of the vehicle's actual speed (1).

The electronic control unit also has stored in its memory the deceleration/acceleration thresholds (6) and (7) which each individual wheel must not exceed. So by means of a systematic, continuous and very rapid comparison between the wheel's deceleration/acceleration values and those of the memorized band, the rolling of the tyres during braking is monitored.

When the driver presses the brake pedal, the wheels may decelerate to different extents. The slowing down or total stoppage of the vehicle with deceleration within the memorized permissible band, does not lead to any intervention of the system in terms of control. However, at the moment when excessive braking force causes the wheel speed to decrease in relation to the vehicle's reference speed, the system starts the deceleration calculation cycle (point A).

If the deceleration threshold (7) is exceeded, the system intervenes by driving the solenoids to reduce the pressure (point B). After the pressure reduction, and after the first instants in which the deceleration increases further because of the inertia of the system, the wheel which is no longer braked reverses the tendency to lock, so regaining speed.

When the deceleration returns within the threshold (7), the intervention of the control system is modified, starting the pressure maintenance phase (point C.)

If the wheel does not regain its speed within a pre-determined time (t), a new pressure reduction phase is started.

The wheel normally regains speed until it exceeds the reference speed; at this point a new braking cycle (point D) commences, characterized by the three regulation phases for reducing, maintaining or re-establishing on the brake calipers the pressure generated by the driver on the brake pedal.

The logic described is not fixed, but adapts to the dynamic behaviour of the tyres in accordance with the different grip coefficients and the relevant deceleration/acceleration thresholds at the various speeds.

The number and frequency of the correction interventions is determined by the dynamic behaviour of the chain consisting of the brake circuit and A.B.S. components, but even more so by the tyre/road surface grip coefficient.

During braking on dry tarmac, six-eight interventions per second can be reached; this frequency is considerably lower on ice or wet roads.

The electronic control unit controls the various phases, supplying pulses of different current intensity to the solenoids. It also ensures that both rear wheels are supplied with the same braking force applicable to the rear wheel which is most liable to lock, i.e. that with least grip on the ground (to ensure the best stability of the trajectory).

NOTE *During the intervention cycle, the brake pedal moves slightly depending on the increase or reduction of the controlled pressure.*

If a wheel is rolling with a flat tyre, the A.B.S. intervenes if necessary to control the braking.

The A.B.S. is also active during braking in reverse gear.

The intervention of the device usually ceases at speeds of under 2.75 km/h to permit complete locking of the wheels when the vehicle is stopped.

NOTE *Since the parameters monitored by the control unit (wheel speed and acceleration) are influenced by the inertia of the wheel/tyre assembly, vehicles with the anti-lock braking system **must only be fitted with the rims, tyres and brake linings recommended and chosen by the manufacturer.***

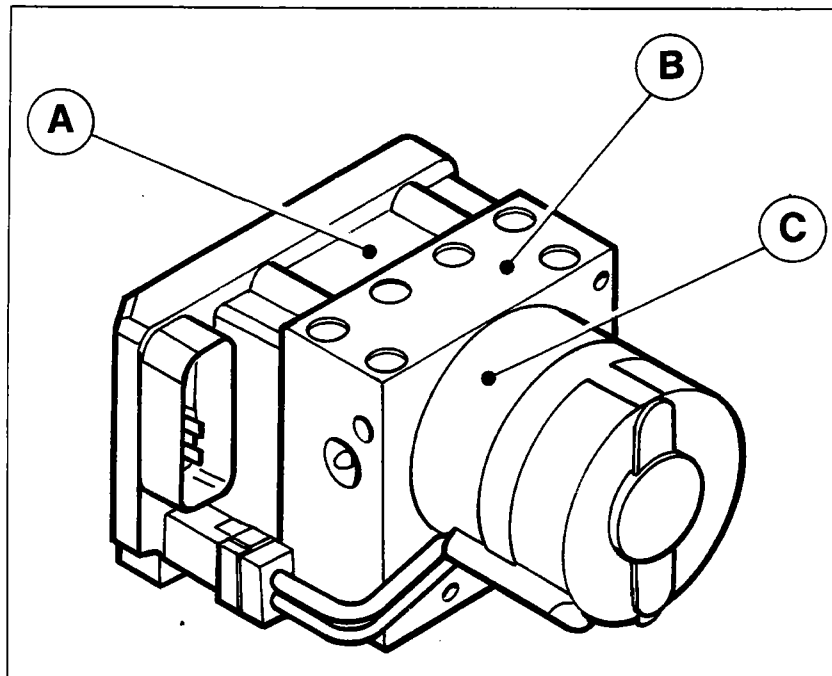
If snow chains are fitted, the resulting rolling condition leads to signals which, suitably filtered in the control unit, do not exclude the anti-lock braking device in the event of driving on hard and compact snow.

In *aquaplaning* conditions, the electronic control unit detects from the rpm sensor a faulty condition even during ordinary driving, with no braking, as the driving wheels tend to rotate at a higher speed than the driven wheels.

This condition would cause the electronic control unit to carry out a regulation cycle which did not meet requirements; for this reason the anti-lock braking system temporarily switches itself off (for such a short time that the warning light does not necessarily come on) and switches itself on again as soon as the *aquaplaning* ceases.

33.

COMPONENTS OF THE TEVES MK20 A.B.S.



P4A04AD01

The main components of the A.B.S. are:

- electrohydraulic unit (1) shown in the figure above which comprises the electronic control unit (A), the electrohydraulic control unit (B) which modulates the braking pressure to the brake calipers by means of eight solenoids (two per wheel) and a dual-circuit recycling pump (C);
- four wheel rpm sensors, one (5) for each front wheel and one (11) for each rear wheel, which measure the rotation speed of the wheels;
- a switch on the brake pedal (8) for detecting the braking condition;
- a warning light (7) located on the instrument panel indicating when the A.B.S. system is working (light goes out after a test) or not working (light stays on).

The system is completed by the hydraulic pipes, specific electrical wiring and a diagnostic socket for the F/L Tester (or Computerized Diagnostic Station).

The presence of a fault causes the A.B.S. to be deactivated immediately.

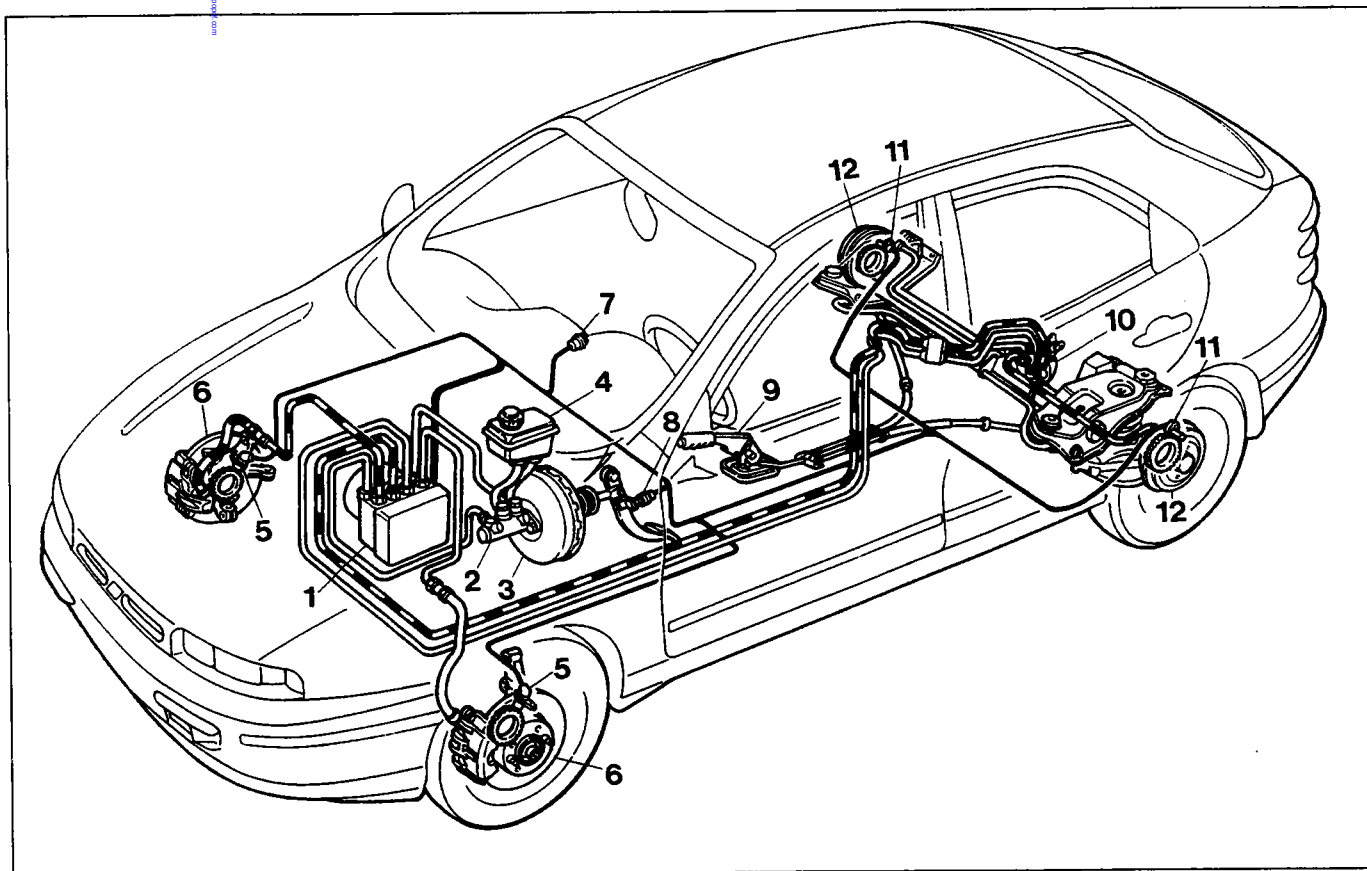
The fault information present can be read by connecting the Fiat/Lancia Tester or Computerized Diagnostic Station to the diagnostic socket.

DIAGRAM OF BRAKING SYSTEM WITH ANTI-LOCK BRAKING SYSTEM

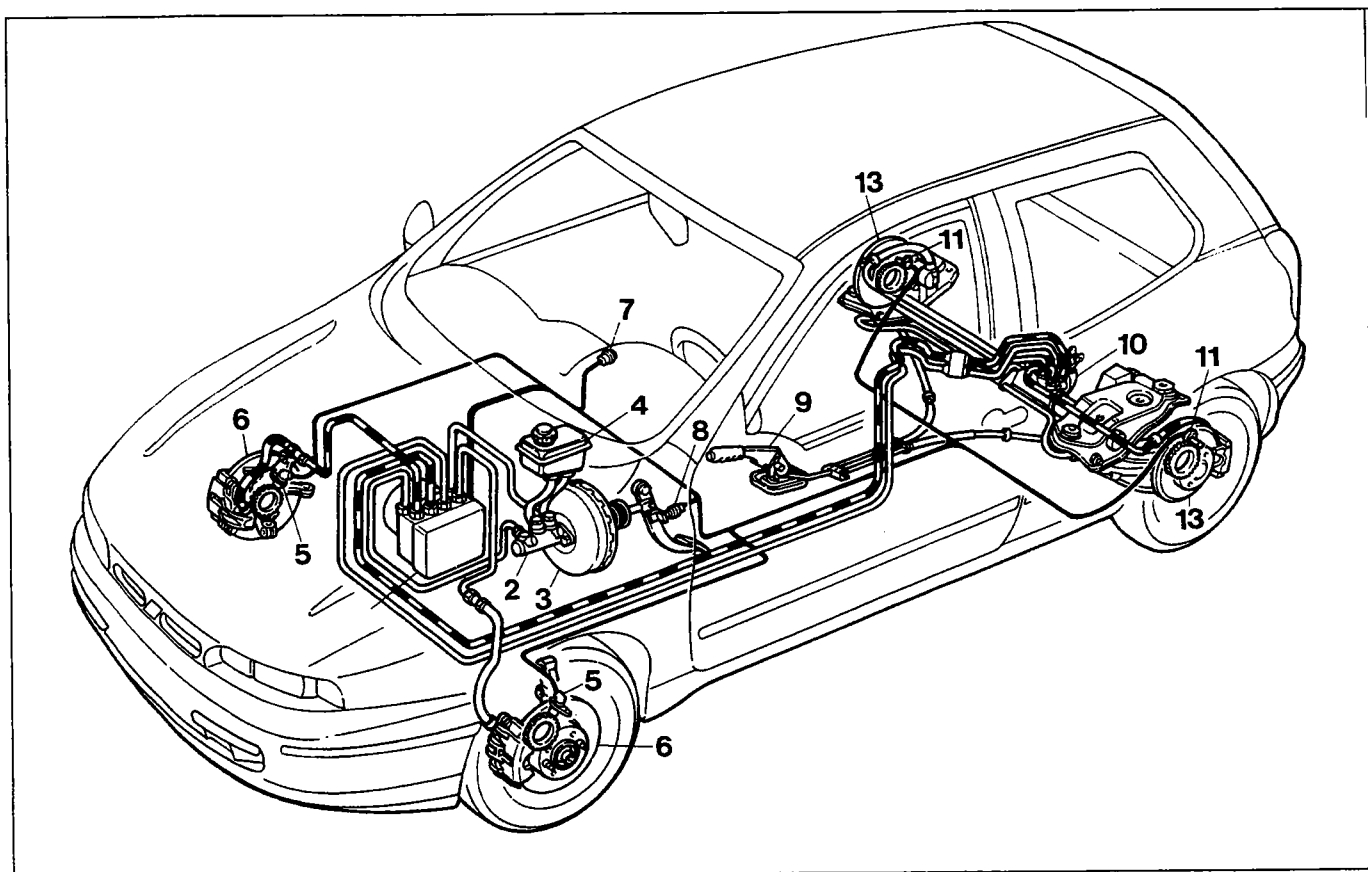
 Hydraulic circuit for front right and rear left brakes

 Hydraulic circuit for front left and rear right brakes

- | | |
|----------------------------------|---|
| 1. Electrohydraulic control unit | 8. Stop lights switch |
| 2. Brake pump | 9. Handbrake lever |
| 3. Servo unit | 10. Brake pressure proportioning valve |
| 4. Brake fluid reservoir | 11. Rear wheel rpm sensors |
| 5. Front wheel rpm sensors | 12. Rear drum brakes (excluding 1998 16v) |
| 6. Front disc brakes | 13. Rear disc brakes (1998 16v only) |
| 7. Fault warning light | |



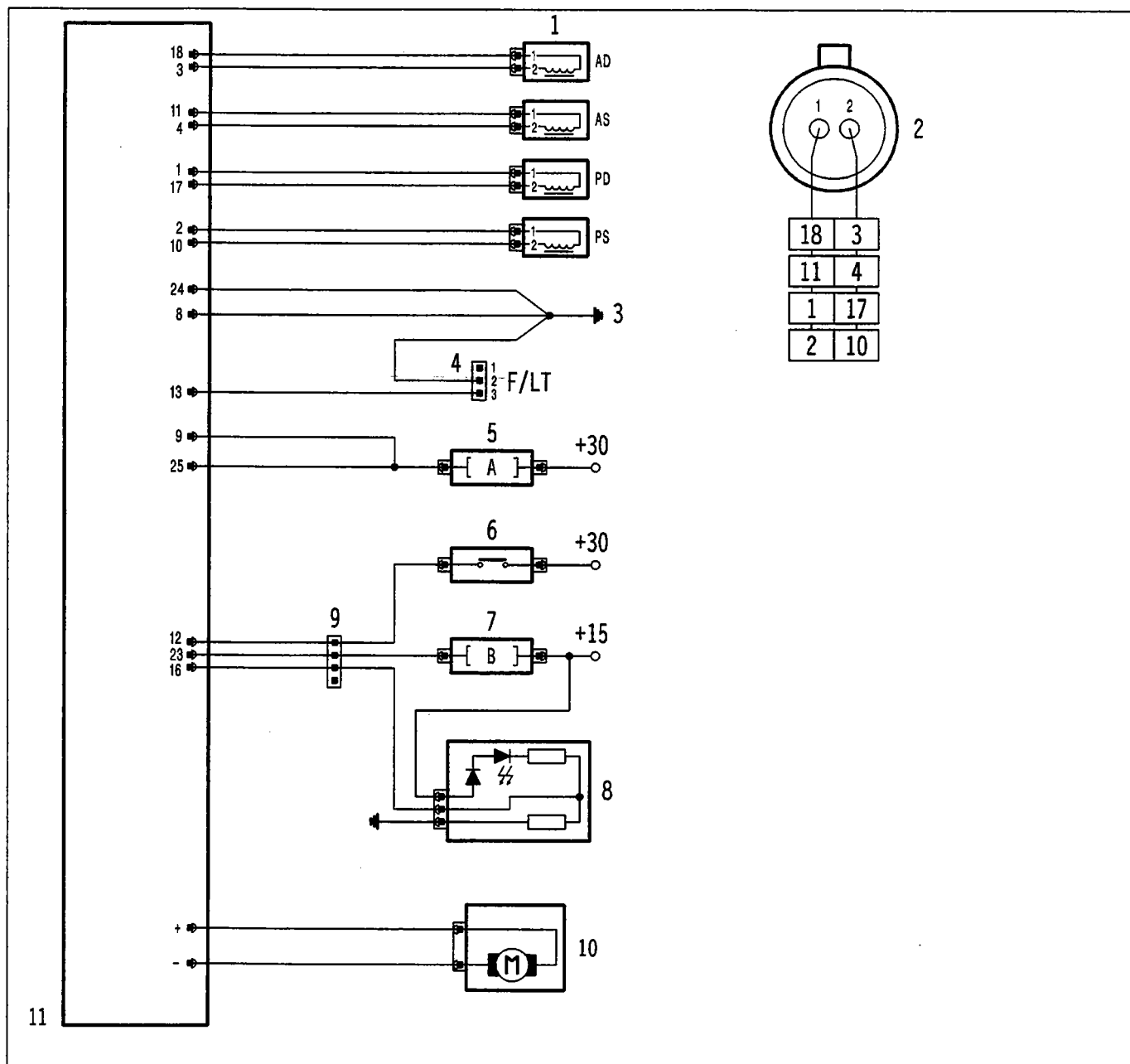
P4A05AD01



P4A05AD02

33.

TEVES MK20 A.B.S. SYSTEM ELECTRICAL DIAGRAM



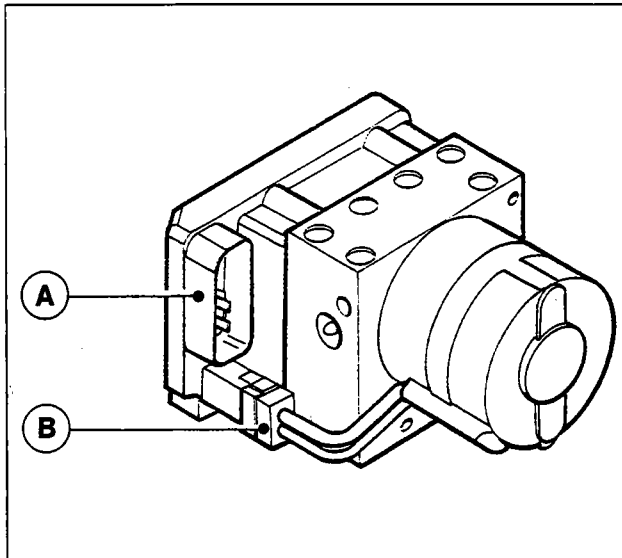
P4A06AD01

NOTE The numbers printed inside boxes refer to the control unit pins.

CONTROL UNIT

The electronic control unit (E.C.U.) consists of:

- **input circuits** for filtering, conditioning and digitizing the signals received from the system via wiring;
- **integrated logic circuits** for processing signals and managing program memories;
- **specific data memory** for the application for which it is intended;
- **output or power stages** for driving, with sufficient current intensity, the regulating solenoids, recycling pump motor and fault warning light.

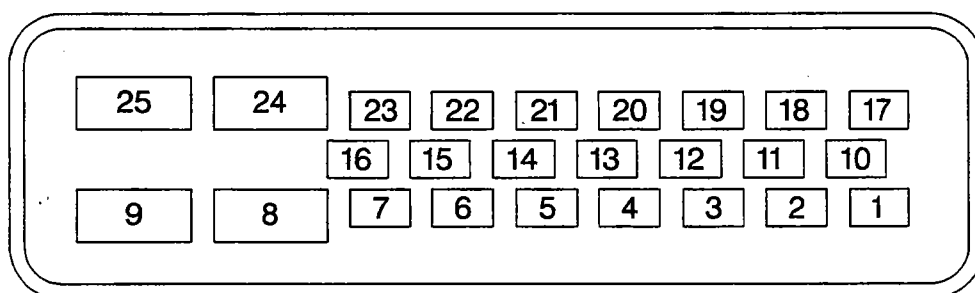


P4A07AD01

NOTE *In the event of a fault, the complete assembly is supplied as a spare part, so the connector (B) must never be disconnected.*

- A. Socket for connector on cables between control unit and system
- B. Connector for cables connecting recycling pump to control unit

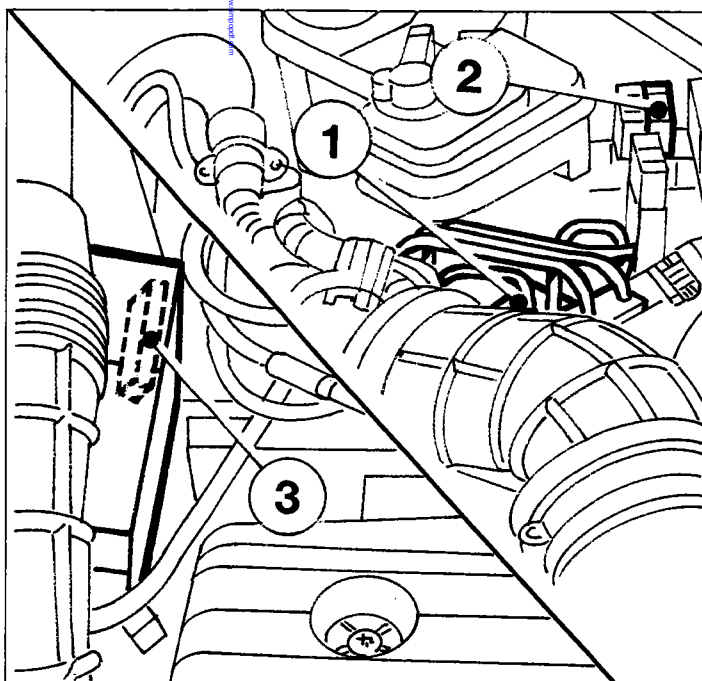
Teves MK 20 A.B.S. control unit output pins



P4A07AD02

- | | |
|------------------------------|----------------------------------|
| 1. Rear right sensor earth | 14. N.C. |
| 2. Rear left sensor earth | 15. N.C. |
| 3. Front right sensor signal | 16. System fault warning light |
| 4. Front left sensor signal | 17. Rear right sensor signal |
| 5. N.C. | 18. Front right sensor earth |
| 6. N.C. | 19. N.C. |
| 7. N.C. | 20. N.C. |
| 8. Power earth | 21. N.C. |
| 9. Supply from battery (+VB) | 22. N.C. |
| 10. Rear left sensor signal | 23. Ignition switch supply (+15) |
| 11. Front left sensor earth | 24. Power earth |
| 12. Brake pedal switch | 25. Supply from battery (+VB) |
| 13. F/L Tester connection | |

33.



The control unit (1) is supplied:

- directly from the battery (+VB) on pins 9 and 25, through a 60A fuse (2);
- under ignition key (+15) on pin 23, through a 10A fuse (3).

FAULT DIAGNOSIS

The system has a self-test function which checks if there are any faults on the following components:

- wheel rpm sensors (4 sensors);
- input solenoids (4 solenoids);
- output solenoids (4 solenoids).

If a malfunction is identified, the control unit's safety circuit excludes the A.B.S. system, nevertheless ensuring normal operation of the conventional braking system.

When the A.B.S. system is switched off, this is indicated to the driver by the warning light on the instrument panel coming on. For safety reasons, the electronic control unit, by means of two microprocessors, controls all the logic functions, its software and all the input signals.

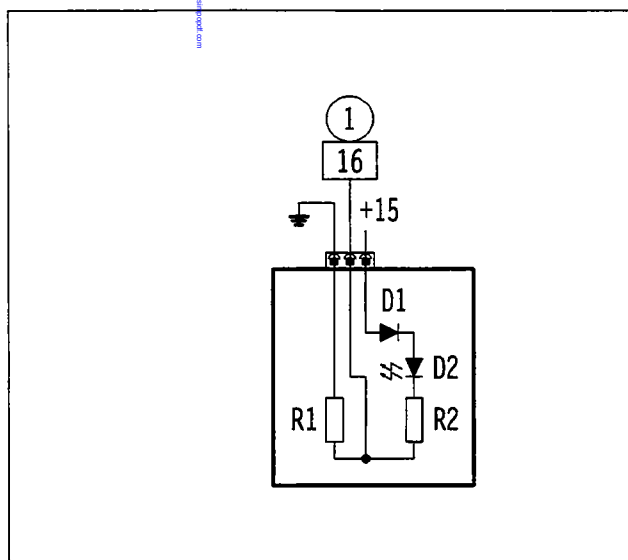
If the two microprocessors receive identical input signals, they supply identical output signals.

If there is a logic discrepancy between input signals and output response over a certain period of time, the safety system detects the fault and the A.B.S. is de-activated.

The electronic control unit also has a safety circuit which monitors the efficiency of the system before every start-up and during driving.

The safety circuit carries out the following self-tests:

1. after the ignition has been switched on and for about 2 seconds, it checks the operation of the control unit, the relays which operate the solenoids and the connection of the sensors;
2. after the engine has started, as soon as the speed of 6 km/h is exceeded, it activates the solenoids and recycling pump for an operating check; it also checks that the 4 speed signals are present;
3. whenever the speed of 24 km/h is exceeded, starting from a standstill, it checks that the 4 speed signals are present;
4. during driving it continuously checks the peripheral speed of the wheels against the calculated reference speed, it checks the memory conditions and supervises the operation of the two relays;
5. during driving it constantly checks the battery voltage.



P4A09AD01

NOTE The fault warning light is connected so that it is on if the connector is not connected to the control unit or if the wire (1) is shorting to earth. Supplied by the instrument panel, it is only off if the battery voltage reaches the wire (1) from the control unit interface.

D1 : protective diode
D2 : LED
R1 & R2 : load resistors

1) Positive from control unit pin 16

Diagnosis of the system with the F/L Tester is only feasible if the peripheral speed of the wheels is below 4 km/h, the battery voltage is over 7 Volts and the A.B.S. system is not operating.

Full diagnosis of the system consists of the following three stages:

1. display of a set of operating parameters;
2. display of any errors that may be present and their deletion;
3. activation of the actuators (active diagnosis).

1. PARAMETERS DISPLAYED	2. PROCEDURE	3. PARTS ACTIVATED
Speed of the individual wheels State of recycling pump motor State of brake pedal switch State of fault warning light	Detection of faults Memorization of the error Deletion of the error	Input solenoids (4) Output solenoids (4) Fault warning light Recycling pump motor

Detection of faults

This is carried out during performance of basic functions and diagnostic tests relating to the sensors/actuators.

Memorization of the error and structure of the error memory.

The error type code and the error counter are memorized for each error in the order in which they arise. This parameter consists of the code of the last fault which has occurred and the relevant counter. The latter is set at 31 in the event of a fault, and subsequently decreased by 1 for every start-up and subsequent increase in speed to over 20 km/h which takes place without the fault.

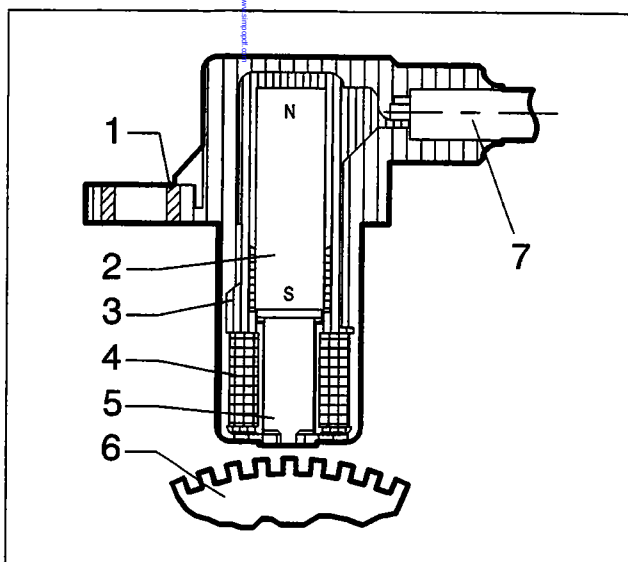
Error deletion

The error is deleted as follows:

- by a command from the F/L Tester;
- when the error counter reaches zero.

NOTE As the start-up of the procedure involves disabling the system, the fault warning light remains on throughout the duration of the procedure.
The procedure is interrupted if the vehicle exceeds the speed of 10 km/h.

33.



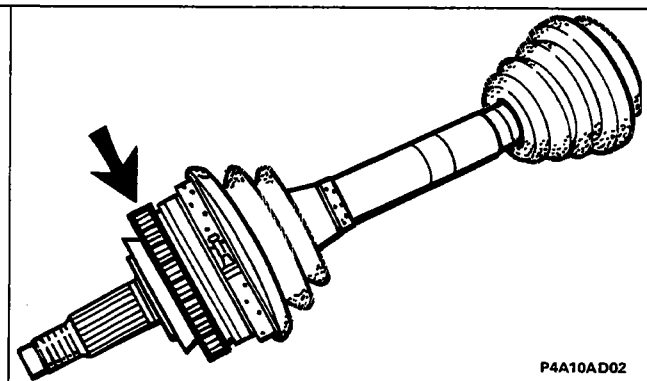
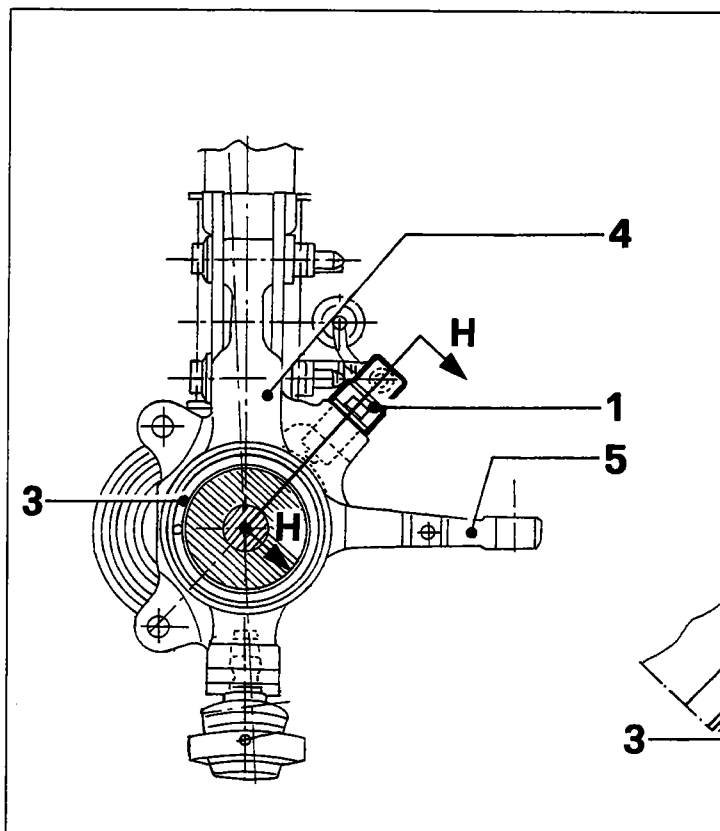
P4A10AD01

WHEEL RPM SENSOR

The vehicle speed measurement system consists of a wheel or toothed crownwheel (phonic wheel) fitted on the hub or wheel axle, and a variable reluctance sensor.

This assembly generates an electrical signal whose frequency is proportional to the speed of rotation.

1. Brass bush
2. Permanent magnet
3. Plastic casing of the sensor
4. Winding or coil
5. Polar core
6. Toothed crownwheel or phonic wheel
7. Coaxial twin cable



P4A10AD02

Sensor/phonic wheel on front wheel

1. Sensor
2. Phonic wheel
3. Hub
4. Vertical link
5. Steering arm

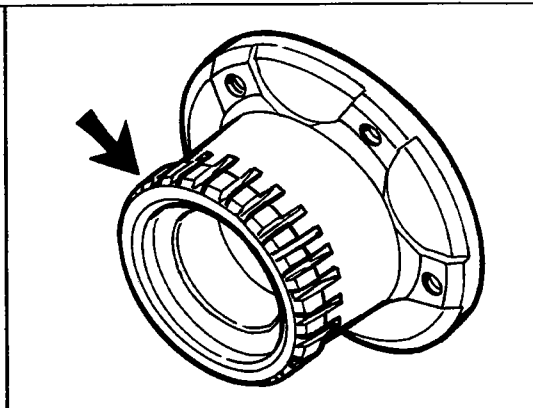
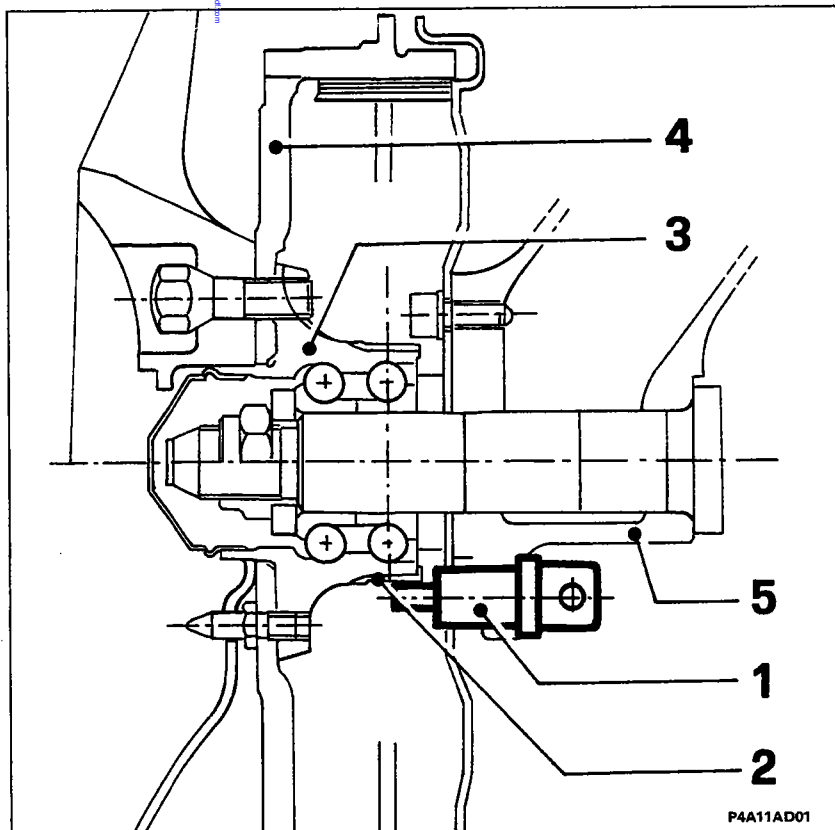
P4A10AD03

The signals are obtained from magnetic flow lines which close through the teeth of a metal toothed wheel facing the sensor, which rotates with the wheel.

The passage from full to empty, due to the presence or absence of the tooth, causes a change in the magnetic flow sufficient to generate an induced alternating voltage, derived from the count of teeth located on a ring (or phonic wheel). Measuring the period gives the speed data, while comparing successive periods gives the wheel acceleration/deceleration data.

The specified gap for obtaining correct signals, between the end of the sensor and the phonic wheel, must be 0.9 ± 0.4 mm.

This gap is not adjustable so, if the gap is outside the tolerance limits, check the condition of the sensor and the phonic wheel.



**Sensor/phonic wheel
on rear wheel**

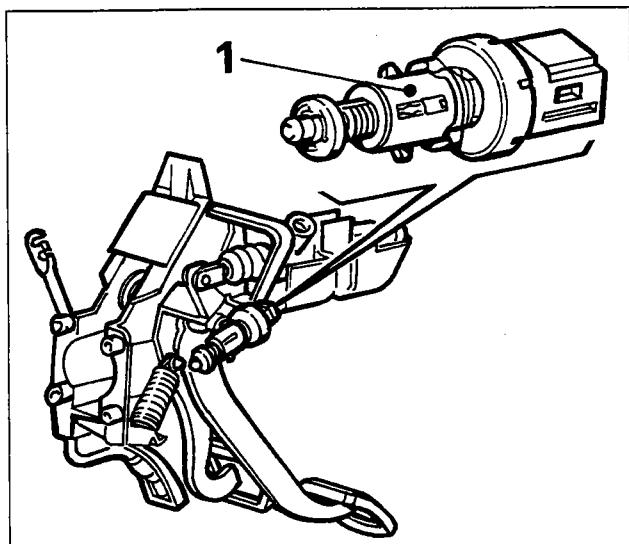
1. Sensor
2. Phonic wheel
3. Hub
4. Brake drum
5. Suspension arm

If one or more phonic wheels break or become deformed, causing a difference in speed of 25% in relation to the reference speed, the electronic control unit switches off the device and switches on the fault warning light. The time for detecting the fault is about 120 seconds with a vehicle speed of over 6 km/h.

NOTE *Whenever fitting an rpm sensor, smear it with water-repellent grease, otherwise it could be damaged during subsequent withdrawal as a result of temperature variations over a period of time.*

STOP LIGHTS SWITCH

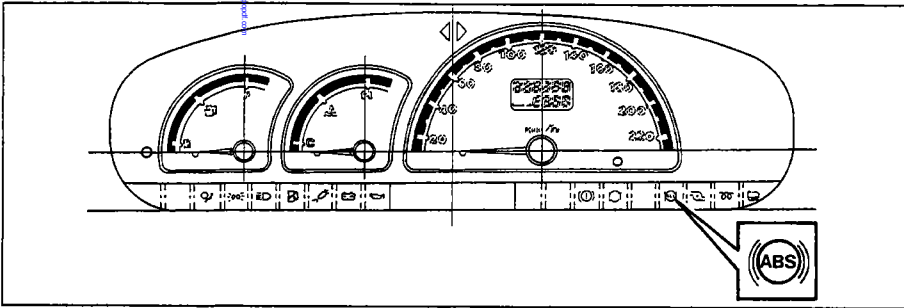
The signal that the brake pedal has been operated reaches the control unit by the connection of the switch (1) controlling the stop lights to pin 12.



This information is useful not only for controlling braking, but also under particular conditions, for example if sudden acceleration which makes the wheels skid is followed by heavy braking, or in the case of rough road surfaces (bumps etc.) which could cause variations in wheel speed for reasons not associated with the braking in progress.

Under these conditions the microprocessors work out a strategy linked to the changes in wheel speed at these moments, ensuring that braking is within correct parameters. As these are particular circumstances of braking control, the efficiency of the system is not impaired if the brake pedal switch is not connected to the control unit. For this reason it is not indicated by the warning light coming on, nor is the A.B.S. disabled.

33.



A.B.S. FAULT WARNING LIGHT

Under normal operating conditions, the red warning light (arrowed) is off.

During starting, when the ignition is switched on, the control unit carries out a static self-test lasting about 2 seconds, during which time the warning light stays on.

If there are no faults after this time, the warning light goes out. During driving, the control unit carries out continuous self-tests. If an error is recognized, the warning light comes on and the A.B.S. is disabled, without affecting the operation of the conventional braking system.

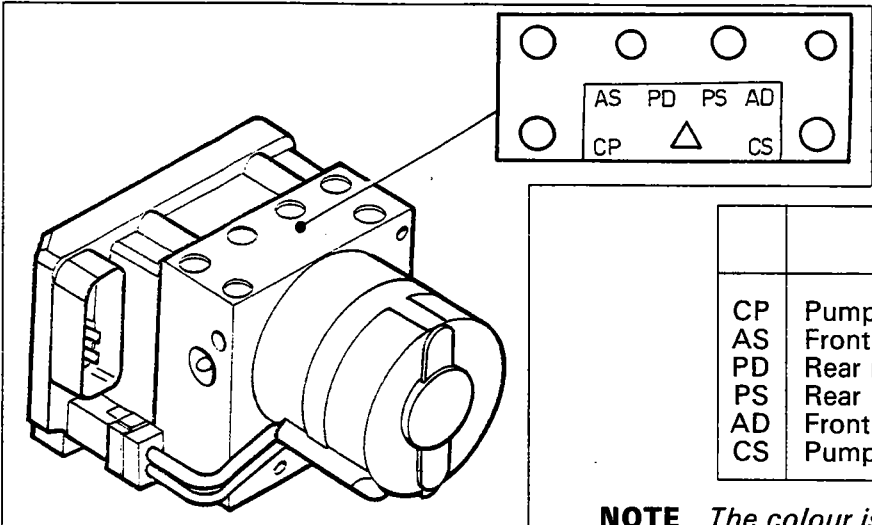
NOTE If the battery has insufficient charge, the warning light and the A.B.S. may be excluded (for example in towns, travelling at low engine speeds, with all the electrical devices switched on).

ELECTROHYDRAULIC CONTROL UNIT

The electrohydraulic control unit is connected to the brake pump and brake caliper cylinders by brake pipes and is incorporated in the electronic control unit. Its purpose is to vary the pressure of the brake fluid in the brake caliper cylinders in accordance with the control signals coming from the electronic control unit. It consists of eight two-way solenoids (two for each hydraulic circuit) and a dual-circuit recycling pump all driven by the electronic control unit. In particular, the pump enables brake fluid to be recovered during the pressure reduction phase, making it available again upstream of the solenoids for the subsequent pressure increase phase.

The accumulators allow brake fluid to be absorbed during the pressure reduction phase.

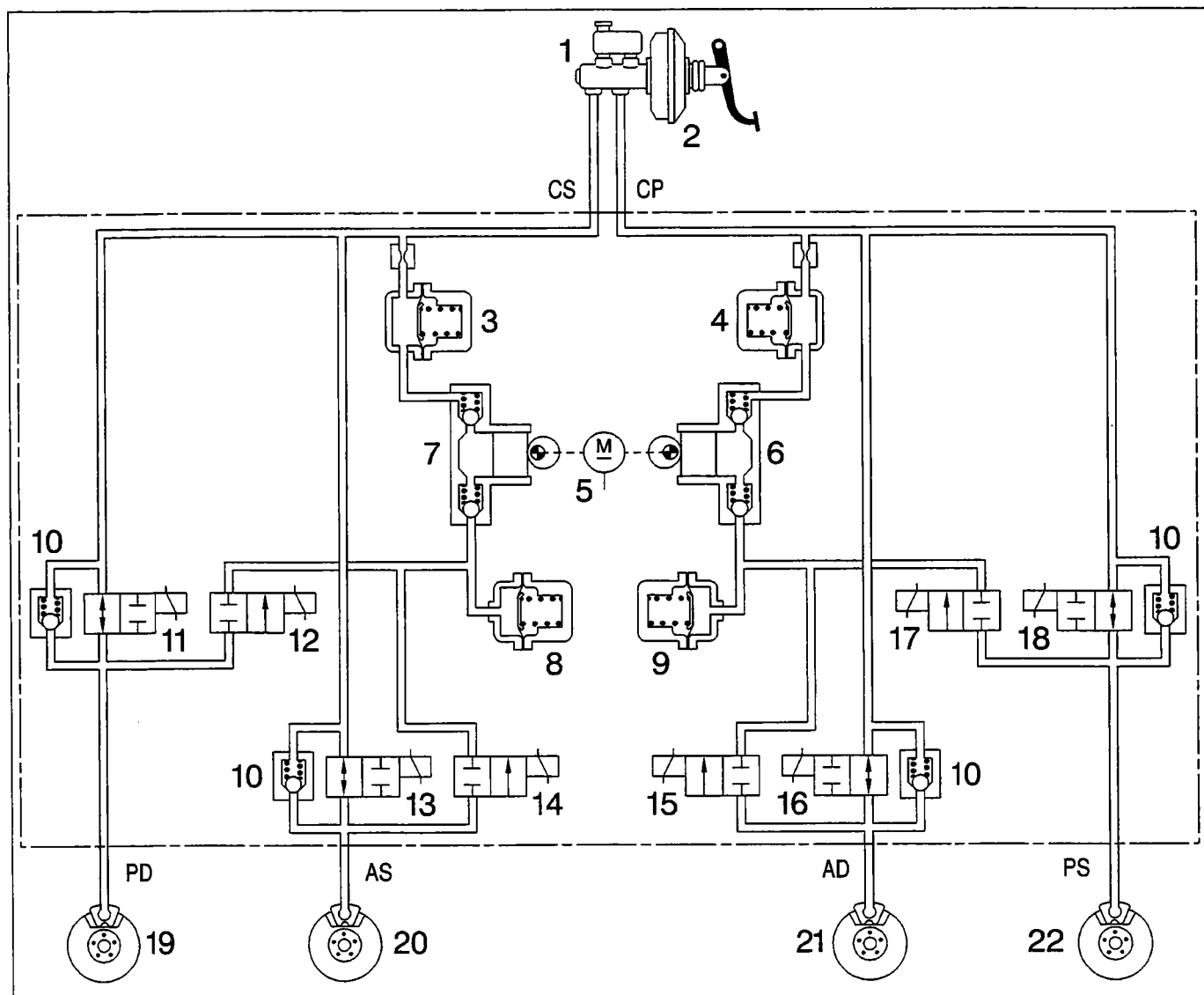
NOTE The electrohydraulic control unit cannot be overhauled. If found to be faulty, it must be fully replaced. The spare part is supplied filled with brake fluid (DOT 4). The braking system is bled in the same way as a conventional system.



	Name	Colour	Connector
CP	Pump primary	-	M12x1
AS	Front left	YELLOW	M12x1
PD	Rear right	BLUE	M10x1
PS	Rear left	RED	M12x1
AD	Front right	GREEN	M10x1
CS	Pump secondary	-	M12x1

NOTE The colour is also shown on the relevant pipe.

HYDRAULIC DIAGRAM OF TEVES MK20 A.B.S.



P4A13AD01

1. Brake pump
2. Servo unit
3. High-pressure accumulator (damping chamber)
4. High-pressure accumulator (damping chamber)
5. Recycling pump motor
6. Recycling pump
7. Recycling pump
8. Low-pressure accumulator (reservoir)
9. Low-pressure accumulator (reservoir)
10. Rapid pressure reducing valve
11. Rear right inlet solenoid
12. Rear right outlet solenoid
13. Front left inlet solenoid
14. Front left outlet solenoid
15. Front right inlet solenoid
16. Front right outlet solenoid

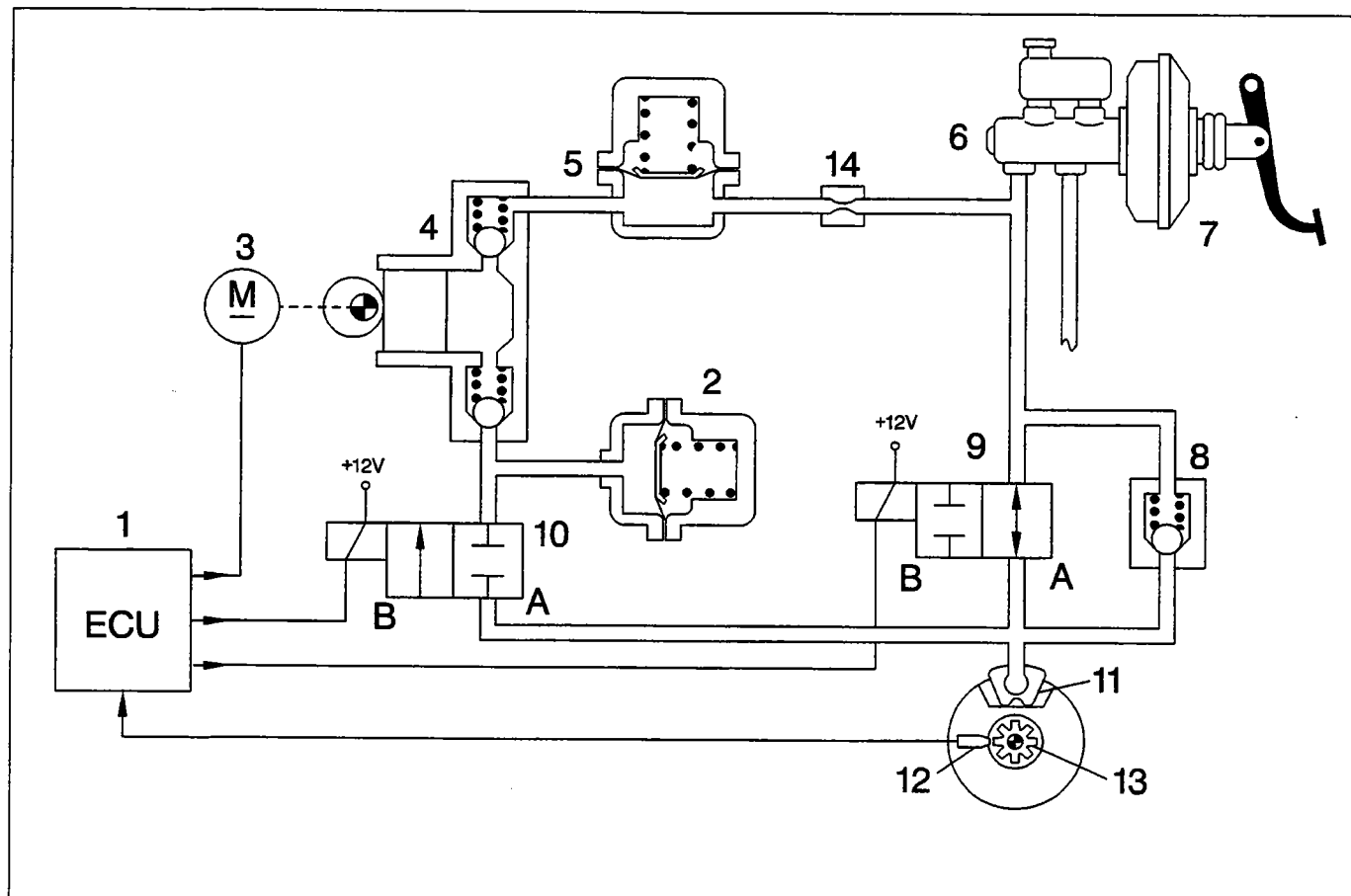
17. Rear left inlet solenoid
18. Rear left outlet solenoid
19. Rear right brake caliper
20. Front left brake caliper
21. Front right brake caliper
22. Rear left brake caliper

- C.P. Primary supply connector
C.S. Secondary supply connector
P.D. Delivery connector to rear right caliper
A.S. Delivery connector to rear left caliper
A.D. Delivery connector to front right caliper
P.S. Delivery connector to rear left caliper

33.

DESCRIPTION OF HYDRAULIC OPERATION OF TEVES MK20 A.B.S.

Rest position



- | | |
|--|---|
| 1. Electronic control unit | 8. Rapid pressure reducing valve |
| 2. Low-pressure accumulator (reservoir) | 9. Inlet solenoid (A) open (B) closed |
| 3. Recycling pump motor | 10. Outlet solenoid (A) closed (B) open |
| 4. Recycling pump | 11. Brake caliper |
| 5. High-pressure accumulator (damping chamber) | 12. Rpm sensor |
| 6. Brake pump | 13. Phonic wheel |
| 7. Servo unit | 14. Constriction |

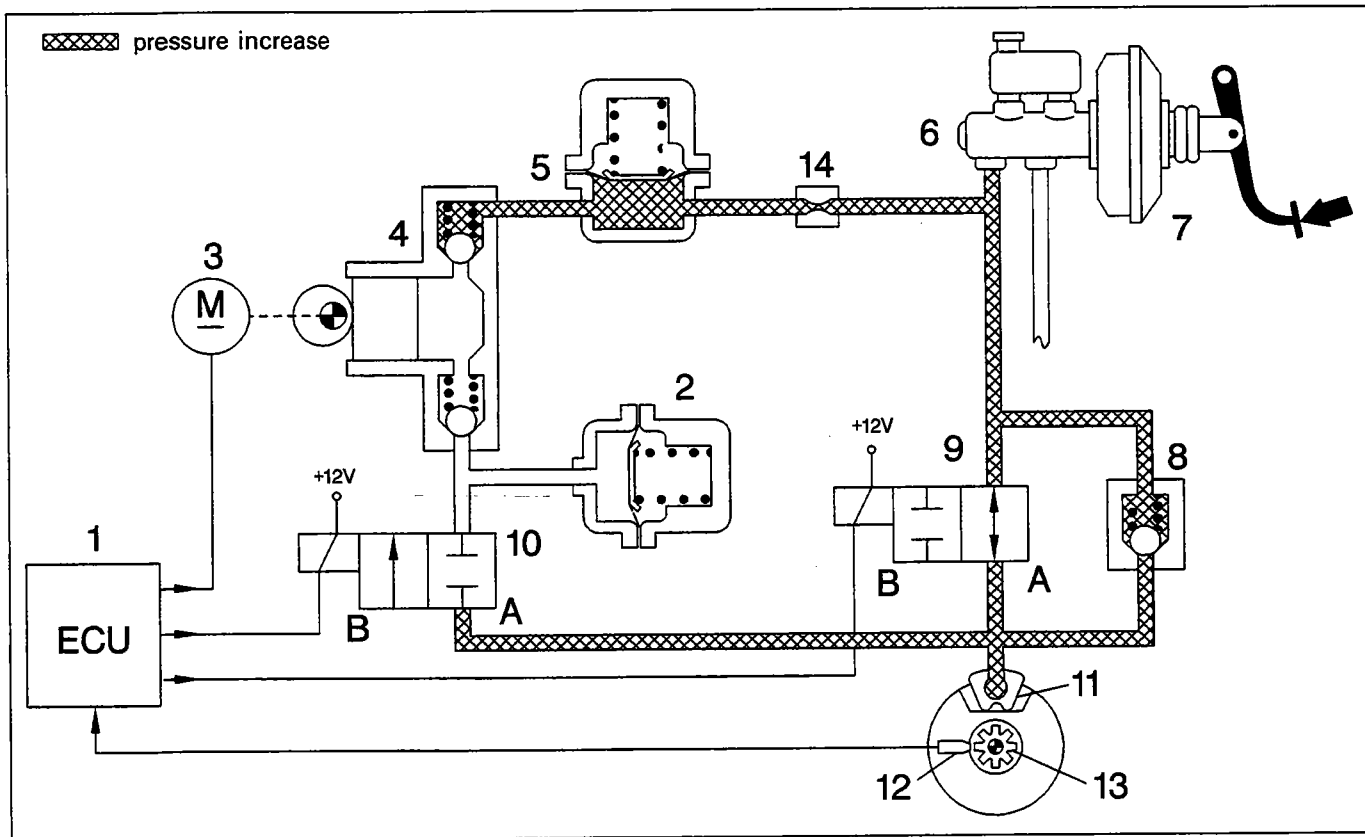
The Teves MK20 A.B.S. has two two-way solenoids for each hydraulic circuit.

When de-activated (not earthed by the control unit), the inlet solenoid (9) is in the open position, thus allowing fluid to pass to the brake caliper. The pressure is maintained by closing this valve, i.e. supplying it electrically.

When de-activated (not earthed by the control unit), the outlet solenoid (10) is in the closed position and does not allow fluid to discharge to the low-pressure accumulator (2).

The accumulators (2) and (5) temporarily store the brake fluid which becomes available during the pressure reduction phase. The recycling pump (4) sends the brake fluid, which flows from the brake calipers during the pressure reduction phase, to the brake pump through the relevant accumulator. On the basis of the signals received from the rpm sensors located on the front and rear wheels, the electronic control unit drives the electrohydraulic control unit which in turn varies the pressure of the brake fluid sent to the caliper in accordance with three phases: increase, maintenance or reduction of pressure.

Presssure increase phase



P4A15AD01

- | | |
|--|---|
| 1. Electronic control unit | 8. Rapid pressure reducing valve |
| 2. Low-pressure accumulator (reservoir) | 9. Inlet solenoid (A) open (B) closed |
| 3. Recycling pump motor | 10. Outlet solenoid (A) closed (B) open |
| 4. Recycling pump | 11. Brake caliper |
| 5. High-pressure accumulator (damping chamber) | 12. Rpm sensor |
| 6. Brake pump | 13. Phonic wheel |
| 7. Servo unit | 14. Constriction |

When the driver presses the brake pedal, the pressure generated by the brake pump (6) reaches the brake calipers without undergoing variations, as the solenoids (9) and (10) of the hydraulic unit are not earthed by the electronic control unit.

When the braking force increases, the wheel deceleration consequently increases: this causes faster deceleration of the car (i.e. the wheel slip increases).

The slip value must not exceed a particular value beyond which the wheel loses grip with the ground and begins to skid, resulting in loss of direction control and increase in braking distances.

The wheel speed sensor (12) indicates when deceleration values which could impair the wheel's grip on the ground are reached; at this point the electronic control unit (1) drives the solenoids on the electro-hydraulic control unit, reducing the braking force and allowing the wheel to increase its speed and so recover grip.

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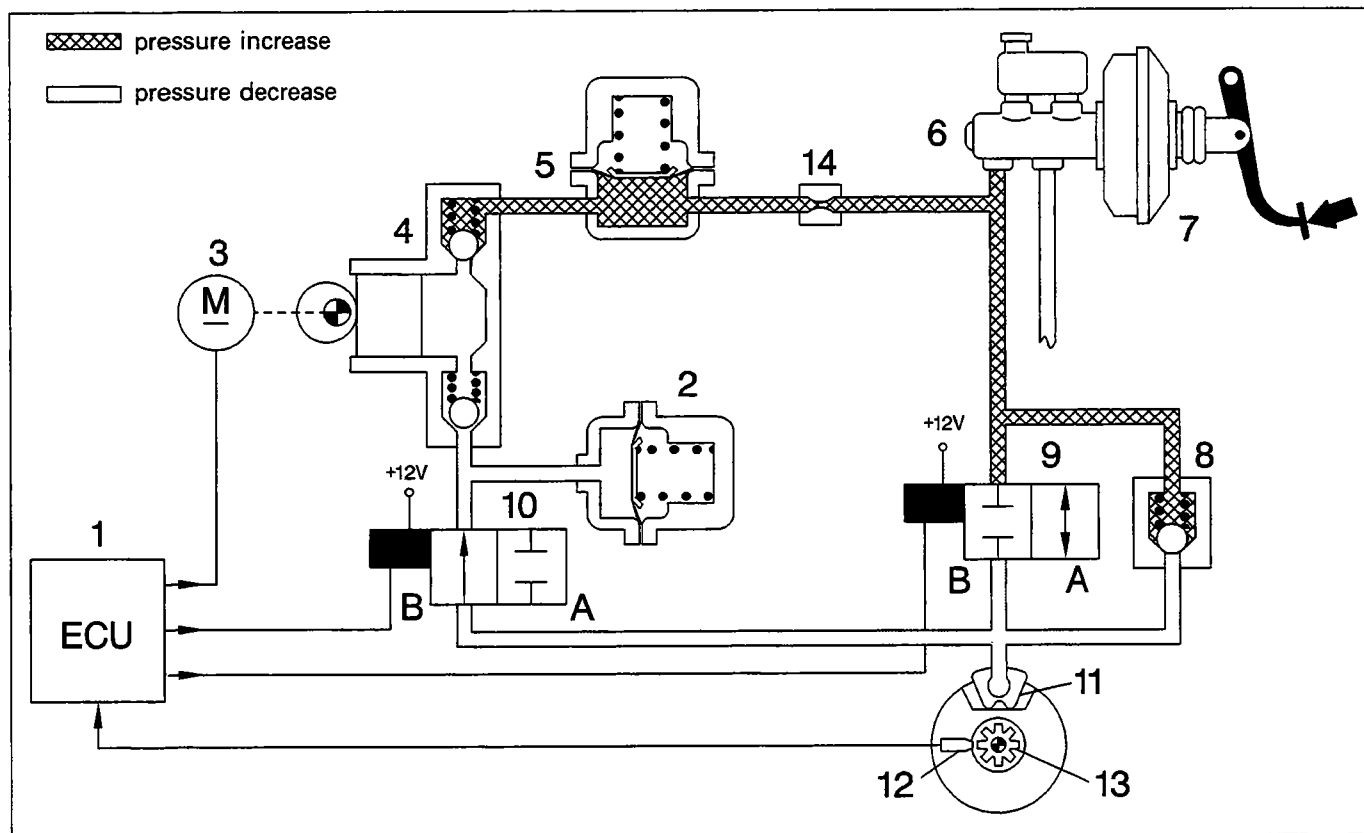
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P4A16AD01

1. Electronic control unit
2. Low-pressure accumulator (reservoir)
3. Recycling pump motor
4. Recycling pump
5. High-pressure accumulator (damping chamber)
6. Brake pump
7. Servo unit
8. Rapid pressure reducing valve
9. Inlet solenoid (A) open (B) closed
10. Outlet solenoid (A) closed (B) open
11. Brake caliper
12. Rpm sensor
13. Phonic wheel
14. Constriction

At this point, the control unit passes from the maintenance phase to the pressure increase phase (if the wheel accelerates) or reduction phase (if the wheel is tending to lock).

Pressure reduction phase



P4A17AD01

- | | |
|--|---|
| 1. Electronic control unit | 8. Rapid pressure reducing valve |
| 2. Low-pressure accumulator (reservoir) | 9. Inlet solenoid (A) open (B) closed |
| 3. Recycling pump motor | 10. Outlet solenoid (A) closed (B) open |
| 4. Recycling pump | 11. Brake caliper |
| 5. High-pressure accumulator (damping chamber) | 12. Rpm sensor |
| 6. Brake pump | 13. Phonic wheel |
| 7. Servo unit | 14. Constriction |

The electronic control unit (1) detects the wheel's tendency to lock and activates the electrohydraulic unit to limit the wheel deceleration to within the permitted threshold values.

The electronic control unit (1) earths the inlet solenoid (9) and outlet solenoid (10).

The inlet solenoid (9) remains closed, maintaining the break in connection between brake pump (6) and brake caliper (11); the outlet solenoid (10) opens thus hydraulically connecting the brake caliper (11) to the low-pressure accumulator (2) and recycling pump (4), in order to remove some of the fluid from the brake caliper (11) and reduce the pressure on that caliper.

At the same time the electronic control unit (1) supplies the motor (3) for driving the recycling pump (4) which returns fluid removed from the brake caliper (11) into the main circuit. The accumulator (2) or low pressure reservoir present in the circuit stores some of the brake fluid removed from the calipers. Through the circuit of the recycling pump (4), the brake fluid is drawn in and sent, through the damping chamber (5) and constriction (14), into the main circuit of the brake pump (6). During this phase, a series of pressure waves (or hydraulic thrusts) is generated, and these are attenuated by the presence of the damping chamber (5) and constriction (14). During this phase, because of the reduction in the braking force, the wheel tends to assume the reference speed calculated by the electronic control unit (1).

33.

The braking is therefore intermittent or in steps, and follows a succession of phases dictated by the rolling conditions of the braked wheel in accordance with a repetitive cycle in the form of jerks. This is not perceived by the driver, because of the speed and frequency with which it takes place and because it is regulated by the inertia of the wheel which, in relation to the speed of intervention of the device, prevents the wheel from reaching extreme skid coefficients.

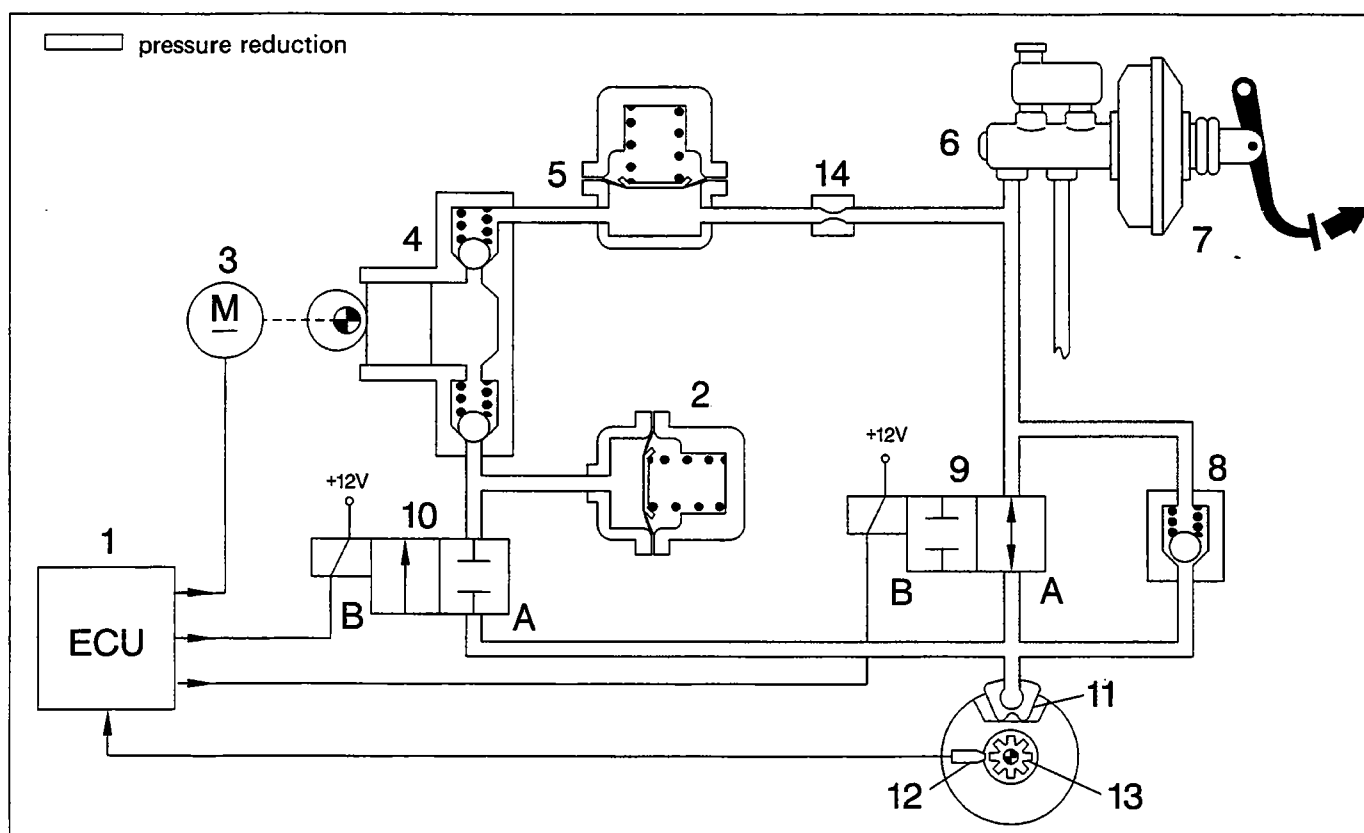
On a car with no A.B.S., the driver is able to intervene intermittently on the brake pedal with a frequency of 2 cycles per second (2 presses and 2 releases).

With the A.B.S. system, the cycles increase to 4-10 per second (depending on the grip).

The intervention of the A.B.S. usually ceases at speeds of less than 2.75 km/h to permit complete locking of the wheels with the car stopped.

NOTE *The recycling pump is of the dual-circuit free piston type, and is driven by an electric motor which is always turning during recycling. The pistons are not coupled to the electric motor, but are only moved along their travel, by the cam, when the brake fluid arrives. The pump can therefore only accomplish one pushing travel, and cannot draw in fluid because there is no mechanical connection between motor and pump.*

Release of brake pedal



P4A18AD01

- | | |
|--|---|
| 1. Electronic control unit | 8. Rapid pressure reducing valve |
| 2. Low-pressure accumulator (reservoir) | 9. Inlet solenoid (A) open (B) closed |
| 3. Recycling pump motor | 10. Outlet solenoid (A) closed (B) open |
| 4. Recycling pump | 11. Brake caliper |
| 5. High-pressure accumulator (damping chamber) | 12. Rpm sensor |
| 6. Brake pump | 13. Phonic wheel |
| 7. Servo unit | 14. Constriction |

To permit a rapid reduction in pressure on the brake caliper (11) when the brake pedal is released, the system has a non-return valve (8) located in parallel with the inlet solenoid (9).

REQUIREMENTS TO BE OBSERVED ON CARS FITTED WITH ANTI-LOCK BRAKING SYSTEM

Before carrying out welding work with electric welders, disconnect the connector from the electronic control unit.

If the battery is removed, after refitting it make sure to tighten the terminals fully.

To replace the electronic control unit, remove the entire hydraulic unit for space reasons and in order not to damage the internal connector.

Before dismantling the electrohydraulic control unit, disconnect the battery's negative lead.

The entire A.B.S. system must be checked with the Fiat/Lancia Tester whenever the electrohydraulic unit, an rpm sensor, the electronic control unit or wiring is replaced.

After every intervention on the hydraulic circuit of the A.B.S. or braking system, fill the system with DOT 4 brake fluid, bleed the air out and check that there are no leaks from the connecting points.

The electrohydraulic control unit is supplied filled with DOT 4 brake fluid and the solenoids not supplied. The system is bled and filled with brake fluid in the same way as a conventional braking system, although it takes longer.

Check that the pipes are not in contact with the bodywork at any point, in order to avoid not only the risk of damaging the pipe protection, but also the transmission of noise during operation of the A.B.S.

If connecting pipes have to be slackened or removed, leak tests must be conducted on the A.B.S. system.



Do not put mineral oil in the brake circuit, as this would damage all the seals.

If it is put in accidentally, the following must be replaced:

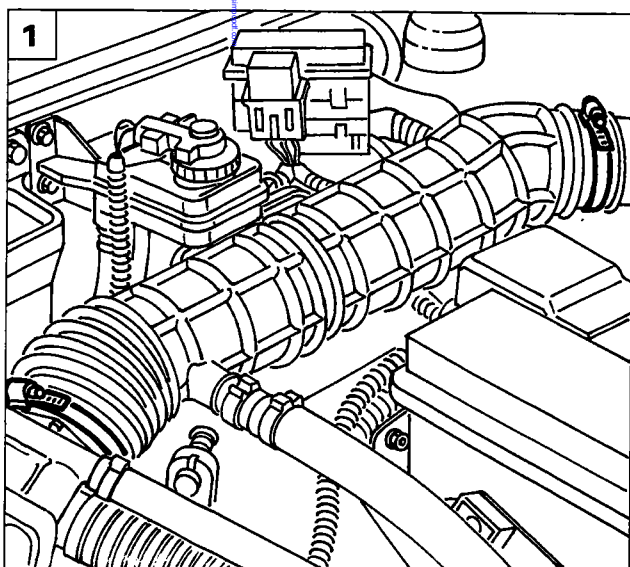
- hydraulic unit;
- brake pump;
- calipers.

PRECAUTIONS TO BE OBSERVED DURING REPAIRS INVOLVING COMPONENTS OF THE ANTI-LOCK BRAKING SYSTEM

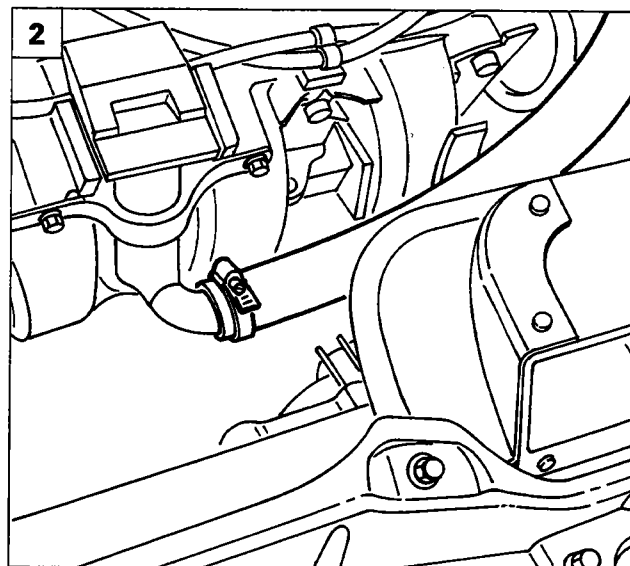
After any repair which has involved the electrical system of the anti-lock braking system or the rpm sensors, during either specific interventions or operations for the dismantling and replacement of mechanical parts (for example spring-damper assembly, constant velocity joints, drive shafts and wheel hubs), a very short road test should be carried out as follows:

1. increase the car speed to over 12 km/h and maintain this speed, in order to allow the electronic control unit to conduct a dynamic check on the sensors and detect any faults, insecure contacts, incorrect positions or the absence of a phonic wheel;
2. after carrying out the above operation, if the warning light does not indicate a fault, continue the test at a speed of 50-60 km/h for 10 minutes, using the brakes normally but without braking sharply. This stage of the test enables the electronic control unit to recognize the presence of an incorrect phonic wheel.

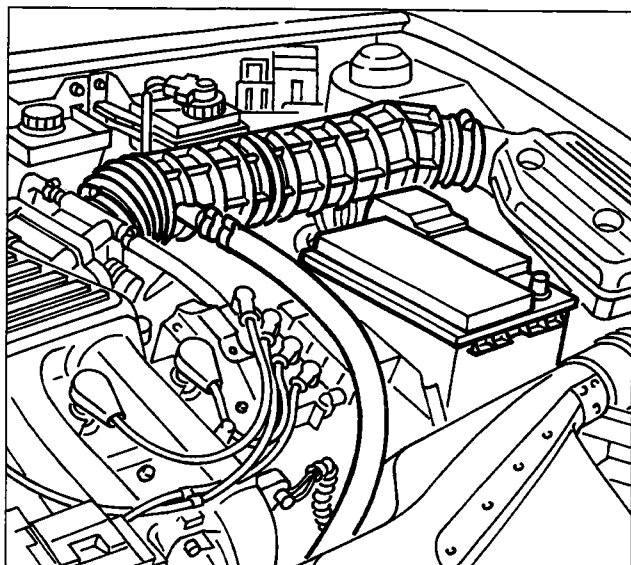
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P4A20AD02



P4A20AD03



P4A20AD01

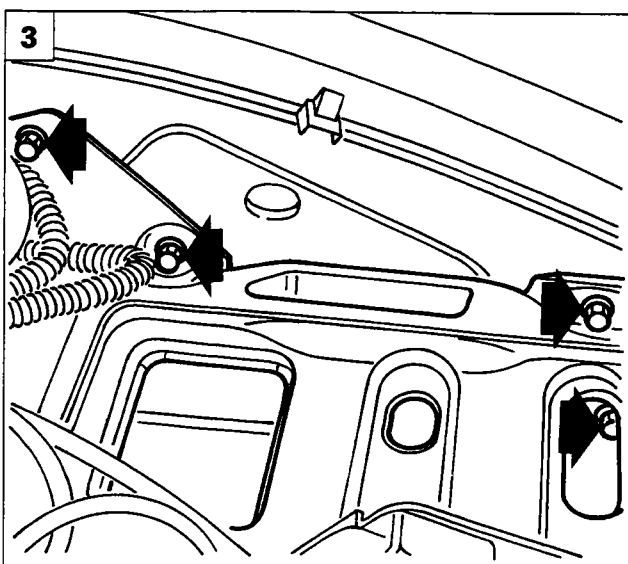


REMOVING-REFITTING COMPONENTS OF THE ANTI-LOCK BRAKING SYSTEM

Electrohydraulic control unit

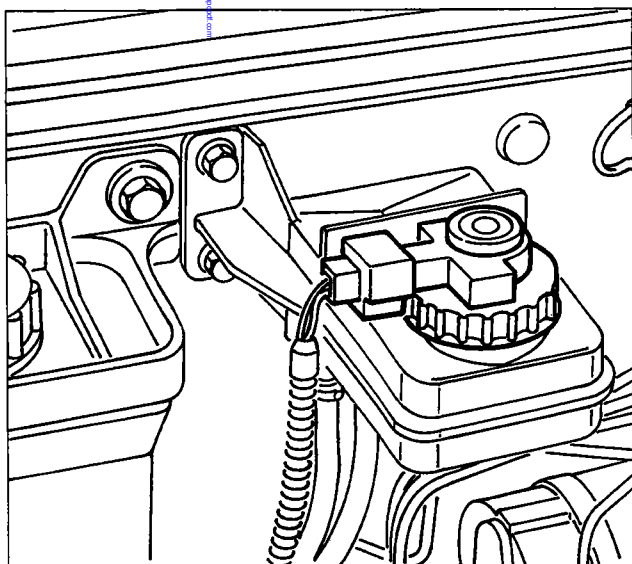
To remove the electrohydraulic unit, proceed as follows:

1. undo the clips securing the inlet pipe;
2. undo the clip securing the oil vapour recirculation pipe and remove the complete inlet pipe;



P4A20AD04

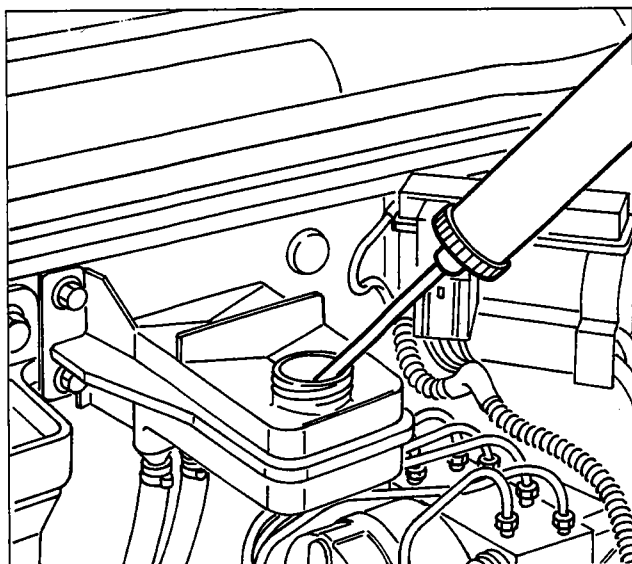
3. remove the battery then undo the bolts indicated and move aside the battery cage;



P4A21AD01



- disconnect the sensor connector on the brake fluid reservoir cap and unscrew the cap;



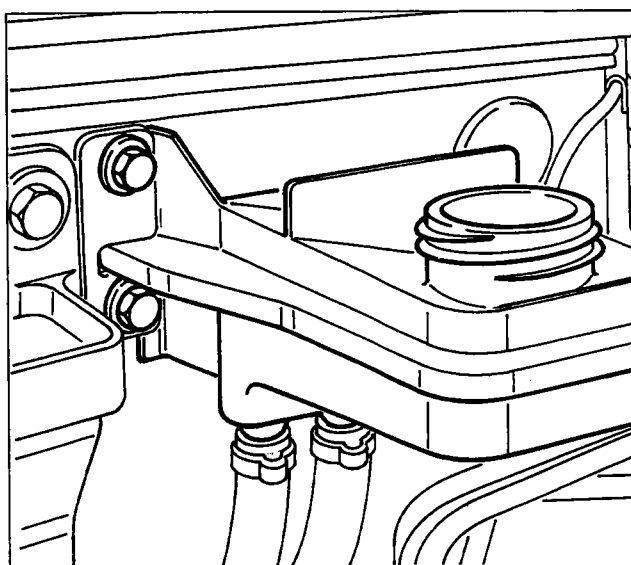
P4A21AD02



- remove the brake fluid from the reservoir using the special syringe;



Take care should residual fluid in the reservoir come out.



P4A21AD03



- undo the bolts and move aside the brake fluid reservoir;

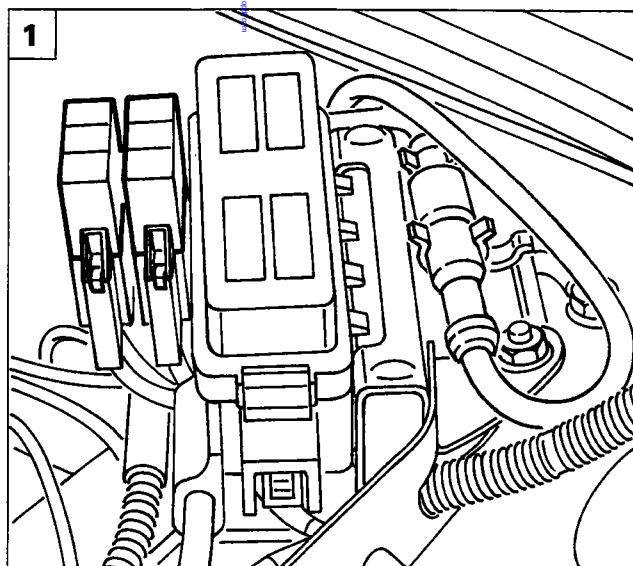


Ensure that the reservoir is absolutely clean before filling it.

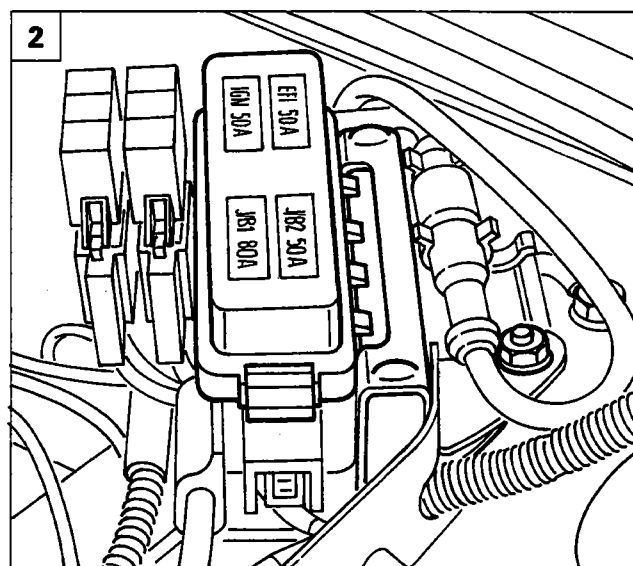


Bleed the hydraulic system

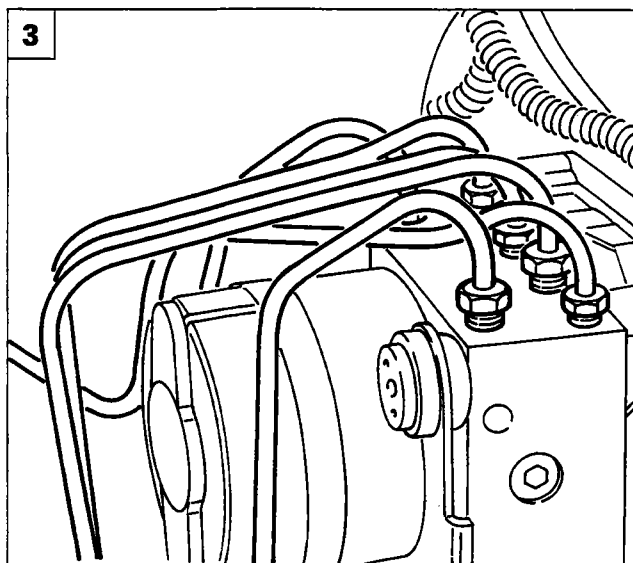
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P4A22AD01



P4A22AD02



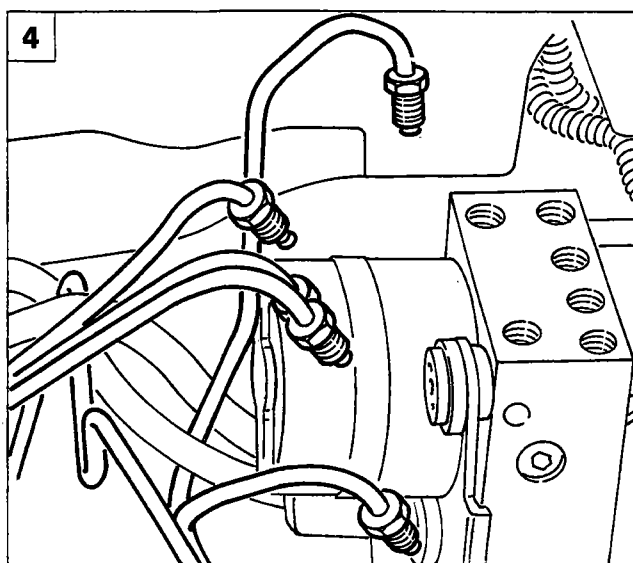
P4A22AD03



1. use a screwdriver to release the two fuses and move them aside;
2. undo the bolt securing the connector block bracket and move aside the connector block with the fuses;
3. undo the brake pipe connections using a 13 mm wrench and tool 1856132000;

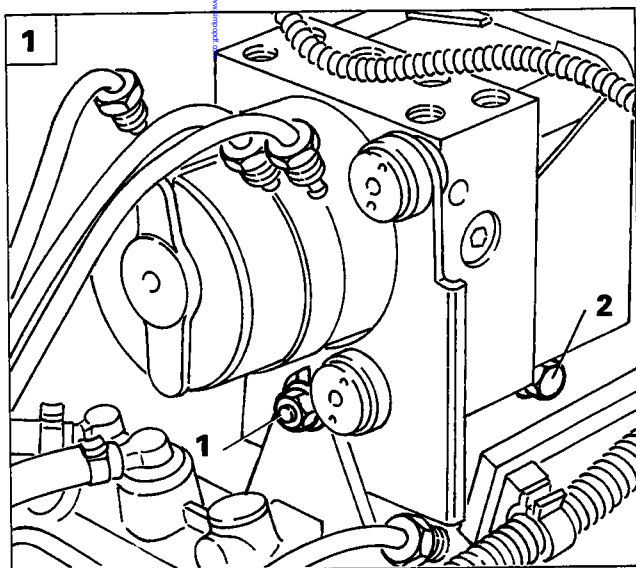


Take care not to damage the pipe connections.

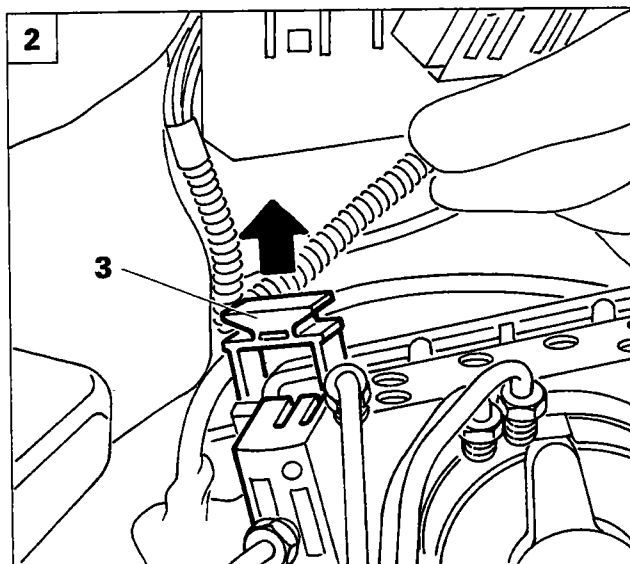


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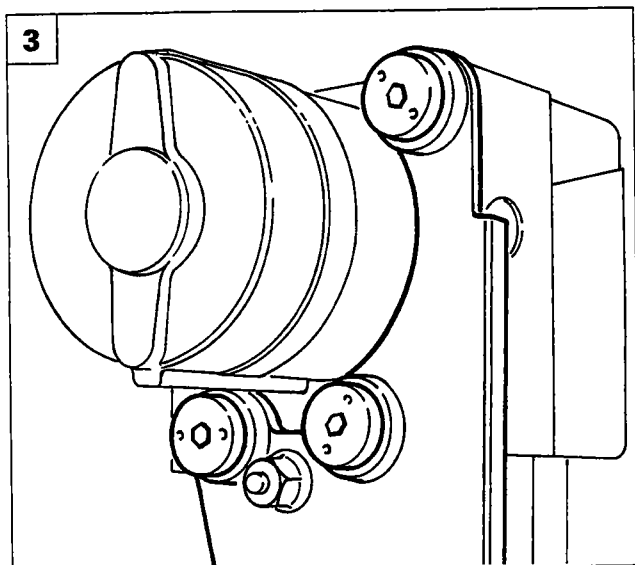
4. move aside the brake pipes in order to be able to withdraw the electrohydraulic unit;



P4A23AD01



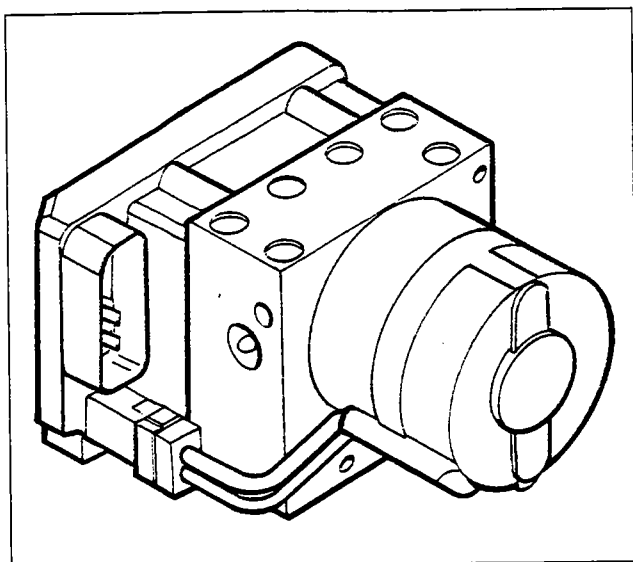
P4A23AD02



P4A23AD03



1. undo the front bolt (1) and remove the side bolt (2);
2. disconnect the connector, pulling the hooking device (3) upwards and remove the electrohydraulic unit;
3. undo the screws shown and detach the mounting bracket from the electrohydraulic unit.

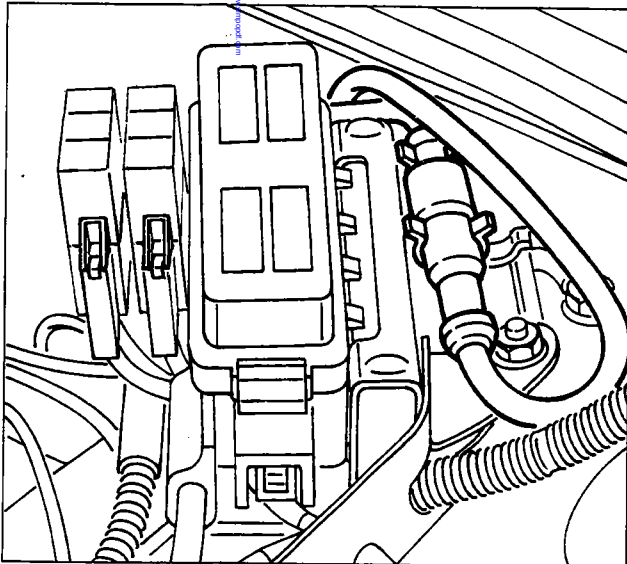


P4A23AD04

NOTE To refit, reverse the procedure for removal.

Electrohydraulic control unit

33.



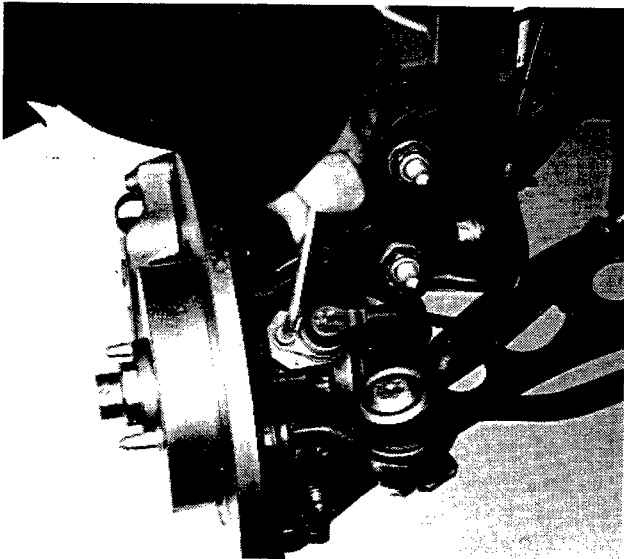
P4A24AD01



Front wheel speed sensor

To remove the front wheel speed sensor, proceed as follows:

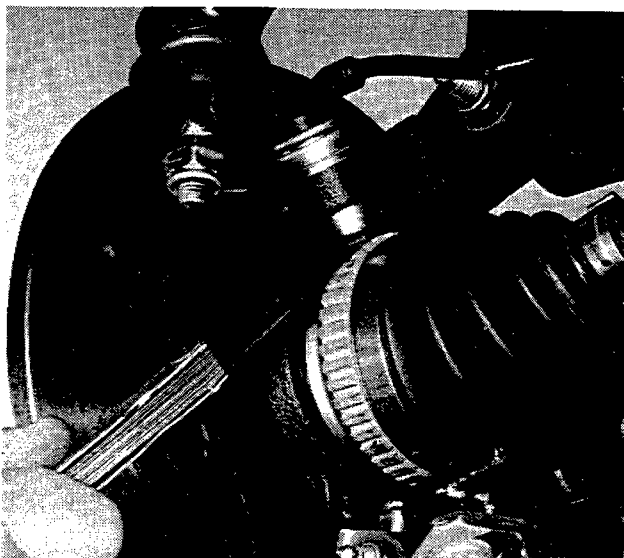
- disconnect the electrical connector;



P4A24AD02



- undo the bolt and remove the sensor.



P4A24AD03

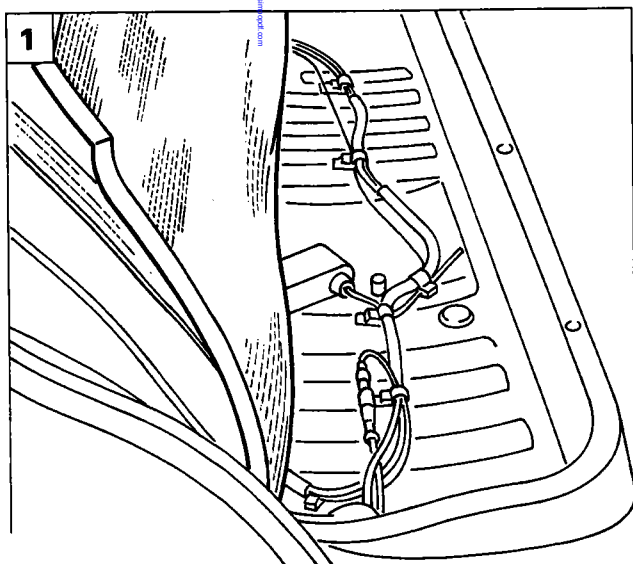


0.645 - 1.305 mm

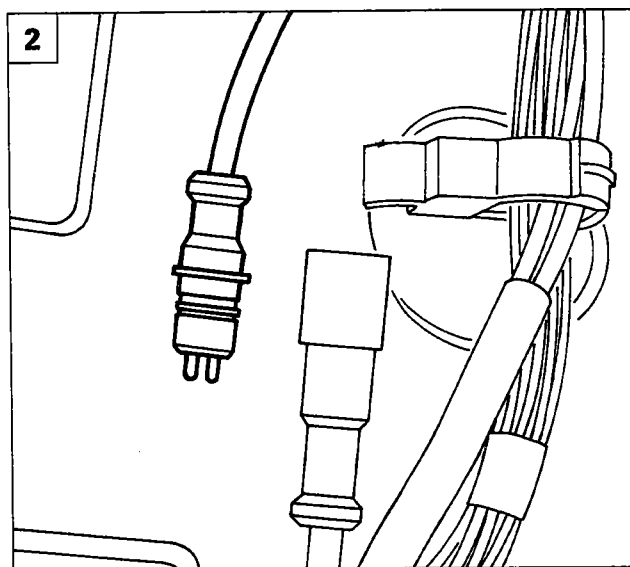
Checking gap between wheel speed sensor and phonic wheel on front wheel constant velocity joint



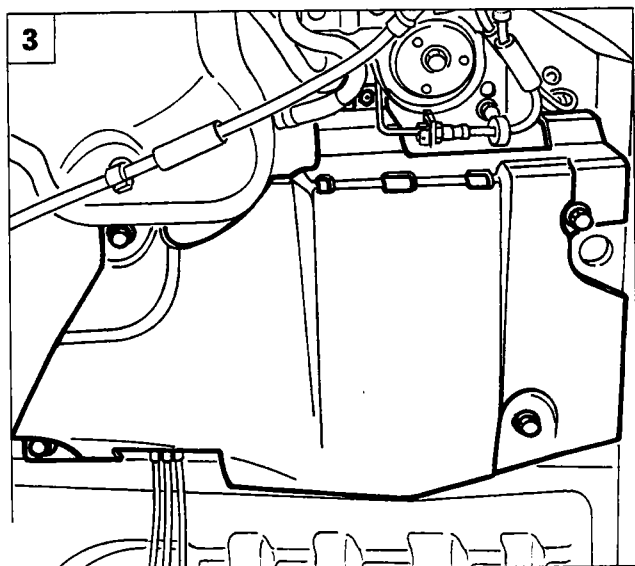
The gap is not adjustable since no shims are supplied for the purpose. If the value measured is outside the specified tolerance limits, check the condition of the sensor and the teeth on the phonic wheel.



P4A25AD01



P4A25AD02



P4A25AD03



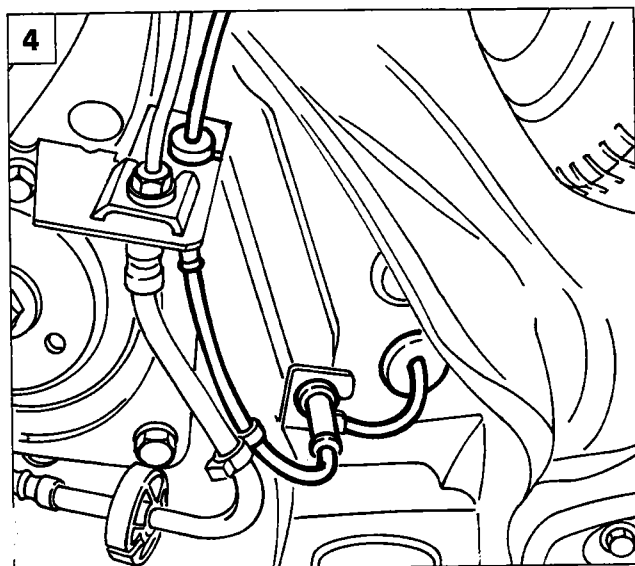
Rear wheel speed sensor

To remove the rear wheel speed sensor, proceed as follows:

1. remove the rear seat and lift the sound-proofing trim;
2. disconnect the sensor's connector.

Raise the vehicle, then:

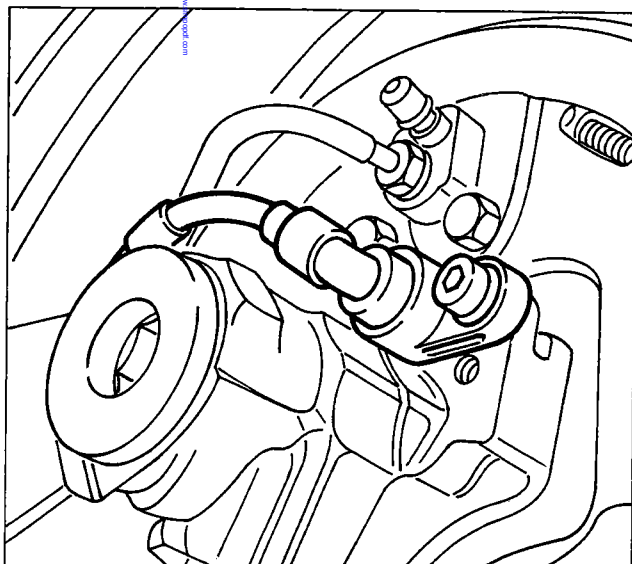
3. undo the bolts securing the fuel filter cover;



P4A25AD04

4. take out the rubber seal and withdraw the sensor cable;

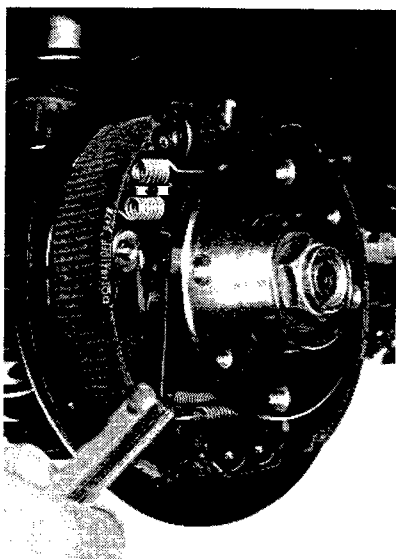
33.



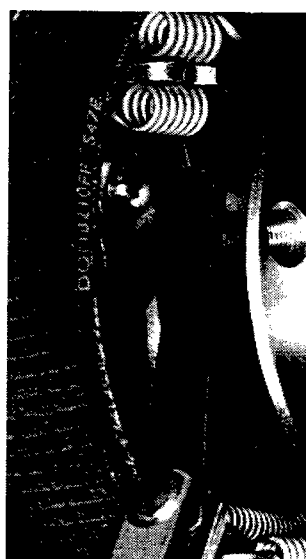
P4A26AD01



- undo the bolt and remove the sensor.



P4A26AD02

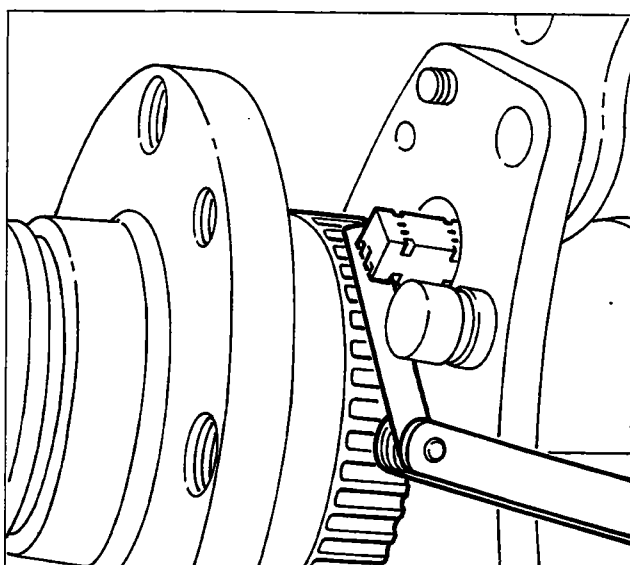


P4A26AD03



1370 12V 1581 16V 1747 16V
1929 D 1910 TD

Checking gap between wheel speed sensor and phonic wheel on rear wheel hub



P4A26AD04



1998 20V



The gap is not adjustable since no shims are supplied for the purpose. If the value measured is outside the specified tolerance limits, check the condition of the sensor and the teeth the phonic wheel.

UPPER STEERING SYSTEM

- Steering wheel 1
- Stalk unit base 2
- Steering column 3
- Ignition switch block 4

STEERING GEAR

- Variable ratio rack-and-pinion steering gear 5
- Operation 6

POWER-ASSISTED STEERING

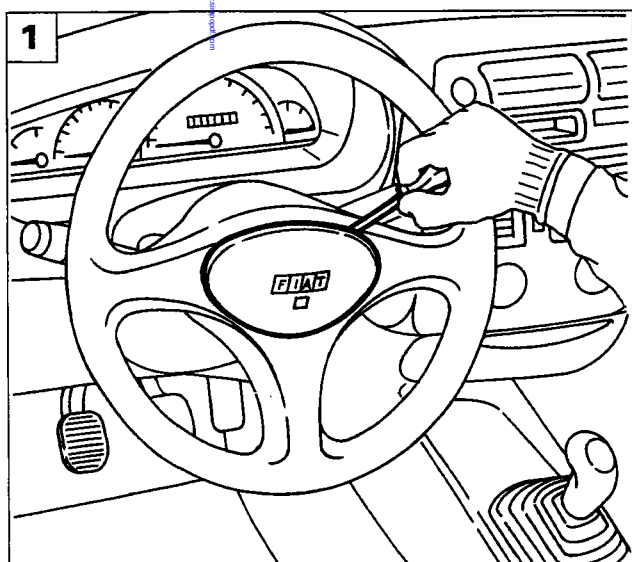
- Description and operation 9
- Front wheel toe-in 11

RACK/PINION POWER STEERING GEAR

- Rack-and-pinion power steering gear 12

POWER STEERING PUMP

- 1370 12v engine 17
- 1581 16v engine 20
- 1747 16v engine 22
- 1998 20v engine 25
- 1929 D engine 27
- 1910 TD engine 29



P4A001F01



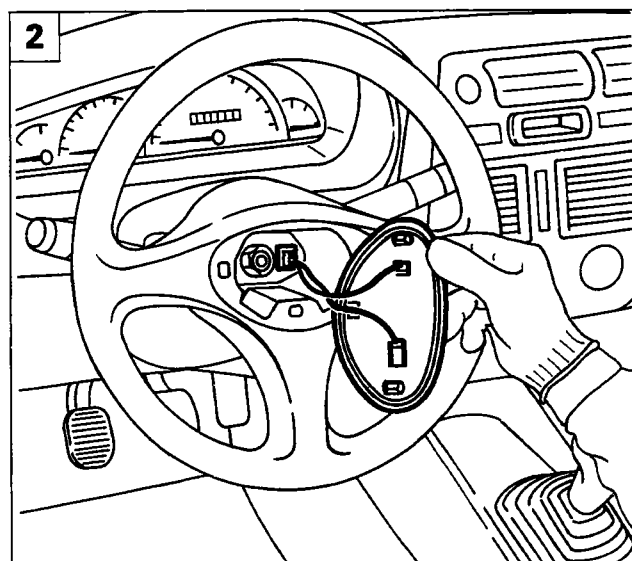
STEERING WHEEL



Removing-refitting

To remove the steering wheel, proceed as follows:

1. use a screwdriver to remove the horn cover;

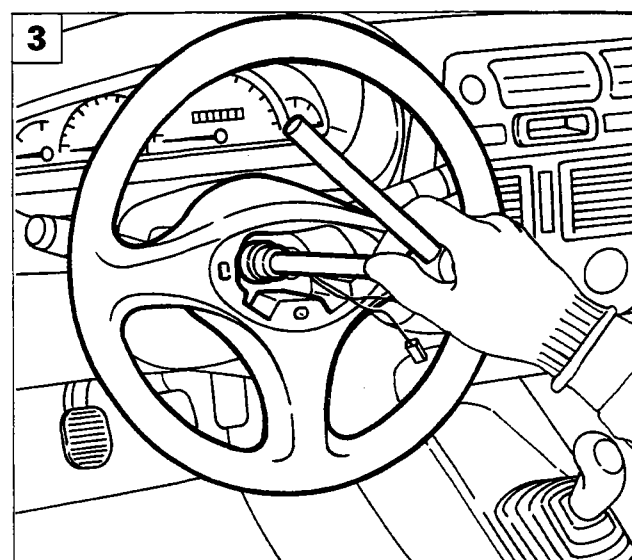


P4A001F02

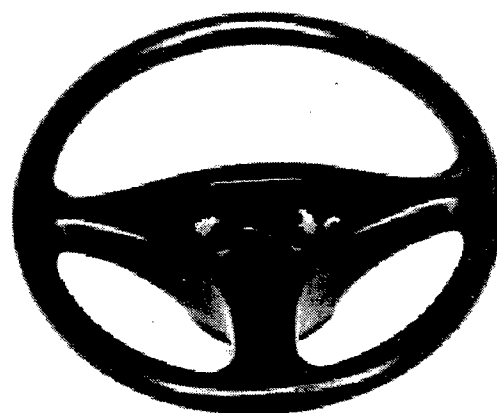
2. disconnect the horn wiring connectors;
3. undo the nut securing the steering wheel to the steering column, then remove the steering wheel.



To remove the steering wheel on vehicles fitted with AIR BAG, see the procedure described in Section 55.

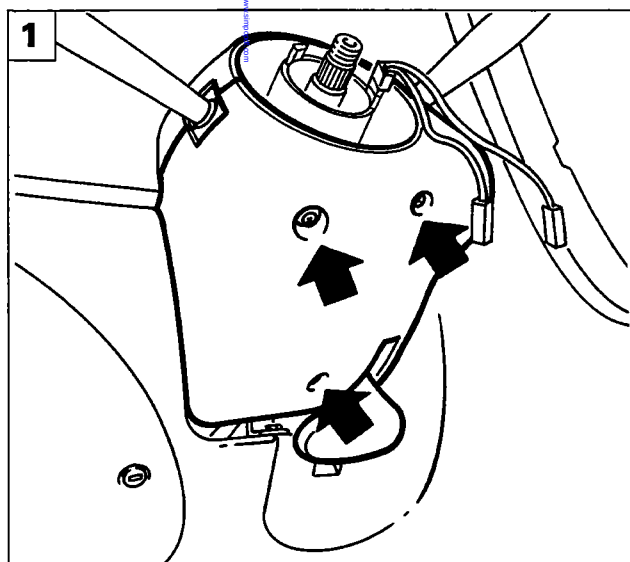


P4A001F03

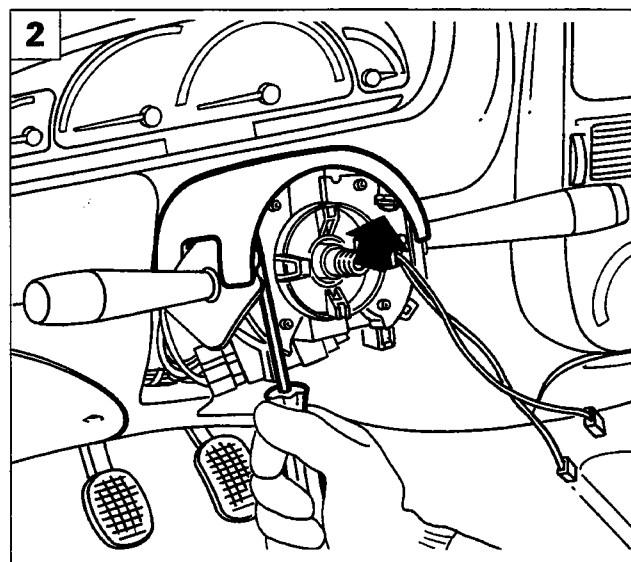


P4A001F04

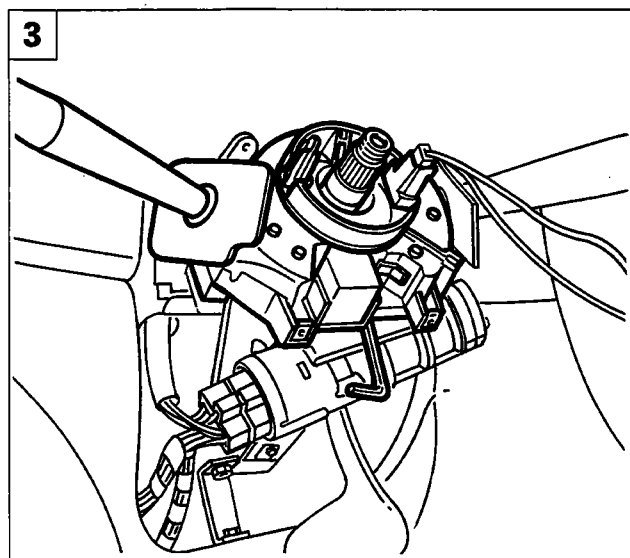
41.



P4A002F01



P4A002F02



P4A002F03



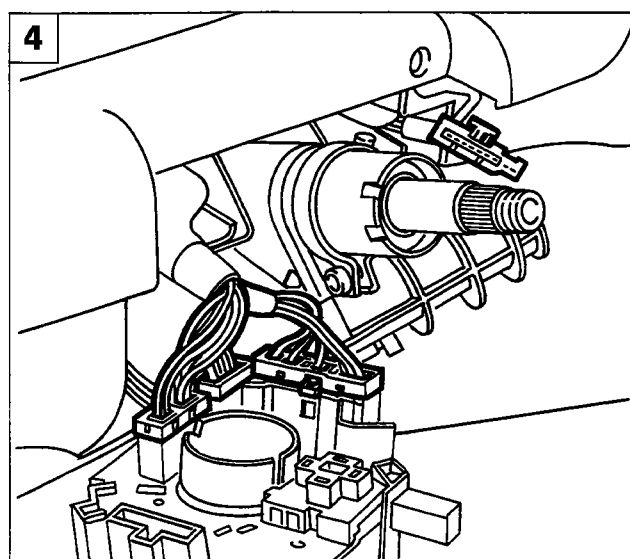
STALK UNIT BASE



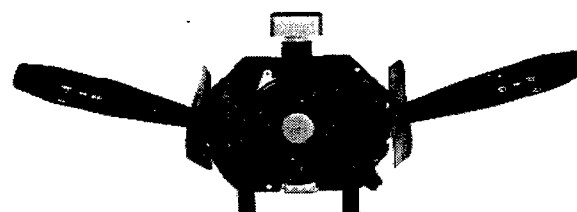
Removing-refitting

To remove the stalk unit base, proceed as follows:

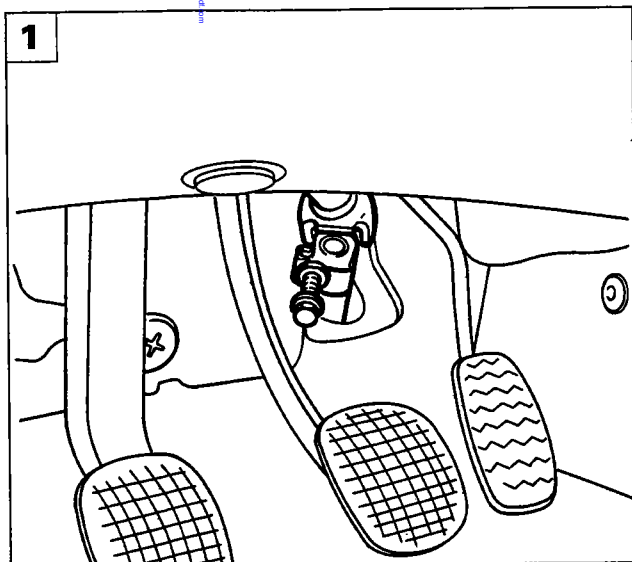
1. undo the bolts arrowed and remove the steering column bottom shroud;
2. undo the bolts arrowed and remove the steering column top shroud;
3. using an Allen key, undo the screw on the attachment collar of the stalk unit base and withdraw the collar;
4. disconnect the wiring connectors of the stalk unit base, and remove it.



P4A002F04



P4A002F05



P4A003F01

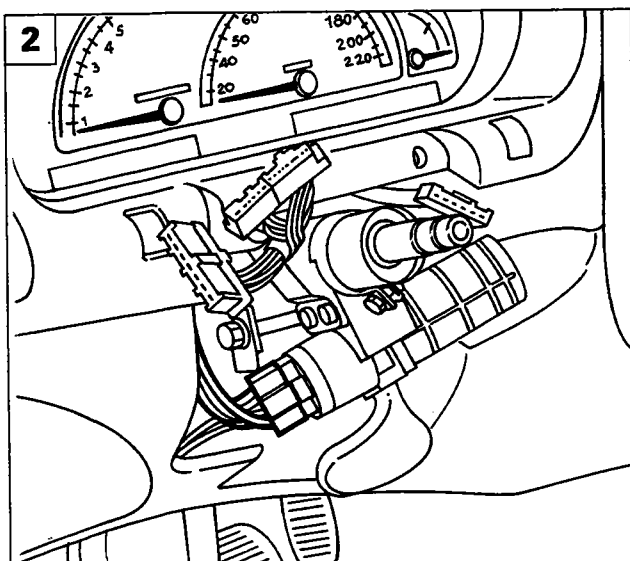


STEERING COLUMN

Removing-refitting

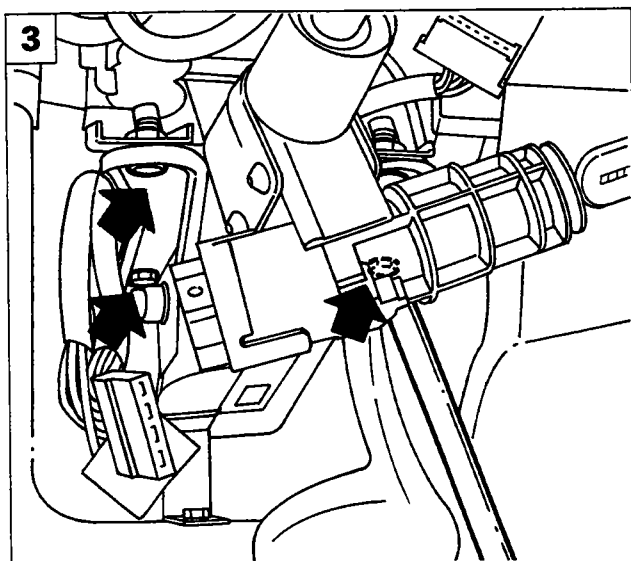
To remove the steering column, proceed as follows:

1. remove the bolt securing the lower steering column to the steering pinion;

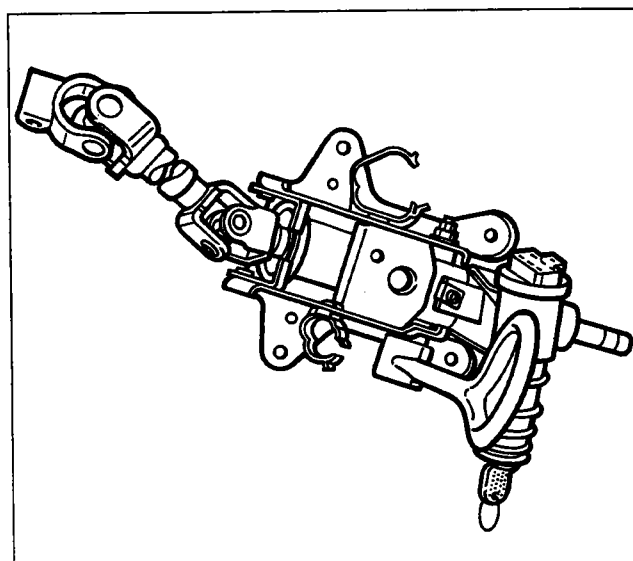


P4A003F02

2. disconnect the ignition switch wiring connector;
3. undo the bolts securing the steering column mounting to the bodywork and remove the steering column complete with lower column.

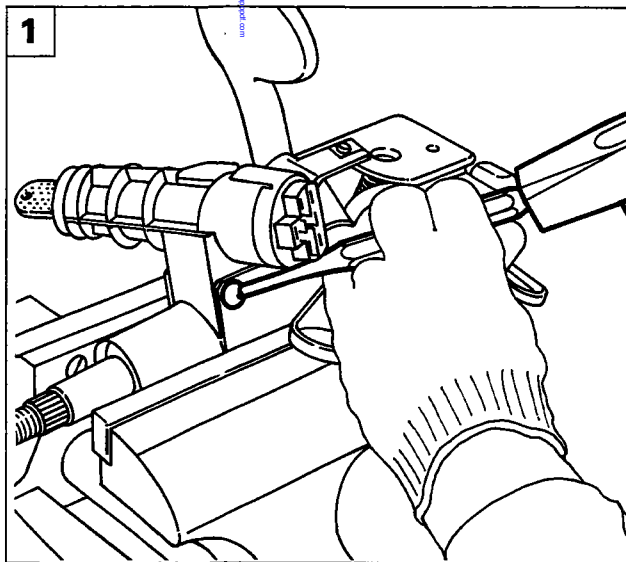


P4A003F03



P4A003F04

41.



P4A004F01

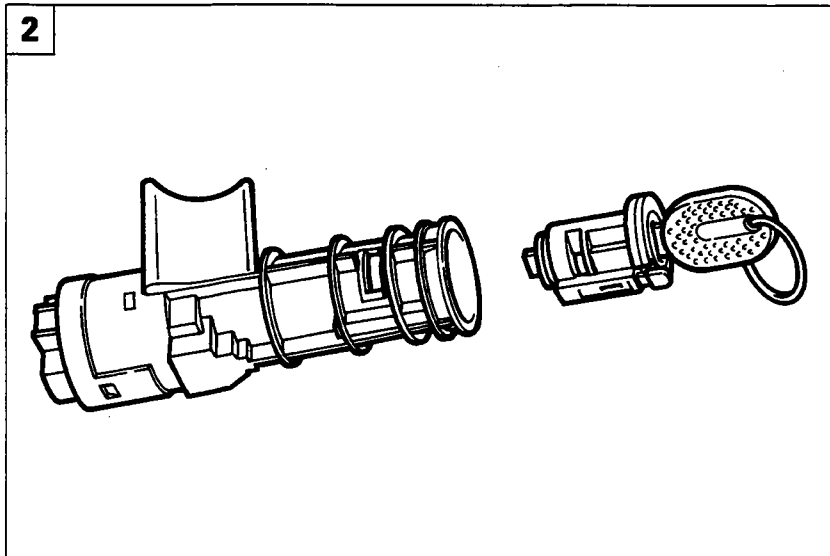


IGNITION SWITCH BLOCK

Dismantling-refitting

To remove the ignition switch block, proceed as follows:

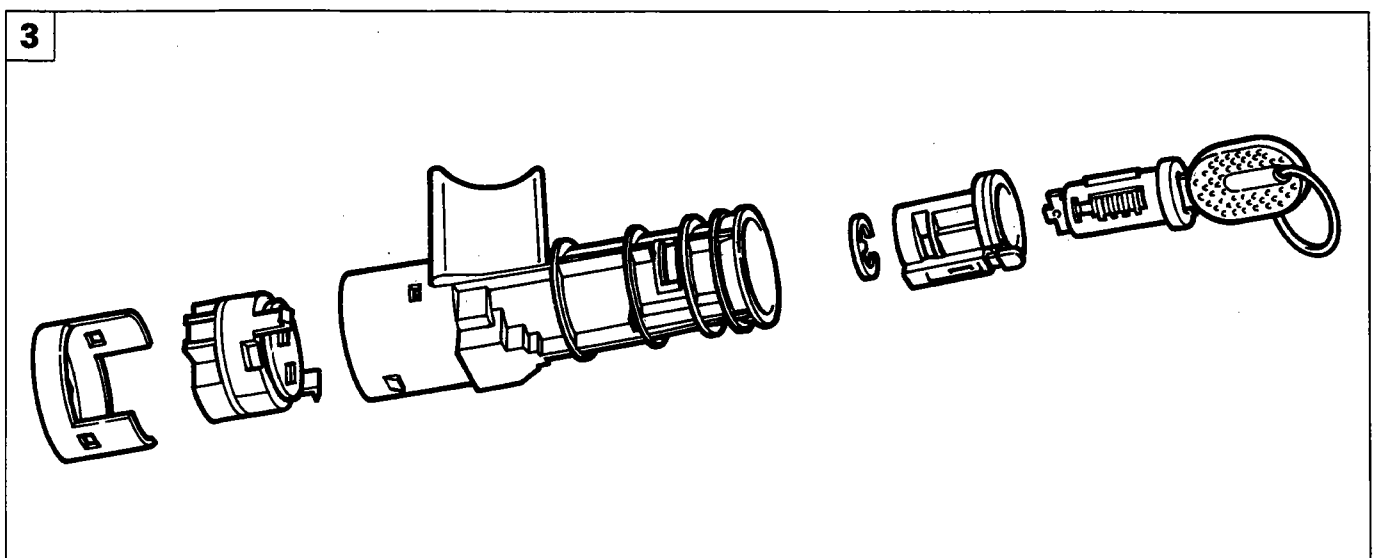
1. use a punch to undo the shear bolts locking the ignition switch block mounting;



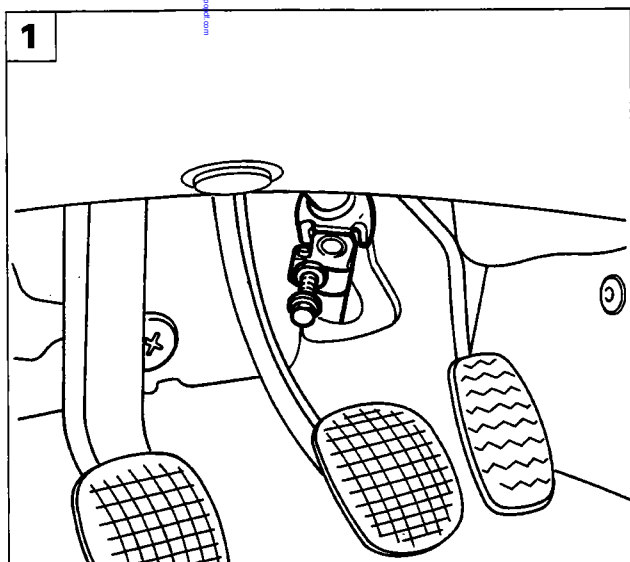
P4A004F02

2. remove the ignition switch block;
3. dismantle the ignition switch and lock from the block.

NOTE When refitting, use new shear bolts and tighten them until the hexagonal head shears off.



P4A004F03



P4A003F01

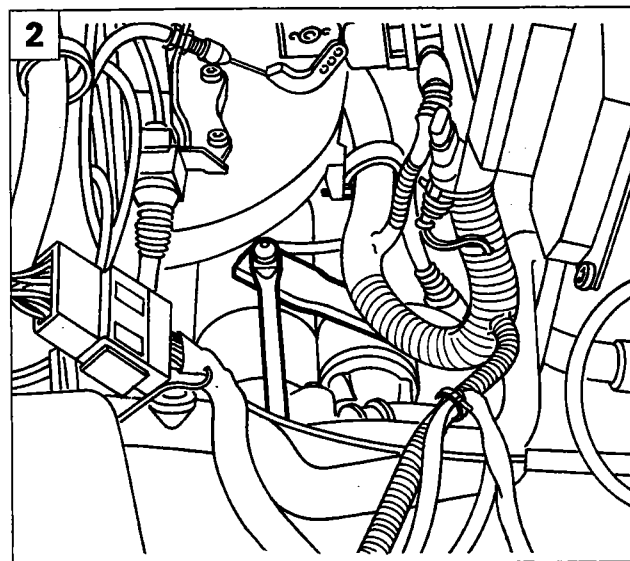


**VARIABLE RATIO RACK-AND-PINION
STEERING GEAR**

Removing-refitting

To remove the steering gear, proceed as follows:

1. remove the bolt securing the lower column to the steering gear pinion;

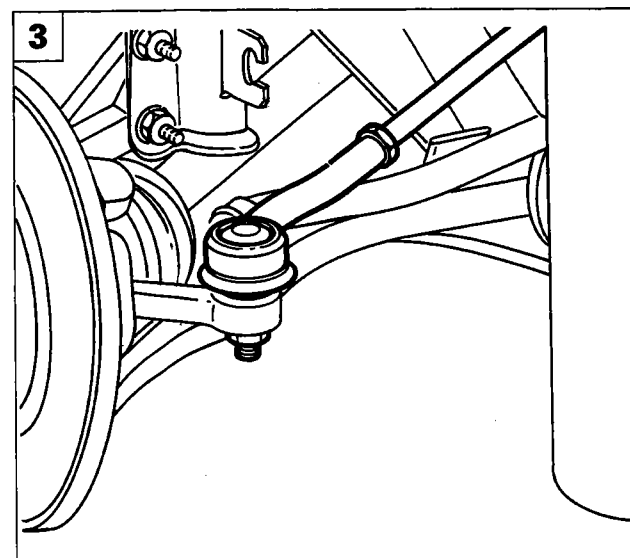


P4A005F01

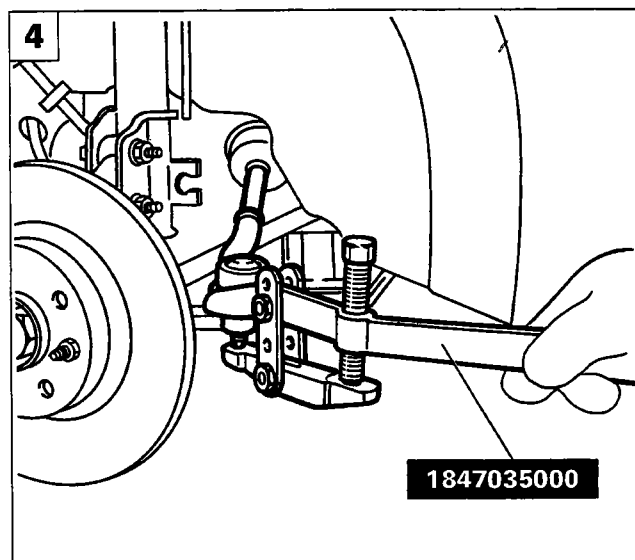
2. disconnect the transfer linkage from the gearchange control linkage.

Raise the vehicle, remove the front wheels, then working from both sides:

3. undo the nuts securing the right and left tie-rods from the front vertical links;
4. use tool 1847035000 to prise off the tie-rod heads from the two vertical links;



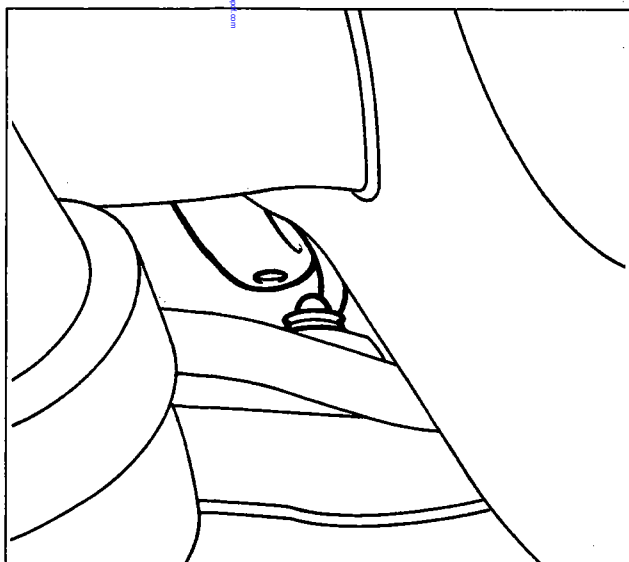
P4A005F02



1847035000

P4A005F03

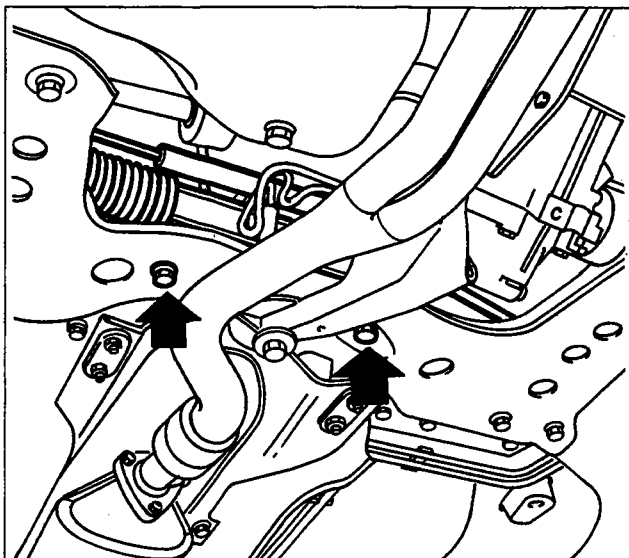
41.



P4A006F01



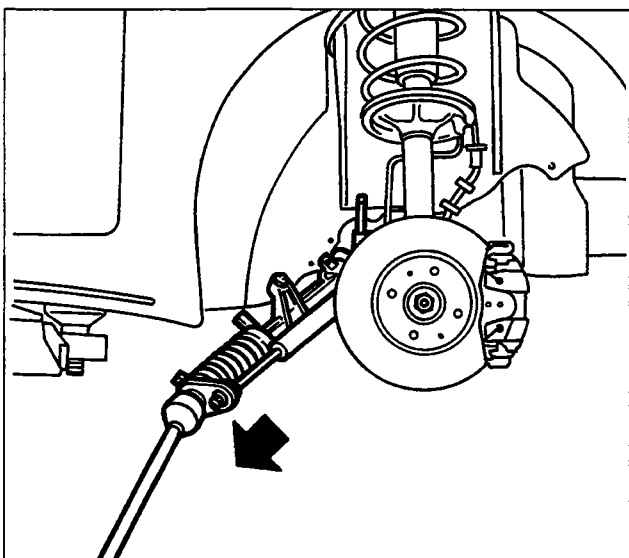
- prise off the gearchange control lever from the head on the steering gear;



P4A006F02



- undo the bolts securing the steering gear to the steering subframe;



P4A006F03

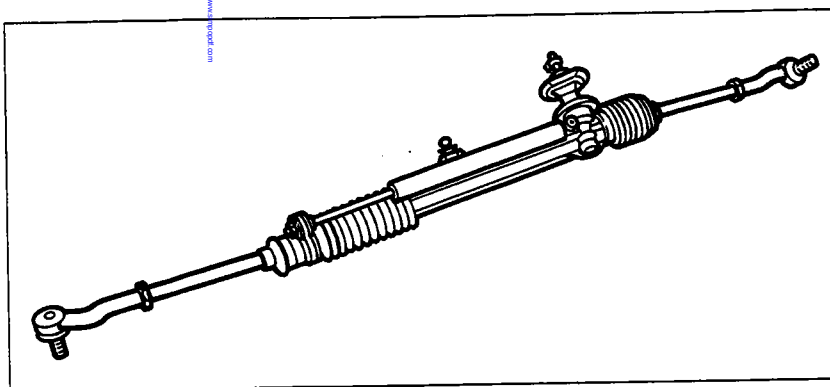


- withdraw the steering gear from under the right wheelarch.

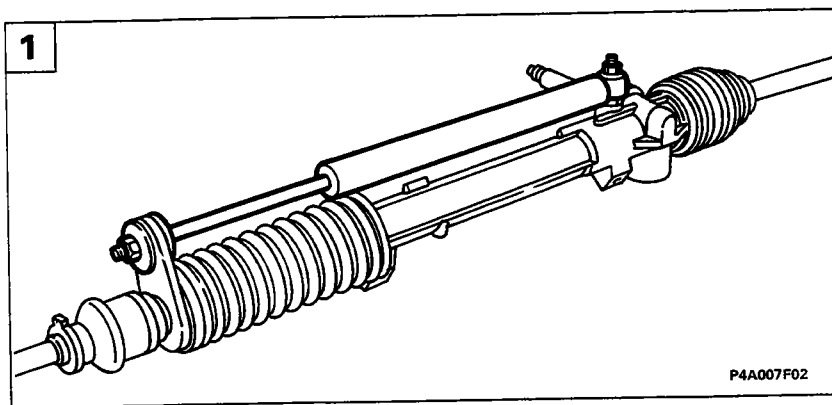
NOTE To refit the steering gear, reverse the procedure for removal.



Check the front wheel toe-in whenever the steering gear is removed and refitted.



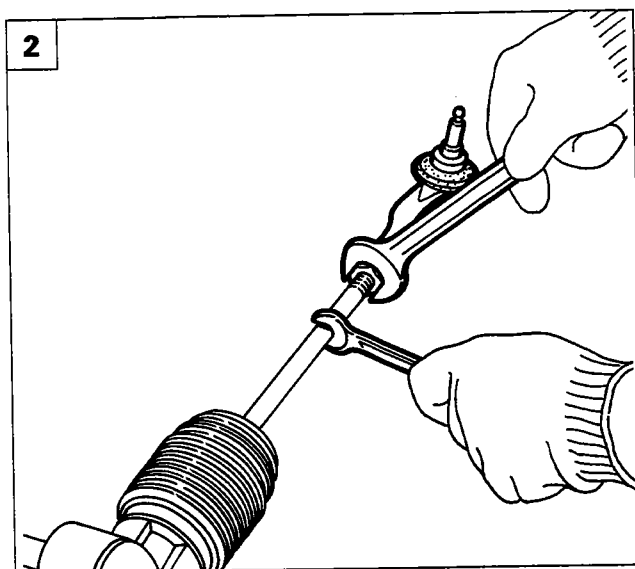
P4A007F01

Variable ratio rack-and-pinion steering gear

P4A007F02

Dismantling-refitting

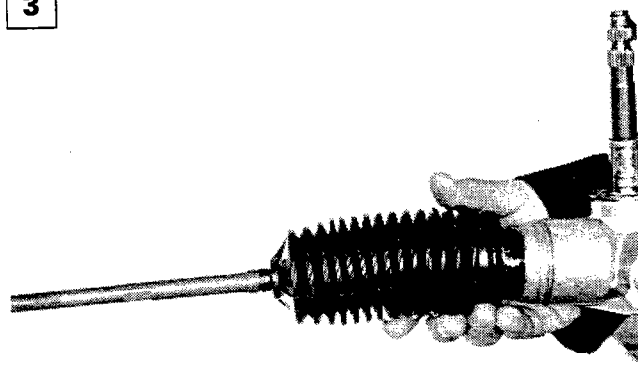
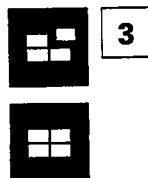
1. undo the nuts shown and remove the steering damper;



P4A007F03

2. slacken the tie-rod locking nut then unscrew the tie-rod until you can remove it;

NOTE Check that there is no stiffness or excessive play on the balljoint, otherwise it will need to be replaced.



P4A007F04

3. undo the clamps on the dust gaiter and lubricating seal, and remove the gaiter.

NOTE Thoroughly check the gaiter for holes or tears, and if necessary replace it.



Before fitting the last gaiter (pinion side), insert the specified quantity of grease.

Steering

Steering gear

41.

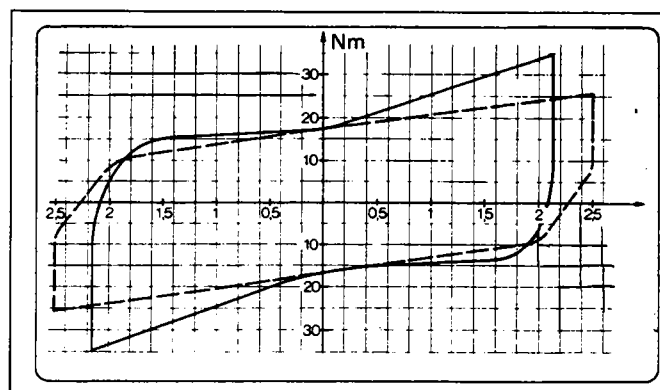
Bravo-Brava

1370 12v

OPERATION

Its innovative characteristic is that it can reduce the difference between the maximum force applied to the steering wheel when the car is on a bend or carrying out manoeuvres with tight steering angles, and the minimum force applied when the steering wheel is for example in the position for driving on a straight line.

Graph showing the different forces applicable on a constant ratio steering gear and a variable ratio steering gear.



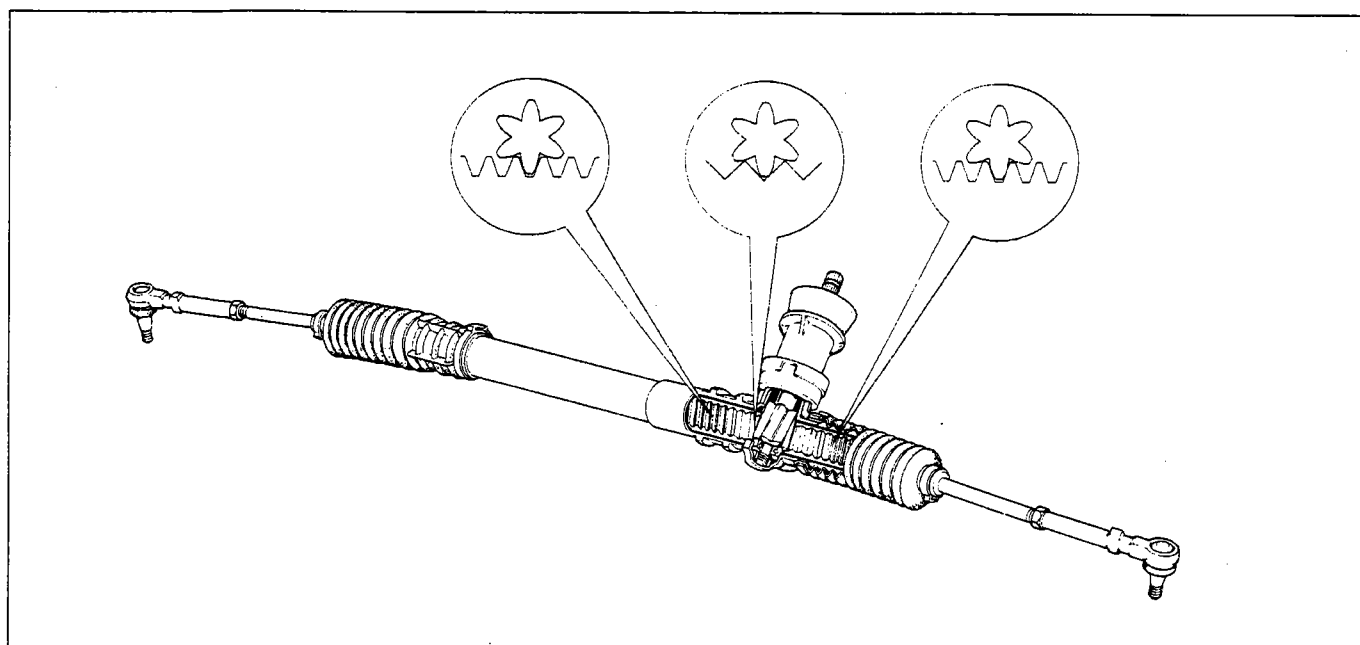
P4A008F01

- Constant ratio steering gear
- - - - Variable ratio steering gear

This characteristic is obtained thanks to the particular shape of the rack teeth, which can determine variable ratios between the force applied to the steering wheel and the force transmitted to the wheels, depending on the position assumed by the rack in relation to the pinion.

The rack teeth are cut with module and pressure angle varying from the centre towards the ends, so that the pinion engages with teeth of different pitch depending on the steering angle executed.

Thus a more direct ratio is obtained when the pinion works on the central part of the rack, and a more geared-down ratio is obtained as the pinion engages nearer the two ends of the rack during turning. This offers **more sensitive handling of the car on straight lines and more comfortable handling on bends and during manoeuvres.**



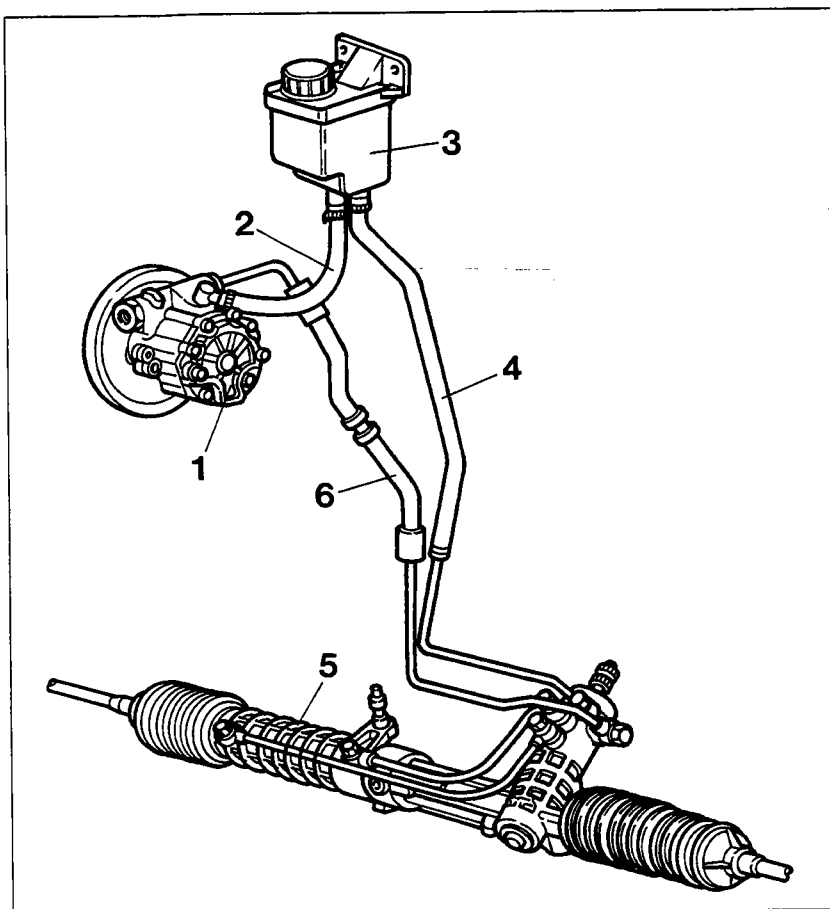
P4A008F02

Cross-section of the variable ratio steering gear showing a schematic representation of the rack and pinion teeth.

DESCRIPTION AND OPERATION

The power-assisted steering system comprises:

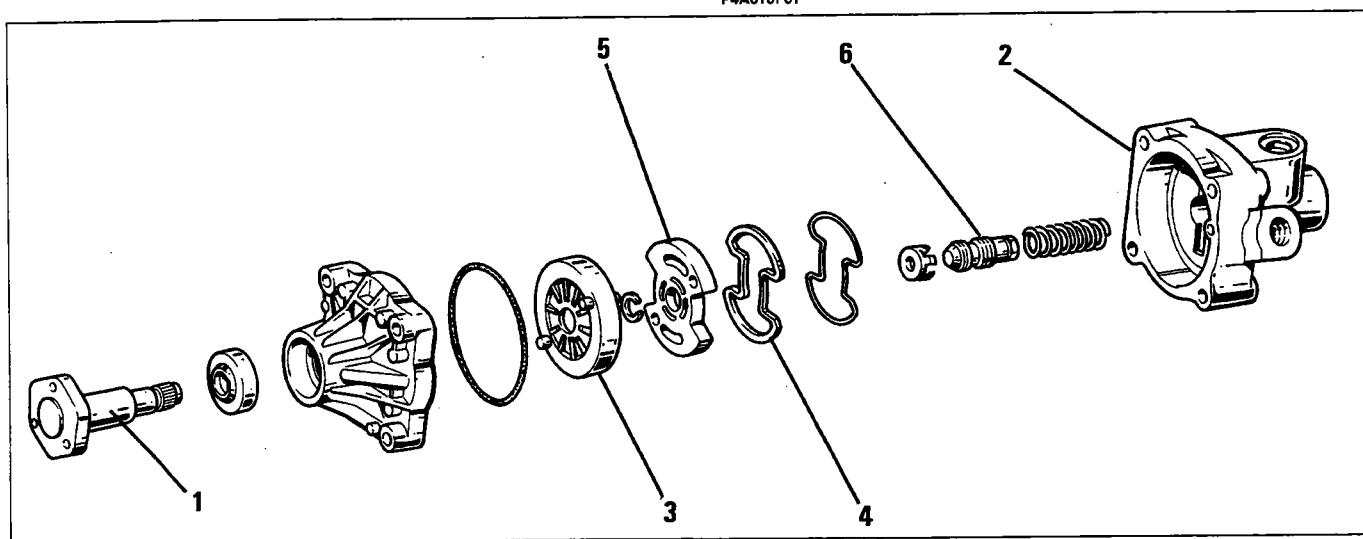
- a feed reservoir located in the engine compartment;
- a vane pump driven by the engine, with flow regulating and pressure relief valve;
- a set of connecting pipes between pump-distributor valve-actuating cylinder-reservoir;
- a hydraulic rack-and-pinion steering gear.



Components of the power steering system

1. Pump
2. Fluid delivery pipe to pump
3. Fluid reservoir
4. Fluid return pipe to reservoir
5. Power-assisted steering gear
6. Pressurized fluid delivery pipe

P4A010F01



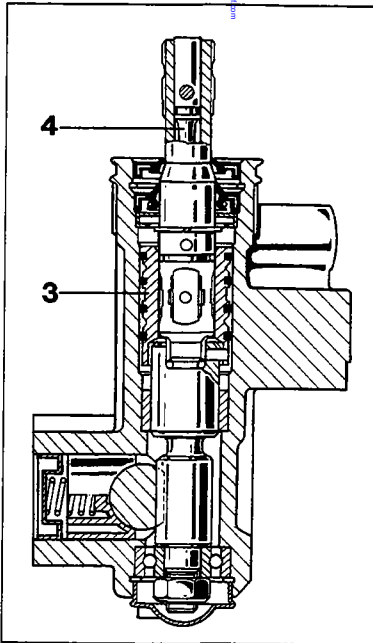
P4A010F02

1. Drive shaft
2. Pump body

3. Vane impeller
4. Seal

5. Impeller side plate
6. Regulating valve

41.



P4A011F01

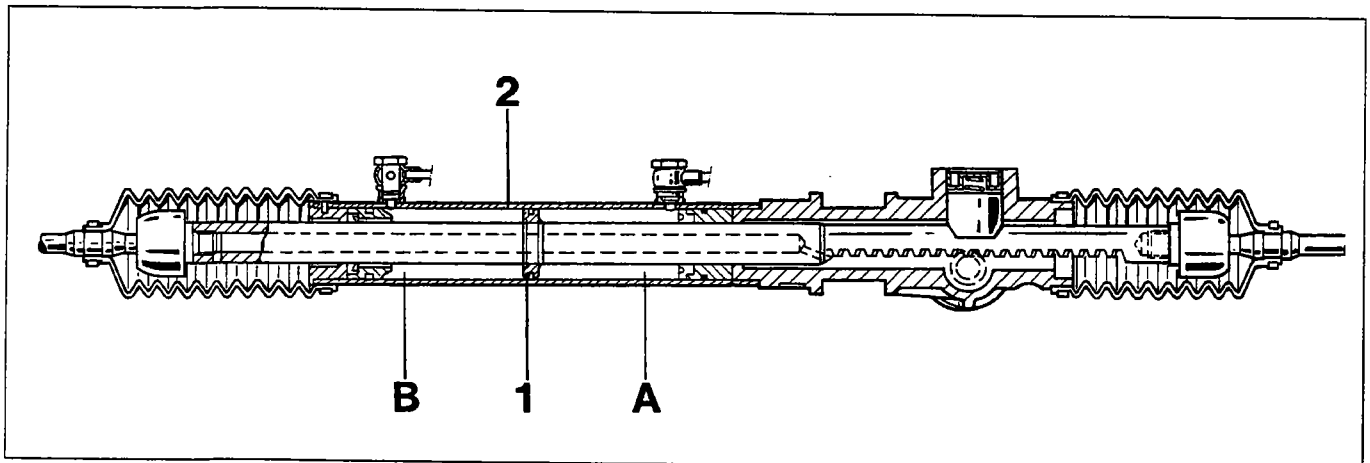


Power steering distributor valve

The power steering pump is driven by the engine by a belt, and can supply a feed pressure varying from 3.5 bar in the "neutral" position to a maximum of 85 bar in the "full lock" position. The power-assisted steering assembly is similar to a mechanical steering gear, except for the following differences:

- the steering gear contains an actuating cylinder (2) in which a double-effect piston (1) slides, joined to the rack;
- in the seating of the worm screw, there is a distributor valve (3) with its pipes. It is controlled by a torsion device (4), located at the end of the worm screw.

Depending on the torsion transmitted by the steering wheel to the device, the fluid is sent from the pump to the reservoir, or to one of the two chambers A or B of the actuating cylinder. The force generated by the fluid pressure on the lateral surface of the piston causes the piston, and hence the rack, to move.



P4A011F02

Longitudinal section of power-assisted rack and pinion steering gear

Checking operation

Check the steering wheel's rolling torque with the car stopped and the engine running. The torque should be between 0.6 daN with the engine idling and 0.75 daN with the engine at maximum rpm. If it exceeds these values, check the system pressure with the wheels at full lock. To do this, fit a pressure gauge, with a T connector, on the pressurized fluid delivery pipe to the power steering gear (from the pump) and turn the steering wheel to full lock on one side. When the steering wheel is forced to rotate further, the pressure reading on the pressure gauge should rise to about 85 bar. If this does not happen, check whether there is a fault in the power steering fluid pump or distributor valve.

The above check should be conducted with the engine running at 2000 - 4000 rpm.

NOTE Under no circumstances should the power steering assembly and vane pump be dismantled into their components; instead they should be returned to the manufacturer for overhaul.

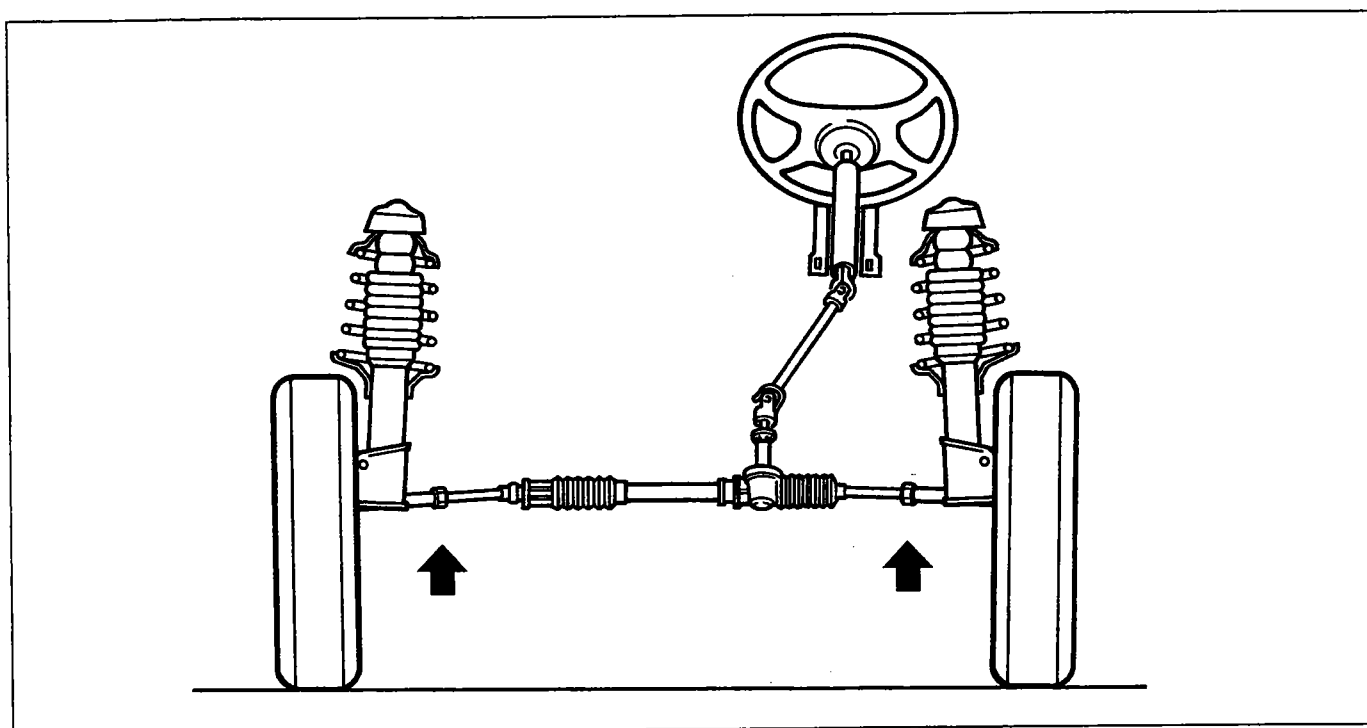
Checking fluid level: the fluid level should be checked with the engine running, and it should be topped up as necessary.



The power-assisted steering system is self-bleeding; it is bled by turning the steering wheel full lock to the right and left with the engine running and the car stopped. This procedure should be carried out whenever the connecting pipes are removed and refitted.

NOTE *If the steering becomes hard, this may be due to slipping of the pump pulley belt, or to a low fluid level.
 If there is a fault in the pump, actuating cylinder or distributor valve, the power steering will function as an ordinary mechanical steering gear.*

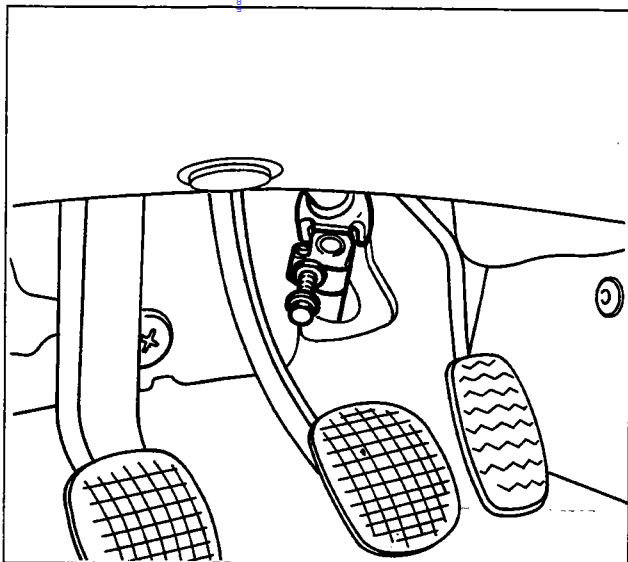
FRONT WHEEL TOE-IN



F4A012F01

On both versions with mechanical steering gear and versions with power-assisted steering, the front wheel toe-in is adjusted by slackening the nut locking the tie-rod and screwing or unscrewing the tie-rod until the specified toe-in value is obtained, without changing the positions of the steering wheel spokes.

41.



P4A003F01



RACK-AND-PINION POWER STEERING GEAR



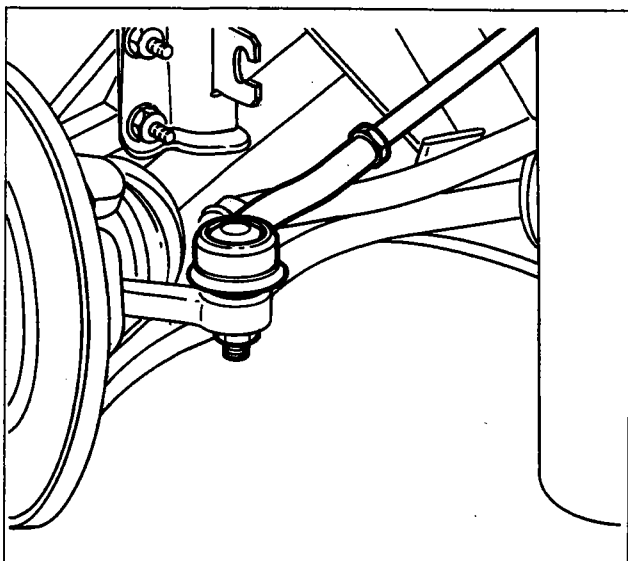
Removing-refitting

Before removing the power steering gear, drain the fluid from the reservoir.

NOTE *The old fluid should not be reused. Top up the level with fresh fluid.*

To remove the rack-and-pinion power steering gear, proceed as follows:

- remove the bolt securing the shaft to the power steering pinion.

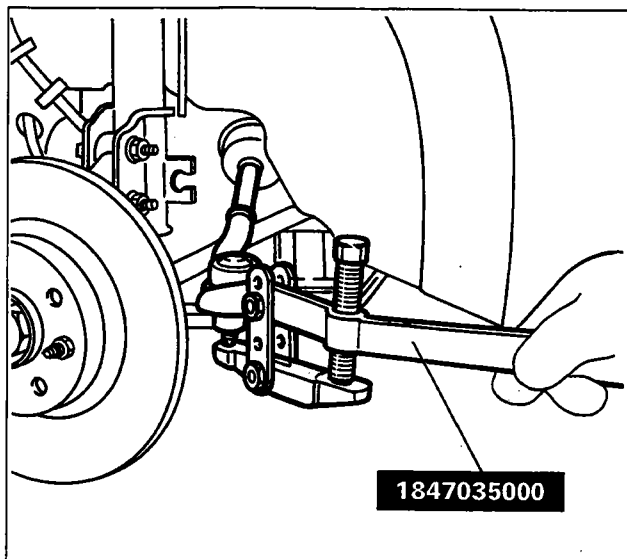


P4A005F02



Raise the vehicle, remove the front wheels, then working on both sides:

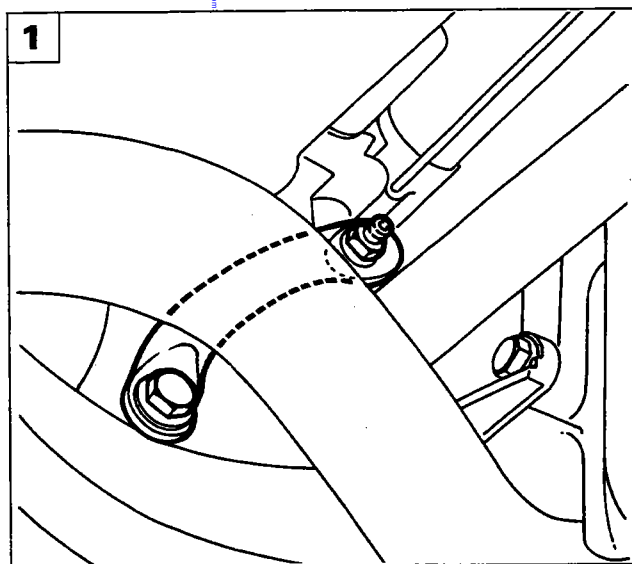
- undo the nuts securing the right and left tie-rods to the vertical links;



P4A005F03



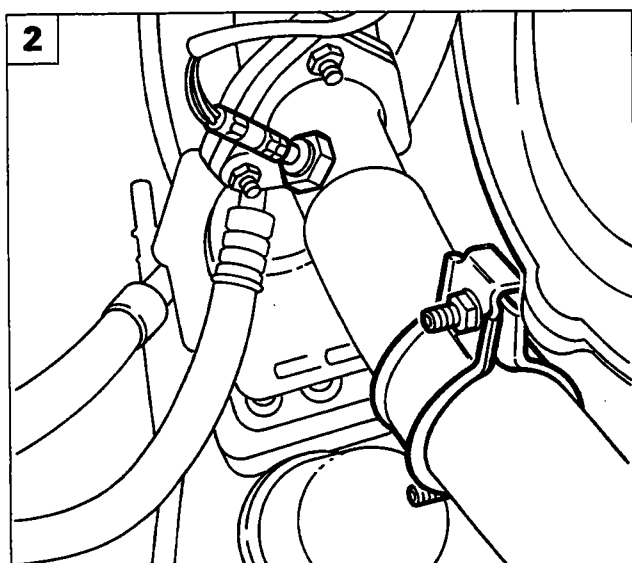
- using tool 1847035000 prise off the tie-rod end heads from the two vertical links;



P4A014F01

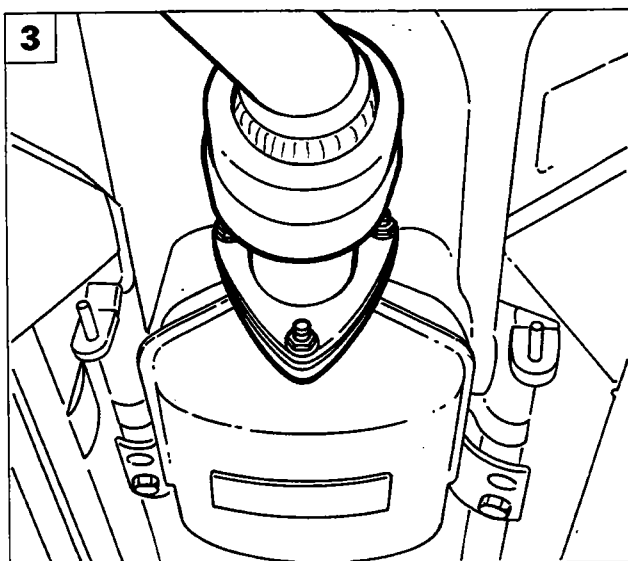


1. remove the reaction link of the power unit mounting bracket, differential side;



P4A014F02

2. disconnect the Lambda probe wiring connector; also undo the two nuts on the clamp securing the front exhaust pipe;



P4A014F04

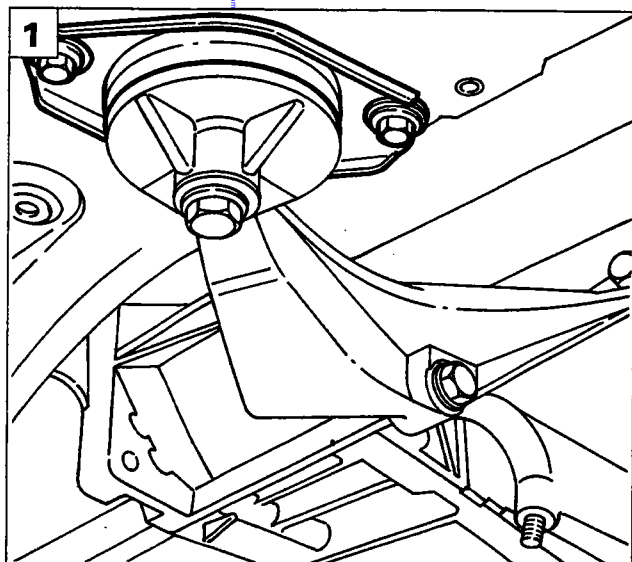
3. undo the nuts securing the front exhaust pipe to the catalytic converter and remove the pipe;

Steering

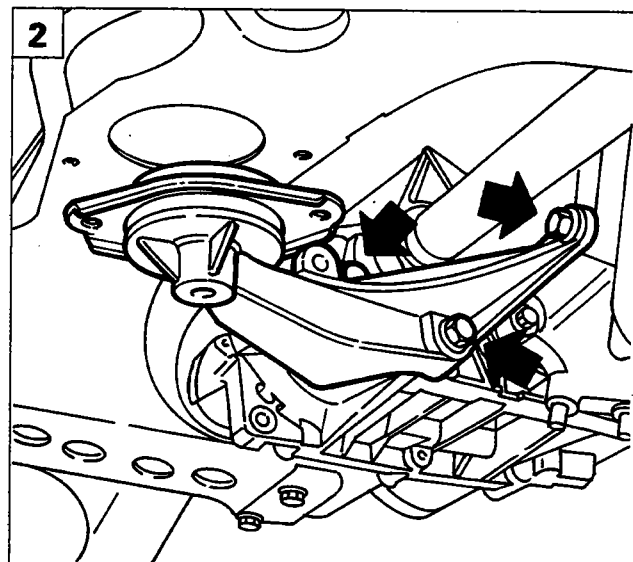
Power-assisted steering gear

Bravo-Brava

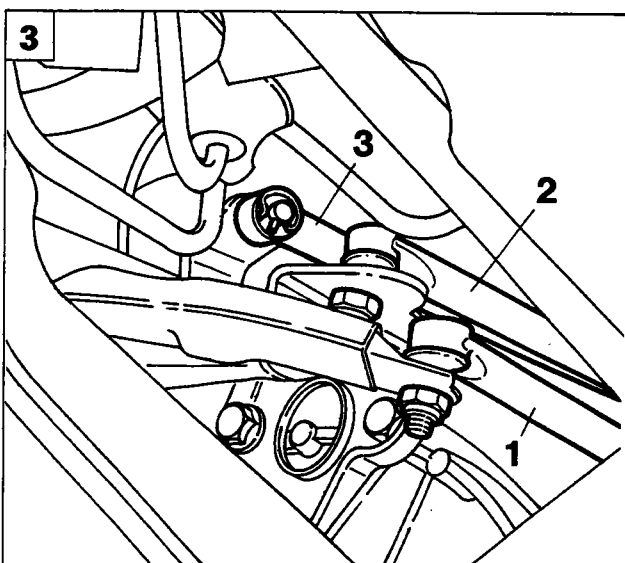
41.



P4A015F01



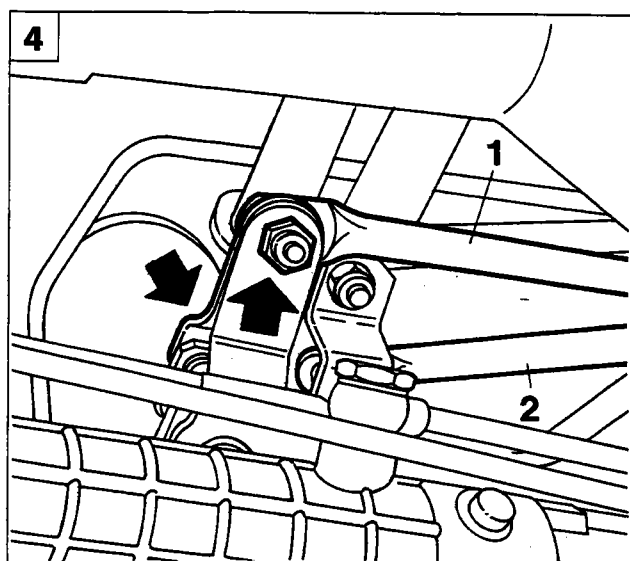
P4A015F02



P4A015F03

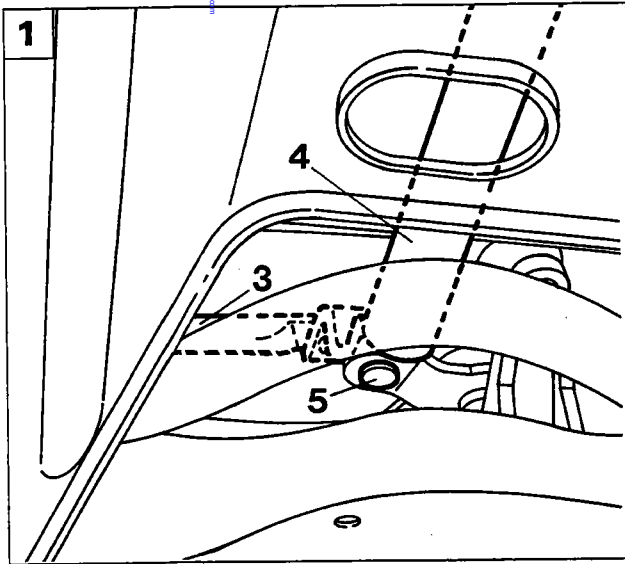


1. undo the bolts securing the power unit mounting, differential side, to the body shell;
2. undo the bolts securing the power unit mounting bracket to the gearbox;
3. undo the nuts securing the gear engagement lever rod (1) and the reaction rod (2); remove the split pin securing the gear selector lever rod (3), then release the rods from their respective seatings;

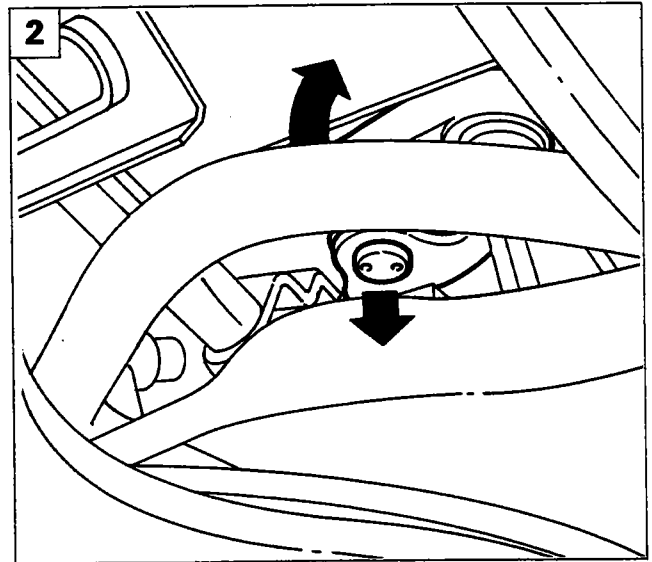


P4A015F04

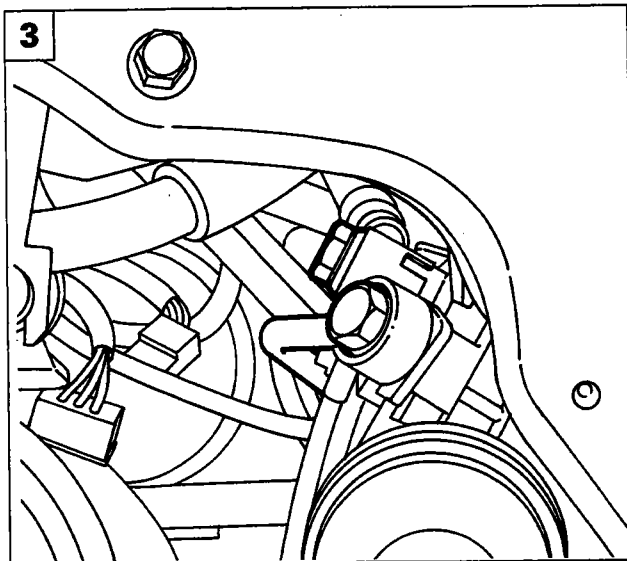
4. undo the nuts (arrowed), then lift and move to the left the top of the relay mounting with the gear engagement lever rod (1) and reaction rod (2);



P4A016F01



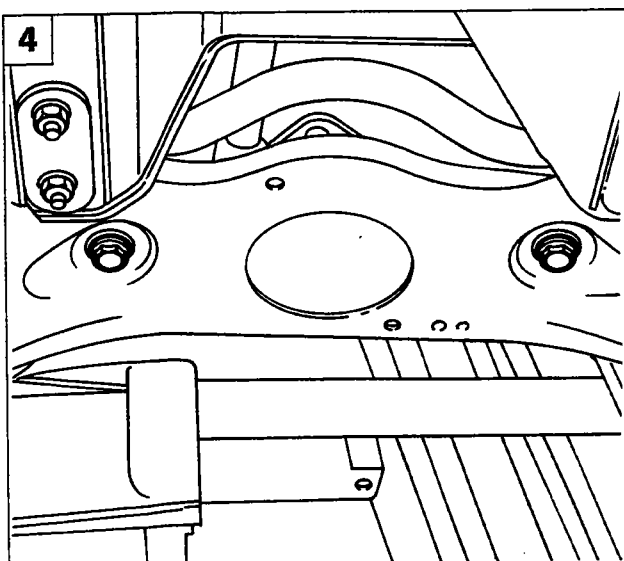
P4A016F02



P4A016F03



1. prise off the head (5) securing the gearchange lever (4) to the relay mounting and move to the left the gearchange lever with the gear selector lever rod (3);
2. rotate backwards the pin securing the relay mounting and withdraw the mounting downwards;
3. undo the bolts securing the fluid delivery and return pipes to the power-assisted steering gear;



P4A016F04

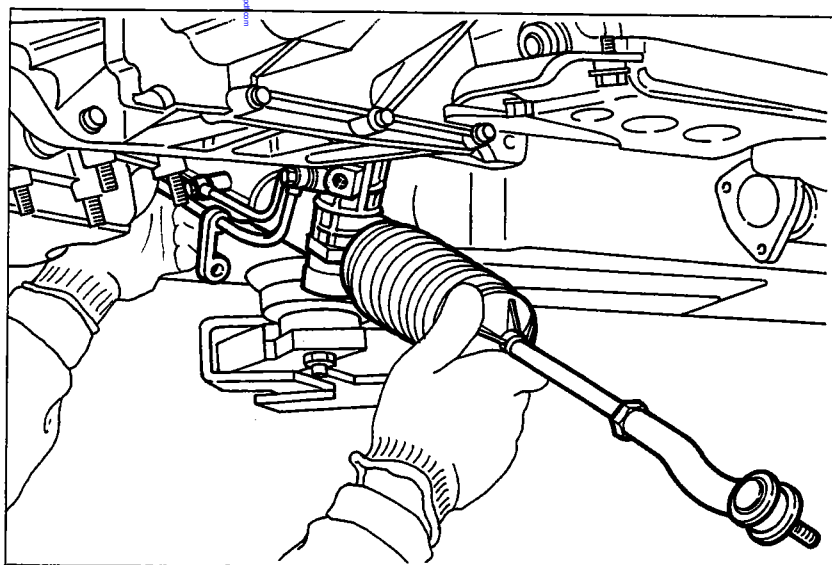
4. undo the bolts securing the power steering gear to the steering subframe;

Steering

Power-assisted steering gear

Bravo-Brava

41.



P4A017F01

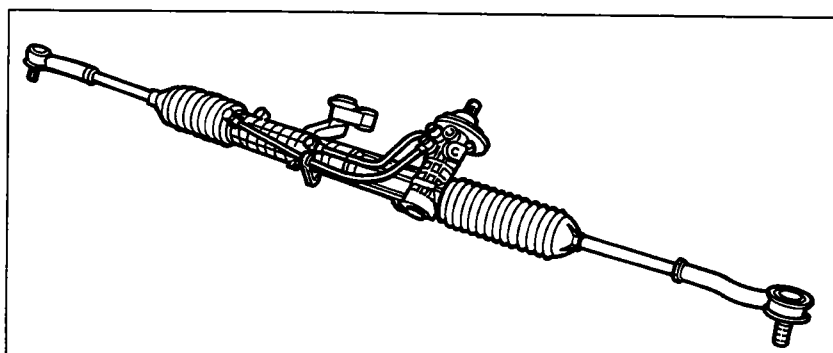


- withdraw the power steering gear from underneath the vehicle.

NOTE To refit the power steering gear, reverse the procedure for removal.

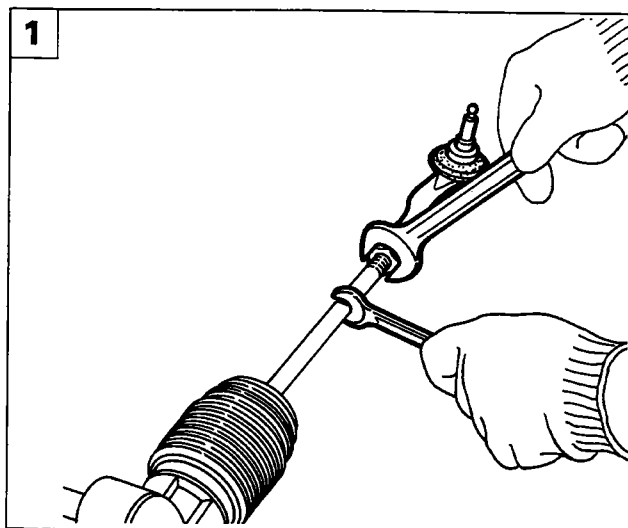


Check the front wheel toe-in whenever the steering gear is removed-refitted.



P4A017F02

Power assisted rack-and-pinion steering gear



P4A007F03

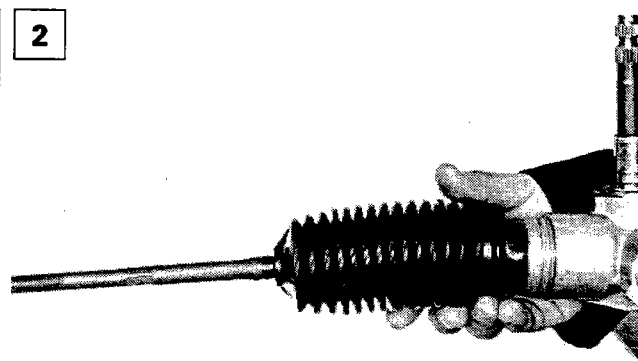
Dismantling-refitting

1. slacken the nut locking the tie-rod then unscrew the tie-rod until you can remove it;

NOTE Check that there is no stiffness or excessive play on the balljoints.



2



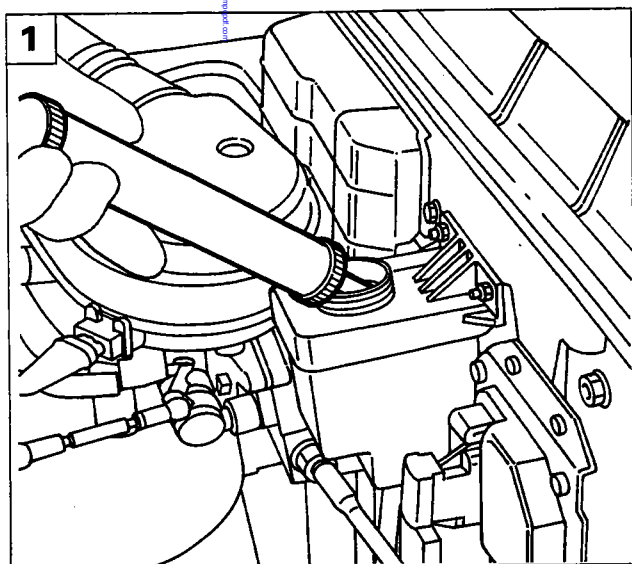
P4A007F04

2. undo the clamps on the dust gaiter and lubricating seal, and remove the gaiter.

NOTE Thoroughly check the gaiter for holes or tears, and if necessary replace it.



Before fitting the last gaiter (pinion side), insert the specified quantity of grease.



P4A018F01

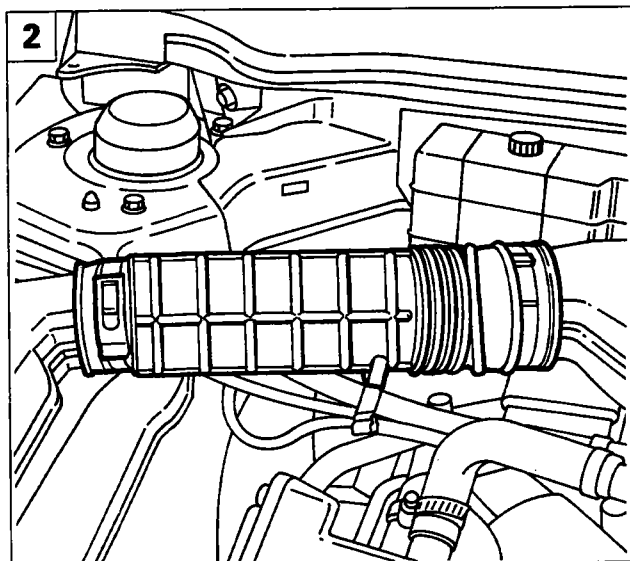


Removing-refitting

To remove the power steering pump, proceed as follows:

1. empty the fluid reservoir using a syringe;

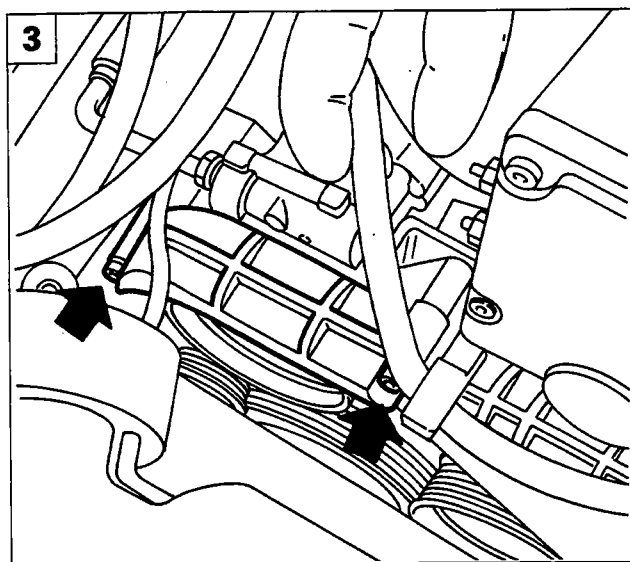
NOTE *The old fluid should not be reused. Top up the level with fresh fluid.*



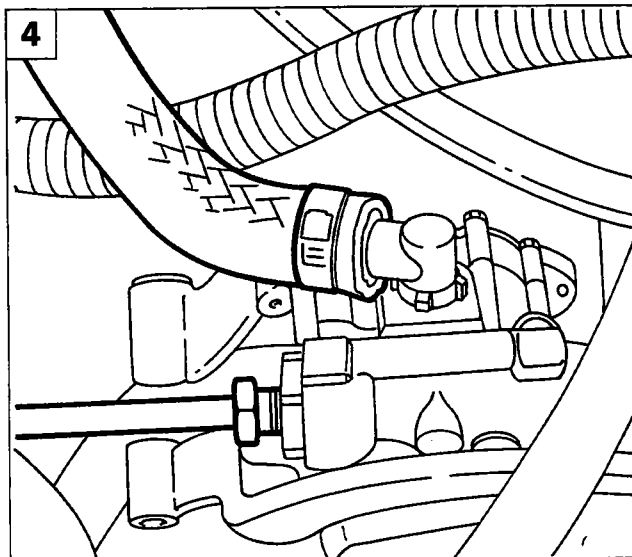
P4A018F02



2. undo the clamps and remove the air intake pipe;
3. undo the bolts indicated and remove the belt guard;
4. disconnect the fluid inlet and outlet pipes from the power steering pump.

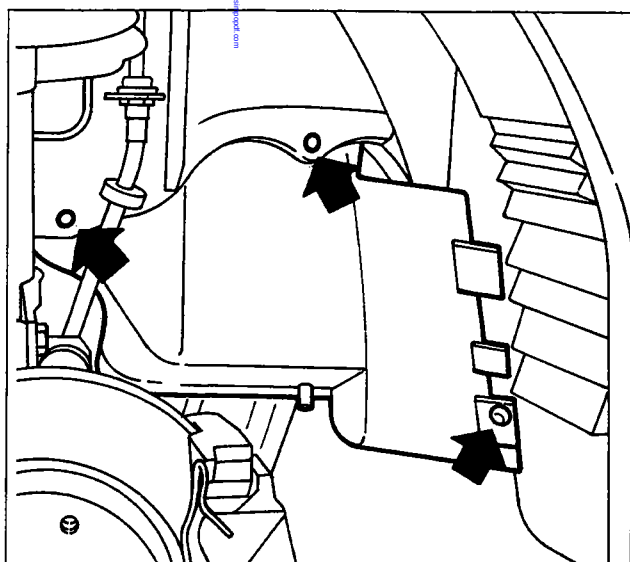


P4A018F03



P4A018F04

41.

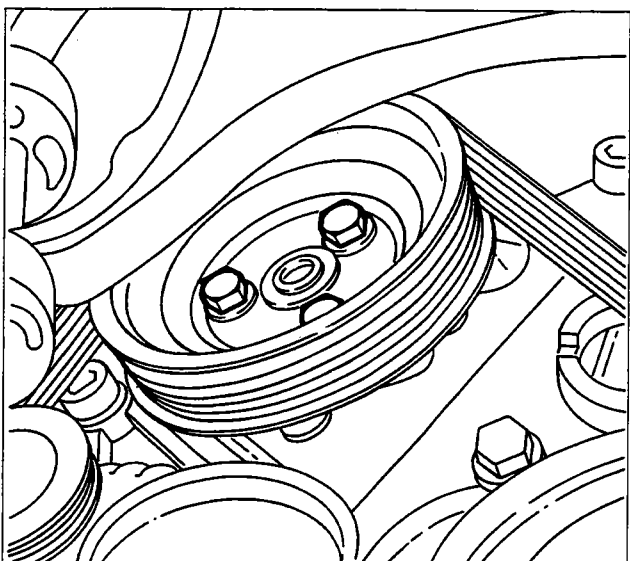


P4A019F01



Place the vehicle on ramps, remove the front wheel, then:

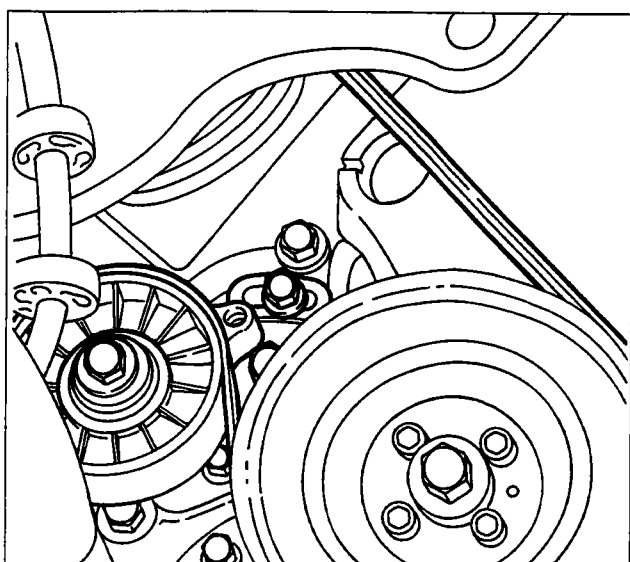
- undo the bolts, release the button and remove the right wheelarch cover;



P4A019F02



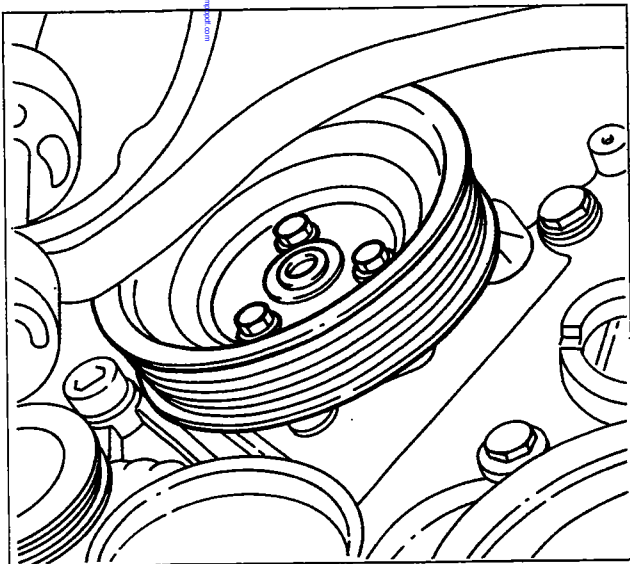
- slacken the pump pulley bolts;



P4A019F03



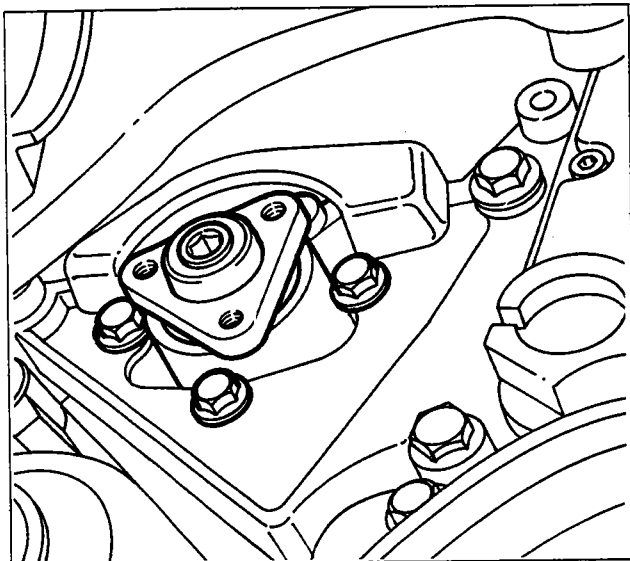
- slacken the belt tensioner and remove the belt;



P4A020F01



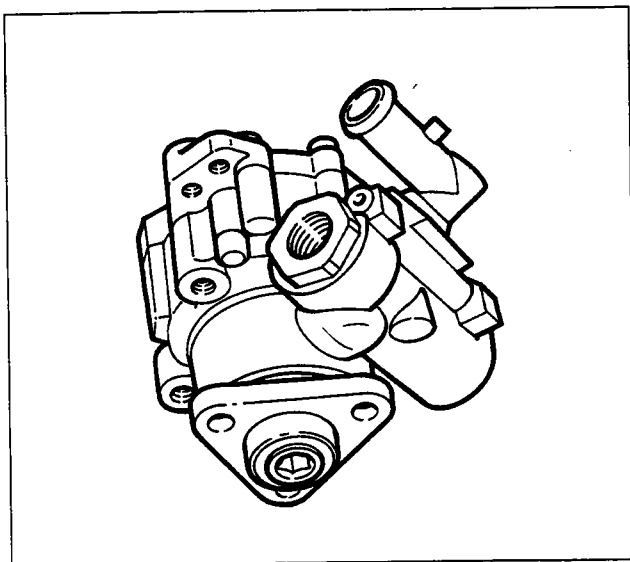
- undo the bolts and remove the pulley;



P4A020F02



- undo the bolts securing the pump to the bracket and remove the pump.

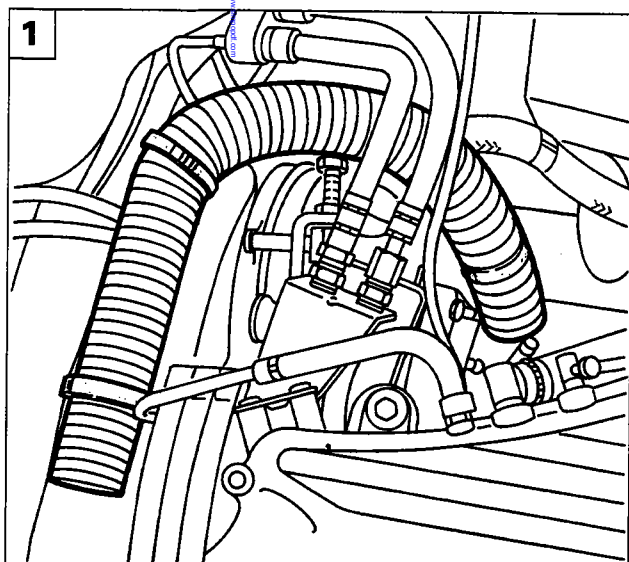


P4A020F03



NOTE To refit the power steering pump, reverse the procedure for removal.

41.



P4A021 F01



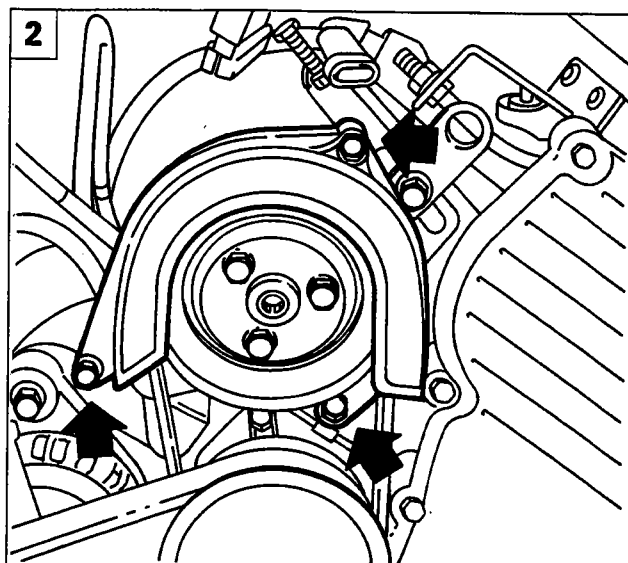
Removing-refitting

Before removing the power steering pump, drain the fluid from the reservoir.

NOTE *The old fluid should not be reused. Top up the level with fresh fluid.*

To remove the power steering pump, proceed as follows:

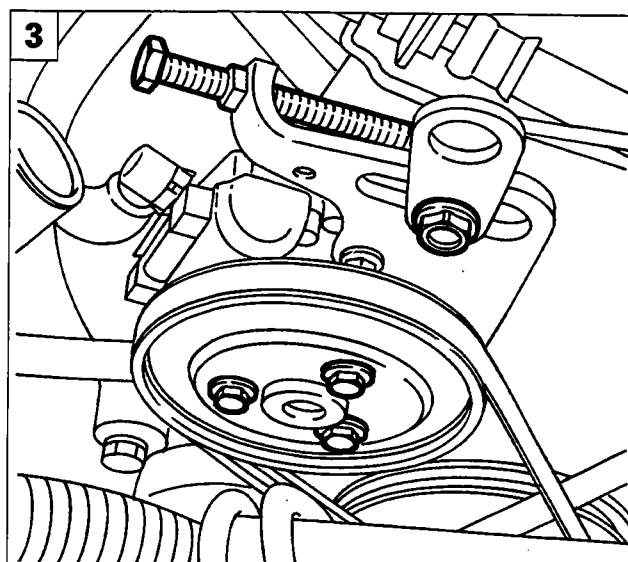
1. remove the alternator cooling pipe;



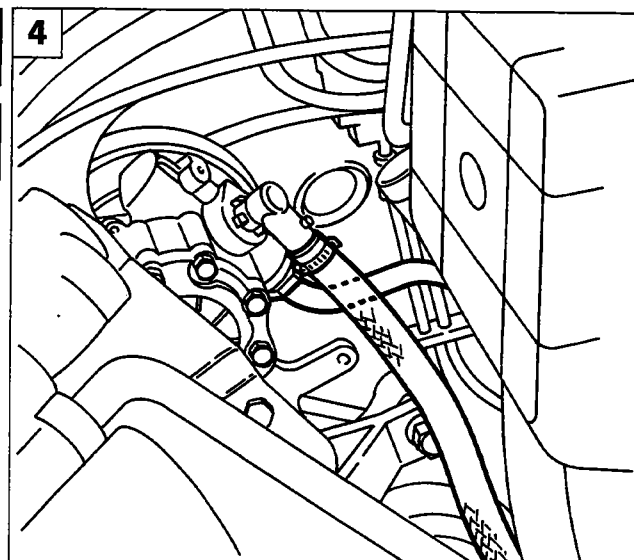
P4A021 F02



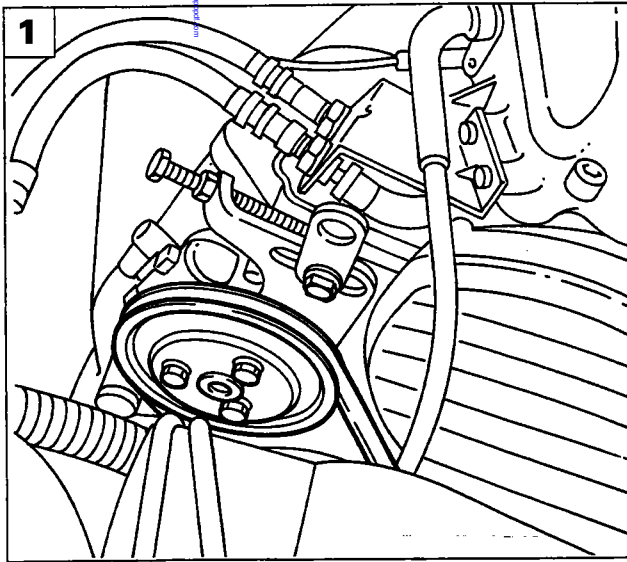
2. undo the three bolts (arrowed) and remove the plastic guard;
3. undo the pulley bolts and belt tensioner bolts;
4. disconnect the fluid inlet and outlet pipes from the power steering pump;



P4A021 F03



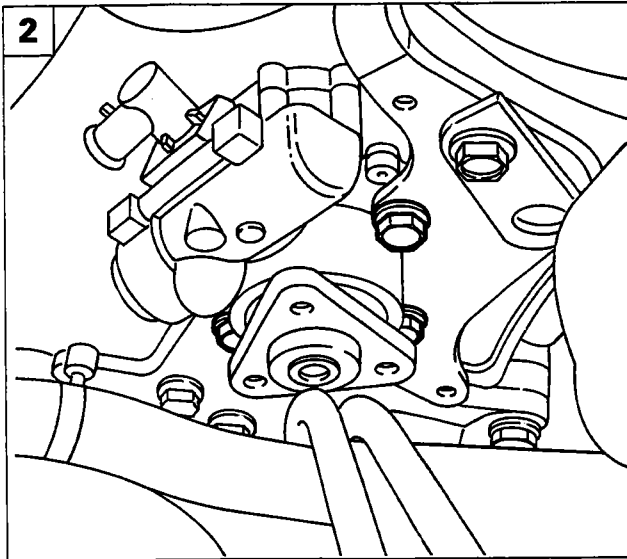
P4A021 F04



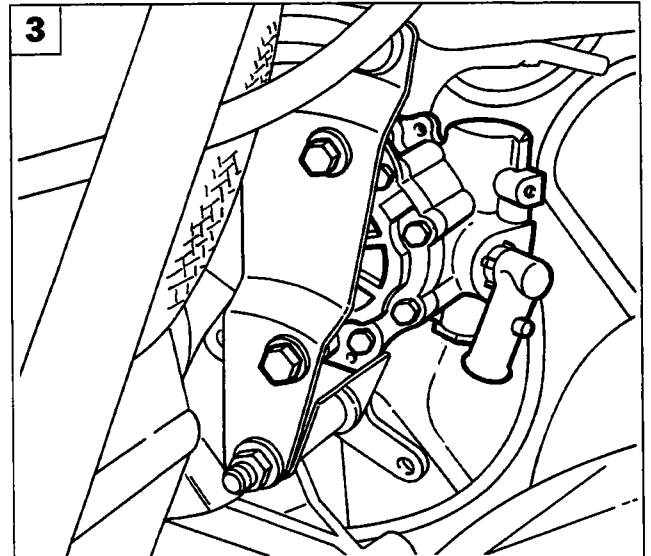
P4A022F01



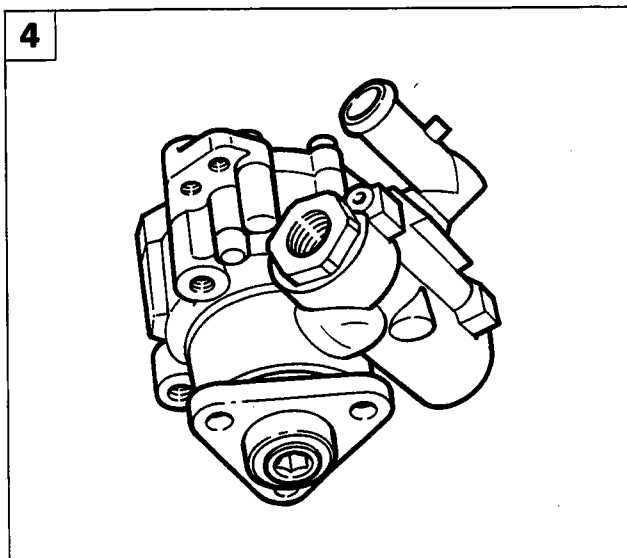
1. undo the bolts and remove the pulley and belt;



P4A022F02



P4A022F03

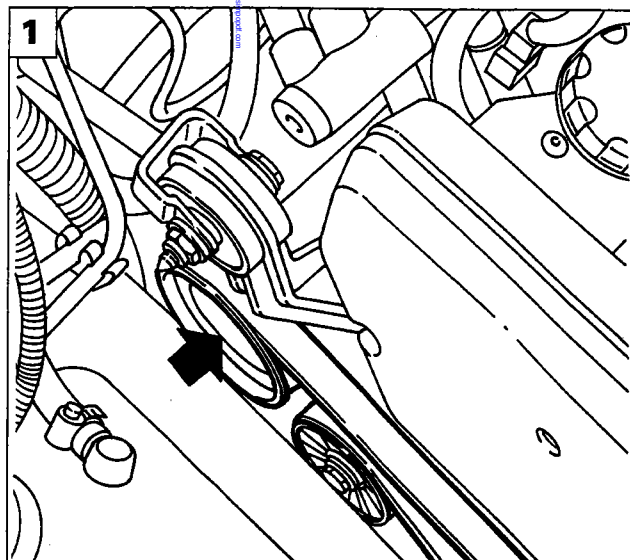


P4A020F03

2. undo the three front bolts securing the pump to the mounting;
3. undo the two rear bolts securing the pump to the mounting;
4. remove the power steering pump.

NOTE To refit the power steering pump, reverse the procedure for removal.

41.



P4A023F01



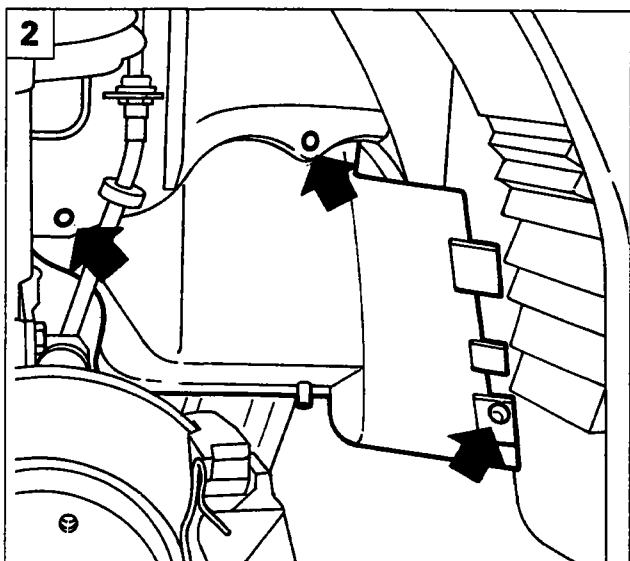
Removing-refitting

Before removing the power steering pump, drain the fluid from the reservoir.

NOTE *The old fluid should not be reused. Top up the level with fresh fluid.*

To remove the power steering pump, proceed as follows:

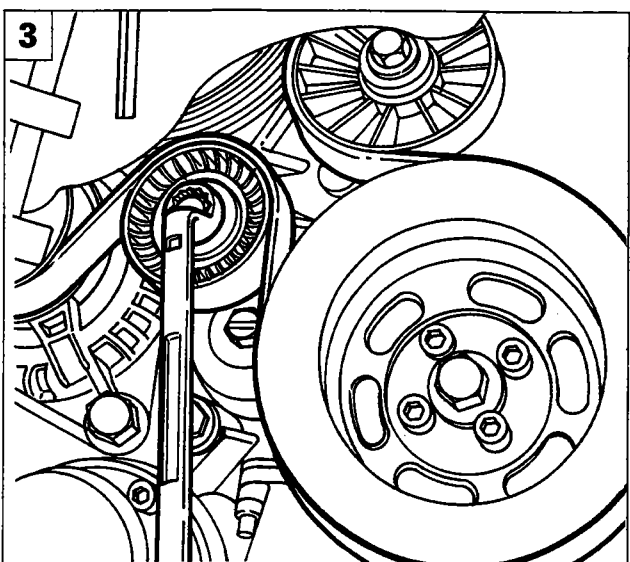
1. undo the pump pulley bolts;



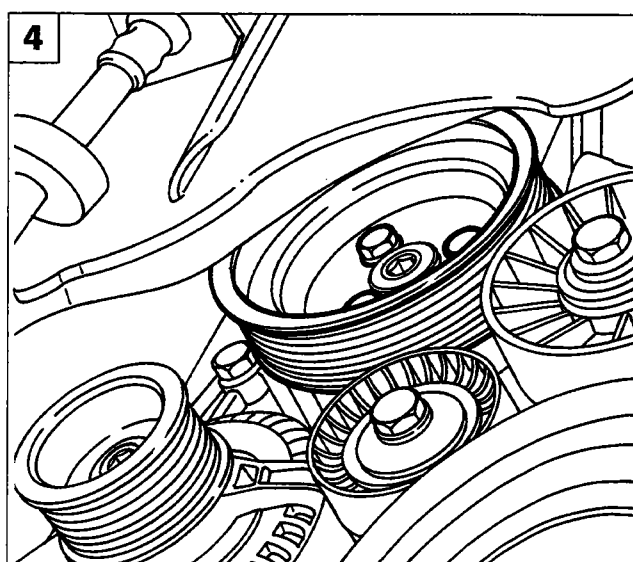
P4A019F01

Place the vehicle on ramps, remove the front right wheel, then:

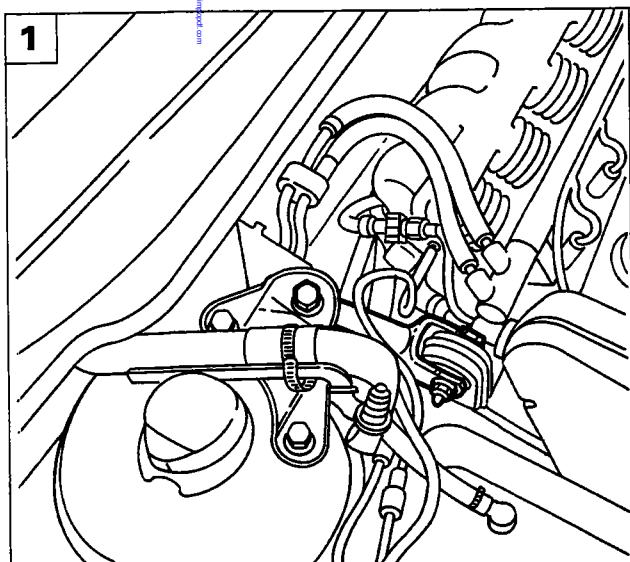
2. undo the bolts, release the button and remove the right wheelarch cover;
3. slacken the belt tensioner and remove the belt;
4. undo the bolts and remove the pulley.



P4A023F02



P4A023F03

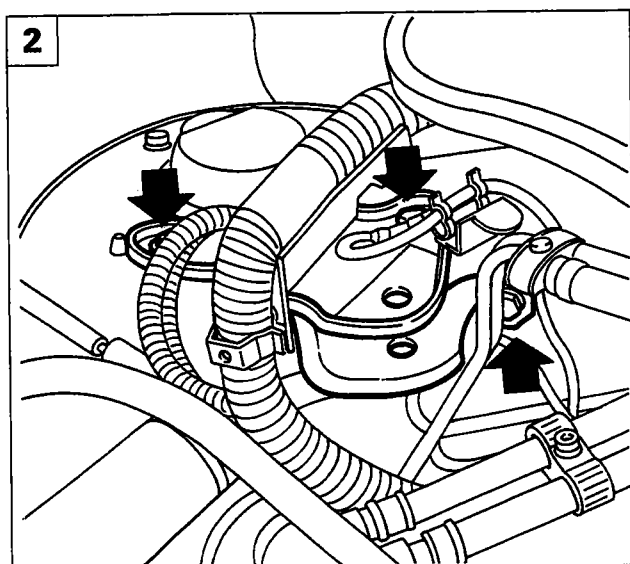


P4A024F01



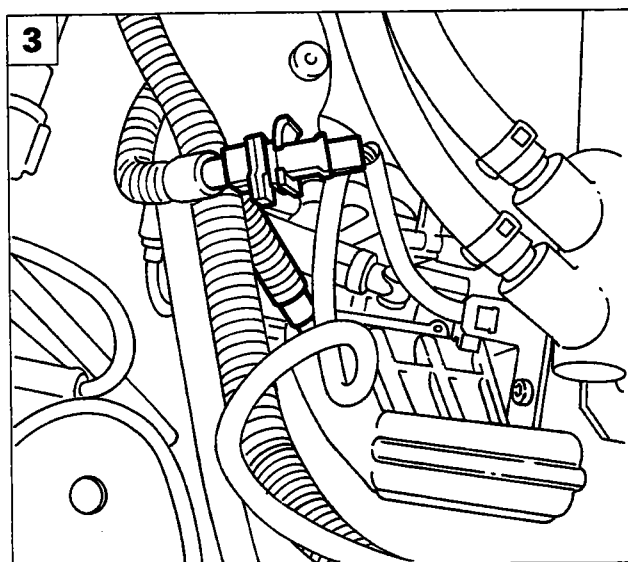
Working from the engine compartment, carry out the following operations:

1. undo the two bolts securing the link to the engine and the bracket, and remove the link;

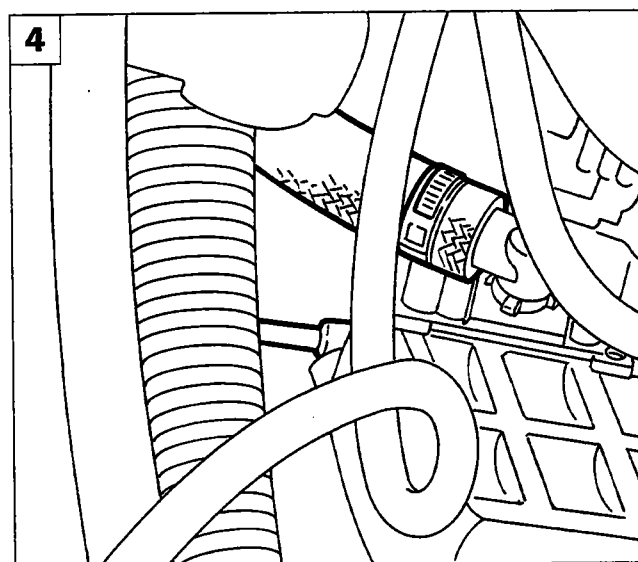


P4A024F02

2. undo the bolts securing the bracket and link to the bodywork and remove the bracket;
3. disconnect the wiring connector and earth cable;
4. disconnect the fluid inlet and outlet pipes from the power steering pump.

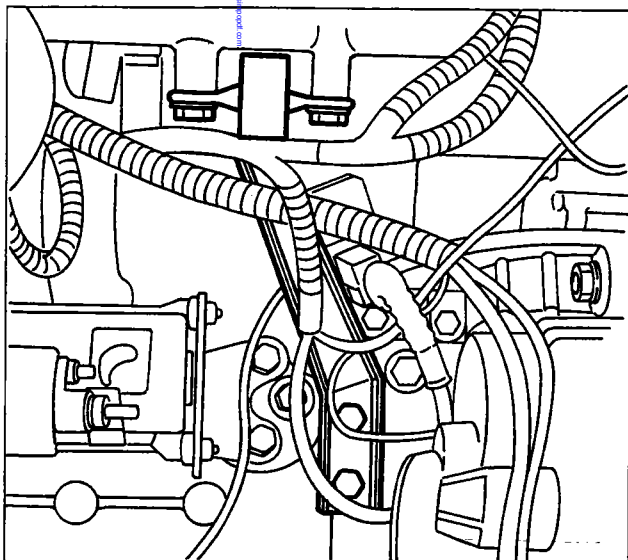


P4A024F03



P4A024F04

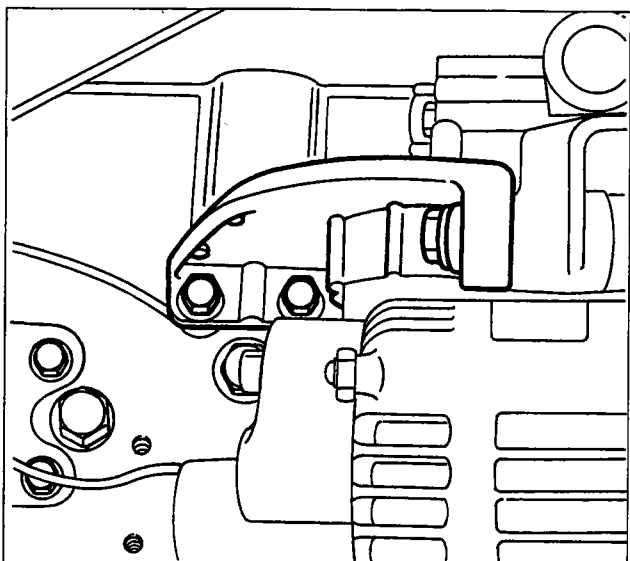
41.



P4A025F01

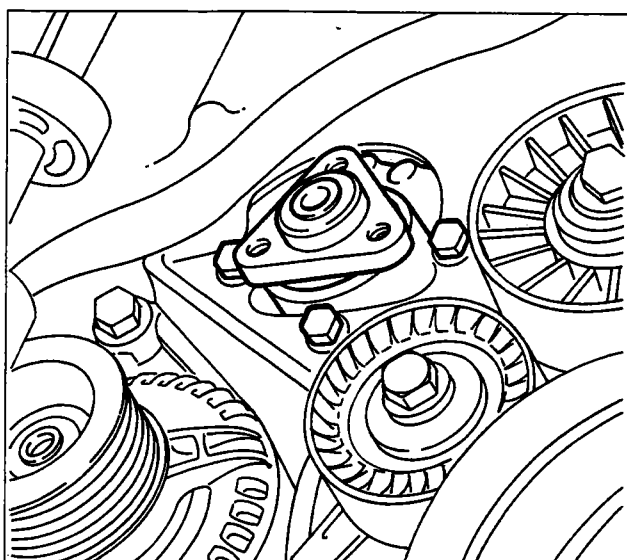
Raise the vehicle, then:

- from the rear, undo the bolts securing the inlet manifold reaction bracket and remove the bracket;



P4A025F02

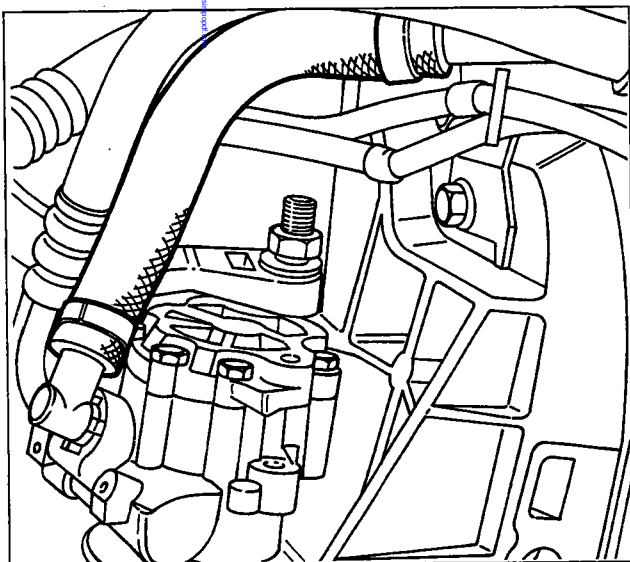
- undo the bolts securing the alternator mounting bracket and remove the bracket;



P4A025F03

- undo the bolts securing the power steering pump and remove it.

NOTE To refit the power steering pump, reverse the procedure for removal.



P4A026F01



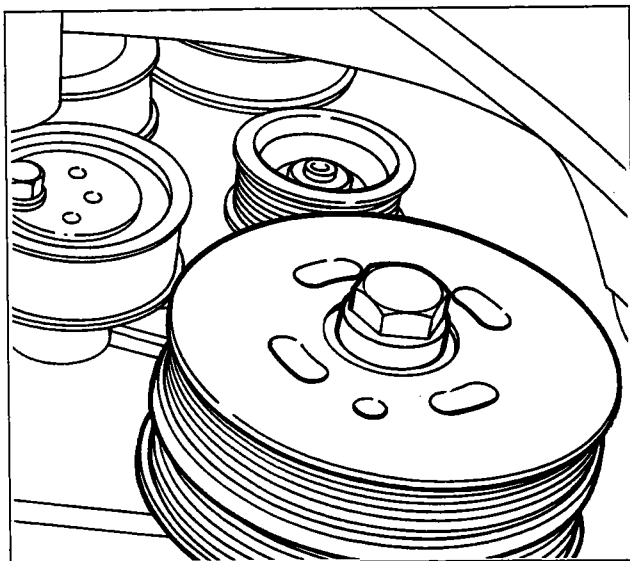
Removing-refitting

Before removing the power steering pump, drain the fluid from the reservoir.

NOTE *The old fluid should not be reused. Top up the level with fresh fluid.*

To remove the power steering pump, proceed as follows:

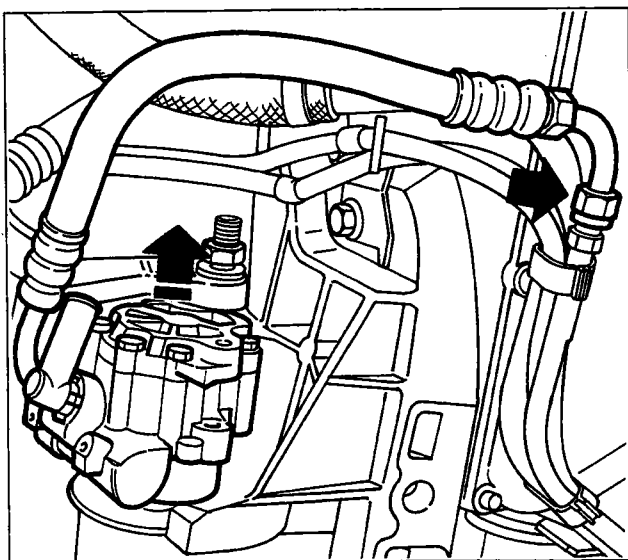
- disconnect the fluid inlet pipe from the power steering pump;



P4A026F02



- after slackening and removing the belts in accordance with the procedure described in Sec. 10, undo the bolt and remove the pulley from the power steering pump;



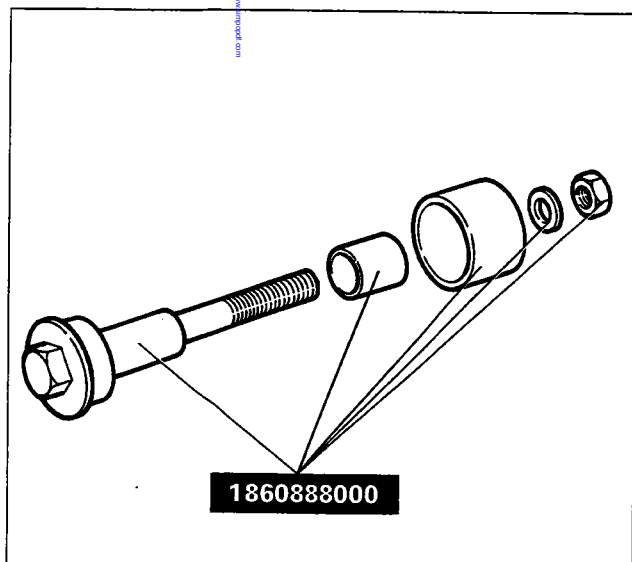
P4A026F03



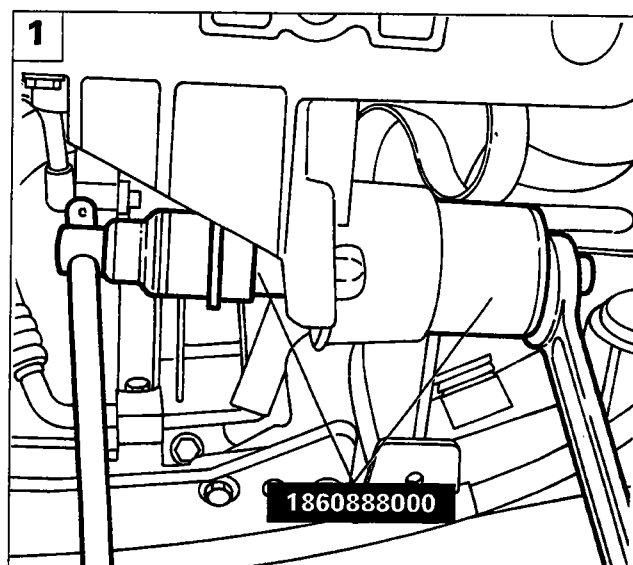
- unscrew the delivery pipe connector (arrowed), then withdraw the pump with the hose.

NOTE *To refit the power steering pump, reverse the procedure for removal, then refit and tension the belts as described in Sec. 10.*

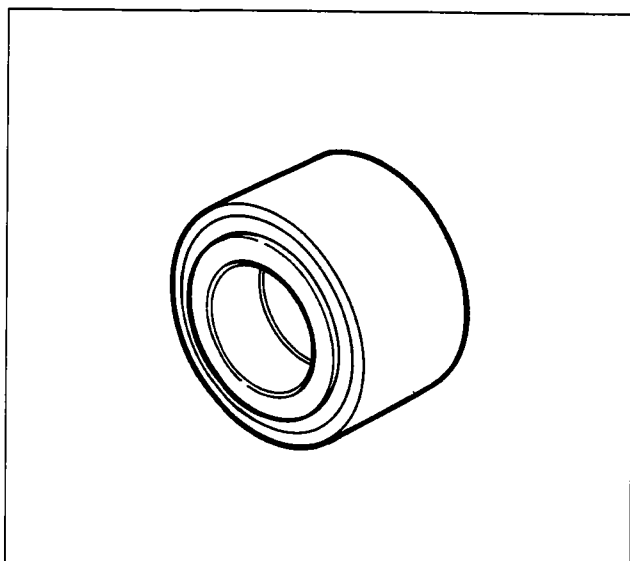
41.



P4A027F01



P4A027F02



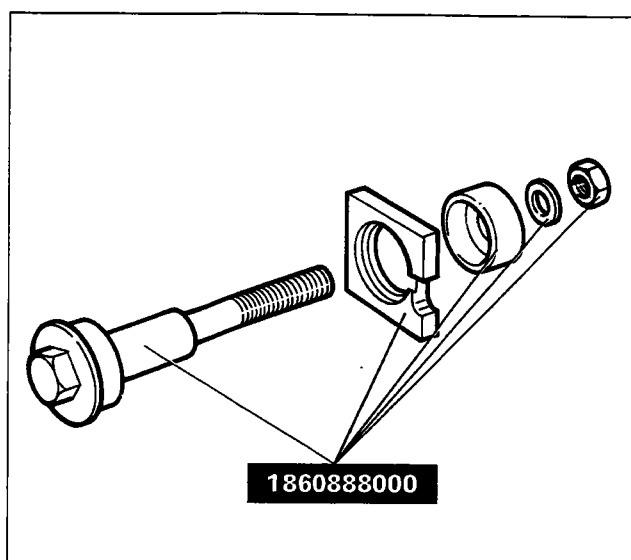
P4A027F03

Dismantling-reassembly power steering pump bearing

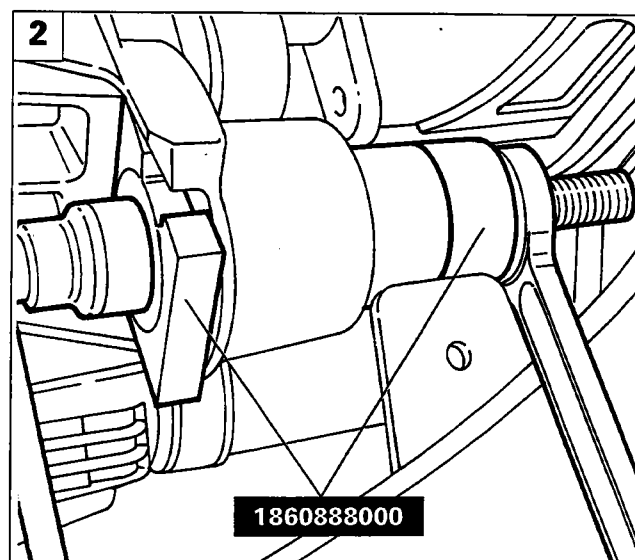
1. Remove the circlip and fit tool 1860888000 as shown in the figure, then tighten the nut until the bearing is fully withdrawn;
2. fit tool 1860888000 as shown in the figure, then tighten the nut until the bearing is fully inserted; refit the circlip.



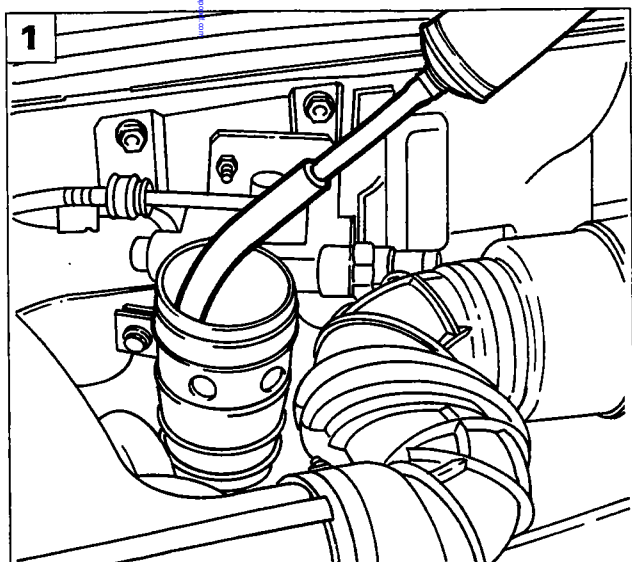
Lubricate the bearing and tools before final assembly.



P4A027F04



P4A027F05



P4A028F01

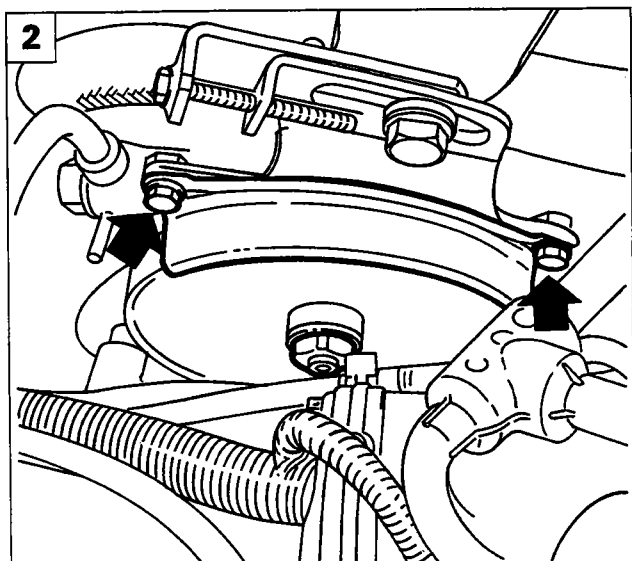


Removing-refitting

To remove the power steering pump, proceed as follows:

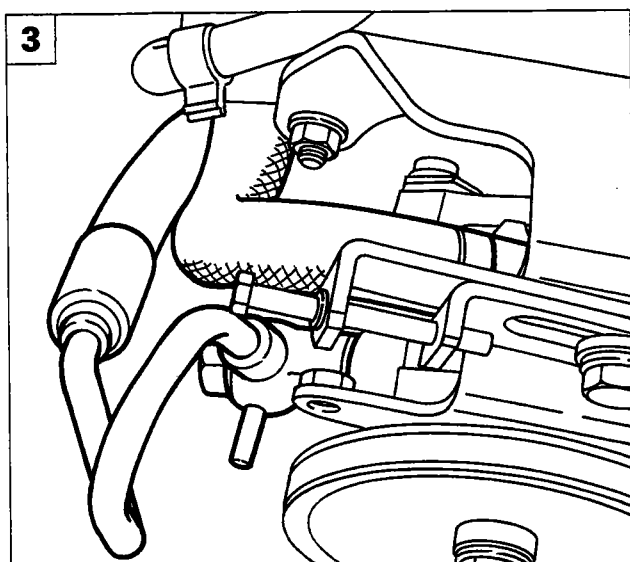
1. drain the fluid reservoir using a syringe;

NOTE *The old fluid should not be reused. Top up the level with fresh fluid.*

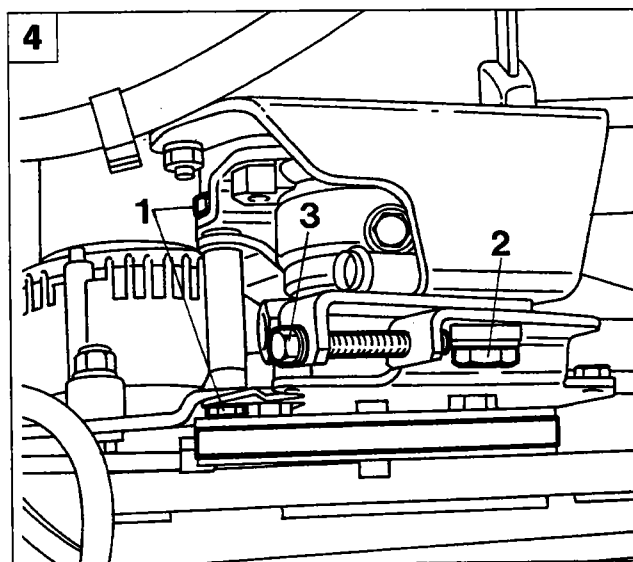


P4A028F02

2. undo the bolts (arrowed) and remove the belt guard; also undo the pulley nut;
3. disconnect the fluid inlet and outlet pipes from the power steering pump;
4. undo the bolts (1) and (2), screw up the belt tensioner (3) to reduce the belt tension, then remove the belt;

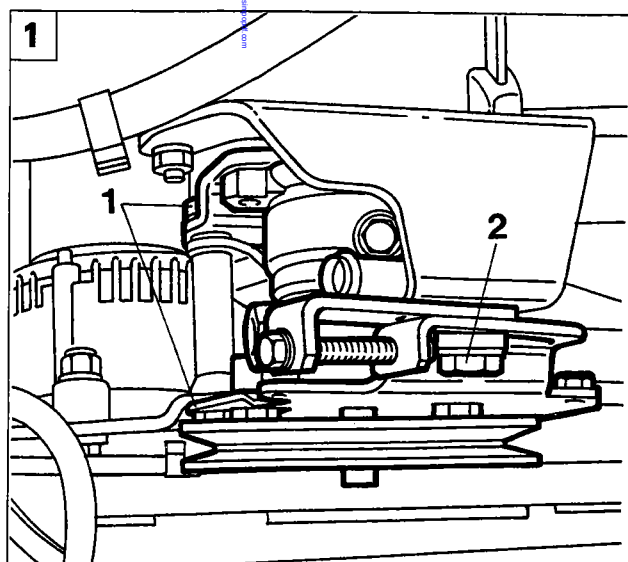


P4A028F03



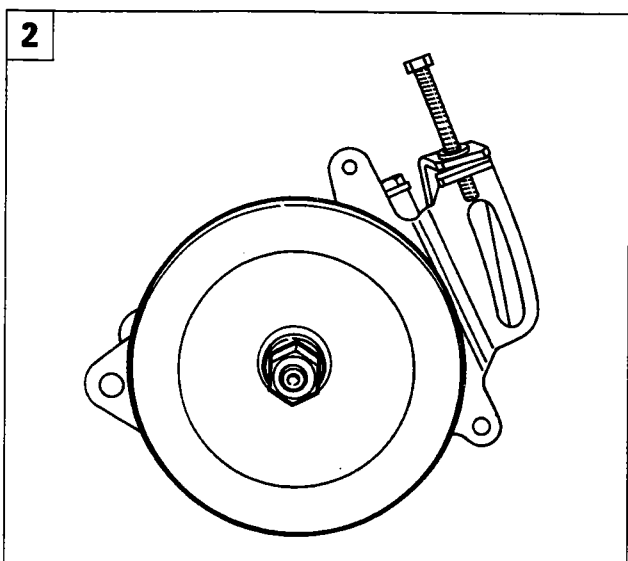
P4A028F04

41.



P4A029F01

1. remove the bolts (1) and (2), then remove the pump body complete with pulley and mounting brackets;



P4A029F02

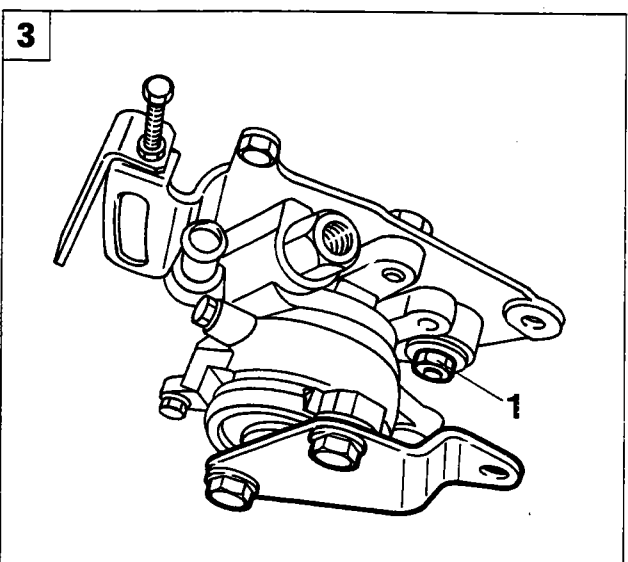
2. undo the nut and remove the pulley;



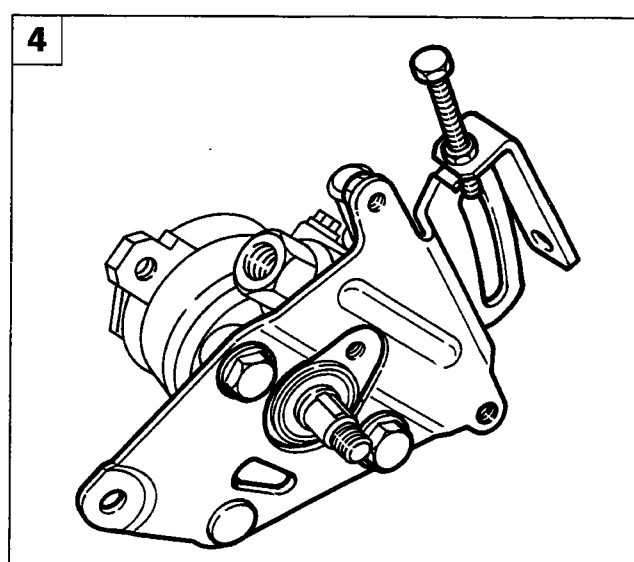
Be careful with the washer during both removal and refitting of the pulley.

3. undo the bolts indicated and remove the rear bracket; also undo the nut (1) on the front bracket;
4. undo the remaining bolts and remove the front bracket.

NOTE *To refit the power steering pump, reverse the procedure for removal.*



P4A029F03



P4A029F04

The documentation relating to this engine was not yet available at the time of going to print.

The procedure for removing and refitting the power steering pump will be published in a subsequent update.

41.

1910 TD ENGINE

The documentation relating to this engine was not yet available at the time of going to print.

The procedure for removing and refitting the power steering pump will be published in a subsequent update.

FRONT SUSPENSION

- Diagram of front suspension assembly	1
- Wishbone and steering subframe	2
- Spring-damper assembly	6
- Vertical link and wheel hub	8
- Components of the front suspension supplied as spare parts	14

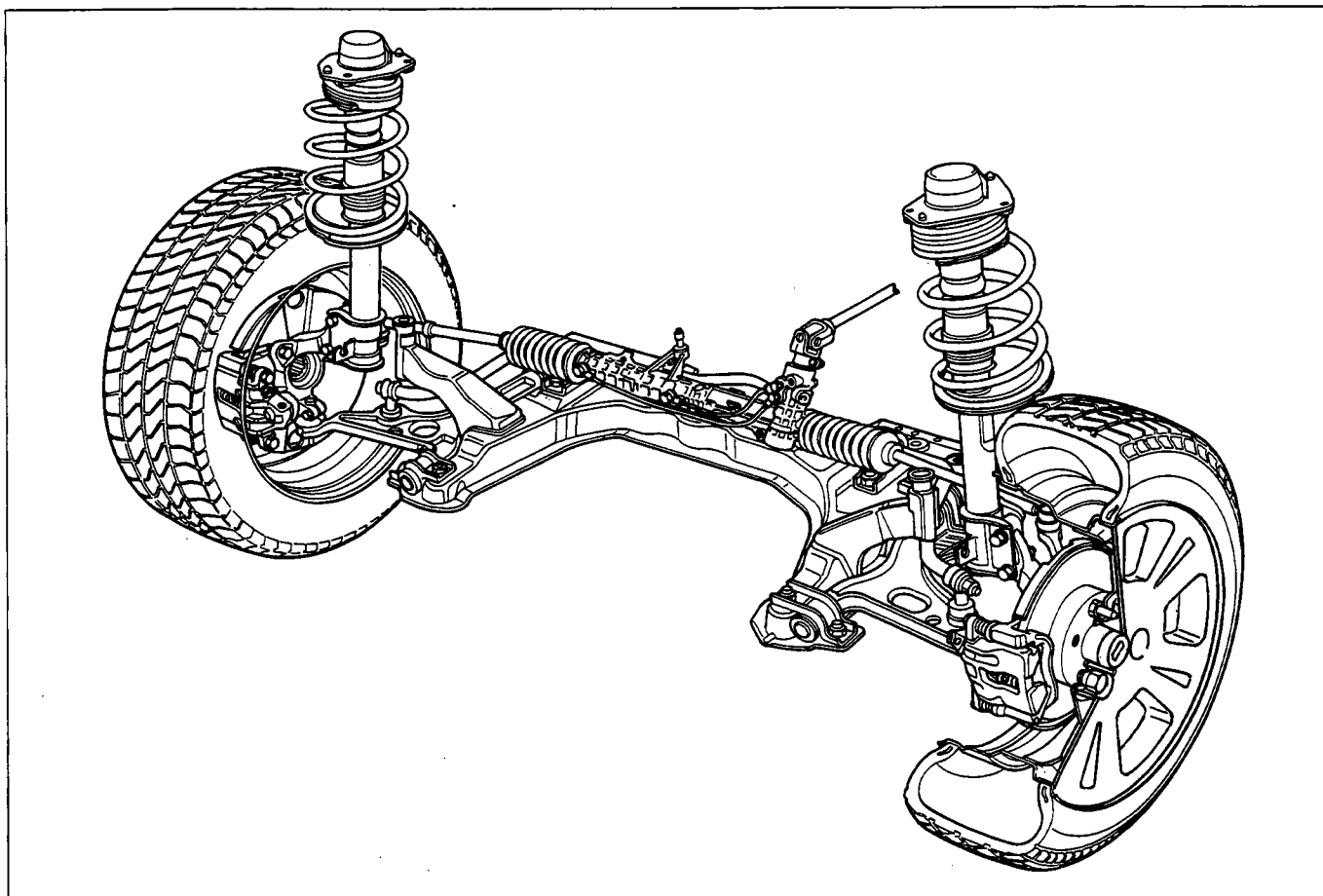
REAR SUSPENSION

- Diagram of rear suspension assembly	16
- Removing-refitting	17
- Dismantling-refitting	22
- Stub axle-Rear wheel hub	24
- Components of the rear suspension supplied as spare parts	28

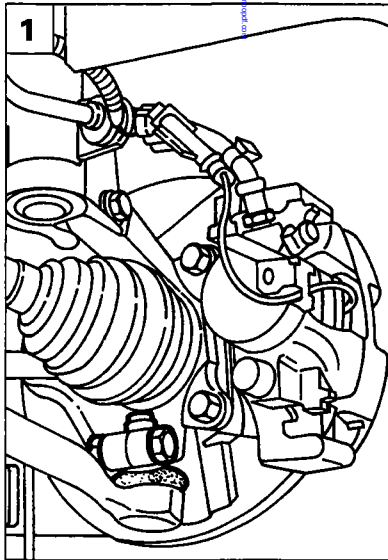
WHEEL GEOMETRY

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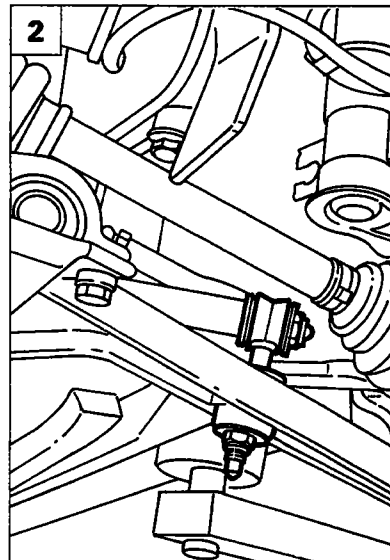
DIAGRAM OF FRONT SUSPENSION ASSEMBLY



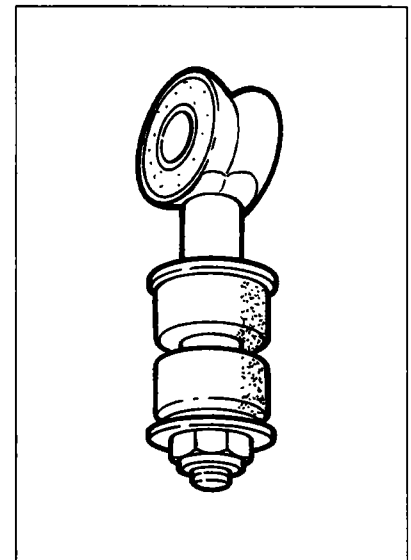
P4A001G01



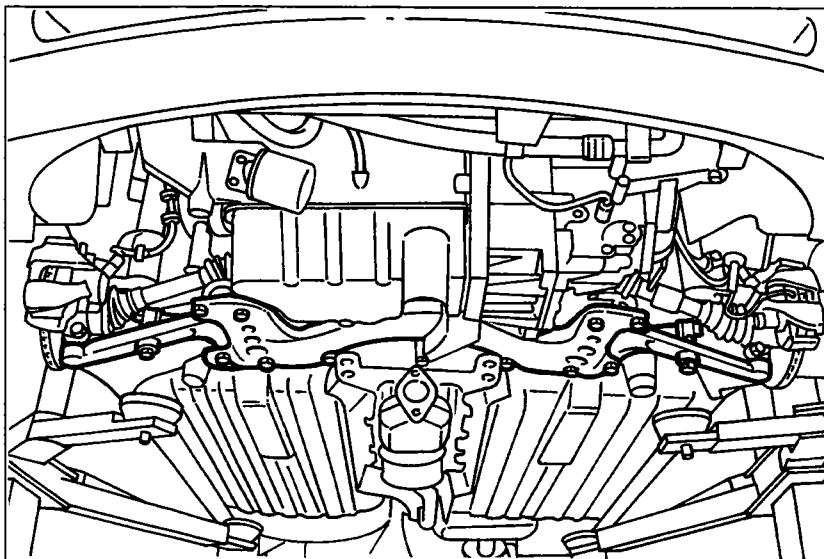
P4A002G02



P4A002G03



P4A002G04



P4A002G01

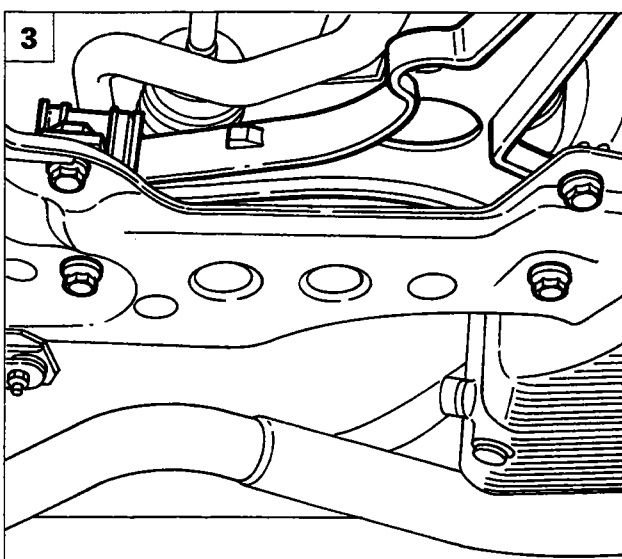


WISHBONE AND STEERING SUBFRAME

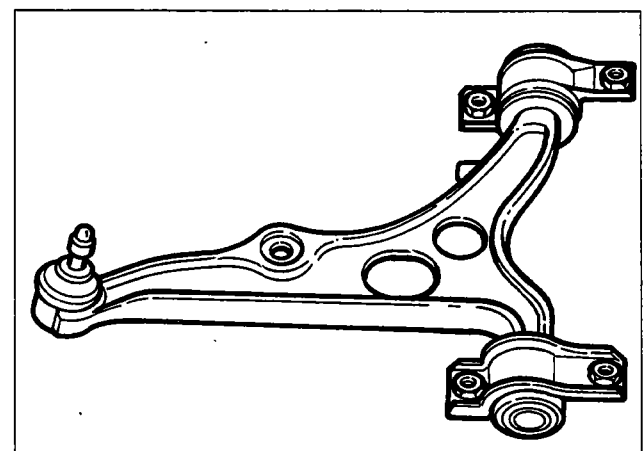
Removal

To remove the wishbone and the steering subframe, place the car on ramps, remove the front wheels and the front section of the exhaust pipe, then carry out the following operations:

1. undo the bolt securing the wishbone balljoint to the vertical link;
2. undo the two nuts securing the anti-roll bar link and remove the link;

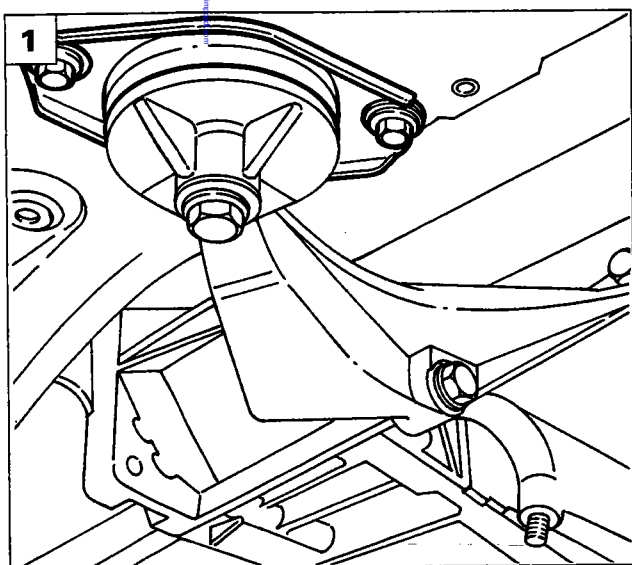


P4A002G05

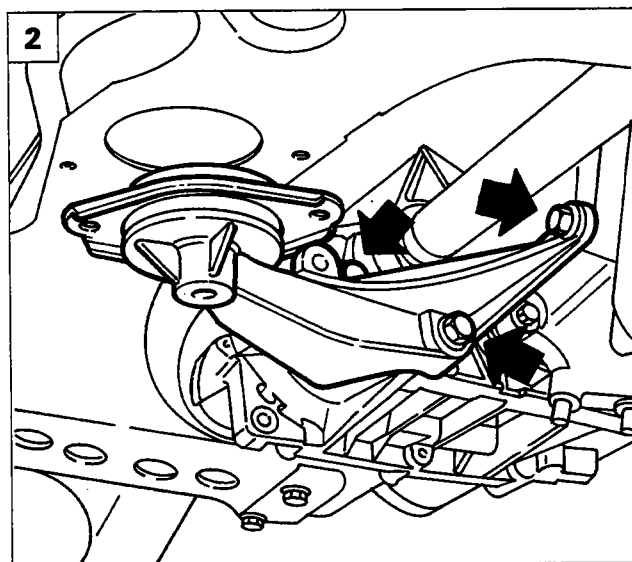


P4A002G06

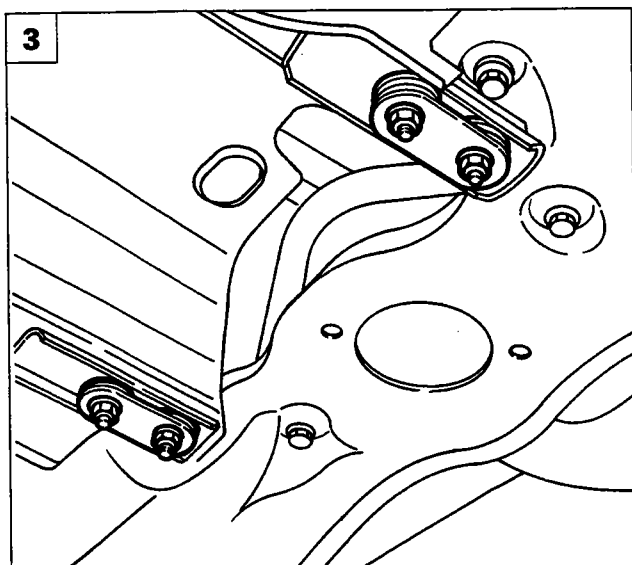
3. undo the bolts securing the wishbone to the steering subframe and remove the wishbone;



P4A015F01



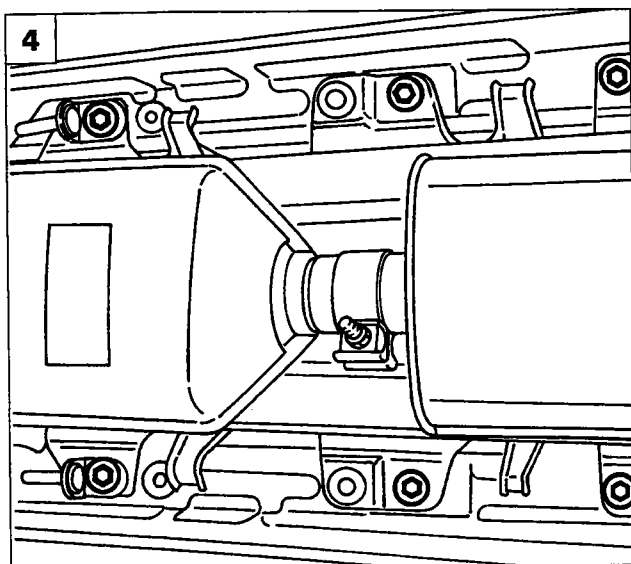
P4A015F02



P4A003G01



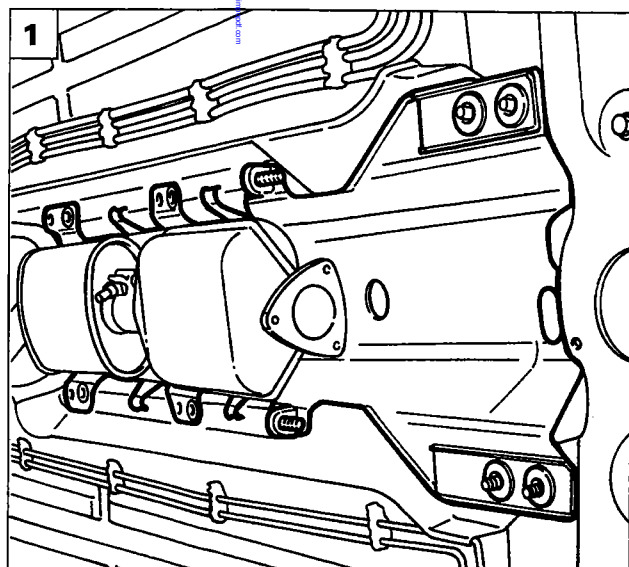
1. undo the bolts securing the engine mounting, differential side, to the sub-frame;
2. undo the bolts securing the engine mounting bracket to the gearbox;
3. undo the bolts securing the heat shield;



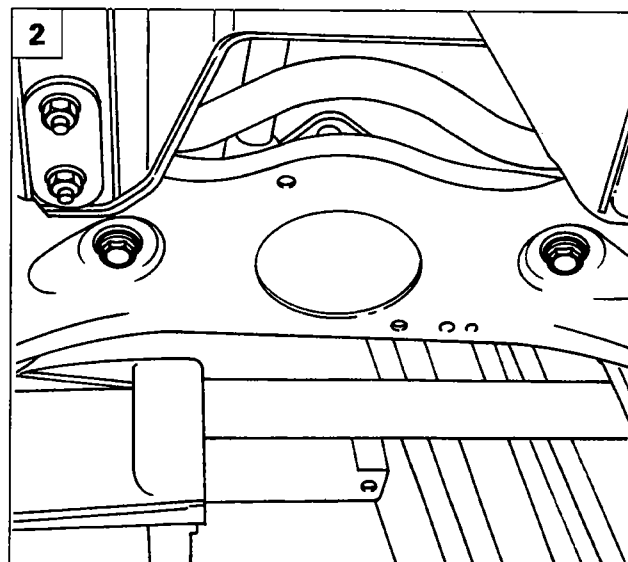
P4A003G02

4. undo the bolts securing the heat shield;

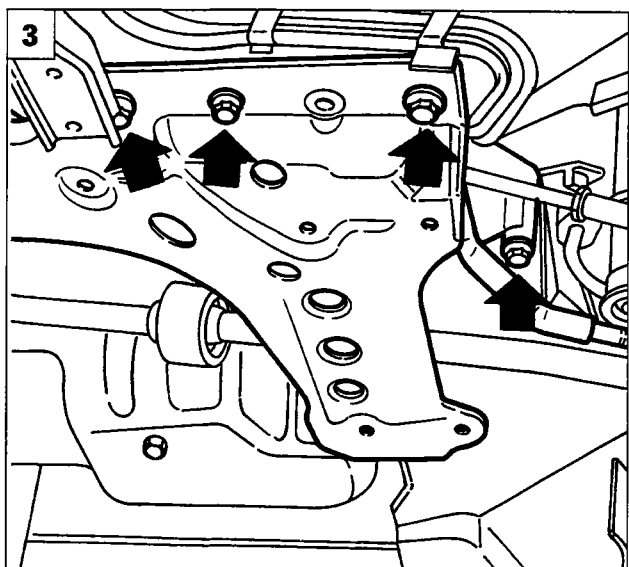
44.



P4A004G01



P4A016F04



P4A004G03



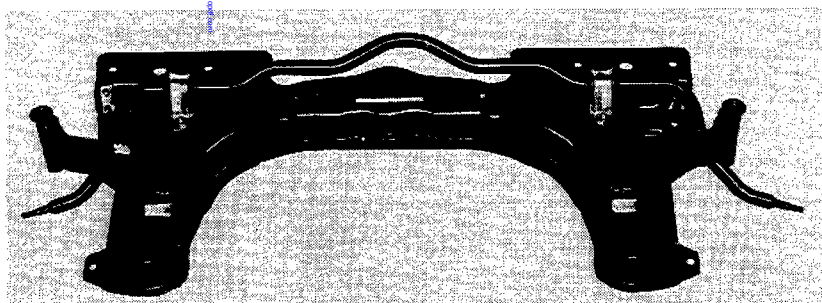
1. rimuovere il riparo anticalore;
2. svitare le viti di fissaggio della scatola servosterzo alla traversa anteriore;
3. posizionare un sollevatore idraulico a colonna sotto la traversa, quindi svitare le viti di fissaggio della traversa alla scocca (freccie); abbassare lentamente il sollevatore e rimuovere la traversa anteriore.

Riattacco

NOTA Per il riattacco della traversa anteriore e del braccio oscillante eseguire in senso inverso le operazioni previste per lo stacco.



Effettuare la convergenza ruote anteriori ogni qualvolta si esegua lo stacco-riattacco della traversa anteriore o di un braccio oscillante.



P4A005G01

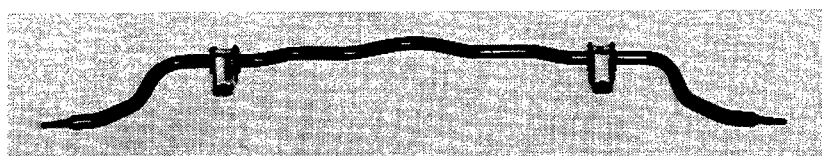


Dismantling-refitting anti-roll bar on steering subframe



Checking anti-roll bar

Neither the rubber buffers nor the bar should show signs of damage, otherwise the buffers and the bar must be replaced.

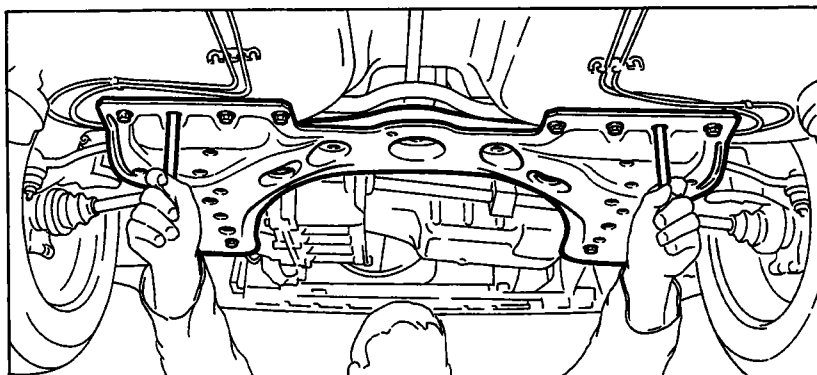


P4A005G02



Checking steering subframe

Check that the steering subframe is not cracked or deformed such that its efficiency is impaired.

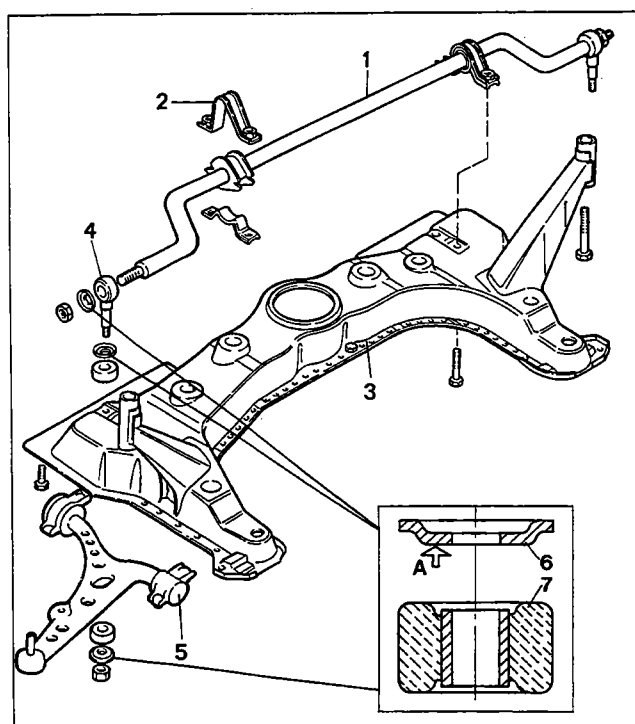


P4A005G03



Refitting steering subframe to body shell

The subframe should be secured temporarily, then centred on the bodywork using two studs of a diameter of about 12 mm, then it should be secured finally.



P4A005G04



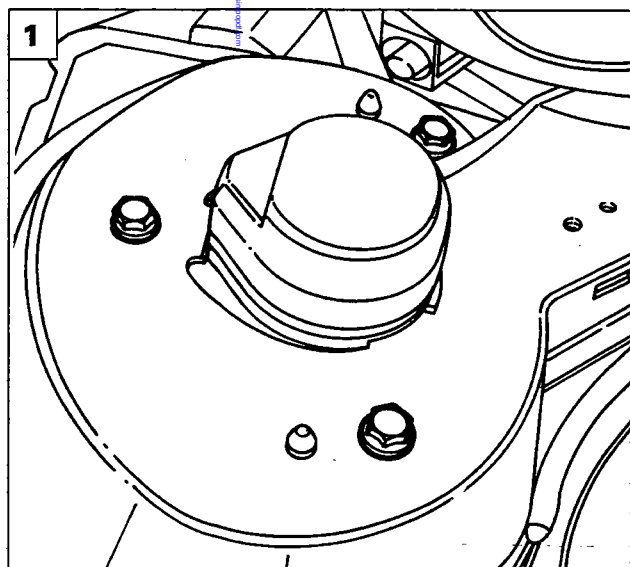
Components of the front suspension supplied as spare parts

1. Anti-roll bar
2. Bracket securing anti-roll bar to steering subframe
3. Steering subframe
4. Link connecting anti-roll bar to wishbone
5. Wishbone
6. Washer for rubber buffer
7. Rubber buffer

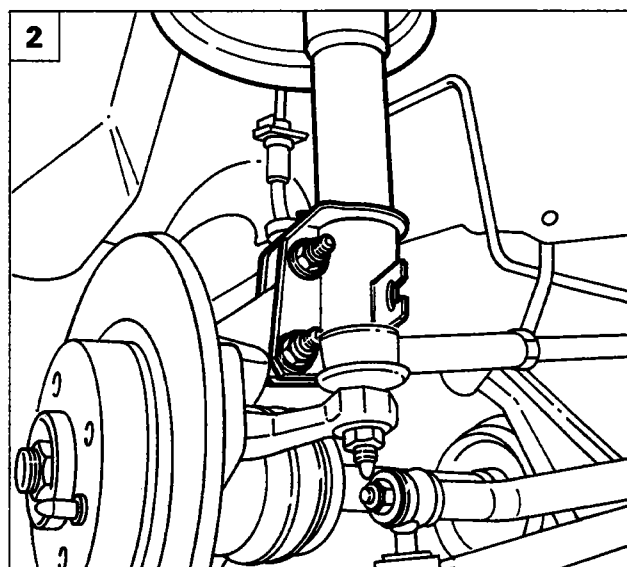


When refitting the anti-roll bar, fit the washers, shown in the insert, with the face (A) facing the rubber buffer (2). Incorrect assembly could impair the life of the rubber buffer (2).

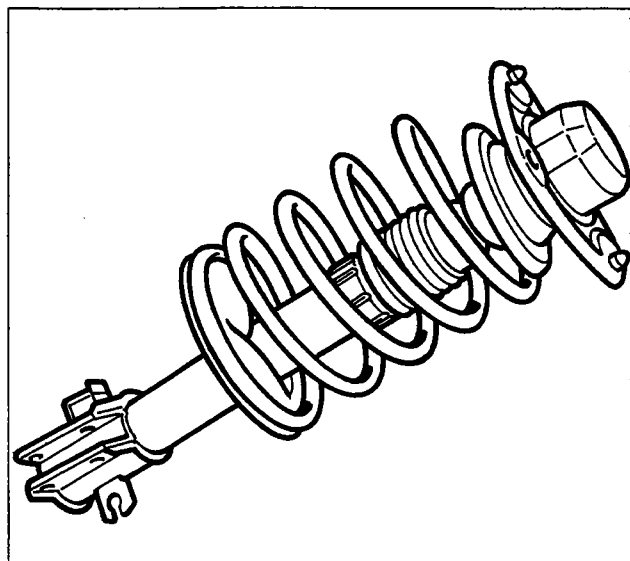
44.



P4A006G01



P4A006G02



P4A006G03



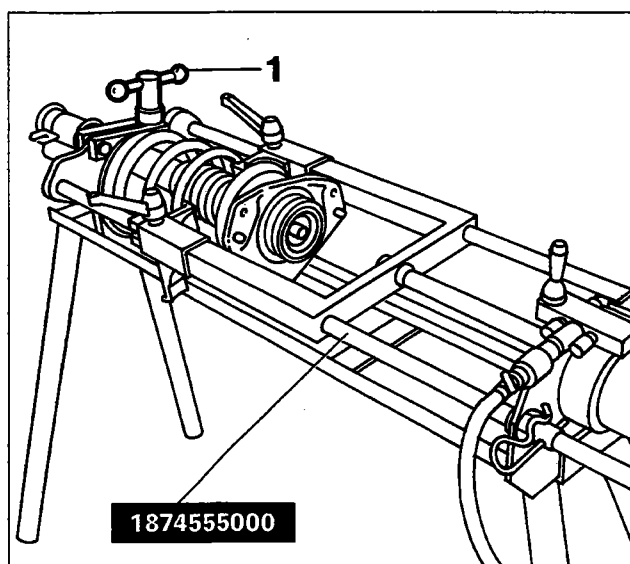
SPRING-DAMPER ASSEMBLY

Removing-refitting

To remove the spring-damper assembly, proceed as follows:

1. undo the bolts securing the damper top plate to the bodywork;
2. undo the bolts securing the damper to the vertical link and remove the coil spring and damper assembly.

Assembly with offset coil spring

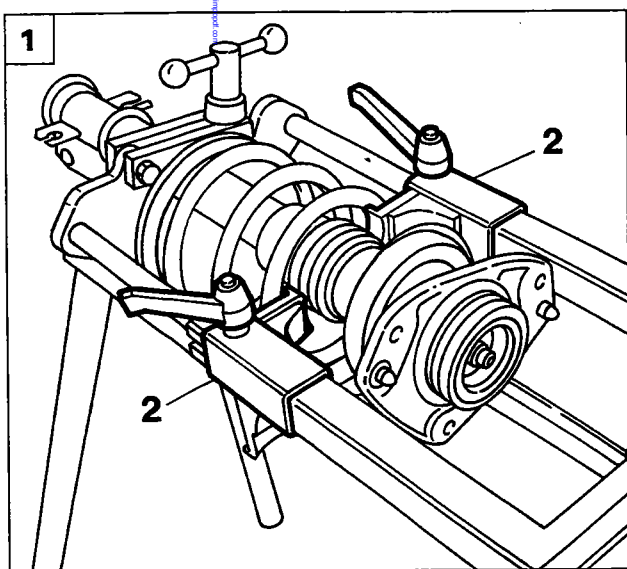


P4A006G04

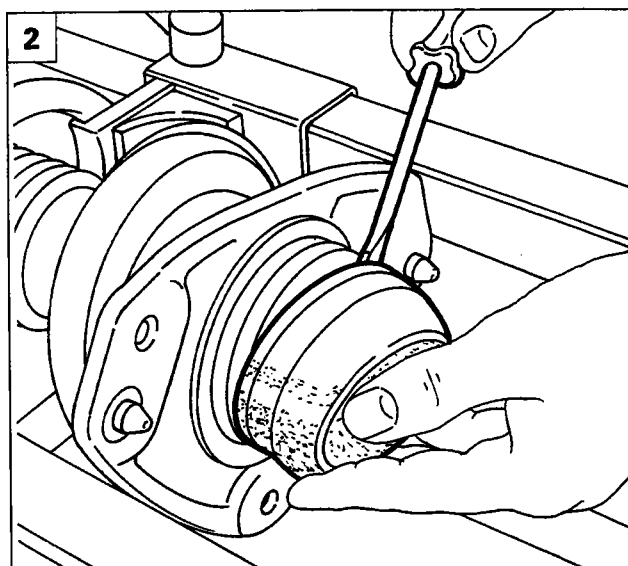
Dismantling-refitting

Detach the coil spring from the damper as follows:

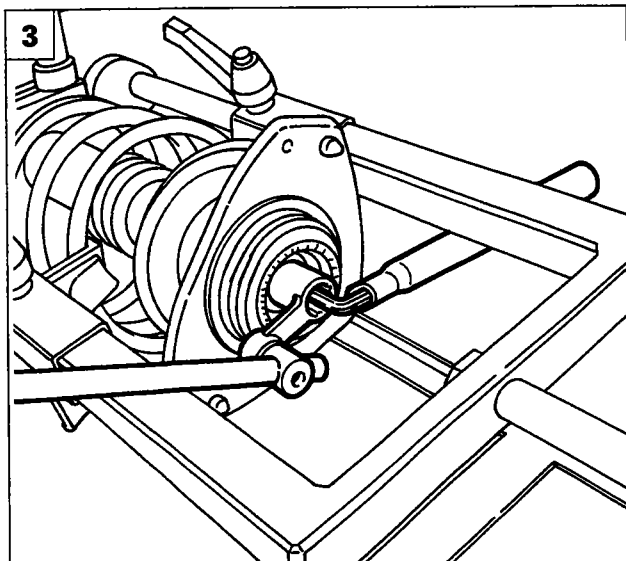
- fit the spring-damper assembly on the pneumatic tool 1874555000 and operate the lever (1) so as to lock the assembly;



P4A007G01



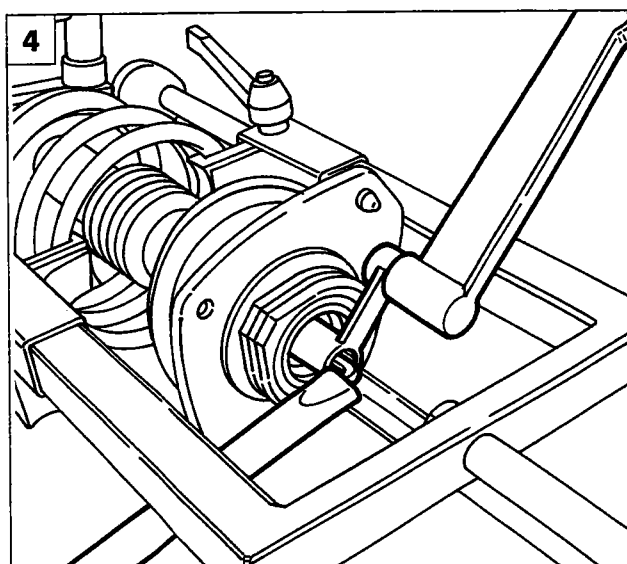
P4A007G02



P4A007G03



1. adjust the position of the hooks (2), moving them close to the spring, then place the tool under pressure until the spring begins to compress;
2. prise off the dust excluder using a screwdriver;
3. undo the nut securing the top plate to the damper stem and remove the plate, then withdraw the spacer, spring and end-of-travel stop.



P4A007G04

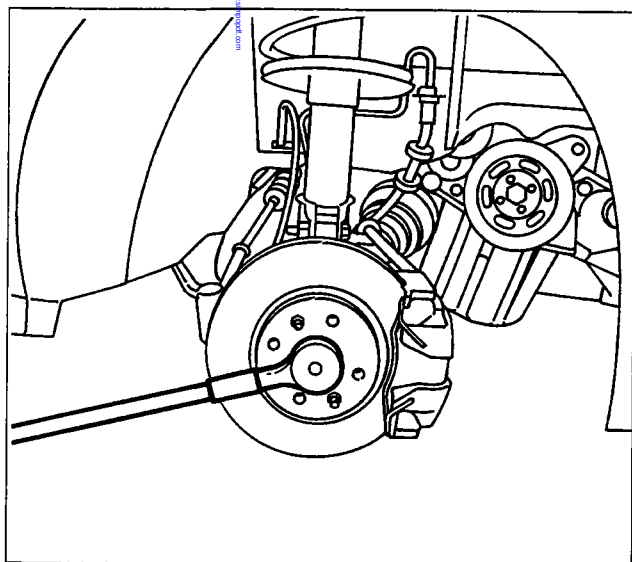


10 daNm

NOTE The coil springs are divided into two categories, identifiable by means of a strip of paint on the central coil. Springs of the same category must be fitted.

4. Refit the components in reverse order, tighten the damper stem nut to the correct torque then refit the dust excluder.

44.



P4A008G01

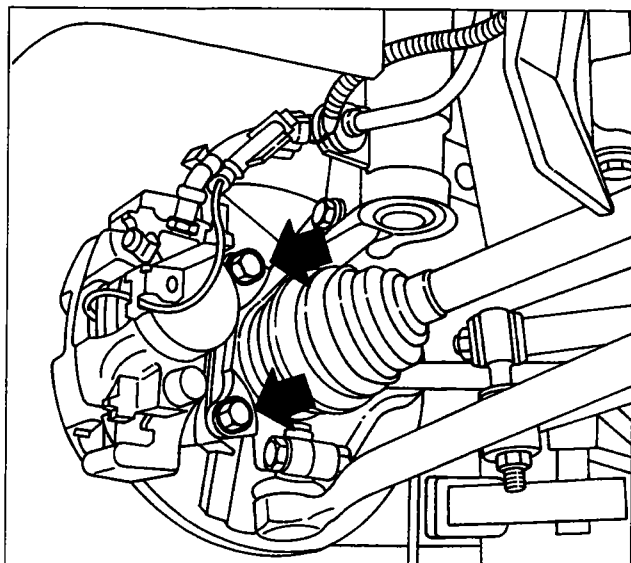


VERTICAL LINK AND WHEEL HUB

Removal

To remove the front vertical link and wheel hub, proceed as follows:

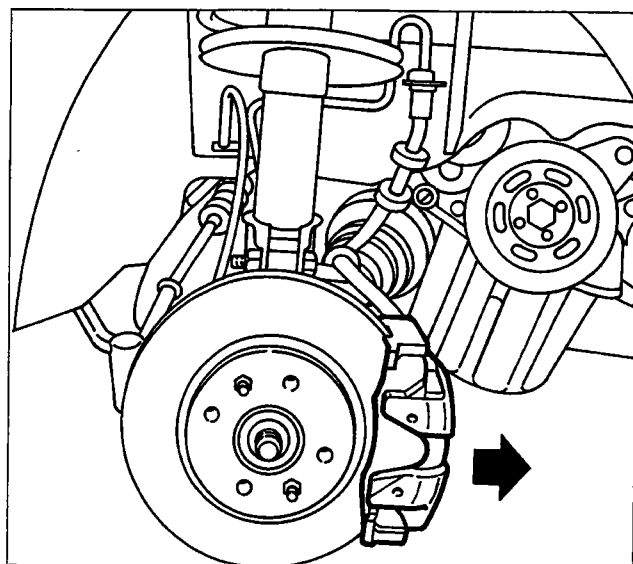
- undo the nut securing the front wheel hub to the stub axle;



P4A008G02



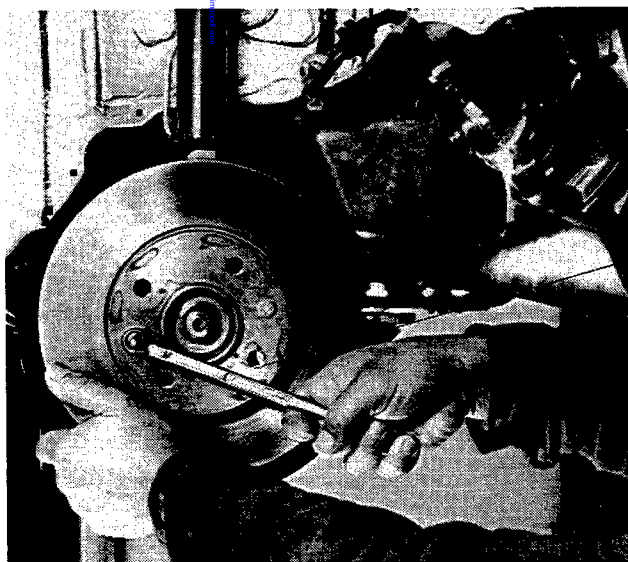
- undo the bolts securing the brake caliper assembly to the vertical link;



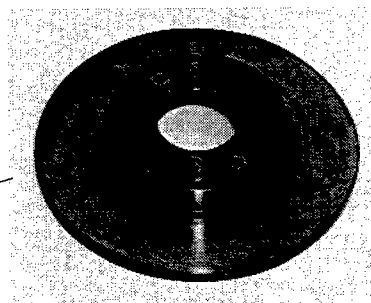
P4A008G03



- withdraw the brake caliper complete with mounting bracket and secure it in the wheelarch without disconnecting the brake pipe;

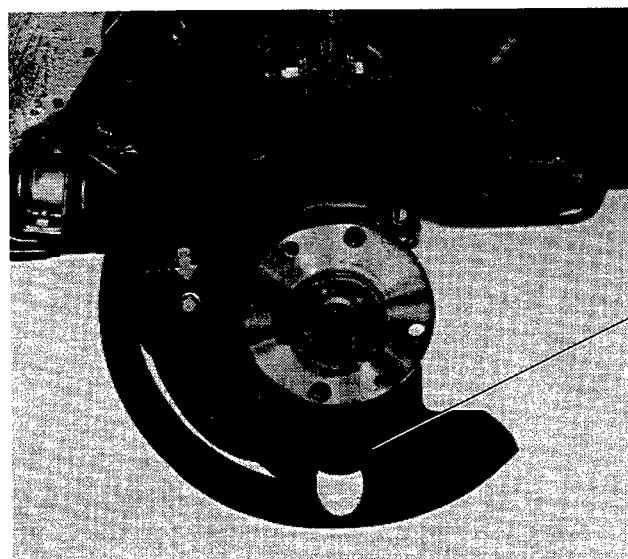


P4A009G01

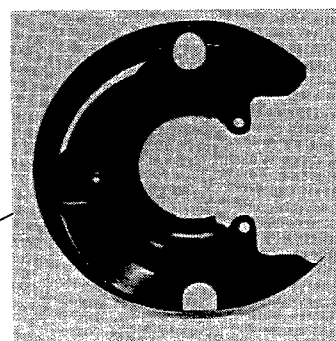


P4A009G02

- undo the bolts and remove the brake disc;



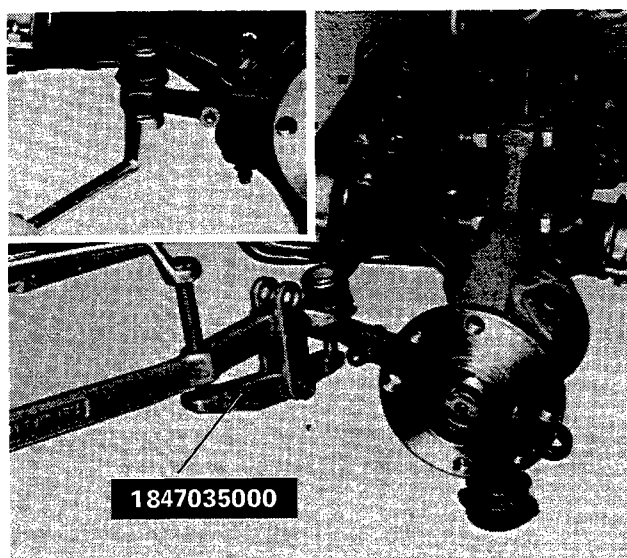
P4A009G03



P4A009G04

- undo the screw and remove the dust shield;

P4A009G06



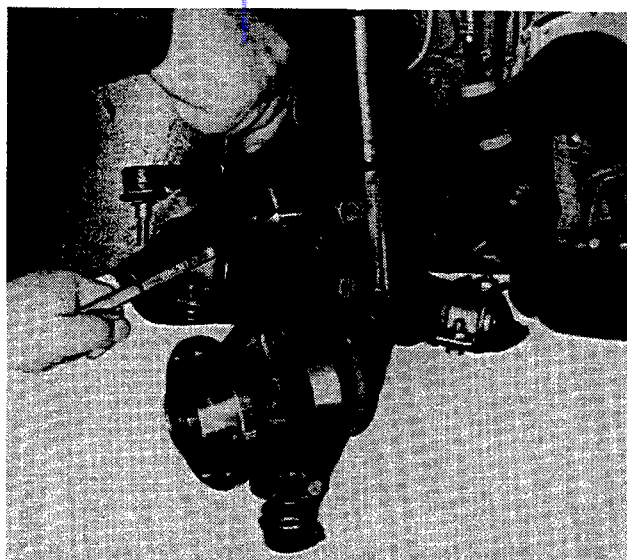
1847035000

P4A009G05



- undo the nut securing the balljoint pin to the tie-rod end, then remove the pin using tool 1847035000;

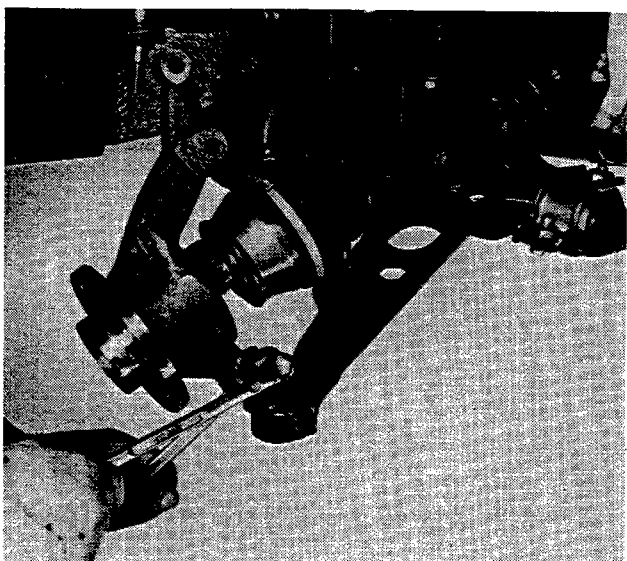
44.



P4A010G01



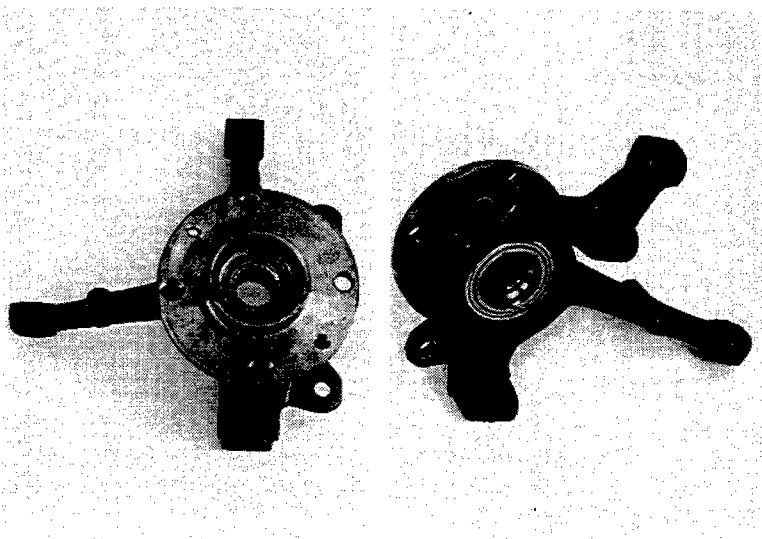
- undo the bolts securing the spring-damper assembly to the vertical link;



P4A010G02



- undo the bolt securing the wishbone ball-joint to the vertical link and remove the vertical link.

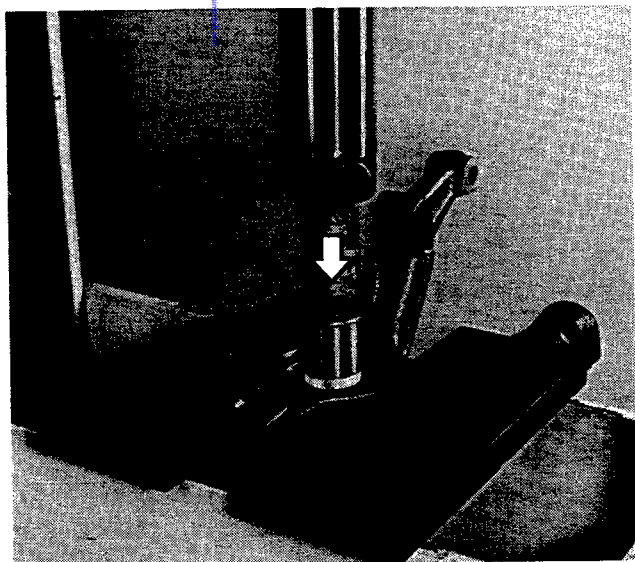


P4A010G03

P4A010G04



Front and rear views of vertical link complete with hub

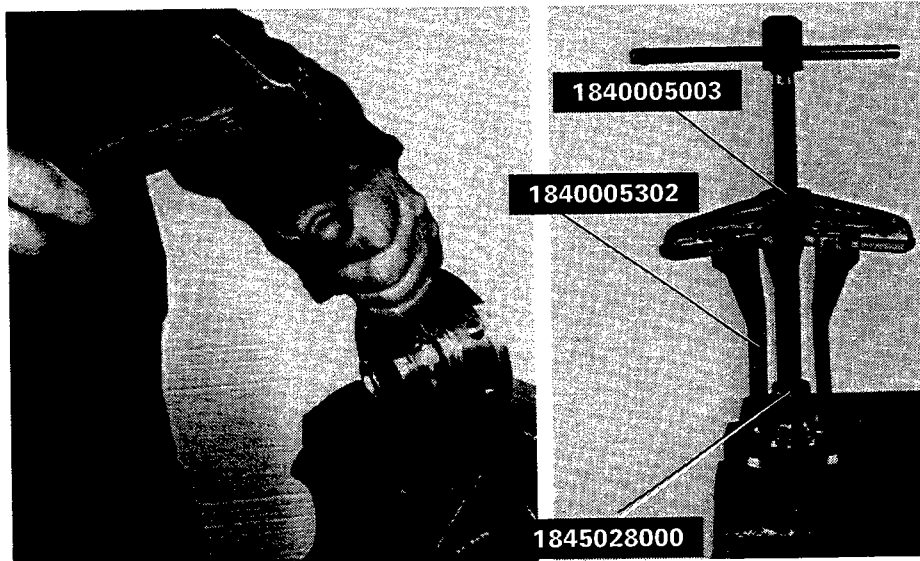


P4A011G01

Dismantling

To dismantle the vertical link and wheel hub, proceed as follows:

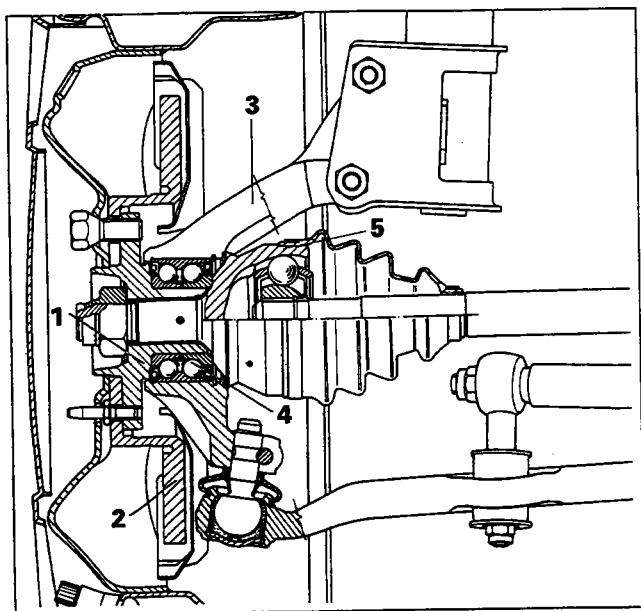
- dismantle the hub from the vertical link using a press;



P4A011G02

P4A011G03

- using a chisel, separate the bearing inner ring from the hub, then withdraw the bearing using the tools shown;



P4A011G04

Longitudinal section of front wheel hub assembly and disc brake

1. Wheel hub
2. Brake disc
3. Vertical link
4. Ball bearing
5. Constant velocity joint

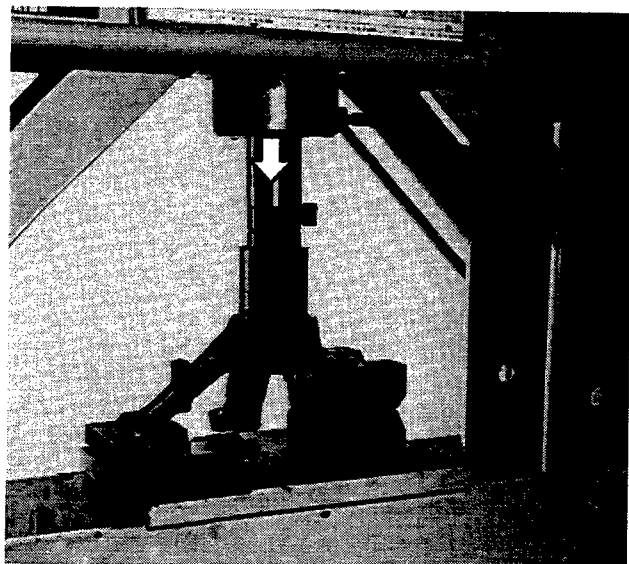
44.



P4A012G02



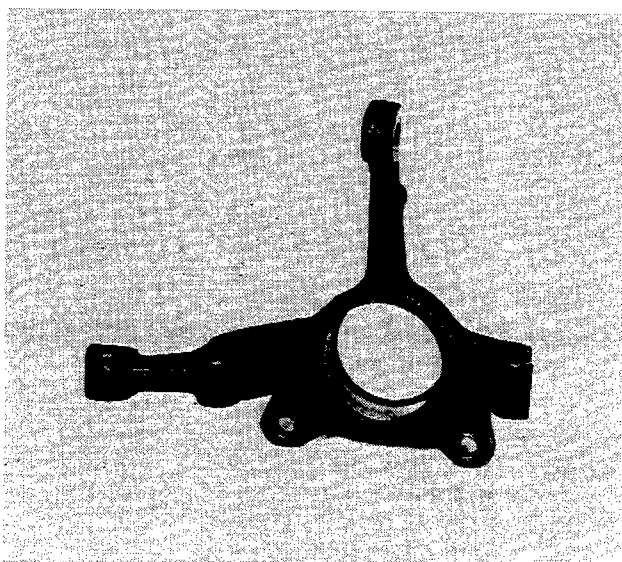
- dismantle the circlip securing the bearing outer race;



P4A012G03



- dismantle the bearing outer race from the vertical link using a press.

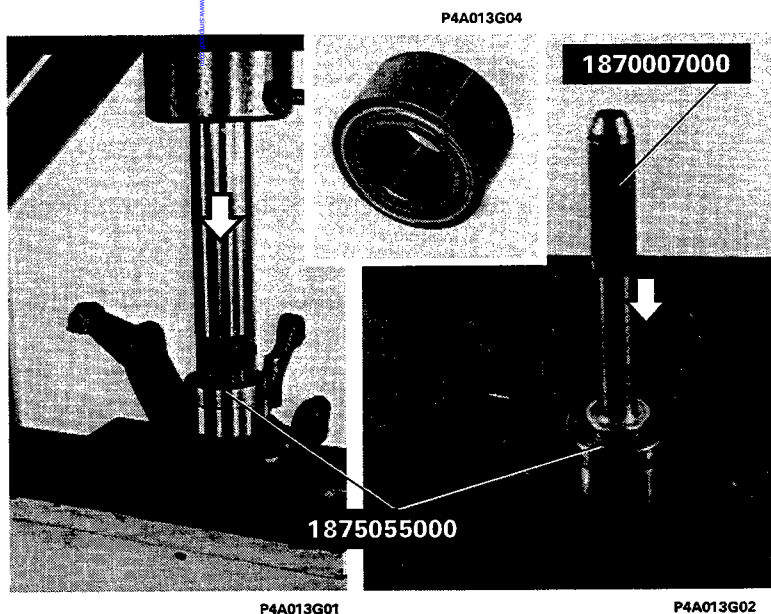


P4A012G04



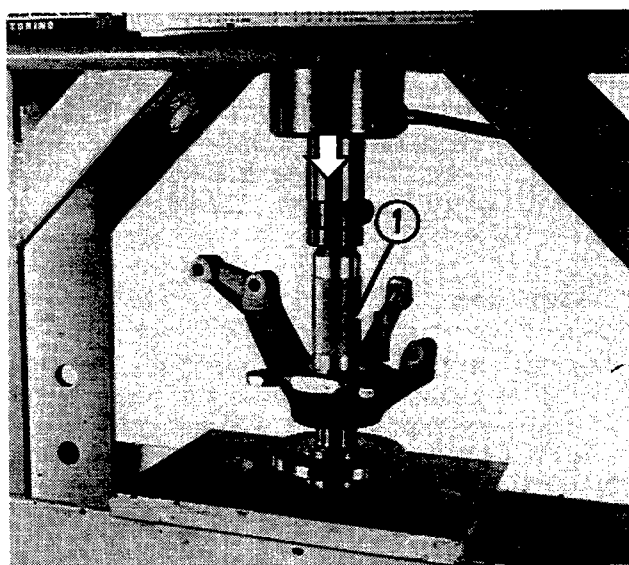
Checking front vertical link

Check that the inner surfaces do not show signs of seizure and that the arms have not sustained visible impact and do not show signs of breakage, otherwise the complete vertical link will need to be replaced.

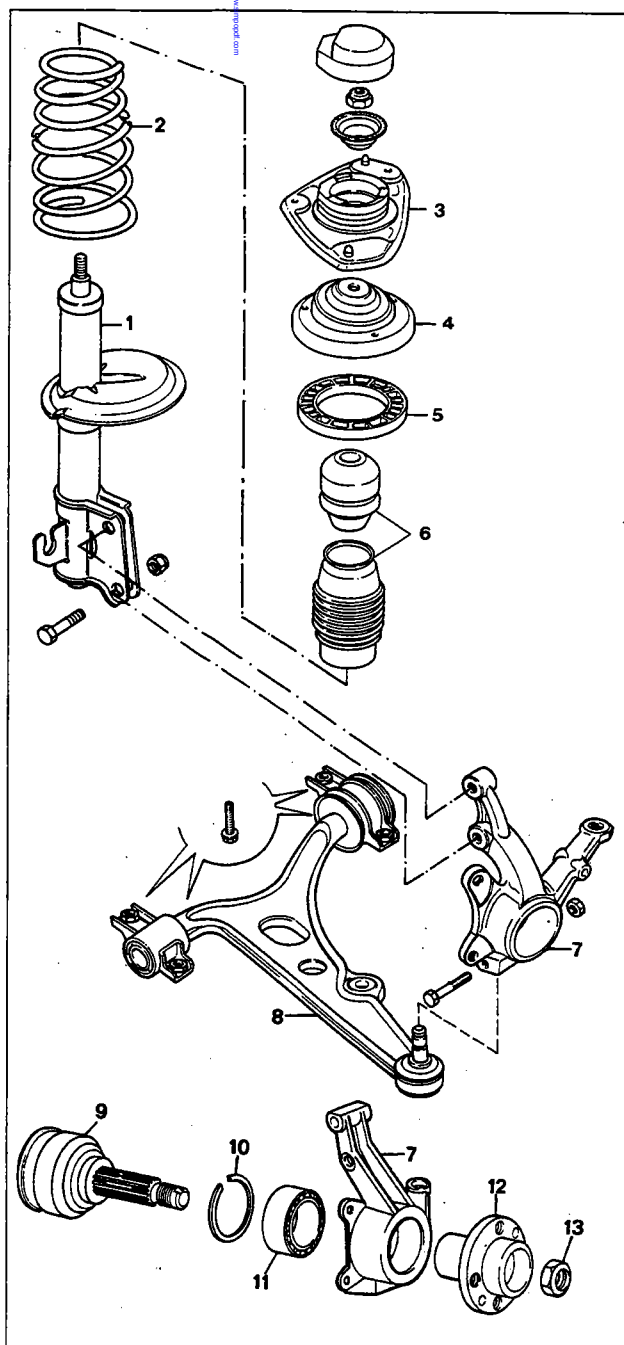


Refitting

The bearing can be refitted on the vertical link either using a press, or using the handle 1870007000. Then fit the bearing circlip.



Fit the hub in the bearing on the vertical link using a press, supporting the bearing inner race with a cylinder (1) of suitable diameter.



P4A014G01

1. Damper
2. Coil spring
3. Damper top plate
4. Spacer
5. Rubber buffer
6. Tube and end-of-travel stop
7. Vertical link

8. Wishbone
9. Constant velocity joint + stub axle
10. Bearing circlip
11. Ball bearing
12. Wheel hub
13. Wheel hub nut



COMPONENTS OF THE FRONT SUSPENSION SUPPLIED AS SPARE PARTS

Components of the damper top mounting

Check that the components have no faults that might impair their efficiency.

Damper

If faults attributable to the damper are found, the entire damper assembly should be replaced.

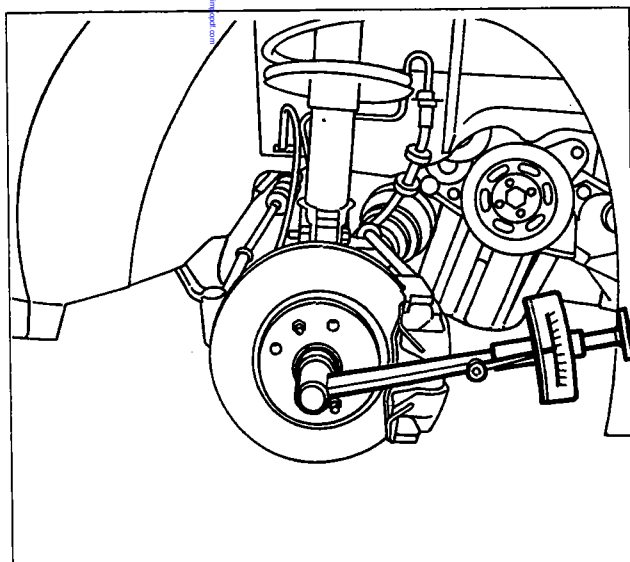
Coil spring

Make sure that it has no cracks or deformations that might impair its efficiency.

NOTE *The coil springs are divided by means of a yellow or green paint strip on the central coil. Coils of the same category should be fitted.*

Wishbone

Check that the wishbone is not deformed, that the balljoint head does not have excessive play, that the dust excluder is not damaged and that the rubber bushes are not worn, otherwise the complete wishbone will need to be replaced.



P4A015G01



24 daNm

1370 1581 1747 1929 D

28 daNm

1998 1910 TD

Fitting hub nut and tightening it to correct torque

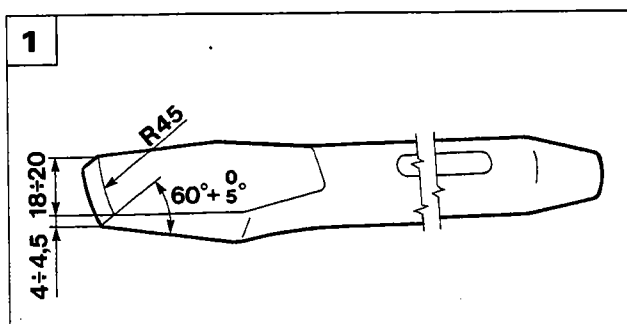


The nuts securing the constant velocity joints to the hubs must always be replaced.

Also check:



Front wheel geometry

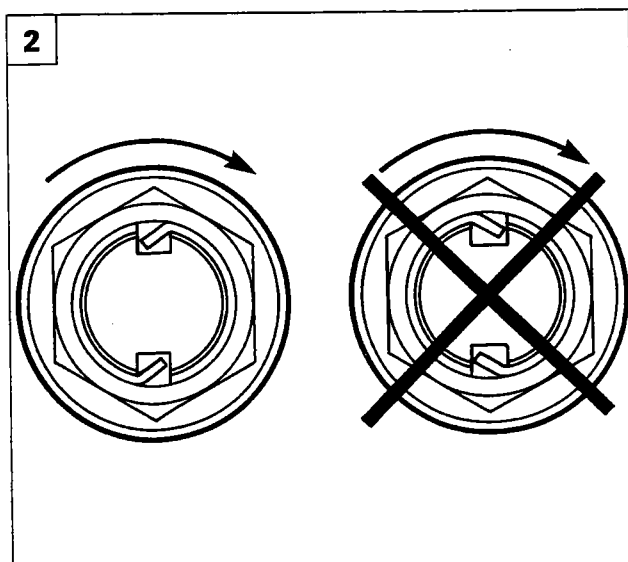


P4A015G02

Staking hub nut

To stake the nut, proceed as described below:

- always use a new nut;
- thoroughly clean the threaded end of the half-shaft using a metal brush, and then with a compressed air jet;

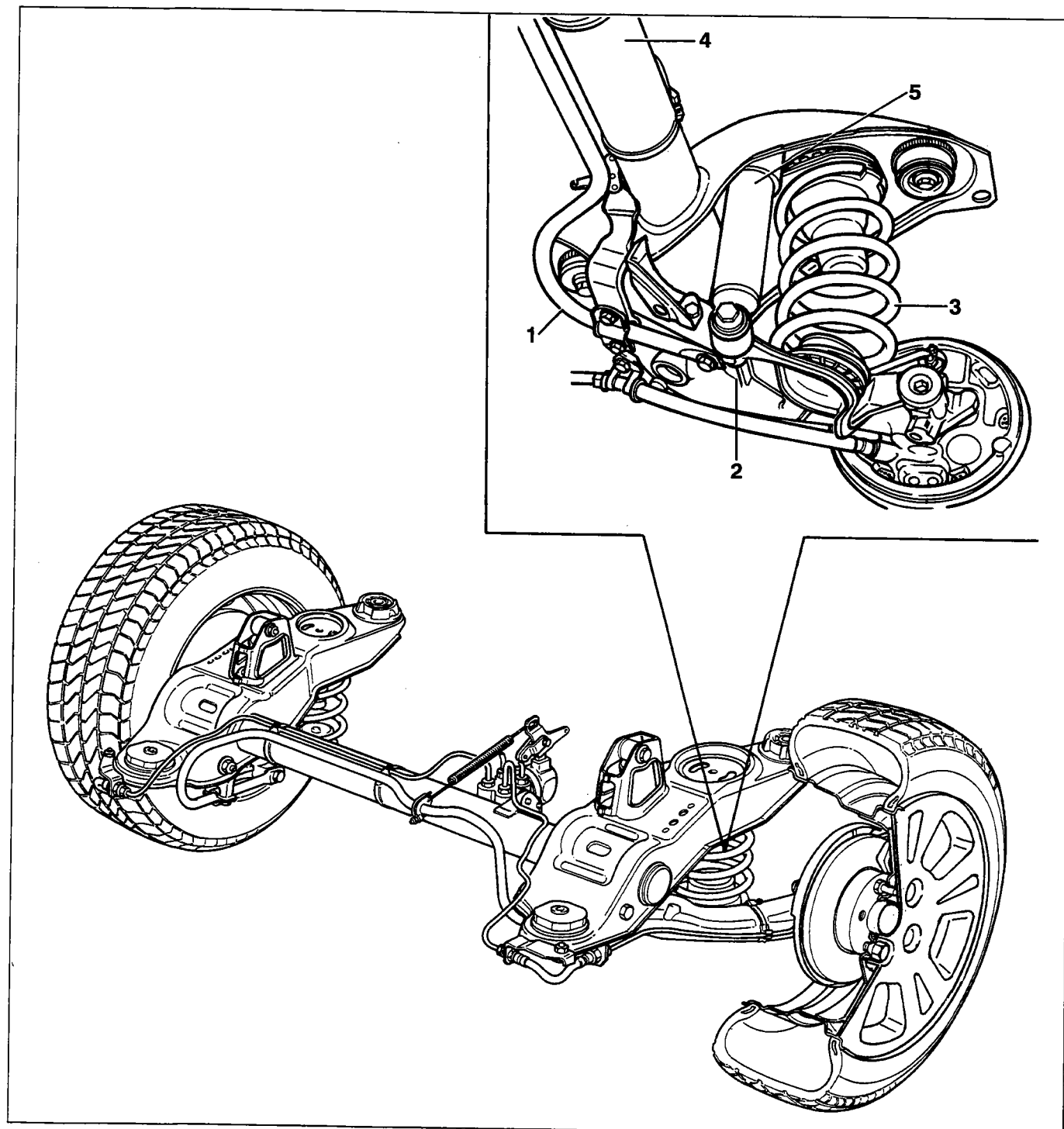


P4A015G03

- clean the thread on the new nut and the threaded end of the half-shaft using paper towel moistened with ethyl alcohol or heptane;
- apply Loctite 270 (or an equivalent product) on the entire threaded part of the half-shaft end;
- tighten the new nut, securing it to the specified torque within 5 minutes of applying the adhesive;
- stake the nut collar using the chisel shown in figure 1 (the chisel should be made on site in accordance with the dimensions shown on the drawing, and taken from article USAG 362 or similar).

The collar should be cut on the notch of the hub on the side opposite that of tightening the nut, so that the safety lug opposes accidental uncrewing (see figure 2).

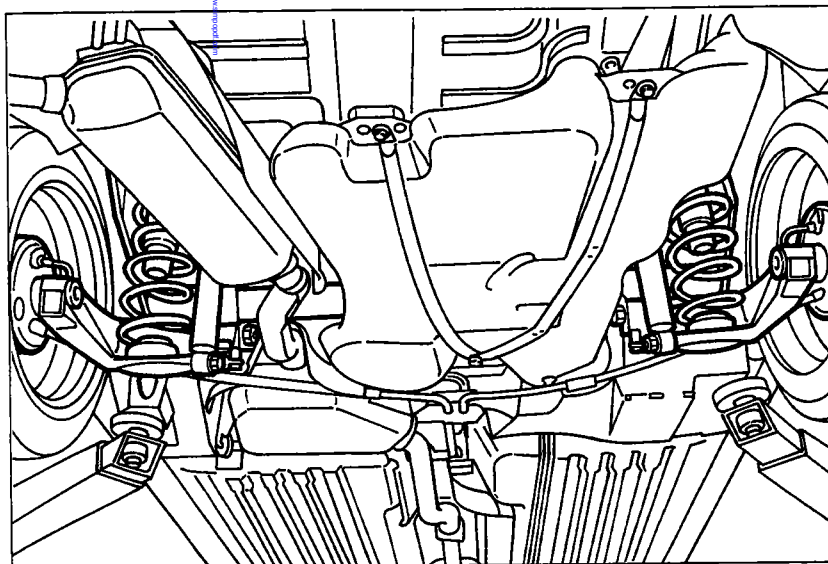
DIAGRAM OF REAR SUSPENSION ASSEMBLY



P4A016G01

- 1. Anti-roll bar
- 2. Trailing arm
- 3. Spring

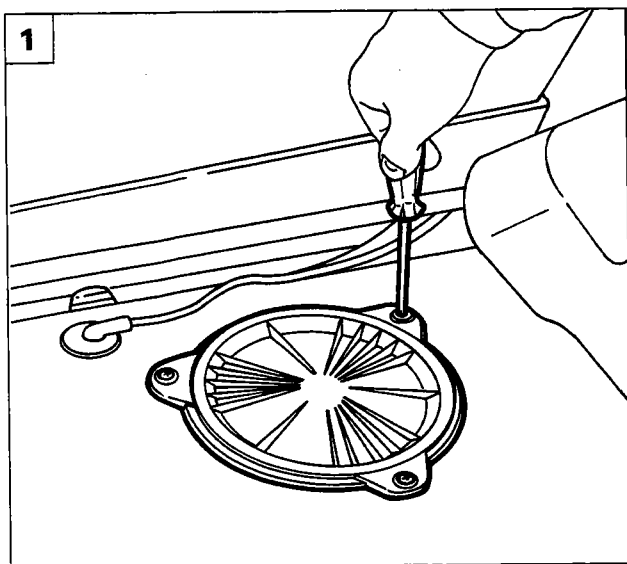
- 4. Torsion bar
- 5. Damper



P4A017G01

REMOVING-REFITTING

NOTE To remove the rear suspension, first remove the fuel tank and the rear section of the exhaust pipe.



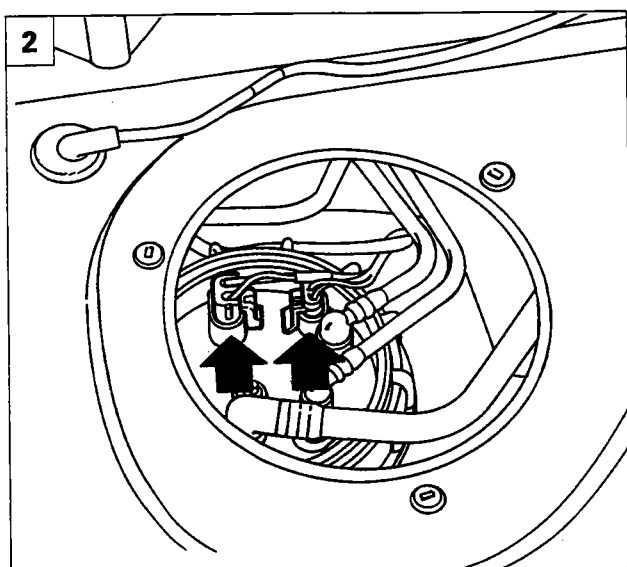
P4A017G02



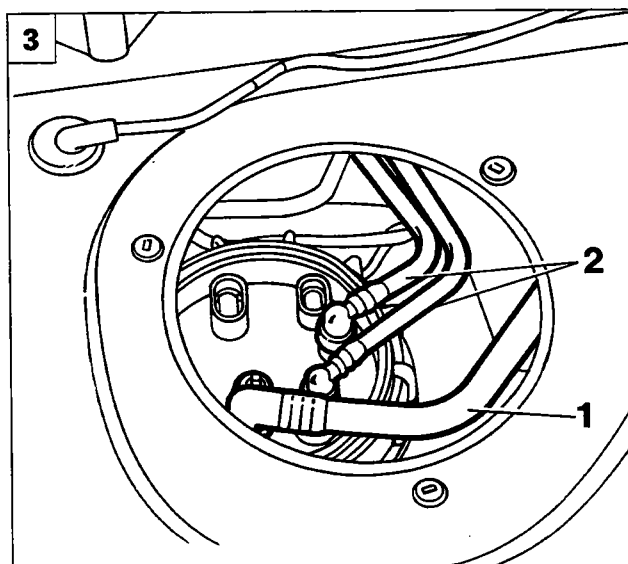
Fuel tank

To remove the fuel tank, proceed as follows:

1. remove the luggage compartment shelf trim and remove the plastic cover;
2. disconnect the two wiring connectors;
3. undo the nut and disconnect the vent pipe (1), then release the retaining lugs and disconnect the fuel delivery and return pipes (2);



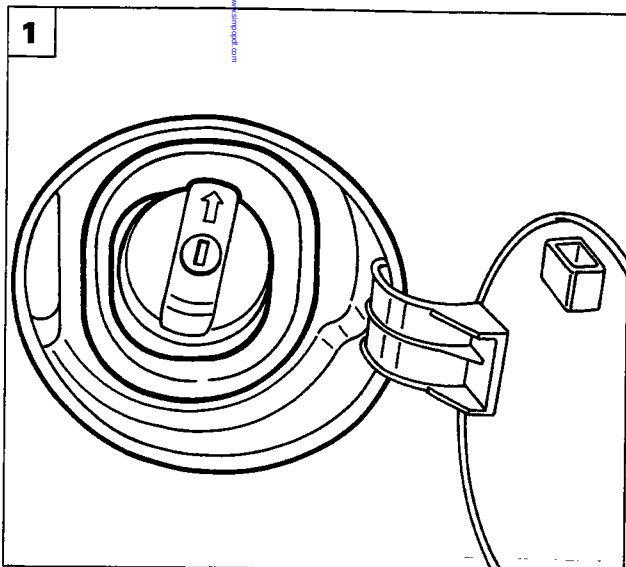
P4A017G03



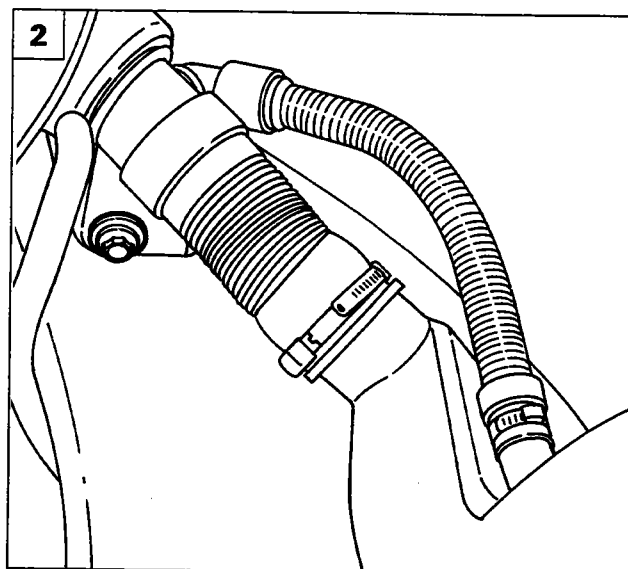
P4A017G04

Rear suspension

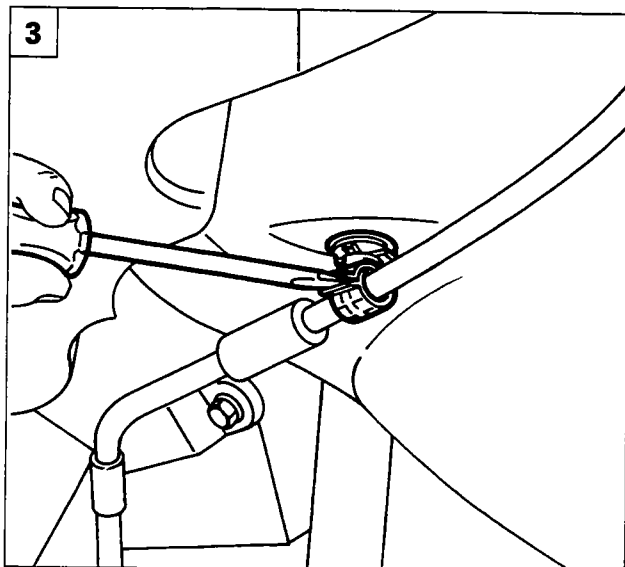
44.



P4A018G01



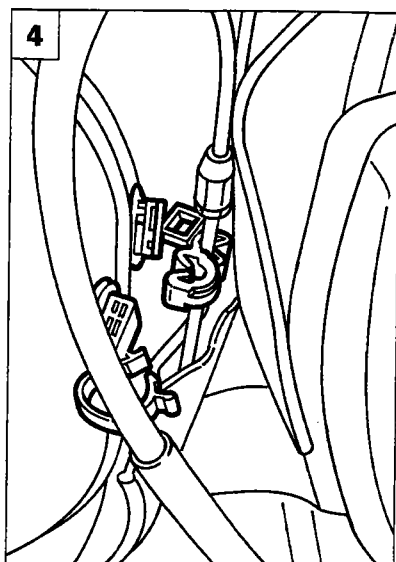
P4A018G02



P4A018G03



1. remove the rubber trim from the fuel filler;
2. undo the screw securing the filler to the body shell;
3. open the clips and release the handbrake cables;

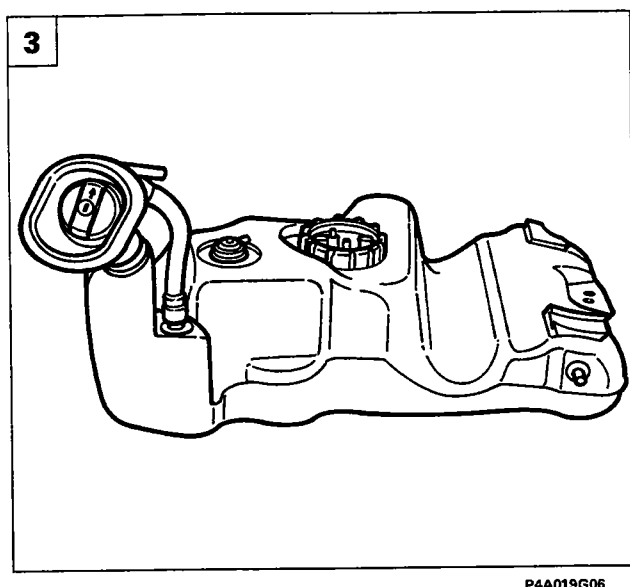
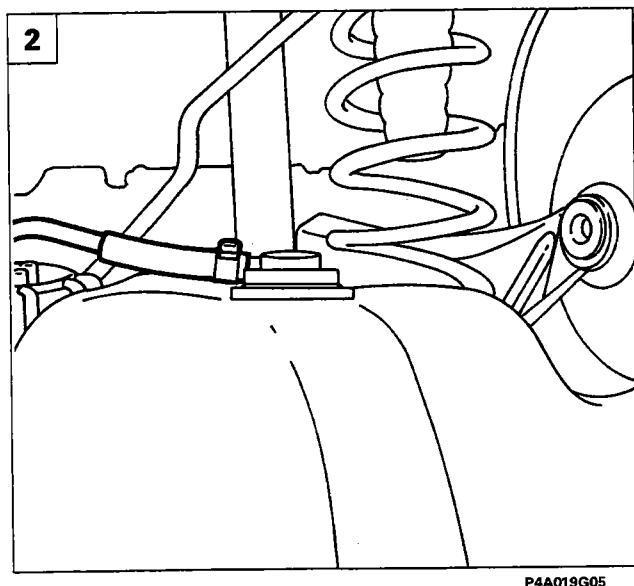
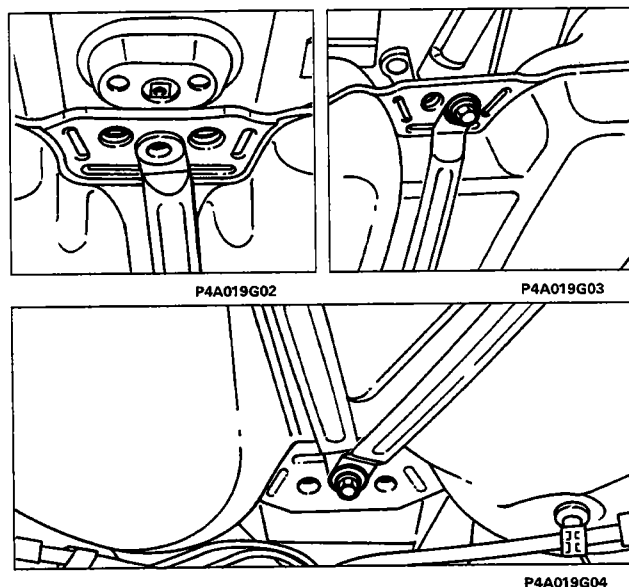
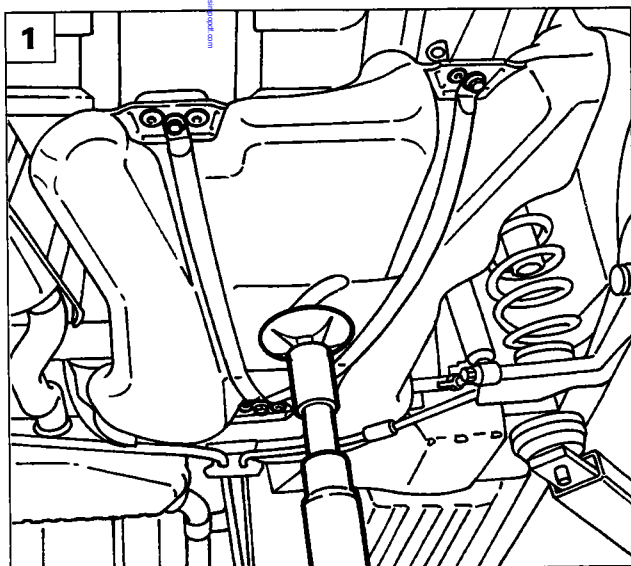


P4A018G04



P4A018G05

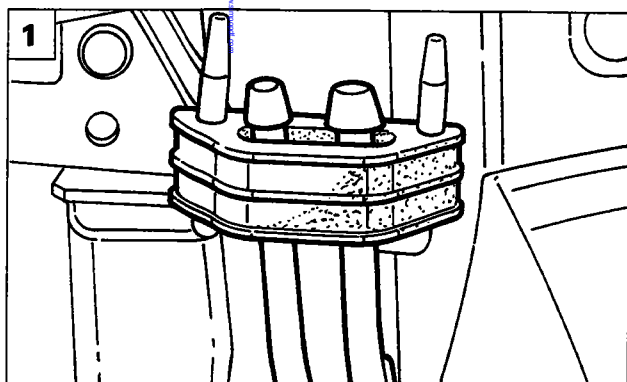
4. disconnect the rear brake pipe attachments from the tank;



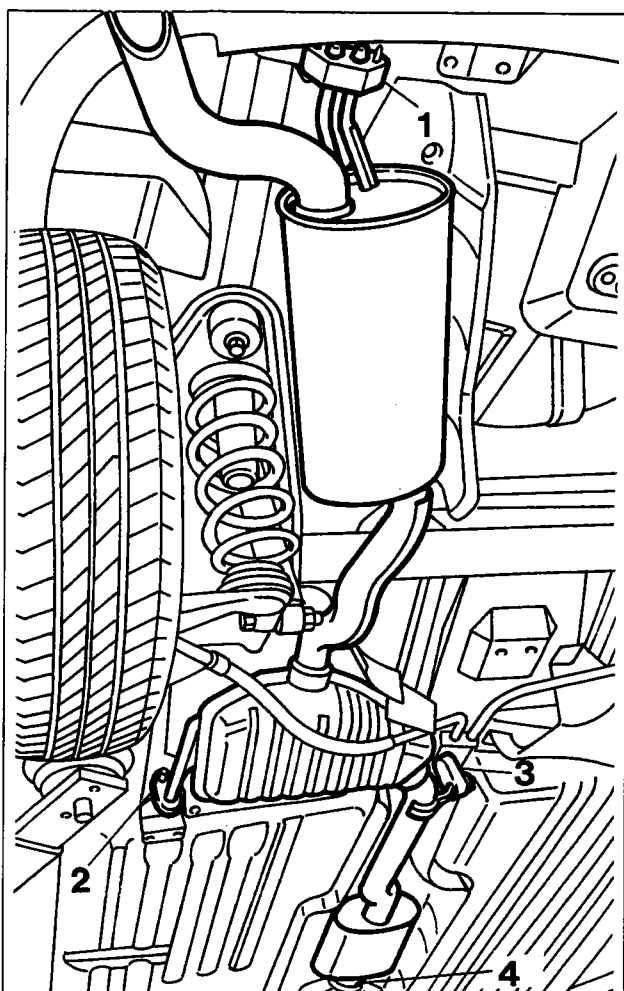
1. place a column jack under the tank, undo the bolts and remove the attachment buttons shown, then gently lower the fuel tank;

2. open the clip and disconnect the petrol vapour pipe;

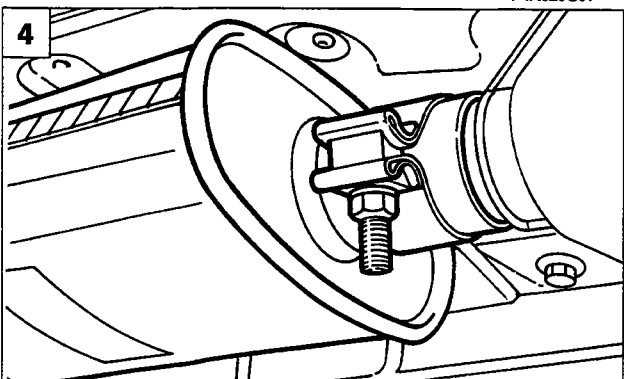
3. fully lower the jack and remove the tank.



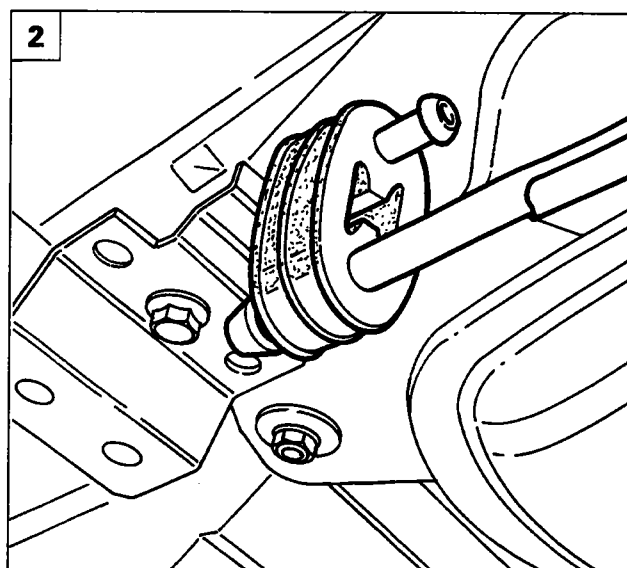
P4A020G02



P4A020G01



P4A020G05



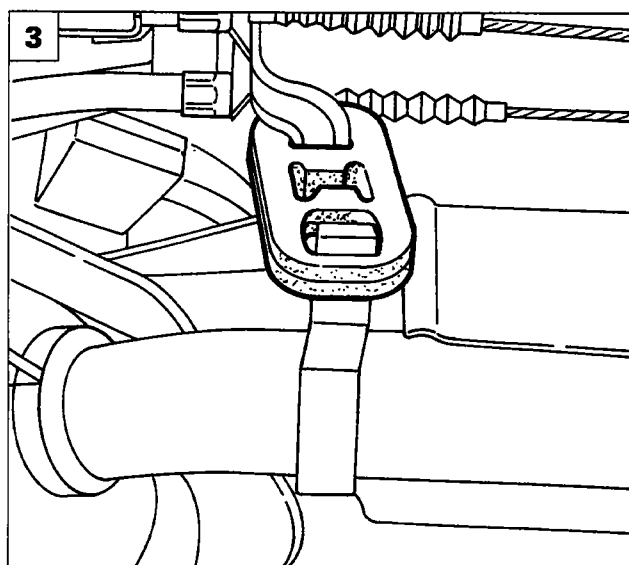
P4A020G03



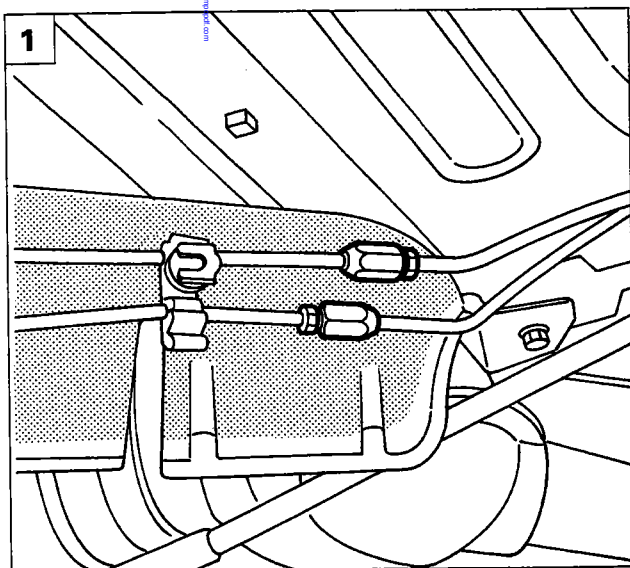
Exhaust pipe

To remove the rear section of the exhaust pipe, proceed as follow:

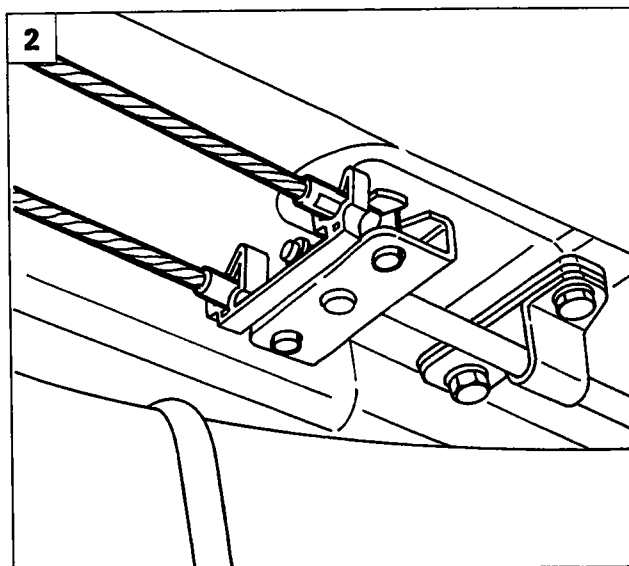
1. remove the rear rubber grommet;
2. remove the central left rubber grommet;
3. remove the central right rubber grommet;
4. undo the bolt on the exhaust pipe clamp and remove the rear section of the exhaust pipe.



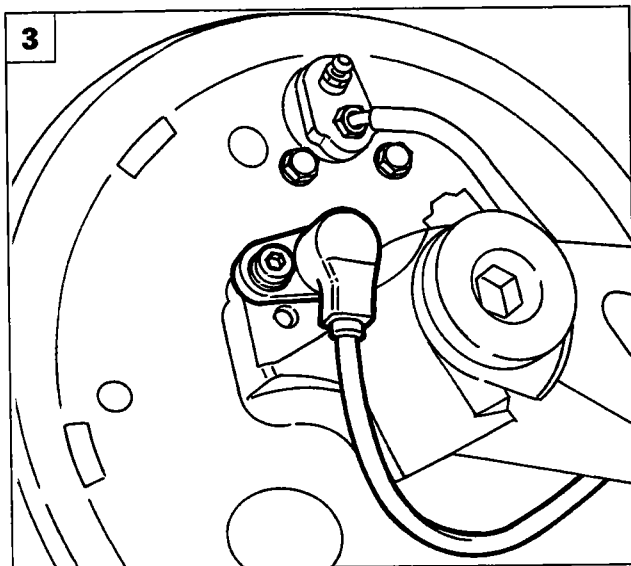
P4A020G04



P4A021G01



P4A021G02



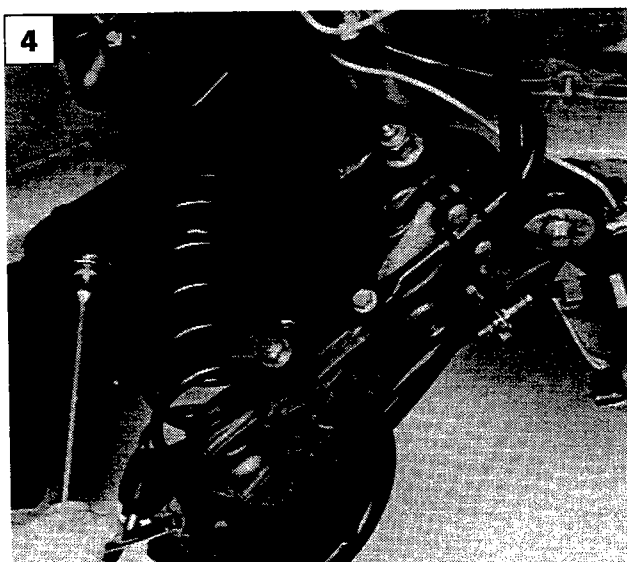
P4A021G03



Suspension assembly

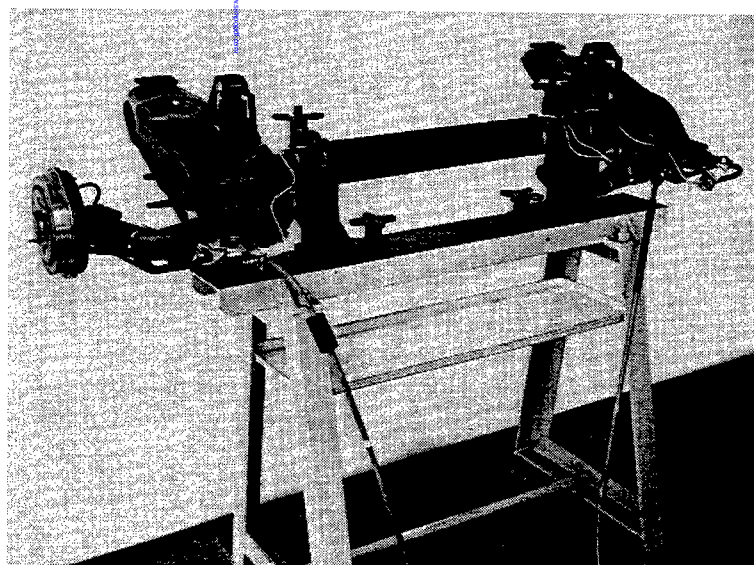
To remove the rear suspension assembly, proceed as follows:

1. disconnect the brake pipe connections;
2. slacken the handbrake cable assembly and disconnect the cables;
3. unscrew and move aside the A.B.S. sensor;



P4A021G04

4. place a hydraulic jack under the suspension crossframe and undo the bolts securing the suspension to the body; lower the hydraulic jack and remove the rear suspension assembly.

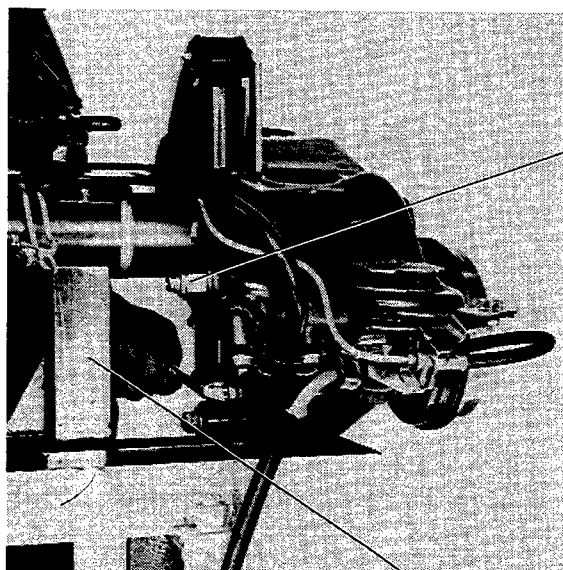


P4A022G01

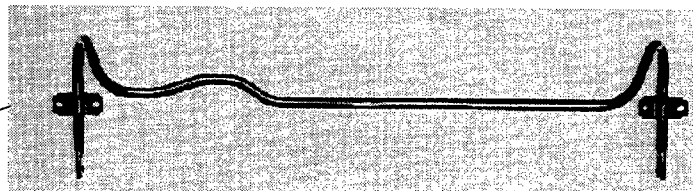


DISMANTLING-REFITTING

Rear suspension on overhaul stand



P4A022G03

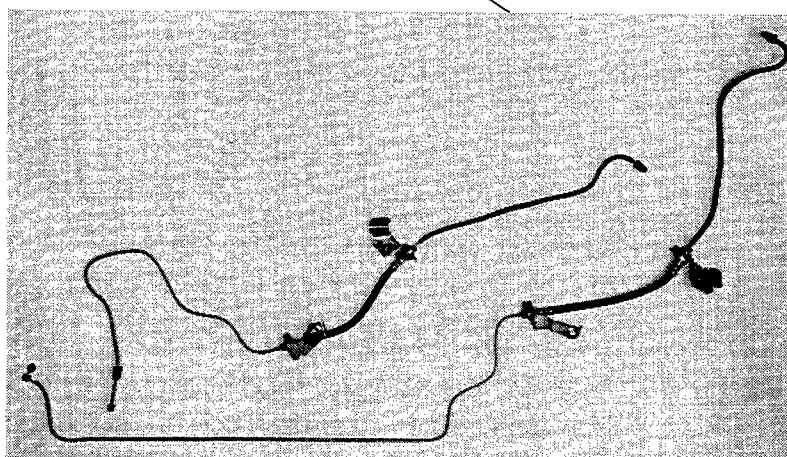


P4A022G02

Dismantling anti-roll bar from attachments on trailing arm

Anti-roll bar

Check that the anti-roll bar is not damaged or deformed, otherwise it will have to be replaced.
Check that the rubber grommets are not damaged.

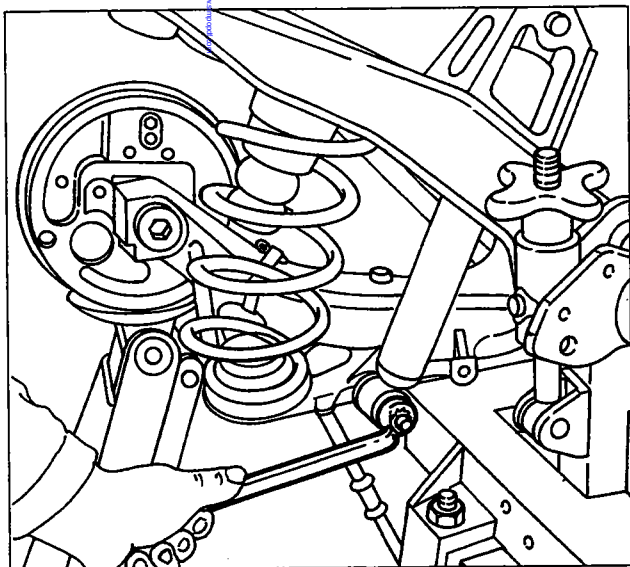


P4A022G04

Dismantling brake pipes from attachments on rear torsion bar



NOTE Whenever the brake pipes are removed, check with compressed air that they are not blocked.
They should be replaced if they have dents, constrictions, cracks or worn connections.



P4A023G01



Dismantling damper from anchorage on trailing arm



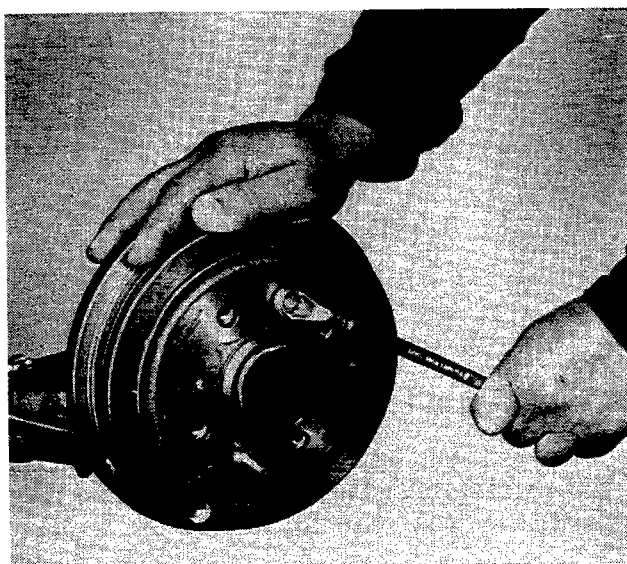
To remove the damper, compress the rear suspension with a hydraulic jack.



P4A023G02



Dismantling damper from anchorage on rear torsion beam

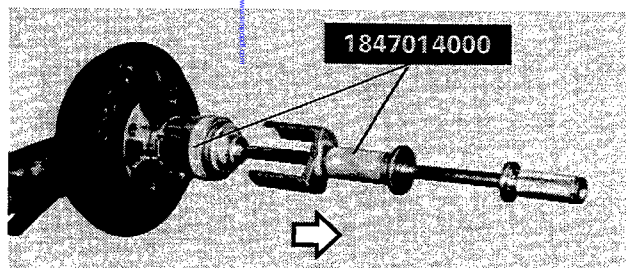


P4A023G03

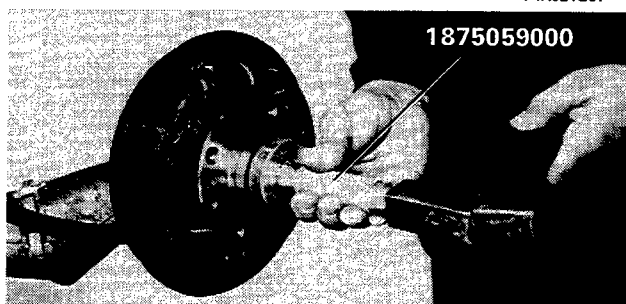


Dismantling - refitting brake drum

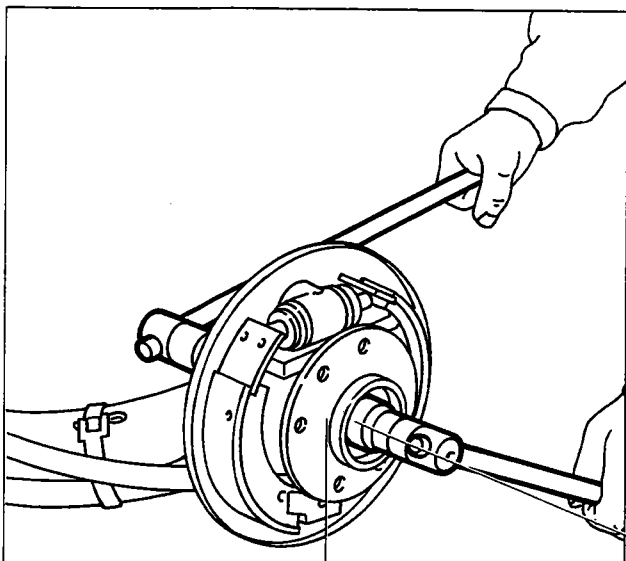
44.



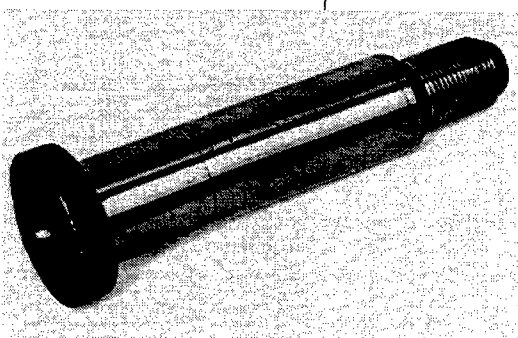
P4A024G01



P4A024G02



P4A024G03



P4A024G05

Checking stub axle

The stub axle must not be cracked, deformed or worn, otherwise it has to be replaced.

Dismantling dust cap from wheel hub

Refitting dust cap on wheel hub

NOTE Before assembly, smear TUTELA MR3 grease around the edge of the cap.

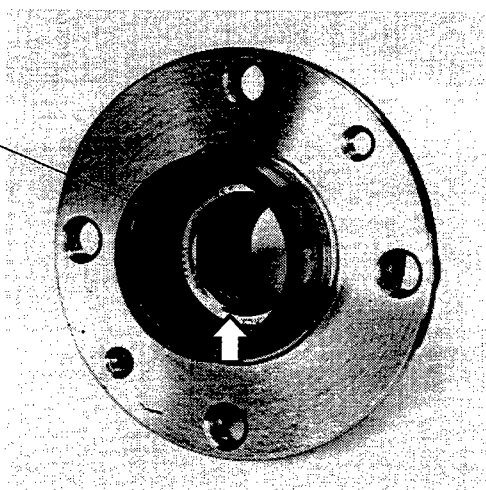
STUB AXLE - REAR WHEEL HUB

Dismantling-reassembly nut securing stub axle and wheel hub



Whenever the hub nut is removed, it should be replaced with a new one.

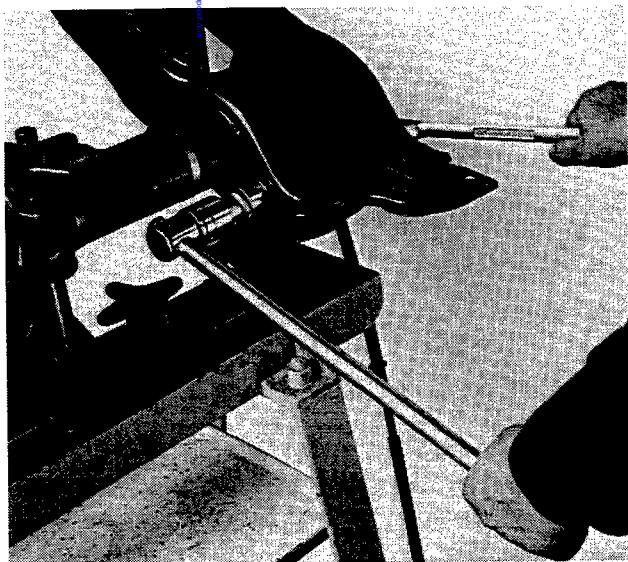
NOTE The hub nut should be tightened to the correct torque with the rear torsion beam fitted to the car.



P4A024G04

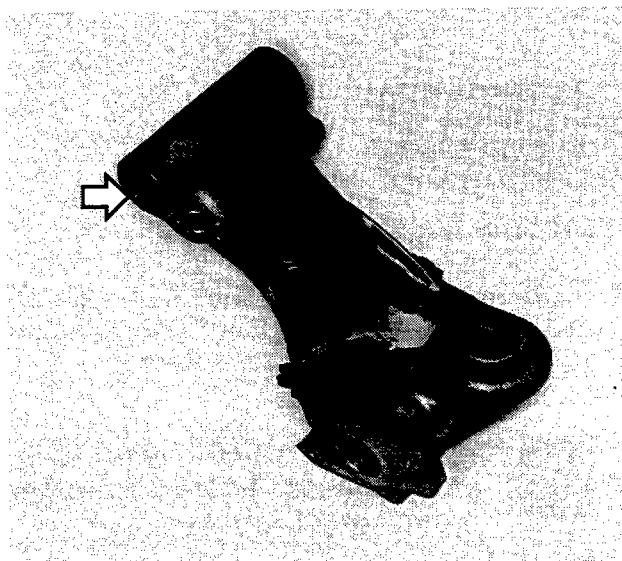
Checking hub

If the wheel bearing (arrowed) is replaced because of noisiness or excessive play, the complete hub must be replaced.



P4A025G01

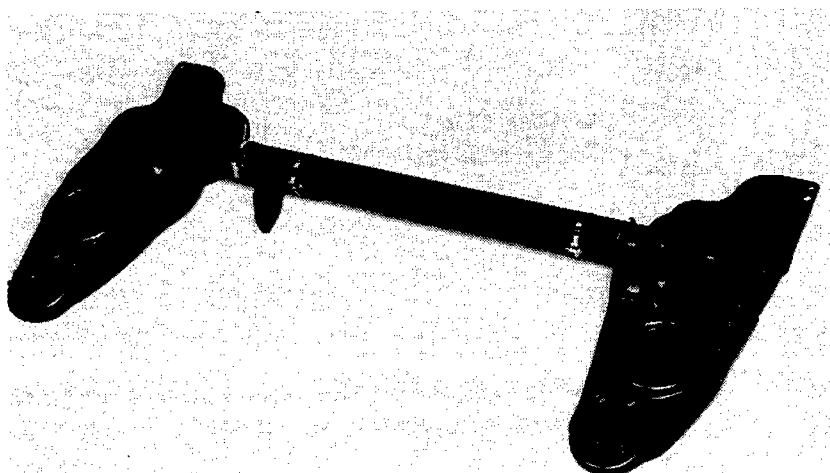
Dismantling trailing arm from rear torsion beam



P4A025G02

Checking trailing arm

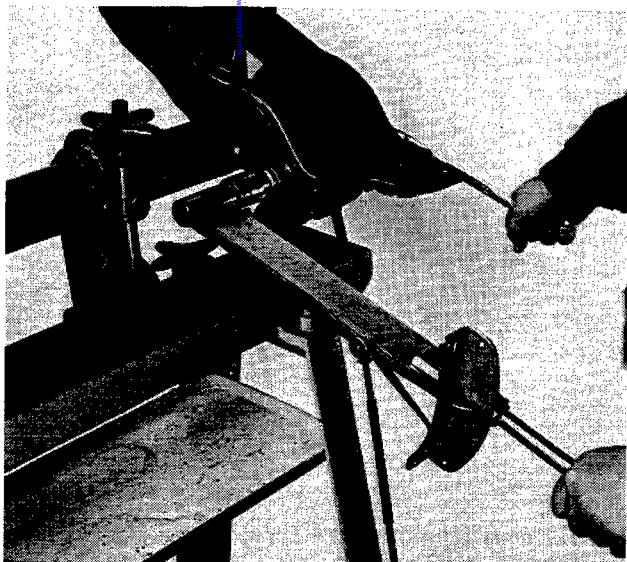
Check that the trailing arm is not cracked, deformed or worn (on the surface on the wheel side), otherwise it will have to be replaced. If the bearings and spacer (arrowed) are replaced because of noisiness or excessive play, the trailing arm must be replaced.



P4A025G03

Checking rear torsion beam

Check that the rear beam is not cracked or deformed, or misaligned between the two side arms, otherwise it will have to be replaced.

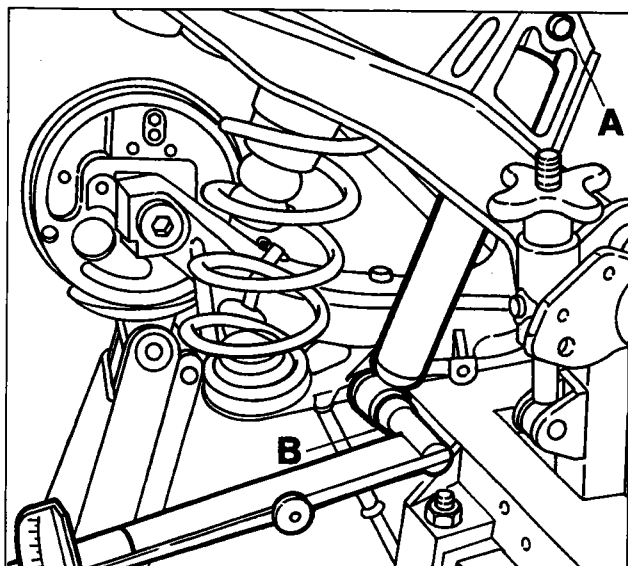


P4A026G01



15 daNm

Fitting trailing arm to rear torsion beam and tightening nut to correct torque



P4A026G02



A 6 daNm

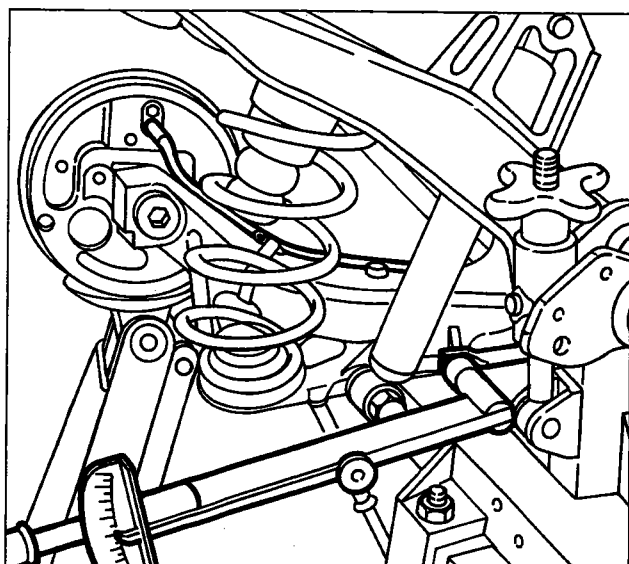
B 8.8 daNm

Refitting damper

Tightening damper top mounting bolt (A) and bottom mounting bolt (B) securing damper to rear suspension assembly



To secure the damper to the trailing arm, compress the rear suspension with a hydraulic jack.



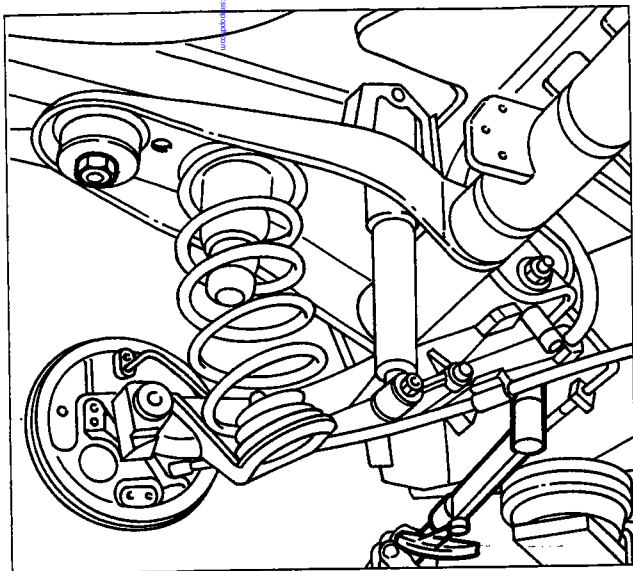
P4A026G03



5.6 daNm

Refitting brake fluid pipe and anti-roll bar on rear suspension assembly

Tightening bolt securing anti-roll bar to trailing arm to correct torque



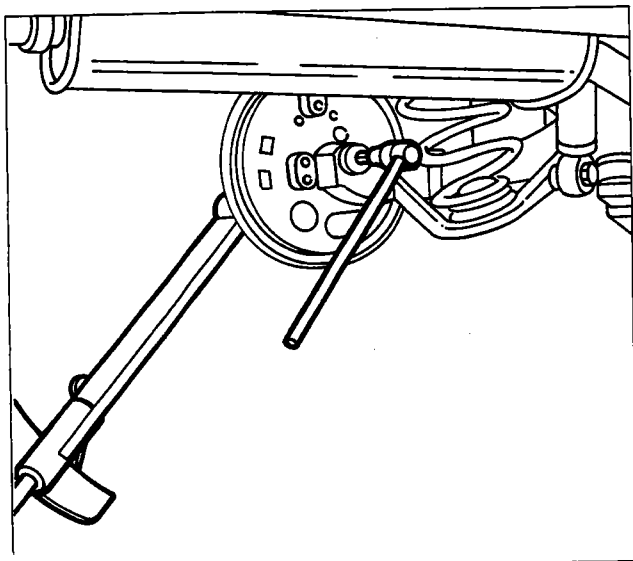
P4A027G01



10.8 daNm

Refitting rear suspension

Tightening bodywork attachment bolts to correct torque



P4A027G02



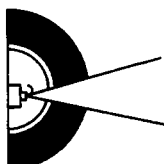
28 daNm

Tightening nut securing stub axle and wheel hub to correct torque

Also:



Bleed the brakes



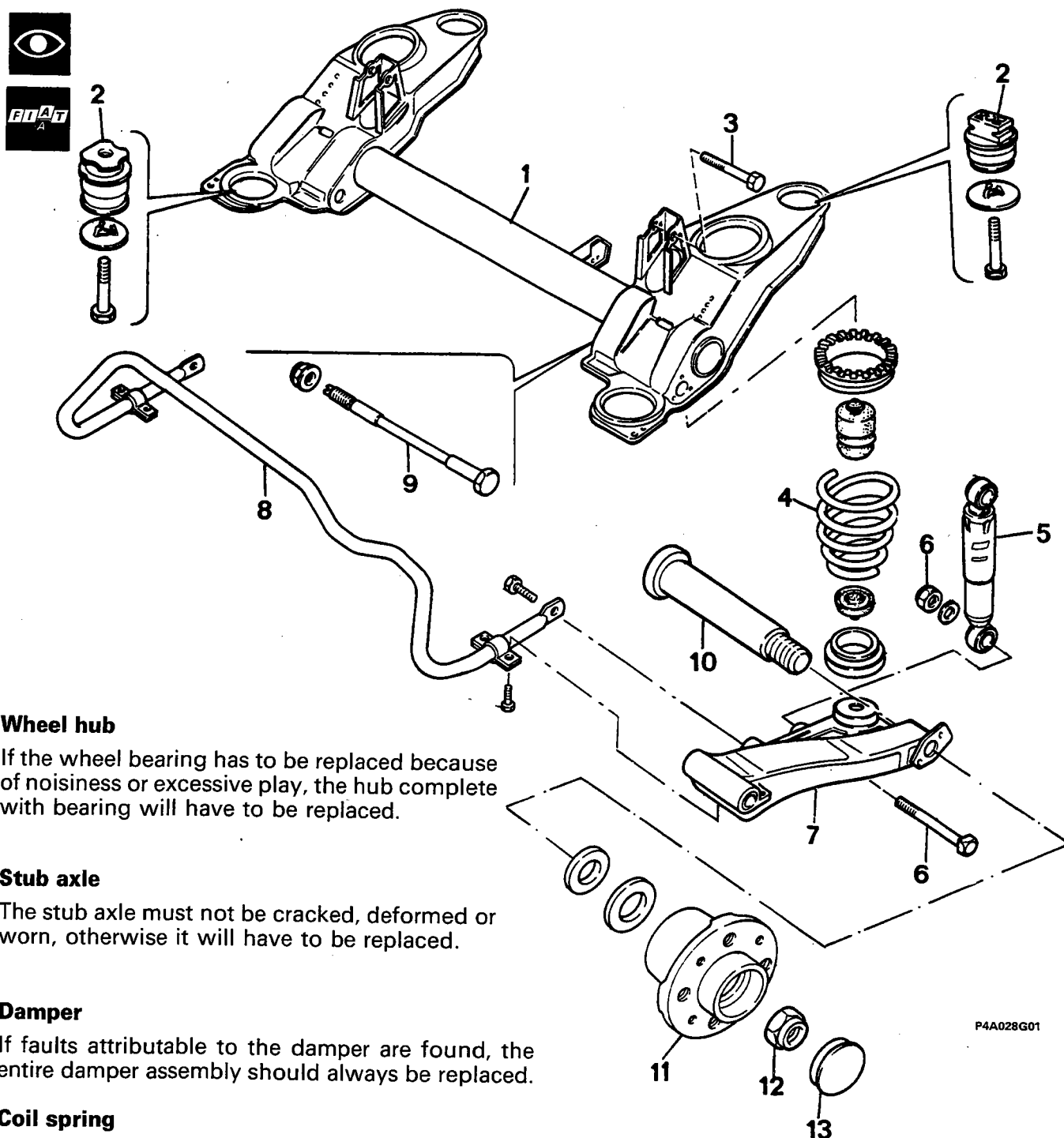
Check the rear wheel geometry

Rear suspension

44.

COMPONENTS OF THE REAR SUSPENSION SUPPLIED AS SPARE PARTS

1. Rear torsion beam - 2. Rubber buffers - 3. Damper top mounting bolt - 4. Coil spring - 5. Damper - 6. Bottom nut and bolt securing damper to trailing arm - 7. Cast iron trailing arm - 8. Anti-roll bar - 9. Nut and bolt securing trailing arm to rear torsion beam - 10. Stub axle - 11. Wheel hub - 12. Nut securing stub axle and wheel hub - 13. Hub dust cap



Wheel hub

If the wheel bearing has to be replaced because of noisiness or excessive play, the hub complete with bearing will have to be replaced.

Stub axle

The stub axle must not be cracked, deformed or worn, otherwise it will have to be replaced.

Damper

If faults attributable to the damper are found, the entire damper assembly should always be replaced.

Coil spring

Make sure that it is not cracked or deformed such that its efficiency is impaired.

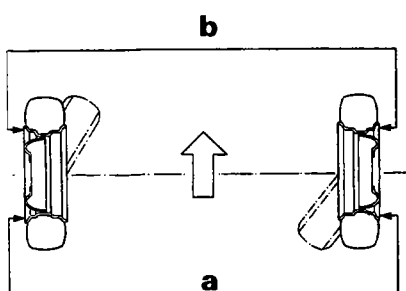
NOTE The coil springs are divided into two categories identified by a yellow or green strip of paint on the central coil. Springs of the same category must be fitted.

P4A028G01

FRONT WHEEL GEOMETRY

The wheel geometry must be checked after the components that affect it have been subjected to the following checks:

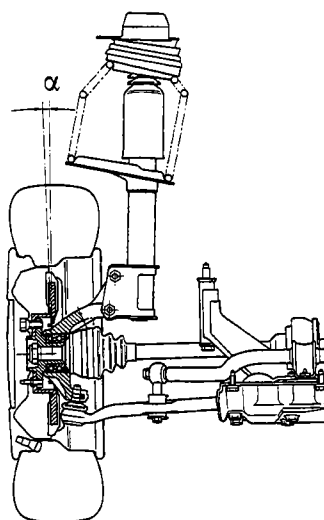
- tyre pressures;
- the eccentricity and out-of-true of the wheel rims must not exceed 3 mm;
- wheel bearing endfloat;
- clearance between vertical link and wishbone balljoint pin;
- tie-rod end play.



P4A029G01

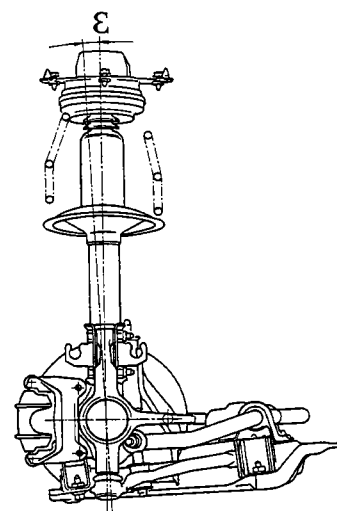
TOE-IN

See data in Sec. 00



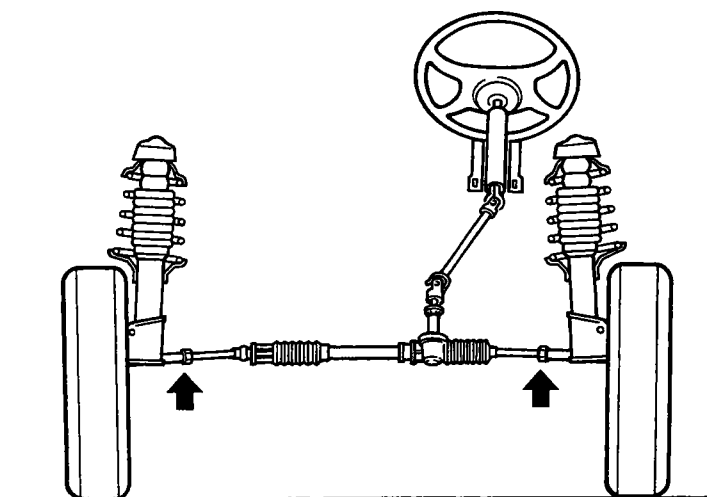
P4A029G02

CAMBER (non adjustable)



P4A029G03

CASTER (non adjustable)



P4A029G04

If, when checking the toe-in, the values measured are not as specified, slacken the steering tie-rod nuts and adjust the steering tie-rods.



If the wheel camber angle is not as specified, check the vehicle body shell.



Closely follow the instructions below whenever you adjust the front wheel toe-in:

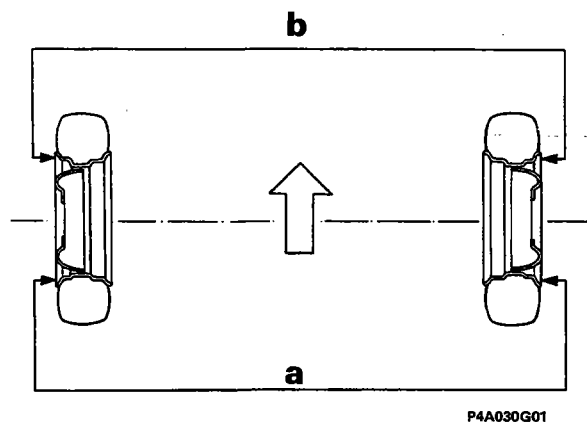
- *undo the clips securing the gaiters on the tie-rods;*
- *check that the gaiter turns freely on the tie-rod; if necessary remove the gaiter and lubricate with MOLYGUARD SYL 133 silicone grease or a similar product;*
- *tighten the clip after adjusting the toe-in and only after checking that the gaiter is in the correct position.*

44.

REAR WHEEL GEOMETRY

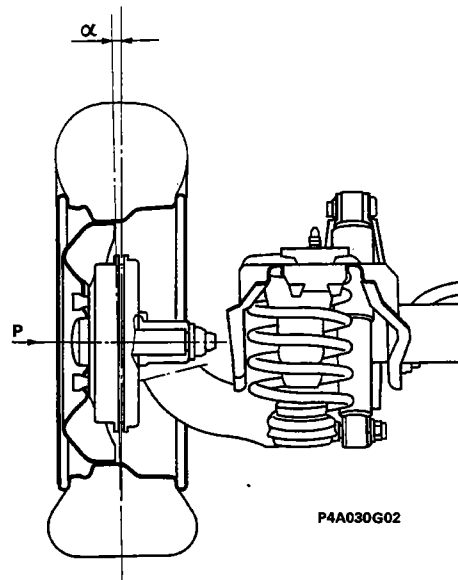
The wheel geometry must be checked after the following checks have been carried out:

- tyre pressures;
- the eccentricity and out-of-true of the wheel rims must not exceed 3 mm;
- wheel bearing endfloat.



TOE-IN (non adjustable)

See data in Sec. 00



CAMBER (non adjustable)

If the rear wheel angles are not as specified, they cannot be adjusted as the rear suspension comprises a rigid torsion beam.

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Bravo/Brava

**Click here to
choose chapter**

Summary

Alarm

Analytical Charts

Electrical Equipment

Electrical Systems

Instrument Panel Japan

Bodywork

Back

4A145V

SERVICE MANUAL COMPOSITION

At present, September 1998, the **Bravo-Brava 2nd volume manual** is composed of the following booklets;

Print N°	Sections	Page Nos.	Comments
506.670/01 With binder (V/1995)	50	1 ÷ 43	Heater - Air conditioning
	55	1 ÷ 154	Electrical equipment
		1 ÷ 55	Wiring diagrams
	70	1 ÷ 145	Removing & refitting - Replacing body panels
506.670/02 (V/1995)	55	16	Update: alarm
		4	Pre-heating
		1 ÷ 103	Wiring diagrams
		105 ÷ 161	Connector blocks
		1 ÷ 117	Electrical equipment fault diagnosis
506.670/05 (II/1996)	55	11	Update: 4D 182L radio
506.670/06 (IV/1996)	55	32	Update: AD 182H radio
		20	Update: alarm
		1	Update: code
		3	Wiring diagrams update
		1	Update: connections
506.670/10 (I/1997)	55	8	Wiring diagrams update
506.670/11 (VI/1997)	55	6	Wiring diagrams
506.670/12 (VII/1997)	50	1	Climate control
	55	2	Radio equipment
		23	Alarm
		6	Alarm
	70	6	Roof lining

4A1BSV

Print N°	Sections	Page Nos.	Comments
506.670/14 (III/1998)	55	6	Alarm
	55	26	Air bag
506.670/15 (V/1998)	55	1 ÷ 6	Japanese version
	70	19 ÷ 24 24/1 ÷ 24/4	Update: Seats
506.670/16 (IX/1998)	55	43 ÷ 44	Update: Wiring diagrams

4A145V

WORKSHOP MANUAL COMPOSITION

As of May 1998, the **Bravo-Brava manual volume 2** is made up of the following parts:

Publication no.	Sections	Page numbers	Notes
506.670/01 With binder (V/1995)	50	1 - 43	Heater - Air conditioner
	55	1 - 154	Electrical equipment
		1 - 55	Wiring diagrams
	70	1 - 145	Removal and refitting - Replacing panels
506.670/02 (V/1995)	55	16	Updated alarm system
		4	Preheating
		1 - 103	Wiring diagrams
		105 - 161	Connector blocks
		1 - 117	Electrical equipment diagnosis
506.670/05 (II/1996)	55	11	Updated radio 4D 182L
506.670/06 (IV/1996)	55	32	Updated radio AD 182H
		20	Updated alarm system
		1	Updated code
		3	Updated wiring diagrams
		1	Updated connections
506.670/10 (I/1997)	55	8	Updated wiring diagrams
506.670/11 (VI/1997)	55	6	Wiring diagrams
506.670/12 (VII/1997)	50	1	Air conditioner
	55	2	Car radio
		23	Alarm
		6	Alarm
	70	6	Roof panel trim

4A15SV

Publication no.	Sections	Page numbers	Notes
506.670/14 (III/1998)	55	6	Alarm
	55	26	Air bag
506.670/15 (V/1998)	55	1-6	Japanese version
	70	19-24 24/1-24/4	Update: Seats

4A02SV

SERVICE MANUAL COMPOSITION

At present, January 1997, the **Bravo-Brava 2nd volume** manual is composed of the following booklets:

Print No.	Sections	Page Nos.	Comments
506.670/01 With binder (V/1995)	50	1 ÷ 43	Heater - Air conditioning
	55	1 ÷ 154	Electrical equipment
		1 ÷ 55	Wiring diagrams
	70	1 ÷ 145	Removing and refitting - Replacing body panels
506.670/02 (V/1995)	55	16	Alarm update
		4	Pre-heating
		1 ÷ 103	Wiring diagrams
		105 ÷ 161	Connector blocks
		1 ÷ 117	Electrical equipment fault diagnosis
506.670/05 (II/1996)	55	11	4D 182L radio update
506.670/06 (IV/1996)	55	32	AD 182H radio update
		20	Alarm update
		1	Code update
		3	Wiring diagrams update
		1	Connections update
506.670/10 (I/1997)	55	8	Wiring diagrams update

4A14SV

WORKSHOP MANUAL COMPOSITION

As of March 1998, the **Bravo-Brava volume 2** manual is made of the following parts:

Publication no.	Sections	Page numbers	Notes
506.670/01 With binder (V/1995)	50	1 - 43	Heater - Air conditioner
	55	1 - 154	Electrical equipment
		1 - 55	Wiring diagrams
	70	1 - 145	Removal-refitting - Replacing body panels
506.670/02 (V/1995)	55	16	Updated alarm system
		4	Preheating
		1 - 103	Wiring diagrams
		105 - 161	Connector blocks
		1 - 117	Electrical equipment diagnosis
506.670/05 (II/1996)	55	11	Updated radio 4D 182L
506.670/06 (IV/1996)	55	32	Updated radio AD 182H
		20	Updated alarm system
		1	Updated code system
		3	Updated wiring diagrams
		1	Updated connections
506.670/10 (I/1997)	55	8	Updated wiring diagrams
506.670/11 (VI/1997)	55	6	Wiring diagrams
506.670/12 (VII/1997)	50	1	Air conditioner
	55	2	Car radio
		23	Alarm
		6	Alarm
	70	6	Roof panel trim

4A035V

Publication no.	Sections	Page numbers	Notes
506.670/14 (III/1998)	55	6	Alarm
	55	26	Air bag

4A02SV

SERVICE MANUAL COMPOSITION

At present, April 1996, the **Bravo-Brava 2nd volume** manual is composed of the following booklets:

Print No.	Sections	Page Nos.	Comments
506.670/01 With binder (V/1995)	50	1 ÷ 43	Heater - Air conditioning
	55	1 ÷ 154	Electrical equipment
		1 ÷ 55	Wiring diagrams
	70	1 ÷ 145	Removing & refitting - Replacing body panels
506.670/02 (V/1995)	55	16	Alarm update
		4	Pre-heating
		1 ÷ 103	Wiring diagrams
		105 ÷ 161	Connector blocks
		1 ÷ 117	Electrical equip. fault diagnosis
506.670/05 (II/1996)	55	11	4D 182L radio update
506.670/06 (IV/1996)	55	32	AD 182H radio update
		20	Alarm update
		1	Code update
		3	Wiring diagrams update
		1	Connections update

4A02SV

SERVICE MANUAL COMPOSITION

At present, June 1995, the **Bravo-Brava 2nd volume** manual is composed of the following booklets:

Print No.	Sections	Page Nos.	Comments
506.670/01 With binder (V/1995)	50	1 ÷ 43	Heater - Air conditioning
	55	1 ÷ 154	Electrical equipment
		1 ÷ 55	Wiring diagrams
	70	1 ÷ 145	Removing & refitting - Replacing body panels

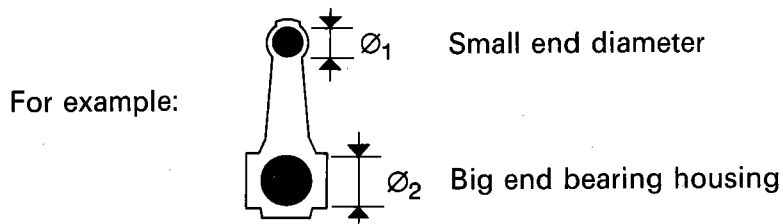
This manual contains the main instructions for repairing and maintaining the **Fiat Bravo and Fiat Brava**.

The manual is divided into sections distinguished by two digit numbers which appear in the parts microfiches and the flat rate manual.

The section **INTRODUCTION AND TECHNICAL DATA (00.)** has a dual function of introducing the model and supporting the remaining part of the manual. This section includes the tables of technical data and specific information relating to the sections in the remaining part of the man.

The remaining sections (10. - 18. etc.) include descriptions of the repair operations.

This manual contains graphic representations and symbols in place of descriptions for mechanical components, operations and repair methods.



Tighten to torque

ENGINES Section 10 contains illustrations of the operations of removing-refitting the power units, operations on vehicle and the various fuel, lubrication and cooling systems.

The procedures for overhauling the individual engines are described in other booklets which have the following print nos.:

Engine	Print No.	Part No.
1370 12V	504.589/19	604.89.774
1581 16V	504.589/20	604.89.781
1747 16V	504.589/18	604.89.192
1998 20V	504.589/22	604.89.788
1929 D	504.593/11	604.89.841
1910 TD	504.593/13	604.44.220

The first 4 booklets are inserted in the Overhauling Petrol Engines Manual 3rd volume, whilst the last ones are inserted in the Overhauling Diesel Engines Manual 2nd volume.

GEARBOXES Section 21-27 contains illustrations of the operations of removing and refitting the various gearboxes. The procedures for overhauling the various manual gearboxes at the bench are published in separate booklets which have the following print nos.:

505.023/08 Inserted in the Overhauling gearboxes manual
 505.023/03 Inserted in the Overhauling gearboxes manual
 505.023/18 Inserted in the Overhauling gearboxes manual 2nd volume

THIS PUBLICATION HAS BEEN PRODUCED IN A LOOSE LEAF FORMAT TO FACILITATE THE OPERATION OF UPDATING THE MODEL.



When using chemical products stick closely to the instructions in the safety chart which the supplier must give to the consumer (for Italy in accordance with D.M. no. 46/1992)

The **Fiat Bravo** is a 2 box, 3 door vehicle with a load carrying structure, transversely mounted engine and front wheel drive

It is produced with 6 different engine types.

The engines have 4 or 5 cylinders in line with clockwise rotation and are mounted transversely at the front.

According to the trim level, the following engines are fitted:

- 1370 cc** four cylinders in line, 12 valves running on unleaded petrol and developing a power output of 59 kW (80 CV) at 6000 rpm.
- 1581 cc** four cylinders in line, 16 valves running on unleaded petrol and developing a power output of 76 kW (103 CV) at 5700 rpm.
- 1747 cc** four cylinders in line, 16 valves running on unleaded petrol and developing a power output of 83 kW (113 CV) at 5800 rpm.
- 1998 cc** five cylinders in line, 20 valves running on unleaded petrol and developing a power output of 108 kW (147 CV) at 6100 rpm.
- 1929 D cc** four cylinders in line, 8 valves, indirect injection running on diesel fuel and developing a power output of 48 kW (65 CV) at 4600 rpm.
- 1910 TD cc** four cylinders in line, 8 valves, indirect injection running on diesel fuel and developing a power output of 74 kW (100 CV) at 4200 rpm.

The **Fiat Brava** is a three box vehicle, with 5 doors, a load carrying structure, transversely mounted engine and front wheel drive

It is produced with 5 different engine types.

The engines are the same as those fitted on the **Fiat Bravo** with the exception of the 1998 cc.

	Remove Disconnect		Inlet
	Refitting Connect		Exhaust
	Dismantling Disassemble		Operation
	Refitting Composition		Tolerance Difference in weight
	Tighten to torque		Pre-loading
	Tighten to torque plus angle		Rotation
	Fully tighten		Compression ratio
	Stake nut		Selection Classes
	Adjustment Regulation		Oversize Greater than Maximum
	Visual inspection Check		Undersize Smaller than Idling
	Warning		Number of revs
	Lubricate Grease		Ratio
	Replace Genuine spares		Pressure
	Bleed braking system		Temperature
	Work surface Machined surface		Temperature < 0°C Cold Winter
	Interference Force fit		Temperature > 0°C Hot Summer
	Distance to be measured Measurement - Check Thickness - Clearance		Windscreen wiper with electric washer pump
	Rolling torque		Rearscreen wiper with electric washer pump
			Engine

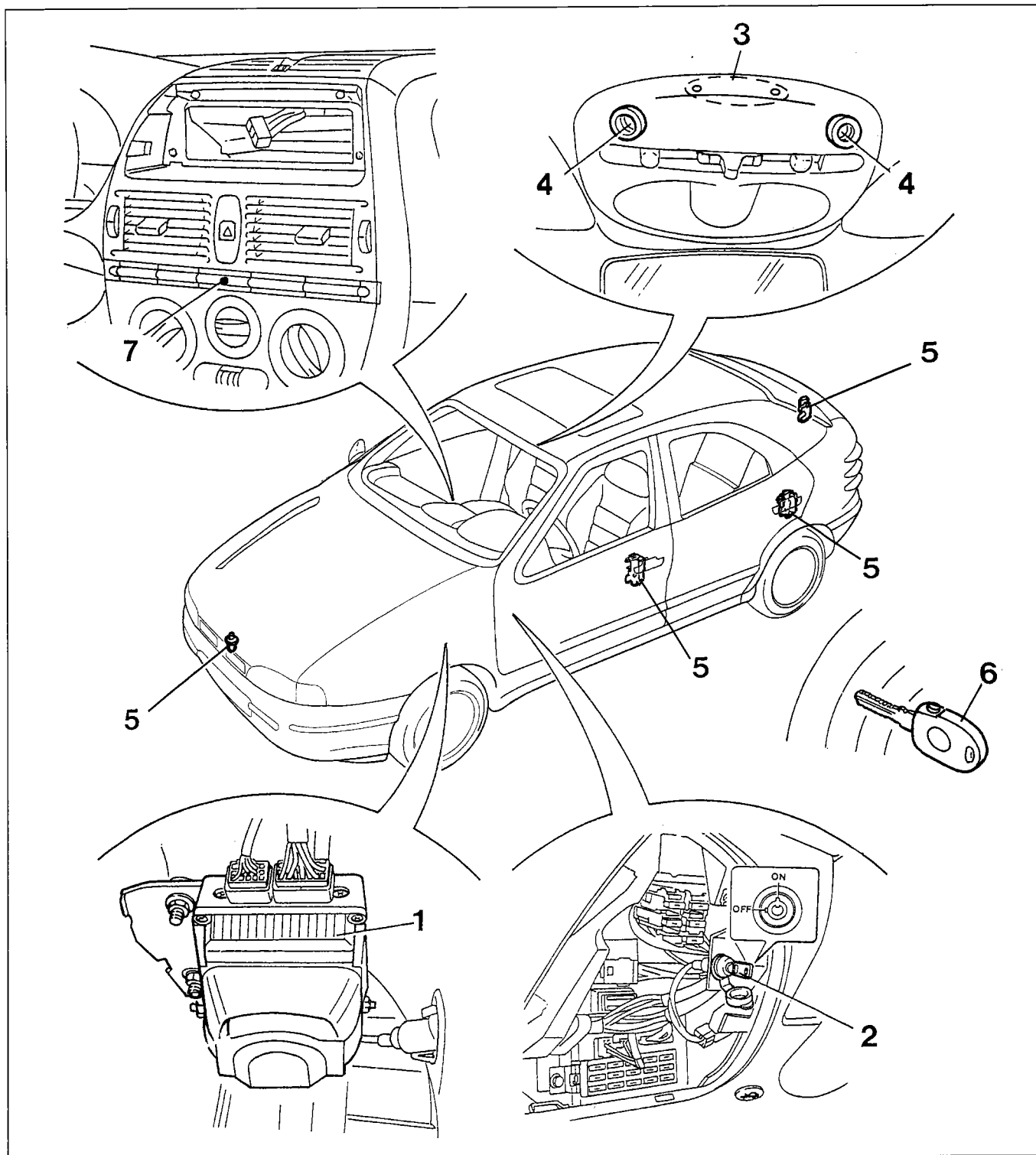
ALARM

- Location of components of alarm system	1
- Introduction	2
- Receiver	2
- Remote control	2
- Emergency key switch	3
- Operation	3
- Programming	3
- Simplified programming	4
- Closing the memory	5
- Programming with closed memory	6
- Opening memory and memorizing a new remote control	6
- Replacing alarm control unit	6



For aspects not discussed, refer to the previous Section 55 - Electrical system - Alarm, on pages 134 and following.

LOCATION OF COMPONENTS OF ALARM SYSTEM



P4A01DL01

- | | |
|---|--|
| 1. Alarm control unit | 5. Doors/bonnet/boot/fuel flap open indicator switches |
| 2. Emergency key switch | 6. Remote control integrated in the ignition key |
| 3. Receiver on front central courtesy light | 7. Warning light / dissuasion LED |
| 4. Volumetric sensors on front central courtesy light | |

INTRODUCTION

The new V.A.S. (Vehicle Alarm System) radiofrequency alarm system offers volumetric and perimetral protection; it monitors the state of the bonnet, boot, fuel flap and doors and the presence of a moving object in the interior compartment.

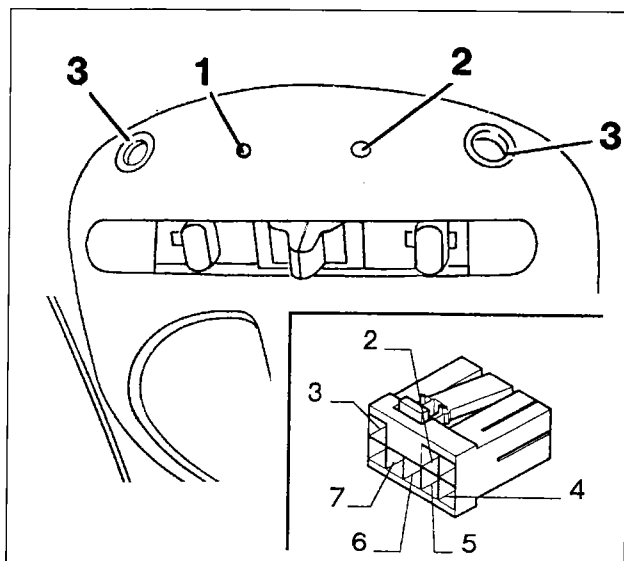
This alarm system has the following differences compared with the model fitted previously:

- new radiofrequency receiver, incorporated in the front central courtesy light, with green warning light (LED) (the LED was previously red);
- radiofrequency remote control, integrated in the differently-shaped ignition key;
- new alarm control unit integrated in a self-supplied siren, which is located in the front left wheelarch;
- new method of programming the remote controls.

RECEIVER

The receiver, built into the front central courtesy light, is an electronic device which captures the radiofrequency signal emitted by the remote control and carries out the functions of opening and closing the doors and activating the alarm control unit.

The receiver has a green warning light (LED) (1) which comes on when it receives the signal, while the button (2) allows the code to be memorized (see "PROGRAMMING").



P4A02DL01

Detail of receiver on front courtesy light

1. Green warning light (LED)
2. memorization button
3. Volumetric sensors

Receiver connector

1. Not connected
2. Serial line to alarm control unit
3. Battery positive (+30)
4. Earth
5. Door unlock
6. Door lock
7. Ignition-dependent positive (+15)
8. Not connected

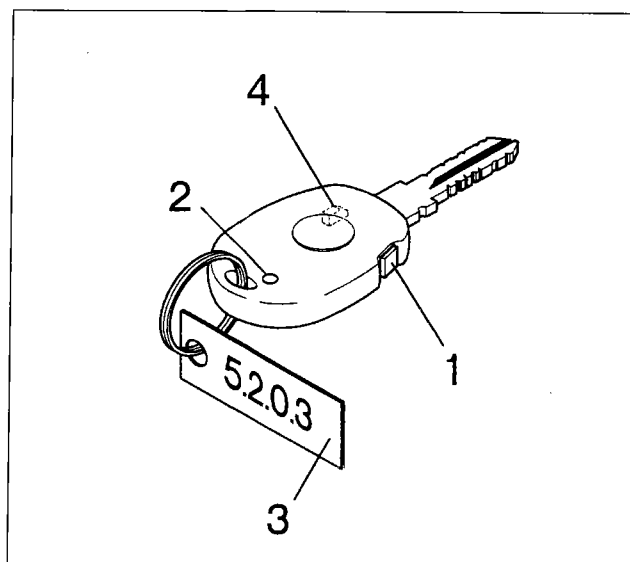
REMOTE CONTROL

The alarm system remote control, built into the ignition key (figure opposite), is an electronic device which sends a signal to the receiver for controlling the opening/closure of the doors and activation/deactivation of the alarm system.

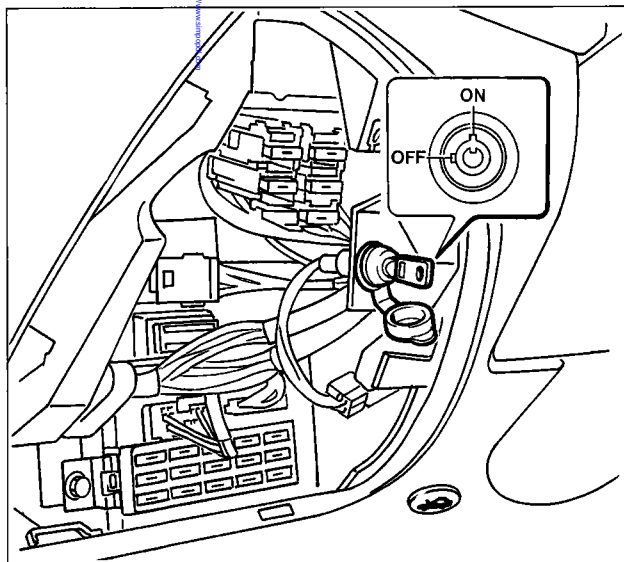
Whenever the button (1) on the remote control is pressed, the remote control issues a radio code which has a radius of action of about 10 metres.

1. Control button
2. Repeater warning light (LED)
3. Access code (password) tag
4. Transponder (for Fiat CODE - not visible)

NOTE If the control unit, receiver and/or remote controls are replaced, components from the same type of system must be used.



P4A02DL02



P4A16AL01

EMERGENCY KEY SWITCH

The emergency circuit key switch allows the alarm system to be excluded, if necessary. It is located on the side under the dashboard and is only accessible after removing the bottom left trim from the dashboard (see figure).

The emergency key switch can assume two positions, namely:

- OFF** (key fully rotated in the anti-clockwise direction), corresponding to deactivation of the alarm circuit
- ON** (key fully rotated in the clockwise direction), corresponding to activation of the supply to the alarm system.

From January 1998, the alarm systems on cars intended for the United Kingdom market no longer have the emergency key switch, so the control unit is permanently in the activated state.

OPERATION

Switching off the alarm

If the remote control's batteries become discharged or the alarm system is faulty, it can be deactivated by turning the emergency key switch to the OFF position.

This key should be rotated to the OFF position if the car is to be left unused for long periods (over three weeks).

To reactivate the system, turn the emergency key switch ON again and check that it is in this position before delivery of the car to the customer.

For cars intended for the British market which have no emergency key switch, in the above-mentioned case in which the remote control's batteries are discharged and the alarm cannot be turned off, wait for the latter to be deactivated (i.e. after the cycles of siren coming on and direction indicators flashing).



As regards "Switching alarm on/off", "Surveillance", "Alarm state", "Switching on with siren excluded" and "Discharged batteries indicator", refer to pages 134/1 and 134/2 of the previous Section 55.

PROGRAMMING

The methods of indicating the alarm may vary depending on the laws in force in the country of registration; it is therefore necessary to programme the system by entering the "country code", as described on the next page.

The system "recognizes" the code of the remote controls with no limit as to quantity, but only the last 8 remain stored in memory (when the ninth remote control is entered, the first is deleted from memory).

There are two programming methods (see the description on the following pages):

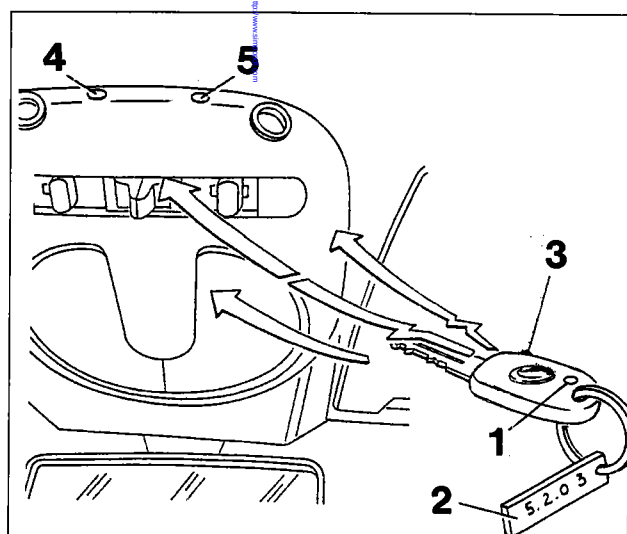
- before entering the access code (password): **SIMPLIFIED PROGRAMMING**
- after closing the memory: **PROTECTED PROGRAMMING**



In view of the importance of carrying out the programming procedure quickly and precisely, it is advisable, at least initially, for two people to carry out the operation: one to read the instructions in sequence and the other to carry them out closely.

Alarm

55.



P4A04DL01

SIMPLIFIED PROGRAMMING

The memorization of a remote control must always take place with:

- alarm off (dissuasion LED off)
- ignition key removed or at the STOP or PARK positions
- emergency key switch (except for versions for the British market which do not have it) at the ON position

With this programming system, all the codes of the remote controls, with no limit as to quantity, are "recognized", but only the last 8 remain stored in the alarm system's memory as follows:

1. press and hold down the button (5) on the receiver, built into the front central courtesy light; the adjacent warning light (LED) (4) should flash;
2. still holding down the button (5), press the button (3) on the remote control;
3. then release the button (3) on the remote control when the LED (4) on the receiver stays on permanently;
4. release the button (5) on the courtesy light to conclude the procedure.

1. Remote control warning light (LED)
2. 4-digit access code (password)
3. Remote control button on ignition key
4. Warning light (LED) on front central courtesy light
5. Programming button

If the LED (4) on the receiver stops flashing and goes out when the remote control button (3) is pressed, this means that the receiver's memory is closed, so "PROTECTED" programming should be used.

NOTE To memorize the subsequent remote controls, repeat the above-mentioned operations.

Programming country code

Procedure a)

After memorizing the remote controls as described above, within 15 seconds of releasing the button (5) of the receiver on the courtesy light, the code of the country where the alarm system has to operate must be memorized.

The country code is programmed by pressing the button (5) of the receiver in rapid succession n times (see table below). The LED (4) will flash at each press of the button.

If the button (5) is not pressed, the system sets itself to the country code previously memorized; if there is none (1st programming), the system sets itself automatically to the operating mode for "ITALY".

NOTE The 15 seconds are reduced to 3 from the second memorization onwards.

COUNTRY CODE (presses of button)	COUNTRY OF OPERATION
1	ITALY
2	GERMANY
3	FRANCE
4	SWITZERLAND

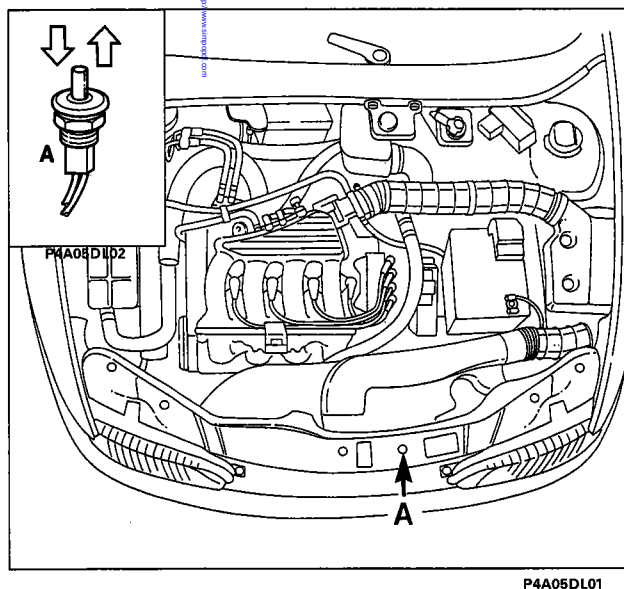
COUNTRY CODE (presses of button)	COUNTRY OF OPERATION
5	UNITED KINGDOM
6	BELGIUM
7	HOLLAND
8	EEC



If the procedure has been carried out correctly, the warning light (LED) (5) on the receiver will flash n times (where n is the selected country code number), confirming that the code has been memorized by both the receiver and the control unit; if not, the LED (5) **comes on and stays on for 5 seconds**; at this point it will be necessary to repeat all the programming operations starting from point 1.

For cars intended for the British market, if the LED does not come on again, this means that the control unit is not connected to the receiver or is not supplied.

NOTE To programme the country code, you can use the procedure with the FIAT/LANCIA Tester and the other diagnostic systems.

**Procedure b)**

Alternatively, the country code can be programmed by means of the following procedure:

- open the bonnet;
- turn the ignition from on to off (STOP position), then before 15 seconds elapse, press 7 times in rapid succession (in less than 10 seconds) the switch (A) (bonnet open sensor); 5 beeps will indicate entry into MANUAL DIAGNOSIS (see page 150 of previous Section 55). During this stage (5 beeps) press and hold down the switch (A). A final long beep will indicate acceptance of this action;
- hold down the switch (A) throughout the duration of the long beep. This long beep confirms start of "country code programming", and so the possibility of subsequently entering the "country code";

- release the switch (A) and within 10 seconds press the same switch n times (see table on preceding page), to select the operating mode for the desired country (each press will be accompanied by a confirming beep).



The simplified programming procedure permanently deletes the UNIVERSAL code, used during the stages prior to delivery of the car to the Customer.

CLOSING THE MEMORY

To avoid the entry of unauthorized remote controls, the memory must be protected (closed); this operation takes place automatically after the alarm system has switched on/off 128 times. The memory can also be closed manually by entering the access code (Password) (4-digit number stated on the tag attached to the ignition key with remote control illustrated on page 2), for example on a new car before delivery, after all the codes of the remote controls given to the Customer have been entered.

The procedure for entering the Password is as follows:

1. Take one of the tags of the remote controls memorized in the receiver, then press for 1 second the button on the receiver: the LED flashes for as long as the button is held down.
2. Then release the button: after about 3 seconds, the LED flashes briefly, to indicate that the first digit of the Password can be entered.
3. Press the receiver button as many times as indicated by the first digit of the Password (e.g. if the Password is 5.2.0.3.: press 5 times). Note that whenever the button is pressed, the LED comes on briefly to give visual confirmation.
4. About 3 seconds after the last press of the button (the fifth in the example), the LED emits another flash to request the entry of the next digit.
5. Proceed as described in point 3 to enter all the subsequent digits.

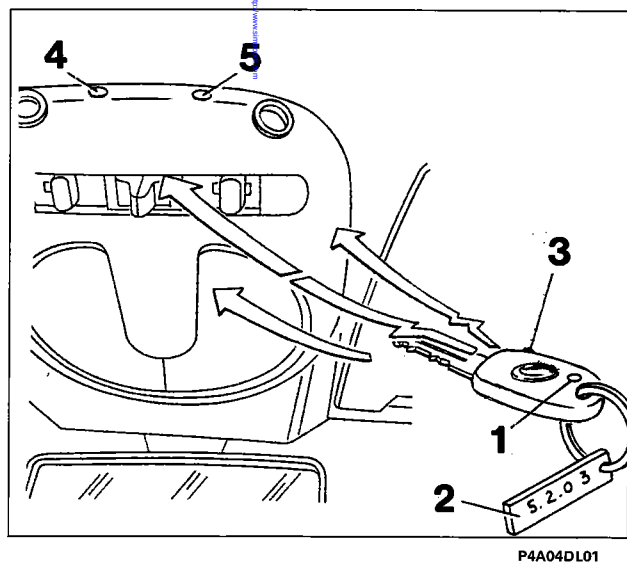
NOTE *When the password (see example) contains a "0", do not press the button on the receiver, but wait for the request to enter a new digit, indicated by the next flash.*

After the 4 digits of the Password have been entered, the LED on the receiver may:

- **flash for about 10 seconds;** to indicate that the Password has been entered correctly;
- **come on and stay on for about 10 seconds;** to indicate that the Password has not been entered correctly, so after the LED has gone out, the Password should be re-entered correctly starting from point 1.

The correct entry of the access code (Password) "closes" (protects) the memory, to prevent the memorization of unauthorized remote controls.

In fact it is impossible to memorize a new remote control, because after transmitting its code, the warning light (LED) on the receiver will stop flashing to indicate that the operation has failed; in this case the memory has to be "opened", proceeding as described on the next page.



1. Transmitter warning light (LED)
2. 4-digit access code (Password)
3. Control button on transmitter
4. Warning light (LED) on courtesy light
5. Programming button

PROGRAMMING WITH CLOSED MEMORY

If the memory is "closed" (protected), further remote control codes can only be entered after the memory has been "opened" with one of the codes of the keys memorized in the receiver.

OPENING MEMORY AND MEMORIZATION OF A NEW REMOTE CONTROL

Opening the memory

To open the memory, carry out the operations listed below in quick succession:

1. press the button (5) on the receiver for about 2 seconds; the LED (4) will flash for as long as the button is pressed;
2. release the button; after about 2 seconds, the LED emits a brief flash to indicate that the first digit of the Password can be entered;
3. press the receiver button (5) as many times as indicated by the first digit of the Password (e.g. if the Password is 5.2.0.3., press 5 times). Note that whenever the button is pressed, the LED (4) comes on briefly to give visual confirmation;

4. after about 2 seconds from the last press of the button (the fifth in the example), the LED emits another flash to request the entry of the next digit;
5. proceed from point 3 to enter all four digits (if the digit is "0", do not press the button, but wait for the next request);
6. if the Password has been entered correctly (memory opened), the LED starts to flash (for about 10 seconds); if instead it comes on and stays on (for about 10 seconds), the procedure will have to be repeated from point 1, as the password has not been recognized.

Memorizing a new remote control

7. While the LED (4) is flashing, press and hold down the button (5); the LED (4) will continue to flash;
8. press the button (3) on the new remote control until the green/red LED (4) on the courtesy light stays on permanently;
9. then release the button (3) of the transmitter when the LED (4) on the courtesy light stays on permanently;
10. release the button (5) on the courtesy light to conclude the programming procedure.



*If the procedure has been carried out correctly, the LED on the receiver will flash **n times** (where n is the selected country code number), confirming that the code has been memorized by both the receiver and the control unit; otherwise the LED **comes on and stays on for 5 seconds**; all the operations will thus have to be repeated starting from point 1 of the programming procedure.*



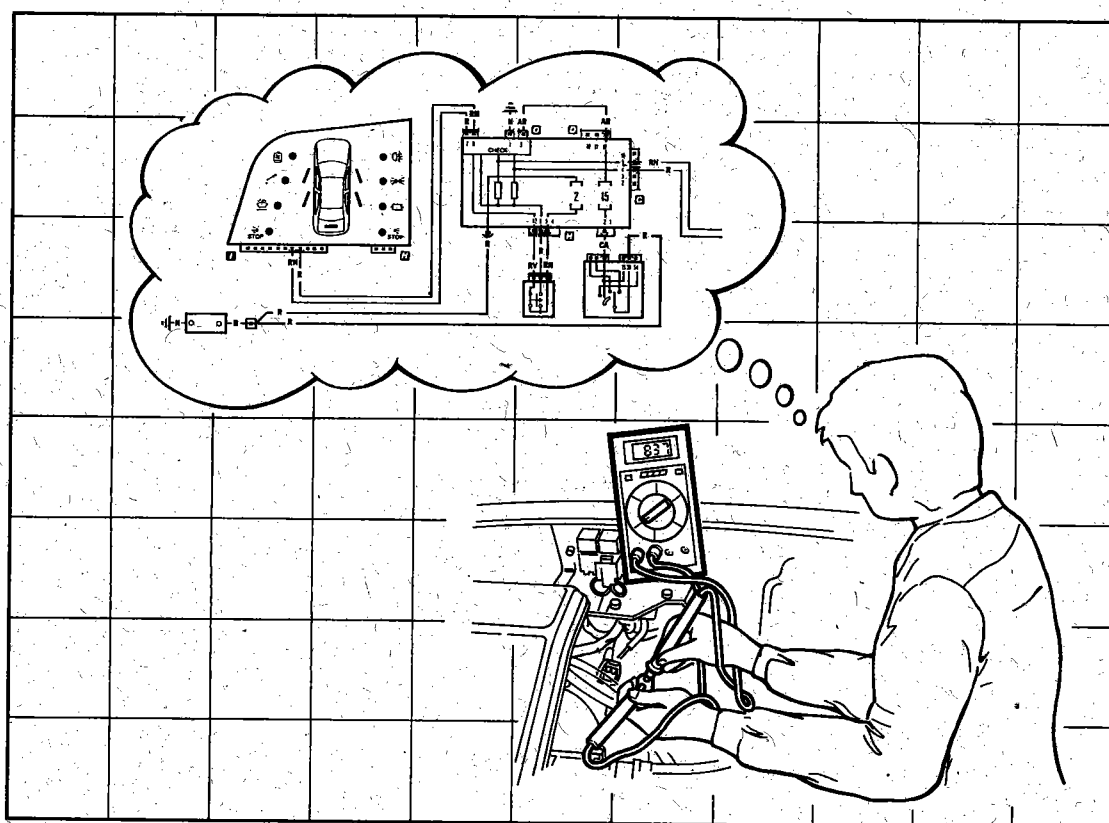
After the new remote control has been memorized, the memory returns to the "closed" state.

REPLACING ALARM CONTROL UNIT

If only the alarm control unit has to be replaced, the new part must be activated by memorizing at least one of the remote controls provided, by following the procedure described in the "SIMPLIFIED PROGRAMMING" sub-section on page 4 or in the "PROGRAMMING WITH CLOSED MEMORY" sub-section at the top of this page.

Analytical charts

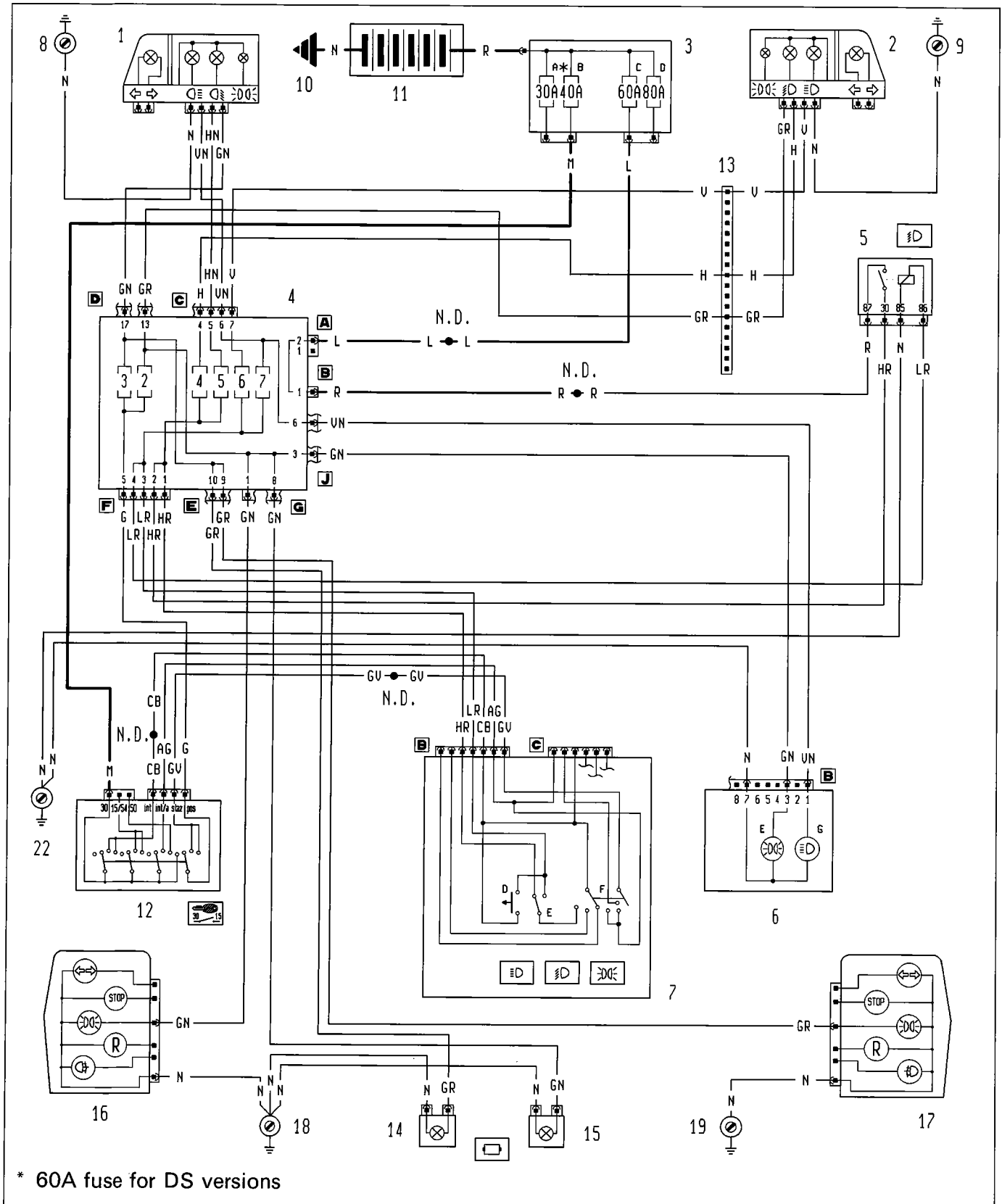
Electrical equipment fault diagnosis



P4A000N01

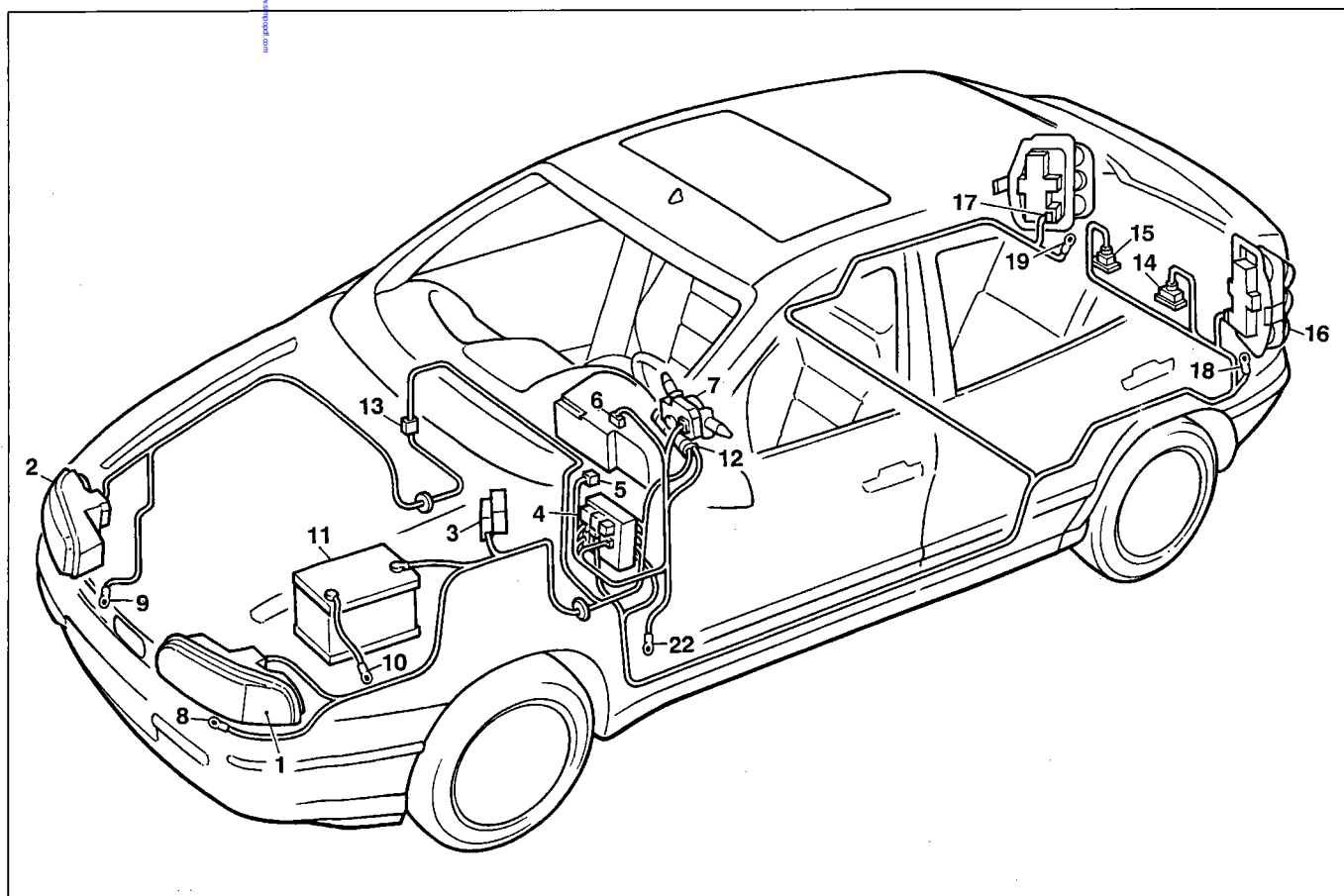
Chart No.	Functions involved
Chart 1 (page 1)	Parking lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights
Chart 2 (page 19)	Trim level: S - SX Electric front windows
Chart 3 (page 27)	Trim level: EL - ELX - GT - HGT Electric front windows
Chart 4 (page 35)	Trim level: EL - ELX Electric rear windows
Chart 5 (page 45)	Version without alarm: S - SX - GT Central locking
Chart 6 (page 57)	Version: EL - ELX - HGT Central door locking and car doors not shut warning system
Chart 7 (page 73)	Trim level: EL - ELX - HGT Direction indicators and warning light - Hazard warning lights and warning light - Braking lights - Reversing lights
Chart 8 (page 97)	Vehicle interior lights - Ideogram lights
Chart 9 (page 107)	Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Water temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter

Parking lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights - (See key at end of wiring diagrams)



* 60A fuse for DS versions

55D.



P4A007N02

Parking lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights

Components key

- | | |
|--|---|
| 1 Left front light cluster | 13 Front right/left cables connection |
| 2 Right front light cluster | 14 Left no. plate light |
| 3 Power fuse box: | 15 Right no. plate light |
| A 30A protective fuse for injection system (60A for DS versions) | 16 Left rear light cluster |
| B 40A protective fuse for ignition system | 17 Right rear light cluster |
| C 60A protective fuse for optional extras | 18 Left rear earth |
| D 80A protective fuse for junction unit | 19 Right rear earth |
| 4 Junction unit | 22 Left dashboard earth |
| 5 Dipped headlamps relay feed | N.D. Ultrasound welding taped in cable loom |
| 6 Instrument panel: | |
| E Side lights warning light | |
| G Main beam headlamps warning light | |
| 7 Steering column switch unit: | |
| D Flasher control | |
| E Switch for dipped/main beam headlamps | |
| F Switch for side lights | |
| 8 Left front earth | |
| 9 Right front earth | |
| 10 Earth for battery on bodyshell | |
| 11 Battery | |
| 12 Ignition switch | |

The outside lights are not working

Check condition of steering column switch unit 7



Not OK



Overhaul or replace steering column switch unit 7



OK



Check the condition of the ignition switch 12



Not OK



Overhaul or replace the ignition switch 12

The side lights and the number plate lights are not working

Check the condition of fuses 2 and 3 in the junction unit 4



Not OK



Check for a short circuit in the system and replace 2 and 3



OK



Check for voltage at the G coloured cable, at connector G pin 5 of the junction unit 4



OK



Check the condition of the control unit 4, overhaul it or replace it



Not OK



Check for voltage at the G coloured cable for the ignition switch 12



OK



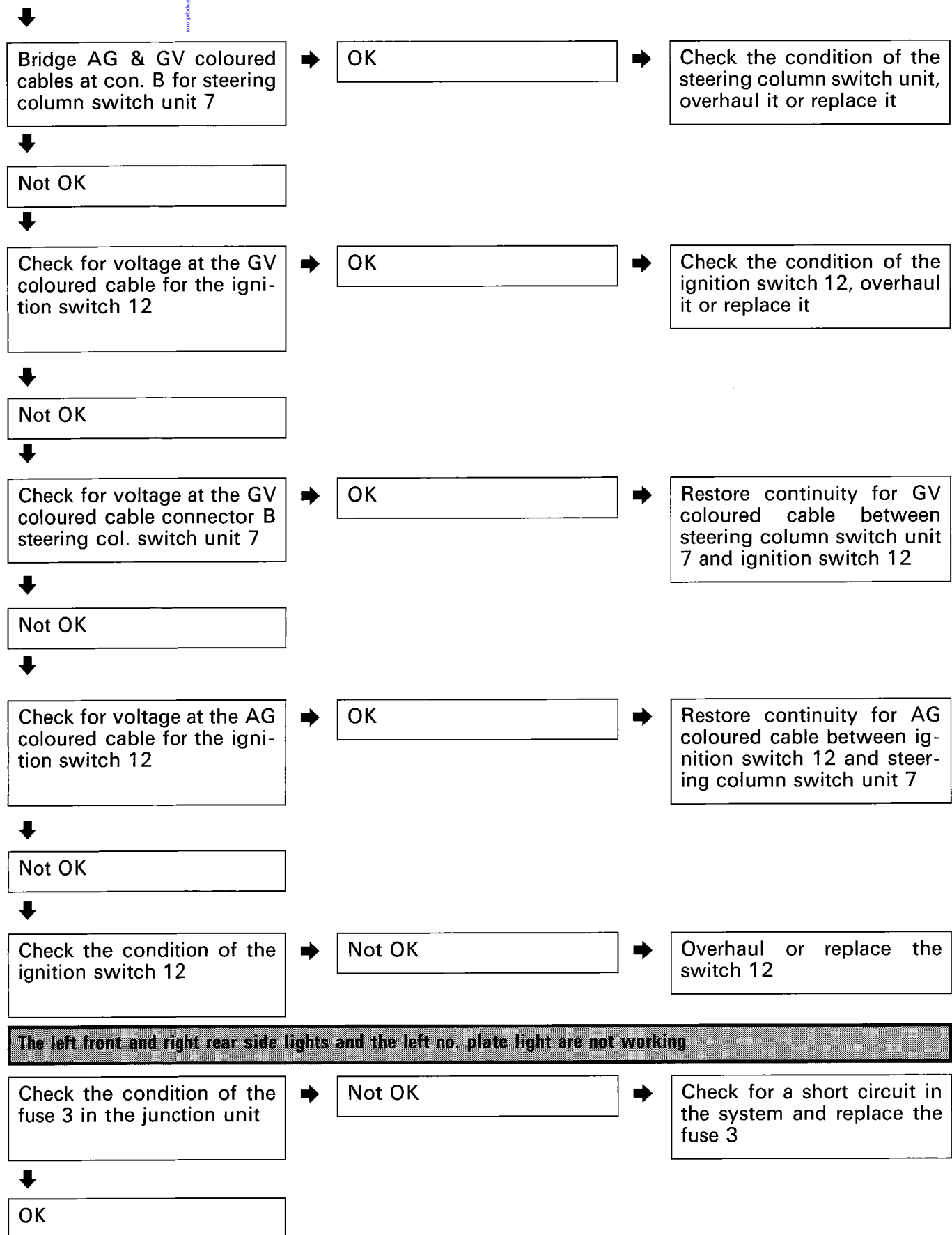
Restore the continuity for the G coloured cable between the ignition switch 12 and the junction unit 4



Not OK



55D.





Check the condition of the junction unit 4



Not OK



Overhaul or replace the junction unit 4

The right front and left rear side lights and right no. plate light are not working

Check the condition of the fuse 2 in the junction unit 4



Not OK



Check for a short circuit in the system and replace the fuse 2



OK



Check the condition of the junction unit 4



Not OK



Overhaul or replace the control unit 4

The left front side light is not working

Check the condition of the bulb



Not OK



Replace the bulb



OK



Check the condition of the bulb holder



Not OK



Replace the bulb holder



OK



Check for voltage at the GN coloured cable for the left front light cluster 1



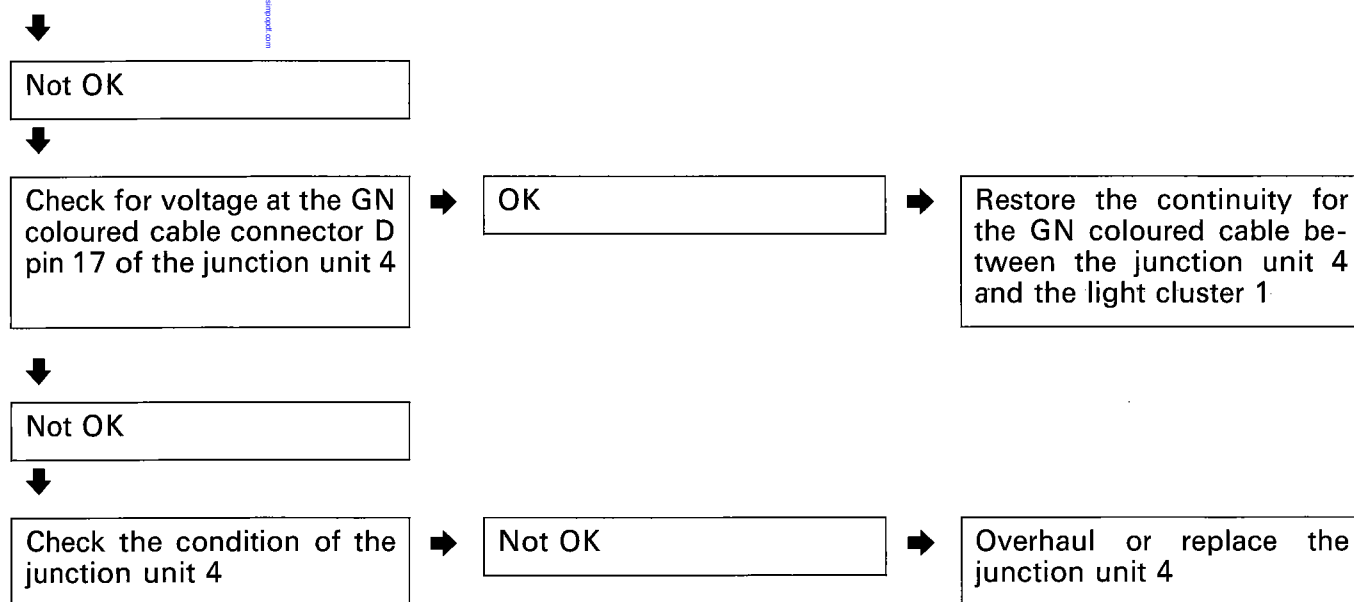
OK



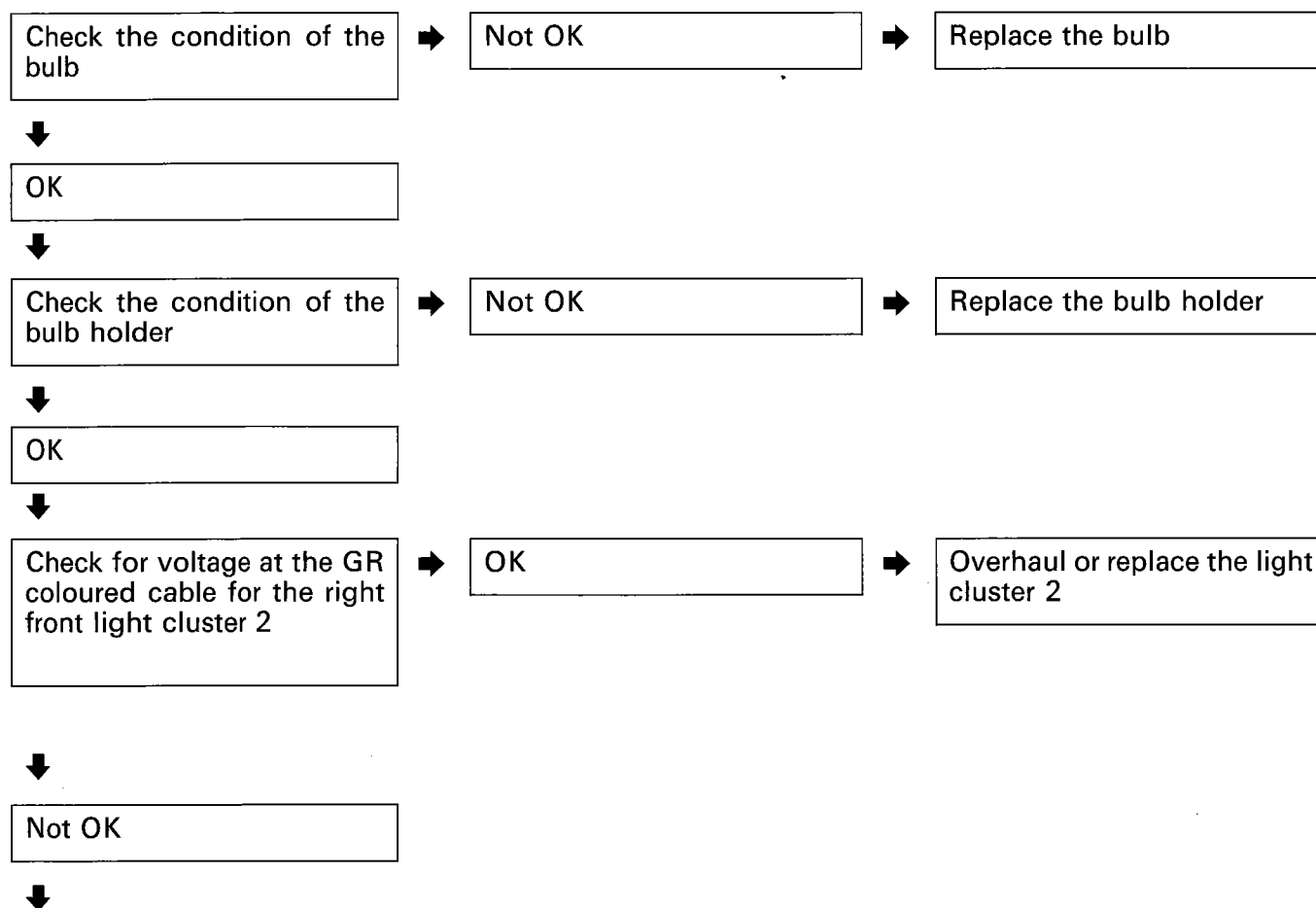
Overhaul or replace the light cluster 1

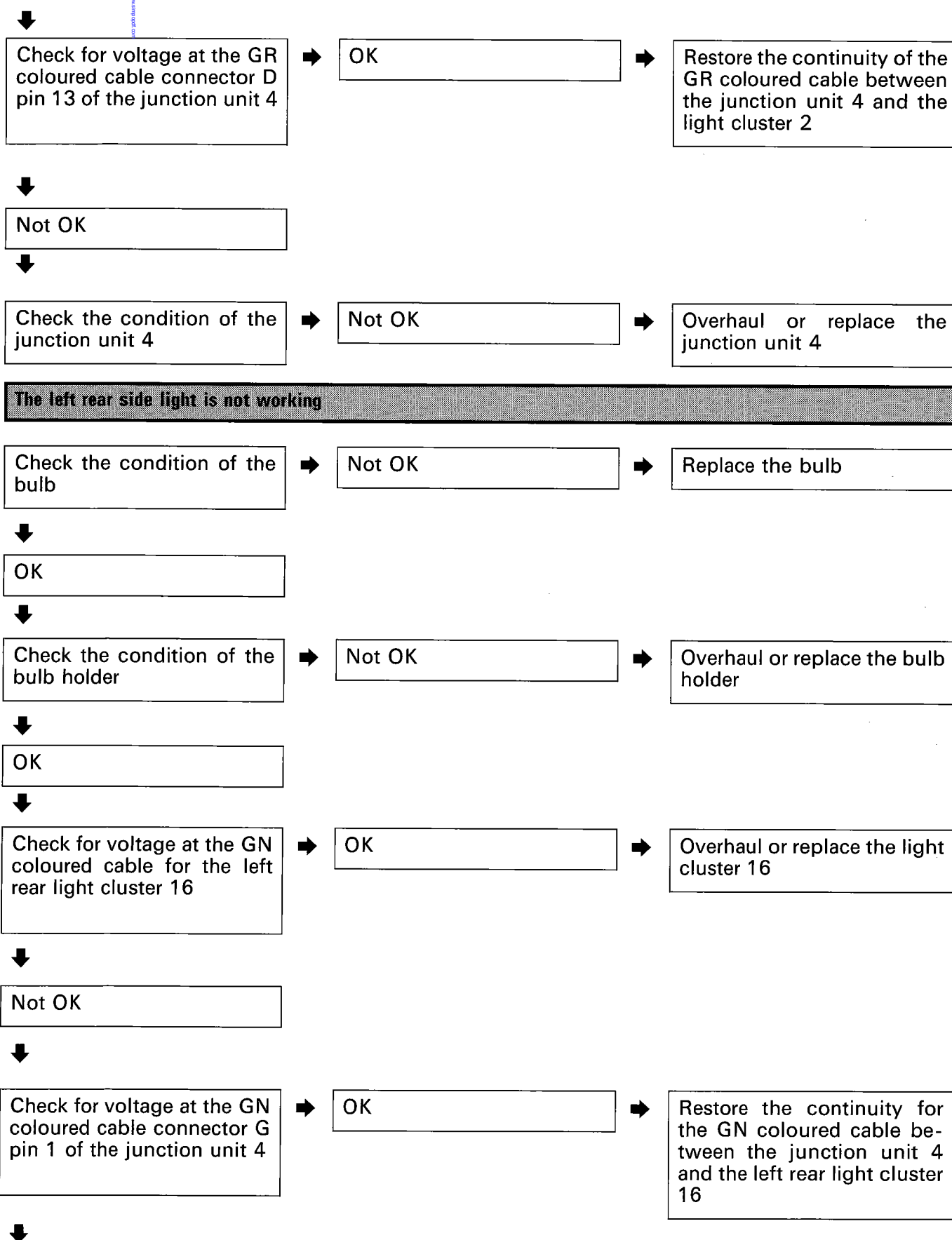


55D.



The right front light is not working





55D.



Not OK



Check the condition of the junction unit 4



Not OK



Overhaul or replace the junction unit 4

The right rear side light is not working

Check the condition of the bulb



Not OK



Replace the bulb



OK



Check the condition of the bulb holder



Not OK



Overhaul or replace the bulb holder



OK



Check for voltage at the GR coloured cable of the right rear light cluster 17



OK



Overhaul or replace the right rear light cluster 17



Not OK



Check for voltage at the GR coloured cable connector G pin 8 of the junction unit 4



OK



Restore the continuity of the GR coloured cable between the junction unit 4 and the right rear light cluster 17



Not OK



Check the condition of the junction unit 4

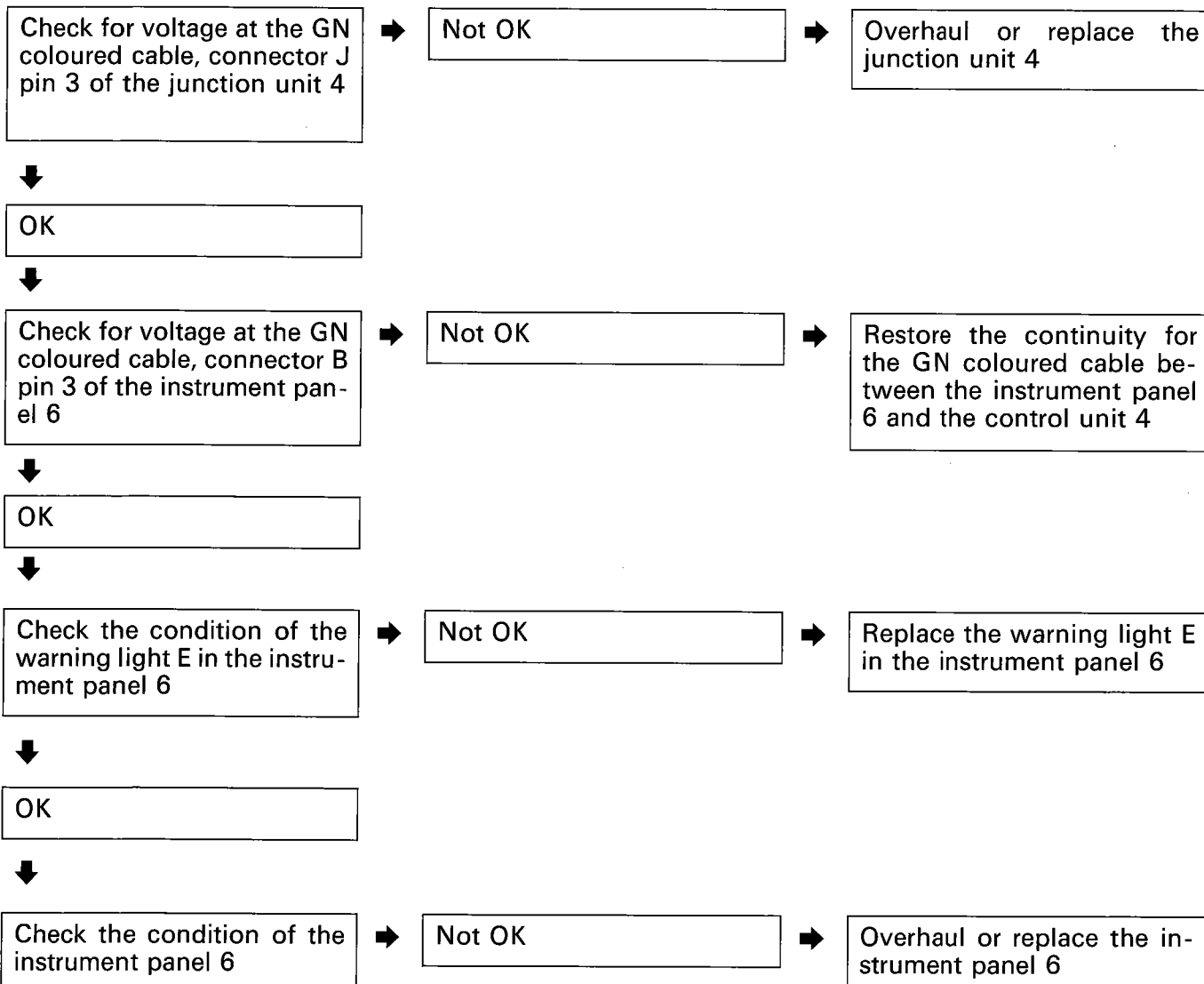


Not OK

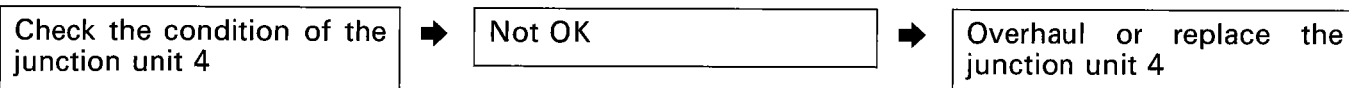


Overhaul or replace the junction unit 4

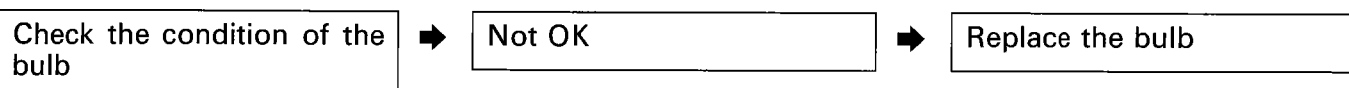
The side lights warning light is not working



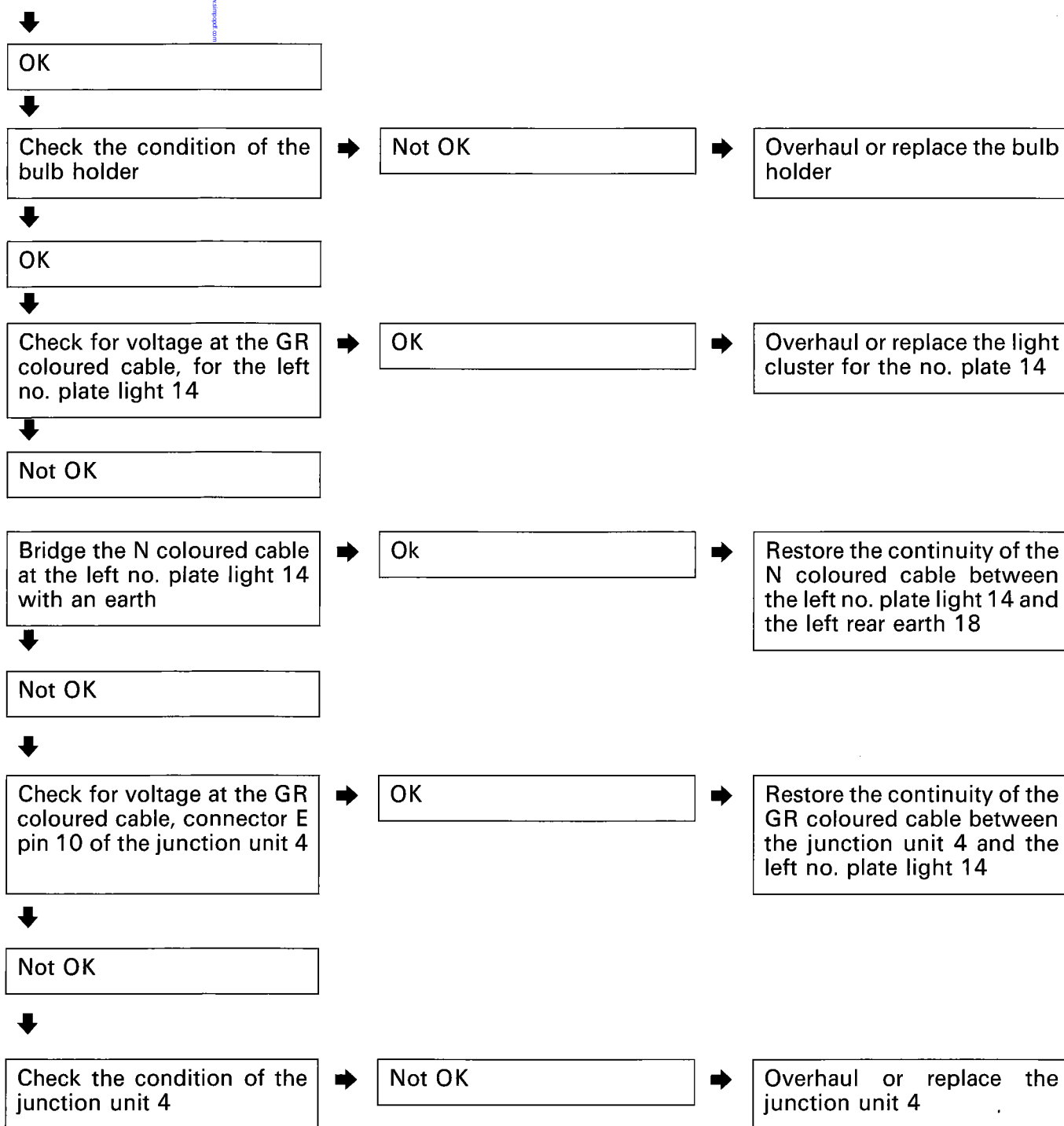
Both the no. plate lights are not working



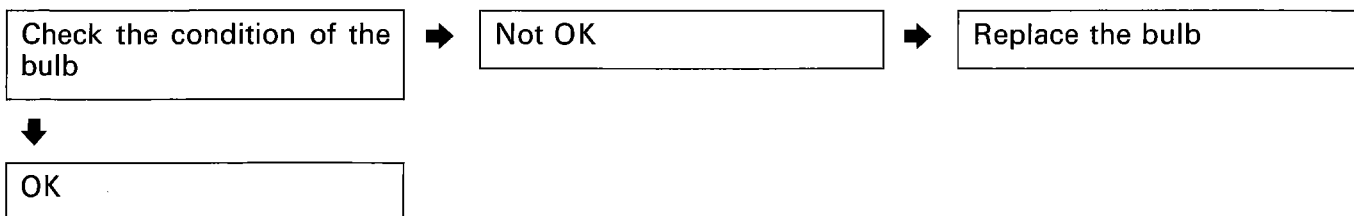
The left no. plate light is not working

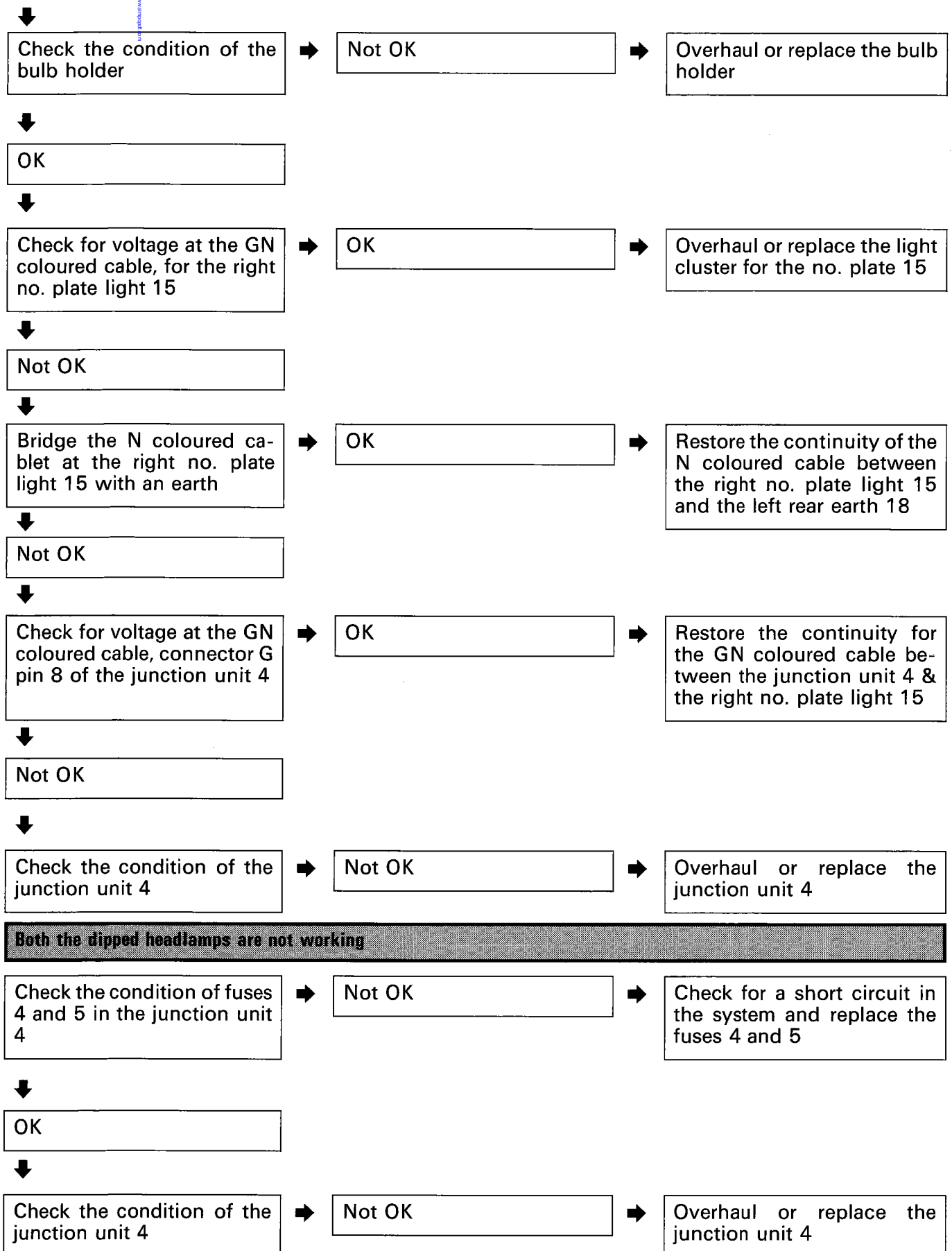


55D.



The right no. plate light is not working





Both the dipped headlamps are not working when operated by the steering column switch unit

Bridge HR & CB coloured cables at connector B for steering col. switch unit 7



OK



Overhaul or replace steering column switch unit 7



Not OK



Check for voltage at the HR coloured cable, connector F pin 1 of the junction unit 4



Not OK



Restore the continuity of the HR coloured cable between the junction unit 4 & the steering col. switch unit 7



OK



Check the condition of the junction unit 4



Not OK



Overhaul or replace the junction unit 4

Both the dipped headlamps are not working with the main beam headlamps on

Bridge the R and HR coloured cables at the dipped headlamps relay 5



OK



Overhaul or replace the relay 5



Not OK



Bridge the R and LR coloured cables at relay 5



OK



Overhaul or replace the relay 5



Not OK



Bridge the N coloured cable at relay 5 with an earth

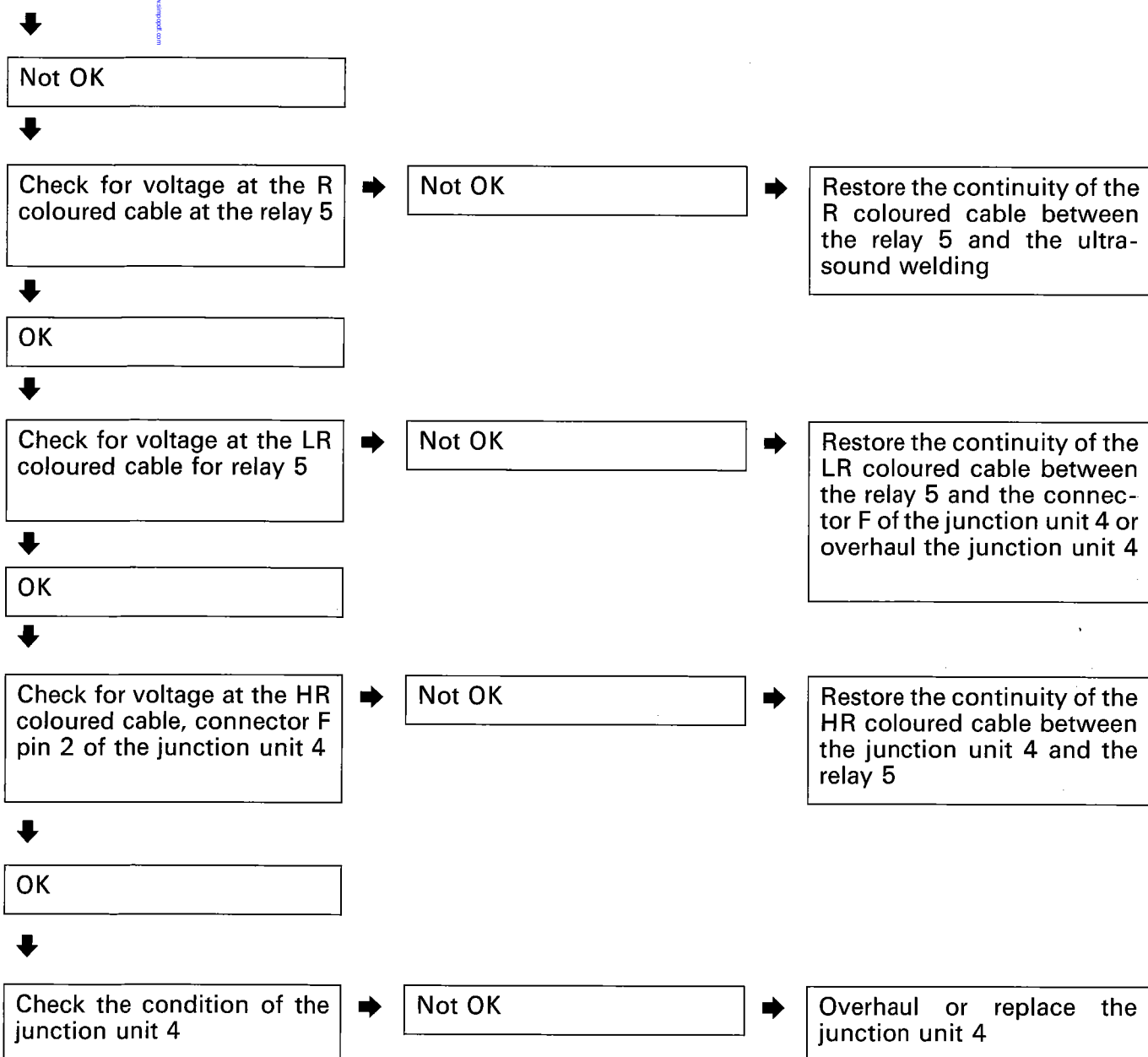


OK

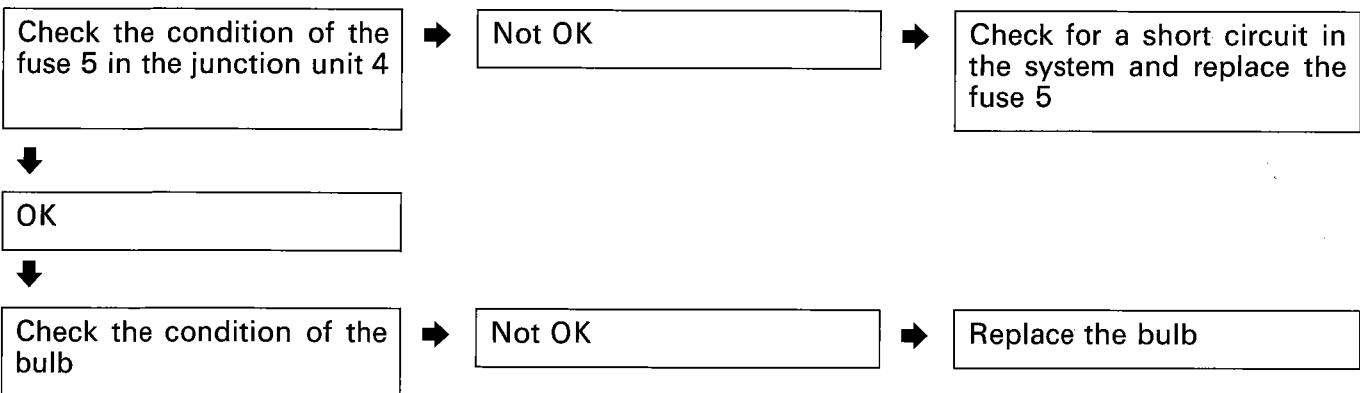


Restore the continuity of the N coloured cable between the relay 5 and the earth on dashboard 22

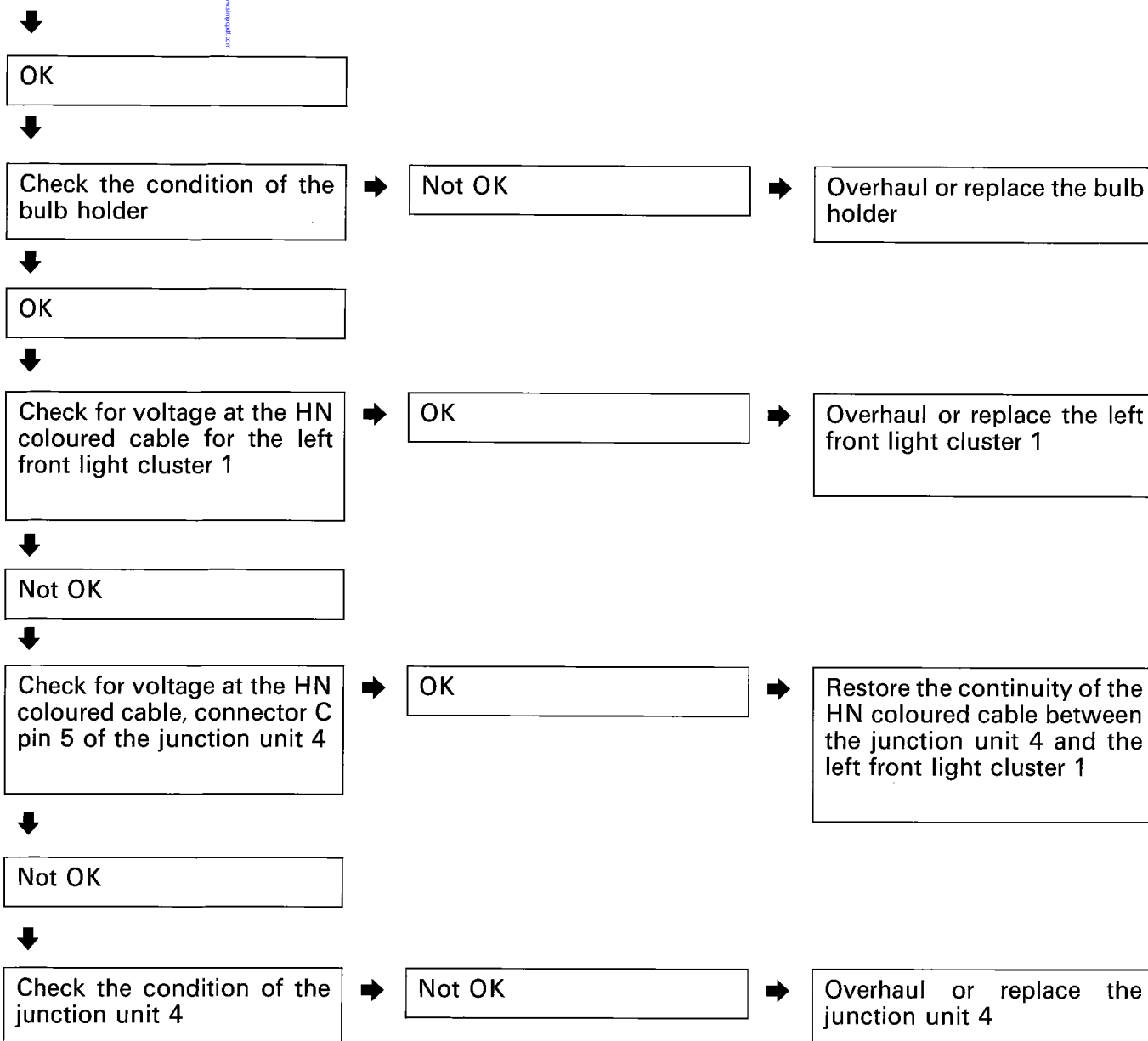




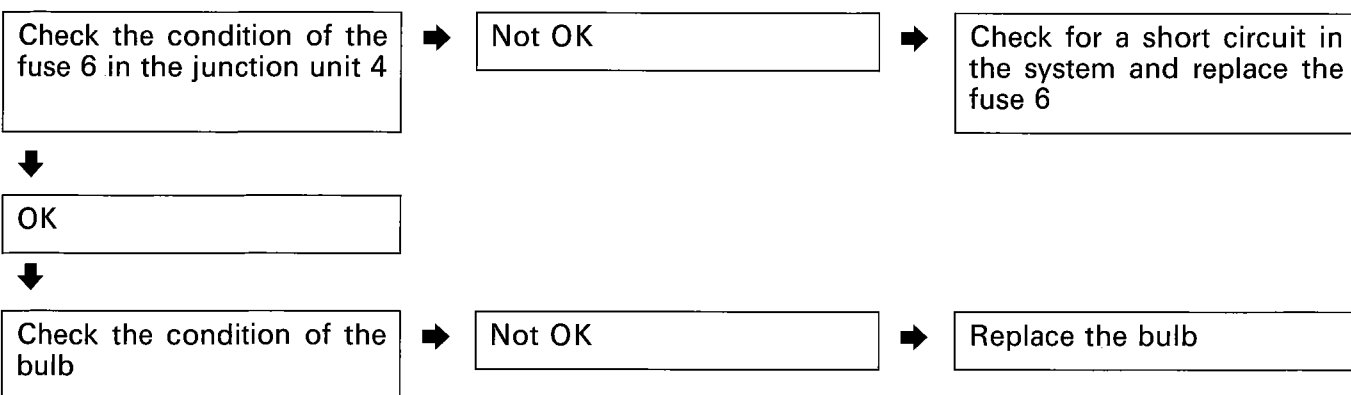
The left dipped headlamp is not working

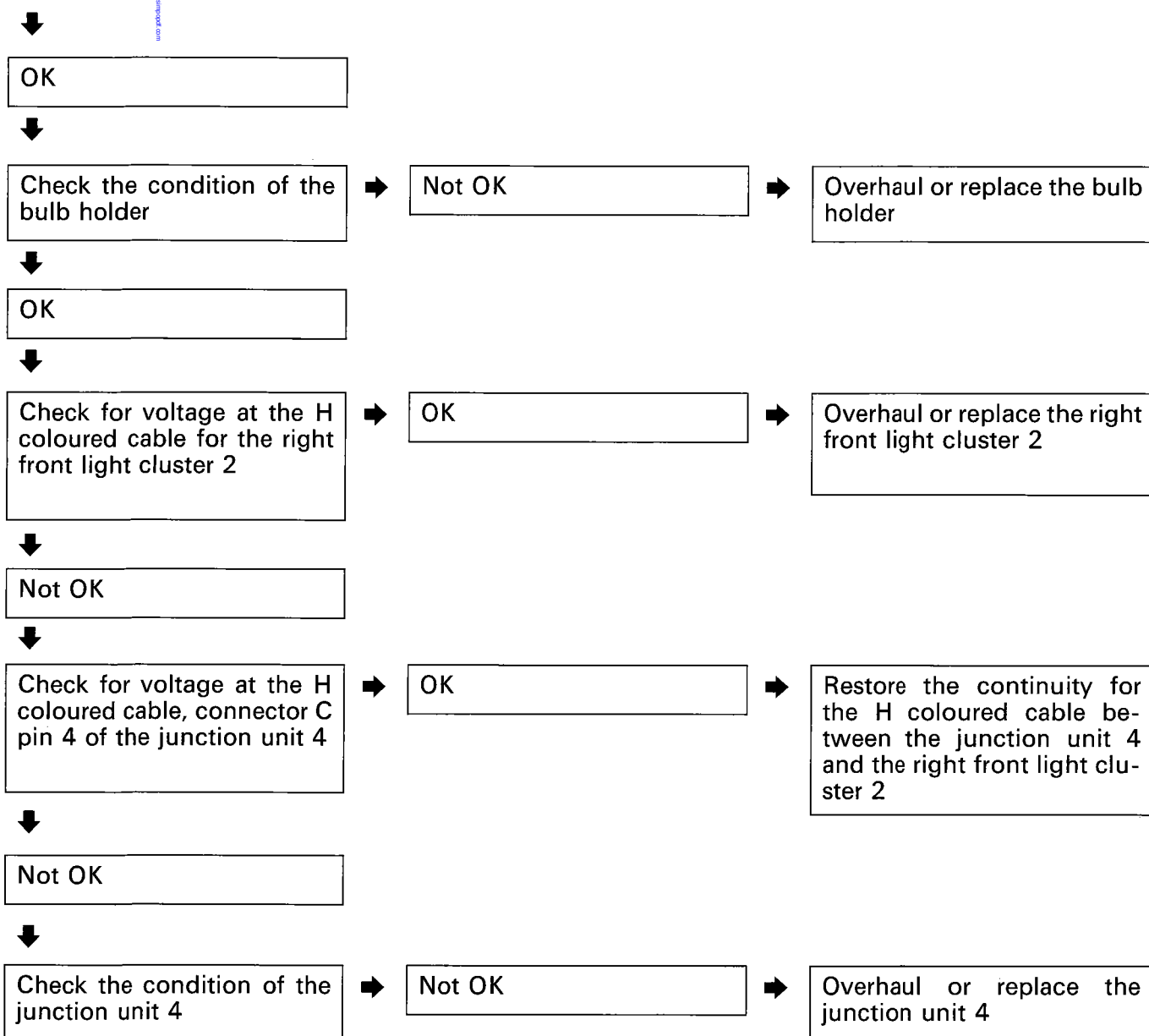


55D.

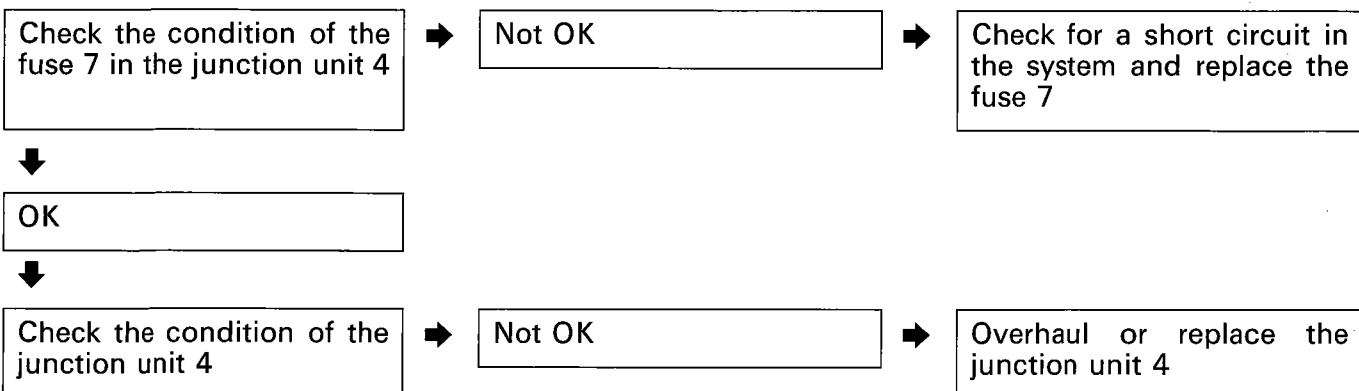


The right dipped headlamp is not working



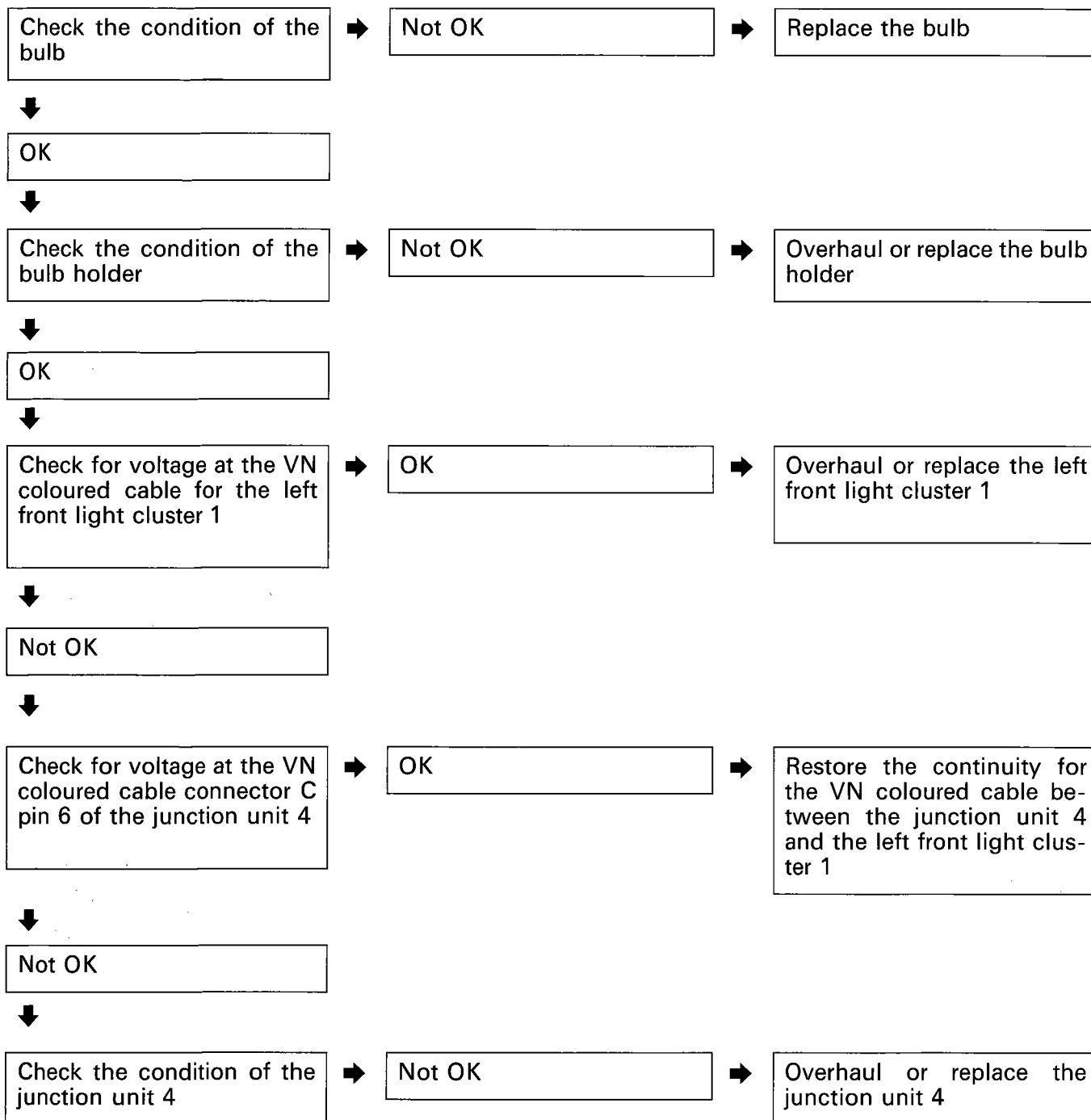


The left dipped headlamp and the warning light are not working

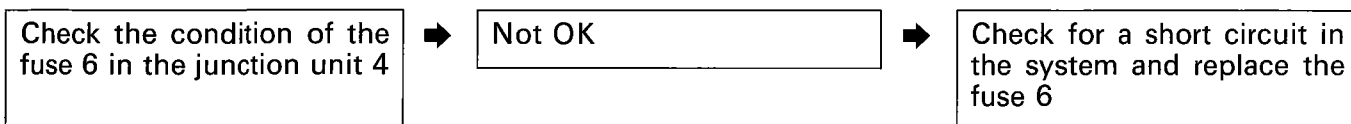


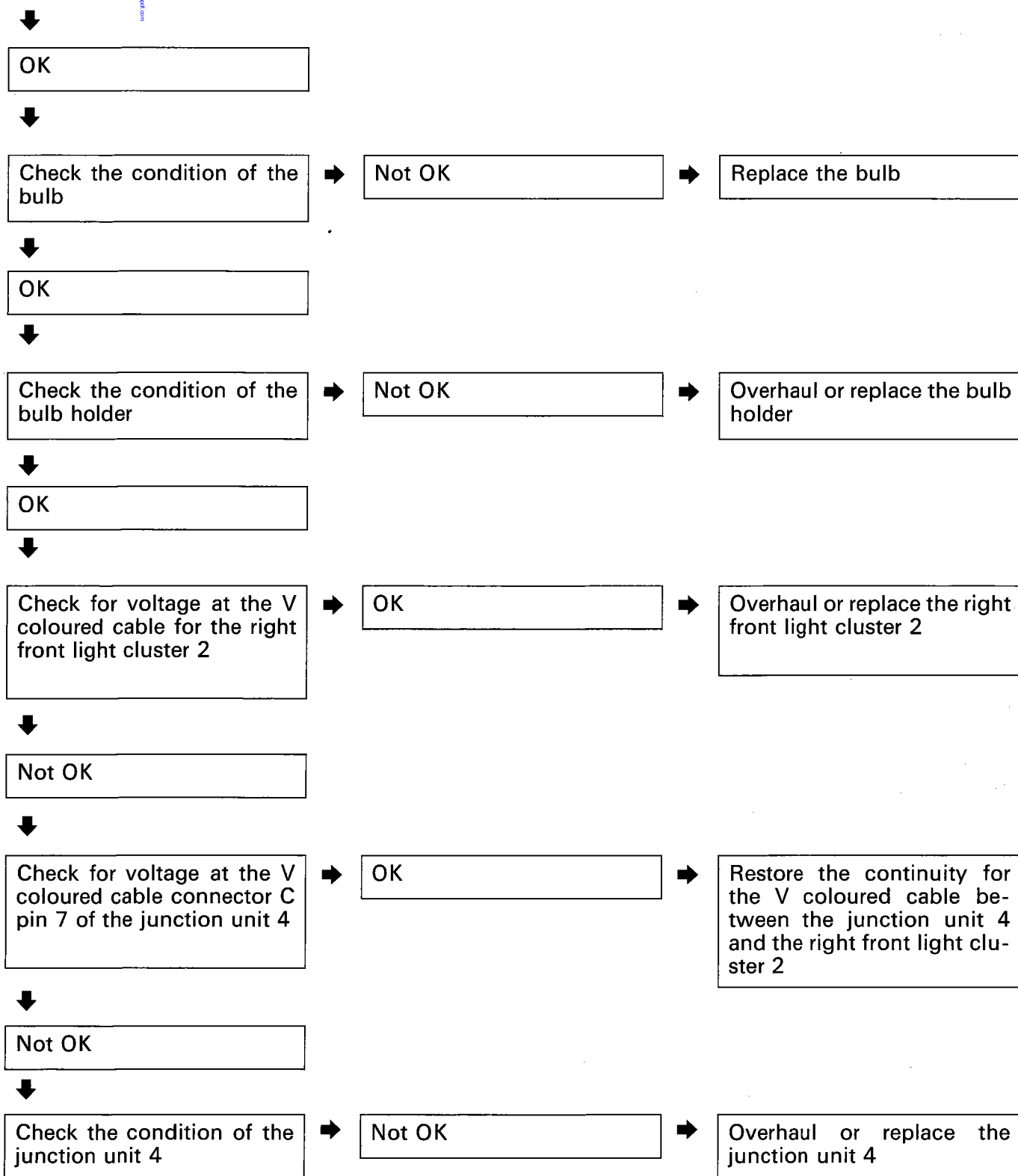
55D.

The left main beam headlamp is not working



The right main beam headlamp is not working





55D.

The main beam headlamps warning light is not working

Check for voltage at the VN coloured cable connector J pin 6 of the junction unit 4

Not OK

Overhaul or replace the junction unit 4



OK



Check for voltage at the VN coloured cable, connector B pin 1 of the instrument panel 6

Not OK

Restore the continuity for the VN coloured cable between the instrument panel 6 and the junction unit 4



OK



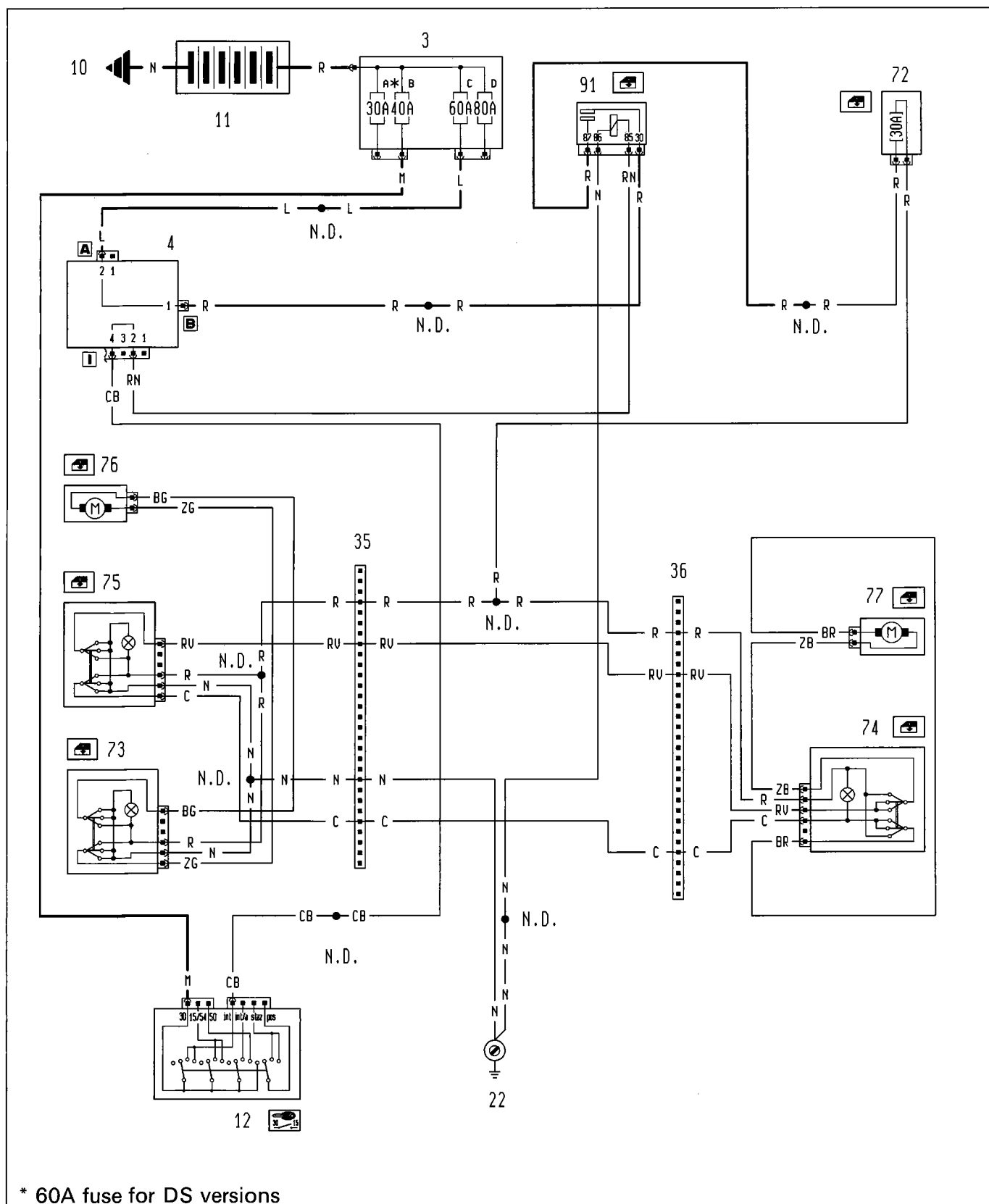
Check the condition of the warning light G in the instrument panel 6 or check the condition of the instrument panel 6

Not OK

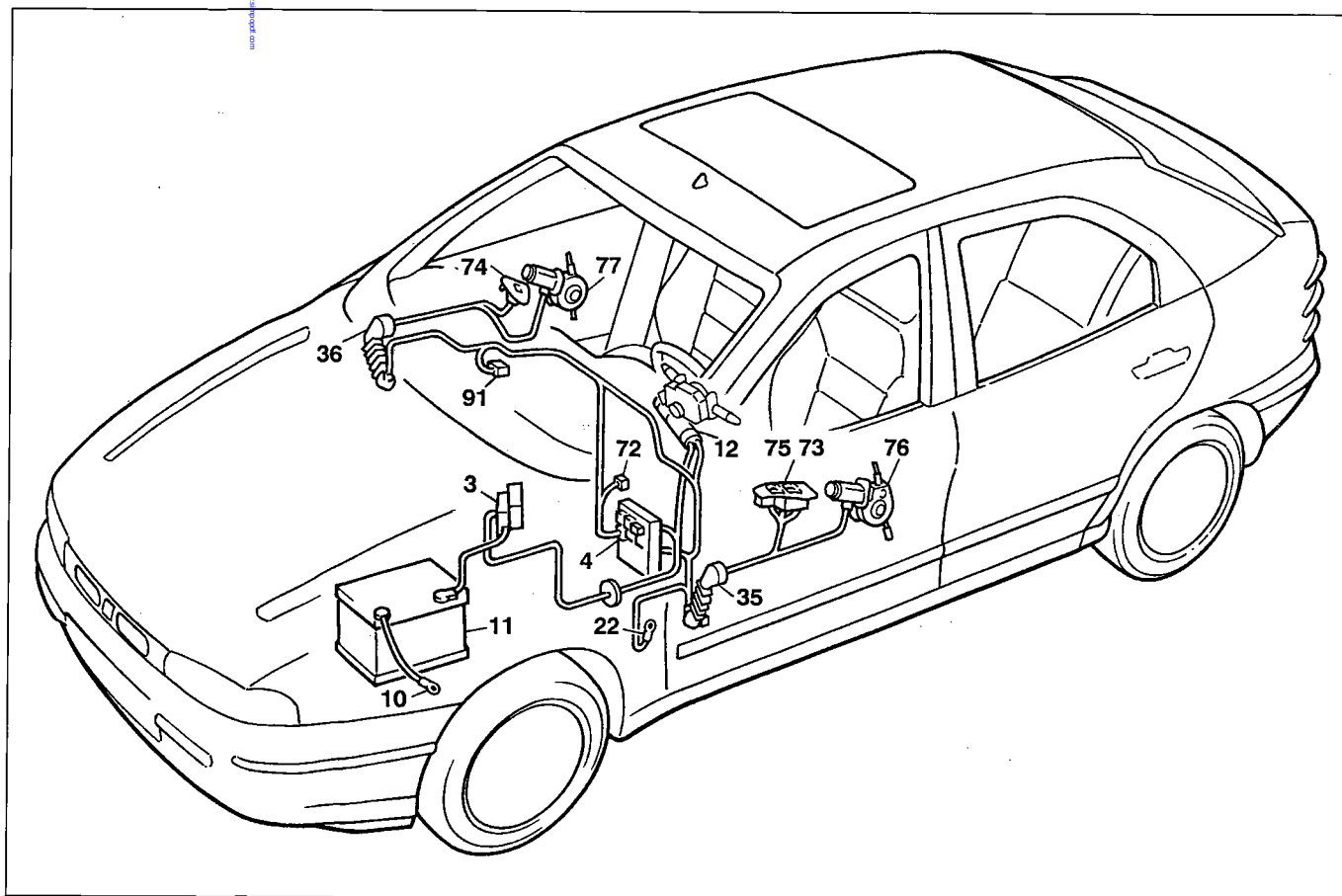
Replace the warning light G or overhaul the instrument panel 6

Trim Level: S - SX

Electric front windows - (See key at end of wiring diagrams)



55D.



P4A039N02

Trim Level: S - SX

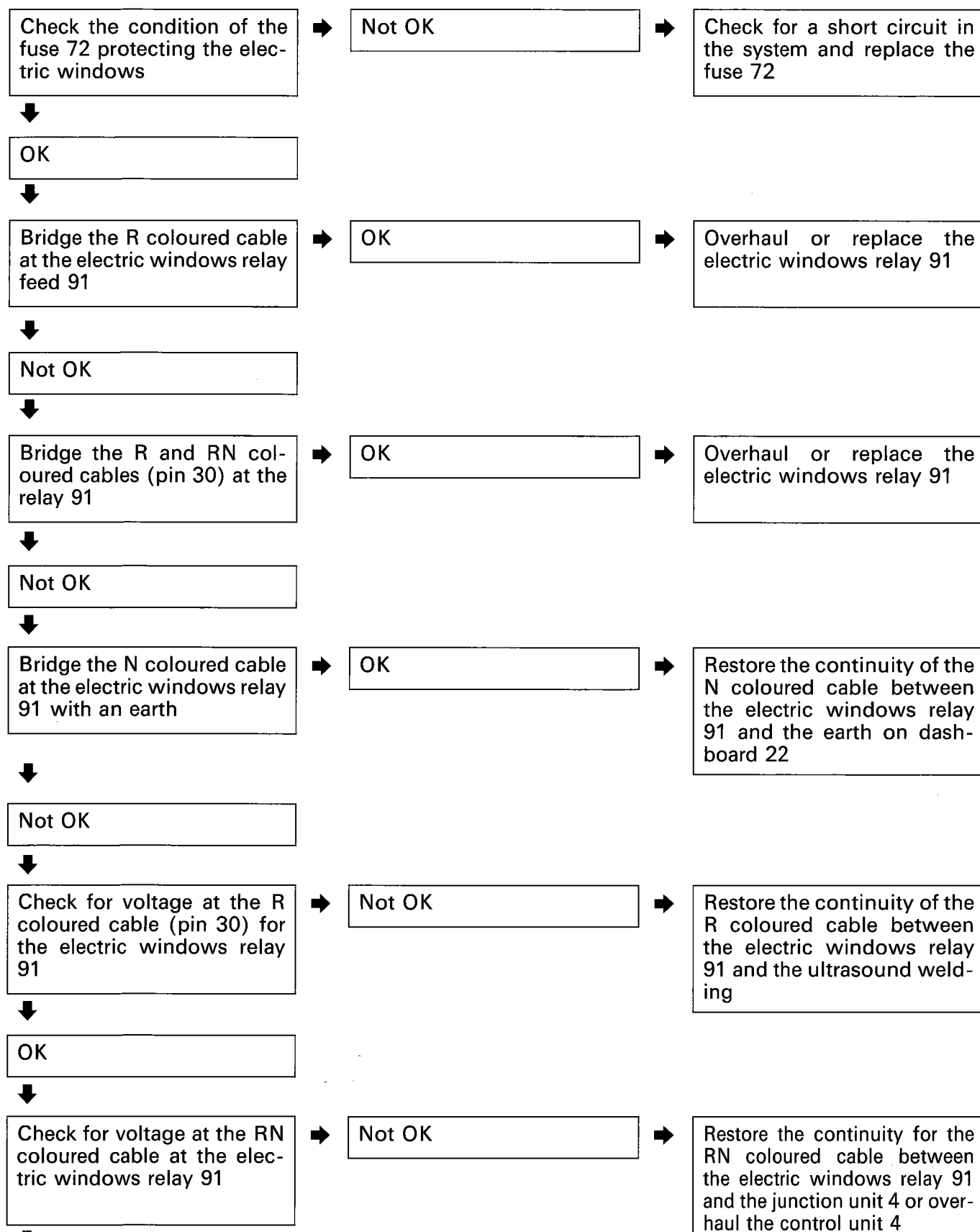
Electric front windows

Components key

- 3 Power fuse box:
 - A 30A protective fuse for injection system (60A for DS versions)
 - B 40A protective fuse for ignition system
 - C 60A protective fuse for optional extras
 - D 80A protective fuse for junction unit
- 4 Junction unit
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 72 30A protective fuse for electric front windos
- 73 Left front electric window control panel
- 74 Right electric front window control panel
- 75 Right front electric window control panel on left front door
- 76 Left front electric window motor
- 77 Right front electric window motor
- 91 Power relay

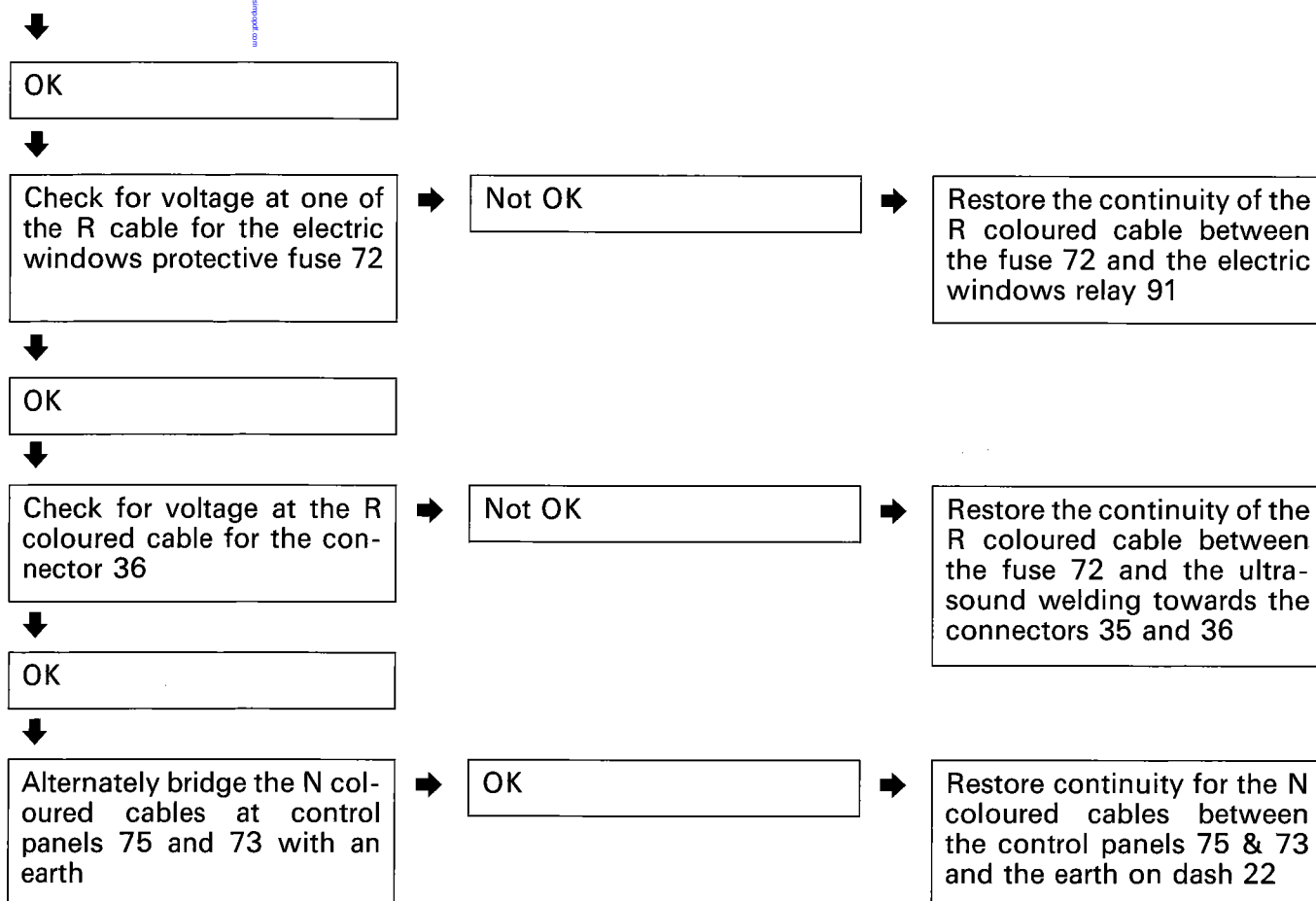
N.D. Ultrasound welding taped in cable loom

The electric front windows are not working

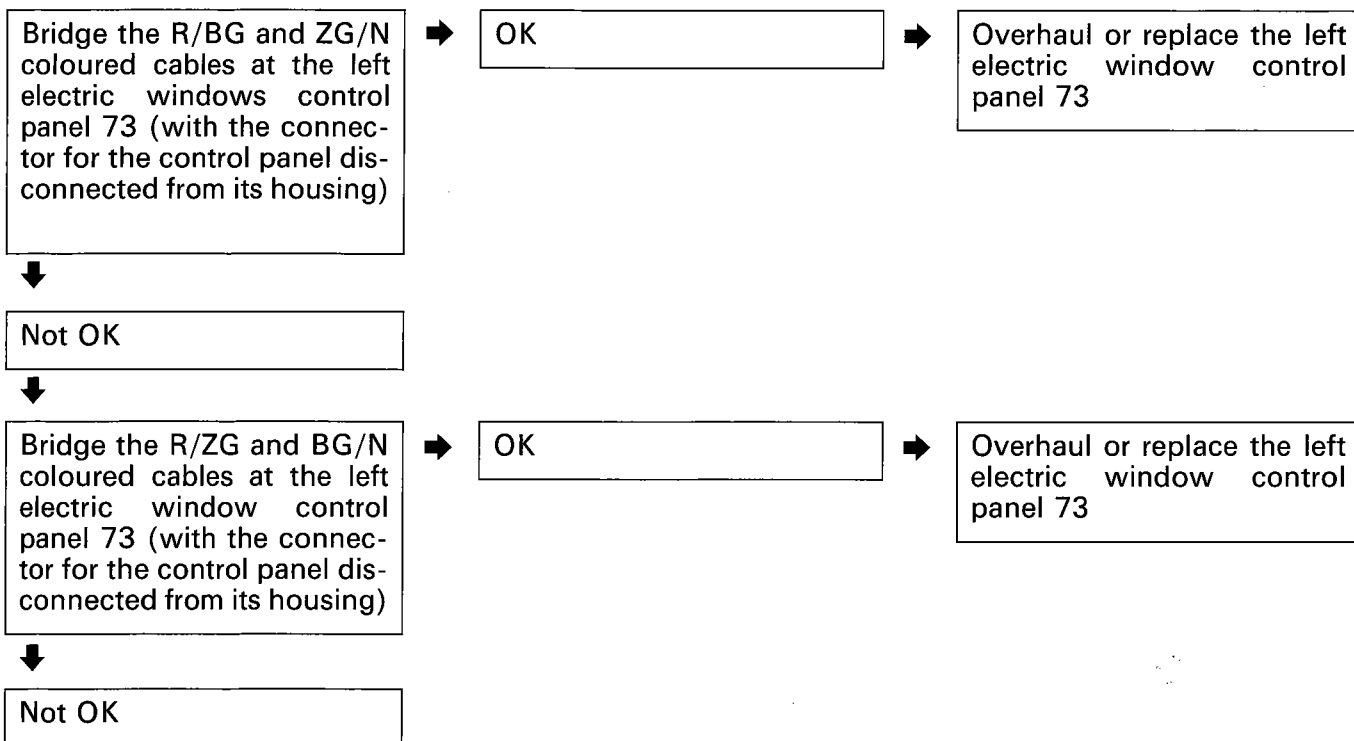


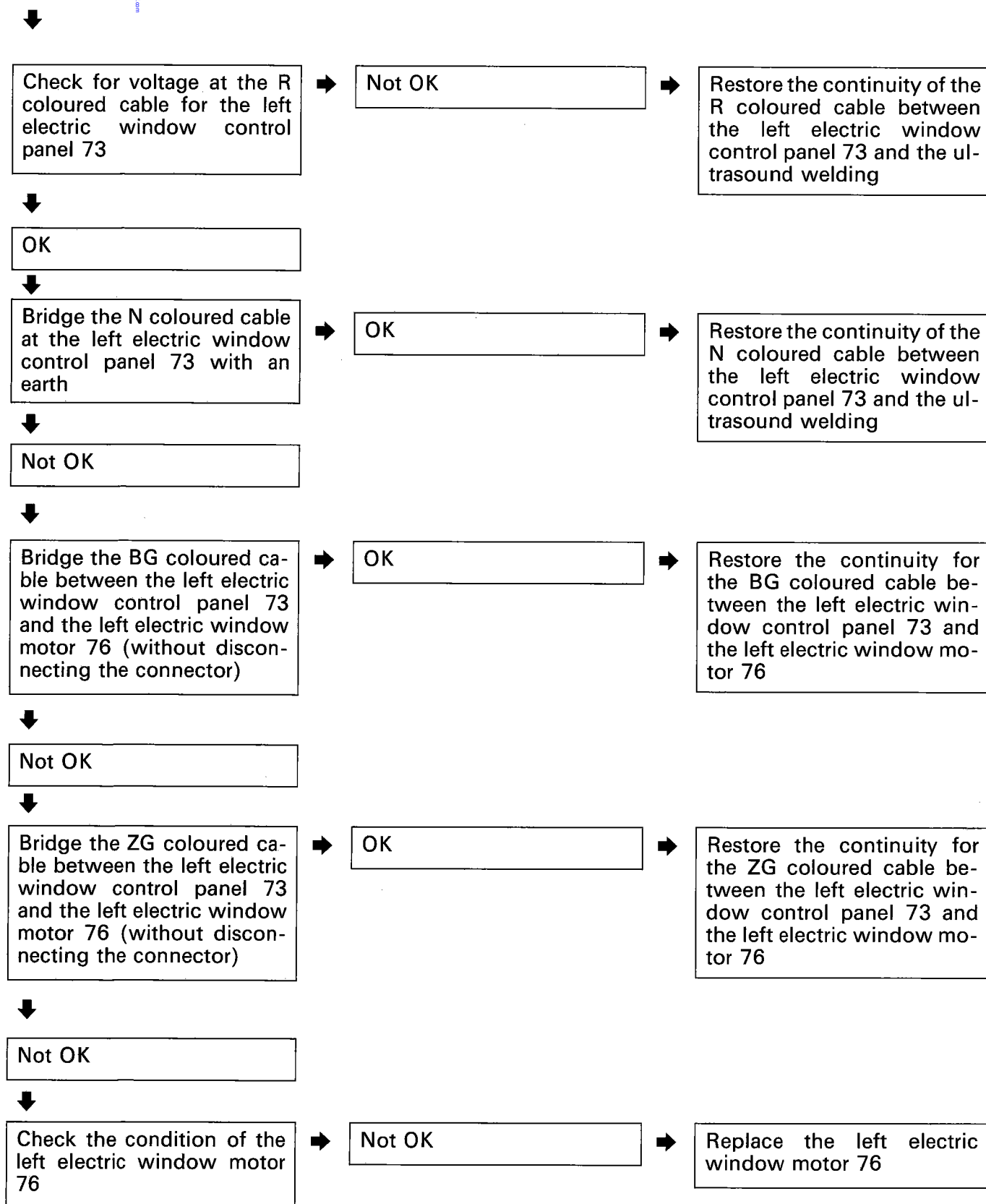
4A421N

55D.



The left front electric window is not working





55D.

The right front electric window is not working when operated by the driver's side control panel

Check for voltage at the R coloured cable for the right electric window control panel 75



Not OK



Restore the continuity of the R coloured cable between the right electric window control panel 75 and the ultrasound welding



OK



Check the condition of the right electric window control panel 75



Not OK



Overhaul or replace the right electric window control panel 75

The right front electric window is not working operated by the passenger side control panel

Check for voltage at the R coloured cable of connector 36



Not OK



Restore the continuity of the R coloured cable between the connector 36 and the ultrasound welding



OK



Check for voltage at the R coloured cable at the electric window con. panel 74



Not OK



Restore the continuity of the R coloured cable between control panel 74 and connector 36



OK



Check the condition of the electric window control panel 74



Not OK



Overhaul or replace the electric window control panel 74

The right front electric window is not working

Bridge the N coloured cable at the electric window control panel 75 with an earth

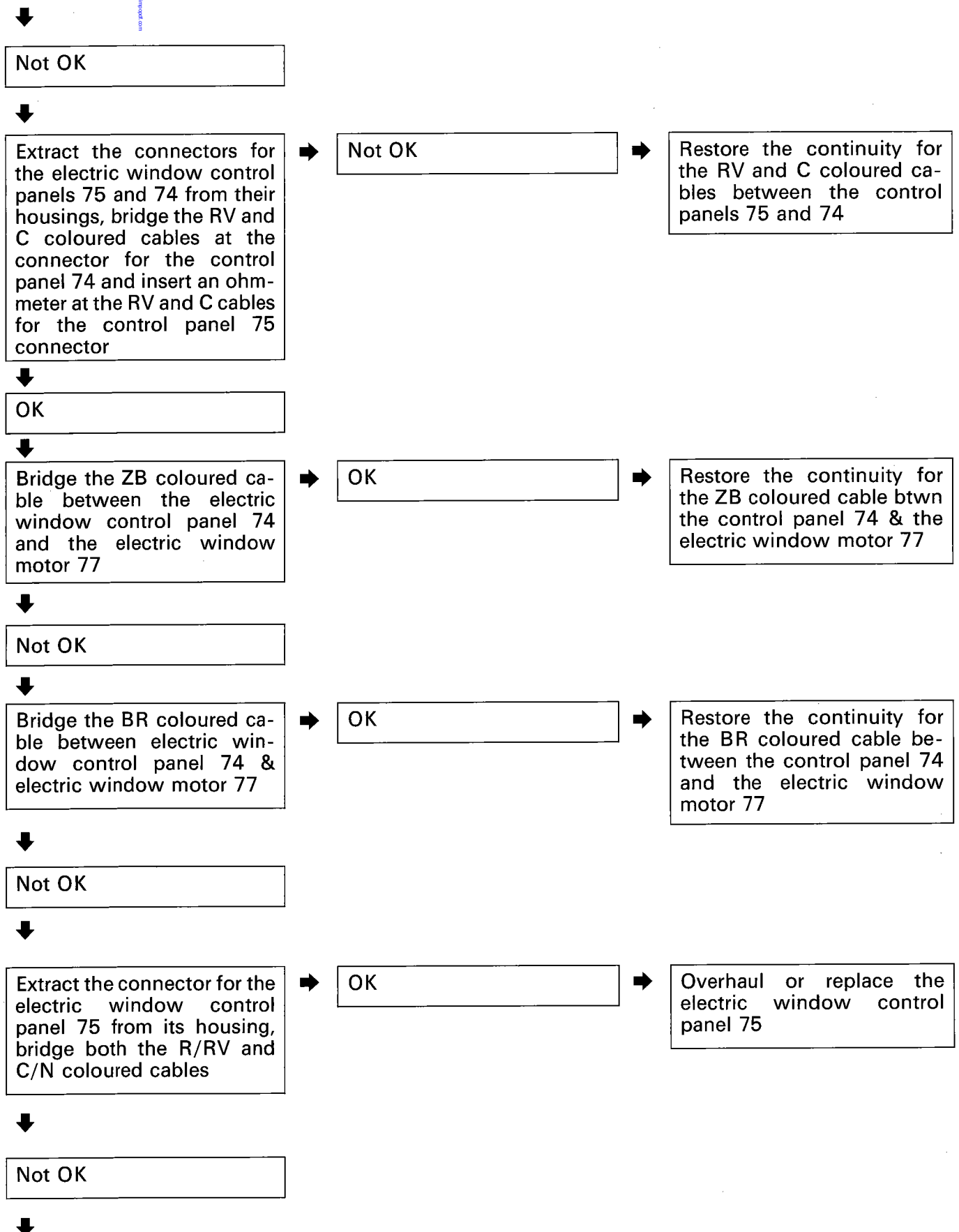


OK

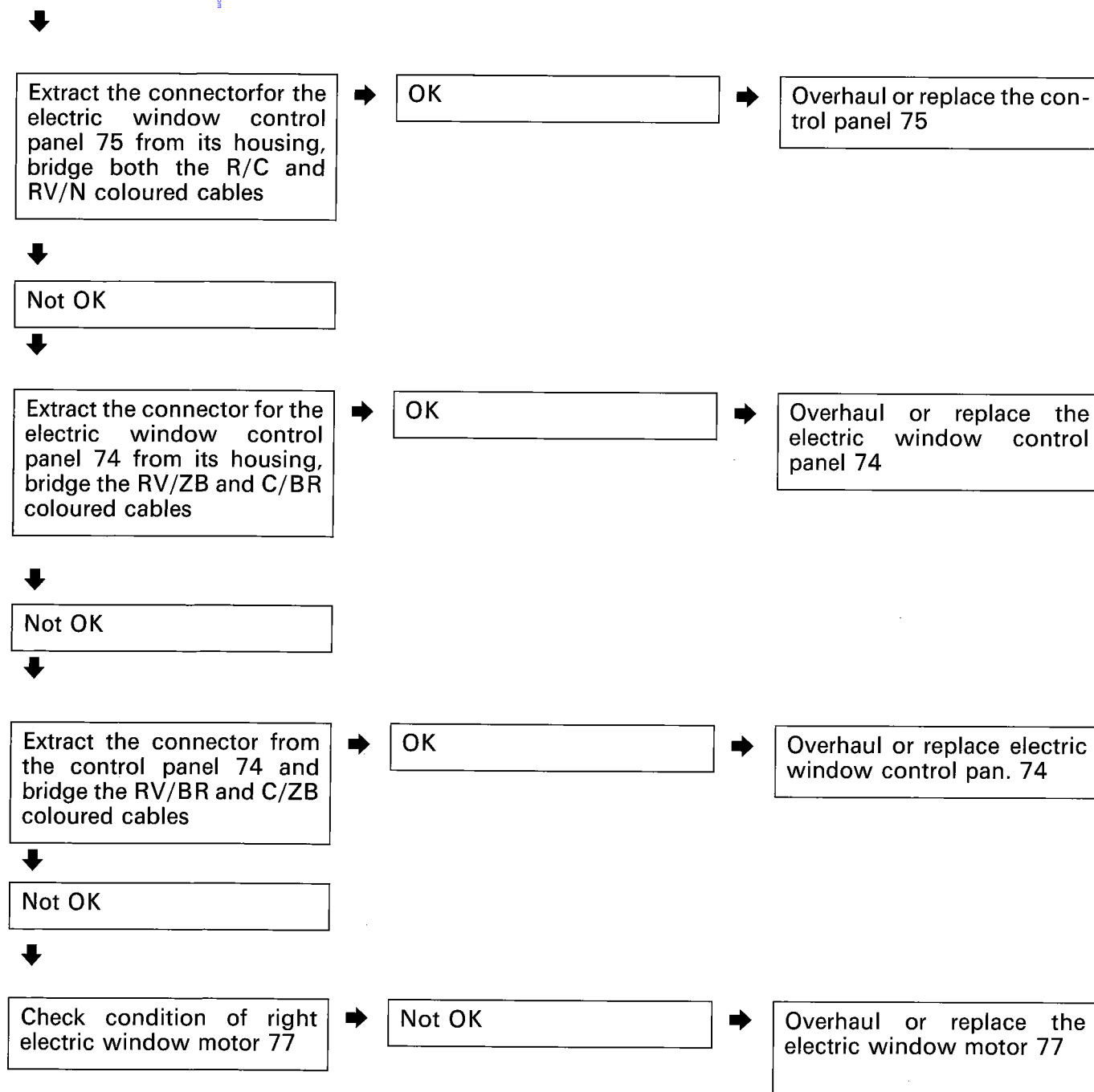


Restore the continuity of the N coloured cable between the electric window control panel 75 and the ultrasound welding



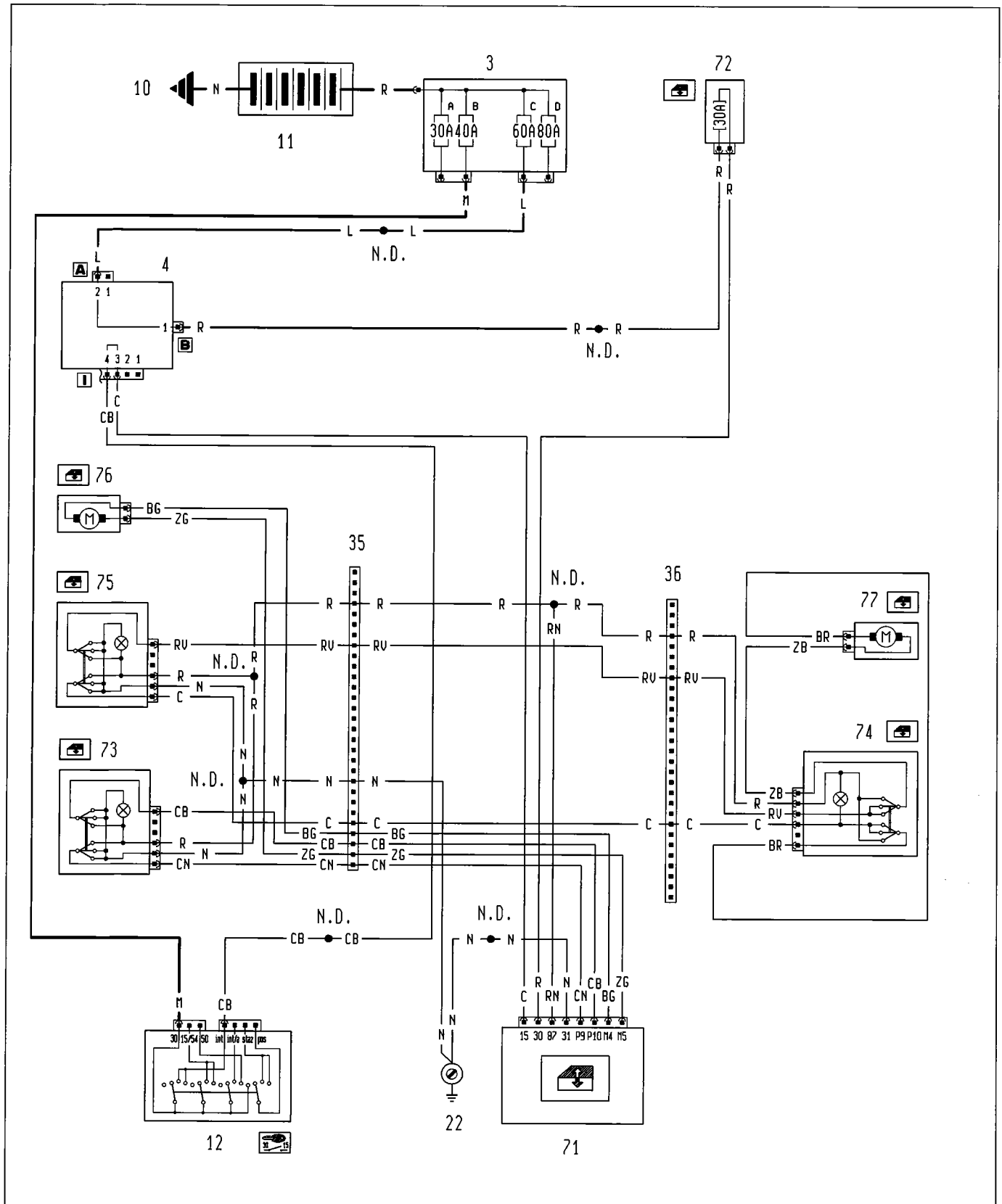


55D.

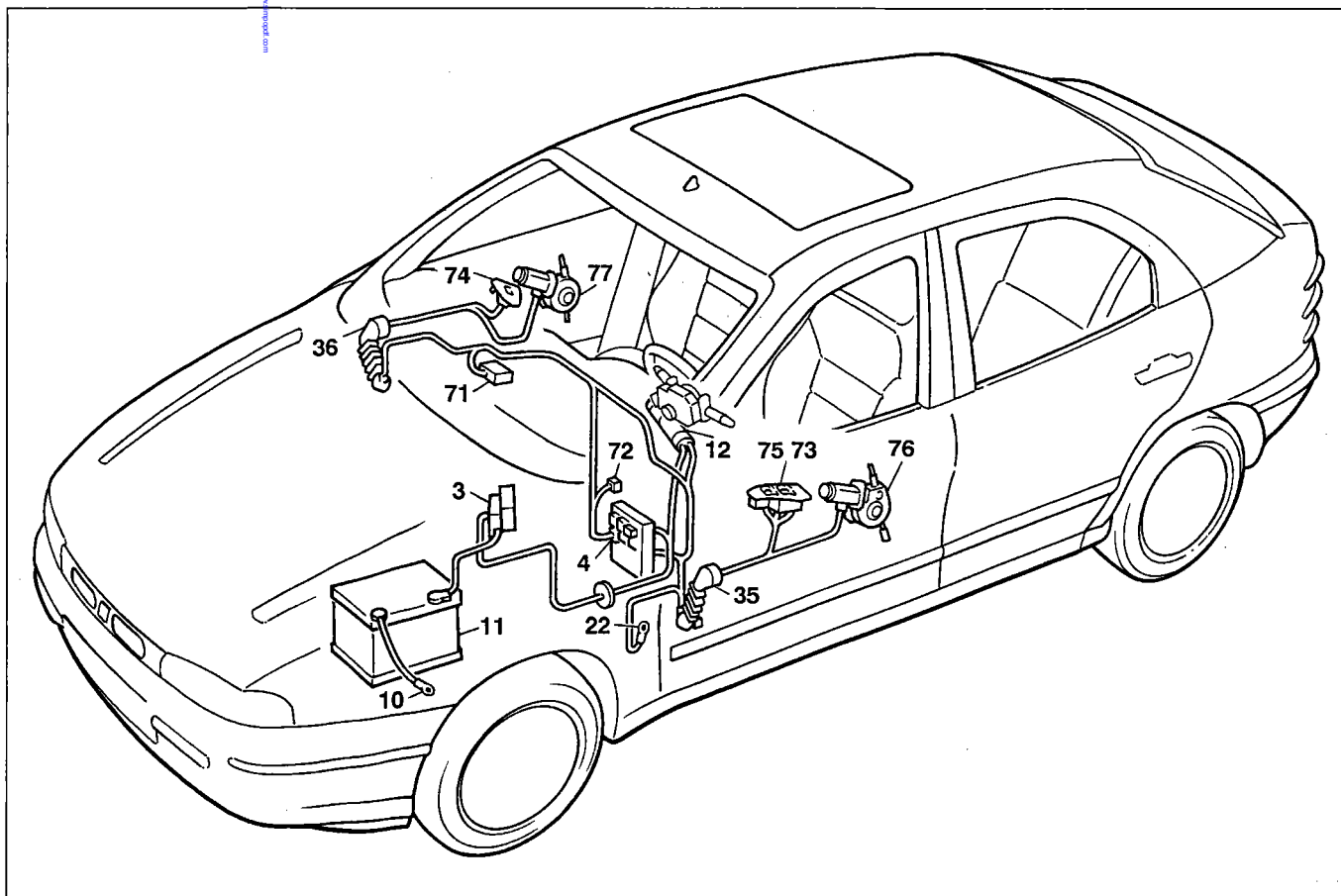


Trim Level: EL - ELX - GT - HGT

Electric front windows - (See key at end of wiring diagrams)



55D.



P4A043N02

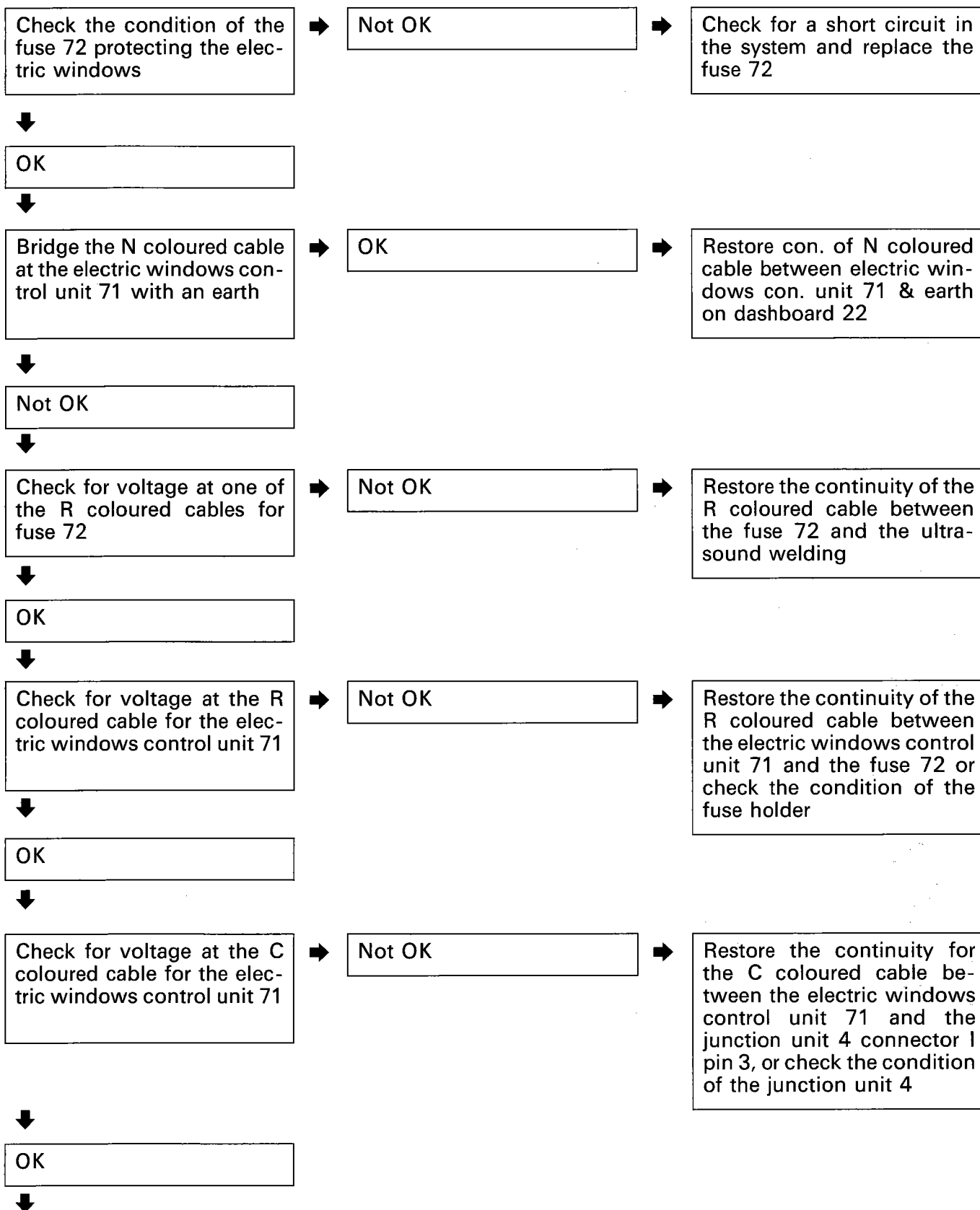
Trim Level: EL - ELX - GT - HGT

Electric front windows

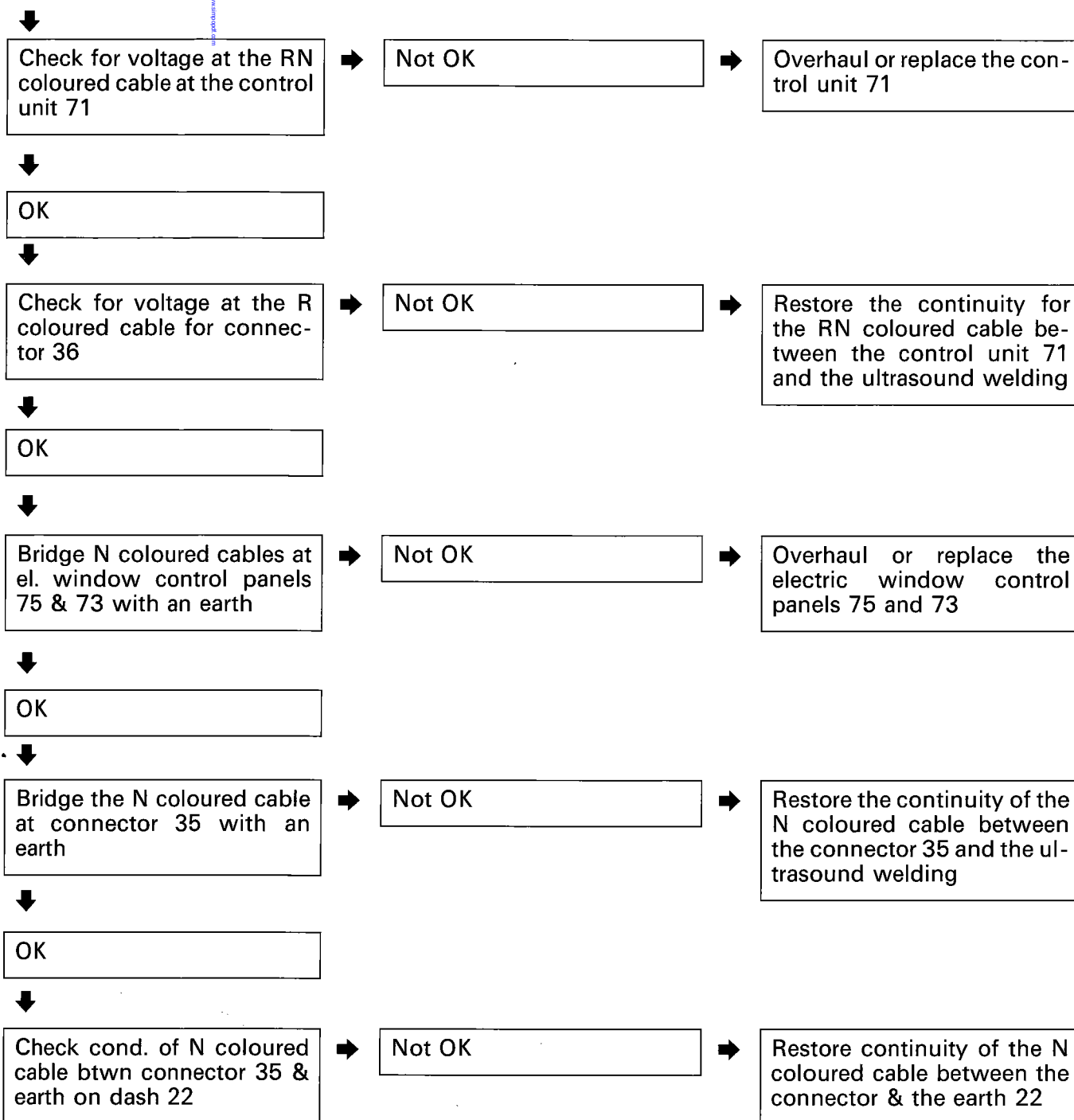
Components key

- 3 Power fuse box:
 - A 30A protective fuse for injection system (60A for DS versions)
 - B 40A protective fuse for ignition system
 - C 60A protective fuse for optional extras
 - D 80A protective fuse for junction unit
- 4 Junction unit
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 71 Electric front windows control unit
- 72 30A protective fuse for electric front windos
- 73 Left front electric window control panel
- 74 Right electric front window control panel
- 75 Right front electric window control panel on left front door
- 76 Left front electric window motor
- 77 Right front electric window motor
- N.D. Ultrasound welding taped in cable loom

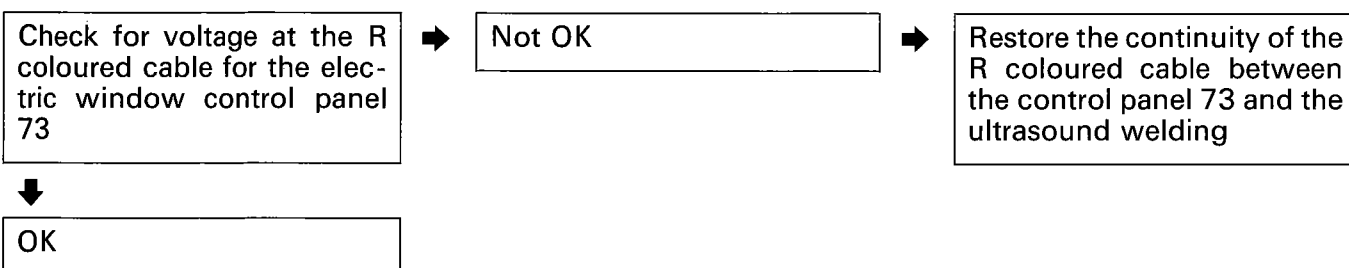
The electric front windows are not working

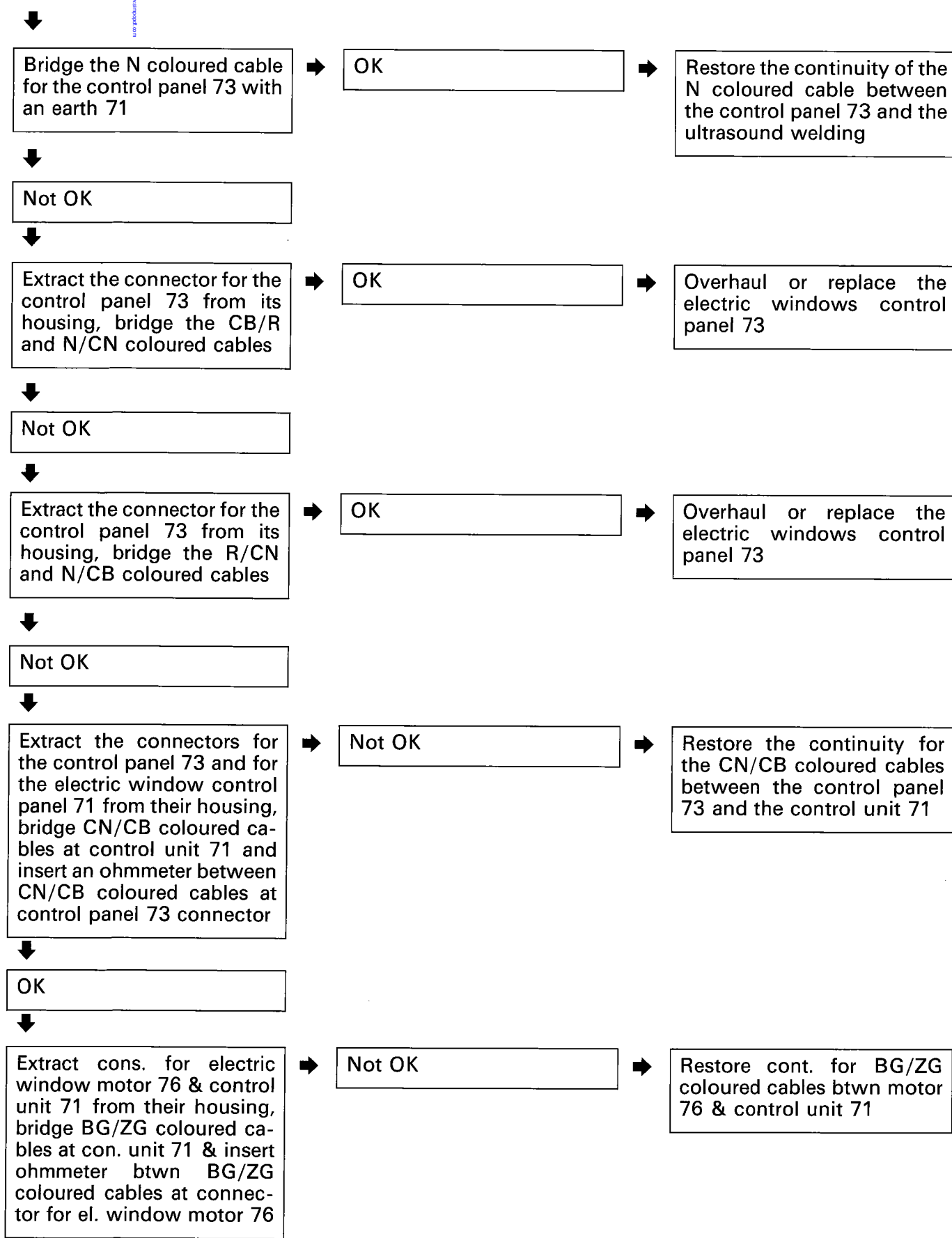


55D.

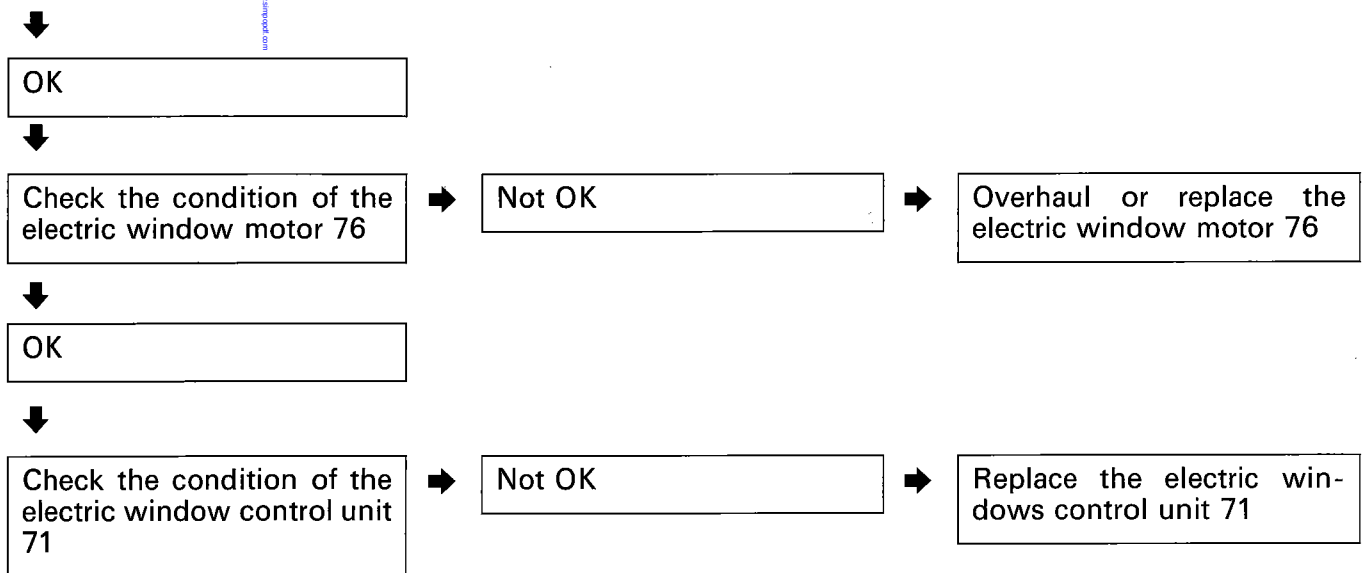


The left electric window is not working

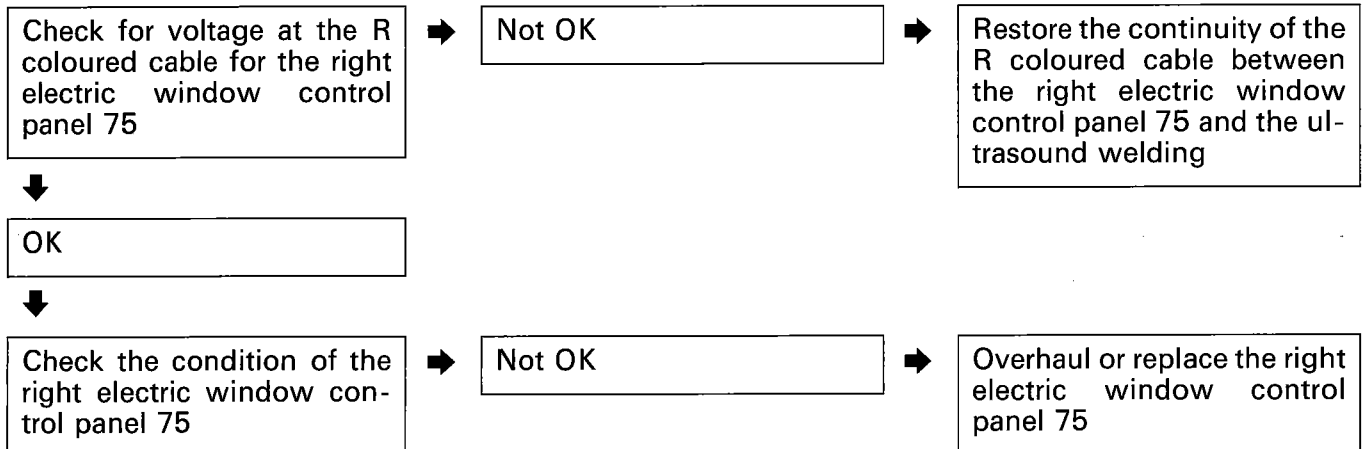




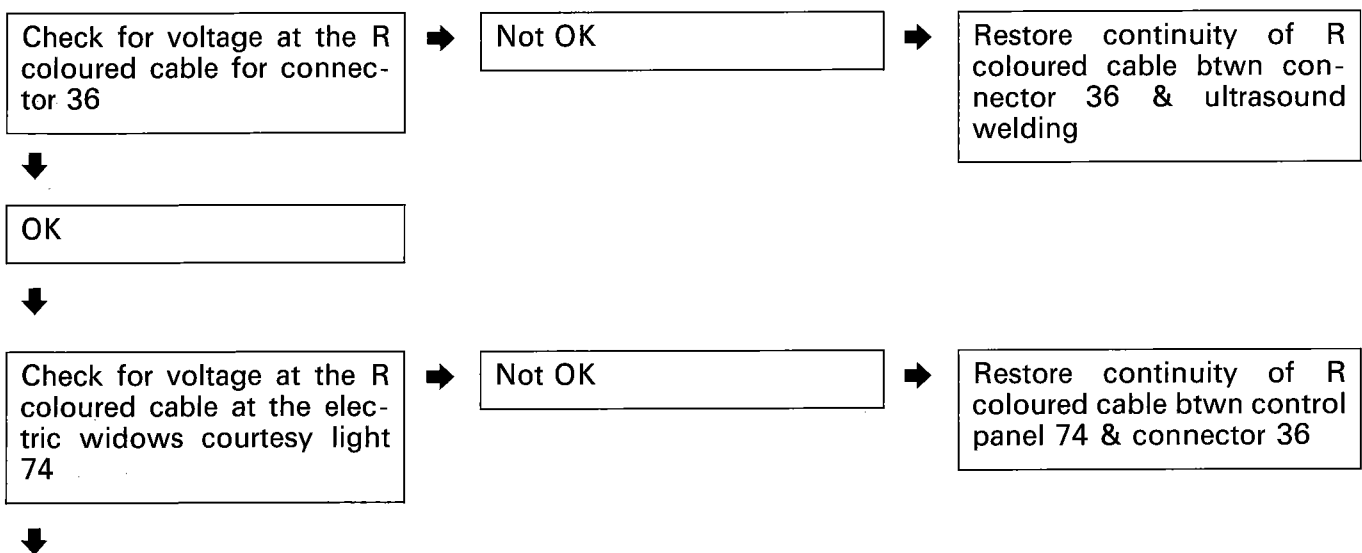
55D.



The right front electric window is not working operated by the driver's control panel



The right front electric window is not working operated by the passenger control panel





OK



Check the condition of the electric window control panel 74



Not OK



Overhaul or replace the electric window control panel 74

The right front electric window is not working

Bridge the N coloured cable at the electric window control panel 75 with an earth



OK



Restore the continuity of the N coloured cable between the electric window control panel 75 and the ultrasound welding



Not OK



Extract the connectors for the electric window control panels 75 & 74 from their housings, bridge the RV and C coloured cables at the connector for panel 74 and insert an ohmmeter at the RV and C cables at the control panel 75 connector



Not OK



Restore continuity for RV & C coloured cables between control panels 75 & 74



OK



Bridge ZB coloured cable btwn electric window control panel 74 & electric window motor 77



OK



Restore the continuity for ZB coloured cable between control panel 74 & electric window motor 77



Not OK



Bridge BR coloured cable between electric window control panel 74 and electric window motor 77



OK

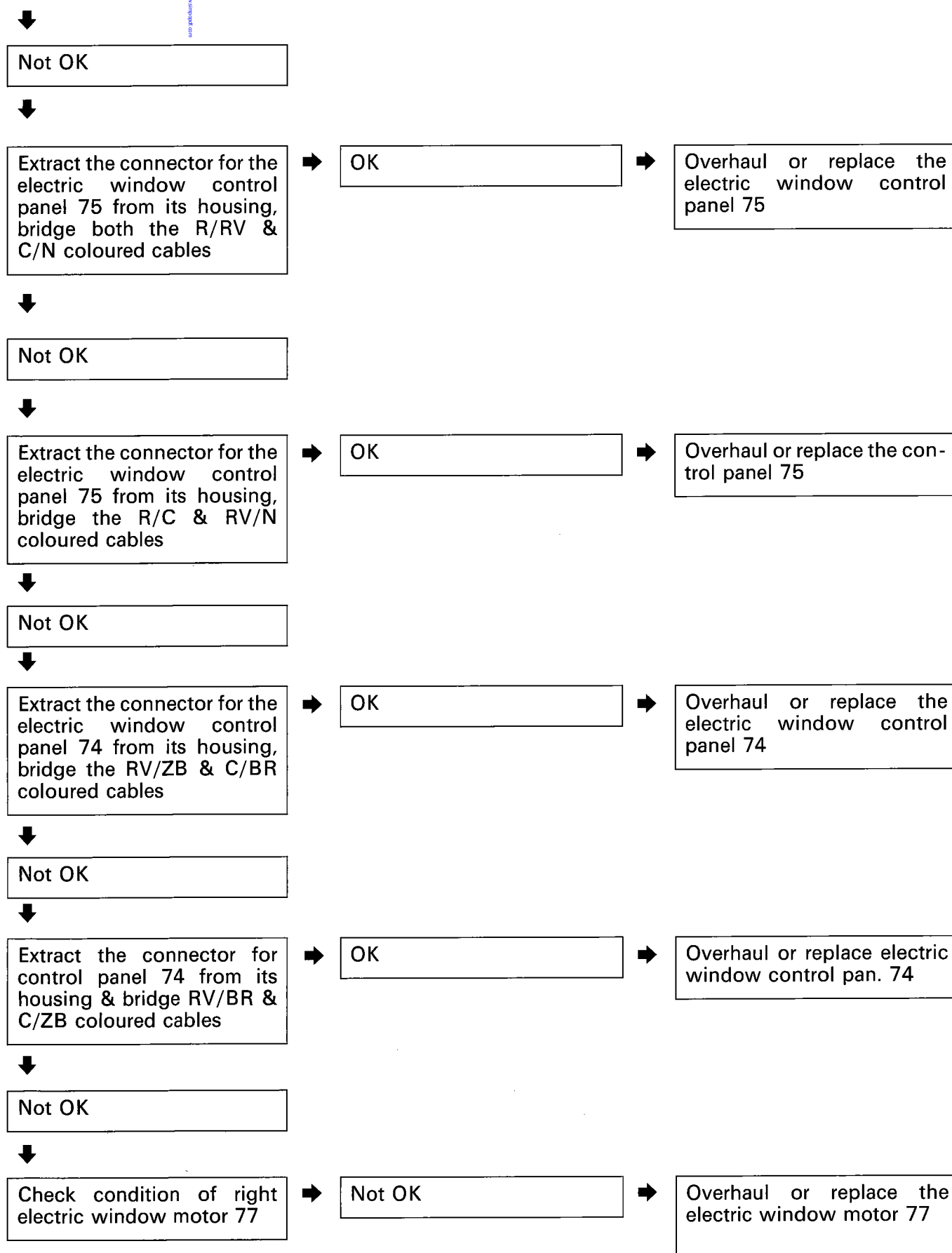


Restore the continuity for BR coloured cable between control panel 74 & electric window motor 77



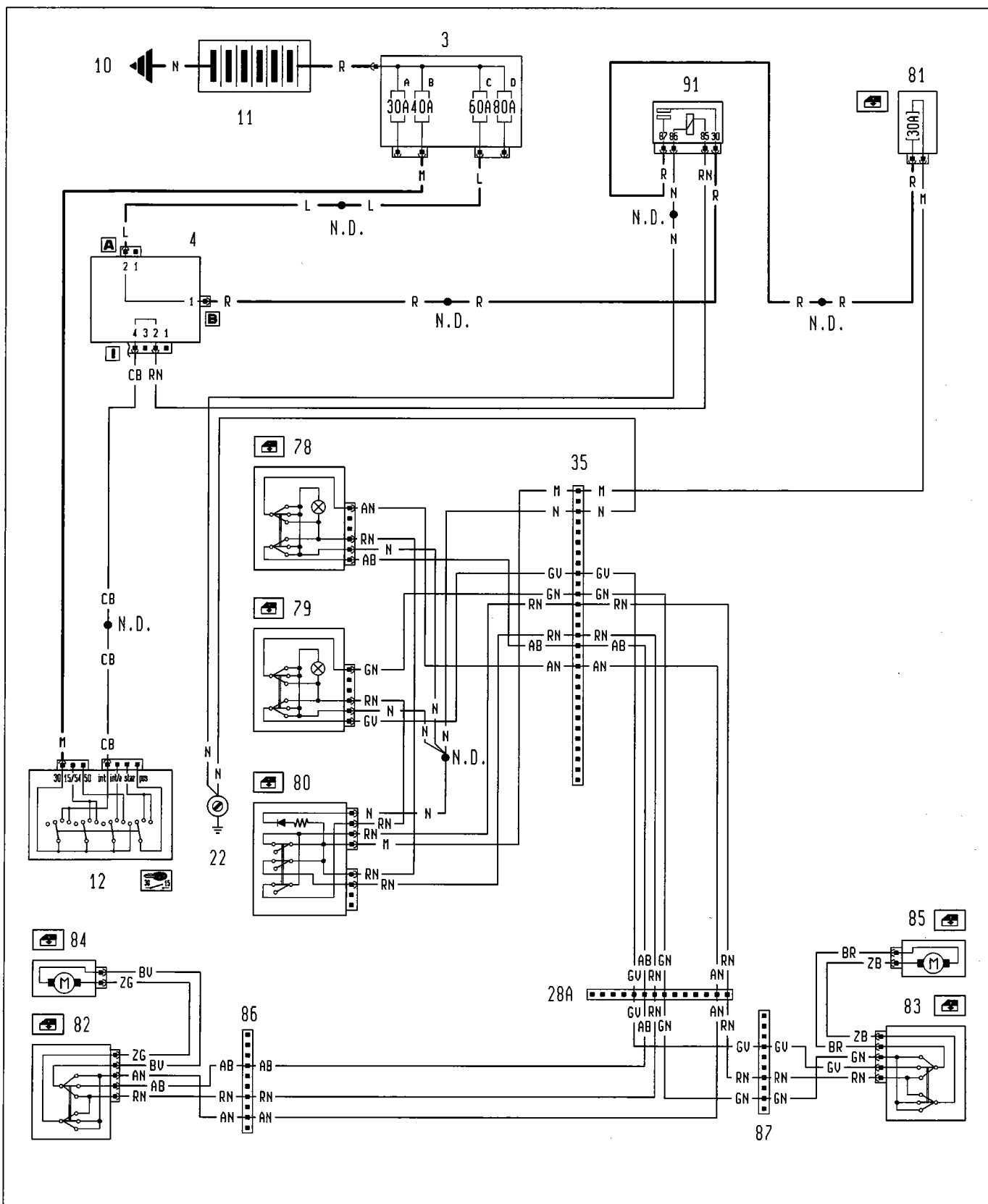
4A433N

55D.

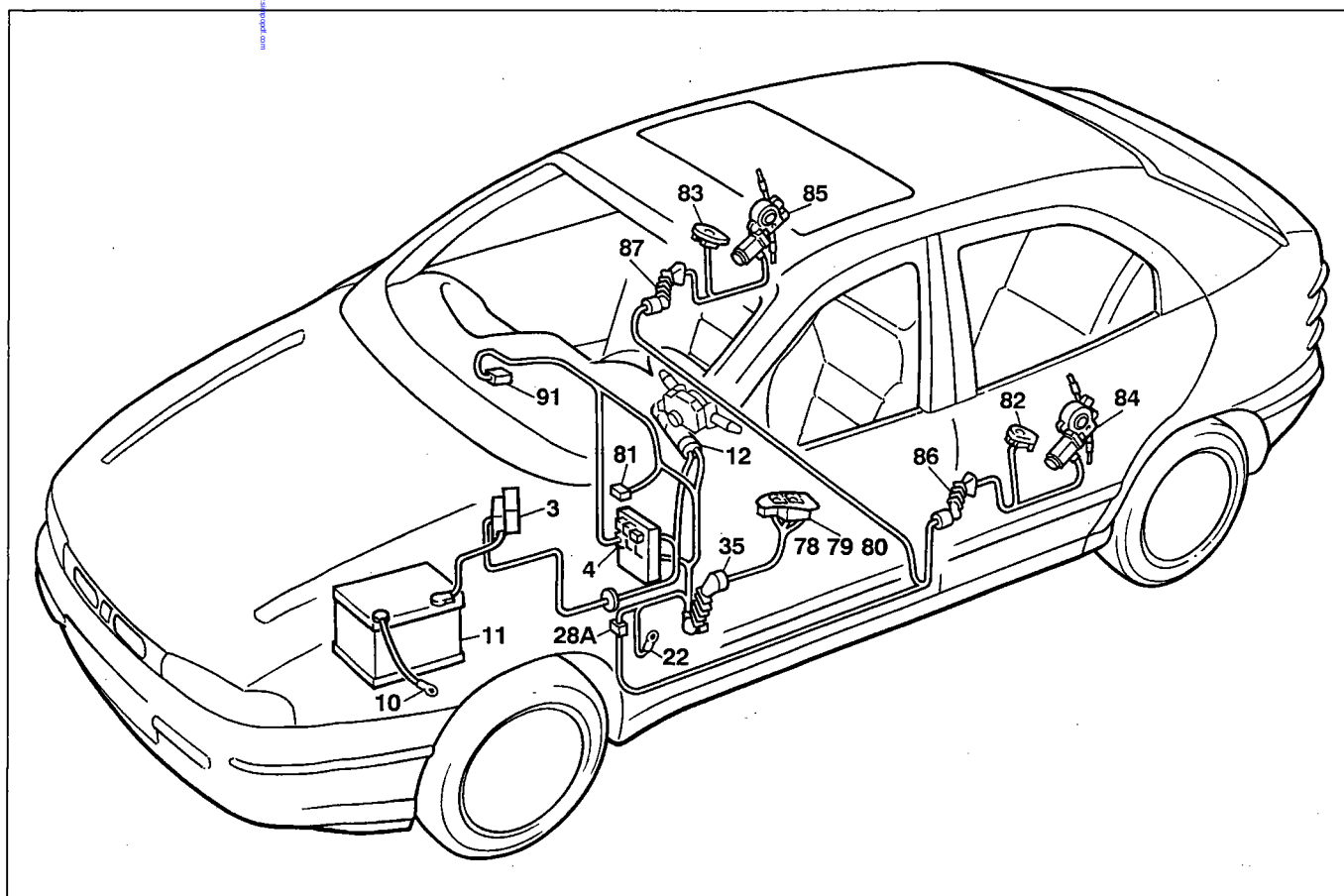


Trim Level: EL - ELX

Electric rear windows - (See key at end of wiring diagrams)



55D.

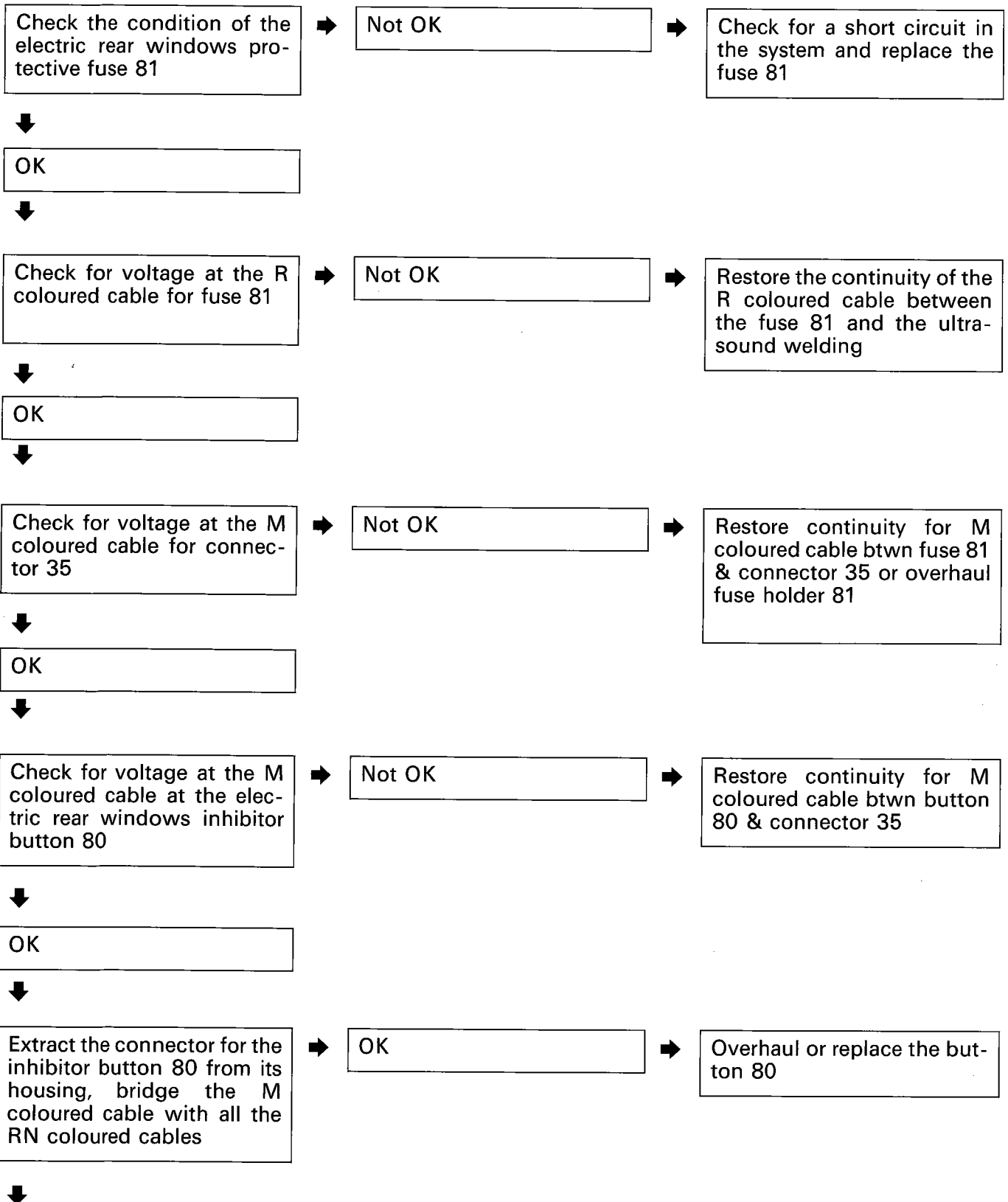


P4A047N02

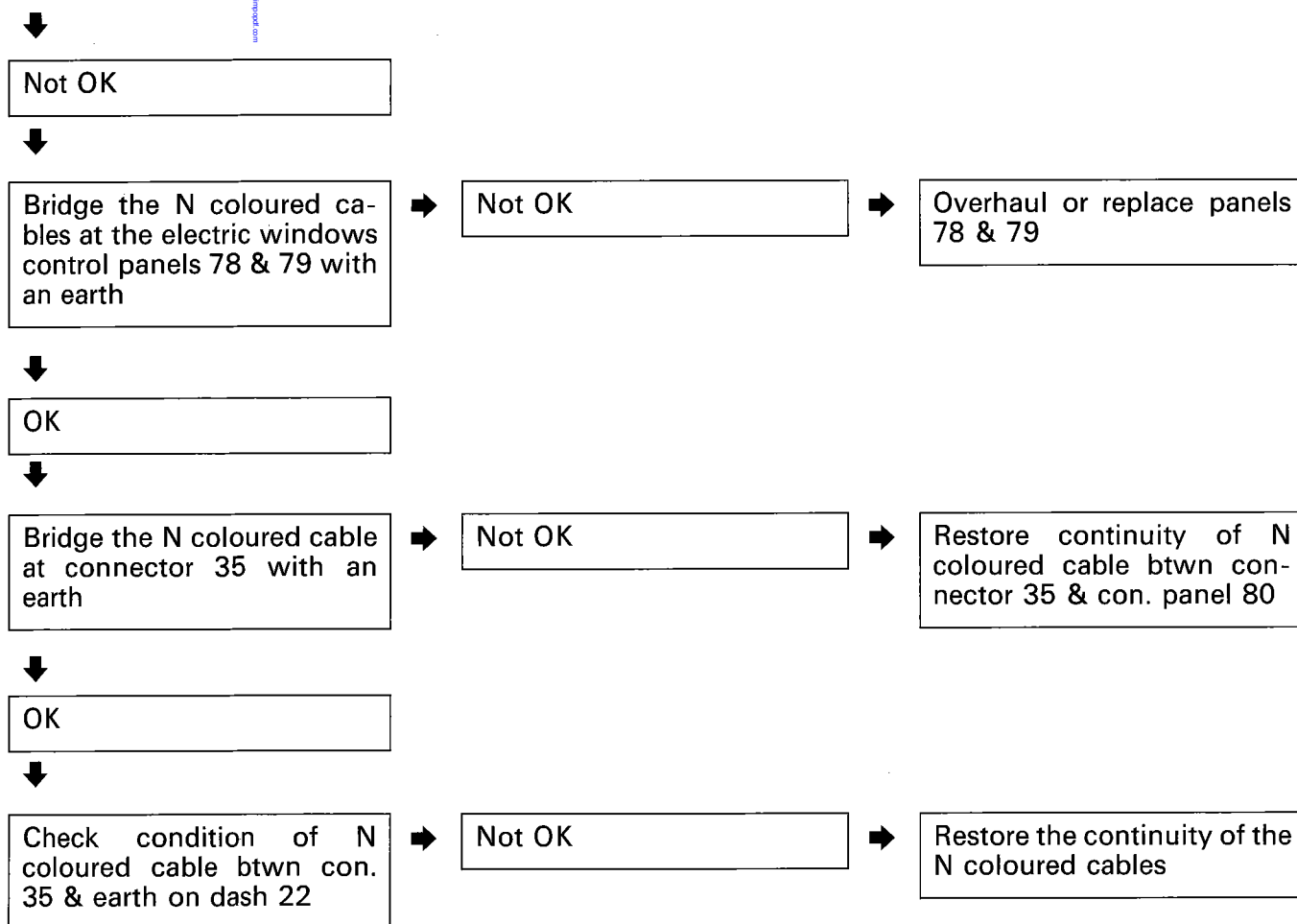
Trim Level: EL - ELX**Electric rear windows****Components key**

- | | |
|--|--|
| 3 Power fuse box: | 83 Right rear electric window control panel on right rear door |
| A 30A protective fuse for injection system (60A for DS versions) | 84 Left rear electric window motor |
| B 40A protective fuse for ignition system | 85 Right rear electric window motor |
| C 60A protective fuse for optional extras | 86 Longitudinal/left rear door cables connection |
| D 80A protective fuse for junction unit | 87 Longitudinal/right rear door cables connection |
| 4 Junction unit | 91 Power relay |
| 10 Earth for battery on bodyshell | N.D. Ultrasound welding taped in cable loom |
| 11 Battery | |
| 12 Ignition switch | |
| 22 Left dashboard earth | |
| 28A Dashboard/longitudinal cables connection | |
| 35 Dashboard/left front door cables connection | |
| 78 Left rear electric window control on left front door | |
| 79 Right rear electric window control on left front door | |
| 80 Electric rear windows inhibitor switch | |
| 81 30A protective fuse for electric rear windows | |
| 82 Left rear electric window control panel on left rear door | |

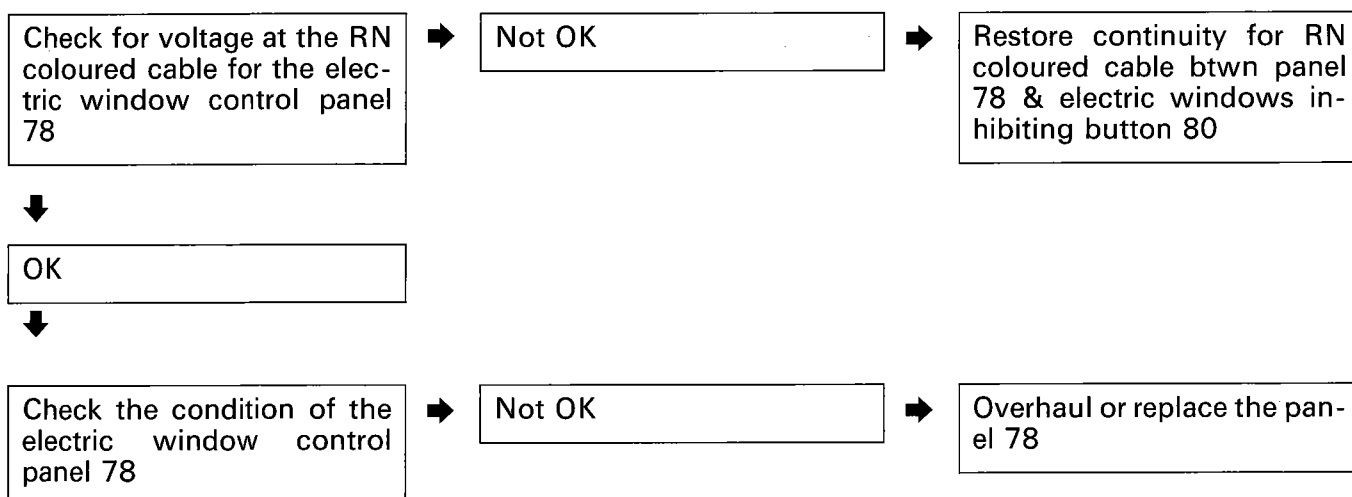
The electric rear windows are not working



55D.



The left rear electric window is not working when operated by the left front panel



The left rear electric window is not working when operated by the left rear panel

Check for voltage at the RN coloured cable pin 15 of connector 35

Not OK

Restore continuity for RN coloured cable btwn connector 35 & electric windows inhibitor button 80



OK



Check for voltage at the RN coloured cable pin 7 for connector 28A

Not OK

Restore the continuity for the RN coloured cable between connector 28A & connector 35



OK



Check for voltage at the RN coloured cable for connector 86

Not OK

Restore the continuity for the RN coloured cable between connector 86 & connector 28A



OK



Check for voltage at the RN coloured cable at the electric window control panel 82

Not OK

Restore the continuity for the RN coloured cable between panel 82 & connector 86



OK



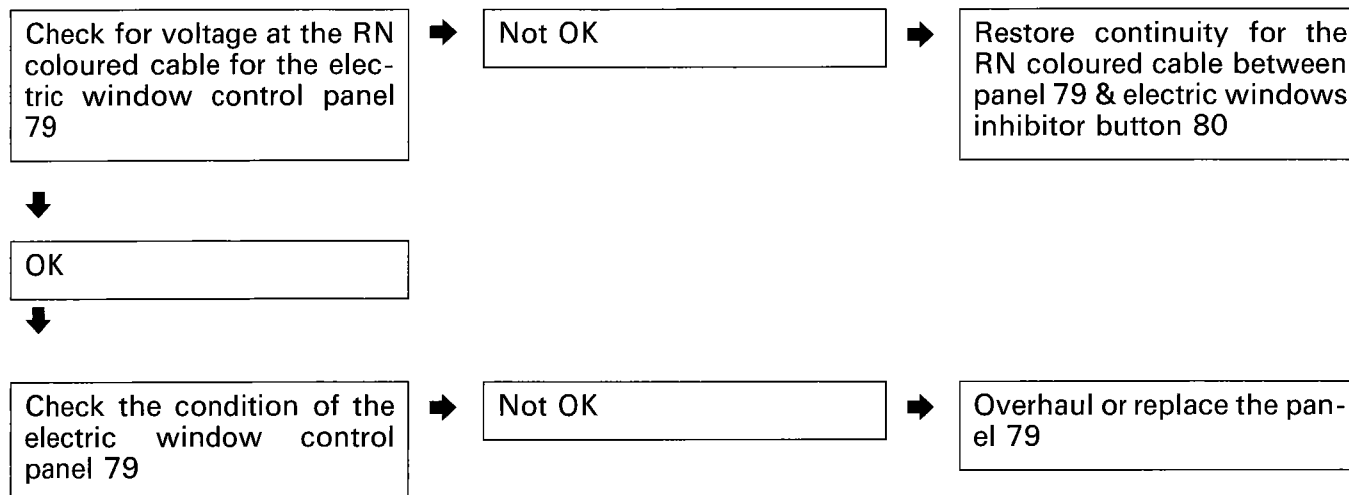
Check the condition of the electric window control panel 82

Not OK

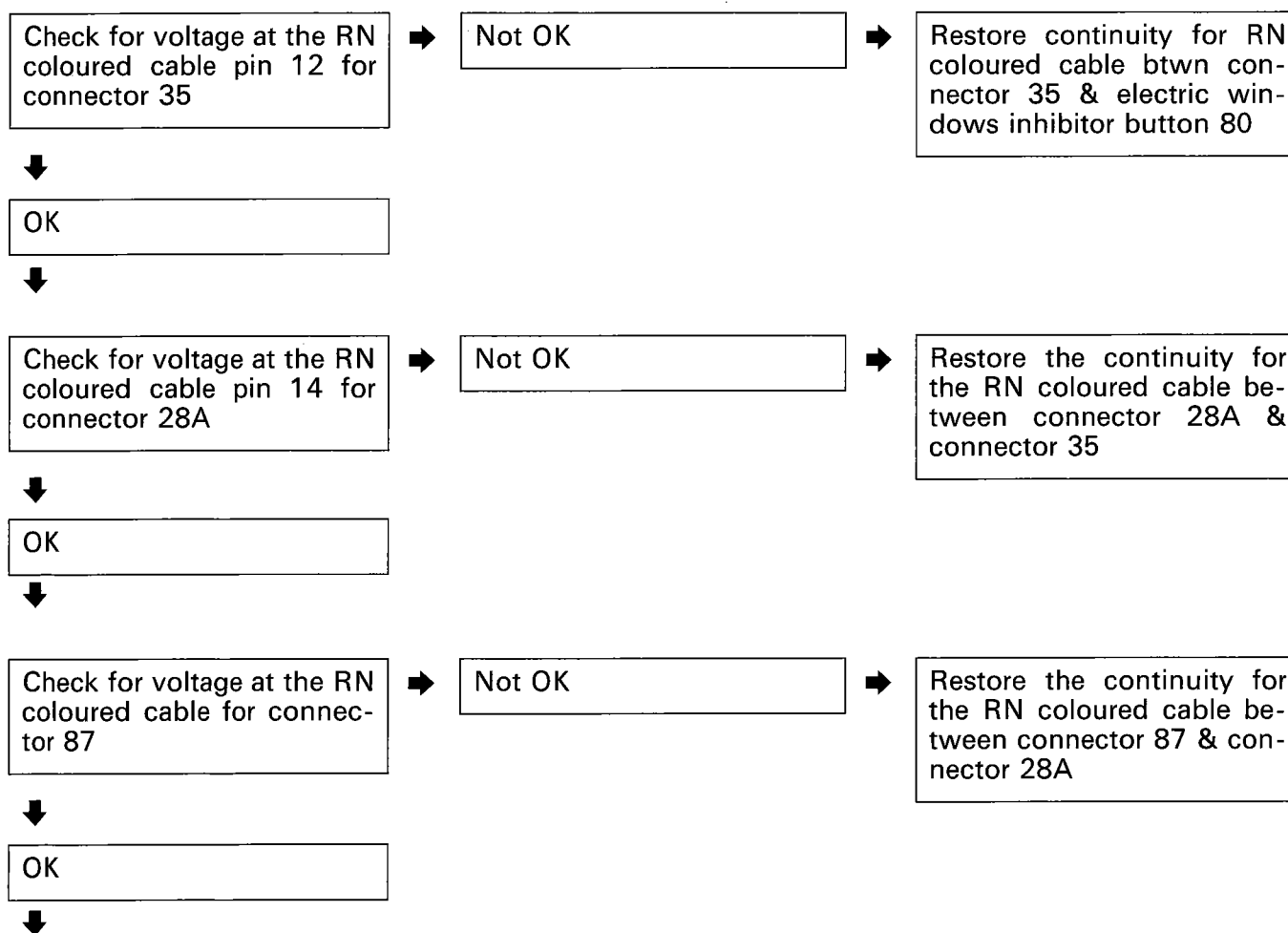
Overhaul or replace the control panel 82

55D.

The right rear electric window is not working when operated by the left front panel



The right rear electric window is not working when operated by the right rear panel





Check for voltage at the RN coloured cable at the electric window control panel 83



Not OK



Restore the continuity for the RN coloured cable between panel 83 & connector 87



OK



Check the condition of the electric window control panel 83



Not OK



Overhaul or replace the panel 83

The left rear electric window is not working

Bridge the N coloured cable at the electric window control panel 78 with an earth



OK



Restore the continuity of the N coloured cable between panel 78 & the ultrasound welding



Not OK



Extract the connector for the panel 78 from its housing, bridge the RN/AN and AB/N coloured cables



OK



Overhaul or replace the panel 78



Not OK



Extract the connector for the panel 78 from its housing, bridge the RN/AB and N/AN coloured cables



OK



Overhaul or replace the panel 78



Not OK



55D.



Extract the connector for the panel 82 from its housing, bridge the RN/ZG and BV/AB coloured cables



OK



Overhaul or replace the panel 82



Not OK



Extract the connector for panel 82 from its housing, bridge the RN/BV and ZG/AN coloured cables



OK



Overhaul or replace the panel 82



Not OK



Extract connectors for panels 78 & 82 from their housings, bridge AN & AB coloured cables at connector for panel 82 & insert an ohmmeter btwn AN & AB coloured cables for connector for panel 78



Not OK



Restore the continuity for the AN and AB coloured cables btwn panels 78 & 82



OK



Extract the connectors for panel 82 and motor 84 from their housings, bridge ZG & BV coloured cables at connector for motor 84 and insert an ohmmeter btwn ZG & BV coloured cables at connector for panel 82



Not OK



Restore the continuity for the ZG and BV coloured cables between motor 84 & panel 82



OK



Check the condition of the electric window motor 84

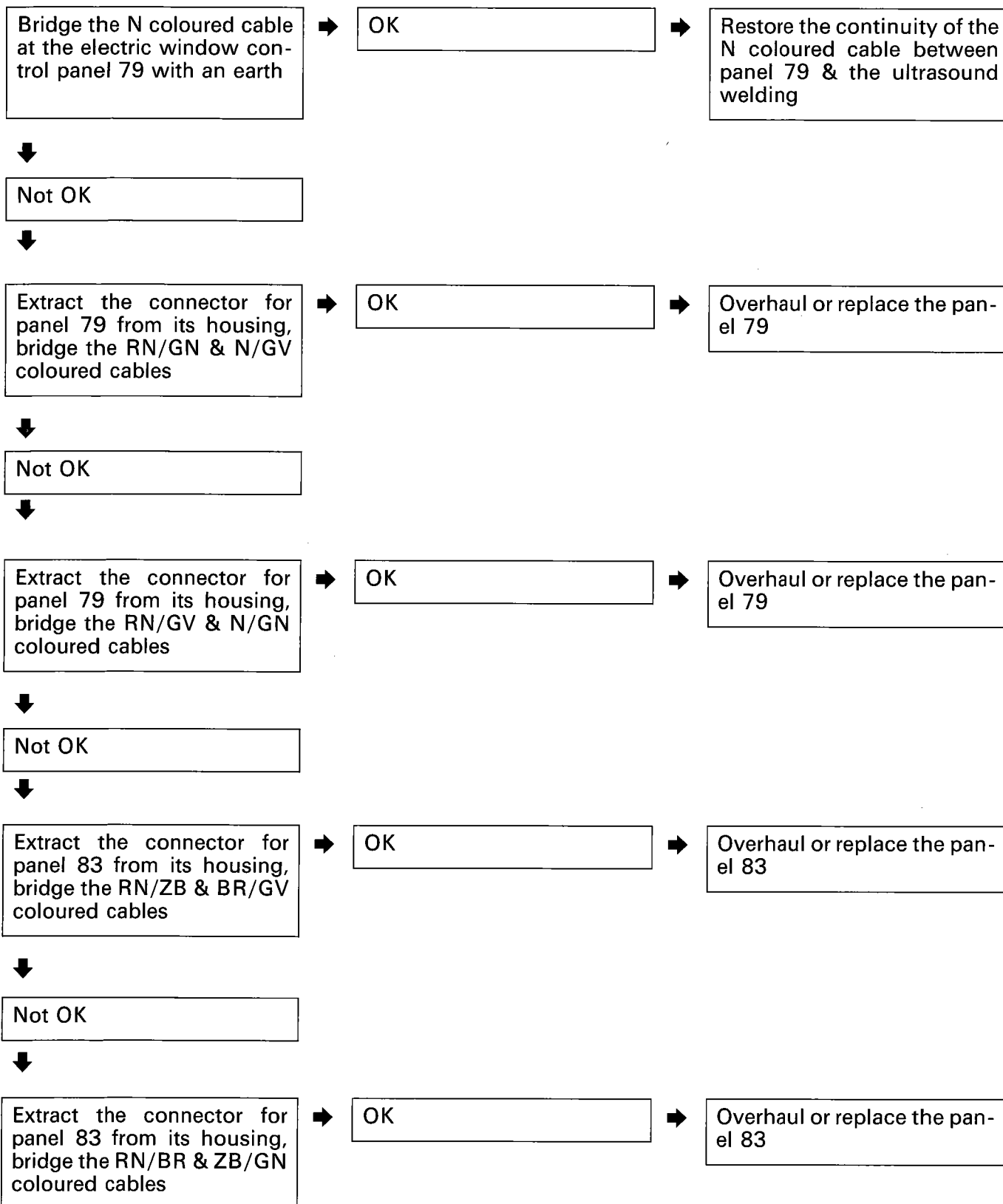


Not OK

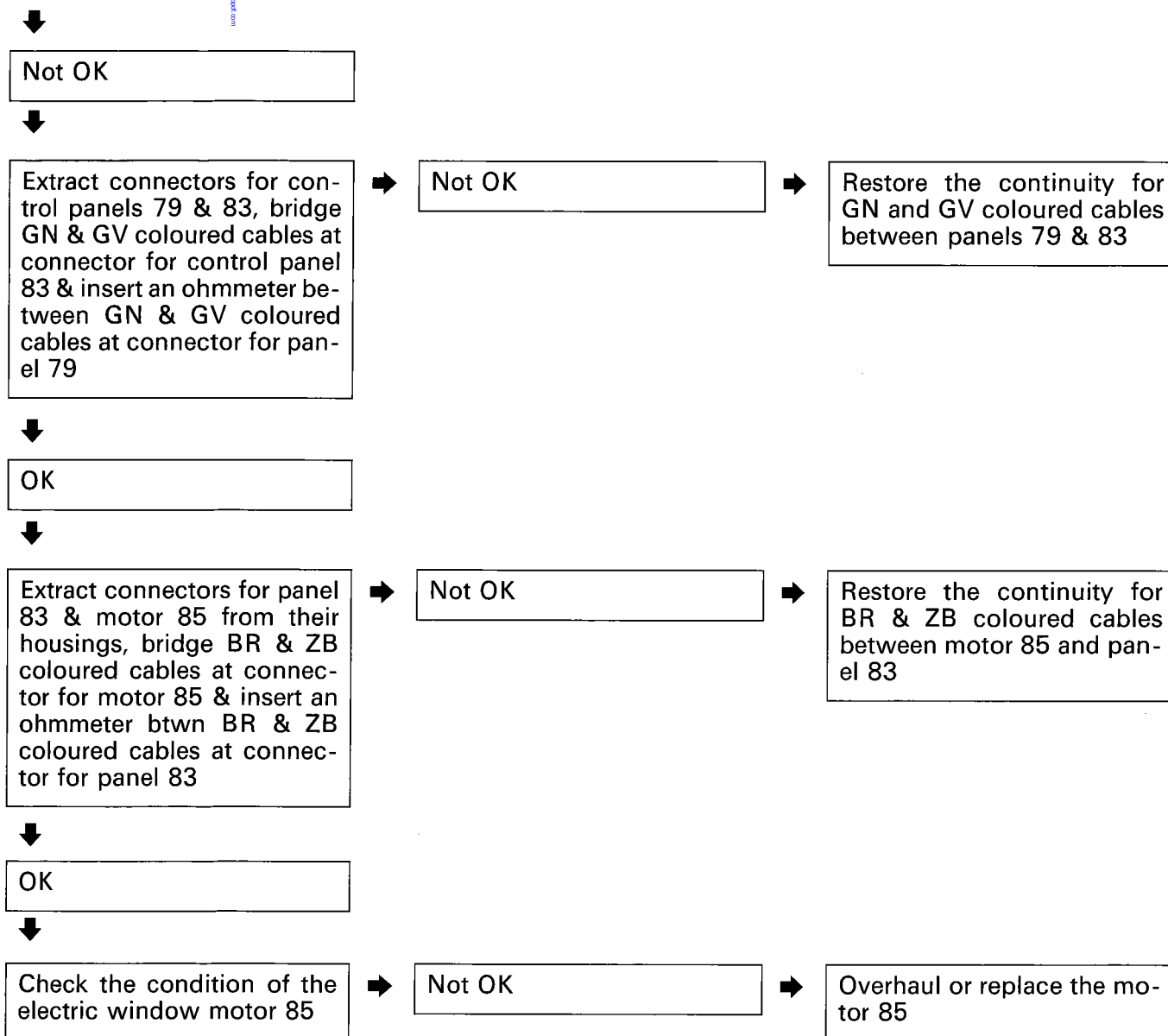


Overhaul or replace the motor 84

The right rear electric window is not working

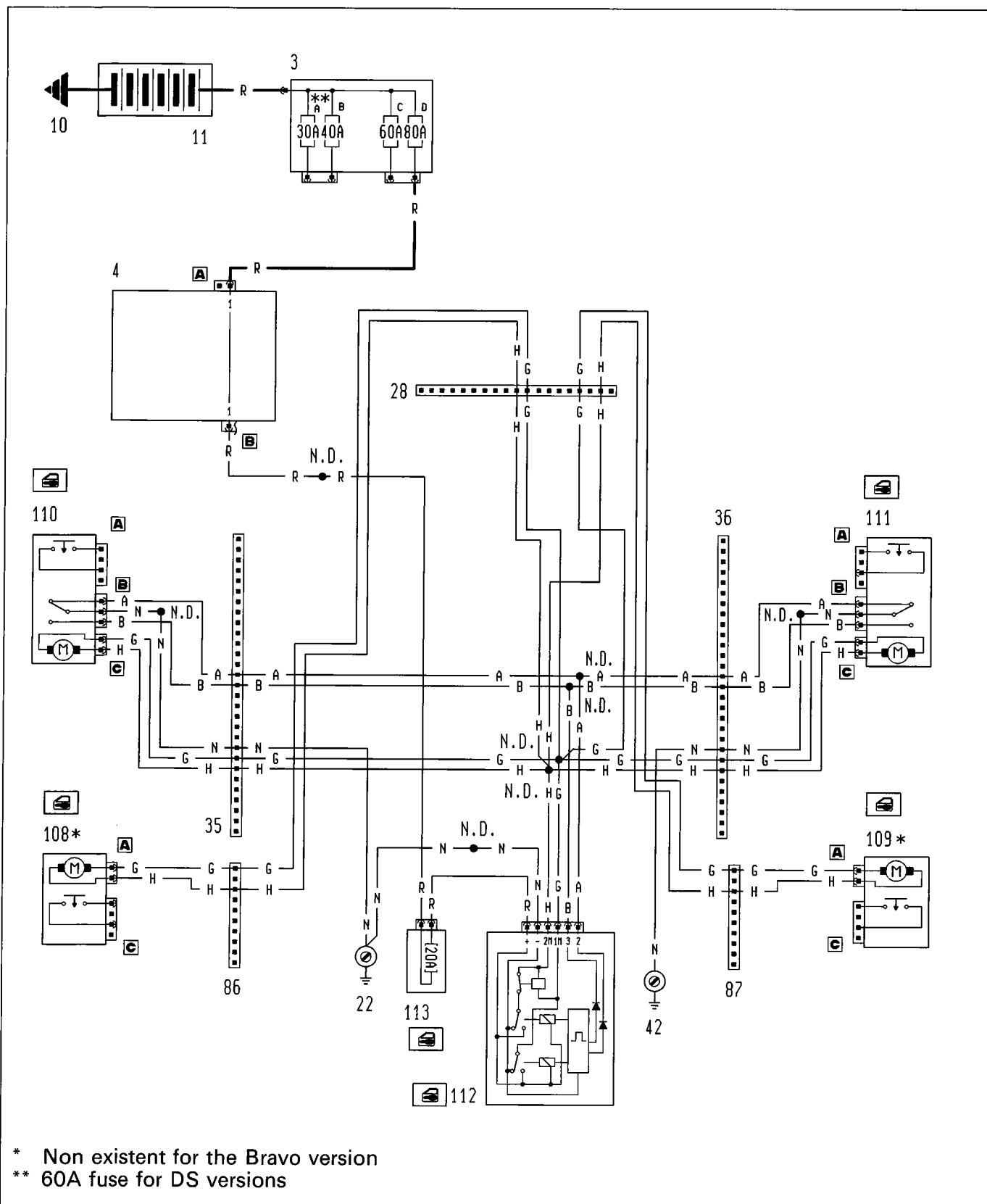


55D.



Version without alarm: S - SX - GT

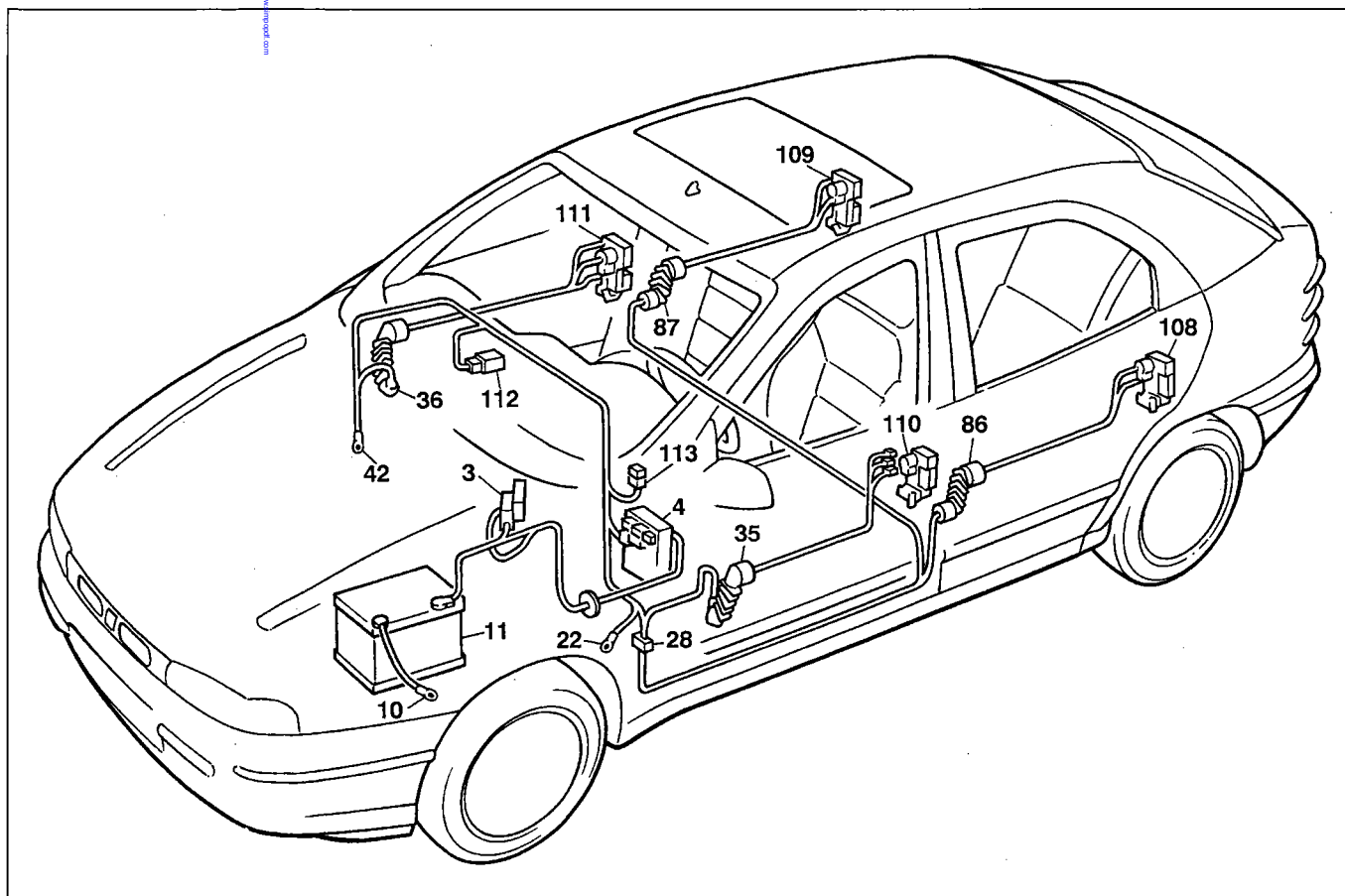
Central locking - (See key at end of wiring diagrams)



* Non existent for the Bravo version

** 60A fuse for DS versions

55D.



P4A063N02

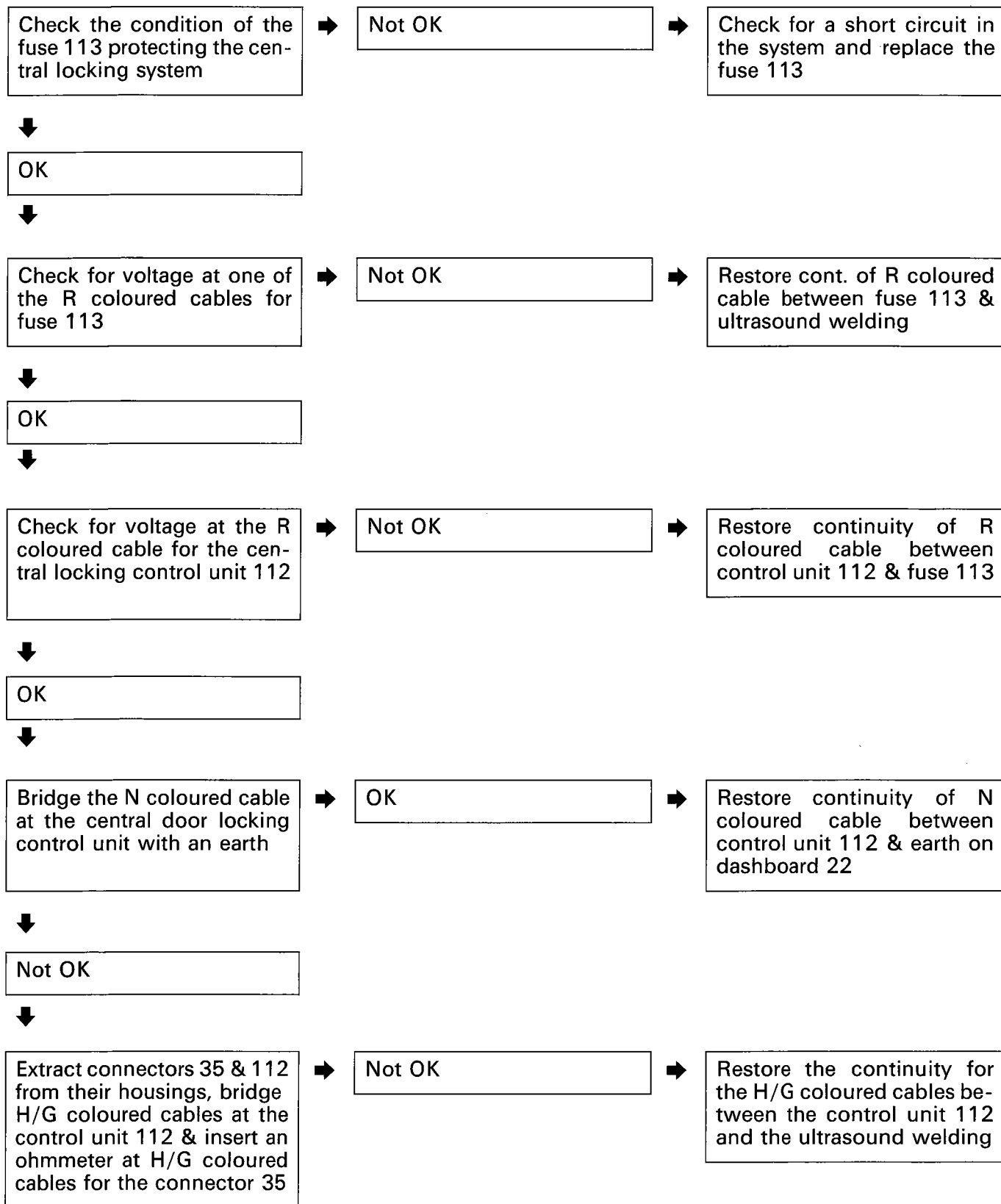
Version without alarm: S - SX - GT

Central locking

Components key

- | | |
|---|---|
| 3 Power fuse box:
A 30A protective fuse for injection system
(60A for DS versions)
B 40A protective fuse for ignition system
C 60A protective fuse for optional extras
D 80A protective fuse for junction unit | 110 Left front central locking/alarm on switch
111 Right front central locking/alarm on switch
112 Central door locking control unit
113 20A protective fuse for central locking system
N.D. Ultrasound welding taped in cable loom |
| 4 Junction unit | |
| 10 Earth for battery on bodyshell | |
| 11 Battery | |
| 22 Left dashboard earth | |
| 28 Dashboard/longitudinal cables connection | |
| 35 Dashboard/left front door cables connection | |
| 36 Dashboard/right front door cables connection | |
| 42 Right dashboard earth | |
| 86 Longitudinal/left rear door cables connection | |
| 87 Longitudinal/right rear door cables connection | |
| 108 Left rear central locking/alarm switch | |
| 109 Right rear central locking/alarm on switch | |

The central locking is not working



55D.



OK



Check the condition of the central locking control unit 112



Not OK



Overhaul or replace the control unit 112

The central locking is not locking the doors

Bridge the A coloured cable at the central locking control unit 112 with an earth



OK



Restore the continuity of the A coloured cable between the control unit 112 and the ultrasound welding



Not OK



Check the condition of the control locking control unit 112



Not OK



Overhaul or replace the control unit 112

The central locking does not lock the doors controlled by the left front lock

Bridge the N coloured cable at the left front central locking 110 with an earth



OK



Restore the continuity of the N coloured cable between the central locking 110 and the earth on dashboard 22



Not OK



Extract connectors 112 & 35 from their housings, bridge A/B coloured cables at control unit connector 112 & insert an ohmmeter between A/B coloured cables for connector 35



Not OK



Restore cont. of A coloured cable between control unit 112 and connector 35





OK



Extract connectors 112 & 110 from their housings, bridge A/B coloured cables at the control unit connector 112 & insert an ohmmeter between the A/B coloured cables of the lock assy 110



Not OK



Restore the continuity of the A coloured cable between the connector 35 and the lock assembly 110



OK



Bridge the A/N coloured cables at the left front lock assembly 110



OK



Overhaul or replace the lock assembly 110



Not OK



Check the condition of the left front lock assembly 110



Not OK



Overhaul or replace the lock assembly 110

The central locking does not lock the doors operated by the right front lock

Bridge the N coloured cable at the right front central locking 111 with an earth



OK



Restore the continuity of the N coloured cable between the central locking 111 and the earth on dashboard 42



Not OK



55D.



Extract connectors 112 & 36 from their housings, bridge A/B coloured cables at control unit connector 112 & insert an ohmmeter between A/B coloured cables for connector 36



Not OK



Restore continuity of A coloured cable btwn control unit 112 & connector 36



OK



Extract connectors 112 & 111 from their housings, bridge A/B coloured cables at the control unit connector 112 & insert an ohmmeter between A/B coloured cables of lock assy 111



Not OK



Restore the continuity of the A coloured cable between the connector 36 and the lock assembly 111



OK



Bridge the A/N coloured cables at the left front lock assembly 111



OK



Overhaul or replace the lock assembly 111



Not OK



Check the condition of the left front lock assembly 111



Not OK



Overhaul or replace the lock assembly 111

The central locking is not unlocking the doors

Bridge the B coloured cable at the central locking control unit 112 with an earth



OK



Restore the continuity of the B coloured cable between the control unit 112 and the ultrasound welding





Not OK



Check the condition of the central locking control unit 112



Not OK



Overhaul or replace the control unit 112

The central locking does not unlock the doors controlled by the left front lock

Bridge the N coloured cable at the left front central locking 110 with an earth



OK



Restore the continuity of the N coloured cable between the central locking 111 and the earth on dashboard 42



Not OK



Extract connectors 112 & 35 from their housings, bridge A/B coloured cables at control unit connector 112 & insert an ohmmeter between A/B coloured cables for connector 35



Not OK



Restore cont. of B coloured cable between control unit 112 & connector 35



OK



Extract connectors 112 and 110 from their housings, bridge the A/B cables at the control unit connector 112 and insert an ohmmeter between the A/B coloured cables of the lock assy 110



Not OK



Restore the continuity of the B coloured cable between the connector 35 and the lock assembly 110



OK



4A481N

55D.



Bridge the B/N coloured cables at the left front lock assembly 110



OK



Overhaul or replace the lock assembly 110



Not OK



Check the condition of the left front lock assembly 110



Not OK



Overhaul or replace the lock assembly 110

The central locking does not unlock the doors operated by the right front lock

Bridge the N coloured cable at the right front central locking 111 with an earth



OK



Restore the continuity of the N coloured cable between the central locking 111 and the earth on dashboard 42



Not OK



Extract connectors 112 & 36 from their housings, bridge A/B coloured cables at the control unit connector 112 & insert an ohmmeter between A/B coloured cables for connector 36



Not OK



Restore continuity of B coloured cable btwn control unit 112 and connector 36



OK



Extract connectors 112 and 111 from their housings, bridge the A/B cables at the control unit connector 112 and insert an ohmmeter between the A/B coloured cables of the lock assy 111

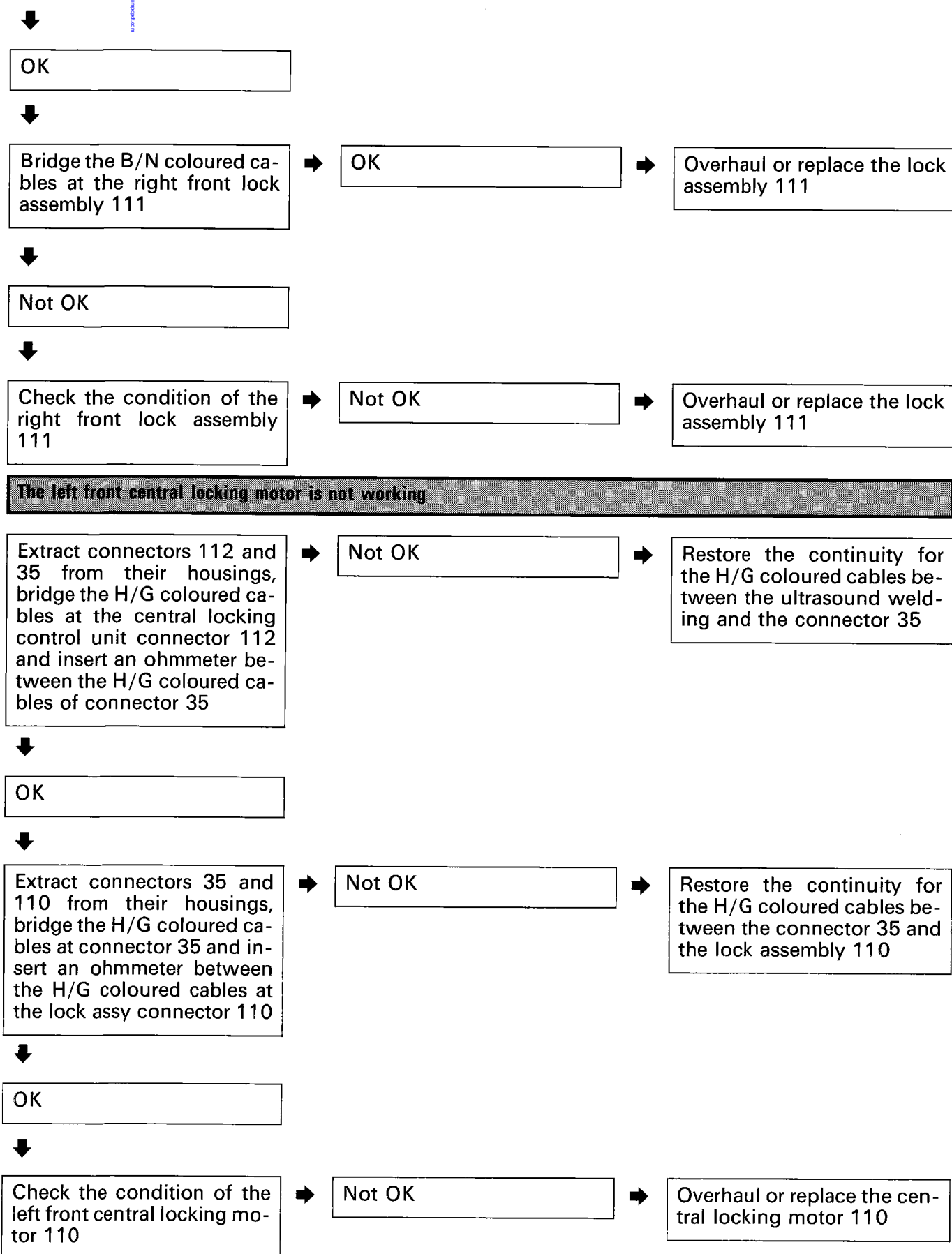


Not OK



Restore the continuity of the B coloured cable between the connector 36 and the lock assembly 111





55D.

The right front central locking motor is not working

Extract connectors 112 and 36 from their housings, bridge the H/G coloured cables at the central locking control unit connector 112 and insert an ohmmeter between the H/G coloured cables of connector 36



Not OK



Restore the continuity for the H/G coloured cables between the ultrasound welding and the connector 36



OK



Extract connectors 36 and 111 from their housings, bridge the H/G coloured cables at connector 36 and insert an ohmmeter between the H/G coloured cables at the lock assy connector 111



Not OK



Restore the continuity for the H/G coloured cables between the connector 36 and the lock assembly 111



OK



Check the condition of the right front central locking motor 111



Not OK



Overhaul or replace the central locking motor 111

The left rear central locking motor is not working (Non existent for the Bravo versions)

Extract connectors 112 and 86 from their housings, bridge the H/G coloured cables at the central locking control unit connector 112 and insert an ohmmeter between the H/G coloured cables of connector 86



Not OK

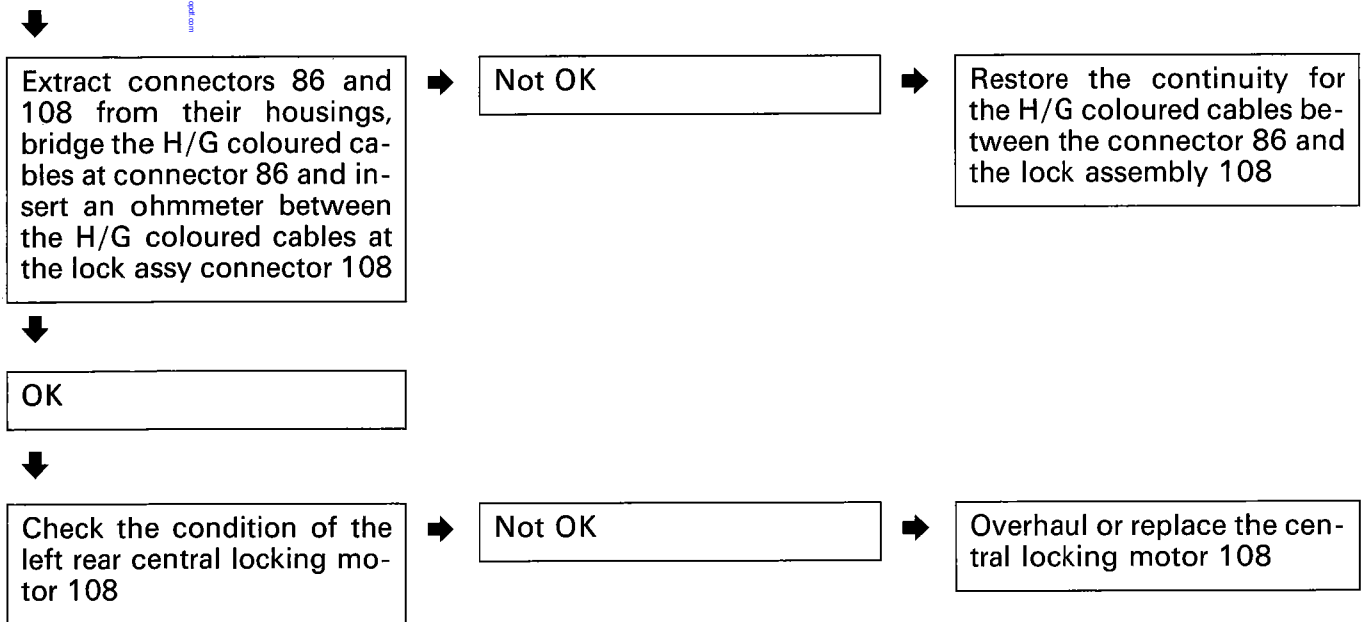


Restore the continuity for the H/G coloured cables between the ultrasound welding and the connector 86

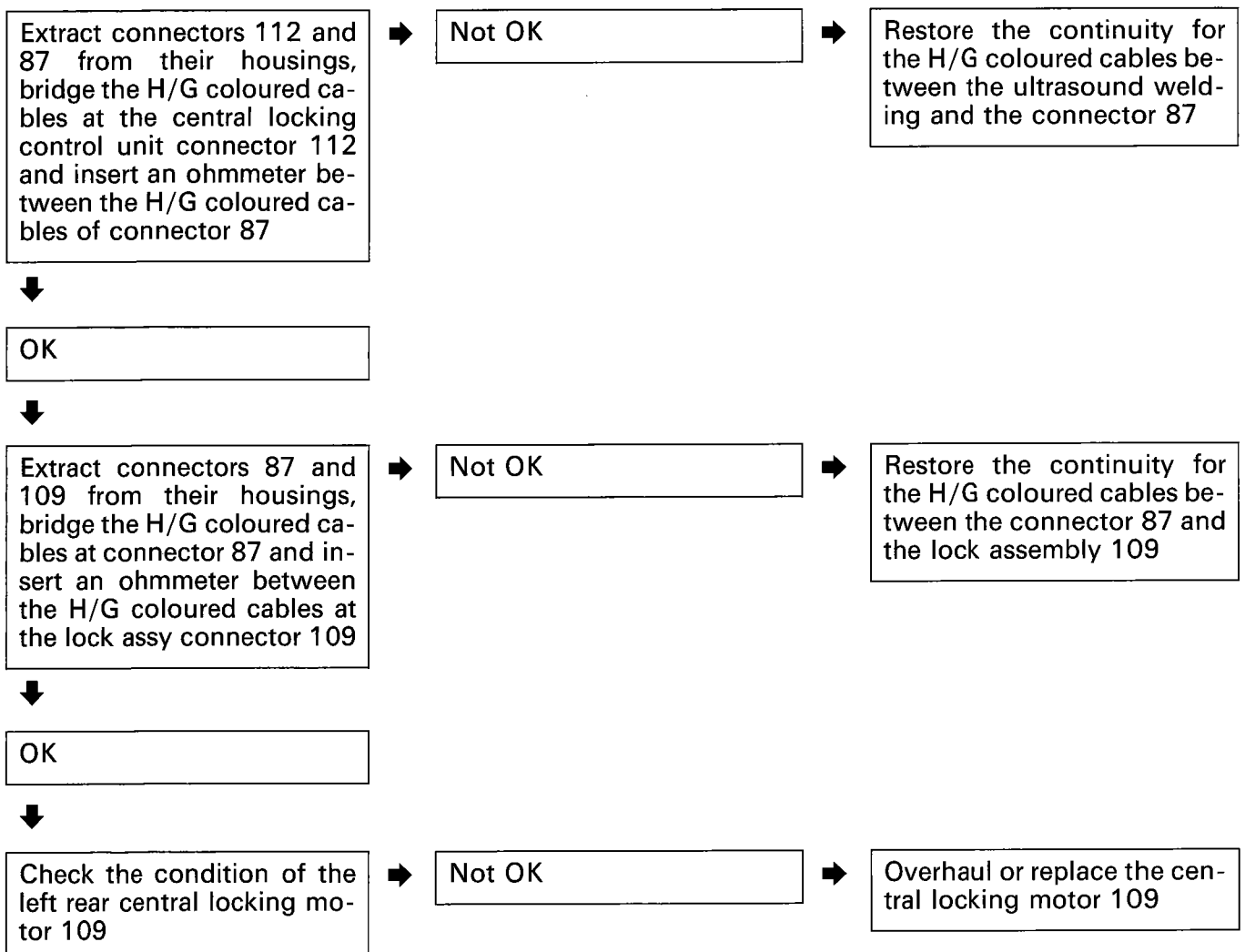


OK



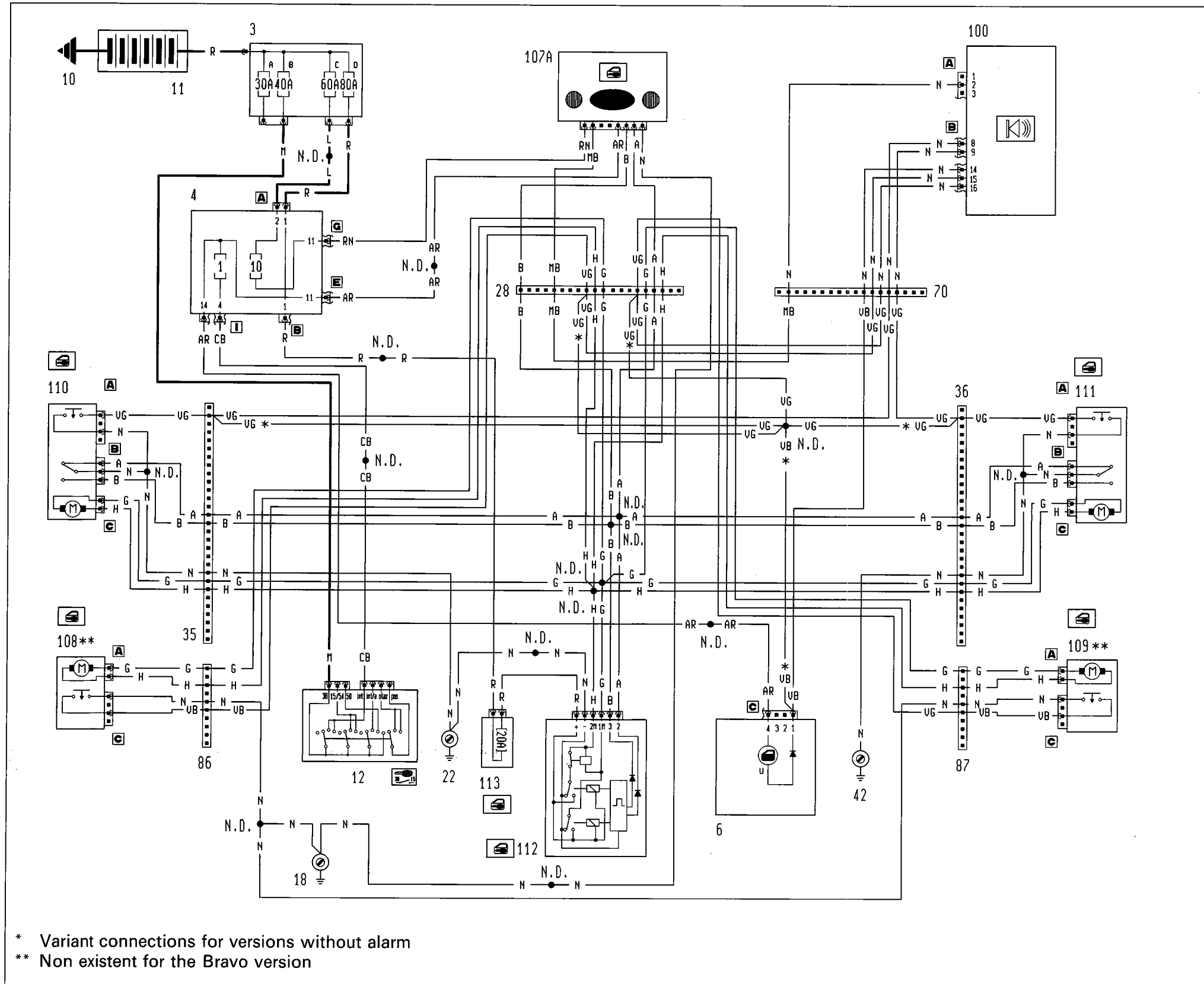


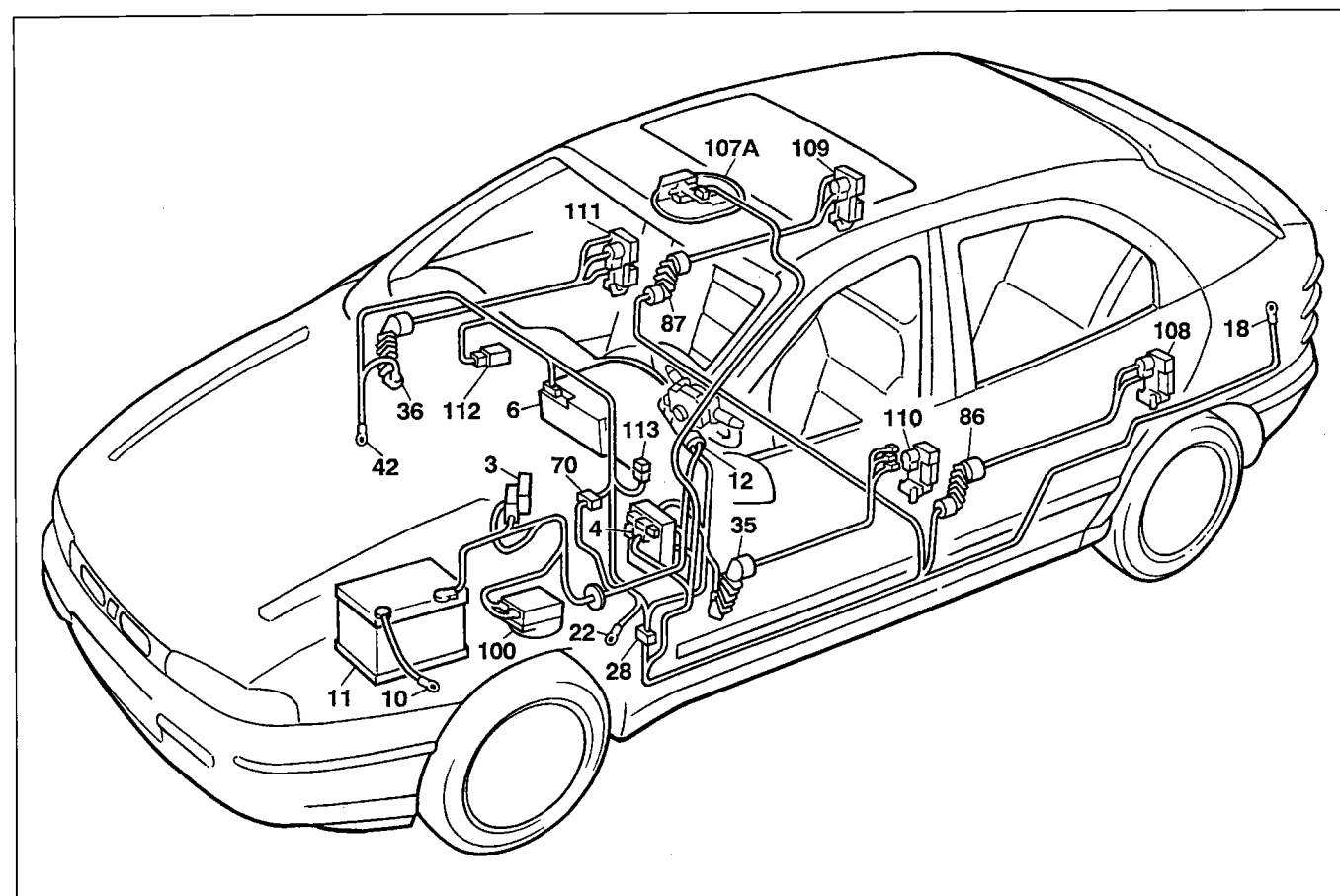
The right rear central locking motor is not working (Non existent for the Bravo versions)



Version: EL - ELX - HGT

Central door locking and car doors not shut warning system - (See key at end of wiring diagrams)





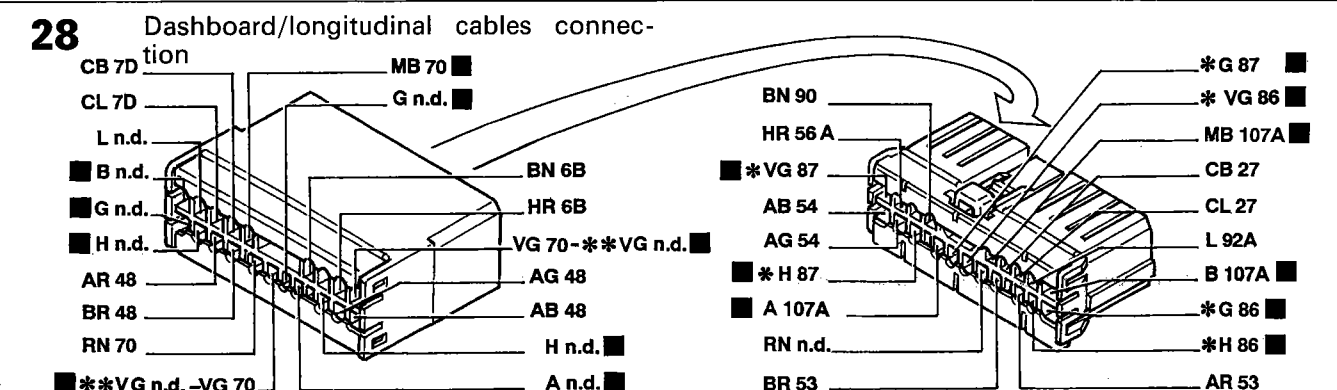
P4A159N02

Version: EL - ELX - HGT

Central door locking and car doors not shut warning system

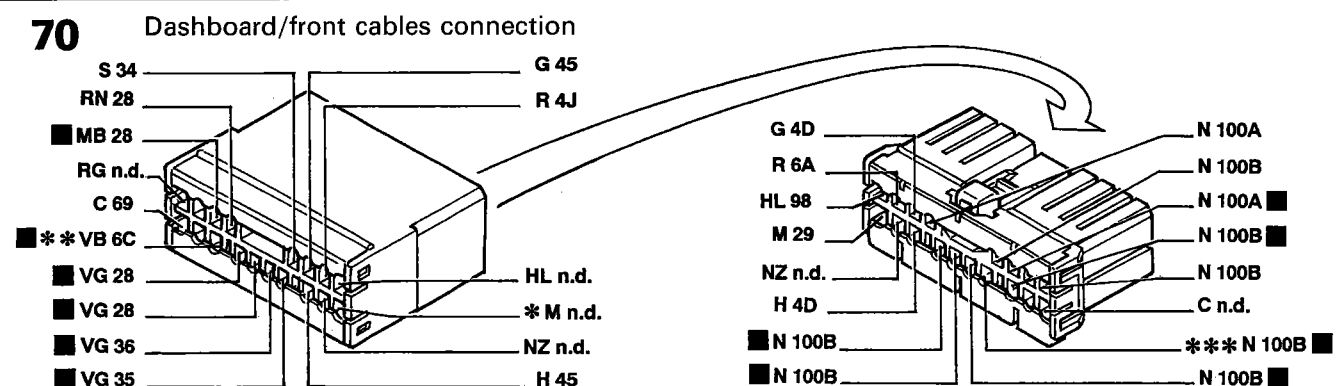
Components key

- | | |
|--|--|
| 3 Power fuse box: | 100 Alarm device electronic control unit |
| A 30A protective fuse for injection system (60A for DS versions) | 107A Central locking remote control receiver |
| B 40A protective fuse for ignition system | 108 Left rear central locking/alarm switch |
| C 60A protective fuse for optional extras | 109 Right rear central locking/alarm on switch |
| D 80A protective fuse for junction unit | 110 Left front central locking/alarm on switch |
| 4 Junction unit | 111 Right front central locking/alarm on switch |
| 6 Instrument panel: | 112 Central door locking control unit |
| U Doors ajar warning light | 113 20A protective fuse for central locking system |
| 10 Earth for battery on bodyside | N.D. Ultrasound welding taped in cable loom |
| 11 Battery | |
| 12 Ignition switch | |
| 18 Left rear earth | |
| 22 Left dashboard earth | |
| 28 Dashboard/longitudinal cables connection | |
| 35 Dashboard/left front door cables connection | |
| 36 Dashboard/right front door cables connection | |
| 42 Right dashboard earth | |
| 70 Dashboard/front cables connection | |
| 86 Longitudinal/left rear door cables connection | |
| 87 Longitudinal/right rear door cables connection | |



* Only for Brava

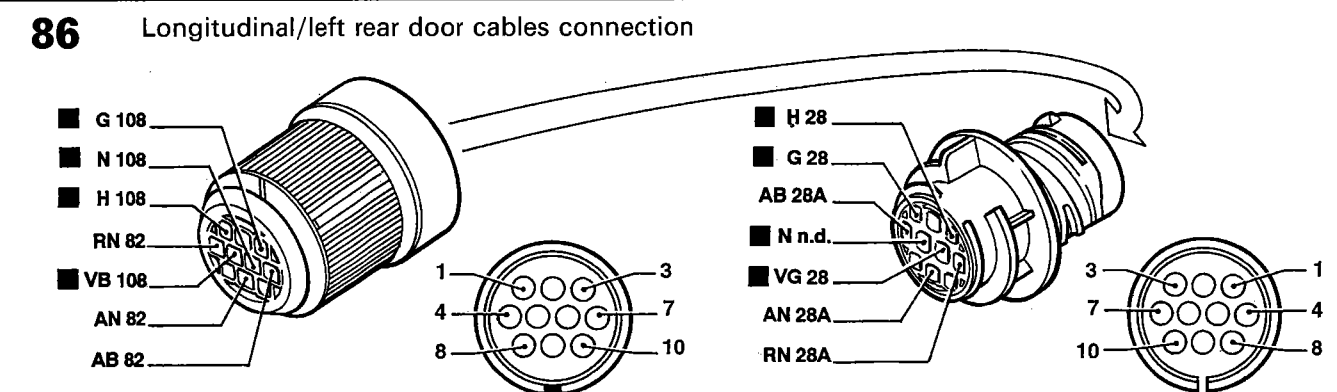
** Valid for versions without alarm



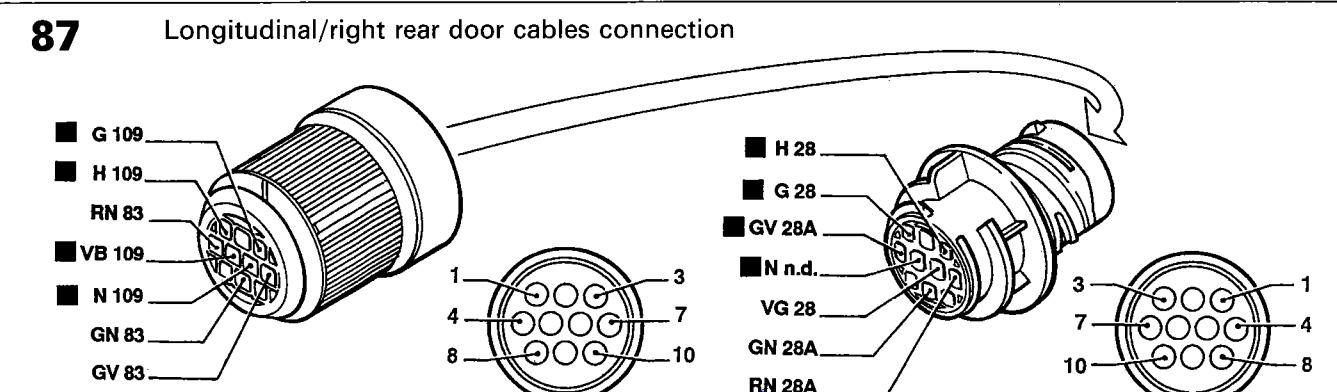
* Non existent for the S trim level

** Valid for for the EL/ELX/HGT trim level

*** Non existent for 1929 DS



Only for Brava

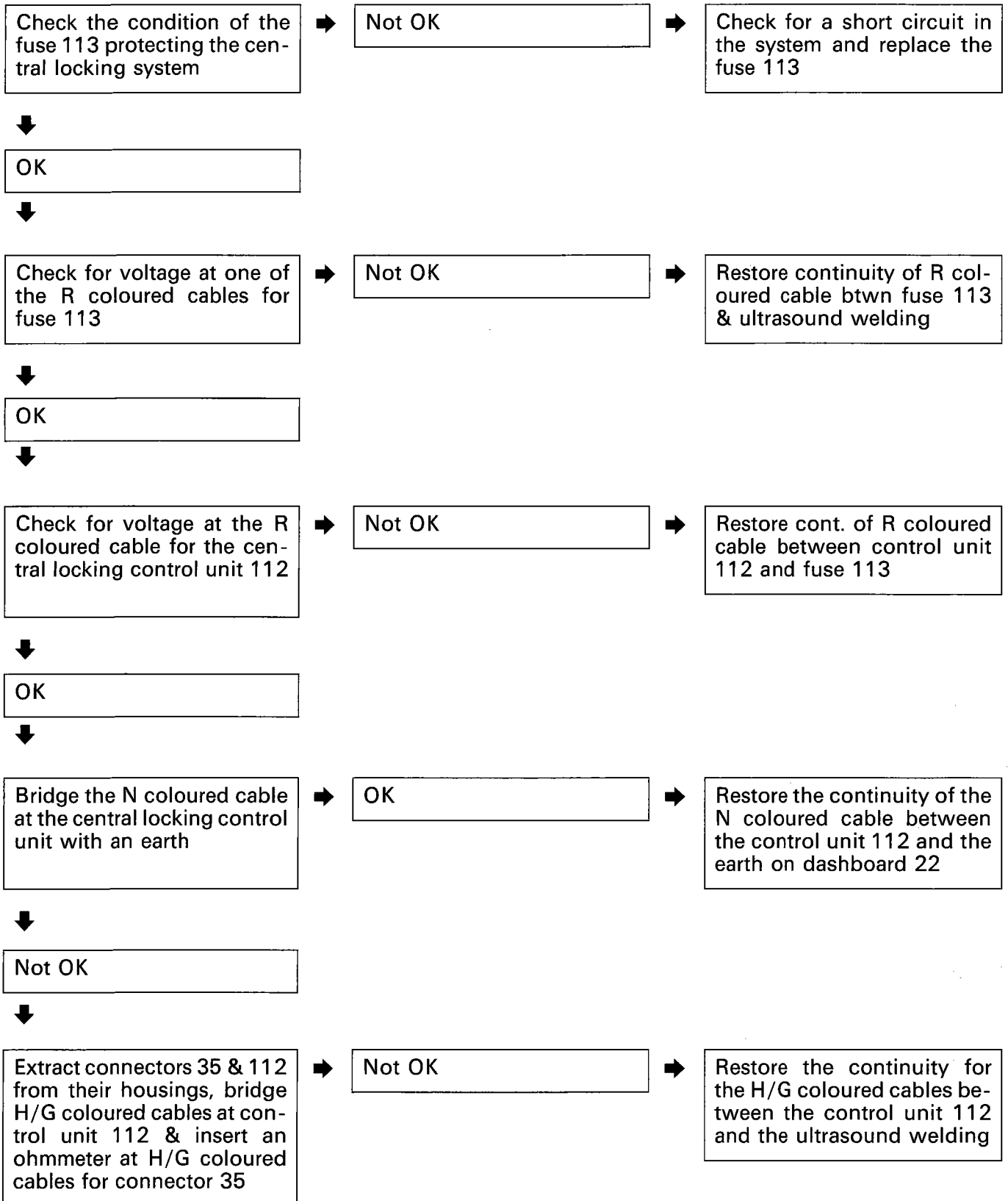


Only for Brava

The cables for the wiring diagram are marked

P4A160N02

The central locking is not working



55D.



OK



Check the condition of the control locking control unit 112



Not OK



Overhaul or replace the control unit 112

The central locking is not working operated by the remote control

Check the voltage of the accumulator inside the remote control



Not OK



Replace the accumulator



OK



Check the condition of the fuse 10 inside the junction unit 4



Not OK



Check for a short circuit in the system and replace the fuse 10



OK



Check for voltage at the RN coloured cable for receiver 107A



Not OK



Restore the continuity for the RN coloured cable between the receiver 107A and the connector G of the junction unit 4



OK



Bridge the N coloured cable at the central locking remote control receiver 107A with an earth



OK



Restore the continuity of the N coloured cable between the receiver 107A and the ultrasound welding



Not OK





Check the condition of the central locking receiver 107A



Not OK



Overhaul or replace the receiver 107A



OK



Check the condition of the central locking remote control



Not OK



Overhaul or replace the remote control

The central locking does not lock the doors operated by the receiver

Bridge the A coloured cable at connector 28 with an earth



Not OK



Restore the continuity of the A coloured cable between the connector 28 and the ultrasound welding



OK



Bridge the A coloured cable at the receiver 107A with an earth



Not OK



Restore continuity of A coloured cable between receiver 107A & connector 28



OK



Check the condition of the receiver 107A



Not OK



Overhaul or replace the receiver 107A

The central locking does not unlock the doors operated by the receiver

Bridge the B coloured cable at connector 28 with an earth



Not OK



Restore the continuity of the B coloured cable between the connector 28 and the ultrasound welding



OK



55D.



Bridge the B coloured cable at the receiver 107A with an earth



Not OK



Restore the continuity of the B coloured cable between the receiver 107A and the connector 28



OK



Check the condition of the receiver 107A



Not OK



Overhaul or replace the receiver 107A

The central locking is not working operated by the alarm device control unit

Bridge MB coloured cable btwn connectors 28 & 70



OK



Restore the continuity of the MB coloured cable between connectors 28 & 70



Not OK



Bridge the MB coloured cable between the alarm control unit 100 connector A pin 2 and the receiver 107A



OK



Restore the continuity of the MB coloured cable between the alarm control unit 100 and the receiver 107A



Not OK



Check the condition of the receiver 107A



Not OK



Overhaul or replace the receiver 107A



OK



Check the condition of the alarm control unit 100

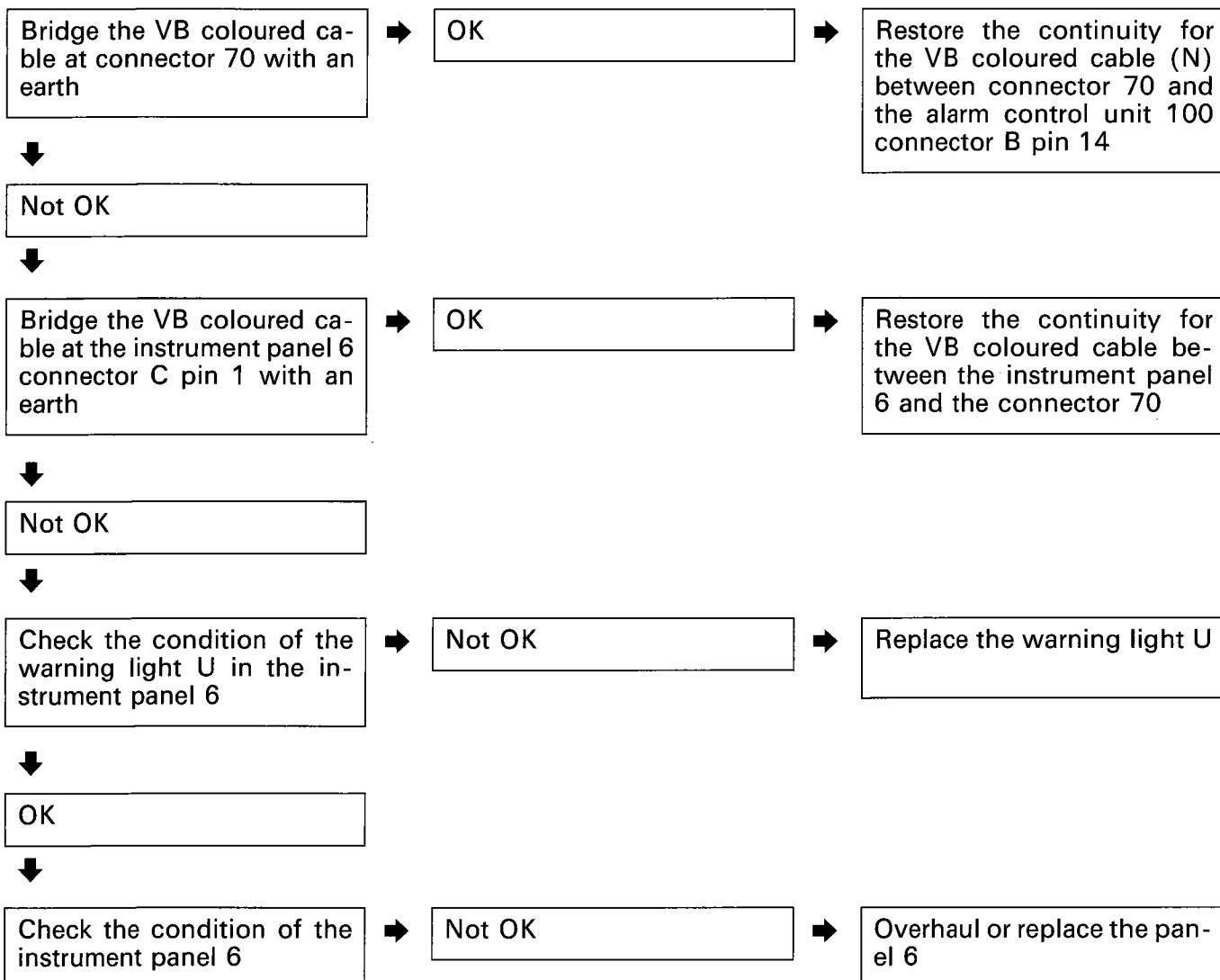


Not OK

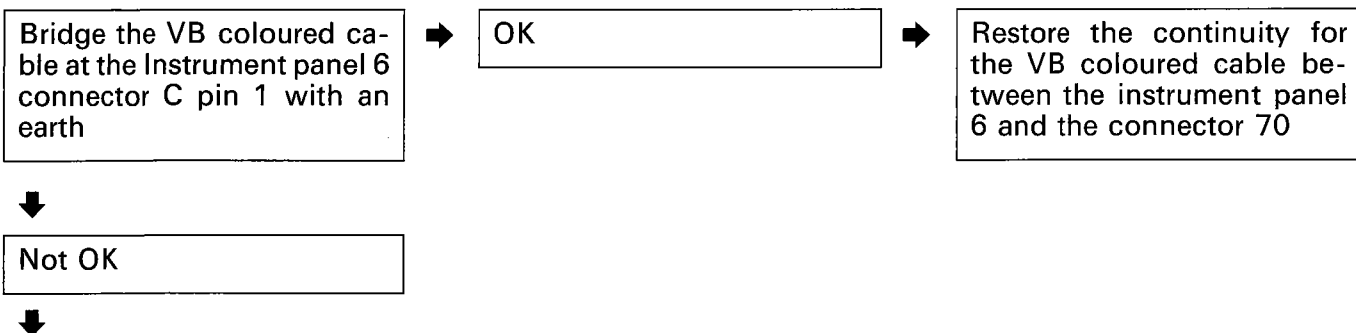


Overhaul or replace the control unit 100

The doors ajar warning light is not working (For the versions with an alarm)



The doors ajar warning light is not working (For versions without alarm)



55D.



Check the condition of the warning light U in the instrument panel 6



Not OK



Replace the warning light U



OK



Check the condition of the instrument panel 6



Not OK



Overhaul or replace the panel 6

The central locking does not lock the doors

Bridge the A coloured cable at the central locking control unit 112 with an earth



OK



Restore the continuity of the A coloured cable between the control unit 112 and the ultrasound welding



Not OK



Check the condition of the control locking control unit 112



Not OK



Overhaul or replace the control unit 112

The central locking does not lock the doors operated by the left front lock

Bridge the N coloured cable at the left front central locking 110 with an earth



OK

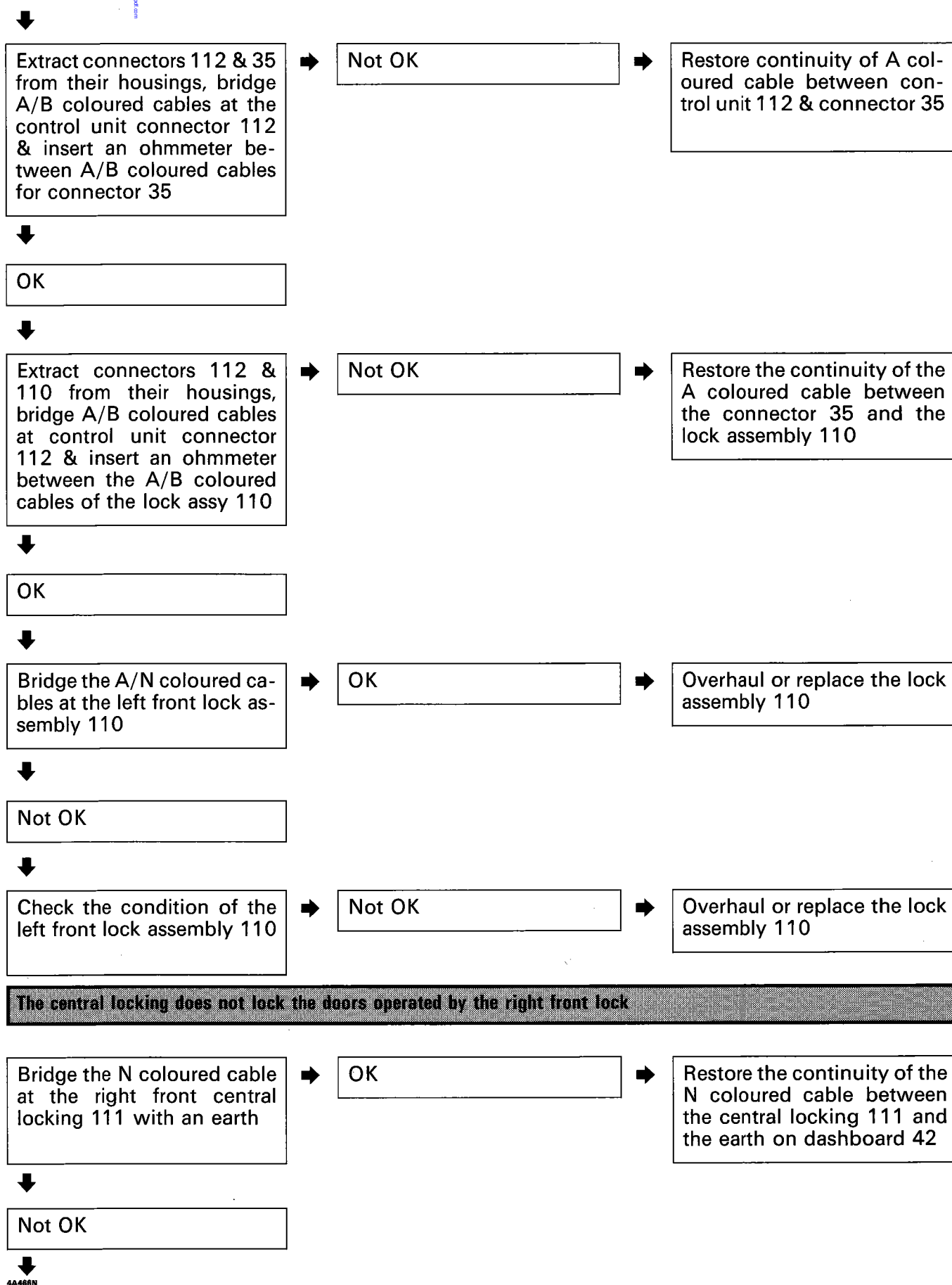


Restore the continuity of the N coloured cable between the central locking 110 and the earth on dashboard 22



Not OK





55D.



Extract connectors 112 & 36 from their housings, bridge A/B coloured cables at control unit connector 112 & insert an ohmmeter between A/B coloured cables for connector 36



Not OK



Restore cont. of A coloured cable between control unit 112 & connector 36



OK



Extract connectors 112 & 111 from their housings, bridge A/B coloured cables at the control unit connector 112 and insert an ohmmeter between the A/B coloured cables of the lock assy 111



Not OK



Restore the continuity of the A coloured cable between the connector 36 and the lock assembly 111



OK



Bridge the A/N coloured cables at the left front lock assembly 111



OK



Overhaul or replace the lock assembly 111



Not OK



Check the condition of the left front lock assembly 111



Not OK



Overhaul or replace the lock assembly 111

The central locking does not unlock the doors

Bridge the B coloured cable at the central locking control unit 112 with an earth



OK



Restore the continuity of the B coloured cable between the control unit 112 and the ultrasound welding





Not OK



Check the condition of the central locking control unit 112



Not OK



Overhaul or replace the control unit 112

The central locking does not unlock the doors operated by the left front lock

Bridge the N coloured cable at the left front central locking 110 with an earth



OK



Restore the continuity of the N coloured cable between the central locking 111 and the earth on dashboard 42



Not OK



Extract connectors 112 & 35 from their housings, bridge A/B coloured cables at control unit connector 112 & insert an ohmmeter btwn A/B coloured cables for connector 35



Not OK



Restore cont. of B coloured cable between control unit 112 & connector 35



OK



Extract connectors 112 and 110 from their housings, bridge the A/B cables at the control unit connector 112 and insert an ohmmeter between the A/B coloured cables of the lock assy 110



Not OK



Restore the continuity of the B coloured cable between the connector 35 and the lock assembly 110



OK



4A468N

55D.



Bridge the B/N coloured cables at the left front lock assembly 110



OK



Overhaul or replace the lock assembly 110



Not OK



Check the condition of the left front lock assembly 110



Not OK



Overhaul or replace the lock assembly 110

The central locking does not unlock the doors operated by the right front lock

Bridge the N coloured cable at the right front central locking 111 with an earth



OK



Restore the continuity of the N coloured cable between the central locking 111 and the earth on dashboard 42



Not OK



Extract connectors 112 & 36 from their housings, bridge A/B coloured cables at control unit connector 112 & insert an ohmmeter between A/B coloured cables of connector 36



Not OK



Restore the continuity of the B coloured cable between the control unit 112 and the connector 36



OK



Extract connectors 112 and 111 from their housings, bridge the A/B cables at the control unit connector 112 and insert an ohmmeter between the A/B coloured cables of the lock assy 111



Not OK



Restore the continuity of the B coloured cable between the connector 36 and the lock assembly 111





OK



Bridge the B/N coloured cables at the right front lock assembly 111



OK



Overhaul or replace the lock assembly 111



Not OK



Check the condition of the right front lock assembly 111



Not OK



Overhaul or replace the lock assembly 111

The left front central locking motor is not working

Extract connectors 112 and 35 from their housings, bridge the H/G coloured cables at the central locking control unit connector 112 and insert an ohmmeter between the H/G coloured cables of connector 35



Not OK



Restore the continuity for the H/G coloured cables between the ultrasound welding and the connector 35



OK



Extract connectors 35 and 110 from their housings, bridge the H/G coloured cables at connector 35 and insert an ohmmeter between the H/G coloured cables at the lock assy connector 110



Not OK



Restore the continuity for the H/G coloured cables between the connector 35 and the lock assembly 110



OK



Check the condition of the left front central locking motor 110



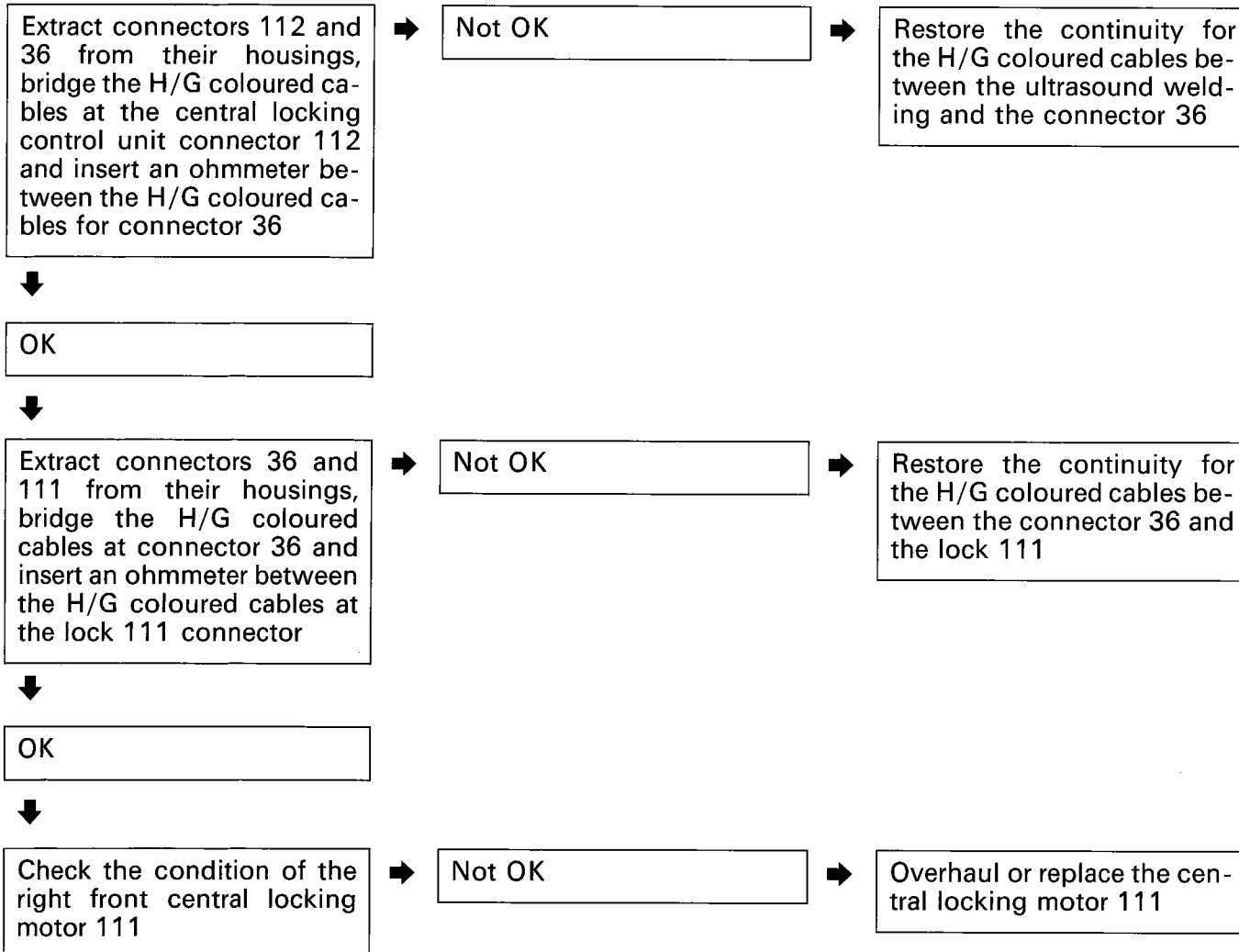
Not OK



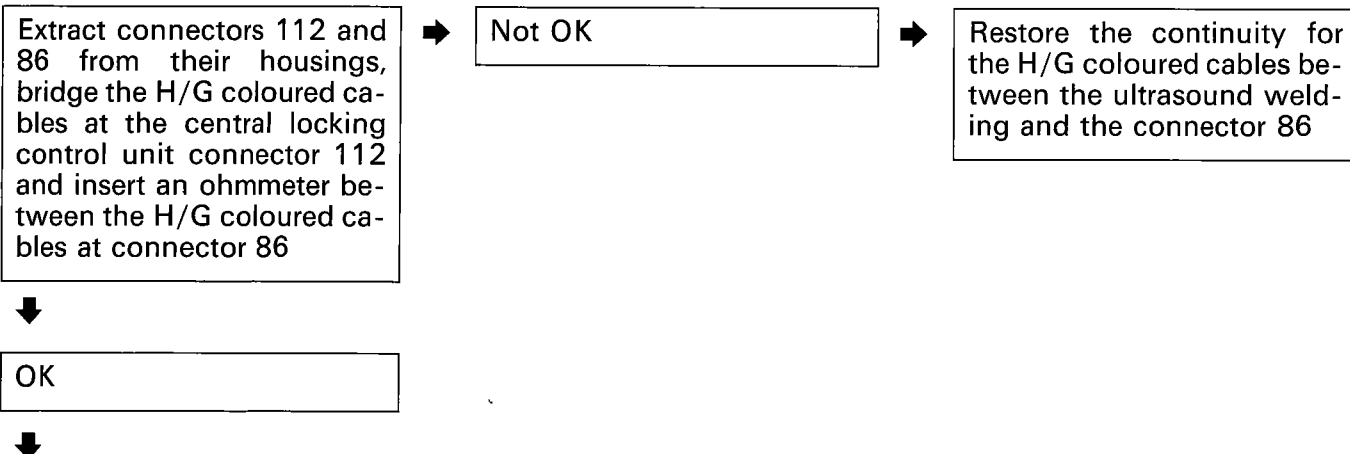
Overhaul or replace the central locking motor 110

55D.

The right front central locking motor is not working



The left rear central locking motor is not working (Non existent for the Bravo versions)





Extract connectors 86 & 108 from their housings, bridge the H/G coloured cables at connector 86 and insert an ohmmeter between the H/G coloured cables at the connector for the lock 108



Not OK



Restore the continuity for the H/G coloured cables between the connector 86 and the lock assembly 108



OK



Check the condition of the left rear central locking motor 108



Not OK



Overhaul or replace the central locking motor 108

The right rear central locking motor is not working (Non existent for the Bravo versions)

Extract connectors 112 & 87 from their housings, bridge the H/G col. cables at the central locking c/unit connector 112 & insert an ohmmeter btwn the H/G col. cables for connector 87



Not OK



Restore the continuity for the H/G coloured cables between the ultrasound welding and the connector 87



OK



Extract connectors 87 & 109 from their housings, bridge the H/G coloured cables at connector 87 & insert an ohmmeter btwn the H/G coloured cables at the connector for the lock assy 109



Not OK



Restore the continuity for the H/G coloured cables between the connector 87 and the lock assembly 109



OK



Check the condition of the left rear central locking motor 109



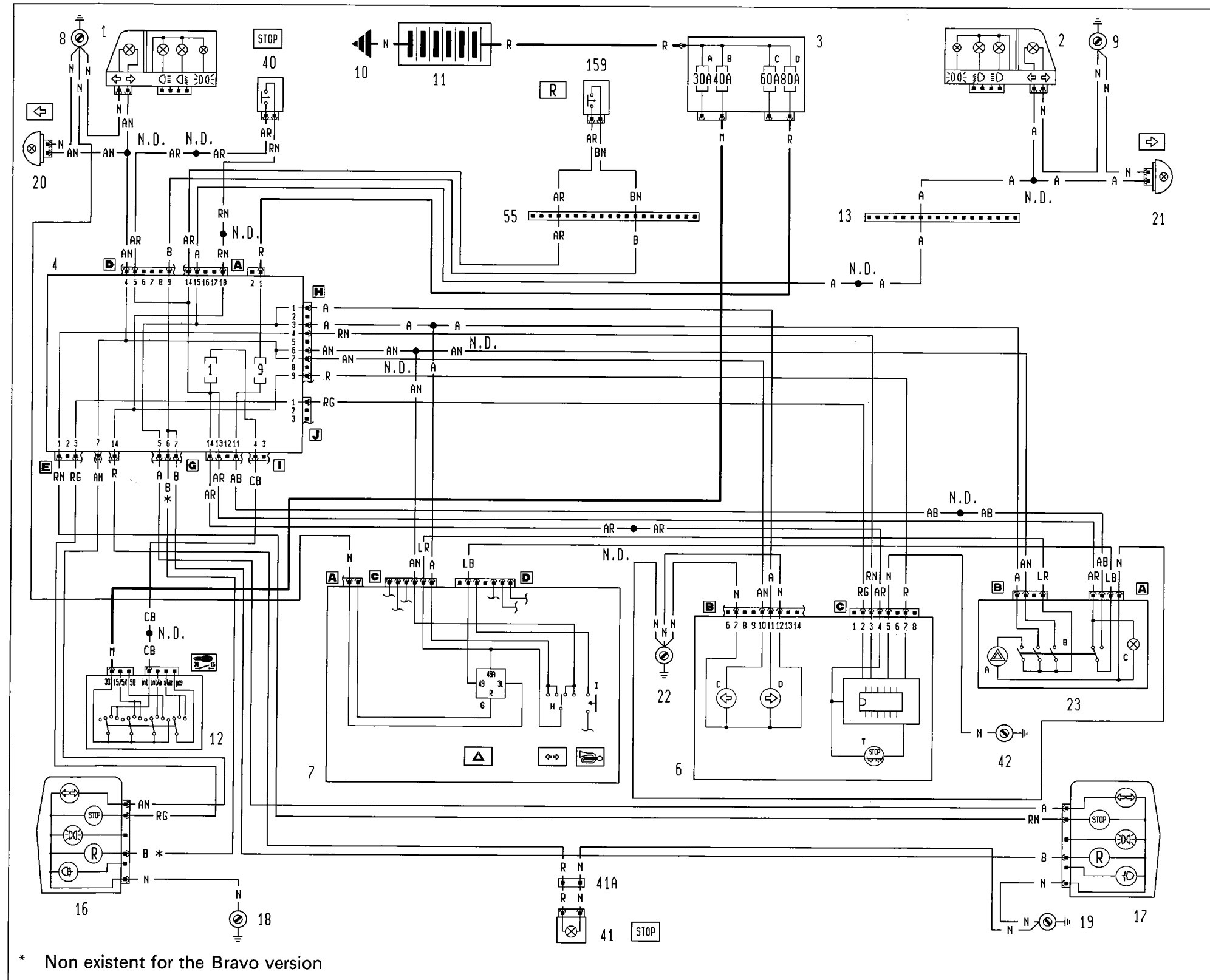
Not OK



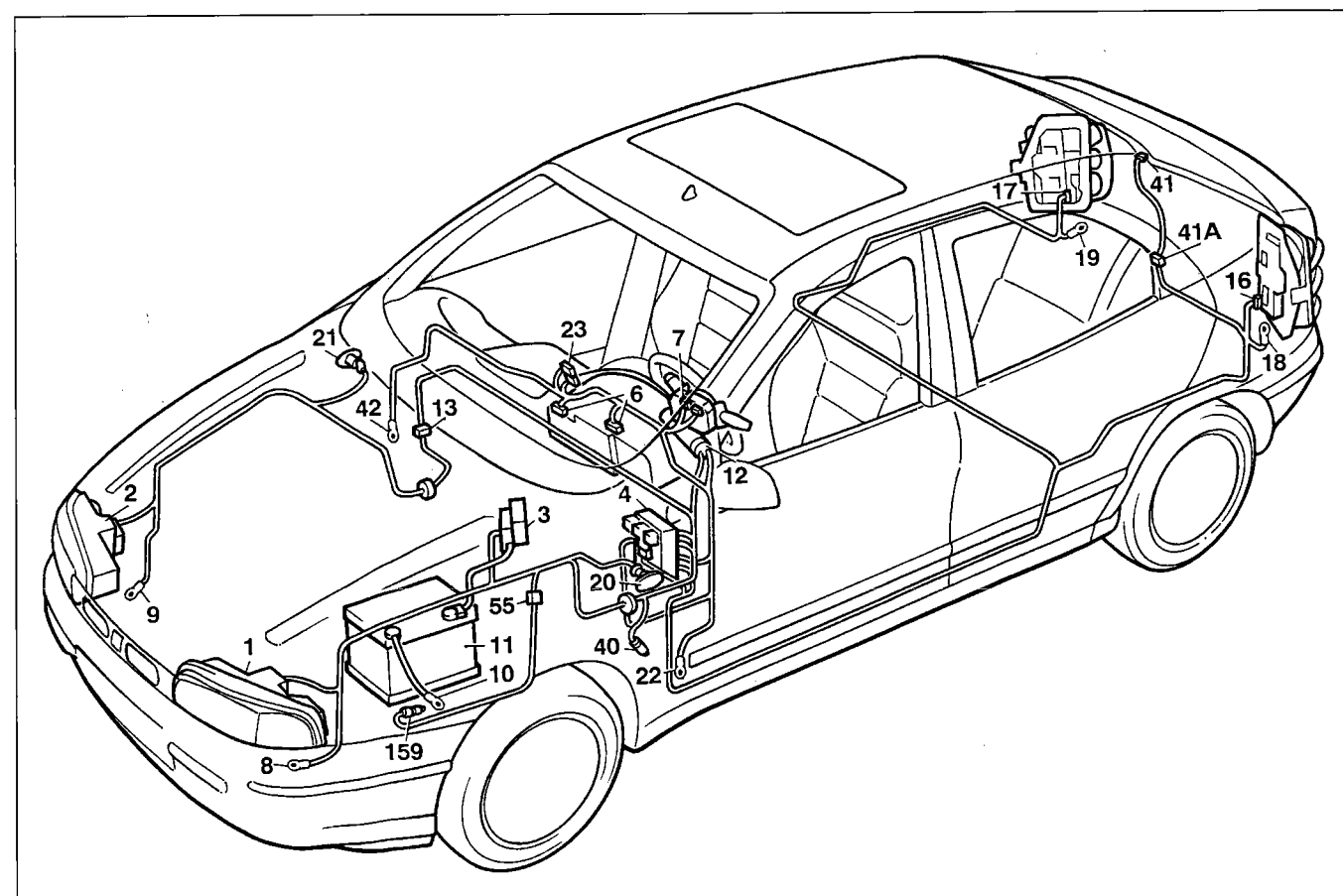
Overhaul or replace the central locking motor 109

Trim level: EL - ELX - HGT

Direction indicators and warning light - Hazard warning lights and warning light - Braking lights - Reversing lights - (See key at end of wiring diagrams)



55.



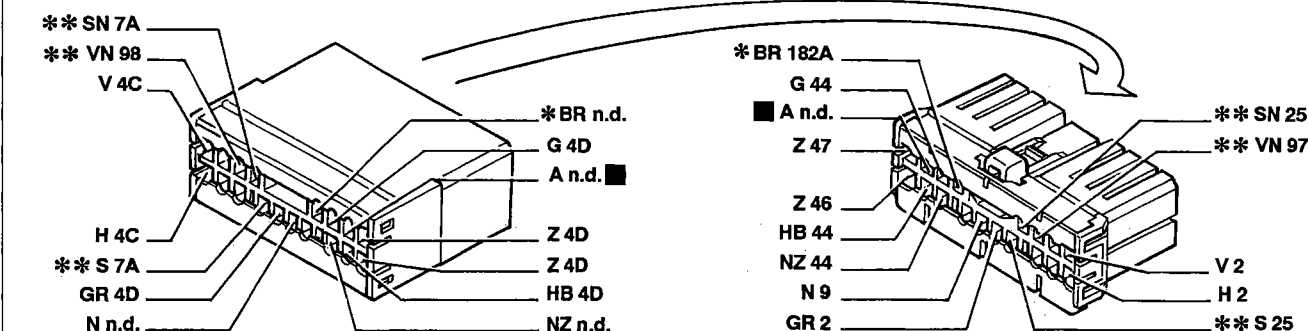
Trim level: EL - ELX - HGT

Direction indicators and warning light - Hazard warning lights and warning light - Braking lights - Reversing lights

Components key

- | | |
|--|---|
| 1 Left front light cluster | 16 Left rear light cluster |
| 2 Right front light cluster | 17 Right rear light cluster |
| 3 Power fuse box: | 18 Left rear earth |
| A 30A protective fuse for injection system (60A for DS versions) | 19 Right rear earth |
| B 40A protective fuse for ignition system | 20 Left front side direction indicator |
| C 60A protective fuse for optional extras | 21 Right front side direction indicator |
| D 80A protective fuse for junction unit | 22 Left dashboard earth |
| 4 Junction unit | 23 Hazard warning lights switch unit |
| 6 Instrument panel: | A Hazard warning lights warning light |
| C Left direction indicator warning light | B Hazard warning lights switch |
| D Right direction indicator warning light | C Hazard warning lights ideogram light |
| T Warning light signalling brake lights failure | 40 Brake lights control switch |
| 7 Steering column switch unit: | 41 Additional brake light |
| H Switch for direction indicators | 41A Additional rear brake light cables connection |
| I Horn control | 42 Right dashboard earth |
| 8 Left front earth | 55 Front/fuel gauge cables connection |
| 9 Right front earth | 159 Reversing lights control switch |
| 10 Earth for battery on bodyshell | N.D. Ultrasound welding taped in cable loom |
| 11 Battery | |
| 12 Ignition switch | |
| 13 Front right/left cables connection | |

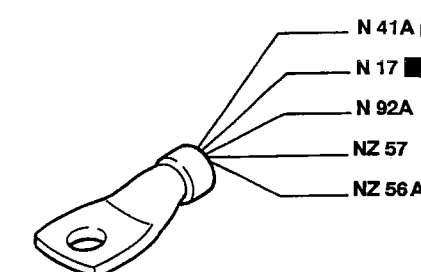
13 Front right/left cables connection



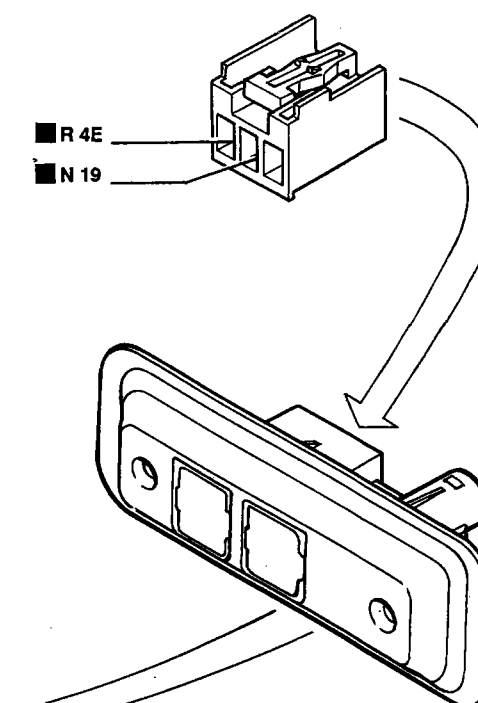
* Only valid for 1998

** Non existent for 1370

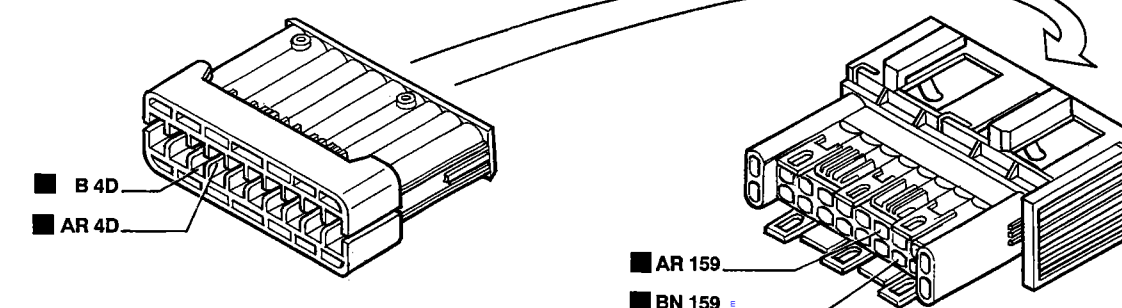
19 Right rear earth



41A Additional brake light rear cables connection



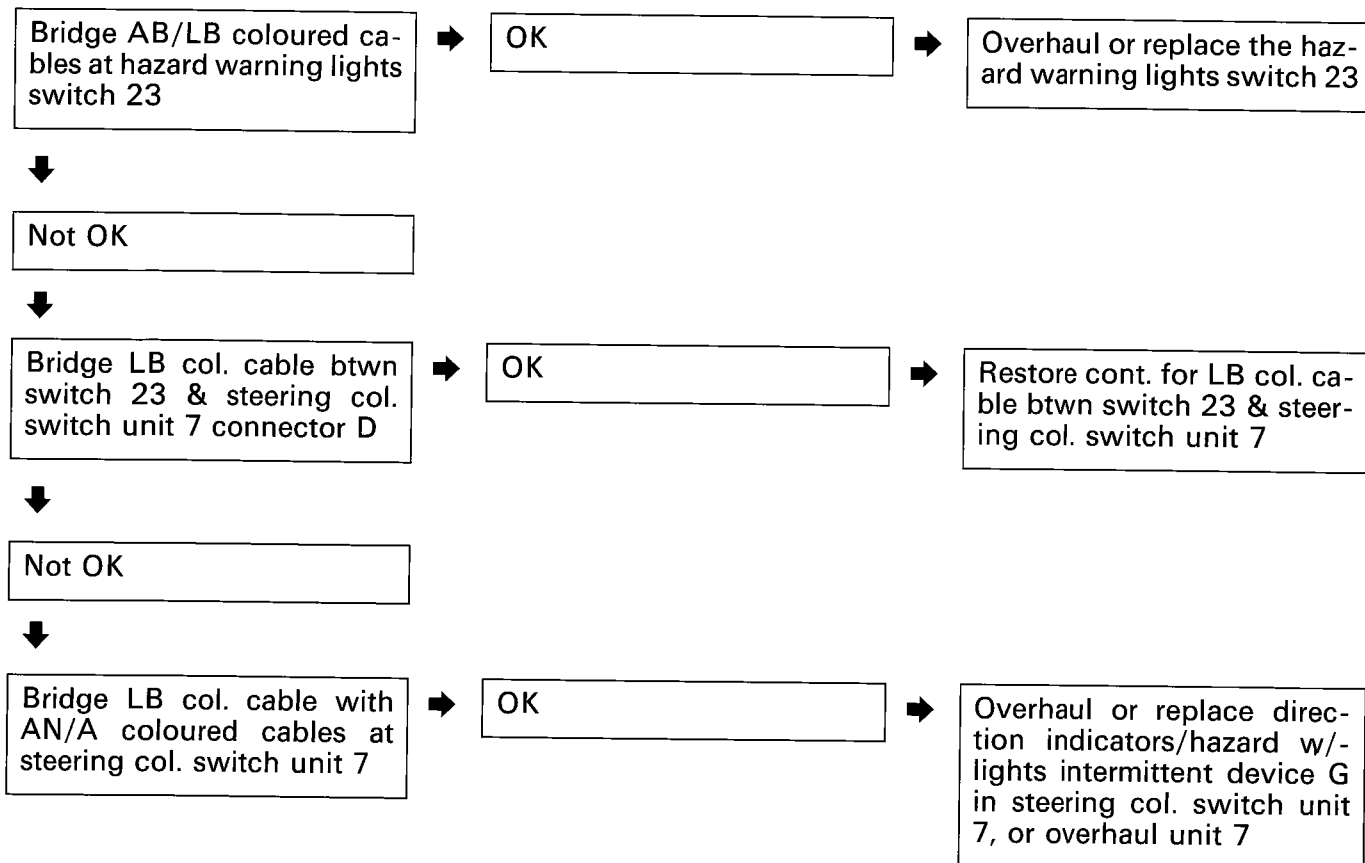
55 Front/engine cables connection



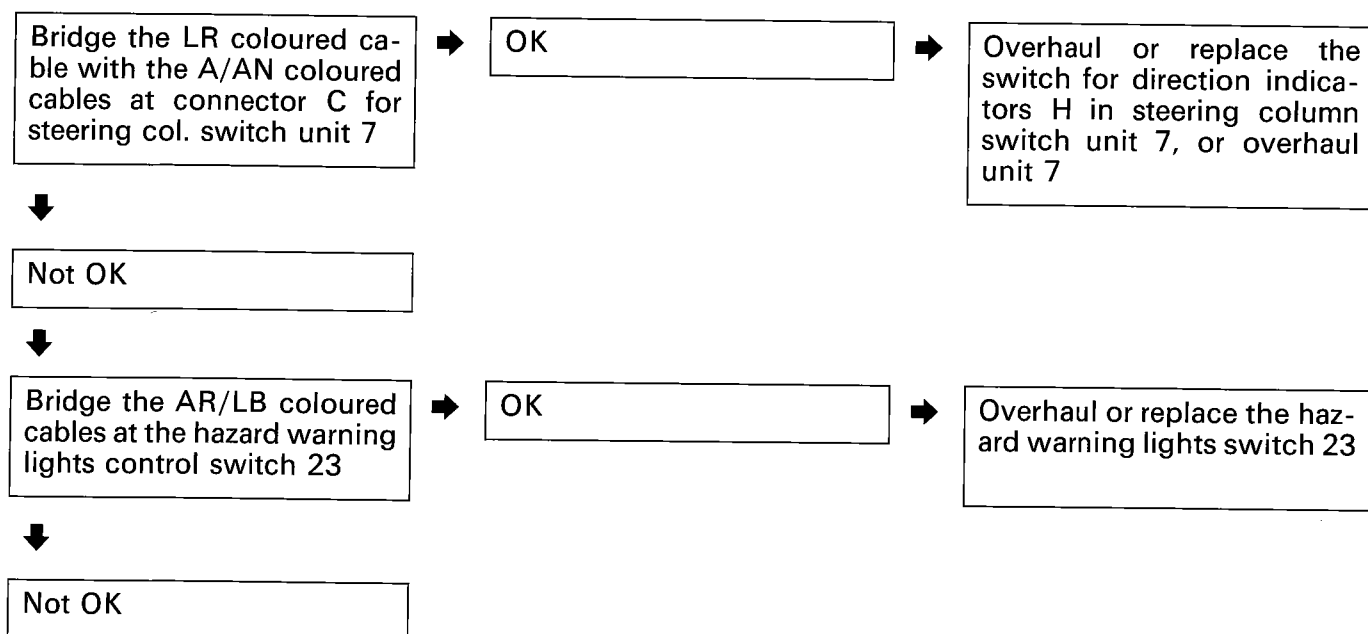
The cables in the wiring diagram are marked

P4A124N02

The direction indicators/hazard warning lights are not working



The direction indicators are not working



55D.



Check for voltage at the AR cable at connector A for the hazard warning lights control switch 23



OK



Overhaul or replace the hazard warning lights switch 23



Not OK



Check for voltage at the AR coloured cable connector I pin 13 of the junction unit 4



Not OK



Overhaul or replace the junction unit 4

The hazard warning lights are not working

Bridge the AB/LB coloured cables at connector A for the hazard warning lights switch 23



OK



Overhaul or replace the hazard warning lights switch 23



Not OK



Check for voltage at AB col. cable connector A of hazard warning lights switch 23



Not OK



Restore the continuity of the AB coloured cable between switch 23 and the ultra-sound welding



OK



Bridge LB/LR col. cables at steering col. switch unit 7



OK

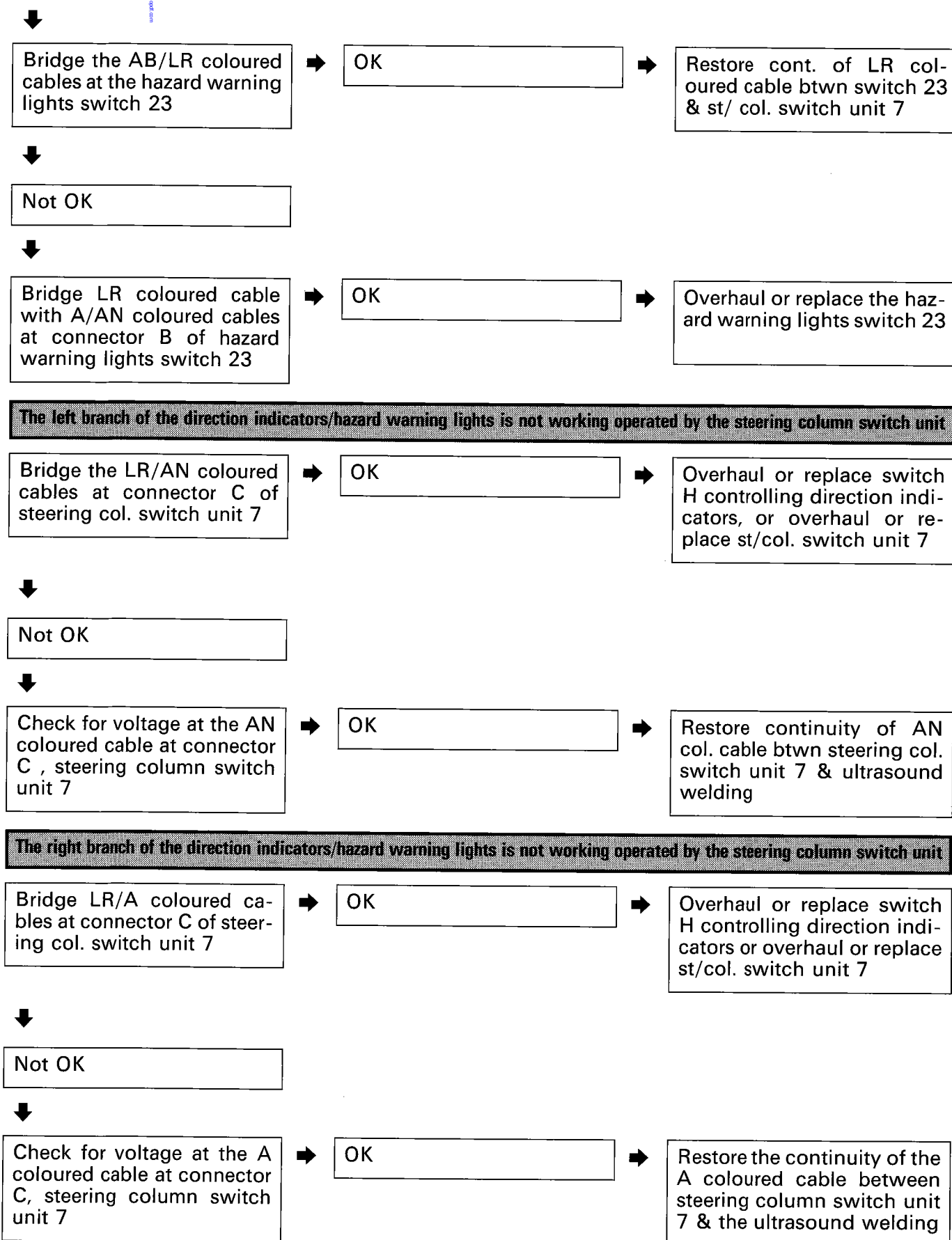


Overhaul or replace the steering col. switch unit 7



Not OK





The left branch of the direction indicators/hazard warning lights is not working operated by the hazard w/lights switch

Bridge the LR/AN coloured cables at connector B of the hazard warning lights switch 23



OK



Overhaul or replace the hazard warning lights switch 23



Not OK



Check for voltage at the AN coloured cable at connector B of the hazard warning lights switch 23



OK



Restore the continuity of the AN coloured cable between switch 23 & the ultrasound welding

The right branch of the direction indicators/hazard warning lights is not working operated by the hazard w/lights switch

Bridge the LR/A coloured cables at connector B of the hazard warning lights switch 23



OK



Overhaul or replace the hazard warning lights switch 23



Not OK



Check for voltage at the A coloured cable at connector B of the hazard warning lights switch 23



OK



Restore the continuity of the A coloured cable between switch 23 & the ultrasound welding

The left front and side direction indicators are not working

Check for voltage at the AN coloured cable connector 1 pin 4 of the junction unit 4



Not OK



Overhaul the junction unit 4



OK





Check for voltage at the AN coloured cable of the left front light cluster 1



Not OK



Restore the continuity of the AN coloured cable between the junction unit 4, connector 1 & the ultrasound welding

The right front and side direction indicators are not working

Check for voltage at the A coloured cable connector A pin 15 of the junction unit



Not OK



Overhaul the junction unit 4



OK



Check for voltage at the A coloured cable, connector 13



Not OK



Restore the continuity of the A coloured cable between the junction unit 4, connector A & connector 13



OK



Check for voltage at the A coloured cable of the right front light cluster 2



Not OK



Restore the continuity of the A coloured cable between the right front light cluster 2 & connector 13

The left front direction indicator is not working

Check the condition of the bulb



Not OK



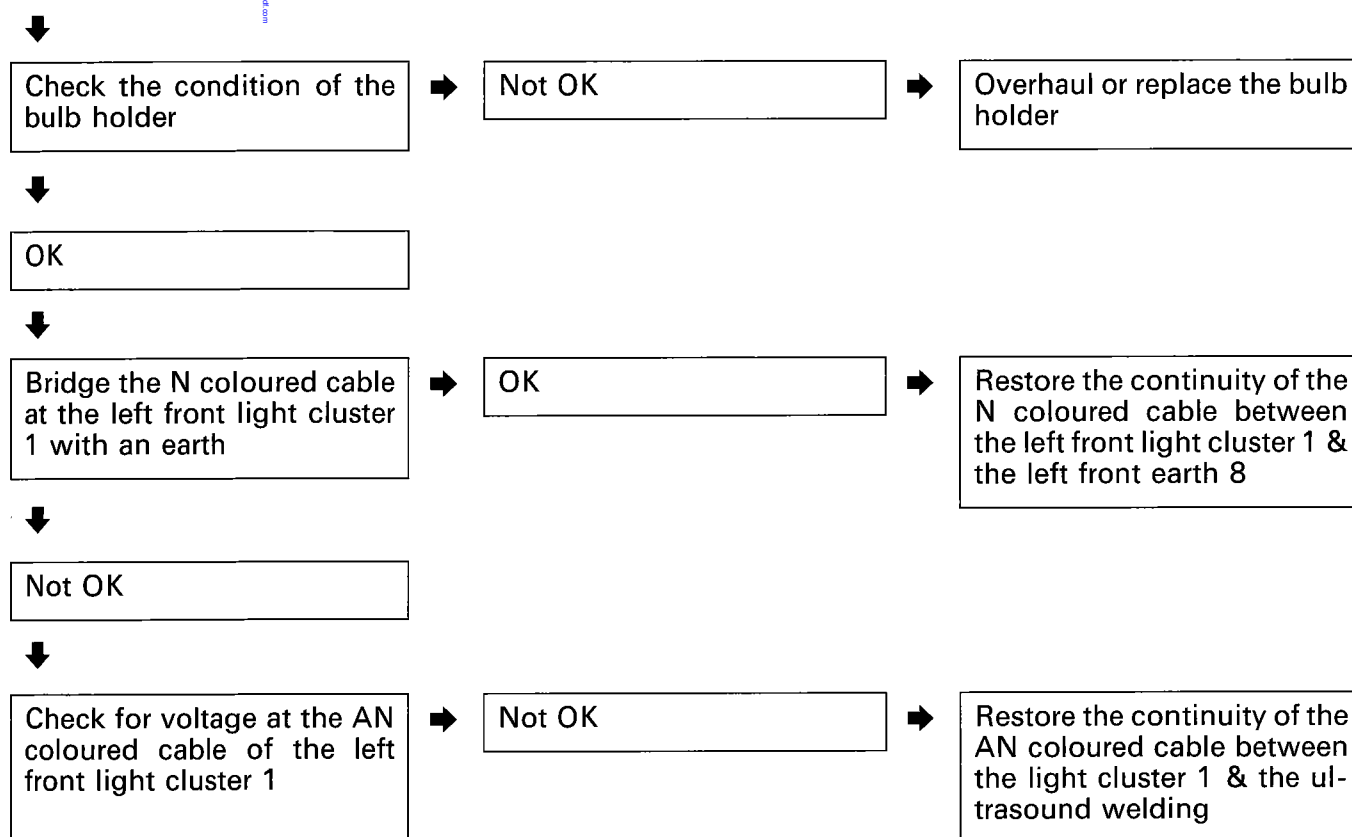
Replace the bulb



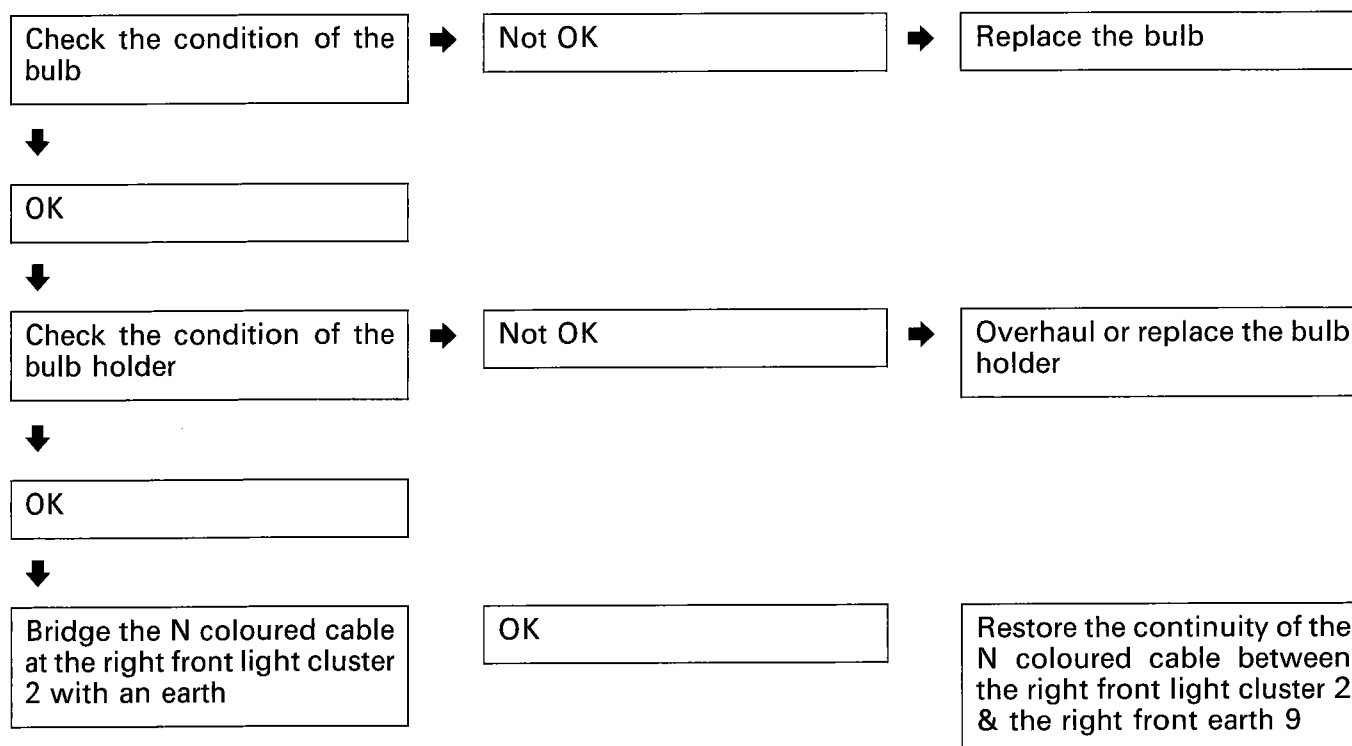
OK



55D.



The right front direction indicator is not working





Not OK



Check for voltage at the A coloured cable of the right front light cluster 2



Not OK



Restore the continuity of the A coloured cable between the light cluster 2 & the ultrasound welding

The left front side direction repeater is not working

Check the condition of the bulb



Not OK



Replace the bulb



OK



Check the condition of the bulb holder



Not OK



Overhaul or replace the bulb holder



OK



Bridge the N coloured cable at the left front repeater 20 with an earth



OK



Restore the continuity of the N coloured cable between the repeater 20 & the left front earth 8



Not OK



Check for voltage at the AN coloured cable at the left front repeater 20



Not OK



Restore the continuity of the AN coloured cable between the repeater 20 & the ultrasound welding

The right front side direction repeater is not working

Check the condition of the bulb



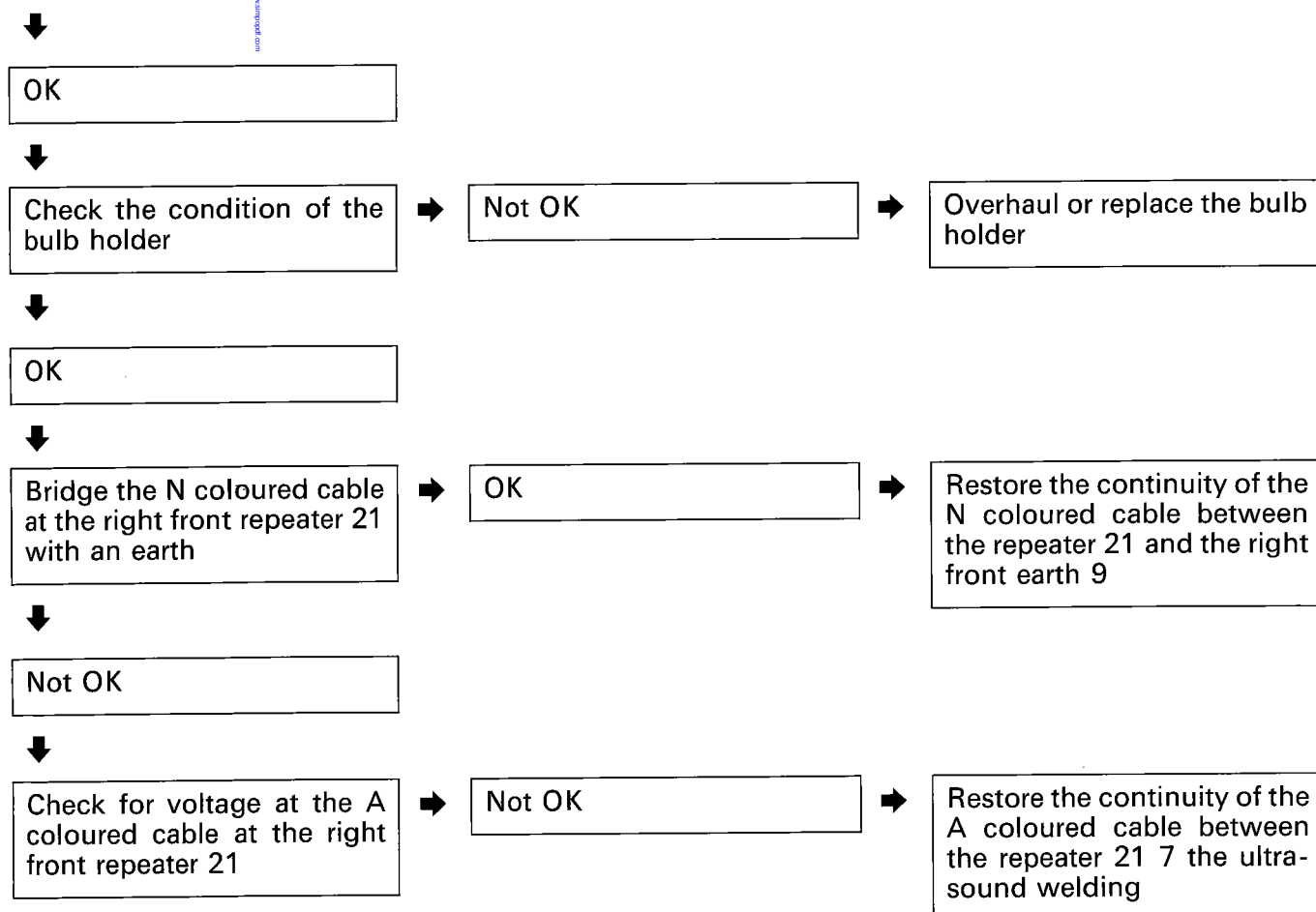
Not OK



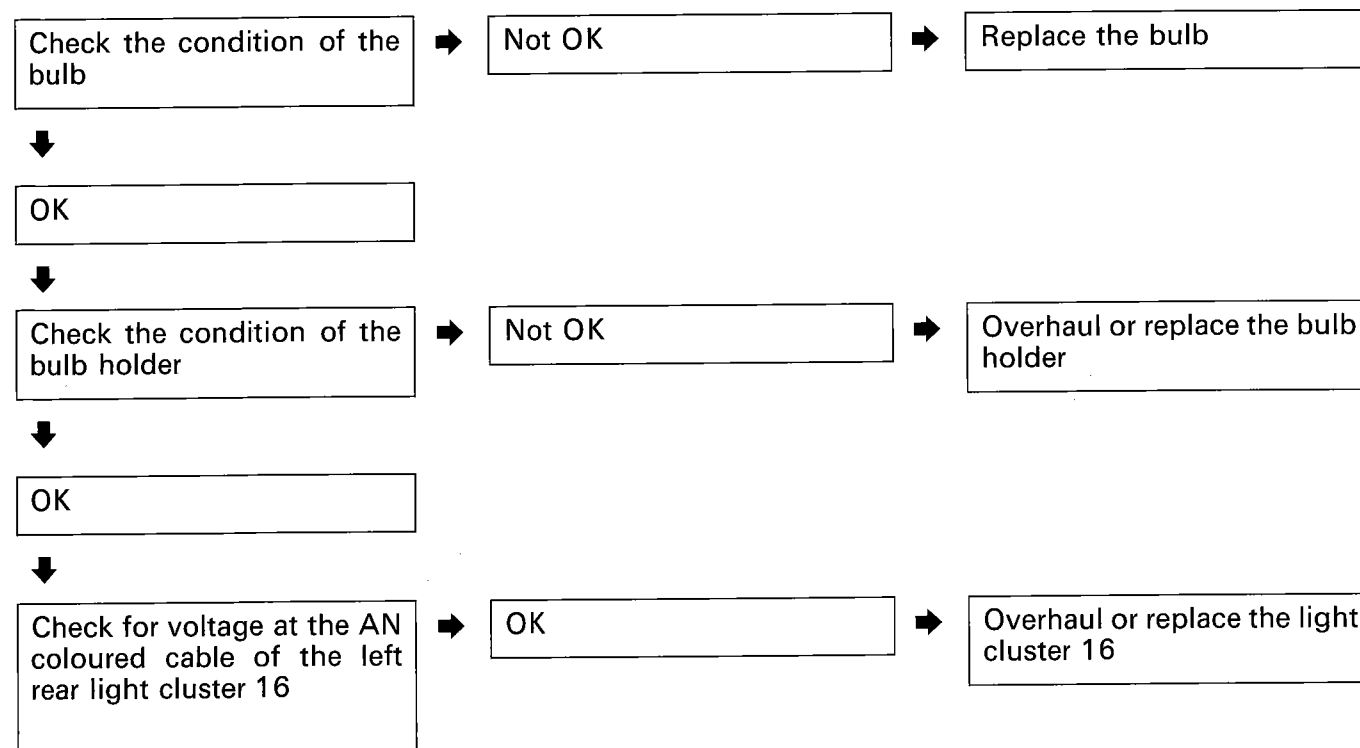
Replace the bulb



55D.



The left rear direction indicator is not working





Not OK



Check for voltage at the AN coloured cable connector E pin 7 of the junction unit 4



OK



Restore the continuity of the AN coloured cable between the junction unit 4 connector E and the light cluster 16



Not OK



Check the condition of the junction unit 4



Not OK



Overhaul or replace the unit 4

The right rear direction indicator is not working

Check the condition of the bulb



Not OK



Replace the bulb



OK



Check the condition of the bulb holder



Not OK



Overhaul or replace the bulb holder



OK



Check for voltage at the A coloured cable for the right rear light cluster 17



OK



Overhaul or replace the light cluster 17



Not OK



55D.



Check for voltage at the A coloured cable connector G pin 5 of the junction unit 4



OK



Restore the continuity of the A coloured cable between the junction unit 4 connector G & the light cluster 17



Not OK



Check the condition of the junction unit 4



Not OK



Overhaul or replace the junction unit 4

The left direction indicators warning light is not working

Check for voltage at the AN coloured cable at connector B pin 10 of the instrument panel 6



OK



Replace the warning light C in the instrument panel 6, or overhaul the instrument panel 6



Not OK



Check for voltage at the AN coloured cable of connector H pin 7 of the junction unit 4



OK



Restore the continuity of the AN coloured cable between the unit 4 connector H & the instrument panel 6 connector B



Not OK



Check the condition of the junction unit 4



Not OK



Overhaul the junction unit 4

The right direction indicators warning light is not working

Check for voltage at the A coloured cable at connector B pin 11 of the instrument panel 6



OK



Replace the warning light D in the instrument panel 6, or overhaul the instrument panel 6





Not OK



Check for voltage at the A coloured cable for connector H pin 1 of the junction unit 4



OK



Restore the continuity of the A coloured cable between the unit 4 connector H & the instrument panel 6 connector B



Not OK



Check the condition of the junction unit 4



Not OK



Overhaul the junction unit 4

The hazard warning lights warning light is not working

Bridge the N coloured cable at connector A of the hazard warning lights switch 23



OK



Restore continuity of N coloured cable between hazard w/lights switch 23 & earth on dashboard 22



Not OK



Check the condition of the hazard warning lights w/- light A in the hazard w/- lights switch 23



Not OK



Replace the warning light A



Not OK



Check the condition of the hazard w/lights switch 23



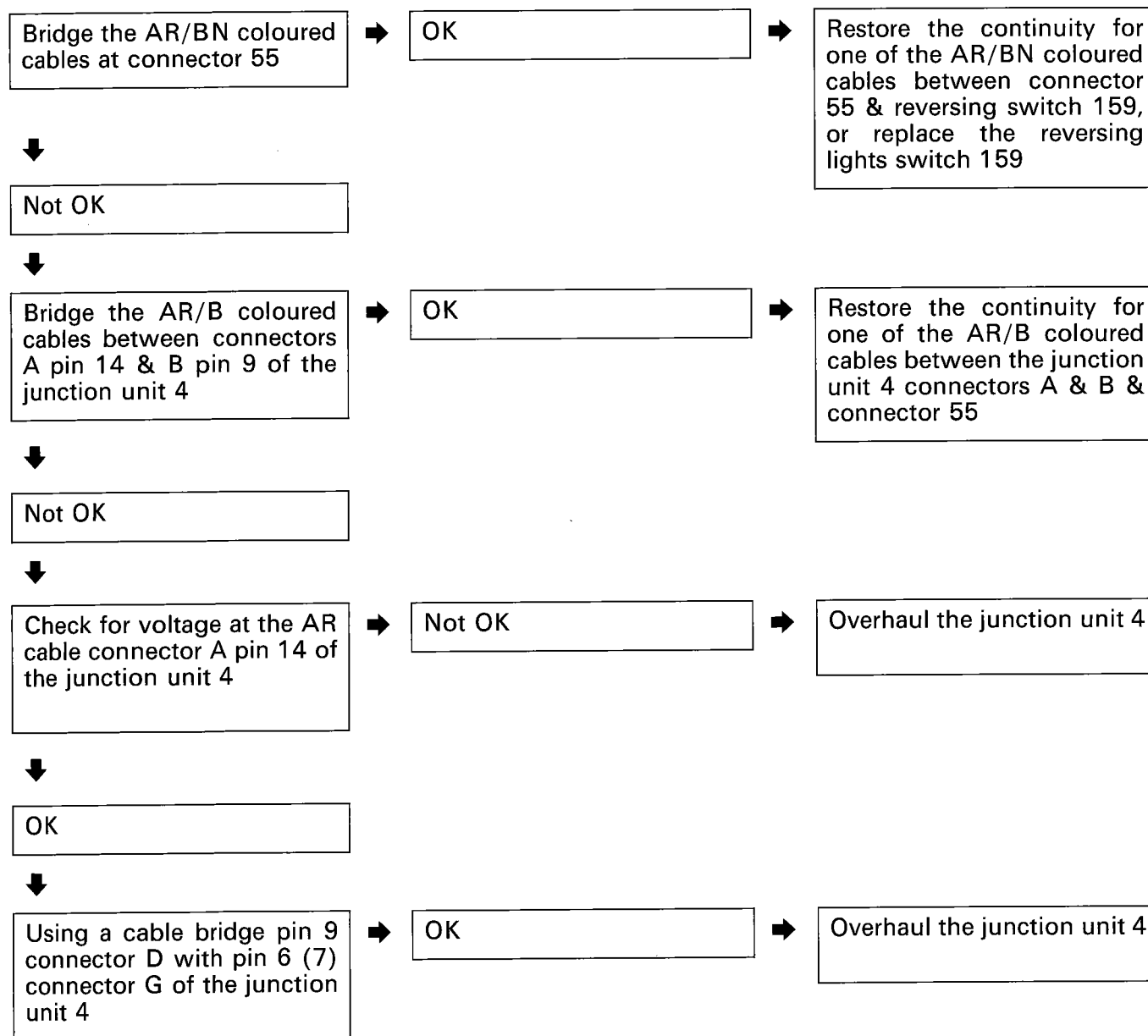
Not OK



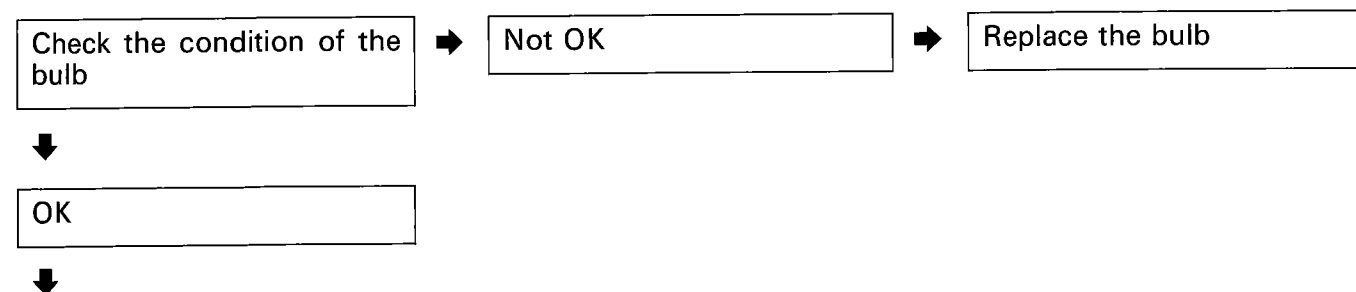
Overhaul or replace the switch 23

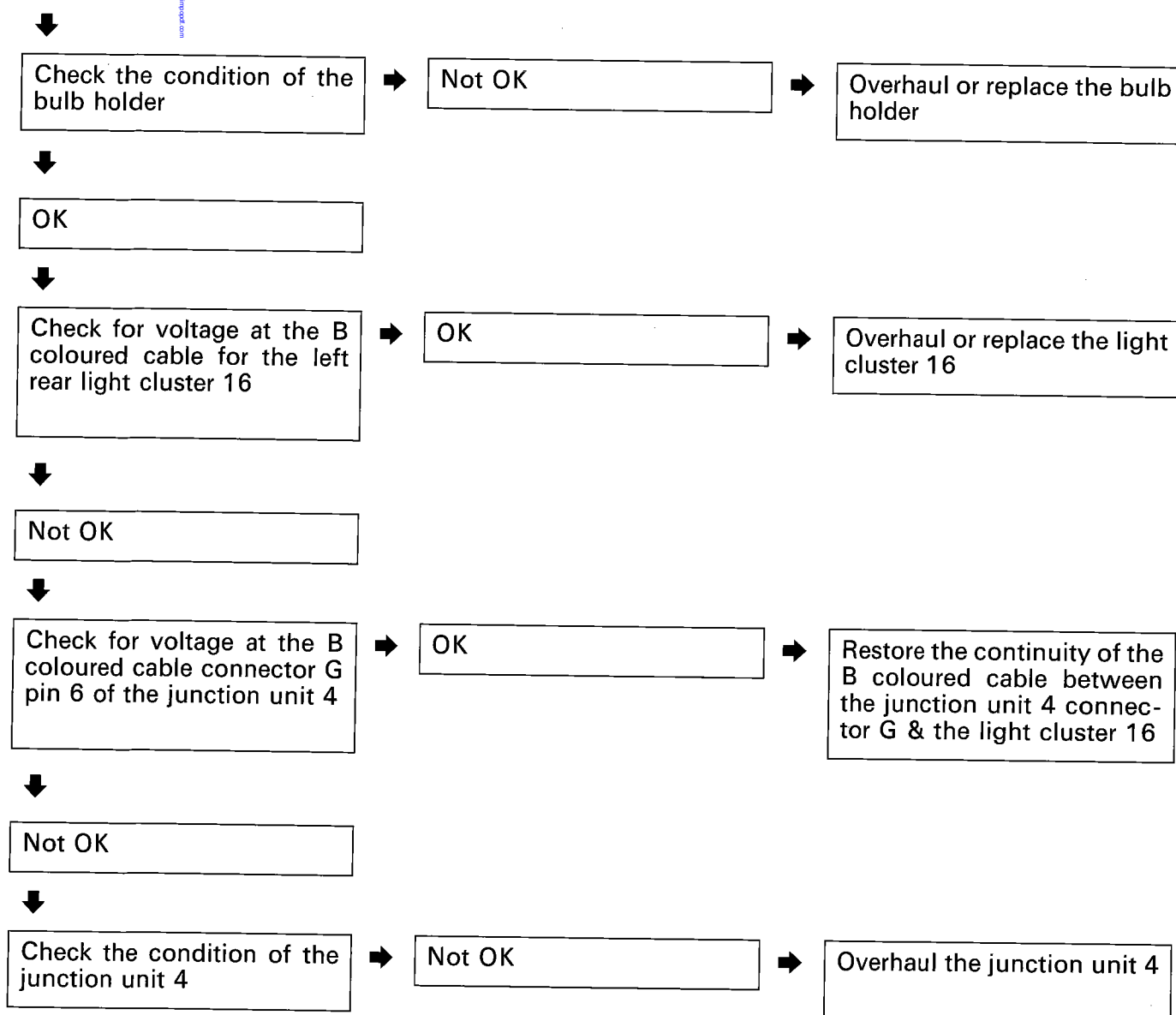
55D.

Both the reversing lights are not working

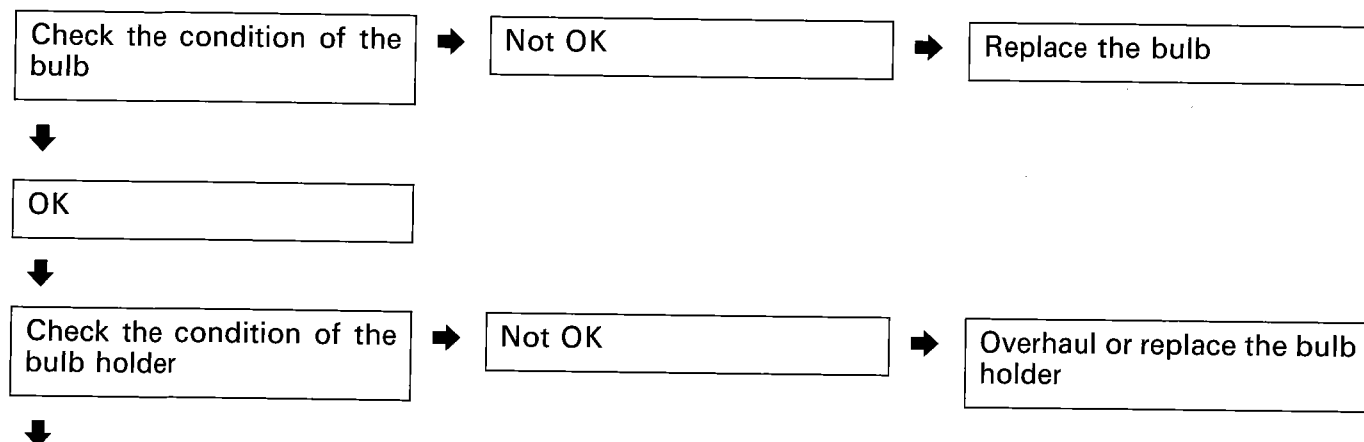


The left reversing light is not working (Non existent for the Bravo versions)

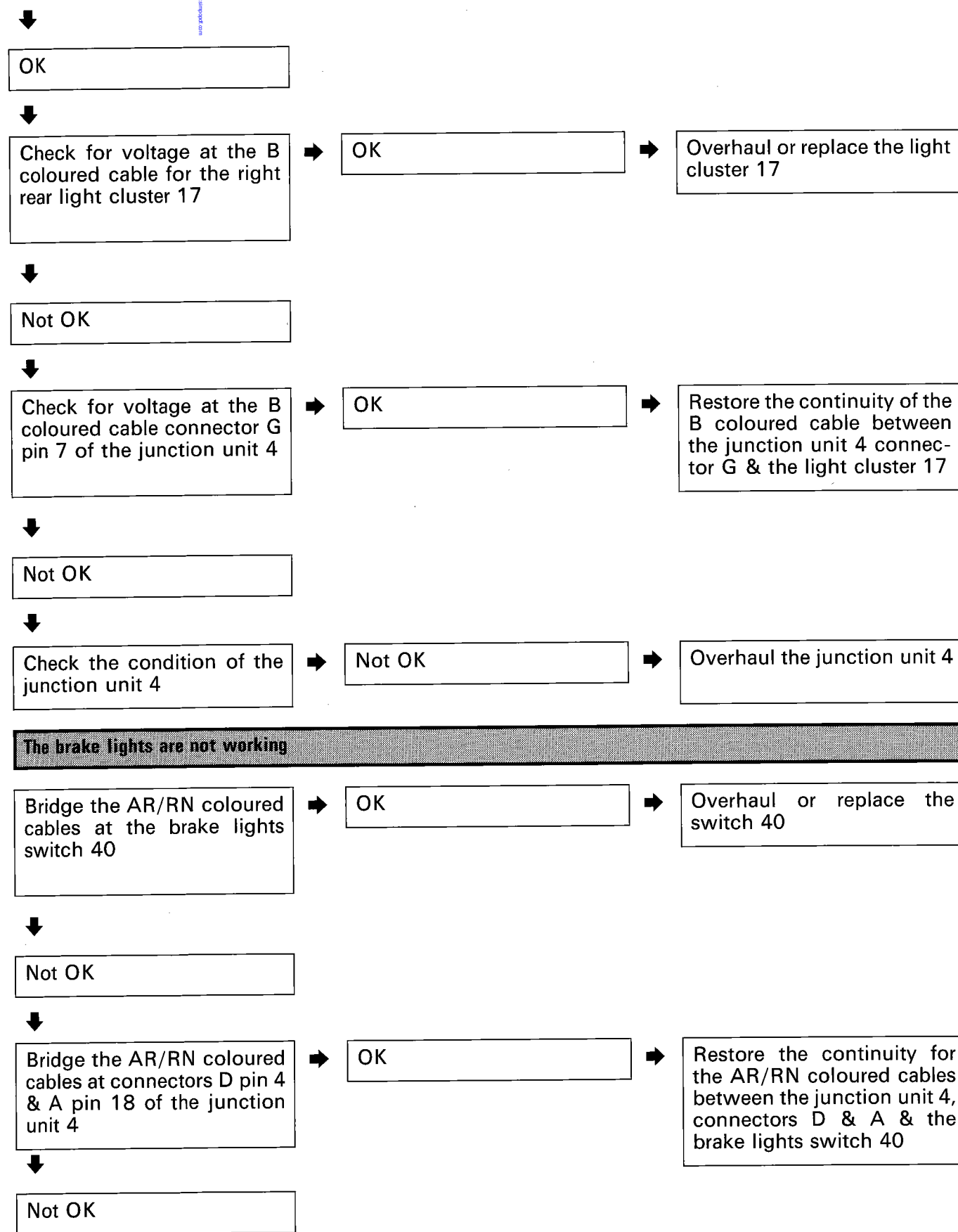




The right reversing light is not working



55D.





Check for voltage at the AR cable connector D pin 5 of the junction unit 4



Not OK



Overhaul the junction unit 4



OK



Using a cable bridge pin 18 connector A & pin 14 (12,13) connector E of the junction unit 4



OK



Overhaul the junction unit 4

The left brake light is not working (Valid for S/SX/GT versions)

Check the condition of the bulb



Not OK



Replace the bulb



OK



Check the condition of the bulb holder



Not OK



Overhaul or replace the bulb holder



OK



Check for voltage at the RG coloured cable for the left rear light cluster 16



OK



Overhaul or replace the light cluster 16



Not OK



Check for voltage at the RG coloured cable connector E pin 12 of the junction unit 4



OK



Restore the continuity of the RG coloured cable between the junction unit 4, connector E & the light cluster 16



55D.



Not OK



Bridge the RN/RG coloured cables at connector E pin 12 & 13 of the junction unit 4



OK



Overhaul the junction unit 4

The right brake light is not working (Valid for S/SX/GT versions)

Check the condition of the bulb



Not OK



Replace the bulb



OK



Check the condition of the bulb holder



Not OK



Overhaul or replace the bulb holder



OK



Check for voltage at the RN coloured cable of the right rear light cluster 17



OK



Overhaul or replace the light cluster 17



Not OK



Check for voltage at the RN coloured cable connector E pin 13 of the junction unit 4



OK



Restore the continuity for the RN coloured cable between the junction unit 4, connector E & the light cluster 17



Not OK



Bridge the RN/RG coloured cables at connector E pin 12 & 13 of the junction unit 4

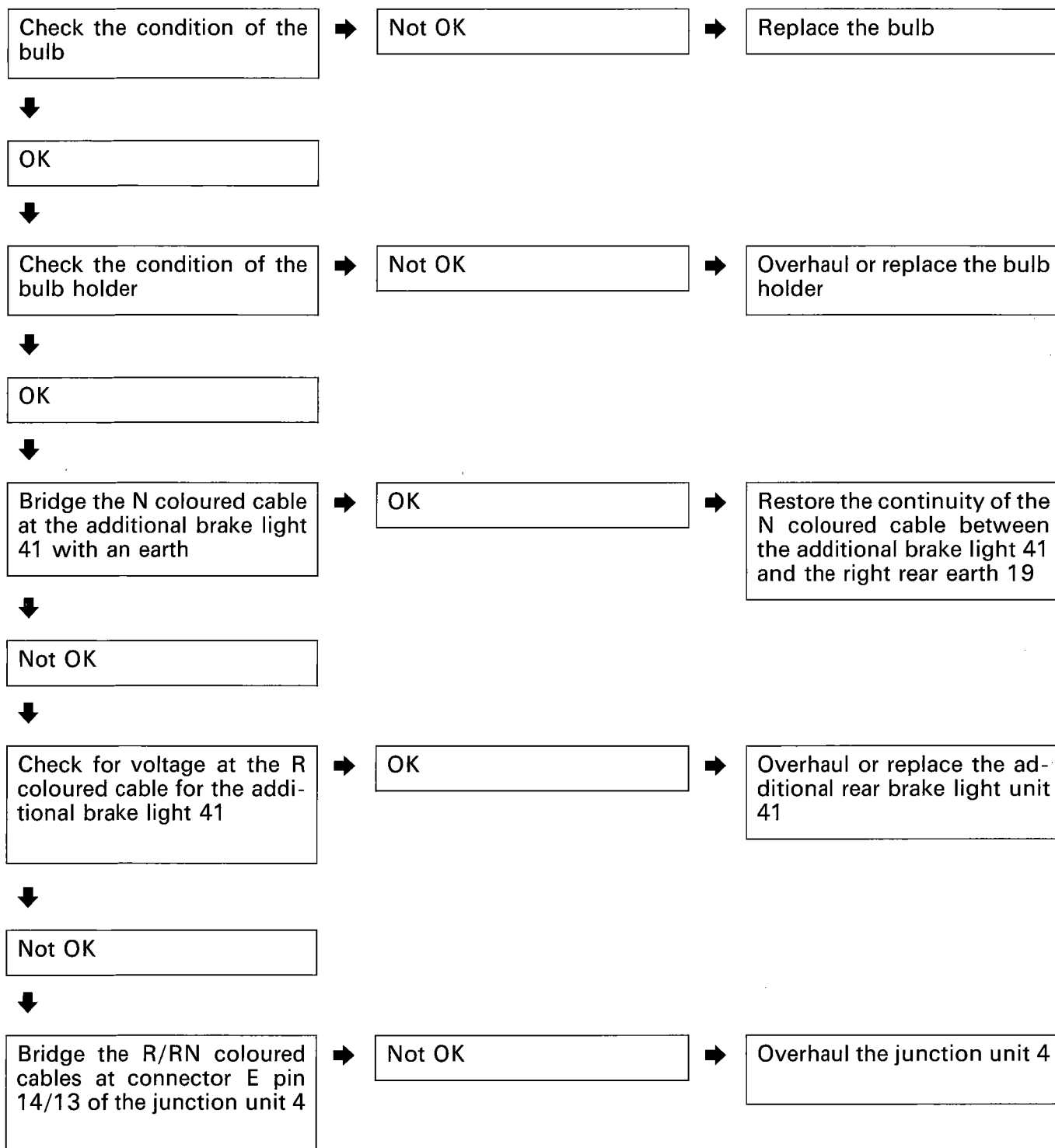


OK



Overhaul the junction unit 4

The addition brake light is not working



**The brake lights are not working, but the additional brake light is working
(Valid for EL/ELX/HGT versions)**

Check for voltage at the R coloured cable connector C pin 7 of the instrument panel 6



Not OK



Restore the continuity of the R coloured cable between the instrument panel 6 connector C & the junction unit 4 connector H, or overhaul the unit 4



OK



Bridge the N coloured cable at the instrument panel 6 connector C pin 15 with an earth



OK



Restore the continuity of the N coloured cable between the instrument panel 6 & the earth on dashboard 42



OK



Check for voltage at the AR cable of the instrument panel 6 connector C pin 4



Not OK



Restore the continuity for the AR coloured cable between the instrument panel 6 connector C & the ultrasound welding



OK



Check for voltage at the RN coloured cable of the instrument panel 6 connector C pin 3



Not OK



Overhaul or replace the brake lights failure control circuit, or overhaul the instrument panel 6

The left brake light is not working (Valid for EL/ELX/HGT versions)

Check the condition of the bulb



Not OK

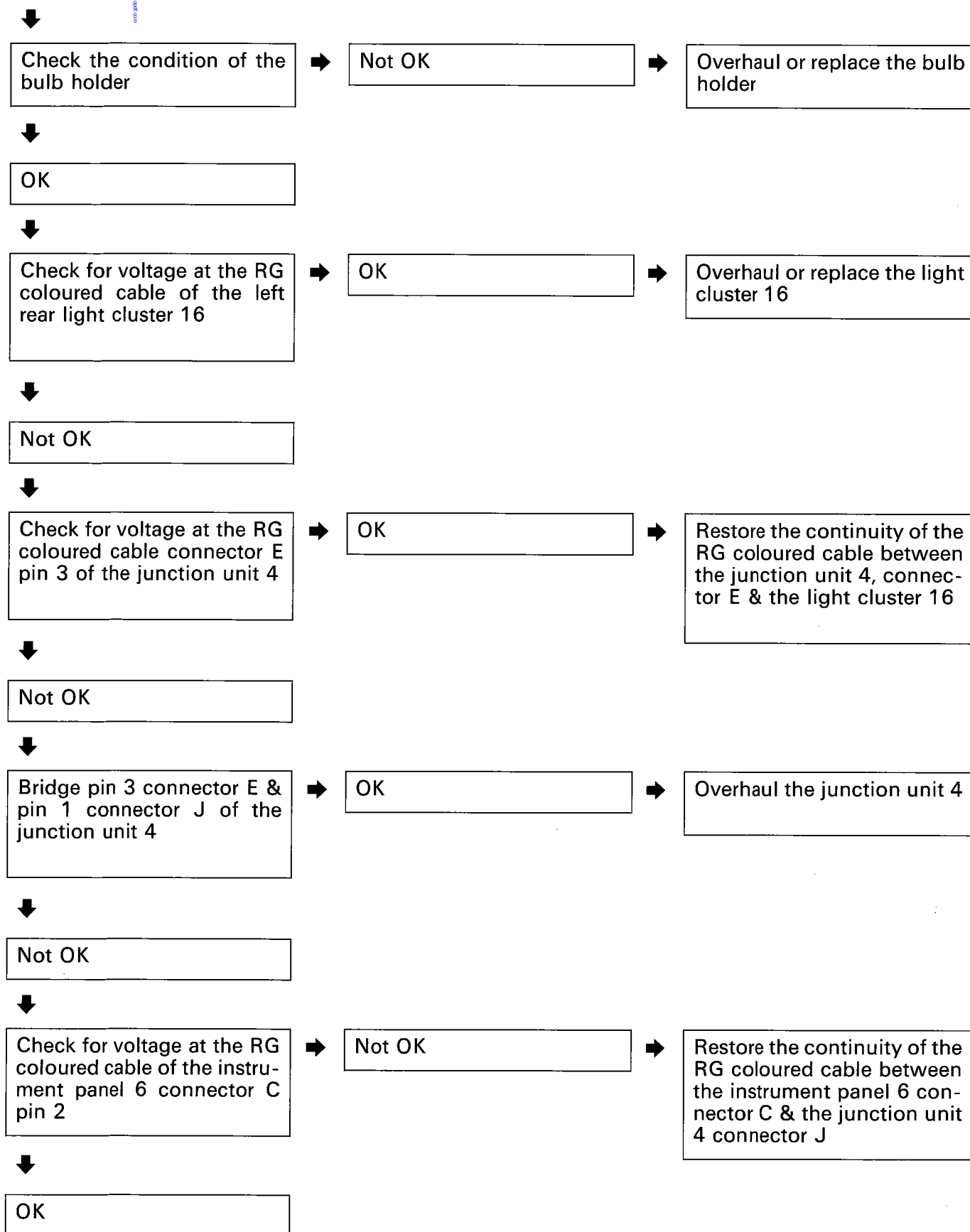


Replace the bulb

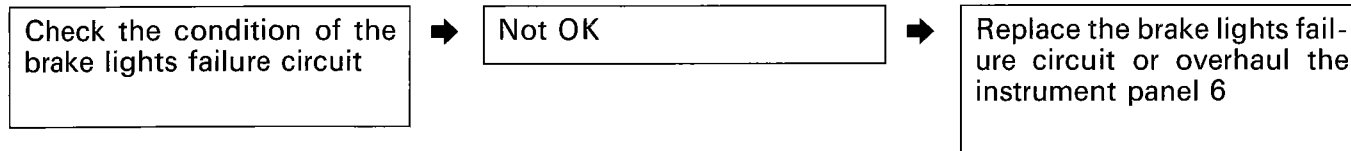


OK

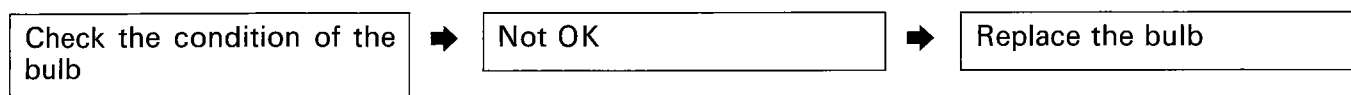




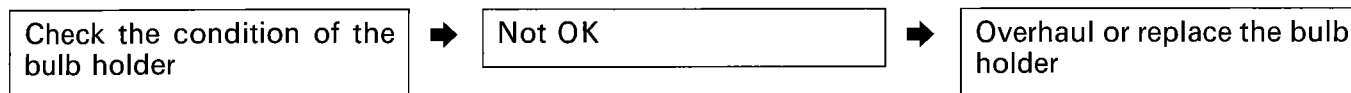
55D.



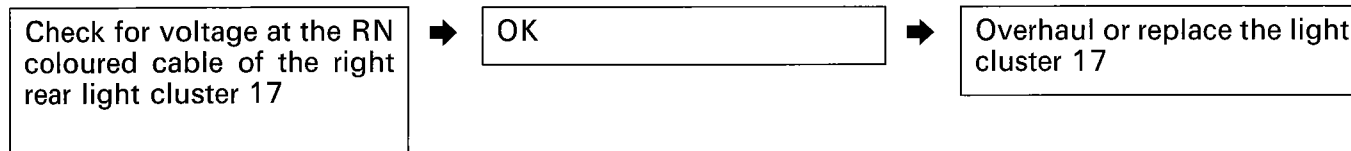
The right brake light is not working (Valid for EL/ELX/HGT versions)



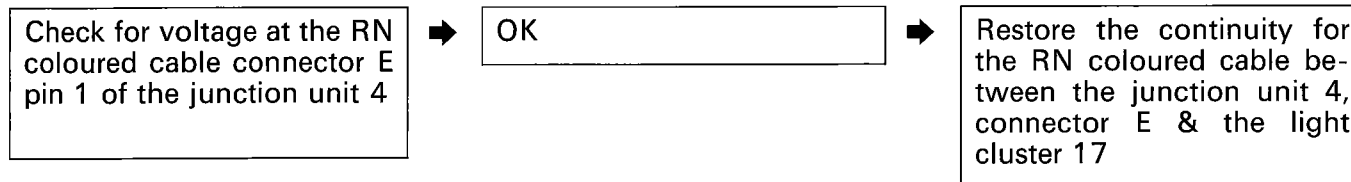
OK



OK

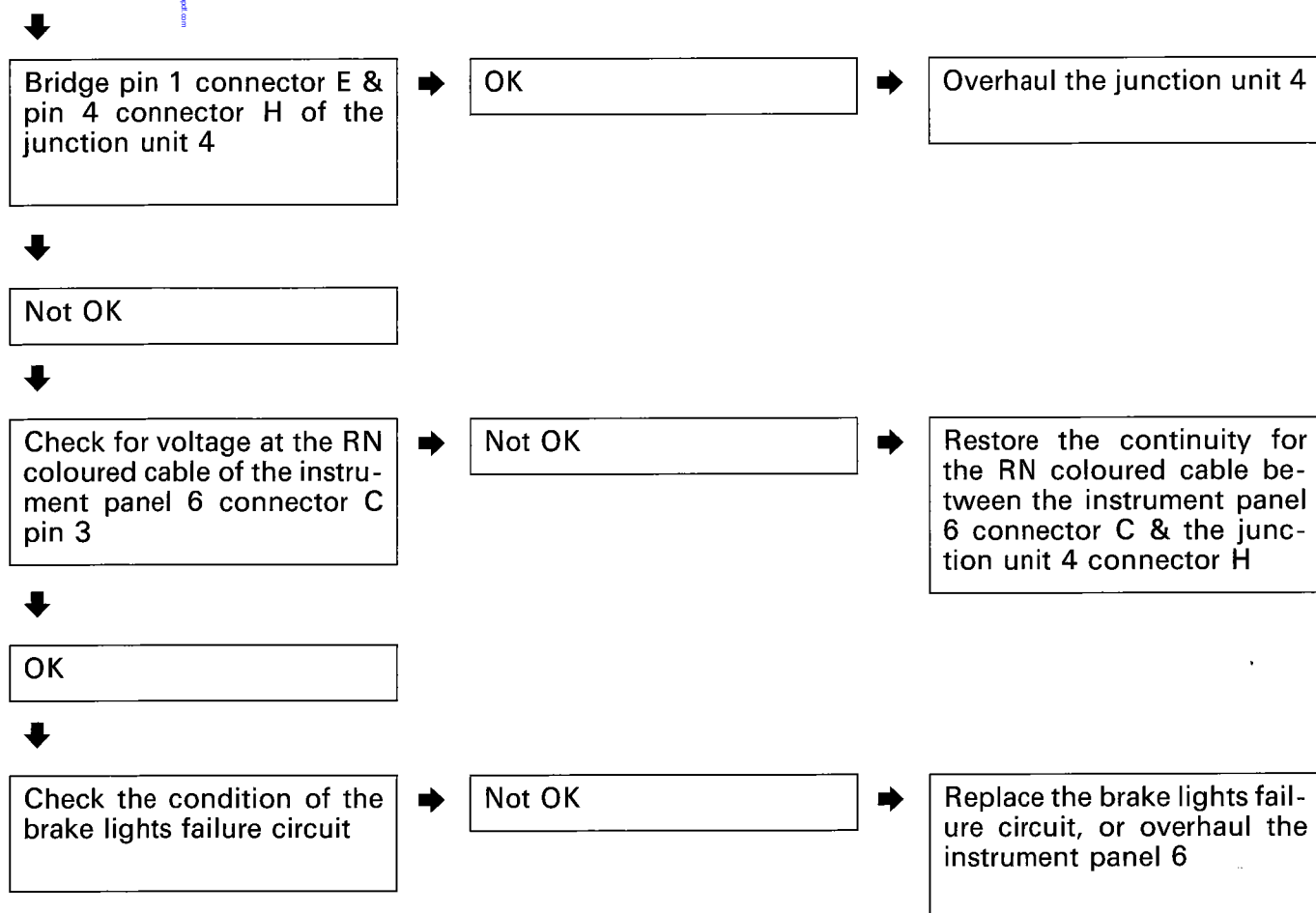


Not OK

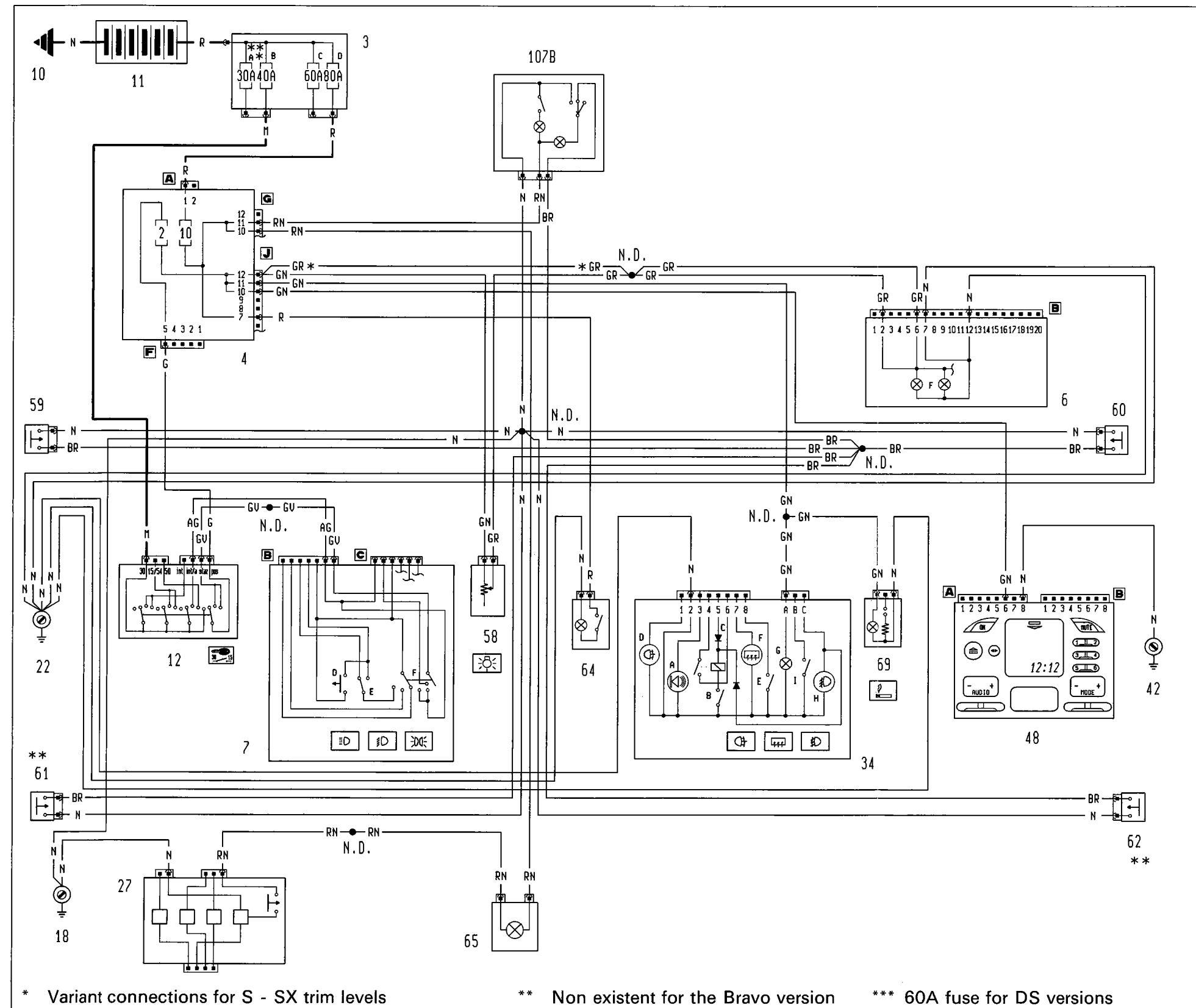


Not OK

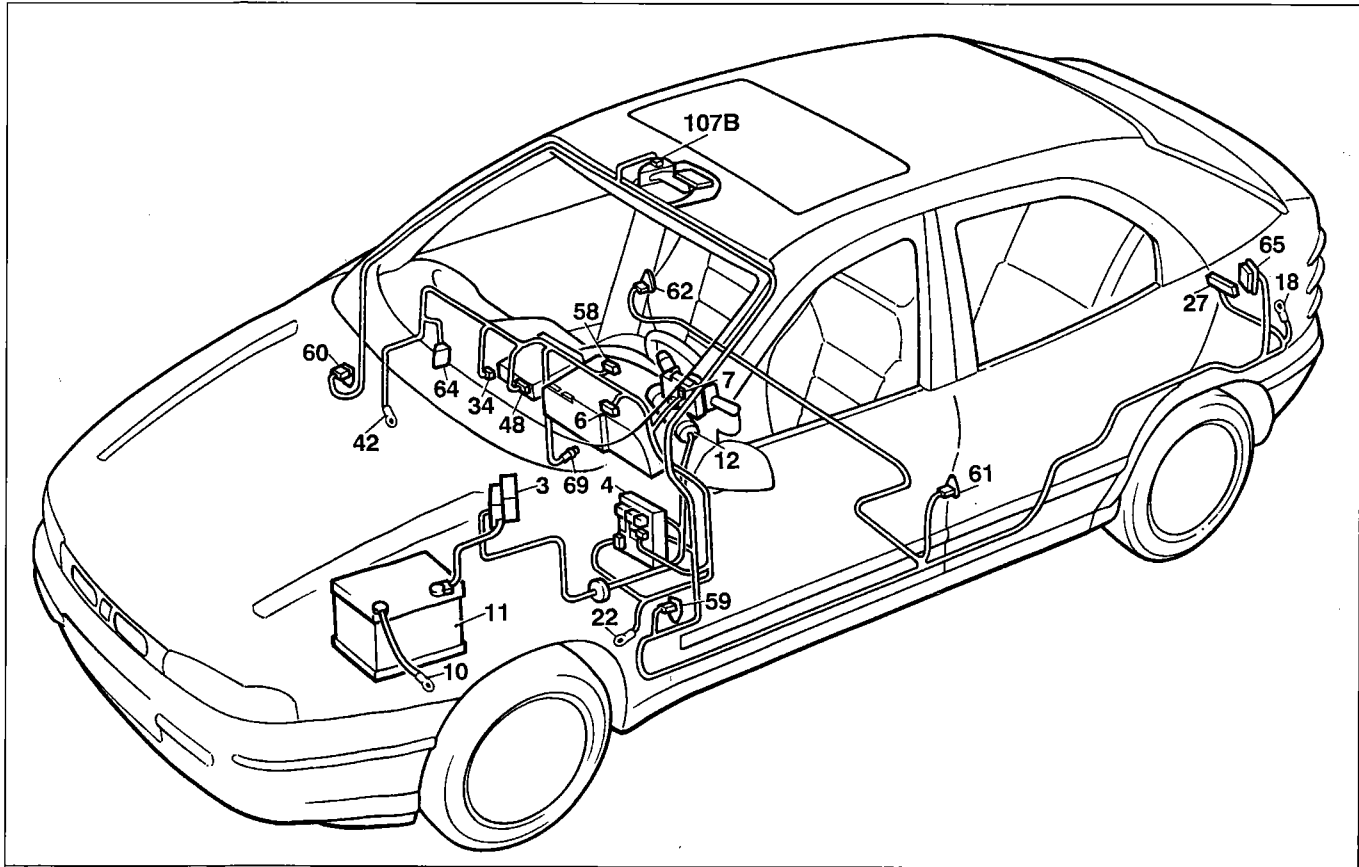




Vehicle interior lights - Ideogram lights - (See key at end of wiring diagrams)



55.

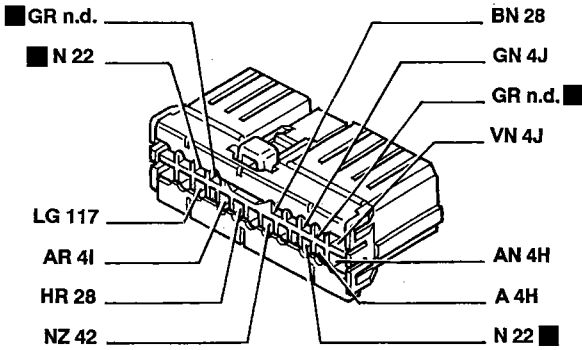


Vehicle interior lights - Ideogram lights

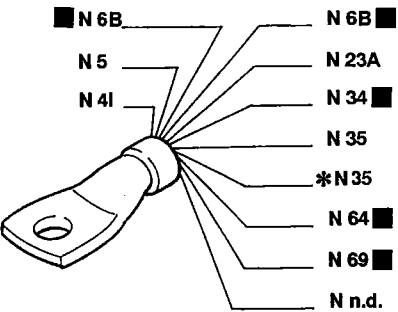
Components key

- | | |
|---|--|
| 3 Power fuse box:
A 30A protective fuse for injection system (60A for DS versions)
B 40A protective fuse for ignition system
C 60A protective fuse for optional extras
D 80A protective fuse for junction unit | 42 Right dashboard earth |
| 4 Junction unit | 48 Radio receiver with clock |
| 6 Instrument panel:
F Instrument panel ideogram lights | 58 Light dimmer |
| 7 Steering column switch unit:
D Flasher control
E Switch for dipped/main beam headlamps
F Switch for side lights | 59 Push button on left front pillar for courtesy light |
| 10 Earth for battery on bodyshell | 60 Push button on right/left pillar for courtesy light |
| 11 Battery | 61 Push button on left rear pillar for courtesy light |
| 12 Ignition switch | 62 Push button on right rear pillar for courtesy light |
| 18 Left rear earth | 64 Glove compartment light bulb with switch incorporated |
| 22 Left dashboard earth | 65 Luggage compartment light/anti-theft device on |
| 27 Contact board for rear connections with luggage compartment light switch incorporated | 69 Cigar lighter |
| 34 Switch control panel:
A Anti-theft warning light on
B Rear fog lamps switch
C Rear fog lamps relay feed
D Rear fog lamps warning light
E Heated rear windscreen switch
F Heated rear windscreen warning light
G Switch control unit ideogram light
H Fog lights warning light
I Fog lights switch | 107B Courtesy lights |
| | N.D. Ultrasound welding taped in cable loom |

6B Instrument panel

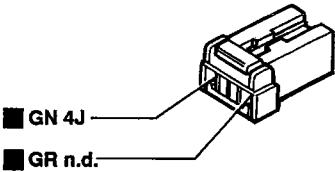


22 Left dashboard earth

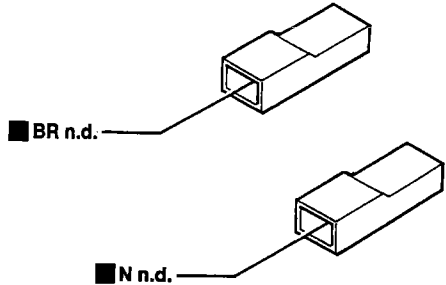


* Only for ELX trim level

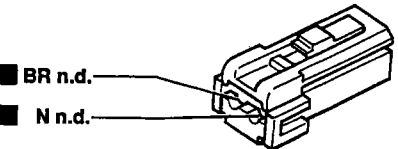
58 Interior light dimmer



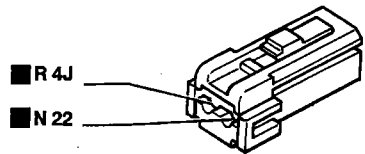
59 Push button on left front pillar for courtesy light



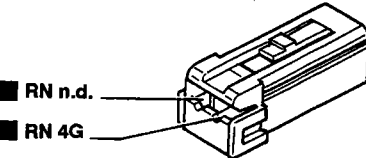
62 Push button on right rear pillar for courtesy light



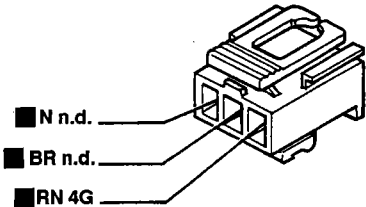
64 Glove compartment light bulb with switch incorporated



65 Luggage compartment light for switching on alarm system



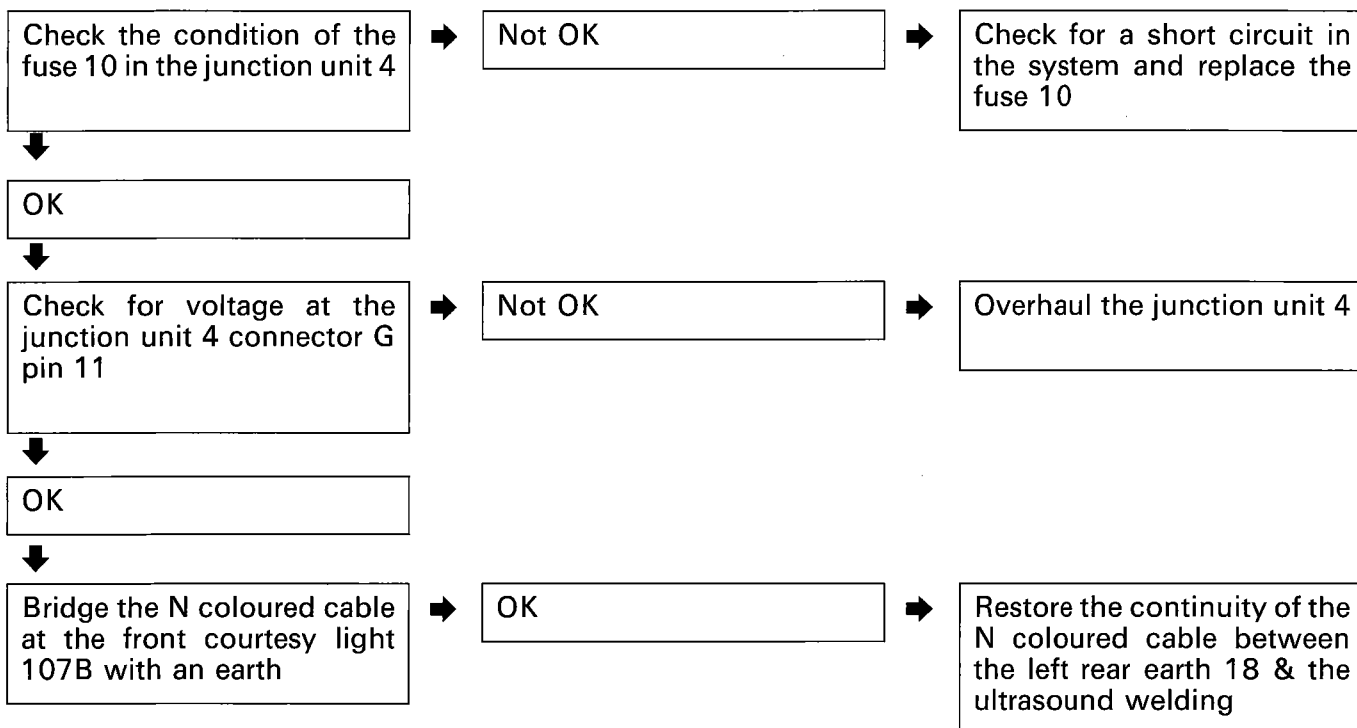
107B Courtesy lights



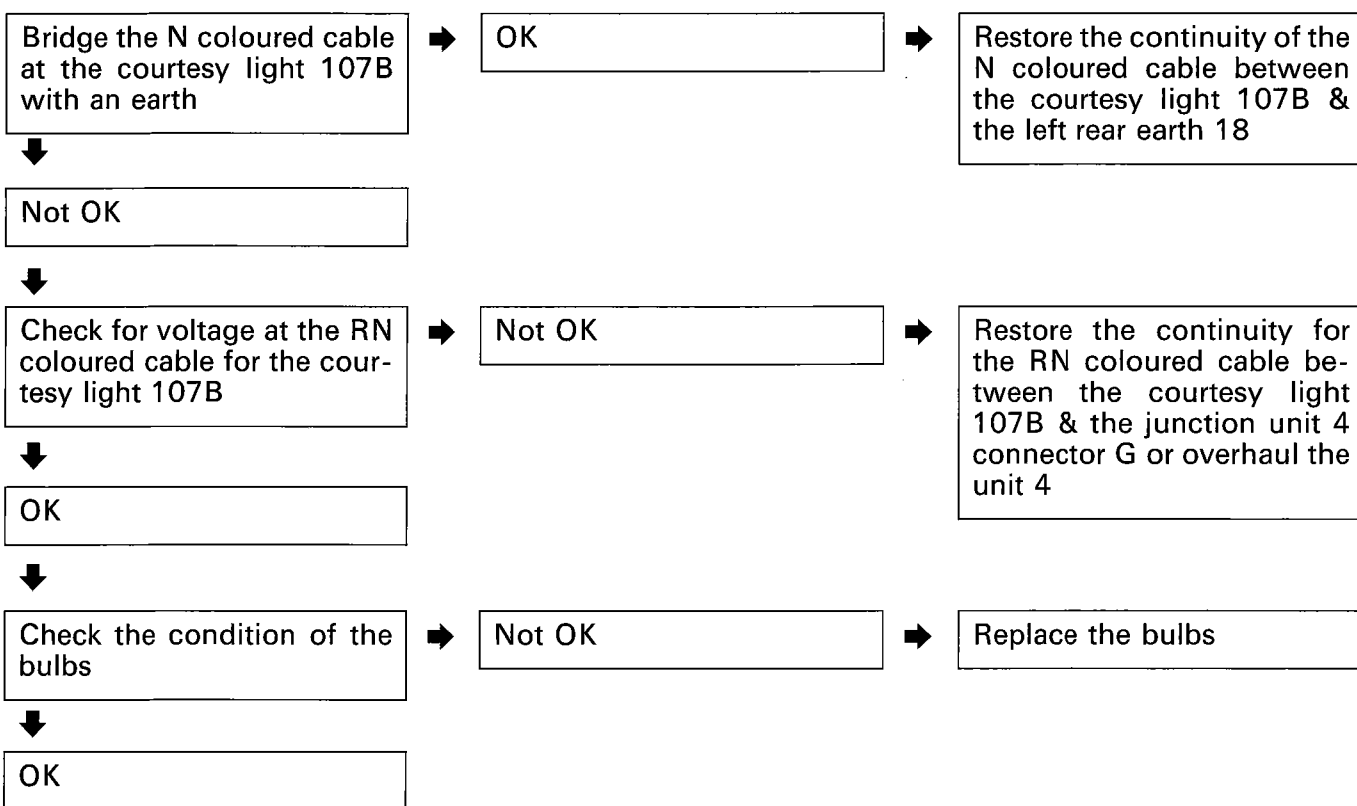
The cables in the wiring diagram are marked

P4A136N02

The front courtesy light, the glove compartment light and the luggage compartment light are not working



The front courtesy light is not working



55D.



Check the condition of the courtesy light 107B



Not OK



Overhaul the courtesy light 107B

The courtesy light is not working when any of the doors are opened

Check the condition of the bulb in the courtesy light 107B



Not OK



Replace the bulb



OK



Bridge BR/N coloured cables at courtesy light 107B



Not OK



Overhaul or replace the courtesy light 107B



OK



Bridge the BR coloured cable at the left front push button 60 with an earth



Not OK



Restore the continuity of the N coloured cable between the courtesy light 107B & the ultrasound welding

The courtesy light does not work when the left front door is opened

Bridge the BR/N coloured cables at the left front courtesy light switch 59



OK



Overhaul or replace the left front push button 59



Not OK



Bridge the BR coloured cable at the left front push button 59 with an earth



Not OK



Restore continuity for BR coloured cable between the left front push button 59 & the ultrasound welding



OK



Bridge the N coloured cable at the left front push button 59 with an earth

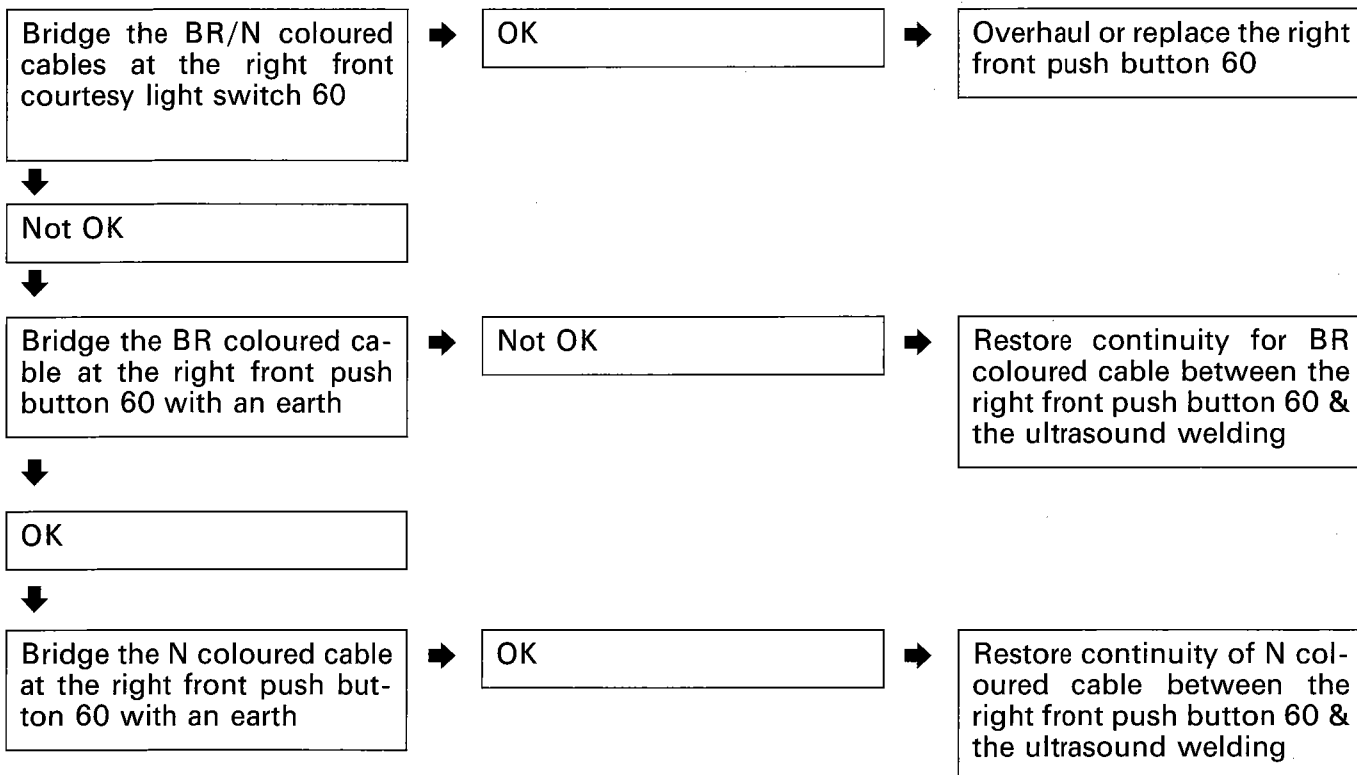


OK

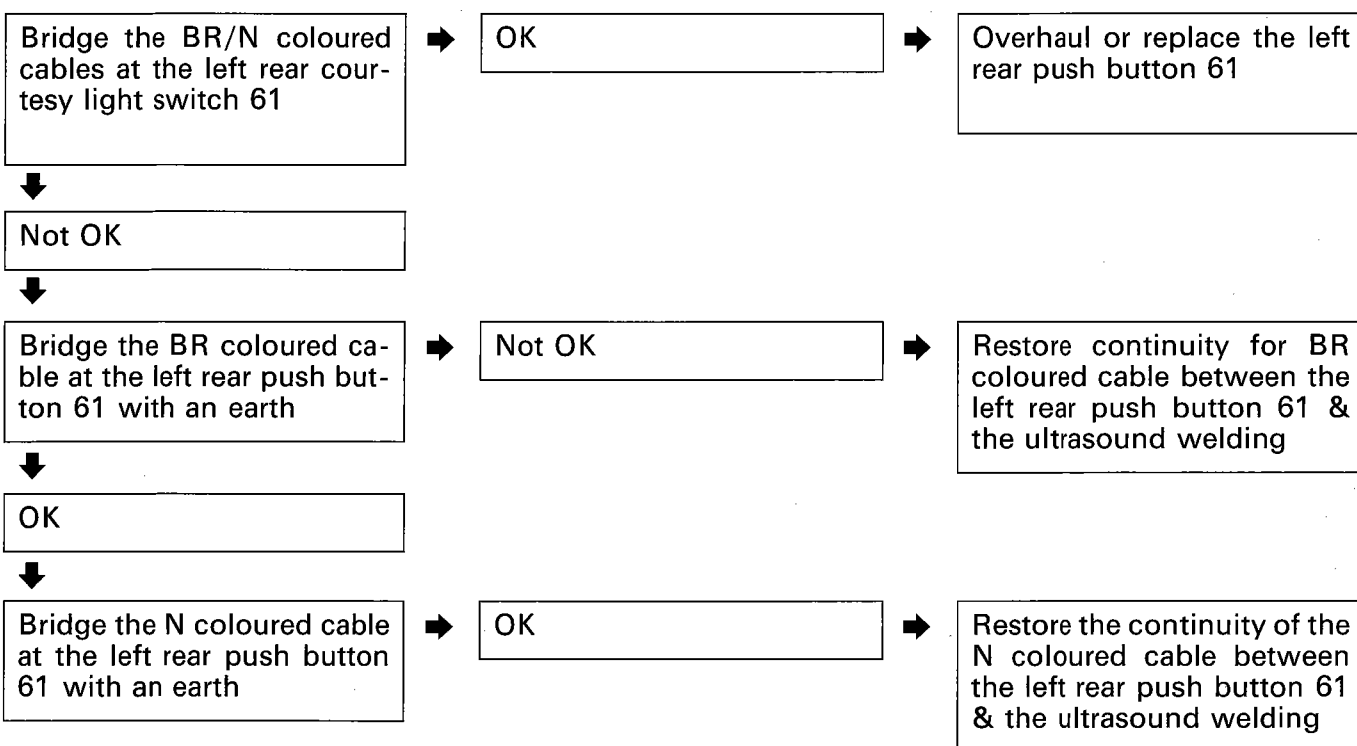


Restore the continuity of the N coloured cable between the left front push button 59 & the ultrasound welding

The courtesy light does not work when the right front door is opened

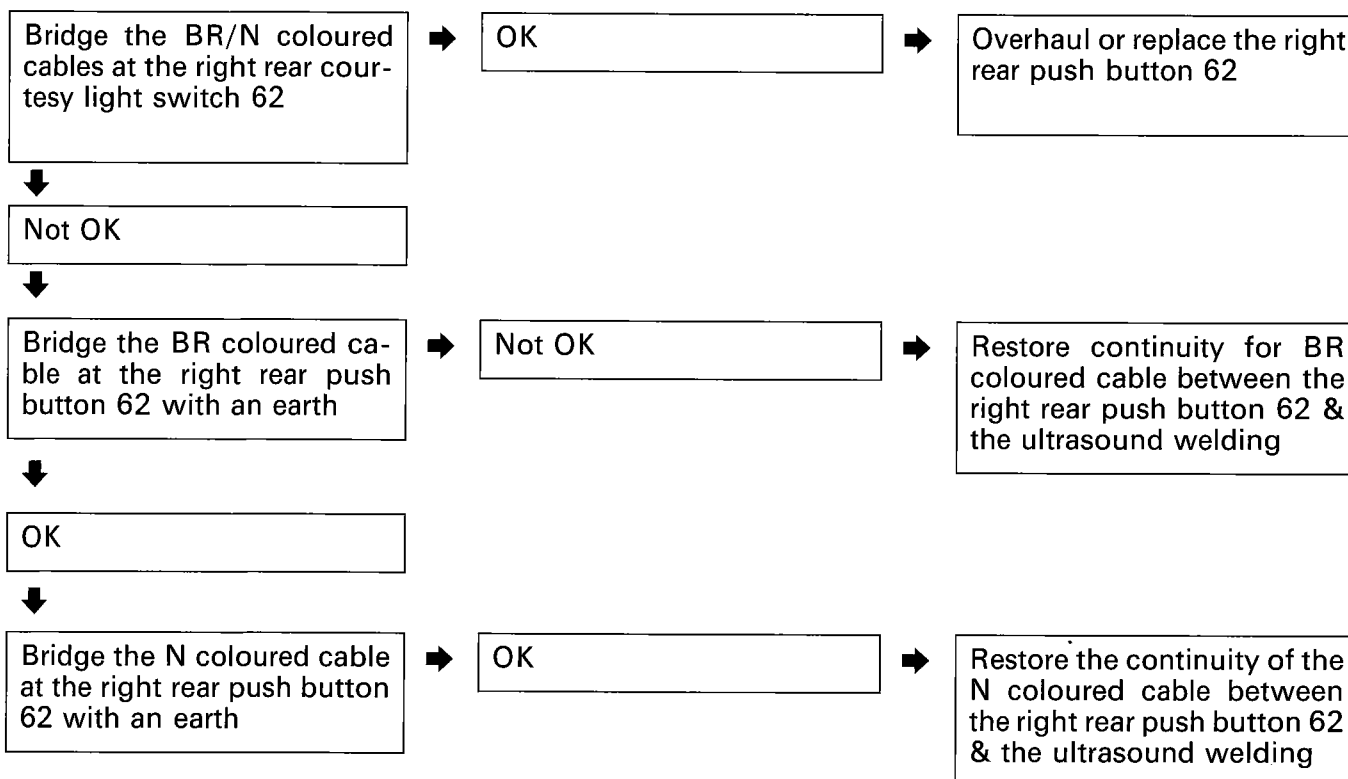


The courtesy light does not work when the left rear door is opened (Only for Brava versions)

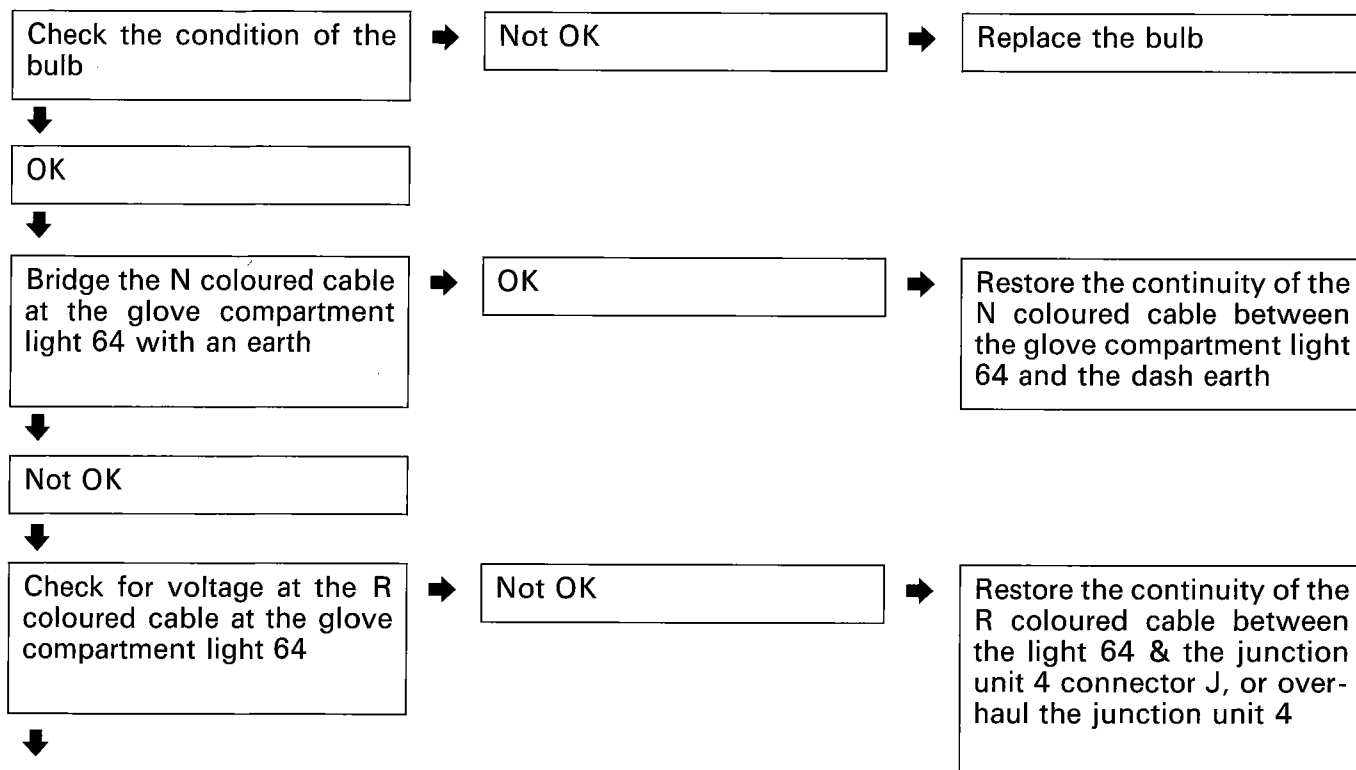


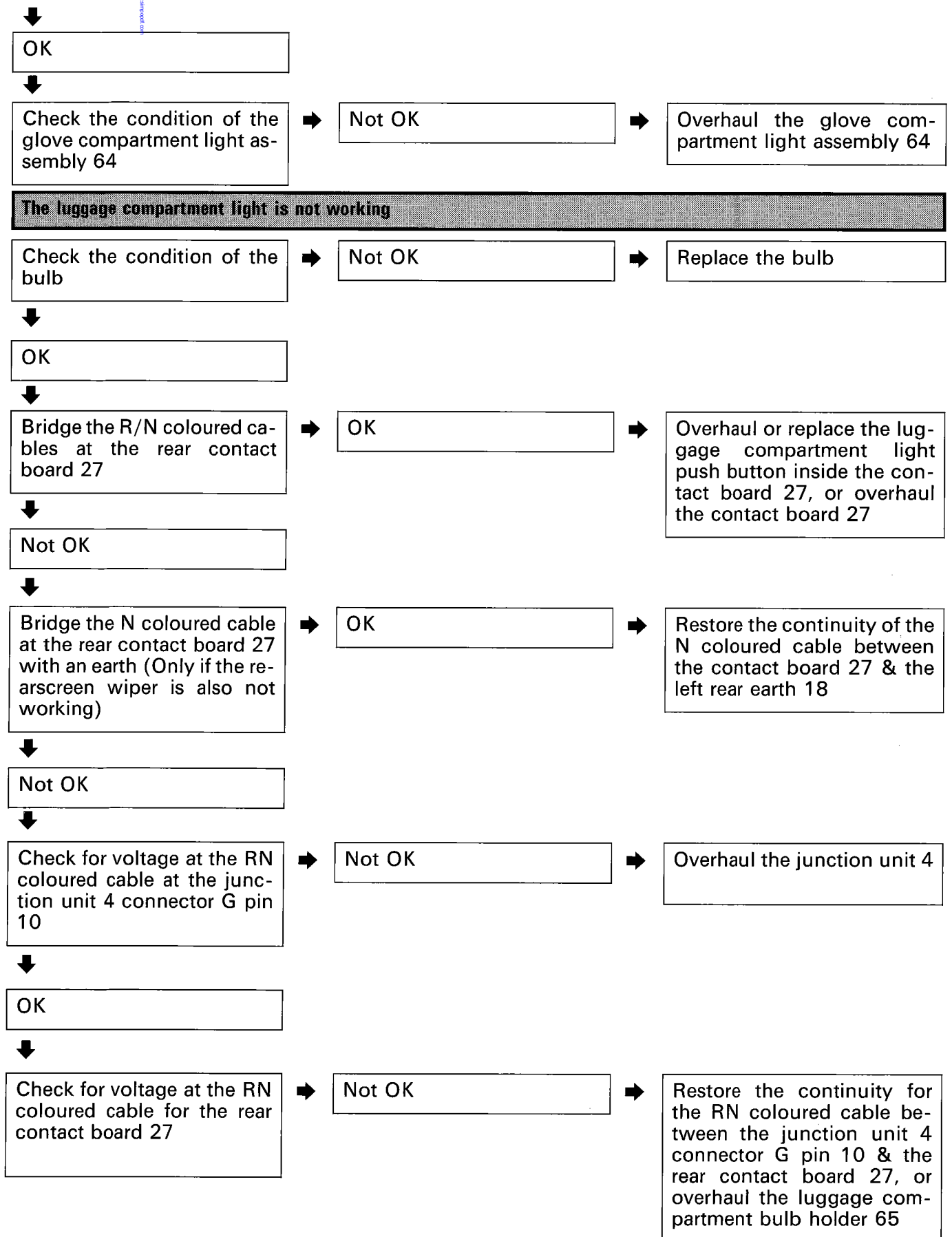
55D.

The courtesy light does not work when the right rear door is opened



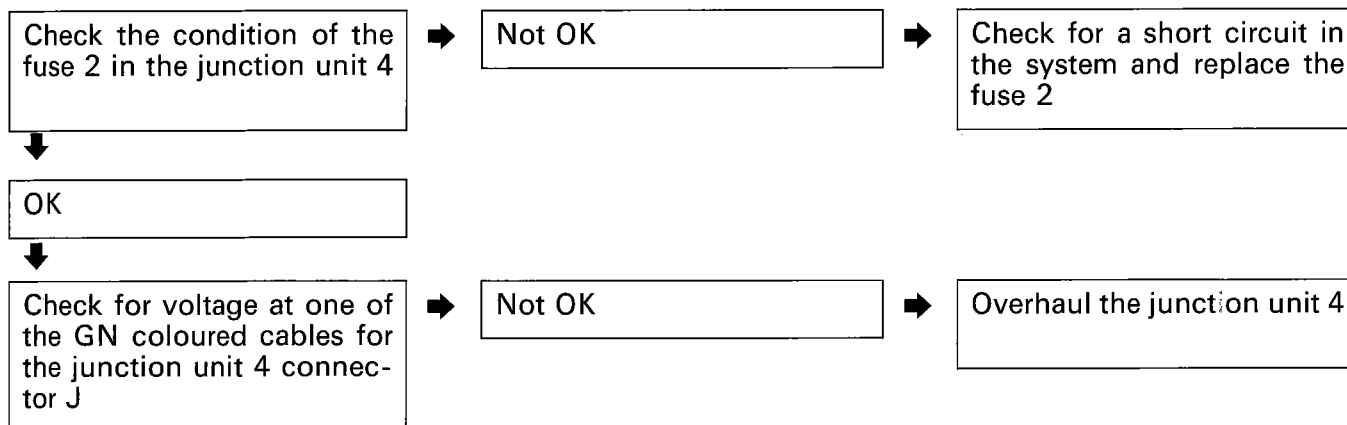
The glove compartment light is not working



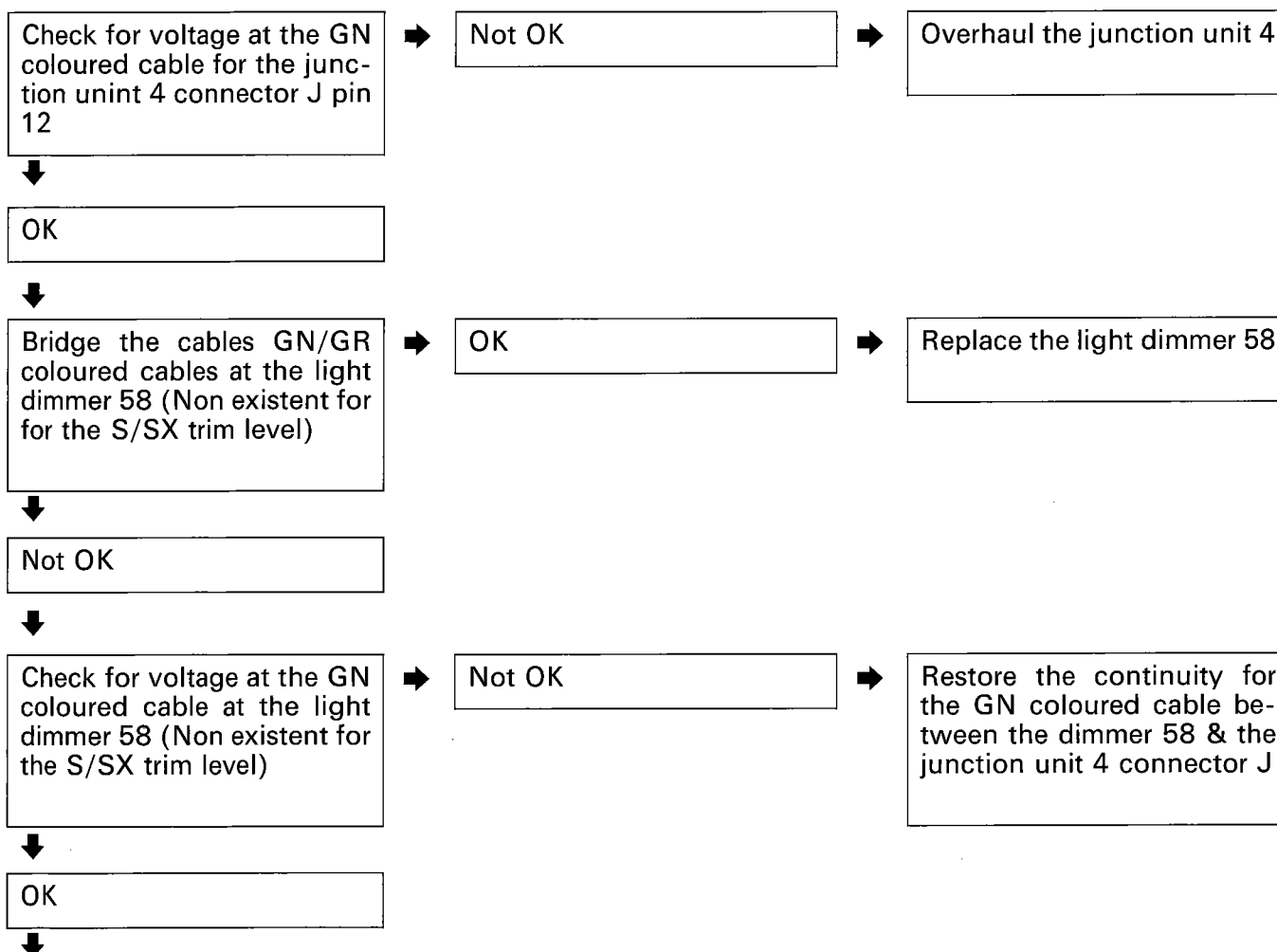


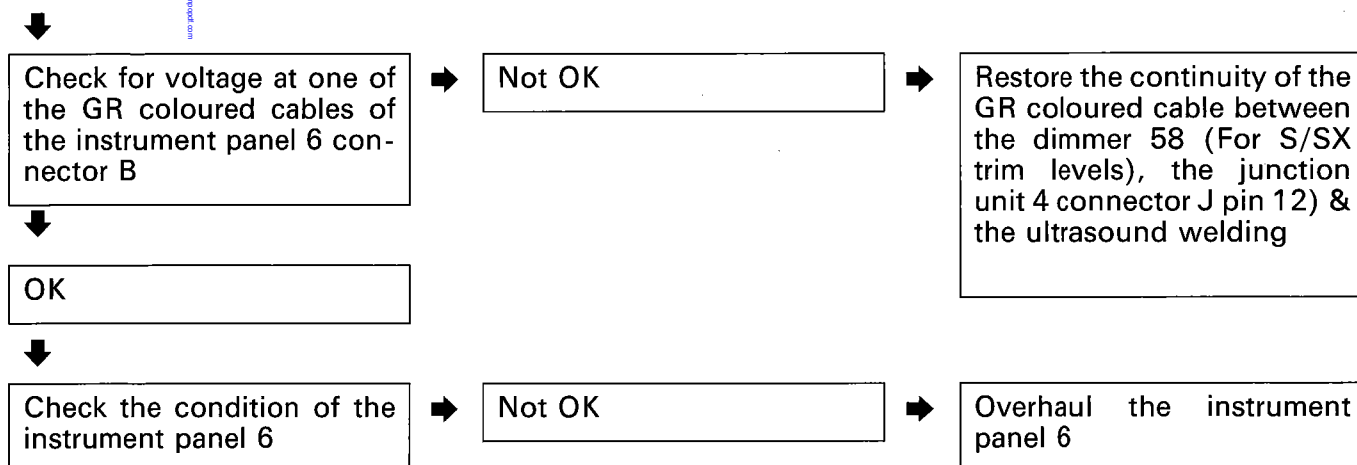
55D.

The ideogram lights are not working

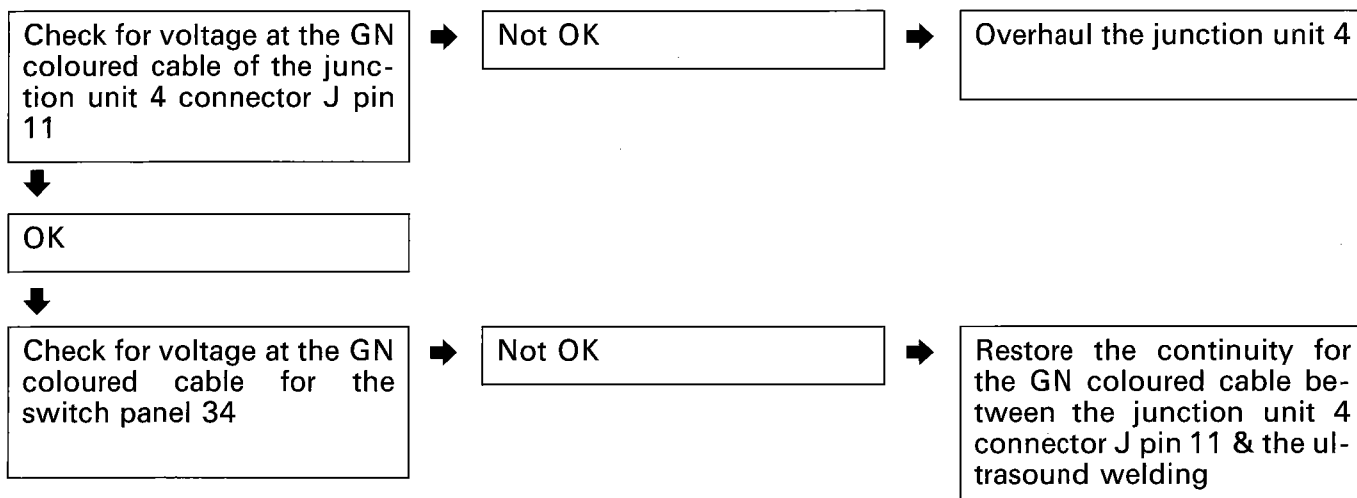


The ideogram lights in the instrument panel are not working

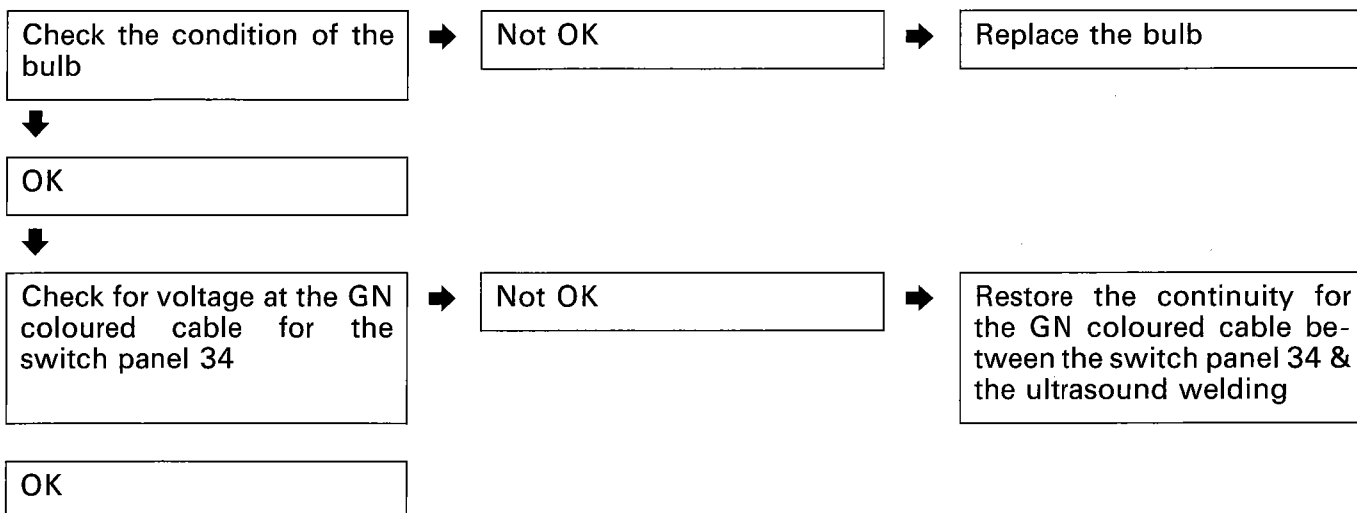




The ideogram lights in the switch panel and the cigar lighter are not working



The ideogram in the switch panel is not working



55D.



Check the condition of the switch panel 34



Not OK



Overhaul the switch panel 34

The ideogram on the cigar lighter is not working

Check the condition of the bulb



Not OK



Replace the bulb



OK



Check for voltage at the GN coloured cable for the cigar lighter 69



Not OK



Restore the continuity for the GN coloured cable between the cigar lighter 69 & the ultrasound welding



OK



Check the condition of the cigar lighter 69



Not OK



Overhaul the cigar lighter 69

The radio light is not working

Check for voltage at the GN coloured cable at the junction unit 4 connector J pin 10



Not OK



Overhaul the junction unit 4



OK



Check for voltage at the GN coloured cable at connector A for the radio 48



Not OK



Restore the continuity for the GN coloured cable between the junction unit 4 connector J & the radio 48



OK



Check the condition of the radio 48



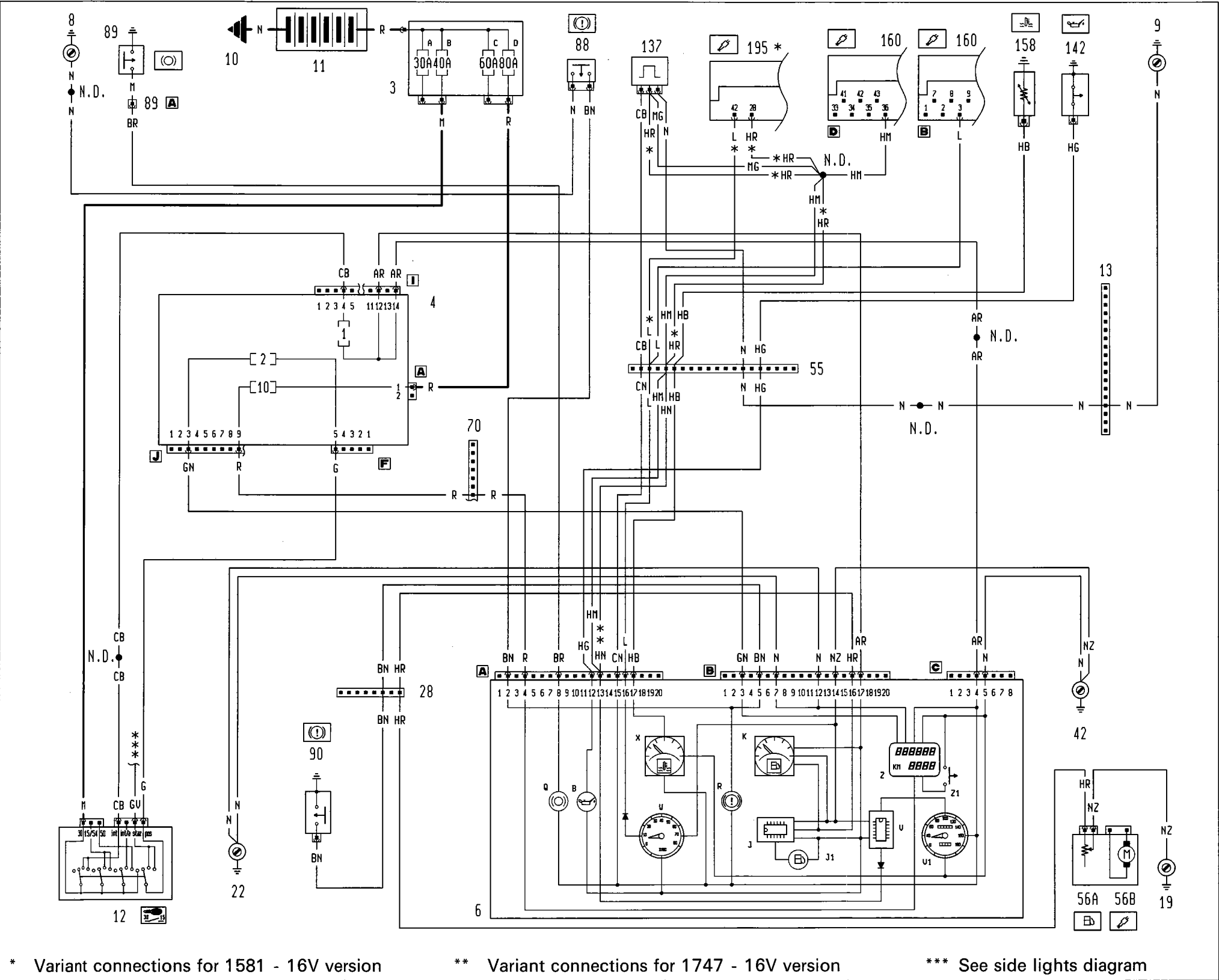
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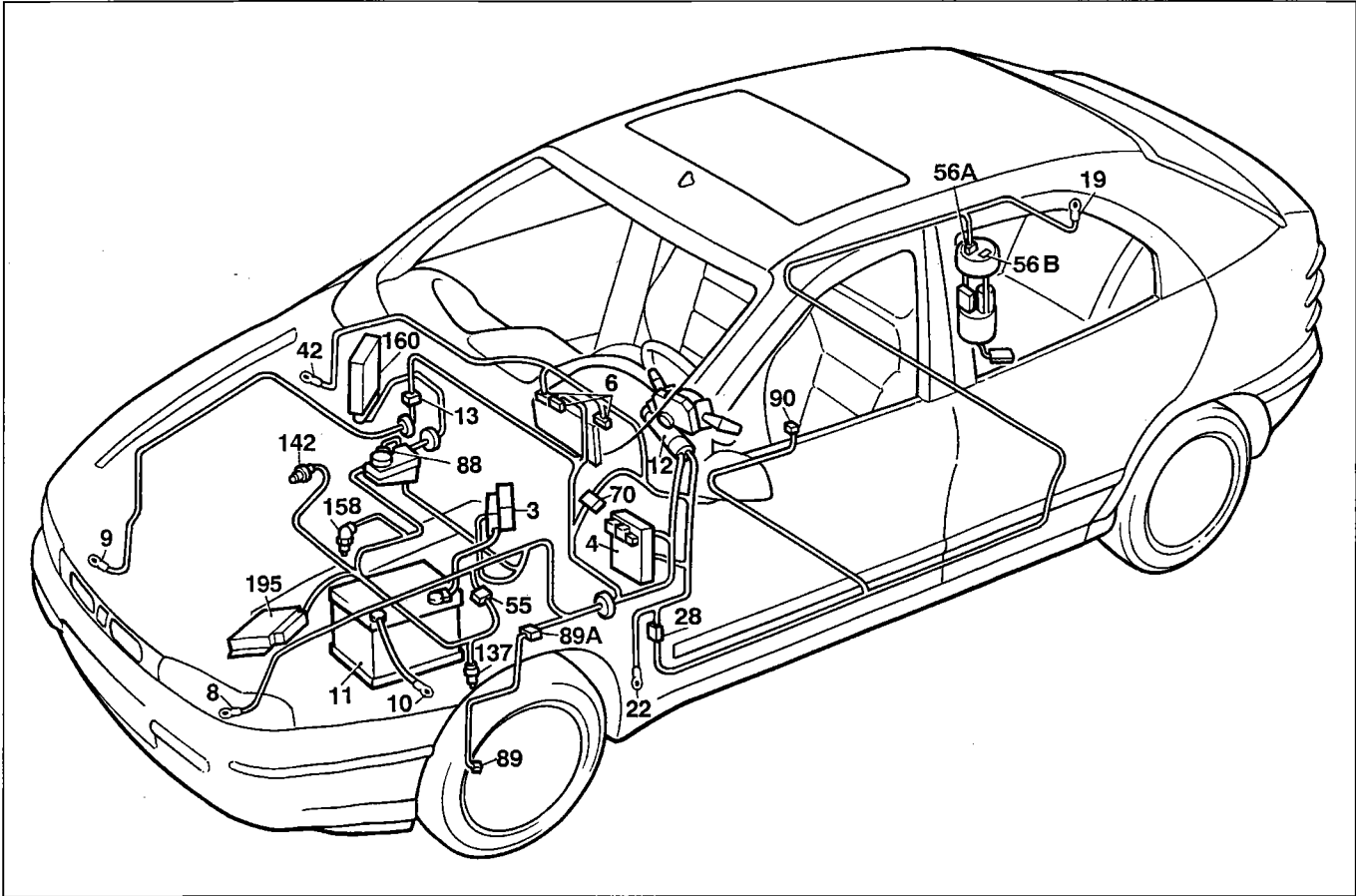
Overhaul the radio 48

Trim level: EL - ELX

Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer
- Milometer/trip meter display and zeroing button - Water temperature gauge- Insufficient engine oil pressure warning
light - Front brake pad wear warning light - Rev counter - (See key at end of wiring diagrams)



55.



Trim level: EL - ELX

P4A143N02

Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer
- Milometer/trip meter display and zeroing button - Water temperature gauge- Insufficient engine oil pressure warning
light - Front brake pad wear warning light - Rev counter

Components key

- 3 Power fuse box:
A 30A protective fuse for injection system (60A for DS versions)
B 40A protective fuse for ignition system
C 60A protective fuse for optional extras
D 80A protective fuse for junction unit

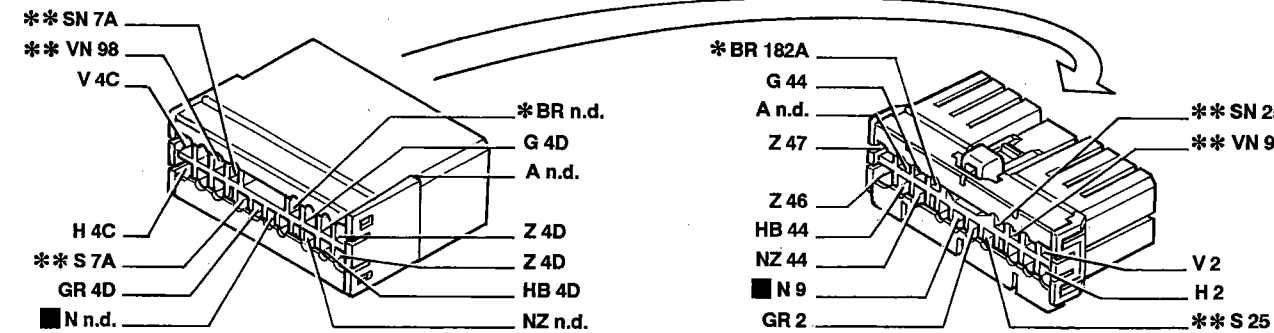
4 Junction unit

6 Instrument panel:
B Insufficient engine oil pressure warning light
J Fuel reserve circuit control module
J1 Warning light signalling fuel reserve
K Fuel level gauge
Q Front brake pad wear warning light
R Hanbrake applied / insufficient brake fluid level warning light
V Speedometer control module
V1 Speedometer
W Rev counter
X Coolant temperature gauge
Z Milometer / trip meter display
Z1 Trip meter zeroing button

8 Left front earth
9 Right front earth
10 Earth for battery on bodyshell
11 Battery
12 Ignition switch
13 Front right/left cables connection
- 19 Right rear earth
22 Left dashboard earth
28 Dashboard/longitudinal cables connection
42 Right dashboard earth
55 Front/fuel gauge cables connection
56 Fuel level gauge
A Fuel level sensor
B Electric fuel pump

70 Dashboard/front cables connection
88 Insufficient brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection
90 Switch signalling handbrake applied
137 Vehicle speed sensor
142 Switch signalling insufficient engine oil pressure
158 Coolant temperature sensor for instrument
160 Injection/ignition electronic control unit (1747 Hi-tachi)
195 Injection/ignition electronic control unit (1581)
N.D. Ultrasound welding taped in cable loom

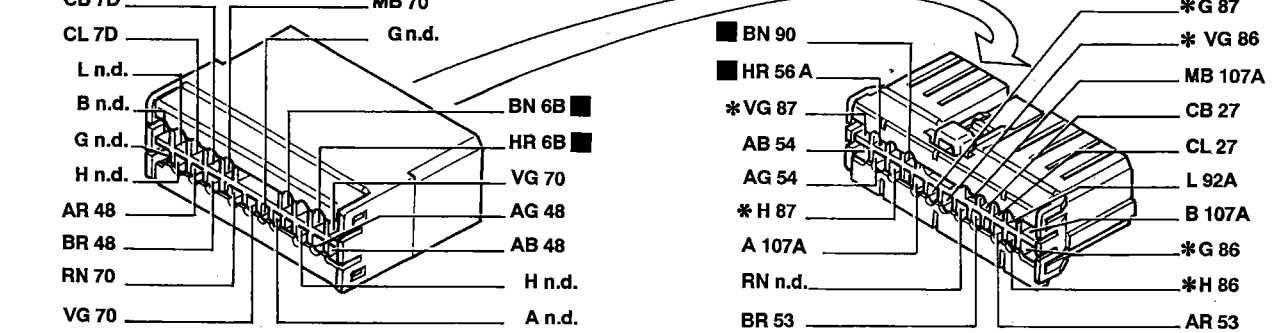
13 Front right/left cables connection



* Only valid for 1998

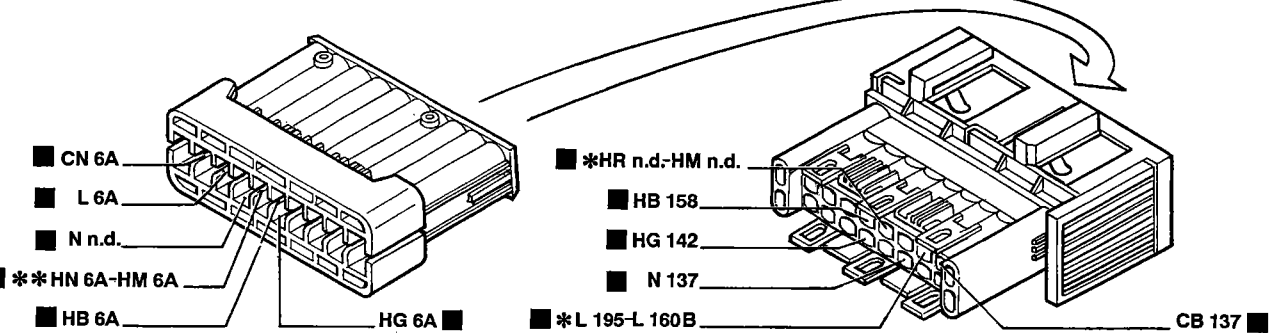
** Non existent for 1370

28 Dashboard/longitudinal cables connection



* Only for Brava

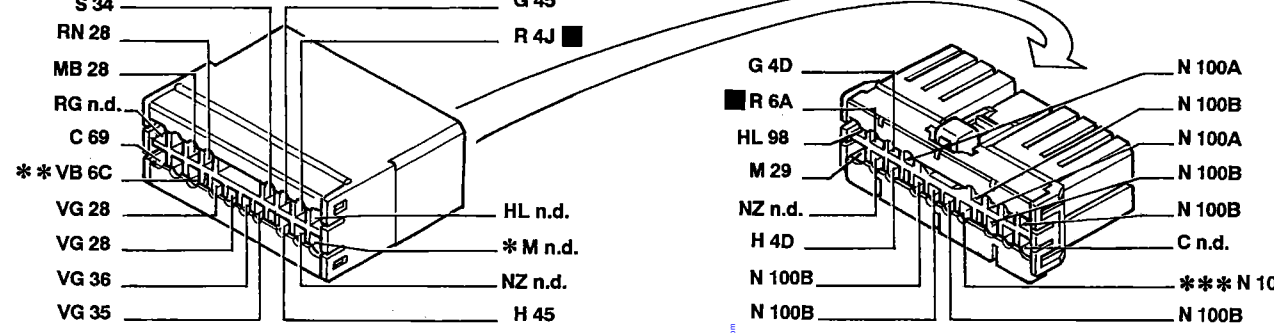
55 Front/engine cables connection



* Only valid for 1581

** Only valid for 1747

70 Dashboard/front cables connection



* Non existent for S trim level

** Valid for EL/ELX/HGT trim level

*** Non existent for 1929 DS

The cables in the wiring diagram are marked

P4A144N02

The fuel level gauge is not working

Bridge the HR/NZ coloured cables at the fuel level gauge 56A so that the pointer on the instrument panel 6 gauge K signals the end of scale - full tank

→ OK

→ Overhaul or replace the fuel level gauge 56A



Not OK



Bridge the NZ coloured cable at the fuel level gauge 56A with an earth

→ OK

→ Restore the continuity for the NZ coloured cable between the assembly 56A & the rear earth 19



Not OK



Bridge the HR coloured cable at connector 28 with an earth so that the instrument panel 6 gauge K pointer signals the end of scale - full tank

→ OK

→ Restore the continuity of the HR coloured cable between connector 28 & the fuel level gauge 56A



Not OK



Bridge the HR coloured cable at the instrument panel 6 connector B pin 16 with an earth, so that the instrument panel 6 gauge K pointer signals the end of scale - full tank

→ OK

→ Restore continuity for the HR coloured cable between the instrument panel 6 connector B & connector 28



Not OK



55D.



Check the condition of the fuel level warning light K in the fuel level circuit J in the instrument panel 6



Not OK



Overhaul or replace the warning light K or the circuit J in the instrument panel 6, or overhaul the instrument panel 6

The engine coolant temperature gauge is not working

Extract the connector for the engine coolant temperature sensor 158 from its housing, connect the terminal for a resistor around 100 ohm in series to the HB coloured cable and connect the other terminal to earth so that the temperature gauge X in the instrument panel signals the end of scale - maximum temperature



OK



Replace the engine coolant temperature sensor 158



Not OK



Extract connector 55 from its housing, connect the terminal of a resistor around 100 ohm in series to the HB coloured cable and connect the other terminal to earth, so that the temperature gauge X in the instrument panel signals the end of scale - maximum temperature



OK

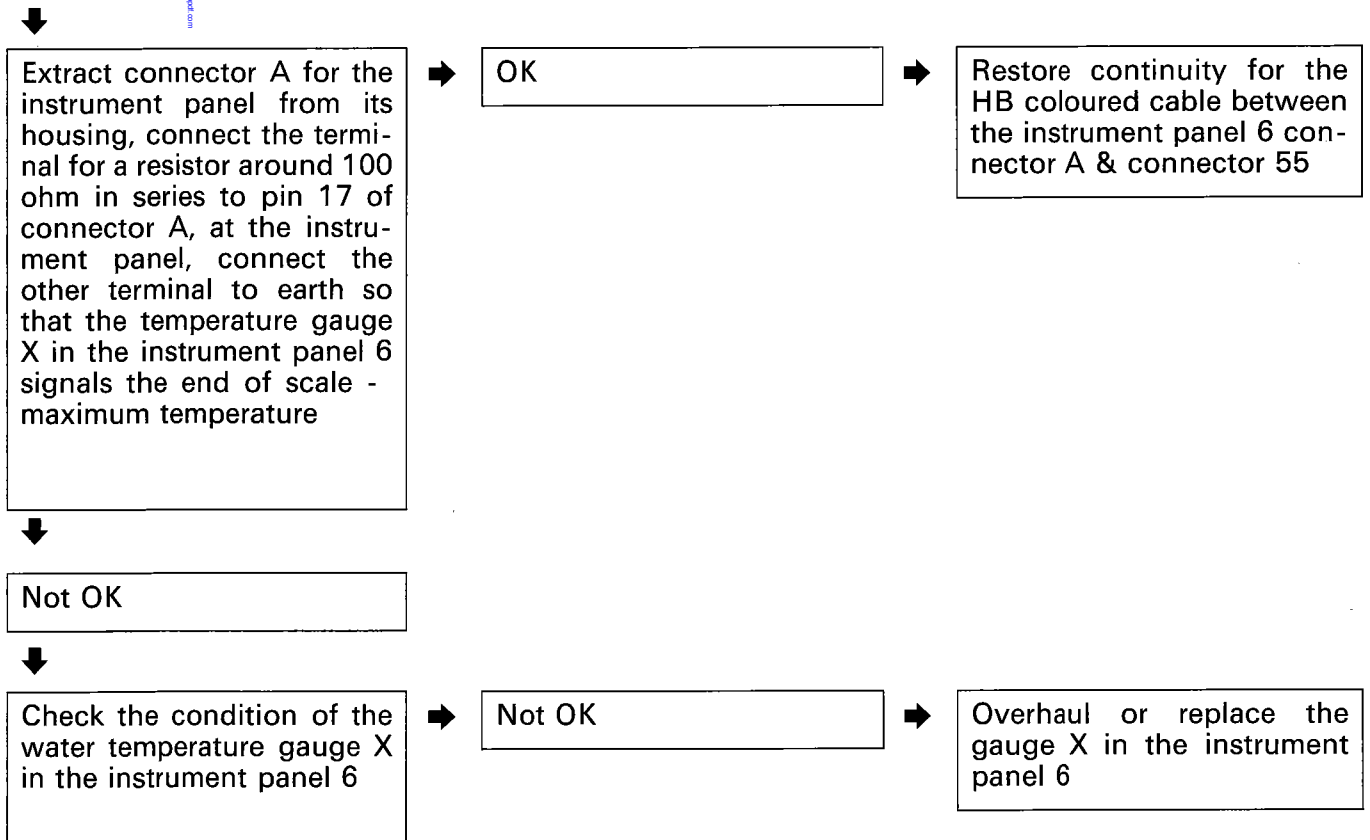


Restore the continuity of the HB coloured cable between connector 55 & temperature sensor 158

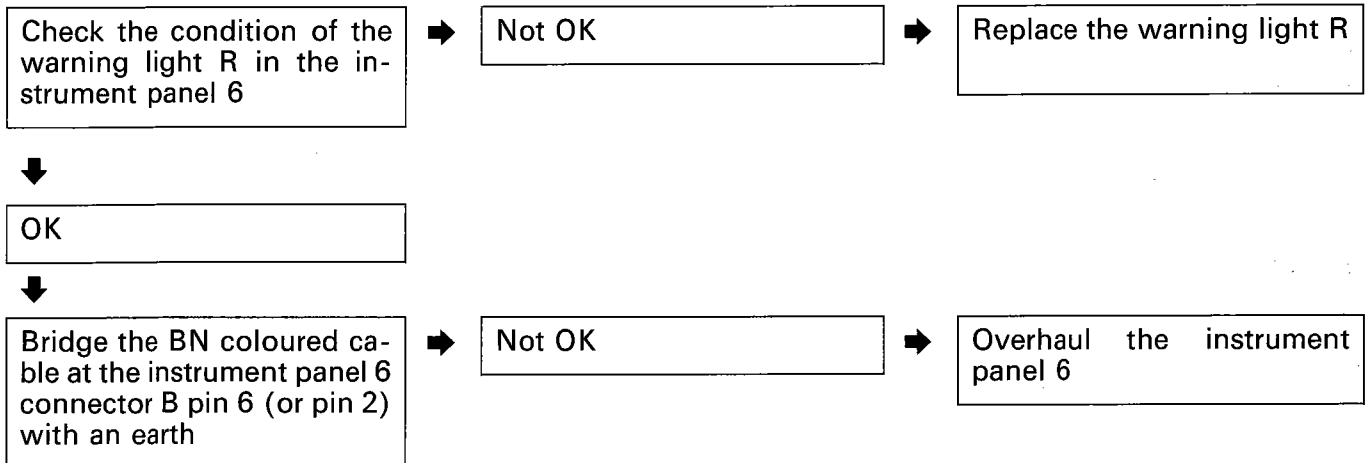


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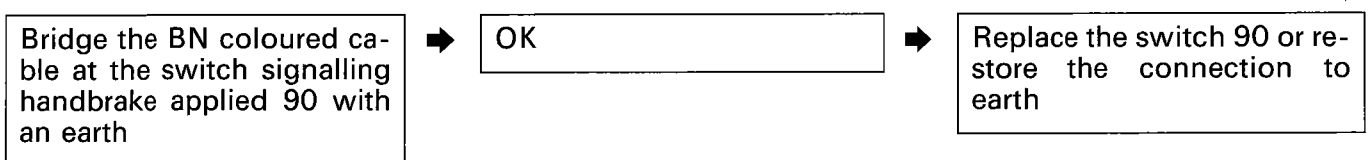




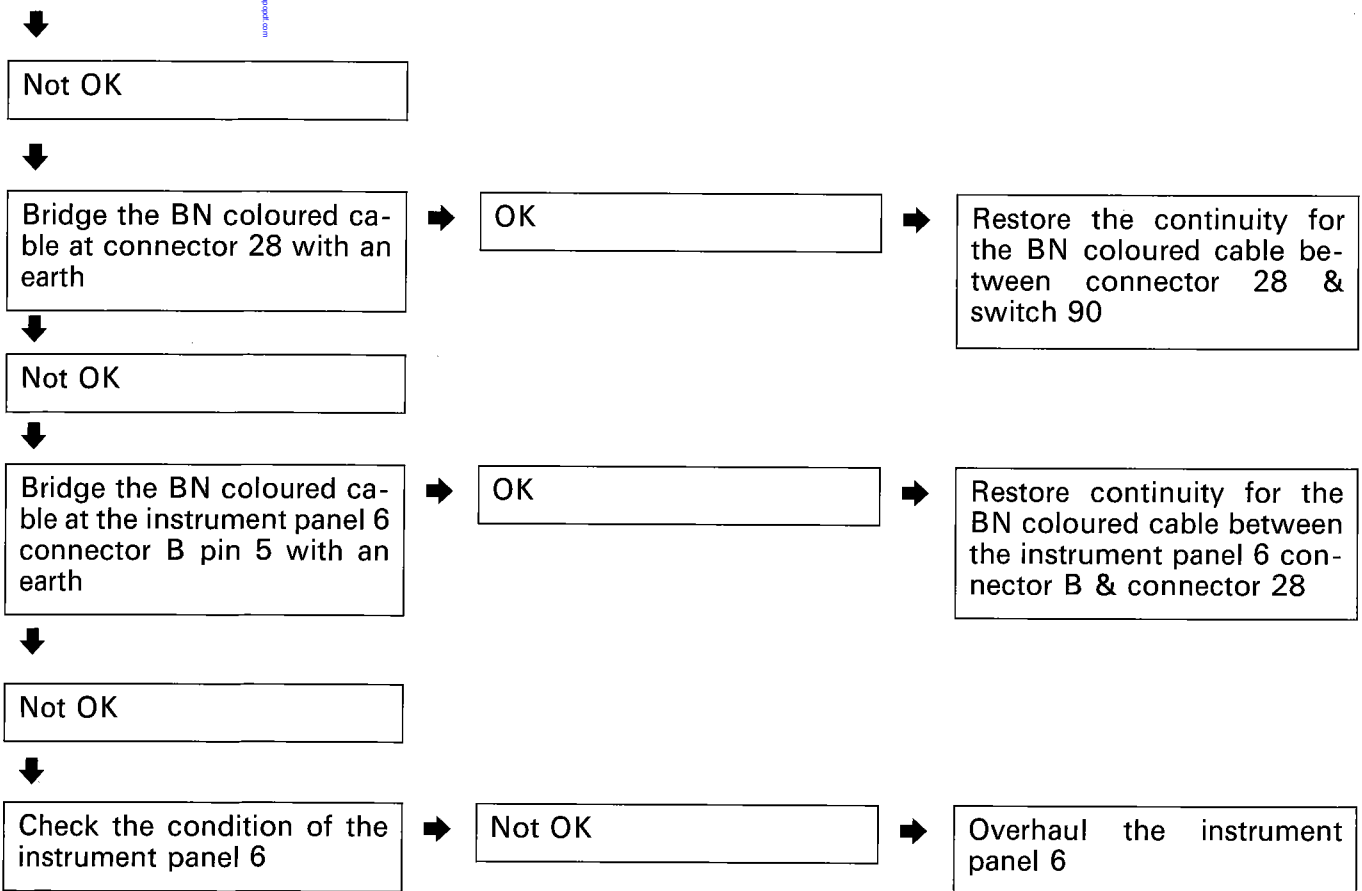
The handbrake applied and insufficient brake fluid is not being signalled



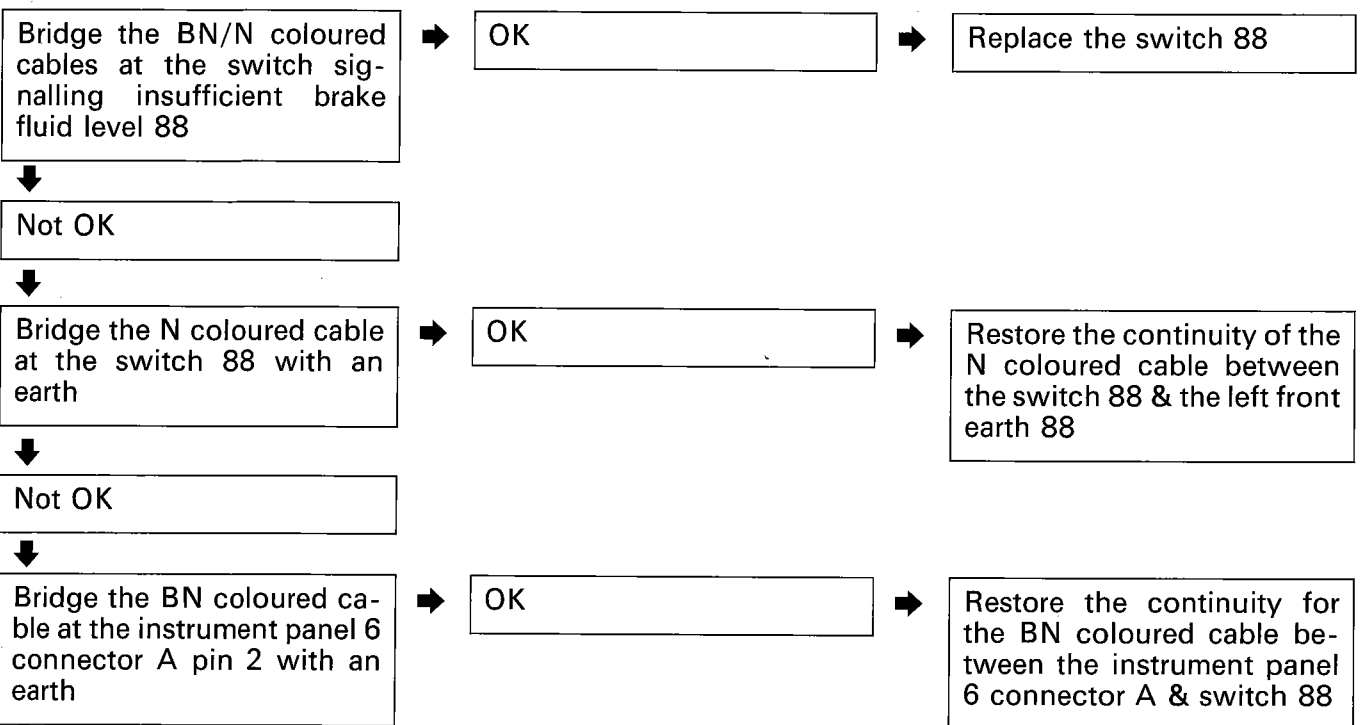
The handbrake applied is not being signalled

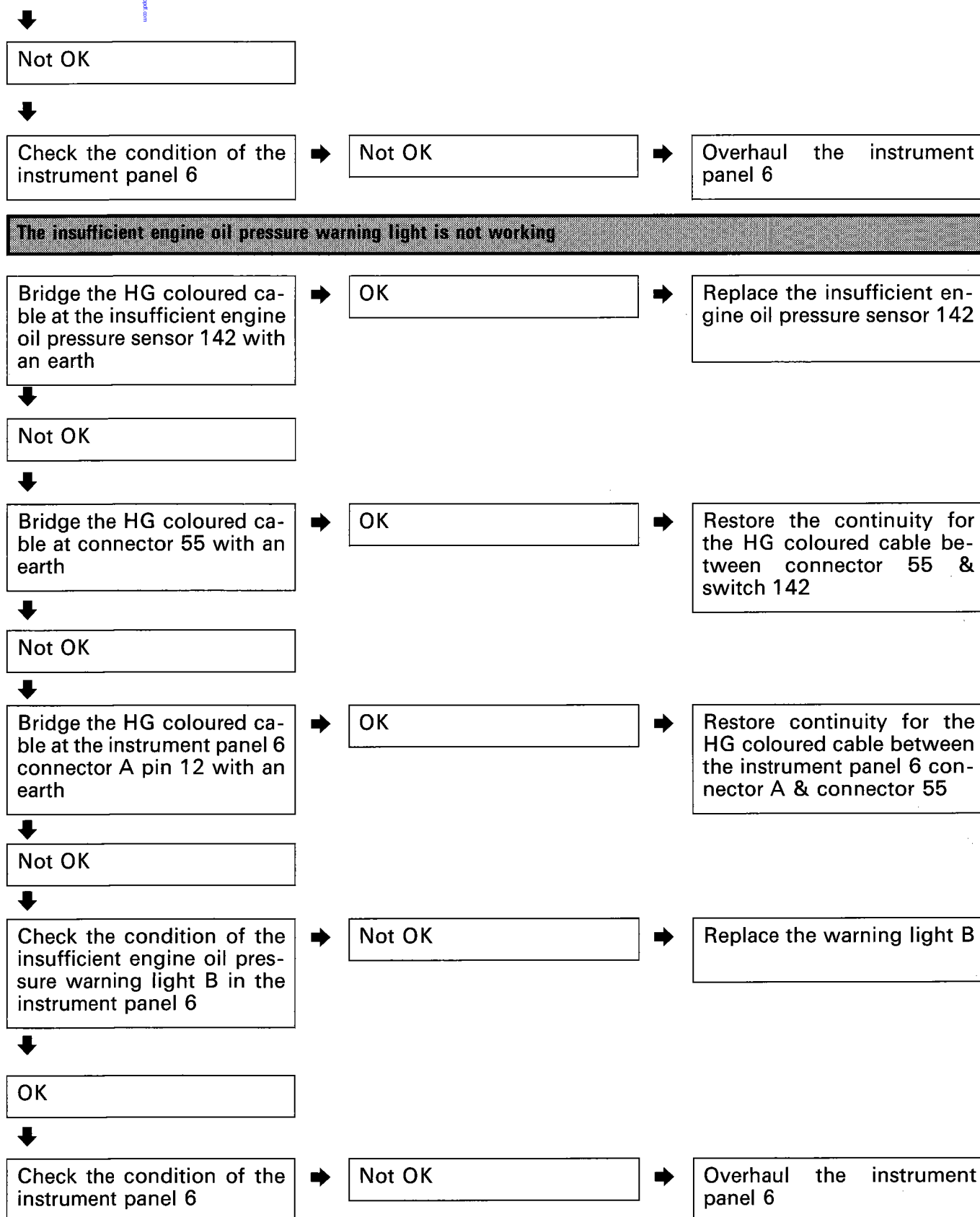


55D.

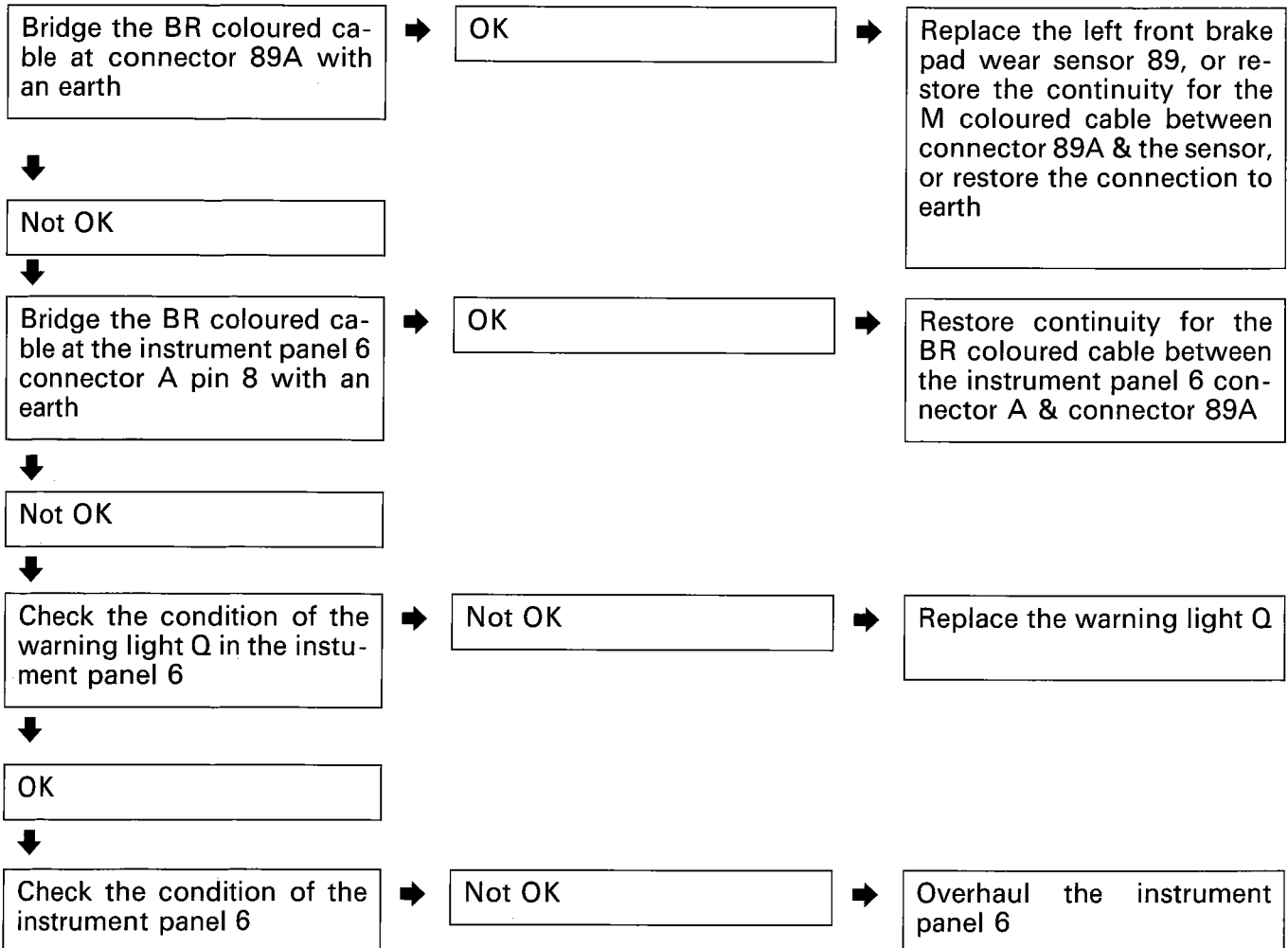


The insufficient brake fluid level is not signalled

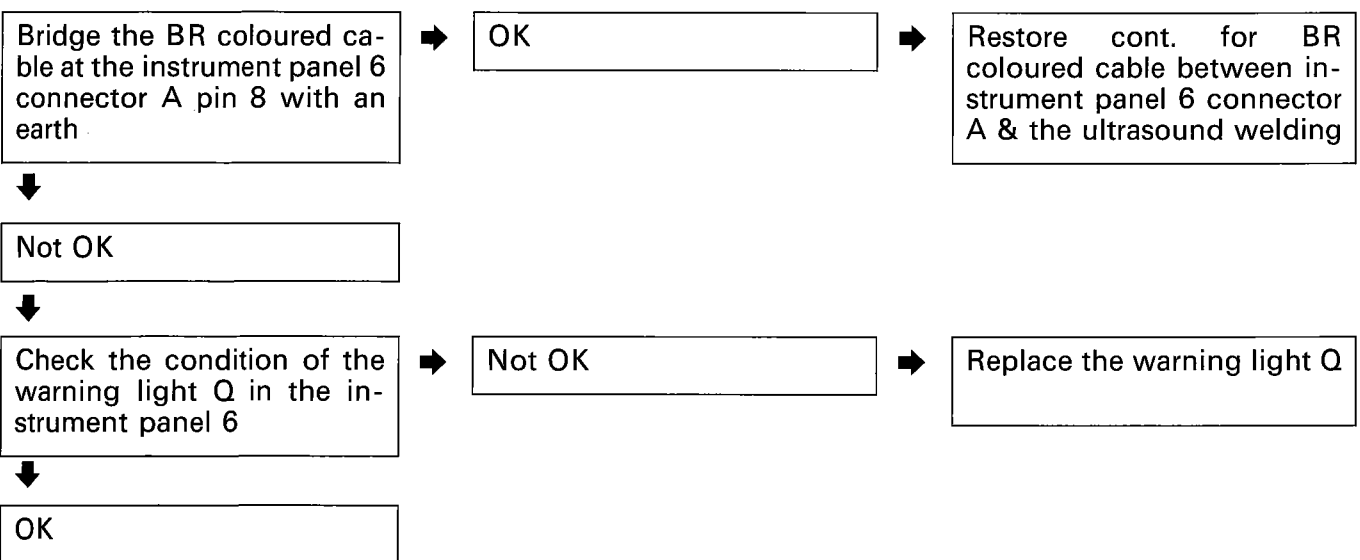




The left front brake pad wear warning light is not working



The front brake pad wear warning light is not working (Only for HGT trim level)





Check the condition of the instrument panel 6



Not OK



Overhaul the instrument panel 6

The left front brake pad wear warning light is not working (Only for HGT trim level)

Bridge the BR coloured cable at connector 89A with an earth



OK



Replace the left front brake pad wear sensor 89, or restore the continuity for the M coloured cable M between connector 89A & the sensor, or restore the connection to earth



Not OK



Bridge the BR coloured cable at the instrument panel 6 connector A pin 8 with an earth



OK



Restore the continuity for the BR coloured cable between connector 89A & the ultrasound welding (See wiring diagram)

The right front brake pad wear warning light is not working (Only for HGT trim level)

Bridge the BR coloured cable at connector 182A with an earth



OK



Replace the right front brake pad wear sensor 182A, or restore the continuity for the M coloured cable between connector 182A and the sensor, or restore the connection to earth



Not OK



Bridge the BR coloured cable at connector 13 with an earth



OK



Restore the continuity for the BR coloured cable between connector 13 & connector 182A



Not OK



Bridge the BR coloured cable at the instrument panel 6 connector A pin 8 with an earth



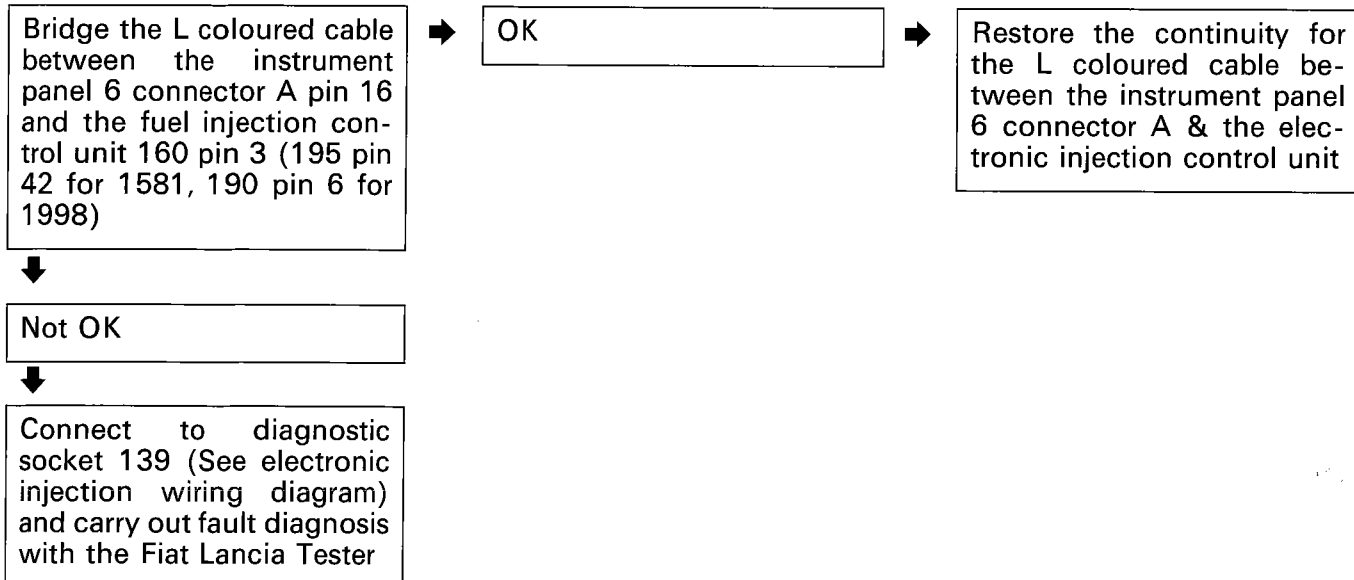
OK



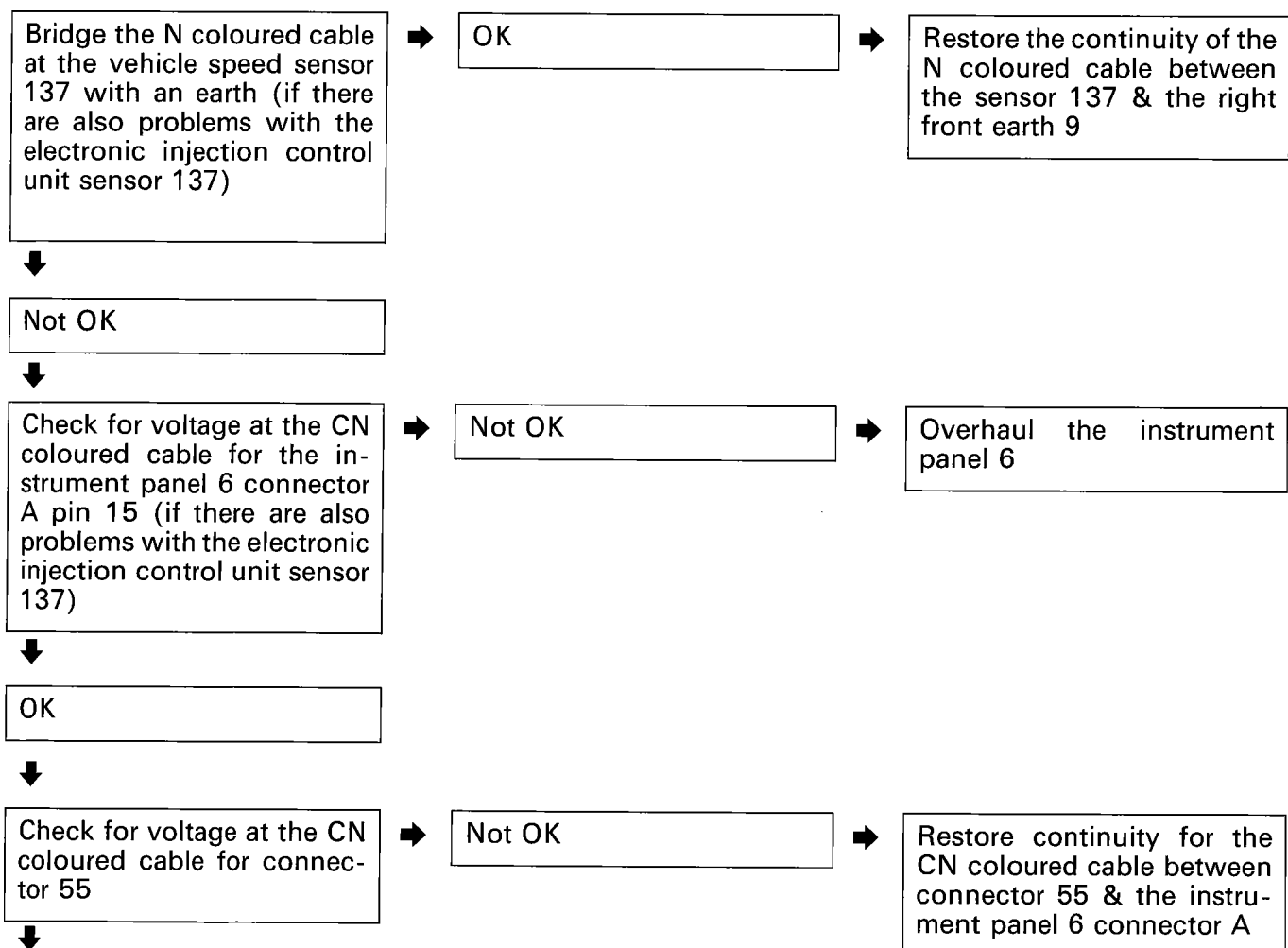
Restore the continuity for the BR coloured cable between connector 13 & the ultrasound welding

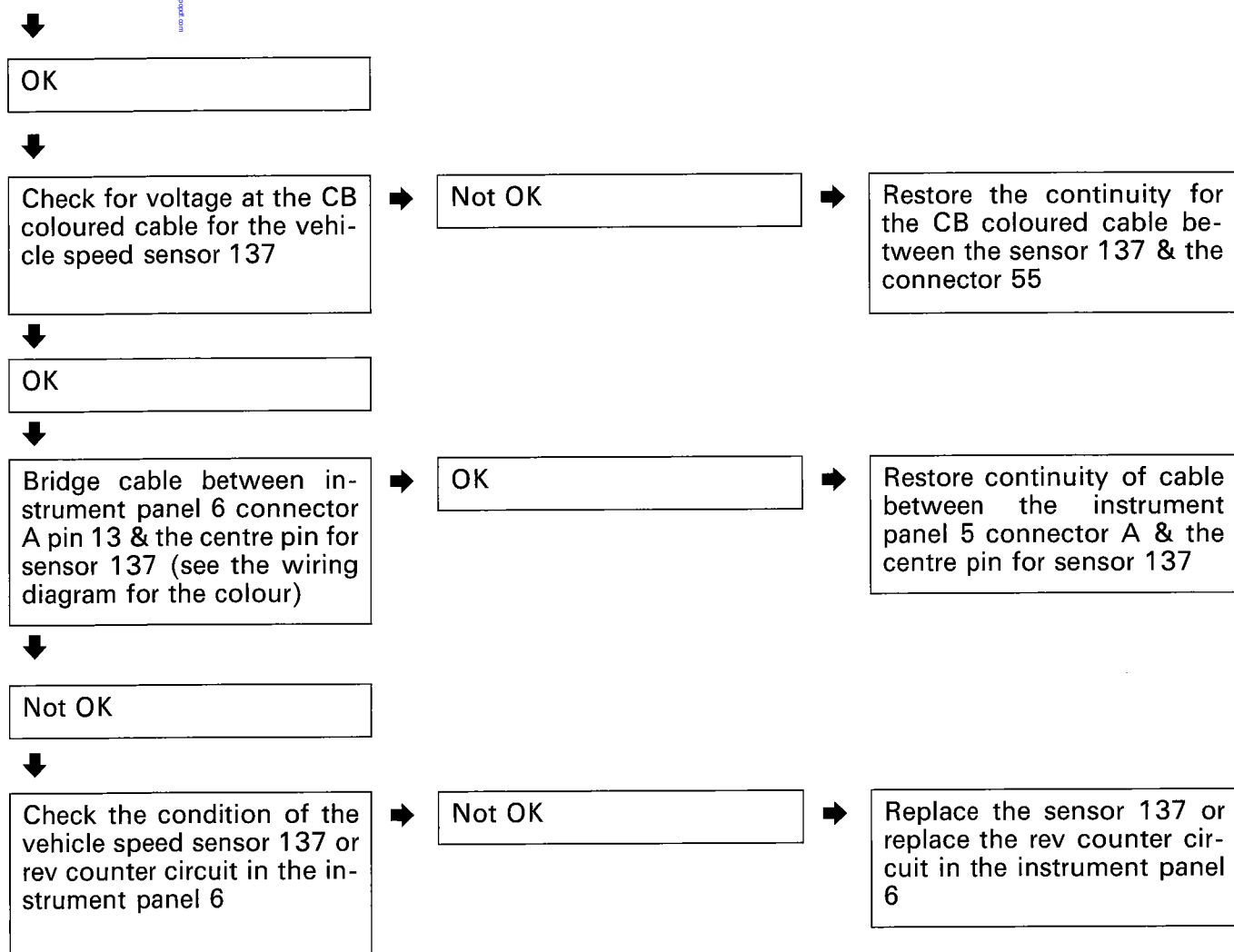
55D.

The rev counter is not working



The speedometer is not working





Components key

- 1 Left front light cluster
2 Right front light cluster
3 Power fuse box
 A 30A protective fuse for injection system (60A for D versions)
 B 40A protective fuse for ignition system
 C 60A protective fuse for optional extras
 D 80A protective fuse for junction unit
4 Junction unit:
 E1 Ignition discharge relay
 E2 Horn relay feed
 E3 Heated rear windscreen relay feed
5 Dipped headlamps relay feed
6 Instrument panel:
 A Battery recharging warning light
 B Insufficient engine oil pressure warning light
 C Left direction indicator warning light
 D Right direction indicator warning light
 E Side lights warning light
 F Instrument panel ideograms light
 G Main beam headlamps warning light
 H Air bag system failure warning light
 I Anti-lock braking system failure warning light (ABS)
 J Fuel reserve circuit control module
 J1 Warning light signalling fuel reserve
 K Fuel level gauge
 L Fiat CODE device failure warning light
 M Injection system failure warning light petrol/ds
 N Maximum turbocharging pressure warning light
 O Heater plugs warning light
 Q Front brake pad wear warning light
 R Handbrake applied/insufficient brake fluid level warning light
 S Brake light failure signalling device electronic control module
 T Warning light signalling brake lights failure
 U Doors ajar warning light
 V Speedometer control module
 V1 Speedometer
 W Rev counter

- X Water temperature gauge
Z Milometer / trip meter display
Z1 Pulsante azzeramento chilometri parziali
7 Steering column switch unit:
 A Windscreen wiper speed control
 B Windscreen washer/headlamp washer/rearscreen washer switch
 C Rearscreen wiper control switch
 D Flasher control
 E Switch for dipped/main beam headlamps
 F Switch for side lights
 G Direction indicators/hazard warning lights switch
 H Switch for direction indicators
 I Horn control
 8 Left front earth
 9 Right front earth
 10 Earth for battery on bodyshell
10A Engine earth
 11 Battery
 12 Ignition switch
 13 Front right/left cables connection
 14 Left no. plate light bulb
 15 Right no. plate light bulb
 16 Left rear light cluster
 17 Right rear light cluster
 18 Left rear earth
 19 Right rear earth
 20 Left front side direction indicator
 21 Right front side direction indicator
 22 Left dashboard earth
 23 Hazard warning lights switch unit
 A Hazard warning lights warning light
 B Hazard warning lights switch
 C Hazard warning lights ideogram light
24 Windscreen wiper motor
25 Windscreen/rearscreen electric washer pump
26 Rearscreen wiper motor
27 Contact board for rear connections with luggage compartment switch incorporated
28 Dashboard/longitudinal cables connection
28A Dashboard/longitudinal cables connection
29 Front/fog light cables connection
30 Left fog lamp
31 Right fog lamp
32 Fog lights relay
33 20A protective fuse for fog lights
34 Switch control panel:
 A Alarm on warning light
 B Rear fog lamps switch
 C Rear fog lamp relay feed

- D Rear fog lamps warning light
E Heated rear windscreen control switch
F Heated rear windscreen warning light
G Switch control unit ideogram light
H Fog lights warning light
I Fog lights switch
35 Dashboard/left front door cables connection
36 Dashboard/right front door cables connection
37 Left external heated rear view mirror resistor
38 Right external heated rear view mirror resistor
39 Heated rear windscreen
40 Brake lights control switch
41 Additional brake light
41A Additional brake light rear cables connection
42 Right dashboard earth
43 Electrical actuator for left headlamp alignment correction
44 Electrical actuator for right headlamp alignment correction
45 Headlamp alignment control unit
46 Left electric horn
47 Right electric horn
48 Radio receiver with clock
49 Left front speaker (tweeter)
50 Right front speaker (tweeter)
51 Speaker in left front door
52 Speaker in right front door
53 Left rear speaker
54 Right rear speaker
55 Front/fuel gauge cables connection
55A Left front/engine cables connection
55B Right front/engine cables connection
55C Left front/engine cables connection
56 Fuel level gauge
 A Fuel level sensor
 B Electric fuel pump
57 Inertia switch
58 Instrument panel light dimmer
59 Push button on left front pillar for courtesy light
60 Push button on right front pillar for courtesy light
61 Push button on left rear pillar for courtesy light

- 62 Push button on right rear pillar for courtesy light
63 Thermostatic switch on radiator
64 Glove compartment light bulb with switch incorporated
65 Luggage compartment light/alarm on switch
66 Electrically adjusted external rear view mirrors control panel
67 Left electrically adjusted external rear view mirror
68 Right electrically adjusted external rear view mirror
69 Cigar lighter
70 Dashboard/front cables connection
71 Electric front windows control unit
72 30A protective fuse for electric front windows
73 Left front electric window control panel
74 Right electric front window control panel
75 Right front electric window control panel on left front door
76 Left front electric window motor
77 Right front electric window motor
78 Left rear electric window control on left front door
79 Right rear electric window control on left front door
80 Electric rear windows inhibitor switch
81 30A protective fuse for electric rear windows
82 Left rear electric window control panel on left rear door
83 Right rear electric window control panel on right rear door
84 Left rear electric window motor
85 Right rear electric window motor
86 Longitudinal/left rear door cables connection
87 Longitudinal/right rear door cables connection
88 Insufficient brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection
90 Switch signalling handbrake applied
91 Power relay
92 20A protective fuse for electric sun roof

- 92A 126 Front/air conditioning cables connection
conr 127 Front left cables/cable on relay holder
93A bracket connection
128 Front/air conditioning cables connection
93B 129 50A protective power fuse for engine cooling fan
93C 130 Diagnostic socket for Air-bag
93D 131 Fiat CODE electronic control unit
132 Petrol vapour cut out solenoid valve (canister)
94 133 5A protective fuse for Air-bag
95 134 Rear/heated driver's seat cables connection
96 134A Heated driver's seat heater pad
135 Rear/heated passenger seat cables connection
97 135A Heated passenger seat heater pad
98 136 Detonation sensor
99 136A Detonation sensor
100 137 Vehicle speed sensor
101 138 Idle adjustment actuator motor
102 139 Diagnostic socket for injection system
103 140 Injection/ignition control unit (1370 spi Bosch)
106 141 Heated Lambda sensor
107A 142 Switch signalling insufficient engine oil pressure
107B 108 Alternator
109 144 Rpm and T.D.C. sensor
110 145 Starter motor
146 Potentiometer on butterfly valve
111 147 Compressor for air conditioning
148 Earth for electronic injection
112 149 Instrument injector
113 150 Injection system relay feed
151 Lambda sensor, electric fuel pump, injector relay feed
114 152 10A protective fuse for injection system (25A for 1581, 30A for 1747, 7.5A for 1998)
117 153 10A protective fuse for electric fuel pump, Lambda sensor (15A for 1747)
120 154 Engine cooling fan
121 155 Ignition coils
122 156 Spark plugs
123 157 Water temperature sensor for injection system
124 158 Water temperature sensor for instrument
125 159 Reversing lights control switch
160 Injection/ignition electronic control unit (1747 HITACHI)

- 161 Ignition power module
162 Injector (1°)
163 Injector (2°)
164 Injector (3°)
165 Injector (4°)
165A Injector (5°)
166 Idle adjustment actuator
167 Air flow meter
168 Timing sensor
170 Resistor for engine cooling fan
171 Heater unit cables connection
172 Two level thermal switch
173 Connector prepared for Compact Disc
174 Power earth for anti-lock brakes (A.B.S.)
175 Battery cables connection for anti-lock brakes (A.B.S.)
176 Diagnostic socket for anti-lock braking system (A.B.S.)
177 Sensor on left front wheel for anti-lock brakes (A.B.S.)
178 Sensor on left rear wheel for anti-lock brakes (A.B.S.)
179 Sensor on right front wheel for anti-lock brakes (A.B.S.)
180 Sensor on right rear wheel for anti-lock brakes (A.B.S.)
181 Hydraulic control unit for anti-lock brakes (A.B.S.)
182 Right wheel brake pad wear sensor
182A Right wheel brake pad wear sensor cables connection
183 Ignition coil (1°)
184 Ignition coil (2°)
185 Ignition coil (3°)
186 Ignition coil (4°)
187 Ignition coil (5°)
188 Ignition coil earth
189 Phase transformer
190 Injection/ignition electronic control unit (1998)
191 Phase transformer relay feed
192 Air temperature sensor
193 Earth for electronic injection
194 Injection cables/injector band connection
195 Injection/ignition electronic control unit (1581)
196 Multiple relay
197 Absolute pressure sensor
198 5A protective fuse for injection/ignition electronic control unit
199 Aerial for Fiat CODE

- 200 Inertia switch relay feed
201 Heater plugs control unit
202 Heater unit/air conditioning controls ideogram light bulbs
203 Air conditioning controls:
 A Air conditioning on switch
 B Air conditioning recirculation switch
204 Electric fan (206) 1st speed relay feed
205 Electric fan (206) relay feed
206 Car interior climate control fan
207 Electric fan (206) speed switch
208 Resistor for electric fan (206) speed
209 Air intake flap control actuator
210 Electronic control unit for compressor
211 Frost sensor (N.T.C.)
212 Engine cooling fan relay feed
213 Earth for Air-Bag
222 Earth for fuel system (Ds)
223 Rpm sensor
224 Instrument injector (Ds)
225 Flow meter
226 Diagnostic socket for Fiat CODE
227 Diagnostic socket for injection system (1747)
228 Heater plugs
229 Engine cut out electro-stop
230 Earth for Fiat CODE
231 Clock spring connection
232 Earth for compressor
233 Thermal relay on water pump
234 7.5A protective fuse for electrically adjusted external rear view mirrors
235 Air conditioning compressor cables connection
N.D. Ultrasound welding taped in cable loom

Cable colour code

A	Light blue	GN	Yellow/Black
B	White	GL	Yellow/Blue
C	Orange	GR	Yellow/Red
G	Yellow	GV	Yellow/Green
H	Grey	HG	Grey/Yellow
L	Blue	HN	Grey/Black
M	Brown	HR	Grey/Red
N	Black	HV	Grey/Green
R	Red	LB	Blue/White
S	Pink	LG	Blue/Yellow
V	Green	LN	Blue/Black
Z	Violet	LR	Blue/Red
AB	Light blue/White	LV	Blue/Green
AG	Light blue/Yellow	MB	Brown/White
AN	Light blue/Black	MN	Brown/Black
AR	Light blue/Red	NZ	Black/Violet
AV	Light blue/Green	RB	Red/White
BG	White/Yellow	RG	Red/Yellow
BL	White/Blue	RN	Red/Black
BN	White/Black	RV	Red/Green
BR	White/Red	SN	Pink/Black
BV	White/Green	VB	Green/White
BZ	White/Violet	VN	Green/Black
CA	Orange/Light blue	VR	Green/Red
CB	Orange/White	ZB	Violet/White
CN	Orange/Black		

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- Connector blocks	31
- Key	36

Electrical system

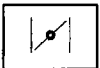
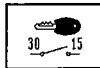
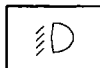
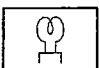
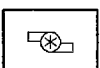
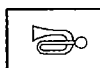
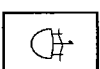
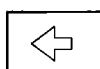
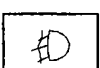
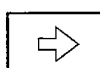
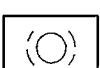
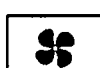
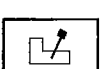
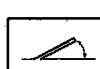
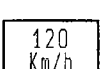
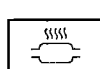
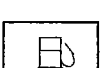
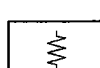
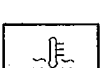
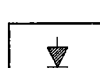
Wiring diagrams

55.

Bravo-Brava

NAME	Bravo					Brava					
	S		SX		GT	S		SX		EL	ELX
	1910 (75 bhp)	1910 (100 bhp)	1910 (75 bhp)	1910 (100 bhp)	1910 (100 bhp)	1910 (75 bhp)	1910 (100 bhp)	1910 (75 bhp)	1910 (100 bhp)	1910 (100 bhp)	1910 (100 bhp)
Version with air conditioner Engine cooling system - Water temperature gauge	5	5	5	5	5	5	5	5	5	5	5
Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system fault warning light - Rev counter		9		9	9		9		9	9	9
Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system fault warning light - Rev counter	13		13			13		13			
Version without air conditioner Engine cooling system - Water temperature gauge - Car interior ventilation	17	17	17	17	17	17	17	17	17	17	17
Windscreen wash/wipe - Rear window wash/wipe - Electric horns - Heated rear window and warning light - Headlamp washer	21	21	21	21	21	21	21	21	21	21	21
Air conditioner	29	25	29	25	25	29	25	29	25	25	25
Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pade wear warning light - Heater plugs warning light - Rev counter	33	33	33	37	37	33	33	33	33	41	41
Instrument panel connections	45	45	45	49	49	45	45	45	45	53	53

Electrical symbols

	Side lights		Choke (starter)		Ign. switch discharge
	Main beam headlamps		Water in fuel filter		Dipped headlamps
	Heated seat		Plug preheating		Indicators with central door locking
	Seat belts		Turbo compressor pressure		Electric horns
	Heated rear window		Rear fog lamps		Left indicator
	Handbrake on and low brake fluid level		Front fog lamps		Right indicator
	A.B.S.		Brake pad wear		Engine cooling system
	Hazard		Turbo compressor pressure		Windscreen wiper
	Indicators		Auto transmission fluid temperature		Electric sunroof
	Handbrake on and low brake fluid		Speed limits		Catalytic converter temperature
	Recharging		Fuel gauge		Resistor
	Engine oil pressure		Coolant temperature		Diode

P4A001N01

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Electrical symbols

	Warning light		Trip computer control		Differential lock
	Bulb		Electronic fuel injection		Auto transmission fluid temperature
	Fuse		Engine oil level		Temperature
	Switch open		Brake fluid level (Japan version)		Anti-theft device
	Selector switch		Doors open		Electric windows
	Button open		Door locking		Earth
	Coil-controlled switch (Relay)		Sport function controlled damping suspension		No. plate lights
	Engine		Transistor		Pulse (Timer) generator
	Rear window wiper		Air Bag		Analogue clock
	Headlamp washer		A.B.S. (Japan version)		Digital clock
	Windscreen wash/wipe		Car stop fault		Speedometer
	Rear wash/wipe window		Windscreen wiper		Rev counter

P4A002N01

Electrical symbols



Digital speedometer



Digital rev counter



Digital fuel gauge



Analogue fuel gauge



Analogue coolant temperature gauge



Econometer



Digital coolant temperature gauge



Engine oil temperature



Engine oil pressure gauge

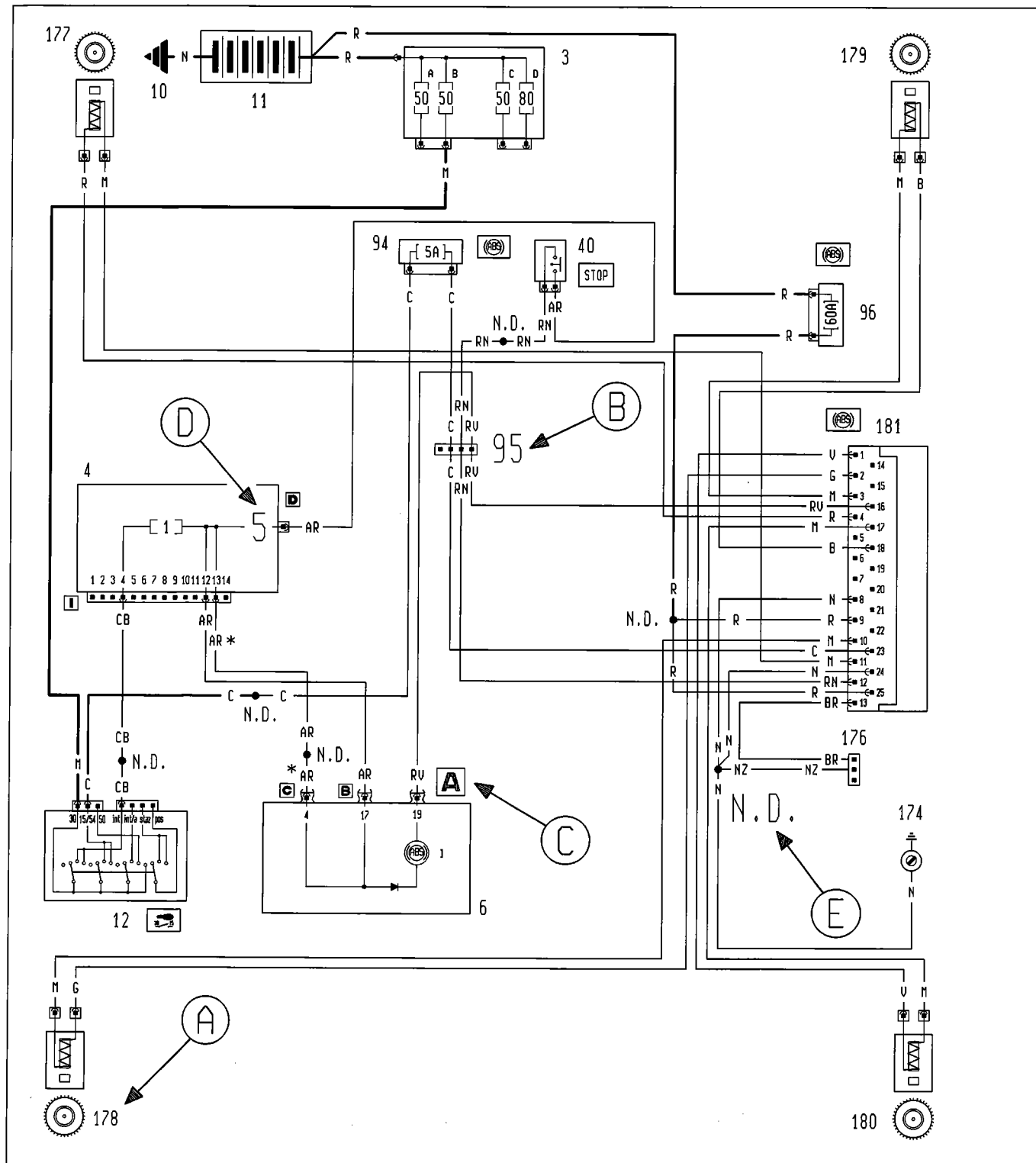


Voltmeter

P4A003N01

55.

Explanation to reading wiring diagram

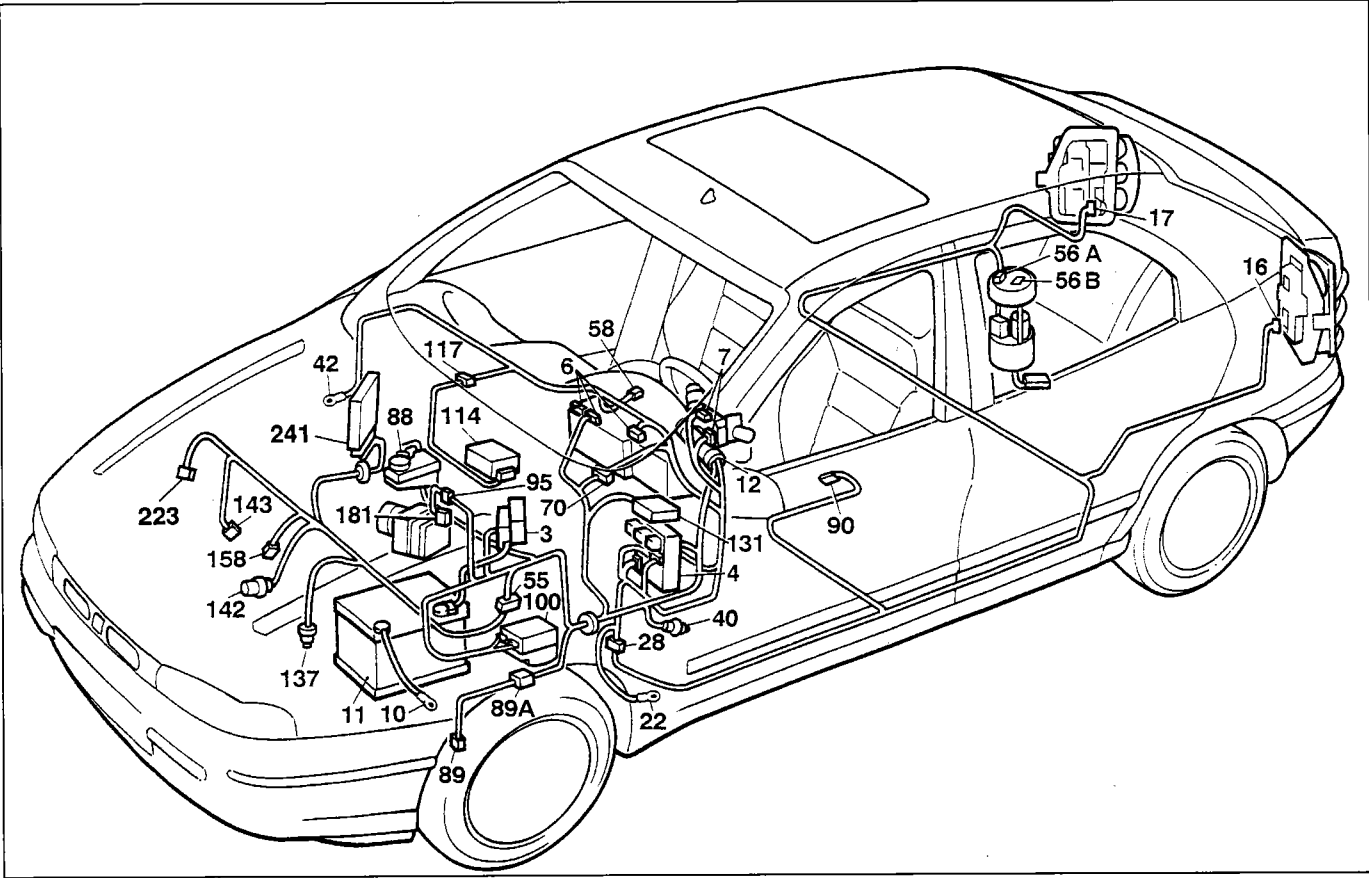


Key to references

- A Component number
- B Connection number
- C Connector identification on component
- D Connecting pin number
- E Ultrasound-soldered joint taped into wiring loom

P4A004N01

55.



P4A55ZL01

Version: EL - ELX
Instrument panel connections
Key to components

- 3 Power fuse box:

 - A 60A fuse protecting fuel injection system
 - B 40A fuse protecting ignition system
 - C 60A fuse protecting additional optional extras
 - D 80A fuse protecting fuse and relay unit

4 Fuse and relay unit

6 Instrument panel:

 - A Low generator charge warning light
 - B Low engine oil pressure warning light
 - C Left direction indicator warning light
 - D Right direction indicator warning light
 - E Side lights warning light
 - F Instrument panel symbol lights
 - G Main beam headlamps warning light
 - H Air Bag fault warning light
 - I Anti-lock braking system fault warning light
 - J Fuel reserve circuit control module
 - J1 Low fuel level warning light
 - K Fuel gauge
 - L Fiat CODE system fault warning light
 - M Fuel injection fault warning light
 - O Heater plugs warning light
 - Q Front brake pad wear warning light
 - R Handbrake on/low brake fluid level warning light
 - S Stop lights fault indicator electronic control module
 - T Stop lights fault warning light
 - U Doors open warning light
 - V Speedometer control module
 - V1 Speedometer
 - W Rev counter
 - X Coolant temperature gauge
 - Z Trip recorder/mileage counter
 - Z1 Trip recorder reset button
- 7 Stalk unit:

 - D Flasher button
 - E Dipped beam/main beam headlamps switch
 - F Side lights switch
 - H Direction indicators switch

10 Battery earth on body shell

11 Battery

12 Ignition switch

16 Rear left lights cluster

17 Rear right lights cluster

22 Left dashboard earth

28 Dashboard/longitudinal cables connection

40 Stop lights switch

42 Right dashboard earth

55 Front/engine cables connection

56 Fuel gauge controller

 - A Fuel level sensor
 - B Electric fuel pump

58 Lighting brightness adjustment rheostat

70 Dashboard/front cables connection

88 Low brake fluid level sensor

89 Left brake pad wear sensor

89A Left brake pad wear sensor cables connection

90 Handbrake on warning light switch

95 Front cables/anti-lock braking system (A.B.S.) cables connection

100 Alarm electronic control unit

114 Air Bag electronic control unit

117 Air Bag/dashboard cables connection

131 Fiat CODE electronic control unit

137 Vehicle speed sensor

142 Low oil pressure warning light switch

143 Alternator

158 Coolant temperature sensor for gauge

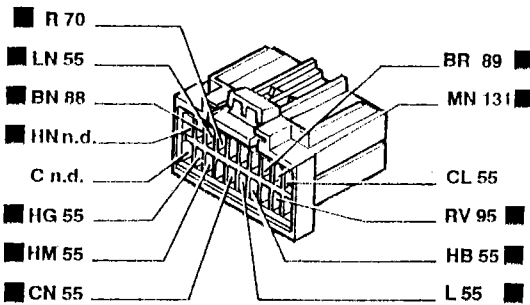
181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)

223 Wheel speed sensor

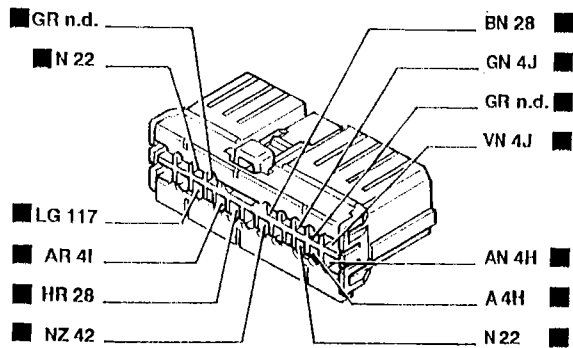
241 Fuel pump electronic control unit

N.D. Ultrasound-soldered joint taped in wiring loom

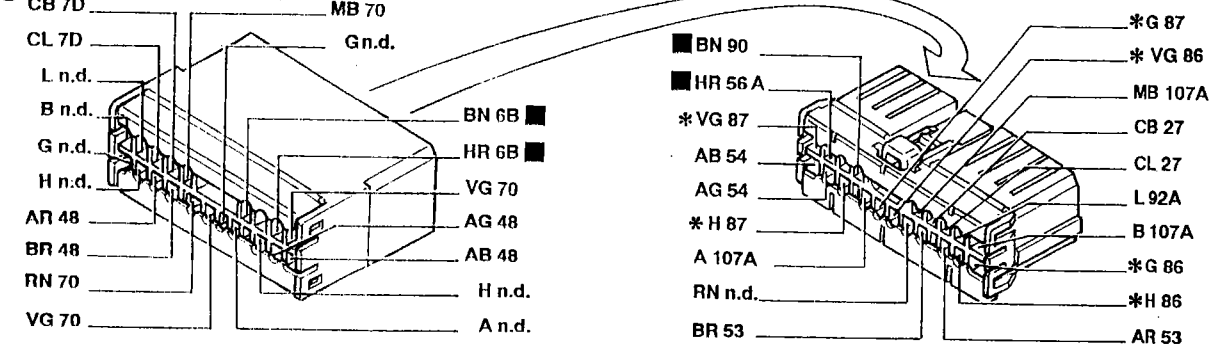
6A Instrument panel



6B Instrument panel

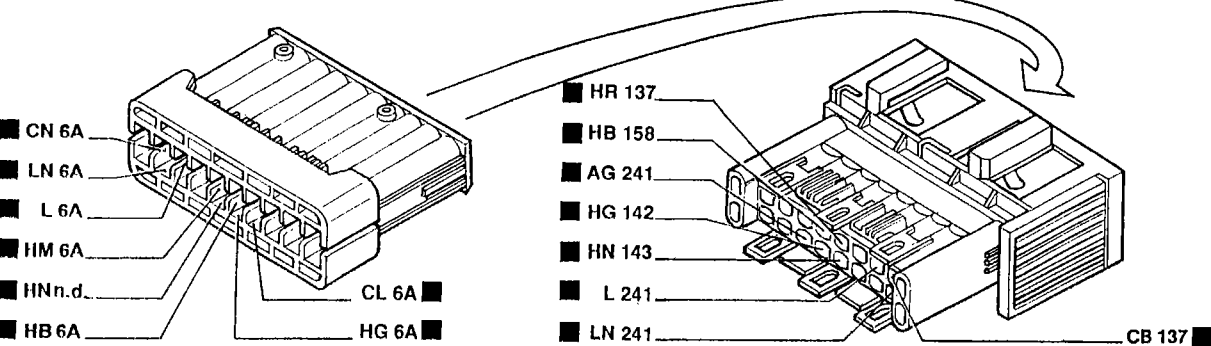


28 Dashboard/longitudinal cables connection

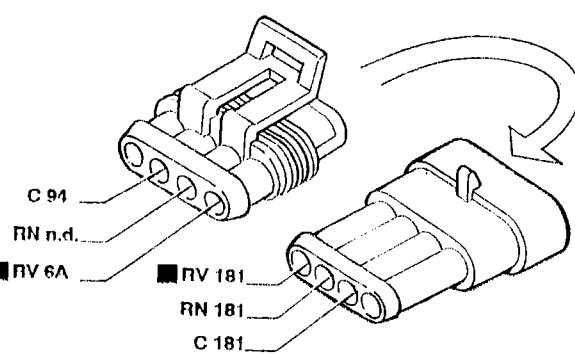


* Brava only

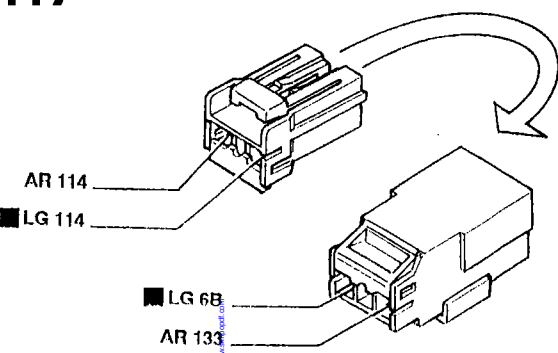
55 Front/engine cables connection



95 Front/anti-lock braking system (A.B.S.) cables connection



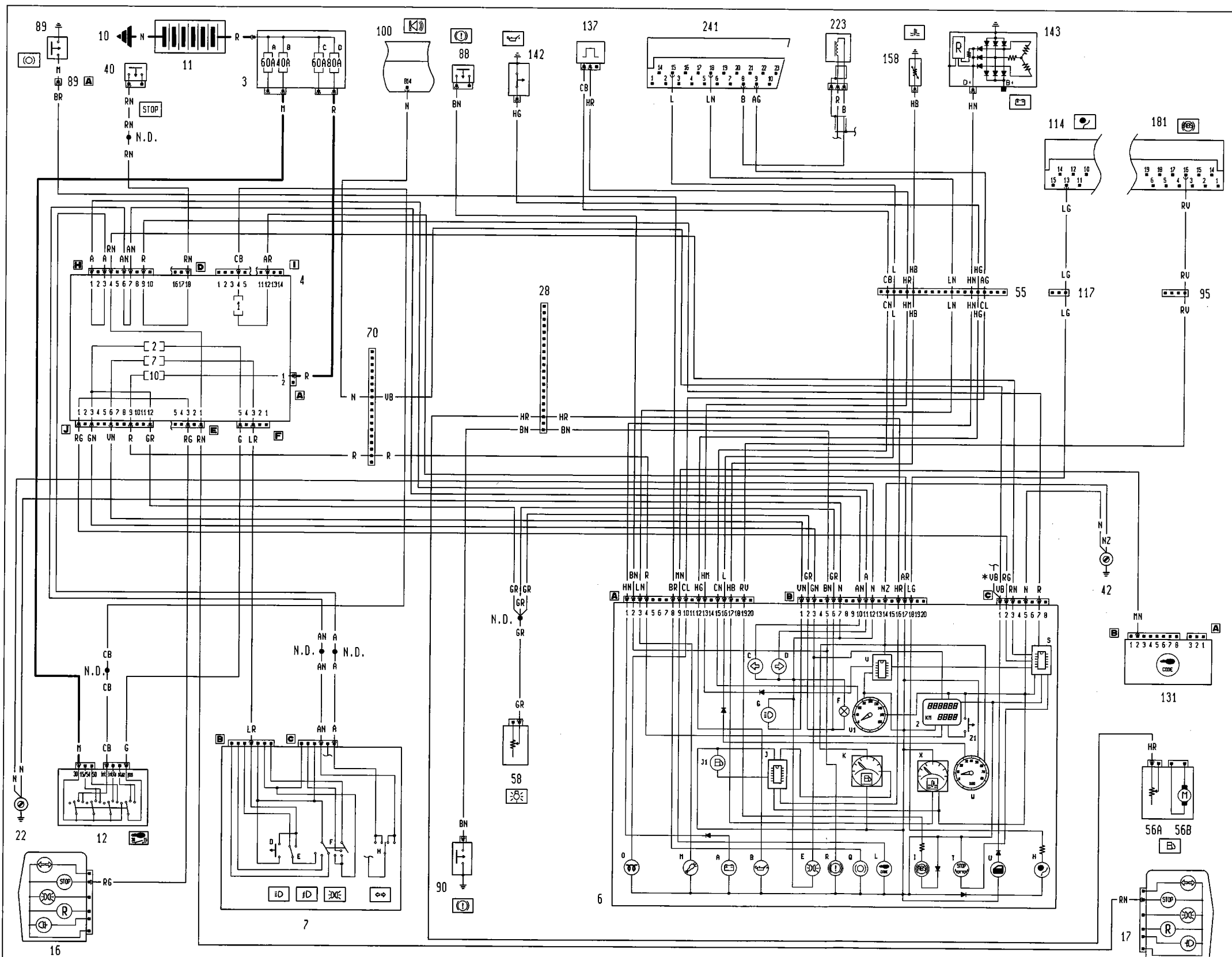
117 Air Bag/dashboard cables connection



P4A56ZL01

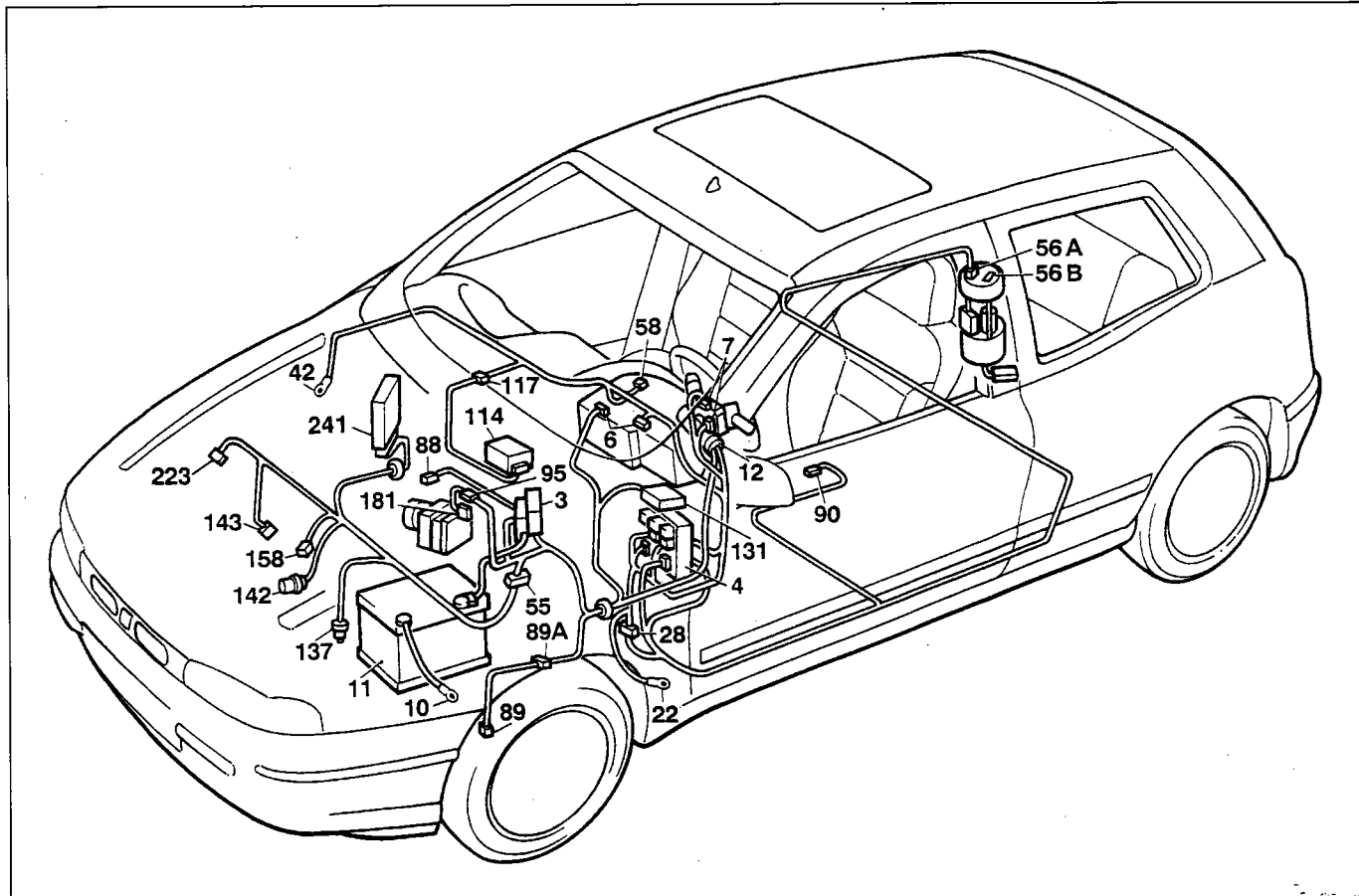
Version: EL - ELX

Instrument panel connections - (See key following diagrams)



* Variant connection for versions without alarm (see door locking)

55.



P4A51ZL01

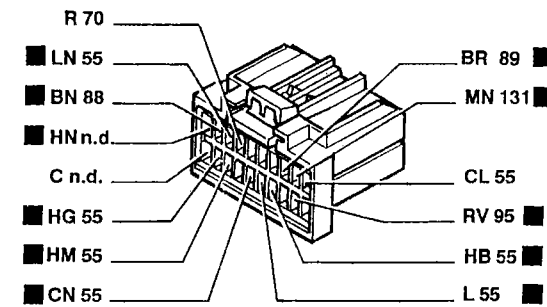
Version: SX - GT

Instrument panel connections

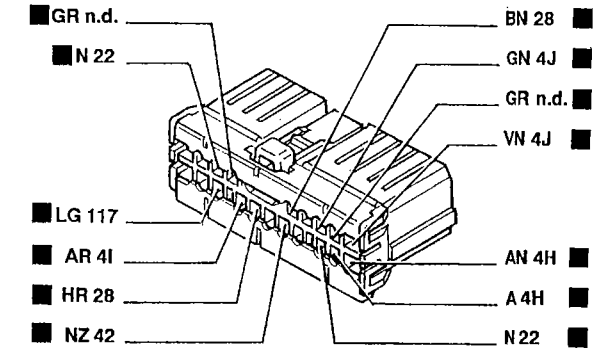
Key to components

- 3 Power fuse box:
 A 60A fuse protecting fuel injection system
 B 40A fuse protecting ignition system
 C 60A fuse protecting additional optional extras
 D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:
 A Low generator charge warning light
 B Low engine oil pressure warning light
 C Left direction indicator warning light
 D Right direction indicator warning light
 E Side lights warning light
 F Instrument panel symbol lights
 G Main beam headlamps warning light
 H Air Bag fault warning light
 I Anti-lock braking system fault warning light
 J Fuel reserve circuit control module
 J1 Low fuel level warning light
 K Fuel gauge
 L Fiat CODE fault warning light
 M Fuel injection fault warning light
 O Heater plugs warning light
 Q Front brake pad wear warning light
 R Handbrake on / low brake fluid warning light
 V Speedometer control module
 V1 Speedometer
 W Rev counter
 X Coolant temperature gauge
- 7 Stalk unit:
 D Headlamp flasher button
 E Dipped beam/main beam headlamps switch
 F Side lights switch
 H Direction indicators switch
- 10 Battery earth on body shell
 11 Battery
 12 Ignition switch
 22 Left dashboard earth
 28 Dashboard/longitudinal cables connection
 42 Right dashboard earth
 55 Front/engine cables connection
 56 Fuel gauge controller
 A Fuel level sensor
 B Electric fuel pump
 58 Lighting brightness adjustment rheostat
 88 Low brake fluid level sensor
 89 Left brake pad wear sensor
 89A Left brake pad wear sensor cables connection
 90 Handbrake on warning light switch
 95 Front cables/anti-lock braking system (A.B.S.) connection
 114 Air Bag electronic control unit
 117 Air Bag/dashboard cables connection
 131 Fiat CODE electronic control unit
 137 Vehicle speed sensor
 142 Low oil pressure warning light switch
 143 Alternator
 158 Coolant temperature sensor for gauge
 181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)
 223 Wheel speed sensor
 241 Fuel pump electronic control unit
- N.D. Ultrasound-soldered joint taped in wiring loom

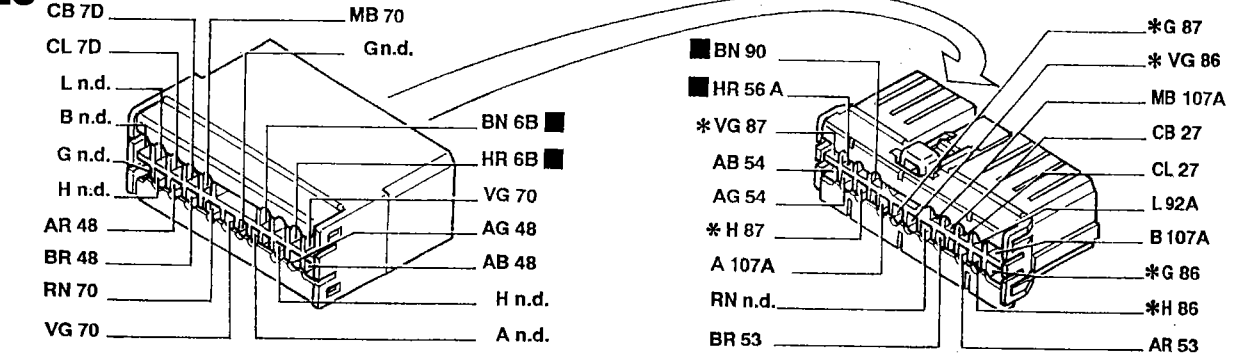
6A Instrument panel



6B Instrument panel

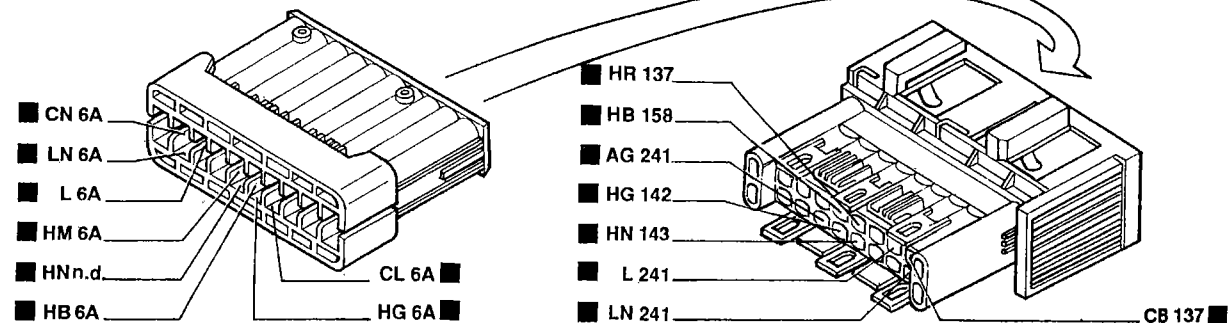


28 Dashboard/longitudinal cables connection

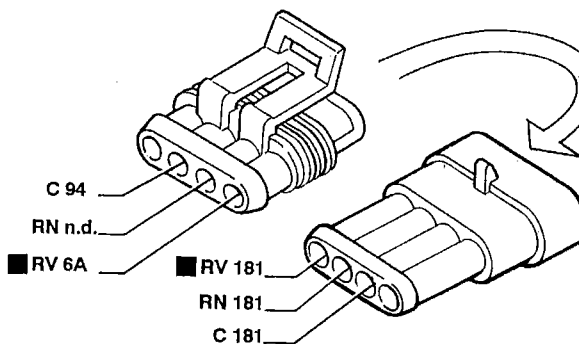


* Brava only

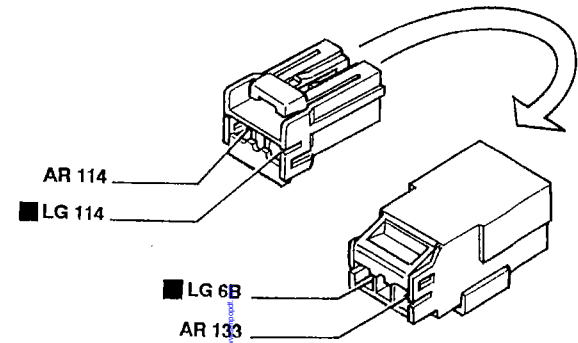
55 Front/engine cables connection



95 Front cables/anti-lock braking system (A.B.S.) cables connection



117 Air Bag/dashboard cables connection

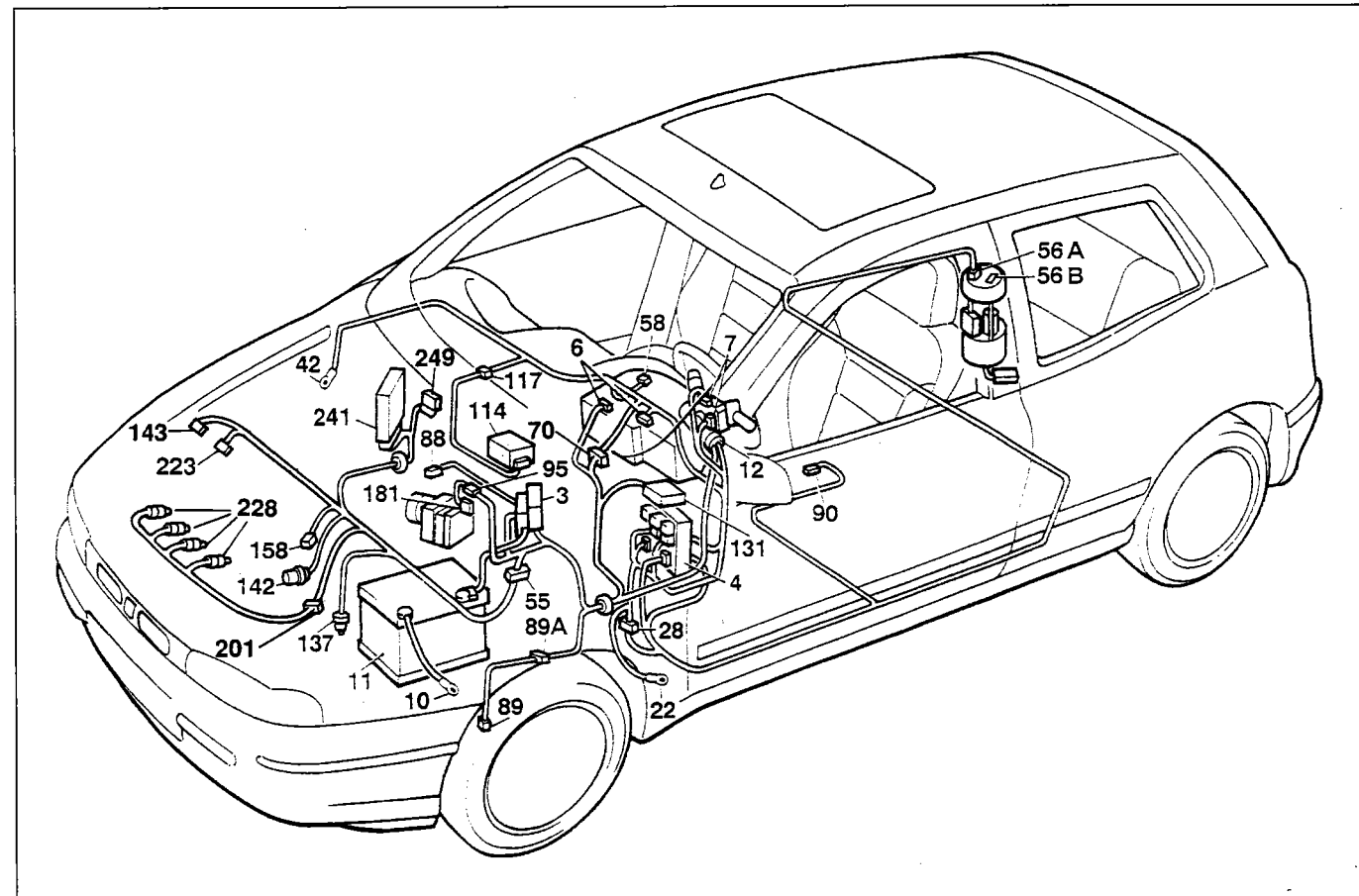


P4A52ZL01

Instrument panel connections - (See key following diagrams)



55.



P4A47ZL01

Version: S - SX

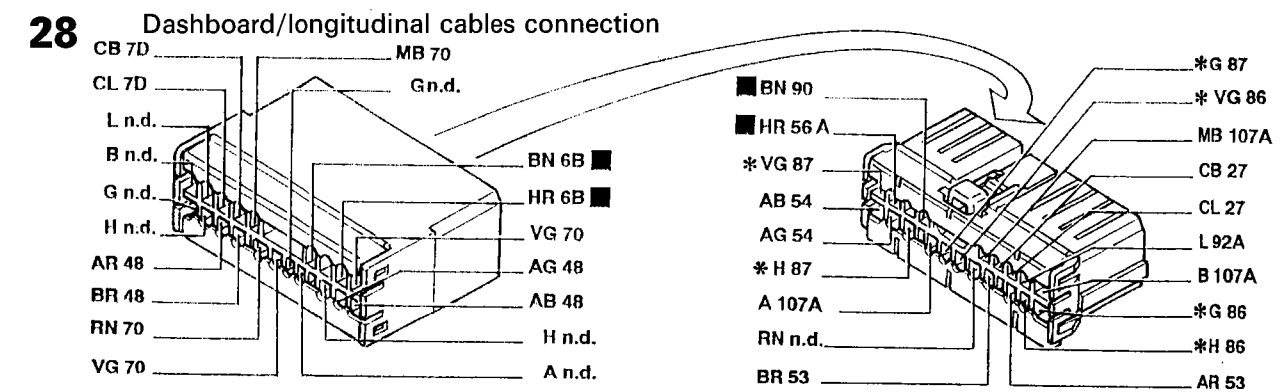
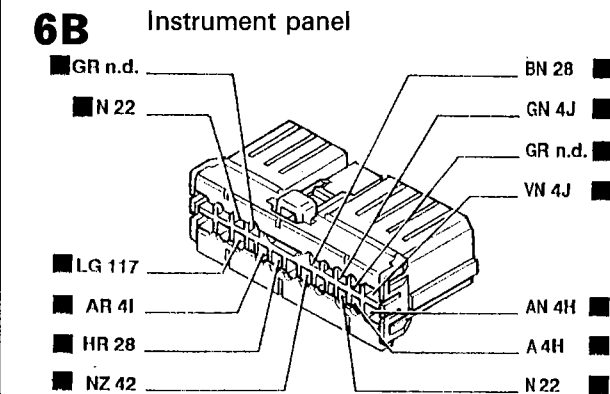
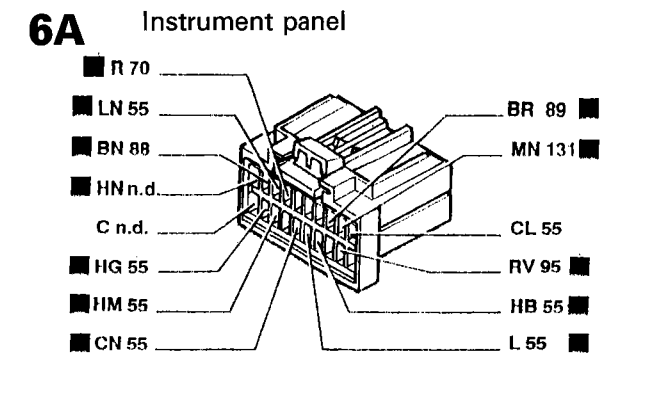
Instrument panel connections

Key to components

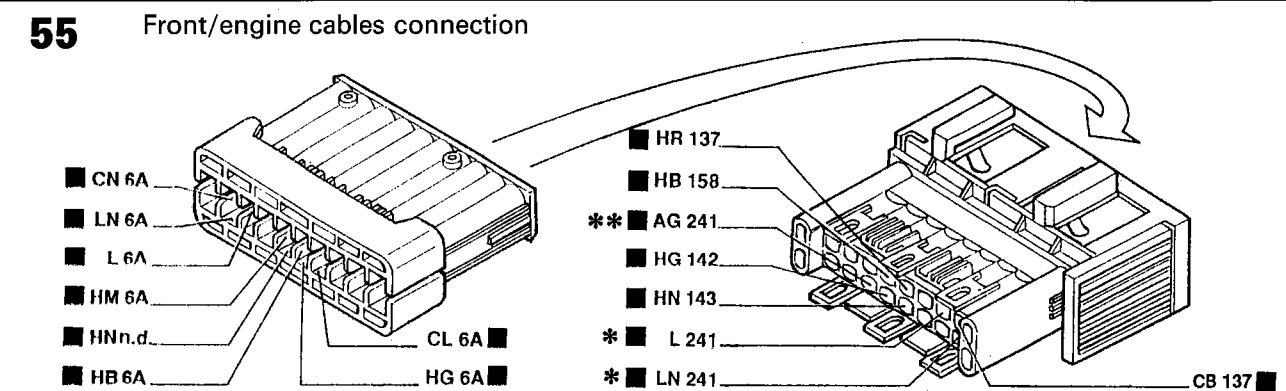
- 3 Power fuse box:
 A 60A fuse protecting fuel injection system
 B 40A fuse protecting ignition system
 C 60A fuse protecting additional extras
 D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:
 A Low generator charge warning light
 B Low engine oil pressure warning light
 C Left direction indicator warning light
 D Right direction indicator warning light
 E Side lights warning light
 F Instrument panel symbol lights
 G Main beam headlamps warning light
 H Air Bag fault warning light
 I ABS fault warning light
 J Fuel reserve circuit control module
 K Low fuel level warning light
 L Fuel gauge
 M Fiat CODE system fault warning light
 N Fuel injection fault warning light
 O Heater plugs warning light
 P Front brake pad wear warning light
 Q Handbrake on / low brake fluid level warning light
 R Speedometer control module
 S Speedometer
 T Rev counter
 U Coolant temperature gauge
 V Trip recorder / mileage counter
 W Trip recorder reset button
- 7 Stalk unit:
 D Headlamp flasher button
 E Dipped beam/main beam headlamps switch
 F Side lights switch
 H Direction indicators switch

- 10 Battery earth on body shell
 11 Battery
 12 Ignition switch
 22 Left dashboard earth
 28 Dashboard/longitudinal cables connection
 42 Right dashboard earth
 55 Front/engine cables connection
 56 Fuel gauge controller
 A Fuel level sensor
 B Electric fuel pump
 58 Lighting brightness adjustment rheostat
 70 Dashboard/front cables connection
 88 Low brake fluid level sensor
 89 Left brake pad wear sensor
 89A Left brake pad wear sensor cables connection
 90 Handbrake on warning light switch
 95 Front cables/A.B.S. cables connection
 114 Air Bag electronic control unit
 117 Air Bag/dashboard cables connection
 131 Fiat CODE electronic control unit
 137 Vehicle speed sensor
 142 Low oil pressure warning light switch
 143 Alternator
 158 Coolant temperature sensor for gauge
 181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)
 201 Plug preheating control unit
 223 Wheel speed sensor
 228 Heater plugs
 241 Fuel pump control unit
 249 E.G.R. electronic control unit

N.D. Ultrasound-soldered joint taped in wiring loom

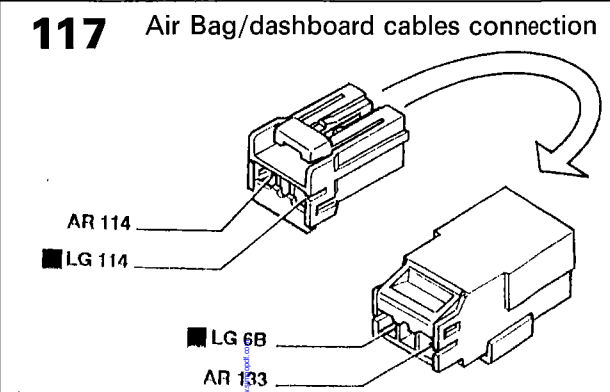
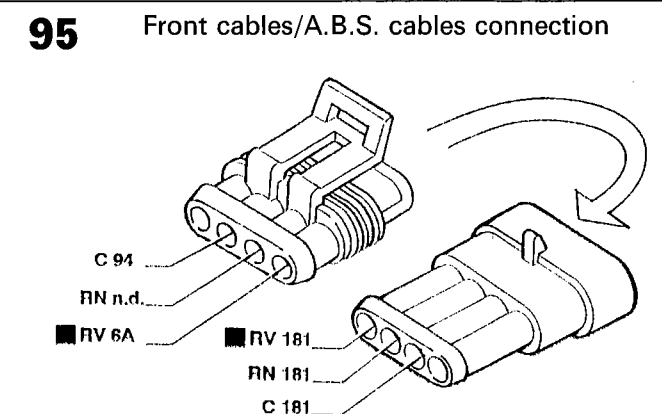


* Brava only



* N.D. for soft version (75cv)

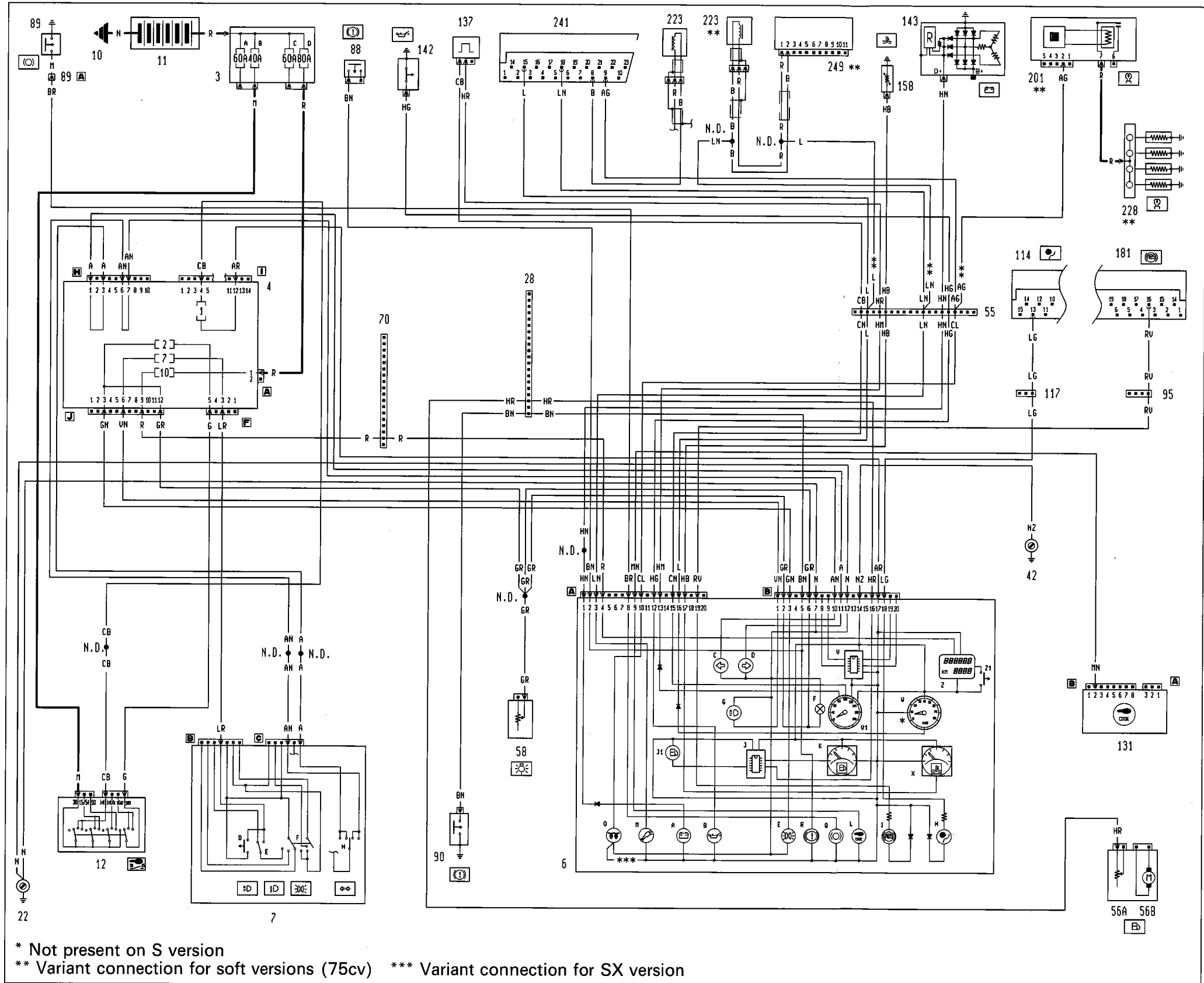
** 201 for soft version (75cv)



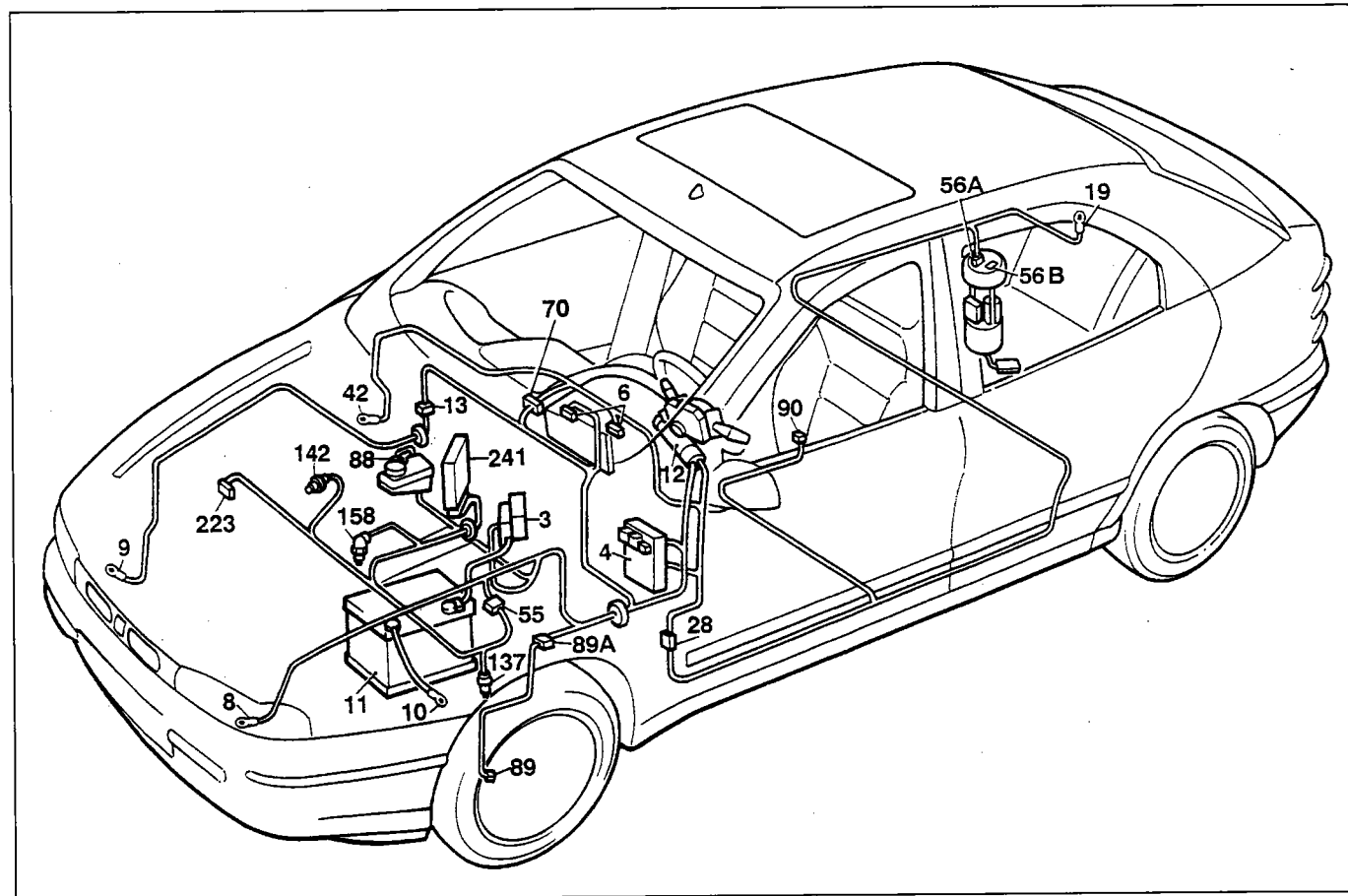
P4A48ZL01

Version: S - SX

Instrument panel connections - (See key following diagrams)



55.



P4A43ZL01

Version: EL - ELX

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter

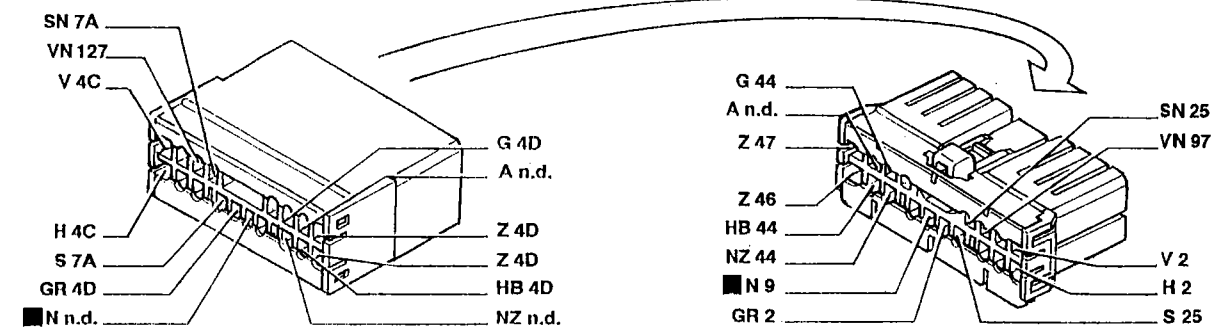
Key to components

- 3 Power fuse box:
A 60A fuse protecting fuel injection system
B 40A fuse protecting ignition system
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:
B Low engine oil pressure warning light
J Fuel reserve circuit control module
J1 Low fuel level warning light
K Fuel gauge
O Heater plugs warning light
Q Front brake pad wear warning light
R Handbrake on / low brake fluid level warning light
V Speedometer control module
V1 Speedometer
W Rev counter
X Coolant temperature gauge
Z Trip recorder/mileage counter
Z1 Trip recorder reset button
- 8 Front left earth
9 Front right earth
10 Battery earth on body shell
11 Battery
12 Ignition switch

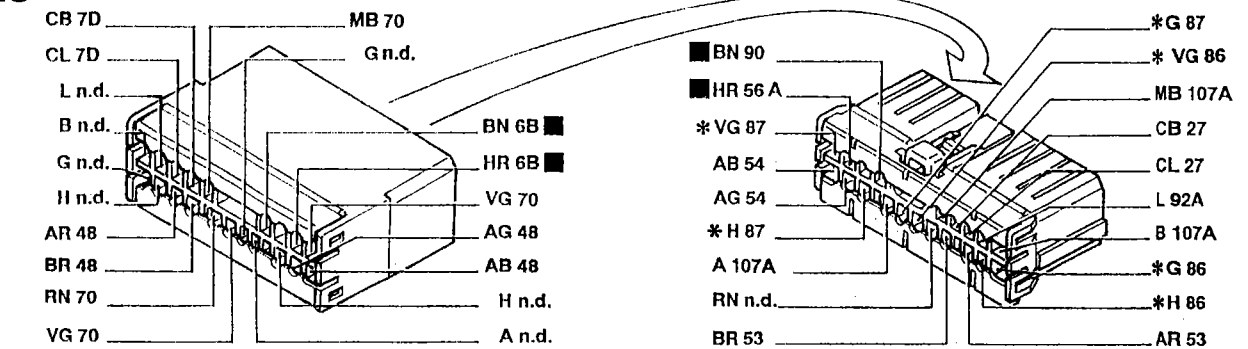
- 13 Front right/left cables connection
19 Rear right earth
28 Dashboard/longitudinal cables connection
42 Right dashboard earth
55 Front/engine cables connection
56 Fuel gauge controller
A Fuel level sensor
B Electric fuel pump
70 Dashboard/front cables connection
88 Low brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection
90 Handbrake on warning light switch
137 Vehicle speed sensor
142 Low oil pressure warning light switch
158 Coolant temperature sensor for gauge
223 Wheel speed sensor
241 Fuel pump electronic control unit

N.D. Ultrasound-soldered joint taped in wiring loom

13 Front right/left cables connection

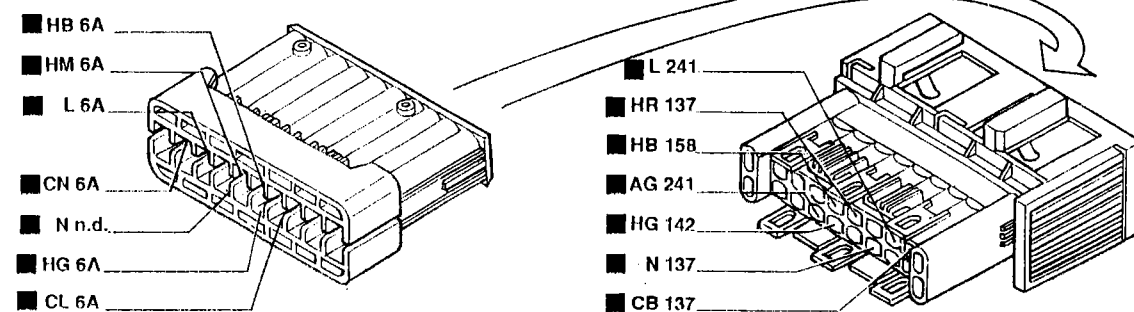


28 Dash./longitudinal cables connection

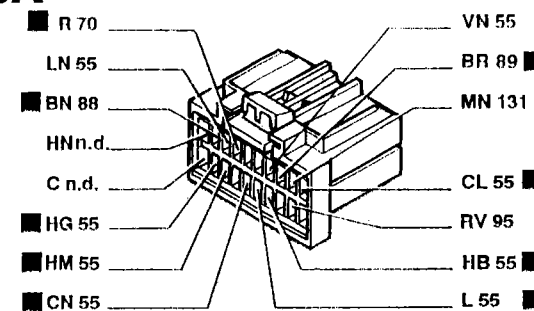


* Brava only

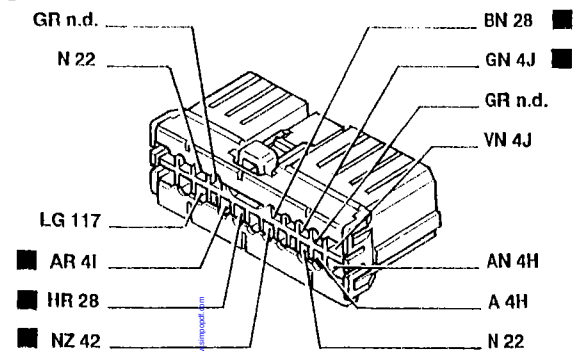
55 Front/engine cables connection



6A Instrument panel



6B Instrument panel

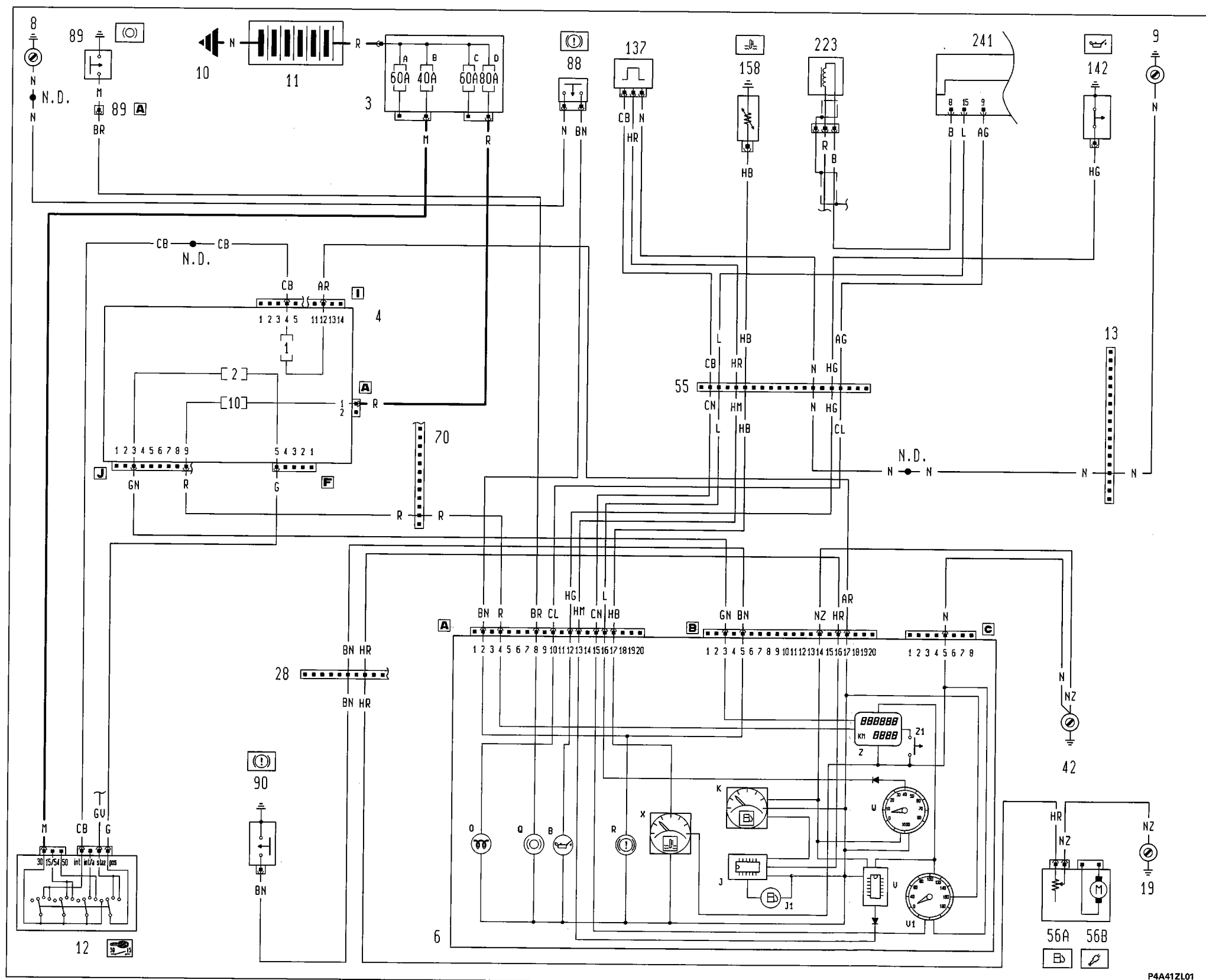


The cables involved in the wiring diagram are marked with a solid square

P4A44ZL01

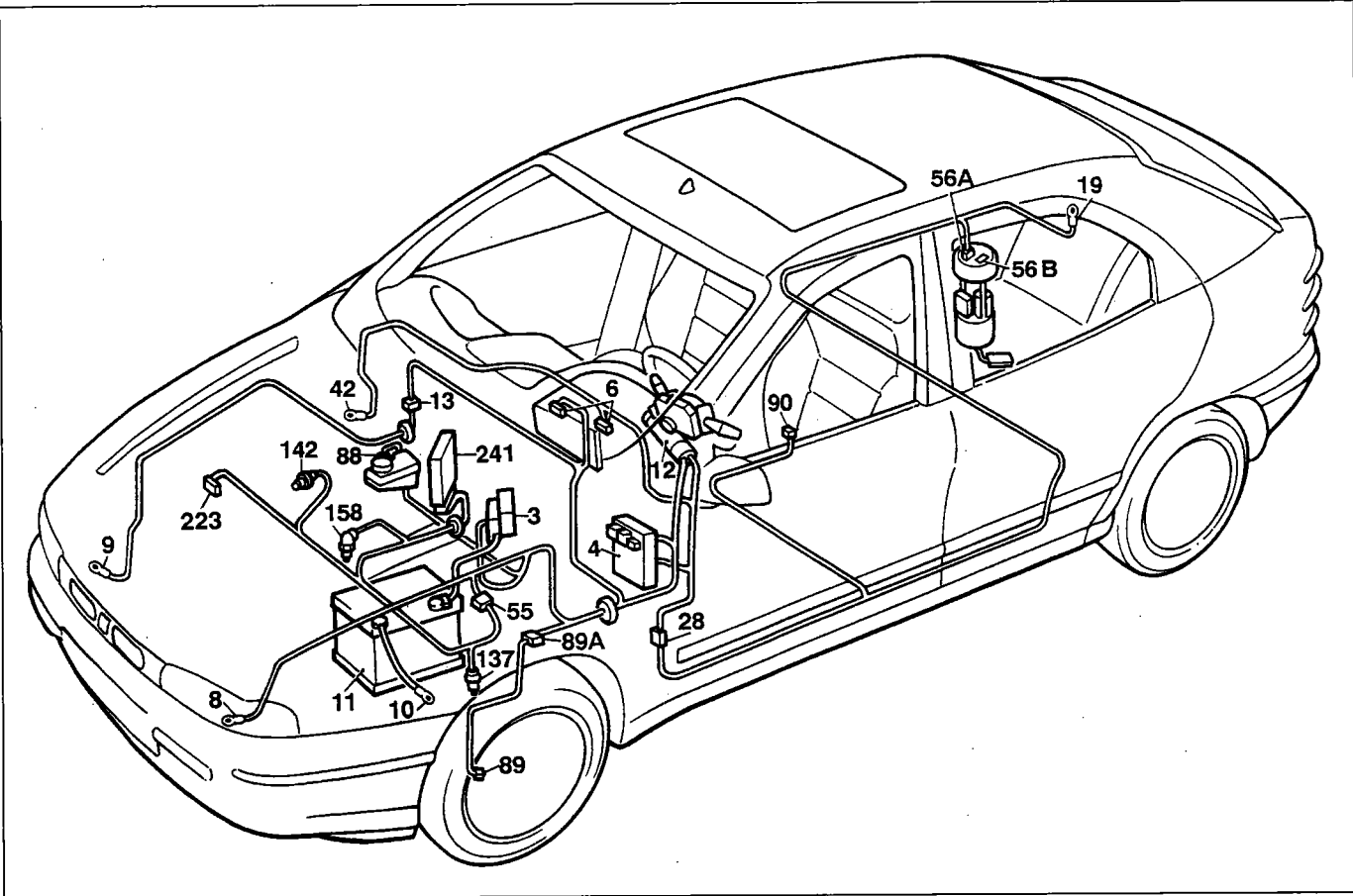
Version: EL - ELX

Fuel level gauge and reserve warning light - Handbrake on / low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter - (See key following diagrams)



P4A41ZL01

55.



P4A39ZL01

Version: SX - GT

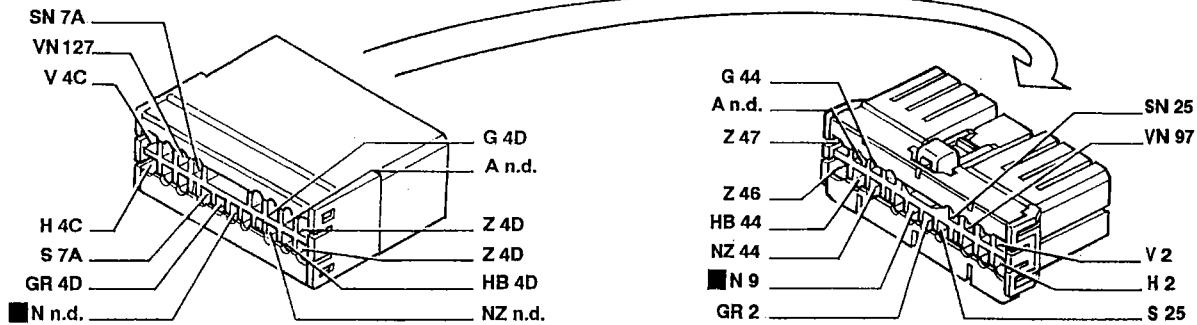
Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Water temperature gauge- Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter

Key to components

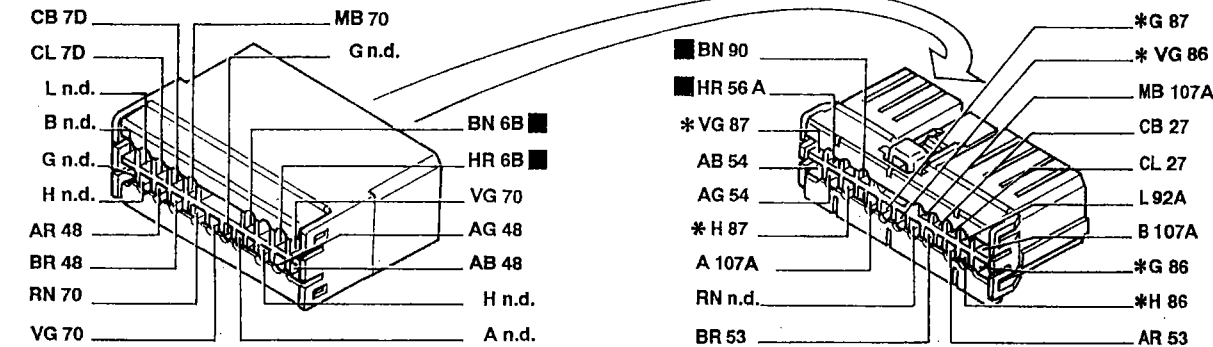
- 3 Power fuse box:
A 60A fuse protecting fuel injection system
B 40A fuse protecting ignition system
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
4 Fuse and relay unit
6 Instrument panel:
B Low engine oil pressure warning light
J Fuel reserve circuit control module
J1 Low fuel level warning light
K Fuel gauge
O Heater plugs warning light
Q Front brake pad wear warning light
R Handbrake on / low brake fluid level warning light
V Speedometer control module
V1 Speedometer
W Rev counter
X Coolant temperature gauge
8 Front left earth
9 Front right earth
10 Battery earth on body shell
11 Battery
12 Ignition switch

- 13 Front right/left cables connection
19 Rear right earth
28 Dashboard/longitudinal cables connection
42 Right dashboard earth
55 Front/engine cables connection
56 Fuel gauge sender assembly
A Fuel level sensor
B Electric fuel pump
88 Low brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection
90 Handbrake on warning light switch
137 Vehicle speed sensor
142 Low oil pressure warning light switch
158 Coolant temperature sensor for gauge
223 Wheel speed sensor
241 Fuel pump electronic control unit
N.D. Ultrasound-soldered joint taped in wiring loom

13 Front right/left cables connection

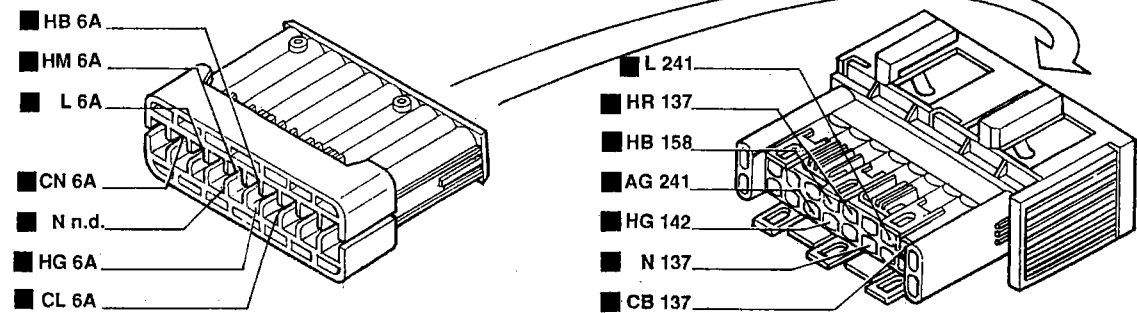


28 Dash./longitudinal cables connection

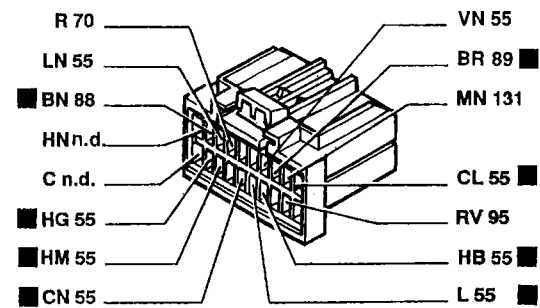


* Brava only

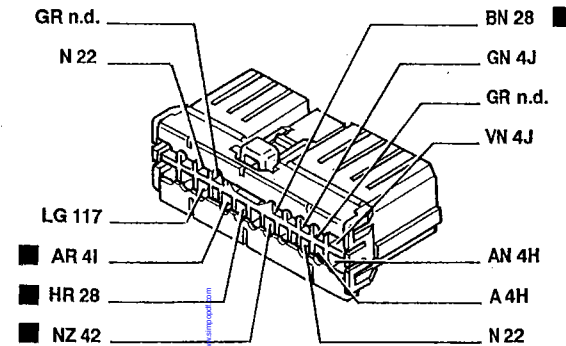
55 Front/engine cables connection



6A Instrument panel



6B Instrument panel

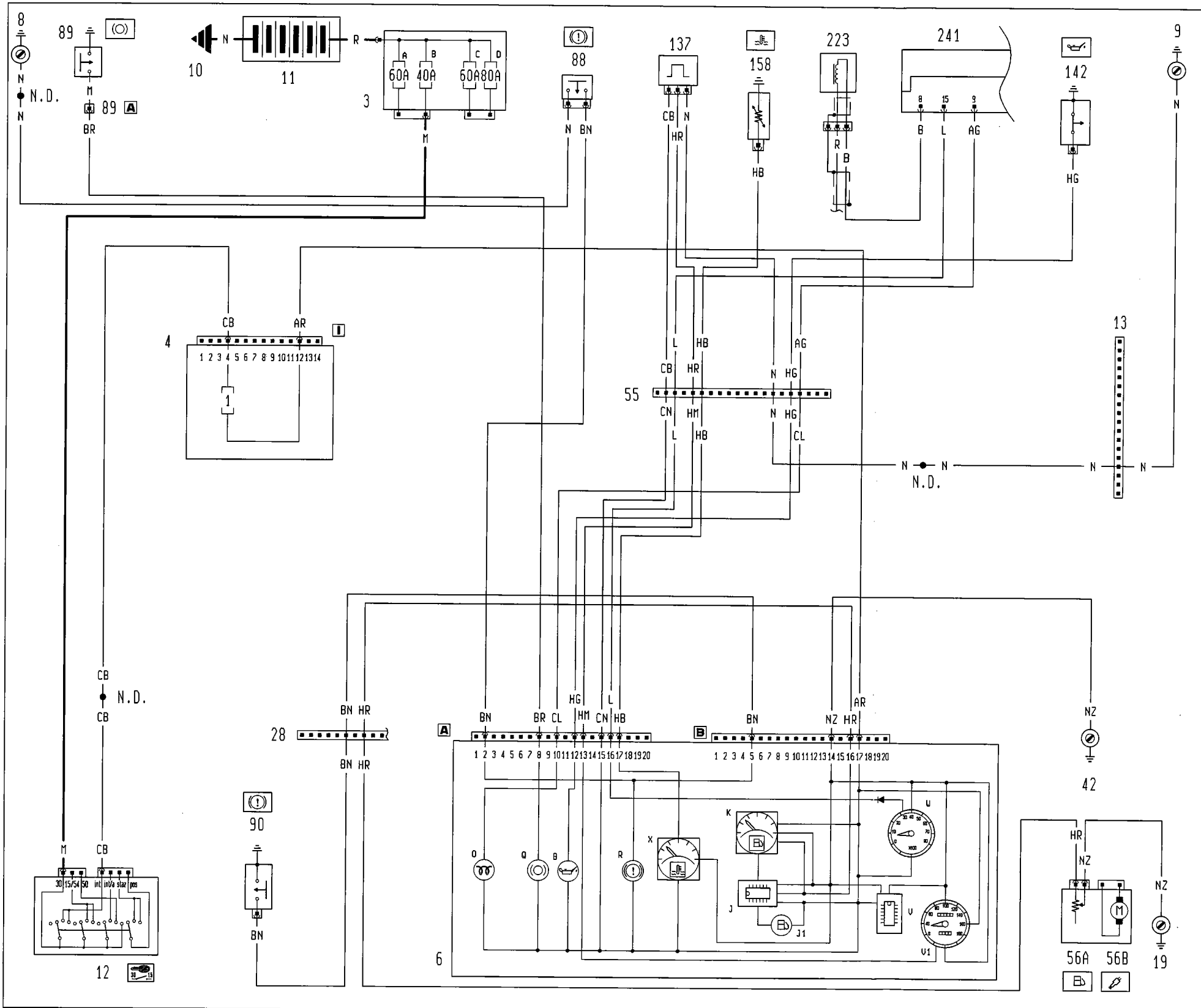


The cables involved in the wiring diagram are marked with a solid square

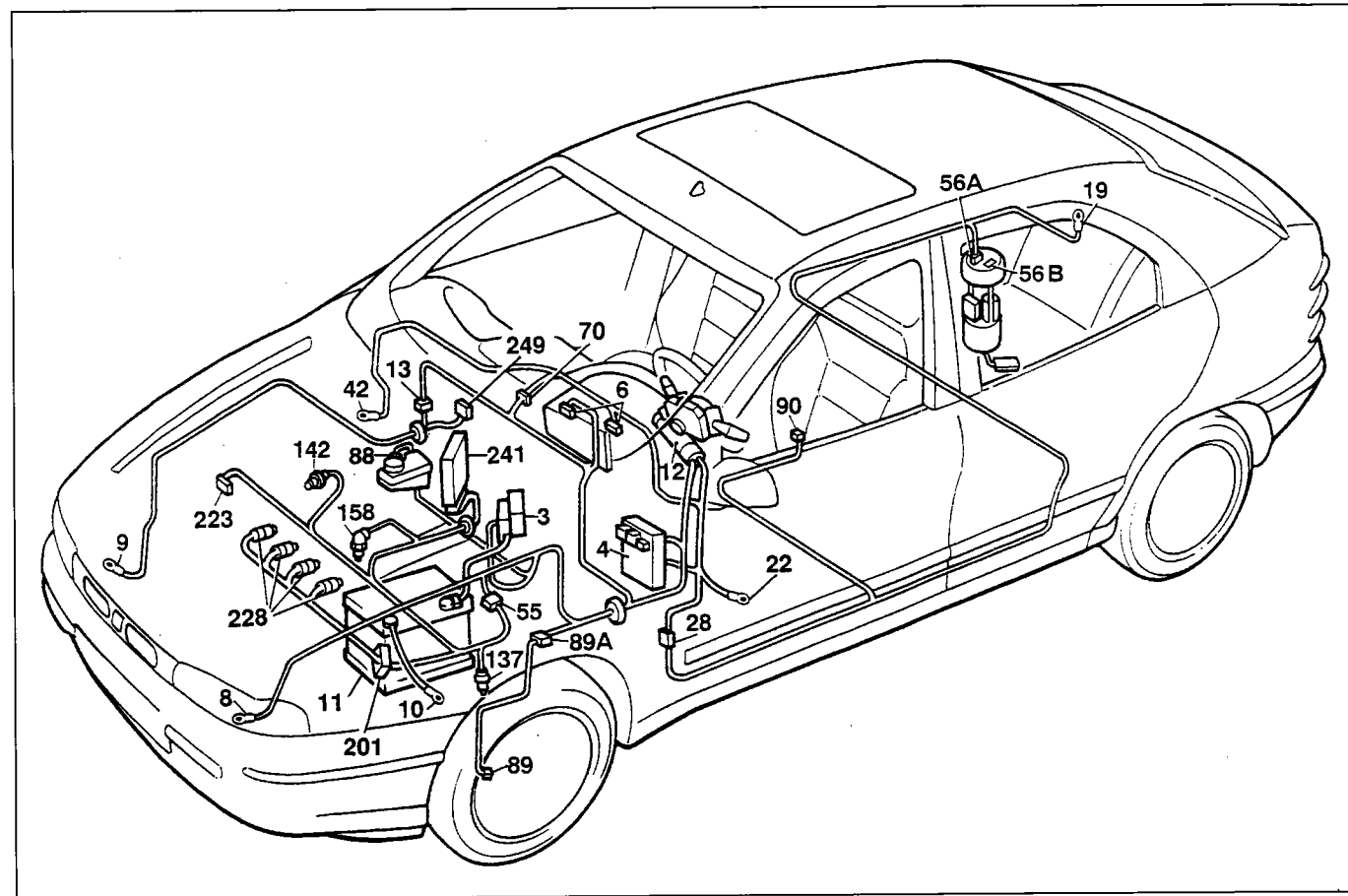
P4A40ZL01

Version: SX - GT

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter - (See key following diagrams)



55.



P4A35ZL01

Version: S - SX

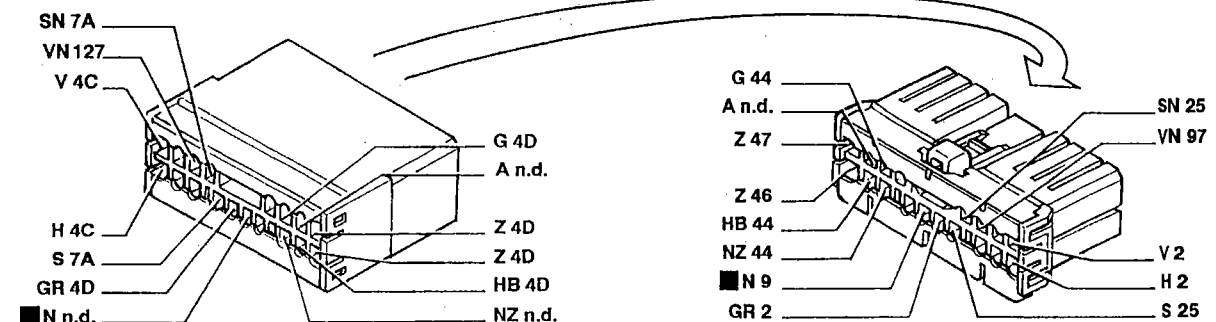
Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge- Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter

Key to components

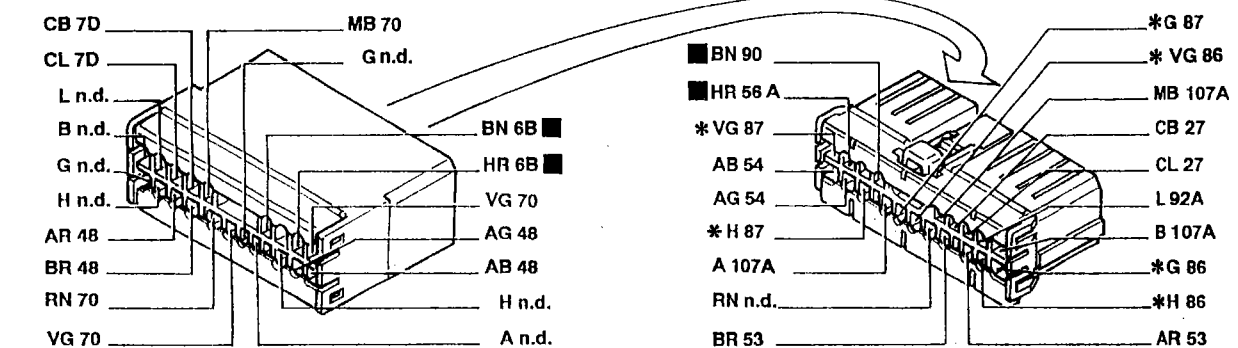
- | | |
|--|--|
| 3 Power fuse box: | 13 Front/left cables connection |
| A 60A fuse protecting fuel injection system | 19 Rear right earth |
| B 40A fuse protecting ignition system | 22 Left dashboard earth |
| C 60A fuse protecting additional optional extras | 28 Dashboard/longitudinal cables connection |
| D 80A fuse protecting fuse and relay unit | 42 Right dashboard earth |
| 4 Fuse and relay unit | 55 Front/engine cables connection |
| 6 Instrument panel: | 56 Fuel gauge sender assembly |
| B Low engine oil pressure warning light | A Fuel level sensor |
| J Fuel reserve circuit control module | B Electric fuel pump |
| J1 Low fuel level warning light | 70 Dashboard/front cables connection |
| K Fuel gauge | 88 Low brake fluid level sensor |
| O Heater plugs warning light | 89 Left brake pad wear sensor |
| Q Front brake pad wear warning light | 89A Left brake pad wear sensor cables connection |
| R Handbrake on / low brake fluid level warning light | 90 Handbrake on warning light switch |
| V Speedometer control module | 137 Vehicle speed sensor |
| V1 Speedometer | 142 Low oil pressure warning light switch |
| W Rev counter | 158 Coolant temperature sensor for gauge |
| X Coolant temperature gauge | 201 Plug preheating control unit |
| Z Trip recorder / mileage counter | 223 Wheel speed sensor |
| Z1 Trip recorder reset button | 228 Heater plugs |
| 8 Front left earth | 241 Fuel pump electronic control unit |
| 9 Front right earth | 249 E.G.R. electronic control unit |
| 10 Battery earth on body shell | |
| 11 Battery | |
| 12 Ignition switch | |

N.D. Ultrasound-soldered joint taped in wiring loom

13 Front right/left cables connection

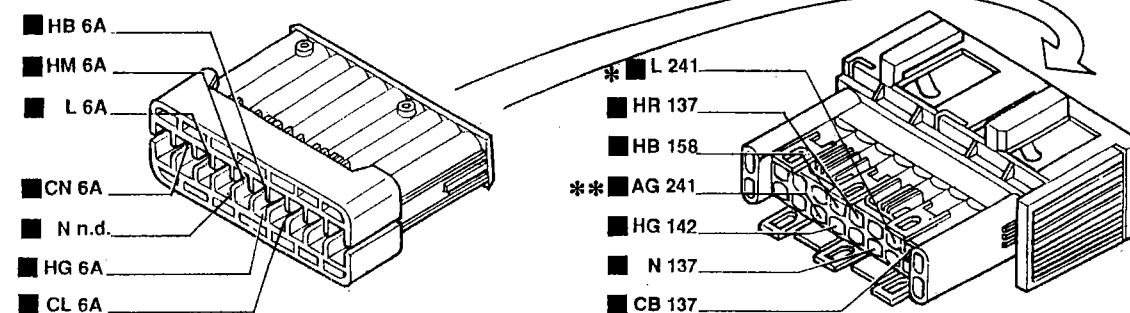


28 Dash./longitudinal cables connection



* Brava only

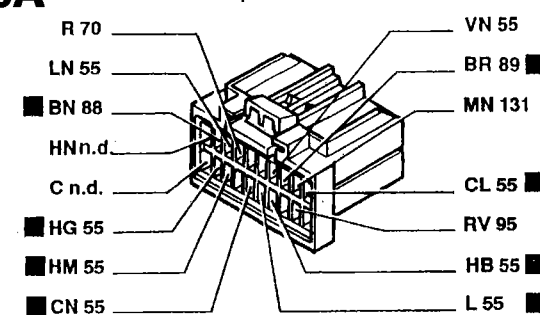
55 Front/engine cables connection



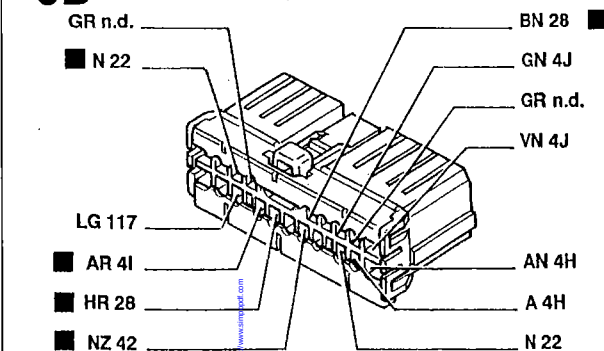
* N.D. for soft version (75cv)

** 201 for soft version (75cv)

6A Instrument panel



6B Instrument panel



The cables involved in the wiring diagram are marked with a solid square

P4A36ZL01

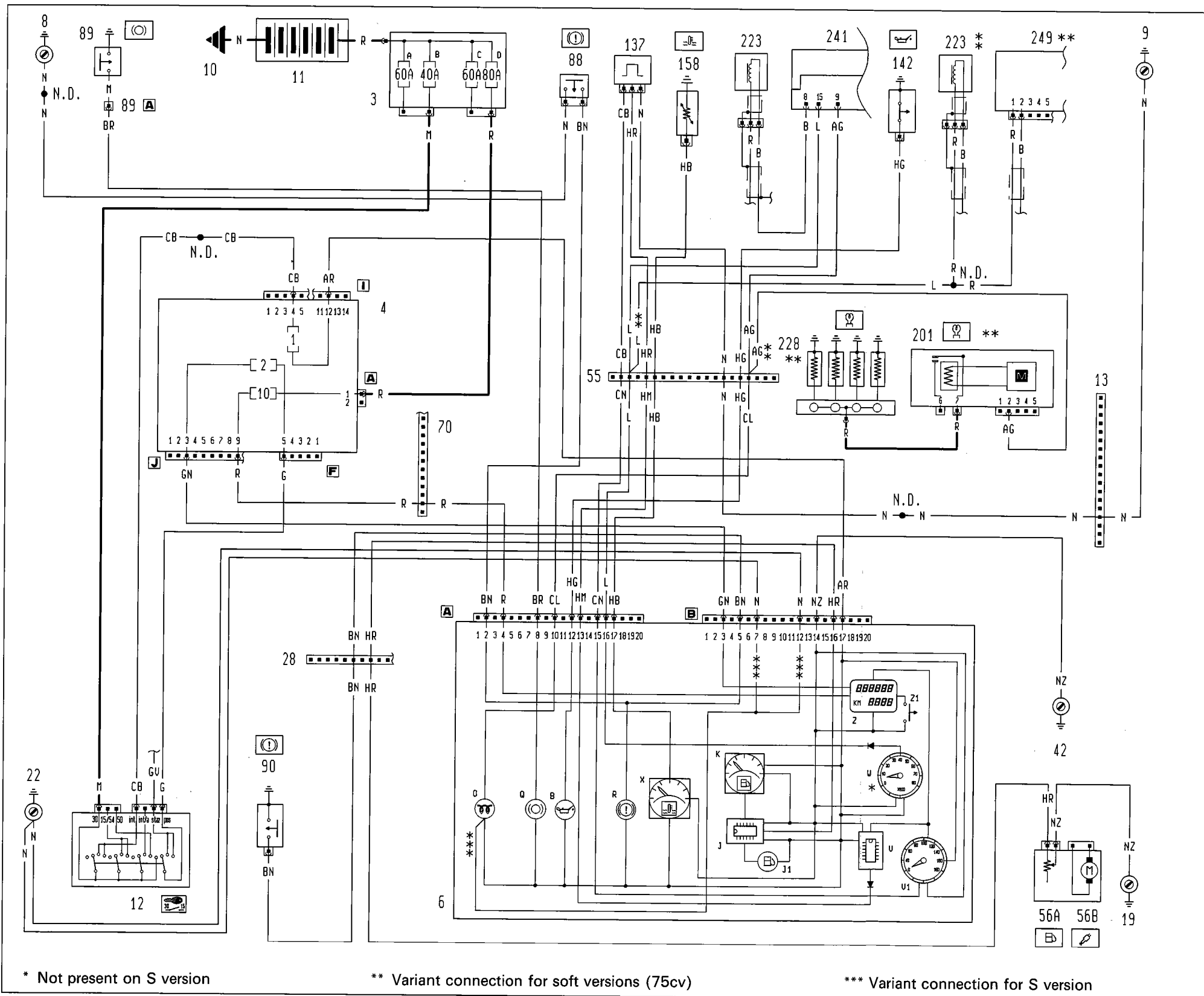
Electrical system

Wiring diagrams

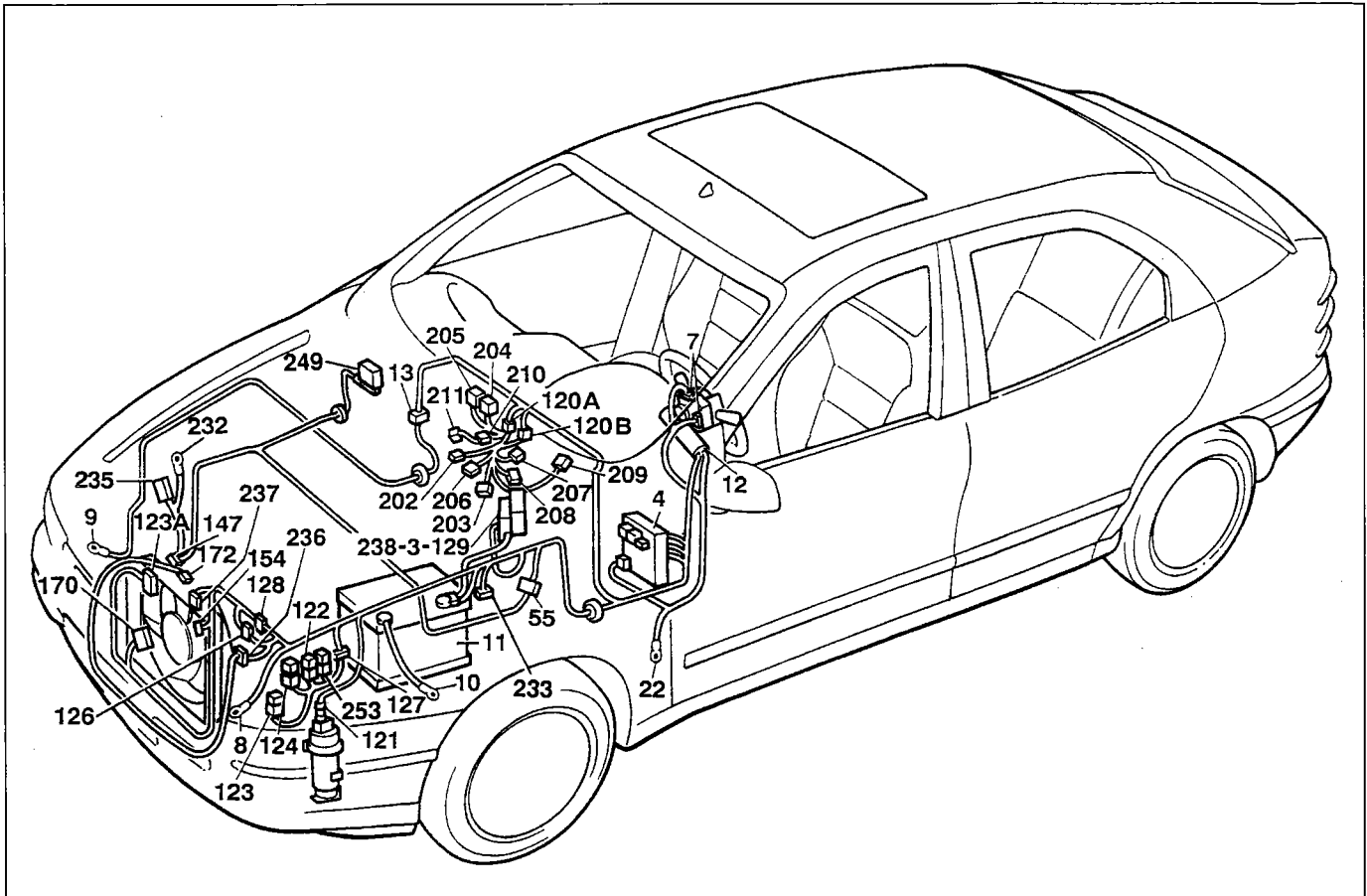
55.

Version: S -SX

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter - (See key following diagrams)



55.



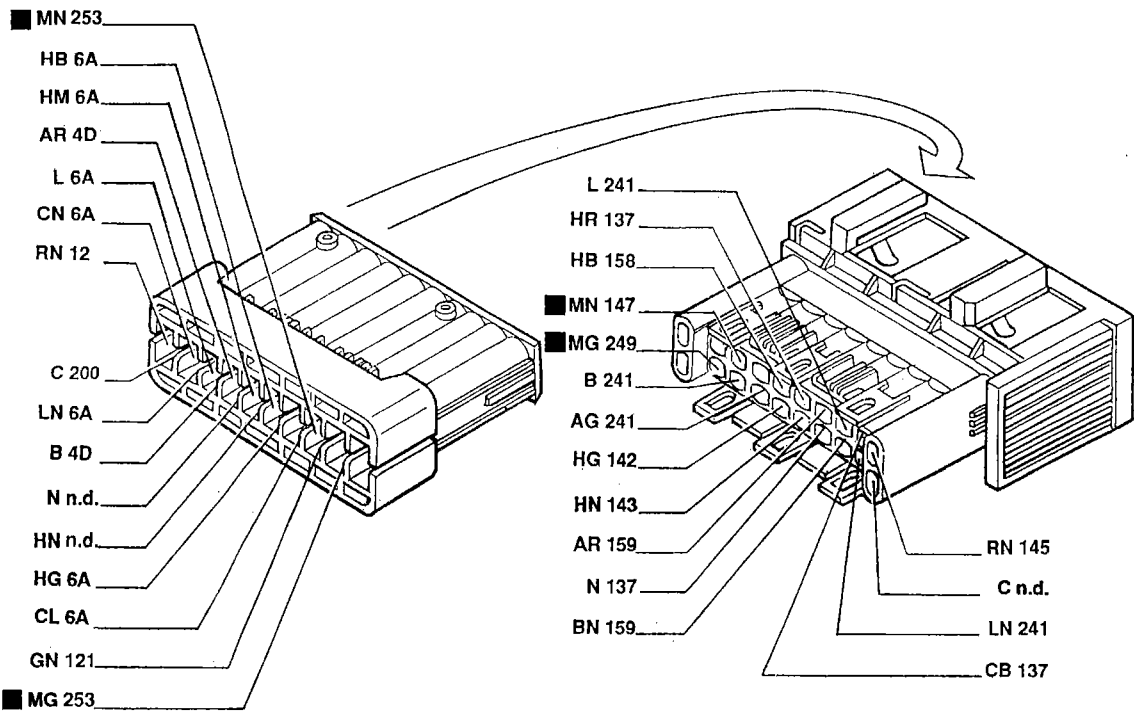
Model: 1910 75 BHP

Air conditioner

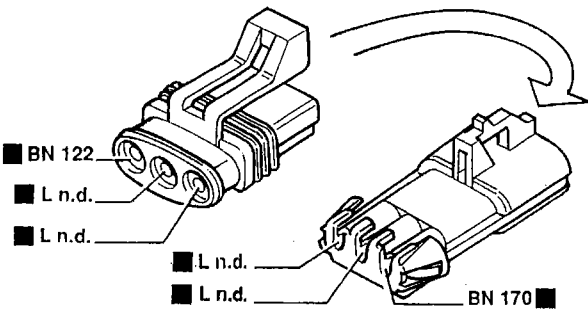
Key to components

- 3 Power fuse box:
A 60A fuse protecting fuel injection system
B 40A fuse protecting ignition system
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:
E1 Ignition switch discharge relay
- 7 Stalk unit
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 22 Left dashboard earth
- 55 Front/engine cables connection
- 120 Air conditioner cables connection
- 121 Three-stage pressure switch
- 122 Engine cooling fan low speed relay
- 123 Engine cooling fan high speed timer
- 123A Engine cooling fan high speed relay
- 124 Air conditioner compressor relay
- 126 Front/air conditioner cables connection
- 127 connection between front left cables/cable on relay bracket
- 128 Front/air conditioner cables connection
- 129 40A power fuse protecting engine cooling fan
- 147 Compressor for air conditioner
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistor
- 172 Two-stage thermostat
- 202 Bulbs lighting heater/air conditioner unit
- 203 Air conditioner controls:
A Switch for switching on air conditioner
B Air conditioner recirculation switch
- 204 Air conditioner fan 1st speed relay
- 205 Air conditioner fan relay
- 206 Heater/air conditioner electric fan
- 207 Heater/air conditioner speed control switch
- 208 Limiting resistor for heater/air conditioner
- 209 Actuator controlling exterior air/recirculation flap
- 210 Electronic thermostat cables connection
- 211 Electronic thermostat (N.T.C.)
- 232 Compressor earth
- 233 Thermostat on coolant pump
- 235 Air conditioner compressor cables connection
- 236 Front/air conditioner cables connection
- 237 Additional engine cooling fan
- 238 40A fuse protecting engine cooling fan
- 249 E.G.R. electronic control unit
- 253 Relay switching off compressor
- N.D. Ultrasound-soldered joint taped in wiring loom

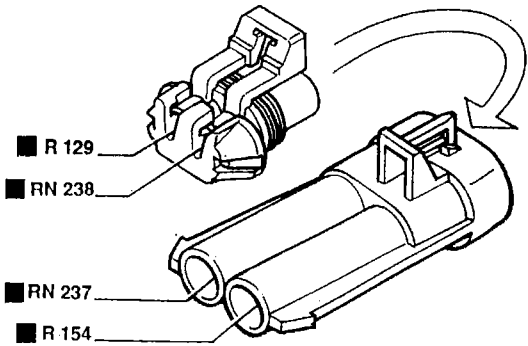
55 Front/engine cables connection



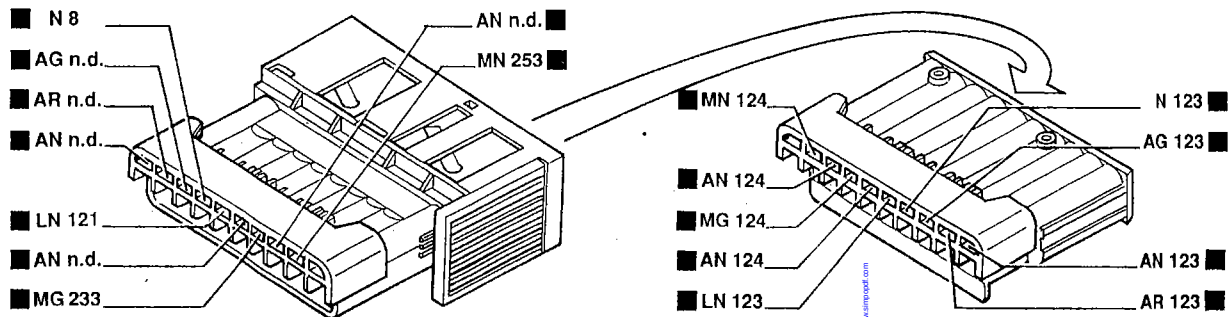
126 Front/air conditioner cables connection



128 Front/air conditioner cables connection



127 Connection between front left cables/cable on relay bracket



The cables involved in the wiring diagram are marked with a solid square

P4A32ZL01

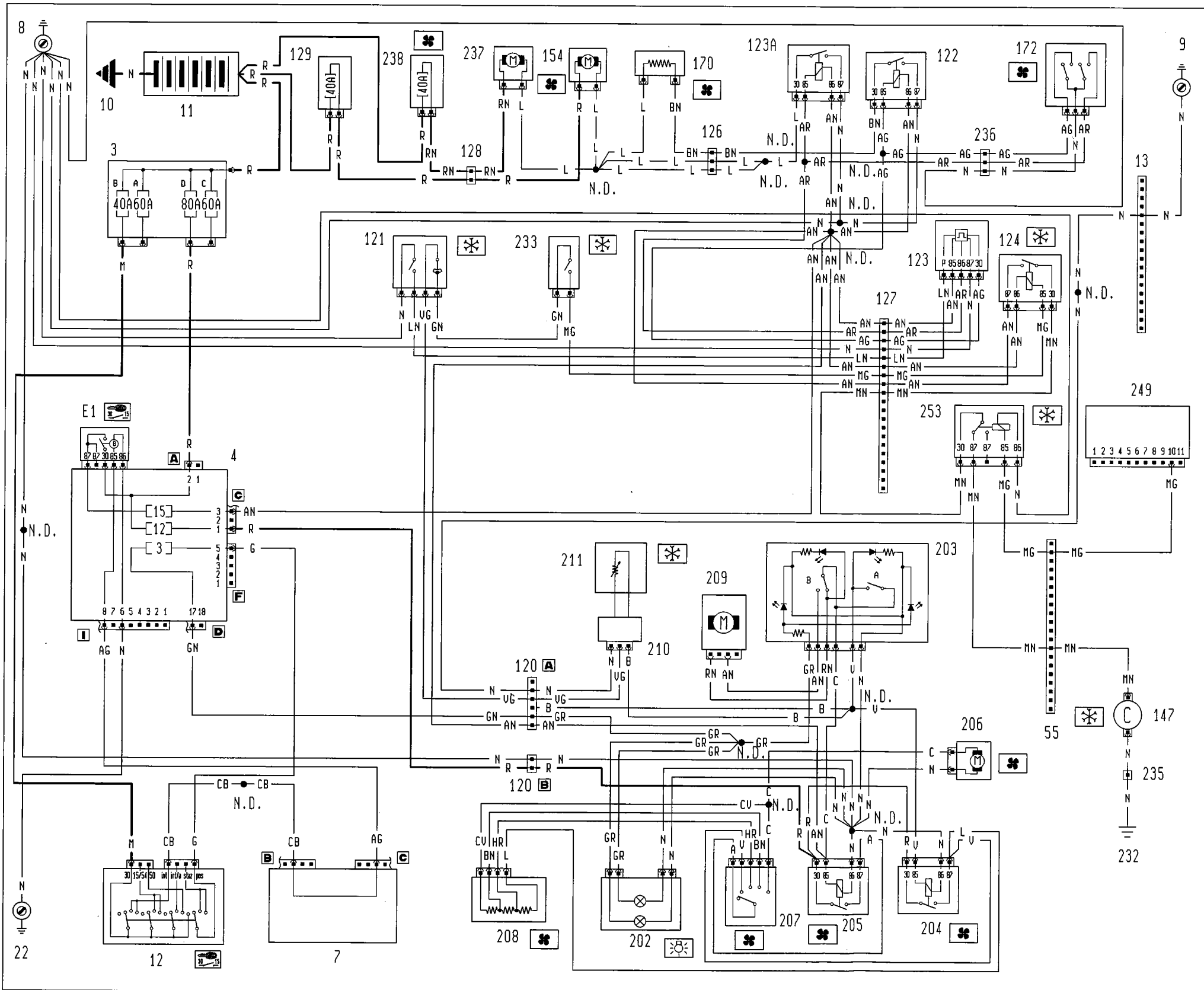
Electrical system

Wiring diagrams

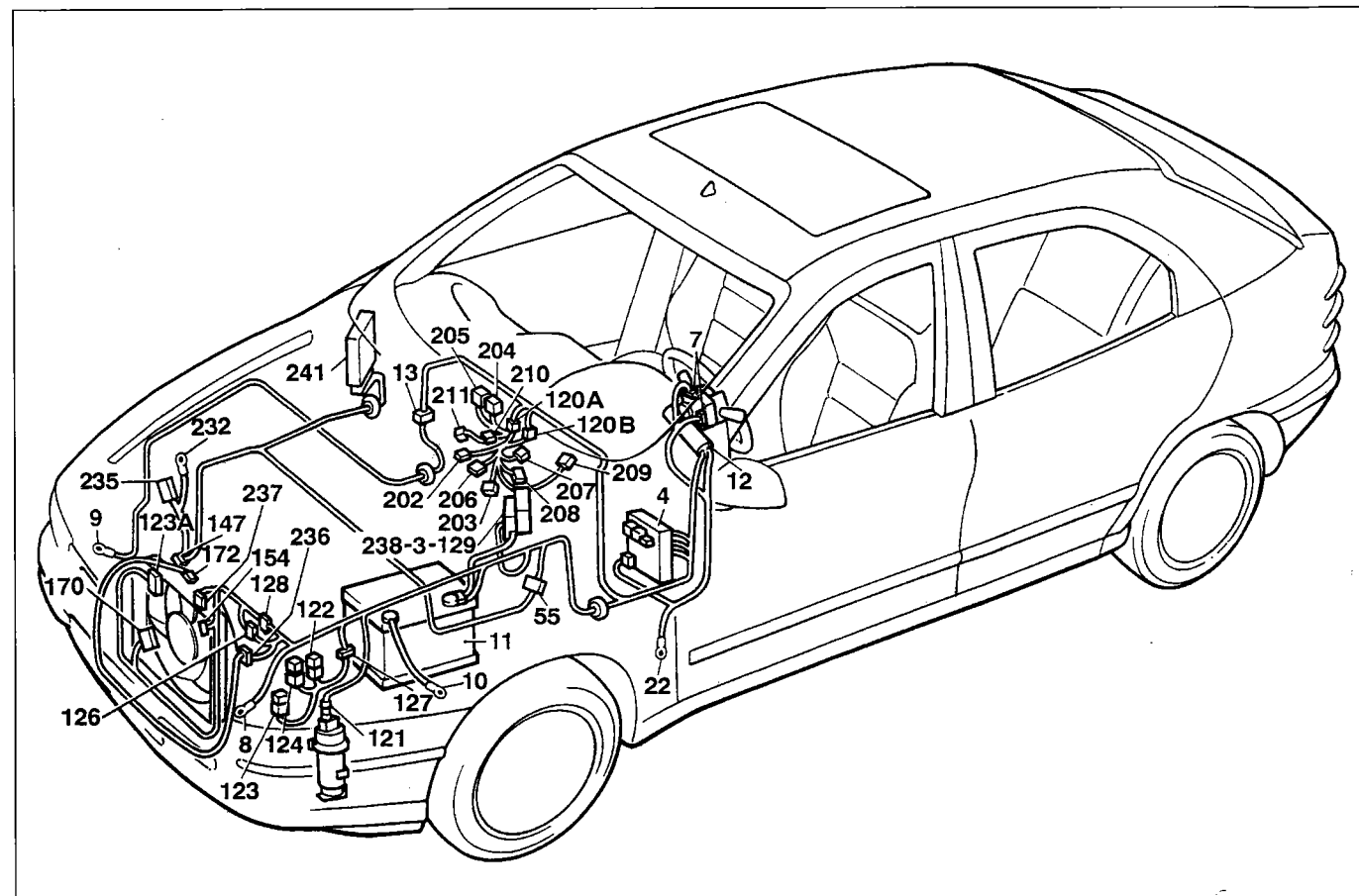
55.

Model: 1910 75 BHP

Air conditioner - (See key following diagrams)



55.



P4A27ZL01

Version: 1910 100 BHP

Air conditioner

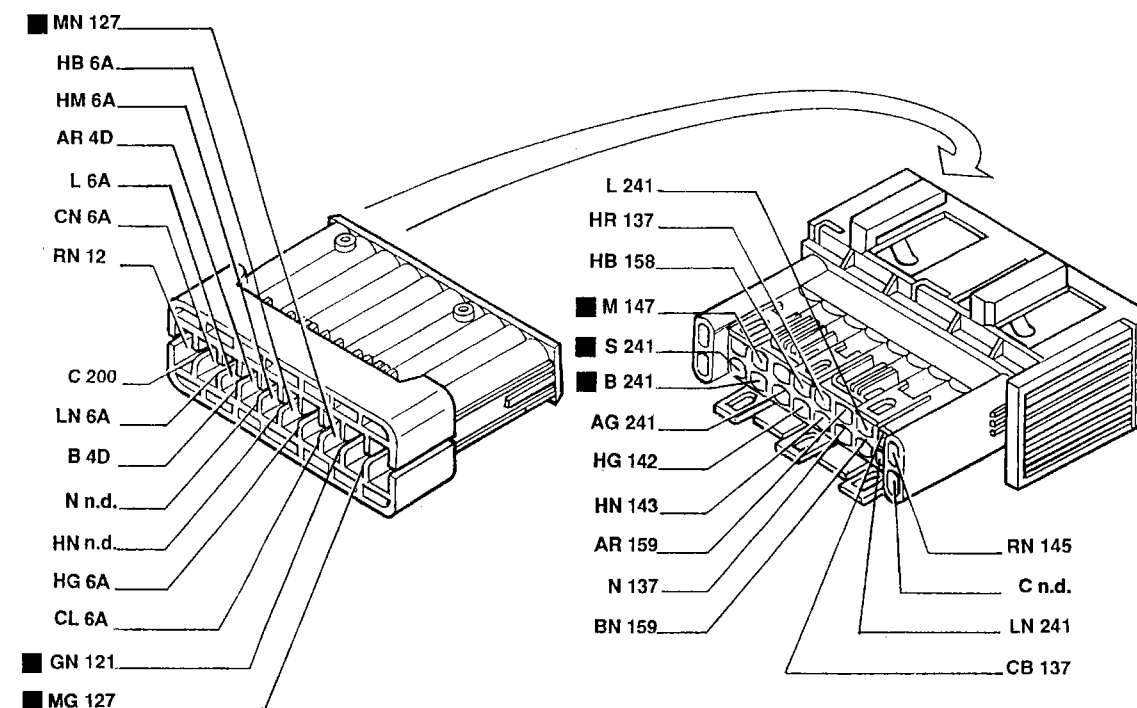
Key to components

- 3 Power fuse box:
 - A 60A fuse protecting fuel injection system
 - B 40A fuse protecting ignition system
 - C 60A fuse protecting additional optional extras
 - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:
 - E1 Ignition switch discharge relay
- 7 Stalk unit
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 22 Left dashboard earth
- 55 Front/engine cables connection
- 120 Air conditioner cables connection
- 121 Three-stage pressure switch
- 122 Engine cooling fan low speed control relay
- 123 Engine cooling fan high speed timer
- 123A Engine cooling fan high speed relay
- 124 Air conditioner compressor relay
- 126 Front/air conditioner cables connection
- 127 Connection between front left cables/cable on relay bracket
- 128 Front/air conditioner cables connection

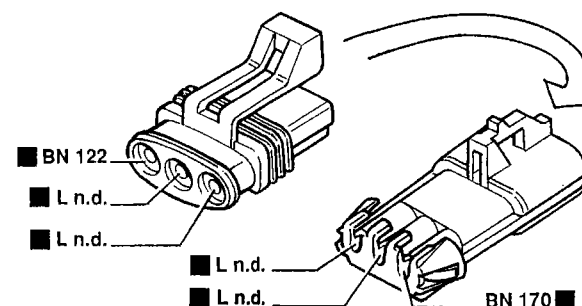
- 129 40A power fuse protecting engine cooling fan
- 147 Compressor for air conditioner
- 154 Engine cooling fan
- 170 Cooling fan limiting resistor
- 172 Two-stage thermostat
- 202 Bulbs for lighting heater/air conditioner unit
- 203 Air conditioner controls:
 - A Switch for switching on air conditioner
 - B Switch controlling air conditioner recirculation
- 204 Relay controlling air conditioner electric fan 1st speed
- 205 Air conditioner fan relay
- 206 Heater/air conditioner electric fan
- 207 Switch controlling speed of heater/air conditioner
- 208 Limiting resistor for heater/air conditioner
- 209 Actuator controlling external air/recirculation flap
- 210 Electronic thermostat cables connection
- 211 Electronic thermostat (N.T.C.)
- 232 Compressor earth
- 235 Air conditioner compressor cables connection
- 236 Front/air conditioner cables connection
- 237 Additional engine cooling fan
- 238 40A fuse protecting engine cooling fan
- 241 Fuel pump electronic control unit

N.D. Ultrasound-soldered joint taped in wiring loom

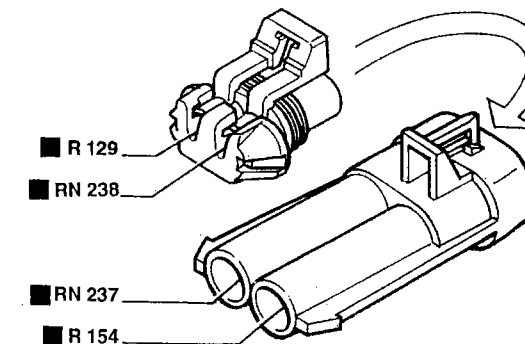
55 Front/engine cables connection



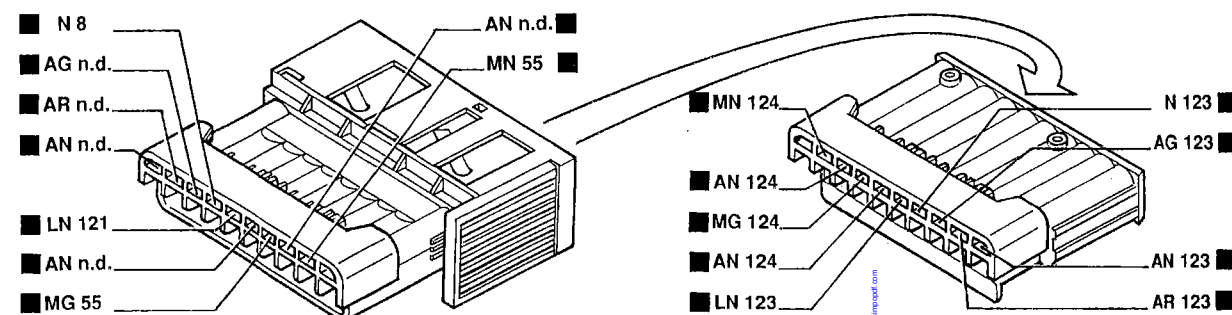
126 Front/air conditioner cables connection



128 Front/air conditioner cables connection



127 Connection between front left cables/cable on relay bracket

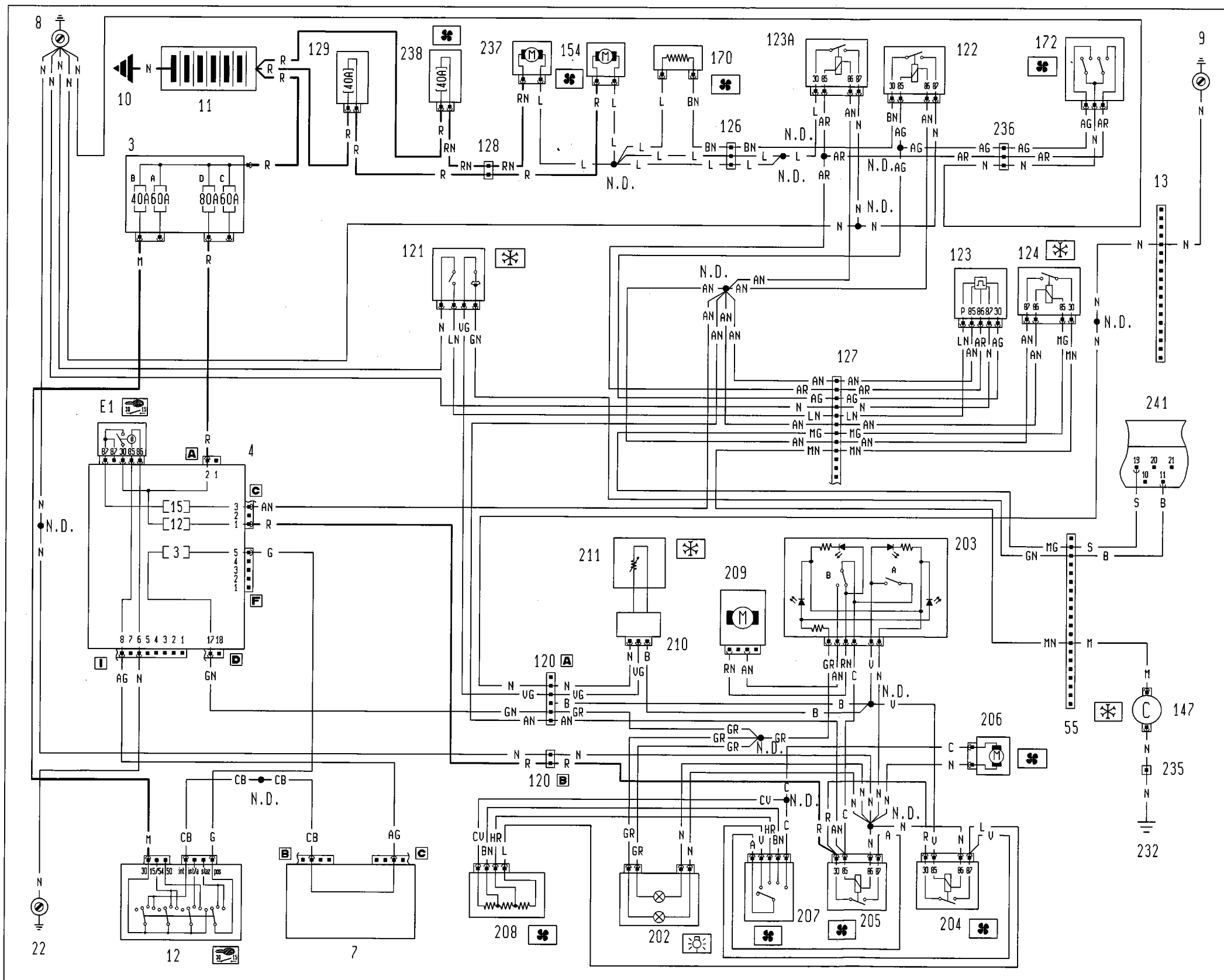


The cables involved in the wiring diagram are marked with a solid square

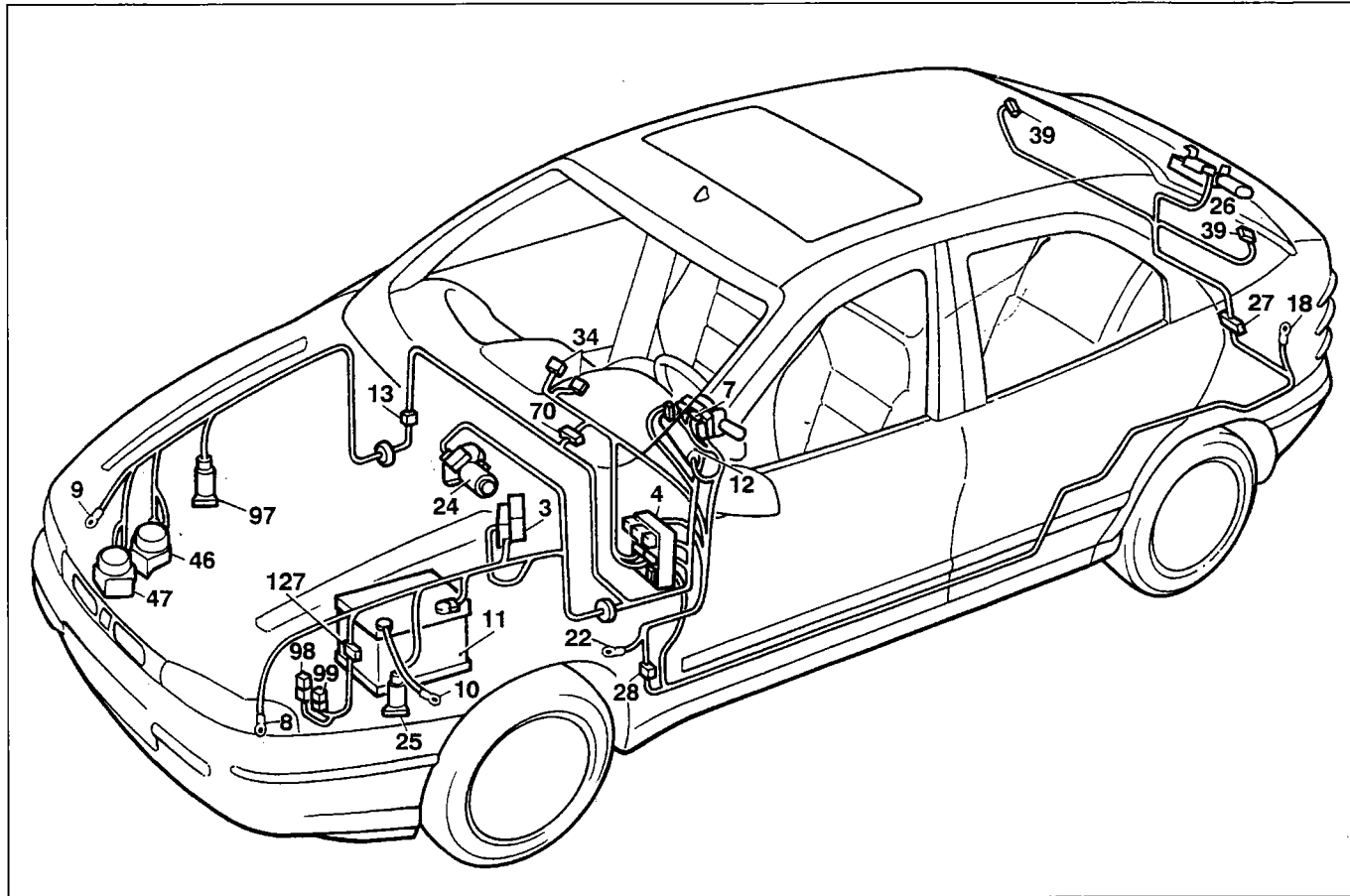
P4A28ZL01

Model: 1910 100 BHP

Air conditioner - (See key following diagrams)



55.



P4A23ZL01

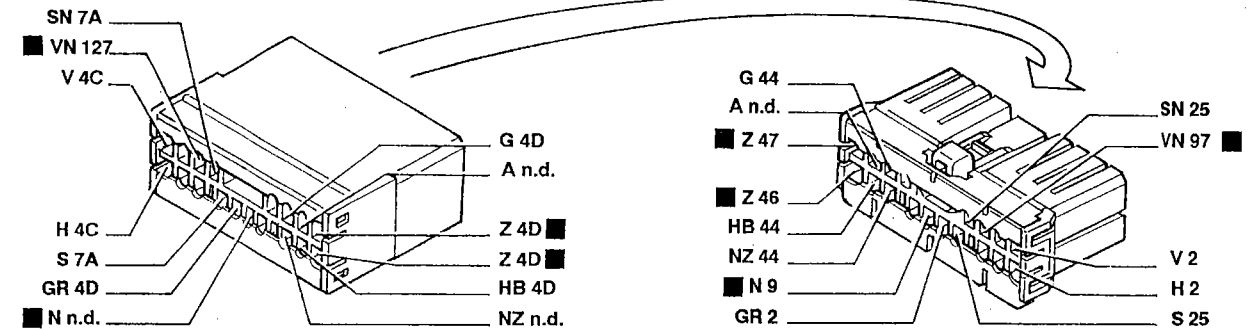
Windscreen wash/wipe - Rear window wash/wipe - Electric horns - Heated rear window and warning light - Headlamp washer

Key to components

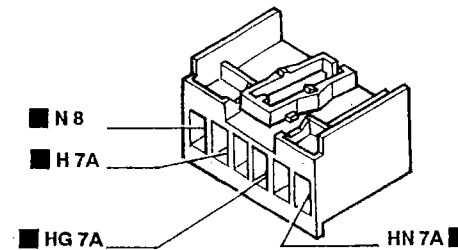
- | | |
|--|--|
| 3 Power fuse box: | 25 Windscreen/rear window wash pump |
| A 60A fuse protecting fuel injection system | 26 Rear window wiper motor |
| B 40A fuse protecting fuel injection | 27 Rear connections contact assembly with built-in boot light switch |
| C 60A fuse protecting additional optional extras | 28 Dashboard/longitudinal cables connection |
| D 80A fuse protecting fuse and relay unit | 34 Switches control unit: |
| 4 Fuse and relay unit: | A Alarm on warning light |
| E1 Ignition switch discharge relay | B Rear fog lamps switch |
| E2 Horn relay | C Rear fog lamps relay |
| E3 Heated rear window relay | D Rear fog lamps warning light |
| 7 Stalk unit: | E Heated rear window switch |
| A Windscreen wiper speed control switch | F Heated rear window warning light |
| B Windscreen wash/headlamp wash/rear window wash controls/switch | G Symbol light on switch assembly |
| C Rear window wiper switch | H Front fog lamps warning light |
| D Flasher button | I Front fog lamps switch |
| E Dipped beam/main beam switch | 39 Heated rear window |
| F Side lights switch | 46 Left horn |
| G Indicators/hazard lights intermittent switch | 47 Right horn |
| H Direction indicators switch | 70 Dashboard/front cables connection |
| I Horn button | 97 Headlamp washer pump |
| 8 Front left earth | 98 Headlamp washer intermittent switch |
| 9 Front right earth | 99 20A fuse protecting headlamp washer |
| 10 Battery earth on body shell | 127 Front left cables/cable on relay bracket |
| 11 Battery | |
| 12 Ignition switch | |
| 13 Front right/left cables connection | |
| 18 Rear left earth | |
| 22 Left dashboard earth | |
| 24 Windscreen wiper motor | |

N.D. Ultrasound-soldered joint taped in wiring loom

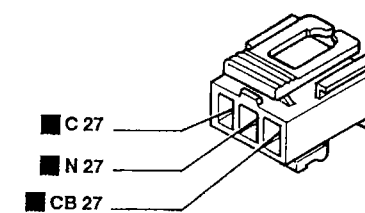
13 Front right/left cables connection



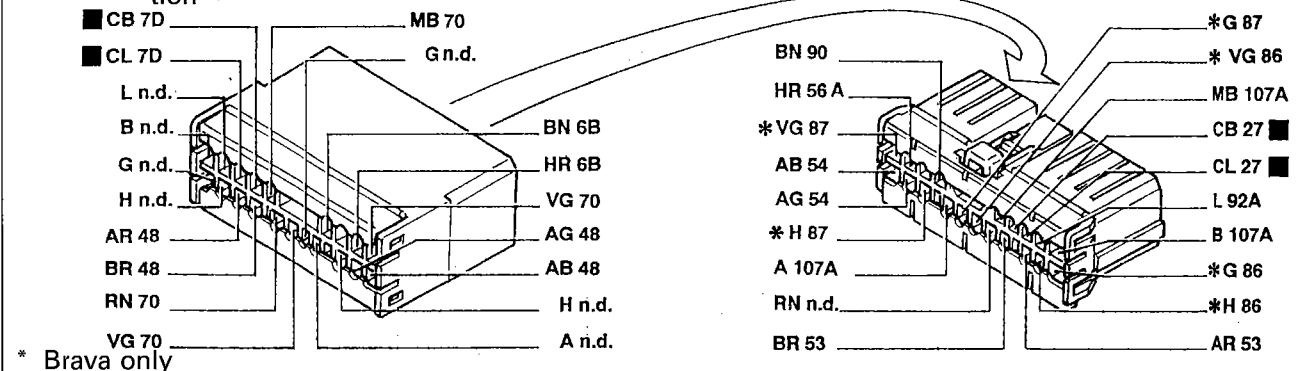
24 Windscreen wiper motor



26 Rear window wiper motor

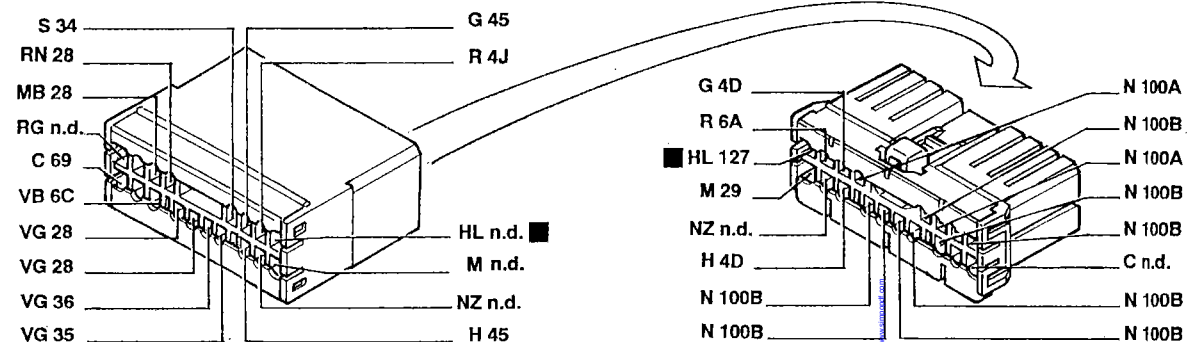


28 Dashboard/longitudinal cables connection



* Brava only

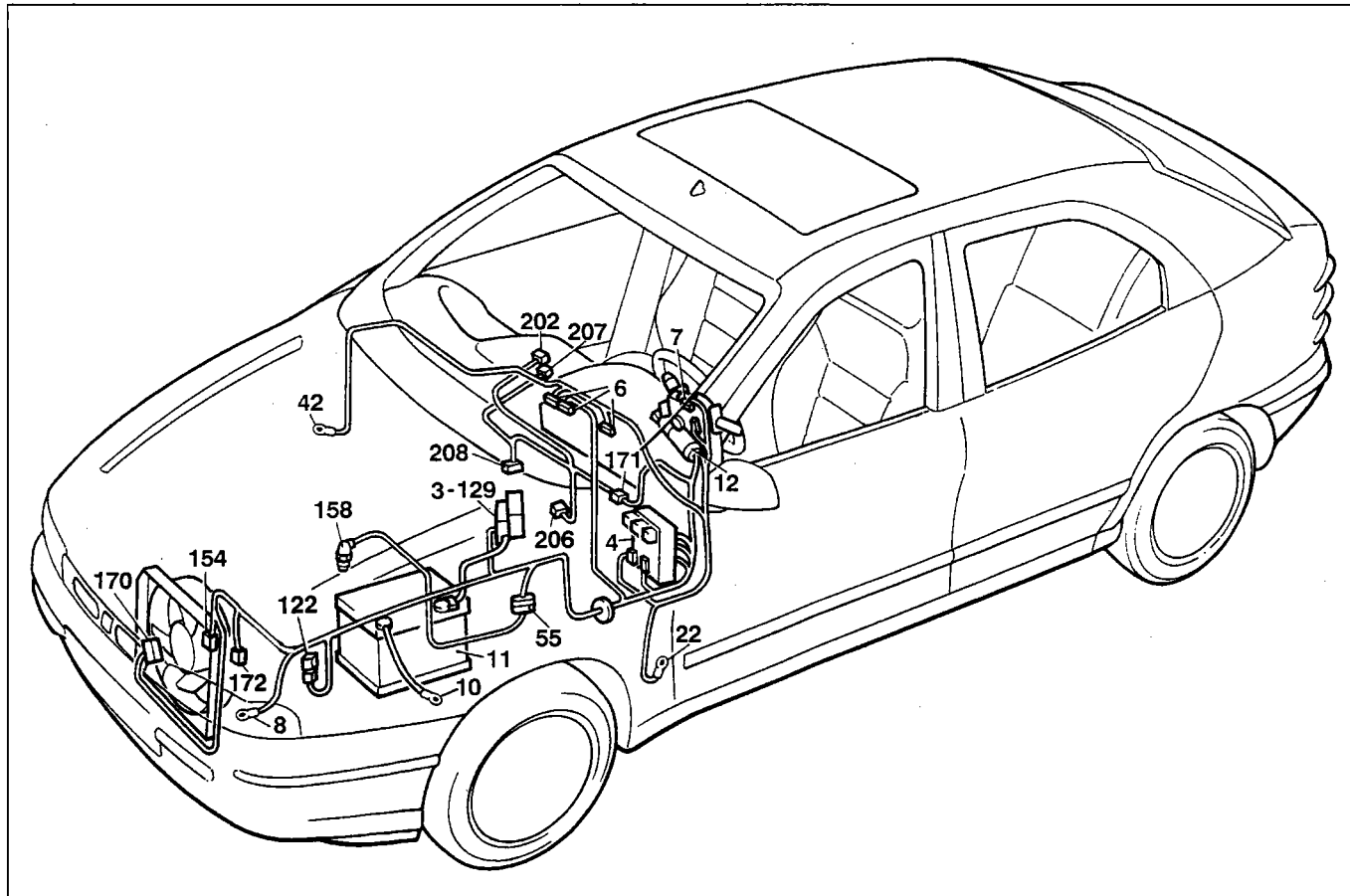
70 Dashboard/front cables connection



The cables involved in the wiring diagram are marked with a solid square

P4A24ZL01

55.



Version without air conditioner

P4A19ZL01

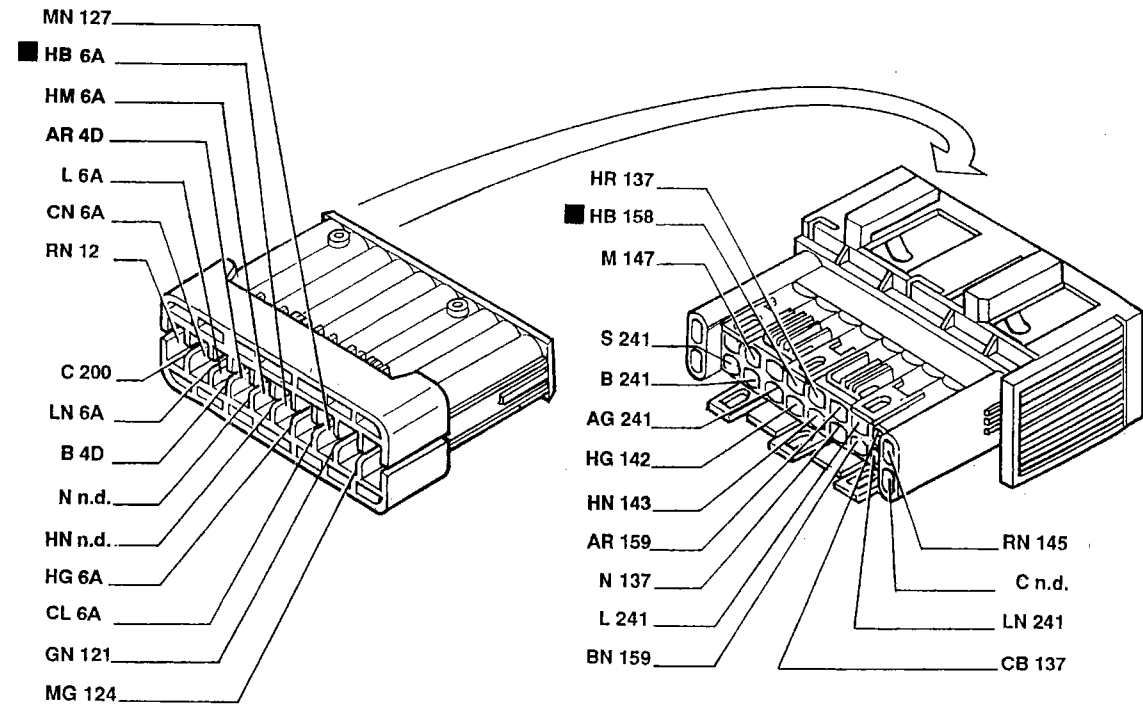
Engine cooling system - Water temperature gauge - Car interior ventilation

Key to components

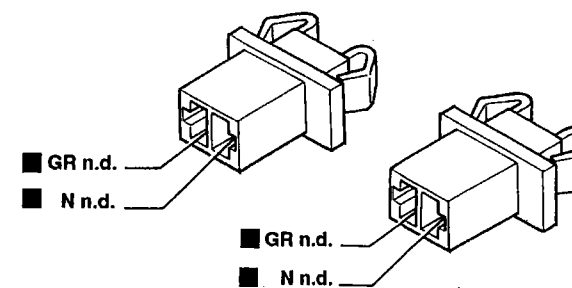
- | | |
|--|--|
| 3 Power fuse box: | 154 Engine cooling fan |
| A 60A fuse protecting fuel injection system | 158 Coolant temperature sensor for gauge |
| B 40A fuse protecting ignition system | 170 Engine cooling fan limiting resistor |
| C 60A fuse protecting additional optional extras | 171 Heater unit |
| D 80A protecting fuse and relay unit | 172 Two-stage thermostat |
| 4 Fuse and relay unit | 202 Bulbs for heater/air conditioner unit |
| E1 Ignition switch discharge relay | 206 Heater/air conditioner electric fan |
| 6 Instrument panel: | 207 Speed control switch for heater/air conditioner unit |
| X Coolant temperature gauge | 208 Limiting resistor for heater/air conditioner unit |
| 7 Stalk unit | |
| 8 Front left earth | |
| 10 Battery earth on body shell | |
| 11 Battery | |
| 12 Ignition switch | |
| 22 Left dashboard earth | |
| 42 Right dashboard earth | |
| 55 Front/engine cables connection | |
| 122 Engine cooling fan low speed relay | |
| 129 40A power fuse protecting engine cooling fan | |

N.D. Ultrasound-soldered joint taped in wiring loom

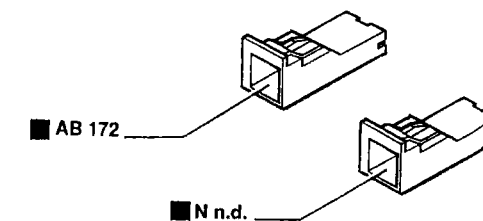
55 Front/engine cables connection



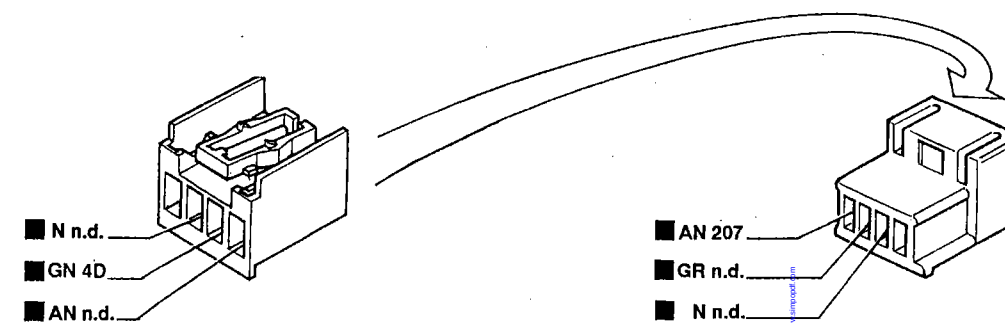
202 Bulbs for illuminating symbols on heater/air conditioner controls



170 Resistor for engine cooling fan



171 Heater cables connection

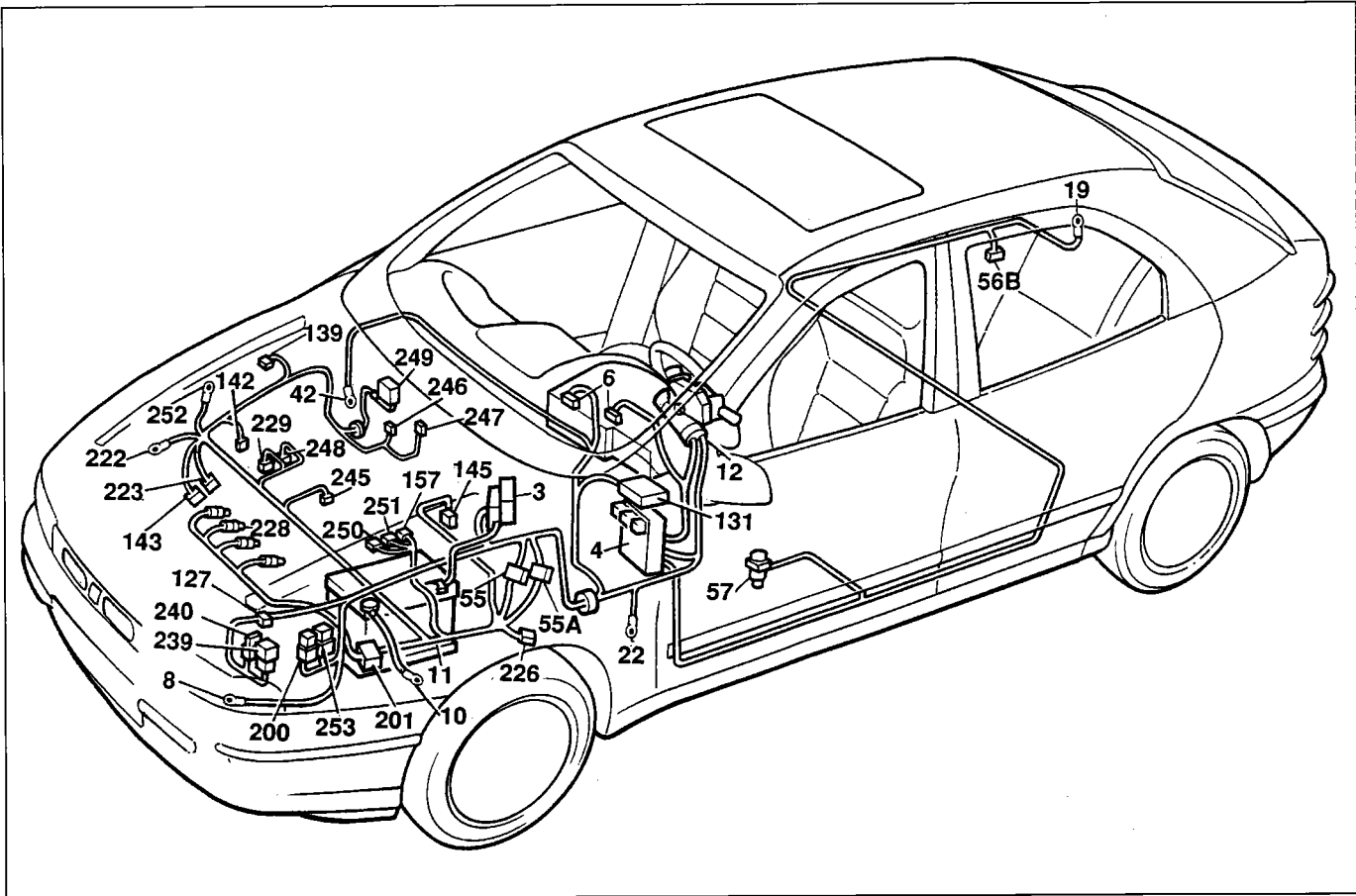


P4A20ZL01

Engine cooling system - Water temperature gauge - Car interior ventilation - (See key following diagrams)



55.

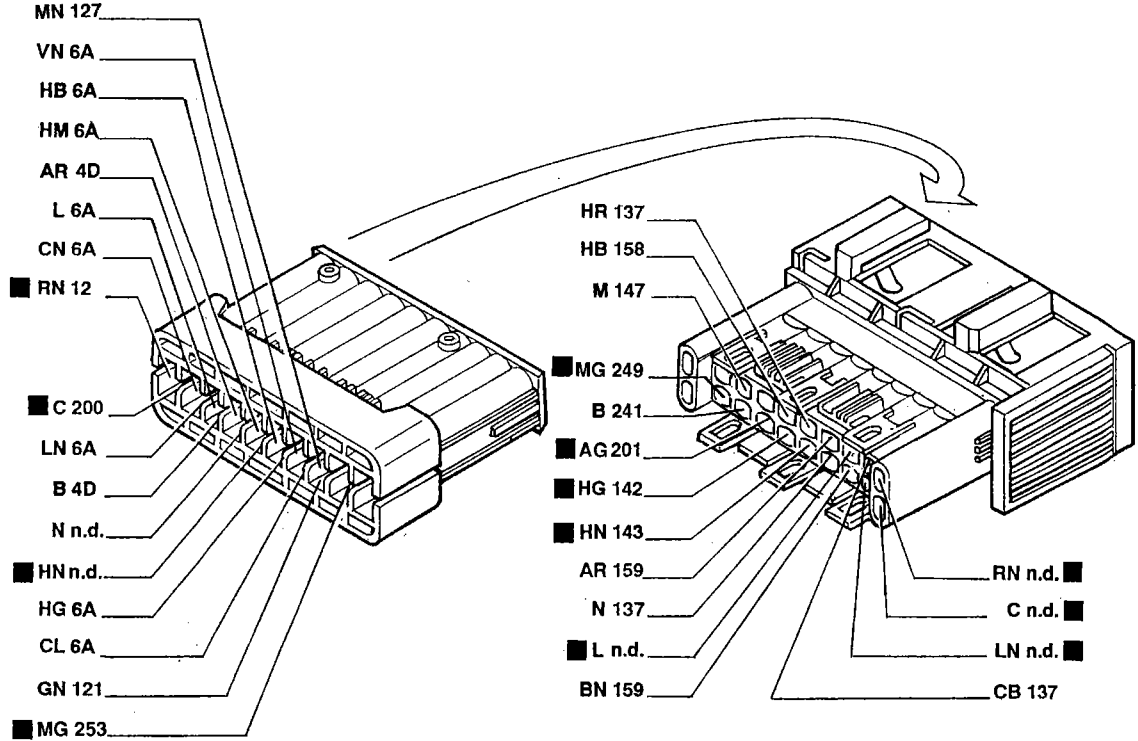


Model: 1910 75 BHP
Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system fault warning light - Rev counter

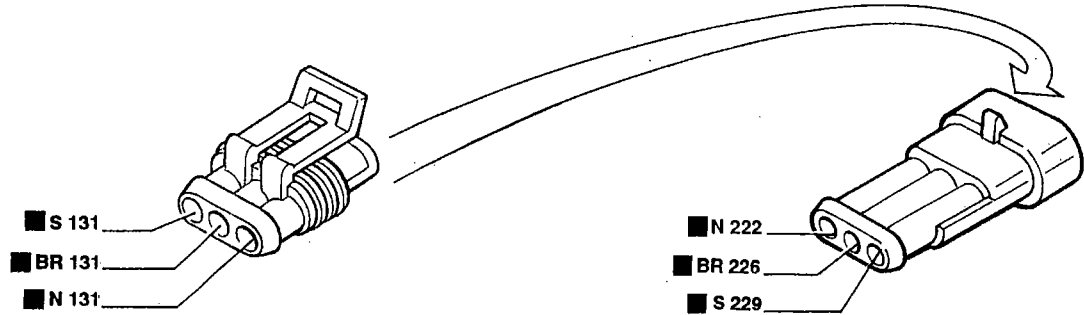
Key to components

- | | |
|--|--|
| 3 Power fuse box:
A 60A fuse protecting fuel injection system
B 40A fuse protecting ignition system
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit | 142 Low oil pressure warning light switch
143 Alternator
145 Starter motor
157 Water temperature sensor for fuel injection
200 Inertial switch control relay
201 Plug preheating control unit
222 Earth for fuel system
223 Wheel speed sensor
226 Diagnostic socket for Fiat CODE system
228 Heater plugs
229 Engine cut-off electrostop
239 Heated diesel filter relay
240 20A fuse protecting heated diesel filter relay
245 E.G.R. solenoid
246 Heated fuel filter
247 Heated fuel filter thermal contact
248 Potentiometer on fuel pump
249 E.G.R. electronic control unit
250 Water temperature sensor for preheating control unit
251 K.S.B. thermal switch
252 K.S.B. earth
253 Relay for switching off compressor
N.D. Ultrasound-soldered joint taped in wiring loom |
| 4 Fuse and relay unit
6 Instrument panel:
A Low generator charge warning light
B Low engine oil pressure warning light
L Fiat CODE system fault warning light
M Fuel injection fault warning light
O Heater plug warning light
W Rev counter | |
| 8 Front left earth
10 Battery earth on body shell
11 Battery
12 Ignition switch
19 Rear right earth
22 Left dashboard earth
42 Right dashboard earth
55 Front/engine cables connection
55A Front left/engine cables connection
56B Fuel gauge sender
57 Inertial switch
127 Connection between front left cables/cable on relay bracket | |
| 131 Fiat CODE electronic control unit
139 Diagnostic socket for fuel injection | |

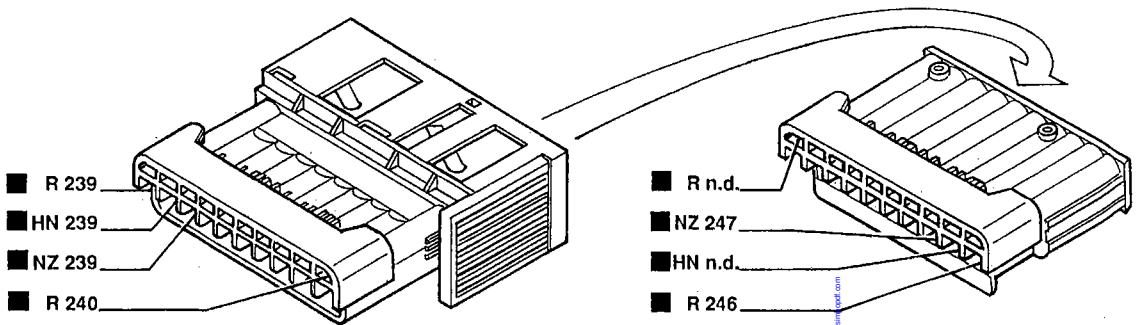
55 Front/engine cables connection



55A Front left/engine cables connection

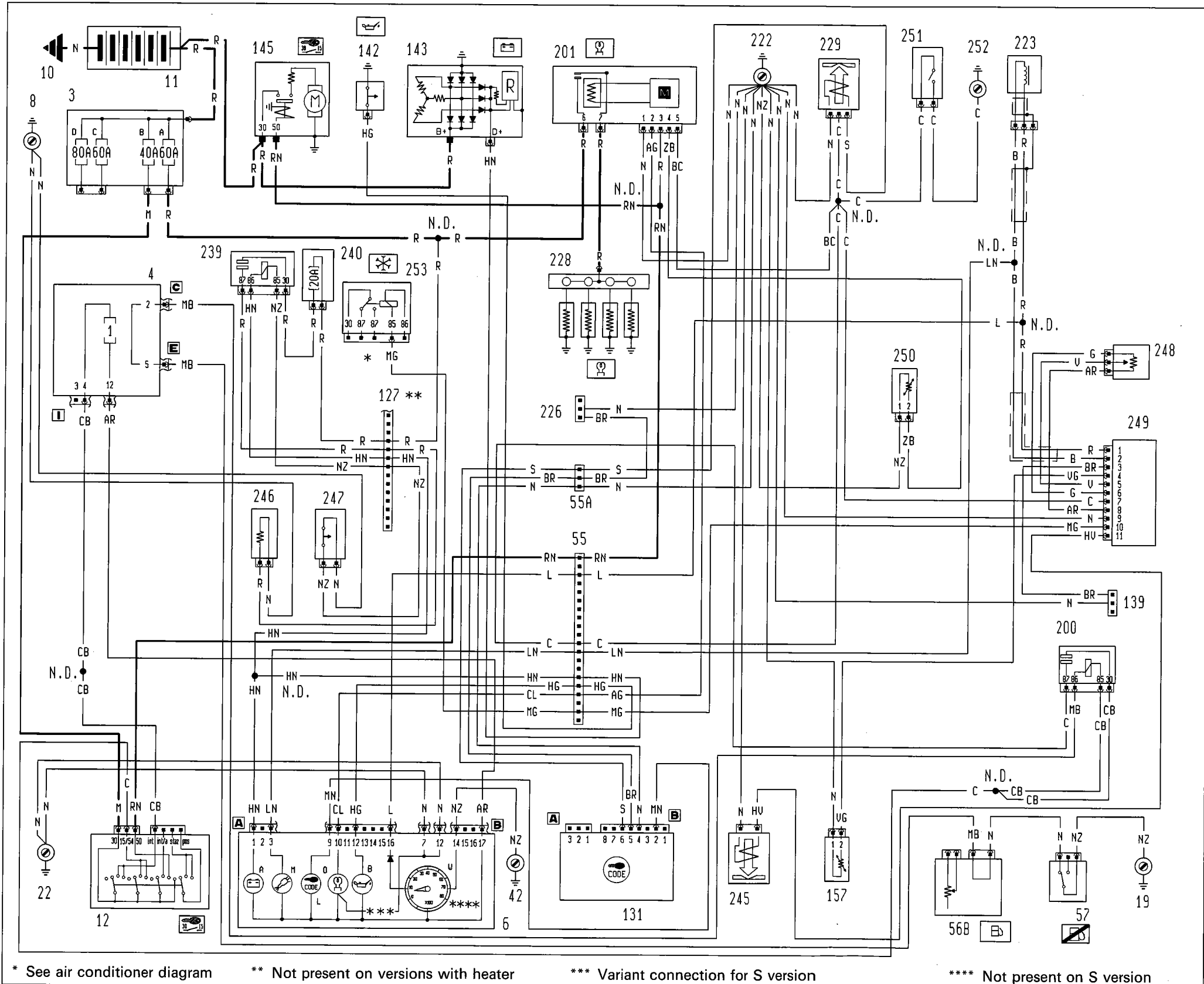


127 Connection between front left cables/cable on relay bracket

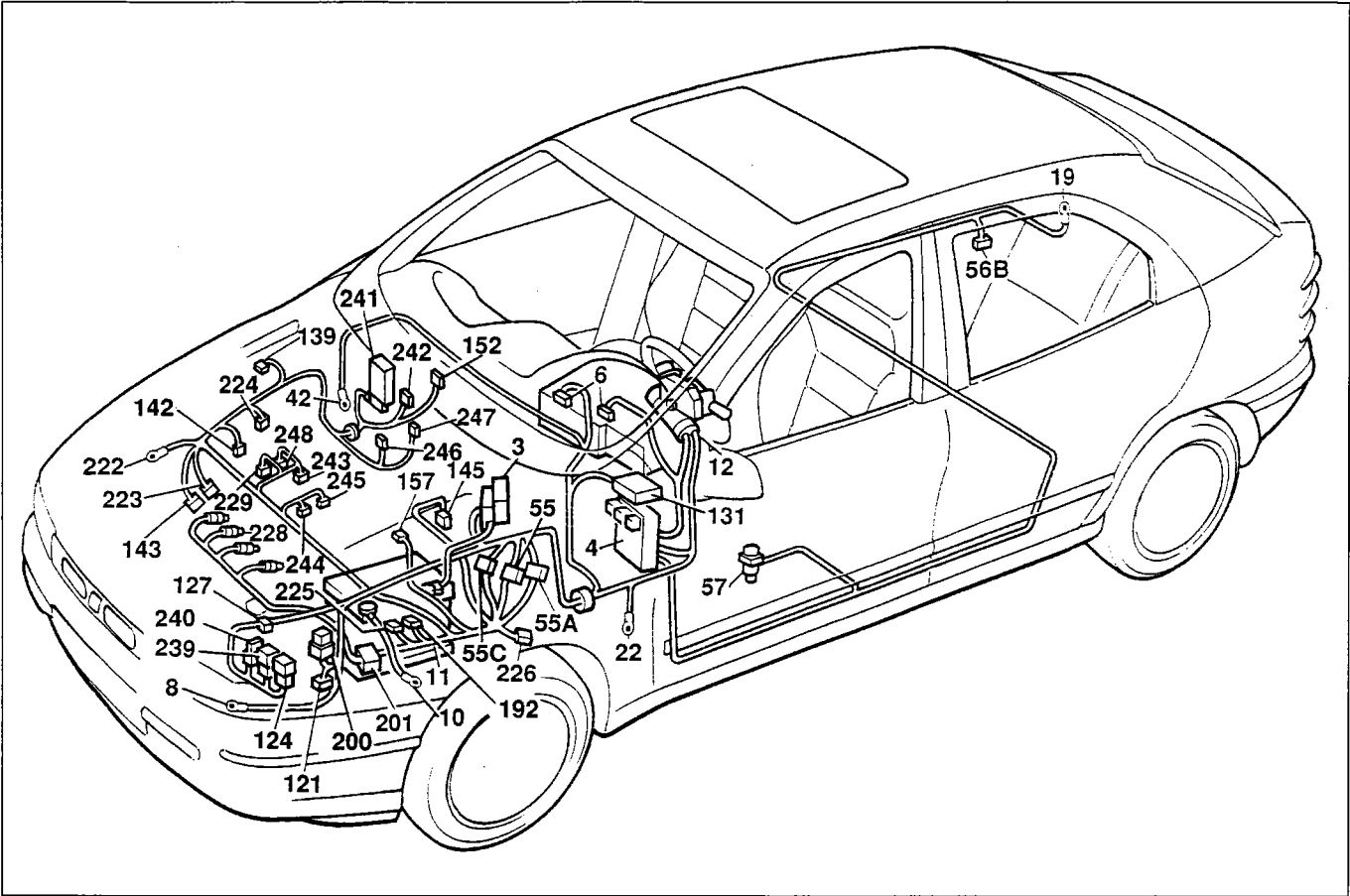


Version: 1910 75 BHP

Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE fault system warning light - Rev counter (See key following diagrams)



55.



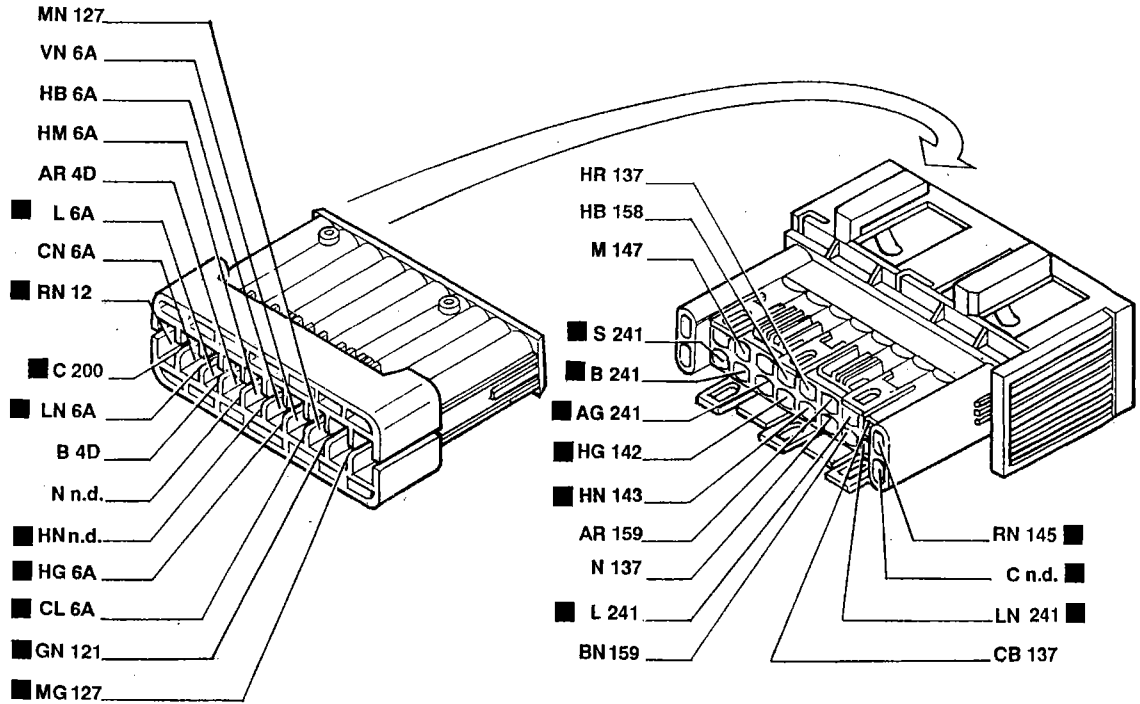
Model: 1910 100 BHP
Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system warning light - Rev counter

Key to components

- | | |
|---|--|
| 3 Power fuse box:
A 60A fuse protecting fuel injection system
B 40A fuse protecting fuel injection system
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
4 Fuse and relay unit
6 Instrument panel:
A Low generator charge warning light
B Low engine oil pressure warning light
L Fiat CODE system fault warning light
M Fuel injection fault warning light
O Plug preheating warning light
W Rev counter
8 Front left earth
10 Battery earth on body shell
11 Battery
12 Ignition switch
19 Rear right earth
22 Left dashboard earth
42 Right dashboard earth
55 Front/engine cables connection
55A Front left/engine cables connection
55C Front left/engine cables connection
56B Fuel gauge sender unit
57 Inertial switch
121 Three-stage pressure switch
124 Air conditioner compressor control relay
127 Connection between front left cables/cable on relay bracket
131 Fiat CODE electronic control unit
139 Diagnostic socket for fuel injection | 142 Low oil pressure warning light switch
143 Alternator
145 Starter motor
152 10A fuse protecting fuel injection
157 Water temperature sensor for fuel injection
192 Air temperature sensor
200 Inertial switch relay
201 Plug preheating control unit
222 Earth for fuel system
223 Wheel speed sensor
224 Instrumented fuel injector
225 Flowmeter
226 Diagnostic socket for Fiat CODE system
228 Heater plugs
229 Engine cut-off electrostop
239 Heated diesel filter relay
240 20A fuse protecting heating diesel filter relay
241 Fuel pump electronic control unit
242 Fuel injection relay
243 Engine advance adjustment solenoid
244 Fast idle solenoid
245 E.G.R. solenoid
246 Heated fuel filter
247 Heated fuel filter thermal contact
248 Potentiometer on fuel pump
N.D. Ultrasound-soldered joint taped in wiring loom |
|---|--|

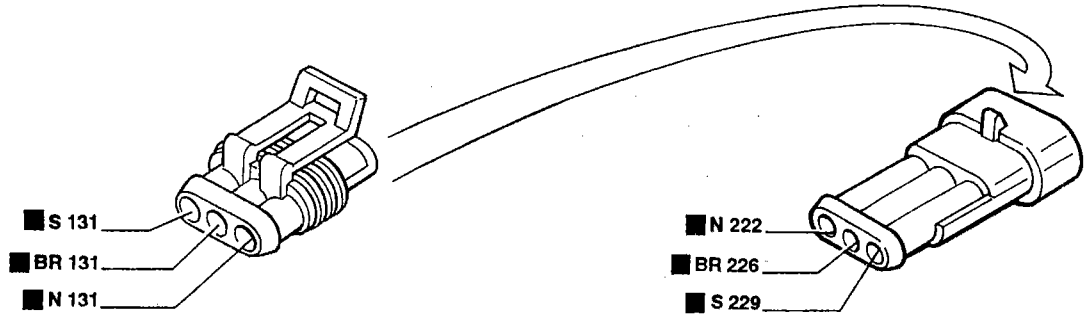
55

Front/engine cables connection



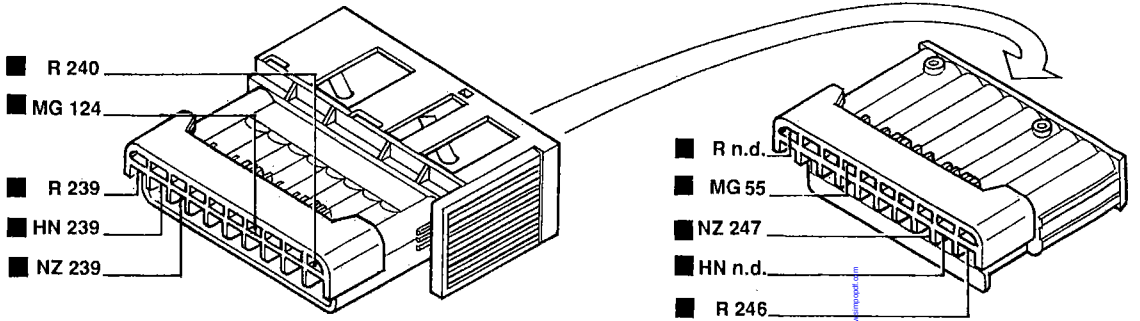
55A

Front left/engine cables connection



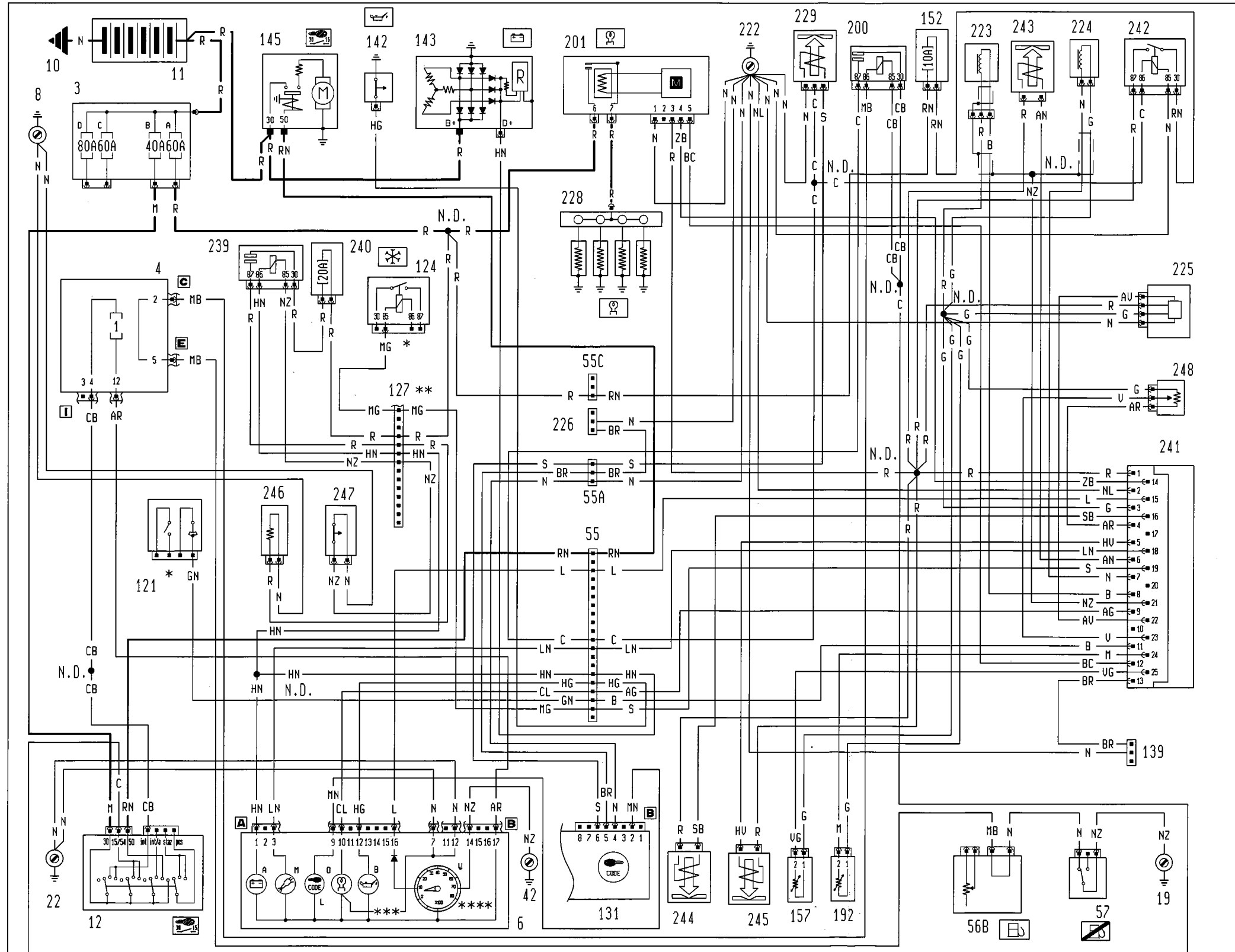
127

Connection between front left cables/cable on relay bracket



Model: 1910 100 BHP

Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system fault warning light - Rev counter - (See key following diagrams)



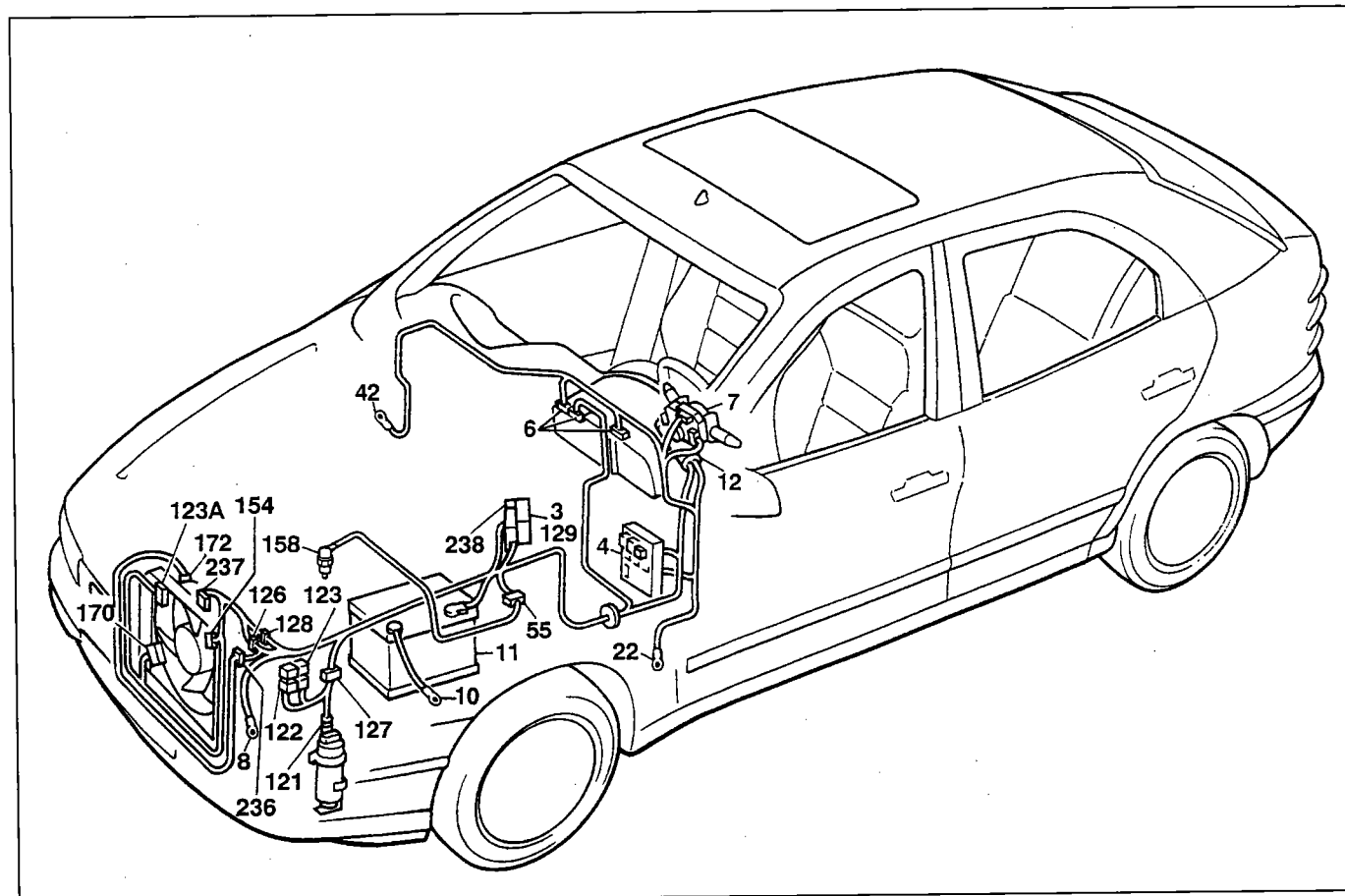
* See air conditioner wiring diagram

** Not present on versions with heater

*** Variant connection for S version

**** Not present on S version

55.



P4A07ZL01

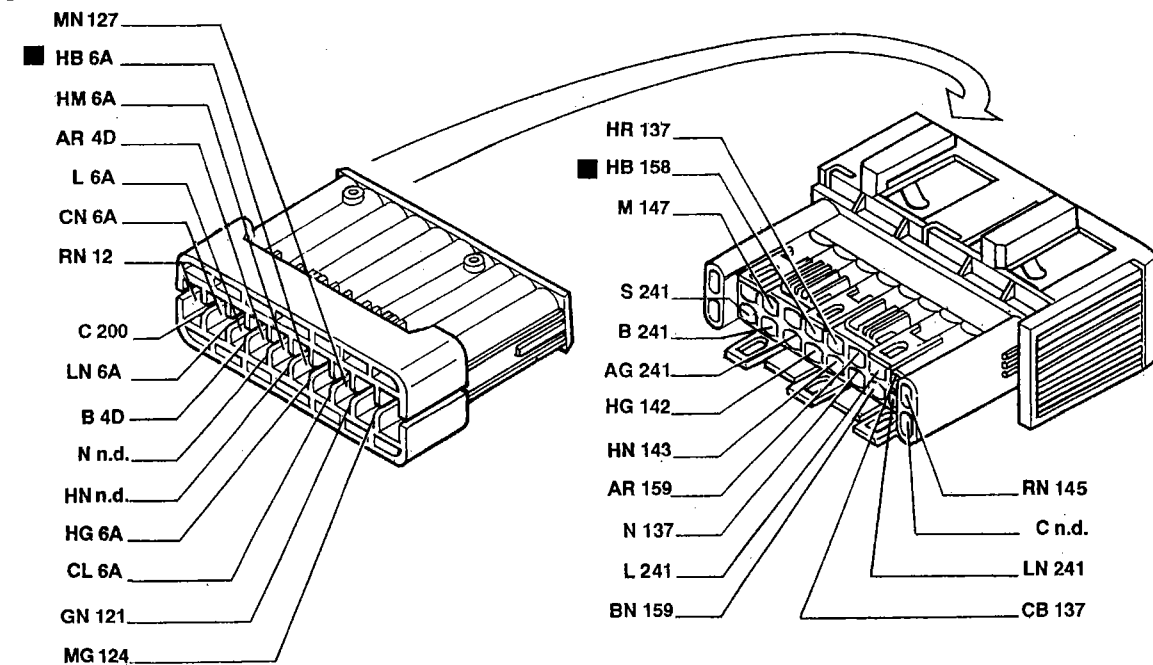
Version with air conditioner

Engine cooling system - Water temperature gauge

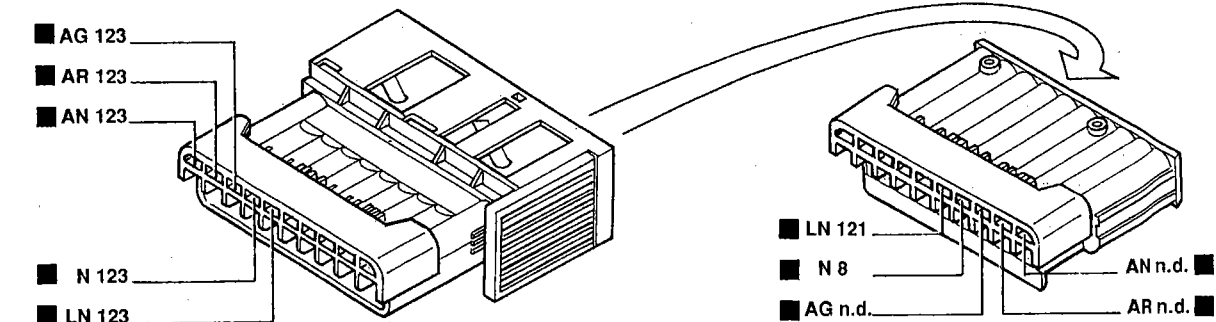
Key to components

- | | |
|--|---|
| <p>3 Power fuse box:
 A 60A fuse protecting fuel injection system
 B 40A fuse protecting ignition system
 C 60A fuse protecting additional optional extras
 D 80A fuse protecting fuse and relay unit</p> <p>4 Fuse and relay unit:
 E1 Ignition switch discharge relay</p> <p>6 Instrument panel:
 X Water temperature gauge</p> <p>7 Stalk unit</p> <p>8 Front left earth</p> <p>10 Battery earth on body shell</p> <p>11 Battery</p> <p>12 Ignition switch</p> <p>22 Left dashboard earth</p> <p>42 Right dashboard earth</p> <p>55 Front/engine cables connection</p> <p>121 Three-stage pressure switch</p> <p>122 Engine cooling fan low speed control relay</p> | <p>123 Engine cooling fan high speed timer</p> <p>123A Engine cooling fan high speed control relay</p> <p>126 Front/air conditioner cables connection</p> <p>127 Connection between front left cables/cable on relay bracket</p> <p>128 Front/air conditioner cables connection</p> <p>129 40A power fuse protecting engine cooling fan</p> <p>154 Engine cooling fan</p> <p>158 Coolant temperature sensor for instrument</p> <p>170 Engine cooling fan limiting resistor</p> <p>172 Two-stage thermostat</p> <p>236 Front/air conditioner cables connection</p> <p>237 Additional engine cooling fan</p> <p>238 40A power fuse protecting engine cooling fan</p> <p>N.D. Ultrasound-soldered joint taped in wiring loom</p> |
|--|---|

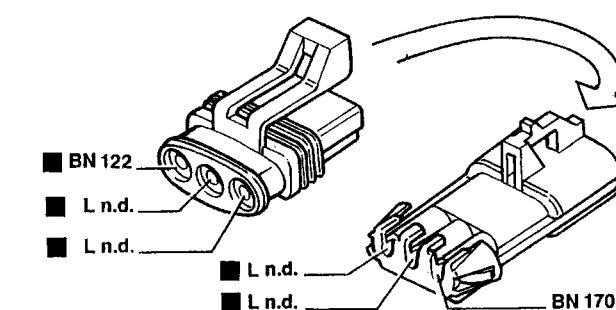
55 Front/engine cables connection



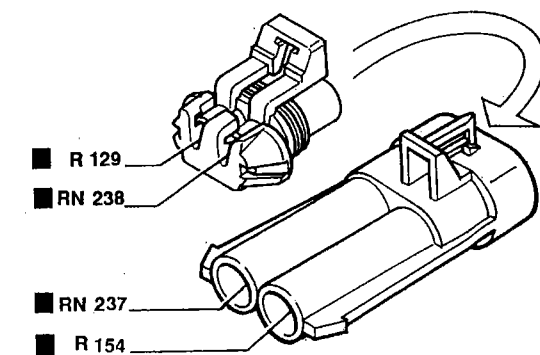
127 Connection between front left cables/cable on relay bracket



126 Front/air conditioner cables connection



128 Front/air conditioner cables connection

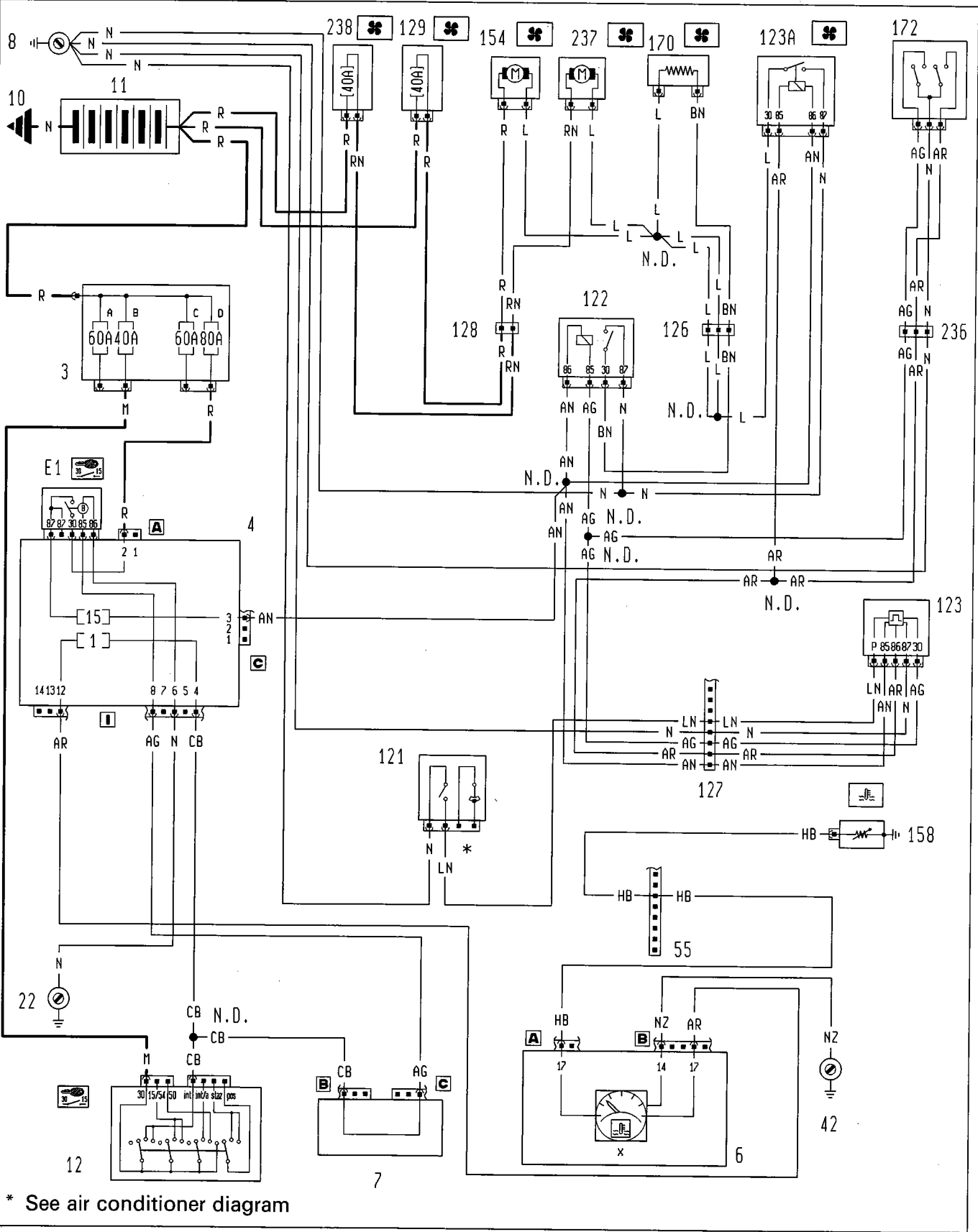


P4A08ZL01

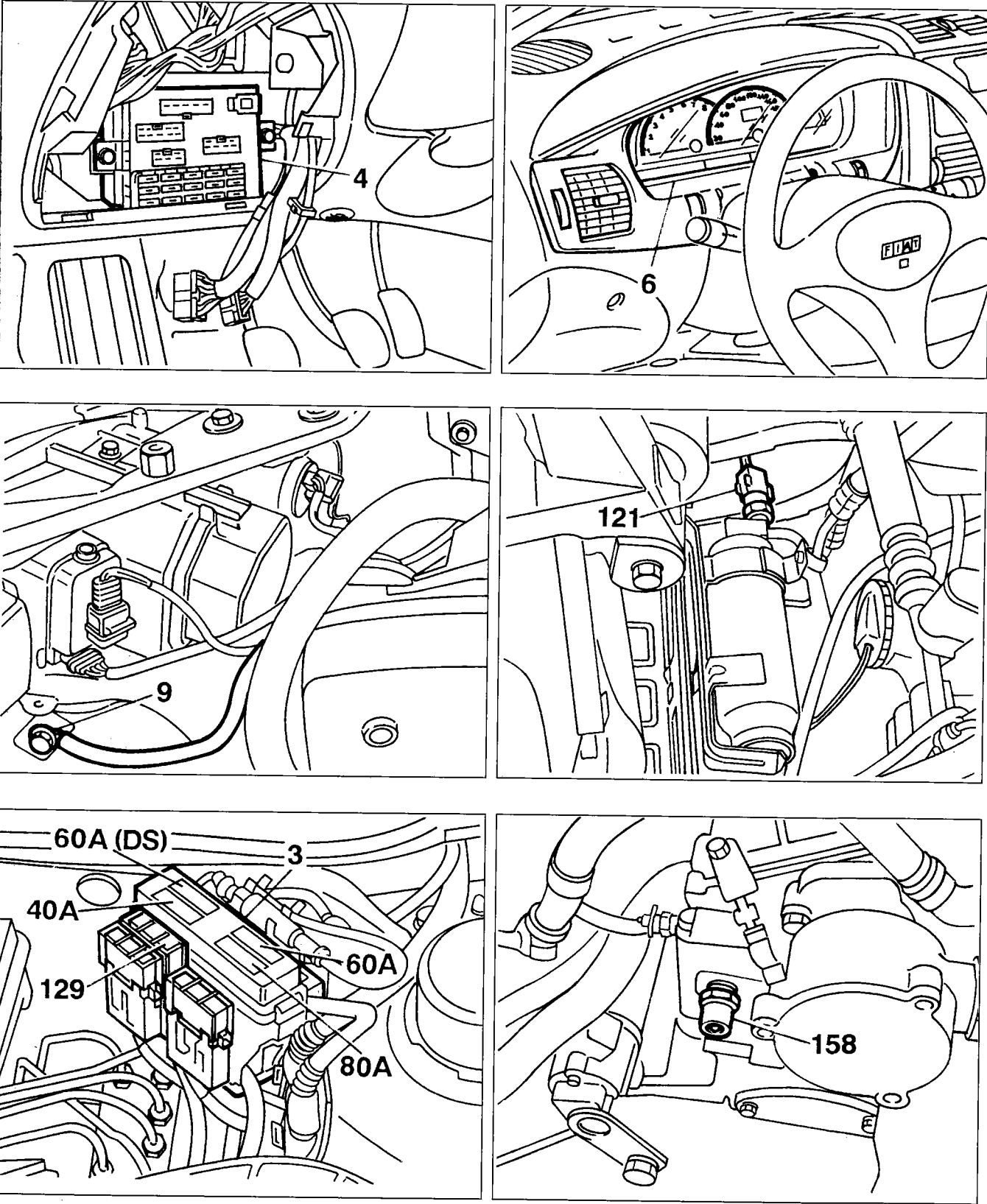
The cables involved in the wiring diagram are marked with a solid square

Electrical system
Wiring diagrams
55.

Version with air conditioner
Engine cooling system - Water temperature gauge - (See key following diagrams)



Location of components



P4A05ZL01

4A06ZL

P4A026N02

CONNECTOR BLOCKS *

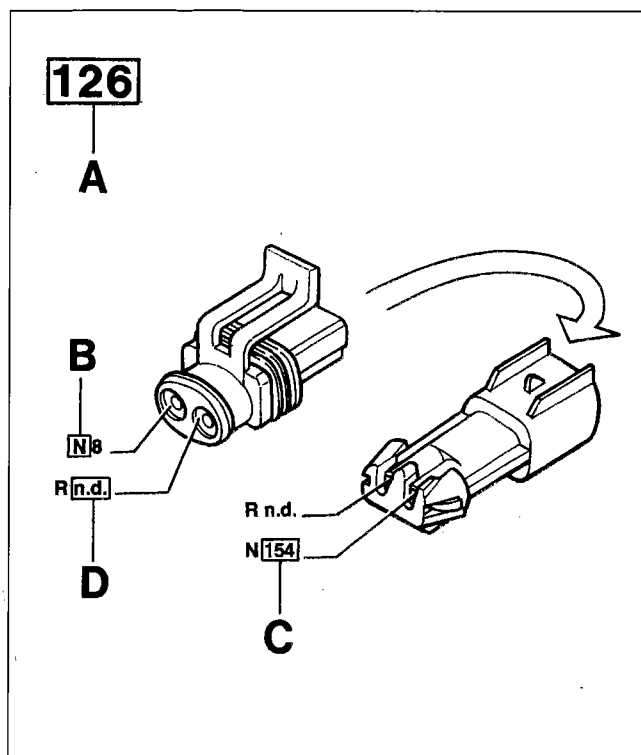
INTRODUCTION	page
Interpretation of the codes on the connector blocks	58
Wiring colour code	58
Connector blocks	59

* With regard to the 1910 Turbo D engine, the connector blocks have been added from the previous publication; for aspects not covered, refer to the Bravo-Brava publication no. 506.670/02.

55.

INTRODUCTION

Interpretation of the codes on the connector blocks



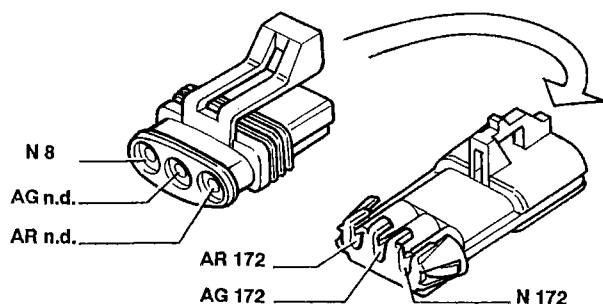
P4A58ZL01

- A** Connector block identification number referring to the wiring diagrams
- B** Cable colour identification code
- C** Identification number of the cable's destination block
- D** The abbreviation n.d. identifies an ultrasound-soldered joint taped into the wiring loom

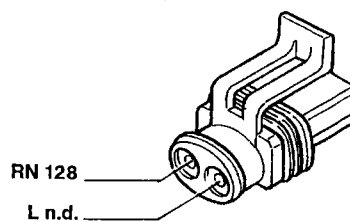
Cable colour codes

A	Light blue	BG	White-Yellow	LB	Blue-White
B	White	BL	White-Blue	LG	Blue-Yellow
C	Orange	BN	White-Black	LN	Blue-Black
G	Yellow	BR	White-Red	LR	Blue-Red
H	Grey	BV	White-Green	LV	Blue-Green
L	Blue	BZ	White-Purple	MB	Brown-White
M	Brown	CA	Orange-Light blue	MN	Brown-Black
N	Black	CB	Orange-White	NZ	Black-Purple
R	Red	CN	Orange-Black	RB	Red-White
S	Pink	GN	Yellow-Black	RG	Red-Yellow
V	Green	GL	Yellow-Blue	RN	Red-Black
Z	Purple	GR	Yellow-Red	RV	Red-Green
AB	Light blue-White	GV	Yellow-Green	SN	Pink-Black
AG	Light blue-Yellow	HG	Grey-Yellow	VB	Green-White
AN	Light blue-Black	HN	Grey-Black	VN	Green-Black
AR	Light blue-Red	HR	Grey-Red	VR	Green-Red
AV	Light blue-Green	HV	Grey-Green	ZB	Purple-White

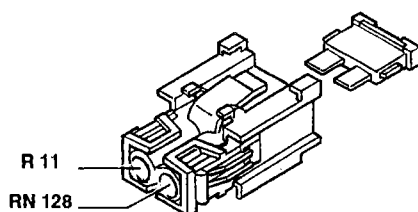
236 Front/air conditioner cables connection



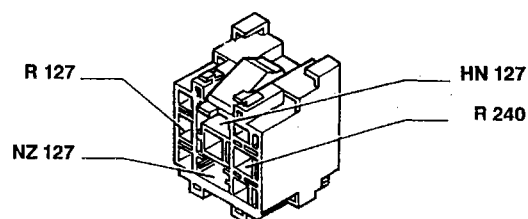
237 Additional engine cooling fan



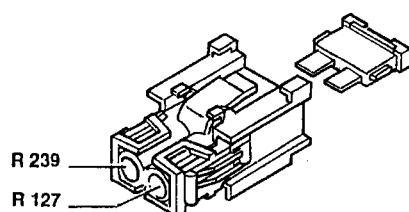
238 40A fuse protecting engine cooling fan



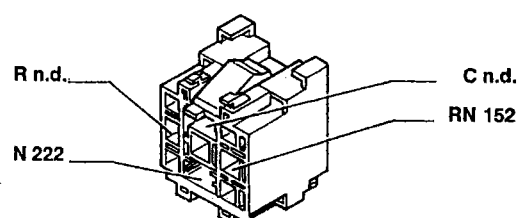
239 Heated diesel filter control relay



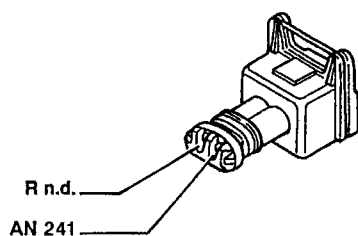
240 20A fuse protecting heated diesel filter control relay



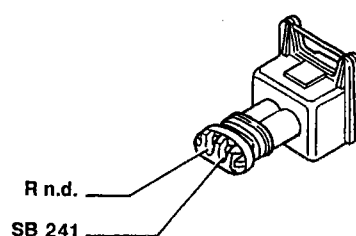
242 Fuel injection control relay



243 Engine advance adjustment solenoid



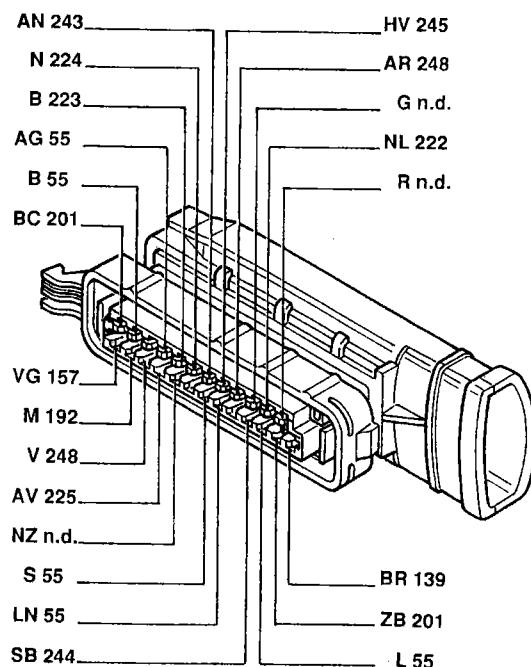
244 Fast idle adjustment solenoid



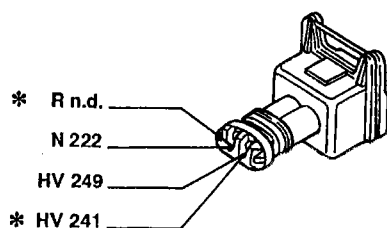
P4A59ZL01

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241 Fuel pump electronic control unit

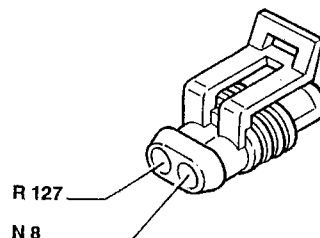


245 E.G.R. solenoid

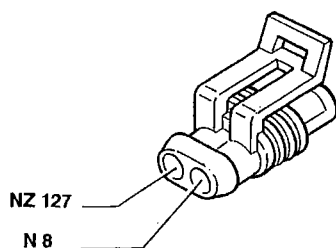


* Variant connections for 100 BHP version

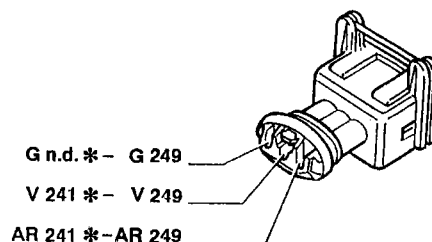
246 Heated fuel filter



247 Heated fuel filter thermal contact



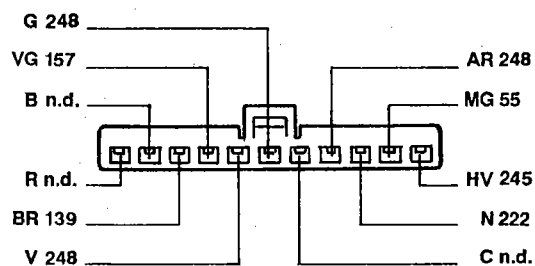
248 Potentiometer on fuel pump



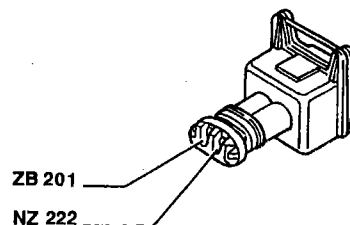
* Variant connections for 100 BHP version

P4A60ZL01

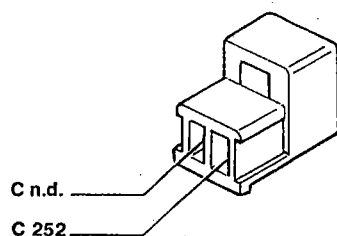
249 E.G.R. electronic control unit



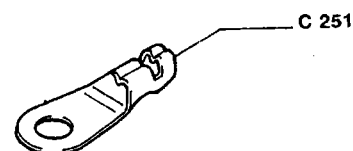
250 Water temperature sensor for preheating control unit



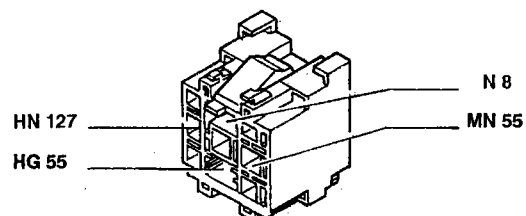
251 Thermal switch for K.S.B.



252 Earth for K.S.B. device



253 Relay for switching off compressor



Key to components:

- 3 Power fuse box:
 - A 60A fuse protecting fuel injection system
 - B 40A fuse protecting ignition system
 - C 60A fuse protecting additional optional extras
 - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:
 - E1 Ignition switch discharge relay
 - E2 Horn relay
 - E3 Heated rear window relay
- 6 Instrument panel:
 - A Low generator charge warning light
 - B Low engine oil pressure warning light
 - C Left direction indicator warning light
 - D Right direction indicator warning light
 - E Side lights warning light
 - F Instrument panel symbol lights
 - G Main beam headlamps warning light
 - H Air Bag fault warning light
 - I Anti-lock braking system fault warning light
 - J Fuel reserve circuit control module
 - J1 Low fuel level warning light
 - K Fuel gauge
 - L Fiat CODE fault warning light
 - M Fuel injection fault warning light
 - O Heater plugs warning light
 - Q Front brake pad wear warning light
 - R Handbrake on / low brake fluid level warning light
 - S Stop lights fault indicator electronic control module
 - T Stop lights fault warning light
 - U Door open warning light
 - V Speedometer control module
 - V1 Speedometer
 - W Rev counter

- X Water temperature gauge
- Z Trip recorder/mileage counter
- Z1 Trip recorder reset button
- 7 Stalk unit:
 - A Windscreen wiper speed switch
 - B Windscreen wash/headlamp wash/rear window wash switch
 - C Rear window wiper switch
 - D Headlamp flasher button
 - E Dipped beam/main beam headlamps
 - F Side lights switch
 - G Indicators/hazard lights intermittent switch
 - H Direction indicators switch
 - I Horn button
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 18 Rear left earth
- 19 Rear right earth
- 22 Left dashboard earth
- 24 Windscreen wiper motor
- 25 Windscreen/rear window washer pump
- 26 Rear window wiper motor
- 27 Rear connections contact assembly with built-in boot light switch
- 28 Dash./longitudinal cables connection
- 34 Switch controls unit:
 - A Alarm on warning light
 - B Rear fog lamps switch
 - C Rear fog lamps relay
 - D Rear fog lamps warning light
 - E Heated rear window switch
 - F Heated rear window warning light
 - G Switch controls unit symbol light
 - H Front fog lamps warning light
 - I Front fog lamps switch
- 39 Heated rear window
- 42 Right dashboard earth
- 46 Left horn
- 47 Right horn
- 55 Front/engine cables connection
- 55A Front left/engine cables connection
- 55C Front left/engine cables connection

56 Fuel gauge controller
 A Fuel level sensor
 B Electric fuel pump
 57 Inertial switch
 58 Lighting brightness adjustment rheostat
 70 Dash./front cables connection
 88 Low brake fluid level sensor
 89 Left brake pad wear sensor
 89A Left brake pad wear sensor cables connection
 90 Handbrake on warning light switch
 95 Front/anti-lock braking system (A.B.S.) cables connection
 97 Headlamp washer pump
 98 Headlamp washer intermittent switch
 99 20A fuse protecting headlamp washer
 114 Air Bag electronic control unit
 117 Air Bag/dashboard cables connection
 120 Air conditioner cables connection
 121 Three-stage pressure switch
 122 Engine cooling fan low speed relay
 123 Engine cooling fan high speed timer
 123A Engine cooling fan high speed relay
 124 Air conditioner compressor relay
 126 Front/air conditioner cables connection
 127 Connection between front left cables/cable on relay bracket
 128 Front/air conditioner cables connection
 129 40A power fuse protecting engine cooling fan
 131 Fiat CODE electronic control unit
 137 Car speed sensor
 139 Diagnostic socket for fuel injection
 142 Low oil pressure warning light switch
 143 Alternator
 145 Starter motor
 147 Compressor for air conditioner
 152 10A fuse protecting fuel injection
 154 Engine cooling fan
 157 Water temperature sensor for fuel injection
 158 Water temperature sensor for gauge
 170 Engine cooling fan limiting resistor
 171 Heater unit

172 Two-stage thermostat
 181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)
 192 Air temperature sensor
 200 Inertial switch relay
 201 Plug preheating control unit
 202 Heater/air conditioner light bulbs
 203 Air conditioner controls:
 A Switch for switching on air conditioner
 B Air conditioner recirculation control switch
 204 Engine cooling fan 1st speed control relay
 205 Air conditioner fan control relay
 206 Heater/air conditioner fan
 207 Heater/air conditioner speed control switch
 208 Heater/air conditioner limiting resistor
 209 Actuator controlling exterior air/recirculation
 210 Electronic thermostat cables connection
 211 Electronic thermostat (N.T.C.)
 222 Earth for fuel system
 223 Wheel speed sensor
 224 Instrumented fuel injector
 225 Flowmeter
 226 Diagnostic socket for Fiat CODE system
 228 Heater plugs
 229 Engine cut-out electrostop
 232 Compressor earth
 233 Thermostat on coolant pump
 235 Air conditioner compressor cables connection
 236 Front/air conditioner cables connection
 237 Additional engine cooling fan
 238 40A fuse protecting engine cooling fan
 239 Heated diesel filter relay
 240 20A fuse protecting heated diesel filter relay
 241 Fuel pump electronic control unit
 242 Fuel injection control relay
 243 Engine advance adjustment solenoid
 244 Fast idle solenoid
 245 E.G.R. solenoid
 246 Heated fuel filter
 247 Heated fuel filter thermal contact

248 Potentiometer on fuel pump
 249 E.G.R. electronic control unit
 250 Water temperature sensor for preheating control unit
 251 K.S.B. thermal switch
 252 K.S.B. earth.
 253 Relay for switching off compressor
 N.D. Ultrasound-soldered joint taped into wiring loom

Cable colour code:

A	Light blue
B	White
C	Orange
G	Yellow
H	Grey
L	Blue
M	Brown
N	Black
R	Red
S	Pink
V	Green
Z	Purple
AB	Light blue-White
AG	Light blue-Yellow
AN	Light blue-Black
AR	Light blue-Red
AV	Light blue-Green
BG	White-Yellow
BL	White-Blue
BN	White-Black
BR	White-Red
BV	White-Green
BZ	White-Purple
CA	Orange-Light blue
CB	Orange-White
CN	Orange-Black
GN	Yellow-Black
GL	Yellow-Blue
GR	Yellow-Red
GV	Yellow-Green
HG	Grey-Yellow
HN	Grey-Black
HR	Grey-Red
HV	Grey-Green
LB	Blue-White
LG	Blue-Yellow
LN	Blue-Black
LR	Blue-Red
LV	Blue-Green
MB	Brown-White
MN	Brown-Black
NZ	Black-Purple
RB	Red-White
RG	Red-Yellow
RN	Red-Black
RV	Red-Green
SN	Pink-Black
VB	Green-White
VN	Green-Black
VR	Green-Red
ZB	Purple-White

page

- Electrical symbols	1
- How to read the wiring diagrams	4
- Wiring diagrams	5
- Key to wiring diagrams	37

55.

NAME	Bravo		Brava			
	S	SX	S	SX	EL	ELX
	1581 16v	1581 16v	1581 16v	1581 16v	1581 16v	1581 16v
Side lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights -	5	5	5	5	5	5
Front fog lamps and warning light - Rear fog lamps and warning light	7	7	7	7	7	7
Version with air conditioner Engine cooling system - Water temperature gauge	9	9	9	9	9	9
Anti-lock braking system (A.B.S.) and fault warning light - Hand brake on/low brake fluid level warning light	11	11	11	11	11	11
Fiat-CODE system and fault warning light	13	13	13	13	13	13
Starting - Electronic ignition and fuel injection - Recharging and warning light - Low engine oil pressure warning light - Fuel injection fault warning light - Rev counter	15	15	15	15	15	15
Model without air conditioner Engine cooling system - Water temperature gauge - Car interior ventilation	17	17	17	17	17	17
Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights	19	19	19	19	21	21
Fuel level gauge and reserve warning light - Hand brake on/low brake fluid level warning light - Speedometer - Trip recorder/total mileage counter and trip recorder reset button - Water temperature gauge - Low engine oil pressure warning light - Rev counter - Front brake pad wear warning light	23	23	23	23	25	25
Air conditioner	27	27	27	27	27	27
Courtesy light - Symbol illumination	29	29	29	29	29	29
Instrument panel connections	31	31	31	31	33	33
Diagnostic socket connections	35	35	35	35	35	35

Electrical symbols

	Side lights		Choke (starter)		Switch discharge
	Main beam		Water in fuel filter		Dipped headlamps
	Heated seat		Heater plug		Indicators flashing with central door locking
	Seat belts		Compressor turbo pressure		Electric horns
	Heated rear window		Rear fog lamps		Left indicator
	Hand brake on and low brake fluid level		Front fog lamps		Right indicator
	A.B.S.		Brake pad wear		Engine cooling
	Hazard warning		Compressor turbo pressure		Windscreen wiper
	Indicators		Auto transmission fluid temperature		Electric sunroof
	Handbrake on and low brake fluid level		Speed limits		Catalytic converter temperature
	Recharging		Fuel gauge		Heating element
	Engine oil pressure		Engine coolant temperature gauge		Diode

P4A01EL01

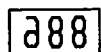
55.

Electrical symbols

	Warning light		Trip computer control		Differential lock
	Bulb		Electronic injection		Auto transmission fluid temperature
	Fuse		Engine oil level		Temperature
	Switch open		Brake fluid level (Japan version)		Anti-theft device
	Selector switch		Doors open		Electric windows
	Button open		Central locking		Earth
	Coil-controlled switch (Relay)		Sport function on electronic suspension system		No. plate lights
	Motor		Transistor		Pulse generator (Timer)
	Rear window wiper		Air Bag		Analogue clock
	Headlamp washer		A.B.S. (Japan version)		Digital clock
	Screen wash/wipe		Car stop fault		Speedometer
	Rear win. wash/wipe		Windscreen wiper		Rev counter

P4A02EL01

Electrical symbols



Digital speedometer



Digital rev counter



Digital fuel gauge



Analogue fuel gauge



Analogue coolant temperature gauge



Econometer



Digital coolant temperature gauge



Engine oil temperature



Engine oil pressure gauge

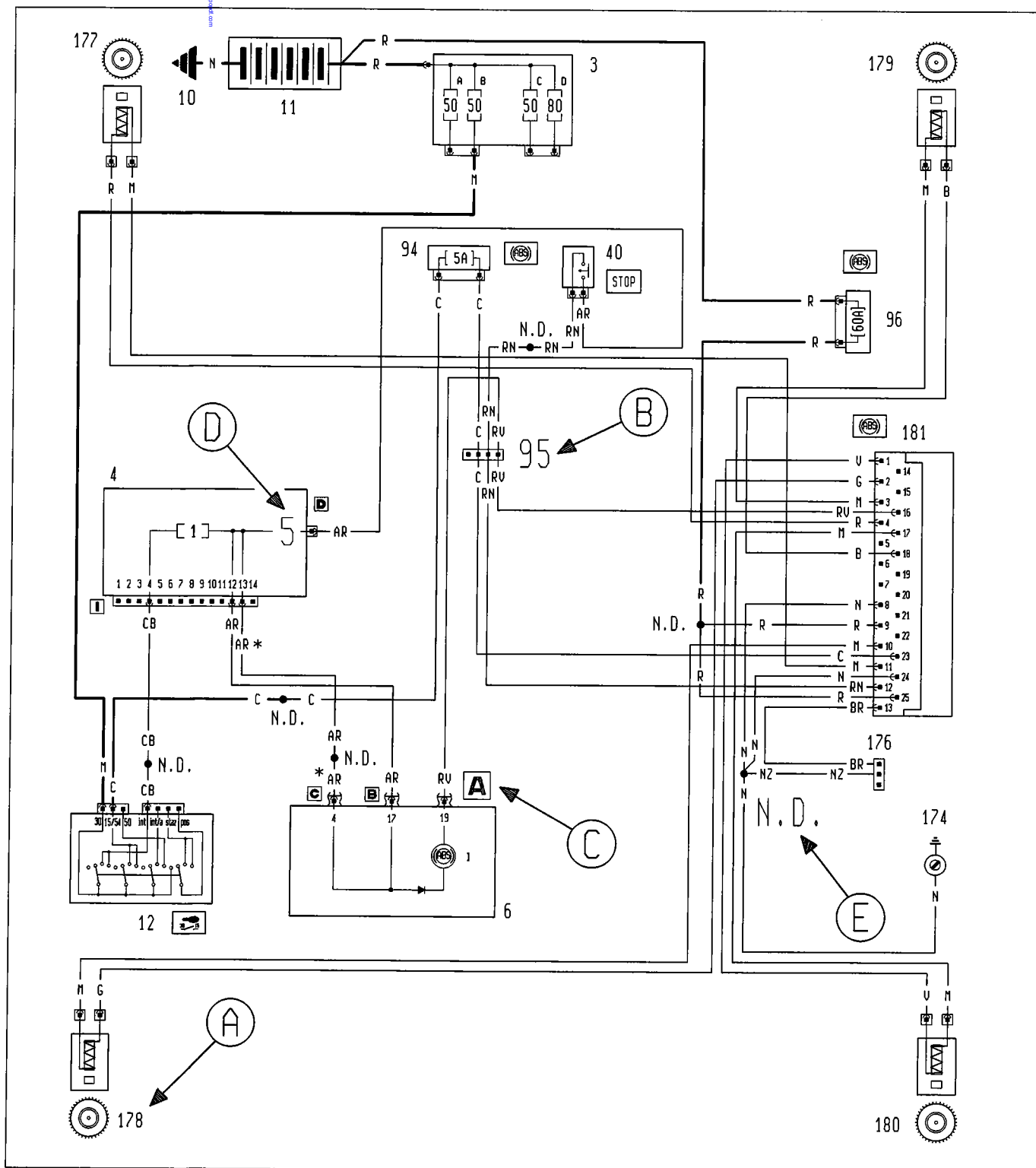


Voltmeter

P4A03EL01

55.

How to read the wiring diagrams

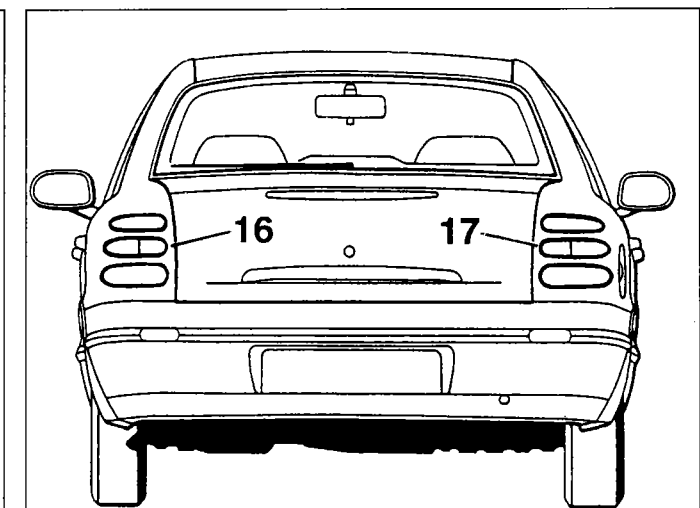
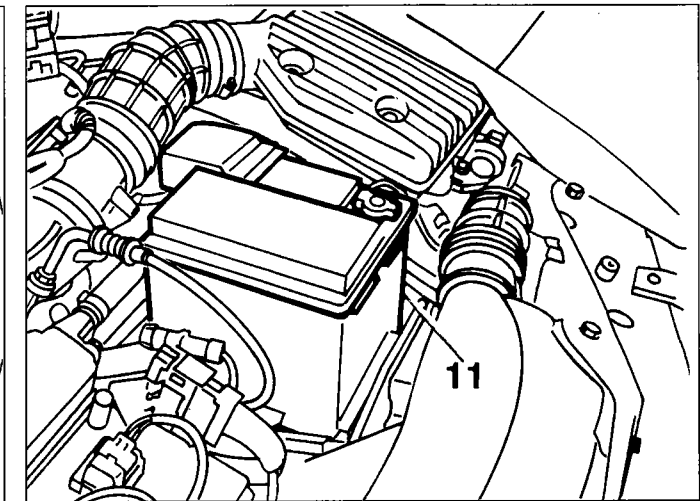
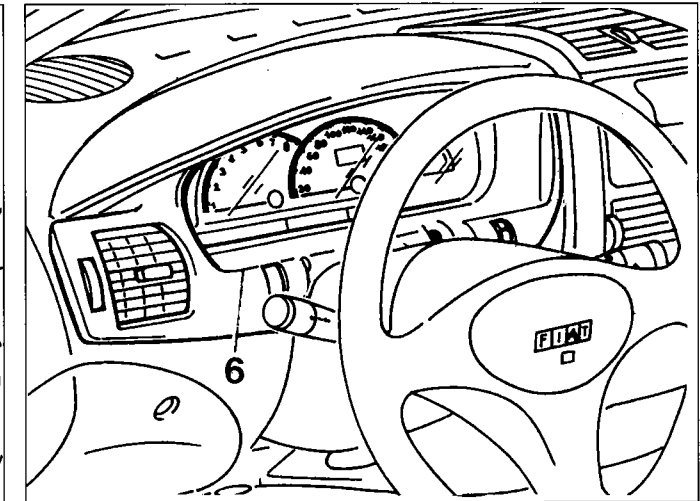
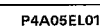


P4A04EL01

Key to references

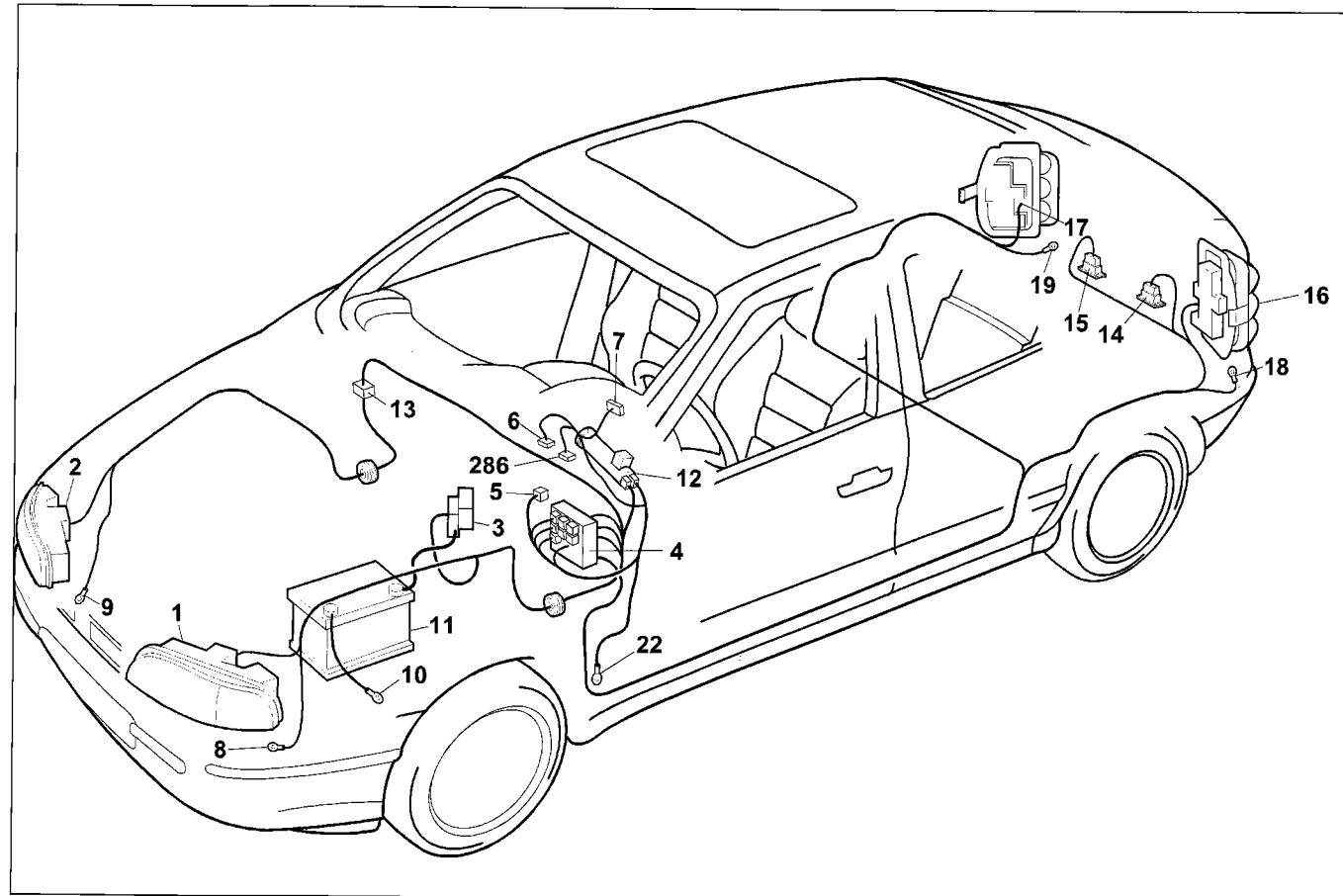
- A Component number
- B Connection number
- C Identification of connector on component
- D Connecting pin number
- E Ultrasound-soldered joint taped in wiring loom

Location of components



P4A06EL01

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P4A07EL01

Side lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights

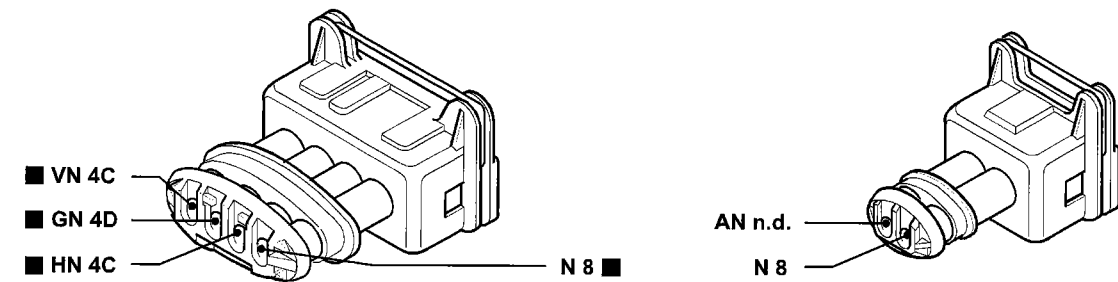
Key to components

- 1 Front left lights cluster
- 2 Front right lights cluster
- 3 Power fuse box:
 - A 30A fuse protecting fuel injection
 - B 40A fuse protecting ignition
 - C 60A fuse protecting additional optional extras
 - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 5 Dipped beam relay
- 6 Instrument panel:
 - E Side lights warning light
 - G Main beam headlamps warning light
- 7 Stalk unit:
 - D Flasher button
 - E Main beam/dipped beam headlamps stalk
 - F Side lights stalk
- 8 Front left earth
- 9 Front right earth

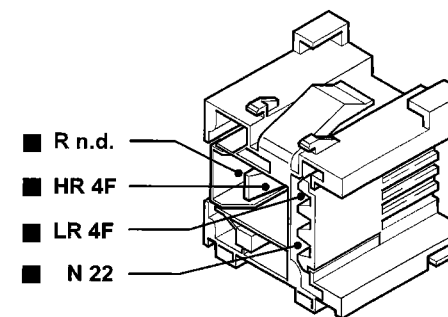
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Connection between front right/left cables
- 14 Left number plate light
- 15 Right number plate light
- 16 Rear left lights cluster
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 22 Left dashboard earth
- 286 Short-circuiting connection

N.D. Ultrasound-soldered joint taped in wiring loom

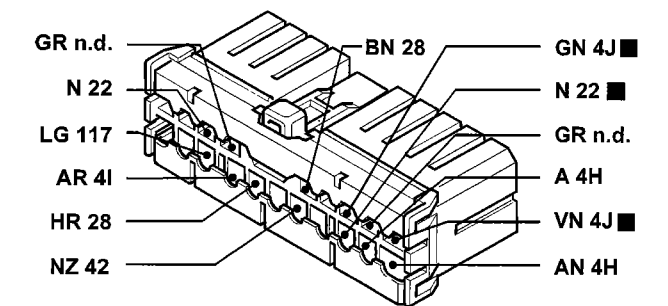
1 Front left lights cluster



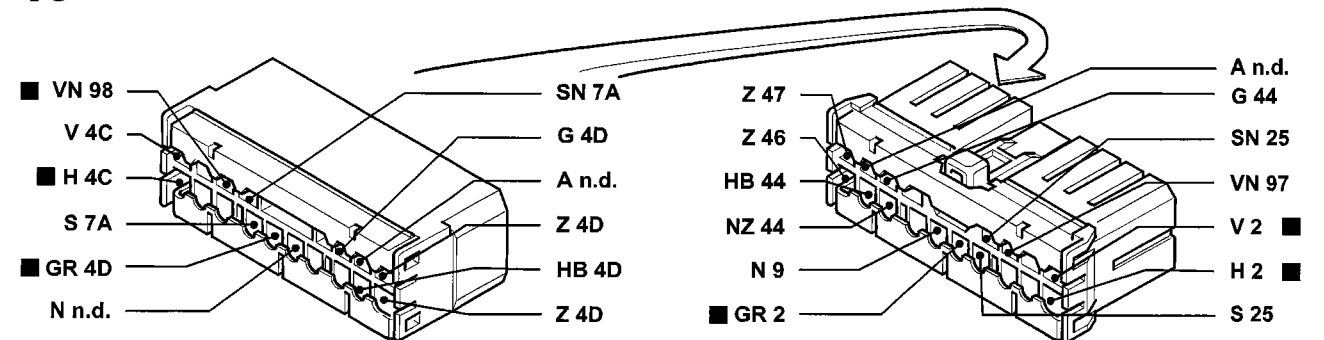
5 Dipped beam relay



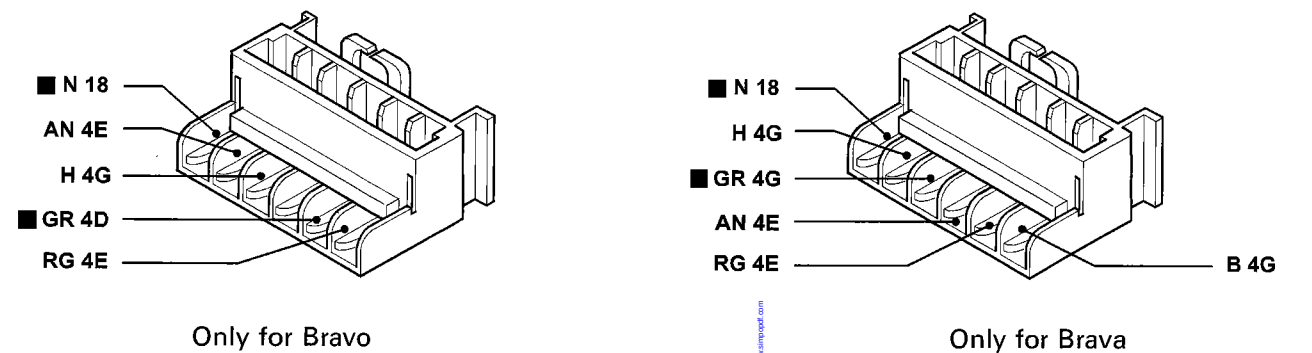
6B Instrument panel



13 Connection between front right/left cables



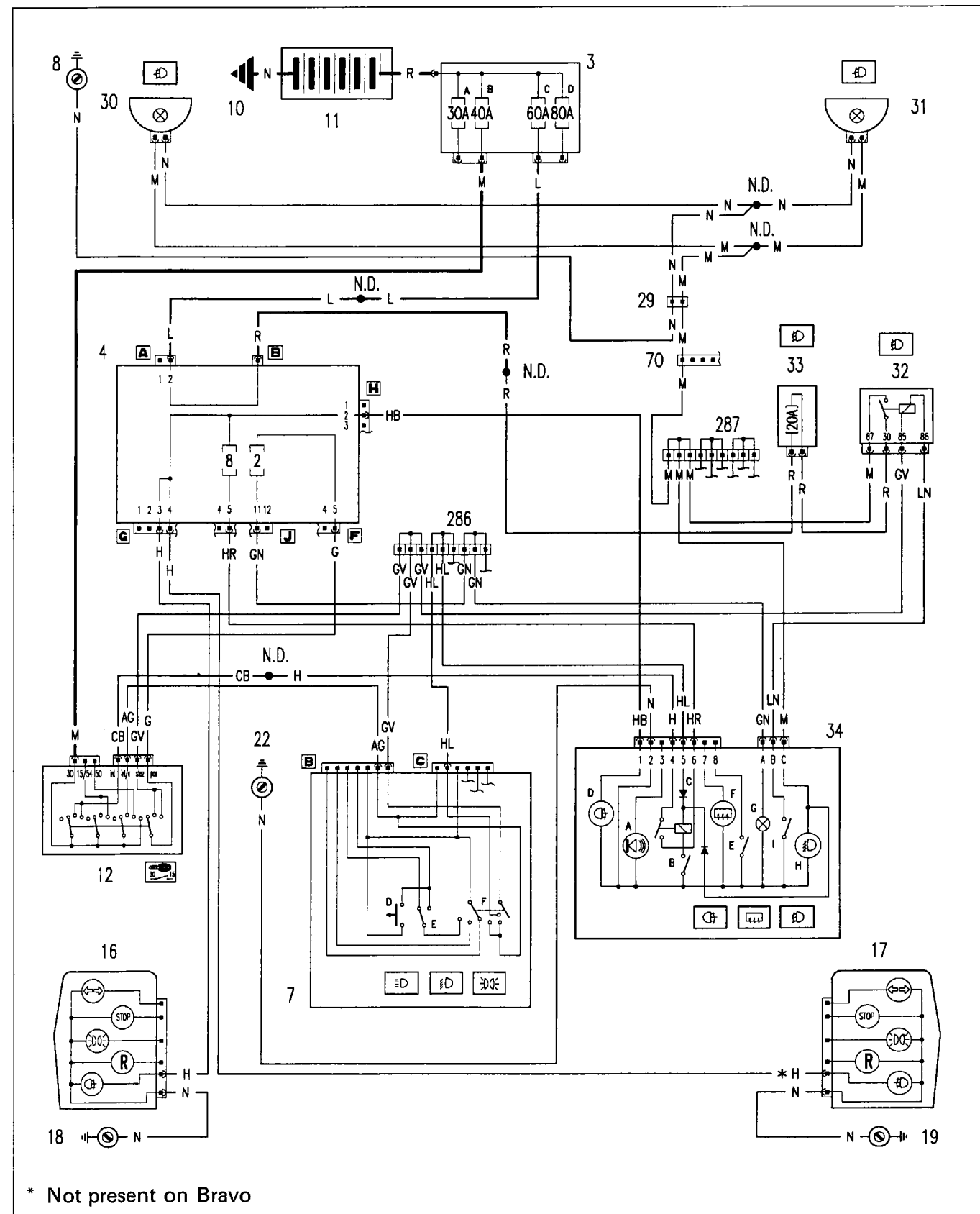
16 Rear lights cluster



■ The cables involved in the wiring diagram are marked by a solid square

P4A08EL01

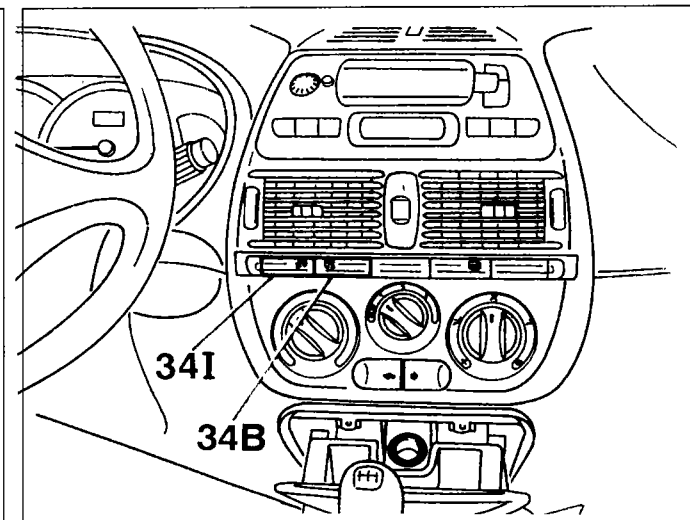
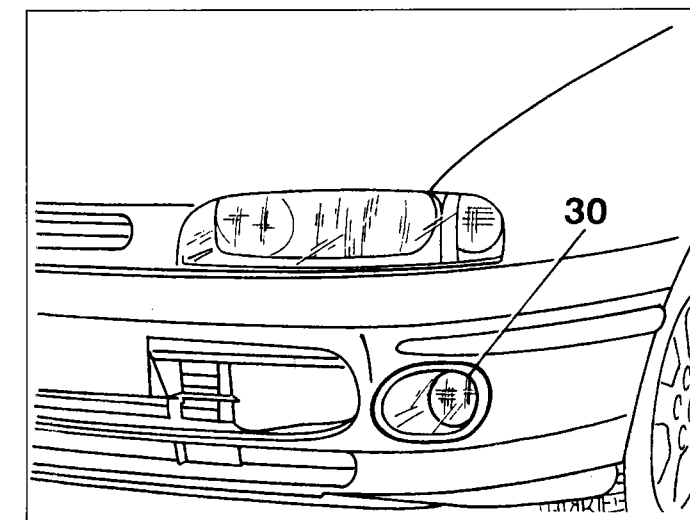
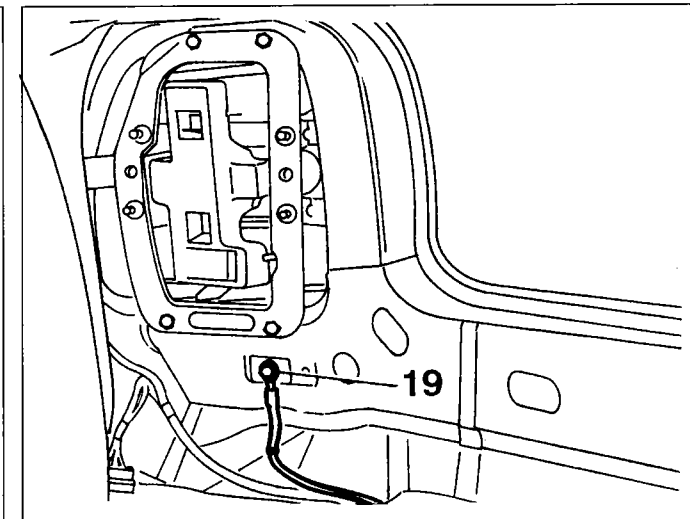
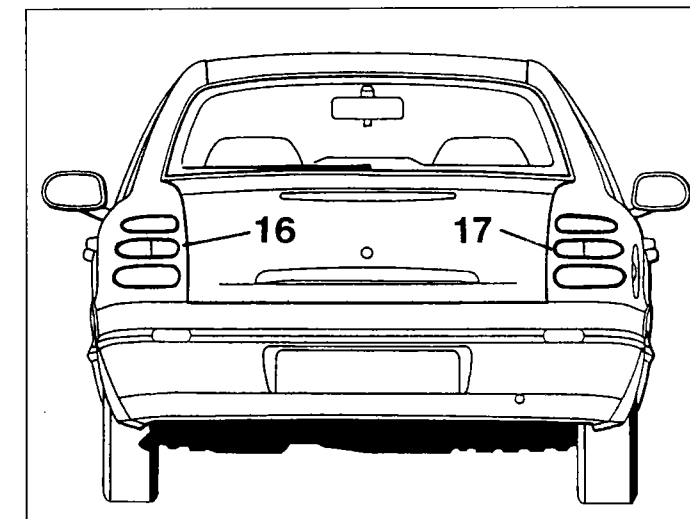
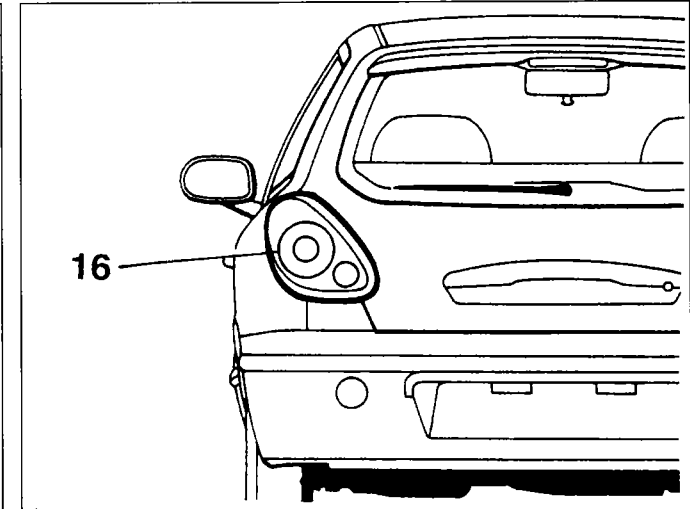
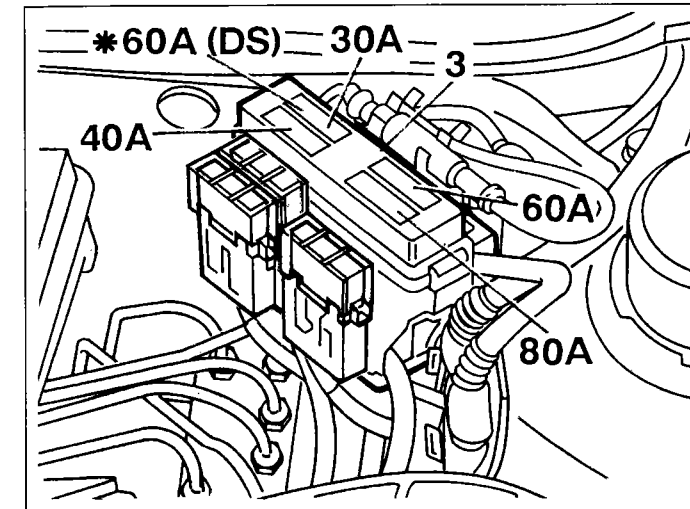
Front fog lamps and warning light - Rear fog lamps and warning light



* Not present on Bravo

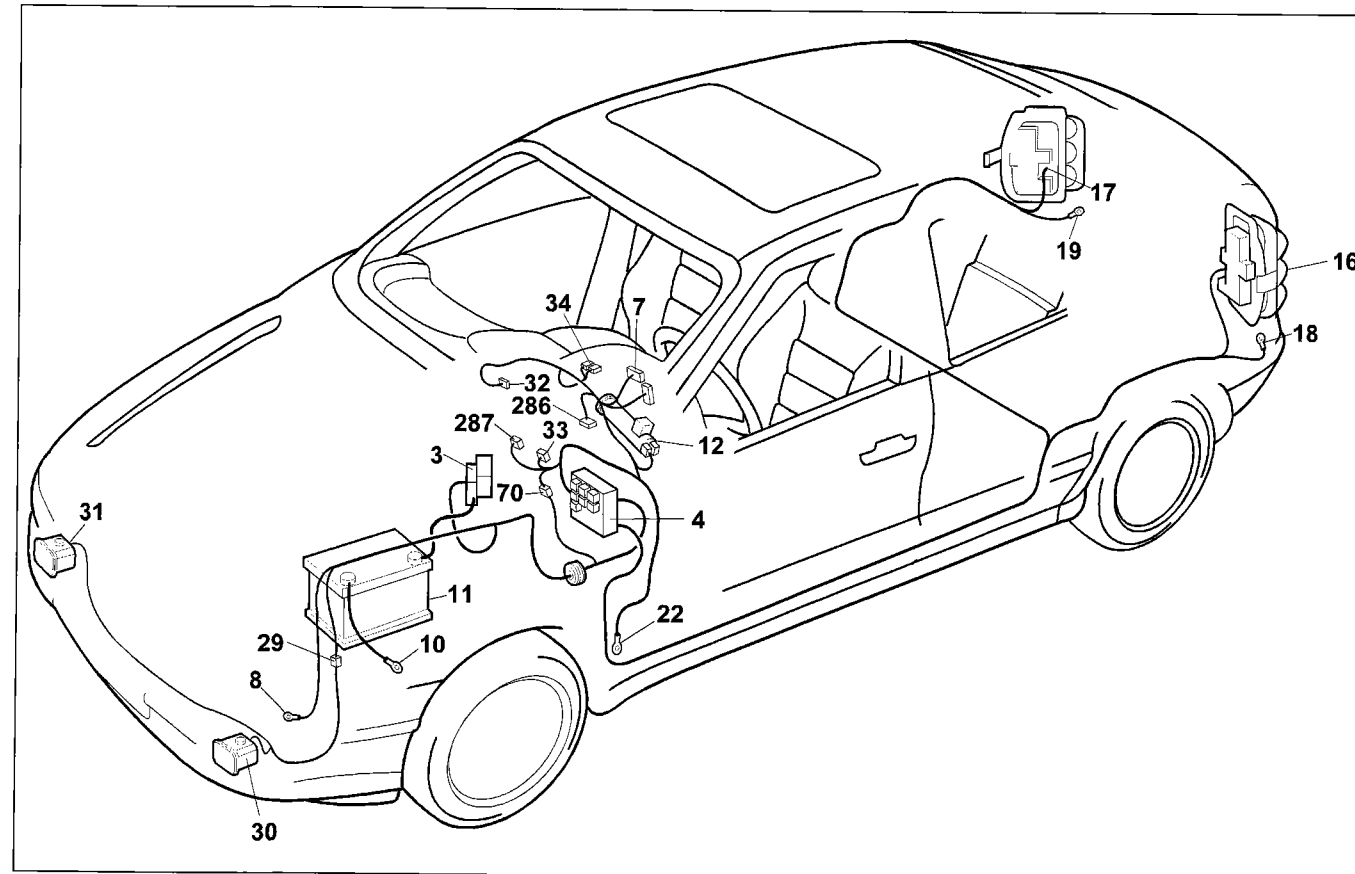
P4A09EL01

Location of components



P4A10EL01

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P4A11EL01

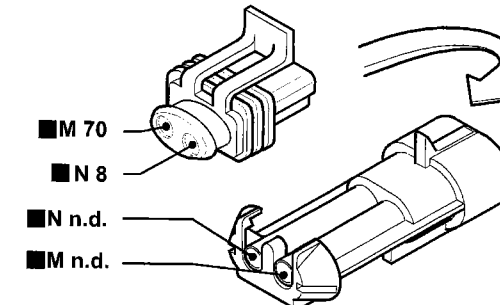
Front fog lamps and warning light - Rear fog lamps and warning light

Key to components

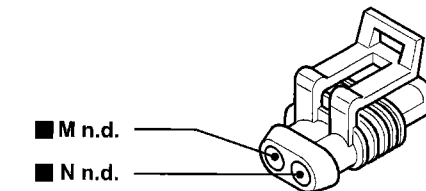
- 3 Power fuse box:
 - A 30A fuse protecting fuel injection
 - B 40A fuse protecting ignition
 - C 60A fuse protecting additional optional extras
 - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 7 Stalk unit:
 - D Flasher button
 - E Dipped beam/main beam headlamps stalk
 - F Side lights stalk
- 8 Front left earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 16 Rear left lights cluster
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 22 Left dashboard earth
- 29 Front/front fog lamps cables connection
- 30 Front left fog lamp

- 31 Front right fog lamp
 - 32 Front fog lamp relay
 - 33 20A fuse protecting front fog lamps
 - 34 Switch controls unit:
 - A Alarm on warning light
 - B Rear fog lamps switch
 - C Rear fog lamps relay
 - D Rear fog lamps warning light
 - E Heated rear window switch
 - F Heated rear window warning light
 - G Switch controls unit symbol light
 - H Front fog lamps warning light
 - I Front fog lights switch
 - 70 Dashboard/front cables connection
 - 286 Short-circuiting connection
 - 287 Short-circuiting connection
- N.D. Ultrasound-soldered joint taped in wiring loom

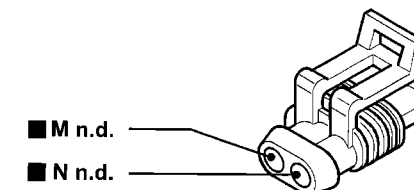
29 Front/front fog lamps cables connection



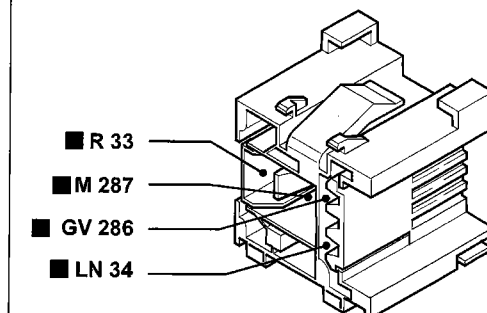
30 Front left fog lamp



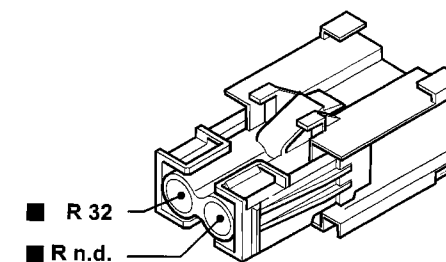
31 Front right fog lamp



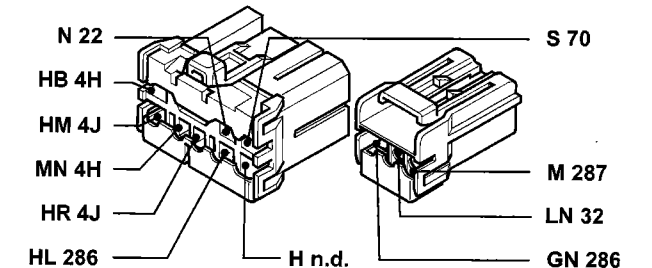
32 Front fog lamp relay



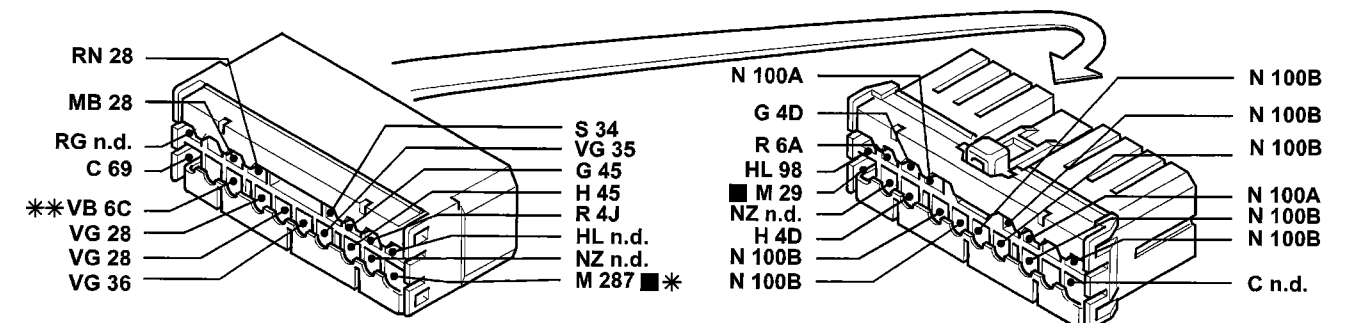
33 20A fuse protecting front fog lamps



34 Switches controls unit



70 Dashboard/front cables connection



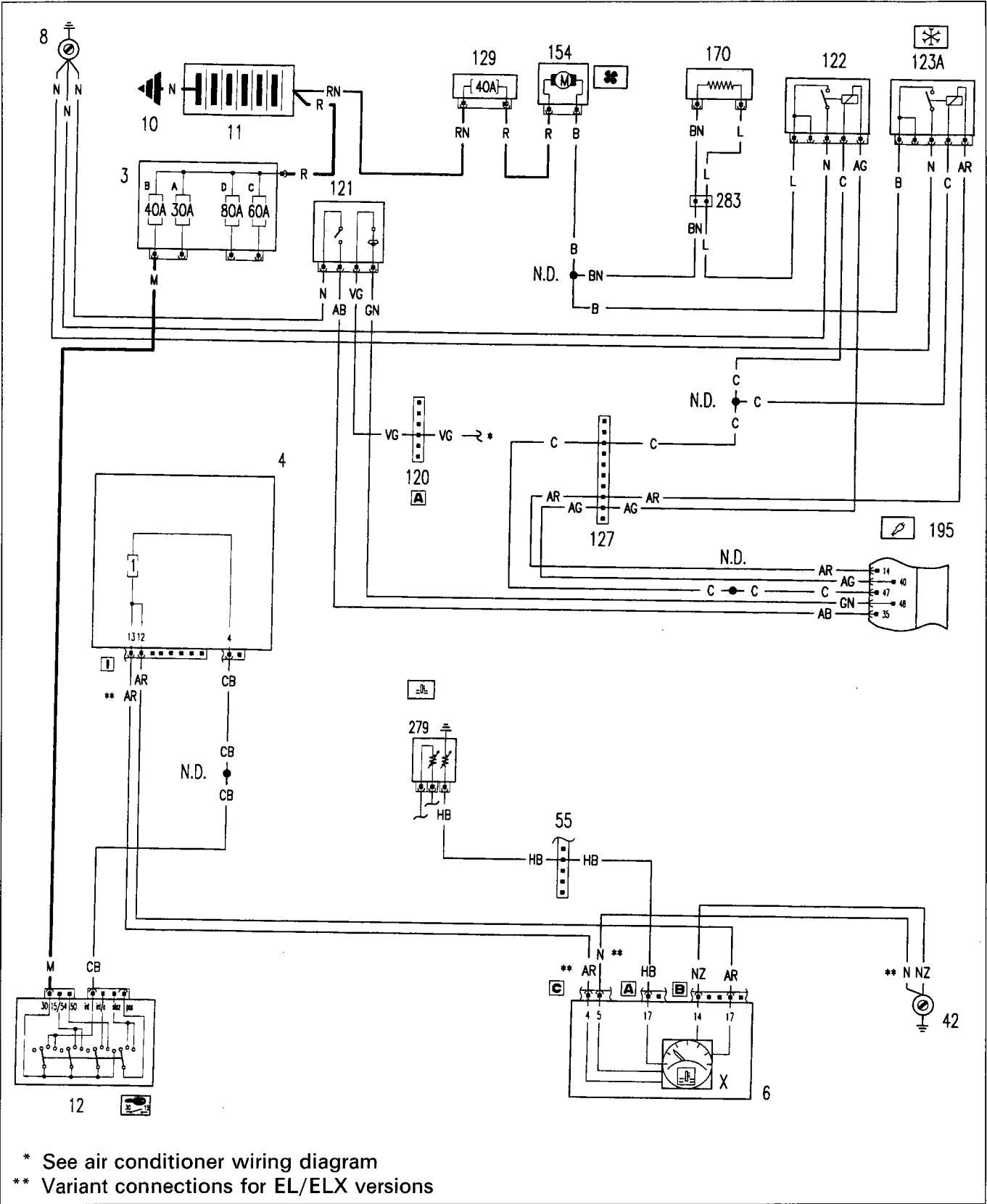
* Not present on S version

** Applies only to EL/ELX version

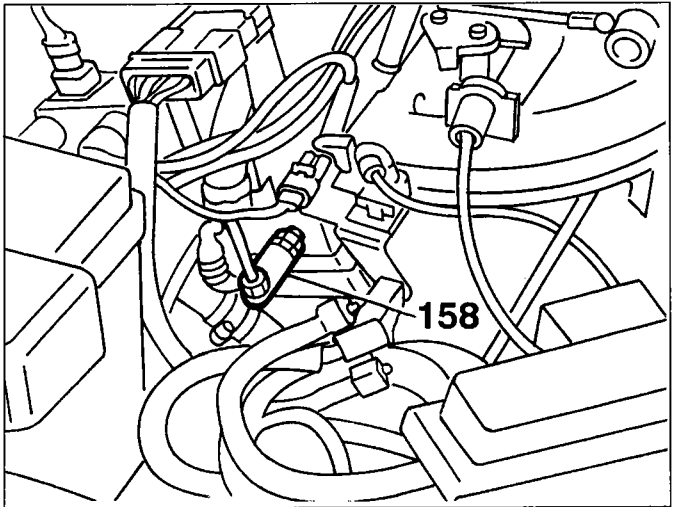
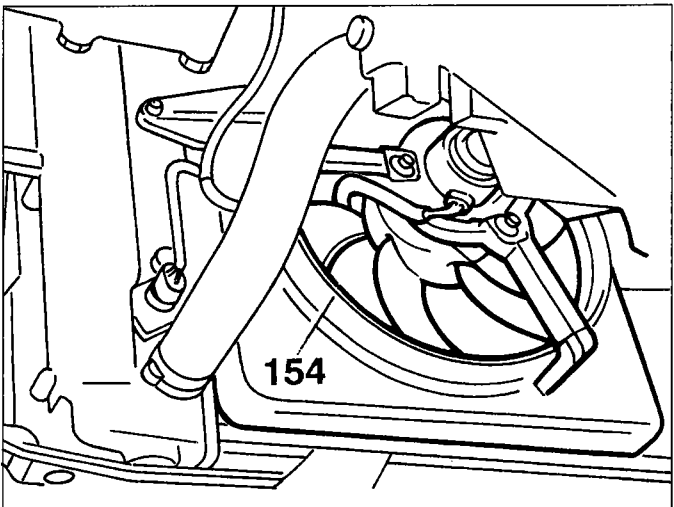
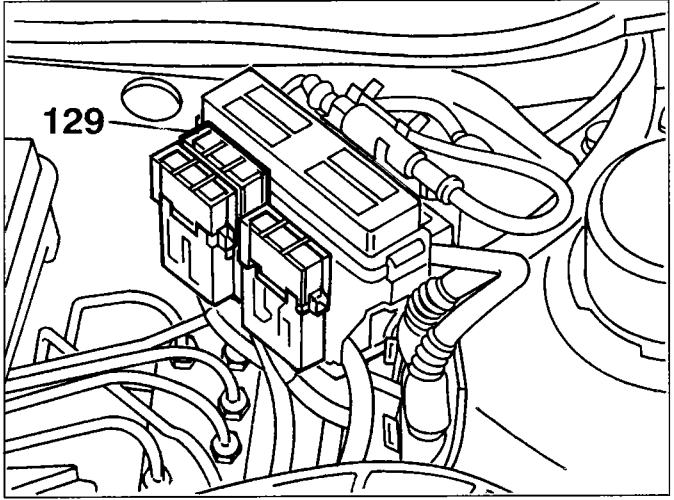
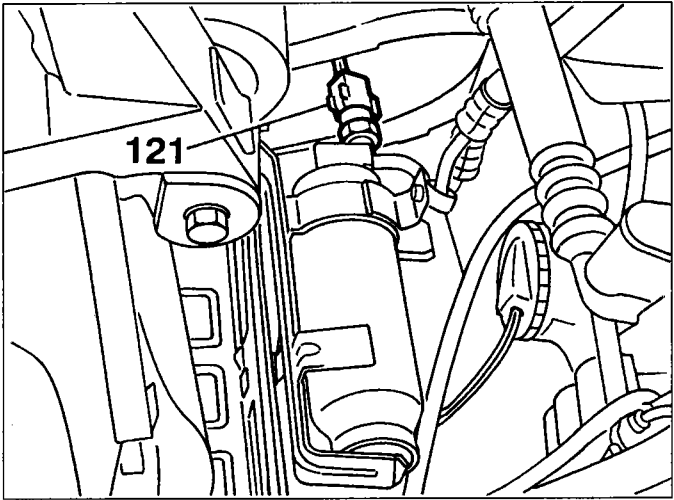
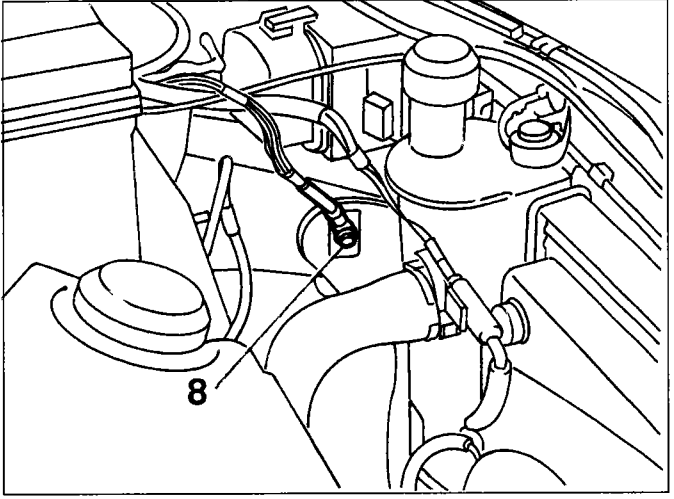
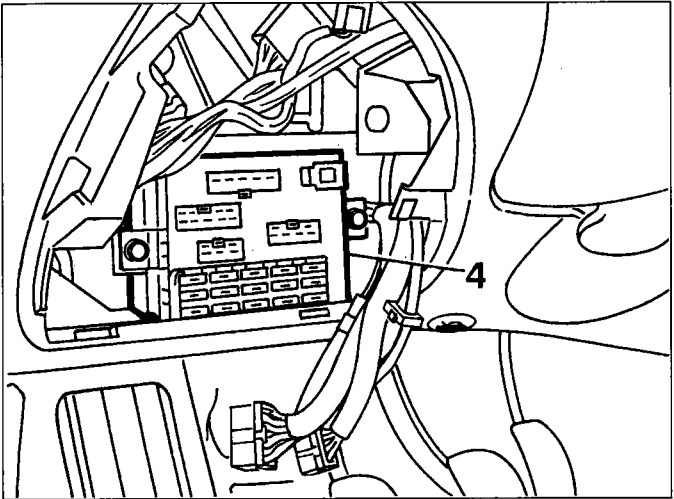
■ The cables involved in the wiring diagram are marked with a solid square

P4A12EL01

Version with air conditioner
Engine cooling system - Water temperature gauge



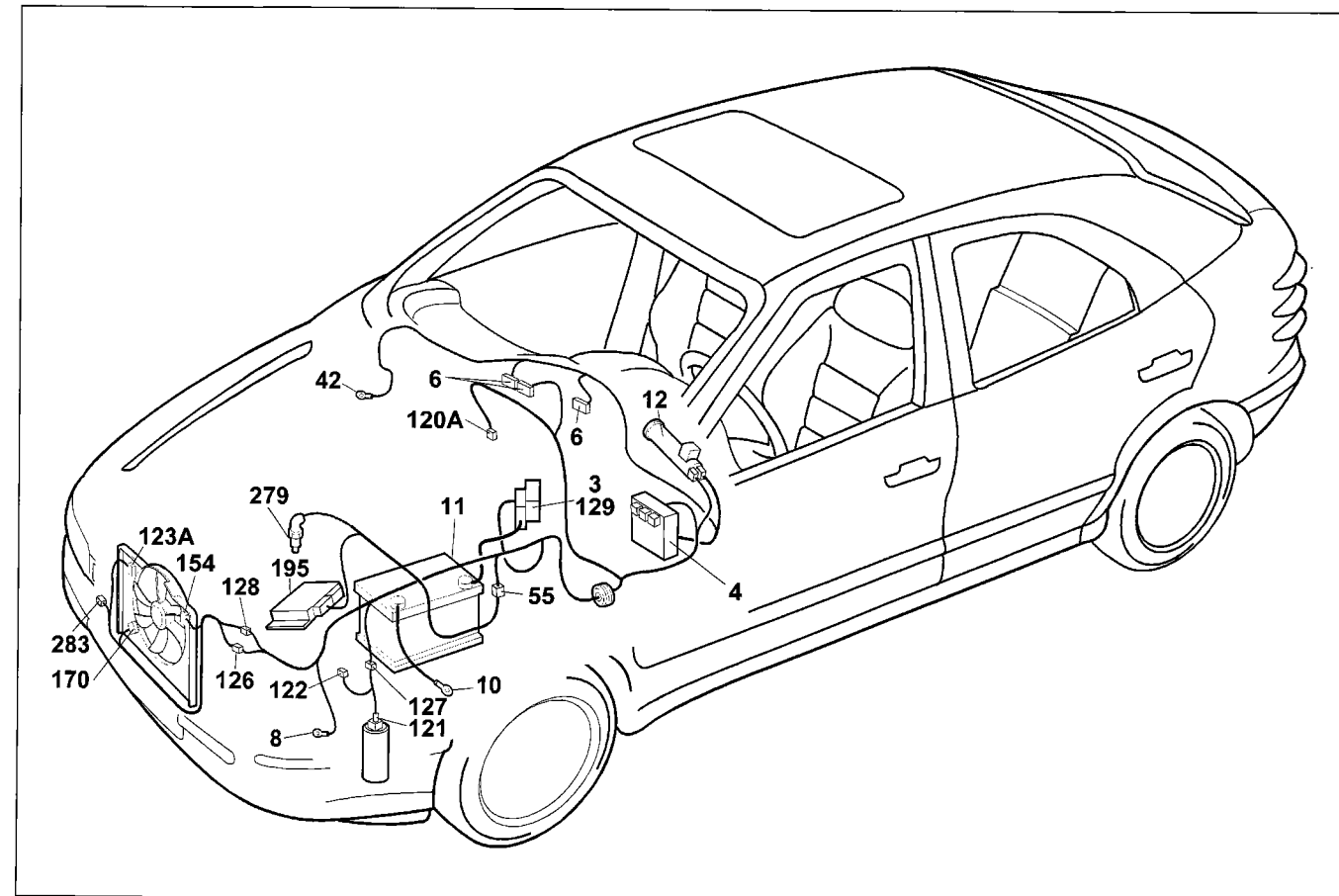
Location of components



P4A13EL01

P4A14EL01

55.



P4A16EL01

Version with air conditioner

Engine cooling system - Water temperature gauge

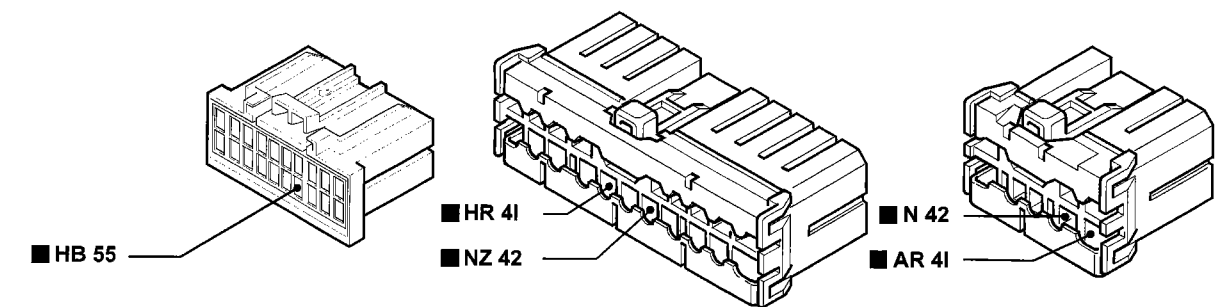
Key to components

- 3 Power fuse box:
30A fuse protecting fuel injection
B 40A fuse protecting ignition
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:
E1 Ignition switch discharge relay
- 6 Instrument panel:
X Water temperature gauge
- 8 Front left earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 42 Right dashboard earth
- 55 Connection between front cables/fuel gauge control
- 120 Air conditioner
- 121 Three-stage pressure switch

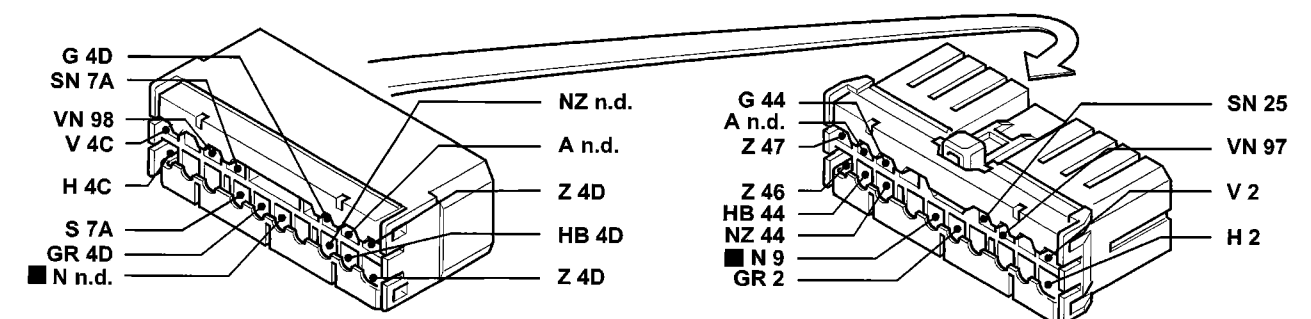
- 122 Engine cooling fan low speed control relay
- 123A Engine cooling fan high speed control relay
- 127 Connection between front left cables/cable on relay carrier bracket
- 128 Front/air conditioner cables connection
- 129 50A power fuse protecting engine cooling fan
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistor
- 195 Ignition/fuel injection electronic control unit (1581)
- 279 Engine coolant temperature double sender unit
- 283 Front cable/resistor connection

N.D. Ultrasound-soldered joint taped in wiring loom

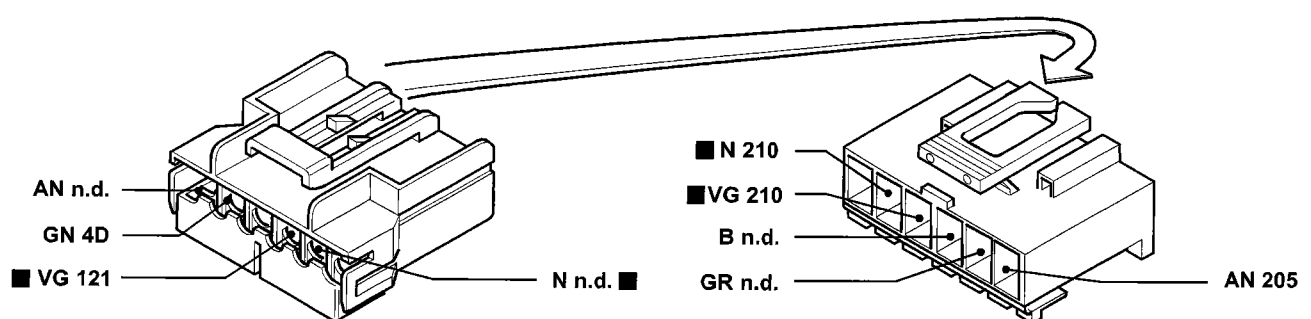
6 A - B - C Instrument panel



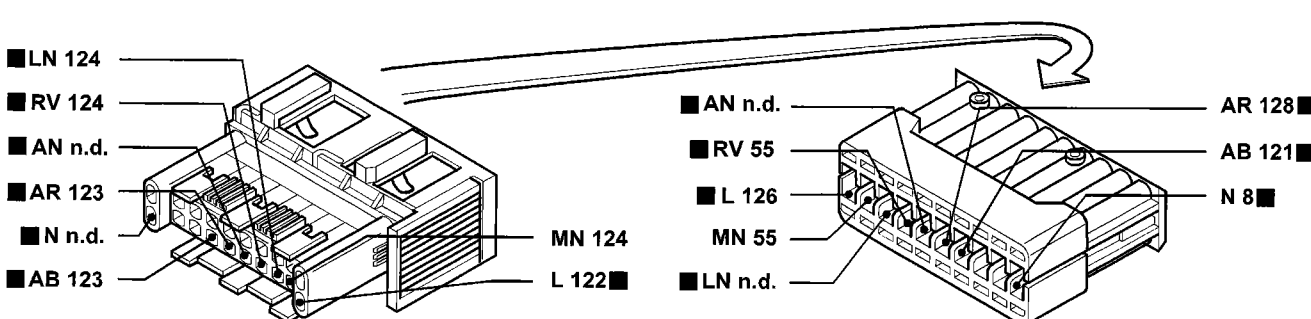
13 Front right/left cables connection



120 Air conditioner cables connection



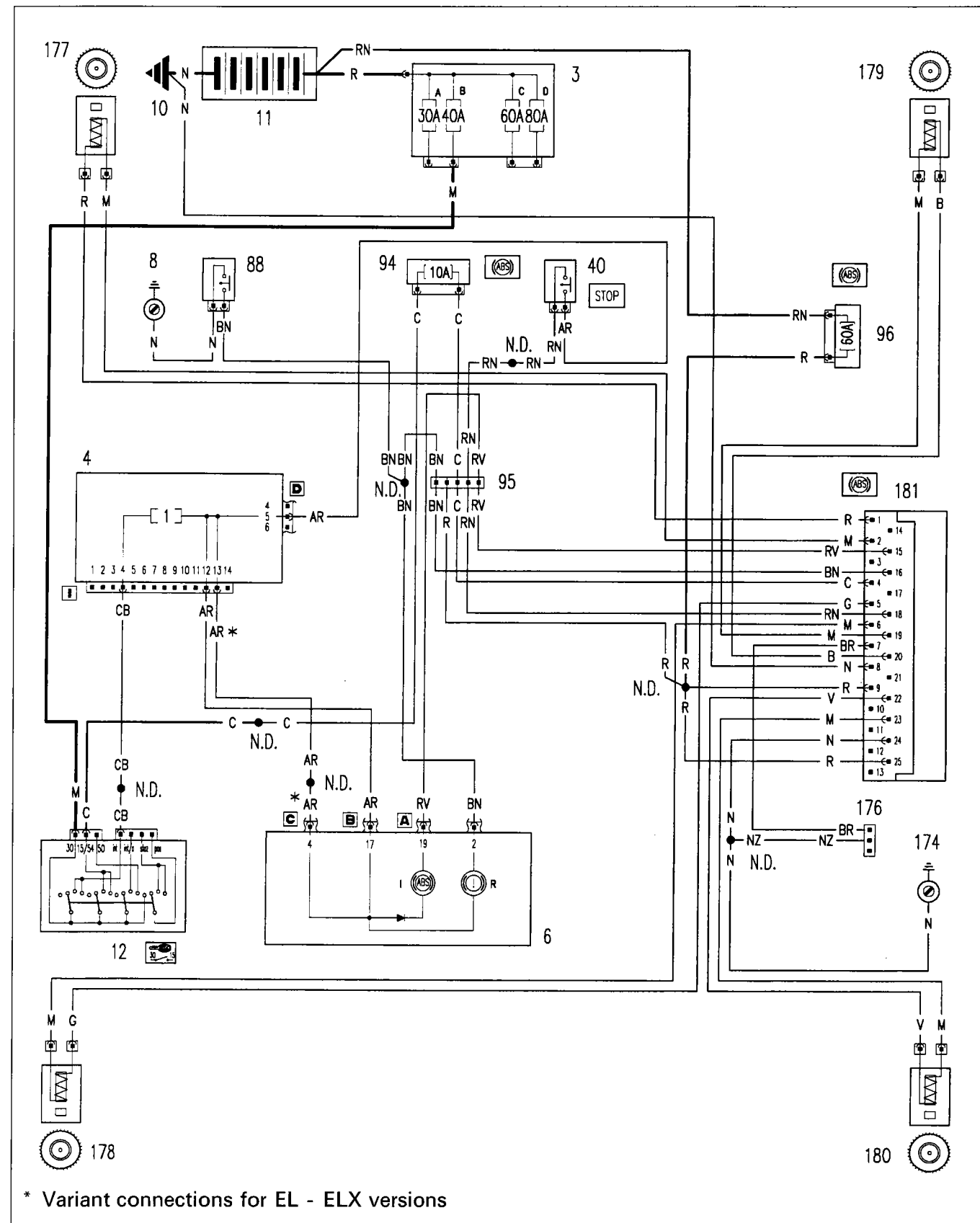
127 Connection between front left cables/cable on relay carrier bracket



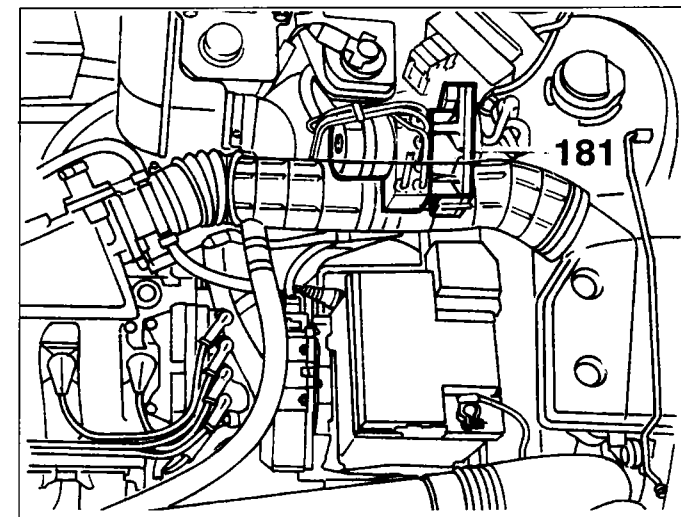
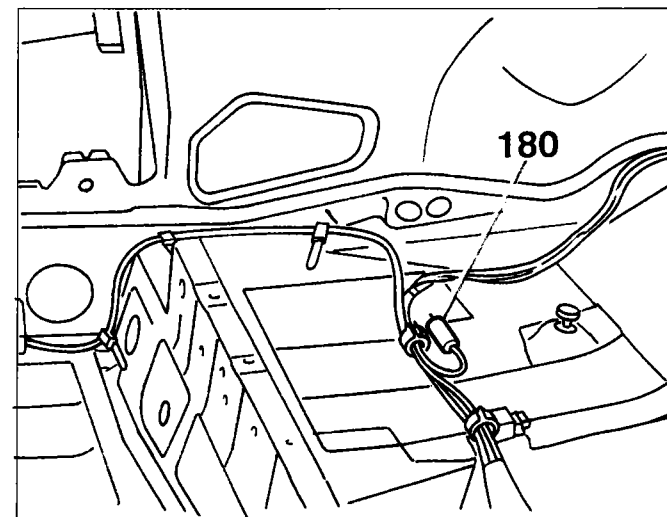
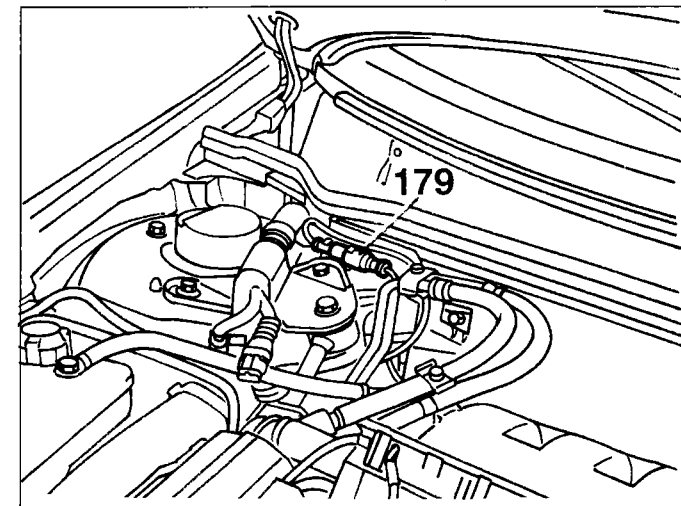
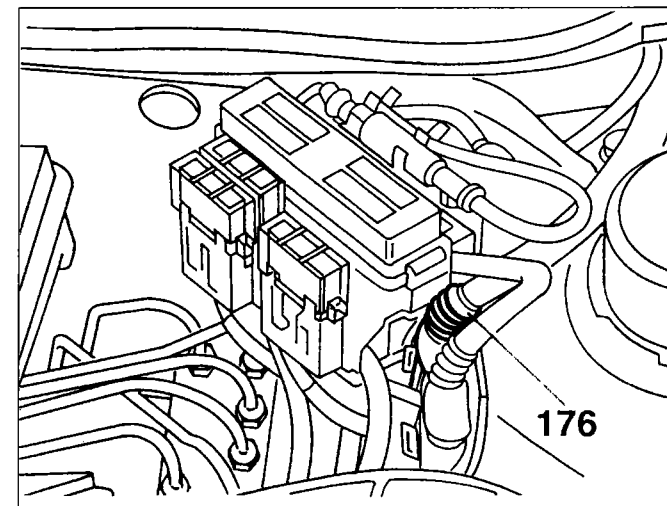
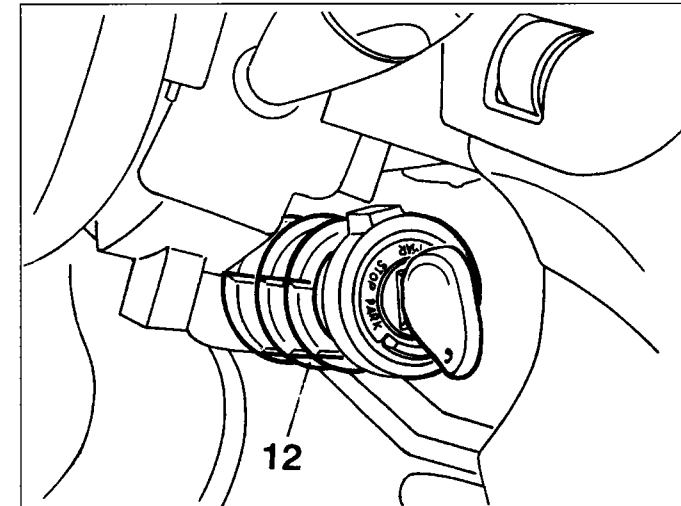
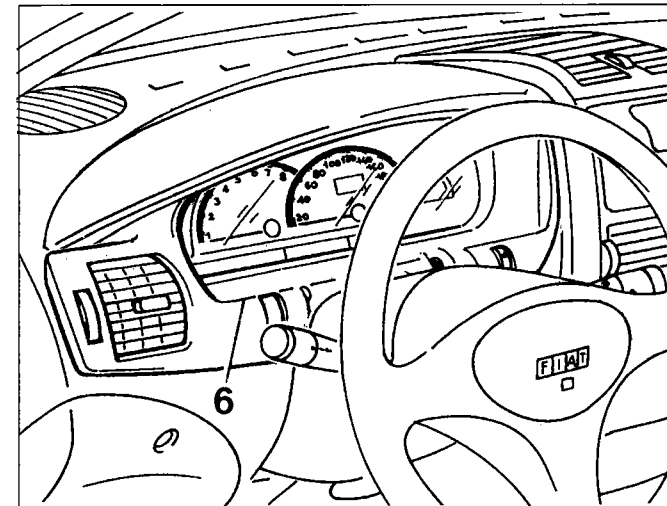
P4A16EL01

Anti-lock braking system (A.B.S.) and fault warning light - Hand brake on/low brake fluid level warning light

Location of components

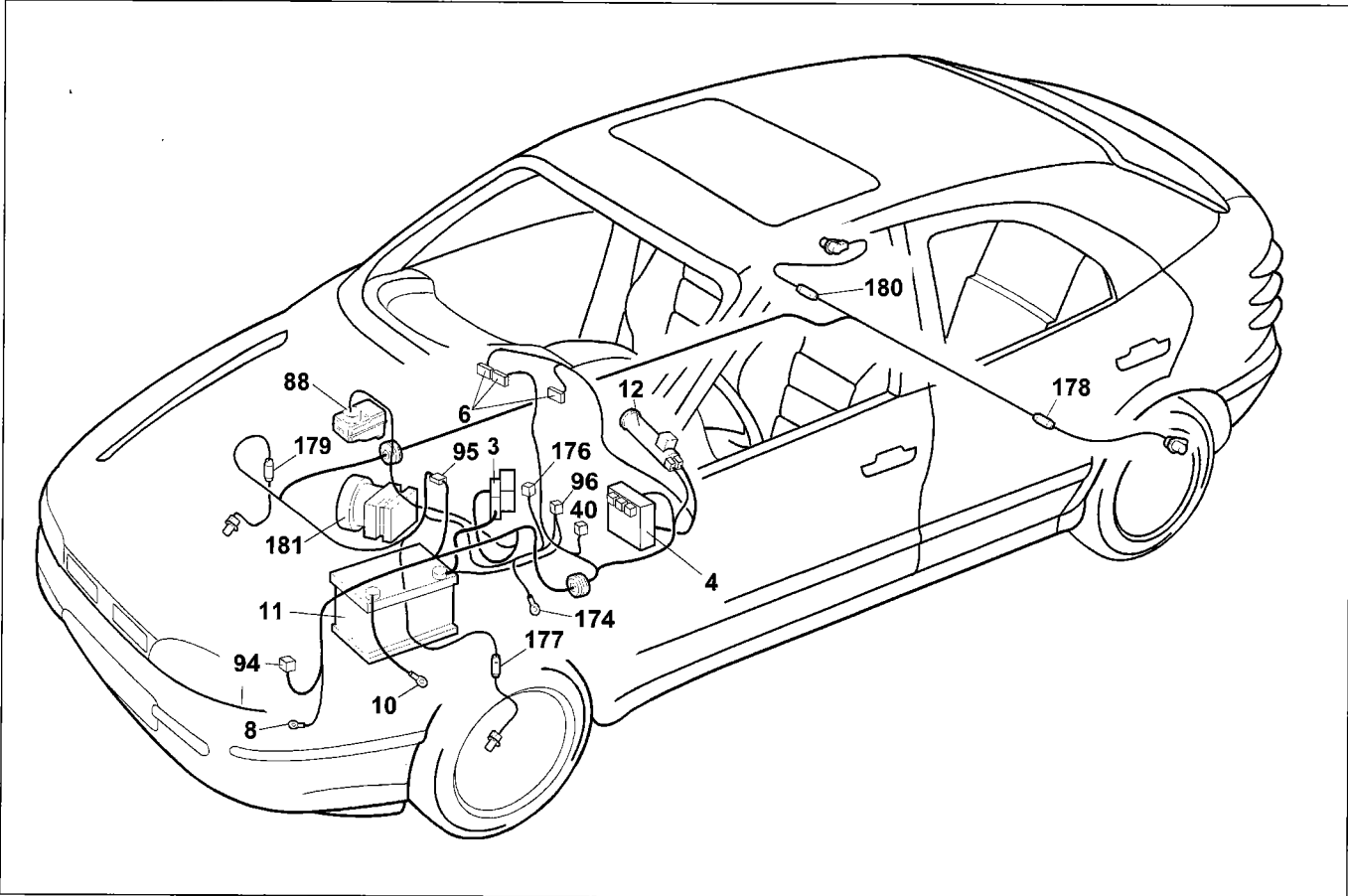


P4A17EL01



P4A18EL01

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P4A19EL01

Anti-lock braking system (A.B.S.) and fault warning light - Hand brake on/low brake fluid level warning light

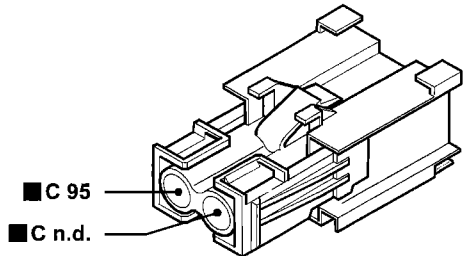
Key to components

- 3 Power fuse box:
A 50A fuse protecting fuel injection
B 50A fuse protecting ignition
C 50A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
4 Fuse and relay unit
6 Instrument panel:
I Hand brake on/low brake fluid warning light
8 Front right earth
10 Battery earth on body shell
11 Battery
12 Ignition switch
40 Stop lights switch
88 Low brake fluid level sensor
94 5A fuse protecting anti-lock braking system (A.B.S.)
95 Front cables/anti-lock braking system (A.B.S.) connection

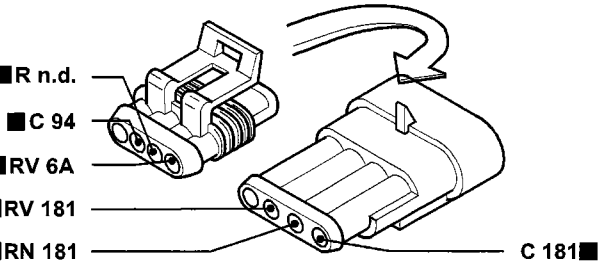
- 96 60A fuse protecting electrical system
174 Power earth for anti-lock braking system (A.B.S.)
176 Diagnostic socket for anti-lock braking system (A.B.S.)
177 Sensor on front left wheel for anti-lock braking system (A.B.S.)
178 Sensor on rear left wheel for anti-lock braking system (A.B.S.)
179 Sensor on front right wheel for anti-lock braking system (A.B.S.)
180 Sensor on rear right wheel for anti-lock braking system (A.B.S.)
181 Anti-lock braking system (ABS) electronic control unit.)

N.D. Ultrasound-soldered joint taped in wiring loom

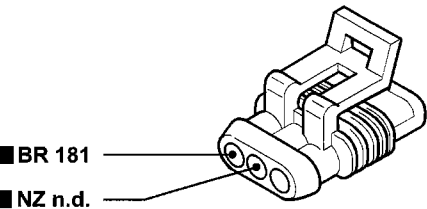
94 5A fuse protecting anti-lock braking system (A.B.S.)



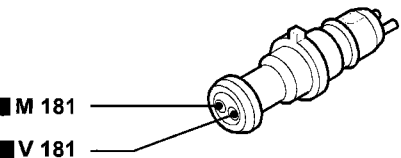
95 Front cables/anti-lock braking system (A.B.S.) connection



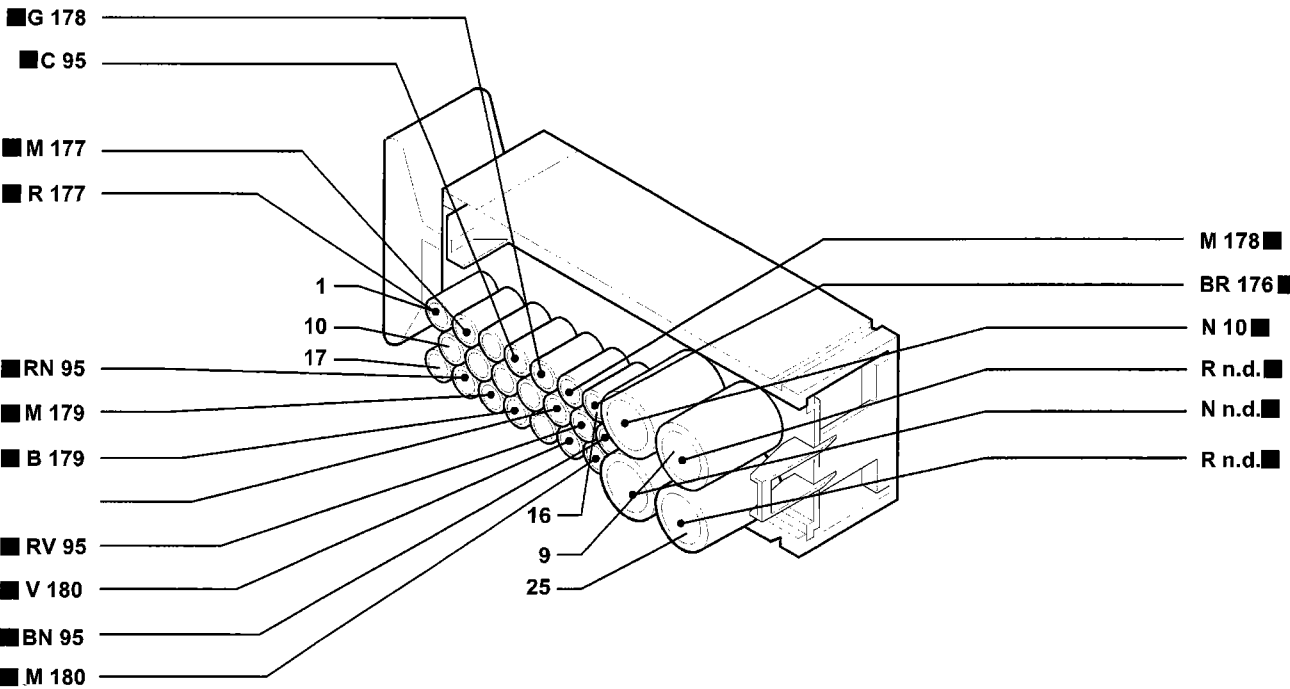
176 Diagnostic socket for anti-lock braking system (A.B.S.)



180 Sensor on rear right wheel for anti-lock braking system (A.B.S.)



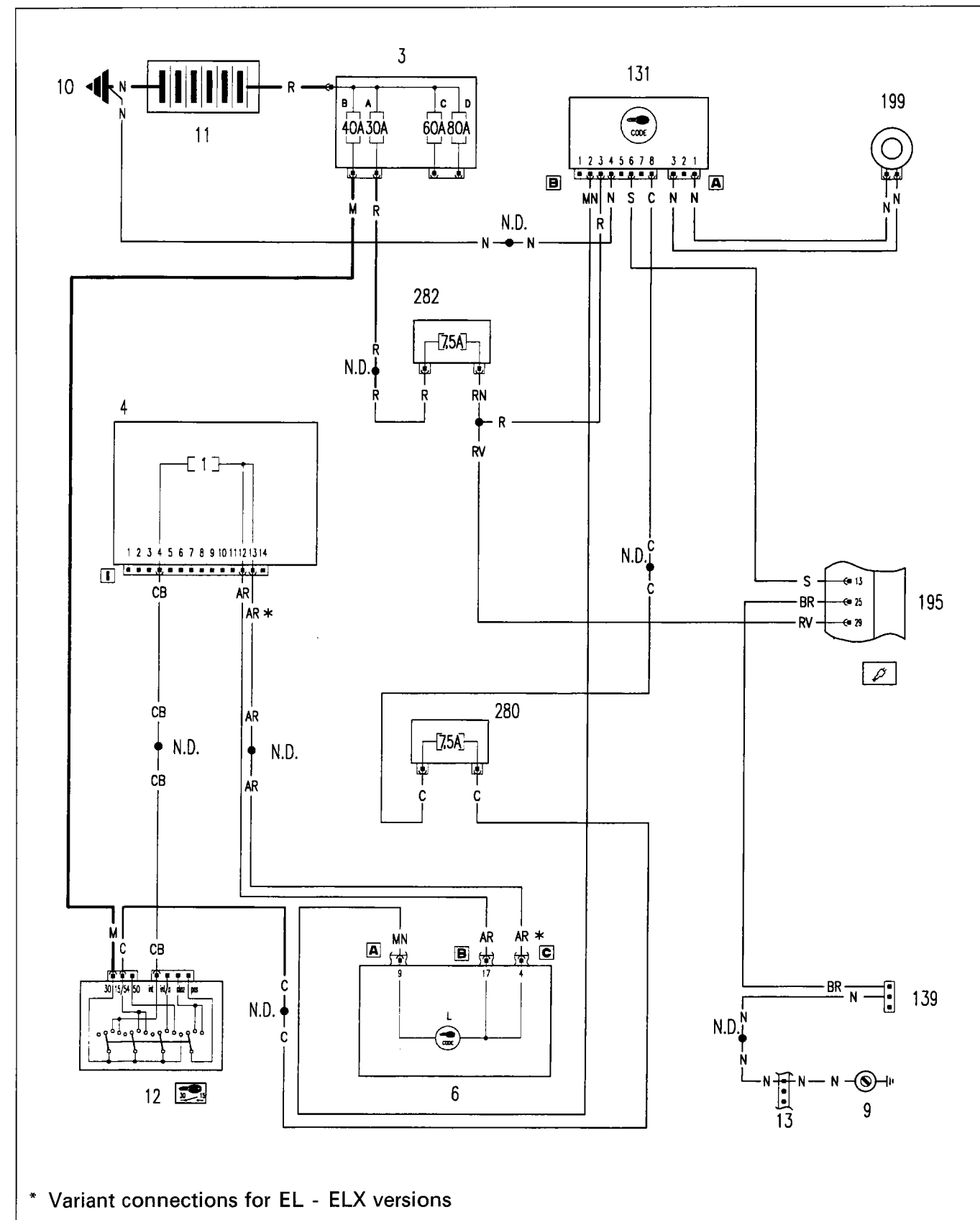
181 Anti-lock braking system (ABS) electronic control unit



■ The cables involved in the wiring diagram are marked with a solid square

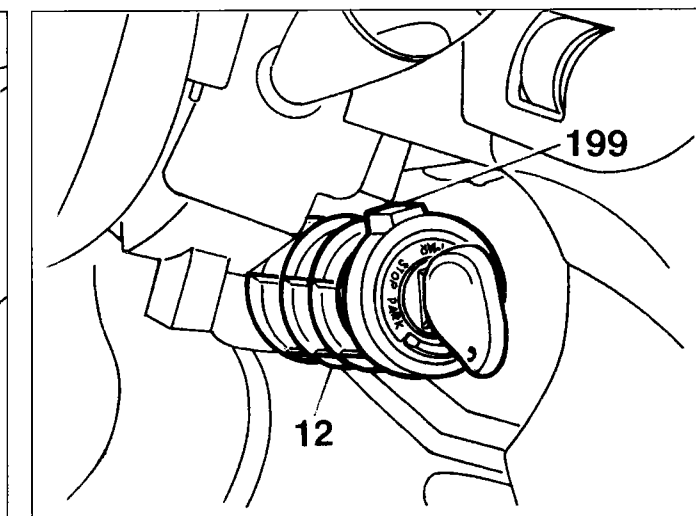
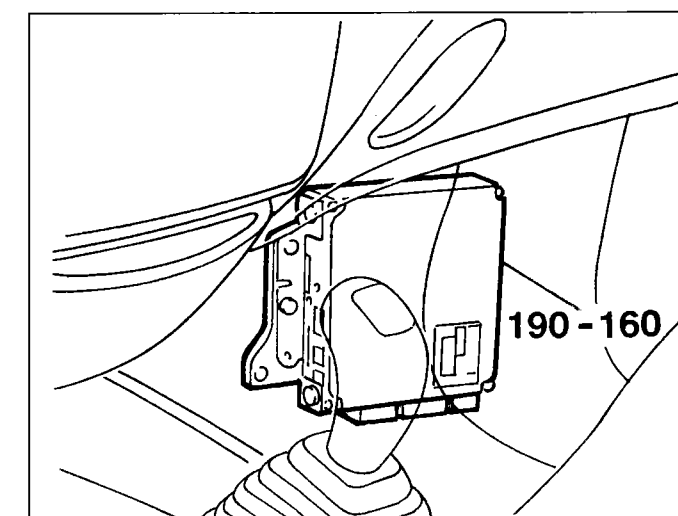
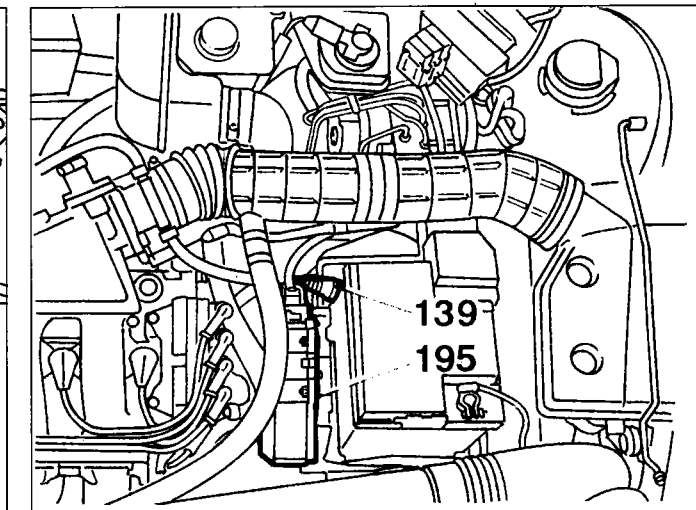
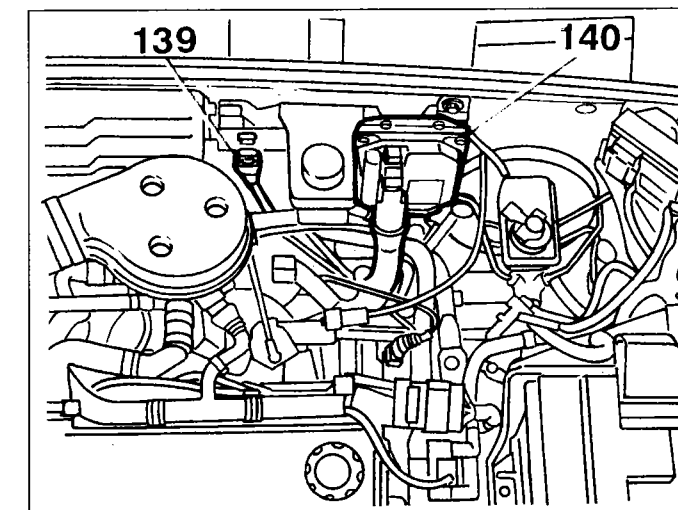
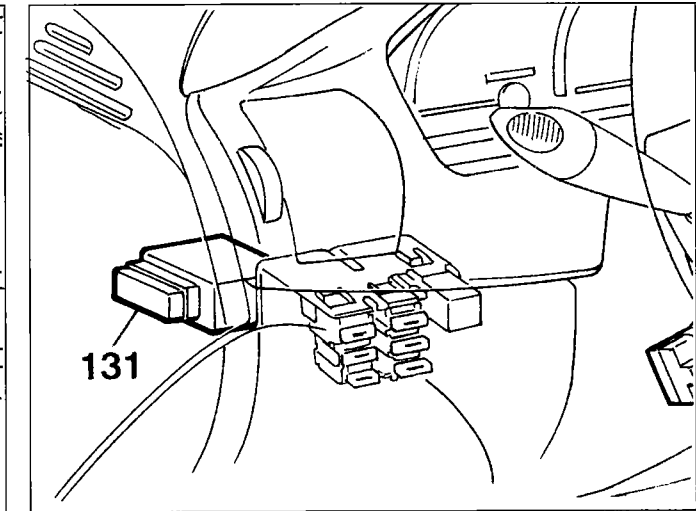
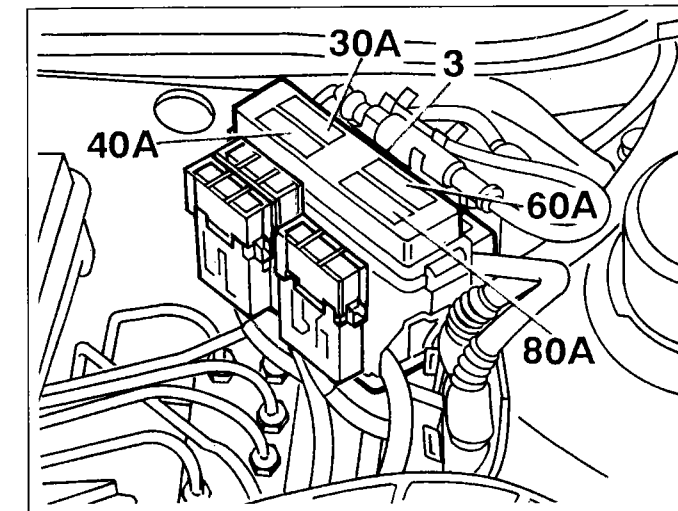
P4A20EL01

Fiat-CODE system and fault warning light



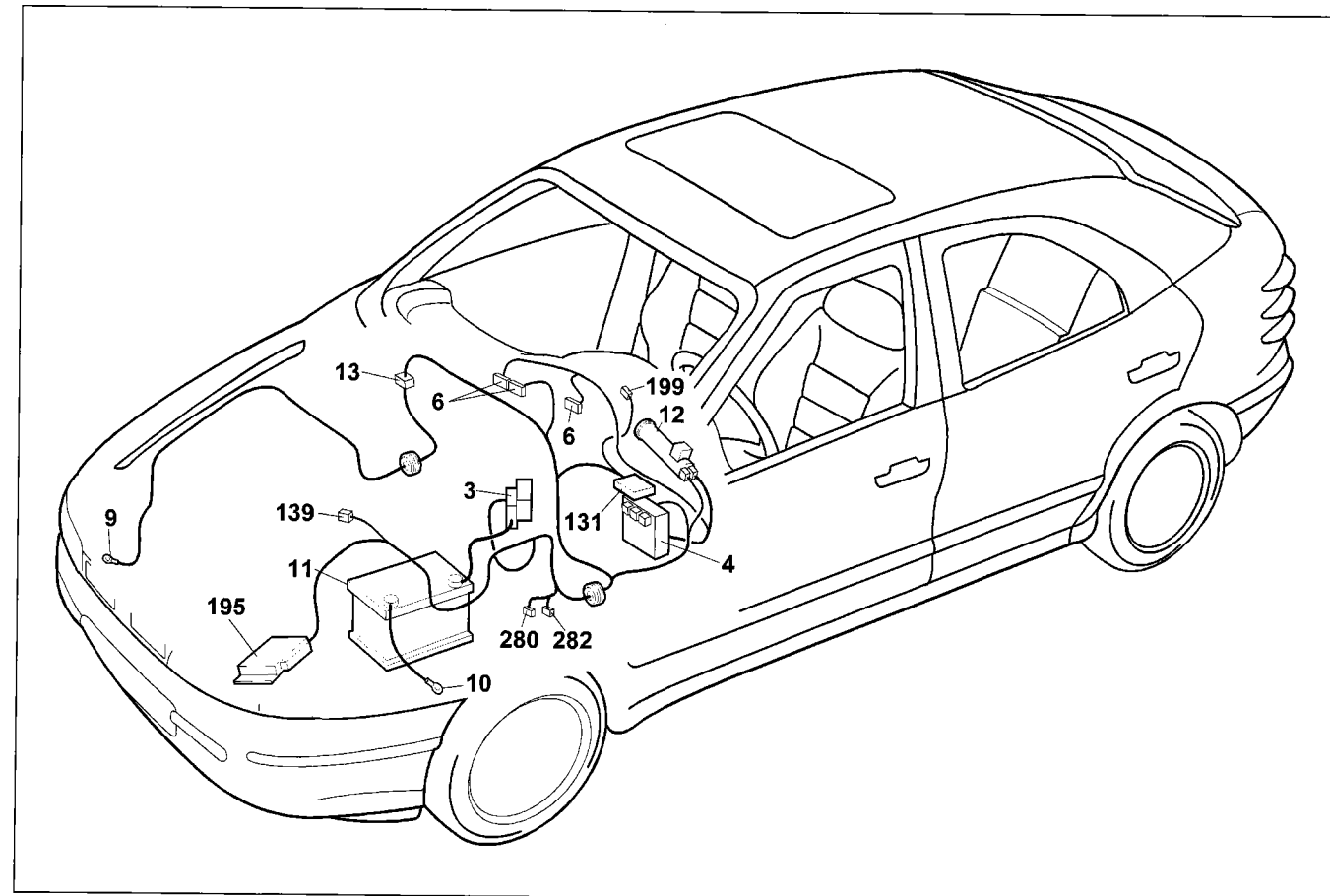
P4A21EL01

Location of components



P4A22EL01

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P4A23EL01

Fiat-CODE system and fault warning light

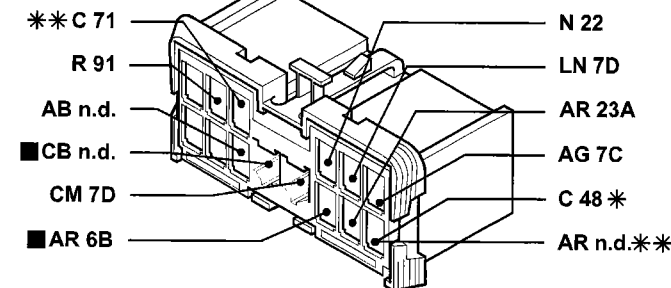
Key to components

- 3 Power fuse box:
 A 30A fuse protecting fuel injection
 B 40A fuse protecting ignition
 C 60A fuse protecting additional optional extras
 D 80A fuse protecting fuse and relay unit
 4 Fuse and relay unit
 6 Instrument panel:
 L Fiat-CODE fault warning light
 9 Front right earth
 10 Battery earth on body shell
 11 Battery
 12 Ignition switch
 13 Right/left cable connection

- 131 Fiat-CODE electronic control unit
 139 Diagnostic socket for fuel injection
 195 Ignition/fuel injection electronic control unit (1581)
 199 Aerial for Fiat-CODE system
 280 7.5 A fuse protecting ignition switch
 282 7.5 A fuse protecting Fiat-CODE/electronic fuel injection

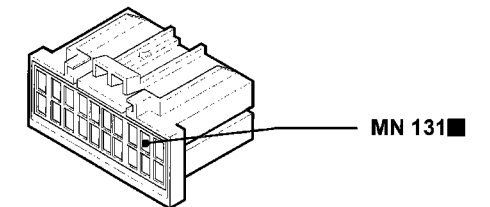
N.D. Ultrasound-soldered joint taped in wiring loom

4I Fuse and relay unit

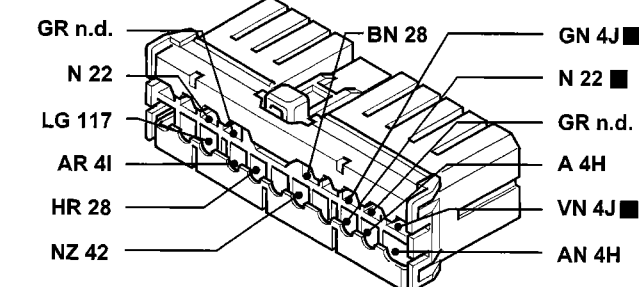


* Applies only to S/SX version
 ** Applies only to EL/ELX version

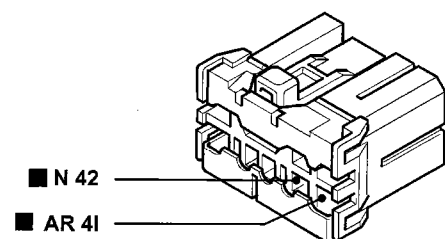
6A Instrument panel



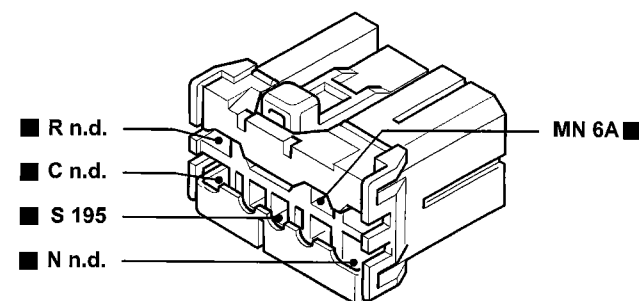
6B Instrument panel



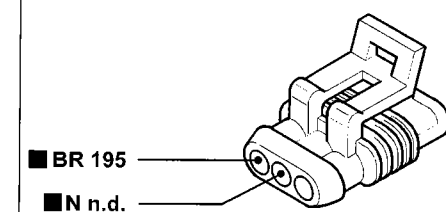
6C Instrument panel



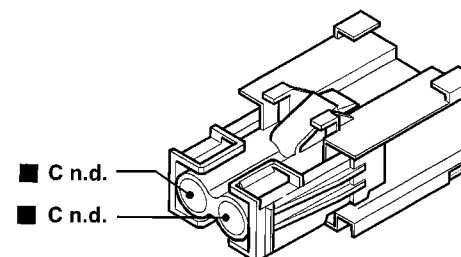
131 Fiat-CODE electronic control unit



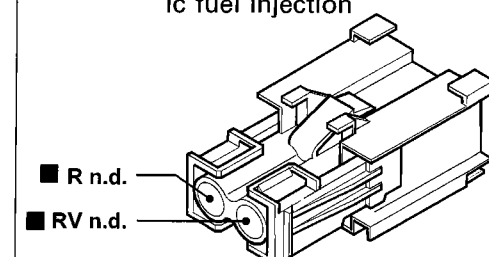
139 Diagnostic socket for fuel injection



280 7.5A fuse protecting ignition switch



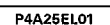
282 7.5A fuse protecting Fiat-CODE/electronic fuel injection



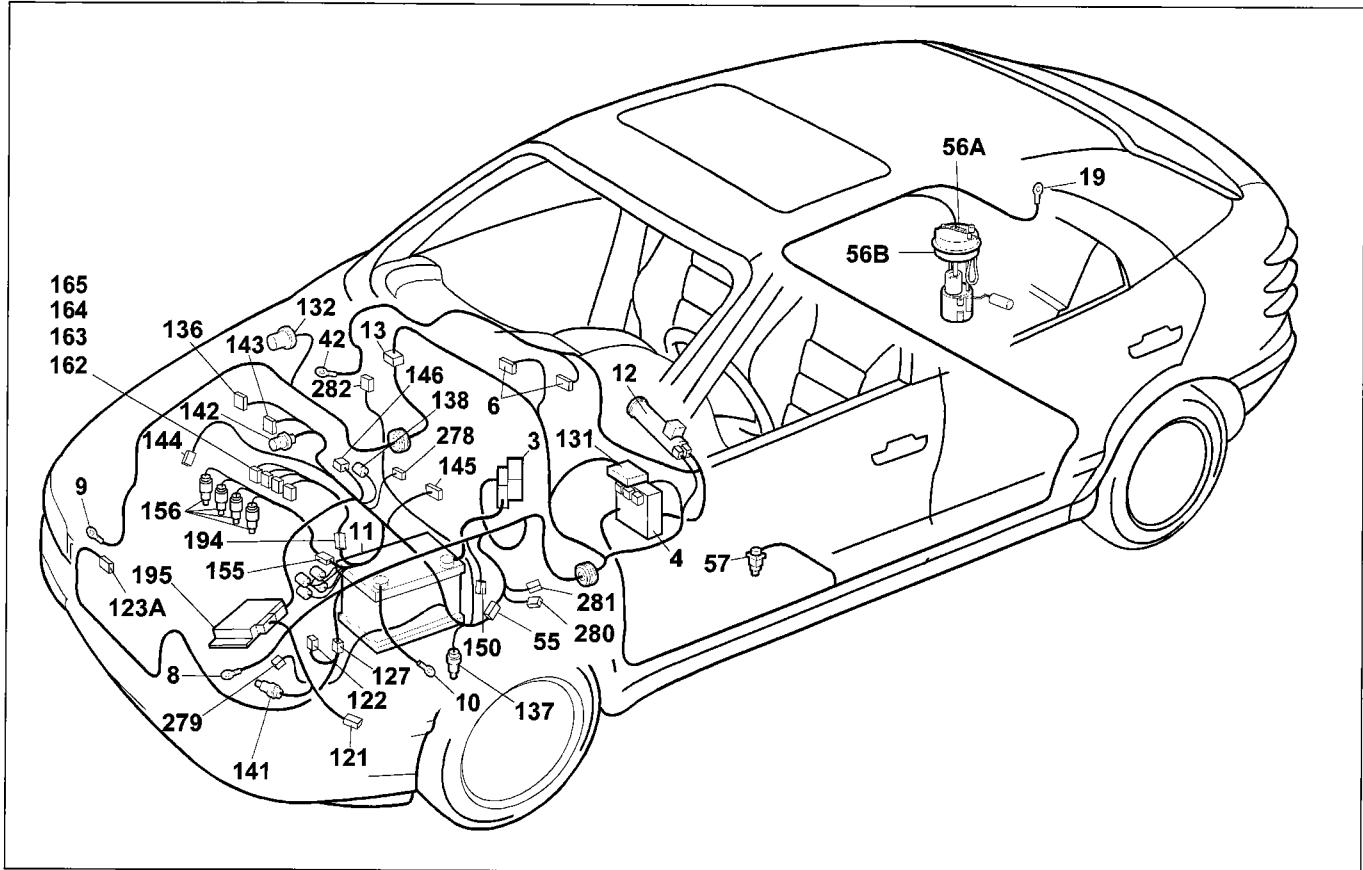
P4A24EL01

■ The cables involved in the wiring diagram are marked with a solid square

Simplo PDF Merge and Split Unregistered Version - <http://www.simplo.com>



55.



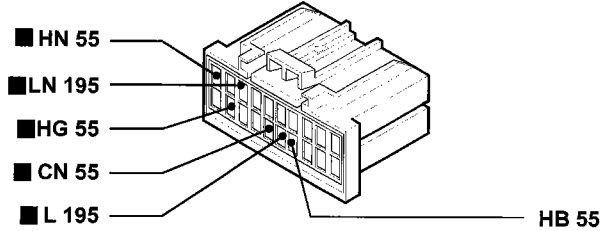
P4A27EL01

Starting - Electronic ignition and fuel injection - Recharging and warning light - Low engine oil pressure warning light - Fuel injection fault warning light - Rev counter

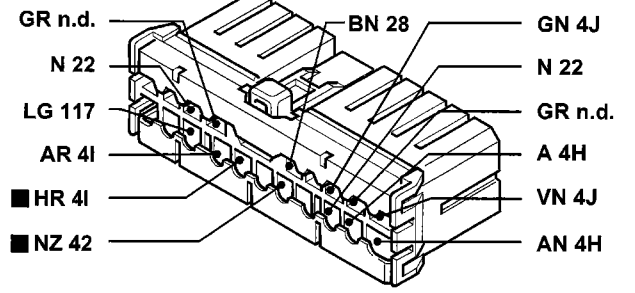
Key to components

- | | |
|--|---|
| 3 Power fuse box:
A 30A fuse protecting fuel injection
B 40A fuse protecting ignition
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit | 139 Diagnostic socket for fuel injection
141 Heated Lambda probe
142 Low oil pressure warning light switch |
| 4 Fuse and relay unit | 143 Alternator |
| 6 Instrument panel:
A Low generator recharging warning light
B Low engine oil pressure warning light
M Fuel injection fault warning light
W Rev counter | 144 Rpm and T.D.C. sensor
145 Starter motor
146 Potentiometer on throttle valve
150 Fuel injection control relay
155 Ignition coils assembly
156 Spark plugs |
| 9 Front right earth | 162 Fuel injector (1st) |
| 10 Battery earth on body shell | 163 Fuel injector (2nd) |
| 11 Battery | 164 Fuel injector (3rd) |
| 12 Ignition switch | 165 Fuel injector (4th) |
| 13 Front right/left cables connection | 194 Fuel injection cables/fuel injector flange connection |
| 19 Rear right earth | 195 Ignition/fuel injection electronic control unit (1581) |
| 42 Right dashboard earth | 278 Integrated air temperature/pressure sender unit |
| 55 Front cables/fuel gauge control connection | 279 Engine coolant temperature double sender unit |
| 56 Fuel gauge control unit
A Fuel gauge sensor
B Electric fuel pump | 280 7.5A fuse protecting ignition switch
281 30A fuse protecting Lambda probe/canister solenoid |
| 57 Inertial switch | 282 7.5 A fuse protecting Fiat-CODE/electronic injection |
| 121 Three-stage pressure switch | |
| 131 Fiat-CODE electronic control unit | |
| 132 Petrol vapours cut-off solenoid (canister) | |
| 136 Knock sensor | |
| 137 Car speed sensor | |
| 138 Idle adjustment actuator | |

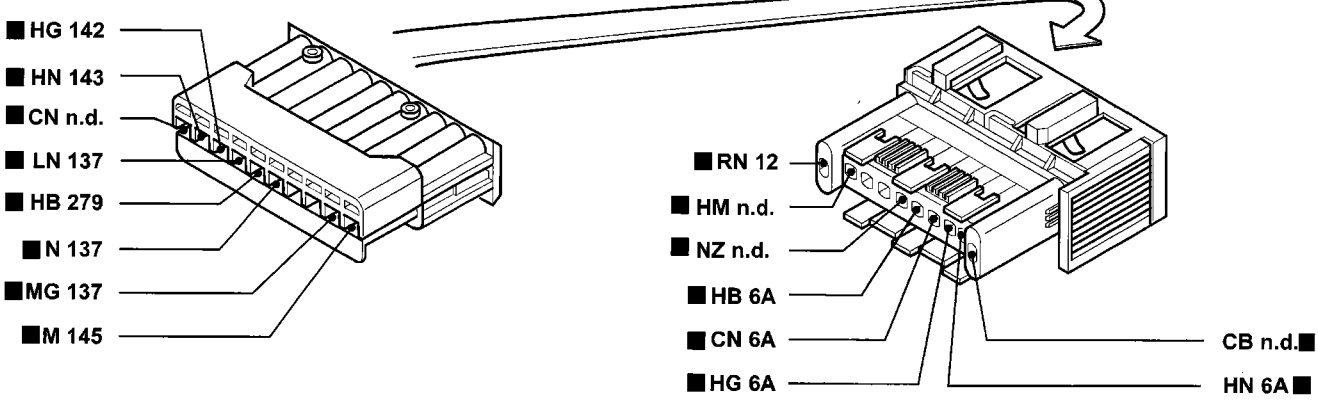
6A Instrument panel



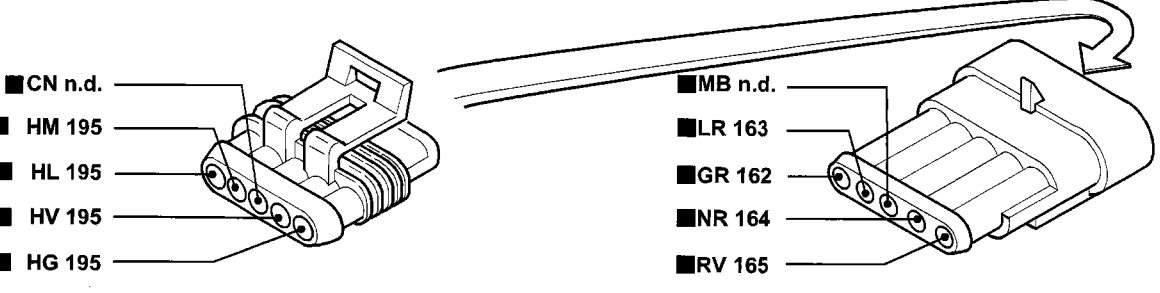
6B Instrument panel



55A Front left/engine cables connection



194 Fuel injection cables/injector flange connection

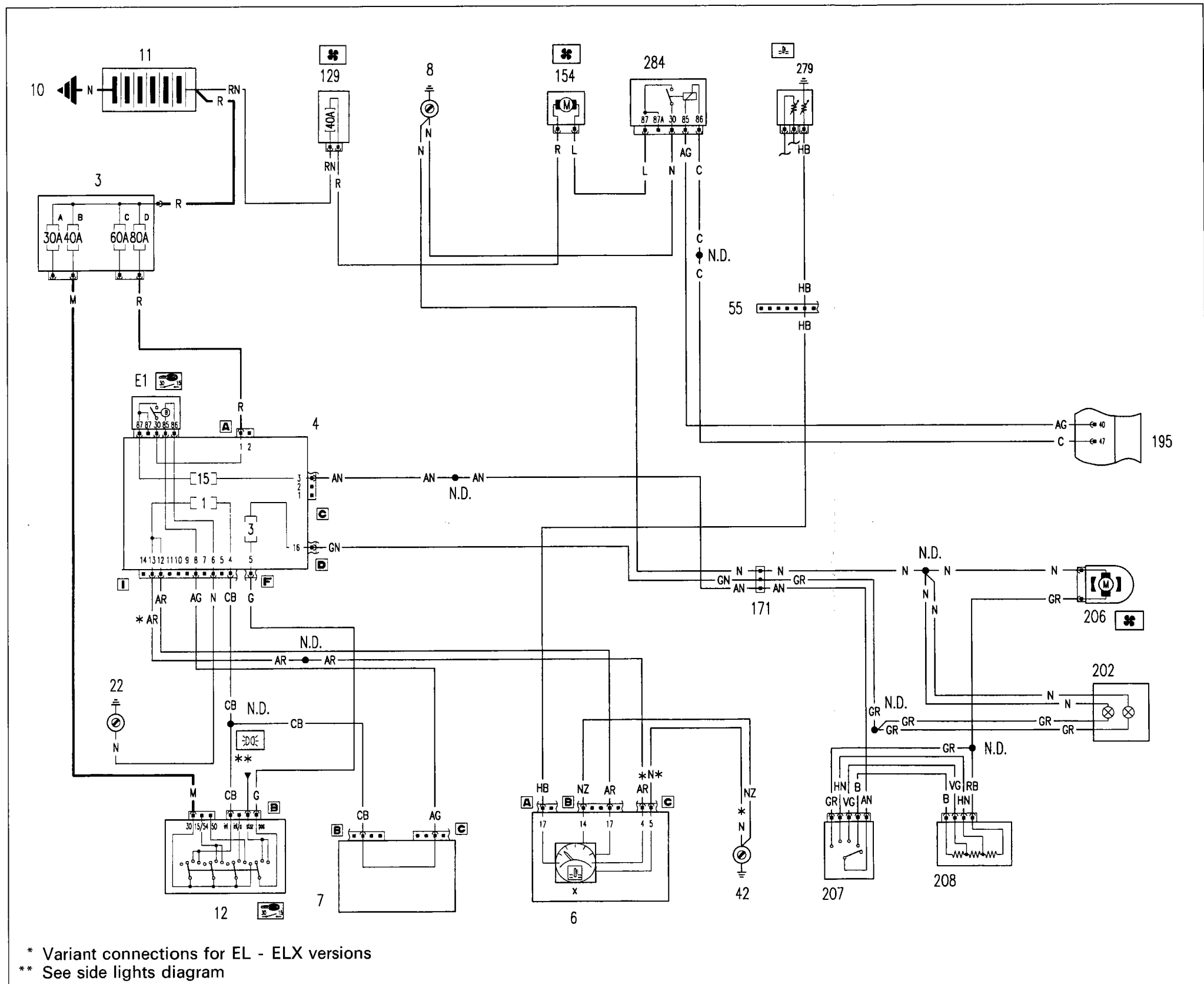


P4A28EL01

■ The cables involved in the wiring diagram are marked with a solid square

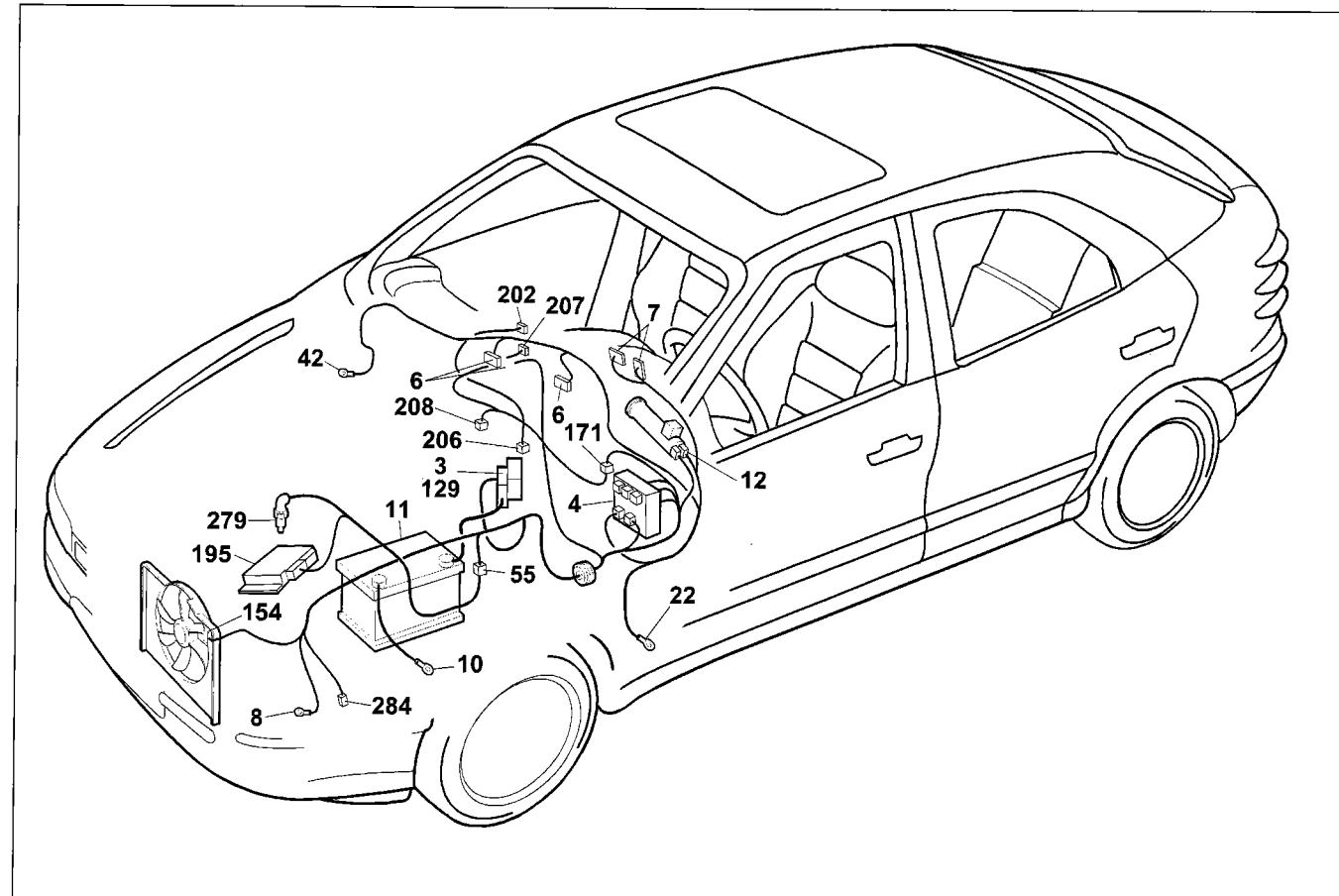
Model without air conditioner

Engine cooling system - Water temperature gauge - Car interior ventilation



P4A29EL01

55.



P4A31EL01

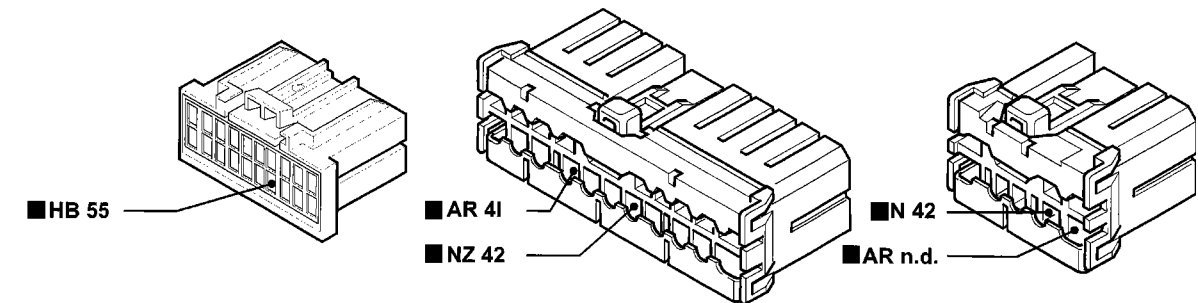
Engine cooling system - Water temperature gauge - Car interior ventilation

Key to components

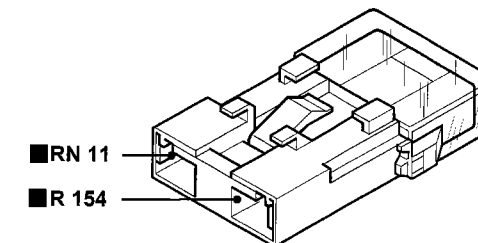
- | | |
|--|--|
| 3 Power fuse box: | 129 50A power fuse protecting engine cooling fan |
| A 30A fuse protecting fuel injection | 154 Engine cooling fan |
| B 40A fuse protecting ignition | 171 Heater unit |
| C 60A fuse protecting additional optional extras | 195 Ignition/fuel injection electronic control unit (1581) |
| D 80A fuse protecting fuse and relay unit | 202 Heater/air conditioner light bulbs |
| 4 Fuse and relay unit | 206 Heater/air conditioner electric fan |
| E1 Ignition switch discharge relay | 207 Heater/air conditioner speed control switch |
| 6 Instrument panel: | 208 Limiting resistor for heater/air conditioner |
| X Coolant temperature gauge | 279 Engine coolant temperature double sender unit |
| 7 Stalk unit | 284 Engine cooling fan relay |
| 8 Front left earth | |
| 10 Battery earth on body shell | |
| 11 Battery | |
| 12 Ignition switch | |
| 22 Left dashboard earth | |
| 42 Right dashboard earth | |
| 55 Front cables/fuel gauge control connection | |

N.D. Ultrasound-soldered joint taped in wiring loom

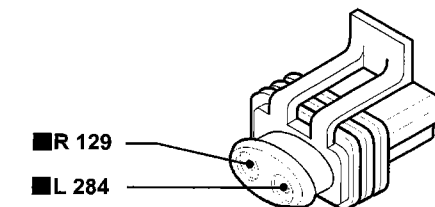
6A - 6B - 6C Instrument panel



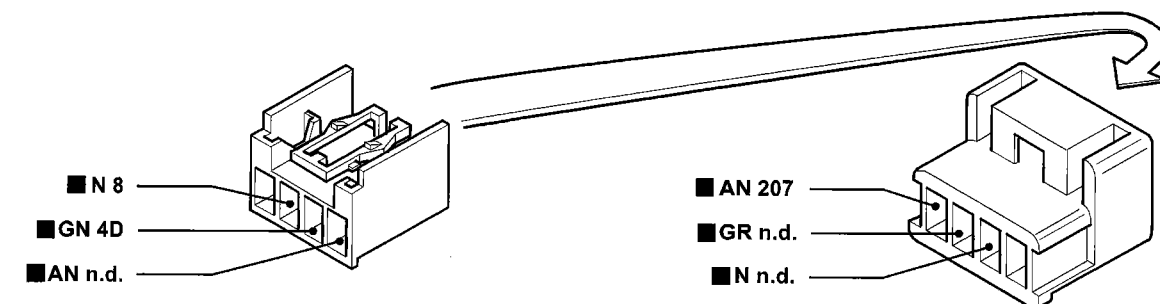
129 50A power fuse protecting engine cooling fan



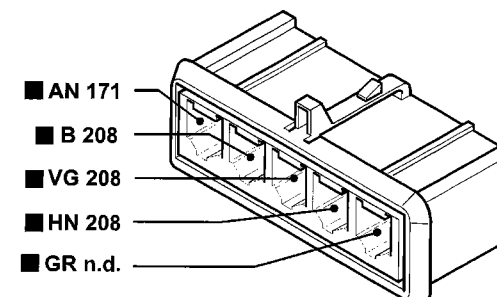
154 Engine cooling fan



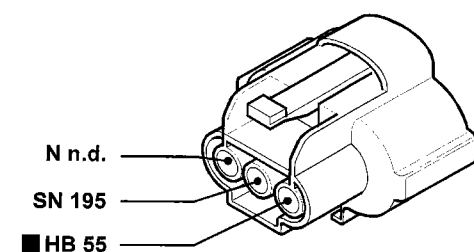
171 Heater unit cables connection



207 Electric fan speed control switch



279 Engine coolant temperature double sender unit

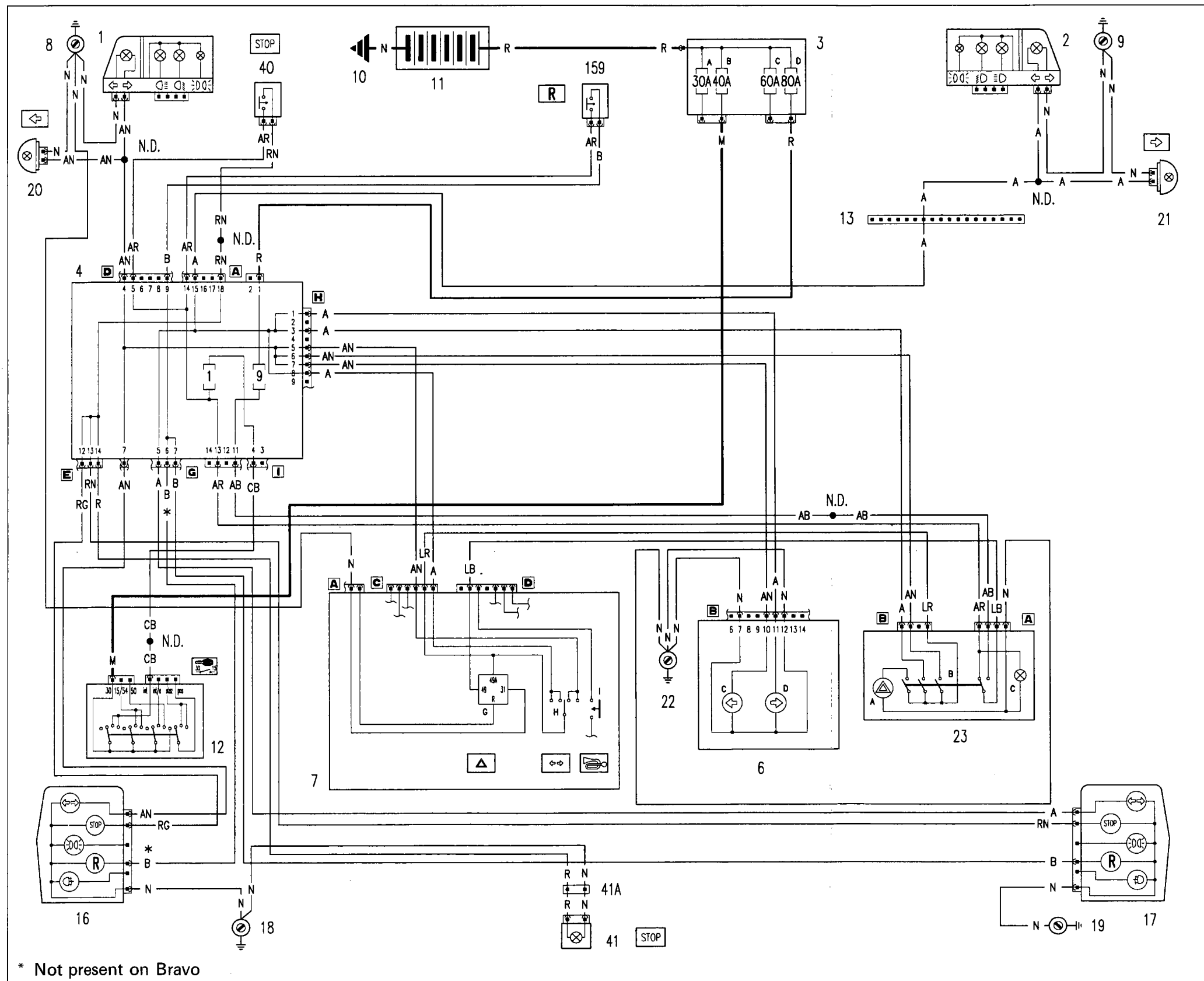


P4A32EL01

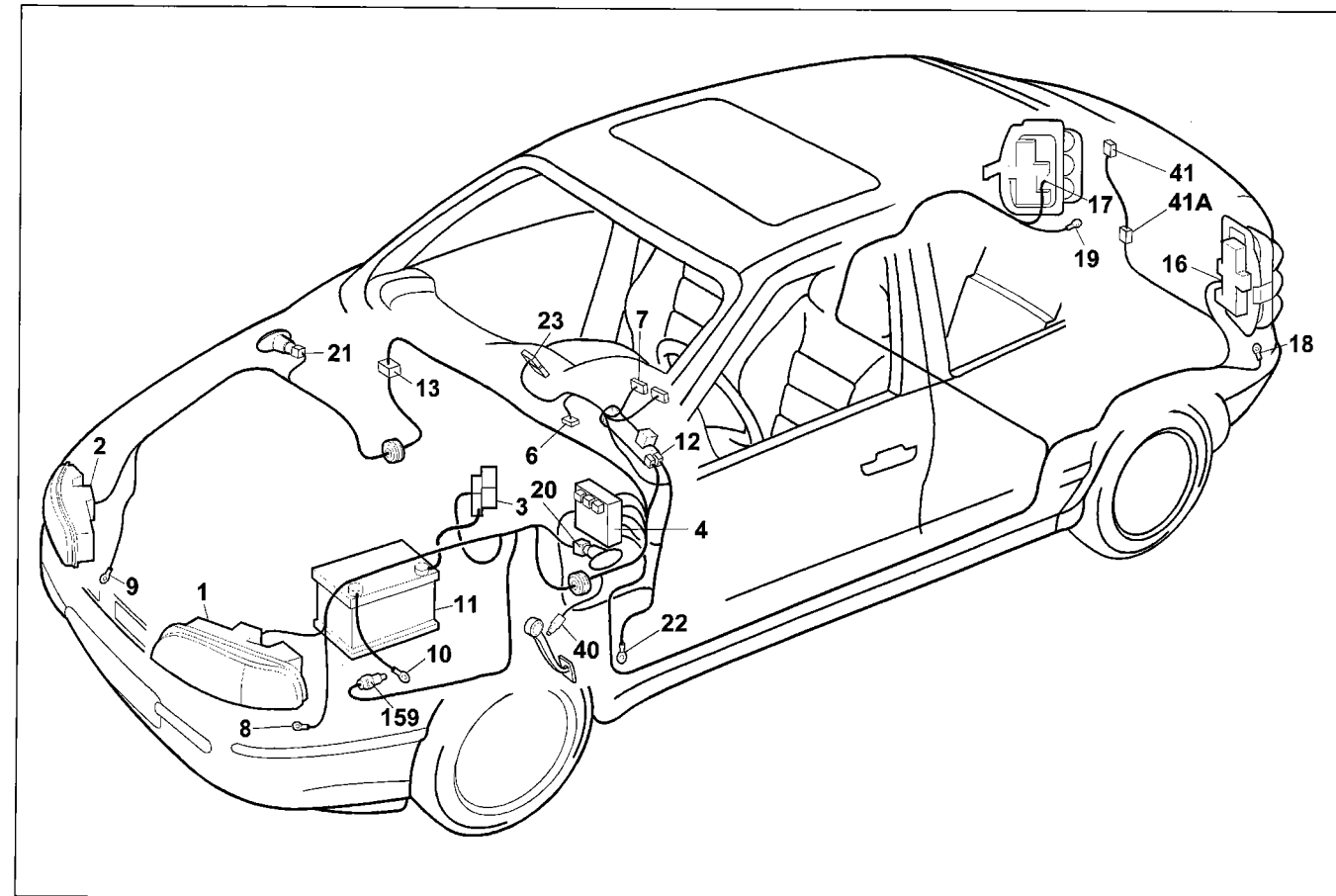
■ The cables involved in the wiring diagram are marked with a solid square

Version: S - SX

Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights



55.



Version: S - SX

P4A35EL01

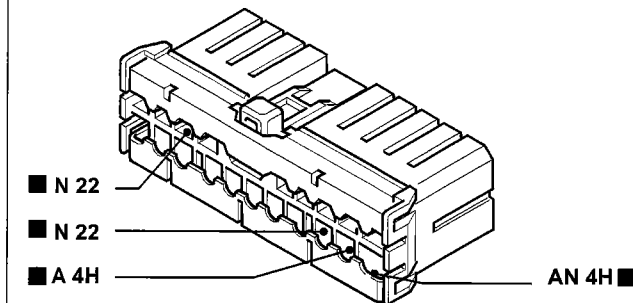
Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights

Key to components

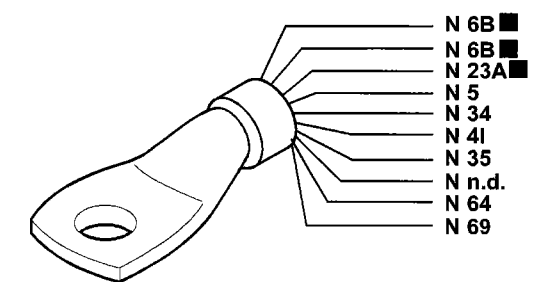
- | | |
|--|--|
| 1 Front left lights cluster | 17 Rear right lights cluster |
| 2 Front right lights cluster | 18 Rear left earth |
| 3 Power fuse box: | 19 Rear right earth |
| A 30A fuse protecting fuel injection | 20 Front left side repeater |
| B 40A fuse protecting ignition | 21 Front right side repeater |
| C 60A fuse protecting additional optional extras | 22 Left dashboard earth |
| D 80A fuse protecting fuse and relay unit | 23 Hazard lights switch unit |
| 4 Fuse and relay unit | A Hazard warning lights warning lamp |
| 6 Instrument panel: | B Hazard lights control switch |
| C Left direction indicator warning light | C Hazard lights unit symbol light |
| D Right direction indicator warning light | 40 Stop lights switch |
| 7 Stalk unit: | 41 Additional stop light |
| H Direction indicators stalk | 41A Additional stop light rear cables connection |
| I Horn button | 159 Reversing lights switch |
| 8 Front left earth | |
| 9 Front right earth | |
| 10 Battery earth on body shell | |
| 11 Battery | |
| 12 Ignition switch | |
| 13 Front right/left cables connection | |
| 16 Rear left lights cluster | |

N.D. Ultrasound-soldered joint taped in wiring loom

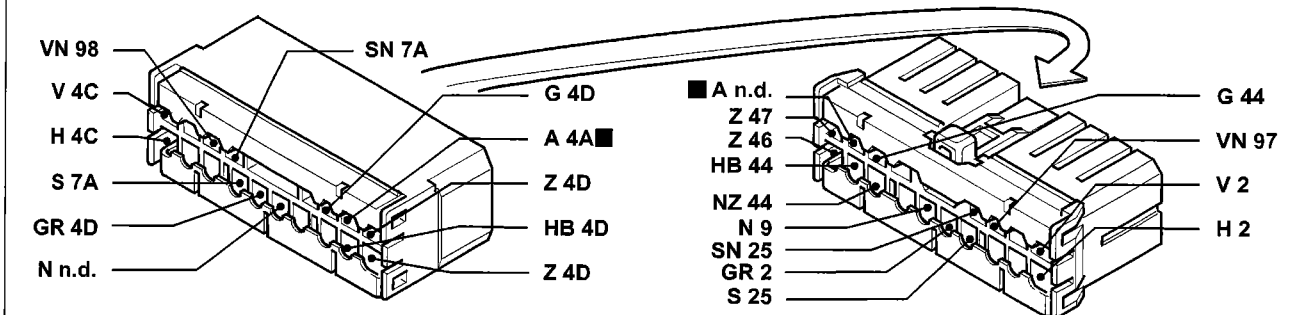
6A Instrument panel



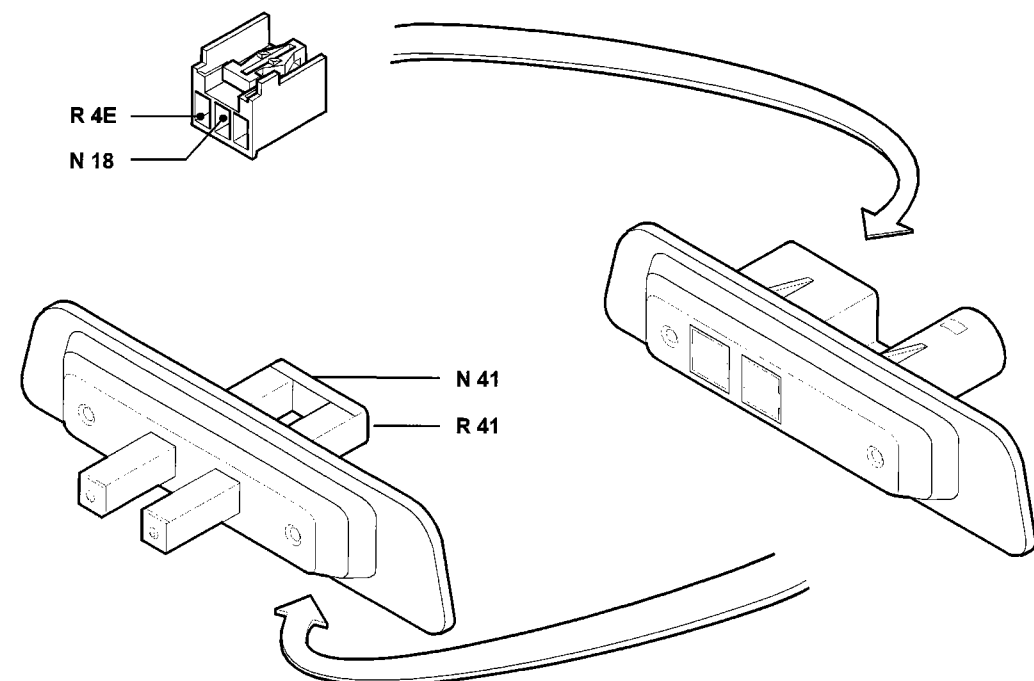
22 Left dashboard earth



13 Front right/left cables connection



41A Additional stop light rear cables connection



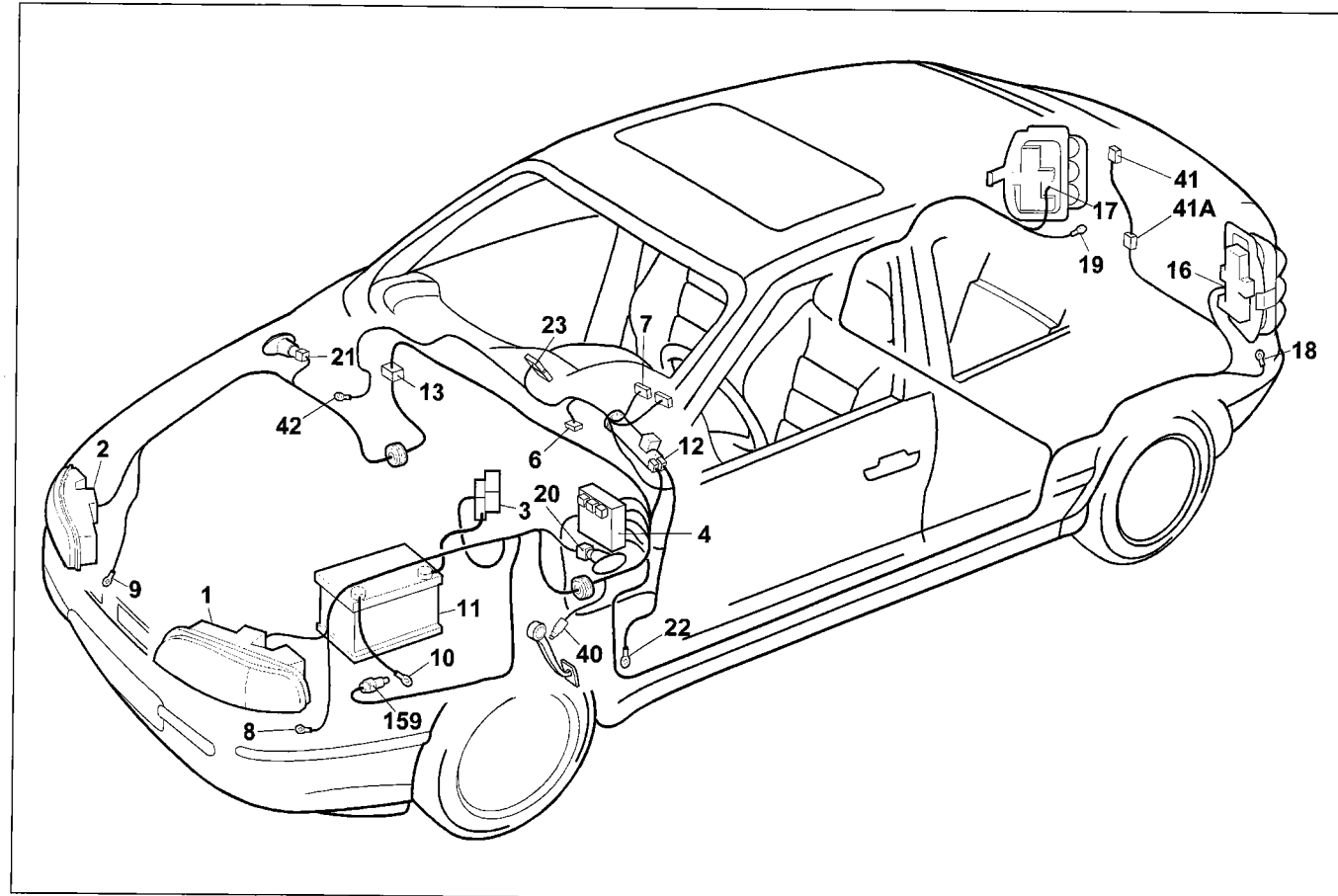
P4A36EL01

■ The cables involved in the wiring diagram are marked with a solid square

Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights



55.



Version: EL - ELX

P4A39EL01

Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights

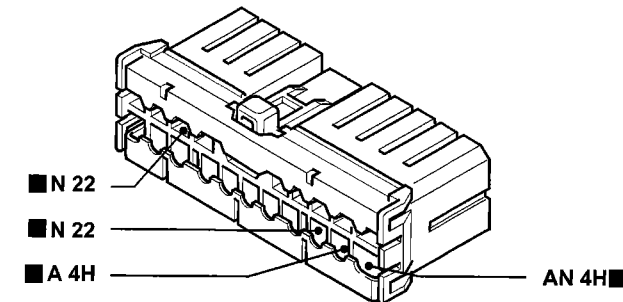
Key to components

- 1 Front left lights cluster
- 2 Front right lights cluster
- 3 Power fuse box:
 - A 30A fuse protecting fuel injection
 - B 40A fuse protecting ignition
 - C 60A fuse protecting additional optional extras
 - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:
 - C Left direction indicator warning light
 - D Right direction indicator warning light
 - T Stop lights fault warning light
- 7 Stalk unit:
 - H Direction indicators stalk
 - I Horn button
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 16 Rear left lights cluster

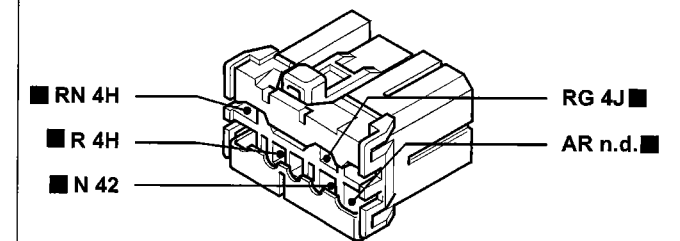
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 20 Front left side repeater
- 21 Front right side repeater
- 22 Left dashboard earth
- 23 Hazard warning lights switch unit
 - A Hazard warning lights warning lamp
 - B Hazard warning lights switch
 - C Hazard warning lights unit symbol light
- 40 Stop lights switch
- 41 Additional stop light
- 41A Additional stop light rear cables connection
- 42 Right dashboard earth
- 159 Reversing lights switch

N.D. Ultrasound-soldered joint taped in wiring loom

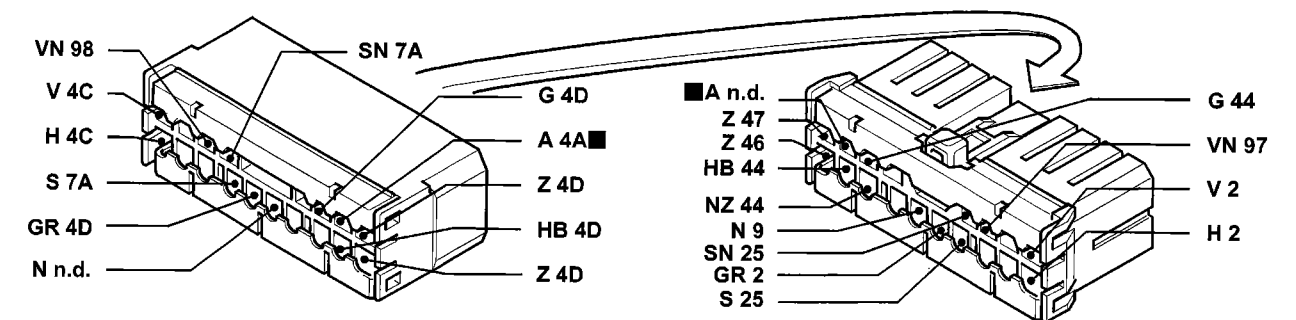
6B Instrument panel



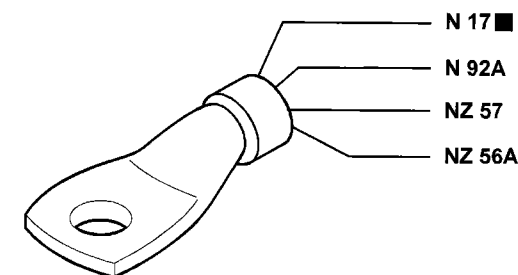
6C Instrument panel



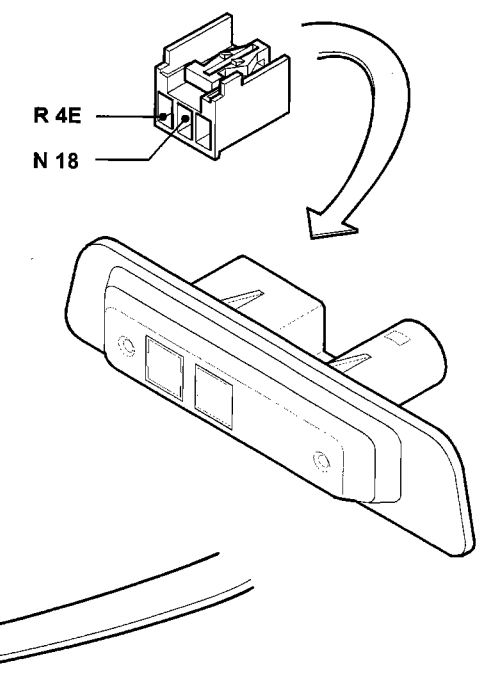
13 Front right/left cables connection



19 Rear right earth



41A Additional stop light rear cables connection

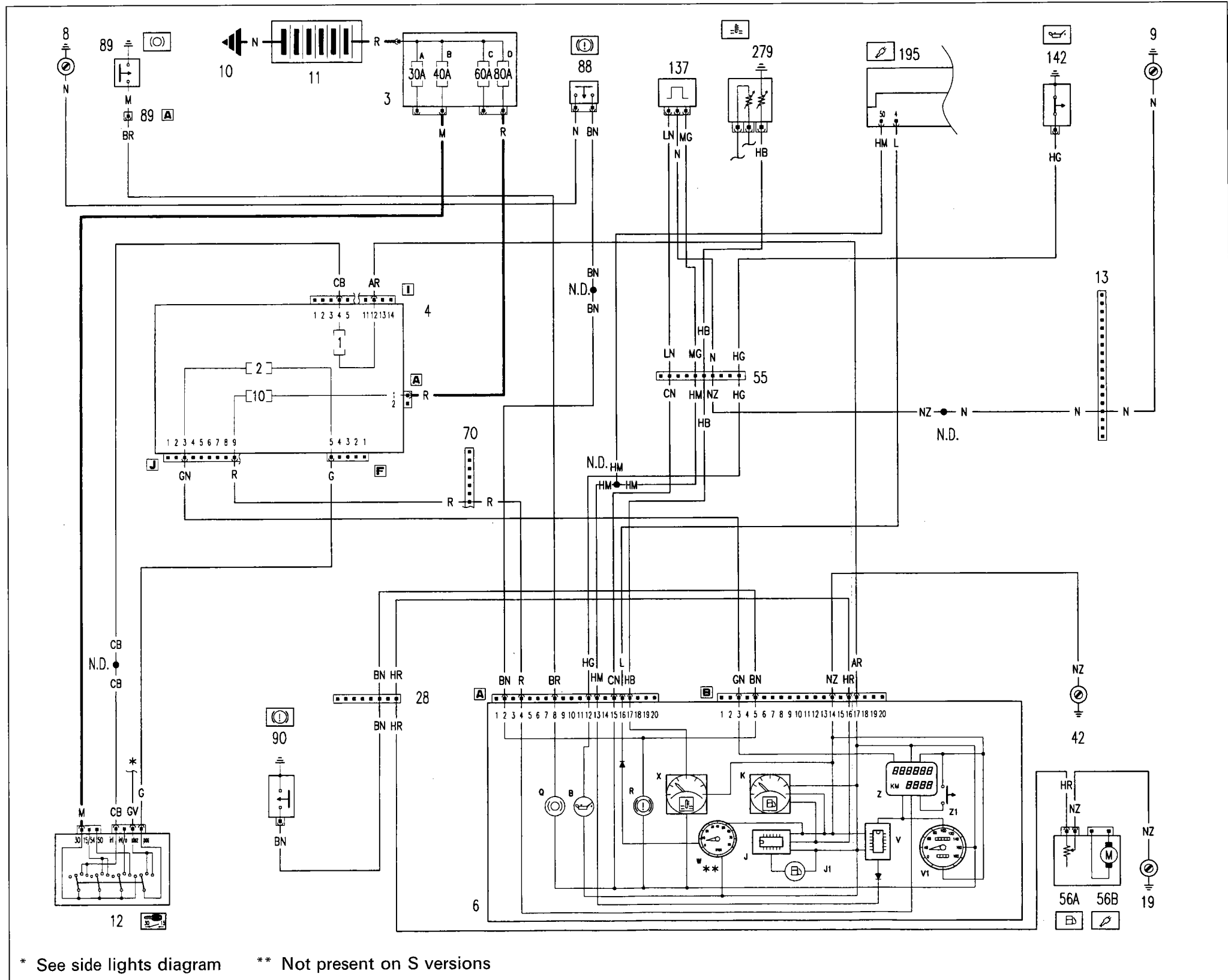


■ The cables involved in the wiring diagram are marked with a solid square

P4A40EL01

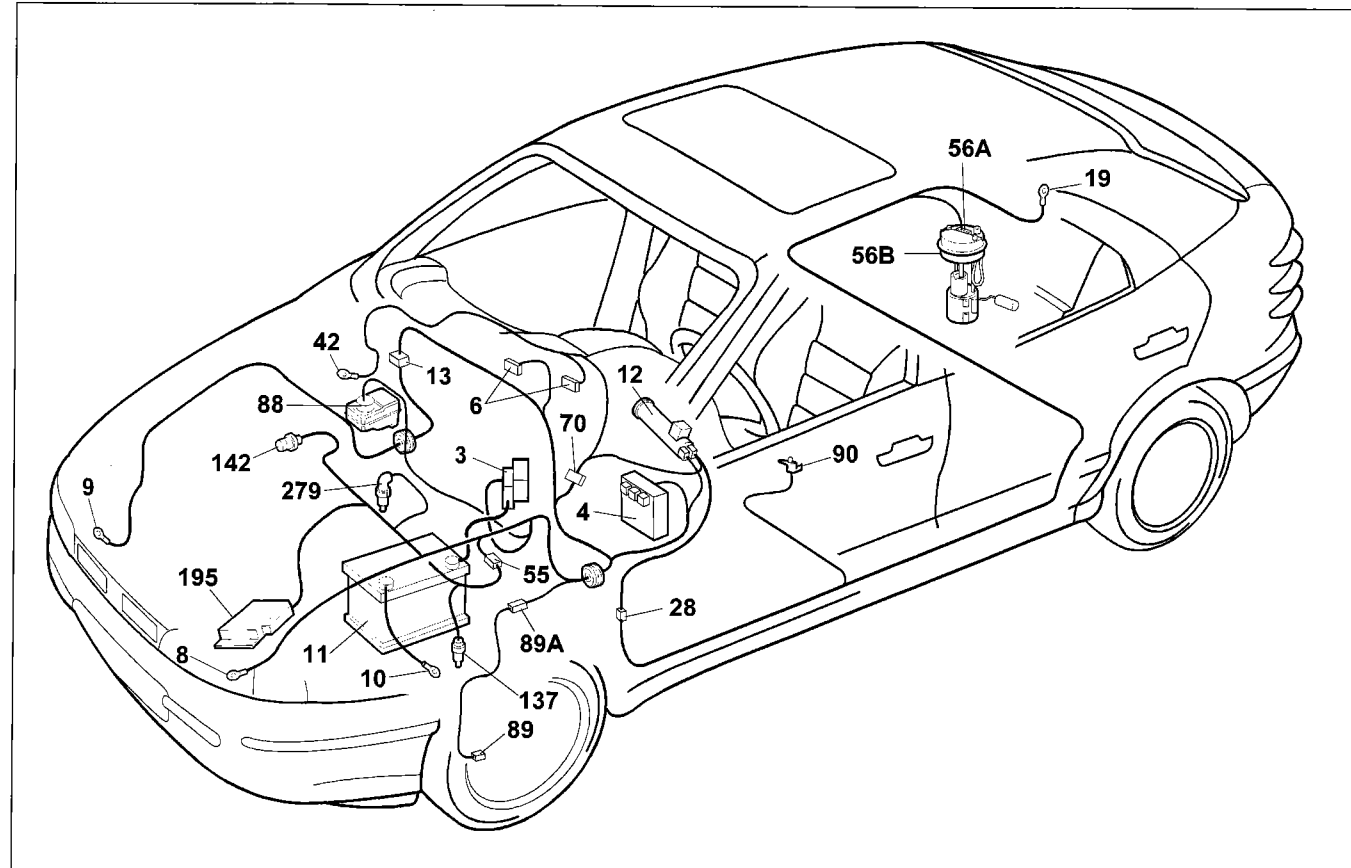
Version: S - SX

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Rev counter - Front brake pad wear warning light



P4A41EL01

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P4A43EL01

Version: S - SX

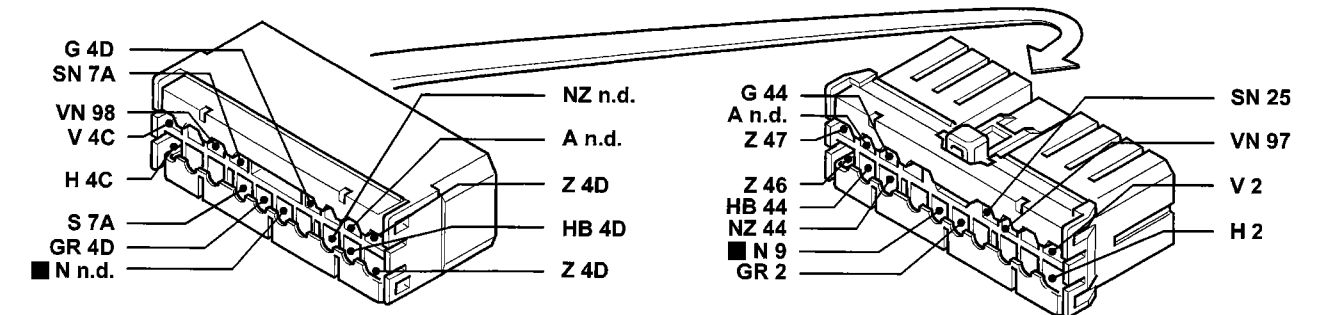
Fuel level gauge and reserve warning light - Hand brake on/low brake fluid warning light - Speedometer - Trip recorder/-total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Rev counter - Front brake pad wear warning light

Key to components

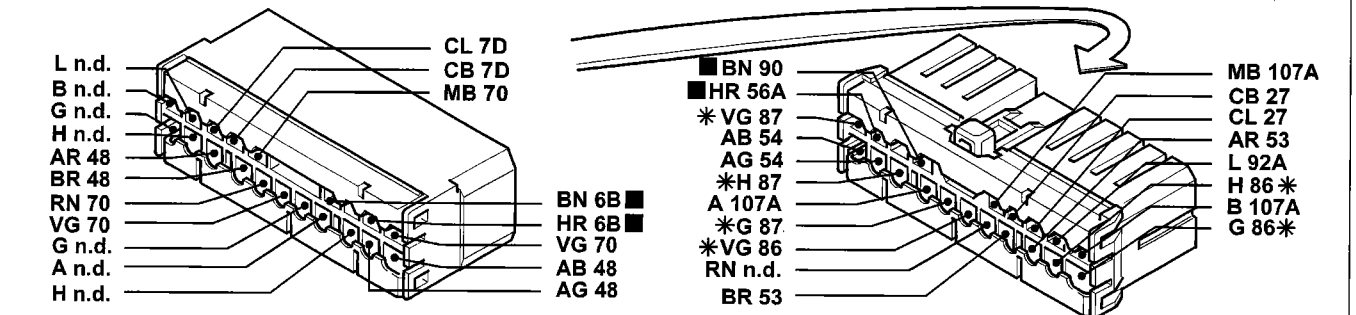
- | | |
|---|--|
| 3 Power fuse box:
A 30A fuse protecting fuel injection
B 40A fuse protecting ignition
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit | 13 Front right/left cables connection
19 Rear right earth
28 Dashboard/longitudinal cables connection
42 Right dashboard earth
55 Front cables/fuel gauge control connection |
| 4 Fuse and relay unit | 56 Fuel gauge control unit
A Fuel gauge sensor
B Electric fuel pump |
| 6 Instrument panel:
B Low engine oil pressure warning light
J Fuel reserve circuit control module
J1 Low fuel level warning light
K Fuel gauge
Q Front brake pad wear warning light
R Hand brake on/low brake fluid level warning light | 70 Dashboard/front cables connection
88 Low brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection |
| V Speedometer control module
V1 Speedometer
W Rev counter
X Coolant temperature gauge
Z Trip recorder/total mileage counter
Z1 Trip recorder reset button | 90 Handbrake on warning light switch
137 Vehicle speed sensor
142 Low oil pressure warning light switch |
| 8 Front left earth
9 Front right earth
10 Battery earth on body shell
11 Battery
12 Ignition switch | 195 Ignition/fuel injection electronic control unit (1581)
279 Engine coolant temperature double sender unit |

N.D. Ultrasound-soldered joint taped in wiring loom

13 Front right/left cables connection

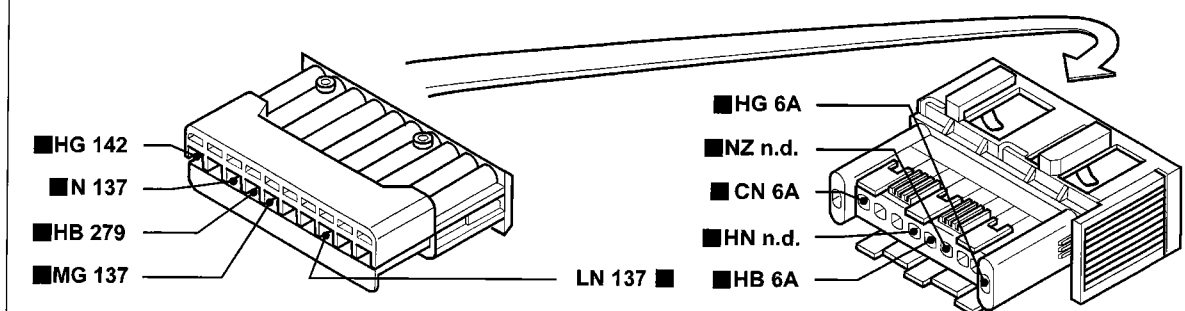


28 Dashboard/longitudinal cables connection

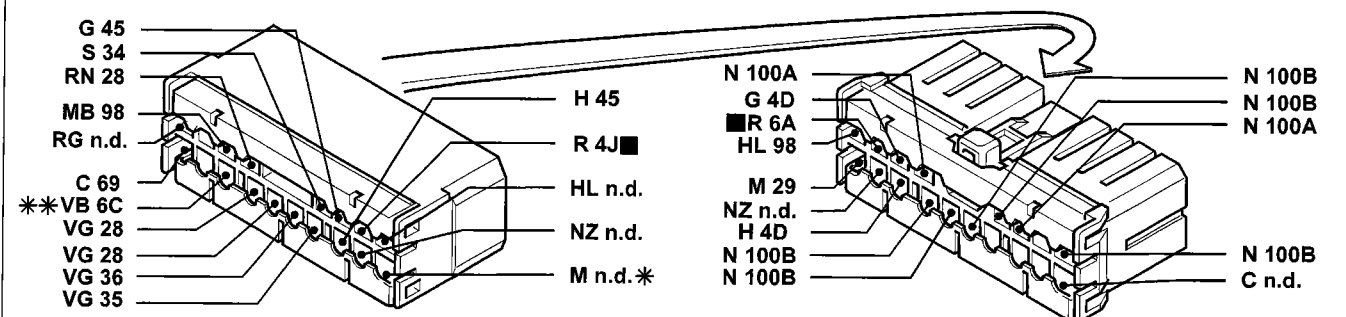


* Only for Brava

55 Front/engine cables connection



70 Dashboard/front cables connection



* Not present on S version

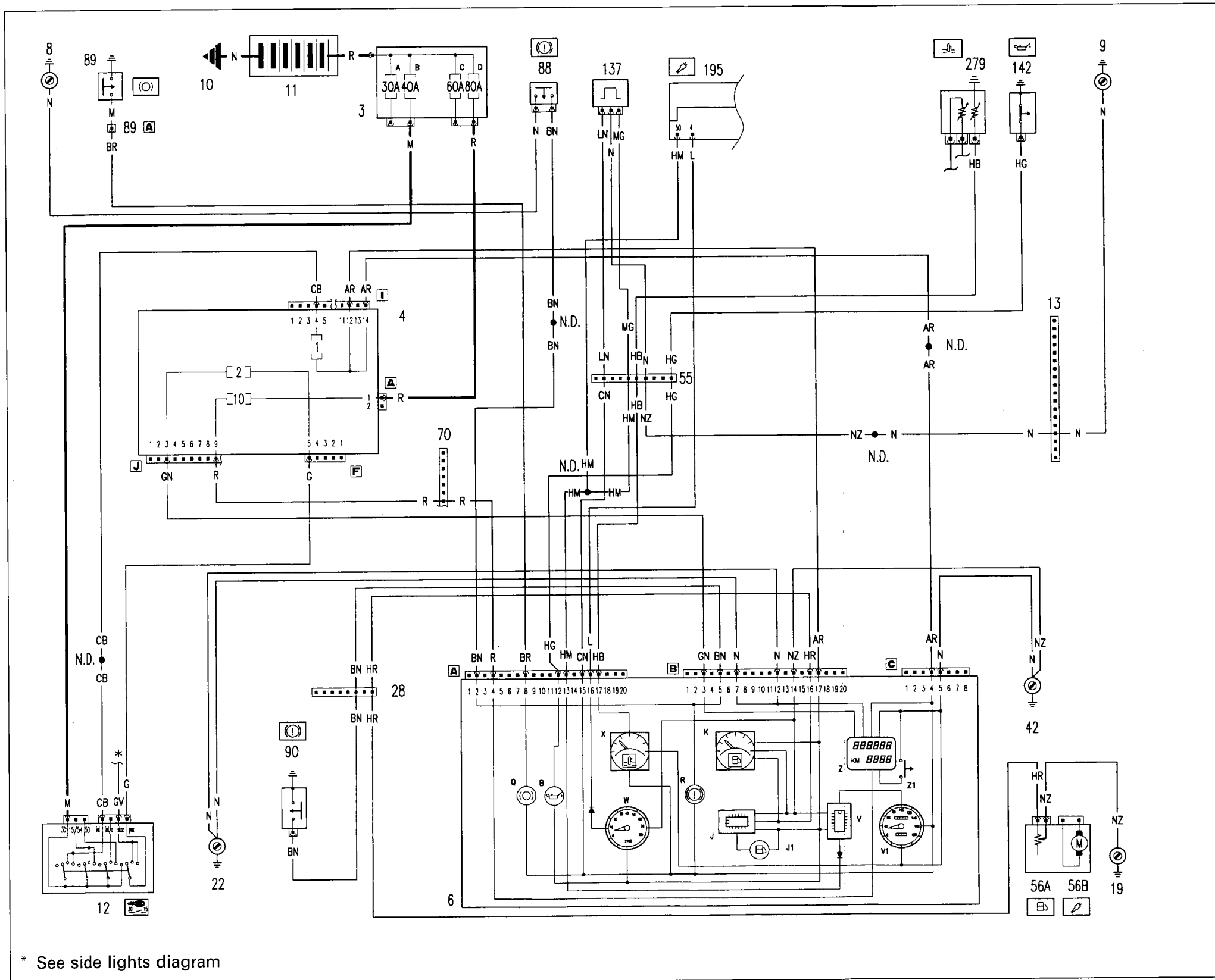
** Applies to EL/ELX version

■ The cables involved in the wiring diagram are marked with a solid square

P4A44EL01

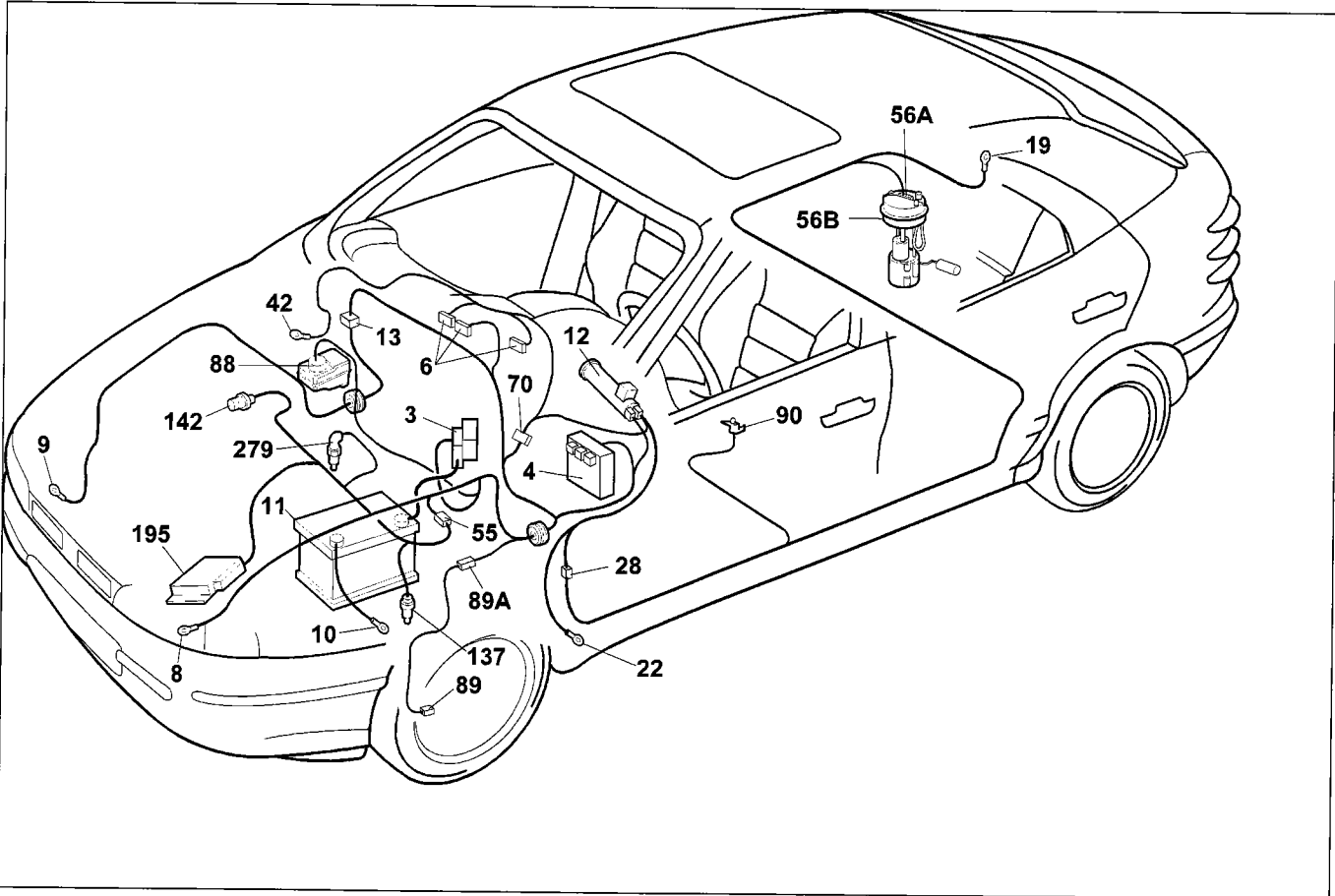
Version: EL - ELX

Fuel level gauge and reserve warning light - Hand brake on/low brake fluid warning light - Speedometer - Trip recorder/total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Rev counter -



P4A45EL01

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Version: EL - ELX

P4A47EL01

Fuel level gauge and reserve warning light - Hand brake on/low brake fluid level warning light - Speedometer - Trip recorder/total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Rev counter

Key to components

- 3 Power fuse box:
A 30A fuse protecting fuel injection
B 40A fuse protecting ignition
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit

4 Fuse and relay unit

6 Instrument panel:
B Low engine oil pressure warning light
J Fuel reserve circuit control module
J1 Low fuel level warning light
K Fuel gauge
Q Front brake pad wear warning light
R Hand brake on/low brake fluid warning light

V Speedometer control module
V1 Speedometer
W Rev counter
X Coolant temperature gauge
Z Trip recorder/total mileage counter
Z1 Trip recorder reset button

8 Front left earth
9 Front right earth
10 Battery earth on body shell
11 Battery
12 Ignition switch
- 13 Front right/left cables connection
19 Rear right earth
22 Left dashboard earth
28 Dashboard/longitudinal cables connection
42 Right dashboard earth
55 Front cables/fuel gauge control connection

56 Fuel gauge control unit
A Fuel gauge sensor
B Electric fuel pump

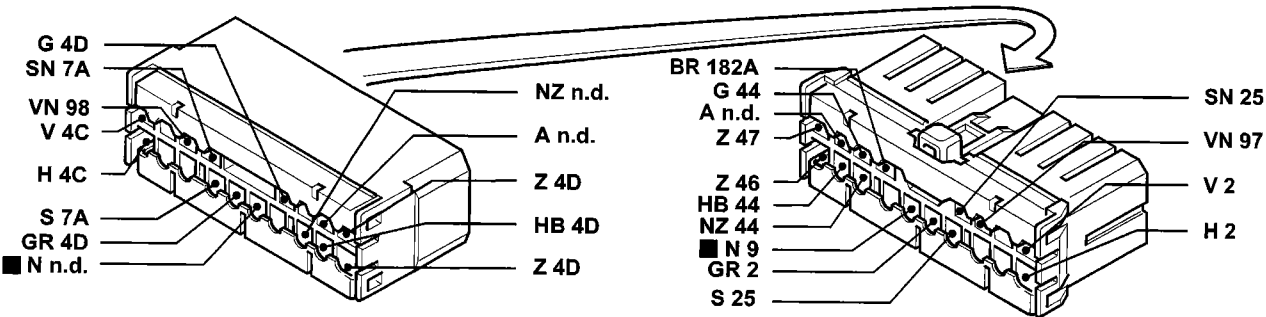
70 Dashboard/front cables connection
88 Low brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection

90 Handbrake on warning light switch
137 Car speed sensor
142 Low oil pressure warning light switch

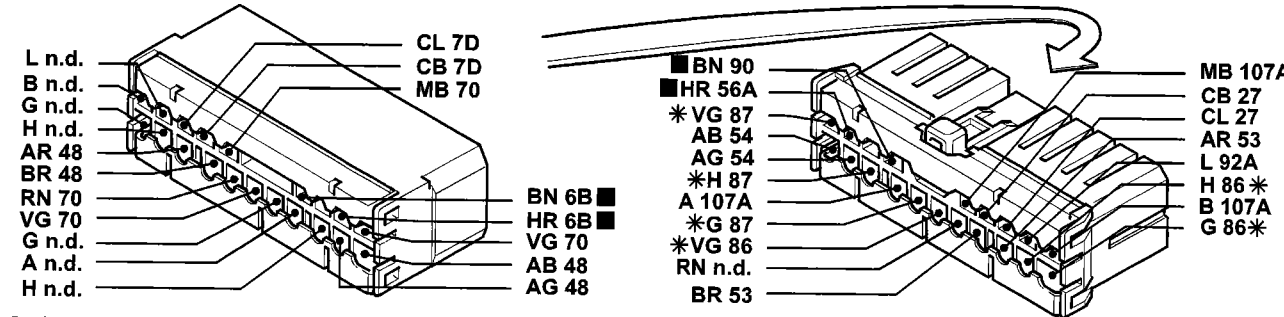
195 Ignition/fuel injection electronic control unit (1581)

279 Engine coolant temperature double sender unit
- N.D. Ultrasound-soldered joint taped in wiring loom

13 Front right/left cables connection

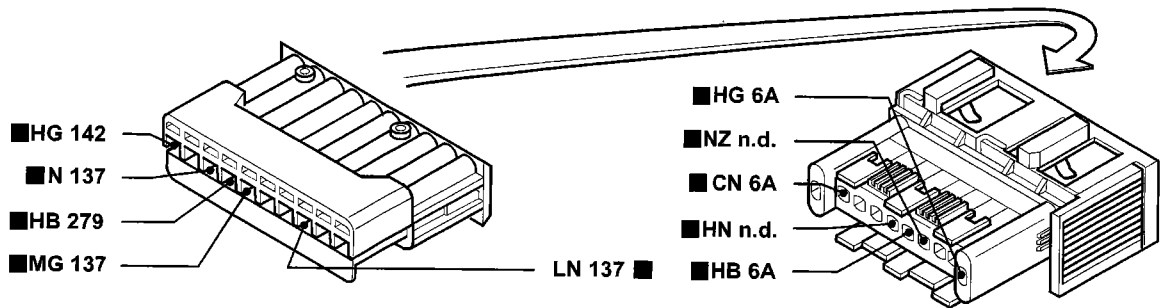


28 Dashboard/longitudinal cables connection

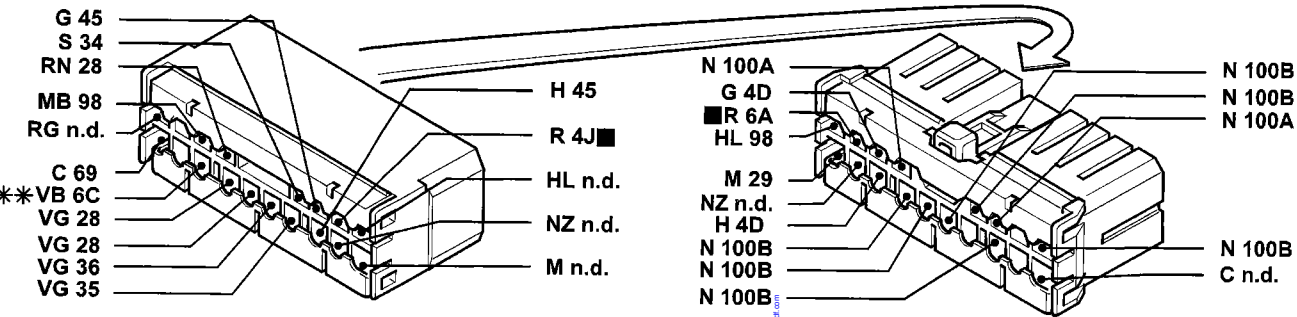


* Only for Brava

55 Front/engine cables connection



70 Dashboard/front cables connection



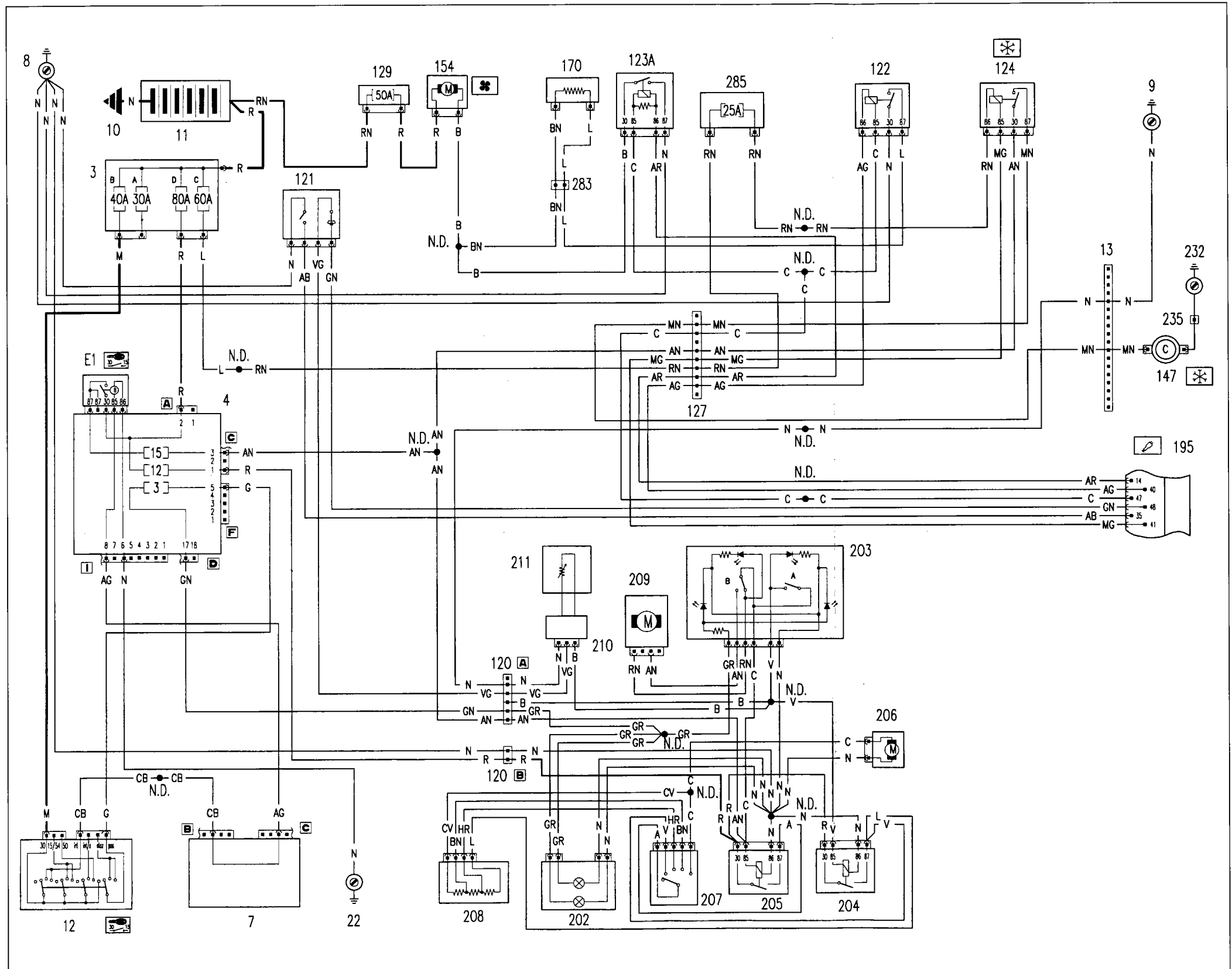
* Not present on S version

** Applies to EL/ELX version

■ The cables involved in the wiring diagram are marked with a solid square

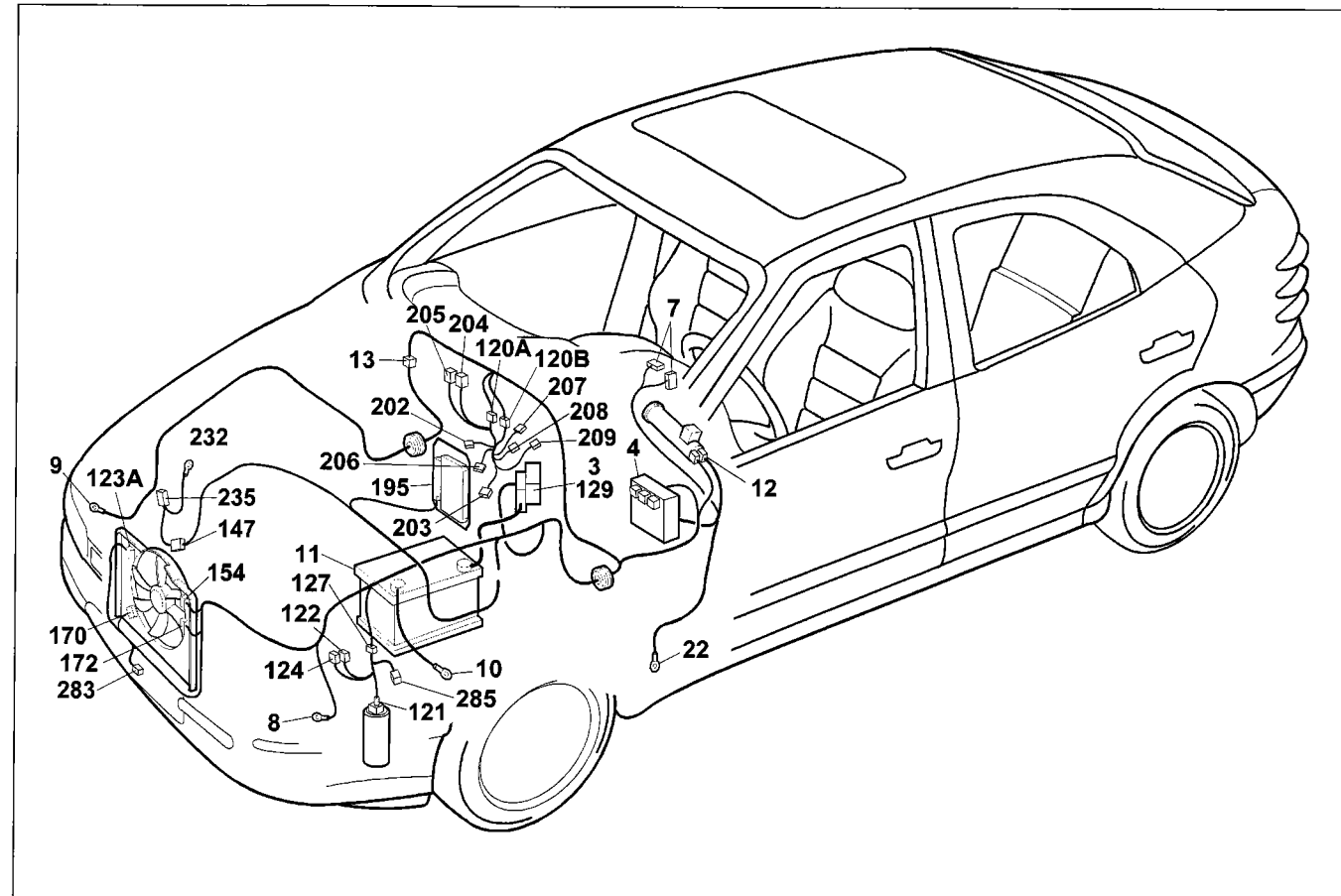
P4A48EL01

Air conditioner



P4A49EL01

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P4A51EL01

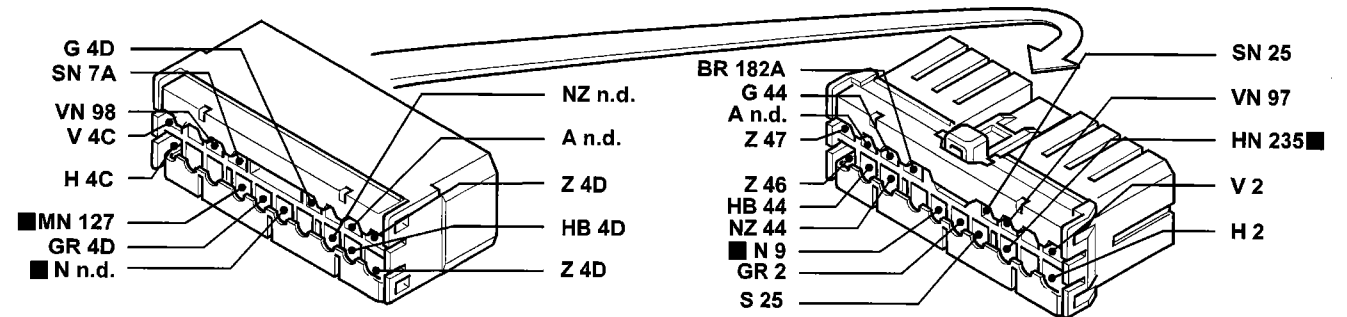
Air conditioner

Key to components

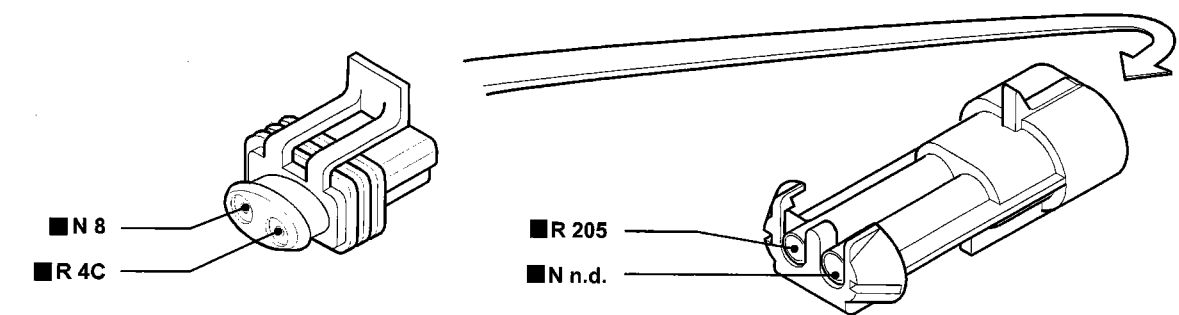
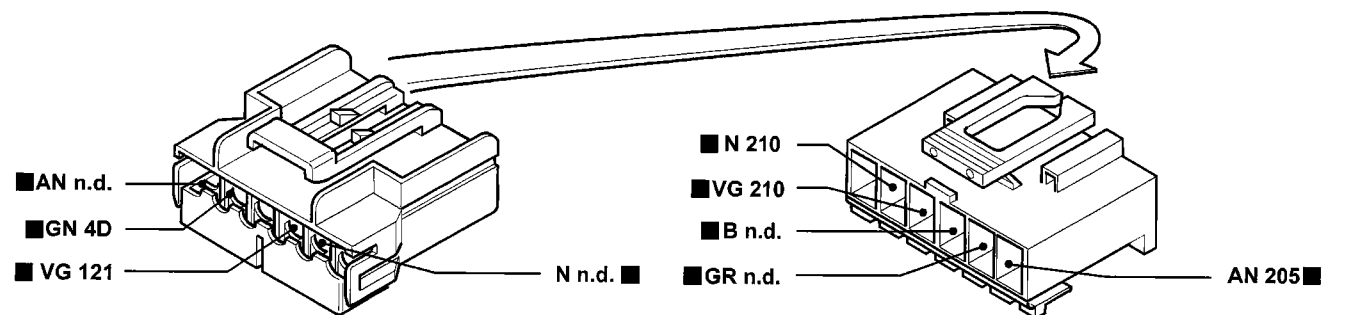
- | | |
|---|--|
| 3 Power fuse box: | 170 Engine cooling fan limiting resistor |
| A 30A fuse protecting fuel injection | 195 Ignition/fuel injection electronic control unit (1581) |
| B 40A fuse protecting ignition | 02 Heater/air conditioner light bulbs |
| C 60A fuse protecting additional optional extras | 203 Air conditioner controls unit: |
| D 80A fuse protecting fuse and relay unit | A Switch for switching on air conditioner |
| 4 Fuse and relay unit: | B Switch for air conditioner recirculation |
| E1 Ignition switch discharge relay | 204 Air conditioner fan 1st speed control relay |
| 7 Stalk unit | 205 Air conditioner fan relay |
| 8 Front left earth | 206 Heater/air conditioner electric fan |
| 9 Front right earth | 207 Heater/air conditioner speed control switch |
| 10 Battery earth on body shell | 208 Limiting resistor for heater/air conditioner |
| 11 Battery | 209 External/recirculation air flap actuator |
| 12 Ignition switch | 210 Electronic thermostat cables connection |
| 13 Front right/left cables connection | 211 Electronic thermostat (N.T.C.) |
| 22 Left dashboard earth | 232 Earth for compressor |
| 120 Air conditioner cables connection | 235 Air conditioner compressor cables connection |
| 121 Three-stage pressure switch | 283 Front cable/resistor cable connection |
| 122 Engine cooling fan low speed relay | 285 25A fuse protecting headlamp washer/compressor relay |
| 123A Engine cooling fan high speed relay | |
| 124 Air conditioner compressor control relay | |
| 127 Connection between front left cables/cable on relay carrier bracket | |
| 129 50A power fuse protecting engine cooling fan | |
| 147 Compressor for air conditioner | |
| 154 Engine cooling fan | |

N.D. Ultrasound-soldered joint taped in wiring loom

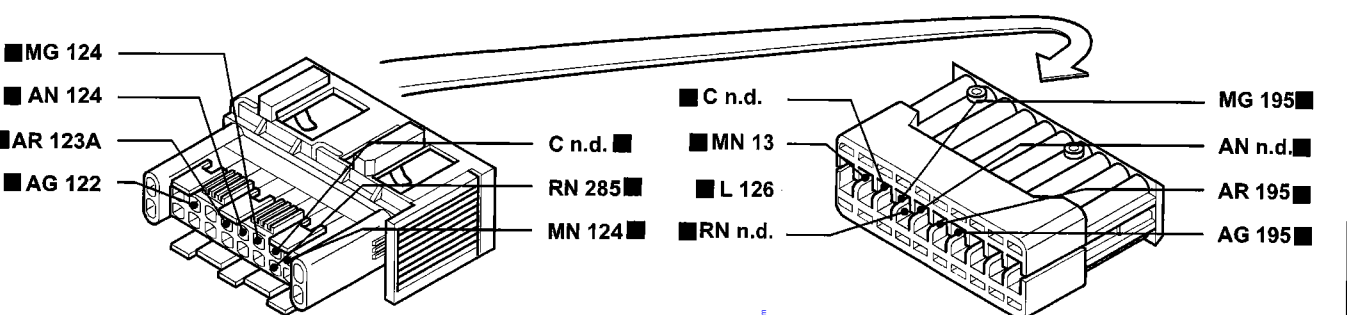
13 Front right/left cables connection



120 Air conditioner cables connection



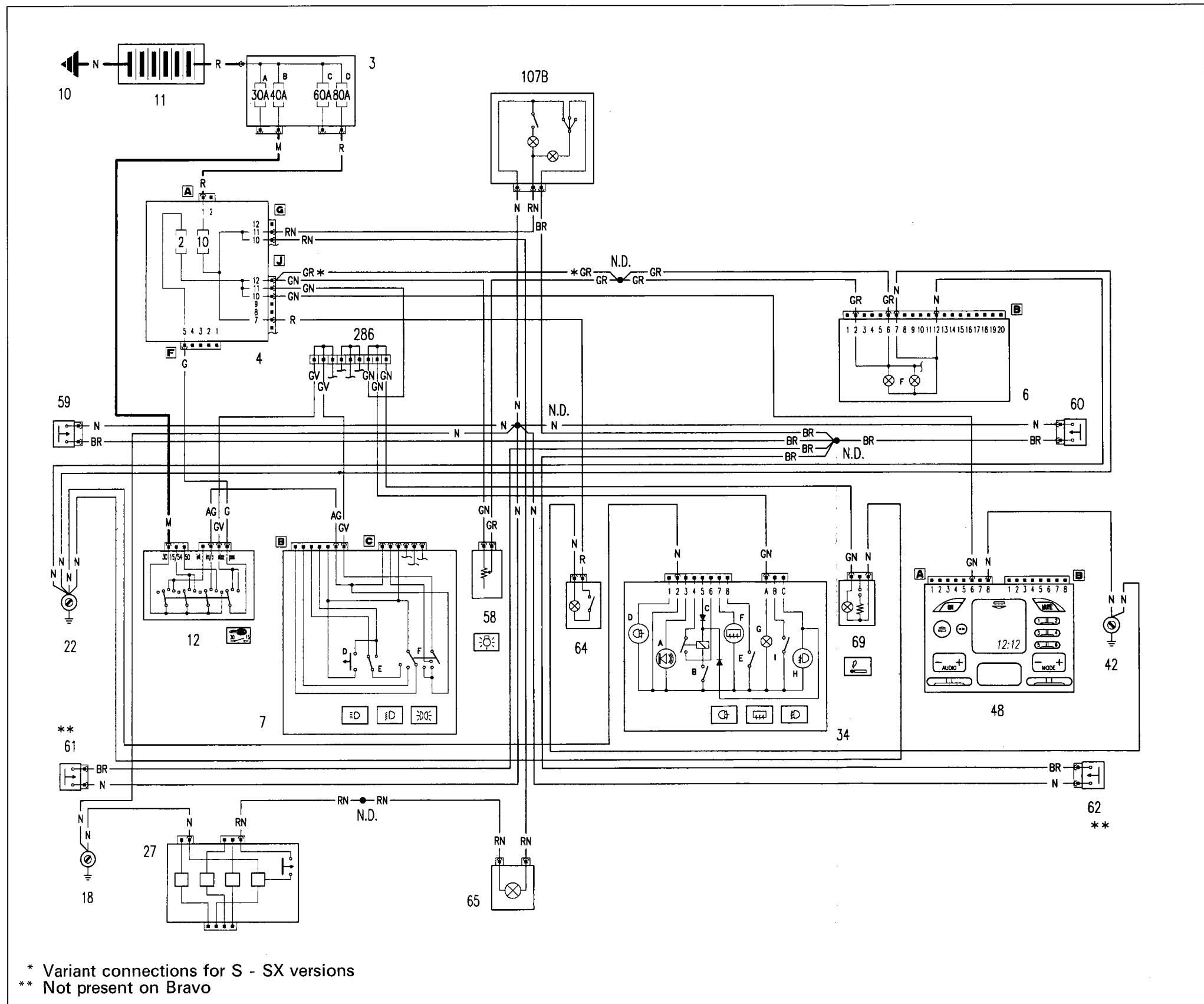
127 Connection between front left cables/cable on relay carrier bracket



■ The cables involved in the wiring diagram are marked with a solid square

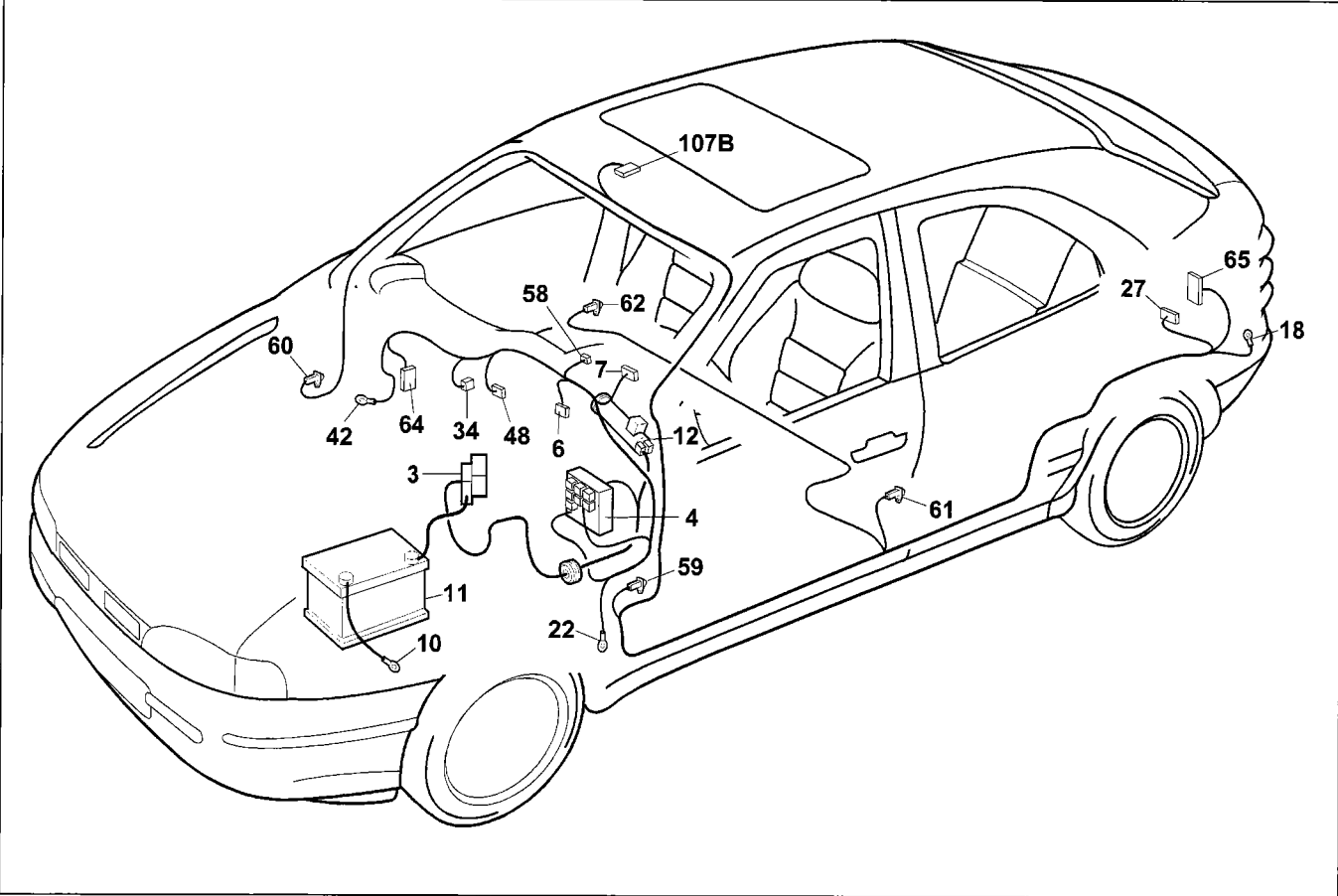
P4A52EL01

Courtesy light - Symbol illumination



P4A53EL01

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Courtesy light - Symbol illumination

Key to components

- 3 Power fuse box:
A 30A fuse protecting fuel injection
B 40A fuse protecting ignition
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
4 Fuse and relay unit
6 Instrument panel:
F Instrument panel symbol lights
7 Stalk unit:
D Flasher button
E Main beam/dipped beam headlamps stalk
F Side lights stalk
10 Battery earth on body shell
11 Battery
12 Ignition switch
18 Rear left earth
22 Left dashboard earth
27 Rear connections contact assembly with built-in boot light
34 Switch controls unit:
A Anti-theft "on" warning light
B Rear fog lamps control switch
C Rear fog lamps relay
D Rear fog lamps warning light
E Heated rear window switch
F Heated rear window warning light

G Switch controls unit symbol light
H Front fog lamps warning light
I Front fog lights switch
42 Right dashboard earth
48 Radio with clock
58 Lighting brightness adjustment rheostat
59 Courtesy light button on front left pillar
60 Courtesy light button on front right pillar
61 Courtesy light button on rear left pillar
62 Courtesy light button on rear right pillar
64 Glove compartment light with built-in switch
65 Boot light / anti-theft device "on"
69 Cigarette lighter
107B Car interior courtesy light
286 Short-circuiting connection

N.D. Ultrasound-soldered joint taped in wiring loom

6B Instrument panel

■ GR n.d.

■ N 22

LG 117

AR 4I

HR 28

NZ 42

BN 28

GN 4J

N 22

GR n.d.

A 4H

VN 4J

AN 4H

22 Left dashboard earth

N 6B

N 6B

N 23A

N 5

N 34

N 4I

N 35 *

N n.d.

N 69

* Only for ELX version

58 Courtesy light brightness adjustment rheostat

■ GN 4J

■ GR n.d.

59 Courtesy light button on front left pillar

■ BR n.d.

■ N n.d.

62 Courtesy light button on front right pillar

■ BR n.d.

■ N n.d.

64 Glove compartment light bulb with integrated switch

■ R 4J

■ N 42

65 Boot light bulb/anti-theft device "on"

■ RN n.d.

■ RN 4G

107B Car interior courtesy light

■ N n.d.

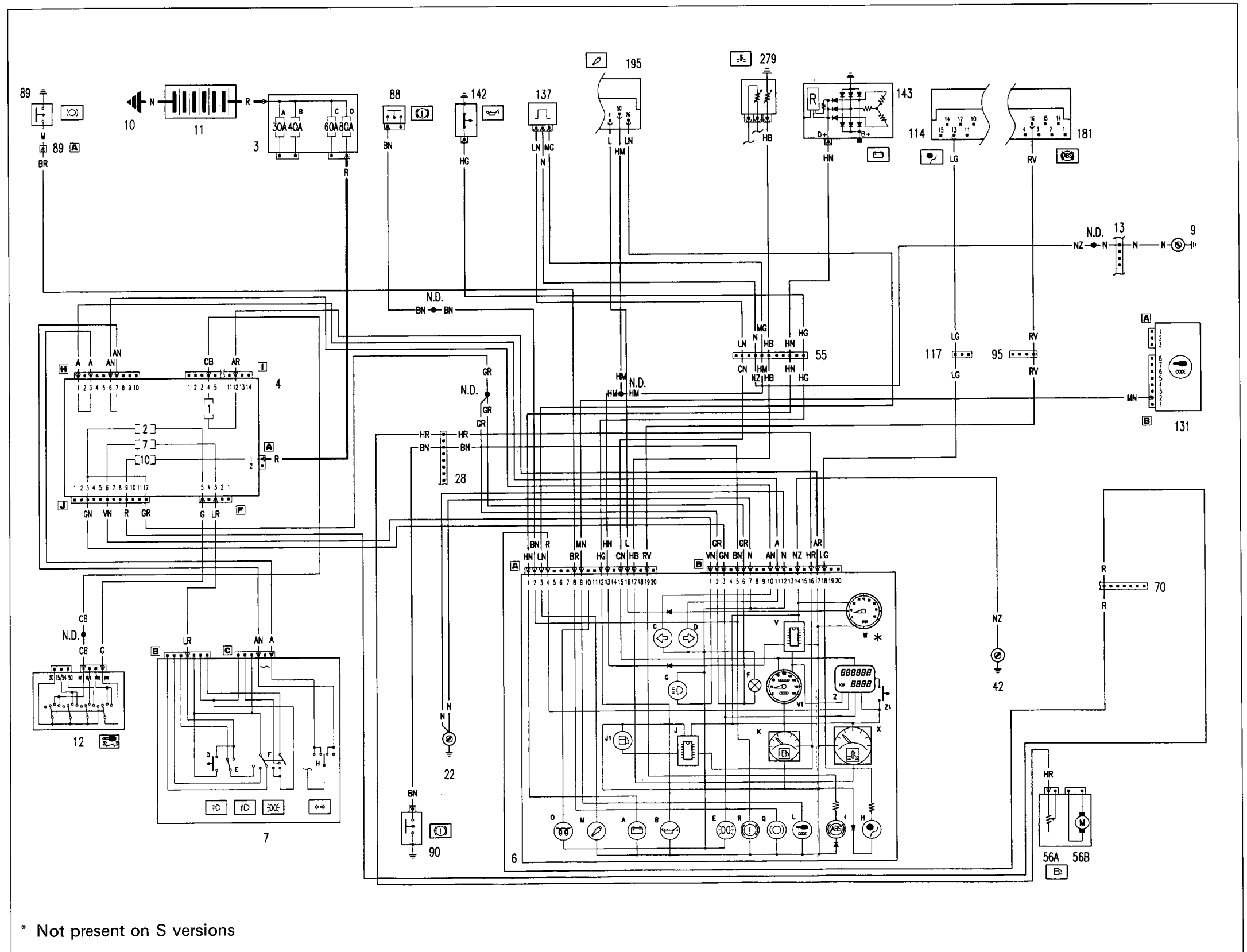
■ BR n.d.

■ RN 4G

■ The cables involved in the wiring diagram are marked with a solid square

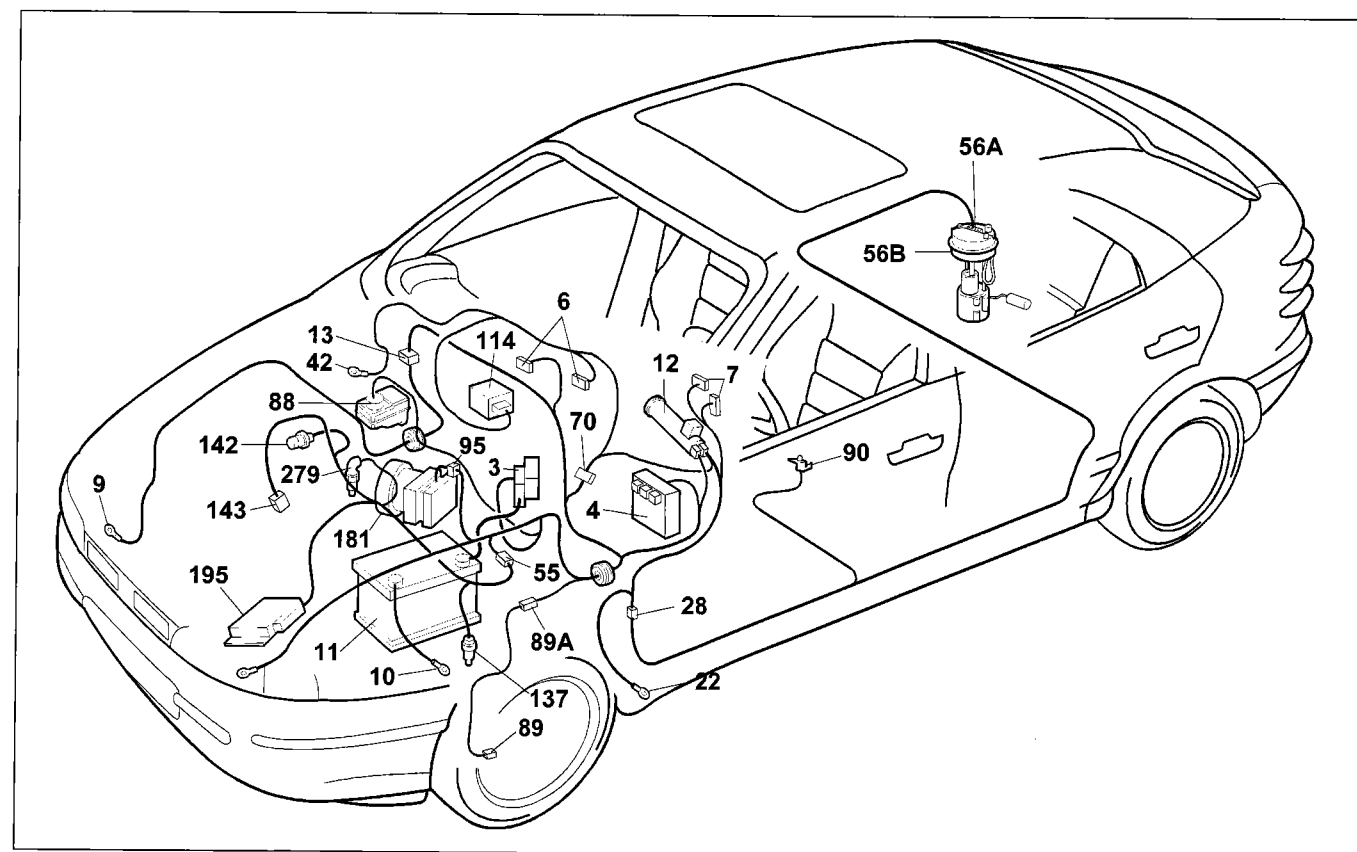
Version: S - SX

Instrument panel connections



P4A57EL01

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Version: S - SX

Instrument panel connections

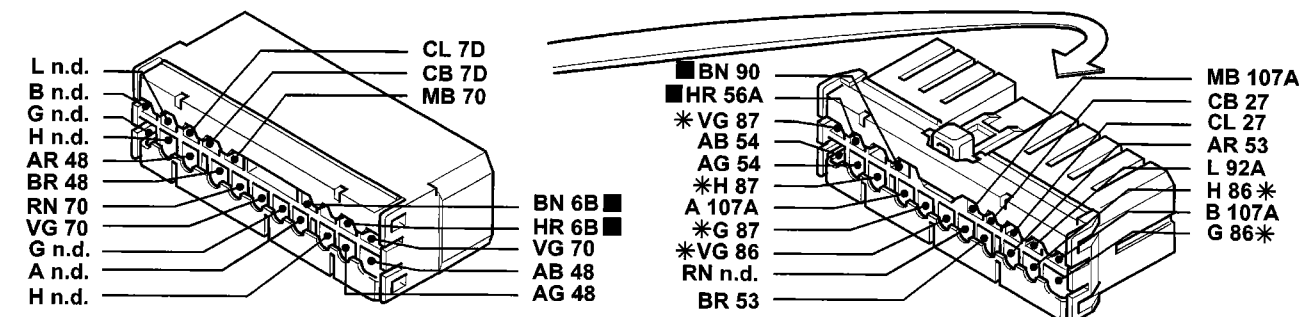
Key to components

- 3 Power fuse box:
A 30A fuse protecting fuel injection
B 40A fuse protecting ignition
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:
A Low generator recharging warning light
B Low engine oil pressure warning light
C Left direction indicator warning light
D Right direction indicator warning light
E Side lights warning light
F Instrument panel symbol lights
G Main beam headlamps warning light
H Air Bag system fault warning light
I Anti-lock braking system fault warning light
J Fuel reserve circuit control module
J1 Low fuel level warning light
K Fuel gauge
L Fiat-CODE system fault warning light
M Petrol/diesel fuel injection fault warning light
Q Front brake pad wear warning light
R Hand brake on / low brake fluid level warning light
V Speedometer control unit
V1 Speedometer
W Rev counter
X Coolant temperature gauge
Z Trip recorder / total mileage counter
Z1 Trip recorder reset button
- 7 Stalk unit:
D Flasher button
E Main beam/dipped beam headlamps stalk
F Side lights stalk
H Direction indicators stalk

- 9 Front right earth
10 Battery earth on body shell
11 Battery
12 Ignition switch
13 Front left/right cables connection
22 Left dashboard earth
28 Dashboard/longitudinal cables connection
42 Right dashboard earth
55 Front/fuel gauge control cables connection
56 Fuel gauge control unit
A Fuel level sensor
B Electric fuel pump
70 Dashboard/front cables connection
88 Low brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection
90 Handbrake on warning light switch
95 Front cables/anti-lock braking system (A.B.S.) connection
114 Air Bag electronic control unit
117 Air Bag/dashboard cables connection
131 Fiat CODE electronic control unit
137 Car speed sensor
142 Low oil pressure warning light switch
143 Alternator
181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)
195 Ignition/fuel injection electronic control unit (1581)
279 Engine coolant temperature double sender unit

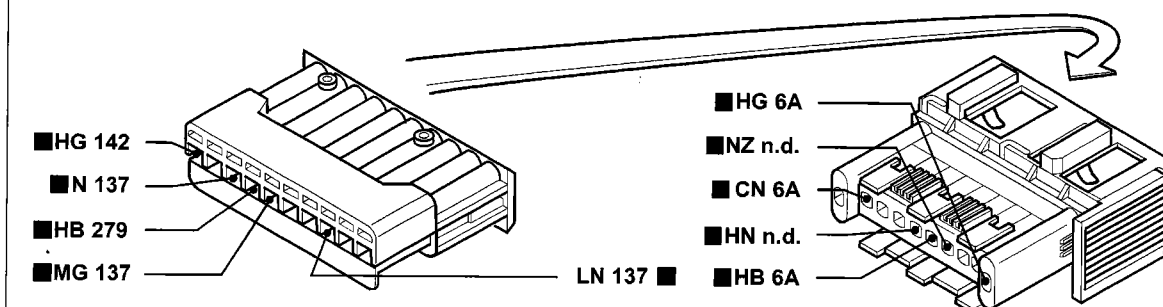
N.D. Ultrasound-soldered joint taped in wiring loom

28 Dash./longitudinal cables connection

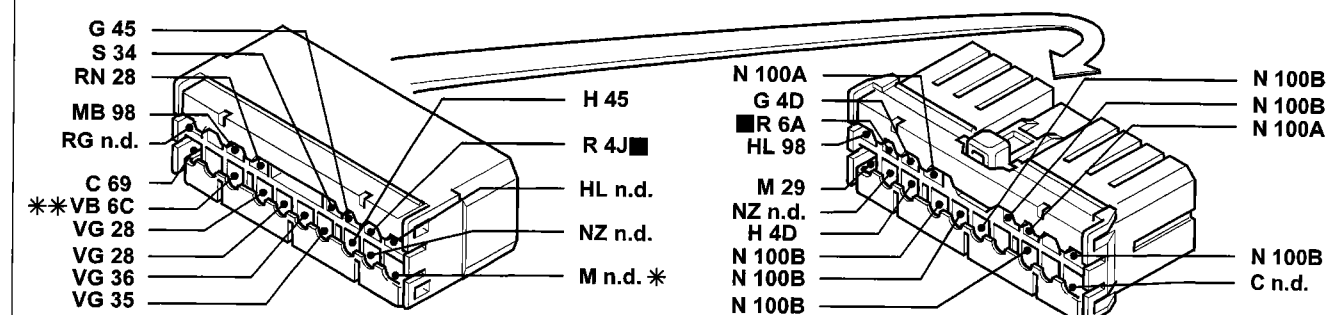


* Only for Brava

55 Front/engine cables connection



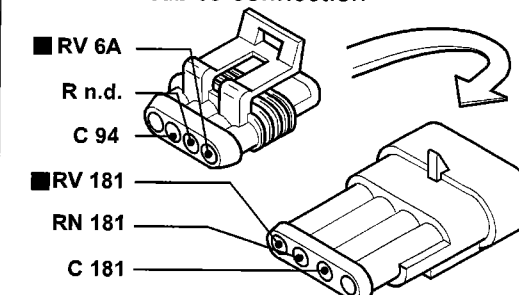
70 Dashboard/front cables connection



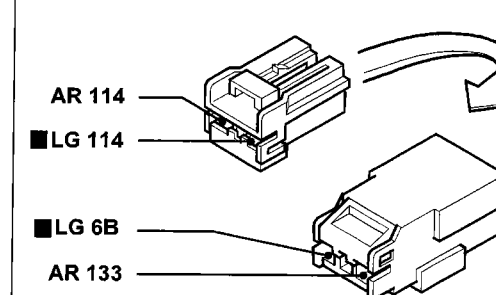
* Not present on S version

** Applies only to EL/ELX version

95 Front/anti-lock braking system (A.B.S.) cables connection



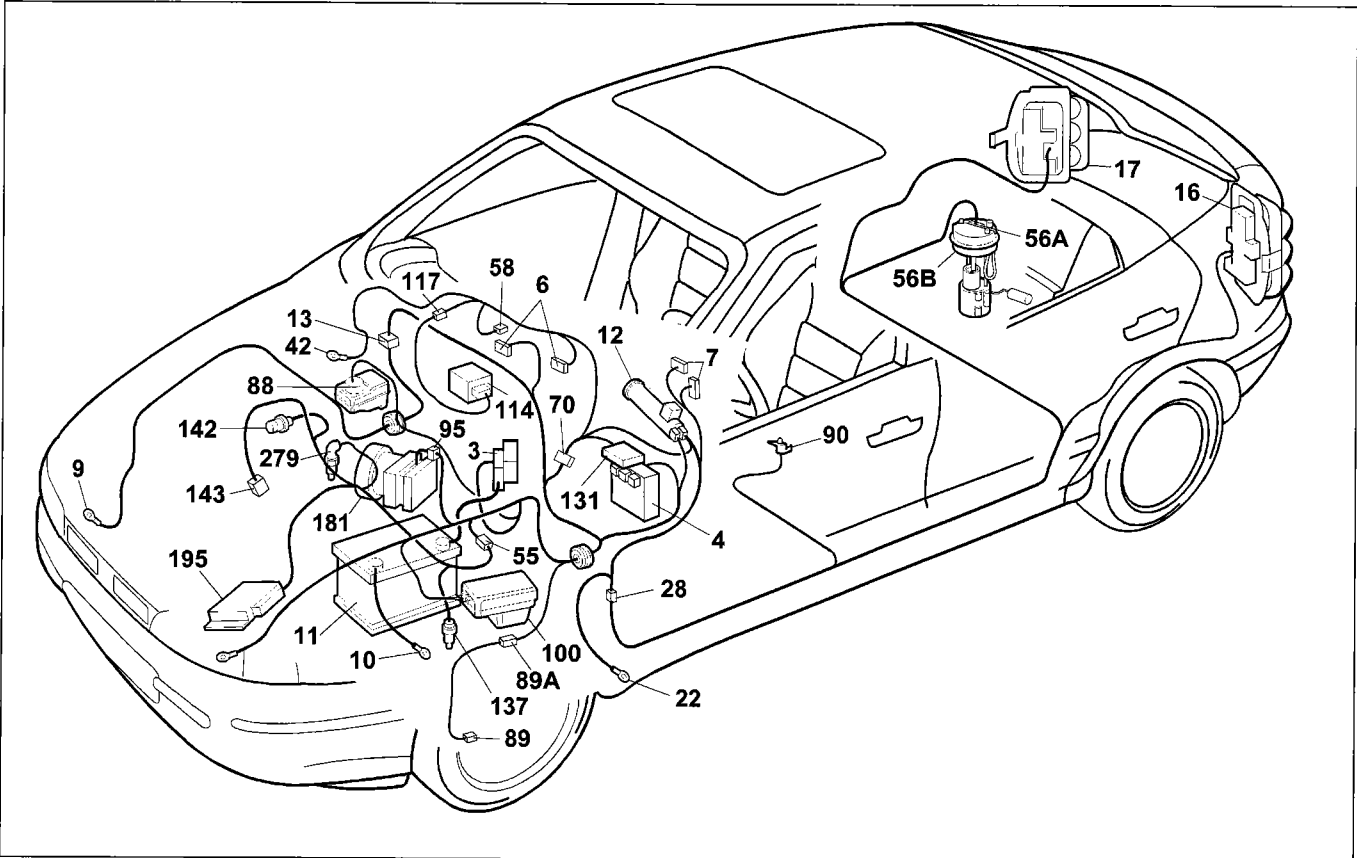
117 Air Bag/dashboard cables connection



■ The cables involved in the wiring diagram are marked with a solid square

P4A61EL01

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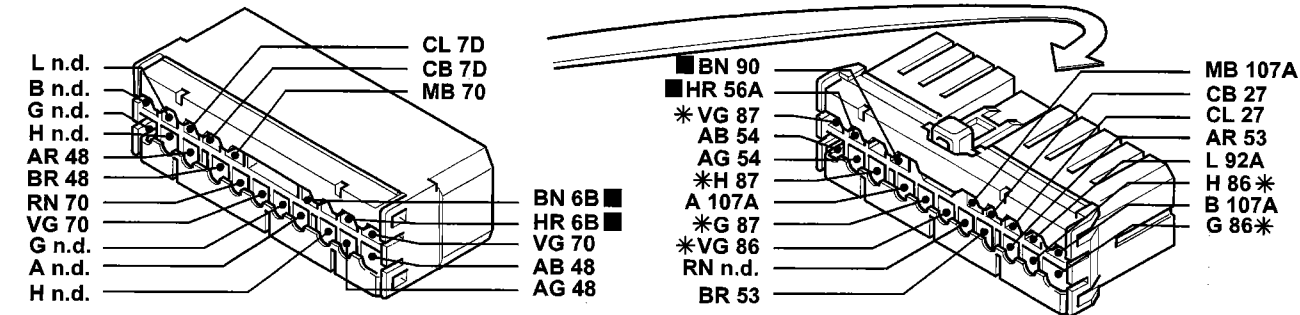
Version: EL - ELX
Instrument panel connections

Key to components

- 3 Power fuse box:
A 30A fuse protecting fuel injection
B 40A fuse protecting ignition
C 60A fuse protecting additional optional extras
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:
A Low generator recharging warning light
B Low engine oil pressure warning light
C Left direction indicator warning light
D Right direction indicator warning light
E Side lights warning light
F Instrument panel symbol lights
G Main beam headlamps warning light
H Air Bag fault warning light
I Anti-lock braking system fault warning light
J Fuel reserve circuit control module
J1 Low fuel level warning light
K Fuel gauge
L Fiat-CODE system fault warning light
M Fuel injection fault warning light
N Maximum turbocharging pressure warning light
O Heater plugs warning light
Q Front brake pad wear warning light
R Hand brake on/low brake fluid level warning light
S Electronic module for car stop lights fault indicator system
- T Stop lights fault warning light
U Door open warning light
V Speedometer control module
V1 Speedometer
W Rev counter
X Water temperature gauge
Z Trip recorder / total mileage counter
Z1 Trip recorder reset button
- 7 Stalk unit:
D Flasher button

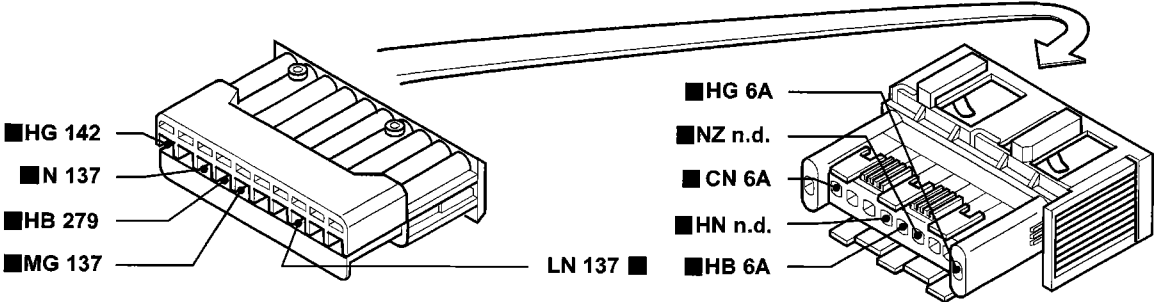
- E Main beam/dipped beam headlamps stalk
F Side lights stalk
H Direction indicators stalk
- 9 Front right earth
10 Battery earth on body shell
11 Battery
12 Ignition switch
13 Front right/left cables connection
16 Rear left lights cluster
17 Rear right lights cluster
22 Left dashboard earth
28 Dashboard/longitudinal cables connection
40 Stop lights switch
42 Right dashboard earth
55 Front/fuel gauge control cables connection
56 Fuel gauge control unit
A Fuel level sensor
B Electric fuel pump
58 Lighting brightness adjustment rheostat
70 Dashboard/front cables connection
88 Low brake fluid level sensor
89 Left brake pad wear sensor
89A Left brake pad wear sensor cables connection
90 Handbrake on warning light switch
95 Front/anti-lock braking system (A.B.S.) cables connection
100 Alarm system electronic control unit
114 Air Bag electronic control unit
117 Air Bag/dashboard cables connection
131 Fiat-CODE electronic control unit
137 Car speed sensor
142 Low engine oil pressure indicator switch
143 Alternator
181 Electronic control unit for anti-lock braking system (A.B.S.)
195 Ignition/fuel injection electronic control unit (1581)
- 279 Engine coolant temperature double sender unit
N.D. Ultrasound-soldered joint taped in wiring loom

28 Dash./longitudinal cables connection

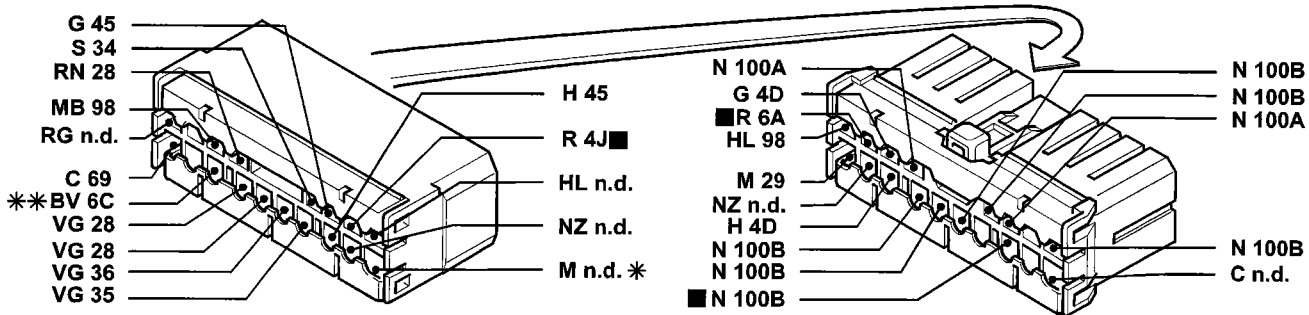


* Only for Brava

55 Front/engine cables connection



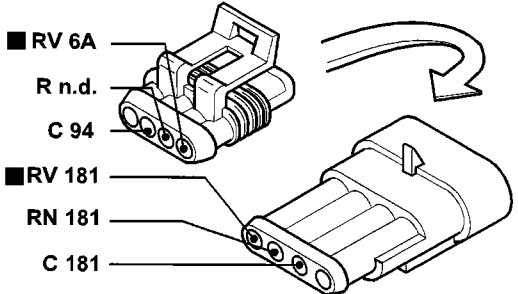
70 Dashboard/front cables connection



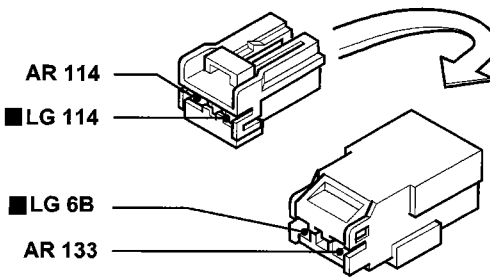
* Not present on S version

** Applies only to EL/ELX version

95 Front/anti-lock braking system (A.B.S.) cables connection



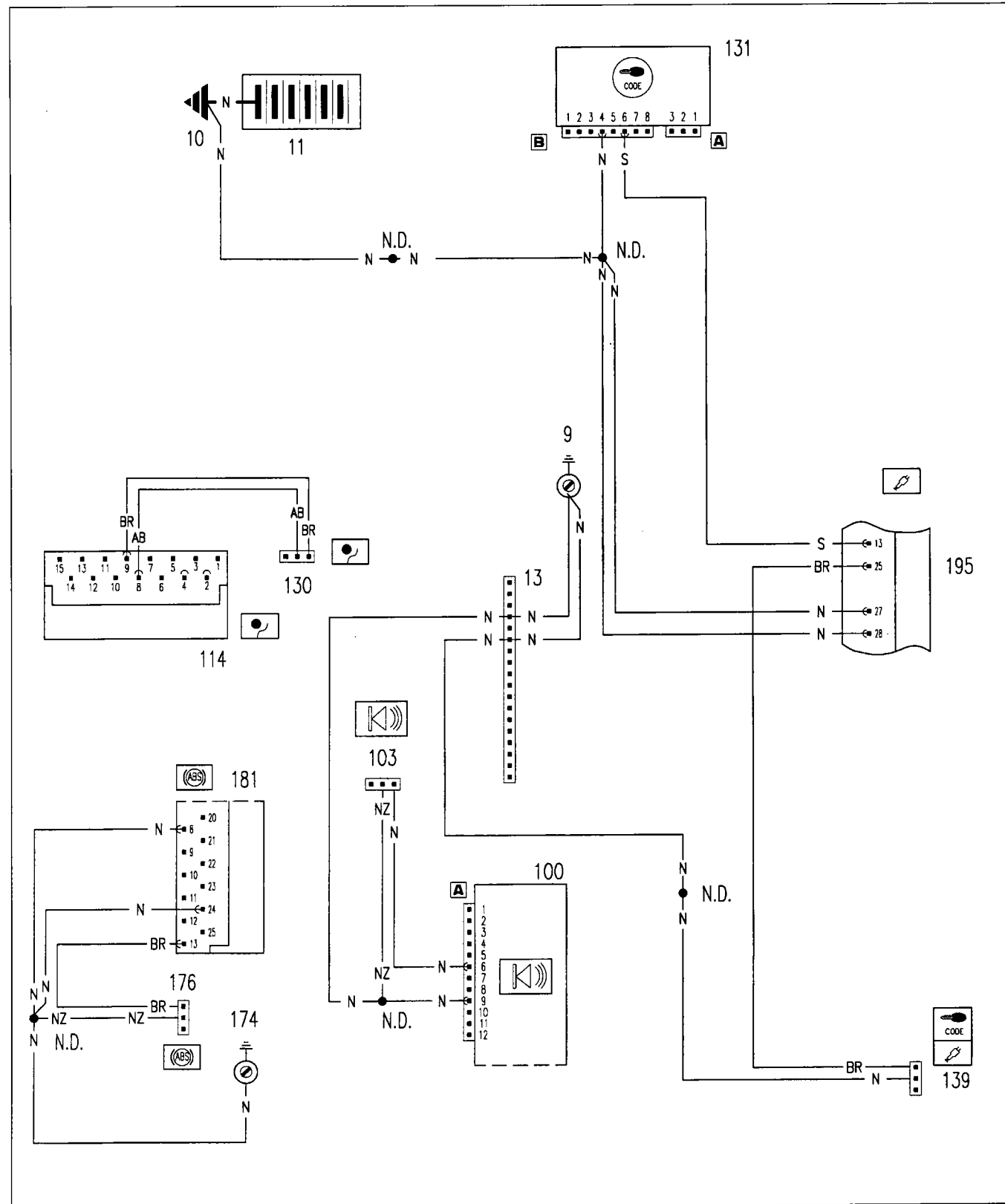
117 Air Bag/dashboard cables connection



■ The cables involved in the wiring diagram are marked with a solid square

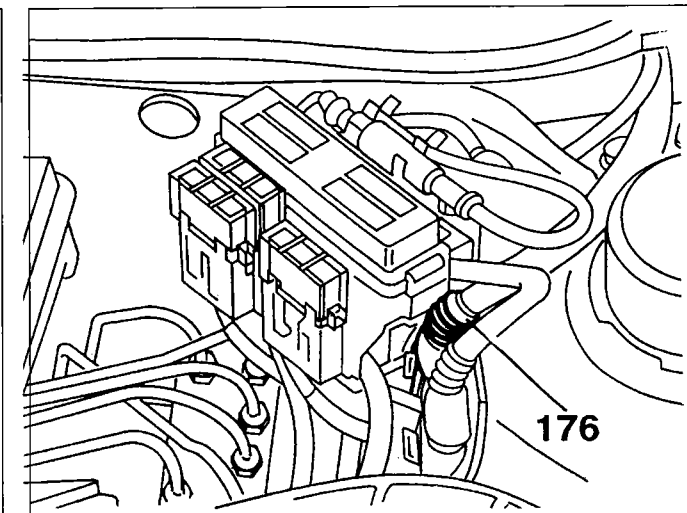
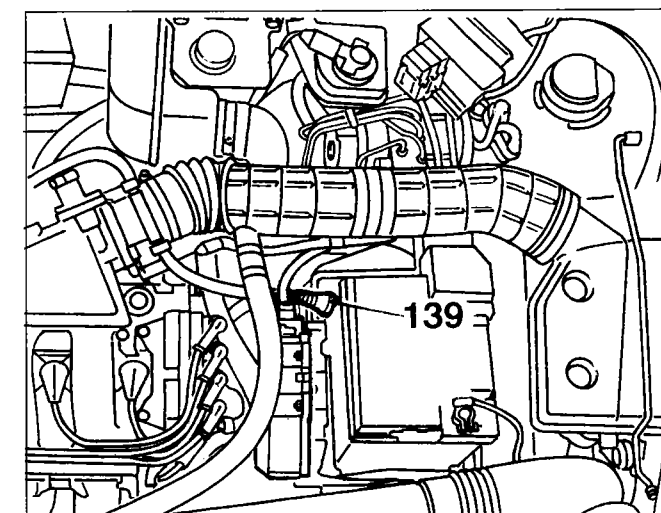
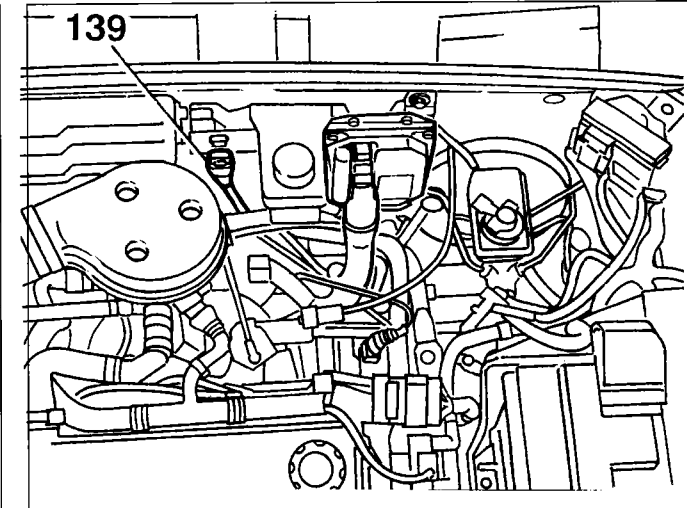
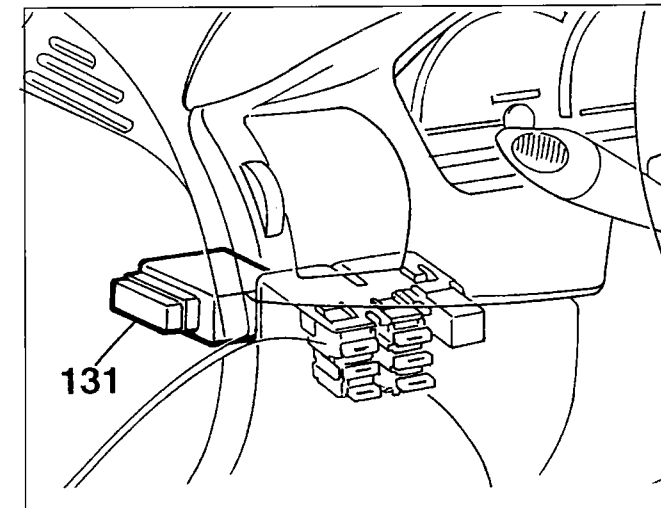
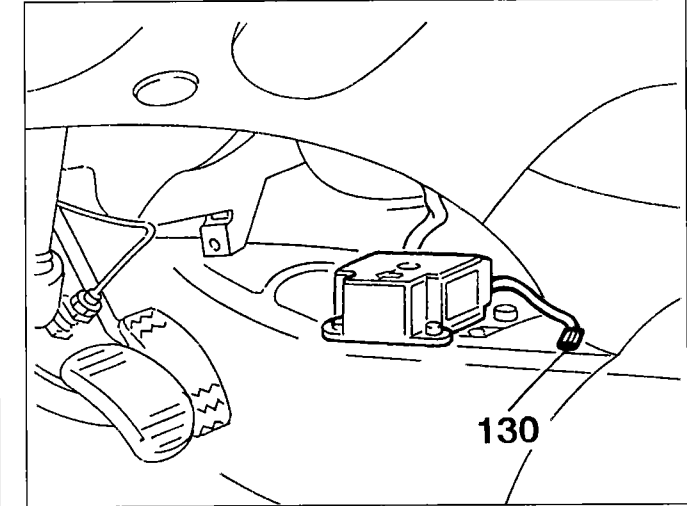
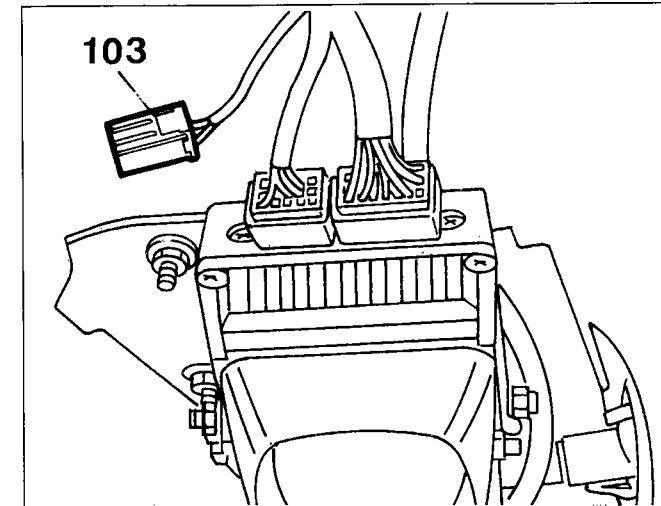
P4A64EL01

Diagnostic socket connections



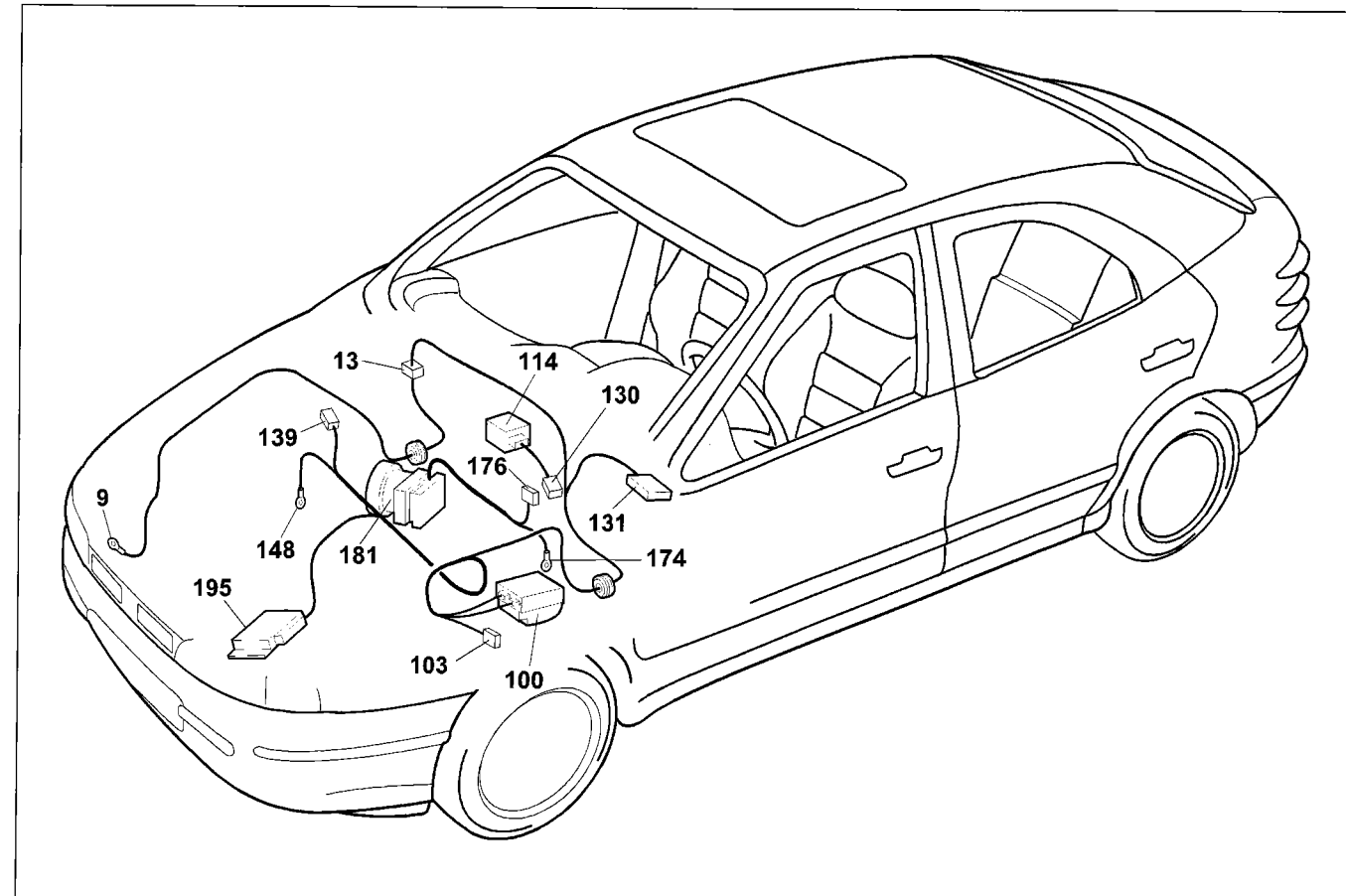
P4A65EL01

Location of components



P4A66EL01

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P4A67EL01

Diagnostic socket connections

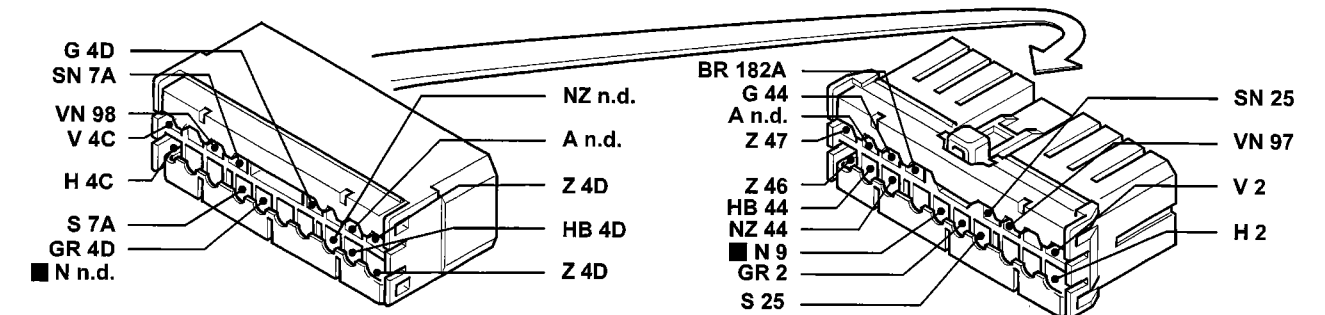
Key to components

- 9 Front right earth
- 10 Battery earth on body shell
- 13 Front right/left cables connection
- 100 Alarm electronic control unit
- 103 Diagnostic socket for alarm
- 114 Air Bag electronic control unit
- 130 Diagnostic socket for Air Bag system
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for fuel injection
- 148 Earth for electronic fuel injection
- 174 Power earth for anti-lock braking system (A.B.S.)

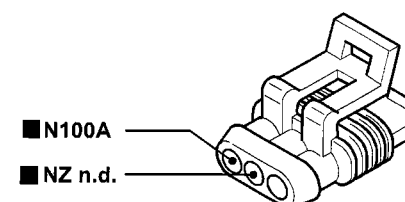
- 176 Diagnostic socket for anti-lock braking system (A.B.S.)
- 181 Anti-lock braking system (ABS) electronic control unit.
- 195 Ignition/fuel injection electronic control unit (1581)

N.D. Ultrasound-soldered joint taped in wiring loom

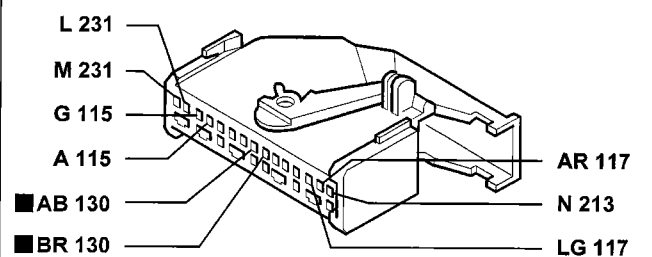
13 Front right/left cables connection



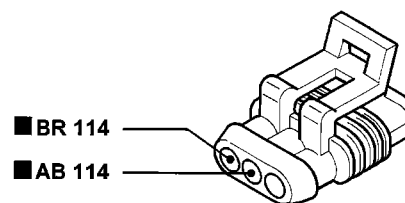
103 Diagnostic socket for alarm



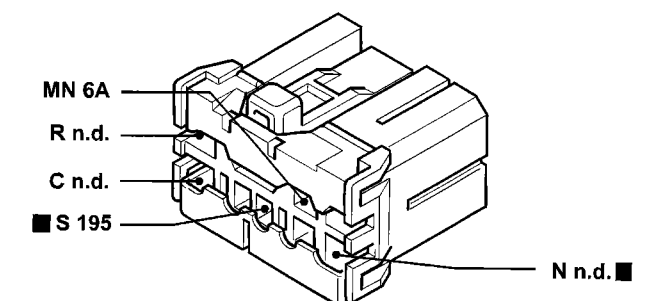
114 Air Bag electronic control unit



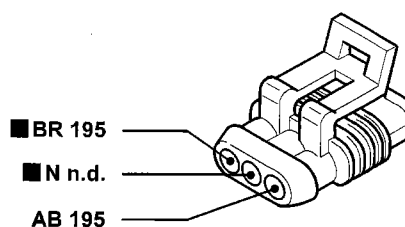
130 Diagnostic socket for Air-bag system



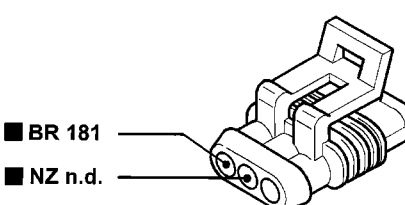
131 Fiat-CODE electronic control unit



139 Diagnostic socket for fuel injection



176 Diagnostic socket for A.B.S



■ The cables involved in the wiring diagram are marked with a solid square

P4A68EL01

Key to components

- 1 Front left lights cluster
 - 2 Front right lights cluster
 - 3 Power fuse box
 - A 50A fuse protecting fuel injection (60A for D versions)
 - B 50A fuse protecting ignition
 - C 50A fuse protecting additional optional extras
 - D 80A fuse protecting fuse and relay unit
 - 4 Fuse and relay unit:
 - E1 Ignition switch discharge relay
 - 5 Dipped beam relay
 - 6 Instrument panel:
 - A Low generator recharging warning light
 - B Low engine oil pressure warning light
 - C Left direction indicator warning light
 - D Right direction indicator warning light
 - E Side lights warning light
 - F Instrument panel symbol lights
 - G Main beam headlamps warning light
 - H Air Bag system fault warning light
 - I Anti-lock braking system fault warning light
 - J Fuel reserve circuit control module
 - J1 Low fuel level warning light
 - K Fuel gauge
 - L Fiat CODE fault warning light
 - M Petrol fuel injection fault warning light
 - Q Front brake pad wear warning light
 - R Hand brake on / low brake fluid warning light
 - light Car stop lights fault warning light
 - V Speedometer control module
 - V1 Speedometer
 - W Rev counter
 - X Water temperature gauge
 - Z Trip recorder / total mileage counter
 - Z1 Trip recorder reset button
- 7 Stalk unit:
- A Windscreen wiper speed control stalk
 - B Windscreen wiper headlamp washer/rear window wiper stalk
 - C Rear window wiper switch
 - D Flasher button

- E Dipped beam/main beam headlamps stalk
- F Side lights stalk
- H Direction indicators stalk
- I Horn button
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 14 Left number plate light
- 15 Right number plate light
- 16 Rear left lights cluster
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 20 Front left side repeater
- 21 Front right side repeater
- 22 Left dashboard earth
- 23 Hazard lights switch unit
 - A Hazard warning lights warning lamp
 - B Hazard warning lights switch
 - C Hazard warning lights symbol light
- 27 Contact assembly for rear connections with integrated boot light switch
- 28 Dash./longitudinal cables connection
- 29 Front/front fog lamps cables connection
- 30 Front left fog lamp
- 31 Front right fog lamp
- 32 Front fog lamp relay
- 33 20A fuse protecting front fog lamps
- 34 Switch controls unit:
 - A Anti-theft device "on" warning light
 - B Rear fog lights switch
 - C Rear fog lights relay
 - D Rear fog lamps warning light
 - E Heated rear window switch
 - F Heated rear window warning light
 - G Switch controls unit symbol light
 - H Front fog lamps warning light
 - I Front fog lights switch
- 40 Stop lights switch
- 41 Additional stop light
- 41A Additional stop light rear cables connection
- 42 Right dashboard earth
- 48 Radio with clock
- 55 Front/fuel gauge control cables connection
- 56 Fuel gauge control unit
 - A Fuel level sensor
 - B Electric fuel pump

- 57 Inertial switch
58 Lighting brightness adjustment rheostat
59 Courtesy light button on front left pillar
60 Courtesy light button on front right pillar
61 Courtesy light button on rear left pillar
62 Courtesy light button on rear right pillar
64 Glove compartment light with integrated switch
65 Boot light bulb/anti-theft device "on"
69 Cigarette lighter
70 Dashboard/front cables connection
88 Low brake fluid level sensor
89 left brake pad wear sensor
89A Left brake pad wear sensor cables connection
90 Handbrake on warning light switch
94 5A fuse protecting anti-lock braking system (A.B.S.)
95 Front/anti-lock braking system (A.B.S.) cables connection
96 60A power fuse protecting electrical system
100 Anti-theft electronic control unit
107B Car interior courtesy light
103 Diagnostic socket for anti-theft device
114 Air Bag electronic control unit
117 Air Bag/dashboard cables connection
120 Air conditioner cables connection
121 Three-stage pressure switch
122 Engine cooling fan low speed relay
123A Engine cooling fan high speed relay
124 Air conditioner compressor relay
127 Connection between front left cables/cable on relay carrier bracket
128 Front/air conditioner cables connection
129 50A power fuse protecting engine cooling fan
130 Diagnostic socket for Air Bag
131 Fiat-CODE electronic control unit
136 Knock sensor
137 Vehicle speed sensor
138 Idle adjustment actuator
139 Diagnostic socket for fuel injection
141 Heated Lambda probe
142 Low oil pressure warning light switch
143 Alternator
144 Rpm and T.D.C. sensor
145 Starter motor
146 Potentiometer on throttle valve
147 Compressor for air conditioner
148 Earth for electronic fuel injection
150 Fuel injection relay
154 Engine cooling fan
155 Ignition coils assembly
156 Spark plugs
159 Reversing lights switch
162 Fuel injector (1st)
163 Fuel injector (2nd)
164 Fuel injector (3rd)
165 Fuel injector (4th)
170 Engine cooling fan limiting resistor
171 Heater
174 Power earth for anti-lock braking system (A.B.S.)
176 Diagnostic socket for anti-lock braking system (A.B.S.)
177 Sensor on front left wheel for anti-lock braking system (A.B.S.)
178 Sensor on rear left wheel for anti-lock braking system (A.B.S.)
179 Sensor on front right wheel for anti-lock braking system (A.B.S.)
180 Sensor on rear right wheel for anti-lock braking system (A.B.S.)
181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)
194 Injection/injector flange cables connection
195 Ignition/fuel injection electronic control unit (1581)
199 Aerial for Fiat CODE system
202 Heater/air conditioner light bulbs
203 Air conditioner controls:
A Air conditioner recirculation switch
B Air conditioner "on" switch
204 Air conditioner fan 1st speed relay
205 Air conditioner fan relay
206 Heater/air conditioner fan
207 Heater/air conditioner speed control switch
208 Limiting resistor for heater/air conditioner
209 External/recirculation air flap actuator

- 210 Electronic thermostat cables connection
211 Electronic thermostat (N.T.C.)
232 Earth for compressor
235 Air conditioner compressor cables connection
278 Integrated air temperature/pressure sender unit
279 Engine coolant temperature double sender unit
280 7.5A fuse protecting ignition switch
281 30A fuse protecting Lambda probe/canister solenoid
282 7.5A fuse protecting Fiat-CODE/electronic fuel injection
283 Front cable/resistor connection
284 Engine cooling fan relay
285 25A fuse protecting headlamp washer/compressor
286 Short-circuiting connection
287 Short-circuiting connection
288 Short-circuiting connection
289 Short-circuiting connection

Cable colour codes

A	Light blue	GN	Yellow-Black
B	White	GL	Yellow-Blue
C	Orange	GR	Yellow-Red
G	Yellow	GV	Yellow-Green
H	Grey	HG	Grey-Yellow
L	Blue	HN	Grey-Black
M	Brown	HR	Grey-Red
N	Black	HV	Grey-Green
R	Red	LB	Blue-White
S	Pink	LG	Blue-Yellow
V	Green	LN	Blue-Black
Z	Purple	LR	Blue-Red
AB	Light blue-White	LV	Blue-Green
AG	Light blue-Yellow	MB	Brown-White
AN	Light blue-Black	MN	Brown-Black
AR	Light blue-Red	NZ	Black-Purple
AV	Light blue-Green	RB	Red-White
BG	White-Yellow	RG	Red-Yellow
BL	White-Blue	RN	Red-Black
BN	White-Black	RV	Red-Green
BR	White-Red	SN	Pink-Black
BV	White-Green	VB	Green-White
BZ	White-Purple	VN	Green-Black
CA	Orange-Light blue	VR	Green-Red
CB	Orange-White	ZB	Purple-White
CN	Orange-Black		

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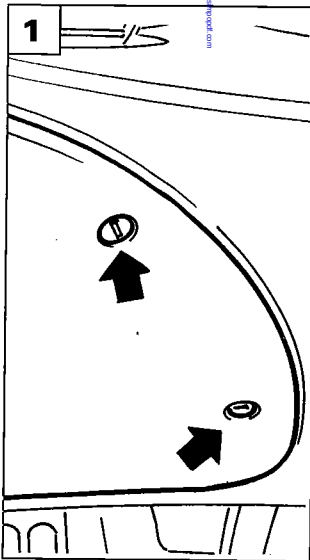
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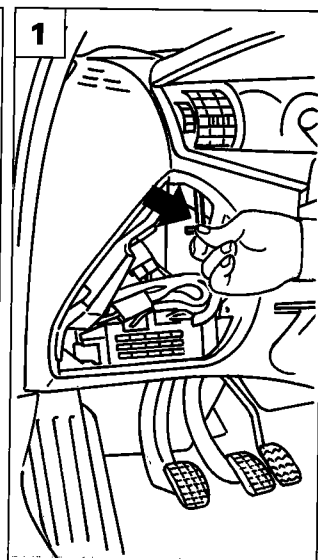
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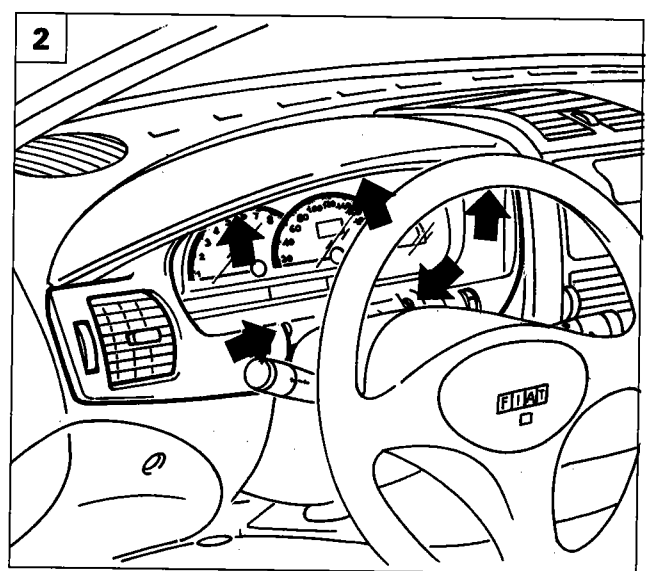
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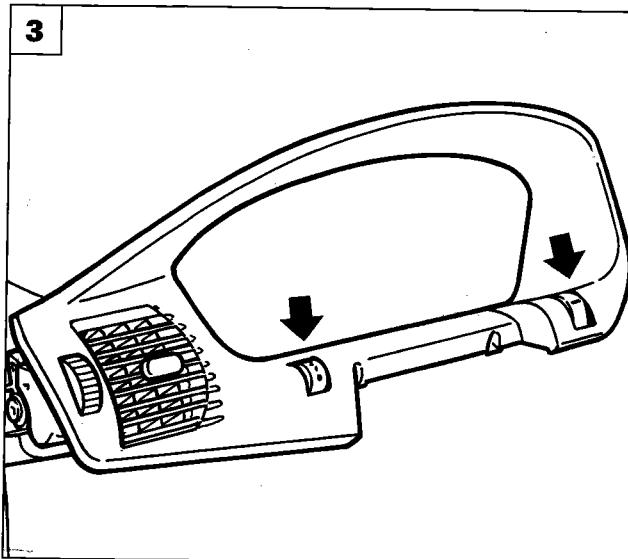
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P4A001L02



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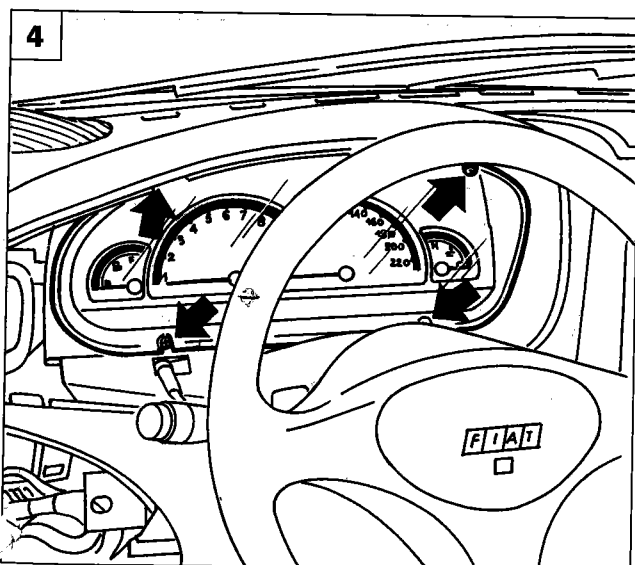


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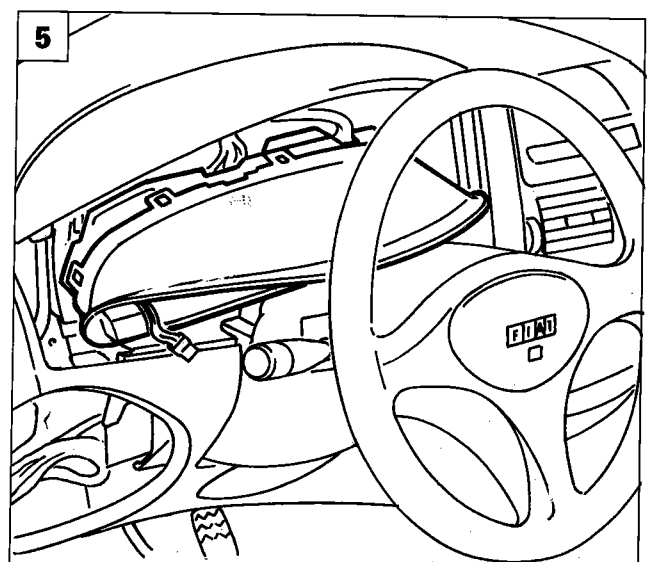


REMOVING-REFITTING

1. Remove the protective cover from the fuse and relay unit. Undo the outer screw securing the control panel frame.
2. Undo the outer screws securing the control panel frame.
3. Withdraw the panel frame after disconnecting the two connectors from the panel lighting rheostat and headlamp adjustment rheostat (arrowed).
4. Undo the screws securing the instrument panel to the dashboard.
5. Disconnect the instrument panel wiring connections and remove it from the car.



P4A001L05

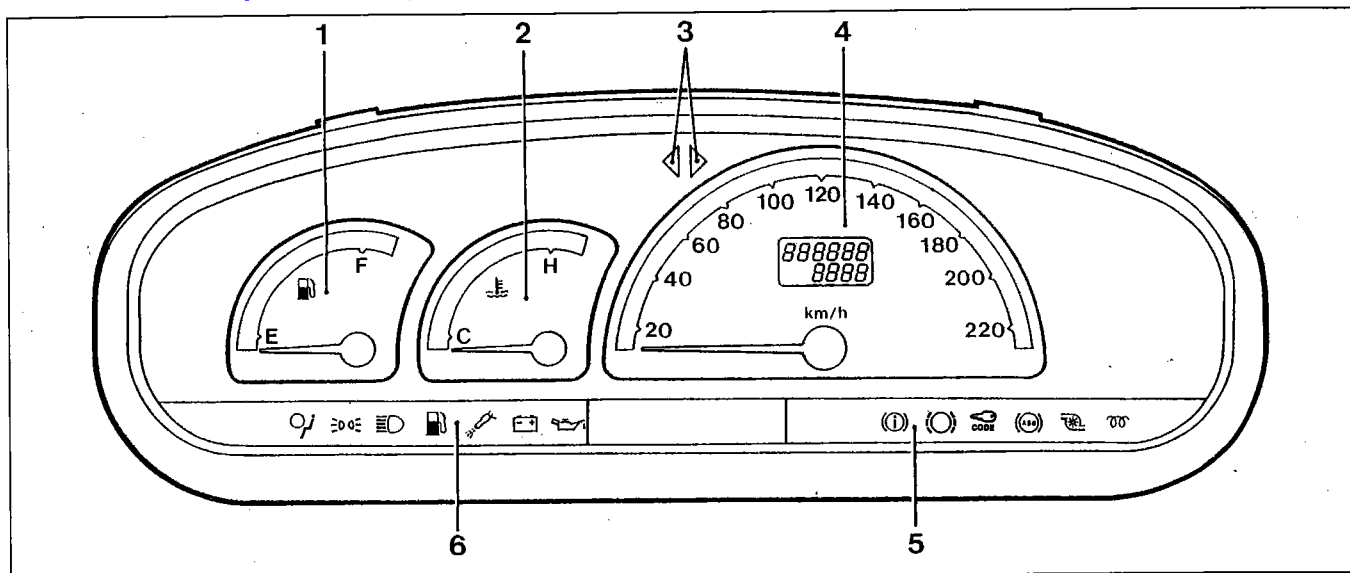


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Instrument panel

55.

INSTRUMENT PANEL FOR S, SX VERSIONS



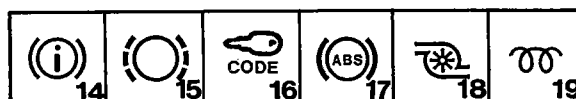
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Front of control panel

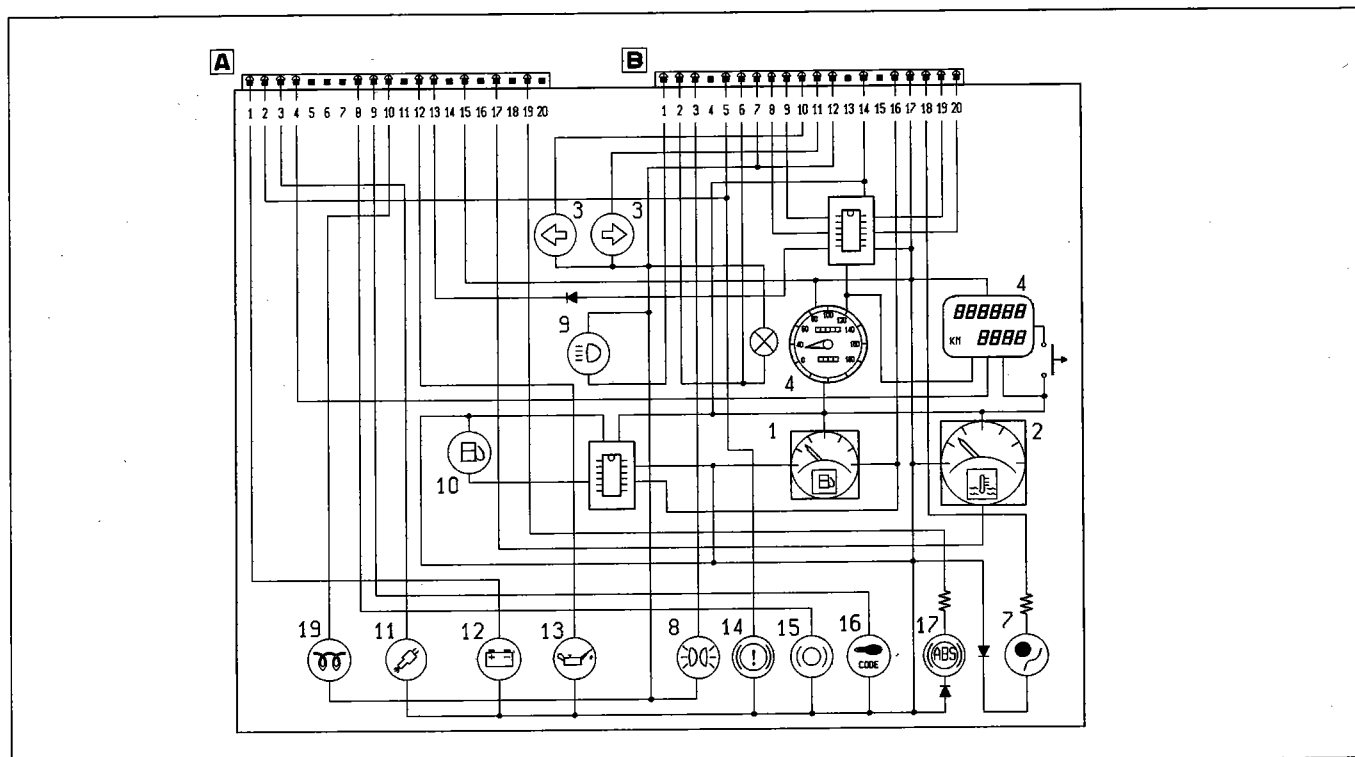
1. Fuel gauge
2. Coolant temperature gauge
3. Direction indicators warning lights
4. Analogue speedometer and digital trip recorder
5. Warning lights (see page 13)
6. Warning lights (see page 13)



P4A002L02

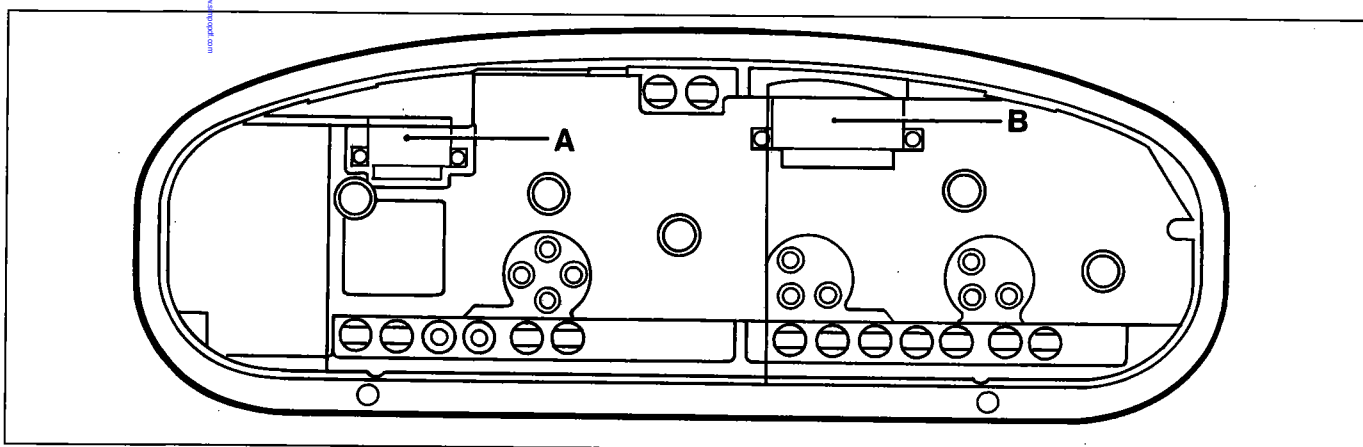


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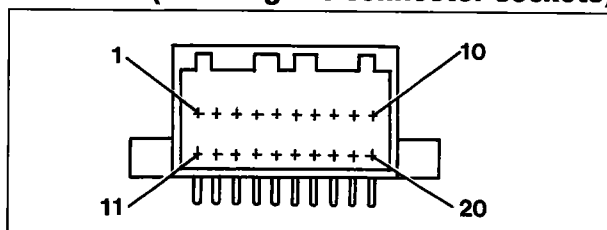


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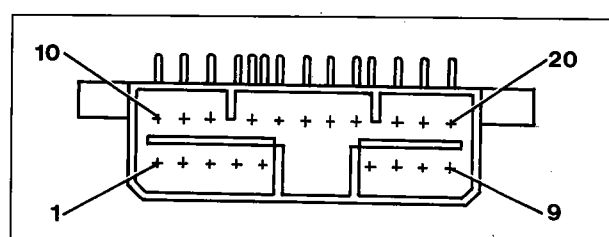
Wiring diagram


Rear side (showing the connector sockets)

P4A003L01


Connector A

P4A003L02


Connector B

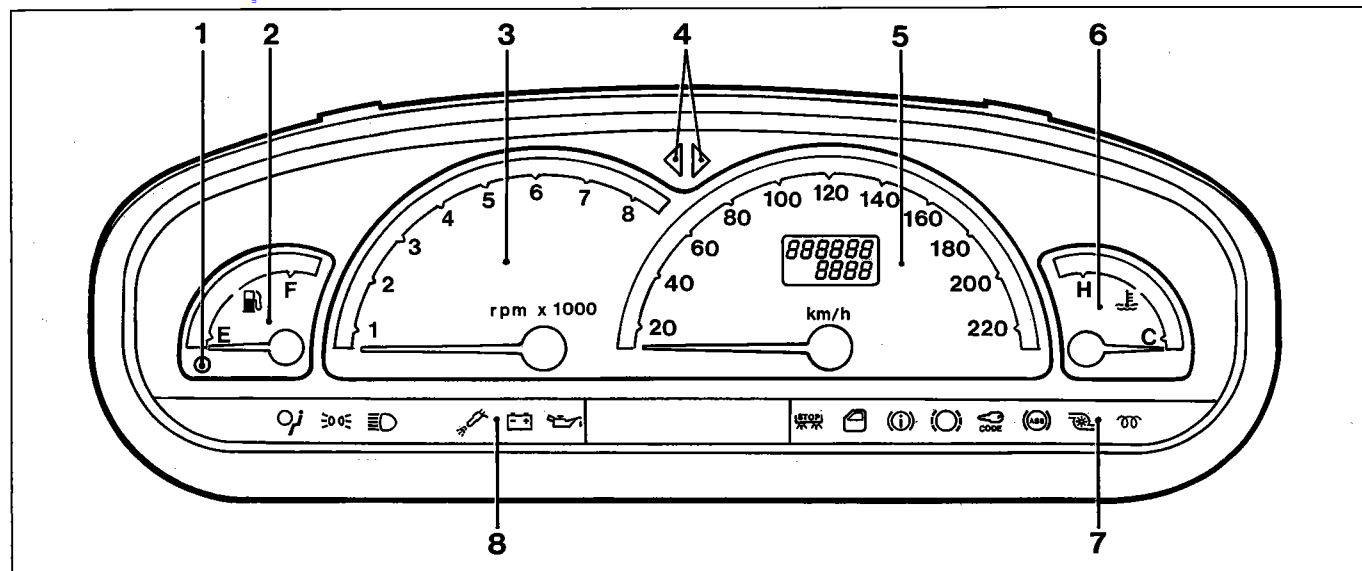
P4A003L03

Pin no.	Wire colour	Circuit involved
1	HN	Generator
2	BN	Brake fluid level
3	LN	Inertial switch fault
4	R	+30 battery (for odometer)
5	-	Not connected
6	-	Not connected
7	-	Not connected
8	BR	Brake pad wear
9	MN	Fiat Code
10	CL	Plug preheating
11	-	Not connected
12	HG	Low oil pressure
13	HM	Speedometer module signal
14	-	Not connected
15	CN	Speedometer signal
16	-	Not connected
17	HB	Coolant temperature
18	-	Not connected
19	RV	Anti-lock braking system
20	-	Not connected

Pin no.	Wire colour	Circuit involved
1	VN	Main beam headlamps
2	GR	Panel symbol lights
3	GN	Side lights
4	-	Not connected
5	BN	Emergency brake-brake fluid level
6	GR	Instrument panel light
7	N	Main earth
8	-	Speedometer output 1
9	-	Speedometer output 2
10	AN	Left direction indicator
11	A	Right direction indicator
12	N	Main earth
13	-	Not connected
14	NZ	Earth (electronic)
15	-	Not connected
16	HR	Fuel gaug
17	AR	+ 15 battery
18	LG	Air Bag fault
19	-	Speedometer output 3
20	-	Speedometer output 4

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INSTRUMENT PANEL FOR EL, ELX VERSIONS



Front side

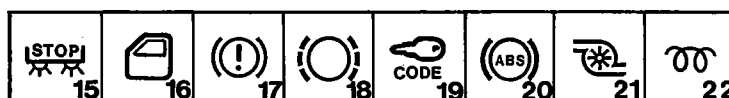
1. Fuel reserve warning light
2. Fuel gauge
3. Rev counter
4. Direction indicators warning lights
5. Analogue speedometer and digital trip recorder

6. Coolant temperature gauge
7. Warning lights (see page 13)
8. Warning lights (see page 13)

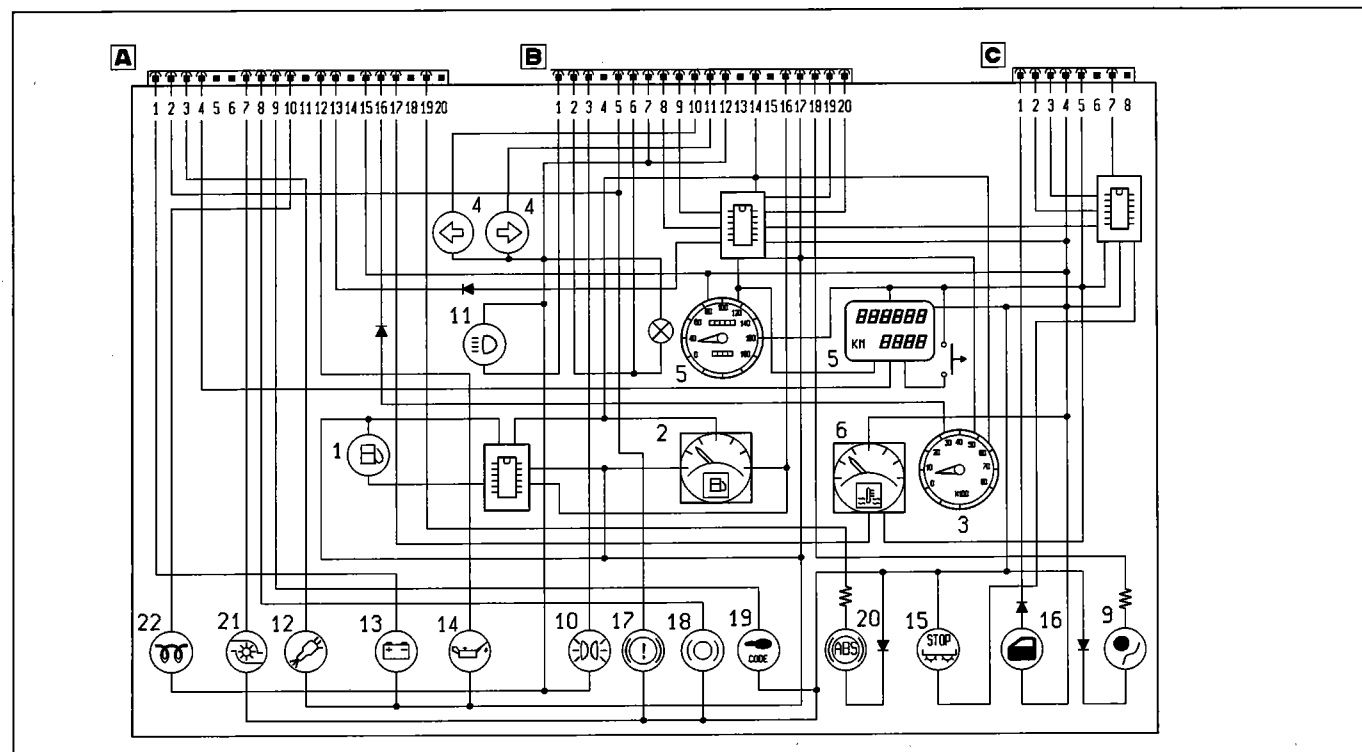
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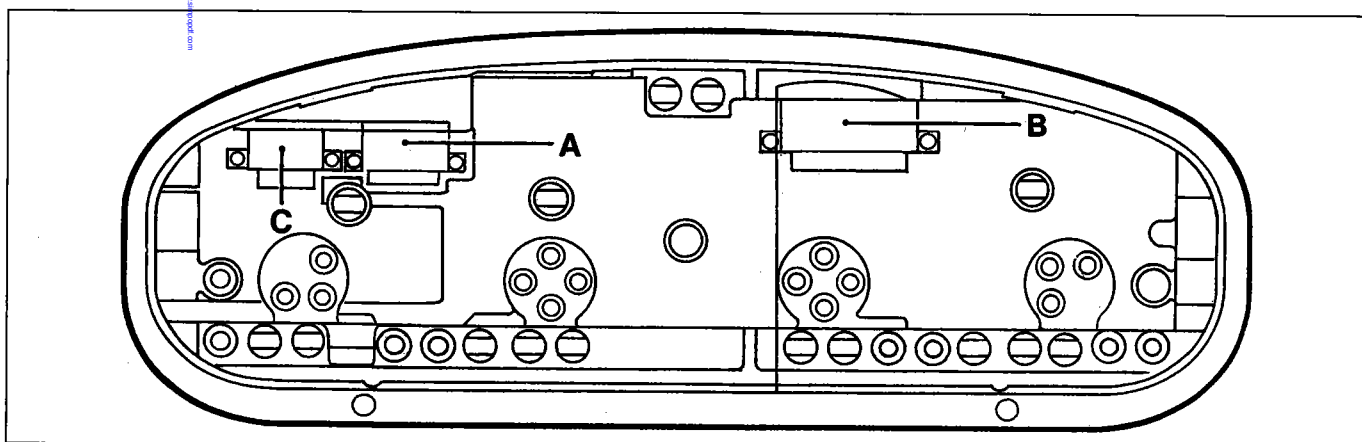


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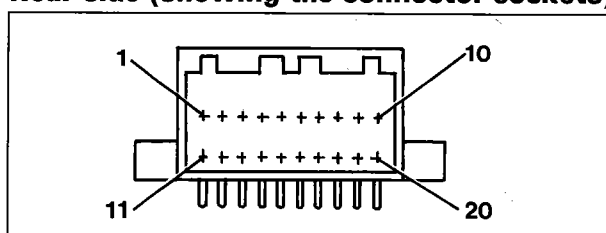
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Wiring diagram



Rear side (showing the connector sockets)

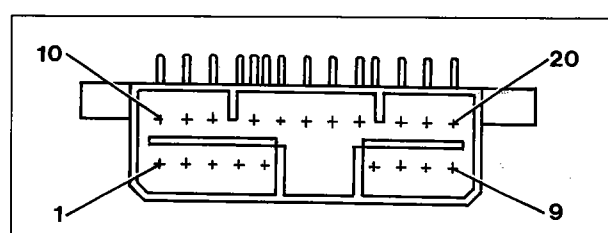
P4A005L01



Connector A

P4A003L02

Pin no.	Wire colour	Circuit involved
1	HN	Generator
2	BN	Brake fluid level
3	LN	Inertial switch fault
4	R	+30 battery (for odometer)
5	-	Not connected
6	-	Not connected
7		Turbocharger
8	BR	Brake pad wear
9	VN	Fiat Code
10	-	Plug preheating
11	-	Not connected
12	HG	Low oil pressure
13	HN	Speedometer module signal
14	-	Not connected
15	CN	Speedometer signal
16	L	Rev counter signal
17	HB	Coolant temperature
18	-	Not connected
19	RV	Anti-lock braking system
20	-	Not connected



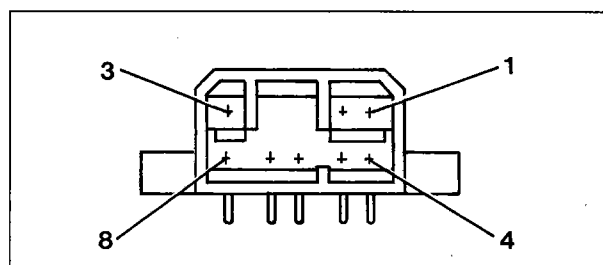
Connector B

P4A003L03

Pin no.	Wire colour	Circuit involved
1	VN	Main beam headlamps
2	GR	Panel symbol lights
3	GN	Side lights
4	-	Not connected
5	BN	Emergency brake-brake fluid level
6	GR	Instrument panel light
7	N	Main earth
8	-	Speedometer output 1
9	-	Speedometer output 2
10	AN	Left direction indicator
11	A	Right direction indicator
12	N	Main earth
13	-	Not connected
14	NZ	Earth (electronic)
15	-	Not connected
16	HR	Fuel gauge
17	AR	+ 15 battery
18	LG	Air Bag fault
19	-	Speedometer output 3
20	-	Speedometer output 4

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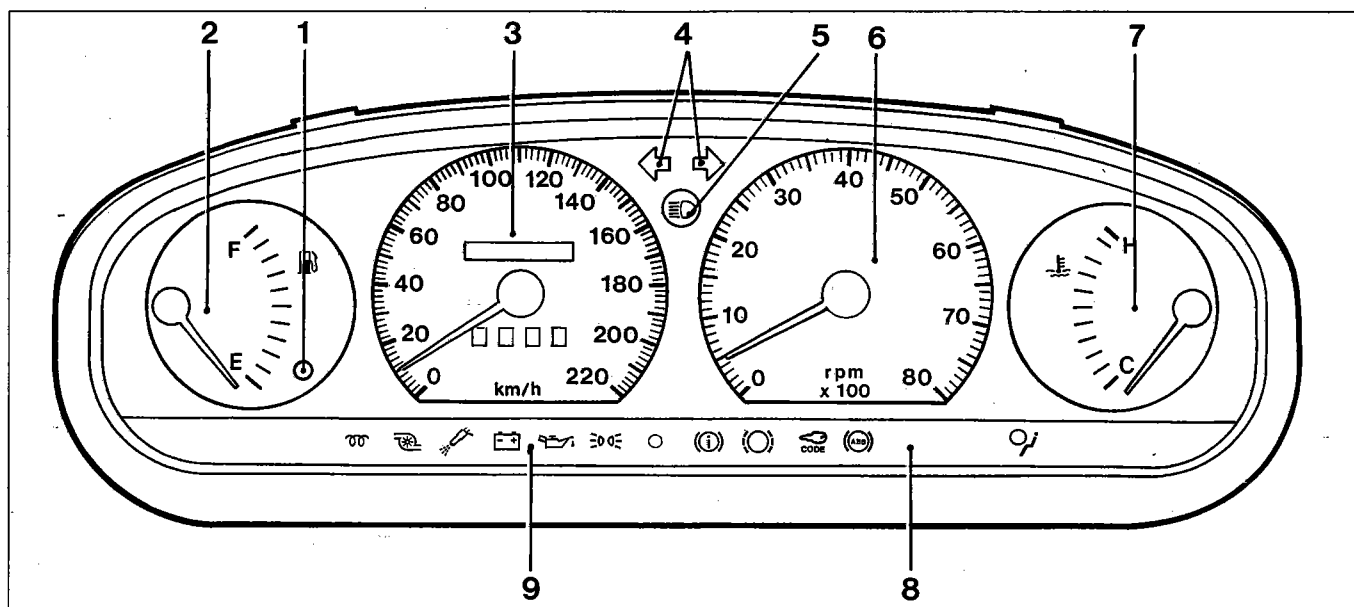
Pin no.	Wire colour	Circuit involved
1	VB	Bonnet/doors not shut
2	RG	Left stop light fault
3	RN	Right stop light fault
4	AR	+15 battery
5	N	Electronic earth
6	-	Not connected
7	R	Stop light (+ from brake pedal)
8	-	Not connected



Connector C

P4A006L01

INSTRUMENT PANEL FOR GT VERSION

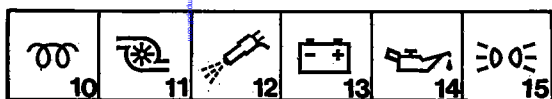


Front side

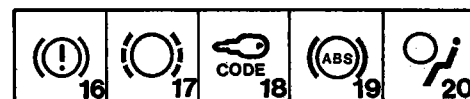
P4A006L02

1. Fuel reserve warning light
2. Fuel gauge
3. Analogue speedometer and trip recorder
4. Direction indicators warning lights
5. Main beam headlamps warning light

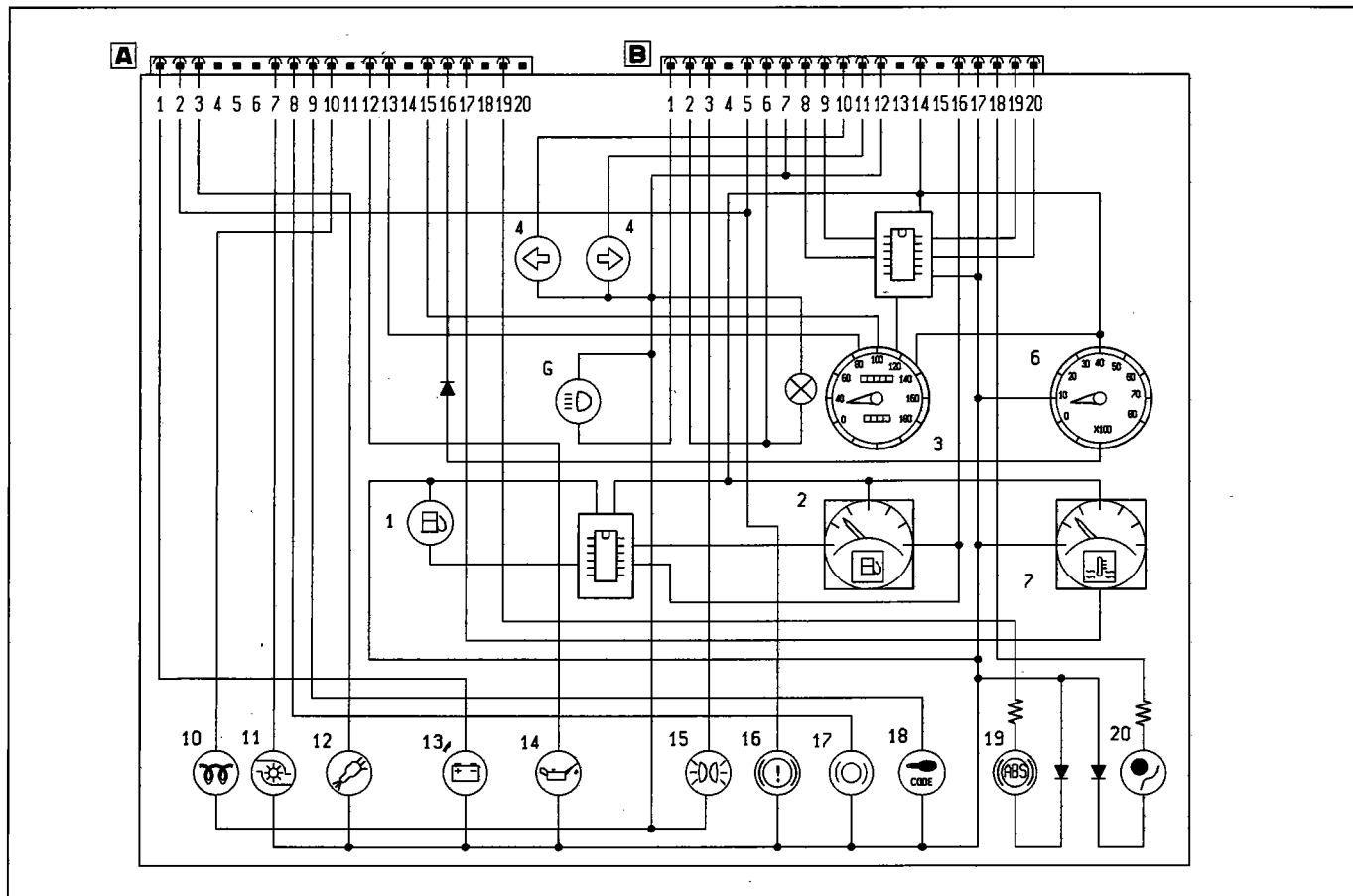
6. Rev counter
7. Coolant temperature gauge
8. Warning lights (see page 13)
9. Warning lights (see page 13)



P4A007L01

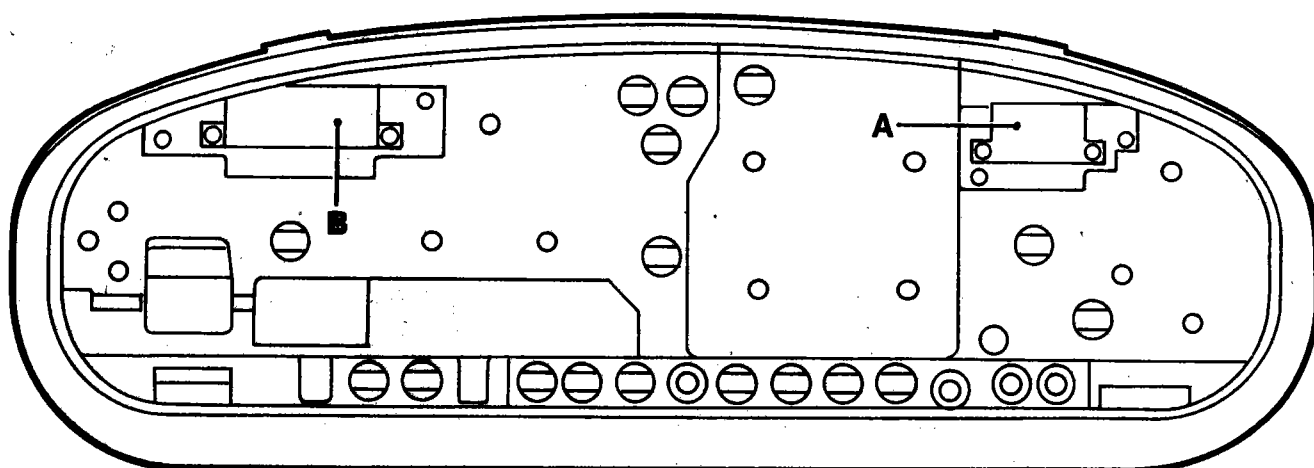


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P4A007L03

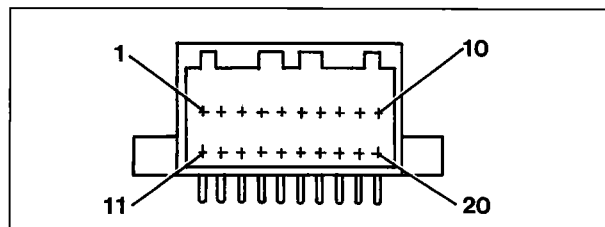
Wiring diagram



Rear side (showing the connector sockets)

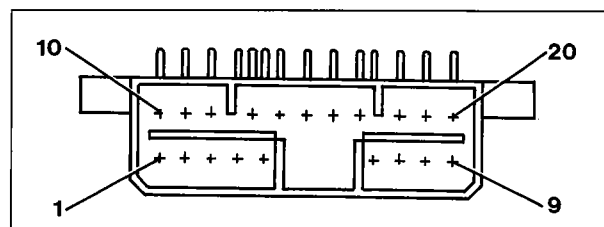
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55.



Connector A

P4A003L02



Connector B

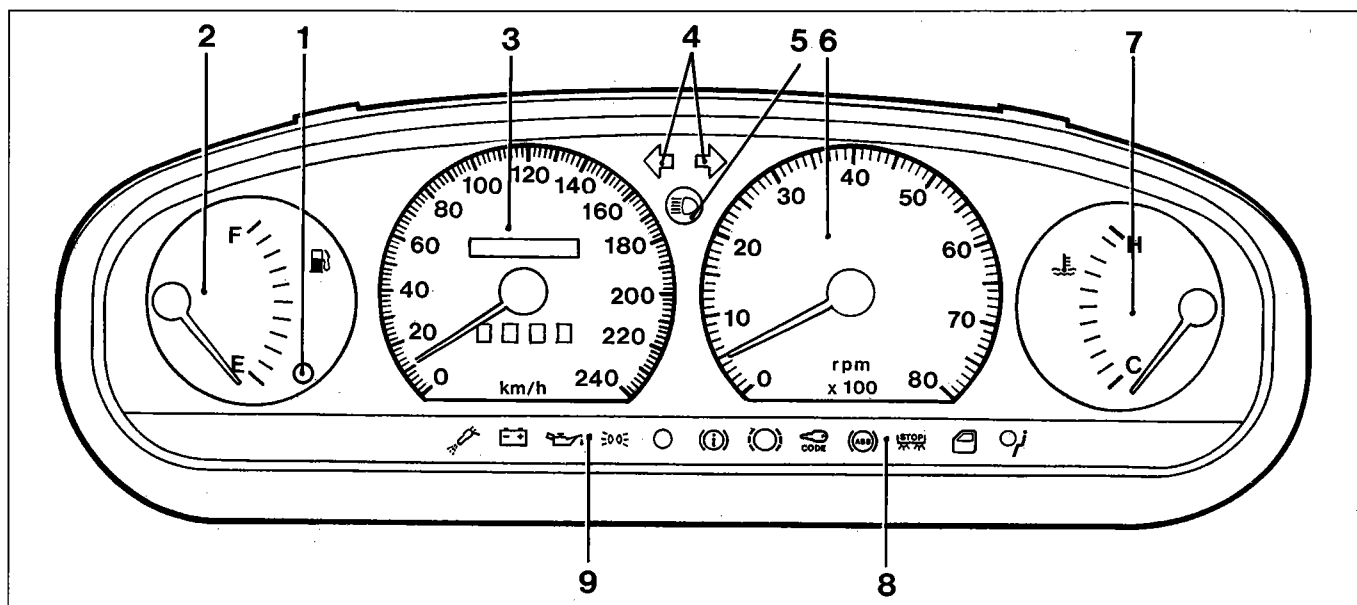
P4A003L03

Pin no.	Wire colour	Circuit involved
1	HN	Generator
2	BN	Brake fluid level
3	LN	Inertial switch fault
4	-	Not connected
5	-	Not connected
6	-	Not connected
7		Turbocharging
8	BR	Brake pad wear
9	MN	Fiat Code
10		Plug preheating
11	-	Not connected
12	HG	Low oil pressure
13	HN	Speedometer module signal
14	-	Not connected
15	CN	Speedometer signal
16	L	Rev counter signal
17	HB	Coolant temperature
18	-	Not connected
19	RV	Anti-lock braking system
20	-	Water in fuel (diesel)

Pin no.	Wire colour	Circuit involved
1	VN	Main beam headlamps
2	GR	Panel symbol lights
3	GN	Side lights
4	-	Not connected
5	BN	Emergency brake-brake fluid level
6	GR	Instrument panel light
7	N	Main earth
8	-	Speedometer output 1
9	-	Speedometer output 2
10	AN	Left direction indicator
11	A	Right direction indicator
12	N	Main earth
13	-	Not connected
14	NZ	Earth (electronic)
15	-	Not connected
16	HR	Fuel gauge
17	AR	+ 15 battery
18	LG	Air Bag fault
19	-	Speedometer output 3
20	-	Speedometer output 4

On the instrument panel fitted to the turbo diesel versions, the full scale on the speedometer and rev counter are 220 km/h and 6000 rpm respectively.

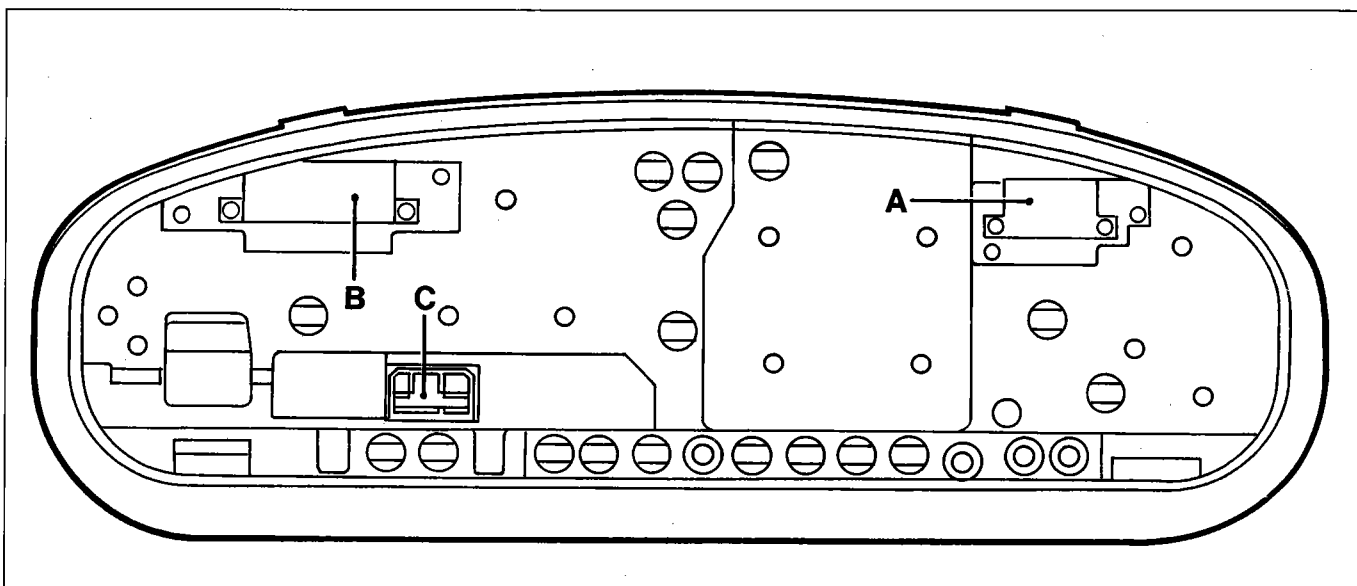
INSTRUMENT PANEL FOR HGT VERSION



P4A009L01

Front side

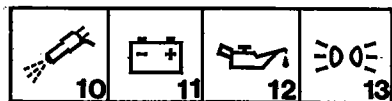
- | | |
|---|---------------------------------|
| 1. Fuel reserve warning light | 6. Rev counter |
| 2. Fuel gauge | 7. Coolant temperature gauge |
| 3. Analogue speedometer and trip recorder | 8. Warning lights (see page 13) |
| 4. Direction indicators warning lights | 9. Warning lights (see page 13) |
| 5. Main beam headlamps warning light | |



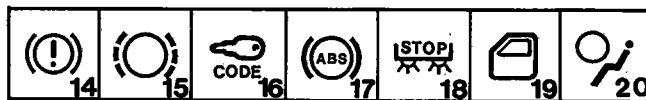
P4A009L02

Rear side (showing the connector sockets)

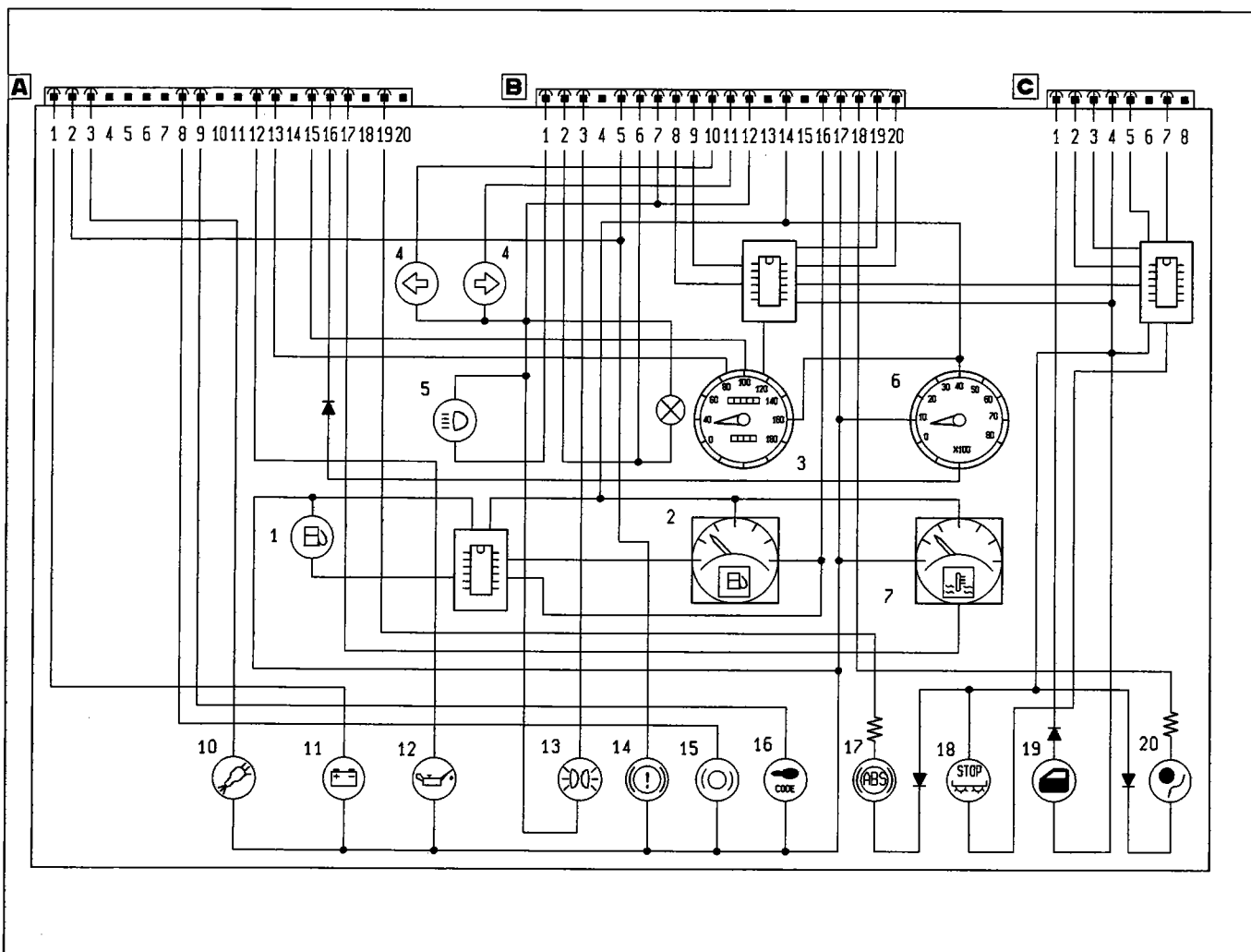
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P4A010L01

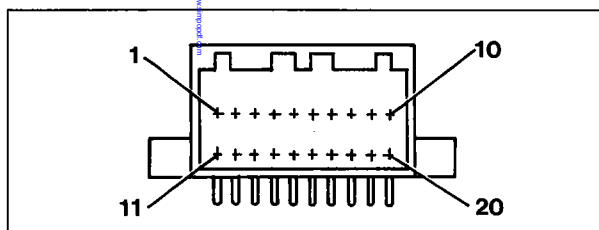


P4A010L02



Wiring diagram

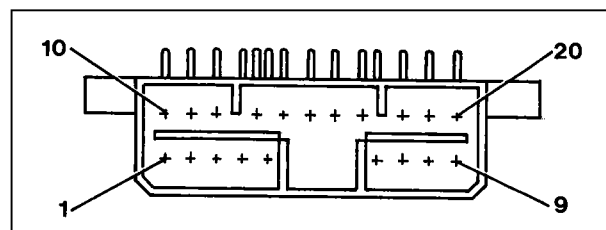
P4A010L03



Connector A

P4A003L02

N° pin	Wiring colours	Circuit involved
1	HN	Generator
2	BN	Brake fluid level
3	LN	Inertia switch failure
4	-	Not connected
5	-	Not connected
6	-	Not connected
7	-	Turbocharging
8	BR	Brake lining wear
9	MN	Fiat Code
10	-	Glow plug preheating
11	-	Not connected
12	HG	Low oil pressure
13	HN	Speedometer module signal
14	-	Not connected
15	CN	Signal from speedometer
16	L	Rev counter signal
17	HB	Coolant temperature
18	-	Not connected
19	RV	Anti-lock braking system
20	-	Signal indicating presence of water in fuel (diesel)



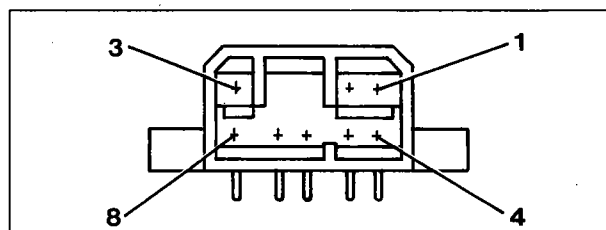
Connector B

P4A003L03

N° pin	Wiring colours	Circuit involved
1	VN	Main beam head-lamps
2	GR	Control panel symbol lights
3	GN	Side lights
4	-	Not connected
5	BN	Emergency brake/brake fluid level
6	GR	Instrument panel light
7	N	Master earth
8	-	Speedometer output 1
9	-	Speedometer output 2
10	AN	Left-hand turn signal
11	A	Right-hand turn signal
12	N	Master earth
13	-	Not connected
14	NZ	Earth (electronic)
15	-	Not connected
16	HR	Fuel level
17	AR	+ 15 battery
18	LG	Air-bag failure
19	-	Speedometer output 3
20	-	Speedometer output 4

Connector C

1	VB	Bonnet/doors not closed
2	RG	Left brake light failure
3	RN	Right brake light failure
4	AR	+15 battery
5	N	Electronic earth
6	-	Not connected
7	R	Car brake light (+ from brake pedal)
8	-	Not connected



Connector C

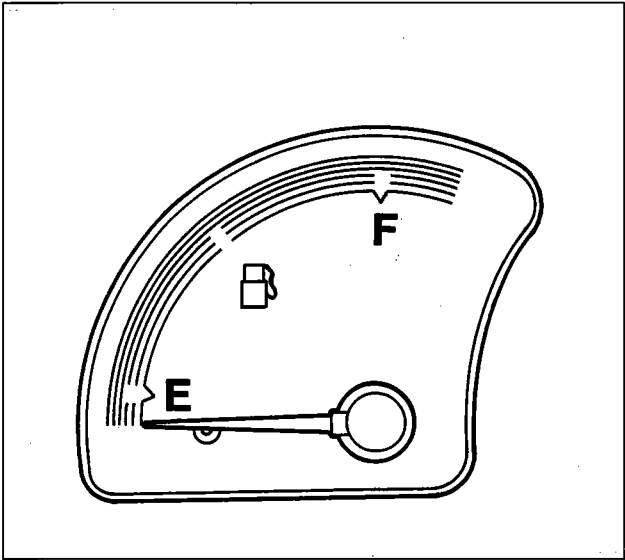
P4A006L01

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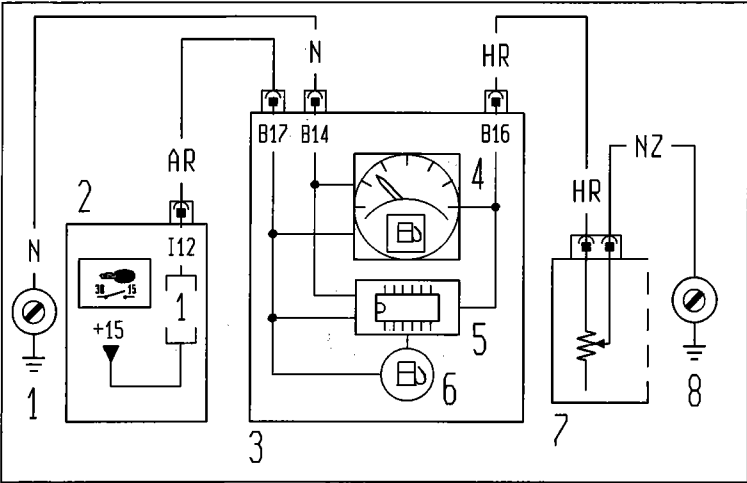
The tables below give values which can be used to test various readings on the following gauges: fuel level and coolant temperature.

Fuel level gauge

Setting test values	
Indicator position	Value in Ohms
4/4 (F)	16 ± 6
1/2	140 ± 12
Reserve begins	240 ± 5
0 (E)	292.5 ± 15



P4A012L01



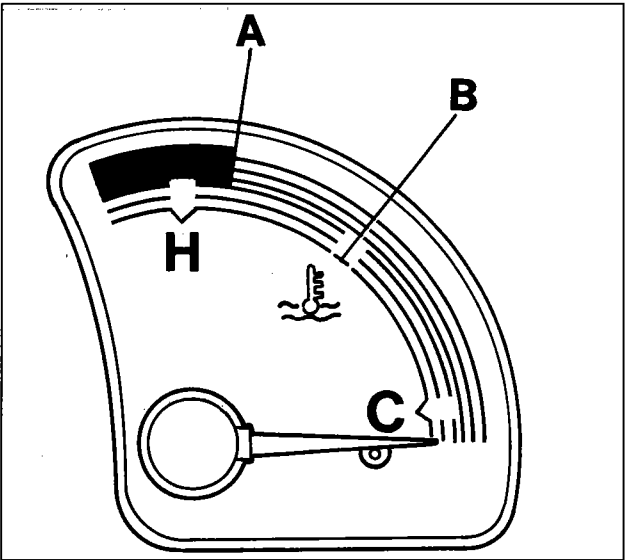
P4A012L02

Fuel level gauge wiring diagram

1. Left hand facia earth
2. Junction unit
3. Instrument panel
4. Fuel level gauge
5. Fuel level control module
6. Fuel reserve warning light
7. Fuel level gauge
8. Right rear earth

Engine coolant temperature gauge

Gauge scale	Average resistance value (ohm)
Indicator off	2000 - 500
B	175 ± 15
A	74.5 ± 5.5



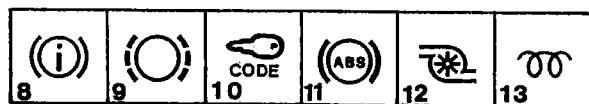
P4A012L03

Warning lights for S, SX versions



P4A013L01

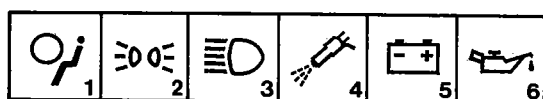
1. Air Bag fault warning light
2. Side lights warning light
3. Main beam headlamps warning light
4. Fuel reserve warning light
5. Fuel injection fault warning light
6. Low alternator recharging warning light
7. Low engine oil pressure warning light



P4A013L02

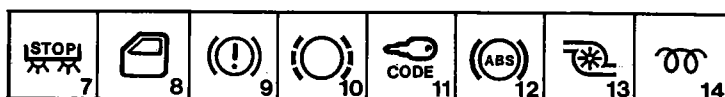
8. Handbrake on/low brake fluid level warning light
9. Brake pad wear warning light
10. Fiat Code system warning light
11. ABS fault warning light
12. Maximum turbo pressure warning light
13. Plug preheating warning light

Warning lights for EL, ELX versions



P4A013L03

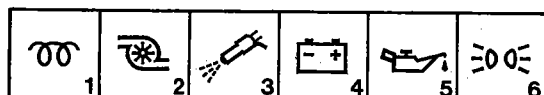
1. Air Bag fault warning light
2. Side lights warning light
3. Main beam headlamps warning light
4. Fuel injection fault warning light
5. Low alternator recharging warning light
6. Low engine oil pressure warning light
7. Stop lights fault warning light



P4A013L04

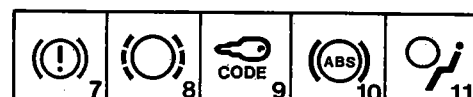
8. Doors open warning light
9. Handbrake on/low brake fluid level warning light
10. Brake pad wear warning light
11. Fiat Code system fault warning light
12. ABS fault warning light
13. Maximum turbo pressure warning light
14. Plug preheating warning light

Warning lights for GT version



P4A013L05

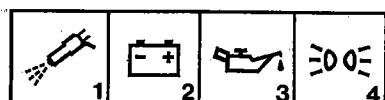
1. Plug preheating warning light
2. Maximum turbo pressure warning light
3. Fuel injection fault warning light
4. Low alternator recharging warning light
5. Low engine oil pressure warning light
6. Side lights warning light



P4A013L06

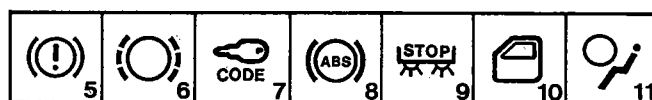
7. Handbrake on/low brake fluid level warning light
8. Brake pad wear warning light
9. Fiat Code system fault warning light
10. ABS fault warning light
11. Air Bag fault warning light

Warning lights for HGT version



P4A013L07

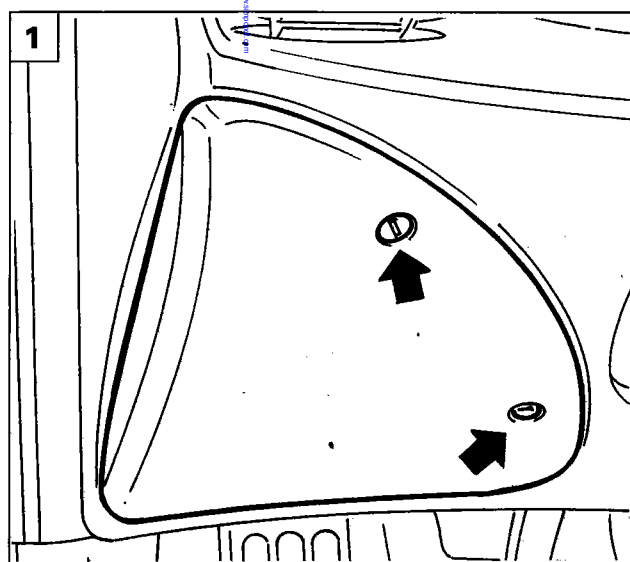
1. Fuel injection fault warning light
2. Low alternator recharging warning light
3. Low engine oil pressure warning light
4. Side lights warning light
5. Handbrake on/low brake fluid level warning light



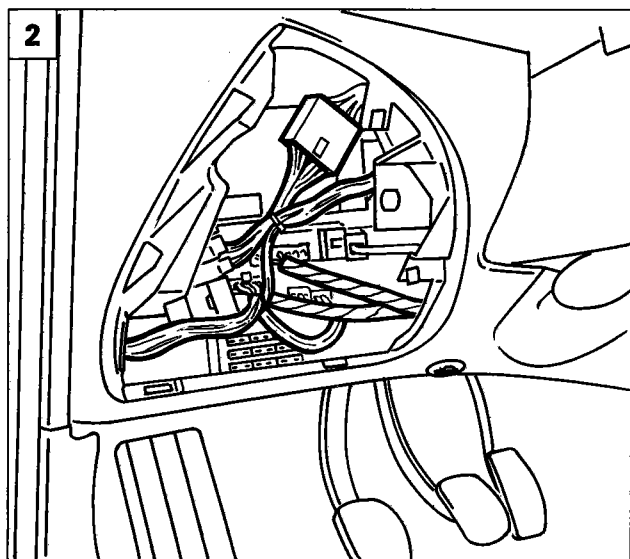
P4A013L08

6. Brake pad wear warning light
7. Fiat Code system warning light
8. ABS fault warning light
9. Stop lights fault warning light
10. Doors open warning light
11. Air Bag fault warning light

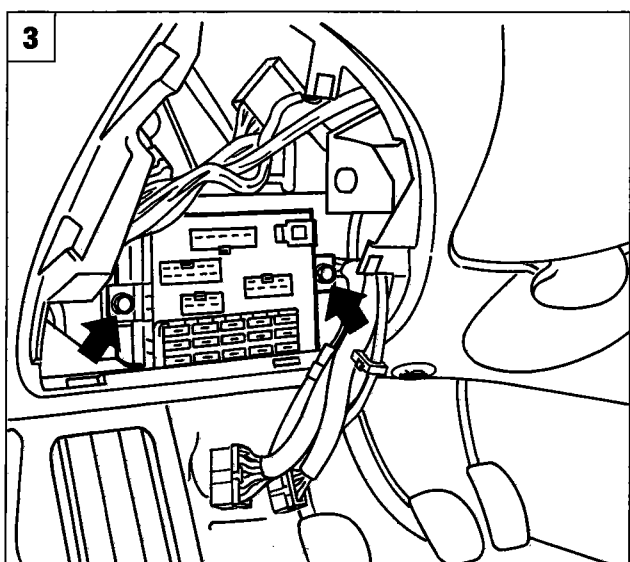
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P4A014L01



P4A014L02



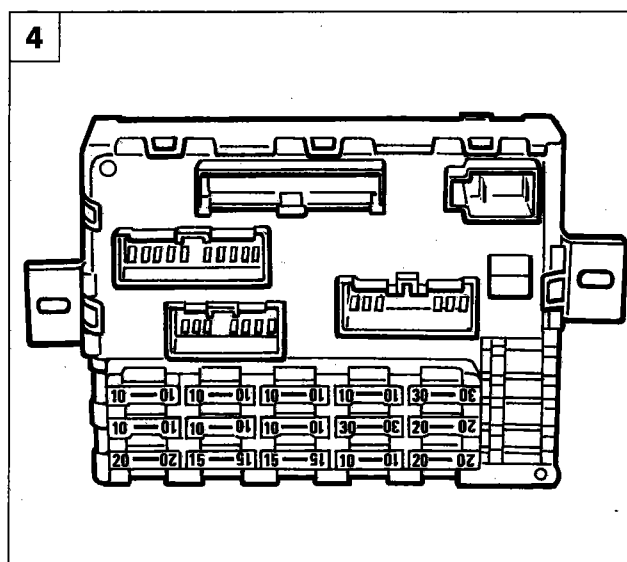
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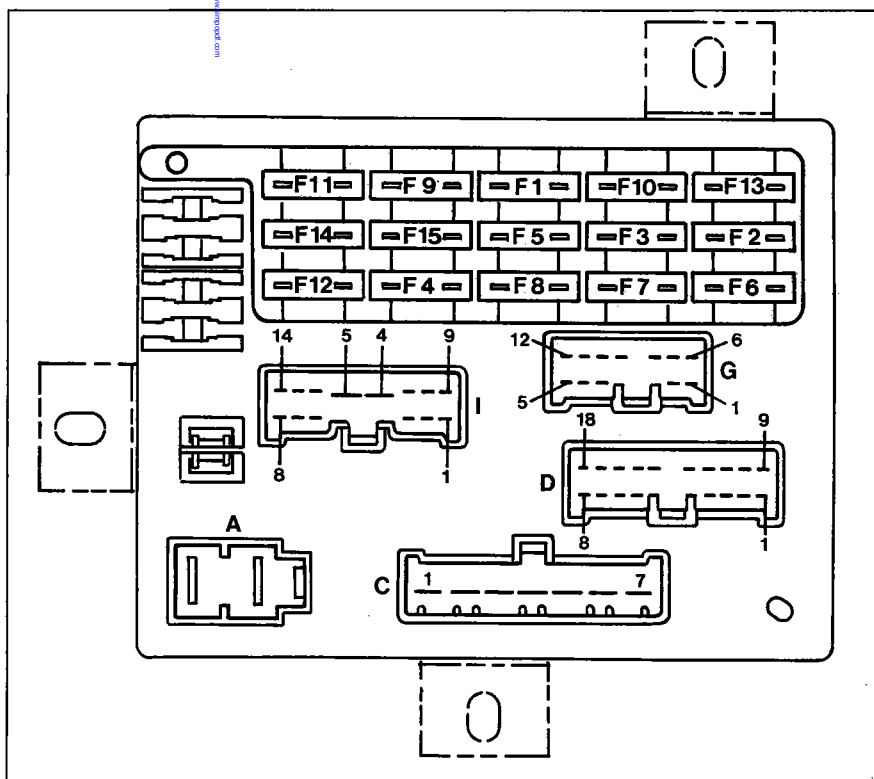
FUSE AND RELAY UNIT

Removing-refitting

1. Undo the screws indicated and remove the unit cover.
2. Disconnect the wiring connectors plugged into the front of the unit.
3. Undo the screws securing the unit to the dashboard.
4. Move aside the unit, disconnect the connectors plugged into the rear of the unit and remove the unit from the dashboard.



P4A014L04

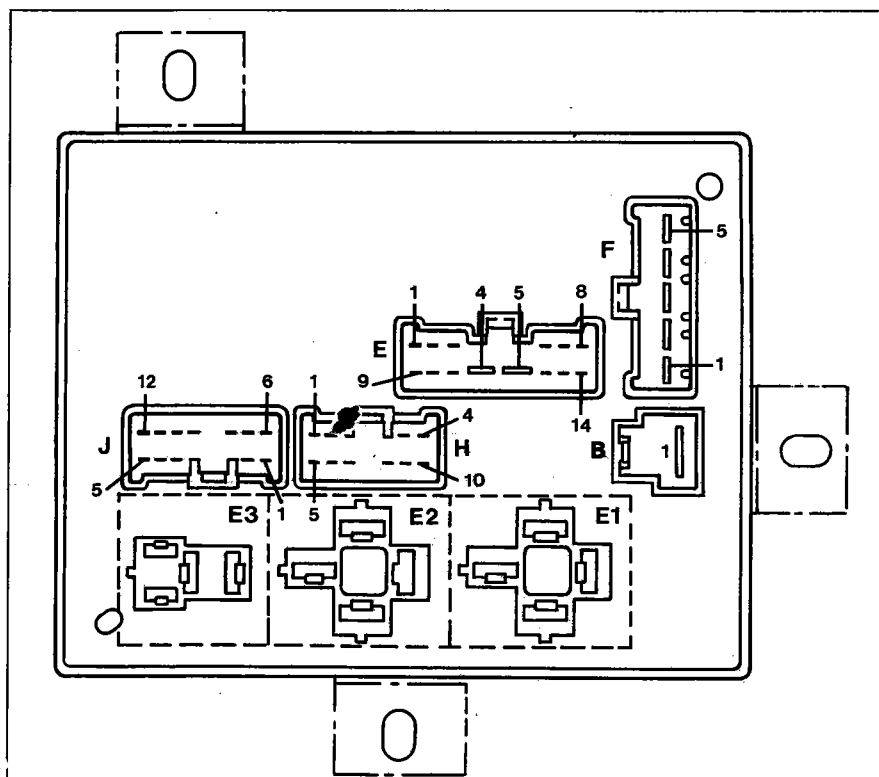


Front view of fuse and relay unit and identification of fuses



The connectors cannot be connected incorrectly, as each is shaped differently. The letters identifying the connectors are the same as those used on the wiring diagrams.

P4A015L01



Rear view of fuse and relay unit and location of relays

- E1. Ignition switch discharge relay
- E2. Horn relay
- E3. Heated rear window relay

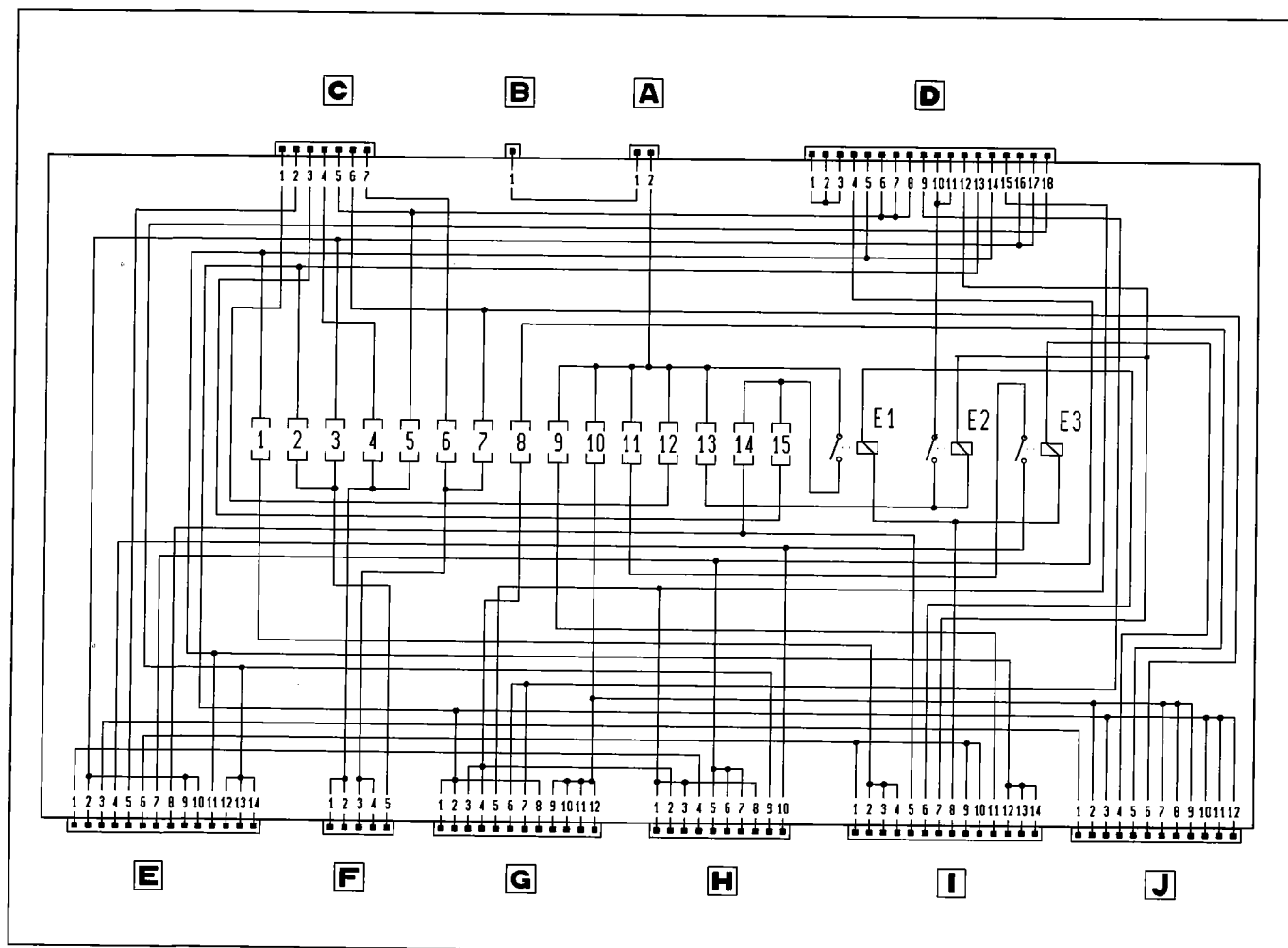
P4A015L02

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List of fuses and main protected circuits

Fuse no.	Amp.	Symbol	Protected circuit	Fuse no.	Amp.	Symbol	Protected circuit
1	15	SERVIZI SERVICES	Reversing lights - Stop lights - Additional stop light (if present) - Direction indicators flasher - Supply to check panel instrument (if present) - Electric windows control (if present) - Air Bag circuit - ABS enablement.	6	10		Right main beam.
2	10		Front right side light - Rear left side light - Right number plate light - Radio lighting - Instrument lighting and side lights warning light - Switch panel lighting.	7	10		Left main beam - Main beam headlamps warning light.
				8	10		Rear fog lamps.
				9	10		Hazard warning lights flasher.
				10	15		Courtesy light - Luggage compartment light - Clock supply - Remote control receiver supply (if present) - Radio supply - Glove compartment light.
				11	20		Heated rear window - Heated rear window warning light - Mirror demisting (if present).
3	10		Front left side light - Heater/air conditioner controls lighting - Rear right side light - Rear right side light - Left number plate light.	12	30		Not used.
				13	20		Horns.
				14	20		Windscreen wiper - Rear window wiper - Windscreen/rear window washer wiper - Headlamp washer intermittent switch.
4	10		Left dipped beam.	15	20		Climate control fan motor and resistor for determining its speed - Relays for first and second speeds of condenser and radiator fans and 2nd speed delay unit - Air conditioner compressor relay - Cigar lighter.
5	10		Right dipped beam - Headlamp adjusters.				

Diagram of fuse and relay unit internal connections

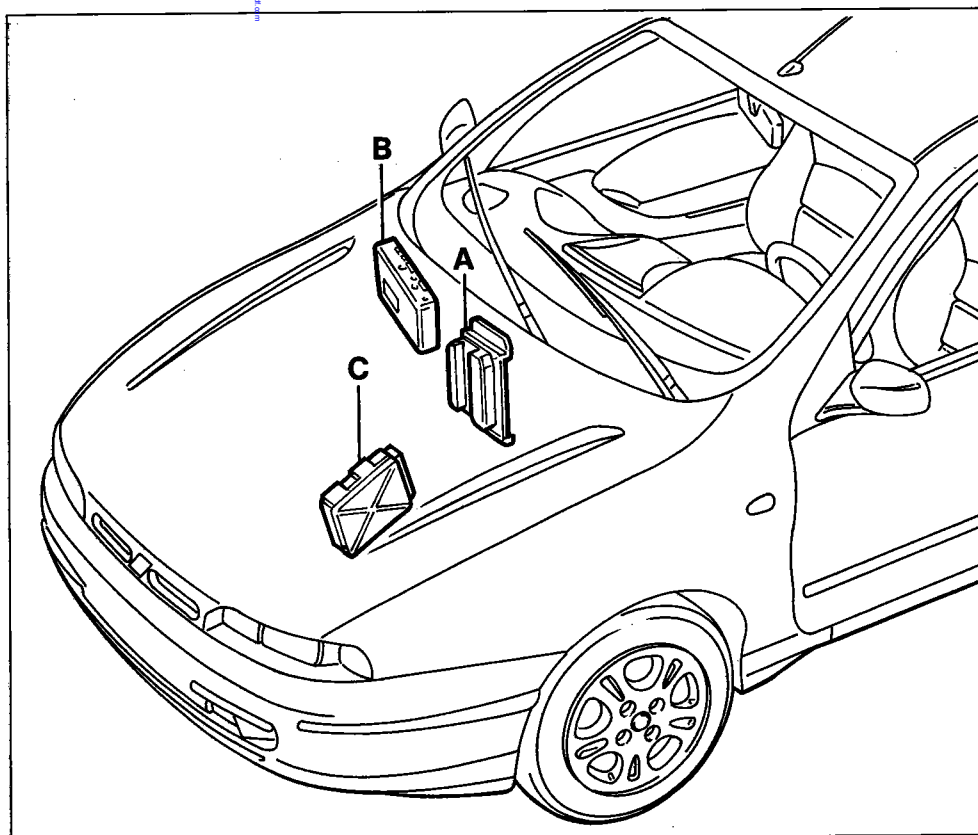


P4A017L01

- E1. Ignition switch discharge relay
- E2. Horn relay
- E3. Heated rear window relay

55.

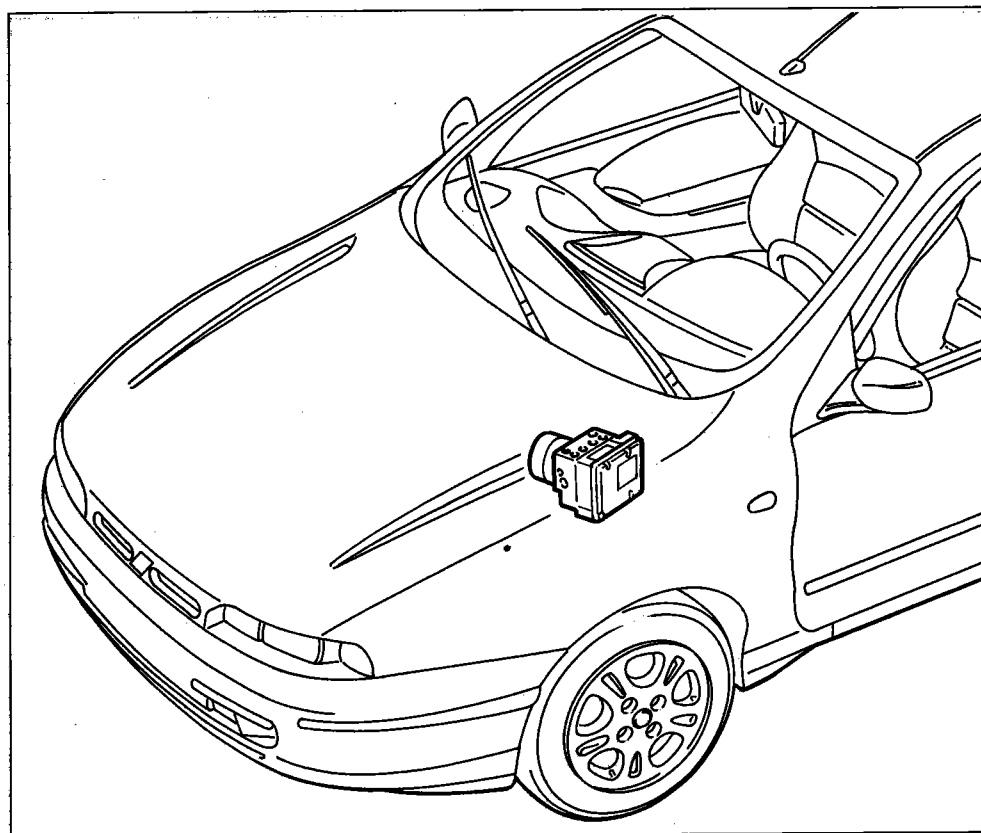
LOCATION OF FUEL INJECTION/IGNITION CONTROL UNIT



- A. 1370 SPI 12V engine
- B. 1747 MPI 16V; 1998 MPI 20V engines (car interior).
- C. 1581 MPI 16V engine

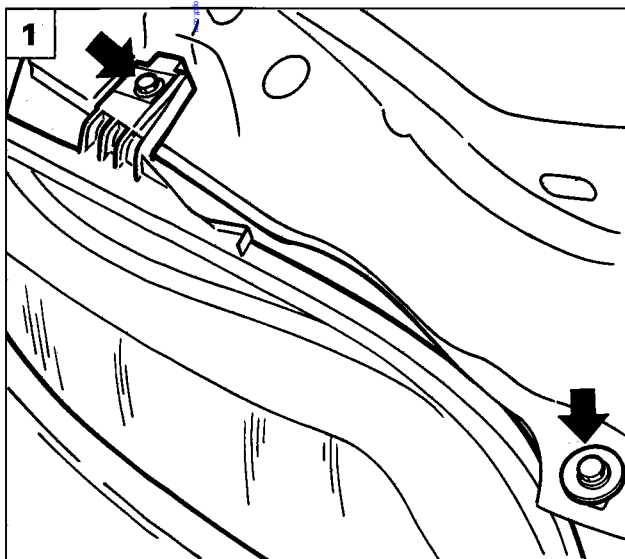
P4A018L01

LOCATION OF ELECTROHYDRAULIC CONTROL UNIT FOR ANTI-LOCK BRAKING SYSTEM



To remove and refit the units shown on this page, consult Section 33 (Braking system).

P4A018L02



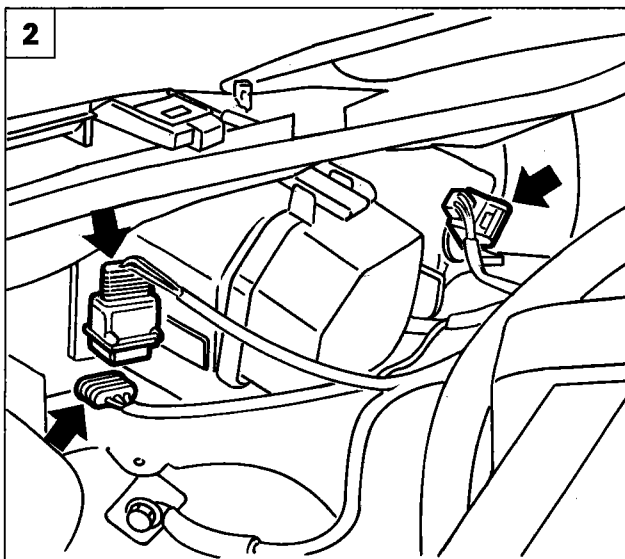
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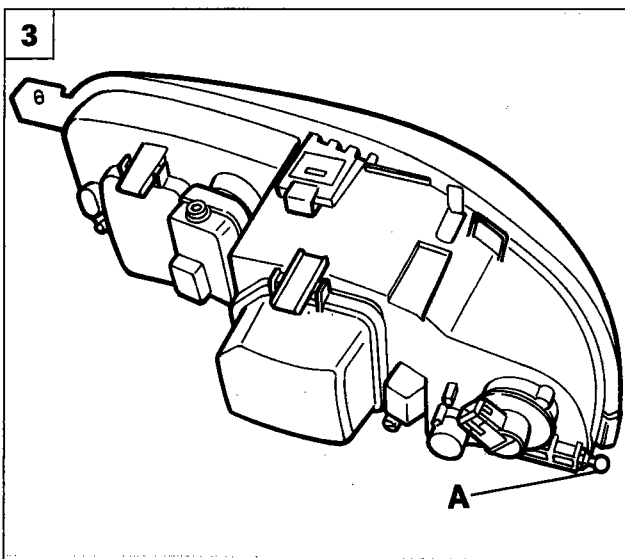
**FRONT LIGHTS CLUSTER WITH
DIRECTION INDICATOR**

Removing-refitting

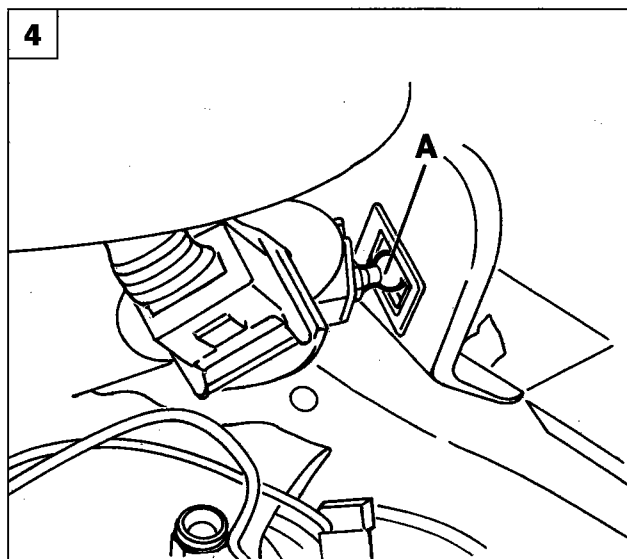
1. Undo the bolts securing the lights cluster to the body shell.
2. Disconnect the wiring connectors from the lights cluster.
3. Remove the complete warning light from the car.
4. During assembly, insert pin A in its seating in the body shell.



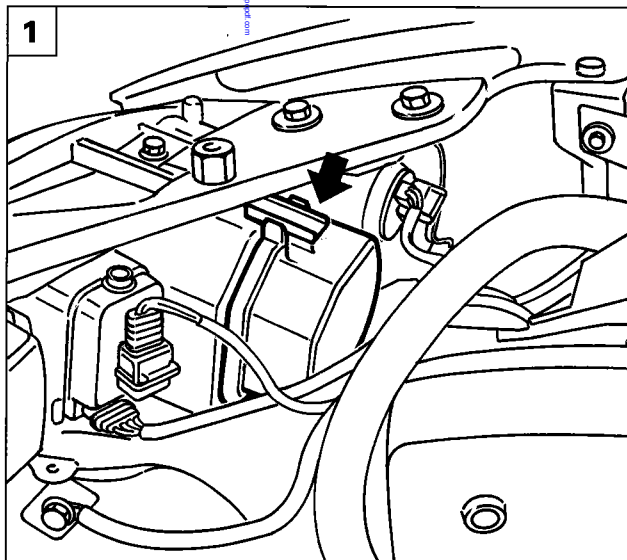
P4A019L02



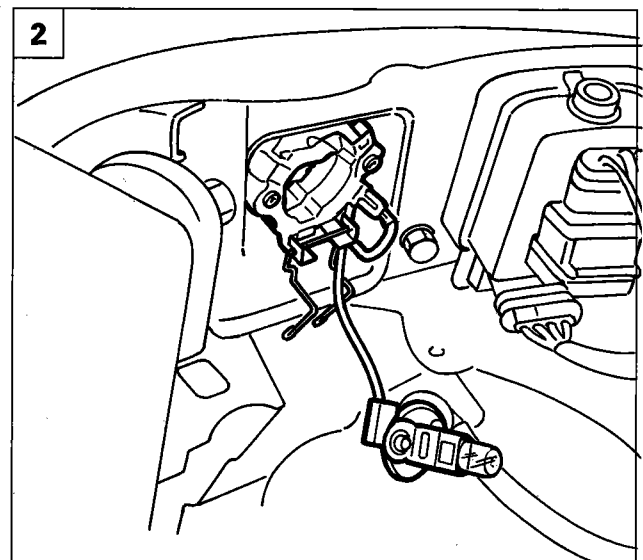
P4A019L03



P4A019L04



P4A020L01

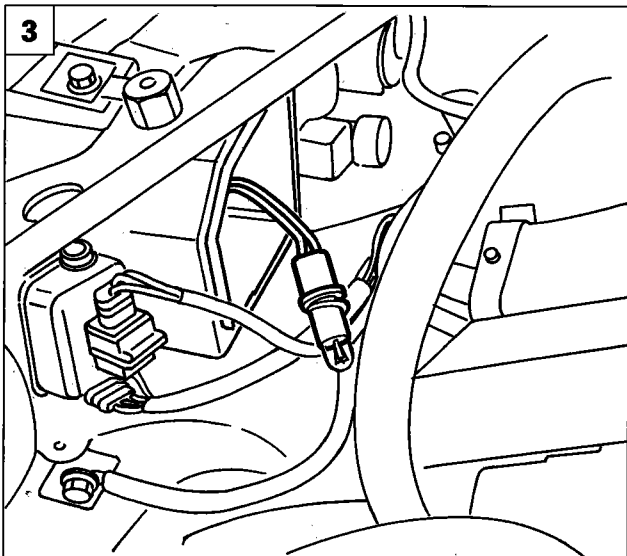


P4A020L03

REPLACING BULBS ON FRONT LIGHTS CLUSTER

Dipped and main beam headlamp bulbs

1. Remove the plastic protections by pressing on the lever indicated which secures them to the lights cluster.
2. Withdraw the bulb concerned (after releasing the retaining lug) from the lights cluster. Disconnect the bulb from its connector and replace it; do not touch it with your bare hands.



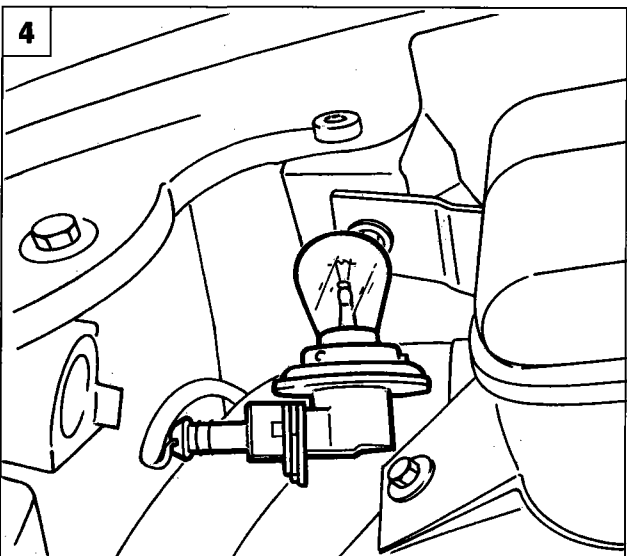
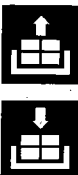
P4A020L02

Side light bulbs

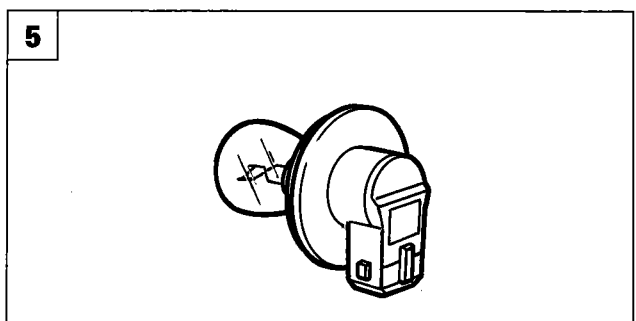
3. Carry out operation 1 and disengage the bulb holder from the lights cluster and then disengage the bulb from the holder.

Direction indicators bulb

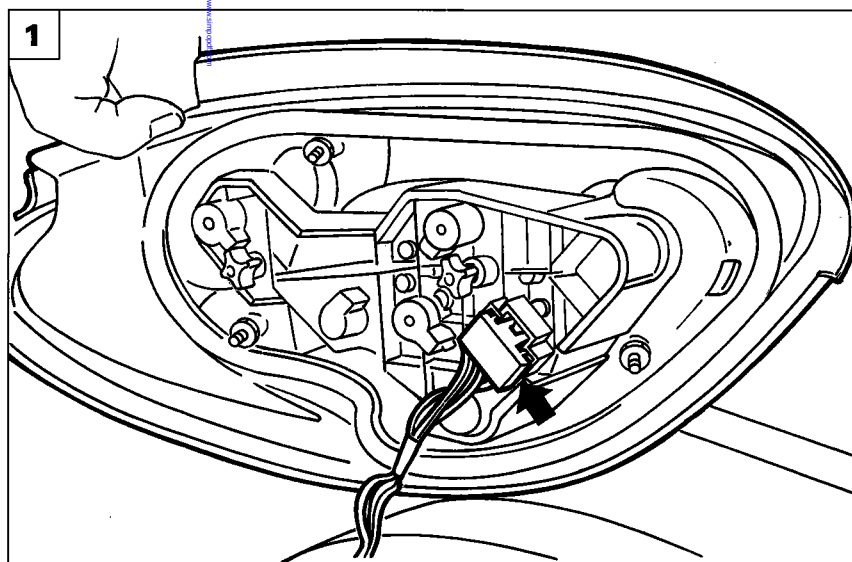
4. Rotate the bulb holder by 90 degrees and withdraw it from the lights cluster.
5. Disconnect the connector from the bulb holder and disconnect the bulb from the holder by rotating it.



P4A020L04



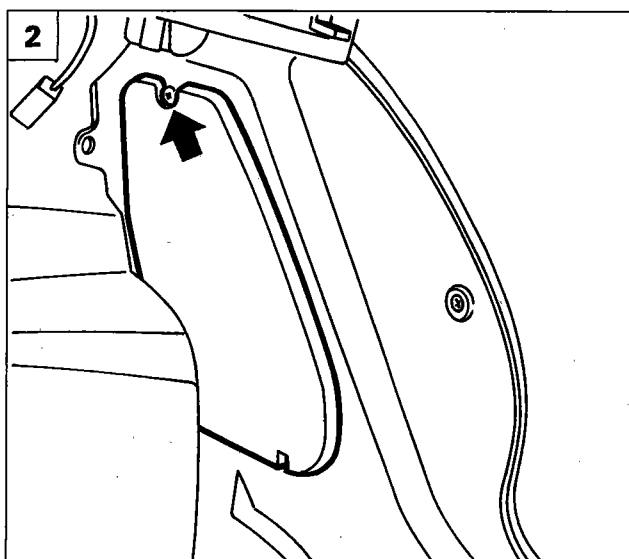
P4A020L05



P4A025L01



1. Disconnect the connection indicated and remove the rear lights cluster from the car.

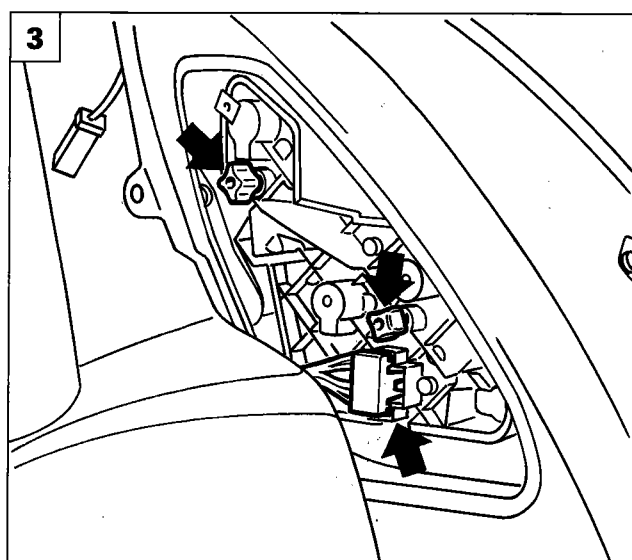


P4A025L02

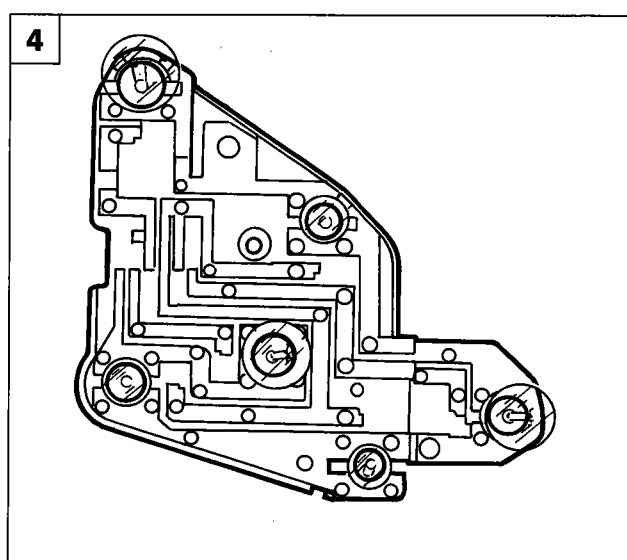


Replacing rear lights cluster bulbs

2. Undo the screws indicated and remove the trim.
3. Undo the stops indicated, disconnect the connection shown and remove the bulb holder from the car.
4. Remove the bulbs concerned.

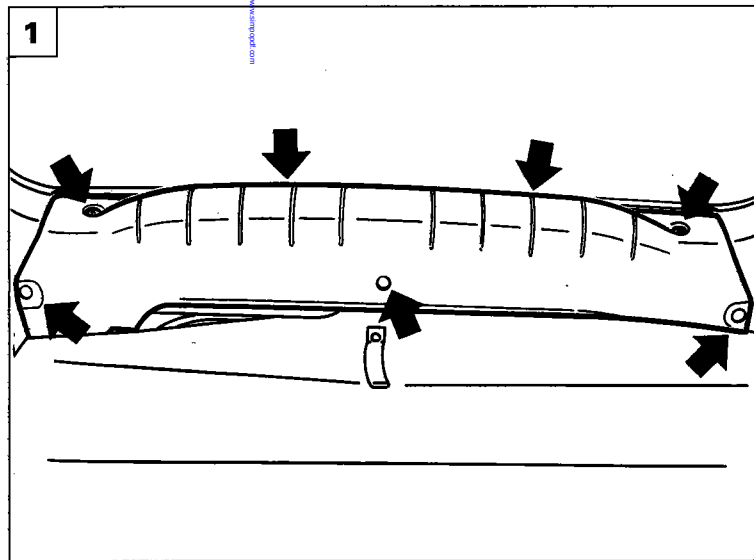


P4A025L03

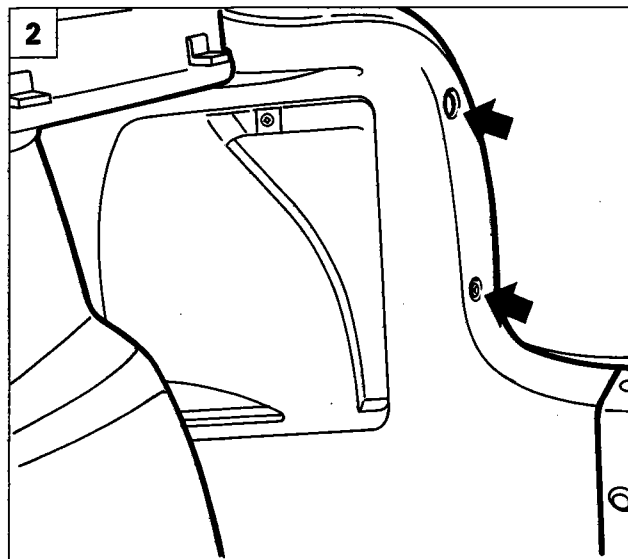


P4A025L04

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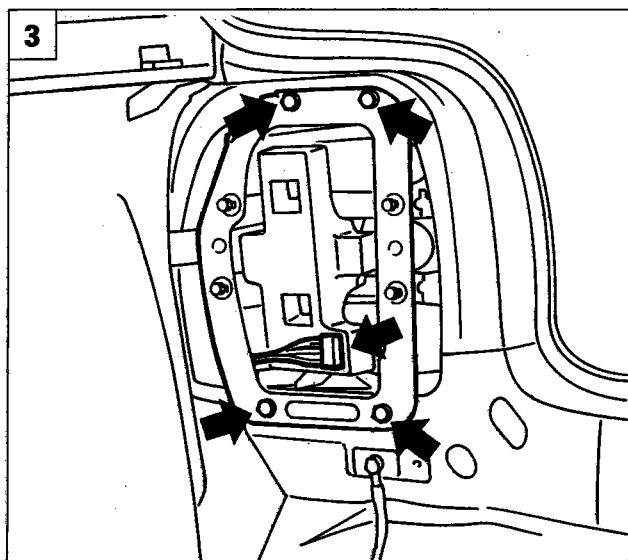
P4A026L01



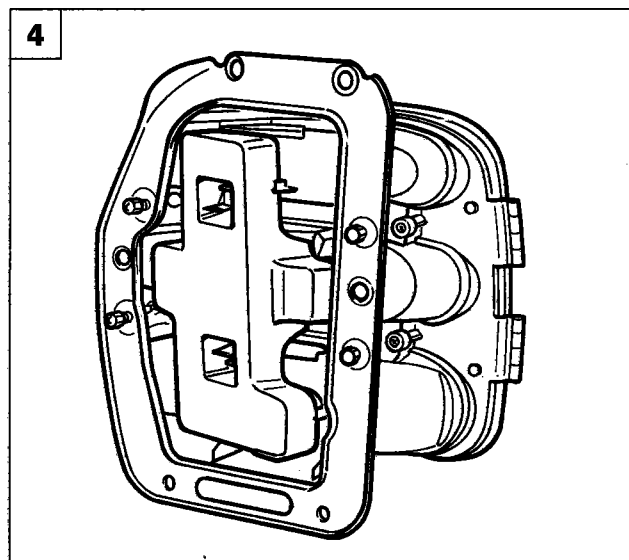
P4A026L02

Removing-refitting rear lights cluster (5-door version)

1. Undo the screws and remove the buttons securing the trim on the rear crossmember and remove the trim.
2. Undo the screw indicated and remove the lights cluster trim.
3. Undo the screws securing the lights cluster to the body shell and disconnect the relevant connector.
4. Remove the lights cluster from the car.



P4A026L03



P4A026L04



Service News

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4/96

FIAT

Fiat Auto S.p.A

D.M.C. - M.P.S. - Servizi Post Vendita
Assistenza Tecnica

Fiat Brava All versions

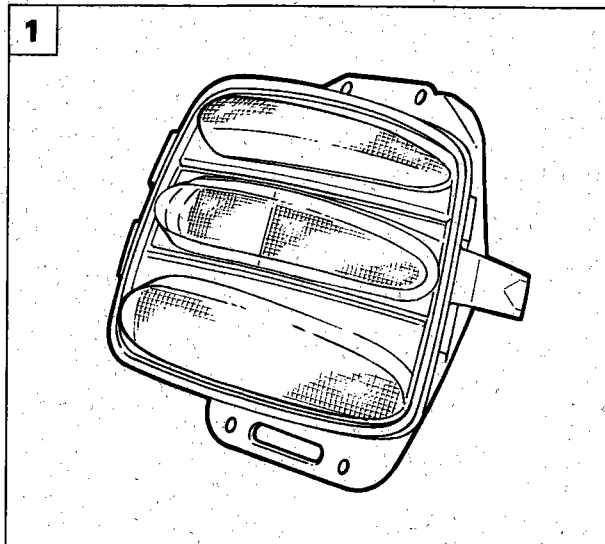
5540 A 461 AE/CC REAR LIGHT CLUSTER instructions for replacement

55

13.96

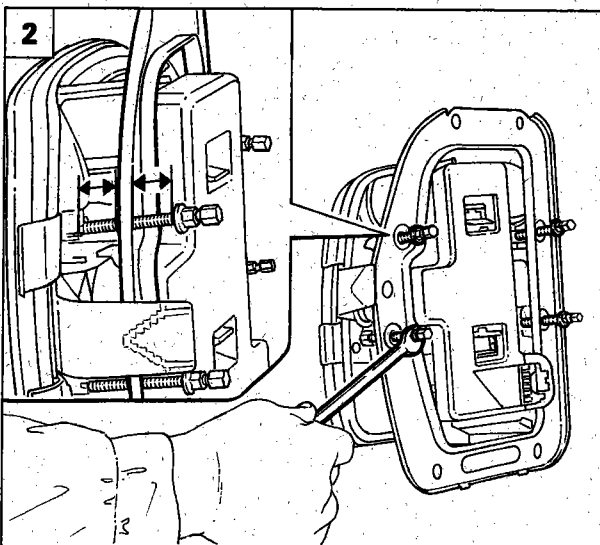


To complete the description in section 55 of the Service Manual, the next page contains the instructions for replacing the rear light cluster on the model in question.



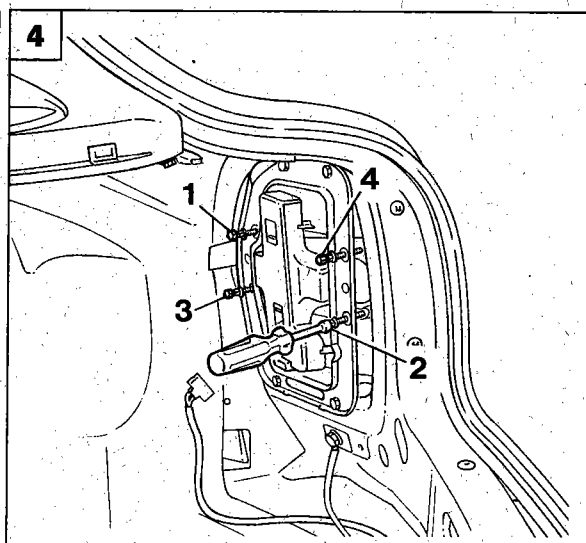
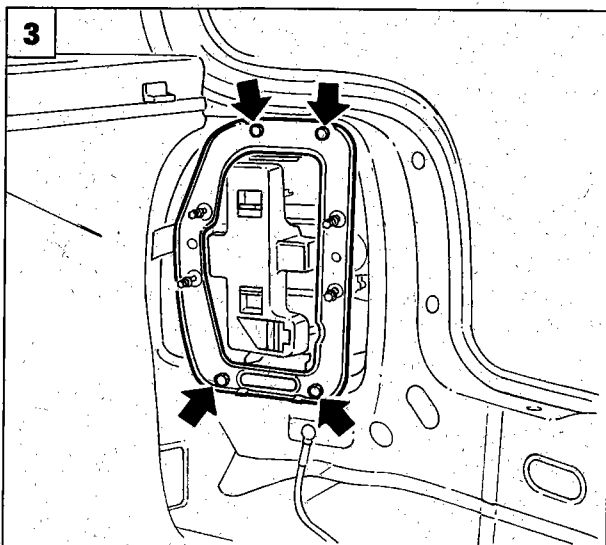
Replacing rear light cluster

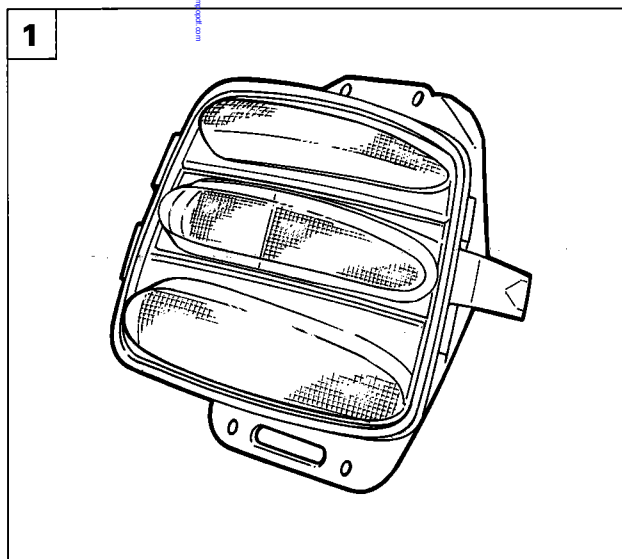
1. Remove the rear light cluster as described on page 26 - sec. 55 of the manual.
2. Make sure, before fitting the rear light cluster, that the frame fixing the light cluster to the bodyshell, is positioned at the centre of the seal pre-loading adjustment screws; if this is not the case, adjust the screws as shown in the diagram.
3. Correctly position the rear light cluster on the bodyshell and tighten the fixing bolts shown in the diagram.
4. Gradually tighten the bolts in the order shown, then continue the tightening until they actually break.



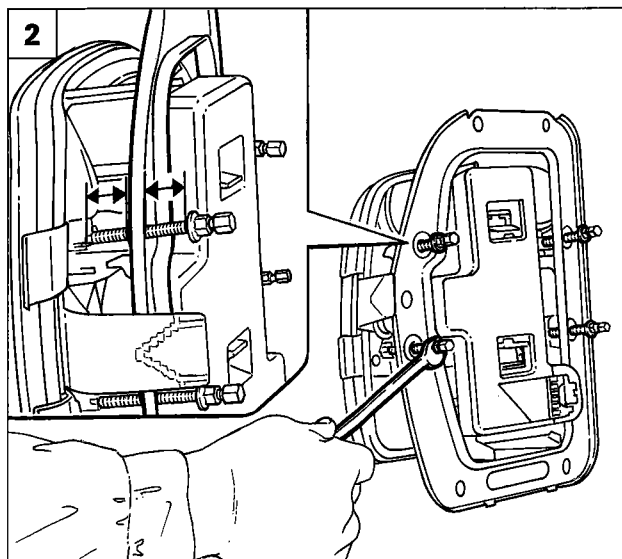
The operation described above allows the right pressure for the rear light cluster perimeter trim on the bodyshell.

NOTE Complete the fitting of the elements removed, reversing the order of the operations carried out for the removal of the rear light cluster.

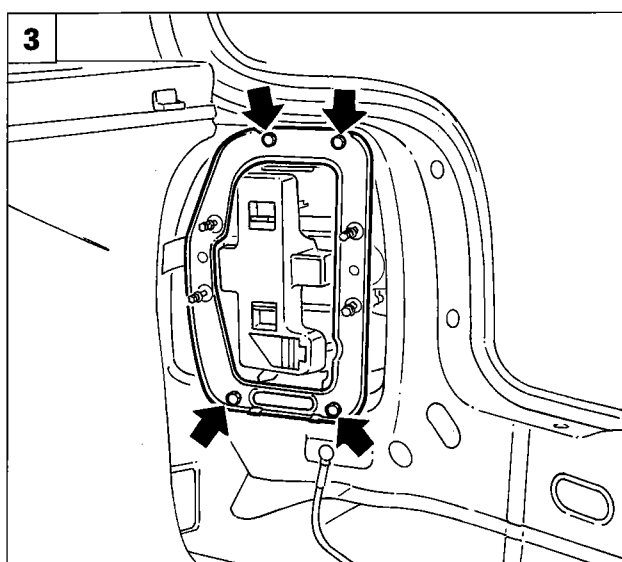




P4A026L05

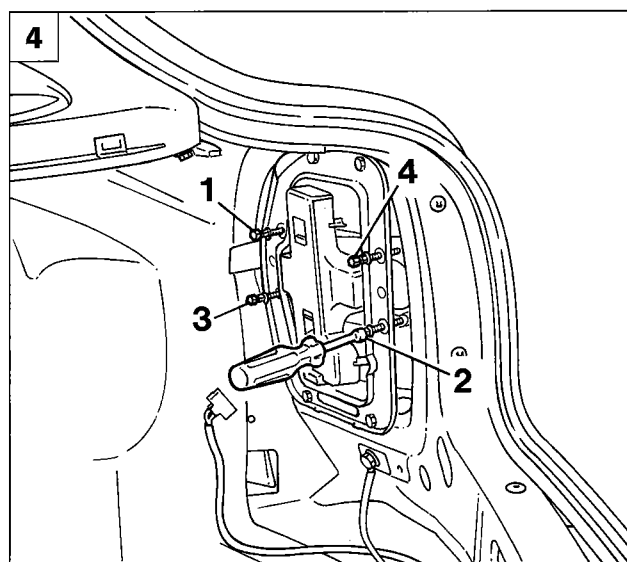


P4A026L06



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4A253L



P4A026L08

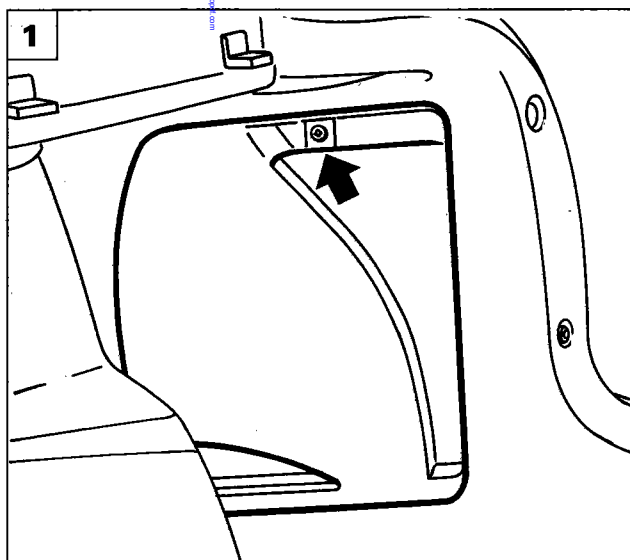
Replacing tail light cluster

1. Remove the tail light cluster as described on page 26.
2. Before fitting the tail light cluster, ensure that the frame fastening the light cluster to the body is positioned half way along the length of the gasket preload adjustment screws. Otherwise adjust the screws as shown in the figure.
3. Correctly position the tail light cluster on the body and tighten the retaining screws shown in the figure.
4. Gradually tighten the screws in the order shown, then continue to tighten to break point.



The above operation allows the gasket between the tail light cluster and body to be adjusted to the correct pressure.

NOTE *Finish refitting the parts by reversing the instructions for tail light removal.*

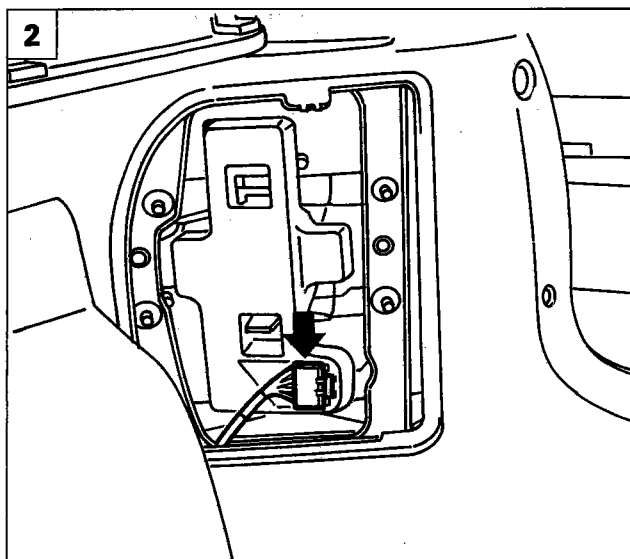


P4A027L01



Replacing rear lights cluster bulbs (5-door version)

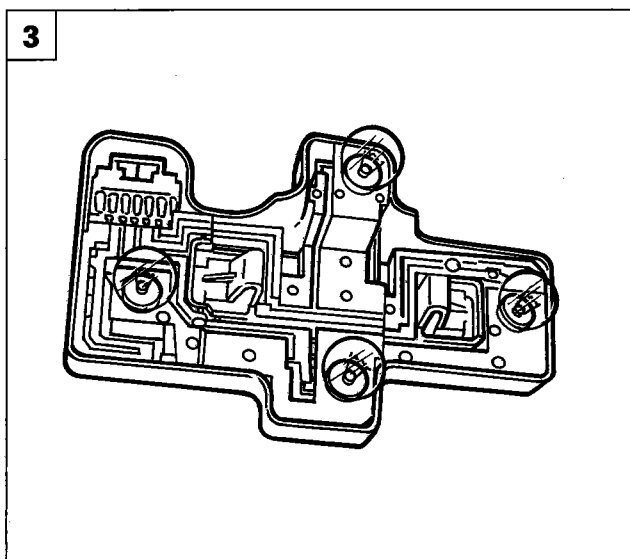
1. Undo the screw indicated and remove the trim.



P4A027L02



2. Disconnect the wiring connector and withdraw the bulb holder unit from the car.

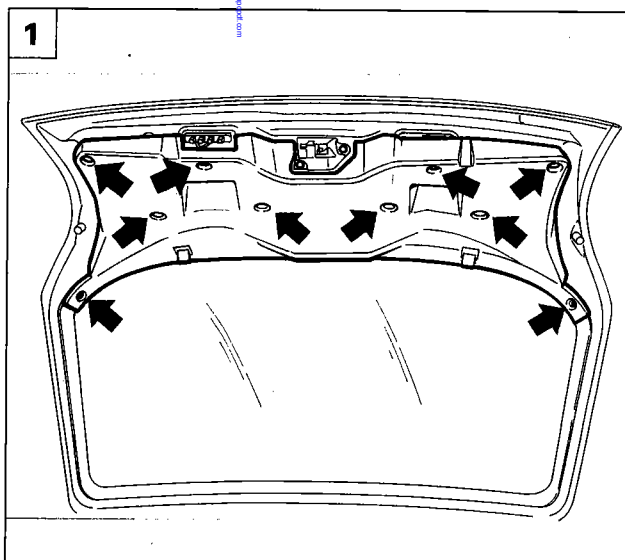


P4A027L03



3. Replace the bulbs concerned.

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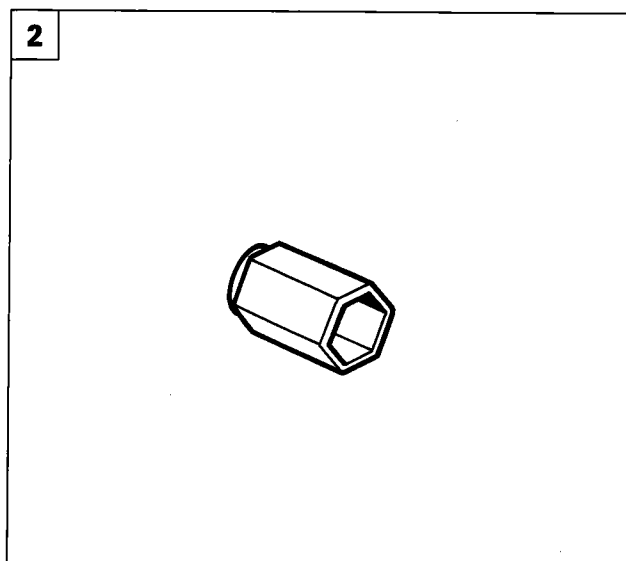
P4A028L01



ADDITIONAL STOP LIGHT

Removing-refitting (5-door version)

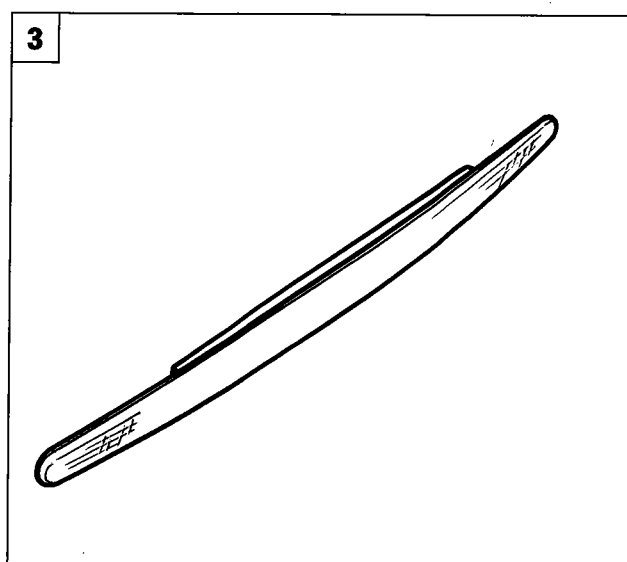
1. Remove the trim by undoing the screws and buttons securing it to the tailgate.



P4A028L02



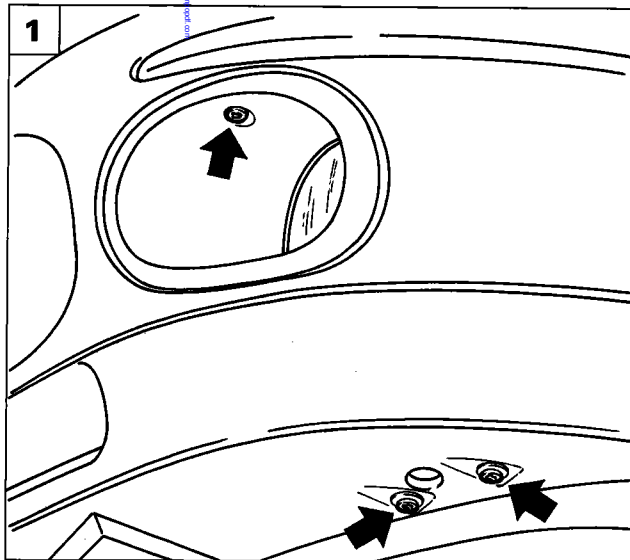
2. Undo the plastic nuts securing the additional stop light to the tailgate.



P4A028L03



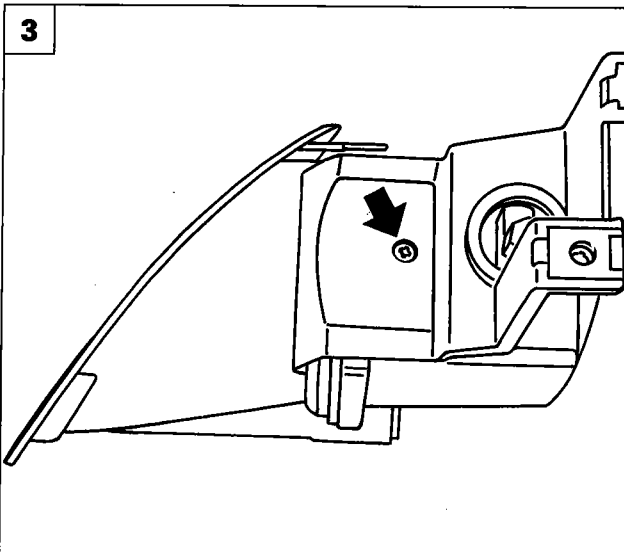
3. Remove the additional stop light from the car.



P4A029L01



P4A029L02



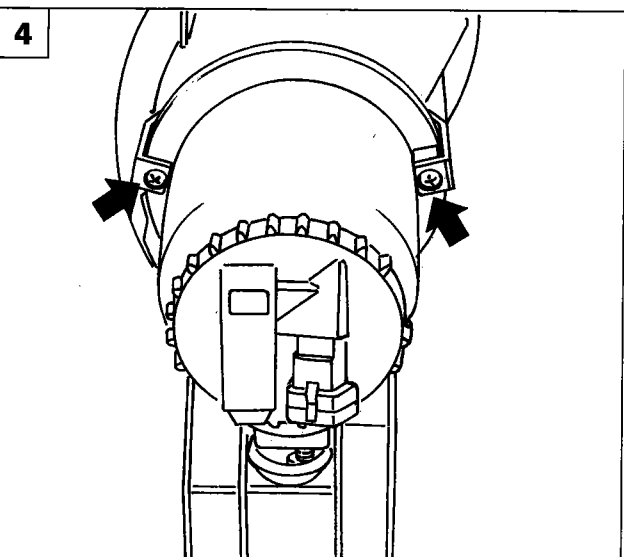
P4A029L03



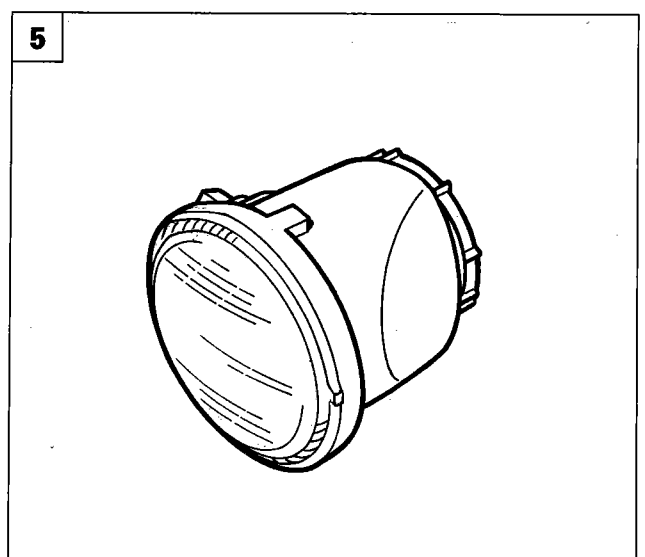
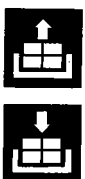
FRONT FOG LAMPS

Removing-refitting

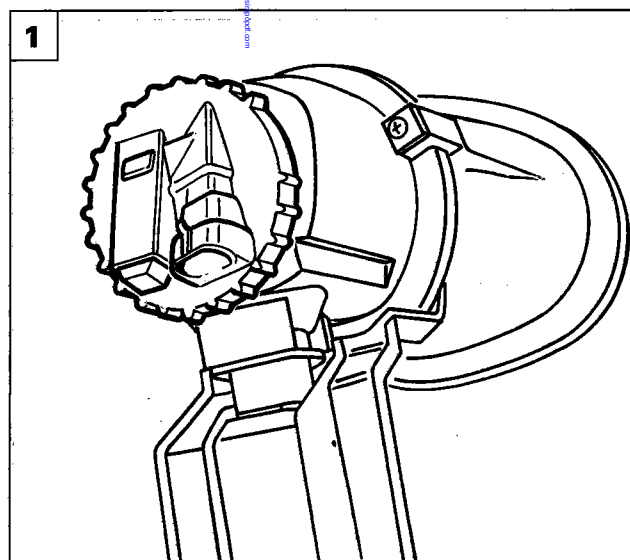
1. Place the car on ramps, raise it and undo the screws shown in the figure.
2. Remove the front fog lamp from the car.
3. Undo the screw shown in the figure.
4. Undo the screws shown in the figure.
5. Detach the frame from the front fog lamp.



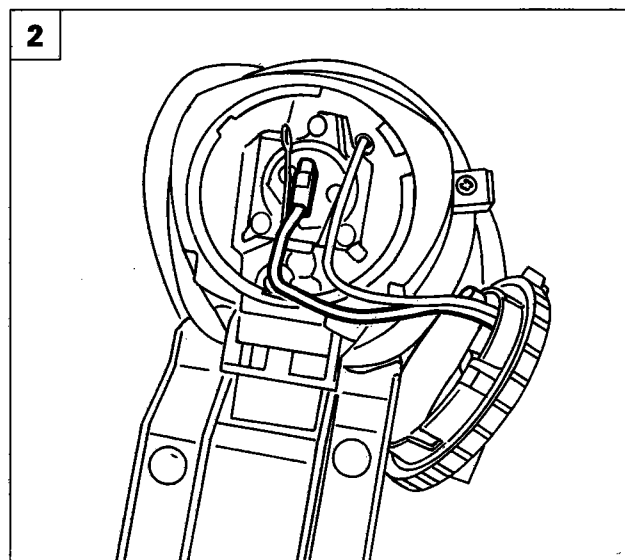
P4A029L04



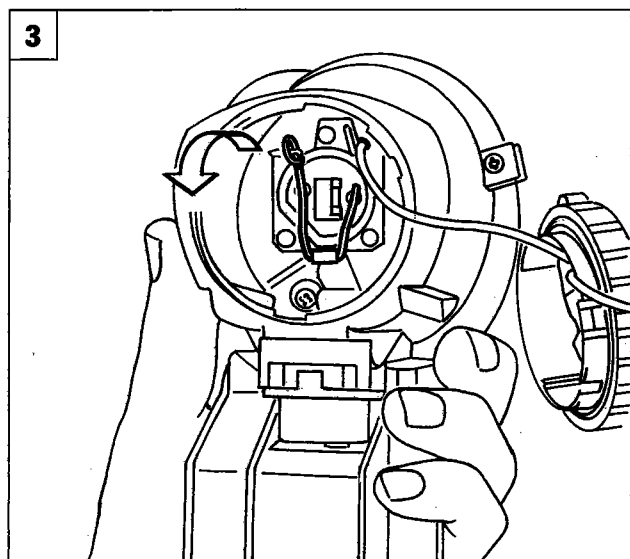
P4A029L05



P4A030L01



P4A030L02



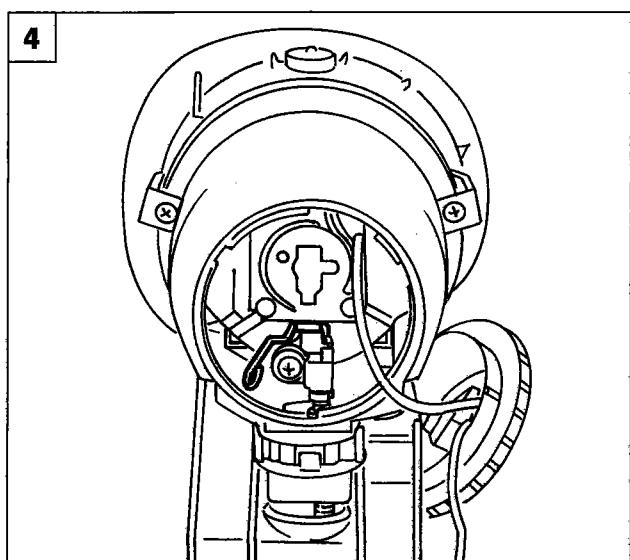
P4A030L03



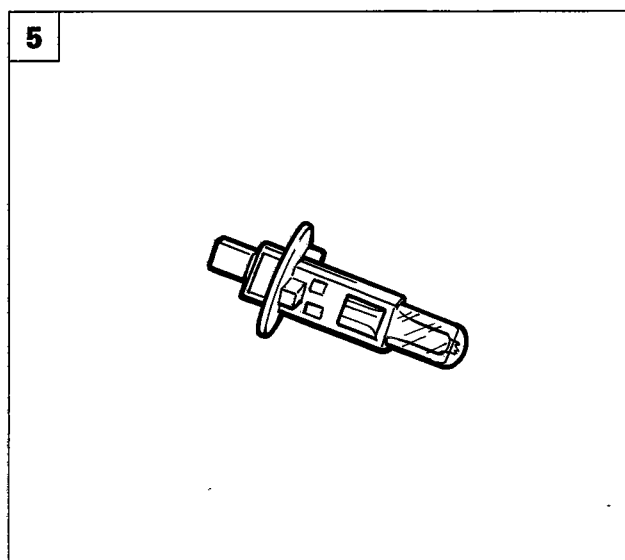
Replacing front fog lamp bulb

Carry out operations 1, 2, 3 described on the previous page.

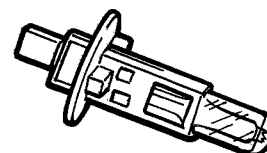
1. Undo the cover located at the rear of the front fog lamp assembly.
2. Disconnect the wiring connection indicated.
- 3-4. Turn the lever indicated which locks the bulb in question.
5. Withdraw the bulb from the bulb holder.

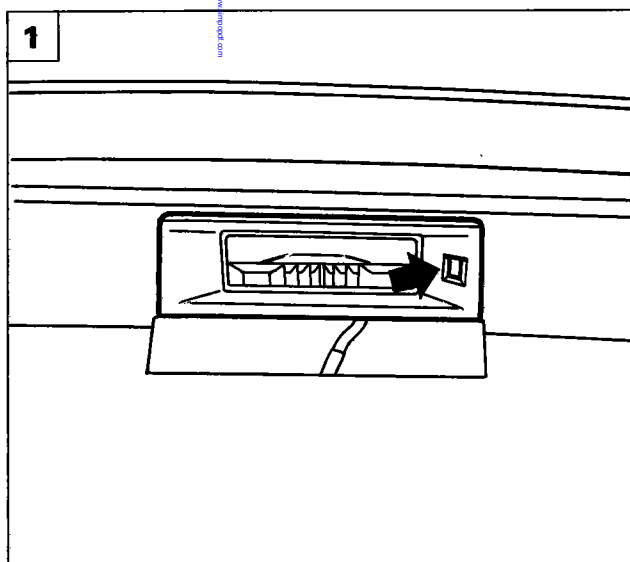


P4A030L04

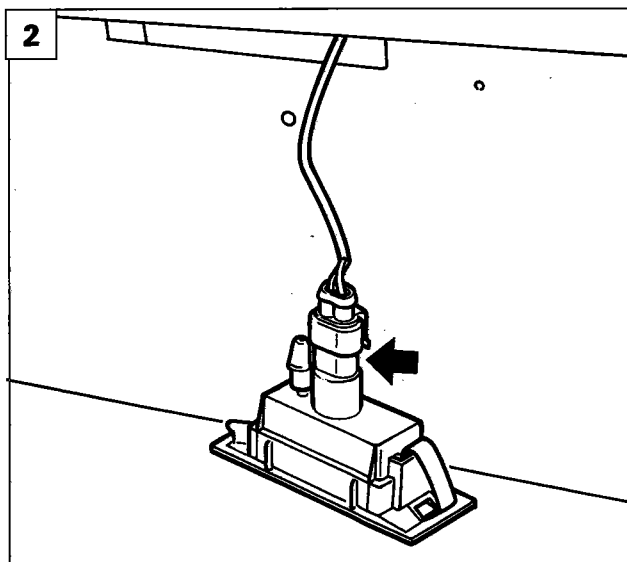


P4A030L05

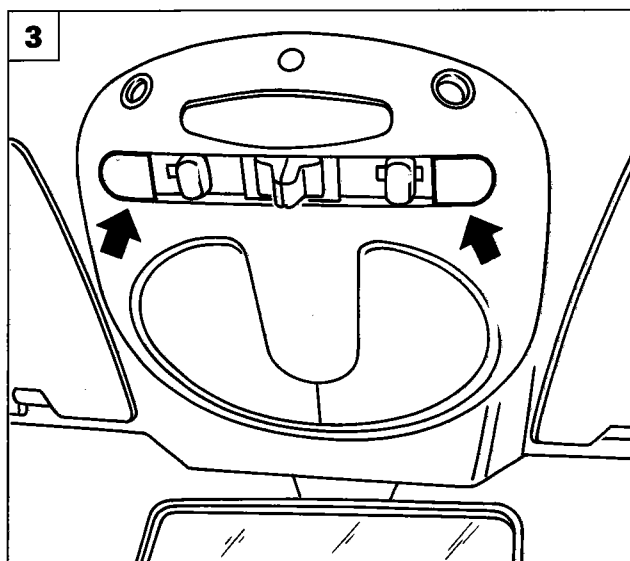




P4A031L01



P4A031L02



P4A031L03



NUMBER PLATE LIGHT

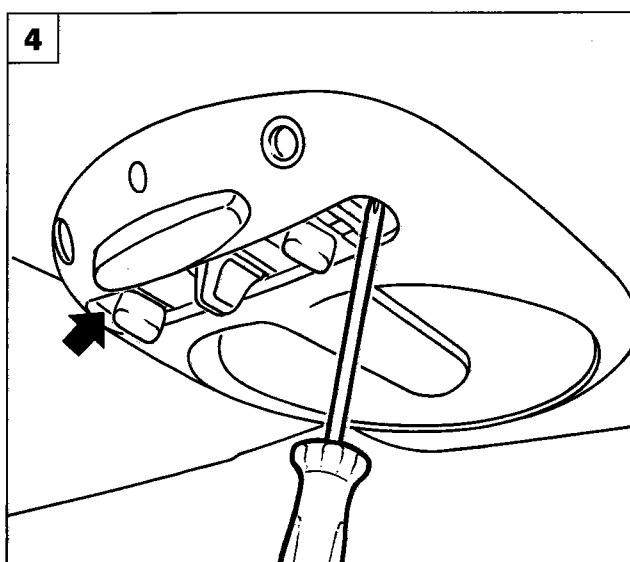
Removing-refitting

1. Release the stop (arrowed) to enable the lamp unit to be withdrawn from the rear bumper.
2. Disconnect the connector indicated and remove the lamp.

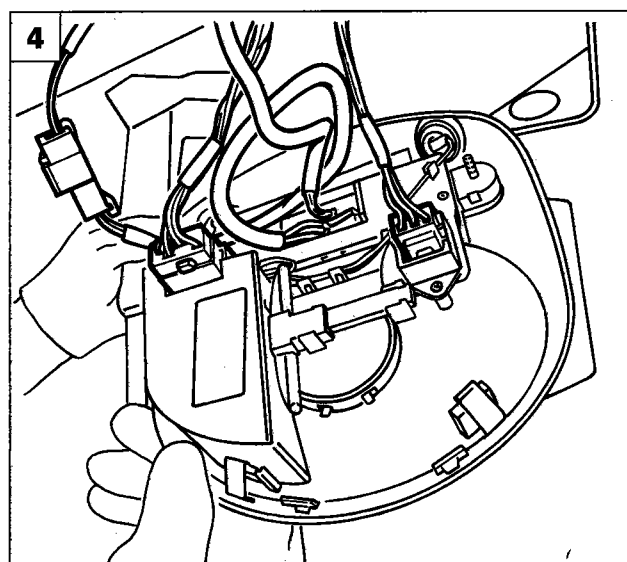
COURTESY LIGHTS

Removing-refitting top courtesy light

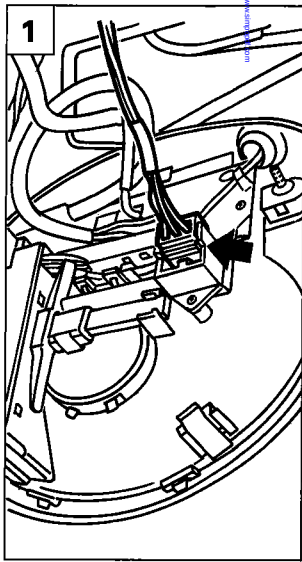
3. Remove the cover pieces (arrowed).
4. Undo the screws (arrowed) securing the courtesy light to the bodywork.
5. Disconnect the wiring connections and remove the courtesy light from the car.



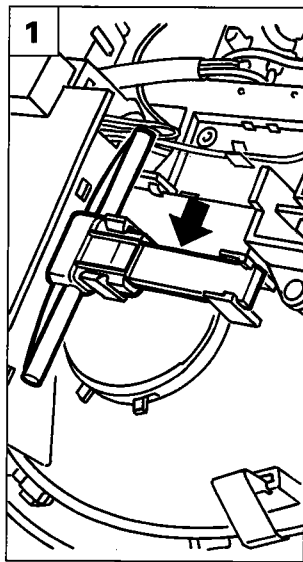
P4A031L04



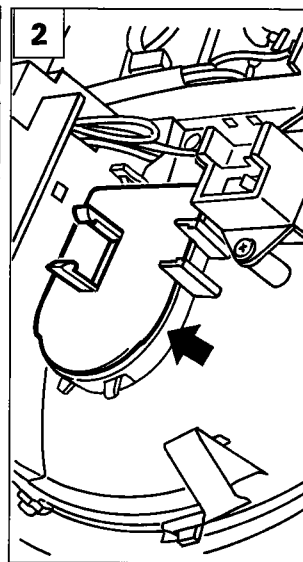
P4A031L05



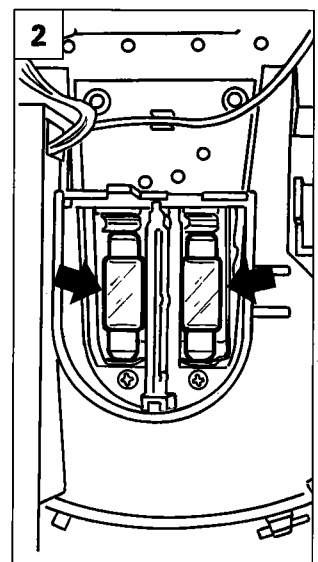
P4A032L01



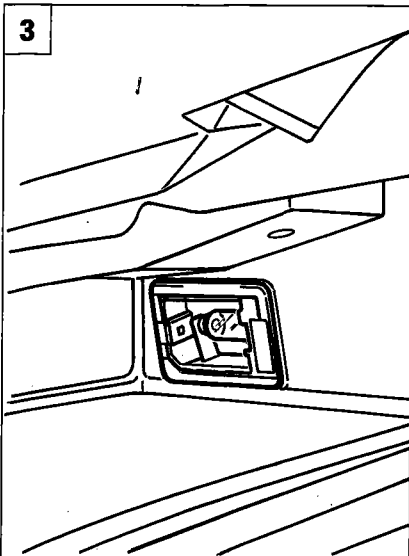
P4A032L02



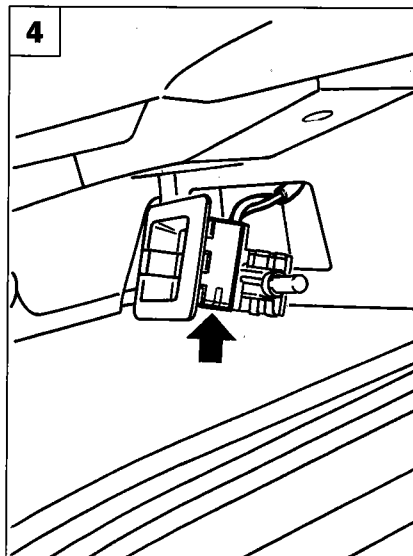
P4A032L03



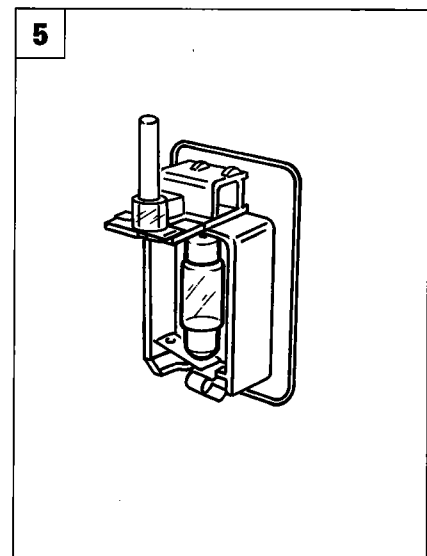
P4A032L04



P4A032L05



P4A032L06



P4A032L07

Replacing courtesy light bulbs

1. Disconnect the connection and remove the part shown in the figure.
2. Remove the protection and replace the bulbs concerned.

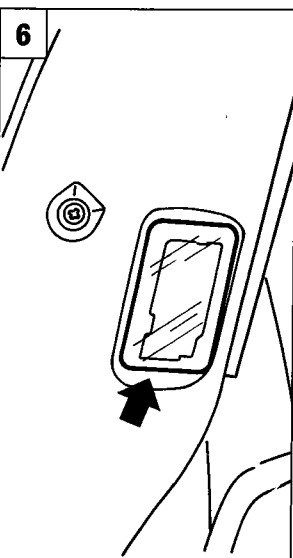
Removing-refitting glove compartment light and replacing bulb

3. Disengage the edges of the courtesy light and remove it from its seating.
4. Disconnect the connector shown and remove the light from the glove compartment.
5. Replace the bulb concerned.

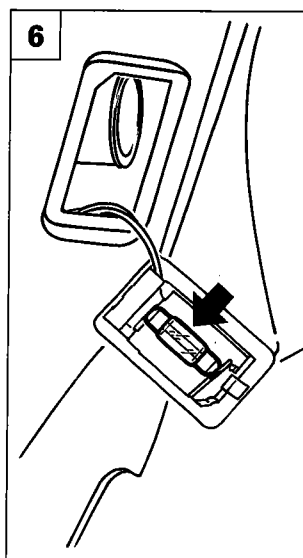
Removing-refitting and replacing luggage compartment bulb

6. Remove the courtesy light from its seating, disconnect the connector and remove the light.

NOTE The bulb can be replaced without removing the courtesy light from the car.

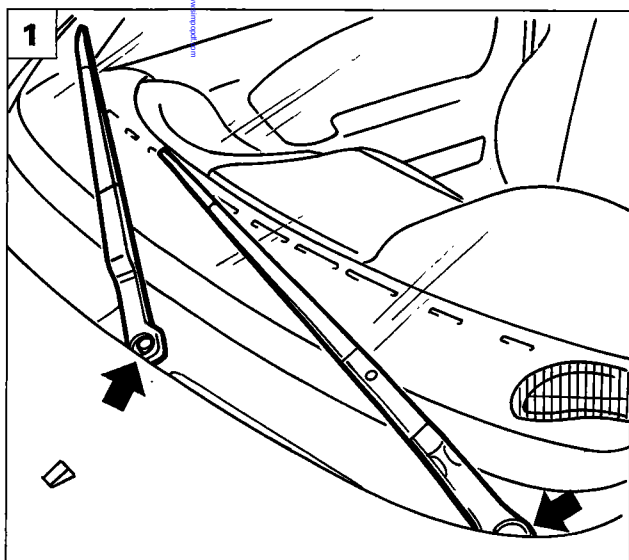


P4A032L08



P4A032L09



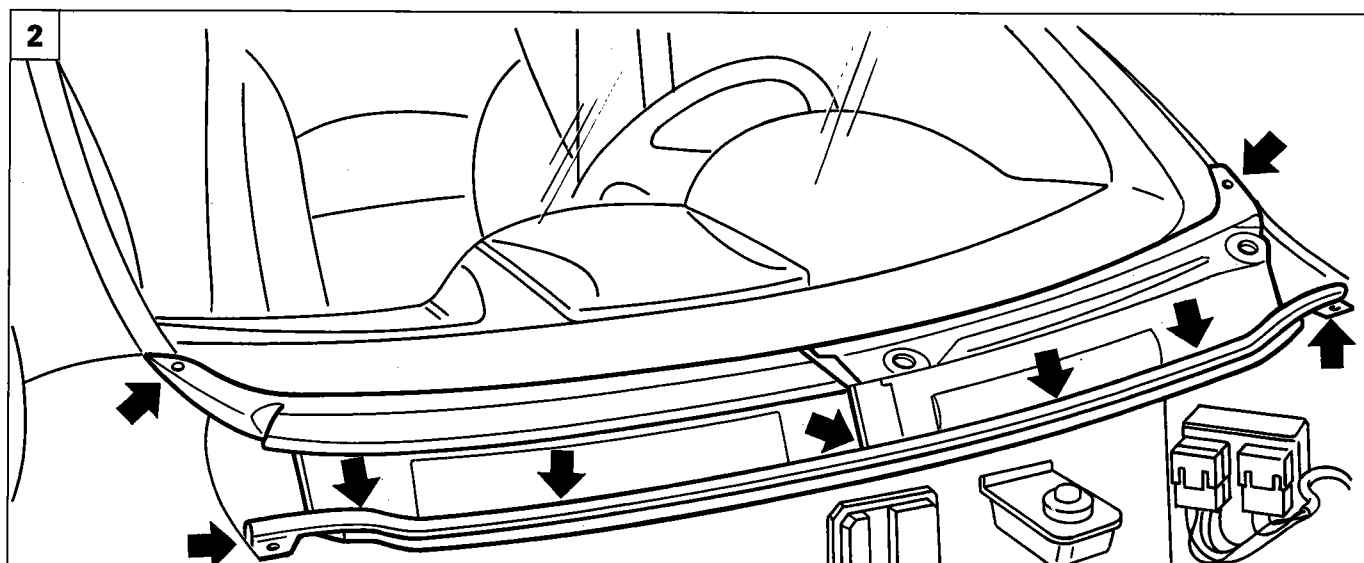


P4A033L01

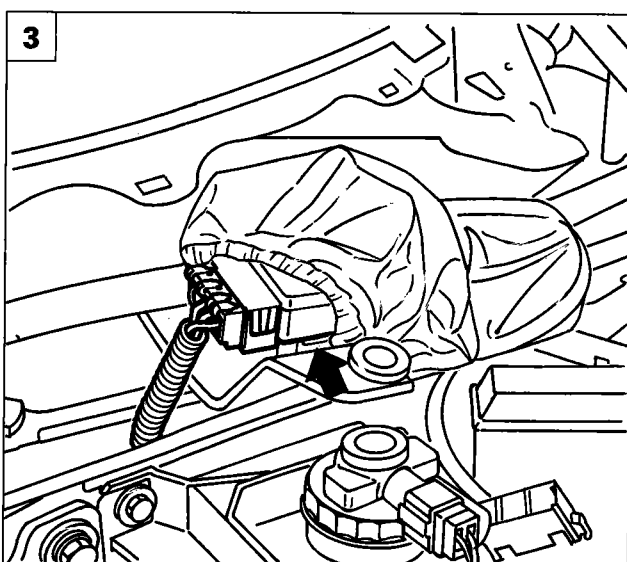


REMOVING-REFITTING WINDSCREEN WIPER MOTOR

1. Remove the protective covers, then undo the nuts and remove the windscreen wiper arms.
2. Raise the bonnet, undo the screws indicated and remove the trim under the windscreen.



P4A033L02

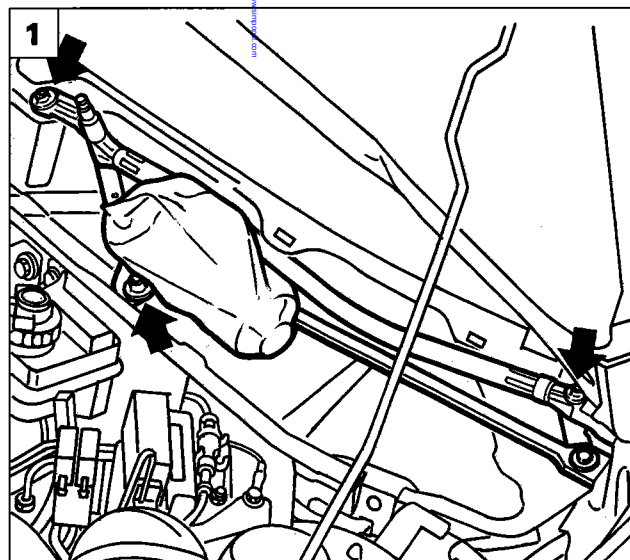


P4A033L03

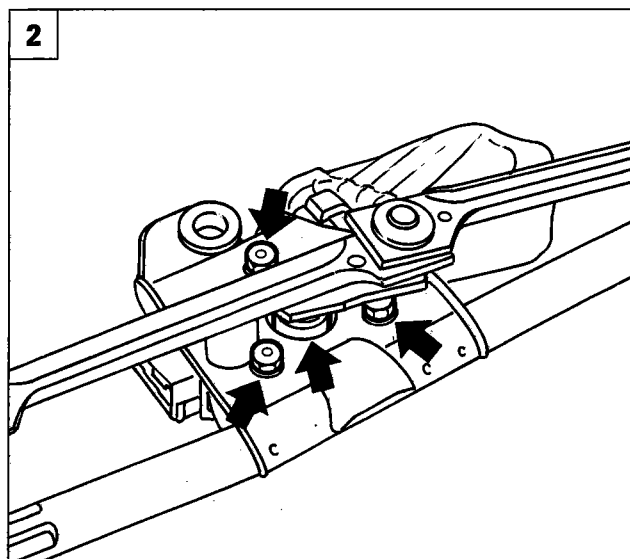


3. Lift the windscreen wiper motor protection and disconnect the connector indicated.

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P4A034L01



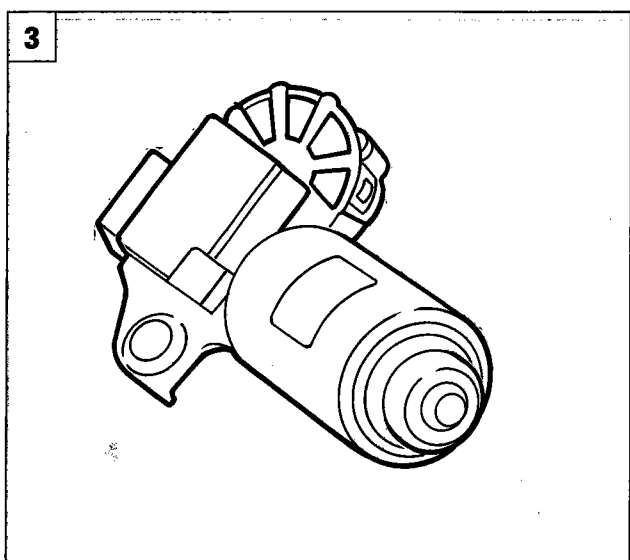
P4A034L02



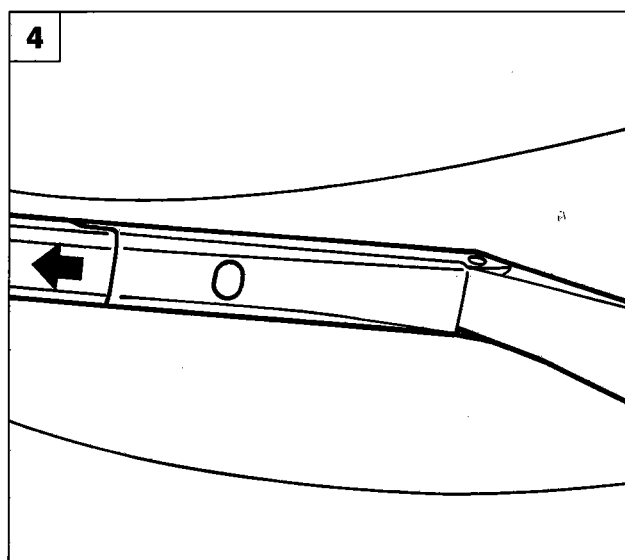
1. Undo the screws indicated and remove the windshield wiper assembly from the car.
2. Undo the bolts and nut indicated.
3. Separate the windshield wiper motor from the linkage.

Replacing windshield wiper blades

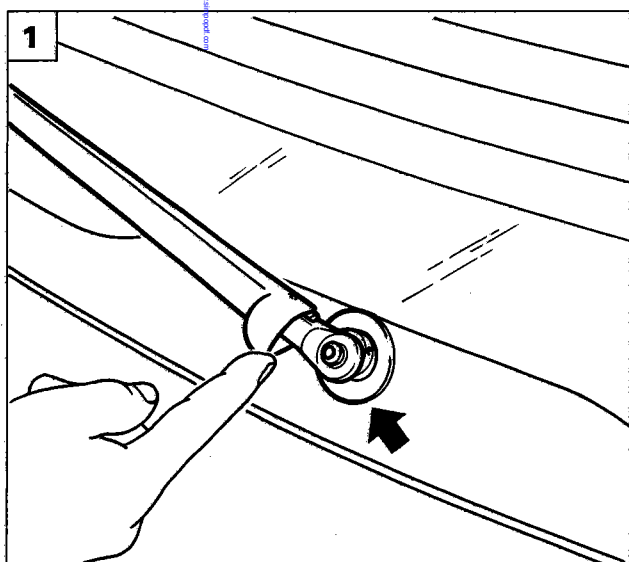
4. To replace the windshield wiper blades, press the button shown in the figure, and withdraw in the direction of the arrow.



P4A034L03



P4A034L04



P4A035L01



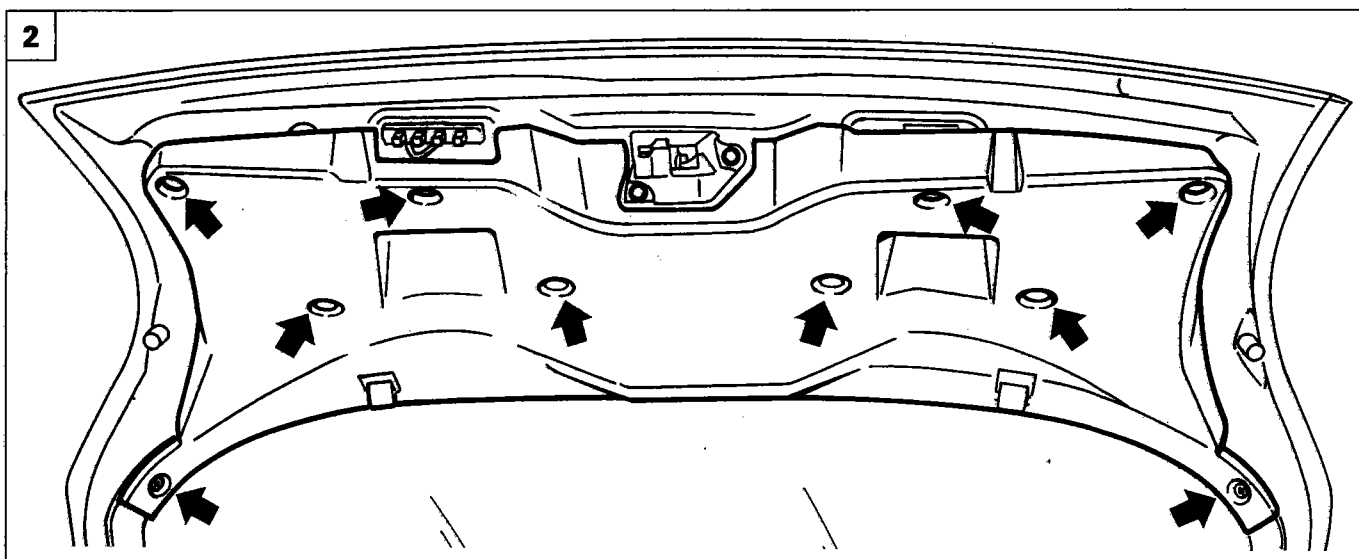
REAR WINDOW WIPER MOTOR

Removing-refitting

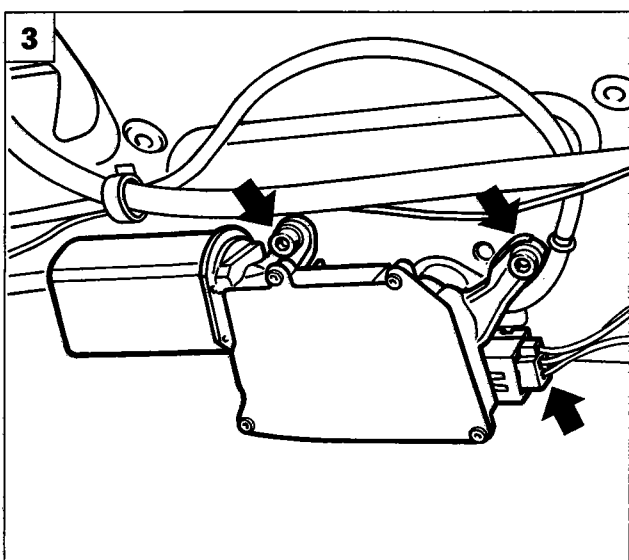
1. Raise the protection indicated in the figure, undo the nut and remove the rear window wiper arm.
2. Lift the tailgate, undo the attachment buttons and remove the trim.
3. Disconnect the electrical connection indicated, undo the socket-headed screws and remove the rear window wiper motor from the car.

Replacing rear window wiper blade

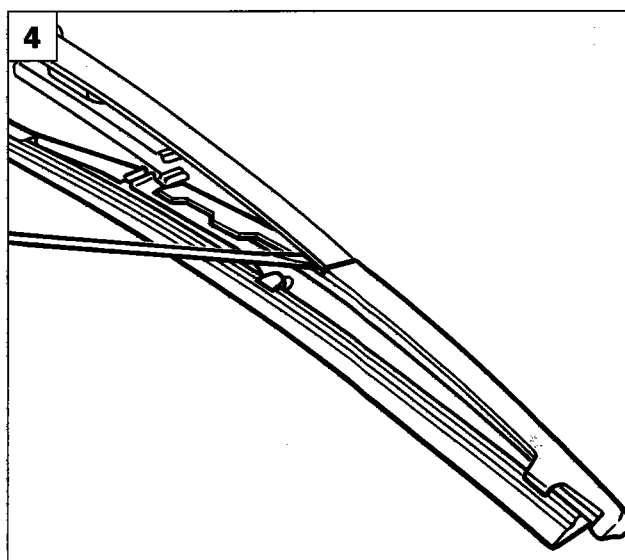
4. Working on both sides of the blade carrier as shown in the figure, remove the blade from the car.



P4A035L02

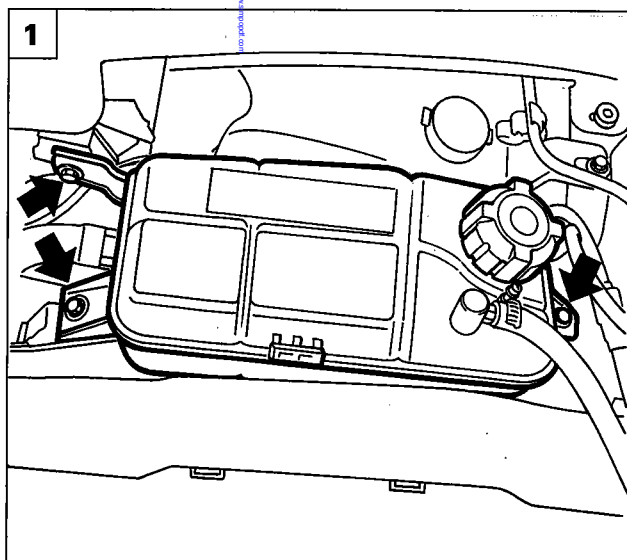


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P4A036L01

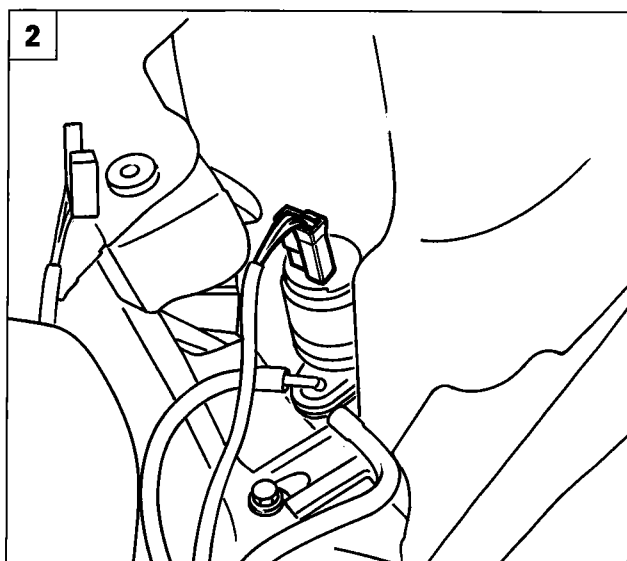


WINDSCREEN/REAR WINDOW WASHER PUMP

Removing-refitting

Lift the bonnet, drain the windscreen washer fluid in the reservoir and save it.

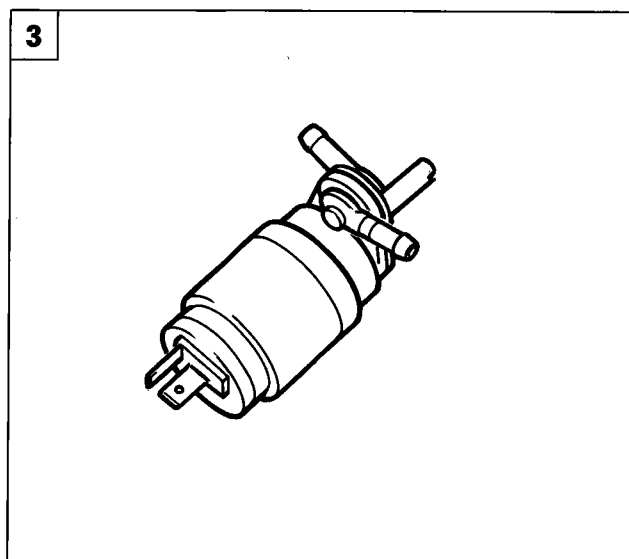
1. Undo the bolts securing the coolant reservoir to the body work and move the reservoir over to one side.



P4A036L02

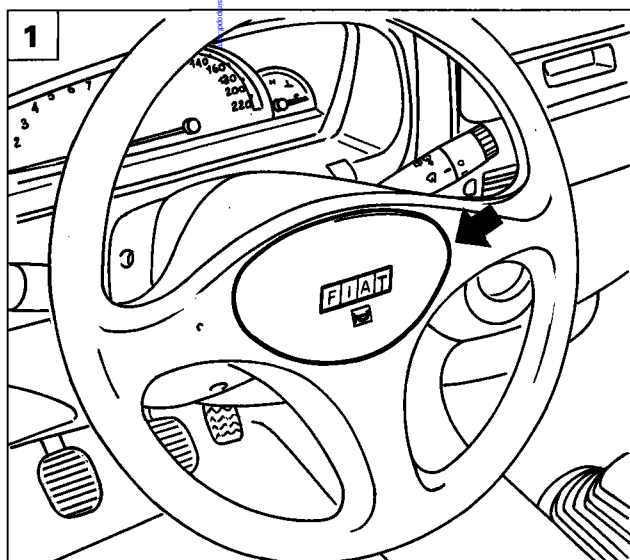


2. Disconnect the pump supply connector.

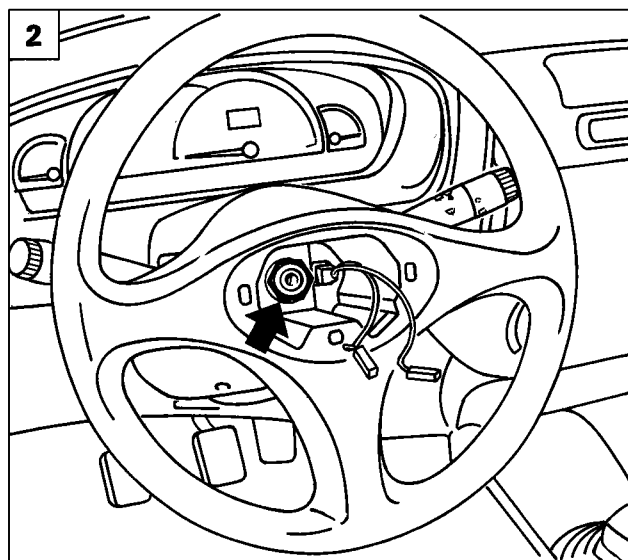


P4A036L03

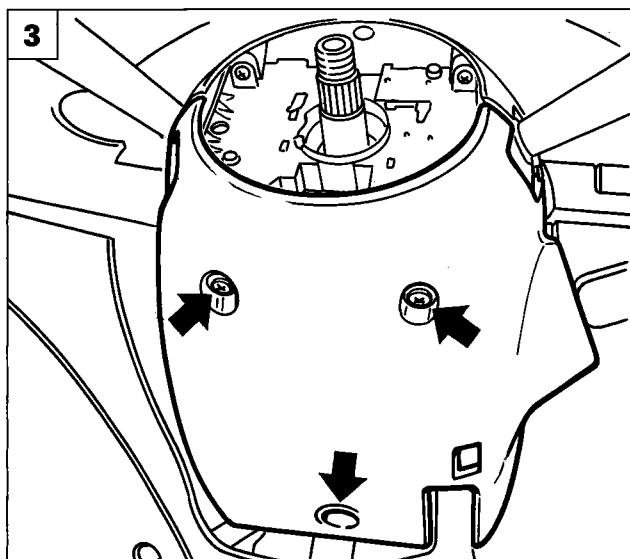
3. Remove the pump from the car.



P4A037L01



P4A037L02



P4A037L03

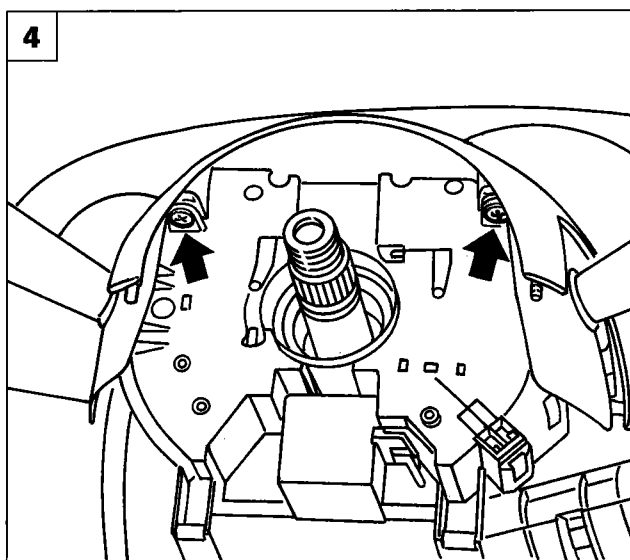


STALK UNIT

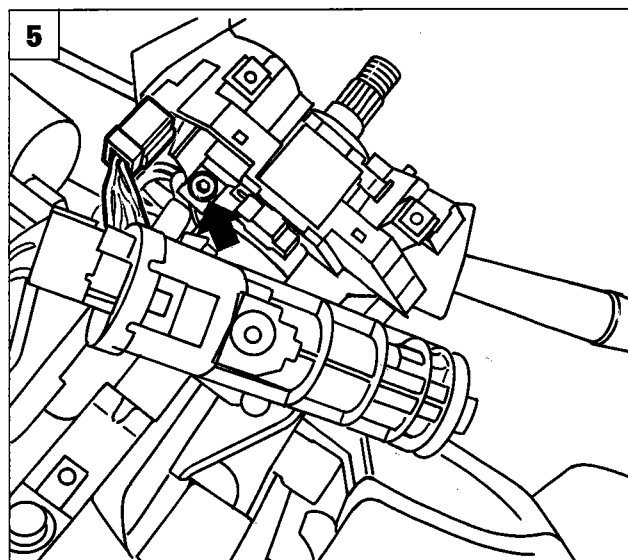
Removing-refitting
(for versions without Air Bag)

NOTE For versions with Air Bag, refer to the relevant sub-section.

1. Disconnect the battery's negative terminal, then remove the horn cover after disconnecting its connections.
2. Undo the nut (arrowed) and remove the steering wheel from the car.
3. Undo the screws (arrowed) and remove the steering column bottom shroud.
4. Undo the screws (arrowed) and remove the steering column upper shroud.
5. Undo the socket-headed screw and disconnect the relevant connectors, then remove the stalk unit from the car.

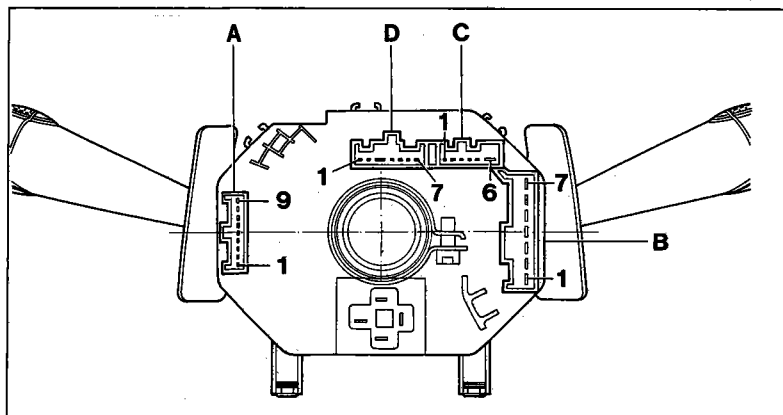


P4A037L04



P4A037L05

P4A038L02



P4A038L03

Publication no. 506.670/01

IDENTIFICATION OF CONNECTOR TERMINALS

Connector A

Pin no.	Wire colour	Circuit involved
1	HN	Windscreen wiper and brake
2	H	Windscreen wiper - High speed
3	-	Not connected
4	HG	Windscreen wiper Intermittent/Low speed
5	S	Bidirectional pump
6	SN	Bidirectional pump
7	SG	Headlamp washer control
8	N	Earth
9	-	Trailer indicators warning light

Connector B

Pin no.	Wire colour	Circuit involved
1	-	Northern Europe legislation
2	-	Northern Europe legislation
3	HR	Dipped headlamps
4	LR	Main beam headlamps
5	CB	Int/A
6	AG	Int
7	GV	Side lights

Connector C

Pin no.	Wire colour	Circuit involved
1	-	Not used
2	HL	Rear fog lamps enablement
3	AG	Int/A
4	AN	Right direction indicator
5	LR	Hazard lights indicator
6	A	Right direction indicator

Connector D

Pin no.	Wire colour	Circuit involved
1	-	Not connected
2	LB	+30
3	LN	Horn
4	-	Not connected
5	CN	Positive Windscreen wash/wipe-rear window washer
6	CL	Rear window wiper
7	CB	Rear window wiper and brake

STALK UNIT RIGHT LEVER

The stalk unit right lever controls the windscreen wiper (two speeds + intermittent operation) and the windscreen washer pump in accordance with the following logic:

- When the right lever is moved downwards one click, the switch is activated, switching on the windscreen wiper intermittent function at the rate of about 15 wipes a minute.
- When the switch is moved two clicks downwards, intermittent operation at about 35 wipes a minute is selected.

Operation remains the same as above, except that the pause time between wipes is reduced to 2 seconds.

- By moving the switch three clicks downwards, continuous operation of the windscreen wiper is switched on at 45 wipes a minute.

If from the STOP position the lever is pushed upwards and held in this position, continuous operation of the windscreen wiper is still selected, but with the lever in an unstable position.

In other words, the windscreen operates for as long as the lever is held in that position, and stops as soon as the lever is released.

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Windscreen wiper motor

On the motor casing, there is a container with the switching circuit, consisting of a relay and a switch for the automatic return of the blades to the rest position.

Windscreen washer

When the right stalk unit lever is moved towards the driver, the windscreen washer pump is supplied. When the lever is released, the pump stops while the windscreen wiper remains on for about four seconds to finish wiping the window.

Windscreen washer pump

The windscreen washer pump is mounted directly on the fluid reservoir.

Rear window wiper

The rear window wiper and pump are controlled by the right stalk unit lever, which has two additional switches; one is of the ring type for controlling the rear window wiper and one controls the pump. The rear window wiper motor has a relay and a switch which constitute the control/reset circuit of the wiper blade.

- A. When the ring switch located on the stalk unit lever is rotated, a terminal of the control relay is connected directly to earth by a cable which supplies the motor continuously.
- B. When the lever is pushed towards the dashboard, the pump and rear window wiper are switched on simultaneously, and remain on until pressure on the lever stops.

Rear window washer

The pump is of the bidirectional type, and has two connections to which are connected two pipes conveying the fluid to the spray jets for the windscreen and the jet for the rear window.

The direction of the fluid and so its destination depend on the direction of rotation of the pump, which is determined by the position to which the stalk unit lever is pushed. In other words, by pushing the lever forwards in a horizontal direction, the pump is supplied sending the positive to the SN cable and the negative to the S cable.

The fluid is thus sent to the rear window and at the same time the rear window wiper is operated until the lever is released.

Headlamp washer

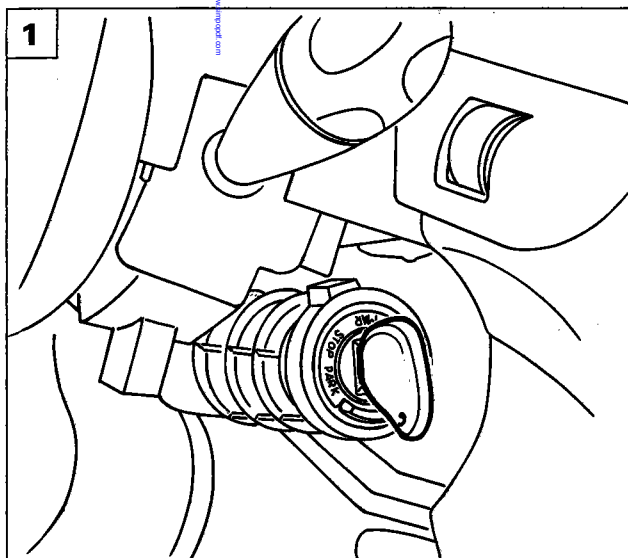
The headlamp washer system comprises a pump located on the windscreen washer fluid reservoir adjacent to the windscreen washer pump, to which two jets secured to the front bumper are connected via the appropriate pipes, and a timer.

With the dipped beam headlamps switched on, when the right stalk unit lever is moved towards the driver, in addition to activating the windscreen washer function, the headlamp washer function is also activated.

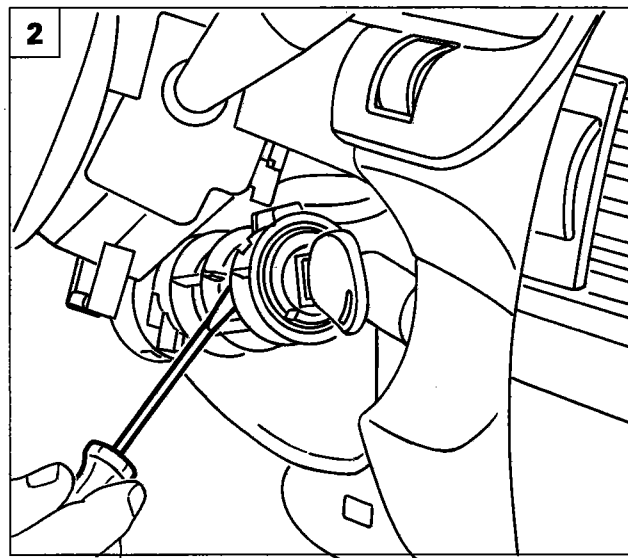
Operation

The timer is supplied by a 12 V positive coming directly from the battery and protected by a 20 A fuse connected to the front left earth via a terminal.

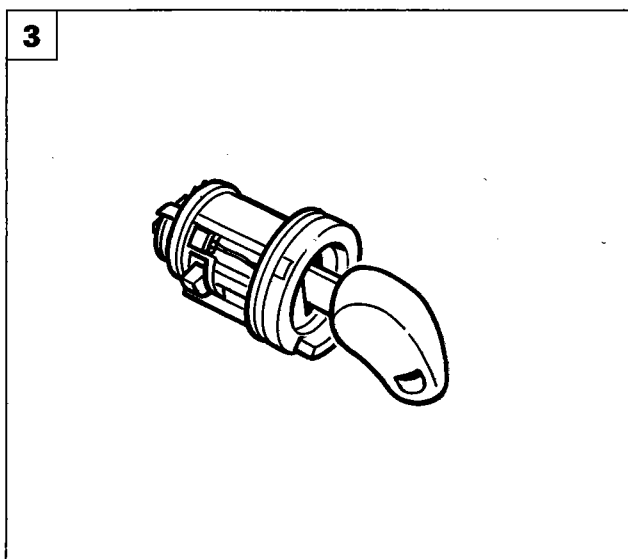
When the the dipped beam headlamps or front and rear fog lamps are switched on, by means of the stalk unit ring switch, a timer on its terminal is supplied, preparing the system for operation.



P4A041L01



P4A041L02



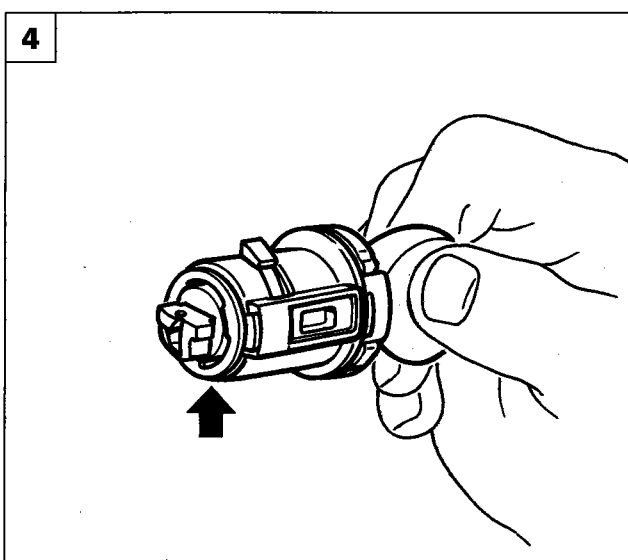
P4A041L03



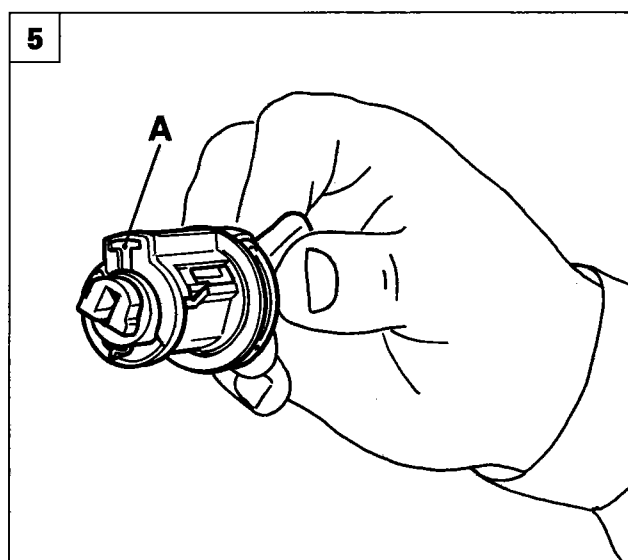
IGNITION SWITCH

Removing-refitting

1. Disconnect the battery's negative terminal and remove the top and bottom steering column shrouds. Insert the ignition key in the ignition switch block and switch the ignition ON.
2. Press on the retaining lug as shown in the figure.
3. Withdraw the block from the ignition switch.
4. Remove the circlip at the rear of the ignition switch block.
5. Press the lever for switching on the parking lights and turn the key so that the stop A is positioned as shown in the figure.

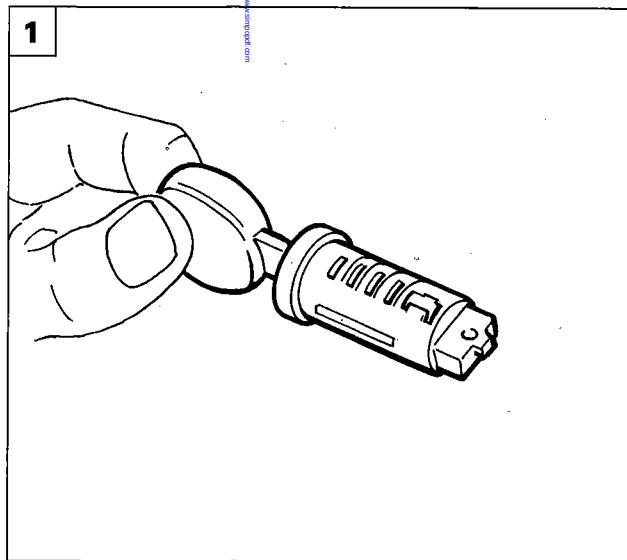


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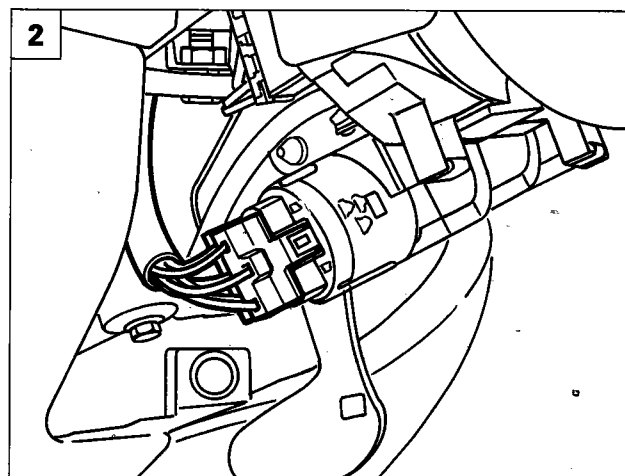


P4A041L05

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P4A042L01



P4A042L02

1. Withdraw the ignition key block.

Removing-refitting ignition key

2. Disconnect the negative terminal from the battery and carry out operation 3 on page 37. Disconnect the wiring connections from the ignition switch.
3. Undo the shear bolts (arrowed).

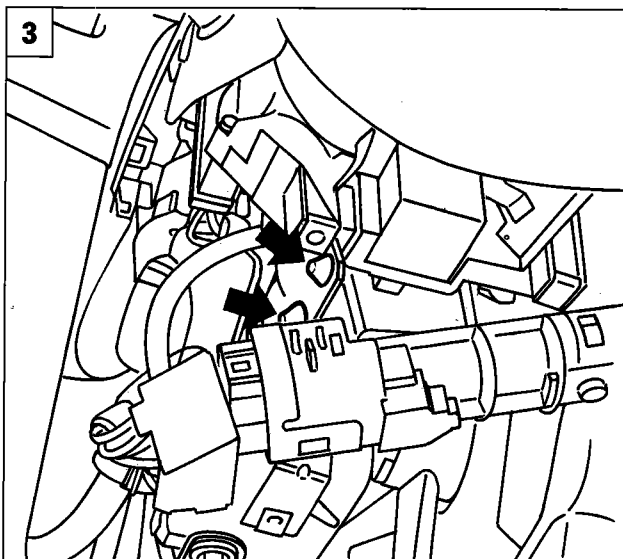


These bolts must be renewed during assembly.

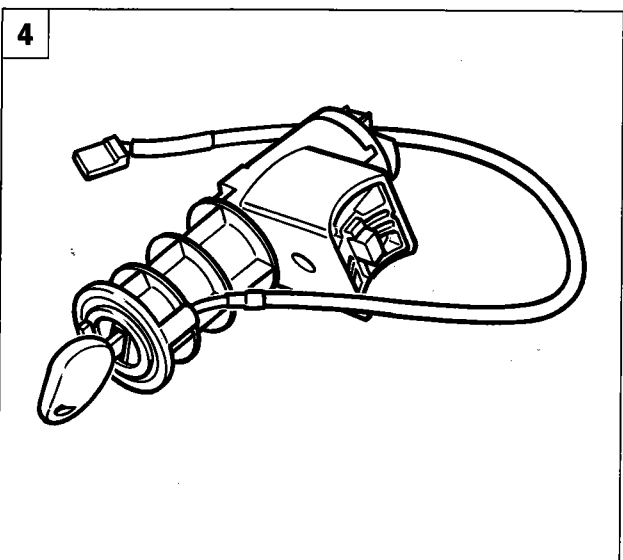
4. Remove the switch from the car.

Removing-refitting ignition switch contact block

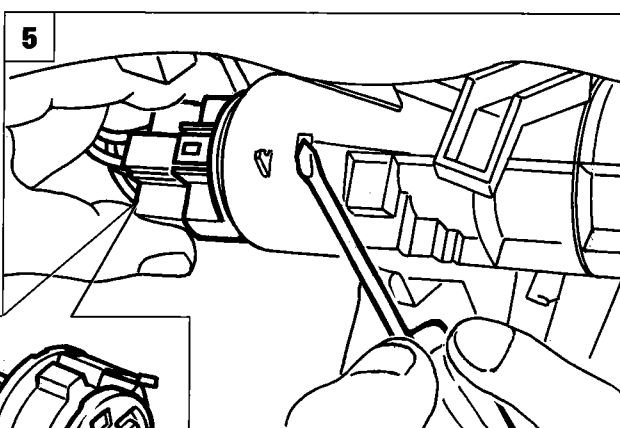
5. Carry out operation 2. Disengage the block from the car as shown in the figure.



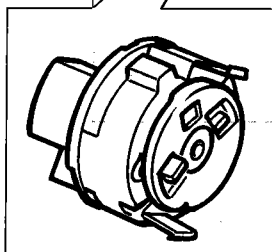
P4A042L03



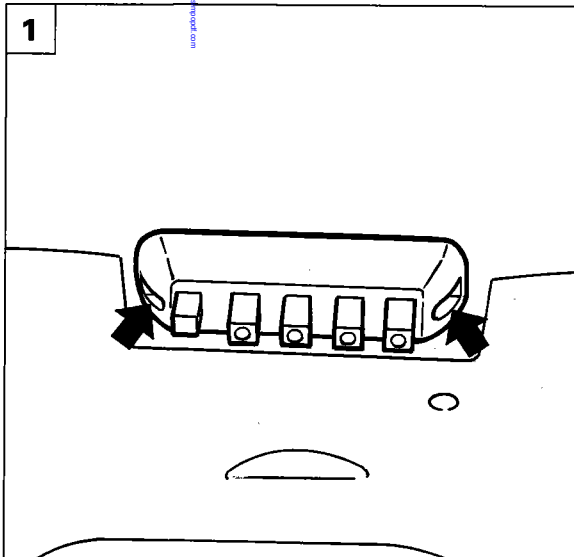
P4A042L04



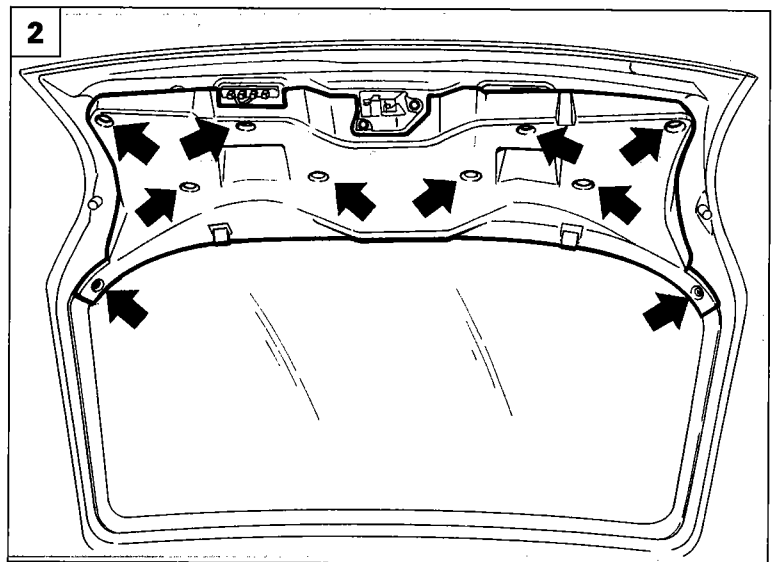
P4A042L05



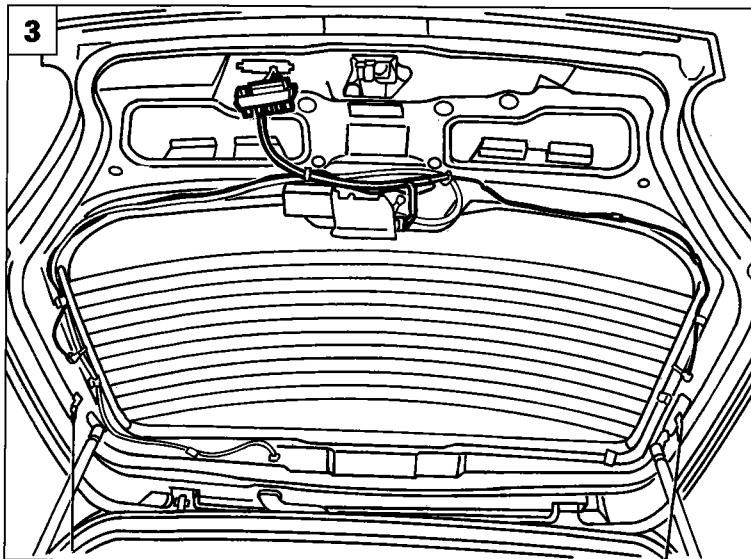
P4A043L01



P4A043L02



P4A043L03



P4A043L04

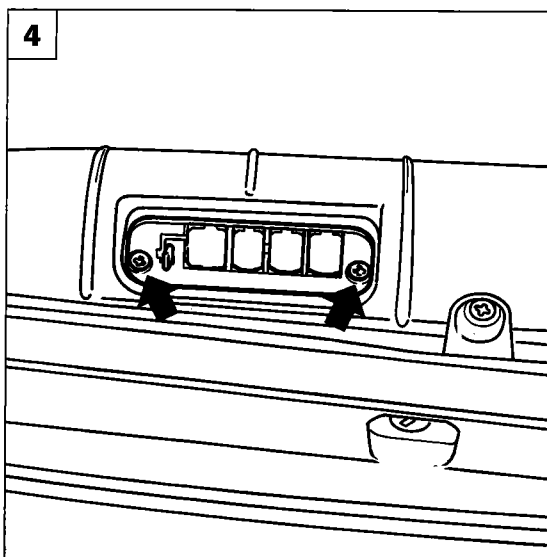
TAILGATE ELECTRICAL CONTACTS

Removing-refitting (on tailgate)

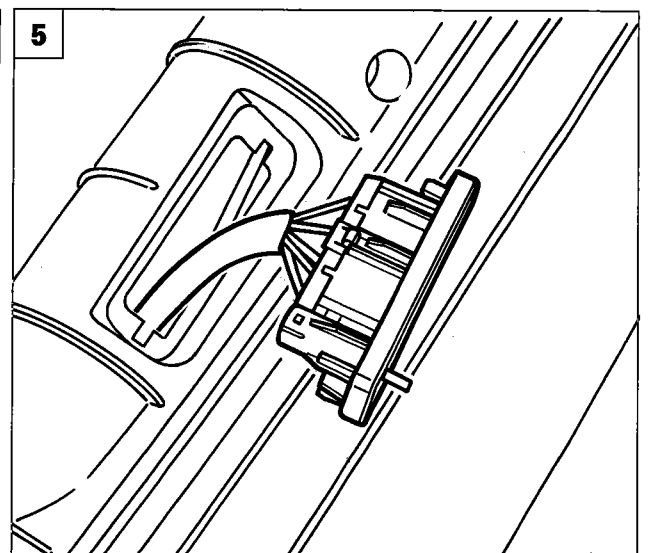
1. Undo the screws (arrowed) and remove the tailgate contact block.
2. Remove the tailgate trim by undoing the attachment buttons.
3. Disconnect the connections shown and remove the tailgate contacts with the relevant wiring.

Removing-refitting (on body shell)

4. Undo the screws (arrowed) and remove the contact block from the bodywork.
5. Disconnect the supply connectors and remove the contact block from the car.

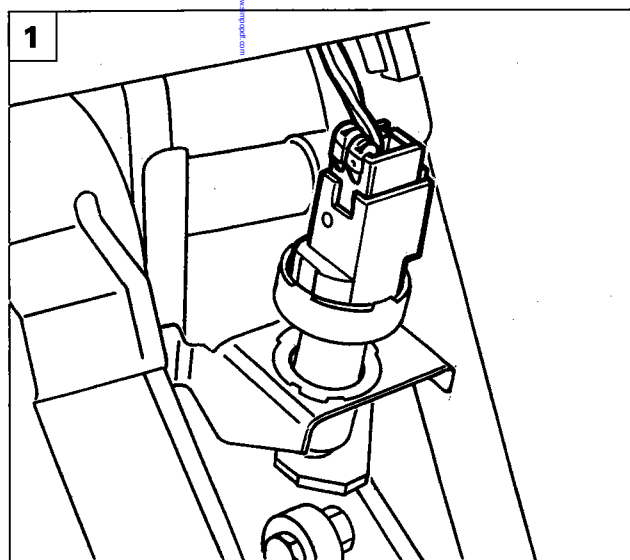


P4A043L05



P4A044L01

55.



P4A044L02



STOP LIGHTS SWITCH

To replace the stop lights switch, closely follow the procedure below:

Dismantling

- Disconnect the electrical connections block;
- withdraw the switch, turning it anti-clockwise by about 60°;

This operation is facilitated if a wrench is used on the hexagonal section (1) in the central figure.

Refitting

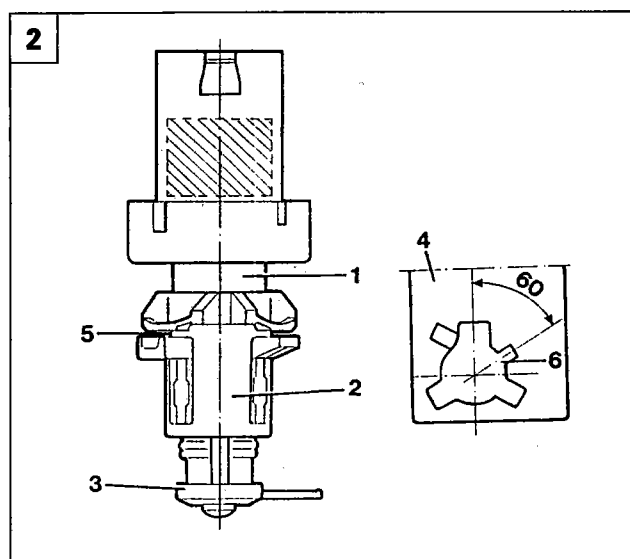
- Fit the new switch complete with bush (2) and spacer (3) in its seating (4) as follows;
- hold the brake pedal depressed, then fit the new switch in the engagement position on the bracket (4);
- turn the switch by about 60° clockwise to the limit of its travel. The retaining lug (5) should be heard engaging in its seating (6).



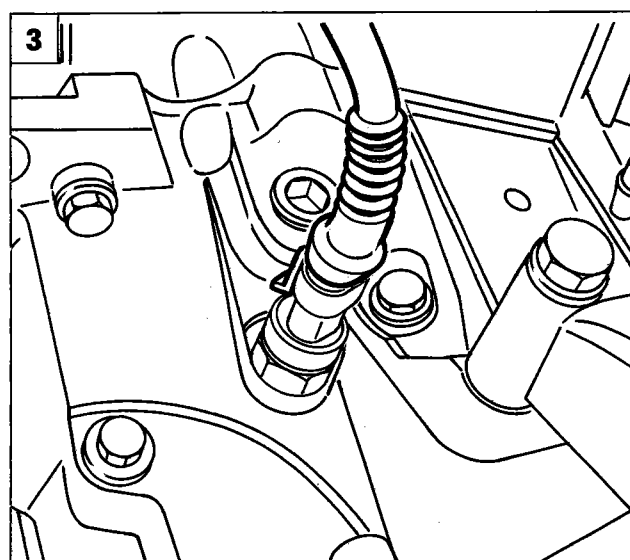
Regulation

- Release the brake pedal to the rest position; the switch will be positioned automatically in relation to the bush (2);
- press the pedal so that the working spacer (3) used as protection during adjustment can be removed and scrapped.

NOTE The working spacer (3) releases an inner stop lug which prevents any further movement between the switch and bush (2).



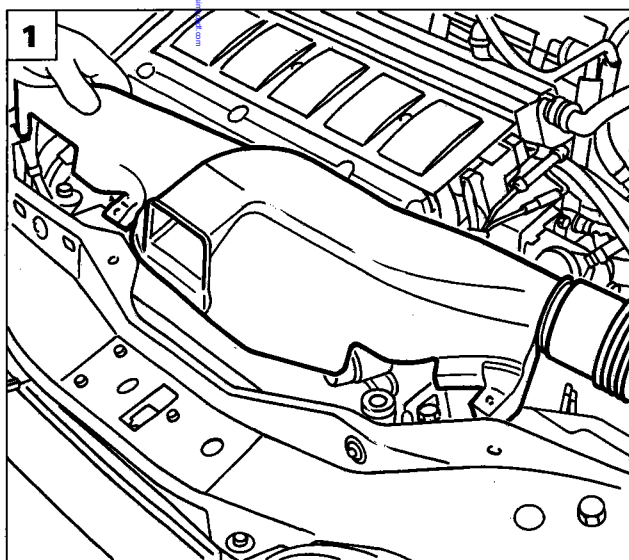
P4A044L06



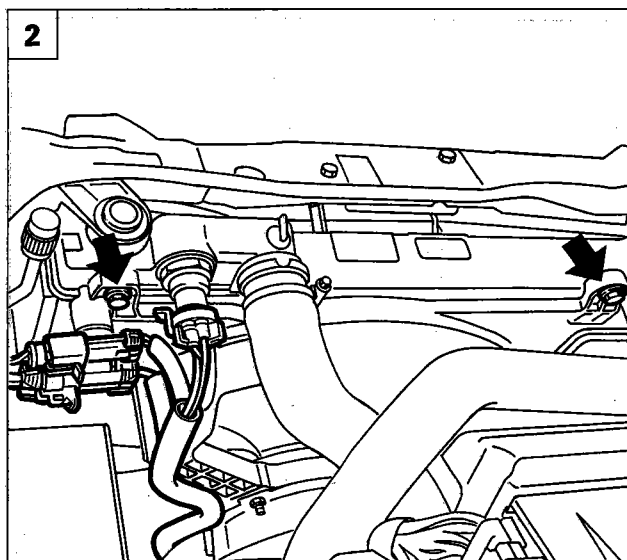
P4A044L03

REVERSING LIGHTS SWITCH

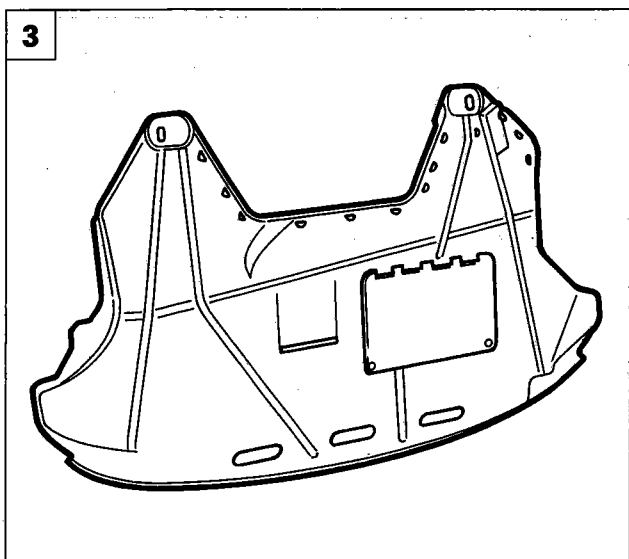
3. Disconnect the connector indicated and undo the gearbox switch, taking care to avoid leakage of oil.



P4A045L01



P4A045L02



P4A045L03

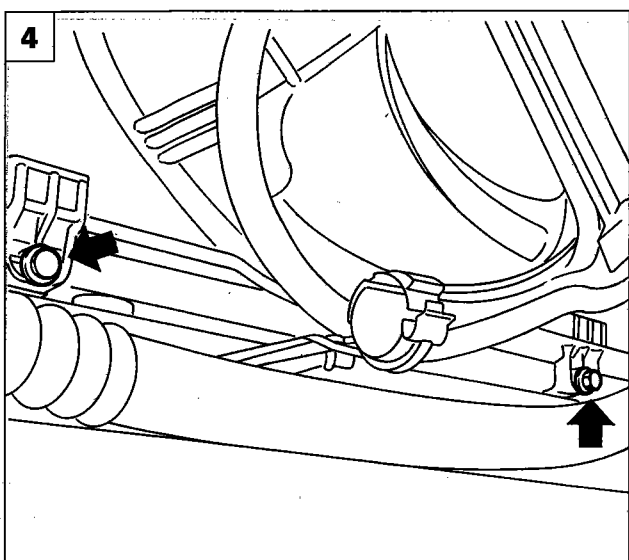


REMOVING-REFITTING RADIATOR FAN

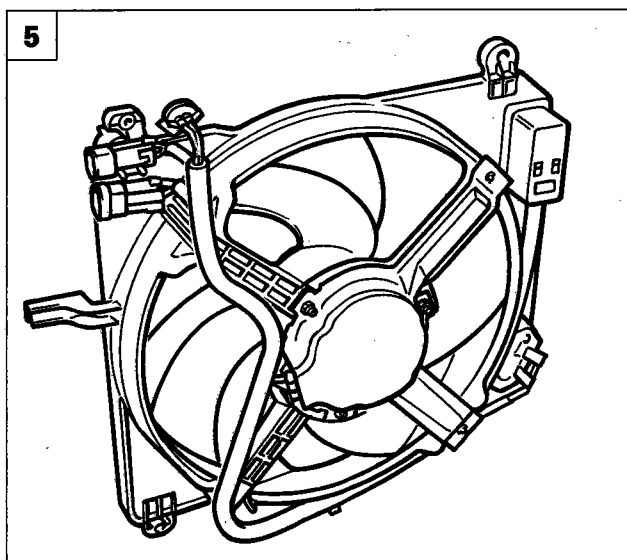
1. Place the car on ramps, disconnect the battery's negative cable, then remove the air duct.
2. Undo the fan's top bolts and the connections indicated.
3. Lift the car and remove the bottom sound-proofing shield from the car.
4. Undo the fan's bottom bolts.
5. Remove the fan from the car.



The operations described above may not apply if the engine or version are not the same as that illustrated above.

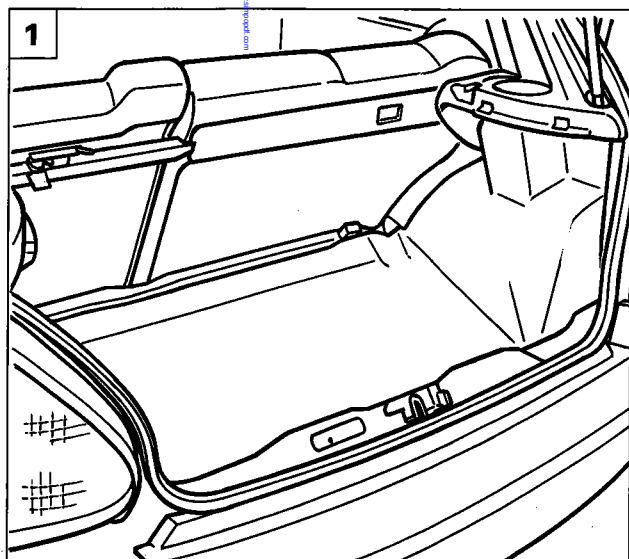


P4A045L04

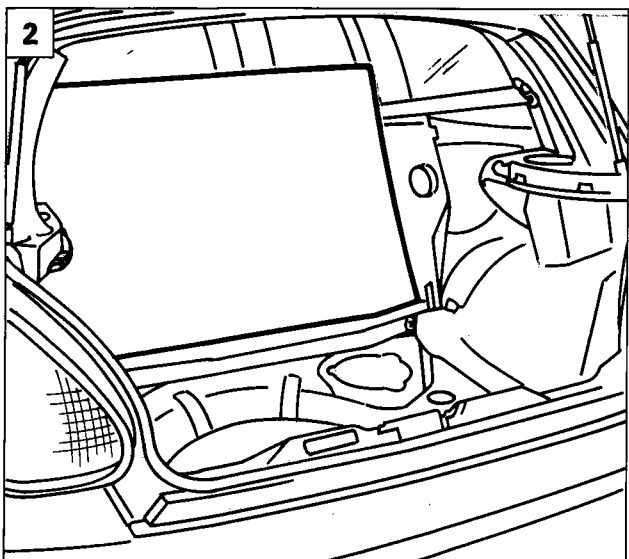


P4A045L05

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P4A046L01



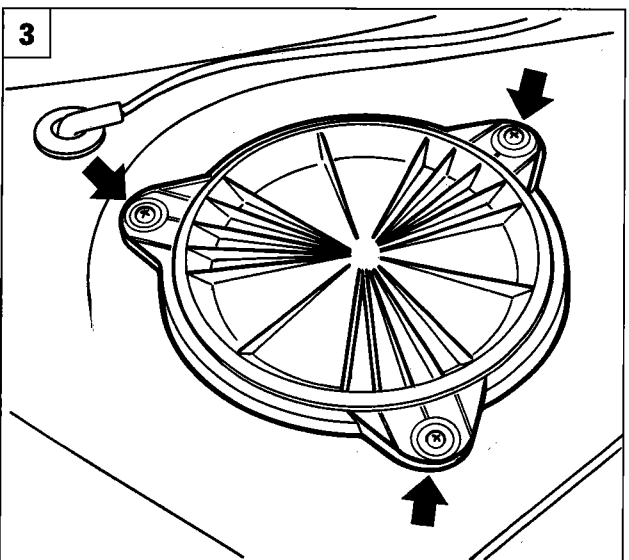
P4A046L02



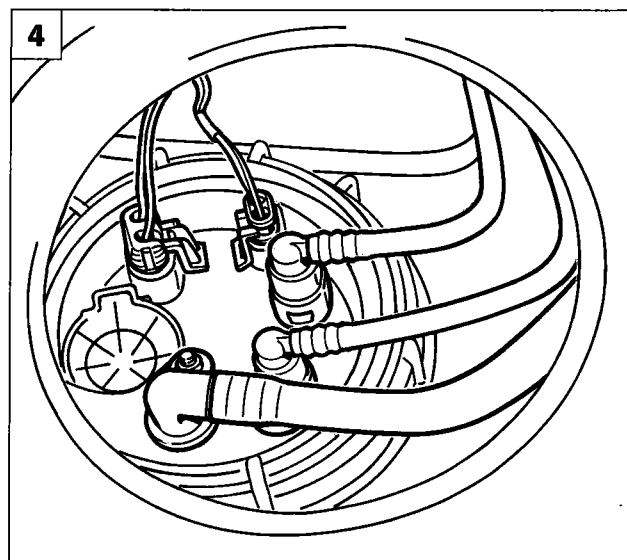
FUEL GAUGE SENDER UNIT

Removing-refitting

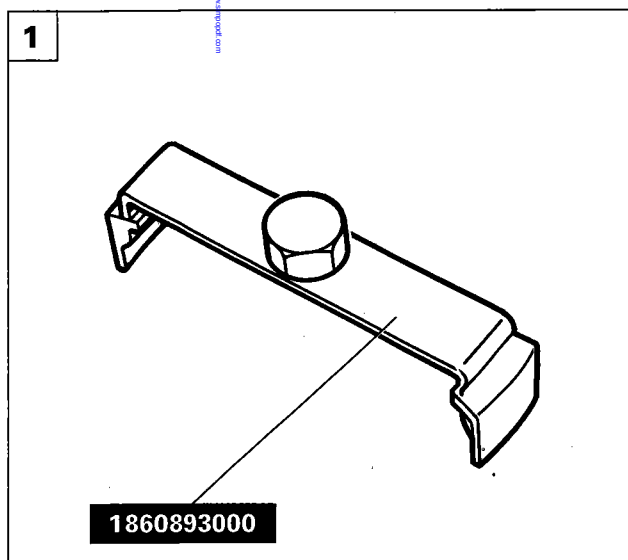
1. Open the tailgate and remove the parcel shelf.
2. Fold down the rear seat and lift the spare wheel cover.
3. Undo the screws (arrowed) and remove the protective cover.
4. Disconnect the electrical connections and the pipes from the fuel gauge sender unit.



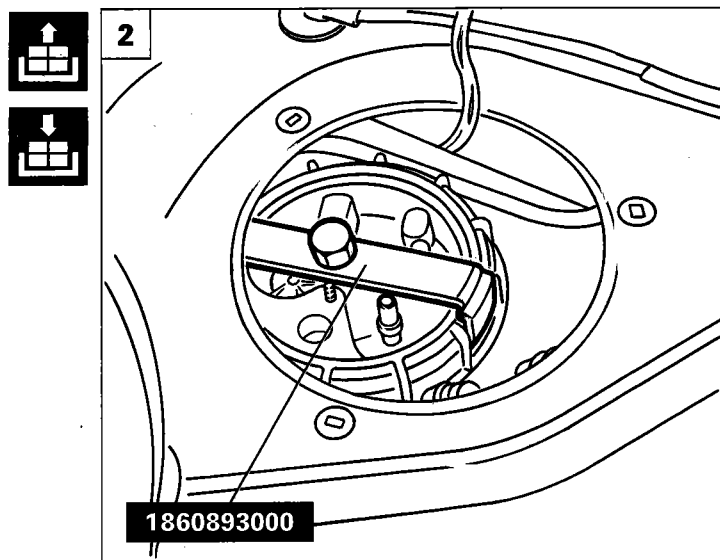
P4A046L03



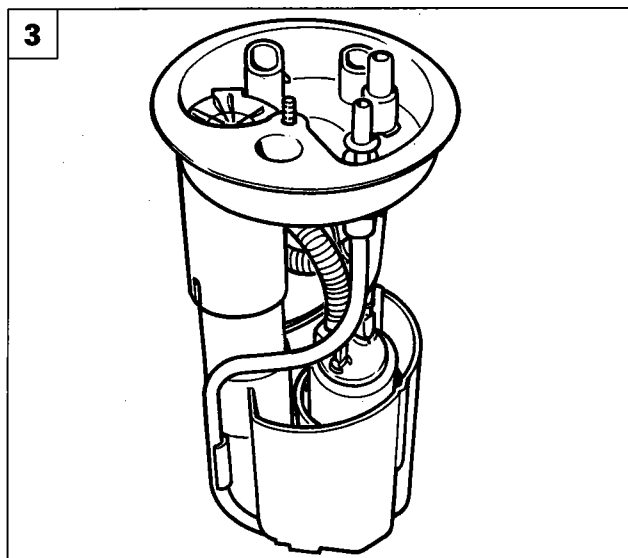
P4A046L04



P4A047L01

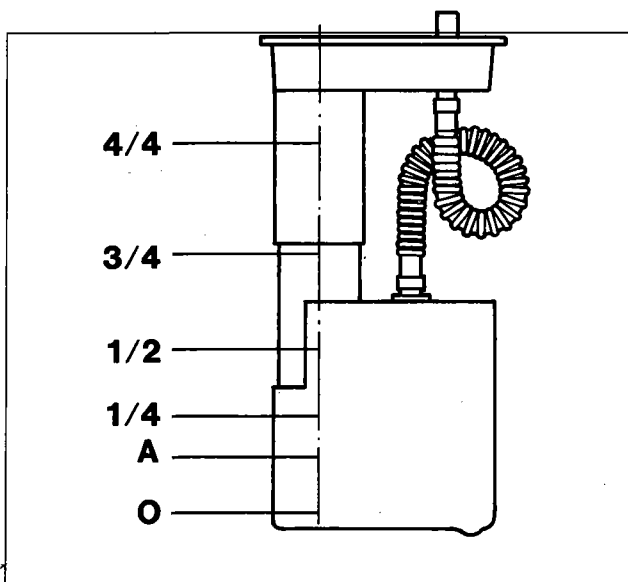


P4A047L02



P4A047L03

- 1-2. Fit the tool 1860893000 on the fuel gauge sender unit and remove the attachment ring nut.
3. Remove the fuel gauge sender unit from the car.



P4A047L04

Fuel gauge

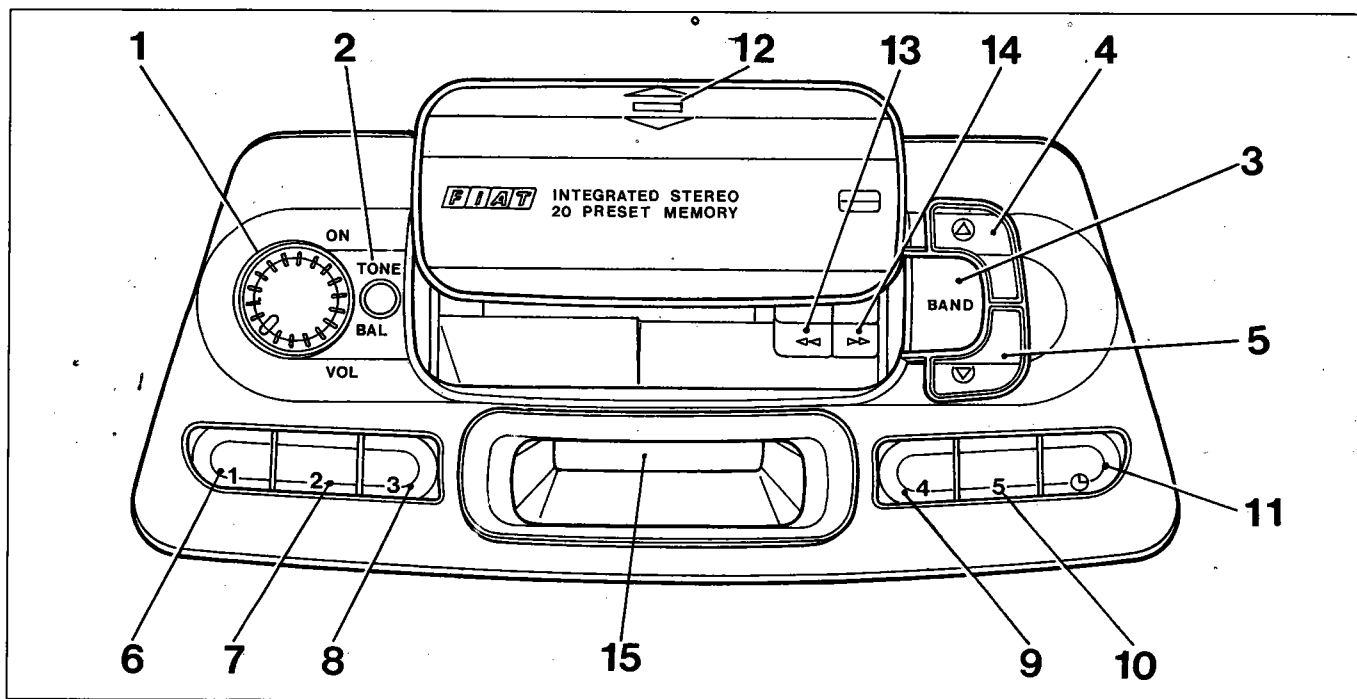
Values for checking calibration	
Pointer position	Value in Ohms
4/4	0 - 6
3/4	59 - 69
1/2	116 - 126
1/4	186 - 201
Start of reserve (A)	255 ± 3
0	290 - 304

55.

GRUNDIG AD 182 L RADIO AND CASSETTE PLAYER

The car is fitted as standard with a radio comprising the following main components:

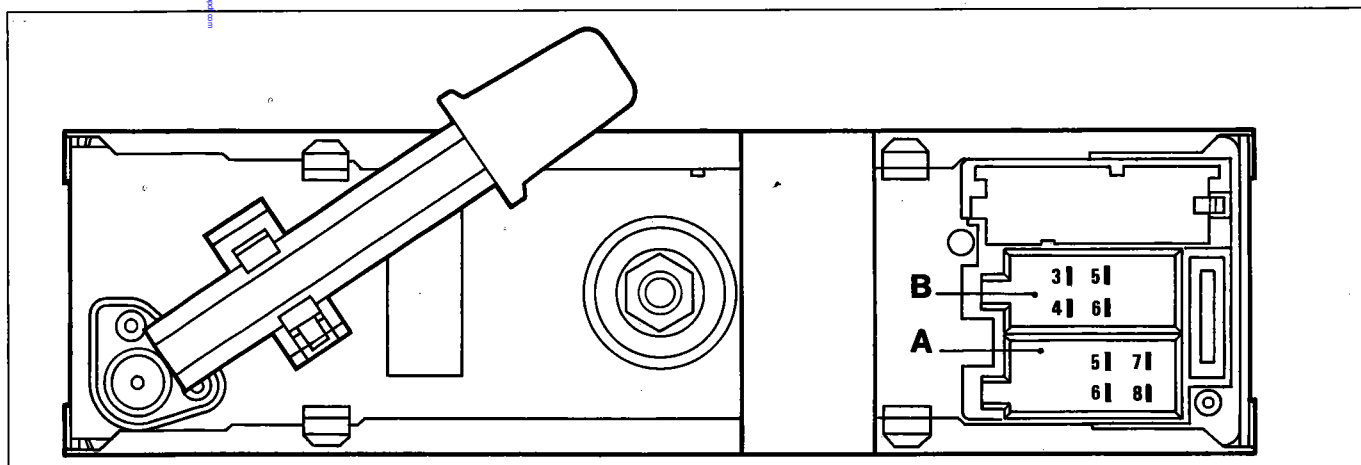
- GRUNDIG AD 182 L radio and cassette player (non removable) which is fitted at the centre of the instrument panel, and its customized FIAT front trim cover is fully integrated in the line of the dashboard;
- two loudspeakers located on the inner panels of the front doors;
- fishpole aerial located at the centre front of the roof.



P4A048L01

1. Knob for switching on the radio (by pressing) and adjusting the volume (by rotating);
2. Cylindrical button for adjusting the tone (pressure and rotation) and adjusting the balance between the two loudspeakers (by pressure, extraction and rotation);
3. Button for selecting the wave bands (FM1 - FM2 - MW - LW);
4. Button for automatic or manual search (single press or prolonged pressure) in order of increasing frequency of transmitting stations;
5. Button for automatic or manual search (single press only or prolonged pressure) in decreasing order of transmitting stations;
6. Button for preselection of transmitting station n° 1 - selection of priority of indication of time / radio frequency on the display;
7. Button for preselecting transmitting station n° 2 - adjustment in decreasing order of time;
8. Button for preselecting transmitting station n° 3 - adjustment of time in increasing order;
9. Button for preselecting transmitting station n° 4 - increasing adjustment of minutes;
10. Button for preselecting transmitting station n° 5 - adjustment in decreasing order of minutes;
11. Button for switching between display of radio frequency / time (single press only) and for selecting time adjustment (prolonged pressure);
12. Point for pressing and opening the flap covering the slot for inserting cassettes;
13. Button for fast rewind of the cassette tape and for expelling the cassette from its seating (press simultaneously with button 14);
14. Button for fast forward feed of the cassette tape and for expelling the cassette from its seating (press simultaneously with button 13);
15. Display of wave band / frequency of station being listened to / stereo transmission / search sensitivity / time.

Rear view of radio



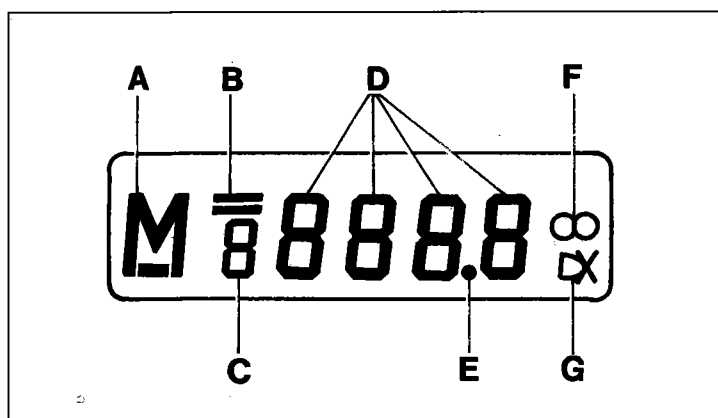
P4A049L01

SOCKET FOR CONNECTOR A	
Pin no.	Connection
5	Service
6	Lighting
7	Supply: positive
8	Supply: negative (earth)

SOCKET FOR CONNECTOR B	
Pin no.	Connection
3	Right loudspeaker
4	Right loudspeaker
5	Left loudspeaker
6	Left loudspeaker

NOTE The pins not mentioned in the tables are not connected.

DISPLAY INFORMATION



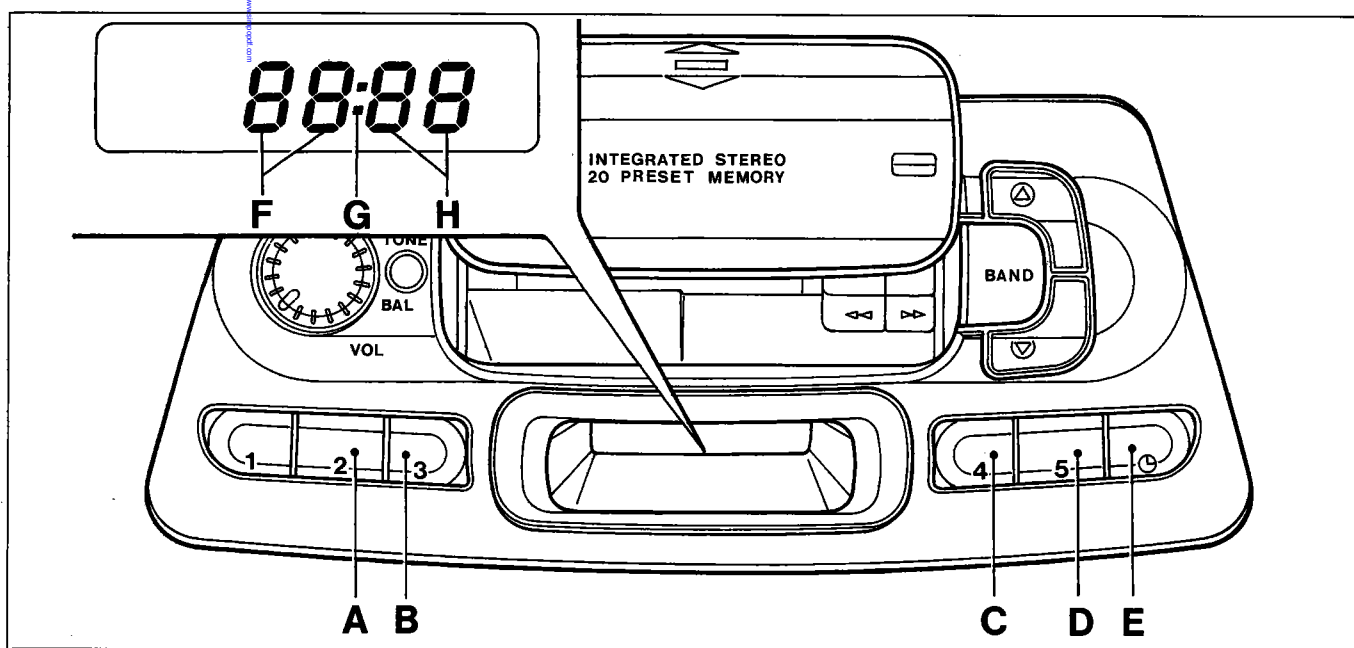
P4A049L02

- A. Distinctive letter of waveband - activation of manual search of transmitting stations - selection of priority of indication of time / radio frequency
- B. Horizontal lines indicating MF bands
- C. Number of preselected transmitting station or for selecting priority of indication of time / radio frequency
- D. Numbers indicating the tuning frequency
- E. Decimal point of frequency
- F. Symbol for listening of transmission in stereo
- G. Symbol of sensitivity of search for transmitting stations

Codes relating to the various wave bands or ranges

Code	Wave band and range
M	Medium wave
L	Long wave
U	Frequency modulation
M (*)	Manual search for transmitting stations
U -	Frequency modulation 1
U =	Frequency modulation 2

(*) = Button



F. Hours

G. Flashing colon

H. Minutes

P4A050L01

ADJUSTING DIGITAL CLOCK

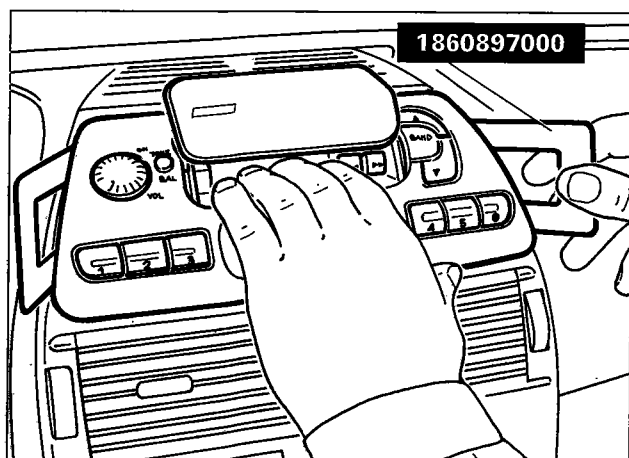
To adjust the clock, carry out the following operations in the order stated:

- Press the E button for more than two seconds until the letter M accompanied by the number 1 or 2 is displayed on the left of the display.
- To adjust the hours (F) press the buttons A and B (which increase or decrease the number).
- To adjust the minutes (H) press the buttons C and D (which increase or decrease the number).
- Press the E button again to memorize the new time, which will also be visible when the car is stopped with the radio off, with the colon (G) flashing.

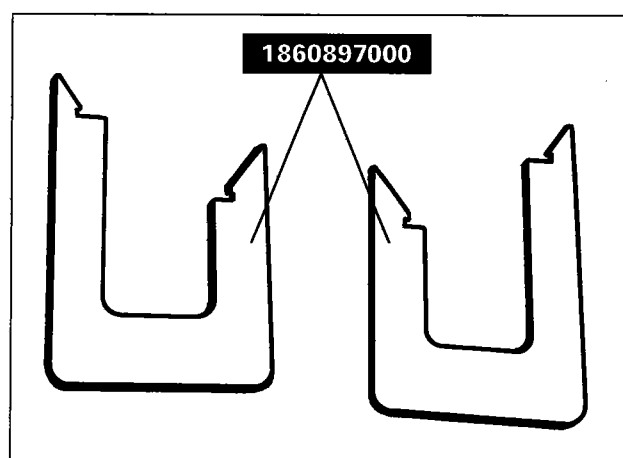
TECHNICAL CHARACTERISTICS	
No. of output channels	2
Musical output power	About 8W peak (per channel)
Nominal output power	≤ at 4W RMS
Load impedance	4 Ohm

REMOVING-REFITTING RADIO

Fit tool 1860897000 as shown in the figure, then lift the flap for inserting the cassette and withdraw the radio from its seating. After disconnecting the electrical connections from the rear, remove the radio from the car.



P4A050L02



P4A050L03

RADIO CASSETTE MODEL AD 182 H

The vehicle can be equipped, on request, with a radio system which is composed of the following main components:

- radio cassette player (which cannot be removed) model AD 182 H which is fitted in place of the previous one in the centre of the dashboard and the personalized FIAT front section is completely integrated with the contours of the dashboard;
- six speakers, two of which are positioned at the side in the upper part of the dashboard, two being positioned in the same place as for the previous system in the front door panels and the last two are positioned at the sides of the rear parcel shelf;
- aerial located at the centre front section of the roof.
- cable for connection with compact disc player (CD) (if fitted);

The radio cassette player model AD 182 H is equipped with the following functions:

RADIO SECTION

- PLL tuning with FM/MW/LW frequency bands
- RDS (Radio Data System) with TP (Traffic Program) - EON functions
- Automatic / manual station tuning
- Manual programming of 6 stations in the FM band, 6 in the RDS1 band, 6 in the RDS2 band, 6 in the MW band and 6 in the LW band.
- Automatic programming (AUTOSTORE function) of 6 stations in the RDS2 band
- Automatic DX function (Distant: maximum sensitivity in searching for radio stations)
- Scan function (scanning for stations programmed).

CASSETTE SECTION

- Autoreverse
- Fast forward and rewinding of the tape
- Automatic recognizing and equalizing of "Cr / Me" tapes with optimum sound reproduction
- Music Search System function (automatic search for previous / next track)
- Listening to radio whilst fast forwarding or rewinding the tape.
- DOLBY B (noise reduction circuit) (*)

COMPACT DISC SECTION (if the CD player is fitted)

- Disc selection (Disc No.)
- Track selection (forwards / backwards)
- Repeat Function (repetition of last track or repetition of CD)
- Scan Function (scanning tracks on Compact Disc)
- Random Function (random reproduction of tracks).

AUDIO SECTION

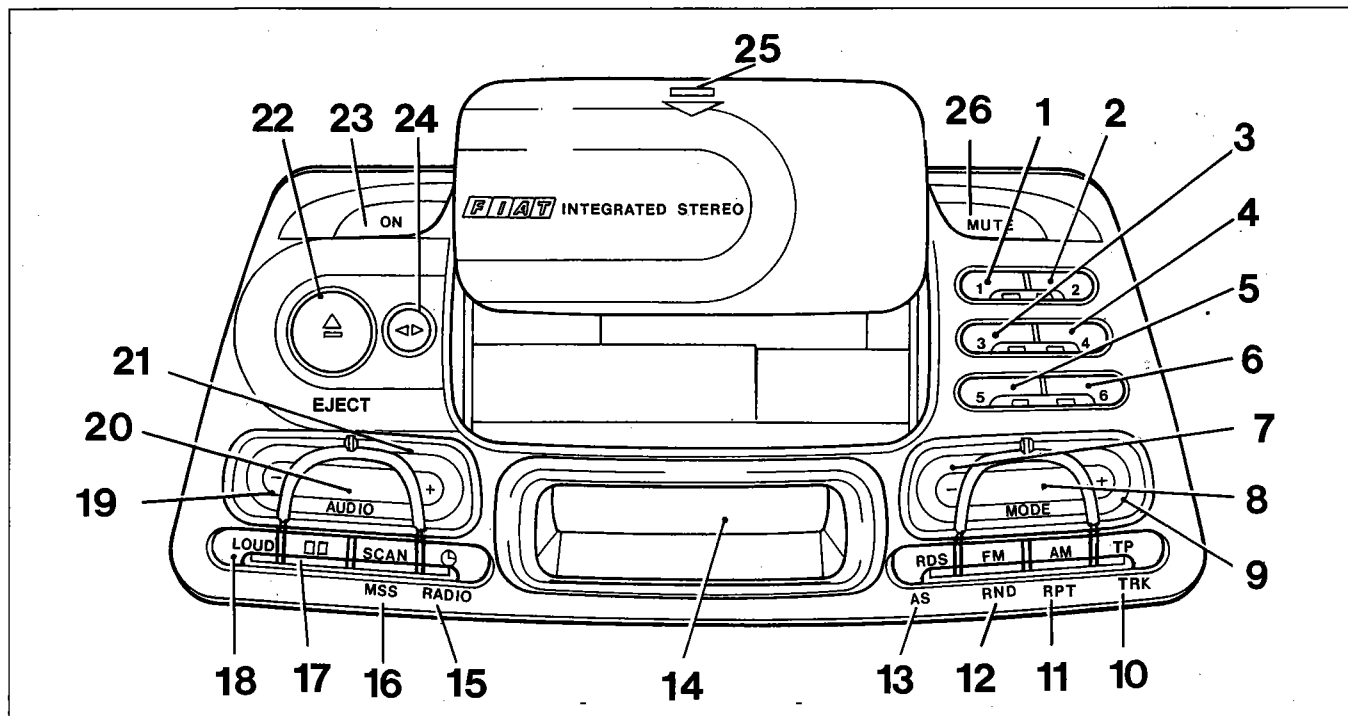
- Loudness Function
- Mute Function
- Pause Function
- Separate adjustment of low / high
- Right / left and front / rear channel balancing
- Radio on / off logic selection
- Pre-setting volume level for TP function.

CLOCK SECTION

- Adjustment of hours / minutes
- Clock / Radio, Cassette or Compact Disc functions priority selection.

(*) *The DOLBY noise reduction circuit is manufactured under licence by the Dolby Laboratories Licensing Corporation. DOLBY and the double D symbol are their registered trade marks.*

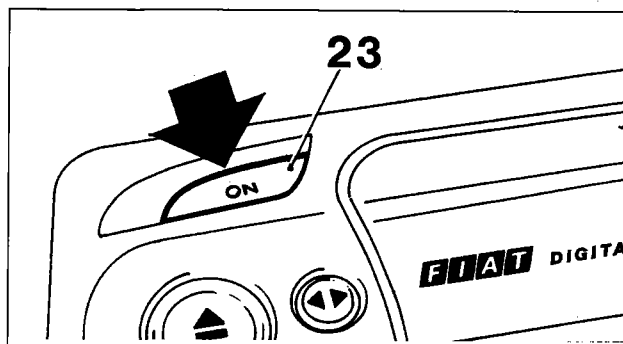
Description of the controls



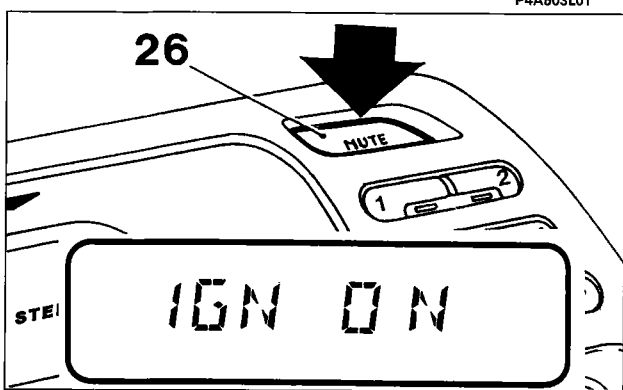
P4A502L01

1. Switch for programming station N. 1 / selecting CD N. 1 / adjustment in decreasing order of clock hours / entering of 1st anti-theft device code figure
2. Switch for programming station N. 2 / selecting CD N. 2 / adjustment in decreasing order of clock hours / entering of 2nd anti-theft device code figure
3. Switch for programming station N. 3 / selecting CD N. 3 / adjustment in decreasing order of clock minutes / entering 3rd anti-theft device code figure
4. Switch for programming station N. 4 / selecting CD N. 4 / adjustment in increasing order of clock minutes / entering 4th anti-theft device code figure
5. Switch for programming station N. 5 / selecting CD N. 5 / selecting hour priority on display
6. Switch for programming station N. 6 / selecting CD N. 6 / selecting radio, cassette, CD function priority on display
7. Switch for automatic or manual tuning in decreasing frequency order, rewinding cassette tape, selecting previous CD track
8. Switch for selecting radio, cassette, CD operating modes
9. Switch for automatic or manual tuning in increasing frequency order, winding on cassette tape, selecting next CD track
10. Switch for selecting the following functions: traffic news (TP), CD track repetition, anti-theft mode with security code
11. Switch for selecting the following functions: medium/long wave bands, manual search for transmitter, CD track repetition
12. Switch for selecting the following functions: FM band, manual search for transmitter, random CD track repetition
13. Switch for selecting the following functions: FM band for RDS stations only (Radio Data System), automatic programming of stations in RDS2 band
14. Display
15. Switch for changing display of radio frequency, cassette player, CD, time (impulse only) and selecting time adjustment (prolonged pressing)
16. Switch for selecting listening for 10 seconds to each of the stations programmed, automatic search for previous or next cassette track, listening for 10 seconds to various CD tracks
17. Dolby B function selection switch (elimination of hissing)
18. Loudness selection switch
19. Switch for adjusting functions selected with switch 20 in decreasing order
20. Audio functions selection switch: volume, low/high tones, right/left balance, front/rear and pre-setting volume level for TP (traffic information)
21. Switch for adjusting functions selected with switch 20 in increasing order
22. Switch for automatically opening cassette housing and ejecting the tape
23. Radio activating/deactivating switch
24. Reverse function selection switch
25. Pressure point for manually closing cassette housing flap
26. Switch for selecting the following functions: Mute, radio on logic

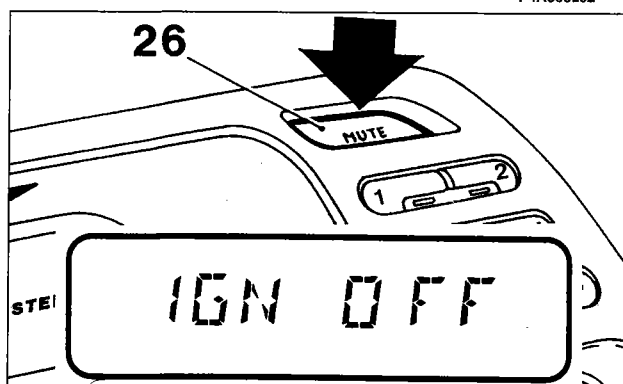
DESCRIPTION OF THE OPERATION OF THE RADIO MODEL AD 182 H



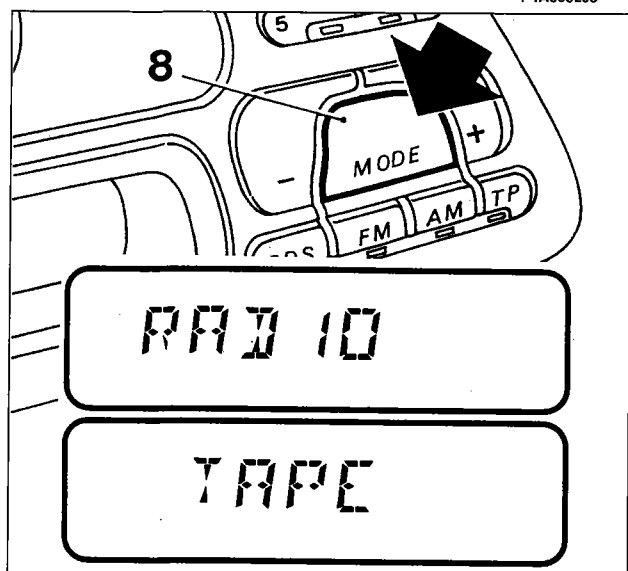
P4A503L01



P4A503L02



P4A503L03



P4A503L04

RADIO ON

Press the ON switch (23) once: the equipment should come on. If the radio is on whilst the engine is off, then it goes off automatically after around 20 minutes.

Switching on / off with engine started / stopped

The radio possesses a logic whereby if activated it allows the radio to be switched on / switched off simultaneously to the engine being started up / switched off.

If the logic is activated: when the engine is started up / switched off, the radio is automatically switched on / off.

If the logic is not activated: the radio can be switched on / off irrespective of whether the engine is switched on / off.

In order to activate this logic, proceed as follows:

- keep the "MUTE" button (26) pressed with the radio off until the words "IGN ON" appear on the display, then switch on the radio with the "ON" switch (23).



The logic is only activated when the radio is switched on with the "ON" switch (23).

To deactivate this logic, proceed as follows:

- keep the "MUTE" button (26) pressed with the radio off until the words "IGN OFF" appear on the display.

Irrespective of whether or not the logic is activated, it is possible to switch the radio on / off and to activate / deactivate the "MUTE" function, which can be selected with the radio on as indicated in the paragraph "Mute Function", without this logic being activated or deactivated.

SELECTING RADIO / CASSETTE / COMPACT DISC FUNCTIONS

Press the "MODE" switch (8) repeatedly to select the following functions cyclically:

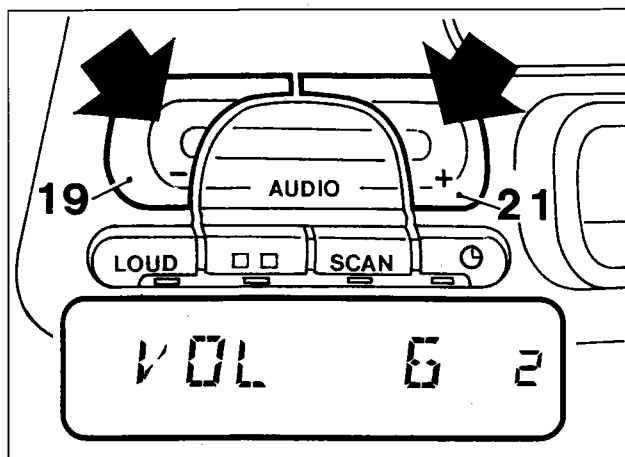
- RADIO: the word "RADIO" appears on the display momentarily;
- CASSETTE (if previously switched on): the word "TAPE" appears on the display momentarily;
- COMPACT DISC (if a Compact Disc player is fitted) : the word "CD" appears on the display momentarily.

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NOTE The functions which cannot be selected (for example cassette when it has not been switched on previously, CD where it is not fitted) are automatically excluded.

PAUSE FUNCTION

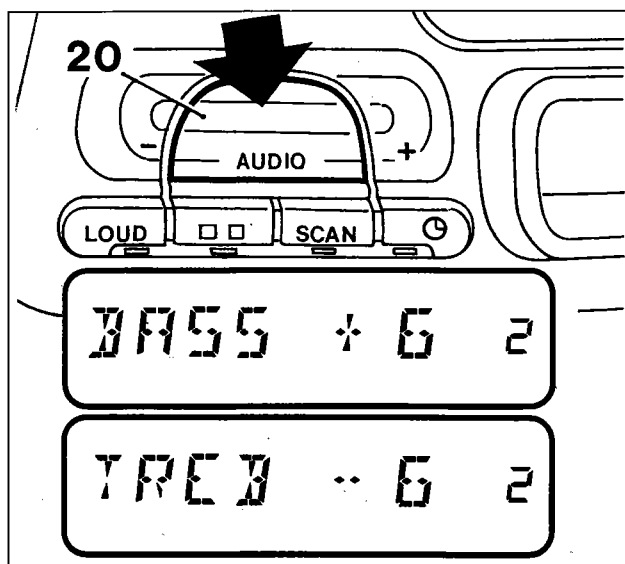
If when listening to a cassette or a compact disc another function is selected (for example the radio), the reproduction is interrupted and when returning to the "Cassette" or "Compact Disc" mode it starts again from the point where it was interrupted. If when listening to the radio another function is selected, on returning to the "Radio" mode, the last station selected is tuned into.



P4A504L01

ADJUSTING THE VOLUME

- Press the "AUDIO +" switch (21) to increase the volume and the "AUDIO -" switch (19) to decrease it;
- by pressing the switch briefly it is possible to change gradually in steps;
- by pressing it for longer, it is possible to change quickly and the word "VOL" appears on the display with the volume level;

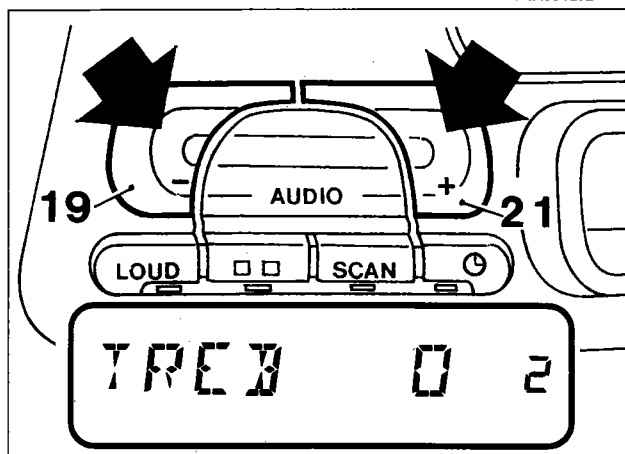


P4A504L02

ADJUSTING THE TONE

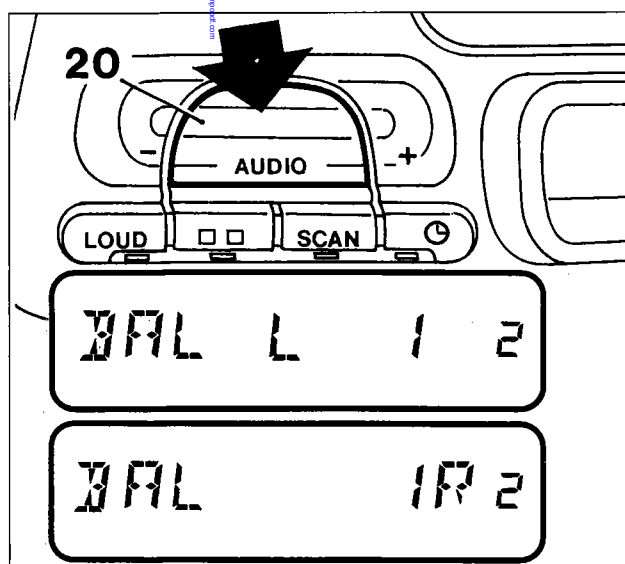
- Press the "AUDIO" switch (20) briefly and repeatedly until the words "BASS" or "TREB" appear on the display (adjustment of Bass or Treble)
- press the "AUDIO +" switch (21) to emphasize the bass or treble or the "AUDIO -" switch (19) to decrease them;

NOTE The "BASS" and "TREB" settings are between - 6 and + 6.

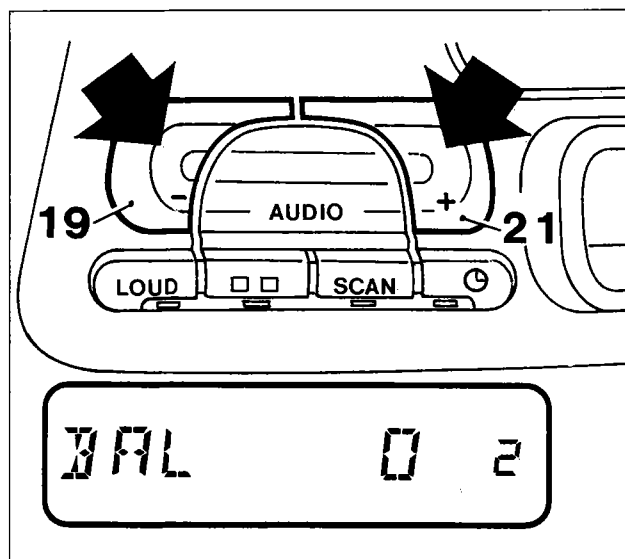


P4A504L03

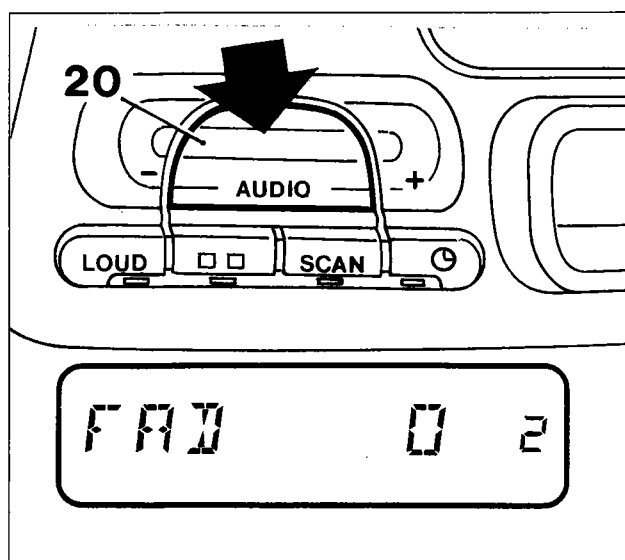
- by pressing the switch briefly it is possible to change gradually in steps;
- by pressing it for longer it is possible to change quickly;
- by pressing the "AUDIO +" and "AUDIO -" switches at the same time, the adjustment in the central position is selected and the zeroed bass / treble level appears on the display.



P4A505L01



P4A505L02



P4A505L03

ADJUSTING THE BALANCE (between right and left speakers)

- Press the "AUDIO" switch (20) briefly and repeatedly until the word "BAL" appears on the display (balance adjustment selection);
- press the "AUDIO +" switch (21) to emphasize the sound coming from the right speakers or the "AUDIO -" switch (19) to emphasize the sound coming from the left speakers and the balance levels appear on the display (L = left, R = right)
- by pressing the switches briefly it is possible to change gradually in steps;
- by pressing them for longer, it is possible to change quickly;

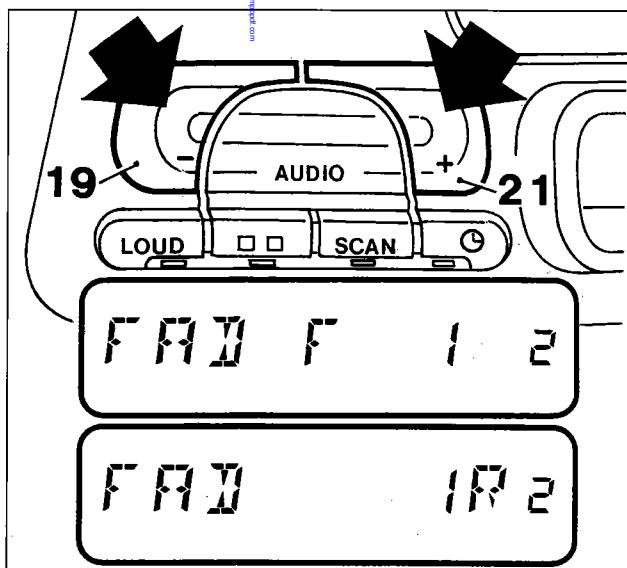
NOTE *The values which can be set for "BAL L" and "BAL R" are between 0 and 15.*

- by pressing the "AUDIO +" and "AUDIO -" switches at the same time, the adjustment is selected in a central position and the zeroed balance level appears on the display.

ADJUSTING THE FADER (balance between front and rear speakers)

- Press the "AUDIO" switch (20) briefly and repeatedly until the word "FAD" appears on the display (Fader adjustment selection).

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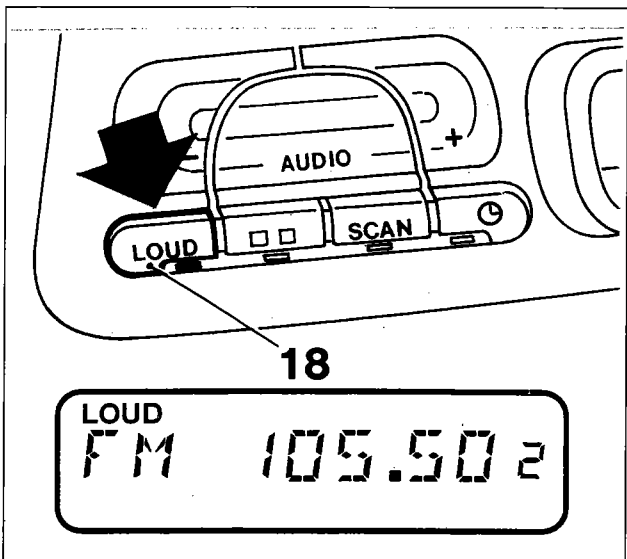


P4A506L01

- press the "AUDIO +" switch (21) to emphasize the sound coming from the rear speakers or the "AUDIO -" switch (19) to emphasize the sound coming from the front speakers and the Fader levels will appear on the display (F = front; R = rear);
- by pressing the switches briefly, it is possible to change gradually in steps;
- by pressing them for longer, it is possible to change quickly;

NOTE The "FAD F" and "FAD R" values which can be set are between 0 and 15.

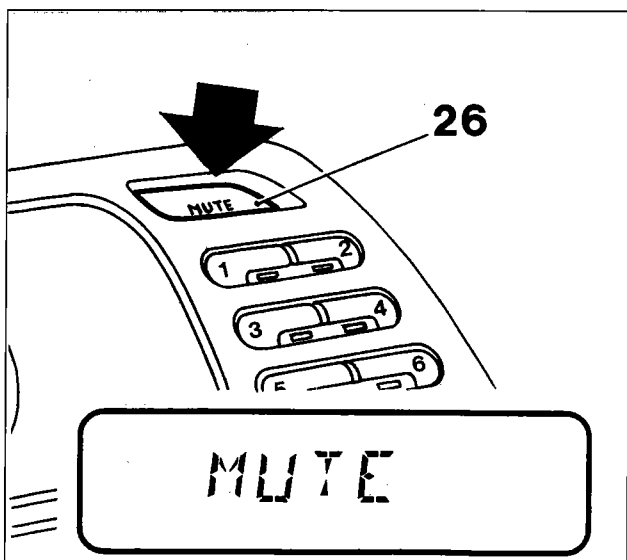
- by pressing the "AUDIO +" and "AUDIO -" switches at the same time the adjustment in the central position is selected and the display shows the zeroed Fader level (see diagram at the foot of the previous page).



P4A506L02

LOUDNESS FUNCTION

- Press the "LOUD" switch (18) to activate / de-activate this function which makes it possible to emphasize the bass whilst listening. If the function is activated, the LED under the switch comes on and the word "LOUD" appears on the display.



P4A506L03

MUTE FUNCTION

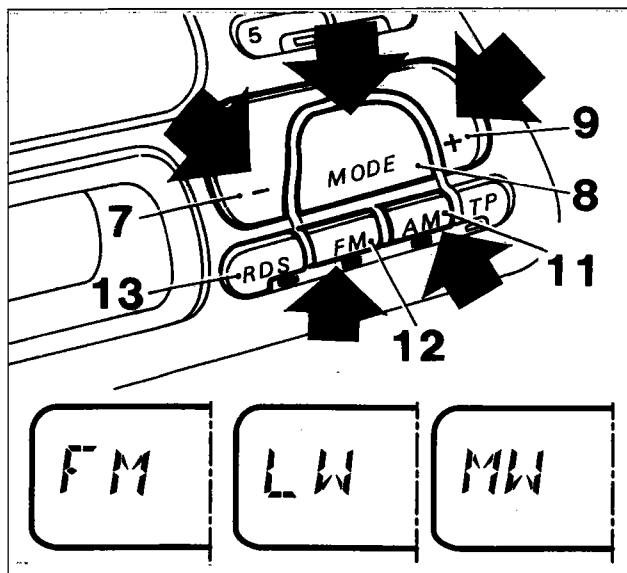
- Press the "MUTE" switch (26) to activate / deactivate this function. If the function is activated, the radio does not send any signal to the speakers and the word "MUTE" appears on the display.

RADIO FUNCTION



The reception conditions vary constantly when driving. The reception can be interfered with by the presence of mountains, buildings or bridges, particularly when the transmitter is far away.

NOTE When the "RADIO" function is activated, the last station listened to before switching off is received.



P4A507L01

Selecting the function

As soon as the radio is switched on, the radio is heard. To select the Radio function whilst listening to a cassette or a compact disc, press the "MODE" switch (8) repeatedly until the word "RADIO" appears on the display.

Selecting the band

Press the "FM" switch (12) or the "AM" switch (11) briefly to select the desired reception band (the LED under the switch selected should come on).

Each time the "AM" switch (11) is pressed, the "MW" or "LW" stations are selected.

If you wish to select stations which are transmitted on the RDS (Radio Data System), see the description overleaf (RDS FUNCTION).

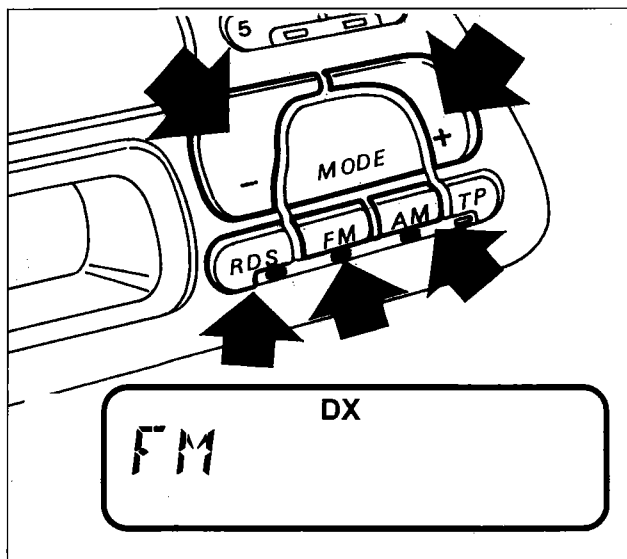
Manual search tuning

This makes it possible to search manually for stations on the pre-selected band.

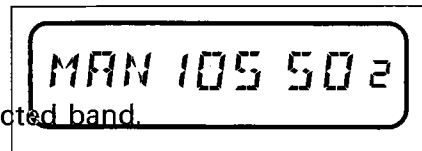
- Select the band: "FM", "MW" or "LW".
- keep the "FM" switch (12) pressed (if the FM band is selected) or the "AM" switch (11) (if the MW or LW band is selected) until the word "MAN" appears on the display.
- press the "MODE +" switch (9) or the "MODE -" switch (7) to select the desired station;
- by pressing the switch briefly it is possible to change frequency gradually in steps;
- by pressing it for longer it is possible to change frequency quickly.



The manual search function is not activated for bands RDS1 and RDS2.



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You return to the automatic tuning mode automatically (the word "MAN" disappears from the display) after 60 seconds or if one of the station programming switches numbered from "1" to "6" is pressed briefly. In the latter case the station previously programmed with this switch is tuned into.

Automatic search tuning

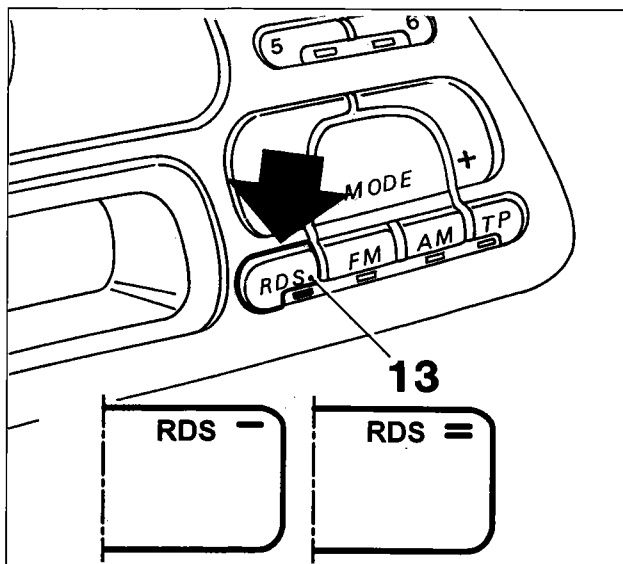
This makes it possible to automatically search for stations in the pre-selected band.

- Select the band: "RDS1", "RDS2", "FM", "MW" or "LW";
- press the "MODE +" switch (9) or the "MODE -" switch (7);

The sensitivity of the search increases starting from the 2nd stage through the entire frequency range (the word "DX" appears on the display).

Programming the last station listened to

The last station listened to for each reception band is automatically kept in the memory and then tuned into the moment the radio is switched on or the reception band is changed.



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RDS FUNCTION (Radio Data System)

If you wish to select stations which transmit on RDS (Radio Data System), press the "RDS" switch (13) briefly (the LED under the switch will come on).

Each time the switch is pressed, the stations on "RDS1" (display shows "RDS -") or "RDS2" (display shows "RDS =") are selected. The RDS system makes it possible, with the transmitters enabled, to automatically tune into the optimum frequency for the station you have selected: you can therefore continue to listen to the station without having to alter the frequency when changing areas. Naturally it must be possible to receive the station being listened to in the area one is passing through.

The name of the station transmitting on RDS appears on the display.

Automatic programming in RDS2 band (AUTOSTORE)

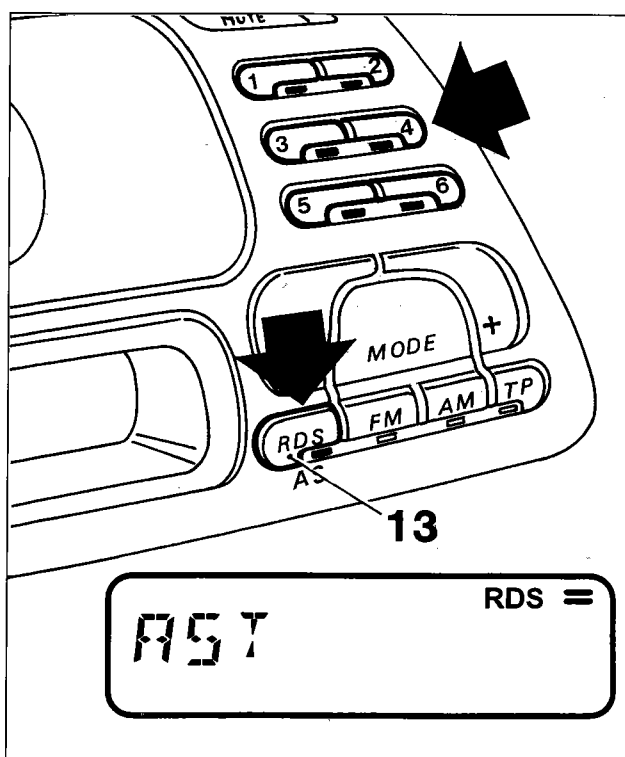
It is possible to memorize 6 stations in the RDS2 band. If the RDS mode is set (RDS1 or RDS2), keep the "AS" switch (13) pressed until the sound switches off.

The stations transmitting programmes on RDS with the most powerful signal at that moment will be automatically programmed at buttons (1), (2), (3), (4), (5) and (6). A maximum of 2 passages through the entire frequency range are made with increasing search sensitivity.

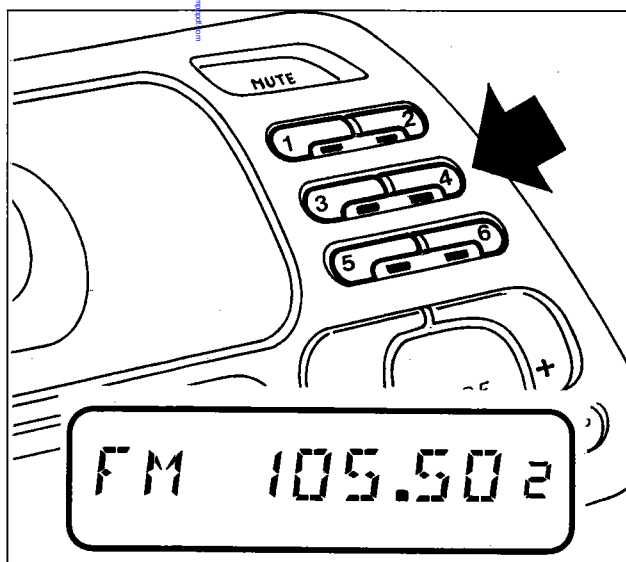
During the search the word "AST" appears on the display. When the programming is complete, the radio tunes in automatically to the frequency programmed for button (1).



The activating of the Autostore takes place if the RDS1 or RDS2 band is set.



P4A508L02



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Manual station programming

The station to which you are listening can be programmed in the range selected using buttons (1), (2), (3), (4), (5) and (6).

Keep the button pressed with which you wish to programme the station until transmitter is audible again. The LED under the switch will come on and the number corresponding to the switch will appear on the display.

Even if the supply voltage is interrupted, the memories remain active.

Listening to stations programmed

Proceed as follows:

- Select the band desired using switches (11), (12) and (13) (see page 50/7);
- press one of the six station programming buttons briefly;

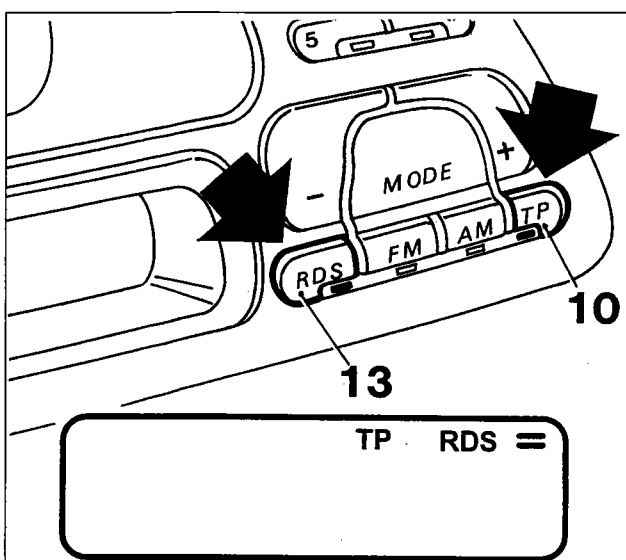
The LED under the switch will come on and the number corresponding to that switch will appear on the display. For bands RDS1 and RDS2, if the reception is not good, an alternative frequency is automatically searched for (the word "SRC" will appear on the display during the search).

TP Function (Traffic Programme)

Several stations belonging to the RDS1, RDS2 bands also transmit information on traffic conditions.

With the TP function (Traffic Programme) it is possible:

- a) to search only for RDS stations which transmit traffic information;
- b) to receive traffic information even if the cassette player or CD player function is selected;
- c) to receive traffic information at a minimum pre-set volume even with the radio volume at zero.



P4A509L02

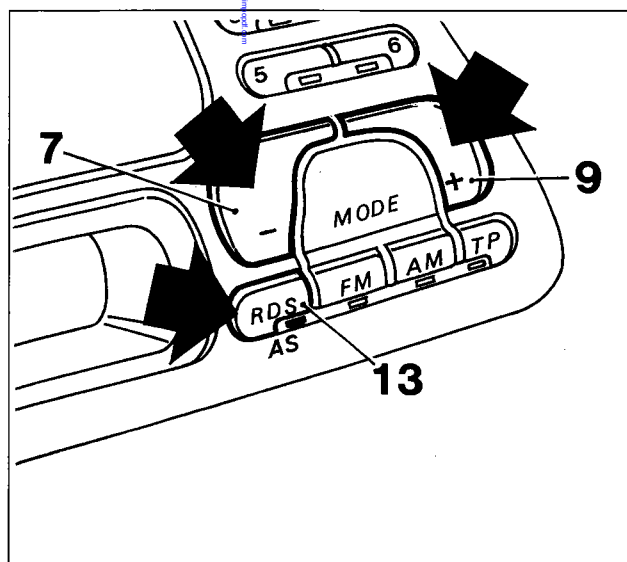
NOTE There follows instructions for carrying out each of the operations illustrated for points a), b) and c) described previously.

Point a)

- Select an RDS1, RDS2 band by pressing the "RDS" switch (13) briefly (the LED under the switch will come on);
- press the "TP" switch (10) briefly so that the word "TP" appears on the display (the LED under the switch will come on).

If the transmitter is not enabled to supply traffic information, then the radio will automatically tune into the closest one able to transmit it.

55.



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If you wish to search for other stations, press the "MODE -" (7) or "MODE +" (9) tuning switches.

To programme transmitters with the "TP" function activated, carry out the programming operations (see paragraph on "Programming a station").

As an alternative to the manual programming, by keeping the "AS" switch (13) pressed until the audio is switched off, the automatic programming will be carried out (see paragraph on "Automatic programming on RDS2 band - Autostore")

Point b)

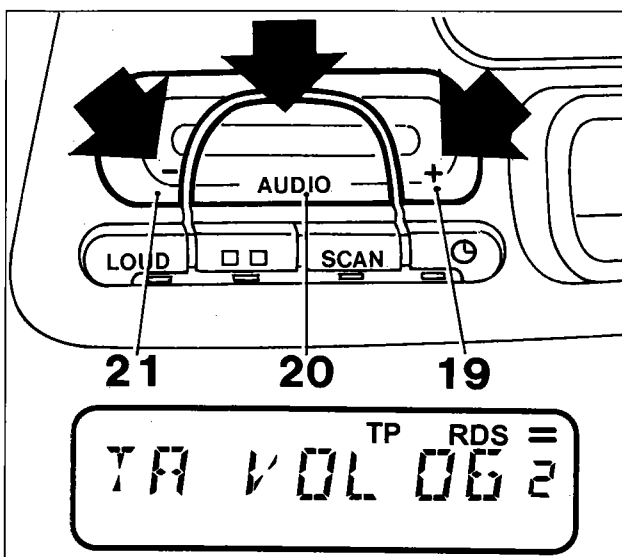
If you wish to receive traffic information, before putting in the tape or the compact disc, tune in to an RDS TP transmitter. If, whilst listening to the tape or compact disc, the latter transmits traffic information, the reproduction of the tape or the compact disc will temporarily be halted and resumed automatically when the message is over.

Point c)

Even when not listening to the radio it is possible to receive traffic information. After tuning in to an RDS TP transmitter and placing the volume level at zero, if traffic information is transmitted it will be heard at a pre-set minimum volume.



In certain countries there are radio stations that, even if the TP function is activated, do not transmit traffic information.



P4A510L02

Pre-setting volume level for TP function (Traffic Programme)

- Select the desired volume level using the "AUDIO -" (19) and "AUDIO +" (21) switches;
- keep the "AUDIO" switch (20) pressed until the words "TA VOL XX" appear on the display, where "XX" is the pre-set volume level;

NOTE The volume level which can be pre-set varies from 5 to 31 (max volume).

If no level or a minimum level of 5 is pre-set, then level 5 is automatically selected.

EON Function (Enhanced Other Network)

In certain countries circuits which cover several transmitters broadcasting traffic information are grouped together.

In these cases listening to the RDS TP station programme will be temporarily interrupted to receive traffic information each time it is transmitted by one of the transmitters in the same circuit.

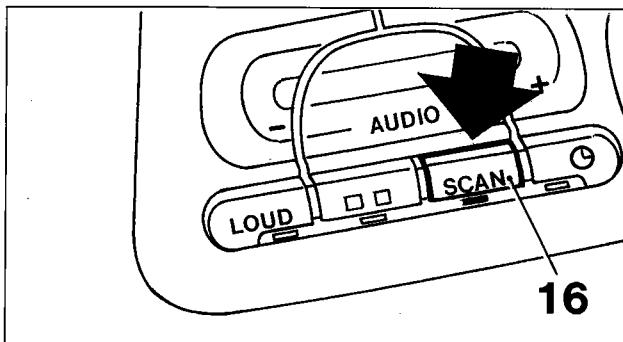
In order to exclude this function (EON), briefly press the "TP" switch (10) (the LED under the switch will go out).

Scanning programmed stations (SCAN Function)

With this function it is possible to cyclically tune in, for 10 seconds at a time, to all the stations which can be received which have been previously programmed on this band.

During scanning, when a station is tuned into, the LED under the switch where it is programmed comes on and the number of the switch appears on the display.

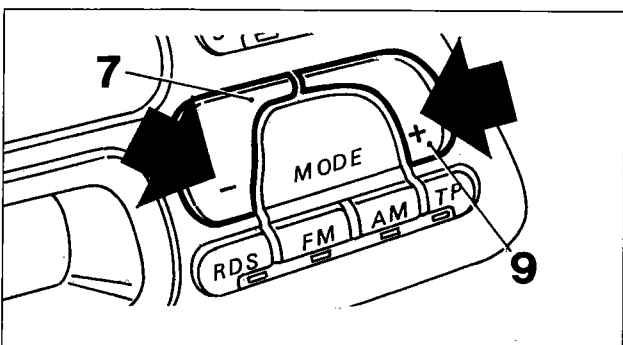
Stations where the signal is too weak cannot be heard.



P4A511L01

In order to select the SCAN function, proceed as described below:

- select the band desired;
- press the "SCAN" switch (16) (the LED under the switch comes on).



P4A511L02

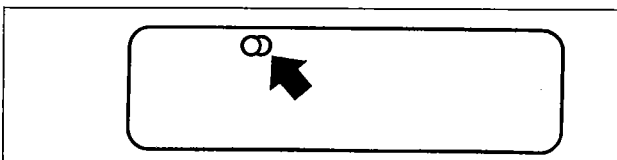
It is possible to change the direction of the search several times by pressing the "MODE +" (9) or "MODE -" (7) switches.

In order to interrupt the scanning, press the "SCAN" switch (16) again : the LED under the switch will go out and the station present at that moment will be heard.

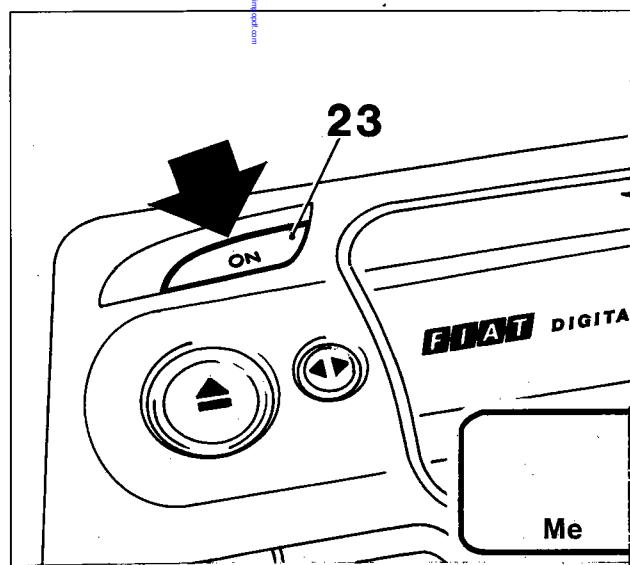
Stereo transmitters

When the station is transmitting the programme in stereo, the symbol shown by the arrow in the diagram below will appear on the display.

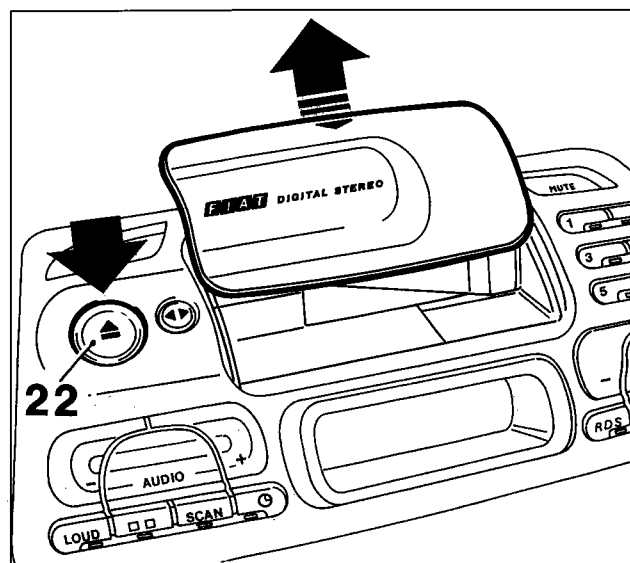
If the signal arriving is weak, the reproduction will be automatically switched from Stereo to Mono.



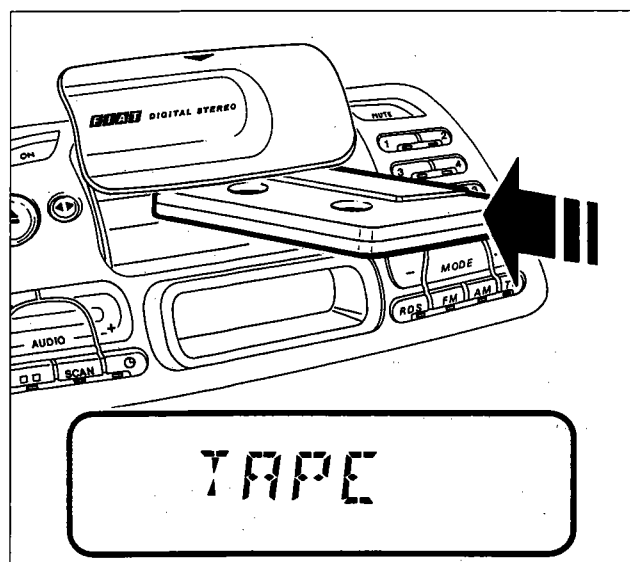
P4A511L03



P4A512L01



P4A512L02



P4A512L03

CASSETTE PLAYER

The radio is equipped with a cassette player which has an "Autoreverse" reverse function which makes it possible to listen to both sides of a tape without having to remove it and turn it over.

Automatic equalizing selection

Depending on the type of tape used the correct equalizing of the cassette player is carried out automatically.

If CHROME (CrO2) or METAL tapes are used, the word "Me" appears on the display.

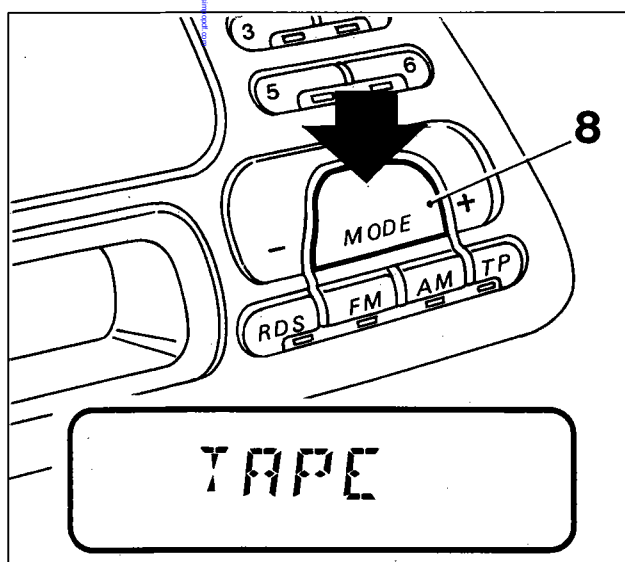
Cassette reproduction

- Activate the radio by pressing the ON switch (23);

- press switch (22), to open the cassette housing protective flap;

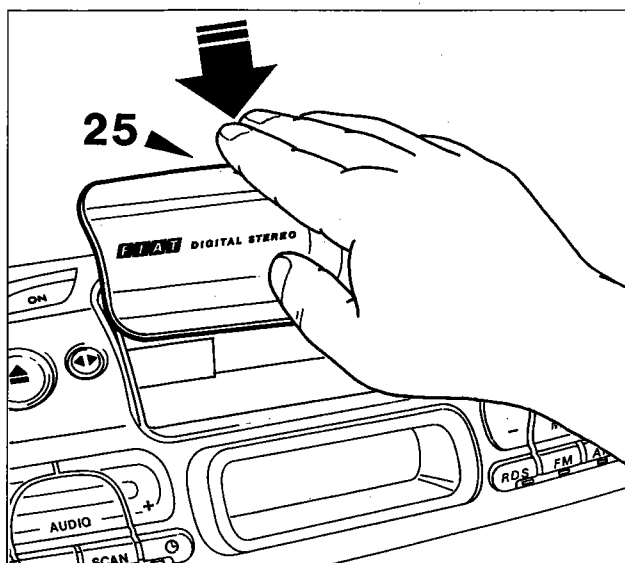
- insert the cassette properly in the housing, making sure that it is correctly in place; the reproduction will start and the word "TAPE" will appear on the display.

NOTE For the correct operation of the automatic selection, only insert the cassette in the housing when the radio is working.



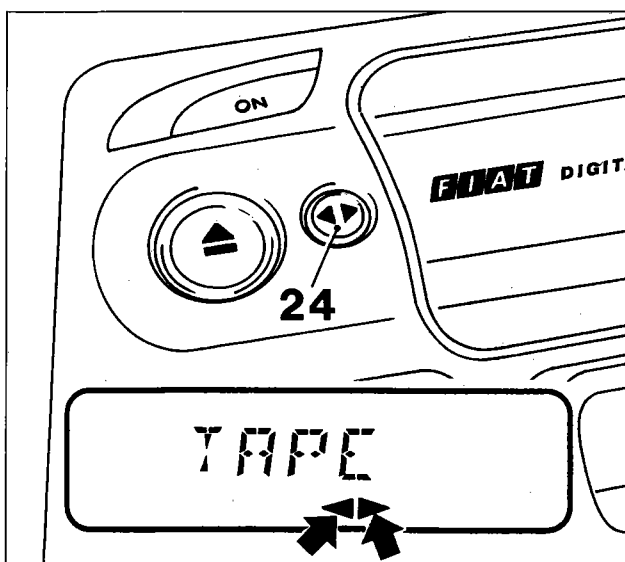
P4A513L01

- in order to reproduce a cassette already inserted previously, whilst listening to the radio or a compact disc, press the "MODE" switch (8) repeatedly until the word "TAPE" appears on the display;



P4A513L02

- to close the cassette housing, press in a vertical direction at the point shown by the symbol above the hand in the diagram at the side (25) with the flap closed until the retaining spring is heard to click.



P4A513L03

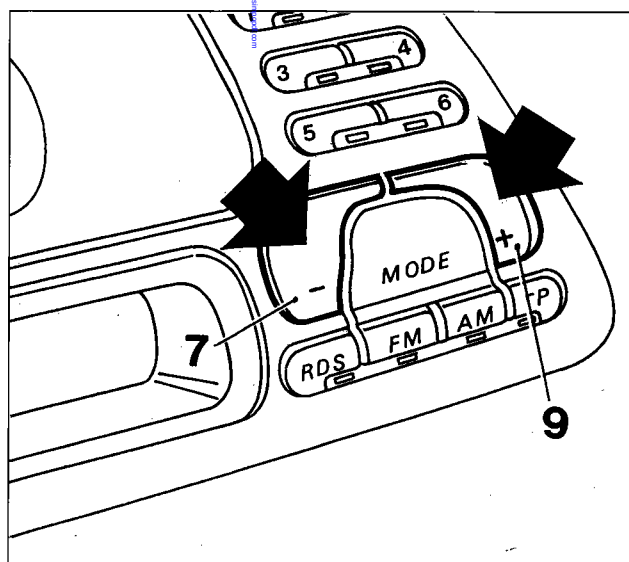
Changing cassette side

At the end of the tape the side of the cassette is changed automatically (Autoreverse). The display shows the side of the cassette being listened to.

The symbol shown by the right arrow illustrates the upper side, whilst the one shown by the left arrow indicates the lower side.

To change the side of the cassette, before the end of the tape, press switch (24) (Reverse).

55.



P4A514L01

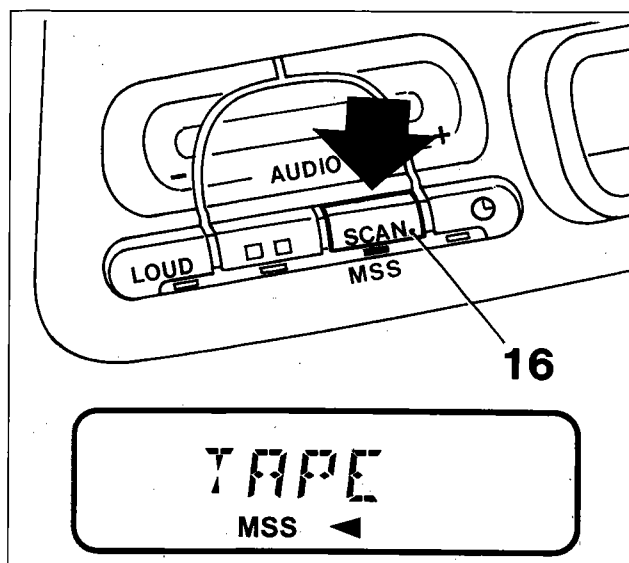
Fast forward / rewind

Press the "MODE +" switch (9) or the "MODE -" switch (7) to fast forward or rewind the cassette tape.

To stop the tape, press the switch used previously again.

Listening to the radio whilst fast forwarding / rewinding the tape

Whilst fast forwarding or rewinding a tape, the last station tuned into will be heard.



P4A514L02

Searching for previous / next track (Music Search System Function)

Keep the "MSS" switch (16) pressed until the word "MSS" appears on the display, at the same time the LED under the switch will come on. The tape will fast forward automatically until the next track is reached, from where it will start to play.

With the MSS function activated, press the "MODE +" switch (9) to listen to the next track on the tape.

Press the "MODE -" switch (7) whilst listening to a track to reproduce the track again from the beginning; by pressing this switch further it is possible to listen to the previous track.

Press these switches several times to go forwards / backwards several tracks equal to the number of times the switch is pressed.

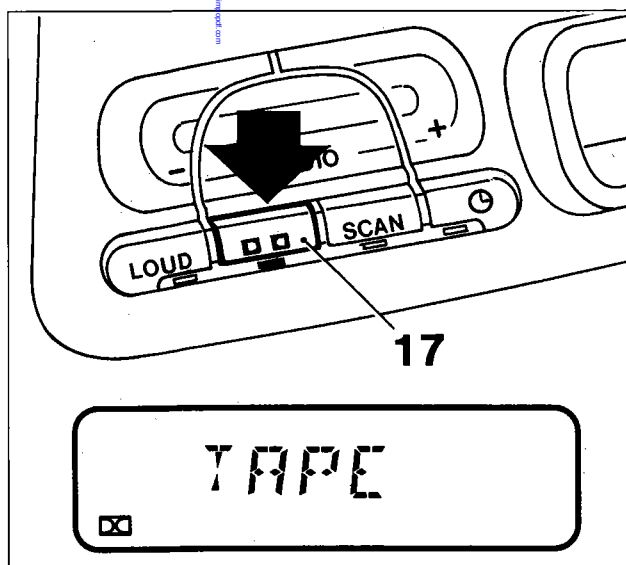
To interrupt the search, gently press the last switch selected (MODE + or MODE -). In these circumstances the reproduction will be activated starting from that point.

To exit from the MSS mode, press the "MSS" switch (16) again: the LED under the switch will go out and the word "MSS" will appear on the display.



The previous / next track search function cannot be activated correctly with the following types of tapes:

- tapes recorded at low levels (for example with weak sound and imperfect recording);
- tapes with conversations;
- tapes with blank sections lasting less than 3 seconds;
- tapes with long periods of silence in the recordings;
- tapes which do not have blank sections of tape (for example live recordings);
- tapes with a lot of background noise in the blank sections.

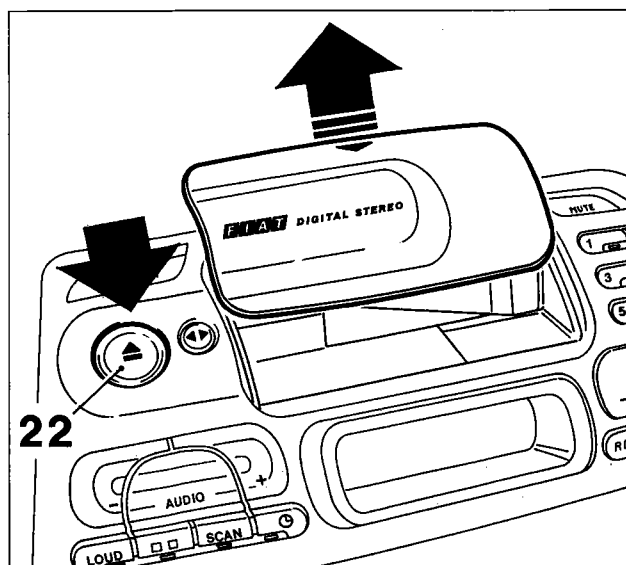


P4A515L01

Dolby B Function

Press switch (17) to activate / deactivate the Dolby B function (device for limiting the noise produced under licence by the "Dolby Laboratories Licensing Corporation") (*). When the Dolby function is activated, the LED under the switch comes on and the appropriate symbol (illustrated in the diagram, bottom left) appears on the display.

(*) *Dolby and the symbol (two Ds) are registered trade marks of the above company.*



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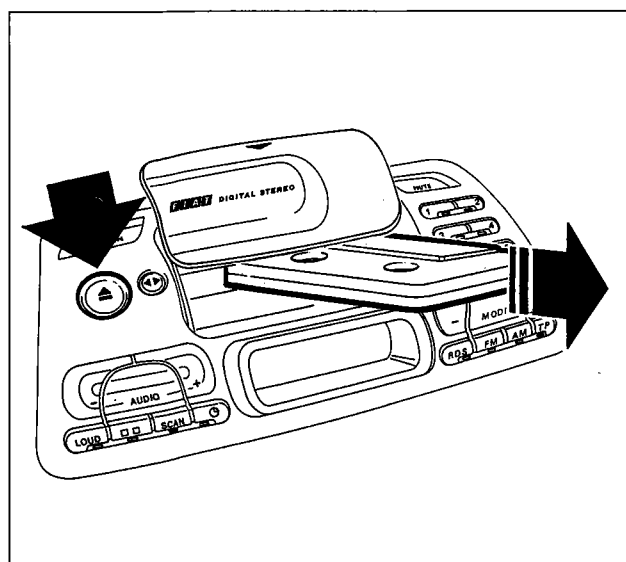
Ejecting the cassette

- Press switch (22) briefly to open the cassette housing protective flap;
- press switch (22) briefly a second time to eject the cassette.

NOTE *The same result is achieved by keeping the switch (22) pressed until the cassette is ejected.*

- After the tape is ejected the word "TAPE" appears on the display and the radio starts to work, tuning in to the last station listened to.

NOTE *The cassette cannot be ejected with the radio off.*



P4A515L03



Never expose cassettes to heat or to direct sunlight, but always store them properly after use.

It is advisable to use good quality cassettes, no longer than C-90 in order to always ensure optimum reproduction.

Impurities on the head caused by tapes can result, in time, in decreased high tones during reproduction. It is therefore advisable to clean the heads periodically using a special non abrasive type head cleaning cassette.

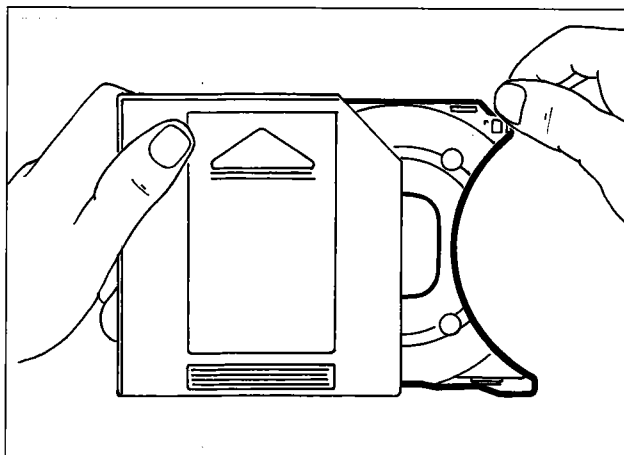
55.

COMPACT DISC PLAYER FUNCTION

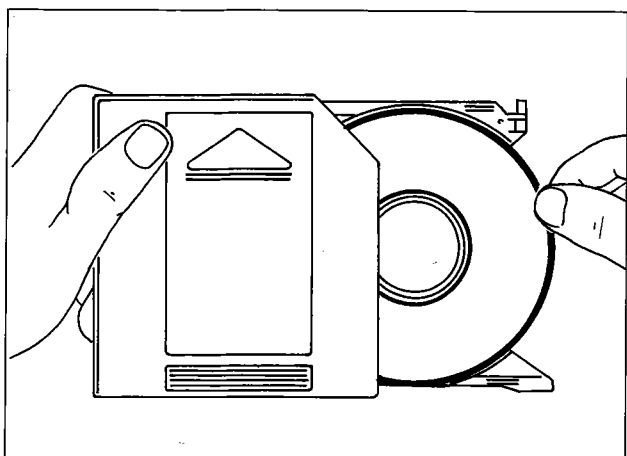
Vehicles equipped with the AD182H radio are prepared for the fitting of a Compact Disc (CD) player with a multipolar cable which ends in the luggage compartment on the left hand side.

A kit is available from FIAT Lineaccessori FIAT which includes a Compact Disc player, an additional connecting multipolar cable and a mounting bracket for the fitting.

The player has a special loader which can hold up to 6 compact discs.



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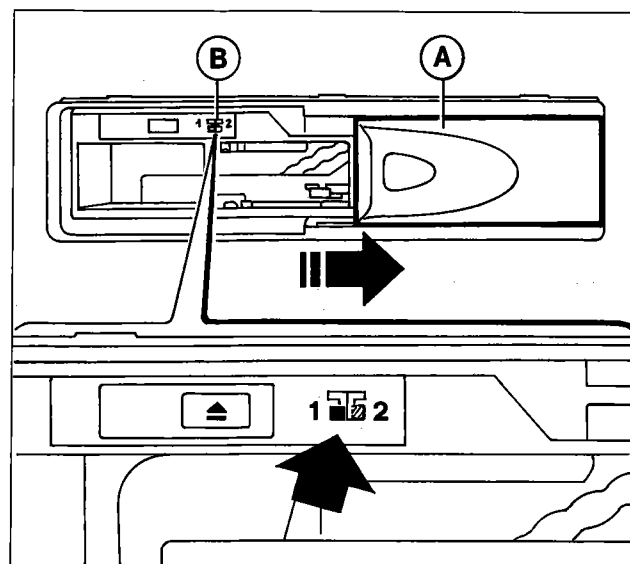
Filling the Compact Disc loader

- Extract a support for each compact disc that you wish to play;

- insert the compact disc with the label or the printed section facing the support.



If the compact disc is placed incorrectly, it will not play.



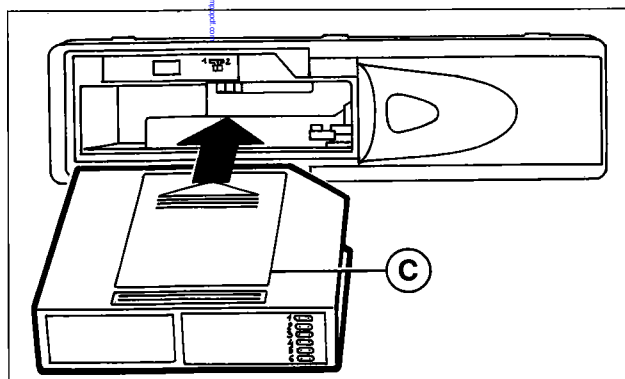
P4A516L03

Inserting loader in Compact Disc player

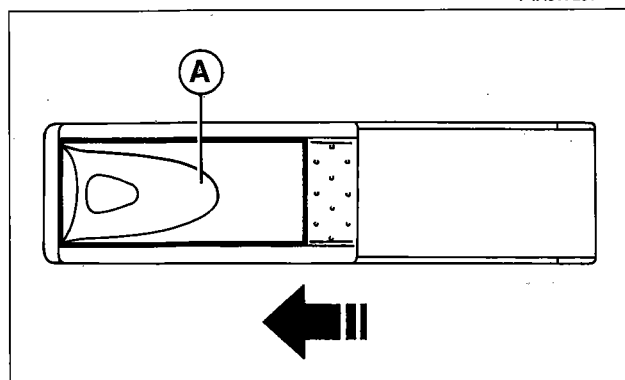
NOTE *The player cannot play 8 cm compact discs (unless special adaptors available from Hi-Fi shops are used).*

To insert the loader in the compact disc player, proceed as described below:

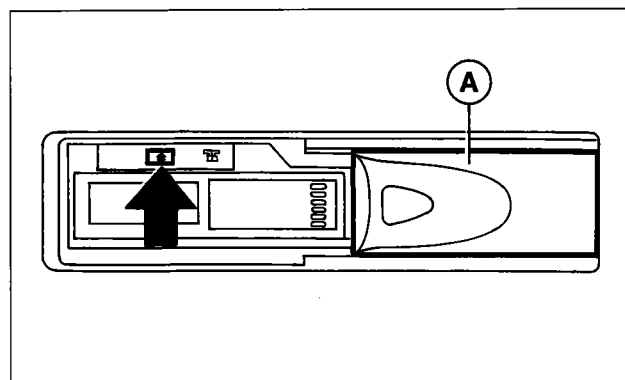
- slide the flap A towards the right, as illustrated in the diagram, until it is not locked;
- check that the switch B is in position "1";



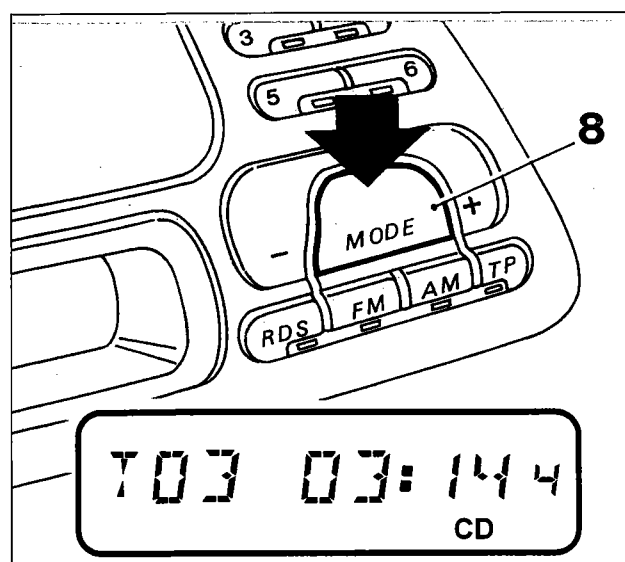
P4A517L01



P4A517L02



P4A517L03



P4A517L04

- insert the loader C in the compact disc player with the side with the label (see arrow) upwards;

- close the sliding flap A after having inserted the loader to prevent foreign bodies and dust from entering the player.

Extracting loader from Compact Disc player

Proceed as illustrated below:

- slide the flap A towards the right, as illustrated in the diagram, until it is not locked;
- act on the eject button (shown by the arrow) on the Compact Disc player.

Extracting compact discs from loader

Extract the discs and supports from the loader.

OPERATION OF THE CD PLAYER

In order to play compact discs already inserted in the player previously, press the "MODE" switch (8) repeatedly until the word "CD" appears on the display.

If this function is selected after inserting the loader, the words "CD CHECK" appear instead whilst the connections and the contents of the loader are examined.

Whilst listening the following appears on the display: "CD", the number of the track (for example "T03" = third track), the playing time (for example "03:14" = 3 minutes and 14 seconds) and the CD number (for example "4").

55.

Possible error messages

If the loader has not been introduced or has not been properly inserted in the Compact Disc player, then the word "MAGAZINE" will appear on the display.

If the loader does not contain any compact discs, then the words "NO CD" appear on the display.

If a compact disc is damaged or has not been introduced properly into the loader, then the word "SURFACE" appears on the display.

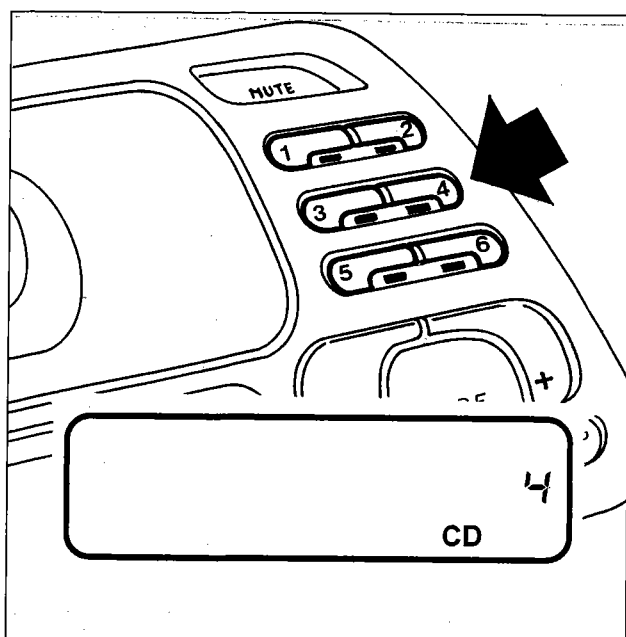
If there is a break in the connection with the compact disc player then the word "CD" appears on the display.

In the case of a mechanical fault with the CD player the word "MECHANIC" appears on the display.

If the compact disc player overheats, the words "TOO HOT" appear on the display.



If the last condition mentioned above occurs, it is advisable to switch off the CD player for a certain period of time.



P4A518L01

Selecting disc

Press one of the following buttons (1), (2), (3), (4), (5) or (6), to select the compact disc to listen to from those stored in the loader and the number of the compact disc selected will appear on the display.

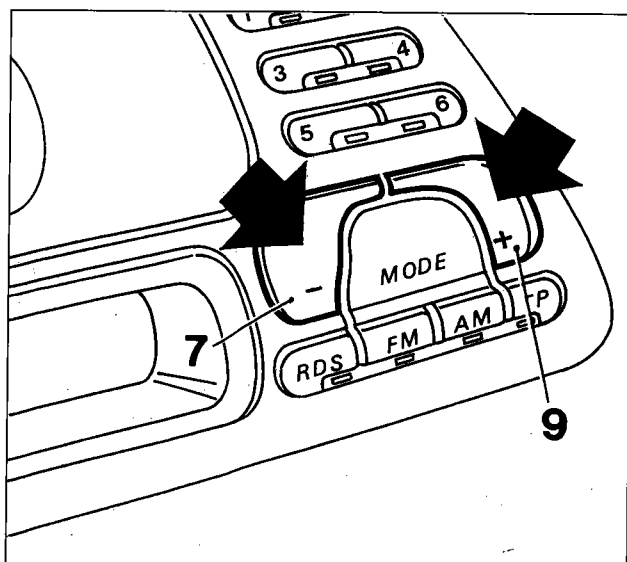


If there is a compact disc in the loader, the LED under the switch corresponding to the number of the compact disc will remain on, otherwise it will remain off.

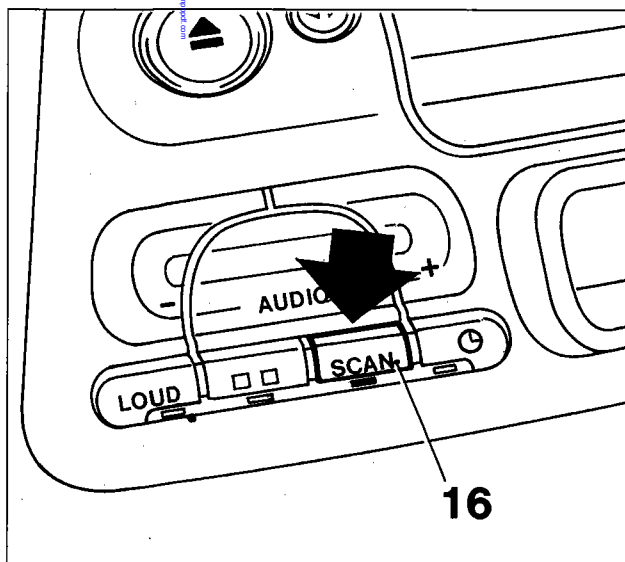
Track search (forwards/backwards)

- Press the "MODE +" switch (9) to play the next track on the CD to which you are listening;
- press the "MODE -" switch (7) whilst listening to a track to play the track again from the beginning; by pressing twice in succession the previous track can be played;
- press these switches several times to go forwards/backwards as many tracks as the number of times the switches are pressed;

NOTE *If the "RANDOM" function is activated, (see page 50/20), tracks from the compact disc to which you are listening are selected at random.*



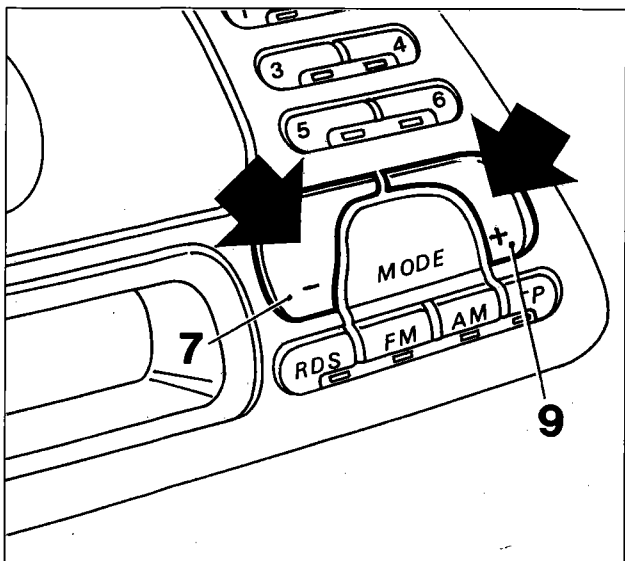
P4A514L01



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Scanning tracks on the compact disc (SCAN Function)

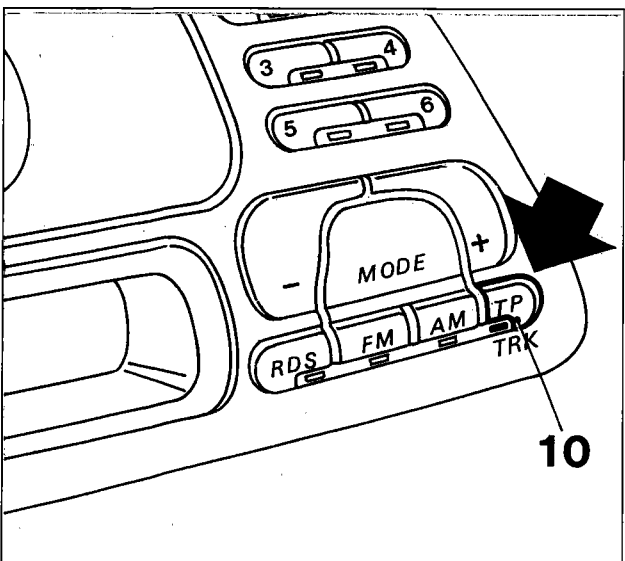
Press the "SCAN" switch (16) (the LED under the switch will come on) to listen to the beginning of all the tracks on all the compact discs in the loader starting from the one selected previously for 10 seconds each.



P4A514L01

NOTE *It is possible to reverse the search direction several times by pressing the "MODE +" (9) or "MODE -" (7) switches.*

- press the "SCAN" switch (16) again to interrupt the scanning whilst listening to a track: the LED under the switch will go out and the compact disc will be played starting from that track.



P4A519L02

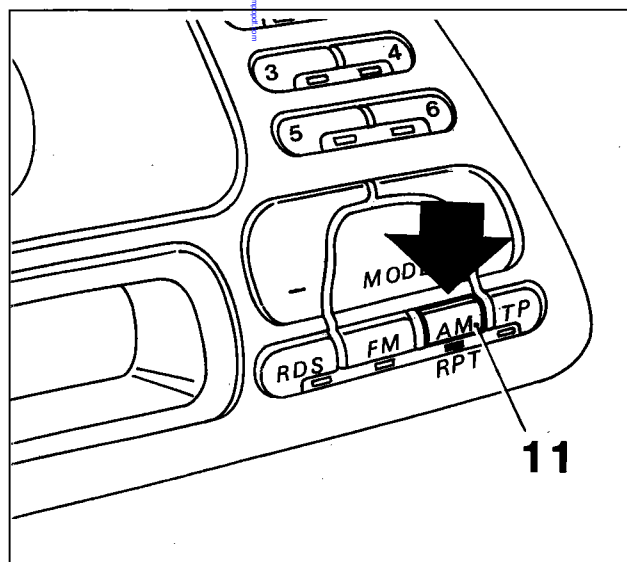
Track repetition (REPEAT Function)

Press the "TRK" switch (10) briefly (the LED under the switch will come on) to listen to the last track played several times.

NOTE *If in the meantime another track is selected whilst remaining in the track repeat mode, it will be played again several times.*

- press the "TRK" switch (10) briefly (the LED under the switch will go out) to exit from this mode.

55.



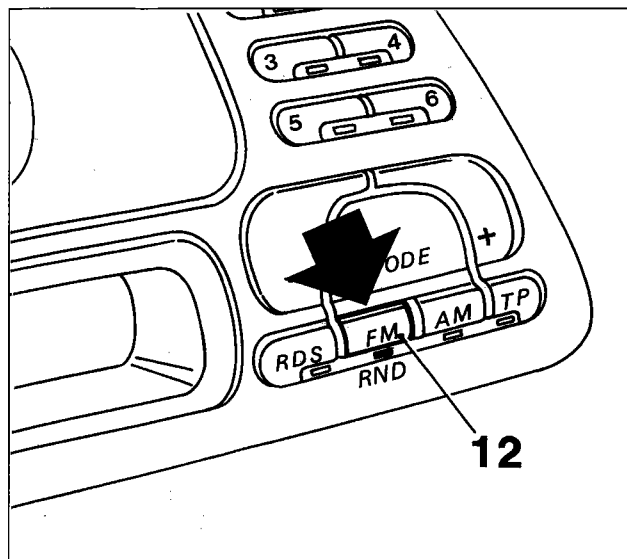
P4A520L01

CD Repetition (REPEAT Function)

Press the "RPT" switch (11) (the LED under the switch will come on) to listen several times to the last compact disc played.

NOTE *If in the meantime another compact disc is selected, whilst remaining in the CD repeat mode, it will be played again several times.*

- press the "RPT" switch (11) again (the LED under the switch will go out) to exit from this mode.



P4A520L02

Random playing of tracks (RRANDOM Function)

If the "RND" switch (12) is pressed (the LED under the switch will come on) a compact disc from those present in the loader will be selected at random and all the tracks on this compact disc will be played at random.

Once all the tracks have been played, another compact disc is selected and so on. Once all the discs have been heard, the random playing starts again in the same way.

NOTE *If the "CD Repeat" mode has been selected previously, all the tracks on the disc selected are played at random.*

- press the "RND" switch (12) again (the LED under the switch will go out) to exit from the "Random playing" mode.



Never expose discs to heat or direct sunlight, they must be stored in an appropriate container after use.

Compact discs should be kept away from dust and you should never touch the surface of the discs with your fingers and care should be taken to ensure they are not scratched as this will affect the sound reproduction.

If the surfaces of a disc is dirty, it should be cleaned with a soft cloth, working from the centre outwards. Do not insert damaged or distorted discs into the loader.

CLOCK FUNCTION

This function makes it possible to display the hours and minutes.

A double point, between the hours and the minutes, flashes once a second on the display.

With the radio on, if the clock appears on the display, whilst the time is being adjusted or a display mode is being selected, the LED under the switch (15) comes on.

With the radio off, the clock is always displayed.

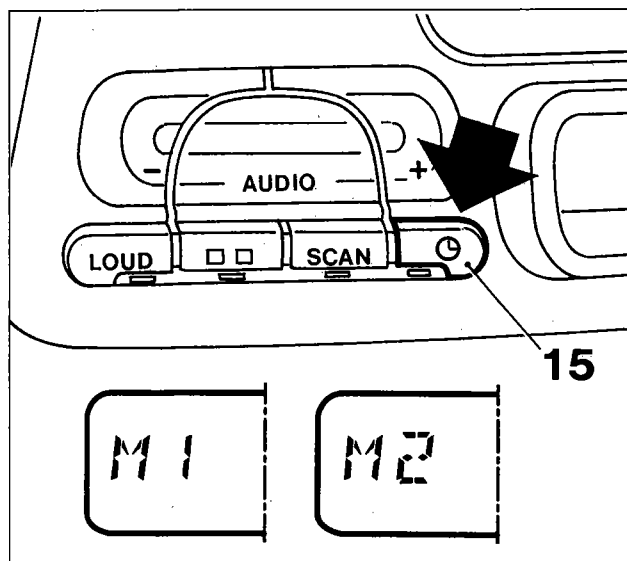
Display modes

When the radio is on, there are two display modes with the following features:

a) Mode 1 (M1)

The clock is displayed in place of the main messages relating to the Radio functions (reception frequency), Audio cassette (word TAPE) or Compact Disc (number of track and playing time).

When the radio is switched on or any Radio, Cassette or Compact Disc function is selected, the messages for the function selected are displayed for around 10 seconds, after which the clock reappears.



P4A521L01

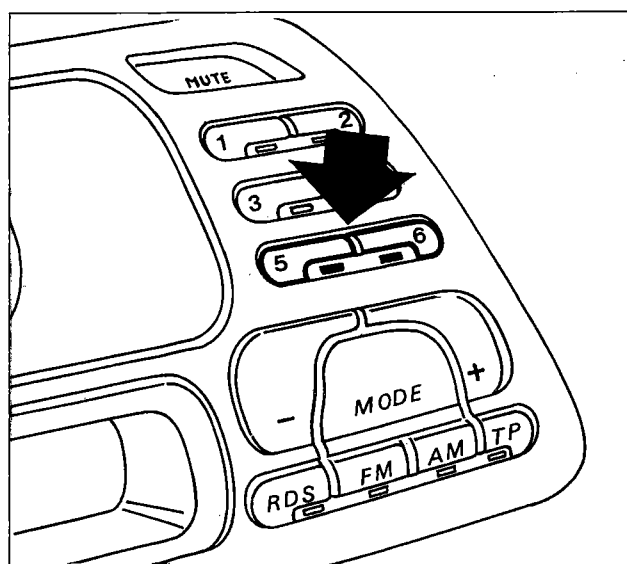
a) Mode 2 (M2)

The messages relating to the Radio, Cassette or Compact Disc functions are displayed in place of the clock.

When the radio is switched on, the mode present before the switching off is automatically selected.

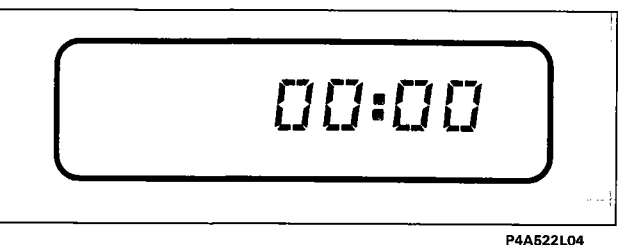
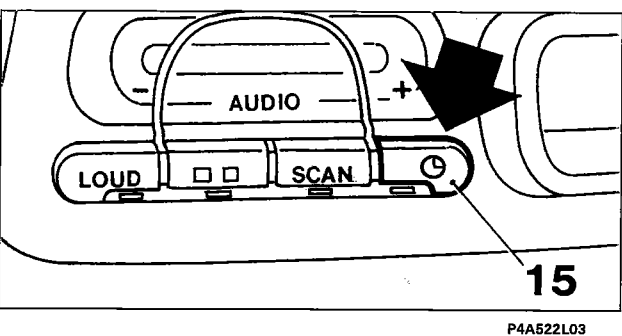
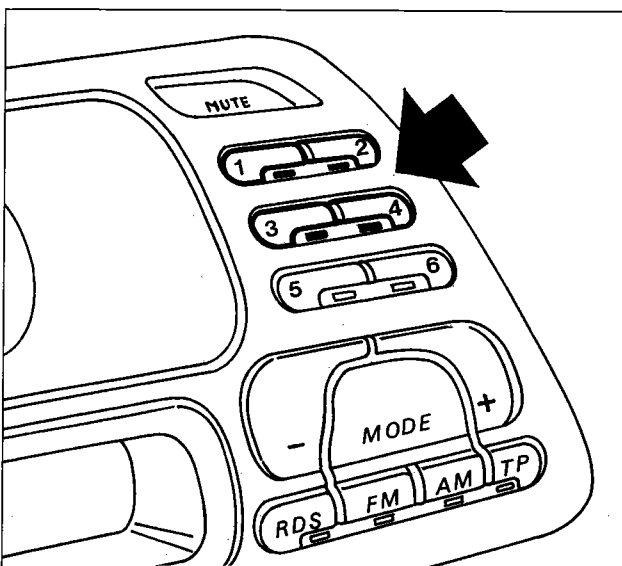
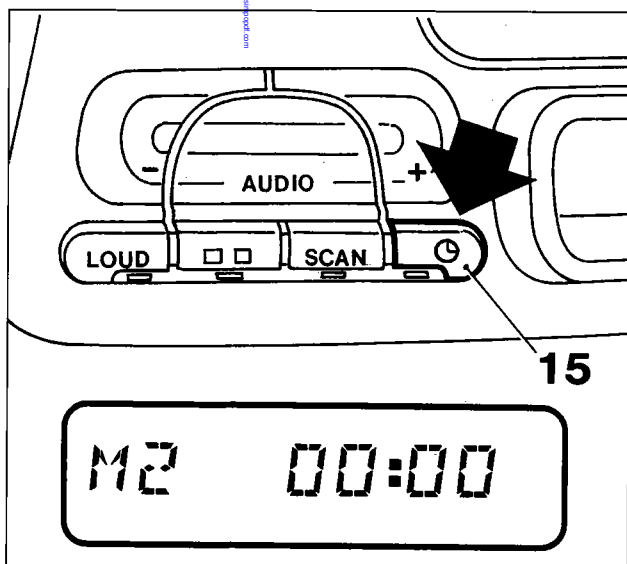
Selecting display modes

- Keep the switch (15) pressed until the double point on the display, between the hours and the minutes, stops flashing and the words "M1" or "M2" appear, depending on the display mode selected;
- press switch (5) or (6) to select display Mode 1 or Mode 2, respectively (the words "M1" or "M2", respectively will appear on the display);
- press switch (15) again briefly to confirm the selection; the double point between the hours and the minutes will start to flash again and the words "M1" or "M2" will disappear.



P4A521L02

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Setting the exact time

- Keep the switch (15) pressed until the double point on the display, between the hours and the minutes, stops flashing and the words "M1" or "M2" appear on the display depending on the display mode selected;
- adjust the hours and minutes indicated on the display, proceeding as described below:
- decrease the hours by pressing switch (1);
- increase the hours by pressing switch (2);
- decrease the minutes by pressing switch (3);
- increase the minutes by pressing switch (4);

NOTE By pressing the switches briefly, the hours and minutes are increased/decreased by one unit whilst by pressing them for longer the hours/minutes display is changed rapidly.

- Once the exact time is set, press the switch (15) again briefly; the counting of the time is started beginning from 0 seconds and it is therefore possible to adjust the clock exactly. The double point, between the hours and the minutes, will start to flash and the words "M1" or "M2" will appear on the display.

Switching priority - time/frequency

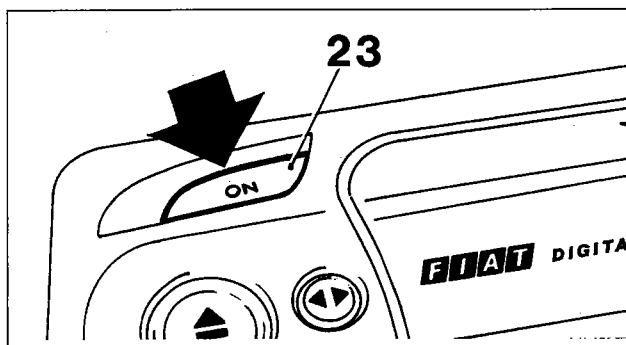
Press switch (15) briefly to switch between the display of the clock and the messages relating to the Radio, Cassette or Compact Disc functions for a duration of 10 seconds, after which the indication, which has priority according to the display mode selected, will reappear automatically.

Disconnecting from the supply

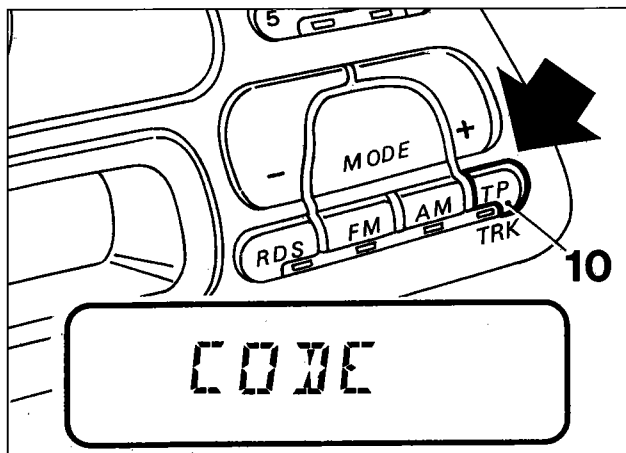
If the radio is disconnected from the supply (even for a short period) when it is connected once again the display will show "00 : 00" with the figures flashing and the double point fixed to indicate that the clock must be adjusted once again.



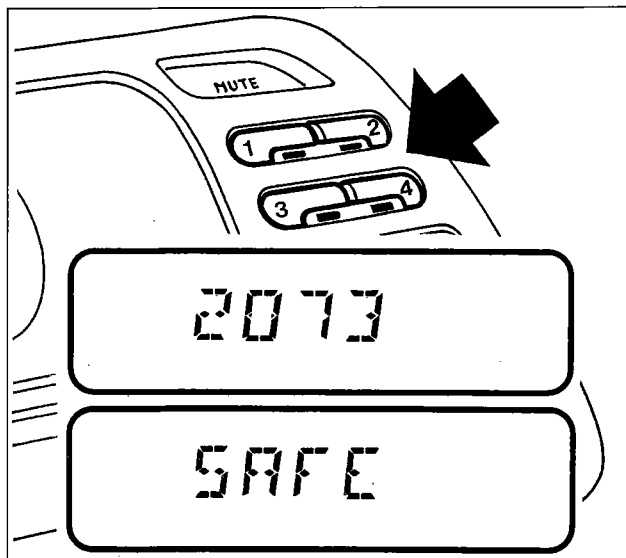
P4A051L03



P4A503L01



P4A051L04



P4A051L05

ANTI-THEFT PROTECTION

The radio is equipped with an anti-theft protection system composed of a secret 4 figure code.

The protection system means that the radio cannot be used once it is removed from the dashboard if it is stolen.

Secret code

The secret 4 figure code is given on the "Security Code card" which comes together with the "Fiat Code Card" for the vehicle. The secret code should be kept in a safe place (for example together with the vehicle documents), **but not in the vehicle**.

Entering the secret code

The activation of the code in the radio becomes necessary:

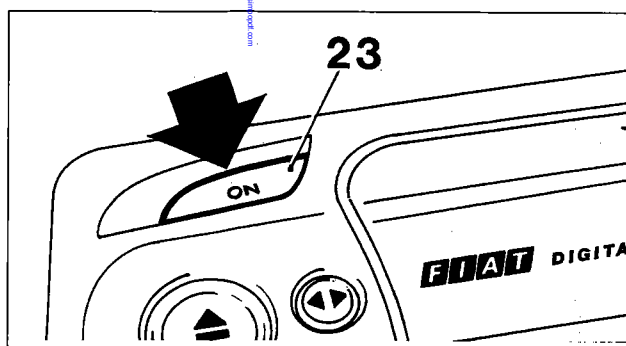
- a) when the vehicle is handed over by the dealer;
- b) after each time the battery supply is interrupted.

Initial entering of secret code

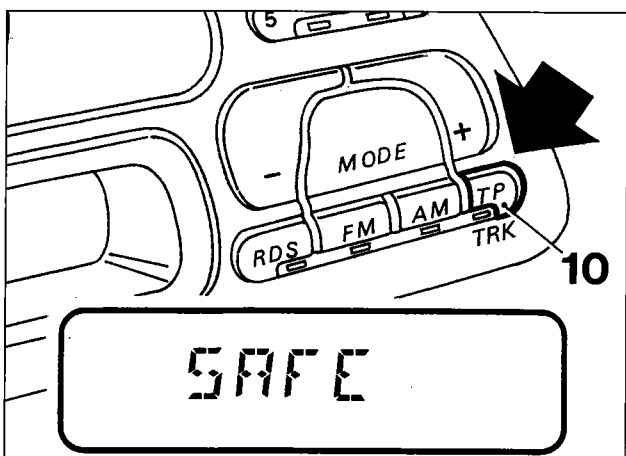
NOTE In order to clarify the procedure, make a note that the number of the secret code on the "Security Code Card" is 2073.

- Switch on the radio by pressing the "ON" button (23);
- keep the "TP" button (10) pressed until the word "CODE" appears on the display for about 3 seconds;
- press button "1" twice. The number "2" should appear on the display;
- press button "2" seven times. The number "27" should appear on the display;
- press button "3" ten times. The number "270" should appear on the display;
- lastly, press button "4" three times. The number "2703" should appear on the display;
- confirm the code number by keeping button "TP" (10) pressed until the word "SAFE" appears on the display;
- after about 3 seconds the radio is operational and the code is activated.

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P4A053L01



P4A052L02

Re-entering the code

Proceed as follows:

- Switch on the radio by pressing the "ON" button (23), the word "SAFE" should appear for around 3 seconds on the display;
- key in the code number following the procedure used for entering the code initially;
- confirm the code number by keeping the "TP" button (10) pressed until the word "SAFE" appears on the display;
- after about 3 seconds the radio is operational and the code is activated.



If an incorrect code has been introduced, the radio remains locked and the word "SAFE" appears permanently on the display.

As a further deterrent against theft, the system prevents repeated attempts at entering the code with increasing longer intervals between one attempt and the next.

During these intervals the radio will not work until the word "SAFE" disappears from the display and the number of attempts appears in its place. The table at the side indicates the intervals between the individual attempts.

Number of attempts (on the display)	Waiting time (approx)
-	21 secs
1	1.5 mins
2	5.5 mins
3	22 mins
4	1.5 hours
5	6 hours
6	24 hours
7	24 hours

Eliminating anti-theft protection

It is possible to eliminate the anti-theft protection by de-activating the radio code:

- switch on the radio by pressing the "ON" button (23);
- Keep the "TP" button (10) pressed until the word "SAFE" appears on the display for around 3 seconds;

- key in the code number working as described previously (see previous page);
- confirm the code number by keeping the "TP" button (10) pressed) until the word "CODE" appears on the display;
- after around 3 seconds the radio is operational and the code is de-activated.

If an incorrect code is entered, the word "SAFE" will appear on the display". If this is the case, try again observing the intervals between the individual attempts.

Checking the activation state of the code

To check whether the radio code is activated, proceed as follows:

- switch on the radio by pressing the "ON" button" (23);
- press button "TP" (10) until something appears on the display;
- if the word "SAFE" appears, the code is activated, if, on the other hand, the word "CODE" appears then the code is not activated; by switching the radio off and then on again, the word "SAFE" or "CODE" will disappear.

TECHNICAL INFORMATION

Aerial

The vehicle is equipped with an aerial located on the roof.

Electrically operated aerial and external amplifier (available on request for the AD182H radio)

The radio comes with an automatic electrically operated aerial (which works as soon as the radio is switched on and lowers when it is switched off) and an external amplifier.

The switching voltage for the aerial is at contact 5 (connector "A") for the radio and the switching voltage for the amplifier is at contact 3 (connector "A").

The switching voltage for both outlets is + 12 V with a maximum current of 0.5 A.

Speakers for AD182H radio system

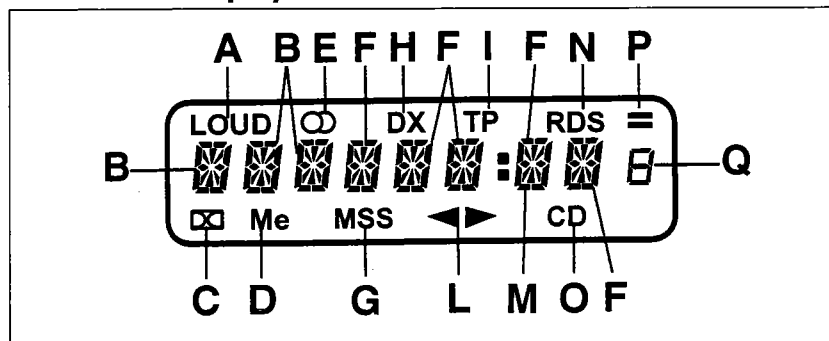
The acoustic system is composed of:

- 2 130 x 180 mm elliptical diffusers 30 W max. power each;
- 2 tweeter-dome diffusers 40 W max power each;
- 2 103 mm diffusers 30 W max power each.

Fuses

The radio is equipped with a 10 A protective fuse.

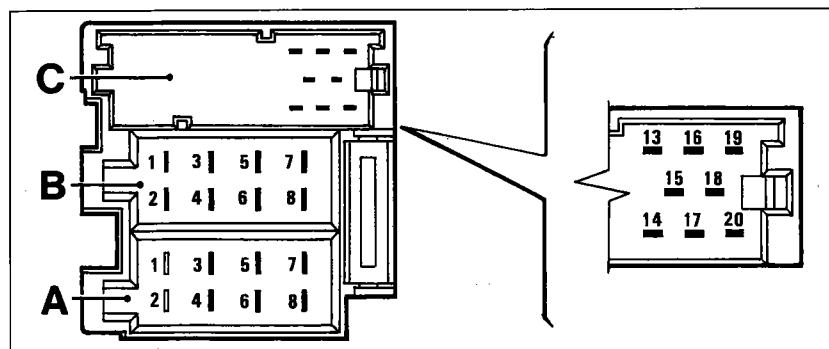
Information displayed



P4A053L02

- A. Loudness
- B. RDS
- C. Dolby
- D. "Metal" band
- E. Stereo signal
- F. RDS - FREQUE
- G. Skip search
- H. Search sensitivity
- I. Traffic Programme
- L. Tape direction
- M. Frequency point
- N. RDS reception
- O. CD mode
- P. RDS1 -; RDS2 =; RDS LEVEL
- Q. Pre-section no.

Partial view of the rear of the radio



P4A053L03

TECHNICAL SPECIFICATIONS

N° of output channels	4
Musical power output	About 30W peak (for each channel)
Nominal power output	≤ at 15W RMS
Impedance	4 Ohm

CON. A HOUSING

Pin N°	Connection
1	NC
2	NC
3	+ Service
4	+ Controlled by ig.
5	+ Service
6	+ Lighting
7	Supply + 30
8	Right dashboard earth

CON. B HOUSING

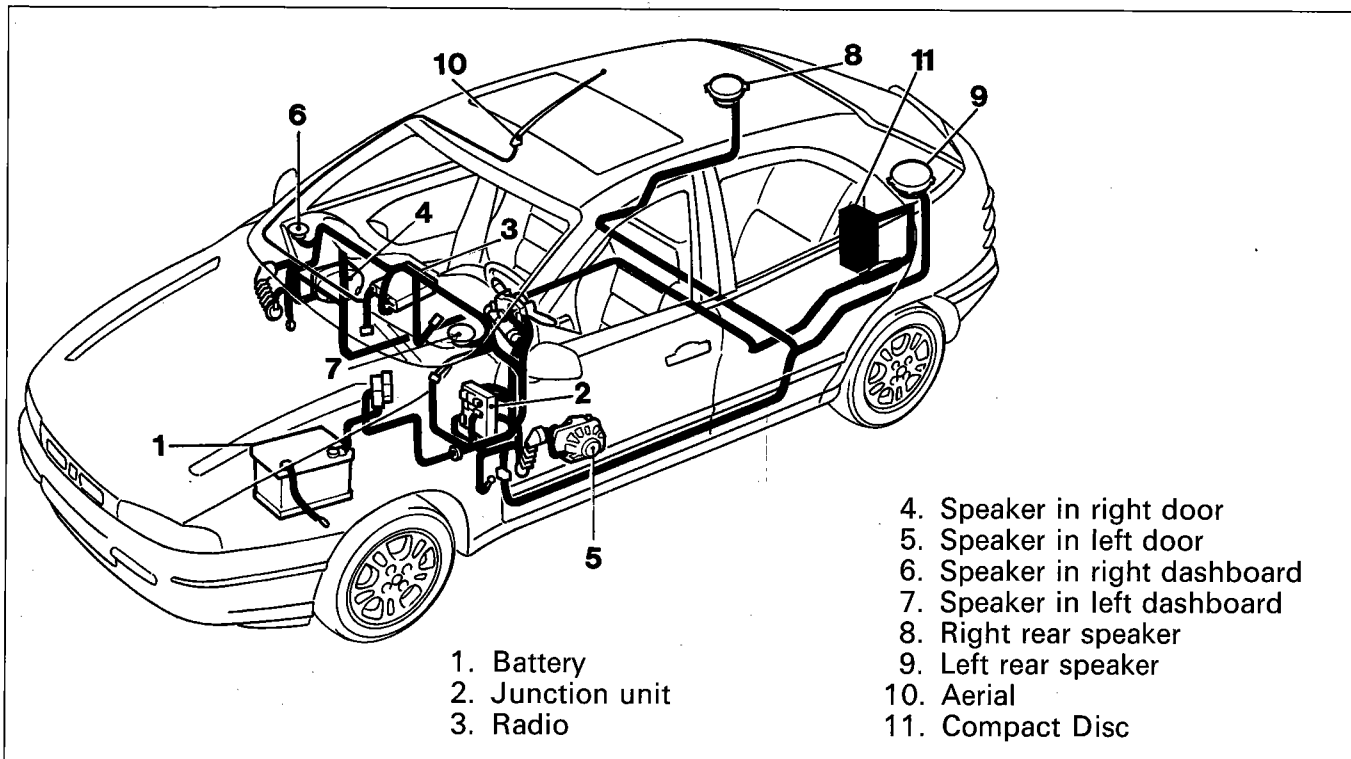
Pin N°	Connection
1	+ Right rear speaker
2	- Right rear speaker
3	+ Right front speaker
4	- Right front speaker
5	+ Left front speaker
6	- Left front speaker
7	+ Left rear speaker
8	- Left rear speaker

CON. C HOUSING

Pin N°	Connection
13	CD data input CD (CD BUS)
14	NC
15	Earth CD
16	+ Supply CD
17	+ Service
18	Earth CD AF
19	Left channel CD
20	Right channel CD

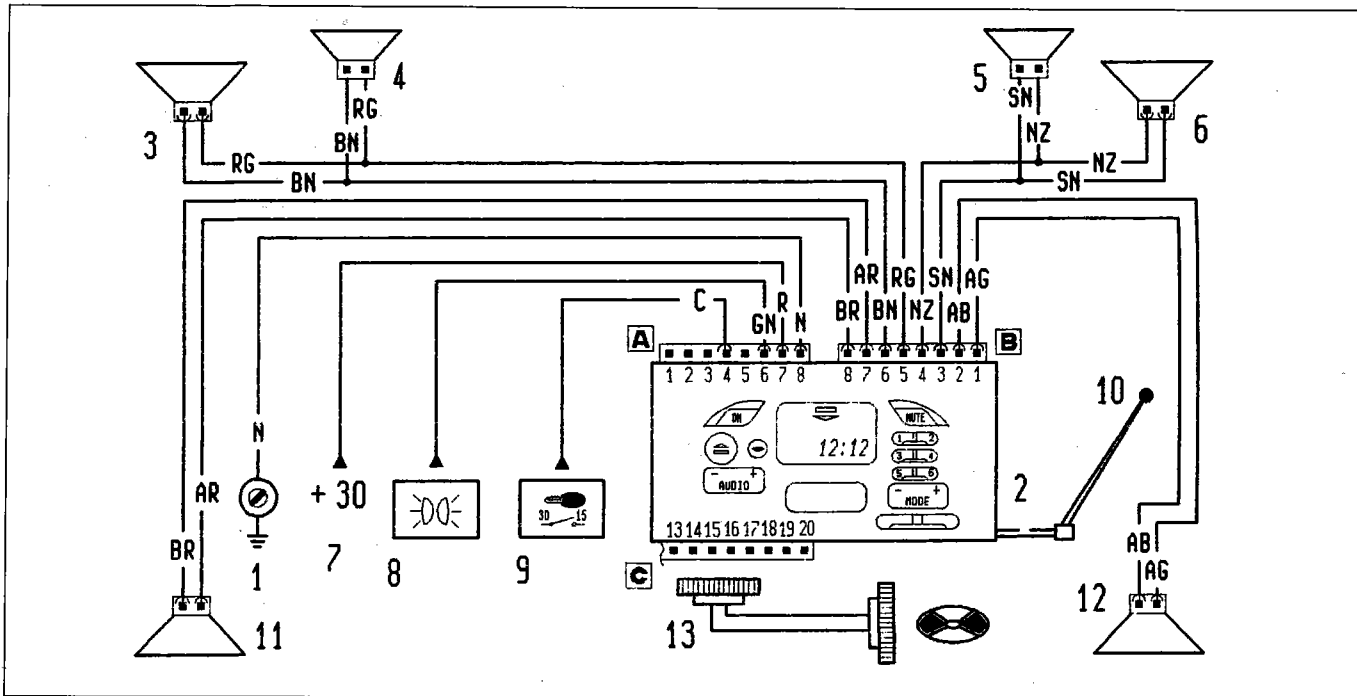
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LOCATION OF RADIO SYSTEM COMPONENTS FOR MODEL AD 182 H



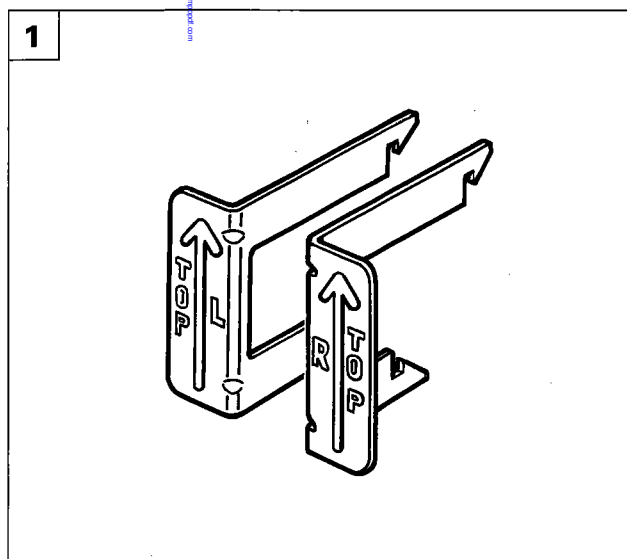
P4A054L06

Wiring diagram



P4A054L07

- | | | |
|---------------------------------------|--------------------------|----------------------------------|
| 1. Earth in right dashboard | 6. Speaker in right door | 12. Right rear speaker |
| 2. Radio | 7. Battery supply (+30) | 13. Connection with compact disc |
| 3. Speaker in left door | 8. Lighting supply | |
| 4. Speaker on left side of dashboard | 9. Key supply (+15) | |
| 5. Speaker on right side of dashboard | 10. Aerial | |
| | 11. Left rear speaker | |



P4A055L03



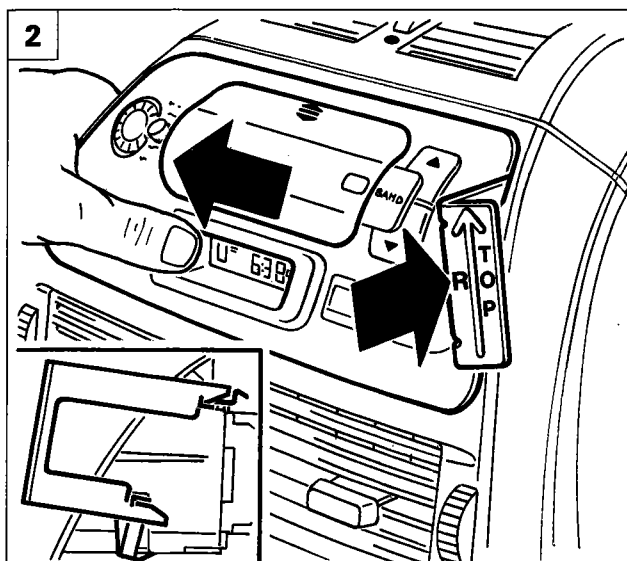
REMOVING RADIO MODEL AD 182 L

1. Tool 1860897000, which should be used to remove the radio, is composed of a right element and a left one, marked with the letters R and L, respectively.

NOTE *The correct direction in which to use each element is shown by an arrow.*



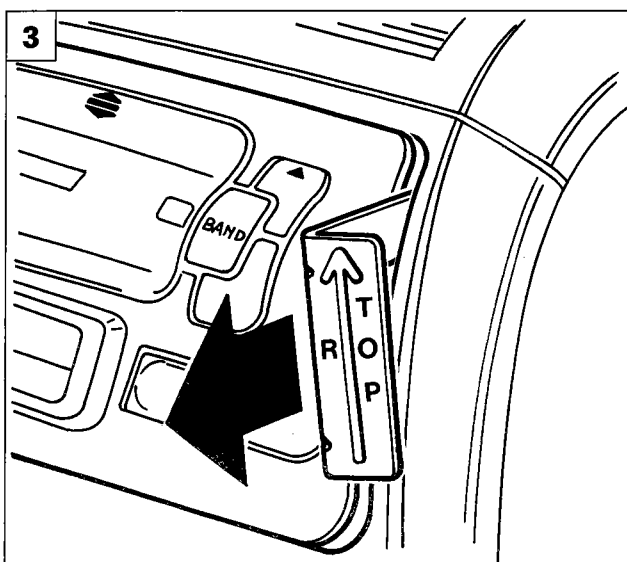
To facilitate the removal operations it is advisable to work from the passenger side.



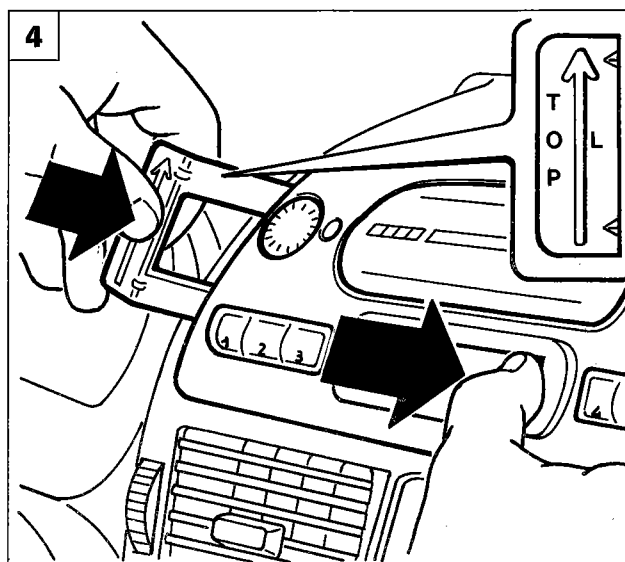
P4A055L04



2. Move the radio towards the left, as illustrated in the diagram, then carefully insert the right element (R) of tool 1860897000 until it can be heard to engage with the actual radio springs (see inset).
3. Using the right element (R) of the tool described above, slightly extract the right part of the radio in the direction shown by the arrow.
4. Move the radio towards the right as illustrated in the diagram, then carefully insert the left element (L) of tool 1860897000 until it can be heard engaging with the radio springs.

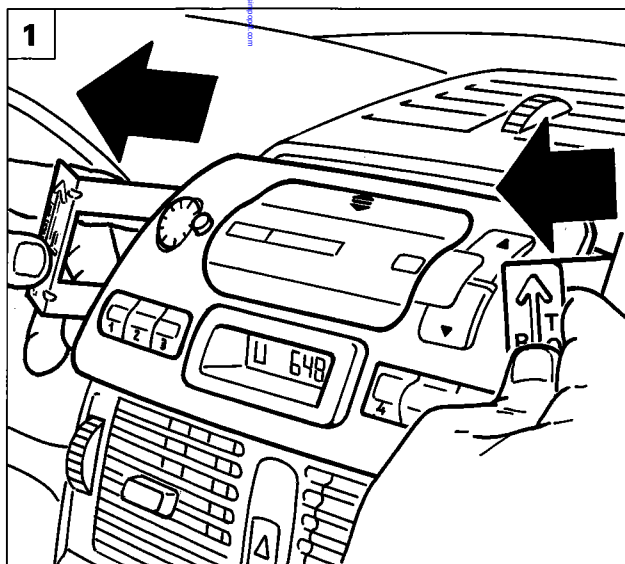


P4A055L05



P4A055L06

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P4A055L07



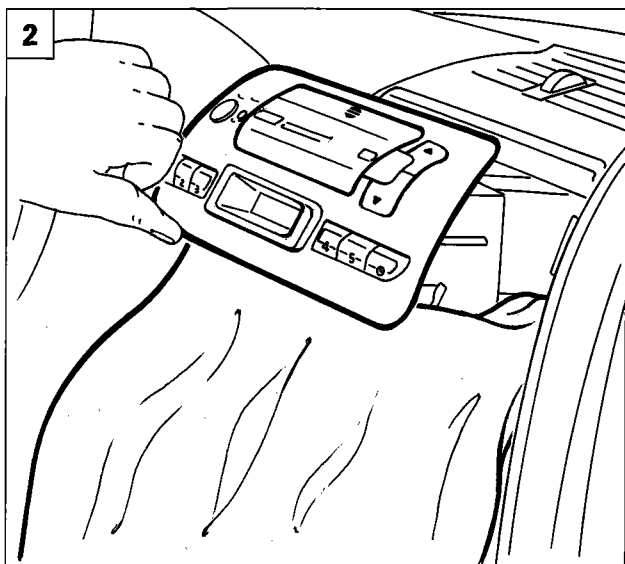
1. Grip both elements of tool 1860897000 and partly extract the radio, then release the two elements of the above tool from the radio.



DO NOT extract the radio working from the glove compartment, but only use the two elements of tool 1860897000, following the procedure described previously.

2. Protect the area of the dashboard under the radio using a cloth as illustrated in the diagram.
3. Completely extract the radio; disconnect connection D for the aerial cable and connectors A and B working in the following way: push connectors A and B towards the radio and press on the retaining springs C shown in the inset and extract them from the housing; then remove the radio from the vehicle.

If the rubber terminal (1) for the centering pin (2) remains inserted in the dashboard cross member, remove it and fit it on the actual pin.

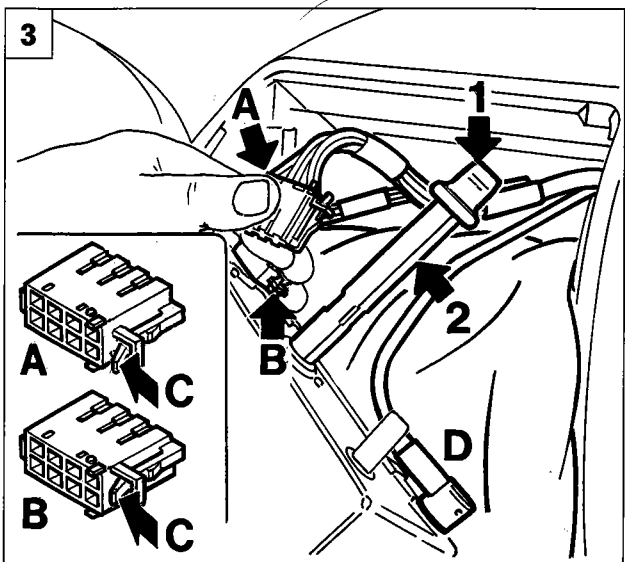


P4A055L08

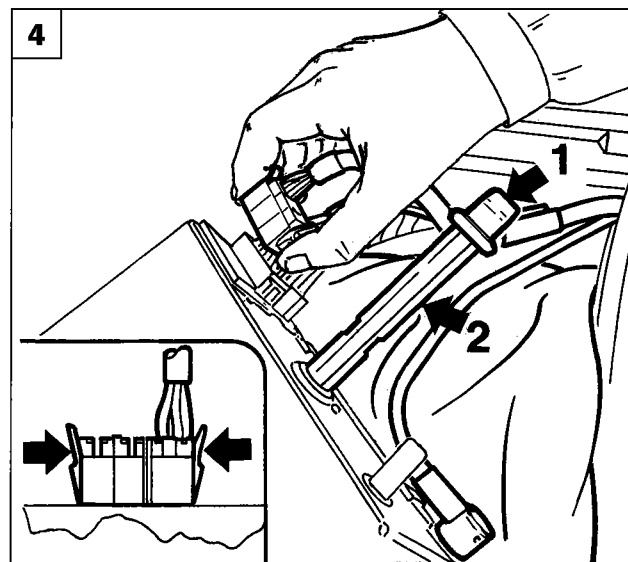
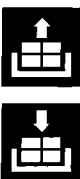


REMOVING RADIO MODEL AD182H

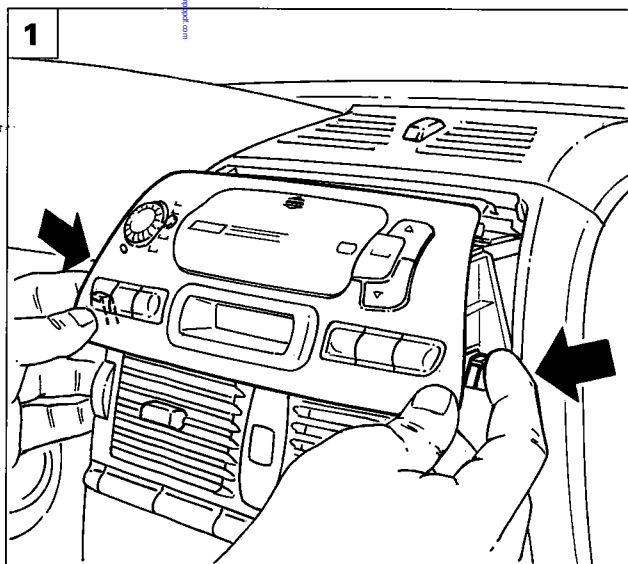
4. Follow the same procedure described for the removal of the radio model AD 182 L until the disconnection of connectors A and B, then disconnect the connector for the Compact Disc (CD) (which can be recognized by the three different colours) acting, at the same time, on the retaining springs shown in the inset.



P4A055L09



P4A055L10

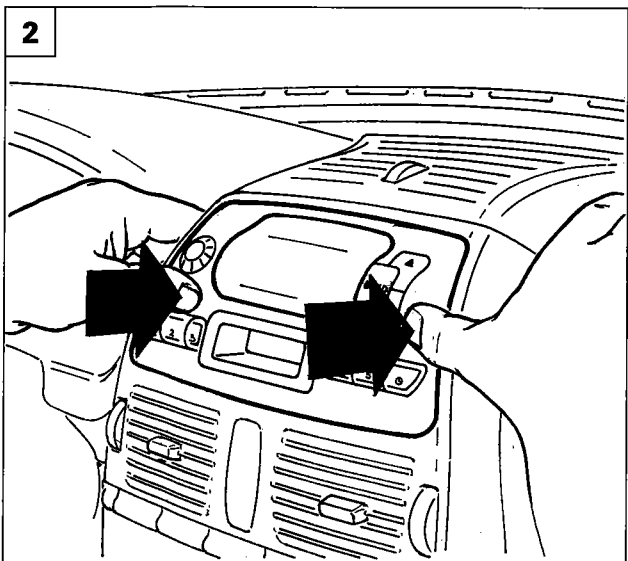


P4A055L11



REFITTING RADIO MODELS
AD 182 L - AD 182 H

1. To refit suitably reverse the operations carried out for the removal, making sure that the rubber terminal (1) is correctly fitted on the centering pin (2). When refitting the radio in its housing, place the cloth on the cowling whilst connecting the connectors and take care to correctly match the centering pin in the housing in the dashboard; introduce the radio slowly into its housing, keeping the two lower springs suitably loaded so that when they enter the housing they do not scratch the dashboard cowling.



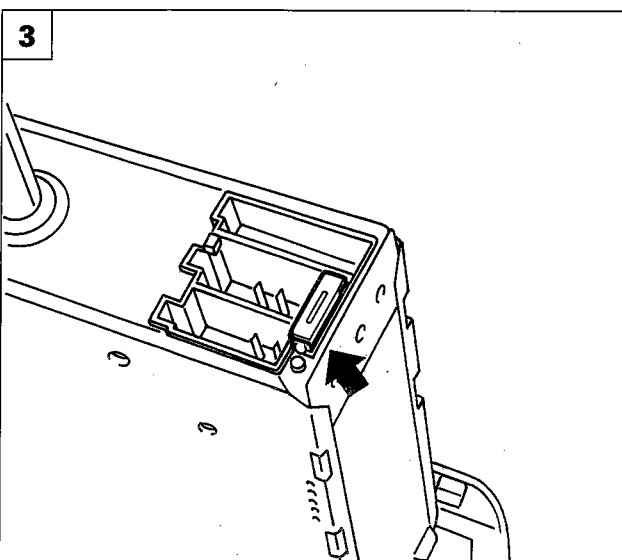
P4A055L12



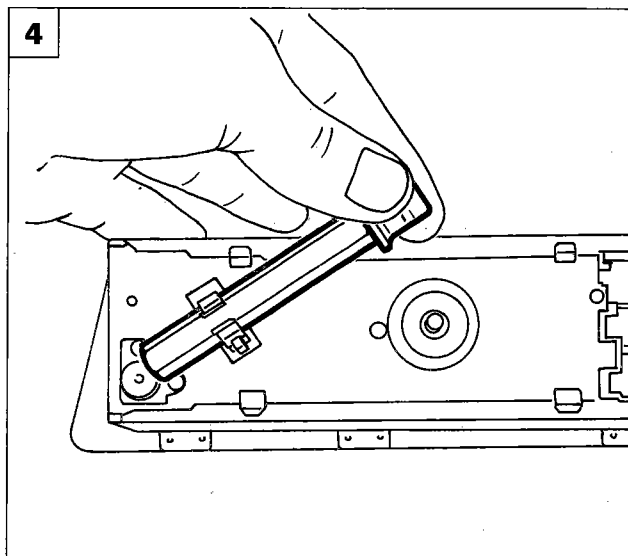
2. At this point press on the radio cowling as illustrated in the diagram, until the retaining springs are heard to click avoiding using force on the control switches.

REPLACING RADIO MODELS AD 182 L - AD 182 H

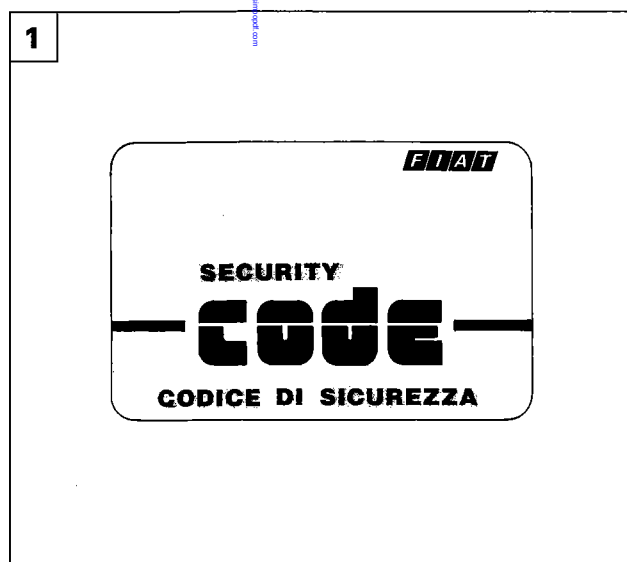
3. If there is a problem with the radio or a break in the protective fuse, shown in the diagram, DO NOT CARRY OUT ANY TYPE OF REPAIR AND/OR REPLACEMENT OPERATION, but proceed as illustrated below.
4. Undo the centering pin and attach it as illustrated in the diagram, then send the complete radio to the Supplier.



P4A055L13



P4A055L14

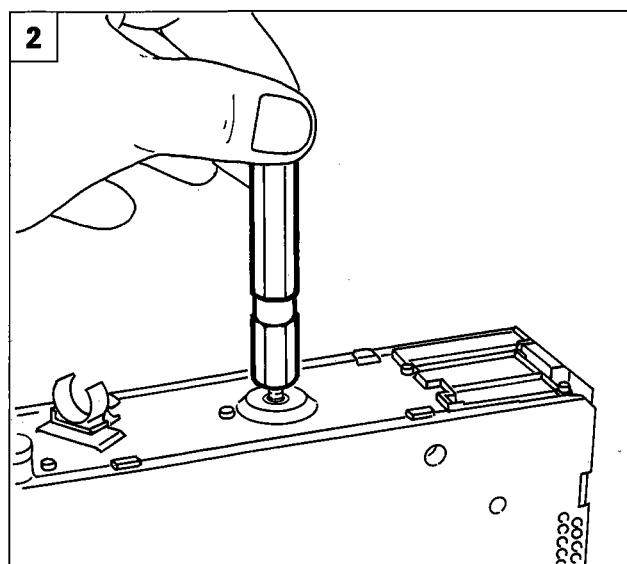


P4A055L15



1. For the AD 182 H model it is necessary to take out the Security Code Card for the radio removed from the Fiat Card envelope and replace it with the one enclosed with the new radio. Attach the old Code Card to the radio replaced.

2. Take a new radio, then attach the centering pin complete with rubber terminal and tighten it in the threaded housing at the bottom of the radio. Proceed with the fitting, following the instructions given on the previous page.



P4A055L16

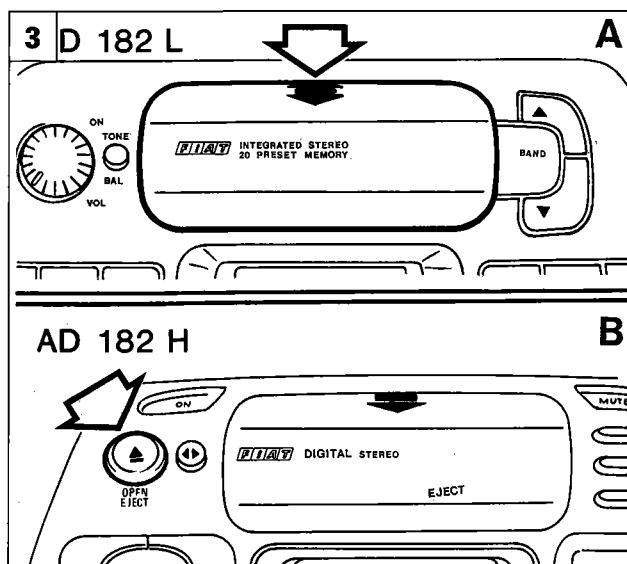


OPENING/CLOSING CASSETTE HOUSING FLAP

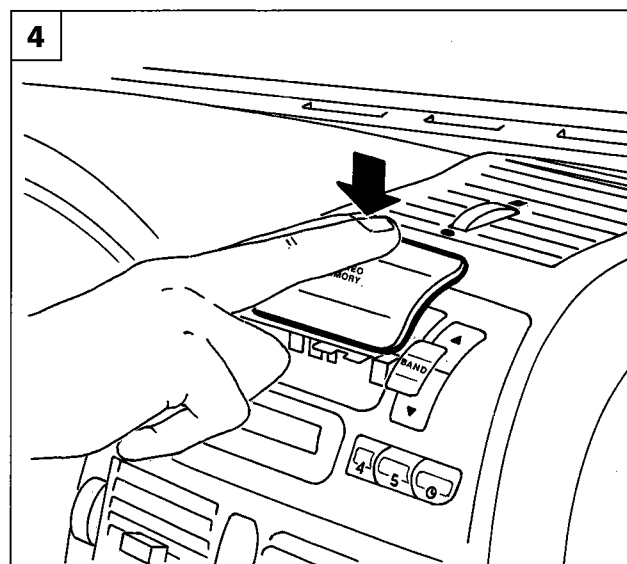
3. The operation of opening the cassette housing access flap differs for the two models:

- AD182L: exert pressure from the top downwards at the point shown in the diagram until the click of the flap releasing can be heard.
- AD182H: press the button shown to automatically open the flap.

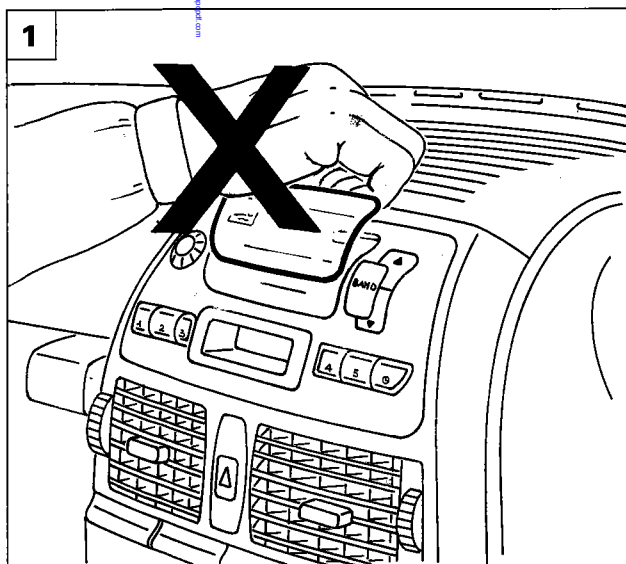
4. In order to close the flap (for both the AD182L model and the AD182H model), exert slight pressure at the point shown in the diagram until the click of the flap attaching can be heard.



P4A055L17



P4A055L18



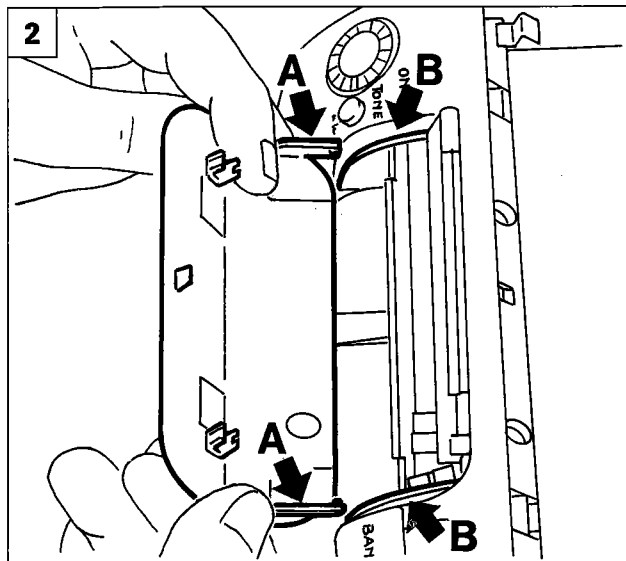
P4A055L19



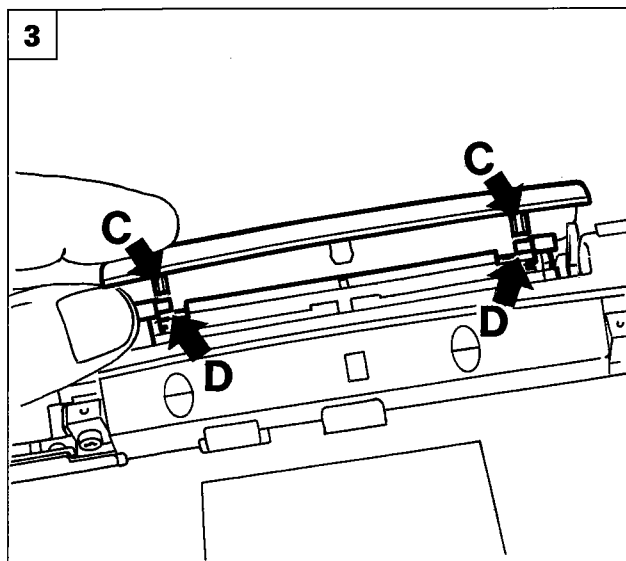
1. DO NOT CLOSE THE CASSETTE HOUSING ACCESS FLAP WORKING AS ILLUSTRATED IN THE DIAGRAM, in order not to cause the actual flap to become detached and cause possible damage to the guides.

Refitting cassette housing access flap

- If the flap becomes detached and there is not damage to the guides or the joints, proceed with the refitting working as described below (for greater clarity the operations have been carried out with the radio not in its housing):
2. Insert the lower guides A for the flap in the sliding slots B in the radio.
 3. Turn the flap making the springs C on the lower face of the actual flap coincide with the pints D for the rotating arm.
 4. Simultaneously press the two sides of the flap between your thumb and index finger to complete the fitting.

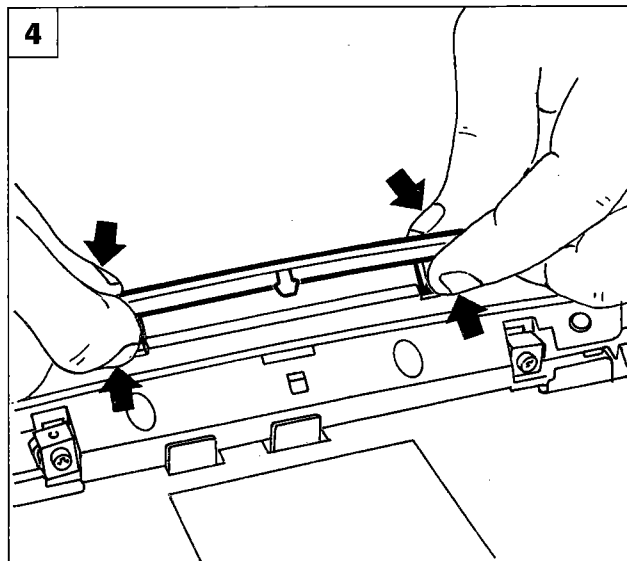


P4A055L20



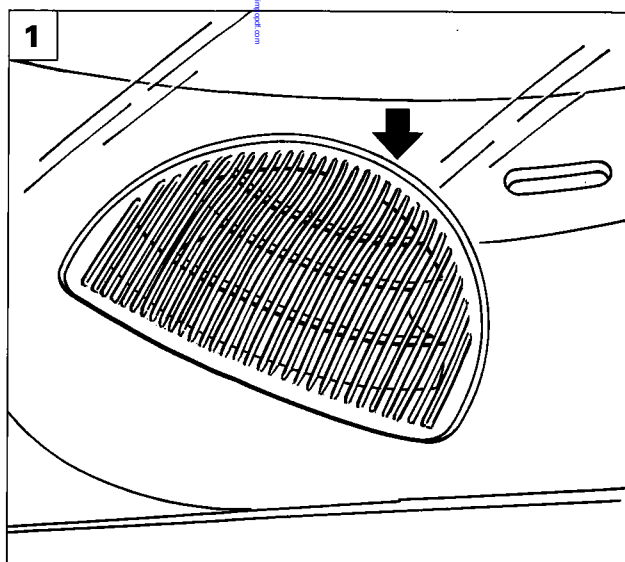
P4A055L21

4A236L

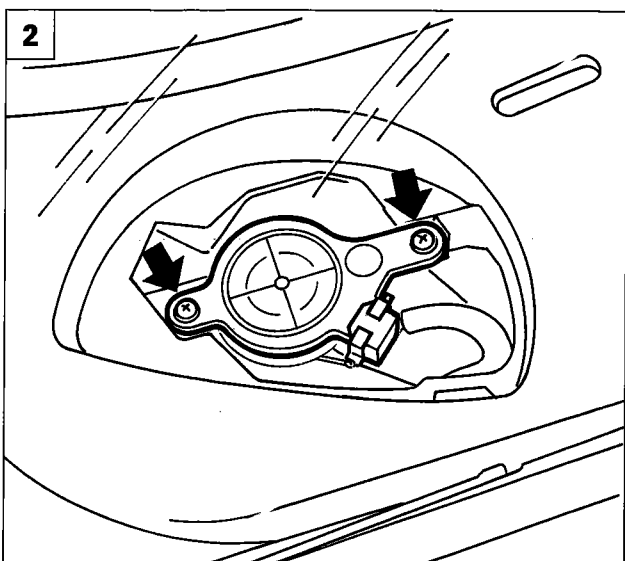


P4A055L22

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P4A056L01



P4A056L02

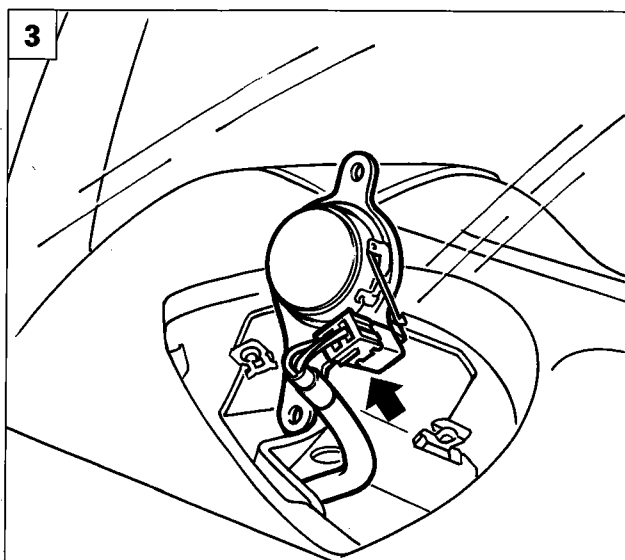
REMOVING-REFITTING SPEAKERS

Speakers in dashboard

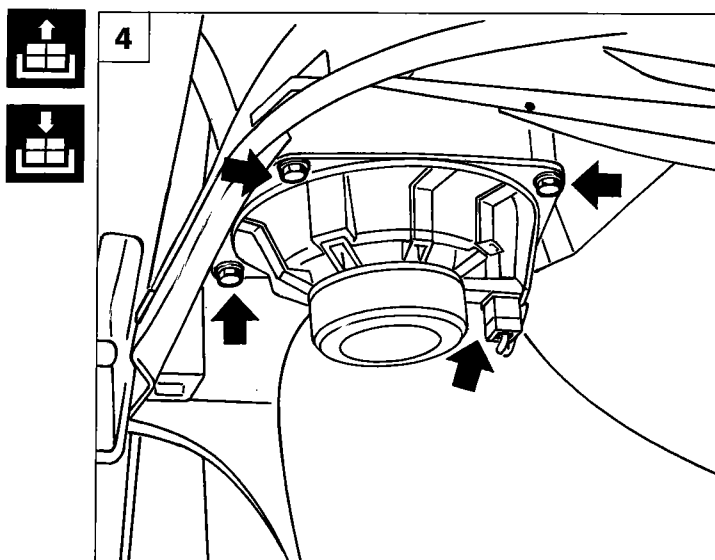
1. Remove the protective grille from the dashboard using a screwdriver at the point shown by the arrow.
2. Undo the bolts fixing the speaker to the dashboard.
3. Disconnect the electrical connection and remove the Speaker from the vehicle.

Rear speaker

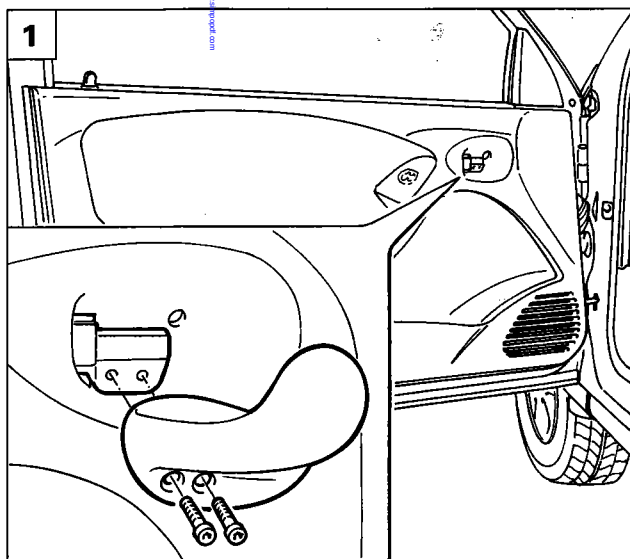
4. Undo the bolts fixing the speaker, and remove it from the vehicle after having disconnected the electrical connection for the supply cables.



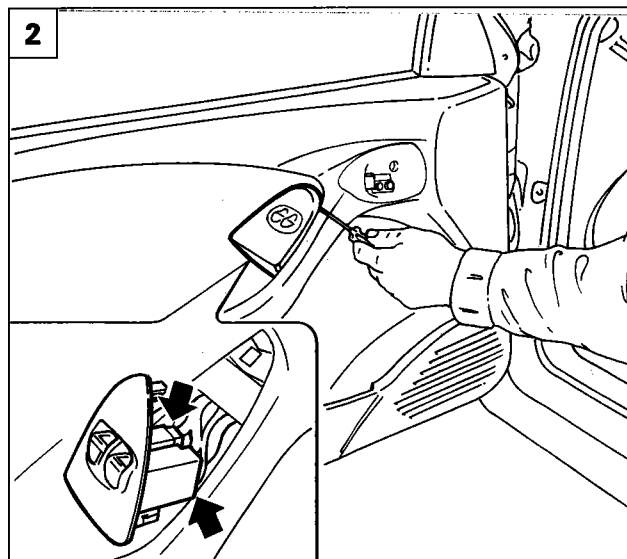
P4A056L03



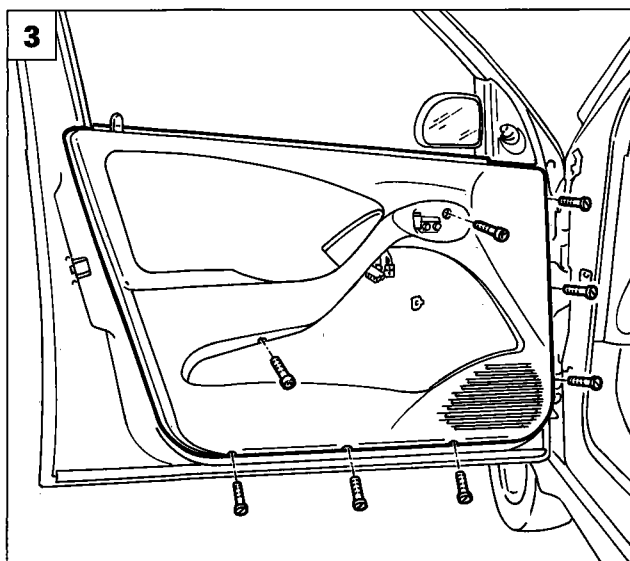
P4A056L04



P4A057L01



P4A057L02

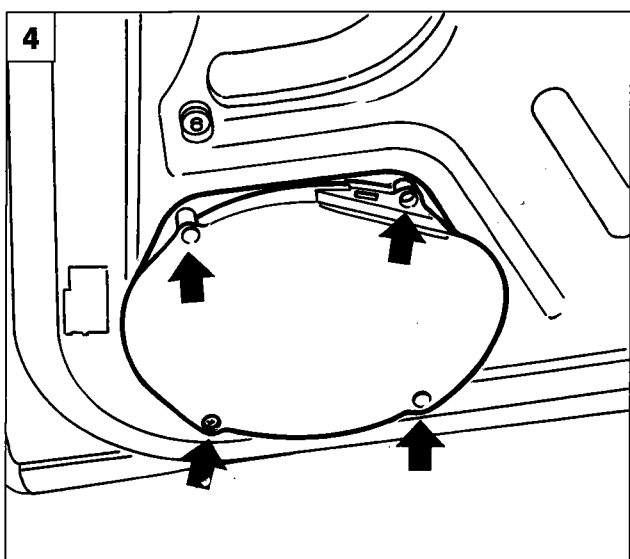


P4A057L03

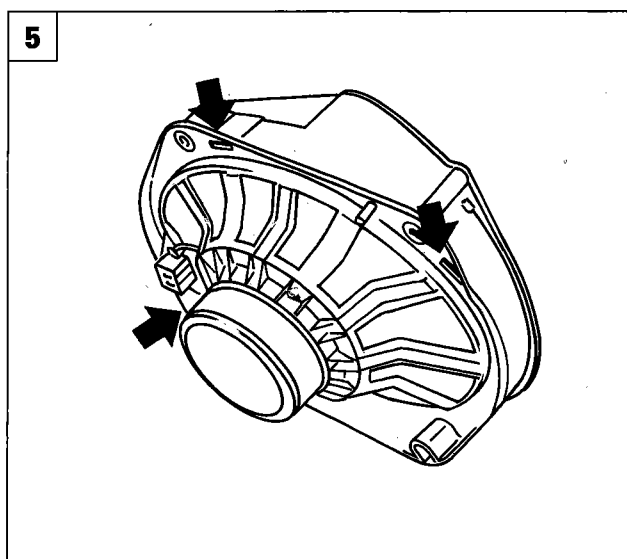


Loudspeakers on front door

1. Remove the door lever by undoing the screws indicated.
2. Remove the electric windows pushbutton unit and disconnect the electrical wiring.
3. Remove the door panel by undoing the attachment screws.
4. Undo the screws securing the loudspeaker assembly and remove it from the car.
5. Separate the protective grille from the loudspeaker by releasing the retaining lugs.



P4A057L04



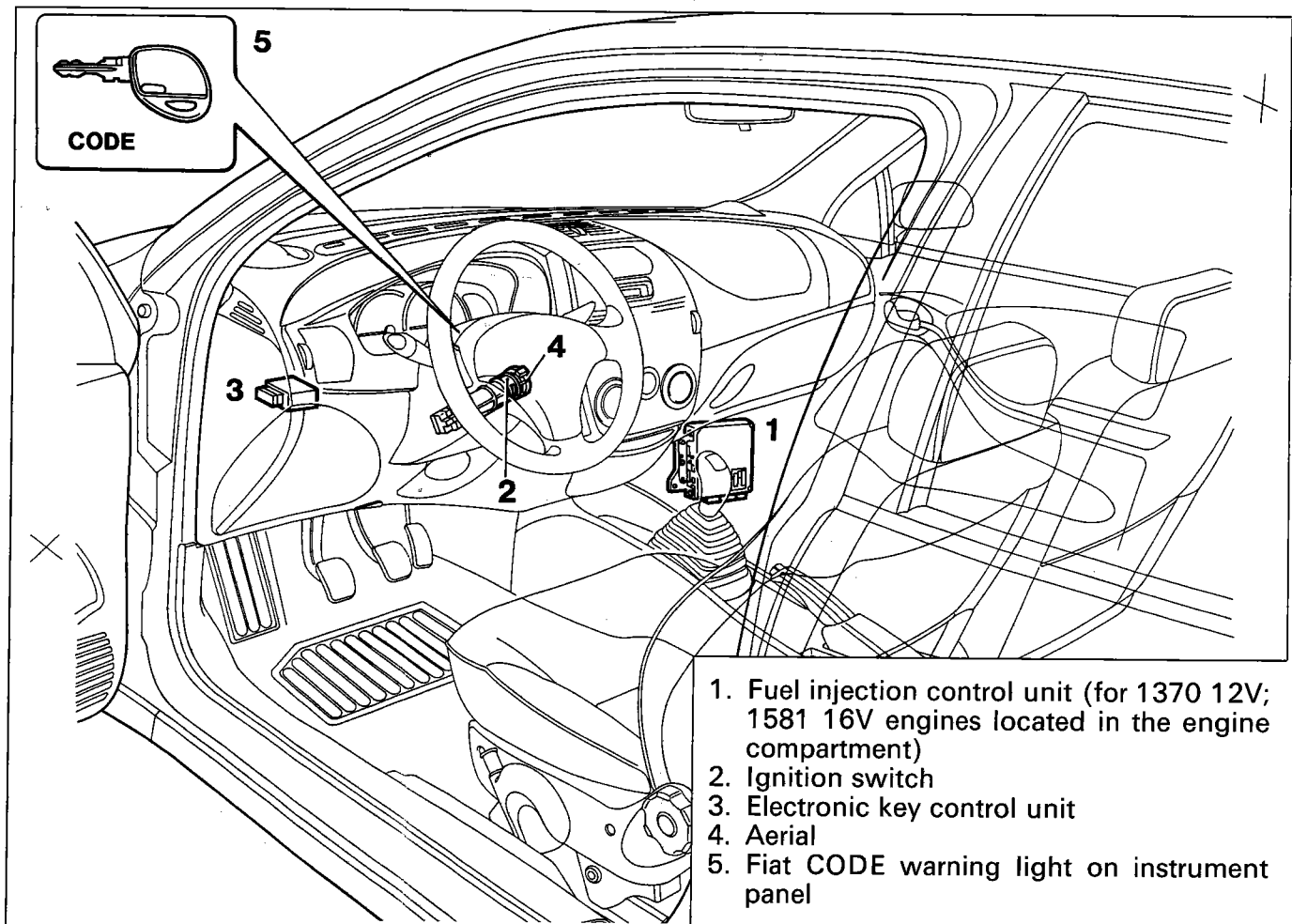
P4A057L05

INTRODUCTION

To increase protection against attempted theft, the cars are fitted with an electronic system for blocking the engine, called "Fiat CODE", which is automatically activated when the ignition key is withdrawn. The keys are fitted with a device which transmits a coded signal to the Fiat CODE control unit which, only if it recognizes the signal, permits engine starting.

The Fiat CODE (immobilizer) system comprises:

- Fiat CODE control unit;
- electronic keys (three or four depending on the car model) containing a device which emits an electronic code;
- specific aerial on ignition switch;
- engine control unit with serial line for communication with the Fiat CODE control unit;
- Code Card with secret code for the emergency starting procedure;
- CODE warning light.



P4A058L01

The functions of the Fiat CODE control unit are:

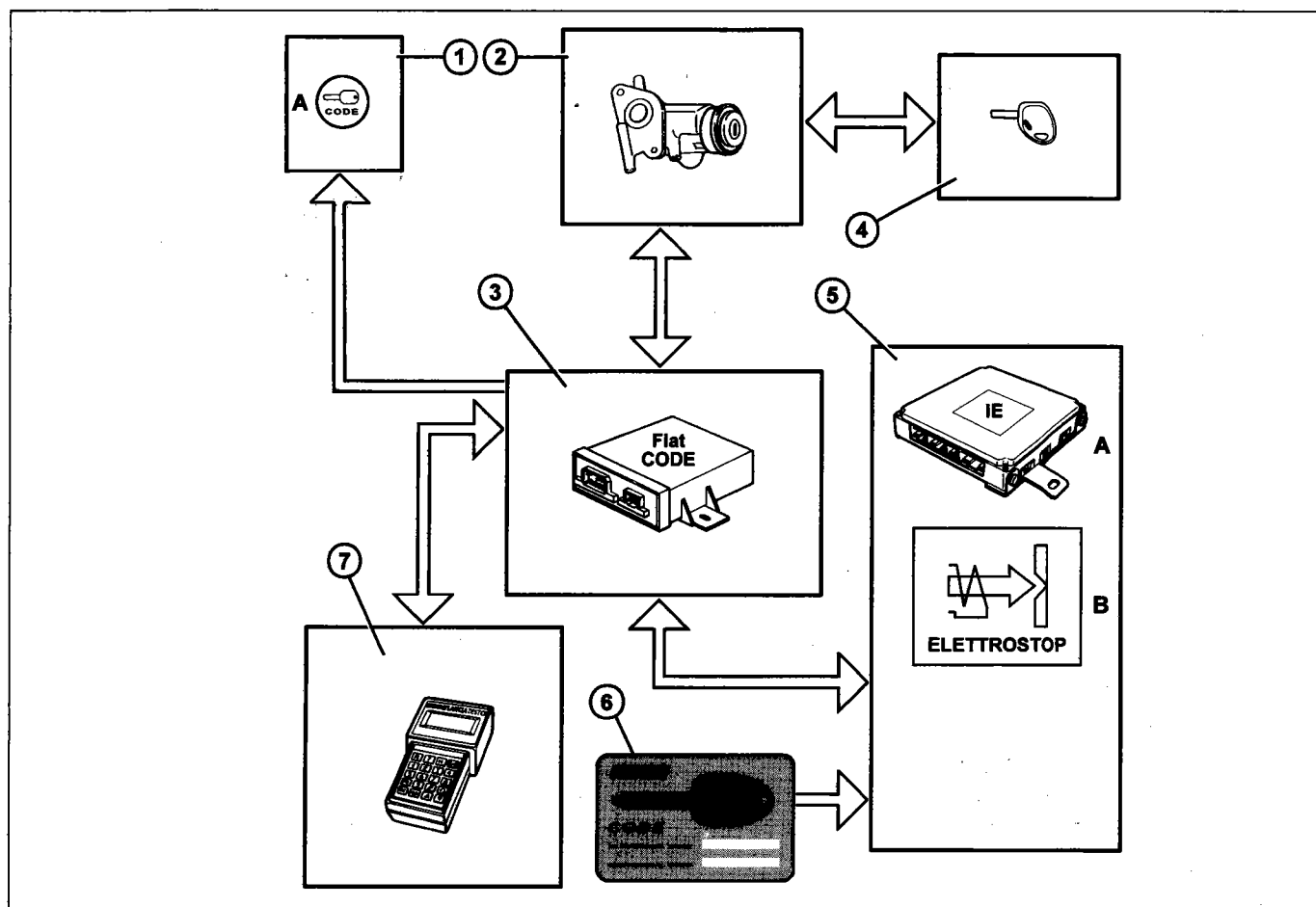
- to recognize the introduction and rotation of a key in the ignition switch;
- to emit an electromagnetic field to give power to and activate the key's TRANSPONDER (code emitter);
- to receive the secret code emitted from the key;
- to memorize a maximum of 8 keys with 8 electronic codes;
- to manage the checking/processing of the codes;
- to manage a single-wire bidirectional serial communication towards the engine control unit;
- to manage the lighting up of a special warning light;
- to recognize the connection with the Fiat/Lancia Tester and, for some versions, to prepare the use of the serial line for the diagnosis function.

The Fiat CODE system enables the operation of the engine control unit by means of an exchange of codes.

When the ignition is ON (+15), the engine control unit sends a code request to the Fiat CODE control unit; the latter responds and sends a secret code only after recognizing (via an aerial) a known electronic key entered in the ignition switch.

After recognizing the code, the engine control unit changes over to the engine starting enablement condition.

The engine control unit can only memorize the secret code by means of a particular procedure.



P4A059L01

1. CODE warning light on instrument panel
2. Ignition switch with aerial
3. Fiat CODE control unit
4. Key with transponder

5. Engine control unit
 - A. Fuel injection/ignition control unit (petrol) or fuel injection pump control unit (diesel)
 - B. Electrostop (diesel)
6. CODE Card
7. Fiat/Lancia Tester

DESCRIPTION OF SYSTEM

Engine control unit

The engine control unit is the fundamental component of the Fiat CODE system as it contains the main code (Master Code).

Depending on the model/version, the engine control unit consists of the following devices:

- Electronic fuel injection-ignition control unit for petrol versions with integrated fuel injection/ignition system.
- Electronic fuel injection control unit for diesel versions with electronic pump.
- Electronic device integrated in the electrostop valve for diesel versions with mechanical fuel injection pump.

When the ignition is switched ON (+15), the engine control unit requests a code from the Fiat CODE control unit; after receiving the code, it compares it with the Master Code stored in memory. If the comparison of the code gives a positive result, the engine control unit permits starting and normal operation of the engine.

If the Fiat CODE control unit is faulty, the engine control unit manages the emergency starting procedure activated by the Fiat Lancia Tester or (for petrol versions with integrated fuel injection/ignition systems and diesel versions with electronic fuel injection) by means of the accelerator pedal.



Under no circumstances may engine control units be exchanged between cars to check whether they are working.



During diagnosis, before replacing the engine control unit, make sure that the component under examination really is faulty, because when the new engine control unit is supplied, the Master Code will be memorized, rendering it entirely unusable on other cars.

Fiat CODE control unit

The main function of the Fiat CODE is to recognize the keys inserted in the ignition switch.

At the request of the engine control unit, the Fiat CODE unit sends to the former:

- the Master Code (key recognized), enabling starting and normal operation of the engine;
- the diagnosis code (key not recognized) preventing engine starting.

The Fiat CODE control unit also has to do the following:

- manage the memorization or rememorization of the keys;
- memorize the Master Code in the engine control unit (at the request of the engine control unit);
- manage the CODE warning light.

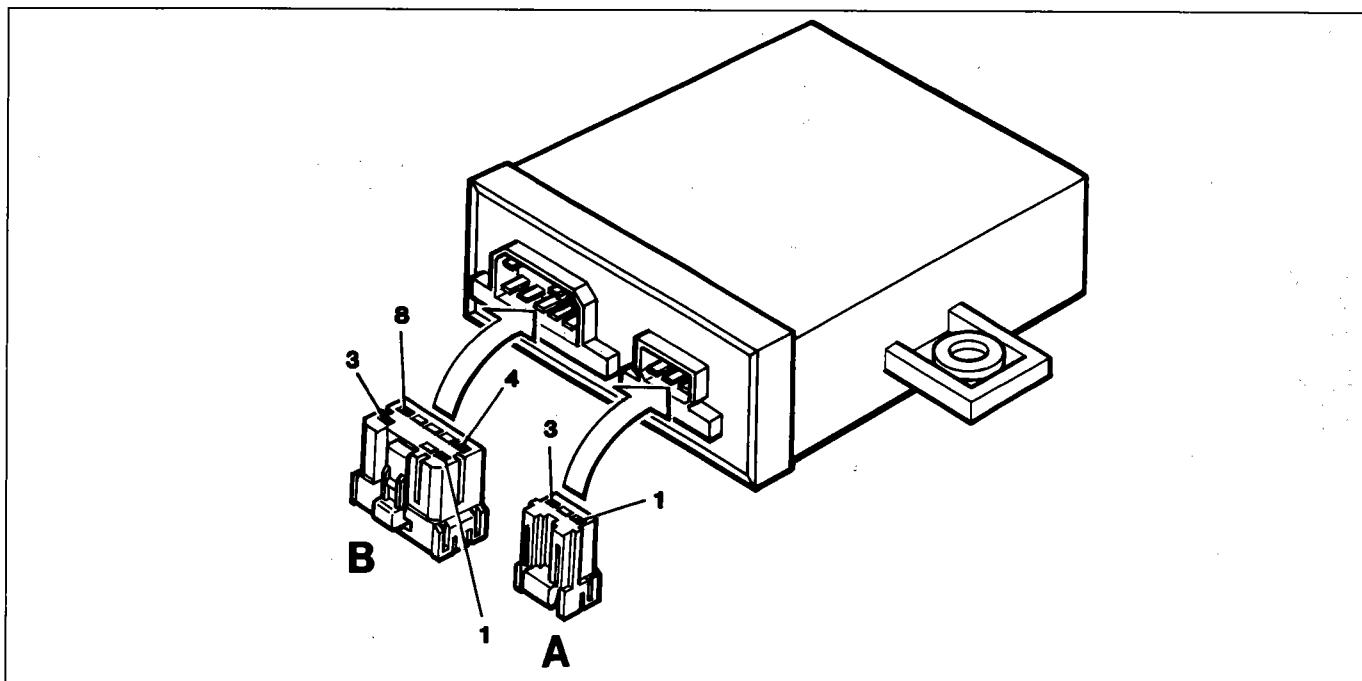
There are two procedures for dialogue between the Fiat CODE control unit and the engine control unit:

- after the Fiat CODE control unit has memorized the keys, dialogue with the UNUSED engine control unit begins. The exchange of information (registration of the code) between the engine control unit and the Fiat CODE control unit is guided only by the engine control unit; the Fiat CODE control unit is only enabled to respond to interrogations from the engine control unit;
- checking the code is a standard procedure which is repeated whenever the user inserts the electronic key in the ignition switch block and turns it to the ON (+15) position; the checking procedure also continues when the user moves the key to the START (+50) position.

With the key at the ON (+15) position, the Fiat CODE control unit must recognize the electronic key with its relevant code. There will be two possibilities:

- recognition of the code by the Fiat CODE control unit; the engine code control unit enables starting and engine operation (the CODE warning light goes out);
- if the code recognition is negative, the Fiat CODE control unit will send a code to the engine control unit which will not permit engine starting (CODE warning light is on permanently).

Perspective view of the Fiat CODE control unit and relevant connectors



P4A061L01

Identification of connector pins

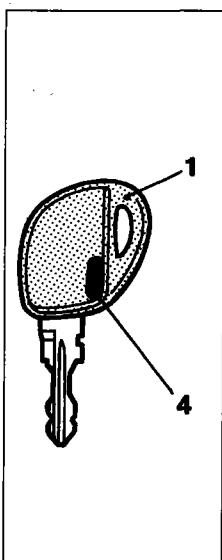
Connector A

1. Aerial
2. Not connected
3. Aerial earth

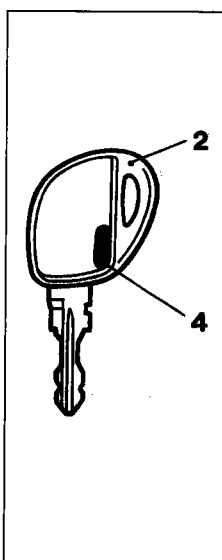
Connector B

1. Not connected
2. CODE warning light
3. +12 V from battery (+30)
4. Earth
5. Not connected
6. Serial line to fuel injection control unit
7. Not connected
8. +12 V with key in ON position (+15)

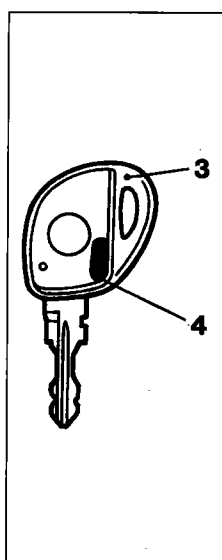
Electronic keys



P4A061L02



P4A061L03



P4A061L04

1. Master key (maroon colour)
2. Main key
3. Key with remote control
4. Transponder

Two types of key are supplied with the car. The key (1) with maroon handle is the MASTER key; a single copy is supplied and it is used to memorize the other keys.



The Master key can also carry out all the functions of the main key; however, it is not advisable to use it except in cases of emergency.

The key (2) is the key for normal use (main key); two copies are supplied and it serves for starting and opening/closing the front doors, tailgate and glove compartment, if the latter has a lock.

For cars with remote control, the key (3) is supplied instead of key (2).

Fiat CODE

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The key handle contains a Transponder, an electronic device NOT supplied by the battery; it contains a code and effects transmission by ether.

When the key is inserted in the ignition switch, the Transponder is activated by the aerial by radio waves and responds automatically by emitting a code.

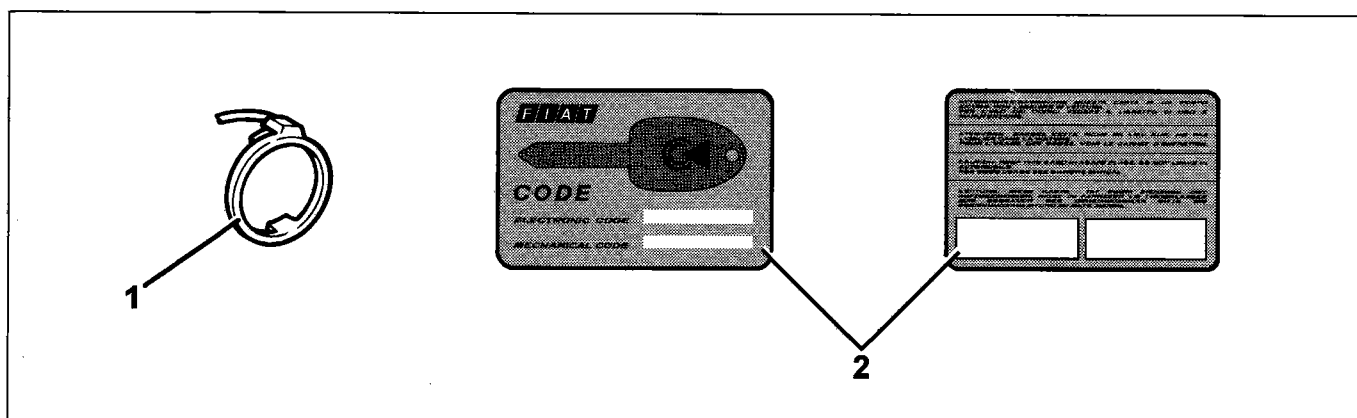
Each key contains a Transponder with a secret code. The MASTER key (maroon key) contains the Master Code and should be used ONLY for the key memorization procedure.

The code of the MASTER key is the Master Code memorized in the engine control unit and Fiat CODE control unit; this links the engine control unit and the MASTER key so that they are inseparable. If the MASTER key is lost or damaged, no further new key memorization procedures will be possible; a subsequent fault in the Fiat CODE control unit will make it necessary, in the absence of the MASTER key, to replace the Fiat CODE control unit and engine control unit.



The owner of the car is advised to CLOSELY follow the instructions below:

- the MASTER key must be stored in a safe place (not in the car);
- the MASTER key must be used only to memorize new keys;
- the CODE Card with the secret code must not be left in the car in case of theft; at the same time it must be available for emergency starting;
- the MASTER key is the right of ownership of the car; if the vehicle is sold, the MASTER key and CODE Card must be handed over to the new owner.



P4A062L01

1. Aerial

2. CODE Card with the secret code

Aerial

The aerial has to do the following:

- supply energy to the Transponder for sending the code;
- receive the code from the Transponder and send it to the Fiat CODE control unit.

Since the aerial has to be close to the Transponder (because of the electromagnetic immunity, small size and limited range of action of the Transponder), it is fitted coaxially in relation to the ignition switch.

CODE Card

The CODE Card is supplied in two copies, containing the following:

- Electronic CODE, 5-digit code for the emergency starting procedure using the Fiat Lancia Tester or, for models where this is possible, using the accelerator pedal;
- Mechanical CODE, should the mechanical part of the key need to be duplicated.

On the back of the card, there are two spaces for applying the self-adhesive labels with any remote controls with the transmitter code (password).

Warning light of the Fiat CODE system

The CODE warning light is managed by the Fiat CODE control unit. The CODE warning light consists of a lamp on the instrument panel. When the ignition is switched on (+15), the warning light can indicate one of the following conditions:

- ON briefly (0.7s) and then OFF: key recognized, correct operation of the system;
- FLASHING: both the engine control unit and the Fiat CODE control unit do not have any code memorized (unused system); for a description of the various flashing modes, refer to the "Manual Diagnosis" sub-section.
- ON: if the warning light comes on permanently when the ignition is ON (+15), this indicates one of the following faults:
 - a. key not recognized by the Fiat CODE control unit (engine management prohibited);
 - b. serial line not connected or the engine control unit and Fiat CODE control unit have not succeeded in establishing communication;
 - c. key memorization procedure not carried out correctly.



If the CODE warning light comes on temporarily or permanently during driving or starting of the car, this does not necessarily mean a fault in the system but, in certain cases, this indicates a condition that may be interpreted as a tampering attempt by a thief.

If this happens, to carry out a proper test on the system, stop the car, switch off the engine and switch the ignition off (STOP position). Turn the ignition on again: the CODE warning light should come on and go out again after about 1 second.

If the CODE warning light stays on after this procedure, repeat the operation, waiting with the ignition off (STOP position) for more than 30 seconds. If the Code warning light stays permanently on when the ignition is on even after this attempt, conduct a diagnosis on the Fiat CODE system.

KEY MEMORIZATION

First key memorization

The first key memorization is carried out in the factory.

To check that memorization has been effected, insert a key in the ignition switch and turn the ignition ON (+15):

- if the CODE warning light goes out, memorization has been effected;
- if after about 2.5 seconds the CODE warning light starts flashing again at a higher frequency, the system is still unused.

The condition of unused Fiat CODE control unit can also be checked by the Fiat Lancia Tester during diagnosis of the engine control unit.

Key memorization with unused system

An unused system means the simultaneous presence on the car of an engine control unit and a Fiat CODE control unit which have NO memorized code (for example following an intervention which has required the replacement of both control units).



Before starting this procedure, make sure that the Fiat CODE control unit is really unused. The use of a Fiat CODE control unit which is faulty or already memorized involves the irreversible memorization of an incorrect code in the engine control unit which will then be unusable in the future on other cars.

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The key memorization procedure is divided into two successive stages:

- a. the secret code of the electronic keys is memorized in the Fiat CODE control unit;
- b. the Fiat CODE control unit manages the memorization of the Master Code in the engine control unit (when the latter is unused).

This second stage is carried out automatically when the first has been completed successfully, when the ignition is switched ON again.

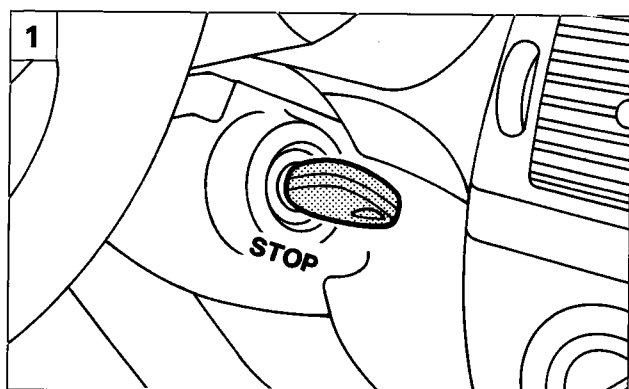
The procedure permits the memorization of up to a maximum of 8 and minimum of 3 keys, including the MASTER key.

The memorization procedure can only be used after the test carried out by the control unit ensures that everything is properly connected and operating (universal code activated and so car not protected).

The presence of the universal code can be checked by the flashing of the Code warning light; it has a frequency of 1.6 Hz and it starts 2.5 seconds after the ignition has been switched on (+15). After this check, the memorization procedure may be commenced.



To avoid errors in the key memorization procedure, the procedure described on the next page should be carried out thoroughly, before being carried out on the car.

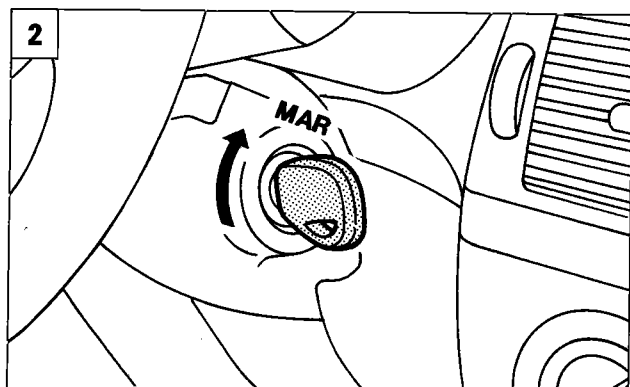


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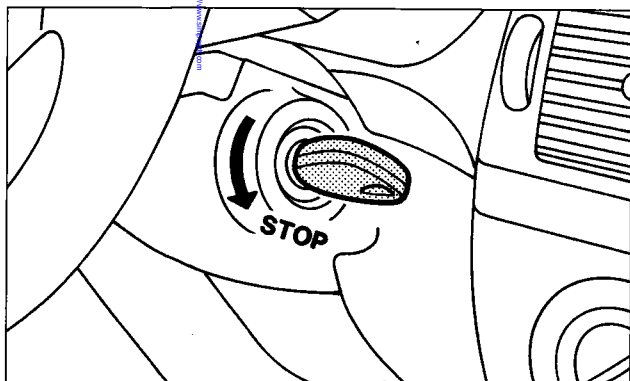
All the keys in the user's possession should be memorized in this procedure.

Insert the MASTER key (maroon) in the ignition switch, in the off (STOP) position.



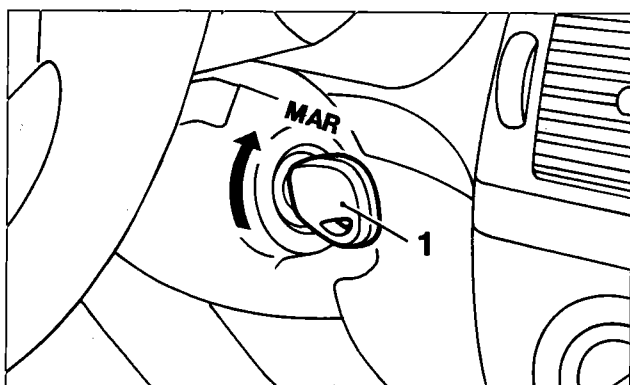
P4A064L02

Turn the MASTER key to the ignition on (+15) position; the CODE warning light comes on for 0.7 s.



P4A064L01

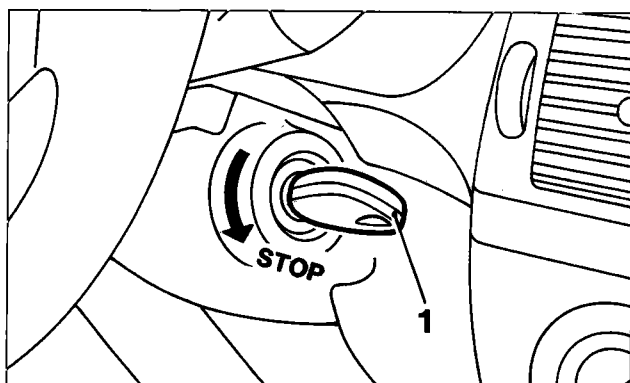
When the CODE warning light goes out, turn the MASTER key to the ignition off (STOP) position.



P4A065L01

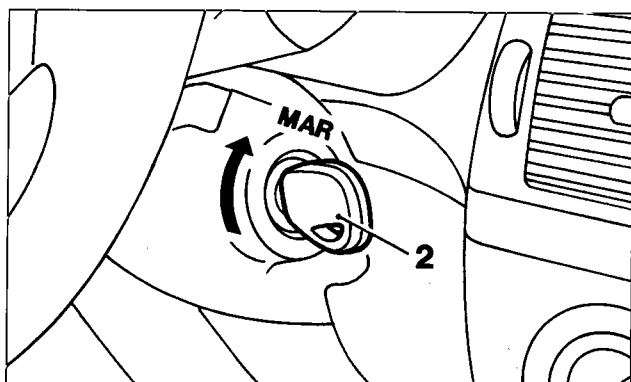
Within 10 seconds:

- withdraw the MASTER key from the ignition switch block;
- insert a new key (1) in the ignition switch block and turn it to the on (+15), position; the CODE warning light will come on for 0.7 s.



P4A065L02

When the CODE warning light goes out, turn the key (1) to the ignition off (STOP) position.



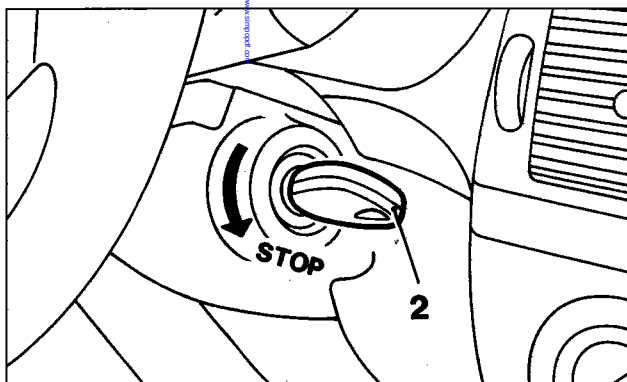
P4A065L03

Within 10 seconds:

- withdraw the key (1) from the ignition switch block;
- insert a new key (2) in the ignition switch block and turn it to the on position (+15); the CODE warning light will come on for 0.7 s.

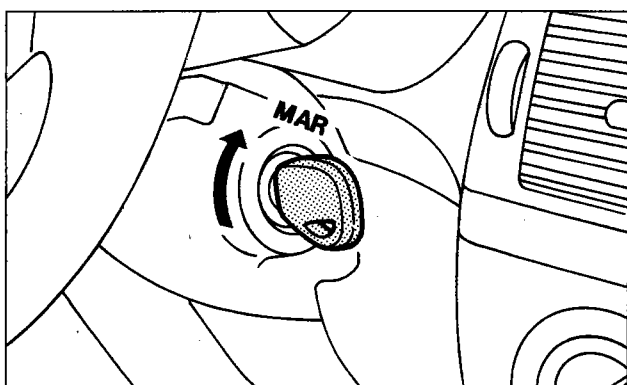
When the CODE warning light goes out, turn the key (2) to the off (STOP) position.

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P4A066L01

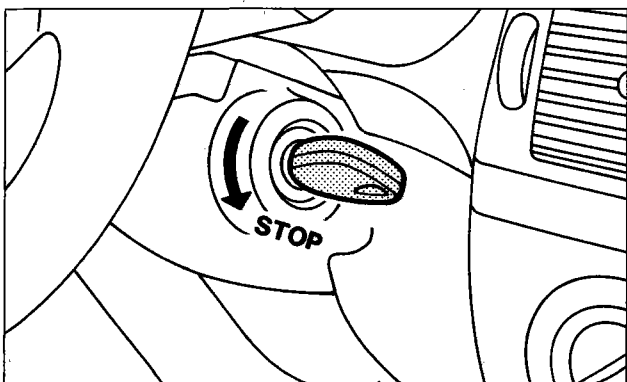
When the CODE warning light goes out, turn the key (2) to the ignition off (STOP) position.



P4A064L02

Within 10 seconds:

- withdraw the key (2) from the ignition switch block;
- insert the MASTER key in the ignition switch block again and turn it to the ON position (+15); the CODE warning light comes on for 0.7 s.



P4A064L01

When the CODE warning light goes out, turn the MASTER key to the off (STOP) position.

The memorization procedure is completed (memorization of the Master Code in the engine control unit) as follows:

- turn the MASTER key to the ignition on (+15) position;
- keep the MASTER key at the ON position for about 3 seconds;
- the CODE warning light comes on for 0.7 s and goes out definitively if the procedure has been successful (positive result);
- the CODE warning light comes on for 0.7 s and starts flashing again after about 2 seconds if the memorization has NOT been successful (negative result). In this case, withdraw the MASTER key and repeat the key memorization procedure from the beginning.

Also refer to the diagram on the next page.

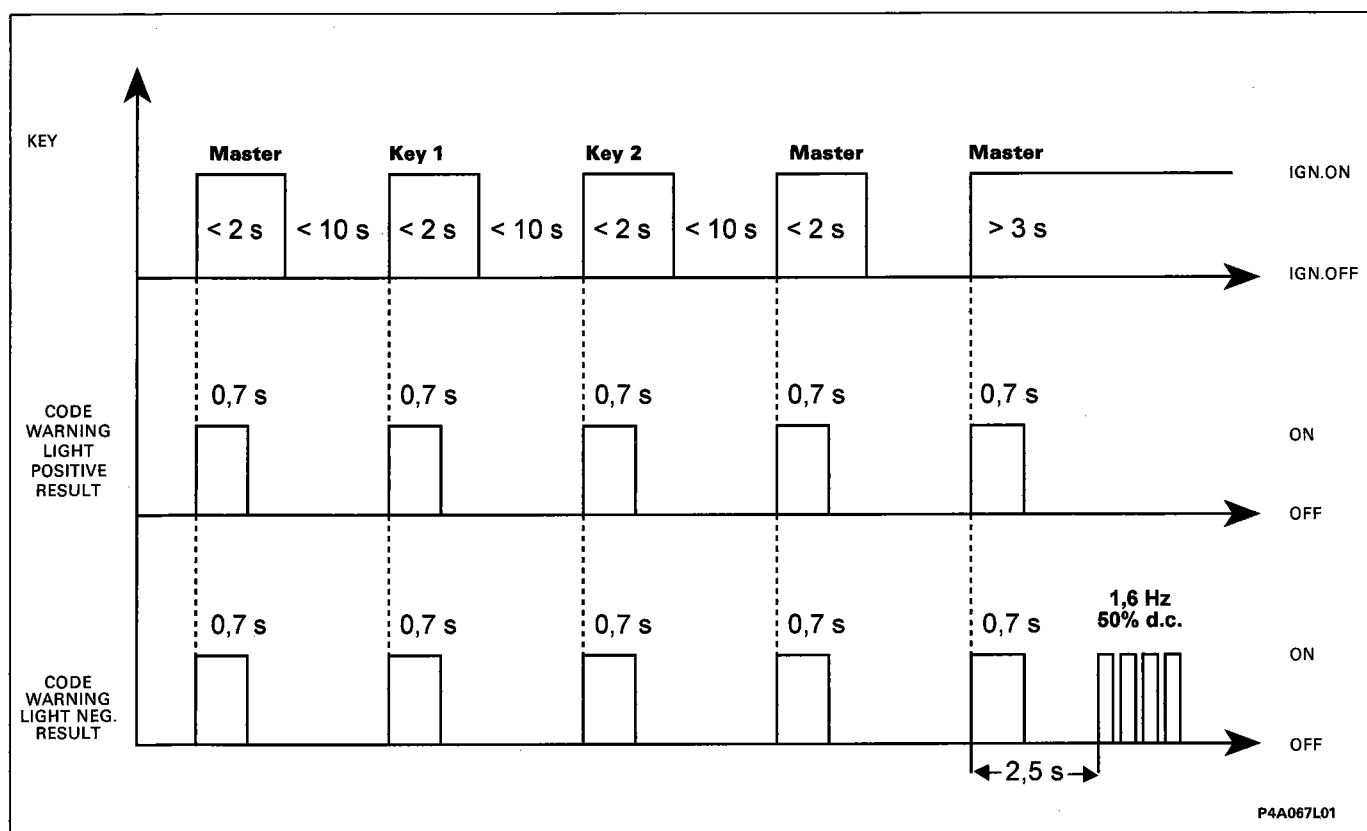
The key memorization procedure on an unused system is not successful if:

- a key is inserted for 2 consecutive times;
- the same key is inserted 2 or more times between 2 insertions of a MASTER key;
- a period when the key is at the ignition on position (+15) lasts for more than 2 seconds;
- a period when the key is at the STOP position lasts more than 10 seconds.

On completion of memorization, ensure that all the keys supplied start the engine; if one of the keys does not start the engine, repeat the key memorization procedure.

NOTE *The memorization procedure has been described for 3 keys (including the MASTER), but should be applied to all the keys supplied with the vehicle, plus any additional keys.*

- If the procedure has not been carried out correctly, the memorization procedure should be repeated very carefully.
- If for any reason and at any time during the key memorization procedure you notice that you have made a mistake, move the key to the on (+15) position for over 2 s or to the off (STOP) position for over 10 s, then start the key memorization procedure from the beginning.



The diagram shows how the CODE warning light comes on depending on the key memorization.

Key memorization with UNUSED Fiat CODE control unit and USED electronic fuel injection control unit

For the key memorization procedure with unused Fiat CODE control unit and used electronic fuel injection control unit, follow the instructions given in the "key memorization with unused system" described above.

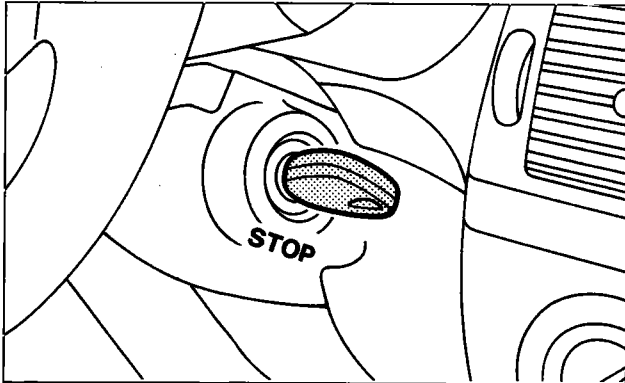
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Key memorization procedure with USED Fiat CODE and electronic fuel injection control units

This procedure is necessary if further keys need to be memorized, or if the key set has to be reset because the notches have been replaced. The procedure consists of memorizing up to a maximum of 8 and a minimum of 3 different keys (MASTER key included).



To avoid errors in the key memorization procedure, the procedure described below should be read carefully before being carried out on the car.

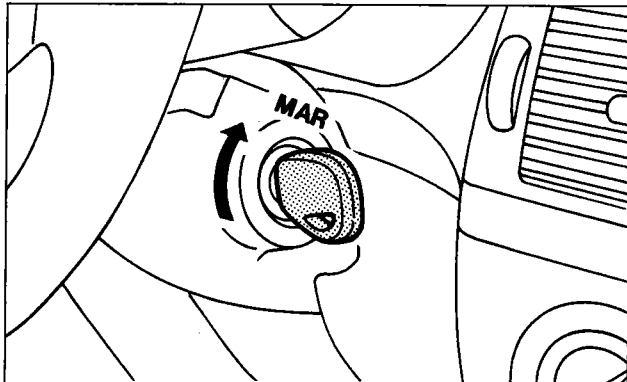


P4A066L02



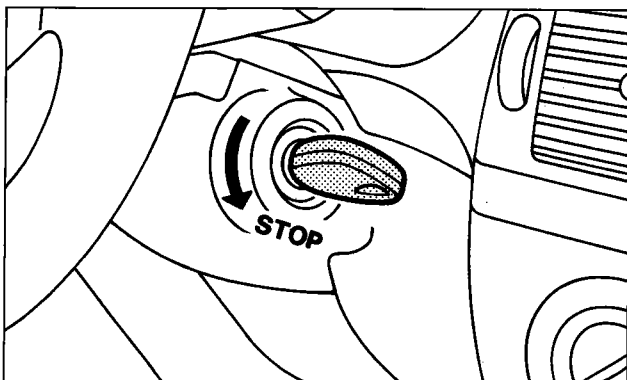
Adding a new key necessarily involves memorizing all the existing keys, as the keys not used during this procedure are deleted from memory.

Insert the MASTER key in the ignition switch at the ignition off (STOP) position.



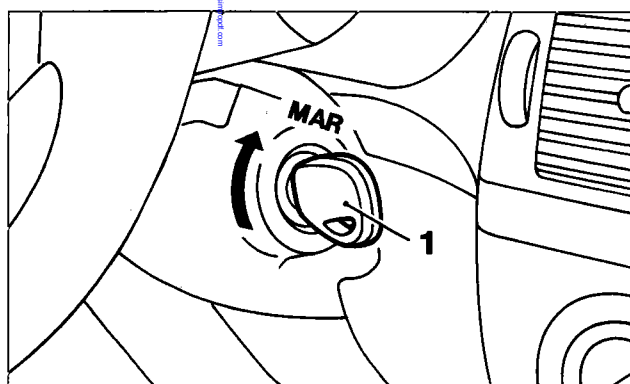
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Turn the MASTER key to the on position (+15); the CODE warning light should come on for 0.7 s.



P4A064L01

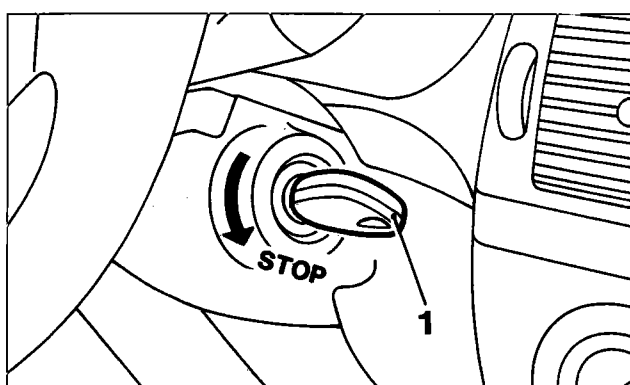
When the CODE warning light goes out, turn the MASTER key to the off (STOP) position.



P4A065L01

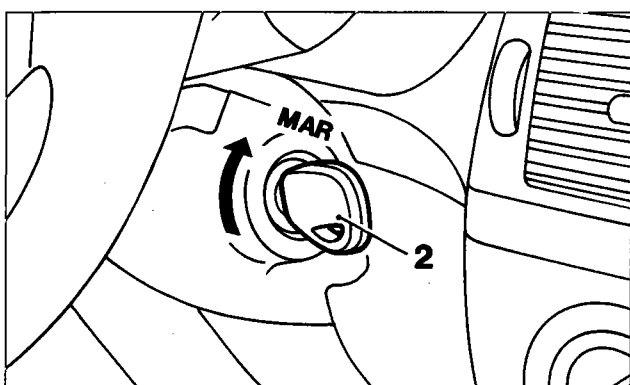
Within 10 seconds:

- withdraw the MASTER key from the ignition switch block;
- insert a new key (1) in the ignition switch block and turn it to the ignition on (+15) position; the CODE warning light comes on for 0.7 s.



P4A065L02

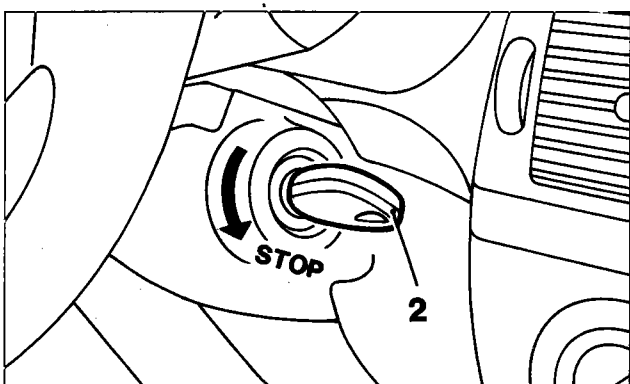
When the CODE warning light goes out, turn the key (1) to the off (STOP) position.



P4A065L03

Within 10 seconds:

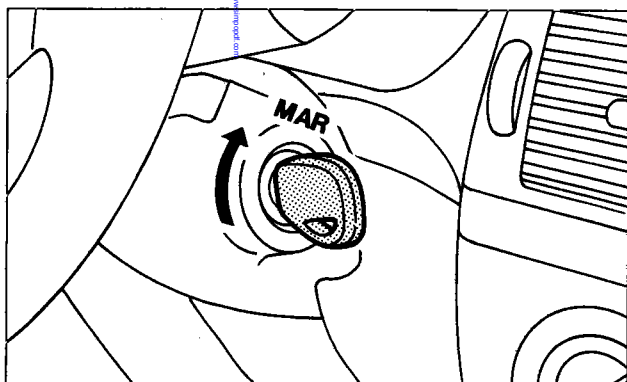
- withdraw the key (1) from the ignition switch block;
- insert a new key (2) in the ignition switch block and turn it to the ignition on position (+15); the CODE warning light comes on for 0.7 s.



P4A066L01

When the CODE warning light goes out, turn the key (2) to the ignition off (STOP) position.

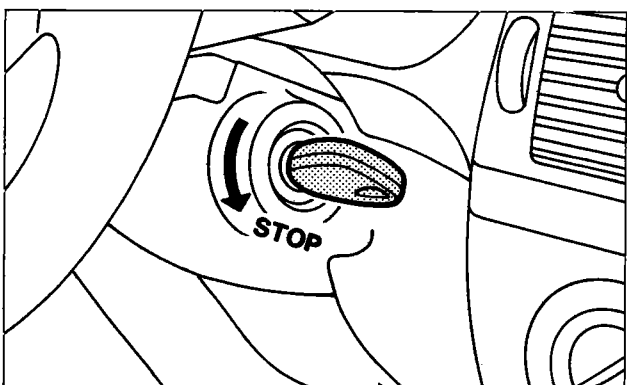
55.



P4A064L02

Within 10 seconds:

- disconnect from the key (2) from the ignition switch block;
- insert the MASTER key in the ignition switch block again and turn it to the on (+15) position; the CODE warning light comes on for 0.7 s.



P4A064L01

When the CODE warning light goes out, turn the MASTER key to the off (STOP) position. On completion of memorization, make sure that all the keys supplied start the engine; if one of the keys does not start the engine, repeat the key memorization procedure.

This procedure cancels the recognition of the keys previously memorized and keeps the MASTER key with the keys just memorized.

The key rememorization procedure is not successful in the following cases:

- a key is inserted for 2 successive times;
- the same key is inserted 2 or more times between 2 insertions of a MASTER key;
- a period when the key is at the on (+15) position lasts more than 2 seconds;
- a period when the key is at the STOP position lasts more than 10 seconds.

If the procedure has not been carried out correctly, repeat the memorization procedure very carefully.

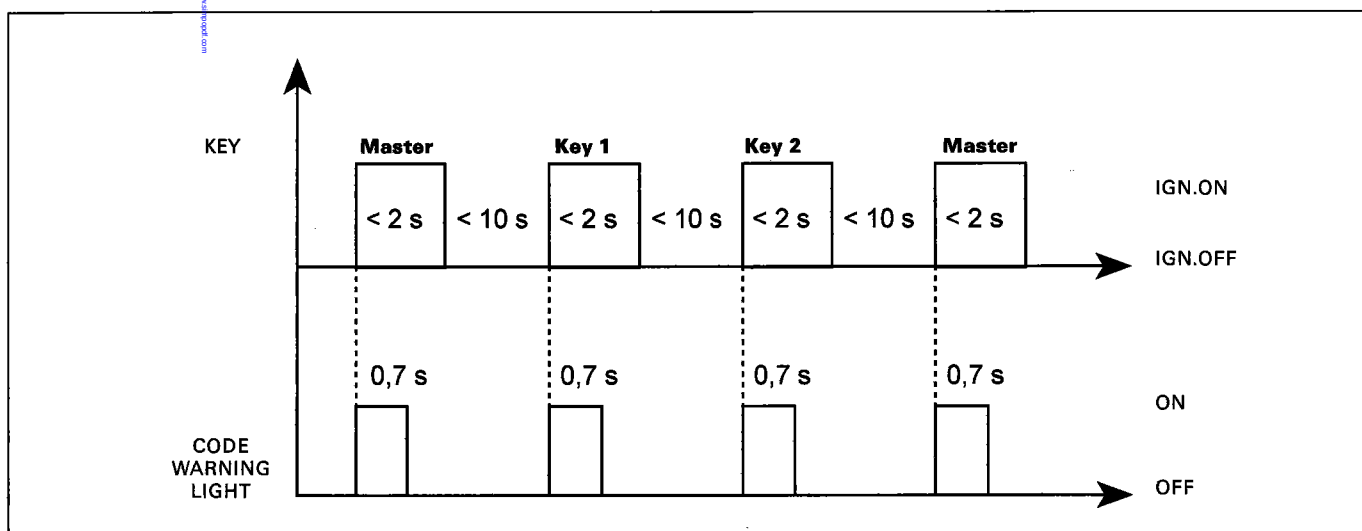
If for any reason and at any time during the memorization procedure you notice that you have made a mistake, move the key to the ignition on (+15) position for over 2 s or to the STOP position for over 10 s, then start the key memorization procedure from the beginning.

If the CODE warning light comes on permanently during the rememorization procedure, this means that the procedure has been interrupted as it has not been carried out correctly; in this case, start the procedure from the beginning.



If the CODE warning light comes on permanently (with MASTER key at the ignition on position) at the second consecutive insertion of the MASTER key, this does not indicate a malfunction of the system, but that the rememorization procedure has been opened (1st insertion) and then interrupted (2nd insertion). To restore correct operation of the CODE warning light, return the MASTER key to the STOP position.

NOTE *The memorization procedure has been described for 3 keys (including the MASTER), but should be applied to all the keys supplied with the vehicle, plus any additional keys.*



The diagram shows how the CODE warning light comes on depending on the key memorization

Key memorization with **USED** Fiat CODE control unit and **UNUSED** electronic fuel injection control unit

If the electronic fuel injection control unit has to be replaced, the Master Code inside it has to be memorized.

To memorize the Master Code in the electronic fuel injection control unit, simply turn a key to the ignition on (+15) position, after checking that the Fiat CODE control unit is working correctly.



Under no circumstances may electronic fuel injection control units be exchanged between cars to check whether they are working.

During diagnosis, before replacing the electronic fuel injection control unit, make sure that the component under examination really is faulty, because when the new electronic fuel injection control unit is supplied, the Master Code will be memorized, rendering it entirely unusable on other cars.

CONNECTION BETWEEN FIAT CODE CONTROL UNIT AND ENGINE CONTROL UNIT

The Fiat CODE control unit and engine control unit dialogue via a serial line consisting of a single cable.

The serial cable is of the bidirectional type; this means that the information travels in a sequential manner from the engine control unit to the Fiat CODE control unit and vice versa.

The information exchanged between control units can relate to the following operating conditions:

- A. Code check - whenever the key is turned to the ignition on position (even during starting), the engine control unit, before starting engine management, requests the MASTER CODE from the Fiat CODE control unit.
- B. Code memorization - These operating stages concern the system when at least one control unit is unused. The following cases may be distinguished:
 - Unused engine control unit and Fiat CODE control unit.
 - Used Fiat CODE control unit and unused engine control unit.
 - Unused Fiat CODE control unit and used engine control unit.

Refer to the "Key Memorization" sub-section for the procedures to be adopted.

- C. Sharing the serial line for diagnosis - Depending on the version, the connection between the Fiat CODE control unit and the diagnostic socket may be configured as follows:

- For petrol versions with Bosch Monomotronic, IAW, Hitachi integrated fuel injection-ignition system, the Fiat CODE system does not have its own diagnostic socket (Figure A next page). To check the operation of the system, conduct a diagnosis on the engine control unit.
- For diesel versions with mechanical fuel injection pump, the Fiat CODE system has its own diagnostic socket.

- For petrol versions with Bosch Motronic system and diesel with electronic fuel injection pump, the Fiat CODE control unit shares the diagnosis line K with the engine control unit (Fig.B).

Within the Fiat CODE control unit there is a remote control switch which changes over the connection between the engine control unit and diagnostic socket or Fiat CODE control unit.

The switch normally permits dialogue between Fiat CODE control unit and engine control unit (Default condition).

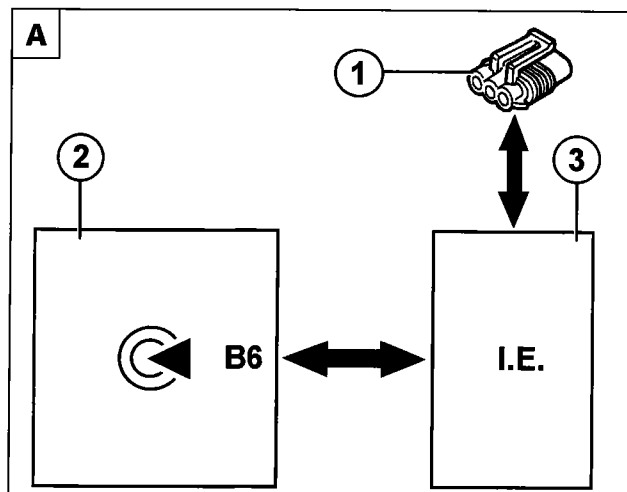
At the start of diagnosis, when the Fiat/Lancia Tester is connected and the ignition is switched on, the Fiat CODE control unit recognizes the diagnosis condition and drives the remote control switch so as to connect pins B5 and B6 to each other, enabling dialogue between the Fiat/Lancia Tester and the engine control unit.

The Fiat CODE control unit permits connection with the Fiat/Lancia Tester only if:

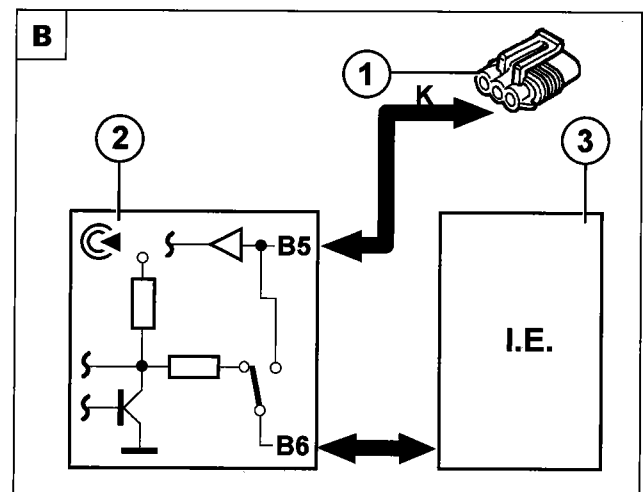
- There is no activity on the serial line between the Fiat CODE control unit and the engine control unit.
- There is a low voltage level on pin B5 for a period of time between 500 ms and 5 s (a low level for a period exceeding 5 s is considered to be a short circuit to earth).

The remote control switch returns to the "Default" position when there is no activity on pin B5 for over 30 s.

When the control unit recognizes that the Fiat/Lancia Tester has been connected, it activates the CODE warning light, indicated that the remote control switch has changed over correctly.



P4A072L01



P4A072L02

1. Diagnostic socket

2. Fiat CODE control unit

3. Engine control unit

MANUAL DIAGNOSIS

When the CODE warning light stays on permanently with the ignition key at the on position (+15), the problems may be as follows:

- key not recognized by the Fiat CODE control unit;
- serial line not connected;
- key rememorization procedure not carried out correctly (procedure interrupted).

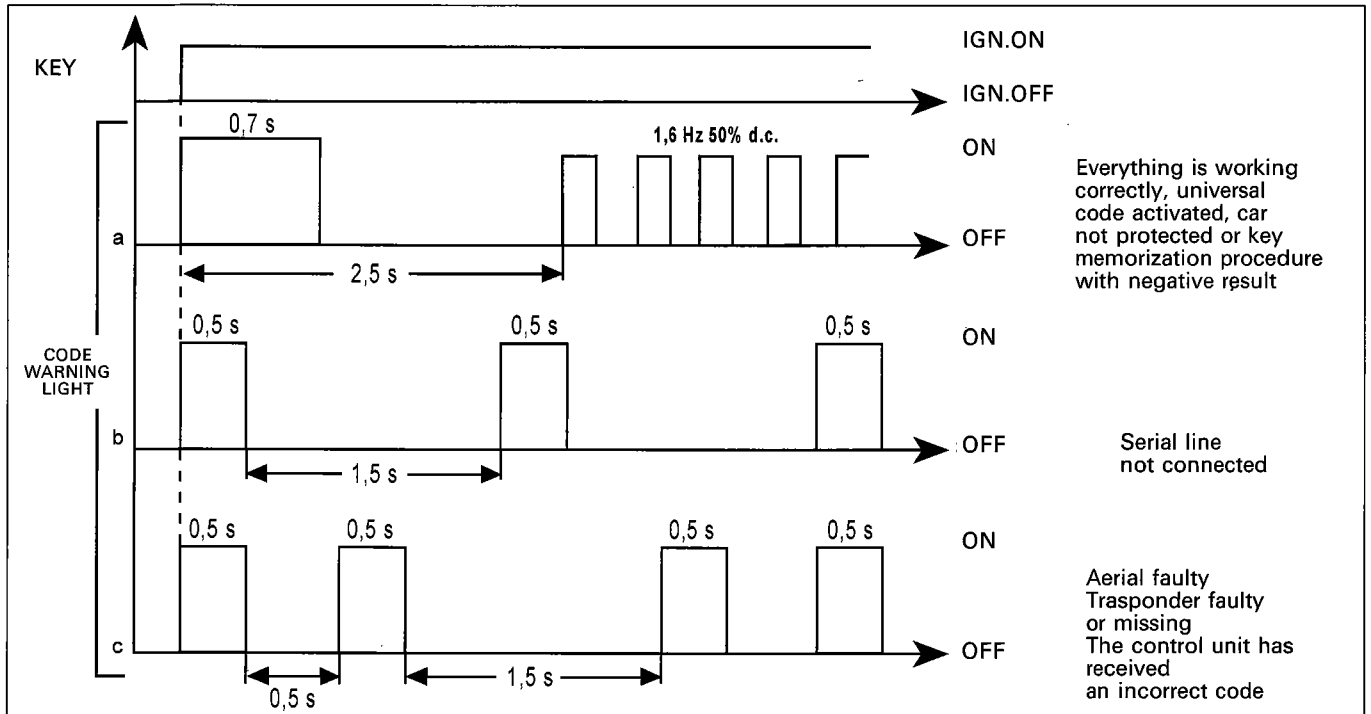
Unused system and ignition on

An unused system means the simultaneous presence on the car of an electronic fuel injection system and a Fiat CODE control unit which do NOT have any memorized codes (for example following an intervention which has required the replacement of both control units). In this case, when the ignition is switched on, the CODE warning light can indicate one of the following conditions also shown on the diagram below:

- When the CODE warning light comes on for 0.7 seconds and after about 2 seconds it starts flashing, everything is properly connected and working, the car is not protected, the universal code is active.
- When the CODE warning light flashes with code 1 (1 flash, pause, 1 flash, etc.), this means that the serial line is not connected or that the two control units have not succeeded in establishing communication.

- c. When the CODE warning light flashes with code 2 (2 flashes, pause, 2 flashes, etc.), this means one of the following conditions:
- aerial faulty;
 - Transponder faulty;
 - Transponder missing;
 - the electronic fuel injection control unit has received an incorrect code.

Manual diagnosis for unused system



P4A073L01

Unused Fiat CODE control unit and ignition on

In the case of cars with unused Fiat CODE control unit and used electronic fuel injection control unit, when the CODE warning light comes on permanently and the ignition is switched on, this indicates one of the following problems:

- aerial faulty;
- Transponder faulty;
- Transponder missing.

FAULT DIAGNOSIS WITH FIAT LANCIA TESTER

For petrol cars fitted with an integrated fuel injection - ignition system and diesel cars with electronic fuel injection pump, the Fiat CODE system does not have its own diagnostic socket. To check whether the system is operating, diagnosis should be conducted on the electronic fuel injection - ignition control unit (petrol cars) or fuel injection control unit (diesel cars).

The following can be measured with the Fiat Lancia Tester:

Parameters

- STARTING PERMITTED/NOT PERMITTED

This means that the engine control unit has recognized the code permitting engine starting.

- PROGRAMMED/NOT PROGRAMMED STATUS OF ELECTRONIC KEY

The indication NOT PROGRAMMED means that both fuel injection and Fiat CODE control units are unused (no memorized code).

Error

- ELECTRONIC KEY ERROR

When diagnosed, the error can be classified as PRESENT or INTERMITTENT.

Continuing the diagnosis, it is possible to distinguish whether the error is due to exchanged fuel injection control units or to a malfunction of the system's components.

Analysing the various screens displayed one after the other, you reach the "DO YOU WANT TO UNBLOCK THE ELECTRONIC KEY?" screen, which permits engine starting by entering the 5-digit code (ELECTRONIC CODE) stated on the Code Card.

EMERGENCY STARTING PROCEDURE

The emergency starting procedure makes it possible to start the engine if there is a problem in the Fiat CODE system (Fiat CODE control unit faulty, keys unusable, etc.).

The emergency procedure can only be activated if the engine control unit is in the "*engine management prohibited*" status. This procedure can be carried out with the Fiat Lancia Tester or, for some versions, also using the accelerator pedal. This operation is useful for starting the engine and driving the car to the closest authorized workshop for repair of the fault.

Emergency starting with Fiat Lancia Tester

The procedure is activated by entering, on the Fiat Lancia Tester, the 5-digit code (ELECTRONIC CODE) on the Code Card.

After an emergency start, when the ignition is switched off (STOP position), the fuel injection control unit returns to the engine starting blocked condition, so to start the engine, the emergency starting procedure must be carried out again.

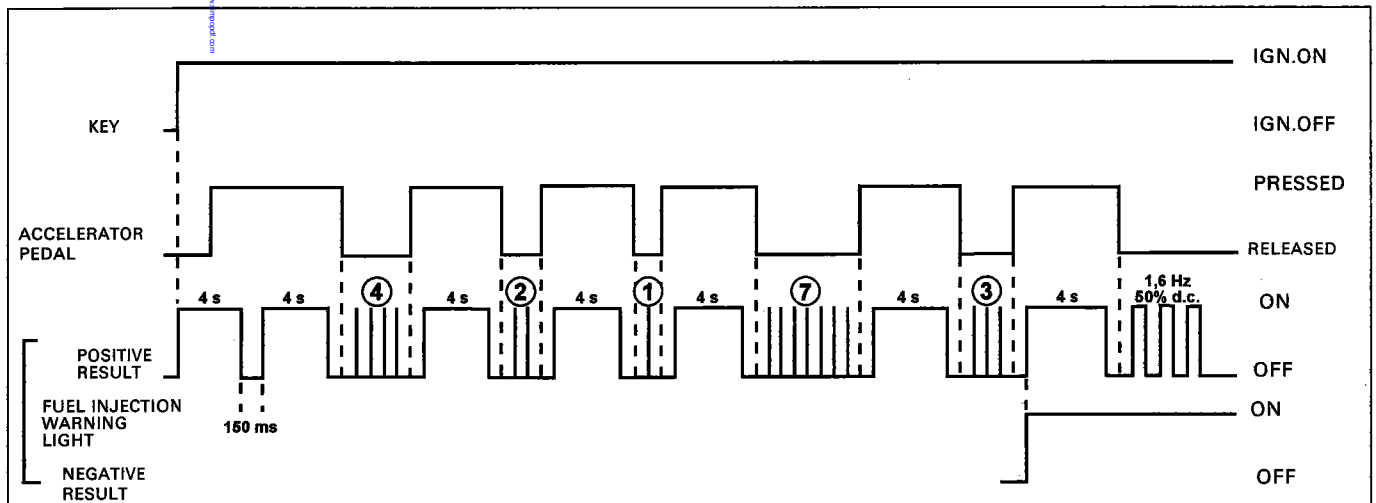
Emergency starting procedure using accelerator pedal

This procedure is applicable only to petrol cars with integrated fuel injection - ignition system and diesel cars with electronic fuel injection pump.

By means of this procedure it is possible, by using the accelerator pedal, to transmit the electronic code to the electronic fuel injection control unit which in turn detects it via the potentiometer located on the throttle valve (petrol version or accelerator pedal (diesel version)).

Carry out the following operations in sequence:

1. Read the 5-digit Electronic Code on the Code Card.
2. Switch the ignition on, press and hold down the accelerator pedal. The fuel injection system warning light comes on for 4 s, then goes out briefly (about 150 ms) and then comes on again for a further 4 s.
3. When the warning light goes out, release the accelerator pedal.
4. When the accelerator pedal is released, the warning light starts flashing (flashing frequency 0.8 Hz with duty - cycle 25% ON).
5. After a number of flashes equal to the first digit of the code read on the Code Card, fully depress and hold down the accelerator pedal.
6. The fuel injection fault warning light comes on again for 4 s and then goes out (first digit acquired).
7. When the warning light goes out, release the accelerator pedal.
8. When the accelerator pedal is released, the warning light again starts flashing as described in point 4.
9. After a number of flashes equal to the second digit of the code, press the accelerator pedal; the warning light comes on for 4 s (second digit acquired), and then release the accelerator.
10. Repeat the operations in points 4,5,6 and 7 for the remaining digits of the electronic code.
11. When the accelerator pedal is released, after the last digit has been acquired, the warning light will flash for 4 s at a frequency of 1.6 Hz with duty - cycle 50% indicating that the code has been accepted, or will remain permanently lit if the code has been refused. If the code has been accepted, start the engine, otherwise switch the ignition off (STOP position) and repeat the procedure.



NOTE The diagram illustrates the actions on the accelerator pedal and the lighting up of the fuel injection fault warning light relating to an example code 42173 (Electronic Code)

This procedure makes it possible to start the engine only once, but it can be repeated an unlimited number of times.



After the code has been acquired, the electronic control unit permits engine starting for a period of 10 minutes, after which it returns to the blocked starting status.

IMPORTANT NOTES CONCERNING THE REPLACEMENT OF COMPONENTS OF THE FIAT CODE SYSTEM

The Fiat CODE system consists of various components connected to each other. Care should be taken when working on and replacing one of these parts.

Engine control unit



Under no circumstances may engine control units be exchanged between cars to check whether they are working.



During diagnosis, before replacing the engine control unit, make sure that the component under examination really is faulty, because when the new control unit is supplied, the Master Code is memorized rendering it entirely unusable on other cars.

Fiat CODE control unit



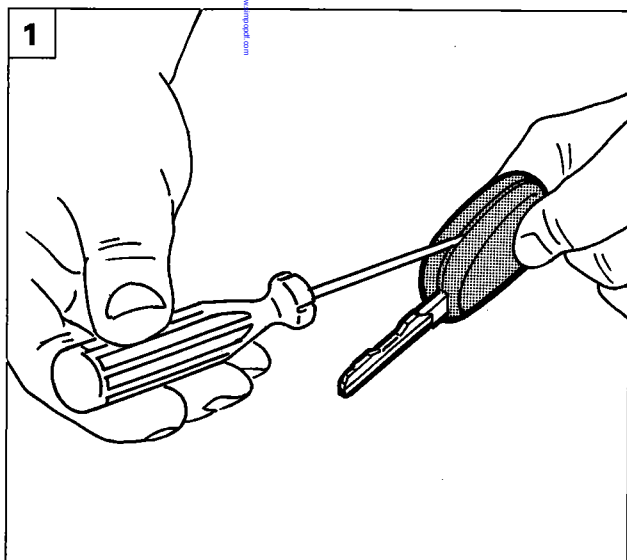
Replacing the Fiat CODE control unit entails the rememorization of the electronic keys following the "Key memorization with unused system" procedure.

Notches kits and new keys

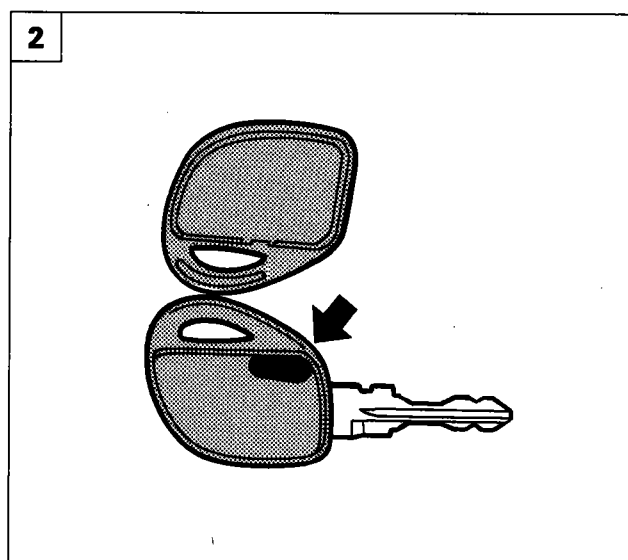


If the ignition switch block has to be replaced, remove the transponder from the old MASTER key and insert it in the new key (see next page), then carry out the "Key memorization procedure for used Fiat CODE and electronic fuel injection control units".

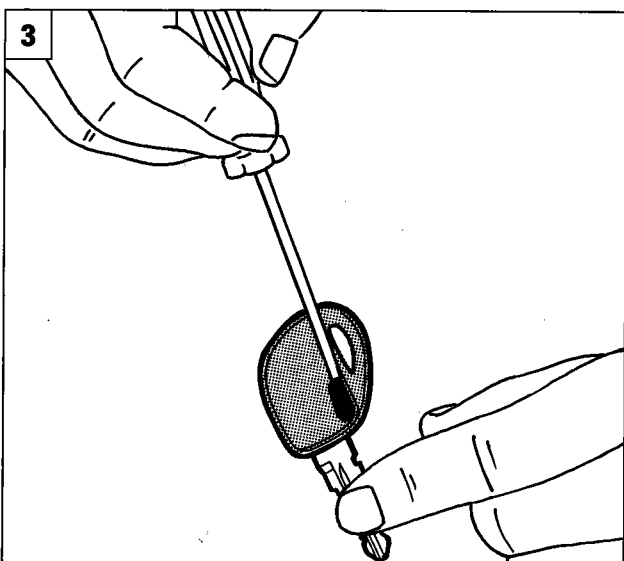
55.



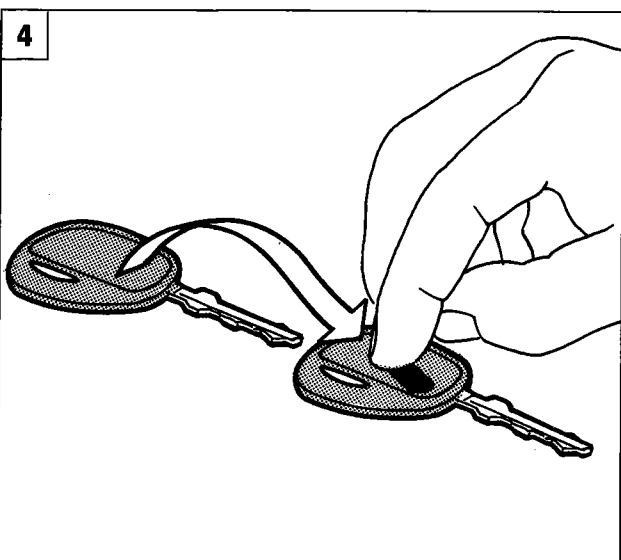
P4A076L01



P4A076L02



P4A076L03



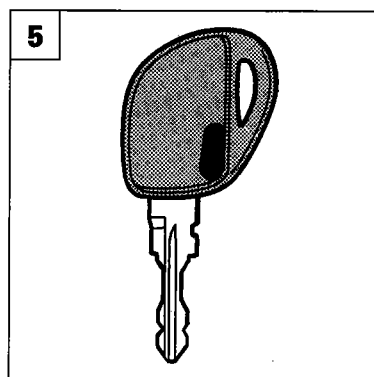
P4A076L04

REPLACING TRANSPONDER

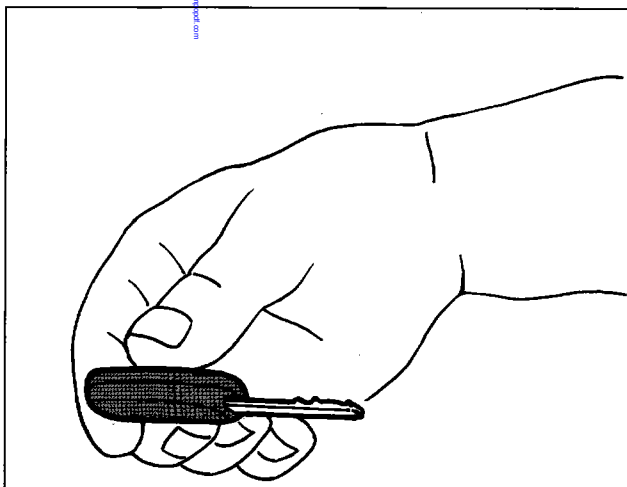


Use the maximum caution to avoid breakage or loss of the Transponder (carry out the dismantling operations on a table).

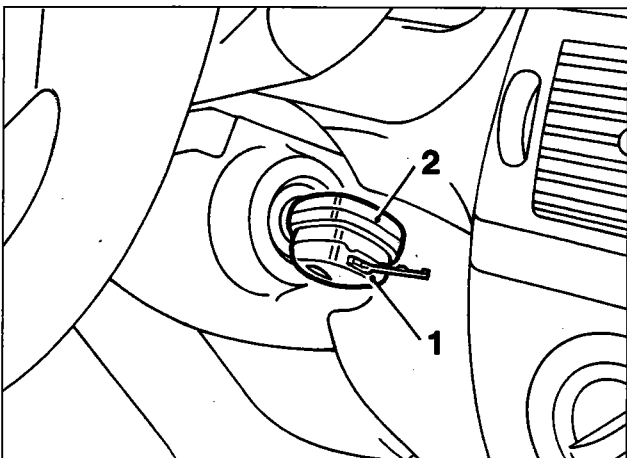
1. Insert a small screwdriver in the key slot and use it as a lever;
2. Open the MASTER key with care, as it consists of two half casings; the Transponder is shown by the arrow;
3. Remove the Transponder from its seating in the OLD MASTER key using a small screwdriver or point;
- 4.5. Fit the Transponder from the OLD MASTER key in the seating in the NEW MASTER key, positioning it as illustrated in the figure above, taking care not to damage the electrical component;



P4A076L05



P4A077L01



P4A077L02

- exert light pressure and join the two half casings of the NEW MASTER key;
- after carrying out the above-mentioned operation, carry out the procedure for memorizing the new set of keys.

If the ignition switch block has been damaged a long distance away from the place where the MASTER key is stored, the following emergency procedure must be carried out:

- replace the damaged switch block;
- insert the new MASTER key (1) without the Transponder in the ignition switch block;
- bring the old key (2) with Transponder in contact with the new MASTER key (1) without Transponder inserted in the ignition switch block.
- Turn the key, keeping the handles in contact for starting.

The Transponder contained in the OLD MASTER key must be transferred to the seating in the handle of the NEW MASTER key as soon as possible.

MASTER key (maroon)



If the MASTER key is unavailable, it will be impossible to memorize new keys which permit engine starting.



If the MASTER key is lost or its Transponder is broken/lost, the following must be replaced:

- notches kit and new keys (including the CODE CARD);
- Fiat CODE control unit;
- electronic fuel injection control unit.

This replacement of components is carried out at the first service intervention where the MASTER key has to be used (for example breakage of the ignition switch block).

Transponder



Under no circumstances may the key Transponders be handled, replaced or exchanged (except in cases of replacing the notches kit and new keys, and only the MASTER key).

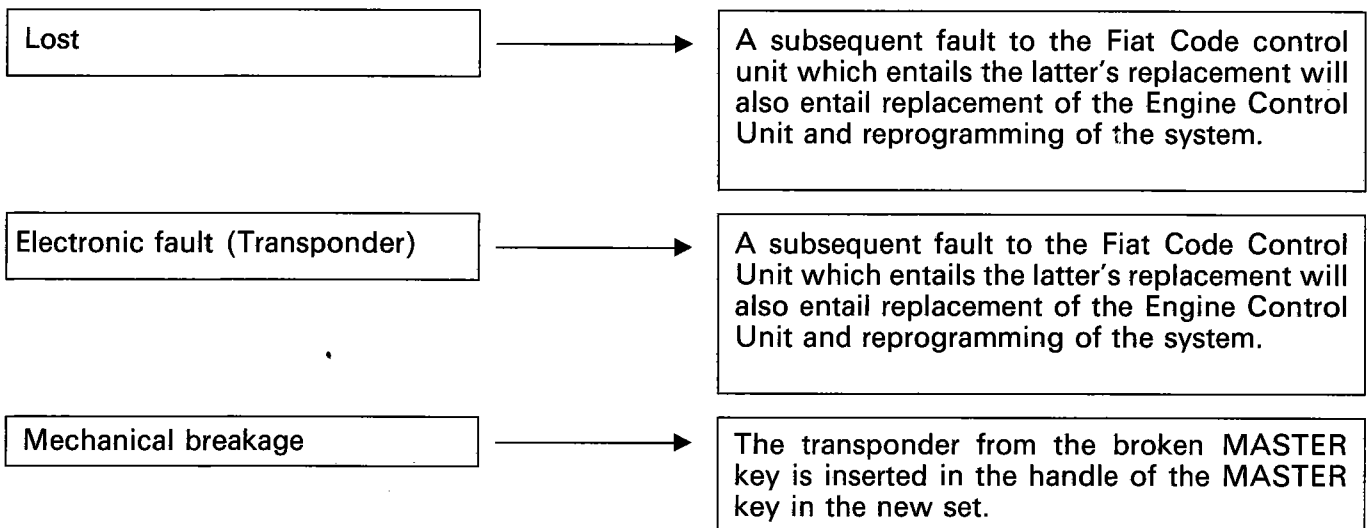
Addition of a new key to the keys supplied with the car



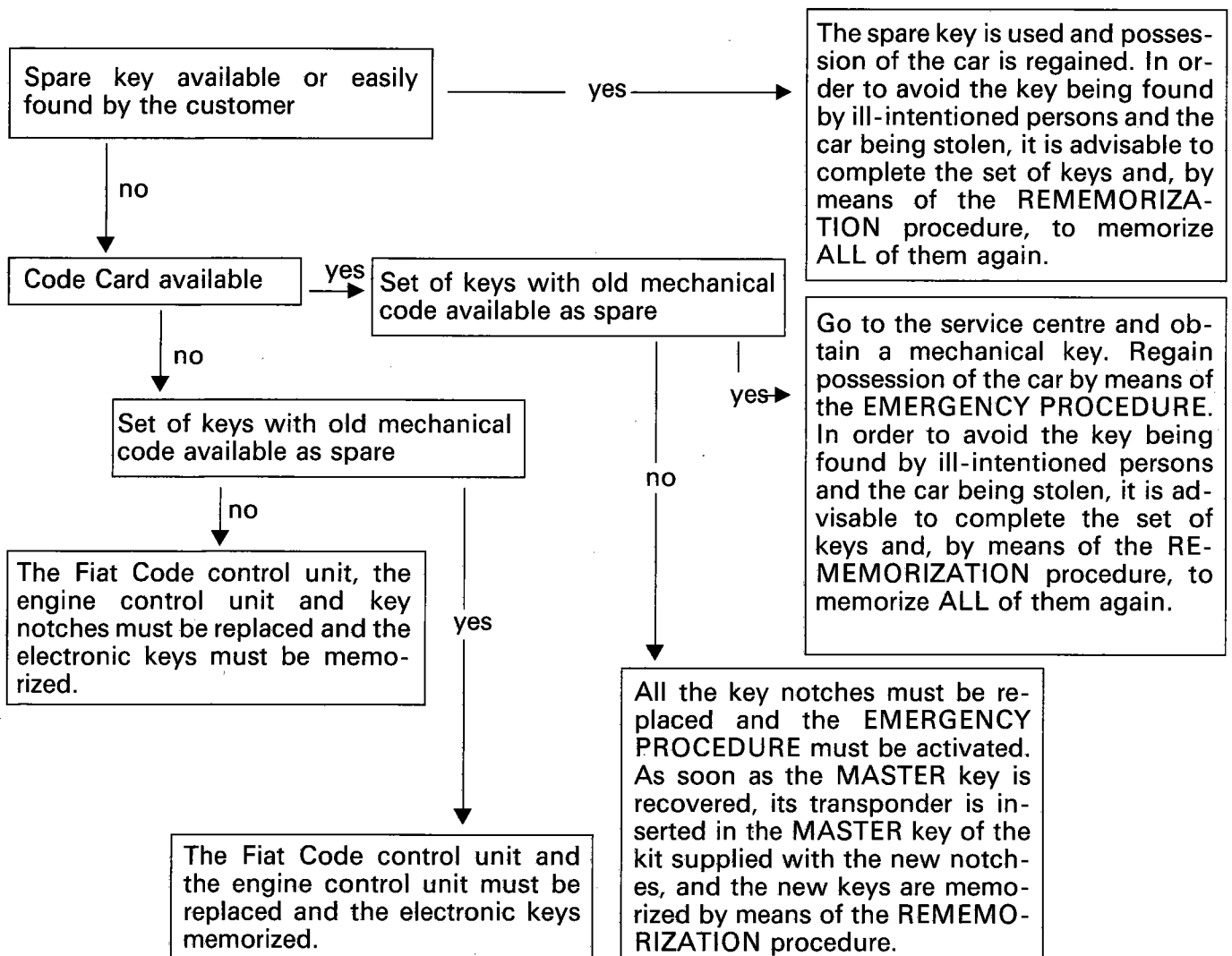
Adding a new key involves the memorization of all the existing keys supplied with the car, as keys not used during this procedure are deleted from memory.

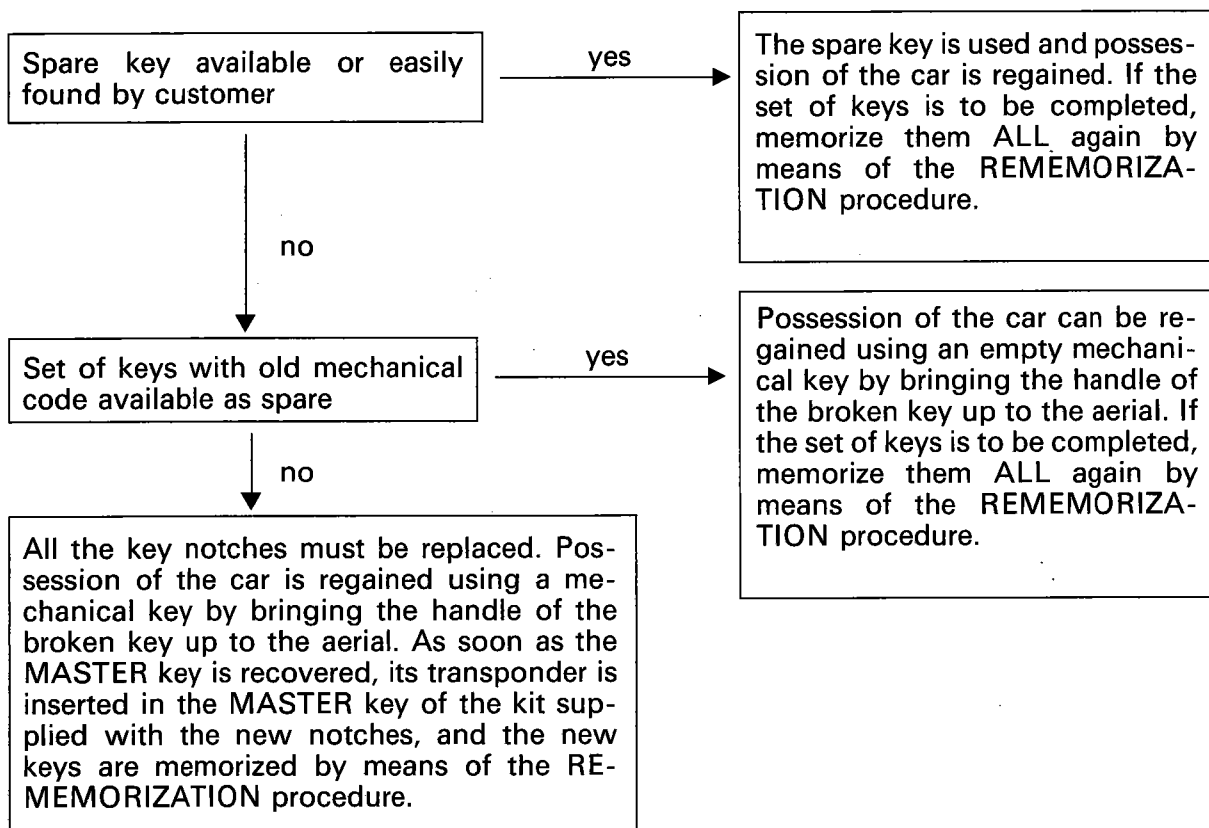
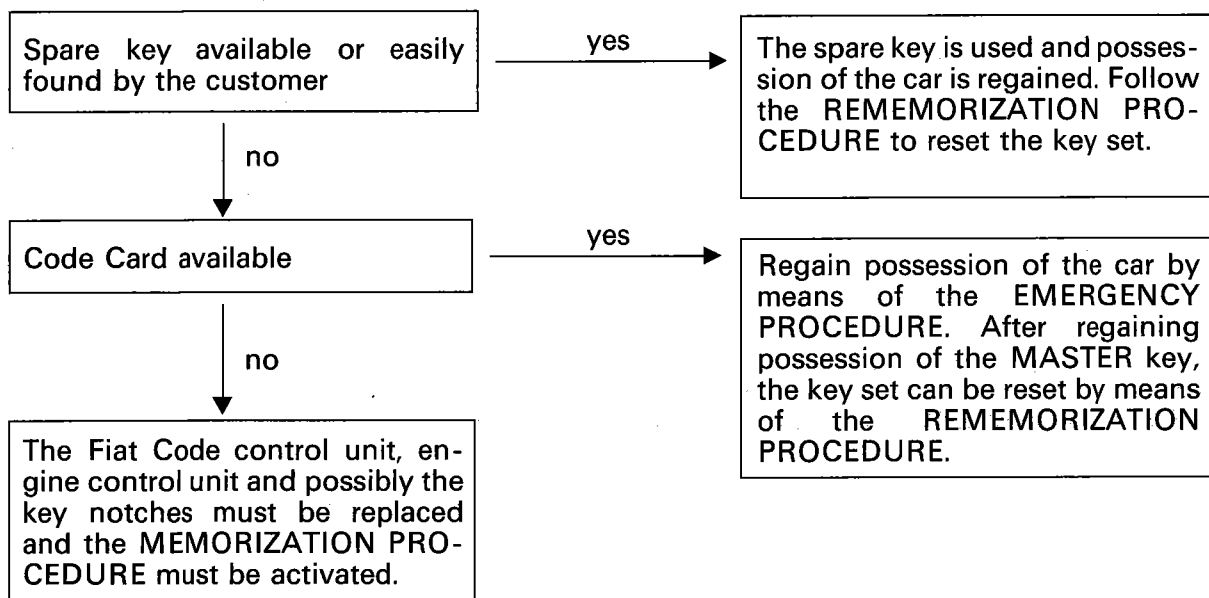
FLOW CHARTS OF FAULT REPAIRS ON FIAT CODE SYSTEM

Master key

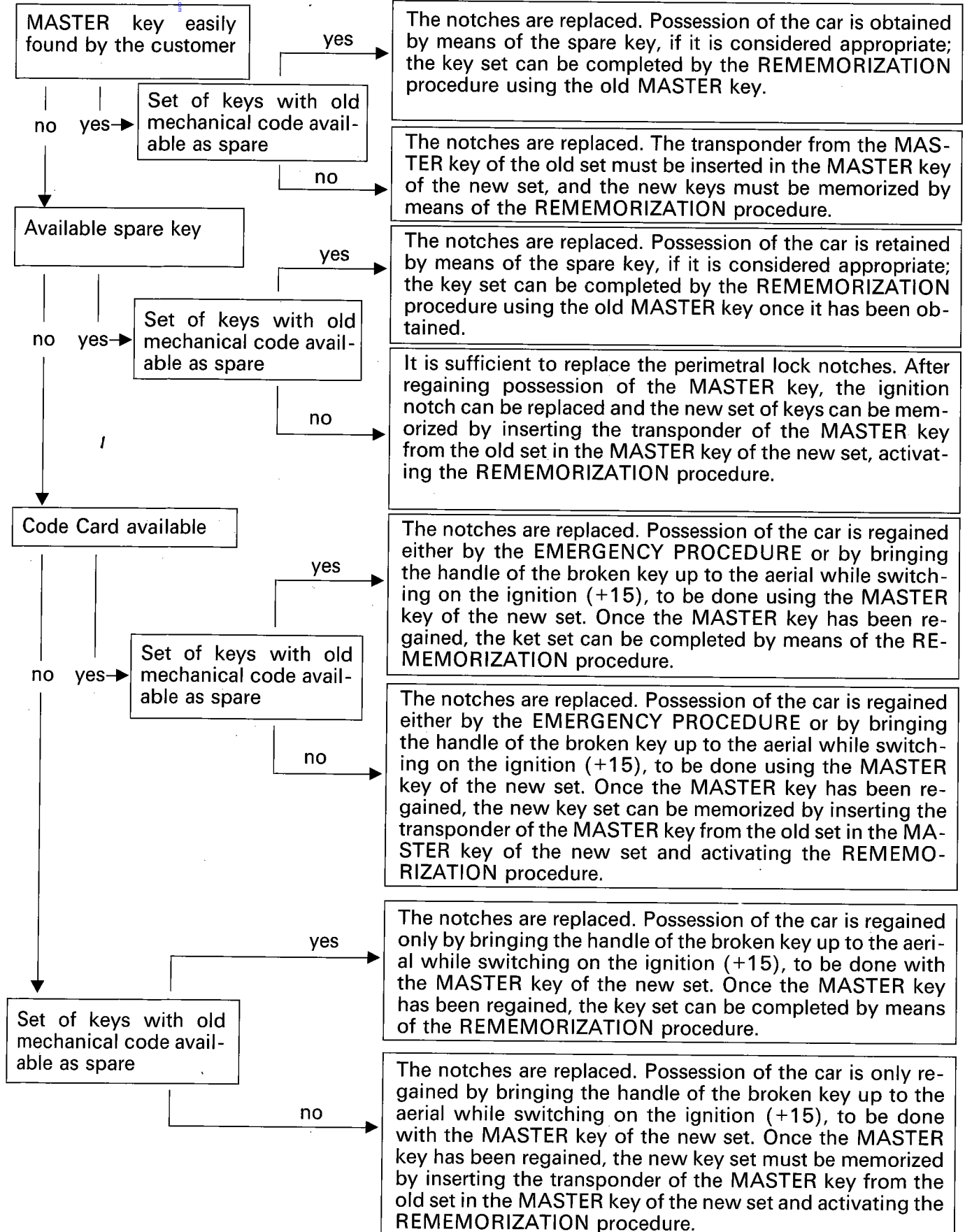


Loss of main key

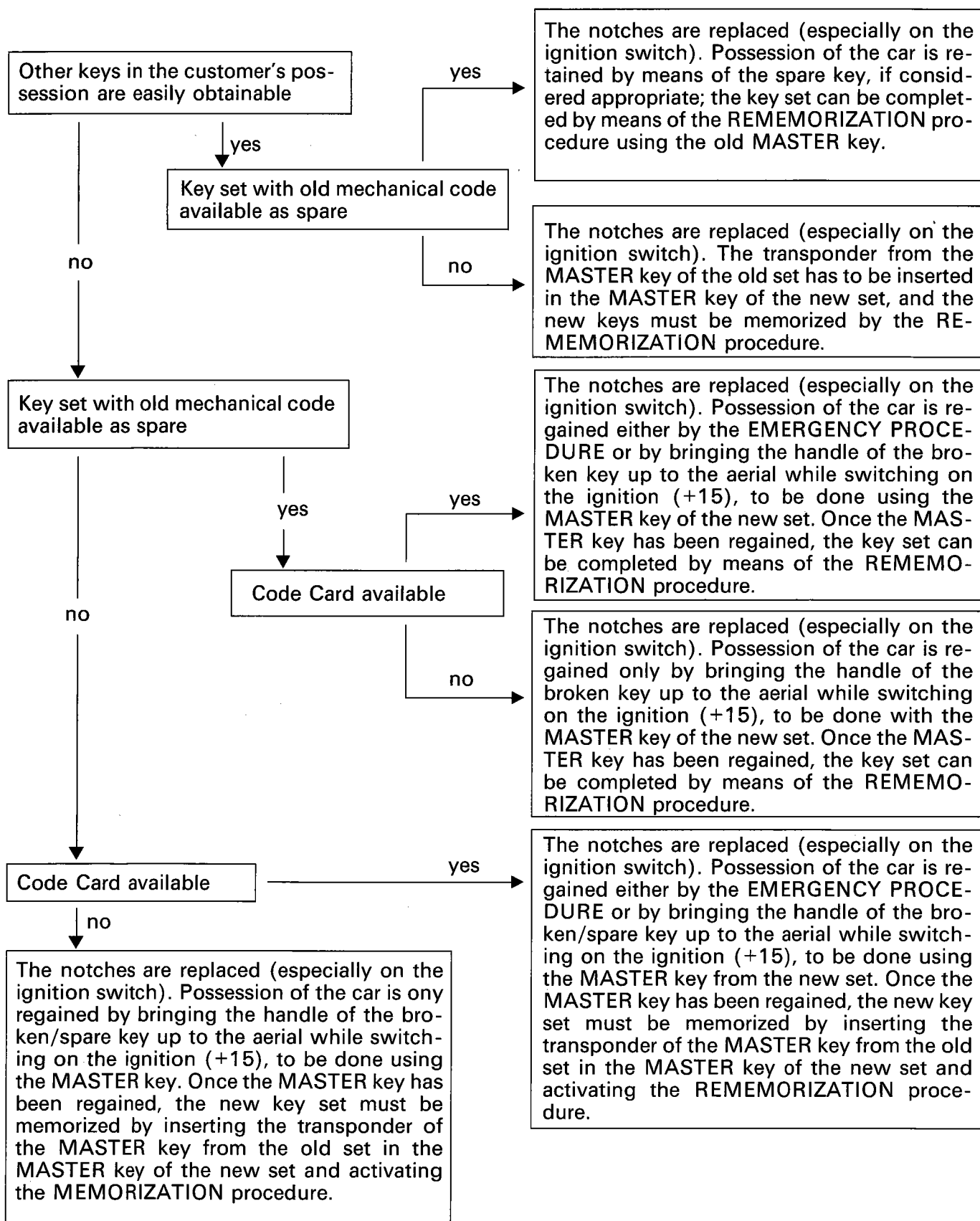


Mechanical breakage of main key (not in notch)**Electronic fault (transponder) main key**

Mechanical breakage of main key in door / bonnet lock notch



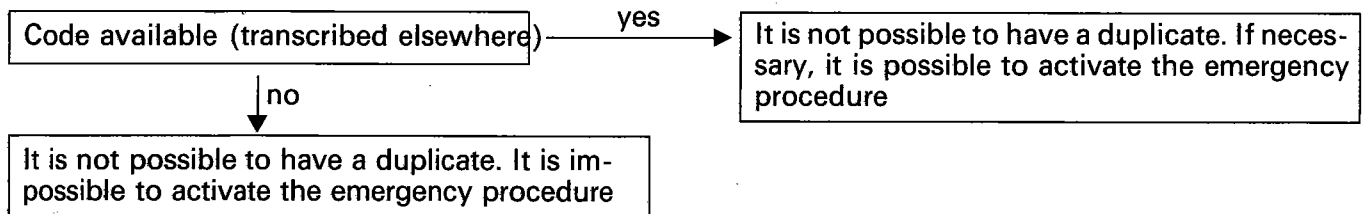
Mechanical breakage of main key in ignition switch notch



Aerial on ignition switch faulty

Replace the aerial

Loss of Code Card



CODE warning light not working

Replace the warning light; meanwhile it is not possible to activate the memorization procedure in a guided manner

Fuel injection fault warning light not working

Replace the warning light; meanwhile it is not possible to activate the EMERGENCY procedure from the accelerator pedal

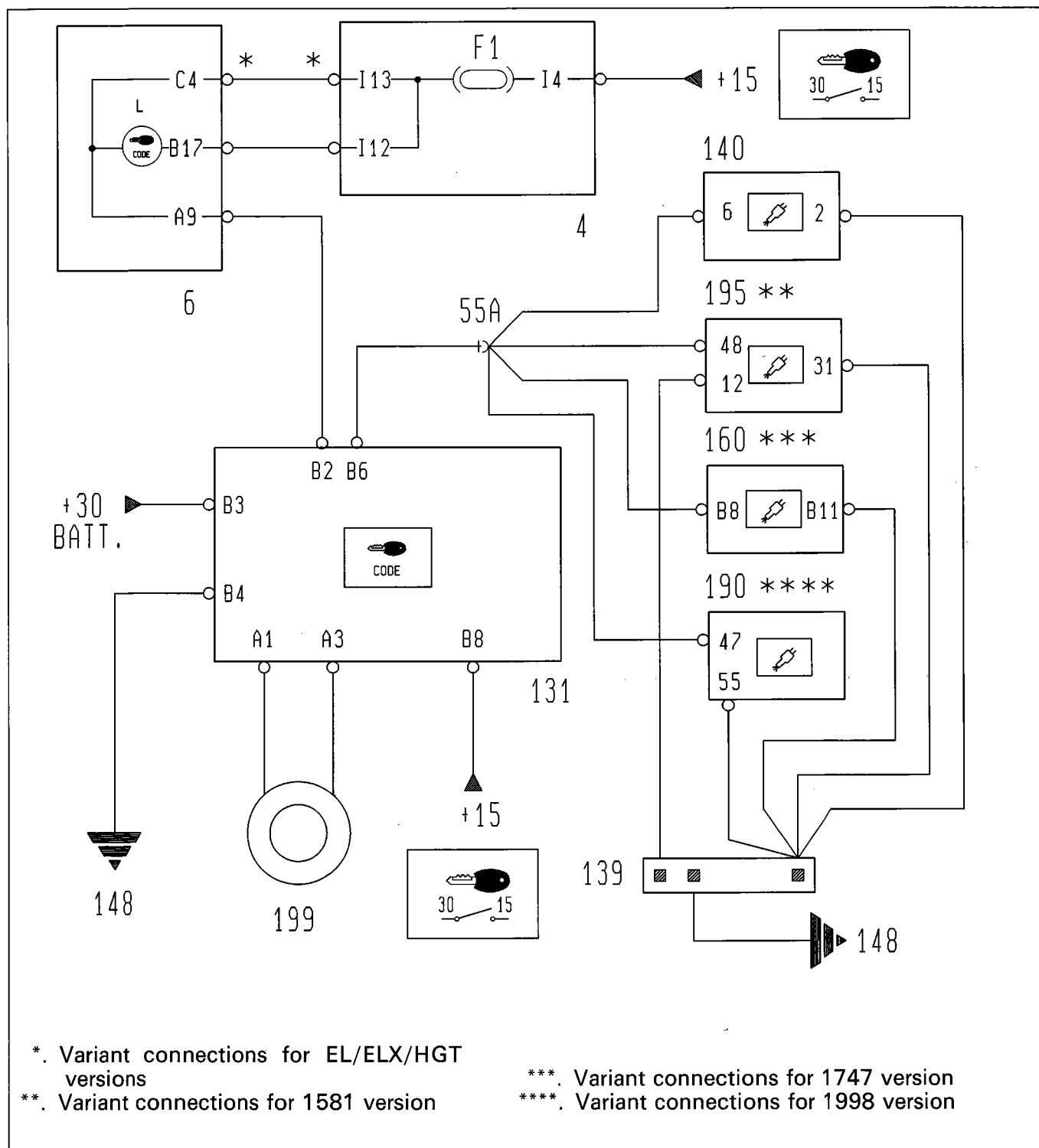
Fiat Code control unit faulty

Replace the Fiat Code control unit and carry out the REMEMORIZATION procedure, memorizing the keys again

Engine control unit faulty

Replace the engine control unit (the code memorization is automatic)

WIRING DIAGRAM OF FIAT CODE SYSTEM (petrol versions)



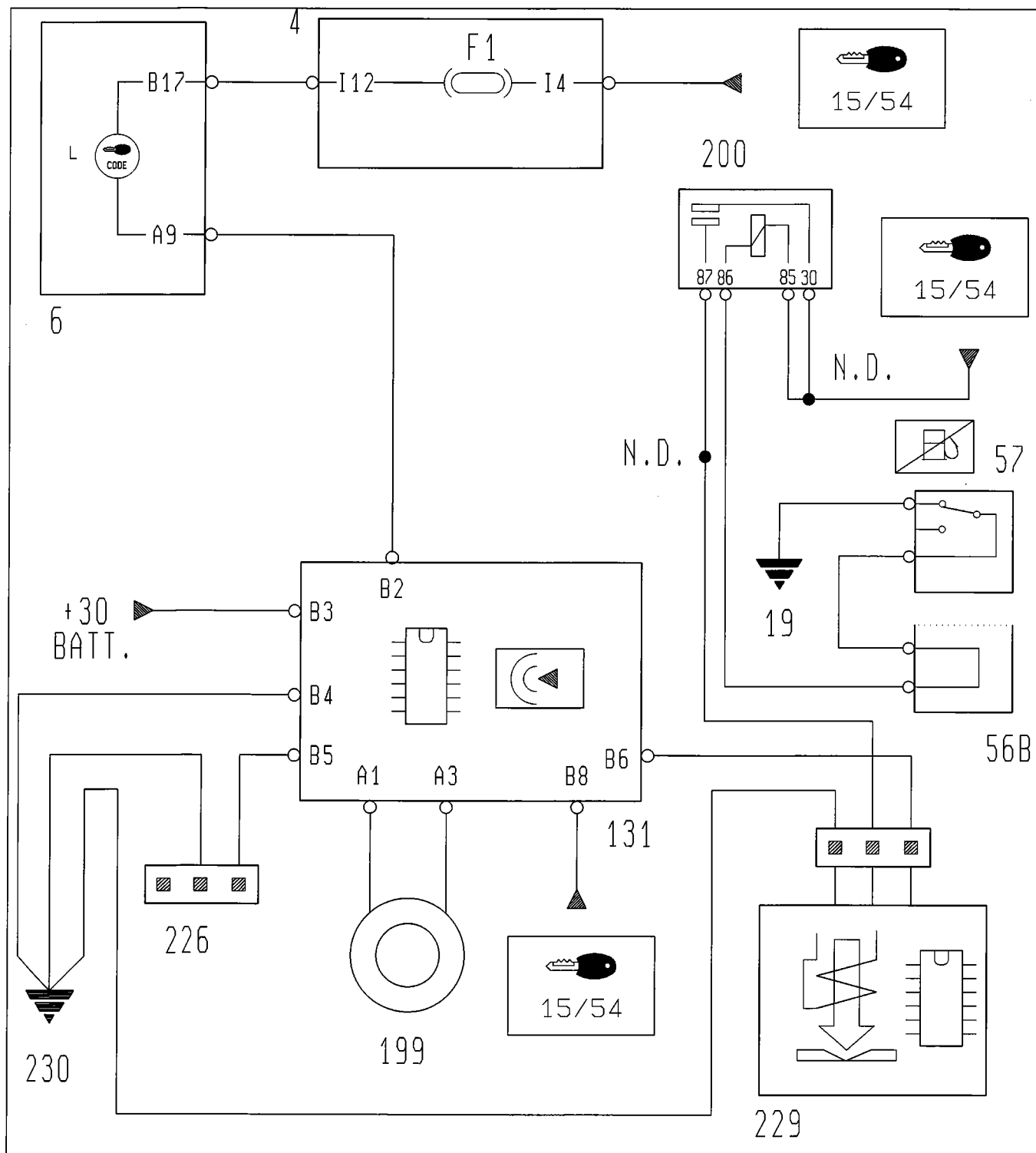
P4A083L01

- 4. Fuse and relay unit
- 6. Instrument panel
- 131. Fiat CODE electronic control unit
- 139. Fuel injection diagnostic socket
- 140. Fuel injection/ignition control unit (1370 cc)
- 148. Earth for electronic fuel injection

- 160. Fuel injection/ignition control unit (1747 cc)
- 190. Fuel injection/ignition control unit (1998 cc)
- 195. Fuel injection/ignition control unit (1581 cc)
- 199. Aerial for Fiat CODE system

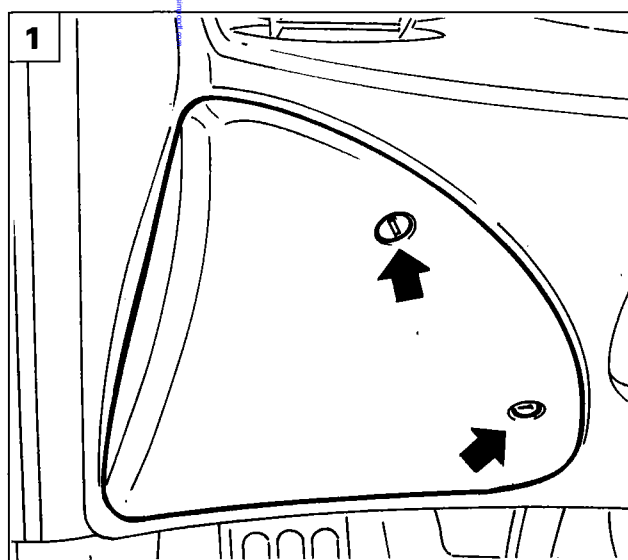
55.

WIRING DIAGRAM OF FIAT CODE SYSTEM (diesel versions)

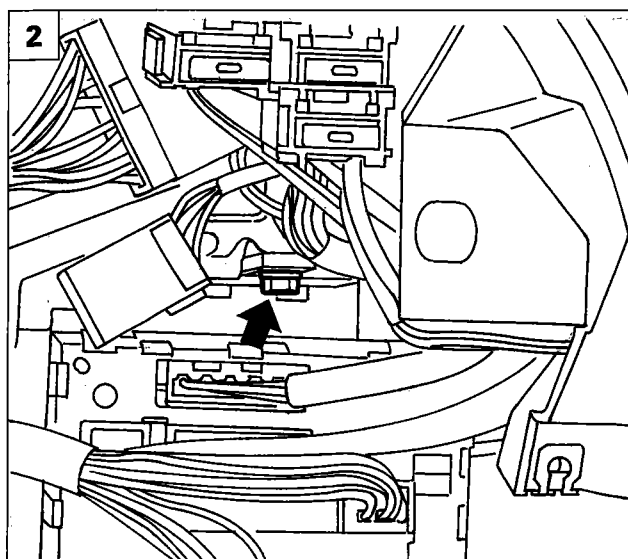


P4A084L01

- | | |
|---|----------------------------------|
| 4. Fuse and relay unit | 199. Aerial for Fiat CODE system |
| 6. Instrument panel | 200. Inertial switch relay |
| 19. Rear earth | 226. Fiat CODE diagnostic socket |
| 56B. Connection between front right cables/engine | 229. Engine cut-out electrostop |
| 57. Inertial switch | 230. Earth for Fiat CODE |
| 131. Fiat CODE electronic control unit | |



P4A014L01

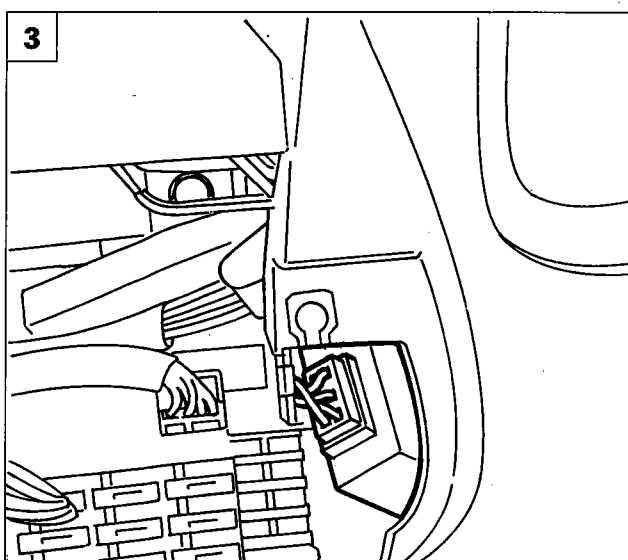


P4A085L02

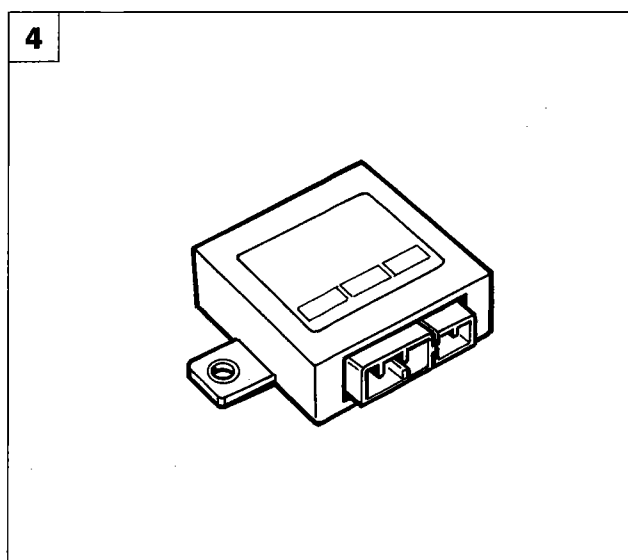


REMOVING-REFITTING Fiat CODE CONTROL UNIT

1. Disconnect the battery's negative terminal, then remove the protection.
2. Undo the bolt securing the Fiat CODE control unit and push it towards the engine.
3. Disconnect the electrical connection from the control unit.
4. Remove the control unit from the car.



P4A085L03



P4A085L04

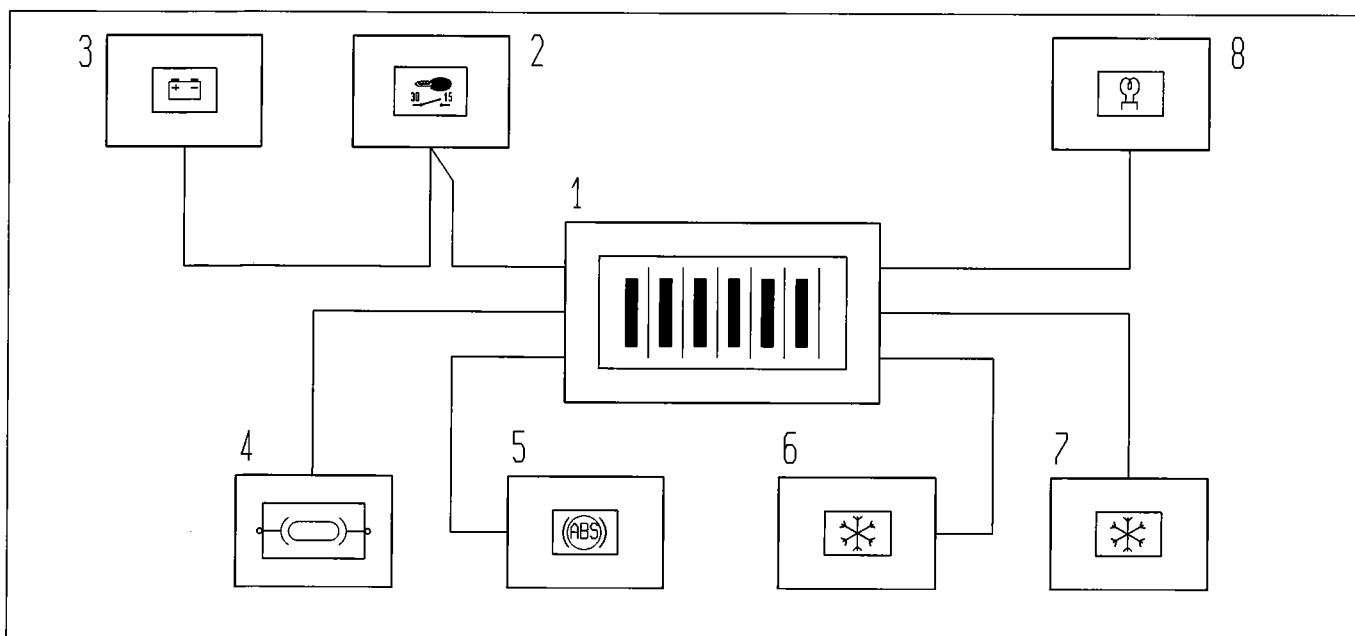
55.

HOT WIRE SAFETY DEVICE

The voltage is distributed in the electrical system using cables suitable for withstanding the current absorbed by the electrical devices. The cables are increased by safety coefficients, so that they are safe to use.

The safety devices with hot wires protect the car from possible overloads, which can damage the whole electrical system at the points where they are not protected in the conventional manner.

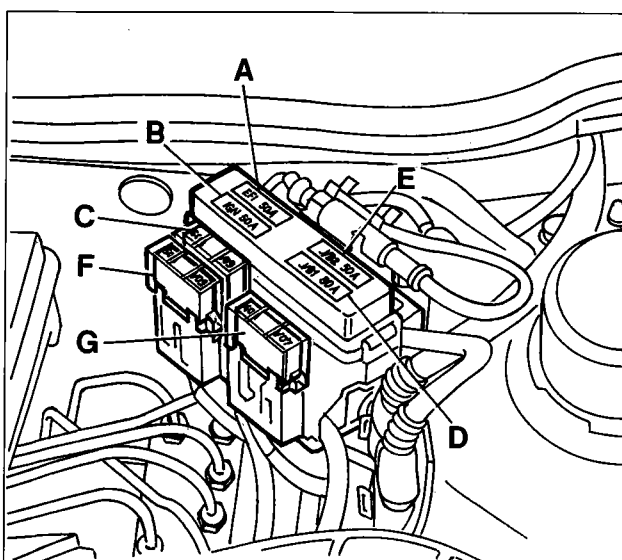
The term "hot wire" means those cables which connect the battery positive to the electrical device without the help of fuse protection; this is possible thanks to the special sheath which covers them.



P4A086L01

There are seven hot wires on this car, and they involve the following components:

- Connection between the battery positive (1) and starter motor (2).
- Connection between starter motor (2) and alternator (3).
- Connection between the battery positive (1) and maxi fuse box (4).
- Connection between battery positive (1) and ABS fuse (5).
- Connection between battery positive (1) and air conditioning system fuse (6).
- Connection between battery positive (1) and fuse for radiator/condenser fan (7).
- Connection between battery positive (1) and preheating control unit (8) (diesel versions).



P4A086L02

This car is fitted with a protection system using a maxi fuse box (containing six fuses, of which three are optional depending on the version of car).

This system is different from the previous systems which used a single fuse, because it manages the various activities separately, so as to avoid seizure of the car if a fault occurs.

The fuses used are:

- A. Fuel injection (30A; 60A for Diesel)
- B. Ignition (40A)
- C. Radiator fan (40A)
- D. Fuse unit (80A)
- E. Additional optional extra (60A)
- F. Air conditioner (50A)
- G. Antiskid (60A)

007



- 3. Power fuse box
- 10. Battery earth on body shell
- 11. Battery
- 96. 60A power fuse protecting electrical system
- 119. 30A fuse protecting air conditioning system
- 129. 50A power fuse protecting engine cooling fan
- 143. Alternator
- 145. Starter motor
- 201. Plug preheating control unit

55.

OPERATION

The electronic control unit on the car checks the operation of the driver's electric window motor (controlled both manually and automatically) and the passenger's electric window motor (only controlled manually).

Manual mode is the start-up and stopping of the window lift motor determined by the user manually by prolonged pressure on the control buttons (period between 60 and 300 ms).

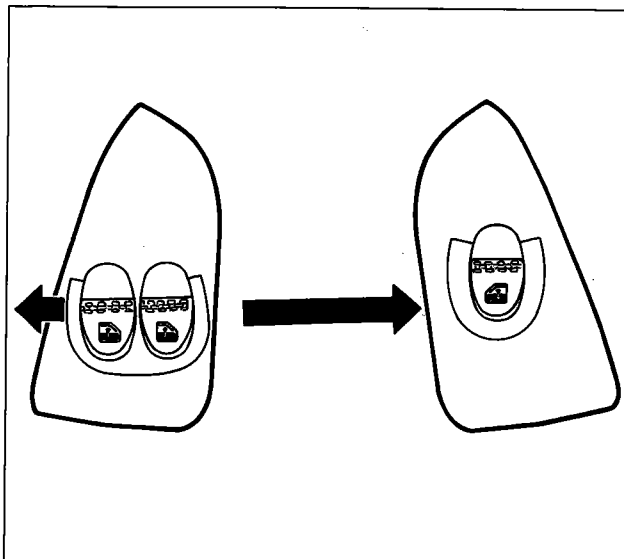
Automatic mode is the start-up of the window lift motor after a pulse (of over 300 ms) has been supplied. The window will return to the rest position once the window has completed its travel. The window can nevertheless be stopped during this stage by again pressing one of the two buttons.

The driver's pushbutton unit is double, and so can control the passenger's window, only in manual (with the ignition on).

The passenger's pushbutton unit is single and only carries out the manual function.

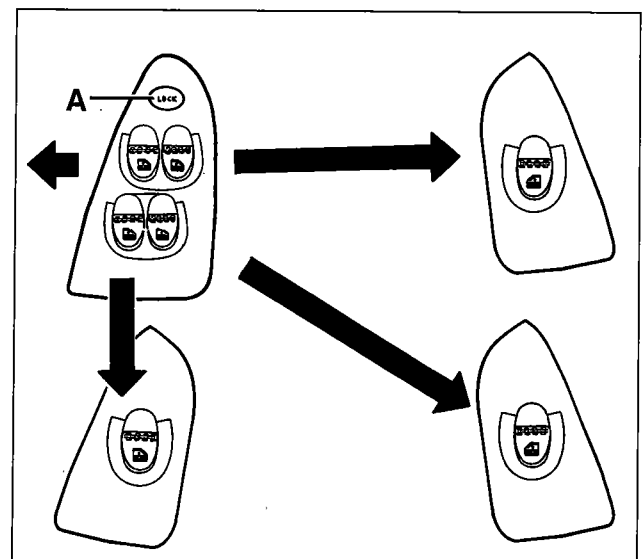
On the FASTBACK version, the driver's pushbutton unit has the rear window control always on manual. It can also exclude the rear window pushbutton units (button A).

The pushbutton units on the rear doors work in the same way as the one on the front passenger side.



Bravo version

P4A088L01



Brava version

P4A088L02

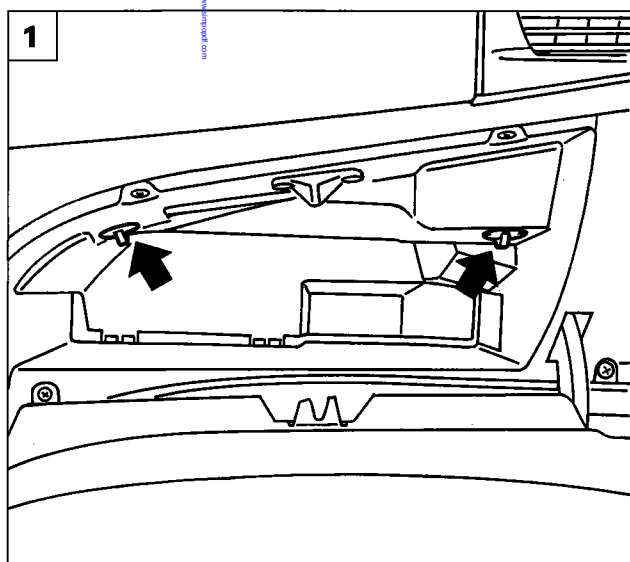
NOISE DETECTOR safety system

If the control switch is pressed when the window has reached the end-of-travel position, the electronic control unit automatically cuts off the supply to the motor. This condition is recognized by an electronic circuit called "NOISE DETECTOR", which can act by analysing the frequency of the disturbance generated by the motor brushes during rotation.

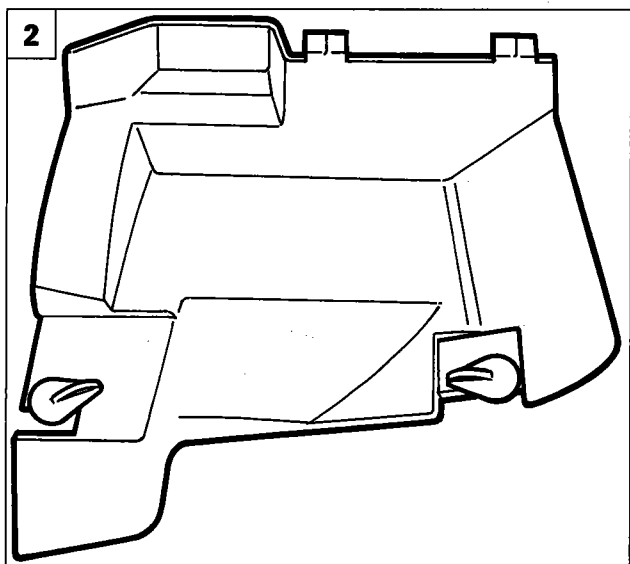
When the motor is turning it generates, by means of the commutation arising between the brushes and commutator, a disturbance signal which is transmitted to the control unit via the supply line, and whose frequency is proportional to the engine speed.

If the frequency of this signal exceeds 15 ± 5 Hz, the control unit recognizes that the motor is turning freely.

When the window reaches the end-of-travel position or tends to jam for mechanical reasons, such as to drastically reduce the normal speed of rotation, the frequency of the disturbance signal is reduced proportionally. When this frequency falls below the specified threshold (15 ± 5 Hz), the NOISE DETECTOR cuts off the supply.



P4A089L01

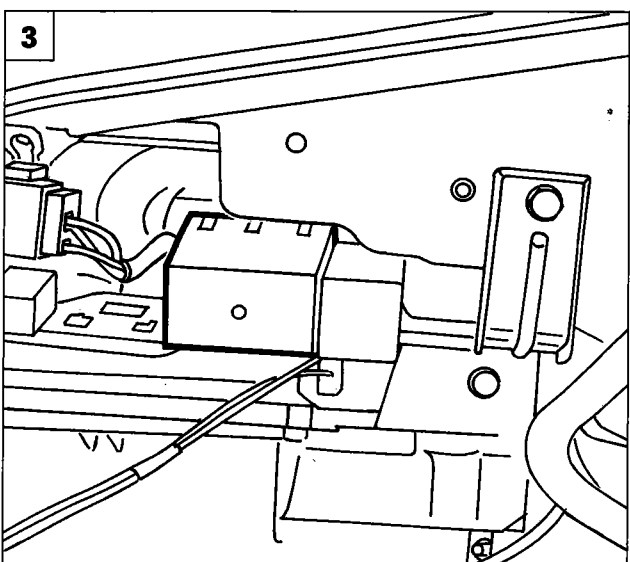


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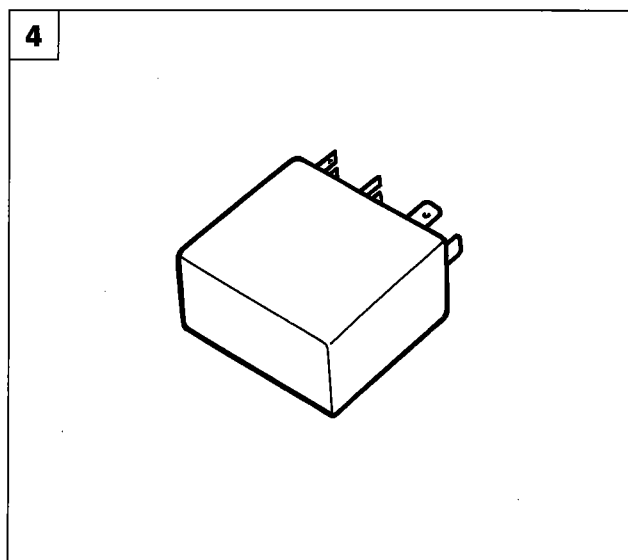


REMOVING-REFITTING ELECTRIC WINDOWS CONTROL UNIT

1. Open the glove compartment and turn the levers (arrowed).
2. Remove the compartment trim from the car.
- 3-4. Withdraw the control unit from its seating.

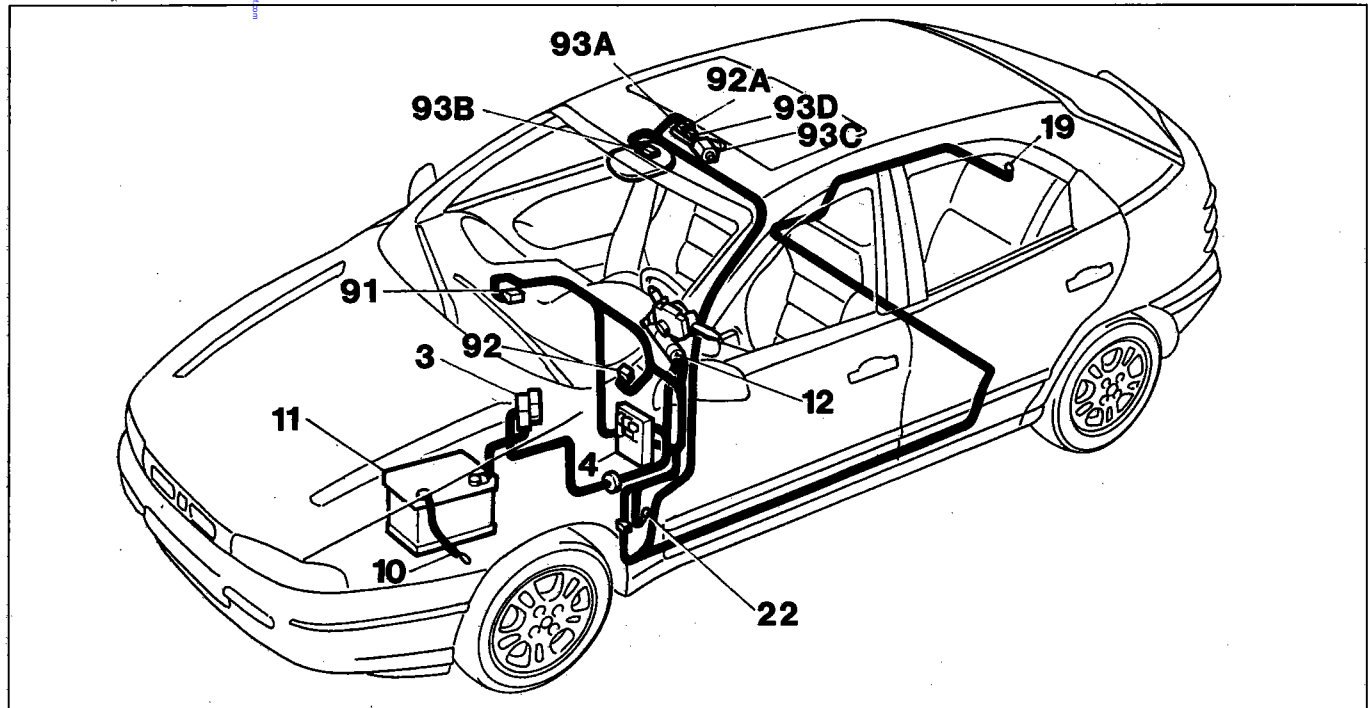


P4A089L03



P4A089L04

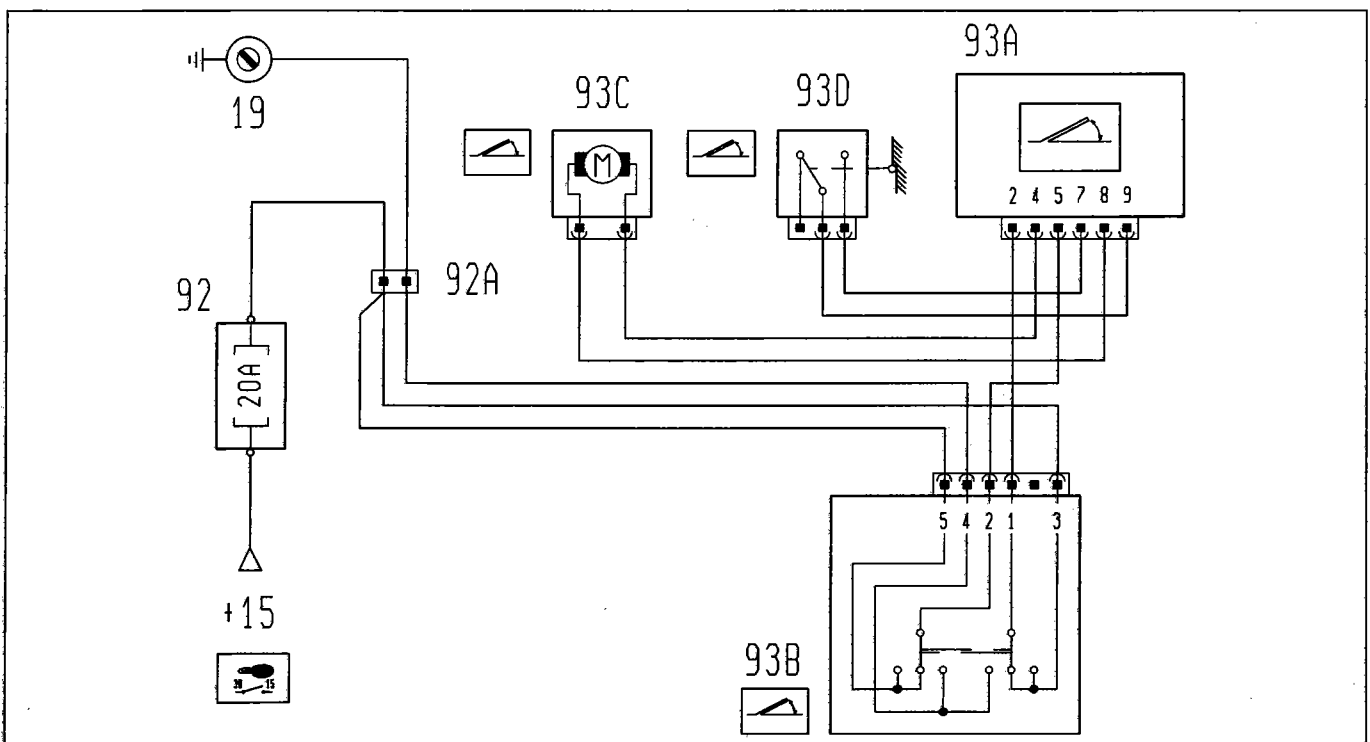
LOCATION OF COMPONENTS AND WIRING LOOM



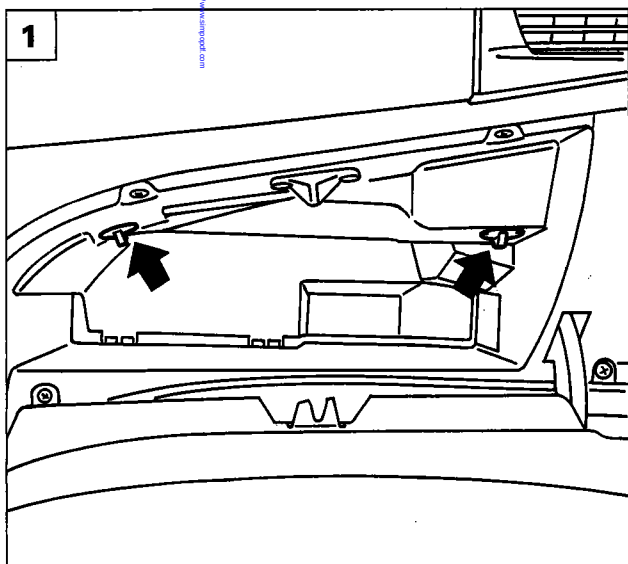
P4A090L01

- 3. Power fuse box
- 4. Fuse and relay unit
- 10. Battery earth
- 11. Battery
- 12. Ignition switch
- 19. Rear earth
- 22. Right dashboard earth
- 91. Power relay
- 92. 20A fuse
- 92A. Cable connection with sunroof
- 93A. Sunroof control unit
- 93B. Sunroof control button
- 93C. Sunroof motor
- 9Bravo. End-of-travel switch

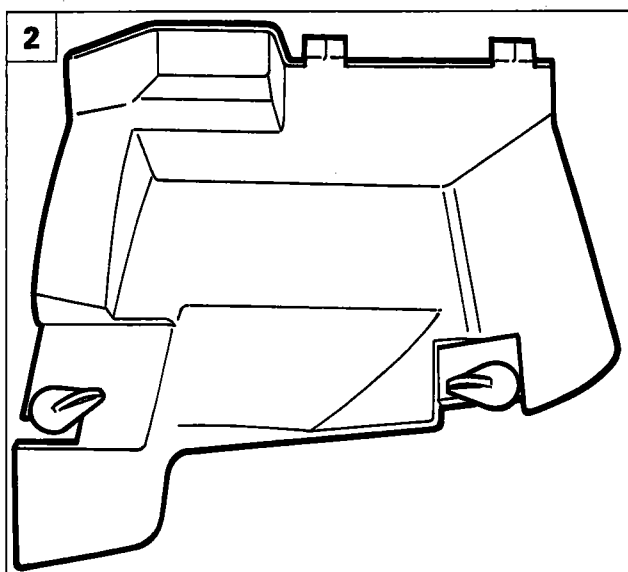
Wiring diagram



P4A090L02



P4A089L01

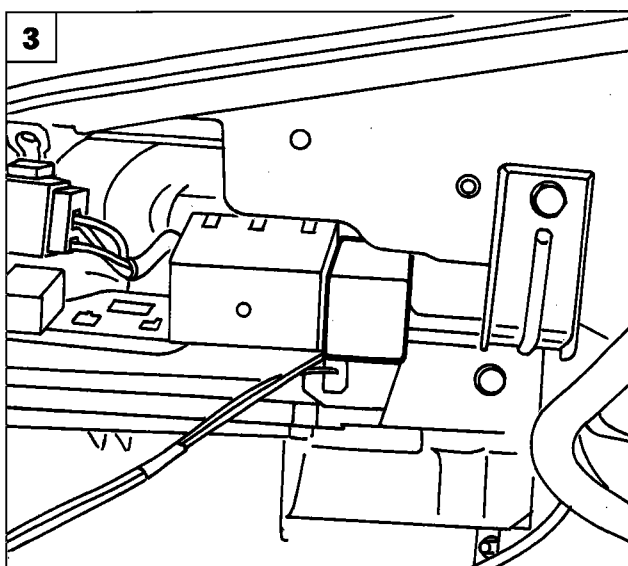


P4A089L02

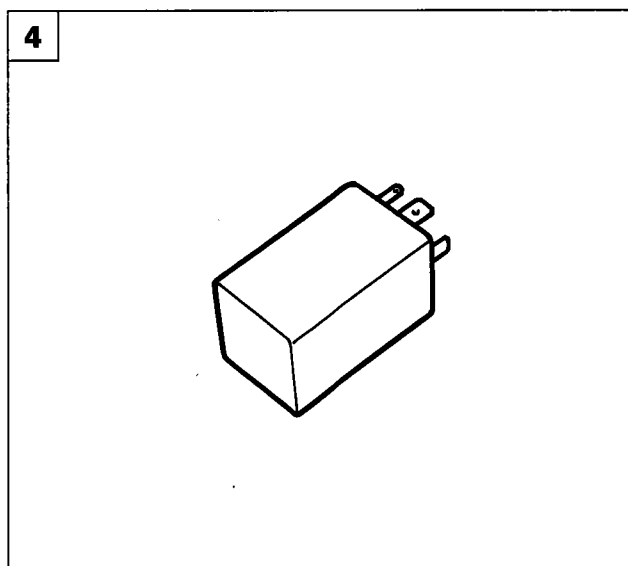


**REMOVING-REFITTING CENTRAL LOCK-
ING ECU**

1. Open the glove compartment and turn the levers shown.
2. Remove the compartment lining from the car.
- 3-4. Disconnect control unit from its housing.



P4A081L01



P4A081L02

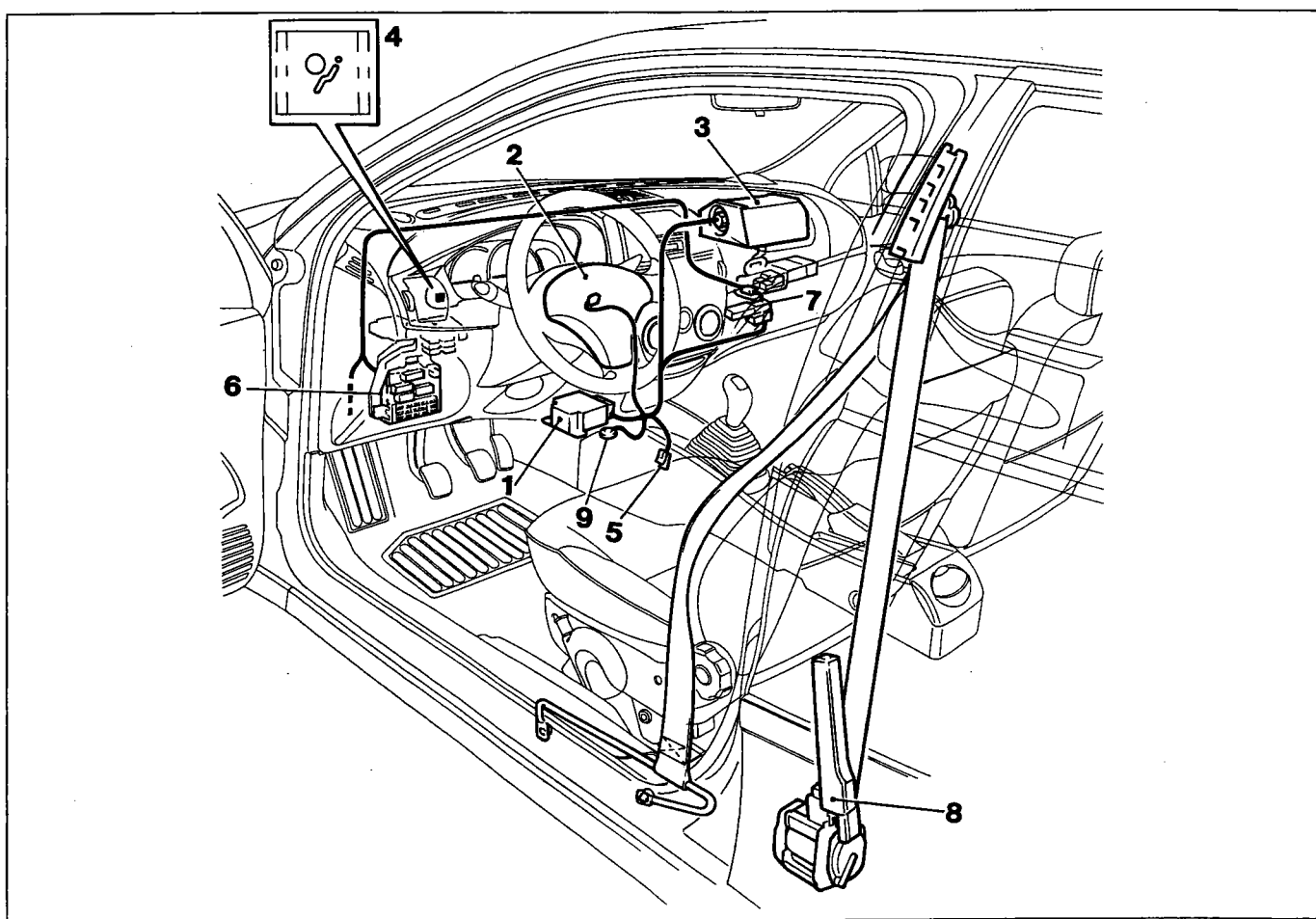
55.

Shiroi 1000 Airplane and Shiroi 1000 Engine Version 1.0 (http://www.shiroi.com)

INTRODUCTION

An AIR BAG is a passive safety device consisting of a bag which automatically inflates in the case of frontal impact in order to form a barrier between the driver's body and car structures. This device will not work to maximum efficiency unless the driver is also secured by seat belts with pretensioners.

Deceleration sensors located inside the electronic control unit are specially adjusted to detect crash conditions. The electronic control unit triggers a reaction with a chemical compound (sodium azide), which produces a gas consisting mainly of nitrogen. This gas instantly inflates synthetic fabric bags housed in the middle of the steering wheel and above the glove compartment in front of the passenger.



P4A092L01

An air bag system consists of the following parts:

1. Electronic control unit:
 - contains an electronic circuit with two deceleration sensors;
 - assesses crash situation, implements intervention strategies, detects and stores faults.
2. Driver's side air bag module
3. Passenger side air bag module (options)
4. Red warning light on instrument panel indicating system faults and test codes
5. Socket for connecting Fiat Lancia Tester
6. Junction unit
7. Relay unit
8. Mechanical pretensioners
9. Air bag earth

ELECTRONIC CONTROL UNIT

The electronic control unit (page 95 reference 1) is located in the car console housing and fastened rigidly to the floor pan.

It is fitted with a 30 pin connector (page 95 reference 2). Nine pins are used for connection to the electrical system. It is supplied with 12 V when the ignition key is turned to MARCIA, but is able to continue working for about 100 ms after the power is cut off, if this should occur as the result of a crash.

This is possible due to the presence of a buffer condenser inside the electronic unit. This accumulates electrical energy to allow the electronic control unit to work normally and to generate the ignition signal required to set off the explosive capsule.

Air-bag operation is therefore ensured even if impact causes system power to be cut off (e.g. damaged or broken battery, broken supply leads etc.).

The control unit must be positioned with arrow (3) facing in the vehicle's direction of motion. This position must be **STRICTLY OBSERVED**, because it determines the direction in which the deceleration signal is detected and is used to assess impact status and thus cause the air bag to operate.

The control unit contains an accelerometric sensor. This produces a signal which is processed by a microprocessor to reveal the severity of impact. The microprocessor then determines whether to set off the pretensioners and air bags.

Fault memory

Throughout the period the vehicle is in motion, the electron control unit continually monitors the system to check the continuity of circuits and components.

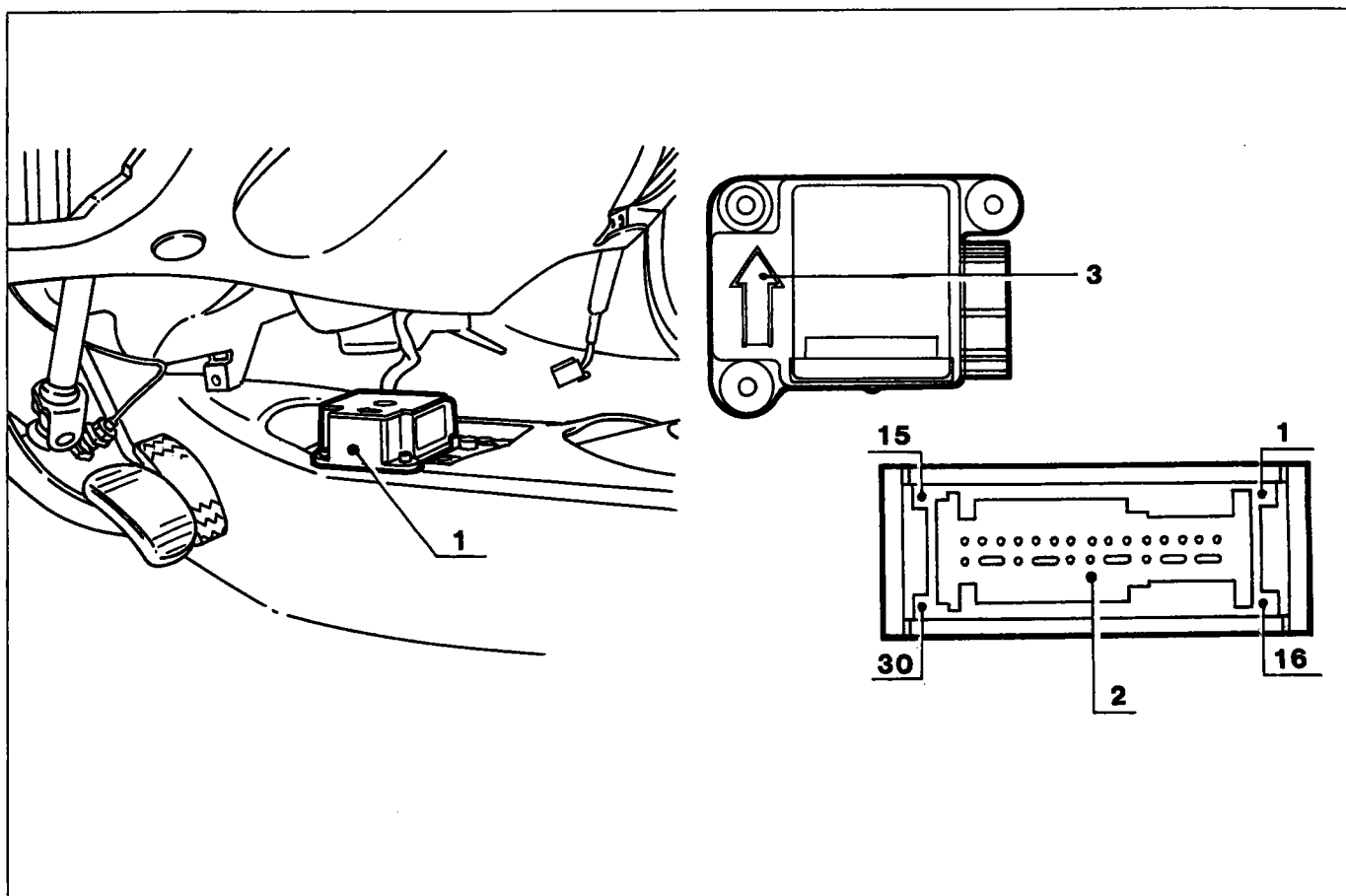
Detected faults are stored and an "air bag failure" warning light comes on on the instrument panel. The FAULT MEMORY may be consulted during Service by connecting a FIAT/LANCIA-TESTER to the tester point (see details below)

Crash memory

As mentioned previously, the complex microprocessor and control unit software monitors the signal from the accelerometric sensor and identifies impact severity level.

If the impact is sufficiently severe, and the safety sensor sends an enablement signal, an activation signal is sent to the pretensioners or air bags.

This activation order is stored in a special crash memory that contains records of intervention threshold violations and safety sensor enablement signals.



P4A085L01

Air bag

55.

DRIVER'S SIDE AIR BAG MODULE

The bag is made out of silicon-coated nylon. Inner volume is 40 litres when the bag is fully inflated. The bag is folded into a plastic case in the steering wheel hub.

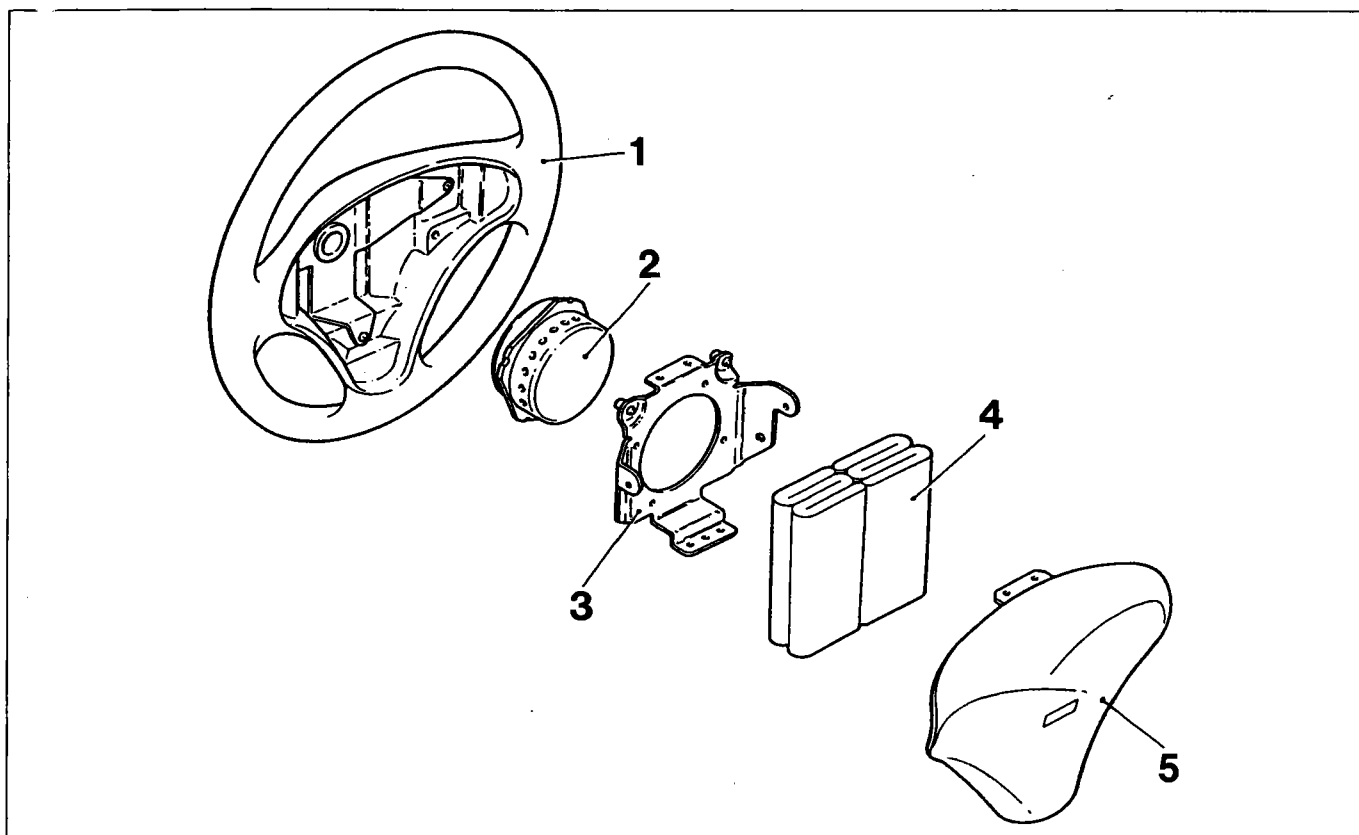
The case is fitted with a cover with pre-established break lines in the middle. This allows the central part to break out so that the bag can emerge.

Because the cover is plastic, it must under no circumstances be cleaned with acids, abrasives or substances that could damage the surface and affect operation in any way.

The gas generator is pyrotechnic and looks like a ring-shaped aluminium solid.

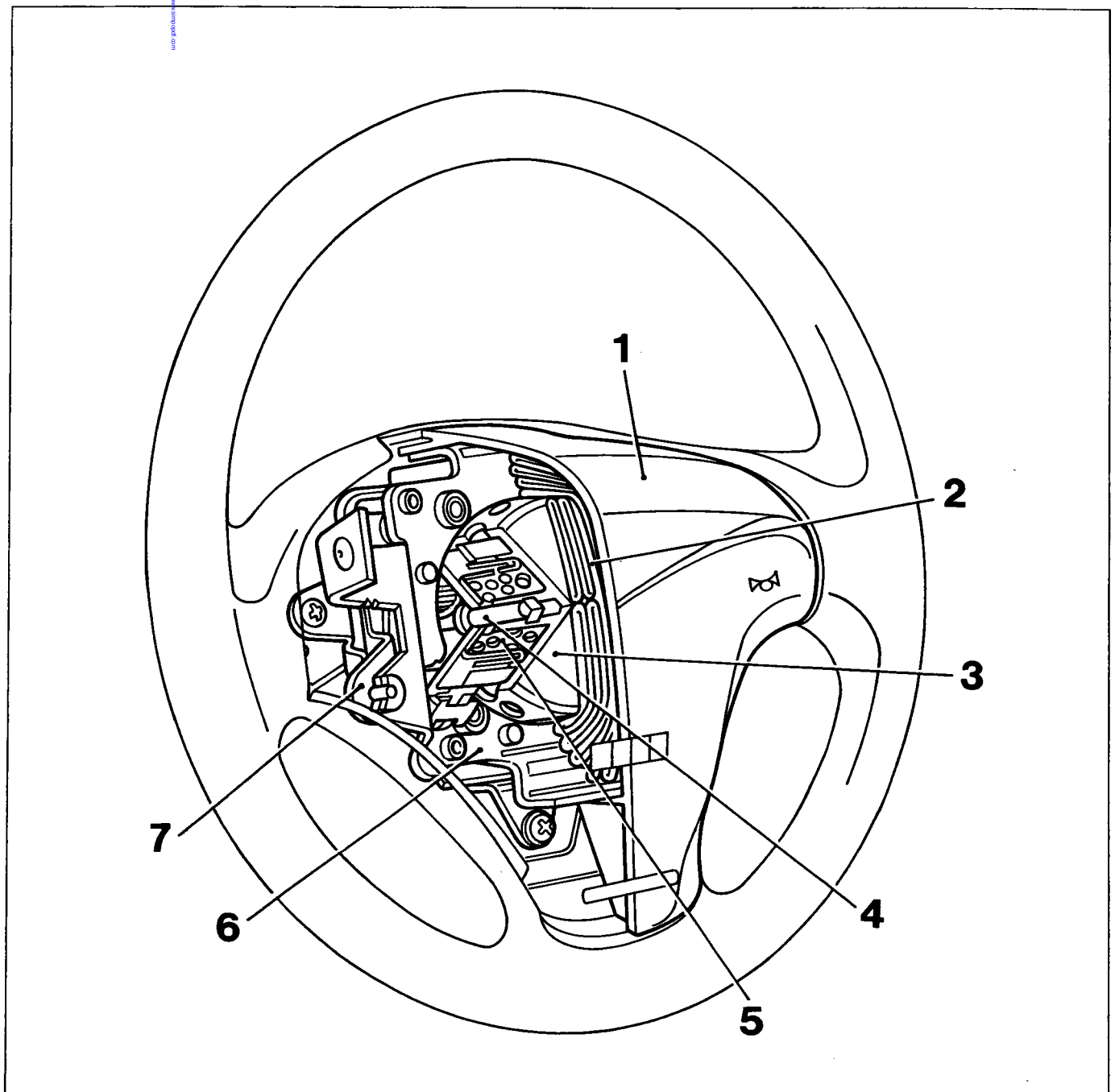
The generator consists of the following parts:

- aluminium container in two halves. The half turned toward the car interior is perforated to allow gas to emerge. The entire system is sealed.
- the sodium azide is contained in a ring-shaped solid and produces a considerable quantity of gas when heated. The detonator triggers the chemical reaction to inflate the bag.



P4A096L01

1. Steering wheel
2. Gas generator
3. Air bag installation plate
4. Bag
5. Bag cover



P4A097L01

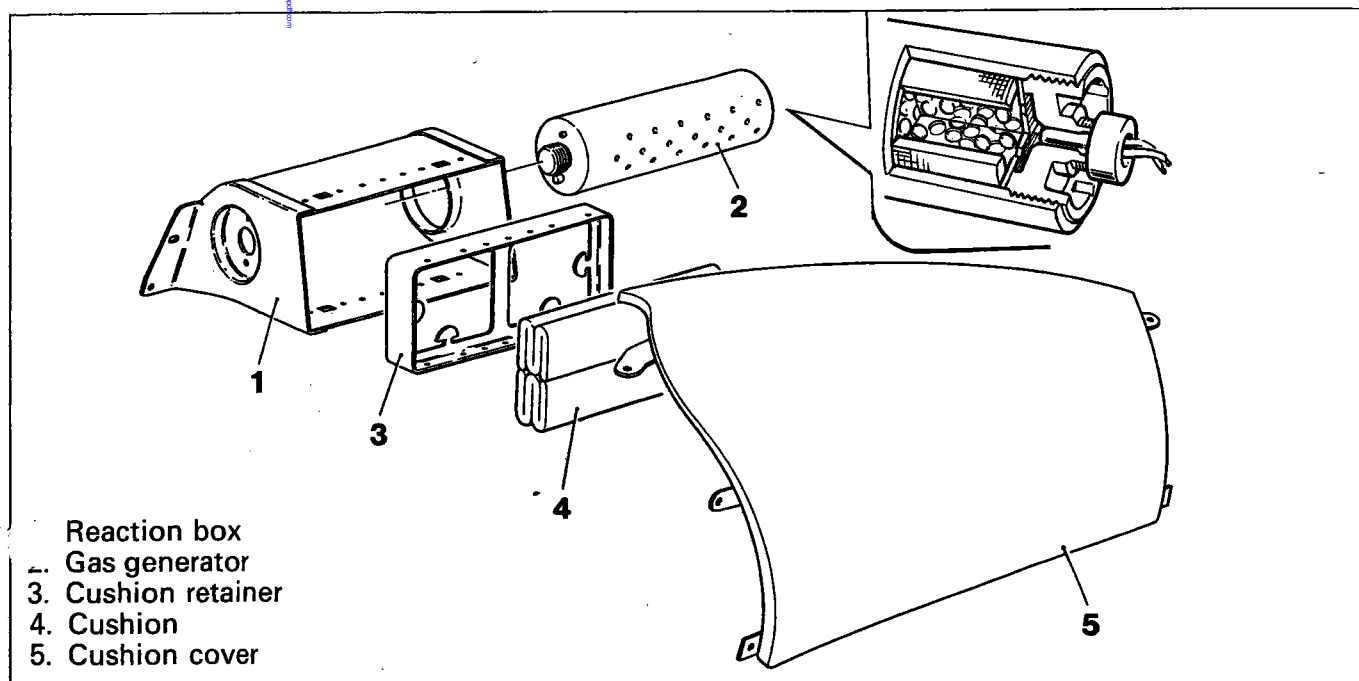
- 1. Air Bag module
- 2. Cushion
- 3. Inflation device
- 4. Triggering device

- 5. Explosive charge (sodium nitride)
- 6. Gas generator mounting plate
- 7. Tilting plate for horn

The innovation on this steering wheel is the horn control, which is in a central position and is of the tilting type.

The horn is housed in the centre and, by means of a tilting plate secured to the bottom of the Air Bag protection, it permits operation of the device. Four springs located on the ends provide the electrical contacts.

PASSENGER'S AIR BAG MODULE



The passenger's Air Bag is enclosed in a container which is secured to a metal frame. The components and principle of operation are the same as for the driver's Air Bag.

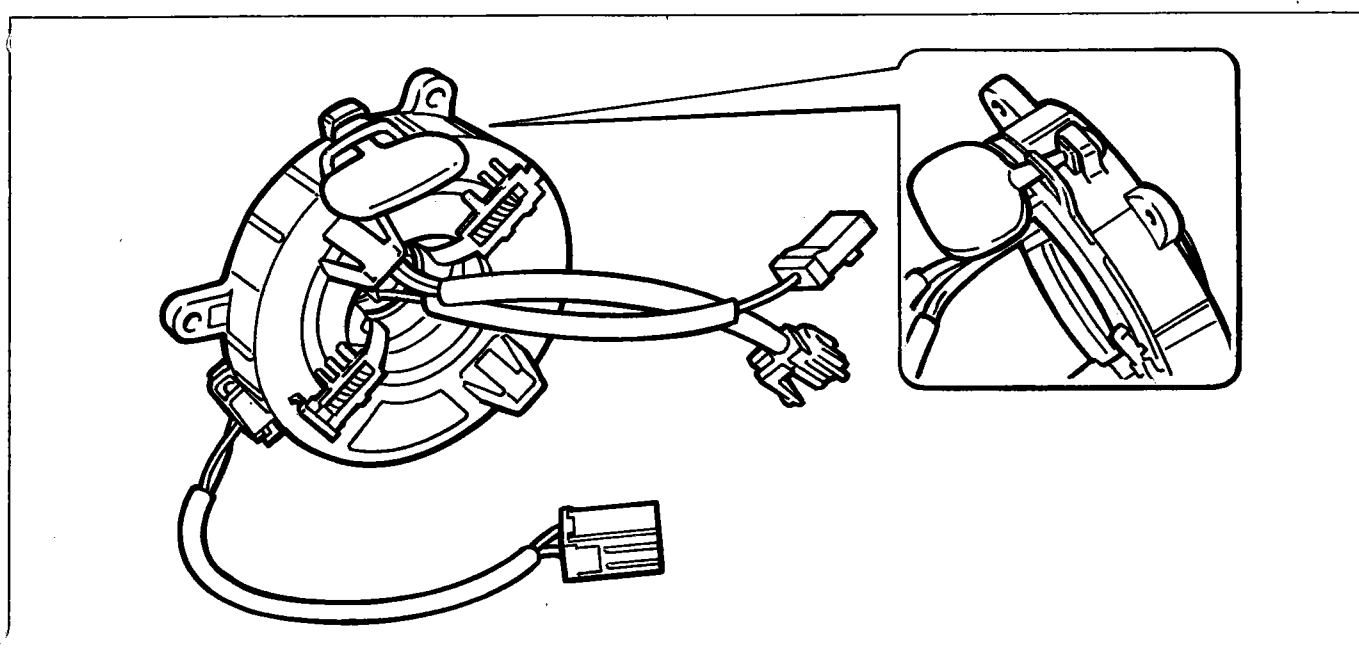
The cushion is made of silicone-coated nylon, and when fully inflated its internal volume is about 90 litres. It is folded in a special casing installed above the glove compartment in the dashboard.

At the centre of the casing there are pre-determined fracture lines which allow the centre of the casing to break and the cushion to emerge.

Since the cover is made of plastic, under no circumstances should it be cleaned with acids, abrasives or substances which could in any way attack the surface and impair its functionality.

The gas generator is of the pyrotechnic type and is a solid aluminium cylindrical element.

DEVICE WITH SPIRAL CABLE (CLOCK SPRING)



The CLOCK SPRING is a part connected to the stalk unit. It allows the steering wheel to turn while ensuring electrical continuity between the driver's side air bag module and its wiring.

The clock spring consists of a container with three leads emerging from it. One lead is connected to electrical wires from the control unit while the other two leads are turned toward the car interior, where they are connected to the horn and the air bag module.

Inside the two plates, the module and horn button connection leads are wound up into a coil so that they can follow steering wheel movements.

The clock spring is fitted with a device which automatically prevents it from turning when the steering wheel is removed. This action prevents the upper plate, now no longer secured to the steering wheel, from turning freely to wind up or unwind the leads and lead to the possibility of breakage.

When the steering wheel is fitted, the device is automatically released.



When removing-refitting the clock spring, ensure that the spring is refitted in its original position.



If for some reason the upper plate of the clock spring turns in relation to the lower plate so that the position upon removal can no longer be determined, it is absolutely necessary to replace the clock spring.



If replacement is required, the clock spring is supplied together with the stalk unit. THE UNIT MUST BE INSTALLED WITH THE WHEELS ALIGNED WITH THE VEHICLE'S LONGITUDINAL AXIS (STRAIGHT AHEAD), because this is the corresponding position of a new part. A new device is fitted with an safety key which keeps it locked. This key must be removed when the steering wheel is installed to allow the system to turn correctly.

FAULT DIAGNOSIS

While the vehicle is in motion, the electronic control unit automatically monitors the air bag system and stores any faults. When a fault is detected, the unit stores it and turns on the air bag warning light on the instrument panel. The warning light comes on for about 4 seconds (initial test stage) upon start up and then goes off. If the warning light does NOT come on or does NOT go off after 4 seconds, the air bag system must be faulty. System activations following crashes of particular severity are also stored in the control unit.

Diagnosis using a Fiat/Lancia Tester

Faults stored in the control unit can be analysed using a FIAT/LANCIA TESTER or other diagnostic tool. Anomalies stored in the control unit may be deleted once the fault has been repaired using a FIAT/LANCIA TESTER or another diagnostic tool.

NOTE *If a crash causes the system to be activated, the control unit memory cannot be deleted and the unit must be replaced in all cases. The control panel warning light also stays on permanently.*



If module lines need to be tested for breaks during fault diagnosis, the modules must be disconnected from the wiring and replaced with appropriate dummy resistances.



SAFETY PRECAUTIONS TO BE OBSERVED WHEN WORKING ON VEHICLES WITH AIR-BAG SYSTEM

The following regulations **MUST ABSOLUTELY BE OBSERVED** during any operations carried out on vehicles fitted with an air bag.

INTERVENTIONS ON VEHICLE

Note that air bag modules should be handled with caution. Their use, transport and storage are governed by legal regulations covering explosives applicable in the country where the vehicle is sold.

Before beginning to carry out:

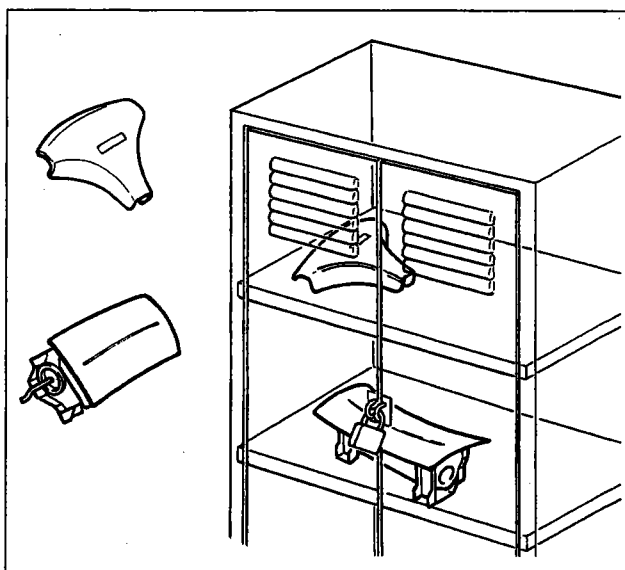
- repairs to the body;
- welding work;
- work where it is necessary to remove the air bag modules, pretensioners or the control unit.

A Turn the ignition key to STOP and remove. Disconnect the battery, i.e. DISCONNECT TERMINALS (- and +) from their respective poles and THOROUGHLY INSULATE using tape.

B Disconnect the control unit connector and wait for at least 10 minutes after removing the battery.

If an air bag inflation device is removed, strictly observe the following procedure:

1. Wait for at least 10 minutes after disconnecting the battery before beginning to remove the module.
2. Unscrew the retaining bolts.
3. Disconnect connector pin of inflation devices.
4. Replace the devices with the cover facing up, in a locked steel cabinet. This cabinet is designed solely for this purpose and should never be used to store other types of materials, particularly if inflammable. The cabinet must be designed to store pyrotechnic charges (steel, impact-resistant cabinet with grilles to allow natural ventilation inside). It must be marked in accordance with current legislative requirements (DANGER EXPLOSIVES - DO NOT USE NAKED FLAMES - NOT TO BE OPENED BY UNAUTHORIZED PERSONNEL).



P4A100L03

NOTE All connectors wired to air bag modules contain a short-circuit clip. The unit cannot be activated in any way until the air bag modules are connected to an appropriate power source by means of the proper connector.



If any system component is NOT activated as a result of an accident, it must be considered still active. Components which are unexploded due to faults, because they have reached the end of their warranty term or because they require replacement for other reasons must be returned to the centre using the procedure described below.



Safety system components must be fitted and removed ONLY by skilled, authorised technical personnel.

The system could be activated when not required and lead to personal injury or unnecessary repairs to the system if the following rules are not respected.

IT IS STRICTLY PROHIBITED TO DISMANTLE AIR BAG MODULES

NOTE *All system components have been designed specifically to work on a car of a particular make and type. Modules and pretensioners cannot therefore be adapted, reused or installed on other cars, but only on the cars for which they have been designed and built. Any attempt to re-use, adapt or install on another type of vehicle may lead to injury to occupants in the case of an accident.*

Replacing an Air Bag (due to defects or warranty expiry)

If an air bag module is replaced due to defects or expiry of the term of warranty, proceed as follows:

1. Remove the adhesive label from the new module, apply to a special file (charge/discharge register) with the vehicle data (chassis no. registration date, model etc.) and add the old module serial number. The file with the registration data must be kept for the purposes of future checks.
2. Before the plate is stuck over the original plate, it must be perforated for the month and year ten years after module installation date (e.g. the year 2006 when the module is fitted in 1996).
3. Connect the module to the connector which emerges from the steering wheel.
4. Fit the air bag module in its housing on the steering wheel and check that the connection lead is properly arranged. Tighten retaining bolts to the specified torque.

Replacing control unit

The electronic control unit must ALWAYS be replaced in the case of a crash involving activation of the system.



Never attempt to reuse the electronic control unit in any way.

If the control unit is replaced, remove the adhesive label from the control unit and stick in the appropriate file as described above.

NOTE *After working on the system, check operation by means of a FIAT/LANCIA TESTER.*

Action following an accident

If any component of the safety system is damaged following an accident, it **MUST** be replaced. Never attempt to repair the control unit, clock spring or air bag modules.

Accidents with or without activation of the air bag system

Some components of the safety system should be inspected if the system has been activated, if the system has been only partly activated or if the system has not been activated at all.

These components are as follows:

- steering column;
- steering column mounts;
- electronic control unit and module anchorage area;
- clock spring contact;
- facia (in passenger air bag module area).

The component should be replaced if found to be distorted, broken or bent.

Accidents involving activation of the air bag system

Some components of the safety system must be replaced if the vehicle experiences a head-on collision involving activation of the safety system.

These components are as follows:

- air bag modules;
- electronic control unit.

Wiring and connectors must be inspected to identify signs of burning, melted outer insulation or damage due to excess heat.

Components must be replaced if signs of damage are noted on the clock spring and electronic control unit or air bag module anchorage areas.

Painting operations

No particular safety precautions need to be observed in the case of painting and subsequent stove drying, because the safety system (air bags and pretensioners) is designed to remain undamaged when the outside vehicle surfaces are heated using normal paint drying systems.



It is forbidden to use naked flames near to modules.

All electronic control units (including the air bag system control unit) must nevertheless be removed if there is a likelihood of their being heated to 85°C or over).

DANGER TO HEALTH

Observe the following precautions when handling activated modules:

1. Use protective gloves and safety goggles.
2. Wash hands and exposed body parts after touching an activated air bag.

EFFECTS OF OVER-EXPOSURE

There is no potential risk of exposure to propellant because the system is fully sealed. The propellant mixture is in the solid state and cannot be inhaled even if the gas generator cartridge should break.

There is no danger to human health if any gas should emerge.

As a precaution, avoid contact with the skin and do not ingest the propellant.



In the case of

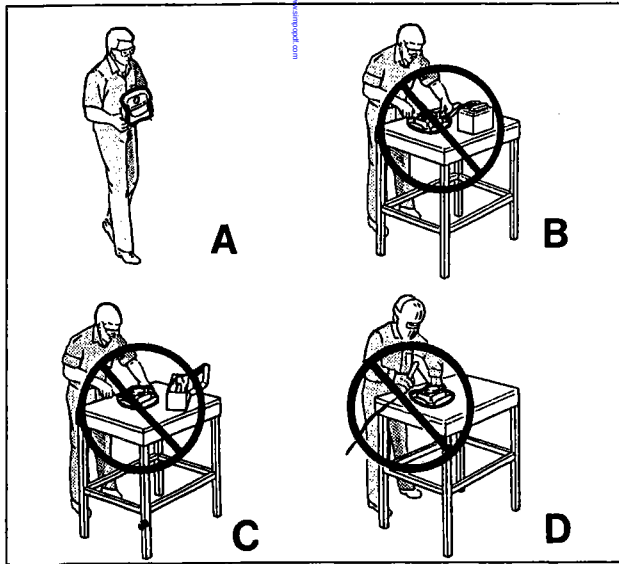
- **Contact with the skin:** *wash immediately with soap and water.*
 - **Contact with eyes:** *rinse the eyes immediately with running water for at least 15 minutes.*
 - **Inhalation:** *take the patient out into the open air immediately.*
 - **Swallowing:** *induce vomiting if the person is conscious.*
- Always call a doctor under these circumstances.*

SAFETY REGULATIONS FOR HANDLING AIR BAG MODULES

Under normal conditions, driver and passenger side air bags are activated after receiving an electronic trigger command during impact. The gas produced under these conditions is mainly non-toxic nitrogen. It is therefore important to ensure that personnel carrying out work on the device when fitted to the vehicle carefully observe the following safety regulations.

Personnel working on the devices must be specially trained.

55.



P4A104L01

- When removing and replacing open (exploded) air bag modules, handle only one module at a time and use gloves and goggles for removal.

After the operations are completed, wash hands thoroughly using neutral soap and rinse eyes immediately in plenty of running water if they come into contact with powder residues.

The metallic parts of a recently detonated air bag are very hot. Avoid touching these components for several minutes (about 20 minutes) after the Air-Bag is activated.

A When removing and replacing UNEXPLODED air bags, always rest the air bag module with the opening flap and pre-marked tear lines turned upward. Never place anything above the flap.

B Do not supply the air bag module with electric current in any way.



It is prohibited to test the continuity of system components unless modules have been replaced by dummy resistances.

C Never repair Air Bag modules. Send all defective modules to the supplier.

D Do not heat the air bag module, e.g. by welding, percussion, drilling, machining etc.

- Never install air bag modules on a vehicle once they have been dropped or show any signs of damage.
- It is forbidden to keep air bag modules together with inflammable material or fuel.
- The gas generators must not come into contact with acid, grease or heavy metals. Contact with such substances could lead to the production of poisonous or harmful gas and explosive compounds.
- Store parts in their original packing. During temporary storage, follow the same procedure for an air bag module removed from the vehicle but not activated, i.e. always use a locked steel cabinet which is suitably designed (steel impact-resistant cabinet with grilles to allow natural ventilation inside). The cabinet must be equipped with special warning signs (DANGER EXPLOSIVES - DO NOT USE NAKED FLAMES - NOT TO BE OPENED BY UNAUTHORIZED PERSONNEL).
- No-one working on a version fitted with an air bag is allowed to work from the front seats without firstly rendering the system inoperative by turning the ignition key to STOP and then disconnecting and insulating the battery, and then waiting for 10 minutes.
- If water and mud reach the level of device components as a result of exceptional atmospheric conditions (floods, high tides etc.), the device must be replaced.



DISPOSING OF USED AIR BAG MODULES

Air bag modules fitted to a vehicle must not be demolished with the vehicle but must be removed beforehand.

Air bags cannot be scrapped without first being activated.

If the air bag module does not go off during an accident, the device must be considered still set to go off. All unexploded material must be sent to GEMCA in Chivasso, indicating the following wording on the delivery note:

"AIR BAG/PRE-TENSIONER DEVICE CONTAINING PYROTECHNIC CHARGE TO BE DE-ACTIVATED".

Devices must be sent to GEMCA in the original packs in which the parts were received. If these are not available, the empty pack can be ordered from the Volvera parts store.

If air bag - pretensioner devices are replaced, the original pack must be kept to use when forwarding un-activated devices to GEMCA.

Foreign markets

Check current local legislation for foreign markets and inform dealers.



Failure to respect the instructions listed here may cause air bags to be activated when not required and lead to personal injury. Unactivated air bags must NOT be disposed of via the normal refuse disposal channels. Unactivated air bags contain harmful substances that could cause personal injury if the sealed container is damaged during disposal. Failure to dispose of air bags in accordance with these instructions could constitute a breach of current legislation.

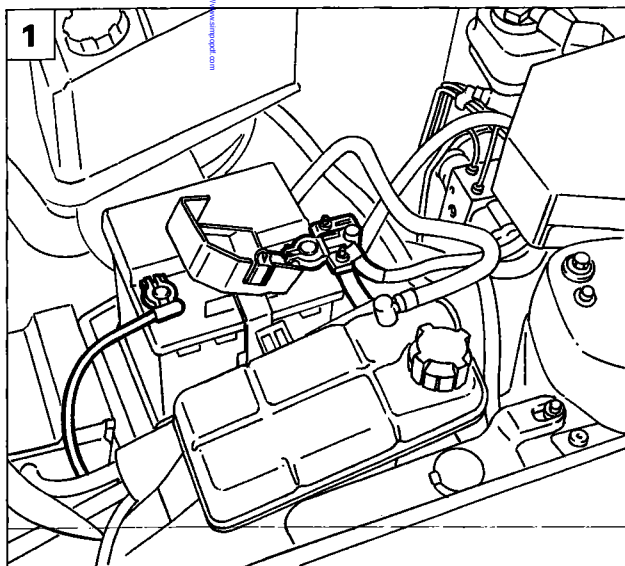
Ordering procedure

If necessary, devices may be ordered as required from the Parts After-sale department in Volvera using only the VOR procedure because Dealers should not hold a stock of such parts. In any case, during internal handling they should be entered in a charge/discharge register which shows module identification numbers and vehicle data (chassis no., registration data, model etc.)

NOTE For foreign markets, check current legislation and inform dealers accordingly.



- | | |
|---------------------------|---------------------------------|
| 4. Junction unit | 130. Tester socket for air bag |
| 6. Instrument panel | 133. 5A fuse for air bag system |
| 114. Air bag control unit | 213. Air bag earth |
| 5. Passenger's air bag | 231. Clock spring connection |
| 116. Driver's air bag | |



P4A107L04



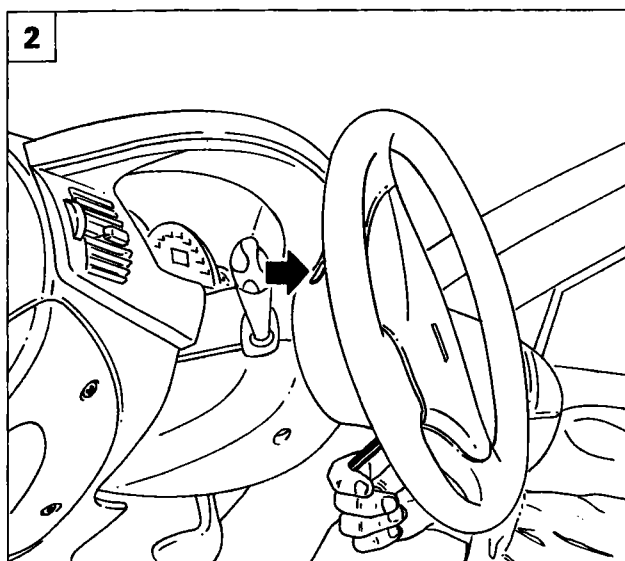
REMOVING DRIVER'S SIDE AIR BAG

Safety measures



Operations on air bag system components must be carried out by specially trained personnel and the following safety measures must be **STRICTLY** adhered to. During removal and replacement operations, it is necessary to use polythene gloves and protective goggles. Do not use naked flames near the air bag and air bag system components. The metal components of an air bag are very hot immediately after activation. Wait at least 20 minutes following activation before touching these parts. Individual damaged or defective parts must not be repaired or tampered with in any way but replaced as a whole unit.

See section beginning on page 99 for further information on safety procedures.

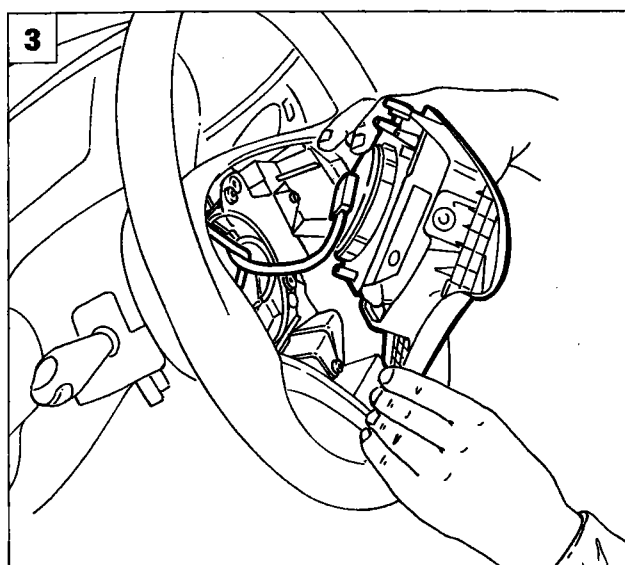


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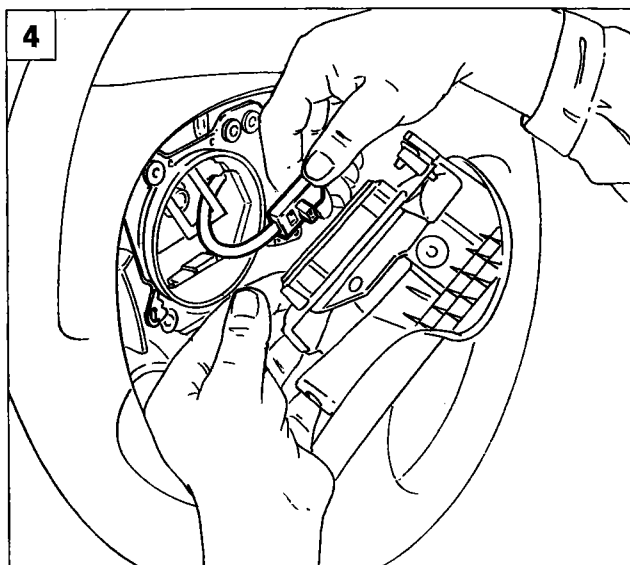


Operation sequence

1. Disconnect battery terminals and protect with insulating tape. Wait 10 minutes and then proceed as follows.
2. Unscrew the two 5 mm hexagonal-headed socket screws located to the rear of the steering wheel. Turn the steering wheel and position as shown in the figure to gain access to each screw.
3. Lift the air bag out of the steering wheel.
4. Turn the air bag and maintain in a vertical position. Then disconnect the yellow two-way connector.



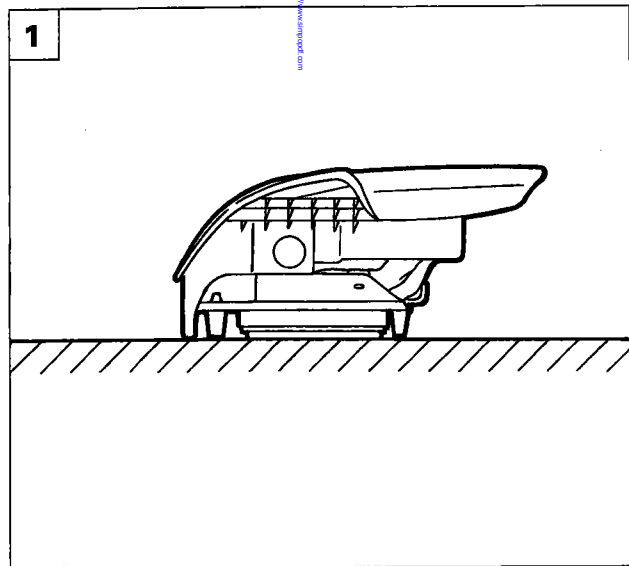
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Air bag

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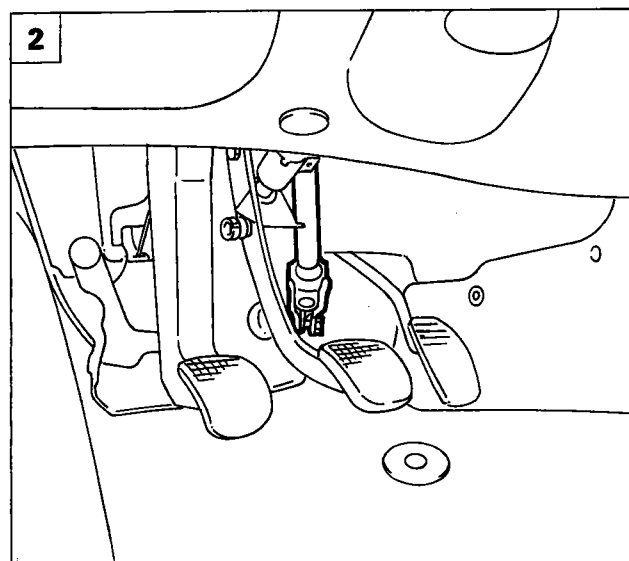


P4A108L06

1. Remove the air bag from the steering wheel.



Following removal, unactivated air bag modules should immediately be placed in a specially marked cabinet and locked away. The module should be placed with the metal part resting on the surface as shown in the figure.



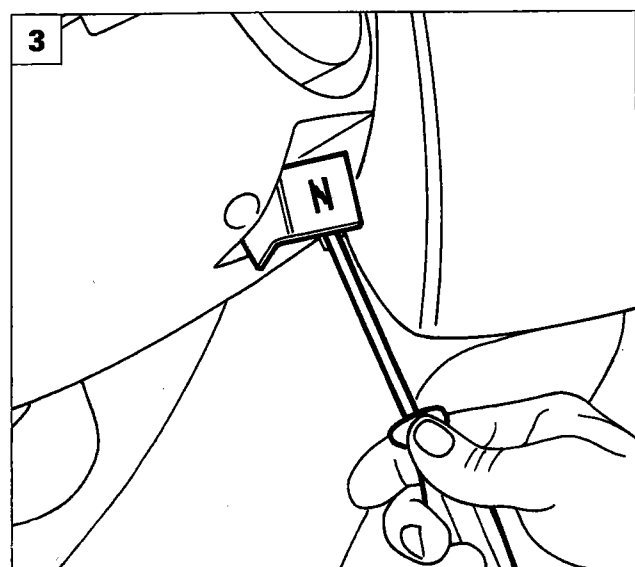
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REMOVING CLOCK SPRING

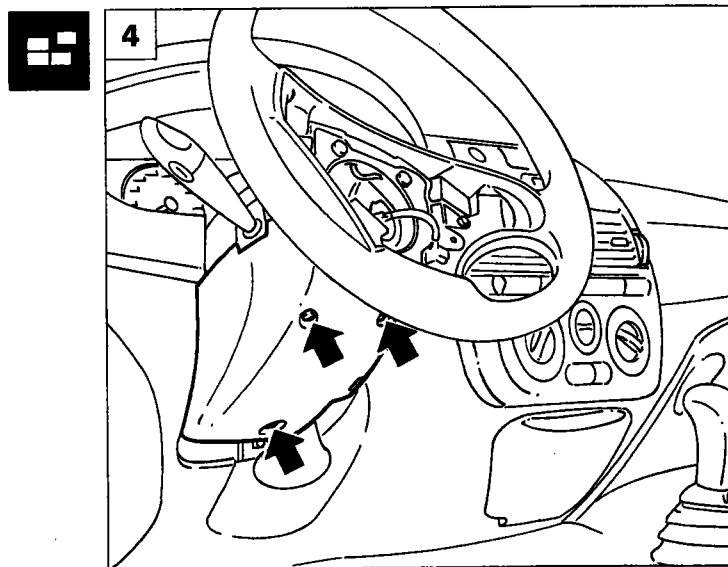
Preliminary operations

Remove the air bag as described on the previous page. Then proceed as follows.

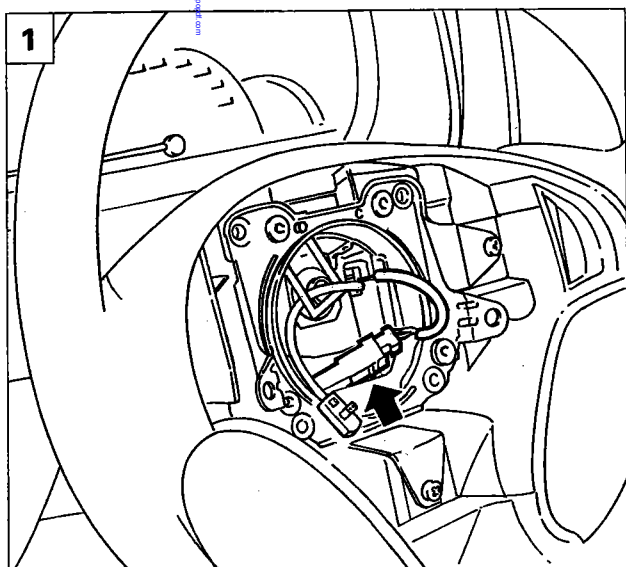
2. Align the wheels and lock the steering column throughout all clock spring removal and refitting operations.
3. **Diesel versions:** unscrew screw retaining advance handle to allow removal of the lower steering column trim.
4. Disconnect the lower steering column trim and unscrew the three cross-headed screws indicated by the arrows.



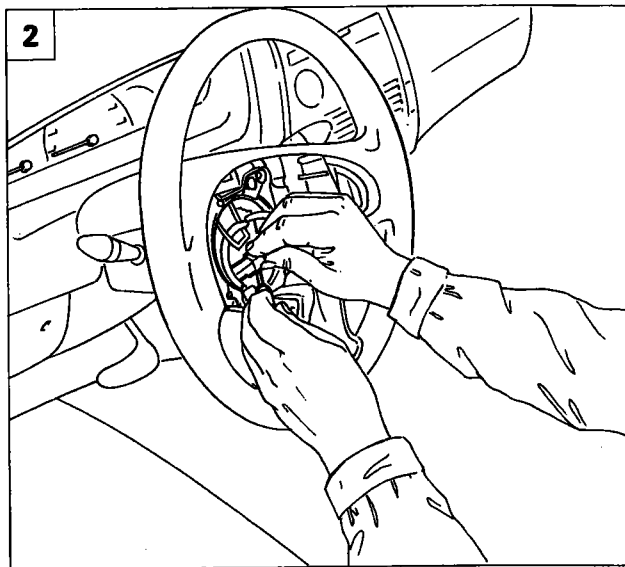
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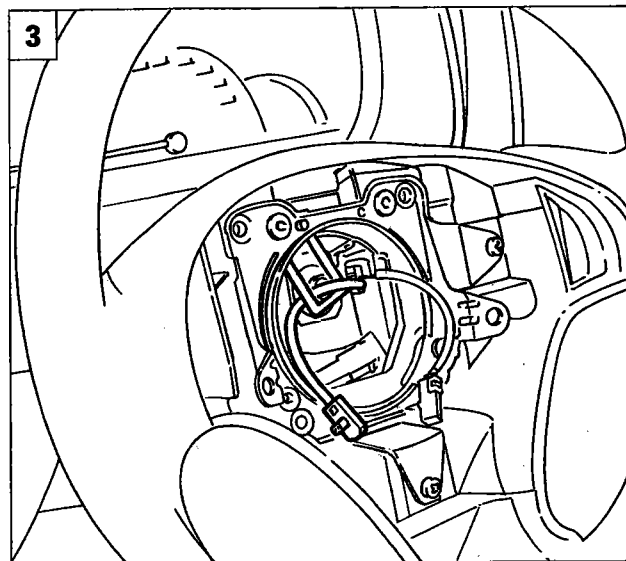
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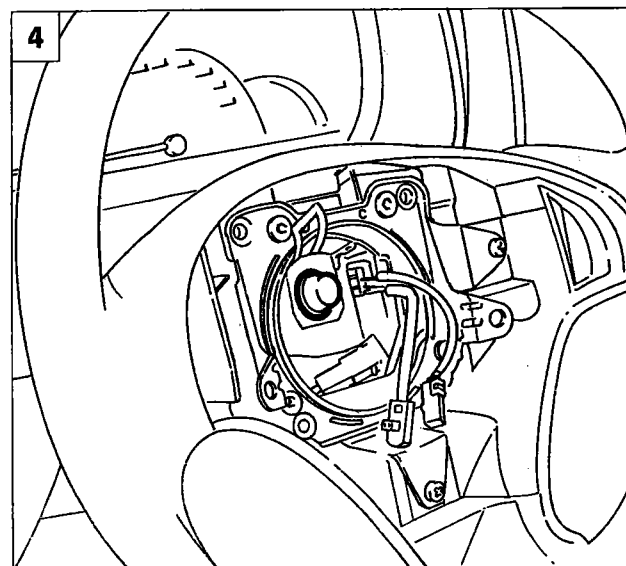


Removing the steering wheel

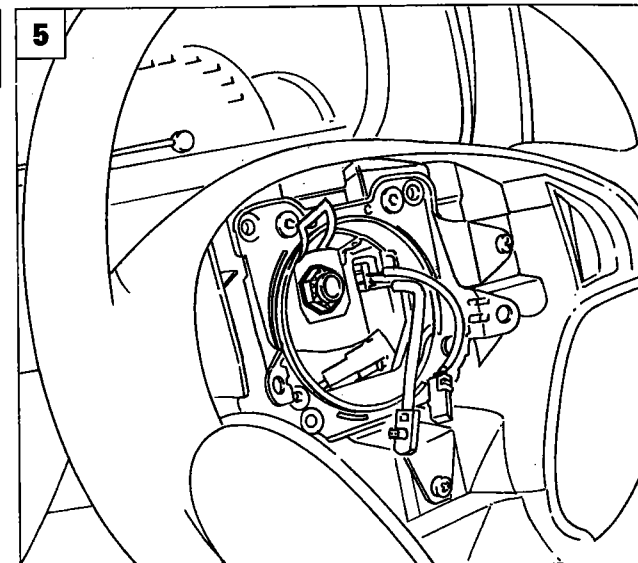


Proceed with great care when carrying out the following operations.

1. Remove the horn connector from its seat.
2. Disconnect the horn connector.
3. Withdraw the yellow cable from the rubber slot.
4. Remove the rubber cover fitted to the nut retaining the steering wheel to the steering column.
5. Unscrew nut retaining the steering wheel to the steering column.

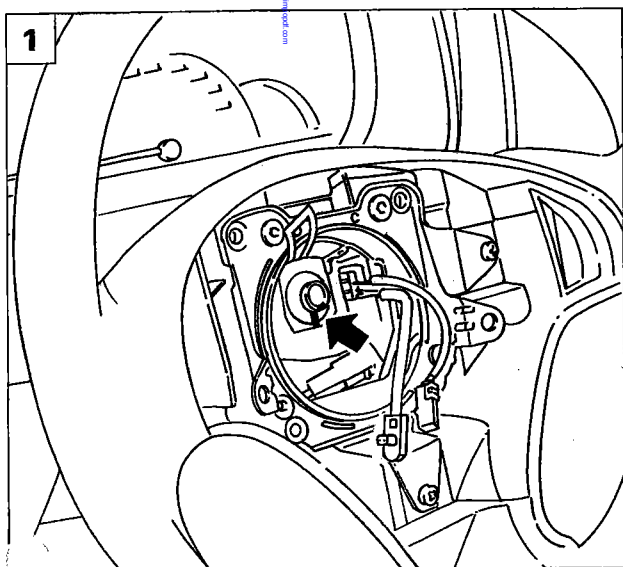


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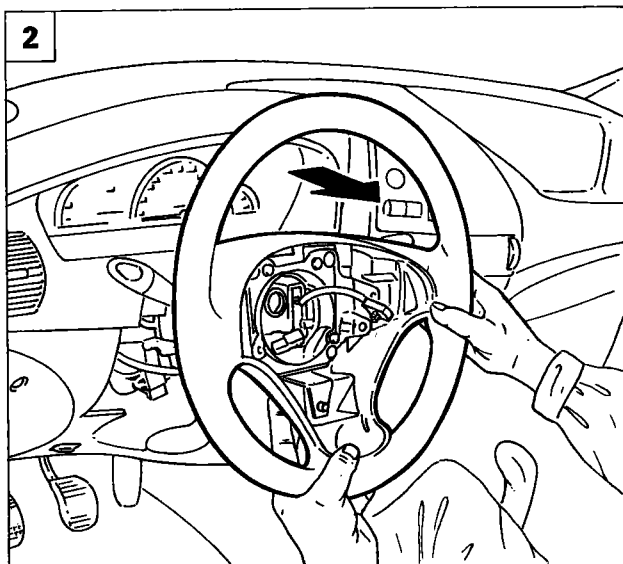


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5.



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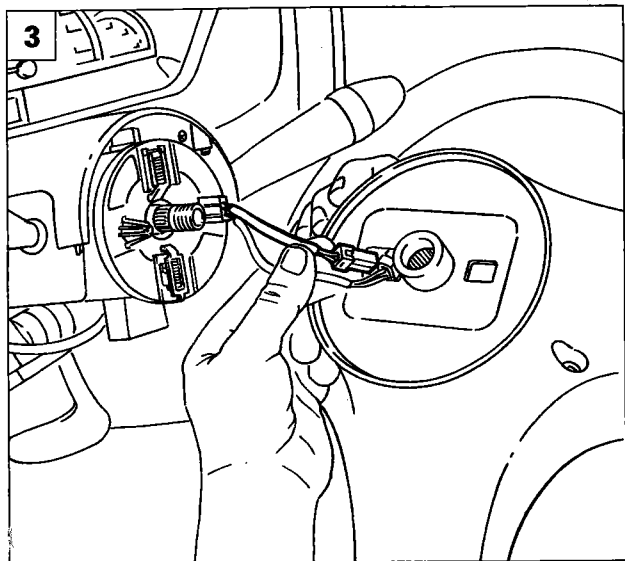


P4A110L06

1. Mark the position of the steering wheel hub in relation to the steering column.
2. Fully remove the steering wheel. Take care not to withdraw the two clock spring leads.



Take care not to knock the steering wheel during the removal operation.

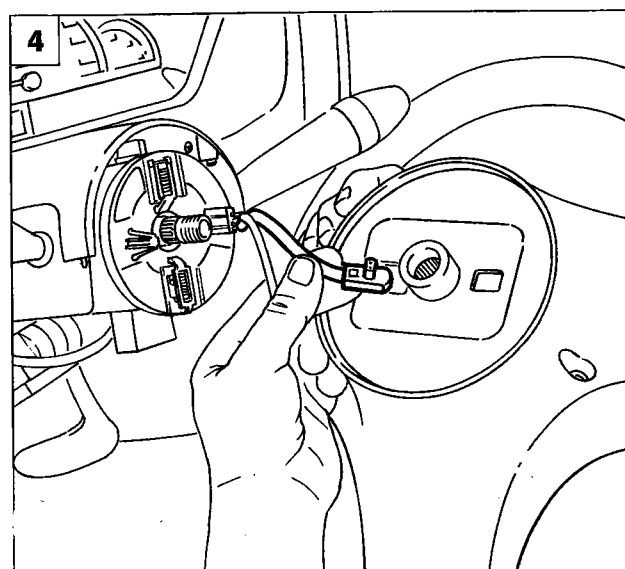


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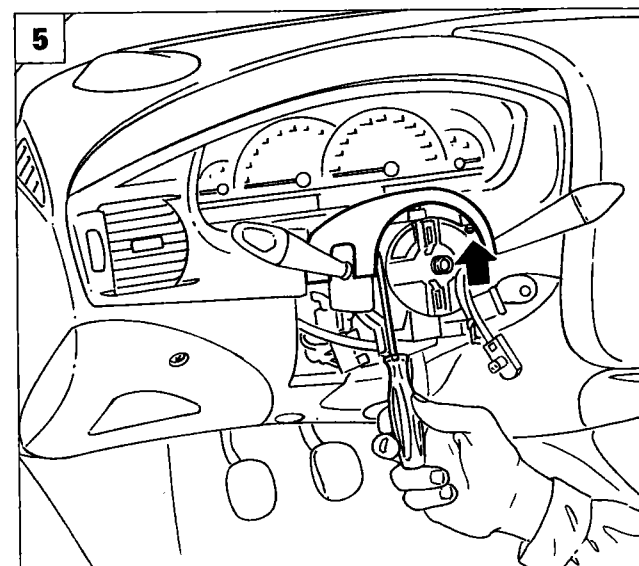
3. Remove the horn supply lead with the white connector from the slot on the steering wheel hub.
4. Remove the air bag supply lead with the yellow two-way connector from the slot on the steering wheel hub and remove the steering wheel from the vehicle.

Removing watch spring

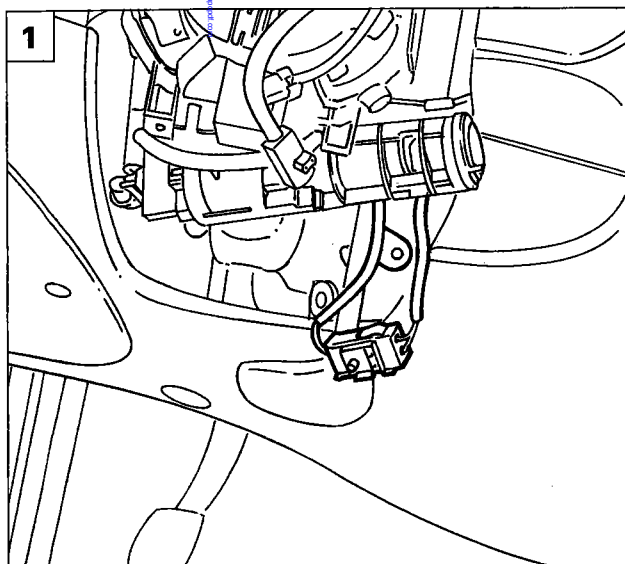
5. Remove the upper steering column trim by unscrewing both cross-headed retaining screws.



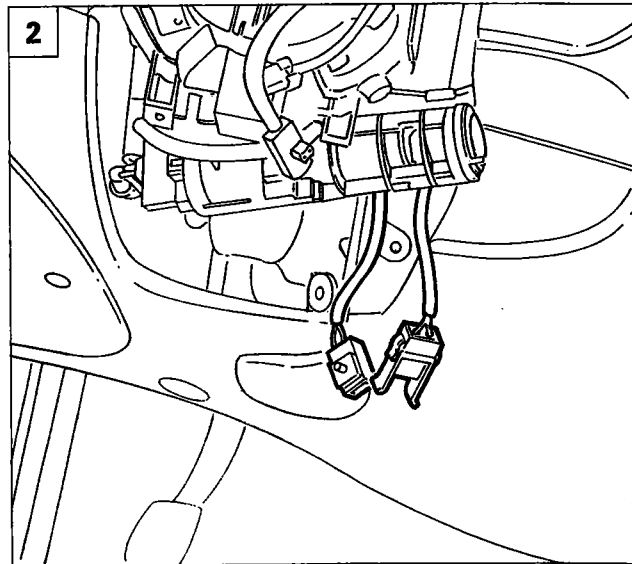
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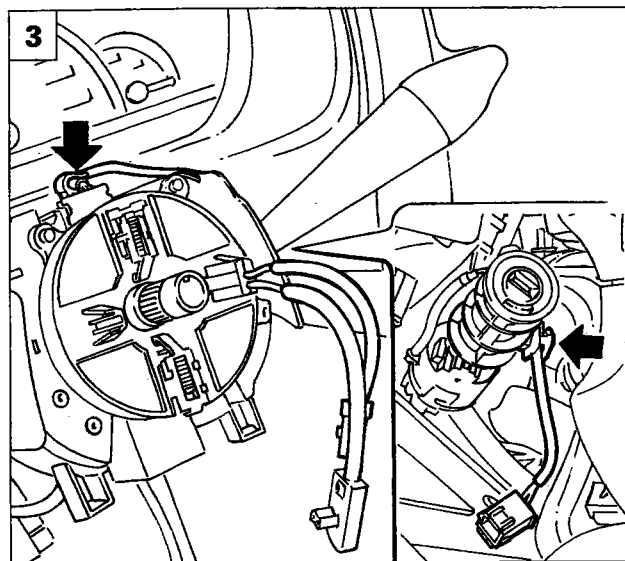
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P4A110L12



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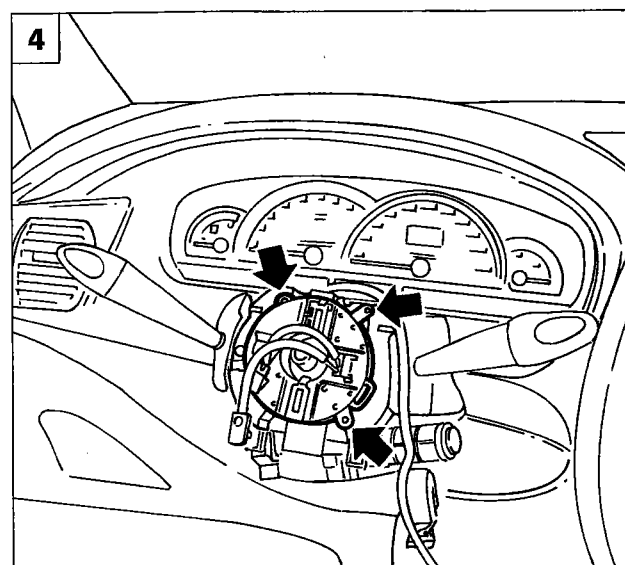


1. Disconnect the yellow connector from the ignition switch bracket.
2. Disconnect the yellow connector connecting the air bag control unit to the clock spring.
3. Release the clock spring lead from its retaining leads.
4. Undo the three cross-headed screws retaining the clock spring and remove from the vehicle.

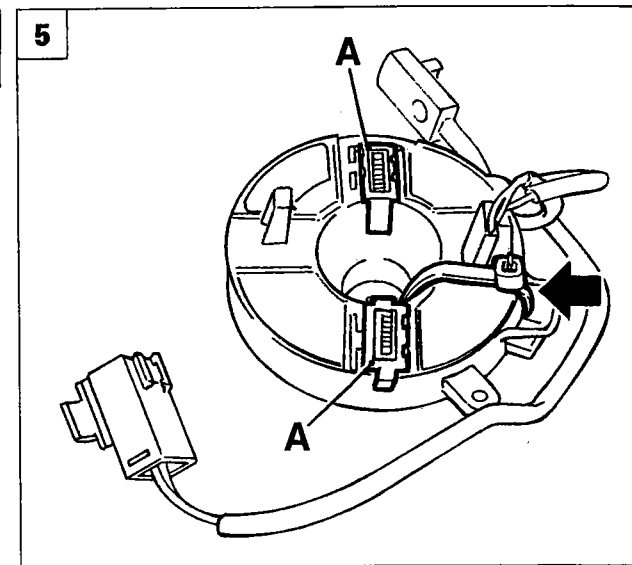


The clock spring is fitted with a system to prevent rotation (clip A fig. 5). This operates when the steering wheel is removed.

5. For greater safety, prevent the clock spring from turning by using a clip or adhesive tape as indicated by the arrow.

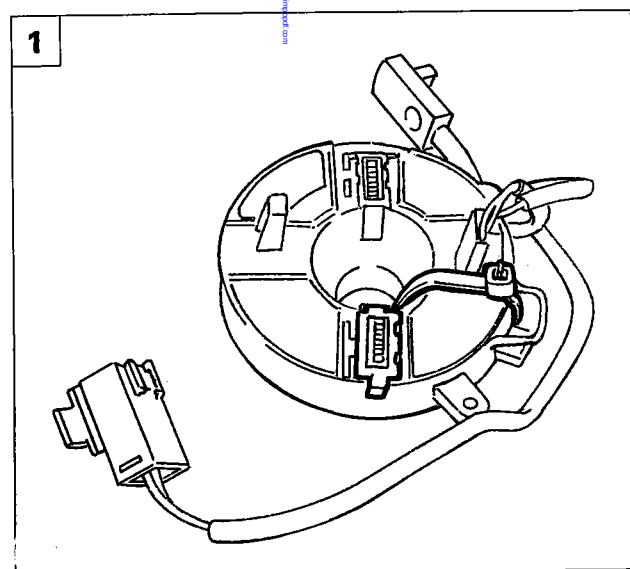


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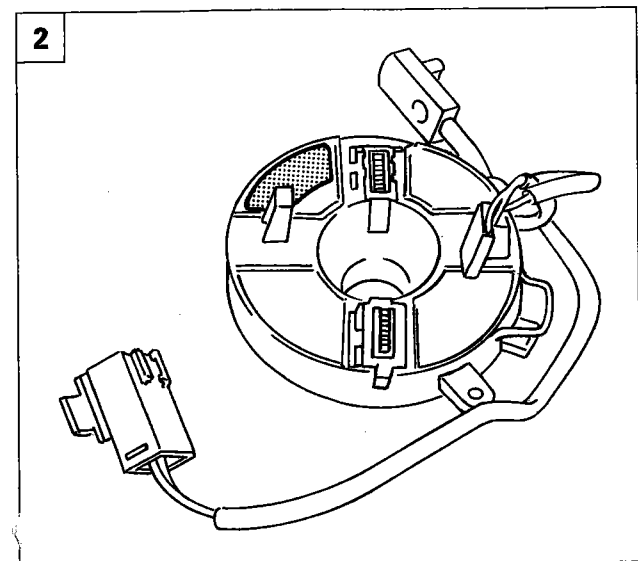


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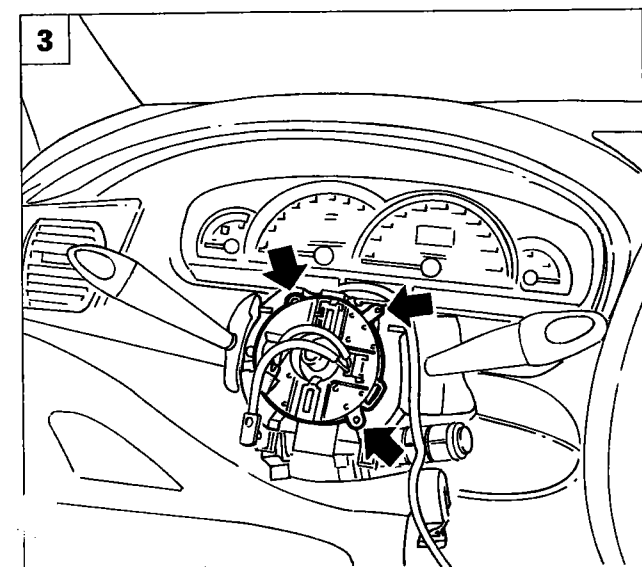
P4A110L16



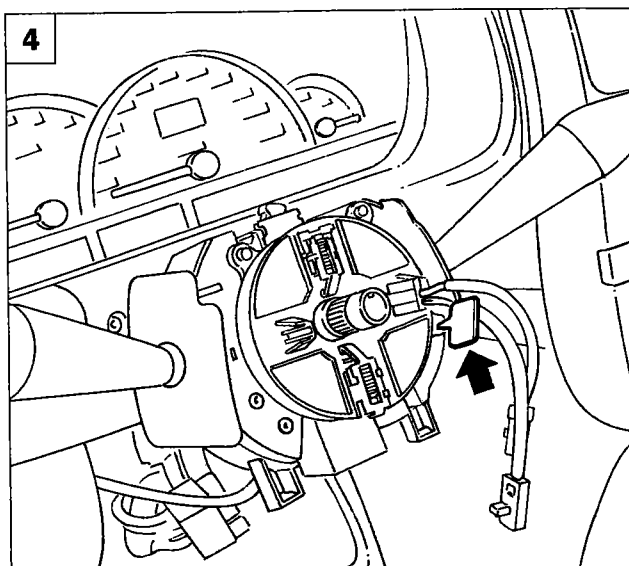
P4A110L17

REFITTING CLOCK SPRING

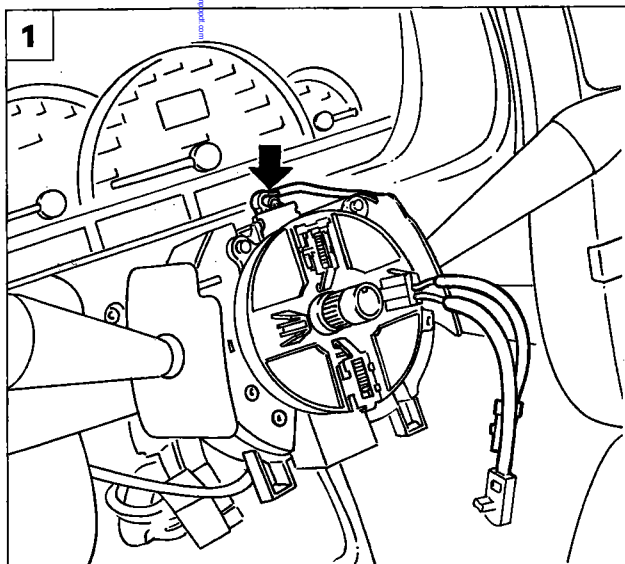
1. If the clock spring does not require replacement, remove the adhesive tape or clip fitted previously without turning the upper ring.
2. The upper clock spring case is identified by one of two different colours:
-Green for vehicles with power steering.
-Red for vehicle without power steering.
3. Position the clock spring on the stalk unit, then fasten by tightening the three cross-headed screws.
4. If a new clock spring is fitted, turn the safety key until it comes completely away after fastening the spring to the stalk unit.



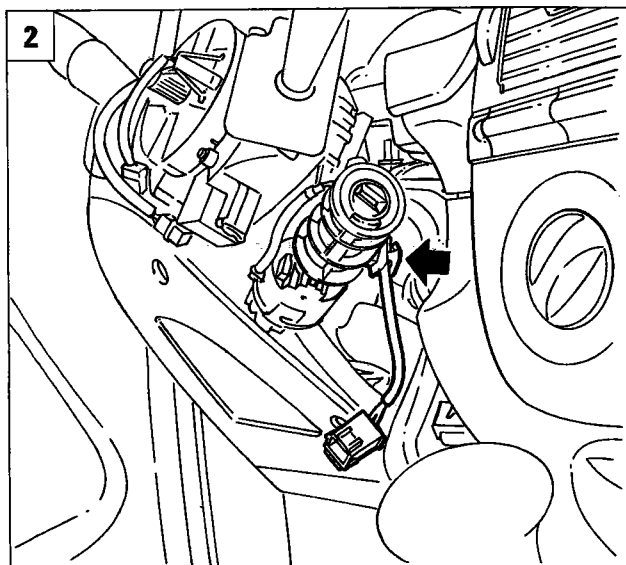
P4A110L14



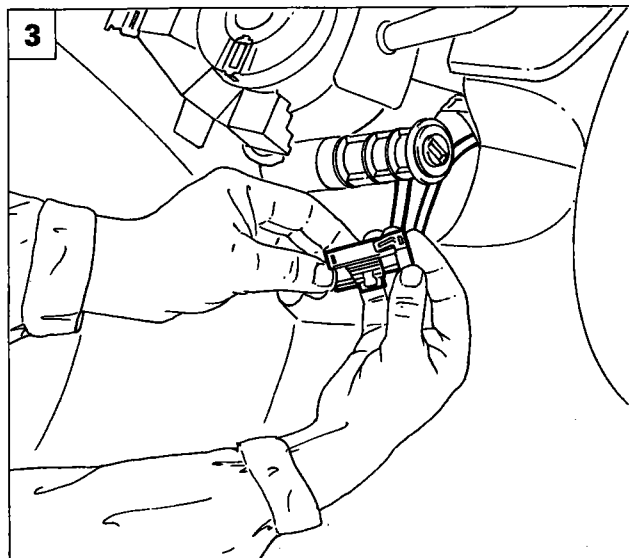
P4A110L18



P4A110L19



P4A110L20



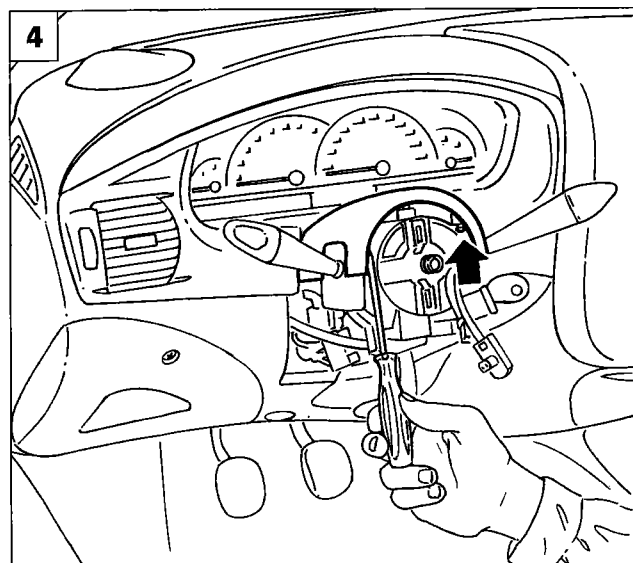
P4A110L21



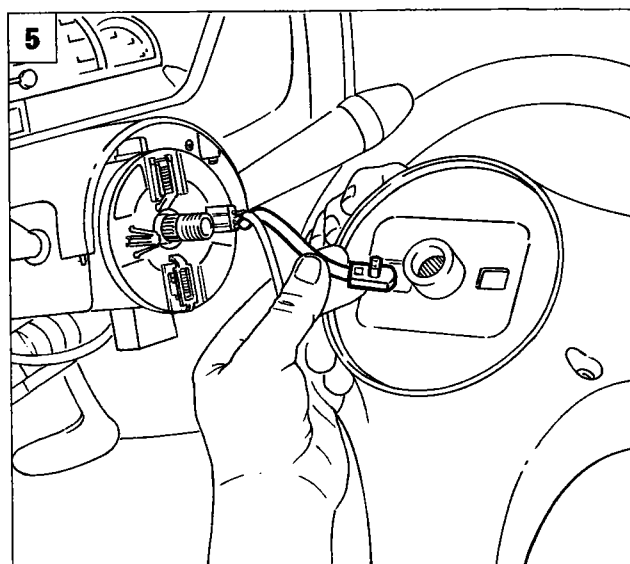
1. Reposition the yellow connection lead in the retaining clip on the stalk unit.
2. Secure the connection lead to the retaining block on the ignition.
3. Connect the clock spring lead to the connection leading from the air bag control unit and secure to the bracket.
4. Refit the upper steering column trim by screwing in the two cross-headed retaining screws.

Refitting the steering wheel

5. Carefully thread the yellow air bag supply lead through the square slot on the steering wheel hub.

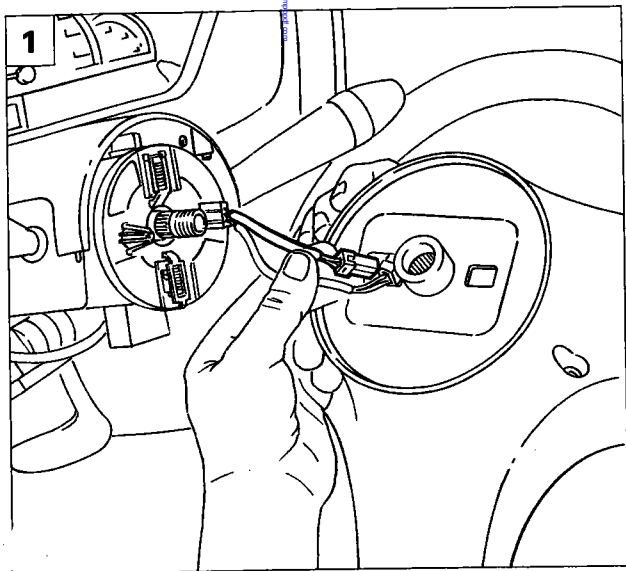


P4A110L09

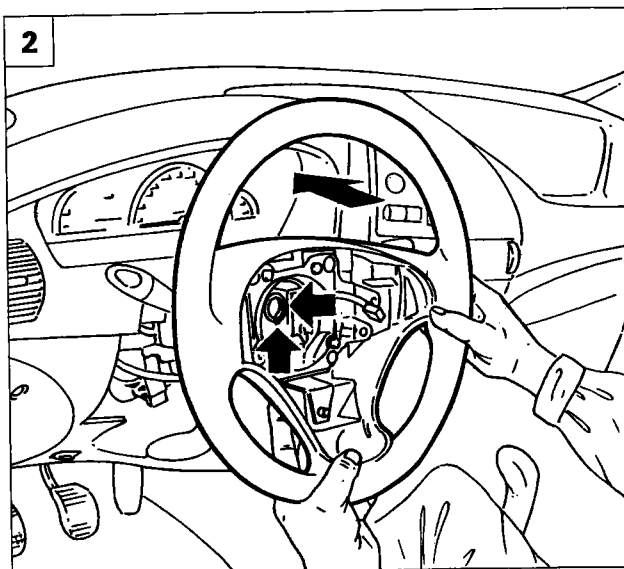


P4A110L08

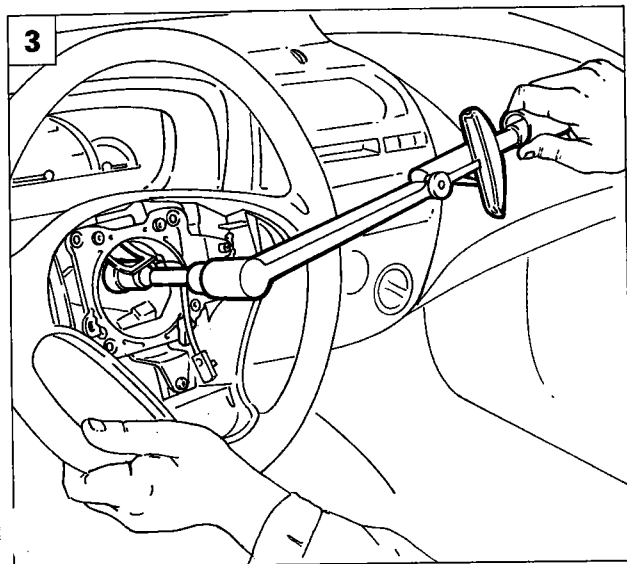
5.



P4A110L07



P4A110L22



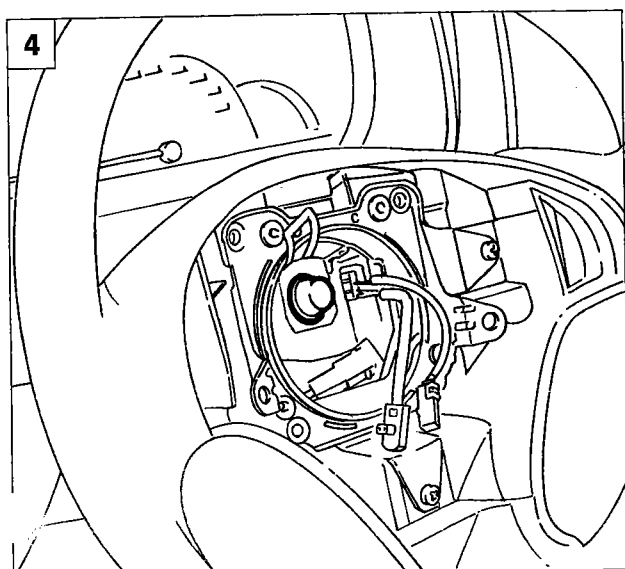
P4A110L23



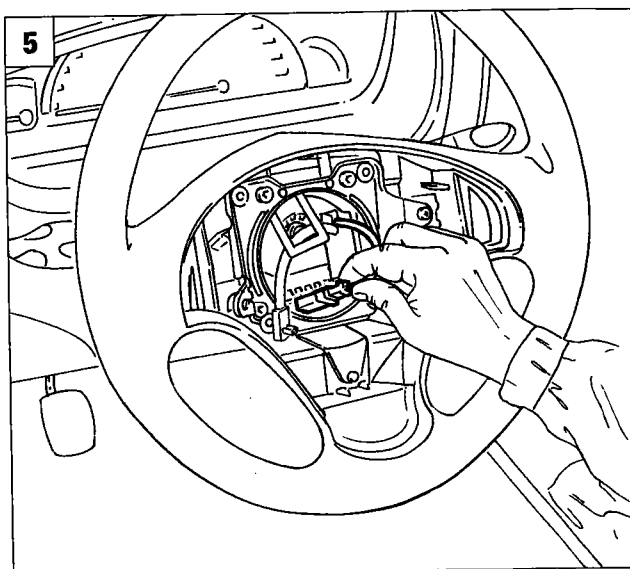
1. Carefully thread the horn supply lead through the same slot on the steering wheel.
2. Fit the steering wheel and align the reference marks made previously.
3. Fit the steering wheel retaining nut and tighten to a torque of 5.5 da Nm.
4. Fit the rubber cover over the steering wheel retaining nut.
5. Connect the connector shown in the figure to the horn connector.



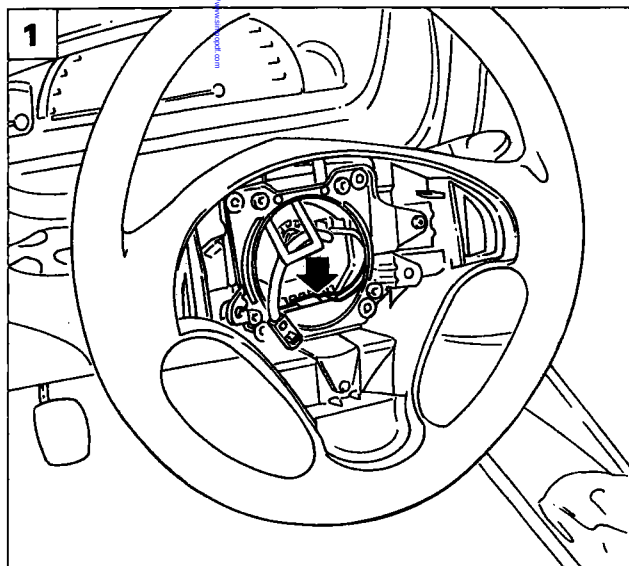
Thread the horn lead through the fittings around the edge of the steering wheel compartment to avoid fouling.



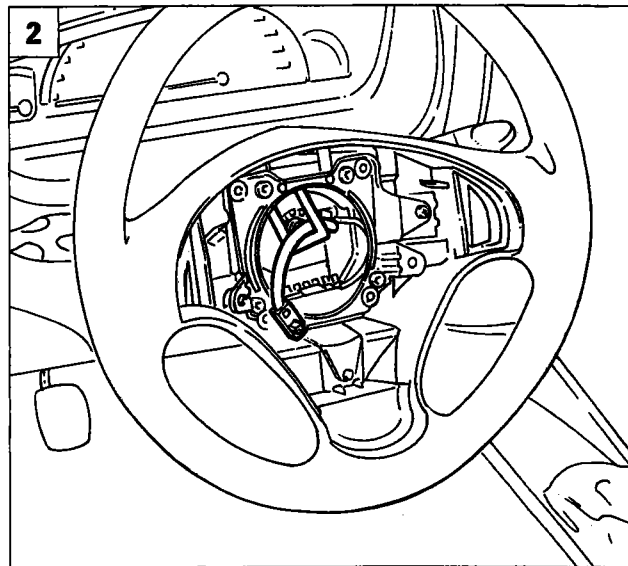
P4A109L08



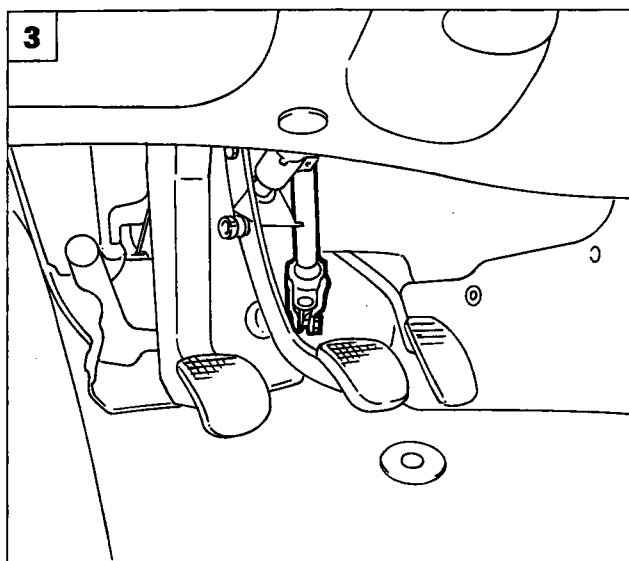
P4A110L24



P4A110L25



P4A110L26

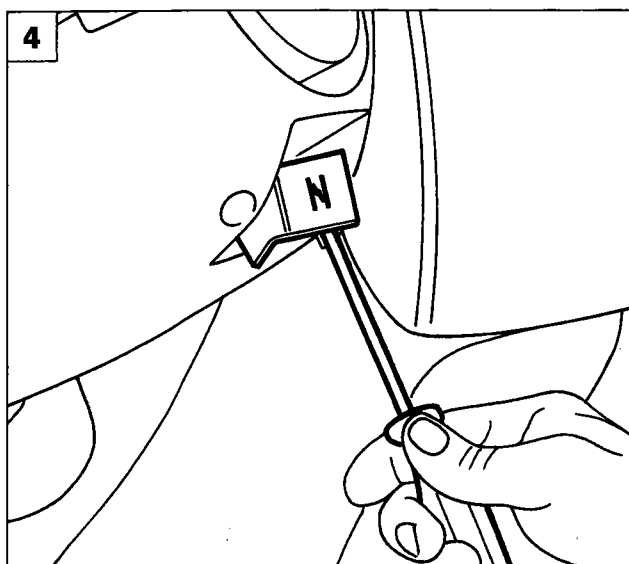


P4A108L07

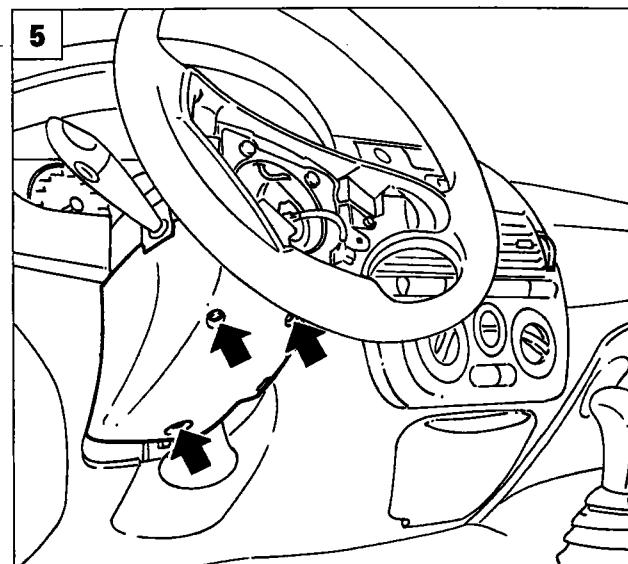


Completing assembly

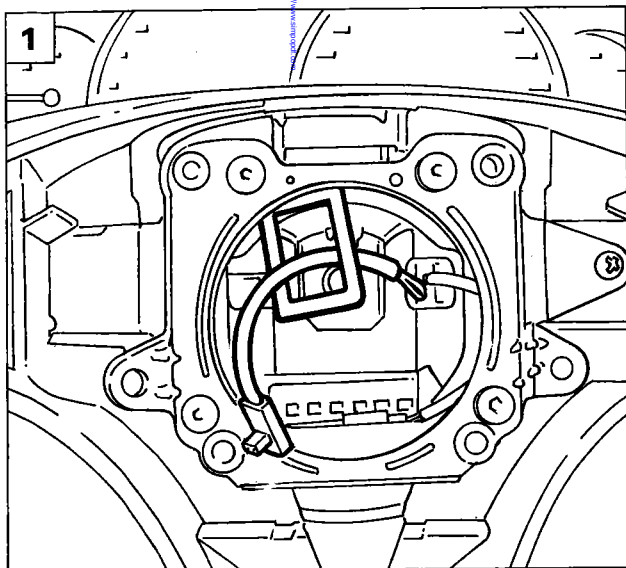
1. Fit the connector and connection lead into their seat under the horn plate.
2. Carefully pass the yellow two-way air bag supply line through the rubber slot.
3. Release the steering column.
4. **Diesel versions:** tighten the advance handle retaining bolt.
5. Refit the lower steering shaft trim and tighten the three cross-headed bolts indicated by arrows.



P4A108L01



P4A108L08



P4A110L31



REFITTING AIR BAG

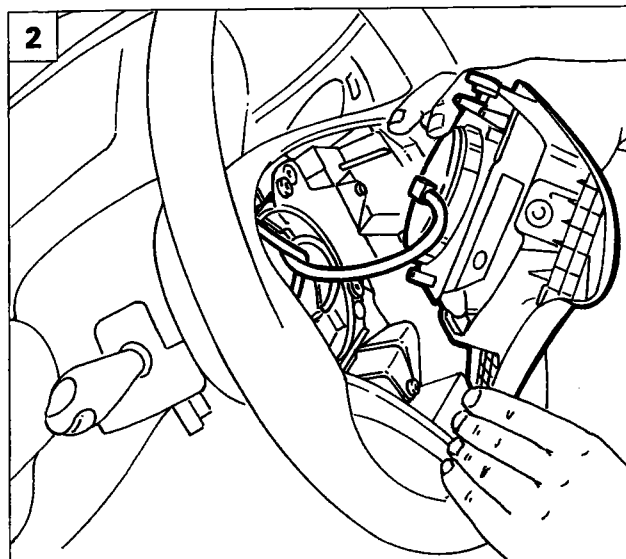
Safety measures



Operations on air bag system components must be carried out by specially trained personnel and safety measures set out in the section beginning on page 99 must be **STRICTLY** adhered to.

Operation sequence

1. Before refitting the air bag, check that the yellow lead attached to the clock spring passes through the rubber slot.
2. Bring the driver's air bag up to its fitting position on the steering wheel and tilt as necessary.
3. Connect the yellow two-way connector leading from the clock spring to the air bag connector.
4. Position the air bag carefully in its seat and then tighten both 5 mm hexagonal-headed socket screws retaining the air bag to the steering wheel.



P4A110L32

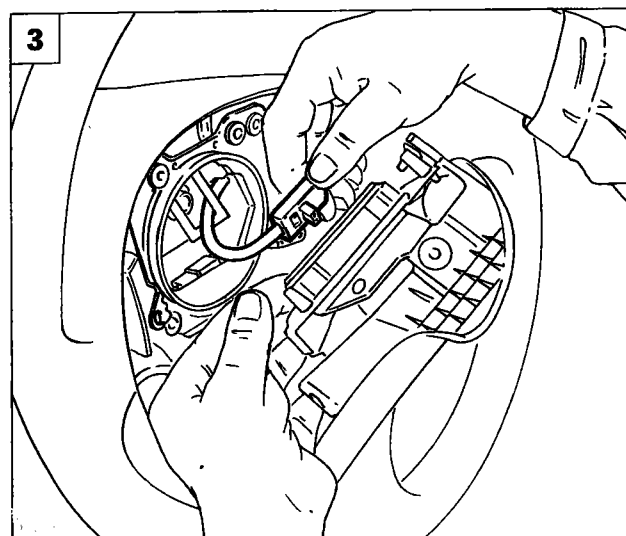


Check system operation by ensuring panel warning light goes off.

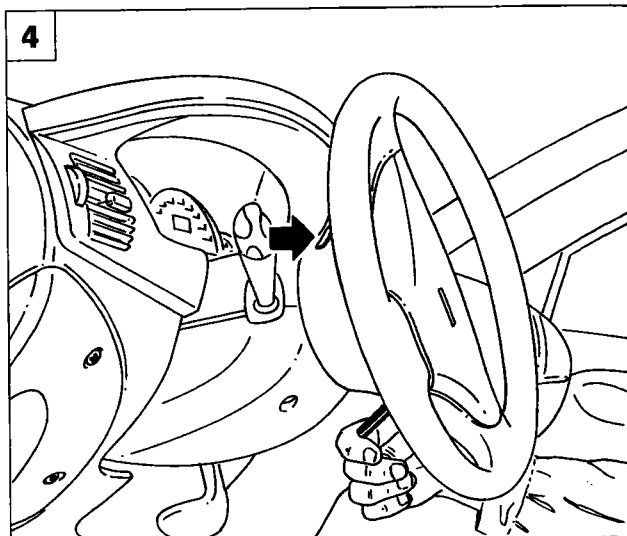


NEVER CONNECT THE BATTERY UNTIL INSTALLATION IS COMPLETE.

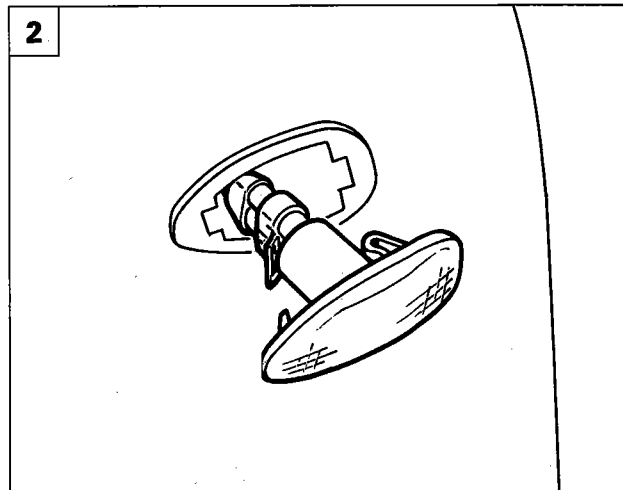
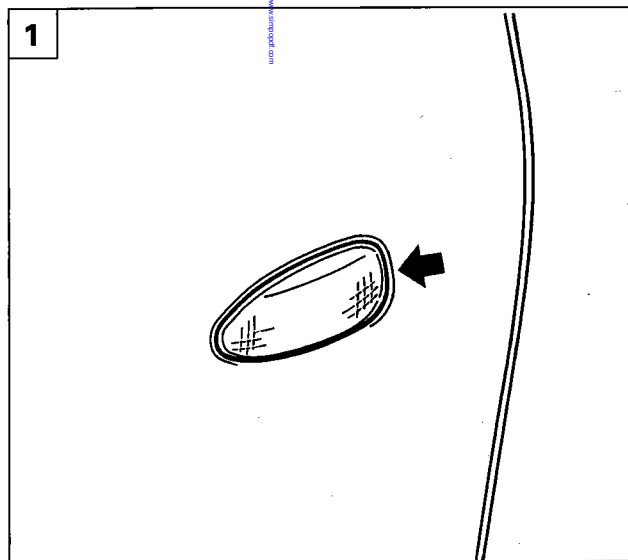
NOTA After refitting, check the system is working properly by means of a FI-AT/ LANCIA TESTER or other diagnostic instrument.



4A246L



P4A107L05



SIDE REPEATER

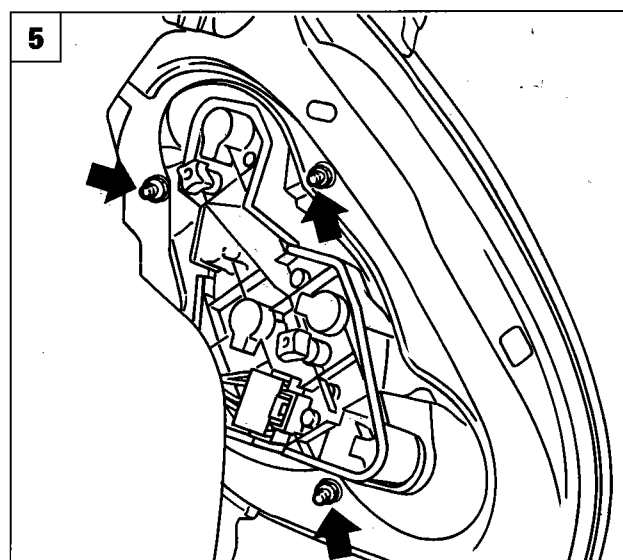
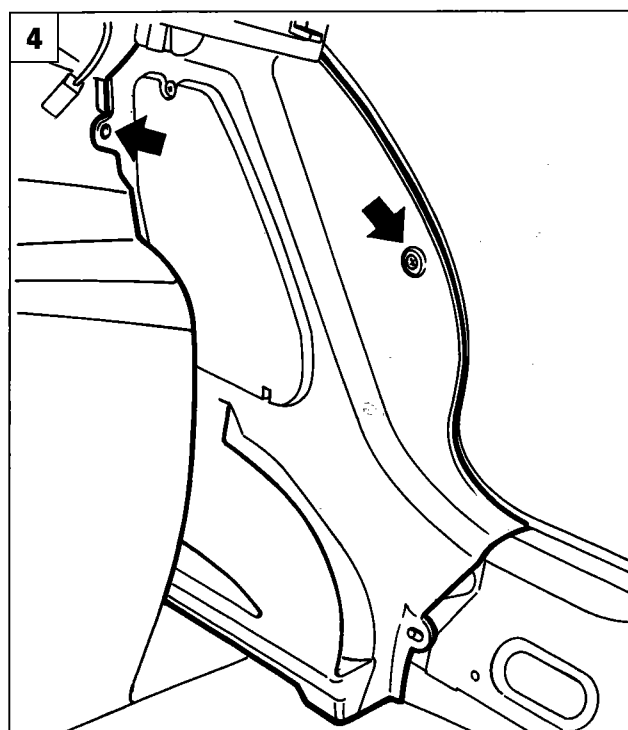
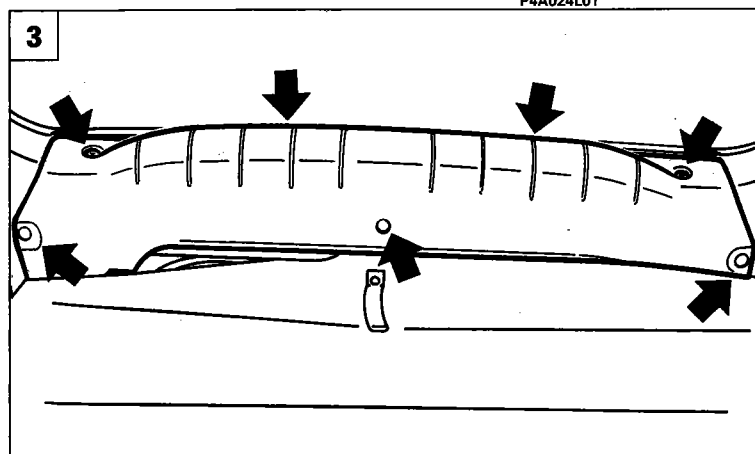
Removing-refitting

1. Use a screwdriver at the point shown by the arrow to disengage the side repeater from the body shell.
2. Disconnect the supply cables connector from the bulb holder, and rotate the holder to release it from the lens.

REAR LIGHTS CLUSTER

Removing-refitting rear lights cluster (3-door version)

3. Undo the screws and remove the buttons securing the rear crossmember trim and remove the trim.
4. Undo the screws (arrowed) and remove the lights cluster trim.
5. Undo the nuts indicated and remove the lights cluster from its seating.

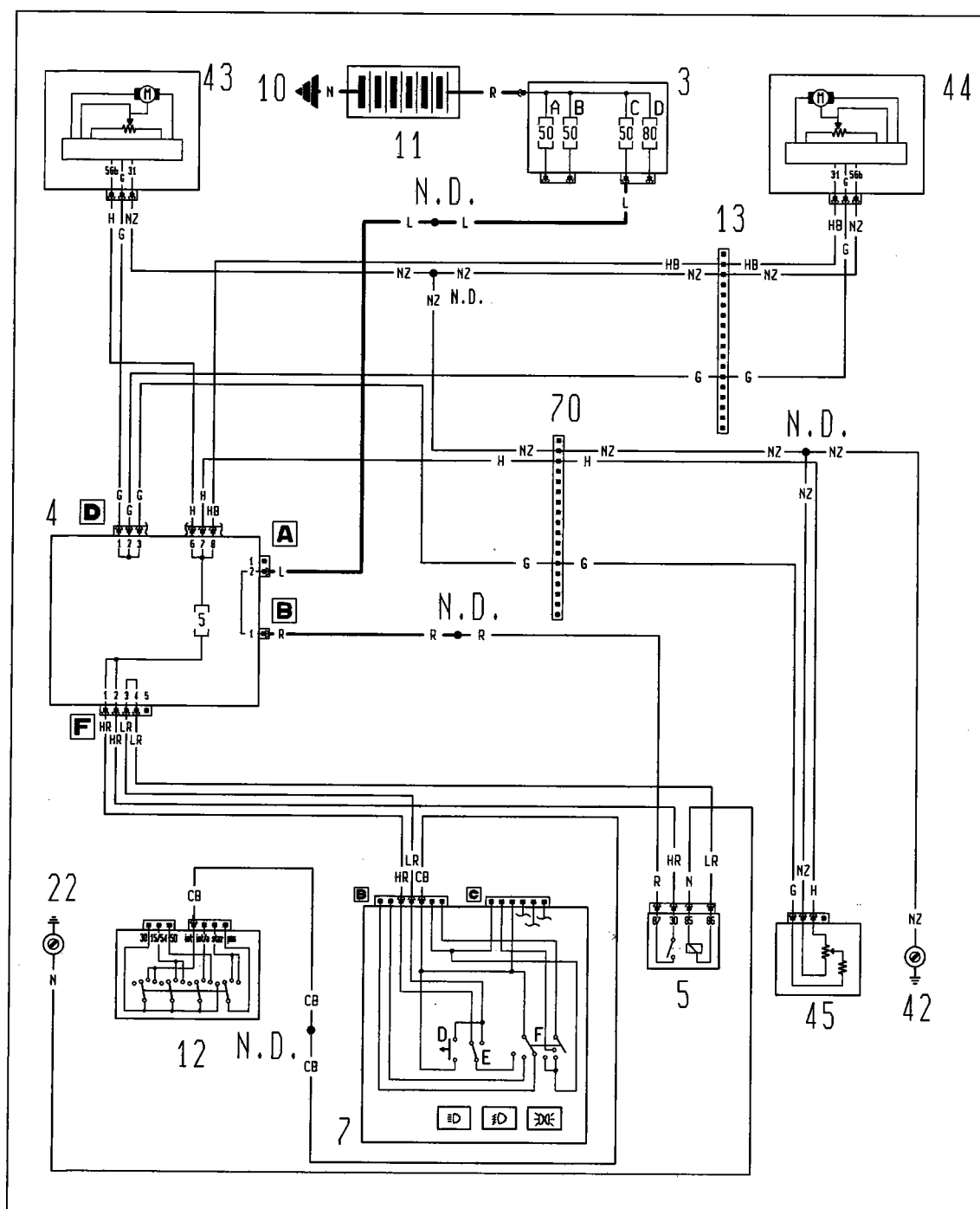


Operation

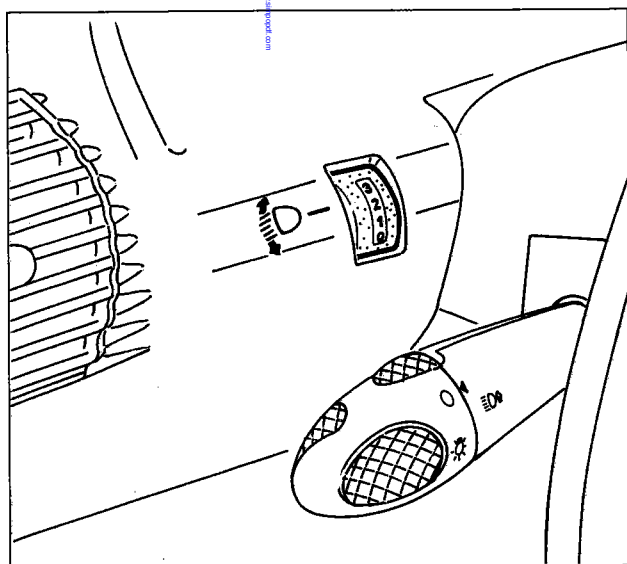
Adjustment is electrical and is effected when the dipped beam headlamps are switched on. The movement is achieved by two motors (43-44) mounted directly on the light clusters. The control (45) is a potentiometer controlled by a knob located on the dashboard, which can be set to four different positions corresponding to the four positions that can be assumed by the lights clusters. The wiring diagram shows the connections of the various devices which constitute the system.

The system is supplied by a voltage of 12 V coming from the ignition switch, and is protected by the fuse (F5) located on the fuse and relay unit (4). The actuator consists of a motor on which a potentiometric position transducer is mounted, and an electronic control unit.

Wiring diagram showing connection of headlamp alignment device



P4A023L01



P4A022L01

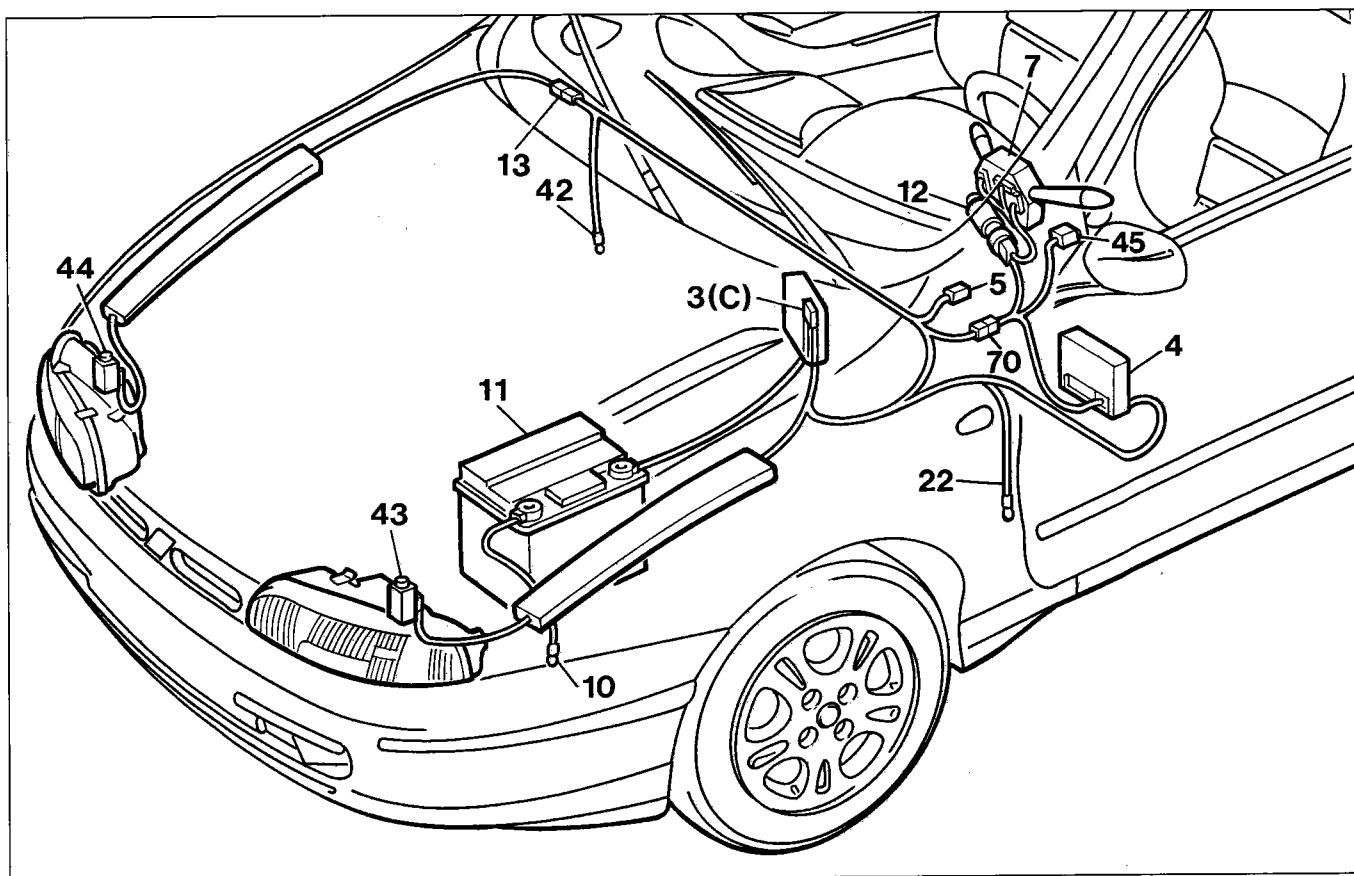
ELECTRIC HEADLAMP ADJUSTER

The vertical alignment of the front lights clusters is adjusted in accordance with the car load by means of a potentiometer located on the instrument panel.

Four numbers are engraved on this potentiometer, corresponding to four different load conditions.

- **Position 0:**
driver only or with passenger on front seat.
- **Position 1:**
all seats occupied (5 persons).
- **Position 2:**
all seats occupied plus load in the luggage compartment.
- **Position 3:**
driver plus maximum permitted load in luggage compartment.

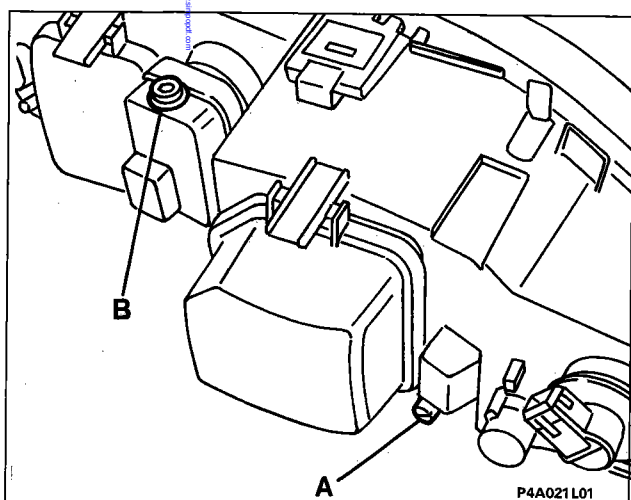
Location of components and wiring loom for electric headlamp adjuster



P4A022L02

- 3(C). 50A fuse protection additional optional extras
- 4. Fuse and relay unit
- 5. Main beam relay
- 7. Stalk unit
- 10. Battery earth on body shell
- 11. Battery

- 12. Ignition switch
- 13. Right/left cable connection
- 22. Left dashboard earth
- 42. Right dashboard earth
- 43. Left headlamp adjustment motor
- 44. Right headlamp adjustment motor
- 45. Headlamp adjuster control



HEADLAMP ALIGNMENT

- A. Screw for horizontal headlamp beam adjustment
- B. Screw for vertical headlamp beam adjustment.

The car must be complete with spare wheel, tools, fluids and fuel reserve, the tyres must be at normal operating pressure and the driver must be on board.

Place the car on flat ground with the lights cluster lenses 10 m away from a screen or opaque surface on which the following lines have been drawn:

V - V: vertical line corresponding to the plane of symmetry of the car.

C - C: corresponding to the vertical planes passing through the reference centres of the lights clusters.

HC-HC: horizontal line corresponding to the height from the ground of the reference centres of the lights clusters.

AC-AC: horizontal line 10 cm below the line Hc-Hc (value for cars which are new, but settled down, corresponding to a 1% drop).

Align the lights clusters on the dipped beam. Using the headlamp alignment device, proceed as follows:

Vertical alignment

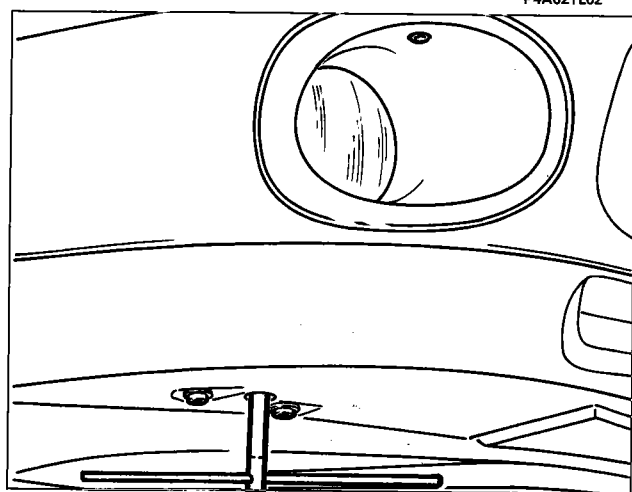
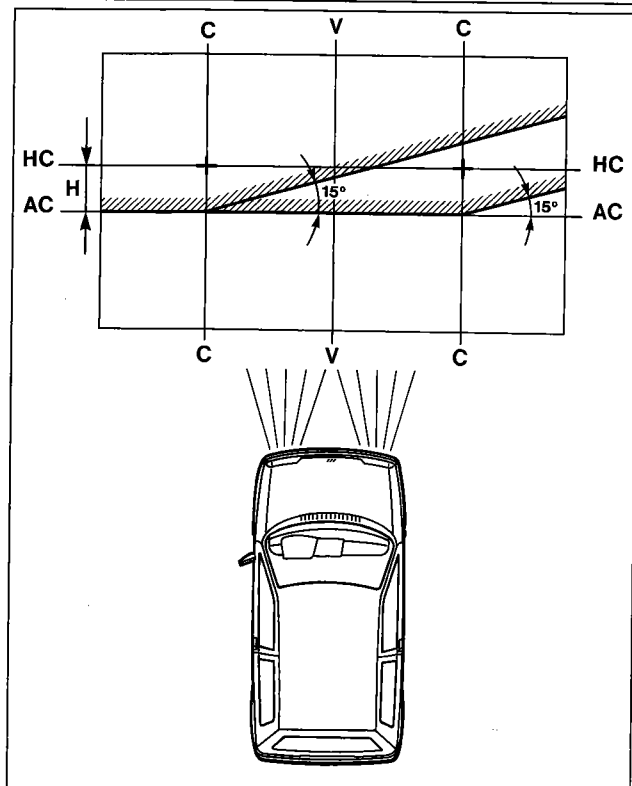
Line up the horizontal section of the demarcating line between the dark area and the area illuminated by the light beam, with the line **AC-AC** drawn on the screen.

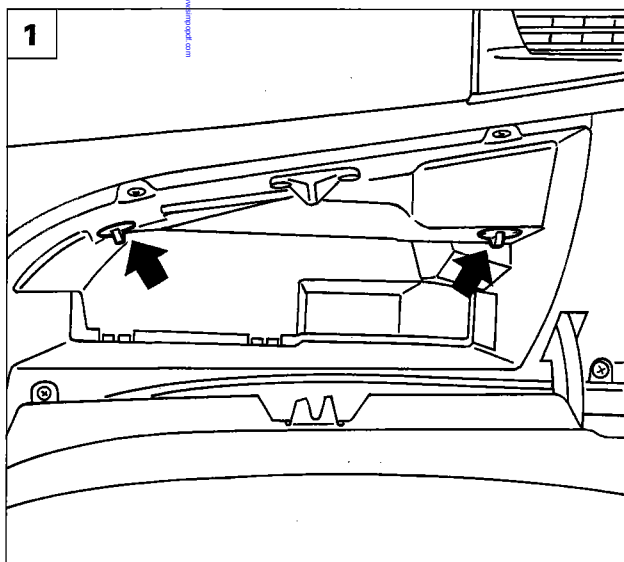
Horizontal alignment

Line up the intersecting point of the two demarcating lines, the horizontal line and the angled line, with the respective intersections of the lines **C-C** and **AC-AC** on the screen. If the screen has to be placed at a shorter distance, this value must be reduced proportionally.

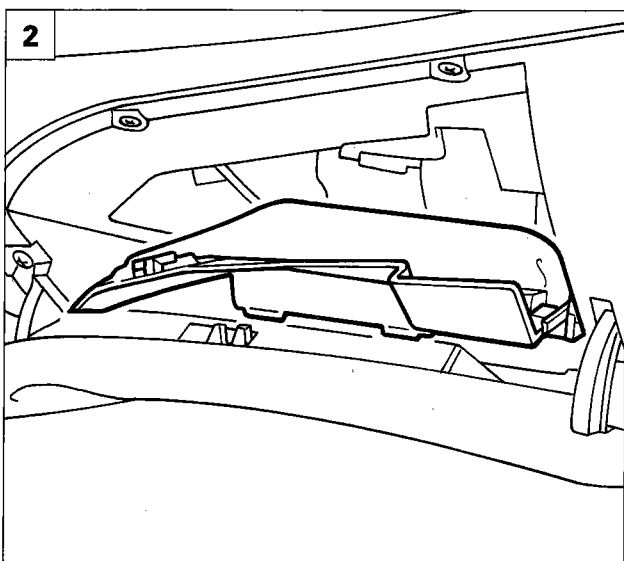
Manual adjustment of front fog lamps

The front fog lamp beam is adjusted using a wrench which should be inserted in the appropriate hole (see Figure).

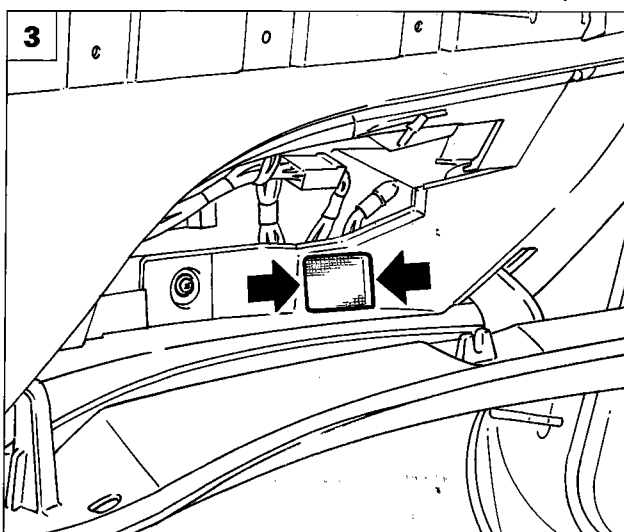




P4A089L01



P4A109L03



4A247L



REMOVING-REFITTING PASSENGER SIDE AIR BAG

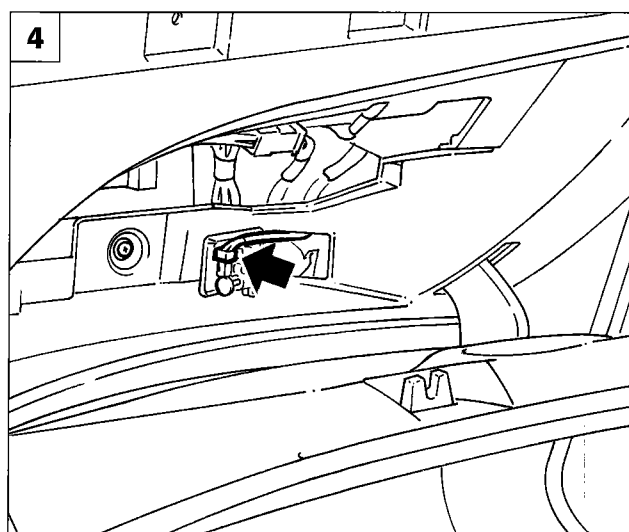
Safety measures



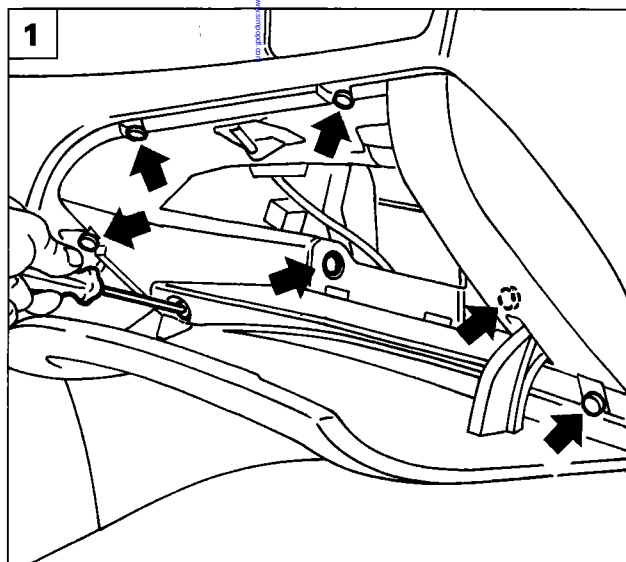
Operations on air bag system components must be carried out by specially trained personnel and the following safety measures must be **STRICTLY** adhered. During removal and replacement operations, it is necessary to use polythene gloves and protective goggles. Do not use naked flames near the air bag and air bag system components. The metal parts of a recently-detonated air bag are very hot, avoid touching these parts for at least 20 minutes after bag activation. Individual damaged or defective parts must not be repaired or tampered with in any way but replaced as a whole unit. See section beginning on page 99 for further information on safety procedures.

Operation sequence

1. Disconnect and insulate battery terminals. Wait 10 minutes. Then open the glove compartment and turn the knobs shown in the figure.
2. Remove the upper part of the trim from inside the glove compartment.
3. Prise off the courtesy light in the glove compartment by means of the retaining tabs.
4. Disconnect the glove compartment courtesy light after disconnecting the connector shown in the figure.



55.



P4A109L04



1. Unscrew the bolts fastening the glove compartment and remove from the car.
2. Disconnect supply connector leading from the control unit.
3. Unscrew the bolts fastening the air bag to the body.
4. Remove the air bag from the car.



Following removal, unactivated air bag modules should immediately be placed in a specially marked cabinet and locked away.

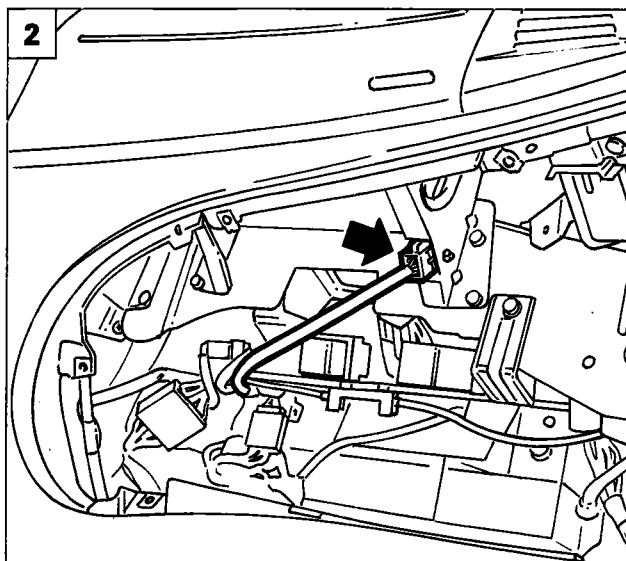
The module should be placed with the metal part resting on the surface as shown in the figure.

NOTE Refit the air bag by carrying out removal instructions in reverse order.

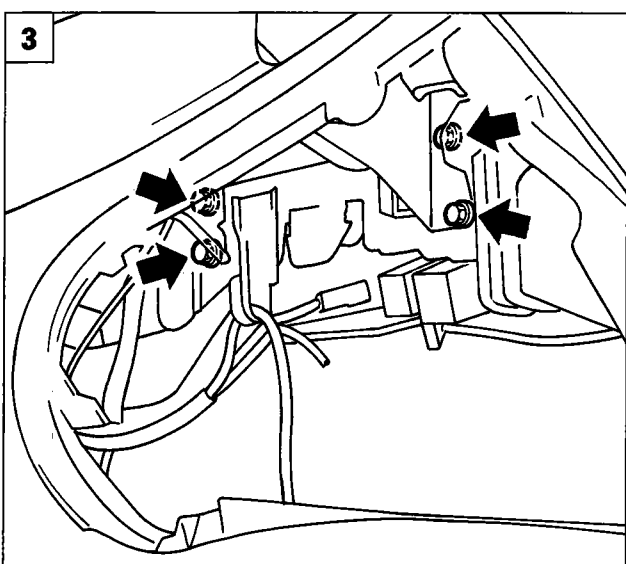


NEVER CONNECT THE BATTERY UNTIL INSTALLATION IS COMPLETE

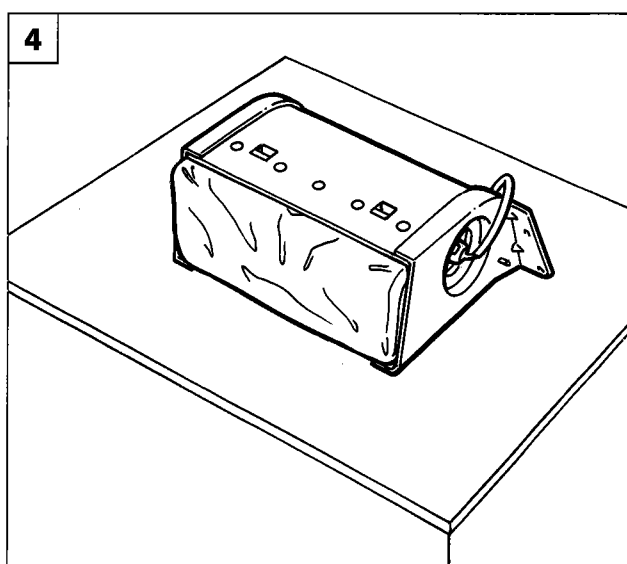
NOTE After refitting, check system operation by means of a FIAT/ LANCIA TESTER or other diagnostic instrument.



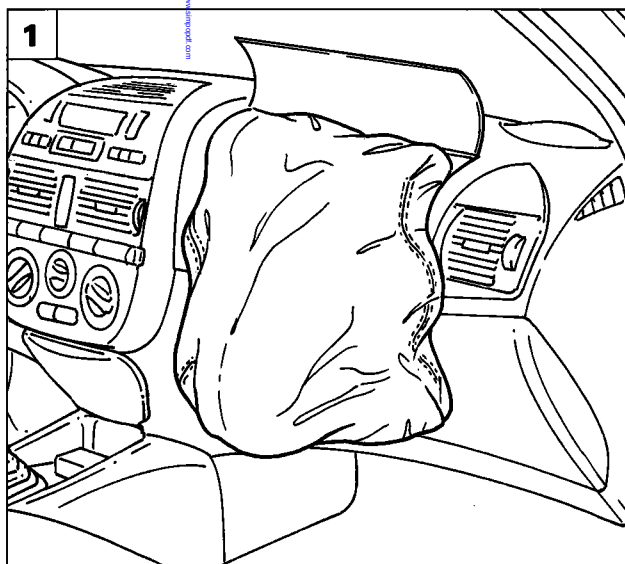
P4A110L35



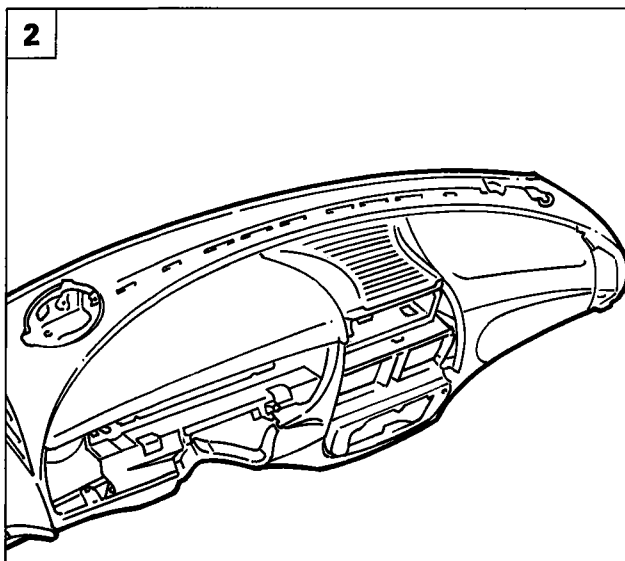
P4A110L01



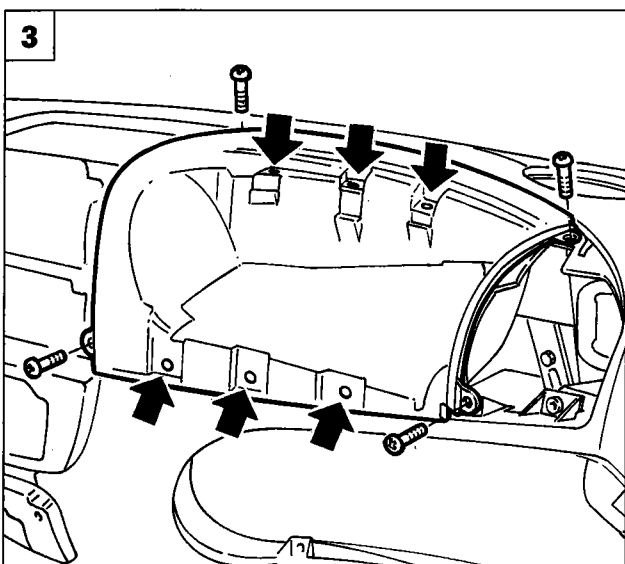
P4A110L36



P4A110L37



P4A110L38



P4A110L39

4A249L



REPLACING PASSENGER SIDE AIR BAG TRIM



Safety measures



Operations on air bag system components must be carried out by specially trained personnel and the following safety measures must be **STRICTLY** adhered to.

During removal and replacement operations, it is necessary to use polythene gloves and protective goggles.

Do not use naked flames near the air bag and air bag system components.

Individual damaged or defective parts must not be repaired or tampered with in any way but replaced as a whole unit. See page 99 onward for further information on safety procedures.



Operation sequence



The metal parts of a recently-detonated air bag are very hot. Avoid touching these parts for at least 20 minutes after bag activation.

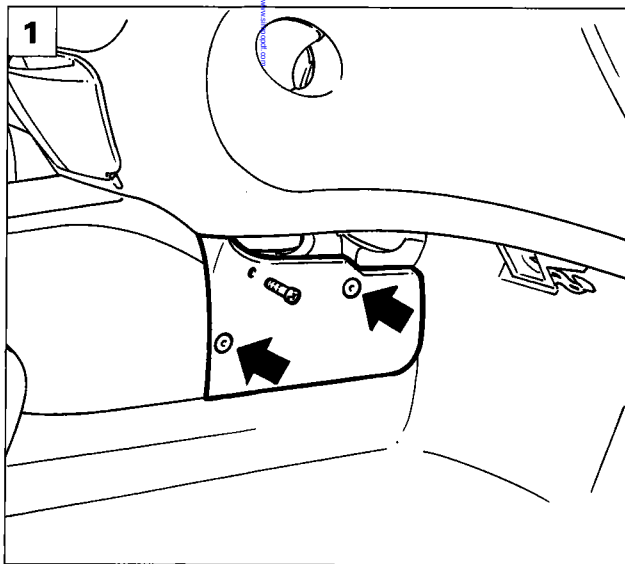
1. Remove the air bag as described from page 110/8 onward.
2. Remove the fascia trim as described from page 30 onward in Section 70 - Bodywork.
3. Remove the passenger side air bag trim by unscrewing the four cross-headed screws and six retaining rivets indicated.



Carefully check that the seats of the four bolts and six rivets on the fascia trim are undamaged. Also check that the trim itself is undamaged. Never fit a new air bag trim to a damaged fascia trim. In this case, always replace the fascia trim.

NOTE Refit the air bag trim by carrying out removal instructions in reverse order.

55.



P4A110L43

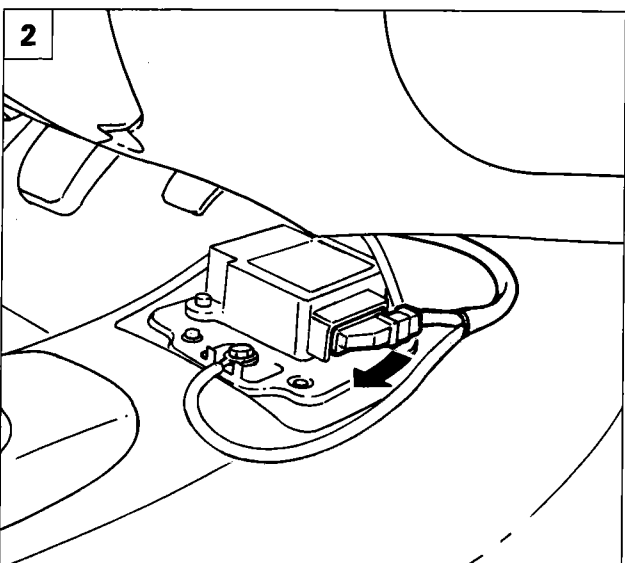


REMOVING-REFITTING CONTROL UNIT AIR BAG SYSTEM



Disconnect and insulate the battery terminals, then carefully observe the safety rules described from page 99 onward.

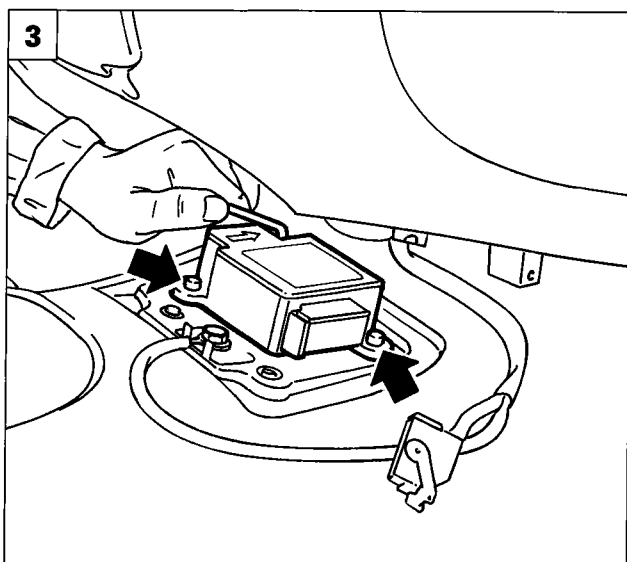
1. Unscrew the bolt and undo the fastening studs. Then disconnect the trim panel located beneath the instrument facia (the right hand panel is shown in the figure. Repeat the procedure for the left hand panel).



P4A110L44



2. Remove the tunnel trim from the car as described on page 30 of Section 70 - Bodywork, then disconnect the connection by turning the retaining lever in the arrowed direction.



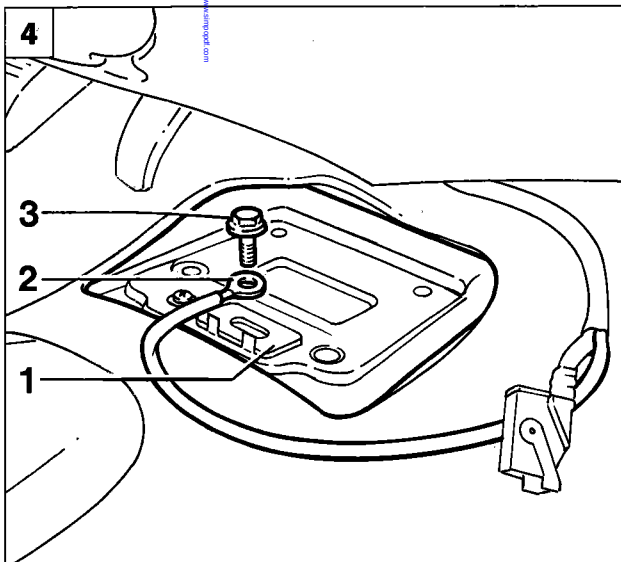
P4A110L45



3. Disconnect the electronic control unit by undoing the three 5 mm hexagonal-headed socket screws.



Tighten the control unit retaining bolts to a torque of 0.8 daNm.



P4A110L46



NOTE Check the insulation retaining bracket is correctly positioned, then refit the control unit by carrying out removal instructions in reverse order.

Operation sequence for fitting control unit earth lead braid

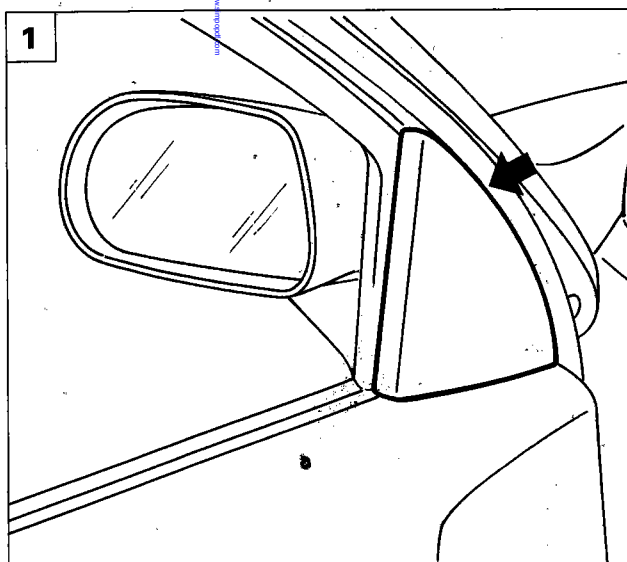
4. Proceed as follows to fit the control unit earth lead braid: insulation retaining bracket (1) - Earth braid (2) - Screw (3).



Tighten bolt (3) to a torque of 0.8 daNm. Pass the earth terminal between the two anti-rotation tabs on the sound insulation retaining bracket.



NOTE After the operation, check the system using a FIAT/LANCIA TESTER or other diagnostic tool.

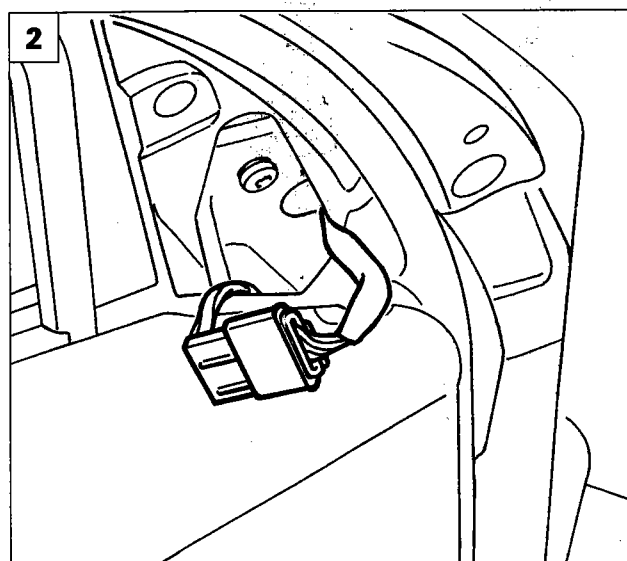


P4A107L01



REMOVING-REFITTING EXTERNAL REARVIEW MIRROR

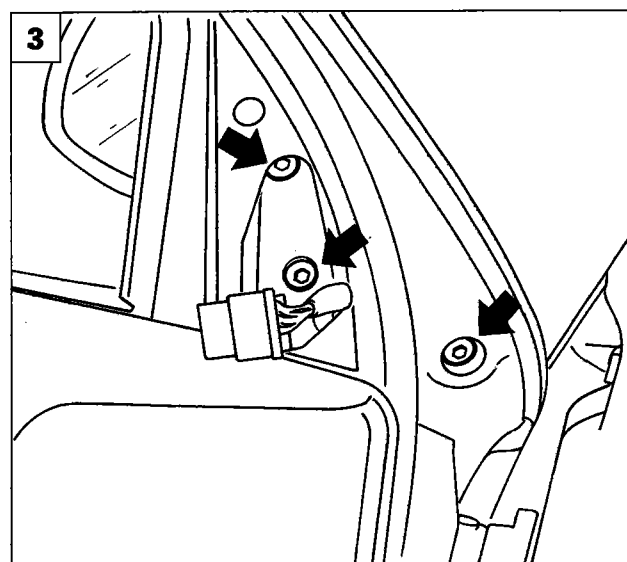
1. Remove the internal trim of the rearview mirror.



P4A107L02



2. Disconnect the electrical supply connector.

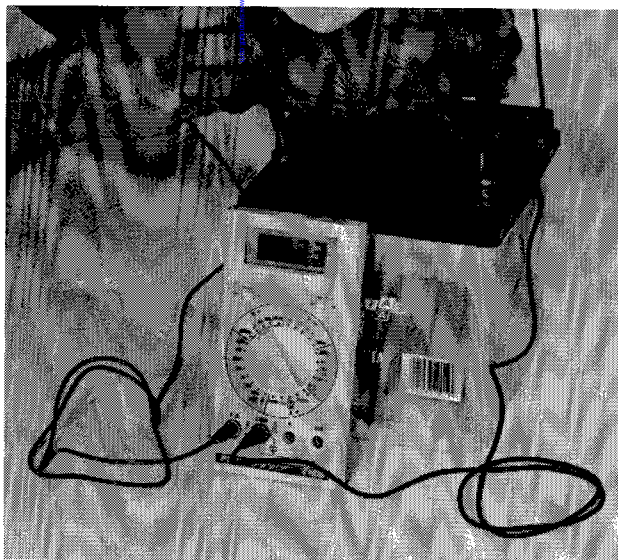


P4A107L03



3. Undo the screws securing the rearview mirror to the door and remove it.

55.



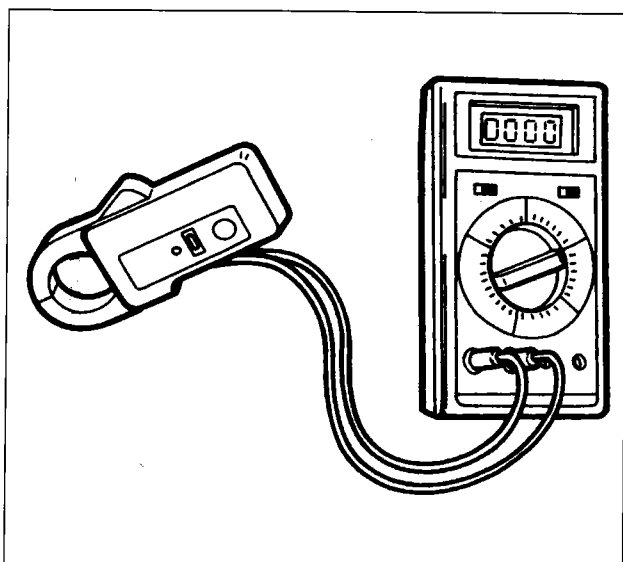
F4A112L01

If the battery appears to be discharged, **after having left it with an open circuit for at least two hours**, measure the voltage with no load, connecting a digital voltmeter to the terminals: if it is less than 12.30 V it is 50% charged; if it reaches 12.48 V it is 75% charged; if it reaches 12.66 V it is 100% charged.



If the level of the electrolyte in one or more of the battery cells is lower than the minimum level line on the plastic container, open the cover on the series of caps and add distilled, de-ionized water (as for ordinary batteries).

NOTE *Never subject the battery to rapid recharging at voltages in excess of 15.5 V, nor high currents or high recharging amperages.*



P4A112L01

BATTERY

The batteries fitted on all versions of this vehicle are the ES type (Energia Sigillata - Sealed Energy) and are maintenance-free.

These type of battery have the following advantages compared with conventional ones:

- reduced electrolyte consumption due to the use of a new type of alloy in the construction of the grilles and the plates;
- reduced self-discharge which improves starting for a period of 7 months and therefore these batteries lend themselves to prolonged storage (at temperatures below 28°C);
- a reduced volume of gases developed during charging which are the ones which cause corrosion and consequent poor contact at the terminal poles.

ALTERNATOR

Check the voltage and the maximum current intensity supplied by the alternator using a digital multimeter and a HALL effect ammeter pliers.

Description and use of ammeter pliers

These are pliers connected to a multimeter which make it possible to measure: the battery charge and discharge current, the current controlled by the SCR (silicon controlled diode), current absorbed by starter motors, from 10 to 600A without having to interrupt the circuit. Before starting the measurements it is necessary to:

- place the 'LO-HI' high switch on "LO" for measurements of up to 200A or on "HI" for measurements of between 200 and 600A.

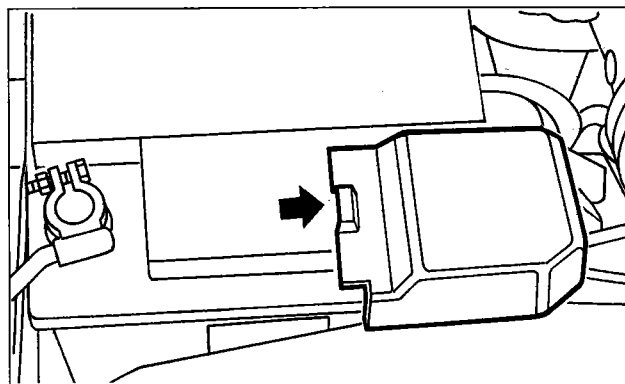
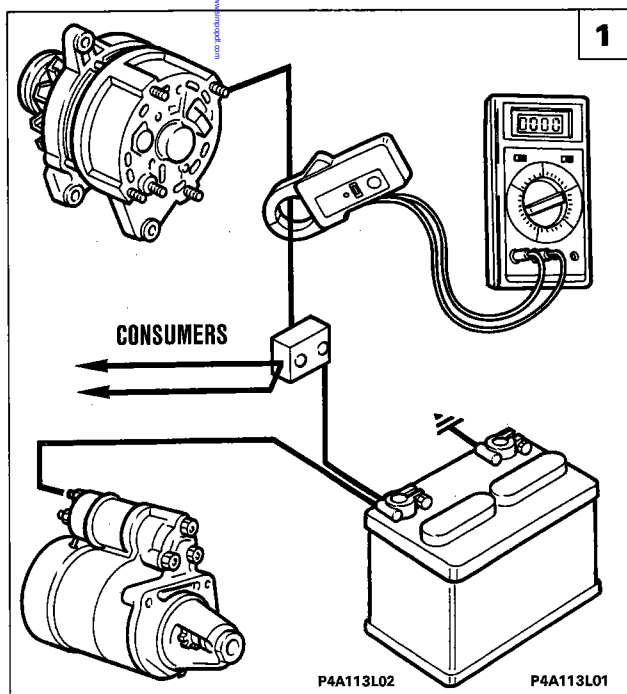
The reading is obtained in both positions for any value, but the change in position is necessary to ensure greater precision of the display reading.

- With the pliers connected to the multimeter it is necessary to set the multimeter at the range 200mV or 2V, alternating or direct according to the current to be measured.

If the range selected is 200mV then the reading will be in Ampere, if the range is 2V then the reading will be multiplied by a thousand.

- At this point it is necessary to zero the reading acting on the "ZERO ADJUST" knob. When there is reason to suspect the existence of magnetic fields it is advisable to adjust the zeroing knob with the pliers between 5 and 10 cm from the conductor.

In the case of direct current measurements, the phenomenon of hysteresis make make it impossible to zero the device. In such a case, open and close the pliers several times and then carry out the zeroing.



NOTE To remove the cover (1) (positioned on the positive battery terminal), act gently using a screwdriver in the position shown by the arrow, until the fixing pins come out.

1. Checking current intensity

- Fit the ammeter pliers on the alternator cable/junction unit
- start up the engine and let it run at between 3000 and 4000 rpm;
- switch on all the available consumers;
- measure the maximum current intensity supplied on the multimeter display.

If this value is more than 5A below the recommended figure, overhaul the alternator.

2. Checking voltage

- Place the multimeter probes in contact with the battery terminals;
- start up the engine and let it run at between 3000 and 4000 rpm;
- gradually switch on several consumers until the absorption is about half the maximum load.

Under these circumstances the voltage reading should be between the maximum and minimum values (see diagrams) depending on the ambient temperature of the electronic regulator (alternator).

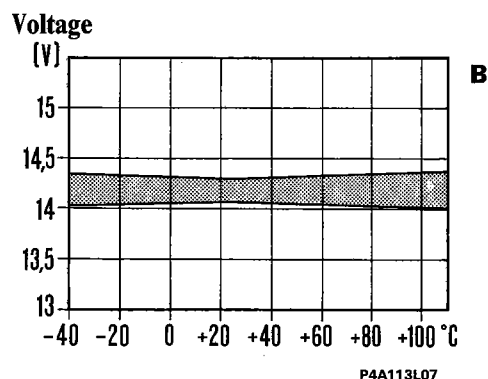
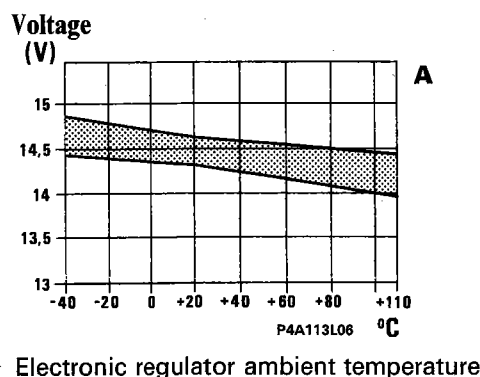
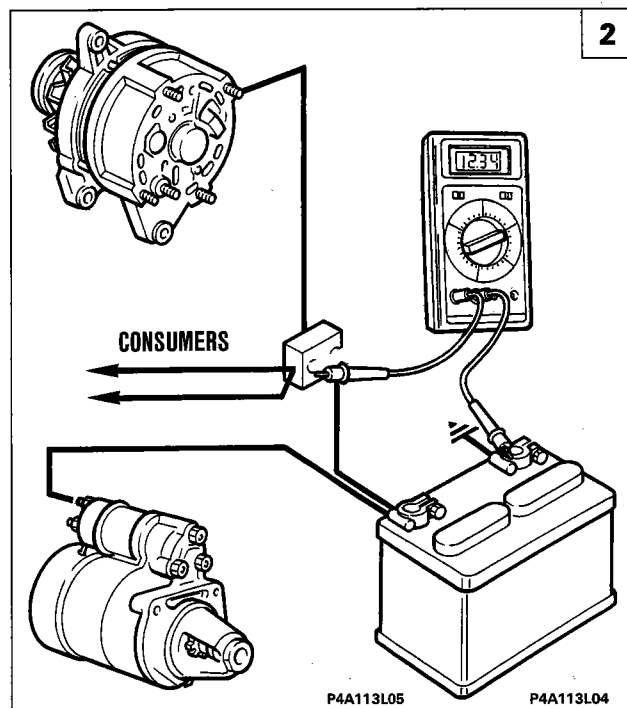
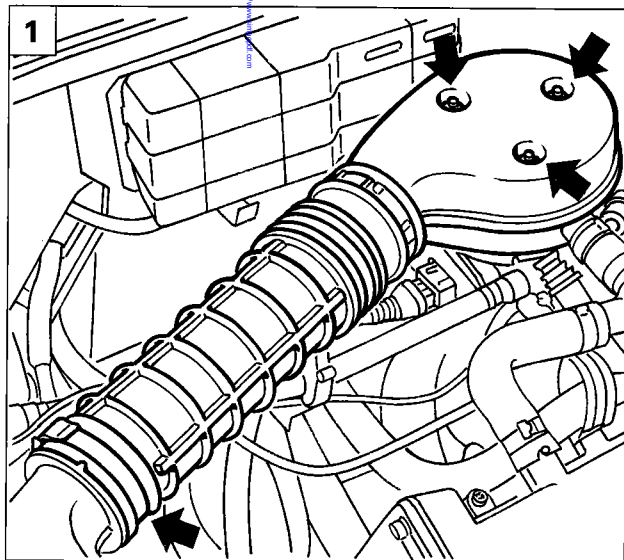
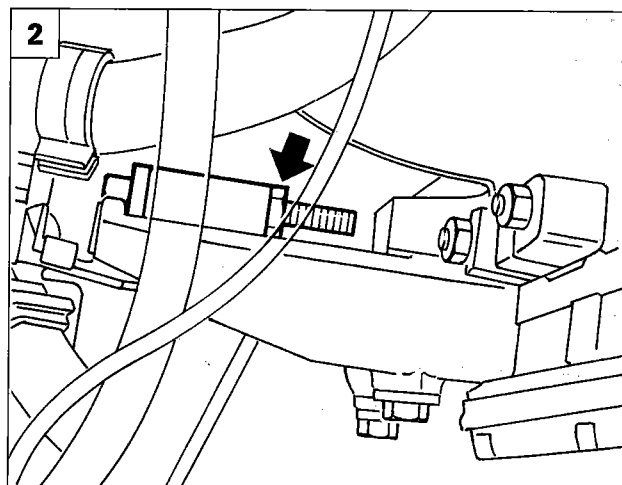


Diagram A refers to an RT 121A electronic regulator which is incorporated in M. Marelli alternators, whilst diagram B refers to the EL 14V 4C electronic regulator which is incorporated in Bosch alternators.



P4A114L01



P4A114L02

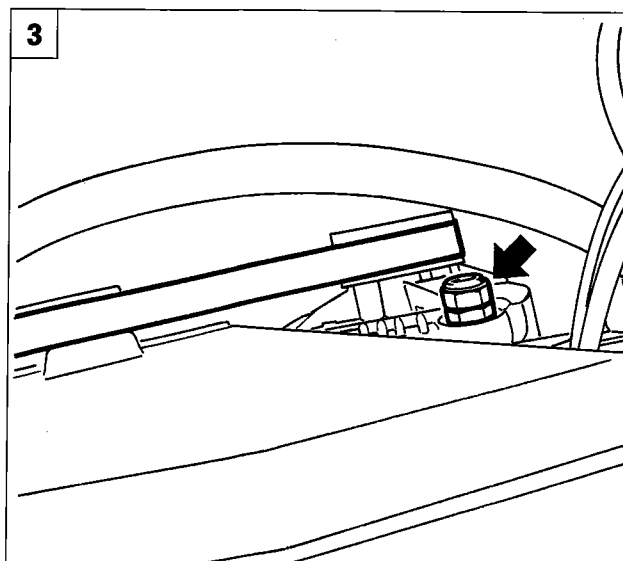


Before carrying out the removal procedures, described in this chapter, disconnect the negative battery terminal.

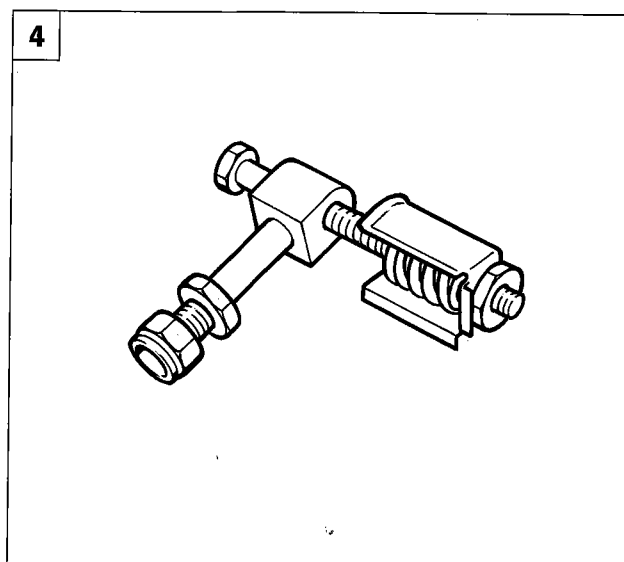
MARELLI A115I 14V 38/65A ALTERNATOR (on 1370 12V; 1929D versions)

Removing-refitting (1370 12V)

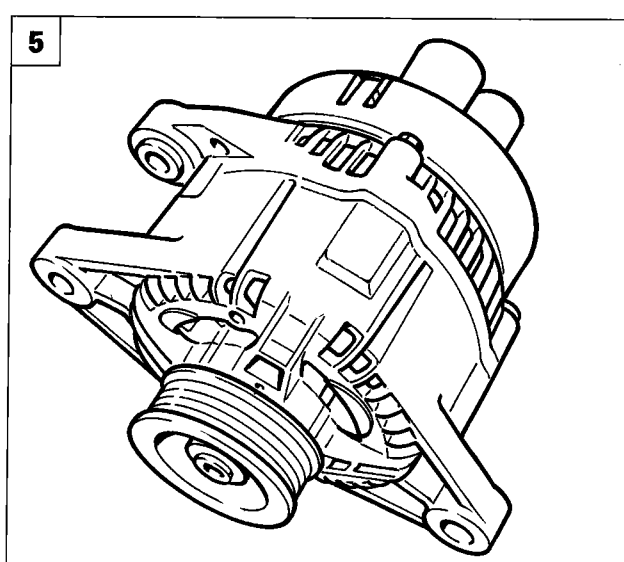
1. Move the air inlet hose away, undoing the nuts and the band shown.
2. Loosen the tension of the belt undoing the nut fixing the belt tensioner.
3. Undo the nut fixing the alternator mounting bracket and the nut fixing the latter to the engine at the top.
4. Remove the belt tensioner from the engine and remove the belt from the pulleys.
5. Undo the lower fixing bolt, disconnect the electrical connection, then remove the alternator from the vehicle.



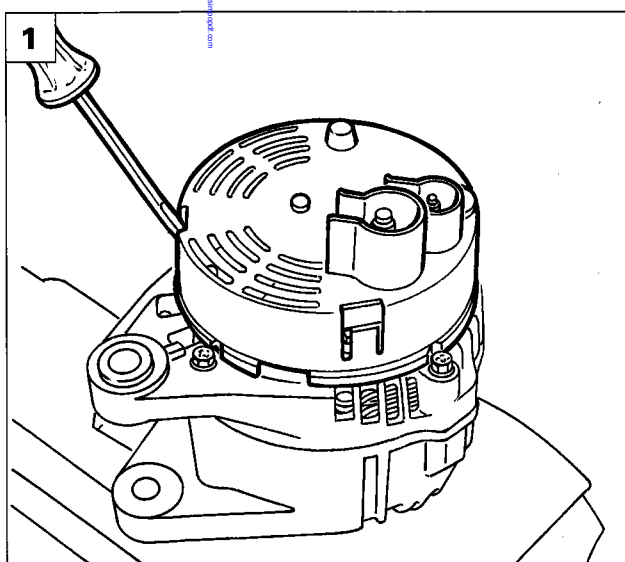
P4A114L03



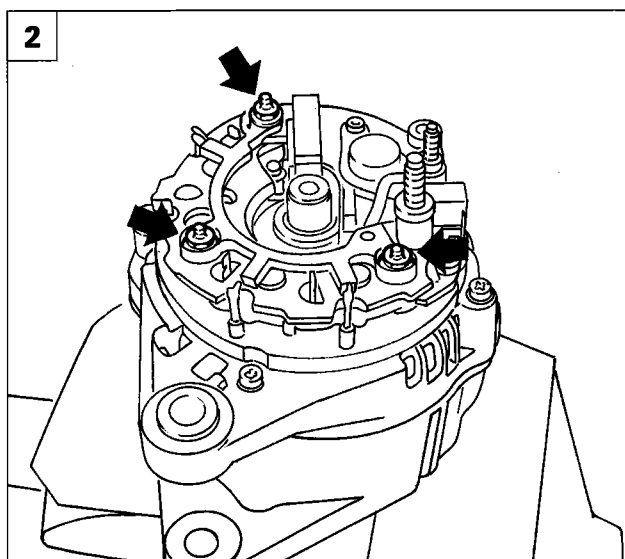
P4A114L04



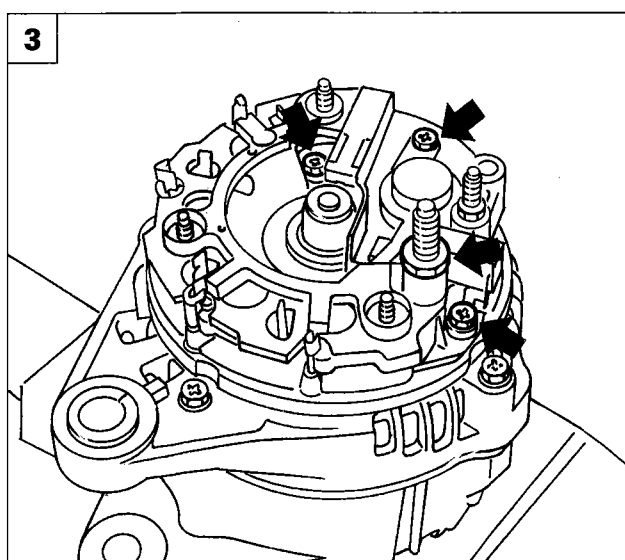
P4A114L05



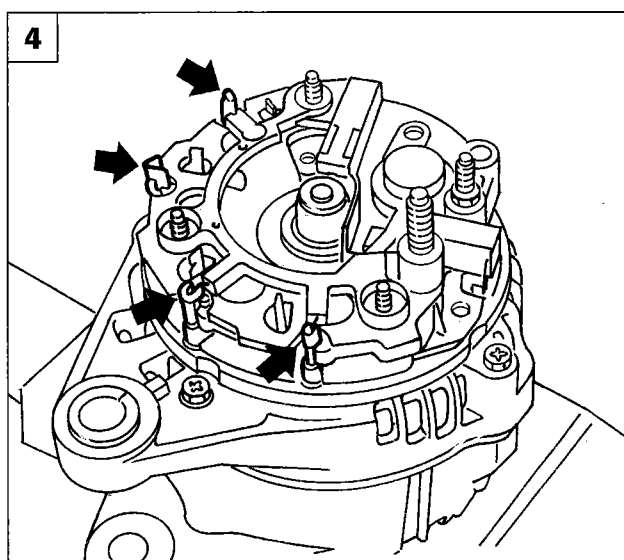
P4A115L01



P4A115L02



P4A115L03



P4A115L04

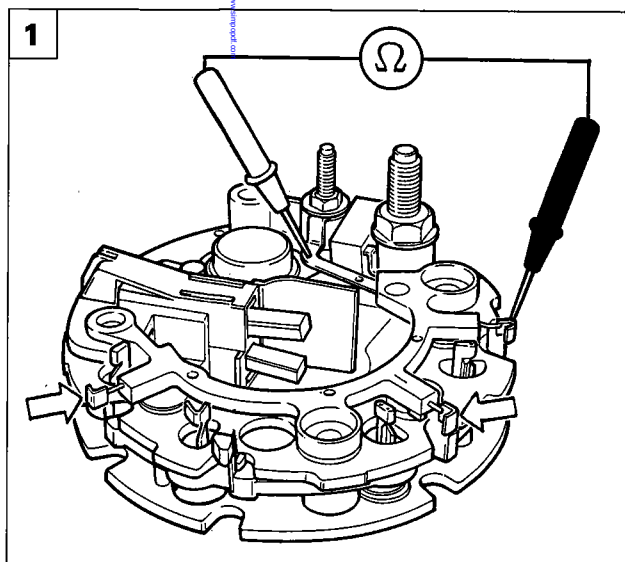
Overhauling

In the case of failed or irregular alternator recharging, completely dismantle the alternator and carry out the following checks:

- check the belt tension;
- check the tightening of the nut at the positive alternator terminal (B+), making sure that the washer is fitted;
- check the tightening of the nut at the energizing terminal (D+), making sure that the washer is fitted;
- check the tightening of the nuts at the positive connector block in the engine compartment;
- check the tightening of the bolts fixing the negative battery terminal on the bodyshell;
- check that the battery terminals are clean and properly tightened.

1. Position the alternator as shown and remove the plastic protection acting on the tabs shown.
2. Undo the nuts shown in the diagram;
3. Undo the bolts shown in the diagram.
4. Using a metal-cutter disconnect all the contacts shown and remove the plate.

55.



P4A116L01



Checking diodes

Checking exciter diodes

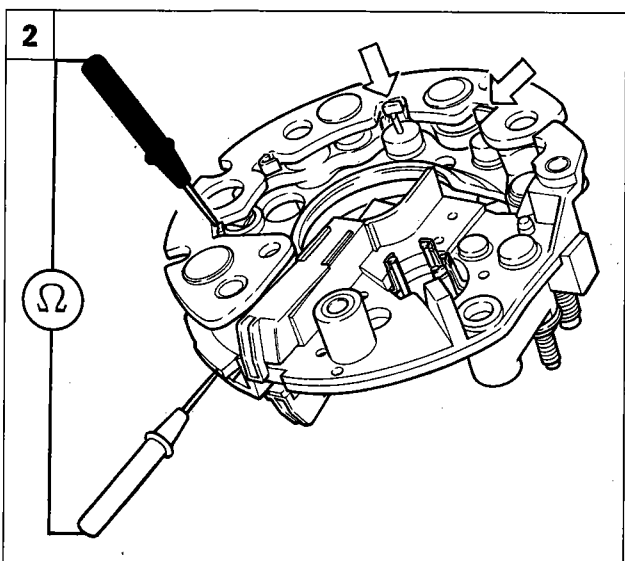
1. Insert the probes of an ohmmeter as illustrated in the diagram.

NOTE The readings at the three exciter diode terminals should show infinite resistance (the current does not flow). Reversing the position of the instrument probes should give the diode resistance reading (the current does flow).

Checking positive diodes

2. Turn the diode plate. Insert the probes of an ohmmeter as illustrated in the diagram.

NOTE The readings at the three positive diode terminals should show infinite resistance (the current does not flow). Reversing the position of the instrument probes will give the diode resistance reading (the current does flow).



P4A116L02



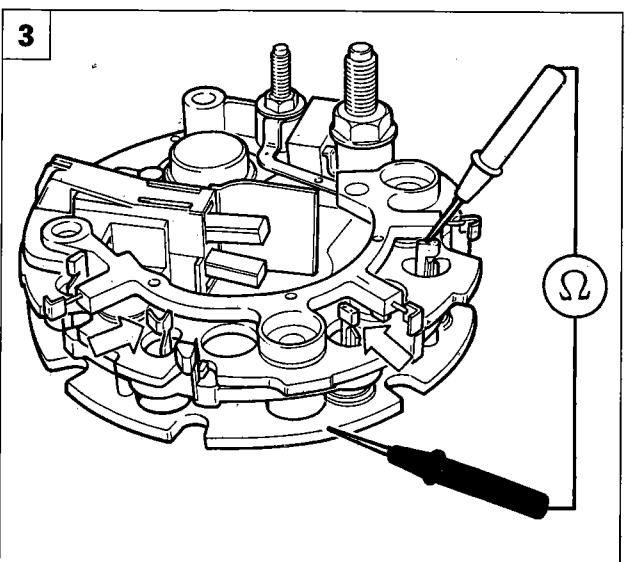
Checking negative diodes

3. Insert the probes of an ohmmeter as illustrated in the diagram.

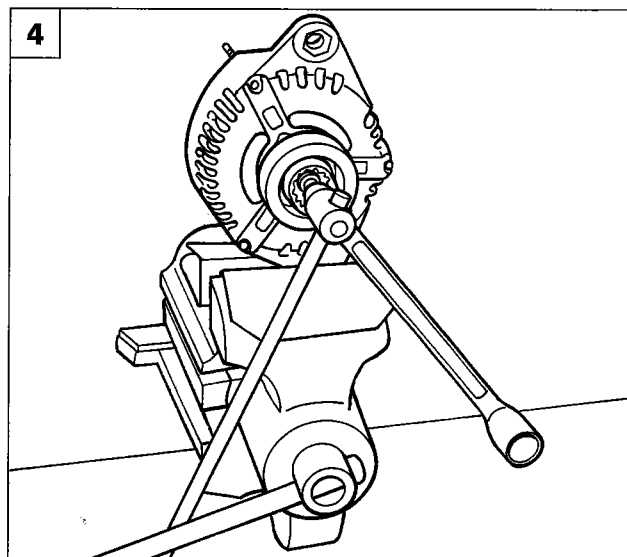
NOTE The readings at the three positive diode terminals show infinite resistance (the current does not flow). Reversing the position of the instrument probes should give the diode resistance value (the current does flow).

Dismantling

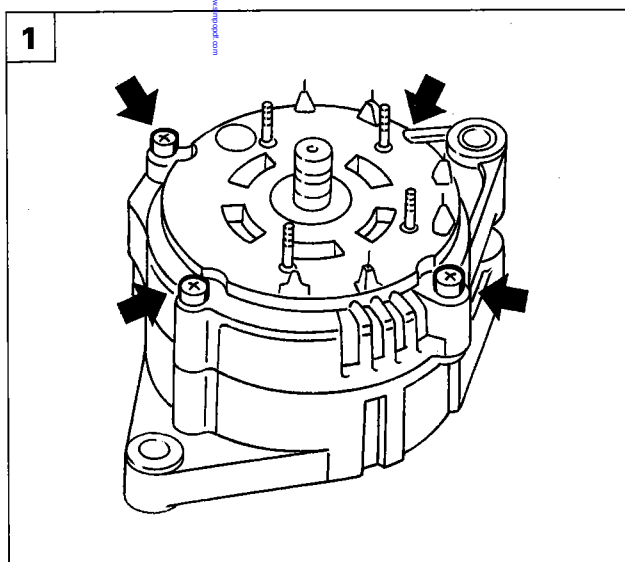
4. Proceed as shown in the diagram in order to undo the nut fixing the pulley and then remove the latter.



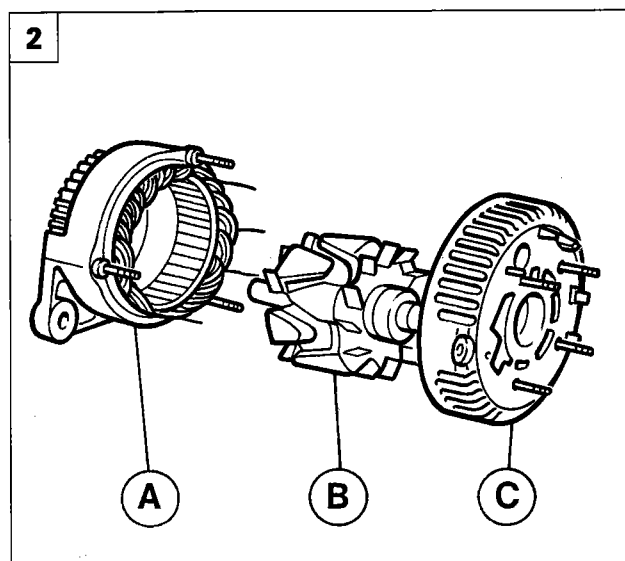
P4A116L03



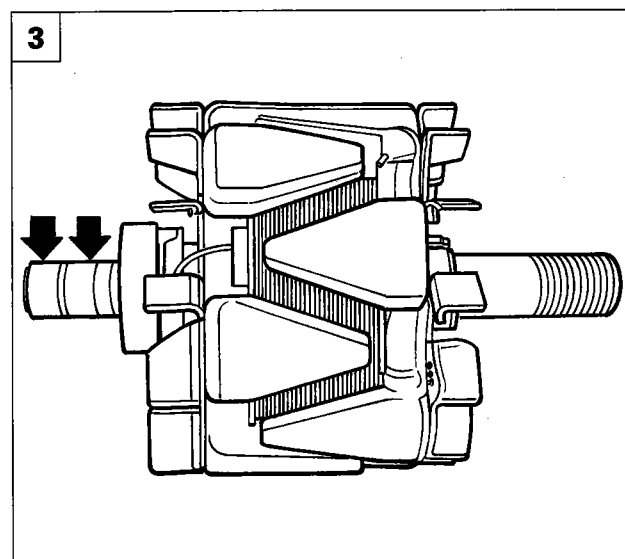
P4A116L04



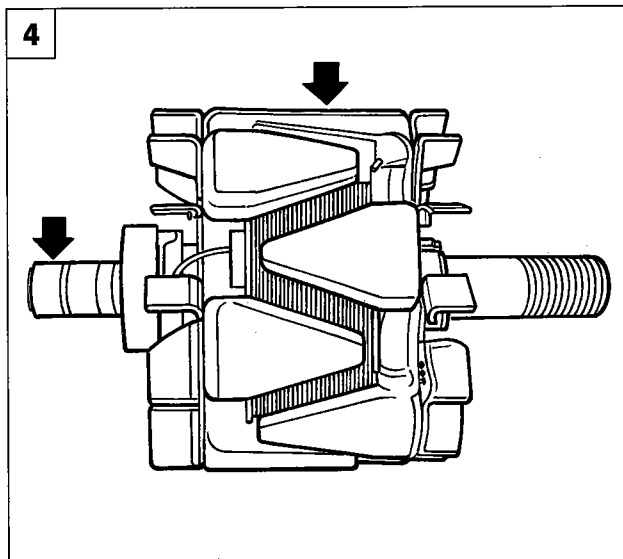
P4A117L01



P4A117L02



P4A117L03



P4A117L04

1. Undo the bolts shown fixing the alternator assembly.
2. Dismantle the following alternator components:
 - A. Rear support plate with stator windings
 - B. Rotor
 - C. Front support plate

3. Checking inductor (rotor) winding resistance at the slip rings

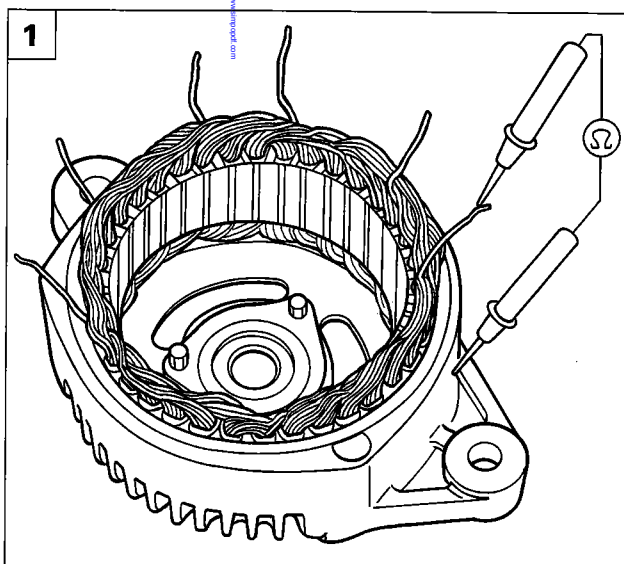
- Place the two probes of an ohmmeter (set on a scale of $\Omega \times 1$) in contact with the rotor slip rings (shown by the arrows): the instrument reading should show a certain resistance value.

NOTE If the resistance value is infinite (broken circuit) (rotto), then the rotor has to be replaced.

4. Checking stator winding insulation

- Place the two probes of an ohmmeter (set on a scale of $\Omega \times 1$) in contact with the windings and the stator casing, respectively;
- the resistance reading on the instrument should be infinite, if this is not the case replace the rotor.

55.

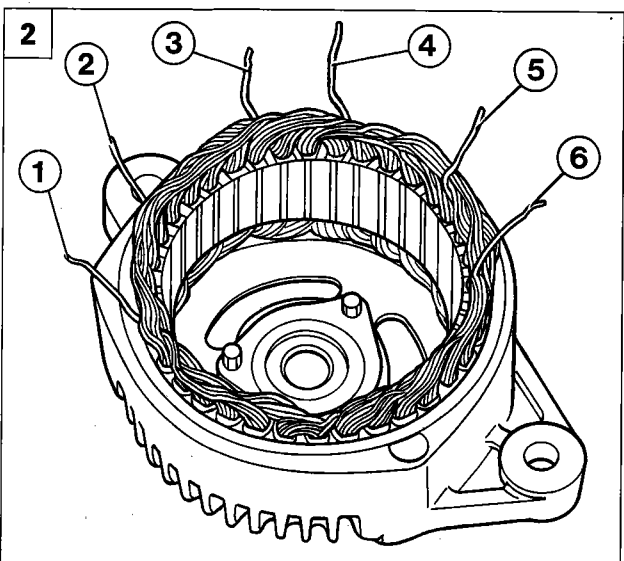


P4A118L01



1. Checking insulation of stator windings:

- place the probes of an ohmmeter (set on a scale of $\Omega \times 1$) in contact with the windings and the stator casing;
 - the reading on the instrument should be infinite resistance, if this is not the case replace the rotor.
- ### 2. Checking continuity of stator windings:
- place the probes of an ohmmeter (set on a scale of $\Omega \times 1$) in contact with the stator windings (1-2), (3-4), (5-6);
 - for each measurement there should be a certain resistance reading on the instrument.



P4A118L02



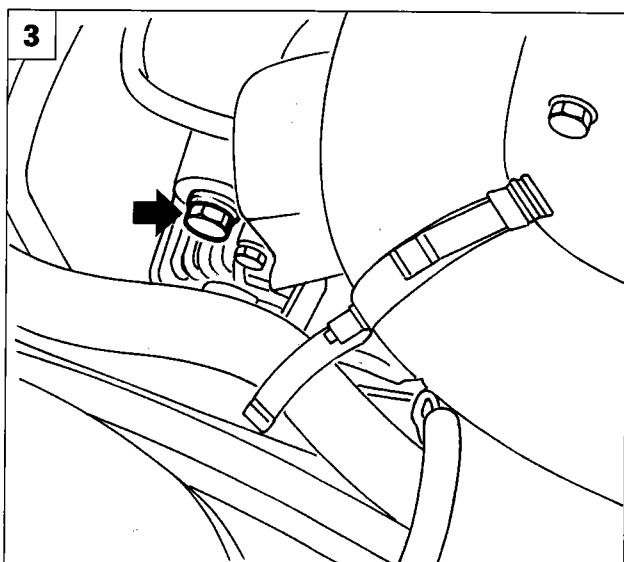
If the resistance value does not move from the start of the scale (infinite resistance) or reaches the end of the scale (nil resistance) then this means that the phase being measured is broken or short circuited and that the stator must be replaced.

MARELLI A115I 14V 40/75A ALTERNATOR (versions with 1580 16V; 1747 16V engines)

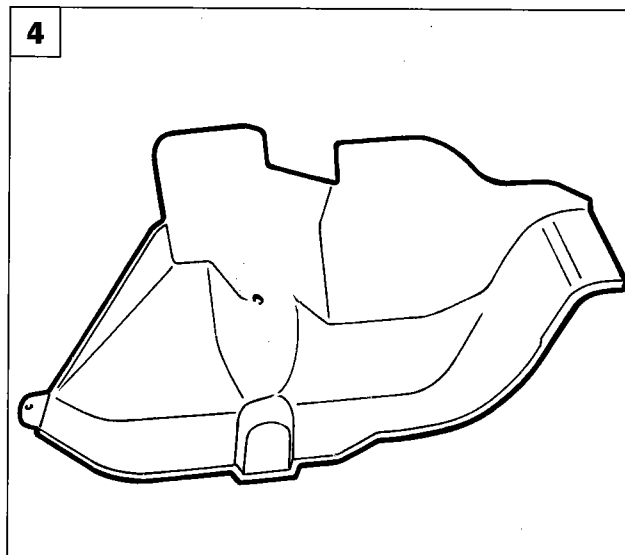
Removing-refitting (1580 16V version)

Position the vehicle on a lift and remove the right wheel.

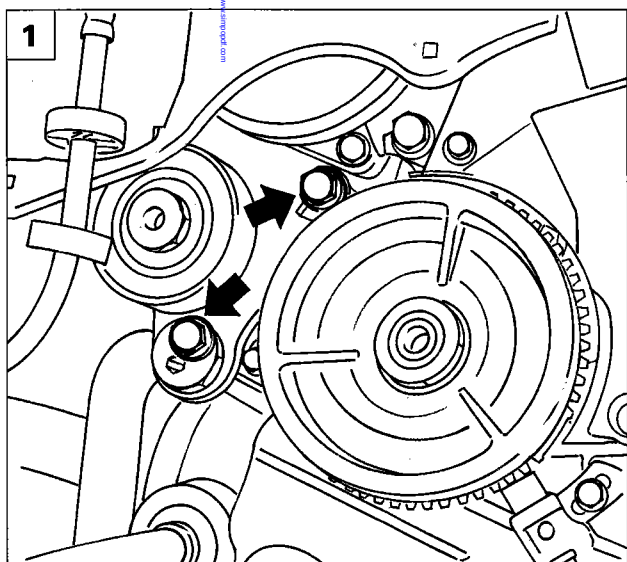
3. Undo the upper bolt fixing the alternator.
4. Raise the vehicle and remove the wheel arch liner after having undone the fixing bolts.



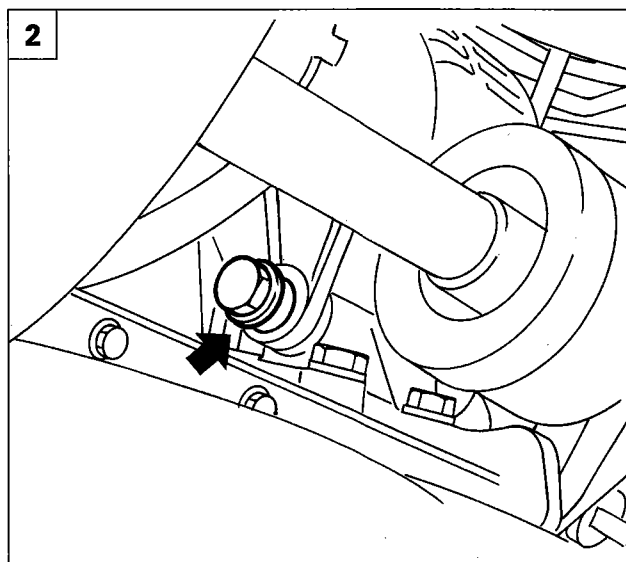
P4A118L03



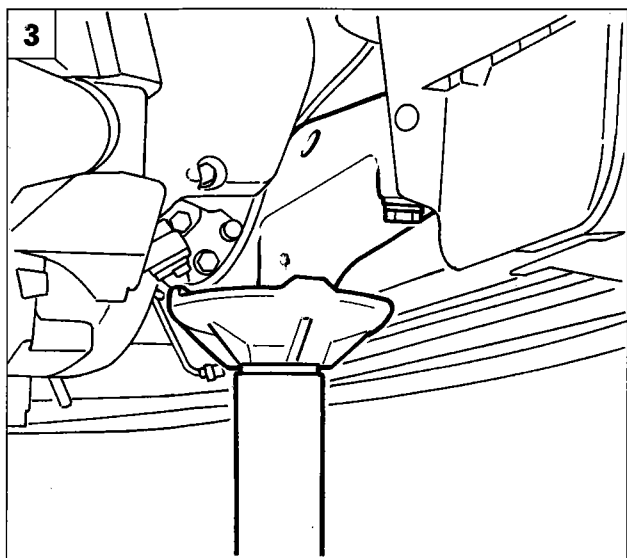
P4A118L04



P4A119L01



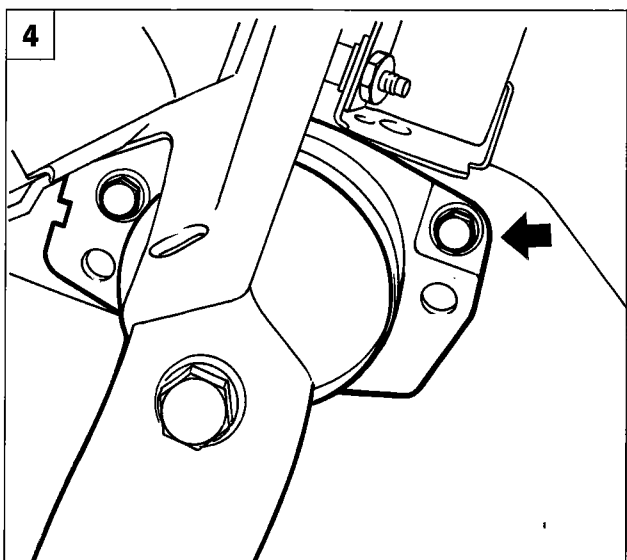
P4A119L02



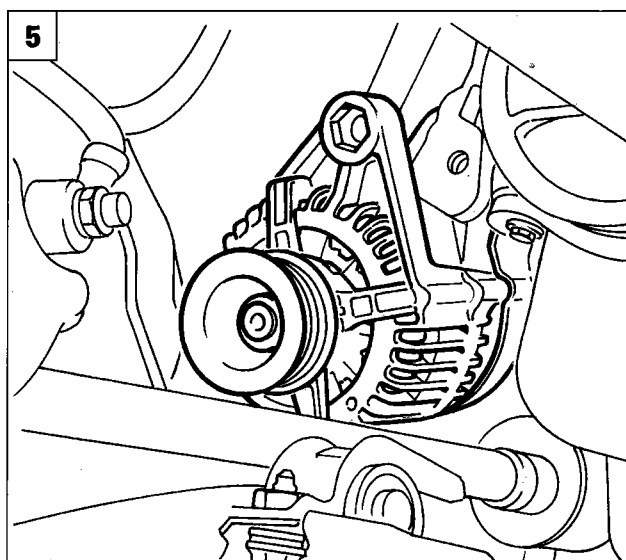
P4A119L03



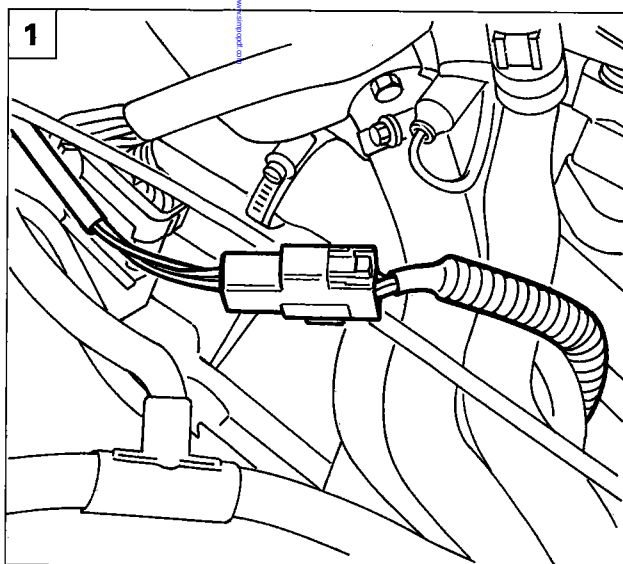
1. Loosen the bolts fixing the belt tensioner bearing, release the belt and remove it from the vehicle.
2. Disconnect the electrical connections, then undo the lower bolt fixing the alternator.
3. Position the hydraulic jack below the engine support as illustrated in the diagram.
4. Undo the bolts fixing the engine support to the bodyshell.
5. Lower the hydraulic jack to allow the removal of the alternator.



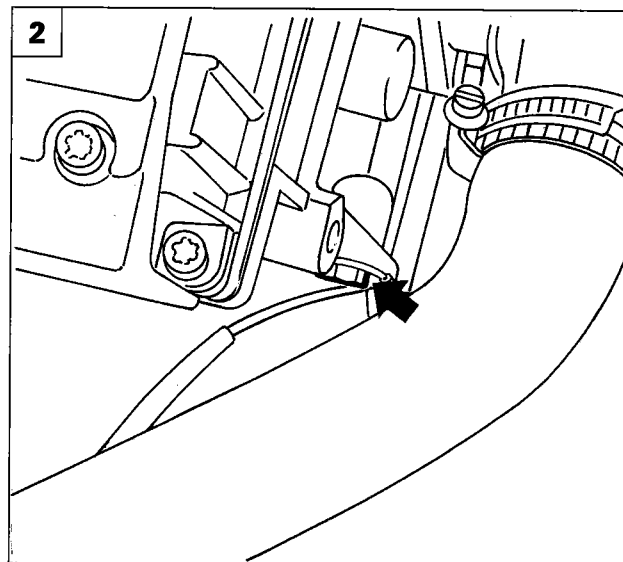
P4A119L04



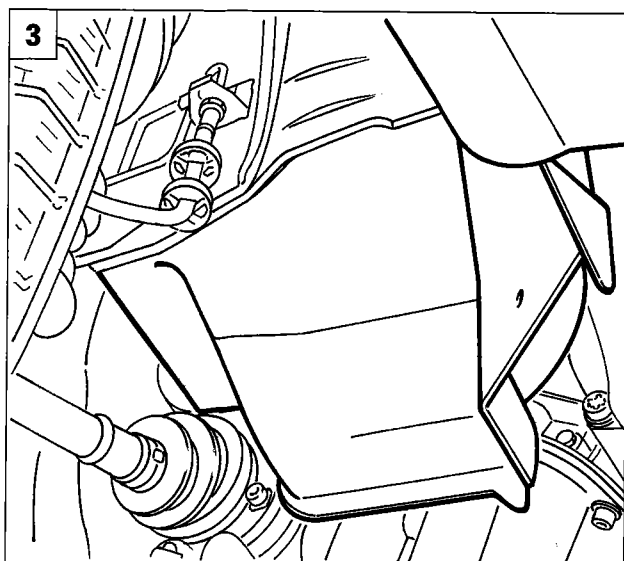
P4A119L05



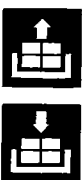
P4A120L01



P4A120L02



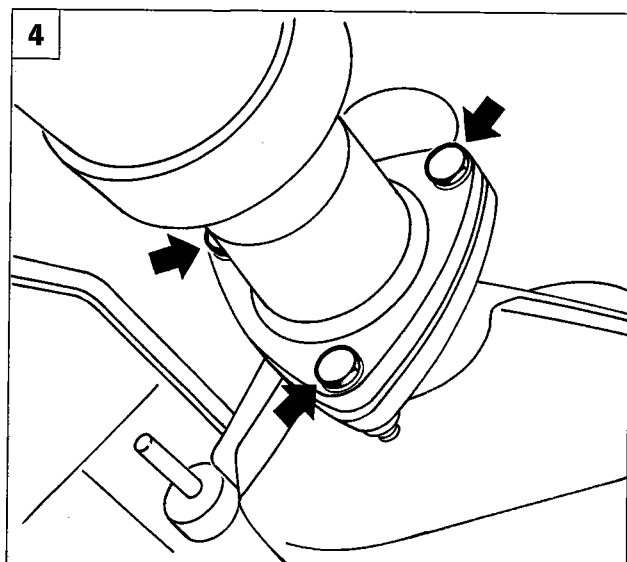
P4A120L03



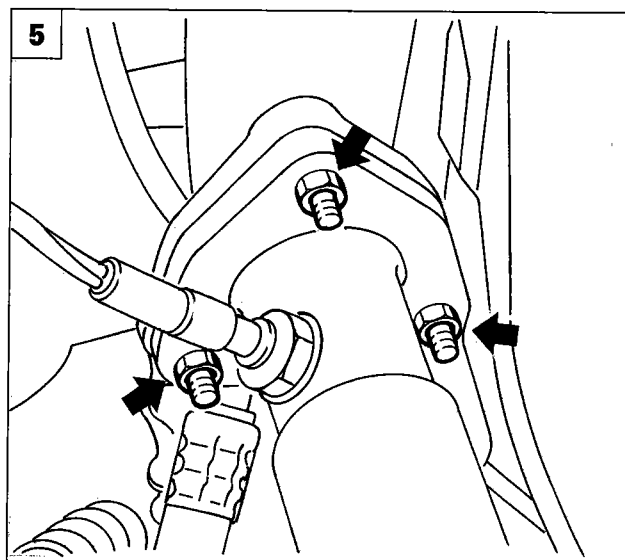
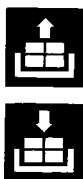
MARELLI A127I 14V 50/85A ALTERNATOR (versions with 1747 16V; 1998 20V; 1910 TD engines)

Removing-refitting (1747 16V version)

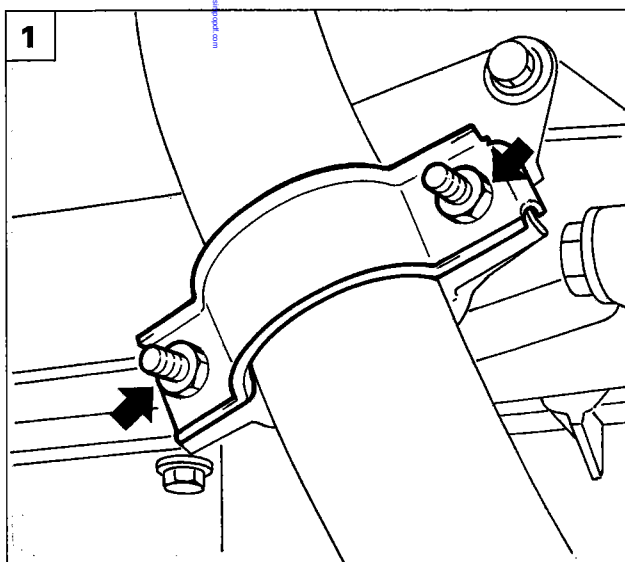
1. Position the vehicle on a lift and disconnect the connector for the Lambda sensor.
2. Undo the bolt shown and release the wiring for the Lambda sensor.
3. Raise the vehicle and remove the wheel arch liner after having undone the fixing bolts, then remove the belt.
4. Remove the fixing the first section of the exhaust pipe to the catalytic converter.
5. Undo the nuts fixing the first section of the exhaust pipe to the exhaust manifold.



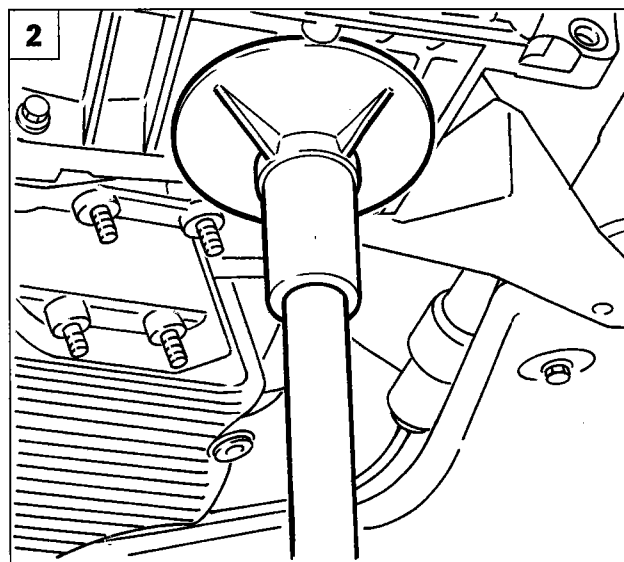
P4A120L04



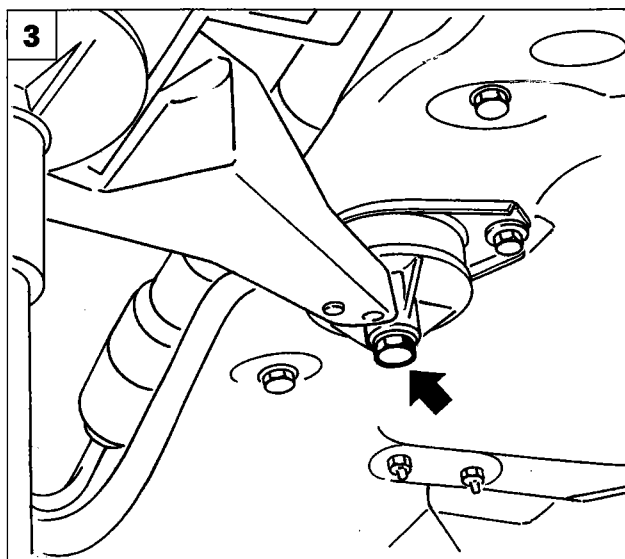
P4A120L05



P4A121L01



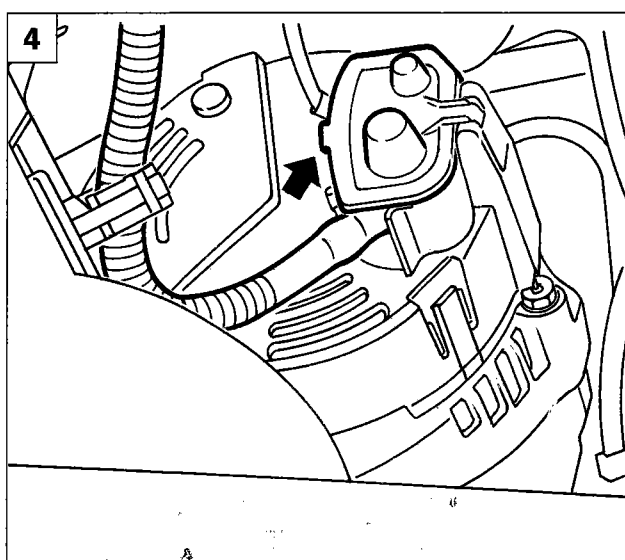
P4A121L02



P4A121L03



1. Undo the nuts fixing the first section of the exhaust pipe to the power unit and remove it from the vehicle.
2. Position the hydraulic jack under the power unit as shown in the diagram.
3. Undo the reaction support bolt. Lower the hydraulic jack to allow the power unit to be moved to extract the alternator.
4. Open the protective cover and disconnect the electrical connections for the alternator.
5. Undo the bolts fixing the alternator to the power unit and remove it from the vehicle.

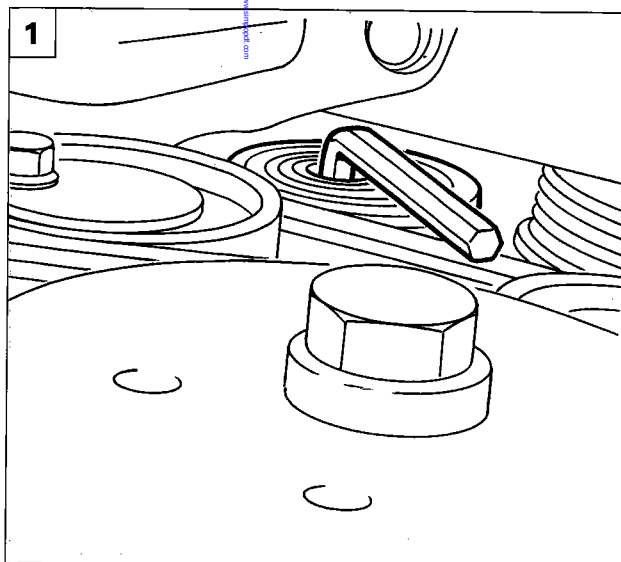


P4A121L04

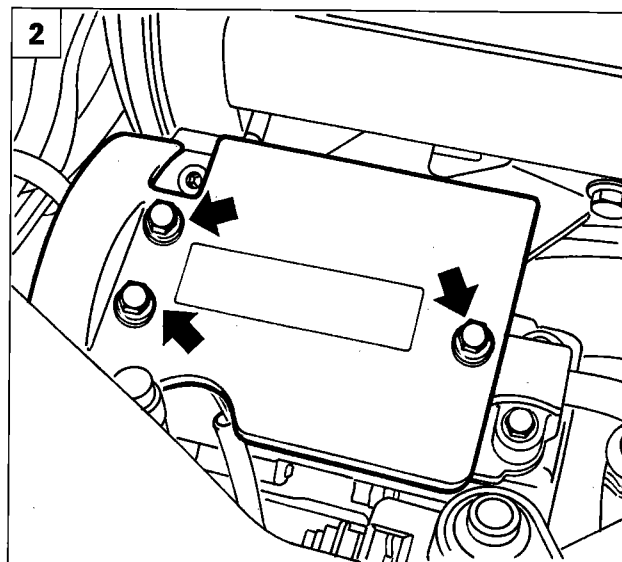


P4A121L05

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P4A122L01



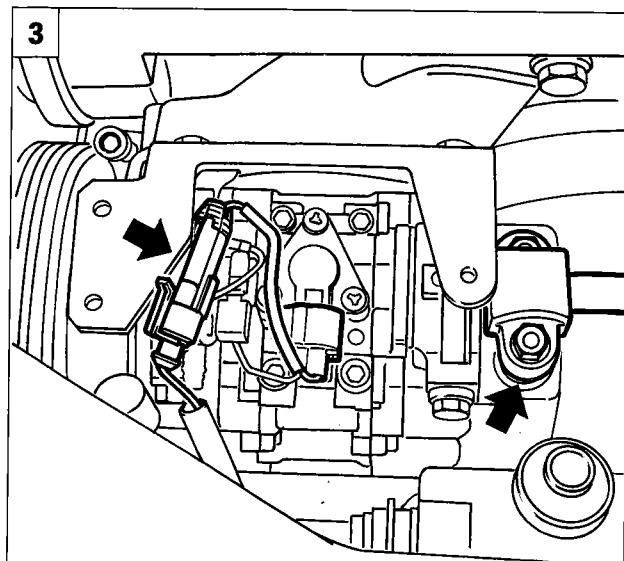
P4A122L02

Removing-refitting (1998 20V version)

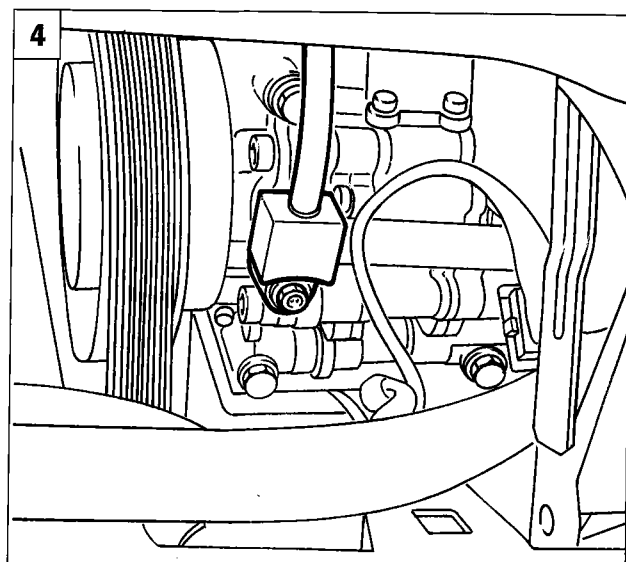
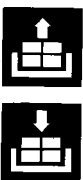
Position the vehicle on a lift and drain the climate control system (see section 50 - Auxiliary units).

Remove the right light cluster following the instructions given on page 19.

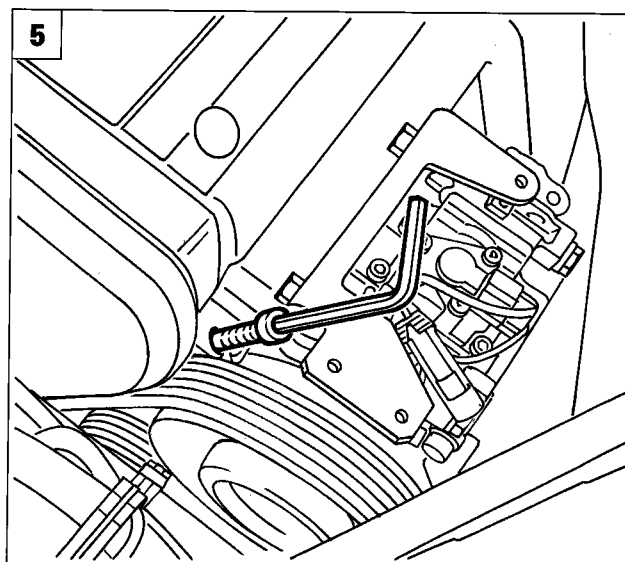
1. Raise the vehicle and loosen the belt tensioner bearing, after having removed the lower protective shield (see page 45).
2. Lower the vehicle and remove compressor protection shown in the diagram.
3. Disconnect the electrical connection and the pipe for the climate control system shown.
4. Disconnect the pipe for the climate control system from the compressor, working from the housing for the light cluster previously removed.
5. Loosen the fixing bolt for the alternator mounting bracket.



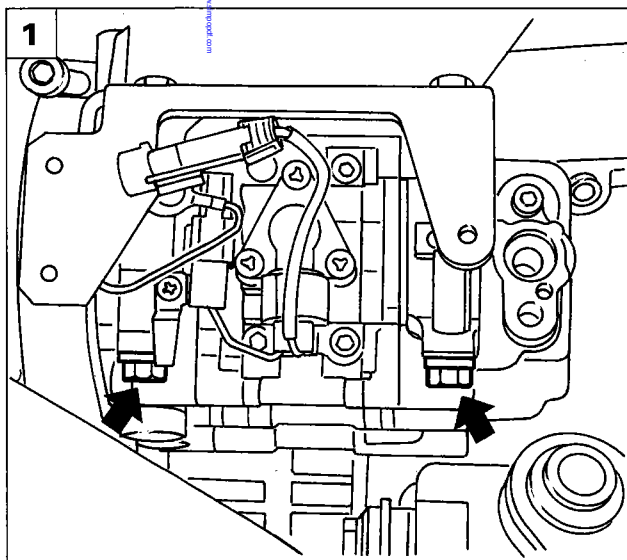
P4A122L03



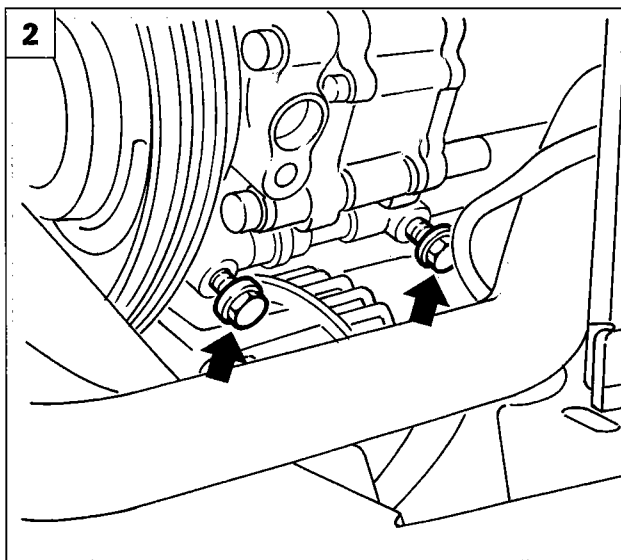
P4A122L04



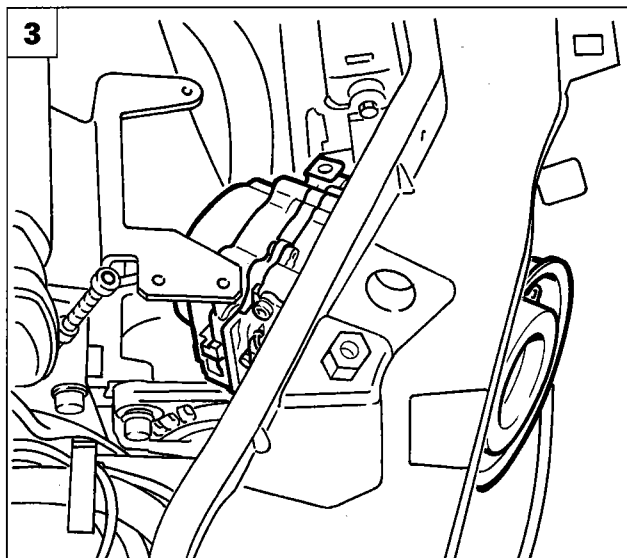
P4A122L05



P4A123L01



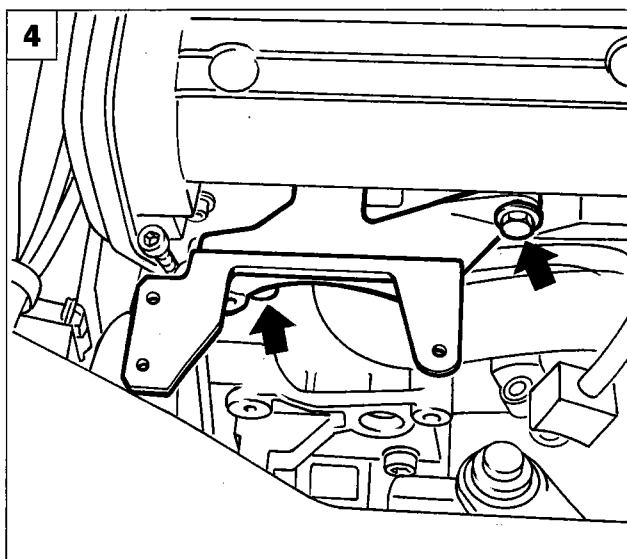
P4A123L02



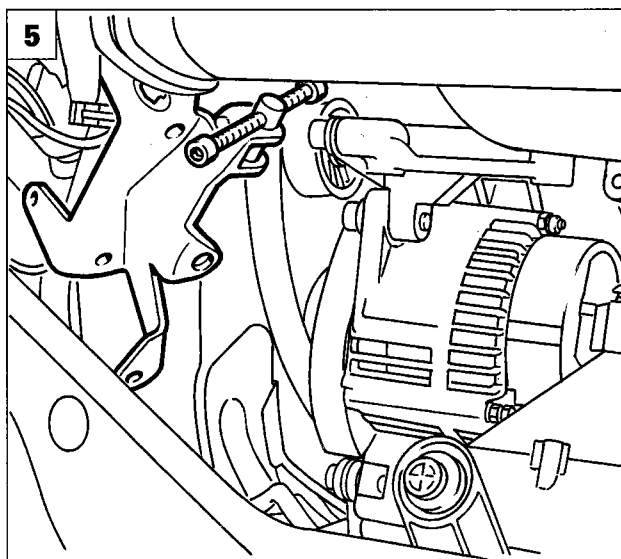
P4A123L03



1. Undo the upper bolts fixing the compressor.
2. Undo the lower bolts fixing the compressor.
3. Remove the belt and extract the compressor from the right light cluster housing.
- 4.5. Undo the bolts fixing the compressor support plate and move it slightly to one side.

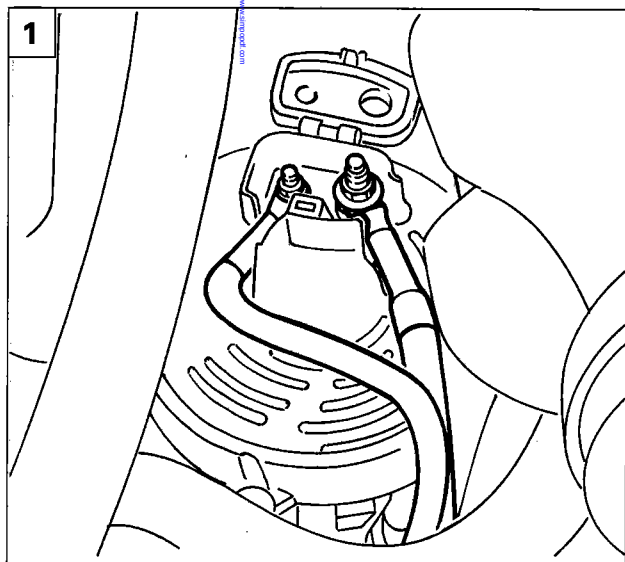


P4A123L04



P4A123L05

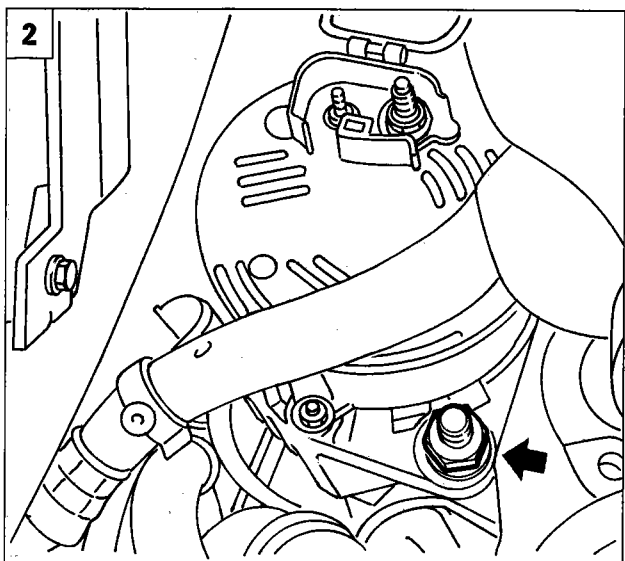
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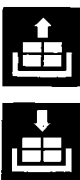
P4A124L01



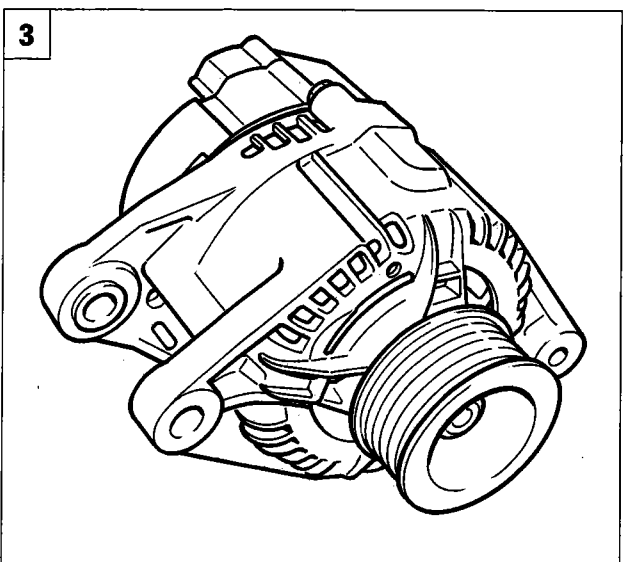
1. Raise the vehicle and disconnect the electrical connections for the alternator.



P4A124L02



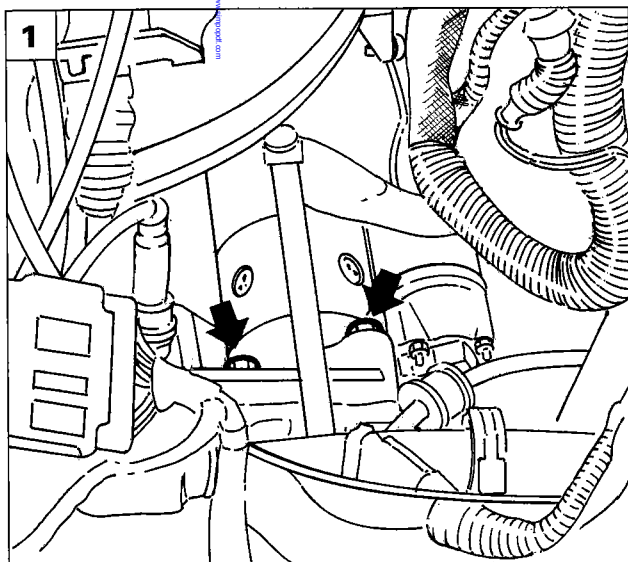
2. Undo the lower bolt fixing the alternator.



P4A124L03



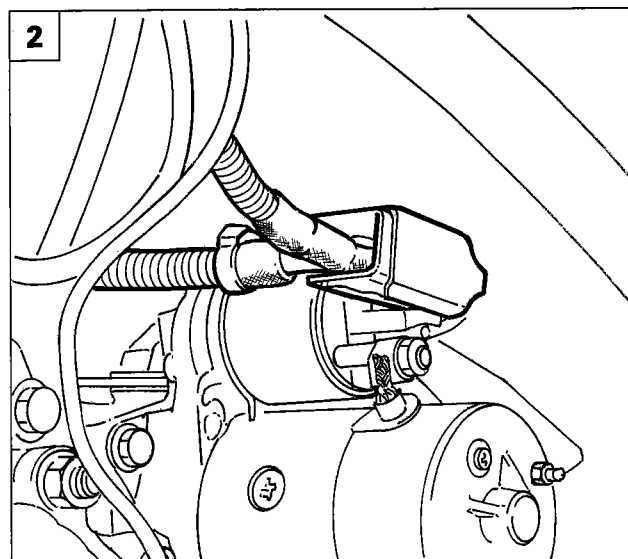
3. Lower the vehicle and remove the upper bolt fixing the alternator, then extract it from the vehicle.



P4A125L01



Before carrying out the removal procedures, described in this chapter, disconnect the negative battery terminal.



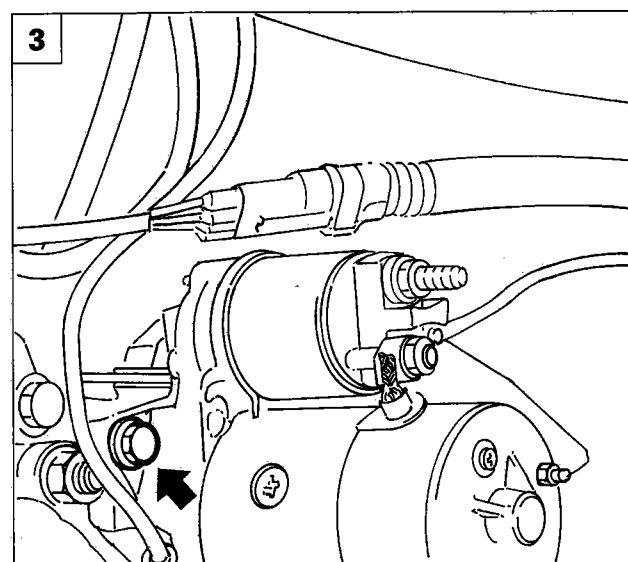
P4A125L02



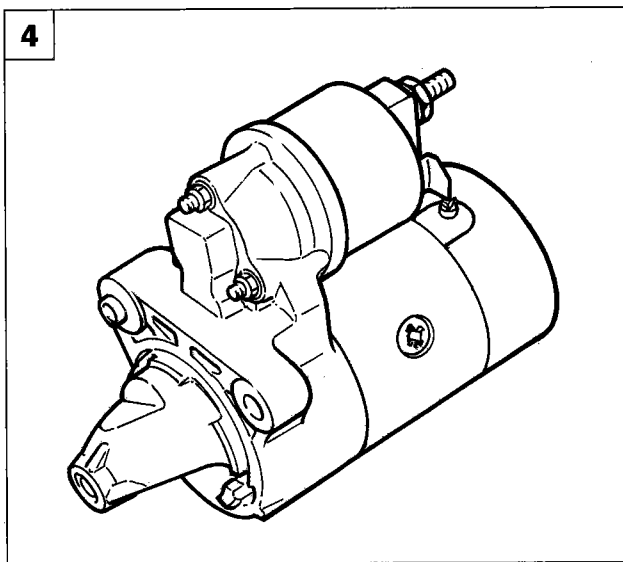
M.MARELLI E80-0.9/12 STATER MOTOR
(versions with 1370 12V; 1580 16V engine)

Removing-refitting (1370 12V engine)

1. Position the vehicle on a lift and lift up the bonnet. Undo the upper bolts fixing the starter motor to the power unit.
2. Raise the vehicle, then disconnect the electrical connections for the starter motor.
3. Undo the lower bolt fixing the starter motor to the power unit.
4. Extract the starter motor from the vehicle.

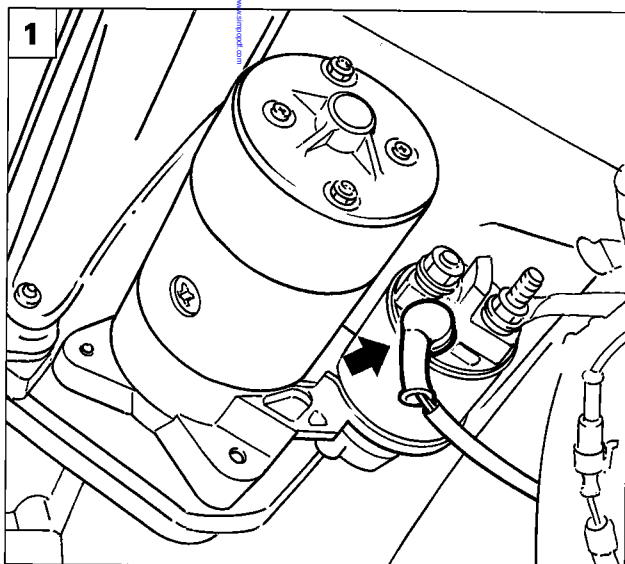


P4A125L03



P4A125L04

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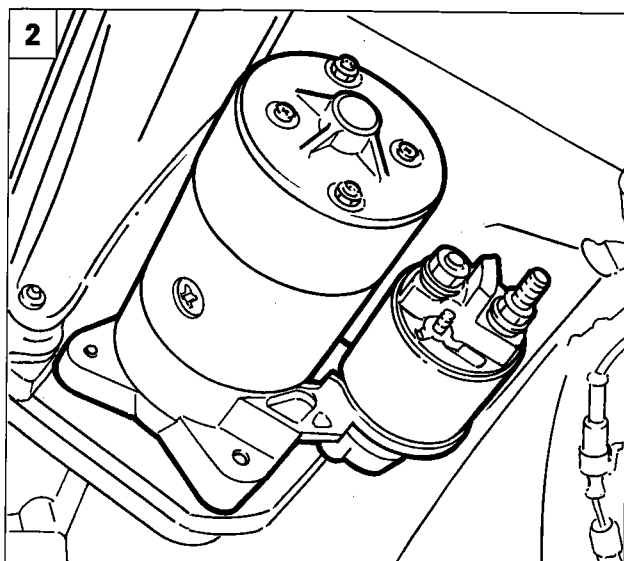
P4A126L01



Removing-refitting (1580 16V engine)

Position the vehicle on a lift.

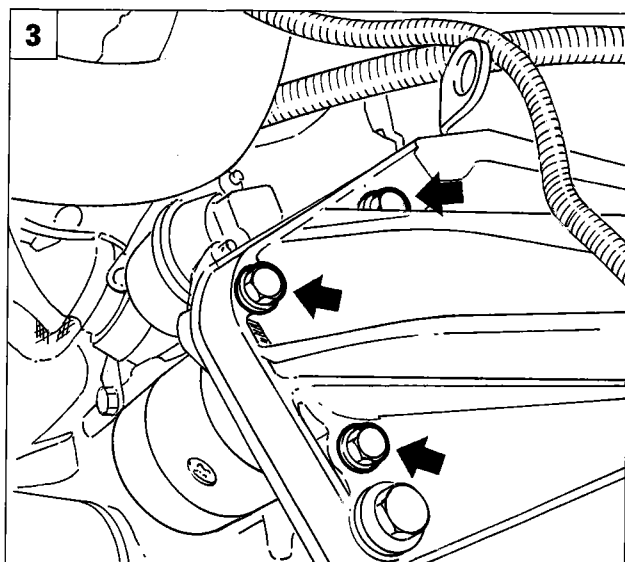
1. Raise the vehicle and move aside the protective boot for the starter motor supply contacts.



P4A126L02



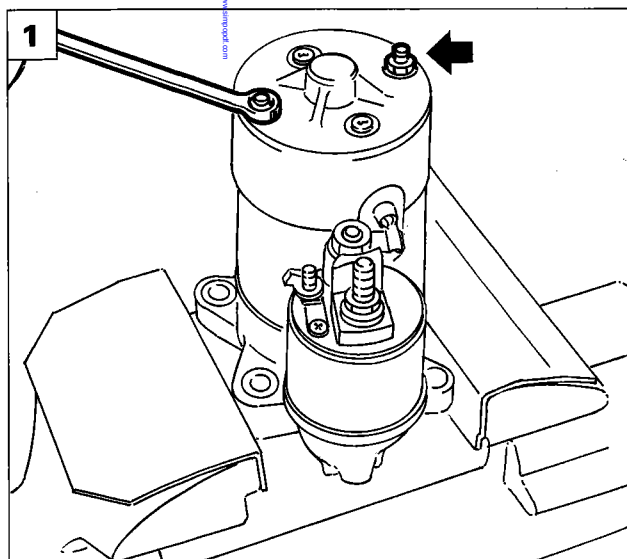
2. Disconnect the supply contacts for the starter motor.



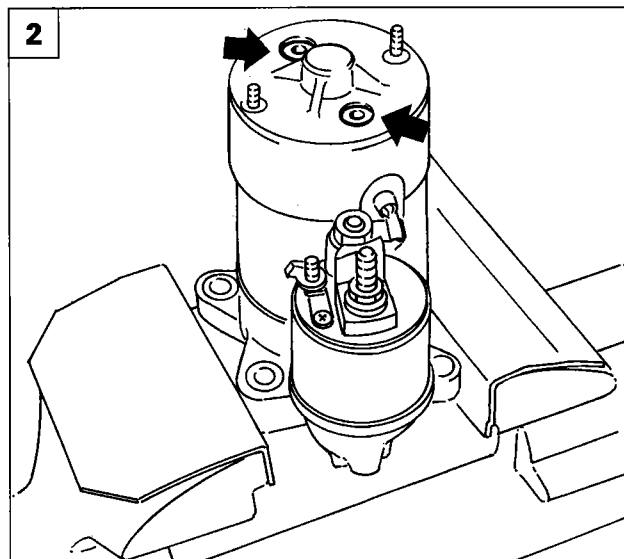
P4A126L03



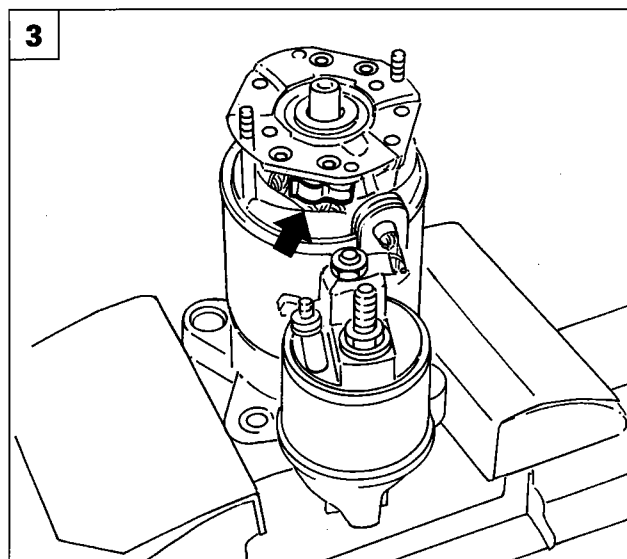
3. Undo the bolts fixing the starter motor to the power unit and remove it from the vehicle.



P4A127L01



P4A127L02

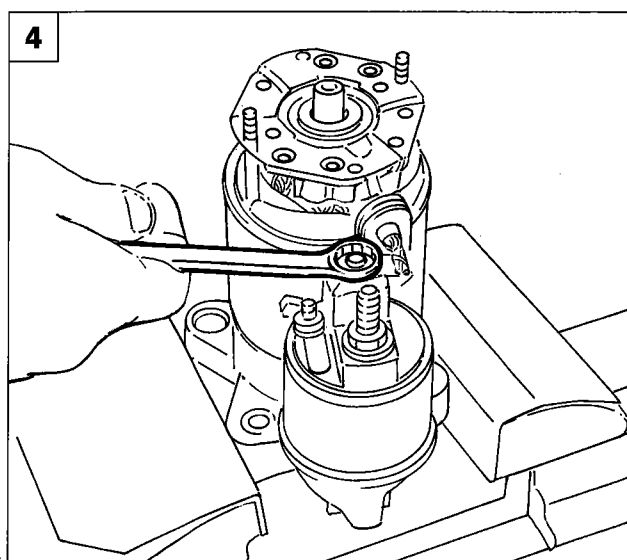


P4A127L03



Overhauling at the bench

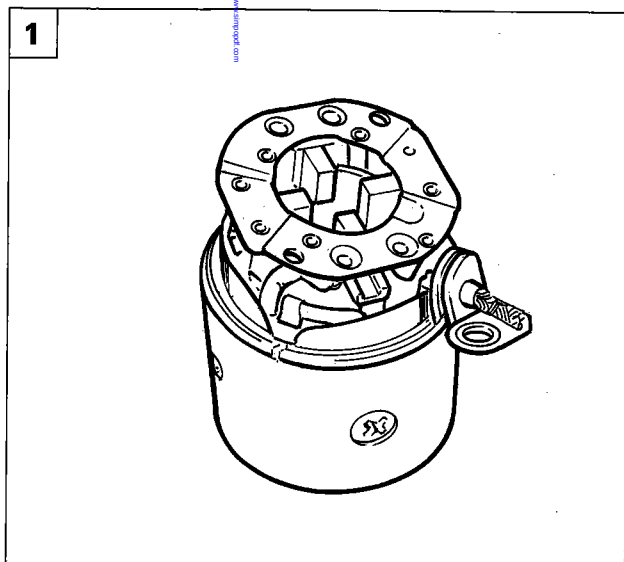
1. Position the starter motor as shown in the diagram and undo the nuts shown.
2. Undo the bolts shown and remove the metal protection for the starter motor.
3. Remove the pressure exerted on the blades positioning the tabs as illustrated in the diagram.
4. Undo the nut shown fixing the electrical connection.



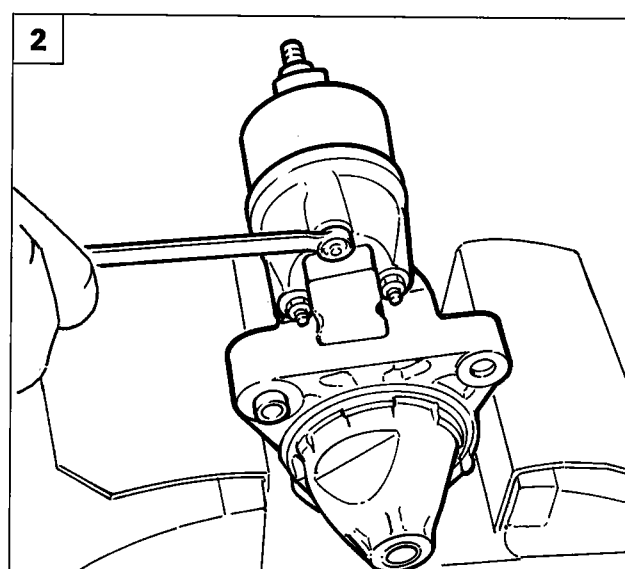
P4A127L04



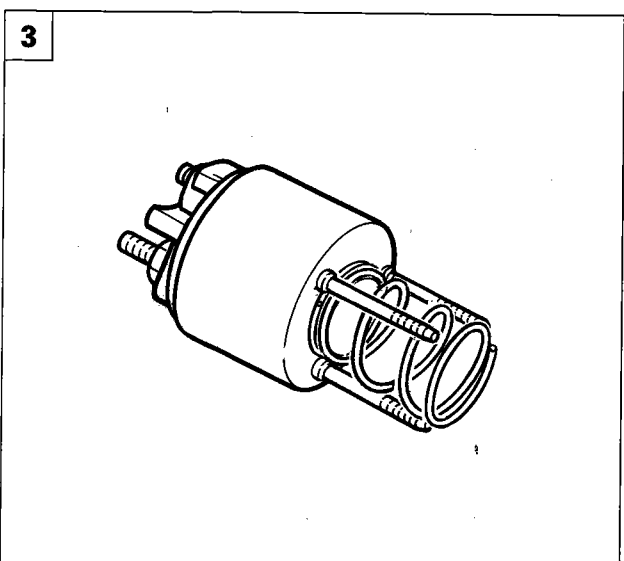
55.



P4A128L01



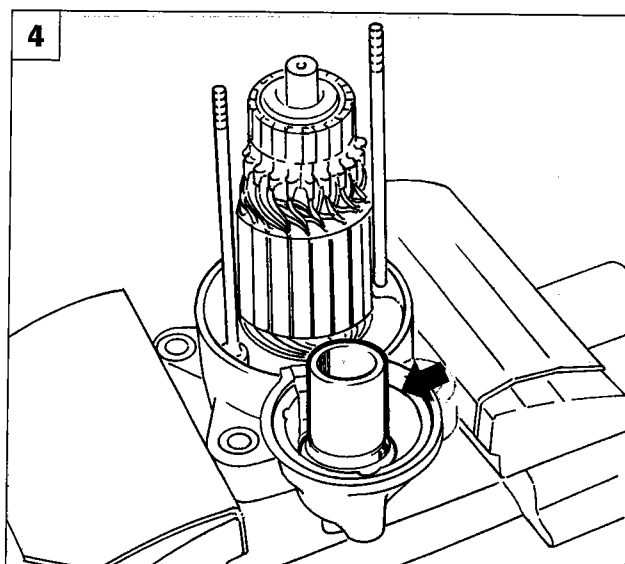
P4A128L02



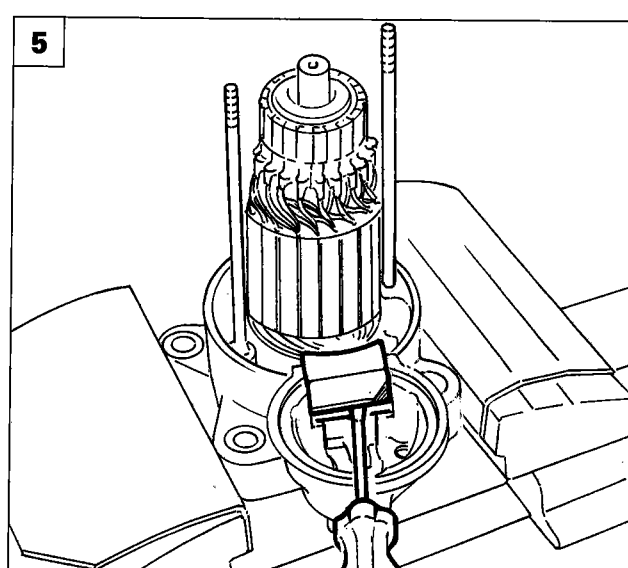
P4A128L03



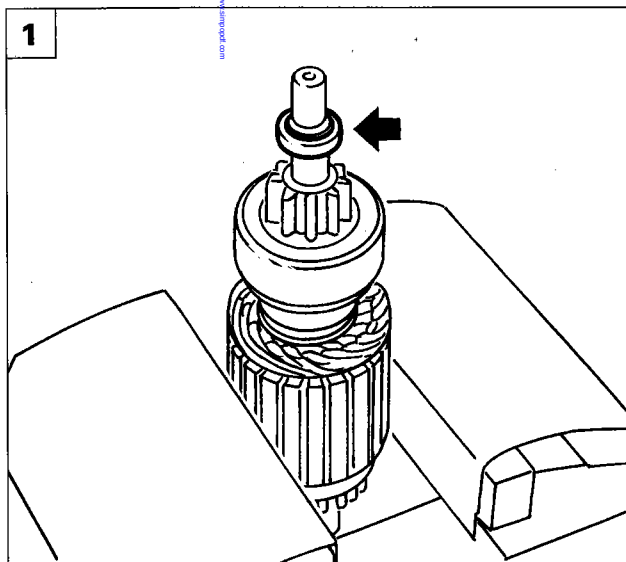
1. Remove the stator/plate brush holder assembly from the starter motor.
2. Undo the nuts shown fixing the electro-magnet to the starter motor.
3. Remove the electro-magnet.
4. Extract the spring guide bush from the starter motor.
5. Using a screwdriver, remove and extract the rotor/pinion engagement fork assembly from the starter motor front support.



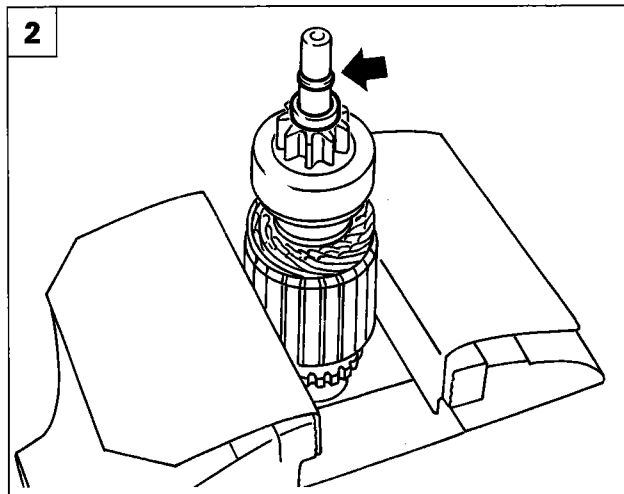
P4A128L04



P4A128L05

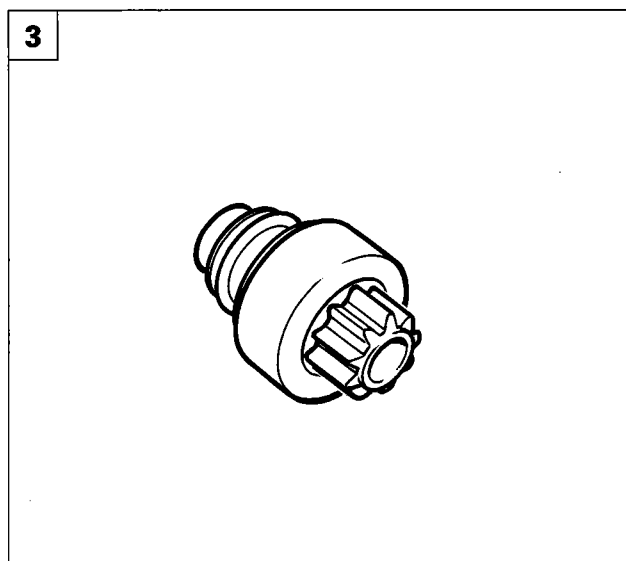


P4A129L01



P4A129L02

1. Remove and lower the safety ring shown.
2. Remove the circlip from the rotor shaft.
3. Remove the free wheel with pinion from the rotor.



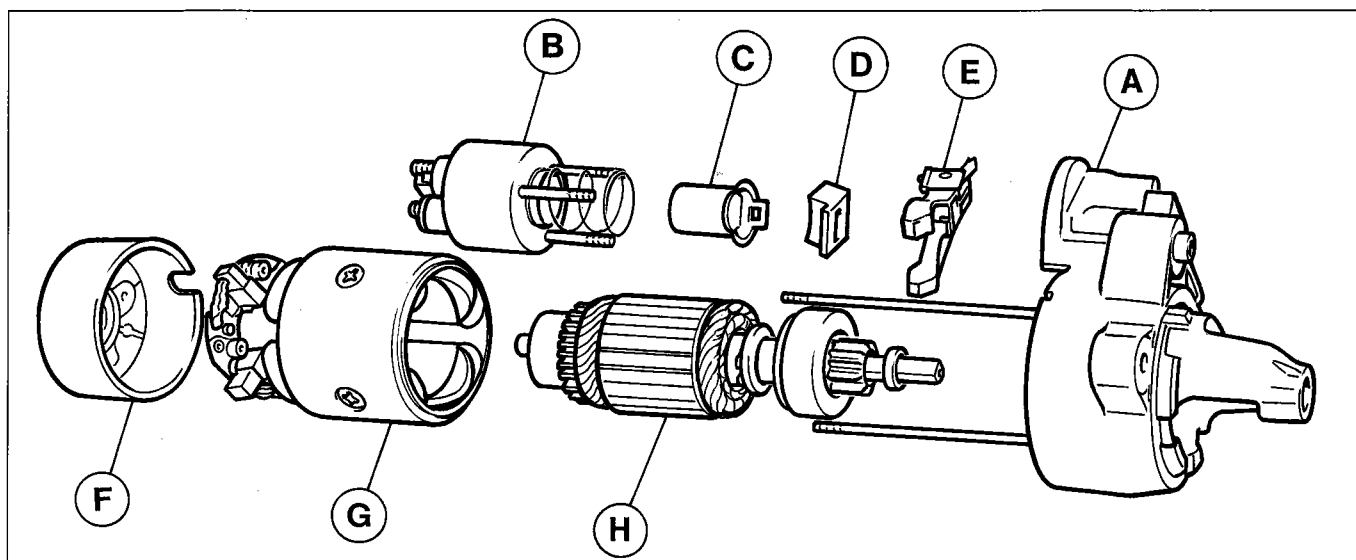
P4A129L03



When refitting, reverse the order of the operations carried out for the removal.

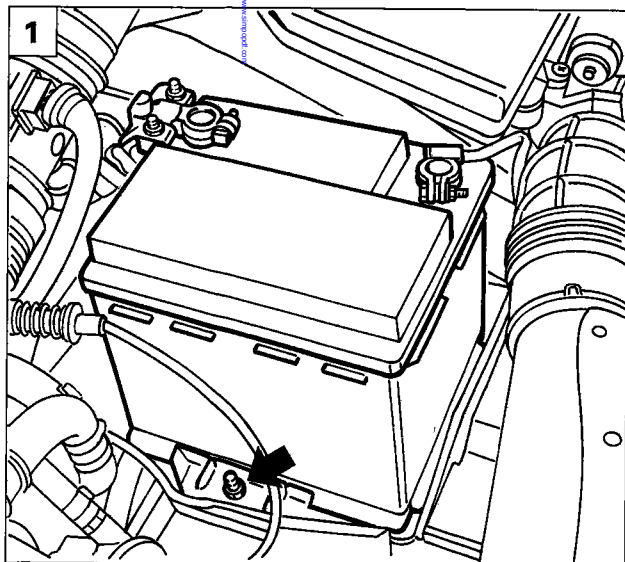
Starter motor components

- A. Front support
- B. Electro-magnet
- C. Spring guide bush
- D. Safety buffer
- E. Pinion engagement fork
- F. Rear support
- G. Stator/brush holder plate assembly
- H. Rotor/pinion with free wheel assembly



P4A129L04

55.

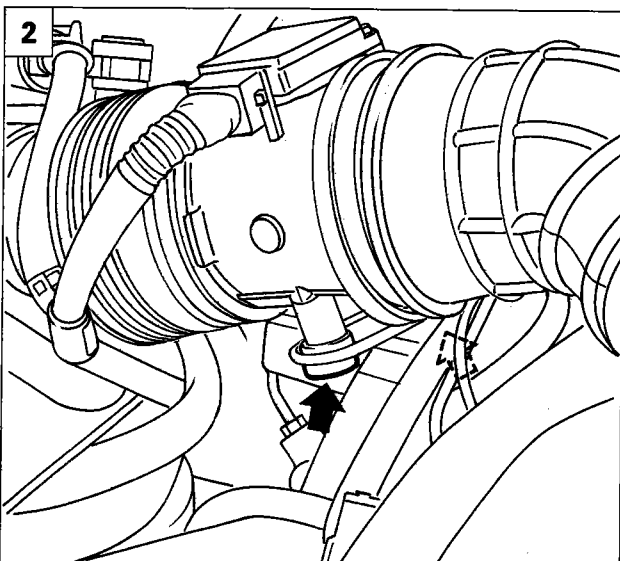


P4A130L01



MARELLI STARTER MOTOR

M 70 R-1.4/12 (versions with 1747 16V;
1998 20V engines)



P4A130L02

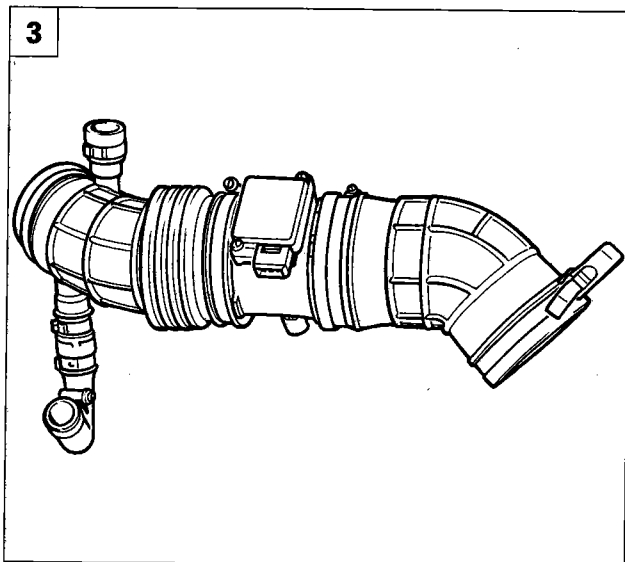


Removing-refitting (1747 16V engine)

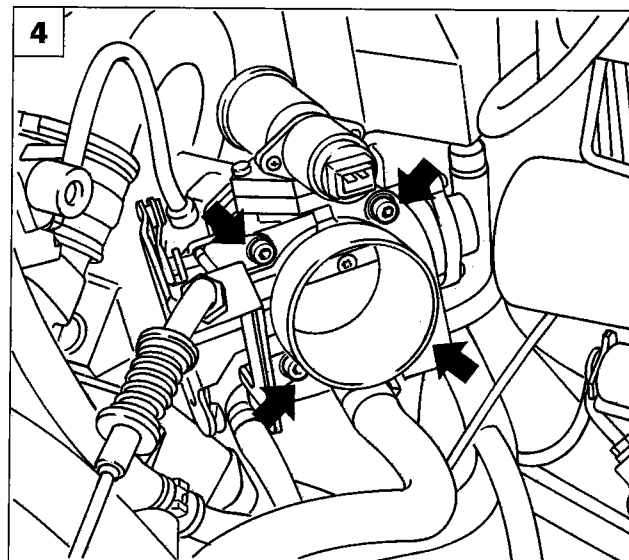
1. Undo the nut shown and remove the battery from the vehicle.

NOTE When removing the cover positioned on the positive battery terminal, act as described on page 113.

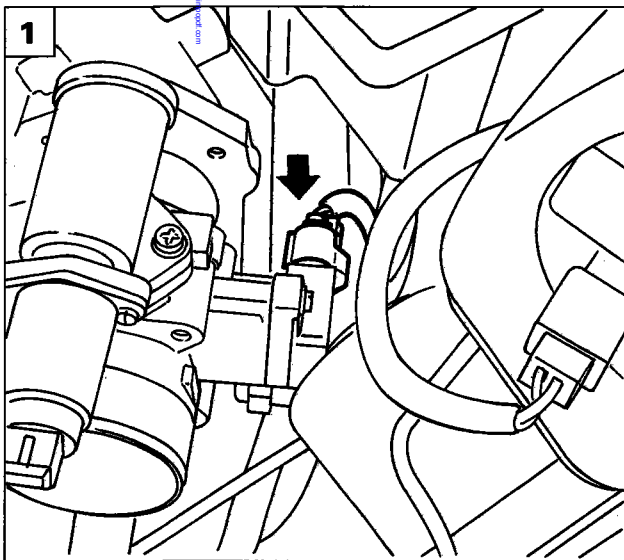
2. Remove the flow meter from the bodyshell undoing the bolts shown.
3. Disconnect the connections and the bands, then remove the flow meter complete with pipes from the vehicle.
4. Undo the bolts fixing the butterfly casing and move it aside.



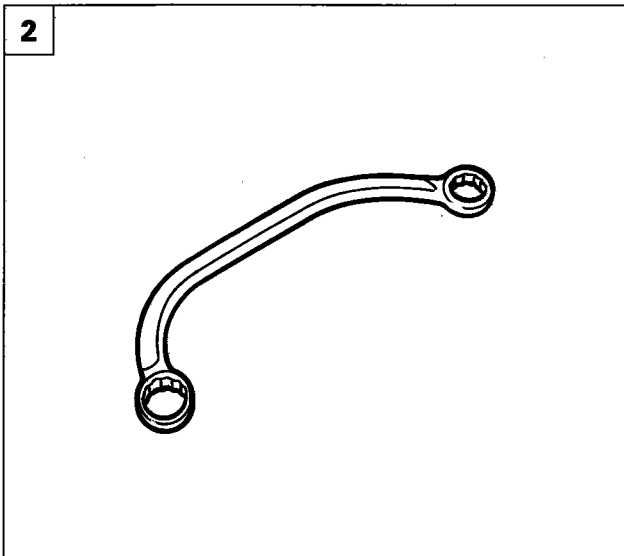
P4A130L03



P4A130L04

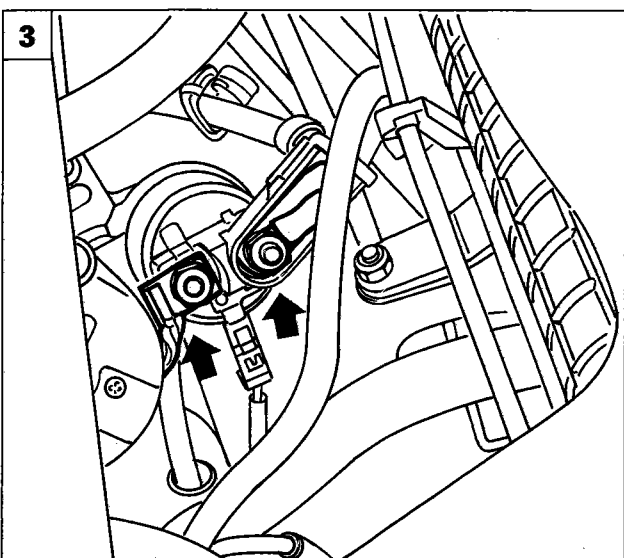


P4A131L01

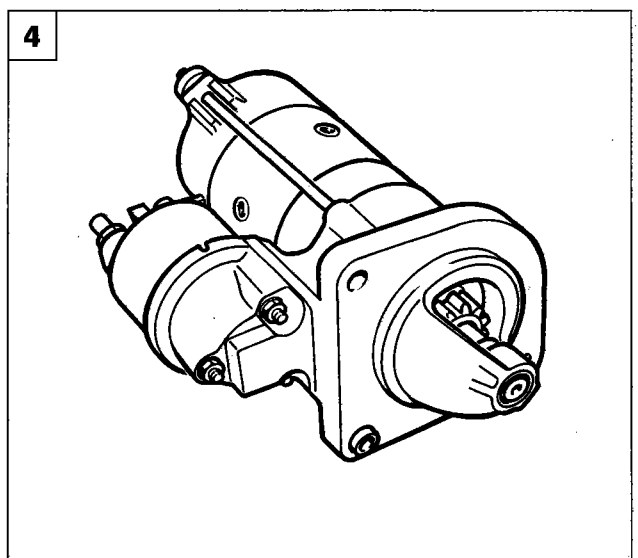


P4A131L02

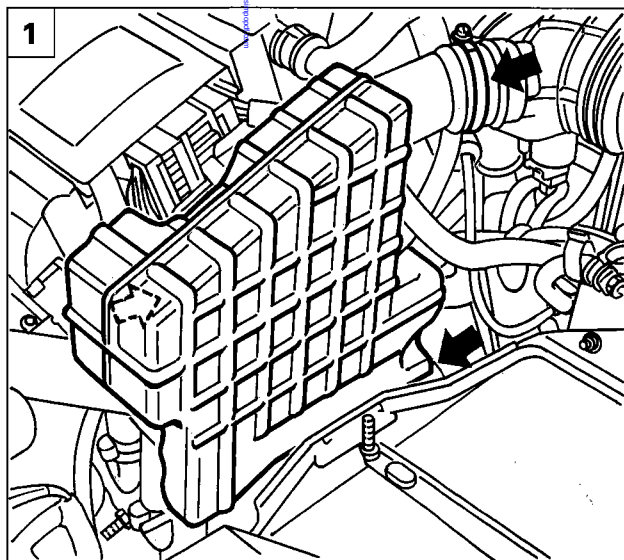
1. Disconnect the connector shown and move the butterfly casing in such a way as to be able to gain access to the starter motor.
2. Use tool 1850167000 to undo the upper bolts fixing the starter motor to the power unit.
3. Raise the vehicle and undo the lower bolt fixing the starter motor to the power unit.
4. Remove the starter motor from the vehicle.



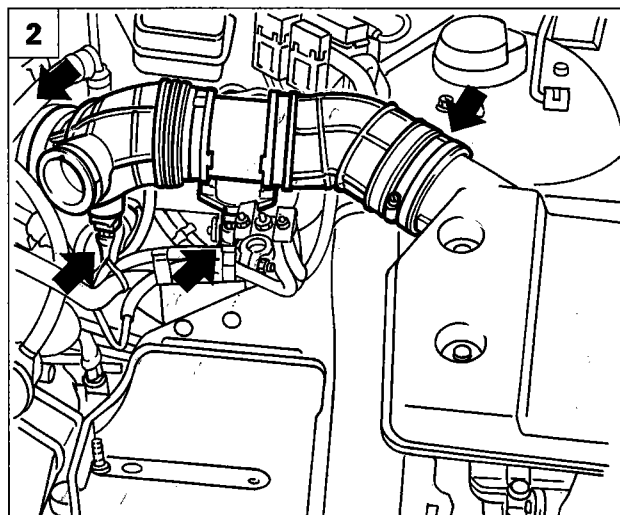
P4A131L03



P4A131L04



P4A132L01



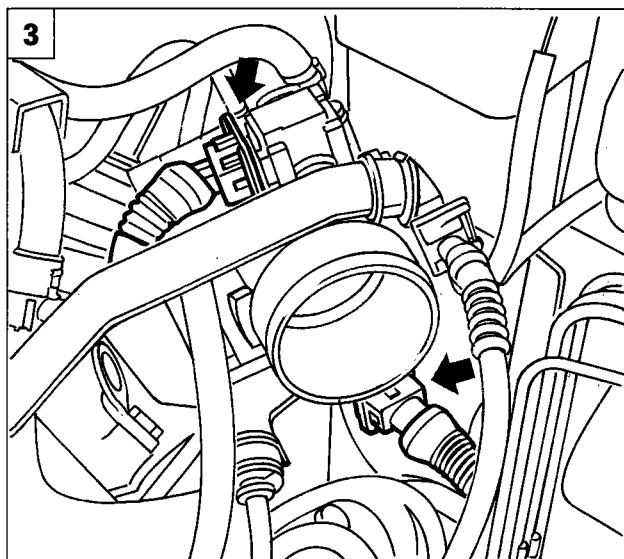
MARELLI E 95 RL-2.2/1.2 STARTER MOTOR (versions with 1747 16V; 1998 20V; 1910 TD engines)

Removing-refitting (1998 20V engine)

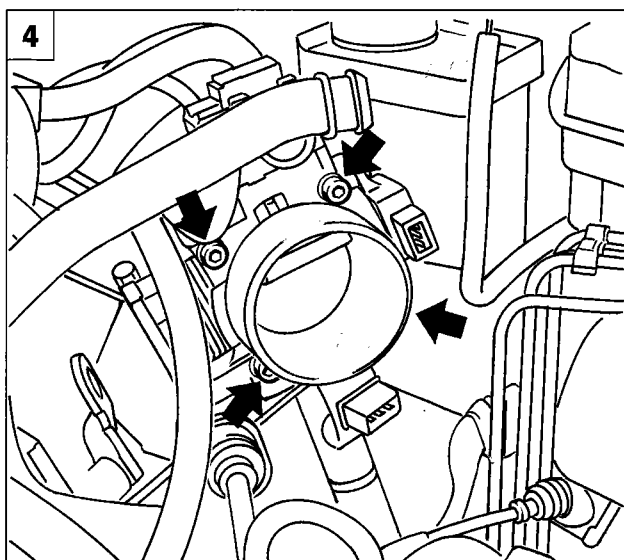
1. Remove the battery, undo the bolts and the band shown and extract the resonator.

NOTE When removing the cover positioned on the positive battery terminal, act as described on page 113.

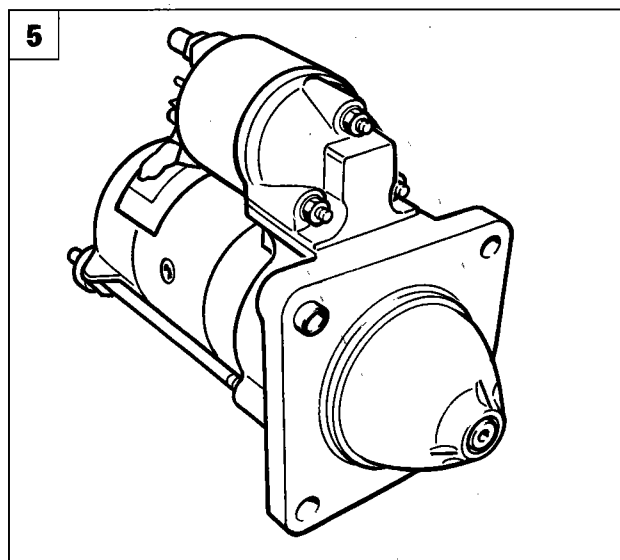
2. Undo the bands and disconnect the connections shown, then extract the air duct which connects the flow meter to the air filter.
3. Disconnect the connections at the flow meter.
4. Undo the bolts fixing the flow meter, move it aside and onto the upper bolts fixing the starter motor.
5. Raise the vehicle remove the supply connections, undo the lower fixing bolt and remove the starter motor from the vehicle.



P4A132L03



P4A132L04



P4A132L05

CHECKS

The starter motor components should be subjected to the tests listed below:

rotor: continuity test, short circuit and insulation to earth

stator: continuity test and insulation to earth

brush holder support: insulation to earth

solenoid valve: continuity test and insulation to earth



Each time the starter motor makes noises during starting, the pinion/free wheel must be replaced.

STARTER MOTOR OPERATIONAL FAULT DIAGNOSIS

1. The motor does not rotate

The cause may be:

- the battery terminals are oxidized;
- starter motor supply cable terminal slack;
- starter motor supply cable terminal broken or oxidized;
- battery completely discharged;
- lack of contact for rotor arms at commutator;
- positive rotor arm short circuited;
- starter switch contacts oxidized, worn or insulated through fragments;
- rotor or inductor to earth;
- rotor or commutator centrifuged;
- pinion engagement solenoid winding broken or to earth.

2. The motor rotates very slowly

The cause may be:

- commutator brushes and blades worn;
- part of inductor or rotor winding coils short circuited;
- battery terminals oxidized;
- battery state of charge very low or one or more elements deteriorated.

3. Excessive noise during starting

The cause may be:

- pinion free wheel mechanism worn;
- poor alignment between motor and flywheel ring gear;
- several flywheel ring gear teeth excessively worn on the engagement side;
- speed reduction gear defective or excessively worn.

Alarm

55.

INTRODUCTION

The alarm is a system which offers volumetric and perimeter protection: in effect it is capable of carrying out a check on the position of the doors and for the presence of a moving object inside the passenger compartment. In addition, it can carry out the function of excluding the audible alarm (siren) and that of signalling that the remote control battery is discharged by the LED in the remote control and the one in the dashboard coming on.

In particular it is capable of:

- adapting its operation to the laws in force in the various markets governing the use of alarm systems;
- distinguishing permanent or intermittent errors or faults;
- memorizing the number of alarms implemented;
- detecting faults or problems at the connecting cables for the switch and key for de-activating the system.

The alarm system basically comprises: a radio frequency receiver located in the courtesy light, a radio frequency transmitter in the ignition keys which come with the vehicle, two volumetric sensors and switches on the doors and the bonnet and boot lids and lastly the electronic control unit (located in the driver's side wheel arch) which is integrated with an alarm siren.

The alarm is excluded by pressing the remote control button for a long time when the alarm switches on (see page 134/2).

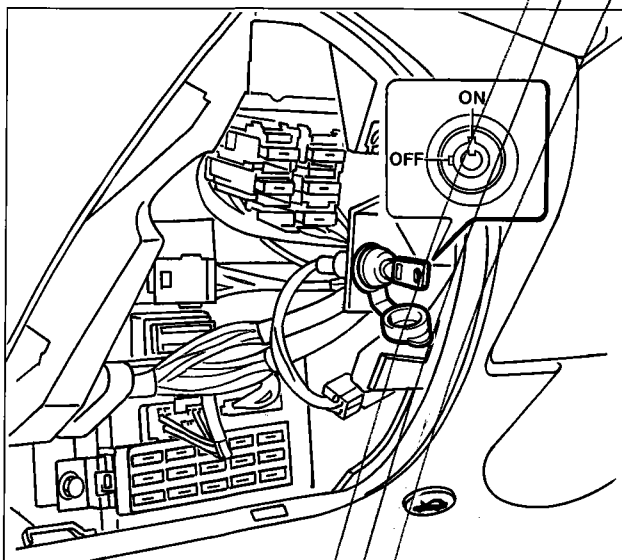
EMERGENCY KEY

The switch and key for the emergency circuit are located near the junction unit.

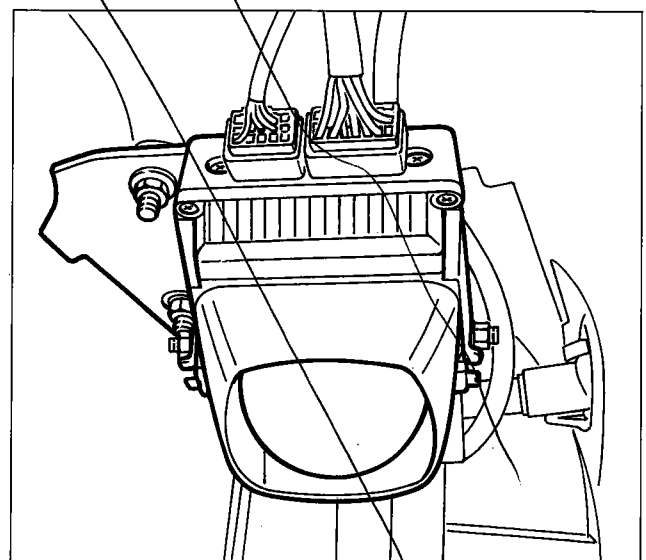
This makes it possible to exclude the alarm if it is activated on account of a fault in the system.

De-activation By turning the emergency key the control unit emits an audible signal to indicate that the alarm is de-activated (OFF position).

Activation By turning the emergency key the control unit remains silent indicating that the alarm is activated (ON position).



Location of emergency circuit switch with key



Location of electronic control unit and alarm in left wheel arch

NOTE The emergency circuit switch is only accessible after having removed the lower dashboard cover, driver's side.

OPERATION**Switching on - Switching off**

The alarm is switched on by pressing the transmitter (remote control) switch and the fact that it is on is signalled by the direction indicators coming on for around 2.5 seconds and a corresponding audible signal (beep).

The operating range is about 10 metres.

The alarm is switched off by the transmitter (remote control) switch being pressed again and this is signalled by the direction indicators flashing twice for 0.5 seconds and two corresponding audible signals (beeps).



It is not possible to switch on the alarm with the ignition switch in the ON position, but only in the OFF or PARK positions.

The switching on or off is also signalled by the LEDs and, in countries where the law permits, also by the above mentioned visual and audible signals (for example: Italy).

Excluding the system

If the transmitter batteries are discharged or the system fails it is possible to deactivate the alarm using the emergency key located behind the lower dashboard cover, driver's side (OFF position).

When the vehicle is delivered, check that the emergency key is in the ON position.

Turn the key to the OFF position if the vehicle is not used for long periods (more than a month).

By placing the key in the ON position again, if the battery is not sufficiently charged or if the control unit has been disconnected, the alarm will give an intermittent audible signal lasting 10 beeps (excluding certain countries where this is not allowed).

Surveillance

During surveillance the LED flashes at a frequency of 0.8 Hz.

In this state the alarm system surveys:

- the doors, the bonnet lid and the boot lid;
- one disconnection of the battery/cables cut;
- the non authorized insertion of the ignition switch;
- movements inside the passenger compartment (volumetric surveillance).

Alarm state

The alarm is triggered off when one of the surveillance sensors (see previous list) detects an irregular situation.

The alarm state is displayed by the activating of the alarm for a maximum of 3 26 second cycles, only if the cause of the alarm persists and by the direction indicators for a maximum of 4.7 minutes still if the cause of the alarm persists (only in countries where the law permits).

To exit from the alarm situation:

- press the transmitter button;
- use the emergency key (N.B. The alarm on condition, however, remains memorized inside the control unit. Only use this procedure if you do not manage to escape from the alarm situation).

SWITCHING ON ALARM EXCLUSION (To be carried out compulsorily each time it is switched on)

It is possible to exclude the operation of the alarm when switching on the alarm by pressing the remote control switch for 4 seconds. Straight after the audible/visual signals that it has been switched on (see previous page) to indicate that it has been excluded 5 audible signals (beeps) follow in quick succession.

SIGNALLING REMOTE CONTROL BATTERIES DISCHARGED

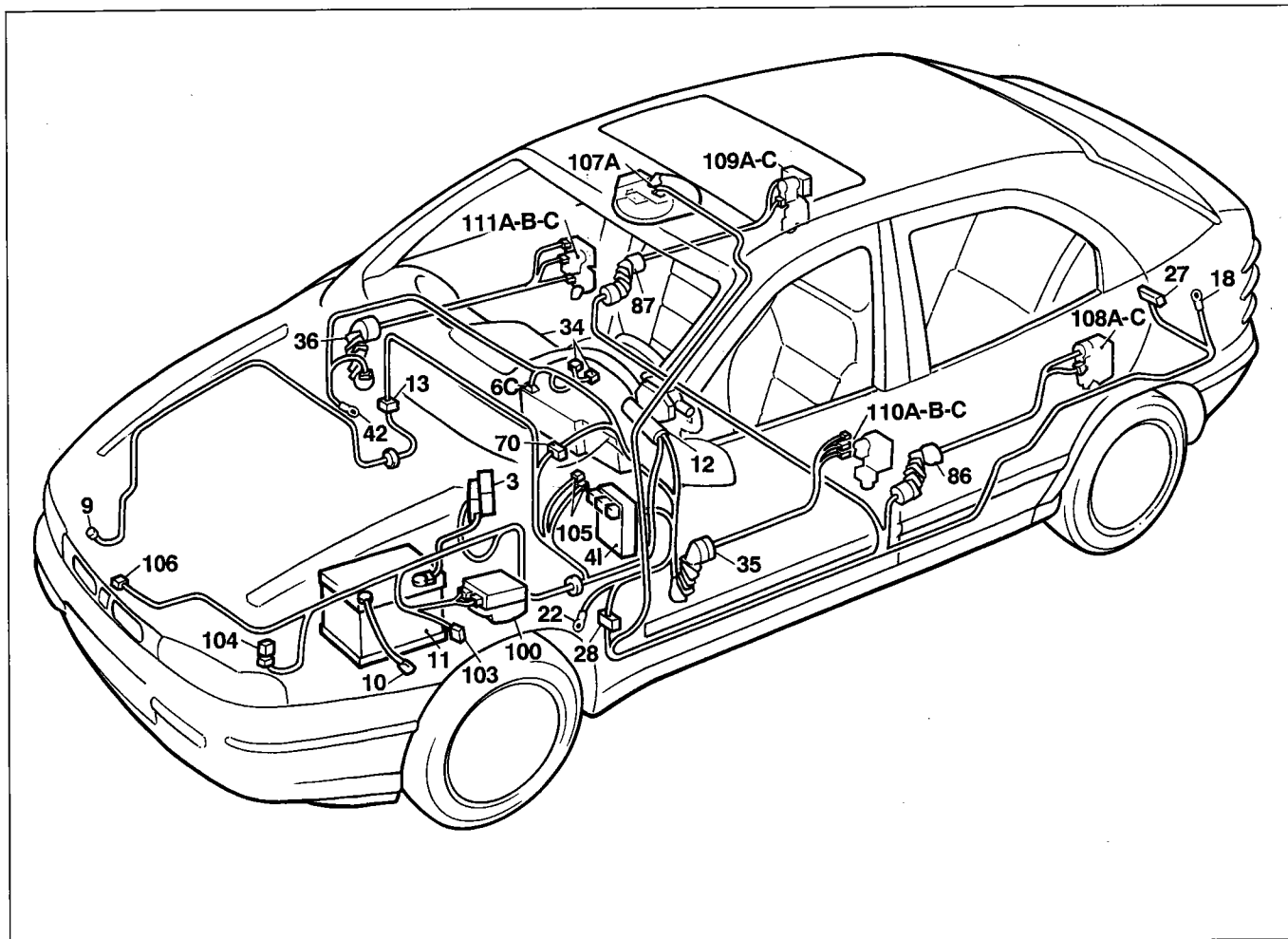
The fact that the remote control batteries are discharged is signalled by a single 200 ms (millisecond) flash of the remote control LED each time the switch is pressed.

When this signal occurs it is necessary to change the remote control batteries as soon as possible

DISTANCE BETWEEN TRANSMITTER AND RECEIVER DURING PROGRAMMING

The distance of the remote control from the receiver in the courtesy light is about 40 cm.

LOCATION OF COMPONENTS



P4A17AL01

- | | |
|---|--|
| 3. Power fuse box | 86. Longitudinal/left rear door cables connection |
| 41. Junction unit | 87. Longitudinal/right rear door cables connection |
| 6C. Instrument panel (connector C) | 100. Alarm device electronic control unit |
| 9. Right front earth | 103. Diagnostic socket for alarm |
| 10. Earth for battery on bodyshell | 104. Alarm 15A protective fuse |
| 11. Battery | 105. Alarm device off switch |
| 12. Ignition switch | 106. Alarm on switch |
| 13. Front right/left cables connection | 107A. Central locking remote control receiver |
| 18. Left rear earth | 108. Left rear central locking/alarm on switch |
| 22. Left dashboard earth | 109. Right rear central locking/alarm on switch |
| 27. Rear connections contact board with luggage compartment light switch incorporated | 110. Left front central locking/alarm on switch |
| 28. Dashboard/longitudinal cables connection | 111. Right front central locking/alarm on switch |
| 34. Switch control unit | |
| 35. Dashboard/left front door cables connection | |
| 36. Dashboard/right front door cables connection | |
| 42. Right dashboard earth | |
| 70. Dashboard/front cables connection | |

PROGRAMMING

Initially the vehicle alarm system comes with a code which is activated by a universal remote control which allows the vehicle to be tested and moved inside the factory.

During the pre-delivery stage it is therefore necessary to programme the receiver with the code for the transmitter which comes with the vehicle.

The alarm signal modes may vary according to the laws in force in the country of registration. It may therefore be necessary to programme the system by entering the Country code.

There are two programming modes:

- before entering the password: SIMPLIFIED PROGRAMMING

- after entering the password: PROTECTED PROGRAMMING.

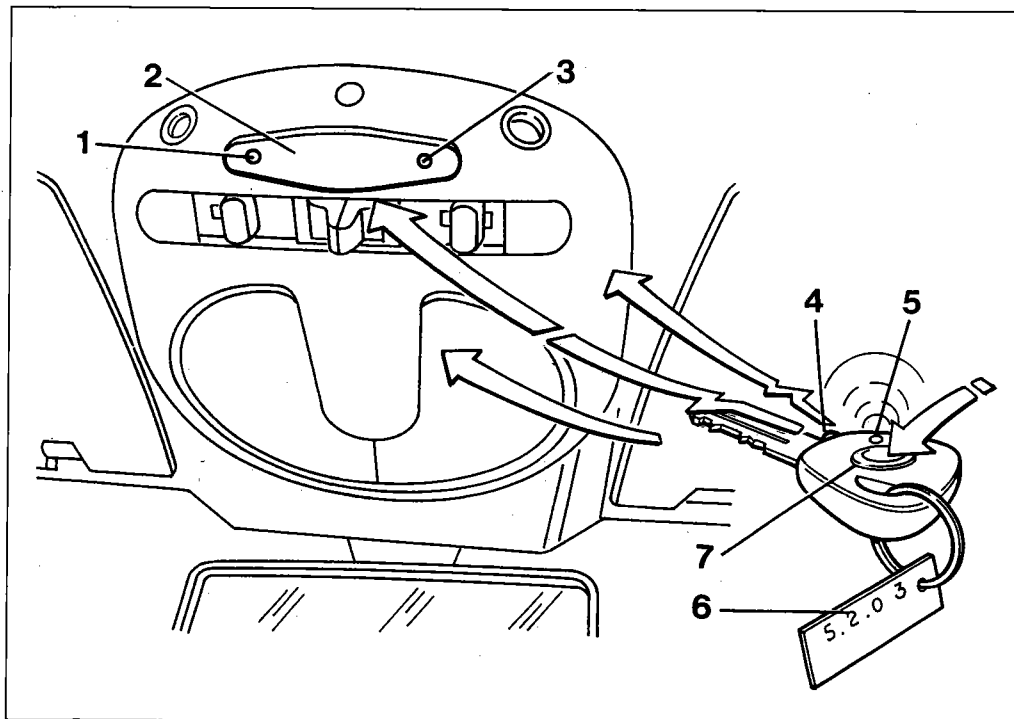
Each transmitter has a paper card with the four figure password for protection against non authorized programming (protected programming). This card should be removed by the customer at the time of purchase and placed in the special space at the back of the Code Card.



- Given the importance of programming it is advisable to carry out the operations, at least initially, with the help of a second person.
- The programming of remote controls should be carried out with the doors of the vehicle closed.

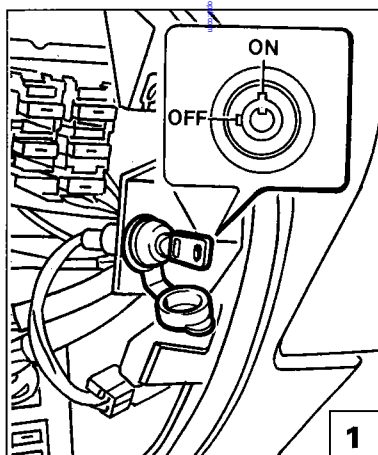
Simplified programming

At the time of delivery the alarm commands for the vehicle should be memorized.

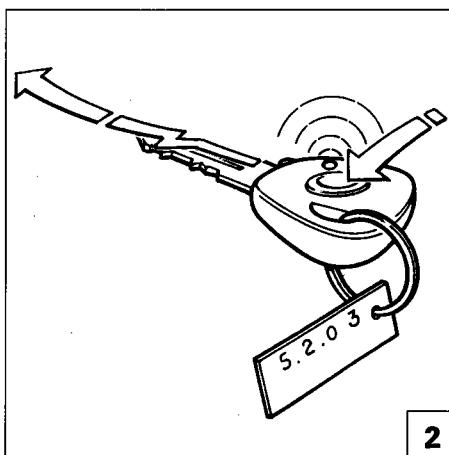


P4A18AL02

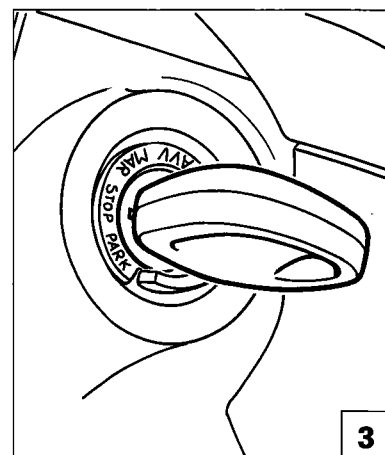
- | | |
|---|----------------------------------|
| 1. Programming button | 5. Transmitter LED |
| 2. Radio frequency receiver in courtesy light | 6. Password code (4 numbers) |
| 3. LED in courtesy light | 7. Control button on transmitter |
| 4. Radio frequency remote control | |



P4A19AL01



P4A19AL08



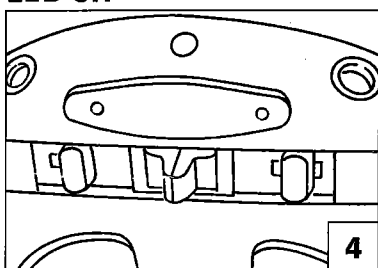
P4A19AL03



The programming of a transmitter should be carried out with the:

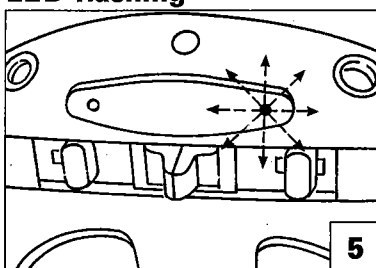
- 1) the emergency key is in the ON position;**
- 2) the anti-theft device is switched off via the remote control;**
- 3) the ignition key is in the OFF position or has been removed.**

LED off



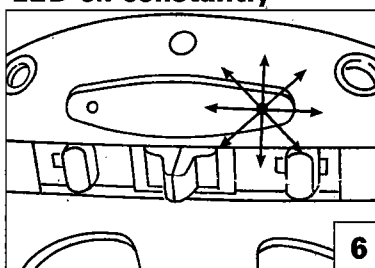
P4A19AL04

LED flashing



P4A19AL05

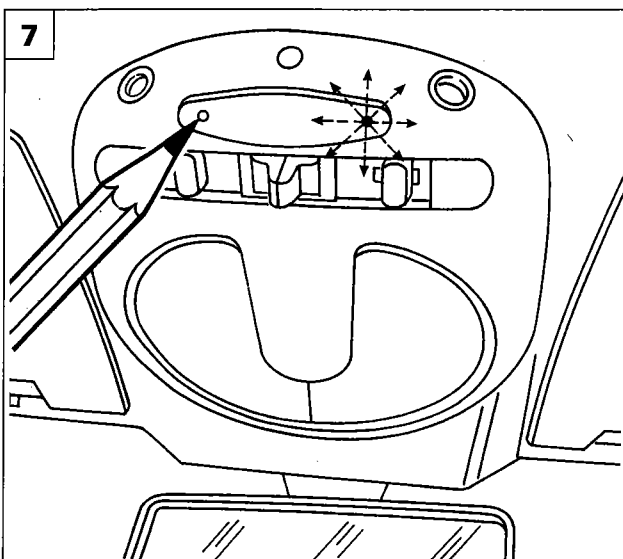
LED on constantly



P4A19AL06

Start of simplified programming (first remote control)

The simplified programming can only be used when the memory has not yet been closed (see chapter on "Protected programming"). The system "recognizes" the code for an unlimited number of remote controls, but only the last eight remote controls remain programmed (when the 9th remote control is entered the first one is expelled from the memory).



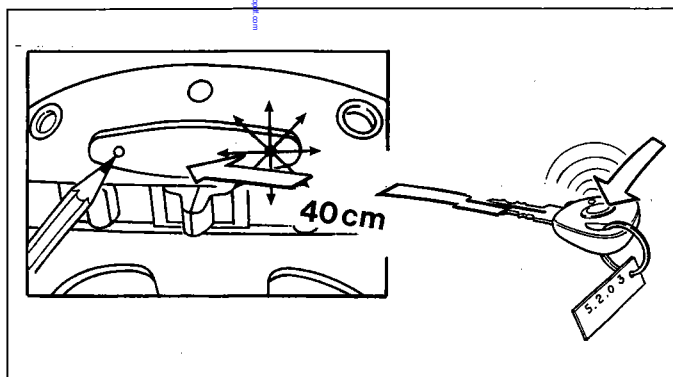
P4A19AL07

- 1) Press the programming button on the receiver; the LED for the receiver will start to FLASH indicating "awaiting to receive a code";**



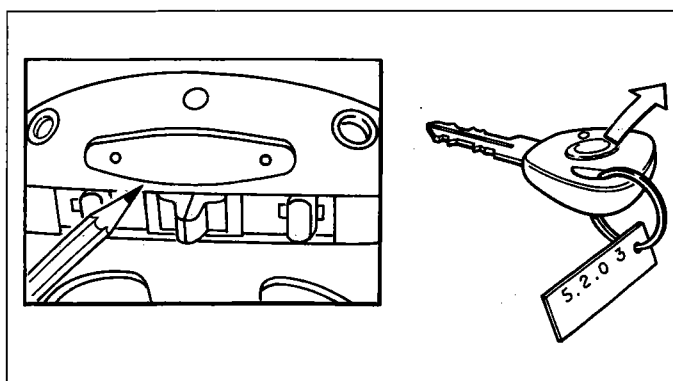
If the LED remains off when the button is pressed, this means that:

- a) the alarm is ON. If this is the case, it can only be switched off using the UNIVERSAL REMOTE CONTROL;*
- b) the receiver is faulty or there is no supply.*



P4A20AL04

- 2) - Keep the receiver button pressed;
 - hold the remote control about 40 cm away;
 - press and release the remote control button;
 - the LED in the courtesy light comes on constantly signalling that the code has been programmed.

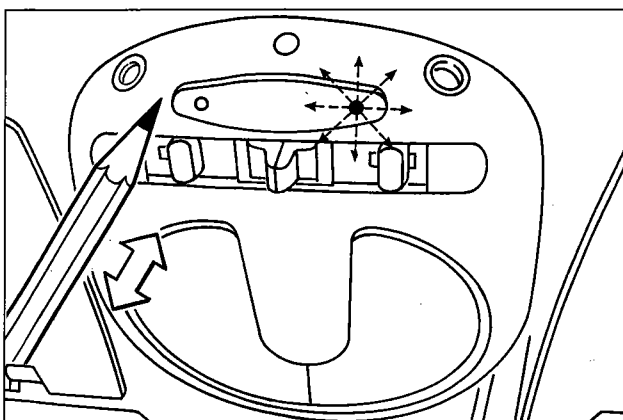


P4A20AL05

- 3) When the button for the receiver is released the LED in the courtesy light goes out. At this point there are two possibilities:
 - a) To programme the alarm to operate in the country where it will be working (country code).
 - b) Not to modify the previously programmed operation.
 To maintain the default operating mode (ITALY)

Code	Country	Code	Country
1	Italy	6	Belgium
2	Germany	7	Holland
3	France	8	EEC (Europe)
4	Switzerland	9	TURIN (toned down al.)
5	United Kingdom	10	TEST

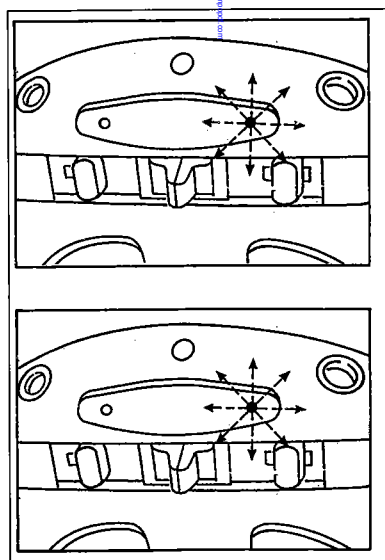
In order to programme the alarm following the instructions in point "a" it is necessary to press the programming button, within three seconds of the LED going out, as many times as indicated in the table at the side.



P4A20AL03



Each time it is pressed the LED will flash.



x 6 = OK

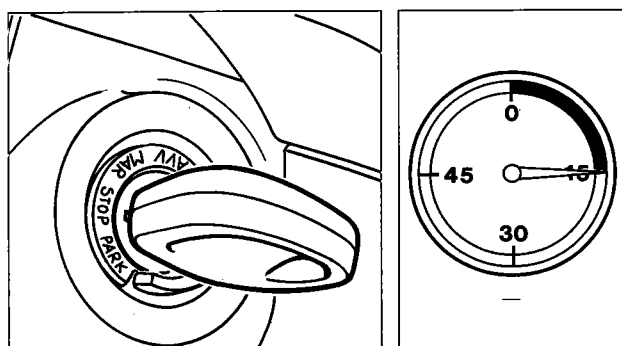
x 18 = NO OK

P4A21AL01



If the programming button in the courtesy light is not pressed the ITALY operating mode will be recognized automatically if this operation is being carried out for the first time. If, on the other hand, this operation has already been carried out previously, then the system will arrange the mode already programmed.

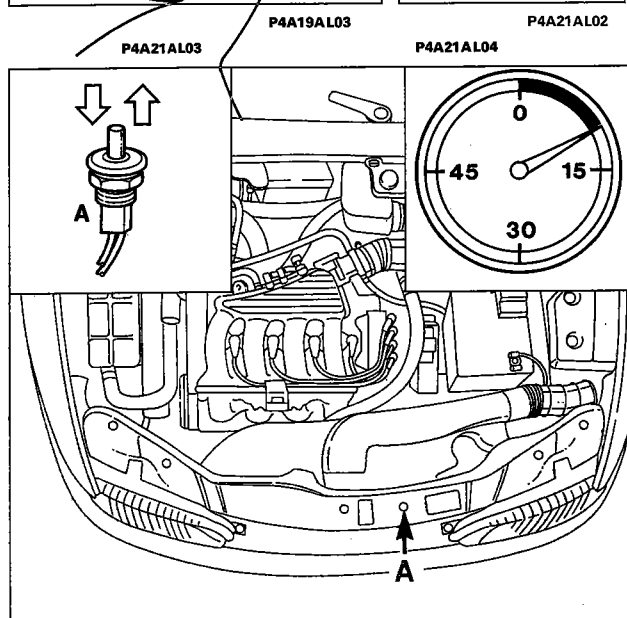
NOTE *In order to programme the country code and recognize the operating mode of the actual Country, use the following procedure.*



P4A19AL03

P4A21AL02

- 1) - Open the bonnet lid;
- 2) - turn the ignition key from the ON position to the OFF position;
- 3) - within 15 seconds move on to the next operation;



P4A21AL03

P4A21AL04

P4A21AL05

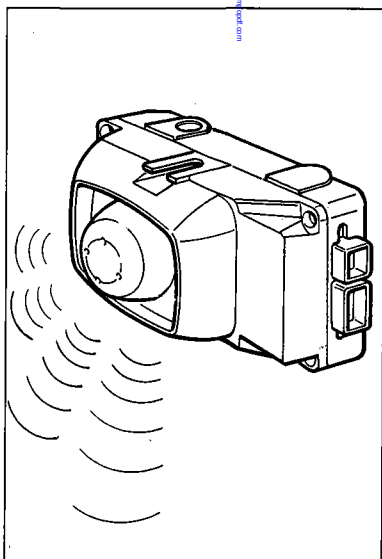
- press the bonnet lid button (A) 7 times in rapid succession;



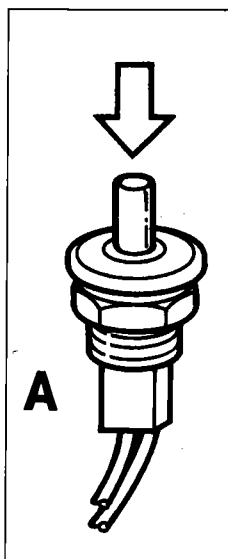
This last manoeuvre should be carried out in less than 10 seconds.

Alarm

55.



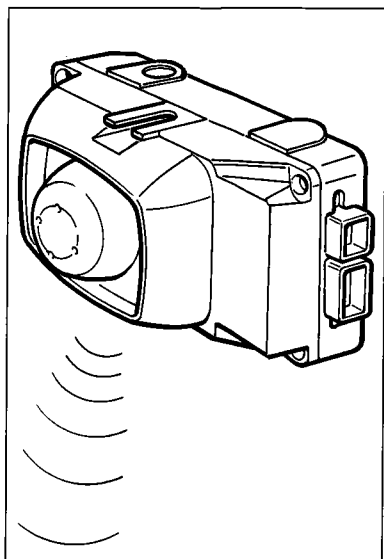
P4A22AL01



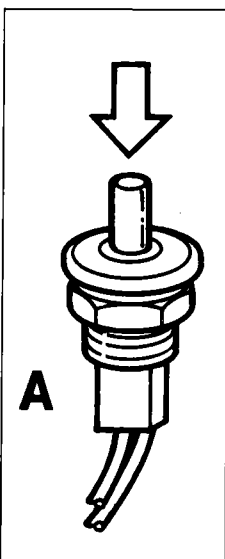
P4A22AL02

- 5 audible signals indicate the entry into MANUAL DIAGNOSIS;

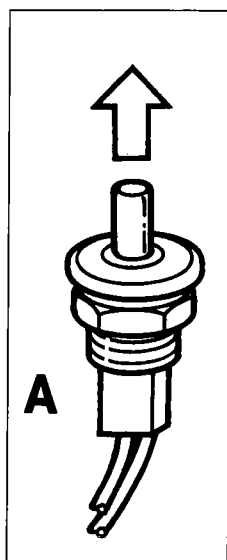
- 4) - during these 5 audible signals press the bonnet lid switch (A) and keep it pressed;
 - a last "beep" will signal that this manoeuvre has been accepted;



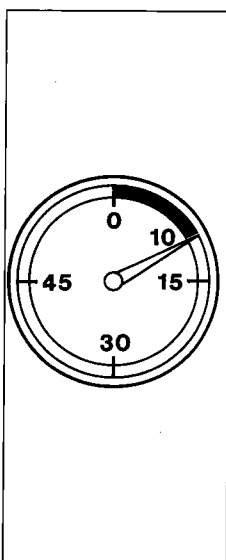
P4A22AL03



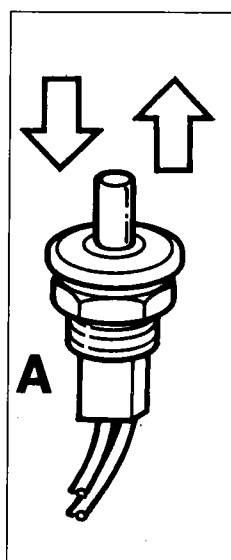
- 5) - keep the switch (A) pressed for the entire duration of the last "beep": this operation signals the entry into the Country programming state and consequently the possibility of entering the country code (see table on page 138);



P4A22AL04



P4A22AL05



P4A22AL06

- release switch A;
- within the next 10 seconds press and release the switch following the instructions given in the table on page 138 (each time the button is pressed there will be an audible confirmation).

NOTE In order to programme the country code it is possible to use the procedure with the Fiat-Lancia Tester.

PROGRAMMING FURTHER REMOTE CONTROLS USING THE SIMPLIFIED PROCEDURE

In order to programme further remote controls, repeat the procedure for the simplified programming. It is possible to programme an unlimited number of remote controls, but the courtesy light will only keep the last eight in its memory.

This procedure is valid until the following conditions occur:

- a) the central locking/alarm system has been switched on/switched off correctly via the remote control 256 times;
- b) the password for one of the remote controls already programmed has been entered (see paragraph on MANUAL ACCESS PROGRAMMING).

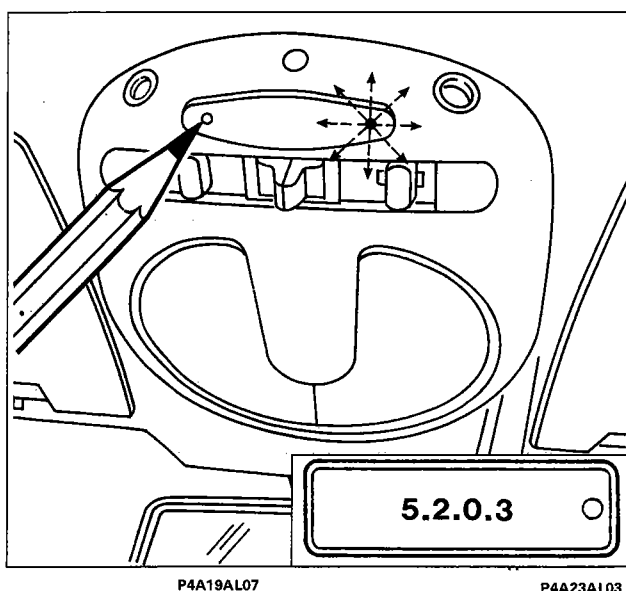


The simplified programming procedure definitively cancels the universal codes present in the courtesy light and alarm control unit.

Protected programming-manual closing of the memory

In order to prevent strangers from being able to enter their code it is necessary to protect (close) the memory. This operation takes place:

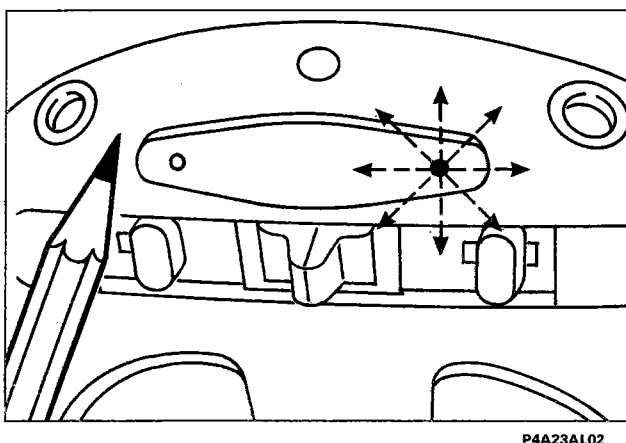
- a) automatically after the alarm system has been switched on/switched off 256 times;
- b) if the user so desires by entering the password (4 figure code on the transmitter card) before the alarm has been switched on/off 256 times, for example on a new vehicle after all the remote control codes given to the Customer have been introduced.



Entering the password

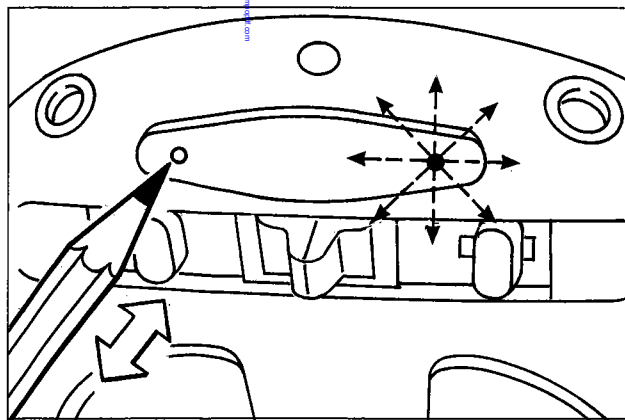
- The method for entering the password (see lower inset) is as follows:

1. Press the button on the receiver for around 2 seconds: the LED should flash.



2. Release the button: after around 2 seconds the LED should flash briefly indicating that it is possible to enter the first figure of the password.

55.

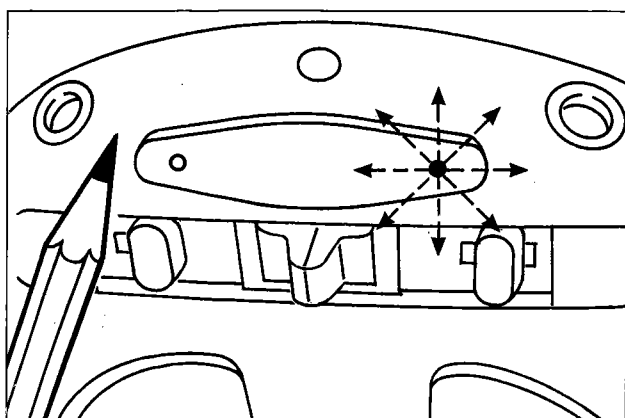


P4A24AL01

5 impulses

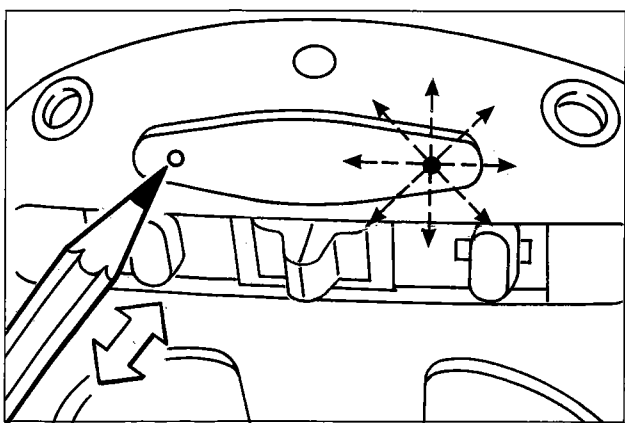
3. Immediately press the button for the receiver as many times as indicated by the first digit of the password (for example: 5 times);

it should be noted that for each impulse the LED will come on briefly to give a visual confirmation.



P4A23AL02

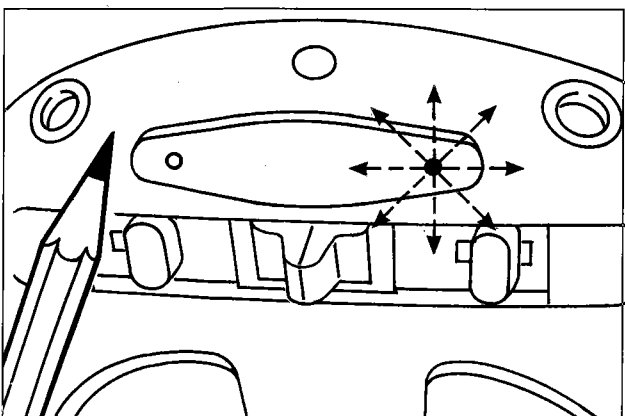
4. About 2 seconds after the last impulse (the fifth in the example) the LED will emit another flash to request the input of the next figure (the 2).



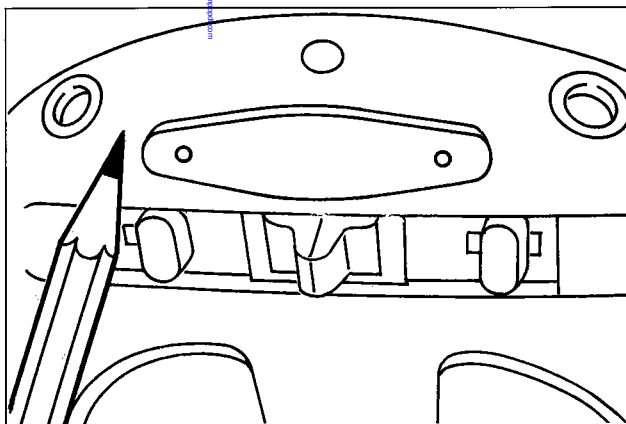
2 impulses

5. Immediately press the button for the receiver as many times as indicated by the second digit of the password (for example: 2 times);

it should be noted that for each impulse the LED will come on briefly to give a visual confirmation.



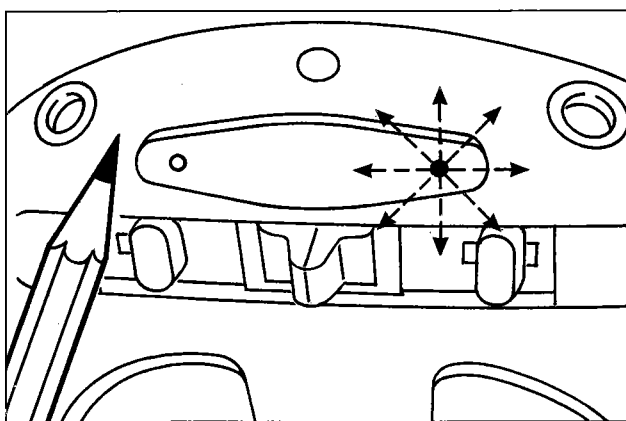
6. About 2 seconds after the last impulse (the second in the example) the LED will emit another flash to request the input of the next figure (the zero).



P4A25AL01

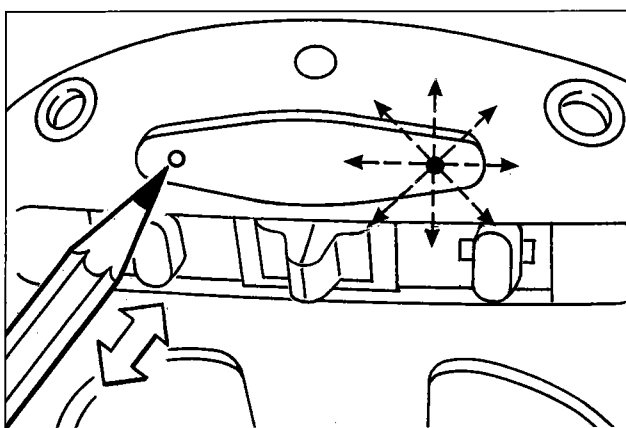
0 impulses

7. When a "zero" appears in the password, the button in the receiver should not be pressed, but you should wait for a new request to enter the figure indicated by the flashing.



P4A23AL02

8. After about 2 seconds the LED will emit another flash to request the input of the last figure (the 3).



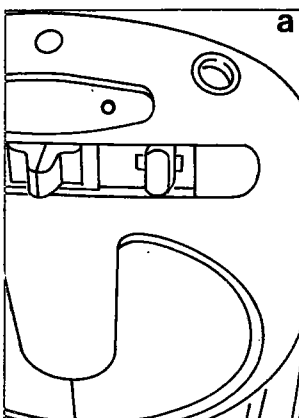
P4A24AL01

3 impulses

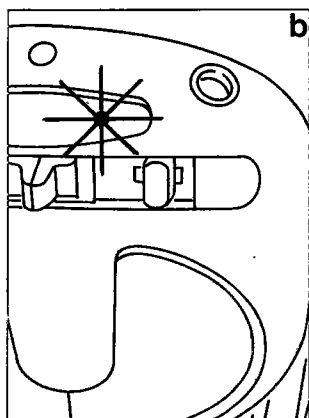
9. Immediately press the button for the receiver as many times as indicated by the last digit of the password (for example: 3 times); it should be noted that for each impulse the LED will come on briefly to give a visual confirmation.

After having entered the four figures of the password, the LED in the receiver may behave in the following way:

- come on flashing (for 10 secs); this indicates that the Password has been entered correctly and belongs to one of the codes for the remote controls programmed;
 - come on constantly for several seconds (10 secs) to indicate that the password has not been correctly entered or that it does not correspond to any of the codes for the remote controls programmed. If this is the case, after the LED goes out, the correct password should be reintroduced starting from point 1;
- when the password has been correctly entered, the memory will be "closed".



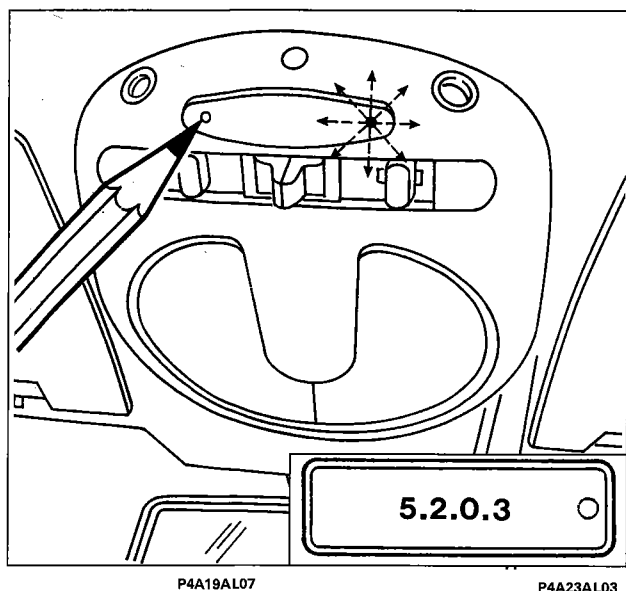
P4A25AL02



P4A25AL03

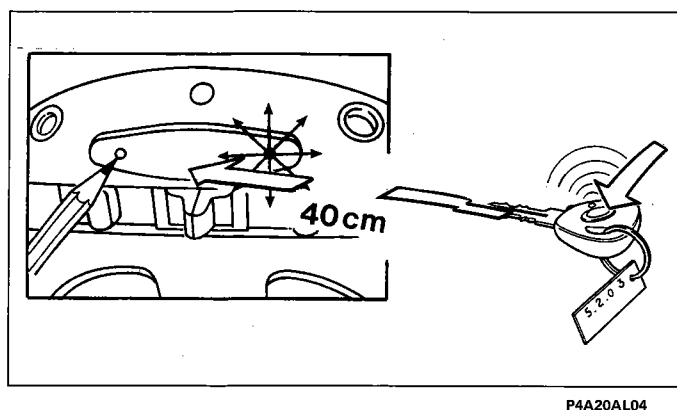
CHECKING THAT THE MEMORY IS CLOSED

If a remote control is programmed with the memory closed, as illustrated below, at the end of the operations the LED will remain off indicating that the operation has not been accepted.

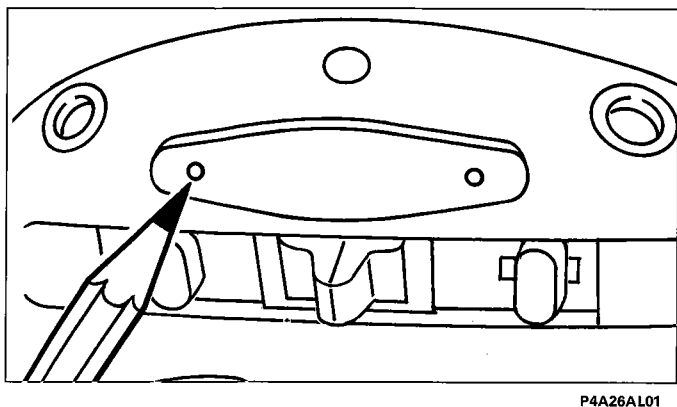


For example

1. Press the programming button in the receiver. The LED for the receiver will start to flash indicating "waiting to receive a code".



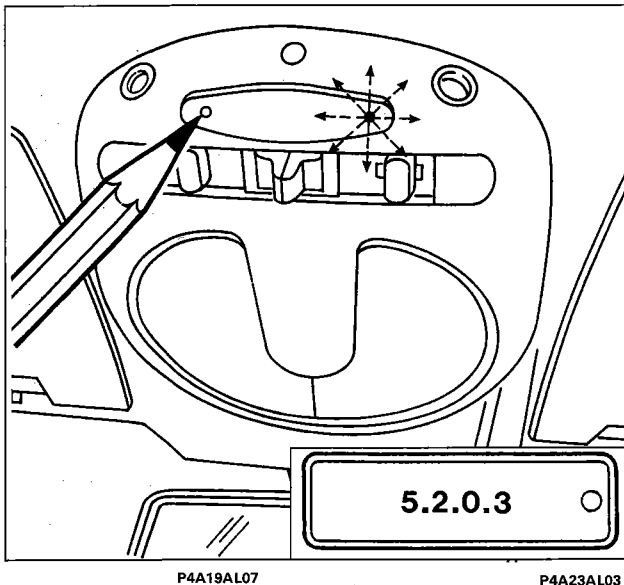
2. The operator, still keeping the receiver button pressed, should press and release the button for one of the remote controls which come with the vehicle (keeping it about 40 cm away).



3. After having transmitted the new code the LED in the courtesy light will stop flashing indicating the failure of the operation. If this is the case, in order to enter the code for a new remote control it is necessary to use the code programming with manual access.

PROGRAMMING CODES WITH MANUAL ACCESS

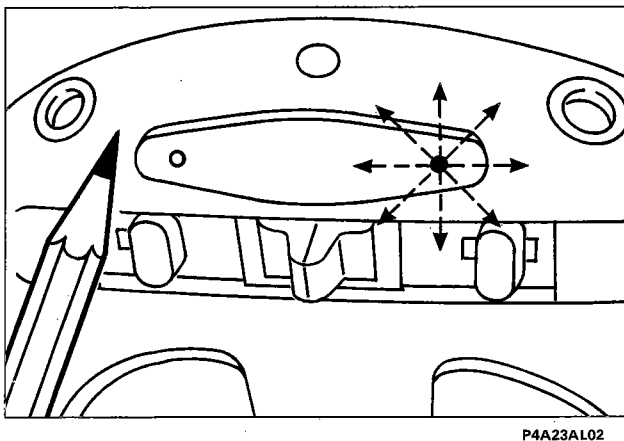
From the moment the memory is "closed", the introduction of further remote control codes takes place by "manually opening the memory". This opening should be carried out following the instructions given in points 1 to 12 working in rapid succession.



Start of manual opening of the memory (entering a known password)

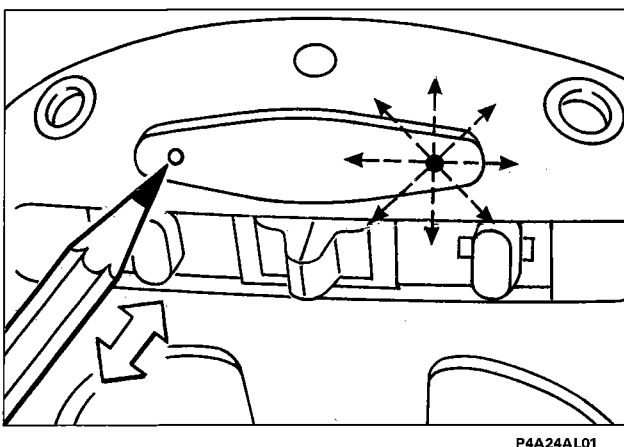
- The method for entering the password is as follows:

1. Press the button in the receiver for around 2 seconds: the LED should flash.

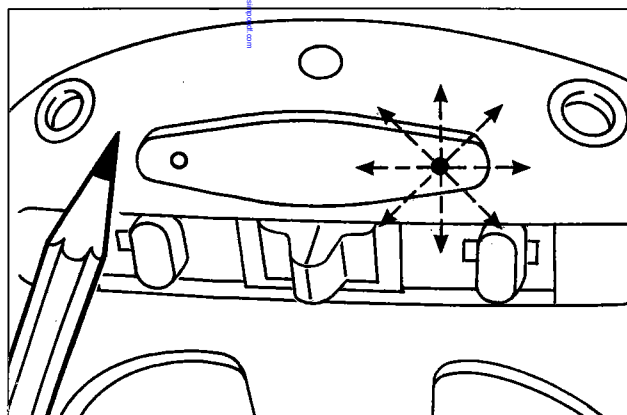


2. Release the button: after about 2 seconds the LED will flash briefly indicating that it is possible to introduce the first figure of the password.

5 impulses

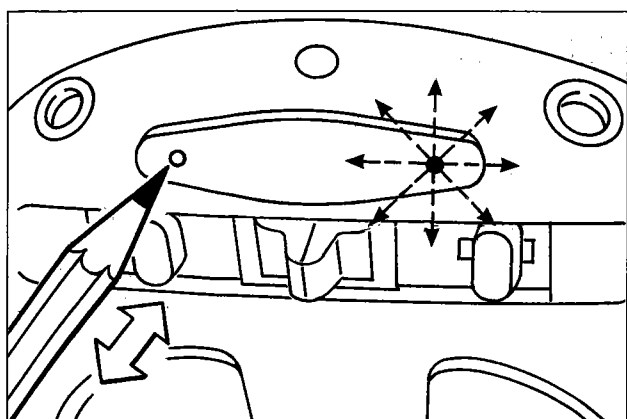


3. Immediately press the button for the receiver as many times as indicated by the first digit of the password (for example: 5 times); it should be noted that for each impulse the LED will come on briefly to give a visual confirmation.



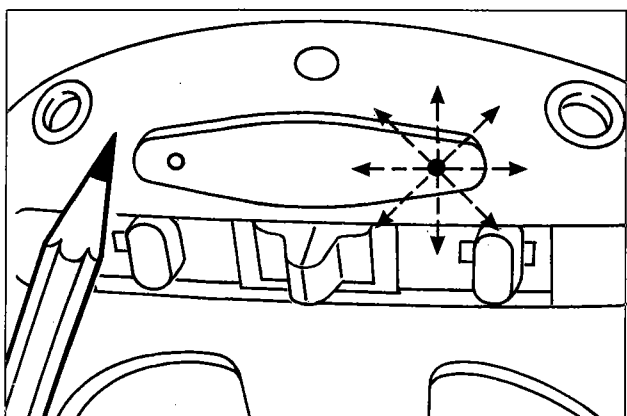
4. About 2 seconds after the last impulse (the fifth in the example) the LED will emit another flash to request the input of the next figure (the 2).

2 impulses



P4A24AL01

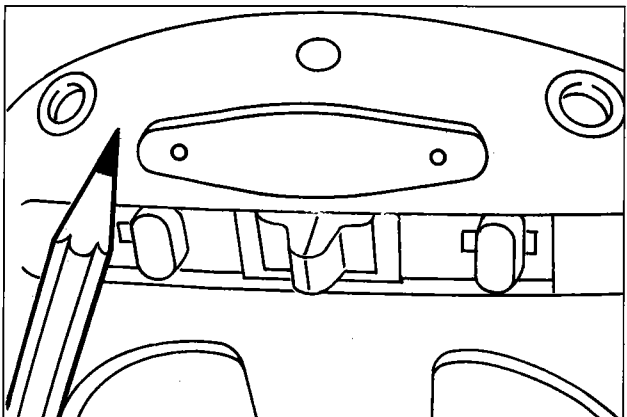
5. Immediately press the button for the receiver as many times as indicated by the second digit of the password (for example: 2 times); it should be noted that for each impulse the LED will come on briefly to give a visual confirmation.



P4A23AL02

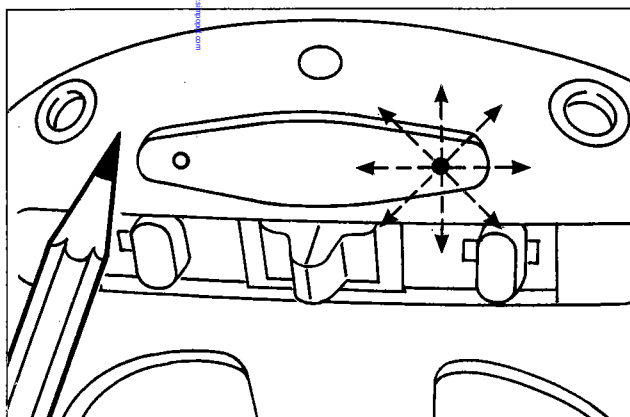
6. About 2 seconds after the last impulse (the second in the example) the LED will emit another flash to request the input of the next figure (the zero).

0 impulses



P4A25AL01

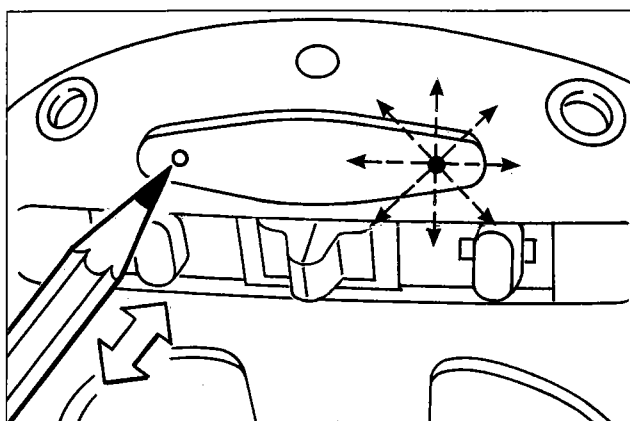
7. When a "zero" appears in the password" the button in the receiver should not be pressed, but you should wait for a new request to enter the figure indicated by the subsequent flashing.



P4A23AL02

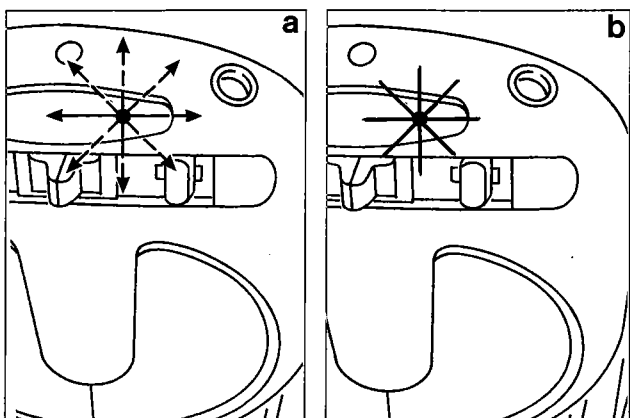
8. After about 2 seconds the LED will emit another flash to request the input of the last figure (the 3).

3 impulses

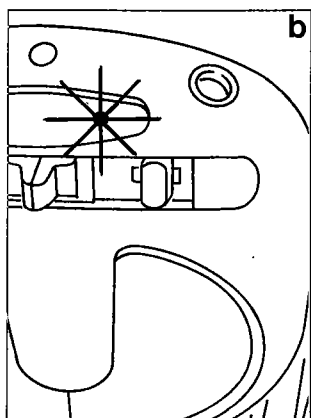


P4A24AL01

9. Immediately press the button for the receiver as many times as indicated by the last digit of the password (for example: 3 times); it should be noted that for each impulse the LED will come on briefly to give a visual confirmation.



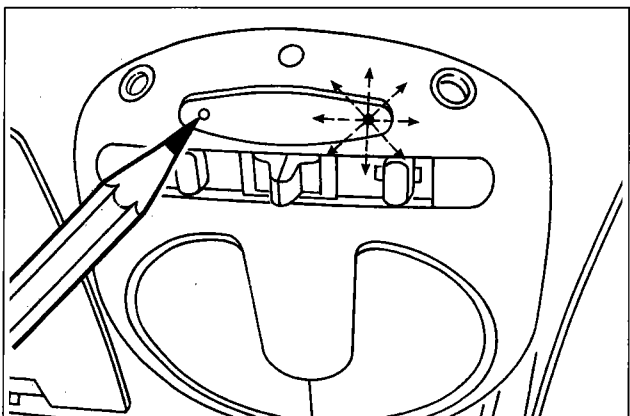
P4A29AL01



P4A25AL03

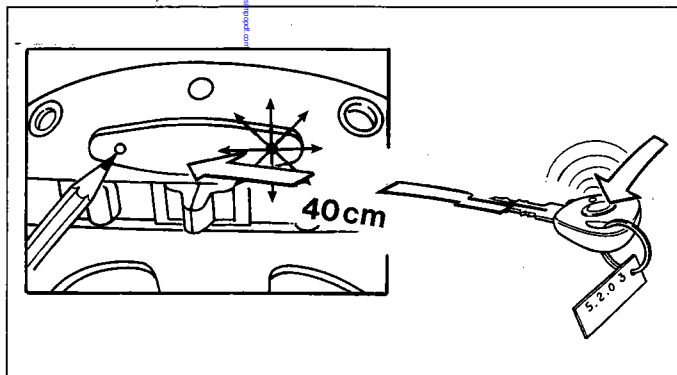
After having entered the four figures of the password, the LED in the receiver should behave in the following way:

- a) it should start to flash for 10 secs if the password has been correctly entered (opening of the memory);
- b) it should come on constantly for 10 seconds to indicate that the password has not been correctly entered or that it does not correspond to any of the codes for the remote controls programmed. If this is the case, after the LED goes out, the correct password should be reintroduced starting from point 1.



P4A19AL07

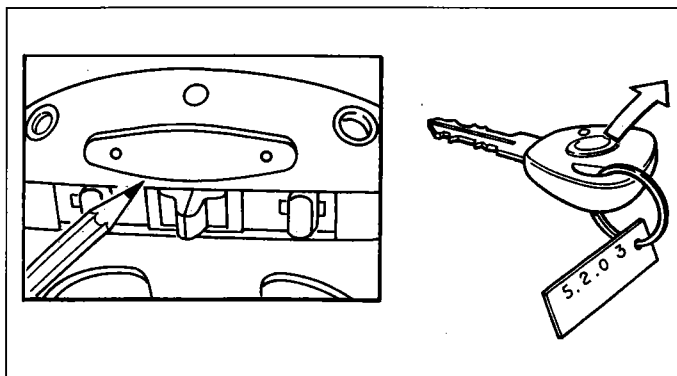
10. Whilst the LED is flashing, press the button in the courtesy light and keep it pressed; the LED should continue to flash.



P4A20AL04

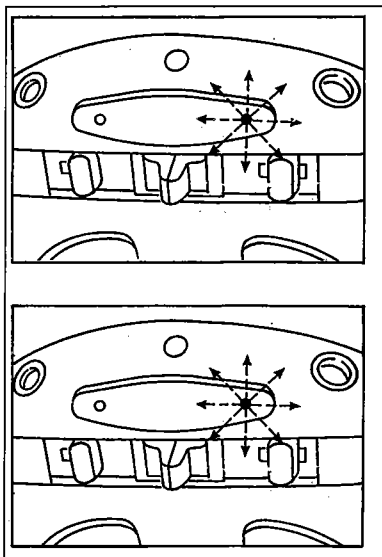
11. Still keeping the receiver button pressed, the operator should hold the new remote control about 40 cm away; then they should press and release the remote control button.

The LED in the courtesy light should come on constantly signalling that the code has been programmed.



P4A20AL05

12. Release the button: the LED in the courtesy light should GO OFF.



P4A21AL01

x 6 = OK

x 18 = NOT OK

At the end of the procedure if the LED:

- FLASHES 6 times then the code has been correctly programmed;
- FLASHES 18 times, then this means that the serial line between the receiver and the alarm is broken.



After having entered the new remote control code the memory becomes closed again automatically. In order to enter a new remote control repeat the procedure from point 1.

ELECTRONIC AUTO-SWITCHING ON FUNCTION (Belgian and United Kingdom markets only)

Vehicles with electronic alarms for the Belgian and United Kingdom markets are equipped with a **"passive"** auto-switching on function. This function ensures that the alarm is automatically switched on shortly (28 seconds) after the vehicle is left by the user.

The surveillance in the **"passive"** operating mode is exactly the same as for the normal one, it can be activated via the remote control, but the doors are not locked.

The automatic switching on takes place 28 seconds after the following conditions are established:

- ignition key turned from ON to OFF;
- opening and subsequent closing of the last door.

The opening of the driver's door or the bonnet lid, before the delay period (28 seconds) has elapsed, stops the counting. The counting starts again from zero when the door/lid is closed.

In order to regain possession of the vehicle after the auto-switching on, the user should press the button in the transmitter remote control once.

NOTES AND SPECIAL FEATURES

The alarm system is capable of signalling any irregularities in the system to the User by the LED coming on constantly or flashing. The transmitter signals that the battery is discharged by its own LED flashing once quickly when the remote control button is pressed.

1. When switching on:

- LED on constantly to indicate faults in the volumetric sensor circuits;
- LED on intermittently slowly for faults with the door and lid buttons;

2. When switching off:

- impulse cycles (number of impulses from 1 to 10) to indicate the cause of the alarm (see decoding in table 2 on page 150).

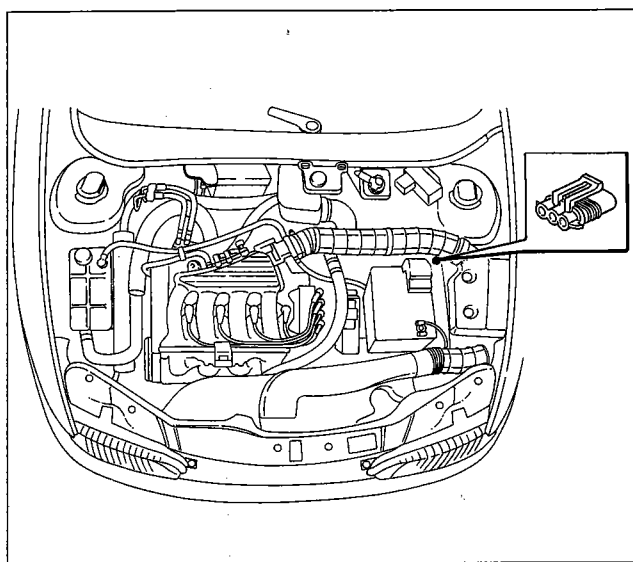
If the LED signals irregularities, the User should seek assistance from the Fiat Service Network.

The LED coming on constantly indicates that the remote control batteries are discharged.

The signal lasts around 2 minutes.



It should be borne in mind that each individual component (in the alarm system) fitted on the vehicle becomes an integral part of it, therefore it should not be fitted or tested on other vehicles, even if they are the same model.



Location of alarm system diagnostic socket

FAULT DIAGNOSIS**Fault diagnosis with the Fiat-Lancia Tester**

The system is equipped with a special diagnostic socket for connection with the Fiat-Lancia-Tester.



Before connecting the Fiat-Lancia-Tester make sure that the emergency switch key is in the ON position.

Alarm

55.

Autodiagnosis

When switched on the system carries out an autodiagnosis which can be recognized by the LED flashing at 4 Hz and if there is a problem or fault in the system, the LED will signal it in accordance with the methods described in table 1.

Table 1. Autodiagnosis display

BLINK CODES	MEANING
8 Hz, duration 2.5 secs	Door/bonnet/boot left open or switch faulty
Light constant, duration 2.5 secs	Volumetric sensors faulty

If a fault is detected for the volumetric sensors, then the appropriate sensor is excluded from the surveillance and an audible warning signal (beep) is emitted a second after switching on.

When it is switched off, the system indicates, via the flashing of the LED, which sensor has set off the alarm during the surveillance (see table 2).

Table 2. Signalling cause of alarm

N° of IMPULSES	MEANING
1 impulse	Right front door
2 impulses	Left front door
3 impulses	Right rear door
4 impulses	Left rear door
5 impulses	Additional sensors - volumetric sensors
6 impulses	Bonnet
7 impulses	Boot
8 impulses	+15
9 impulses	+30
10 impulses	At least 3 causes of alarm
Light constant	Transmitter battery discharged

The blink codes are given in order.

These codes have an interval of 1.5 seconds between them.

Manual diagnosis

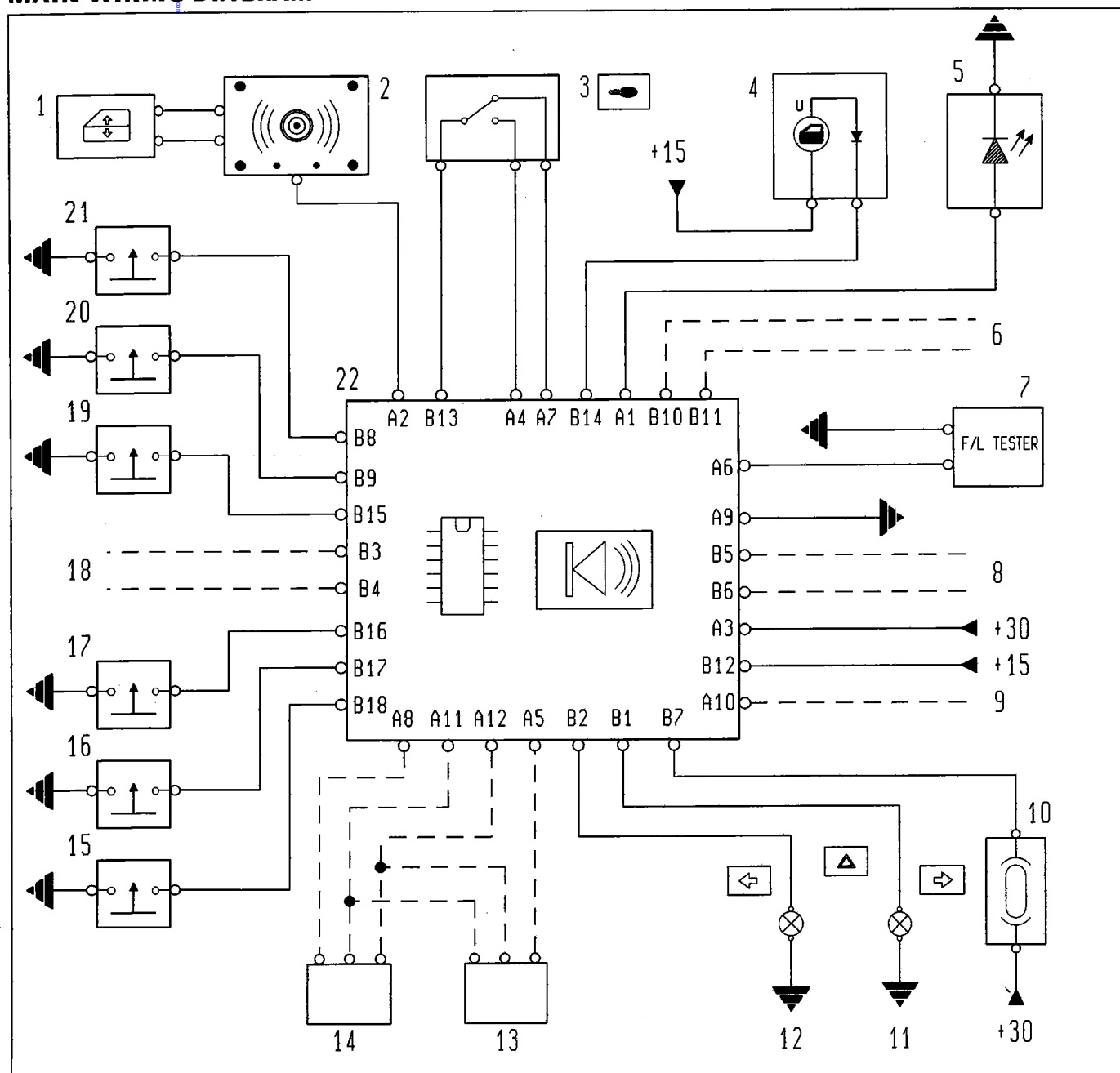
It is also possible to carry out a MANUAL DIAGNOSIS by opening the lid and turning the ignition key from the ON position to the OFF position; the lid protective button must be pressed within 15 seconds 7 times in rapid succession in less than 10 seconds; 5 beeps will signal the start of the manual diagnosis procedure. After 10 seconds the LED or the direction indicators will flash once.

By entering into this mode the autodiagnostic procedure for the volumetric sensors connected to the control unit will automatically be activated.

If the test does not indicate irregularities, then the direction indicators will flash 3 times and there will be 3 beeps of the alarm.

After this first stage, each time the state of the switches is altered there will be a corresponding quick flash of the direction indicators and a beep, accompanied by the LED in the centre console flashing. If the key is turned to the ON position, the alarm will sound briefly (500 msecs) and the direction indicators will flash (2.5 secs).

This last operation indicates the exit from manual diagnosis procedure. It is also possible to leave the MANUAL DIAGNOSIS by not carrying out any actions for 30 seconds: the exit is signalled by the direction indicators coming on for around 2.5 secs and a beep.

MAIN WIRING DIAGRAM


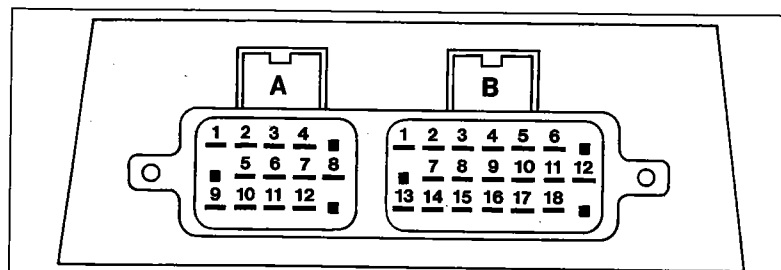
P4A36AL01

- | | |
|--|--|
| 1. Central locking control unit | 12. Left direction indicators |
| 2. Courtesy light with receiver, ultrasound sensors | 13. Anti-lifting |
| 3. Ignition switch | 14. Expansions |
| 4. Check panel | 15. Switch signalling bonnet lid open |
| 5. Warning-light (LED) signalling anti-theft device on | 16. Switch signalling boot lid open |
| 6. Function for twin LED (function not activated) | 17. Switch signalling right rear door |
| 7. Diagnostic socket for Fiat-Lancia-Tester | 18. Preparation for relay (inhibiting diesel pump electrostop, heater plugs/+15 injection wiring, fuel pump) |
| 8. Preparation for relay (outlet +50 starter motor supply) | 19. Switch signalling left rear door |
| 9. Preparation for serial line (injection control unit) | 20. Switch signalling right front door |
| 10. Anti-theft device 15A protective fuse | 21. Switch signalling left front door |
| 11. Right direction indicators | 22. V.A.S. anti-theft device control unit |

INPUT AND OUTPUT SIGNALS FROM THE ANTI-THEFT DEVICE CONTROL UNIT

PIN	I/O	I Max (A)	FUNCTION
B1	OUT	6	Relay n.a. contact: right direction indicators operation
B2	OUT	6	Relay n.a. contact: left direction indicators operation
B3	OUT	8	Preparation for relay n.c. contact: inhibition of diesel pump electrostop + heater plugs / +15 injection wiring / petrol pump
B4	IN	8	Preparation for relay n.c. contact: +15 for B3
B5	OUT	8	Preparation for relay n.c. contact: outlet +50 starter motor supply
B6	IN	8	Preparation for relay n.c. contact: +50 for B5 and B10
B7	IN	12	Direction indicators relay common contact: +30 direction indicators supply
B8	IN	*	Left front door open (=closed) switch
B9	IN	*	Right front door open (=closed) switch
B10	OUT	0,04	Preparation for two coloured LED operation
B11	IN	0,04	Preparation required for operating two coloured LED by Fiat CODE
B12	IN	2	Positive controlled by the ignition (+15)
B13	IN	*	Remote key: common
B14	OUT	0,3	Operation of check: signalling door/s open
B15	IN	*	Switch signalling left rear door open (=closed)
B16	IN	*	Switch signalling right rear door open (=closed)
B17	IN	*	Switch signalling boot lid open (=closed)
B18	IN	*	Switch signalling bonnet lid open (=closed)
A1	OUT	0,04	Operation of (two coloured) LED flashing
A2	I/O	*	VAS serial line from courtesy light
A3	IN	*	Direct positive supply (+30)
A4	IN	*	Remote key: internal supply
A5	OUT	0,03	Anti-lifting modules positive supply
A6	I/O	*	Line K-Fiat tester
A7	OUT	*	Remote key: external supply
A8	OUT	0,03	Volumetric modules supply positive
A9	IN	2	VAS control unit earth
A10	I/O	*	Preparation for serial line (supply control unit)
A11	OUT	0,06	External modules earth
A12	IN	*	Alarm signal from external modules (low = alarm)

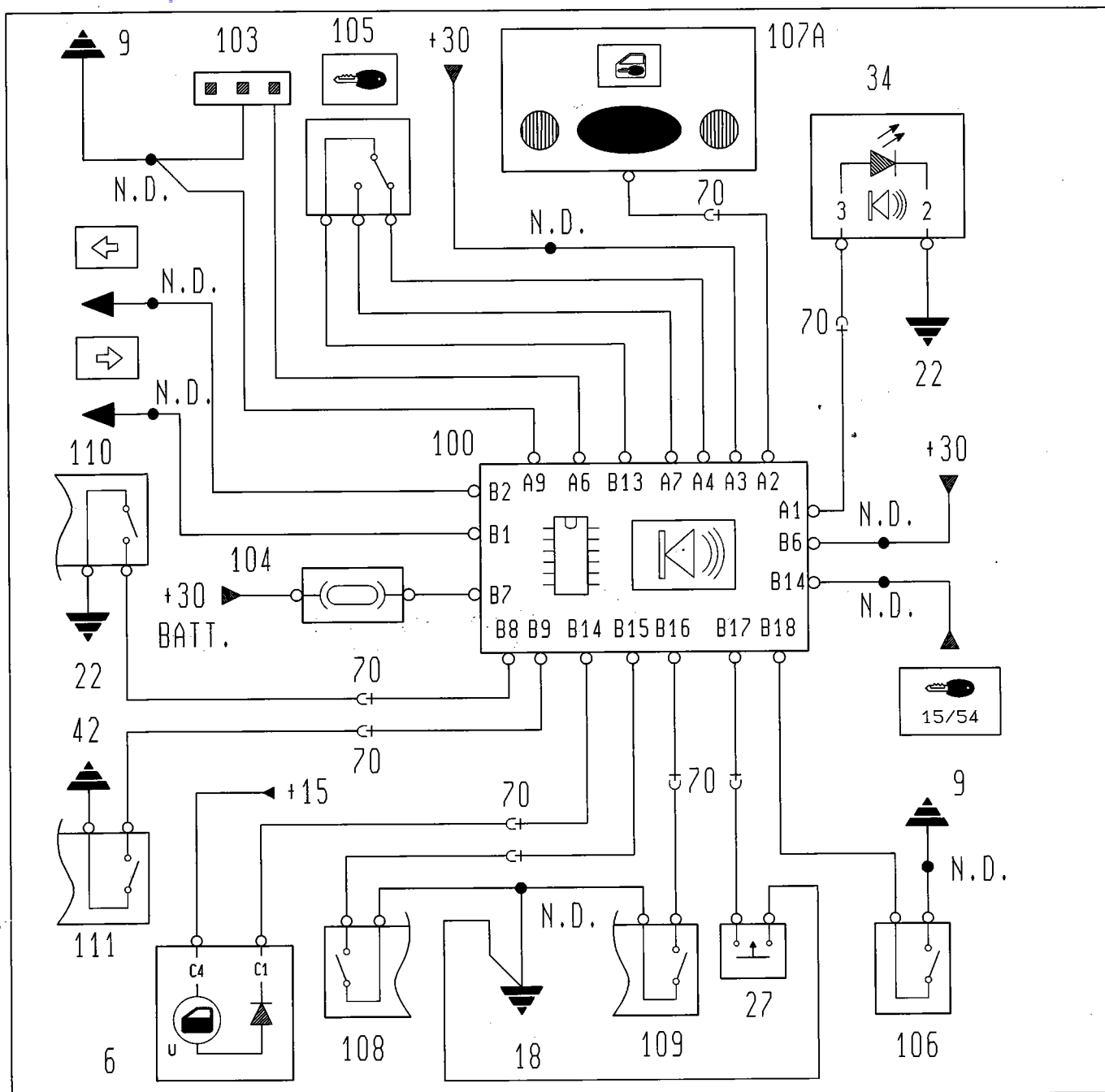
* Signal current > 0,3 mA, < 10mA.



P4A35AL01

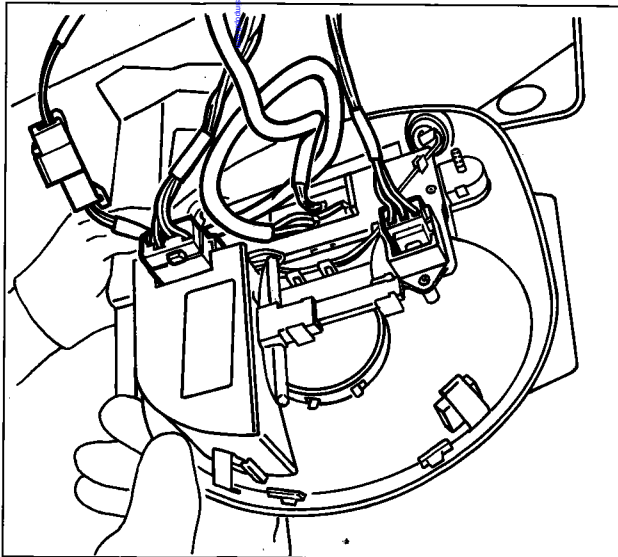
Alarm control unit input and output signals

WIRING DIAGRAM

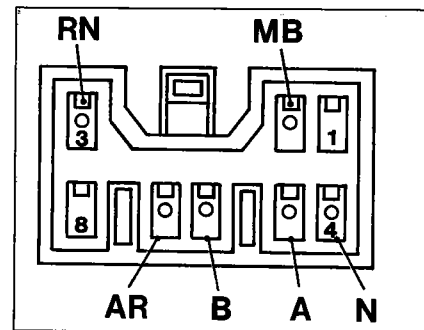


P4A37AL01

- | | |
|---|--|
| 6. Instrument panel | 103. Diagnostic socket for alarm |
| 9. Right front earth | 104. Alarm 15A protective fuse |
| 18. Left rear earth | 105. Alarm off switch |
| 22. Left dashboard earth | 106. Alarm on switch |
| 27. Contact board for rear connections with luggage compartment light switch incorporated | 107A. Central locking remote control receiver |
| 34. Switch unit: alarm warning light on | 108. Left rear central locking/alarm on switch |
| 42. Right dashboard earth | 109. Right rear central locking/alarm on switch |
| 70. Connection for dashboard cables/front | 110. Left front central locking/alarm on switch |
| 100. Alarm electronic control unit | 111. Right front central locking/alarm on switch |



P4A031L05

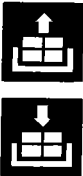


P4A35AL02

RECEIVER CONNECTOR

The receiver is a module housed in the roof of the vehicle behind the courtesy light, which has an 8 way connector with the following connections:

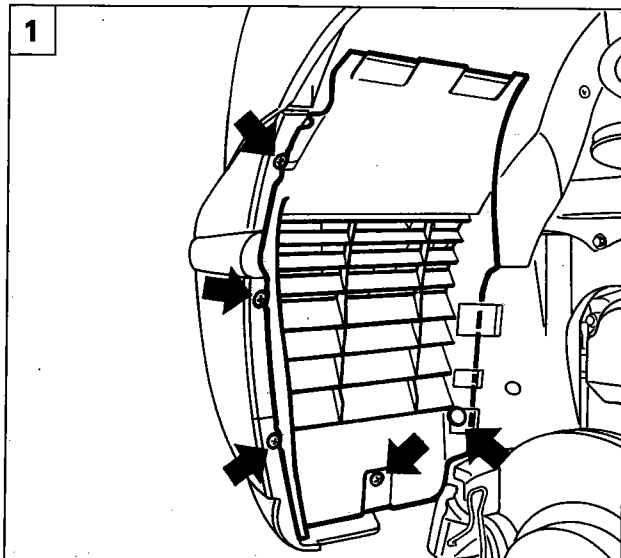
1. Not connected
2. Serial line towards the anti-theft device
3. Positive from battery (+30)
4. Earth
5. Command to central locking to unlock
6. Command to central locking to lock
7. Positive from ignition switch (+15)
8. Not connected



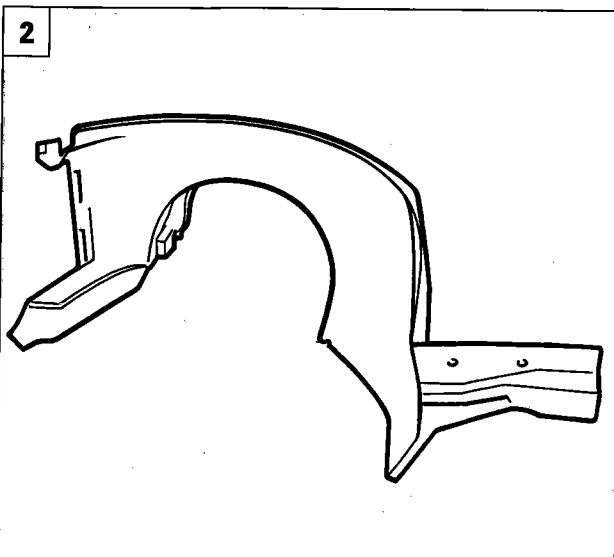
REMOVING-REFITTING ALARM CONTROL UNIT

Position the vehicle on a lift and remove the left wheel.

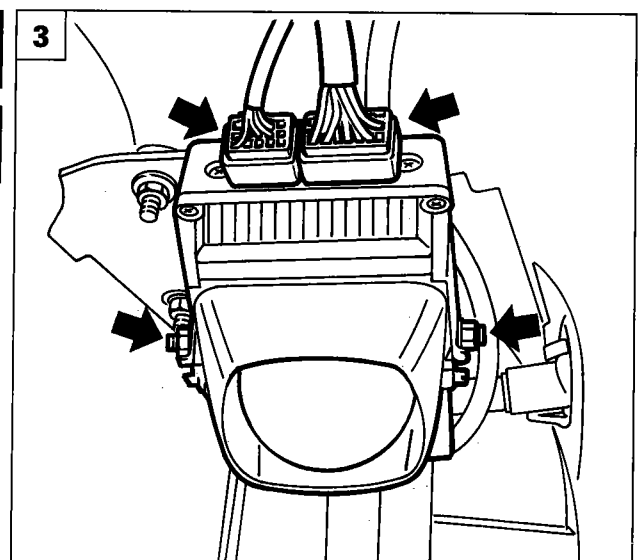
1. Undo the fixing bolts and remove the front section of the wheel arch liner.
2. Undo the fixing bolts and remove the remaining part of the wheel arch liner.
3. Disconnect the electrical connections, undo the nuts shown and remove the alarm control unit from the vehicle.



P4A154L01



P4A154L02



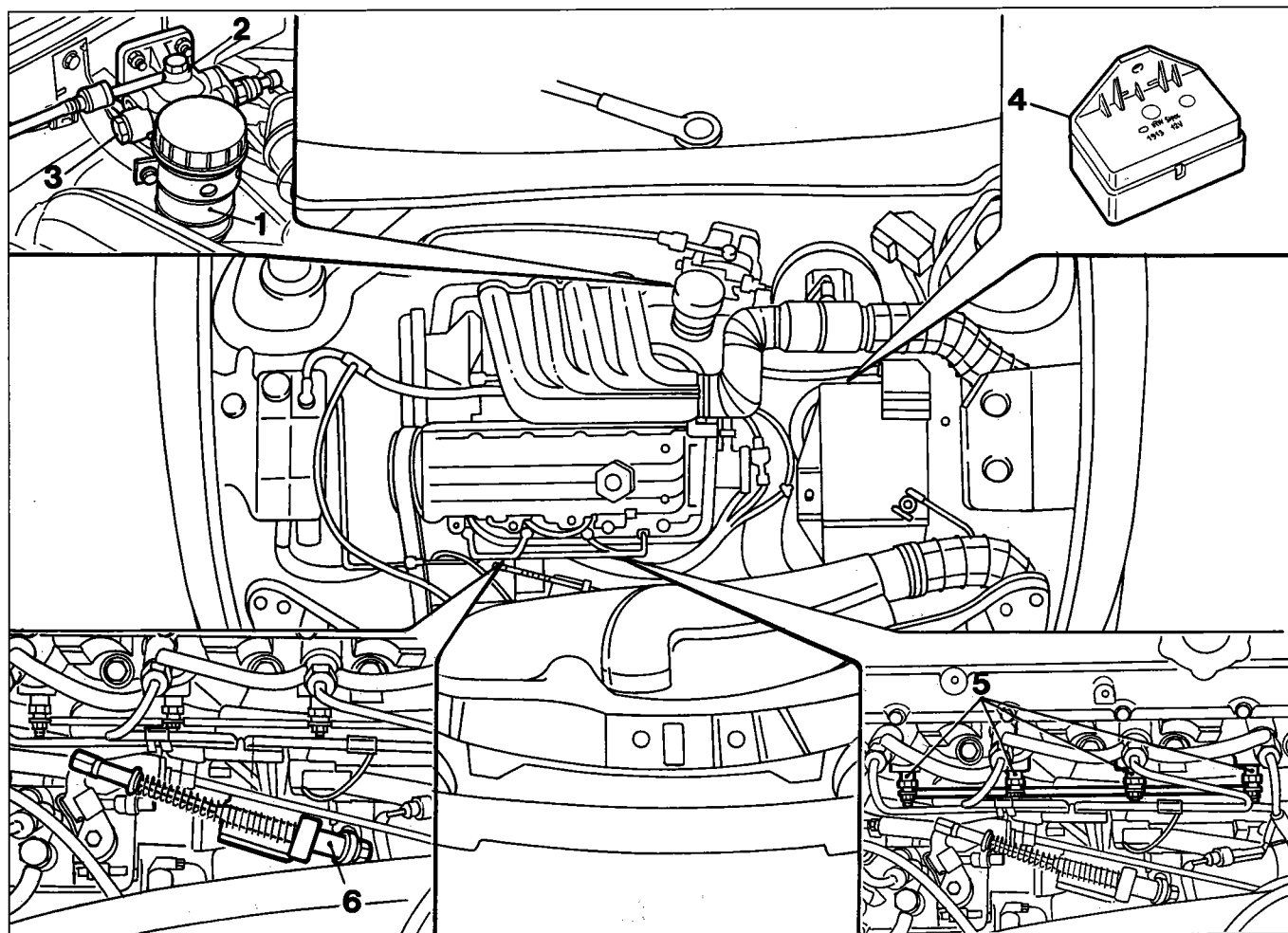
P4A154L03

INTRODUCTION

The preheating control system brings the temperature of the prechambers up to a temperature to permit self-ignition, and it consists of the following components:

- a preheating electronic control unit located in the engine compartment;
- four rapid glow plugs;
- a wait-to-start warning light located on the instrument panel.

Location of preheating components in car



P4A155L01

1. Fuel filter
2. Fuel outlet
3. Fuel inlet

4. Preheating control unit
5. Glow plugs
6. Manual device for injection advance when cold

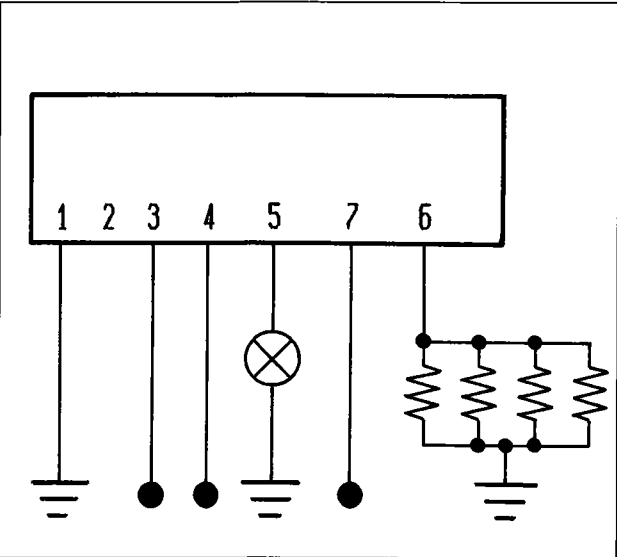
PREHEATING ELECTRONIC CONTROL UNIT

The purpose of the electronic control unit in the engine compartment is to carry out the following:

- deliver current from the battery to the spark plugs for a length of time varying in accordance with the engine compartment temperature, before starting. This temperature is recorded by a negative temperature coefficient (NTC) gauge located in the electronic control unit;
- keep the wait-to-start warning light on for a period of time depending on the engine compartment temperature (from 1.5 to 4.5 seconds at a temperature of 70°C, from 20 to 27 seconds at a temperature of -20°C);
- ensure for a so-called "distraction" time (about 20 seconds) that the glow plugs remain supplied if the engine does not start, and if the engine does start, to interrupt the delivery of current at the end of the distraction time;
- if one of the glow plugs or the current cable accidentally shorts to earth, immediately stop the delivery of current.

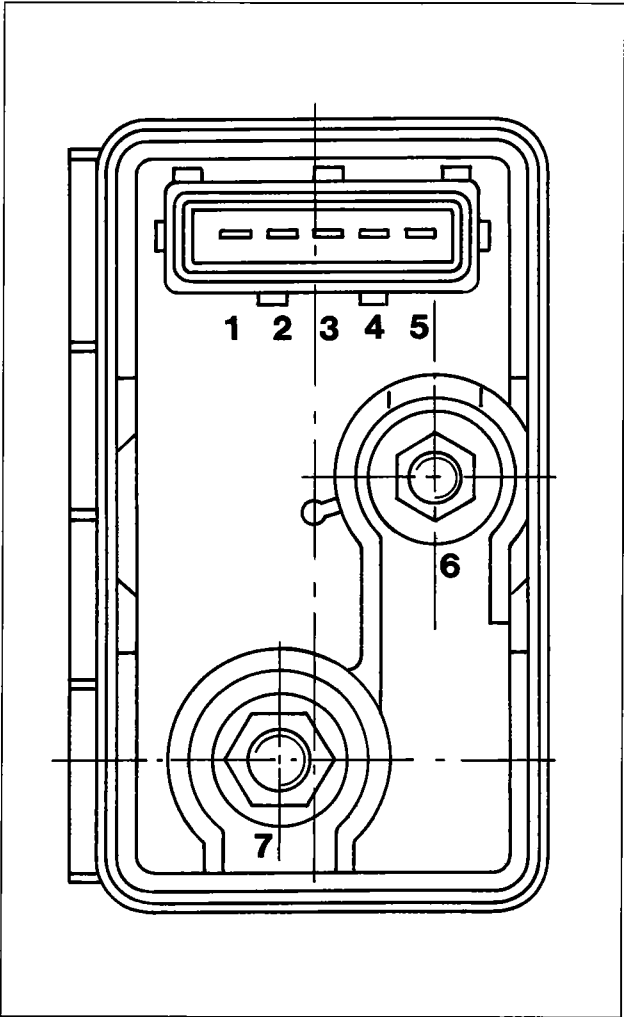
55.

Wiring diagram



P4A156L01

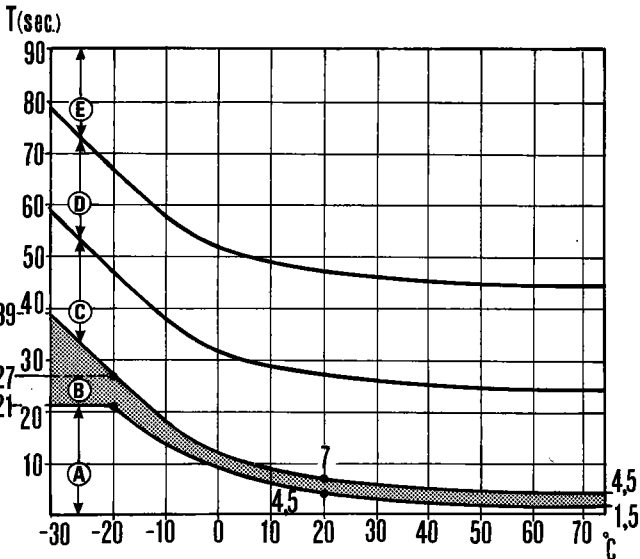
Pin No.	Wire colour	Circuit involved
1	N	Car earth
2	-	Not connected
3	C	Ignition switch (+15)
4	R	Ignition switch (+50)
5	CL	Wait-to-start warning light
6	M	Glow plugs
7	R	Battery positive



P4A156L02

Changes in preheating time of the glow plugs

- A. Time period during which the warning light is on and preheating is on.
- B. Tolerance range in which the warning light goes out, with preheating on.
- C. Period with preheating on and warning light off. This stage is characterized by a period of 15 - 20 seconds of constant intervention, and is counted from the moment when the warning light goes out.
- D. POST-HEATING period, with glow plugs on and warning light off. This stage, characterized by a period of 15 - 20 seconds of constant intervention, is counted from the end of the starting phase with the engine running.
- E. Period with warning light off and post-heating off.

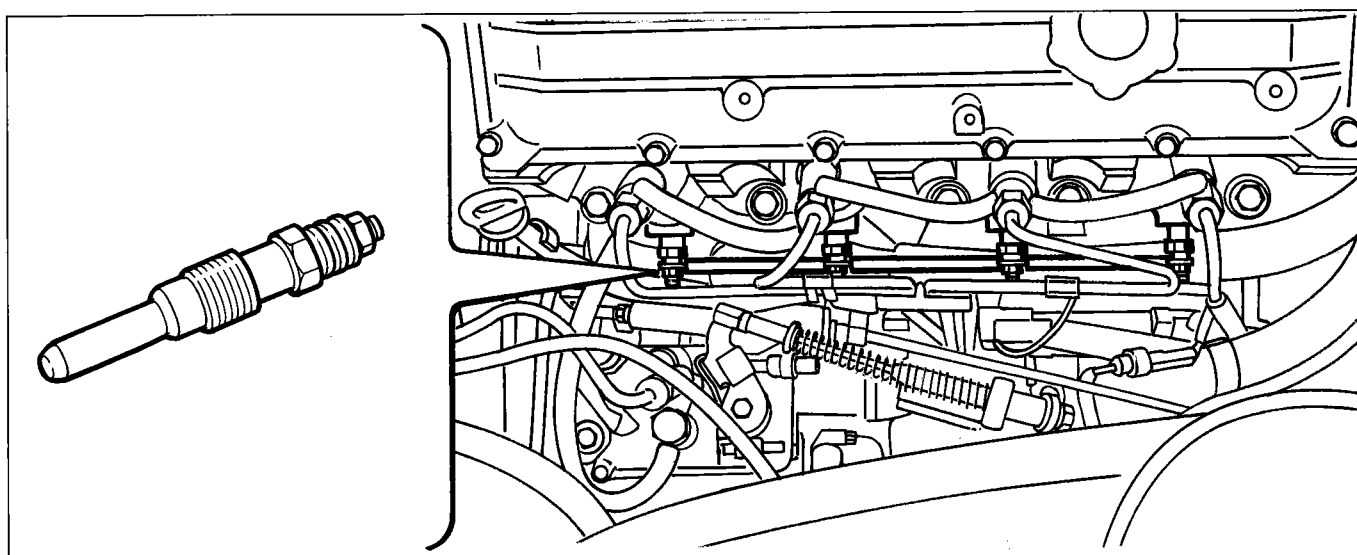


P4A156L03

CHECKING GLOW PLUGS

If there are difficulties in starting, make sure that all the plugs are working properly. The electrical continuity of each plug should be checked using a digital ohmmeter ($\text{Ohm}=0.6$ at 20°C). It is advisable to carry out this check with the plugs fitted to the cylinder head, as the faulty plug may not appear to be faulty if checked when dismantled from its seating, without the deforming effect caused by the pressure of assembly. Also check that the engine stop solenoid on the fuel injection pump is not short-circuited, broken or disconnected.

NOTE Remember that difficulties in starting may be due to an engine with excessively worn seals, a faulty starter motor or a discharged or badly connected battery.

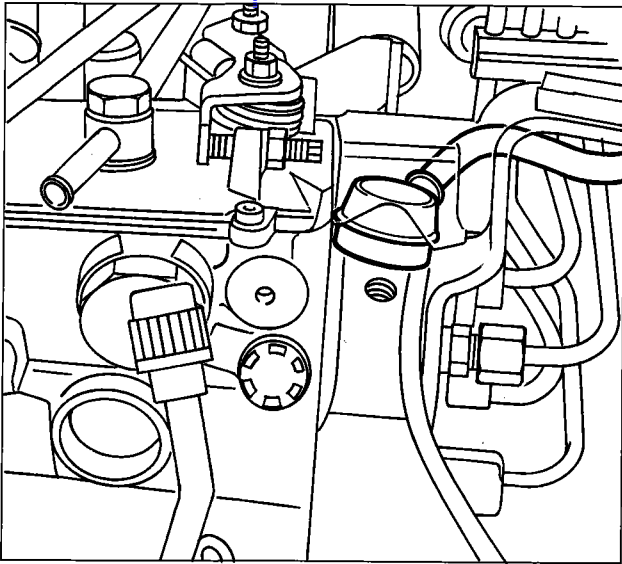


P4A157L01

MAIN OPERATING FAULTS IN THE PREHEATING SYSTEM

Fault	Cause	Remedy
Wait-to-start warning light does not come on	Warning light bulb blown Connecting cable between warning light and pin 5 of the control unit broken	Replace bulb Clean corroded cable ends or replace cable
The engine has difficulty in starting	Faulty control unit giving insufficient preheating times	Replace control unit
The engine does not start	Electronic control unit not earthed One or several plugs faulty Circuit between ignition switch and tag terminal 3 (+15) of control unit broken Circuit between ignition switch and engine stop solenoid on pump broken Ignition switch faulty	Check that pin 1 of the control unit is earthed Replace faulty plugs Restore the connection Replace ignition switch

55.



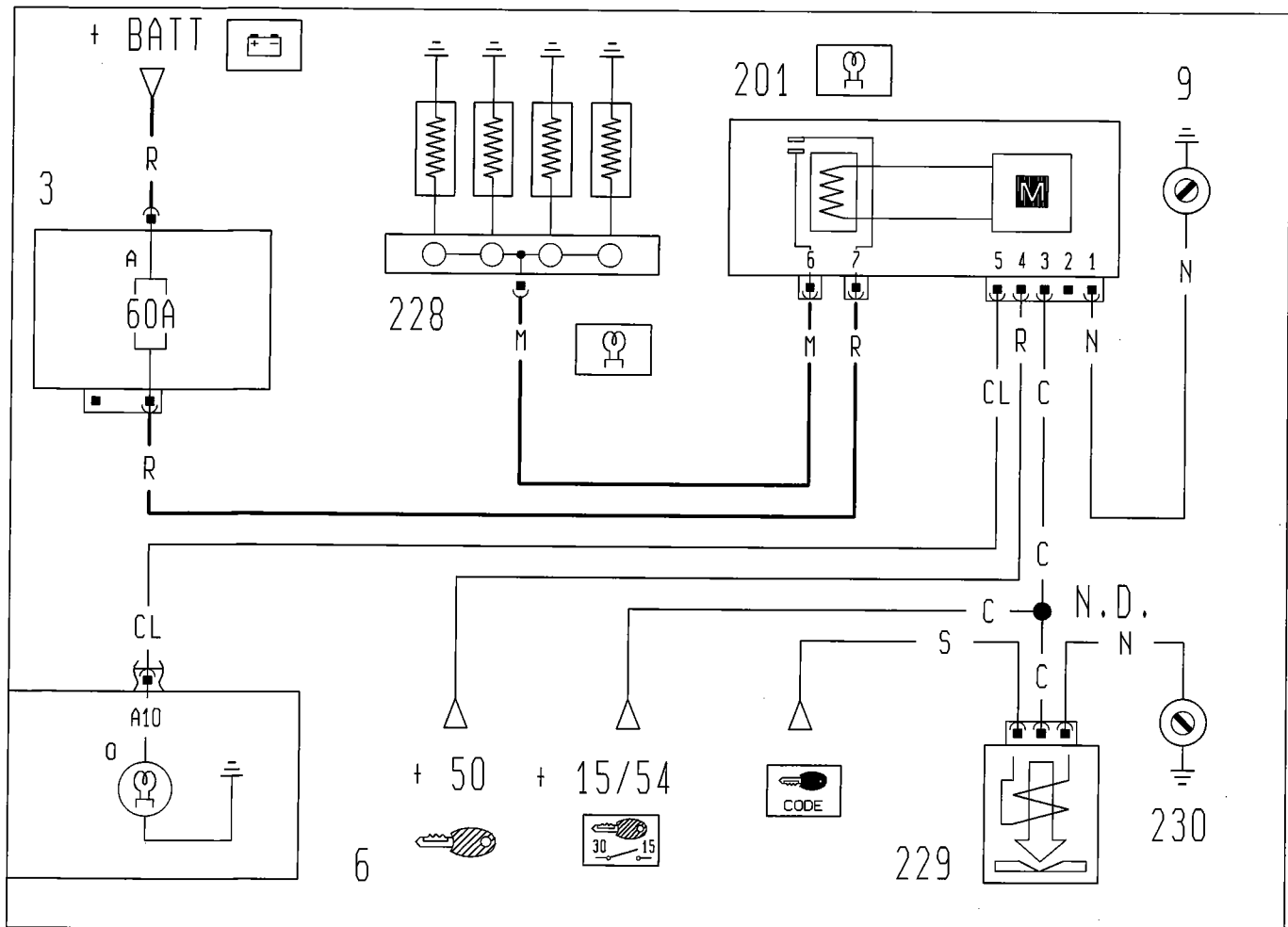
ENGINE CUT-OUT SOLENOID

Checking operation of engine cut-out solenoid (on fuel injection pump)

Turn the ignition on to energize the engine cut-out solenoid on the fuel injection pump. The sound of the solenoid clicking should be perceived from the engine compartment. If not, check the operation of the solenoid and, if this is satisfactory, check whether the connecting cable between the ignition switch and engine cut-out solenoid is broken.

Wiring diagram

P4A158L01

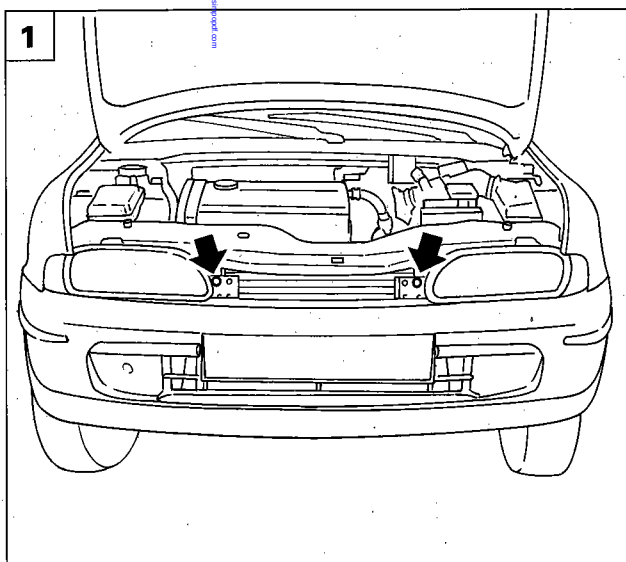


P4A158L02

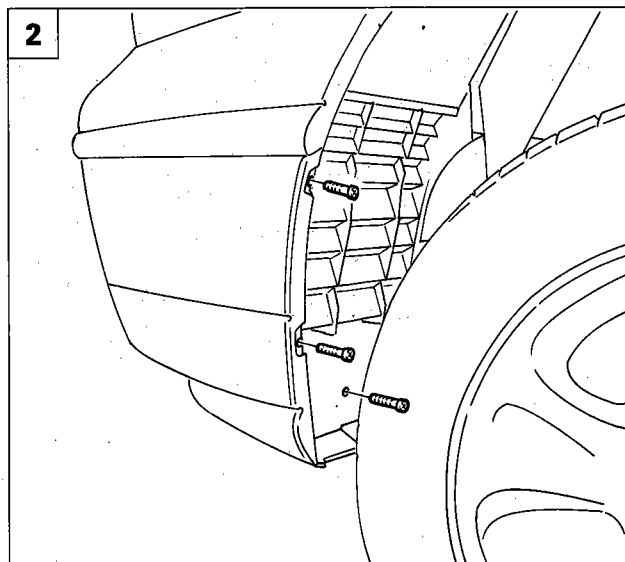
- 3. Power fusebox
- A. 60A fuse protecting fuel injection system
- 6. Instrument panel
- O. Heater plugs warning light
- 9. Front right earth

- 201. Preheating control unit
- 228. Glow plugs
- 229. Engine cut-out electrostop (Fiat code)
- 230. Earth for Fiat code
- N.D. Ultrasound-soldered joint taped in wiring loom

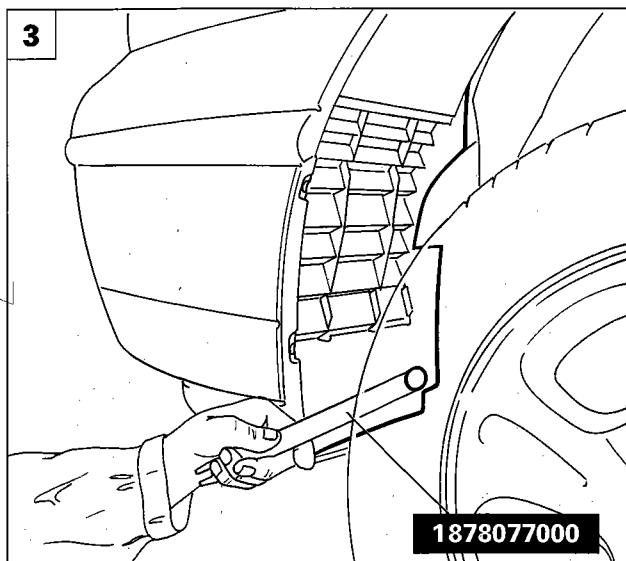
	page		page
BUMPERS		SEAT BELT PRETENSIONER	
- Front bumpers	1	- Introduction	37
- Rear bumpers (5D)	2	- Operation	37
- Rear bumpers (3D)	3	- Removal setting bracket	38
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- Removing-refitting panel and protective door trim	5	WINDOW GLASSES	
- Removing-refitting door outer handle	6	- Introduction	45
- Replacing door lock barrel	6	- Equipment	45
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- Removing-refitting door opening mechanism	7	- Replacing rear window glass (3D) (rear window)	53
- Removing-refitting descending window glass	8	- Replacing rear window glass (5D) (rear window)	55
- Removing-refitting window mechanism	8	- Replacing rear quarter light	57
- Removing-refitting door mirror	9		
- Removing-refitting door finish trim	10	SUN-ROOF	
- Removing-refitting door moulding	10	- Introduction	59
REAR DOOR		- Removing-refitting roof assembly	61
- Removing-refitting panel and protective door trim	11	- Dismantling-fitting roof assembly	62
- Removing-refitting descending window glass	12	- Adjustments during refitting	63
- Removing-refitting window mechanism	12		
BONNET LID		REPLACING BODY PANELS	
- Removing-refitting bonnet lid	13	- Introduction	64
- Adjustments	13	- Graphic index	65
- Removing-refitting engine bay catch striker	14	- Symbols	66
- Removing-refitting windscreen washer pipes	14	- Front wing	67
- Removing-refitting front grille	14	- Replacing rear wing (3D)	69
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TAIL-GATE		- Replacing door sill rail	85
- Removing-refitting tail-gate (5D)	15	- Replacing vehicle roof panel	89
- Removing-refitting tail-gate (3D)	16	- Replacing rear beam trim (3D)	93
- Adjustments	17	- Replacing rear beam trim (5D)	97
- Removing refitting tail-gate lock	18	- Replacing tail-light cluster compartment (3D)	101
- Replacing lock barrel (5D)	18		
- Replacing lock barrel (3D)	19	REPLACING STRUCTURAL PANELS	
SEATS		- Graphic index	105
- Removing-refitting front seat	20	- Symbols	106
- Dismantling-fitting front seat covers	21	- Replacing front beam trim	107
- Removing-refitting front seat guides	24	- Replacing front side assembly	111
- Removing-refitting seat raise device	24/1	- Replacing front pillar	117
- Removing-refitting rear seat	24/2	- Replacing central pillar (5D)	121
- Dismantling-fitting one-piece rear cushion	24/3	- Replacing door sill rail front reinforcement (3D)	125
- Dismantling-fitting one-piece rear squab	24/4	- Replacing door sill rail rear reinforcement (3D)	129
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- Removing-refitting rear side panel (3D)	25	- Specified dimensions	137
- Roof panel trim	26	REPLACING STRUCTURAL PANELS	
- Roof panel trim for versions with sun-roof	29/1	- Replacing partial front side	147
- Removing-refitting dashboard	30	- Replacing rear floor pan complete with rails	152
- Removing-refitting rear belts	36		



P4A001M01



P4A001M02



P4A001M03

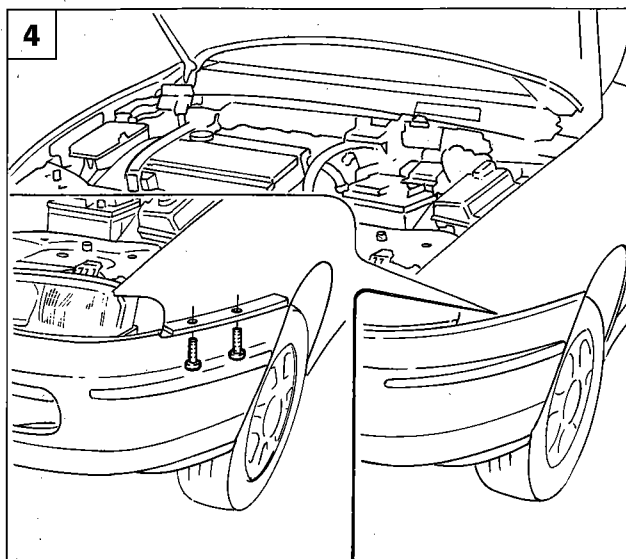


FRONT BUMPER

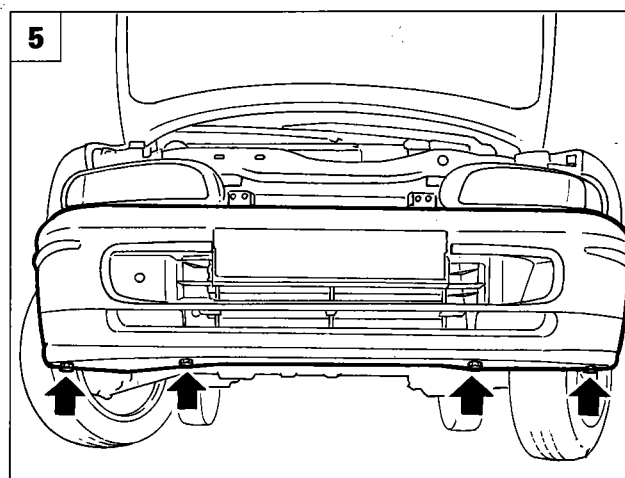
Removing-refitting

1. Raise the bonnet lid, then undo the upper bolts fixing the bumpers to the front cross member cover.
2. Undo the bolts fixing the front wheel arch liner.
3. Using tool 1878077000 remove the fixing button and extract the front wheel arch liner.
4. Undo the bolts fixing the bumper to the front wing.
5. Remove the front bumper from the bodyshell, undoing the lower fixing bolts shown by the arrows.

NOTE To refit, simply reverse the order of the operations carried out for the removal.

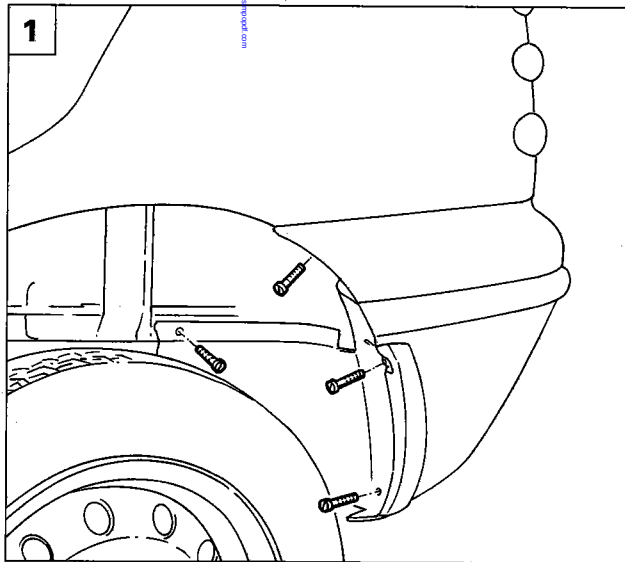


P4A001M04

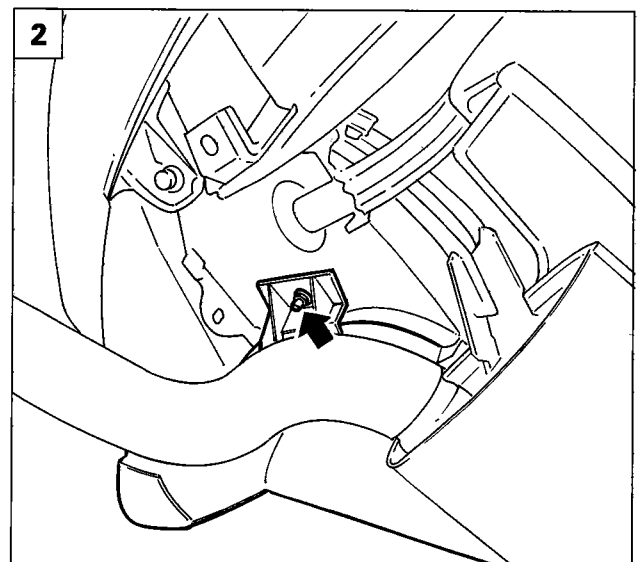


P4A001M05

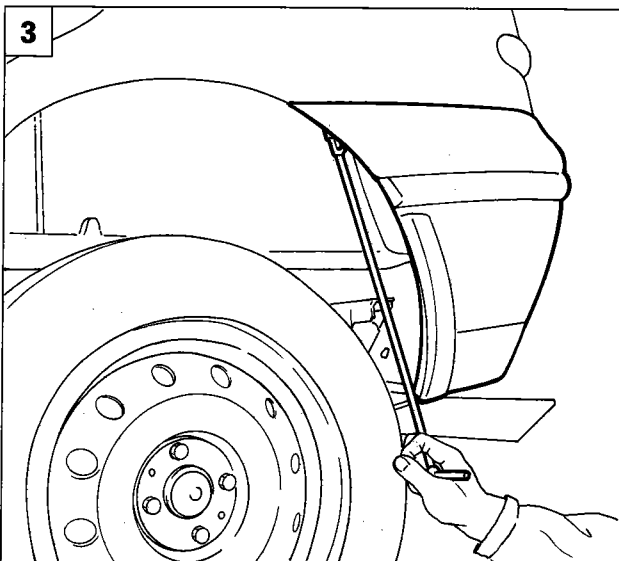
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P4A002M01



P4A002M02



P4A002M03

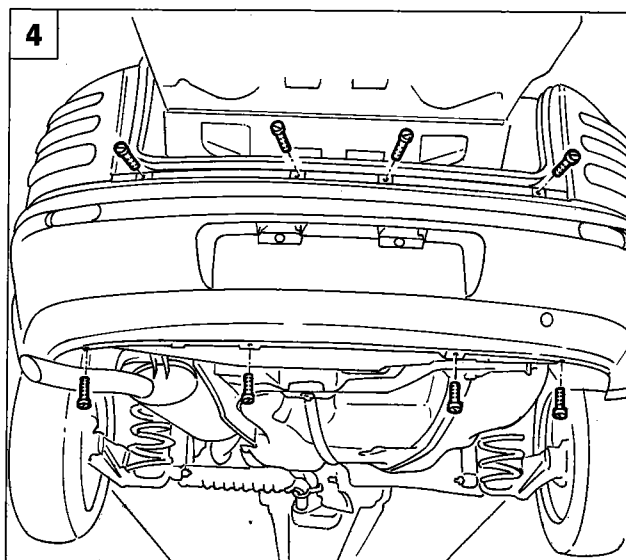


REAR BUMPER

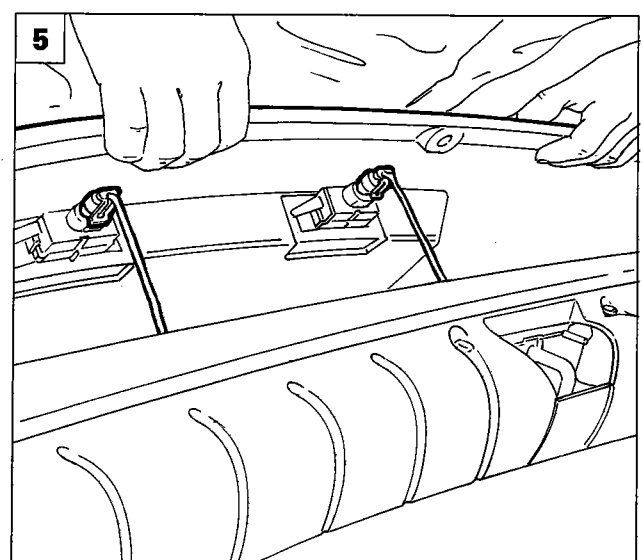
Removing-refitting

1. Undo the bolts fixing the bumpers to the wheel arch liner.
2. Remove the wheel arch liner, undoing the fixing nut shown by the arrow.
3. Undo the bolt fixing the bumpers to the rear wing.
4. Lift up the boot lid, then undo the bolts fixing the bumpers to the rear cross member cover.
5. Remove the bumpers after having disconnected the connections for the number plate lights.

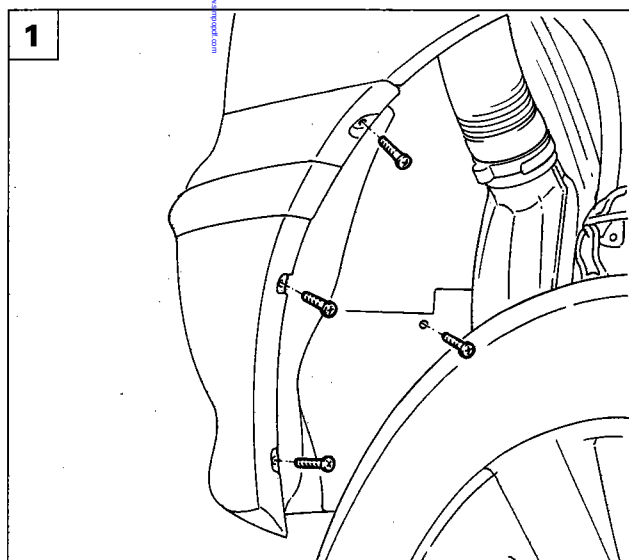
NOTE To refit simply reverse the order of the operations carried out for the removal.



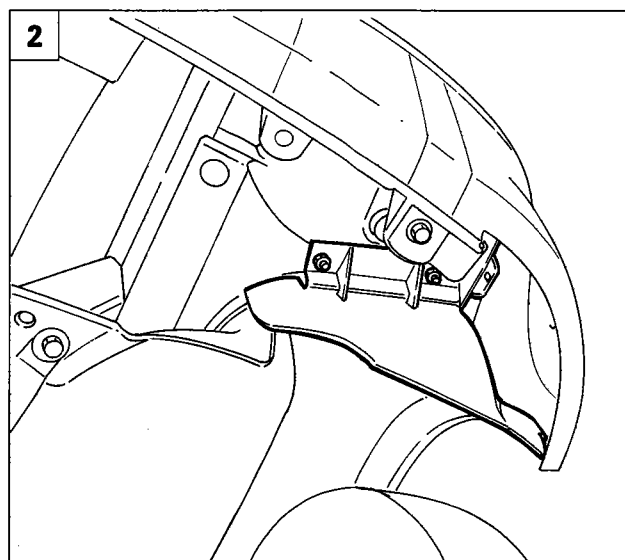
P4A002M04



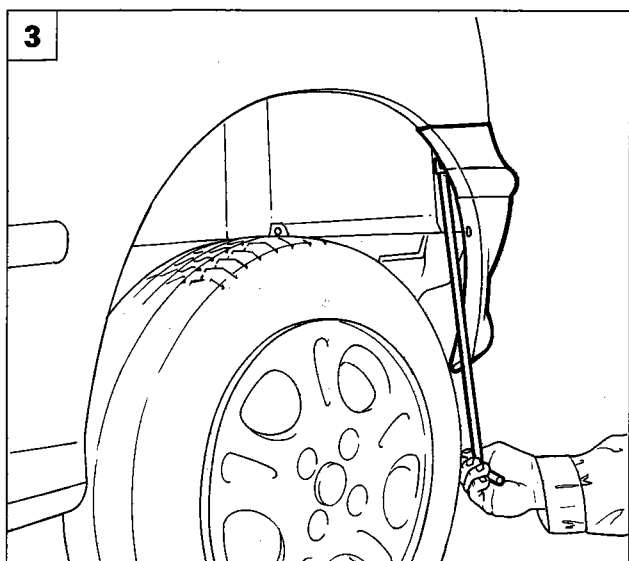
P4A002M05



P4A003M01



P4A003M02



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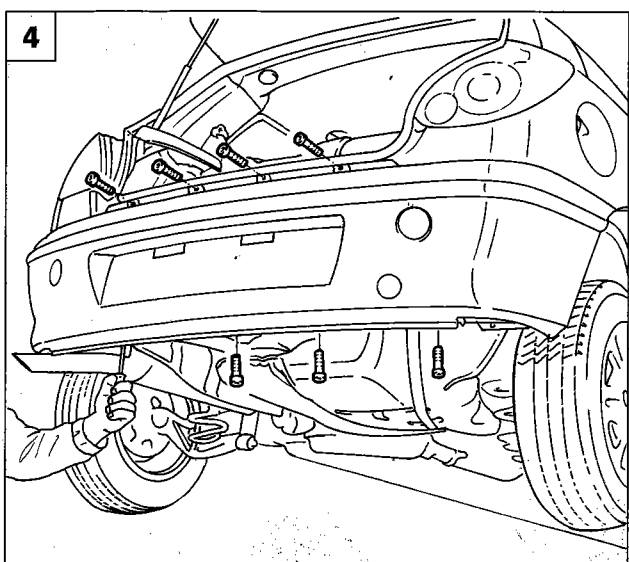


REAR BUMPER

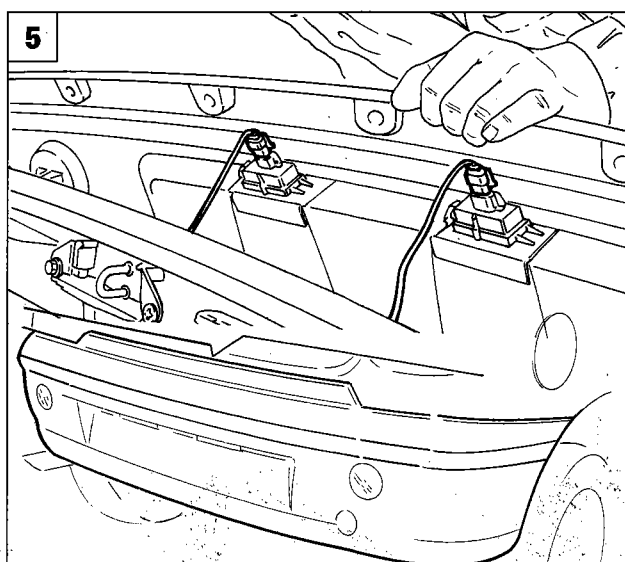
Removing-refitting

1. Undo the bolts fixing the bumper to the wheel arch liner.
2. Remove the wheel arch liner, undoing the fixing nuts.
3. Undo the bolt fixing the bumper to the rear wing.
4. Lift up the rear tailgate, then undo the bolts fixing the bumper to the rear cross member lining.
5. Remove the bumpers after having disconnected the connections for the number plate lights.

NOTE To refit simply reverse the order of the operations carried out for the removal.

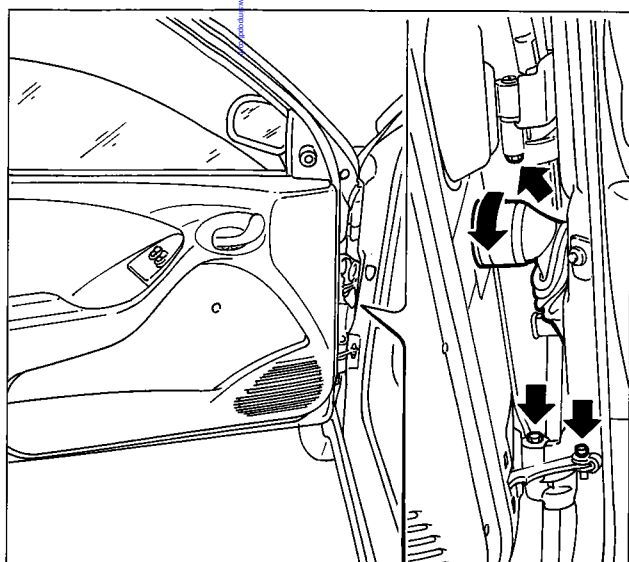


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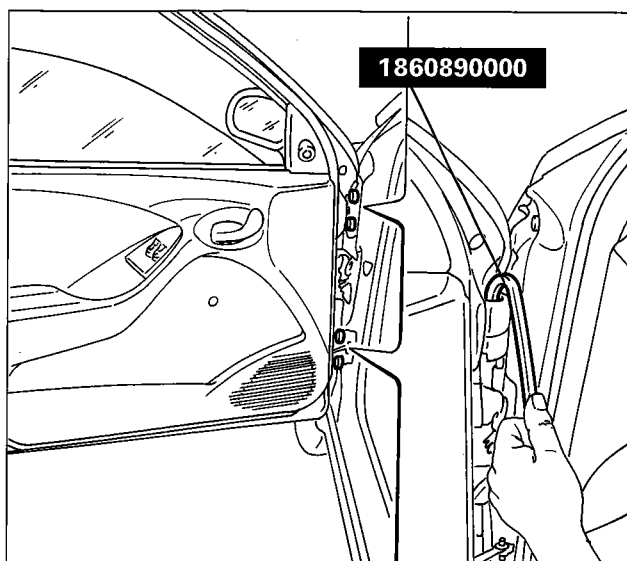
P4A004M01



REMOVING-REFITTING DOOR

- Disconnect the supply connector for the door electrical devices;
- remove the flexible pin for the door check strap, using tool 1878081000;
- remove the door after having undone the fixing bolts shown;

NOTE To refit, simply reverse the order of the operations carried out for the removal, tightening the bolts fixing the hinges to the door to the recommended torque (1.5 daNm).



P4A004M02

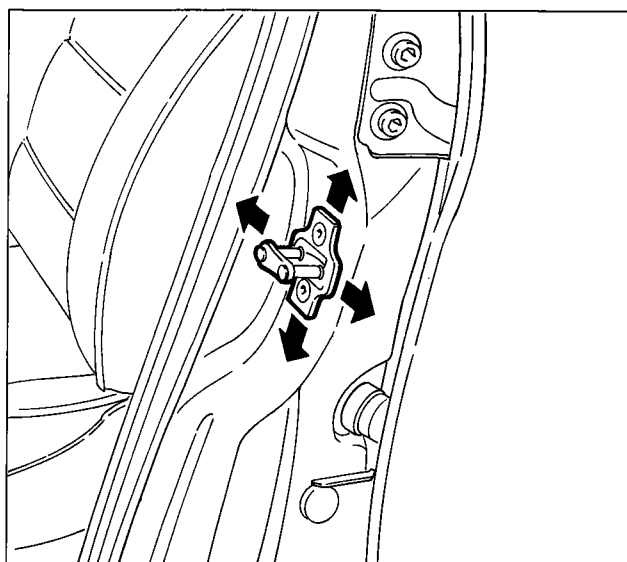


ADJUSTMENTS

Adjusting front door

- Loosen the nuts fixing the hinge to the door, using tool 1860890000.
- adjust the position of the door;
- when the adjustment has been carried out, tighten the nuts fixing the hinge to the door to the recommended torque (4.5 daNm).

NOTE The arrows indicate the possible movements for the adjustment.



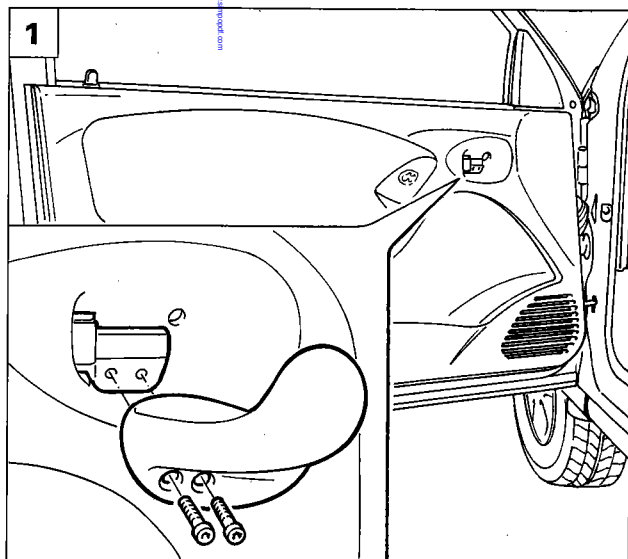
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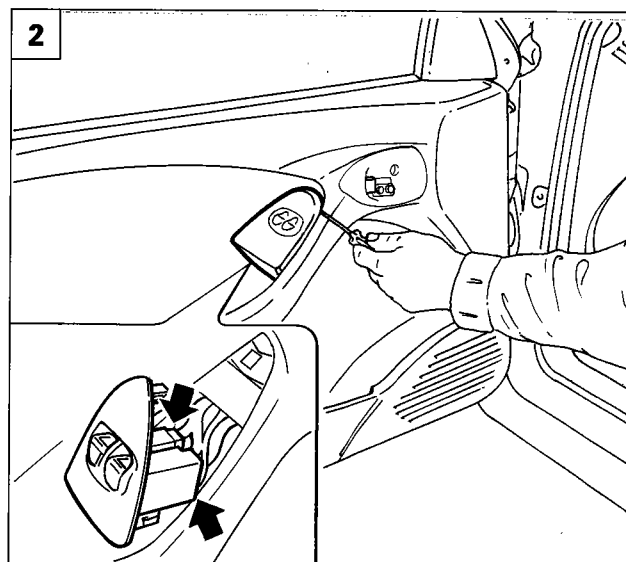
Adjusting position of door lock striker

- Loosen the bolts fixing the striker and adjust its position;
- when the adjustment has been carried out, fully tighten the striker fixing bolts.

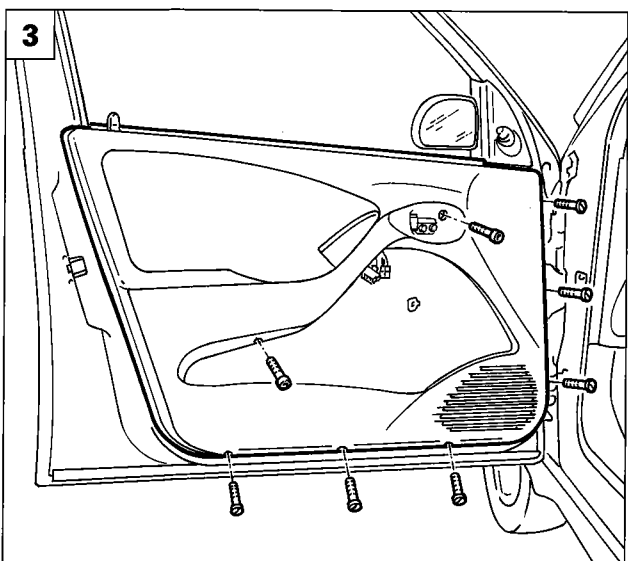
NOTE The arrows indicate the possible movements for the adjustment.



P4A005M01



P4A005M02



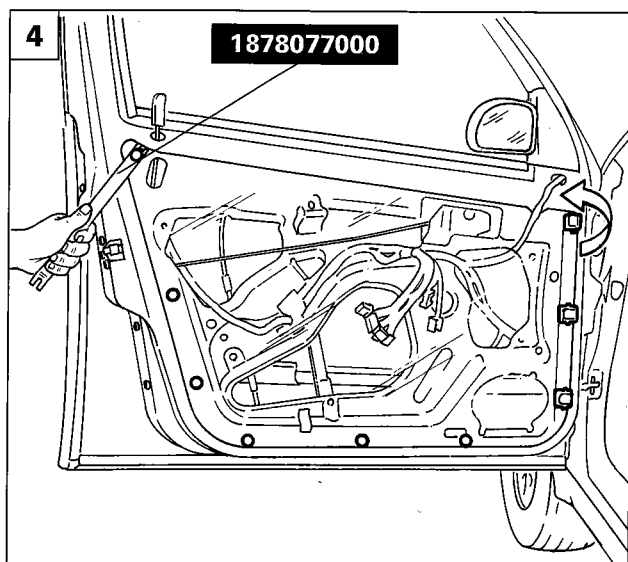
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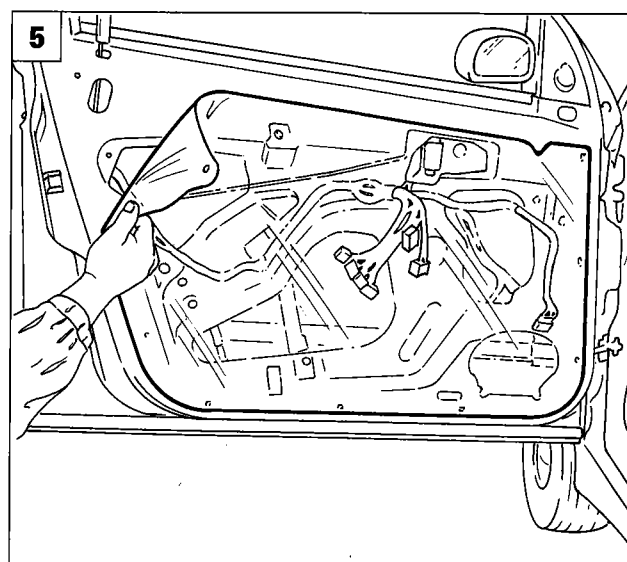
REMOVING-REFITTING DOOR PANEL AND PROTECTIVE LINING

1. Remove the door opening control lever undoing the fixing bolts shown in the diagram.
2. Remove the window opening control panel, then disconnect the relevant connections.
3. Remove the door lining panel, undoing the fixing bolts shown in the diagram.
4. Using tool 1878077000, remove the fixing buttons shown, extract the side blocks from the door, turning them as shown in the diagram.
5. Remove the protective door lining.

NOTE To refit, simply reverse the order of the operations carried out for the removal.

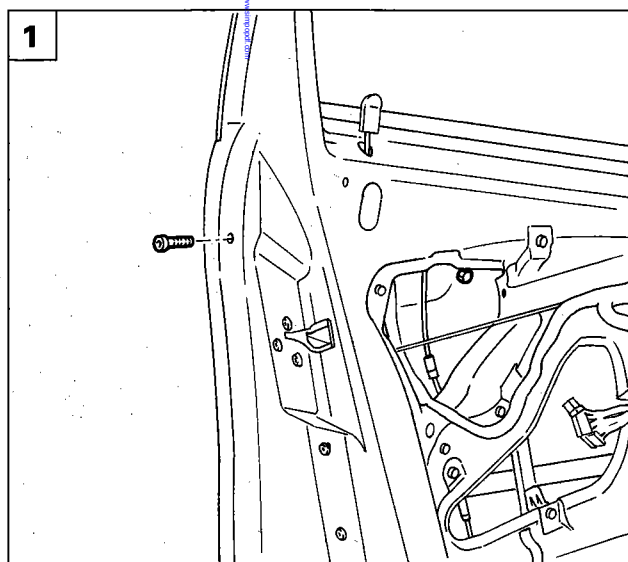


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P4A005M05

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P4A006M01

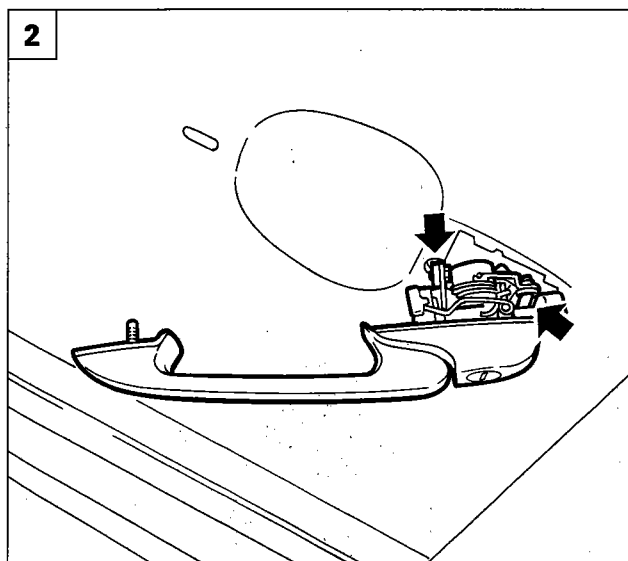


REMOVING-REFITTING OUTER DOOR HANDLE

Remove the door panel lining as described on page 5.

1. Undo the bolt and the nut fixing the handle to the door.
2. Disconnect the door opening control rods releasing them from the attachment points, then remove the handle from the door.

NOTE To refit simply reverse the order of the operations carried out for the removal.



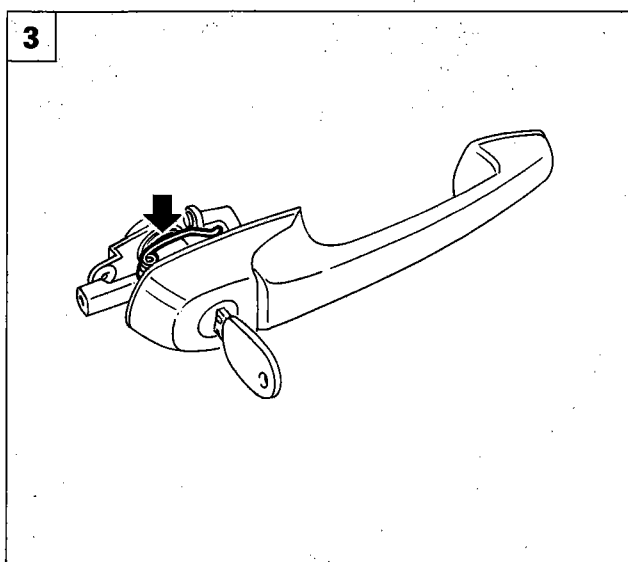
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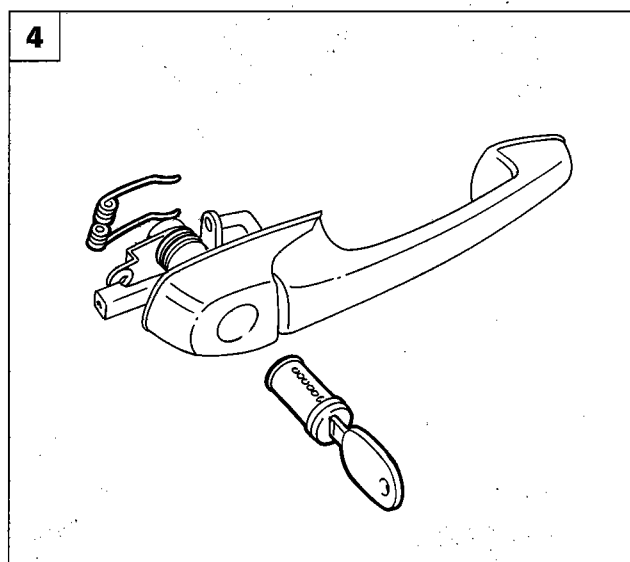
REPLACING DOOR LOCK BARREL

3. Remove the outer door handle following the instructions given above, insert the key in the lock barrel, then remove the fixing spring.
4. Remove the retaining spring, then extract the lock barrel.

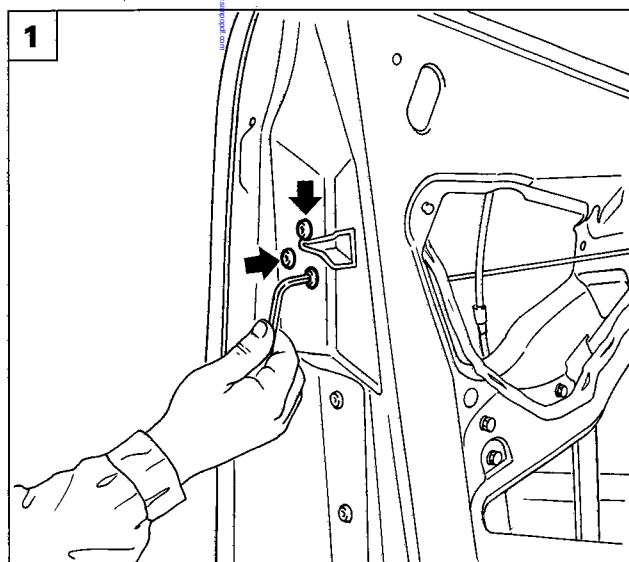
NOTE When refitting suitably reverse the order of the operations carried out for the removal.



P4A006M03



P4A006M04



P4A007M01



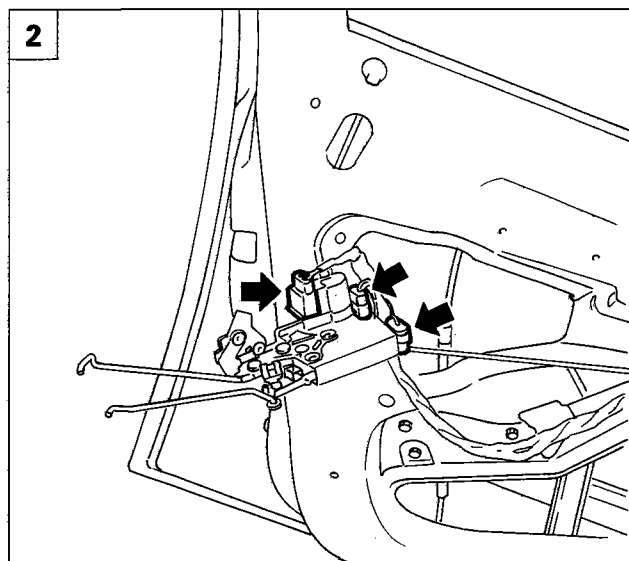
REMOVING-REFITTING DOOR LOCK



Remove the outer door handle following the instructions given on page 6.

1. Undo the bolts fixing the lock to the door.
2. Remove the lock from the door disconnecting the connectors shown by the arrows and the door opening control rod.

NOTE To refit simply reverse the order of the operations carried out for the removal.



P4A007M02



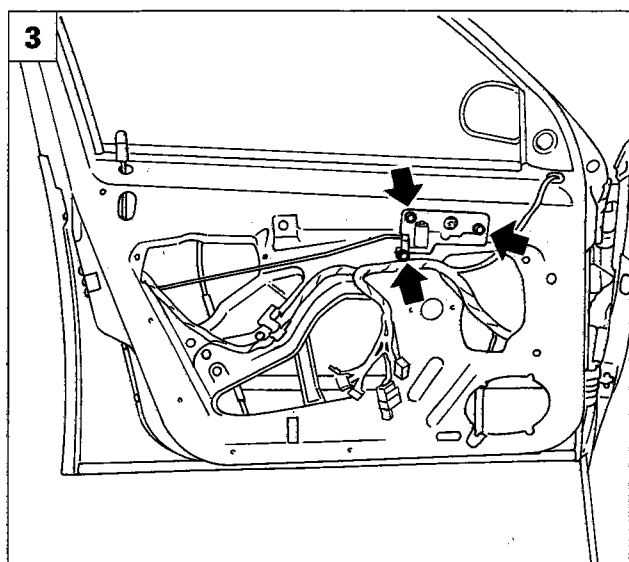
REMOVING-REFITTING DOOR OPENING LEVER



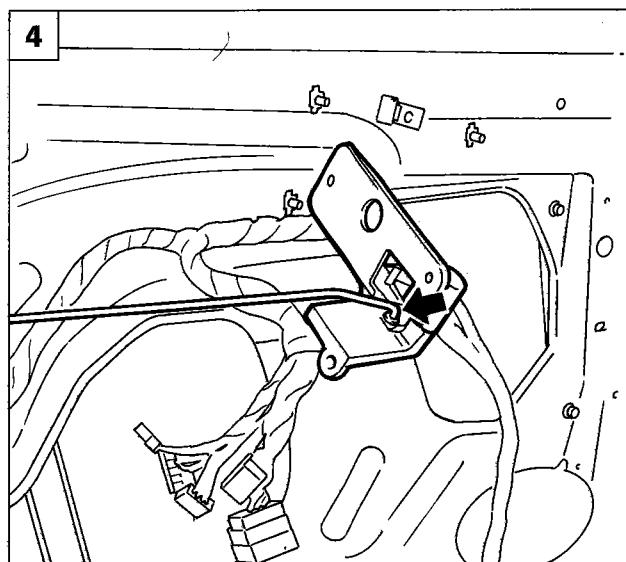
Remove the door panel lining following the instructions given on page 5.

3. Undo the nuts fixing the door opening control lever.
4. Remove the door opening control lever from its housing releasing it from the lock operating rod shown.

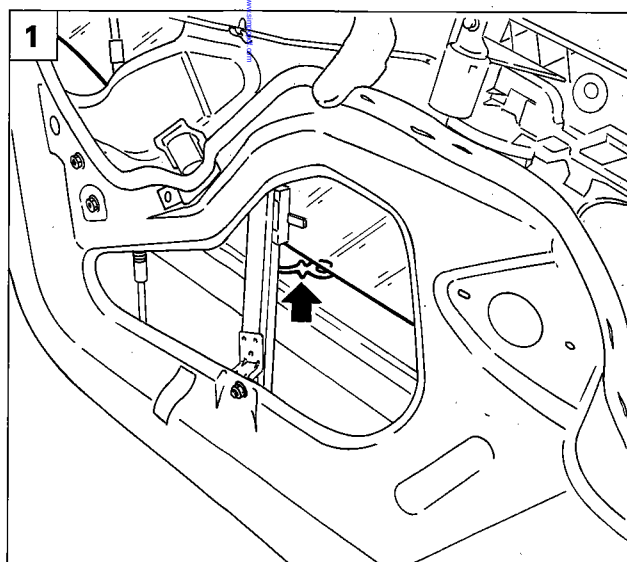
NOTE To refit simply reverse the order of the operations carried out for the removal.



P4A007M03



P4A007M04



P4A008M01



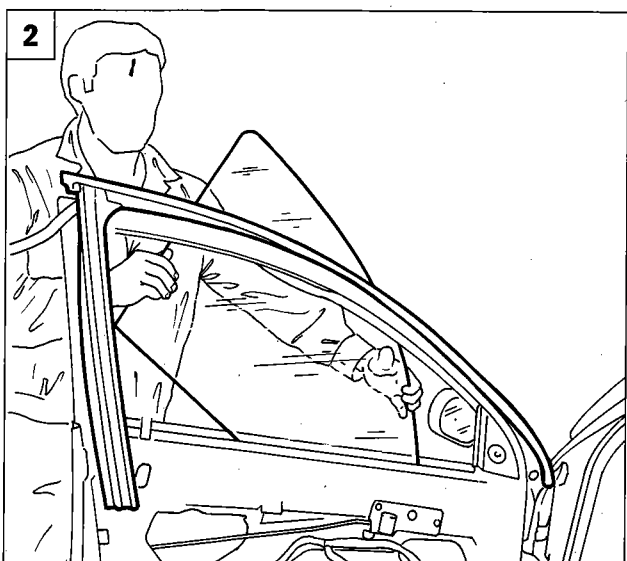
REMOVING-REFITTING LOWERING WINDOW GLASS



Remove the door panel and protective cover, as shown on page 5.

1. Release the window from its device.
2. Remove the outer and inner door perimeter trim, then extract the window.

NOTE To refit simply reverse the order of the operations carried out for the removal.



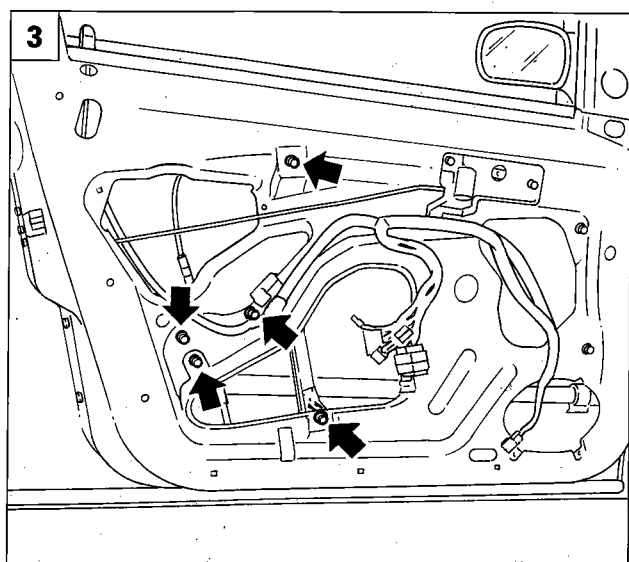
P4A008M02



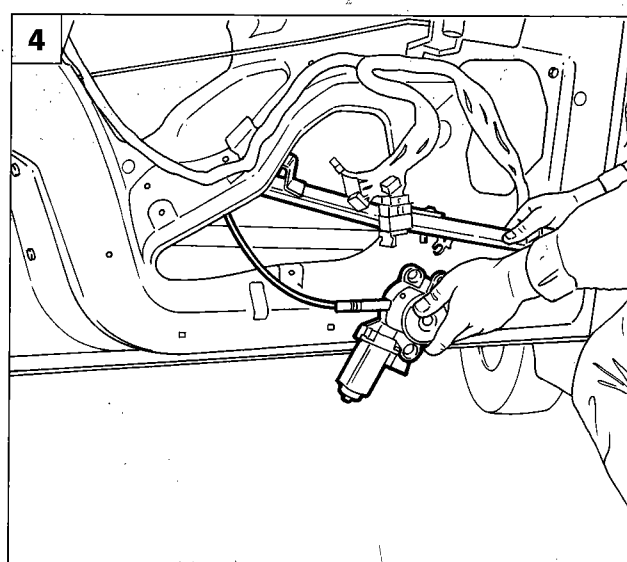
REMOVING-REFITTING WINDOW OPENING DEVICE

3. Release the window from its device as described above, then undo the boltsfixing the window opening device to the door.
4. Extract the window opening device from its housing.

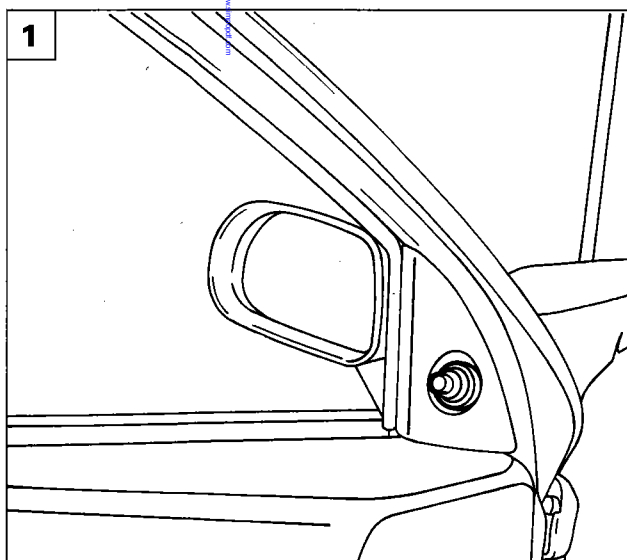
NOTE To refit simply reverse the order of the operations carried out for the removal.



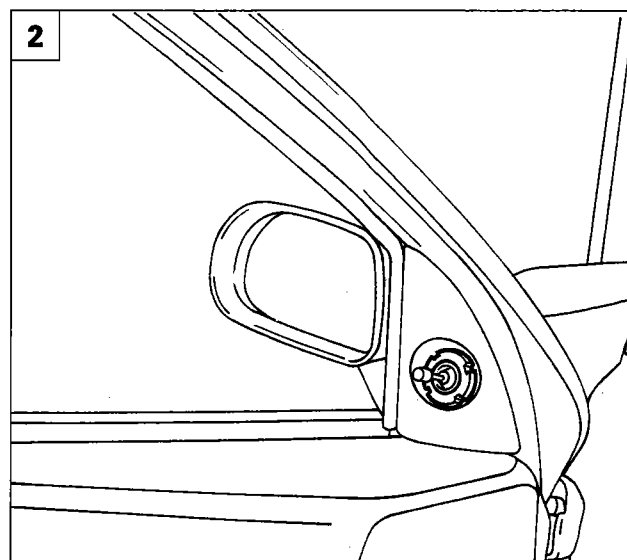
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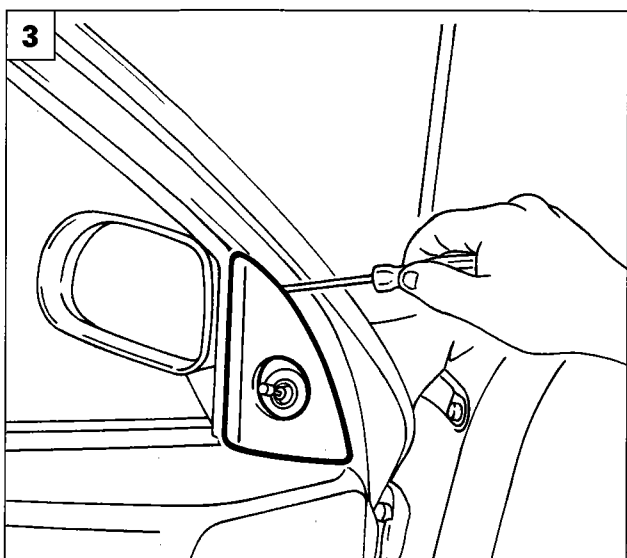
P4A008M04



P4A009M01



P4A009M02



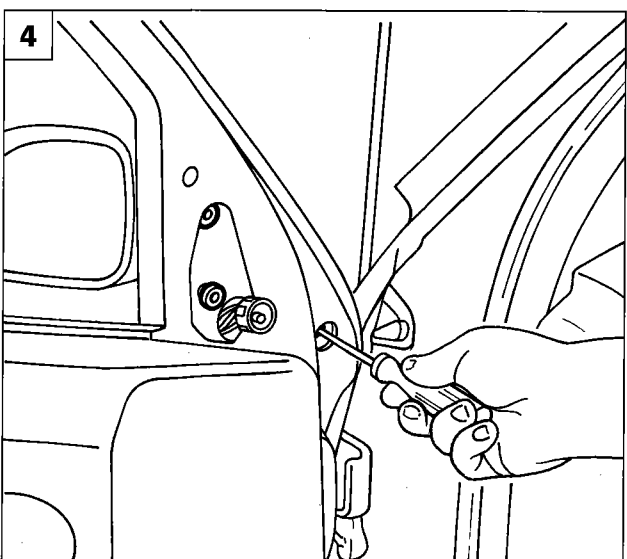
P4A009M03



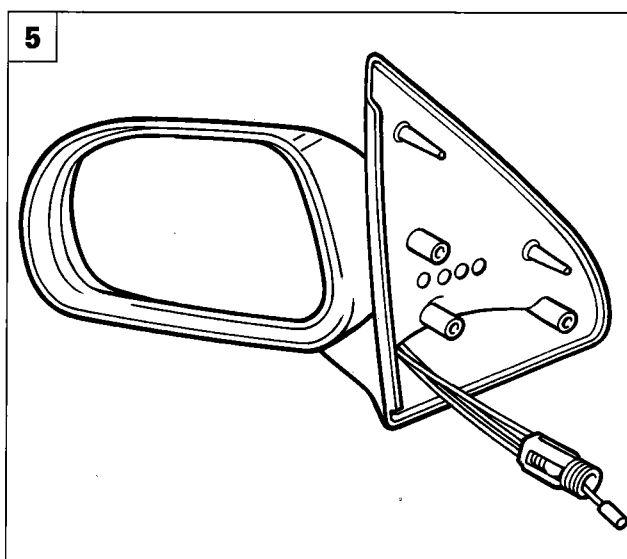
REMOVING-REFITTING EXTERNAL REAR VIEW MIRROR

1. Remove the rubber trim.
2. Undo the fixing ring nut shown in the diagram.
3. Remove the fixing cover for the mirror acting on the retaining tabs.
4. Undo the bolts fixing the mirror to the bodyshell.
5. Remove the external rear view mirror complete with plastic trim.

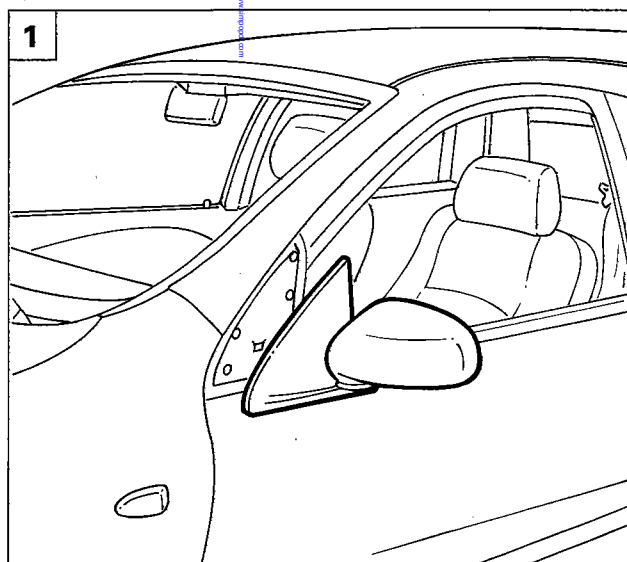
NOTE To refit simply reverse the order of the operations carried out for the removal.



P4A009M04



P4A009M05



P4A010M01



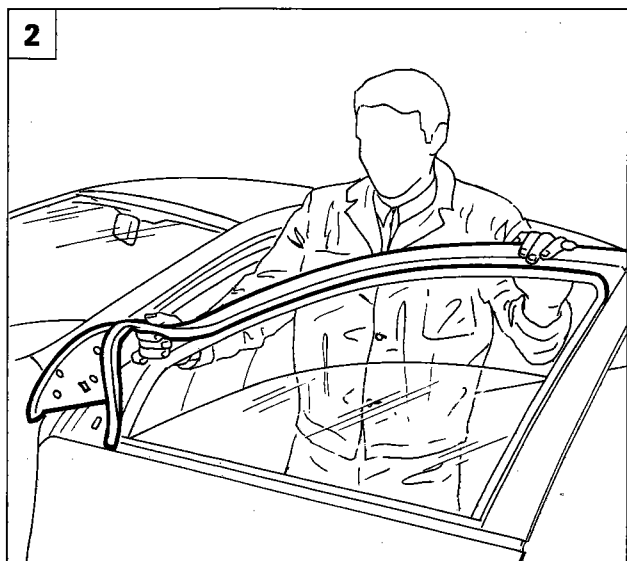
REMOVING-REFITTING DOOR TRIM



1. Remove the external rear view mirror following the instructions given on the previous page.

2. Remove the trim from the door.

NOTE To refit simply reverse the order of the operations carried out for the removal.



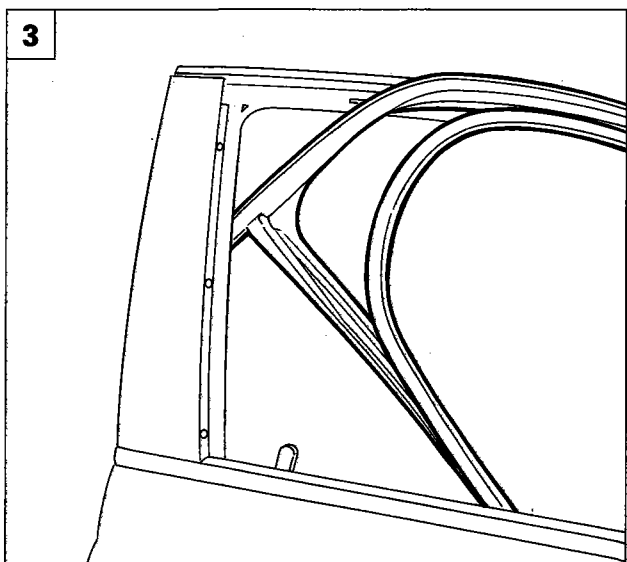
P4A010M02



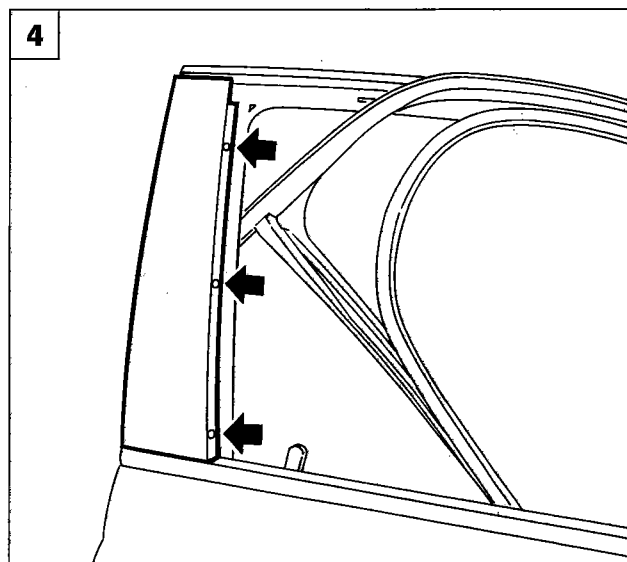
REMOVING-REFITTING DOOR REAR PILLAR TRIM

3. Working from the outside of the car, move the trims and the perimeter trim for the window housing partly to one side.
4. Remove the door trim undoing the fixing bolts shown by the arrows.

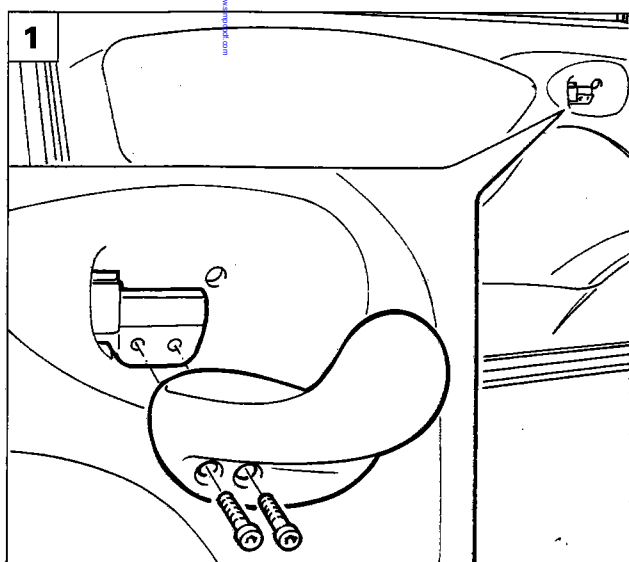
NOTE To refit simply reverse the order of the operations carried out for the removal.



P4A010M03



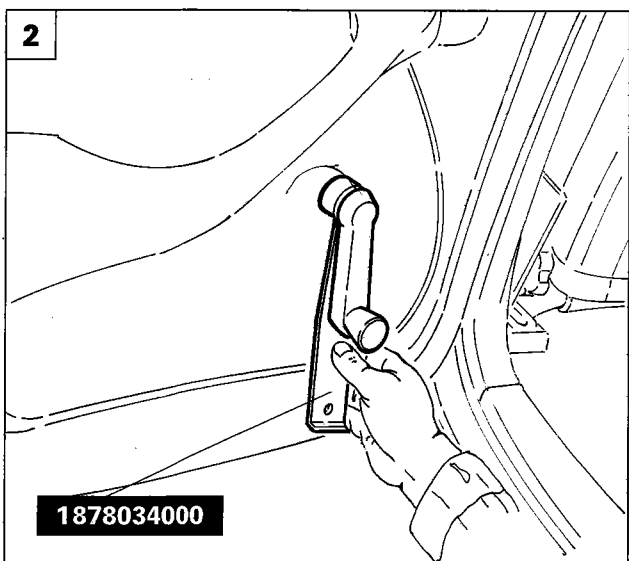
P4A010M04



P4A011M01



REMOVING-REFITTING DOOR PANEL AND PROTECTIVE LINING

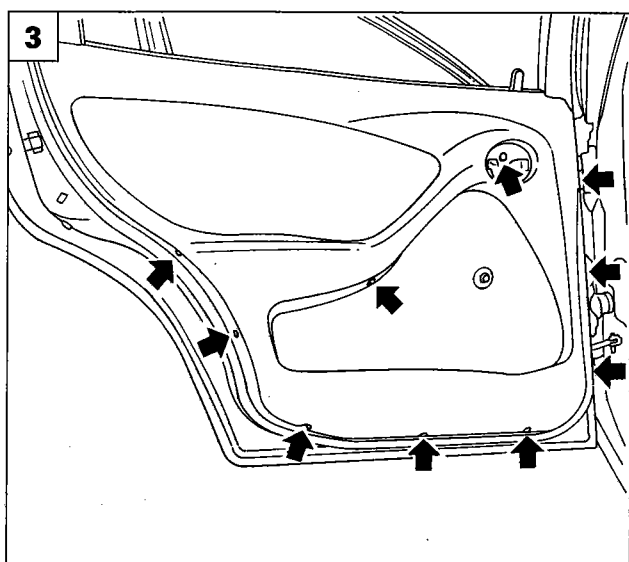


P4A011M02

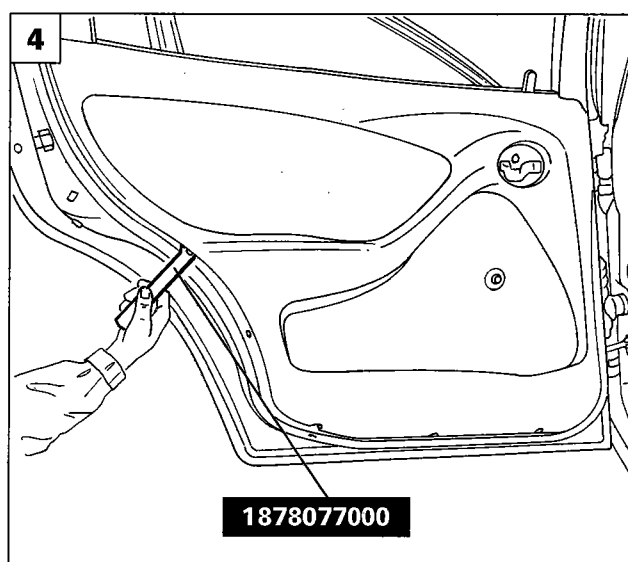


1. Remove the door opening control lever undoing the fixing bolts shown in the diagram.
2. Using tool 1878034000, remove the split pin retaining the crank to the window opening pin.
3. Undo the bolts fixing the door lining panel.
4. Using tool 1878077000, remove the buttons fixing the lining panel to the door, then remove the protective door lining.

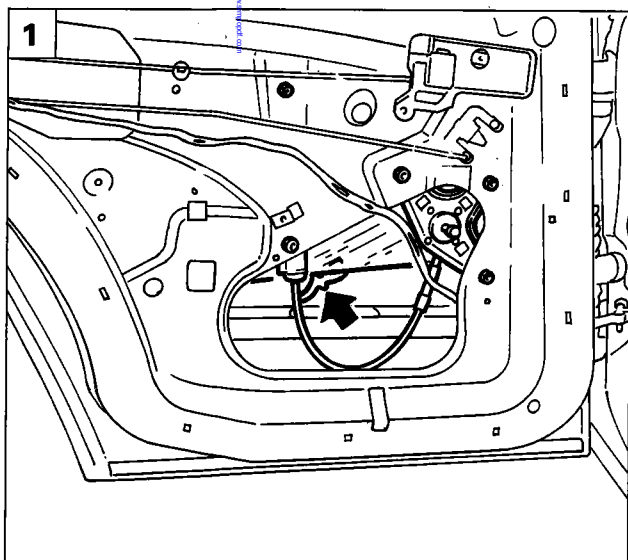
NOTE To refit simply reverse the order of the operations carried out for the removal.



P4A011M03



P4A011M04



P4A012M01

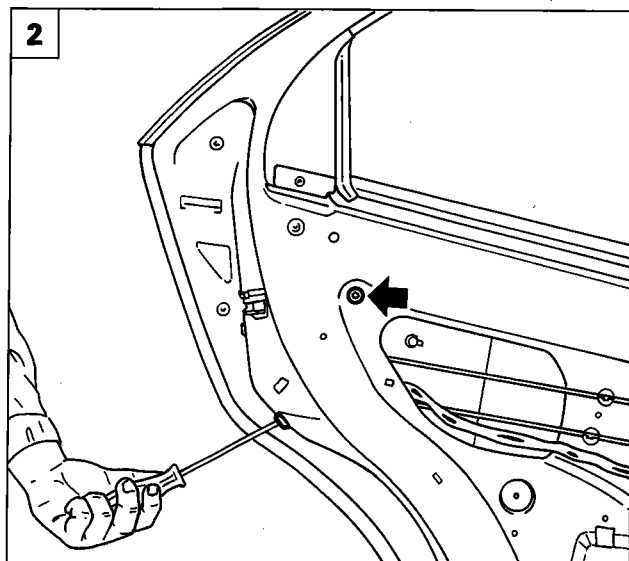


REMOVING-REFITTING LOWERING WINDOW GLASS

Remove the door panel and protective cover, proceeding as described on page 11.

1. Release the window from its device.
2. Loosen the fixing bolts shown by the arrows and extract the window guide.
3. Remove the door outer and inner perimeter trim, then extract the window.

NOTE To refit simply reverse the order of the operations carried out for the removal.



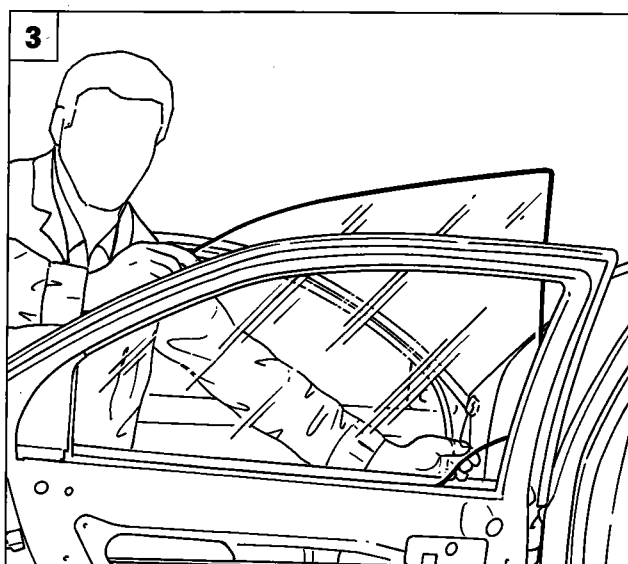
P4A012M02



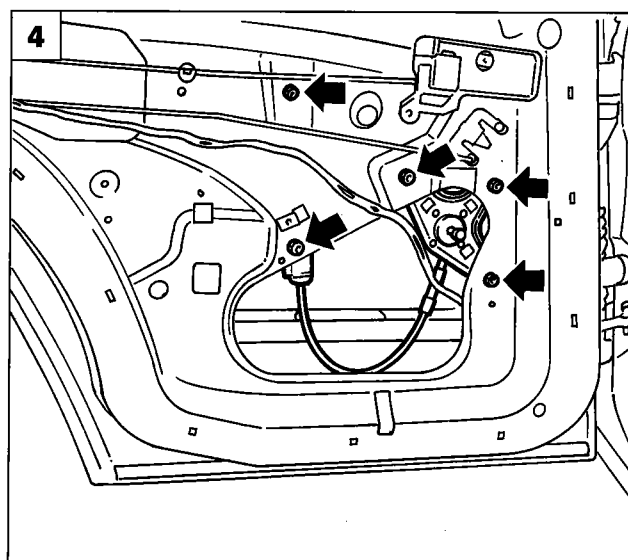
REMOVING-REFITTING WINDOW OPENING DEVICE

4. Release the window from the window opening device acting as described above, then undo the fixing nuts shown by the arrows and extract the window opening device.

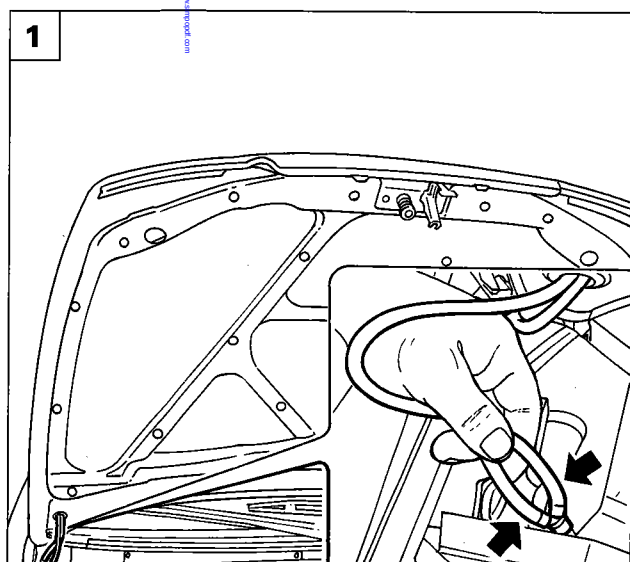
NOTE To refit simply reverse the order of the operations carried out for the removal.



P4A012M03



P4A012M04



P4A013M01



REMOVING-REFITTING BONNET LID

1. Raise the bonnet lid then disconnect the windscreen washer pipes.
2. Undo the bolts fixing the hinges shown by the arrows then, with the help of a second operator, remove the bonnet lid from the vehicle.

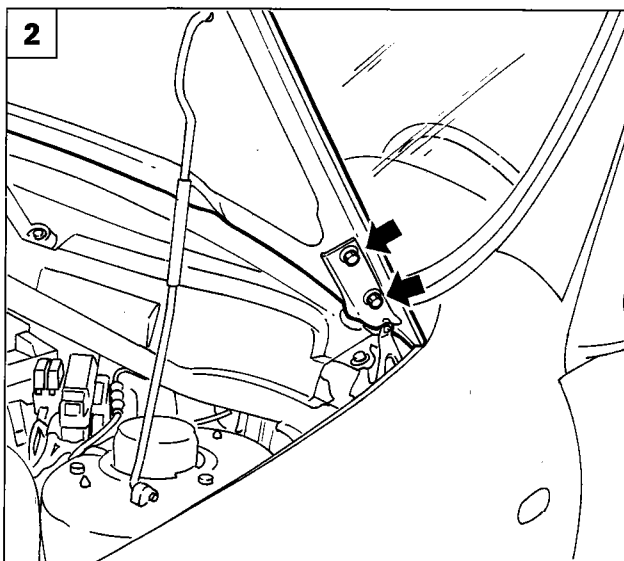
NOTE To refit simply reverse the order of the operations carried out for the removal.

ADJUSTMENTS

Adjusting bonnet lid position

3. Loosen the bolts fixing the hinges, then adjust the position of the bonnet lid.

NOTE The arrows indicate the possible movements for the adjustment.

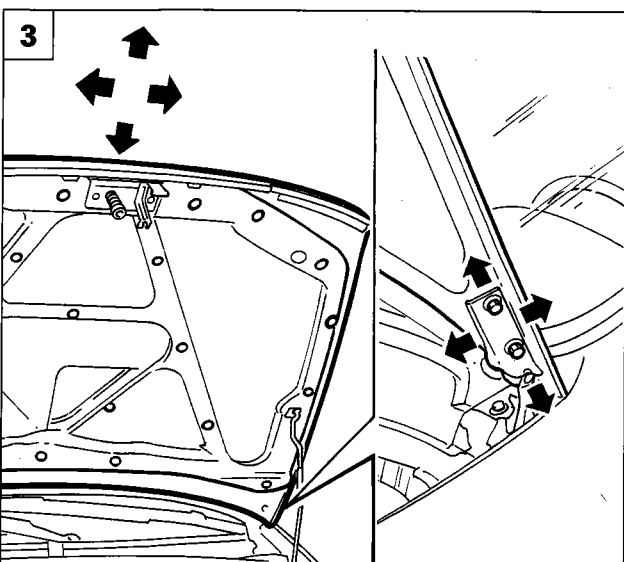


P4A013M02

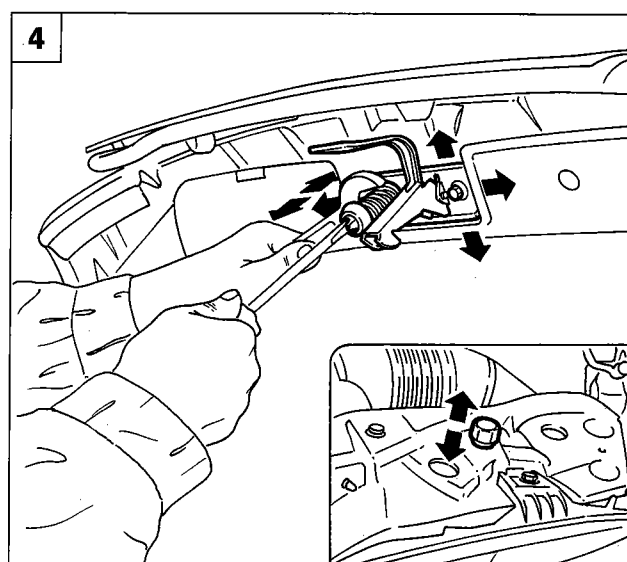
Adjusting bonnet lid closing device

4. Working as illustrated in the diagram, adjust the vertical position of the bonnet lid; this adjustment can also be carried out by rotating the rubber mountings at the edges of the engine compartment.

NOTE The arrows indicate the possible movements for the adjustment.

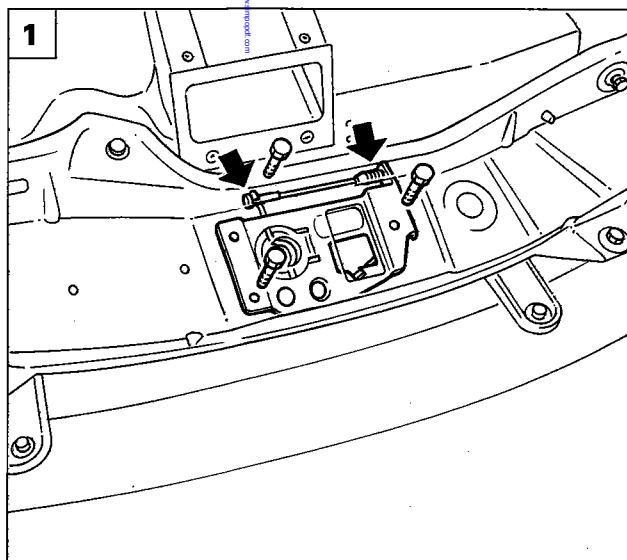


P4A013M03



P4A013M04

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P4A014M01



REMOVING-REFITTING BONNET LID STRIKER

1. Disconnect the bonnet release, then remove the striker undoing the fixing bolt.

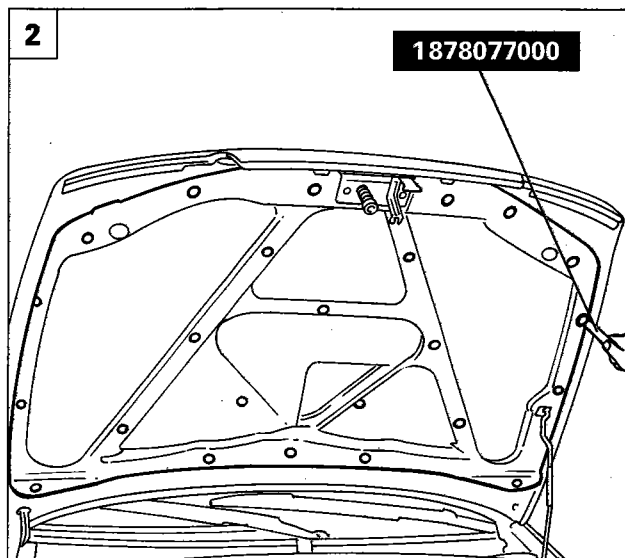
NOTE To refit simply reverse the order of the operations carried out for the removal.



REMOVING-REFITTING WINDSCREEN WASHER PIPES

2. Using tool 1878077000, remove the fixing buttons and remove the sound-insulation lining for the bonnet lid.
3. Remove the windscreen washer pipes, releasing them from the bonnet lid after having removed the bands and having disconnected them from the jets.

NOTE To refit simply reverse the order of the operations carried out for the removal.



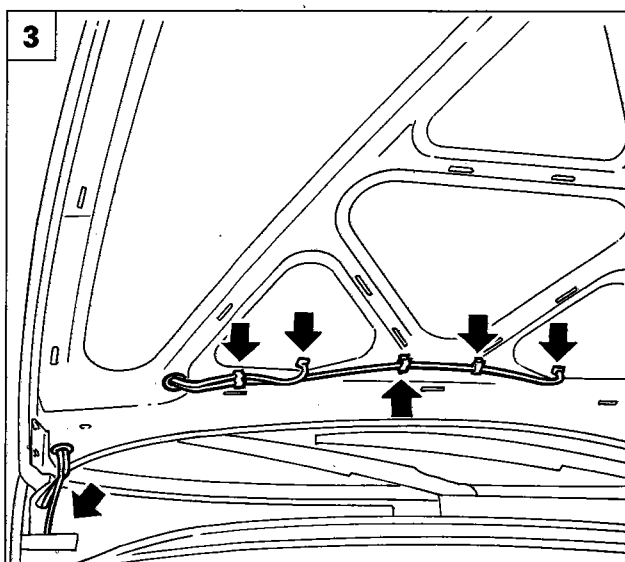
P4A014M02



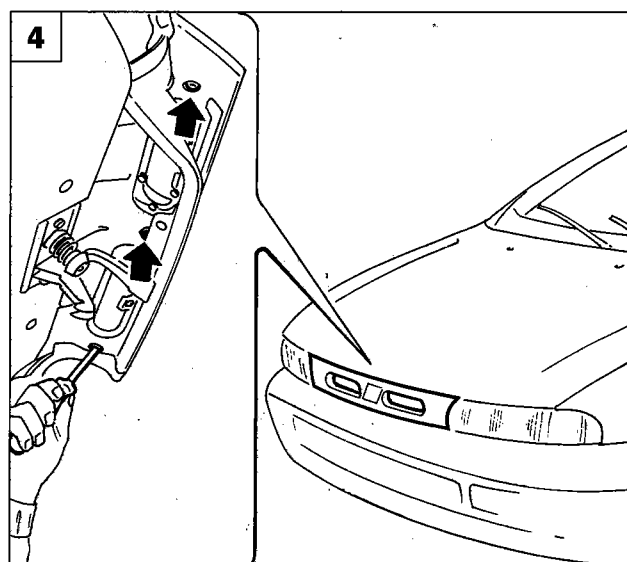
REMOVING-REFITTING FRONT GRILLE

4. Raise the bonnet lid, then remove the front grille undoing the fixing nuts shown in the diagram.

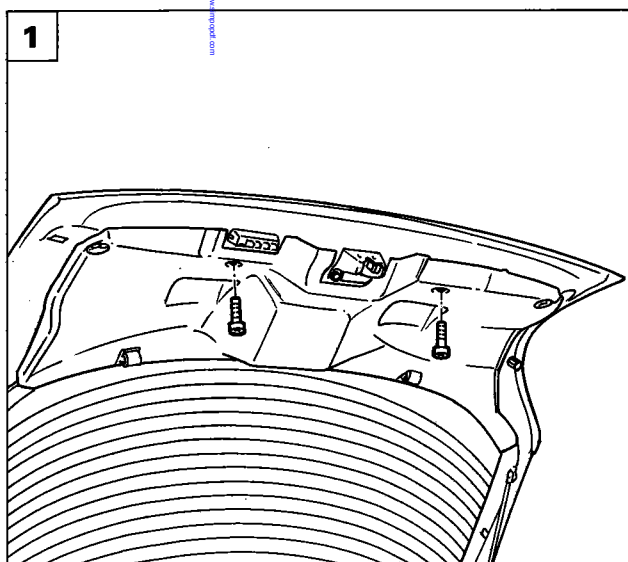
NOTE To refit simply reverse the order of the operations carried out for the removal.



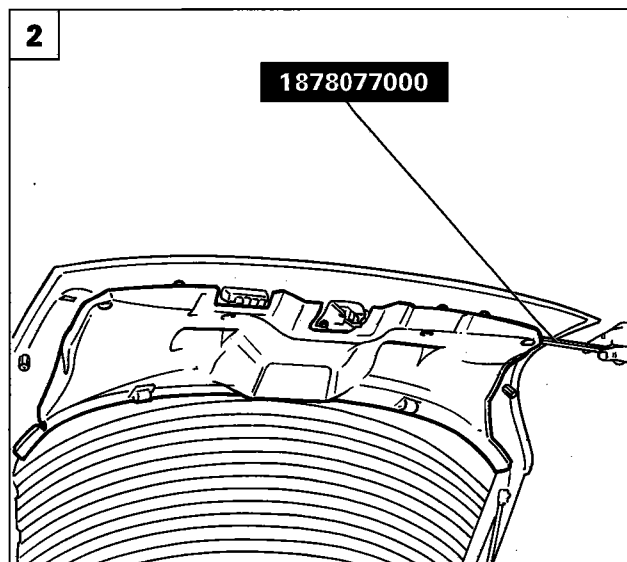
P4A014M03



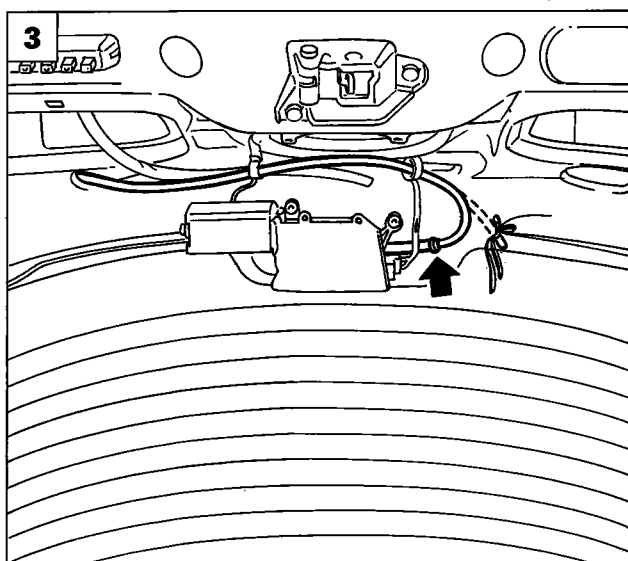
P4A014M04



P4A015M01



P4A015M02



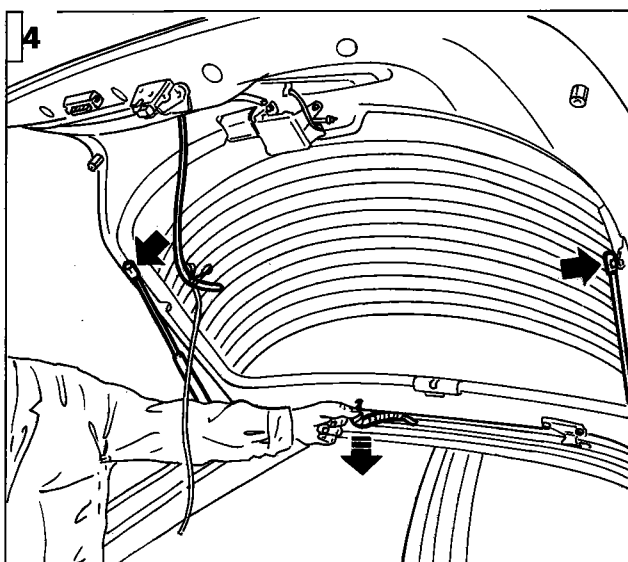
P4A015M03



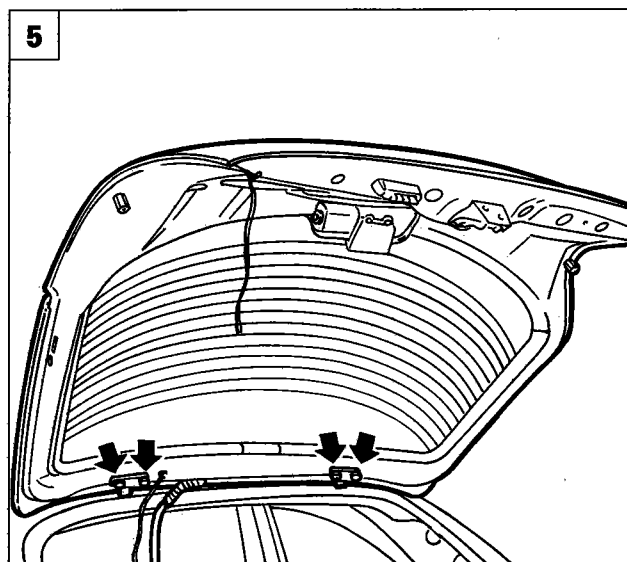
REMOVING-REFITTING TAILGATE

1. Undo the bolts fixing the tailgate inner lining.
2. Remove the tailgate inner lining, removing the fixing buttons using tool 1878077000.
3. Disconnect the pipe from the rearscreen washer, then fasten appropriately to facilitate the subsequent refitting inside the tailgate.
4. Remove the pipe from the rearscreen washer, then disconnect the shock absorbers support the tailgate from the upper mounting.
5. Undo the bolts fixing the hinges shown by the arrows, then remove the tailgate, with the help of a second operator.

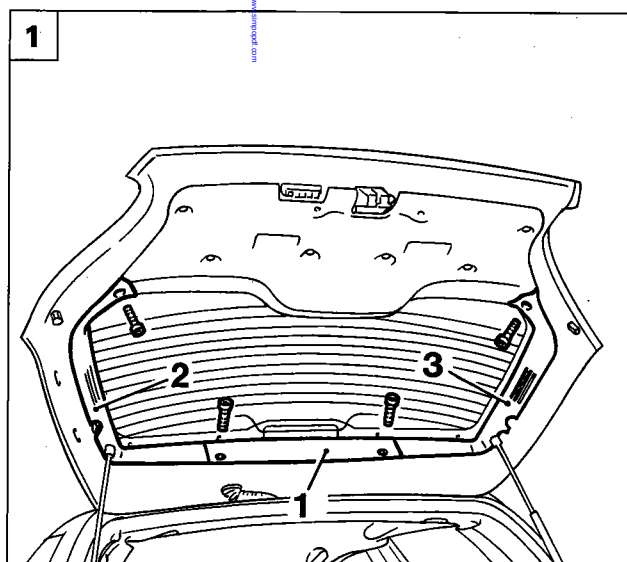
NOTE To refit simply reverse the order of the operations carried out for the removal.



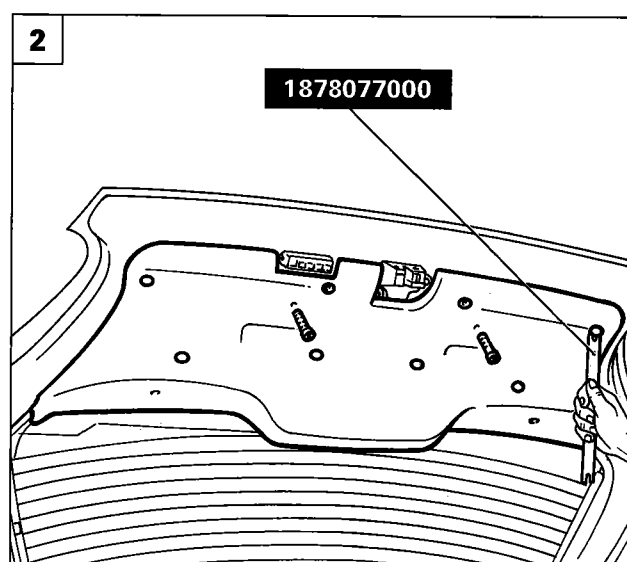
P4A015M04



P4A015M05



P4A016M01

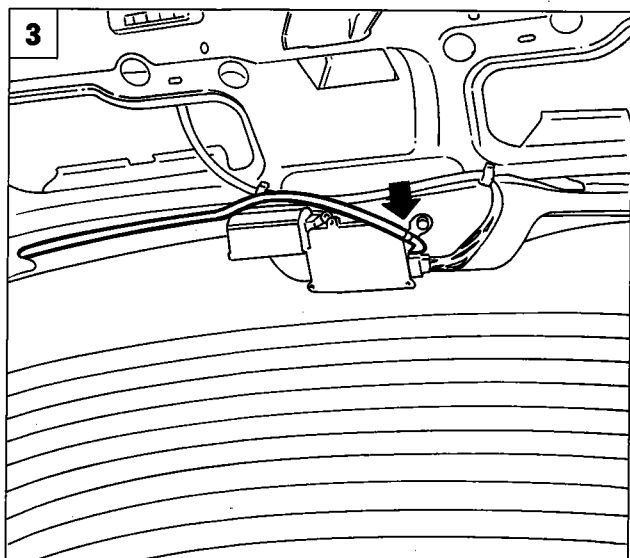


P4A016M02

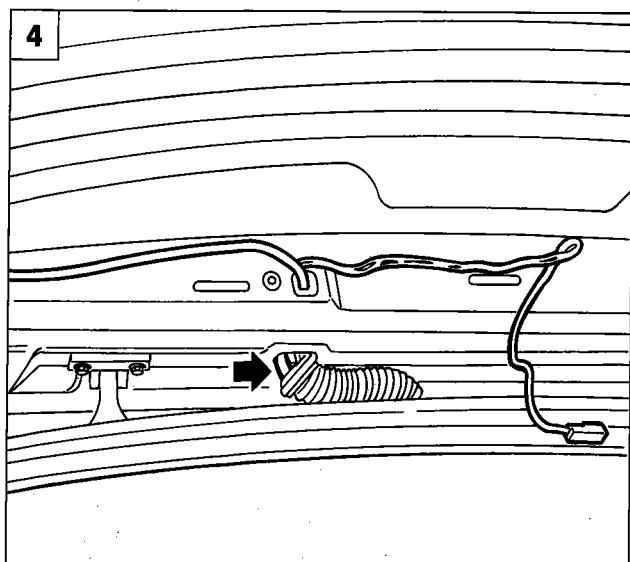
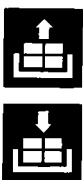
REMOVING-REFITTING TAILGATE

1. Undo the bolts fixing the tailgate perimeter interior linings and remove them in the order given.
2. Remove the tailgate inner lining removing the fixing buttons using tool 1878077000 and undoing the fixing bolts.
3. Disconnect the pipe for the rear screen washer from the operating motor.
4. Remove the pipe for the rear screen washer and the wiring for the additional brake lights from the inside of the tailgate.
5. Disconnect the shock absorbers supporting the tailgate from the upper mounting, then remove the rear tailgate with the help of a second operator.

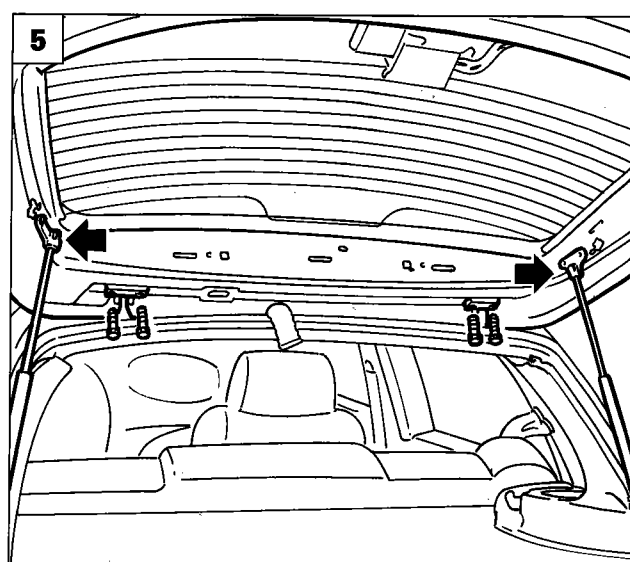
NOTE To refit simply reverse the order of the operations carried out for the removal.



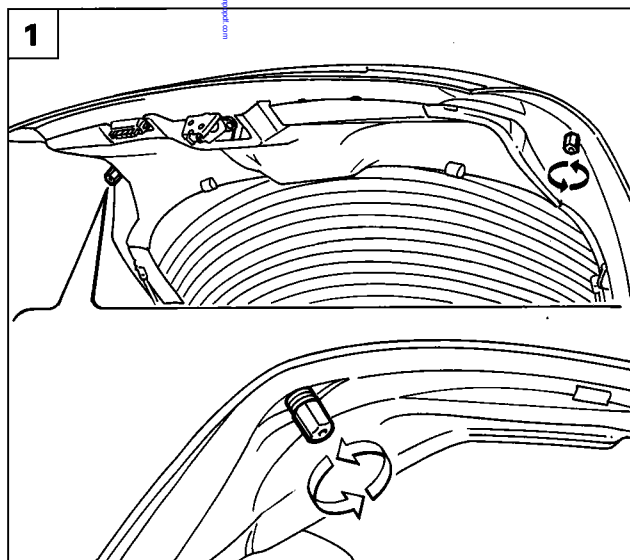
P4A016M03



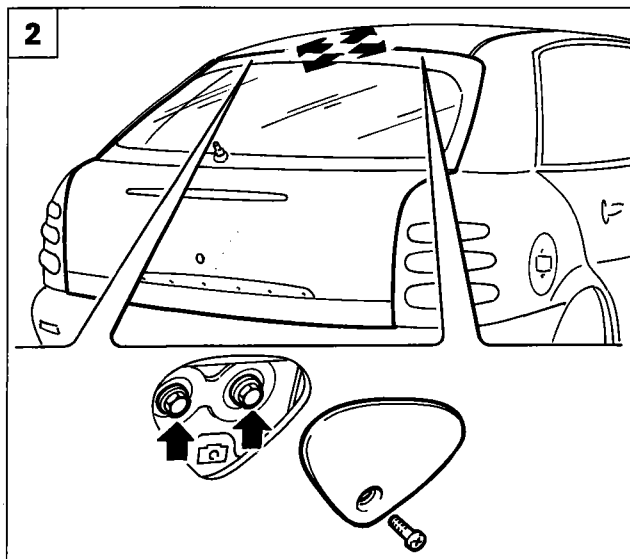
P4A016M04



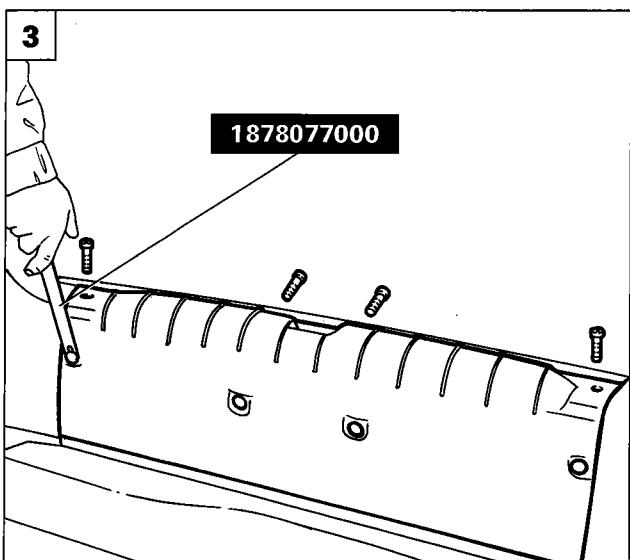
P4A016M05



P4A017M01



P4A017M02



P4A017M03



ADJUSTMENTS

Adjusting position of tailgate buffers

1. Rotate the rubber mountings positioned at the edges of the tailgate .



An incorrect adjustment of the buffers involves forcing the tailgate or clearance for the closing mechanism, causing damage to the tailgate.

Adjusting horizontal position of tailgate

2. Undo the bolts fixing the trims on the roof lining, then loosen the bolts fixing the hinges and adjust the position of the tailgate.

NOTE The arrows indicate the possible movements for the adjustment.



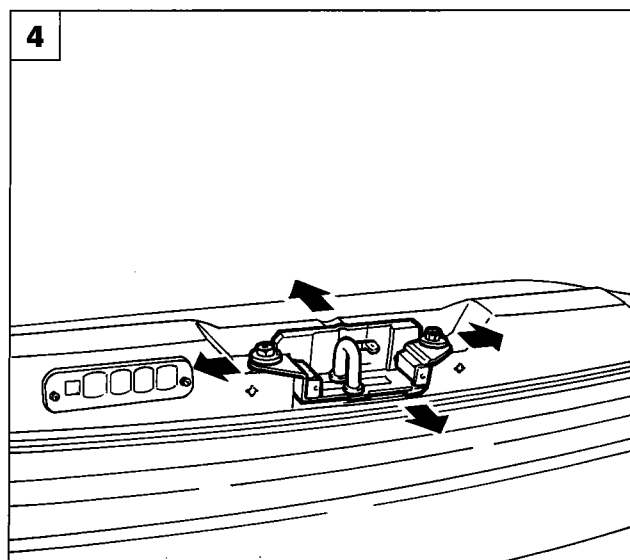
If the hinges are removed-refitted, it is necessary to apply a suitable air drying acrylic sealant such as IVI 854.210 or an equivalent product between the hinges and the bodyshell; if only the tailgate is being adjusted, apply the sealant along the perimeter of the hinge with the bodyshell, after having removed the old sealant.



Adjusting position of tailgate lock striker

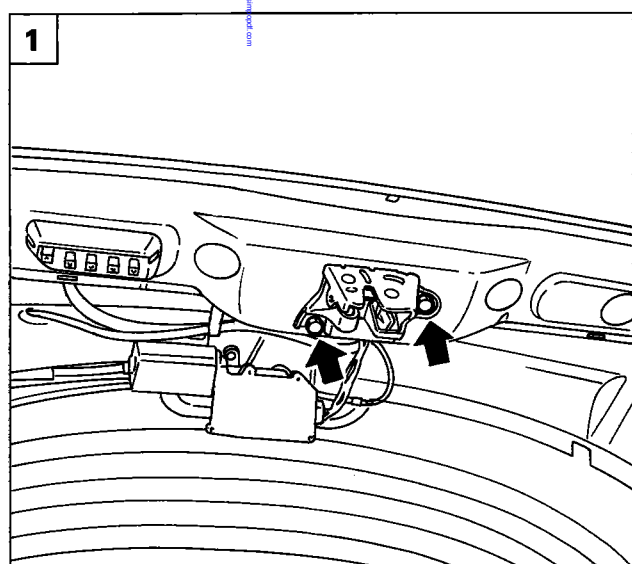
3. Undo the fixing bolts and using tool 18778077000 remove the fixing buttons, then remove the luggage compartment lining.
4. Loosen the bolts fixing the striker and adjust its position.

NOTE The arrows indicate the possible movements for the adjustment.



P4A017M04

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P4A018M01



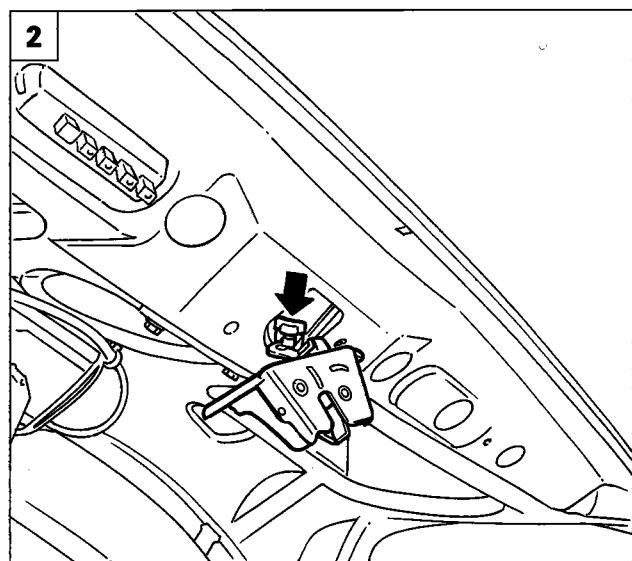
REMOVING-REFITTING TAILGATE LOCK



The procedure is carried out on the 5 door version; as far as the 3 door version is concerned, the procedure is the same.

1. Remove the tailgate inner lining (see page 15), then undo the bolts fixing the lock shown by the arrows.
2. Remove the lock releasing the rod joined with the lock barrel.

NOTE *To refit simply reverse the order of the operations carried out for the removal.*



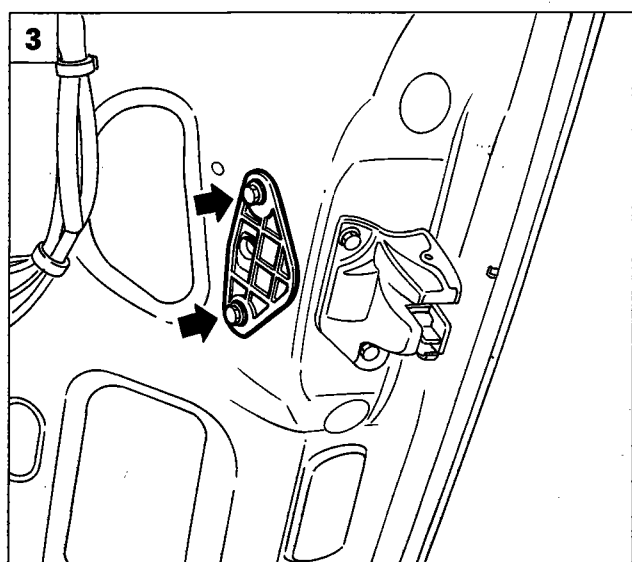
P4A018M02



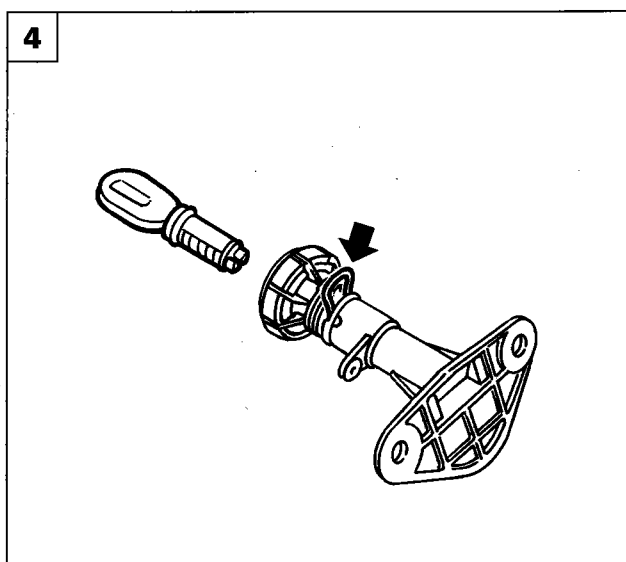
REPLACING LOCK BARREL

3. Remove the tailgate inner lining (see page 15), loosen the fixing bolts shown by the arrows, then remove the barrel from the lock disconnecting the joining rod.
4. Insert the key in the barrel, lift up the retaining spring shown by the arrow, then extract the barrel and replace it.

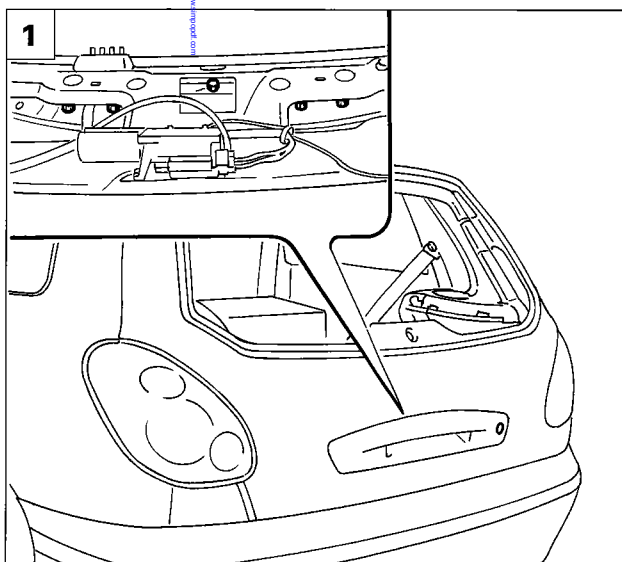
NOTE *To refit simply reverse the order of the operations carried out for the removal.*



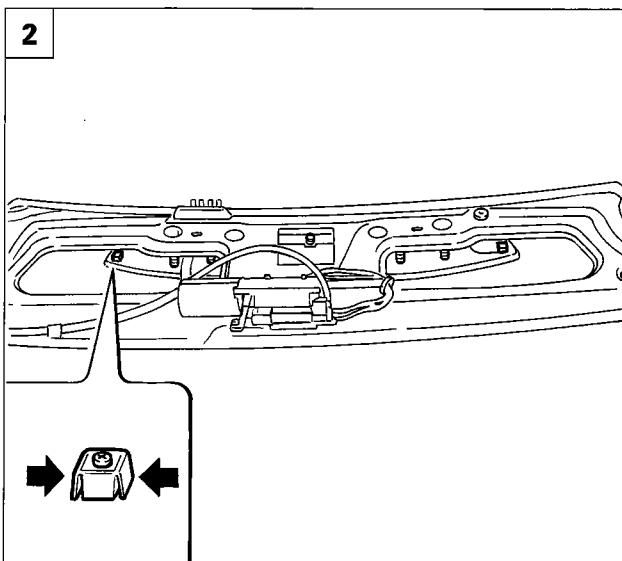
P4A018M03



P4A018M04



P4A019M01



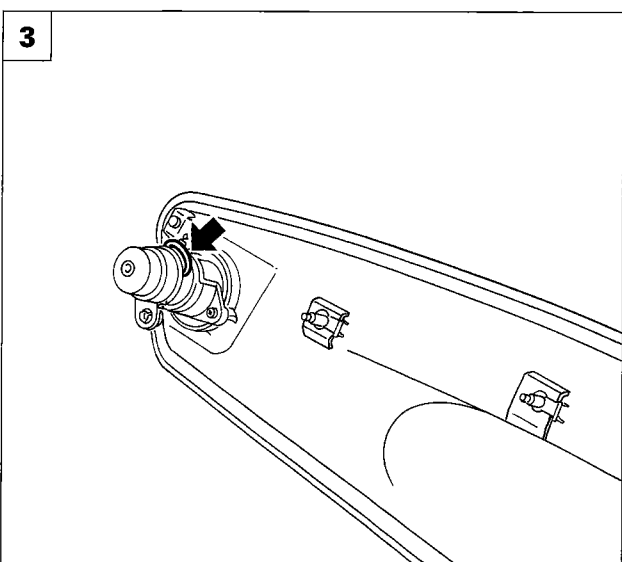
P4A019M02



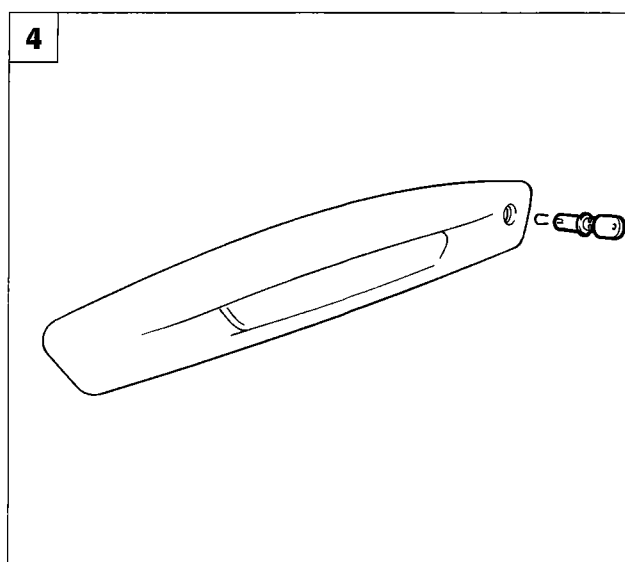
REPLACING LOCK BARREL

1. Remove the tail-gate interior trim as described on page 16 and the lock as described on page 18. Then work from inside the tail-gate to unscrew the opening handle retaining bolts.
2. Undo the fastening block tabs and remove the tail-gate opening handle.
3. Insert the key in the lock barrel, then lift the retaining clip indicated by the arrow.
4. Remove the lock barrel and replace.

NOTE Reverse removal operation sequence to refit.

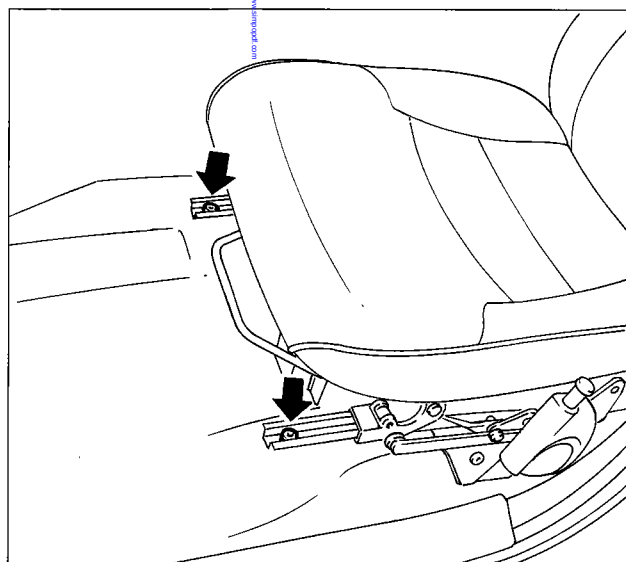


P4A019M03



P4A019M04

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P4A020M01

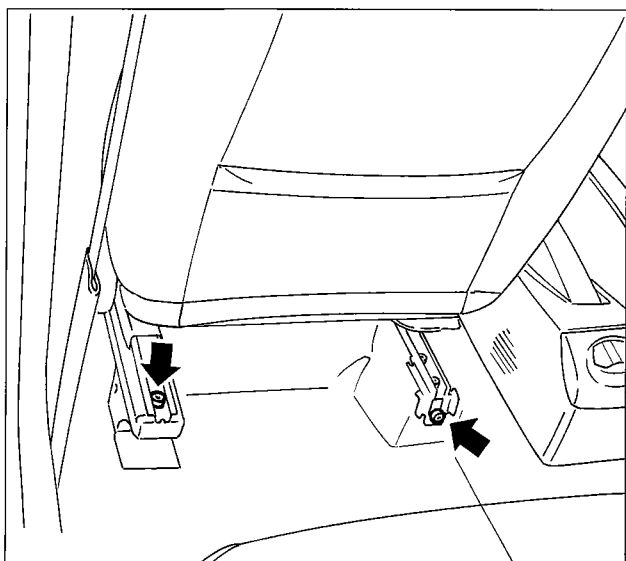


REMOVING-REFITTING SEAT FRONT



Operation sequence

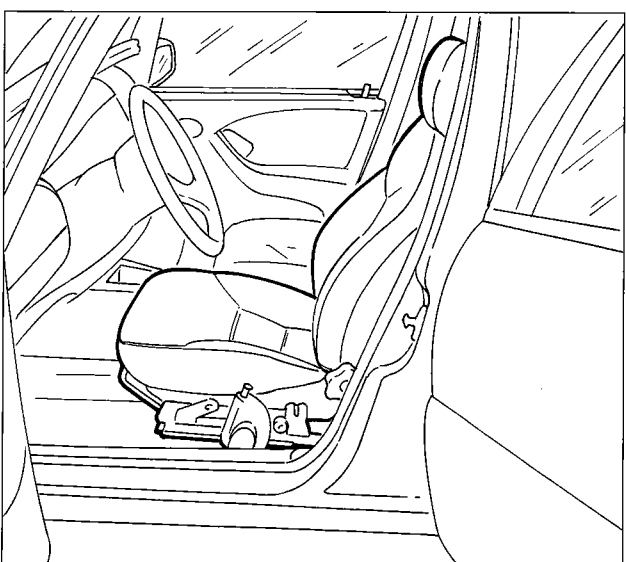
- Move the seat fully backward to the end of its travel, then unscrew the bolts retaining the seat guides to the floorpan;



P4A020M02



- move the seat fully forward to the end of its travel, then unscrew the bolts retaining the seat guide to the floorpan;



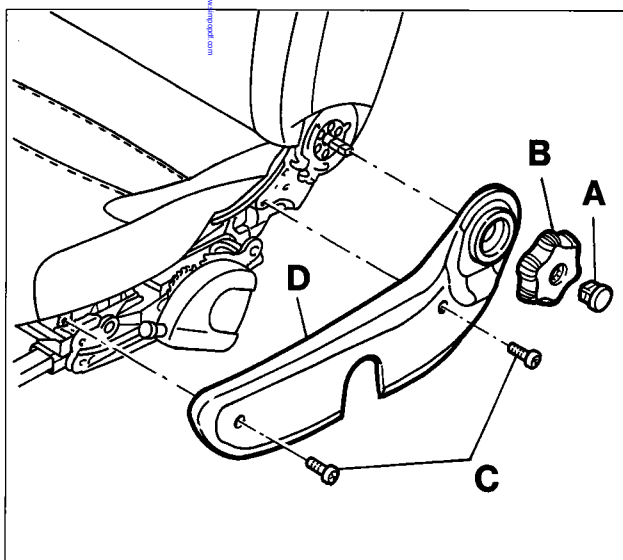
P4A020M03



- remove the seat from the car .



NOTE Reverse the order of removal operations to refit. Tighten the retaining bolts to a torque of 2.4 daNm.



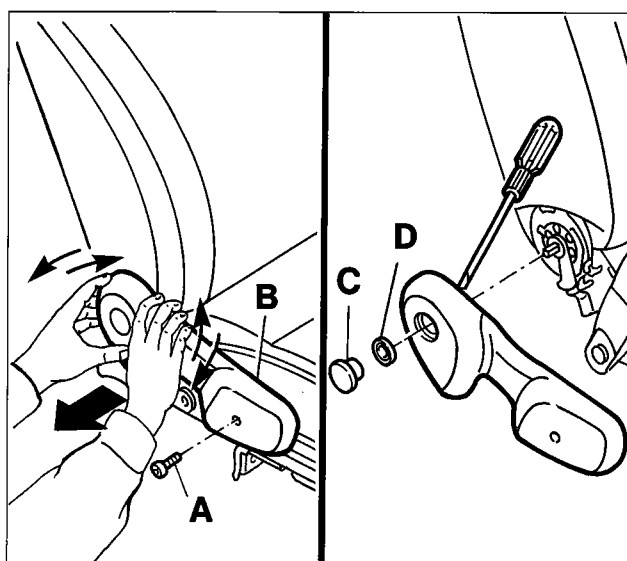
P4A021M06

DISMANTLING-FITTING FRONT SEAT COVERS

Operation sequence

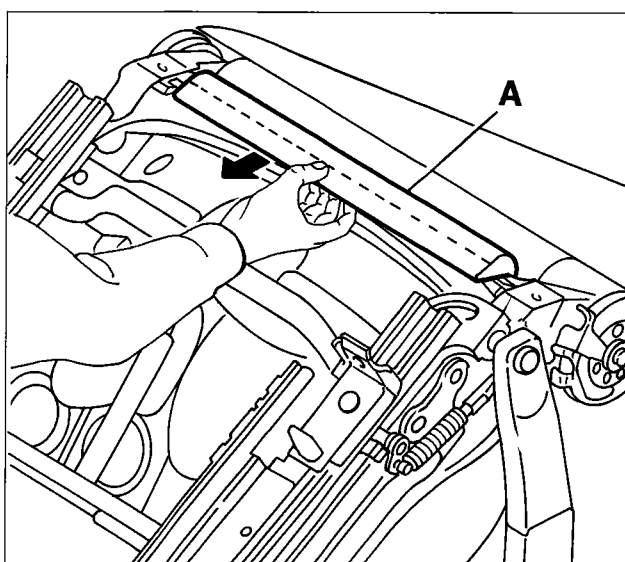
Remove the seat assembly from the car, then proceed as follows:

1. Remove cap A and squab adjustment knob B. Unscrew bolts C retaining exterior trim D, then remove.

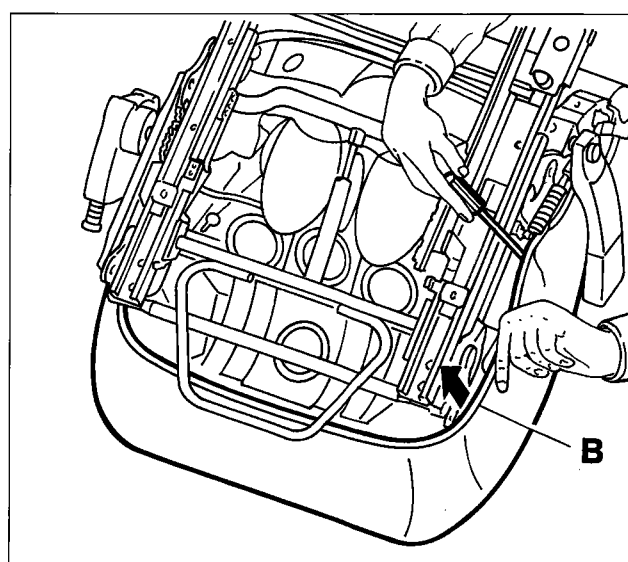


P4A021M07

2. Unscrew screw A retaining interior trim B. Remove trim B to remove washer D. Take care not to break. Push cap C out from the inside after removing the trim. Recover washer D.
3. Take off the plastic moulding from the rear as shown in the figure.
4. Remove plastic moulding B, beginning at the rear side. Release with the aid of a screwdriver, then remove the cushion.

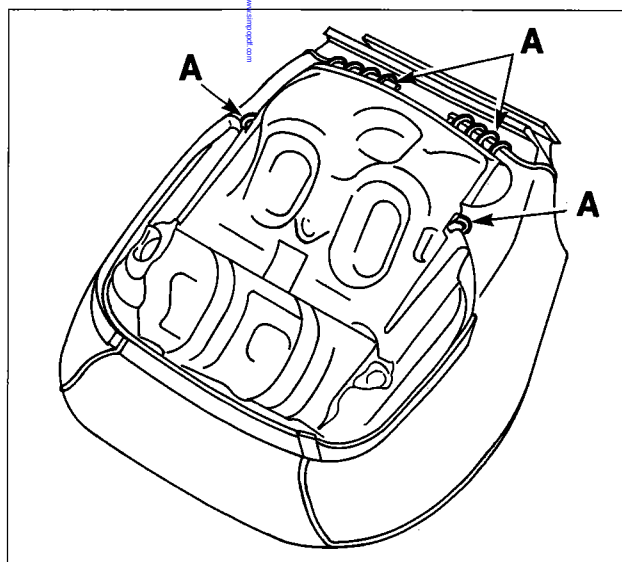


P4A021M08



P4A021M09

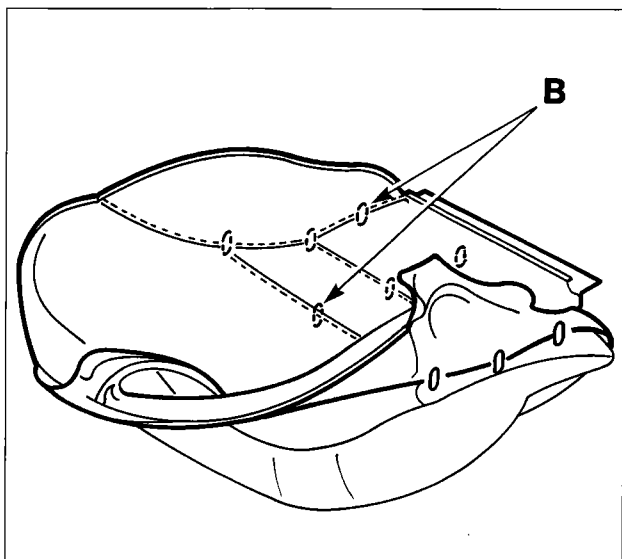
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P4A022M06



1. Use cutting pliers to remove retaining hooks A securing the cover to the padding.



P4A022M07

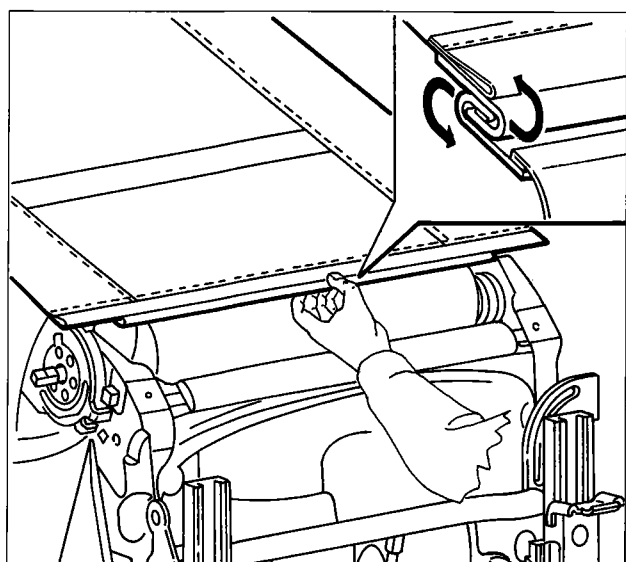


2. Fold back the cover and remove retaining hooks B positioned around the upholstered edges.

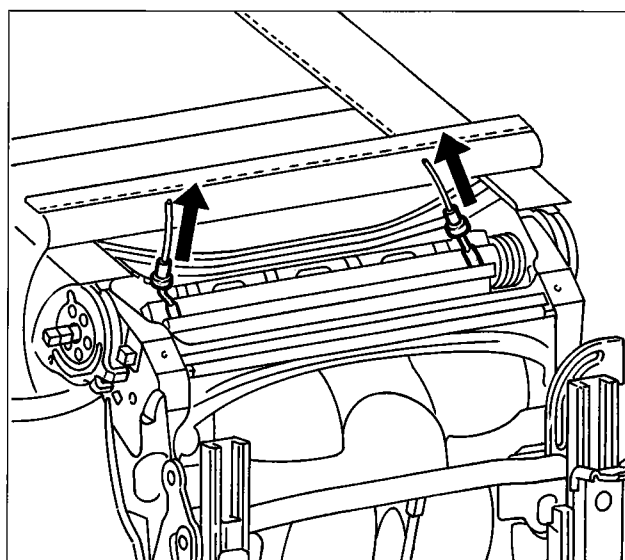
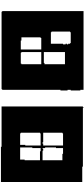


Remove any remaining parts of the hooks connected to the padding to prevent damage to the new cover.

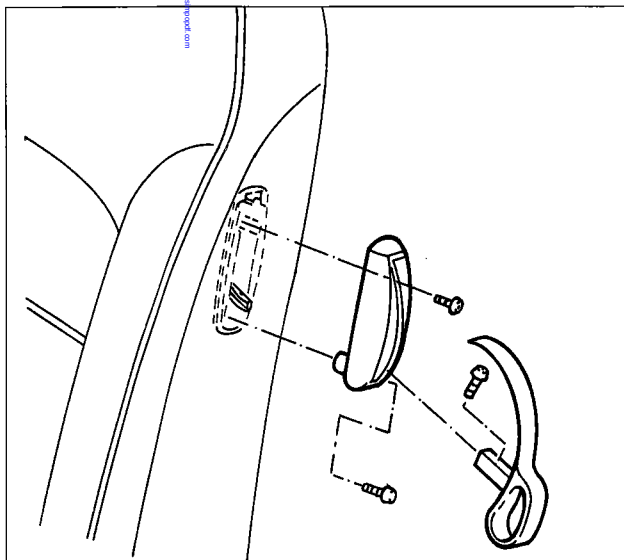
3. Remove the edge of the squab cover from its fasteners.
4. Disconnect the seat tensioners.



P4A022M08



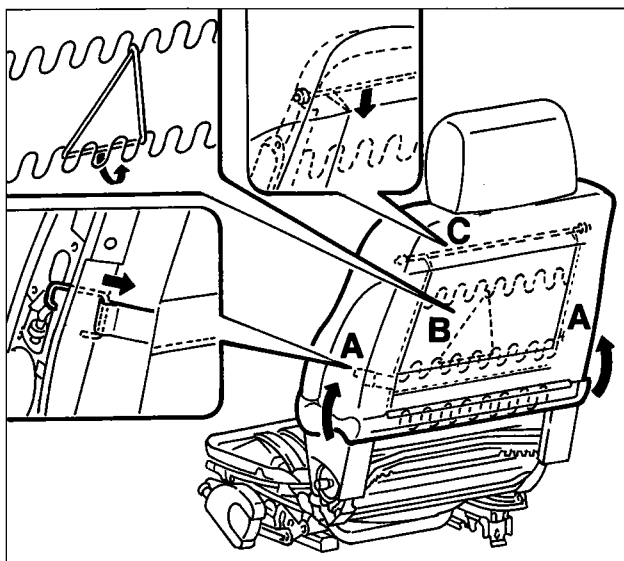
P4A022M09



P4A023M06



1. Release the squab recline handle. Unscrew bolt A, remove handle B and unscrew bolts C. Remove panel D (only for BRAVO version).



P4A023M07

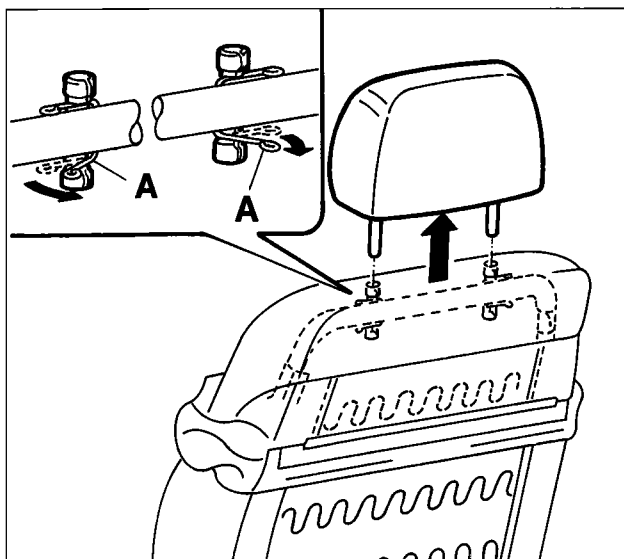


2. Withdraw the cover, then remove retaining hooks A; release elastic B and then upper edge C.
3. Turn springs and head restraint A, then remove head restraint.
4. Release both links A from the pipe and remove the cover.

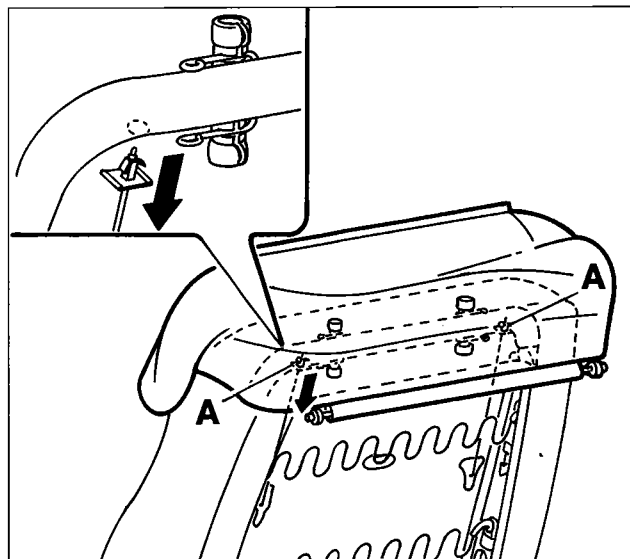
NOTE Reverse removal instructions to refit. Fasten cushion hooks using tool 1878077000.



Use new hooks.

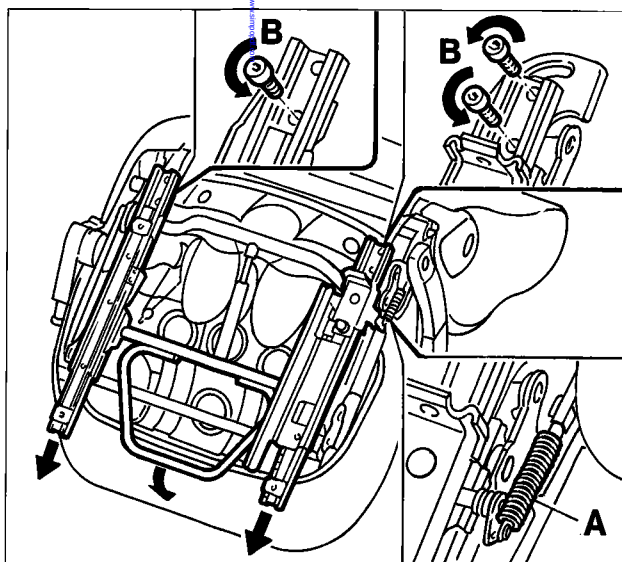


P4A023M08



P4A023M09

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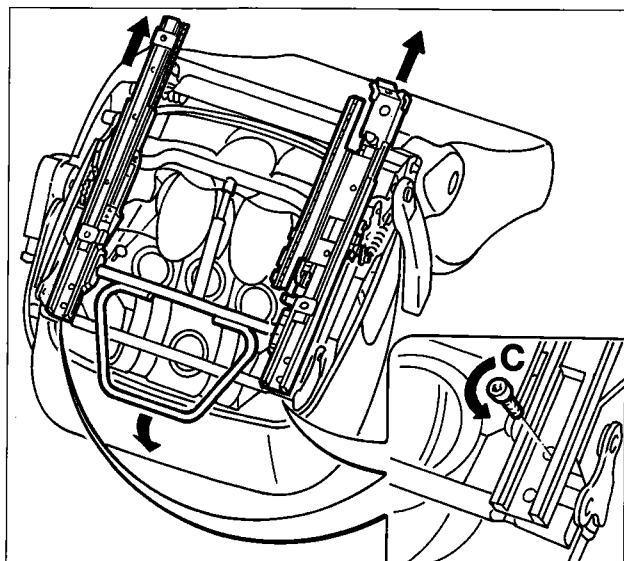
P4A024M06



REMOVING-REFITTING FRONT SEAT GUIDES

NOTE Upholstering operations are not required.

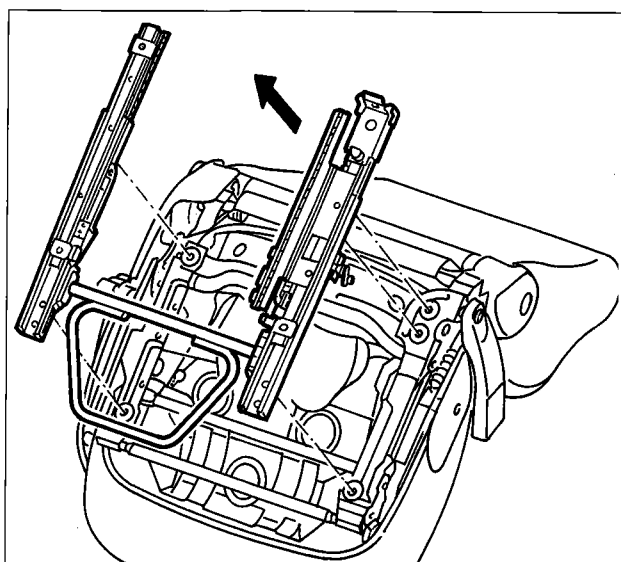
1. Remove the seat from the car. Position the seat on the bench. Push the guides forward using a release control bow. Only for BRAVO version, release memory A control lever spring using appropriate pliers. Unscrew rear guide retaining bolts B.



P4A024M07



2. Move the guides back using the release control bow. Unscrew front bolts C retaining the guides on the inside and outside.



P4A024M08

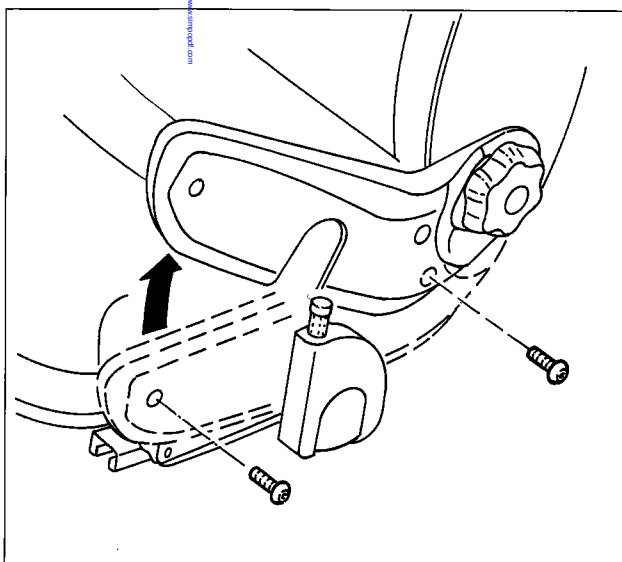


3. Remove the guides.



Do not remove the control bow before removing the guides in order to prevent deformation that could impair operation.

NOTE Reverse removal instructions to refit. Tighten retaining bolts to a torque of 2.4 daNm.



P4A024M09

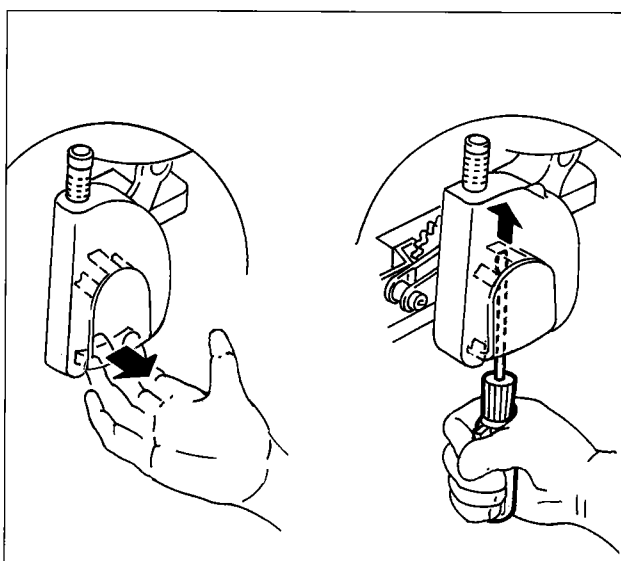


REMOVING-REFITTING SEAT RAISE DEVICE



The seat need not be removed from the car .

1. Position the seat fully forward and fully raised. Unscrew screws retaining outer trim A. Turn trim B upward.

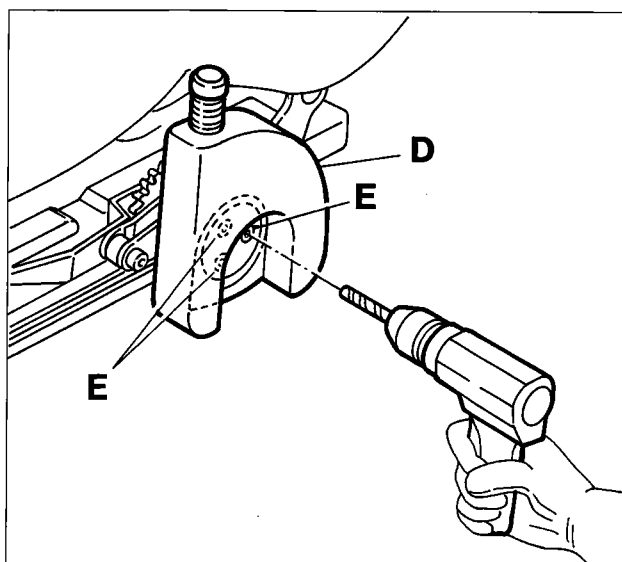


P4A024M10



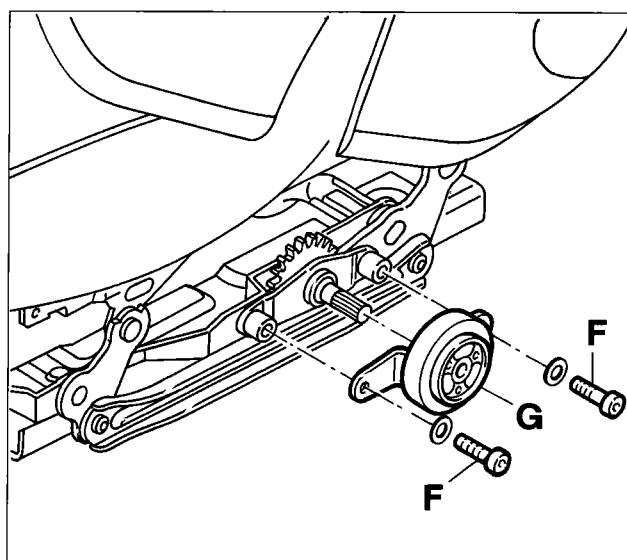
2. Remove panel C covering seat raise lever fastener. Take care not to break the tabs. Remove the lower part by hand (box 1) and then use a screwdriver to prise up the upper tab (box 2) and remove the panel.
3. Remove lever D and drill off the head of rivets E.
4. Unscrew bolts F retaining the seat raise device and then remove.

NOTE *Reverse removal instructions to refit. Tighten retaining bolts to a torque of 1.2 daNm.*



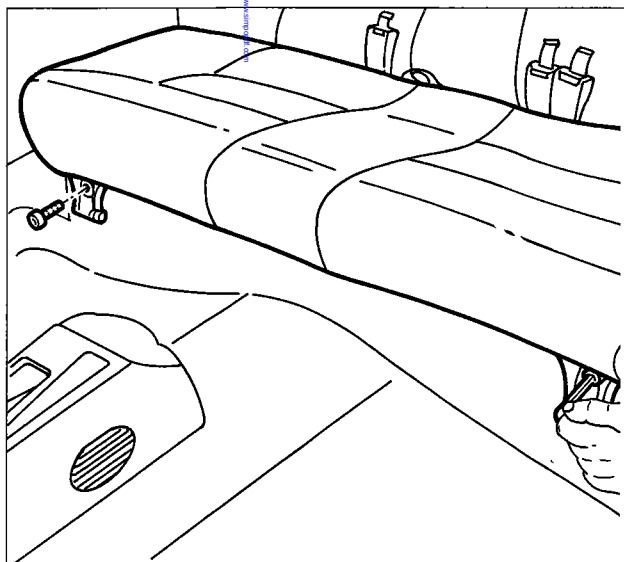
P4A024M11

4A197M



P4A024M12

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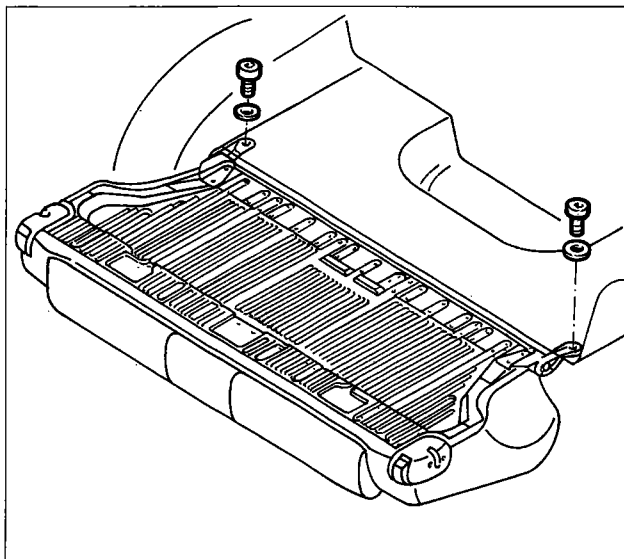


P4A024M13



REMOVING-REFITTING REAR SEAT

1. Unscrew the bolts fastening the cushion to the body, then take out of the car.

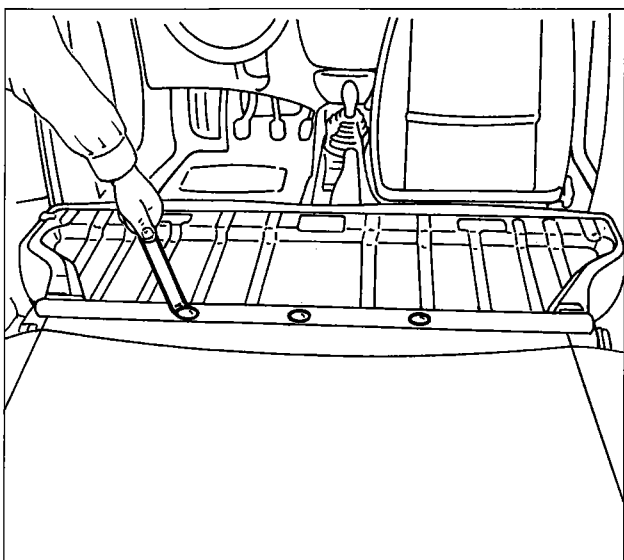


P4A024M14

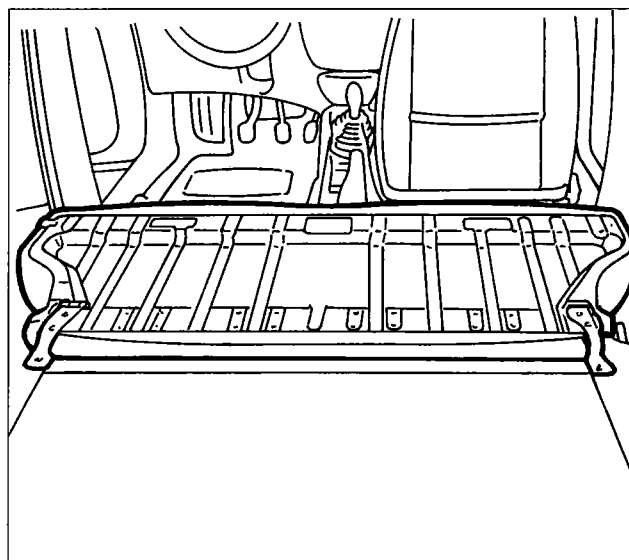


2. Lower the squab, then unscrew the bolts with associated washers.
3. Use tool 1878077000 to undo the studs fastening the boot trim to the squab.
4. Remove the squab from the car.

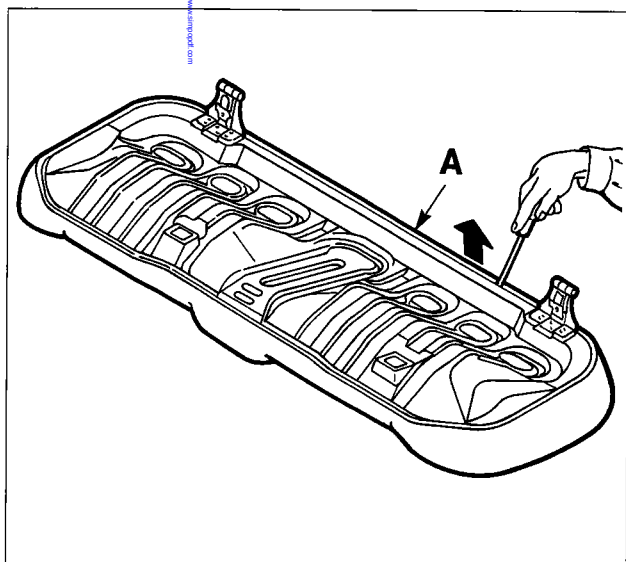
NOTE To refit, carry out removal instructions in reverse order. Tighten retaining bolts to a torque of 2.4 daNm.



P4A024M15



P4A024M16



P4A024M17

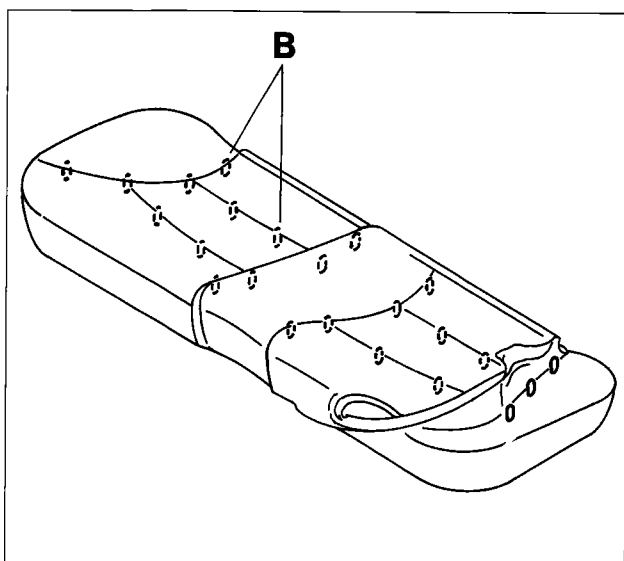


**DISMANTLING-FITTING
REAR CUSHION**

ONE-PIECE



1. Remove the cushion from the car (see previous page). Release plastic moulding A as shown in the figure. Remove upholstered cushion.



P4A024M18



2. Fold back the cover and use cutting pliers to cut hooks B fastening the padding cover around the edges of the upholstery.

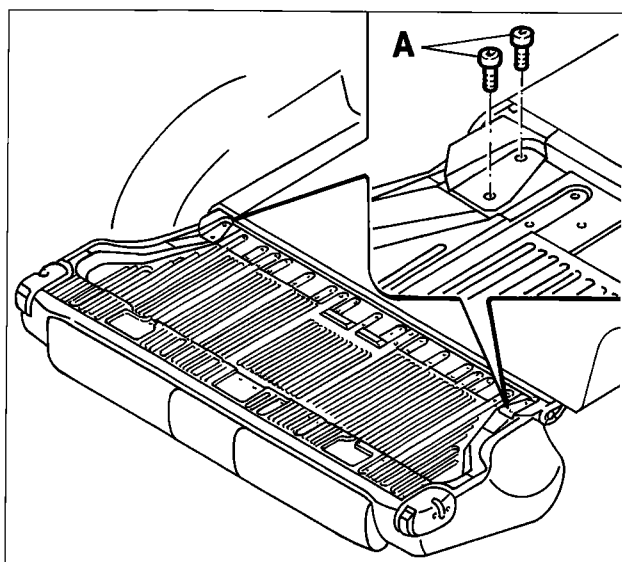


Then remove all residual parts of the hooks attached to the padding to prevent damage to the new cover.

NOTE Use tool 1878077000 when refitting to fasten the cushion hooks



Use new hooks.



4A199M

P4A024M19



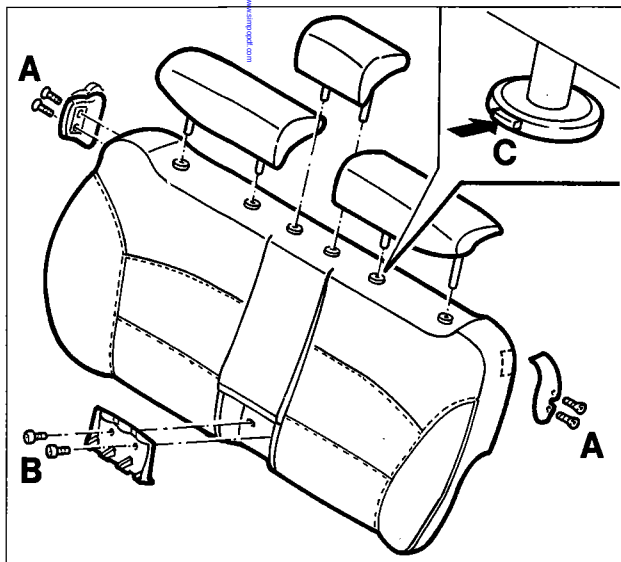
**DISMANTLING-FITTING
REAR SQUAB**

ONE-PIECE



1. Fold down the squab. Unscrew bolts A retaining the squab to the bracket, then remove the squab from the car.

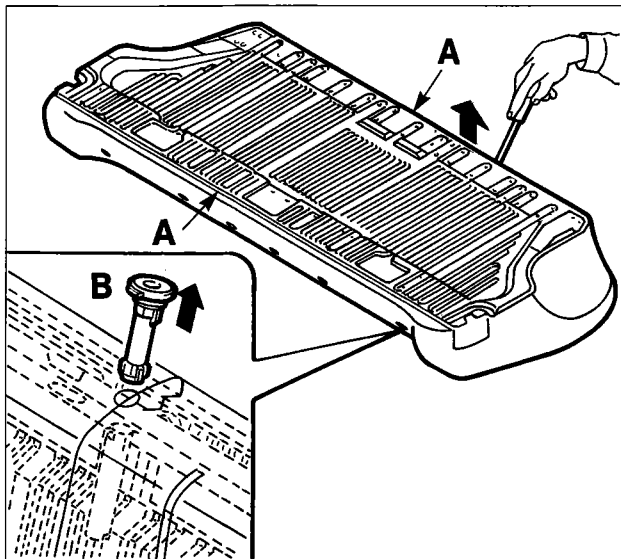
70.



P4A024M20



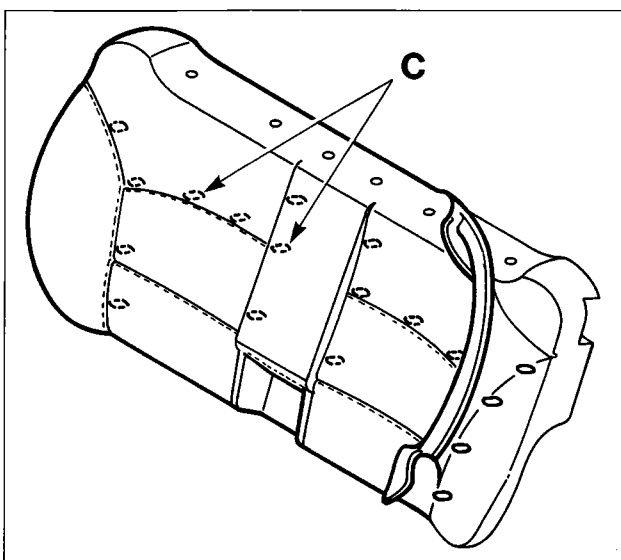
1. Remove side fasteners by unscrewing bolts A. Take off the central belt carrier by unscrewing bolts B. Remove the two side head restraints and the central head restraint by pushing key C on the plastic bushes.



P4A024M21



2. Release cover plastic mouldings A from the reinforcement channel. Remove plastic bushes B by moving the padding and undoing the clip. Remove the upholstered squab module.



P4A024M22

4A200M

3. Fold back the cover and cut hooks C retaining the cover to the padding around the edge of the upholstery.

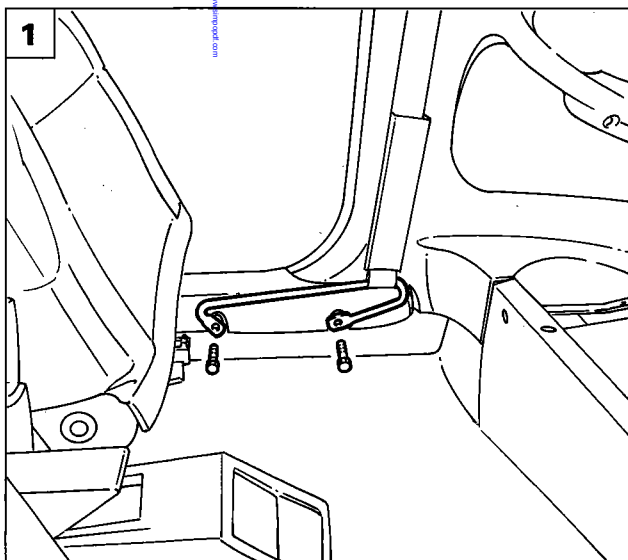


Remove all residual parts of hooks attached to the padding to prevent damage to the new cover.

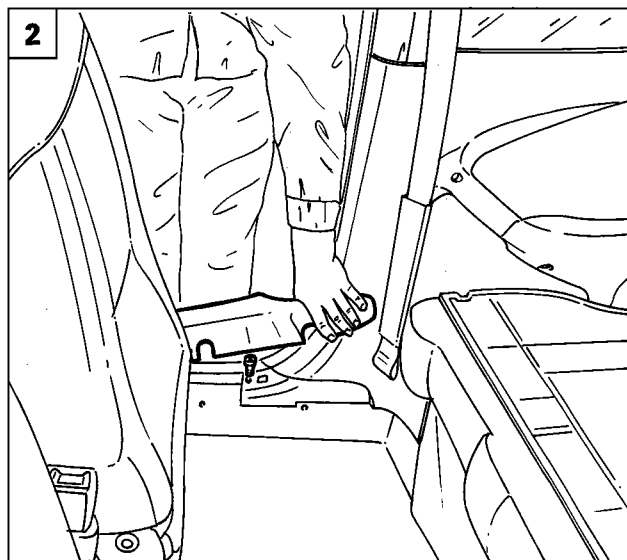
NOTE Reverse order of removal instructions to refit. Fasten the hooks using tool 1878077000.



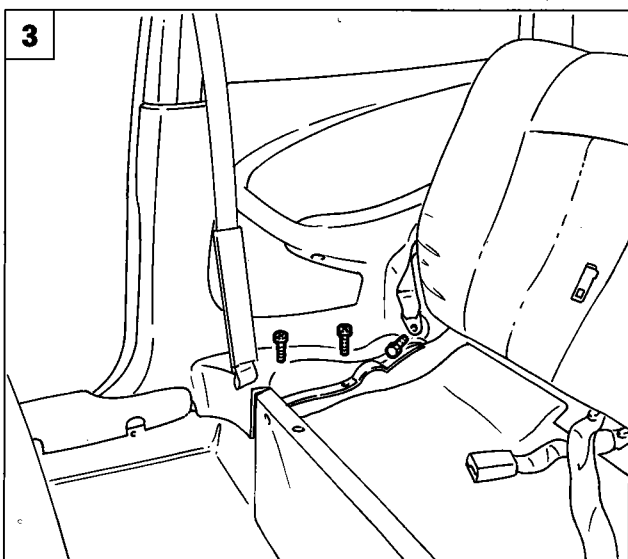
Use new hooks.



P4A025M01



P4A025M02



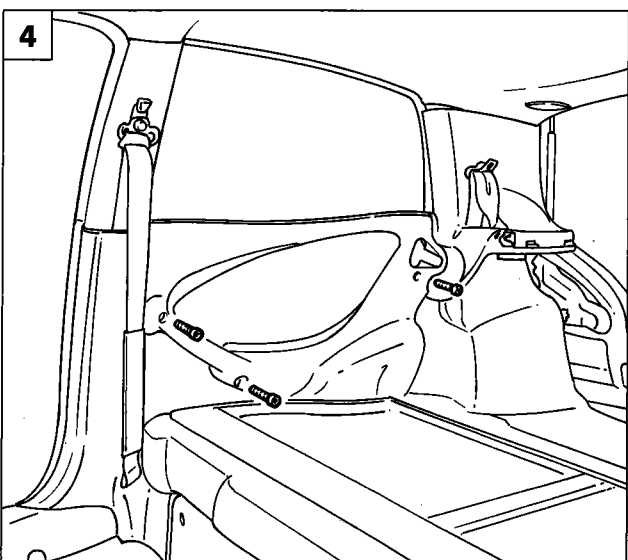
P4A025M03



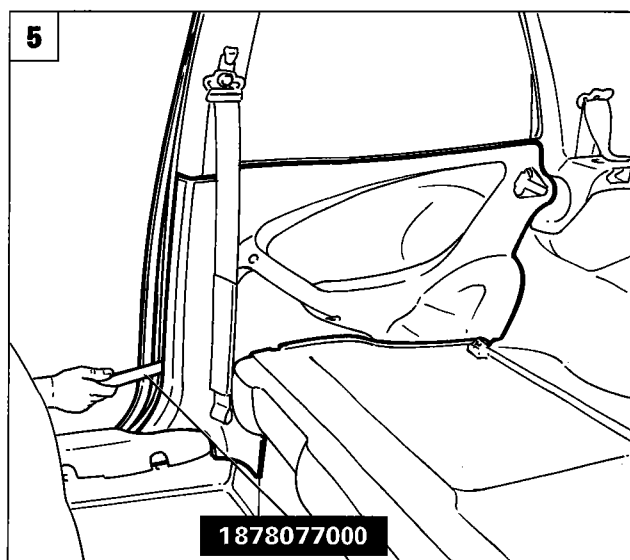
REMOVING-REFITTING REAR SIDE PANEL

1. Remove the seat cushion following the instructions given on the previous page, then remove the seat belt attachment bracket undoing the fixing bolts.
2. Lift up the running board trim, then undo the bolt underneath.
3. Undo the bolt fixing the rear seat belt and the bolts fixing the panel to the floor.
4. Lower the seat backrest, then undo the bolts fixing the panel to the bodyshell.
5. Gently remove the door seal, then using tool 1878077000 remove the rear side panel from the vehicle.

NOTE To refit simply reverse the order of the operations carried out for the removal.



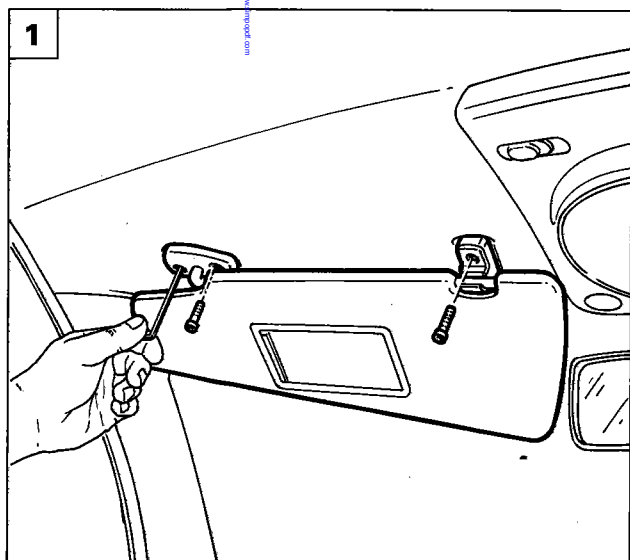
P4A025M04



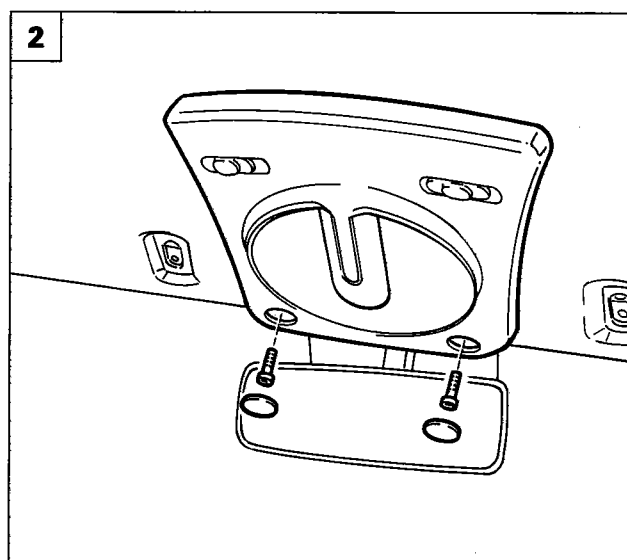
P4A025M05

1878077000

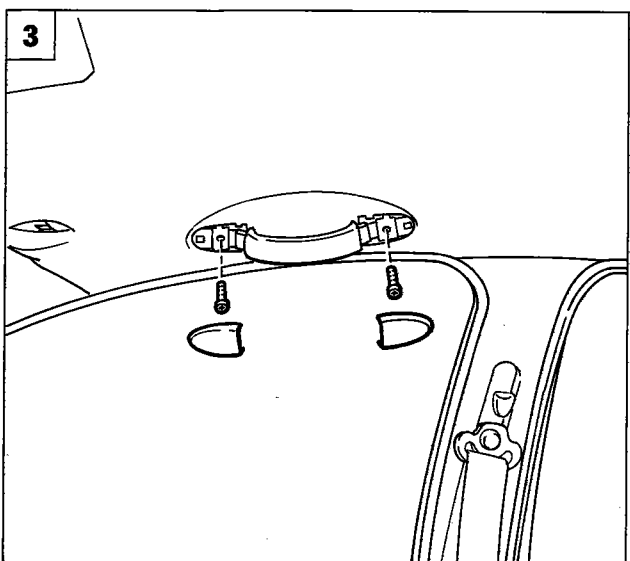
70.



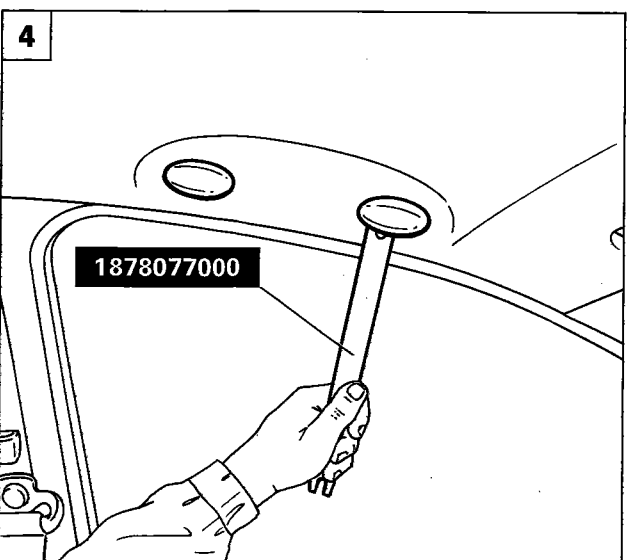
P4A026M01



P4A026M02



P4A026M03



P4A026M04

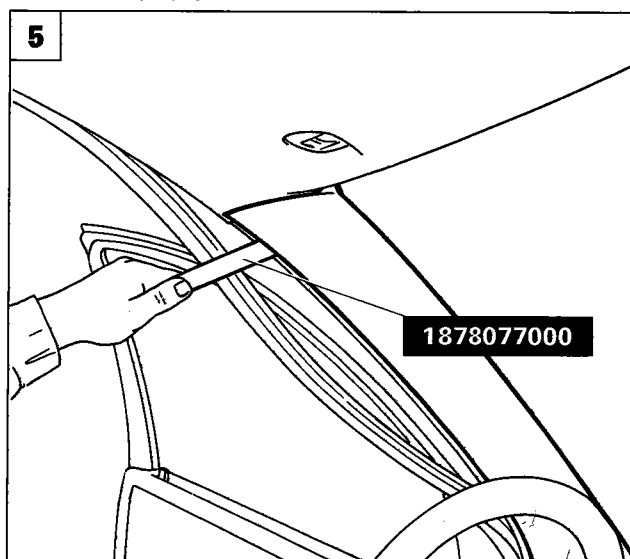
ROOF LINING

Removing

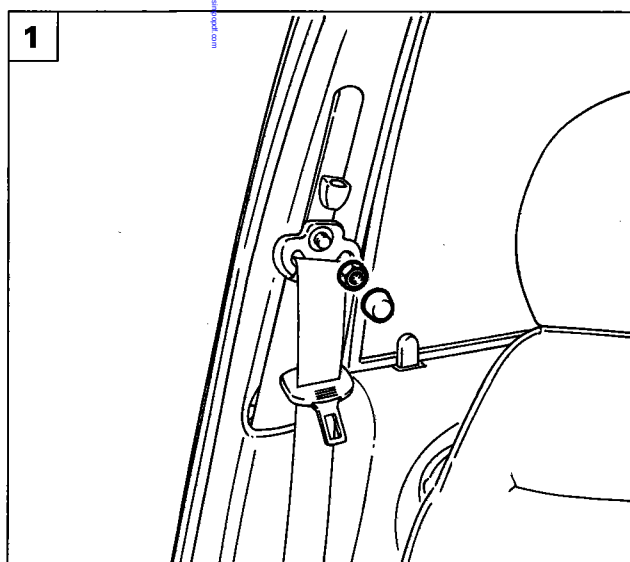


The procedure is carried out on the 5 door version; as far as the 3 door version is concerned, the procedure is the same.

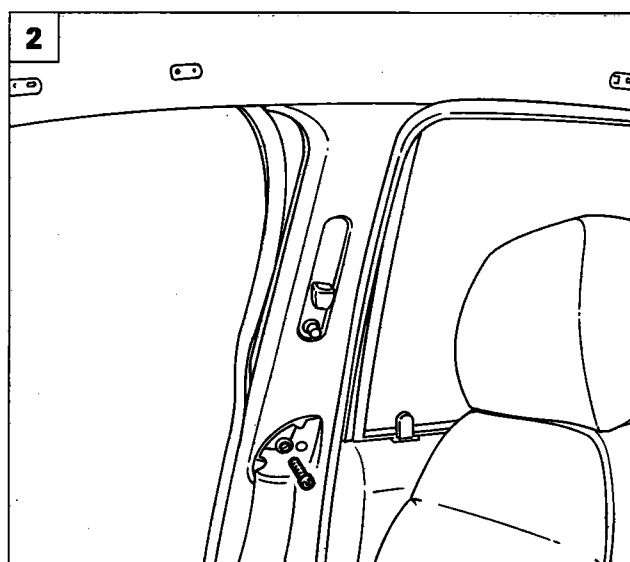
1. Undo the fixing bolts shown and remove the sun visors with the relevant attachment systems.
2. Remove the fixing covers and undo the bolts underneath then remove the courtesy light disconnecting the appropriate connector.
3. Remove the fixing covers and undo the bolts underneath, then remove the passenger grab handles.
4. Using tool 1878077000 remove the buttons fixing the roof lining to the bodyshell.
5. Move the door housing trim aside and use tool 1878077000 to remove the front pillar covers.



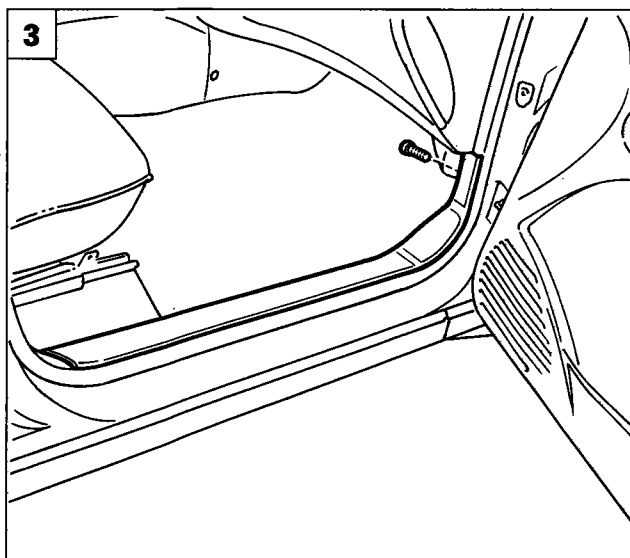
P4A026M05



P4A027M01



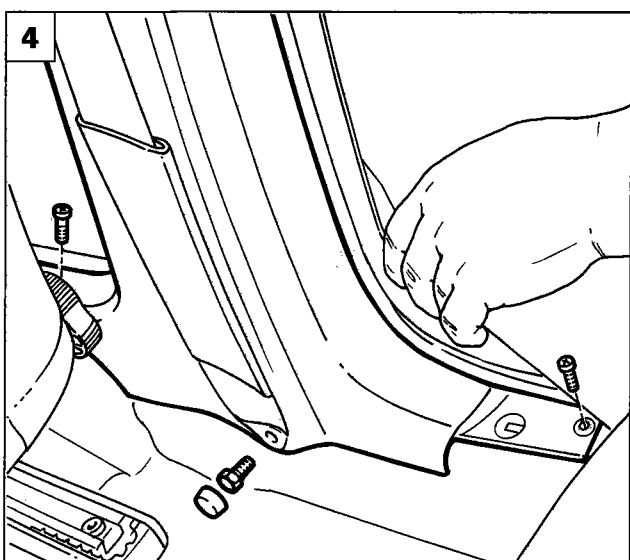
P4A027M02



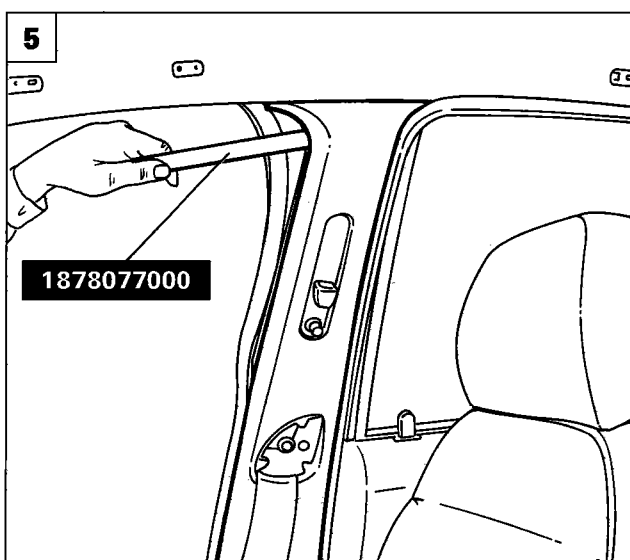
P4A027M03



1. Remove the fixing cover and undo the front seat belt height adjustment nut.
2. Undo the bolt fixing the pillar cover.
3. Undo the bolt fixing the running board.
4. Undo the lower bolts fixing the centre pillar cover and the bolt fixing the seat belt.
5. Remove the centre pillar cover using tool 1878077000.

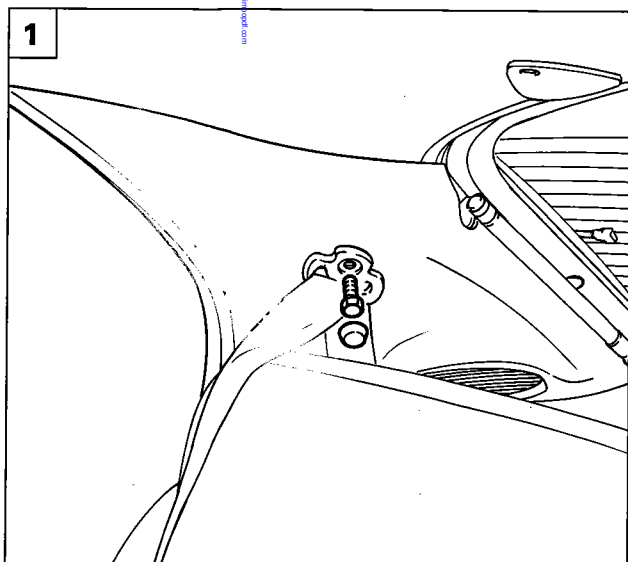


P4A027M04

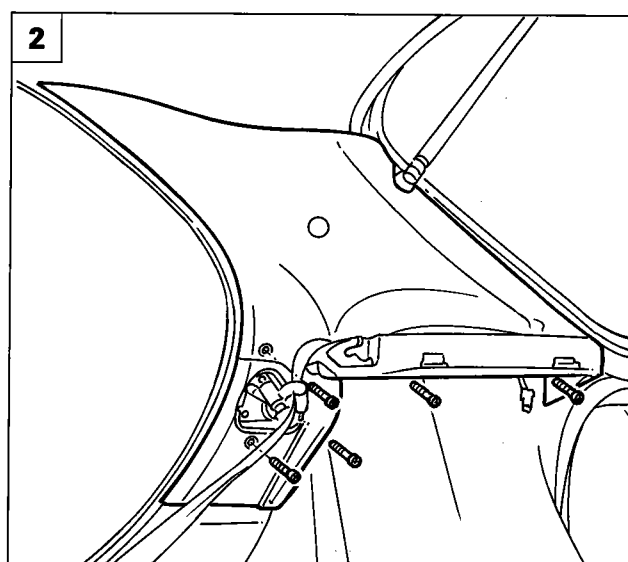


P4A027M05

70.



P4A028M01



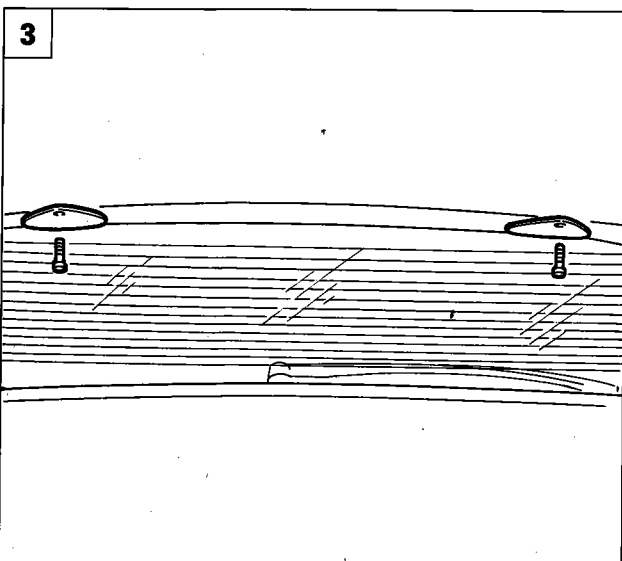
P4A028M02

1. Remove the fixing cover and undo the bolt fixing the rear seat belt.
2. Undo the bolts shown and remove the rear pillar cover.
3. Undo the bolts shown and remove the rear access trims for the tailgate hinge fixings.
4. Heat the roof from the outside using an infra red lamp to assist with the separation of the bodysell lining:

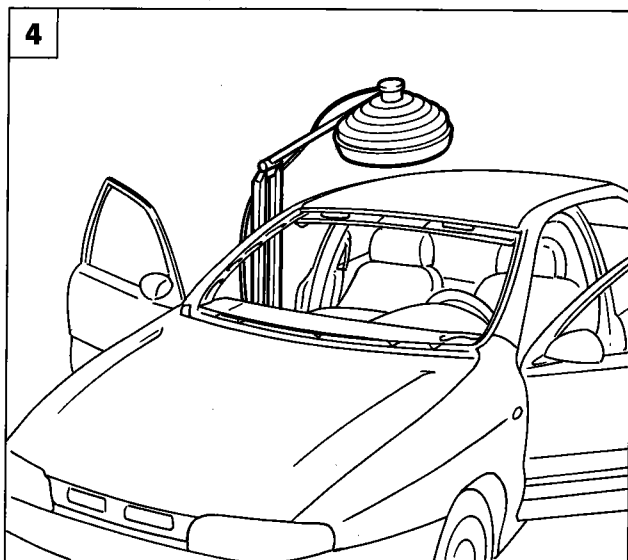
Avoid temperatures exceeding 90°C in order not to damage the paint-work.



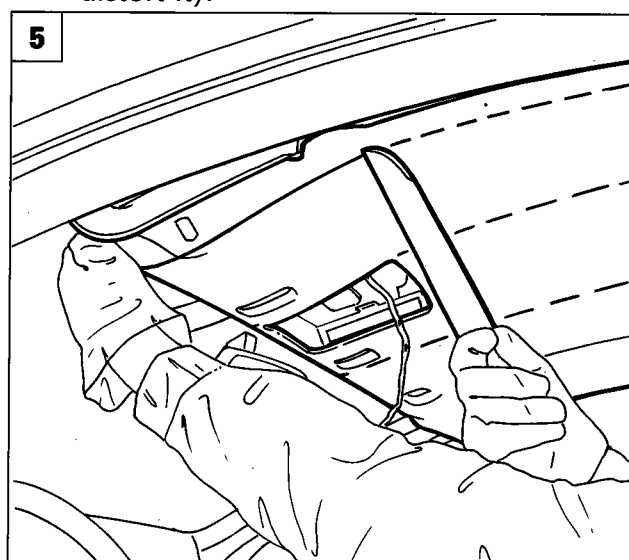
5. Cut the lining in a longitudinal direction to allow the subsequent removal of the roof panel from the vehicle, then extract it through the tailgate housing. (Do not pull the roof panel downwards so as not to distort it).



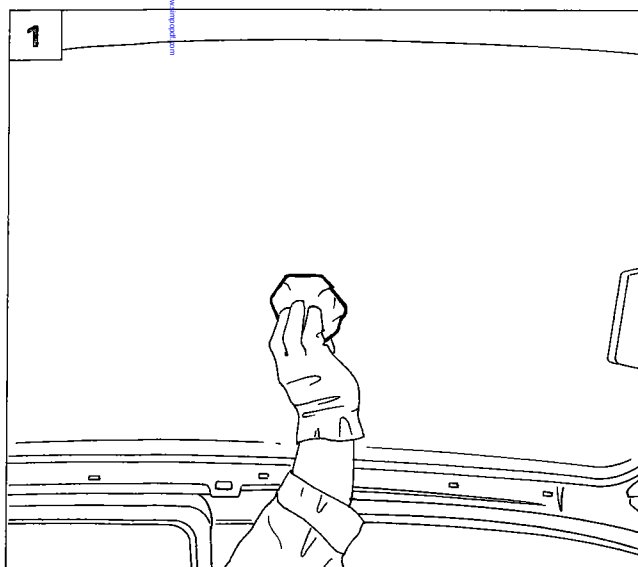
P4A028M03



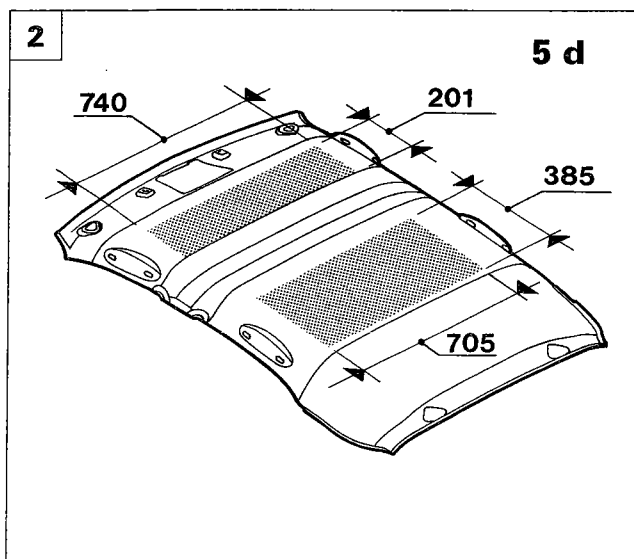
P4A028M04



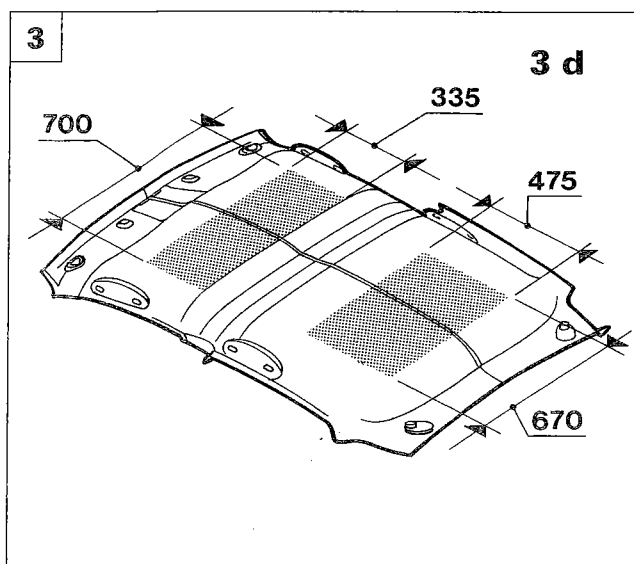
P4A028M05



P4A029M01



P4A029M02



P4A029M03

4A029M

Refitting

1. Clean the roof panel thoroughly using disposable paper impregnated in heptane.
- 2.3 Apply the specified adhesive to the area shaded in the figure. Observe the dimensions shown.

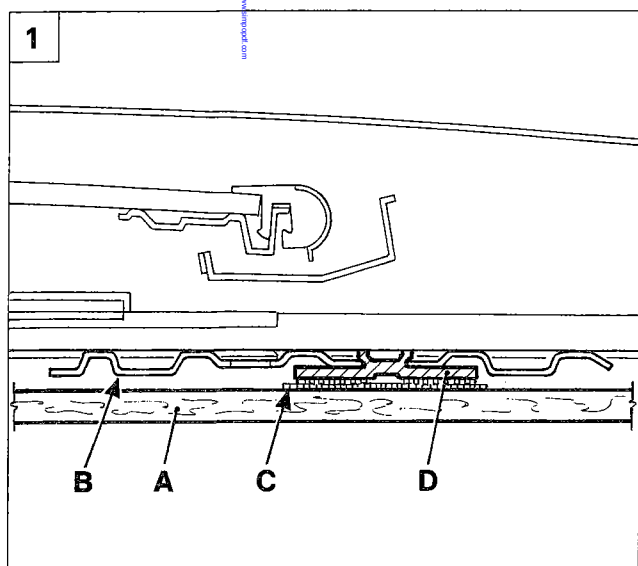
NOTE It is advisable to use a water-based adhesive, e.g. TIVOCOLL 4769/59 manufactured by TIVOLI, or an equivalent GURIT or ESSEX product.

- 2.3 Heat the roof panel trim for about 5-6 minutes using an infra-red lamp and position the trim on the roof panel.



Do not allow the temperature to exceed 90°C, then fit the passenger grab handles and retaining studs. Press the trim so that it adheres to the roof, working from the centre outwards, then finish refitting by reversing removal instructions.

70.



P4A029M05

ROOF PANEL TRIM FOR VERSIONS WITH SUN-ROOF

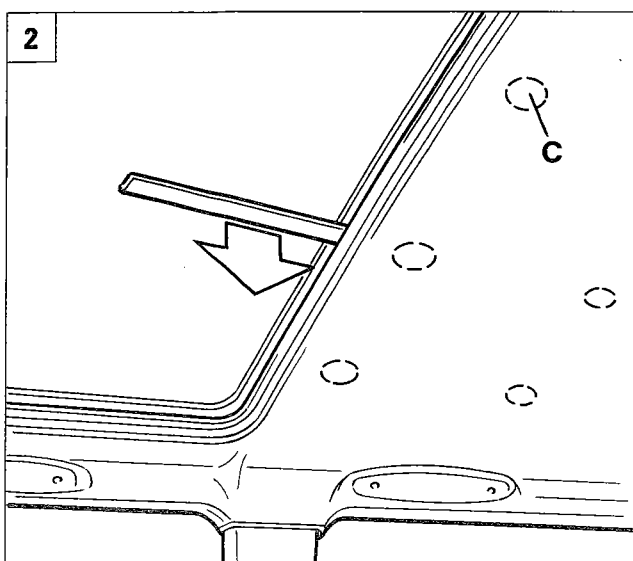
The roof panel trim (A) for versions with sun-roof is fastened round the outside as in other versions and in the centre (as shown in cross section in figure 1) by means of six velcro circles (C) arranged in two parallel lines (figure 3), which are joined to the same number of blocks (D) (with velcro) fitted on beam (B)) of the sun-roof assembly.

This type of fastening allows the roof panel trim to be reused when the sun-roof assembly is repaired and it is able to absorb vibrations.

Removing

After removing the various parts described on the previous pages, insert a 4-5 cm wide blade between the sun-roof frame and the roof panel trim (figure 2). Taking care not to damage the trim, separate the velcro inserts (C) from the blocks (D).

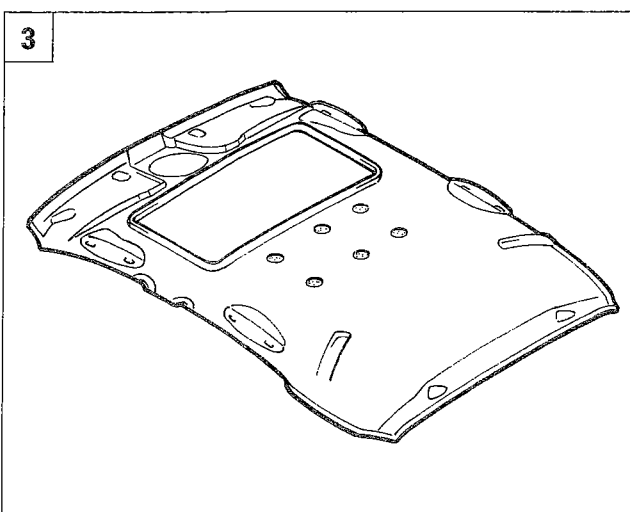
Then remove the roof panel trim from the vehicle through the rear tail-gate compartment (see page 60)



P4A029M06

Refitting

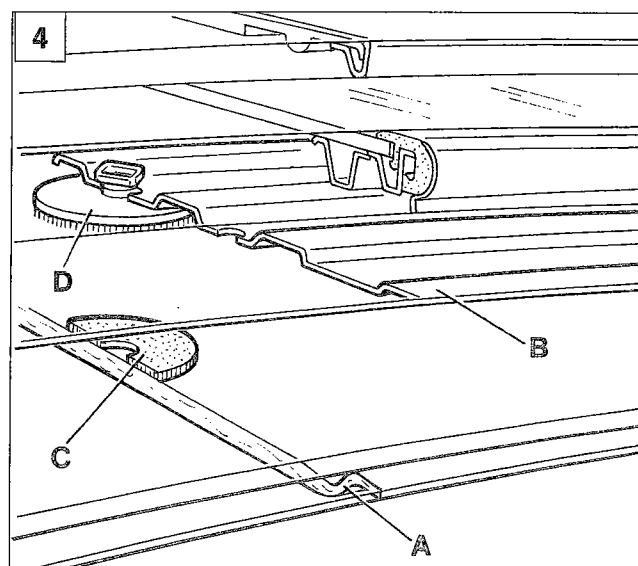
Position roof panel trim (4) correctly inside the vehicle roof, and then fasten around the edge after pressing velcro application points (C). Refit the various parts by carrying out the operations described in the previous pages in reverse order.



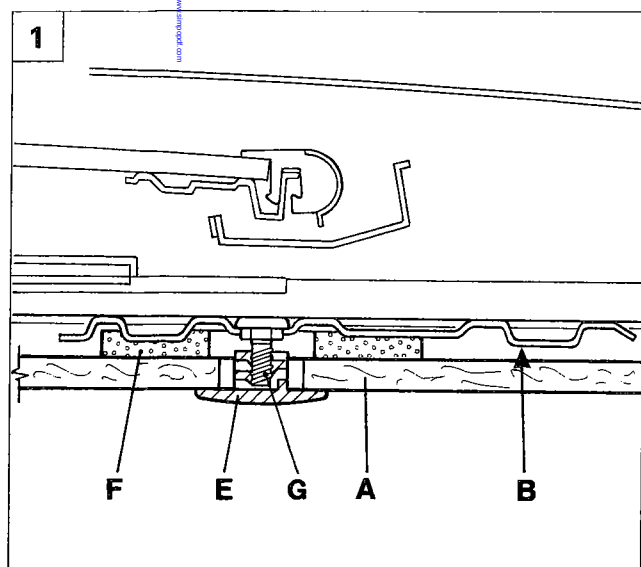
P4A029M07

Detail of roof panel trim

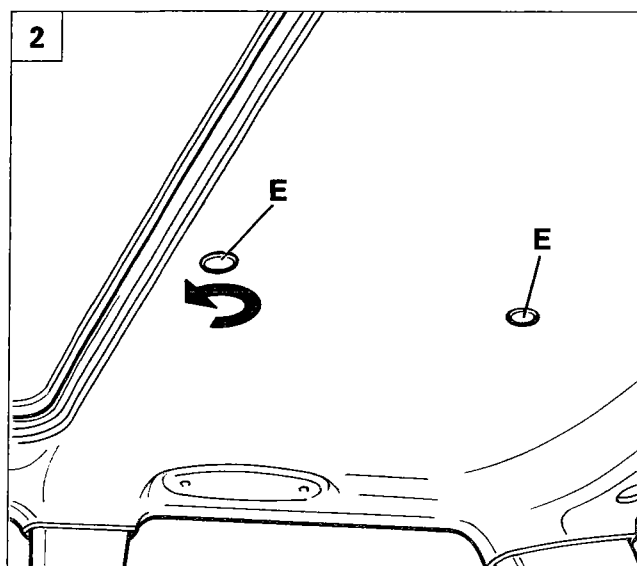
4A230M



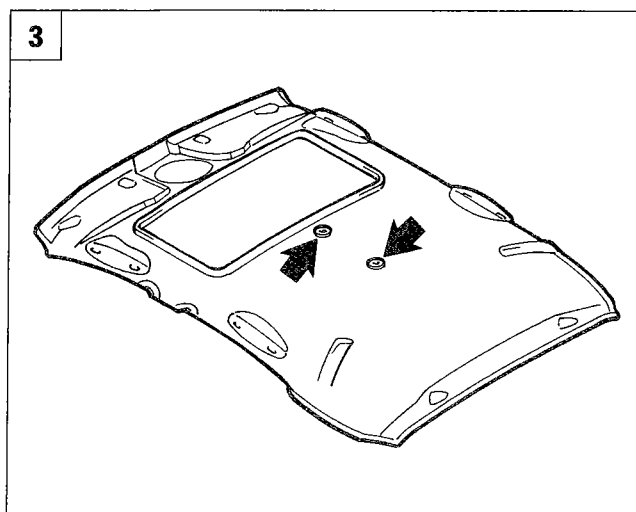
P4A029M08



P4A029M09



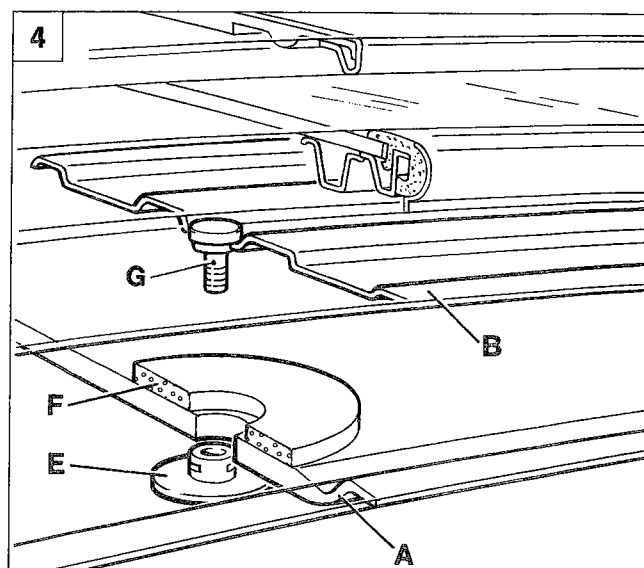
P4A029M10



P4A029M11

Detail of roof panel trim

4A231M



P4A029M12

The roof panel trim (A) is now fastened round the edge as with the other versions and in the centre (as shown in cross section in figure 1) by means of two studs that screw into bolts (G) applied to beams (B) of the sun-roof assembly.

Two vibration-damping foam washers (F) are fastened to the roof panel trim on the through holes used for the fastening studs.

Removing

Remove the various parts described in the previous pages, which are used to fasten the roof panel trim round then edge. Then unscrew studs (E, figure 2) retaining the trim to the sun-roof beam, taking care not to damage the trim.

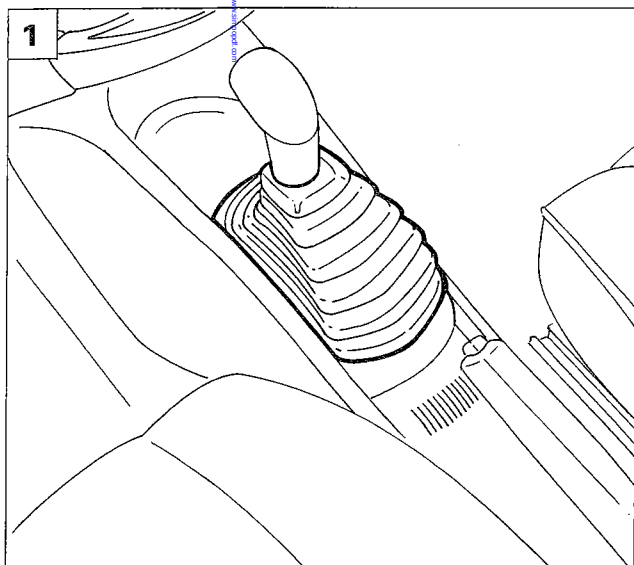
Lastly, remove the roof panel trim from the vehicle through the tail-gate compartment (see illustration on page 60).

Refitting

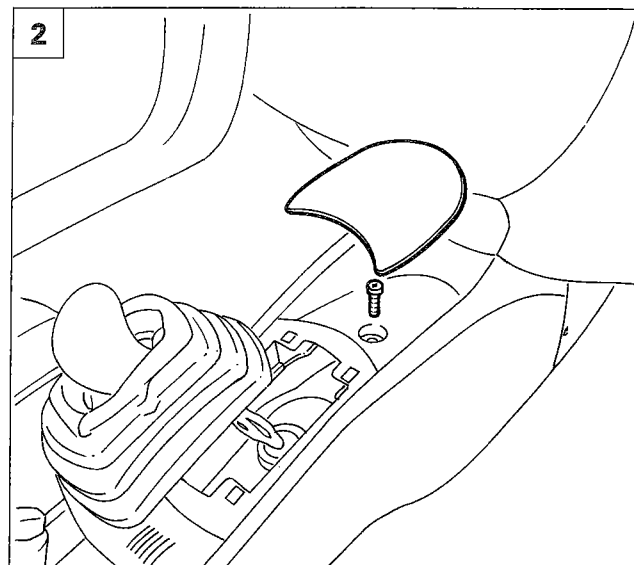
Position the roof panel trim correctly inside the vehicle roof so that the two holes (arrowed in figure 3) coincide with bolts (G) applied to beams (B) of the sun-roof assembly.

Fit studs (E) onto bolts (G) and then carry on fastening the roof trim by refitting the various parts described previously and carrying out the operations described on the previous pages in reverse order.

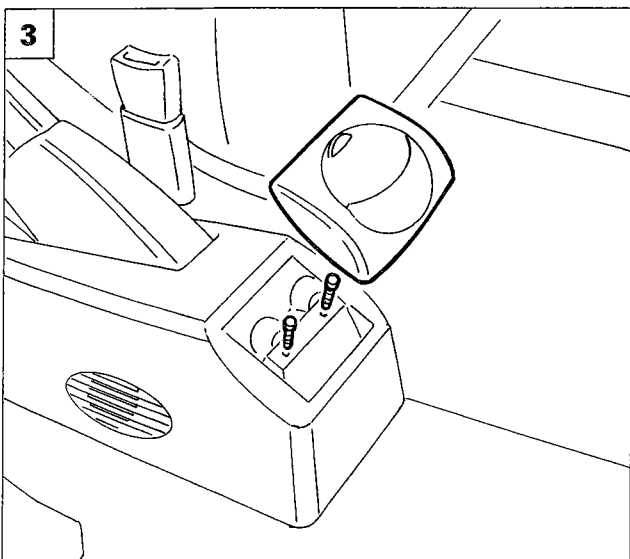
70.



P4A030M01



P4A030M02



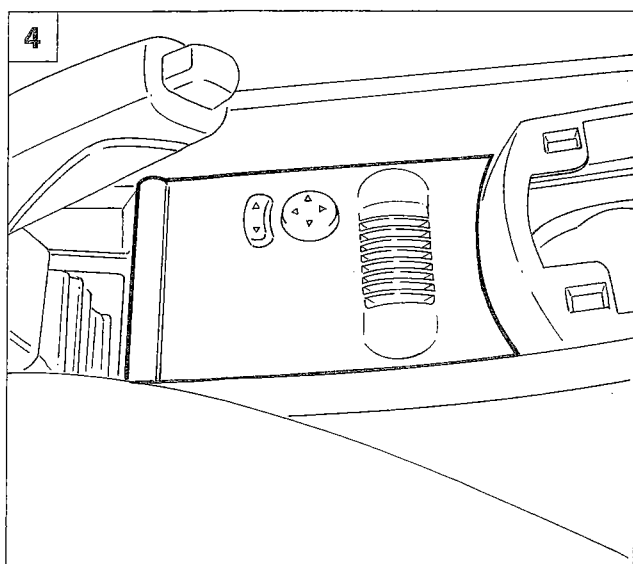
P4A030M03



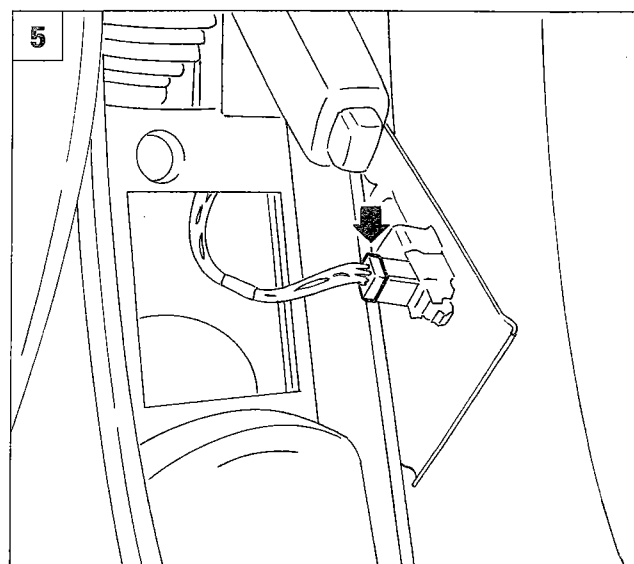
REMOVING-REFITTING DASHBOARD

Remove the stalk unit from the vehicle as described in section 55 - Electrical equipment.

1. Prise the protective boot from the gear lever.
2. Lift the object mat and unscrew the underlying bolt.
3. Remove the ashtray and unscrew the underlying bolts.
4. Undo the retaining tabs and lift the panel shown.
5. Disconnect the door mirror control connector and remove the panel.

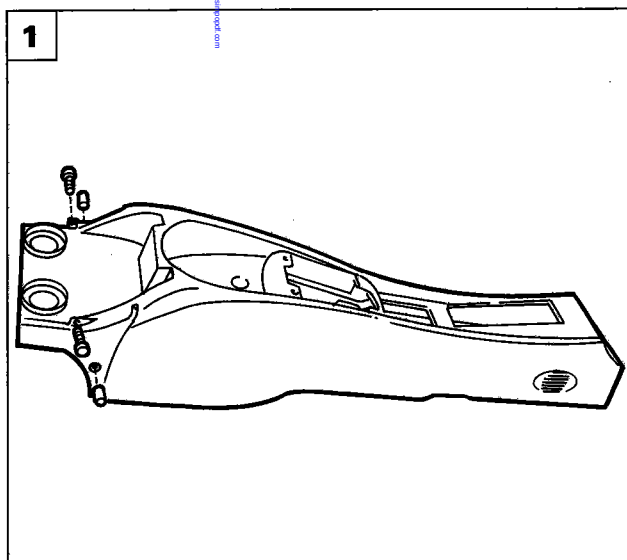


P4A030M04

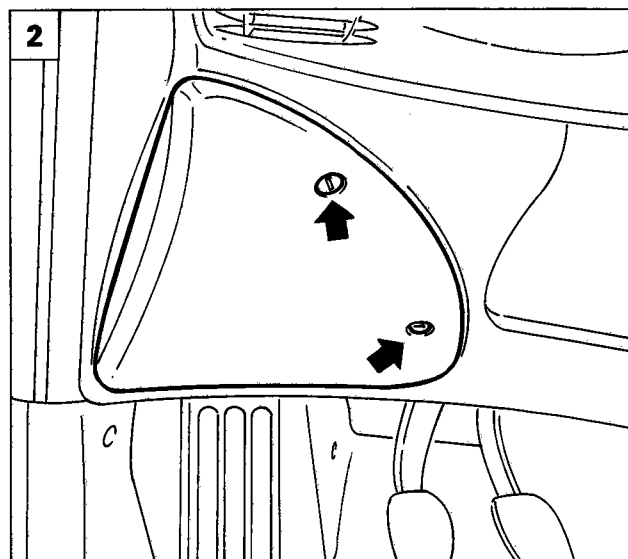


P4A030M05

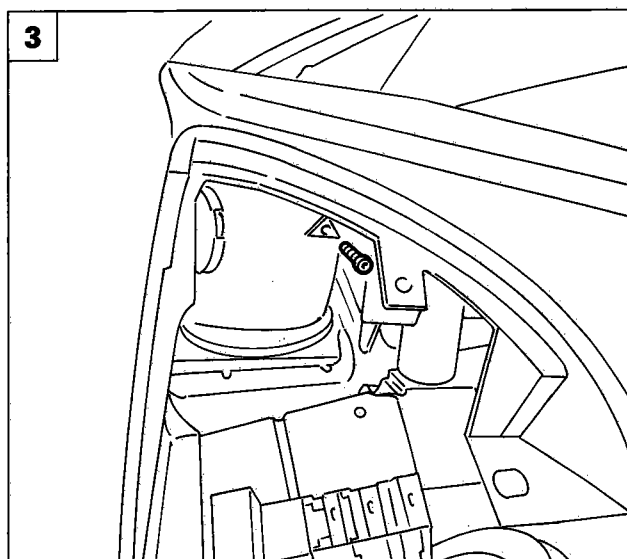
4A030M



P4A031M01



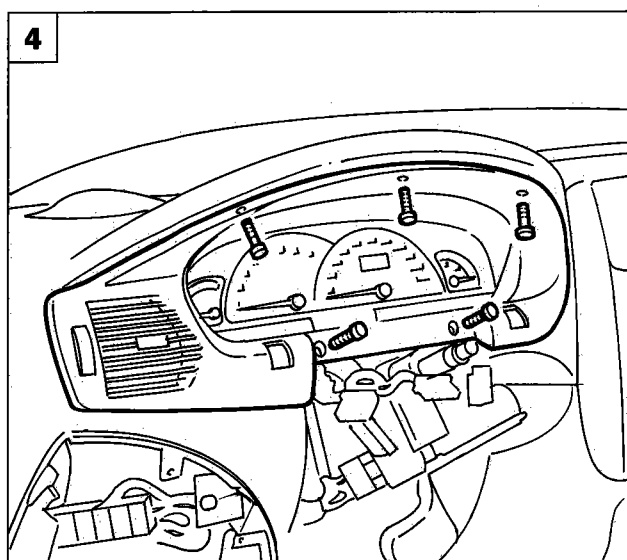
P4A031M02



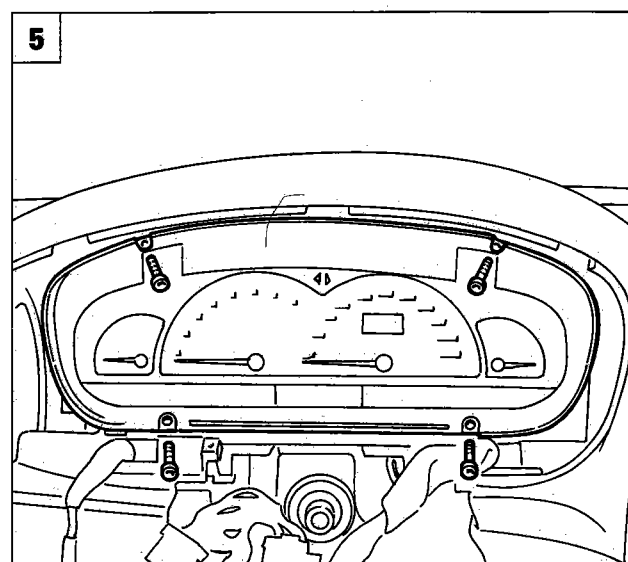
P4A031M03



1. Remove the clips, undo the bolts shown and remove the tunnel cover from the vehicle.
2. Acting at the points shown, remove the protection for the junction unit.
3. Undo the bolt inside the junction unit protection.
4. Undo the bolts shown, then remove the instrument panel cowling.
5. Loosen the fixing bolts shown, disconnect the connectors at the rear of the instrument panel, then remove the latter from the dashboard.

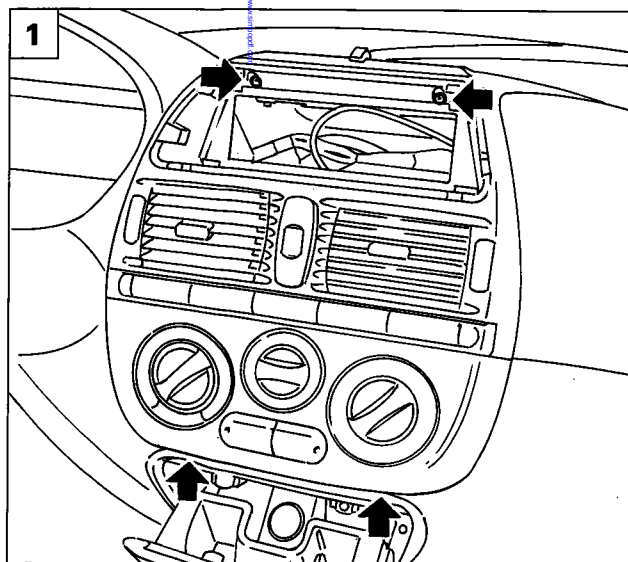


P4A031M04

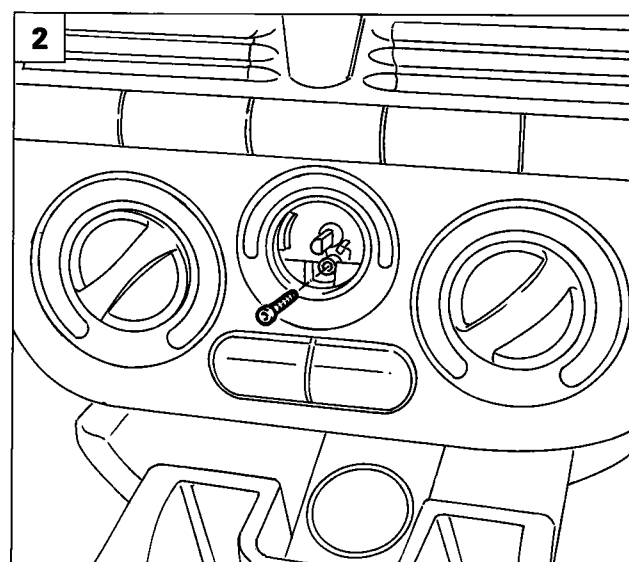


P4A031M05

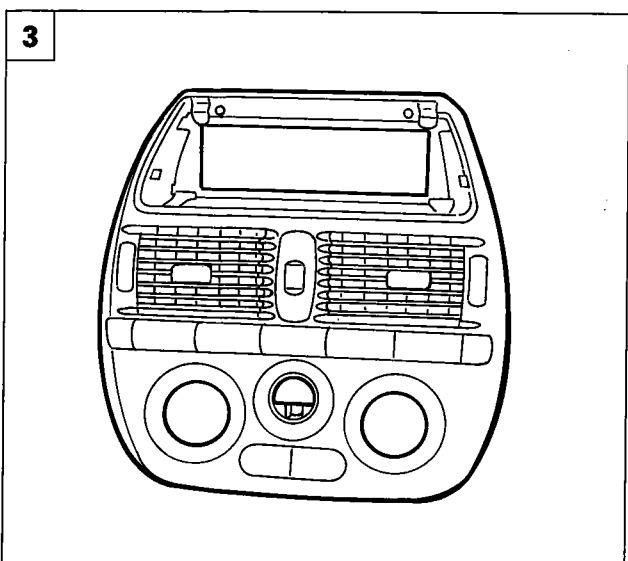
70.



P4A032M01



P4A032M02

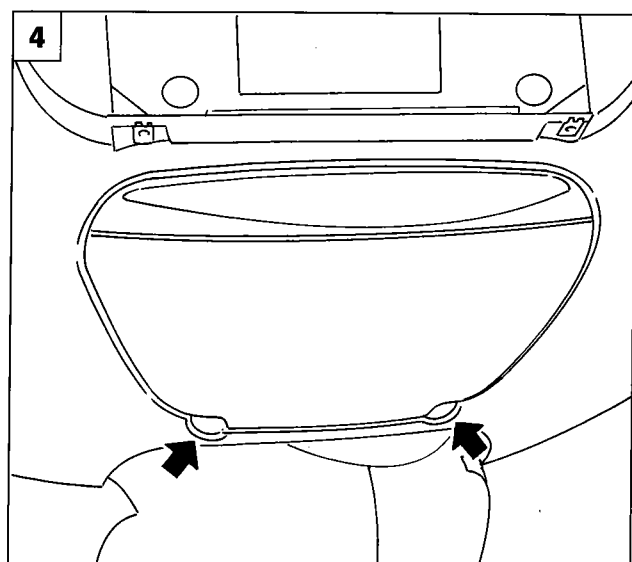


P4A032M03

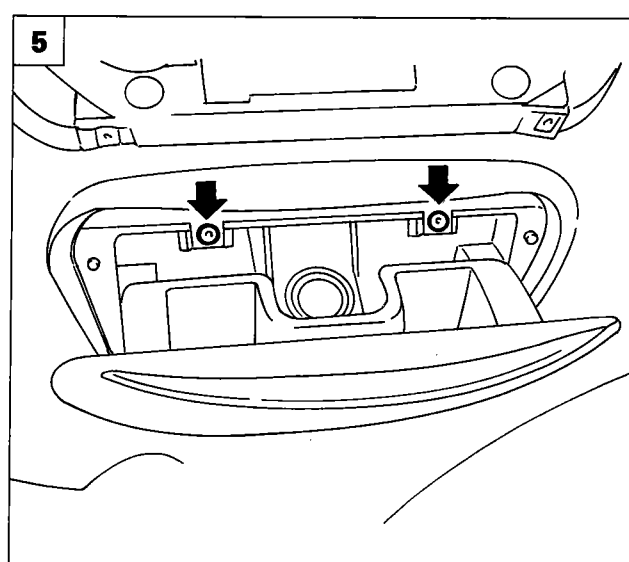


Remove the radio from the vehicle following the instructions in section 55 - Electrical equipment.

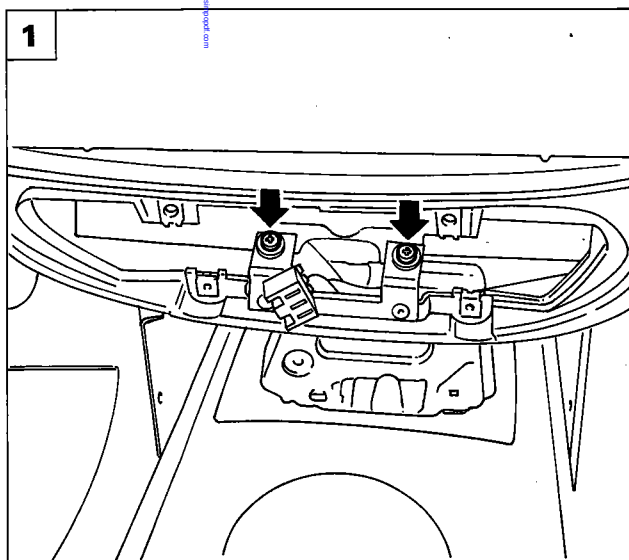
1. Undo the bolts fixing the heater control panel and various switches.
2. Extract the ventilation control knob then undo the bolt underneath.
3. Remove the heater control panel and various switches from the dashboard after having disconnected the relevant connections.
4. Undo the lower bolts fixing the ashtray to the dashboard.
5. Undo the upper bolts shown in the diagram, disconnect the connector for the cigar lighter, then remove the ashtray from the dashboard.



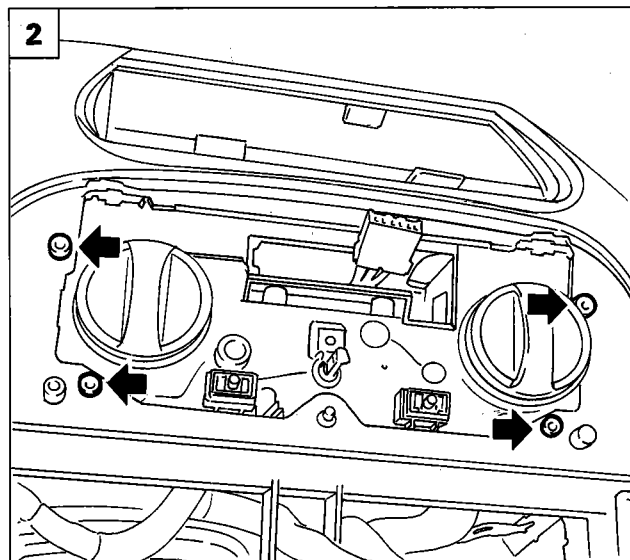
P4A032M04



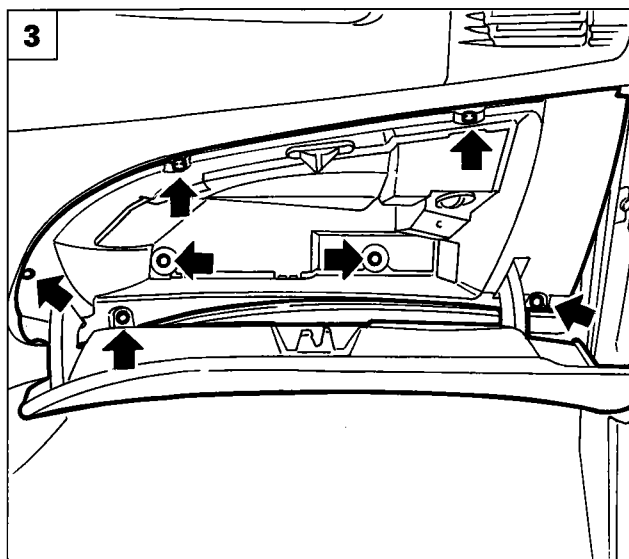
P4A032M05



P4A033M01

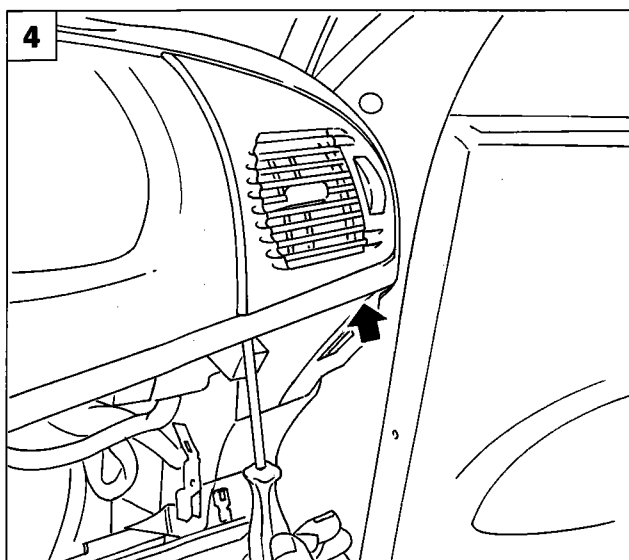


P4A033M02

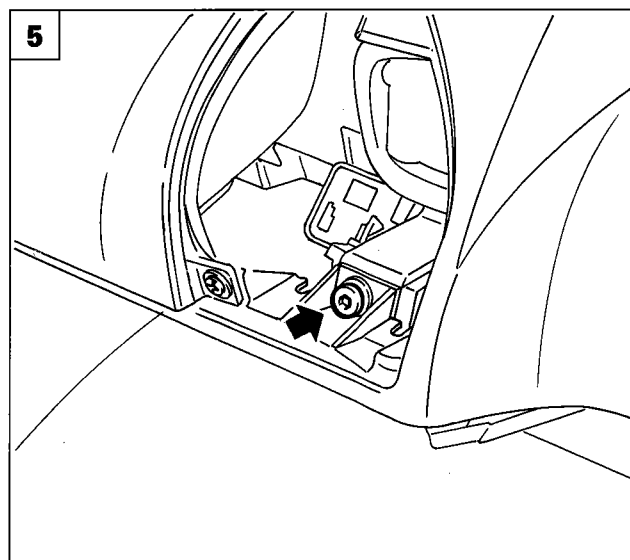


P4A033M03

1. Undo the bolts in the ashtray housing fixing the dashboard to the heater.
2. Undo the bolts fixing the dashboard to the heater.
3. Loosen the fixing bolts shown in the diagram and remove the glove compartment.
4. Remove the left and right side air vents undoing the fixing bolts.
5. Undo the bolt shown fixing the dashboard to the bodyshell on both sides.

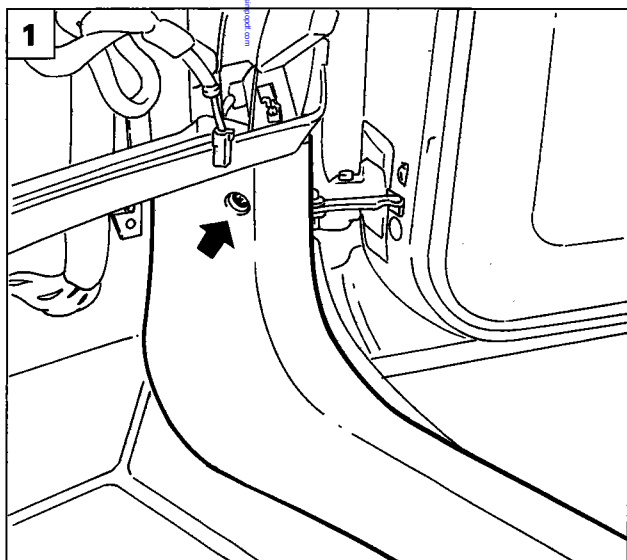


P4A033M04

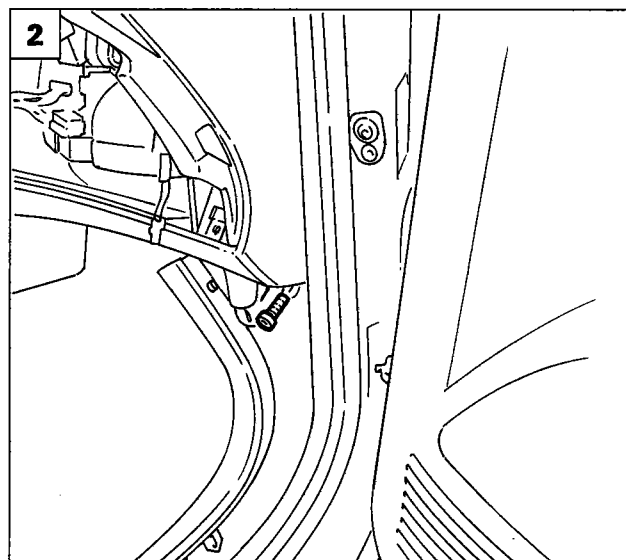


P4A033M05

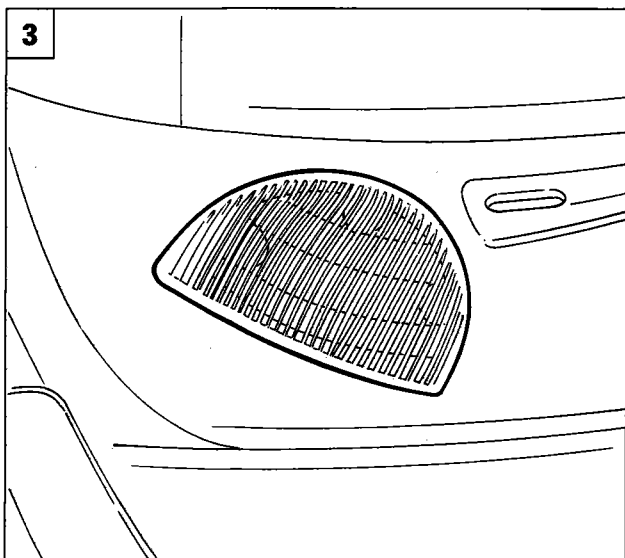
70.



P4A034M01



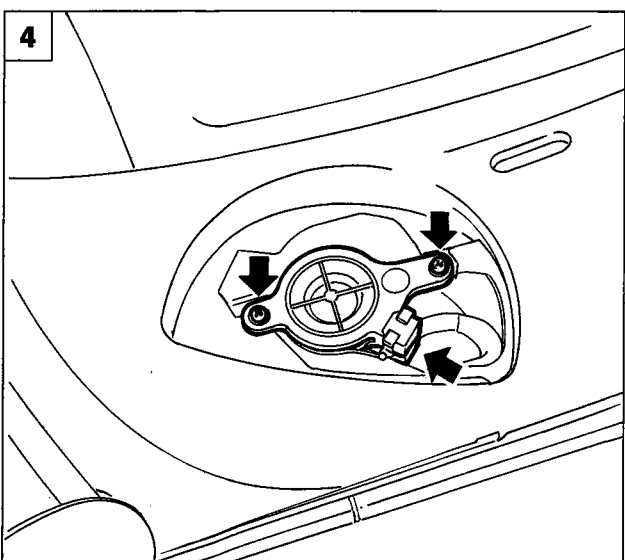
P4A034M02



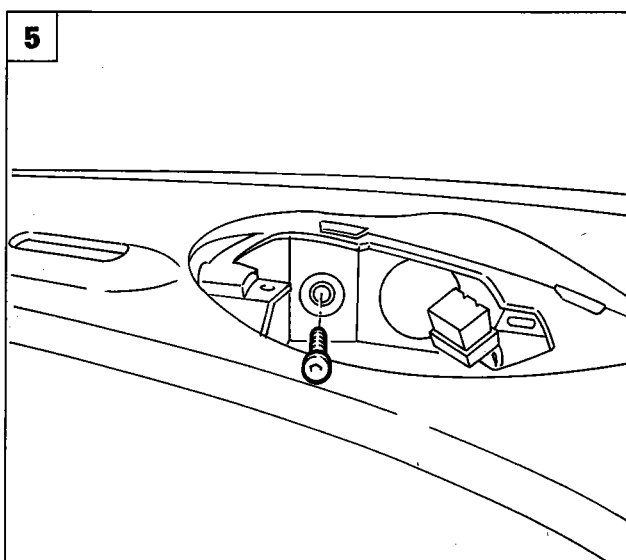
P4A034M03



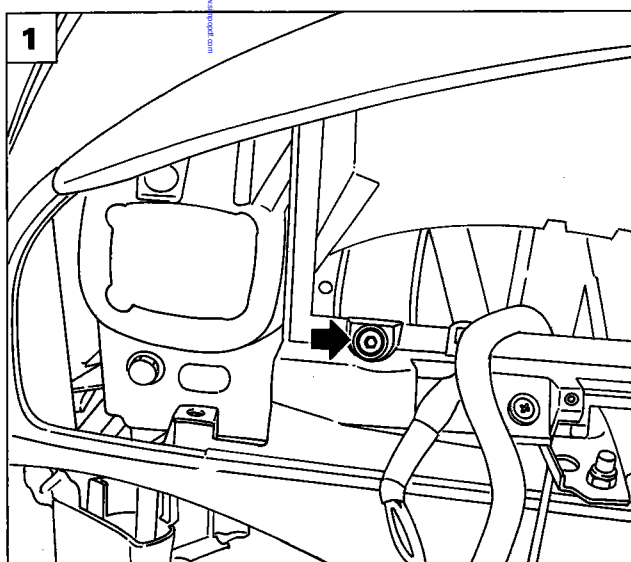
1. Undo the bolt shown and move the underdoor lining from both sides to one side.
2. Working as appropriate, undo the bolt underneath the underdoor lining from both sides fixing the dashboard to the bodyshell.
3. Acting on the retaining tabs, remove the speaker grille from both sides.
4. Remove the left and right speakers, undoing the fixing bolts and connectors.
5. Undo the bolt in left and right speaker housings fixing the dashboard to the bodyshell.



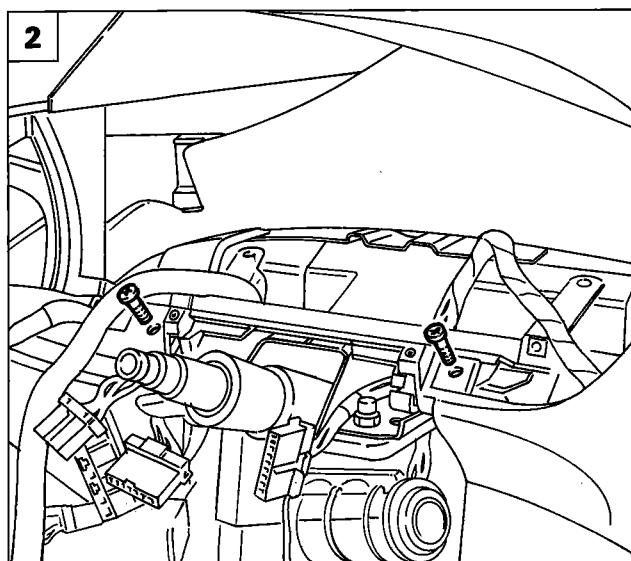
P4A034M04



P4A034M05



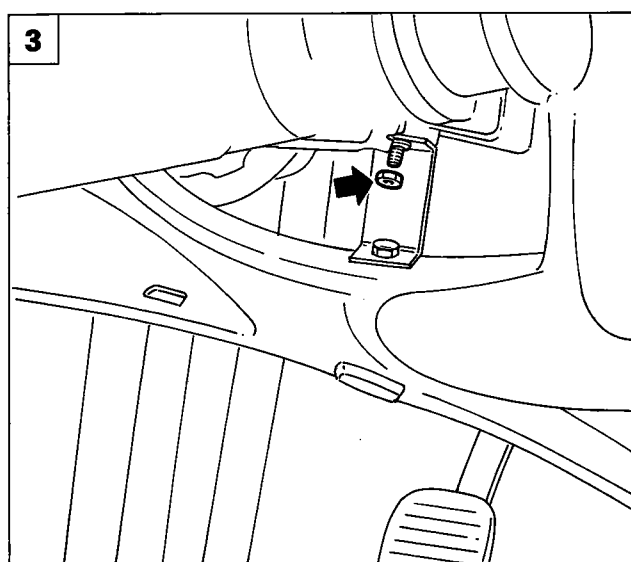
P4A035M01



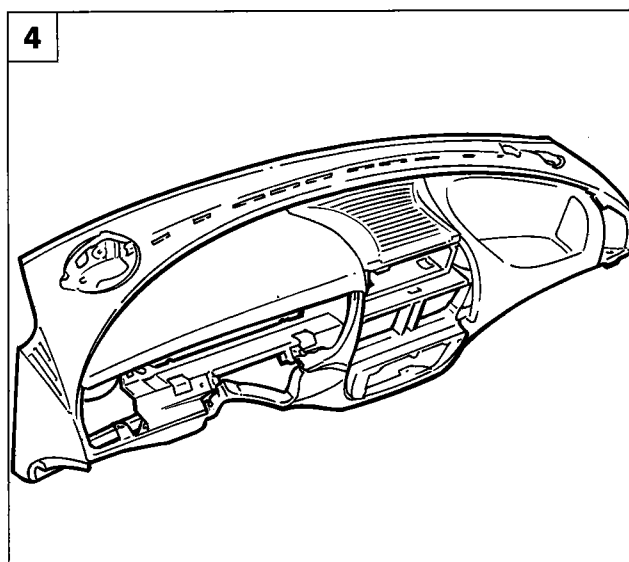
P4A035M02



1. Undo the bolt fixing the dashboard to the bodysell at the centre and at the top (the diagram shows the centre fixing bolt).
2. Undo the bolts fixing the dashboard to the steering column.
3. Undo the nut fixing the bracket connecting the dashboard and the bodysell.
4. Remove the dashboard from the vehicle, with the help of a second operator.

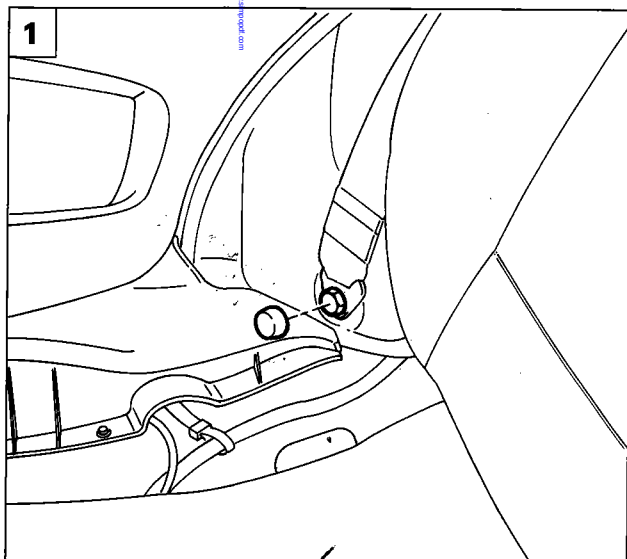


P4A035M03

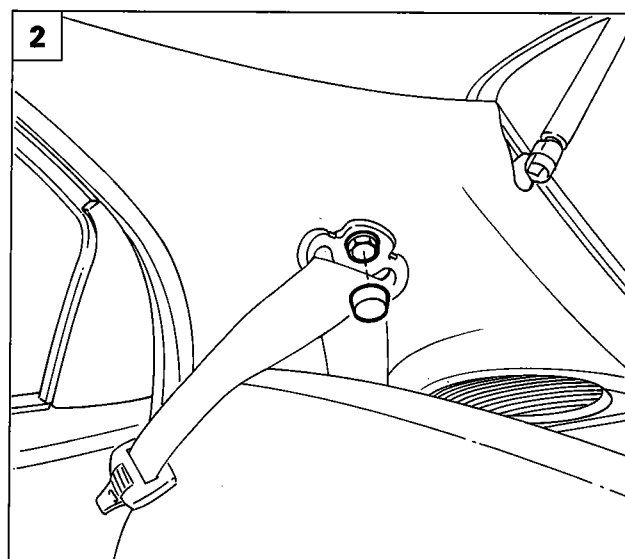


P4A035M04

70.



P4A036M01



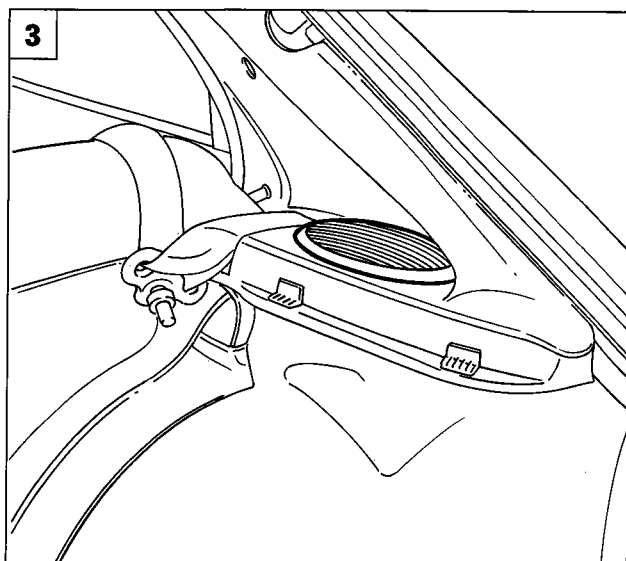
P4A036M02

REMOVING-REFITTING REAR SEAT BELTS

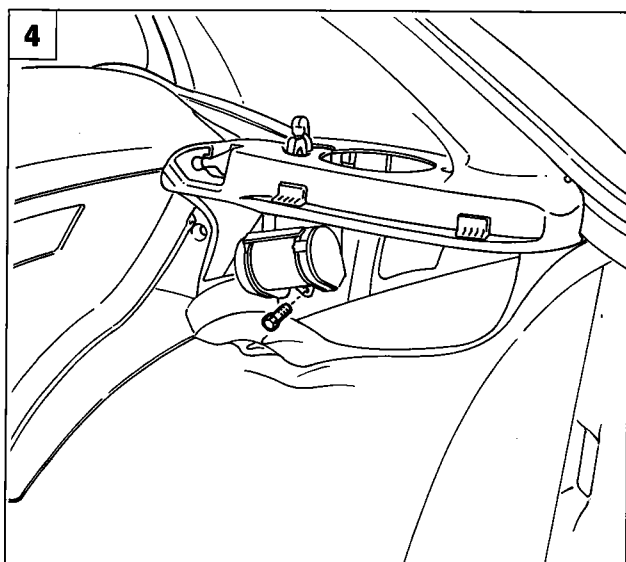


The procedure is carried out on the 5 door version; as far as the 3 door version is concerned, the procedure is the same.

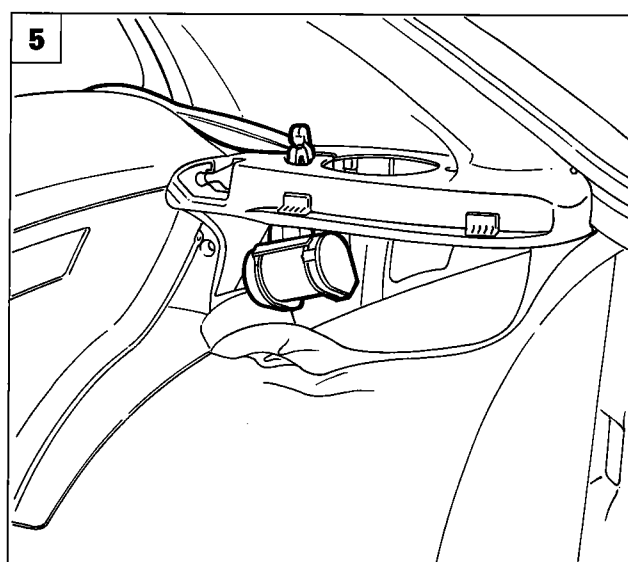
1. Fold over the rear seat cushion and remove the fixing cover shown, then undo the lower bolt fixing the belt.
2. Remove the fixing cover and undo the upper bolt fixing the belt.
3. Remove the speaker griller, acting on the appropriate retaining tabs.
4. Move the luggage compartment inner lining aside, then undo the bolt fixing the reel.
5. Remove the belt through the slot in the rear pillar cover, then remove the belt complete with reel.



P4A036M03



P4A036M04



P4A036M05

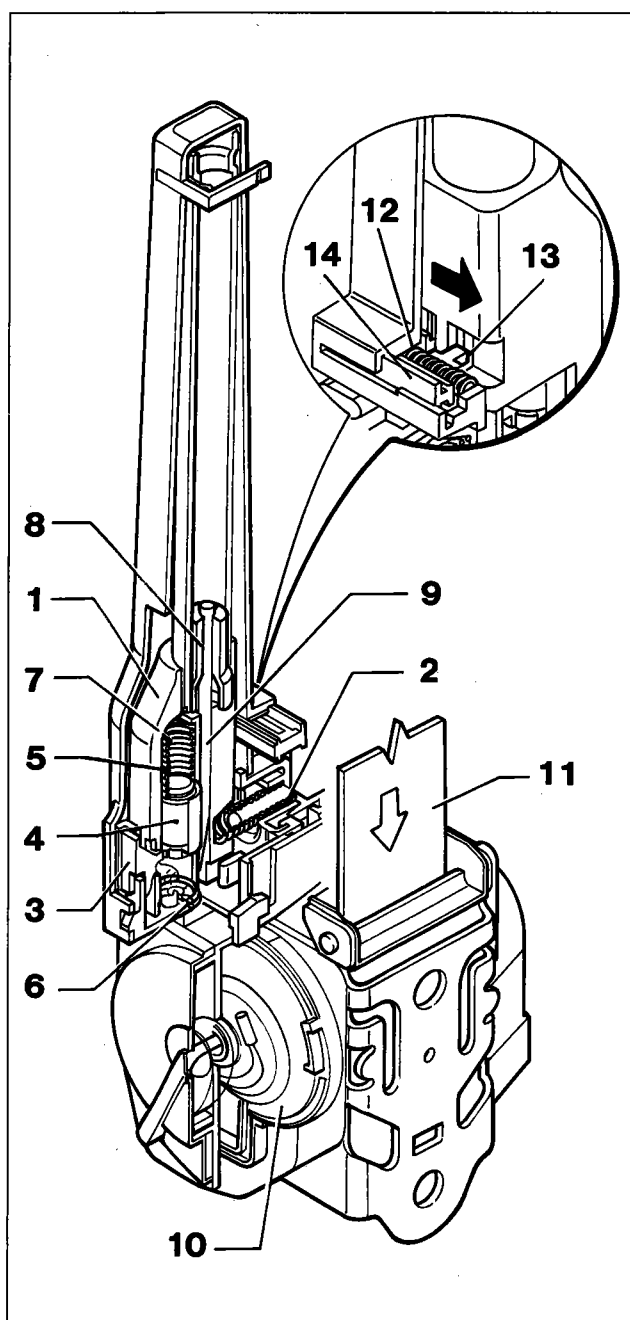
INTRODUCTION

The seat belt PRE-TENSIONER is a device integrated in the reel which, in the case of a frontal impact, recovers the inevitable lengthening of the belt due to the action of the weight of the body of the person in the seat, ensuring that they adhere to the backrest.

It is, in effect, vital that the belt remains adhering as closely as possible to the body of the person in order to gradually absorb the kinetic energy assumed during the impact.

The lengthening of the belt can be due to the following causes:

- delay in the operation of the inertia locking device;
- stretching of the belt fibres;
- wrapping of the belt around the reel (spooling effect);
- garments of a certain thickness which increase the distance between the belt and the chest.



P4A037M01

Diagram showing operation of pre-tensioner

OPERATION

The pre-tensioner fitted on the vehicle is equipped with a bracket (see page 38) which has the task of making the system active.

This takes place because the end of the above mentioned bracket acts on the pulley (14) overcoming the spring (12) loading and pushing the pulley (14) tooth (13) in the direction of the arrow shown in detail in the diagram, releasing the oscillating mass (1) thereby allowing it to act.

Sudden deceleration, caused by an impact, causes the advance of the oscillating mass (1) and the compression of the opposing spring (2). In the case of sufficiently rapid deceleration the oscillating mass is placed in such a position that the gas generator (4) is released from its retaining system (3) and moves downwards through the action of the thrust spring (5) and impacts with the percussion-pin (6) which causes the engagement of the ignition charge. This gives rise to the combustion of the pyrotechnic charge which activates the main charge and the development of the gas in the chamber (7) which flows through the special opening to the piston (8) causing the rapid movement along the expansion chamber.

The metal rod (9), fixed on one side to the piston and on the other wrapped around a pulley fitted on the same axis of the belt (11) winding (10) roller, causes the rotary movement required for the latter to rewind.

At the end of the operation the reel locks in the maximum return position for the actual belt on the body of the occupant of the appropriate seat.



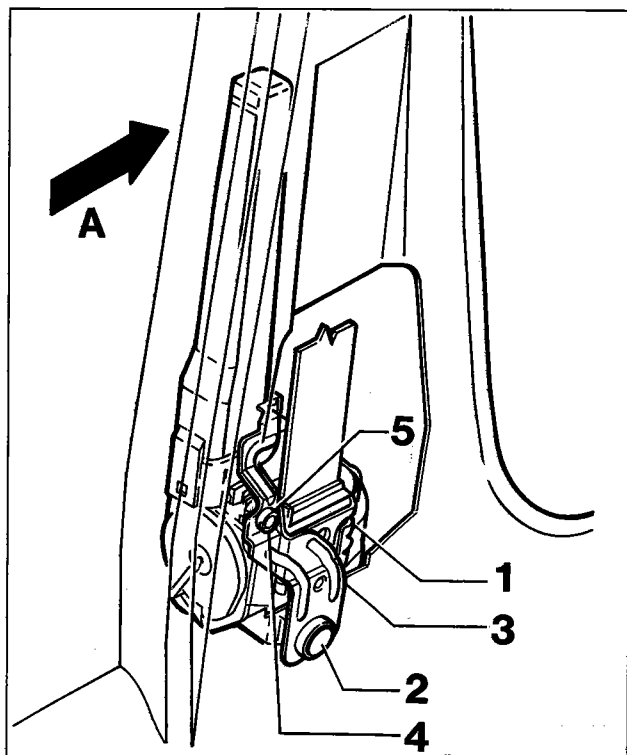
The locked belt is an indication that the pre-tensioner has been activated, or of a malfunction of the reel. In both cases, the device must be replaced by authorized personnel.

70.

REMOVING BRACKET



The removal of the bracket (3 in the diagram overleaf) prevents the pyrotechnic device from accidentally being activated. This operation **should be carried out** each time a service operation which may cause the accidental activation of the device is carried out. The bracket should **ALWAYS ONLY BE REFITTED** with the pre-tensioner unit fitted on the vehicle in order to prevent injury to the personnel carrying out the operation



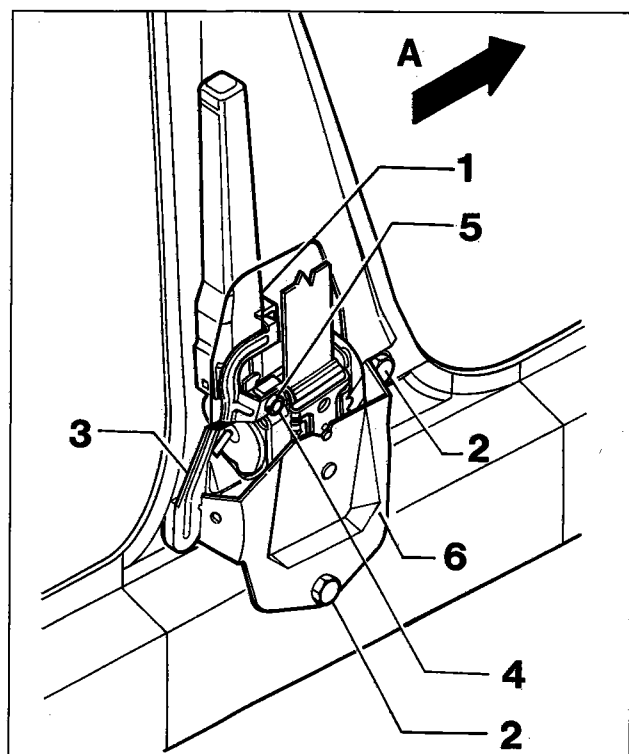
P4A038M01

3 door version

(A) Direction of travel

Break the protective collar (5) (guarantee seal), undo the fixing bolt (4) and remove the bracket (3) (also see diagram at the top of the page overleaf).

Undo the bolt (2) which fixes the pre-tensioner (1) to the bodyshell and extract the pre-tensioner from inside the pillar.



P4A038M02

5 door version

(A) Direction of travel

Break the protective collar (5) (guarantee seal), undo the fixing bolt (4) and remove the bracket (3) (see diagram at the foot of the page overleaf).

Undo the bolts (2) fixing the pre-tensioner support to the bodyshell and remove the support (6) assembly and the pre-tensioner (1) from the pillar and separate the two components.

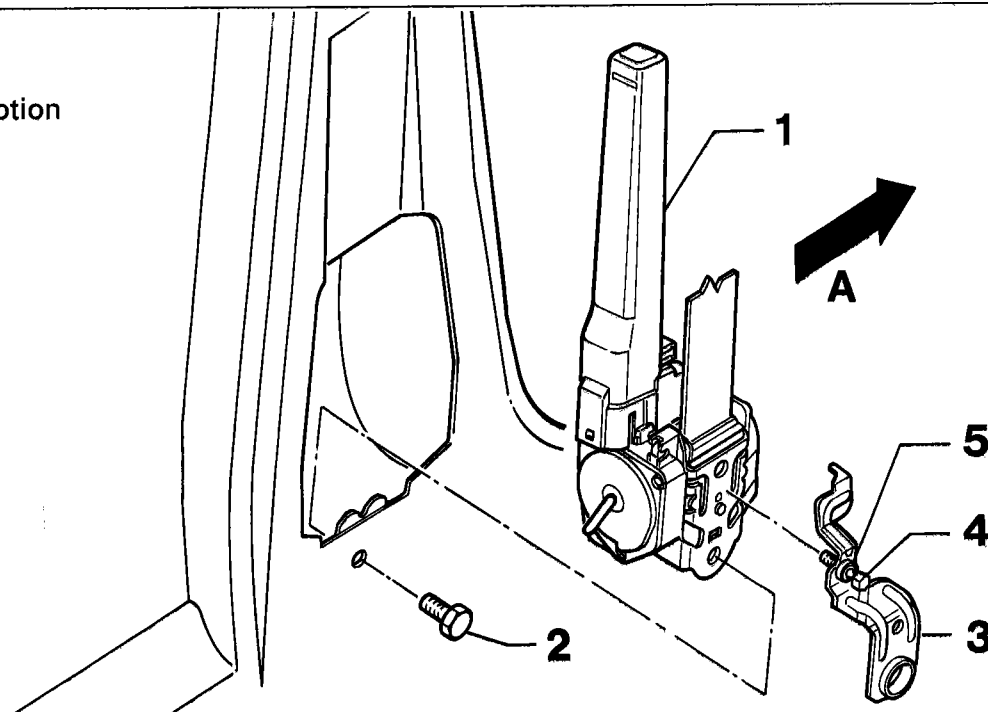
FITTING SEAT BELT WITH PRETENSIONER

When fitting pretensioner assembly (1) to the car, firstly secure pretensioner (1) and bracket (6) (the latter is only fitted on the 5 door version) to the body by means of bolts (2), which must be tightened to a torque of 4 daNm. Then secure firing bracket (3) by means of double-headed bolt with pre-established break point (4). Tighten to 0.4 daNm.

NOTE Note that the system will only work correctly if the head of bolt (4) breaks in the required area. The bolt and firing bracket (3) are supplied as a single part and must be replaced whenever the pretensioner is removed.

3 door version

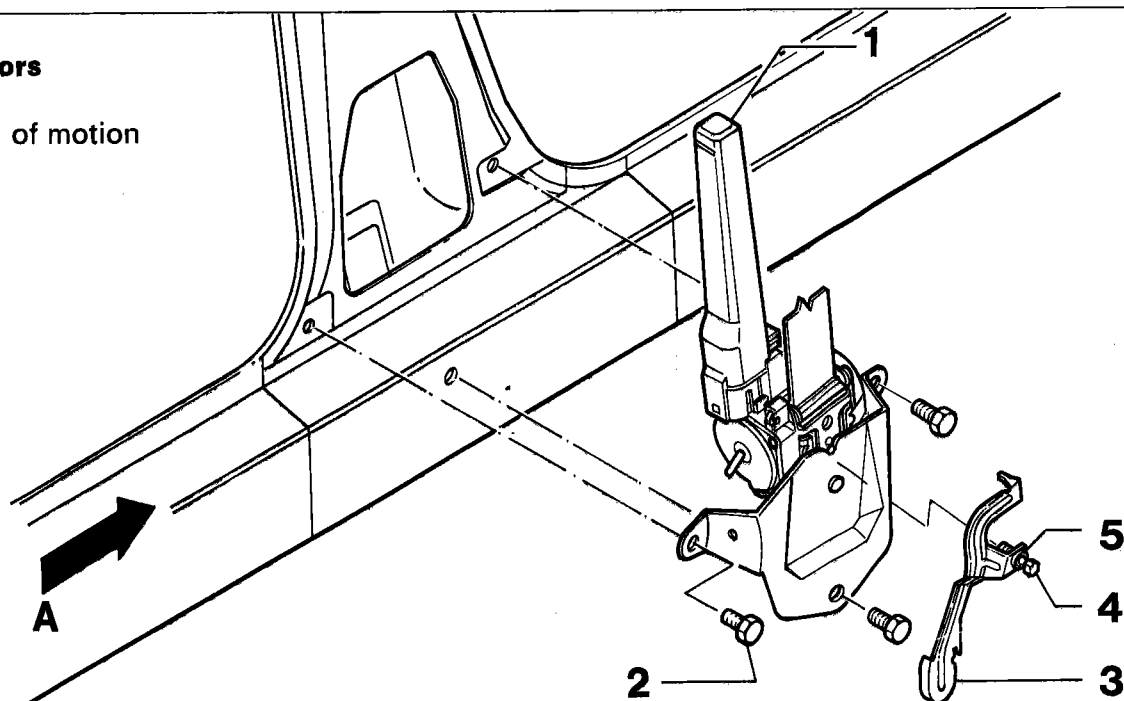
(A) Direction of motion



P4A039M01

Version 5 doors

(A) Direction of motion

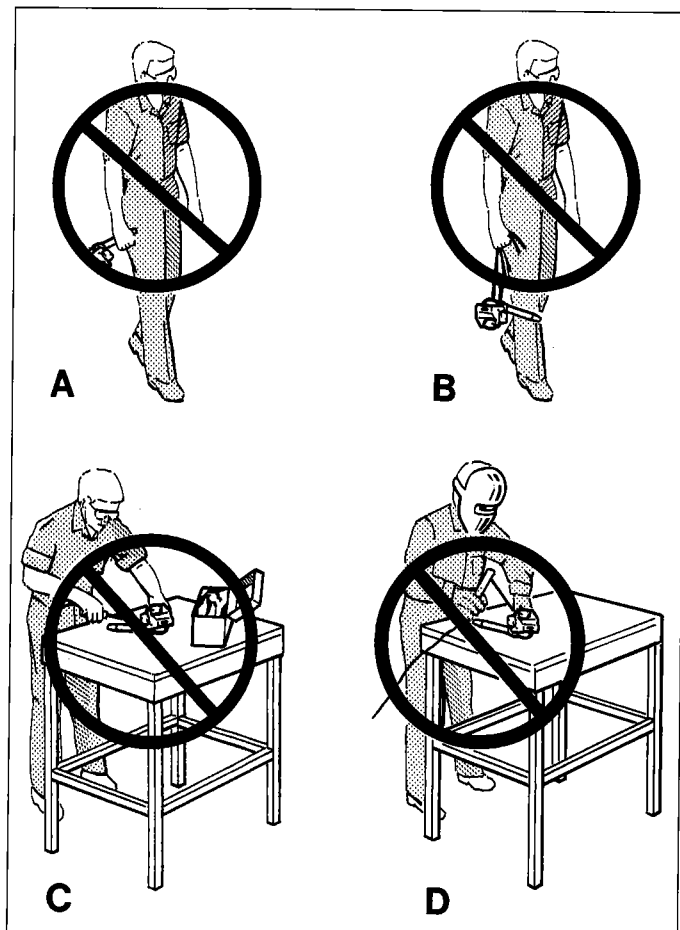


P4A039M02

70.

SAFETY RULES FOR HANDLING SEAT BELT UNIT WITH PRETENSIONER

Pretensioners are explosive parts and must therefore be handled, moved and stored correctly in order to prevent damage or injury



Under normal conditions, the pretensioner is activated only during impact. The gas produced under these conditions is mainly non-toxic nitrogen.



The following rules must ABSOLUTELY be observed to ensure operator safety and prevent damage to the seat belt pretensioner unit. Remove the firing bracket before each intervention.

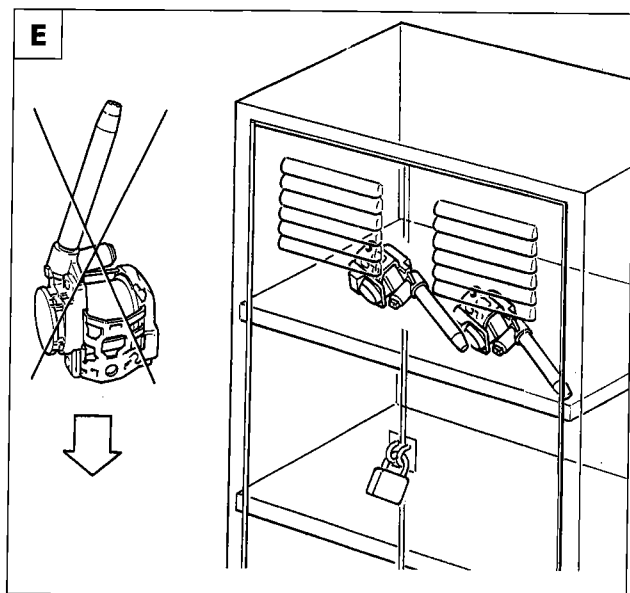
- A. Never move pretensioners by holding them by the pipe.
- B. Never move the pretensioner by holding the belt.
- C. Never tamper with pretensioners or attempt to repair them. Send all defective pretensioners back to the manufacturer.
- D. Never subject pretensioners to percussion, drilling, machining or heating due to welding.
- E. Never allow the unit to drop or subject it to impact. Pretensioners which have been dropped from a height greater than 1 metre must not be used but sent back to the manufacturer.

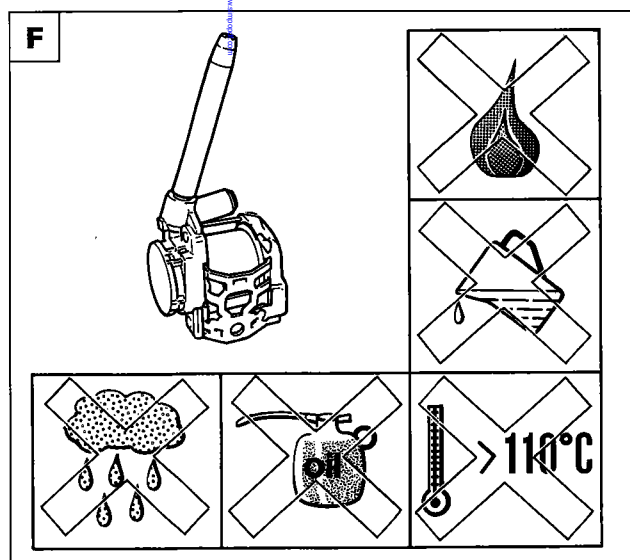
When operations carried out on a vehicle require temporary removal of the unit, use a steel cabinet which meets legal requirements for the housing of explosive charges.

- F. Never bring naked flames, liquids, solvents or lubricants close to the device and do not expose to a temperature higher than 110° C. With temperatures higher than 180° C, the gas generator may self-ignite.

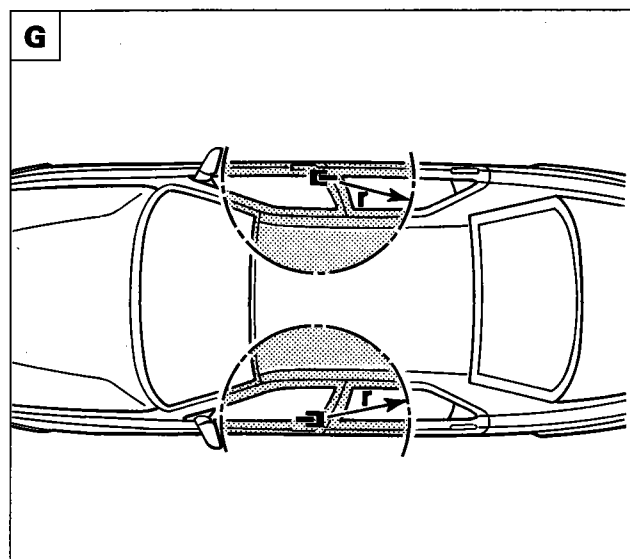
When handling a device that has been activated, use gloves and protective goggles. If the device has gone off, ALWAYS leave at least 20 minutes following activation before touching the device.

Wash hands with soap and water after handling the device.





P4A041M01



P4A041M02



If on account of exceptional atmospheric conditions (floods, sea-storms etc.) the water and mud reaches such a height that the device components are affected, it must be replaced.

The pre-tensioner is maintenance-free and should definitely not be lubricated. Any modifications invalidate its efficiency.

Bodywork operations

- G. Do not subject the area surrounding the pre-tensioner (60-70 cm radius) to great impacts due to bodywork repairs (for example the use of a hammer; if necessary, remove the complete pre-tensioner unit. If it is necessary to use heating lamps on the paintwork in the area surrounding the pre-tensioner or to carry out welding or brazing, then the complete pre-tensioner reel assembly has to be removed.

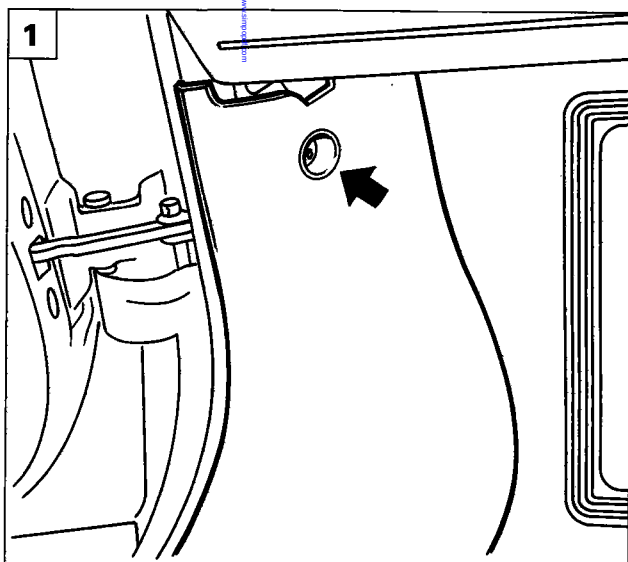
If a vehicle with one or more pre-tensioners has to be moved, then they should be placed in the luggage compartment and not in the passenger compartment which is forbidden. A pre-tensioner which has not been activated in the case of an accident should be considered still active; therefore if they have not exploded because they are defective or have reached the end of their warranty or for other reasons, they should be replaced and returned (the complete device) to the special Centre following the same procedure as described for Air Bag modules (see section 55 - Electrical equipment).

Ordering instructions

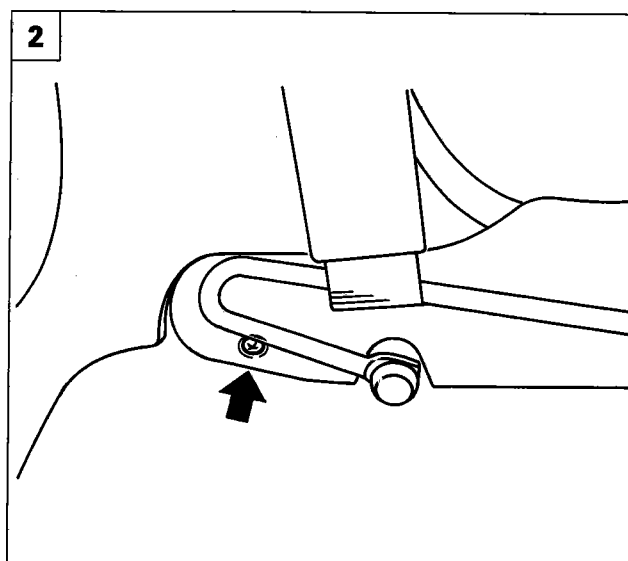
Follow the same procedures already described for ordering Air Bag modules (see section 55 - Electrical equipment).

NOTE *Pre-tensioners have been specially designed to be fitted on each individual type and marque of vehicle on account of which they cannot be adapted, reused or fitted on other vehicles, but only on those for which they were designed and produced. Any attempts to reuse, adapt or fit pre-tensioners on different types of vehicles could cause serious or fatal injuries to the occupants of the vehicle both in the case of an accident or in the case of normal usage. After being fitted the pre-tensioner bracket can be activated if it receives an impact of sufficient force.*

70.



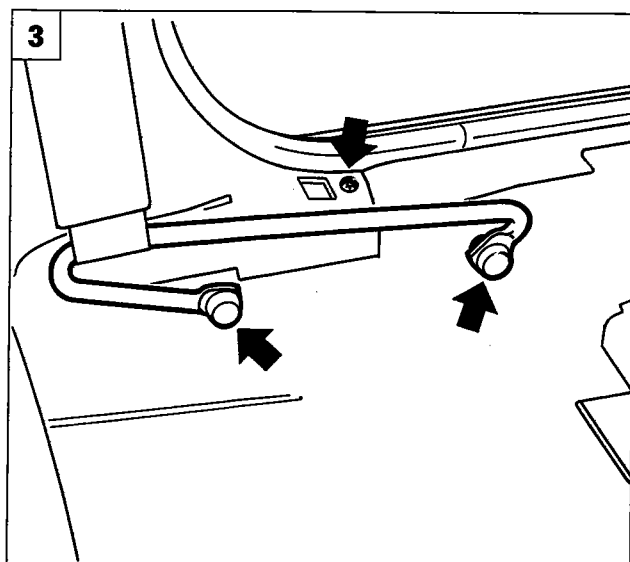
P4A042M01



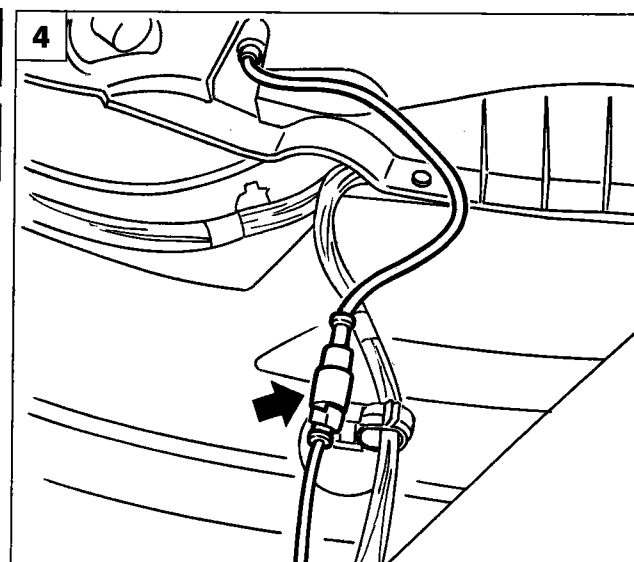
P4A042M02

REMOVING-REFITTING (3 door version)

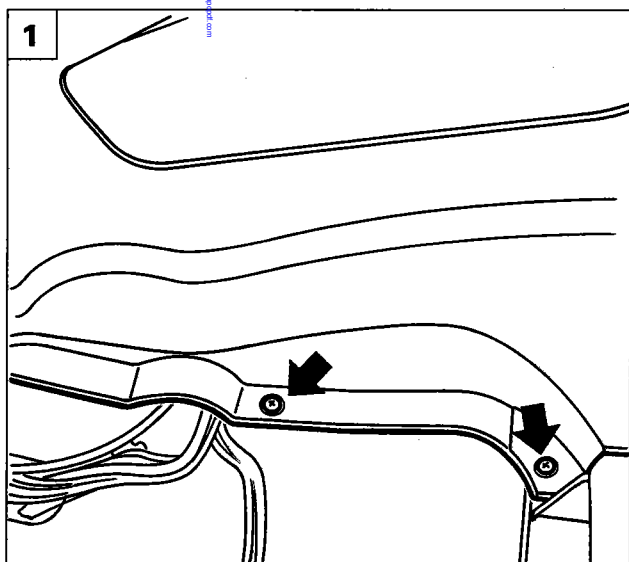
1. Undo the bolt which fixes the underdoor lining at the front to the bodyshell which is located under the left lower part of the dashboard.
2. Undo the bolt shown which fixes the underdoor lining to the bodyshell at the rear and remove the lining from the vehicle.
3. Undo the bolts shown which fix the pillar cover and the seat belt lower fixing bracket to the bodyshell. Access can be gained to the fixing bolts after removing the bolt covers.
4. Remove the rear seat cushion and disconnect the connector for the ABS system (if fitted).



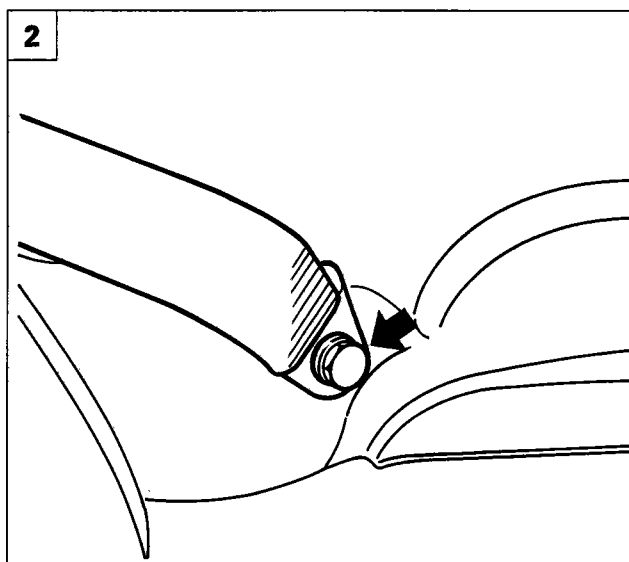
P4A042M03



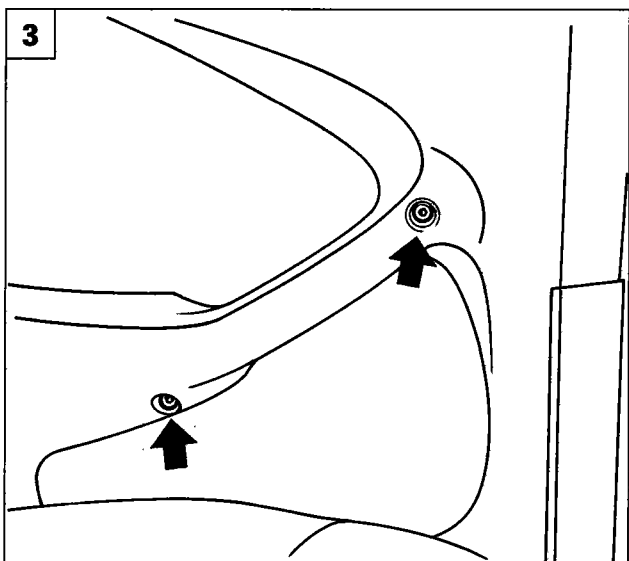
P4A042M04



P4A043M01



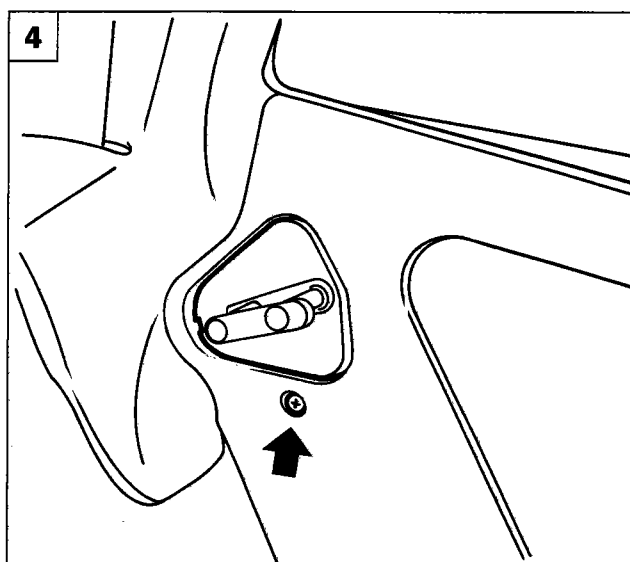
P4A043M02



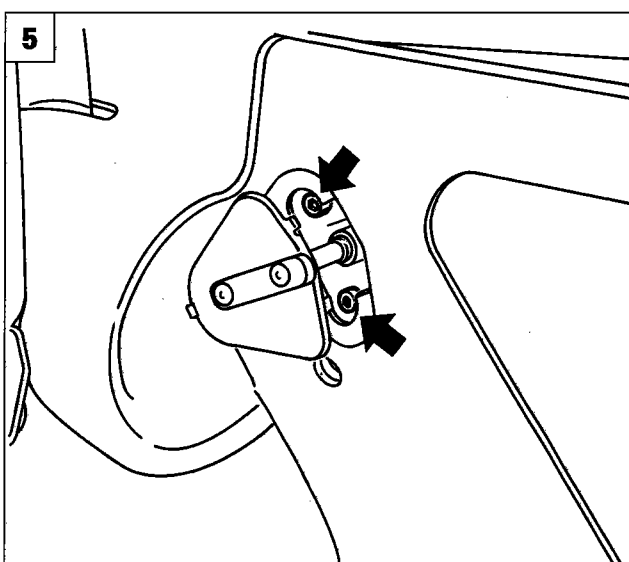
P4A043M03



1. Undo the lower bolts fixing the side panel.
2. Remove the protective trim and undo the lower bolt underneath fixing the seat belt.
3. Remove the trims and undo the bolts underneath which fix the side panel at the centre.
4. Undo the bolt fixing the side lining and move the seat attachment device trim to one side.
5. Undo the bolts fixing the seat attachment device.

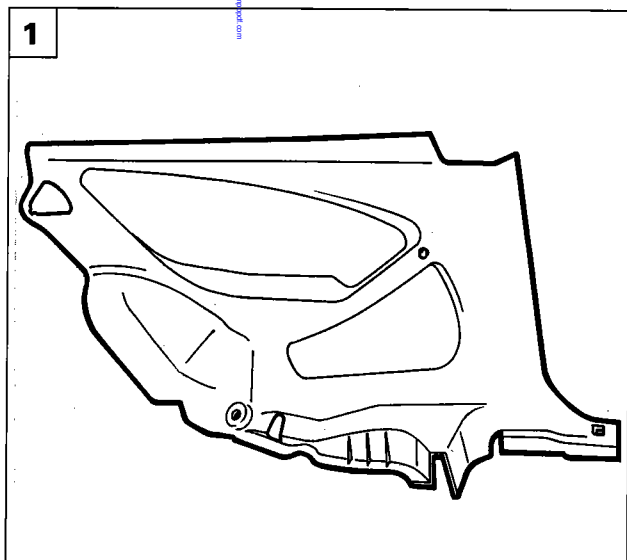


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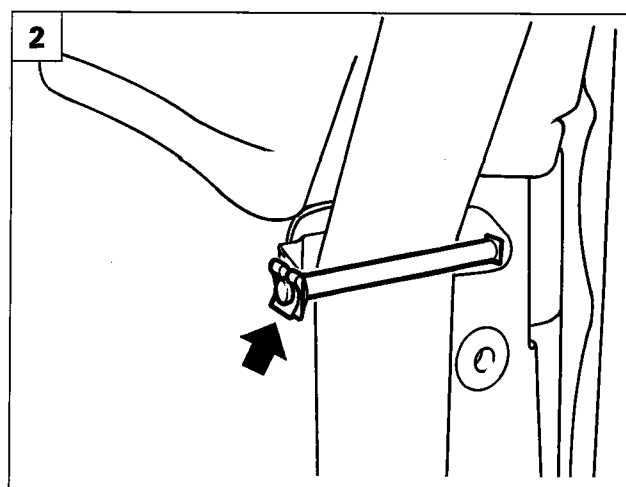


P4A043M05

70.

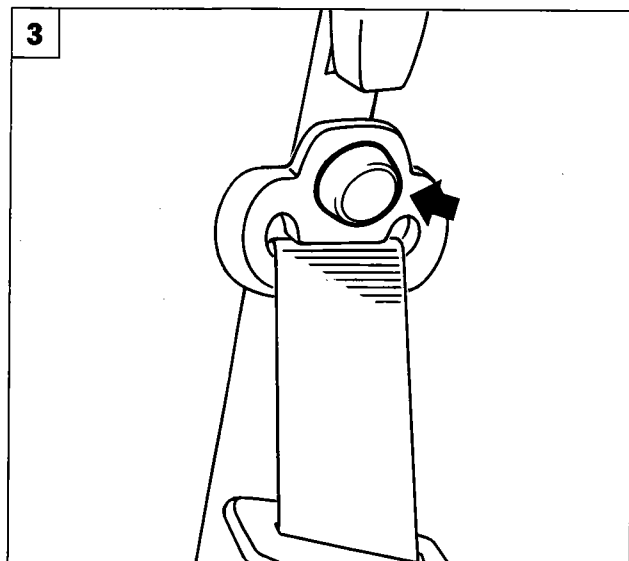


P4A044M01

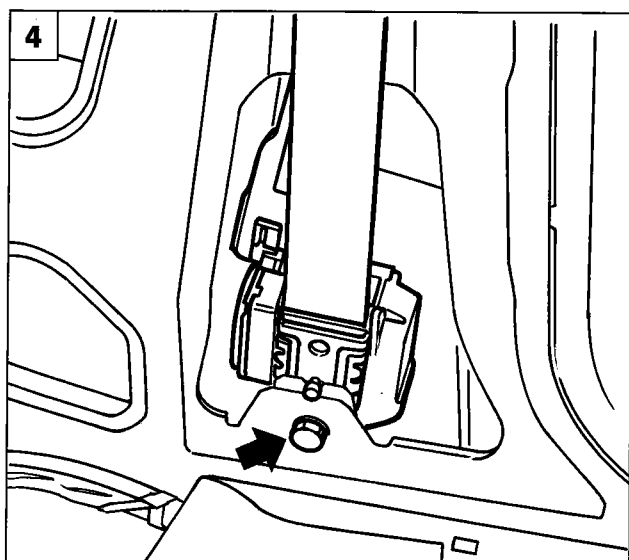


P4A044M02

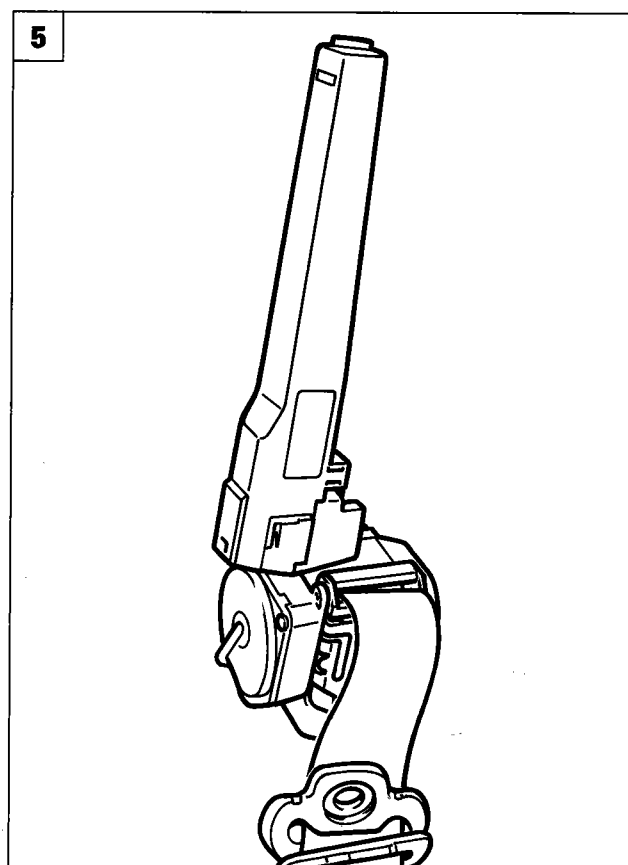
1. Remove the side panel from the vehicle.
2. Remove the spring and remove the retaining pin shown, then release the belt.
3. Remove the upper trim for the seat belt and undo the fixing nut underneath.
4. Undo the bolt fixing the pre-tensioner to the bodyshell (to remove the bracket, proceed as described on page 38).
5. Remove the pre-tensioner from the vehicle.



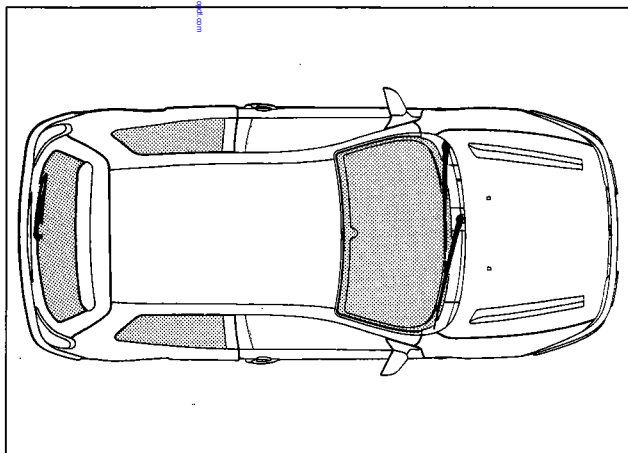
P4A044M03



P4A044M04



P4A044M05



P4A045M01

INTRODUCTION

The windows on the Bravo-Brava meet industrial standards concerning the methods of removing/refitting fixed window glasses.

This system is greatly advantageous, both in terms of quality because it ensures perfect permeability and resistance to air and in terms of safety because it makes the structure stronger and quieter.

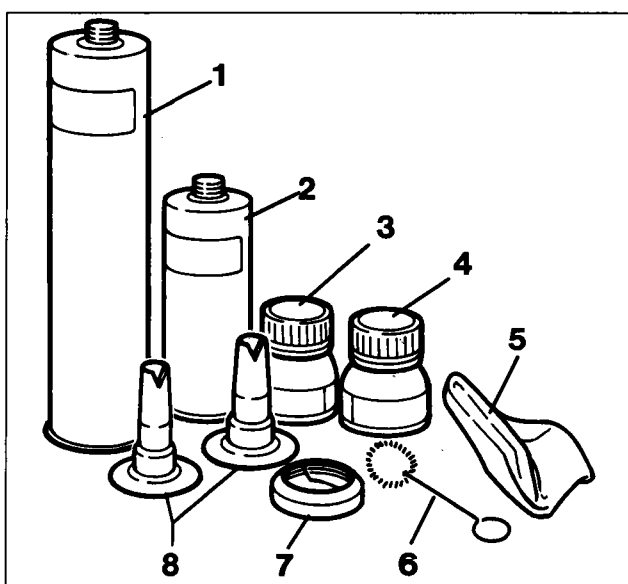
In addition to the windscreen and the rear screen the 3 door version also has bonded side rear windows.

EQUIPMENT

In order to remove and refit bonded windows the products and equipment described below must be used

Composition of Kit

1. Cartridge of GURIT BETASEAL sealant
2. 1/2 Cartridge of GURIT BETASEAL sealant
3. Adhesion promoter (primer) for glass
4. Container of de-greasing product
5. Cloth for de-greasing
6. Wad for applying adhesion promoter (primer)
7. Wire
8. N° 2 diffusers



P4A045M02

The previous adhesive marketed by Direzione Marketing e Commerciale Volvra has been replaced with an improved product. It is BETASEAL 1703 Sprint, in single compound polyurethane with rapid polymerization.

This is undoubtedly an advantage because the greater the hardening speed of the adhesive, the less time the window has to be retained with special equipment. In addition the repaired vehicle can be returned sooner to the Customer.

The mechanical characteristics conform with Capitolo Fiat Auto S.P.A.

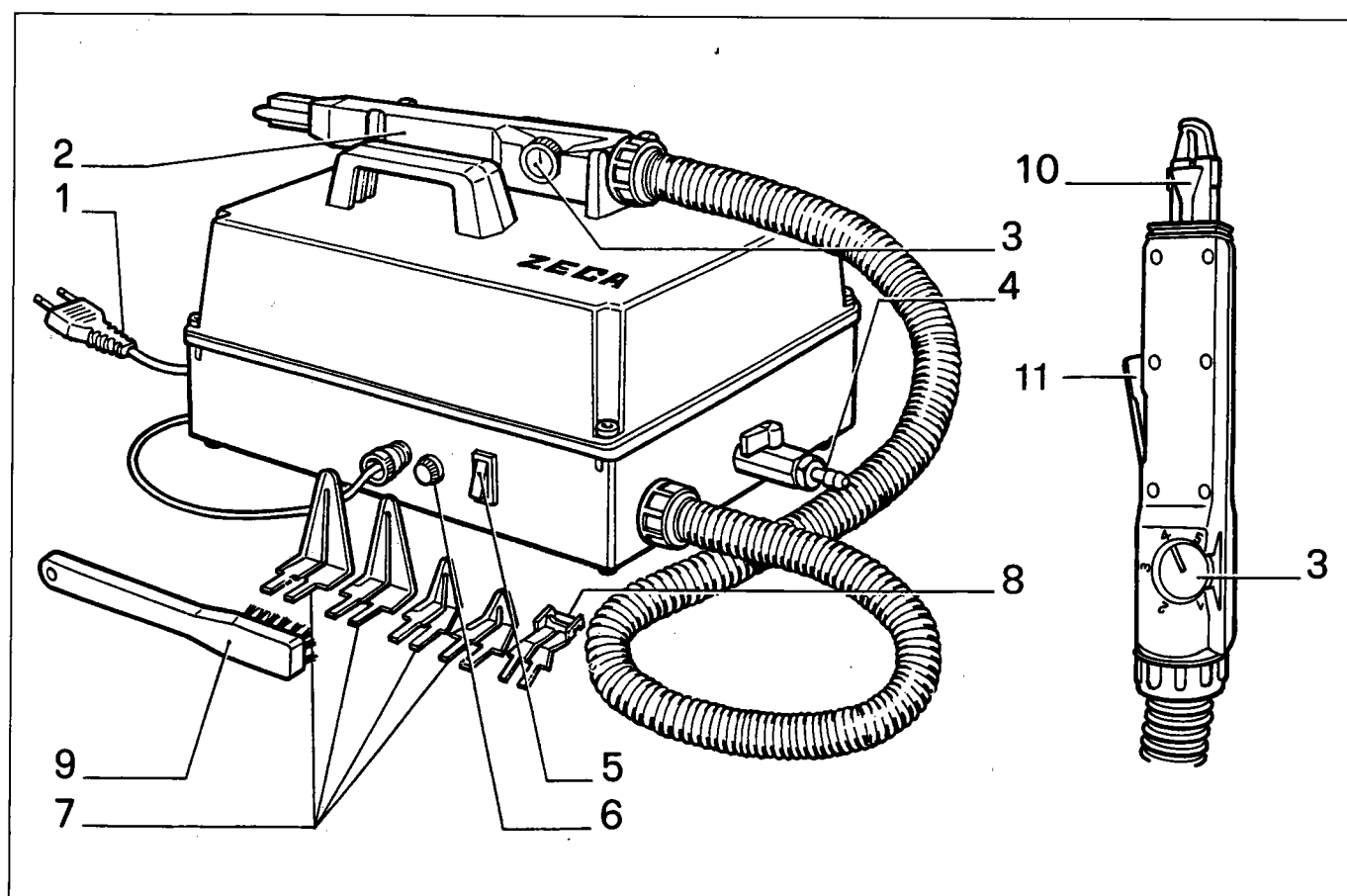
70.

Thermal knife

This consists of a piece of equipment which thermally heats a blade to facilitate cutting the sealant. It is possible to adjust the temperature of the blade up to 700 °C, but it is advisable to limit the temperature of the knife in use to around 150°C to avoid burning the sealant and producing harmful fumes. The knife is equipped with a fume aspiration system.

Different shaped blades are available to suit different cutting conditions.

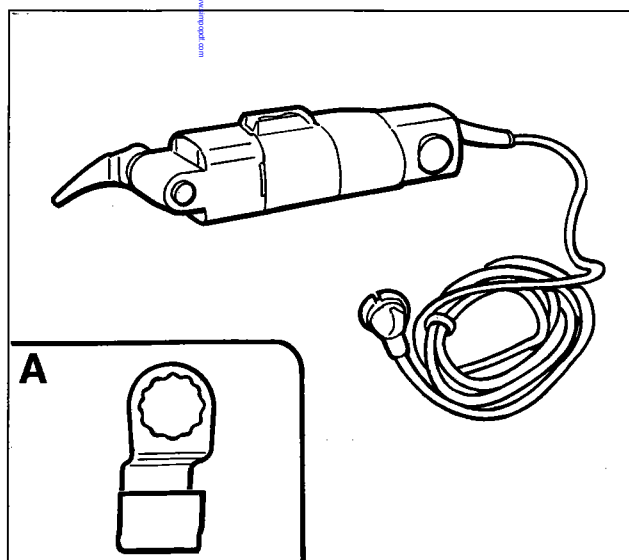
It is important during cutting that the blade should always be kept perfectly parallel to the window to prevent excessive force and the risk of breaking the actual window.



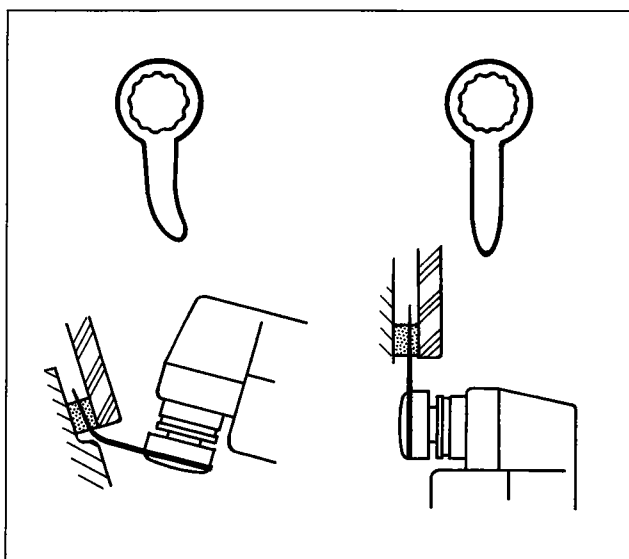
P4A046M01

- 1. Supply pin
- 2. Knife body
- 3. Temperature adjustment knob
- 4. Compressed air tap
- 5. On switch
- 6. Protective fuse

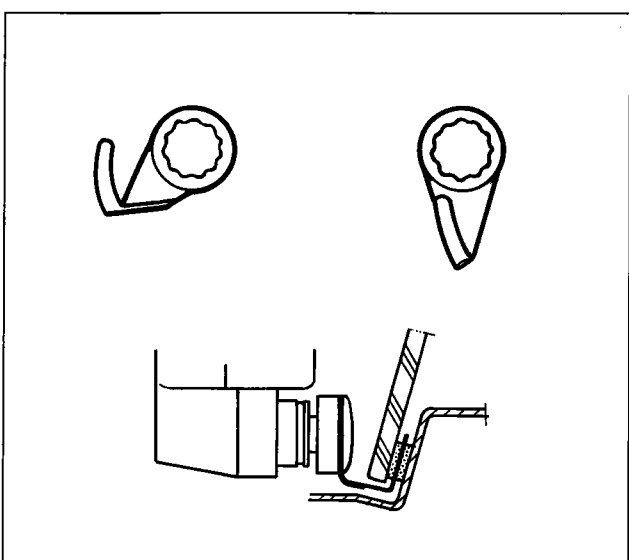
- 7. Blades for cutting
- 8. Blade for levelling
- 9. Blade cleaning brush
- 10. Fume inlet
- 11. Contact lever



P4A047M01



P4A047M02



P4A047M03

Vibrating knife

The vibrating knife is made up of special shears and a suitable set of vibrating blades with electrically adjustable oscillation numbers.

It can be used to cut polyurethane sealants. It is important that when cutting the blade is always kept parallel to the window and to the bodywork, to prevent breaking the blade.

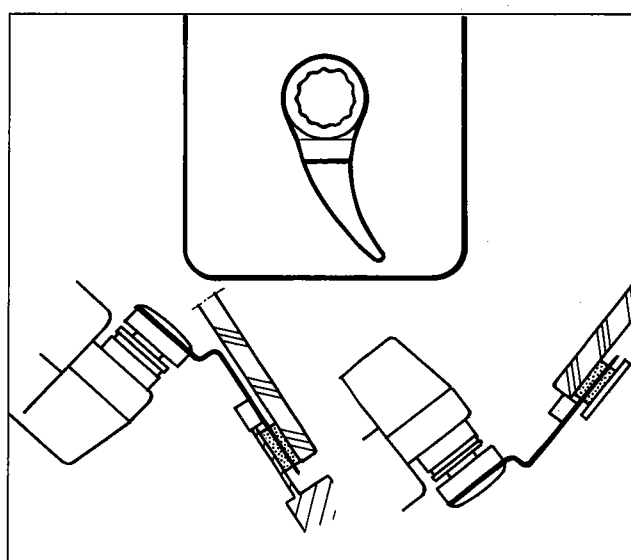
To prevent the shears from overheating it is useful to adjust the advance and the number of oscillations according to the usage conditions.

Detail A shows the scraper to be fitted to the vibrating shears to level the residues of sealant.



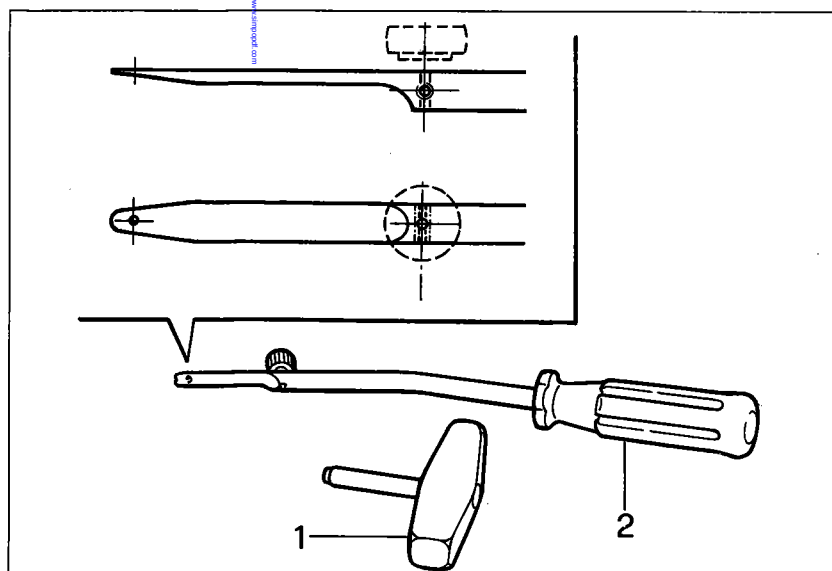
*Do not use lubricants during cutting.
The blades should always be sharpened.*

The diagrams at the side and underneath illustrate certain situations which recur when cutting bonded windows with the appropriate type of blade.



P4A047M04

70.

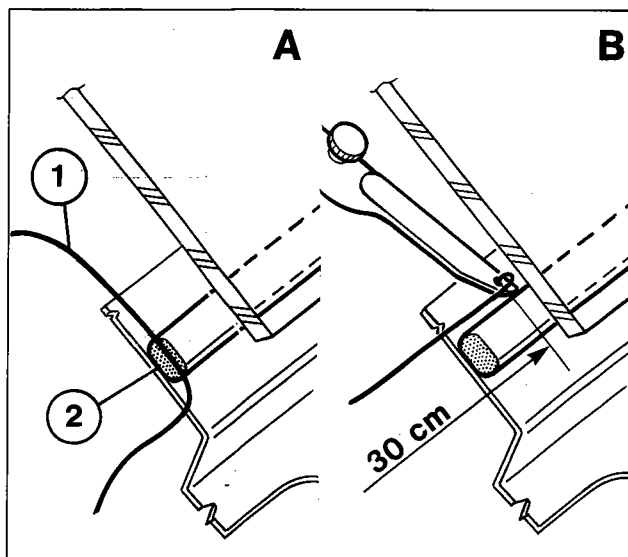


P4A048M01

Wire

The tool illustrated in the diagram must be used to cut the bead of sealant with the wire.

1. Traction handle
2. Retaining tool



P4A048M02

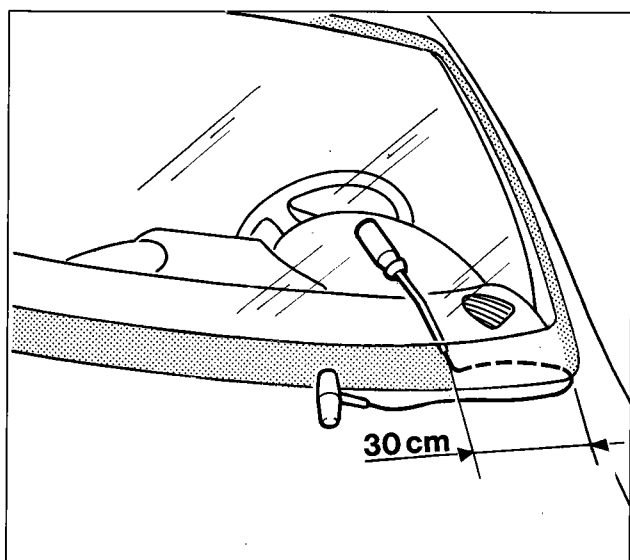
Instructions for using wire contained in Kit

Cut a segment of wire about 50 cm long and introduce one end of the wire (part 1 detail A) through the bead of sealant (heat the wire and use pliers to facilitate this operation).

Fix the end of the wire to the retaining tool inside the vehicle and the other end to the traction handle outside the vehicle. The operator inside the vehicle should introduce the retaining tool into the bead of sealant (FIG. B) about 30 cm from the point where the wire passes (detail A).

The other operator outside the vehicle should pull the handle following the line of the windscreen surround and cut the bead of sealant.

Repeat the operation at 30 cm sections, suitably reducing the length at the corners of the window, until the sealant bead is completely cut.

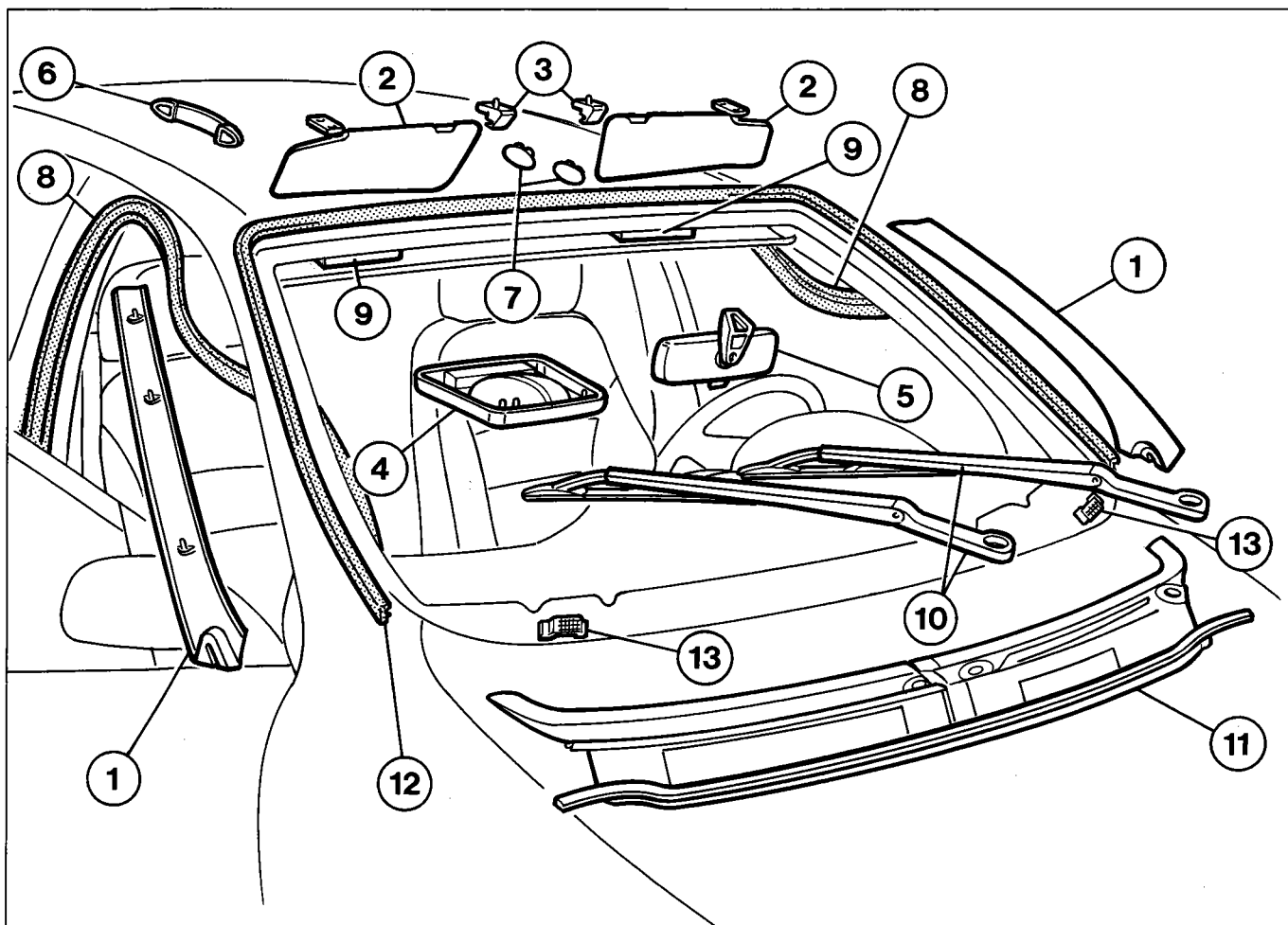


P4A048M03

REPLACING FRONT WINDOW GLASS (WINDSCREEN)

Removing vehicle trims and protection

The components shown in the exploded diagram are numbered in the order in which they should be removed.



P4A049M01

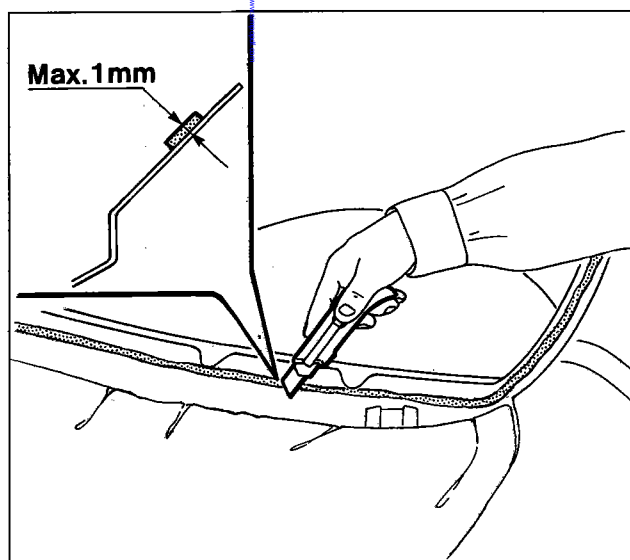
- | | |
|-------------------------|-----------------------------|
| 1. Pillar covers | 8. Door seal |
| 2. Sun visors | 9. Spacers |
| 3. Sun blind attachment | 10. Windscreen wiper blades |
| 4. Courtesy light | 11. Lower window trim |
| 5. Rear view mirror | 12. Window perimeter trim |
| 6. Grab handle | 13. Retaining mountings |
| 7. Roof fixing trim | |

- Slightly lower the lining under the roof without distorting it
- Protect the dashboard and the seats with a cover or suitable paper.
- Press on the retaining mountings (3) and move them downwards.
- Protect the perimeter of the windscreen housing with adhesive tape

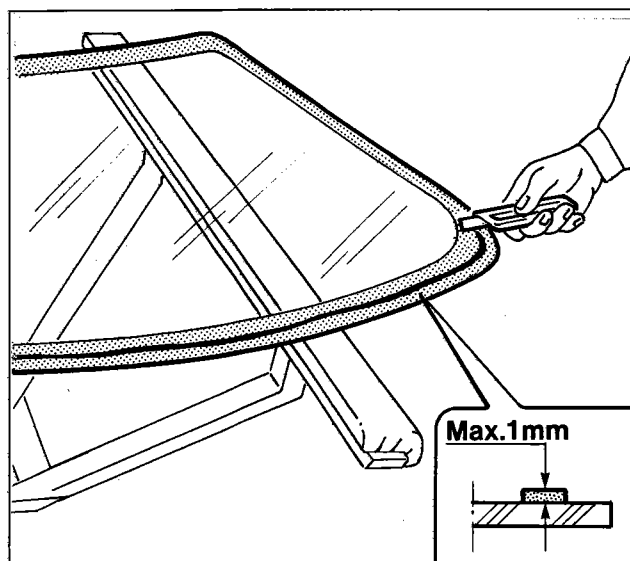


The window perimeter trim should always be replaced.

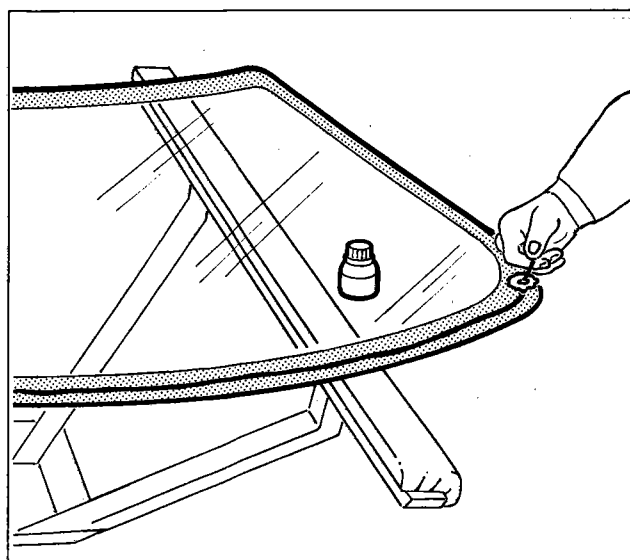
70.



P4A050M01



P4A050M02



P4A050M03

Preparing the windscreen housing

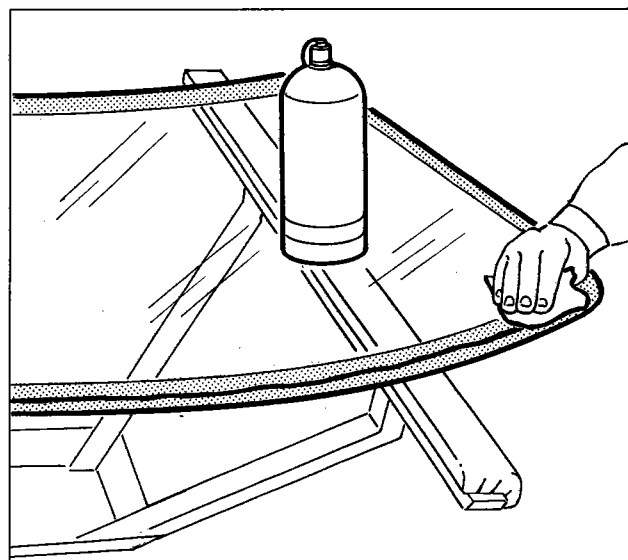
Using a suitable blade, cut and level the sealant for the windscreen housing, leaving a thickness of between 0.25 and 1 mm without reaching the paint and scratching it.

NOTE *The film of sealant remaining on the windscreen housing will act as a support for the subsequent adhesion.*

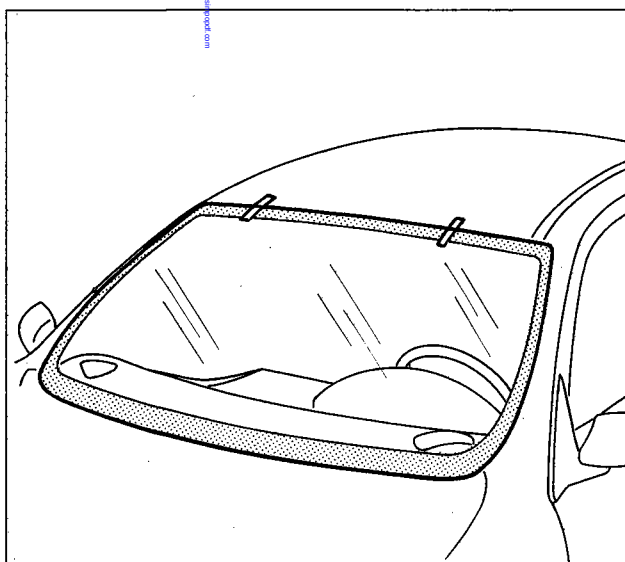
Preparing the windscreen

If the window which has been removed is being reused:

- Using a suitable blade, cut and level the bead of sealant trying to reduce the thickness to a minimum. It is not necessary to remove the sealant completely. Avoid touching the surfaces of the sealant remaining. Take care not to damage the black serigraphy on the window perimeter.
- De-grease the serigraphed section of the windscreen using heptane.
- Apply the adhesion promoter (primer) for glass to the serigraphed area using the wad supplied in the kit. The product does not have to be applied to the remaining sealant.
- Wait for 15 minutes before proceeding with the operations to allow the evaporation of the adhesion promoter (primer) thinner.



P4A050M04



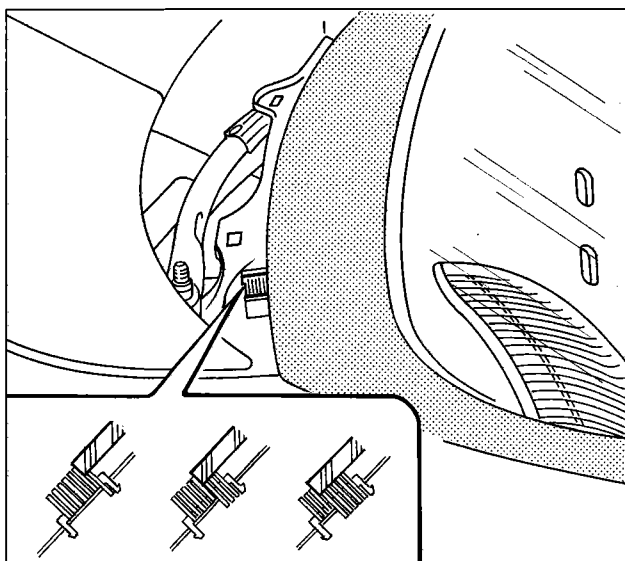
P4A051M01

Refitting

- Fit the trim on the windscreen avoiding touching the area where the adhesion promoter (primer) has been applied with your fingers.
- Carry out a test fitting to centre the windscreen perfectly and make reference marks.



The sliding retaining mountings located in the lower part should support the windscreen towards the top and keep it aligned with the roof.



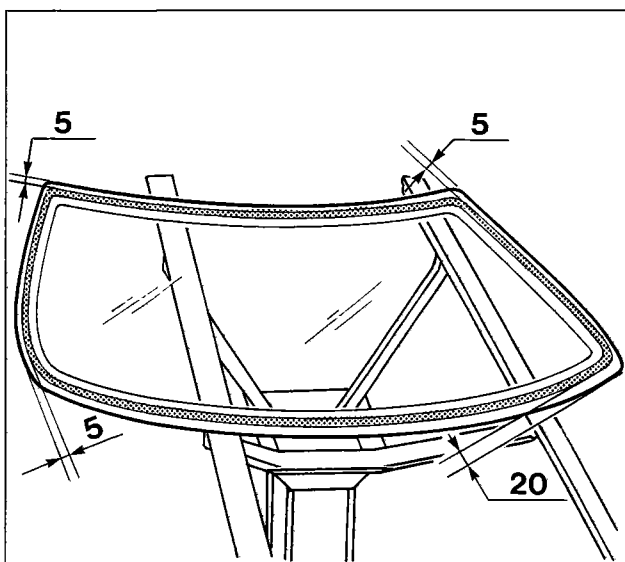
P4A051M02



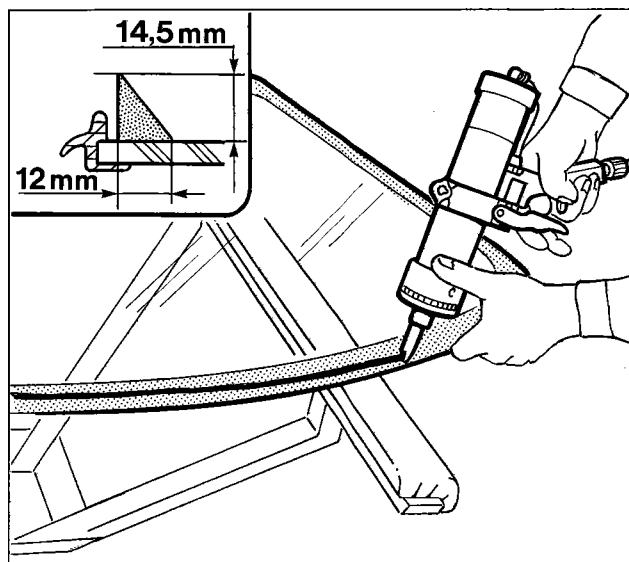
- Using a pneumatic gun, extrude a bead of sealant along the perimeter of the windscreen as evenly as possible (if there is excess, level the bead using a slice of potato).



In the lower part of the windscreen apply the sealant scrupulously following the figures given in the diagram to prevent it ending up on the retaining mountings.



P4A051M03

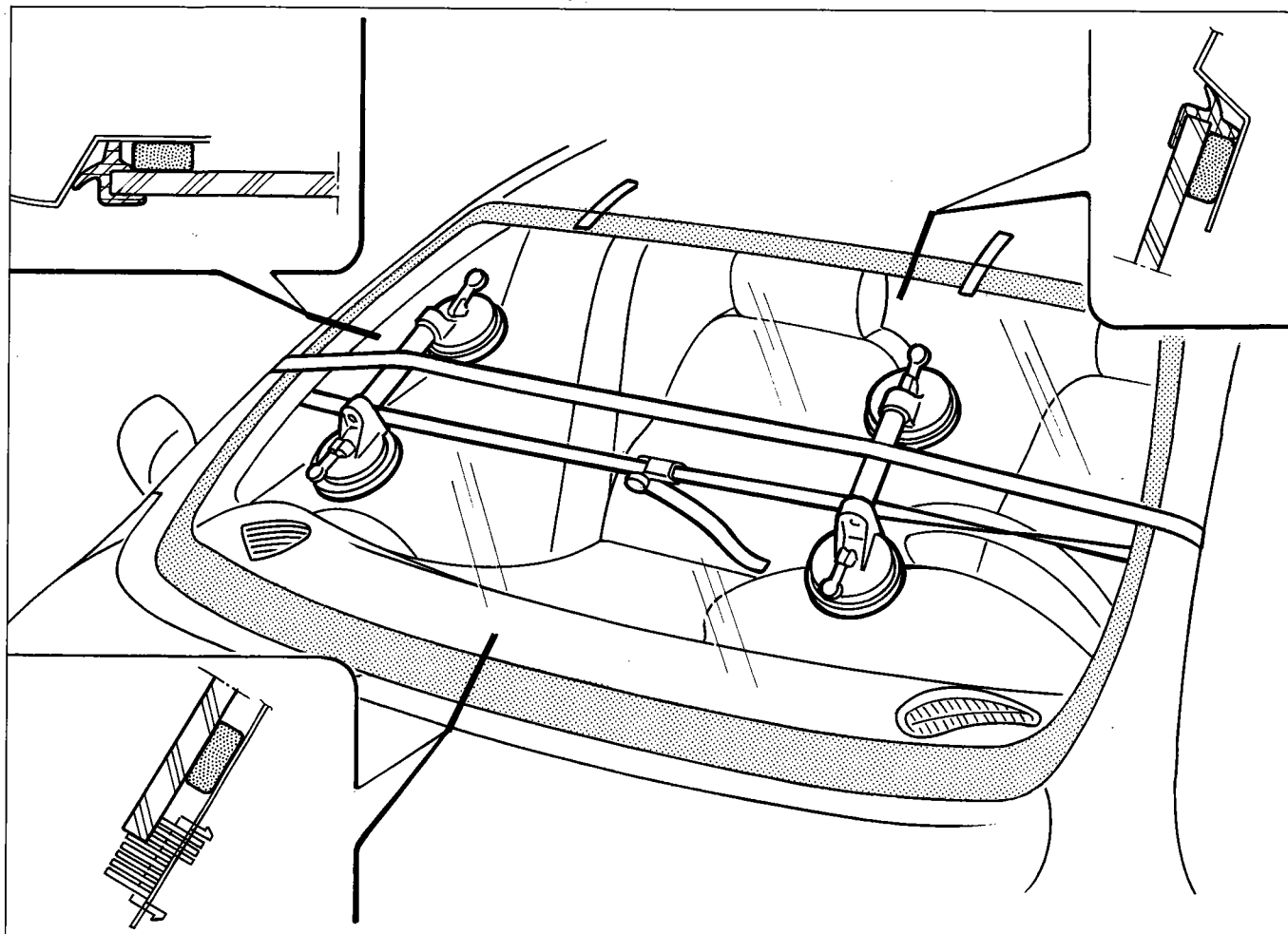


P4A051M04

70.

- Using the special suction pads, place the windscreen in position immediately after applying the sealant.
- Using suitable belts and shims, exert slight pressure on the windscreen so that the trim is correctly aligned with the pillars.

Keep the glass under pressure for at least 1 hour. During this period it is possible to let water run over the window to locate any possible penetration points and accelerate the polymerization of the sealant.



P4A052M01

- Any excess sealant inside the pillars can be removed when the sealant has hardened, cutting it with a blade and removing it with pliers.



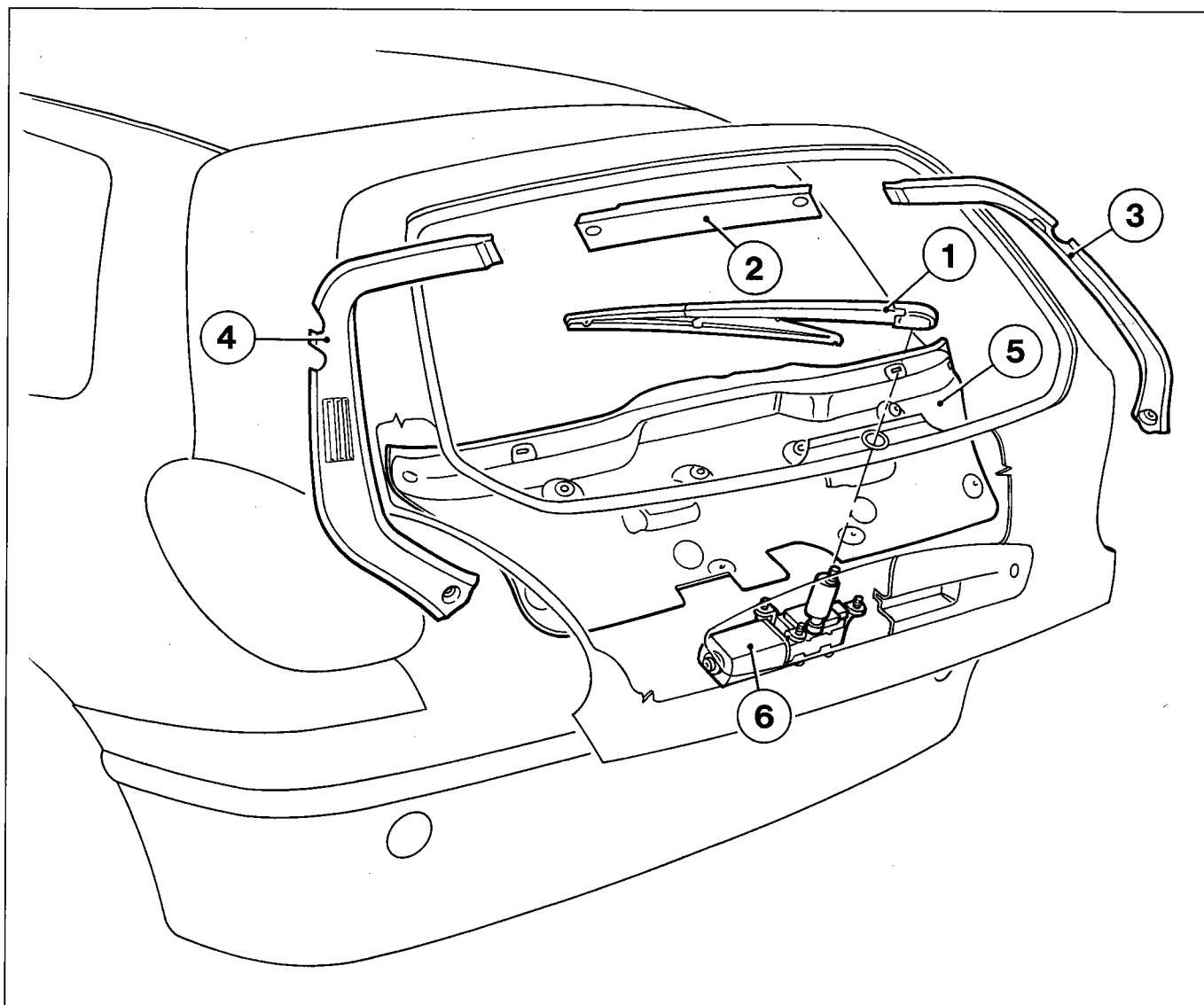
Take care not to damage the serigraphed area of the windscreen with the blade.

- Refit the elements removed previously and clean the window.

The vehicle should not be handed back for at least 15 hours after the windscreen has been stuck.

REPLACING REAR WINDOW GLASS (REARSCREEN)**Removing vehicle trims and protection**

The components shown in the exploded diagram are numbered in the order in which they are removed.



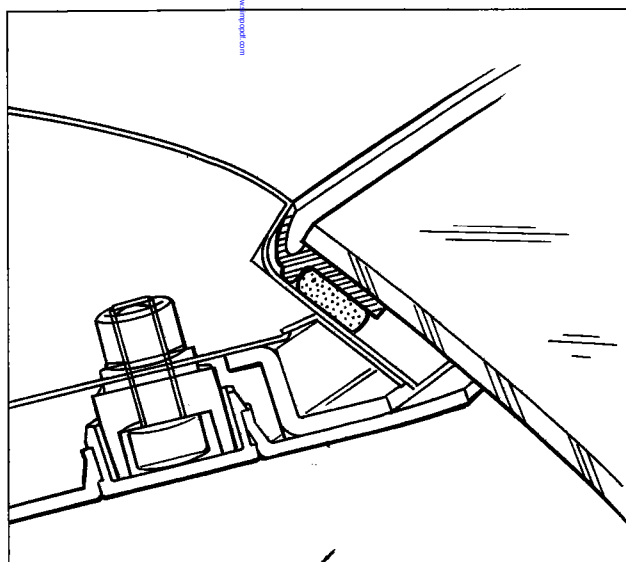
P4A053M01

- | | |
|--|---------------------------------------|
| 1. Rearscreen wiper blade | 4. Tailgate interior left side lining |
| 2. Tailgate interior centre lining | 5. Tailgate interior lining |
| 3. Tailgate interior right side lining | 6. Windscreen wiper motor |

- Protect the perimeter of the rearscreen housing with adhesive tape
- Protect the carpets with a cloth or suitable paper.

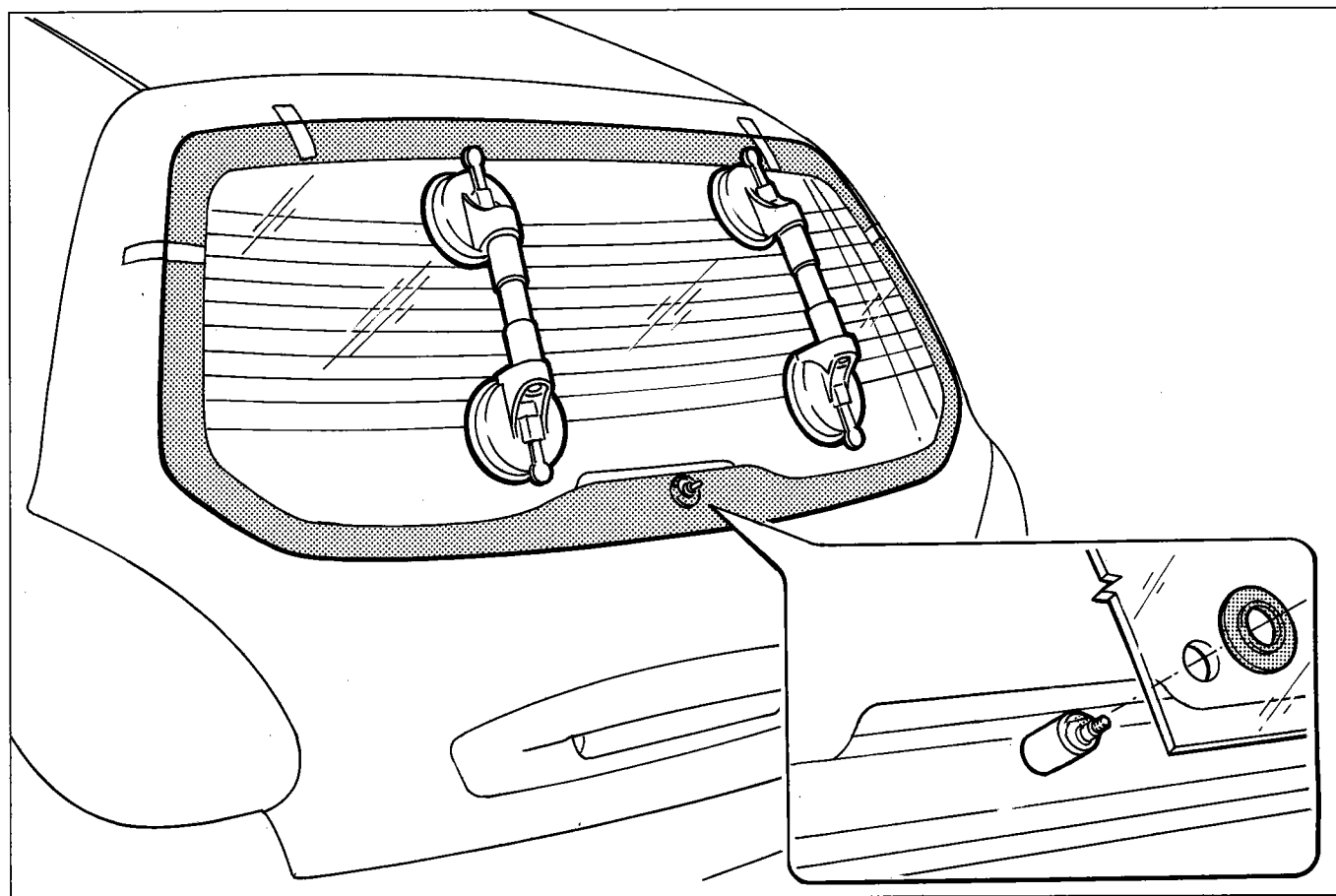
NOTE If the rearscreen is being reused, cut the adhesive with the vibrating knife working from inside the tailgate so as not to ruin the pressed perimeter seal.

70.



Refitting

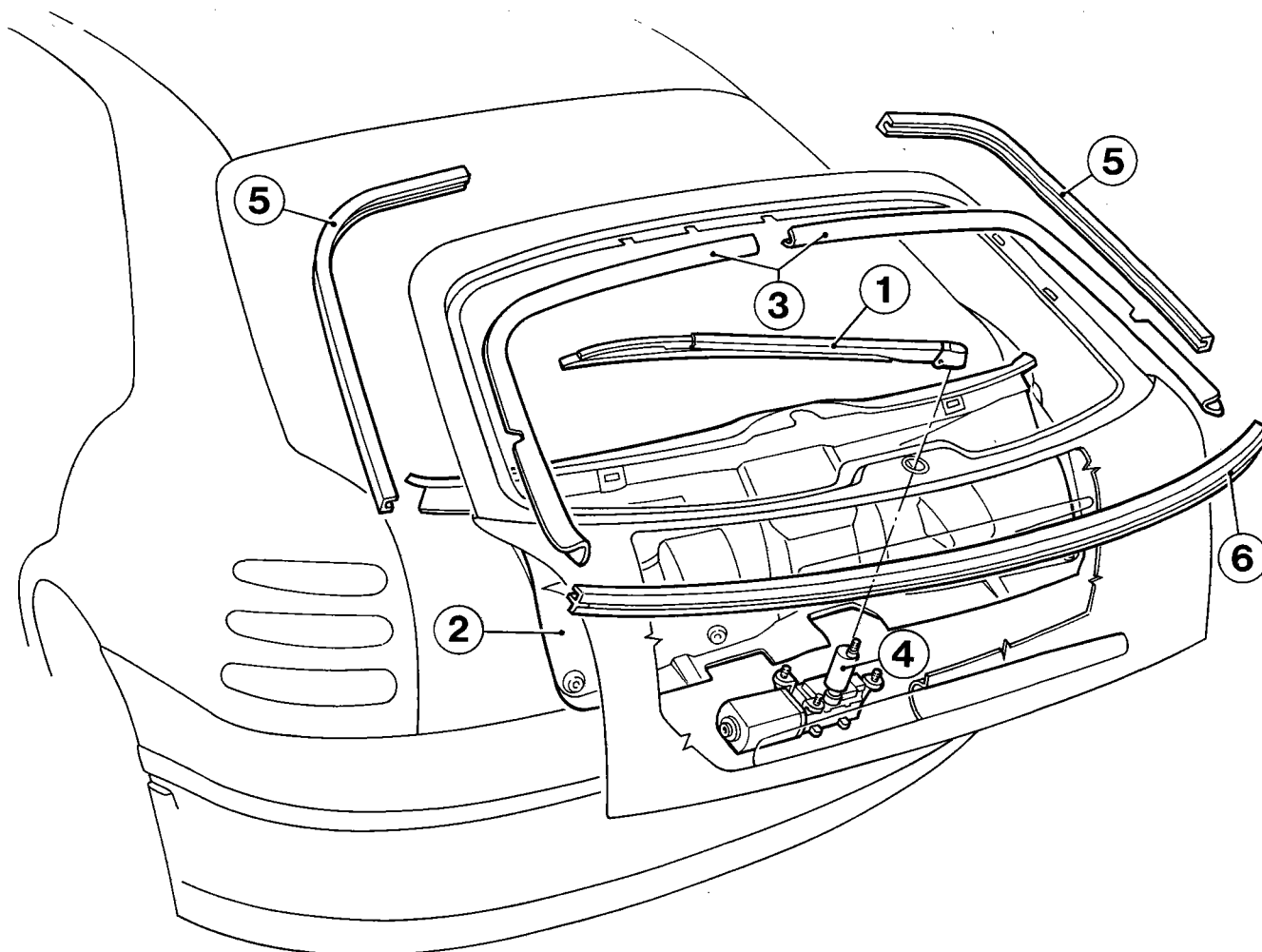
- In order to prepare the tailgate window to be refitted, follow the instructions given for the windscreen (see page 50).
- As far as applying the sealant is concerned, there are no difficulties relating to the distance to be maintained from the edge of the window. In effect, the sealant is applied directly on the inner edge of the seal which is the pressed type.



Position the crystal in the tailgate housing using the centering references, above all taking into account the opening for the windscreen wiper motor.

REPLACING REAR WINDOW GLASS (REARSCREEN)**Removing vehicle trims and protection**

The components shown in the exploded diagram are numbered in the order in which they are removed.



P4A055M01

1. Rearscreen wiper blade
2. Tailgate interior lining
3. Tailgate interior trim

4. Windscreen wiper motor
5. Tailgate side trims
6. Lower window trim

- Protect the perimeter of the rearscreen housing with adhesive tape.
- Protect the carpets with a cover or suitable paper.

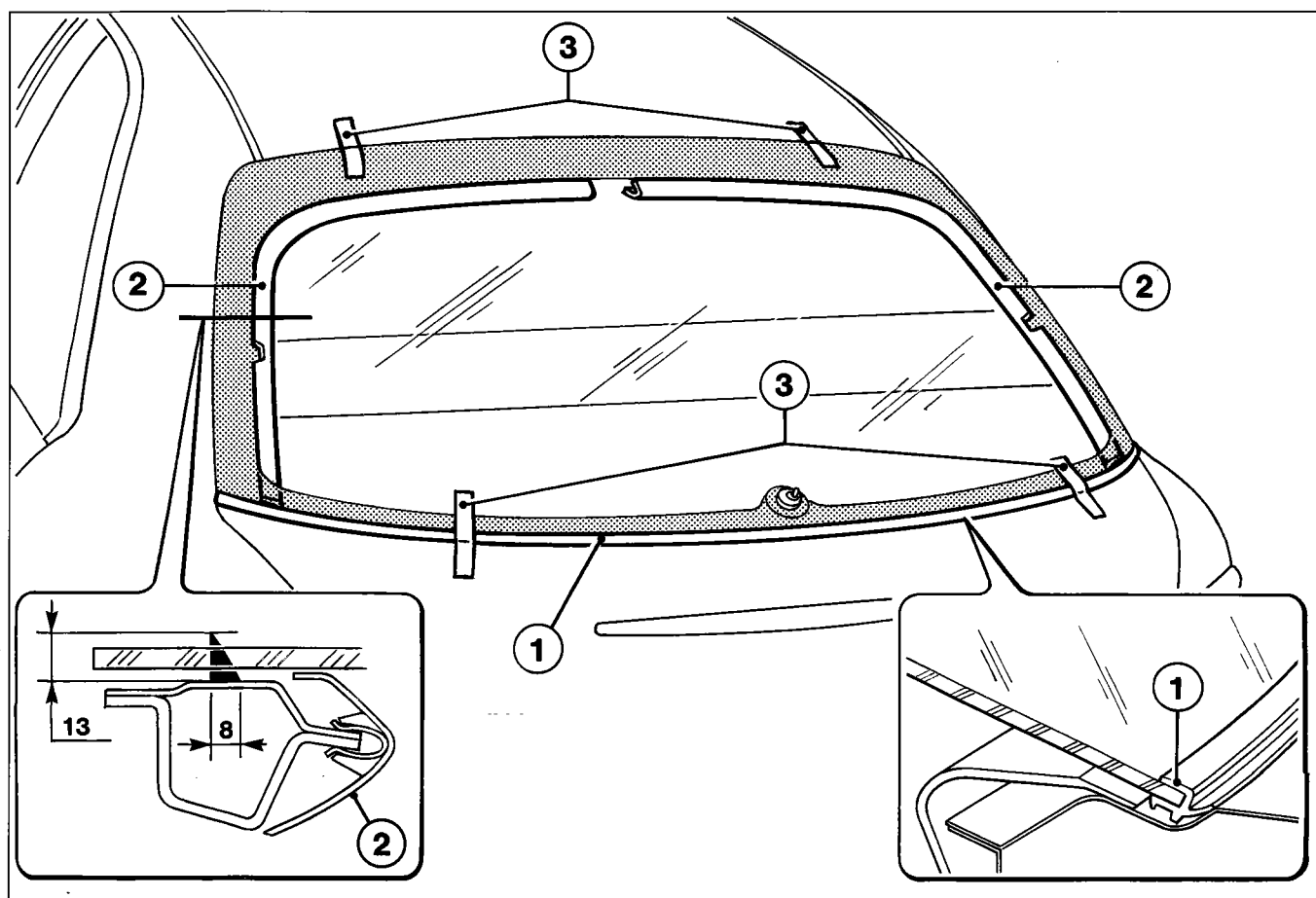
NOTE *If the window is being reused, cut the sealant with the vibrating knife working from inside the tailgate.*

70.

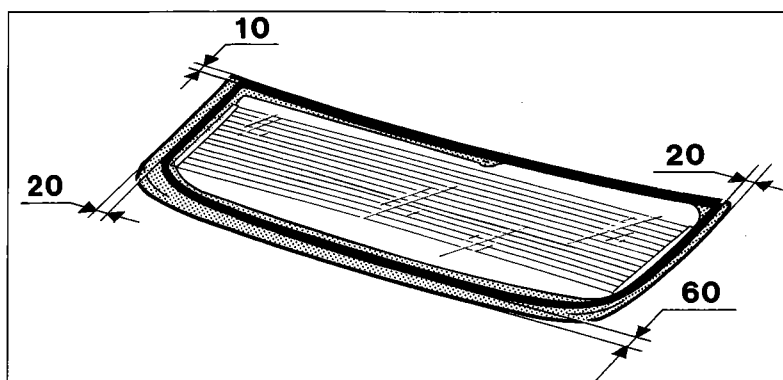
Refitting

Before refitting, prepare both the window and the housing in the tailgate, following the instructions for the windscreen (see page 50).

To ensure that the rear screen is correctly aligned with the bodyshell, refit the trim (1) at the base of the window and the trims (2) at the inner edges of the tailgate. Take the position of the opening in the windscreen wiper motor pin into consideration. Then apply the references (3).



P4A056M01



P4A056M02

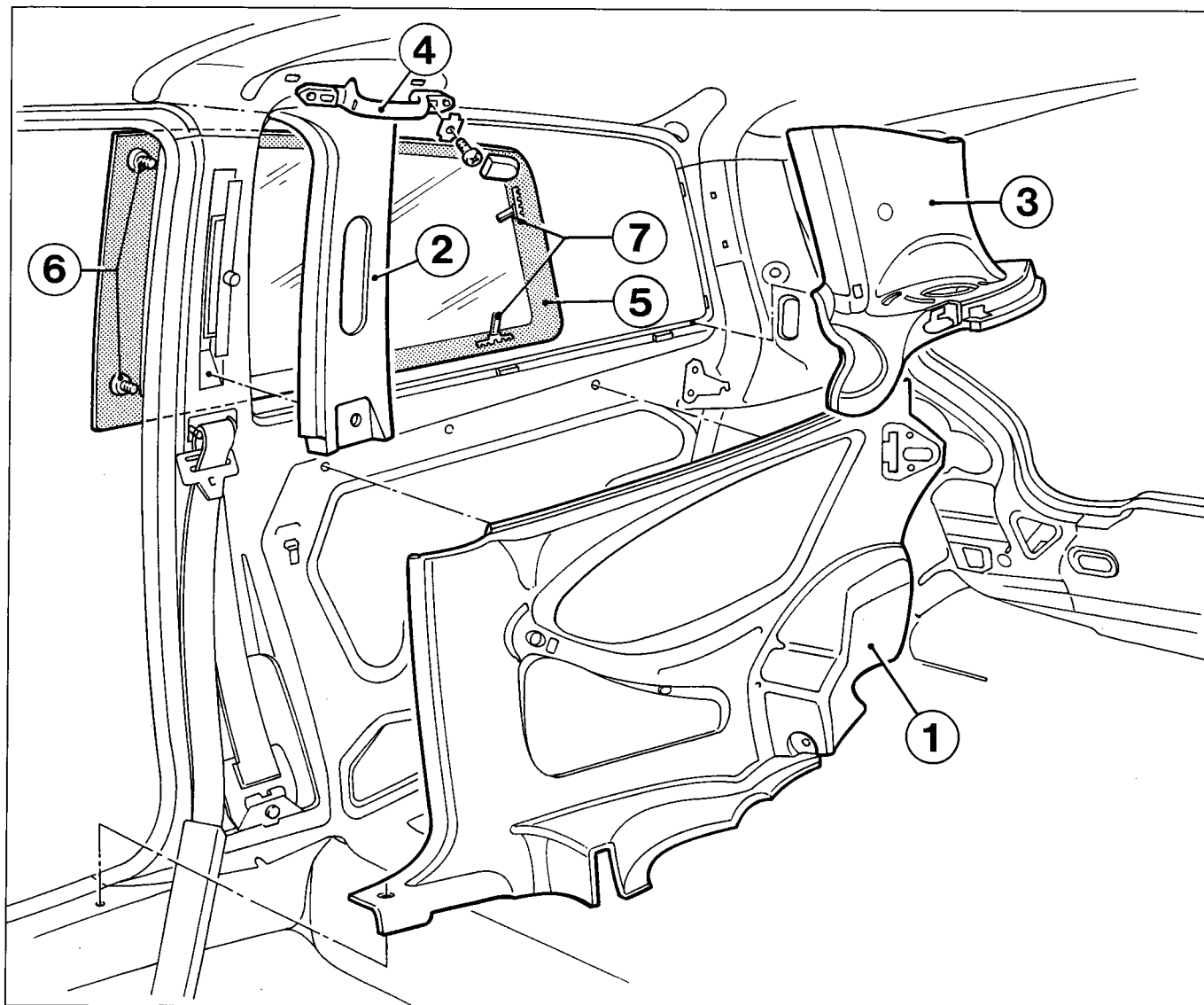
- Extrude a bead of sealant, along the perimeter of the rear screen scrupulously following the figures given in the diagrams.

REPLACING THIRD FIXED WINDOW

Removing trim and protection from vehicle

The diagram below shows the components to be removed before moving onto the subsequent preparation stages.

- Protect the outer perimeter of the third glass housing with adhesive tape
- Slightly lower the roof lining, then position the appropriate spacers.



P4A057M01

- | | |
|----------------------------|----------------------------|
| 1. Rear panel inner lining | 5. Fixed glass |
| 2. Centre pillar cover | 6. Threaded reference pins |
| 3. Rear pillar cover | 7. Retaining clips |
| 4. Passenger grab handle | |

NOTE *It is preferable to cut the sealant working from inside the vehicle using an appropriate blade to prevent scratching the bodywork.*



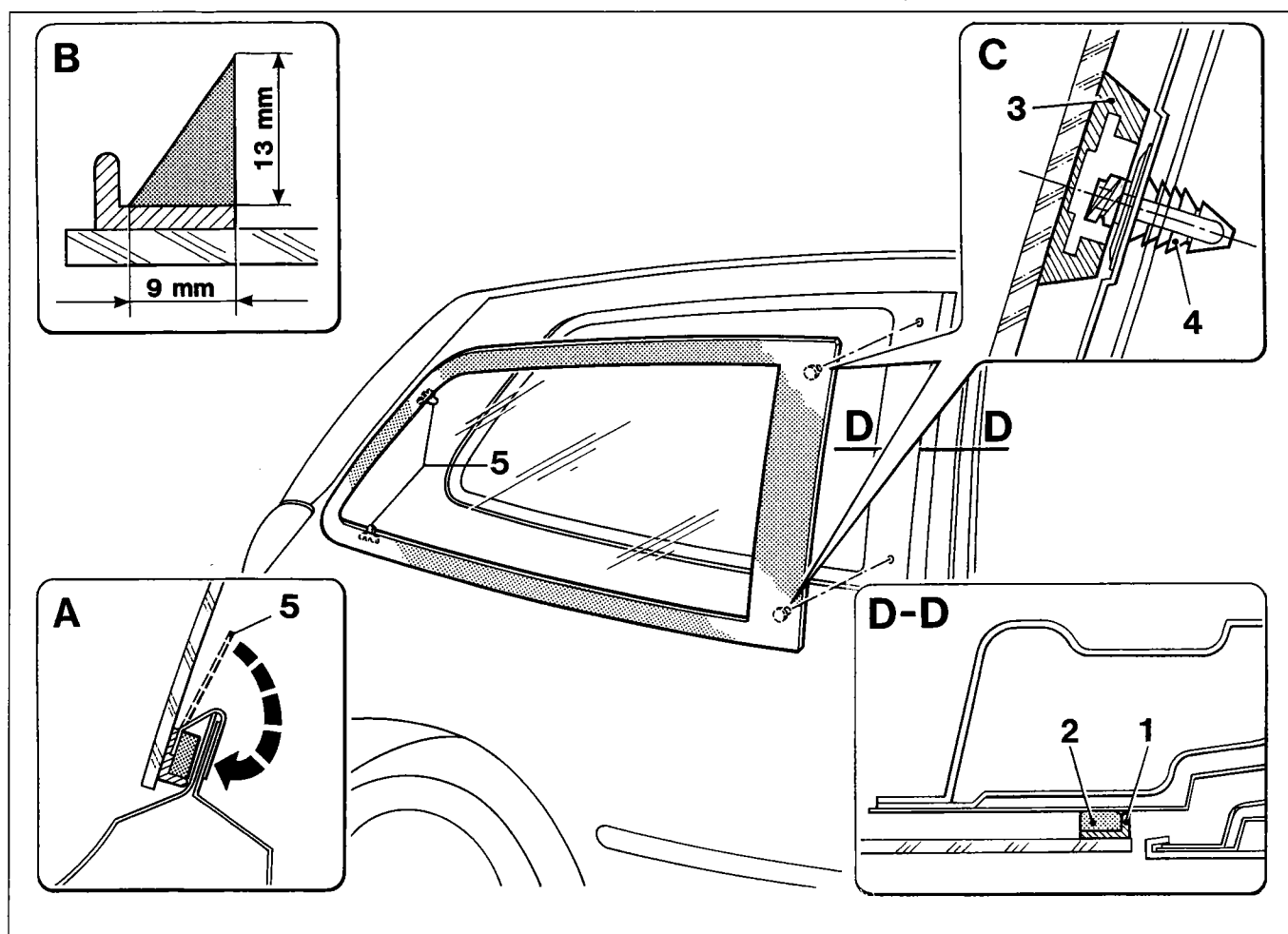
Open the retaining clips (7) before cutting the sealant.

70.

Refitting

For the preparation of the glass and the housing, refer to the instructions already described previously (see page 50).

The rear window glass has an extruded trim (1) along the entire perimeter. The sealant (2) which sticks the window glass to the bodyshell is applied to the trim in a continuous bead along the entire perimeter. The measurements for the dimensions of the bead and the distance from the edge of the trim are given in inset B.



P4A058M01

There are two housings (3) at the two front corners of the window for fitting the threaded pins (4) which act as references for the centering. The section of the window corresponding to the threaded pins is shown in inset C.

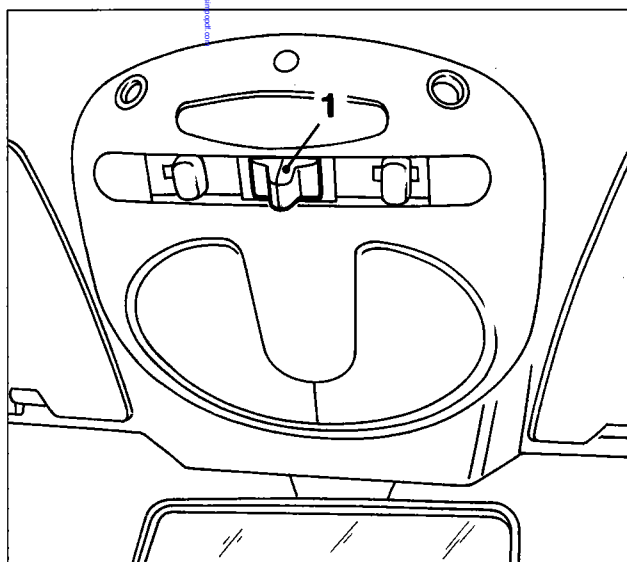
The threaded pins are available as spares and it is advisable to modify two of them, removing the tabs to use them as reference pins during the operation of offering up the window when dry.

To lock the window, during the hardening of the sealant, fold back the clips (5) as shown in inset A.

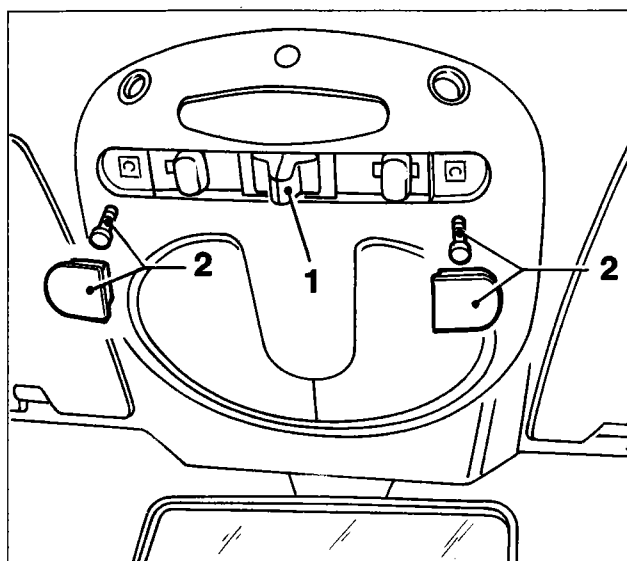
INTRODUCTION

The sun roof is electrically operated. The closing flap is in glass which means that the transmission of light and energy equals 25%. It can be opened, completely or partly, by a push button (1) positioned on the upper courtesy light.

The sun blind is opened manually and irrespective of the operation of the sun roof.



P4A059M01

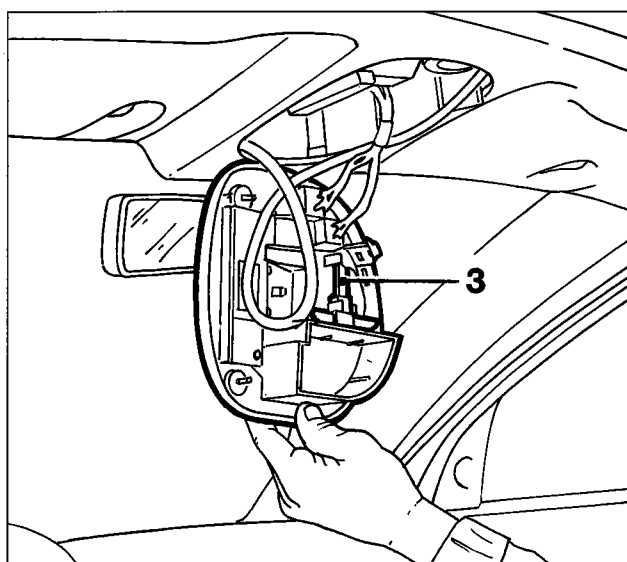


P4A059M02

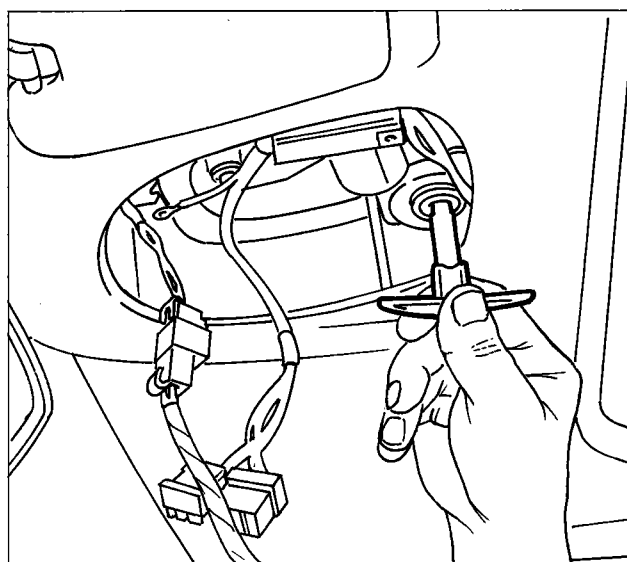
Emergency procedure

If the electrically operated device fails, it is possible to operate the sun roof manually, proceeding as follows:

- remove the seals and bolts (2);
- extract the special key (3) from inside the courtesy light;
- insert it in the special splining for the electric motor, then rotate and move the roof.



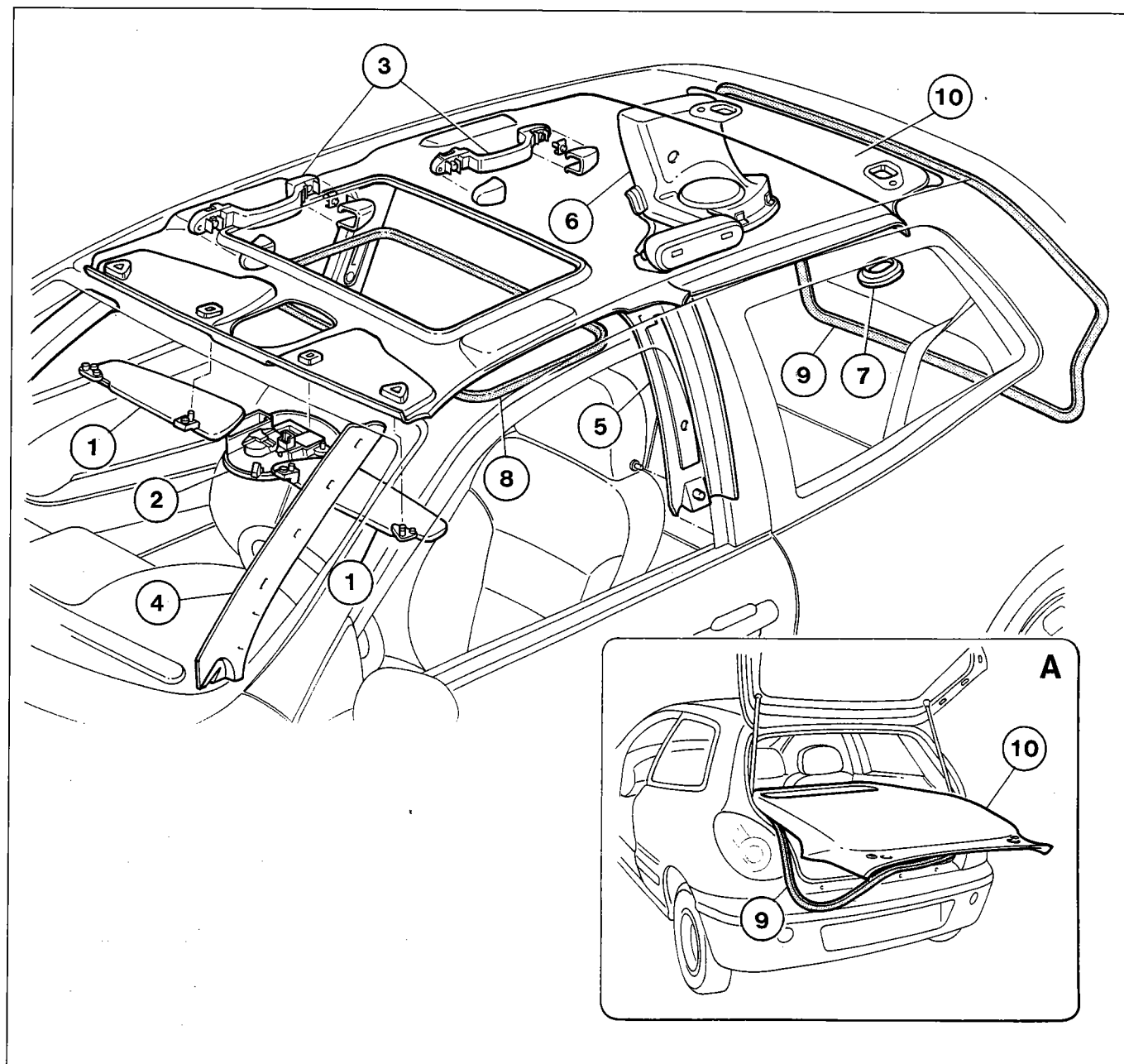
P4A059M03



P4A059M04

Removing trim

To remove the trim for the sun roof, remove the components shown in the diagram.



P4A060M01

1. Sun visors
2. Courtesy light
3. Grab handles
4. Windscreen pillar covers
5. Centre pillar covers

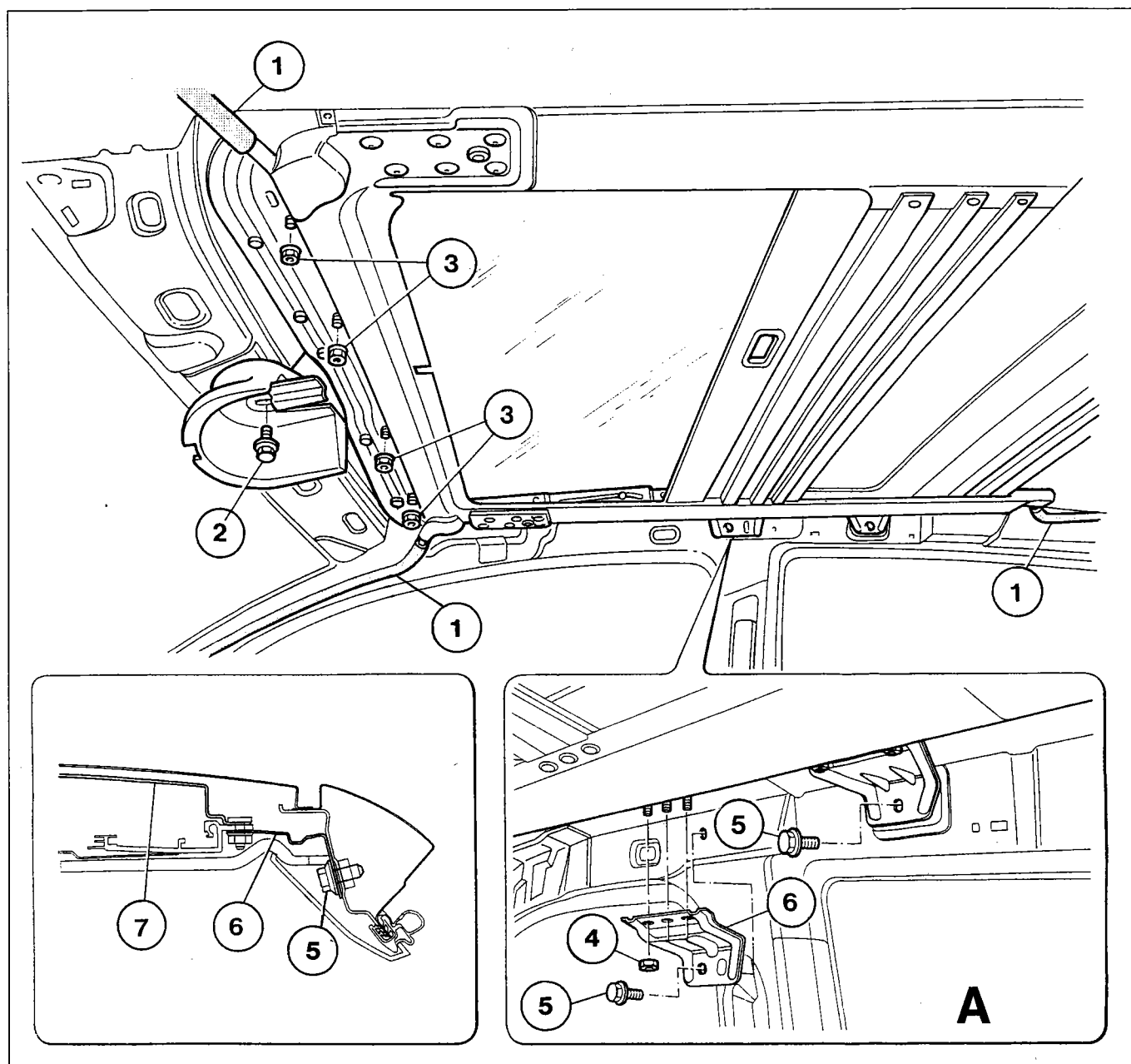
6. Rearscreen pillar covers
7. Tailgate hinge covers and roof lining fixing plugs
8. Flap trim
9. Tailgate housing trim
10. Roof lining

NOTE Extract the roof lining from the passenger compartment passing it through the tailgate housing after having removed the upper and side part of the trim (see detail A).

REMOVING-REFITTING COMPLETE ROOF

After removing the trim for the internal components (see previous page), proceed with the removal of the complete roof, following the instructions given below:

- disconnect the water drainage pipes (1);
- on the front cross member for the frame undo the centre bolt (2) and the nuts (3);
- working from the side, remove the nuts (4) and the bolts (5);



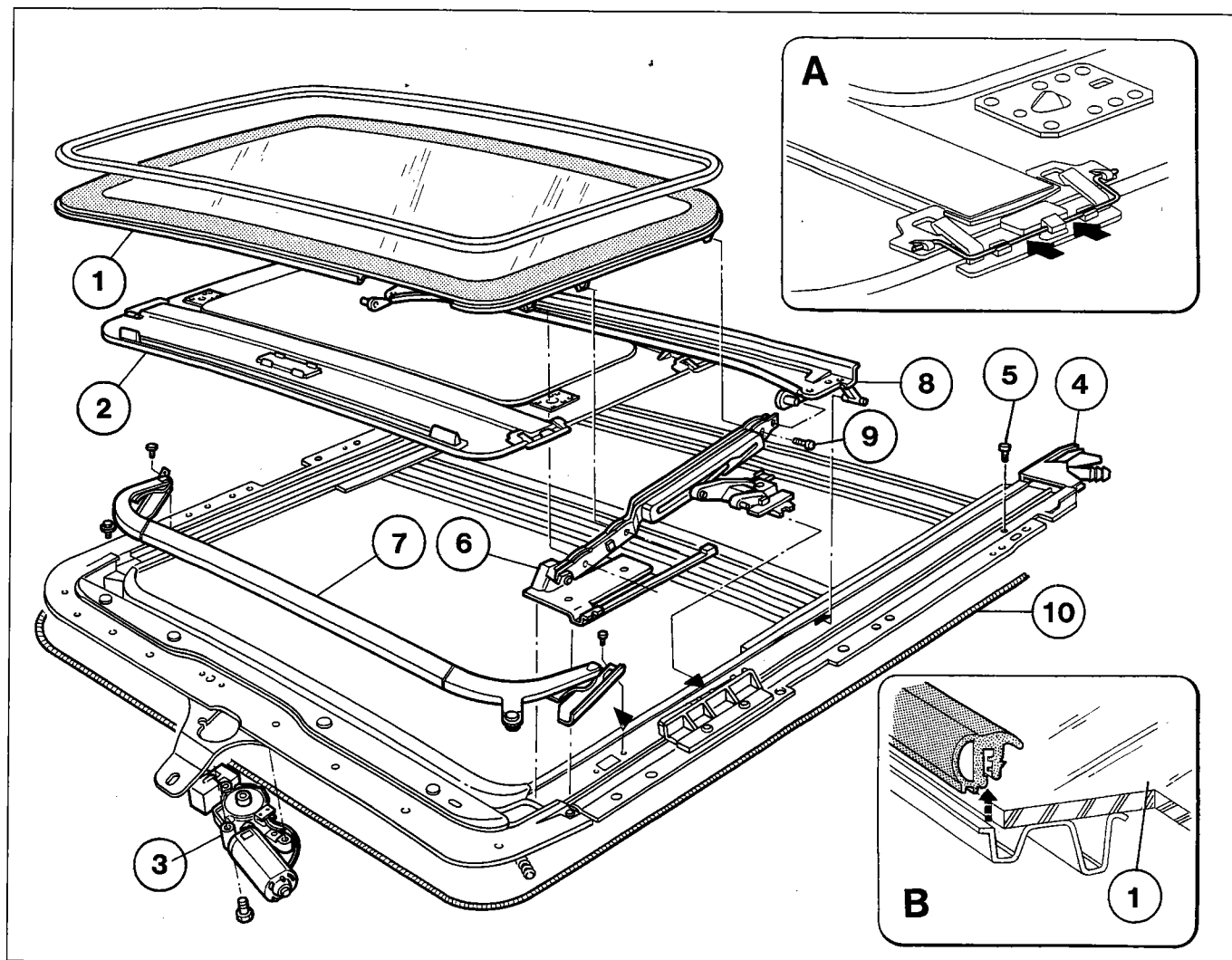
P4A061M01

NOTE The centre brackets (6) are connected to the roof rib (7); to remove the sun roof frame they must be completely disconnected (see detail A)

DISMANTLING-REASSEMBLING COMPLETE ROOF

To dismantle the sun roof, proceed as described below:

- Remove the crystal (1) from the pullies (6) through the bolts (9). Remove the rain gutter (8). Remove the sun visor panel (2) releasing it from the guides (see detail A).
- Remove the electric motor (3).
- Remove the terminals (4) (water drainage) stuck with Betaseal type polyurethane sealant.
- Undo the two end of travel bolts (5).
- Extract the pullies (6) after having moved them into the end of travel position.
- Remove the bowden cable (10).
- Remove the deflector (7).



P4A062M01

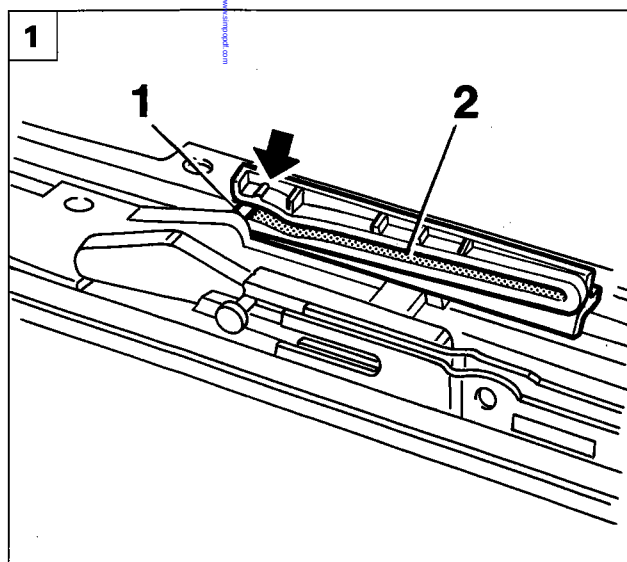


The bolts (9) securing the glass are treated with special glue. After the bolt has completed six travels this feature is worn out. **ONLY THESE SPECIAL BOLTS SHOULD BE USED.**

NOTE The following components can be removed with the assembly fitted on the vehicle: crystal (1); trim (detail B); electric motor (3); sun blind panel (2).



When refitting lubricate the sliding components with MOLYHOTE PG 30 L type grease or an equivalent product.



P4A063M01

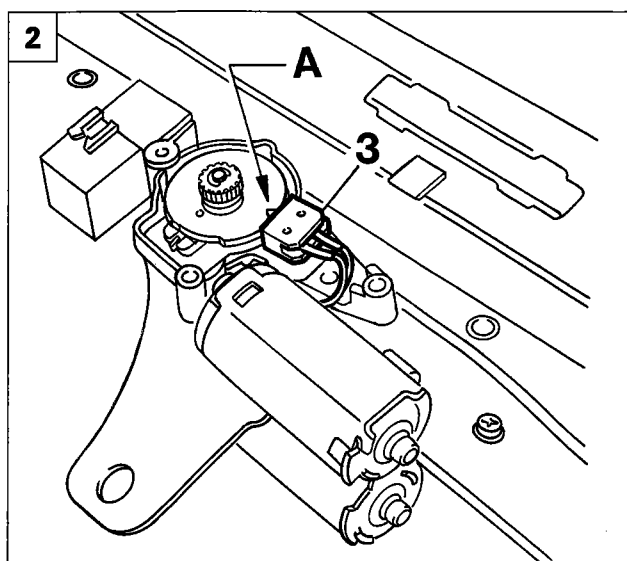


ADJUSTMENTS DURING REFITTING

Adjustment of opening device.

For a correct synchronism between the electrical operation and the opening/closing of the roof the parts concerned must be adjusted as follows:

1. position the rollers (1) for the pullies exactly at the start of the sliding duct (2), before the reference mark shown by the arrow;
2. refit the electric motor with reference A corresponding to the micro-switch (3);
- lastly, refit the window.



P4A063M02

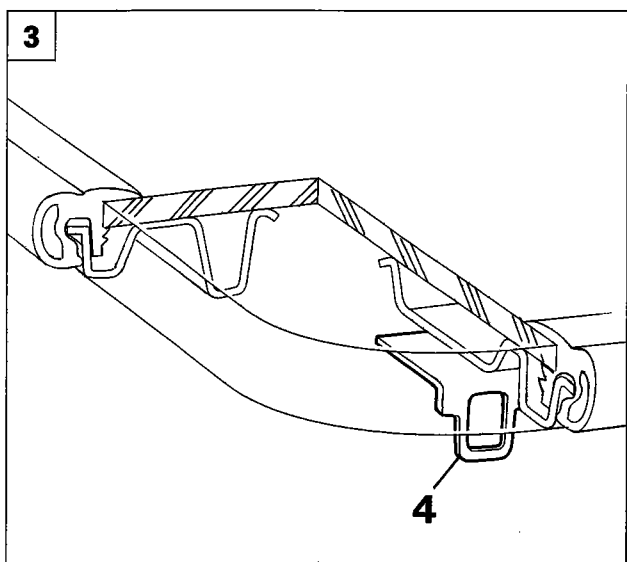


Adjusting the window

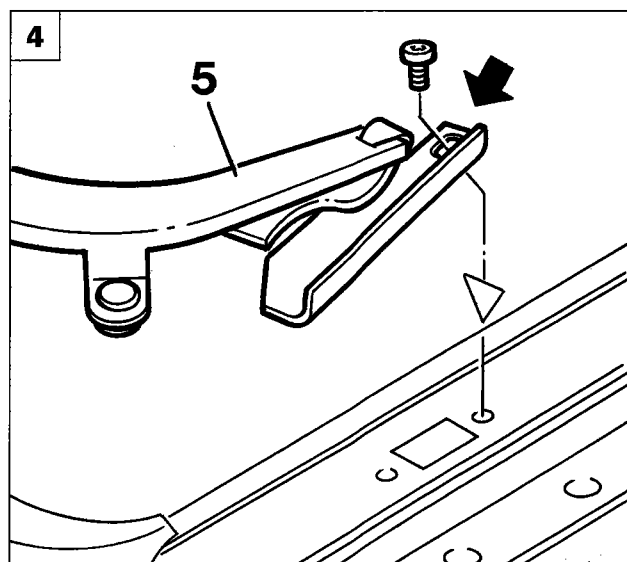
3. If necessary, adjust the alignment of the window with the profile of the roof using the slots in the frame (4).

Adjusting the spoiler

4. At the edges of the spoiler (5) there are two openings with slots (shown by the arrows) for fixing and alignment with the vehicle profile.



P4A063M03



P4A063M04

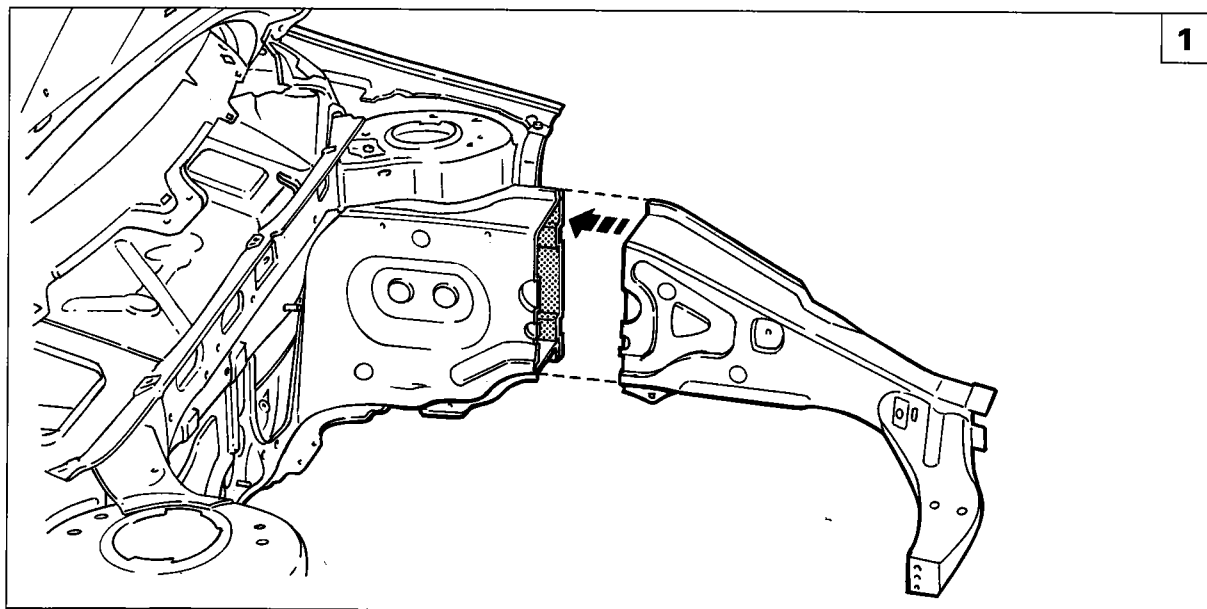
70.

INTRODUCTION

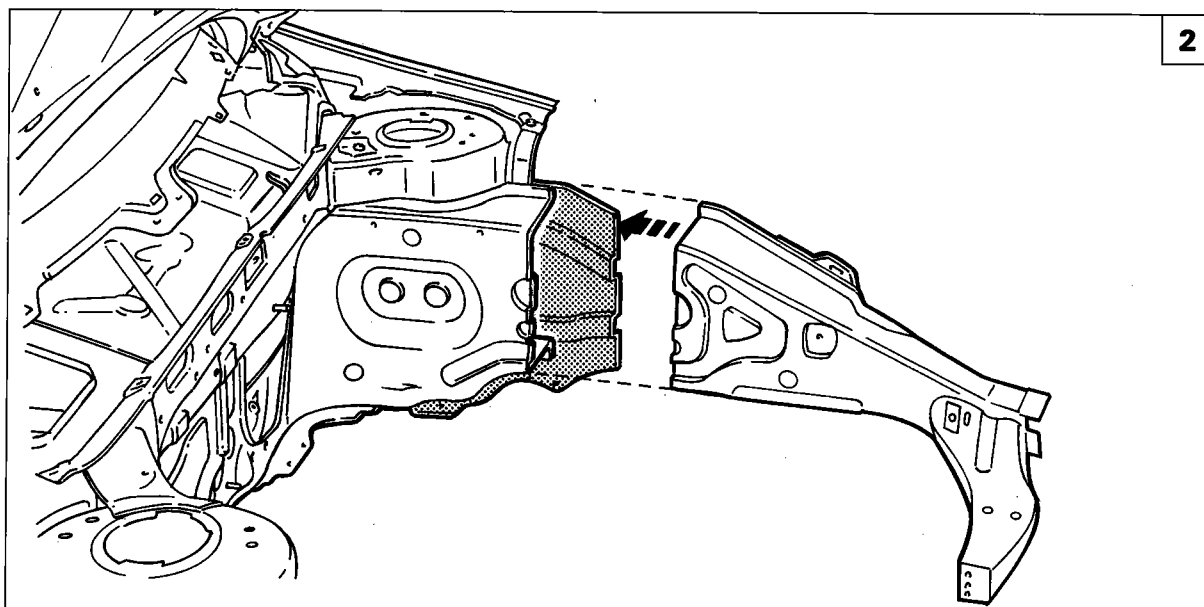
General instructions for the repair

For safety reasons and for a better quality repair, it is forbidden:

- To replace a side member, half block or block, without using a repair bench. The use of the bench makes it possible to ensure the restructuring of the vehicles with the original manufacturing distances, ensuring the correct positioning of the elements of both the front section and the rear section.
- Cut and weld any element of the bodywork and its reinforcement, edge to edge, along the same line (see figure 1).
- Heat the side members for straightening.



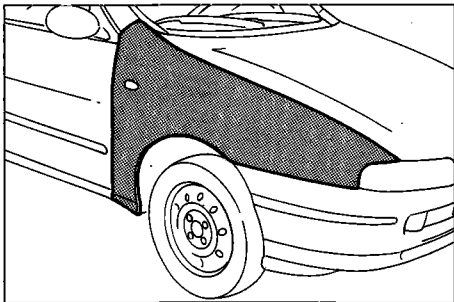
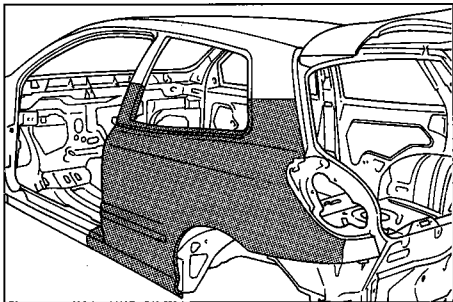
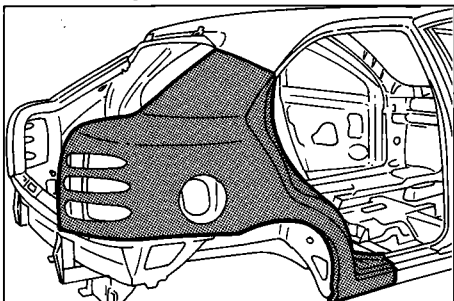
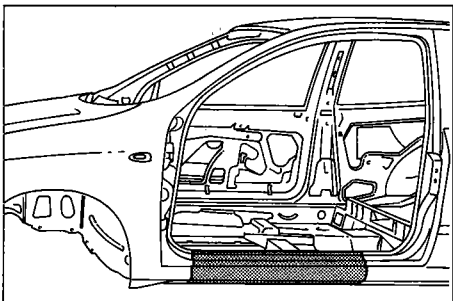
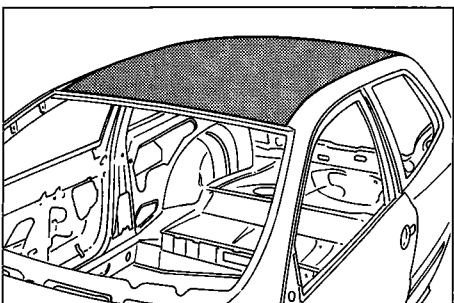
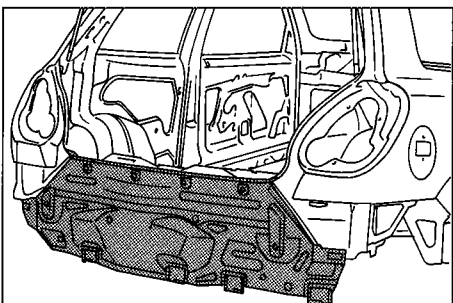
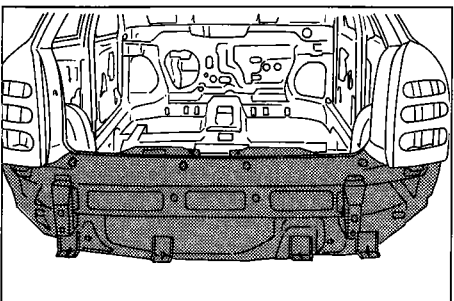
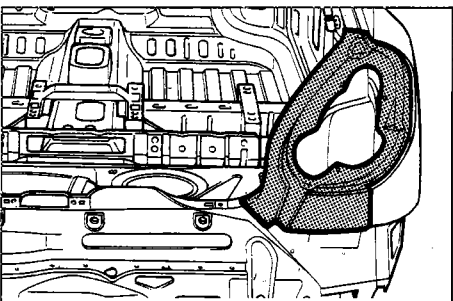
P4A064M01



P4A064M02

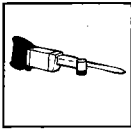
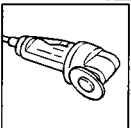
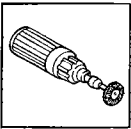
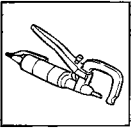
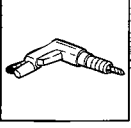
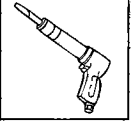
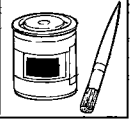
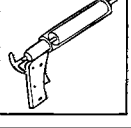
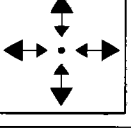
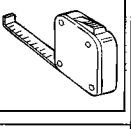
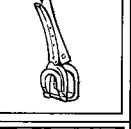
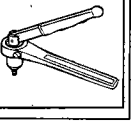
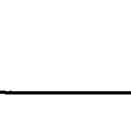
When carried out correctly the operation will involve an excess of several centimetres between the two cutting lines in order to distribute the points created by welding (see figure 2).

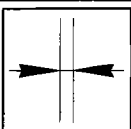
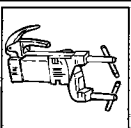
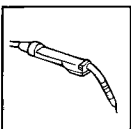
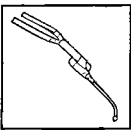
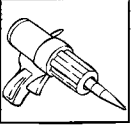
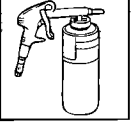
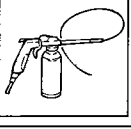
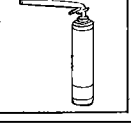
GRAPHIC INDEX

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Rear wing 5 P  P4A065MO3	Underdoor side member lining  P4A065MO4	
Replacing roof panel  P4A065MO5	Rear cross member cover 3 P  P4A065MO6	Replacing body panels 5 door version: page 89 3 door version: page 93
Rear cross member cover 5 P  P4A065MO7	Rear light cluster housing 3P  P4A065MO8	
		Replacing body panels 5 door version: page 97 3 door version: page 101

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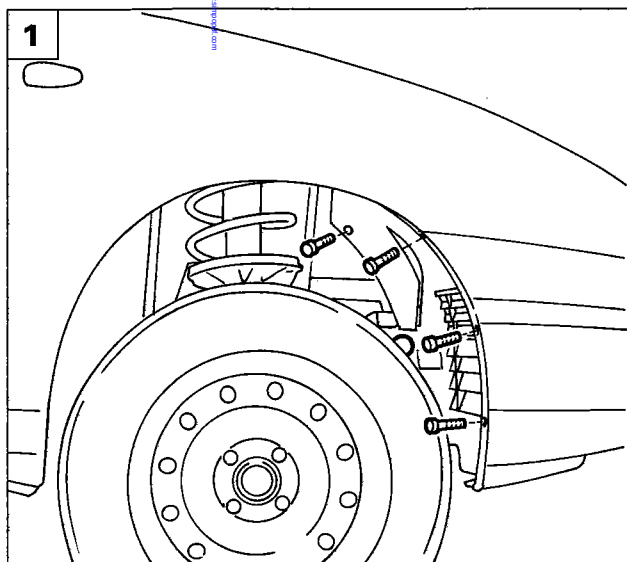
SYMBOLS

CUTTING WITH HACK SAWING MACHINE	
CUTTING WITH CIRCULAR BLADE SAW	
CLEANING WITH ROTARY BRUSH	
REMOVING SPOT WELDS WITH CHAMFERING MACHINE	
REMOVING SPOT WELDS WITH DRILL	
DRILLING FOR MIG WELDING	
REMOVING PANEL WITH CHISEL	
DRILLING FOR MIG WELDING	
APPLYING ELECTRO-WELDABLE PROTECTIVES	
APPLYING HIGH THICKNESS ELECTRO-WELDABLE PROTECTIVES	
CENTERING COMPONENTS	
MEASURING	
FIXING COMPONENTS	
FIXING THREADED RIVETS	

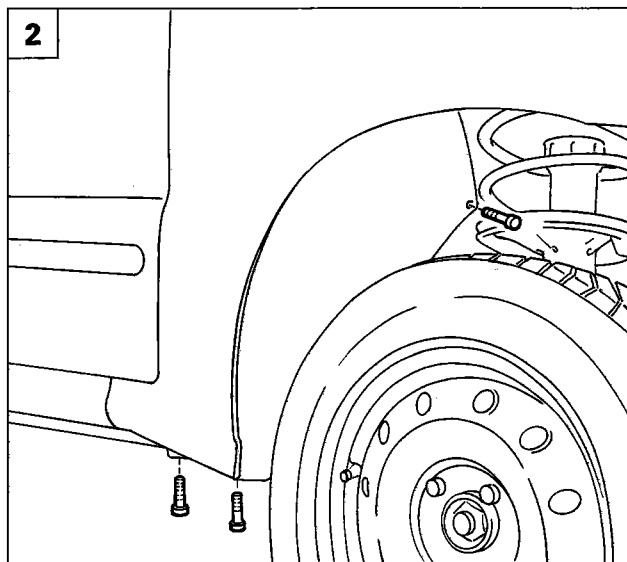
CHECKING GAPS AND ALIGNMENTS	
SPOT WELDING	
MIG WELDING	
WELDING WITH OXYACETYLENE CANISTER	
GRINDING	
APPLYING ANTI-OXIDANT PROTECTIVES	
APPLYING SEALANTS	
APPLYING UNDERBODY PROTECTIVES	
APPLYING PAINTS	
APPLYING WAX BASED PROTECTIVES	
APPLYING FOAM PRODUCTS	

SYMBOLS IN ILLUSTRATIONS

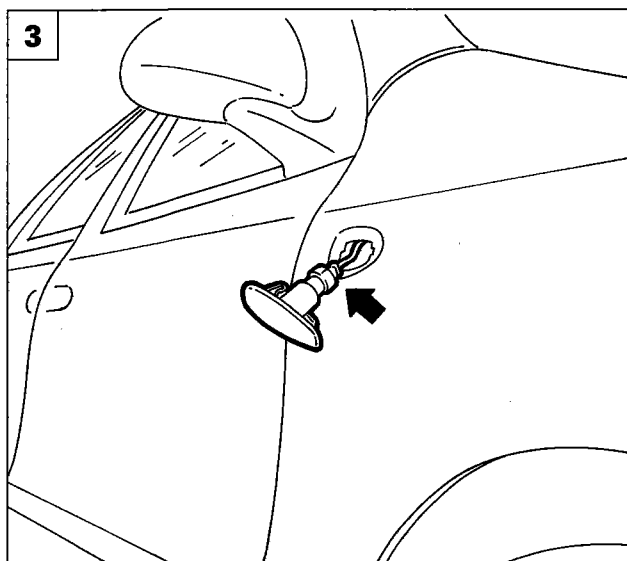
- CUTTING LINE
- ● ● ● SPOT WELDING
- ■ ■ ■ MIG WELDING FOR FILLING
- UUUUUU CONTINUOUS MIG WELDING
- XXXXXXXX BRAZING



P4A067M01



P4A067M02



P4A067M03

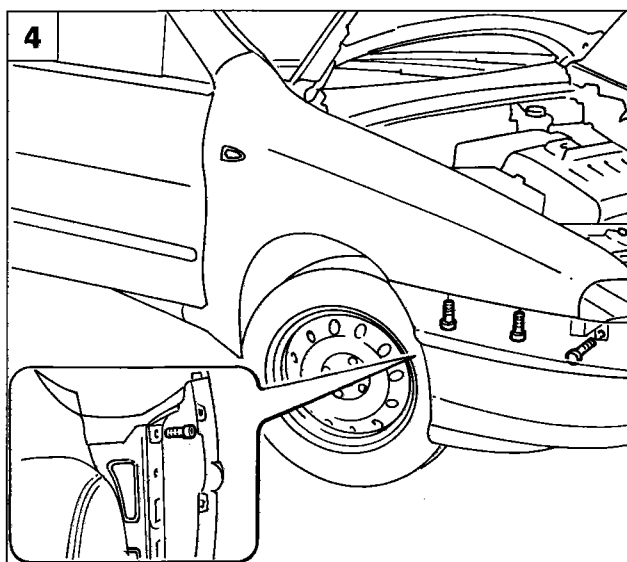


FRONT WING

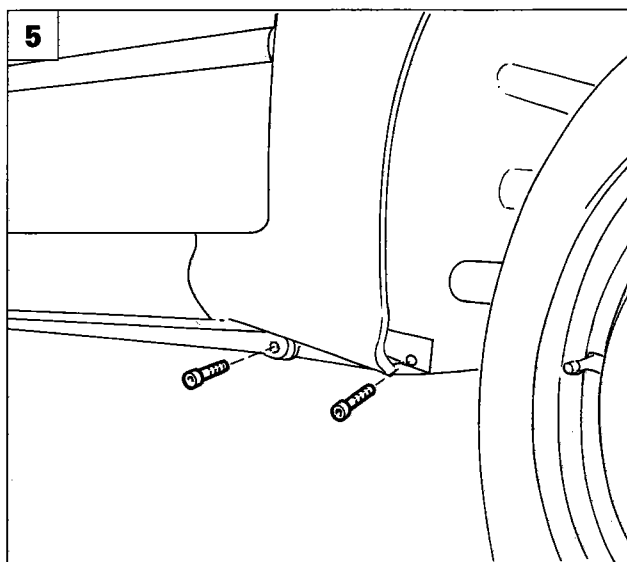
Removing

Remove the front light cluster as shown in Section 55 - Electrical equipment.

1. Undo the bolts and the button fixing the front wheel arch liner using tool 1878077000.
2. Remove the front wheel arch liner, undoing the fixing bolts.
3. Remove the side direction indicator acting on the retaining tabs and disconnecting the connector.
4. Undo the bolts fixing the bumpers to the front wing and the bolts fixing the wing to the front side panel.
5. Undo the bolts fixing the wing to the underdoor lining.

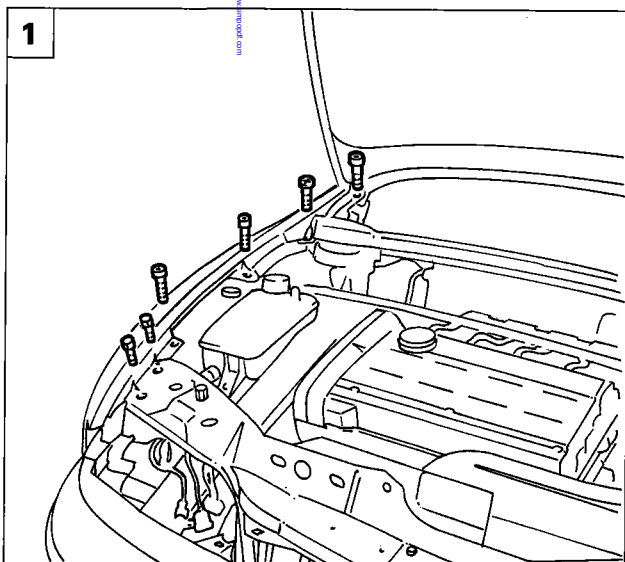


P4A067M04

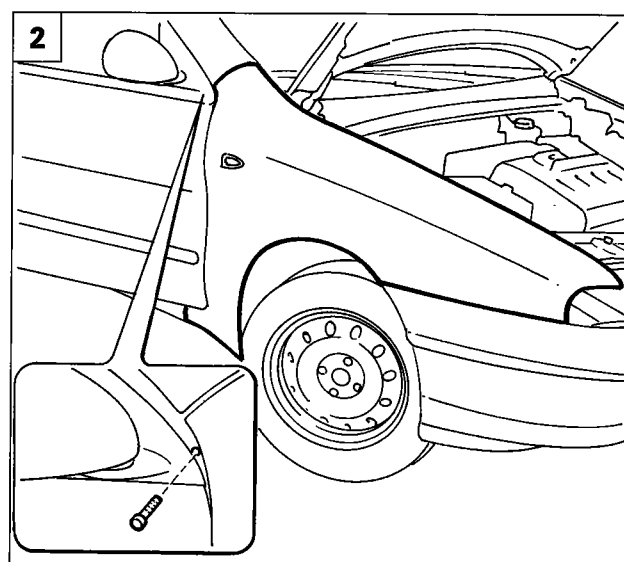


P4A067M05

70.



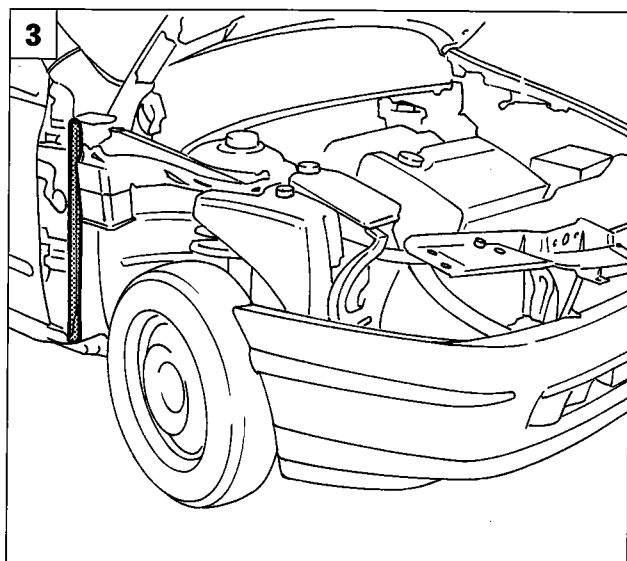
P4A068M01



P4A068M02



1. Undo the upper bolts fixing the wing to the vehicle and the lower window lining.
2. Undo the bolt fixing the wing to the front pillar cover, then separate the wing from the adhesive sealant.

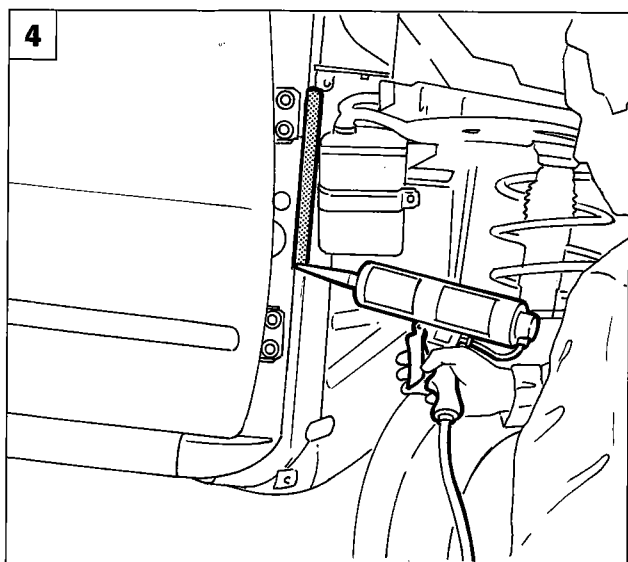


P4A068M03

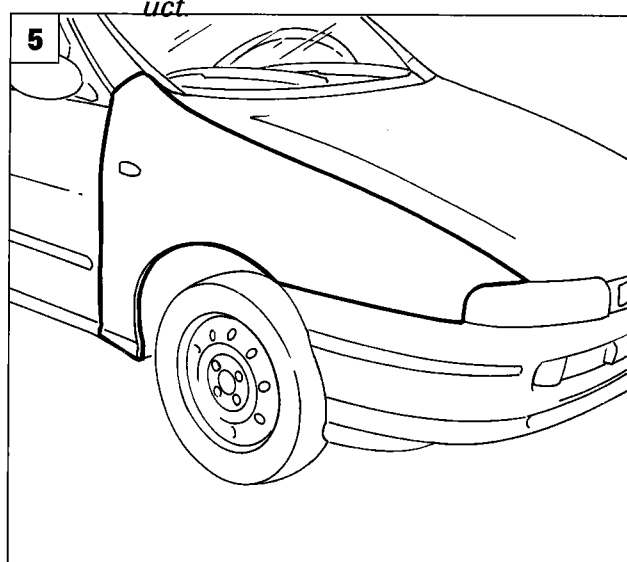
Refitting

3. Remove the old sealant from the area in contact with the vehicle.
4. Apply sealant to the contact area between the wing and the vehicle.
5. Place the replacement part in position, tighten the bolts fixing the wing to the vehicle, then refit all the components previously removed.

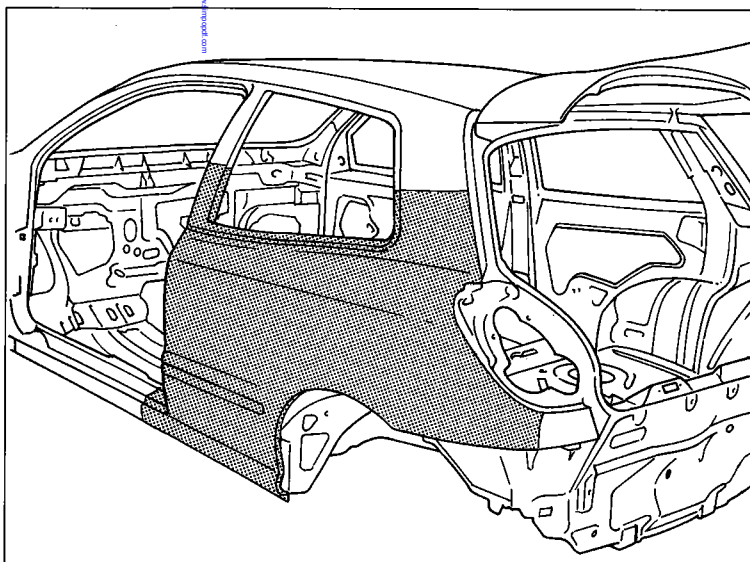
NOTE Use **SIKAFLEX 221** (made by **SIKA**) sealant which hardens at ambient temperature or an equivalent product.



P4A068M04



P4A068M05



REPLACING REAR WING (7090A 54)*

(*) This number indicates the operation code given in the Flat rate manual.

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

P4A069M01

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshe'll alignment figures. Carry out any straightening operations required to the bodyshe'll using suitable methods (jigs, templates or gauges), before cutting the component. After this operation check that the components not being replaced are intact.

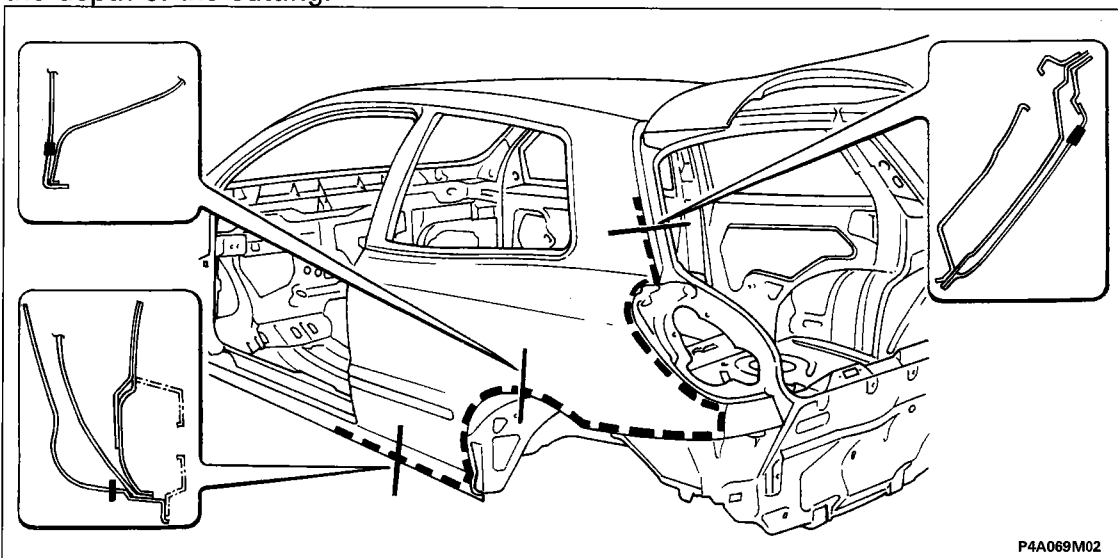
PRECAUTIONS/WARNINGS AND PRELIMINARY DISMANTLING

Protect the seats and the parts which could be damaged using cloths. Remove the fuel tank, disconnect the battery and all the electrical and electronic components because the currents produced during the welding operations could cause serious damage.

REMOVING AND REFITTING OPERATING CYCLE

The replacement of the panels can be "total or "partial"; this second solution is preferable when trying to avoid damage to another panel which has been assembled through welding. Cut the wing using a power saw following the dotted lines shown in the diagram below.

We show the sections of the panels at the cutting points to allow the operator to adjust the position and the depth of the cutting.



P4A069M02



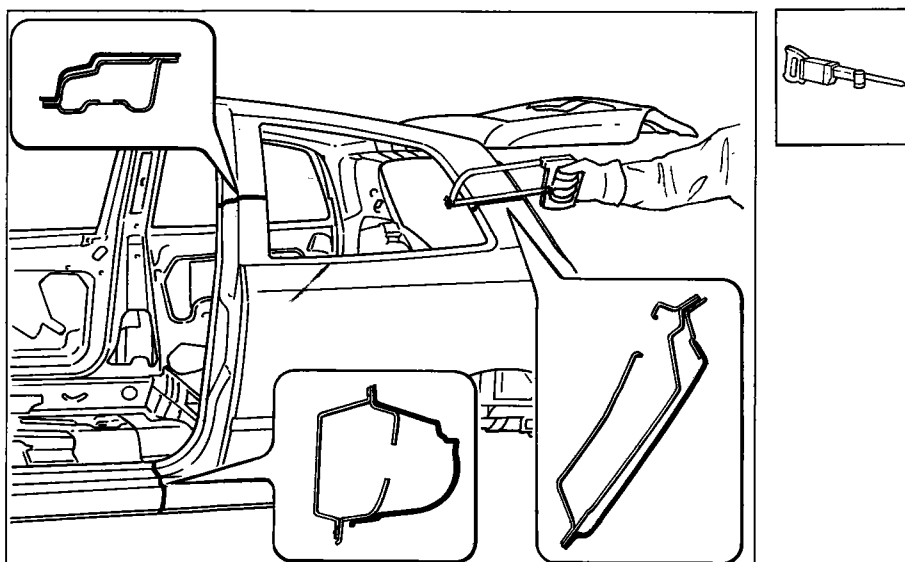
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, masks and gloves during the welding and painting operations.

70.

Using the saw, cut the underdoor side member, the centre and rear pillars; these parts will be later welded "edge to edge" using the continuous welding machine.



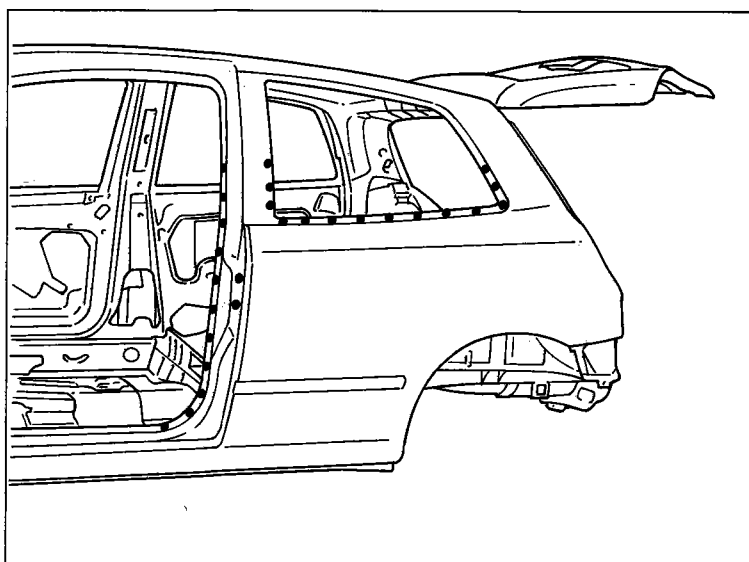
It is advisable to cut the wing using a hand saw so as not to affect the reinforcements underneath.



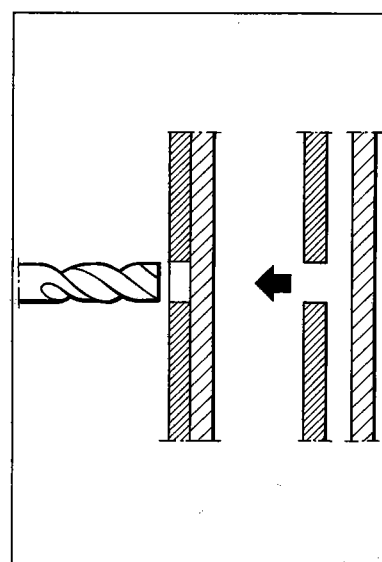
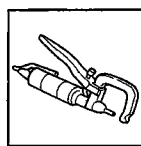
P4A070M01

Remove the spot welds using a special remover.

The cutter for removing the spot welds acts on the panel which makes up the element to be replaced as far as the panel underneath thereby eliminating the weld spot as shown in the right inset.

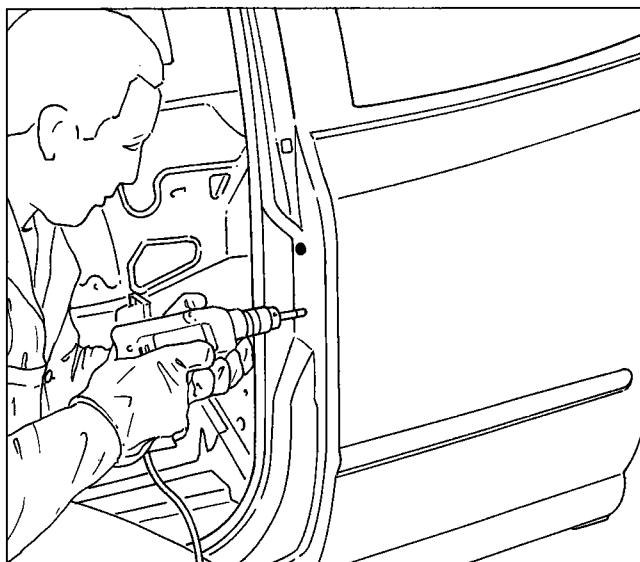


P4A070M02

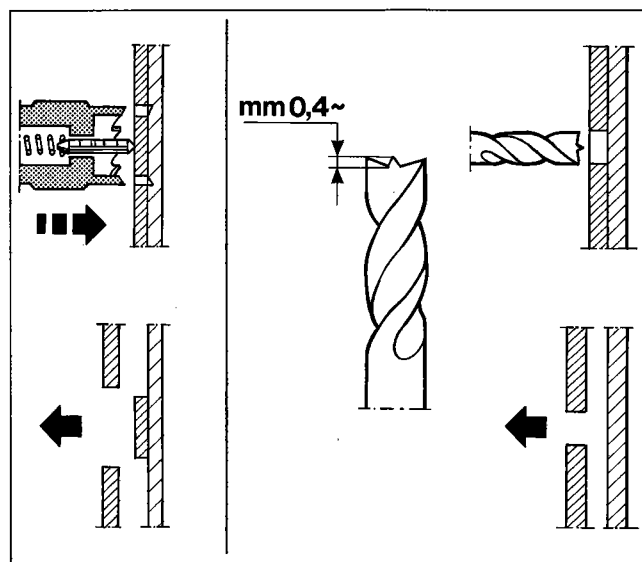


P4A070M03

Where it is not possible to use a spot weld remover, use a special cutter and an ordinary drill (it is also possible to use a normal drill modified as shown in the diagram underneath).

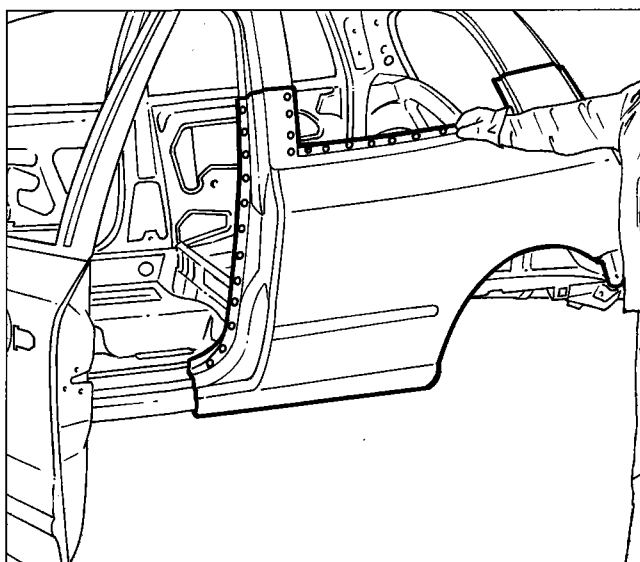


P4A071M01

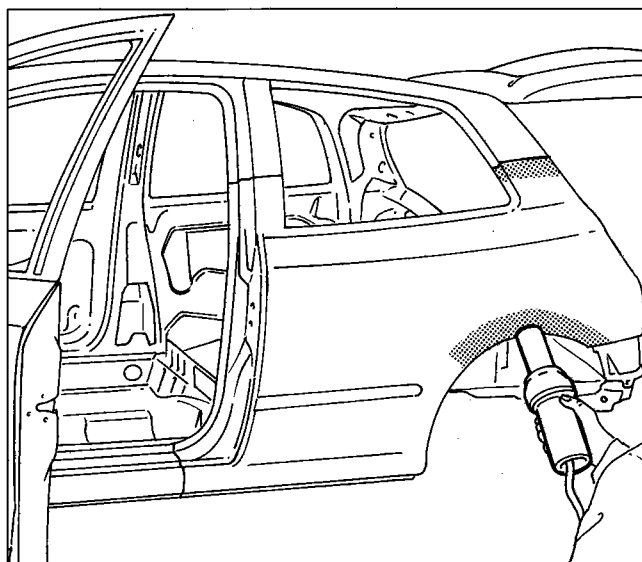


P4A071M02

Remove the rear wing taking care not to distort the inner frames.



P4A071M03

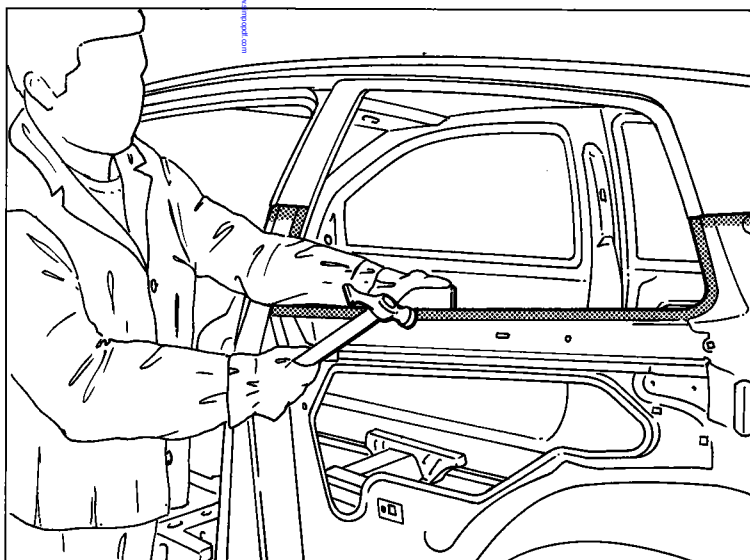


P4A071M04



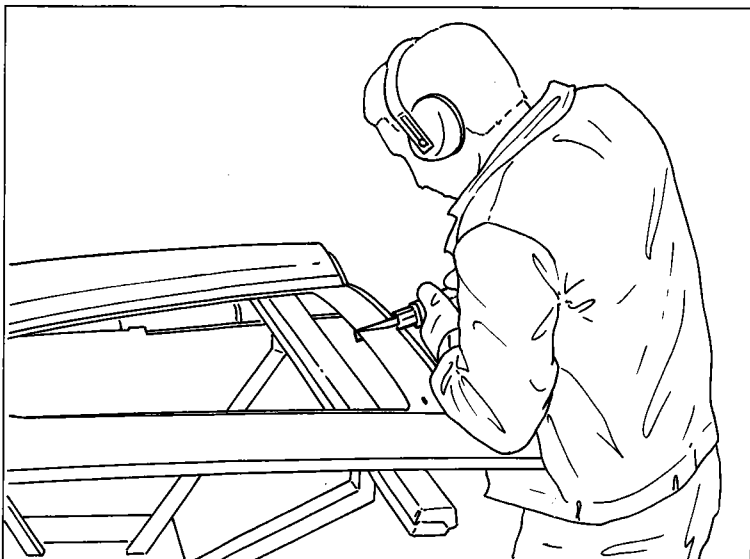
If there are difficulties when removing the wing, it is advisable to heat the section of sealant in the area of the wheel arch and the foam in the upper part of the rear pillar using a hot air blower.

70.



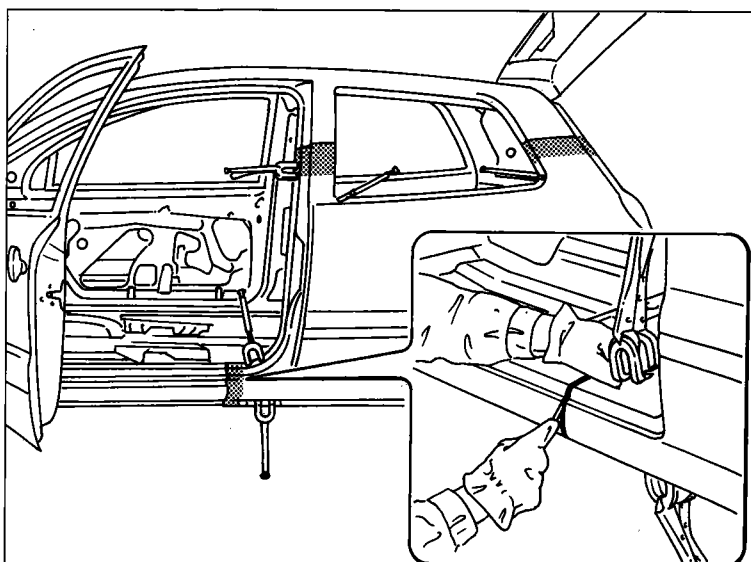
P4A072M01

- Using a hammer and dolly block straighten the edges of the vehicle.



P4A072M02

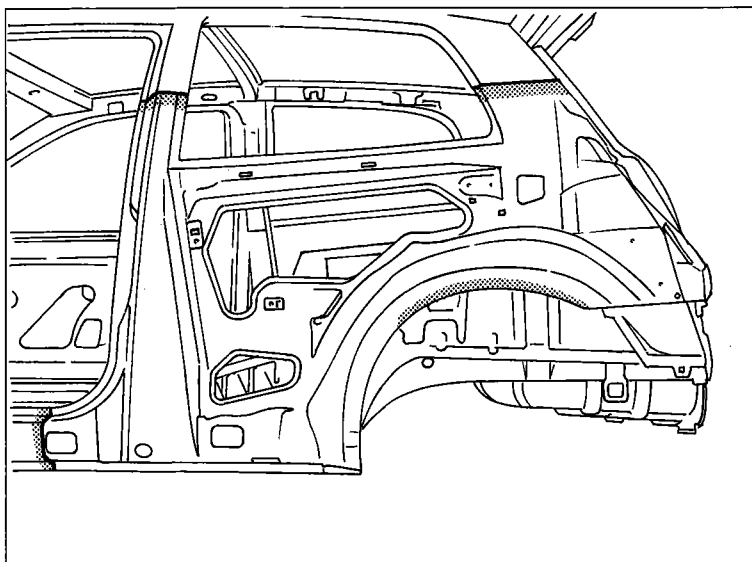
- Remove the excess parts from the replacement part so that the replacement pillars are about 50 mm longer than the part removed from the vehicle.



P4A072M03

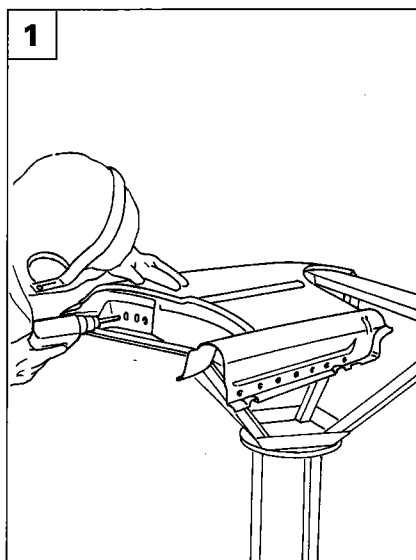
- Place the spare part in position on the vehicle and check the alignment with the adjacent elements, then fix it using the special self-locking clamps;
- after having made sure that it is perfectly superimposed (pillar and underdoor panel), mark the parts to be removed on the bodyshell using a tracer point.

Remove the replacement part from the vehicle and remove the offcuts from the pillars and the underdoor panel.

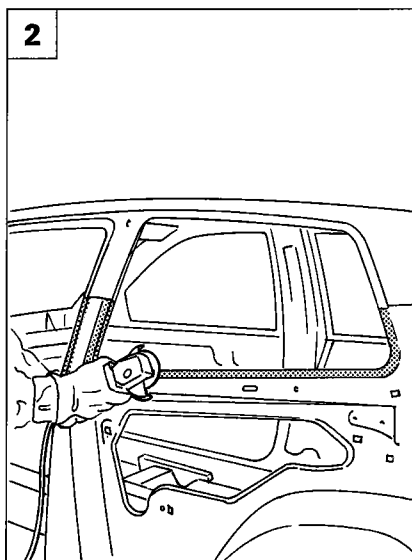


P4A073M01

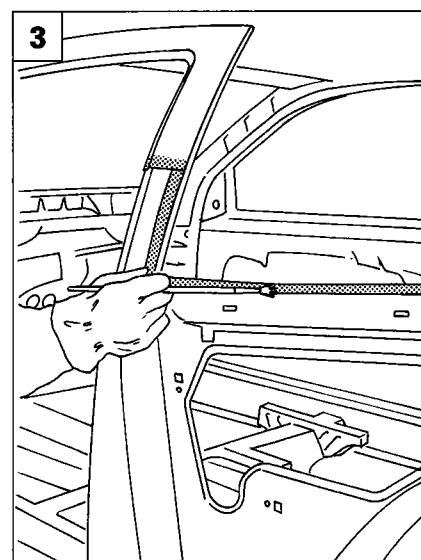
1. Drill the replacement part at the points where the continuous welding machine will insert the rivets.
2. Grind the spot weld residues and bare all the inner and outer surfaces in the areas to be welded (avoid the burnt painted box sections not perfectly anchored to the panels adversely affecting the subsequent protection operations).
3. Apply electro-weldable anti-rust protection to the inner edges to be welded.



P4A073M02



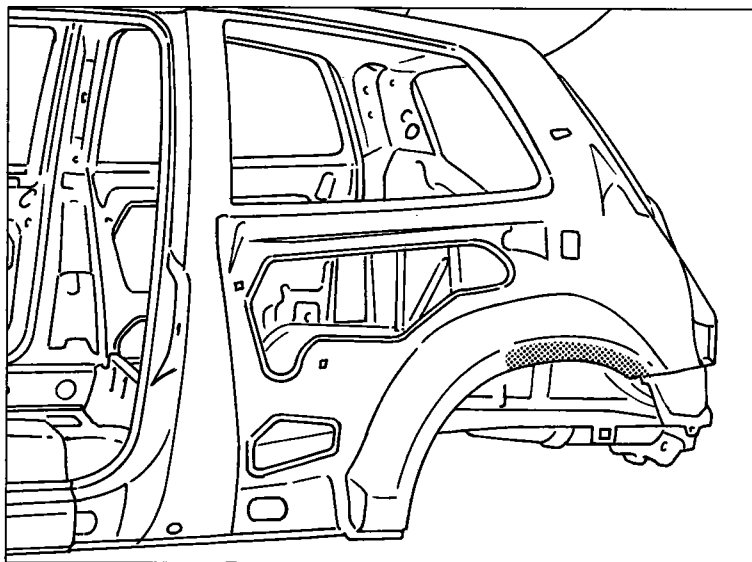
P4A073M03



P4A073M04

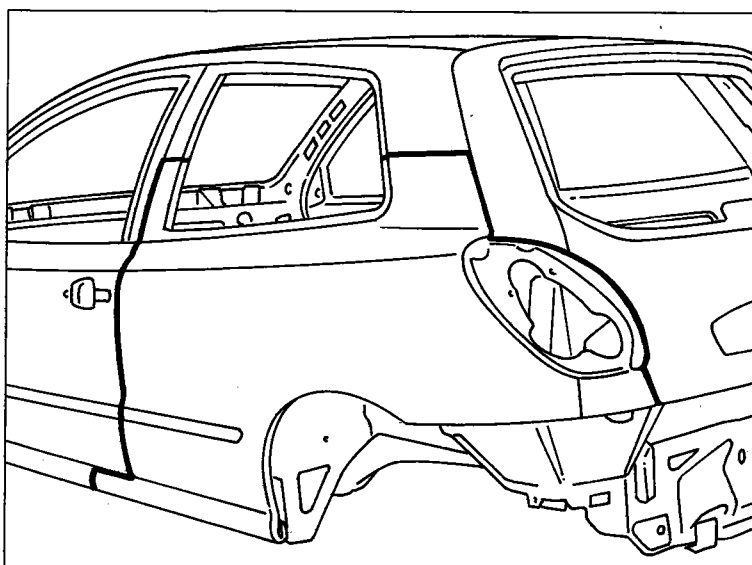
70.

Place sealant between the wheel arch and the wing along the section indicated in the diagram.



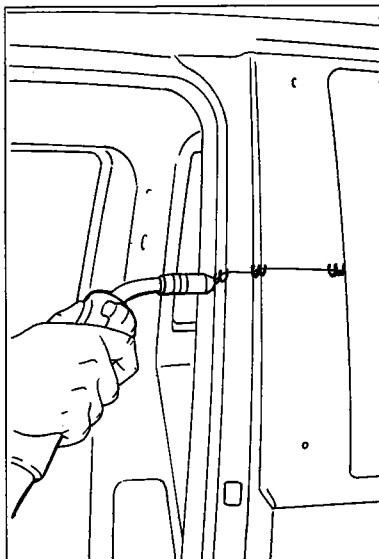
P4A074M01

Offer up the replacement part on the vehicle, check the alignment with the adjacent elements and check that it is perfectly aligned with the components to be welded edge to edge.

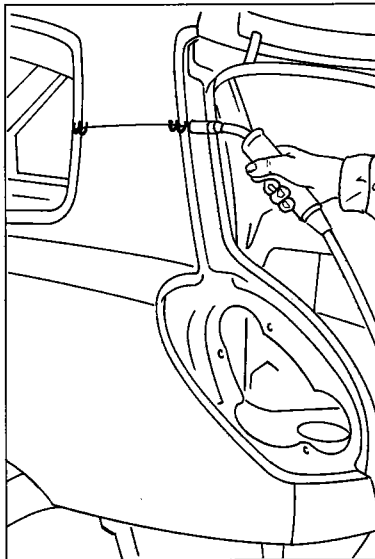


P4A074M02

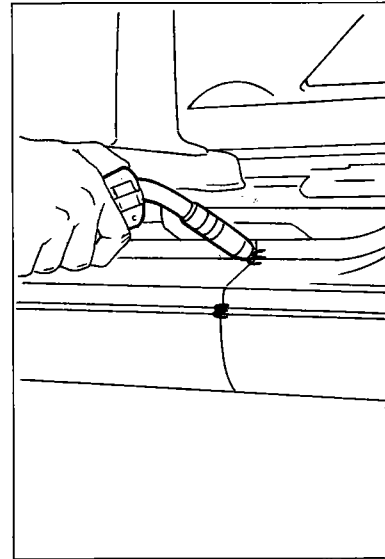
Start the welding operations using the continuous welding machine and tack the corners of the pillars and the underdoor panel.



P4A075M01



P4A075M02

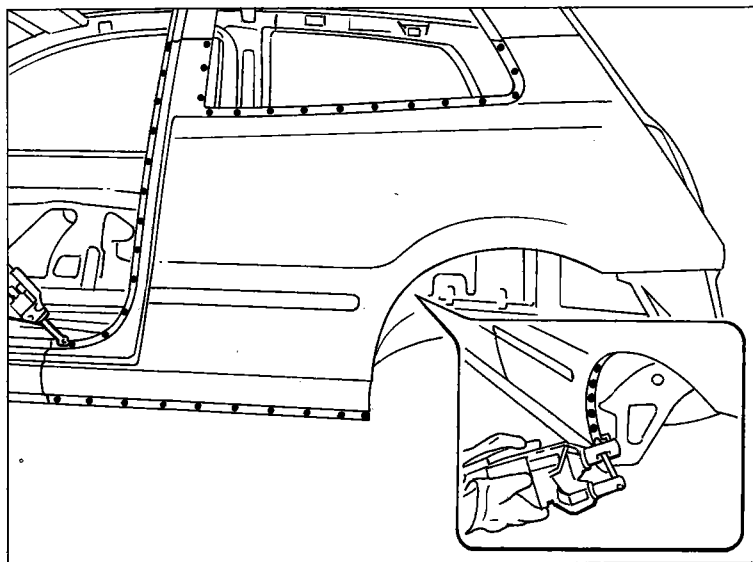


P4A075M03

Carry out electrical spot welding in the areas shown.



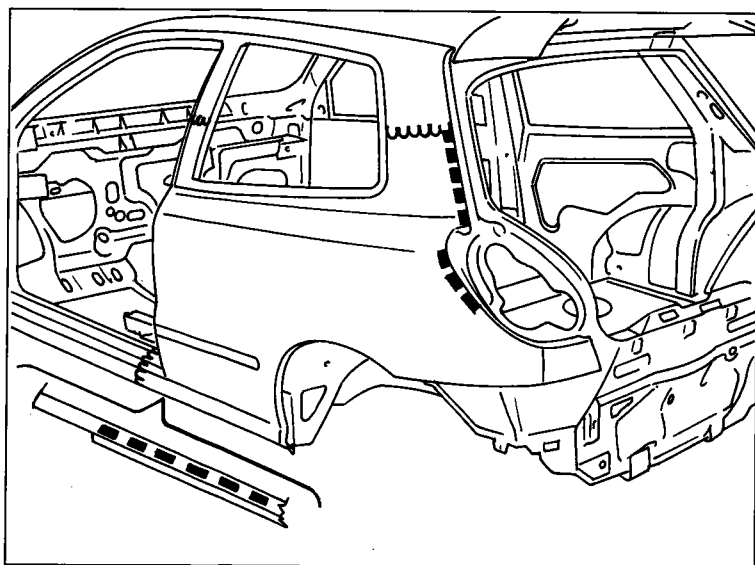
When carrying out electrical spot welding it is necessary that the parts to be welded are perfectly matched and that the panels are scrupulously clean to avoid excessive resistance leading to burning and the consequent fragility of the welding.



P4A075M04

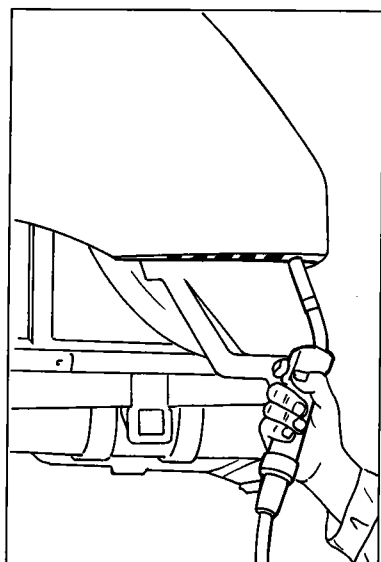
70.

Using the continuous welding machine, weld the pillars and the underdoor panel, proceeding in chain-stitch fashion in order not to distort the panels.

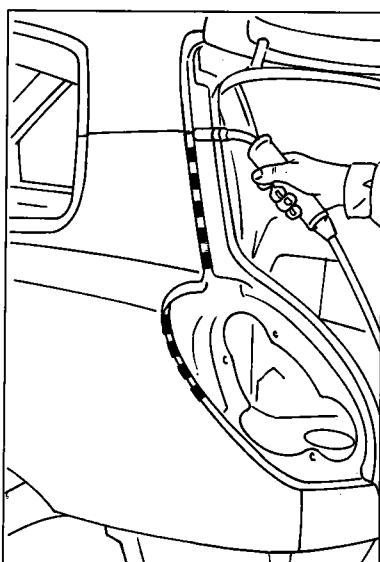


P4A076M01

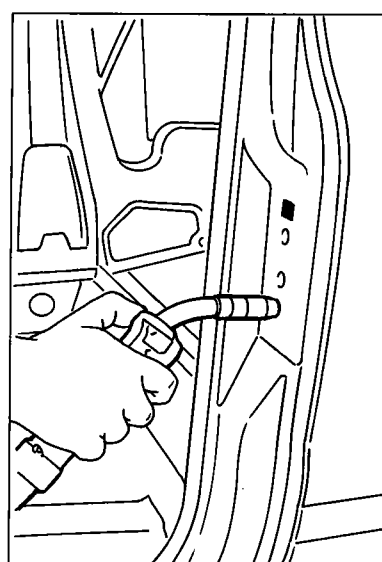
Carrying out the filling (riveting) in the holes made previously in the replacement part.



P4A076M02

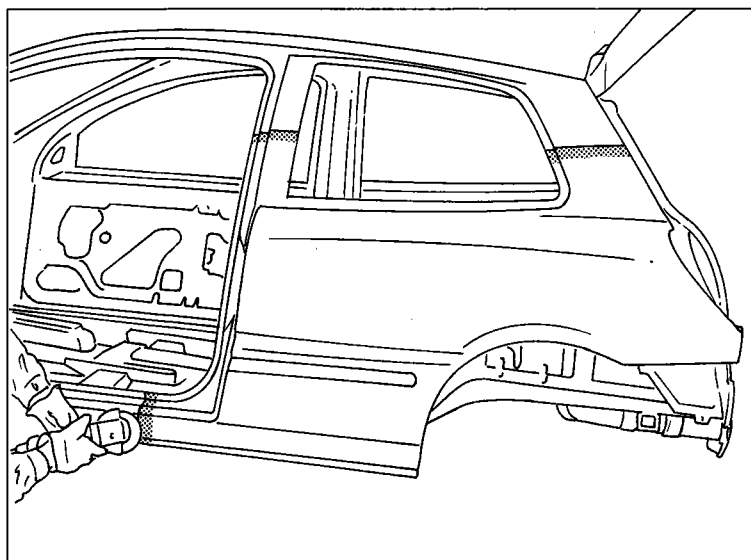


P4A076M03



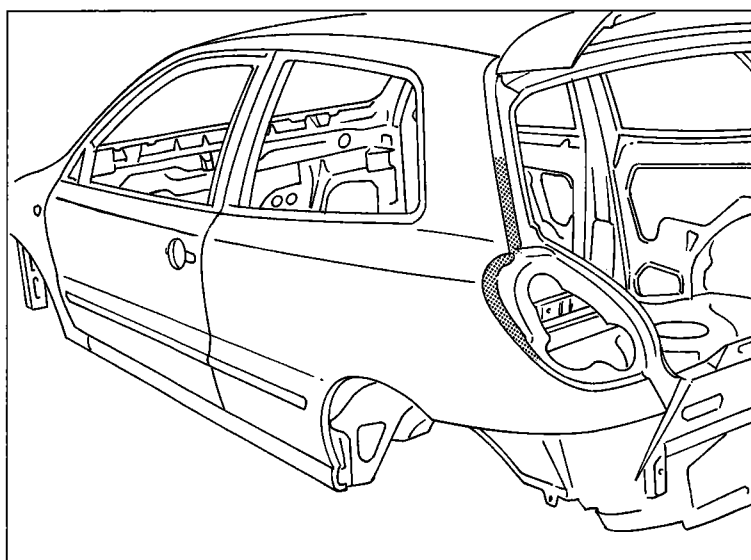
P4A076M04

Using a disc grinder, level the weld beads made with the continuous welding machine on the pillars and underdoor panel.



P4A077M01

Level at the points where the filling welding (riveting) has been carried out.



P4A077M02

70.

PROTECTION OF REPAIRED PARTS

To avoid any problems in the future it is important, after replacing or repairing a bodywork element, to restore the correct protection, both internal and external, so that the identical characteristics to the original ones are restored to ensure the quality of the repair and guarantee it against corrosion.

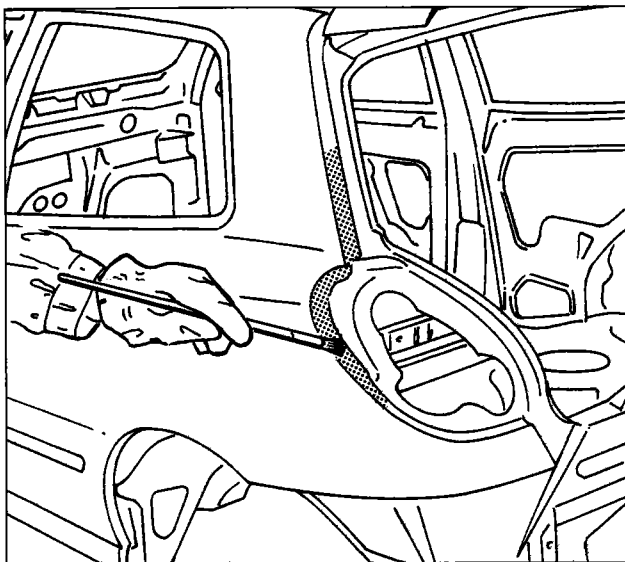
The replacement parts are subjected to the same cycle as the bodyshell.

Per conservare le qualità anticorrosive di origine, questi elementi devono essere smerigliati solo dove strettamente necessario.

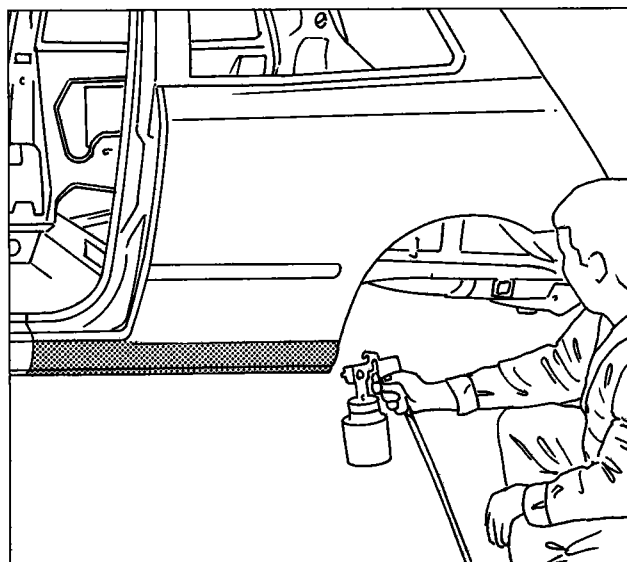
PREPARATION AND PAINTING PROCEDURE

1. Preparing the areas welded or repaired by dry sanding with P100 grade abrasive paper.
This operation is designed to remove any layers of paint which are not properly anchored to the panel and, at the same time, to level the unevenness or "steps".
2. Dry sanding of the replaced part and the surrounding paintwork the P320 abrasive paper.
Simply make the replacement part "opaque" and level any imperfections, grooves, lumps or scratches, avoiding, as far as possible, removing the original treatment.
3. Blow through thoroughly and wash with diluent because the dust could seriously affect the adhesion of the products to be applied.
4. Phosphating: apply an anti-rust phosphating product to the exposed areas, if necessary using a brush, which as well as preventing corrosion improves the adhesion of the subsequent products.
5. Finish off with metal filler to perfect and eliminate any grooves and/or depressions in the welded or repaired panels.
The application using a spatula of a suitable thickness of polyester filler, is carried out in one or more goes.
Take care not to carry out excess catalysis, which could show up on the paintwork as yellow marks due to peroxide.
6. Dry sand using P 80-100 paper.
To remove the excess filler applied previously, work manually using rubber or wooden buffers or manual sanders. The sanding should be done skillfully, above all in the areas surrounded by paintwork to avoid large scratches. Any overhauling of uneven areas, grooves, porousness, etc. should be carried out now using the same filler to avoid later operations. Finish off with a finer grade abrasive paper (P320).
Blow and degrease very thoroughly.
7. Finishing coat (with two components).
Protect the parts not involved in the application of the coat. The application of the finishing base coat should be carried out following the manufacturers instructions to the letter. A very light layer of black paint, atomized by hand, applied to the base coat will show up any imperfections during the sanding so that they can be removed.
8. Dry or water sanding with P500-P600 abrasive paper.
9. Blowing/degreasing.
(Dust and humidity have a serious adverse affect on the adhesion of the paint products).

10. Sealing. Protect the joins for the components superimposed, the lower part of the wheel arch and the underdoor panel with a two component sealant, applied by brush or by spraying.

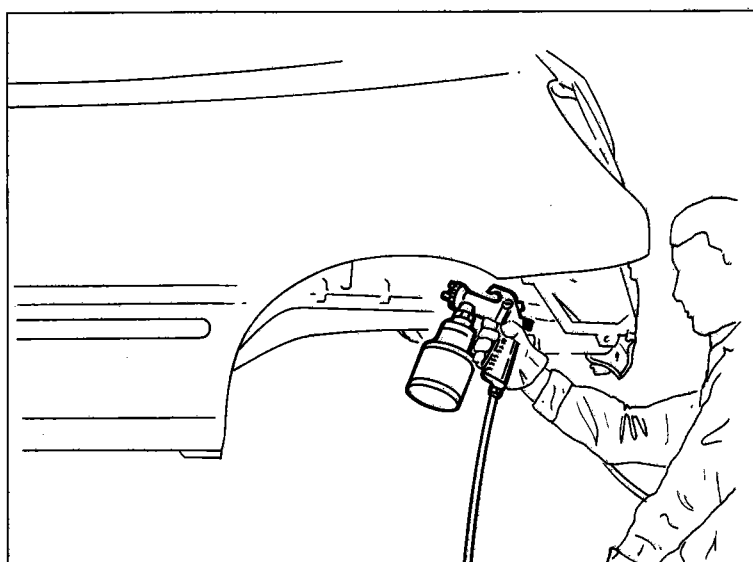


P4A079M01



P4A079M02

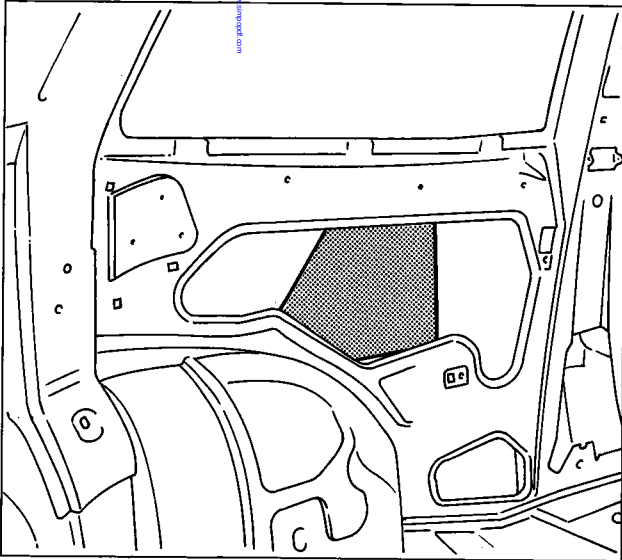
Apply a layer of sealant to the contact edge between the wheel arch and the rear wing using a spray gun.



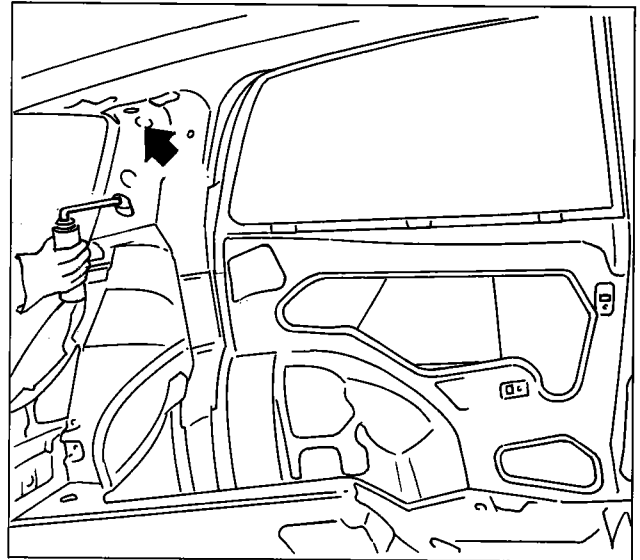
P4A079M03

Replacing body panels

70.

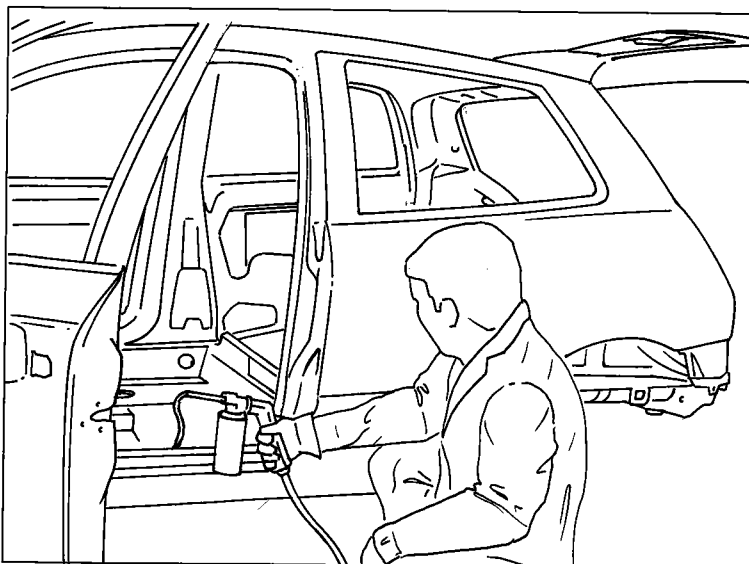


P4A080M01



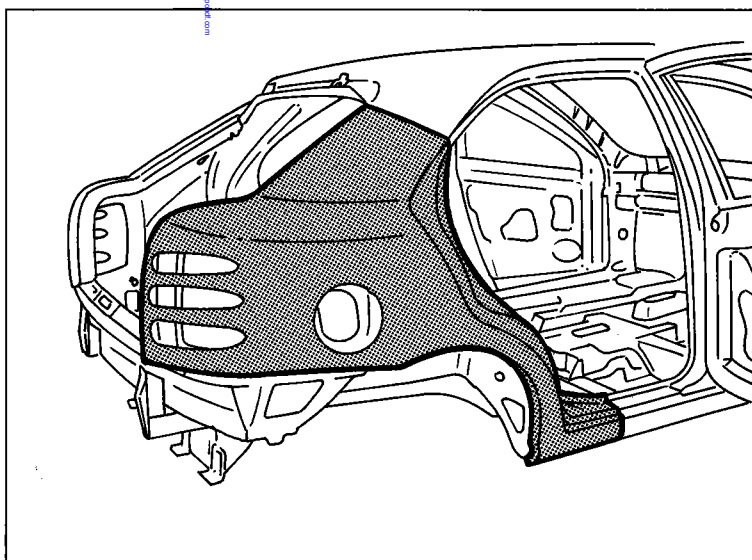
P4A080M02

11. Damper panels. Fit the damping panels to the inside of the wing.
12. Foam. Apply the foam through the openings shown.
13. Preparing any joins to be shaded and/or preparing the elements adjacent to the shading, wet sanding with P1200 grade abrasive paper or with abrasive polish.
14. Protection (after checking the tint).
Use industrial paper which does not release volatile impurities.
15. Blowing and preparing for painting.
Wash with anti-silicon diluent and dry, lastly clean with a chemical wad.
16. Painting. Follow the technical specifications and the instructions for applying enamels, recommended in the technical charts from the manufacturers of the product used.



P4A080M03

17. After painting, spray the product on the parts which are not accessible, especially the continuous spot welds.



REPLACING REAR WING (7090A 54)*

(*) This number indicates the operation code given in the Flat rate manual.

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

P4A081M01

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodysheet alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodysheet before cutting the component. After this operation check that the components not being replaced are in tact.

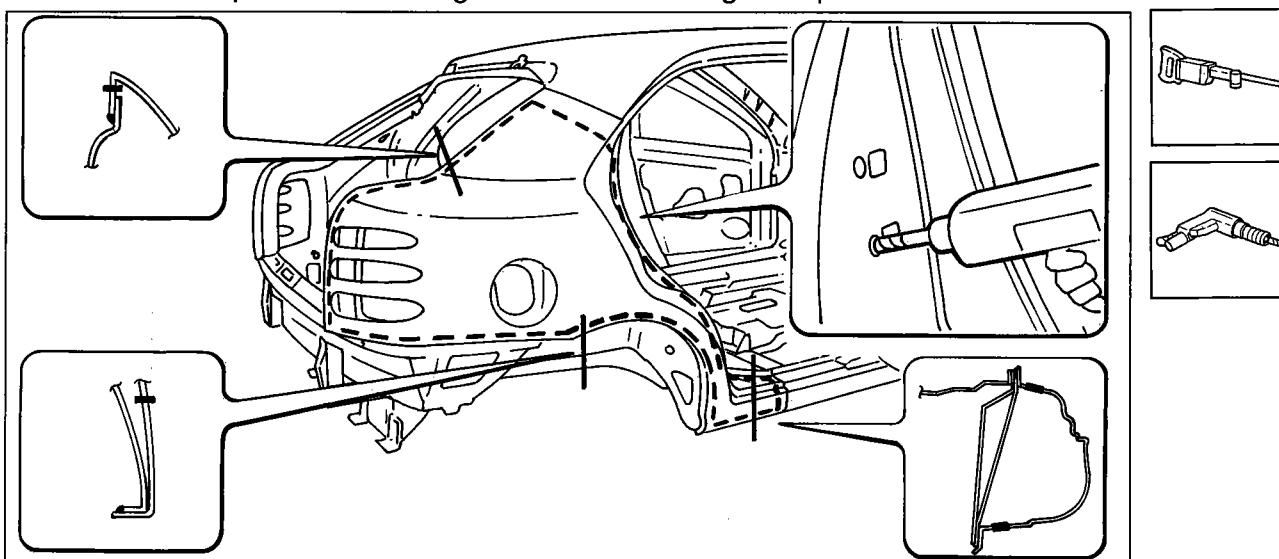
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the rear wing of the vehicle using a power saw following the dotted lines shown in the diagram below and remove the spot welds along the section of the door striker housing.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A081M02

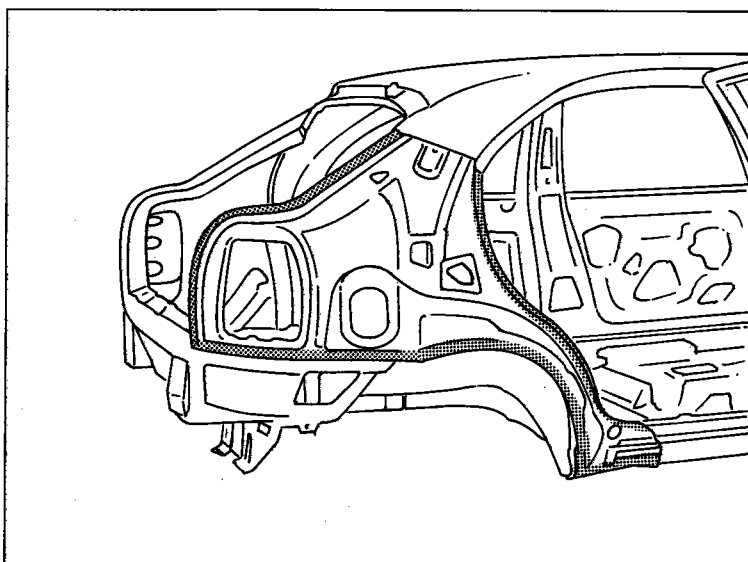


When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

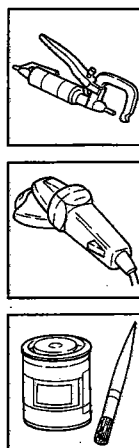
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the weld points along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

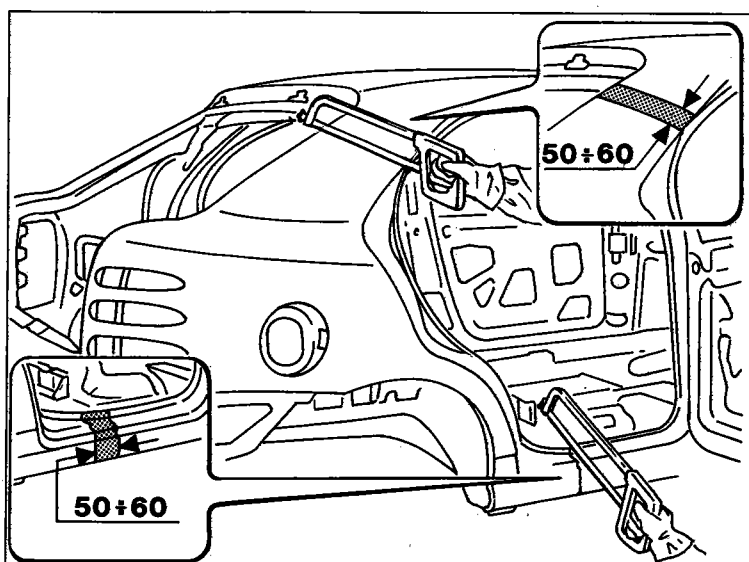


P4A082M01

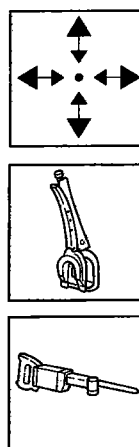


Adjusting the replacement part

1. Cut the upper section of the replacement part then place it in position so that it adheres perfectly to the bodyshell.
2. Check that the wing is superimposed 50 - 60 mm over the bodyshell.
3. Fix the replacement part using the special self-locking clamps.
4. Cut the two edges of the panel so that the join is perfectly aligned.

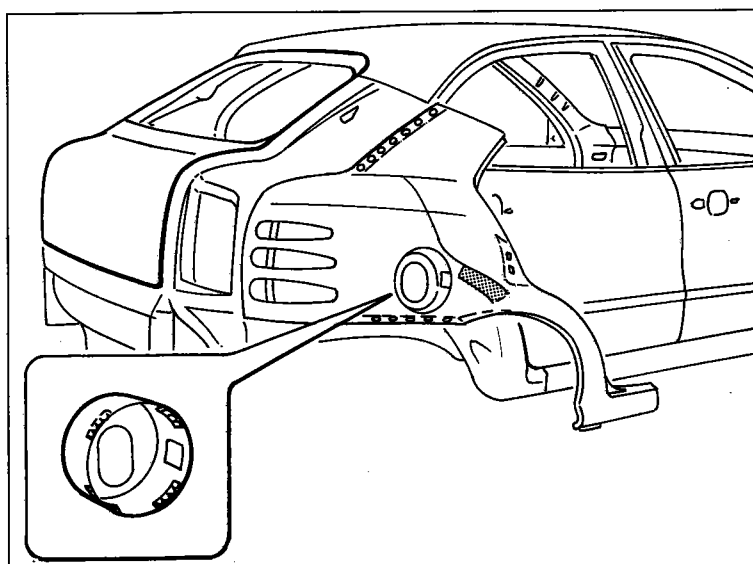


P4A082M02

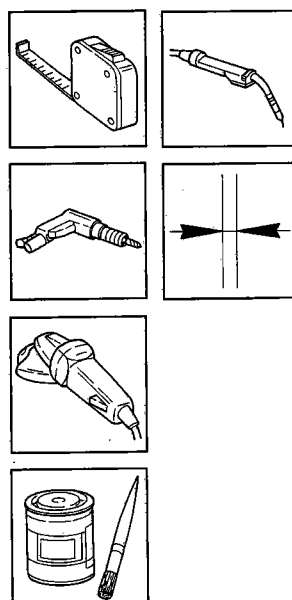


Preparing the spare part and checking that it is correctly positioned on the bodyshell

1. Make equidistant holes in the edges of the replacement part as shown in the diagram.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a special grinder.
3. Use electro-galvanizing paint on the edges in contact with the bodyshell.
4. Use the MIG welder to fill the holes made previously between the wing and the fuell filler housing.
5. Tack the replacment part using several spot welds.
6. Fit the boot lid, close the door and check the alignment and the evenness of the surrounding gap.

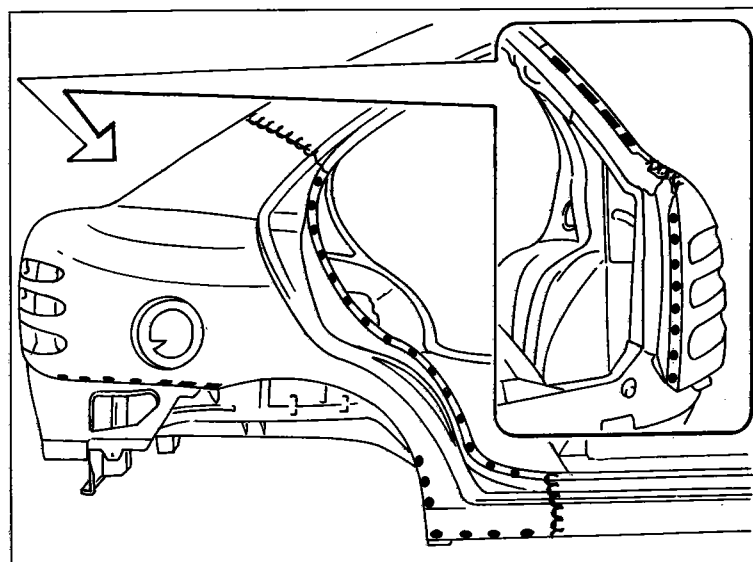


P4A083M01

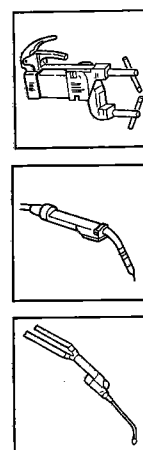


Welding the spare part

1. Carry out spot welding along the edges of the door seal, wheel arch and rear light cluster housing.
2. Use the MIG welder between the underdoor side member and the wing and between the wing and the bodyshell.
3. Weld using brass and the oxyacetylene canister by the rearscreen housing and the luggage compartment.
4. Fill the holes made previously in the part by welding.



P4A083M02

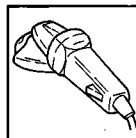
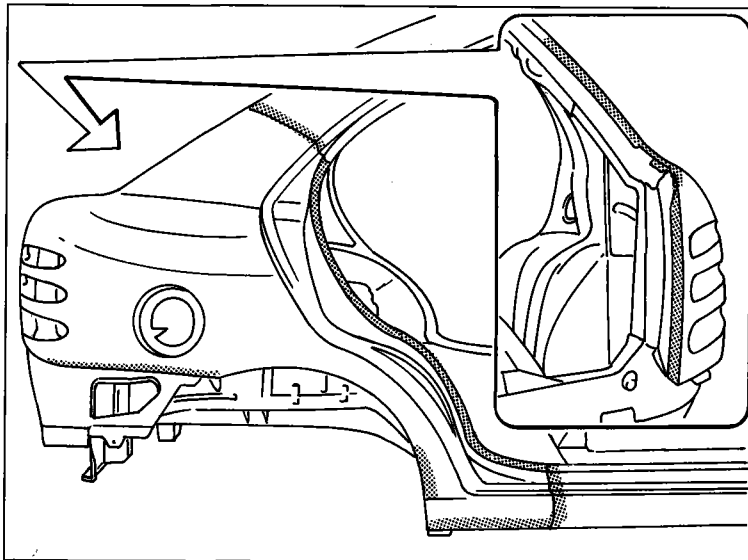


Replacing body panels

70.

Finishing operations

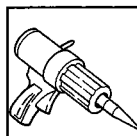
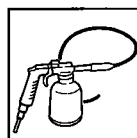
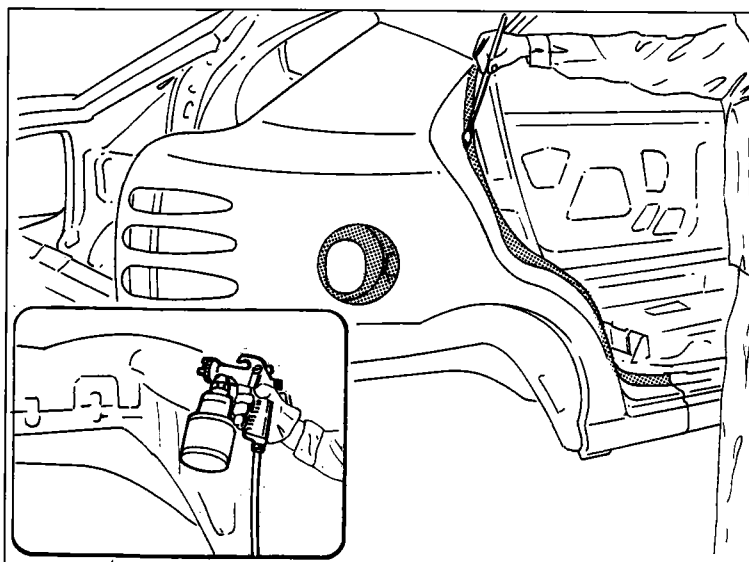
1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.



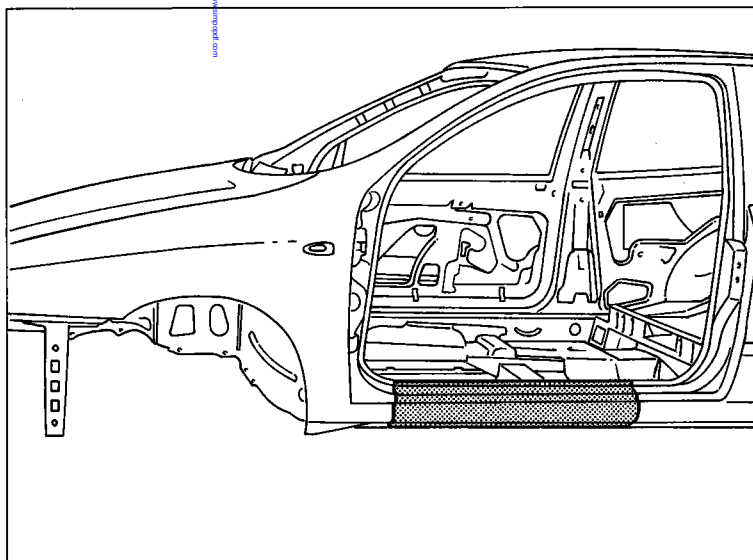
P4A084M01

Protections

1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the joints between the wing and the bodyshell using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.



P4A084M02



P4A085M01

**REPLACING UNDERDOOR
SIDE MEMBER (7090G 62)***

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting the component. After this operation check that the components not being replaced are in tact.

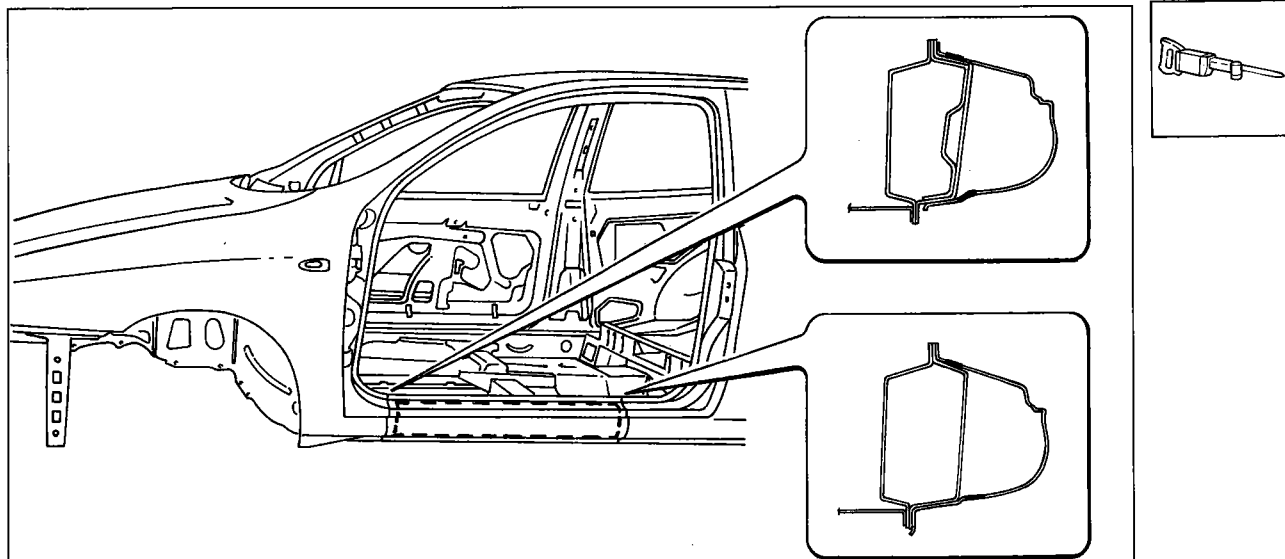
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the vehicle underdoor side member using a hammer and chisel (upper area) and a power saw (lower area), following the cutting lines shown in the diagram below.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A085M02

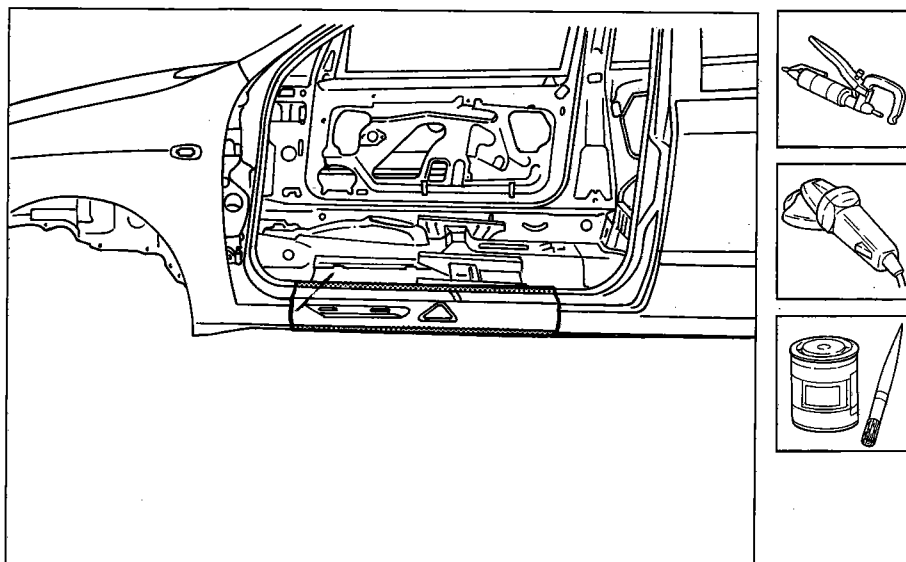


When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

70.

Removing off cuts and preparing edges of bodyshell

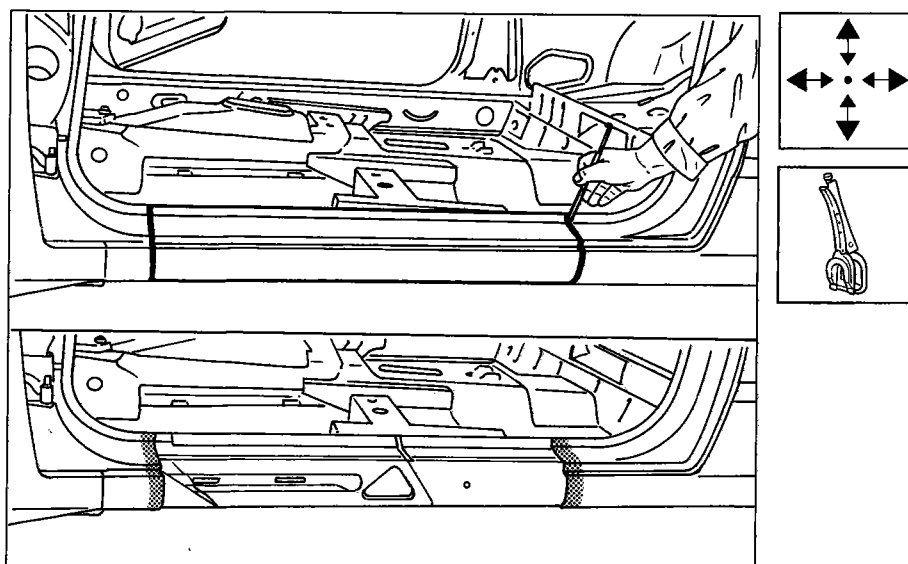
1. Remove the weld points along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.



P4A086M01

Adjusting replacement part and finishing the edges of the bodyshell

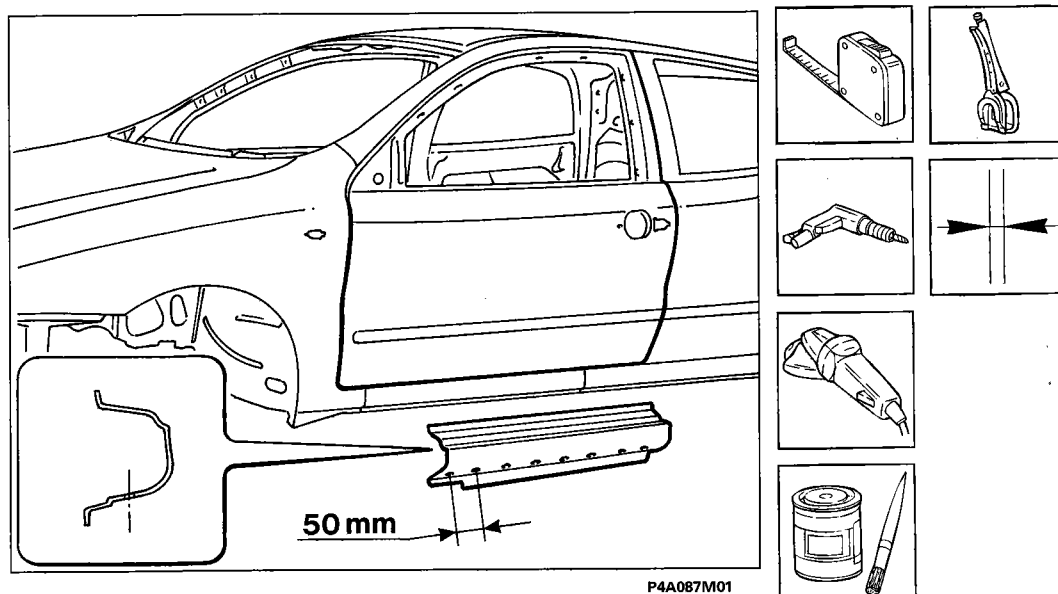
1. Place the replacement part in position after having degreased it suitably and fix it using the special self-locking clamps.
2. Trace the profile of the replacement part on the bodyshell using a tracer point.
3. Remove the replacement part and cut the excess from the edges of the bodyshell along the line drawn previously using bodywork shears.



P4A086M02

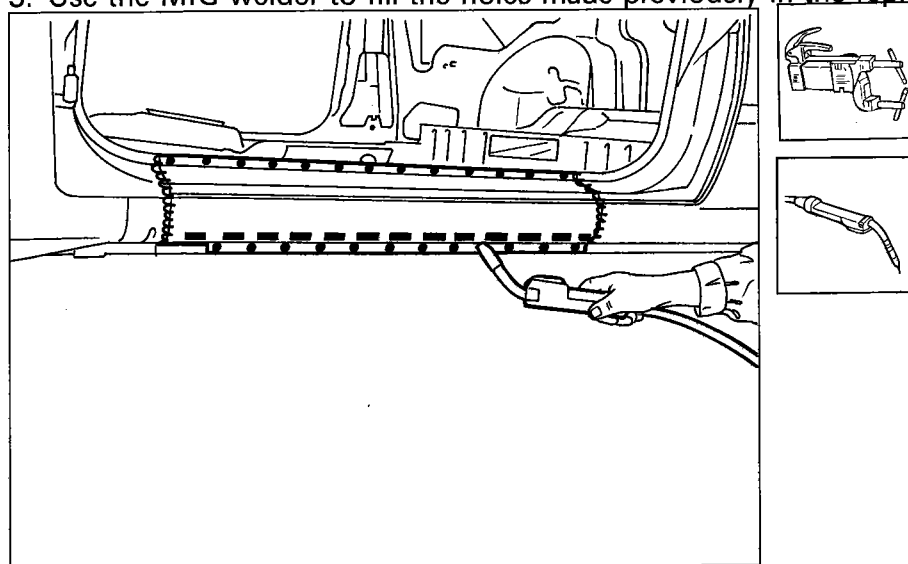
Preparing the spare part and checking that it is correctly positioned on the bodyshell

1. Make equidistant holes along the entire lower edge of the replacement part.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a special grinder.
3. Use electro-galvanizing paint on the edges in contact with the bodyshell.
4. Position the replacement part in place and fix it using the special self-locking clamps.
5. Fit the door, then check the alignment and evenness of the surrounding gap.



Welding the spare part

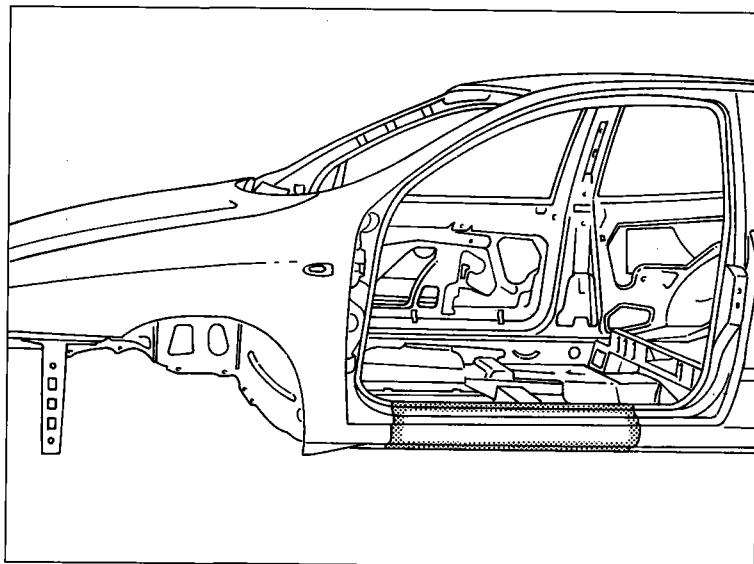
1. Carry out spot welding on the upper and lower edges of the underdoor side member welding it to the bodyshell.
2. Use the MIG welder by the bodyshell pillars.
3. Use the MIG welder to fill the holes made previously in the replacement part.



70.

Finishing operations

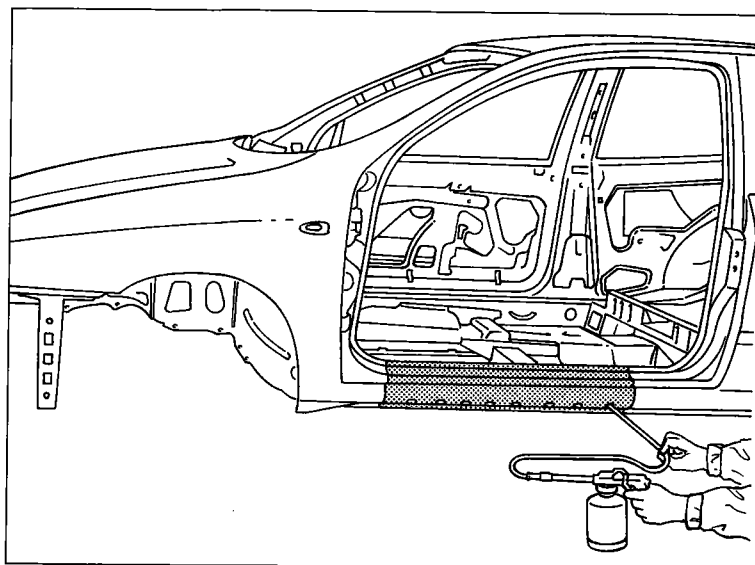
1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.



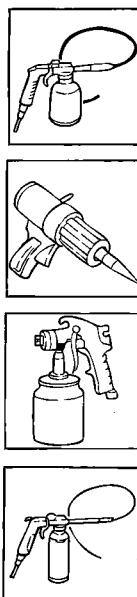
P4A088M01

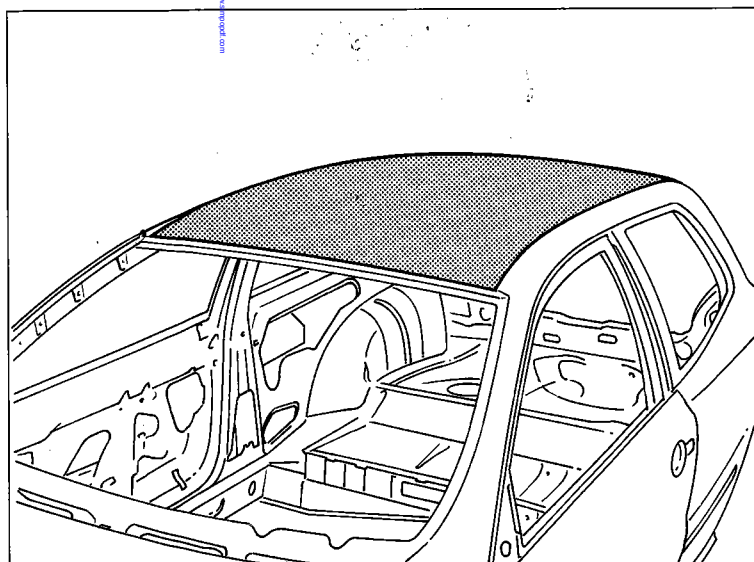
Protections

1. Apply the electro-phoretic treatment to the areas previously involved in the welding.
2. Seal the joints between the underdoor side member and the bodysell, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective inside the underdoor side member.



P4A088M02





P4A089M01

**REPLACING VEHICLE
ROOF PANEL (7090A 58)***

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting the component. After this operation check that the components not being replaced are in tact.

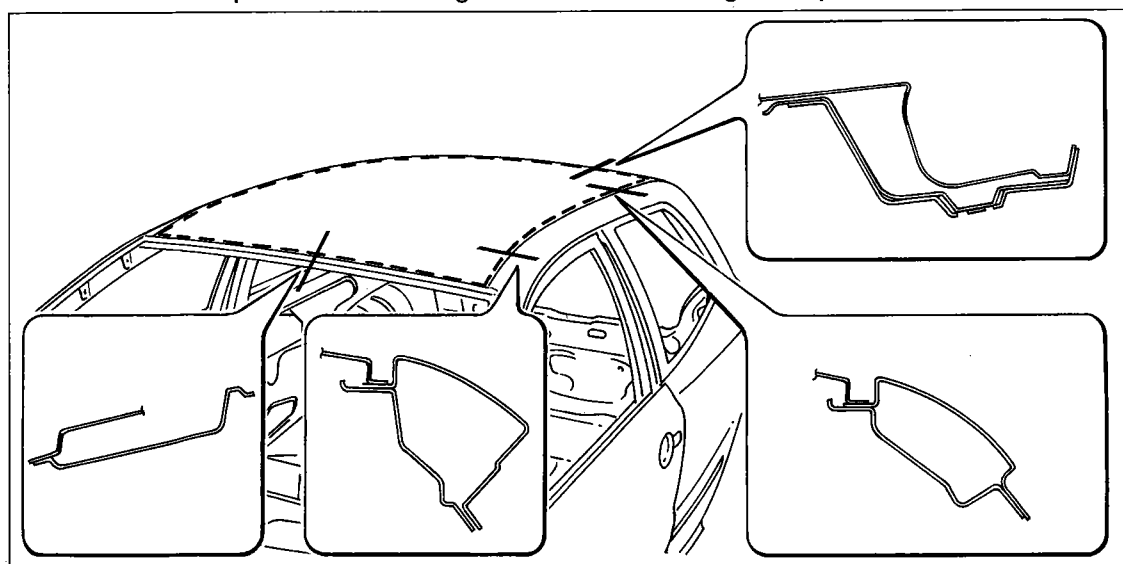
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the vehicle roof panel using a power saw following the dotted lines shown in the diagram below.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A089M02

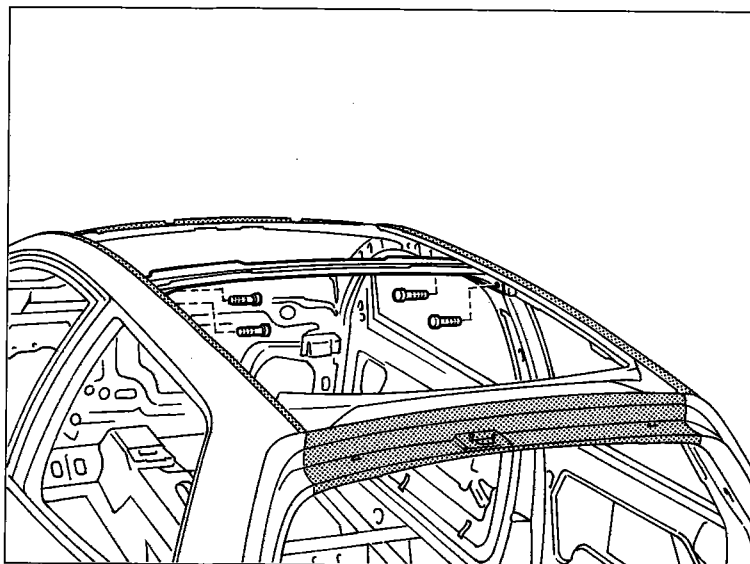


When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

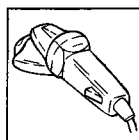
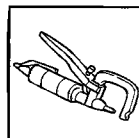
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the weld points along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Remove the centre rib, undoing the fixing bolts.
6. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

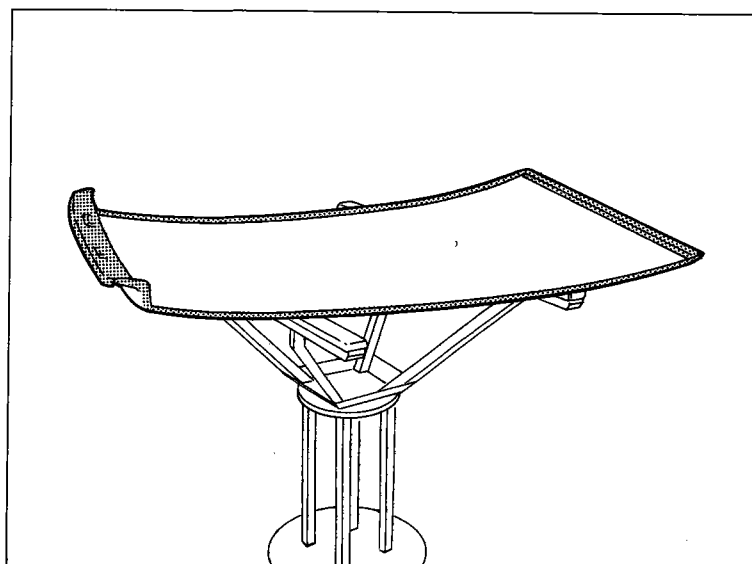


P4A090M01

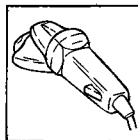
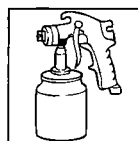


Preparing the spare part

1. Apply a base coat using a spray gun.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a disc grinder.
3. Use electro-galvanizing paint on the edges in contact with the bodyshell.

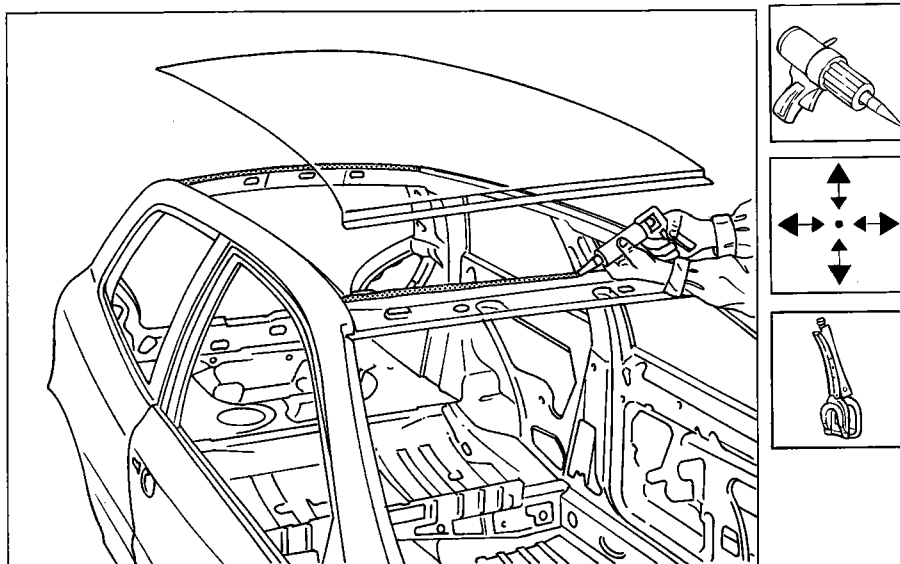


P4A090M02



Positioning the replacement part

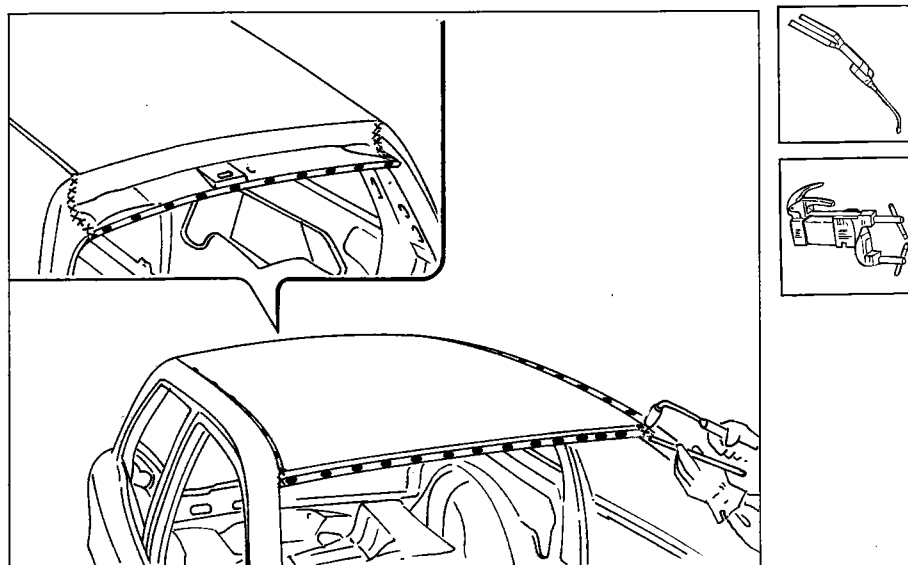
1. Renew the sealant on the bodysell ribs, using IVI 854210 transparent acrylic sealant or an equivalent product.
2. Carefully place the replacement part in position .
3. Check that the roof panel is perfectly positioned on the bodysell.
4. Fix the replacement part to the bodysell using the special self-locking clamps.



P4A091M01

Welding the spare part

1. Carry out the brass welding using an oxyacetylene canister by the corners of the front and rear roof pillars.
2. Using a continuous welder continue the operation on the entire contact edge between the roof and the bodysell.

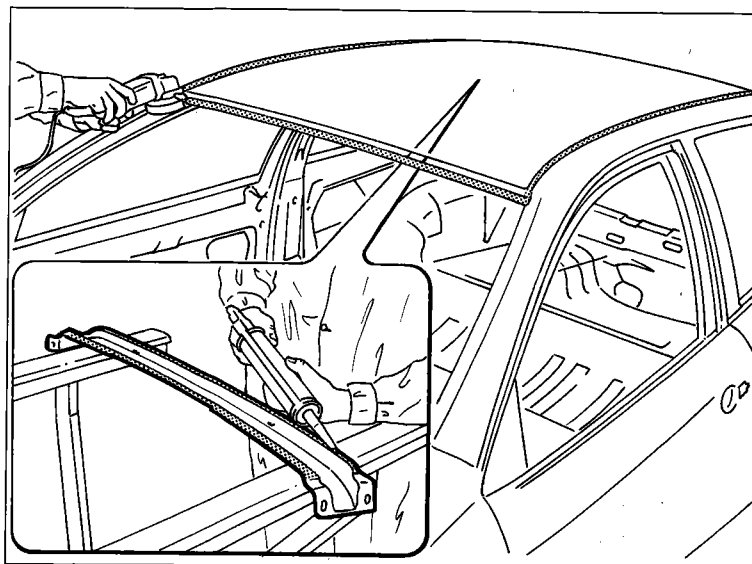


P4A091M02

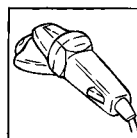
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.
3. Renew the sealant on the rib removed previously, then refit it on the bodyshell making sure that it adheres perfectly to the roof.

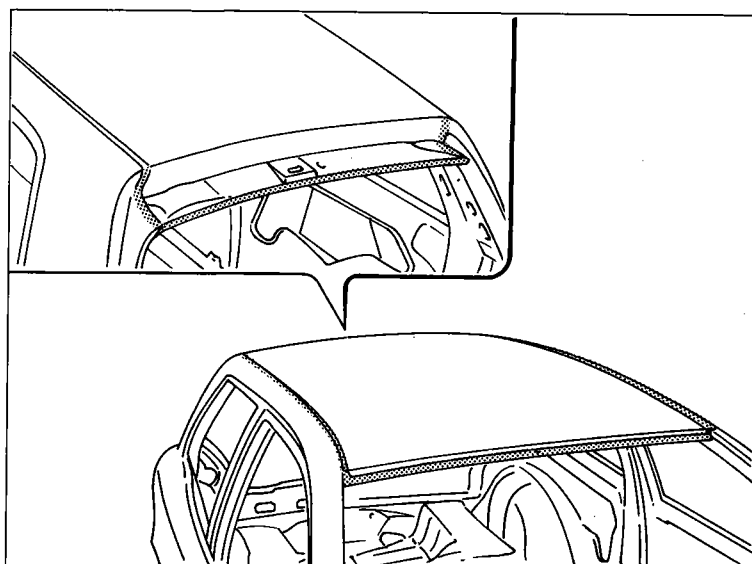


P4A092M01

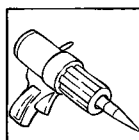
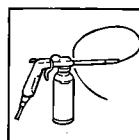


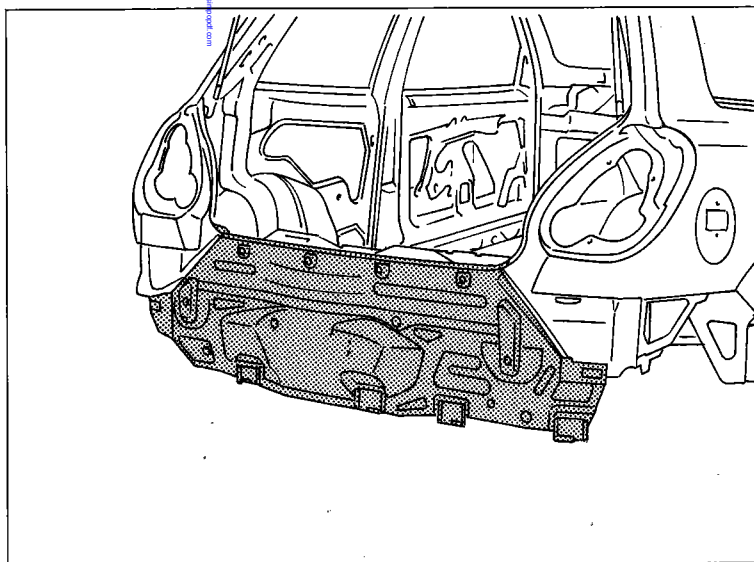
Protections

1. Apply the electro-phoretic treatment to the areas previously involved in the welding.
2. Seal the joints between the roof and the bodyshell using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.



P4A092M02





P4A093M01

REPLACING REAR CROSS MEMBER LINING (7090G 76)*

(*) This number indicates the operation code given in the Flat rate manual.

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting the component. After this operation check that the components not being replaced are in tact.

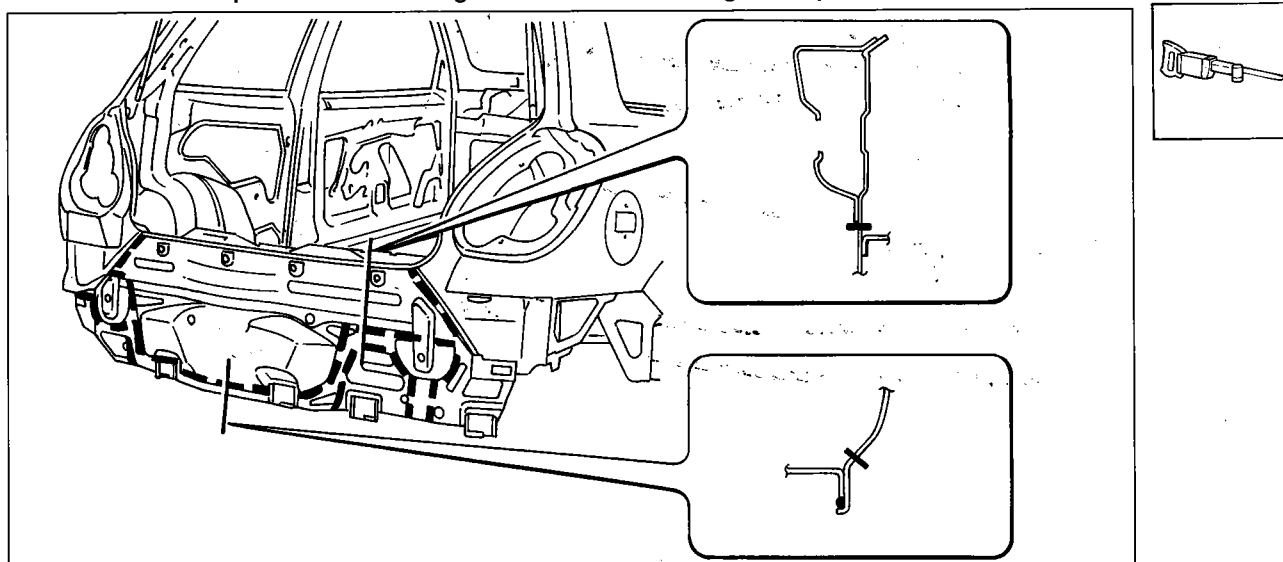
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the vehicle rear cross member cover using a power saw following the dotted lines shown in the diagram below.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A093M02

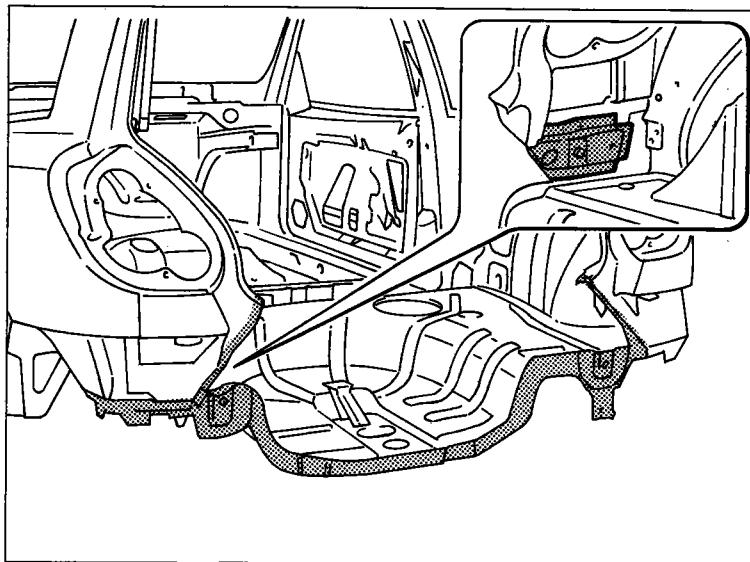


When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

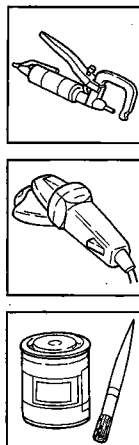
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the weld points along the entire perimeter of the edge of the bodyshell and the reinforcement below the light cluster housing as shown in the inset using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

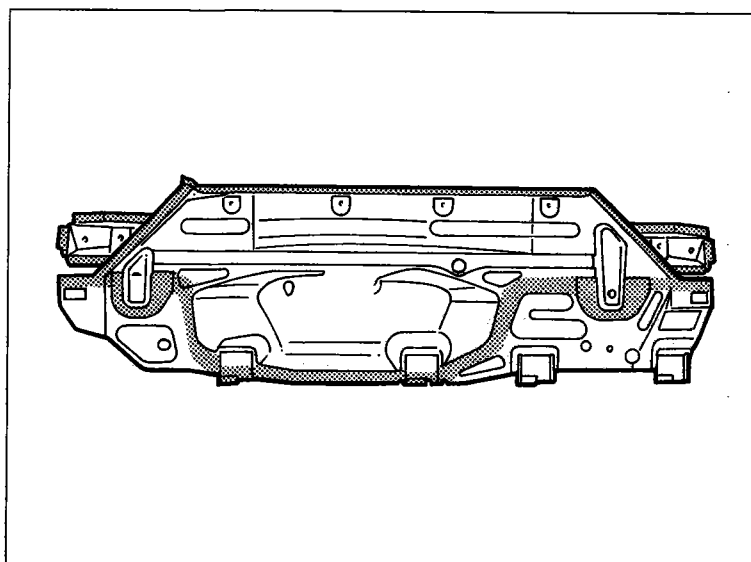


P4A094M01

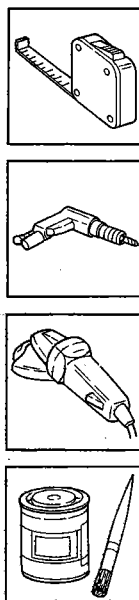


Preparing the spare part

1. Make equidistant holes in the edges of the replacement part shown in the diagram.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a disc grinder.
3. Use electro-galvanizing paint on the edges previously treated.

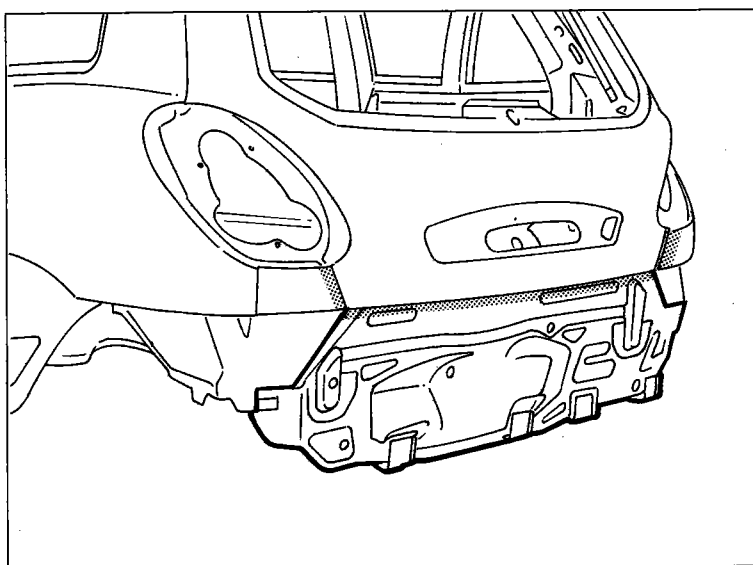


P4A094M02

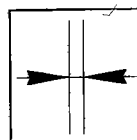
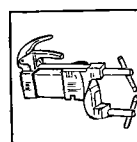
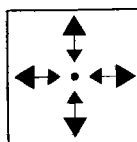


Positioning the replacement part

1. Carefully place the replacement part in position .
2. Check that the cross member lining is perfectly positioned.
3. Fix the replacement part to the bodyshell using the special self-locking clamps.
4. Tack the replacement part making several spot welds.
5. Close the boot lid and check the alignment and the evenness of the surrounding gap.

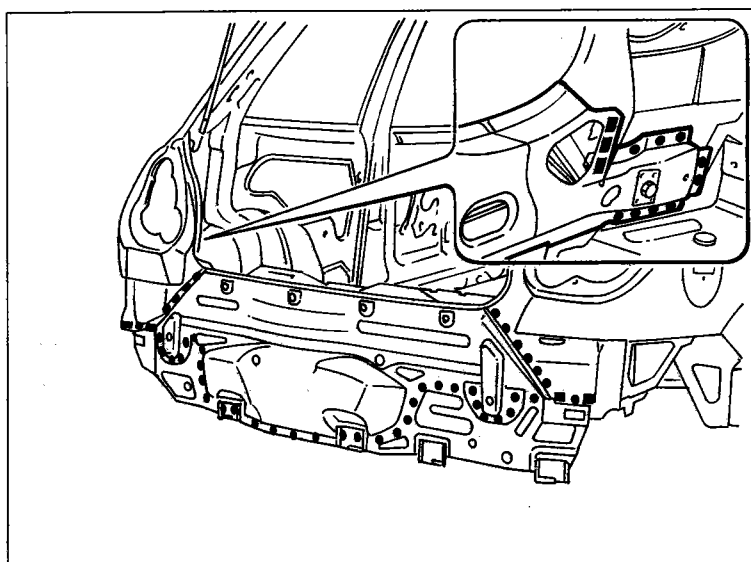


P4A095M01

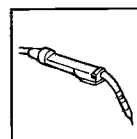
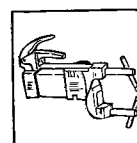


Welding the spare part

1. Carry out spot welding at the contact edges between the rear cross member lining and the wing and the internal reinforcement.
2. Continue the spot welding on the contact edges near the spare wheel arch housing and the side edges.
3. Using a MIG welder fill the holes made previously in the replacement part.



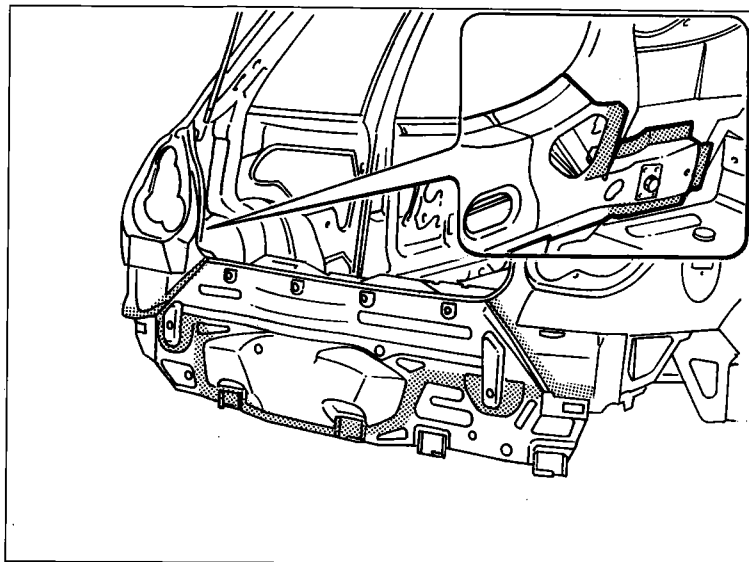
P4A095M02



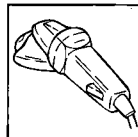
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.

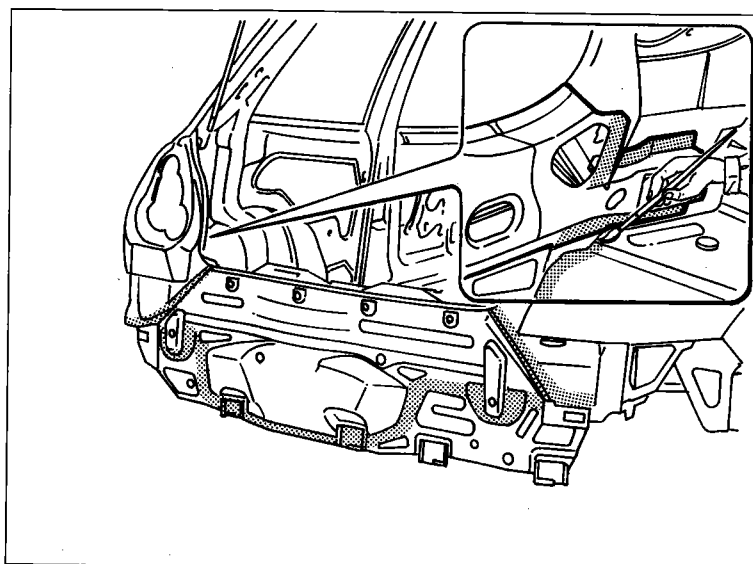


P4A096M01

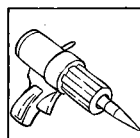
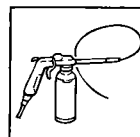


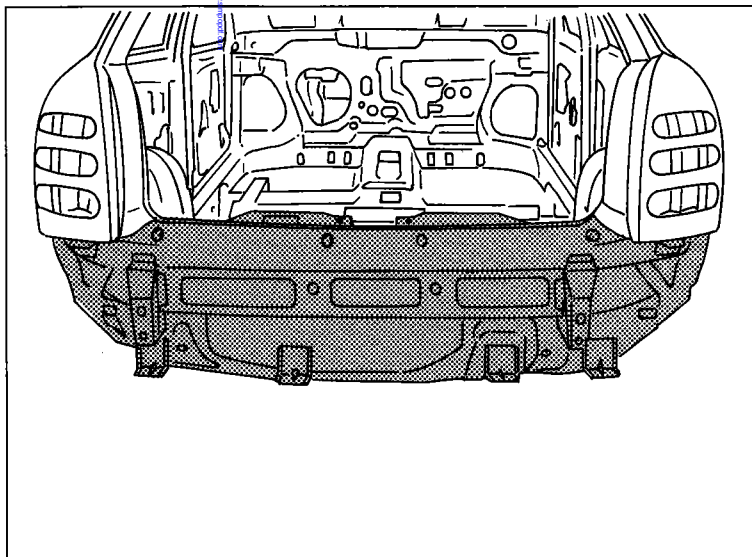
Protections

1. Apply the electro-phoretic treatment to the areas previously involved in the welding.
2. Seal the joints between the rear cross member cover and the bodyshell using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.



P4A096M02





REPLACING REAR CROSS MEMBER LINING (7090A 46)*

(*) This number indicates the operation code given in the Flat rate manual.

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

P4A097M01

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting the component. After this operation check that the components not being replaced are in tact.

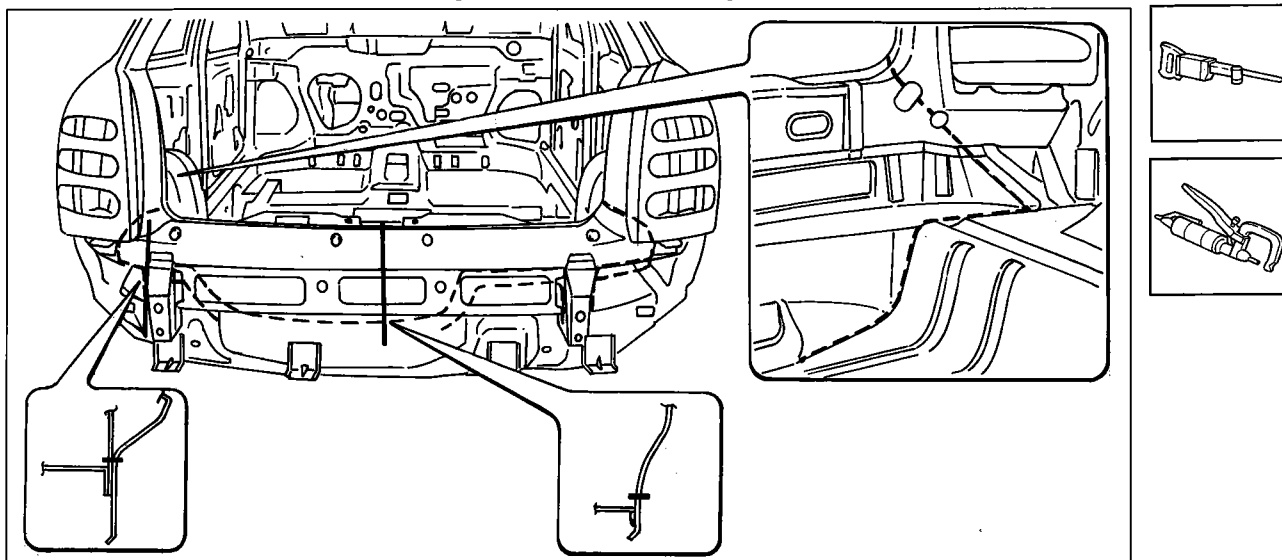
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the vehicle rear cross member cover using a power saw following the dotted lines shown in the diagram below, remove the spot welds for the floor panel side members.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A097M02



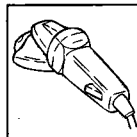
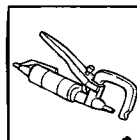
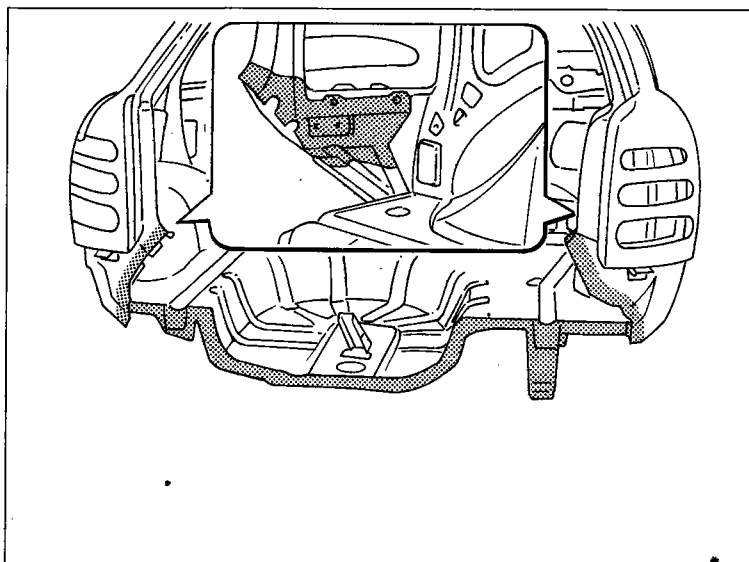
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

Replacing body panels

70.

Removing off cuts and preparing edges of bodyshell

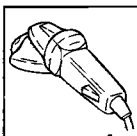
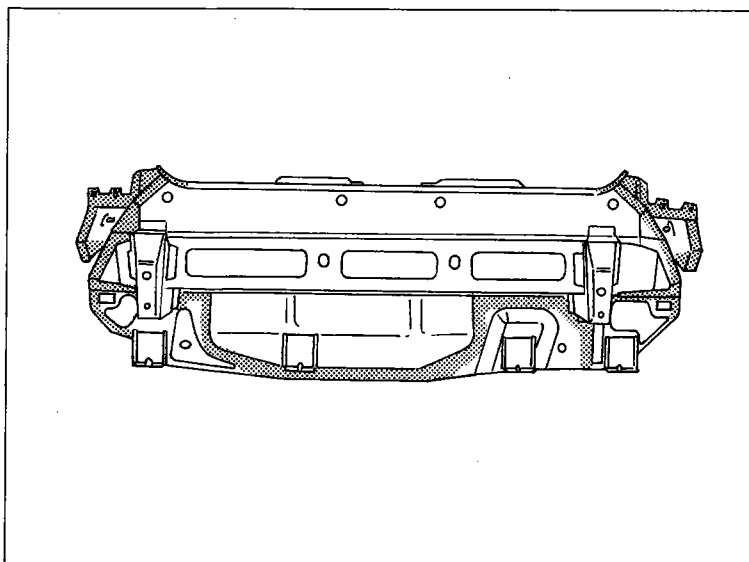
1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.



P4A098M01

Preparing the spare part

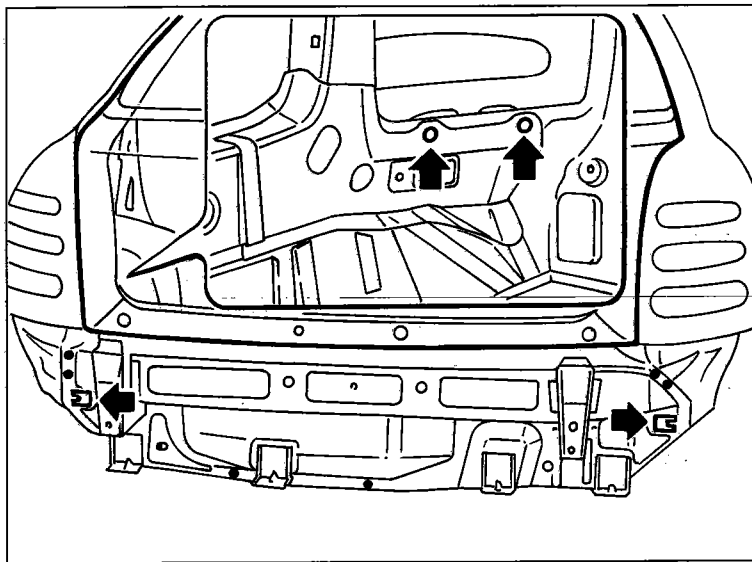
1. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a disc grinder.
2. Use the electro-galvanizing paint on the edges previously treated.



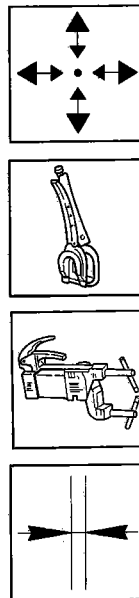
P4A098M02

Positioning the replacement part

1. Carefully place the replacement part in position working from inside the luggage compartment..
2. Check that the cross member lining is correctly positioned and in particular that the tabs on the body-shell and the openings in the light cluster housing and in the cross member lining reinforcement are as shown in the inset.
3. Fix the replacement part to the bodyshell using the special self-locking clamps.
4. Tack the replacment part using several spot welds.
5. Close the boot lid and check the alignment and the evenness of the surrounding gap.

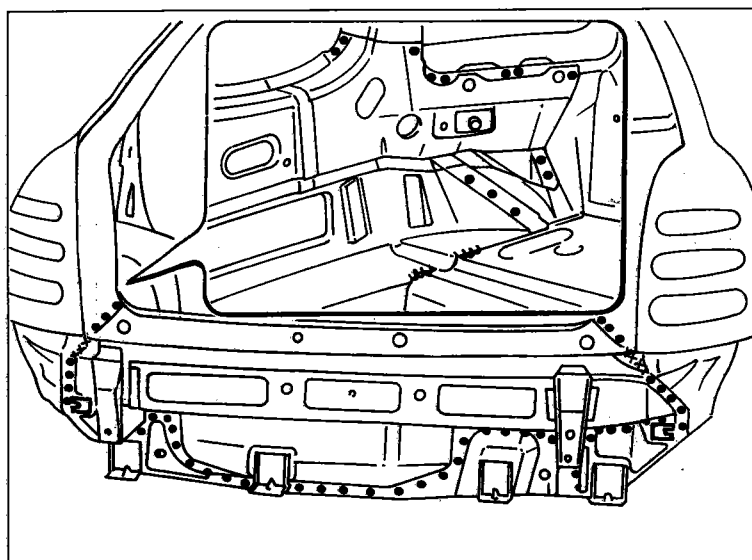


P4A099M01

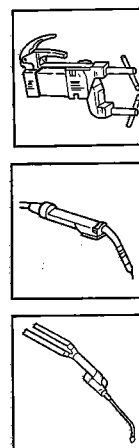


Welding the spare part

1. Carry out spot welding by the light clusters.
2. Continue the spot welding at the contact edges near the spare wheel housing and the rear wings.
3. Using a MIG welder carry out continuous welding as shown in the diagram.
4. Carry out brass welding using an oxyacetylene canister by the contact edges between the cross member and the wings.



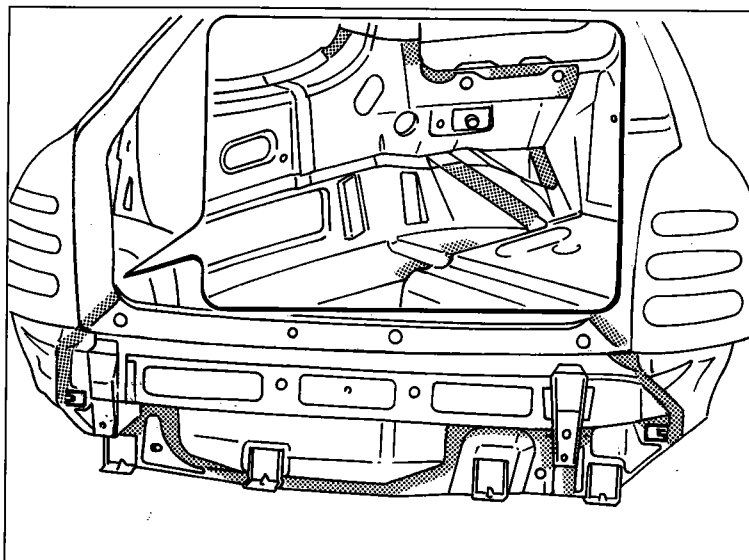
P4A099M02



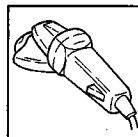
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.

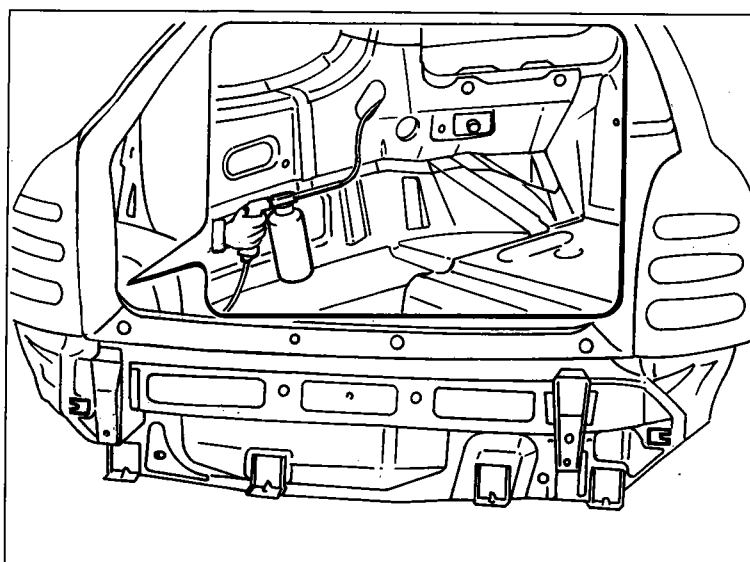


P4A100M01

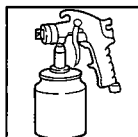
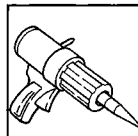
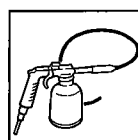


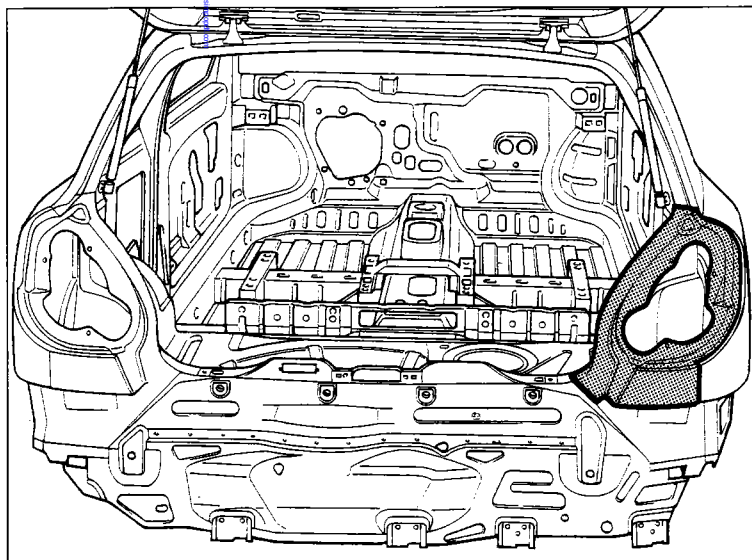
Protections

1. Apply the electro-phoretic treatment to the areas previously involved in the welding.
2. Seal the joints between the rear cross member cover and the bodyshell using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.



P4A100M02





**REPLACING REAR LIGHT
 CLUSTER HOUSING (7090G 86)***

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures. Carry out any straightening operations required to the bodyshell using suitable methods (jigs, templates or gauges), before cutting the component. After this operation check that the components not being replaced are in tact.

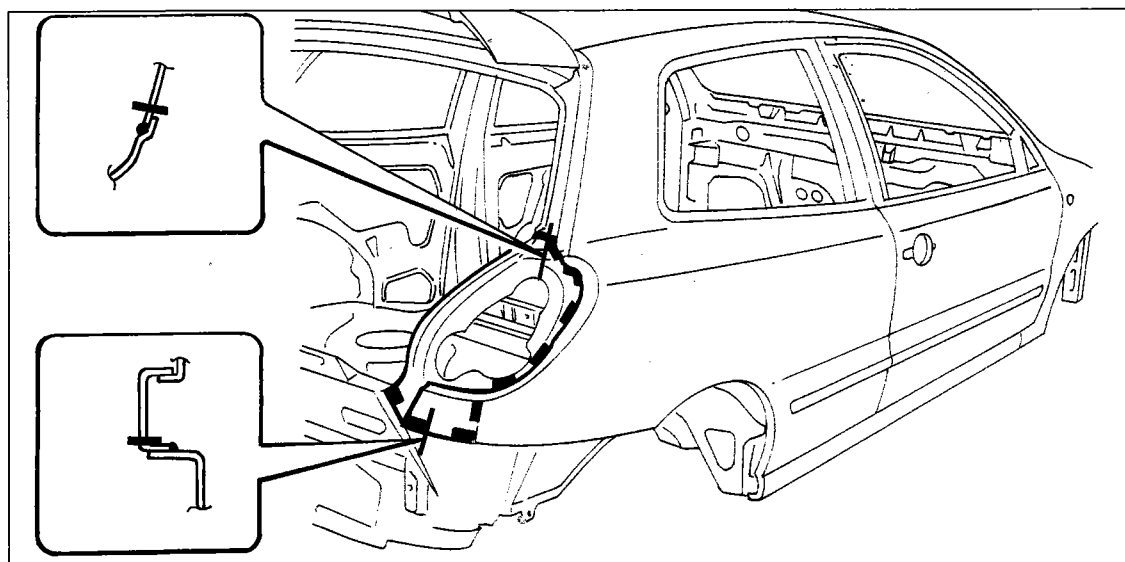
PRECAUTIONS/WARNINGS AND PRELIMINARY DISMANTLING

Protect the parts which could be damaged using cloths. Remove the fuel tank, disconnect the battery and all the electrical and electronic components because the currents produced during the welding operations could cause serious damage.

REMOVING AND REFITTING OPERATING CYCLE

The replacement of the body panels can be "total or "partial"; this second solution is preferable when it prevents damage of another panel which is assembled by welding. cut the light cluster housing using a power saw following the dotted lines shown in the diagram below.

The sections of the body panels at the cutting points are given to allow the operator to adjust the position and the depth of the cutting.

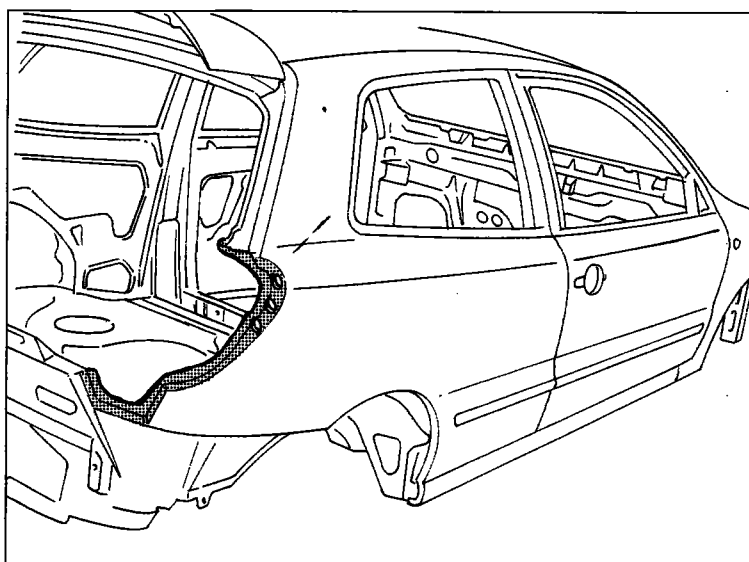


When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, masks and gloves during the welding and painting operations.

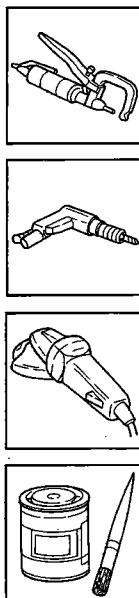
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Make equidistant holes in the edge of the rear wing as shown in the diagram.
4. Straighten the edges with a hammer and dolly block.
5. Remove the weld residues using the disc grinder.
6. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

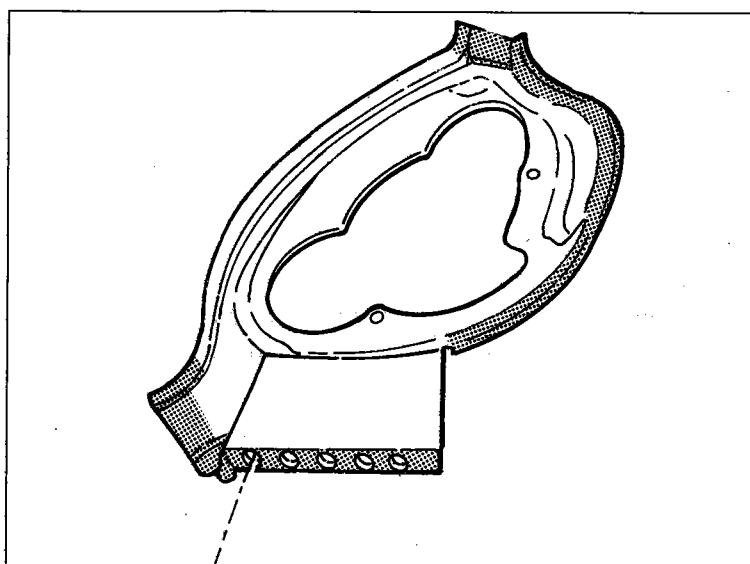


P4A100M05

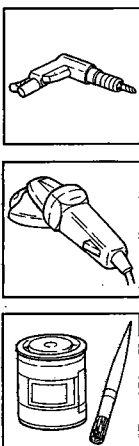


Preparing the spare part

1. Make equidistant holes in the edges of the replacement panel as shown in the diagram.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and outside of the replacement panel using a disc grinder.
3. Use electro-galvanizing paint on the edges previously treated.

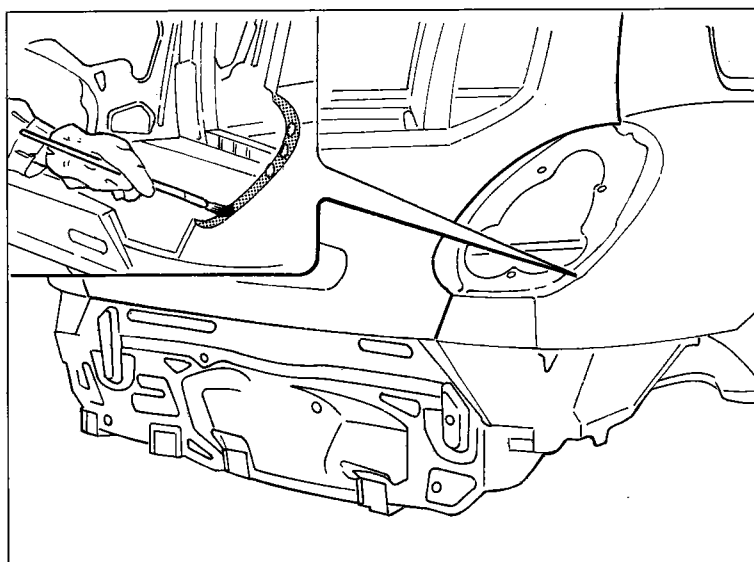


P4A100M06

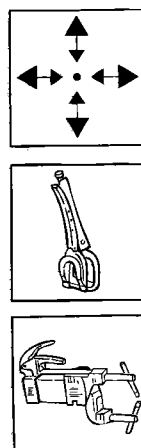


Positioning the replacement part

1. Place sealant on the wing along the section shown in the diagram.
2. Carefully place the replacement part in position .
3. Check that the light cluster housing is perfectly positioned.
4. Fix the replacement part to the bodyshell using the special self-locking clamps.
5. Tack the replacement part making several spot welds.
6. Close the boot lid and check the alignment and the evenness of the surrounding gap.

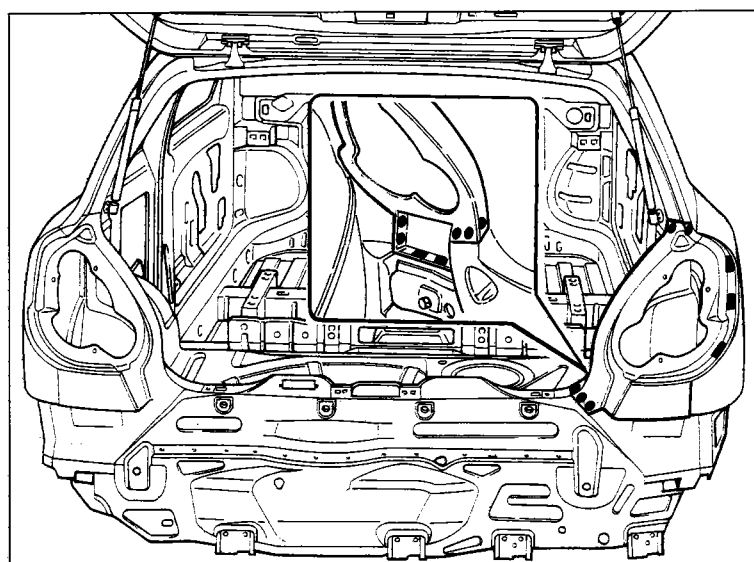


P4A100M07

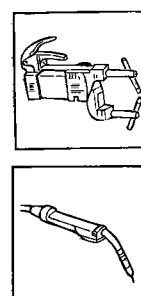


Welding the spare part

1. Carry out spot welding on the edges as shown in the diagram.
2. Using a MIG welder fill the holes made previously in the replacement part.



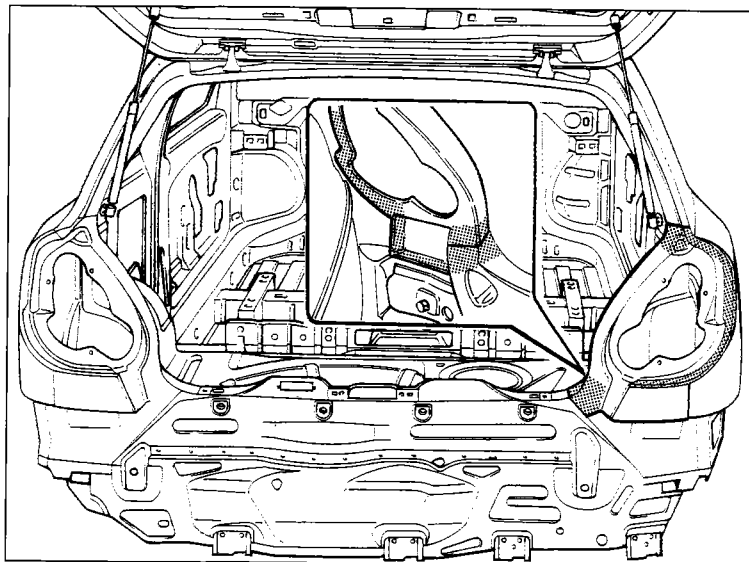
P4A100M08



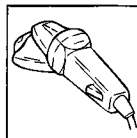
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.

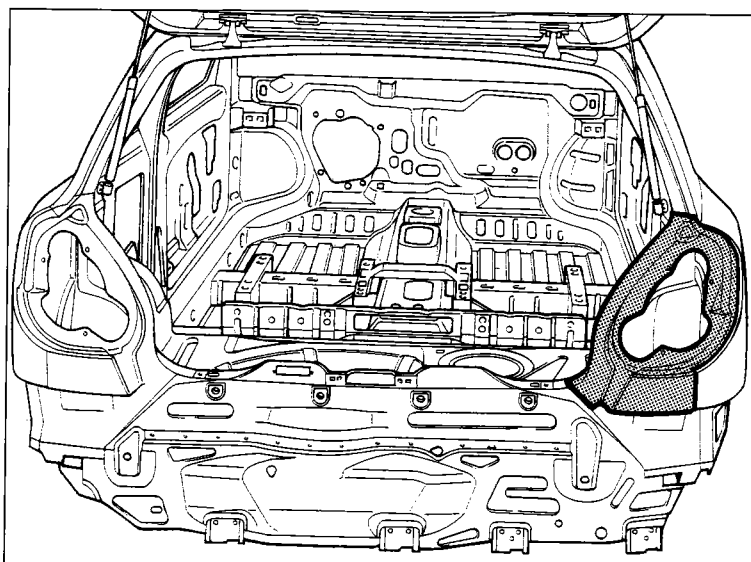


P4A100M09

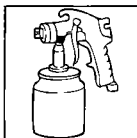
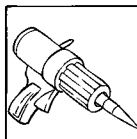
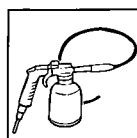


Protections

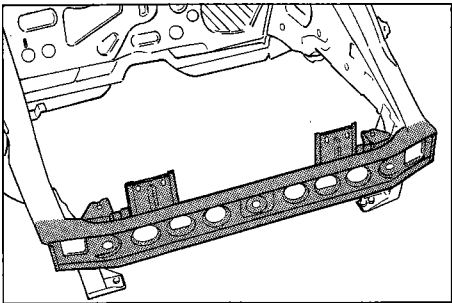
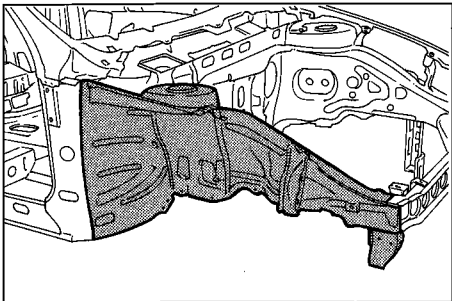
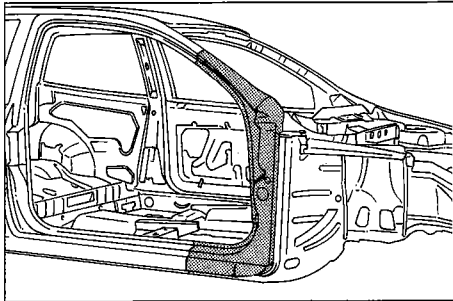
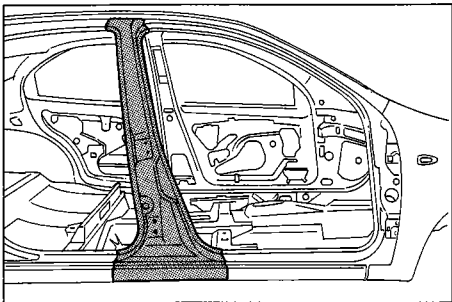
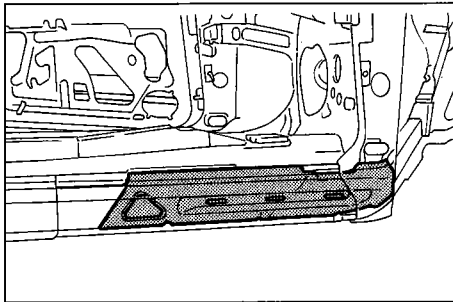
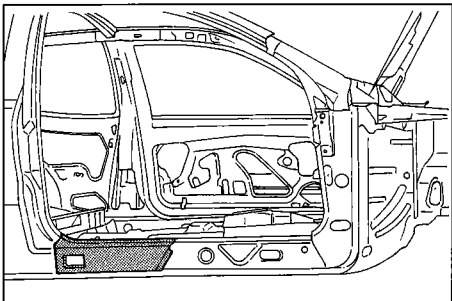
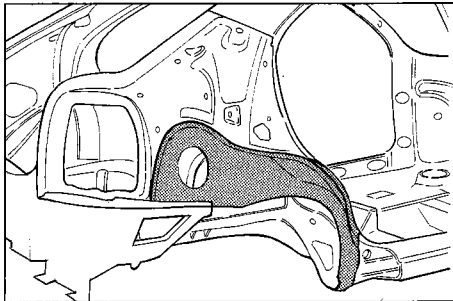
1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the joints between the wing and the bodyshell using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.



P4A100M03

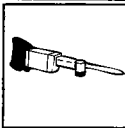
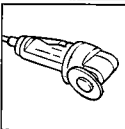
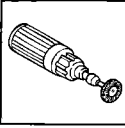
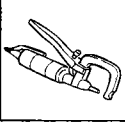
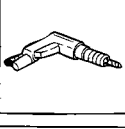
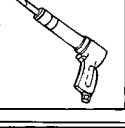
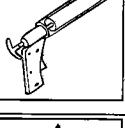
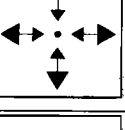
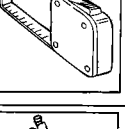
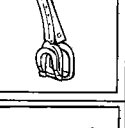
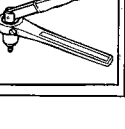


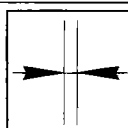
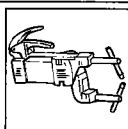
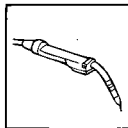
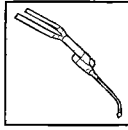
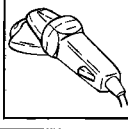
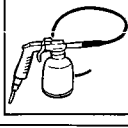
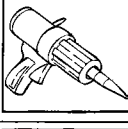
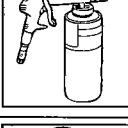
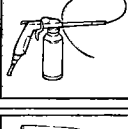
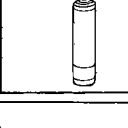
GRAPHIC INDEX

Replacement operation		Reference in Manual
Front cross member cover  P4A101M01		Replacing body panels Structural page 107
Compleat front panel  P4A101M02	Front pillar  P4A101M03	Replacing body panels Structural page 111 page 117
Centre pillar 5 P  P4A101M04	Underdoor front reinforcement 3 P  P4A101M05	Replacing body panels Structural page 121 page 125
Underdoor rear reinforcement 3 P  P4A101M06	Rear wheel arch 5 P  P4A101M07	Replacing body panels Structural page 129 page 133

70.

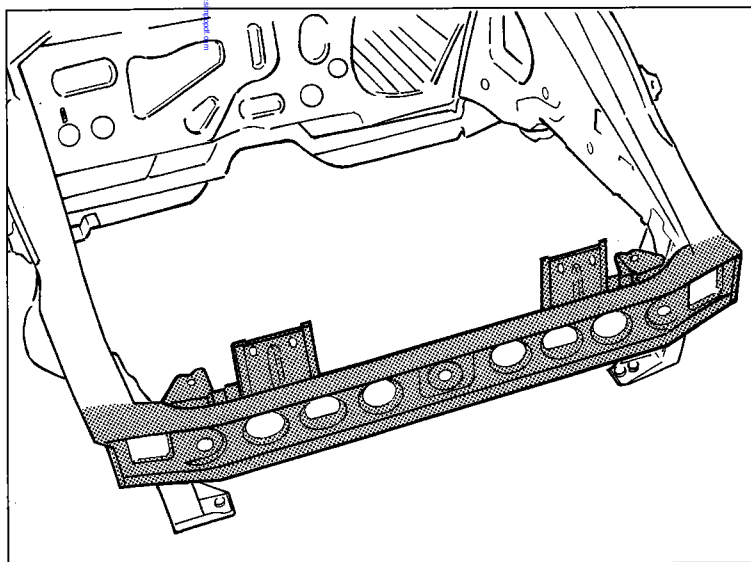
SYMBOLS

CUTTING WITH HACK SAWING MACHINE	
CUTTING WITH CIRCULAR BLADE SAW	
CLEANING WITH ROTARY BRUSH	
REMOVING SPOT WELDS WITH CHAMFERING MACHINE	
REMOVING SPOT WELDS WITH DRILL	
DRILLING FOR MIG WELDING	
REMOVING PANEL WITH CHISEL	
DRILLING FOR MIG WELDING	
APPLICATION OF ELECTRO-WELDABLE PROTECTIVES	
APPLICATION OF HIGH THICKNESS ELECTRO-WELDABLE PROTECTIVES	
CENTERING COMPONENTS	
MEASURING	
FIXING COMPONENTS	
FIXING THREADED RIVETS	

CHECKING GAPS AND ALIGNMENTS	
SPOT WELDING	
MIG WELDING	
WELDING WITH OXYACETYLENE CANISTER	
GRINDING	
APPLYING ANTI-OXIDANT PROTECTIVES	
APPLYING SEALANTS	
APPLYING UNDERBODY PROTECTIVES	
APPLYING PAINTS	
APPLYING WAX BASED PROTECTIVES	
APPLYING FOAM PRODUCTS	

SYMBOLS IN THE ILLUSTRATIONS

---	CUTTING LINE
● ● ● ●	SPOT WELDING
■ ■ ■ ■	MIG WELDING FOR FILLING
UUUUUU	CONTINUOUS MIG WELDING
XXXXXXX	BRAZING



P4A103M01

REPLACING FRONT CROSS MEMBER LINING (7090G 07)*

(*) This number indicates the operation code given in the Flat rate manual.

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting the component. After this operation check that the components not being replaced are intact.

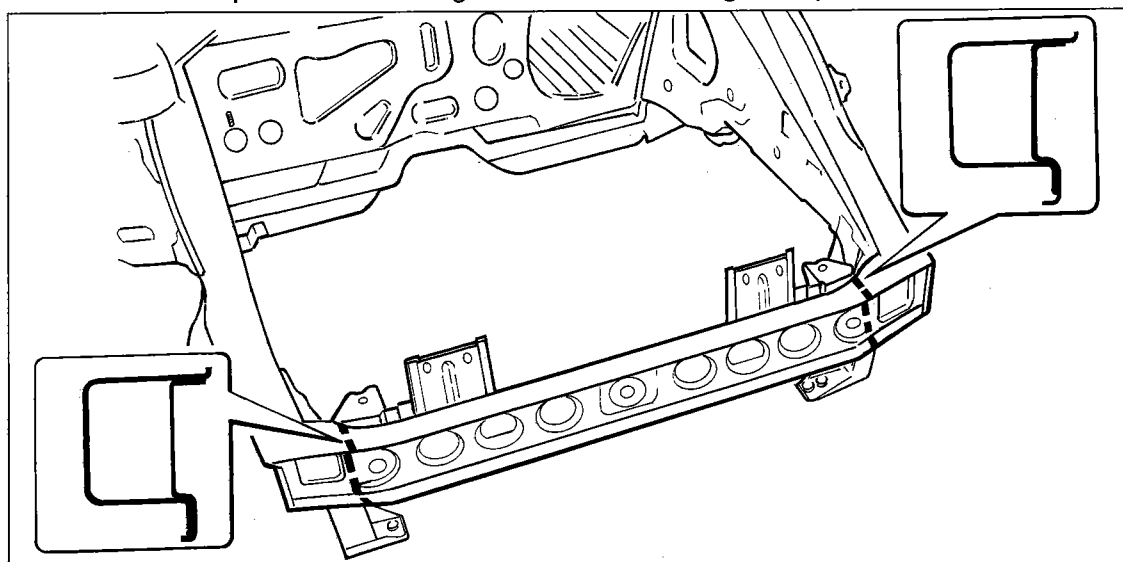
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the vehicle front cross member cover using a power saw following the dotted lines shown in the diagram below.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A103M02



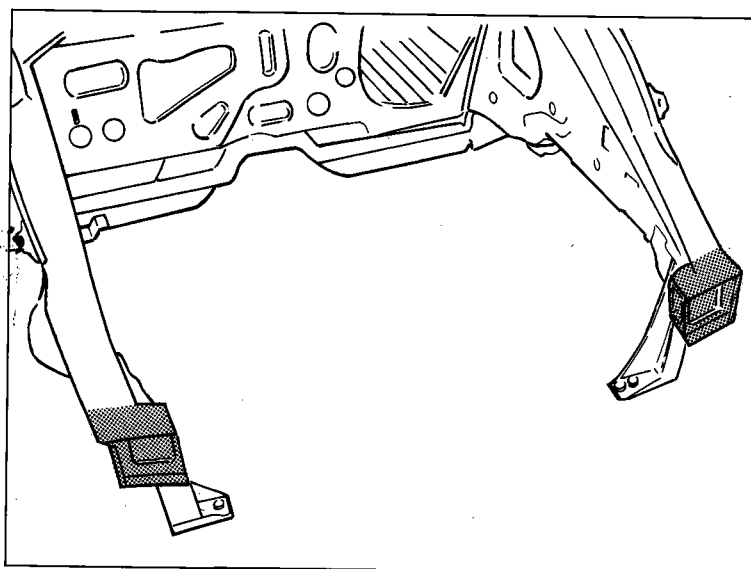
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

Replacing structural body panels

70.

Removing off cuts and preparing edges of bodyshell

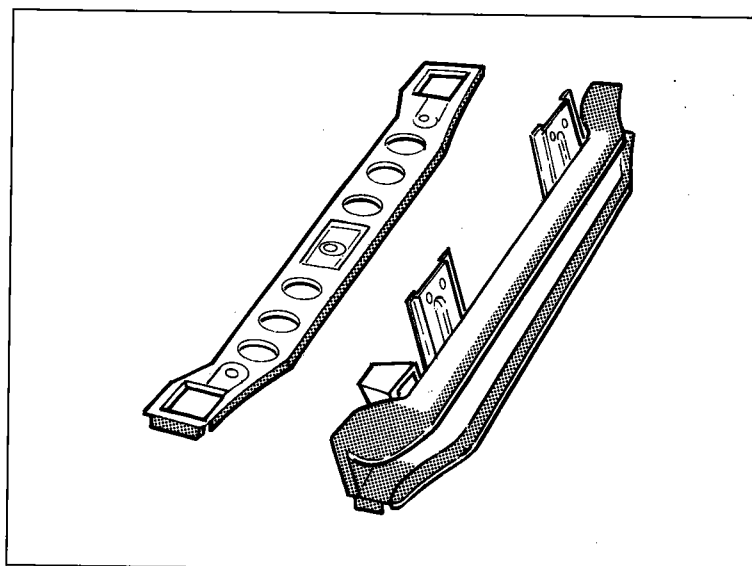
1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.



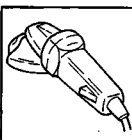
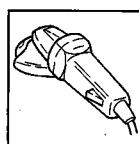
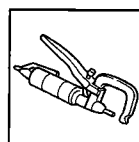
P4A104M01

Preparing the replacement parts

1. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a disc grinder.
2. Use electro-galvanizing paint on the edges previously treated.

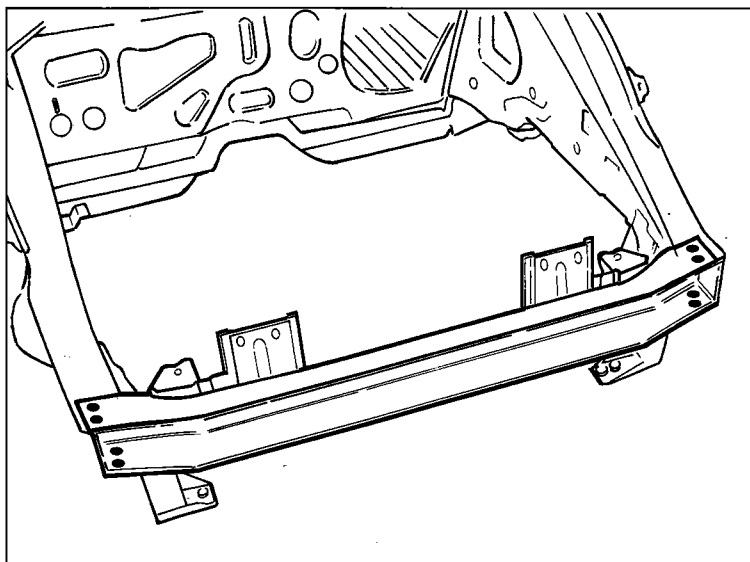


P4A104M02

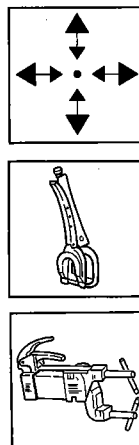


Positioning the front cross member and welding

1. Correctly position the front cross member on the bodyshell.
2. Check that the replacement part is perfectly positioned.
3. Fix the replacement part to the bodyshell using the special self-locking clamps.
4. Carry out spot welding on the edges of the bodyshell.

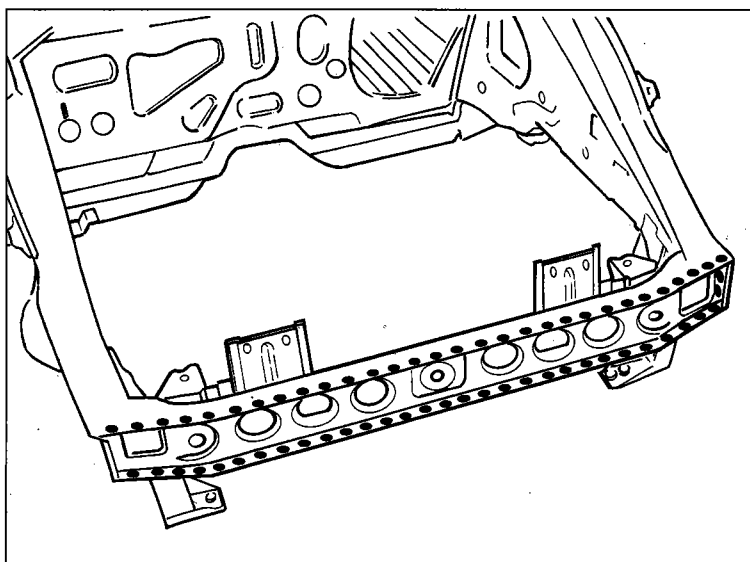


P4A105M01

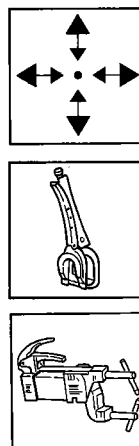


Positioning the front lining and welding

1. Correctly position the front lining on the cross member.
2. Check that the replacement part is perfectly positioned.
3. Fix the replacement part to the cross member and to the bodyshell using the special self-locking clamps.
4. Carry out spot welding on the edges of the cross member and the bodyshell.



P4A105M02

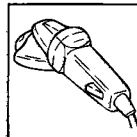
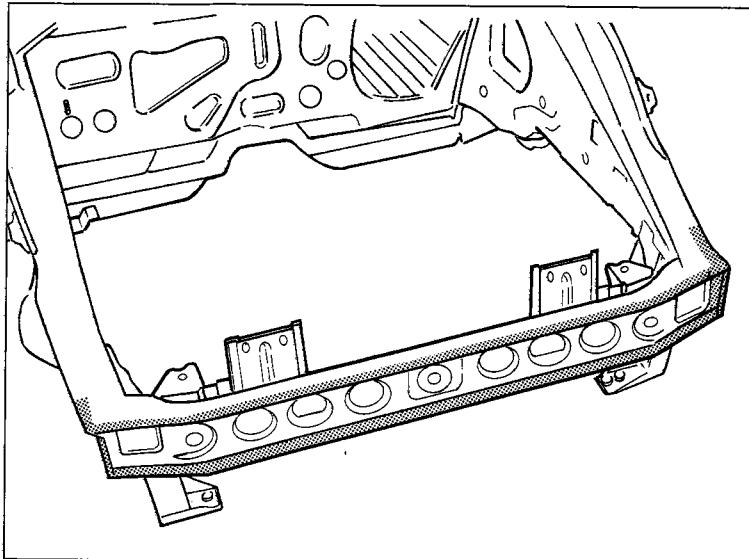


Replacing structural body panels

70.

Finishing operations

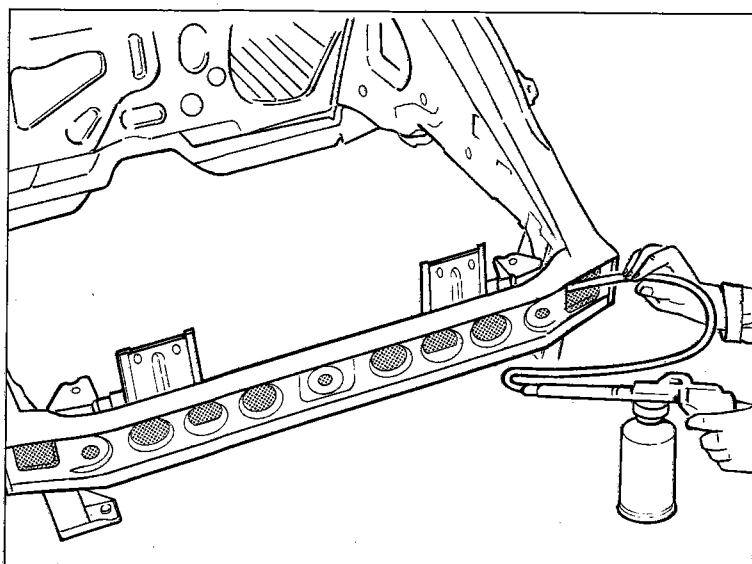
1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.



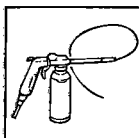
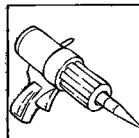
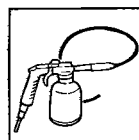
P4A108M01

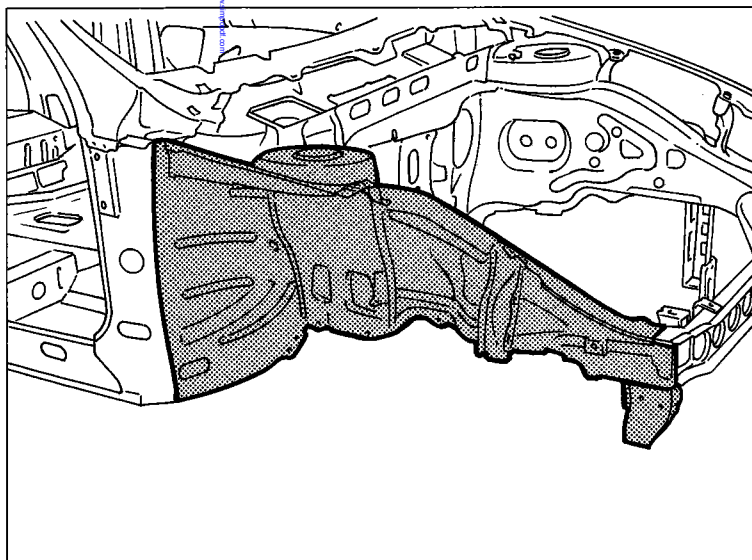
Protections

1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the joins between the replacement parts and the bodyshell, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective.



P4A108M02



**REPLACING COMPLETE FRONT SIDE PANEL (7090G 10)***

(*) This number indicates the operation code given in the Flat rate manual.

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

P4A107M01

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting.
After this operation check that the components not being replaced are intact.

PRELIMINARY DISMANTLING

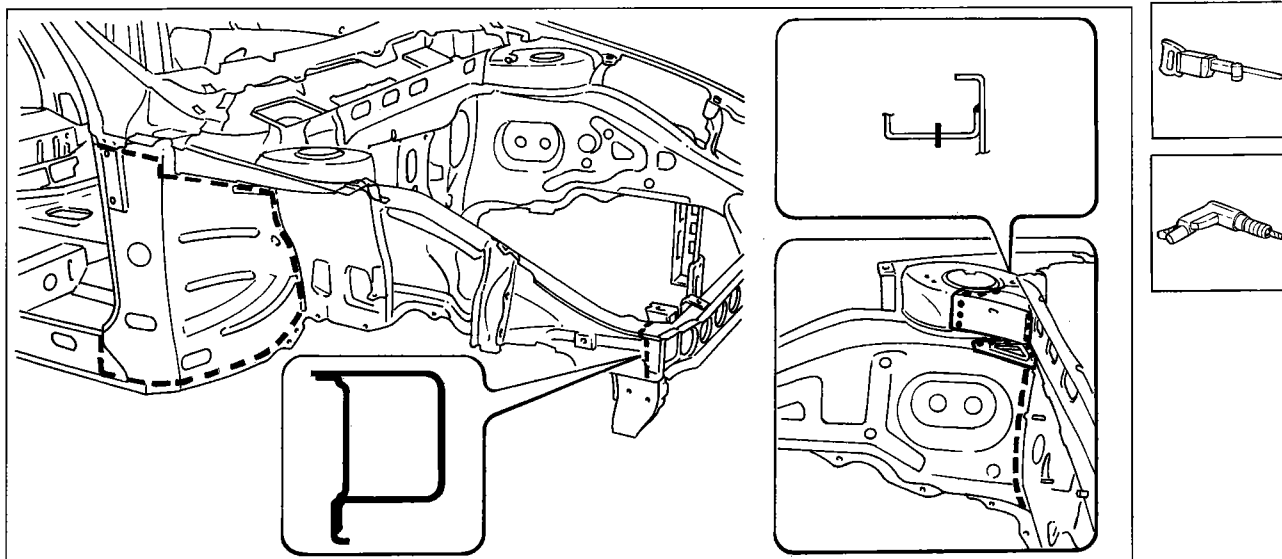
Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

Remove the front pillar (see: "Replacing structural body panels - Replacing Front Pillar").

REMOVING

Carry out the cutting using a power saw following the dotted lines shown below and remove the brackets inside the engine compartment removing the spot welds using a drill.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A107M02



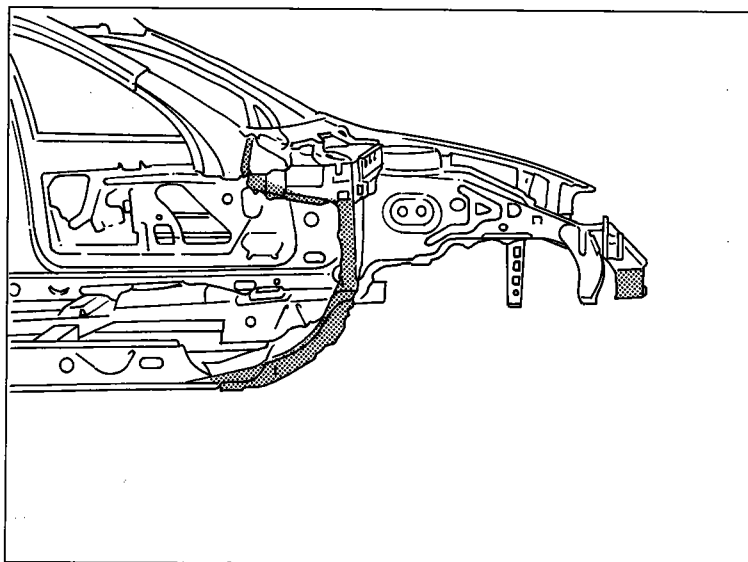
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

Replacing structural body panels

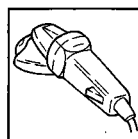
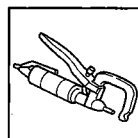
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

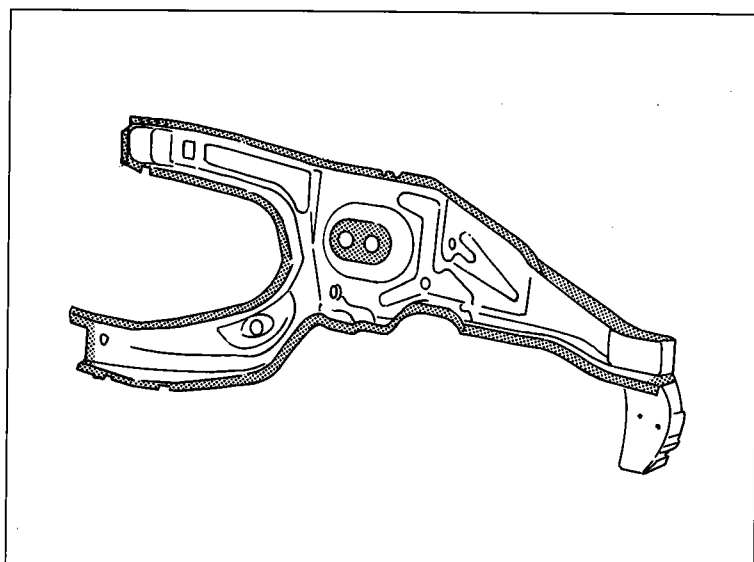


P4A108M01

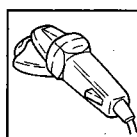


Preparing the replacement internal panel

1. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a disc grinder.
2. Use electro-galvanizing paint to the edges previously treated.

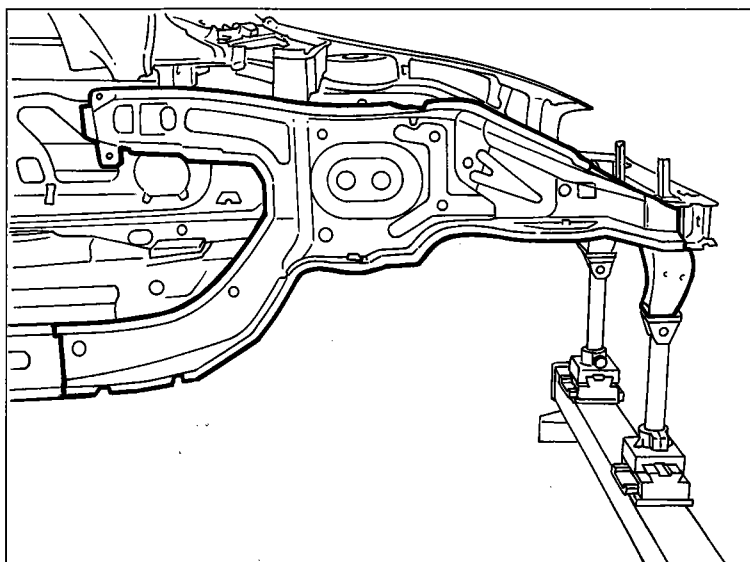


P4A108M02



Positioning the replacement internal panel

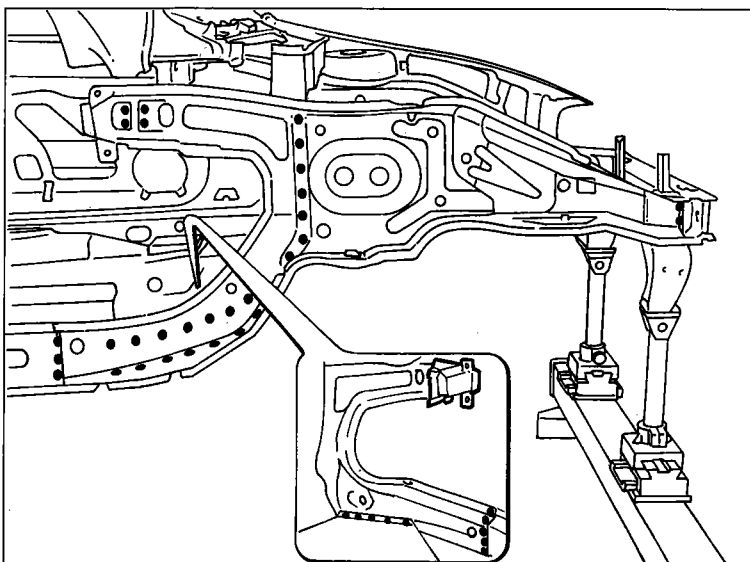
1. Correctly position the internal panel using the template.
2. Check that the internal panel is perfectly positioned.
3. Fix the replacement part to the bodyshell using the special self-locking clamps.



P4A109M01

Welding the replacement internal panel

1. Carry out spot welding by the floor.
2. Continue the spot welding on the edges in contact with the bodyshell.
3. Carry out spot welding on the front cross member.

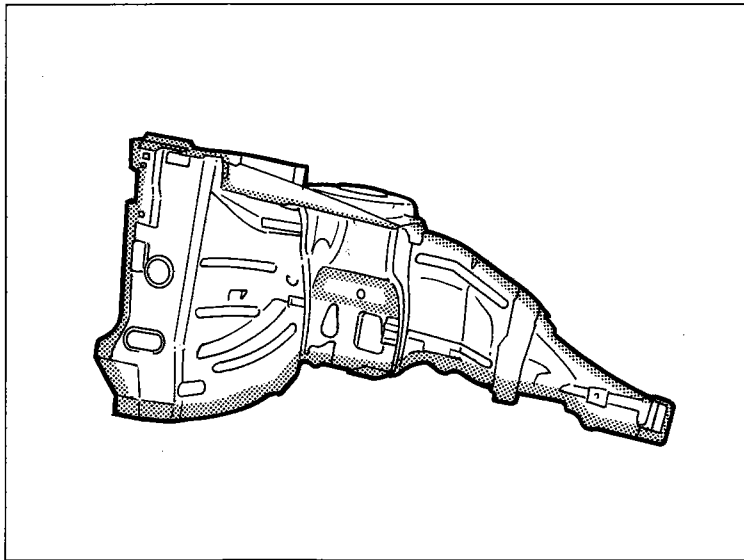


P4A109M02

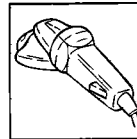
70.

Preparing the replacement outer panel

1. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a disc grinder.
2. Use electro-galvanizing paint on the edges previously treated.

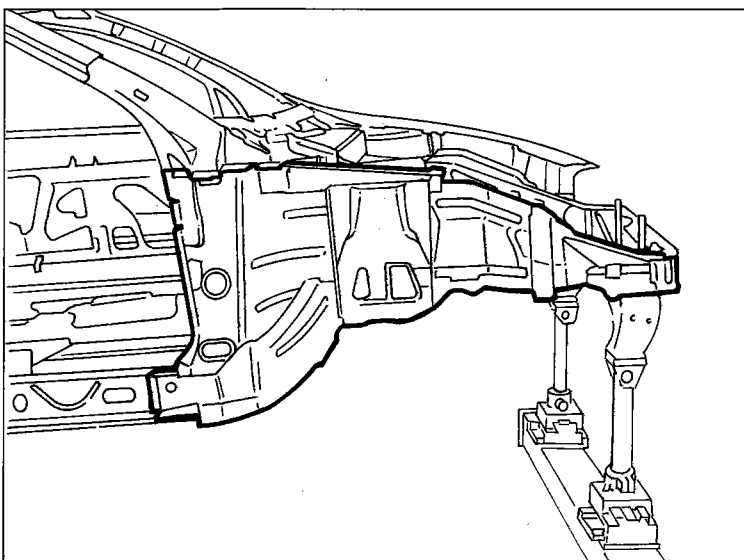


P4A110M01

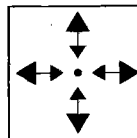


Positioning the replacement outer panel

1. Correctly position the outer panel.
2. Check that the outer panel is perfectly positioned.
3. Fix the replacement part to the bodyshell using the special self-locking clamps.

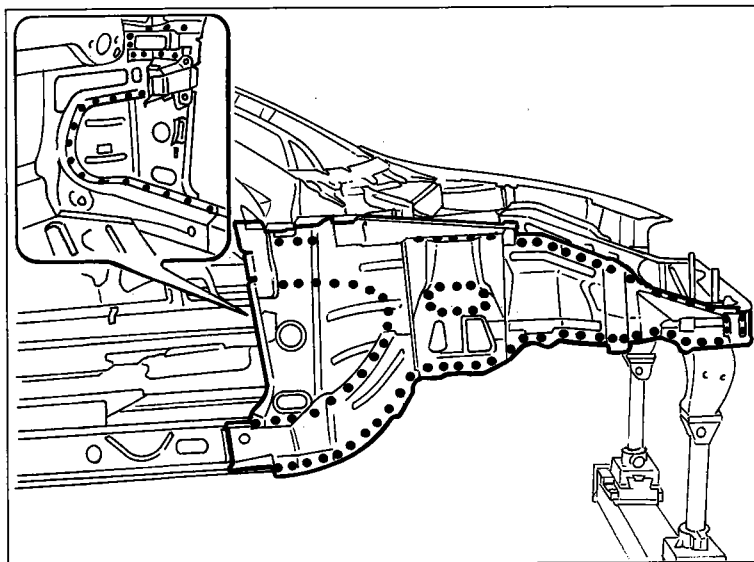


P4A110M02



Welding replacement outer panel

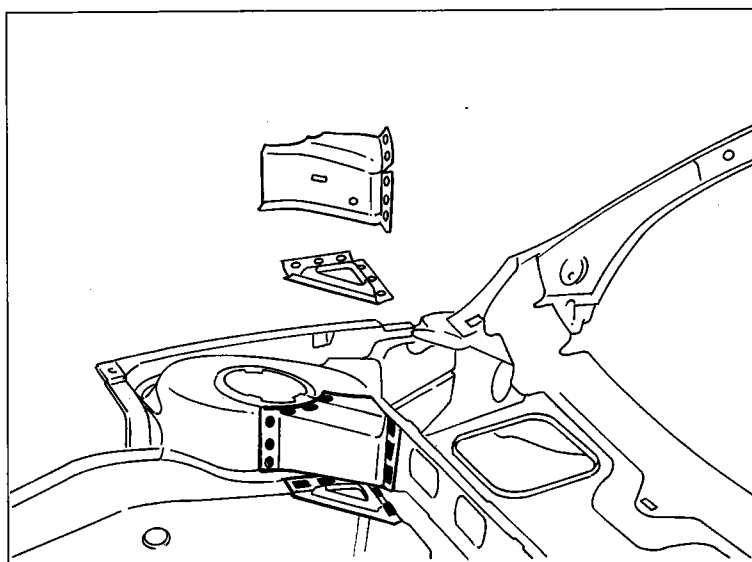
1. Carry out spot welding on the edges in contact with the internal panel.
2. Continue the spot welding working from inside the vehicle, continuing the welding on the internal panel and on the edges of the bodyshell.
3. Carry out spot welding on the edges of the front cross member.



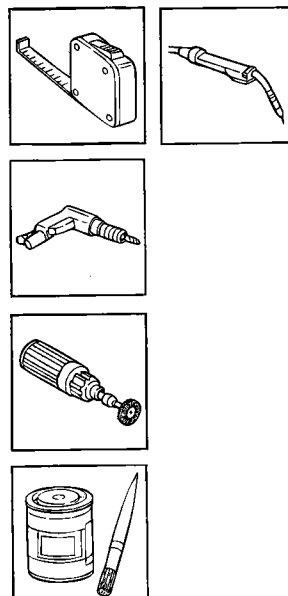
P4A111M01

Preparing and welding the brackets

1. Make equidistant holes in the edges of the brackets.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a rotating brush.
3. Apply the electro-galvanizing paint to the areas previously treated.
3. Using the MIG welder carry out welding filling the holes made previously.



P4A111M02

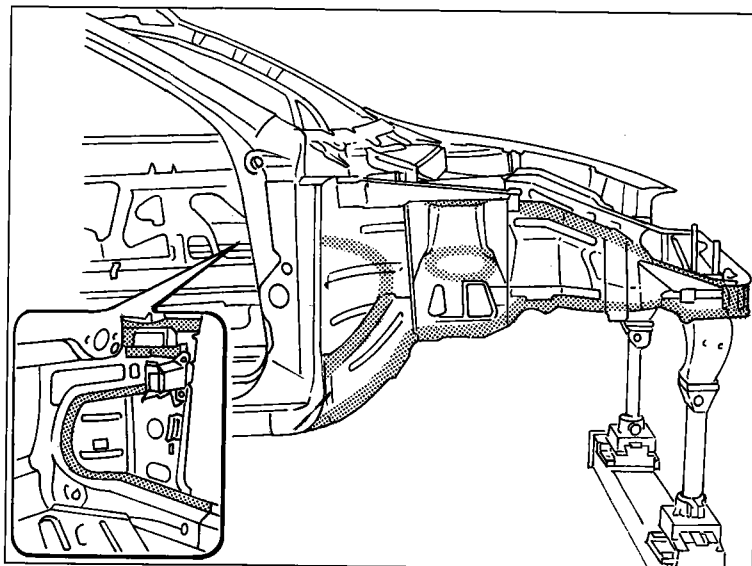


Proceed with fitting the front pillar (see: "Replacing Structural Panels - Replacing Front Pillar").

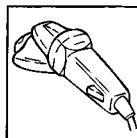
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.

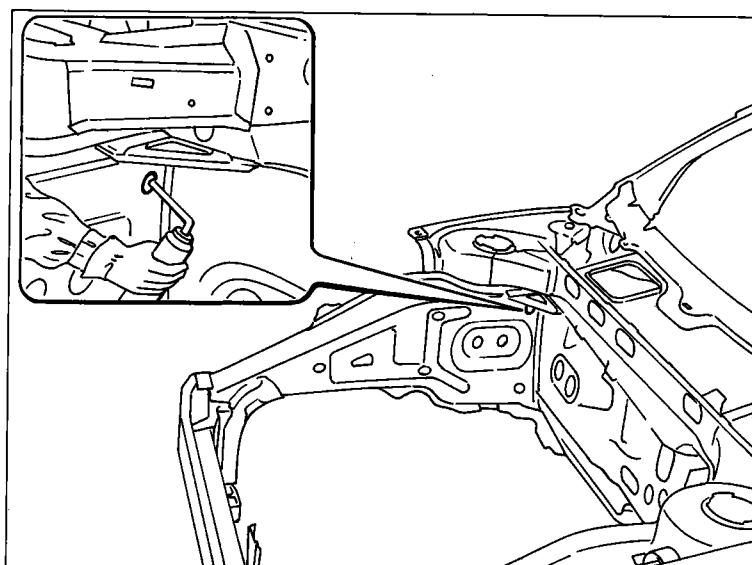


P4A112M01

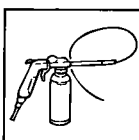
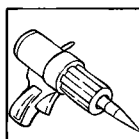
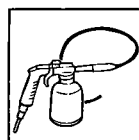


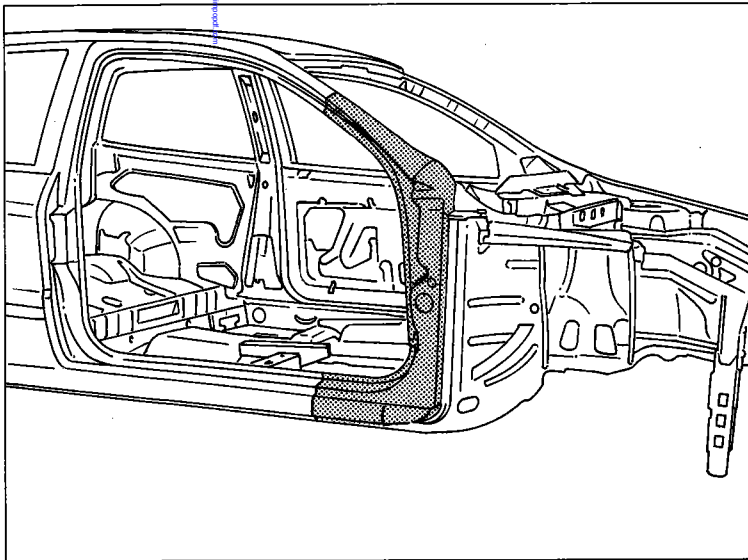
Protections

1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the joints between the replacement parts and the bodyshell, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective.



P4A112M02





P4A113M01

REPLACING FRONT PILLAR (7090G 30)*

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting the component. After this operation check that the components not being replaced are intact.

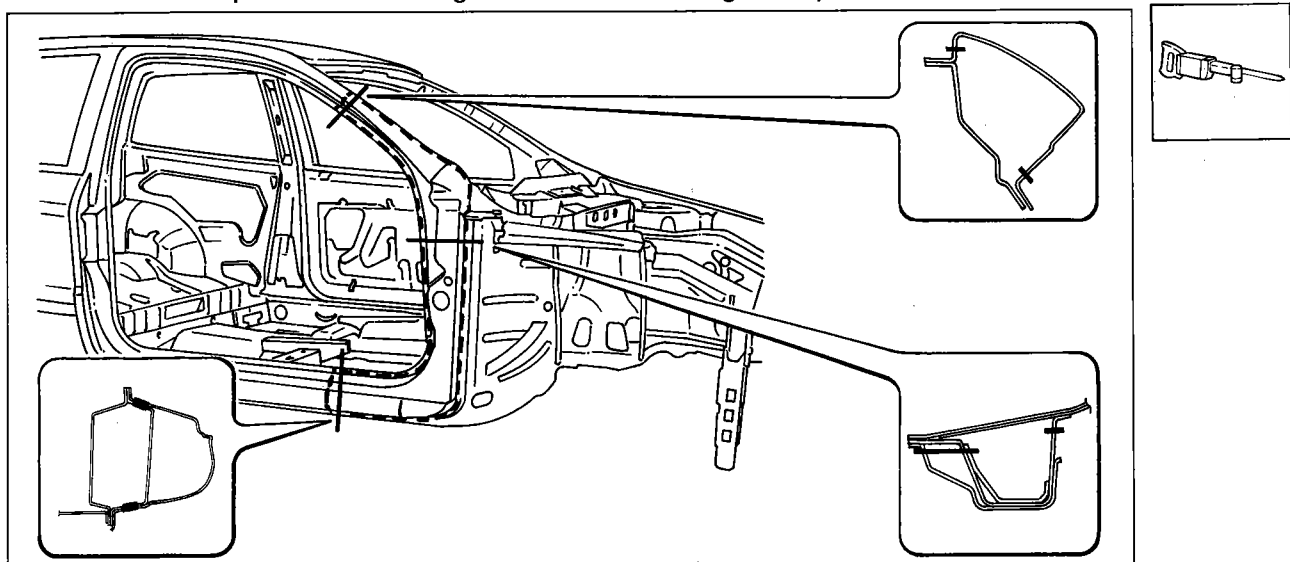
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the vehicle front pillar using a power saw following the dotted lines shown in the diagram below.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A113M02

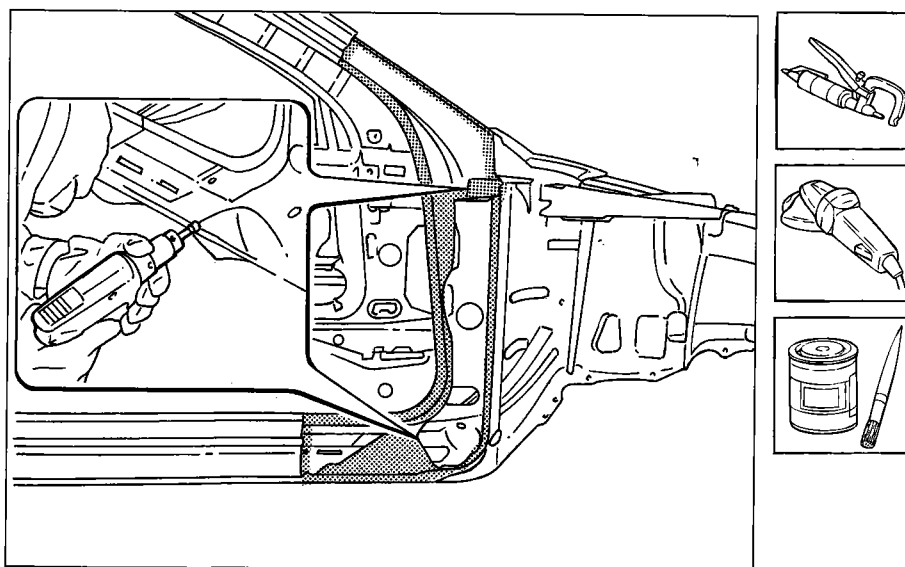


When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

70.

Removing off cuts and preparing edges of bodyshell

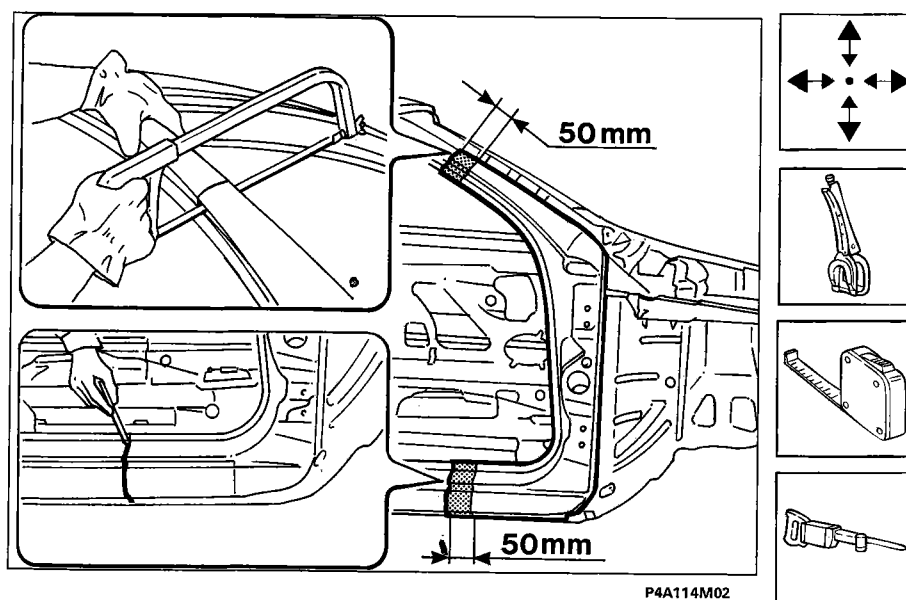
1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter and on the internal reinforcement.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.



P4A114M01

Adjusting the replacement part

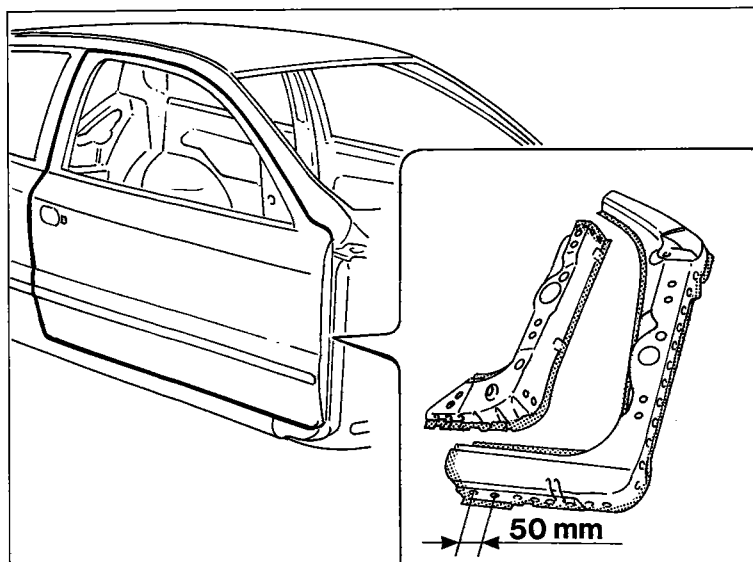
1. Place the pillar in position, using the special self-locking clamps and check that the replacement part is superimposed about 50 mm beyond the bodyshell.
2. Trace the profile of the replacement part on the underdoor side member lining using a tracer point.
3. Cut the two edges of the panel on the windscreen pillar to obtain a perfect join line.
4. Remove the excess on the bodyshell.



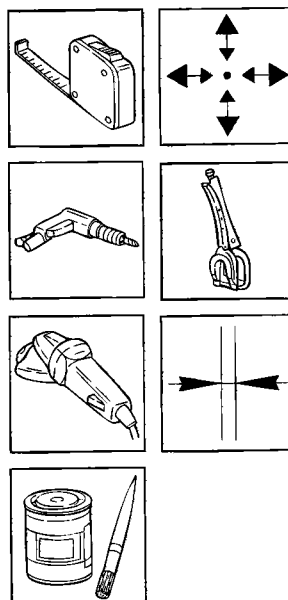
P4A114M02

Preparing the replacement parts and check that they are correctly positioned on the bodyshell

1. Make equidistant holes in the replacement parts as shown in the diagram.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a special grinder.
3. Use electro-galvanizing paint on the edges in contact with the bodyshell.
5. Offer up the replacement parts and fix them using the special self-locking clamps
4. Fit the front door hinges and the door seal and check the alignment and the evenness of the surrounding gap.

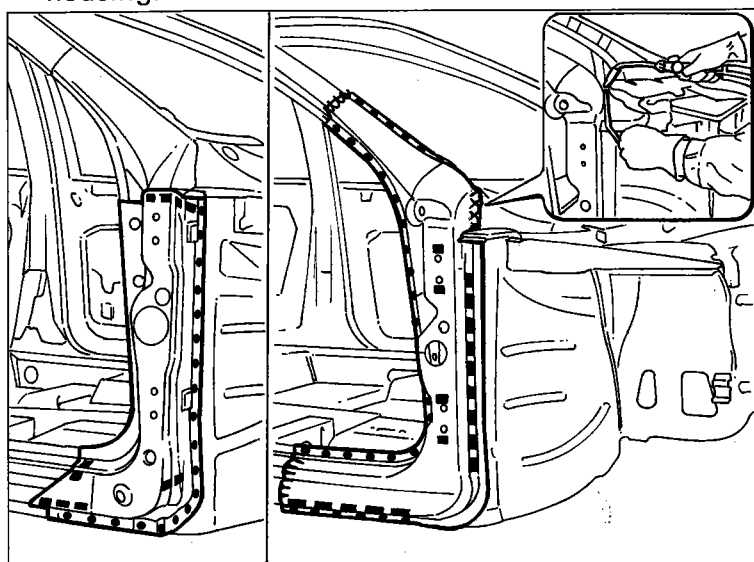


P4A115M01

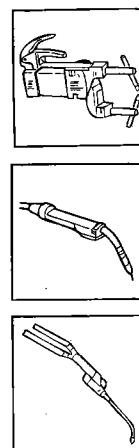


Welding replacement parts

1. Place the internal reinforcement in position and spot weld the side edge.
2. Use the MIG welder and fill the holes made previously.
3. Remove any weld slag and apply the electro-weldable galvanizing paint.
4. Place the pillar in position and spot weld the perimeter edges.
5. Use the MIG welder at the edges.
6. Use the MIG welder and fill the holes made previously.
7. Carry out brass welding on the contact edges between the replacement part and the windscreen housing.



P4A115M02

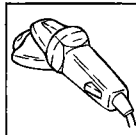
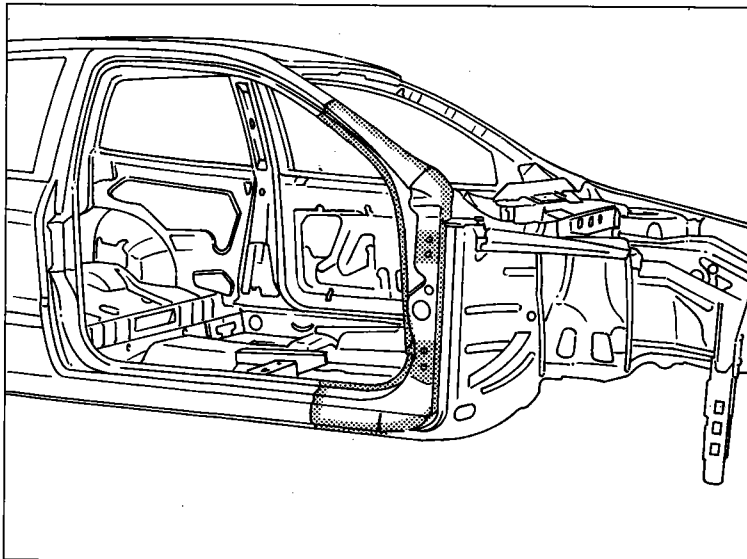


Replacing structural body panels

70.

Finishing operations

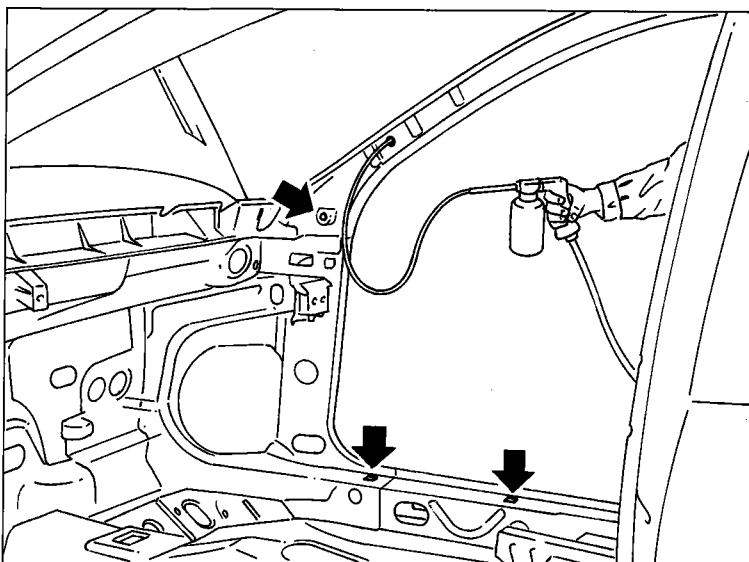
1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.



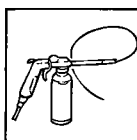
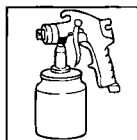
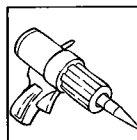
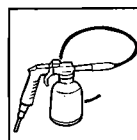
P4A116M01

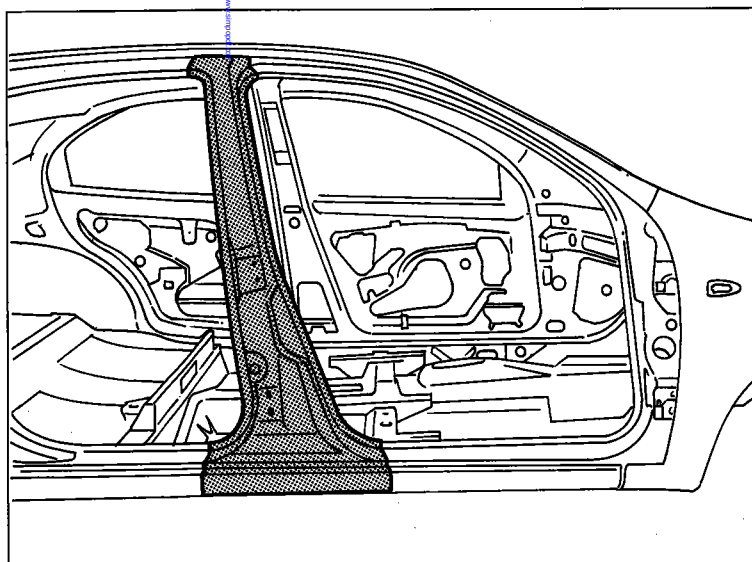
Protections

1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the joints between the front pillar and the bodyshell, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective to the inside of the front pillar.



P4A116M02





P4A117M01

**REPLACING CENTRE
PILLAR (7090G 40)***

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting the component. After this operation check that the components not being replaced are intact.

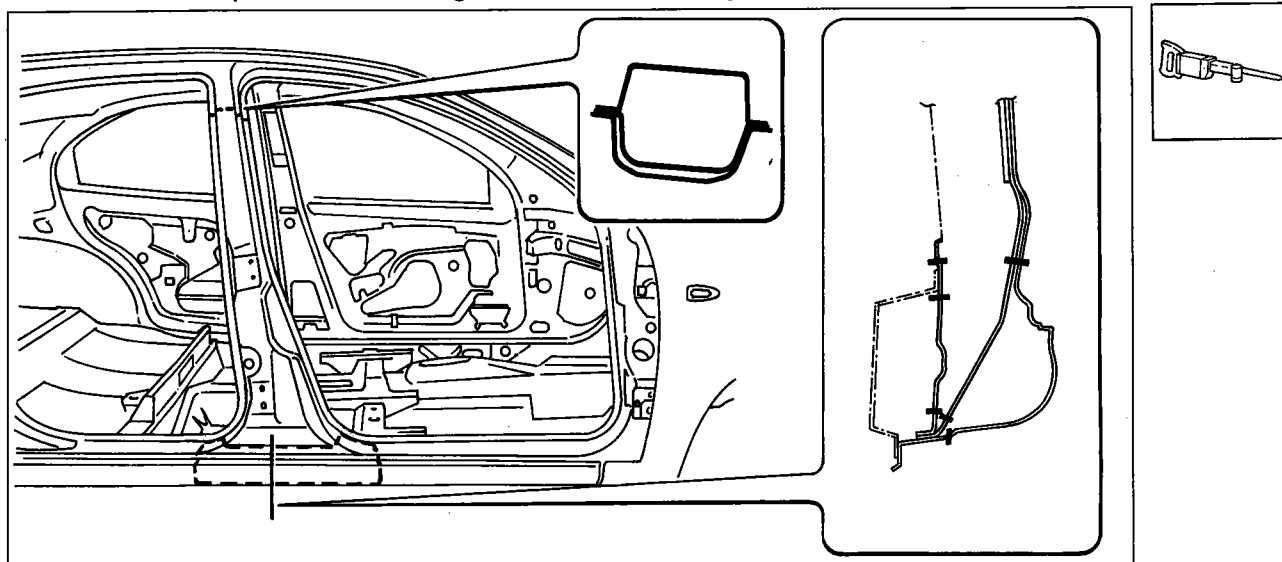
PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

REMOVING

Cut the vehicle centre pillar using a power saw following the dotted lines shown in the diagram below.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A117M02



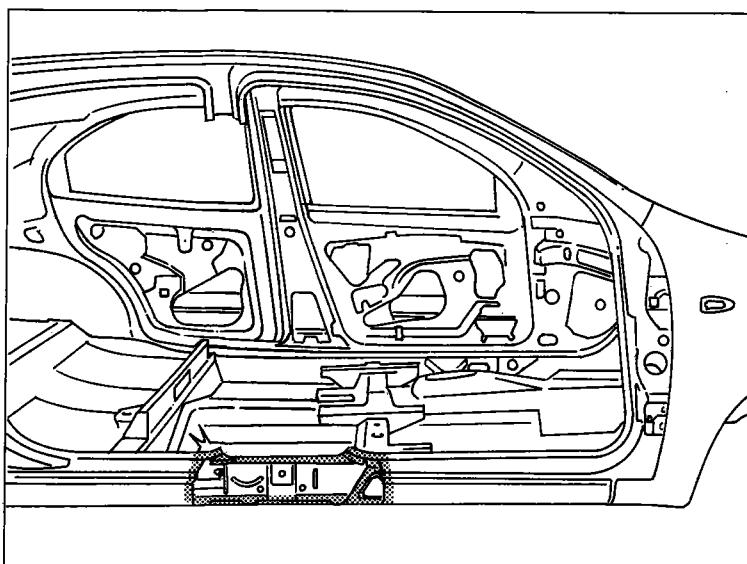
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

Replacing structural body panels

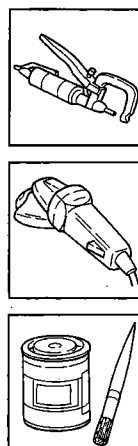
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

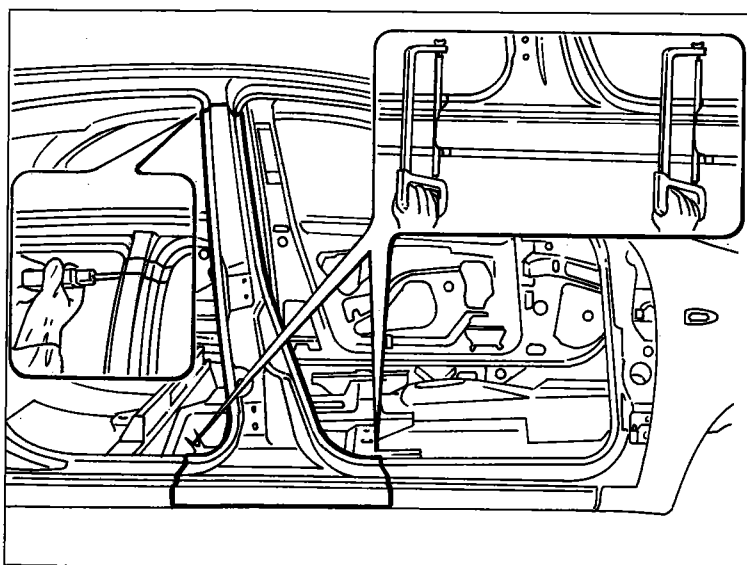


P4A118M01

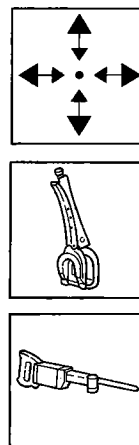


Adjusting the outer centre pillar

1. Carefully position the outer centre pillar.
2. Fix the replacement part to the bodyshell and fix it using self-locking pliers.
3. Cut the edges of the excess panel superimposed on the bodyshell.

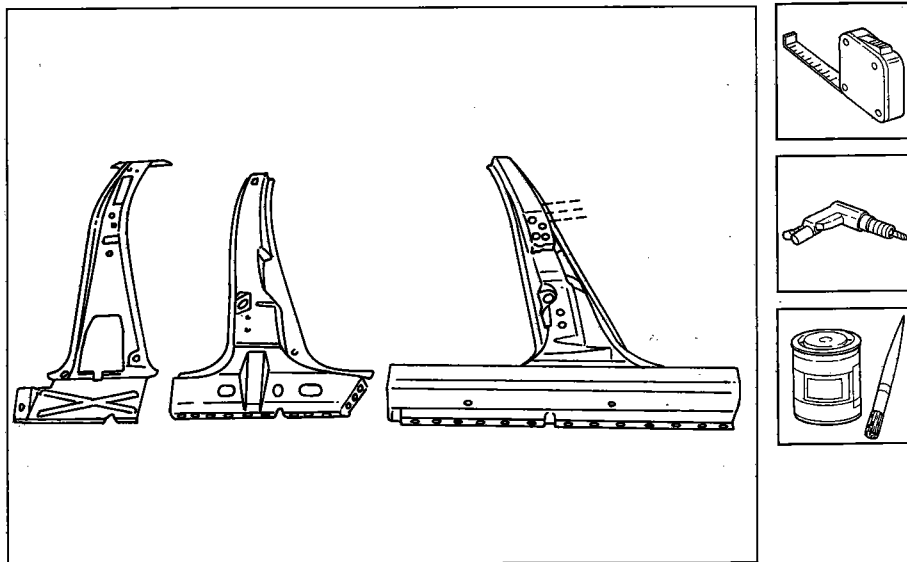


P4A118M02



Preparing the replacement parts

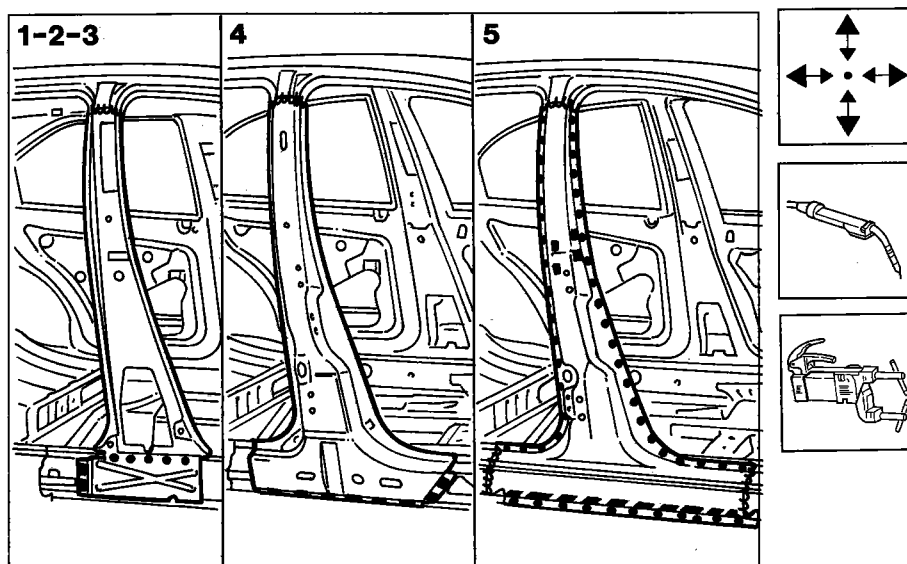
1. Make equidistant holes in the replacement parts as shown in the diagram.
2. Remove the anti-corrosion treatment from the entire perimeter of the outside of the replacement part using a disc grinder.
3. Use the electro-galvanizing paint on the edges treated previously.



P4A119M01

Welding replacement parts

1. Position the inner pillar and carry out continuous welding on the upper edge.
2. Continue the welding filling the holes made previously in the underdoor side member reinforcement.
3. Carry out spot welding on the underdoor side member edges.
4. Position the intermediate pillar inserting it inside the remains of the upper bodysell, carry out continuous welding on the upper edge and fill the holes made previously.
5. Position the outer centre pillar and carry out continuous welding on the outer edges, filling the holes made previously in the replacement part and spot welding along the entire perimeter of the replacement part.



P4A119M02

Replacing structural body panels

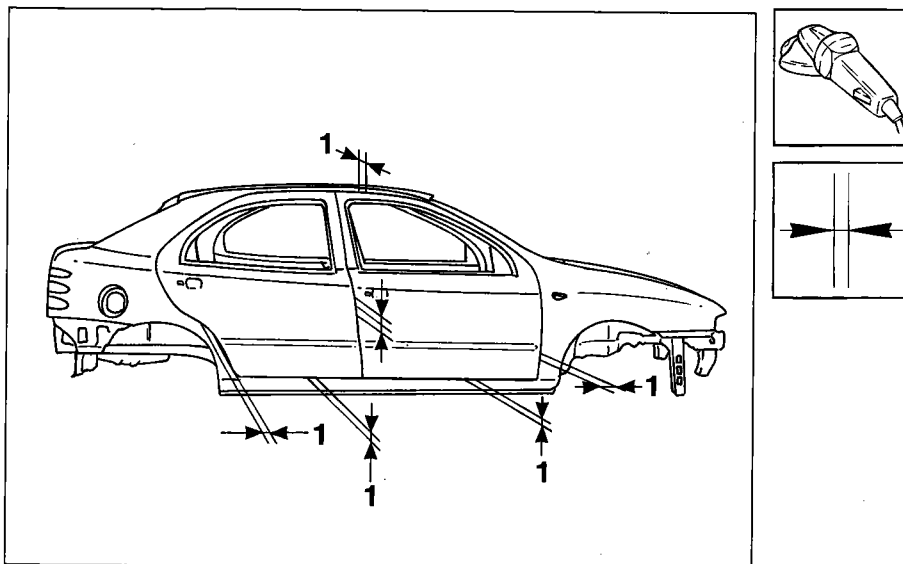
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.

Checking alignments

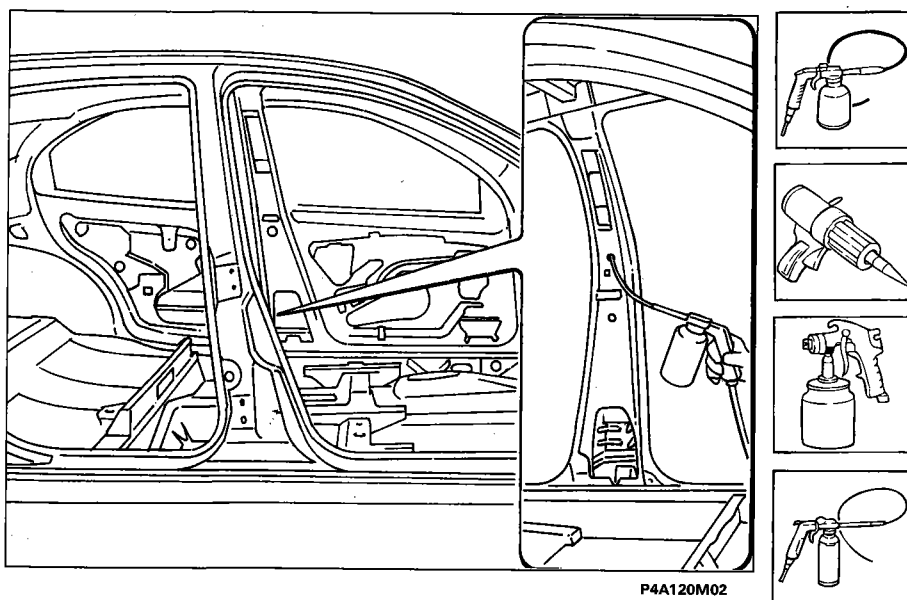
1. Check the parallelism, openings and angles (this involves fitting the moving components previously removed with seals and parts which, once fitted, make it possible to check that the operations have been carried out correctly).



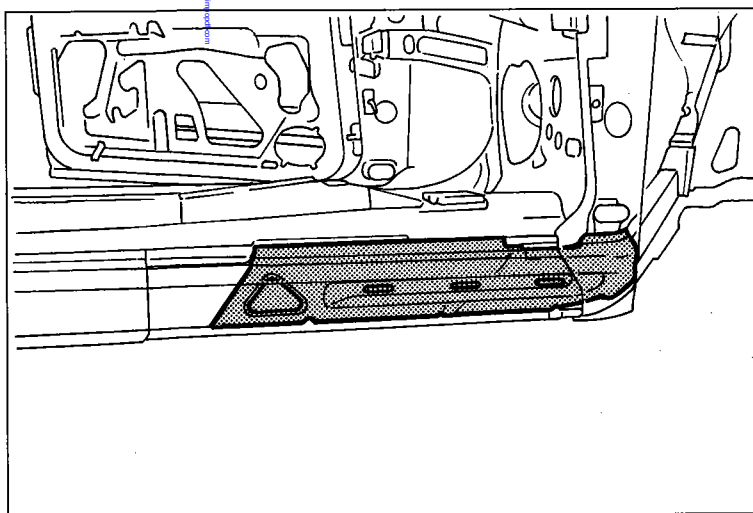
P4A120M01

Protections

1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the joints between the replacement panels and the bodyshell, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective.



P4A120M02



P4A121M01

**REPLACING UNDERDOOR
 SIDE MEMBER FRONT
 REINFORCEMENT (7090G 30)***

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodysheel alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodysheel before cutting. After this operation check that the components not being replaced are intact.

PRELIMINARY DISMANTLING

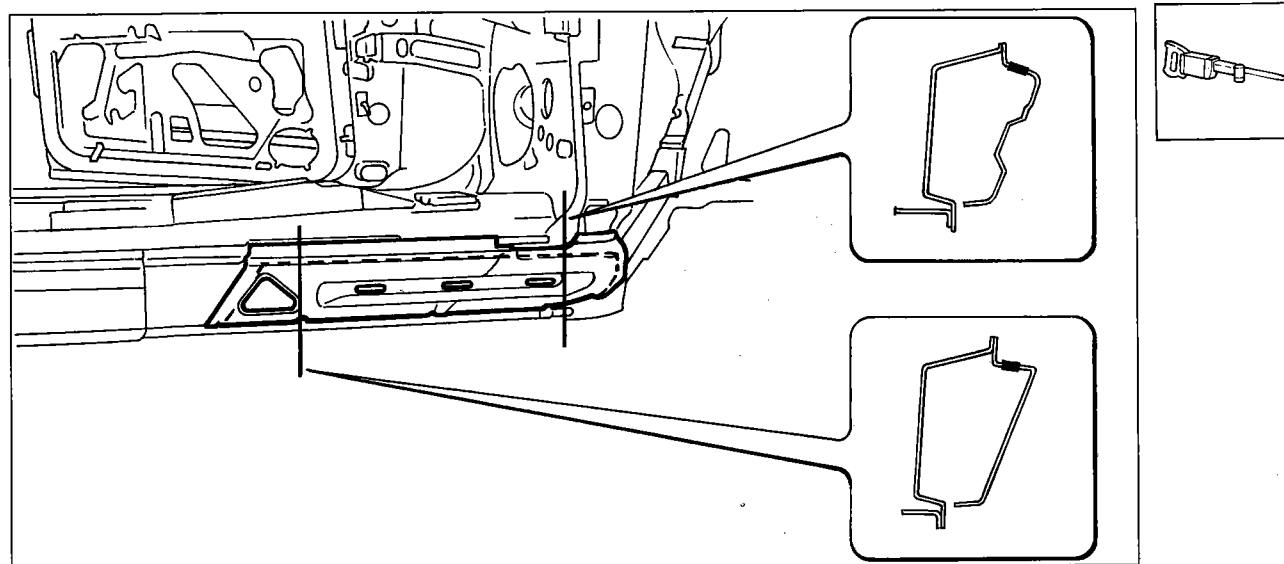
Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

Remove the underdoor side member (see: "Replacing body panels - Replacing Underdoor side member").

Remove the front pillar (see: "Replacing structural body panels - Replacing Front pillar").

REMOVING

Cut using the power saw following the dotted lines shown below. The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A121M02



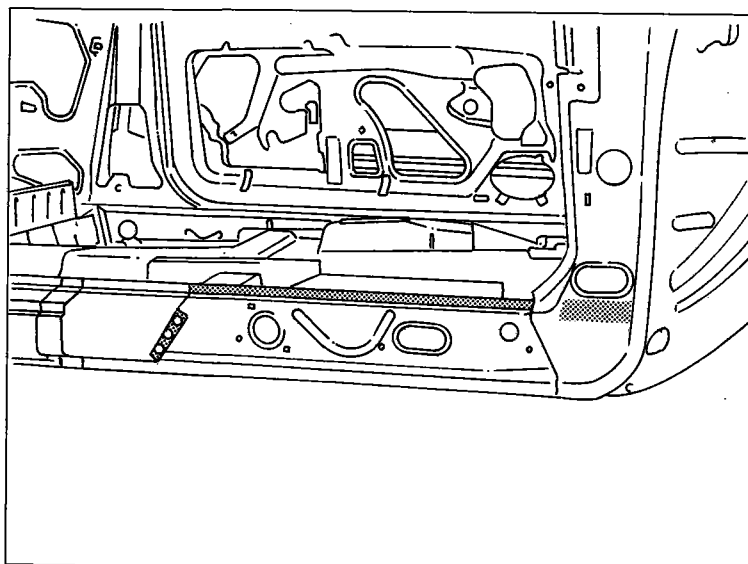
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

Replacing structural body panels

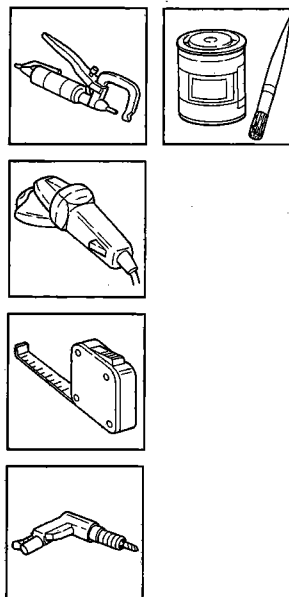
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Make equidistant holes in the edge of the underdoor side member rear reinforcement.
6. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

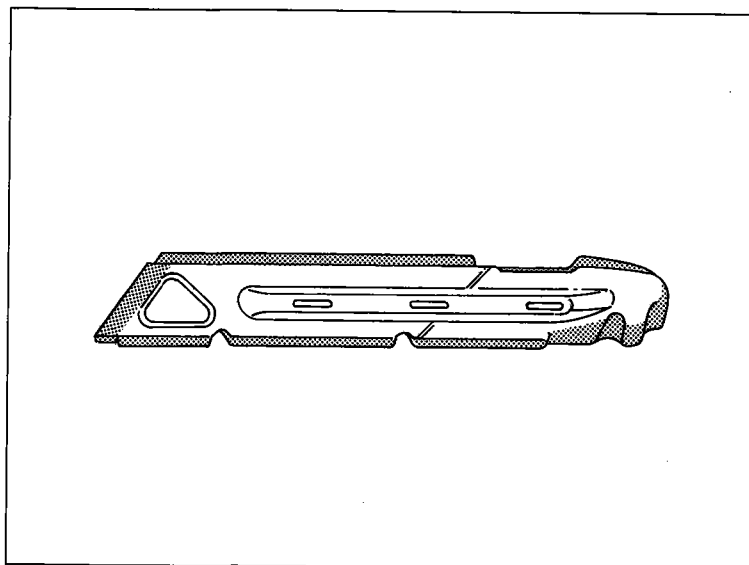


P4A122M01



Preparing the spare part

1. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement panel using a disc grinder.
2. Use electro-galvanizing paint on the edges previously treated.

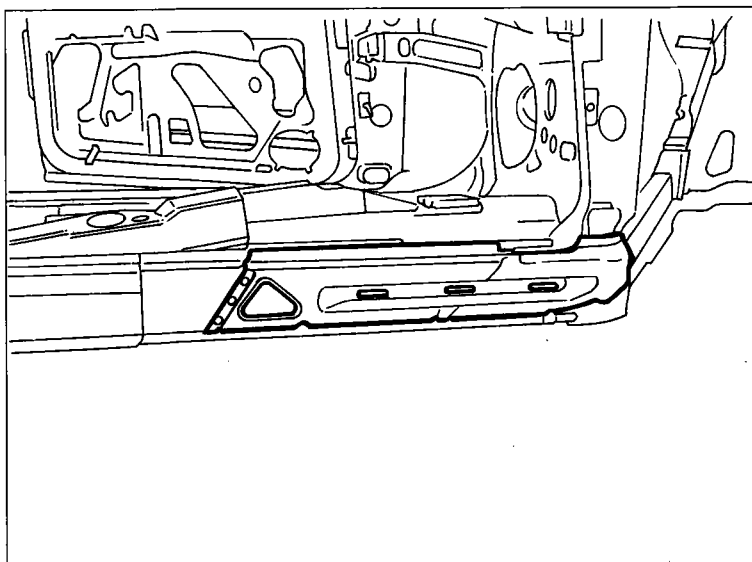


P4A122M02

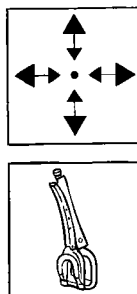


Positioning the replacement part

1. Carefully place the replacement part in position, from the inside of the underdoor side member rear reinforcement.
2. Fix the replacement part to the bodyshell using the special self-locking clamps.

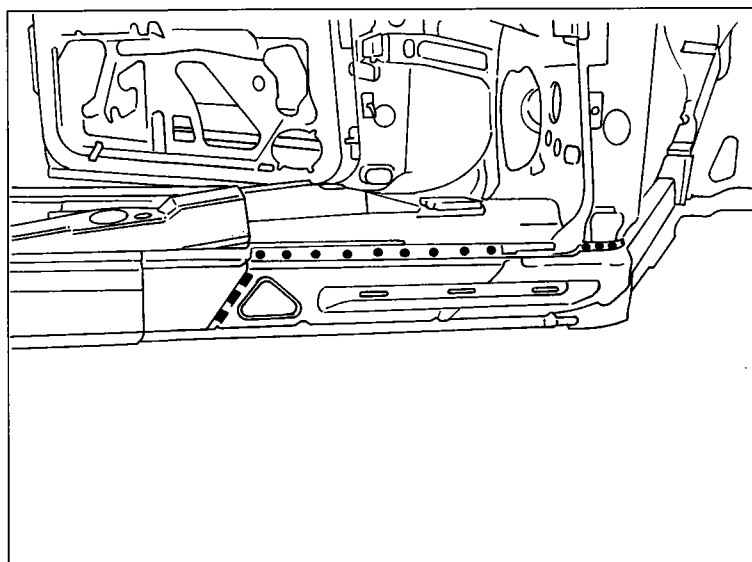


P4A123M01

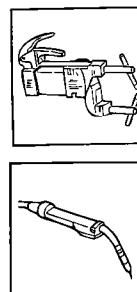


Welding the spare part

1. Carry out spot welding by the front pillar frame and the upper edges.
2. Using the MIG welder fill the holes made previously in the bodyshell.



P4A123M02



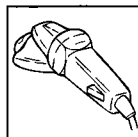
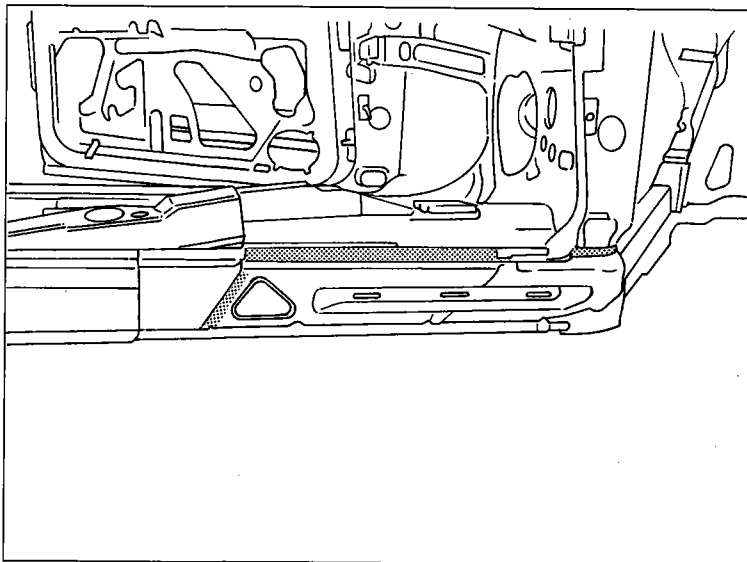
Proceed with fitting the front pillar and the underdoor side member (see: "Replacing structural body panels - Replacing Front pillar" and "Replacing body panels - Replacing underdoor side member").

Replacing structural body panels

70.

Finishing operations

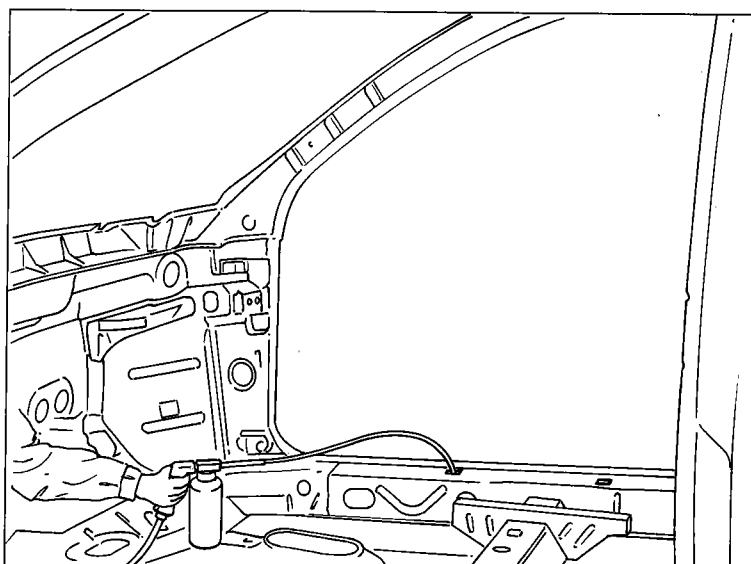
1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.



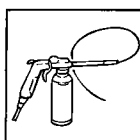
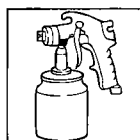
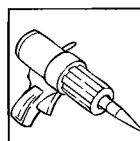
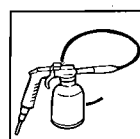
P4A124M01

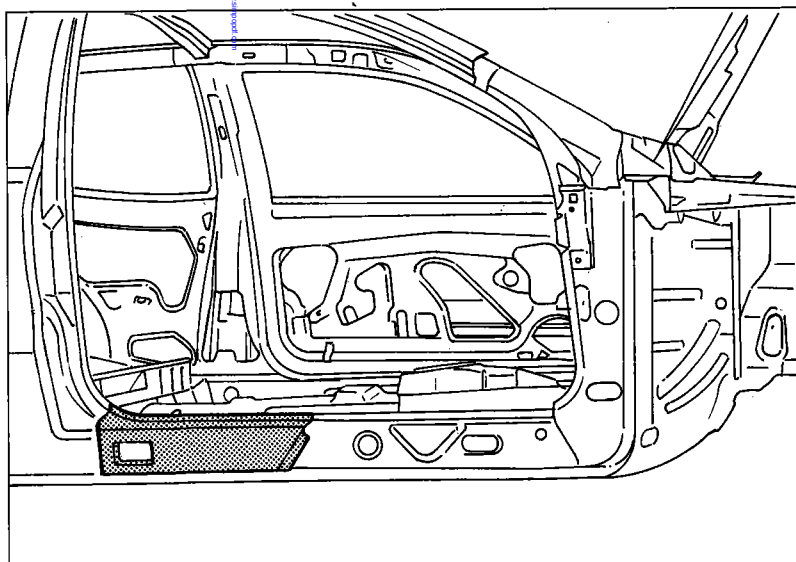
Protections

1. Apply the electro-phoretic protective treatment to the reas previously involved in the welding.
2. Seal the join lines, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective to the inside of the underdoor side member.



P4A124M02





**REPLACING UNDERDOOR
SIDE MEMBER REAR
REINFORCEMENT (7090G 54)***

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

P4A125M01

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting.
After this operation check that the components not being replaced are intact.

PRELIMINARY DISMANTLING

Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

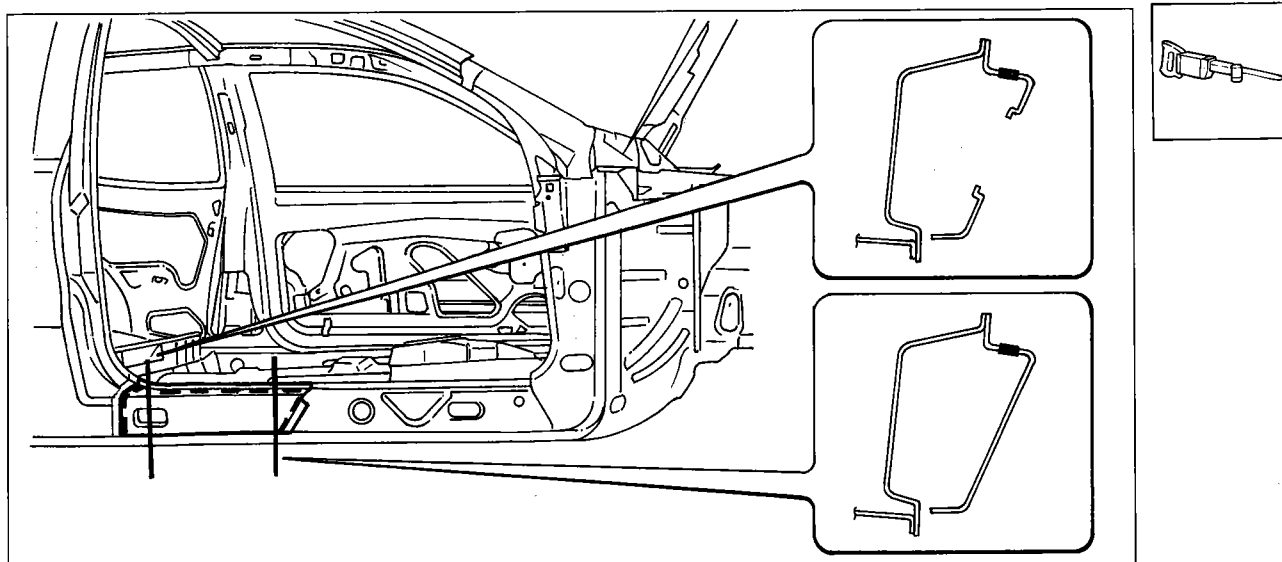
Remove the underdoor side member (see: "Replacing body panels -Replacing Underdoor side member").

Remove the rear wing (see: "Replacing body panels -Replacing rear wing").

REMOVING

Cut using a power saw following the dotted lines shown below.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



P4A125M02



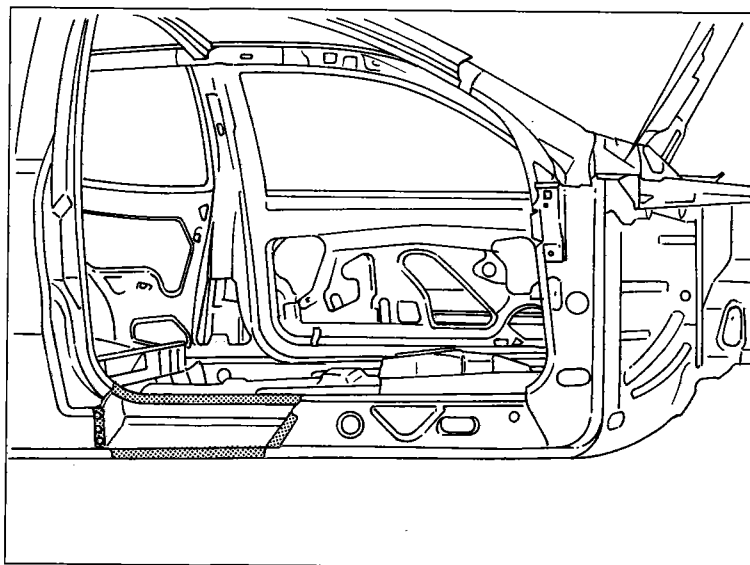
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

Replacing structural body panels

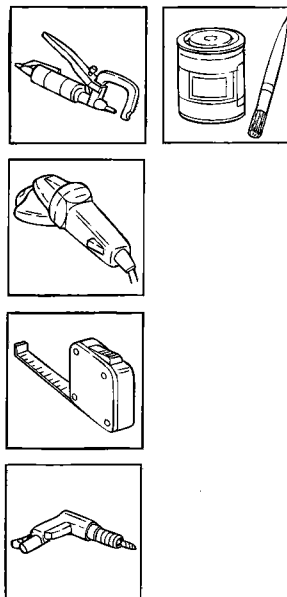
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Make equidistant holes in the edge of the pillar reinforcement.
6. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

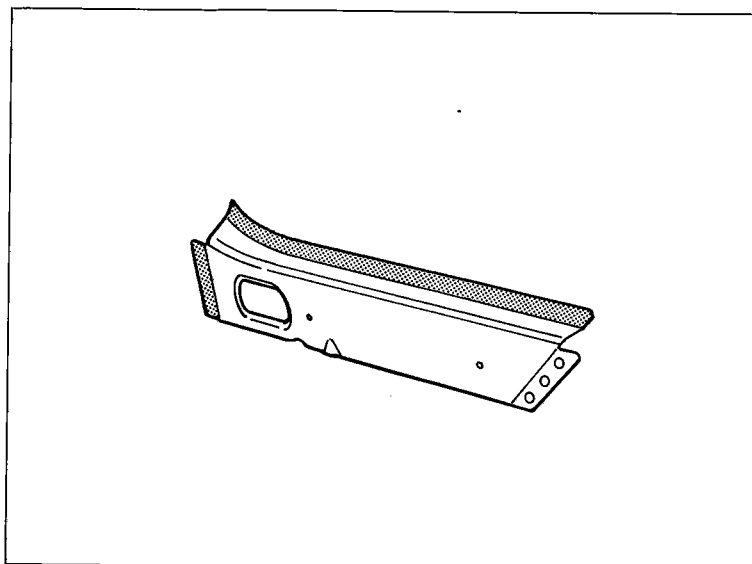


P4A126M01

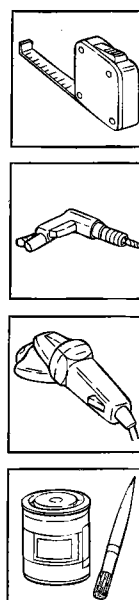


Preparing the spare part

1. Make equidistant holes in the side edge.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of replacement part using a disc grinder.
3. Use electro-galvanizing paint on the edges previously treated.

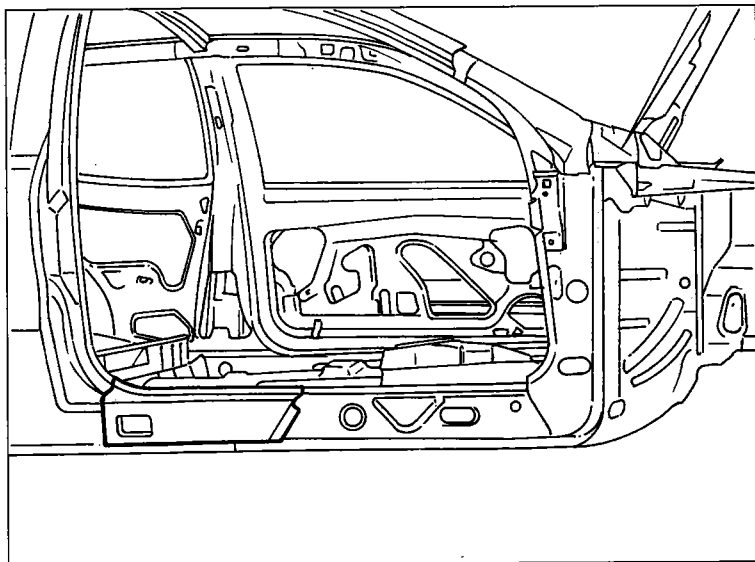


P4A126M02

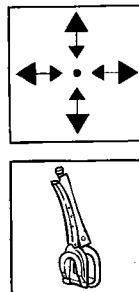


Positioning the replacement part

1. Carefully place the replacement part in position, from inside the pillar reinforcement.
2. Fix the replacement part to the bodyshell using the special self-locking clamps.

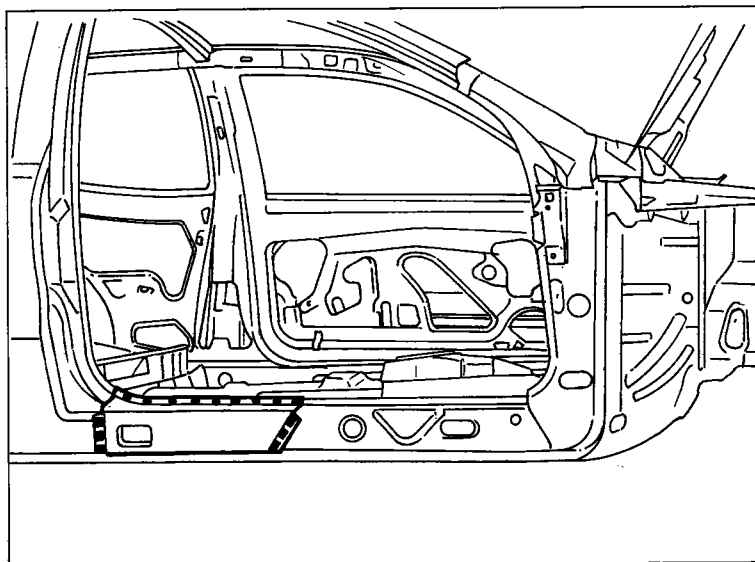


P4A127M01

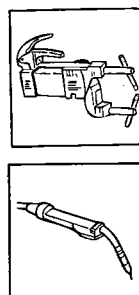


Welding the spare part

1. Carry out spot welding by the upper edge.
2. Using the MIG welder fill the holes made previously in the bodyshell.



P4A127M02



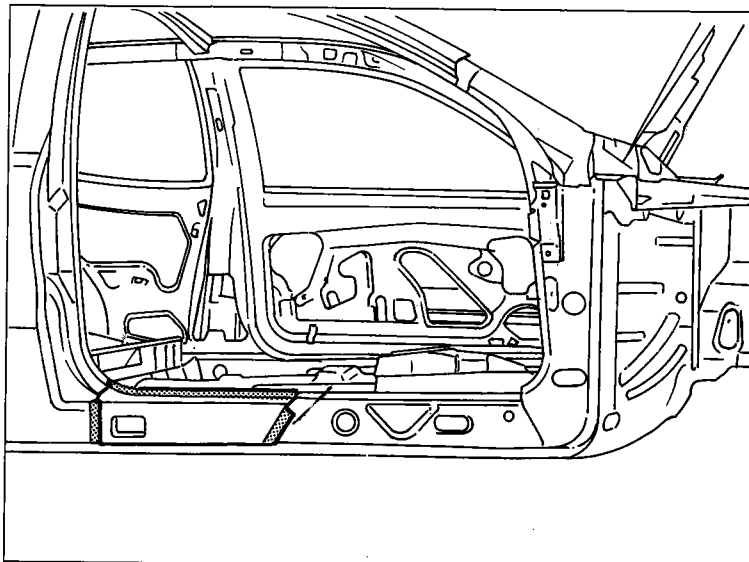
Proceed with fitting the underdoor side member and the rear wing (see: "Replacing body panels - Replacing Underdoor side member" and - Replacing rear wing").

Replacing structural body panels

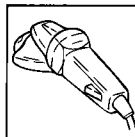
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.

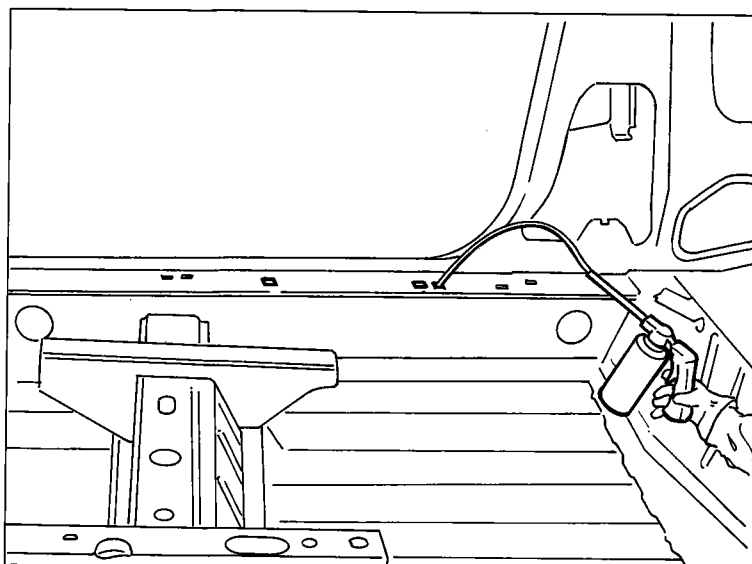


P4A128M01

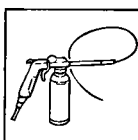
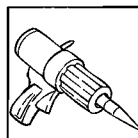
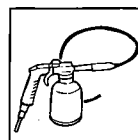


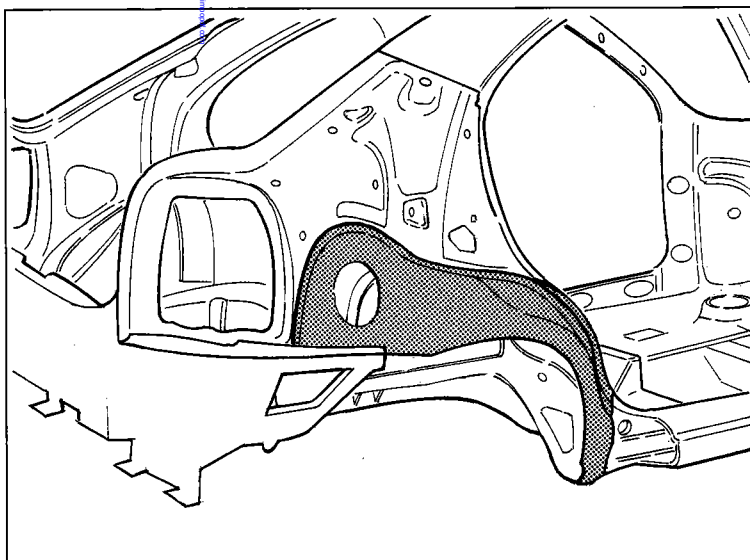
Protections

1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the join lines, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective to the inside of the underdoor side member.



P4A128M02



**REPLACING REAR
WHEEL ARCH (7090G 72)***

(*) *This number indicates the operation code given in the Flat rate manual.*

The component for which the replacement procedure is given is highlighted in the diagram at the side.

PRELIMINARY PROCEDURES

Establish the extent of the damage, check if there are distortions to the connected components by checking the bodyshell alignment figures, using suitable methods (jigs, templates or gauges).

Carry out any straightening operations required to the bodyshell before cutting.
After this operation check that the components not being replaced are intact.

PRELIMINARY DISMANTLING

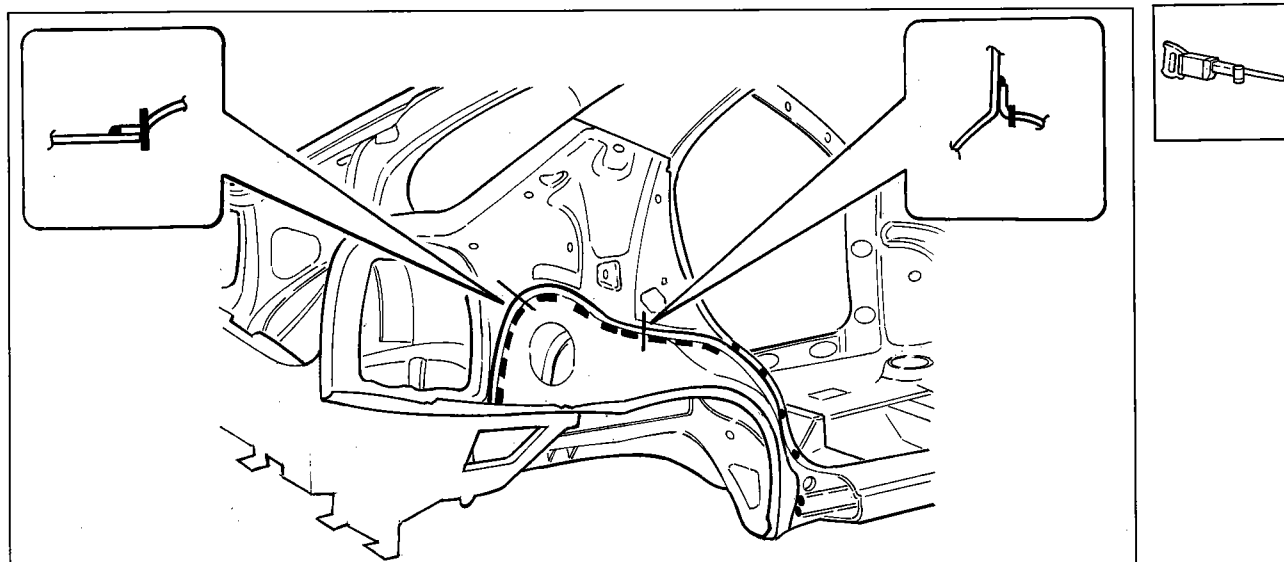
Remove the moving parts of the bodywork and interior fittings, which could impede the repair operations or be damaged during them.

Remove the rear wing (see: "Replacing body panels Replacing rear wing").

REMOVING

Cut using a power saw following the dotted lines shown in the diagram below, then remove the spot welds shown in the diagram.

The most important sections of the body panel are shown in order to allow the operator to adjust the position and the depth of the cutting so as not to damage the panels underneath.



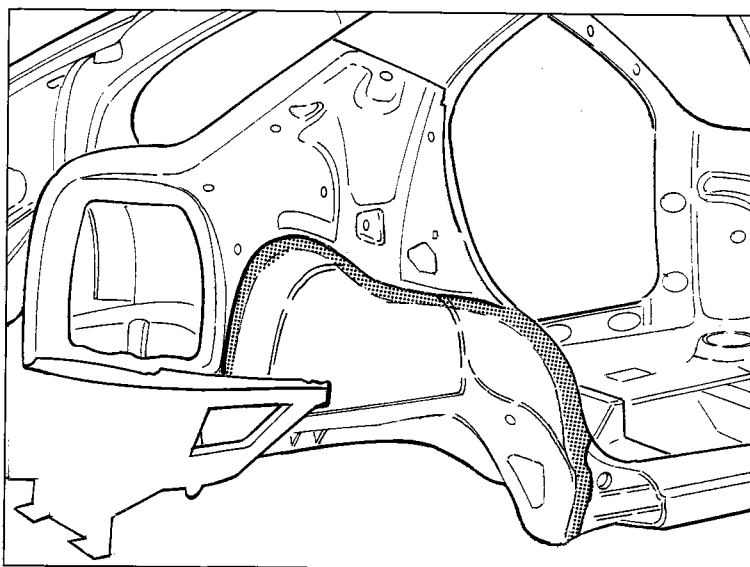
When carrying out the operations described, adhere strictly to the safety procedures. Protective shoes, ear-muffs and gloves should be worn during the cutting operations, welding masks and gloves during the welding operations, and a protective mask and gloves during the painting operations.

Replacing structural body panels

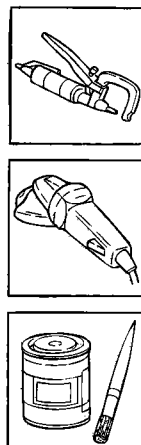
70.

Removing off cuts and preparing edges of bodyshell

1. Remove the spot welds along the entire perimeter of the edge of the bodyshell, using a special cutter.
2. Remove the metal off cuts using pliers.
3. Straighten the edges with a hammer and dolly block.
4. Remove the weld residues using a disc grinder.
5. Apply the IVI Epox epoxide type primer or an electro-weldable galvanized paint or an equivalent product, to the areas previously ground.

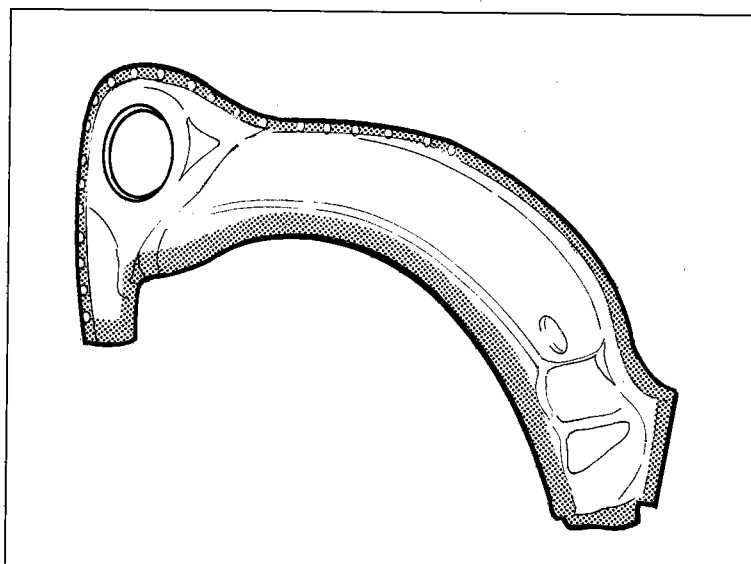


P4A130M01

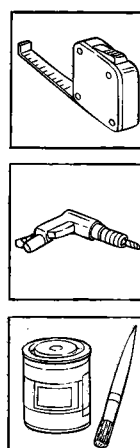


Preparing the spare part

1. Make equidistant holes in the upper edge of the replacement part.
2. Remove the anti-corrosion treatment from the entire perimeter of the inside and the outside of the replacement part using a disc grinder.
3. Use electro-galvanizing paint on the edges previously treated.

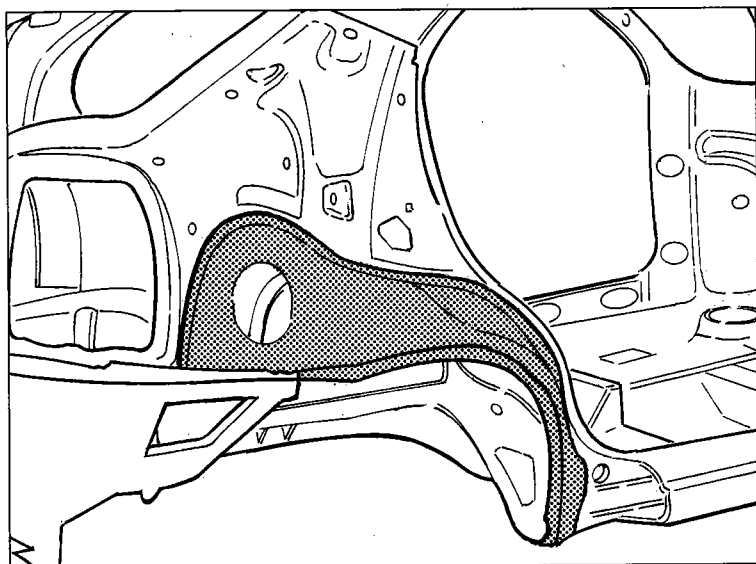


P4A130M02

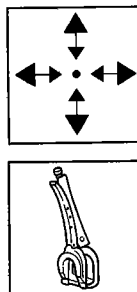


Positioning the replacement part

1. Carefully place the replacement part in position.
2. Fix the replacement part to the bodyshell using the special self-locking clamps.

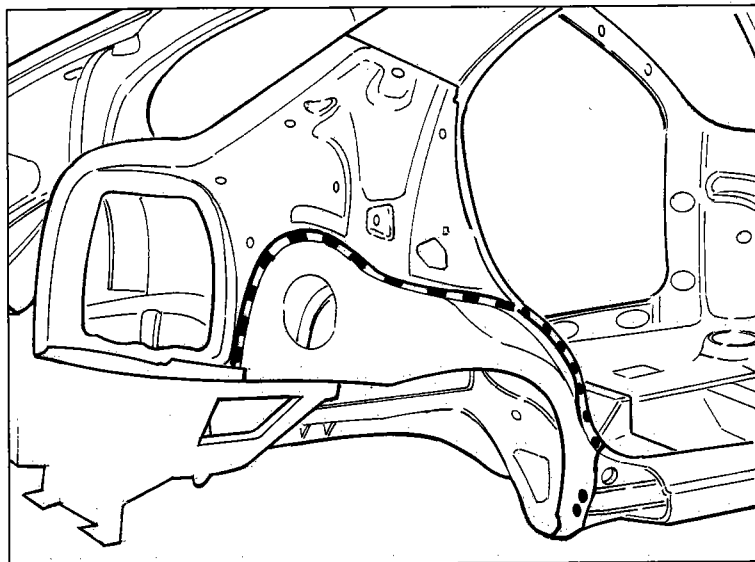


P4A131M01

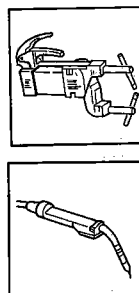


Welding the spare part

1. Carry out spot welding by the lower edge.
2. Using the MIG welder fill the holes made previously in the replacement part.



P4A131M02

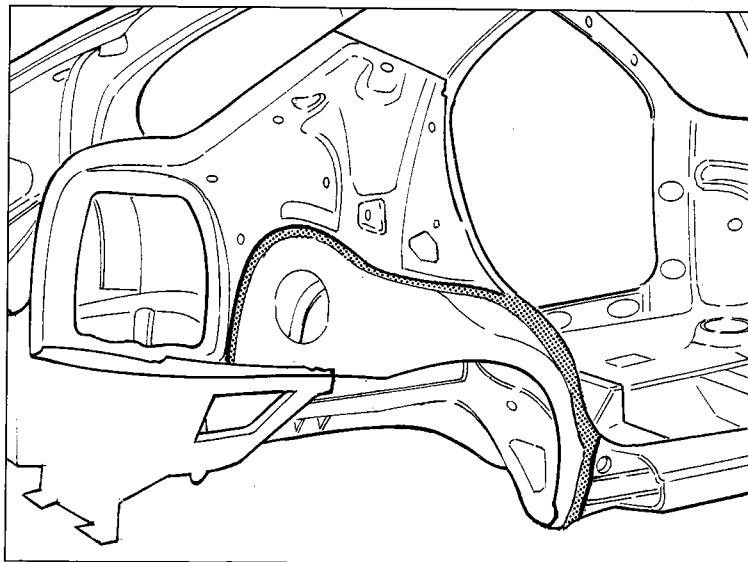


Replacing structural body panels

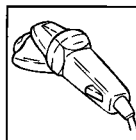
70.

Finishing operations

1. Correct any distortions to the panel using a hammer and dolly block.
2. Remove any weld slag using a disc grinder.



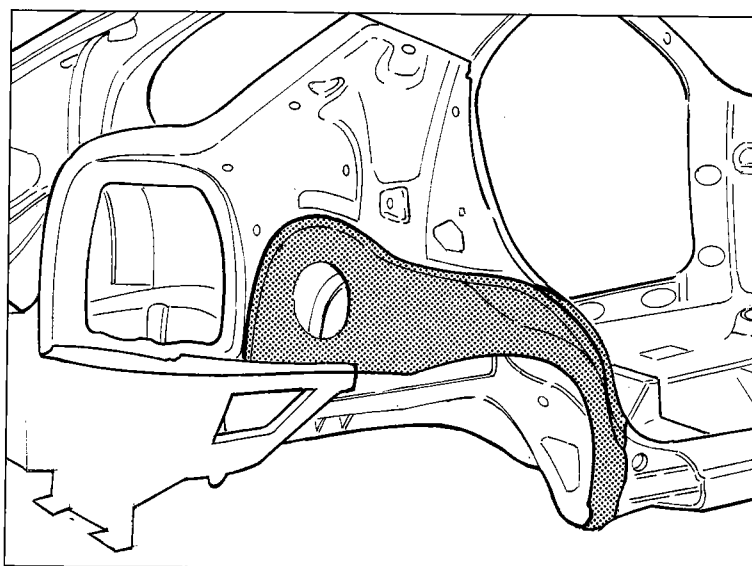
P4A132M01



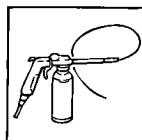
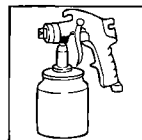
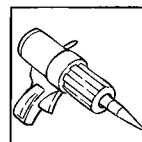
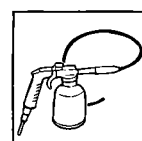
Proceed with fitting the rear wing (see: "Replacing body panels - Replacing Rear wing").

Protections

1. Apply the electro-phoretic protective treatment to the areas previously involved in the welding.
2. Seal the join lines, using IVI 854210 transparent acrylic sealant or an equivalent product.
3. Proceed with the painting and waxing stage.
4. Apply wax based oil protective to the inside of the underdoor side member.



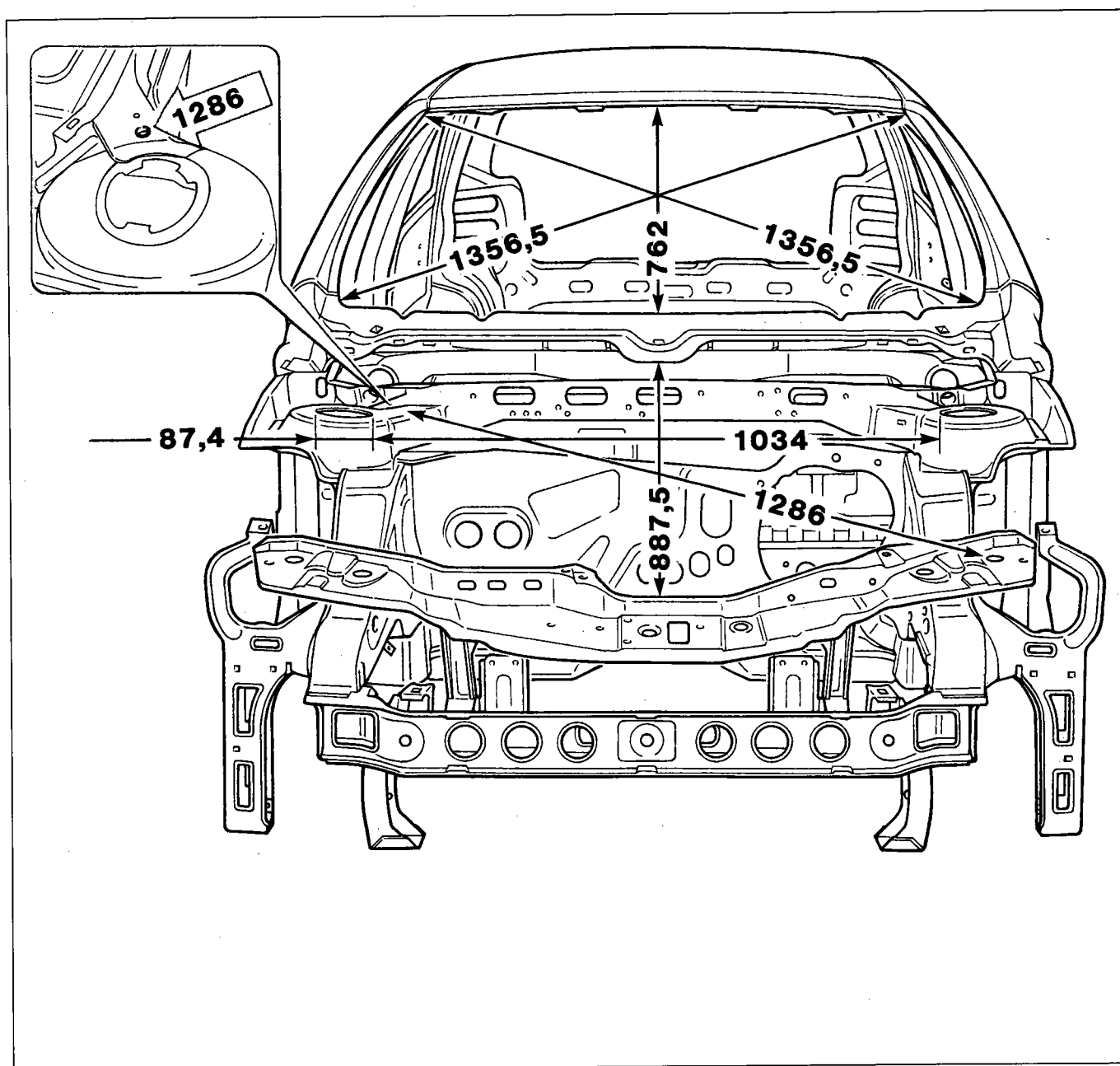
P4A132M02



TYPICAL MEASUREMENTS

Measuring windscreen housing and engine compartment dimensions

The figures for the housings, given below, are taken from the technical designs and are subject to tolerances of around ± 2 mm.

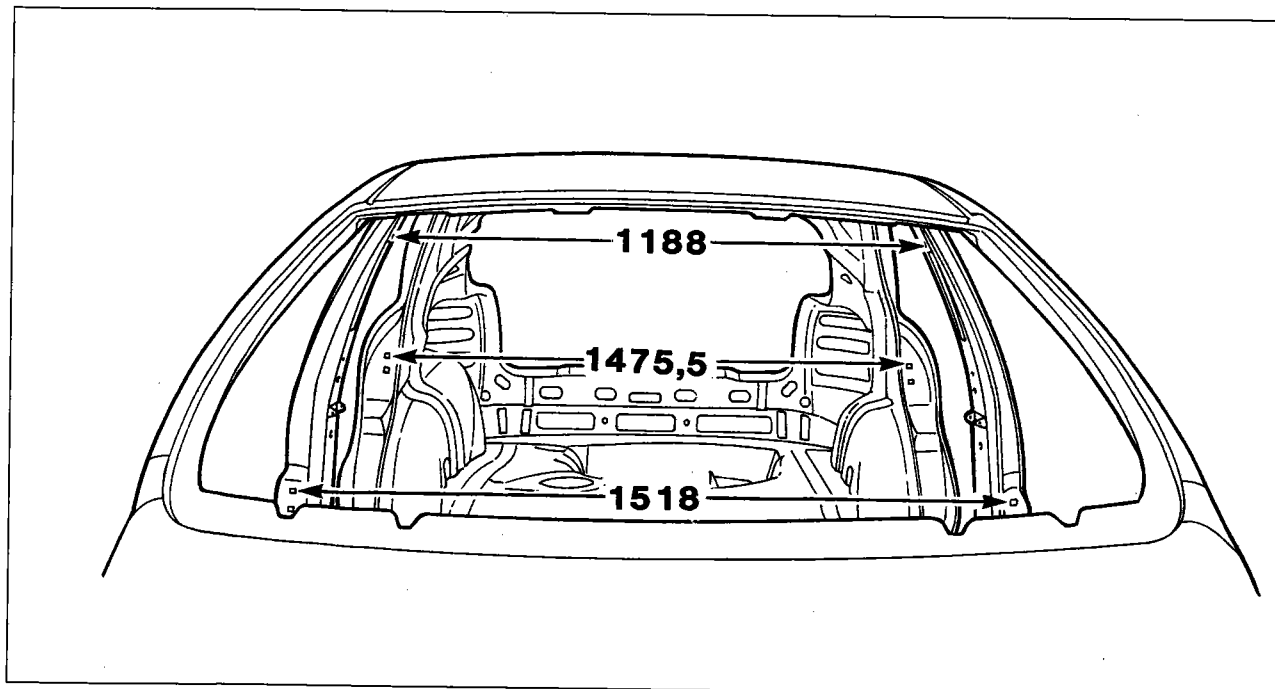


P4A133M01

Figures for checking windscreen housing, engine compartment and distance for front shock absorber attachment turrets

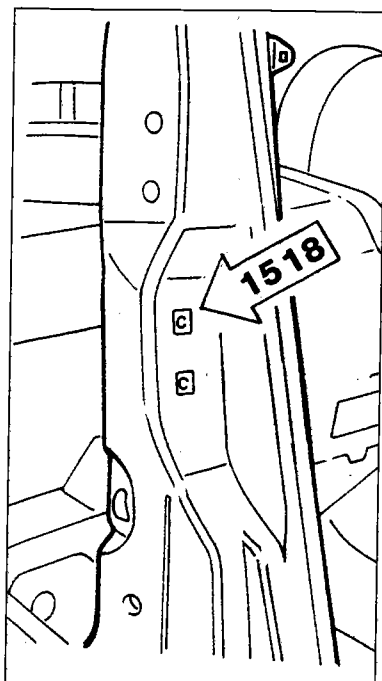
70.

Measuring dimensions of centre and rear pillar housing (5 door version)

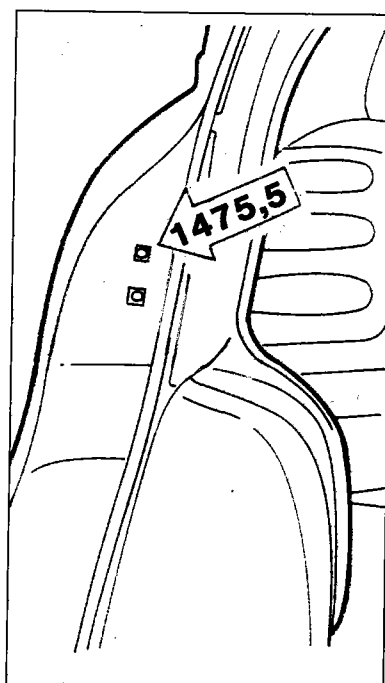


P4A134M01

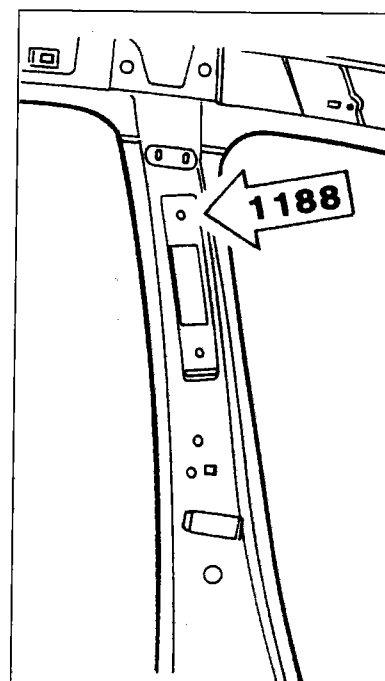
- *1518 : Centre pillar
- *1475,5: Rear pillar



P4A134M02



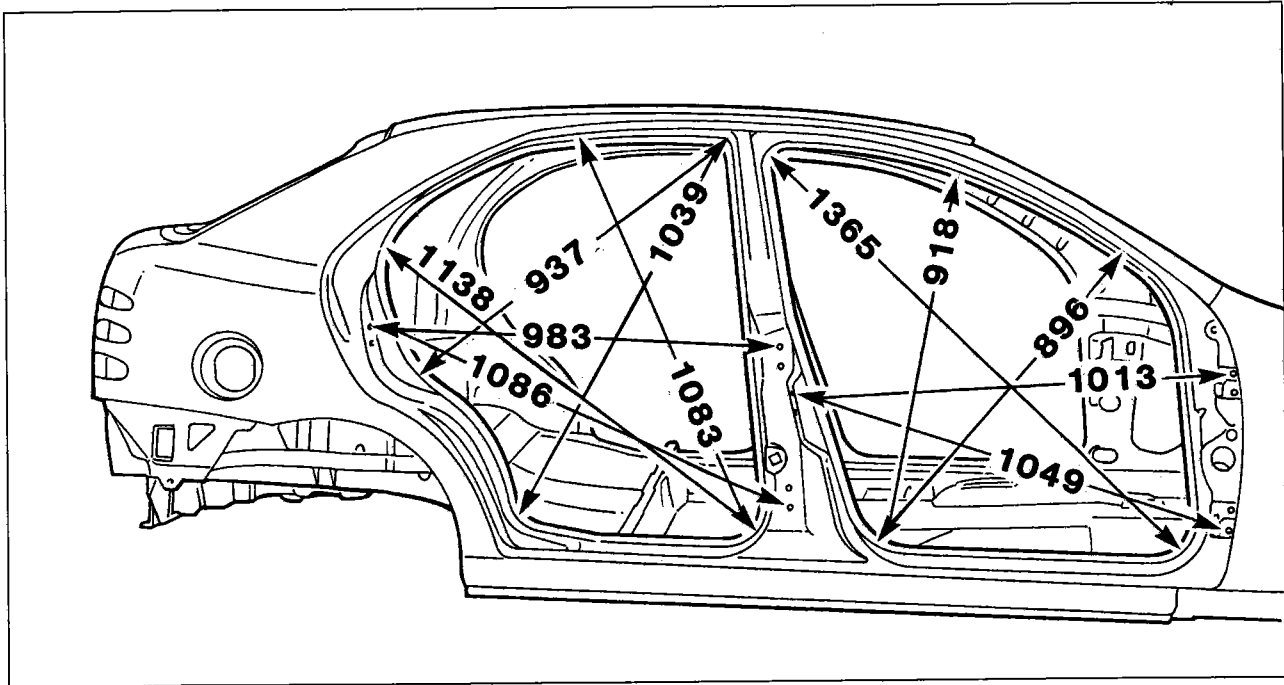
P4A134M03



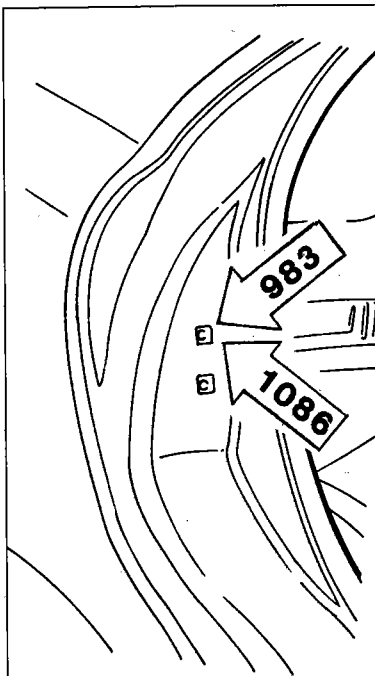
P4A134M04

Figures for checking distance between centre pillars for doors measured by the seat belt attachment nuts and between the lock strikers (5 door version)

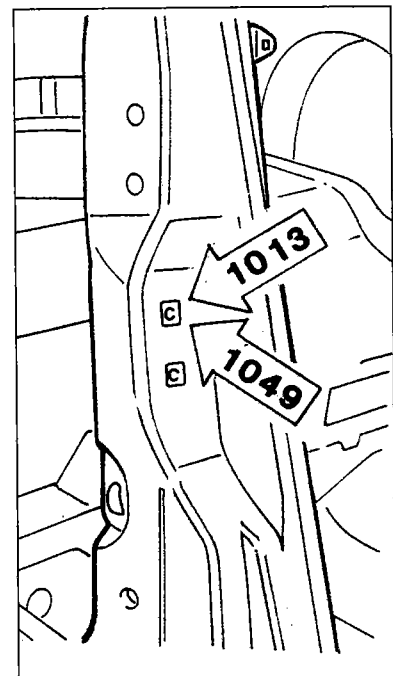
Measuring door housing dimensions



P4A135M01



P4A135M02

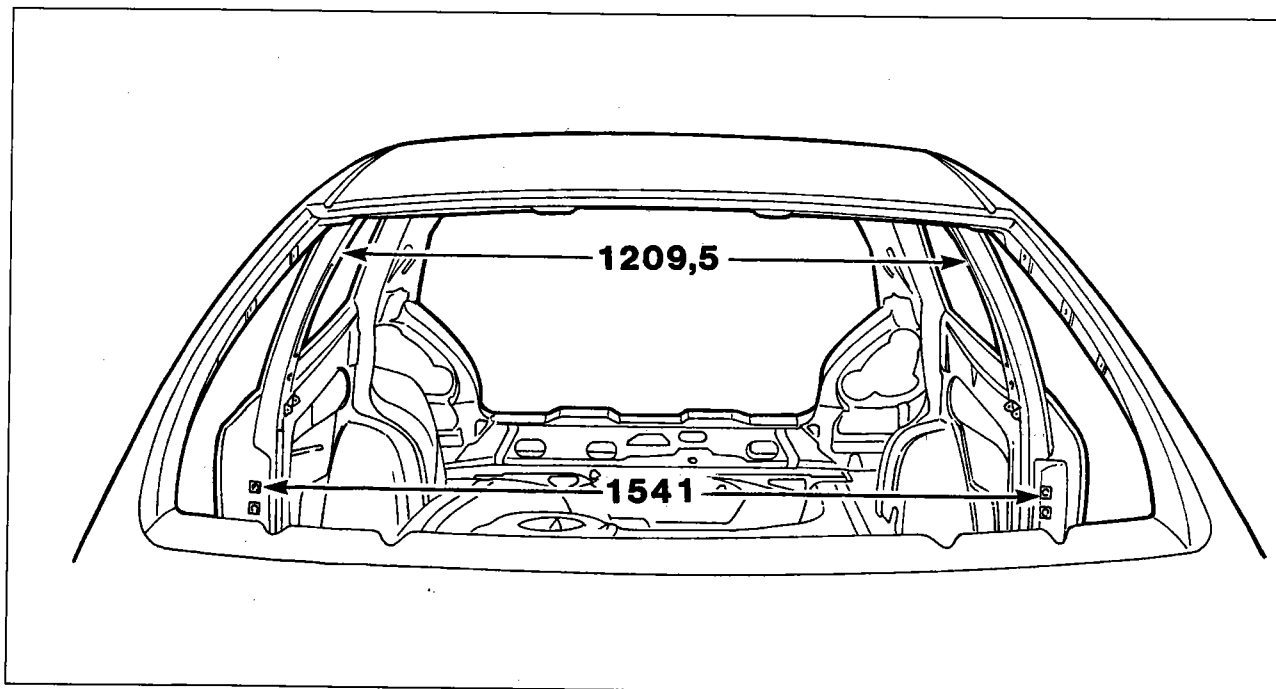


P4A135M03

Figures for checking door housings (5 door version)

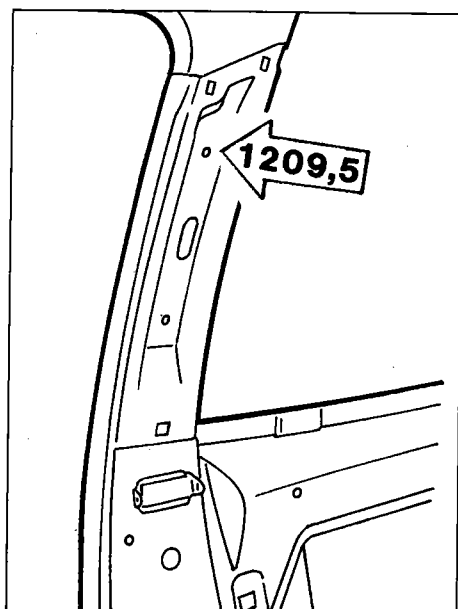
70.

Measuring dimensions of centre pillar housing and door housings (3 door version)

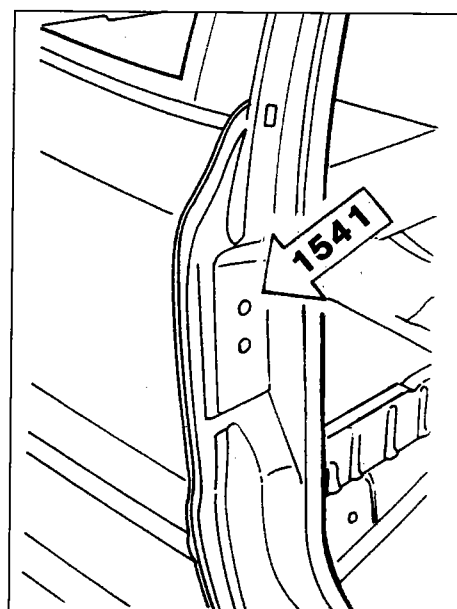


P4A136M01

Figures for checking distance between centre pillars for doors measured by the seat belt attachment nuts and between the lock strikers (3 door version)

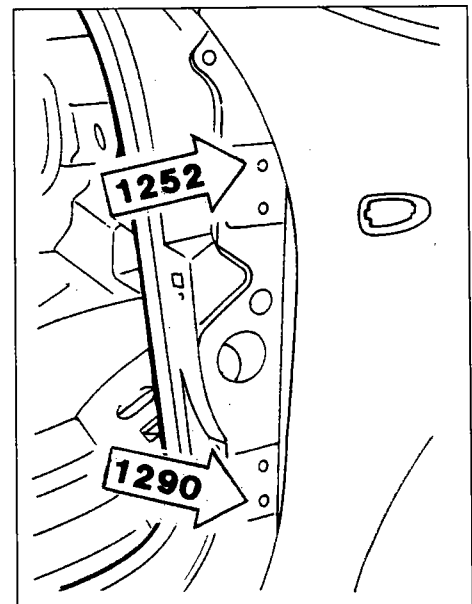
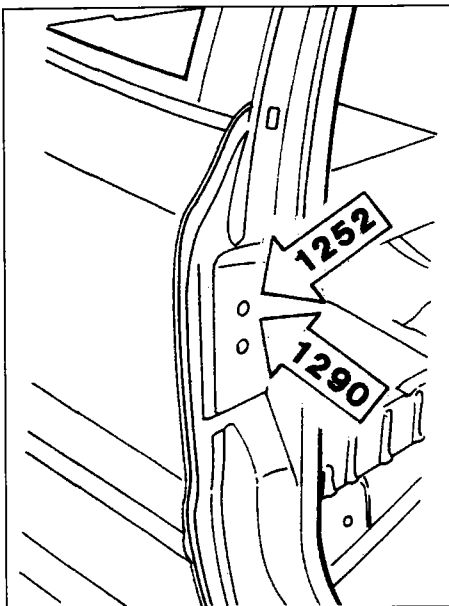
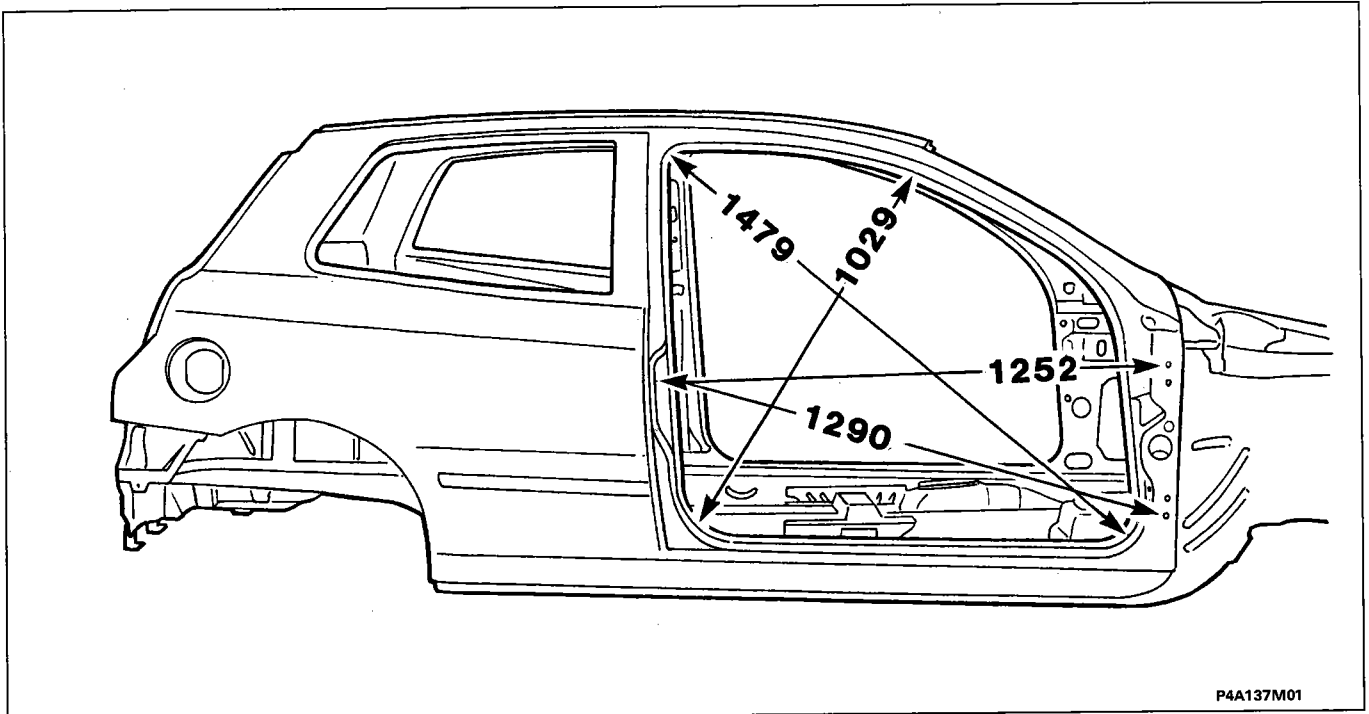


P4A136M02



P4A136M03

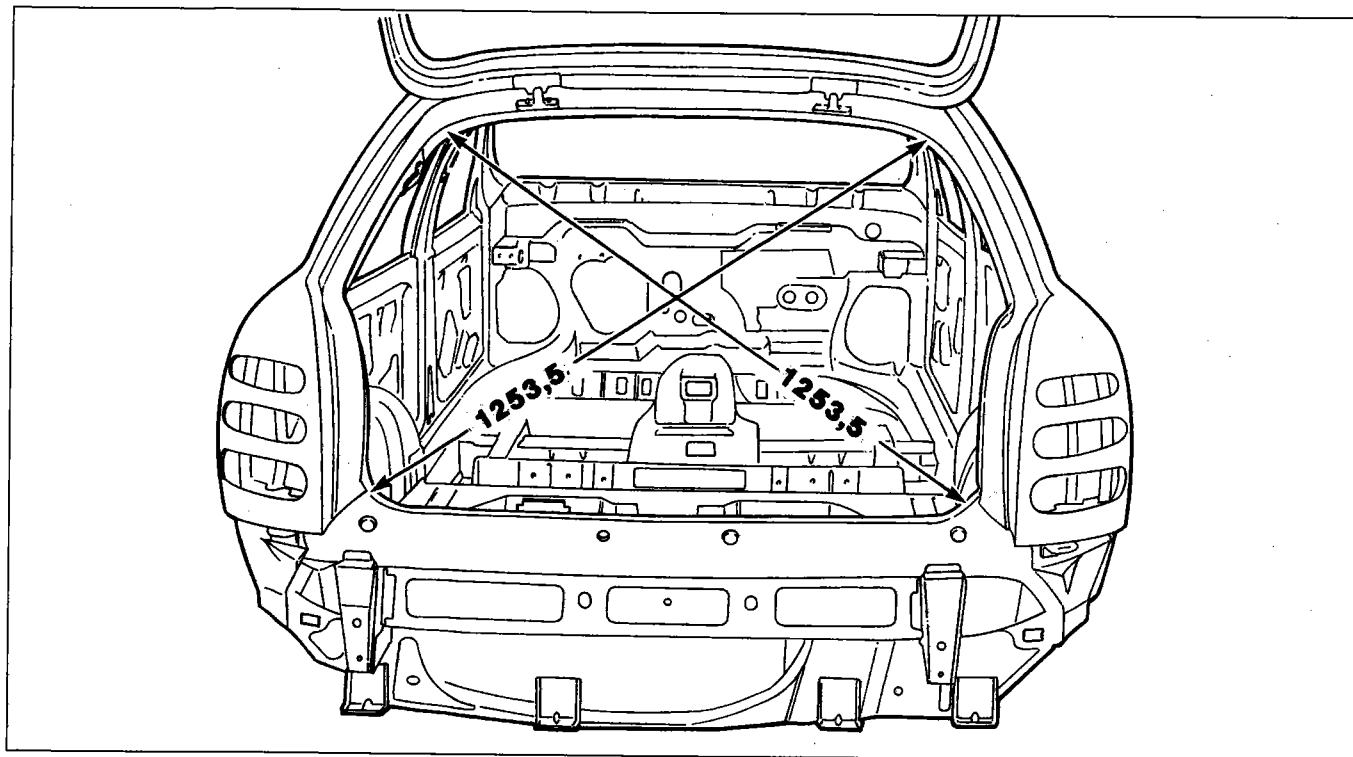
Measuring door housing dimensions



Figures for checking door housings (3 door version)

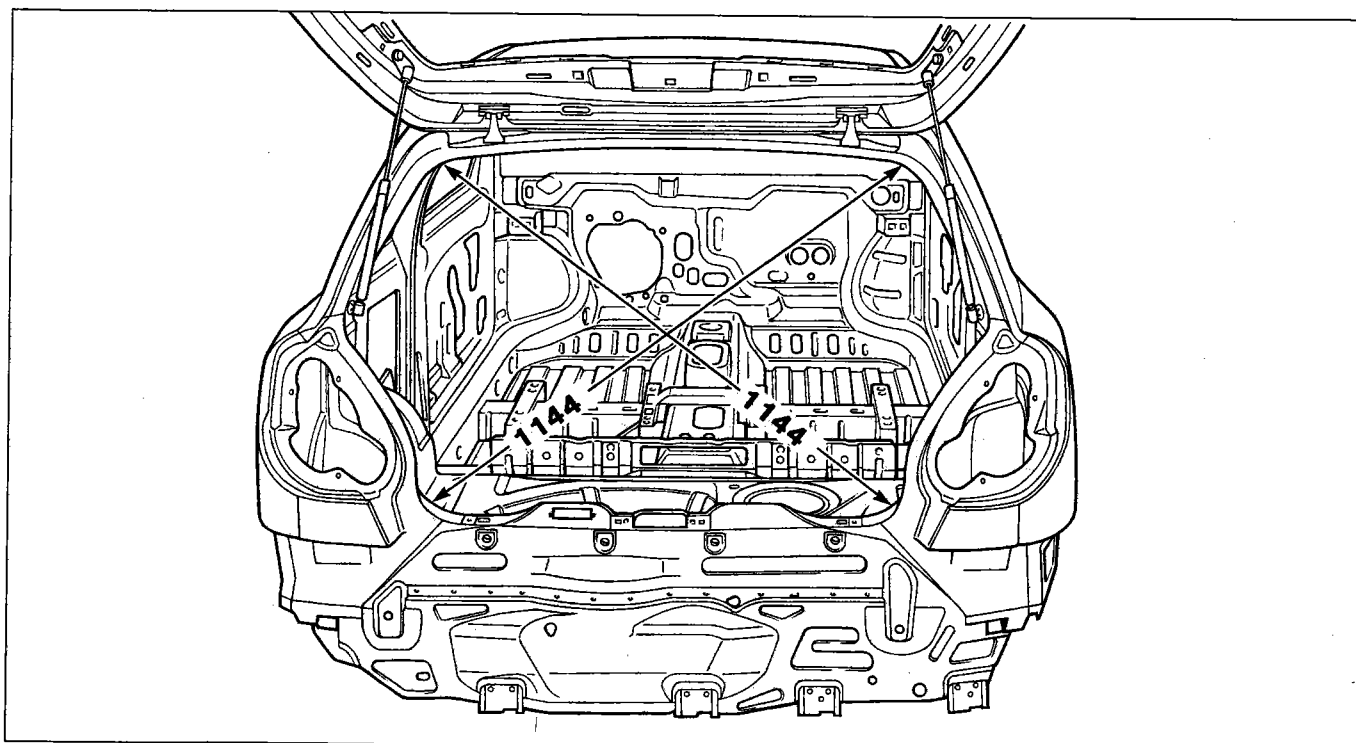
70.

Measuring rear tailgate housing dimensions (5 door version)

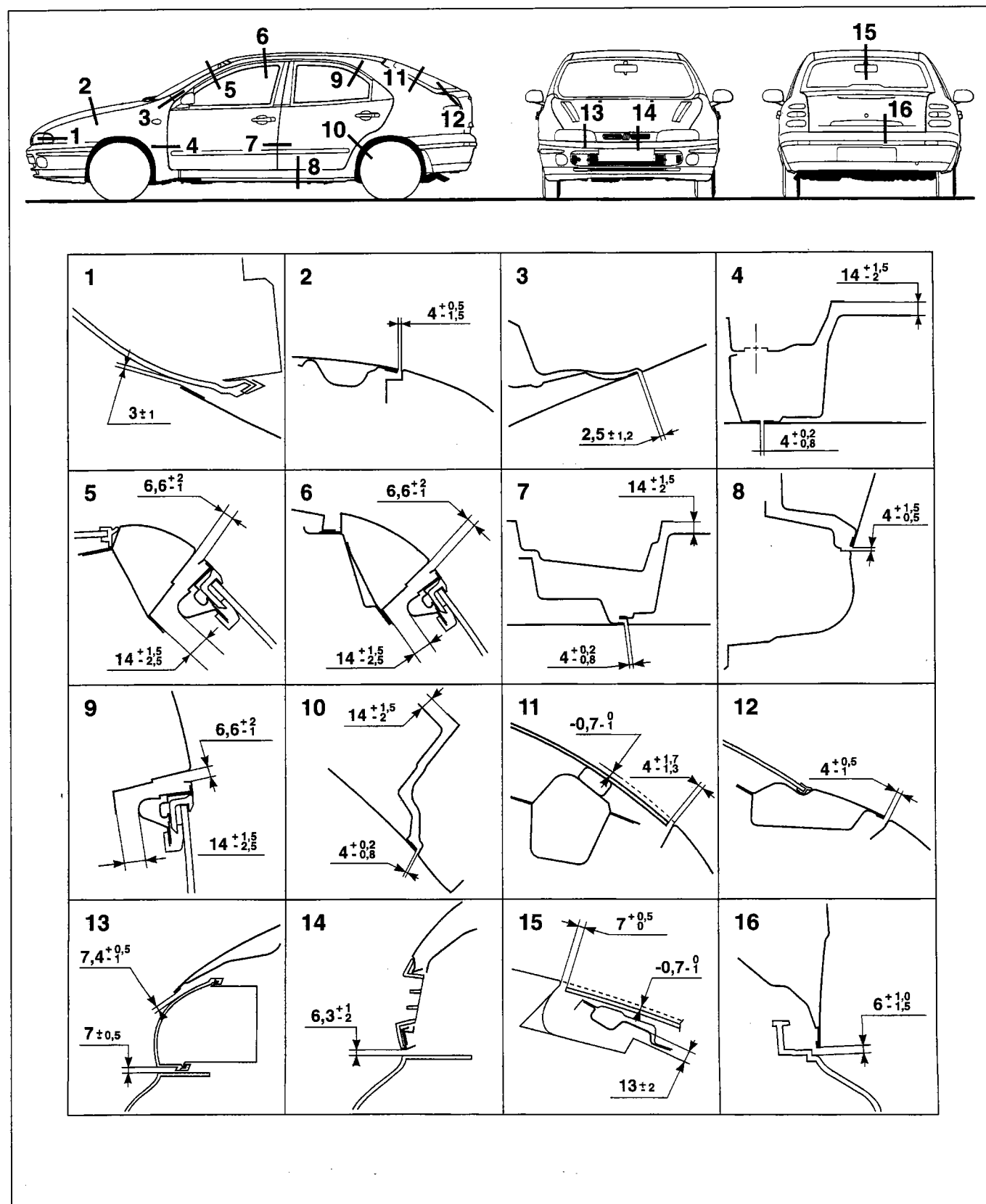


P4A138M01

Measuring rear tailgate housing dimensions (3 door version)



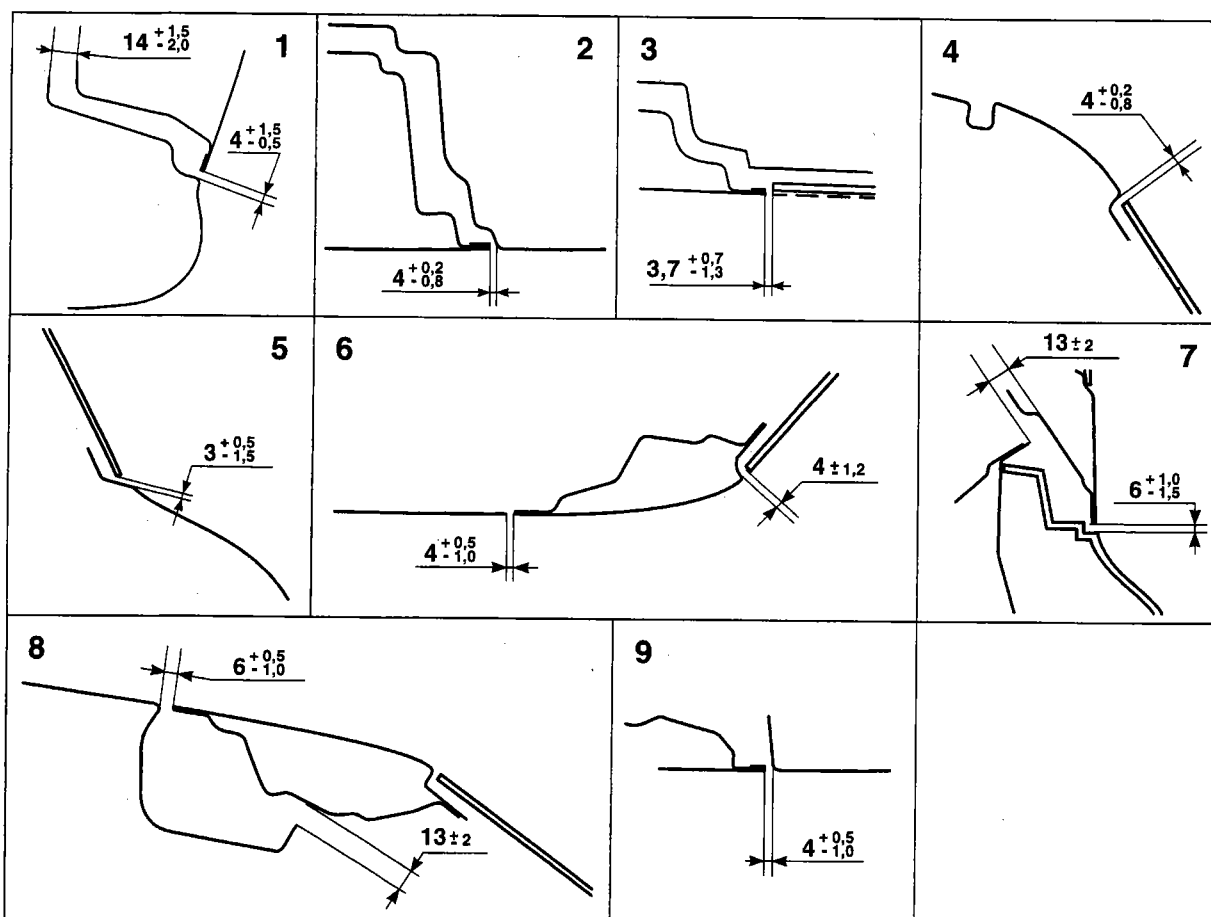
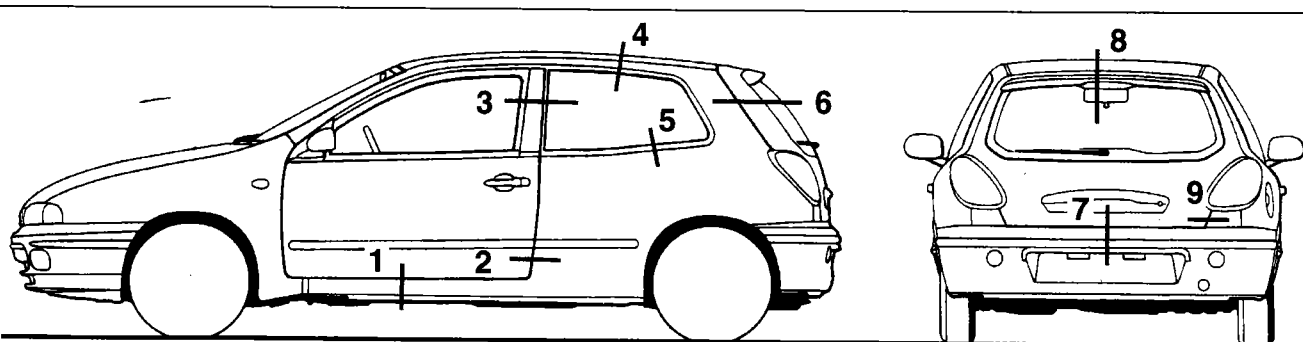
Figures for adjusting moveable parts (5 door version)



P4A139M01

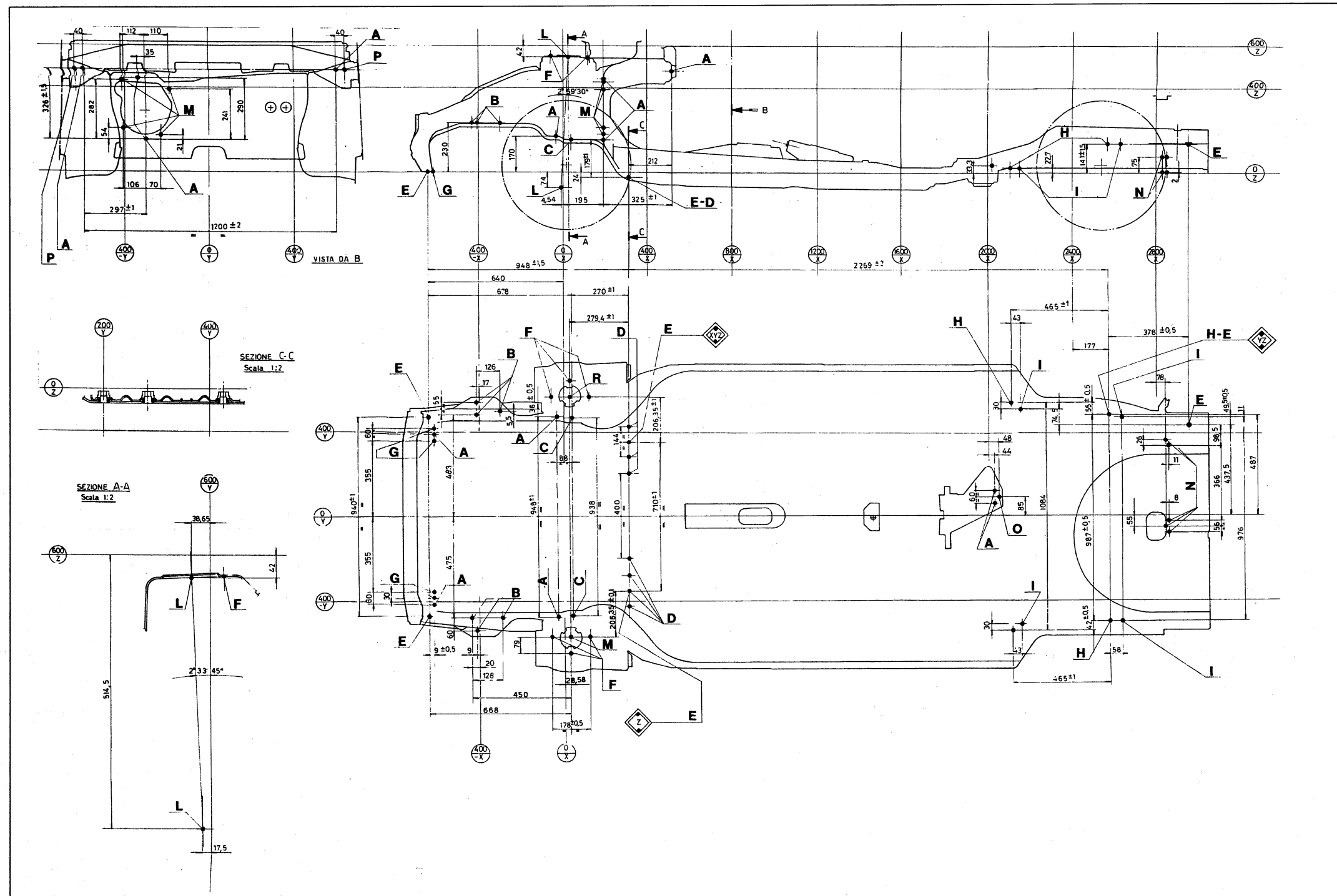
70.

Figures for adjusting moveable parts (5 door version)



P4A140M01

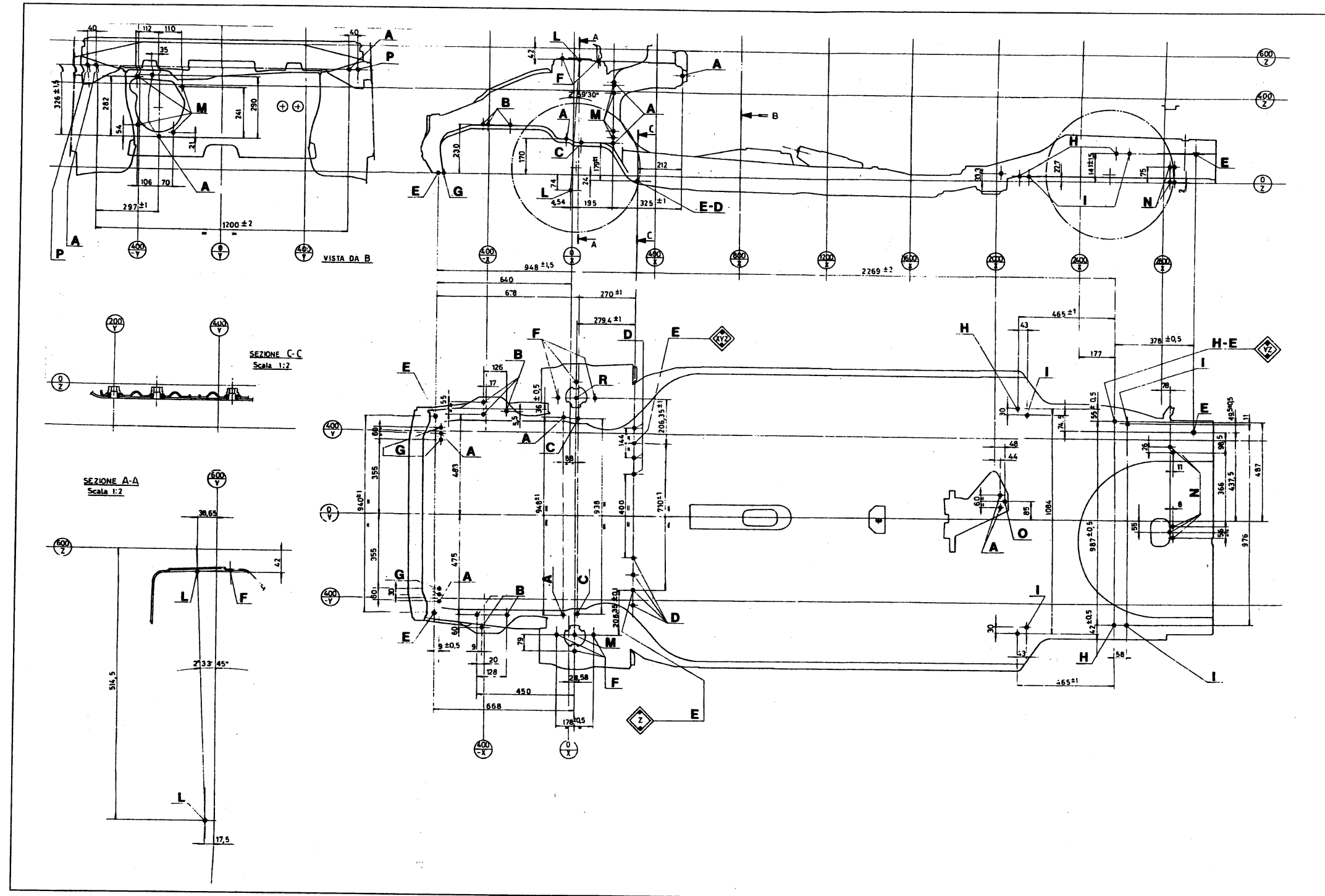
DIAGRAM FOR CHECKING THE FLOORPAN



P4A141 M01

- A. Reference hole for automatic screwing
- B. Engine attachments
- C. Suspension crossbeam front attachment
- D. Suspension crossbeam rear attachment
- E. Primary hole
- F. Damper attachment block fitting
- G. Centring holes for suspension on chassis
- H. Centring holes for suspension on pallet
- I. Rear suspension attachment
- L. Front suspension attachment
- M. Brake servo unit attachment
- N. Fuel tank attachment
- O. Exhaust attachment
- P. Crossbeam behind dashboard and steering column attachment

Diagram for checking the underbody



- A. Automatic tightening reference hole
- B. Engine fastenings
- C. Front suspension beam fastening
- D. Rear suspension beam fastening
- E. Main hole
- F. Damper attachment block fastener
- G. Lower radiator fastening
- H. Holes for locating suspension on pallet
- I. Rear suspension fastening
- L. Front suspension fastening
- M. Brake servo fastening
- N. Tank fastening
- O. Exhaust pipe fastening
- P. Facia beam and steering column fastening

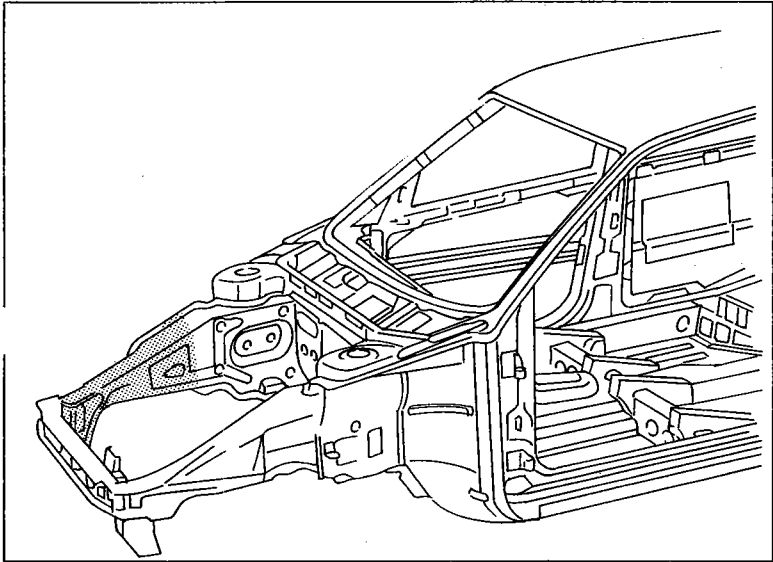
P4A141 M01

GRAPHIC INDEX

replacement operation

Reference in Manual

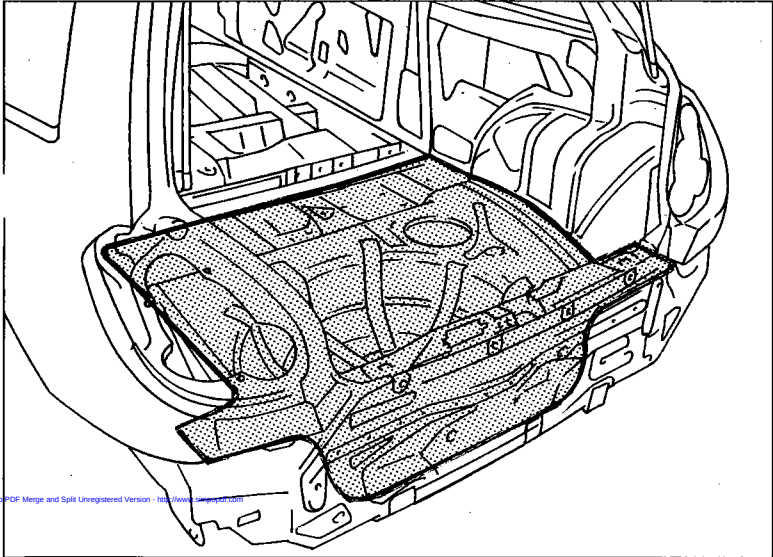
Partial front panel



P4A146M01

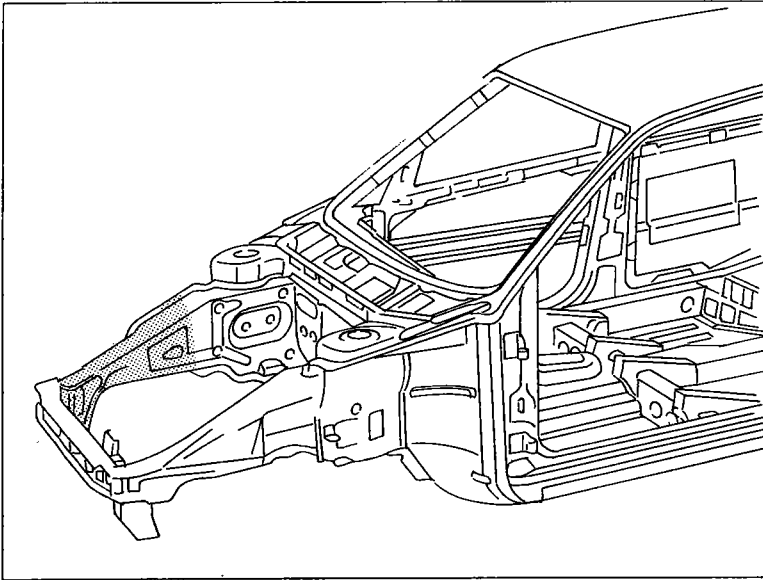
Replacing structural body panels page 147

Rear floor complete with side members



P4A146M02

Replacing structural body panels page 152



P4A146M01

PARTIAL REPLACEMENT OF FRONT PANEL

The component for which the replacement procedure is given is highlighted in the diagram at the side.

Preliminary procedures and safety regulations

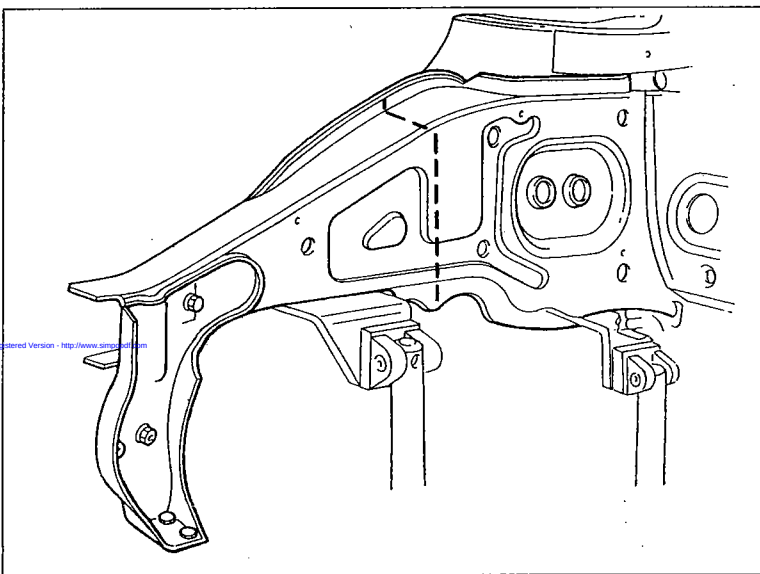
- Stick to what has been described previously for the other components.

Preliminary dismantling

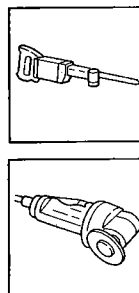
- Remove the front cross member (see: "Replacing body panels - Replacing front cross member")

Removing

- Cut the part to be replaced and remove it from the vehicle.



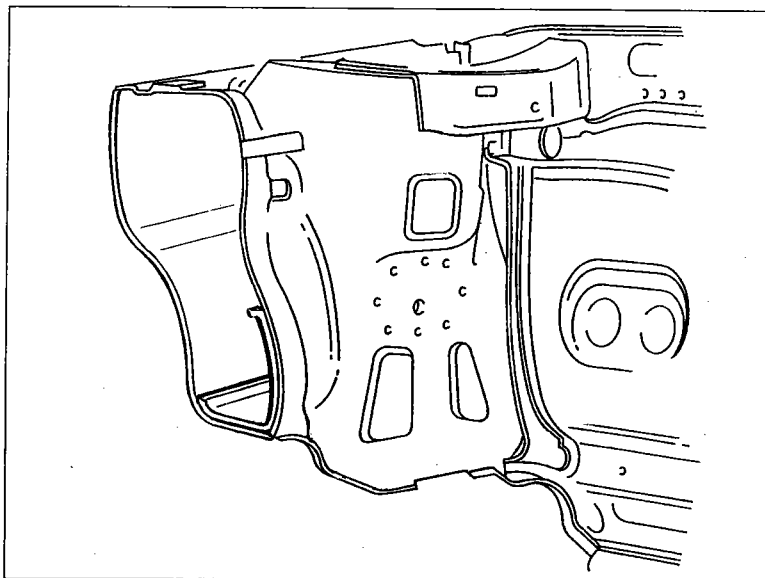
P4A147M01



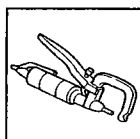
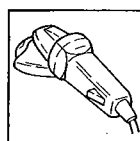
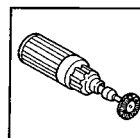
70.

Removing off cuts and preparing edges of bodyshell

1. Straighten any distortions to the bodyshell.

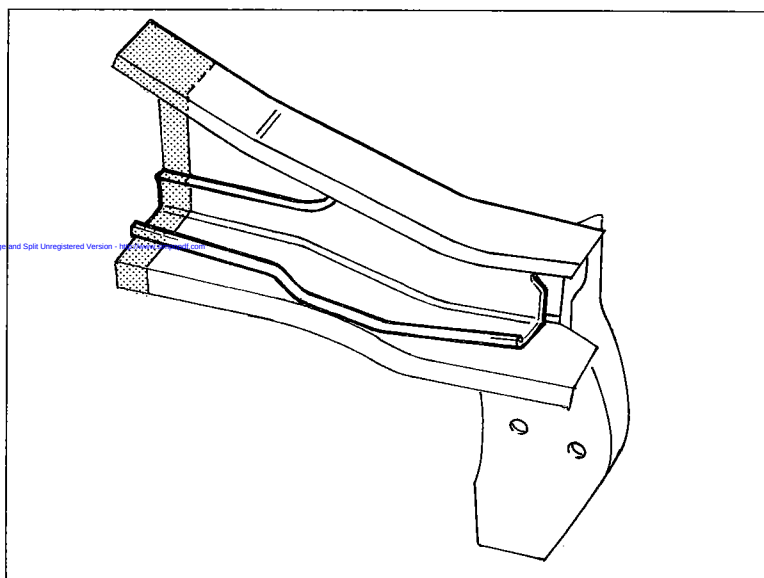


P4A148M01

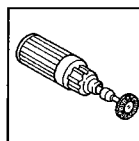


Preparing the spare part

1. Remove the excess from the replacement part so that it is about 20 mm longer than the part previously removed from the vehicle.

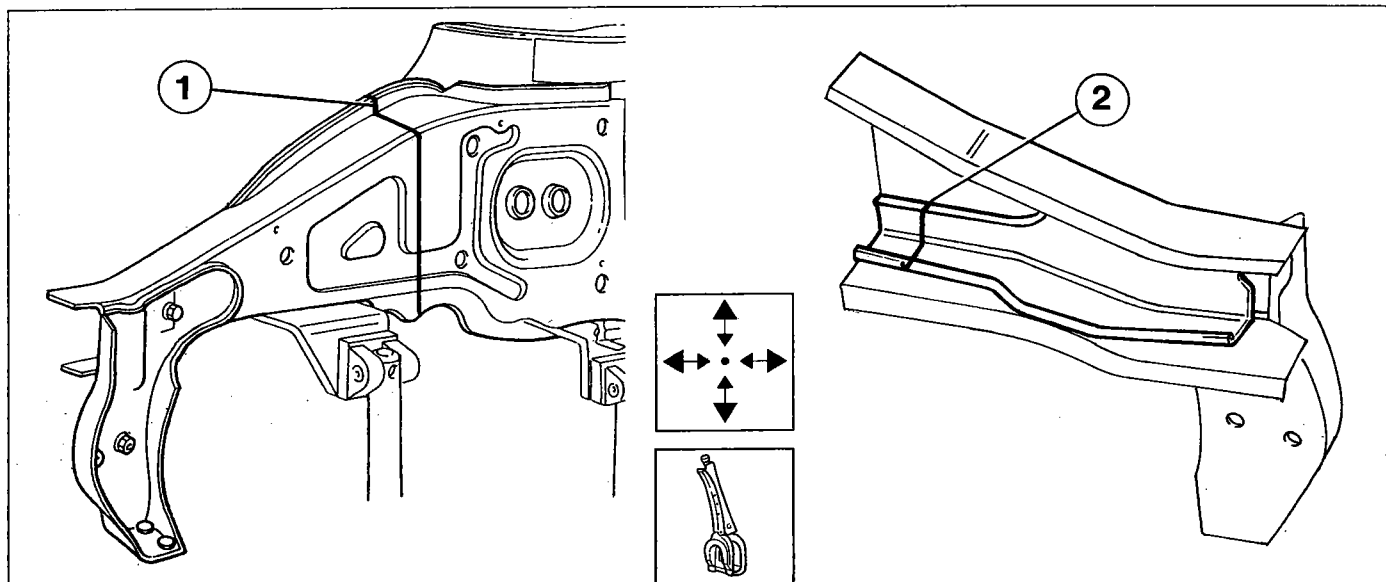


P4A148M02



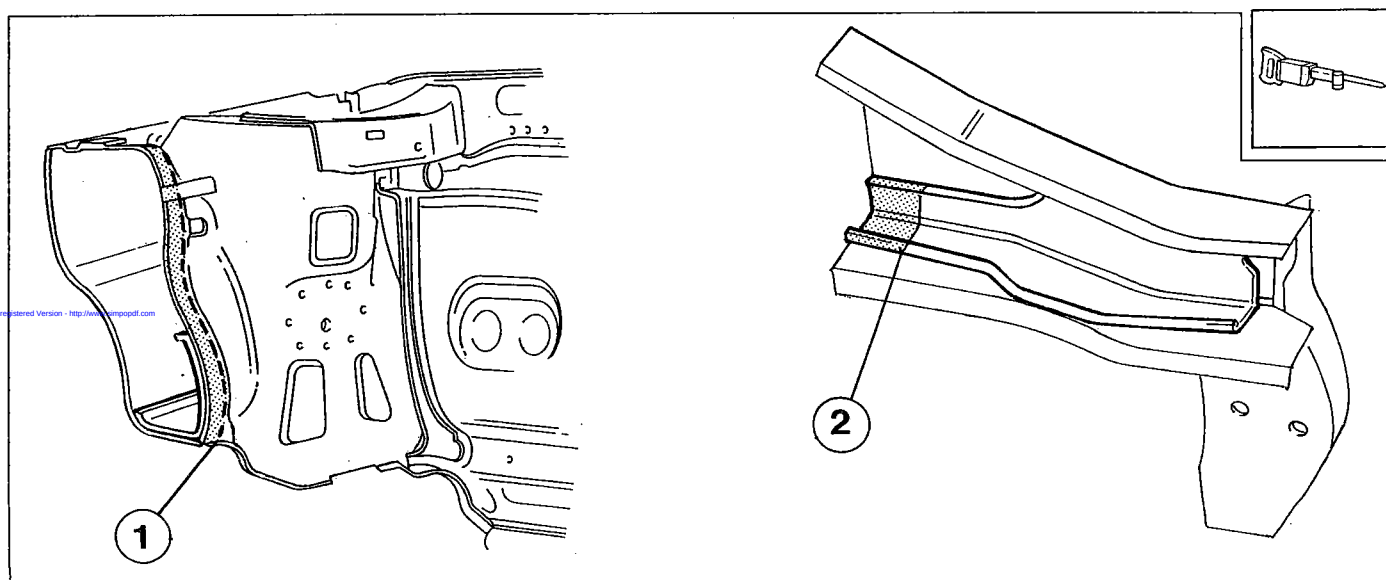
Positioning the replacement part

1. Position the replacement part on the vehicle and on the template and, after having checked that it is perfectly superimposed, mark the parts to be removed on the vehicle (1) and on the replacement reinforcement (2).



P4A149M01

2. Remove the part previously marked with the cutting line (1) from the bodyshell, taking care not to damage the internal reinforcement.
3. Remove the section of the reinforcement marked previously with the cutting line (2) from the replacement part.

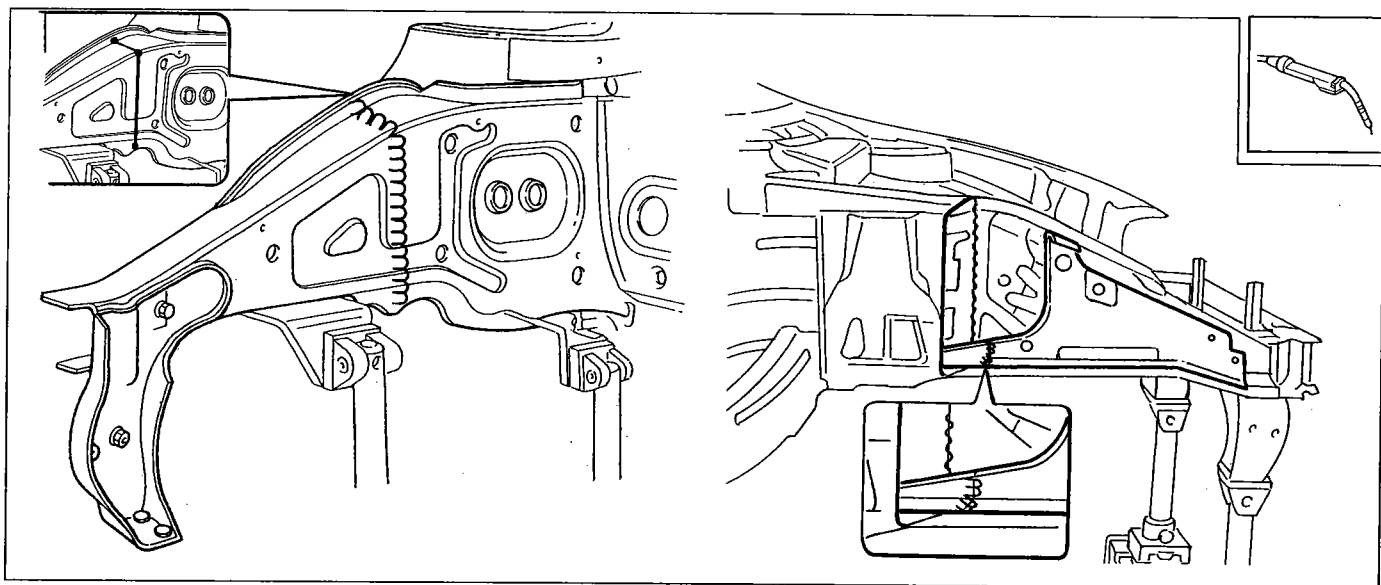


P4A149M02

70.

Welding the spare part

1. Reposition the replacement part on the vehicle and on the template, check that it is perfectly aligned and then weld the panel and then the reinforcement.

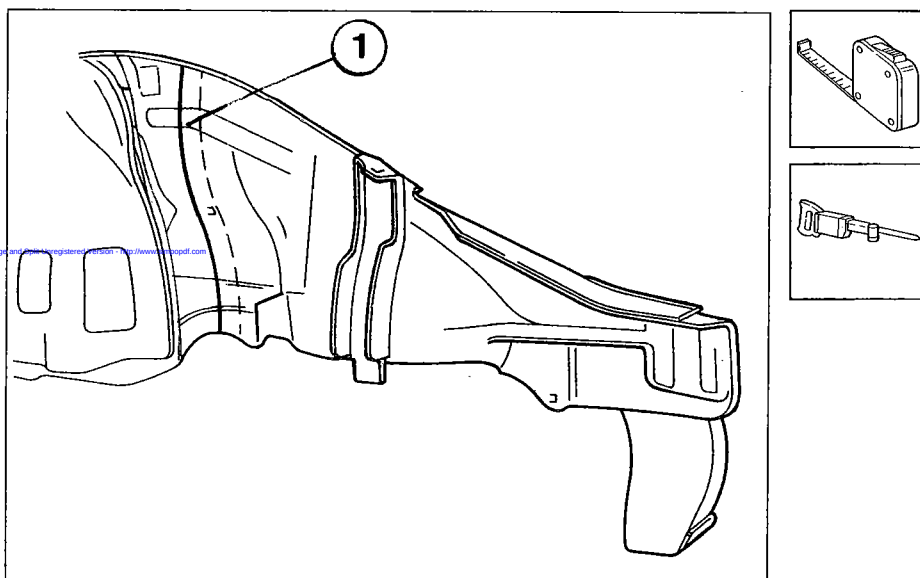


UUUUUUU Continuous MIG welding

P4A150M01

Preparing and positioning the replacement part

1. Remove the excess from the replacement part so that it is about 20 mm longer than the part previously removed from the vehicle.
2. Position on the template and on the vehicle marking it on the vehicle with the cutting line (1).
3. Remove the area previously marked by the cutting line (1) from the vehicle.



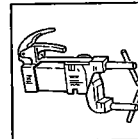
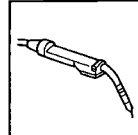
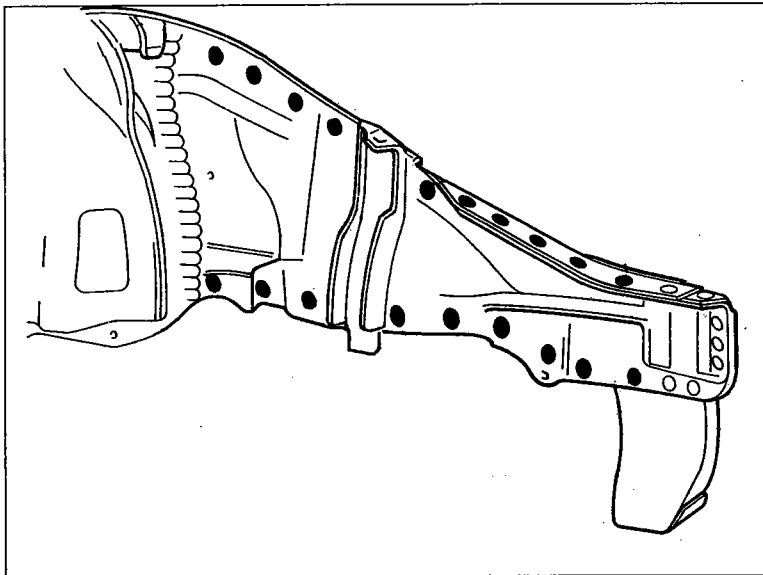
P4A150M02

Welding the outer panel replacement part

1. Reposition the replacement part on the template and on the bodyshell, align it correctly, then weld it as illustrated in the diagram.



Carry out the three welds illustrated so that they are not positioned along the same line and are therefore offset to one another (see page 59 in this manual).

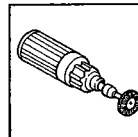
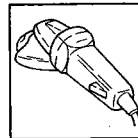
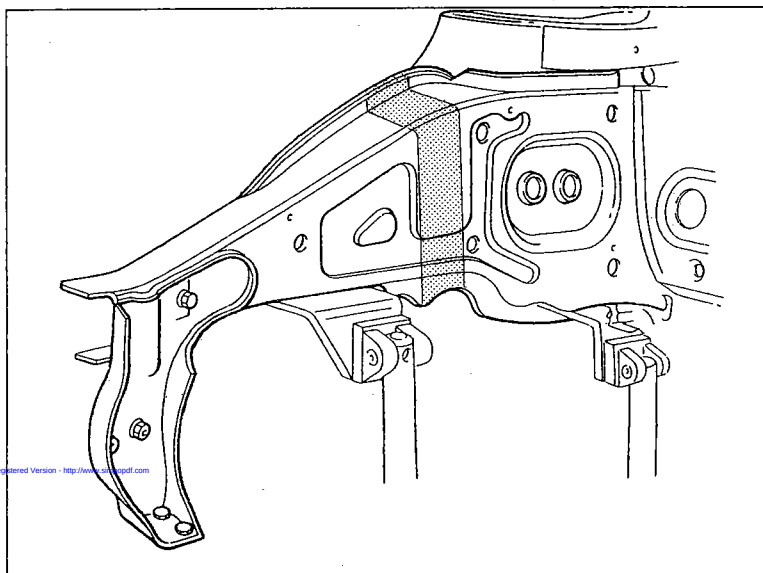


~~~~~ Continuous MIG welding  
..... Spot welding

P4A151 M01

### Finishing operations

1. Remove and smooth out the weld residues.



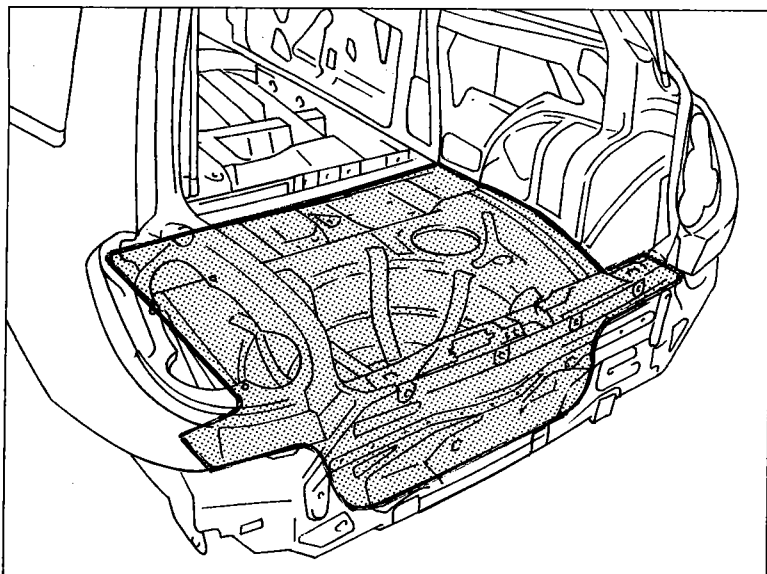
P4A151 M02

Proceed with fitting the front cross member (see: "Replacing front cross member")

### Protections

Refer to what has been described previously for the other components.

### 70.



P4A146M02

### PARTIAL REPLACEMENT OF REAR FLOOR

The component for which the replacement procedure is given is highlighted in the diagram at the side.

#### Preliminary procedures and safety regulations

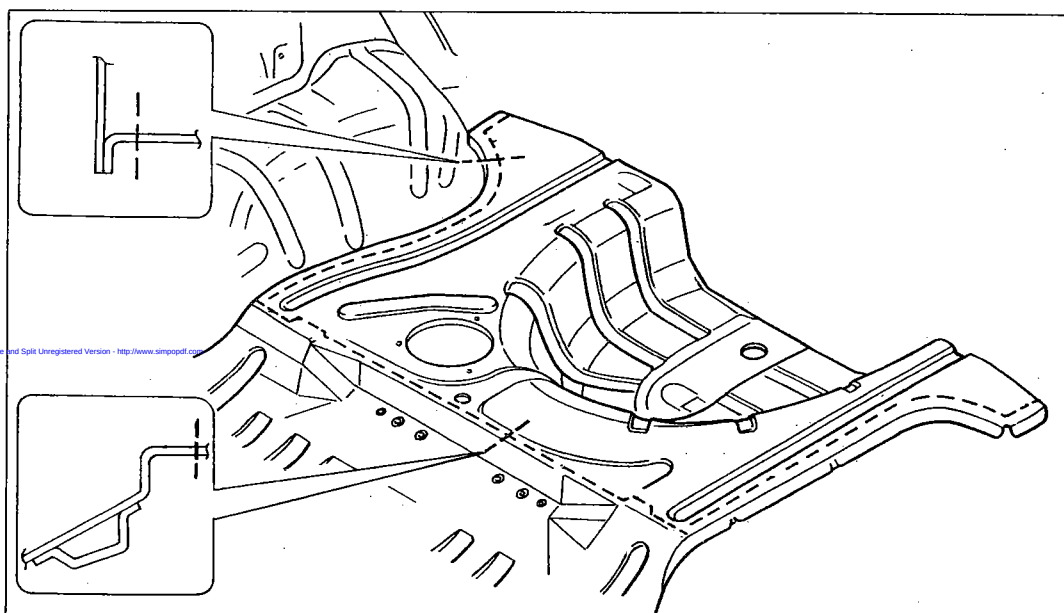
- Refer to the previous description for the other components.

#### Preliminary dismantling

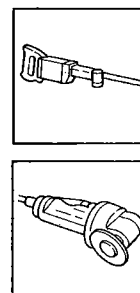
- Remove the rear cross member (see: "Replacing body panels - Replacing rear cross member")

#### Removing

- Using a power saw, cut along the dotted lines shown below.

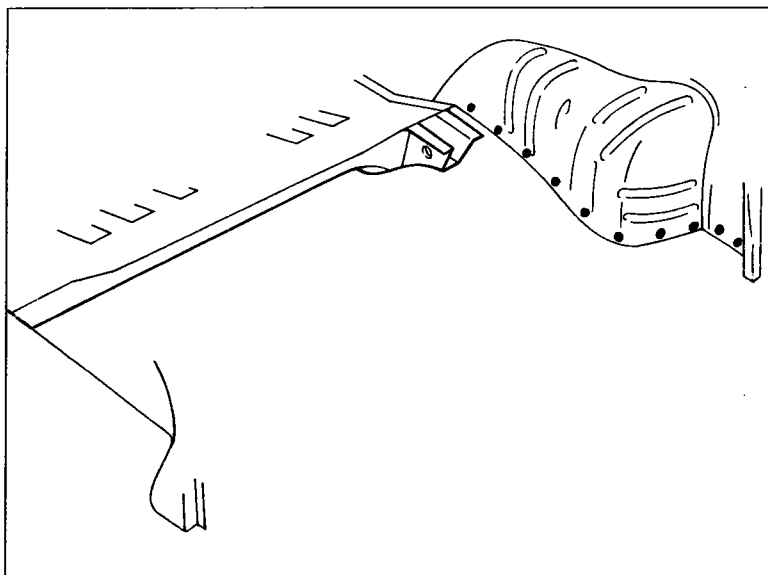


P4A152M01

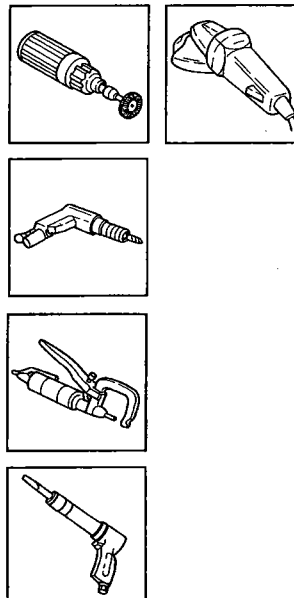


### Removing the off cuts, preparing the edges of the bodyshell

1. Remove the weld points along the wheel arches.

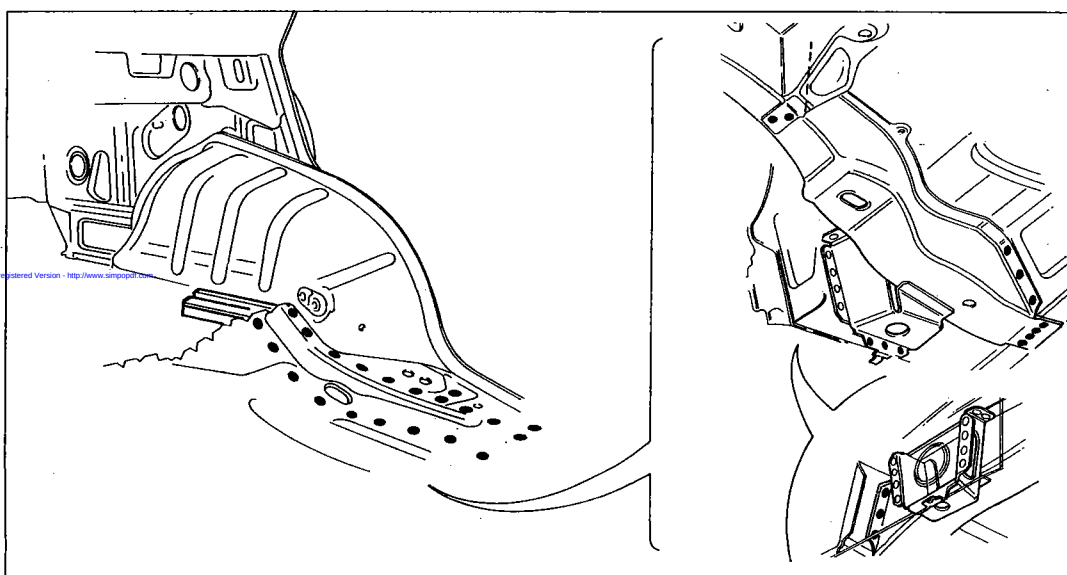


P4A153M01

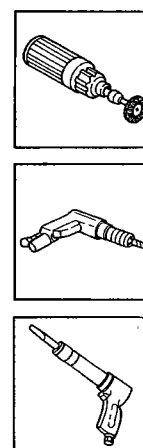


### COMPLETE REPLACEMENT OF A SIDE MEMBER

1. Remove the lower and upper spot welds for the side member.
2. Open the tab and remove the side member off cuts.
3. Straighten the edges of the bodyshell.
4. Remove the weld residues.



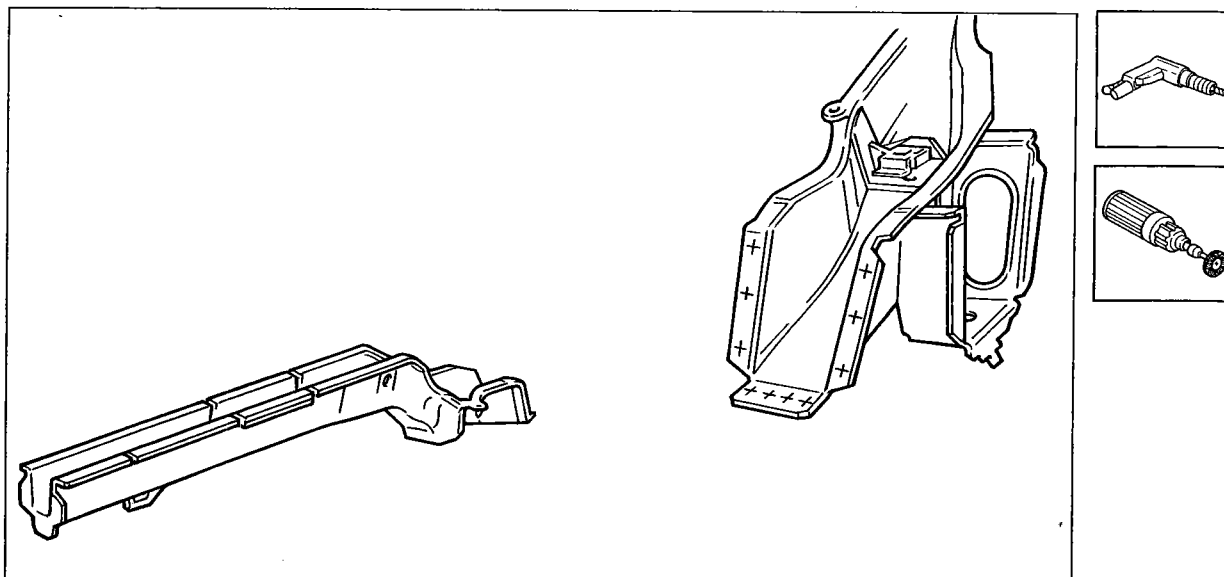
P4A153M02



## 70.

### Preparing the spare part

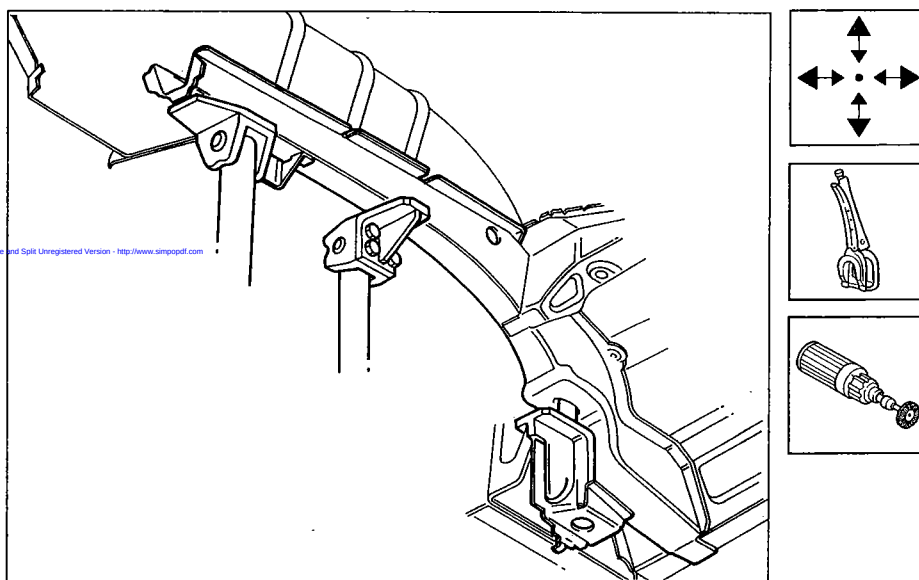
1. Trace and drill the new side member with a 5 mm point, as shown in the diagram.
2. Clean the areas affected by the welding.



P4A154M01

### Positioning the replacement part

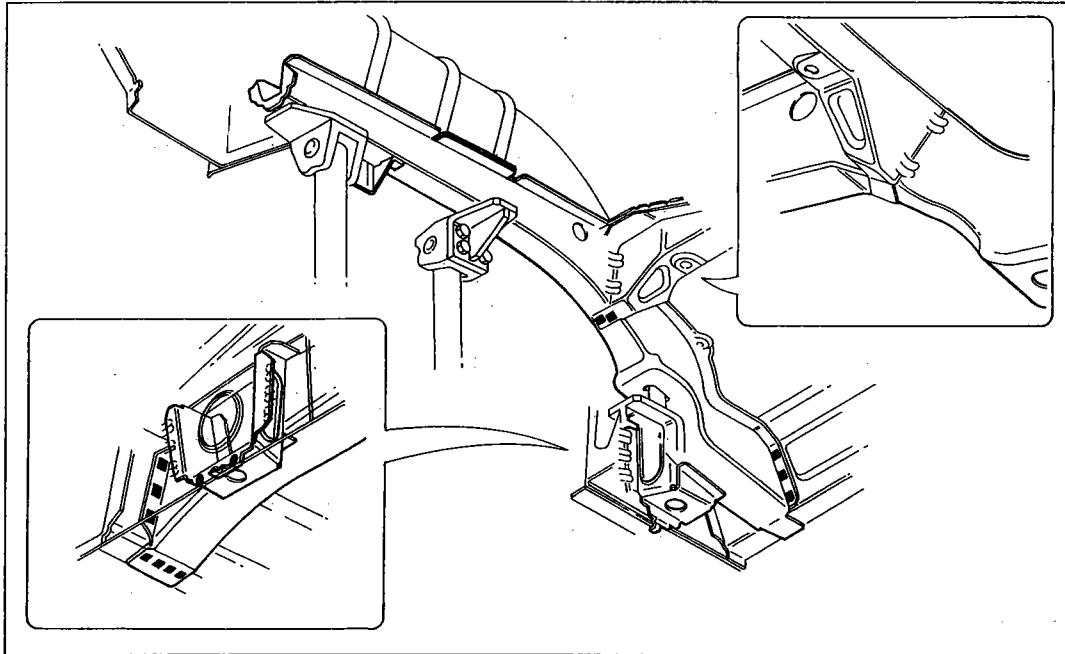
1. Correctly position the replacement part, using the templates; match and block the components to be welded, using pliers.



P4A154M02

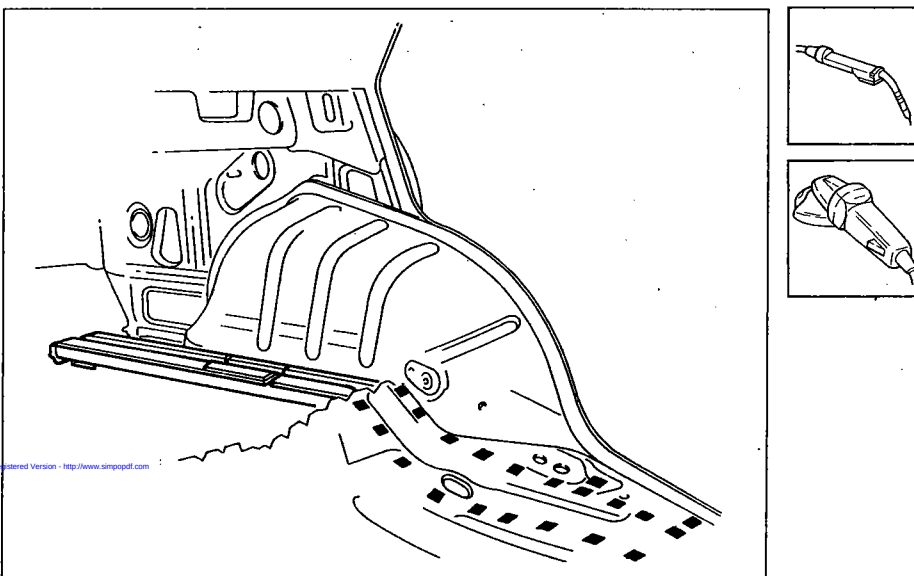
### Welding the spare part

1. Carry out the specific welds as shown in the diagram.



P4A155M01

2. Carry out the welding for filling.
3. Remove and level the weld residues, using an abrasive grinder.



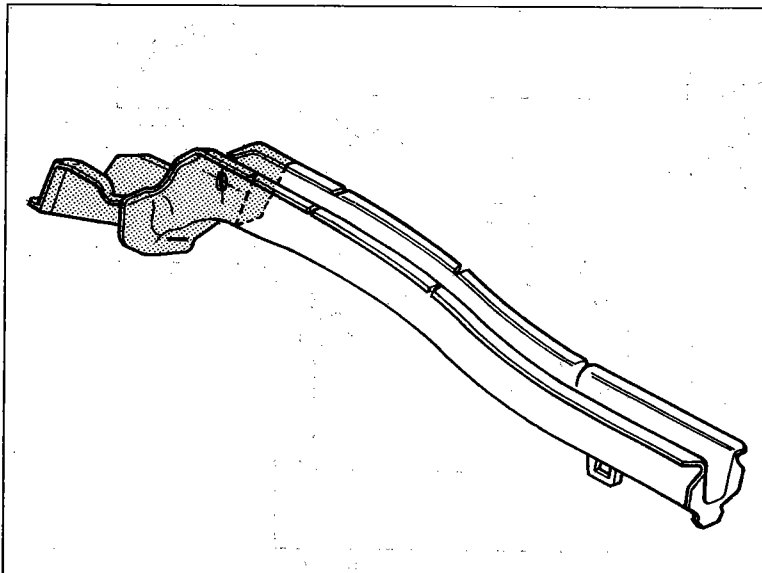
P4A155M02

### 70.

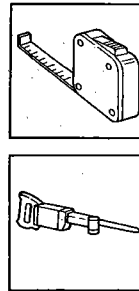
#### PARTIAL REPLACEMENT OF A SIDE MEMBER

##### Preparing the spare part

1. Remove the excess from the replacement part so that it is about 20 mm longer than the part removed from the vehicle.

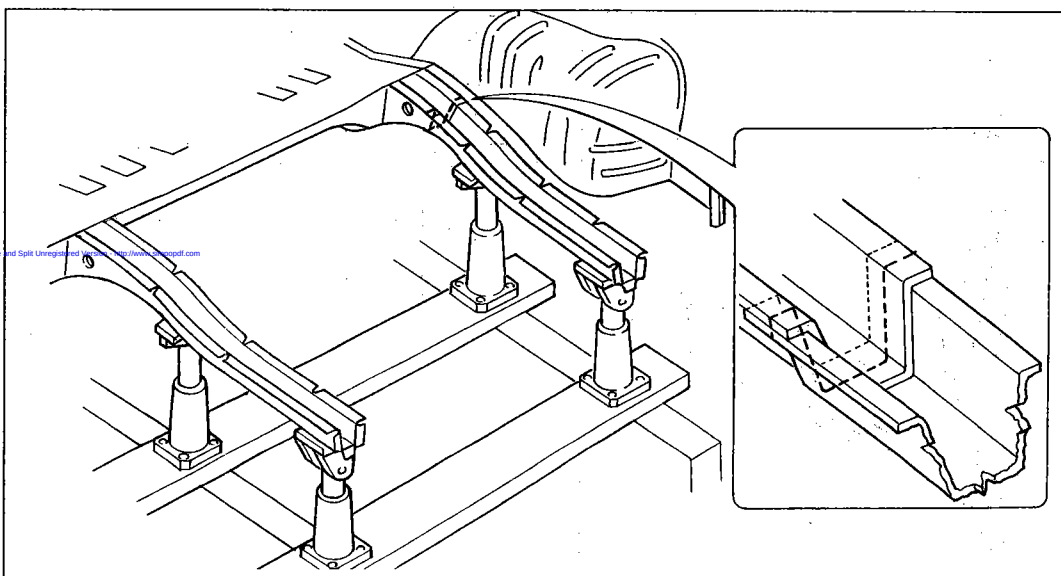


P4A156M01

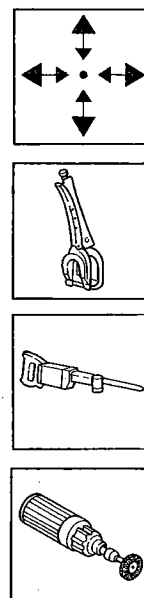


##### Positioning the replacement part

1. Correctly position the side member using the templates, superimpose it, lock it and trace the outline.
2. Trim it removing the excess parts.
3. Clean the areas affected by the welding.



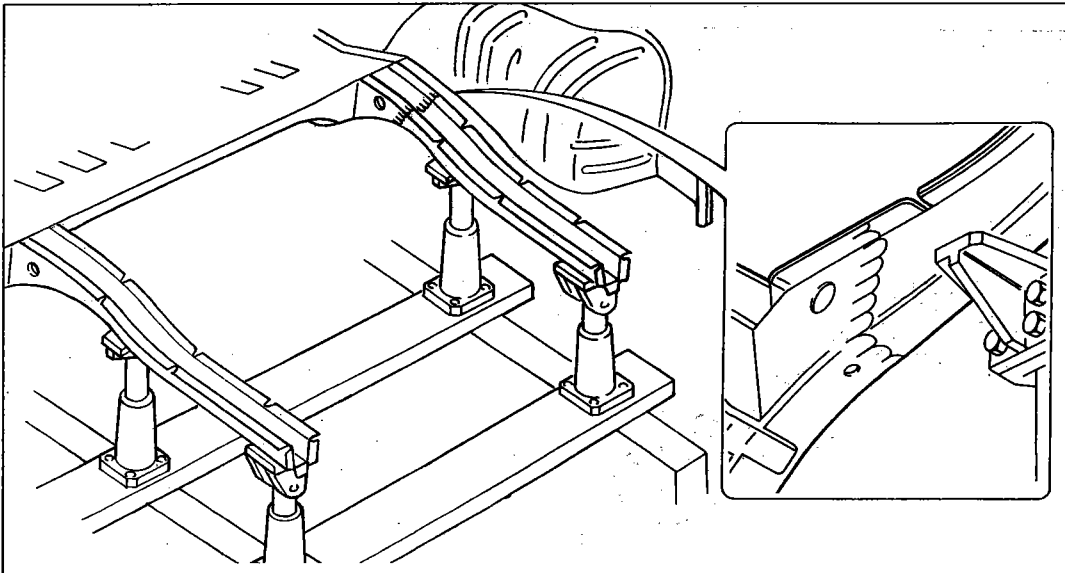
P4A156M02





### Welding the spare part and finishing off

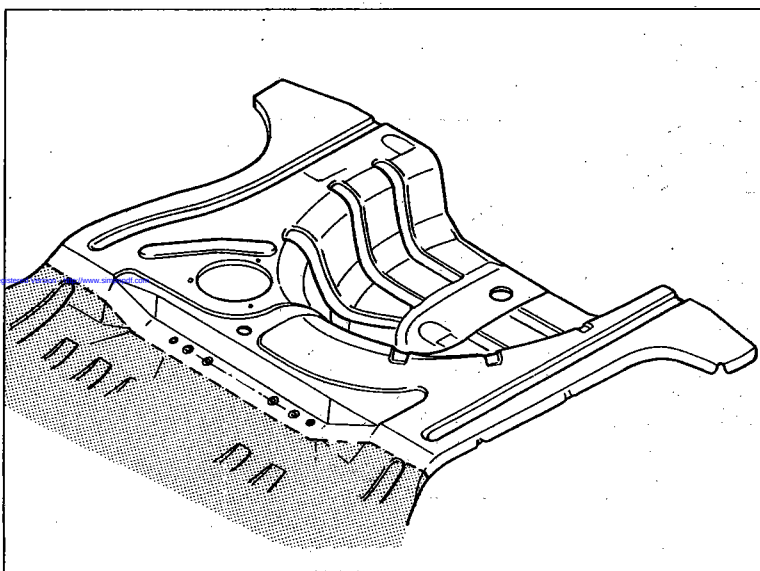
1. Proceed with the continuous MIG welding.
2. Remove and level the weld residues.



P4A157M01

### Preparing the spare part

1. Remove the excess from the replacement part so that it is about 20 mm longer than the part removed from the vehicle.



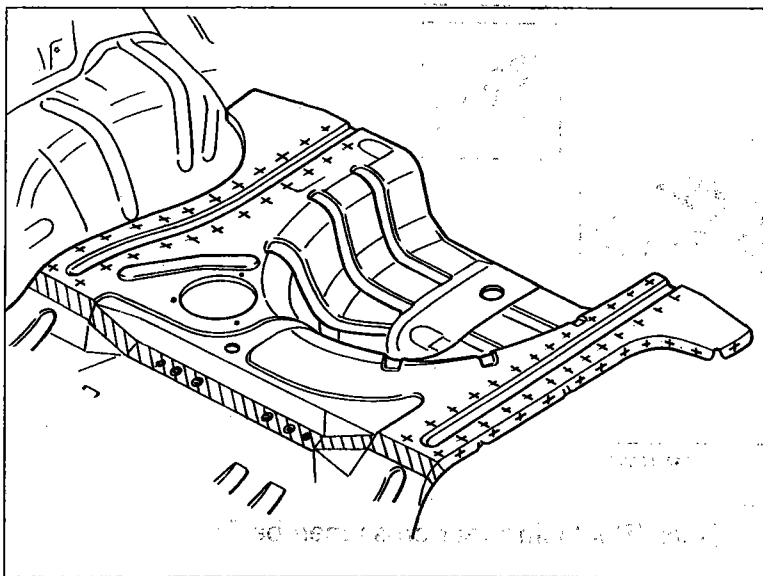
P4A157M02

## Replacing structural body panels

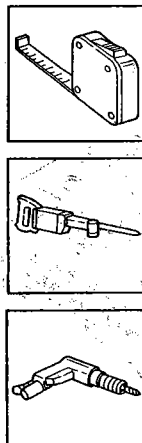
### 70.

#### Positioning the replacement part

1. Place the rear floor in position.
2. Check that the panels are correctly superimposed in the join area.
3. Mark the part to be removed on the bodyshell.
4. Trace the points to be drilled along the contact area with the side members underneath and the wheel arches in order to be able to carry out the MIG welding for filling.
5. Remove the replacement part, remove the excess from the bodyshell and drill the spare part. Also drill the sides of the replacement part which will be subsequently welded to the wheel arches.

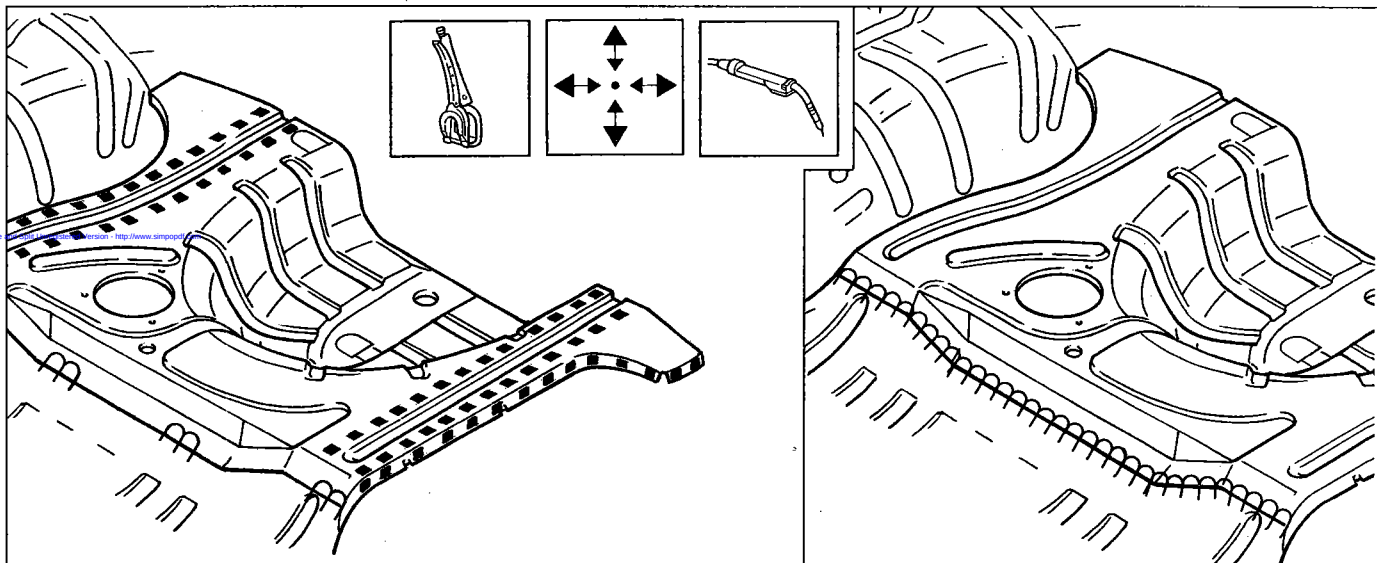


P4A158M01



#### Welding the spare part

1. Correctly reposition the replacement part and lock it with clamps.
2. Fix the replacement part to the bodyshell tacking it to the parts to be welded, edge to edge.
3. Weld and fill the holes made previously in the replacement part.
4. Finish off the welding, edge to edge.

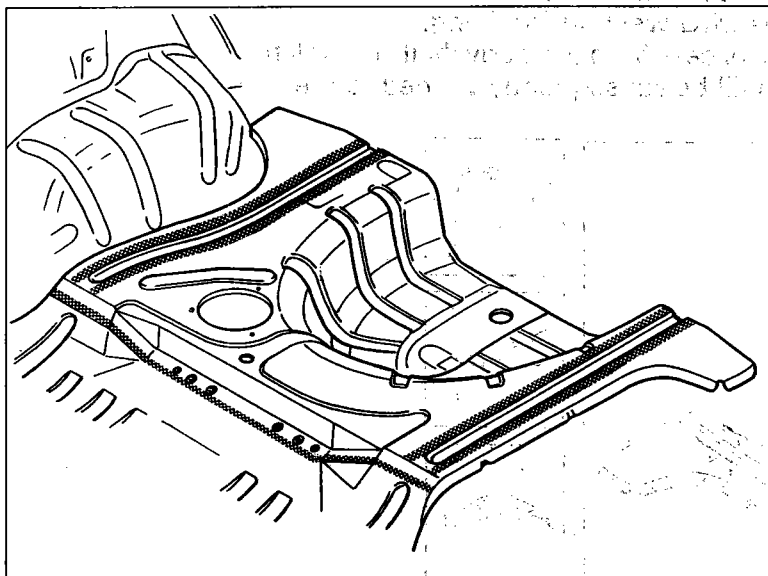


P4A158M02

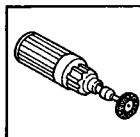
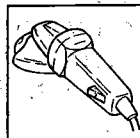
P4A158M03

### Finishing operations

1. Remove and level off the weld residues.



P4A159M01



Proceed with refitting the rear cross member (see: "Replacing rear cross member")

### Protections

Refer to to the previous description for the other components.



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## Bravo/Brava

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Planned Maintenance

Engine

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Auto trans. & diff

Gearbox & Diff

Braking system

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Radio

Electrical Sys Wiring

Electrical System

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## TECHNICAL SERVICE MANUAL COMPOSITION

At present, October 1999, the **Bravo-Brava 3rd volume** manual is composed of the booklets indicated below:

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| <b>506.670/08</b><br>(IX/1996) | <b>10</b>    | 28        | Fuel system 1910 TD 100 engine                         |
|                                | <b>10</b>    | 1 - 29    | Removing-refitting 1910 TD 100 engine                  |
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|                                | <b>10</b>    | 4         | Removing-refitting 1910 TD 100 engine                  |
| <b>506.670/09</b><br>(II/1997) | <b>00</b>    | 1 - 50    | Planned maintenance operations                         |
| <b>506.670/11</b><br>(VI/1997) | <b>00</b>    | 2         | Introduction                                           |



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|                                 | <b>10</b>    | 5         | Removing - refitting 1910 TD 75 engine                                                                                    |
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| <b>506.670/12</b><br>(VII/1997) | <b>00</b>    | 4         | Introduction                                                                                                              |
| <b>506.670/13</b><br>(XI/1997)  | <b>10</b>    | 2         | Fuel system 1910 TD 75                                                                                                    |
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**TECHNICAL SERVICE MANUAL COMPOSITION**

As of May 1999, the **Bravo-Brava volume 3** manual is composed of the parts indicated below

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| <b>506.670/17</b><br>(I/1999)   | <b>10</b>    | 35 - 36   | Fuel system update <b>1998</b> , <b>20V</b> 98 range                           |
|                                 |              | 21 - 22   | Fuel system update <b>1910</b> , <b>JTD</b> 98 range                           |
|                                 | <b>21-27</b> | 1 - 13    | Gearbox and differential <b>1242</b> , <b>16V</b> 98 range                     |
|                                 | <b>33</b>    | 7 - 8     | ABS with active sensors update (98 range)                                      |
|                                 | <b>50</b>    | 17 - 29   | Climate control update - Additional heater 98 range                            |
|                                 | <b>55</b>    | 1 - 82    | Electrical equipment update 98 range                                           |
| <b>506.670/18</b><br>(II/1999)  | <b>10</b>    | 27 - 44   | Fuel system <b>1910</b> , <b>JTD</b> 98 range - Removing-refitting components. |
| <b>506.670/19</b><br>(III/1999) | <b>00</b>    | 39 - 40   | Technical data update 98 range                                                 |
|                                 | <b>10</b>    | 31        | Update: 1910 TD 100 engine lubrication diagram                                 |
| <b>506.670/20</b><br>(V/1999)   | <b>00</b>    | 11        | Technical data update <b>1581</b> , <b>16V</b> 98 range                        |
|                                 | <b>10</b>    | 51 - 54   | Fuel system update <b>1242</b> , <b>16V</b> 98 range                           |
|                                 |              | 37 - 38   | Fuel system update <b>1998</b> , <b>20V</b> 98 range                           |
|                                 | <b>55</b>    | 83 - 88   | Electrical equipment update 98 range                                           |





## SERVICE MANUAL COMPOSITION

At present, March 1999, the **Bravo-Brava 3<sup>rd</sup> volume** manual is composed of the booklets indicated below

| Print N°                       | Sections     | Page Nos. | Comments                                               |
|--------------------------------|--------------|-----------|--------------------------------------------------------|
| <b>506.670/06</b><br>(III/95)  | <b>00</b>    | 1 - 6     | Technical data Bravo 1988 HGT 20v Sport Pack           |
|                                | <b>10</b>    | 1 - 18    | Fuel system 1910 TD 100 engine                         |
|                                | <b>21-27</b> | 1 - 50    | Automatic transmission                                 |
|                                | <b>55</b>    | 1 - 36    | Wiring diagrams - Connector blocks                     |
| <b>506.670/07</b><br>(VI/1996) | <b>00</b>    | 1 - 11    | Technical data 1910 TD and 1581 automatic transmission |
|                                | <b>21-27</b> | 51 - 69   | Automatic transmission                                 |
|                                | <b>55</b>    | 1 - 11    | Middle of the range radio                              |
| <b>506.670/08</b><br>(IX/1996) | <b>10</b>    | 28        | Fuel system 1910 TD 100 engine                         |
|                                | <b>10</b>    | 1 - 29    | Removing-refitting 1910 TD 100 engine                  |
| <b>506.670/10</b><br>(XI/96)   | <b>00</b>    | 6         | Introduction-Technical data                            |
|                                | <b>10</b>    | 1 - 34    | Fuel system 1910 TD 75 engine                          |
|                                | <b>10</b>    | 1 - 24    | Removing-refitting 1910 TD 75 engine                   |
|                                | <b>10</b>    | 4         | Removing-refitting 1910 TD 100 engine                  |
| <b>506.670/09</b><br>(II/1997) | <b>00</b>    | 1 - 50    | Planned maintenance operations                         |
| <b>506.670/11</b><br>(VI/1997) | <b>00</b>    | 2         | Introduction                                           |

| Print N°                        | Sections     | Page Nos. | Comments                                                                                                     |
|---------------------------------|--------------|-----------|--------------------------------------------------------------------------------------------------------------|
| <b>506.670/11</b><br>(VI/1997)  | <b>10</b>    | 4         | Removing - refitting 1910 TD 100 engine                                                                      |
|                                 | <b>10</b>    | 5         | Removing - refitting 1910 TD 75 engine                                                                       |
|                                 | <b>21-27</b> | 4         | Automatic transmission and differential                                                                      |
| <b>506.670/12</b><br>(VII/1997) | <b>00</b>    | 4         | Introduction                                                                                                 |
| <b>506.670/13</b><br>(XI/1997)  | <b>10</b>    | 2         | Fuel system 1910 TD 75                                                                                       |
|                                 | <b>33</b>    | 6         | Brakes - EBD                                                                                                 |
| <b>506.670/14</b><br>(III/1998) | <b>00</b>    | 1 - 10    |  16V 98 range               |
|                                 | <b>10</b>    | 1 - 64    | Fuel system  16V 98 range |
|                                 | <b>55</b>    | 1 - 37    | Wiring diagrams4 16V 98 range                                                                                |
| <b>506.670/16</b><br>(IX/1998)  | <b>00</b>    | 1 - 77    | Technical data 98 range                                                                                      |
|                                 | <b>10</b>    | 1 - 54    | Fuel system  16V 98 range |
|                                 |              | 1 - 42    | Fuel system  20V 98 range |
|                                 |              | 1 - 26    | Fuel system  JTD 98 range |
|                                 | <b>50</b>    | 1 - 16    | Climate control 98 range                                                                                     |
|                                 | <b>55</b>    | 1 - 11    | Control panels - 98 range radio                                                                              |
|                                 |              | 1 - 25    | Wiring diagrams 98 range                                                                                     |
|                                 |              | 15 - 16   | Wiring diagram update                                                                                        |

| Print N°                        | Sections     | Page Nos. | Comments                                                                                                                         |
|---------------------------------|--------------|-----------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>506.670/17</b><br>(I/1999)   | <b>10</b>    | 35 - 36   | Fuel system update  <b>20V</b> 98 range        |
|                                 |              | 21 - 22   | Fuel system update  <b>JTD</b> 98 range        |
|                                 | <b>21-27</b> | 1 - 13    | Gearbox and differential  <b>16V</b> 98 range |
|                                 | <b>33</b>    | 7 - 8     | ABS with active sensors update (98 range)                                                                                        |
|                                 | <b>50</b>    | 17 - 29   | Climate control update - Additional heater 98 range                                                                              |
|                                 | <b>55</b>    | 1 - 82    | Electrical equipment update 98 range                                                                                             |
| <b>506.670/19</b><br>(III/1999) | <b>00</b>    | 39 - 40   | Technical data update 98 range                                                                                                   |
|                                 | <b>10</b>    | 31        | Update: 1910 TD 100 engine lubrication diagram                                                                                   |



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## SERVICE MANUAL COMPOSITION

At present, January 1999, the **Bravo-Brava 3rd volume** manual is composed of the following booklets:

| Print N°                        | Sections       | Page Nos. | Comments                                               |
|---------------------------------|----------------|-----------|--------------------------------------------------------|
| <b>506.670/06</b><br>(III/1995) | <b>00</b>      | 1 ÷ 6     | Tech. data Bravo 1988 HGT 20v Pack-Sport               |
|                                 | <b>10</b>      | 1 ÷ 18    | Fuel system 1910 TD 100 engine                         |
|                                 | <b>21-27</b>   | 1 ÷ 50    | Automatic transmission                                 |
|                                 | <b>55</b>      | 1 ÷ 36    | Wiring diagrams-Connector blocks                       |
| <b>506.670/07</b><br>(VI/1996)  | <b>00</b>      | 1 ÷ 11    | Technical data 1910 TD and 1581 automatic transmission |
|                                 | <b>21-27</b>   | 51 ÷ 69   | Automatic transmission                                 |
|                                 | <b>55</b>      | 1 ÷ 11    | Mid range radio                                        |
| <b>506.670/08</b><br>(IX/1996)  | <b>10</b>      | 28        | Fuel system 1910 TD 100 engine                         |
|                                 | <b>10</b>      | 1 ÷ 29    | Removing-refitting 1910 TD 100 eng.                    |
| <b>506.670/10</b><br>(I/1997)   | <b>00</b>      | 6         | Introduction-Technical data                            |
|                                 | <b>10</b>      | 1 ÷ 34    | 1910 TD 75 engine fuel system                          |
|                                 | <b>10</b>      | 1 ÷ 24    | Removing-refitting 1910 TD 75 eng.                     |
|                                 | <b>10</b>      | 4         | Removing-refitting 1910 TD 100 eng.                    |
| <b>506.670/09</b><br>(II/1997)  | <b>00</b>      | 1 ÷ 50    | Planned maintenance operations                         |
| <b>506.670/11</b><br>(VI/1997)  | <b>00</b>      | 2         | Introduction                                           |
|                                 | <b>10</b>      | 4         | Removing - refitting 1910 TD 100 engine                |
|                                 | <b>10</b>      | 5         | Removing - refitting 1910 TD 75 engine                 |
|                                 | <b>21 - 27</b> | 4         | Automatic gearbox and differential                     |
| <b>506.670/12</b><br>(VII/1997) | <b>00</b>      | 4         | Introduction                                           |
| <b>506.670/13</b><br>(XI/1997)  | <b>10</b>      | 2         | Fuel system 1910 TD 75                                 |
|                                 | <b>33</b>      | 6         | Braking system - EBD device                            |

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| Print N°                        | Sections     | Page Nos. | Comments                                                                                                                    |
|---------------------------------|--------------|-----------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>506.670/14</b><br>(III/1998) | <b>00</b>    | 1 ÷ 10    |  16v 98 range                              |
|                                 | <b>10</b>    | 1 ÷ 64    | Fuel system  16v 98 range                |
|                                 | <b>55</b>    | 1 ÷ 37    | Wiring diagrams  16v 98 range            |
| <b>506.670/16</b><br>(IX/1998)  | <b>00</b>    | 1 ÷ 77    | Technical data 98 range                                                                                                     |
|                                 | <b>10</b>    | 1 ÷ 54    | Fuel system  16v 98 range                |
|                                 |              | 1 ÷ 42    | Fuel system  20v 98 range                |
|                                 |              | 1 ÷ 26    | Fuel system  JTD 98 range                |
|                                 | <b>50</b>    | 1 ÷ 16    | Climate control 98 range                                                                                                    |
|                                 | <b>55</b>    | 1 ÷ 11    | Control panels - Radio 98 range                                                                                             |
|                                 |              | 1 ÷ 25    | Wiring diagrams 98 range                                                                                                    |
|                                 |              | 15 ÷ 16   | Wiring diagram update                                                                                                       |
| <b>506.670/17</b><br>(I/1999)   | <b>10</b>    | 35 ÷ 36   | Fuel system update  20v 98 range       |
|                                 |              | 21 ÷ 22   | Fuel system update  JTD 98 range       |
|                                 | <b>21-27</b> | 1 ÷ 13    | Gearbox and differential  16v 98 range |
|                                 | <b>33</b>    | 7 ÷ 8     | ABS with active sensors update (98 range)                                                                                   |
|                                 | <b>50</b>    | 17 ÷ 29   | Update: climate control -<br>Additional heater 98 range                                                                     |
|                                 | <b>55</b>    | 1 ÷ 82    | Update: Electrical equipment 98 range                                                                                       |

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**SERVICE MANUAL COMPOSITION**

At present, September 1998, the **Bravo-Brava manual 3rd volume** is composed of the following book-lets:

| Print N°                        | Sections       | Page Nos. | Comments                                               |
|---------------------------------|----------------|-----------|--------------------------------------------------------|
| <b>506.670/06</b><br>(III/1995) | <b>00</b>      | 1 ÷ 6     | Tech. data Bravo 1988 HGT 20v Sport-Pack               |
|                                 | <b>10</b>      | 1 ÷ 18    | Fuel system: 1910 TD 100 engine                        |
|                                 | <b>21-27</b>   | 1 ÷ 50    | Automatic transmission                                 |
|                                 | <b>55</b>      | 1 ÷ 36    | Wiring diagrams-Connector blocks                       |
| <b>506.670/07</b><br>(VI/1996)  | <b>00</b>      | 1 ÷ 11    | Technical data 1910 TD and 1581 automatic transmission |
|                                 | <b>21-27</b>   | 51 ÷ 69   | Automatic transmission                                 |
|                                 | <b>55</b>      | 1 ÷ 11    | Middle of the range radio                              |
| <b>506.670/08</b><br>(IX/1996)  | <b>10</b>      | 28        | Fuel system: 1910 TD 100 engine                        |
|                                 | <b>10</b>      | 1 ÷ 29    | Removing-refitting 1910 TD 100 eng.                    |
| <b>506.670/10</b><br>(I/1997)   | <b>00</b>      | 6         | Introduction-Technical data                            |
|                                 | <b>10</b>      | 1 ÷ 34    | 1910 TD 75 engine fuel system                          |
|                                 | <b>10</b>      | 1 ÷ 24    | Removing-refitting 1910 TD 75 eng.                     |
|                                 | <b>10</b>      | 4         | Removing-refitting 1910 TD 100 eng.                    |
| <b>506.670/09</b><br>(II/1997)  | <b>00</b>      | 1 ÷ 50    | Planned maintenance operations                         |
| <b>506.670/11</b><br>(VI/1997)  | <b>00</b>      | 2         | Introduction                                           |
|                                 | <b>10</b>      | 4         | Removing - refitting 1910 TD 100 engine                |
|                                 | <b>10</b>      | 5         | Removing - refitting 1910 TD 75 engine                 |
|                                 | <b>21 - 27</b> | 4         | Automatic gearbox and differential                     |
| <b>506.670/12</b><br>(VII/1997) | <b>00</b>      | 4         | Introduction                                           |
| <b>506.670/13</b><br>(XI/1997)  | <b>10</b>      | 2         | Fuel system: 1910 TD 75                                |
|                                 | <b>33</b>      | 6         | Braking system - EBD device                            |



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| Print N°                        | Sections  | Page Nos. | Comments                                                                                                         |
|---------------------------------|-----------|-----------|------------------------------------------------------------------------------------------------------------------|
| <b>506.670/14</b><br>(III/1998) | <b>00</b> | 1 ÷ 10    |  16v 98 range                   |
|                                 | <b>10</b> | 1 ÷ 64    | Fuel system  16v 98 range     |
|                                 | <b>55</b> | 1 ÷ 37    | Wiring diagrams  16v 98 range |
| <b>506.670/16</b><br>(IX/1998)  | <b>00</b> | 1 ÷ 77    | Technical data 98 range                                                                                          |
|                                 | <b>10</b> | 1 ÷ 54    | Fuel system  16v 98 range     |
|                                 |           | 1 ÷ 42    | Fuel system  20v 98 range     |
|                                 |           | 1 ÷ 26    | Fuel system  JTD 98 range     |
|                                 | <b>50</b> | 1 ÷ 16    | Climate control 98 range                                                                                         |
|                                 | <b>55</b> | 1 ÷ 11    | Control panels - Radio 98 range                                                                                  |
|                                 |           | 1 ÷ 25    | Wiring diagrams 98 range                                                                                         |
|                                 |           | 15 ÷ 16   | Update: wiring diagram                                                                                           |

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**WORKSHOP MANUAL COMPOSITION**

As of March 1998, the **Bravo-Brava volume 3** manual is made up of the following parts:

| Publication no.                 | Sections       | Page numbers | Notes                                                   |
|---------------------------------|----------------|--------------|---------------------------------------------------------|
| <b>506.670/06</b><br>(III/1995) | <b>00</b>      | 1 - 6        | Tech. data: Bravo 1988 HGT 20v Pack-Sport               |
|                                 | <b>10</b>      | 1 - 18       | 1910 TD 100 engine fuel system                          |
|                                 | <b>21-27</b>   | 1 - 50       | Automatic transmission                                  |
|                                 | <b>55</b>      | 1 - 36       | Wiring diagrams-Connector blocks                        |
| <b>506.670/07</b><br>(VI/1996)  | <b>00</b>      | 1 - 11       | Technical data: 1910 TD and 1581 automatic transmission |
|                                 | <b>21-27</b>   | 51 - 69      | Automatic transmission                                  |
|                                 | <b>55</b>      | 1 - 11       | Mid-range car radio                                     |
| <b>506.670/08</b><br>(IX/1996)  | <b>10</b>      | 28           | 1910 TD 100 engine fuel system                          |
|                                 | <b>10</b>      | 1 - 29       | Removing refitting 1910 TD 100 unit                     |
| <b>506.670/10</b><br>(I/1997)   | <b>00</b>      | 6            | Introduction-Technical data                             |
|                                 | <b>10</b>      | 1 - 34       | 1910 TD 75 engine fuel system                           |
|                                 | <b>10</b>      | 1 - 24       | Removing refitting 1910 TD 75 unit                      |
|                                 | <b>10</b>      | 4            | Removing refitting 1910 TD 100 engine                   |
| <b>506.670/09</b><br>(II/1997)  | <b>00</b>      | 1 - 50       | Programmed maintenance operations                       |
| <b>506.670/11</b><br>(VI/1997)  | <b>00</b>      | 2            | Introduction                                            |
|                                 | <b>10</b>      | 4            | Removing - refitting 1910 TD 100 engine                 |
|                                 | <b>10</b>      | 5            | Removing - refitting 1910 TD 75 engine                  |
|                                 | <b>21 - 27</b> | 4            | Automatic transmission and differential                 |
| <b>506.670/12</b><br>(VII/1997) | <b>00</b>      | 4            | Introduction                                            |
| <b>506.670/13</b><br>(XI/1997)  | <b>10</b>      | 2            | 1910 TD 75 fuel system                                  |
|                                 | <b>33</b>      | 6            | Braking system - EBD device                             |

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| Publication no.          | Sections | Page numbers | Notes                                                                                                              |
|--------------------------|----------|--------------|--------------------------------------------------------------------------------------------------------------------|
| 506.670/14<br>(III/1998) | 00       | 1 ± 10       |  16v 1998 range                   |
|                          | 10       | 1 ± 64       | Fuel system  16v 1998 range     |
|                          | 55       | 1 ± 37       | Wiring diagrams  16v 1998 range |

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## WORKSHOP MANUAL COMPOSITION

As of July 1997, the **Bravo-Brava manual, volume 3** is made up of the following parts:

| Publication no.                 | Sections       | Number of pages | Notes                                                     |
|---------------------------------|----------------|-----------------|-----------------------------------------------------------|
| <b>506.670/06</b><br>(III/1995) | <b>00</b>      | 1 - 6           | Technical data on Bravo 1988 HGT 20v Sport-Pack           |
|                                 | <b>10</b>      | 1 - 18          | 1910 TD 100 engine fuel system                            |
|                                 | <b>21-27</b>   | 1 - 50          | Automatic transmission                                    |
|                                 | <b>55</b>      | 1 - 36          | Wiring diagrams-Connector blocks                          |
| <b>506.670/07</b><br>(VI/1996)  | <b>00</b>      | 1 - 11          | Technical data on 1910 TD and 1581 automatic transmission |
|                                 | <b>21-27</b>   | 51 - 69         | Automatic transmission                                    |
|                                 | <b>55</b>      | 1 - 11          | Mid-range car radio                                       |
| <b>506.670/08</b><br>(IX/1996)  | <b>10</b>      | 28              | 1910 TD 100 engine fuel system                            |
|                                 | <b>10</b>      | 1 - 29          | Removing refitting 1910 TD 100 unit                       |
| <b>506.670/10</b><br>(I/1997)   | <b>00</b>      | 6               | Introduction-Technical data                               |
|                                 | <b>10</b>      | 1 - 34          | 1910 TD 75 engine fuel system                             |
|                                 | <b>10</b>      | 1 - 24          | Removing refitting 1910 TD 75 unit                        |
|                                 | <b>10</b>      | 4               | Removing refitting 1910 TD 100 unit                       |
| <b>506.670/09</b><br>(II/1997)  | <b>00</b>      | 1 - 50          | Programmed maintenance operations                         |
| <b>506.670/11</b><br>(VI/1997)  | <b>00</b>      | 2               | Introduction                                              |
|                                 | <b>10</b>      | 4               | Removing - refitting 1910 TD 100 engine                   |
|                                 | <b>10</b>      | 5               | Removing - refitting 1910 TD 75 engine                    |
|                                 | <b>21 - 27</b> | 4               | Automatic transmission and differential                   |
| <b>506.670/12</b><br>(VII/1997) | <b>00</b>      | 4               | Introduction                                              |



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## SERVICE MANUAL COMPOSITION

At present, September 1996, the **Bravo-Brava 3rd volume** manual is composed of the following booklets:

| Print No.                       | Sections     | Page Nos. | Comments                                               |
|---------------------------------|--------------|-----------|--------------------------------------------------------|
| <b>506.670/06</b><br>(III/1995) | <b>00</b>    | 1 ÷ 6     | Tech. data Bravo 1988 HGT 20v Pack-Sport               |
|                                 | <b>10</b>    | 1 ÷ 18    | 1910 TD 100 engine fuel system                         |
|                                 | <b>21-27</b> | 1 ÷ 50    | Automatic transmission                                 |
|                                 | <b>55</b>    | 1 ÷ 36    | Wiring diagrams-Connector blocks                       |
| <b>506.670/07</b><br>(VI/1996)  | <b>00</b>    | 1 ÷ 11    | Technical data 1910 TD and 1581 automatic transmission |
|                                 | <b>21-27</b> | 51 ÷ 69   | Automatic transmission                                 |
|                                 | <b>55</b>    | 1 ÷ 11    | Medium range radio                                     |
| <b>506.670/08</b><br>(IX/1996)  | <b>10</b>    | 28        | 1910 TD 100 engine fuel system                         |
|                                 | <b>10</b>    | 1 ÷ 29    | Removing-refitting 1910 TD 100 engine                  |





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## SERVICE MANUAL COMPOSITION

At present, June 1996, the **Bravo-Brava 3rd volume** manual is composed of the following booklets:

| Print No.                       | Sections     | Page Nos. | Comments                                               |
|---------------------------------|--------------|-----------|--------------------------------------------------------|
| <b>506.670/06</b><br>(III/1995) | <b>00</b>    | 1 ÷ 6     | Technical data Bravo 1988 HGT 20v Pack-S-port          |
|                                 | <b>10</b>    | 1 ÷ 18    | Fuel system - 1910 TD engine                           |
|                                 | <b>21-27</b> | 1 ÷ 50    | Automatic transmission                                 |
|                                 | <b>55</b>    | 1 ÷ 36    | Wiring diagrams-Connector blocks                       |
| <b>506.670/07</b><br>(VI/1996)  | <b>00</b>    | 1 ÷ 11    | Technical data - 1910 TD & 1581 automatic transmission |
|                                 | <b>21-27</b> | 51 ÷ 69   | Automatic transmission                                 |
|                                 | <b>55</b>    | 1 ÷ 11    | Medium range radio                                     |



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## SERVICE MANUAL COMPOSITION

At present, April 1996, the **Bravo-Brava 3rd volume** manual is composed of the following booklets:

| Print No.                      | Sections     | Page Nos. | Comments                                 |
|--------------------------------|--------------|-----------|------------------------------------------|
| <b>506.670/06</b><br>(VI/1995) | <b>00</b>    | 1 ÷ 6     | Tech. data Bravo 1988 HGT 20v Pack-Sport |
|                                | <b>10</b>    | 1 ÷ 18    | 1910 TD engine fuel system               |
|                                | <b>21-27</b> | 1 ÷ 50    | Automatic gearbox                        |
|                                | <b>55</b>    | 1 ÷ 36    | Wiring diagrams-Connector blocks         |



This manual contains the main instructions for repairing and maintaining the **Fiat Bravo and Fiat Brava**.

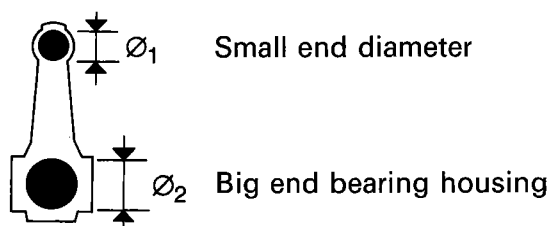
The manual is divided into sections distinguished by two digit numbers which appear in the parts microfiches and the flat rate manual.

The section **INTRODUCTION AND TECHNICAL DATA (00.)** has a dual function of introducing the model and supporting the remaining part of the manual. This section includes the tables of technical data and specific information relating to the sections in the remaining part of the man.

**The remaining sections (10. - 18. etc.)** include descriptions of the repair operations.

This manual contains graphic representations and symbols in place of descriptions for mechanical components, operations and repair methods.

For example:



Tighten to torque

**ENGINES** Section 10 contains illustrations of the operations of removing-refitting the power units, operations on vehicle and the various fuel, lubrication and cooling systems.

*The procedures for overhauling the individual engines are described in other booklets which have the following print nos.:*

| Engine          | Print No.         | Part No.          |
|-----------------|-------------------|-------------------|
| <b>1370 12V</b> | <b>504.589/19</b> | <b>604.89.774</b> |
| <b>1581 16V</b> | <b>504.589/20</b> | <b>604.89.781</b> |
| <b>1747 16V</b> | <b>504.589/18</b> | <b>604.89.192</b> |
| <b>1998 20V</b> | <b>504.589/22</b> | <b>604.89.788</b> |
| <b>1929 D</b>   | <b>504.593/11</b> | <b>604.89.841</b> |
| <b>1910 TD</b>  | <b>504.593/13</b> | <b>604.44.220</b> |

*The first 4 booklets are inserted in the Overhauling Petrol Engines Manual 3rd volume, whilst the last ones are inserted in the Overhauling Diesel Engines Manual 2nd volume.*

**GEARBOXES** Section 21-27 contains illustrations of the operations of removing and refitting the various gearboxes. The procedures for overhauling the various manual gearboxes at the bench are published in separate booklets which have the following print nos.:

505.023/08      Inserted in the Overhauling gearboxes manual  
 505.023/03      Inserted in the Overhauling gearboxes manual  
 505.023/18      Inserted in the Overhauling gearboxes manual 2nd volume

**THIS PUBLICATION HAS BEEN PRODUCED IN A LOOSE LEAF FORMAT TO FACILITATE THE OPERATION OF UPDATING THE MODEL.**



*When using chemical products stick closely to the instructions in the safety chart which the supplier must give to the consumer (for Italy in accordance with D.M. no. 46/1992)*

The **Fiat Bravo** is a 2 box, 3 door vehicle with a load carrying structure, transversely mounted engine and front wheel drive

It is produced with 6 different engine types.

The engines have 4 or 5 cylinders in line with clockwise rotation and are mounted transversely at the front.

According to the trim level, the following engines are fitted:

**1370 cc** four cylinders in line, 12 valves running on unleaded petrol and developing a power output of 59 kW (80 CV) at 6000 rpm.

**1581 cc** four cylinders in line, 16 valves running on unleaded petrol and developing a power output of 76 kW (103 CV) at 5700 rpm.

**1747 cc** four cylinders in line, 16 valves running on unleaded petrol and developing a power output of 83 kW (113 CV) at 5800 rpm.

**1998 cc** five cylinders in line, 20 valves running on unleaded petrol and developing a power output of 108 kW (147 CV) at 6100 rpm.

**1929 D cc** four cylinders in line, 8 valves, indirect injection running on diesel fuel and developing a power output of 48 kW (65 CV) at 4600 rpm.

**1910 TD cc** four cylinders in line, 8 valves, indirect injection running on diesel fuel and developing a power output of 74 kW (100 CV) at 4200 rpm.

The **Fiat Brava** is a three box vehicle, with 5 doors, a load carrying structure, transversely mounted engine and front wheel drive

It is produced with 5 different engine types.

The engines are the same as those fitted on the **Fiat Bravo** with the exception of the 1998 cc.

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Introduction & Tech Data

Introduction & Tech Data 1998 20

Introduction & Tech Data 1998 16

Introduction & Tech Data 1998





The Planned Maintenance Programme whose operations are described later on is the one in force at the time of printing and replaces and cancels the one in volume 1 of the Manual

**PLANNED MAINTENANCE PROGRAMME**

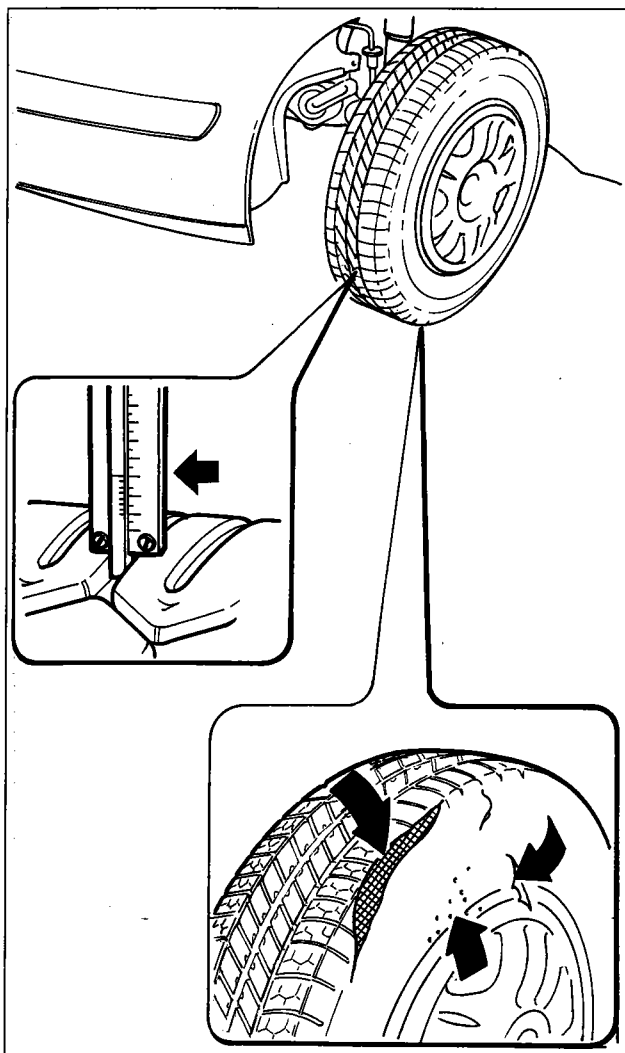
| N° | OPERATION                                                                                                                                                    | THOUSANDS OF KM |    |    |    |     |     |     |     |     | PAGE |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----|----|----|-----|-----|-----|-----|-----|------|
|    |                                                                                                                                                              | 20              | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 |      |
| 1  | Check tyre condition and wear                                                                                                                                | •               | •  | •  | •  | •   | •   | •   | •   | •   | 1    |
| 2  | Check operation of front disc brake pad wear sensor                                                                                                          | •               | •  | •  | •  | •   | •   | •   | •   | •   | 2    |
| 3  | Check condition of rear disc brake pads (Bravo 1998 20v)                                                                                                     |                 | •  |    | •  |     | •   |     | •   |     | 2    |
| 4  | Check rear drum brake linings condition and wear                                                                                                             |                 |    | •  |    |     | •   |     |     | •   | 2    |
| 5  | Visually inspect condition of: underbody exterior and protection, pipes (exhaust, fuel system, braking system), rubber elements (boots, hoses, bushes, etc.) | •               | •  | •  | •  | •   | •   | •   | •   | •   | 3    |
| 6  | Check tension and, if necessary, adjust various drive belts (excluding engines equipped with automatic tensioners)                                           | •               |    |    |    |     |     |     |     |     | 3    |
| 7  | Visually inspect condition of trapezoid belts and/or various Poly-V drive belts                                                                              |                 | •  |    | •  |     | •   |     | •   |     | 6    |
| 8  | Check/adjust clutch pedal travel or height (excluding hydraulically operated version)                                                                        |                 | •  |    | •  |     | •   |     | •   |     | 7    |
| 9  | Check/adjust handbrake lever travel                                                                                                                          |                 | •  |    | •  |     | •   |     | •   |     | 8    |
| 10 | Check/adjust tappet clearance (1910 TD diesel version)                                                                                                       | •               | •  |    | •  |     | •   |     | •   |     | 8    |
| 11 | Check/adjust tappet clearance (1929 D diesel version)                                                                                                        | •               |    | •  |    | •   |     | •   |     | •   | 9    |
| 12 | Checking exhaust gas emissions/diesel fumes                                                                                                                  |                 | •  |    | •  |     | •   |     | •   |     | 10   |
| 13 | Check operation of anti-evaporation system                                                                                                                   |                 |    |    | •  |     |     |     | •   |     | 13   |
| 14 | Replace fuel filter (petrol engines)                                                                                                                         |                 | •  |    | •  |     | •   |     | •   |     | 13   |
| 15 | Replace fuel filter (diesel engines)                                                                                                                         | •               | •  | •  | •  | •   | •   | •   | •   | •   | 14   |
| 16 | Replace air filter cartridge (petrol engines)                                                                                                                |                 | •  |    | •  |     | •   |     | •   |     | 15   |
| 17 | Replace air filter cartridge (diesel engines)                                                                                                                | •               | •  | •  | •  | •   | •   | •   | •   | •   | 15   |
| 18 | Check/top up fluid levels (engine cooling, braking system, power steering, windscreen washer, battery, etc.)                                                 | •               | •  | •  | •  | •   | •   | •   | •   | •   | 16   |
| 19 | Replace timing belt                                                                                                                                          |                 |    |    |    |     | •   |     |     |     | 20   |
| 20 | Replace spark plugs, check leads                                                                                                                             |                 | •  |    | •  |     | •   |     | •   |     | 43   |
| 21 | Check operation of engine control systems (using diagnostic socket)                                                                                          |                 | •  |    | •  |     | •   |     | •   |     | 45   |
| 22 | Check gearbox and differential oil level (only for version with manual gearbox)                                                                              |                 |    |    | •  |     |     |     | •   |     | 46   |
| 23 | Checking automatic gearbox oil level                                                                                                                         | •               | •  | •  | •  | •   | •   | •   | •   | •   | 46   |
| 24 | Changing engine oil (or every 18 months) (every 10,000 Km for diesel engines)                                                                                | •               | •  | •  | •  | •   | •   | •   | •   | •   | 47   |
| 25 | Replace engine oil filter (every 10,000 km for diesel engines)                                                                                               | •               | •  | •  | •  | •   | •   | •   | •   | •   | 47   |
| 26 | Change brake fluid (or every 24 months)                                                                                                                      |                 |    | •  |    |     | •   |     |     | •   | 48   |
| 27 | Replace pollen filter (or every 12 months)                                                                                                                   | •               | •  | •  | •  | •   | •   | •   | •   | •   | 50   |



## Foreword

The maintenance operations consist of checking and restoring the efficiency of certain vehicle components subject to wear which may deteriorate during normal usage conditions. This section describes the operations which should be carried out on the vehicle at the intervals set out in the Planned Maintenance Programme (on the previous page). Each operation is described independently on account of which there is no pre-defined ideal operating cycle to be repeated at each interval. It is therefore necessary to ensure that those operations which require the same components to be dismantled are carried out at the same intervals in order to maximize the efficiency of the repair times. If, when carrying out each operation, the need arises to carry out additional replacements or further repairs not envisaged in the Planned Maintenance Programme, prior approval must be obtained first from the Customer.

## PLANNED MAINTENANCE OPERATIONS



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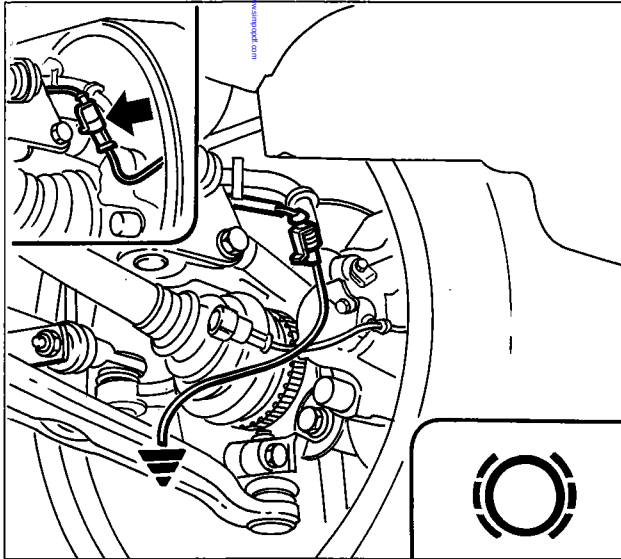
### **1 CHECK CONDITION OF TYRES AND WEAR**

Check the condition of the tyres making sure, in particular, that there are no signs of ageing on the tread and the tyre walls, that the tyres are not excessively/unevenly worn and that there are no abrasions/burrs, porousness or cuts.

Check the depth of the tread using a special gauge, taking the measurement at the intersection between the transverse and longitudinal splining (at several points on the circumference). The minimum permissible depth is 1.6mm. The difference between the depths of tread on the same tyre should not exceed 2 mm. The difference between the depths of tread on different tyres on the same axle should not exceed 5 mm.

If the tread wear is uneven, check the tyre inflation pressure and inform the Customer of the possible need to balance the wheels.

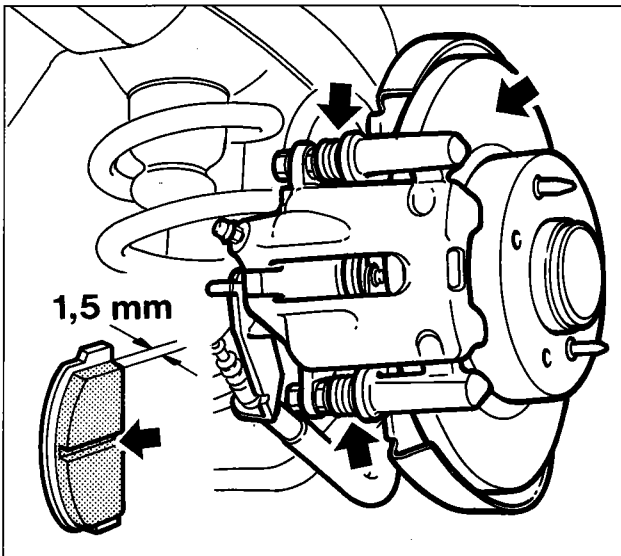
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## 2 CHECK OPERATION OF FRONT DISC BRAKE PAD WEAR SENSOR

Disconnect the connector for the front disc brake pad wear sensor, place the terminal for the wiring side coupling to earth and check that the relevant warning light in the instrument panel comes on.



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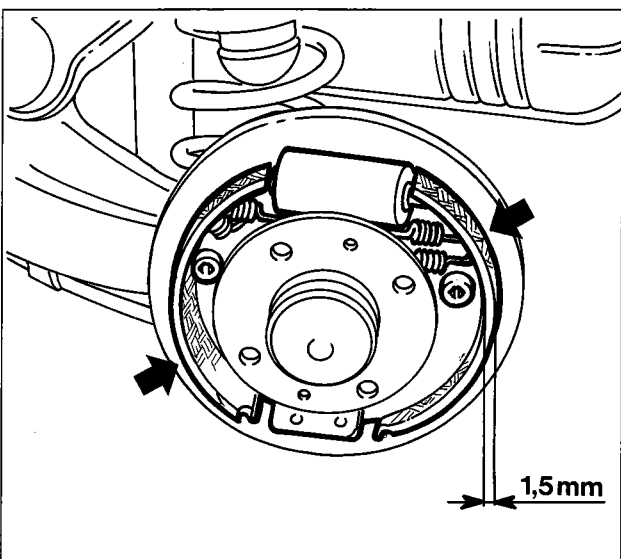
## 3 CHECK CONDITION OF REAR DISC BRAKE PADS (Bravo 1998 20v)

Remove one of the rear wheels and check the thickness of the friction material through the slit in the brake caliper; the minimum permissible thickness is 1.5 mm. Check that the wear of the pads is even. Visually inspect the condition of the brake caliper dust boots. Check the condition of the brake disc work surfaces (for wear or deep grooves). Notify the Customer of the need to replace or re-grind (in the case of a brake pad) one of the components which has been checked.

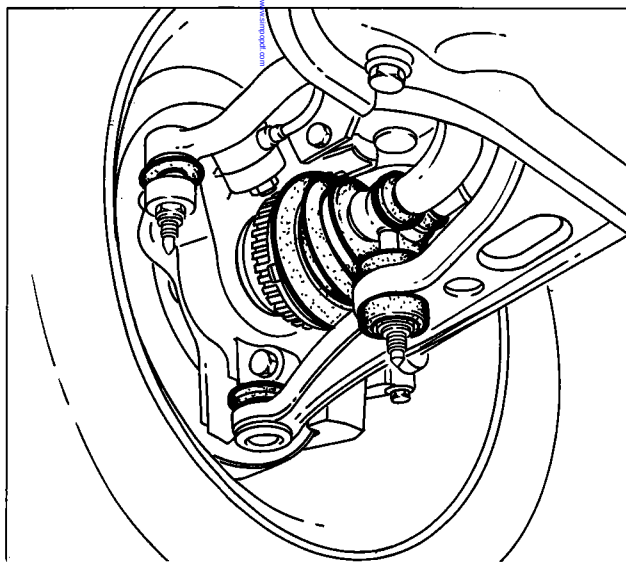
## 4 CHECK CONDITION AND WEAR OF REAR DRUM BRAKES

With one of the rear wheels removed, remove the brake drum. Check the thickness of the brake linings: the minimum permissible thickness is 1.5 mm. Also check that there is no fouling from oil or grease. Check the efficiency of the shoe return device and the automatic recovery of the clearance between the drum and the shoes. Check the efficiency of the wheel cylinders (sliding of pistons, condition of dust boots). Check the condition of the drum work surfaces (for wear or grooves). Notify the Customer of the need to replace or skim (in the case of brake drums) one of the components which has been checked.

If there is an inspection window in the brake drum it is possible to check the thickness of the brake linings without having to remove the actual drum.



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**5 VISUALLY INSPECT CONDITION OF: PIPES, RUBBER ELEMENTS, FLEXIBLE PIPES FOR BRAKING SYSTEM AND FUEL SYSTEM**

Position the vehicle on a lift. Visually inspect:

- for the presence of any fluid leaks from the following systems: lubrication, fuel, engine cooling, braking and power assisted steering;
- the condition of the rubber elements: bushes, flexible (support) mountings and (protective) boots; check that the collars retaining the pipes and bushes have not loosened.

Check that the wires and cables for the retaining brackets in the engine compartment are correctly positioned.

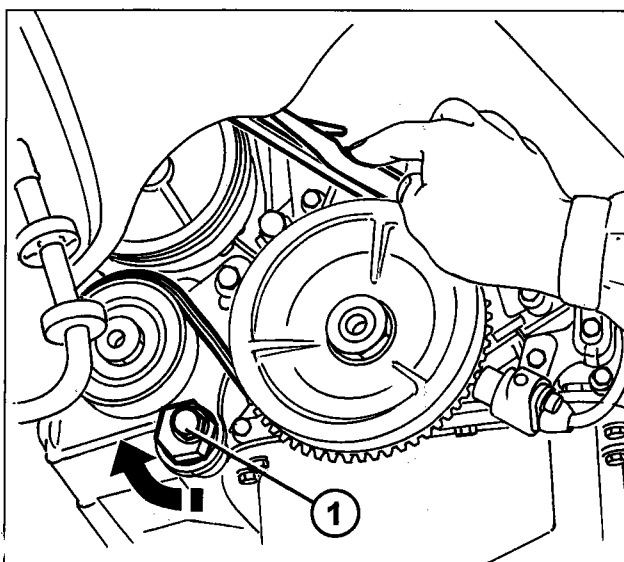
Also check for possible interference of the flexible brake pipes in maximum steering conditions.

**6 CHECK CONDITION AND TENSION OF VARIOUS DRIVE BELTS AND ADJUST, IF NECESSARY**

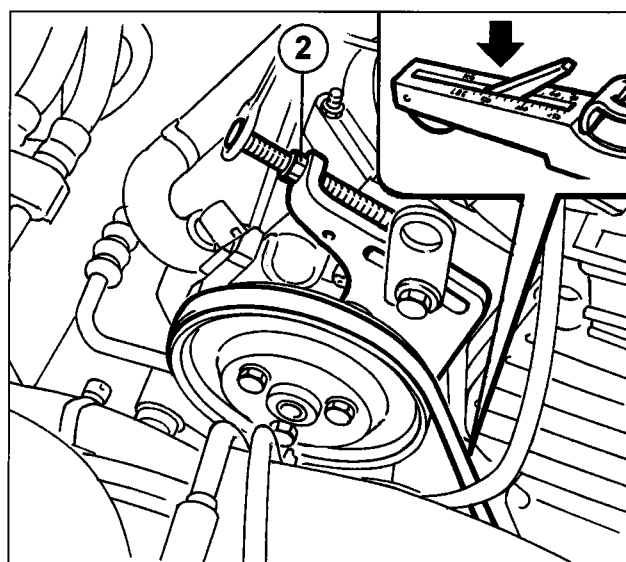
The tension of the various drive belts is checked using tool 1895762000. Engines equipped with automatic tensioners are exempt from this check.

**Bravo-Brava 1581 16v**

Check that alternator drive belt and power assisted steering drive belt tension, measured using the special equipment, are within the recommended values given in the table at the bottom of this paragraph. If the tension values are not correct, loosen the bolt (1), and rotate the tensioner further working on the hexagonal opening, then tighten the bolt once again and check the tension of the alternator belt. To adjust the power assisted steering pump belt, act on the adjustment screw and the lock nut (2).

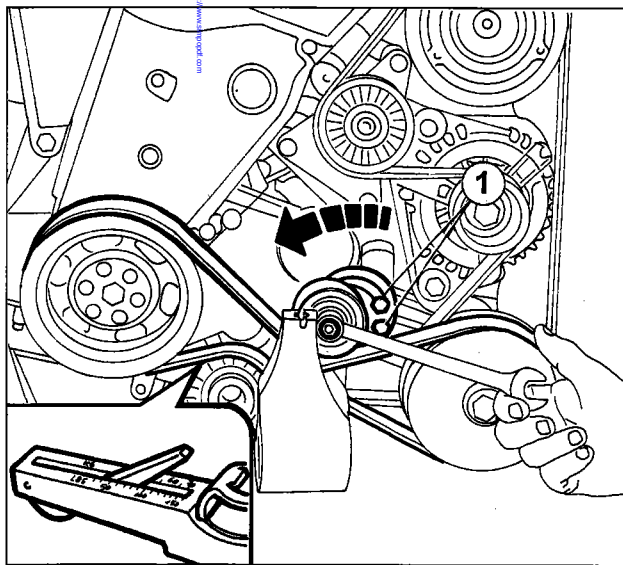


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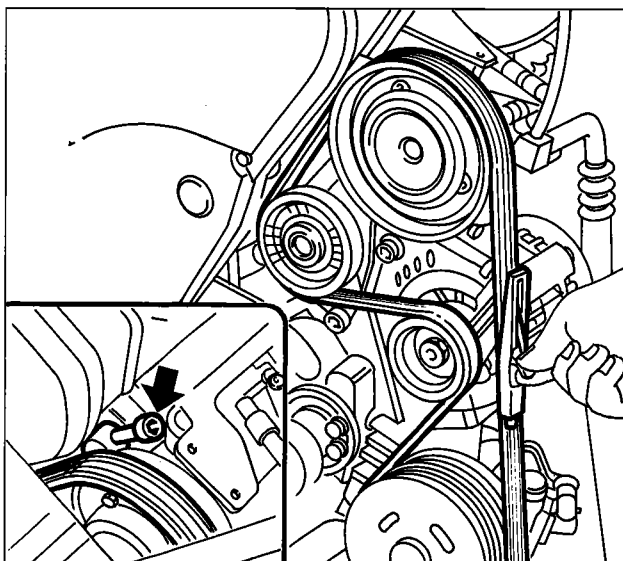
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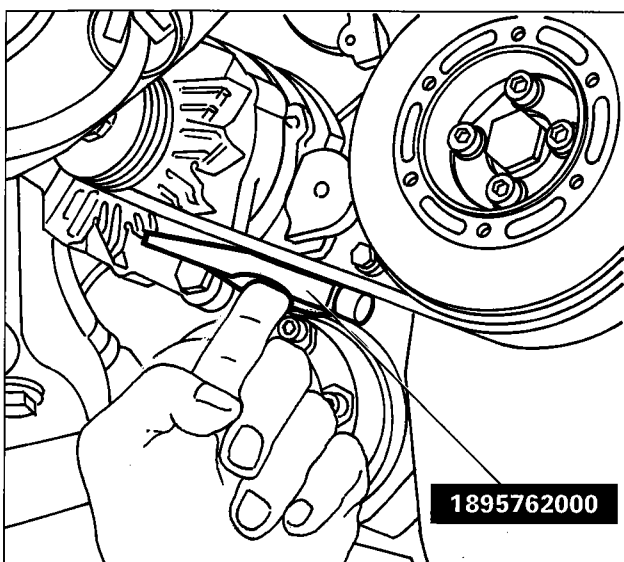
### Bravo 1998 20v

Check that the tension values for the alternator/air conditioning compressor drive belt and the power assisted steering drive belt, measured using the special equipment, correspond to the recommended figures, given in the table overleaf. If the tension values are not correct, act on the centre tensioner screw to adjust the power assisted steering belt tension, with the fixing bolts (1) slack, tension and lock the bolts (1).



P4A04CA02

To adjust the tension of the alternator/air conditioning compressor belt tension, act on the special adjustment screw removing the compressor cover, if necessary.



P4A10EX03

### Bravo-Brava 1929 D

Check that the tension values measured using the special tool, correspond to the recommended figures, given in the table overleaf. If the tension values are not correct, act on the bolts fixing the alternator and the screw for adjusting the drive belt tension and the special micrometric screw and bolts fixing the pump to correct the tension of the power assisted steering pump drive belt tension.



### Tension values for used belts

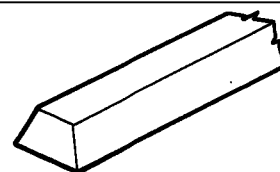
| BELT SECTION |               |                | TENSION daN |
|--------------|---------------|----------------|-------------|
| AV 10        | TYPE A        | Not pre-run in | 20 ÷ 29     |
|              | TYPES B and C | Not pre-run in | 25 ÷ 35     |
| AV 11        | TYPES B and C | Not pre-run in | 25 ÷ 35     |
| AV 13        | TYPE A        | Not pre-run in | 30 ÷ 40     |
|              | TYPES B and C | Not pre-run in | 32 ÷ 43     |
| POLY-V       | 3 ribs        |                | 23 ÷ 30     |
|              | 4 ribs        |                | 30 ÷ 41     |
|              | 5 ribs        |                | 38 ÷ 53     |
|              | 6 ribs        |                | 45 ÷ 62     |
|              | 7 ribs        |                | 54 ÷ 74     |

### Tension figures for new belts

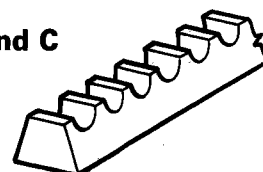
| BELT SECTION |              | TENSION daN |
|--------------|--------------|-------------|
| AV 10        | TYPE A       | 30 ÷ 40     |
|              | TYPE B and C | 40 ÷ 55     |
| AV 11        | TYPE B and C | 40 ÷ 55     |
| AV 13        | TYPE A       | 45 ÷ 55     |
|              | TYPE B and C | 50 ÷ 65     |
| POLY-V       | 3 ribs       | 36 ÷ 45     |
|              | 4 ribs       | 48 ÷ 60     |
|              | 5 ribs       | 60 ÷ 75     |
|              | 6 ribs       | 72 ÷ 90     |
|              | 7 ribs       | 84 ÷ 105    |

### Trapezoid type belts

#### Type A



#### Type B and C

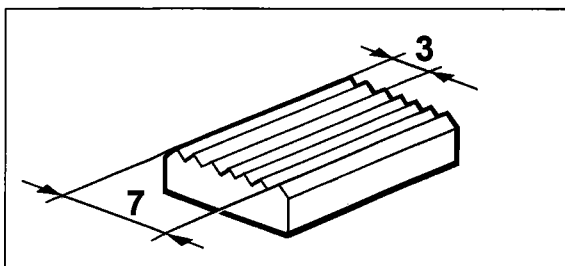


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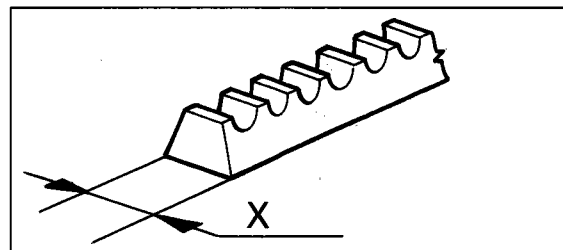
In order to determine whether the trapezoid belt in question is type AV 10 - AV 11 - etc., it is necessary to measure the distance "X" on the back of the belt; if the figure is 10 mm then the belt is a type AV10, if it is 11 mm then it is type AV 11 and so on.

### Poly-V type belts

In order to determine the number of ribs on the poly-v belt in question it is necessary to count the number of teeth (or points) from 3 - 7 on the actual belt, as illustrated in the diagram below.



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### 7 VISUALLY INSPECT CONDITION OF VARIOUS TRAPEZOID AND/OR POLY-V DRIVE BELTS

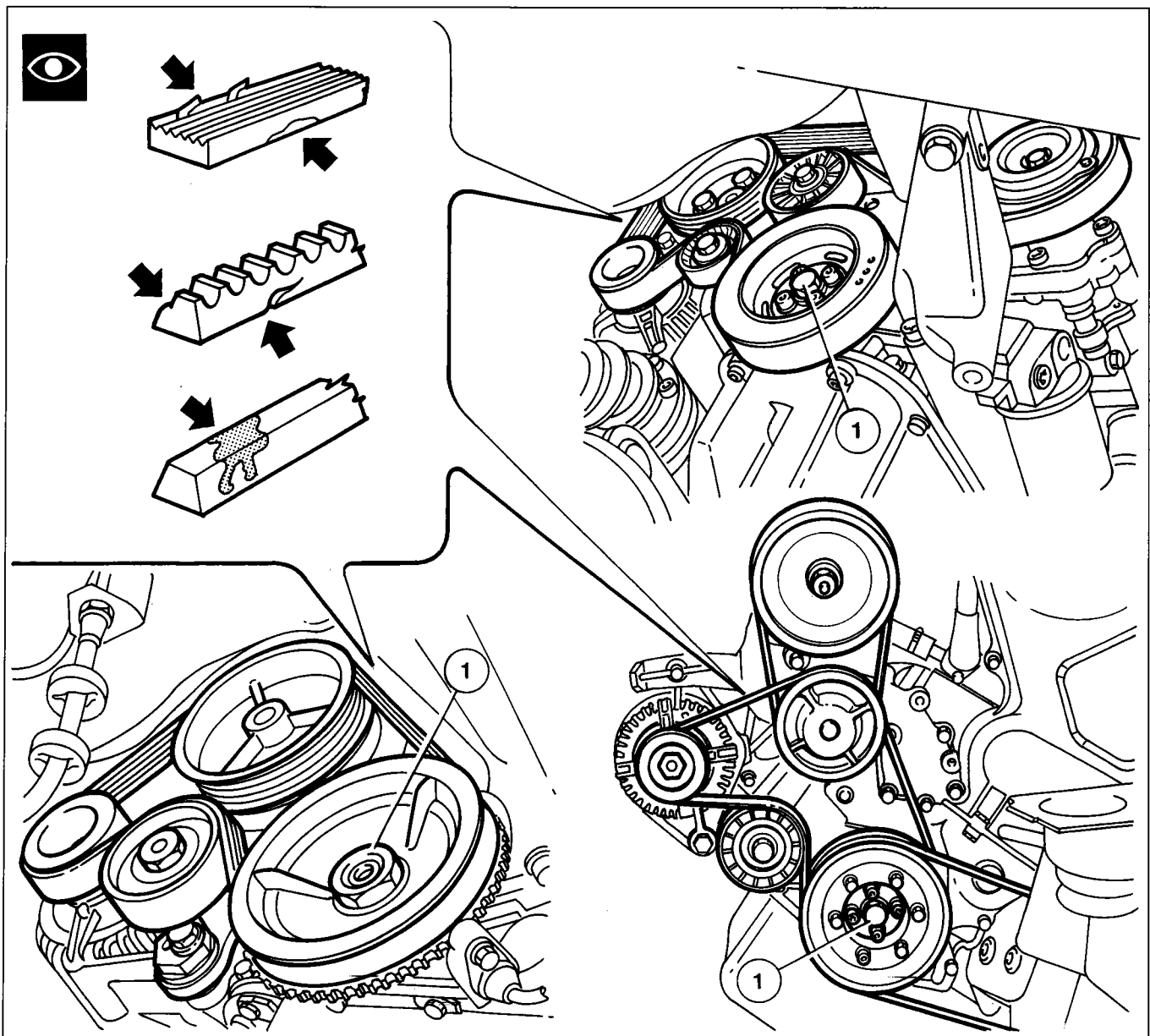
- Disconnect the negative battery lead, remove the right front wheel, then remove the wheel arch lining to gain access to the auxiliary shaft drive belts.
- Insert a spanner in the nut (or bolt) fixing the damper flywheel (1), rotate the crankshaft and check the condition of the auxiliary shaft drive belts along the entire perimeter.



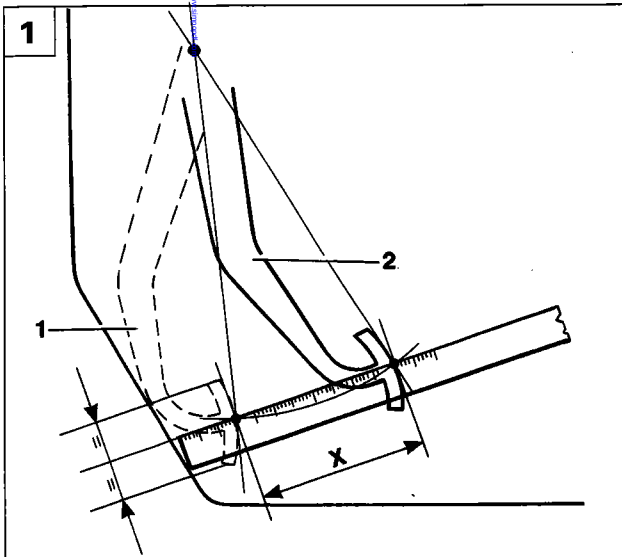
*Check the condition of the belts, check in particular that there are no: cracks, cuts, surface wear of the material (which would appear smooth and shiny), dry or hard sections with a consequent loss of grip.*

*Also check that the belts have not come into contact with oil or solvents which could adversely affect the elasticity of the rubber or the adhesion properties.*

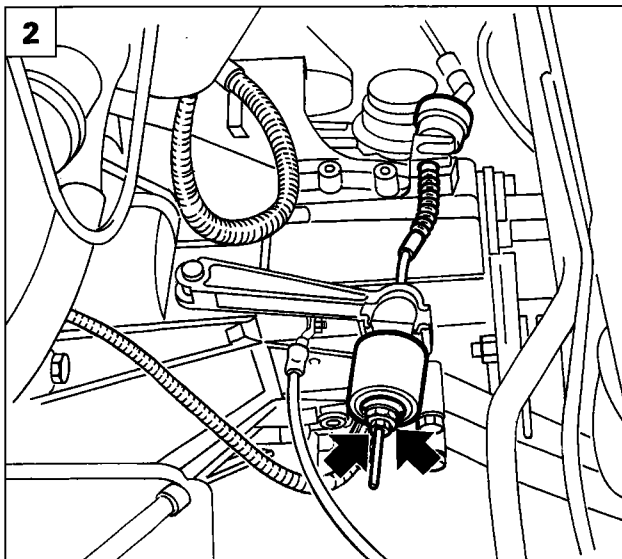
*If one of the above faults is found, inform the Customer of the need to replace the belts.*



P4A06CA01



P4A07CA01



P4A07CA02



## **8 CHECK, ADJUST CLUTCH PEDAL TRAVEL OR HEIGHT**



The check should only be carried out on vehicles with mechanical release devices (1370 12v - 1581 16v - 1747 16v - 1910 TD - 1929 D). The 1998 20v engine type has a hydraulic release device.

### **1. Measure the clutch pedal travel:**

1. Pedal in end of travel position
2. Pedal in rest position

X. Pedal travel:

155 ± 10 mm (1370 12v)

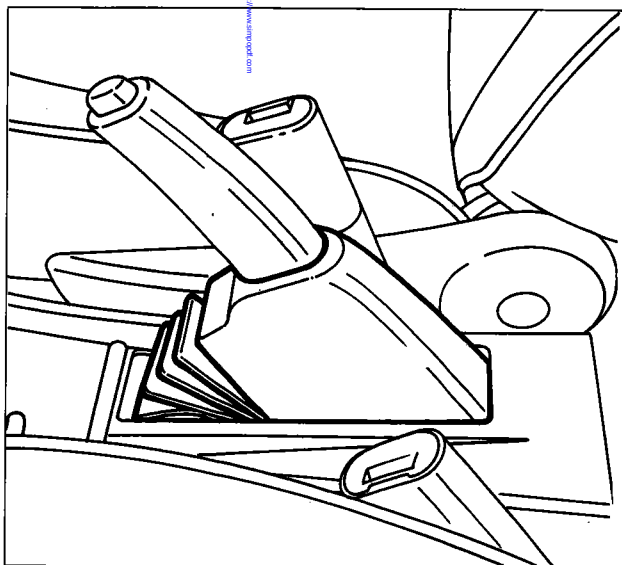
170 ± 10 mm (1581 16v - 1747 16v - 1910 TD - 1929 D)

### **2. In order to adjust the clutch pedal in the rest position it is necessary:**

- to let the clutch operating mechanism bed in by fully depressing the pedal 2 or 3 times;
- to check that the travel "X" corresponds to the recommended figure. The travel is measured using a rule corresponding to the pedal centre line and is equivalent to the distance between the pedal in the end of travel position (pedal in contact with the bodyshell) and the pedal in the rest position.
- any adjustments to the travel are carried out via the nut and lock nut for the clutch cable, gearbox side.

**NOTE** *There should be no obstructions in the area under the pedals preventing the total travel of the pedals: take care, in particular, that any mats are lying flat and not interfering with the pedals.*

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### 9 CHECK/ADJUST HANDBRAKE LEVER TRAVEL

Operate the handbrake lever several times and check that the travel of the toothed sector is 5 notches.

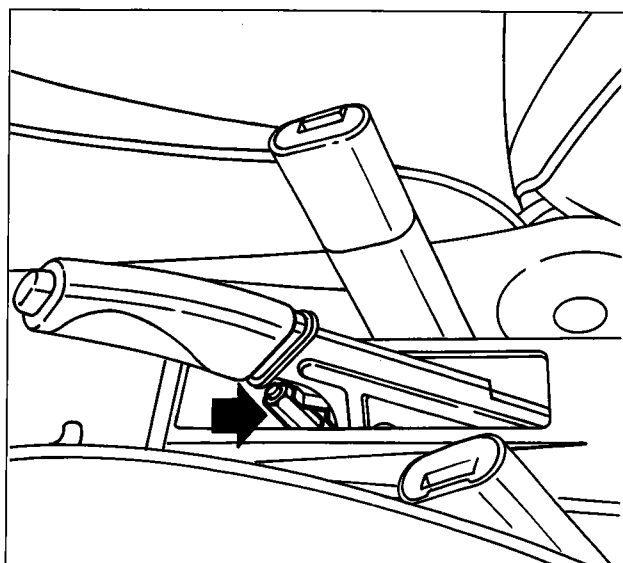
If this is not the case, proceed with the adjustment as follows:

- remove the protective boot for the control lever;
- act on the adjustment nut shown, tightening or loosening it in order to increase or decrease the handbrake lever cable travel;
- check that the lever travel is equal to 5 notches on the toothed sector.

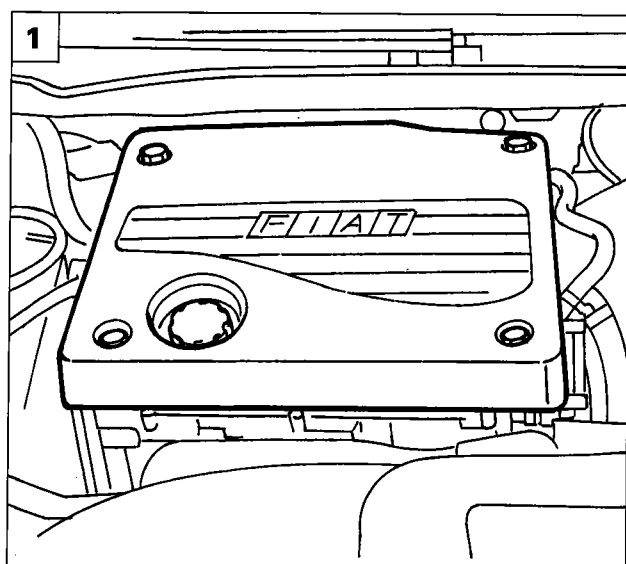


*When the adjustment has been carried out, the control lever travel should not exceed 5 notches on the toothed sector.*

*With the handbrake lever in the rest position the rear wheels should rotate freely; if this is not the case, repeat the adjustment.*



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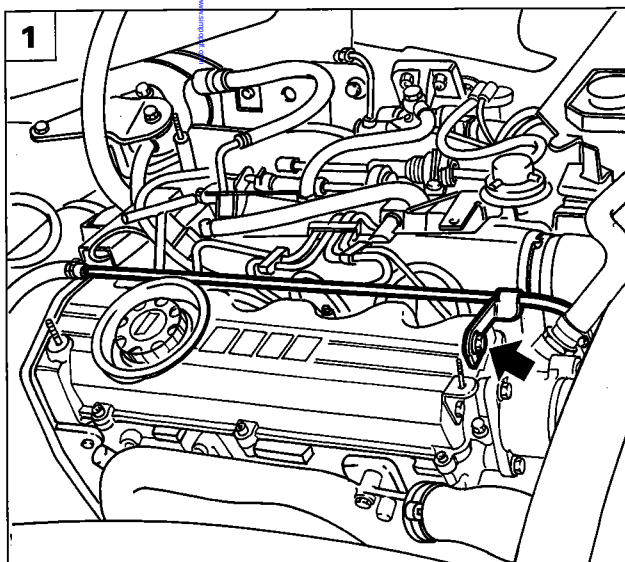
### 10 11 CHECK/ADJUST TAPPET CLEARANCE



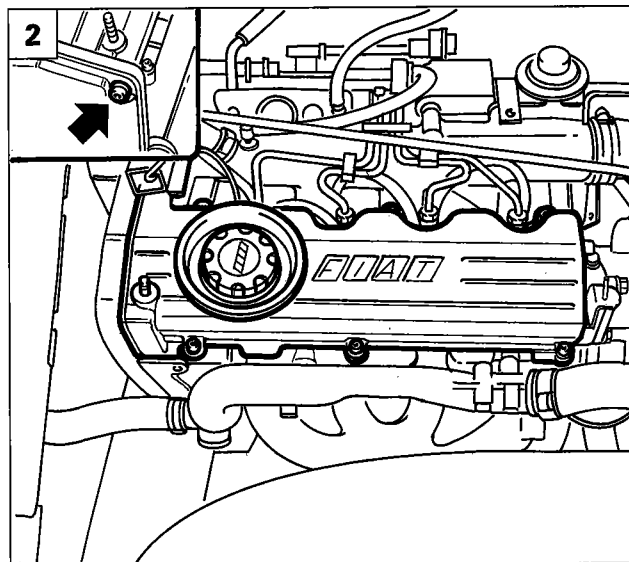
The following components must be removed in order to check and, if necessary, adjust the tappet clearance.

### Bravo-Brava 1910 TD

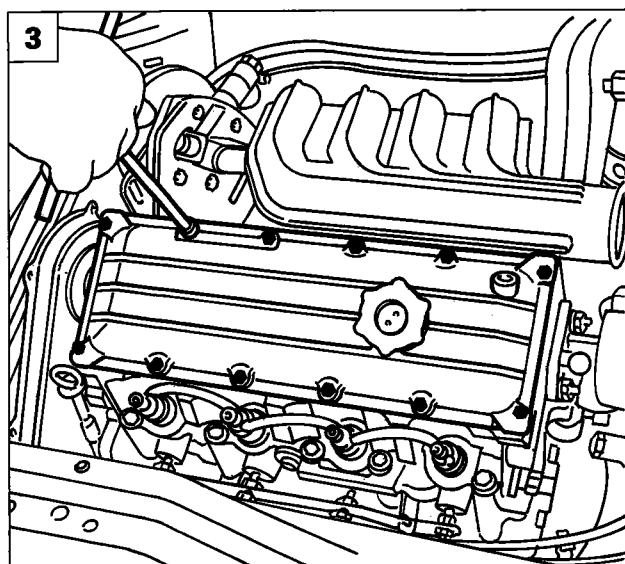
1. Remove the upper engine protection.



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P4A09CA02



P4A17EX04



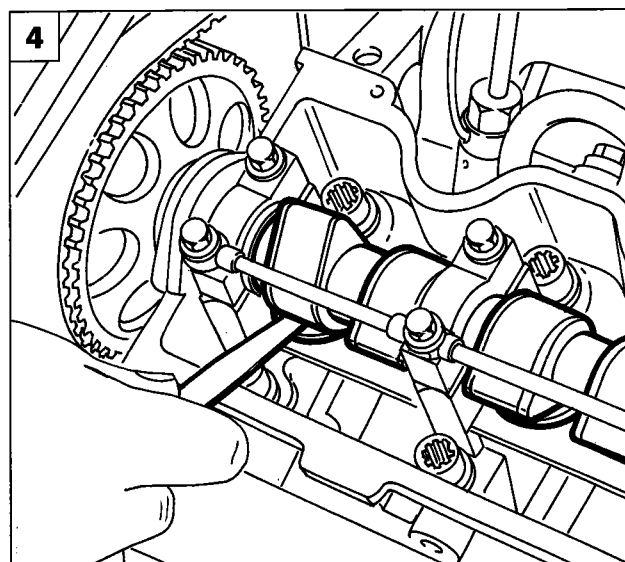
1. Disconnect the rigid engine coolant pipe using tool 1860967000 to undo the connector on the cylinder head; also undo the bolt shown and position the pipe at the side.
2. Undo the bolts fixing the tappet cover and remove it taking care to disconnect the oil vapour recovery pipe and the bolt shown-in the inset fixing the timing belt cover to the tappet cover. Then proceed with checking the tappet clearance.

### Bravo-Brava 1929 D

3. Undo the bolts fixing the tappet cover, disconnect the brackets connected to it and remove it. Then proceed with checking the tappet clearance.

### Checking tappet clearance and, if necessary, adjusting

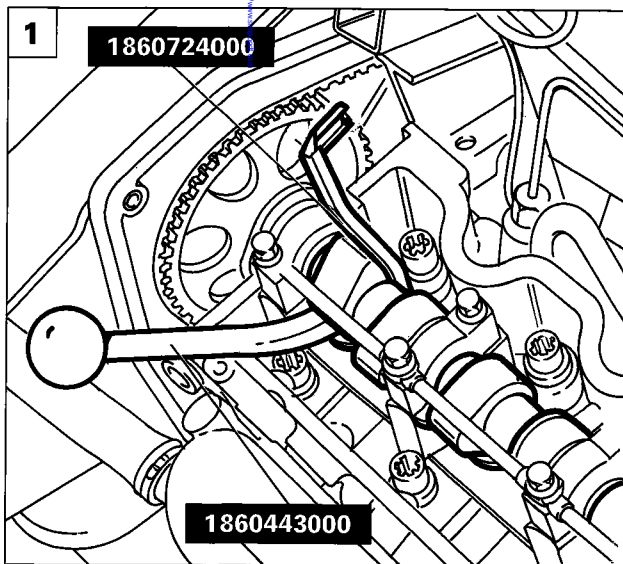
4. Rotate the camshaft so that the inlet and exhaust valves are in the closed position. With the engine cold, check the clearance between the cam recess radius and the tappet is within the recommended values using a feeler gauge.



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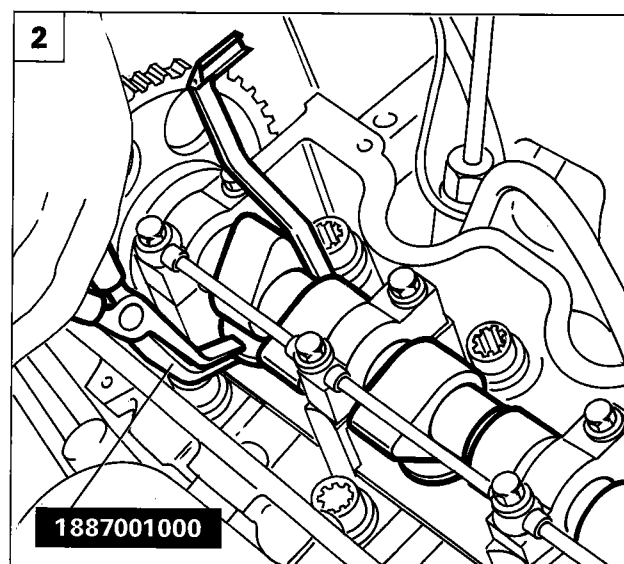
| Engine type | 1910 TD | 1929 D  |
|-------------|---------|---------|
| Inlet       | 0.35 mm | 0.30 mm |
| Exhaust     | 0.35 mm | 0.35 mm |

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If the tappet clearance does not correspond to the recommended figures, proceed as follows:

1. Using pressure lever 1860443000, lower the cup for the tappet concerned and insert tool 1860724000 for retaining tappets positioning the notches in the edge of the tappet in such a way as to facilitate the subsequent extraction of the shim to be replaced.



2. Lift up the shim to be replaced, working as appropriate, then remove it using pliers 1887001000.

**NOTE** Replace the shim removed with another one of the appropriate size to restore the correct valve clearance. Carry out the same operation for the other shim for the pair of valves being adjusted.

## 12 CHECK EXHAUST GAS EMISSIONS (petrol engines)

The electronic injection/ignition systems used are capable of automatically controlling the advance, the carbon monoxide (CO) content and the idle air flow rate, therefore no manual adjustment operations are required. However, a check on the content of the exhaust gases downstream of the catalyzer can provide useful indications on the injection/ignition system operating conditions and the engine and catalyzer parameters.

The concentration of carbon monoxide (CO), unburnt hydrocarbons (HC) and the value  $\lambda$ , is measured with the catalyzer at operating temperature (300 - 350 °C) (we recommend driving hard along a section of road for around 5 to 10 minutes to ensure that the catalyzer reaches operating temperature), the insert a suitably calibrated tester sensor at least 30 cm into the end of the exhaust pipe as shown in the diagram overleaf.

If the shape of the end section of the exhaust pipe is such that the sensor cannot be fully introduced, add a special extension pipe ensuring the seal in the join area.

1. Check that the concentration of CO and the value  $\lambda$  during idling and accelerated idle, correspond to the values recommended in the government circular:

**Engine measurement during idling: CO limit  $\leq 0.5\%$  vol.**

**Measurement for accelerated idle (2000 - 2500 rpm): CO limit  $\leq 0.3\%$  vol.**

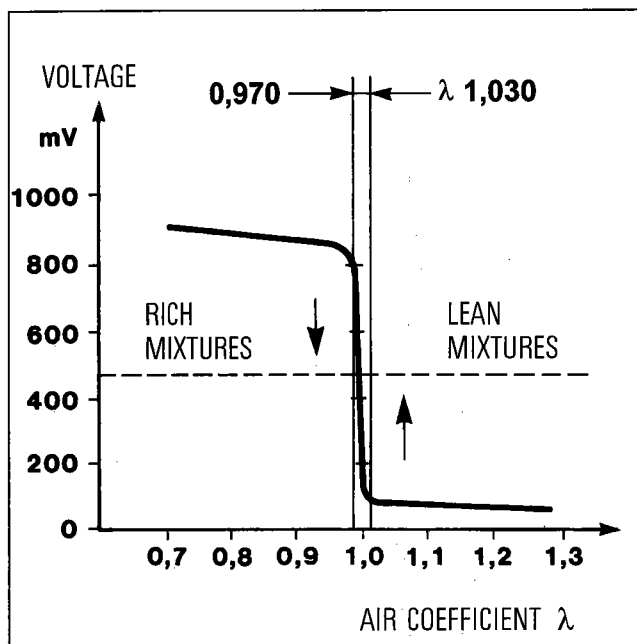
**Lambda =  $1 \pm 0.03$**



If the values are not within the limits set out in the government circular, the Customer must be notified of the need to check:

- that the Lambda sensor is working properly using the Fiat/Lancia tester;
- for the presence of air penetration in the area surrounding the Lambda sensor housing;
- the injection system, particularly the wear of the spark plugs.

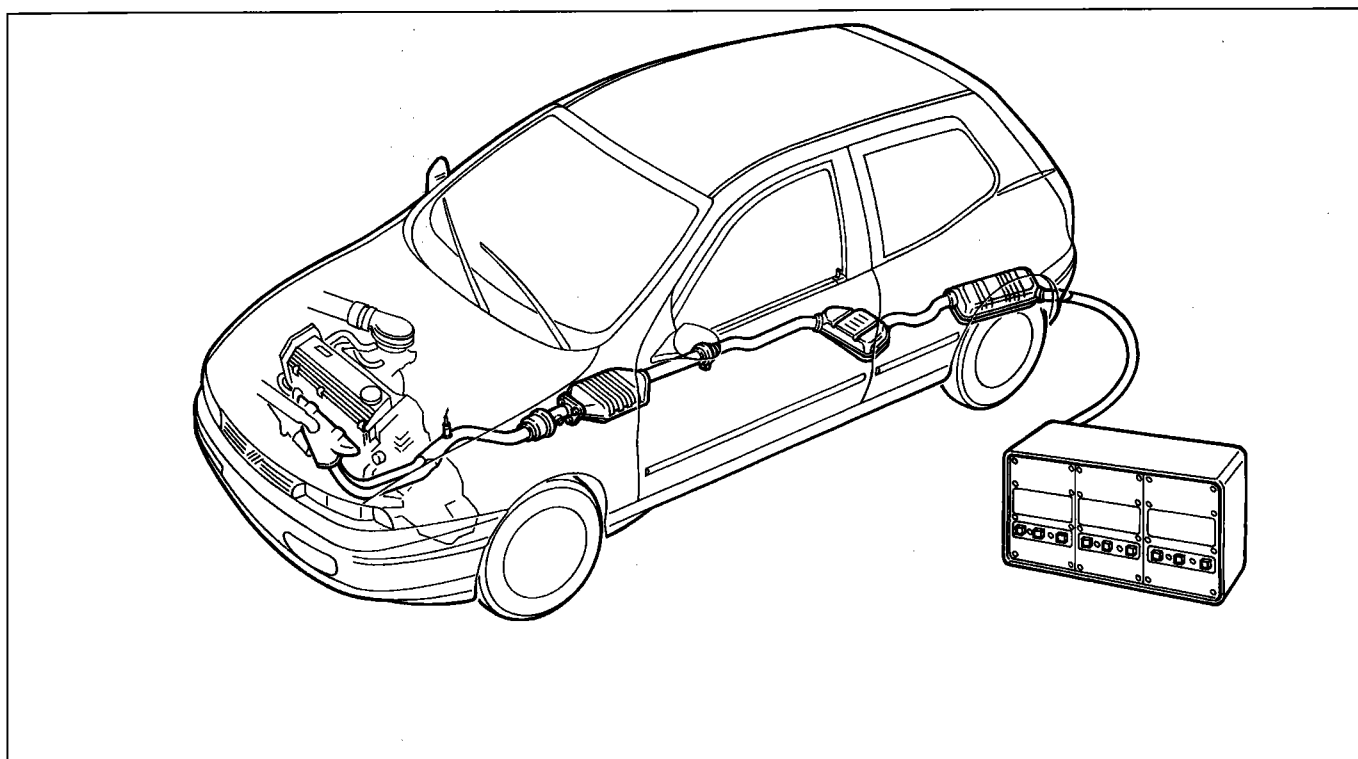
2. If the HC figure is more than 90 p.p.m., the cause of the problem should be sought in the engine timing or the decreased efficiency of the catalyzer.



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Factor  $\lambda$  is obtained from the ratio between the quantity of intake air and the theoretical quantity of air required to burn all the fuel injected.

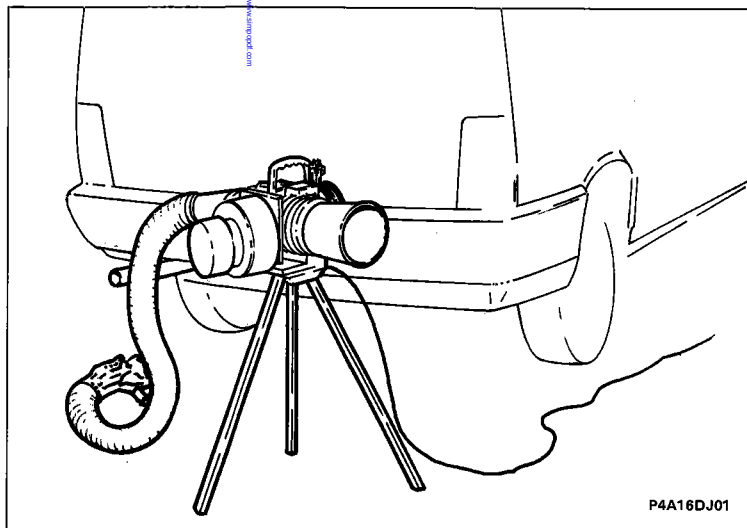
To achieve an optimum mixture the quantity of fuel injected must be as close as possible to the theoretical quantity required to be completely burnt in relation to the quantity of air drawn in by the engine. In this case the Lambda factor is equal to 1 (ideal mixture) and the CO content is within the legal limits. With  $\lambda \geq 1$  (lean mixture), excess air, the CO tends to assume low values: with  $\lambda \leq 1$  (rich mixture), lack of air, the CO values tend to be high.



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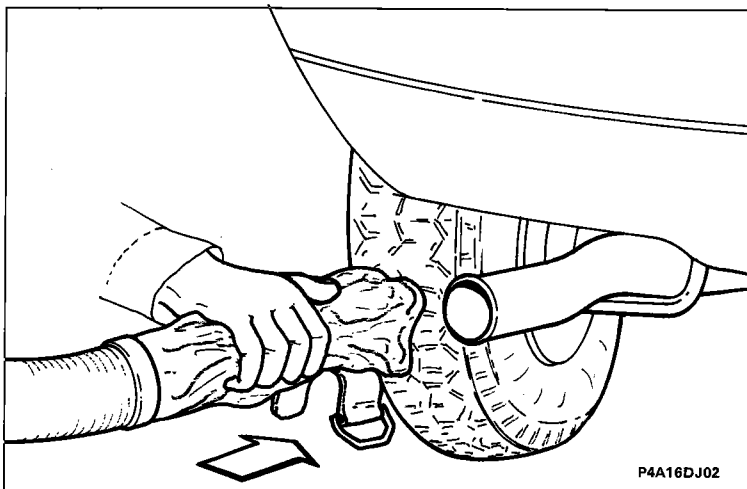
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## 12 CHECK EXHAUST GAS EMISSIONS (diesel engines using opacity meter)

Start up the engine and let it reach operating temperature (radiator cooling fan comes on twice).

Place the opacity metering measuring unit in a stable position near the vehicle exhaust pipe (the opacity meter exhaust must be positioned against the wind).



Connect the measuring unit flexible pipe with the vehicle exhaust pipe. Carry out the equipment connections and adjustments in accordance with the Manufacturers' instructions.

Fully depress the accelerator pedal three times in quick succession so that the engine revs limiter speed is reached.

Carry out measurements for five subsequent full accelerations.

Make a note of the maximum values reached. To obtain the figure for the test, calculate the arithmetical average of the three closest values.

If there is more than one suitable trio, select the one which gives the highest average value.

Compare the values with the limit given on the plate on the vehicle conforming with the EEC directive.

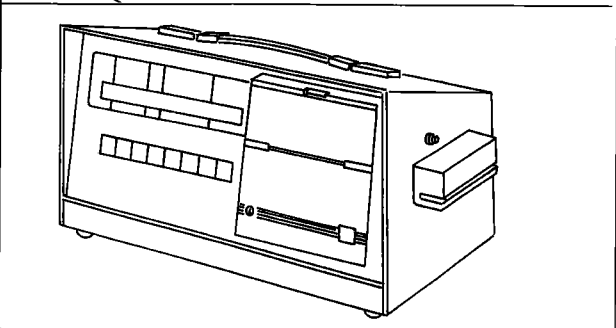
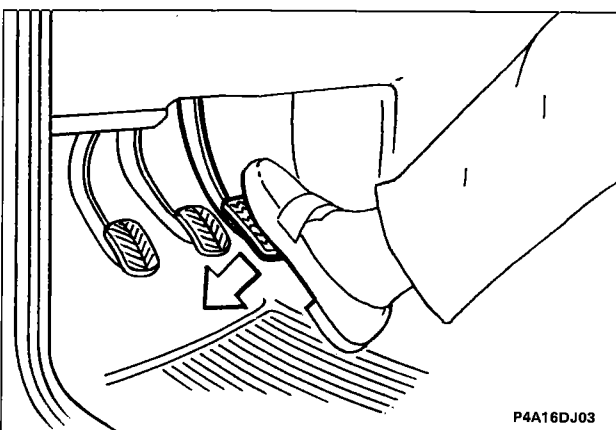
Where figures are not available, apply the following limits from directive 92/55/EEC:

**Naturally aspirated diesel engine:**

$$K = 2,5 \text{ m}^{-1}$$

**Diesel engine with turbocharger:**

$$K = 3 \text{ m}^{-1}$$



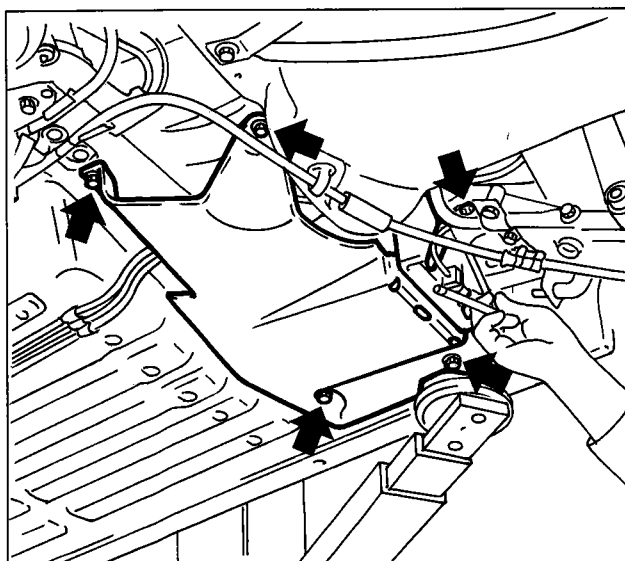
If the figure for the exhaust fumes is more than 70%, notify the Customer of the need to carry out a series of tests on: the condition of the air filter, injection pump timing and flow rate, valve clearance and timing, injector calibration and cleanliness, compression ratio.

### 13 CHECK ANTI-EVAPORATION SYSTEM

The anti-evaporation system prevents the petrol vapours, which form in the tank and the fuel system, from being discharged into the atmosphere and consequently releasing the light hydrocarbons (HC) which they contain, producing a pollutant effect.

It is therefore necessary to check that the anti-evaporatin system pipes are correctly positioned in the engine compartment; also check their condition, making sure that there are no signs of cracks, cuts or leaks and that they are correctly fixed and not interfering with other components. Check the condition of the active charcoal filter. Position the vehicle on a lift and check the condition of the pipes under the floo of the vehicle.

### 14 REPLACE FUEL FILTER (petrol engines)



P4A41CJ02

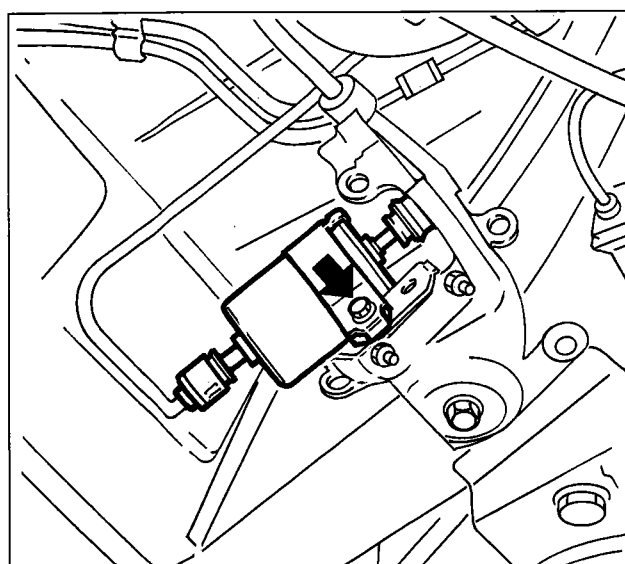


Proceed with removing the fuel filter by carrying out the following operations:



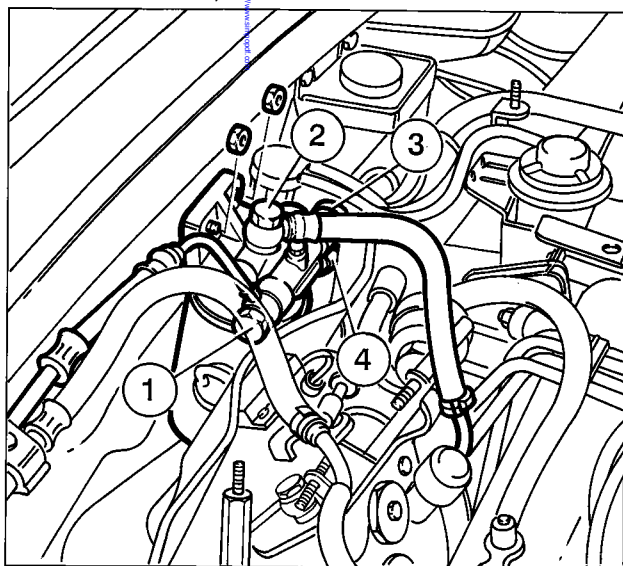
- Raise the vehicle;
- undo the bolts shown in the diagram and remove the protective shield.
- disconnect the rapid fue inlet and outlet connectors from the filter, collecting the fuel which comes out during the operation in a suitable container.
- undo the fixing bolt and remove the filter.

**NOTE** *The filter should NEVER BE FITTED THE WRONG WAY ROUND, or else it has to be replaced (even after working in the wrong position for a short period). The arrow on the outer casing indicates the direction in which the fuel should flow. After replacing the filter, start up the engine and check that there are no leaks of fuel from the seals.*

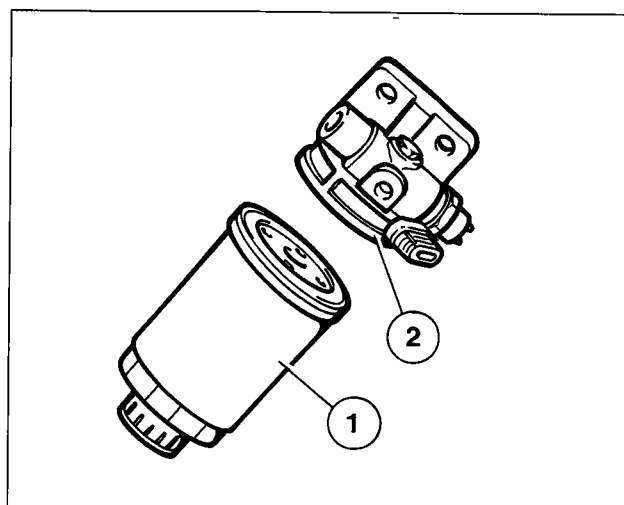


P4A41CJ03

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P4A14CA01



P4A14CA02

#### 15 REPLACE FUEL FILTER (diesel engines)

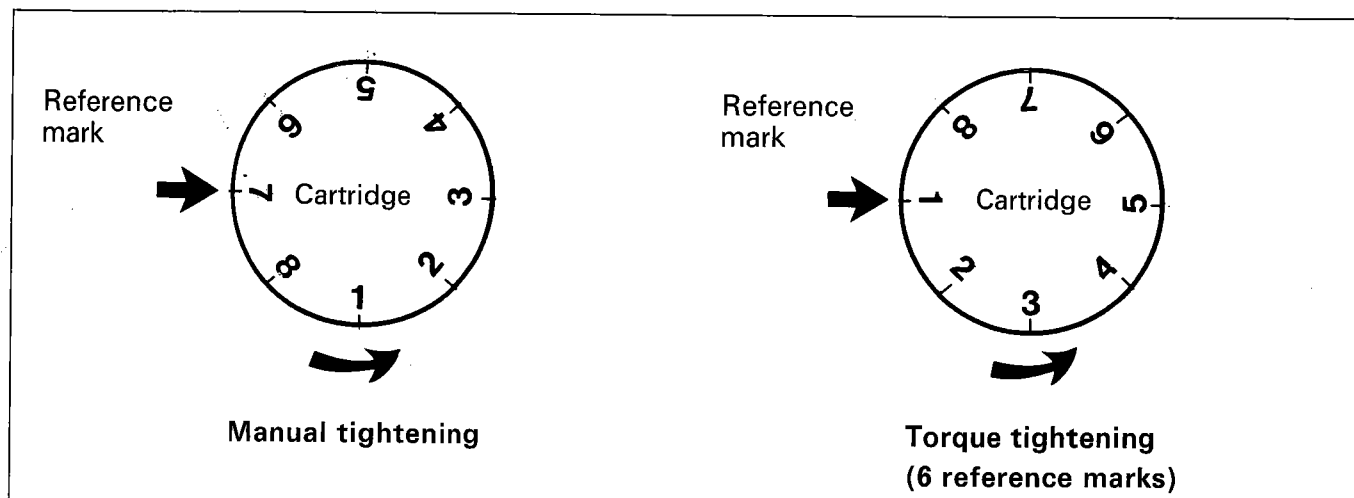
To replace the fuel filter, after having disconnected the negative battery lead, proceed as follows:

- Disconnect the connector (1) for the fuel supply pipe from the tank from the filter;
- Disconnect the connector (2) for the fuel supply pipe to the injection pump from the filter;
- Disconnect the electrical connection (3) from the fuel pre-heating device sensor;
- Disconnect the electrical connection (4) supplying the fuel pre-heating device;
- Undo the two nuts fixing the partition between the passenger and engine compartments and remove the complete fuel filter.
- At the bench, undo the fuel filter (1) with the seal from the support (2).

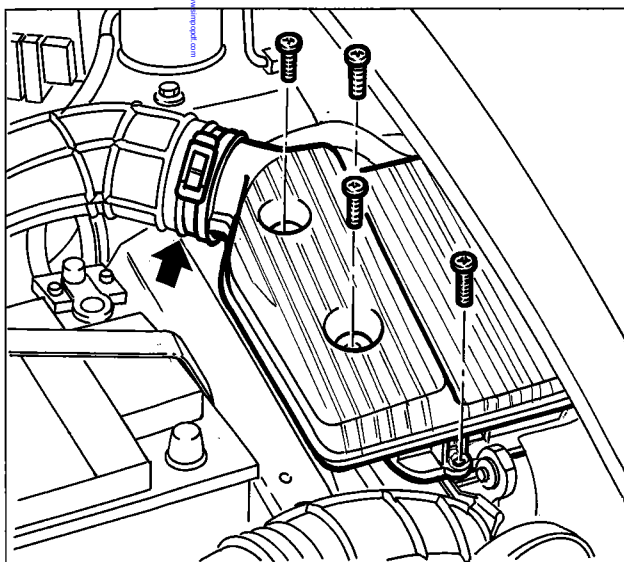
When refitting the fuel filter, proceed as follows:

- lubricate the rubber seal for the cartridge;
- fill the filter cartridge with diesel fuel (in order to shorten the self-bleeding time);
- tighten the cartridge in contact with the support;
- close the cartridge by 3/4 of a turn (to achieve a tightening torque of 1.3 - 1.6 daNm).

For the 1929 D version, which is equipped with a Lucas pump, this is achieved by means of the numbered references on the cartridge. For example, when the cartridge is in contact with the support a mark must be made on the support corresponding to one of the references on the filter, then the filter must be tightened counting 6 reference marks after that reference.



P4A10DJ01



P4A15CA01



### 16 17 REPLACE AIR FILTER CARTRIDGE

Undo the bolts fixing the air filter cover. Lift up the cover and extract the filter element; to facilitate this last operation, release the retaining band for the connecting hose to the butterfly casing.



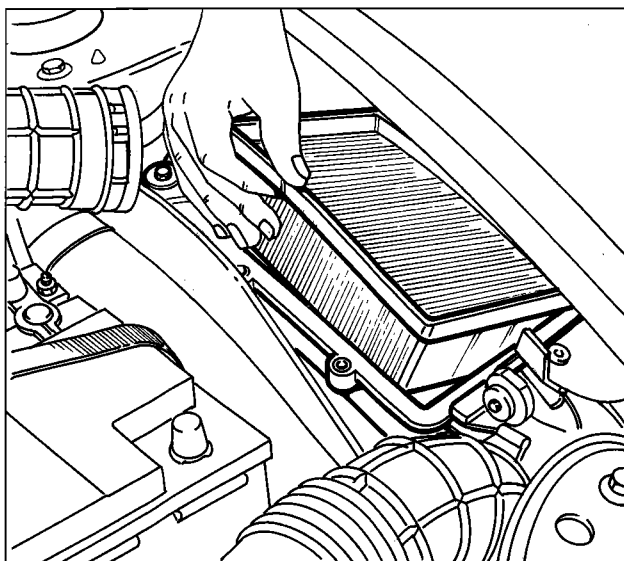
*Any cleaning operation could damage the filter and risk adversely affecting the operation of the engine fuel system.*

Clean the air filter cartridge container carefully, replace the filter, then refit the cover and fix it using the appropriate bolts.



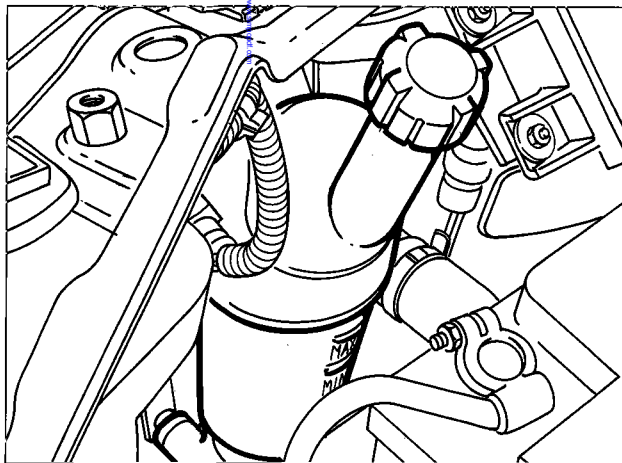
*If there are traces of oil on the filter, check for possible penetration throughout the entire air circuit.*

**NOTE** *If the vehicle is used on dusty roads replace the air filter more often. If they ask, the Customer should be provided with suitable information on the optimum maintenance frequencies depending on the specific usage of the vehicle.*



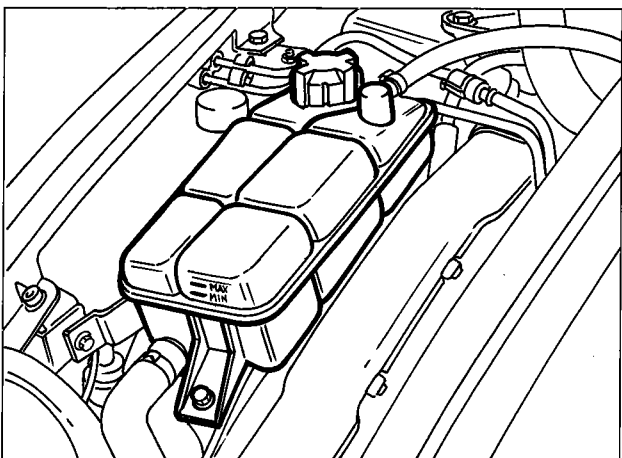
P4A15CA02

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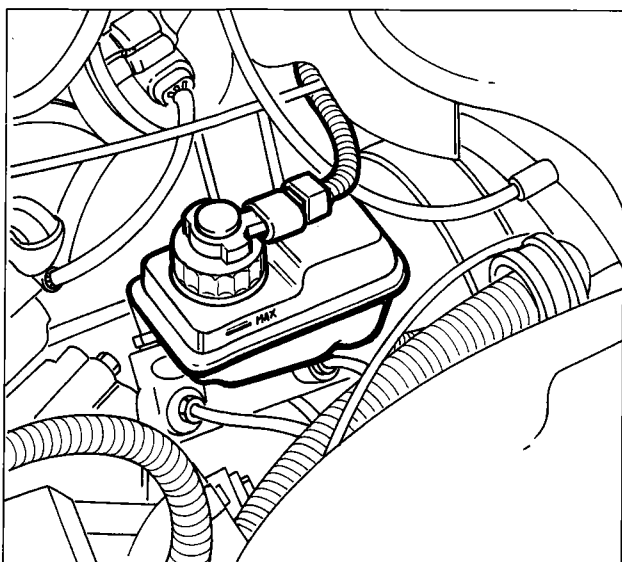
1370 12v - 1581 16v

P4A16CA01



1747 16v - 1998 20v - 1910 TD - 1929 D

P4A16CA02



P4A16CA03

## 18 TOP UP FLUID LEVELS

### Engine coolant



*Do not remove the radiator cap when the engine is very hot as there is a danger of being scalded.*

The fluid level should be checked with the engine cold and it should not be below the MIN level on the tank.

If the level is too low, slowly pour a mixture of 50% distilled water and Fiat Lubrificanti Paraflu 11 through the filler.

**NOTE** *The addition of "Paraflu Formula Europa" to Paraflu 11 used originally means that it is not possible to check the efficiency of the anti-freeze using the regular test equipment. "Paraflu Formula Europa" is already mixed which means that water does not have to be added.*

### Brake fluid level

The brake fluid level is checked with the vehicle on a flat surface.

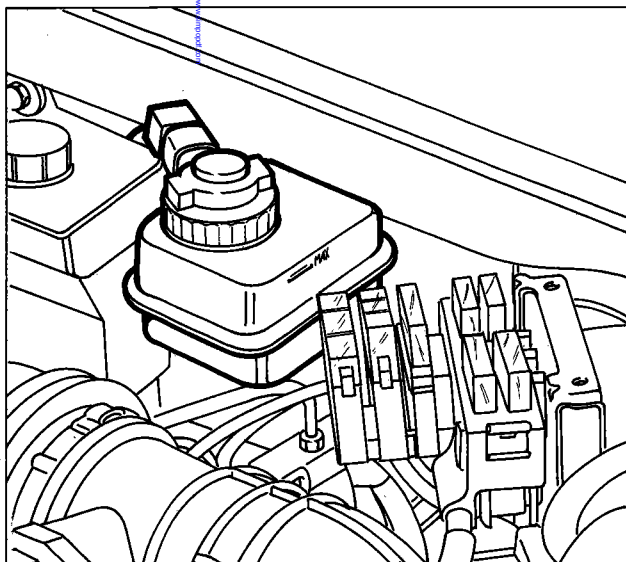
Check that the level of the fluid in the tank corresponds to the MAX reference on the tank.

It is normal for the brake fluid level to decrease over a period of time because this indicates that the brake pads are working properly.

The level of the brake fluid should not exceed the MAX level in the tank.

Check the operation of the warning light in the instrument panel: when the cover of the tank is pressed (with the ignition in the ON position) the warning light (①) should come on.





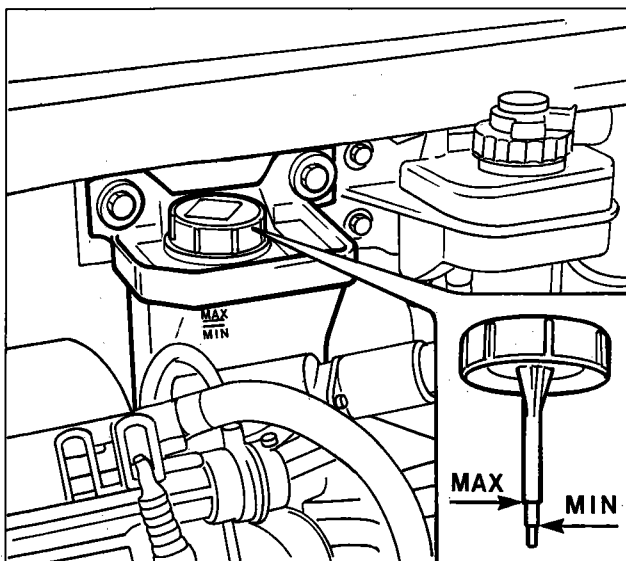
P4A17CA01

If fluid has to be added, only use DOT4 classification. Tutela TOP 4 270°C, which is used initially, is particularly recommended.



*Avoid the brake fluid, which is particularly corrosive, from coming into contact with the paintwork. If it does, wash immediately with cold water.*

*The symbol , on the container, identifies synthetic type brake fluids, distinguishing them from mineral types. The use of mineral type fluids irreparably damages the rubber seals in the braking system.*



P4A17CA02

### Power steering fluid level

Check that, with the vehicle on a flat surface and the engine cold, the fluid level is between the MIN and MAX references on the dip stick in the tank cap or on the actual tank.

In order to carry out the check, clean the dip stick, fully tighten the cap, undo it and check the level.

When the fluid is hot it may exceed the MAX level.

If necessary, add fluid, making sure that it has the same characteristics as the fluid already present in the system.

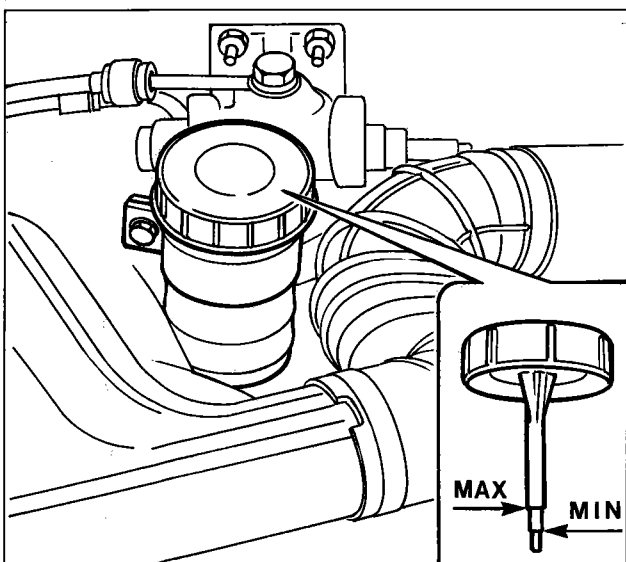
Start up the engine and wait until the level of the fluid in the tank stabilizes.

With the engine running and the vehicle stationary, turn the steering wheel completely to the right and to the left several times.

Top up until the level corresponds to the MAX reference, then retighten the cap.

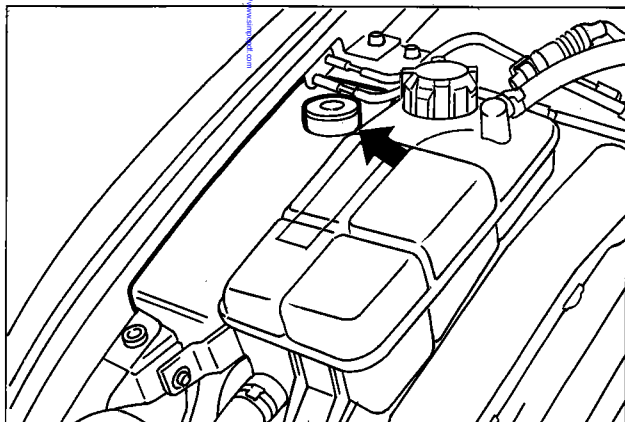


*Avoid power steering fluid coming in to contact with the hot parts of the engine as it is inflammable.*



P4A17CA03

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### Windscreen/rearscreen and headlamp washer fluid level

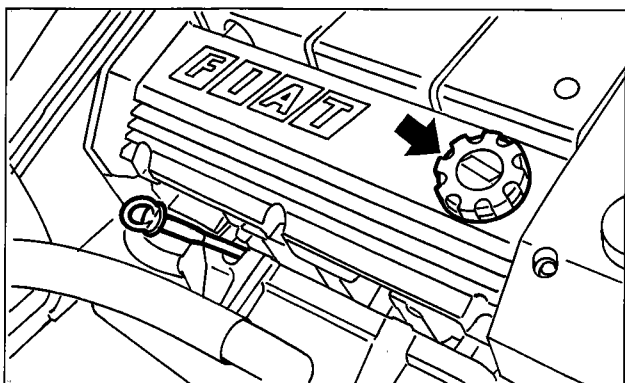
In order to add fluid, lift up the cap, lift up the filter and pour a mixture of water and Arexons DP1 fluid in the following percentages:

- 30% Arexons DP1 and 70% water in summer;
- 50% Arexons DP1 and 50% water in winter.

In the case of temperatures below -20 °C, use undiluted Arexons DP1.

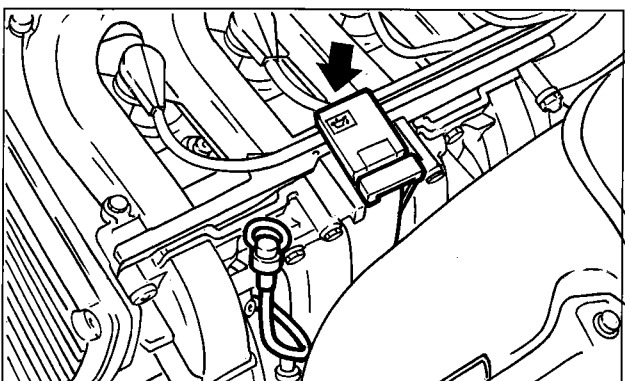
Versions with headlamp washers are fitted with a dip stick indicating the amount of fluid in the windscreen washer reservoir.

### Bravo-Brava 1370 12v



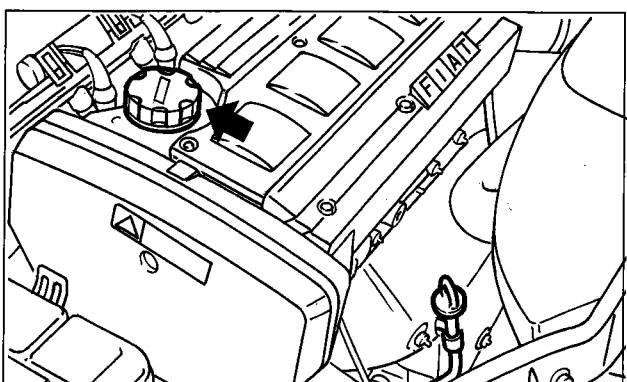
P4A18CA02

### Bravo-Brava 1581 16v



P4A18CA03

### Bravo-Brava 1747 16v



P4A18CA04

### Engine oil level

The engine oil level is checked with the vehicle on a flat surface and the engine cold, or around 10 minutes after the engine has been switched off.

The oil level should be between the MIN and MAX marks on the dip stick. The gap between the MIN and MAX levels corresponds to around 1 litre of oil.

If the level of the oil is close to or actually below the MIN reference, add oil through the filler until the MAX reference is reached.



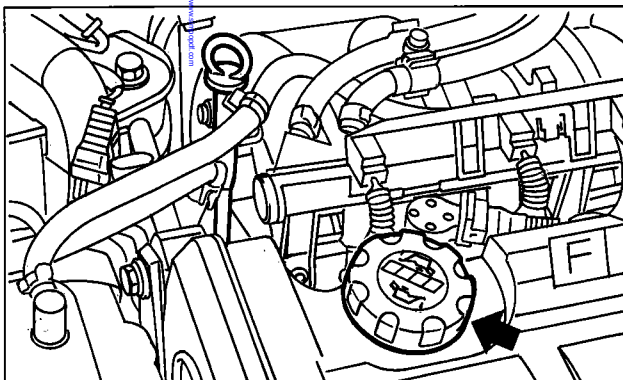
*The level of the oil should never exceed the MAX reference.*

*When topping up with oil take great care to avoid accidentally spilling engine oil in the alternator ventilation slits which could cause serious damage to the alternator and also represents a fire hazard.*

*Do not add oil with different characteristics from those of the oil used in the engine. Only the use of semi-synthetic oil guarantees the planned maintenance intervals.*

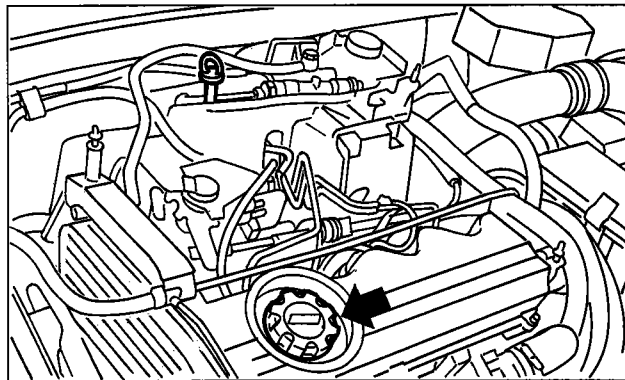
After having added oil, before checking the level, let the engine run for a few seconds and wait for several minutes after it has been switched off.





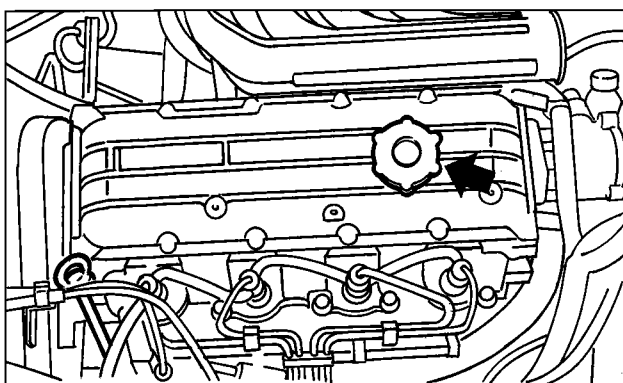
P4A19CA01

**Bravo 1998 20v**



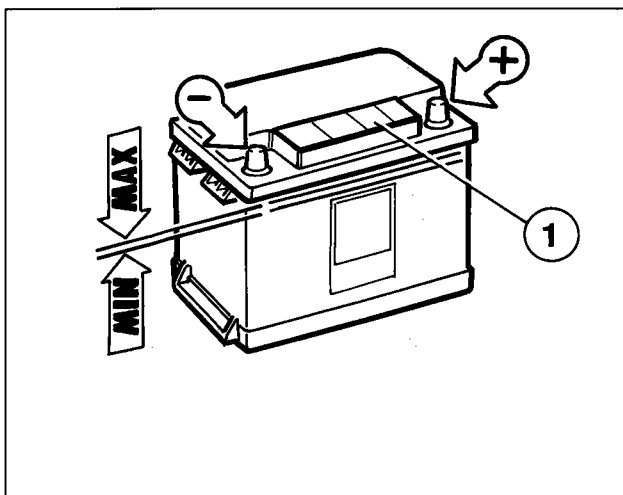
P4A19CA02

**Bravo-Brava 1910 TD**



P4A19CA03

**Bravo-Brava 1929 D**



P4A19CA04

### Battery fluid level

The battery is the "reduced maintenance" type: in normal usage conditions it does not need topping up with distilled water.

The level of the battery fluid (electrolyte), with the vehicle on a flat surface, should be between the references on the battery. If the level is below the MIN mark, lift up the protective cover (1) and top up using distilled water.



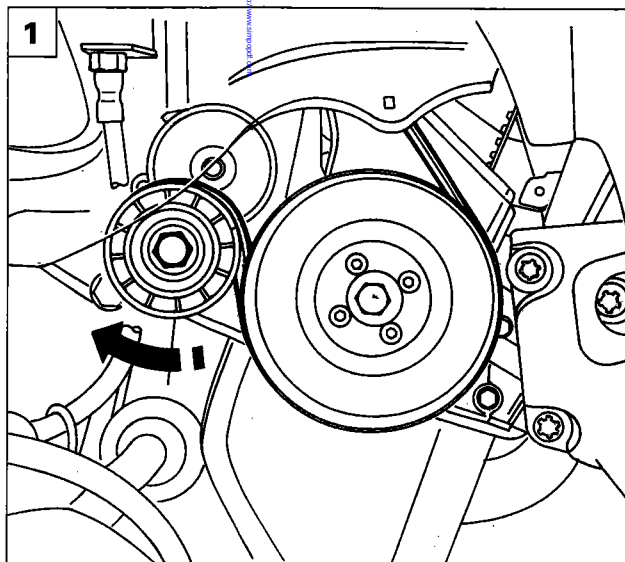
*The fluid contained in the battery is poisonous and corrosive. Avoid contact with the skin and eyes. Keep naked flames and possible sources of sparks away from the battery as there is a danger of explosion and fire.*



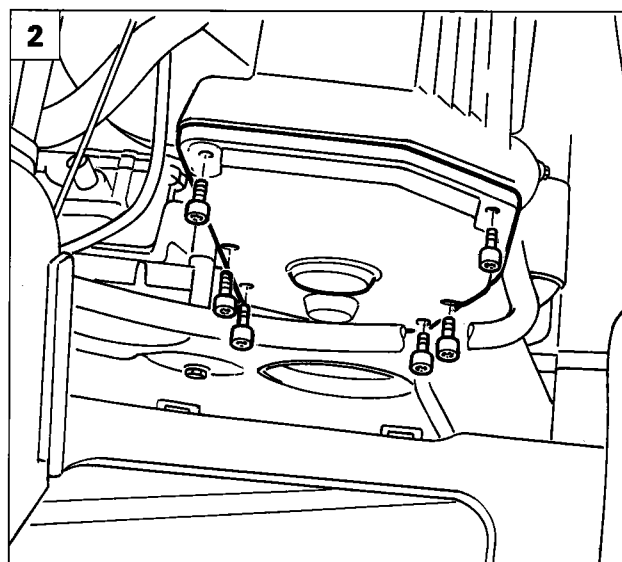
*The state of charge of the battery should be checked, preferably at the beginning of the cold season, to avoid the possibility of the electrolyte freezing.*

*This check should be carried out more often if the vehicle is mainly used for short journeys or if it is equipped with consumers which absorb power permanently with the ignition switched off, particularly if they have been fitted in the after market.*

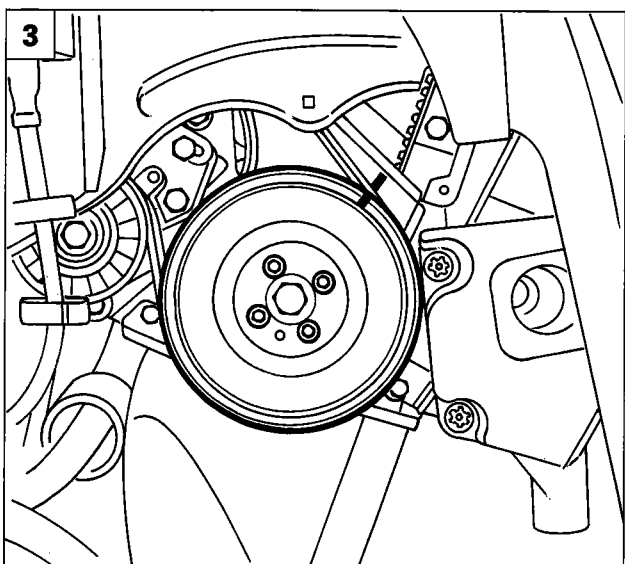
## 00.



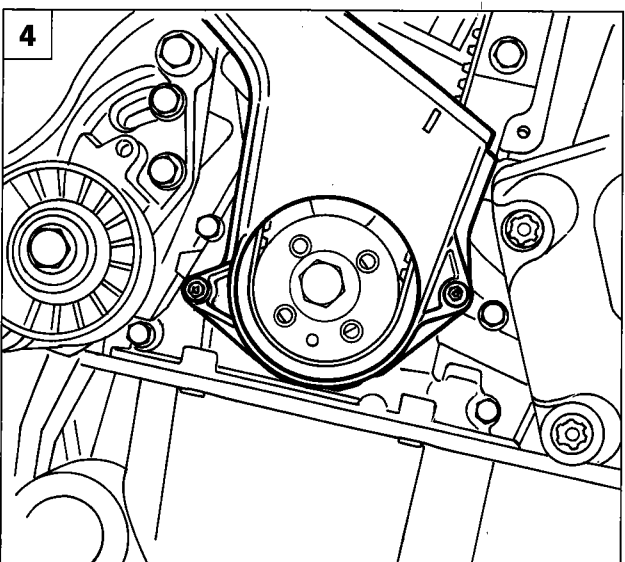
P4A11AX01



P4A12AX02



P4A12AX03



P4A12AX04



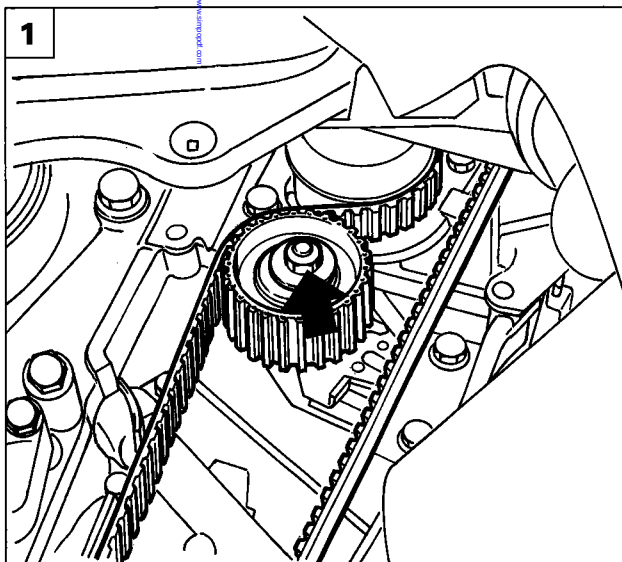
### 19 REPLACE TIMING BELT

#### Bravo-Brava 1370 12v

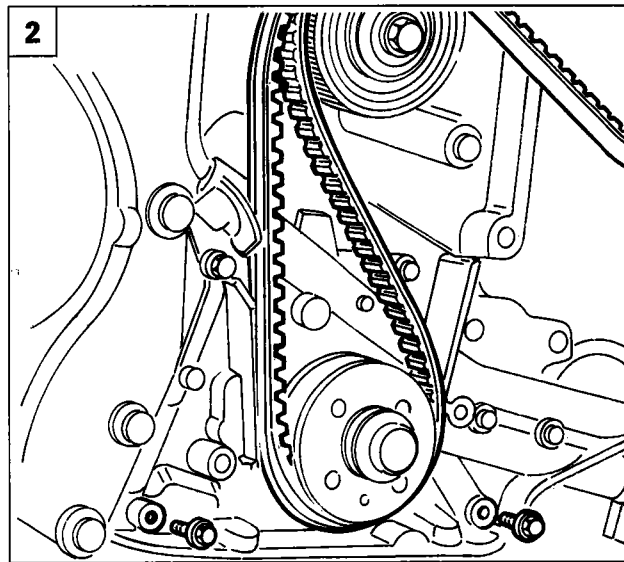
Position the vehicle on a lift, then:

- disconnect the negative battery lead;
- remove the right front wheel;
- remove the right wheel arch liner to gain access to the auxiliary shaft drive belt.

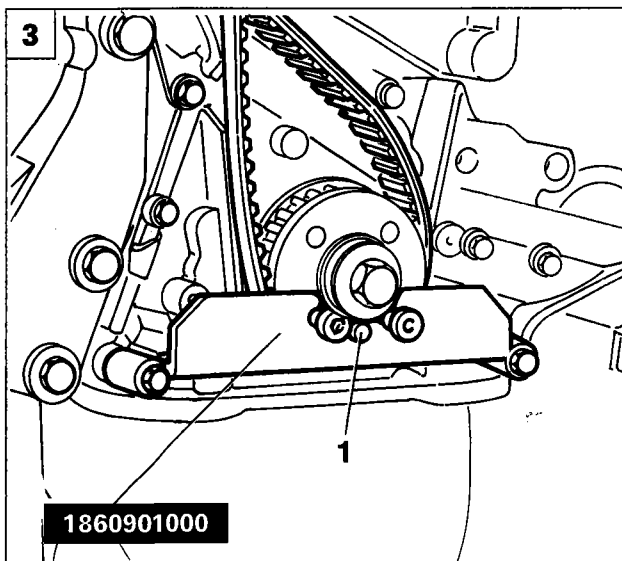
1. Loosen the auxiliary shaft drive belt tension acting on the centre nut for the automatic tensioning device to release the spring inside the actual device. Then remove the actual belt from the damper flywheel leaving it fitted on the power steering pump pulley; it is not necessary to remove the upper shield for the power assisted steering pump.
2. Remove the upper shield for the timing drive belt after having removed the support for the coolant pipe.
3. Loosen the bolts fixing the damper flywheel, then rotate the latter until the reference on it coincides with the reference on the shield underneath. Then, remove the damper flywheel.
4. Remove the lower timing belt lower shield.



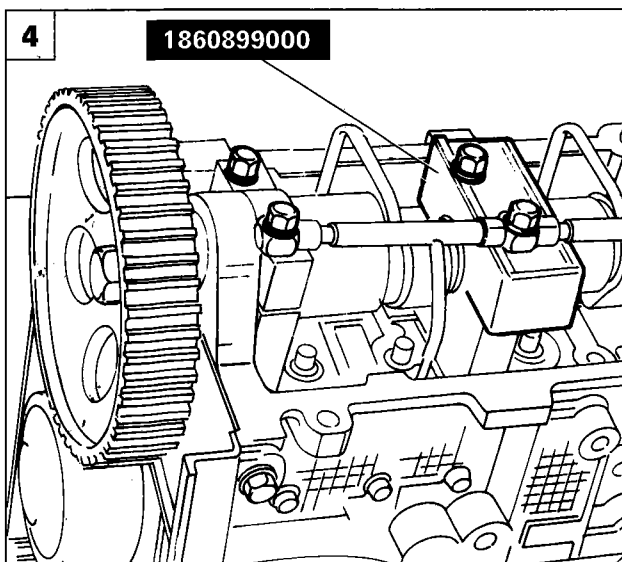
P4A14AX01



P4A30AX01



P4A30AX02



P4A31AX01



1. Loosen the automatic tensioner bolt, releasing the belt tension, then remove it.



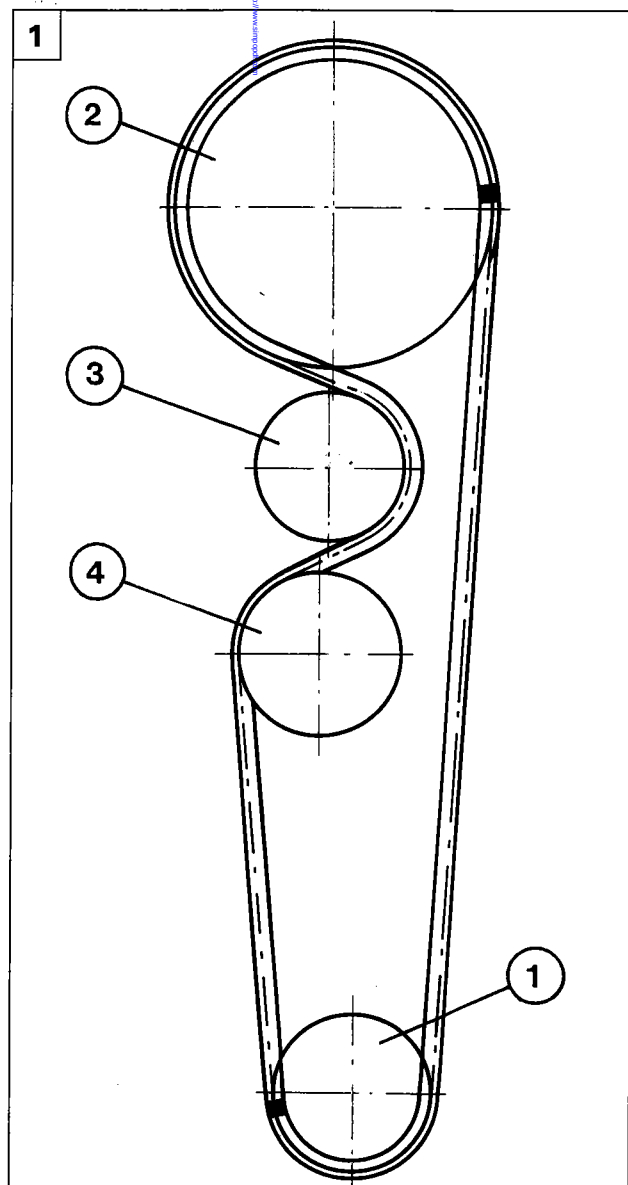
### Fitting timing drive belt

2. After having removed the tappet cover, loosen the bolt fixing the camshaft drive pulley using spanner 1860831000; fit the toothed belt on the crankshaft gear and remove the two bolts illustrated fixing the oil pump to the crankcase.
3. Place tool 1860901000 in position, ensuring that the opening (1) in the tool coincides with the dowel on the crankshaft gear; in this position cylinder no. 1° is at T.D.C.
4. Remove the bolts fixing the 1st - 2nd - 3rd and 4th timing caps, exhaust side, loosen the inlet side ones, raise the lubrication duct, remove the 2nd cap and place tool 1860899000 for timing the camshaft in the housing, then tighten all the caps to a pre-torque of 1 daNm.

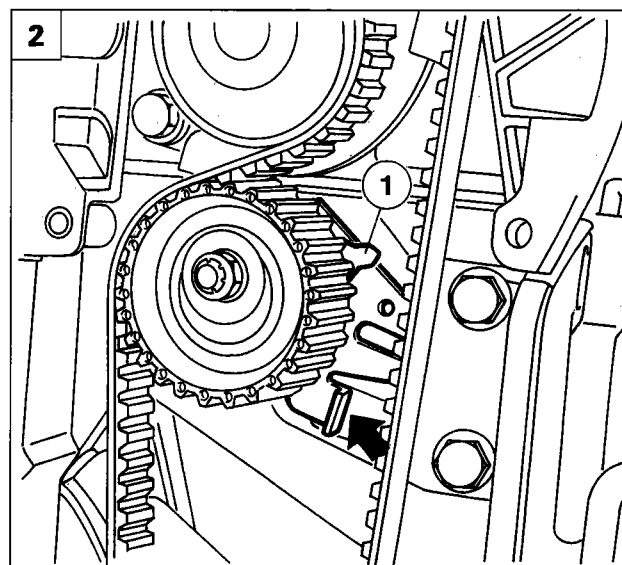


*Work with due care when raising the lubrication duct to avoid the duct being distorted or broken.*

## 00.



P4A14AX02



P4A14AX03



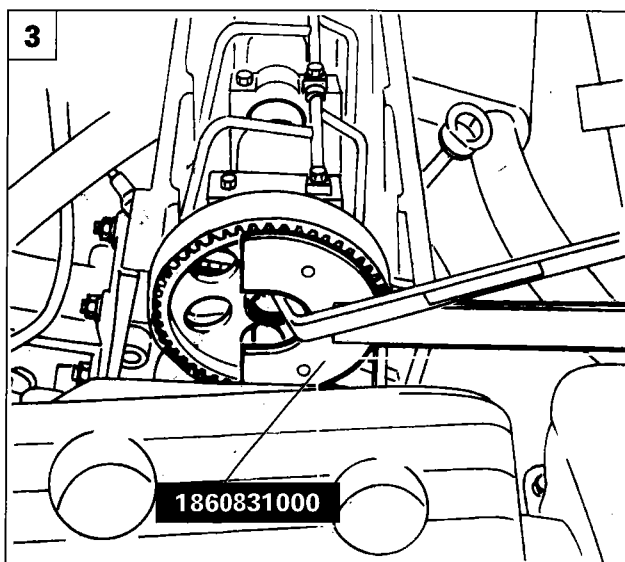
1. Complete the refitting of the belt observing the following order:



- crankshaft drive pinion (1);
- camshaft drive pulley (2);
- water pump pulley (3);
- automatic tensioner (4).

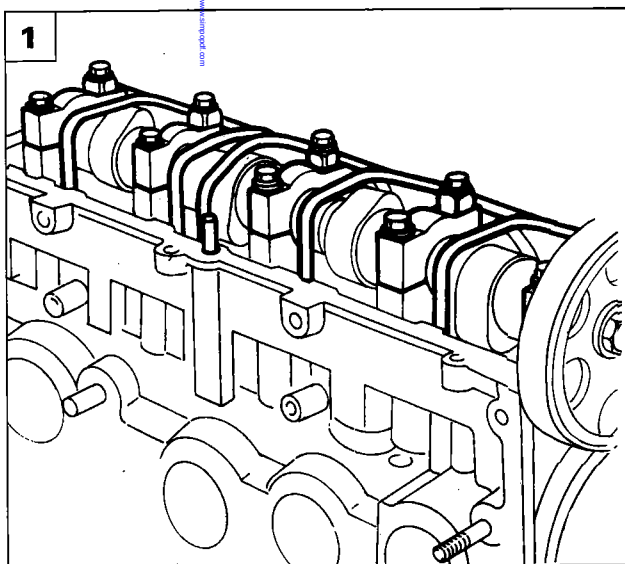
**NOTE** The belt should be fitted avoiding bending it at acute angles in order not to adversely affect the structure of the actual belt.  
The belt should also be fitted with the arrows on it facing in the direction of rotation of the engine.

### Tensioning timing drive belt



P4A32AX01

2. Using tool 1860443000, act at the point shown by the arrow and place the moving index (1) on the tensioner in the maximum tension position, then lock the nut fixing the tensioner.
3. Tighten the fixing bolt for the camshaft drive pulley to a torque of 11.3 daNm using spanner 1860831000.

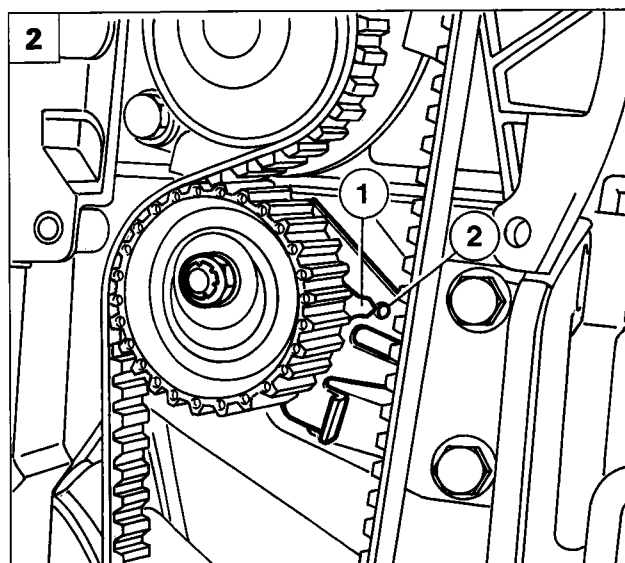


P4A32AX02

1. Remove tool 1860899000 and refit the 2nd cap.  
 In order to carry out this operation it is necessary to remove the bolts fixing the 1st - 2nd - 3rd and 4th caps, exhaust side, loosen the inlet ones, slightly raise the lubrication duct, remove the tool and position the cap, tightening the cap fixing bolts to the recommended torque.

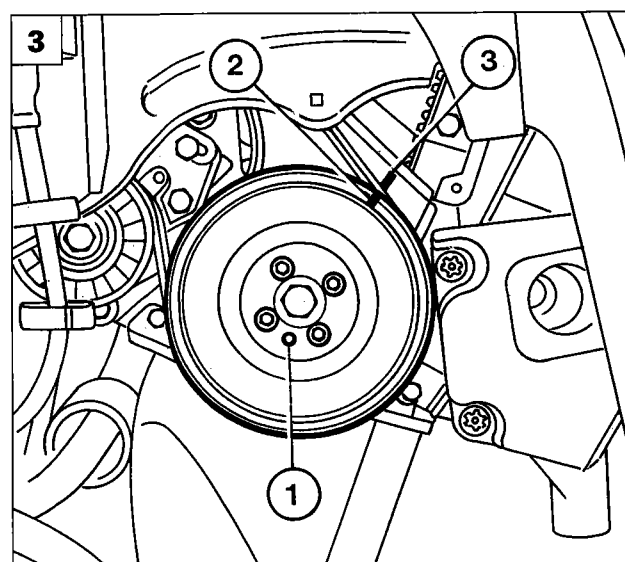


*Work with due care when raising the lubrication duct to avoid the duct from being distorted or broken.*



P4A15AX01

2. Remove tool 1860901000 placed previously on the timing gear and rotate the crankshaft through two revolutions in its direction of rotation. Loosen the tensioner fixing nut, make sure that the moving index (1) coincides with the fixed reference (2), then lock the nut fixing the tensioner and tighten it to the recommended torque.

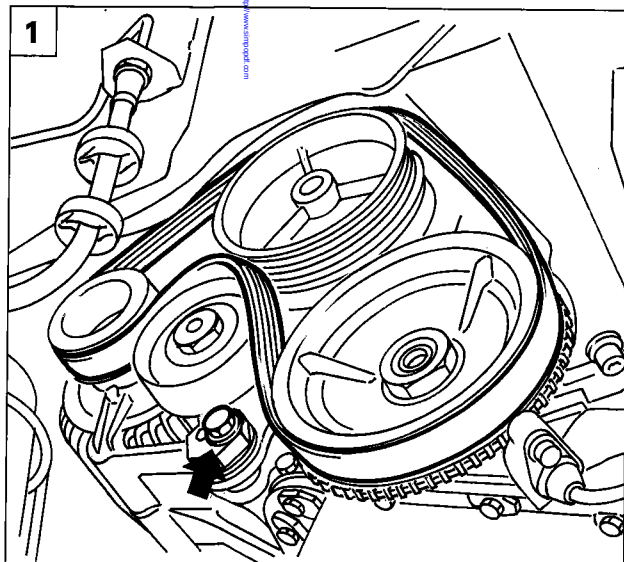


P4A15AX02

3. Refit the previously removed components, taking care to refit the auxiliary shaft drive pulley with the opening in the actual pulley engaged with the dowel (1) on the crankshaft pinion and also checking the engine timing ensuring that the reference (2) on the pulley corresponds with the reference (3) on the timing belt shield.

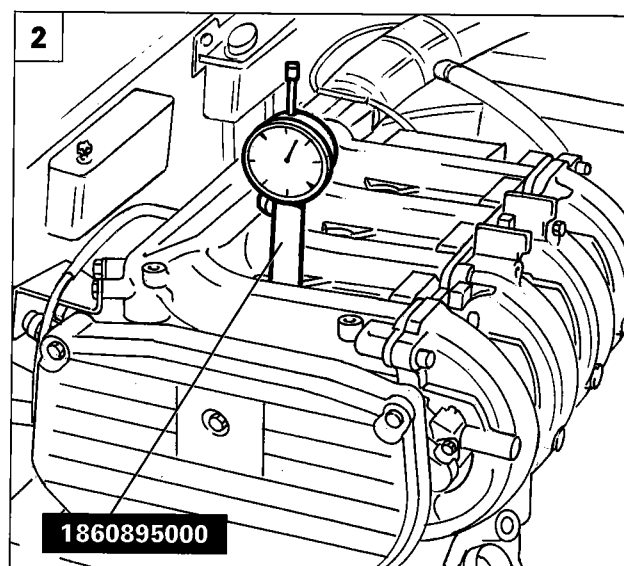


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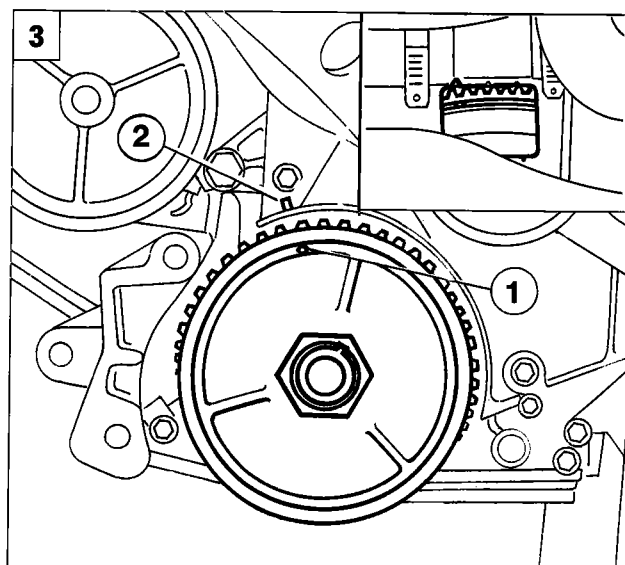


P4A09CX03

P4A11CX05



P4A11CX03



P4A11CX04

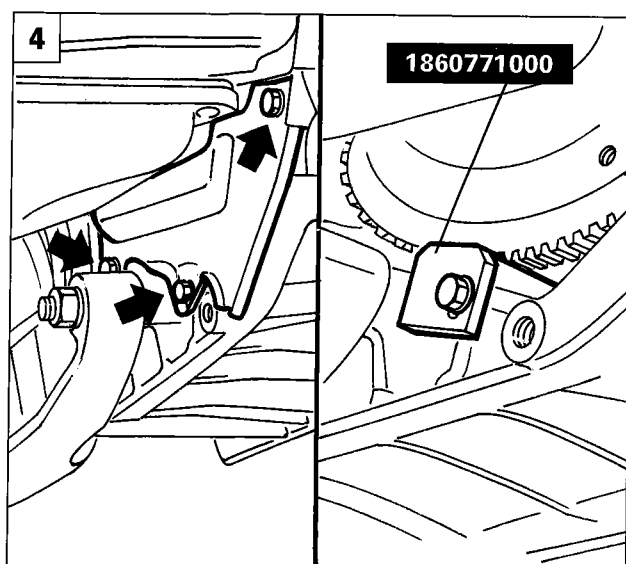


### Bravo-Brava 1581 16v

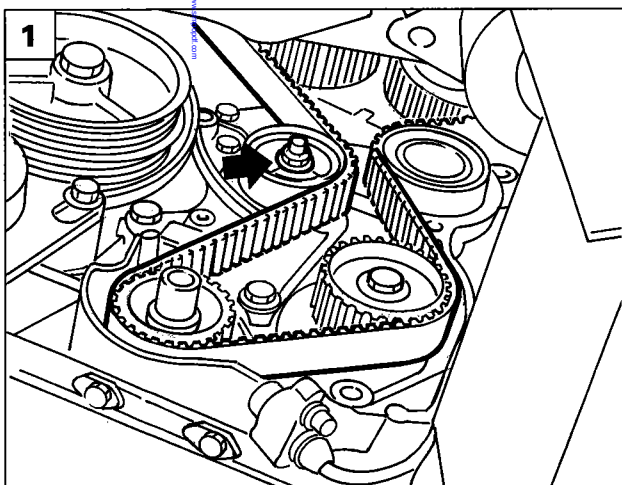
Position the vehicle on a lift, then:

- disconnect the negative battery lead;
- remove the right front wheel;
- remove the right wheel arch liner.

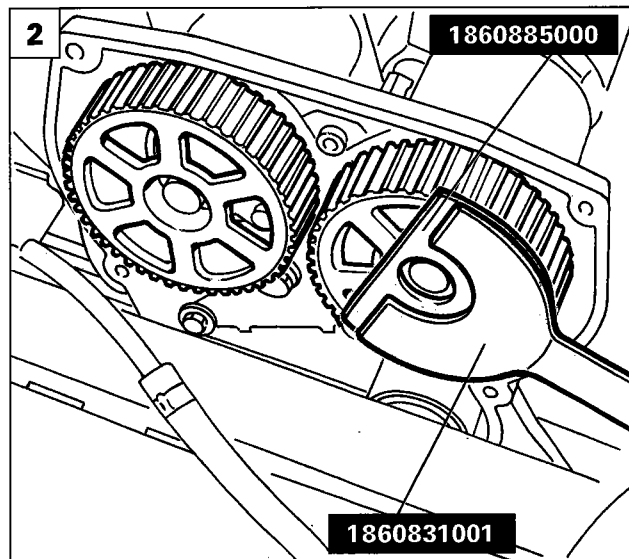
1. To gain access to the timing belt it is necessary to remove the alternator drive belt from the damper flywheel. In order to do so, act on the tensioner fixing bolt shown in the diagram.
2. After having removed the air intake pipe near the upper part of the timing belt shield, remove the spark plugs and position the dial gauge by cylinder no. 1 using support 1860895000; rotate the crankshaft until T.D.C. is found.
3. Check that the reference (1) on the damper flywheel is aligned with the reference (2) on the timing belt lower shield. Also check that the reference on the flywheel coincides with the reference on the bell housing, as shown in the inset.
4. Remove the lower protective casing for the flywheel from the bell housing, then place flywheel lock 1860771000 in position and remove the damper flywheel. Then undo the upper and lower bolts fixing the timing belt shield and remove it.



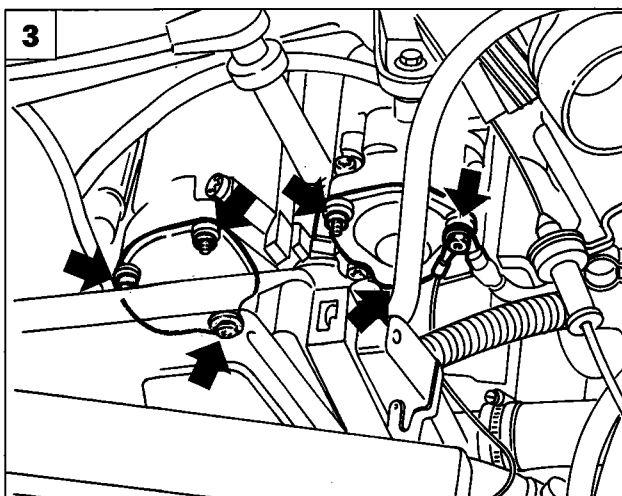
P4A12CX01



P4A12CX04



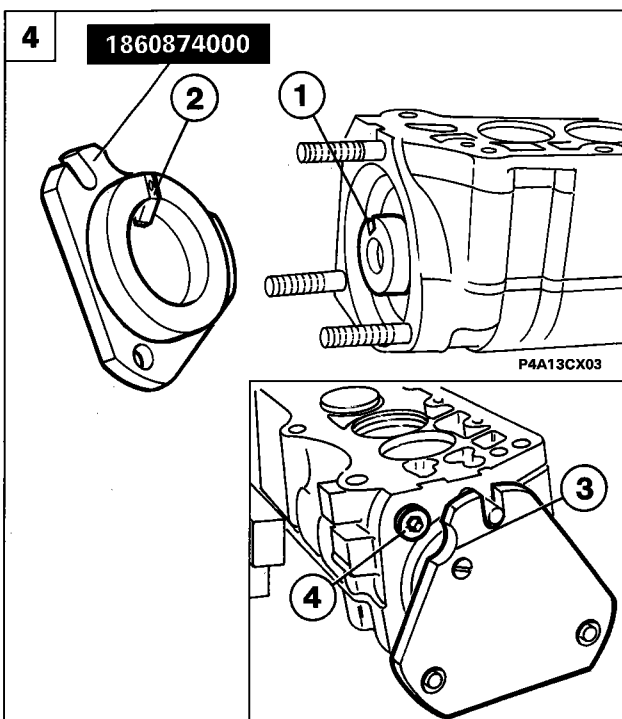
P4A12CX05



1. Loosen the nut fixing the automatic belt tensioner in order to discharge the belt tension, then remove the actual belt.

### Timing at "0"

2. Loosen the bolts fixing the camshaft pulleys using tool 1860885000 fitted on support 1860831001.
3. Remove the ignition coils acting on the mounting bracket fixing nuts, after having disconnected the appropriate supply connections. Then remove the camshaft rear covers, as shown in the diagram.
4. Position tools 1860874000 for timing the camshafts, making sure that the housing (1) for the shaft coincides with the element (2) on the tools; engage the element in the housing and fix the tool to the camshaft housing by the covers which were removed previously. Repeat this operation both the camshaft inlet shaft and the exhaust one.



P4A13CX04



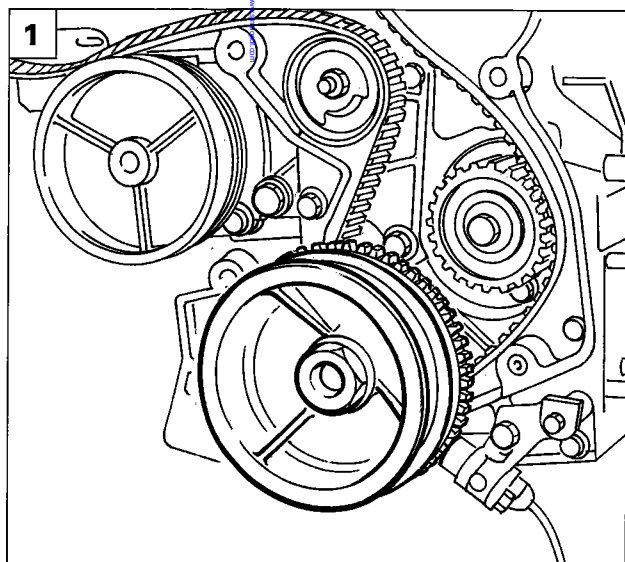
*If the tools do not fit perfectly and it is necessary to rotate the camshafts, align the pistons so that none of them are at T.D.C. thereby avoiding the valves from being incorrectly positioned.*



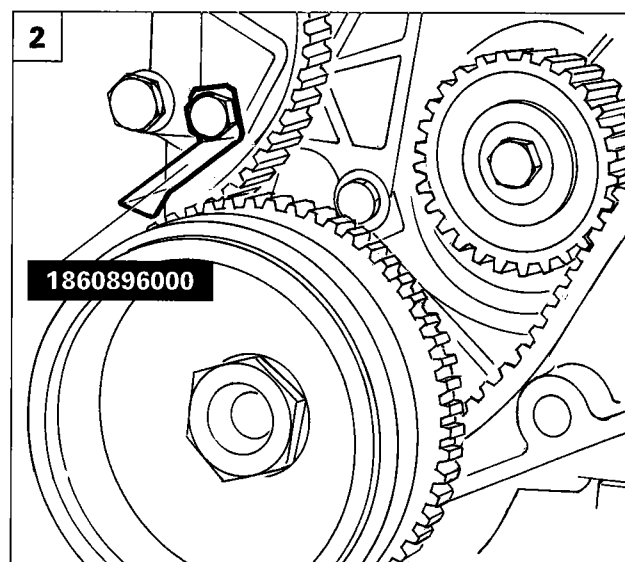
*Tools 1860874000 for timing the shafts differ only in terms of the reference housing (3) in the angle at the bottom which should correspond to the plug (4) in the camshaft housing.*



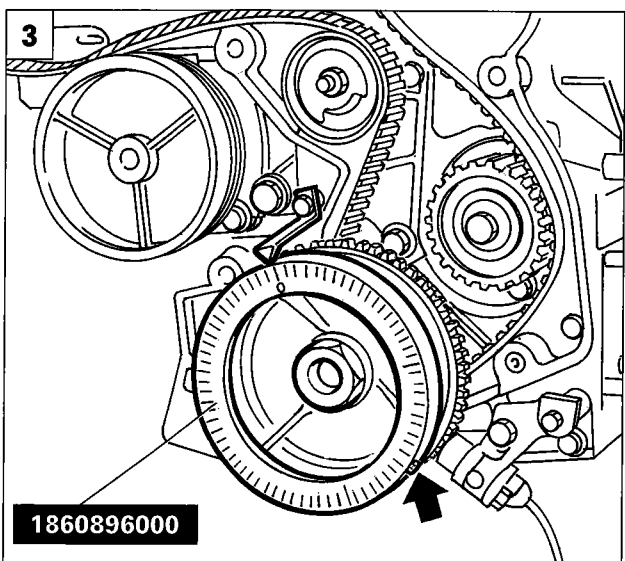
# 00.



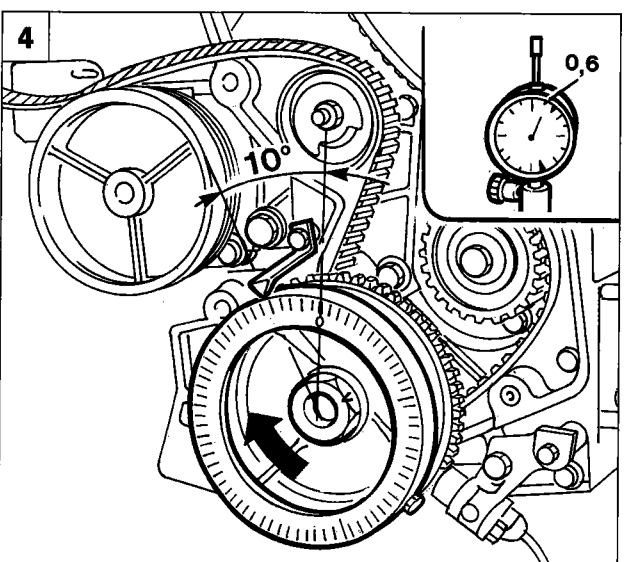
P4A14CX02



P4A14CX04

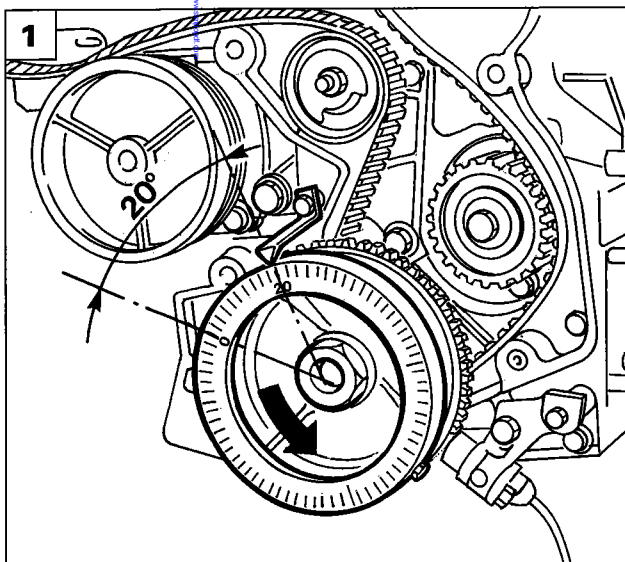


P4A15CX01

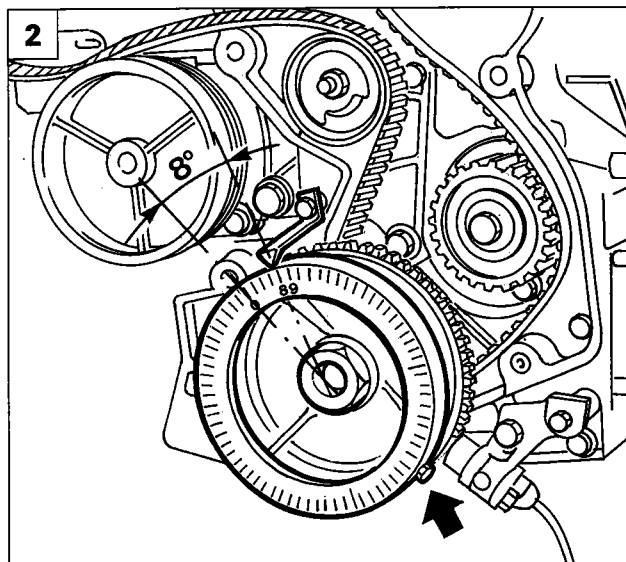


P4A15CX02

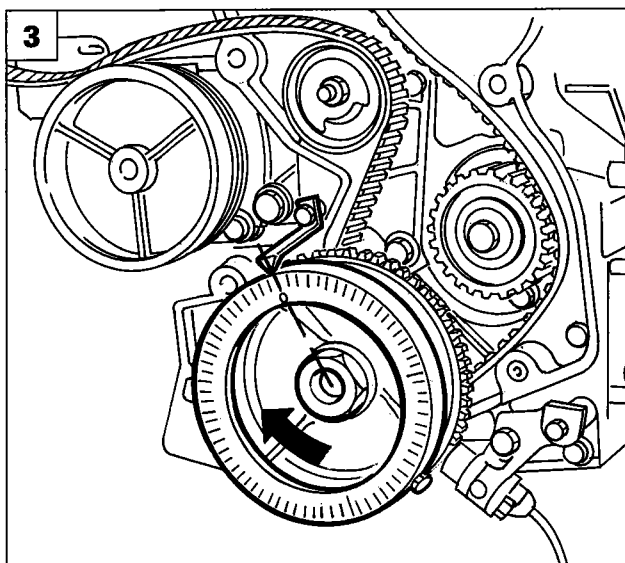
1. Only fit the timing drive belt on the crankshaft pinion. With flywheel lock 1860771000 fitted, fit the damper flywheel and tighten the fixing nut to a torque of 22 daNm, then remove the flywheel lock.
2. Remove the auxiliary shaft belt tensioning device acting on the fixings in order to allow the tool to be positioned for timing at "0". Use a dial gauge to recheck that cylinder no. 1 is at T.D.C. then, using the fixing bolt for the timing belt shield, fix the fixed reference shown in the diagram in the housing of the bolt used.
3. Fit the support base for the graduated disc 1860896000 on the auxiliary shaft drive pulley and fix it to the pulley using a bolt. Then fit the graduated disc on the support base ensuring that the "0" on the disc coincides with the fixed reference positioned previously.
4. Rotate the crankshaft through around 10° in its normal direction of rotation using a special spanner on the damper flywheel fixing nut; take a reading of the axial movement of the piston from the dial gauge (for example 0.6 mm).



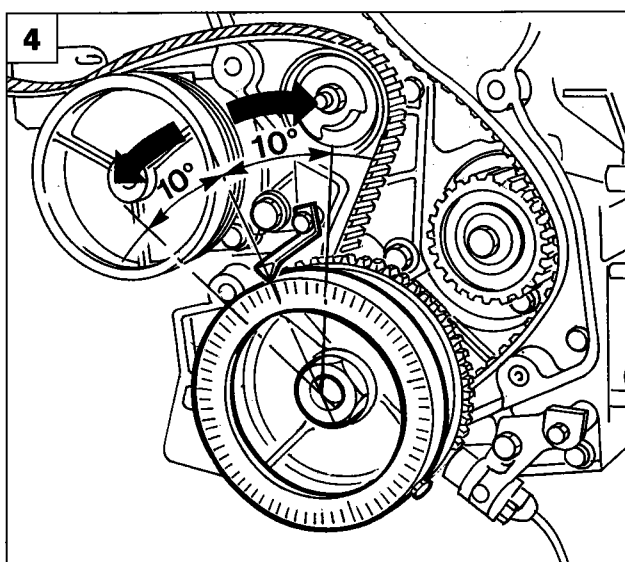
P4A15CX03



P4A15CX04



P4A16CX01



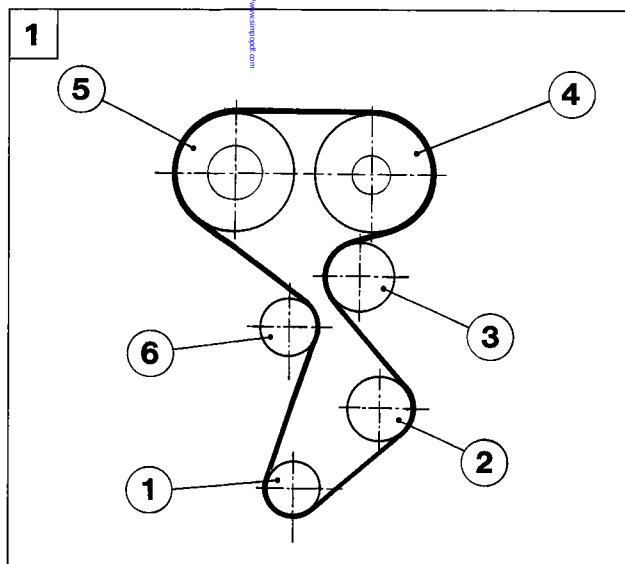
P4A16CX02

1. Rotate the crankshaft in the opposite direction to the normal direction of rotation through  $20^\circ$  in relation to the fixed reference. Rotate the crankshaft once again in its normal direction of rotation until the same axial movement value which appeared previously on the dial gauge (0.6 mm) appears.
2. Read the angular value on the graduated disc corresponding to the previous axial movement (for example  $8^\circ$ ). Take the arithmetical average of the angular value of the crankshaft set at the beginning of the procedure ( $10^\circ$ ) and the current value ( $8^\circ$ ), then release the graduated disc from the base, position it in relation to the fixed reference, without rotating the crankshaft, at the value which is the arithmetical average (for example  $9^\circ = \text{the average of } 10^\circ \text{ and } 8^\circ$ ), then lock the graduated disc once again.
3. Rotate the crankshaft pulley in a clockwise direction until the "0" on the graduated disc coincides with the fixed reference.
4. Rotate the crankshaft through  $10^\circ$  in a clockwise direction and an anti-clockwise direction checking that the reading on the dial gauge during the clockwise rotation of the crankshaft is the same as that for the anti-clockwise rotation.

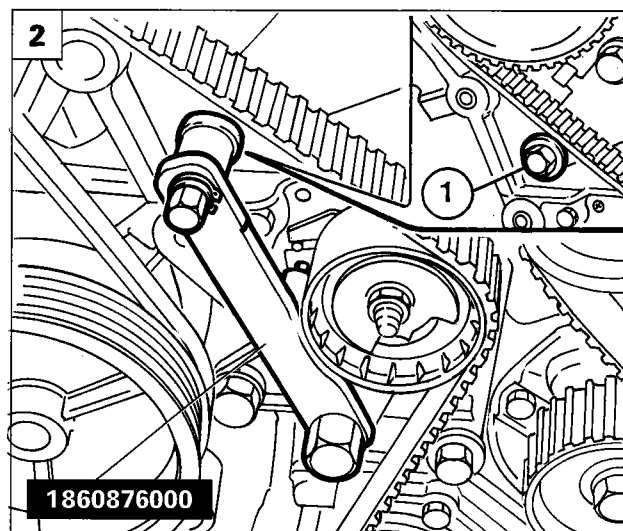


*If the readings on the dial gauge after the check carried out for point 4 are not the same, repeat the procedure described on the previous pages.*

# 00.



P4A16CX03

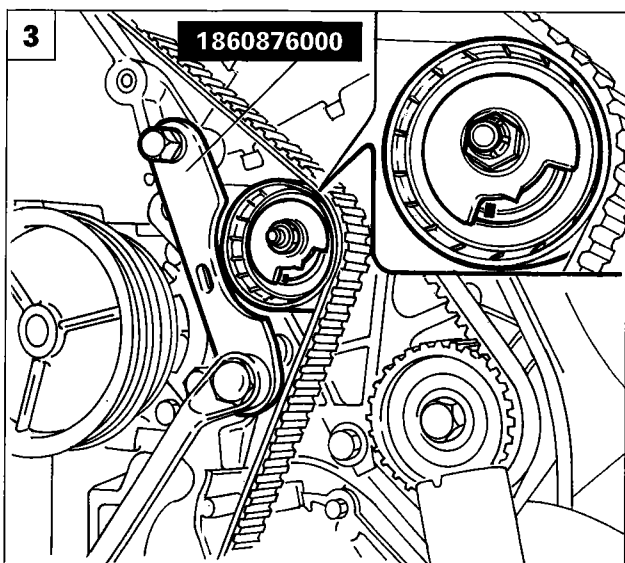


### Tensionamento cinghia distribuzione

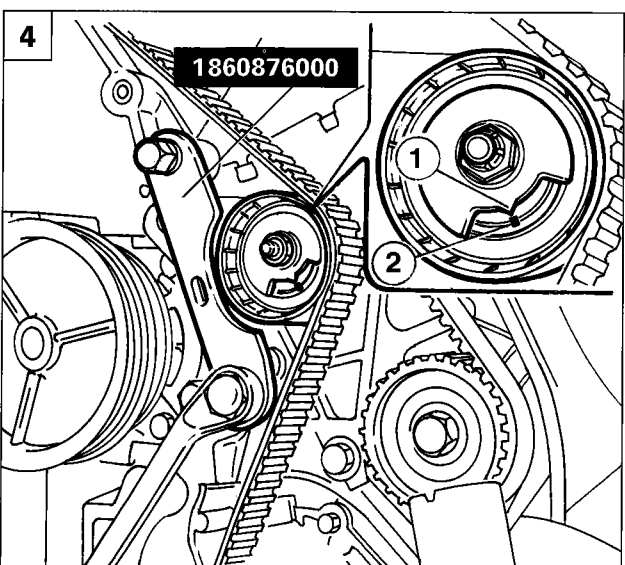
1. Complete the fitting of the belt in the following order: 1. Crankshaft gear (already fitted) - 2. Oil pump gear - 3. Fixed pulley - 4. Timing pulley, inlet side - 5. Timing pulley, exhaust side - 6. Automatic tensioner.



*Fit the belt with the camshaft pullies facing towards the right in order to recover any necessary clearance for fitting the belt perfectly on the actual pulleys, ensuring the correct tension in the section of the belt already fitted.*



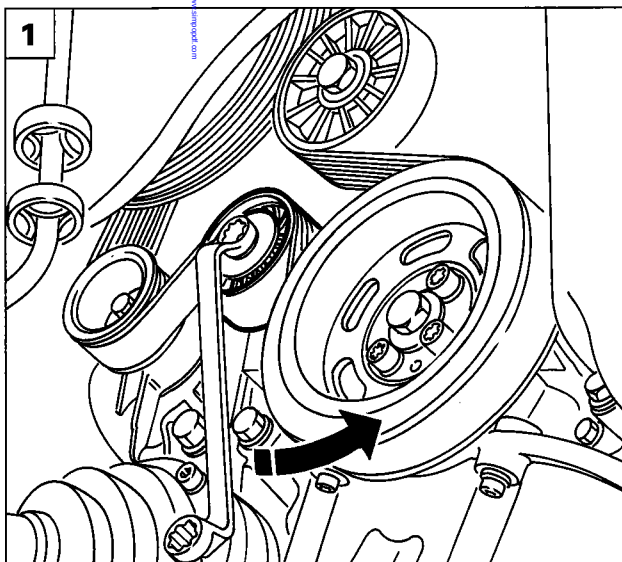
P4A17CX01



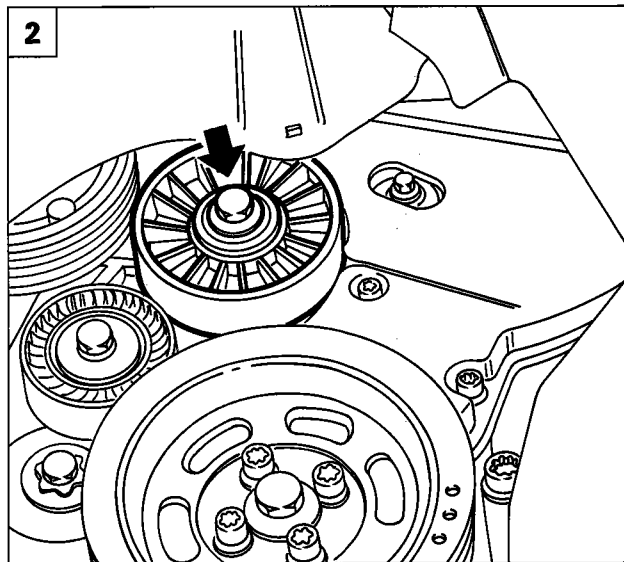
P4A17CX03

2. Remove the bolt (1) to allow tool 1860876000 for tensioning the timing belt to be positioned.
3. Acting on tool 1860876000, place the belt tensioner in the maximum tension position, then lock the tensioner nut. Remove the dial gauge and tighten the camshaft pullies to a torque of 11.5 daNm using tool 1860885000 on support 1860831001.
4. Remove tools 1860874000; rotate the crankshaft through two revolutions in the direction of rotation, loosen the nut locking the tensioner and, using a special spanner on the belt tensioner, position reference (1) in line with reference (2), then tighten the belt tensioner lock nut to a torque of 2.3 daNm.

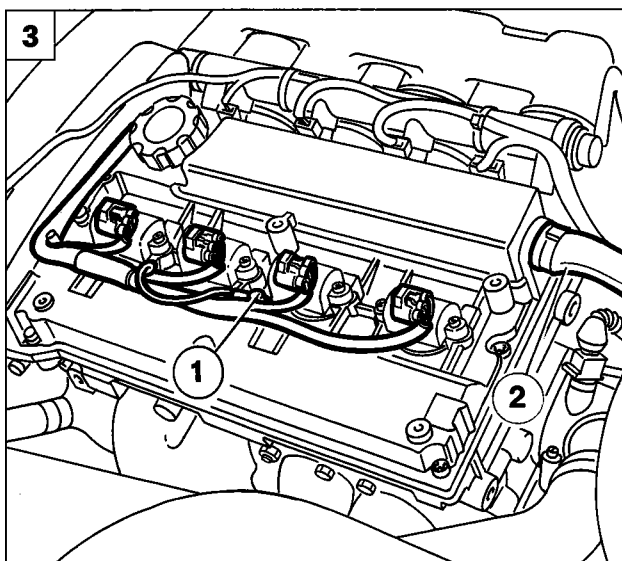
As a further check, refit the dial gauge, detect T.D.C. and check that tools 1860874000 fit on the camshafts, then refit the components removed previously.



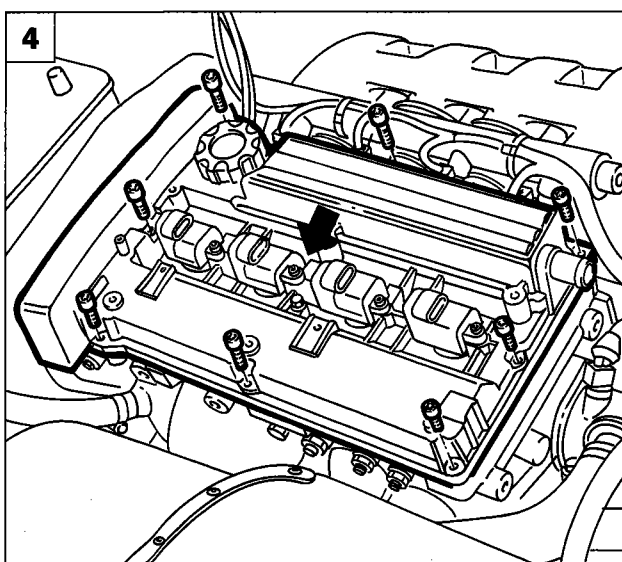
P4A11BX01



P4A11BX03



P4A12BX03



P4A12BX05



### Bravo-Brava 1747 16v

Position the vehicle on a lift, then:

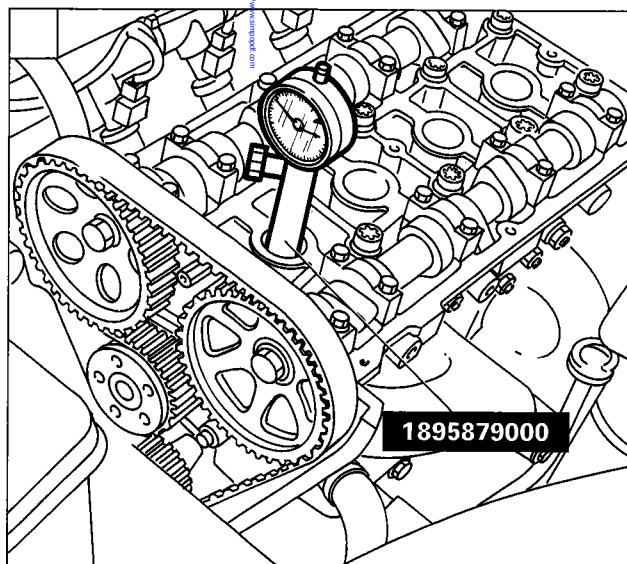


- disconnect the negative battery lead;
- remove the right front wheel;
- remove the right wheel arch liner.

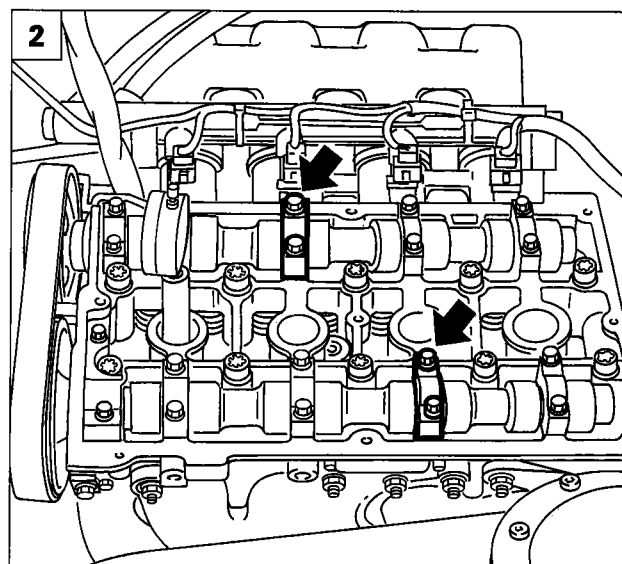
1. Loosen the tension for the auxiliary shaft drive belt acting in an anti-clockwise direction on the centre nut for the automatic tensioning device to release the spring inside the actual device; then fit the belt.
2. Remove the fixed pulley for the auxiliary shaft drive belt, then undo the upper and lower bolts fixing the timing belt shield and remove it.
3. Remove the cover for the ignition coils, disconnect the connections from the coils, the earth cable (1) and the oil vapour recovery pipe from the cylinder head cover.
4. Disconnect the connector from the air conditioning compressor, release the cable and remove the cylinder head cover acting on the fixing bolts shown in the diagram.



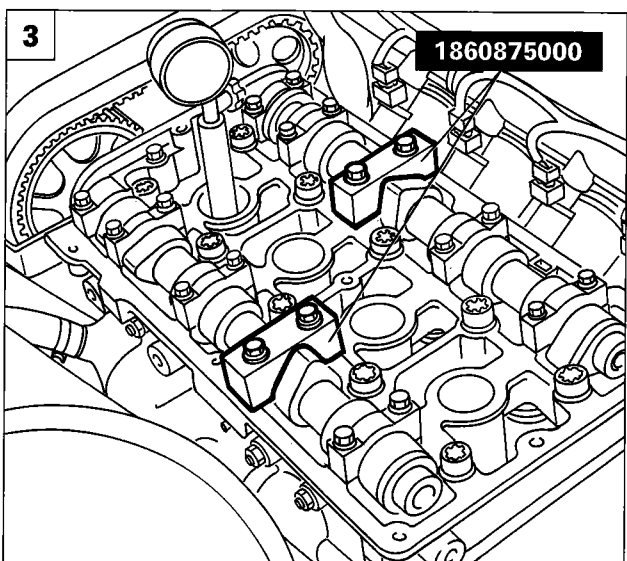
# 00.



P4A13BX02



P4A13BX03



P4A13BX04



1. Remove the spark plugs using a special spanner. Position the dial gauge by cylinder no. 1 using support 1895879000, rotate the crankshaft until T.D.C. is detected.

2. Remove the 2nd cap fixing the inlet side camshaft and the 3rd cap fixing the exhaust side camshaft, as shown in the diagram.



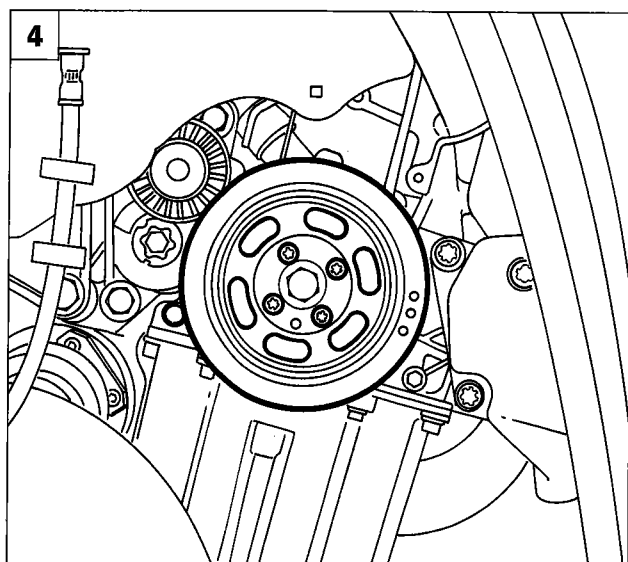
*When the camshaft caps are removed, they must be marked so that they can be refitted in the correct position. If this is not the case, there could be problems with the reliability of the camshafts.*

3. Position and fix the pair of tools 1860875000 by the previously removed caps.

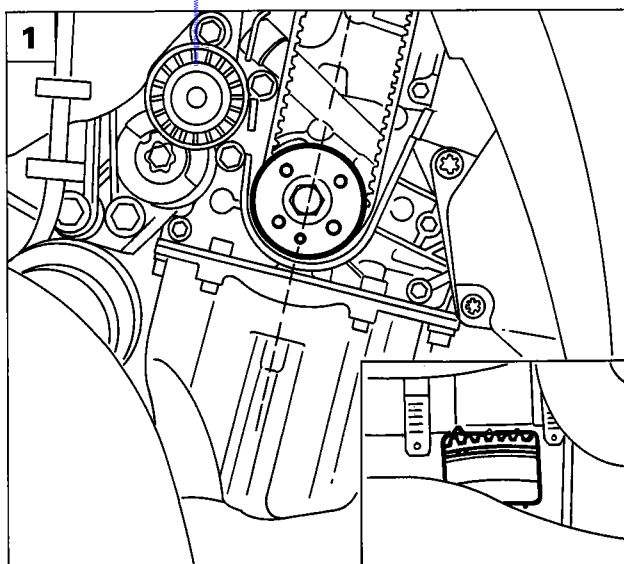


*The pair of tools 1860875000 should exact follow the profile of the camshaft cams.*

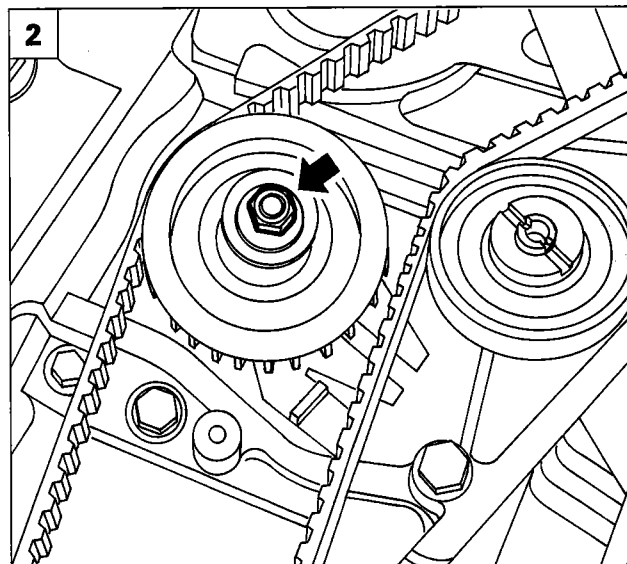
4. Remove the lower gearbox protective cover and place flywheel lock 1860898000 in position. Then remove the damper flywheel (auxiliary shaft drive pulley).



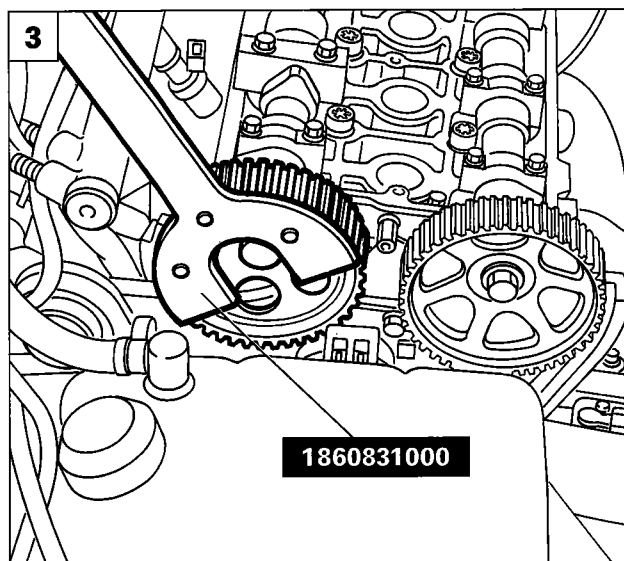
P4A14BX02



P4A14BX03



P4A14BX04



P4A15BX01



1. Check that the centering dowel on the timing drive gear is in line with the engine. Also remove the inspection cover on the bell housing and check that the reference on the fly-wheel coincides with the reference on the actual bell housing.
2. Loosen the timing belt tension acting on the nut shown in the diagram, then remove the actual belt.

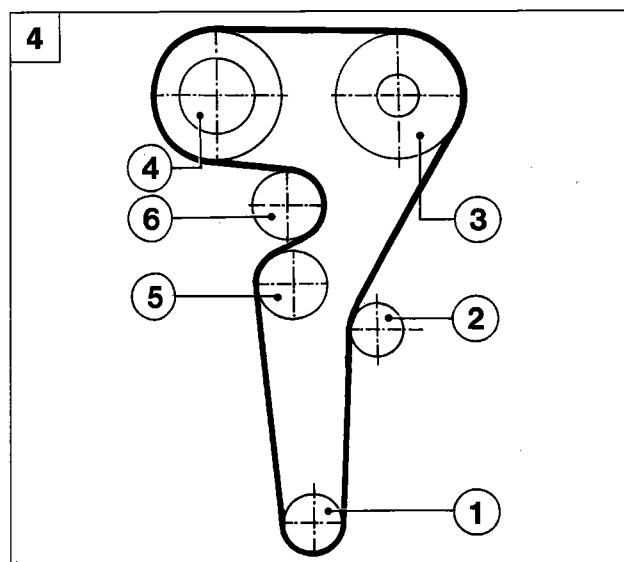
### Fitting the timing belt

3. To facilitate the positioning of the timing belt, loosen the bolt fixing the inlet side camshaft pulley and the exhaust side pulley, using tool 1860831000. These pulleys have slots, allowing the correct matching of the belt-pulley.
4. Fit the belt observing the following order:  
1. Crankshaft drive pinion - 2. Fixed pulley - 3. Camshaft pulley, exhaust side - 4. Camshaft pulley, inlet side - 5. Automatic tensioner pulley - 6. Water pump pulley.

**NOTE** The belt should be fitted avoiding any bends at acute angles in not to adversely affect the structure of the actual belt.

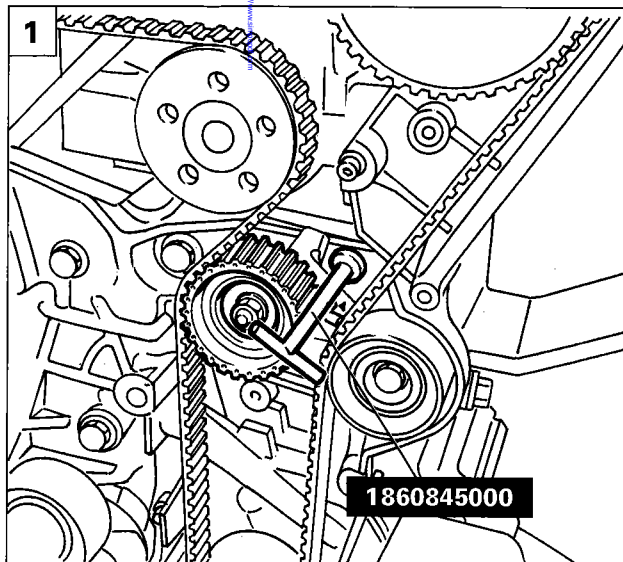


Fit the belt so that the arrow is pointing in the direction of rotation of the engine. There are three reference marks on the belt for fitting during production.

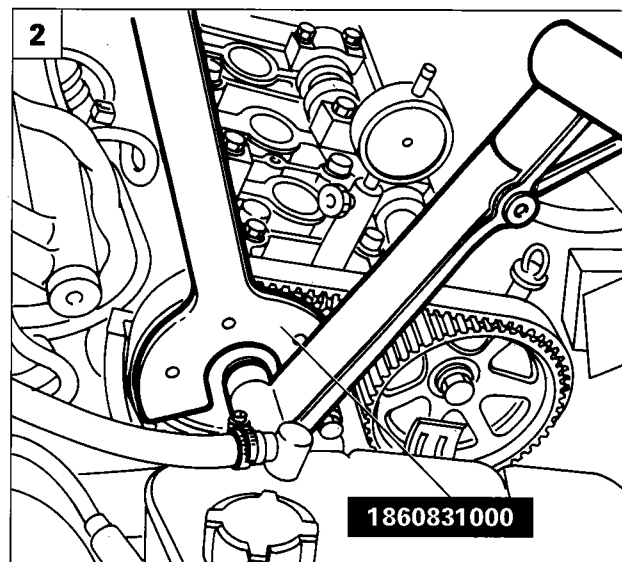


P4A31CA01

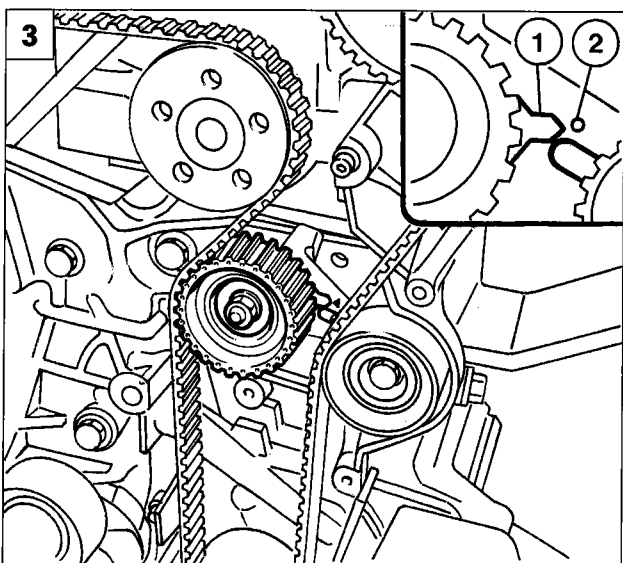
### 00.



P4A16BX01



P4A16BX02



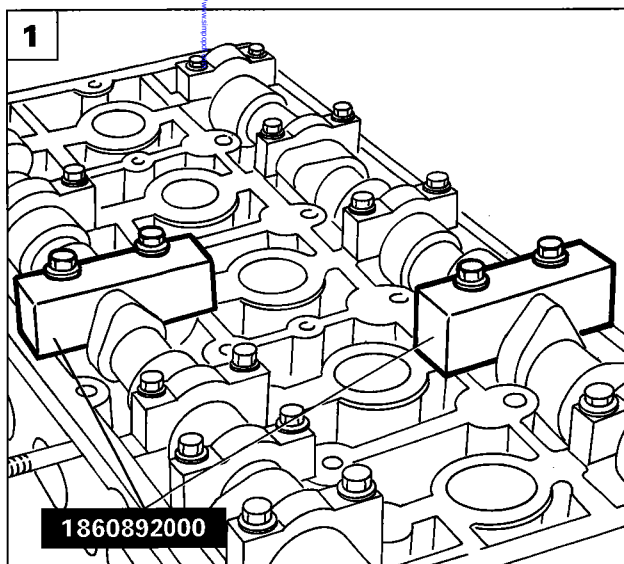
P4A16BX03

### Tensioning the timing belt

1. Introduce tool 1860845000 in the opening in the automatic tensioner support; rotate the tool to exert force on the automatic tensioner until it is in the maximum tension position, then tighten the nut fixing the tensioner to the support.
2. Tighten the bolts fixing the inlet side and exhaust side camshaft pulley to a torque of 11.8 daNm using tool 1860831000.
3. Remove the pair of tools 1860875000 and return the camshaft caps (marked during the dismantling) to their correct position and tighten them to a torque of 1.5 daNm. Remove the flywheel lock 1860898000, then rotate the crankshaft through two revolutions in its direction of rotation.

Loosen the belt tensioner fixing nut and, using tool 1860845000, make sure that the moving reference (1) for the belt tensioner coincides with the fixed reference (2) on the crankcase. Tighten the nut fixing the belt tensioner to a torque of 2.5 daNm and proceed with refitting the components removed previously.

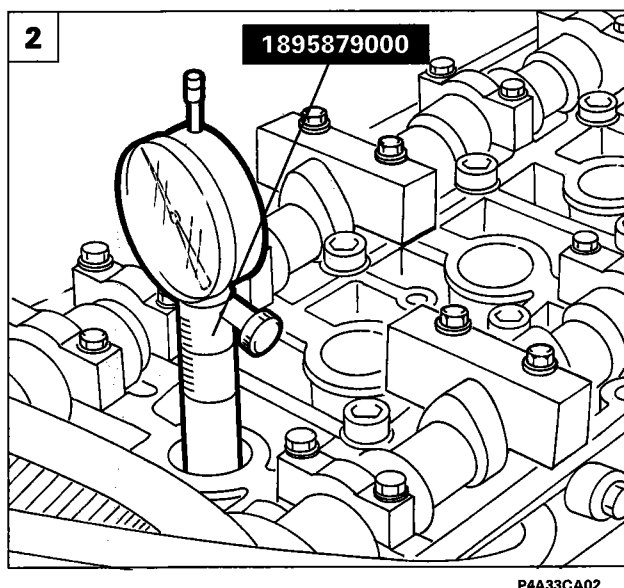




**Bravo 1998 20v**

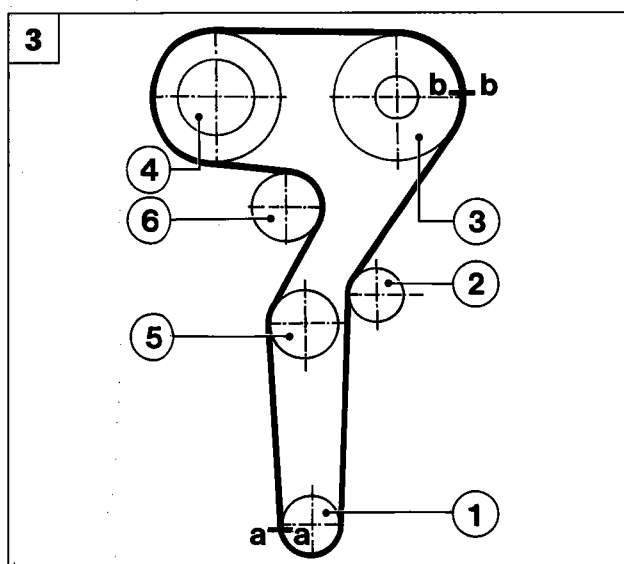
The removing-refitting of the timing drive belt cannot be carried out on the vehicle as there is insufficient space between the timing belt cover and the bodysell to do so. It must be replaced with the engine at the bench; for more details on the procedure, refer to the instructions in the manual for overhauling this engine type.

1. The camshafts are timed by positioning tools 1860892000 in place of the cap for the 2nd cylinder, exhaust side and the cap for the 3rd cylinder, inlet side.



**NOTE** The letters "A" and "S" on tools 1860892000 indicate "Aspirazione" and "Scarico" (inlet and exhaust). Make sure when refitting, that the profile on the tools is perfectly in line with the profile of the camshaft caps.

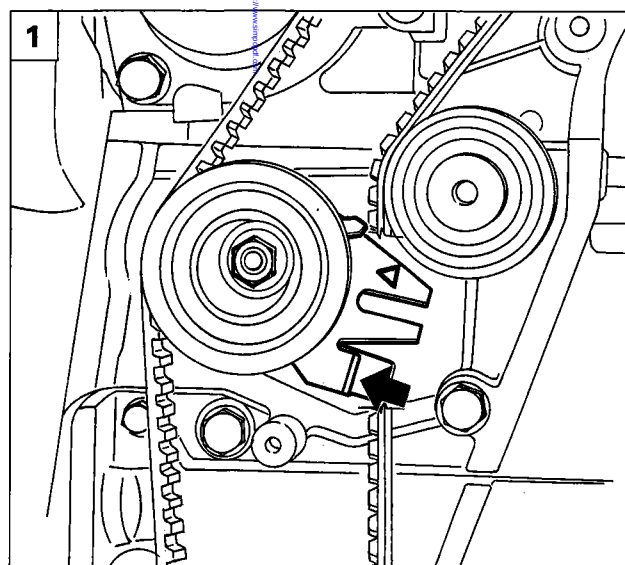
2. To determine T.D.C. for cylinder n° 1, position a dial gauge with tool 1895879000 for support, tightened in place of the spark plug for the first cylinder. Rotate the crankshaft until T.D.C. is reached shown by the dial gauge. Under these circumstances the reference on the crankshaft gear should coincide with the reference on the oil pump cover.



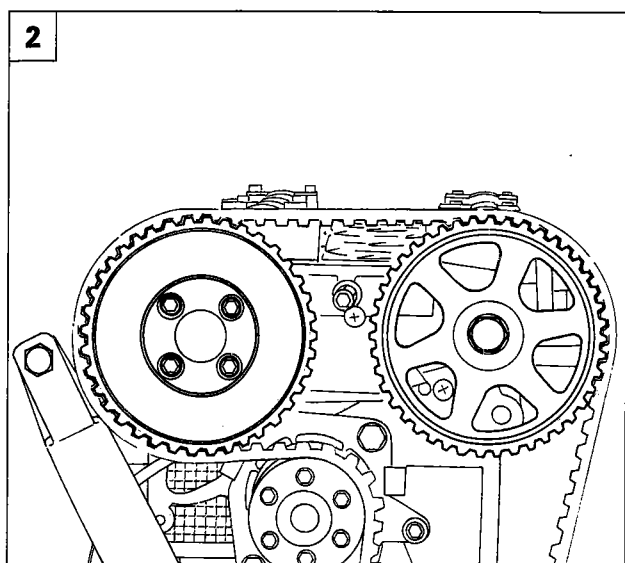
3. With the camshaft pullies slack, fit the belt observing the following order:  
1. Crankshaft gear - 2. Fixed pulley - 3. - Camshaft pulley, exhaust side - 4. - Camshaft pulley, inlet side - 5. Automatic tensioner - 6. Water pump.



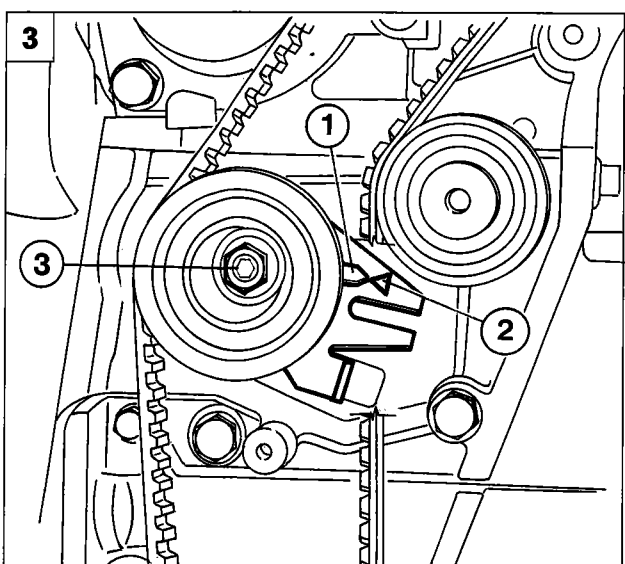
There is an arrow on the belt which indicates the direction of rotation of the engine. There are also references used in production for fitting.

**00.**

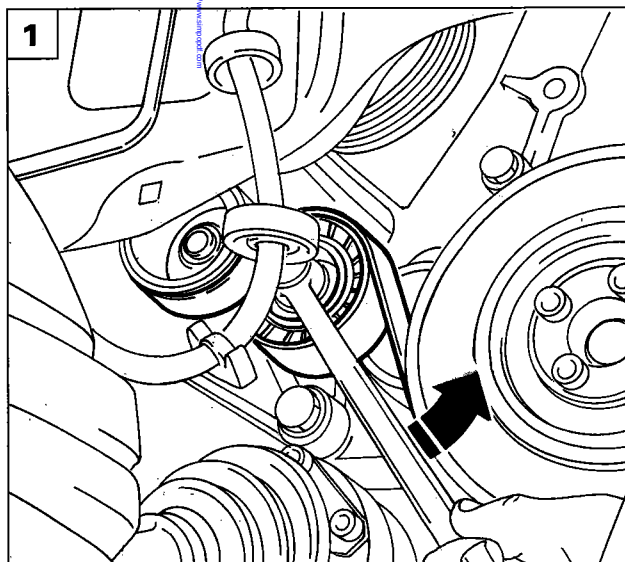
1. Using a screwdriver, apply force to the automatic tensioner tab so that the tensioner is in the maximum tension position, then tighten the nut fixing the tensioner to the support.



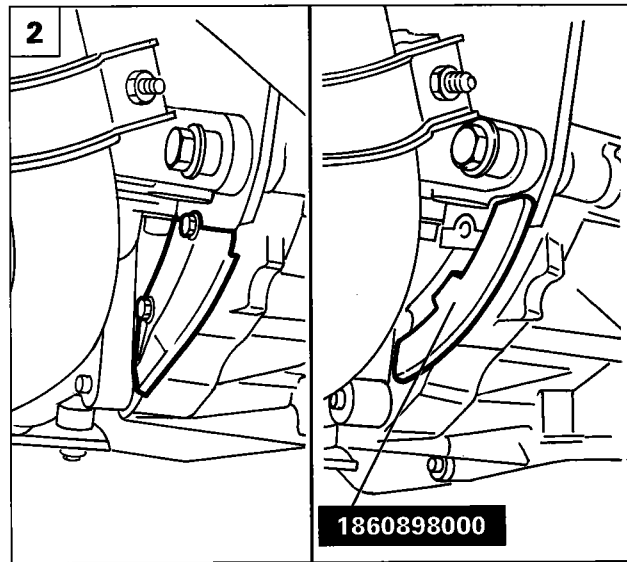
2. Using spanner 1860831000, torque tighten the inlet and exhaust side pullies to the recommended figures. Remove the tools positioned for timing and locking the camshafts and rotate the crankshaft through two revolutions in its direction of rotation.



3. Loosen the nut fixing the tensioner and ensure that the moving reference on the tensioner (1) coincides with the fixed reference (2), then tighten the nut fixing the tensioner to torque and proceed with the refitting of the components removed previously.

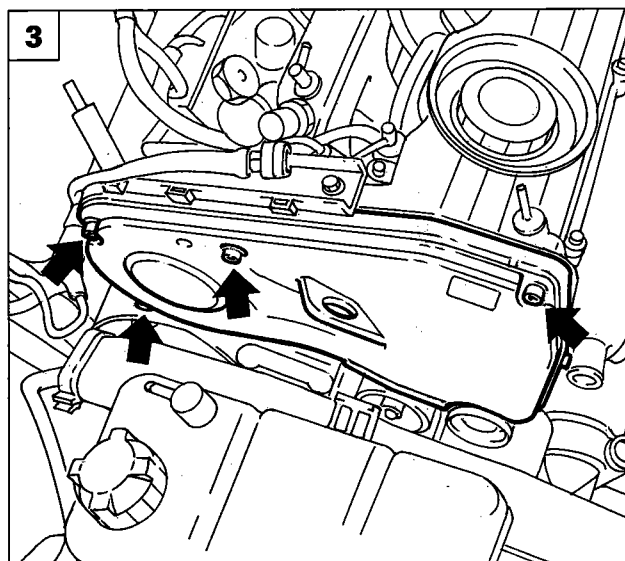


P4A35CA01

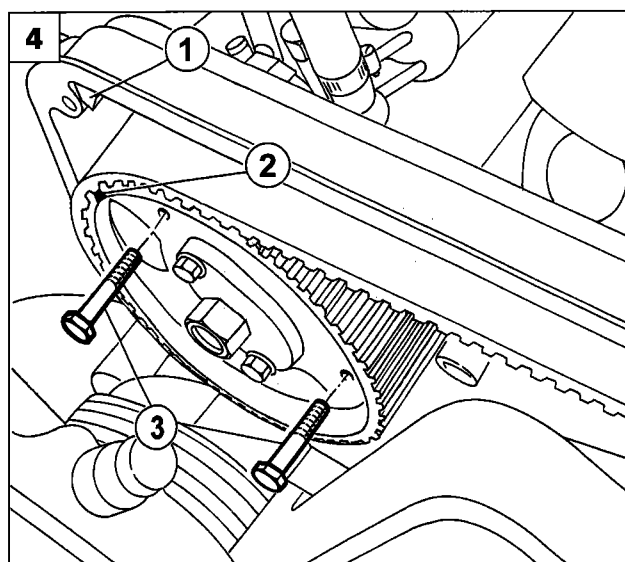


P4A35CA02

P4A35CA03



P4A35CA04



P4A35CA05

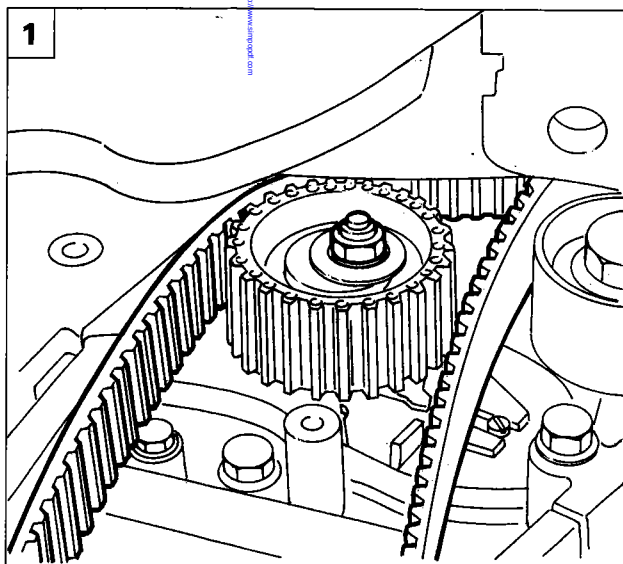
### Bravo-Brava 1910 TD 75 e 100

Position the vehicle on a lift, then:

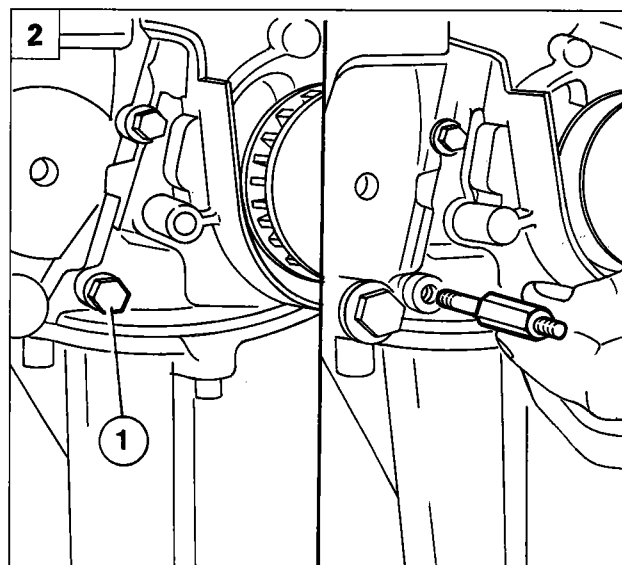


- disconnect the negative battery lead;
- remove the right front wheel;
- remove the right wheel arch liner.

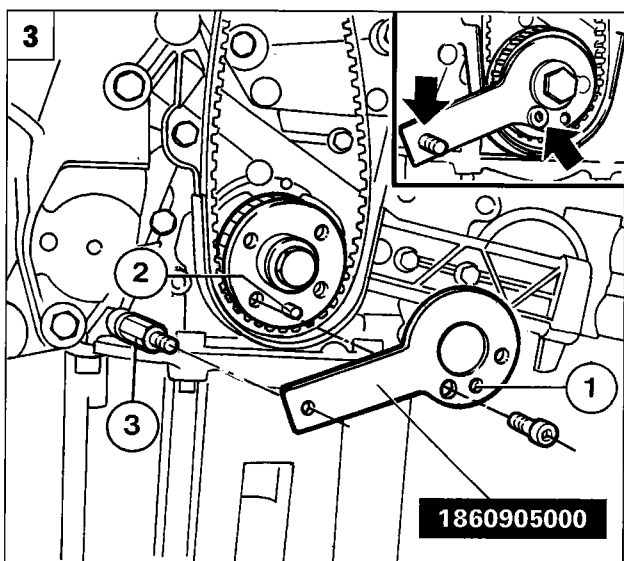
1. Rotate the device tensioning the auxiliary shaft drive belt in the direction shown by the arrow, slacken the belt tension and remove it.
2. Remove the lower shield for the engine compartment, undo the bolts for the gear-box shield and position the flywheel lock 1860898000. Then remove the damper flywheel (auxiliary shaft drive pulley).
3. Remove the lower shield for the timing belt; remove the reaction connecting rod complete with mounting bracket near the upper timing belt shield, then remove the latter as well.
4. For the 1910 TD 75 version, check that the injection pump timing is correct by making sure that references (1) and (2) illustrated are in line, then lock the pulley in position using the service bolts (3) inserted in the special housings in the actual pulley.



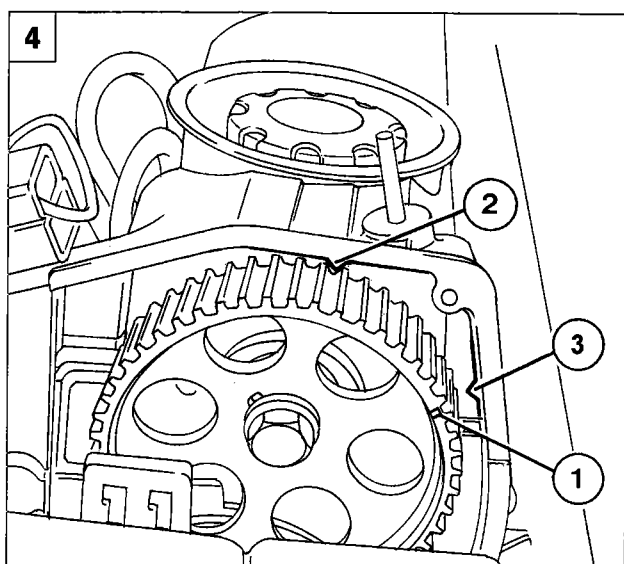
P4A36CA01



P4A36CA02



P4A36CA03



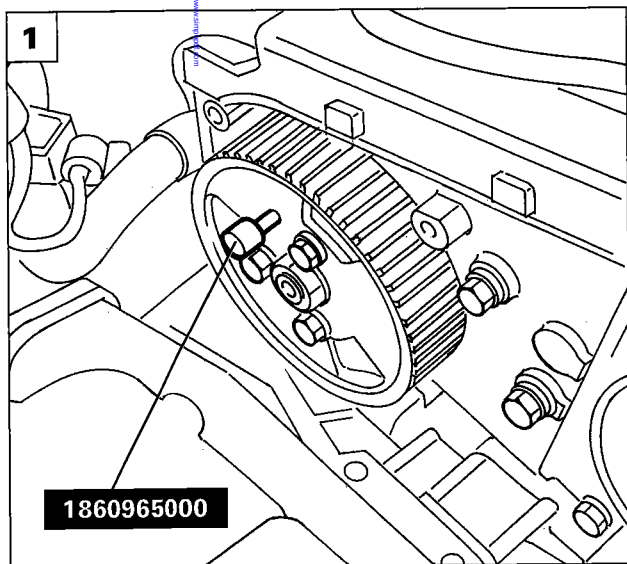
P4A13GX04

1. Loosen the nut illustrated for the tensioning device, release the belt tension, then remove it.

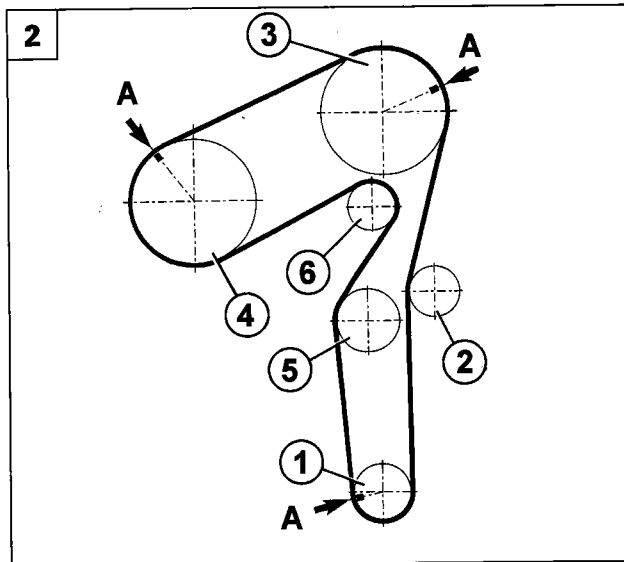
#### Refitting and tensioning the timing belt

2. Remove the bolt (1) illustrated fixing the oil pump; place the pin for tool 1860905000 in place of the bolt. Then fit the timing belt on the crankshaft gear only.
3. Position tool 1860905000 on the crankshaft gear and on the pin (3); rotate the crankshaft using small movements until the dowel (2) is matched up with the opening (1). In this position cylinder no. 1 is at T.D.C.
4. Using tool 1860831000, rotate the camshaft pulley until the following alignments are achieved:
  - up to engine n° 416499  
the reference (1) on the pulley should have moved 7 teeth (in a clockwise direction) in relation to the reference (2) on the tappet cover.
  - from engine n° 416450  
the reference (1) on the pulley should be aligned with the reference (3) on the tappet cover.

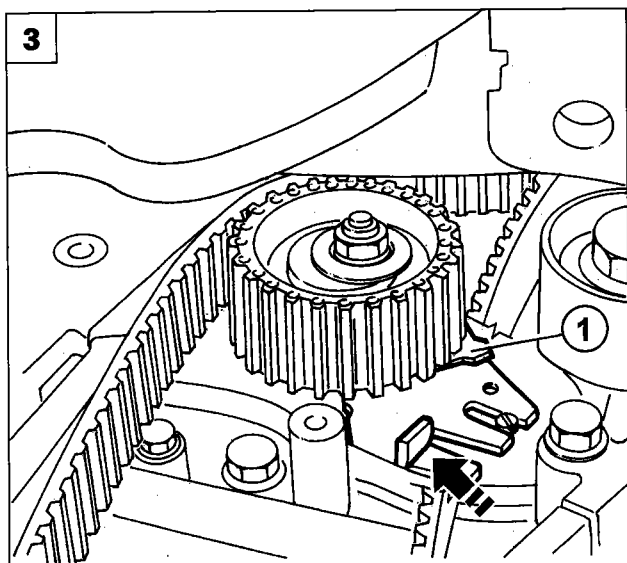
**NOTE** The timing is correct when, with piston n° 1 at T.D.C., the reference (1) is in the position shown in the diagram (for engines up to n° 416449 the exact position of the reference can vary  $\pm 3^\circ$  engine or  $\frac{1}{2}$  point).



P4A37CA01



P4A37CA02



P4A14GX02



1. For the 1910 TD 100 version, loosen the bolts fixing the injection pump pulley and rotate it until pin 1860965000 can be inserted at the point shown.

2. Complete the fitting of the timing belt observing the following order:

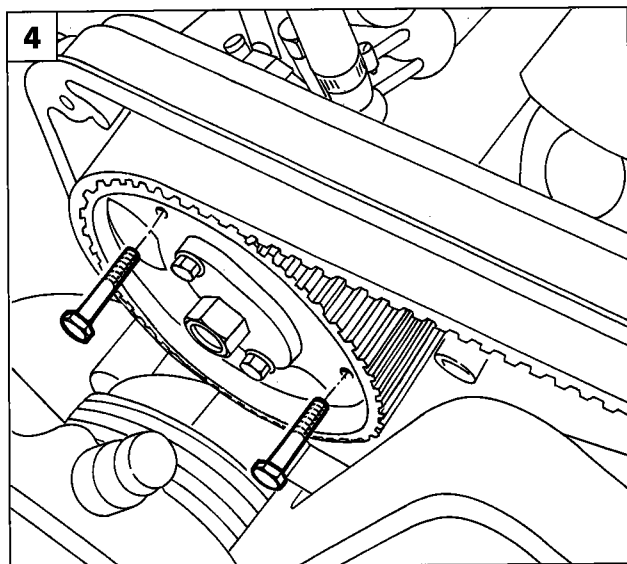
1. Crankshaft gear
2. Fixed pulley
3. Timing pulley
4. Injection pump pulley
5. Automatic tensioner
6. Water pump

For all the pre and post modification engines the new belt can be fitted and timed by following the alignment of the transverse references (A) on the back of the timing belt and the references on the pulleys.

**NOTE** *Fit the belt so that the arrow is pointing in the direction of rotation of the engine.*

3. Exert force at the point shown on the automatic tensioner placing the tensioner moving reference (1) in the maximum tension position, then lock the belt tensioner fixing nut.

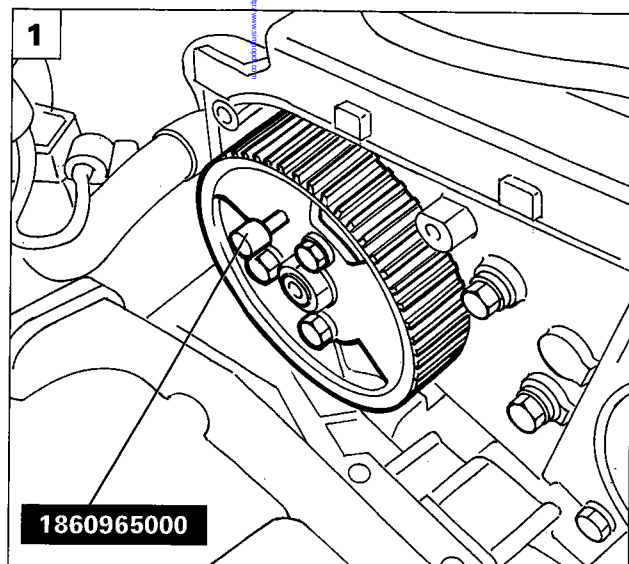
4. For the 1910 TD 75 version, release the injection pump drive pulley by undoing the three bolts positioned previously.



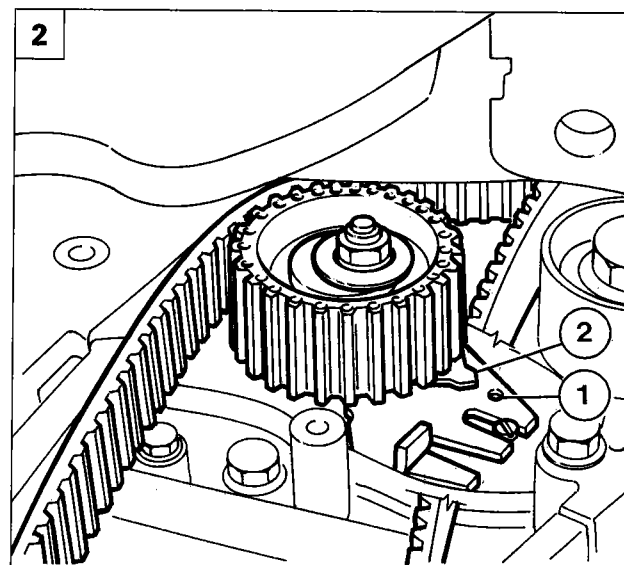
P4A14GX03



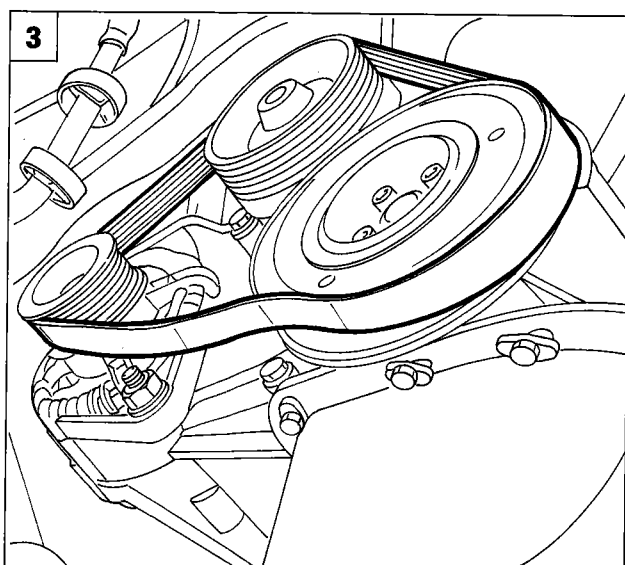
# 00.



1. For the 1910 TD 100 version, fix the injection pump pulley tightening the fixing bolts to the recommended torque and removing pin 1860965000 from the housing.



2. Rotate the crankshaft through two revolutions in its normal direction of rotation, release the nut fixing the tensioner and make sure that the fixed reference (1) on the tensioner support coincides with the moving reference (2) for the belt tensioner. Lock the tensioner fixing nut and then tighten it to the recommended torque. Proceed with refitting the components previously removed reversing the order of the operations described previously.

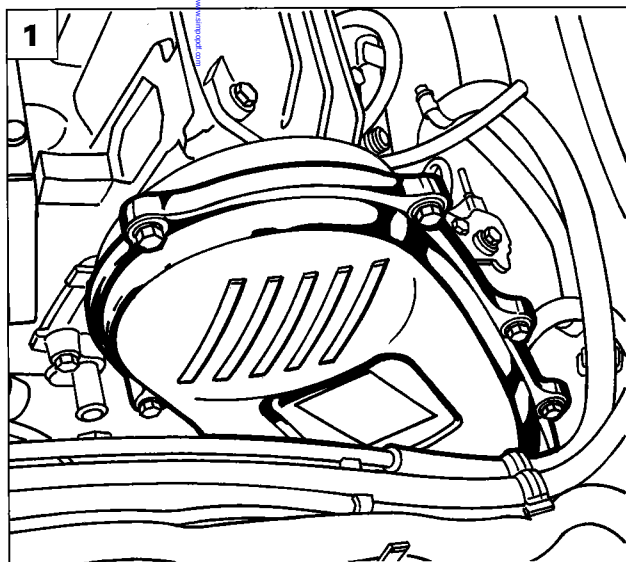


### Bravo-Brava 1929 D

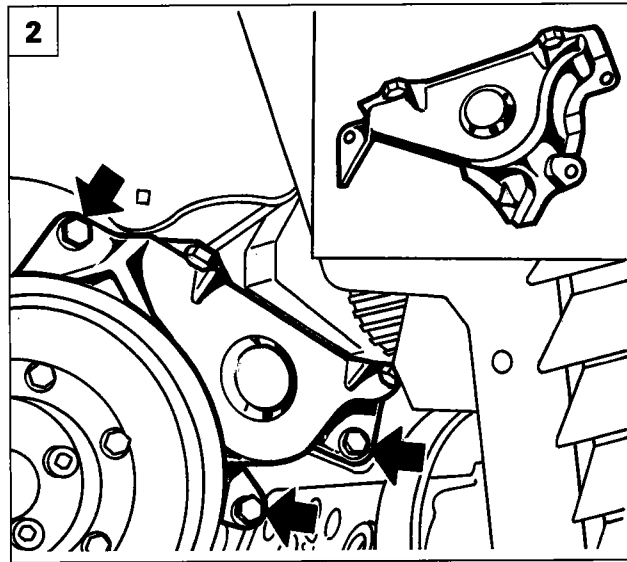
Position the vehicle on a lift, then:

- disconnect the negative battery lead;
- remove the right front wheel;
- remove the right wheel arch liner.

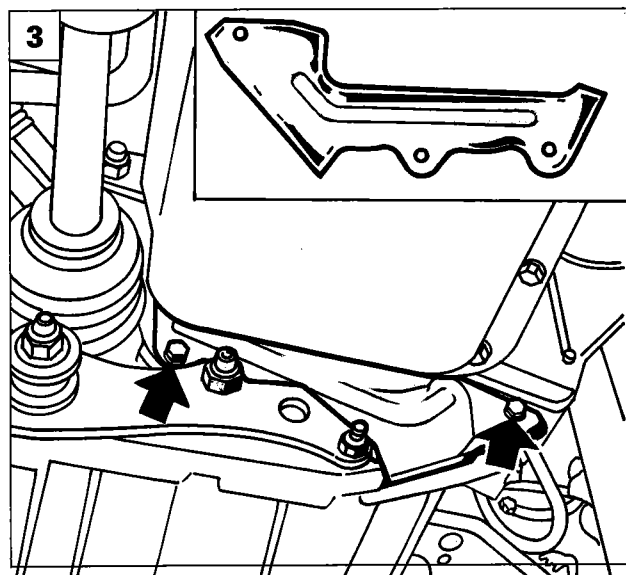
3. Remove alternator drive belt acting on the fixing bolts and the adjustment screw. If the vehicle is equipped with air conditioning, remove the air conditioning compressor drive belt from the damper flywheel.



P4A11EX01



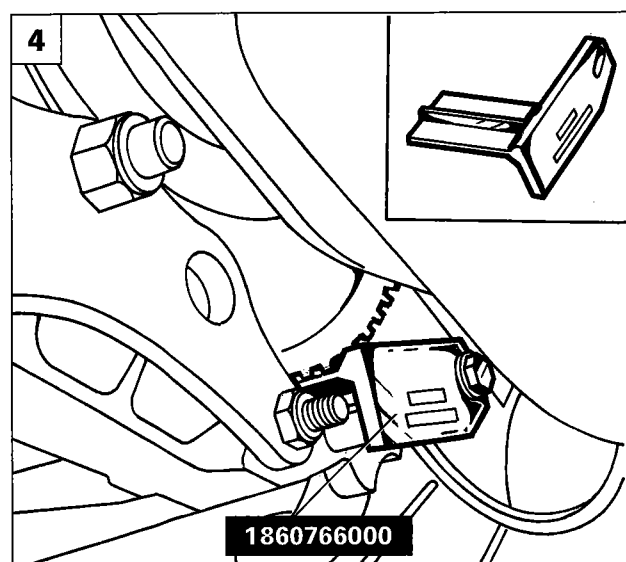
P4A11EX03



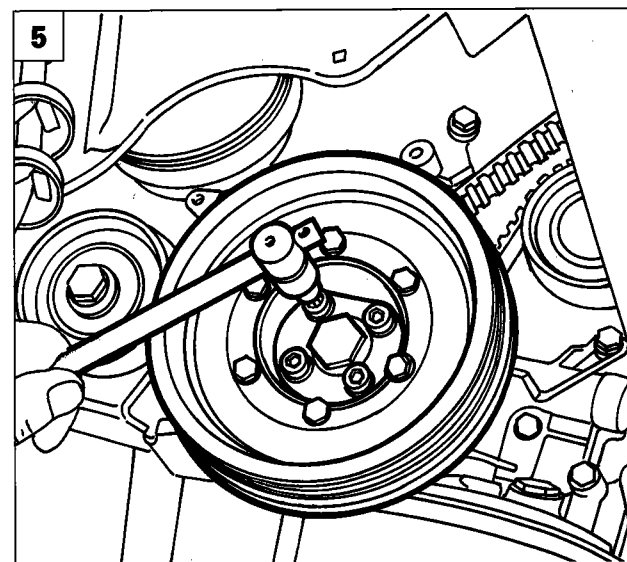
P4A11EX04



1. Remove the upper protective cover for the timing drive belt; if necessary, release the mounting brackets for the engine cooling system pipes.
2. Remove the lower timing belt cover.
3. Remove the lower flywheel shield from the bell housing.
4. Place flywheel lock 1860766000 in position to prevent the rotation of the crankshaft.
5. Remove the damper flywheel, then remove the flywheel lock 1860766000.



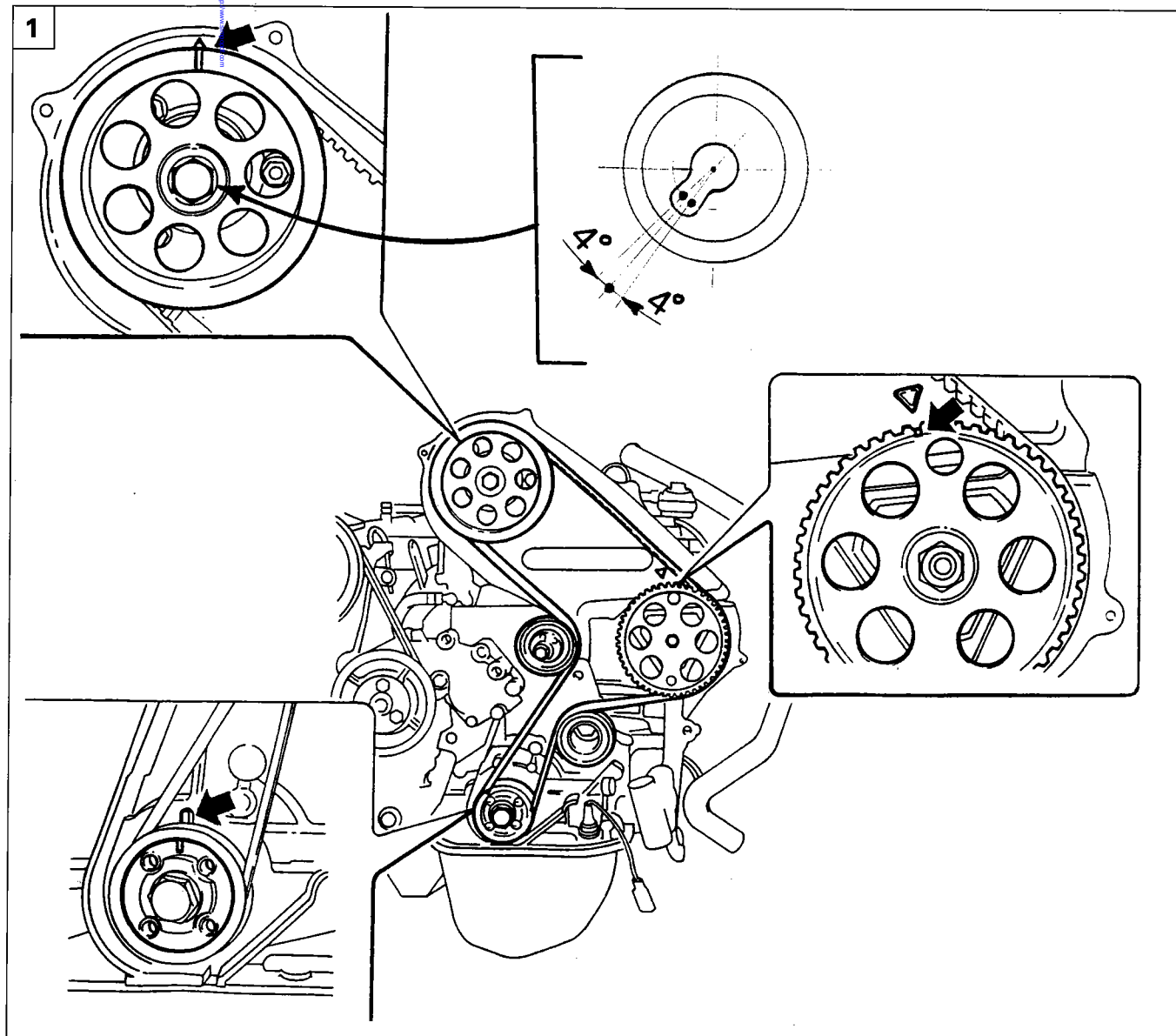
P4A12EX03



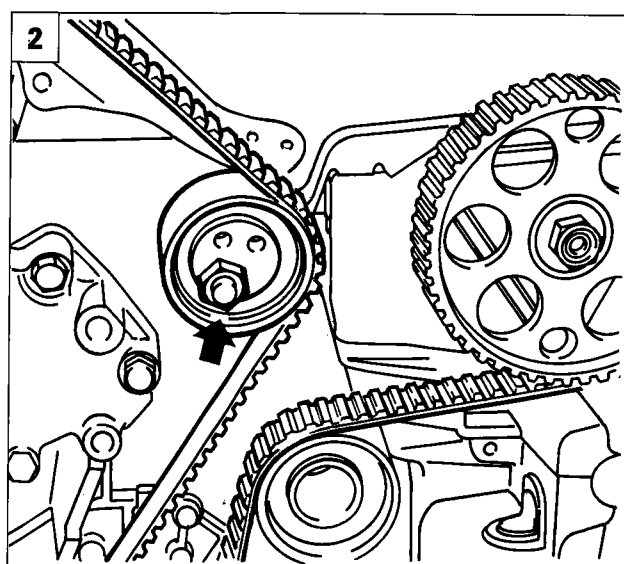
P4A12EX04



**00.**



P4A40CA01



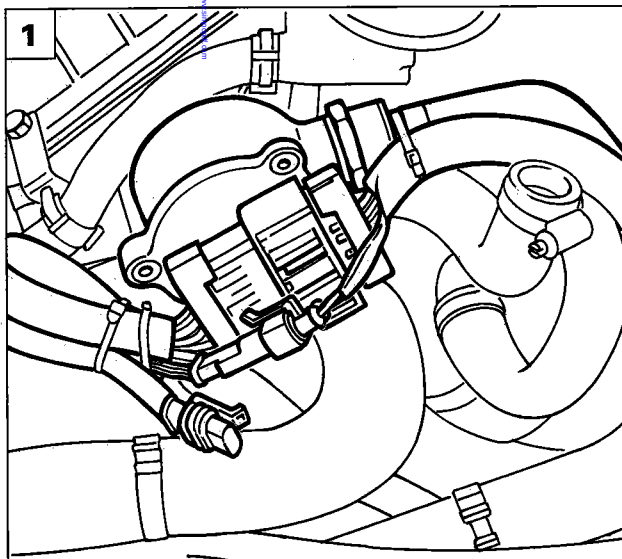
P4A40CA02



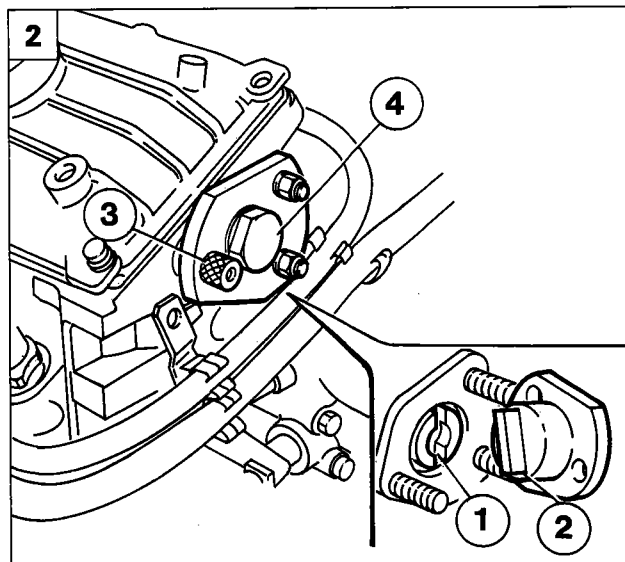
1. Rotate the crankshaft in its normal direction of rotation until the references on the crankshaft pulley and the injection pump drive pulley are in line with the fixed references on the engine. Cylinder no. 1 will be at T.D.C., under these circumstances and the camshaft will be timed for the explosion stroke in cylinder no. 1.

**NOTE** The fixing opening for the camshaft drive pulley has a slot on account of which under these circumstances the reference on it should not coincide exactly with the fixed reference on the cover.

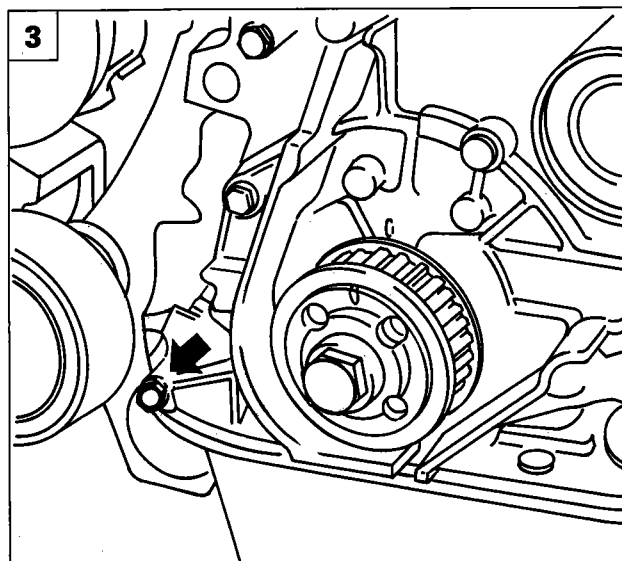
2. Loosen the belt tensioner nut, then remove the timing drive belt.



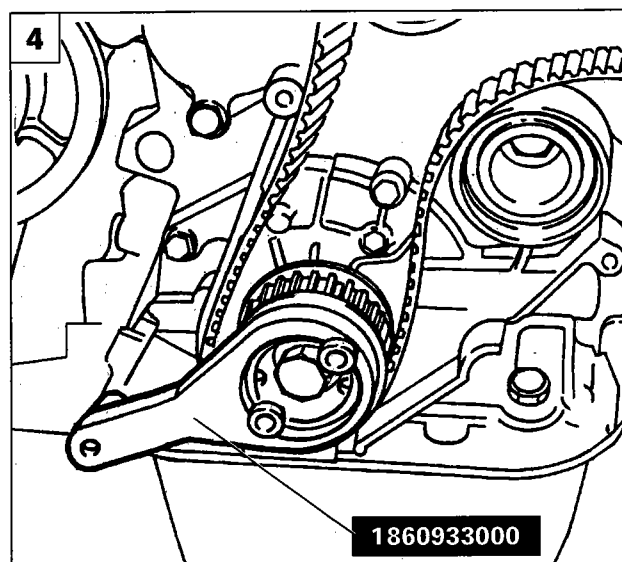
P4A41CA01



P4A41CA02



P4A41CA03

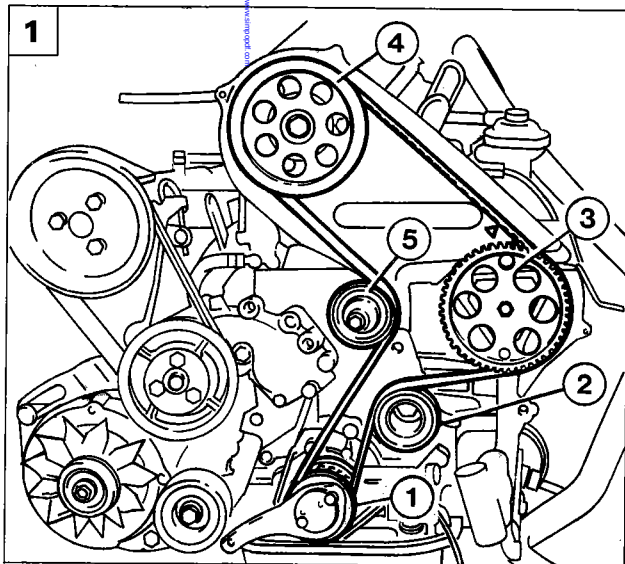


P4A41CA04



1. Move the connections and the cables shown in the diagram aside, then undo the nuts fixing the brake servo vacuum pump to the cylinder head and remove it.
2. Position tool 1860934000 for timing the camshaft, matching the splining (1) for the camshaft with the projection (2) on the tool.  
Fix the tool to the cylinder head placing the centering dowel (3) as illustrated in the diagram. The dowel should be perfectly centered on the tool; if it is not, use a spanner (4) to centre the dowel on the tool using extremely small movements.
3. Remove the bolt shown in the diagram which fixes the front cover to the crankcase. Then fit the timing drive belt on the crankshaft drive gear only.
4. Position tool 1860933000 for accurately determining T.D.C. for cylinder no. 1. The tool should be perfectly fixed to the crankshaft drive gear using two bolts and using another bolt to the crankshaft front cover (for the bolt removed previously). Then loosen the bolt fixing the camshaft drive pulley using tools 1860831000 and 1860848000.

# 00.



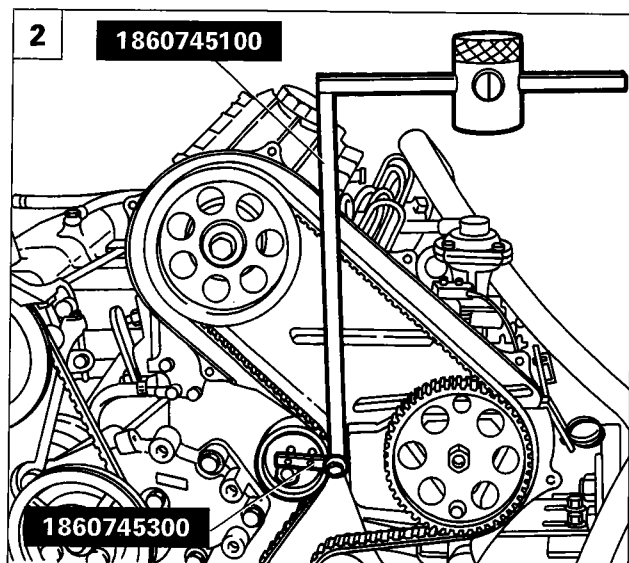
### Fitting and tensioning the timing drive belt

1. Complete the fitting of the timing belt observing the following order:

- Crankshaft gear;
- fixed pulley;
- injection pump pulley;
- timing pulley;
- belt tensioner.



*Check that the reference on the injection pump corresponds with the fixed reference on the rear cover.*



2. Fit part 1860745300 on tool 1860745100, the position the weight with the knurled part 120 mm away on the millimetric rod and lock it in place.

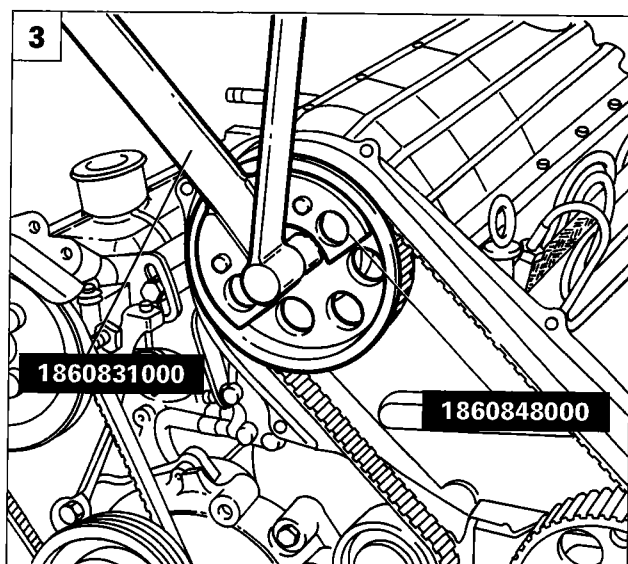
Fit the tool produced in this way on the belt tensioner as illustrated in the diagram and, acting on the joint, position the millimetric rod on the horizontal plane and lock the joint fixing bolt.

3. Tighten the bolt fixing the camshaft drive pulley to the recommended torque. Remove the tools positioned previously for determining the timing and T.D.C. and the flywheel lock.

Let the belt bed in by rotating the crankshaft through two revolutions in its direction of rotation and tighten the nut fixing the belt tensioner to torque, then remove the tools used for the tensioning.

**NOTE** *During this last phase the millimetric rod may move away from the horizontal plane; if this is the case, the joint must be adjusted again and the operation repeated.*

Refit the previously removed components reversing the procedure described for the removal.



### 20 REPLACE SPARK PLUGS AND CHECK LEADS

The cleanliness and condition of the spark plugs are critical for the efficiency of the engine and containing pollutant emissions. The following types of spark plug are fitted:

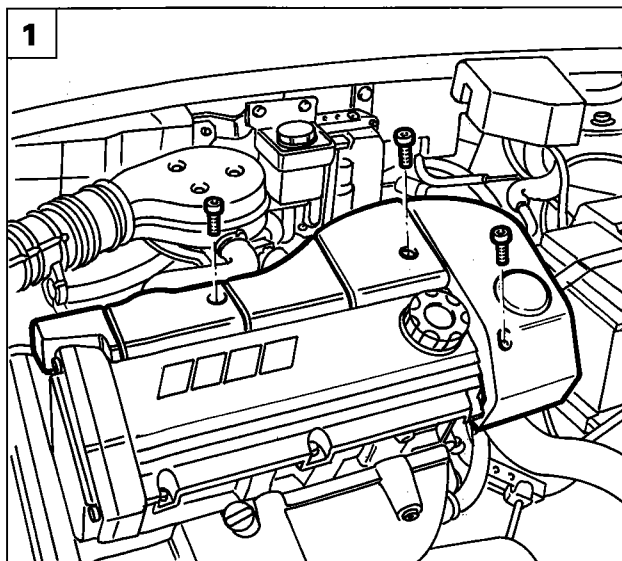
|                      | Spark plug type                                                                        |
|----------------------|----------------------------------------------------------------------------------------|
| 1370 12v<br>1581 16v | Champion RC8BYC<br>Golden Lodge 2HLDR<br>NGK BKR6EKC                                   |
| 1747 16v             | Fiat 7GBMSR<br>Champion RC7BMC<br>Champion RC8BYC<br>Golden Lodge 2HLDR<br>NGK BKR6EKC |
| 1998 20v             | Fiat 7GBMSR<br>Champion RC7BMC                                                         |



*Only use recommended type spark plugs: if the heat rating is insufficient or not guaranteed for the correct period, problems can arise.*

Also check the condition of the supply cables making sure that there are no cuts, cracks or restrictions along the entire length.

**NOTE** Carry out the following operations with the engine cold.

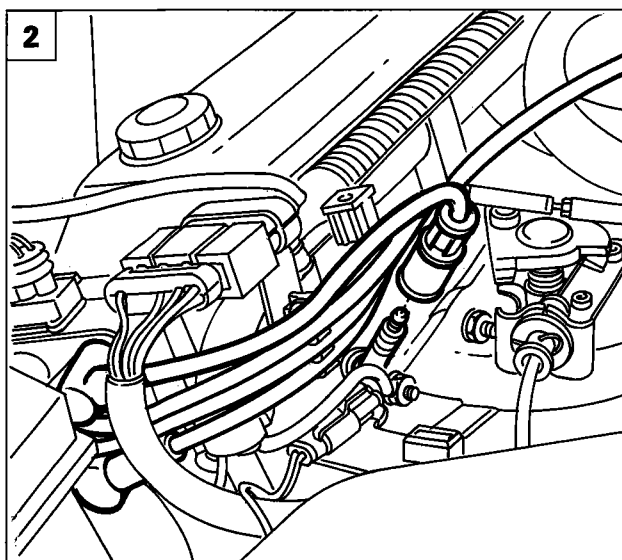


P4A43CA01



#### Bravo-Brava 1370 12v

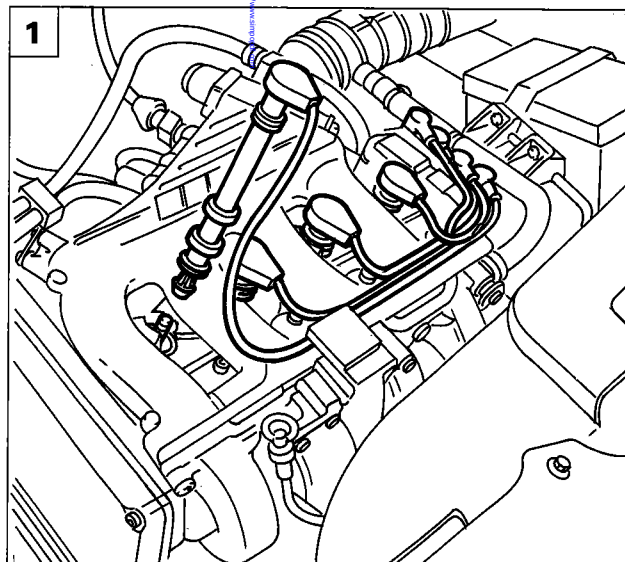
1. Remove the cylinder head shield shown in the diagram.



P4A43CA02

2. Disconnect the H.T. leads from the spark plugs taking great care when extracting the boots and remove and replace the spark plugs using an appropriate spanner.

# 00.

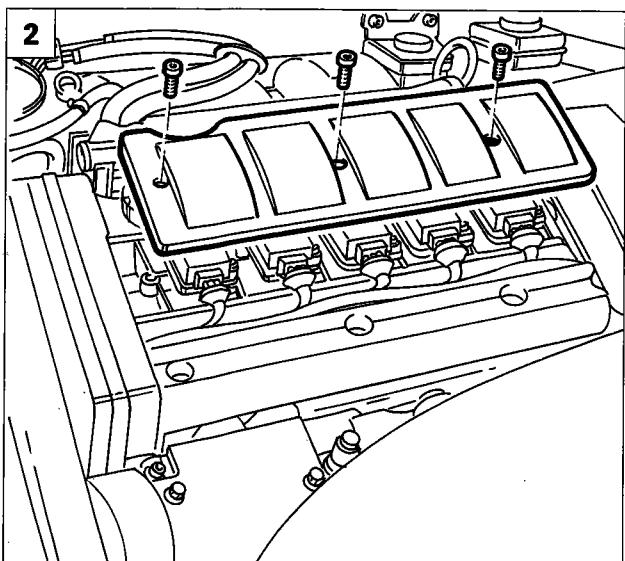


P4A44CA01



### Bravo-Brava 1581 16v

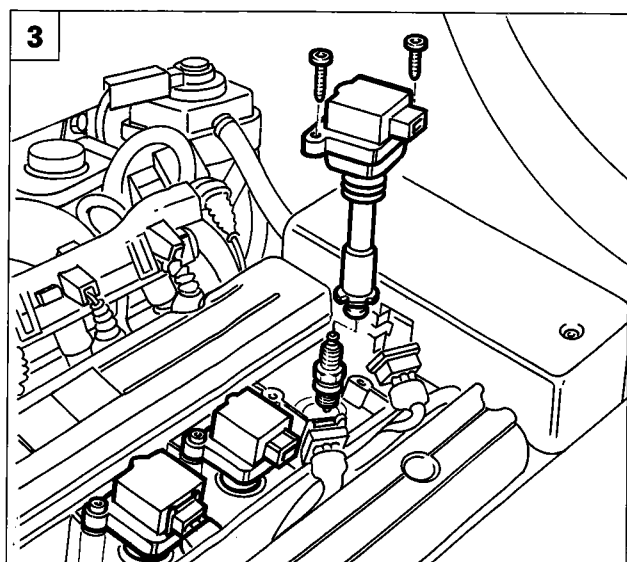
1. Disconnect the H.T. leads from the spark plugs taking great care when extracting the boots and remove and replace the spark plugs using an appropriate spanner.



P4A44CA02

### Bravo-Brava 1747 16v - 1998 20v

2. Remove the cover for the ignition coils, then disconnect the supply connectors.



P4A44CA03

3. Remove the ignition coils acting on the fixing bolts; undo the spark plugs using a special spanner and proceed with replacing them.



## **21 CHECK OPERATION OF ENGINE CONTROL SYSTEMS (using the autodiagnostic socket)**

A complete electronic fault diagnosis of the injection/ignition system can be carried out by connecting the Fiat/Lancia Tester or the SDC or Examiner stations to the diagnostic socket.

The system is also equipped with an autodiagnostic function which recognizes, memorizes and signals any failures.

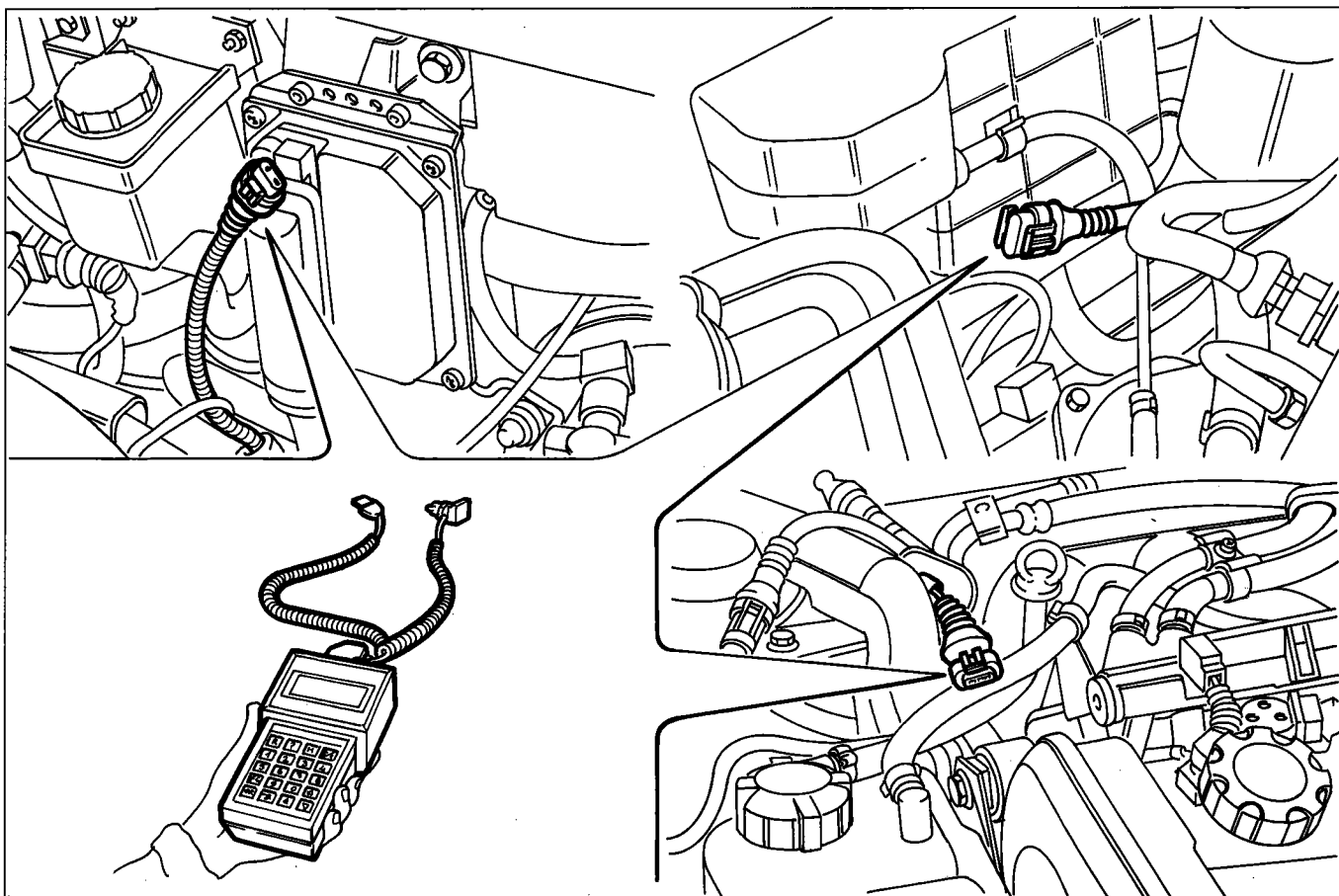
If a fault is detected and confirmed it is permanently memorized and the relevant sensor is excluded from the system until it is repaired.

When a fault is detected and confirmed the warning light in the dashboard usually comes on: when the fault is repaired the light goes out.

Working with the Fiat/Lancia Tester or the SDC or the Examiner it is possible to carry out a complete system fault diagnosis which consists of three stages:

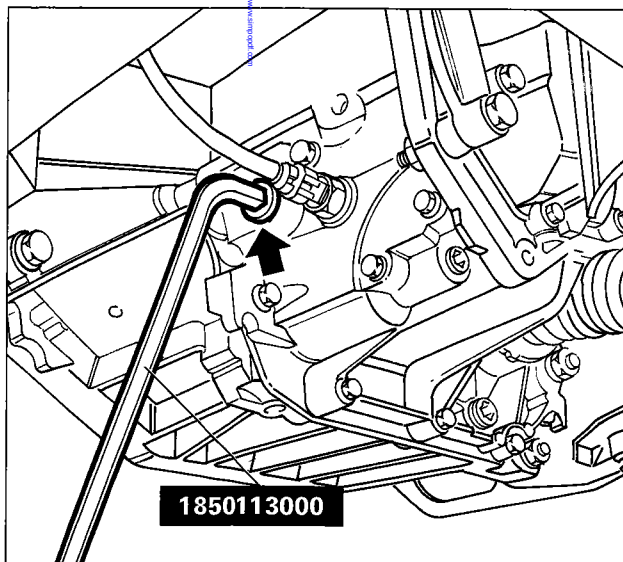
1. display of a series of functional parameters;
2. display of the errors or their cancelling;
3. activation of certain actuators (active diagnosis).

Unlike the Fiat/Lancia Tester, the SDC and Examiner equipment use a "touch screen" type display which is easy to use and can display several parameters simultaneously; a single CD ROM, which can be periodically updated, makes it possible to carry out fault diagnosis for electronic systems on all Group vehicle models. Also, if connected to a printer, the results of the fault diagnosis can be certified. In addition to the diagnostic functions these pieces of equipment have powerful integrated measuring instruments.



P4A45CA01

# 00.



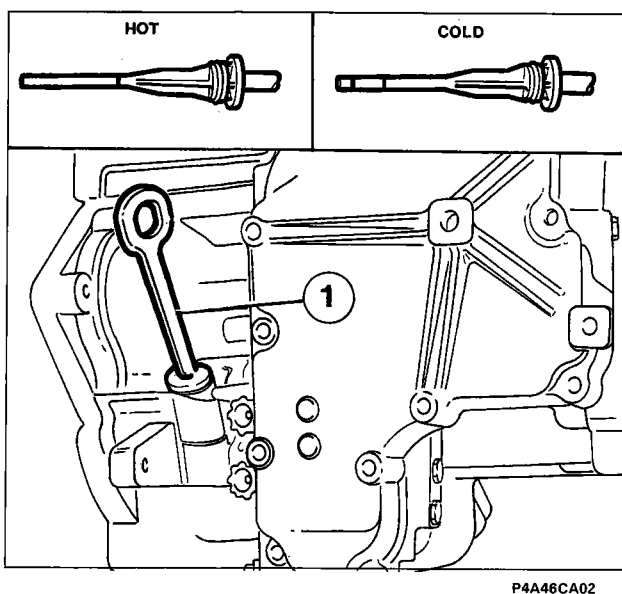
## 22 CHECK GEARBOX/DIFFERENTIAL OIL LEVEL



Position the vehicle on a lift. Undo the filler plug and check that the level of the oil is below the lower edge of the opening.

If necessary, top up until the correct level is restored.  
Retighten the filler plug tightening it to a torque of 4.6 daNm.

## 23 CHECK AUTOMATIC GEARBOX OIL LEVEL (Bravo-Brava 1581 16v)



**NOTE** The gearbox oil level should be checked with the engine and the gearbox at normal operating temperature (gearbox oil temperature: 70 - 80°C), on account of which the vehicle must be driven for a suitable length of time before the check.

Proceed with checking the gearbox oil level by carrying out the following operations:

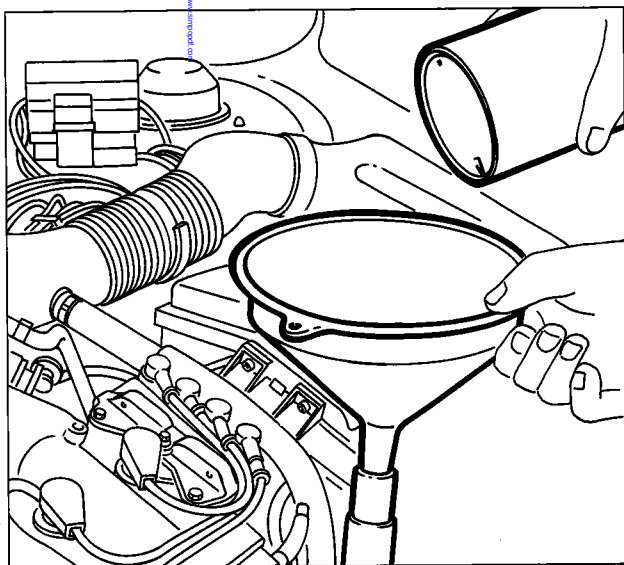
- park the vehicle on a flat surface and apply the handbrake;
- with the engine idling, gently move the selector lever from position P to position 1, then return it to P;
- extract the oil dip stick (1) and clean it again;

- completely insert the dip stick in its housing;
- extract the dip stick once again and check the the level of the oil is between the two reference on the side of the rod marked HOT.



If the check takes place with the temperature of the gearbox oil low, check that the level of the oil is between the reference on the side of the dip stick marked COLD. If possible, check the level again with the oil at the correct temperature (70 - 80 °C).



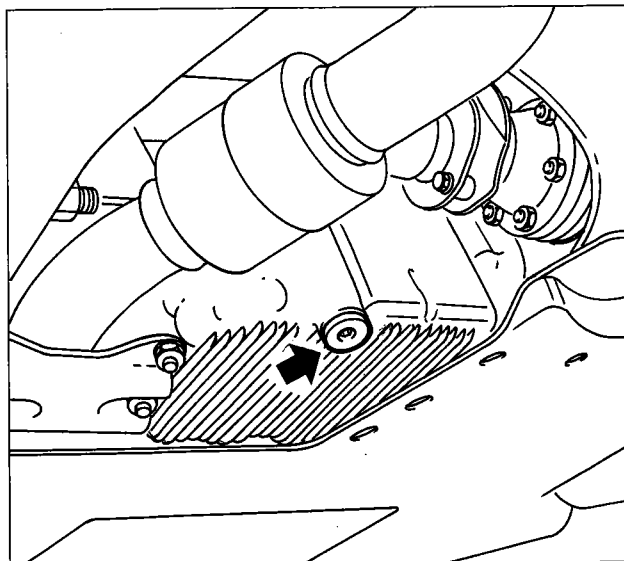


P4A47CA01

If the oil level is low, notify the Customer of any leaks or seepage and the need to solve the problem. If refilling is necessary, extract the dip stick and, using a clean container in order not to contaminate the oil, pour in the necessary quantity of gearbox oil. Then recheck the level using the dip stick and check that there are no leaks from the drain plug.

**Recommended gearbox oil: TUTELA GI/2**

**Periodic replacement: 3 litres (2.7 kg)**



P4A47CA02

## **24 25 CHANGE ENGINE OIL AND FILTER**

- With the engine hot remove oil filler plug;
- remove the engine oil dip stick.



*With the engine warm, work very carefully inside the engine compartment because there is a danger of being scalded. Remember that, with the engine hot, the fan may start working with the danger of injury.*

- Raise the vehicle, remove the engine compartment lower shield and undo the drain plug and completely drain the oil into a suitable container.

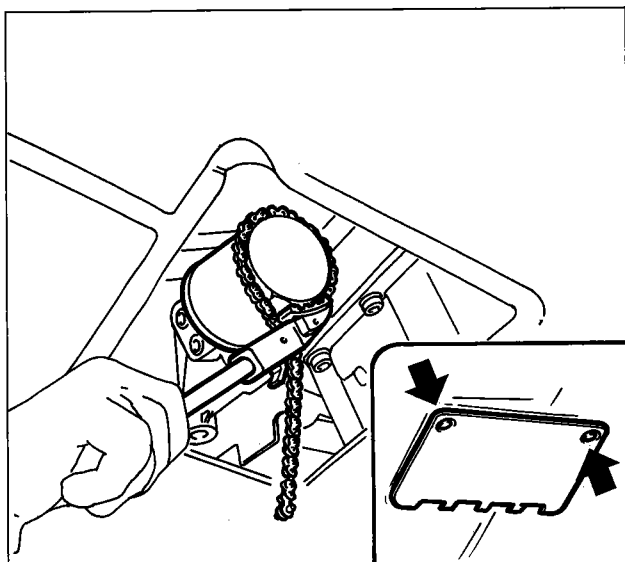


*Work very carefully whilst removing the drain plug because the oil could be very hot.*

- Working from underneath the vehicle using the appropriate equipment, release the oil filter and remove it;

**NOTE** *For the 1747 16v and 1998 20v versions, the engine compartment lower shield does not have to be removed because the drain plug is accessible from the rear of the engine and the oil filter can be reached by removing the special flap on the actual shield.*

- clean the drain plug and tighten it, with the appropriate seal, to the recommended torque;
- lubricate the seal for the new filter with oil and tighten fully by hand.



P4A47CA03

## 00.

- lower the vehicle, introduce the correct quantity of recommended oil;
- check that the oil level is correct using the dip stick;
- reposition the oil filler plug, let the engine idle for around 2 minutes, switch off the engine and wait for several minutes, then check the level of the oil and make sure there are no leaks.

### NOTE

If the vehicle is mainly used in one of the following particularly harsh conditions:

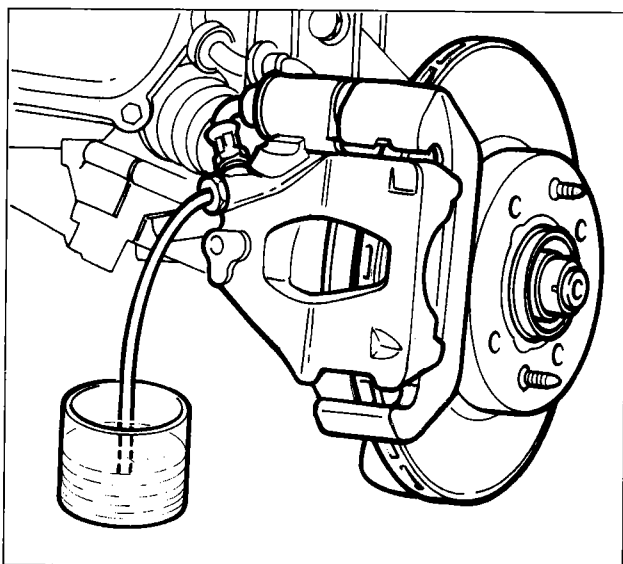
- towing a trailer or caravan
- dusty roads
- short, repeated journeys (less than 7-8 km) at sub-zero temperatures
- engine often idling or driving long distances at low speeds

notify the Customer of the need to change the oil more often than indicated in the Planned Maintenance Programme.



*The engine oil used and the oil filter replaced contain substances which are dangerous to the environment. The used oil and the filters should be deposited in special containers and then disposed of in accordance with the laws in force.*

## 26 CHANGE BRAKE FLUID



P4A48CA01

The brake fluid is hygroscopic, i.e. it absorbs humidity. To avoid problems with braking, the brake fluid should be changed every two years, irrespective of the mileage.

- Raise the vehicle and, if necessary, remove the wheels;
- connect a flexible pipe to the bleed screws on the brake calipers (for rear drum brakes to the bleed screws on the wheel cylinders), loosen them and, acting on the control pedal, drain the fluid into a suitable container.
- remove the plug from the brake fluid reservoir and (simultaneously to the operation of draining the old fluid) introduce the recommended fluid into the system. Continue to introduce the new fluid until it starts to come out of the bleed screws, then tighten them.



*Avoid the brake fluid, which is extremely corrosive, coming into contact with the paintwork. If it does, wash immediately with water.*

*The symbol , present on the container, identifies a synthetic type of brake fluid, distinguishing it from mineral kinds. The use of mineral type fluids irreparably damages the special rubber seals in the braking system.*

- Bleed the system keeping the flexible pipe connected to the bleed screw and the opposite end immersed in a transparent container filled with the same fluid as the circuit;
- loosen the bleed screw and, at the same time, press the brake pedal letting it return slowly; repeat this operation until any air bubbles finish coming out;
- with the pedal fully depressed, tighten the bleed screw and remove the pipe. Carry out this operation separately for each wheel starting at the rear (the furthest from the brake fluid reservoir).

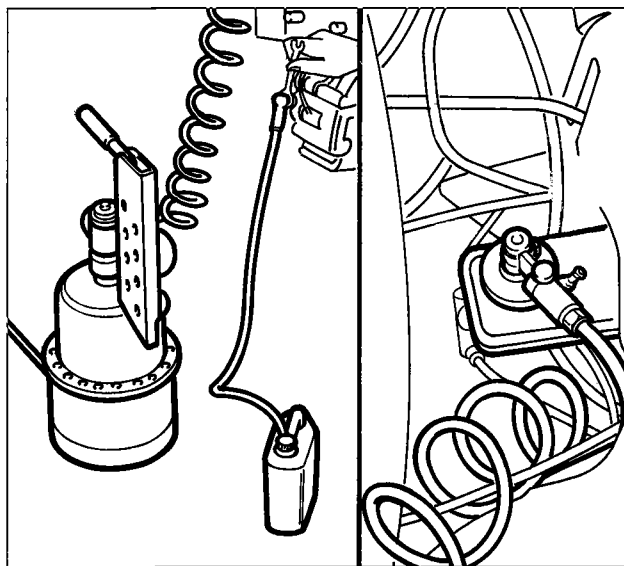


*During the bleeding operation keep the level of the fluid in the reservoir above the MIN reference.*

*Do not reuse the hydraulic fluid drained during the bleeding procedure.*

- Restore the level of the fluid in the reservoir and refit the cap;
- check the efficiency of the braking system.

**NOTE** *For versions with hydraulic clutches (Bravo 1998 20v) the fluid in the circuit must be drained by connecting a flexible pipe to the clutch operating cylinder bleed screw, loosening it and acting on the pedal to drain the fluid into a suitable container. Proceed with bleeding the hydraulic clutch circuit in the same way as described for the braking circuit, using the clutch pedal this time.*

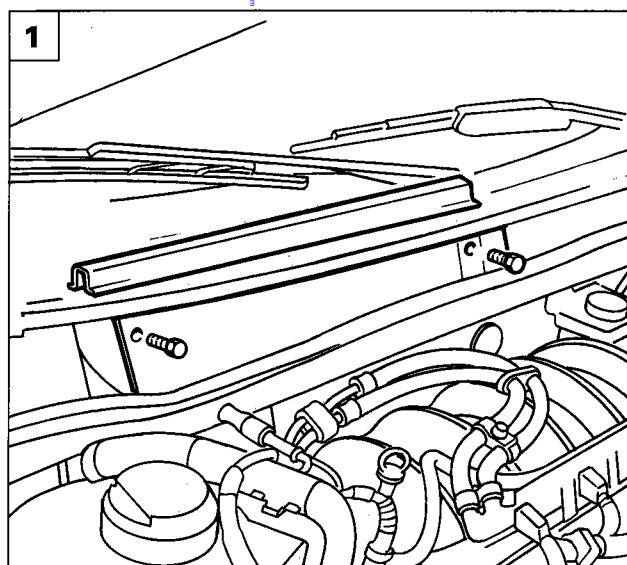


P4A49CA01

The bleeding operation can also be carried out using the "Jollyfren" equipment. This equipment allows the hydraulic system to be bled quickly. The bleeding action is carried out simultaneously for both wheels by a single operator representing a considerable time saving.

# 00.

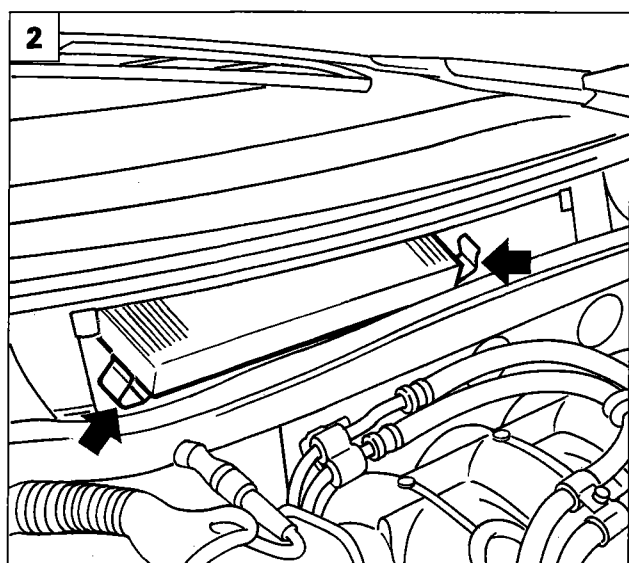
## 27 REPLACE POLLEN FILTER



P4A50CA01



1. To gain access to the pollen filter it is necessary to raise the seal shown in the diagram and then undo the bolts shown and remove the access flap for the pollen filter.



P4A50CA02

2. Release the side retaining springs in the pollen filter housing, extract it and proceed with replacing it.

**NOTE** Failure to replace the filter can considerably reduce the efficiency of the climate control system.  
If the vehicle is often used in dusty or strongly polluted areas, advise the Customer of the need to replace the filter element more often; it should especially be replaced if a decrease in the flow rate of the air introduced into the passenger compartment is noticed.

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Engine 1910 TD

Engine 1910 TD 100

Engine 98 1242 16v

Engine 98 1998 20v

Engine 98 1910 JTD



**INTRODUCTION**

|                                  |   |
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| - Identification data            | 1 |
| - Weights                        | 2 |
| - Performance - Fuel consumption | 3 |
| - Capacities                     | 4 |

**TECHNICAL DATA**
**ENGINE**  **TD 75 CV**  **TD 100 CV**

|                                                       |   |
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| - Typical curves                                      | 4 |
| - Characteristics                                     | 5 |
| - Cylinder head assembly and valve gear components    | 6 |
| - Fuel system and supercharging                       | 7 |
| - Data for checking Bosch injection pump type VER 679 | 8 |
| - Data for checking Lucas injection pump type FT 09   | 9 |

**GEARBOX AND DIFFERENTIAL** 11

**AISIN AUTOMATIC GEARBOX** 13

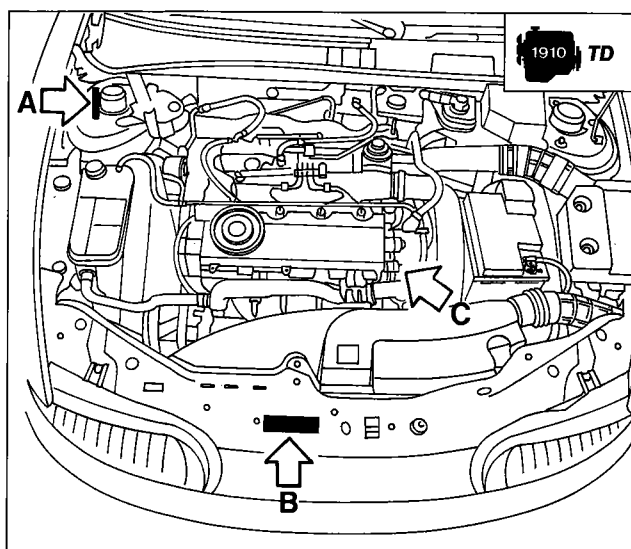
**FRONT SUSPENSION** 14

N.D. Data not available at the time of printing

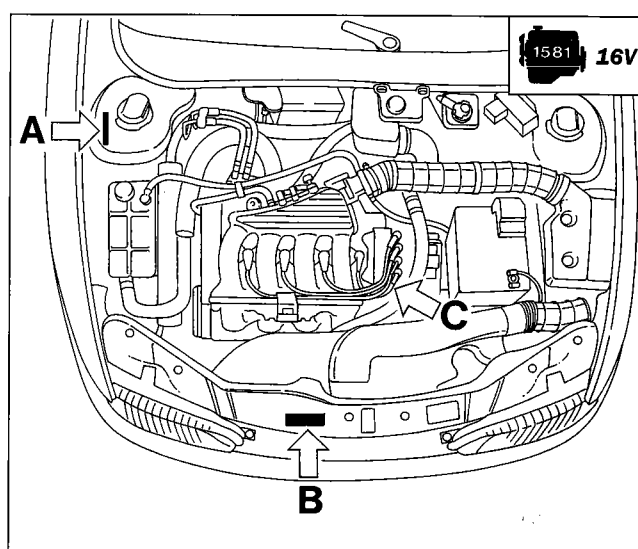
|                                                                                                          |             |                   |                    |       |                                                                                     | GEARBOX                                                                             |  |  |   |
|----------------------------------------------------------------------------------------------------------|-------------|-------------------|--------------------|-------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--|--|---|
| CHASSIS                                                                                                  | ENGINE      | VERSION           | BRAVO              | BRAVA |  |  |  |  |   |
|  <b>1581 16V</b>        | ZFA 182 000 | 182 A4.000        | 182 AB 1AA 01      | ●     |                                                                                     | ●                                                                                   |  |  |   |
|                                                                                                          |             |                   | 182 AB 1AA 018 (▲) | ●     |                                                                                     |                                                                                     |  |  |   |
|                                                                                                          |             |                   | 182 BB 1AA 11      |       | ✓                                                                                   |                                                                                     |  |  |   |
|                                                                                                          |             |                   | 182 BB 1AA 11B (▲) |       | ●                                                                                   |                                                                                     |  |  |   |
|                                                                                                          |             |                   | 182 AB 11A 02      | ●     |                                                                                     |                                                                                     |  |  | ● |
|                                                                                                          |             |                   | 182 BB 11A 12      |       | ●                                                                                   |                                                                                     |  |  |   |
| 182 A6.000 (*)                                                                                           |             | 182 AH 1AA 08 (*) | ●                  |       | ●                                                                                   |                                                                                     |  |  |   |
|                                                                                                          |             | 182 BH 1AA 17 (*) |                    | ●     |                                                                                     |                                                                                     |  |  |   |
|  <b>1910 TD 100 CV</b>  |             | 182 A7.000        | 182 AF 1AA 06      | ●     |                                                                                     | ●                                                                                   |  |  |   |
|                                                                                                          |             |                   | 182 BF 1AA 15      |       | ●                                                                                   |                                                                                     |  |  |   |
|  <b>1910 TD 75 CV</b> |             | 182 A8.000        | 182 AI 1AA 09      | ●     |                                                                                     | ●                                                                                   |  |  |   |
|                                                                                                          |             |                   | 182 BI 1AA 18      |       | ●                                                                                   |                                                                                     |  |  |   |

(\*) Versions for specific markets (Germany)

(▲) Voluntary - Germany



P4A003A04

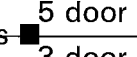
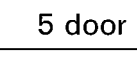
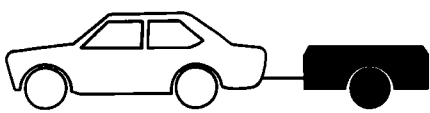


P4A002A02

- A. Vehicle type identification code and chassis manufacture number**
- B. V.I.N. Plate (EEC regulations)**
- C. Engine type and number.**



## WEIGHTS (in kg)

| ENGINE TYPE                                                                                                                                                                                                                                                                                                                                                                                                     |                        | <br>16V | <br>16V | <br>TD 100 CV | <br>TD 75 CV |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <br> +500 =  (▲)                                                            | 3 door                 | 1050                                                                                     | 1090                                                                                       | 1155                                                                                             | 1145                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | 5 door                 | 1090                                                                                     | 1120                                                                                       | 1180                                                                                             | 1170                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | 3 door                 | 1550                                                                                     | 1590                                                                                       | 1665                                                                                             | 1655                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | 5 door                 | 1630                                                                                     | 1660                                                                                       | 1720                                                                                             | 1710                                                                                            |
| Maximum permissible loads on the axles <br>5 door <br>3 door <br>5 door  | 3 door                 | 850                                                                                      | 850                                                                                        | 920                                                                                              | 920                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | 5 door                 | 850                                                                                      | 850                                                                                        | 920                                                                                              | 920                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | 3 door                 | 850                                                                                      | 850                                                                                        | 900                                                                                              | 900                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | 5 door                 | 850                                                                                      | 850                                                                                        | 900                                                                                              | 900                                                                                             |
| Maximum permissible load on the roof                                                                                                                                                                                                                                                                                                                                                                            |                        | 80                                                                                       | 80                                                                                         | 80                                                                                               | 80                                                                                              |
| Load on the tow hook<br>(trailer with braking system)                                                                                                                                                                                                                                                                                                                                                           | Minimum                | -                                                                                        | -                                                                                          | -                                                                                                | -                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | Maximum                | 70                                                                                       | 70                                                                                         | 70                                                                                               | 70                                                                                              |
|                                                                                                                                                                                                                                                                                                                              | Without braking system | 400                                                                                      | 400                                                                                        | 400                                                                                              | 400                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | With braking system    | 1100                                                                                     | 1100                                                                                       | 1300                                                                                             | 1300                                                                                            |

■ Loads which must never be exceeded

(▲) 510 for Bravo 1910 TD - 540 for Brava

(●) With automatic transmission

**NOTE FOR VERSIONS WITH ACCESSORIES:** If special equipment is fitted (non standard air conditioner, sun roof, trailer towing device), the empty weight increases and therefore the carrying capacity may decrease, in relation to the maximum permissible loads.

The fuel consumption figures according to the 80/1268/EEC standards given overleaf have been defined in the course of official tests and in accordance with procedures laid down by EEC regulations. In particular, the bench tests measure simulated urban cycle figures whilst consumption at constant speeds of 90 and 120 kph are measured directly on a flat, dry road and in equivalent bench tests. The fuel consumption figures according to the 93/116E standards have been defined in the course of homologation tests involving:

- an urban cycle which included cold starting followed by a varied urban cycle simulation.
  - an extra-urban cycle which includes frequent acceleration in all gears simulating normal extra-urban usage of the vehicle. The speed varies between 0 and 120 kph.
  - The average combined consumption is obtained from 37% of the urban cycle and 63% of the extra-urban cycle.
- The type of journey, traffic conditions, driving styles, atmospheric conditions, trim level/equipment/accessories, whether a roof rack is fitted, the presence of special equipment and the general state of the vehicle can lead to fuel consumption figures which differ from those obtained through the above mentioned procedures.
- The CO<sub>2</sub> exhaust emissions (in g/km) are obtained from the average combined cycle

| ENGINE TYPE                                                                                                                                                        |                                                                                    | <br>16V |  (▲)<br>16V | <br>TD 100 CV | <br>TD 75 CV |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <p>Speed kph (average load)</p>                                                   |   | 52                                                                                       | —                                                                                              | 36                                                                                               | 34                                                                                              |
|                                                                                                                                                                    |   | 90                                                                                       | —                                                                                              | 63                                                                                               | 59                                                                                              |
|                                                                                                                                                                    |   | 132                                                                                      | 184<br>180                                                                                     | 97                                                                                               | 92                                                                                              |
|                                                                                                                                                                    |   | 175                                                                                      | —                                                                                              | 137                                                                                              | 128                                                                                             |
|                                                                                                                                                                    |   | 184<br>(180 ●)<br>180<br>(177 ●)                                                         | —                                                                                              | 182<br>180                                                                                       | 165                                                                                             |
|                                                                                                                                                                    |  | 53                                                                                       | —                                                                                              | 36                                                                                               | 34                                                                                              |
| <p>Maximum climable gradient</p>                                                | %                                                                                  | 37                                                                                       | 31                                                                                             | 41                                                                                               | 38                                                                                              |
|                                                                                                                                                                    |                                                                                    |                                                                                          | 30                                                                                             | 40                                                                                               | 37                                                                                              |
| <p>Fuel consumption according to 80/1268/CEE standards (litres/100 km) (*)</p>  | Urban cycle (A)                                                                    | 9,3                                                                                      | 11,2                                                                                           | 7,5                                                                                              | 7,7                                                                                             |
|                                                                                                                                                                    | Constant speed 90 kph (B)                                                          | 5,5                                                                                      | 5,8<br>5,9                                                                                     | 4,6<br>4,7                                                                                       | 4,5                                                                                             |
|                                                                                                                                                                    | Constant speed 120 kph (C)                                                         | 7,5                                                                                      | 7,6<br>7,7                                                                                     | 6,5<br>6,6                                                                                       | 6,4<br>6,5                                                                                      |
|                                                                                                                                                                    | Av. consumption (CCMC proposal)<br>A + B + C<br>3                                  | 7,4                                                                                      | 8,2<br>8,3                                                                                     | 6,2<br>6,3                                                                                       | 6,2<br>6,23                                                                                     |
|                                                                                                                                                                    | Urban                                                                              | 11,0<br>11,3                                                                             | 13,8<br>13,8                                                                                   | 8,5<br>8,7                                                                                       | 8,5<br>8,6                                                                                      |
| <p>Fuel consumption according to 93/116/CE standards (litres/100km) (*)</p>                                                                                        | Extra-urban                                                                        | 6,5<br>6,6                                                                               | 8,3<br>8,3                                                                                     | 5,2<br>5,3                                                                                       | 5,1<br>5,2                                                                                      |
|                                                                                                                                                                    |                                                                                    | 8,2<br>8,3                                                                               | 10,3<br>10,3                                                                                   | 6,4<br>6,5                                                                                       | 6,3<br>6,4                                                                                      |
|                                                                                                                                                                    | Combined                                                                           | 194<br>197                                                                               | 246<br>246                                                                                     | 171<br>173                                                                                       | 168<br>171                                                                                      |
|                                                                                                                                                                    |                                                                                    |                                                                                          |                                                                                                |                                                                                                  |                                                                                                 |

(\*) See specification on previous page

(●) Versions for specific markets (Germany)

(▲) With automatic transmission

**NOTE** The figures with the shaded background refer to the Fiat Brava

# Introduction

## Capacities

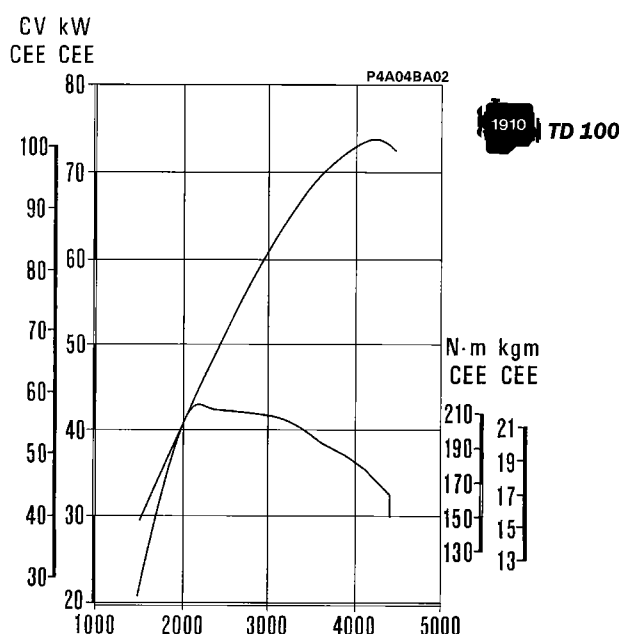
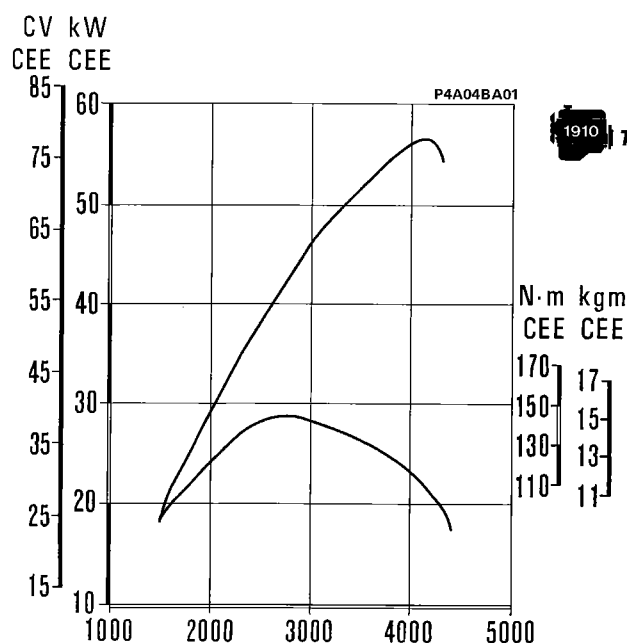
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**Bravo-Brava**

| Capacities                                                                                                                                                                          |                                                                                                                        | Unit                                                                               |                                                                                    | Quantity                                                                          |                                                                                   |                                                                                   |             |                 |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------|-----------------|---|
|                                                                                                                                                                                     |                                                                                                                        |                                                                                    |                                                                                    | dm <sup>3</sup> (l)                                                               | (kg)                                                                              |                                                                                   |             |                 |   |
|                                                                                                    | Petrol ≥ O.R. 95<br>Unleaded                                                                                           |   |   | 1581                                                                              | 50                                                                                | –                                                                                 |             |                 |   |
|                                                                                                                                                                                     | Diesel                                                                                                                 |                                                                                    |                                                                                    | 1910 TD                                                                           | 60                                                                                | –                                                                                 |             |                 |   |
|  50%<br>+<br> (▲) |                                       |   |   |  |  |  | 1581        | 7<br>(6,4 ■)    | – |
|                                                                                                                                                                                     |                                                                                                                        |                                                                                    |                                                                                    |                                                                                   |                                                                                   |                                                                                   | 1910 TD 75  | 6,55<br>(6,8 ■) | – |
|                                                                                                                                                                                     |                                                                                                                        |                                                                                    |                                                                                    |                                                                                   |                                                                                   |                                                                                   | 1910 TD 100 | 6,3<br>(6,55 ■) | – |
|                                                                                                                                                                                     |                                                                                                                        | Total capacity<br>of cooling system                                                |                                                                                    |                                                                                   |                                                                                   |                                                                                   |             |                 |   |
|                                                                                                    | Petrol engines:<br><br>SELENIA 20 K<br>(SAE 10 W/40)                                                                   |   |                                                                                    | 1581                                                                              | 4,5                                                                               | 4                                                                                 |             |                 |   |
|                                                                                                                                                                                     | Diesel engines<br>SELENIA<br>Turbo Diesel<br>(SAE 15 W/40)                                                             |                                                                                    |                                                                                    | 1910 TD 75                                                                        | 5                                                                                 | 4,35                                                                              |             |                 |   |
|                                                                                                                                                                                     |                                                                                                                        |                                                                                    |                                                                                    | 1910 TD 100                                                                       |                                                                                   |                                                                                   |             |                 |   |
|                                                                                                  | <b>a</b> = TUTELA<br>ZC 75 Synth<br> |  |  | 1581                                                                              | 3,8<br>(3,5 ●)                                                                    | 3,4<br>(3,1 ●)                                                                    |             |                 |   |
|                                                                                                                                                                                     |                                                                                                                        |                                                                                    |                                                                                    | 1910 TD 75                                                                        | 4,5<br>(4,2 ●)                                                                    | 4<br>(3,7 ●)                                                                      |             |                 |   |
|                                                                                                                                                                                     |                                                                                                                        |                                                                                    |                                                                                    | 1910 TD 100                                                                       |                                                                                   |                                                                                   |             |                 |   |
|                                                                                                                                                                                     |                                                                                                                        | Partial capacity<br>(periodic replacement)                                         |                                                                                    |                                                                                   |                                                                                   |                                                                                   |             |                 |   |
|                                                                                                  | <b>b</b> = TUTELA<br>GI/2<br>       |  |  | <b>a</b>                                                                          | 1,98                                                                              | 1,8                                                                               |             |                 |   |
|                                                                                                                                                                                     |                                                                                                                        |                                                                                    |                                                                                    | <b>b</b>                                                                          | 6<br>(4,3 *)                                                                      | 5,4<br>(3,9 *)                                                                    |             |                 |   |

(▲) Distilled water  
(●) Engine sump only

(■) For versions with air conditioning  
(\*) Periodic replacement

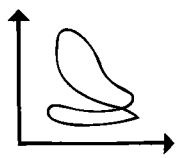
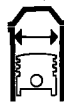
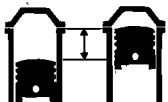
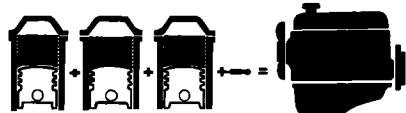
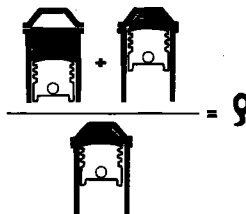
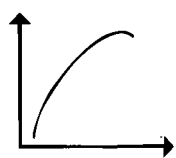
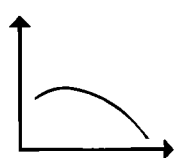


### Engine power curves obtained by EEC method

The power curves illustrated can be obtained with the engine overhauled and run in, without a fan and with a silencer and air filter fitted at sea level.

|                                                                                                         |                                                                                                          |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
|  <b>1910 TD 100 CV</b> |  <b>1910 TD 75 CV</b> |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|

**CHARACTERISTICS**

|                                                                                       |                          |                               |             |
|---------------------------------------------------------------------------------------|--------------------------|-------------------------------|-------------|
|      | Cycle                    | DIESEL 4 stroke               |             |
|                                                                                       | Timing                   | single overhead camshaft      |             |
|                                                                                       | Type of fuel system      | Indirect mechanical injection |             |
|  ... | Number of cylinders      | 4                             |             |
|      | Cylinder liner (bore) mm | 82                            |             |
|      | Stroke mm                | 90,4                          |             |
|    | Capacity cc              | 1910                          |             |
|    | Compression ratio        | 20,7 ± 0,5                    |             |
| Total volume of combustion chamber cc                                                 |                          | 24,6                          |             |
|    | kW (CV)                  | 74 (100)                      | 55 (75)     |
|                                                                                       | rpm                      | 4200                          | 4200        |
|    | daNm (kgm)               | 20 (20,4)                     | 14,7 (15, ) |
|                                                                                       | rpm                      | 2250                          | 2750        |

# Technical data

**Bravo-Brava**

Engine: cylinder head assembly and valve gear components

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TD 100 CV

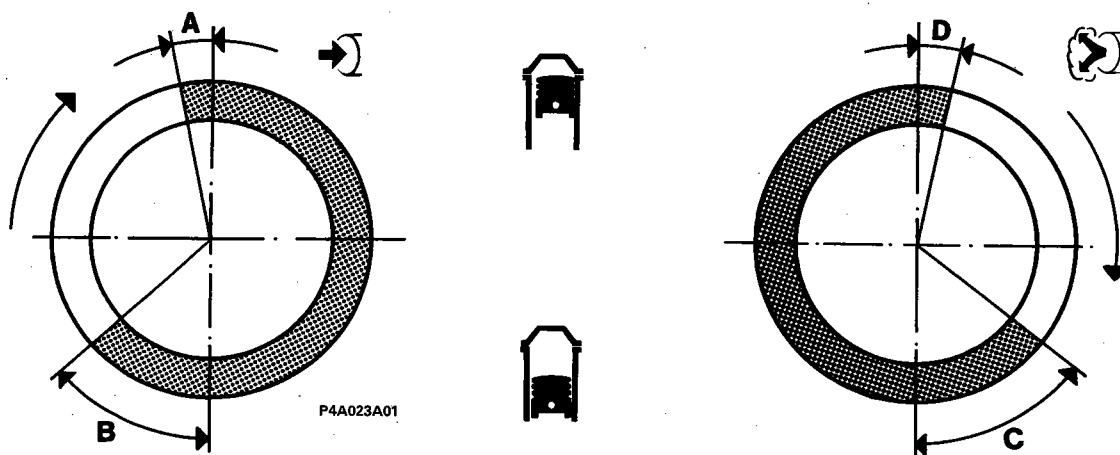


TD 75 CV

## DESCRIPTION

|       |  |                            |  | Values in mm |     |
|-------|--|----------------------------|--|--------------|-----|
| 17    |  | Cam lift                   |  | 8,5          | 8,5 |
|       |  |                            |  | 8,5          | 8,5 |
| 17-20 |  | clearance for timing check |  | 0,50         |     |
|       |  |                            |  | 0,50         |     |
|       |  |                            |  | 0,35 ± 0,05  |     |
|       |  |                            |  | 0,35 ± 0,05  |     |
|       |  | operational clearance      |  |              |     |

## TIMING DIAGRAMS



## Timing angles

|                     |  |                  |     |     |
|---------------------|--|------------------|-----|-----|
| <b>A</b><br>Inlet   |  | opens before TDC | 6°  | 6°  |
|                     |  | closes after BDC | 26° | 26° |
| <b>C</b><br>Exhaust |  | opens before BDC | 26° | 26° |
|                     |  | closes after TDC | 6°  | 6°  |



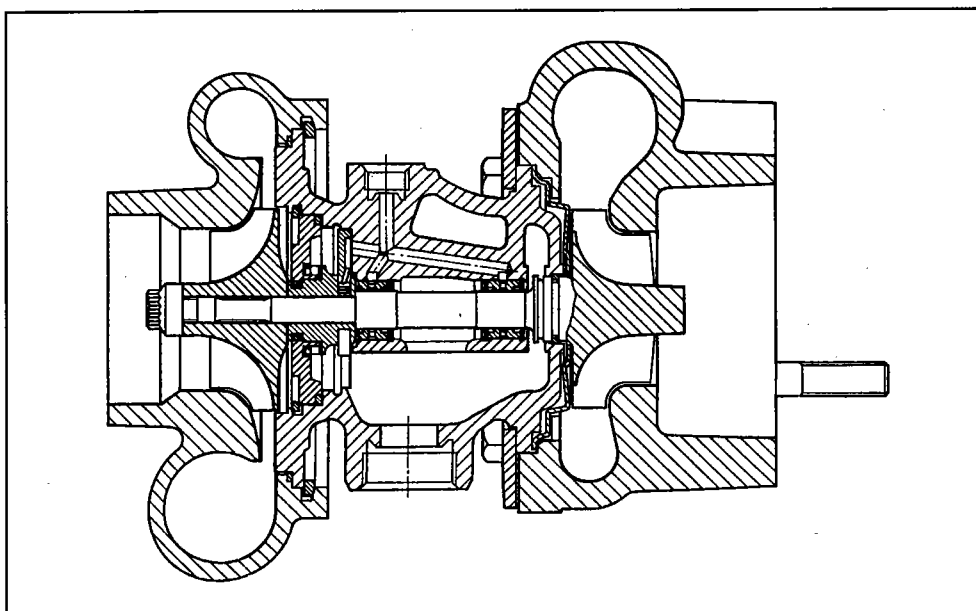
**SPECIFICATIONS**

|                                                                                                    |                                  |                           |
|----------------------------------------------------------------------------------------------------|----------------------------------|---------------------------|
| Firing order                                                                                       | 1-3-4-2                          |                           |
| Injection pump                                                                                     | LUCAS DPC-FT09, electronic       | BOSCH, mechanical VER-679 |
| Injector                                                                                           | LUCAS                            | BOSCH                     |
| Nozzle holder                                                                                      | LCD 011R02AA1 (*)<br>LCR 6705344 | BOSCH KCA 30S41           |
| Nozzle                                                                                             | LUCAS RND 05DC6897               | BOSCH DN 0 SD 321         |
| Injector setting pressure                                                                          | 143-150 bar                      | 150-158 bar               |
| Injection pump timing adjustment: pump piston travel with cylinder no.1 at TDC (compression stage) | Electronic adjustment            | 0.92 mm                   |
| Engine idle speed                                                                                  | 870-930/min                      | 830-870/min               |
| Top engine speed with no load                                                                      | 4920-5020/min                    | 5000-5100/min             |

(\*) Signal injector installed on cylinder no. 1

**TURBOCHARGING** Turbocharger operated by exhaust gases with waste-gate pressure valve and air/air heat exchanger (intercooler)

|                              |               |           |
|------------------------------|---------------|-----------|
| Turbocharger: type           | Garrett GT 15 |           |
| Maximum turbo boost pressure | < 1.05 bar    | 0.950 bar |



**Cross section through turbocharger**

4A007A02

## Engine: fuel system

### 00.10

#### TEST DATA FOR BOSCH INJECTION PUMP, type VE R 679

| GENERAL TEST CONDITIONS                                                                                                                                             |    |                          |                    | SPECIFIC TEST CONDITIONS                                                                                                     |                       |                             |                                                    |                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------|----------------------------------------------------|---------------------------|
| - Test oil: ISO 4113<br>- Test fluid temperature: $45^{\circ} \pm 1^{\circ}\text{C}$ (reflux outlet ●)<br>- Pump intake pressure: 0.35 bars<br>- Clockwise rotation |    |                          |                    | - Bosch 1.688.901.022 Injectors<br>- Nozzles: Bosch 1.688.901.922 (DNO SD 1510) set to 130 - 133 bar<br>- Pipes: 2x6x450 mm. |                       |                             |                                                    |                           |
| Check type                                                                                                                                                          |    | Regulator lever position | Rotation speed rpm | Advance check mm                                                                                                             | Transfer pressure bar | Output per element mm/cycle | Max. deviation between individual strokes mm/cycle | Stroke reduction Total mm |
| Max                                                                                                                                                                 | 1  | Max                      | 1000               | 2.4-3.8                                                                                                                      | 5.4-6.4               | -                           | -                                                  | -                         |
|                                                                                                                                                                     | 2  | Max                      | 1500               | 5.1-6.3                                                                                                                      | 6.8-7.8               | -                           | -                                                  | -                         |
|                                                                                                                                                                     | 3  | Max                      | 2100               | 8.2-9.6                                                                                                                      | 8.3-9.3               | -                           | -                                                  | -                         |
| Output                                                                                                                                                              | 4  | Max                      | 600                | -                                                                                                                            | -                     | 39.3-43.9                   | -                                                  | -                         |
|                                                                                                                                                                     | 5  | Max                      | 1000               | -                                                                                                                            | -                     | 40.3-44.9                   | -                                                  | -                         |
|                                                                                                                                                                     | 6  | Max                      | 1500               | -                                                                                                                            | -                     | 41-45                       | $\leq 2.5$                                         | -                         |
|                                                                                                                                                                     | 7  | Max                      | 2100               | -                                                                                                                            | -                     | 41.3-45.9                   | -                                                  | -                         |
|                                                                                                                                                                     | 8  | Max                      | 2400               | -                                                                                                                            | -                     | 26.2-36.2                   | -                                                  | -                         |
|                                                                                                                                                                     | 9  | Max                      | 2600               | -                                                                                                                            | -                     | 8.4-18.4                    | -                                                  | -                         |
|                                                                                                                                                                     | 10 | Max                      | 2800               | -                                                                                                                            | -                     | $\leq 3$                    | -                                                  | -                         |
| Ignition (enrichment)                                                                                                                                               | 11 | Max                      | 100                | -                                                                                                                            | -                     | 50-80                       | -                                                  | -                         |
| Elimination of enrichment                                                                                                                                           | 12 | Max                      | 400                | -                                                                                                                            | -                     | 52-72                       | -                                                  | -                         |
|                                                                                                                                                                     | 13 | Max                      | 525                | -                                                                                                                            | -                     | 55-65                       | -                                                  | -                         |
| Reflux output (●)                                                                                                                                                   | 14 | Max                      | 600                | -                                                                                                                            | -                     | 15-31 l/h                   | -                                                  | -                         |
|                                                                                                                                                                     | 15 | Max                      | 2100               | -                                                                                                                            | -                     | 20-50 l/h                   | -                                                  | -                         |
| Idle                                                                                                                                                                | 16 | Min                      | 425                | -                                                                                                                            | -                     | 10.5-18.3                   | $\leq 2.5$                                         | -                         |
| Residual flow                                                                                                                                                       | 17 | Min                      | 500                | -                                                                                                                            | -                     | $\leq 3$                    | -                                                  | -                         |
| Arrest (●●)                                                                                                                                                         | 18 | Min                      | 425                | -                                                                                                                            | -                     | $\leq 3$                    | -                                                  | -                         |
| Delay device (LFB)                                                                                                                                                  | 19 | 1500                     | -                  | -                                                                                                                            | P. MAX (0.2±0.1)      | O. MAX (10±1)               | -                                                  | -                         |
|                                                                                                                                                                     | 20 | 1500                     | -                  | -                                                                                                                            | -                     | -                           | -                                                  | 0.7-09                    |

Fixed installation advance = 0.92 mm

Electric arrest control: minimum operating voltage 8V. Operating voltage 11-13V

Maximum engine speed with no load:  $5050 \pm 50$ /min.

Engine idle speed:  $850 \pm 20$ /min.

(●) Fuel return from pump to tank

(●●) Carry out with electric arrest control turned off.



**DATA FOR CHECKING LUCAS FT09 INJECTION PUMP FOR 1910 TD 100 ENGINE**

| <b>GENERAL TEST CONDITIONS</b><br>- Test oil: ISO 4113 (SHELL S-9365)<br>- Temperature of test oil: 40° ± 1°C<br>- Injectors ISO 9008-025A<br>- Injector setting 130÷133 bar<br>- Injectors RDNOSDC 6876<br>- Supply pressure: 0,1 bar<br>- Direction of rotation: clockwise (seen from control side)<br>- Injection piping: 2,5×6×330 mm<br>- Max engine free running speed: 5000±50 rpm |        |                    |                    |                                              |            |                                                    |                                                                           |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------|--------------------|----------------------------------------------|------------|----------------------------------------------------|---------------------------------------------------------------------------|--|--|
| Type of check or adjustment                                                                                                                                                                                                                                                                                                                                                               | Op. N° | Adjust. lever pos. | Rotation speed rpm | Av. capacity per cyl. mm <sup>3</sup> /cycle | Advance α° | Max. discr. btwn flow rates mm <sup>3</sup> /cycle | Ops. or checks to be carried out                                          |  |  |
| Filling and bleeding                                                                                                                                                                                                                                                                                                                                                                      | 1      | Max                | 0                  | —                                            | —          | —                                                  | Fill pump with test fluid through filler on cover                         |  |  |
| Electrical supply                                                                                                                                                                                                                                                                                                                                                                         | 2      | Max                | 0                  | —                                            | —          | —                                                  | With supplier stabilized at 11V the control unit is the interface         |  |  |
| Advance instrument setting                                                                                                                                                                                                                                                                                                                                                                | 3      | Max                | 0                  | —                                            | 0          | —                                                  | Adjust acting on the potentiometer on the reader                          |  |  |
| Check hydraulic continuity                                                                                                                                                                                                                                                                                                                                                                | 4      | Max                | 1000               | —                                            | —          | —                                                  | Let the pump run for 3 minutes checking that there is no air in the fluid |  |  |
| Let oil temp. warm up                                                                                                                                                                                                                                                                                                                                                                     | 5      | Max                | 2000               | —                                            | —          | —                                                  | Stabilize the temperature at 40÷40,5 °C (pump outlet)                     |  |  |
| Dynamic fitting                                                                                                                                                                                                                                                                                                                                                                           | 6      | Max                | 1500               | —                                            | 6°         | —                                                  | Supercharging pressure 1 bar<br>Act on the variable pick-up               |  |  |
| Max no load check                                                                                                                                                                                                                                                                                                                                                                         | 7      | Max                | 2530               | 19±4                                         | —          | 4                                                  | Supercharging pressure 1 bar                                              |  |  |
| Regulator intervention check                                                                                                                                                                                                                                                                                                                                                              | 8      | Max                | 2330               | 405±4                                        | —          | 4                                                  | Supercharging pressure 1 bar                                              |  |  |
| Max capacity check                                                                                                                                                                                                                                                                                                                                                                        | 9      | Max                | 2100               | 56,5±2                                       | 7,5±0,5    | 4                                                  | Supercharging pressure 1 bar                                              |  |  |
| Max capacity check                                                                                                                                                                                                                                                                                                                                                                        | 10     | Max                | 1250               | 55,4±2                                       | 4,5±0,5    | 4                                                  | Supercharging pressure 1 bar                                              |  |  |
| Start of supercharging intervention                                                                                                                                                                                                                                                                                                                                                       | 11     | Max                | 750                | 40,2±2,5                                     | 1,5±0,5    | 4                                                  | Supply pressure 0,15 bar                                                  |  |  |
| Supercharging device gradient                                                                                                                                                                                                                                                                                                                                                             | 12     | Max                | 750                | Q12-Q11 = 11±2                               | 0          | 4                                                  | Supercharging pressure 0,45 bar                                           |  |  |

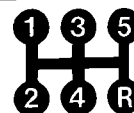
| Type of check or adjustment | Op. N° | Adjust. lever pos. | Rotation speed rpm | Av. cap. per cyl. mm <sup>3</sup> /cycle | Advance α° | Max. discr. btwn flow rates mm <sup>3</sup> /cycle | Ops. or checks to be carried out     |
|-----------------------------|--------|--------------------|--------------------|------------------------------------------|------------|----------------------------------------------------|--------------------------------------|
| Max capacity check          | 13     | Max                | 750                | 55,0±3                                   | 0          | —                                                  | Supercharging pressure 1 bar         |
| Max capacity check          | 14     | Max                | 450                | 35,0±4                                   | 0          | —                                                  | Supercharging pressure 0 bar         |
| Max capacity check          | 15     | Max                | 100                | 42,0±8                                   | 0          | —                                                  | Supercharging pressure 0 bar         |
| Idle setting                | 16     | Min                | 450                | 6,5±2                                    | 0          | 4                                                  | Pull the specific levers             |
| Idle check when cold        | 17     | Min                | 450                | 12,0±2                                   | 0          | 4                                                  | Release the specific levers          |
| Regulator state             | 18     | Min                | 400                | (Q16+9)±4                                | 0          | 4                                                  | Lever drawn                          |
| Anti-stall capacity         | 19     | Min                | 450                | 4,5±1,3                                  | 0          | 4                                                  | Pull the STOP lever                  |
| Recirculation flow rate     | 20     | Max                | 2100               | 10÷40 l/h                                | 0          | —                                                  | Supercharging pressure 1 bar         |
| Supply stop                 | 21     | Max                | 400                | ≤3,0                                     | 0          | —                                                  | Remove the supply to the electrostop |

# Technical data

## Gearbox and differential

**Bravo-Brava**

**00.21-27**



Type

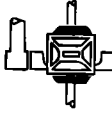
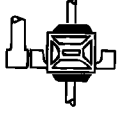
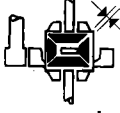
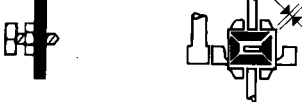
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### GEARBOX

|                   |                                |       |       |
|-------------------|--------------------------------|-------|-------|
| <br>Synchronizers | <br>spring ring (Porsche type) | -     |       |
|                   | <br>baulk ring type            |       |       |
| <br>Gears         | <br>straight toothed           |       |       |
|                   | <br>helical toothed            |       |       |
| <br>Gear ratios   |                                | 3,909 | 3,909 |
|                   |                                | 2,238 | 2,238 |
|                   |                                | 1,444 | 1,444 |
|                   |                                | 1,029 | 1,029 |
|                   |                                | 0,815 | 0,767 |
|                   |                                | 3,909 | 3,909 |



**DIFFERENTIAL**

|                                                                                     |                                                                                    | 1910 TD 75                                                                                                       | 1910 TD 100     |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-----------------|
|    | Ratio crown wheel & pinion reduction                                               | 17/57<br>(3,352)                                                                                                 | 20/63<br>(3,15) |
|    |   | 13,102                                                                                                           | 12,313          |
|                                                                                     |   | 7,501                                                                                                            | 7,049           |
|                                                                                     |   | 4,840                                                                                                            | 4,548           |
|                                                                                     |   | 3,449                                                                                                            | 3,241           |
|                                                                                     |   | 2,731                                                                                                            | 2,416           |
|                                                                                     |  | 13,102                                                                                                           | 12,313          |
|  | Differential internal casing bearing                                               | <br>conical roller bearings |                 |
|  | Adjustment of bearing pre-loading                                                  | <br>by shims                |                 |
|  | Thickness of shims                                                                 | 1,70 ÷ 2,89                                                                                                      |                 |
|  | Interference to obtain exact bearing pre-loading                                   | Bearing not pre-loaded = 0,12<br>bearings pre-loaded (350 daN) = 0,08                                            |                 |
|  | Clearance btwn planet and sat. gears                                               | ≤ 0,10                                                                                                           |                 |
|  | Adjustment of clnce btwn planet/sat. gears                                         | no adjustment is carried out                                                                                     |                 |

# Technical data

## Engine: typical curves

**Bravo-Brava**

**00.10**

**AISIN  
AUTOMATIC GEARBOX**

**ENGINE TYPE**



|                                              |                                                         |                     |
|----------------------------------------------|---------------------------------------------------------|---------------------|
| Gears                                        |                                                         | <b>1 2 3 4 R</b>    |
| <br>Gear ratios                              | <b>1</b> ○ ○ ○ ○ ○                                      | 2,807               |
|                                              | ○ <b>2</b> ○ ○ ○ ○                                      | 1,479               |
|                                              | ○ ○ <b>3</b> ○ ○ ○                                      | 1,0                 |
|                                              | ○ ○ ○ <b>4</b> ○                                        | 0,735               |
|                                              | ○ ○ ○ ○ <b>R</b>                                        | 2,769               |
| <br>Idler ratio                              |                                                         | 1,019 (54/53)       |
| <br>Torque converter                         | Ø mm                                                    | 216                 |
| <br>Ratio (multiplication) for engine torque |                                                         | 2,150               |
| <br>Quantity of oil<br>GI/2                  | total, with gearbox converter, radiator and pipes empty | 6 litres (5,4 kg)   |
|                                              | replacement only                                        | 4,3 litres (3,9 kg) |

### DIFFERENTIAL

|                                      |                    |                       |
|--------------------------------------|--------------------|-----------------------|
| <br>Crown wheel and pinion reduction |                    | 3,565 (82/23)         |
|                                      | Final ratio        | 3,633 (54/53 × 82/23) |
| <br>Ratio at the wheels              | <b>1</b> ○ ○ ○ ○ ○ | 10,197                |
|                                      | ○ <b>2</b> ○ ○ ○ ○ | 5,373                 |
|                                      | ○ ○ <b>3</b> ○ ○ ○ | 3,633                 |
|                                      | ○ ○ ○ <b>4</b> ○   | 2,670                 |
|                                      | ○ ○ ○ ○ <b>R</b>   | 10,059                |

## Front suspension

### 00.44

**Front suspension** independent, Mac Pherson type with steel track control arms anchored to an auxiliary cross member. Offset coil springs and double acting telescopic shock absorbers. Anti-roll torsion bar.

| ENGINE TYPE |  16V |   |   |
|-------------|-----------------------------------------------------------------------------------------|---|---|
| VERSION     | A                                                                                       | B | C |

#### Coil springs

|                                                                        |                    |           |             |             |
|------------------------------------------------------------------------|--------------------|-----------|-------------|-------------|
| Diameter of wire                                                       | mm                 | 12,3±0,05 | 12,5 ± 0,05 | 12,7 ± 0,05 |
| Number of turns                                                        |                    | 3,75      | 3,75        | 3,75        |
| Direction of coil                                                      |                    | clockwise | clockwise   | clockwise   |
| Height of spring released                                              | mm                 | 461       | 461         | 454         |
| Height of spring under a load of:                                      | 320,5 ÷ 346,5 mm   | 192       | –           | –           |
|                                                                        | 340 ÷ 368 mm       | –         | 192         | –           |
|                                                                        | 352 ÷ 382 mm       | –         | –           | 192         |
| The springs are subdivided into two categories, identifiable by a mark |                    |           |             |             |
| yellow (1) for those under a load of:                                  | 333,5 height of mm | >192      | –           | –           |
|                                                                        | 354 height of mm   | –         | >192        | –           |
|                                                                        | 367 height of mm   | –         | –           | >192        |
| green (1) for those under a load of:                                   | 333,5 height of mm | ≤192      | –           | –           |
|                                                                        | 354 height of mm   | –         | ≤192        | –           |
|                                                                        | 367 height of mm   | –         | –           | ≤192        |

(1) Springs of the same category must be fitted.

A. With automatic transmission

B. With automatic transmission and climate control

C. With auto. trans., climate control and ABS.

#### Shock absorbers

|                                                    |             |           |           |
|----------------------------------------------------|-------------|-----------|-----------|
| Type: telescopic, double acting (low pressure gas) | WAY-ASSAUTO |           |           |
| Open (start of damping action)                     | mm          | 518 ± 2,5 | 511 ± 2,5 |
| Closed (metal against metal)                       | mm          | 361 ± 2,5 | 354 ± 2,5 |
| Travel                                             | mm          | 157       | 157       |

#### Stabilizer bar

|                            |    |    |    |
|----------------------------|----|----|----|
| Diameter of stabilizer bar | mm | 22 | 23 |
|----------------------------|----|----|----|

## **SPORT PACK**

|                         | page |
|-------------------------|------|
| <b>INTRODUCTION</b>     | 1    |
| <b>STEERING</b>         | 2    |
| <b>FRONT SUSPENSION</b> | 3    |
| <b>REAR SUSPENSION</b>  | 4    |
| <b>WHEELS</b>           | 5    |



A "SPORT PACK" option is available for the Bravo 1998 20v HGT which makes its behaviour on the road even more sporty.

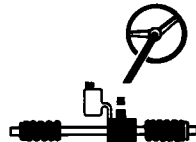
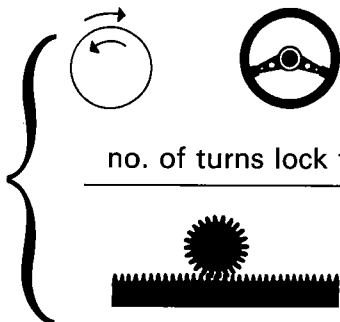
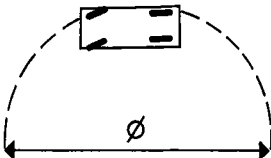
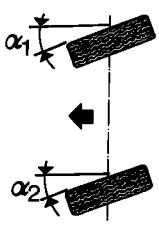
With this option the vehicle is equipped with special suspension and larger tyres which improve road holding, agility and driving precision.

In practice it involves personalizing the vehicle aimed at more demanding customers with a passion for sports driving.

The technical contents of the "SPORT PACK" are as follows:

- **flexible suspension elements** which are more rigid to restrict rolling and pitching
- **height from the ground reduced at the front by 20 mm** in order to lower the centre of gravity, improve the aerodynamic coefficient (CX) and minimize the front aerodynamic lightening at high speeds
- **special front wheel steering knuckles**, with **specific steering geometry** for a high level of responsiveness and to minimize understeer round tight bends; this geometry allows the front wheels to "work" optimally, with consequent improvements to the driving as well;
- **special power assisted steering**, which features a direct steering ratio (60 mm/turn, or 2 and 1/4 turns lock to lock) which makes the steering responsive and precise; this direct steering associated with the specific variation in the toe in which the front wheels undergo during rolling (which improves stability when entering bends) ensures complete control of the vehicle during more decided variations in trajectory;
- **special pressurized Sachs Boge shock absorbers**, which improve the handling of the vehicle and at the same time guarantee a high level of comfort over unmade roads;
- **larger 205/50 R15 tyres**, which ensure road holding which is more appropriate to the driving characteristics and the demands of Customers who love sporty driving.

**NOTE** *The variation in the geometry and larger tyres mean that snow chains cannot be used.*

|                |                                                                                                                               |             |  |
|----------------|-------------------------------------------------------------------------------------------------------------------------------|-------------|--|
| Type           |  <p>rack and pinion<br/>power assisted</p> |             |  |
| Ratio          |  <p>no. of turns lock to lock</p>            | 2.3         |  |
|                |  <p>rack travel</p>                          | 128 ±1,5 mm |  |
| Turning circle |  <p>12 m</p>                                |             |  |
| Steering angle |  <p>outer wheel <math>\alpha_1</math></p>  | 26° ± 30'   |  |
|                | <p>inner wheel <math>\alpha_2</math></p>                                                                                      | 34° ± 30'   |  |
| Steering col.  |  <p>with 2 universal joints</p>          |             |  |

**Front suspension** independent, Mac Pherson type with steel track control arms anchored to an auxiliary cross member. Offset coil springs and double acting, telescopic shock absorbers. Torsion anti-roll bar.

#### Coil springs

|                                                                        |                                    |           |
|------------------------------------------------------------------------|------------------------------------|-----------|
| Diameter of wire                                                       | mm                                 | 13,5±0,05 |
| Number of turns                                                        |                                    | 4         |
| Direction of coil                                                      |                                    | clockwise |
| Height of spring released                                              | mm                                 | 355       |
| Height of spring under a load of:                                      | 340÷360 daN<br>(358÷388 daN)* mm   | 170       |
| The springs are subdivided into two categories, identifiable by a mark |                                    |           |
| yellow (1) for those under a load of:                                  | 350 daN<br>(373 daN)* height of mm | > 170     |
| green (1) for those under a load of:                                   | 350 daN<br>(373 daN)* height of mm | ≤ 170     |

(1) Springs of the same category must be fitted.

(\*) For vehicles with air conditioning

#### Shock absorbers

|                                                    |    |             |
|----------------------------------------------------|----|-------------|
| Type: telescopic, double acting (low pressure gas) |    | BOGE        |
| Open (start of damping action)                     | mm | 458,5 ± 2   |
| Closed (metal against metal)                       | mm | 291,5 ± 2,5 |
| Travel                                             | mm | 167         |

#### Stabilizer bar

|                            |    |    |
|----------------------------|----|----|
| Diameter of stabilizer bar | mm | 23 |
|----------------------------|----|----|

## Rear suspension

### 00.44

**Rear suspension** independent with cast iron track control arms. Coil springs and shock absorbers with vulcanized bushes. Torsion anti-roll bar. Rigid H auxiliary frame made up of transverse tubular element and two pressed side members connected to it.

#### Coil spring

|                                                                        |              |           |
|------------------------------------------------------------------------|--------------|-----------|
| Diameter of wire                                                       | mm           | 11,8±0,05 |
| Number of turns                                                        |              | 4,5       |
| Direction of coil                                                      |              | clockwise |
| Height of spring released                                              | mm           | 296,8     |
| Height of spring under a load of: 275÷303 daN                          | mm           | 194       |
| The springs are subdivided into two categories, identifiable by a mark |              |           |
| yellow (1) for those under a load of: 289 daN                          | height of mm | > 194     |
| green (1) for those under a load of: 289 daN                           | height of mm | ≤ 194     |

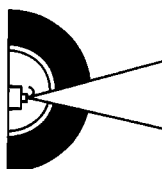
(1) Springs of the same category must be fitted.

#### Shock absorbers

|                                                    |    |           |
|----------------------------------------------------|----|-----------|
| Type: telescopic, double acting (low pressure gas) |    | BOGE      |
| Open (start of damping action)                     | mm | 317 ± 3   |
| Closed (metal against metal)                       | mm | 220,5 ± 3 |
| Travel                                             | mm | 96,5      |

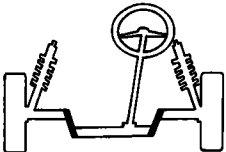
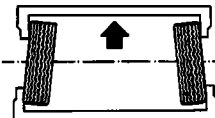
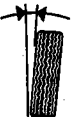
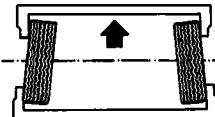
#### Stabilizer bar

|                            |    |    |
|----------------------------|----|----|
| Diameter of stabilizer bar | mm | 17 |
|----------------------------|----|----|



unladen car (■)

**WHEEL GEOMETRY**

|                                                                                                            |                                                                                                        |                                          |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------|
|  <p>Front suspension</p>  | <p>camber (**)</p>    | <p><math>-1' \pm 30'</math></p>          |
|                                                                                                            | <p>caster (**)</p>    | <p><math>2^{\circ}20' \pm 30'</math></p> |
|                                                                                                            | <p>toe in</p>         | <p><math>-1 \div 1 \text{ mm}</math></p> |
|                                                                                                            | <p>front wheel offset<br/>▲</p>                                                                        | <p><math>0^{\circ}</math></p>            |
|  <p>Rear suspension</p> | <p>camber (**)</p>  | <p><math>-45' \pm 30'</math></p>         |
|                                                                                                            | <p>toe in (**)</p>  | <p><math>1 \div 5 \text{ mm}</math></p>  |
|                                                                                                            | <p>rear wheel thrust angle ▲</p>                                                                       | <p><math>0^{\circ}</math></p>            |

(\*\*) Angles cannot be adjusted

(■) With tyres inflated to the correct pressure and vehicle in running order with 5 litres of fuel

(▲) Angular values, which cannot be adjusted, used for the correct alignment of the vehicle

| ENGINE          | <br>Pressed steel wheel rim type | <br>Radial, tubeless tyre | <br>Tyre inflation pressure in bar |            |              |            |
|-----------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------|--------------|------------|
|                 |                                                                                                                   |                                                                                                            | Front                                                                                                                 |            | Rear         |            |
|                 |                                                                                                                   |                                                                                                            | average load                                                                                                          | heavy load | average load | heavy load |
|                 | 6J×15"– 49                                                                                                        | 205/50 ZR 15 P700Z (●)                                                                                     | 2,5                                                                                                                   | 2,7        | 2,2          | 2,5        |
| SPARE WHEEL (*) | 4B×15"– 35                                                                                                        | 115/70 R15 90M                                                                                             | 4,2                                                                                                                   |            |              |            |

(●) Not to be used with snow chains because they could interfere with the wheel arch

#### INTRODUCTION

- Identification data 1
- Performance - Fuel consumption 1

#### TECHNICAL DATA

##### ENGINE 16V

- Specifications 2
- Typical curves 2
- Cylinder block/crankcase and associated components 3
- Timing system 4
- Timing diagrams 5
- Fuel system 6

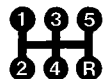
##### GEARBOX/DIFFERENTIAL 7

##### ELECTRICAL EQUIPMENT

- Starting 9
- Recharging 11

This section contains data relating to cars fitted with a 1581 16v STEP A engine.  
For further information, refer to data in section 00 of the first and third volume.



|                                                                                       | CHASSIS     | ENGINE     | VERSION                | Bravo | Brava | GEARBOX                                                                             |
|---------------------------------------------------------------------------------------|-------------|------------|------------------------|-------|-------|-------------------------------------------------------------------------------------|
|                                                                                       |             |            |                        |       |       |  |
|  16v | ZFA 182.000 | 182 A4.000 | 182 AB 1AA 01C         | ●     |       | ●                                                                                   |
|                                                                                       |             |            | 182 AB 1AA 11B 01D (▲) | ●     |       |                                                                                     |
|                                                                                       |             |            | 182 BB 1AA 11C         |       | ●     |                                                                                     |
|                                                                                       |             |            | 182 BB 1AA 11B 01D (▲) |       | ●     |                                                                                     |

(▲) Versions for specific markets (Germany)

|                                                                                                                                                       |                                                                                     |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------|
| <br>Speed km/h<br>(average load)                                     |    | 50          |
|                                                                                                                                                       |    | 87          |
|                                                                                                                                                       |    | 135         |
|                                                                                                                                                       |    | 184 (180)   |
|                                                                                                                                                       |   | 178         |
|                                                                                                                                                       |  | 50          |
| <br>% Gradient when fully laden                                    |                                                                                     | 37          |
| <br>Fuel consumption<br>as per<br>93/116/EC<br>(litres/100 km) (*) | Urban                                                                               | 10.6 (10.8) |
|                                                                                                                                                       | Out-of-town                                                                         | 6.0 (6.1)   |
|                                                                                                                                                       | Combined                                                                            | 7.7 (7.8)   |
| Exhaust CO <sub>2</sub> emissions (g/km)                                                                                                              |                                                                                     | 183 (186)   |

**NOTE:** Values shown in brackets refer to the Fiat Brava.

(\*) 93/116/EC fuel consumption figures were determined during homologation tests:

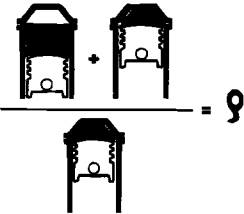
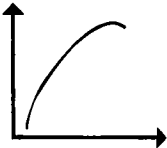
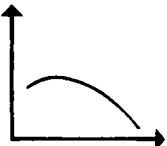
- an urban cycle, i.e. a cold start followed by a simulated varied urban route
- out-of-town cycle, i.e. frequent accelerations in all gears to simulate normal out-of-town vehicle use, with speed between 0 and 120 km/h.

- Average combined fuel consumption is assumed to be 37% of the urban cycle and 63% of the extraurban cycle. Type of route, traffic situations, driving style, weather conditions, version/equipment/accessory level, presence of a roof rack, presence of special equipment and vehicle condition in general may lead to fuel consumption figures other than those measured as above.

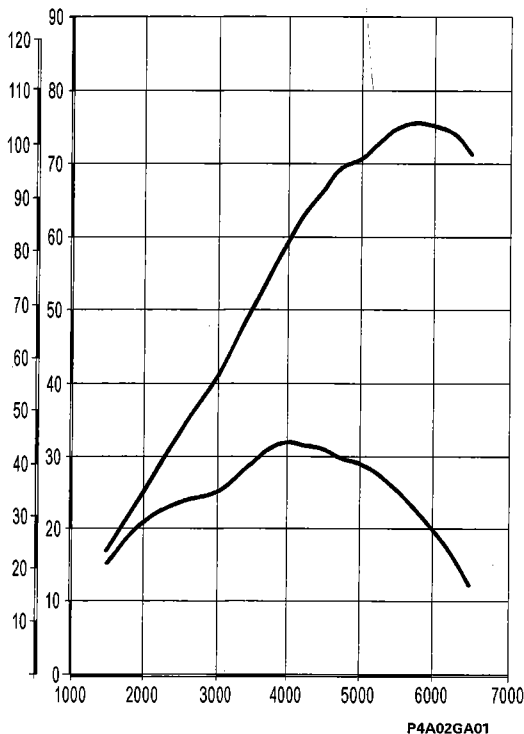
Exhaust CO<sub>2</sub> emissions (in g/km) are measured over an average combined cycle.



SPECIFICATIONS

|                                                                                     |                   |                   |              |
|-------------------------------------------------------------------------------------|-------------------|-------------------|--------------|
|    |                   | Compression ratio | 10.5 ± 0.15  |
|    | Maximum power EC  | kW (BHP)          | 75.8 (103.1) |
|                                                                                     |                   | rpm               | 5750         |
|  | Maximum torque EC | daNm (kgm)        | 14.2 (14.5)  |
|                                                                                     |                   | rpm               | 4000         |

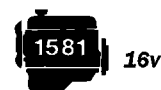
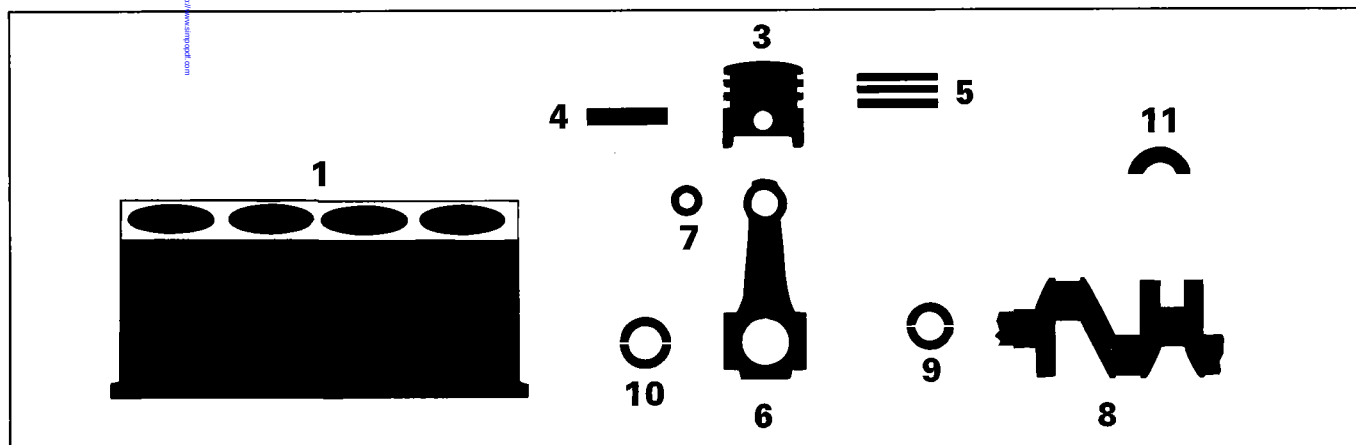
CV kW  
CEE CEE



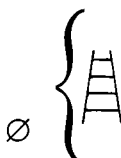
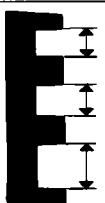
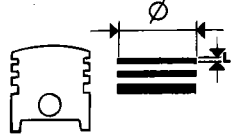
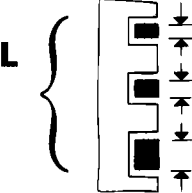
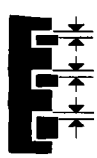
Typical engine curves measured by EEC method

The power curves illustrated can be obtained with the engine overhauled and run in, without a fan and with a silencer and air cleaner fitted at sea level.

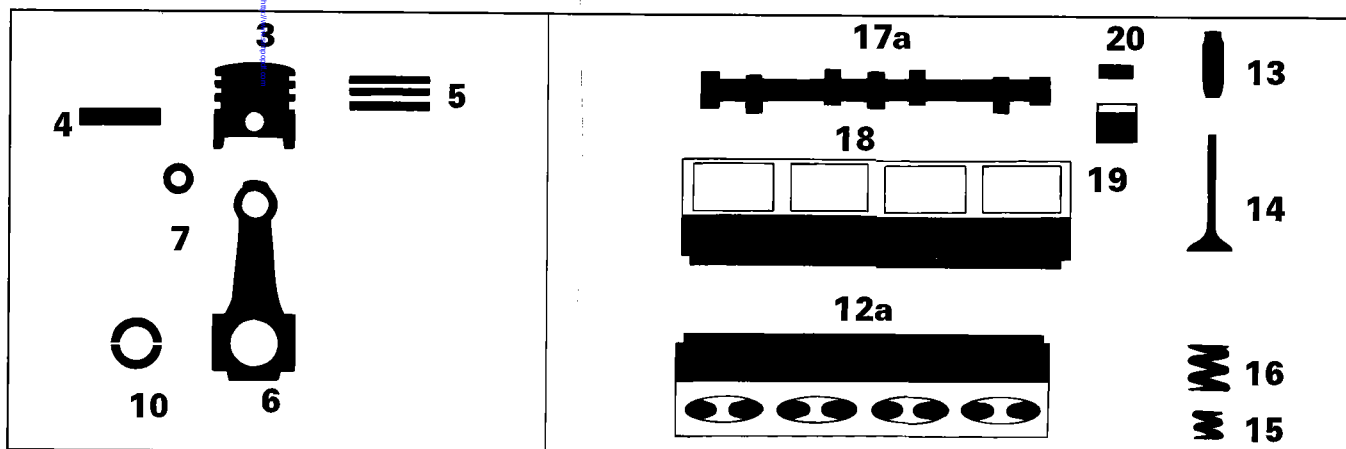
**NOTE** The data and curve shown on this page refer to the 1581 16v engine with order number 46474405



**DESCRIPTION**

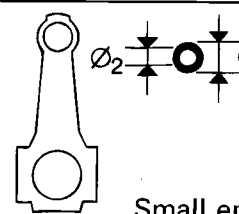
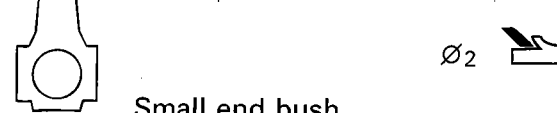
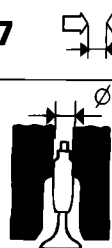
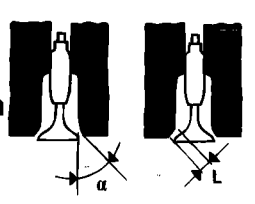
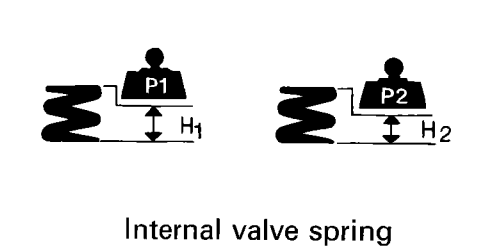
|                                                                                                                                                   |                                                                                              |                                                                                         | Values in mm    |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------|
|  <p><b>3</b></p> <p>Piston</p>                                 |  <p>Ø</p>  | X                                                                                       | 10.2            |
|                                                                                                                                                   |                                                                                              | A                                                                                       | 86.352 - 86.362 |
|                                                                                                                                                   |                                                                                              | B                                                                                       | 86.359 - 86.371 |
|                                                                                                                                                   |                                                                                              | C                                                                                       | 86.368 - 86.378 |
|                                                                                                                                                   |                                                                                              | Ø  > | 0.4             |
|  <p><b>3</b></p> <p>Piston ring grooves</p>                    |           | 1                                                                                       | 1.520 - 1.540   |
|                                                                                                                                                   |                                                                                              | 2                                                                                       | 1.510 - 1.530   |
|                                                                                                                                                   |                                                                                              | 3                                                                                       | 3.010 - 3.030   |
|  <p><b>5</b></p> <p>Piston rings</p>                           |  <p>L</p> | 1                                                                                       | 1.470 - 1.490   |
|                                                                                                                                                   |                                                                                              | 2                                                                                       | 1.470 - 1.490   |
|                                                                                                                                                   |                                                                                              | 3                                                                                       | 3.000           |
|                                                                                                                                                   |                                                                                              | Ø  > | 0.4             |
|  <p><b>5-3</b></p> <p>Piston rings<br/>Piston ring grooves</p> |           | 1                                                                                       | 0.035 - 0.075   |
|                                                                                                                                                   |                                                                                              | 2                                                                                       | 0.020 - 0.060   |
|                                                                                                                                                   |                                                                                              | 3                                                                                       | 0.010 - 0.030   |

00.10

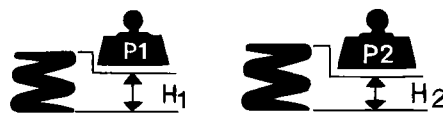
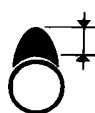
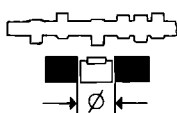


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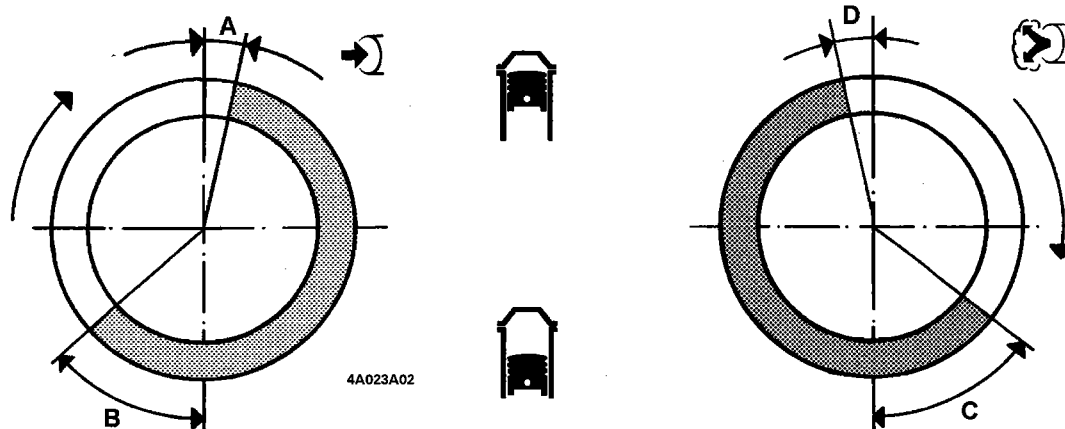
Values in mm

|                                                                                                                                              |                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|  <p>7</p> <p>Small end bush</p>                            | <p>Ø1</p> <p>24.016-24.041</p>                                                                          |
|  <p>4-7</p> <p>Piston pin<br/>Small end bush</p>           | <p>Ø2</p> <p>22.004-22.009</p>                                                                          |
|  <p>12a</p> <p>Valve guide seat<br/>on cylinder head</p>  | <p>Ø</p> <p>12.950-12.977</p>                                                                           |
|  <p>12a</p> <p>Valve seat</p>                             | <p>α</p> <p>45°±20'</p> <p>45°±20'</p> <p>L</p> <p>about 2</p>                                          |
|  <p>Volume of combustion<br/>chamber in cylinder head</p> | <p>cm<sup>3</sup></p> <p>33.35</p>                                                                      |
|  <p>15</p> <p>Internal valve spring</p>                   | <p>P1</p> <p>8.3-9.3 daN</p> <p>H1</p> <p>27.5</p> <p>P2</p> <p>17.6-19.6 daN</p> <p>H2</p> <p>18.5</p> |

**DESCRIPTION**

|     |                                                                                   |                    |                                                                                   |                 |
|-----|-----------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------|-----------------|
| 16  |  | Outer valve spring | P1                                                                                | 23.4 - 25.6 daN |
|     |                                                                                   |                    | H1                                                                                | 33.5            |
|     |                                                                                   |                    | P2                                                                                | 46 - 50 daN     |
|     |                                                                                   |                    | H2                                                                                | 24.5            |
| 17a |  | Cam lift           |  | 8.5             |
| 17b |                                                                                   |                    |  | 8               |
| 12a |  | Tappet housings    | Ø                                                                                 | 33.000 - 33.025 |

**TIMING DIAGRAMS**



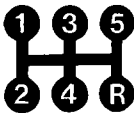
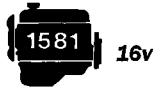
**Timing angles**

|   |         |                                                                                     |                  |     |
|---|---------|-------------------------------------------------------------------------------------|------------------|-----|
| A | Intake  |  | Begins after TDC | 4°  |
|   |         |                                                                                     | Ends after BDC   | 38° |
| C | Exhaust |  | Ends before BDC  | 28° |
|   |         |                                                                                     | Ends before TDC  | 4°  |

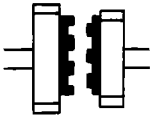
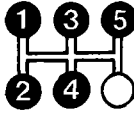
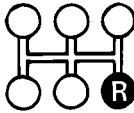
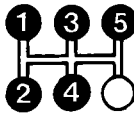
### INTEGRATED ELECTRONIC INJECTION/IGNITION SYSTEM COMPONENTS



|                                                                       |                                      |                                  |
|-----------------------------------------------------------------------|--------------------------------------|----------------------------------|
| Electronic control unit                                               | Versions with manual gearbox         | I.A.W. 49 F.B4                   |
|                                                                       | Versions with automatic transmission | I.A.W. 49 F.L2                   |
| Intake air pressure and temperature sensor                            |                                      | M. Marelli TPRT 03               |
| Fuel vapour solenoid valve                                            |                                      | SIEMENS EC1                      |
| Throttle body                                                         |                                      | M. Marelli 46 SX F2              |
| Idle adjustment actuator                                              |                                      | M. Marelli IB/02                 |
| Injector                                                              |                                      | M. Marelli IWP 064               |
| Fuel pressure regulator                                               |                                      | M. Marelli RPM 84                |
| Coolant temperature sending unit                                      |                                      | SYLEA 402.183.01<br>ELTH 2690350 |
| Top Dead Centre and rpm sensor                                        |                                      | JAEGER CVM 02                    |
| Throttle position sensor (potentiometer)                              |                                      | M. Marelli IPF 2C                |
| Dual relay for electric fuel pump and injection-ignition control unit |                                      | BITRON                           |
| Electric fuel pump                                                    |                                      | MARWALL ESS 291                  |
| Lambda sensor                                                         |                                      | NTK OZA 334-A1                   |
| Fuel filter                                                           |                                      | MARWALL FA 5325 IN               |
| Knock sensor                                                          |                                      | NTK KNE 03                       |
| Ignition coil                                                         |                                      | COOPER BAE 920 A                 |



GEARBOX

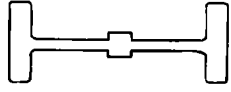
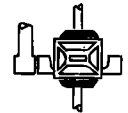
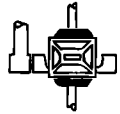
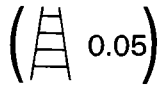
| Type                                                                                               |                                                                                                          | C.513.514.26                                                                          |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <br>Synchronizers | ring type (Porsche)<br> | -                                                                                     |
|                                                                                                    | free ring<br>           |    |
| <br>Gears       | spur toothed<br>       |   |
|                                                                                                    | helical toothed<br>   |  |
| <br>Gear ratios |                       | 3.909                                                                                 |
|                                                                                                    |                       | 2.238                                                                                 |
|                                                                                                    |                       | 1.444                                                                                 |
|                                                                                                    |                       | 1.029                                                                                 |
|                                                                                                    |                       | 0.816                                                                                 |
|                                                                                                    |                       | 3.909                                                                                 |

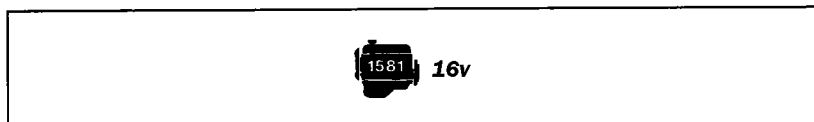


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### DIFFERENTIAL

|                                                                                                                                                                                                                                                                                        |  |                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------|
|   Ratio gear and pinion set                                                                                          |  | 3.353<br>(17/57)                                                                                        |
|   Ratio at the wheels                                                                                                |  |  13.107                |
|                                                                                                                                                                                                                                                                                        |  |  7.504                 |
|                                                                                                                                                                                                                                                                                        |  |  4.842                 |
|                                                                                                                                                                                                                                                                                        |  |  3.450                 |
|                                                                                                                                                                                                                                                                                        |  |  2.736                 |
|                                                                                                                                                                                                                                                                                        |  |  13.107                |
|  Differential internal casing bearing                                                                                                                                                                |  |  taper roller type |
|    Bearing preload adjustment |  |  by shims          |
|    Thickness of shims         |  | 0.05<br>mm<br>0.10                                                                                      |
|  Interference to obtain exact bearing pre-loading                                                                                                                                                   |  | mm<br>bearings not pre-loaded = 0.12<br>bearings pre-loaded (350 dan) = 0.08                            |
|  Differential-planet gear backlash                                                                                                                                                                  |  | mm<br>≤ 0.10                                                                                            |
|   Adjusting differential-planet gear backlash                                                                    |  |  by shims          |
|    Thickness of shims         |  | 0.80 - 1.25                                                                                             |



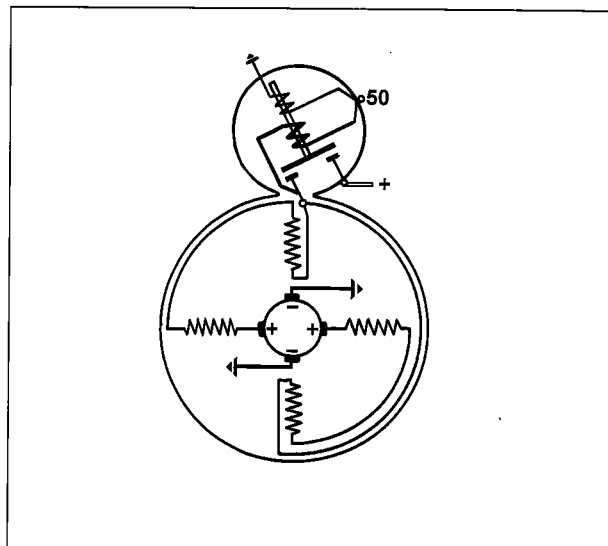
**STARTER MOTOR**

|                                          |                                                     |                          |
|------------------------------------------|-----------------------------------------------------|--------------------------|
| Type                                     | M. Marelli<br>M70R-12V-1,3 kW (with reduction unit) |                          |
| Voltage                                  | V                                                   | 12                       |
| Rated power                              | kW                                                  | 1.3                      |
| Rotation, pinion side                    |                                                     | clockwise                |
| No. of poles                             |                                                     | 4                        |
| Field coil                               |                                                     | series-parallel winding  |
| Engagement                               |                                                     | free wheel               |
| Control                                  |                                                     | electromagnetic          |
| End float of armature shaft              | mm                                                  | 0.15 - 0.45              |
| <b>Data for bench test</b>               |                                                     |                          |
| Operating test (*):                      |                                                     |                          |
| current                                  | A                                                   | 360 - 380                |
| speed                                    | rpm                                                 | 1150                     |
| voltage                                  | V                                                   | 8.15                     |
| torque developed                         | daNm                                                | 1.30                     |
| Engagement test (*):                     |                                                     |                          |
| current                                  | A                                                   | 680 - 700                |
| voltage                                  | V                                                   | 4.9                      |
| torque developed                         | daNm                                                | 3.11                     |
| Free running test (*):                   |                                                     |                          |
| current                                  | A                                                   | 60 - 80                  |
| voltage                                  | V                                                   | 11.1                     |
| speed                                    | rpm                                                 | 4040                     |
| <b>Relay</b>                             |                                                     |                          |
| Winding resistance (*)                   | pull in $\Omega$                                    | 0.33 - 0.37              |
|                                          | hold in $\Omega$                                    | 1.13 - 1.27              |
| <b>Lubrication</b>                       |                                                     |                          |
| Internal splines and shaft bushes        |                                                     | VS <sup>+</sup> SAE 10 W |
| Engagement sleeve and intermediate plate |                                                     | TUTELA MR3               |

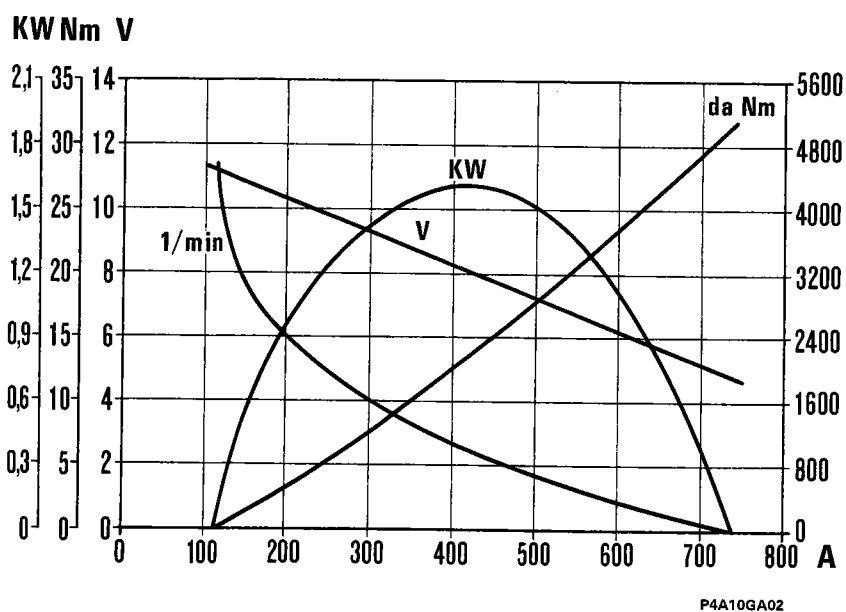
(\*) Data measured at environmental temperature of 20°C.

**NOTE** During service, the insulation between commutator bars need not be lowered

#### STARTER MOTOR - WIRING DIAGRAM AND TYPICAL CURVES



Wiring diagram of M. Marelli M70R-1.3/12 starter motor



Typical curves for starter motor  
M. Marelli M70R-1.3/12  
(with epicyclic reduction gear)

|                                                                                       |                                                                                                                  |                                                                                            |                                                                                            |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
|  16V |  16V<br>with air<br>conditioner |  16V ** |  16V ** |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|

**ALTERNATOR**

| Make                                                      | M.Marelli<br>A115I-14V-40/75A | M.Marelli<br>A127IR-14V-40/85A | Bosch<br>KCB1-14V-45/80A | Bosch<br>KCB2-14V-50/90A<br>Bosch●<br>KCB2-14V-55/105A |
|-----------------------------------------------------------|-------------------------------|--------------------------------|--------------------------|--------------------------------------------------------|
| Rated system voltage V                                    | 14V                           |                                |                          |                                                        |
| Maximum current A                                         | 75                            | 85                             | 80                       | 90A (105)●                                             |
| Nominal current at 1800 rpm                               | 40                            | 50                             | 45                       | 50 (55)●                                               |
| Nominal current at 6000 rpm A                             | 75                            | 85                             | 80                       | 90 (105)●                                              |
| Field winding resistance between the two slip rings (*) Ω | 25.87 - 2.613                 |                                | 2.16 - 2.64              | 2.34 - 2.86<br>(1.8 - 2.2)●                            |
| Direction of rotation (seen from control side)            | Clockwise                     |                                |                          |                                                        |
| Diode power rectifiers                                    | Bridge                        |                                |                          |                                                        |

(\*) Data obtained at an ambient temperature of 20°C.

● For cars with air conditioner destined for ISRAEL

(\*\*) Alternators without cooling system fitted from chassis no. 4788901.

**VOLTAGE REGULATOR**

|                                 |  | Built in electronic |             |
|---------------------------------|--|---------------------|-------------|
| Make                            |  | RTM 151 B           | BR1         |
| Alternator speed for test rpm   |  | 7000                | 7000        |
| Thermal stabilisation current A |  | -                   | -           |
| Test current A                  |  | -                   | -           |
| Regulation voltage (*) V        |  | 14.3 - 14.6         | 14.3 - 14.6 |

(\*) Data obtained at an ambient temperature of 23°C.



|                                                                                                                                                                                                  | page |                                 | page |
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| - Typical curves                                                                                                                                                                                 | 24   |                                 |      |
| - Crankcase and crankshaft                                                                                                                                                                       | 25   |                                 |      |
| - Cylinder head assembly and valve gear                                                                                                                                                          | 29   |                                 |      |
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|                                                                                       | CHASSIS     | ENGINE     | VERSION    | 3<br>Doors | 5<br>Doors | GEARBOX                                                                             |  |
|---------------------------------------------------------------------------------------|-------------|------------|------------|------------|------------|-------------------------------------------------------------------------------------|--|
|                                                                                       |             |            |            |            |            |  |  |
|  16v | ZFA 182 000 | 182 B2.000 | 182 AP 1AA | ●          | —          | ●                                                                                   |  |
|                                                                                       |             |            | 182 BP 1AA | —          | ●          |                                                                                     |  |
|  20v |             | 182 B3.000 | 182 AQ 1AA | ●          | —          | ●                                                                                   |  |
|  JTD |             | 182 B4.000 | 182 AR 1AA | ●          | —          | ●                                                                                   |  |
|                                                                                       |             |            | 182 BR 1AA | —          | ●          |                                                                                     |  |

### NOTE

This section deals with the new engine versions in the 1998 range.  
For the remaining engine versions, refer to the Bravo-Brava manual, publication no. 506.670, and subsequent updates.



# Introduction

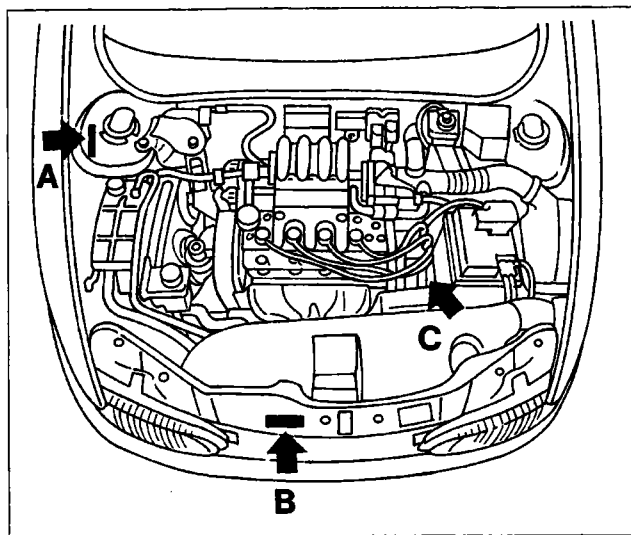
## Identification data

**Bravo-Brava**

**1998 range**

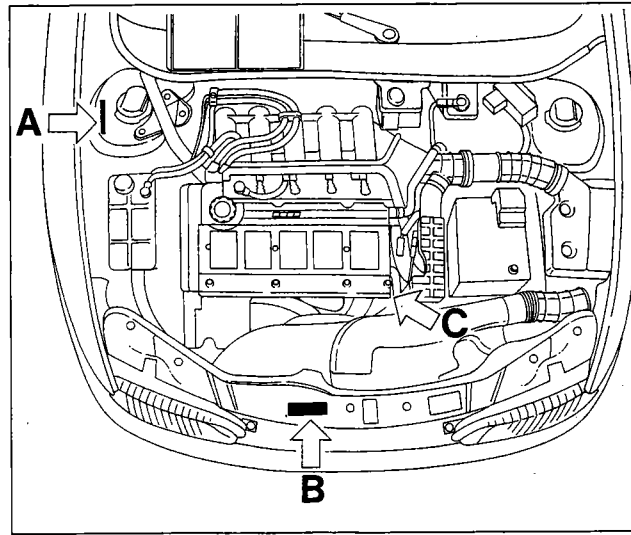
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**1242 16v**



P4A02HA01

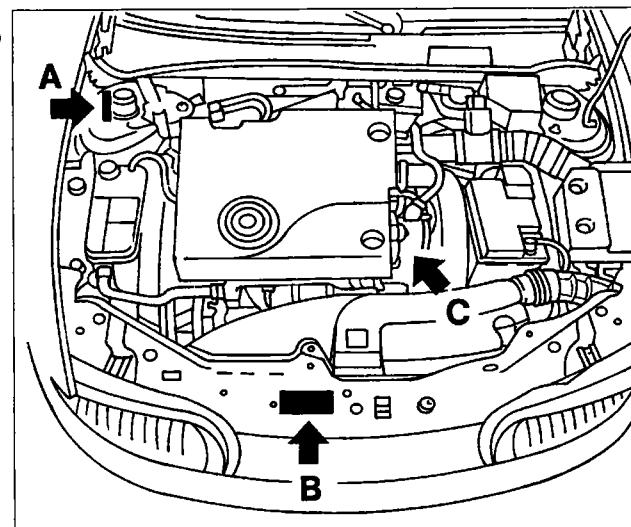
**1998 20v**



P4A003A02

1. Vehicle type identification code and chassis manufacture number
2. Engine type and number.

**1910 JTD**



P4A02HA02

3. Marking summary plate (EEC regulation.)

|                              |      |
|------------------------------|------|
| A                            |      |
| B                            |      |
| C                            | ☆ D  |
| E Kg                         |      |
| F Kg                         |      |
| 1-                           | G Kg |
| 2-                           | H Kg |
| MOTORE-ENGINE                |      |
| VERSIONE-VERSION             |      |
| N° PER RICAMBI-N° FOR SPARES |      |
| M                            |      |
| N                            |      |

F4A003A01

- A. Name of manufacturer
- B. Homologation number
- C. Vehicle type identification code
- D. Chassis manufacture number
- E. Maximum authorized weight of vehicle fully laden
- F. Maximum authorized weight of vehicle fully laden plus trailer.
- G. Maximum authorized weight on first axle (front)
- H. Maximum authorized weight on second axle (rear)
- I. Engine type
- L. Bodywork version code
- M. Parts number
- N. Corrected smoke absorption factor (only for diesel engines)

**WEIGHTS**

(values expressed in kg)

| ENGINE                                                                                                                                                                         |                        |  16v |  20v<br>STEP A |  JTD |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                                                                                               | 3 doors                | 1010                                                                                  | 1190                                                                                              | 1170                                                                                    |
|                                                                                                                                                                                | 5 doors                | 1040                                                                                  | —                                                                                                 | 1195                                                                                    |
|                                                                                                                                                                                | 3 doors                | 1510                                                                                  | 1690                                                                                              | 1680                                                                                    |
|                                                                                                                                                                                | 5 doors                | 1570                                                                                  | —                                                                                                 | 1735                                                                                    |
|  +500 =  150 | 3 doors                | 850                                                                                   | 970                                                                                               | 920                                                                                     |
|                                                                                                                                                                                | 5 doors                | 850                                                                                   | —                                                                                                 | 920                                                                                     |
|                                                                                                                                                                                | 3 doors                | 850                                                                                   | 900                                                                                               | 920                                                                                     |
|                                                                                                                                                                                | 5 doors                | 850                                                                                   | —                                                                                                 | 920                                                                                     |
| Maximum load permitted on roof                                                                                                                                                 |                        | 80                                                                                    | 80                                                                                                | 80                                                                                      |
| Load on tow hook ball<br>(trailer with braking system)                                                                                                                         | Minimum                | —                                                                                     | —                                                                                                 | —                                                                                       |
|                                                                                                                                                                                | Maximum                | 70                                                                                    | 70                                                                                                | 70                                                                                      |
|                                                                                             | Without braking system | 400                                                                                   | 400                                                                                               | 400                                                                                     |
|                                                                                                                                                                                | With braking system    | 1000                                                                                  | 1300                                                                                              | 1300                                                                                    |

■ Loads that should never be exceeded

**NOTE FOR VERSIONS WITH ACCESSORIES:** With special equipment fitted (non-standard air conditioner, sun-roof, trailer tow hook), the unladen weight increases and maximum carrying capacity may decrease.

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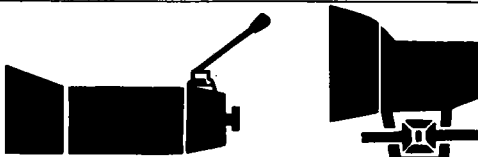
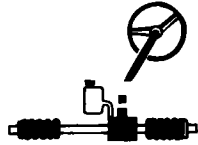
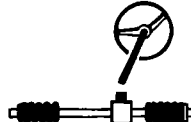
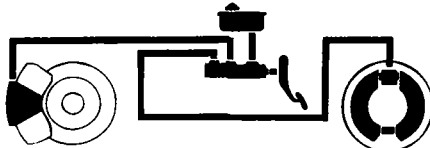
| ENGINE                                                                                                                                                   |                                                                                    |  16v |  20v<br>STEP A |  JTD |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <br>Speed km/h<br>(average load)                                        |   | 42                                                                                    | 59                                                                                                | 36                                                                                      |
|                                                                                                                                                          |   | 76                                                                                    | 94                                                                                                | 63                                                                                      |
|                                                                                                                                                          |   | 121<br>110*                                                                           | 139                                                                                               | 97                                                                                      |
|                                                                                                                                                          |   | 167<br>145*                                                                           | 182                                                                                               | 136                                                                                     |
|                                                                                                                                                          |   | 173                                                                                   | 213                                                                                               | 187<br>185*                                                                             |
|                                                                                                                                                          |  | 43                                                                                    | 54                                                                                                | 36                                                                                      |
| <br>% Gradient<br>when laden                                          | 37                                                                                 |                                                                                       |                                                                                                   |                                                                                         |
| <br>Fuel consumption<br>as per EC standards 93/116<br>(litres/100 km) | Urban<br>cycle                                                                     | 9.4<br>9.5*                                                                           | 13.1                                                                                              | 7.2<br>7.3*                                                                             |
|                                                                                                                                                          | Out of town<br>cycle                                                               | 5.3<br>5.4*                                                                           | 7.2                                                                                               | 4.4<br>4.5*                                                                             |
|                                                                                                                                                          | Combined<br>cycle                                                                  | 6.8<br>6.9*                                                                           | 9.4                                                                                               | 5.4<br>5.5*                                                                             |
| Exhaust emissions CO <sub>2</sub> (g/km)                                                                                                                 |                                                                                    | 162<br>164*                                                                           | 222                                                                                               | 143<br>146*                                                                             |

Fuel consumption as per EC standards 93/116 was determined during the following official tests:

- an urban cycle, i.e. a cold start followed by a simulated varied urban route
- urban cycle, i.e. frequent accelerations in all gears to simulate normal out-of-town vehicle use, with speed between 0 and 120 km/h.
- The average combined fuel consumption test involves 37% of the urban cycle and 63% of the extraurban cycle. Type of route, traffic situations, driving style, weather conditions, version/equipment/accessory level, presence of a roof rack, presence of special equipment and vehicle condition in general may lead to fuel consumption figures other than those measured as above.

Exhaust CO<sub>2</sub> emissions (in g/km) were measured over an average combined cycle.

(\*) 5D version (Brava)

| Capacities                                                                                                                                                                                                                                                                                                 |                                                                                   | Unit                                                                                                                                                                                                          |                                                                                        | Amount                                                                               |                                                                                                                                                                               |                                       |     |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----|------|
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               |                                                                                        | dm <sup>3</sup> (l)                                                                  | (kg)                                                                                                                                                                          |                                       |     |      |
|  Petrol ≥ N.O. 95<br>Unleaded                                                                                                                                                                                             |                                                                                   |                                             | 1242 16v                                                                               | 50                                                                                   | —                                                                                                                                                                             |                                       |     |      |
| Diesel                                                                                                                                                                                                                                                                                                     |                                                                                   |                                                                                                                                                                                                               | 1998 STEP A                                                                            | 60                                                                                   | —                                                                                                                                                                             |                                       |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1910 JTD                                                                               | 60                                                                                   | —                                                                                                                                                                             |                                       |     |      |
|  50%<br>+<br>H <sub>2</sub> O (▲)                                                                                                        |  | <br>Total cooling system capacity                                                                                           | 1242 16v                                                                               | 5.3<br>(6.4■)                                                                        | —                                                                                                                                                                             |                                       |     |      |
|                                                                                                                                                                                                                                                                                                            |  |                                                                                                                                                                                                               | 1998 STEP A                                                                            | 7.4<br>(7.2■)                                                                        | —                                                                                                                                                                             |                                       |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1910 JTD                                                                               | 6.3<br>(6.5■)                                                                        | —                                                                                                                                                                             |                                       |     |      |
|  <b>Petrol engines:</b><br><br>SELENIA 20K<br>(SAE 10 W/40)                                                                                                                                                               |                                                                                   | <br>Total capacity                                                                                                           | 1242 16v                                                                               | 3.1                                                                                  | 2.8                                                                                                                                                                           |                                       |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1998 STEP A                                                                            | 5.5                                                                                  | 4.9                                                                                                                                                                           |                                       |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1910 JTD                                                                               | 5.4                                                                                  | 4.7                                                                                                                                                                           |                                       |     |      |
|  <b>Diesel engines</b><br><br>SELENIA<br>Turbo Diesel<br>(SAE 10 W/40)                                                                                                                                                   |                                                                                   |  <br>Partial capacity<br>(periodic changes) | 1242 16v                                                                               | 2.8<br>(2.5●)                                                                        | 2.55<br>(2.25●)                                                                                                                                                               |                                       |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1998 STEP A                                                                            | 4.8<br>(4.5●)                                                                        | 4.3<br>(4.0●)                                                                                                                                                                 |                                       |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1910 JTD                                                                               | 4.9<br>(4.3●)                                                                        | 4.23<br>(3.75●)                                                                                                                                                               |                                       |     |      |
|  a = TUTELA<br>ZC 75 SINT <br>b = TUTELA<br>GI/A  |                                                                                   |                                                                                                                           | 1242 16v                                                                               | a                                                                                    | 1.7                                                                                                                                                                           | 1.5                                   |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1998 STEP A                                                                            |                                                                                      | 2                                                                                                                                                                             | 1.8                                   |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | 1910 JTD                                                                               |                                                                                      | b                                                                                                                                                                             | —                                     | —   |      |
|  a = TUTELA<br>GI/A                                                                                                                                                                                                     |                                                                                   | a                                                                                                                          | b  | a                                                                                    | —                                                                                                                                                                             | 1.1                                   |     |      |
|  b = K 854                                                                                                                                                                                                              |                                                                                   |                                                                                                                                                                                                               |                                                                                        |                                                                                      | b                                                                                                                                                                             | —                                     | 0.8 |      |
|  TUTELA<br>TOP 4<br>(270°C)                                                                                                                                                                                             |                                                                                   | <br>Total capacity                                                                                                        |                                                                                        | without<br>abs                                                                       | 0.38**<br>0.40                                                                                                                                                                | —                                     |     |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               |                                                                                        | with abs                                                                             | 0.45<br>(0.54)*                                                                                                                                                               | —                                     |     |      |
|  + <br>AREXONS                                                                                                                       |                                                                                   |                                                                                                                            | 3%                                                                                     |  |  +  | 5<br>(6.4 with<br>headlamp<br>washer) | —   |      |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                            | ~ - 10°C                                                                               |                                                                                      |                                                                                                                                                                               |                                       |     | 50%  |
|                                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                               | ~ - 20°C                                                                               |                                                                                      |                                                                                                                                                                               |                                       |     | 100% |

- (▲) Distilled water  
 (●) Only engine sump  
 (■) For versions with air conditioner  
 (\*) For versions 1998 20v  
 (\*\*) For versions 1242 16v

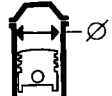
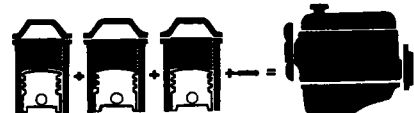
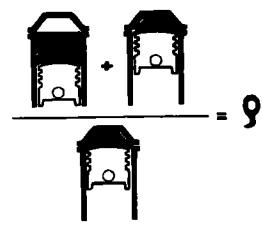
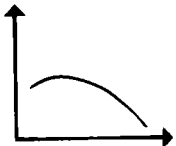
# Introduction

## Fiat Lubricant product characteristics

**Bravo-Brava**  
**1998 range**

**00.0**

| Name product                            | Description International designation                                                                      | Usage                                                      |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>SELENIA SAE 15 W/40</b>              | Semisynthetic multigrade engine oil. Meets specifications API SH, CCMC-G5 and UNI 20153                    | Temperature<br>- 25°C - 40°C                               |
| <b>SELENIA Turbo Diesel SAE 10 W/40</b> | Semisynthetic multigrade engine oil. Meets specifications API CD, ACEA B3-96                               | Temperature<br>- 15°C - 40°C                               |
| <b>TUTELA ZC 75 SINT</b>                | SAE 75W/90EP fluid. Meets specifications MIL-L-2105D and API GL5                                           | Manual gearboxes and differentials                         |
| <b>TUTELA GI/A</b>                      | Automatic transmission fluid - "DEXRON II".                                                                | Automatic transmissions<br>Power assisted steering         |
| <b>TUTELA TOP 4 (270 °C)</b>            | Synthetic fluid, F.M.V.S.S. n° 116 DOT 4 ISO 4925, CUNA NC 956-01                                          | Hydraulic brakes and hydraulic clutches                    |
| <b>K 854</b>                            | Lithium-based grease, consistency NLGI = 000, containing molybdenum disulphide                             | Rack and pinion steering boxes                             |
| <b>Arexons DP1</b>                      | Mixture of alcohol, water and tensio-active agents CUNA NC 956-11                                          | Use neat or diluted in windscreen washer systems           |
| <b>Paraflu<sup>11</sup></b>             | Mono-ethylene glycol based anti-freeze for cooling system inhibited mono-ethylene glycol, CUNA NC 596 - 16 | Cooling circuits<br>Percentage to be used 50% up to - 35°C |
| <b>Diesel Mix Arexons</b>               | Additive for diesel fuel with protective action for diesel engines                                         | To be mixed with diesel (25 cc for 10 litres)              |

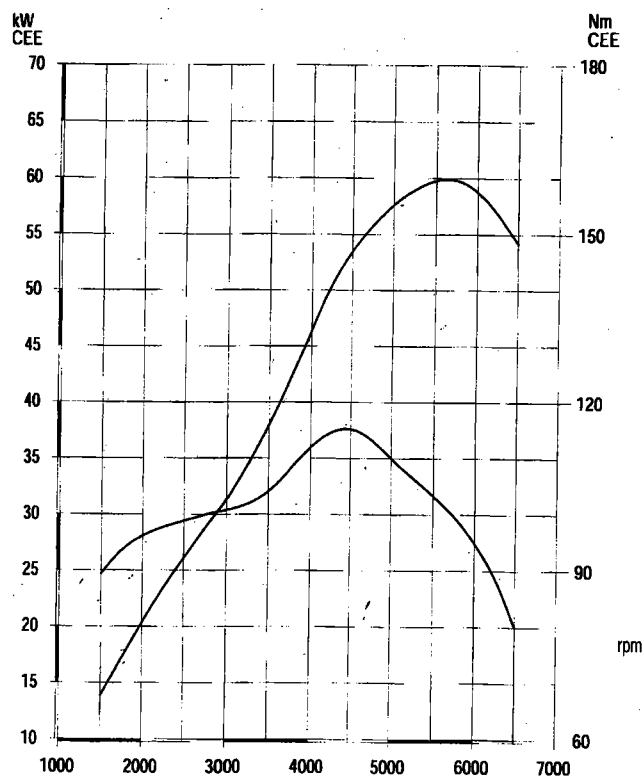
| CHARACTERISTICS                                                                     |                          |  16v |  20v STEP A |
|-------------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|    | Cycle                    | OTTO, 4-STROKE                                                                         |                                                                                                |
|                                                                                     | Timing gear              | twin overhead camshaft                                                                 |                                                                                                |
|                                                                                     | Fuel system type         | Integrated electronic injection-ignition                                               |                                                                                                |
|                                                                                     |                          | BOSCH M 1.5.5                                                                          | MPI BOSCH ME 3.1                                                                               |
|    | Number of cylinders      | 4                                                                                      | 5                                                                                              |
|    | Cylinder liner (bore) mm | 70.80                                                                                  | 82                                                                                             |
|   | Stroke mm                | 78.86                                                                                  | 75.65                                                                                          |
|  | Capacity cm <sup>3</sup> | 1242                                                                                   | 1998                                                                                           |
|  | Compression ratio        | 10.2                                                                                   | 10.7 ±0.15                                                                                     |
|  | Maximum power EC         | kW (PS)                                                                                | 60 (82)                                                                                        |
|                                                                                     |                          | rpm                                                                                    | 5500                                                                                           |
|  | Maximum torque EC        | daNm (kgm)                                                                             | 11.3 (11.5)                                                                                    |
|                                                                                     |                          | rpm                                                                                    | 4250                                                                                           |
|                                                                                     |                          |                                                                                        | 18.6 (19)                                                                                      |
|                                                                                     |                          |                                                                                        | 3750                                                                                           |

# Technical data

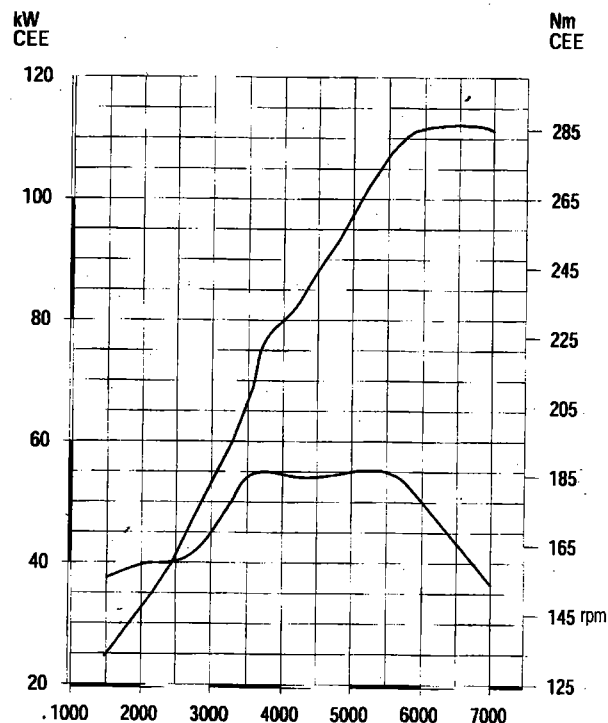
## Engine: typical curves

**Bravo-Brava**  
1998 range

00.10



P4A08HA01



P4A08HA02

| Speed when laden (rpm) | Time in minutes | Load at brake |
|------------------------|-----------------|---------------|
| 800-1000               | 10'             | no load       |
| 1500                   | 10'             | no load       |
| 2000                   | 10'             | no load       |

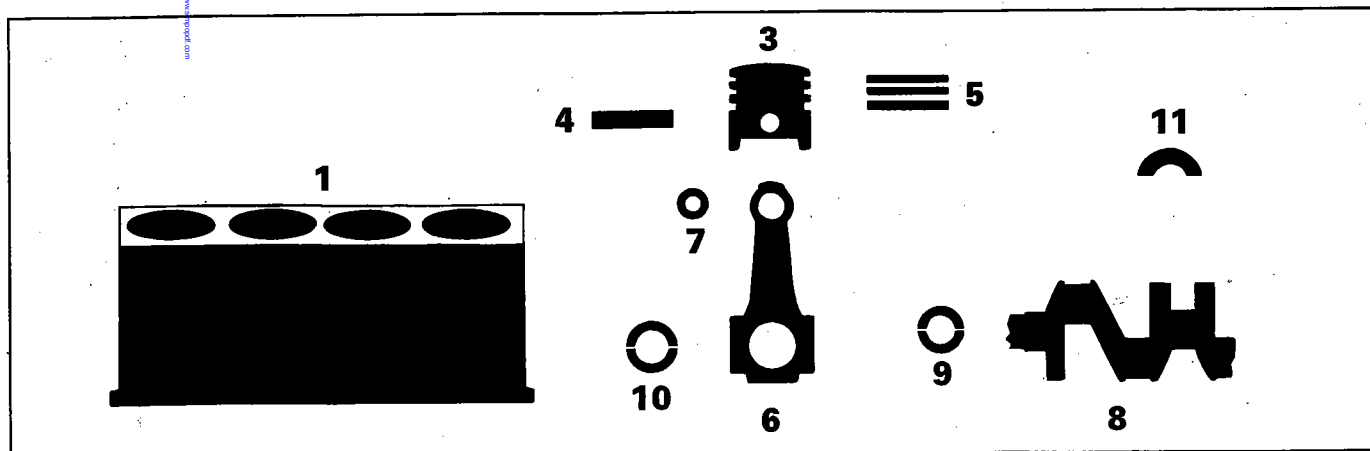
### Bench test cycles for overhauled engines

When bench-testing serviced engines, it is not advisable to run the engine at top speed but observe the specifications in the table; finish running in the engine on the car.

### Engine power curves obtained by eec method

The power curves illustrated can be obtained with the engine overhauled and run in, without a fan and with a silencer and air filter fitted at sea level.



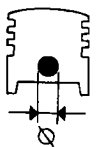
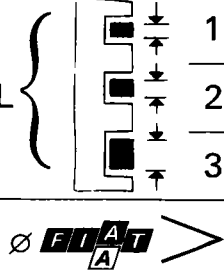
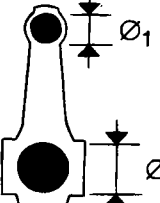


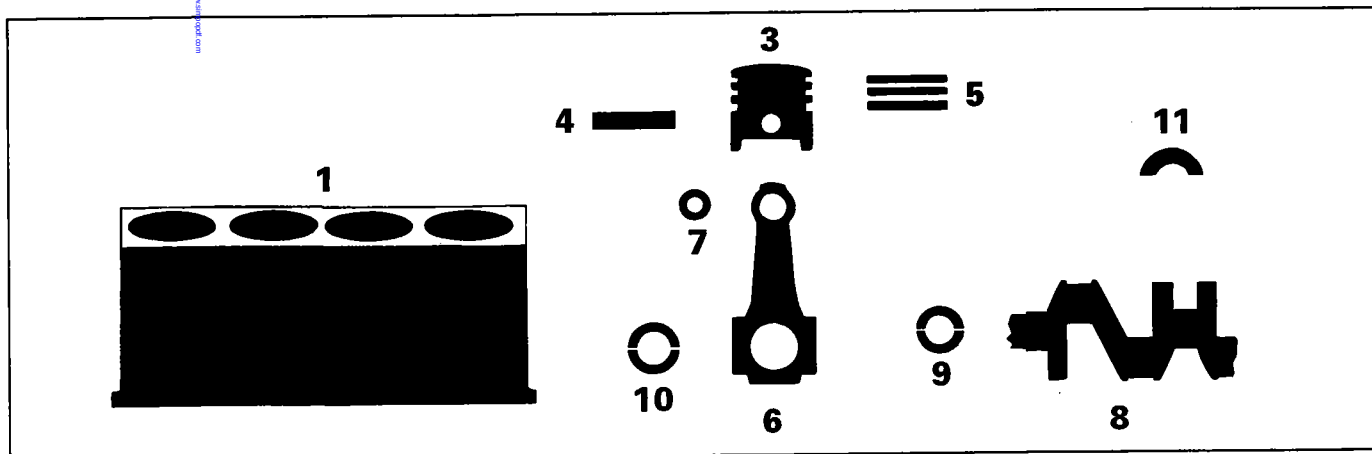
### DESCRIPTION

|                                       |       | Values in mm  |                 |
|---------------------------------------|-------|---------------|-----------------|
|                                       |       | 1242 16v      | 1998 20v STEP A |
| <br>Main bearing supports             | L     | 19.14-19.20   | 21.72-21.80     |
|                                       | 1     | 51.705-51.709 | 63.705-63.718   |
|                                       | 2     | 51.709-51.713 |                 |
|                                       | 3     | 51.713-51.717 |                 |
| <br>Cylinder bore                     | A     | 70.800-70.810 | 82.000-82.010   |
|                                       | B     | 70.810-70.820 | 82.010-82.020   |
|                                       | C     | 70.820-70.830 | 82.020-82.030   |
|                                       | X     | 6             | 12.5            |
| <br>Piston                            | A     | 70.760-70.770 | 81.952-81.962   |
|                                       | B     | 70.770-70.780 | 81.959-81.971   |
|                                       | C     | 70.780-70.790 | 81.968-81.978   |
|                                       | 0.4   |               |                 |
| <br>weight difference between pistons | ± 5 g |               |                 |
| <br>Piston<br>Cylinder liner          | A     | 0.030 - 0.050 | 0.038-0.058     |
|                                       | B     |               | 0.039-0.061     |
|                                       | C     |               | 0.042-0.062     |

|                                                                                       |                                                                                                |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|  16v |  20v STEP A |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|

### DESCRIPTION

|                                                                                     |                                                                                     |                                           |                | Values in mm    |                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------|----------------|-----------------|-----------------|
| <b>3</b>                                                                            |    | Piston pin seat                           | Ø              | 17.982 - 17.986 | 20.002 - 20.007 |
| <b>4</b>                                                                            |    | Piston pin                                | Ø              | 17.970 - 17.974 | 19.996 - 20.000 |
|    |                                                                                     |                                           |                | 0.2             |                 |
| <b>4-3</b>                                                                          |    | Piston pin - Housing                      |                | 0.008 - 0.016   | 0.002 - 0.011   |
| <b>3</b>                                                                            |   | Piston ring grooves                       |                | 1               | 1.190 - 1.230   |
|                                                                                     |                                                                                     |                                           |                | 2               | 1.190 - 1.230   |
|                                                                                     |                                                                                     |                                           |                | 3               | 2.490 - 2.530   |
| <b>5</b>                                                                            |  | Piston rings                              |                | 1               | 1.170 - 1.190   |
|                                                                                     |                                                                                     |                                           |                | 2               | 1.175 - 1.190   |
|                                                                                     |                                                                                     |                                           |                | 3               | 2.475 - 2.490   |
|  |                                                                                     |                                           |                | 0.4             |                 |
| <b>5-3</b>                                                                          |  | Piston rings                              |                | 1               | 0 - 0.06        |
|                                                                                     |                                                                                     | Piston ring grooves                       |                | 2               | 0 - 0.055       |
|                                                                                     |                                                                                     |                                           |                | 3               | 0 - 0.055       |
| <b>5-1</b>                                                                          |  | Piston ring end opening in cylinder liner |                | 1               | 0.200 - 0.400   |
|                                                                                     |                                                                                     |                                           |                | 2               | 0.250 - 0.450   |
|                                                                                     |                                                                                     |                                           |                | 3               | 0.200 - 0.450   |
| <b>6</b>                                                                            |  | Bush housing or small end seat            | Ø <sub>1</sub> | 17.939 - 17.956 | 22.939 - 22.972 |
|                                                                                     |                                                                                     | Connecting rod bearing seat               | Ø <sub>2</sub> | 45.128 - 45.138 | 51.354 - 51.366 |



### DESCRIPTION

Values in mm

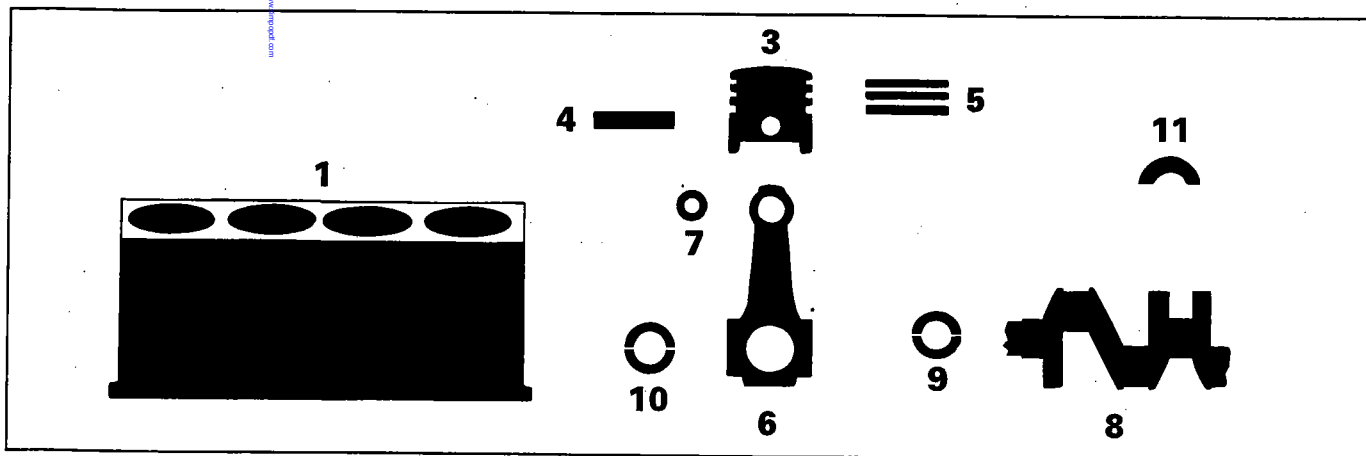
|     |                                        |               |                 |
|-----|----------------------------------------|---------------|-----------------|
| 4   |                                        | 0.014 - 0.035 | -               |
| 7   | <p>Small end bush</p>                  | -             | 23.007 - 23.027 |
| 4-7 | <p>Gudgeon pin<br/>Small end bush</p>  | -             | 20.006 - 20.012 |
| 7-6 | <p>Small end bush<br/>Bush housing</p> | -             | 0.006 - 0.020   |
|     |                                        | -             | 0.035 - 0.088   |

# Technical data

## Engine: crankcase assembly

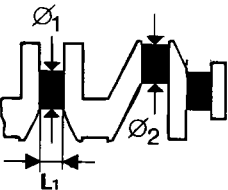
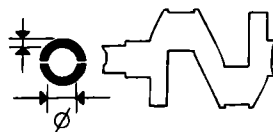
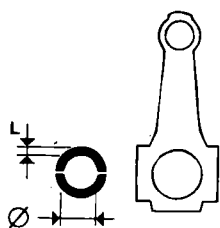
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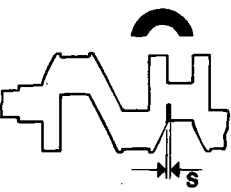
**Bravo-Brava**  
1998 range



|  16v |  20v STEP A |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|

#### DESCRIPTION

|                                                                                     |                                                                                                       | Values in mm                      |               |               |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------|---------------|---------------|
| 8                                                                                   |                    | Main journals $\varnothing_1$ { 1 | 47.982-47.988 | 59.994-60.000 |
|                                                                                     |                                                                                                       | 2                                 | 47.988-47.994 | 59.988-59.99  |
|                                                                                     |                                                                                                       | 3                                 | 47.994-48.000 | 59.982-59.98  |
|                                                                                     | Crank pins $\varnothing_2$ { A                                                                        | 41.990-42.008                     | 48.238-48.24  |               |
|                                                                                     |                                                                                                       | B                                 | -             | 48.232-48.23  |
|                                                                                     |                                                                                                       | C                                 | -             | 48.226-48.23  |
|                                                                                     | L1                                                                                                    | 23.975-24.025                     | 26.575-26.625 |               |
| 9                                                                                   |                                                                                                       | Crankshaft bearings               |               |               |
|  | L { 1                                                                                                 | 1.836 - 1.840                     | 1.836 - 1.840 |               |
|                                                                                     | 2                                                                                                     | 1.843 - 1.847                     | 1.839 - 1.843 |               |
|                                                                                     | 3                                                                                                     | 1.848 - 1.852                     | 1.842 - 1.846 |               |
|                                                                                     | $\varnothing$  $<$ | 0.254 - 0.508                     |               |               |
| 9-8                                                                                 |                                                                                                       | Main bearings - Journals          |               |               |
|  |                                                                                                       | 0.025 - 0.040                     | 0.025 - 0.052 |               |
| 10                                                                                  |                                                                                                       | Connecting rod bearings           |               |               |
|  | L                                                                                                     | 1.544 - 1.548                     | 1.536 - 1.540 |               |
|                                                                                     |                                                                                                       |                                   | 1.539 - 1.543 |               |
|                                                                                     |                                                                                                       |                                   | 1.542 - 1.546 |               |
|                                                                                     | $\varnothing$  $<$ | 0.254 - 0.508                     |               |               |

|             |                                                                                   |                                |                                                                                       |  16v |  20v STEP A |
|-------------|-----------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| DESCRIPTION |                                                                                   |                                |                                                                                       | Values in mm                                                                           |                                                                                                |
| 10-8        |  | Connecting rod bearings - Pins | A                                                                                     | 0.024 - 0.060                                                                          | 0.030 - 0.056                                                                                  |
|             |                                                                                   |                                | B                                                                                     | -                                                                                      |                                                                                                |
|             |                                                                                   |                                | C                                                                                     | -                                                                                      |                                                                                                |
| 11          |  | Thrust half-rings              | S                                                                                     | 2.310 - 2.360                                                                          | 2.342 - 2.358                                                                                  |
|             |                                                                                   |                                | S  > | 0.127                                                                                  |                                                                                                |
| 11-8        |  | Crankshaft end float           |                                                                                       | 0.055 - 0.265                                                                          | 0.059 - 0.161                                                                                  |

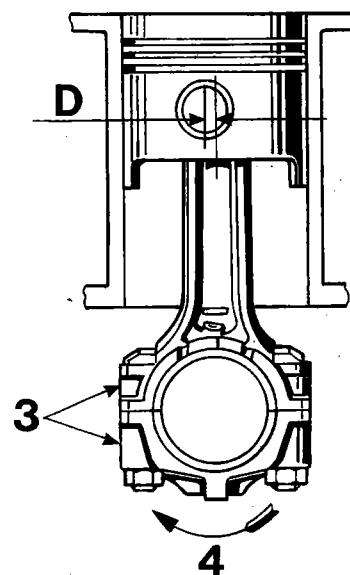
**Diagram showing connecting rod- piston assembly and direction of rotation in engine**

- Area where matching cylinder liner number is stamped
- Engine direction of rotation  
(The arrow shows the direction of rotation of the engine as seen from the timing side)

**Value (in mm ) of offset between connecting rod axis and piston axis**

**D= 0.85 - 1.15 (for 1242 16v)**

**D= 0.10 - 0.60 (for 1998 20v STEP A)**



P4A13HA01

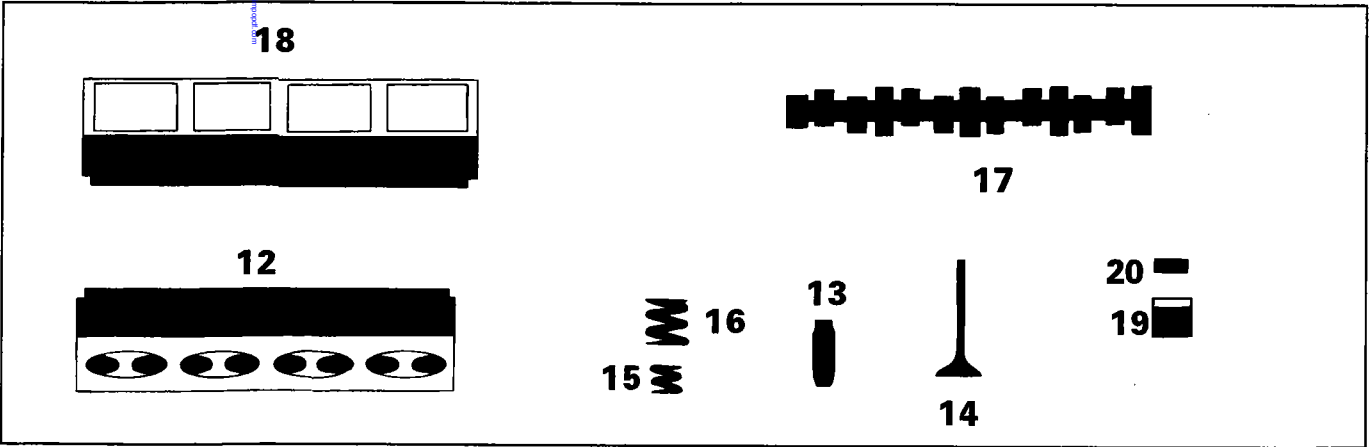
Technical data

Engine: cylinder head and valve gear

Bravo-Brava

1998 range

00.10



16v

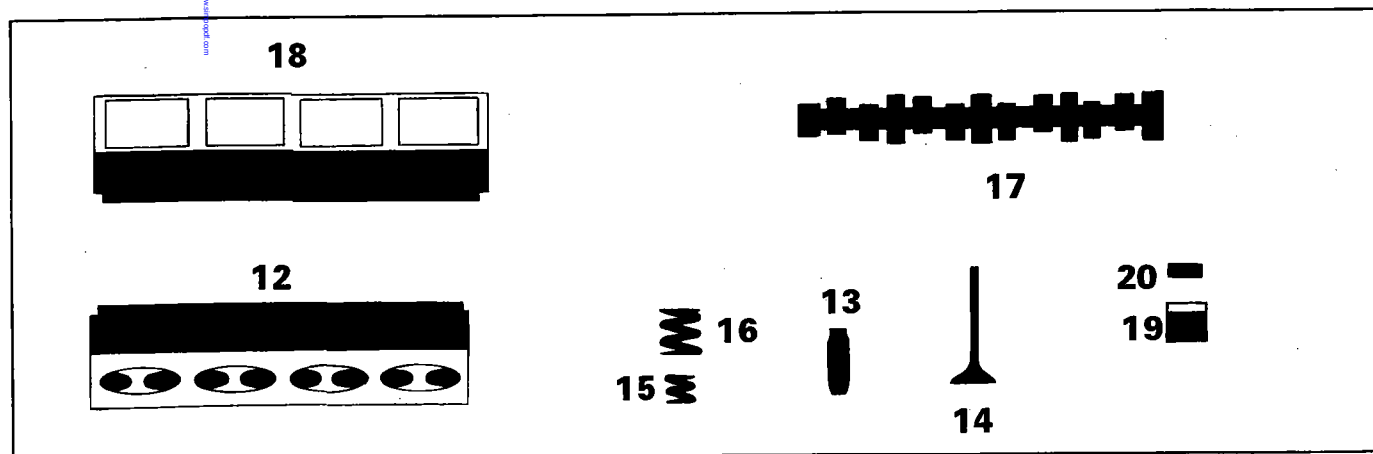


20v STEP A

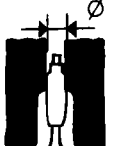
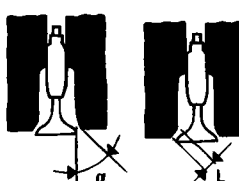
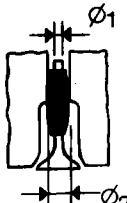
DESCRIPTION

Values in mm

|                                    |       |   |               |
|------------------------------------|-------|---|---------------|
| Camshaft supports on cylinder head |       |   |               |
| <br>12                             | <br>Ø | - | 26.045-26.070 |
|                                    | L(*)  | - | 19.100-19.150 |


**DESCRIPTION**

Values in mm

|                                                                                                                                                                                                                                                |                                                                                      |                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  <p>12 Valve guide bore in cylinder head</p> <p><math>\varnothing</math></p>                                                                                 | <p>9.959 - 9.989</p>                                                                 | <p>12.950 - 12.977</p>                                                                 |
|  <p>Valve seat</p> <p><math>\alpha</math></p> <p><math>L</math></p>                                                                                         | <p><math>45^\circ \pm 20'</math></p> <p><math>45^\circ \pm 20'</math></p> <p>1.5</p> | <p><math>45^\circ \pm 5'</math></p> <p><math>45^\circ \pm 5'</math></p> <p>about 2</p> |
|  <p>Volume of combustion chamber in cylinder head</p> <p>cm<sup>3</sup></p>                                                                                 | <p>12.28</p>                                                                         | <p>38.2</p>                                                                            |
|  <p>13 Valve guide</p> <p><math>\varnothing_1</math></p> <p><math>\varnothing_2</math></p> <p><math>\varnothing_2</math> <b>FIDAT</b> <math>&gt;</math></p> | <p>6.022 - 6.040</p> <p>10.010 - 10.030</p> <p>-</p>                                 | <p>7.022 - 7.040</p> <p>13.010 - 13.030</p> <p>0.05-0.10-0.25</p>                      |
| <p>13-12</p>  <p>Valve guide Bore in cylinder head</p>                                                                                                      | <p>0.049 - 0.051</p>                                                                 | <p>0.033 - 0.080</p>                                                                   |
| <p>12</p> <p>Tappet housing on cylinder head</p> <p><math>\varnothing</math></p>                                                                                                                                                               | <p>-</p>                                                                             | <p>33.000 - 33.025</p>                                                                 |



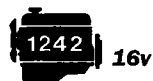
# Technical data

Engine: cylinder head and valve gear

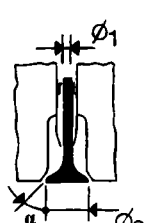
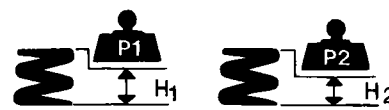
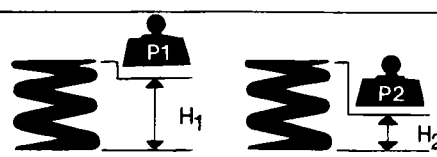
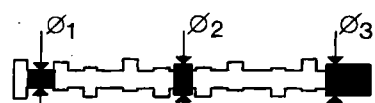
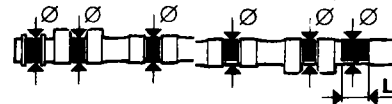
**Bravo-Brava**

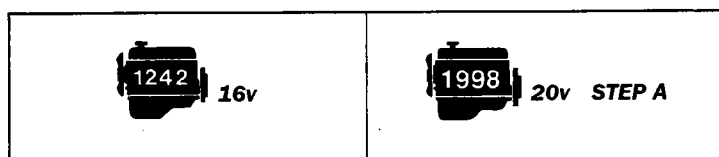
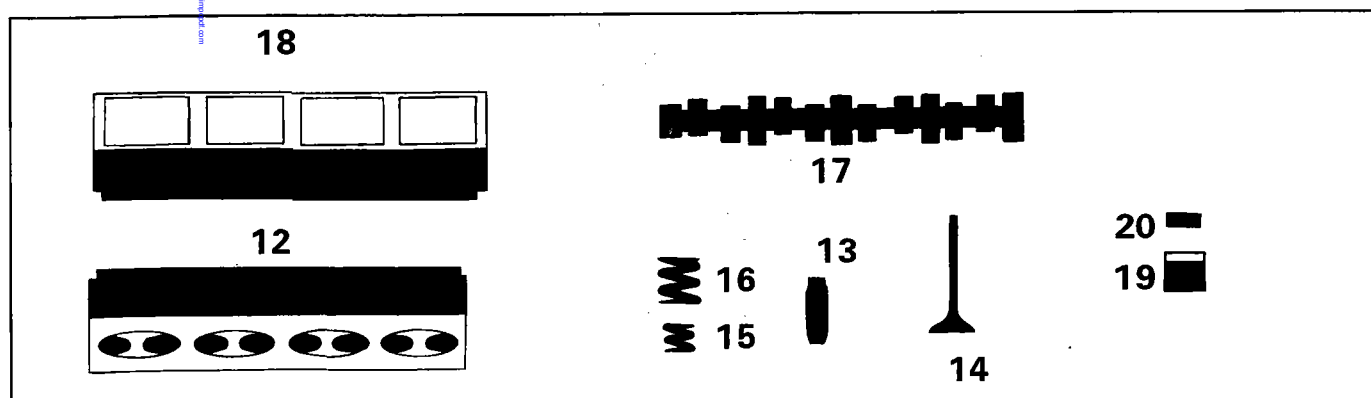
1998 range

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## DESCRIPTION

|                                                                                              |                                                                                                                                     | 1242 16v     |                 | 1998 20v STEP A   |                 |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------|-------------------|-----------------|
| DESCRIPTION                                                                                  |                                                                                                                                     | Values in mm |                 |                   |                 |
| 14                                                                                           |  Valve                                             |              | $\phi_1$        | 5.974 - 5.992     | 6.975 - 6.930   |
|                                                                                              |                                                                                                                                     |              | $\phi_2$        | 22.250 - 22.550   | 29.900 - 30.200 |
|                                                                                              |                                                                                                                                     |              | $\alpha$        | -                 | 45° 30' ± 5'    |
|                                                                                              |                                                                                                                                     |              | $\phi_1$        | 5.974 - 5.992     | 6.960 - 6.975   |
|                                                                                              |                                                                                                                                     |              | $\phi_2$        | 22.250 - 22.550   | 25.900 - 26.200 |
|                                                                                              |                                                                                                                                     |              | $\alpha$        | -                 | 45° 30' ± 5'    |
| 14-13                                                                                        |  Valve<br>Valve guide                              |              | 0.030 - 0.066   |                   | 0.032 - 0.065   |
|                                                                                              |                                                                                                                                     |              |                 |                   | 0.047 - 0.080   |
| 15                                                                                           |  Internal valve spring                            | $P_1$        | -               | 11.08 - 12.07daN  |                 |
|                                                                                              |                                                                                                                                     | $H_1$        | -               | 29.5              |                 |
|                                                                                              |                                                                                                                                     | $P_2$        | -               | 21.58 - 23.54 daN |                 |
|                                                                                              |                                                                                                                                     | $H_2$        | -               | 20                |                 |
| 16                                                                                           |  External valve spring                           | $P_1$        | 22.5 daN        | 27.7 - 29.43 daN  |                 |
|                                                                                              |                                                                                                                                     | $H_1$        | 31              | 34                |                 |
|                                                                                              |                                                                                                                                     | $P_2$        | 42.3            | 48.46 - 52.38 daN |                 |
|                                                                                              |                                                                                                                                     | $H_2$        | 23              | 24.5              |                 |
| Camshaft bearings                                                                            |                                                                                                                                     | $\phi_1$     | 35.000 - 35.015 | -                 |                 |
| 17a                                                                                          |                                                  | $\phi_2$     | 48.000 - 48.015 | -                 |                 |
|                                                                                              |                                                                                                                                     | $\phi_3$     | 49.000 - 49.015 | -                 |                 |
|                                                                                              |                                                                                                                                     | $\phi$       | -               | 26.000 - 26.015   |                 |
| 17b                                                                                          |                                                  | $L$          | -               | 19.250 - 19.330   |                 |
|  Cam lift |                                                                                                                                     |              | 7.5             | 9                 |                 |
|                                                                                              |                                                                                                                                     |              | 7.5             | 9                 |                 |
| 12-17a                                                                                       |  Camshaft<br>journals<br>Cylinder head<br>mounts | $\phi_1$     | 0.030-0.070     | -                 |                 |
|                                                                                              |                                                                                                                                     | $\phi_2$     | 0.030-0.070     |                   |                 |
|                                                                                              |                                                                                                                                     | $\phi_3$     | 0.030-0.070     |                   |                 |
| 12-17b                                                                                       | radial                                                                                                                              | -            | 0.030 - 0.070   |                   |                 |
|                                                                                              | axial                                                                                                                               | -            | 0.100 - 0.230   |                   |                 |



### DESCRIPTION

|                         |                                              | Values in mm.     |                 |
|-------------------------|----------------------------------------------|-------------------|-----------------|
| 18                      | <br>Camshaft bearings in camshaft housing    | Ø1                | 35.045-35.070   |
|                         |                                              | Ø2                | 48.045-48.070   |
|                         |                                              | Ø3                | 49.045-49.070   |
| 18                      | <br>Tappet housings Ø                        |                   | 28.400 - 28.421 |
| 19                      | <br>Tappet Ø                                 |                   | 28.354-28.370   |
| 19-12                   | <br>Tappet Bore in cylinder head             |                   | 0.025-0.066     |
| 19-18                   | <br>Tappet - Bore in cylinder head extension |                   | 0.046 - 0.051   |
| 17-20                   |                                              | 0.45              |                 |
| <br>for timing<br>check |                                              | Hydraulic tappets |                 |

# Technical data

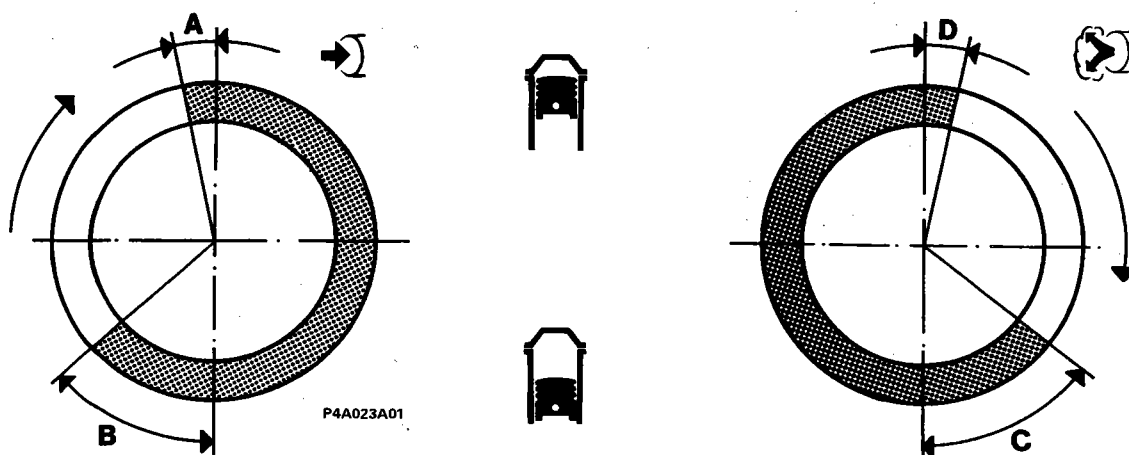
Engine: cylinder head and valve gear

**Bravo-Brava**

1998 range

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## TIMING DIAGRAMS



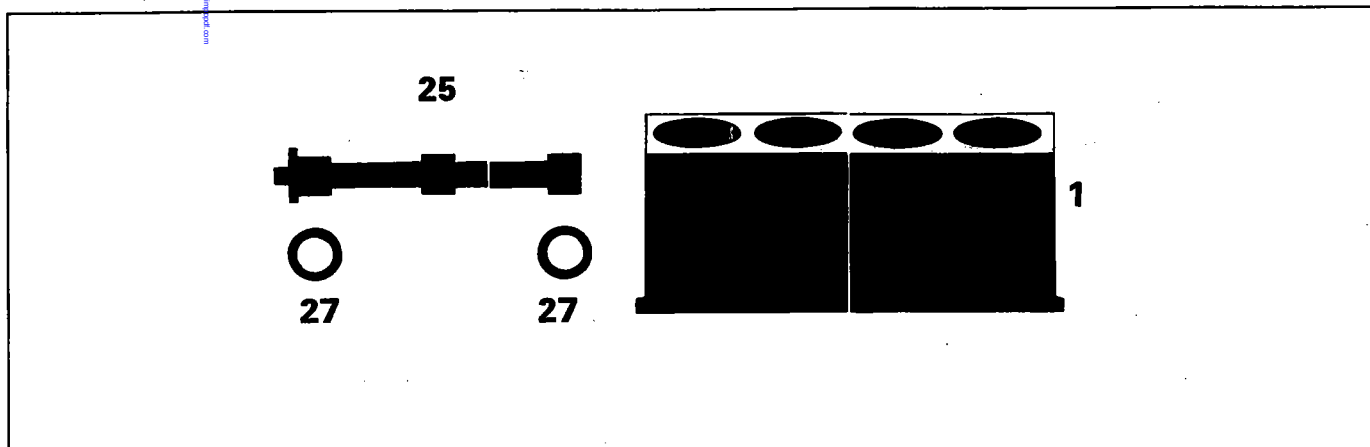
|          |                 |
|----------|-----------------|
| 1242 16v | 1998 20v STEP A |
|----------|-----------------|

### Timing angles

|          |         |                  |         |                  |
|----------|---------|------------------|---------|------------------|
| <b>A</b> | Inlet   | start before TDC | 0°      | 9° (*) after TDC |
| <b>B</b> |         | end after BDC    | 32° 42' | 49° (**)         |
| <b>C</b> | Exhaust | start before BDC | 32° 42' | 40°              |
| <b>D</b> |         | end after TDC    | 0°      | 0°               |

(\*) With variable valve timing beginning 9° BTDC

(\*\*) With variable valve timing ending 31° after BDC



|          |                 |
|----------|-----------------|
| 1242 16v | 1998 20v STEP A |
|----------|-----------------|

### DESCRIPTION

|              |                                              | Values in mm |                          |
|--------------|----------------------------------------------|--------------|--------------------------|
| <b>25</b>    | Counter-rotating shaft drive                 | -            | via oil pump driven gear |
| <b>27</b>    | <br>Ball bearings for counter-rotating shaft | Ø1           | 19.900 - 20.000          |
|              |                                              | Ø2           | 46.989 - 47.000          |
| <b>25</b>    | <br>Counter-rotating shaft journals          | Ø            | 19.980 - 19.993          |
| <b>1</b>     | Bearing seats in crankcase                   | Ø            | 46.975 - 47.000          |
| <b>27-1</b>  | <br>Ball bearings<br>Cylinder block seats    | -            | +0.011 - - 0.025         |
| <b>25-27</b> | <br>Shaft journals<br>Ball bearings          | -            | +0.020 - - 0.003         |

# Technical data

Engine: lubrication

**Bravo-Brava**

1998 range

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## LUBRICATION

|                                            |                                      | Values in mm                                                         |                                                                     |
|--------------------------------------------|--------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------|
| Engine lubrication system                  |                                      | forced circulation, via lobe gear pump with cartridge filter in line | forced circulation, via gear pump with in-line cartridge oil filter |
| Oil pump                                   |                                      | lobe gear                                                            | gear, located in the front crankshaft cover                         |
| Pump operated                              |                                      | via crankshaft                                                       | via chain driven by the crankshaft                                  |
| Oil pressure relief valve                  |                                      | incorporated in crankshaft front cover                               |                                                                     |
| Full flow filter                           |                                      | —                                                                    | cartridge                                                           |
| Insufficient oil pressure sender unit      |                                      | —                                                                    | electrical                                                          |
|                                            | between pump housing and driven gear | 0.100 - 0.210                                                        | —                                                                   |
|                                            | between gear edges and pump case     | —                                                                    | 0.110 - 0.180                                                       |
|                                            | between gear edges and pump cover    | 0.025 - 0.070                                                        | —                                                                   |
|                                            |                                      | —                                                                    | 0.016 - 0.086                                                       |
| Full flow filter                           |                                      | cartridge                                                            |                                                                     |
| Insufficient oil pressure sender unit      |                                      | electrical                                                           |                                                                     |
|                                            | between drive and driven gears       | 0.30                                                                 |                                                                     |
|                                            | when idling                          | 1 bar                                                                |                                                                     |
| Operating pressure at temperature of 100°C | at 4000 rpm                          | 4 bar                                                                |                                                                     |
|                                            | P <sub>1</sub>                       | 11.73 - 12.51                                                        |                                                                     |
| Oil pressure relief valve spring           | H <sub>1</sub>                       | 35                                                                   |                                                                     |

**COOLING**


|                                                                                                                     |                                                                                                       |         |                        |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------|------------------------|
| Cooling circuit                                                                                                     | coolant circulation via centrifugal pump, radiator, expansion tank and fan operated by thermal switch |         |                        |
| coolant pump drive                                                                                                  | via belt                                                                                              |         |                        |
|  Thermal switch for fan activation |                      | stage 1 | 90° - 94°C             |
|                                                                                                                     |                                                                                                       | stage 2 | 95° - 99°C (■)         |
|                                                                                                                     |                      | stage 1 | 85° - 89°C             |
|                                                                                                                     |                                                                                                       | stage 2 | 90° - 94°C (■)         |
| Engine coolant thermostat                                                                                           | opening starts                                                                                        |         | 81° - 85°C             |
|                                                                                                                     | max opening                                                                                           |         | 103°C      101°C-105°C |
|                                                                                                                     | valve travel                                                                                          |         | 9.5 mm                 |
| Fitting clearance between vanes and pump casing                                                                     |                    |         | -                      |
| Pressure for checking system water tightness                                                                        | 0.98 bar                                                                                              |         |                        |
| Checking exhaust valve on supplementary expansion tank                                                              | 0.98 bar                                                                                              |         |                        |

(■) Versions with climate control

**FUEL SYSTEM**

|                                 |                                            |                                            |
|---------------------------------|--------------------------------------------|--------------------------------------------|
| Make                            | Integrated electronic injection - ignition | Integrated electronic injection - ignition |
| Pump                            | electrical, submerged in tank              |                                            |
| Output                          | ≥ 110 l/h                                  | ≥ 120 l/h                                  |
| Fuel pressure regulator setting | 3.5 bar                                    |                                            |

**Checking idle concentration of pollutant emissions**

|                                       | CO (%)  | HC (p.p.m.) | CO <sub>2</sub> (%) |
|---------------------------------------|---------|-------------|---------------------|
| Upstream of the catalytic converter   | 0.4 - 1 | ≤ 600       | ≥ 12                |
| Downstream of the catalytic converter | ≤ 0.35  | ≤ 90        | ≥ 13                |

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### INTEGRATED ELECTRONIC INJECTION/IGNITION SYSTEM COMPONENTS



|                                          |                                 |                     |
|------------------------------------------|---------------------------------|---------------------|
| Injection system electronic control unit | Bosch 0.261.204.578             | Bosch 0.261.204.271 |
| Throttle body                            | Bosch 0.280.750.013             | -                   |
| Motorized throttle body                  | -                               | Bosch 0.250.003.052 |
| Absolute pressure sensor                 | Bosch 0.261.230.013             | -                   |
| Injector                                 | Bosch 0.280.155.816             | Bosch 0.280.155.770 |
| Electric fuel pump                       | Bosch 0.580.313.011             |                     |
| Air flow meter                           | -                               | Bosch 0.281.002.199 |
| Engine coolant temperature sensor        | ELTH 2690350 – SYLEA 402.183.01 |                     |
| Lambda sensor                            | Bosch 0.258.006.071             | Bosch 0.258.006.072 |
| Fuel vapour solenoid valve               | Bosch 0.280.142.330             | Bosch 0.280.142.340 |
| Knock sensor                             | Bosch 0.261.231.007             | Bosch 0.261.231.131 |
| Hall effect injection timing sensor      | -                               | Bosch 0.232.101.036 |
| TDC and rpm sensor                       | Bosch 0.281.210.124             | Bosch 0.261.210.160 |




**CHARACTERISTICS**

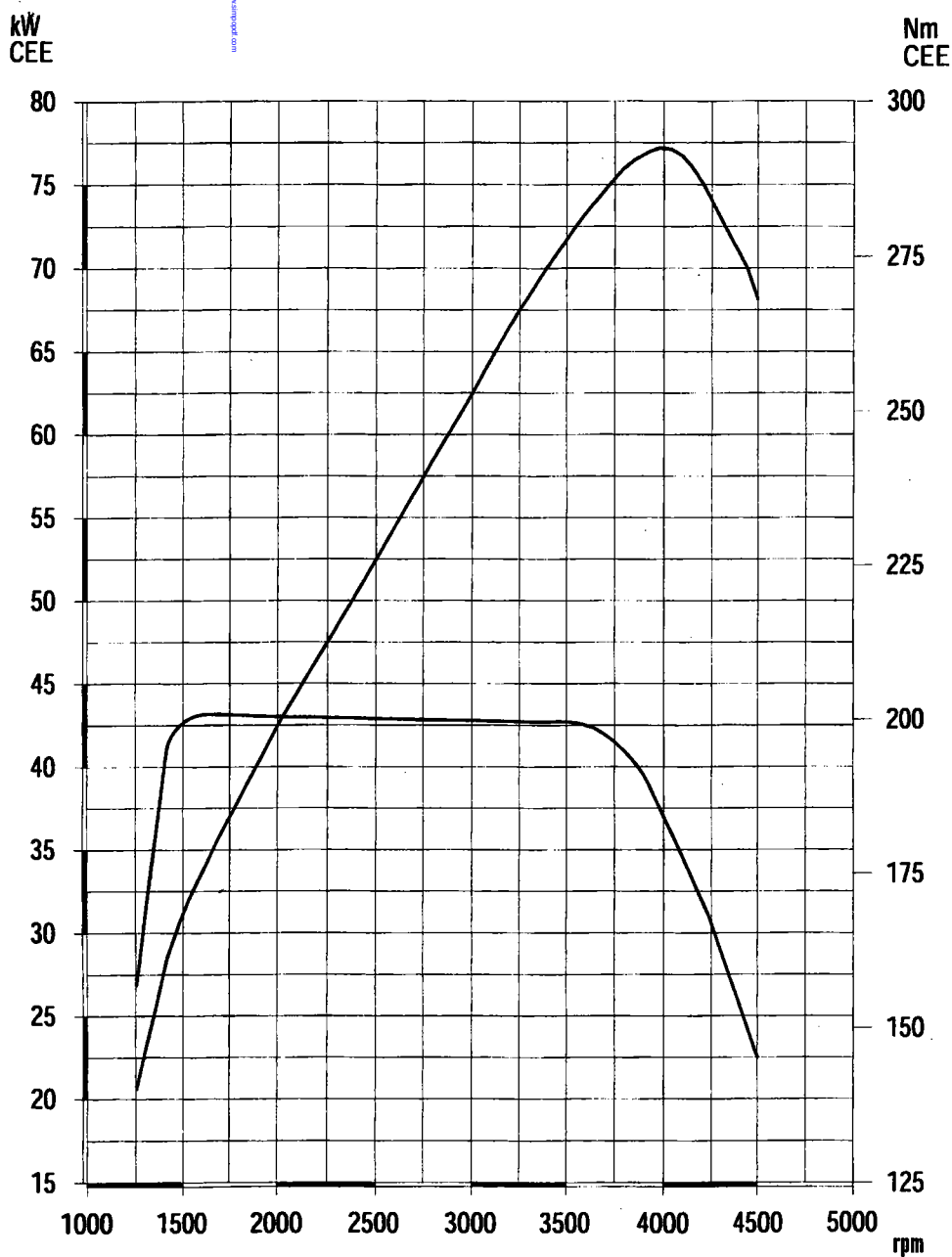
|                                 |                       |                                    |       |
|---------------------------------|-----------------------|------------------------------------|-------|
|                                 | Cycle                 | DIESEL, 4 STROKE                   |       |
|                                 | Timing gear           | single overhead cam                |       |
|                                 | Fuel system type      | Direct - Bosch Common Rail EDC-15C |       |
|                                 | Number of cylinders   | 4                                  |       |
|                                 | Cylinder liner (bore) | mm                                 | 82    |
|                                 | Stroke                | mm                                 | 90.4  |
|                                 | Capacity              | cm <sup>3</sup>                    | 1910  |
|                                 | Compression ratio     | 18.45 ± 0.5                        |       |
| Total combustion chamber volume |                       | cm <sup>3</sup>                    | 27.35 |
|                                 | kW (BHP)              | 77 (105)                           |       |
|                                 | rpm                   | 4000                               |       |
|                                 | daNm (kgm)            | 20.0 (20.4)                        |       |
|                                 | rpm                   | 1500                               |       |

# Technical data

## Engine: typical curves

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**Bravo-Brava**  
1998 range



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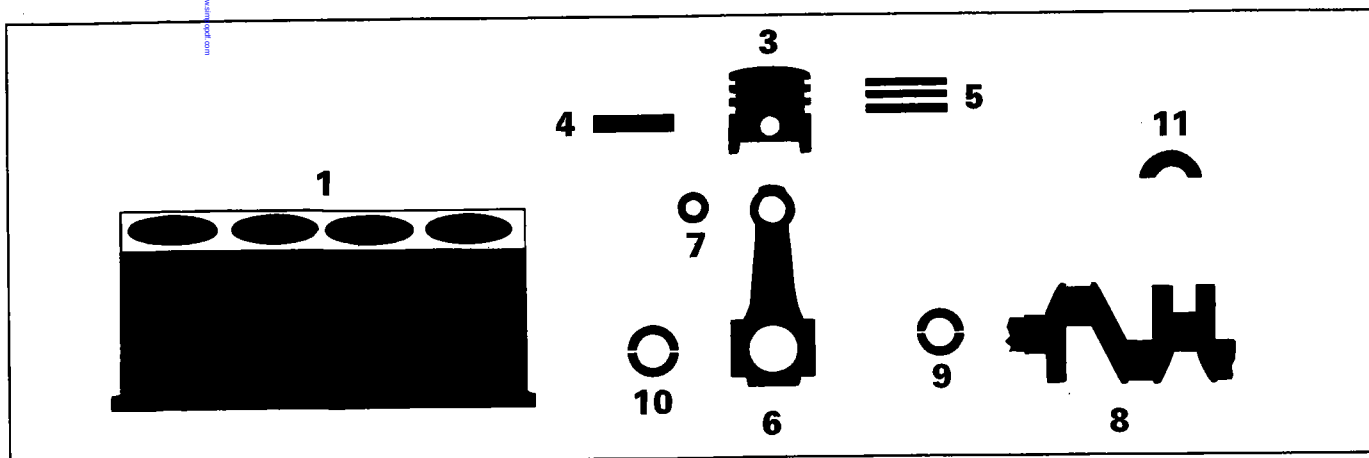
| Test speed (rpm) | Time in minutes | Load at brake |
|------------------|-----------------|---------------|
| 800-1000         | 10'             | no load       |
| 1500             | 10'             | no load       |
| 2000             | 10'             | no load       |

#### Bench test cycles for overhauled engines

When bench-testing serviced engines, it is not advisable to run the engine at top speed but observe the specifications in the table; finish running in the engine on the car.

#### Engine power curves obtained by EC method

The power curves illustrated can be obtained with the engine overhauled and run in, without a fan and with a silencer and air filter fitted at sea level.



**DESCRIPTION**

|                                               |                 | Values in mm    |
|-----------------------------------------------|-----------------|-----------------|
| <b>1</b><br>Main bearing supports             | L               | 21.75 - 22.25   |
|                                               | L1              | 22.30 - 22.70   |
|                                               | L2              | 21.75 - 22.25   |
|                                               | Ø               | 63.691 - 63.732 |
|                                               | Ø {             |                 |
| <b>3</b><br>Piston                            | A               | 82.000 - 82.010 |
|                                               | B               | 82.010 - 82.020 |
|                                               | C               | 82.020 - 82.030 |
|                                               | X               | 8               |
|                                               | Ø {             |                 |
| <b>3-1</b><br>Piston projection               | A               | 81.920 - 81.930 |
|                                               | B               | 81.930 - 81.940 |
|                                               | C               | 81.940 - 81.950 |
| <b>3</b><br>Weight difference between pistons | Ø <b>FIAT</b> > | 0.4             |
|                                               |                 | 0.845 - 1.105   |
| <b>3-1</b><br>Piston<br>Cylinder bore         |                 | ± 5 g           |
|                                               |                 | 0.070 - 0.090   |

# Technical data

Engine: crankcase assembly

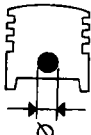
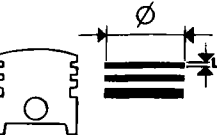
**Bravo-Brava**

1998 range

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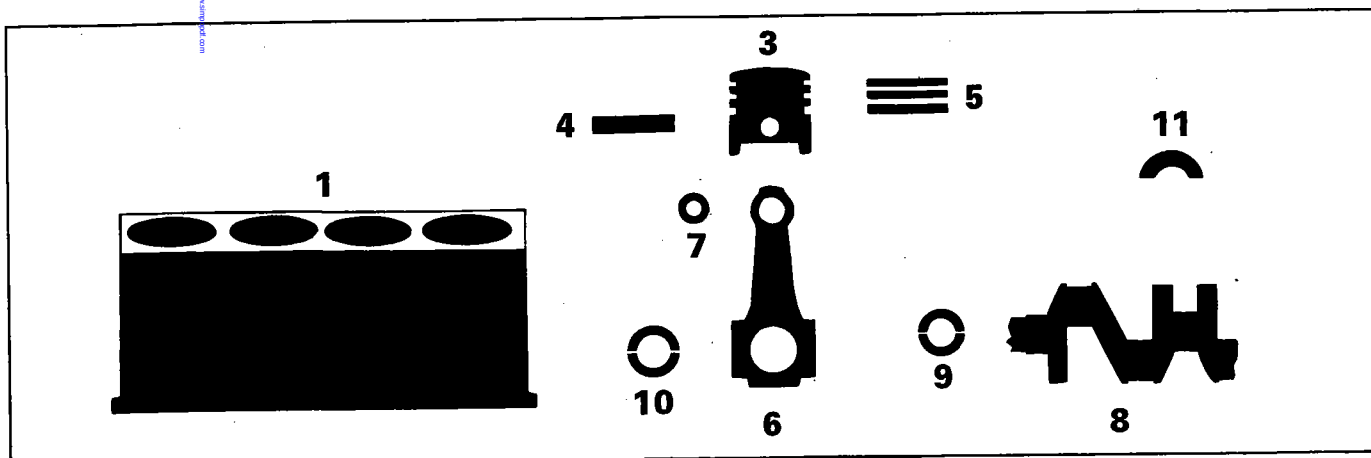


## DESCRIPTION

|     |                                                                                                                                  |   |  | Values in mm       |
|-----|----------------------------------------------------------------------------------------------------------------------------------|---|--|--------------------|
| 3   |  Piston pin seat                                | Ø |  | 25.999 - 26.004    |
| 3   |  Piston ring grooves                            | 1 |  | 2.685 - 2.715 (*)  |
|     |                                                                                                                                  | 2 |  | 2.020 - 2.040      |
|     |                                                                                                                                  | 3 |  | 3.020 - 3.040      |
| 4   |  Piston pin                                    | Ø |  | 25.982 - 25.988    |
|     | Ø  >                                          |   |  | -                  |
| 4-3 |  Piston pin - Housing                         |   |  | 0.004 - 0.014      |
| 5   |  Piston rings                                 | 1 |  | 2.568 - 2.597 (**) |
|     |                                                                                                                                  | 2 |  | 1.970 - 1.995      |
|     |                                                                                                                                  | 3 |  | 2.970 - 2.990      |
|     | Ø  >                                          |   |  | 0.4 - 0.6          |
| 5-3 |  Piston rings<br>Piston ring grooves          | 1 |  | 0.088 - 0.147      |
|     |                                                                                                                                  | 2 |  | 0.025 - 0.070      |
|     |                                                                                                                                  | 3 |  | 0.030 - 0.070      |
| 5-1 |  Piston ring<br>end opening<br>cylinder liner | 1 |  | 0.250 - 0.400      |
|     |                                                                                                                                  | 2 |  | 0.250 - 0.500      |
|     |                                                                                                                                  | 3 |  | 0.250 - 0.500      |

(\*) Measured on diameter of 73.8 mm

(\*\*) Measured 1.5 mm from outer edge



### DESCRIPTION

Values in mm

|     |  |                                       |        |                 |
|-----|--|---------------------------------------|--------|-----------------|
| 6   |  | Bush or small end pin seat            | Ø1     | 28.939 - 28.972 |
|     |  | Connecting rod bearing seat           | Ø2     | 53.897 - 53.909 |
| 6   |  | Difference in weight between con rods |        | ± 2.5 g         |
| 7   |  | Small end bush                        | Ø1     | 29.018 - 29.038 |
|     |  |                                       | Ø2     | 26.006 - 26.012 |
| 4-7 |  | Piston pin<br>Small end bush          |        | 0.018 - 0.030   |
| 7-6 |  | Small end bush<br>Bush housing        |        | 0.046 - 0.099   |
| 8   |  | Main journals                         | Ø1 { 1 | 59.994 - 60.000 |
|     |  |                                       | 2      | 59.988 - 59.994 |
|     |  |                                       | 3      | 59.982 - 59.988 |
|     |  | Crank pins                            | Ø2 { A | 50.799 - 50.805 |
|     |  |                                       | B      | 50.793 - 50.799 |
|     |  |                                       | C      | 50.787 - 50.793 |
|     |  |                                       | L      | 26.80 - 27.20   |
|     |  |                                       | L1     | 25.90 - 26.10   |

# Technical data

Engine: crankcase assembly

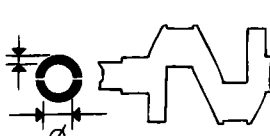
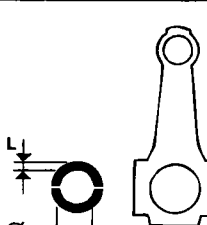
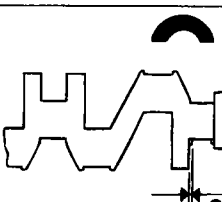
**Bravo-Brava**

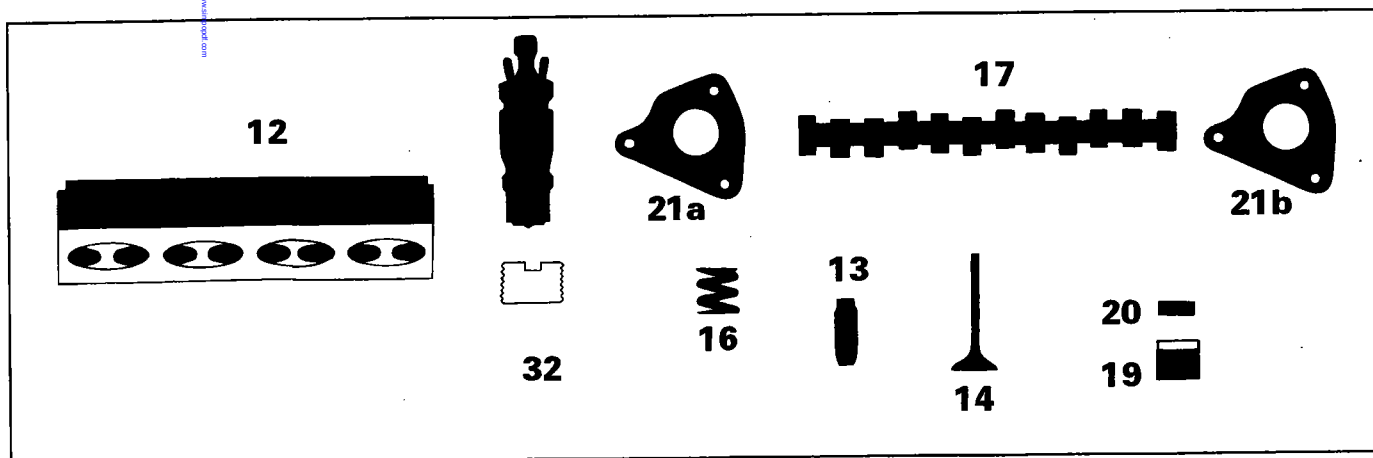
1998 range

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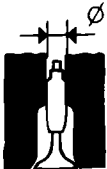
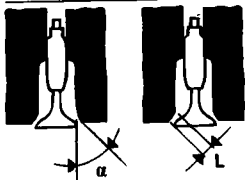
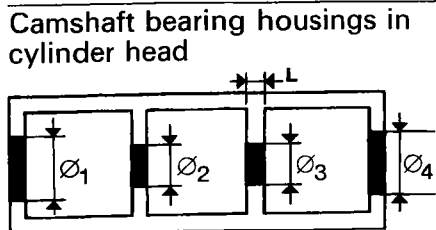
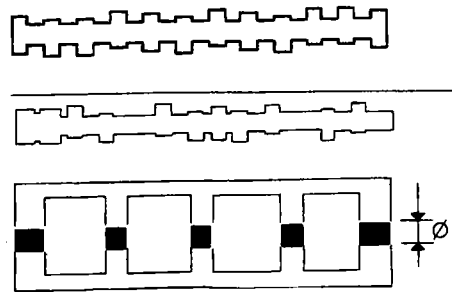
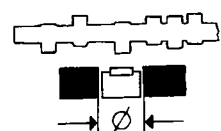


## DESCRIPTION

|      |                                                                                                                                 |                                                                                     | Values in mm  |
|------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
| 9    |  <p>Crankshaft bearings</p>                    | 1                                                                                   | 1.836 - 1.840 |
|      |                                                                                                                                 | 2                                                                                   | 1.839 - 1.843 |
|      |                                                                                                                                 | 3                                                                                   | 1.842 - 1.846 |
|      |                                                                                                                                 |    | 0.254 - 0.508 |
| 9-8  |  <p>Crankshaft bearings-<br/>Main journals</p> |                                                                                     | 0.011 - 0.071 |
| 10   |  <p>Connecting rod<br/>bearings</p>           | A                                                                                   | 1.527 - 1.531 |
|      |                                                                                                                                 | B                                                                                   | 1.530 - 1.534 |
|      |                                                                                                                                 | C                                                                                   | 1.533 - 1.537 |
|      |                                                                                                                                 |  | 0.254 - 0.508 |
| 10-8 |  <p>Big end bearings-<br/>Main journals</p>  |                                                                                     | 0.030 - 0.056 |
| 11   |  <p>Thrust<br/>half-rings</p>                | S                                                                                   | 2.469 - 2.485 |
|      |                                                                                                                                 |  | 0.127         |
| 11-8 |  <p>Crankshaft end float</p>                 |                                                                                     | 0.049 - 0.211 |



### DESCRIPTION

|                                                                                                                                       |                 | Values in mm       |
|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|
|  <p>Valve guide bore in cylinder head</p>           | $\varnothing$   | 13.950 - 13.977    |
|                                                                                                                                       | $\alpha$        | $45^\circ \pm 20'$ |
|  <p>Valve seats</p>                                | L               | about 2.7          |
|                                                                                                                                       |                 |                    |
|  <p>Camshaft bearing housings in cylinder head</p> | $\varnothing_1$ | -                  |
|                                                                                                                                       | $\varnothing_2$ | -                  |
|                                                                                                                                       | $\varnothing_3$ | -                  |
|                                                                                                                                       | $\varnothing_4$ | -                  |
|                                                                                                                                       | L*              | -                  |
|  <p>Camshaft supports</p>                          | $\varnothing$   | 26.045 - 26.070    |
|                                                                                                                                       | L*              | 19.100 - 19.150    |
|  <p>Tappet housing</p>                             | $\varnothing$   | 37.000 - 37.025    |

(\*) Cap size



# Technical data

Engine: cylinder head and valve gear

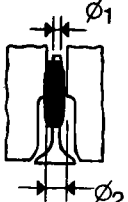
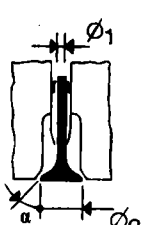
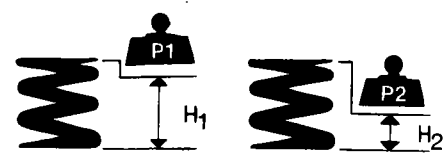
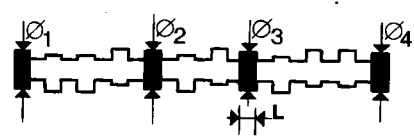
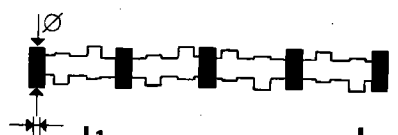
**Bravo-Brava**

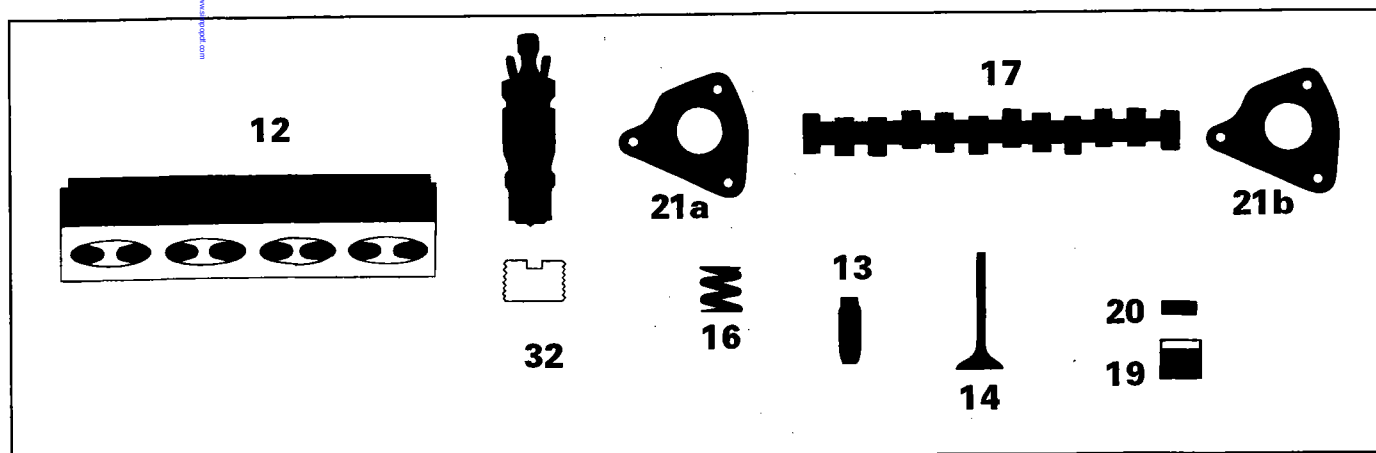
1998 range

00.10

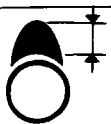
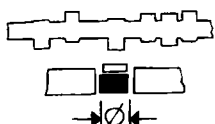


## DESCRIPTION

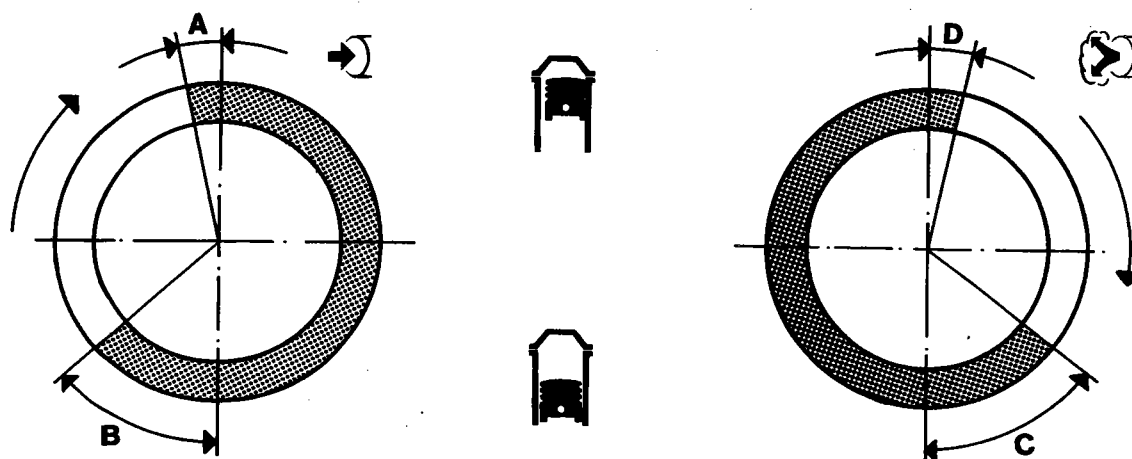
|                                                                                                |                                      |                                                                                                   | Values in mm       |
|------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|
| <b>13</b>     | Valve guide                          | $\varnothing_1$                                                                                   | 8.022 - 8.040      |
|                                                                                                |                                      | $\varnothing_2$                                                                                   | 14.010 - 14.030    |
|                                                                                                |                                      | $\varnothing_2$  | 0.05 - 0.10 - 0.25 |
| <b>13-12</b>  | Valve guide<br>Bore in cylinder head |                                                                                                   | 0.033 - 0.080      |
| <b>14</b>     | Valve                                | $\varnothing_1$                                                                                   | 7.974 - 7.992      |
|                                                                                                |                                      | $\varnothing_2$                                                                                   | 35.40 - 35.60      |
|                                                                                                |                                      | $\alpha$                                                                                          | 45°30' ± 15'       |
|                                                                                                |                                      | $\varnothing_1$                                                                                   | 7.974 - 7.992      |
|                                                                                                |                                      | $\varnothing_2$                                                                                   | 34.40 - 34.60      |
|                                                                                                |                                      | $\alpha$                                                                                          | 45°30' ± 5'        |
| <b>14-13</b>                                                                                   | Valve - Valve guide                  |                                                                                                   | 0.030 - 0.066      |
| <b>16</b>   | Valve spring                         | $P_1$                                                                                             | 36.69 - 39.63 daN  |
|                                                                                                |                                      | $H_1$                                                                                             | 36                 |
|                                                                                                |                                      | $P_2$                                                                                             | 55.91 - 60.82 daN  |
|                                                                                                |                                      | $H_2$                                                                                             | 26.5               |
| <b>17</b>   | Camshaft journals                    | $\varnothing_1$                                                                                   | -                  |
|                                                                                                |                                      | $\varnothing_2$                                                                                   | -                  |
|                                                                                                |                                      | $\varnothing_3$                                                                                   | -                  |
|                                                                                                |                                      | $\varnothing_4$                                                                                   | -                  |
|                                                                                                |                                      | L                                                                                                 | -                  |
|                                                                                                |                                      |                                                                                                   |                    |
|             |                                      | $\varnothing$                                                                                     | 26.000 - 26.015    |
|                                                                                                |                                      | L                                                                                                 | 23.10 - 23.70      |
|                                                                                                |                                      | L1                                                                                                | 19.25 - 19.30      |



### DESCRIPTION

|              |                                                                                     |                        |                                                                                     | Values in mm    |
|--------------|-------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------|-----------------|
| <b>17-12</b> |    |                        | radial                                                                              | 0.030 - 0.070   |
|              |                                                                                     |                        | axial                                                                               | 0.100 - 0.230   |
| <b>17</b>    |  | Cam lift               |  | 8.5             |
|              |                                                                                     |                        |  | 8.5             |
| <b>19</b>    |  | Tappet                 | Ø                                                                                   | 36.975 - 36.995 |
| <b>19-12</b> |  | Tappet - Cylinder head |                                                                                     | 0.005 - 0.050   |
| <b>20</b>    |  | Shim                   | $S \left( \begin{array}{c} \text{0.05} \end{array} \right)$                         | 3.25 - 4.90     |
| <b>17-20</b> |  | for timing<br>check    |  | 0.50            |
|              |                                                                                     |                        |  | 0.50            |
|              |                                                                                     |                        |  | 0.30 ± 0.05     |
|              |                                                                                     |                        |  | 0.35 ± 0.05     |

#### TIMING DIAGRAMS



P4A023A01

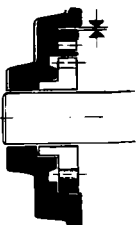
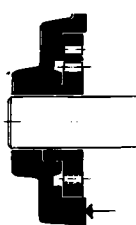
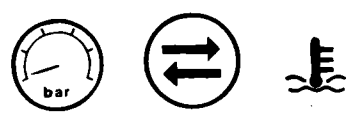
#### Timing angles

|          |         |                                                                                     |                  |     |
|----------|---------|-------------------------------------------------------------------------------------|------------------|-----|
| <b>A</b> | Inlet   |  | start before TDC | 0°  |
|          |         |                                                                                     | end after BDC    | 32° |
| <b>C</b> | Exhaust |  | start before BDC | 32° |
|          |         |                                                                                     | end after TDC    | 0°  |



**LUBRICATION**

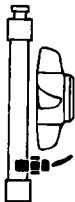
Values in mm

|                                                                                                                                            |                                                                 |  |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--|
| Engine lubrication system                                                                                                                  | forced circulation, via lobe pump with in-line cartridge filter |  |
| Oil pump                                                                                                                                   | lobe gears                                                      |  |
| Pump driven                                                                                                                                | by crankshaft                                                   |  |
| Oil pressure relief valve                                                                                                                  | built into front crankshaft cover                               |  |
|  between pump housing and driven gear                     | 0.080 - 0.186                                                   |  |
|  between the upper side of the gears and the pump cover | 0.025 - 0.056                                                   |  |
| Full flow filter                                                                                                                           | cartridge                                                       |  |
| Insufficient oil pressure sender unit                                                                                                      | electrical                                                      |  |
| <br>Operating pressure at temperature of 100°C          | 3.43 - 4.9 bar                                                  |  |
|  $P_1$                                                  | 6.27 - 7.06 daN                                                 |  |
| Oil pressure relief valve spring $H_1$                                                                                                     | 36                                                              |  |

**00.10**



**COOLING SYSTEM**

|                                                                                                                                |                                                                                                                              |                |           |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|
| Cooling circuit                                                                                                                | coolant circulation via centrifugal pump, radiator and two speed electrical fan controlled by engine management control unit |                |           |
| Water pump operation                                                                                                           | via belt                                                                                                                     |                |           |
|  <div>thermal switch for fan activation</div> |                                             | 1st speed      | 2nd speed |
|                                                                                                                                |                                                                                                                              | 93.5°C         | 99°C      |
|                                                                                                                                |                                             | 97°C           | 102.5°C   |
| Engine coolant thermostat                                                                                                      | opening begins                                                                                                               | 86° - 90°C     |           |
|                                                                                                                                | max opening                                                                                                                  | 101° - 105°C   |           |
|                                                                                                                                | valve travel                                                                                                                 | ≥9.5 mm        |           |
| Installation fit between blades of impeller and pump case                                                                      |                                           | 0.40 - 0.75 mm |           |
| Radiator tightness test pressure                                                                                               | 1 bar                                                                                                                        |                |           |
| Checking setting of outlet spring on supplementary expansion tank                                                              | 0.9 - 1.1 bar                                                                                                                |                |           |

**COMPONENTS OF BOSCH COMMON RAIL  
ELECTRONIC FUEL SYSTEM**



|                              |                     |
|------------------------------|---------------------|
| Control unit                 | Bosch 0.281.001.928 |
| Debimeter                    | Bosch 0.281.002.199 |
| Coolant temperature sensor   | Jaeger 402.183.01   |
| Diesel temperature sensor    | Bosch 0.281.002.209 |
| Rpm sensor                   | Bosch 0.281.002.214 |
| Timing sensor                | Bosch 0.281.002.213 |
| Turbocharger pressure sensor | Bosch 0.281.002.215 |
| Fuel pressure sensor         | Bosch 0.281.002.210 |
| Injector                     | Bosch 0.445.110.002 |
| Preheating control unit      | Bosch 0.281.003.215 |
| Glow plug                    | Bosch 0.250.202.028 |
| EGR solenoid                 | 46419651            |

# Technical data

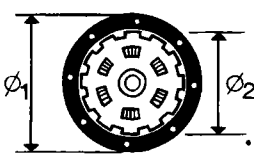
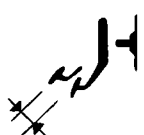
## Clutch

00.18

**Bravo-Brava**

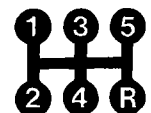
**1998 range**

|                                                                                       |                                                                                                   |                                                                                         |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  16v |  20v<br>STEP A |  JTD |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|

|                                                                                                                                                        |                                                                                   | Values in mm                                                                                                                                                                                             |           |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----|
| Type                                                                                                                                                   |                                                                                   |  <br>dry, single plate with bearing |           |     |
| Operating mechanism                                                                                                                                    |  | <br>diaphragm spring                                                                                                  |           |     |
| Spring loading                                                                                                                                         | daN                                                                               | 400                                                                                                                                                                                                      | 485       | 500 |
| <br>Lining                                                          | Ø <sub>1</sub>                                                                    | 190                                                                                                                                                                                                      | 230       | 230 |
|                                                                                                                                                        | Ø <sub>2</sub>                                                                    | 134                                                                                                                                                                                                      | 155       | 155 |
|  Distance between pedal in end of travel position and rest position |                                                                                   | 155 ±10                                                                                                                                                                                                  | 140 ±5    |     |
| Clutch release                                                                                                                                         |                                                                                   | mechanical                                                                                                                                                                                               | hydraulic |     |

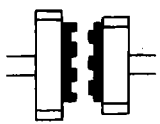
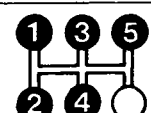
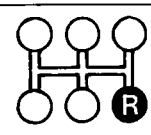
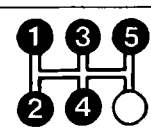
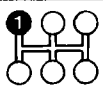
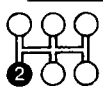
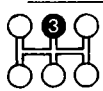
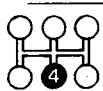
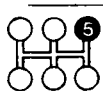
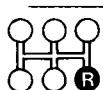


|                                                                                       |                                                                                                |                                                                                         |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  12v |  20v STEP A |  JTD |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|

|                                                                                     |
|-------------------------------------------------------------------------------------|
|  |
|-------------------------------------------------------------------------------------|

| Type | C.514.5.13 | C.510.5.21 | C.510.5.17 |
|------|------------|------------|------------|
|------|------------|------------|------------|

**GEARBOX**

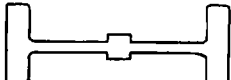
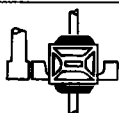
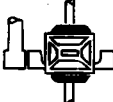
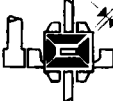
|                                                                                                                                                                                        |                                                                                                               |                                                                                       |       |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------|-------|
| <br>Synchronizers                                                                                     | elastic ring (Porsche type)  | -                                                                                     |       |       |
|                                                                                                                                                                                        | ring                         |    |       |       |
| <br>Gears                                                                                           | with narrow teeth          |  |       |       |
|                                                                                                                                                                                        | with helical teeth         |  |       |       |
|  <br>Gear ratios |                            | 3.909                                                                                 | 3.545 | 3.909 |
|                                                                                                                                                                                        |                            | 2.158                                                                                 | 2.238 | 2.238 |
|                                                                                                                                                                                        |                            | 1.345<br>1.480*                                                                       | 1.520 | 1.444 |
|                                                                                                                                                                                        |                            | 0.974<br>1.121*                                                                       | 1.156 | 1.029 |
|                                                                                                                                                                                        |                            | 0.829<br>0.891*                                                                       | 0.970 | 0.767 |
|                                                                                                                                                                                        |                            | 3.818                                                                                 | 3.909 | 3.909 |

(\*) 5D version (Brava)

00.21-27

### DIFFERENTIAL

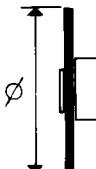
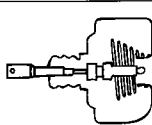
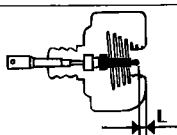
|                                                                                       |                                                                                                   |                                                                                         |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  16v |  20v<br>STEP A |  JTD |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|

|                                                                                     |                                                                                                                |                                                                                               |                  |                                                                        |                                                                                                      |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|    |                               | Spur gear and pinion set ratio                                                                | 3.887<br>(15/58) | 3.353<br>(17/57)                                                       | 3.053<br>(19/58)                                                                                     |
|    |                               |              | 15.115           | 11.886                                                                 | 11.933                                                                                               |
|                                                                                     |                                                                                                                |              | 8.344            | 7.504                                                                  | 6.832                                                                                                |
|                                                                                     |                                                                                                                |              | 5.200<br>5.753*  | 5.096                                                                  | 4.408                                                                                                |
|                                                                                     |                                                                                                                |              | 3.766<br>4.357*  | 3.876                                                                  | 3.141                                                                                                |
|                                                                                     |                                                                                                                |              | 3.205<br>3.463*  | 3.252                                                                  | 2.341                                                                                                |
|                                                                                     |                                                                                                                |             | 14.763           | 13.107                                                                 | 11.933                                                                                               |
|  | <br>taper roller bearings |                                                                                               |                  |                                                                        |                                                                                                      |
|  | <br>using shims           |                                                                                               |                  |                                                                        |                                                                                                      |
|  |                             |  mm        | 0.05<br>0.10     | -<br>2.00 - 3.00                                                       | 1.70 - 2.60<br>-                                                                                     |
|  | Interference to obtain exact bearing pre-loading                                                               |                                                                                               | mm               | bearings not pre-loaded = 0.12<br>bearings pre-loaded (350 dan) = 0.08 |                                                                                                      |
|  | Differential-planet gear backlash                                                                              |                                                                                               | mm               | ≤ 0.10                                                                 |                                                                                                      |
|  | Adjusting differential-planet gear backlash                                                                    |                                                                                               |                  | no adjustment necessary                                                | <br>using shims |
|  |                             |  (0.05) mm | -                | 0.80 - 1.25                                                            |                                                                                                      |

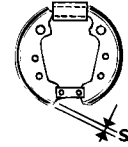
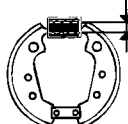
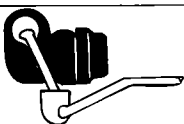
(\*) 5D version (Brava)

|                                                                                       |                                                                                                   |                                                                                         |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  16v |  20v<br>STEP A |  JTD |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|

### FRONT BRAKES

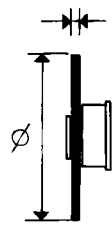
|                                                                                     |  |                                                                          |                                                                                                                                                                                            |     |                                                   |                                                      |                                                   |
|-------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------|------------------------------------------------------|---------------------------------------------------|
|    |  | Disc                                                                     | S {<br><br><br>< Allowed | Ø   | 257                                               | 283.8 - 284.2                                        | 257                                               |
|                                                                                     |  |                                                                          |                                                                                                                                                                                            |     | 11.80 - 12.10                                     | 21.90 - 22.10                                        | 19.80 - 20.10                                     |
|                                                                                     |  |                                                                          |                                                                                                                                                                                            |     | 11.10                                             | 20.55                                                | 18.55                                             |
|                                                                                     |  |                                                                          |                                                                                                                                                                                            |     | 10.20                                             | 20.20                                                | 18.20                                             |
|    |  | Brake pads                                                               | S < Allowed                                                                                                                                                                                | 1.5 |                                                   |                                                      |                                                   |
|    |  | Caliper                                                                  |                                                                                                                                                                                            | Ø   | 54                                                |                                                      |                                                   |
|    |  | Master cylinder (pump)                                                   |                                                                                                                                                                                            | Ø   | 22.225 (7/8")                                     | 23.81 (15/15")                                       | 22.225 (7/8")                                     |
|  |  | Brake servo                                                              |                                                                                                                                                                                            |     | Iso-Vac 8" vacuum servo acting on all four wheels | ISO-VAC 8"+7" vacuum servo acting on all four wheels | Iso-Vac 8" vacuum servo acting on all four wheels |
|  |  | Distance of hydraulic piston push rod from master cylinder support plate |                                                                                                                                                                                            | L   | 22.45 - 22.65                                     |                                                      |                                                   |

### REAR BRAKES

|                                                                                     |                          |     |                                                                                     |                                    |     |                       |
|-------------------------------------------------------------------------------------|--------------------------|-----|-------------------------------------------------------------------------------------|------------------------------------|-----|-----------------------|
|  | Drum                     | S { |                                                                                     | 203.10-203.40<br>180.00-180.25 (*) | -   | 203.10-203.40         |
|                                                                                     |                          |     |  | 180.95                             | -   | 204.10                |
|                                                                                     |                          |     | > allowed                                                                           | 181.35                             | -   | 204.70                |
|  | Shoes                    | S   | < allowed                                                                           | -                                  | 1.5 | -                     |
|  | Cylinders                | Ø   |                                                                                     | 22.00                              | -   | 22.00                 |
|  | Load proportioning valve |     |                                                                                     | acting on rear wheels              | -   | acting on rear wheels |
|                                                                                     | Ratio (reduction)        |     |                                                                                     | 0.36                               | -   | 0.36                  |

(\*) Version without ABS

00.33

|                                                                                              |               |  16v |  20v<br>STEP A |  JTD |
|----------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| REAR BRAKES                                                                                  |               | Values in mm                                                                          |                                                                                                   |                                                                                         |
|  Disc       | $\varnothing$ | -                                                                                     | 240                                                                                               | -                                                                                       |
|                                                                                              |               | -                                                                                     | 10.80 - 11.10                                                                                     | -                                                                                       |
|                                                                                              |               | -                                                                                     | 10.10                                                                                             | -                                                                                       |
|                                                                                              |               | < Allowed                                                                             | 9.20                                                                                              | -                                                                                       |
|  Brake pads | $S$ < Allowed | -                                                                                     | 1.5                                                                                               | -                                                                                       |
|  Caliper    | $\varnothing$ | -                                                                                     | 34                                                                                                | -                                                                                       |

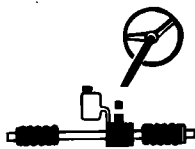
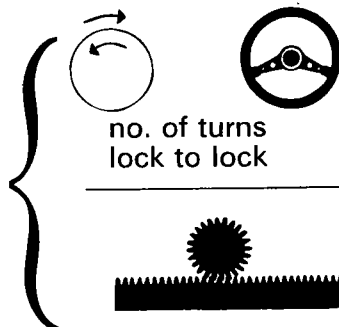
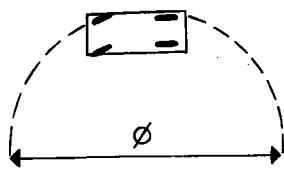
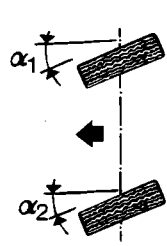
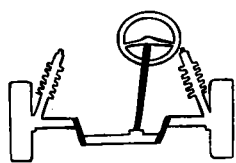
### LOAD PROPORTIONING VALVE Adjustment figures

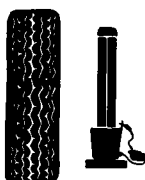
| Vehicle      | Engine type                                                                                                                                                                     | Weight<br>in luggage compart-<br>ment | Load to be<br>applied |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------|
|              |                                                                                                                                                                                 | kg                                    | daN                   |
| <b>Bravo</b> |  16v  16v | 94<br>85.5*                           | 5.5                   |
| <b>Brava</b> |  16v  16v | 64<br>55*                             | 5.5                   |
| <b>Bravo</b> |  16v                                                                                         | 85.5<br>75*                           | 5.5                   |
| <b>Brava</b> |  16v                                                                                         | 55<br>46*                             | 5.5                   |
| <b>Bravo</b> |  TD75 ; TD100 ; JTD                                                                          | 85.5<br>66* ●                         | 5.5                   |
| <b>Brava</b> |  TD75 ; TD100 ; JTD                                                                          | 64<br>46* ●                           | 5.5                   |
| <b>Bravo</b> |  20v                                                                                         | 85.5<br>75*                           | 4                     |

(\*) Weight to be applied for vehicles complete with all accessories

(●) Weights referring to 1910 TD 100 and 1910 JTD versions only

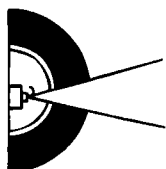
| ENGINE |  16v |  20v<br>STEP A |  JTD |
|--------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|--------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|

|                                                                                                        |                                                                                                                                                                                                                     |               |             |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|
| Type                                                                                                   | <br>rack and pinion power assisted                                                                                               |               |             |
| Ratio                                                                                                  | <br><br>no. of turns lock to lock<br>rack travel | 3             | 142 ±1.5 mm |
| <br>Turning circle  | 10.4 m                                                                                                                                                                                                              |               |             |
| <br>Steering angle  | <br>offside wheel $\alpha_1$                                                                                                     | 31° 30' ±30'  |             |
|                                                                                                        | <br>nearside wheel $\alpha_2$                                                                                                    | 38° 15' ± 30' |             |
| <br>Steering column | <br>with 2 universal joints                                                                                                    |               |             |

| ENGINE                                                                                                                   | <br>Wheel rim type | <br>Tubeless tyre<br>radial tread, type | <br>Tyre<br>pressure<br>in bars |              |                 |              |
|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------|-----------------|--------------|
|                                                                                                                          |                                                                                                     |                                                                                                                          | Front                                                                                                              |              | Rear            |              |
|                                                                                                                          |                                                                                                     |                                                                                                                          | average<br>load                                                                                                    | full<br>load | average<br>load | full<br>load |
|  16v <b>Brava</b><br><br><b>Bravo</b>   | 5½J×14" -37<br>6J×14" -43<br>6J×15" -40                                                             | 175/65 R14 82T<br>175/65 R14 82H<br>185/55 R14 81H                                                                       | 2.2                                                                                                                | 2.3          | 2.2             | 2.5          |
|                                                                                                                          | 5½J×14" -37                                                                                         | 175/65 R14 82H                                                                                                           |                                                                                                                    |              |                 |              |
|  20v <b>Bravo</b><br><br><b>STEP A</b>  | 6J×15" -49<br>6J×15" -49                                                                            | 195/55 R15 84V<br>205/50 ZR15 (■)                                                                                        | 2.5                                                                                                                | 2.7          | 2.2             | 2.4          |
|  JTD <b>Brava</b><br><br><b>Bravo</b> | 6J×15" -40<br>5½J×14" -37<br>6J×14" -43                                                             | 185/55 R15 81H<br>185/60 R14 82H<br>185/60 R14 82H                                                                       | 2.3                                                                                                                | 2.3          | 2.2             | 2.5          |
|                                                                                                                          | 6J×15" -40<br>6J×14" -43                                                                            | 185/55 R15 81H<br>185/60 R14 82H                                                                                         |                                                                                                                    |              |                 |              |
| SPARE WHEEL (*)                                                                                                          | 4B×14" -43<br>4B×15" -35                                                                            | 105/70 R14 84M<br>115/70 R15 90M                                                                                         | 4,2                                                                                                                |              |                 |              |

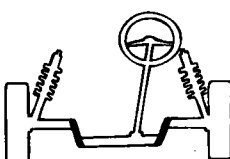
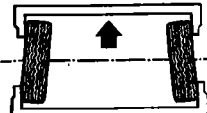
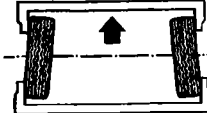
(\*) Speed limit: 80 km/h

(■) Do not fit chains because they could foul against the wheel arch



unladen car (■)

**WHEEL GEOMETRY**

|                                                                                                        |                                                                                                                |                                                       |
|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <br>Front suspension  | <br>camber (**)               | $-7' \pm 30'$<br>$-33' \pm 30'$ (only for Bravo 1998) |
|                                                                                                        | <br>caster (**)               | $2^{\circ}50' \pm 30'$                                |
|                                                                                                        | <br>toe-in                    | $-1 - 1 \text{ mm}$                                   |
|                                                                                                        | <br>front wheel offset      | $0^{\circ}$                                           |
| <br>Rear suspension | <br>camber (**)             | $-0^{\circ}46' \pm 30'$                               |
|                                                                                                        | <br>toe-in (**)             | $0 - 4$                                               |
|                                                                                                        | <br>rear wheel thrust angle | $0^{\circ}$                                           |

(\*\*) Angles cannot be adjusted

(■) With tyres inflated to the correct pressure and vehicle in running order with 5 litres of fuel

(▲) Non-adjustable angles, used for correct vehicle alignment



# Technical data

## Front suspension

**Bravo-Brava**

**1998 range**

**00.44**

**Front suspension** independent wheel, MacPherson type with forged steel wishbones anchored to a subframe. Offset coil springs and double-acting telescopic dampers. Anti-roll torsion bar.

### Coil springs

| ENGINE                                                                  |                                        |  16v |  20v<br>STEP A |  JTD |
|-------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Diameter of wire                                                        | mm                                     | 12.2±0.05                                                                             | 13.2 ± 0.05                                                                                       | 12.7 ± 0.05<br>(12.9 ± 0.05)*                                                           |
| Number of turns                                                         |                                        | 3.75                                                                                  |                                                                                                   |                                                                                         |
| Direction of coil                                                       |                                        | clockwise                                                                             |                                                                                                   |                                                                                         |
| Height of spring released                                               | mm                                     | 449.2 (461)*                                                                          | 404.5 (419.6)*                                                                                    | 454 (449)*                                                                              |
| Spring height under a load of:                                          | 303 - 335 daN<br>(320.5 - 346.5 daN)*  | mm                                                                                    | 192                                                                                               | -                                                                                       |
|                                                                         | 340 - 368 daN<br>(352 - 382 daN)*      | mm                                                                                    | -                                                                                                 | -                                                                                       |
|                                                                         | 344 daN<br>(369 daN)*                  | mm                                                                                    | -                                                                                                 | 192                                                                                     |
|                                                                         | 352 ± 382 daN<br>(366 ± 396 daN)*      | mm                                                                                    | -                                                                                                 | 192                                                                                     |
| The springs are subdivided into two categories, identifiable by a mark: |                                        |                                                                                       |                                                                                                   |                                                                                         |
| yellow (1) springs loaded to:                                           | 319 daN<br>(333.5 daN)* a height of mm |                                                                                       | > 192                                                                                             | -                                                                                       |
|                                                                         | 354 daN<br>(367 daN)* a height of mm   |                                                                                       | -                                                                                                 | -                                                                                       |
|                                                                         | 344 daN<br>(369.2 daN)* a height of mm |                                                                                       | -                                                                                                 | > 192                                                                                   |
|                                                                         | 367 daN<br>(381 daN)* height of mm     |                                                                                       | -                                                                                                 | -                                                                                       |
| green (1) springs loaded to:                                            | 319 daN<br>(333.5 daN)* a height of mm |                                                                                       | ≤ 192                                                                                             | -                                                                                       |
|                                                                         | 354 daN<br>(367 daN)* a height of mm   |                                                                                       | -                                                                                                 | -                                                                                       |
|                                                                         | 344 daN<br>(369 daN)* a height of mm   |                                                                                       | -                                                                                                 | ≤ 192                                                                                   |
|                                                                         | 367 daN<br>(381 daN)* height of mm     |                                                                                       | -                                                                                                 | ≤ 192                                                                                   |

(1) Springs of the same category must be fitted together.

(\*) For vehicles with air conditioner.

### Shock absorbers

|                                                            |    |             |
|------------------------------------------------------------|----|-------------|
| Type: telescopic, double-acting<br>(low pressure gas type) |    | WAY-ASSAUTO |
| Open (damping starts)                                      | mm | 518 ± 2.5   |
| Closed (steel against steel)                               | mm | 361 ± 2.5   |
| Stroke                                                     | mm | 157         |

### Stabilizer bar

|                            |    |    |
|----------------------------|----|----|
| Diameter of stabilizer bar | mm | 23 |
|----------------------------|----|----|

**Rear suspension** independent with ductile cast iron tie rods. Coil springs and dampers with vulcanised bushes. Anti-roll torsion bar. Rigid H-shaped subframe consisting of one transverse tubular element and two moulded rails fastened to it.

| VERSIONS | BRAVO<br> 16v  | BRAVO<br> | BRAVA<br>  |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Coil spring

|                                                                         |                                  |                           |           |           |
|-------------------------------------------------------------------------|----------------------------------|---------------------------|-----------|-----------|
| Diameter of wire                                                        | mm                               | 11.5±0.05<br>(11.9±0.05)* | 11.8±0.05 | 11.9±0.05 |
| Number of turns                                                         |                                  | 4.75(5)*                  | 4.5       | 5         |
| Direction of coil                                                       |                                  | clockwise                 |           |           |
| Height of spring released                                               | mm                               | 311 (309)*                | 297       | 309       |
| Spring height under load of:                                            | 270 - 298 daN<br>(286- 316 daN)* | mm                        | 194       | -         |
|                                                                         | 275 - 303 daN                    | mm                        | -         | 194       |
|                                                                         | 286 - 316 daN                    | mm                        | -         | 194       |
| The springs are subdivided into two categories, identifiable by a mark: |                                  |                           |           |           |
| yellow (1) springs loaded to:                                           | 284 daN<br>(301 daN)*            | height of mm              | >194      | -         |
|                                                                         | 289 daN                          | height of mm              | -         | >194      |
|                                                                         | 301 daN                          | height of mm              | -         | >194      |
| green (1) springs loaded to:                                            | 284 daN<br>(301 daN)*            | height of mm              | ≤194      | -         |
|                                                                         | 289 daN                          | height of mm              | -         | ≤194      |
|                                                                         | 301 daN                          | height of mm              | -         | ≤194      |

(1) Springs of the same category must be fitted together

(\*) For 1910 JTD cars with air conditioning.

### Shock absorbers

|                                                            |    |             |         |           |
|------------------------------------------------------------|----|-------------|---------|-----------|
| Type: telescopic, double-acting<br>(low pressure gas type) |    | WAY-ASSAUTO |         |           |
| Open (damping starts)                                      | mm | 322.5 ± 2   | 312 ± 2 | 322.5 ± 2 |
| Closed (steel against steel)                               | mm | 223 ± 2     | 223 ± 2 | 223 ± 2   |
| Stroke                                                     | mm | 99.5        | 89      | 99.5      |

### Stabilizer bar

|                            |    |    |
|----------------------------|----|----|
| Diameter of stabilizer bar | mm | 17 |
|----------------------------|----|----|

# 00.55



|                          |                                                                       |                                                                         |
|--------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------|
| <b>STARTER MOTOR</b>     | M. Marelli E80E-12V-0,9KW                                             | M. Marelli<br>M70R-12V-1,4kW<br>(with reduction unit)                   |
| <b>ALTERNATOR</b>        | M. Marelli<br>A115I-14V-38/65A<br>M. Marelli<br>A115IM-14V-50/90A (●) | M. Marelli<br>A127IR-14V-50/80A<br>M. Marelli<br>A127IR-14V-55/100A (●) |
| <b>VOLTAGE REGULATOR</b> | BUILT IN ELECTRONIC                                                   |                                                                         |
| <b>BATTERY</b>           | 12V-40Ah-200A<br>12V-50Ah-250A*                                       | 12V-50Ah-250A                                                           |
| <b>IGNITION SYSTEM</b>   | Built-in electronic<br>injection-ignition<br>MPI Bosch M 1.5.5        | Built-in electronic<br>injection-ignition<br>MPI Bosch Motronic ME 3.1  |
| <b>IGNITION COIL</b>     | Bosch<br>0.221.503.407                                                | Bosch<br>0.221.504.014                                                  |
| <b>SPARK PLUGS</b>       | NGK RDCPR 8EKC<br>CHAMPION RA4HCX                                     | CHAMPION RC8BY                                                          |

(●) For vehicles with air conditioner

(\*) For cars equipped with alarm system



|                                                                   |                                                                                           |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>STARTER MOTOR</b>                                              | BOSCH DIAM 78,5 - 12V - 2,0 kW<br>M. Marelli M70R - 12V - 1.8 kW<br>(with reduction unit) |
| <b>ALTERNATOR</b>                                                 | M. Marelli<br>A 127IR - 14V - 55/100A                                                     |
| <b>VOLTAGE REGULATOR</b>                                          | Built in electronic                                                                       |
| <b>BATTERY</b>                                                    | 12V - 60 Ah - 380A                                                                        |
| <b>PRE-HEATING ELECTRONIC<br/>CONTROL UNIT</b>                    | BOSCH 0.281.003.215                                                                       |
| <b>ELECTRONIC CONTROL UNIT<br/>ENGINE FUEL SYSTEM<br/>CONTROL</b> | N.D.                                                                                      |
| <b>GLOW PLUGS</b>                                                 | BOSCH 0.250.202.028                                                                       |

# Technical data

## Electrical equipment: starting

### 00.55

**Bravo-Brava**  
1998 range

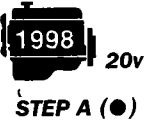
#### STARTER MOTOR

|                                                                                       |                                                                                                 |                                                                                         |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  16v |  20v<br>STEP A |  JTD |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|

|                                   |      |                              |                                                        |                                                            |                                                 |           |
|-----------------------------------|------|------------------------------|--------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------|-----------|
| Type                              |      | M. Marelli<br>E80-12V-0.9 kW | M. Marelli<br>M70R-12V-1.4 kW<br>(with reduction unit) | BOSCH DIAM 78.5<br>- 12V - 2.0 kW<br>(with reduction unit) | M. Marelli<br>M70R-12V-1.8 kW<br>(with gearing) |           |
| Voltage                           | V    | unit) 12                     |                                                        |                                                            |                                                 |           |
| Power rating                      | kW   | 0.9                          | 1.4                                                    | 2.0                                                        | 1.8                                             |           |
| Rotation, pinion side             |      | clockwise                    |                                                        |                                                            |                                                 |           |
| No. of poles                      |      | 4                            |                                                        | 6                                                          | 4                                               |           |
| Field coil                        |      | in line                      |                                                        | permanent magnets                                          | in-line-parallel                                |           |
| Engagement                        |      | free wheel                   |                                                        |                                                            |                                                 |           |
| Operation                         |      | solenoid                     |                                                        |                                                            |                                                 |           |
| End float of armature shaft       | mm   | 0.1 - 0.5                    |                                                        |                                                            |                                                 |           |
| <b>Data for bench test</b>        |      |                              |                                                        |                                                            |                                                 |           |
| Operating test (*):               |      |                              |                                                        |                                                            |                                                 |           |
| current                           | A    | 180 (200)                    | 360 . 380                                              | 500                                                        | 400                                             |           |
| speed                             | rpm  | 1720 (2200)                  | 1150                                                   | 1950                                                       | 1400                                            |           |
| voltage                           | V    | 9.5 (9.8-10)                 | 8.15                                                   | 7.30                                                       | 9.60                                            |           |
| torque developed                  | daNm | 0.37 (0.38)                  | 1.30                                                   | 1.30                                                       | 1.40                                            |           |
| Engagement test (*):              |      |                              |                                                        |                                                            |                                                 |           |
| current                           | A    | 324 (440)                    | 680 - 700                                              | 1200                                                       | 1100-1150                                       |           |
| voltage                           | V    | 7.1 (7.6)                    | 4.9                                                    | 5.5                                                        | 4.4 - 4.6                                       |           |
| torque developed                  | daNm | ≥0.97 (≥1.25)                | 3.11                                                   | 3.0                                                        | 5.0                                             |           |
| Free running test (*):            |      |                              |                                                        |                                                            |                                                 |           |
| current                           | A    | 40 (44-48)                   | 60 - 80                                                | 70 - 80                                                    | 120 - 140                                       |           |
| Voltage                           | V    | 11.4 (11.4-11.5)             | 4.9                                                    | 11.5                                                       | 11                                              |           |
| speed                             | rpm  | 8500 - 9000<br>(11400-12300) | 4040                                                   | 5450 - 5750                                                | 4750 - 5000                                     |           |
| <b>Relay</b>                      |      |                              |                                                        |                                                            |                                                 |           |
| Winding resistance (*)            | {    | pull in Ω                    | 0.30-0.32<br>(0.32)                                    | 0.33 - 0.37                                                | 0.4                                             | 0.30-0.37 |
|                                   |      | hold in Ω                    | 1.2-1.3 (1.09)                                         | 1.13 - 1.27                                                | 1.7                                             | 1.2-1.3   |
| <b>Lubrication</b>                |      |                              |                                                        |                                                            |                                                 |           |
| Internal splines and shaft bushes |      | VS* SAE 10 W                 |                                                        |                                                            |                                                 |           |
| Sleeve and intermediate disc      |      | TUTELA MR3                   |                                                        |                                                            |                                                 |           |

(\*) Data measured at environmental temperature of 20°C.

**NOTE** The insulation between commutator segments need not be lowered during service.

|                                                                                   |                                                                                    |                                                                                     |                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | <br> |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# **ALTERNATOR**

| Type                                                      | M.Marelli<br>A115I-14V-38/65A | M.Marelli<br>A115IM - 14V-<br>50/90A | M. Marelli<br>A127IR - 14V-<br>50/85A | M. Marelli<br>A127IR - 14V-<br>55/100A |     |
|-----------------------------------------------------------|-------------------------------|--------------------------------------|---------------------------------------|----------------------------------------|-----|
| Voltage rating                                            | V                             | 14                                   |                                       |                                        |     |
| Maximum current                                           | A                             | 65                                   | 93                                    | 85                                     | 105 |
| Current rating at<br>1800 rpm                             | rpm                           | 38                                   | 50                                    | 50                                     | 55  |
| Current rating at<br>6000 rpm                             | A                             | 65                                   | 93                                    | 85                                     | 105 |
| Field winding resistance<br>between the slip rings<br>(*) | Ω                             | 2.4                                  | 2.23                                  | 2,6                                    |     |
| Direction of rotation<br>(seen from drive side)           | clockwise                     |                                      |                                       |                                        |     |
| Diode rectifiers                                          | preconstituted bridge         |                                      |                                       |                                        |     |

(\*) Data measured at environmental temperature of 20°C.

(●) For vehicles with air conditioner

# **VOLTAGE REGULATOR**

|                                  |     | Built in electronic |           |
|----------------------------------|-----|---------------------|-----------|
| Type                             |     | RTM 151 A           | RTM 151 B |
| Alternator speed for<br>test     | rpm | 6000                |           |
| Thermal stabilization<br>current | A   | -                   |           |
| Test current                     | A   | -                   |           |
| Regulation voltage (*)           | V   | 14.05 - 14.35       |           |

(\*) Data measured at environmental temperature of 23°C.

# Technical data

Electrical equipment: electronic injection-ignition

**Bravo-Brava**

1998 range

**00.55**

## INTEGRATED ELECTRONIC INJECTION-IGNITION CONTROL MODULE



|              |                     |
|--------------|---------------------|
| Type         | Bosch 0.261.204.578 |
| Firing order | 1 - 3 - 4 - 2       |

## COIL WITH 4 HIGH TENSION OUTLETS

|                                                    |               |
|----------------------------------------------------|---------------|
| Type                                               | Bosch         |
| Code                                               | 0.221.503.407 |
| Ohmic resistance of primary winding at 20°C    Ω   | 0.45 - 0.55   |
| Ohmic resistance of secondary winding at 20°C    Ω | 12000 - 14600 |

## TOP DEAD CENTRE AND RPM SENSOR

|                                                                    |                     |
|--------------------------------------------------------------------|---------------------|
| make and type                                                      | Bosch 0.281.210.124 |
| Sensor winding resistance at 20° C    Ω                            | 486 - 594           |
| Distance (gap) between sensor and tooth of crankshaft pulley    mm | 0.8 - 1.5           |

## ADVANCE ON ENGINE

|                                   |      |
|-----------------------------------|------|
| With engine idling (850 ± 50 rpm) | N.A. |
|-----------------------------------|------|

## SPARK PLUGS

|                     |                                  |
|---------------------|----------------------------------|
| Make and type       | NGK RDCPR8EKC<br>CHAMPION RA4HCX |
| Thread              | M 14×1.25                        |
| Electrode gap    mm | 0.8                              |



**INTEGRATED ELECTRONIC INJECTION - IGNITION SYSTEM**

20v STEP A

|              |                     |
|--------------|---------------------|
| Type         | Bosch 0.261.204.271 |
| Firing order | 1 - 2 - 4 - 5 - 3   |

**IGNITION COIL (1 FOR SPARK PLUG)**

|                                                        |               |
|--------------------------------------------------------|---------------|
| Type                                                   | Bosch         |
| Code                                                   | 0.221.504.014 |
| Ohmic resistance of primary winding at 20°C $\Omega$   | 0,4           |
| Ohmic resistance of secondary winding at 20°C $\Omega$ | 8500          |

**TOP DEAD CENTRE AND RPM SENSOR**

|                                                   |                     |
|---------------------------------------------------|---------------------|
| Make and type                                     | Bosch 0.261.210.160 |
| Sensor winding resistance at 20 °C $\Omega$       | 774 - 946           |
| Gap between sensor and crankshaft pulley teeth mm | 0.8 - 1.5           |

**KNOCK SENSOR**

|      |               |
|------|---------------|
| Type | Bosch         |
| Code | 0.261.231.131 |

**SPARK PLUGS**

|                  |                |
|------------------|----------------|
| Make and type    | CHAMPION RC8BY |
| Thread           | M 14×1.25      |
| Electrode gap mm | 0.8            |

# Technical data

Electrical equipment: electronic injection

**Bravo-Brava**

1998 range

**00.55**

## BOSCH COMMON RAIL ELECTRONIC FUEL SYSTEM



|                          |               |
|--------------------------|---------------|
| Type                     | Bosch EDC15C  |
| Spontaneous firing order | 1 - 3 - 4 - 2 |

## PREHEATING CONTROL UNIT

|      |               |
|------|---------------|
| Type | Bosch         |
| Code | 0.281.003.215 |

## TOP DEAD CENTRE AND RPM SENSOR

|                                                   |                     |
|---------------------------------------------------|---------------------|
| Make and type                                     | Bosch 0.281.002.214 |
| Sensor winding resistance at 20 °C $\Omega$       | 774 - 946           |
| Gap between sensor and crankshaft pulley teeth mm | 0.8 - 1.5           |

## TIMING SENSOR

|      |               |
|------|---------------|
| Type | Bosch         |
| Code | 0.281.002.213 |

## GLOW PLUGS

|                                         |                     |
|-----------------------------------------|---------------------|
| Make and type                           | Bosch 0.250.202.028 |
| Engine attachment thread                | M 12 $\times$ 1.25  |
| Electrical resistant at 20°C m $\Omega$ | 700                 |

| Tool number | TOOL DESCRIPTION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                  |  16v |  20v<br>STEP A |  JTD |

**ENGINE**

|                   |                                                                          |   |   |   |
|-------------------|--------------------------------------------------------------------------|---|---|---|
| <b>1806149001</b> | Fuel consumption tester                                                  | ● |   |   |
| <b>1820225000</b> | Stand for removing and refitting power unit                              | ● |   |   |
| <b>1822144000</b> | Oil sump removal wrench                                                  |   |   | ● |
| <b>1822145000</b> | Oil sump removal wrench                                                  |   |   | ● |
| <b>1850132000</b> | Wrench (13 mm) with 1/2" fitting for removing intake manifold fastenings |   | ● |   |
| <b>1850184000</b> | Wrench for removing/refitting spark plugs                                |   | ● |   |
| <b>1850193000</b> | Spark plug wrench                                                        | ● |   |   |
| <b>1852154000</b> | Wrench, with 1/2" fitting, for cylinder head bolts                       |   | ● | ● |
| <b>1852159000</b> | Wrench for removing/refitting belt tensioner                             |   | ● |   |
| <b>1852161000</b> | Wrench for variable valve timing                                         |   | ● |   |
| <b>1852162000</b> | Alternator pulley wrench                                                 |   | ● |   |
| <b>1860183000</b> | Pliers (Ø 75-110) for removing and refitting piston rings                | ● | ● | ● |
| <b>1860313000</b> | Installer for fitting oil seal to valve guide                            | ● | ● |   |
| <b>1860313002</b> | Drift for press-fitting oil seal to valve guide                          |   |   | ● |
| <b>1860395000</b> | Drift for valve guide removal                                            | ● | ● |   |
| <b>1860395001</b> | Drift for removing valve guide                                           |   |   | ● |
| <b>1860443000</b> | Pressure lever                                                           |   |   | ● |

## 00.A

| Tool number | TOOL DESCRIPTION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                  |  16v |  20v<br>STEP A |  JTD |

|                   |                                                                                                                       |   |   |   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------|---|---|---|
| <b>1860470000</b> | Tool for retaining cylinder head during overhaul                                                                      | ● | ● | ● |
| <b>1860490000</b> | Fixture to retain valve tightness test device 1895868000 (to be used with 1860470000))                                | ● |   |   |
| <b>1860592000</b> | Universal hook, power plant lifting and handling                                                                      | ● |   |   |
| <b>1860644000</b> | Extractor for half-cones, cups, springs and valves                                                                    |   |   | ● |
| <b>1860700000</b> | Collar (∅ 60-125 mm) for fitting normal and oversized pistons in cylinders                                            | ● | ● |   |
| <b>1860724000</b> | Tool to hold tappets for replacing plates while adjusting valve clearance (to be used with 1860443000)                |   |   | ● |
| <b>1860744000</b> | Tool for turning crankshaft (at bench)                                                                                | ● |   |   |
| <b>1860790000</b> | Tool for removing springs, cups, half-cones and valves (use with 1860786000 - 1860787000 - 1860788000 and 1860877000) | ● |   |   |
| <b>1860812000</b> | Tool for fitting valve guide                                                                                          |   | ● | ● |
| <b>1860813000</b> | Guide for fitting oil seal to valve guide                                                                             |   | ● | ● |
| <b>1860814000</b> | Installer for applying oil seal to valve guide                                                                        |   |   | ● |
| <b>1860815000</b> | Adaptor for turning crankshaft                                                                                        | ● | ● | ● |
| <b>1860816000</b> | Drift for fitting oil pump gasket                                                                                     |   | ● | ● |
| <b>1860817000</b> | Tool for locating cover gasket on crankshaft                                                                          |   | ● |   |
| <b>1860818000</b> | Camshaft timing tools                                                                                                 |   | ● |   |
| <b>1860821000</b> | Tool for removing small end bush                                                                                      |   | ● |   |
| <b>1860821000</b> | Tool for removing/fitting small end bush                                                                              |   |   | ● |

| Tool number | TOOL DESCRIPTION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                  |  16v |  20v<br>STEP A |  JTD |

|                   |                                                                                |   |   |   |
|-------------------|--------------------------------------------------------------------------------|---|---|---|
| <b>1860822000</b> | Oil pump timing adjustment tool                                                |   | ● |   |
| <b>1860824000</b> | Tool for fitting camshaft seal                                                 |   | ● |   |
| <b>1860831000</b> | Wrench for timing pulley                                                       | ● |   |   |
| <b>1860833000</b> | Hexagonal, splined wrench for removing-refitting oil sump                      |   | ● |   |
| <b>1860834000</b> | Hexagonal, splined wrench for removing-refitting oil sump                      | ● | ● |   |
| <b>1860835000</b> | Extractor for removing oil seal on valve guide                                 |   | ● |   |
| <b>1860836000</b> | Tool for preventing crankshaft from turning                                    |   | ● |   |
| <b>1860846000</b> | Tool to hold flywheel (operations at bench)                                    | ● |   | ● |
| <b>1860854000</b> | Pressure pump pulley extractor                                                 |   |   | ● |
| <b>1860859000</b> | Adaptor for removing-refitting power unit (use with 1860859000 and 1860860000) |   | ● |   |
| <b>1860860000</b> | Support for removing-refitting power unit                                      |   | ● |   |
| <b>1860877000</b> | Tool for dismantling and reassembling half-cones, cups, springs and valves     | ● |   |   |
| <b>1860879000</b> | Universal handle                                                               | ● |   |   |
| <b>1860881000</b> | Tool for fitting rear crankshaft cover                                         | ● |   |   |
| <b>1860893000</b> | Fuel pump cover wrench                                                         | ● | ● | ● |
| <b>1860898000</b> | Flywheel retainer (on vehicle)                                                 |   | ● |   |
| <b>1860905000</b> | Tool for measuring T.D.C.                                                      |   |   | ● |

## 00.A

| Tool number | TOOL DENOMINATION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|-------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                   |  16v |  20v<br>STEP A |  JTD |

|            |                                                                             |   |   |   |
|------------|-----------------------------------------------------------------------------|---|---|---|
| 1860942000 | Angle wrench                                                                | ● |   | ● |
| 1860955000 | Equipment for testing fuel supply circuit                                   | ● |   |   |
| 1860961000 | Template for camshaft timing adjustment                                     |   | ● |   |
| 1860985000 | Tools for timing and securing camshafts                                     | ● |   |   |
| 1860986000 | Tool for removing and fitting piston pin                                    | ● |   |   |
| 1860987000 | Timing belt tensioning tool                                                 | ● |   |   |
| 1860988000 | Tapet retaining tool                                                        | ● |   |   |
| 1860989000 | Extractor for valve guide oil seal                                          |   |   | ● |
| 1860990000 | Two-way installer for fitting crankshaft and camshaft front cover oil seals | ● |   |   |
| 1860992000 | Tools for positioning pistons in line                                       | ● |   |   |
| 1860993000 | Tool for fitting valve guide oil seals                                      | ● |   |   |
| 1860994000 | Tool for removing and refitting valve guide                                 | ● |   |   |
| 1861001032 | Bracket to secure engine (distribution side) on rotating stand 1861000000   | ● |   |   |
| 1861001034 | Bracket to secure engine (flywheel side) on rotating stand 1861000000       | ● |   |   |
| 1861001039 | Pair of brackets for fastening engine to rotary stand                       |   | ● | ● |
| 1867029000 | Tool to hold flywheel                                                       |   | ● |   |
| 1870404000 | Stand for dial gauge used to measure cylinder liner depth or protrusion     |   | ● | ● |

| Tool number | TOOL DESCRIPTION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                  |  16v |  20v<br>STEP A |  JTD |

|                   |                                                                      |   |   |   |
|-------------------|----------------------------------------------------------------------|---|---|---|
| <b>1870718000</b> | Blade for removing oil sump                                          |   |   | ● |
| <b>1890385000</b> | Valve guide bore reamer                                              |   | ● |   |
| <b>1895615000</b> | Tool to check piston pin unseating load (to be used with 1895884000) | ● |   |   |
| <b>1895762000</b> | Torque wrench for checking auxiliary drive belts                     | ● | ● |   |
| <b>1895868000</b> | Valve tightness tester                                               | ● | ● |   |
| <b>1895881000</b> | Dial gauge                                                           | ● |   |   |
| <b>1895890000</b> | Pressure gauge for measuring electric pump supply pressure           |   | ● |   |
| <b>1895897000</b> | Graduated disc for cylinder head bolt angular tightening             |   | ● |   |

### CLUTCH

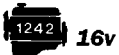
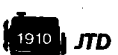
|                   |                           |   |   |  |
|-------------------|---------------------------|---|---|--|
| <b>1875086000</b> | Clutch disk centering pin | ● | ● |  |
|-------------------|---------------------------|---|---|--|

### GEARBOX-DIFFERENTIAL

|                   |                                                                                      |   |   |  |
|-------------------|--------------------------------------------------------------------------------------|---|---|--|
| <b>1842133000</b> | Tool for dismantling differential bearing and gearbox gears                          | ● |   |  |
| <b>1842134000</b> | Tool for dismantling gearbox gears and hubs                                          | ● |   |  |
| <b>1845028000</b> | Reaction block for removing differential bearings                                    | ● |   |  |
| <b>1845057000</b> | Tool for removing layshaft 5th speed gear bush                                       | ● |   |  |
| <b>1845062000</b> | Tool to remove front axle shaft constant velocity joint (to be used with 1847017001) |   | ● |  |



### 00.A

| Tool number | TOOL DESCRIPTION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                  |  16v |  20v<br>STEP A |  JTD |

|                   |                                                                                |   |   |   |
|-------------------|--------------------------------------------------------------------------------|---|---|---|
| <b>1847017001</b> | Striker (use with 1860889000)                                                  | ● | ● | ● |
| <b>1847017004</b> | Plate for removing flanged shaft from differential gear (use with 1847017001)  |   | ● |   |
| <b>1847056000</b> | Extractor for differential output shafts                                       | ● |   |   |
| <b>1850132000</b> | Wrench for differential housing seal cover retaining bolts                     |   | ● |   |
| <b>1850113000</b> | Wrench (12 mm), oil sump draining plug                                         | ● | ● |   |
| <b>1855035000</b> | Wrench (19 mm) for removing and refitting gearbox                              | ● | ● |   |
| <b>1860691000</b> | Drift for removing and refitting gear stiffening ball plug                     | ● |   |   |
| <b>1860851000</b> | Beam for removing-refitting gearbox                                            | ● | ● | ● |
| <b>1860851001</b> | Adaptor for beam used to remove-refit gearbox (use with 1860851000)            | ● | ● | ● |
| <b>1860873000</b> | Bracket for removing-refitting gearbox                                         | ● | ● |   |
| <b>1860889000</b> | Two-way fitting for striker (use with 1847017001)                              | ● | ● | ● |
| <b>1870007000</b> | Universal handle                                                               | ● | ● |   |
| <b>1870152000</b> | Drift for fitting hubs and gears to main shaft and lay shaft                   | ● |   |   |
| <b>1870419000</b> | Part for fitting main shaft seal to gearbox bell housing (use with 1870007000) | ● | ● |   |
| <b>1870448000</b> | Tool for fitting front bearing inner race                                      |   | ● |   |
| <b>1870469000</b> | Part for fitting differential bearing (use with 1870007000)                    | ● |   |   |
| <b>1870478000</b> | Tool for fitting 4th speed gear bush and rear bearing                          |   | ● |   |

| Tool number | TOOL DENOMINATION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|-------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                   |  16v |  20v<br>STEP A |  JTD |

|                   |                                                                                  |   |   |  |
|-------------------|----------------------------------------------------------------------------------|---|---|--|
| <b>1870629000</b> | Drift for fitting differential casing cover gasket (use with 1870007000)         | ● |   |  |
| <b>1870630000</b> | Drift for fitting differential casing gasket (use with 1870007000)               | ● |   |  |
| <b>1870631000</b> | Drift for fitting main and layshaft bearing and gears                            | ● |   |  |
| <b>1870632000</b> | Drift for fitting bearings                                                       | ● |   |  |
| <b>1874541000</b> | Tool for fitting differential bearing outer race                                 |   | ● |  |
| <b>1875016000</b> | Drift to fit gasket on axle shaft flange                                         |   | ● |  |
| <b>1875017000</b> | Tool to remove and refit differential bearing rings (to be used with 1840005003) |   | ● |  |
| <b>1875088000</b> | Drift for fitting main and layshaft bearings                                     | ● |   |  |
| <b>1881124000</b> | Pliers for main and layshaft rear bearing retaining rings                        | ● |   |  |
| <b>1895655000</b> | Tool to select differential bearing adjusting shims (to be used with 1895884000) | ● |   |  |

#### BRAKING SYSTEM

|                   |                                                                   |   |   |   |
|-------------------|-------------------------------------------------------------------|---|---|---|
| <b>1856132000</b> | Wrench (10-11 mm) for brake line unions                           | ● | ● | ● |
| <b>1856133000</b> | Wrench for handling rear brake caliper self-adjusting device      |   | ● |   |
| <b>1872273000</b> | Set of tools to hold cylinder pistons when installing brake shoes | ● |   | ● |
| <b>1895901000</b> | Tool for adjusting load proportioning valve position              | ● | ● |   |

#### STEERING

|                   |                                   |   |   |   |
|-------------------|-----------------------------------|---|---|---|
| <b>1847035000</b> | Puller for steering rod ball pins | ● | ● | ● |
|-------------------|-----------------------------------|---|---|---|

## 00.A

| Tool number | TOOL DESCRIPTION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                  |  16v |  20v<br>STEP A |  JTD |

### SUSPENSION SYSTEM

|                   |                                                                                                                    |   |   |   |
|-------------------|--------------------------------------------------------------------------------------------------------------------|---|---|---|
| <b>1845028000</b> | Tool for removing front hub bearing inner race from flange (to be used with 1840005003, 1840005302 and 1840005400) | ● | ● | ● |
| <b>1847014000</b> | Puller, wheel hub cap                                                                                              | ● | ● | ● |
| <b>1874551000</b> | Tool for retaining front damper rod while manoeuvring retaining nut                                                | ● | ● | ● |
| <b>1874555000</b> | Pneumatic tool for compressing suspension springs when removing dampers                                            | ● | ● | ● |
| <b>1875055000</b> | Drift to fit front wheel hub bearings (to be used with 1870007000)                                                 | ● | ● | ● |
| <b>1875059000</b> | Installer, rear wheel hub caps                                                                                     | ● | ● | ● |

### ELECTRICAL EQUIPMENT

|                   |                                             |   |   |   |
|-------------------|---------------------------------------------|---|---|---|
| <b>1860893000</b> | Tool for removing fuel level gauge ring nut | ● | ● | ● |
| <b>1860897000</b> | Tool for removing radio                     | ● | ● | ● |

### BODYWORK

|                   |                                                                                                                    |   |   |   |
|-------------------|--------------------------------------------------------------------------------------------------------------------|---|---|---|
| <b>1860890000</b> | Wrench for removing-refitting door hinges                                                                          | ● | ● | ● |
| <b>1878034000</b> | Remover, window regulator handles                                                                                  | ● | ● | ● |
| <b>1878077000</b> | Tool to remove door trim panels or plastic buttons                                                                 | ● | ● | ● |
| <b>1878080000</b> | Fixture for positioning door stop rod during assembly of retaining pin (to be used in conjunction with 1878081000) | ● | ● | ● |
| <b>1878081000</b> | Pliers for removing/refitting door stop link retaining pin (use with 1878080000 during assembly)                   | ● | ● | ● |

| Tool number | TOOL DESCRIPTION | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-------------|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|             |                  |  16v |  20v<br>STEP A |  JTD |

### GENERAL-PURPOSE TOOLS

|                   |                                                                                             |   |   |   |
|-------------------|---------------------------------------------------------------------------------------------|---|---|---|
| <b>1840005000</b> | Puller, universal                                                                           | ● | ● | ● |
| <b>1840206000</b> | Percussion extractor (use with special parts)                                               | ● | ● | ● |
| <b>1846017000</b> | Base for puller half-rings                                                                  | ● | ● | ● |
| <b>1847017001</b> | Percussion extractor (use with special parts)                                               | ● | ● | ● |
| <b>1861000000</b> | Rotary stand for engine overhaul (used also for gearbox and differential)                   | ● | ● | ● |
| <b>1861000001</b> | Pair of sections for brackets supporting the engine on rotating stand 1861000000 1861000000 | ● | ● | ● |
| <b>1870007000</b> | Universal handle                                                                            | ● | ● | ● |
| <b>1870404000</b> | Support for measuring depth and protrusion (use with 1895881000)                            | ● | ● | ● |
| <b>1871000000</b> | Rotary column for servicing gearboxes and differential                                      | ● | ● | ● |
| <b>1876048000</b> | Mini Hylok Contact terminal extractor (MHF) dia. 2.15 mm                                    | ● | ● | ● |
| <b>1881138000</b> | Adjustable pliers for pipe retaining collars and tabs                                       | ● | ● | ● |
| <b>1882002010</b> | Tool panel to be fixed to wall or stand 1882003000 (with hooks)                             | ● | ● | ● |
| <b>1882003000</b> | Stand to hold two tool panels                                                               | ● | ● | ● |
| <b>1882011000</b> | Set of additional hooks (50) for tool panel                                                 | ● | ● | ● |
| <b>1895113000</b> | Feeler gauge (0.05-0.10...0.80 mm) for checking valve clearance                             | ● | ● | ● |
| <b>1895881000</b> | Centesimal gauge for special tools (10 mm capacity; stem length 16.7 mm) mm 10;             | ● | ● | ● |
| <b>1895882000</b> | Centesimal gauge for special tools (10 mm capacity; stem length 88 mm)                      | ● | ● | ● |
| <b>1895884000</b> | Centesimal gauge for special tools (10 mm capacity; stem length 16.7 mm)                    | ● | ● | ● |

# Technical data

## Tightening torques

**Bravo-Brava**  
1998 range

**00.**

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

### ENGINE

|                                                             |                     |                      |   |   |   |
|-------------------------------------------------------------|---------------------|----------------------|---|---|---|
| Bolt retaining main bearing caps to crankcase               | M10×1.25            | 4 + 90°              | ● |   |   |
|                                                             | M12                 | 2 + 100°             |   | ● | ● |
| Bolt, cylinder head to engine block                         | M9                  | 3 +<br>90° + 90°     | ● |   |   |
|                                                             | M10                 | 4 +<br>90°+90°+90°   |   | ● |   |
|                                                             | M10                 | 6.5 +<br>90°+90°+90° |   |   | ● |
| Nut retaining connecting rod cap                            | M8                  | 4.1                  | ● |   |   |
| Bolt retaining connecting rod cap                           | M8                  | 2 + 60°              |   | ● | ● |
| Bolt, flywheel to crankshaft                                | M8                  | 4.4                  | ● |   |   |
|                                                             | M12x1.25            | 16                   |   | ● | ● |
| Bolt retaining drive shaft to crankshaft                    | M16x1.5<br>left (*) | 2 + 90°              | ● |   |   |
|                                                             | M16<br>left (*)     | 36                   |   | ● | ● |
| Bolt retaining flywheel and timing end cover                | M6                  | 0.9                  |   | ● | ● |
| Bolt retaining timing belt guards                           | M6                  | 0.9                  |   | ● | ● |
| Bolt retaining camshaft driven gear and rear camshaft gears | M12x1.25            | 12                   | ● | ● | ● |
| Screw, camshaft caps                                        | M7                  | 1.5                  | ● | ● | ● |
| Belt tensioner retaining bolt                               | M8x1.25             | 2.5                  | ● |   |   |
| Bolt retaining coolant intake pipe to pump                  | M6                  | 1                    | ● |   |   |
| Bolt retaining coolant intake pipe to cylinder head         | M6                  | 0.9                  |   | ● |   |
|                                                             | M10                 | 5                    |   | ● |   |
| Coolant pump retaining bolt                                 | M8                  | 2.5                  |   | ● | ● |
| Bolt retaining thermostat to cylinder head                  | M8                  | 2.5                  |   | ● | ● |

(\*) The bolt need not be greased

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                                  |                 |     |   |   |   |
|------------------------------------------------------------------|-----------------|-----|---|---|---|
| Bolt retaining plate to oil pump case                            | M6              | 0.7 | ● |   |   |
| Screw, cylinder head to engine block                             | M9              | 0.9 |   | ● | ● |
| Bolt retaining oil sump to crankcase                             | M6              | 1   | ● |   |   |
|                                                                  | M8              | 2.5 |   | ● | ● |
| Nut retaining oil sump to covers                                 | M6              | 0,5 | ● |   |   |
| Sump drain plug                                                  | M18             | 2   |   | ● | ● |
| Oil dipstick pump retaining bolt and nut                         | M6              | 0.9 |   | ● | ● |
| Bolt retaining alternator to crankcase, used also for adjustment | M10x1.25        | 5   | ● |   |   |
| Bolt retaining engine to crankcase                               | M8              | 2.2 | ● |   |   |
|                                                                  | M10             | 5   |   | ● |   |
| Bolt retaining bracket to engine mount                           | M8              | 2.5 |   | ● |   |
|                                                                  | M10x1.25        | 5   |   | ● |   |
| Bolt retaining alternator to slot                                | M10x1.25        | 5   | ● |   |   |
| Nut retaining lower bracket to alternator mount and fastening    | M12             | 7   |   | ● | ● |
| Bolt retaining compressor to support                             | M8              | 2.5 |   | ● |   |
|                                                                  | M10             | 5   |   | ● | ● |
| Power steering pump retaining bolt                               | M10x1.25        | 5   | ● |   |   |
| Bolt retaining pulley to power steering pump                     | M10x1.25        | 5   | ● |   |   |
| Spark plugs                                                      | M12x1.25        | 2.7 | ● | ● |   |
| Oil pressure switch                                              | M14x1.5         | 3.2 | ● |   |   |
|                                                                  | M14x1.5         | 2.2 |   | ● | ● |
| Coolant temperature sender unit                                  | M16x1.5 tapered | 3.4 | ● |   |   |
|                                                                  | M16x1.5 tapered | 2.5 |   | ● | ● |

# Technical data

## Tightening torques

**Bravo-Brava**

**1998 range**

**00.**

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                                             |          |     |   |   |   |
|-----------------------------------------------------------------------------|----------|-----|---|---|---|
| Coolant temperature sender unit for i.e. system                             | M12x1.5  | 2   |   | • | • |
| Bolt retaining sensors to crankcase and cylinder head                       | M6       | 0.9 |   | • | • |
| Bolt retaining phonic wheel to crankshaft                                   | M6       | 0.9 |   | • |   |
| Bolt retaining knock sensor to crankcase                                    | M8       | 2.5 |   | • |   |
| Oil temperature sender unit on sump                                         | M14x1.5  | 2.2 |   | • |   |
| Oil level sending unit                                                      | M12x1.25 | 2   |   | • | • |
| Bolt retaining auxiliary pulley                                             | M8       | 2.2 | • |   |   |
|                                                                             | M8       | 2.5 |   |   | • |
| Bolt retaining pulley to power steering pump                                | M10x1.25 | 5   | • |   |   |
| Flanged bolt retaining auxiliary component fixed belt tensioner             | M8       | 2.5 |   |   | • |
| Bolt retaining automatic belt tensioner to alternator mount                 | M8       | 2.5 |   | • | • |
|                                                                             | M10      | 7   |   | • | • |
| Bolt retaining fixed belt tensioner to alternator mount and auxiliary parts | M8       | 2.5 |   | • | • |
| Bolt retaining fixed belt tensioner to air conditioner compressor mount     | M10x1.25 | 5   |   | • | • |
| Bolt retaining tensioner bracket to engine mount (for a/c versions)         | M10x1.25 | 5   |   | • |   |
| Bolt retaining belt tensioner to engine mount                               | M8       | 2.5 |   | • |   |
|                                                                             | M10      | 5   |   | • |   |
| Bolt retaining reinforcement between front bracket and rear bracket         | M10x1.25 | 5   | • |   |   |
| Bolt retaining alternator/compressor rear mount to crankcase                | M10x1.25 | 5   | • |   |   |
| Bolt securing power steering mount to crankcase                             | M10x1.25 | 5   | • |   |   |
| Bolt retaining power steering pump plate                                    | M8       | 2.2 | • |   |   |



| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                               |          |     |   |   |   |
|---------------------------------------------------------------|----------|-----|---|---|---|
| Power steering pump retaining bolt                            | M6       | 2.5 |   |   | • |
| Bolt retaining pulley to power steering pump                  | M8       | 2.5 |   | • | • |
| Compressor tensioner retaining bolt                           | M10x1.25 | 5   | • |   |   |
| Nut retaining compressor pivot                                | M10x1.25 | 5   | • |   |   |
| Screw retaining compressor to support                         | M8       | 2.2 | • |   |   |
| Alternator retaining bolt                                     | M10x1.25 | 5   | • |   |   |
|                                                               | M10x1.25 | 8   |   |   |   |
| Bolt retaining rear tensioner to compressor                   | M10x1.25 | 5   | • |   |   |
| Nut securing rear compressor/alternator mount to engine block | M10x1.25 | 5   | • |   |   |
| Power steering guard retaining bolt                           | M6       | 0.7 | • |   |   |
| Alternator retaining/tensioning bolt                          | M8       | 2.2 | • |   |   |
| Bolt retaining plate to engine block                          | M10x1.25 | 5   | • |   |   |
| Nut retaining cam cover to cylinder head                      | M6       | 0.9 |   | • | • |
| Bolt retaining cylinder head extension to cylinder head       | M7       | 1.5 | • |   |   |
| Nut retaining rear cover to cylinder head extension           | M6       | 0.9 | • |   |   |
| Nut retaining intake manifold to cylinder head                | M7       | 1.5 | • |   |   |
|                                                               | M8       | 2.5 |   |   | • |
| Nut retaining exhaust manifold to cylinder head               | M8x1.25  | 2.7 | • |   |   |
|                                                               | M8x1.25  | 2.5 |   | • | • |
| Bolt retaining coils to rear cover                            | M4       | 0.2 | • |   |   |
| Coil retaining bolt                                           | M6       | 0.9 |   | • |   |

# Technical data

## Tightening torques

**Bravo-Brava**  
1998 range

**00.**

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                                          |         |     |   |   |   |
|--------------------------------------------------------------------------|---------|-----|---|---|---|
| Coil cover retaining bolt                                                | M6      | 0.9 |   | ● |   |
| Nut retaining upper part of intake manifold to lower part                | M6      | 0.9 | ● |   |   |
| Adjustment screw for securing intake manifold                            | M6      | 0.9 | ● |   |   |
| Plug sealing channels for bolts securing head extension to cylinder head | M16     | 1.5 | ● |   |   |
| Tapered plug for tightening oil channel to cylinder head extension       | M14x1.5 | 1.5 | ● |   |   |
| Nut for retaining front cover                                            | M6      | 0.9 | ● |   |   |
| Tapered plug for sealing oil channel on head extension (timing end)      | M20x1.5 | 3   | ● |   |   |
| Plugs sealing camshaft timing studs                                      | M16x1.5 | 1.5 | ● |   |   |
| Bolts retaining belt guard to steel bushes                               | M6      | 0.9 | ● |   |   |
| Plug on head extension with resonator retaining seat                     | M18     | 3   | ● |   |   |
| Stud with screw for securing resonator                                   | M8x1.25 | 2.5 | ● |   |   |
| Bolts retaining cable channels                                           | M6      | 0.9 | ● |   |   |
| Heat shield retaining nuts                                               | M6      | 0.9 | ● |   |   |
| Hexagonal, splined bolt retaining dust shield                            | M6      | 0.9 |   | ● | ● |
| Half-axle mount retaining bolt                                           | M10     | 5   |   | ● |   |
| Bolt retaining connector beneath cam cover                               | M6      | 0.9 |   | ● |   |
| Bolt retaining reaction bracket to duct and half-axle mount              | M8      | 2.5 |   | ● |   |
| Nut retaining intake manifold bracket and wiring channel                 | M8      | 2.5 |   | ● |   |

| PART                                                            | Thread   | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|-----------------------------------------------------------------|----------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                                                                 |          | daNm               |  16v |  20v<br>STEP A |  JTD |
| Bolt retaining damping flywheel to gear                         | M8       | 2.5                | ●                                                                                       |                                                                                                   |                                                                                         |
| Timing belt tensioner retaining bolt                            | M10      | 5                  | ●                                                                                       | ●                                                                                                 |                                                                                         |
| Bolt retaining intake gear to variable valve timing             | M6       | 0.9                | ●                                                                                       |                                                                                                   |                                                                                         |
| Bolt retaining oil pump casing to cap                           | M6       | 0.9                | ●                                                                                       |                                                                                                   |                                                                                         |
| Bolt for heat exchanger connection                              | M20      | 3                  | ●                                                                                       |                                                                                                   |                                                                                         |
| Bolt retaining coolant return line from heater to cylinder head | M10x1.25 | 5                  | ●                                                                                       |                                                                                                   |                                                                                         |
| Bolt retaining coolant delivery line to crankcase               | M8x1.25  | 2.5                | ●                                                                                       |                                                                                                   |                                                                                         |
| Air conditioner shield retaining bolt                           | M6       | 0.9                | ●                                                                                       |                                                                                                   |                                                                                         |
| Adjustment bolt retaining nut                                   | M10      | 5                  | ●                                                                                       |                                                                                                   |                                                                                         |
| Bolt, reaction bracket to half-axle                             | M10x1.25 | 5                  |                                                                                         | ●                                                                                                 | ●                                                                                       |
| Nut for bolt between sump and half-axle mount                   | M8       | 2.5                |                                                                                         | ●                                                                                                 | ●                                                                                       |
| Bolt retaining power steering pump to rod mount                 | M8       | 2.5                |                                                                                         | ●                                                                                                 |                                                                                         |
| Bolt retaining power steering pulley to shaft                   | M16      | 10                 |                                                                                         | ●                                                                                                 |                                                                                         |
| Nut retaining oil vapour separator to intake duct               | M6       | 0.9                |                                                                                         |                                                                                                   | ●                                                                                       |
| Flanged bolt retaining auxiliary mount to crankcase             | M8       | 2.5                |                                                                                         |                                                                                                   | ●                                                                                       |
|                                                                 | M10      | 5                  |                                                                                         |                                                                                                   | ●                                                                                       |
| Injector retaining bracket tightening nut                       | M8       | 3.2                |                                                                                         |                                                                                                   | ●                                                                                       |
|                                                                 | M32x1.5  | 11.8               |                                                                                         |                                                                                                   |                                                                                         |
| Fastening, exhaust manifold reaction bracket to crankcase       | M8       | 2.5                |                                                                                         |                                                                                                   | ●                                                                                       |
| Bolt retaining injection pump to mount, crankcase end           | M8       | 3.2                |                                                                                         |                                                                                                   | ●                                                                                       |

# Technical data

## Tightening torques

**Bravo-Brava**  
1998 range

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| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                                   |          |     |  |  |   |
|-------------------------------------------------------------------|----------|-----|--|--|---|
| Bolt retaining injection pump to intake manifold end mount        | M8       | 2.6 |  |  | • |
| Injection pump gear retaining nut                                 | M14      | 5   |  |  | • |
| Fuel temperature sensor                                           | M12      | 1.6 |  |  | • |
| Nut retaining fuel filter to intake manifold                      | M8       | 2.5 |  |  | • |
| Nut retaining turbocharger to exhaust manifold                    | M8       | 2.5 |  |  | • |
| Nut retaining manifold to turbocharger                            | M8       | 2.5 |  |  | • |
| Union retaining oil delivery pipe to turbocharger                 | M10      | 1.5 |  |  | • |
|                                                                   | M12      |     |  |  |   |
| Heat exchanger valve retaining fitting                            | M20      | 6.5 |  |  | • |
| Bolt retaining nozzle assembly to crankcase                       | M6       | 0.9 |  |  | • |
| Bolt retaining front coolant intake union to cylinder head        | M6       | 0.9 |  |  | • |
| Nut retaining thermostat to coolant outlet union to cylinder head | M7       | 1.5 |  |  | • |
| Upper and lower alternator reaction bracket retaining bolt        | M10x1.25 | 5   |  |  | • |
| Bolt retaining vacuum pump to cylinder head                       | M8       | 2.5 |  |  | • |
| Nut retaining valve to exhaust manifold                           | M8       | 2.5 |  |  | • |
| Bolt retaining pipe to valve                                      | M8       | 2.5 |  |  | • |
| Air pressure sensor                                               | M6       | 0.9 |  |  | • |
| Preheating glow plugs                                             | M12      | 1.5 |  |  | • |
| Lines from fuel manifold to injectors - injector end              | M12      | 2.3 |  |  | • |

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                          |     |     |  |  |   |
|----------------------------------------------------------|-----|-----|--|--|---|
| Injector fuel manifold lines , manifold end              | M14 | 3.2 |  |  | ● |
| Lines from pressure pump to fuel manifold - pump end     | M14 | 3.2 |  |  | ● |
| Lines from pressure pump to fuel manifold - manifold end | M14 | 3.2 |  |  | ● |

## EXHAUST

|                                                                                                             |     |     |   |   |   |
|-------------------------------------------------------------------------------------------------------------|-----|-----|---|---|---|
| Front bolt retaining exhaust pipe to differential end bracket                                               | M8  | 1.8 |   | ● |   |
| Self-locking nut retaining flange to exhaust manifold                                                       | M8  | 3   | ● |   |   |
| Bolt retaining first exhaust pipe section to manifold                                                       | M8  | 3.2 | ● |   |   |
| Nut retaining front section to catalytic converter                                                          | M8  | 3   | ● |   |   |
| Bolt for collar retaining rear section to catalytic converter                                               | M10 | 5   | ● |   |   |
| Flanged bolt retaining brackets with side and rail nut                                                      | M8  | 2.8 | ● | ● | ● |
| Flanged bolt retaining front pipe to turbine fitting                                                        | M8  | 2.4 |   |   | ● |
| Front section bracket retaining bolt                                                                        | M8  | 2.4 |   |   | ● |
| Front bracket retaining bolt                                                                                | M8  | 2.4 |   |   | ● |
| Bolt retaining front exhaust pipe half-bracket connection bracket to bracket anchored to differential mount | M8  | 2.5 |   | ● |   |
| Bolt with safety washer retaining front section to catalytic converter                                      | M8  | 2.5 |   | ● |   |
| Bolt for retaining bracket with block to differential end mount                                             | M8  | 2.5 |   | ● |   |
| Nut retaining front exhaust pipe flange to manifold                                                         | M8  | 2.8 |   | ● |   |
| Self-locking nut with metal insert retaining front exhaust half-bracket                                     | M8  | 2.5 |   | ● |   |

# Technical data

## Tightening torques

**Bravo-Brava**  
1998 range

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| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                                            |          |     |   |   |   |
|----------------------------------------------------------------------------|----------|-----|---|---|---|
| Self-locking nut with tapered safety washer retaining bracket to crankcase | M8       | 2.5 |   | ● |   |
| Nut joining rear pipe to catalytic converter                               | M10x1.25 | 4   |   | ● |   |
| Lambda probe                                                               | M18x1.5  | 3.6 | ● | ● | ● |
| Nut retaining anti-flex bracket to oil sump                                | M10      | 3   |   | ● |   |

### POWER UNIT MOUNTING

|                                                       |          |     |   |   |   |
|-------------------------------------------------------|----------|-----|---|---|---|
| Bolt retaining mount to gearbox-differential end      | M12x1.25 | 8.5 | ● | ● | ● |
| Bolt retaining engine to body, engine and gearbox end | M8       | 3.2 | ● | ● | ● |
| Bolt retaining bracket to gearbox-differential end    | M10x1.25 | 4.5 | ● |   |   |
| Bolt retaining bracket to gearbox-differential end    | M12x1.25 | 9   | ● |   |   |
| Bolt retaining connecting rod mount to body           | M8       | 3.8 |   | ● |   |
| Tapered bolt retaining connecting rod mount to body   | M8       | 2.8 |   | ● |   |
| Fastener, bracket to block and body - engine end      | M10x1.25 | 5   | ● |   |   |
| Fastener - engine mount to body - engine end          | M8       | 3.2 | ● |   |   |
| Nut retaining block to engine end mount               | M12x1.25 | 8   |   | ● |   |
| Flanged bolt retaining mount to gearbox               | M10x1.25 | 5   | ● |   |   |
| Nut retaining differential mount to gearbox           | M12x1.25 | 8   |   | ● | ● |
| Screw, reaction link to bracket and to engine mount   | M10x1.25 | 5   |   | ● |   |
| Bolt retaining reaction link to body                  | M8       | 2.8 | ● |   |   |
|                                                       | M8       | 3.8 |   |   |   |
| Bolt retaining mount to engine sump, differential end | M12x1.25 | 8   |   | ● |   |

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                        |          |     |   |   |   |
|--------------------------------------------------------|----------|-----|---|---|---|
| Bolt retaining brace to differential end mount         | M12x1.25 | 8   |   | ● |   |
| Bolt retaining differential end flexible block to beam | M8       | 3.6 | ● | ● | ● |
| Bolt retaining bracket to gearbox - gearbox end        | M10x1.25 | 5   |   | ● |   |
| Power unit reaction link retaining bolt                | M10      | 5   | ● |   |   |

#### PEDAL UNIT

|                                                                              |    |      |   |   |   |
|------------------------------------------------------------------------------|----|------|---|---|---|
| Nut retaining accelerator pedal to pedal unit                                | M6 | 0.5  | ● | ● | ● |
| Flanged nut retaining brake and clutch pedal unit mount to body              | M8 | 1.5  | ● | ● | ● |
| Broad-flanged bolt for automatic fittings retaining pedal unit to dashboard  | M8 | 2.6  | ● | ● | ● |
| Self-locking nut for retaining and adjusting clutch control cable on gearbox | M6 | 0.44 | ● | ● | ● |
| Self-locking nut retaining brake and clutch pedal pivot pin to pedal unit    | M8 | 3    | ● | ● | ● |

#### EXTERNAL GEARBOX LINKAGE

|                                                                   |    |      |   |   |   |
|-------------------------------------------------------------------|----|------|---|---|---|
| Bolt retaining gear lever mount to floor pan                      | M6 | 0.74 | ● | ● | ● |
| Screw retaining bottom selection and engagement rod to gear lever | M8 | 2.8  | ● | ● | ● |
| Nut retaining intermediate return pin                             | M8 | 1.5  | ● | ● | ● |
| Nut retaining ball heads to levers                                | M8 | 1.5  | ● | ● | ● |
| Nut for bolt retaining selection idler to gearbox                 | M8 | 1.5  | ● | ● | ● |
| Bolt retaining reverse pipe to gearbox                            | M8 | 2.4  | ● | ● | ● |
| Nut retaining ball heads to selection lever                       | M8 | 1.5  | ● | ● | ● |



# Technical data

## Tightening torques

**Bravo-Brava**  
1998 range

**00.**

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                            |    |      |   |   |   |
|--------------------------------------------|----|------|---|---|---|
| Bolt retaining reaction bracket to gearbox | M8 | 2.4  | ● | ● | ● |
| Nut retaining gearbox linkage to mount     | M6 | 0.74 | ● | ● | ● |

### GEARBOX AND DIFFERENTIAL

|                                                                 |          |      |   |   |   |
|-----------------------------------------------------------------|----------|------|---|---|---|
| Nut retaining spring in speed rod position                      | M14x1.4  | 3    | ● | ● | ● |
| Screw retaining plate to gear case                              | M8       | 2.5  | ● | ● | ● |
| Screw retaining gear case cover and plate                       | M8       | 2.5  | ● | ● | ● |
| Screw retaining cover to bell housing                           | M8       | 2.5  | ● | ● | ● |
| Screw retaining gear case to bell housing                       | M6       | 1    | ● | ● | ● |
|                                                                 | M8       | 2.5  |   |   |   |
| Screw retaining reversing shaft                                 | M8       | 3.4  | ● | ● | ● |
| Lock ring, main and layshaft, 5th speed gear                    | M20x1.5  | 11.8 | ● | ● | ● |
| Screw retaining gear control forks                              | M6       | 1.8  | ● | ● | ● |
| Bolt retaining speed selection and engagement shaft lever       | M8       | 2.5  | ● | ● | ● |
| Reverse lever support retaining screw                           | M6       | 1    | ● | ● | ● |
| Screw retaining bush for gear shaft                             | M6       | 1    | ● | ● | ● |
| Screw retaining front drive axle ring gear                      | M10x1.25 | 8.8  | ● | ● | ● |
| Screw retaining differential case retaining flange to gear case | M10x1.25 | 4.9  | ● | ● | ● |
|                                                                 | M8       | 2.5  |   |   |   |
| Screw retaining speedometer support                             | M6       | 1.2  | ● | ● | ● |

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                               |          |     |   |   |   |
|---------------------------------------------------------------|----------|-----|---|---|---|
| Tapered, thread                                               | M22x1.5  | 4.6 | ● | ● | ● |
| Tapered threaded plug for filling gear case with oil          | M22x1.5  | 4.6 | ● | ● | ● |
| Screw retaining differential right shaft support              | M6       | 1   | ● | ● | ● |
| Tapered threaded plug for 1st-2nd speed rod seat on gear case | M18x1.5  | 2   | ● | ● | ● |
| Gear selection lever support retaining screw                  | M8       | 1.5 | ● | ● | ● |
| Reversing light switch                                        | M14x1.25 | 3   | ● | ● | ● |

## BRAKING SYSTEM

|                                                                                                  |          |      |   |   |   |
|--------------------------------------------------------------------------------------------------|----------|------|---|---|---|
| Screw with split safety washer retaining brake carrier plate to suspension arm                   | M8       | 2.4  | ● | ● | ● |
| Bolt retaining front brake caliper                                                               | M10x1.25 | 5.7  | ● | ● | ● |
| Bolt with tapered safety washer retaining front brake calipers to pillar                         | M12x1.25 | 10.5 |   | ● |   |
| Bolt retaining front brake disc, rear brake disc, rear brake drum (with wheel centring function) | M8       | 1.2  | ● | ● | ● |
| Bolt with tapered safety washer retaining bracket assembly for braking system                    | M8       | 2.5  | ● | ● | ● |
| Fitting connecting hose to front brake caliper                                                   | M10x1    | 1.4  | ● | ● | ● |
| Bleed screw on front and rear brake caliper                                                      | M8       | 0.6  | ● | ● | ● |
| Fitting connecting hose to rear brake caliper                                                    | M10x1    | 1.4  |   | ● |   |
| Bolt retaining cylinder to rear brake carrier plate                                              | M6       | 0.8  | ● |   | ● |
| Bleed screw on rear drum brake cylinder Ø180                                                     | M8       | 0.65 | ● |   |   |
| Brake pump restriction fitting (ABS version)                                                     | M10      | 1.4  | ● | ● | ● |

# Technical data

## Tightening torques

**Bravo-Brava**

**1998 range**

**00.**

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                                                                                 |       |      |   |   |   |
|-------------------------------------------------------------------------------------------------|-------|------|---|---|---|
| Male fitting for flared hoses fastening rigid pipe to rear drum brake cylinder                  | M10x1 | 1.4  | ● | ● | ● |
| Flanged nut retaining load proportioning valve to bracket                                       | M6    | 0.76 | ● | ● | ● |
| Self-locking nut with polyamide ring for bolt retaining EBD spring bracket to rear antiroll bar | M6    | 0.6  | ● | ● | ● |
| Bolt for square load proportioning valve adjustment lever                                       | M8    | 1.8  | ● | ● | ● |

## POWER ASSISTED STEERING AND STEERING

|                                                                             |          |     |   |   |   |
|-----------------------------------------------------------------------------|----------|-----|---|---|---|
| Power steering retaining nuts and bolts                                     | M6       | 0.5 | ● | ● | ● |
|                                                                             | M8       | 1.5 |   |   |   |
| Union for return fitting from power steering to tank                        | M12x1.25 | 2   | ● | ● | ● |
| Flanged bolt retaining box to beam                                          | M10x1.25 | 7   | ● | ● | ● |
| Union for pump/power steering outlet fitting on power steering              | M14x1.5  | 3   | ● | ● | ● |
| Self-locking nut retaining box link to pillar                               | M10x1.25 | 3.4 | ● | ● | ● |
| Union for pump/power steering outlet fitting on pump                        | M12      | 3.6 | ● | ● | ● |
| Bolt with tapered safety washer retaining fork and universal joint          | M8       | 2   | ● | ● | ● |
| Nut retaining steering wheel to steering column                             | M16x1.5  | 5   | ● | ● | ● |
| Bolt with tapered end with safety washer for steering column mount fastener | M8       | 2.2 | ● | ● | ● |
| Bolt with safety washer retaining airbag module to steering wheel           | M6       | 0.8 | ● | ● | ● |
| Bolt with tapered end and safety washer retaining strut to column mount     | M8       | 2.2 | ● | ● | ● |
| Nut retaining reinforcement strut to pedal unit                             | M8       | 2.2 | ● | ● | ● |

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

## FRONT SUSPENSION

|                                                                                                         |          |       |   |   |   |
|---------------------------------------------------------------------------------------------------------|----------|-------|---|---|---|
| Bolt retaining front and rear of front beam to body                                                     | M10x1.25 | 8     | ● | ● | ● |
|                                                                                                         | M12x1.25 | 10.8  | ● | ● | ● |
| Broad-flanged bolt retaining front of front beam to body                                                | M12x1.25 | 10.8  | ● | ● | ● |
| Flanged nut for nut fastening rear of front beam to body                                                | M10x1.25 | 8     | ● | ● | ● |
| Screw with flat and tapered washer retaining front and rear outside of plates joining wishbone to beam  | M10x1.25 | 6.9   | ● | ● | ● |
| Screw with flat and tapered washer retaining front and rear interior of plate jointing wishbone to beam | M10x1.25 | 6.9   | ● | ● | ● |
| Flanged nut fastening top of damper to block                                                            | M12x1.25 | 10    | ● | ● | ● |
| Screw with broad flange retaining top damper block to body                                              | M8       | 3.2   | ● | ● | ● |
| Self-locking nut retaining damper to pillar                                                             | M10x1.25 | 7     | ● | ● | ● |
|                                                                                                         | M12x1.25 | 10    | ● | ● | ● |
| Self-locking nut for bolt retaining wishbone pivot head to pillar                                       | M10x1.25 | 7     | ● | ● | ● |
| Screw with tapered and flat safety washer retaining anti-roll bar support plate to beam                 | M8       | 4     | ● | ● | ● |
| Self-locking nut retaining end of anti-roll bar to connecting rod                                       | M10x1.25 | 7     | ● | ● | ● |
| Self-locking nut retaining bar to front suspension arm                                                  | M10x1.25 | 3.1   | ● | ● | ● |
| Nut retaining front wheel hub to coupling                                                               | M22x1.5  | 7+55° | ● | ● | ● |
|                                                                                                         | M24x1.5  | 7+62° | ● | ● | ● |
| Wheel stud                                                                                              | M12x1.25 | 8.6   | ● | ● | ● |

00.

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

### REAR SUSPENSION

|                                                                         |          |      |   |   |   |
|-------------------------------------------------------------------------|----------|------|---|---|---|
| Screw with broad flange retaining front flexible block to rear subframe | M12×1.25 | 10.8 | ● | ● | ● |
| Screw with broad flange retaining rear flexible block to body           | M12×1.25 | 10.8 | ● | ● | ● |
| Nut for stud retaining rear swinging arm to sub-frame                   | M16×1.5  | 15   | ● | ● | ● |
| Nut for screw retaining lower damper to suspension                      | M12×1.25 | 8.8  | ● | ● | ● |
| Screw retaining top of damper to mount                                  | M10×1.25 | 6    | ● | ● | ● |
| Nut for pivot pin retaining rear hub                                    | M22×1.5  | 28   | ● | ● | ● |
| Bolt retaining stabilizer bar to rear suspension arm                    | M10×1.25 | 5.6  | ● | ● | ● |
| Bolt retaining stabilizer bar support plates to rear suspension arm     | M8       | 2.8  | ● | ● | ● |
| Wheel stud                                                              | M12×1.25 | 8.6  | ● | ● | ● |
| Nut for bolt retaining square lever to wishbone                         | M8       | 1.5  | ● | ● | ● |

### AIR CONDITIONER

|                                                          |       |      |   |   |   |
|----------------------------------------------------------|-------|------|---|---|---|
| Bolt retaining dehydrating filter inlet and outlet ducts | M6    | 0.55 | ● | ● | ● |
| Bolt retaining evaporator pipe to compressor             | M6    | 0.55 | ● | ● | ● |
| Three-stage pressure switch fastener                     | M10x1 | 0.8  | ● | ● | ● |

### ELECTRICAL EQUIPMENT

|                                             |    |      |   |   |   |
|---------------------------------------------|----|------|---|---|---|
| Nut retaining i.e. control unit             | M6 | 0.55 | ● | ● | ● |
| Bolts and nuts retaining i.e. control unit. | M6 | 0.55 | ● | ● | ● |

| PART | Thread | Tightening torques | ENGINE                                                                                  |                                                                                                   |                                                                                         |
|------|--------|--------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|      |        | daNm               |  16v |  20v<br>STEP A |  JTD |

|                                   |    |      |   |   |   |
|-----------------------------------|----|------|---|---|---|
| Headlamp retaining nuts and bolts | M6 | 0.55 | ● | ● | ● |
| Third brake light retaining bolt  | M5 | 0.2  | ● | ● | ● |
| Bolt retaining earth to body      | M8 | 2.4  | ● | ● | ● |

### BODYWORK

|                                                                        |          |      |   |   |   |
|------------------------------------------------------------------------|----------|------|---|---|---|
| Bolt with hexagonal splined groove retaining luggage compartment catch | M8       | 2    | ● | ● | ● |
| Bolt with tapered washer retaining side door lock                      | M6       | 0.75 | ● | ● | ● |
| Hexagonal socket screw retaining fixed side door hinge                 | M10×1.25 | 4.5  | ● | ● | ● |
| Bolt retaining front bumpers                                           | M6       | 0.4  | ● | ● | ● |
| Bolt retaining brackets to pretensioner                                | M6       | 4-6  | ● | ● | ● |

### AIR BAG SYSTEM

|                                                |    |     |   |   |   |
|------------------------------------------------|----|-----|---|---|---|
| Bolt retaining air bag control unit            | M6 | 0.8 | ● | ● | ● |
| Bolt retaining driver module to steering wheel | M6 | 0.8 | ● | ● | ● |
| Bolt retaining passenger module to facia beam  | M6 | 0.7 | ● | ● | ● |





**FUEL SYSTEM**

|                                                              |    |
|--------------------------------------------------------------|----|
| - Fuel system with Lucas FT09 pump                           | 1  |
| - Introduction                                               | 1  |
| - Fuel system components                                     | 1  |
| - Location of fuel system components                         | 2  |
| - Air intake circuit                                         | 3  |
| - Fuel feed circuit                                          | 4  |
| - Fuel circuit diagram                                       | 7  |
| - Electric-electronic system                                 | 8  |
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| - Exhaust gas recirculation system (E.G.R.)                  | 18 |

## **FUEL SYSTEM WITH LUCAS FT09 PUMP**

### **INTRODUCTION**

The devices making up the injection system are collectively responsible for introducing fuel into each cylinder and ensuring the required quantity is provided to provide even, effective combustion.

Efficient engine operation depends largely on precise injection.

The following essential conditions must be satisfied:

- each cylinder must be provided with the amount of fuel required by the engine during each cycle as dictated by rpm and load. In practice, this involves metering the fuel;
- the fuel must be introduced at the most effective moment and the beginning of injection must always be repeated at the same point in the cycle. This point is chosen to bring conditions as close as possible to the ideal engine operation cycle. It must be possible to alter this moment as the rpm changes;
- the fuel must be nebulised into tiny droplets to facilitate ignition;
- the droplets must possess sufficient kinetic energy to penetrate the mass of compressed air;
- the fuel particles must be diffused as evenly as possible in all directions so that as much of the air in the cylinder as possible can be used for combustion

The main features of the 1910 TD indirect injection system are as follows:

- fuel injection advance managed by an electronic control unit (ECU);
- turbocharged by a turbocharger and intercooler
- cross flow intake/exhaust ducts;
- Exhaust gas recirculation system for removal of NOx (controlled by the electronic control unit);
- Crankcase case recirculation system (Blow-by).

These devices ensure that this version meets EC F2 emission requirements while also allowing better fuel returns, lower noise levels and better handling.

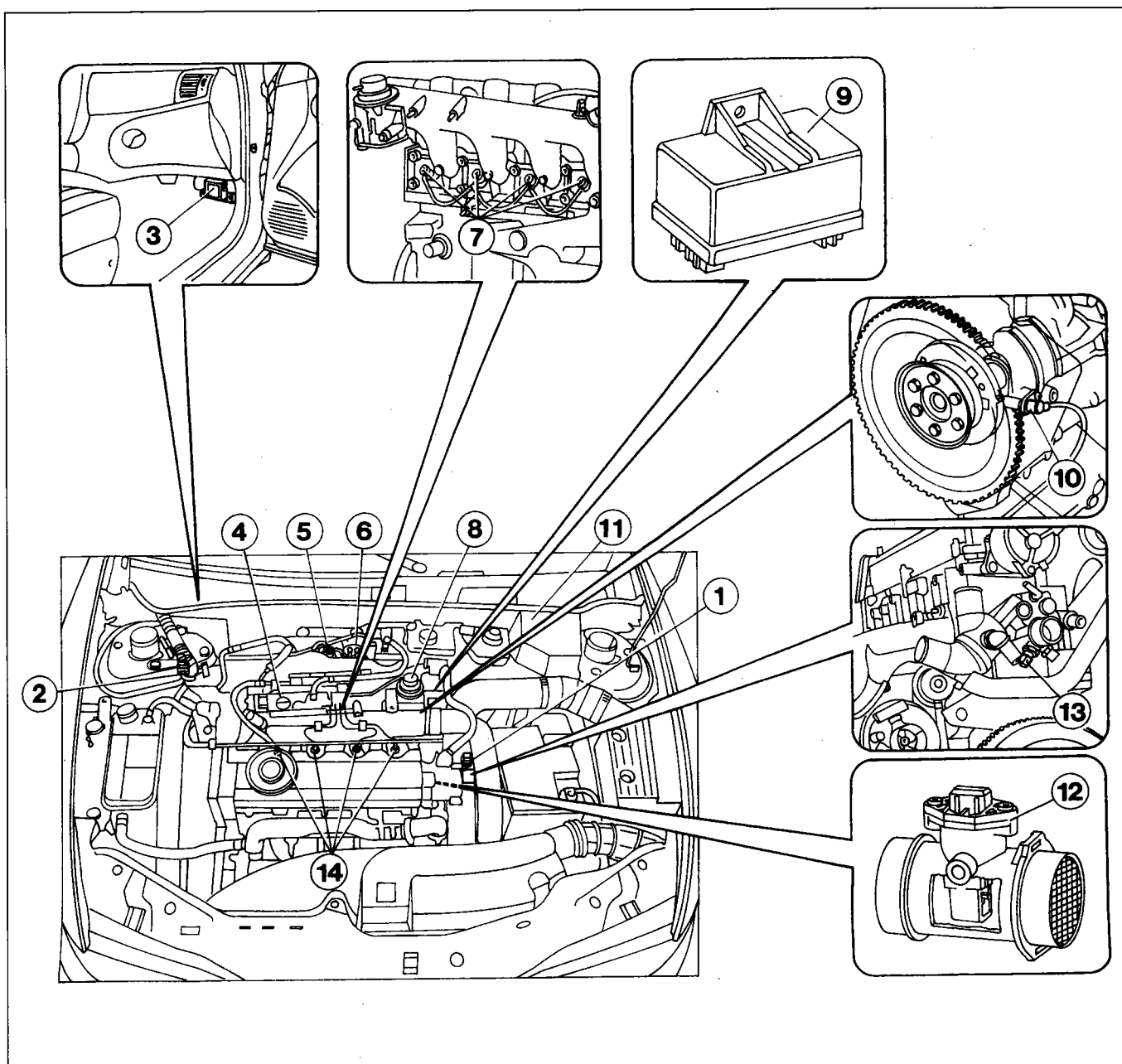
### **FUEL SYSTEM COMPONENTS**

The fuel system is made up of the following main subsystems:

- Air intake circuit
- Fuel supply circuit
- Electric/electronic circuit
- Circuit for recirculating vapours from the crankcase (blow-by gases)
- Exhaust gas recirculation circuit (E.G.R.)

# 10.

## LOCATION OF FUEL SYSTEM COMPONENTS



P4A02EJ01

- 1. Air temperature sensor
- 2. Diagnostic socket
- 3. Electronic control unit
- 4. Injection pump
- 5. Fast idle valve
- 6. Borg Warner modulator valve
- 7. Heater plugs

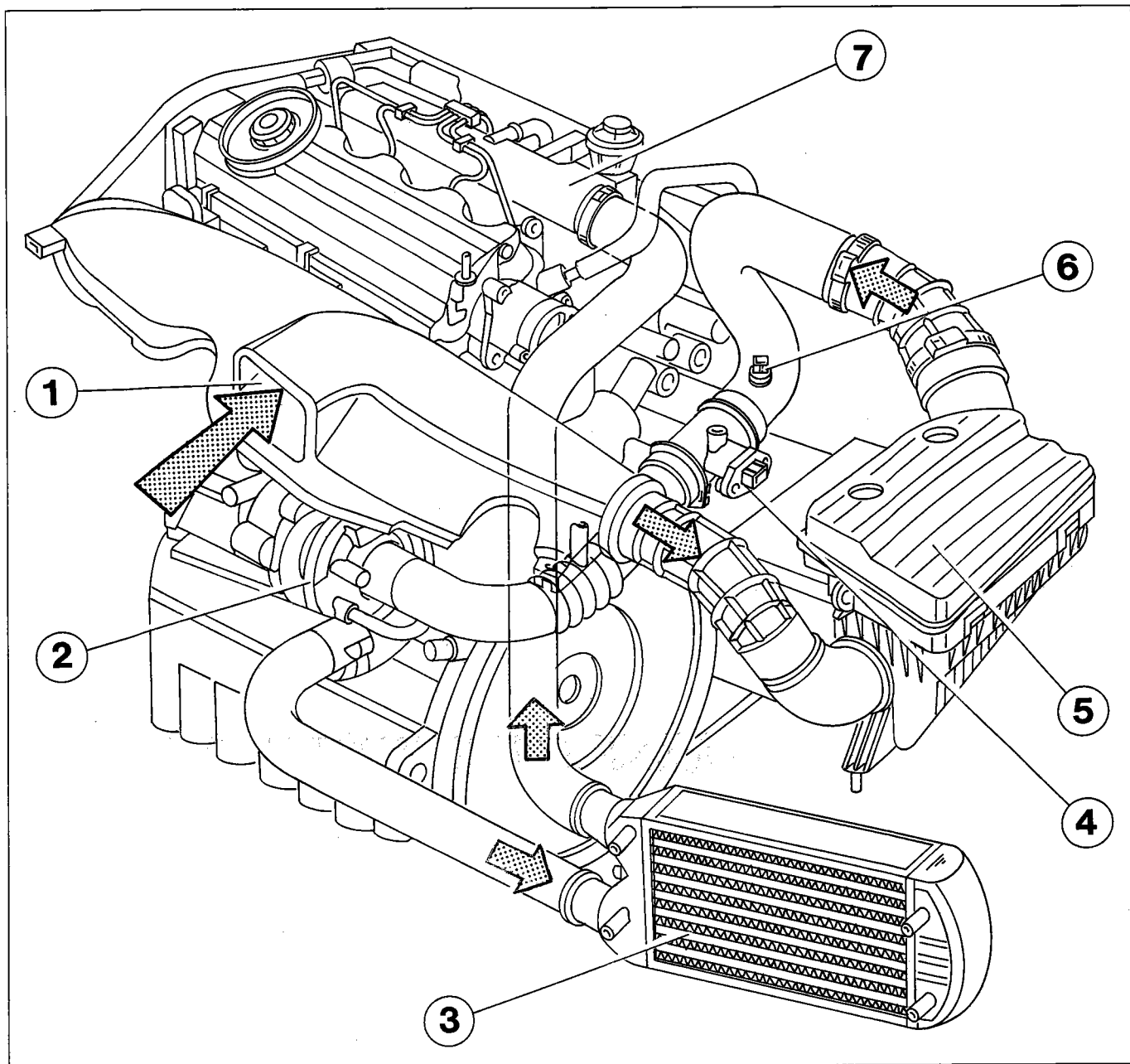
- 8. E.G.R. valve. (Mitsubishi)
- 9. Pre-heating control unit
- 10. Rpm sensor
- 11. Preheating control unit fuse
- 12. Air flow meter (debimeter)
- 13. Coolant temperature sensor
- 14. Injectors

## AIR INTAKE CIRCUIT

The air intake circuit is turbocharged by means of a Garrett GT15 turbocharger with waste-gate.

Air is taken in through intake (1) and flows through filter (5) before compression in exhaust gas-driven turbocharger (2). Air then flows through the heat exchanger (intercooler) (3).

The air assumes optimal temperature and density properties and then flows to the intake manifold (7) for distribution to the cylinders.



P4A03EJ01

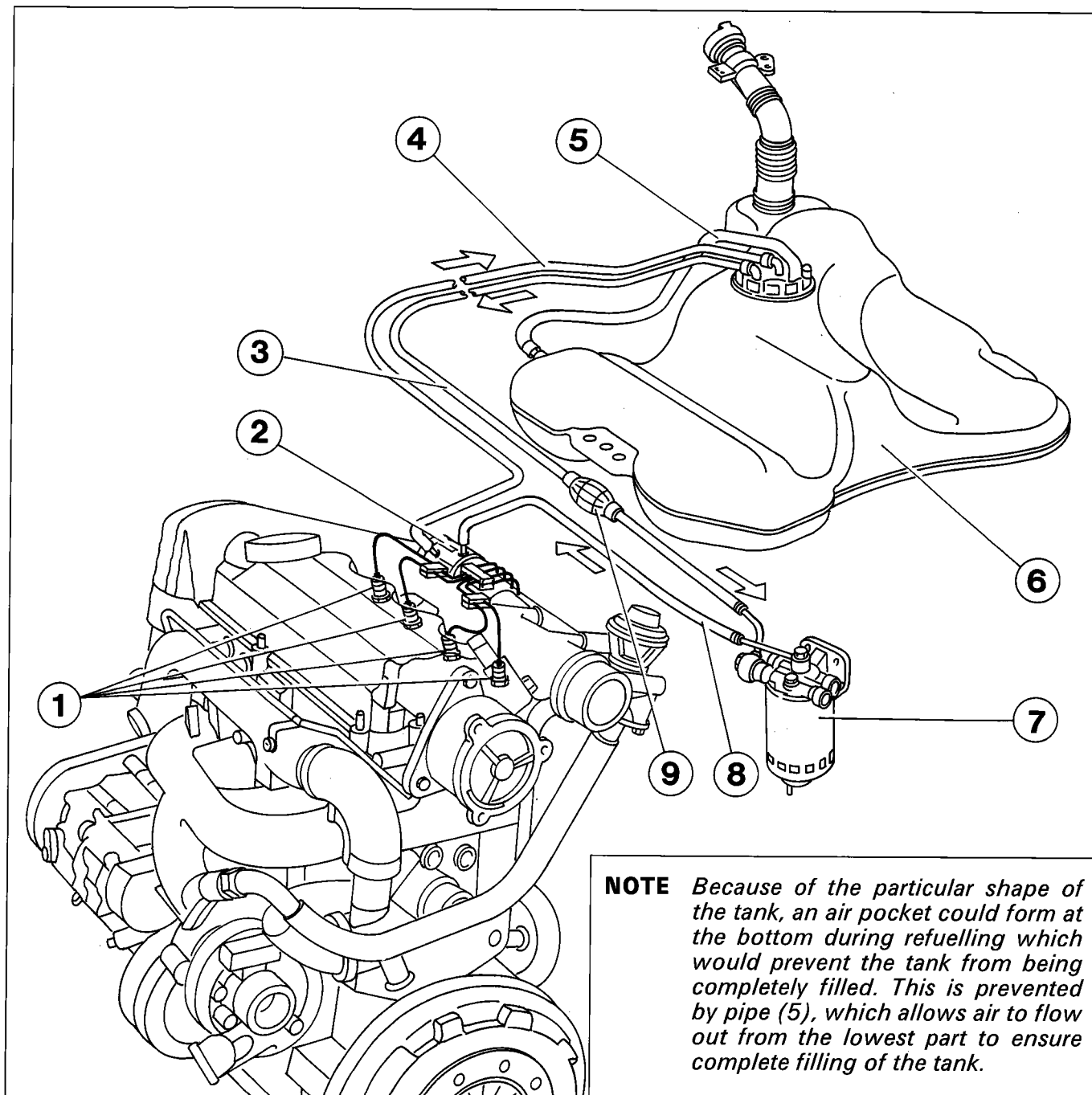
- |                                 |                           |
|---------------------------------|---------------------------|
| 1. Inlet fitting                | 5. Air cleaner            |
| 2. Turbocharger                 | 6. Air temperature sensor |
| 3. Heat exchanger (intercooler) | 7. Inlet manifold         |
| 4. Air flow meter (debimeter)   |                           |

## 10.

### FUEL FEED CIRCUIT

The main components of the fuel system are as follows: tank, filter, injection pump and injectors. Fuel flows from tank (6) to injection pump (2) through filter (7). A pump (9) is fitted upstream from filter (7) to prime the fuel if necessary (e.g., after replacing the fuel filter).

Rotary injection pump (2) ensures injectors (1) are properly supplied with fuel in the firing order 1-3-4-2.



**NOTE** Because of the particular shape of the tank, an air pocket could form at the bottom during refuelling which would prevent the tank from being completely filled. This is prevented by pipe (5), which allows air to flow out from the lowest part to ensure complete filling of the tank.

P4A04EJ01

1. Injectors
2. Injection pump
3. Delivery line from tank to filter
4. Return line (recirculation)
5. Vent pipe

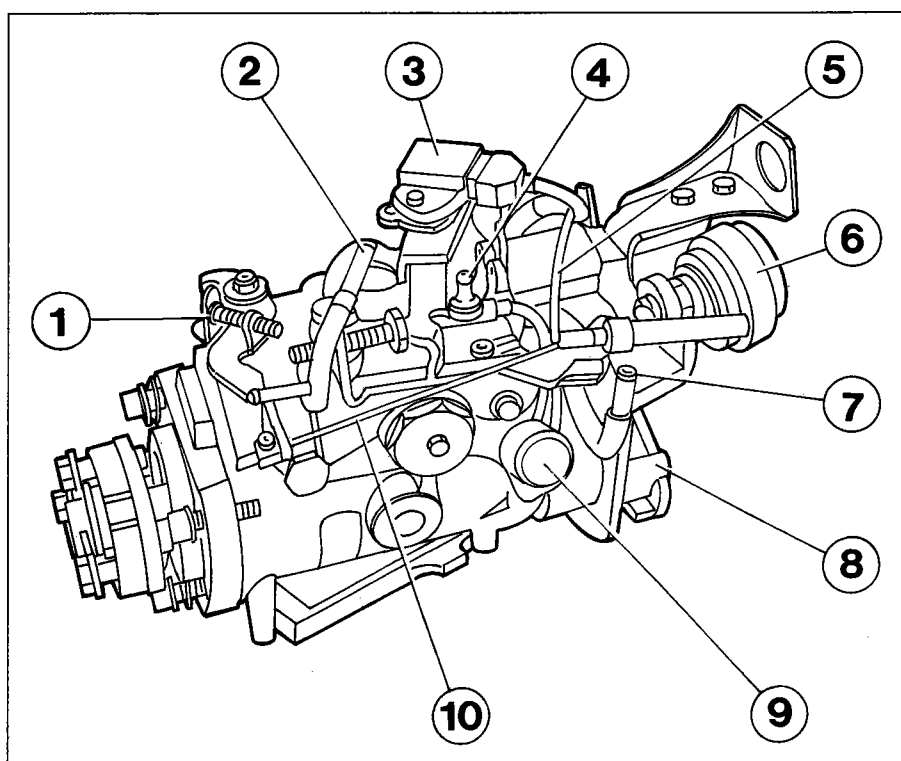
6. Reservoir
7. Fuel filter
8. Fuel outlet line from filter to injection pump
9. Hand-operated priming pump

**Injection pump**

The Lucas FT09 injection pump is designed specifically for indirect injection diesel pumps. New innovative features optimise engine service characteristics under all operating conditions. More specifically, the pump reduces fuel consumption, harmful emissions and noise levels.

The pump is rotary and its main characteristics are as follows:

- Injection advance altered by an electronic control unit.
- Centrifugal mass maximum flow regulator fitted to the pump shaft.
- Pump is lubricated by the fuel used to drive the pump.
- Extra fuel under conditions of fuel engine load or when full power is required.
- Coded, electronic fuel flow stop device built into the immobiliser system (Fiat CODE).



P4A05EJ01

- |                                           |                                                 |
|-------------------------------------------|-------------------------------------------------|
| 1. Idle speed adjustment screw            | 6. Fast idle actuator control device            |
| 2. Fitting for diesel return line to tank | 7. Fitting for diesel delivery line from filter |
| 3. Throttle lever position sensor.        | 8. Diesel delivery fitting to injectors         |
| 4. Accelerator control lever              | 9. Advance actuator                             |
| 5. Engine stop solenoid protective cover  | 10. Fast idle cable                             |



# 10.

## Principle of operation

Fuel taken up from tank (11) and filtered by filter (12), flows to feed pump (7) which increases fuel pressure.

Under the effect of the feed pump pressure regulator valve (2), the pressure increases in more or less linear fashion as engine rpm rises.

Valve (2) also by-passes the feed pump (7) during priming.

Fuel flows from the feed pump to metering device (6), which calculates the amount of fuel to be sent to pumping element (4) and thus the effective output of the injectors.

The position of metering device (6) is controlled by speed regulator (13) on the basis of accelerator pedal position.

The pumping element consists of two opposing plungers which slide radially in the rotor and are operated by the profile of a ring with cams via rollers and sliding pads.

The plungers lack return springs because they are pressed outward by centrifugal force and the pressure of the fuel entering during the supply stage.

The rollers which drive the plungers come into contact with the cam profile at different points according to the length of travel during the fuel supply stage.

This travel is dependent upon the amount of fuel entering the pumping chamber, regulated by the metering device, and upon plunger expansion time determined by pump rotating speed.

During the injection stage, the plunger control rollers come into contact with the cams and the plungers are pushed inward to raise the pressure and bring about injection.

At the end of the injection stage, the plungers are pushed outward to lower the pressure. Fuel delivery stops and valve (5) seals off the outlet pipe.

Valve (5) not only closes the delivery pipe but also instantaneously lowers the pressure in the pipe leading to injector (10). This quickly shuts off injection to prevent the injector dripping.

The maximum quantity of fuel which may be fed into the pumping element (4) during each cycle is determined by a maximum flow regulator.

Pressure inside pumping element (4) is maintained at a constant level by pressurisation valve (9).

Turbocharging control valve (1) increases the fuel flow. Increased turbocharging pressure compresses a membrane located inside the valve to move a piston which transfers feed pressure to the sliding pad actuator located inside pumping element (4). The sliding pads move to alter plunger travel and thus also the quantity of fuel injected.

Solenoid (8), controlled by a electronic control unit, alters the pump delivery advance to bring about an increase when engine load exceeds a given threshold.

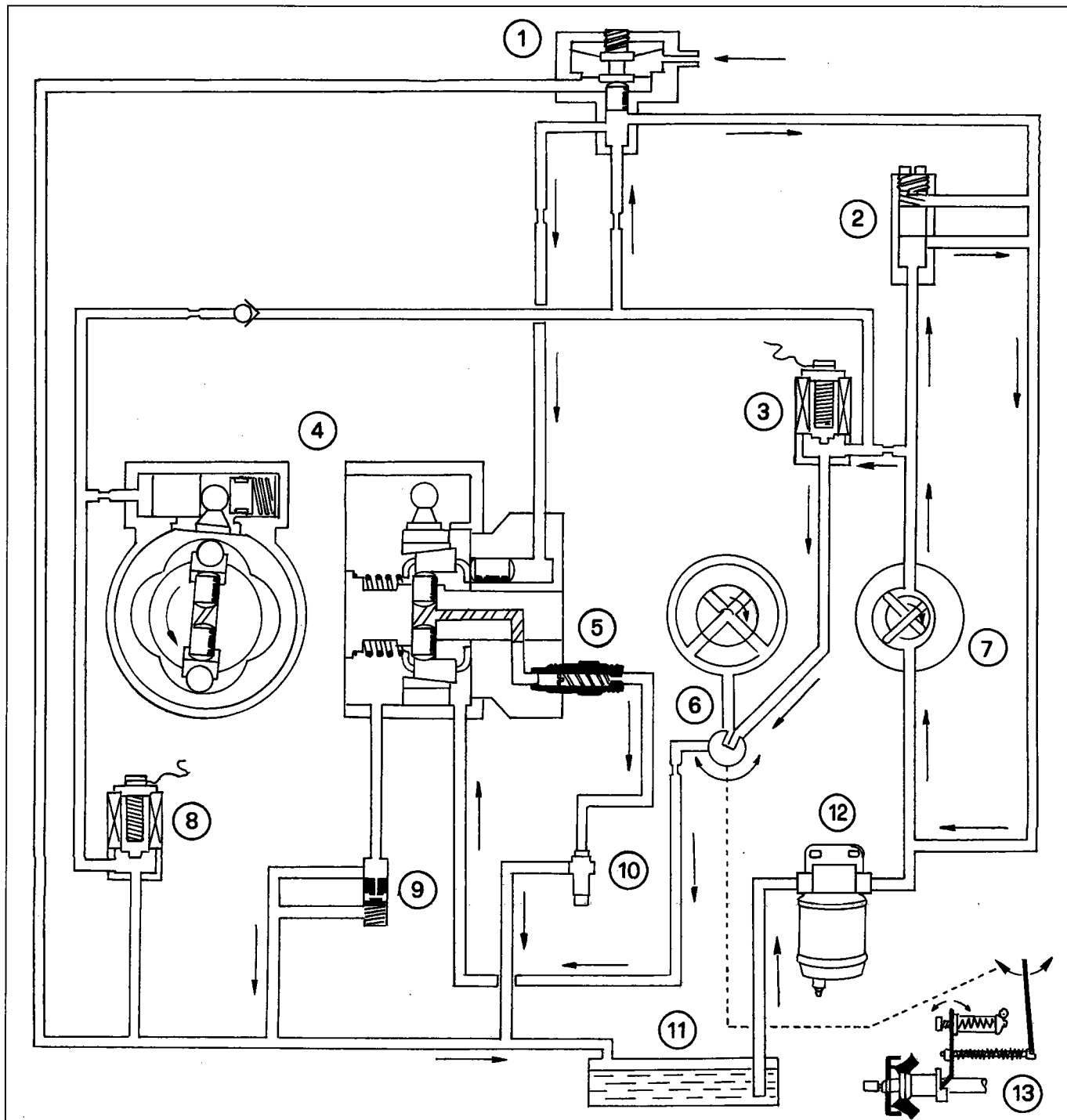
The engine stop solenoid (3) is protected by a tamper-proof cover.

During engine operation, the solenoid remains active so that fuel may flow from feed pump (7) to the intake duct.

When the key is turned to switch off the engine, the solenoid is deactivated to shut off the fuel flow. The metering device feed chamber is no longer supplied with fuel and the engine stops.



**FUEL CIRCUIT DIAGRAM**



P4A07EJ01

1. Turbocharging control valve
2. Feed pressure regulator valve
3. Engine stop solenoid
4. Pumping element
5. Outlet valve
6. Metering device

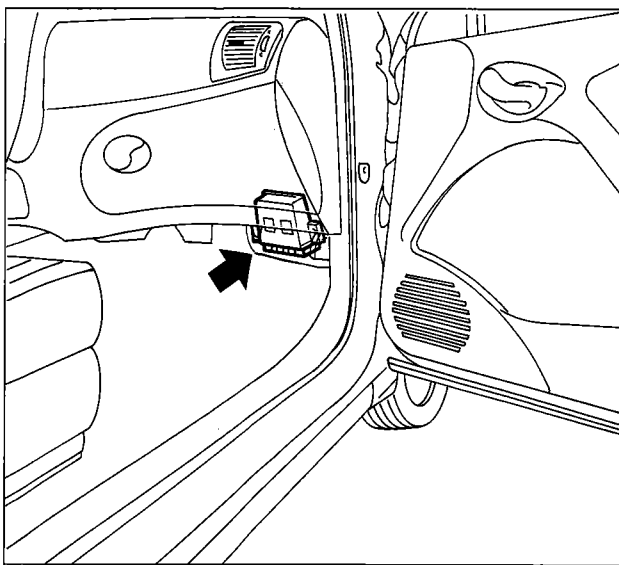
7. Feed pump
8. Advance actuator control solenoid
9. Pressurisation valve
10. Injectors
11. Tank
12. Filter
13. Speed regulator

### 10.

#### ELECTRIC-ELECTRONIC SYSTEM

The fuel system electric - electronic circuit comprises a wiring circuit, an electronic unit (control unit) and the following sensors and actuators:

- Rpm sensor
- Coolant temperature sensor
- Air flow meter (debimeter)
- Intake air temperature sensor
- Injector with controls
- Accelerator lever position sensor
- Fast idle control solenoid
- Preheating control unit



P4A08EJ01

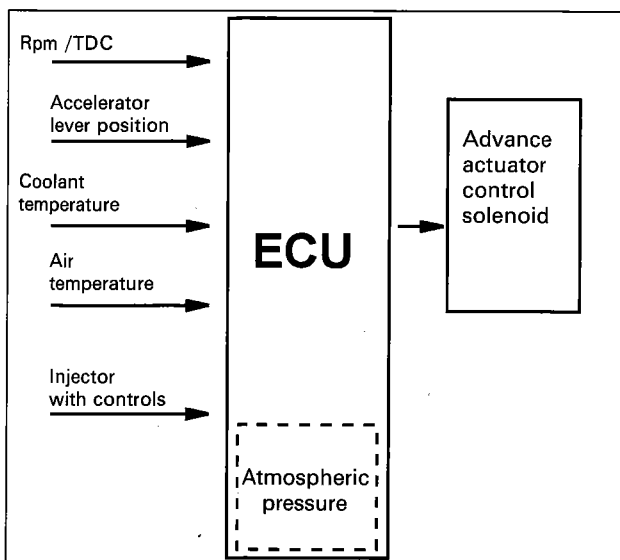
#### Electronic control unit

The electronic control unit (ECU) is located beneath the glove compartment (right hand side) and is connected to the wiring by a 25 pin connector. This receives all the data on engine service conditions transmitted by the various sensors in addition to atmospheric pressure information obtained by a sensor located inside the control unit. The control unit uses this data in conjunction with specific programs to implement the following operating strategies:

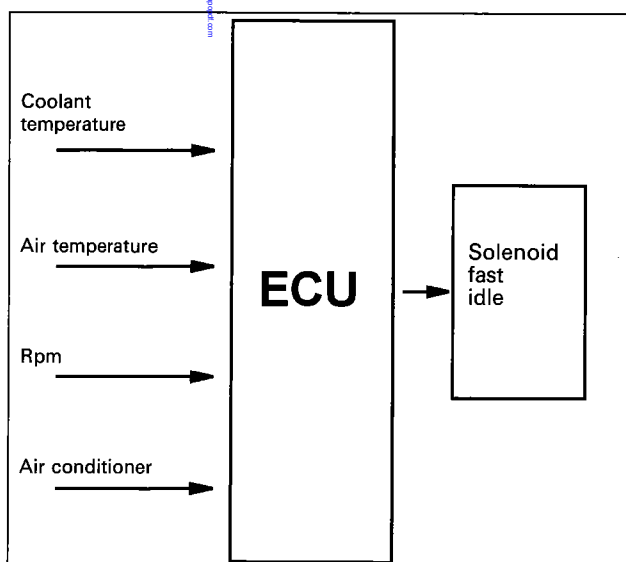
- injection advance control
- fast idle control
- exhaust gas recirculation
- glow plug pre/post heating control
- air conditioning system control

#### INJECTION ADVANCE CONTROL

The electronic control unit uses data on engine rpm/TDC, accelerator lever position, air and coolant temperature and atmospheric pressure to calculate the optimal injection advance. It compares this with the actual value transmitted by the injector with controls and adjusts the advance actuator control solenoid when required.



P4A08EJ03

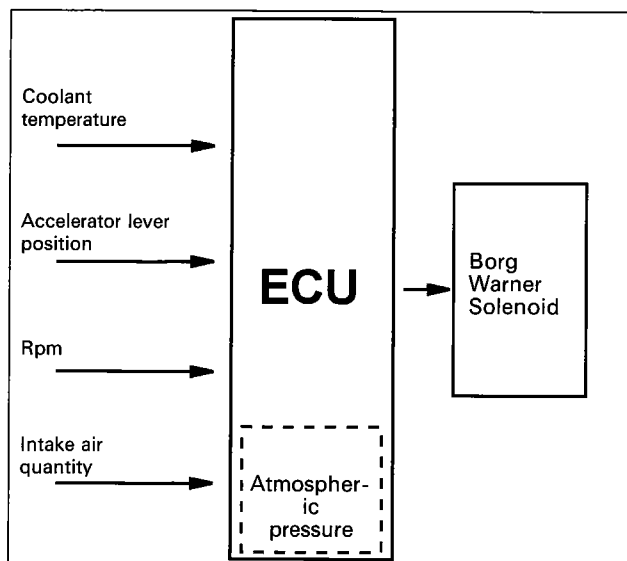


P4A09EJ01

### FAST IDLE MANAGEMENT

The control unit activates the fast idle when at least one of the following conditions occurs:

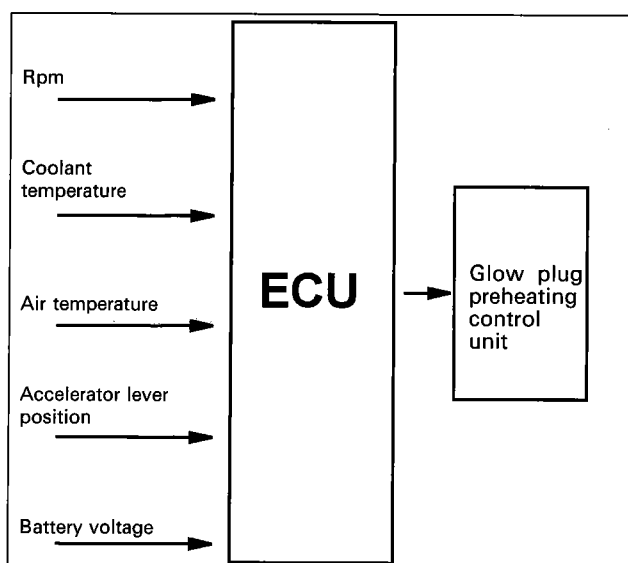
1. Intake air temperature less than 25° C and coolant temperature less than 55° C.
2. Air conditioner compressor on.
3. Engine speed less than 750 rpm.



P4A09EJ02

### EXHAUST GAS RECIRCULATION CONTROL

The control unit calculates the weight ratio between "clean" air taken in and the quantity of burnt gases which may be returned to the intake. On the basis of engine load, coolant temperature and intake air quantity, the control unit controls the Borg Warner modulator valve which in turn activates the EGR valve via a vacuum signal in order to recirculate the exhaust gas.

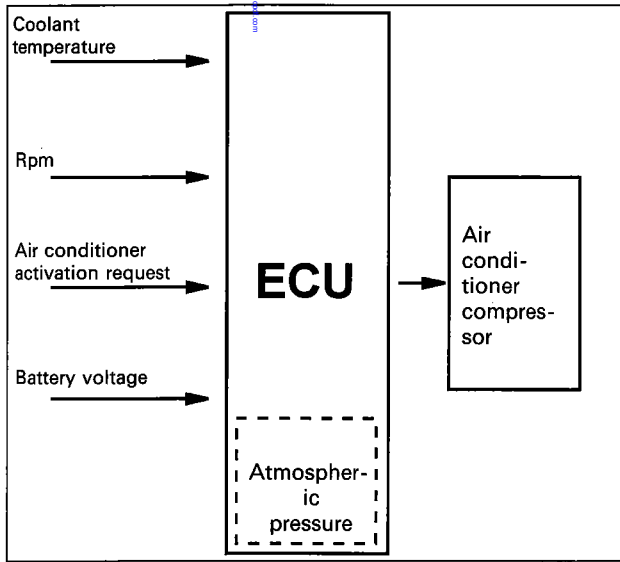


P4A09EJ03

### GLOW PLUG PRE/POST HEATING MANAGEMENT

The electronic control unit (ECU) controls the glow plug preheating control unit directly to manage pre and post heating times, mainly on the basis of coolant and intake air temperature. When calculating post-heating times, the control unit also takes into account accelerator lever position and rpm. Heating times are reduced when there is a high demand for engine power.

## 10.



P4A10EJ01

### AIR CONDITIONING SYSTEM CONTROL

When the air conditioner is turned on, the compressor absorbs power from the engine, which tends to stall when only idling. The control unit activates the fast idle function described previously to prevent this problem occurring.

The control unit also deactivates the compressor if one of the following conditions occurs:

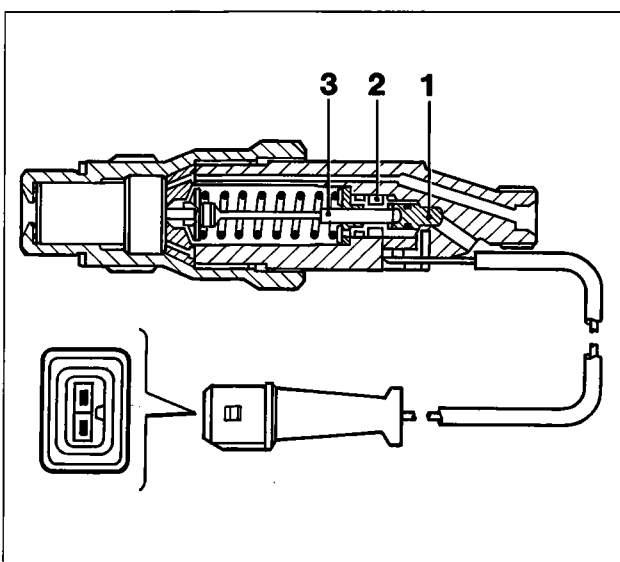
1. Coolant temperature greater than 110 °C.
2. A given rpm threshold is exceeded (about 4500).
3. High engine power demand (high acceleration).

Under conditions 1 and 2 the compressor is reactivated when coolant temperature or rpm drop below the intervention threshold.

Under condition 3, power is cut off only temporarily and automatically restored after a few seconds even if the power requirement is still high.

### Injector with controls

The injector with controls informs the electronic control unit of the true injection advance (beginning of injection stage, i.e. when the needle valve begins to move).



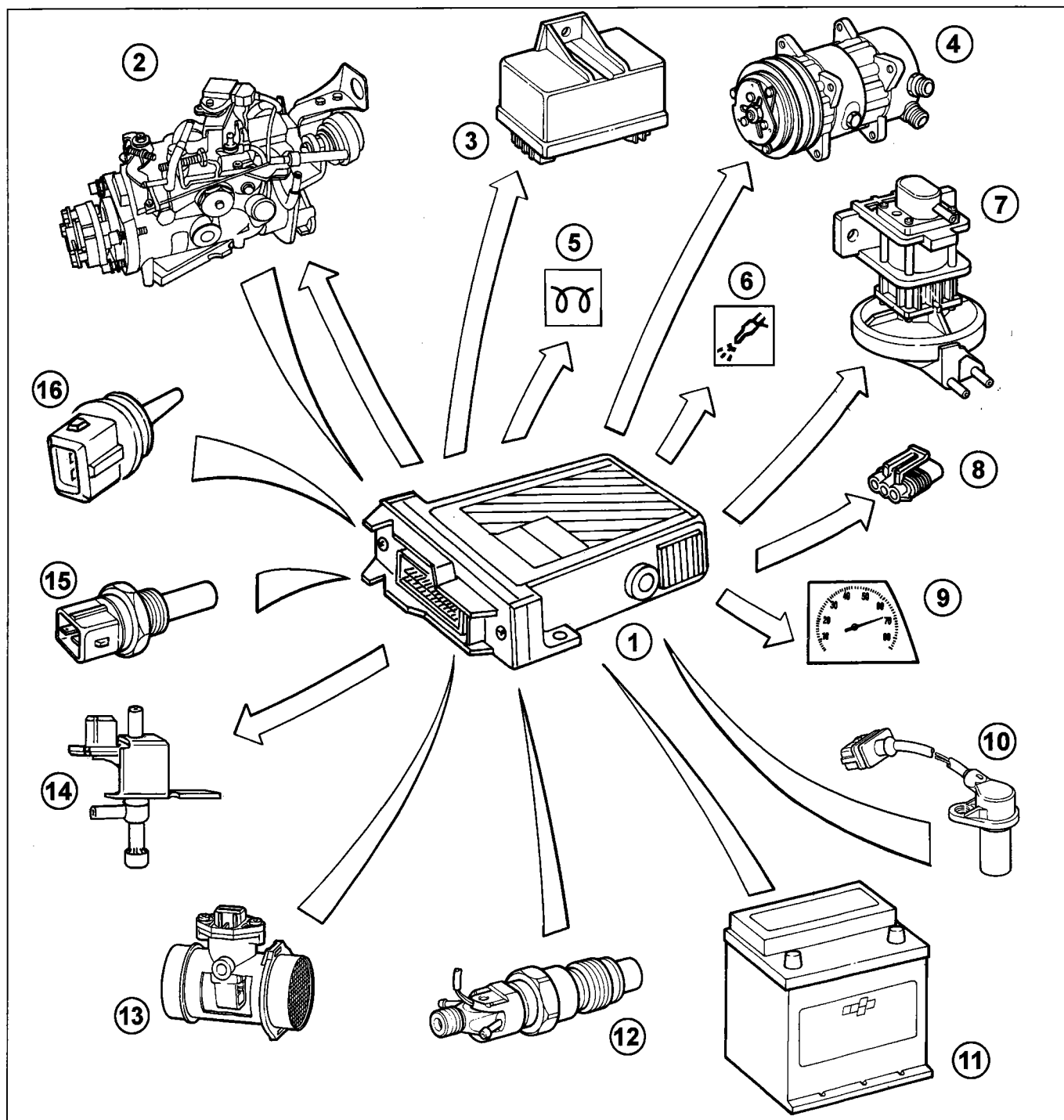
P4A08EJ02

On the basis of the signal, the control unit corrects the advance set by the injector actuator until the rated value is reached.

The injector is fitted to cylinder (1) and equipped with a device to identify the exact moment at which the injection stage begins and wiring to send a signal to the electronic control unit.

The injector contains a coil (2), a needle valve (3) and an adjustment pin (1). The coil is electrically activated and generates a magnetic flow which affects the needle valve (3). When the needle valve begins to open the nozzle for fuel injection, the magnetic flow alters in coil (2). The control unit identifies this as the moment when injection begins and bases its advance adjustment strategy on this reading.

**INPUT AND OUTPUT SIGNALS BETWEEN ECU/SENSORS AND ACTUATORS**

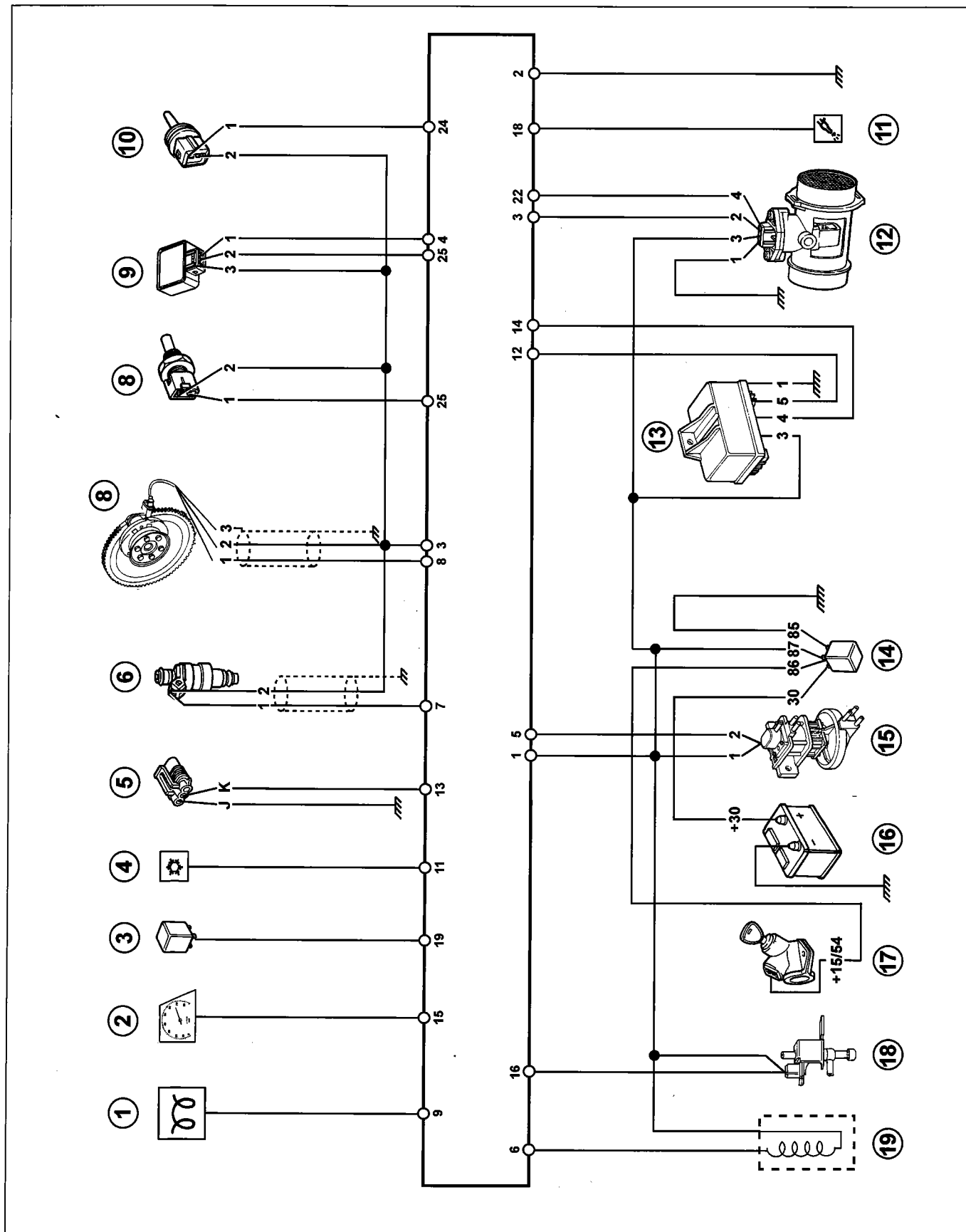


P4A09EJ04

- |                                           |                                |
|-------------------------------------------|--------------------------------|
| 1. Electronic control unit                | 9. Rev counter                 |
| 2. Injection pump                         | 10. Rpm sensor                 |
| 3. Glow plug control unit                 | 11. Battery                    |
| 4. Heating/ventilation system             | 12. Injector with controls     |
| 5. Glow plug warning light                | 13. Air flow meter (debimeter) |
| 6. Injection system failure warning light | 14. Fast idle valve            |
| 7. Borg Warner solenoid                   | 15. Coolant temperature sensor |
| 8. Diagnostic socket                      | 16. Air temperature sensor     |

# 10.

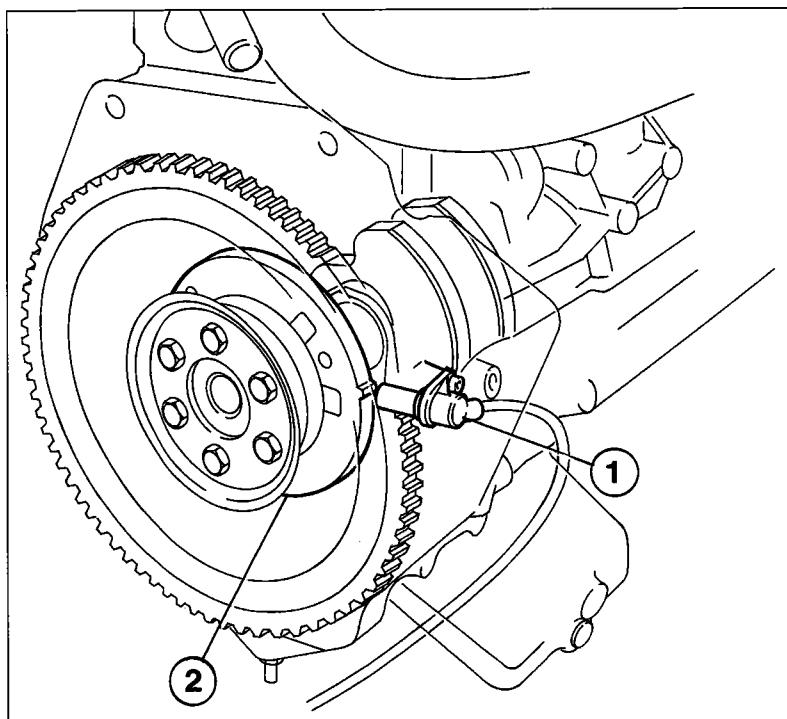
## WIRING DIAGRAM



P4A10EJ02

**Key to wiring diagram**

- |                                             |                                            |
|---------------------------------------------|--------------------------------------------|
| 1. Heater plugs warning light               | 11. Injection system failure warning light |
| 2. Rev counter signal                       | 12. Debimeter                              |
| 3. Air conditioner relay                    | 13. Preheating control unit                |
| 4. Air conditioner activation button        | 14. System relay                           |
| 5. Fiat/Lancia Tester fault diagnosis point | 15. Borg Warner solenoid (E.G.R)           |
| 6. Injector with controls                   | 16. Battery                                |
| 7. Rpm and TDC sensor                       | 17. Ignition switch                        |
| 8. Coolant temperature sensor               | 18. Fast idle valve                        |
| 9. Accelerator lever position sensor        | 19. Solenoid for advance adjustment device |
| 10. Intake air temperature sensor           |                                            |

**Rpm and phonic wheel sensor****Specifications:**

Gap  
0.8 - 1.5 mm

Winding resistance  
860 ohm  $\pm$  10% at 20°C

- 1. Rpm sensor
- 2. Phonic wheel

The rpm sensor is fitted on the crankcase and faces a phonic wheel located inside the crankcase and fastened to the crankshaft.

The steel phonic wheel is fitted with two reference dowels on the outer part of the circumference, each one located 10° after top dead centre.

When these dowels or teeth pass beneath the sensor, the gap brings about a change in the magnetic flux which in turn induces a current in the sensor coil windings.

This signal provides the control unit with information on engine rpm.



### 10.

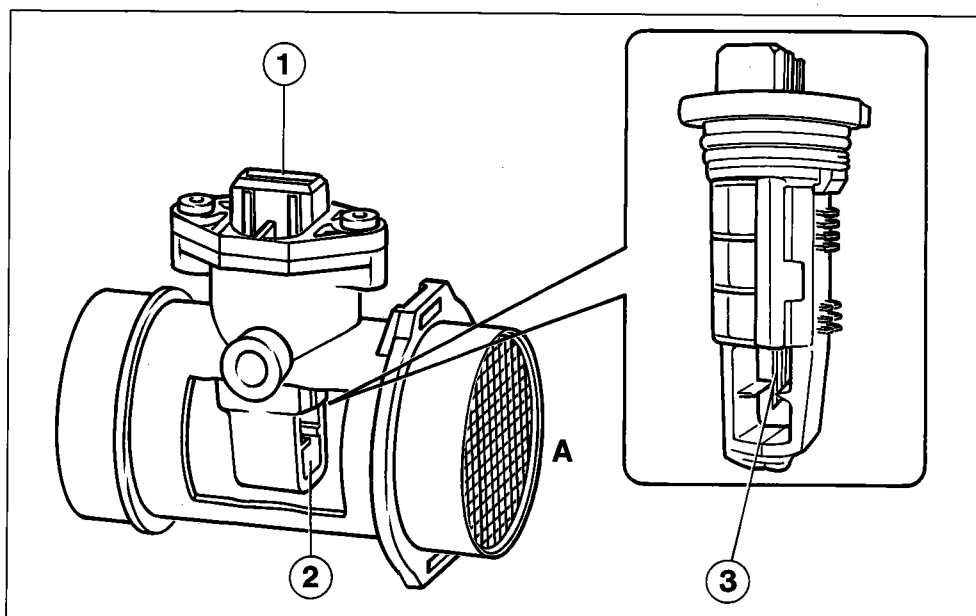
#### Air flow meter (Debimeter)

The air flow meter (Debimeter) is hot film type. In this system, a heated membrane is placed in a measurement channel through which air is taken into the engine.

The film membrane is maintained at a constant temperature ( $\sim 120^{\circ}\text{C}$  above air temperature) by an adjacent heating coil.

The mass of air flowing through the measurement channel tends to remove heat from the membrane. To keep the membrane at constant temperature, a certain current must therefore flow through the heating coil. This current is measured by means of a Wheatstone bridge.

The measured current is therefore proportional to the flowing air mass.



- 1. Connector
- 2. Measuring channel
- 3. Hot film sensor
- A= Air intake

P4A31FJ01

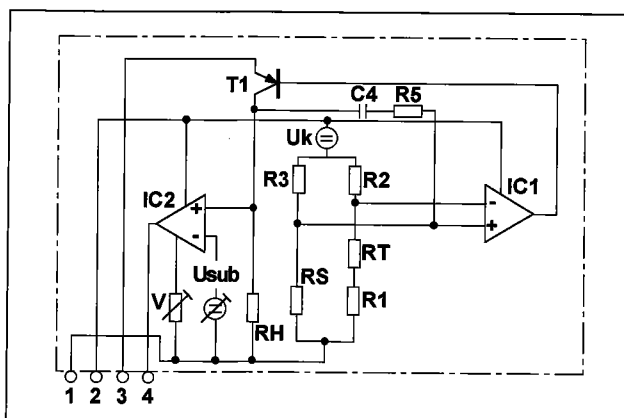
**NOTE** This debimeter measures air mass directly (not volume) and thus eliminates problems of temperature, altitude, pressure etc.

#### Operating description

The Wheatstone bridge ( $R_3, R_2, R_s, R_t + R_1$  format) is in equilibrium when  $R_s$  is about  $120^{\circ}\text{C}$  more than air temperature.

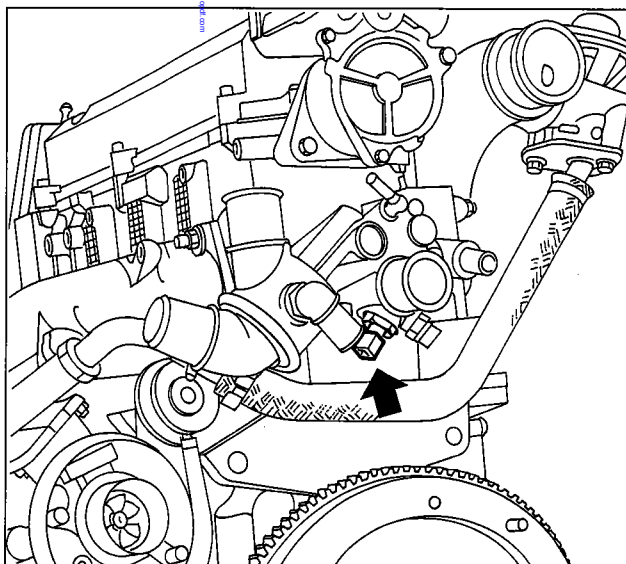
The air flowing through the membrane removes heat from  $R_s$ , and the bridge becomes imbalanced. This situation is detected by the circuit connected to IC1, which controls transistor T1 to an extent proportional to bridge imbalance. T1 then sends more current through  $R_h$  to heat  $R_s$  and thus restore the bridge to equilibrium.

Circuit IC2 measures the current flowing through  $R_h$ . This current maintains the bridge in equilibrium and is thus proportional to the mass of air flowing through the air meter.



P4A31FJ02

Wiring diagram of air flow meter



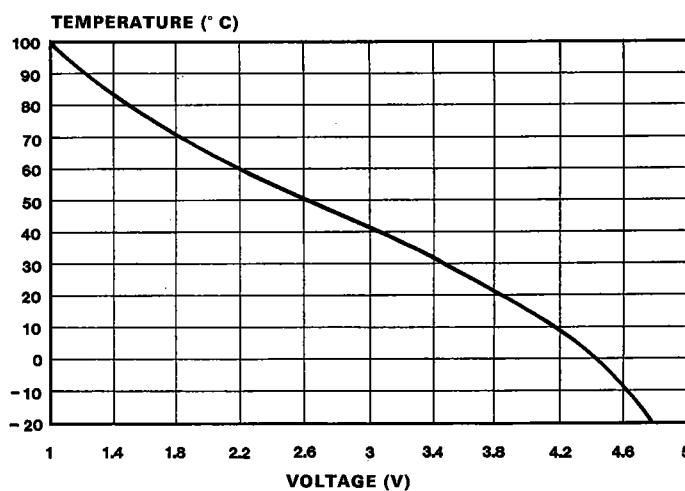
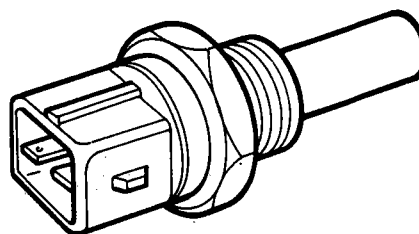
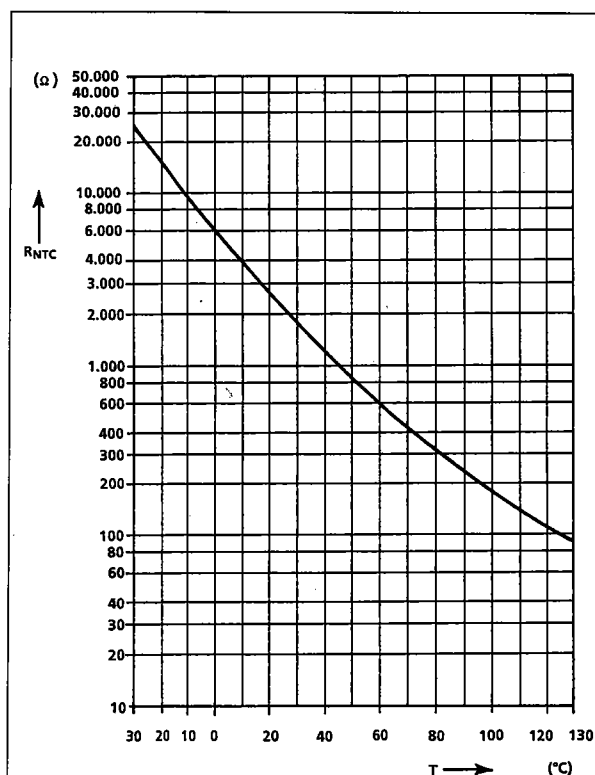
P4A13EJ01

### Coolant temperature sensor

Coolant temperature is measured by a sensor containing an NTC resistance, which alters resistance in inverse proportion to temperature as shown in the diagram.

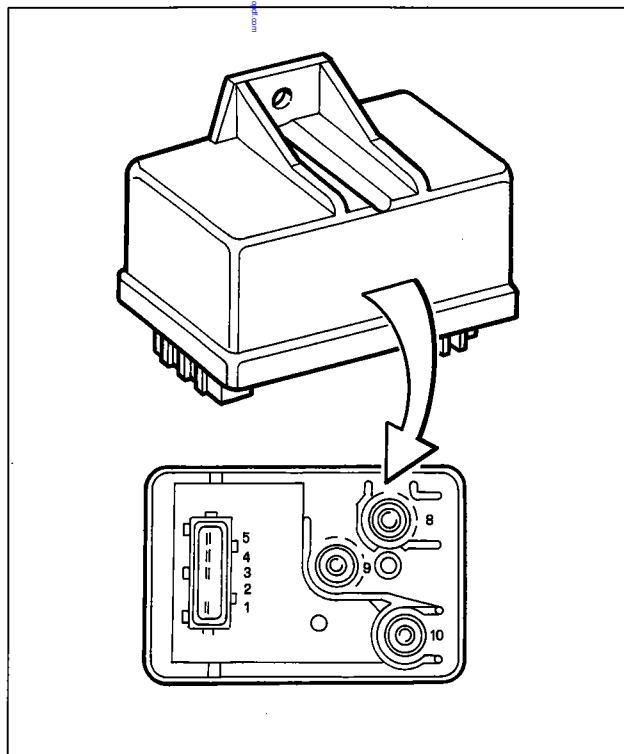
The control unit records a voltage change proportional to the current intensity flowing through the sensor.

When fitting the sensor, take care not to tighten to more than 15 Nm



P4A13EJ02

## 10.



P4A14EJ01

### Preheating control unit

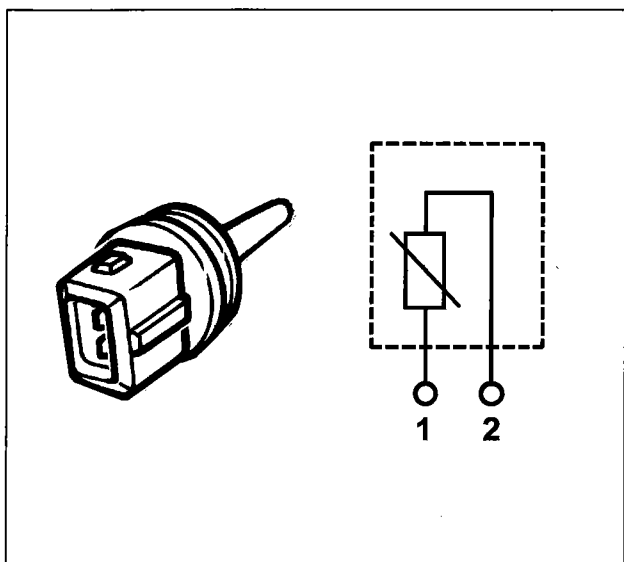
The glow plugs are controlled by the preheating control unit under the direct control of the electronic control unit.

The unit contains a smart relay which sends feedback to the electronic control unit in order to inform it of faults in the preheating unit or short-circuits in the glow plugs.

The figure shows the connectors located on the base of the preheating control unit and the pin-outs.

### Connections

1. Vehicle earth
2. Not connected
3. Ignition switch (+15)
4. Electronic control unit (pre-postheating activation)
5. Electronic control unit (fault diagnosis)
8. Battery positive
9. Glow plugs
10. Glow plugs



P4A30FJ01

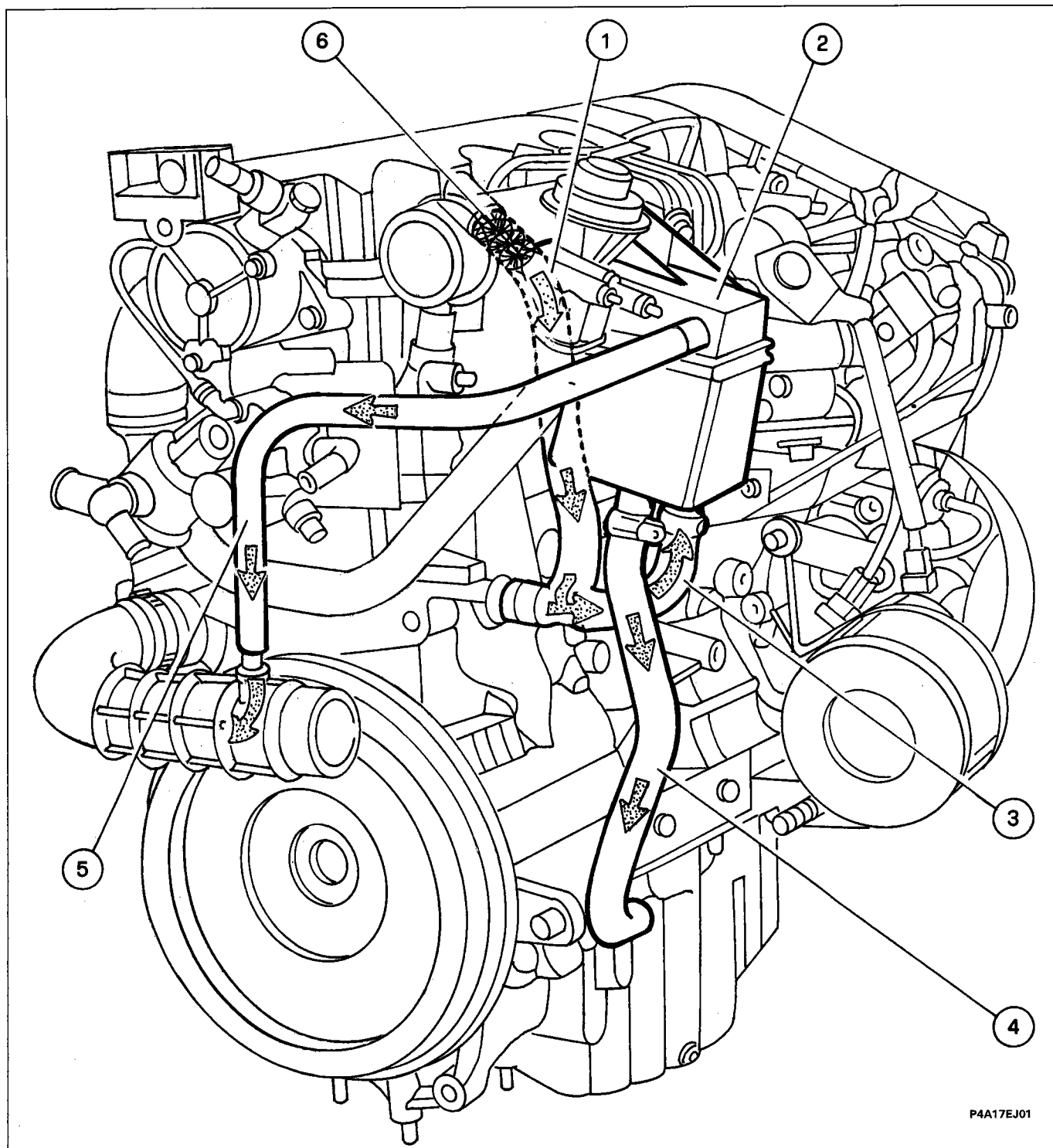
### Air temperature sensor

The intake air temperature sensor is separate from the air flow meter in this version. It is a normal Negative Temperature Coefficient (NTC) sensor: its electric resistance drops as temperature increases.

Because the control unit input circuit is designed as a voltage divider, this voltage is distributed between a resistance in the control unit and the sensor NTC resistance.

The control unit is therefore able to assess sensor resistance changes through voltage changes and obtain temperature information.

**BLOW-BY GAS RECIRCULATION DIAGRAM)**



Crankcase emissions are made up of a mixture of air, diesel and burnt gases which leak through the piston rings, in addition to lubrication oil vapour.

This mixture is defined "blow-by" or "vent" gas.

Vent gases from the crankcase and cylinder head flow through pipe (3) to separator (2) where they lose part of their oil content in the vortex. This falls back to the sump through pipe (4) in the form of droplets (4).

The remaining gases flow through pipe (5) and are directed to the intake circuit.

Cylinder head gas outlet pipe (1) contains a flap trap (6) to prevent the pipe catching fire due to flame flash-back.

## 10.

### EXHAUST GAS RECIRCULATION SYSTEM (E.G.R.))

This system directs a proportion of the exhaust gases to the intake under certain engine operating conditions.

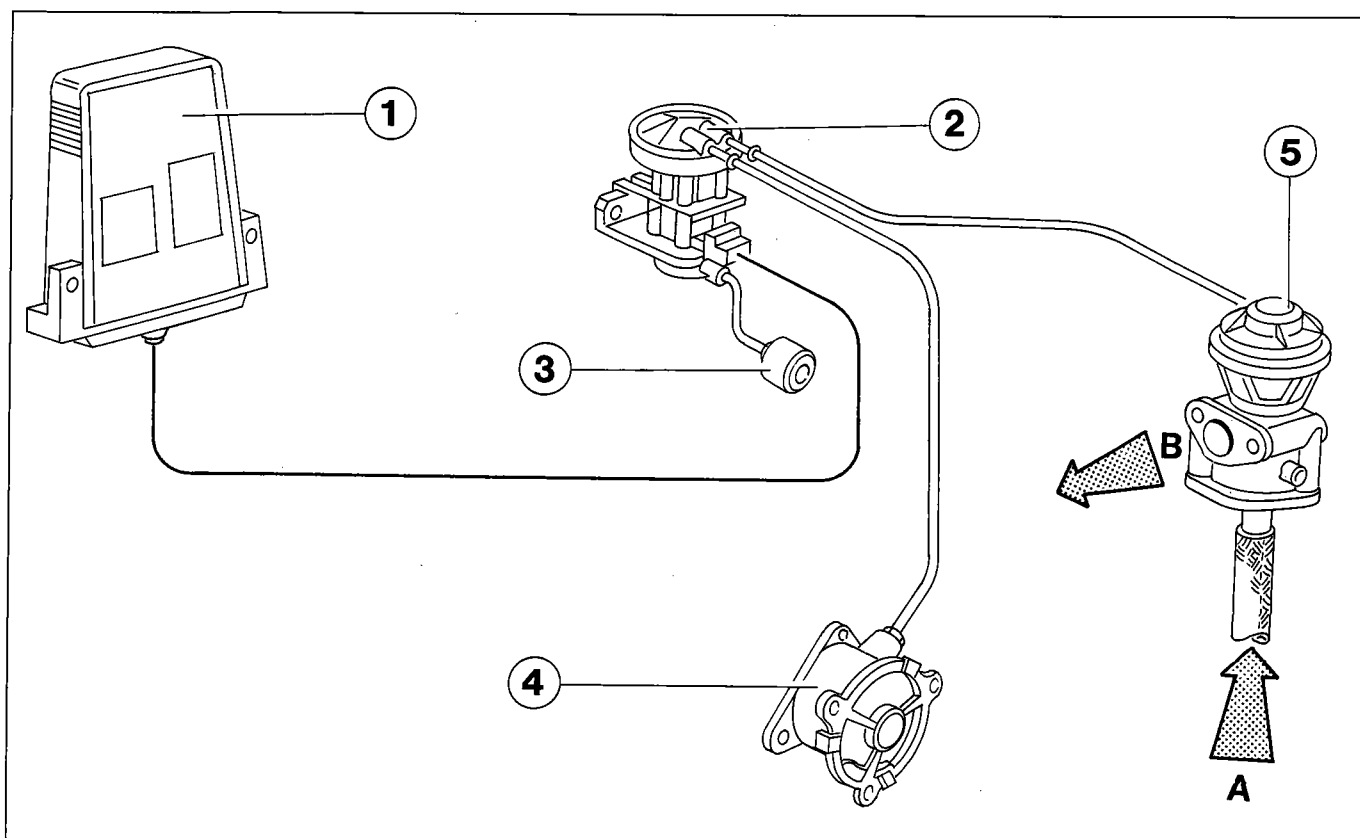
The process dilutes the fuel mixture with inert gases to lower the temperature peak in the combustion chamber. This reduces the formation of nitrogen oxides to bring about a 30-50 % reduction in emissions.

Exhaust gas recirculation is allowed only at medium-low loads, when the air - fuel ratio is very high and engine operation is not impaired by the presence of inert gases instead of air.

The recirculation system is controlled by electronic control unit (1), which receives input signals from a potentiometer on the accelerator lever (on the injection pump) and from the rpm and coolant temperature sensors. It produces an output signal which controls the Borg Warner modulator solenoid and hence the E.G.R. (2).

The E.G.R. is connected to the atmosphere through filter (3). According to an input signal, the valve directs a higher or lower vacuum from the brake servo vacuum pump (4) to the Pierburg EGR valve (5). If the vacuum is sufficient, this valve opens to bring the exhaust manifold into communication with the intake manifold.

The amount of gas recirculated can therefore be altered by adjusting Pierburg E.G.R. valve opening continuously on the basis of maps saved in the ECU memory and the degree of opening, which is in turn dependent on signals received.



P4A16EJ01

- |                                                    |                                  |
|----------------------------------------------------|----------------------------------|
| 1. Electronic control unit                         | 4. Vacuum pump for brake servo   |
| 2. Borg Warner modulator solenoid controlling EGR. | 5. E.G.R. valve.                 |
| 3. Atmospheric intake filter                       | A. Gas from the exhaust manifold |
|                                                    | B. Gas sent to intake            |

**REMOVING - REFITTING**

- Removing - refitting power unit 1

**REPLACING AUXILIARY SHAFT BELT**

- Removing - refitting alternator and power assisted steering drive belt 12

**REPLACING TIMING BELT**

- Removing timing drive belt 13
- Refitting and tensioning timing drive belt 15

**REMOVING - REFITTING CYLINDER HEAD**

- Removing cylinder head 18
- Refitting cylinder head gasket 24
- Refitting and tightening cylinder head 25

**REPLACING WATER PUMP**

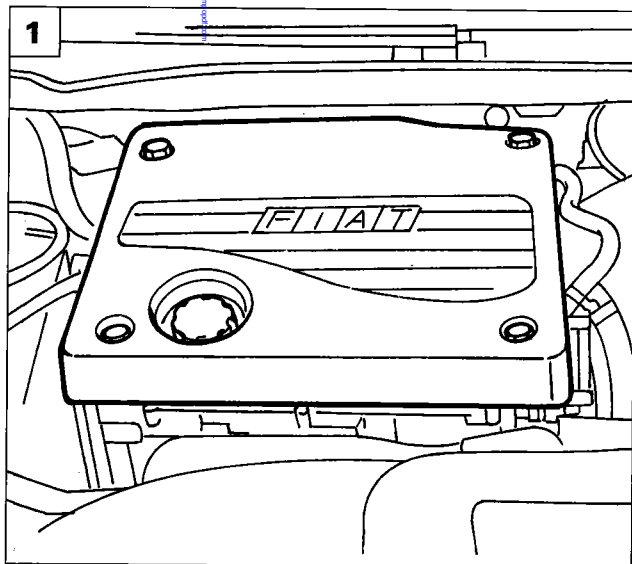
- Replacing water pump 26

**REMOVING - REFITTING RADIATOR**

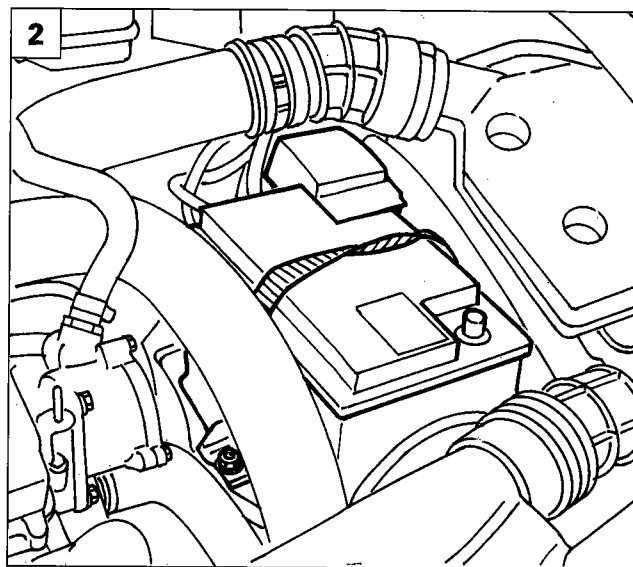
- Removing - refitting radiator 27
- Procedure for filling engine cooling circuit (version with heating and air conditioning for 75 and 100 cv versions) 28

**DIAGRAM SHOWING ENGINE LUBRICATION SYSTEM**

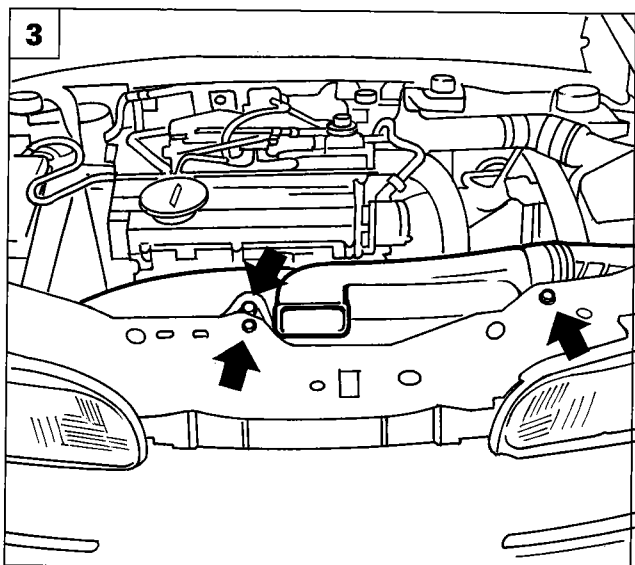
31



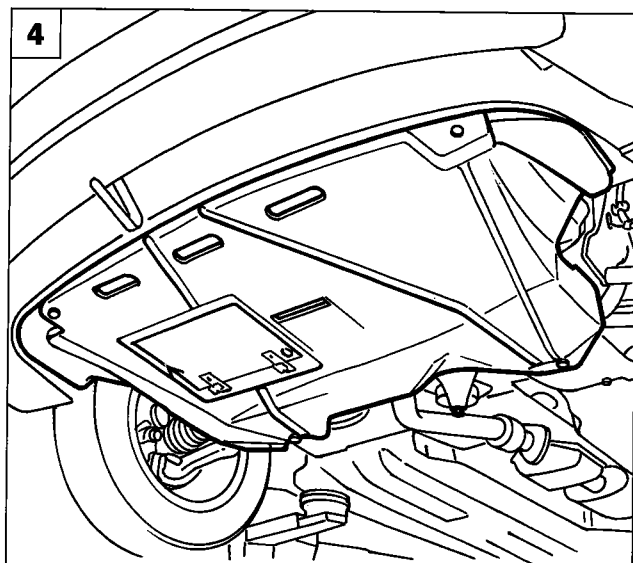
P4A01FX01



P4A01FX02



P4A01FX03



P4A01FX04

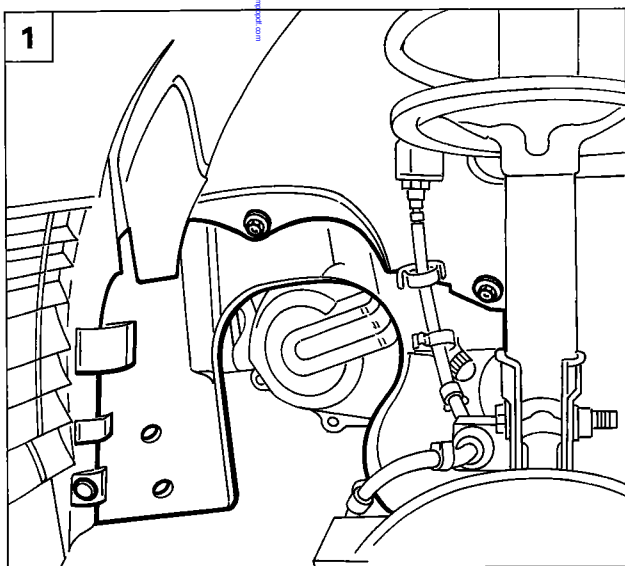
### REMOVING - REFITTING

Position the vehicle on a lift, remove the front wheels and disconnect the battery negative terminal. Then proceed as follows.

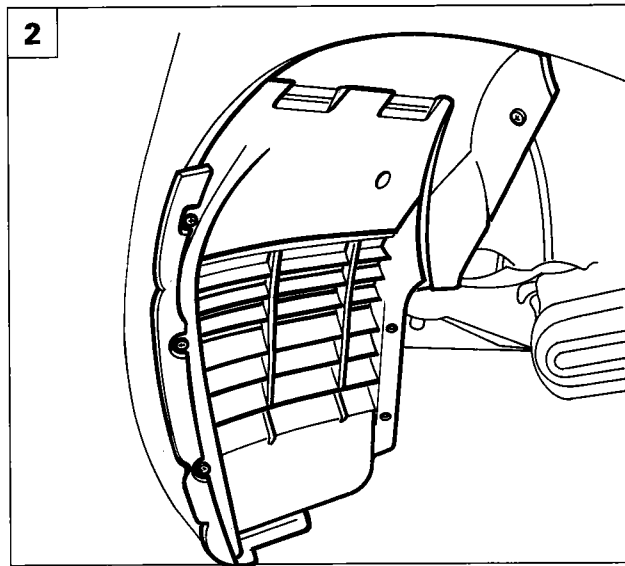
1. Remove the upper engine guard.
2. Disconnect the battery positive terminal, unscrew the nut securing the battery to its cradle and remove from the engine bay.
3. Unscrew the retaining bolts shown and remove the air shroud shown in the figure.
4. Raise the lift and remove the lower engine bay guard.



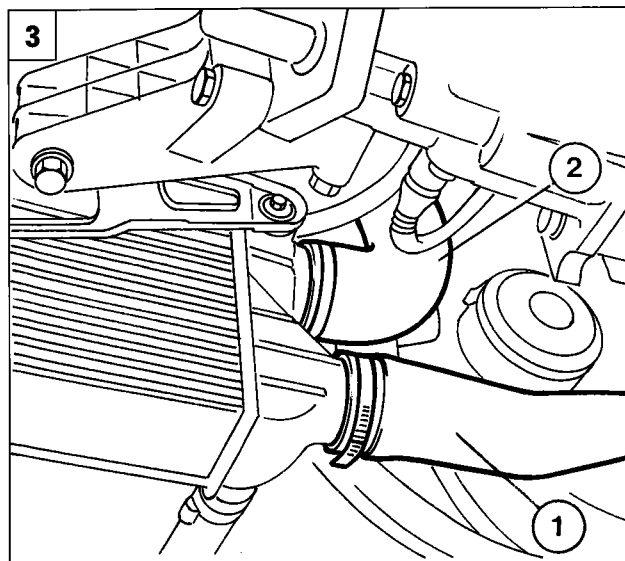
### 10.



P4A02FX01



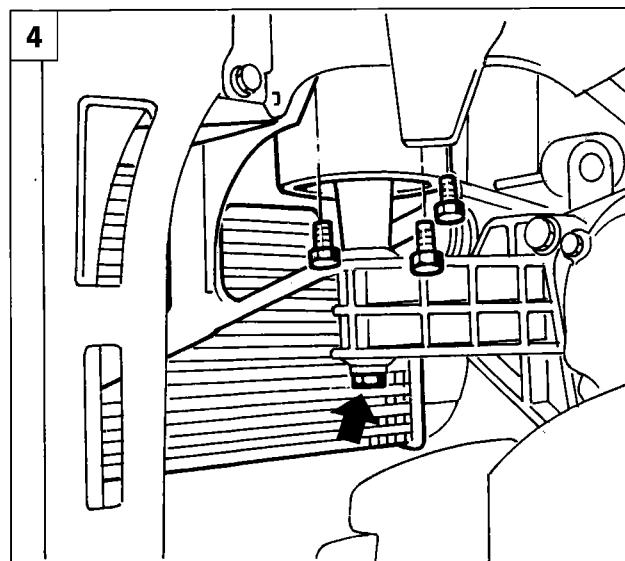
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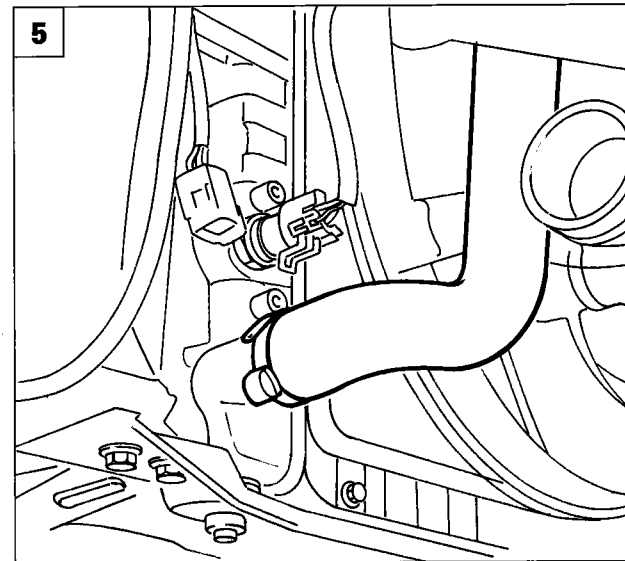
P4A02FX03



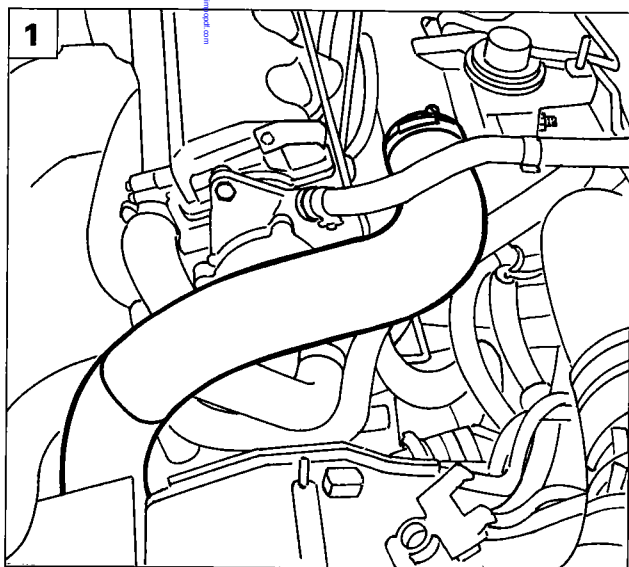
1. Use tool 1878077000 to undo the stud, unscrew the bolts and release the dust guard from its seat.
2. Remove the wheel arch guard shown.
3. Disconnect sleeve (1) connecting turbine - intercooler and air outlet sleeve (2) from intercooler to intake manifold.
4. Position the hydraulic jack to support the power unit and remove the engine mount on the body. Lower the engine and remove the intercooler with bracket. Reposition the engine mount when the operation is complete.
5. Position a container to recover the engine coolant, then disconnect the coolant intake sleeve from the radiator.



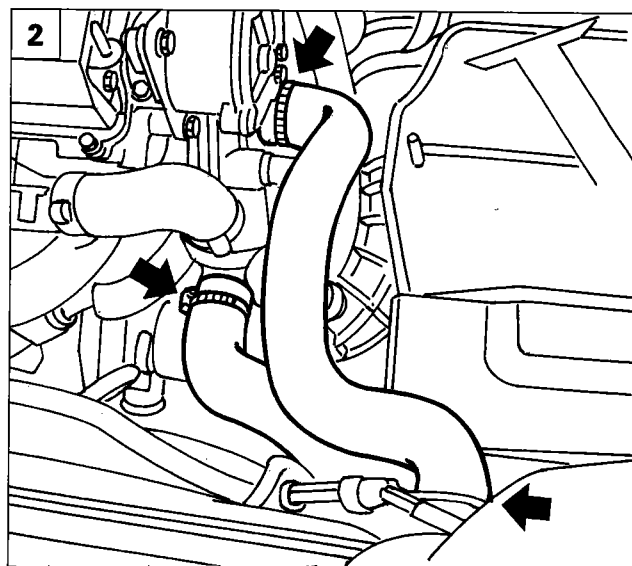
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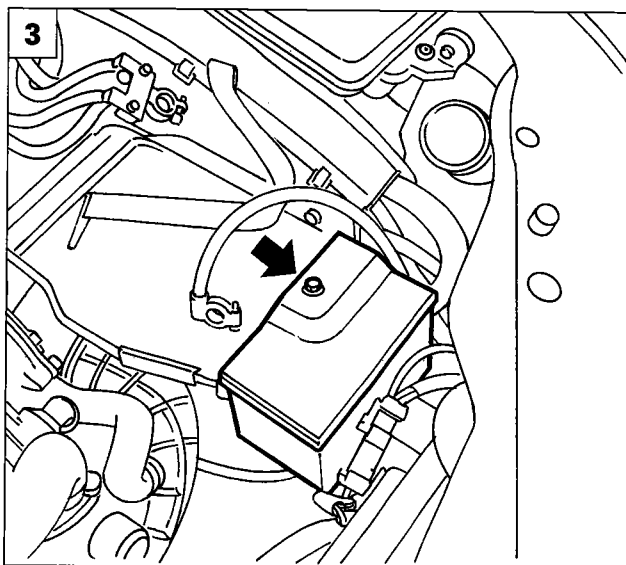
P4A02FX05



P4A03FX01



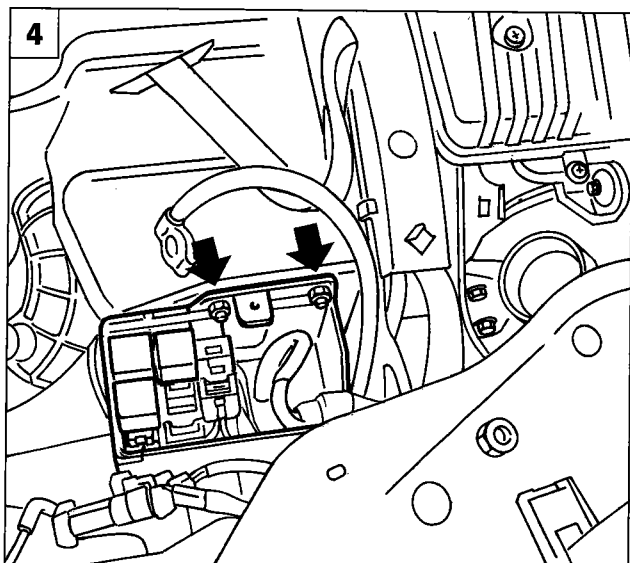
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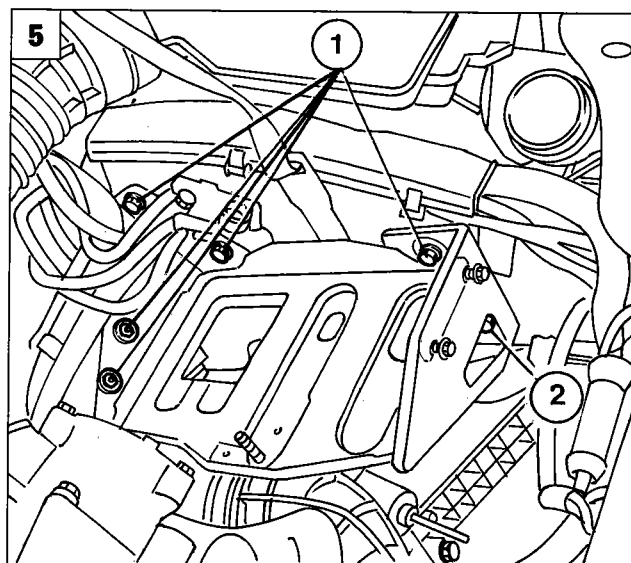
P4A03FX03



1. Remove the pipe indicated by disconnecting from the clip located on the intake manifold.
2. Remove the coolant intake and outlet pipes from the points shown.
3. Unscrew the relay case cover bolt shown in the figure.
4. Unscrew the nuts illustrated and place the relay box to one side in the engine bay
5. Unscrew bolts (1), loosen bolt (2) and then remove the battery cradle.

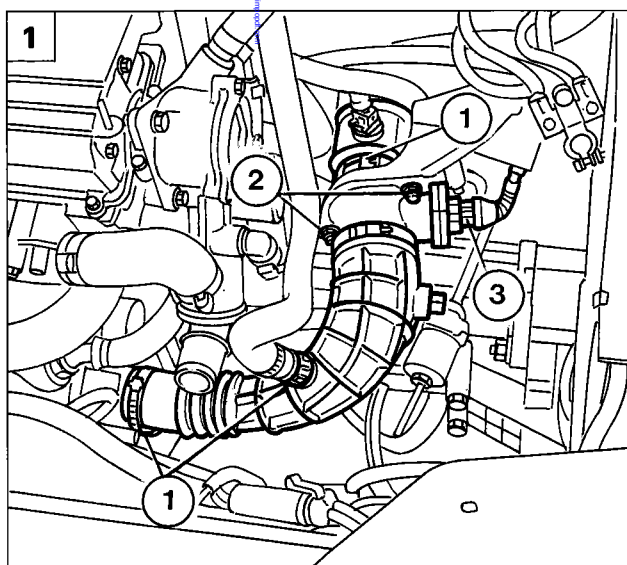


P4A03FX04

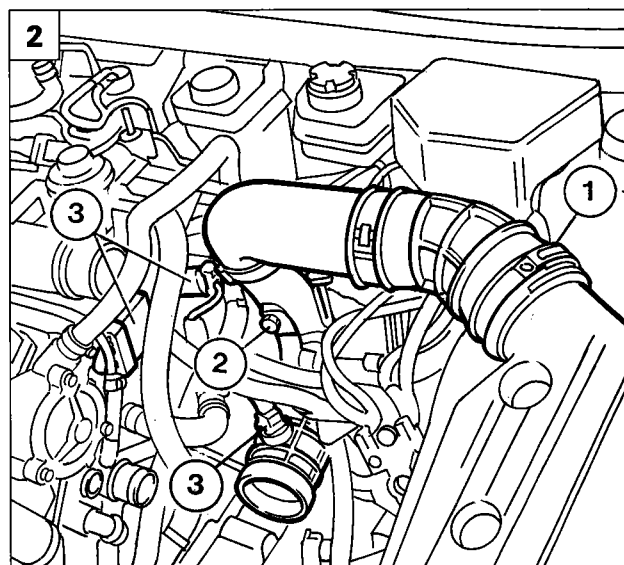


P4A03FX05

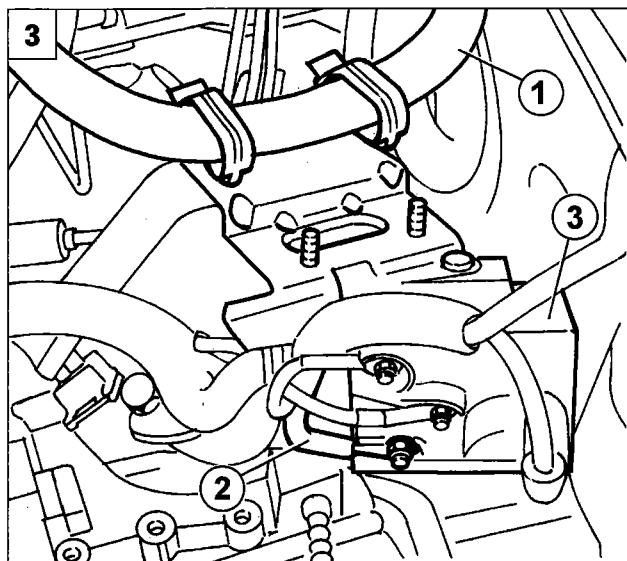
## 10.



P4A04FX01



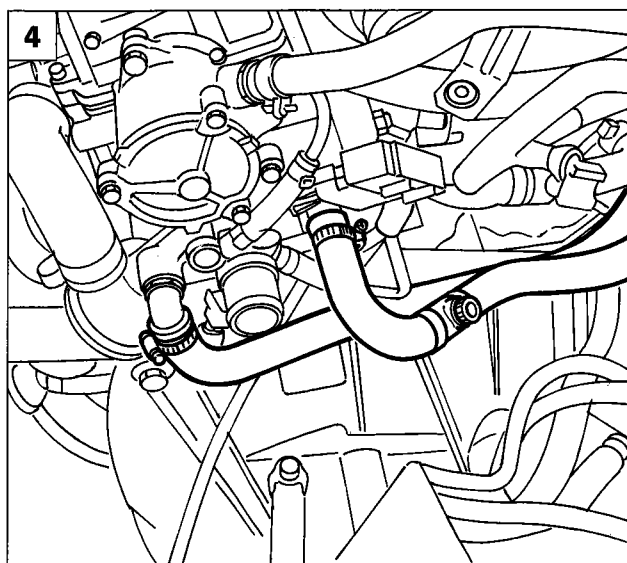
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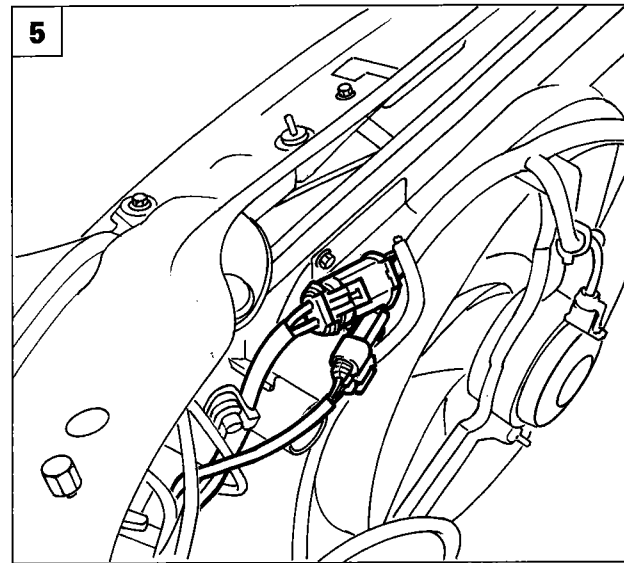
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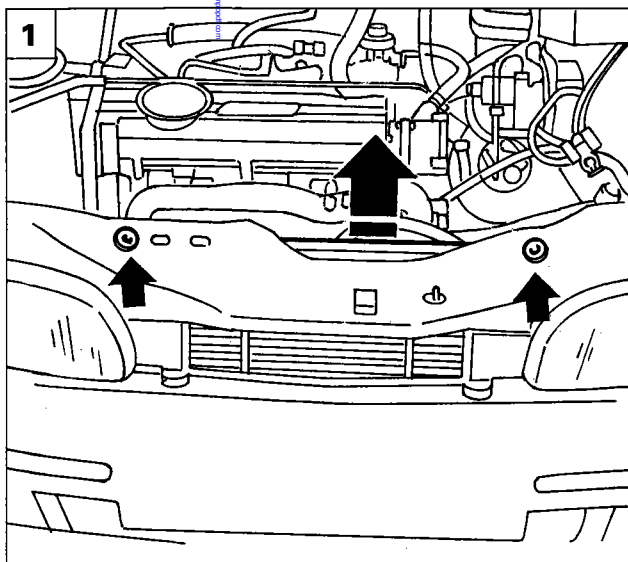
1. Loosen clips (1), unscrew bolts (2), disconnect connection (3) and then disconnect the first section of the air intake pipe complete with debimeter.
2. Loosen clip (1), unscrew screw (2) disconnect electrical connections (3) and then disconnect the second section of the air intake pipe.
3. Open both clips and release cable (1), disconnect cable (2) and then move glow plug ECU (3) with its bracket to one side.
4. Disconnect the two pipes leading from the heater unit from the thermostat.
5. Disconnect both fan electrical connections.



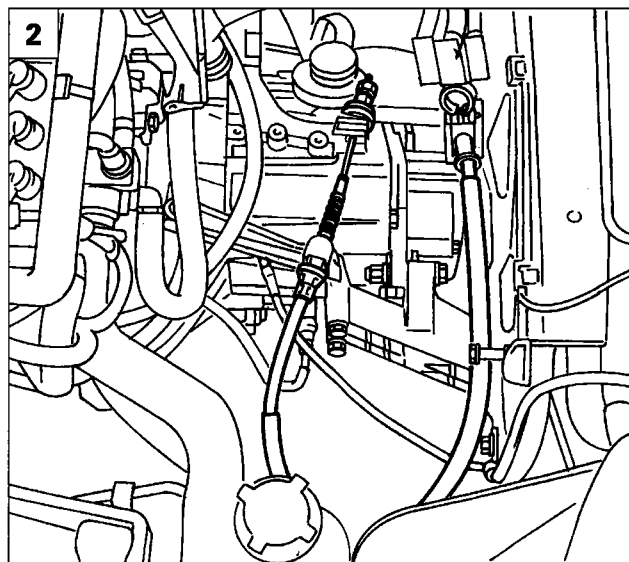
P4A04FX04



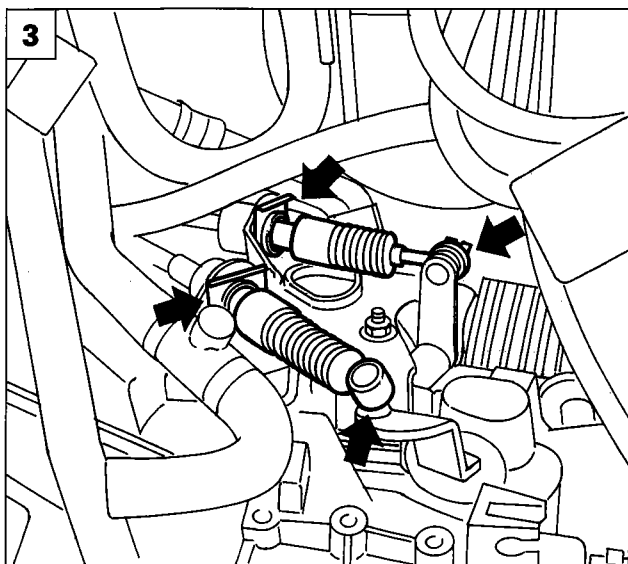
P4A04FX05



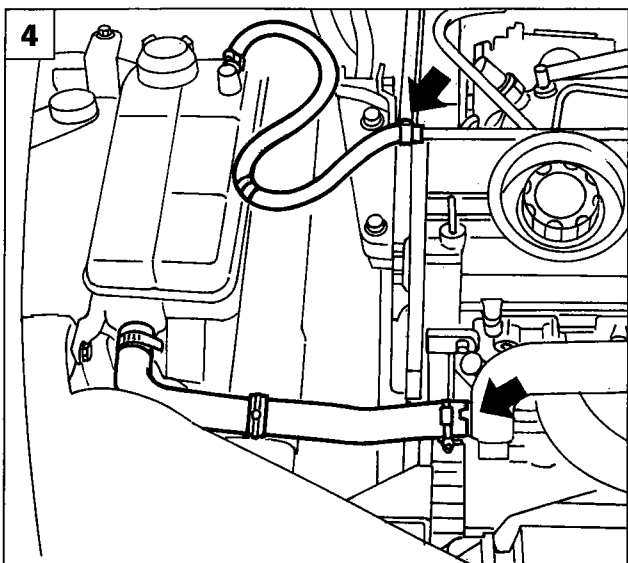
P4A05FX01



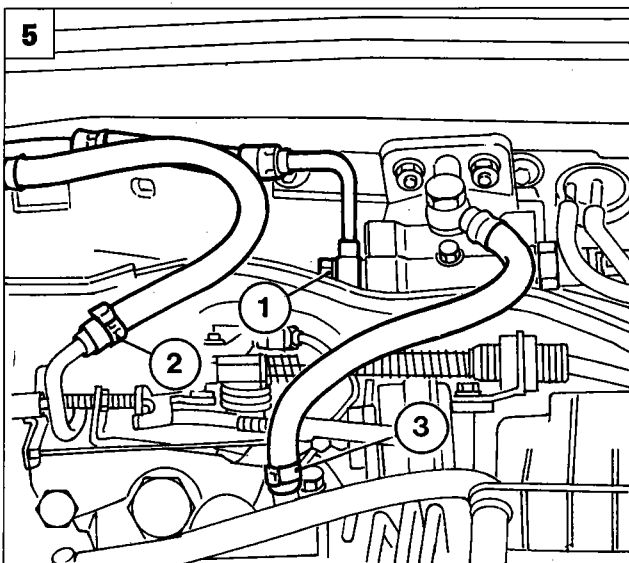
P4A05FX02



P4A05FX03



P4A05FX04

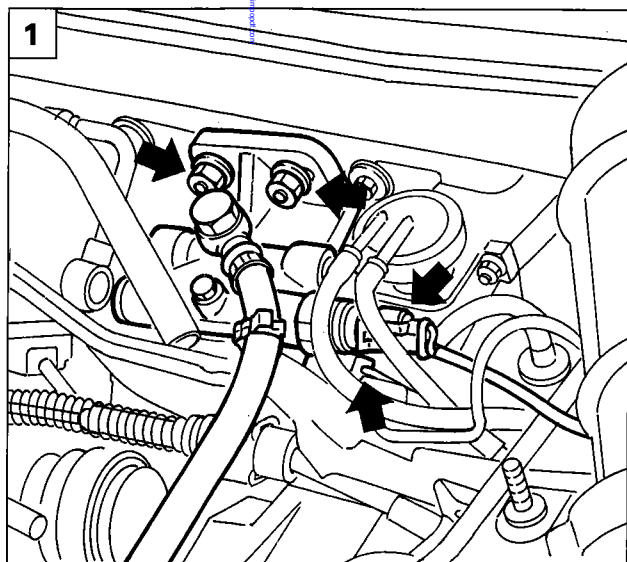


P4A05FX05

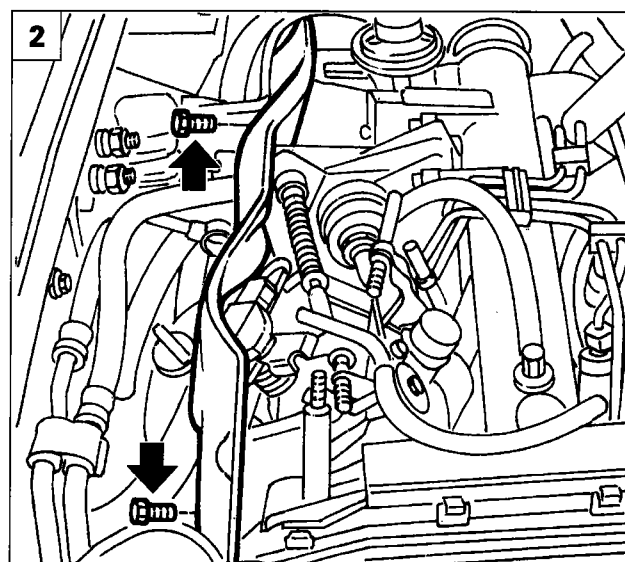
1. Unscrew both bolts retaining the radiator to the body, then remove the radiator - fan assembly.
2. Disconnect the clutch release cable from the anchorages on the gearbox.
3. Disconnect the gear selection and engagement cables from the points indicated, taking care not to damage the cables as the head is removed.
4. Disconnect both expansion tank pipes from the points indicated.
5. Disconnect fuel outlet and inlet lines (1) and (2) and pipe (3) carrying fuel from the diesel filter to the injection pump.



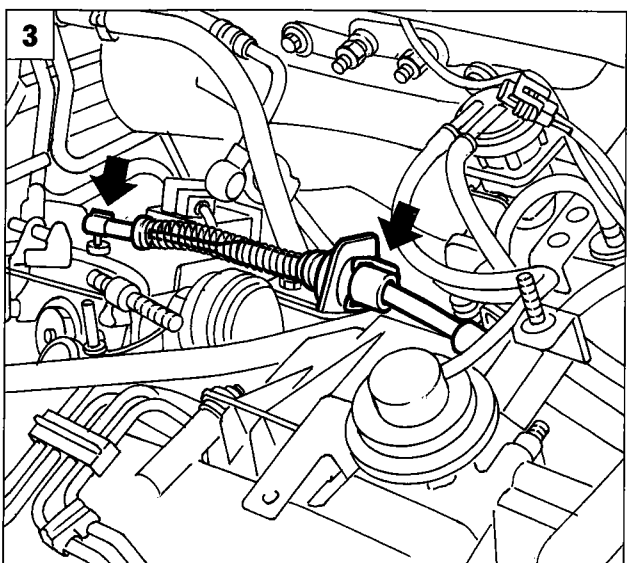
## 10.



P4A06FX01



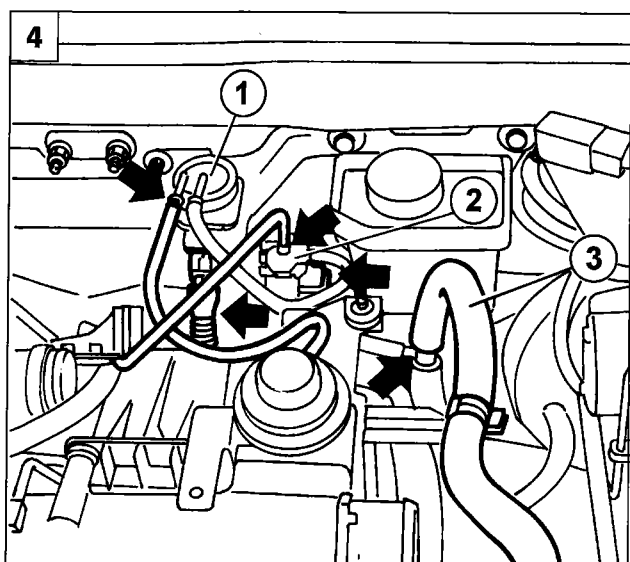
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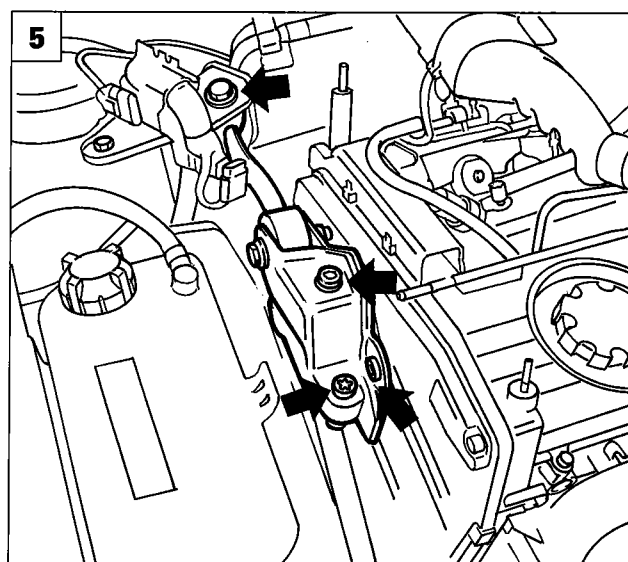
P4A06FX03



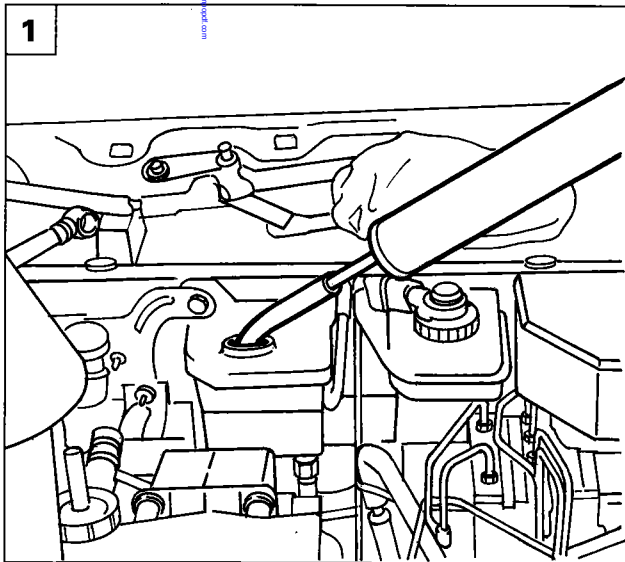
1. Unscrew the nuts, disconnect both electrical connections shown and then remove the diesel filter.
2. Remove the rear sound-proofed guard by unscrewing the bolts shown.
3. Disconnect the accelerator cable from the points shown.
4. Disconnect the pipe from modulator valve (1), the pipe from fast idle valve (2) and then disconnect the electrical connections shown and the vacuum pump sleeve for brake servo (3) from the point shown.
5. Remove the reaction bracket complete with mount by unscrewing the retaining bolts shown.



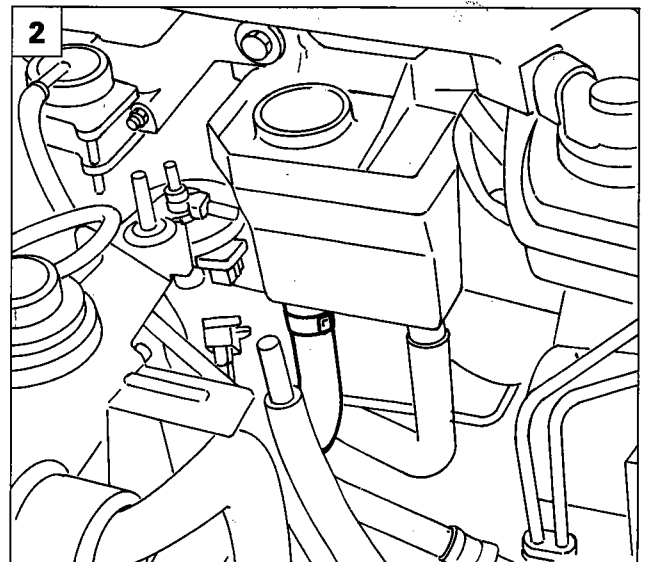
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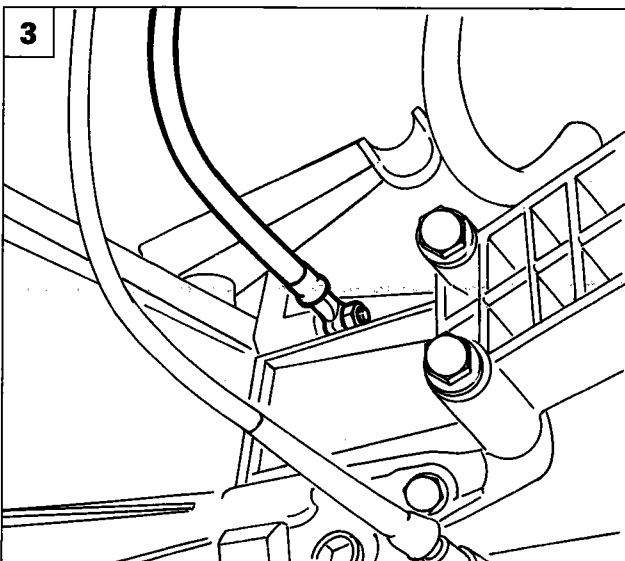
P4A06FX05



P4A07FX01



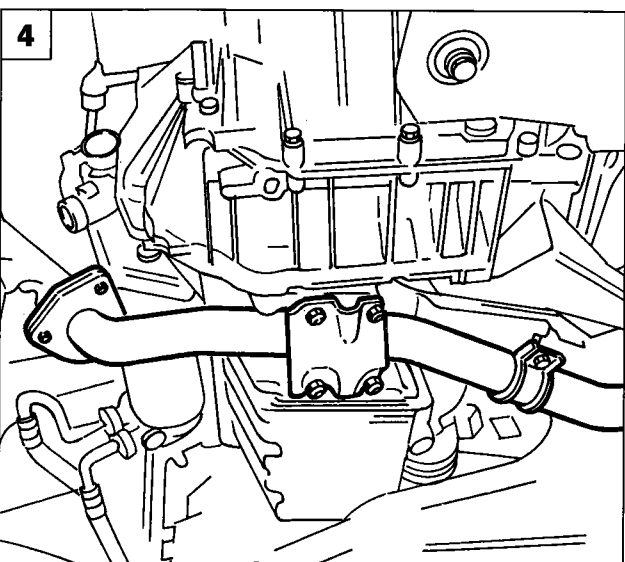
P4A07FX02



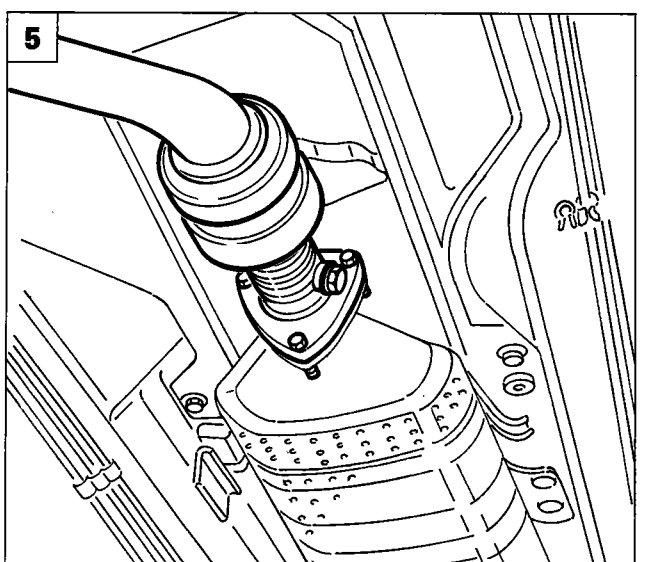
P4A07FX03



1. Drain the power steering pump fluid and use an appropriate container to collect the fluid.
2. Disconnect the pipe carrying fluid to the power steering pump from the reservoir.
3. Disconnect the earth lead from the gear box
4. Remove the front section of the exhaust pipe from the connector and from both vibration-resistant brackets.
5. Disconnect the front section of the exhaust pipe from the catalytic converter, then remove from the vehicle.

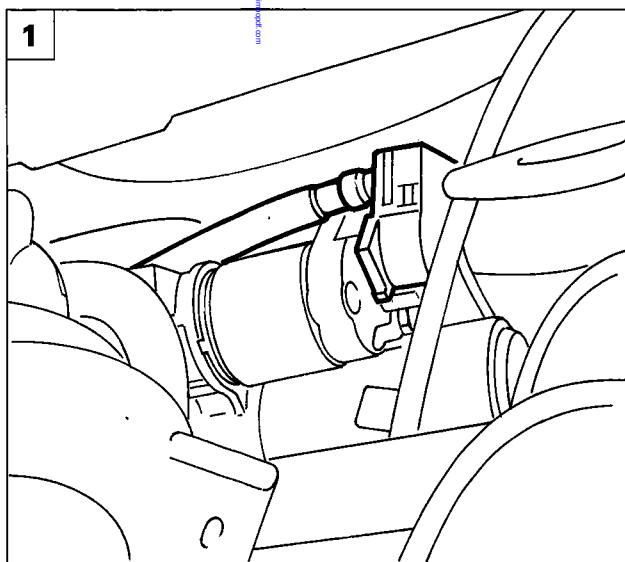


P4A07FX04

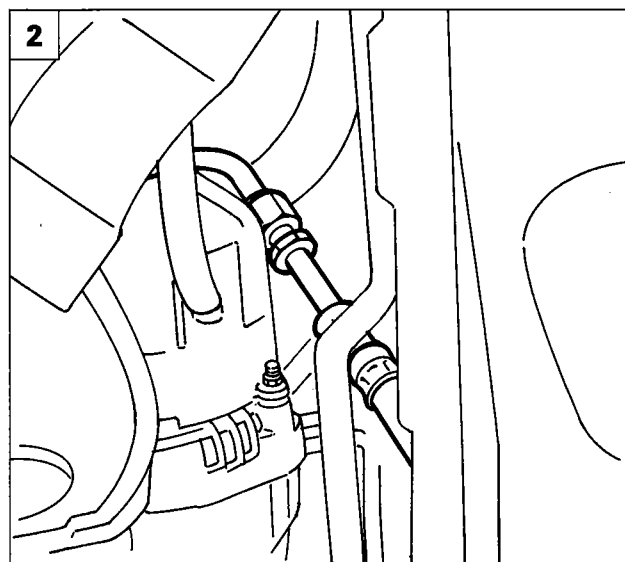


P4A07FX05

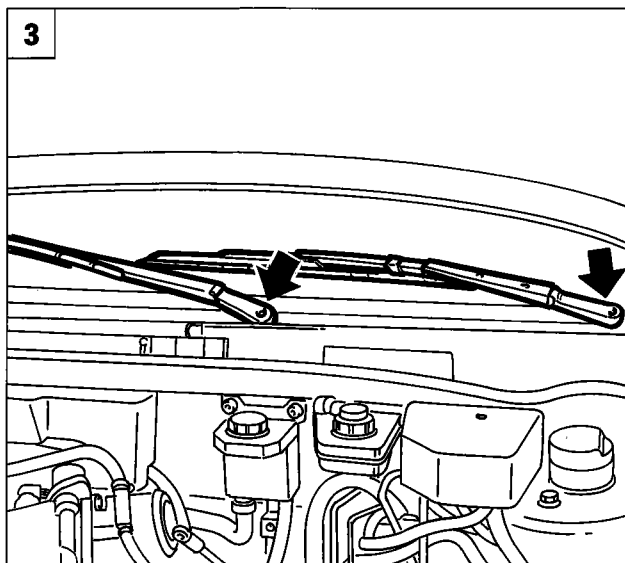
### 10.



P4A08FX01



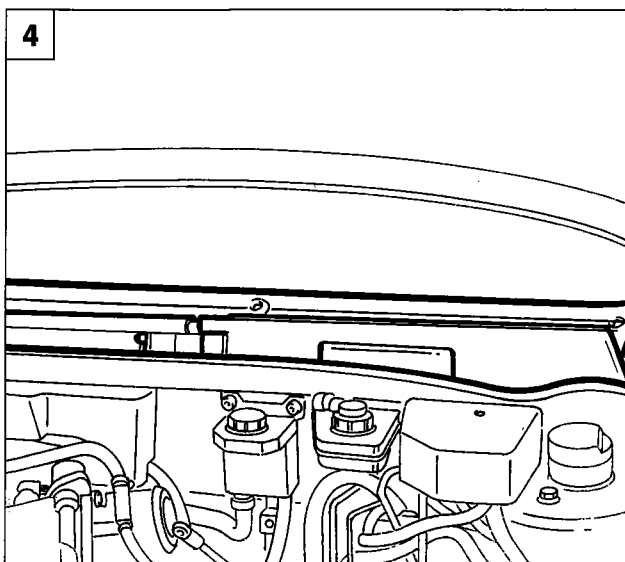
P4A08FX02



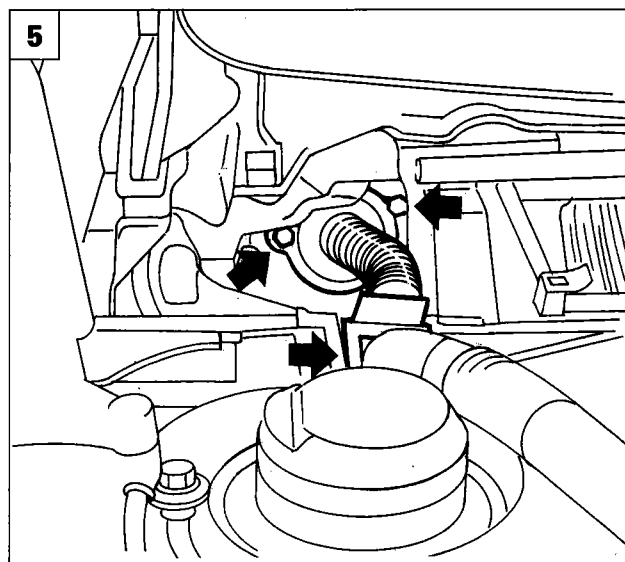
P4A08FX03



1. Disconnect the supply lead from the starter motor.
2. Disconnect the return fitting from the power steering pump.
3. Remove the wiper arms by prising up the plastic protection and unscrewing the underlying nut.
4. Remove the pollen filter plastic protection.
5. Undo the nuts retaining the engine wiring mount bracket to the body.

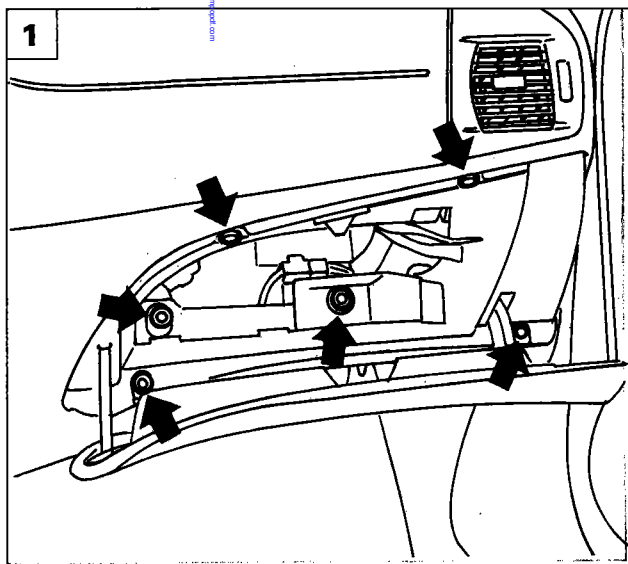


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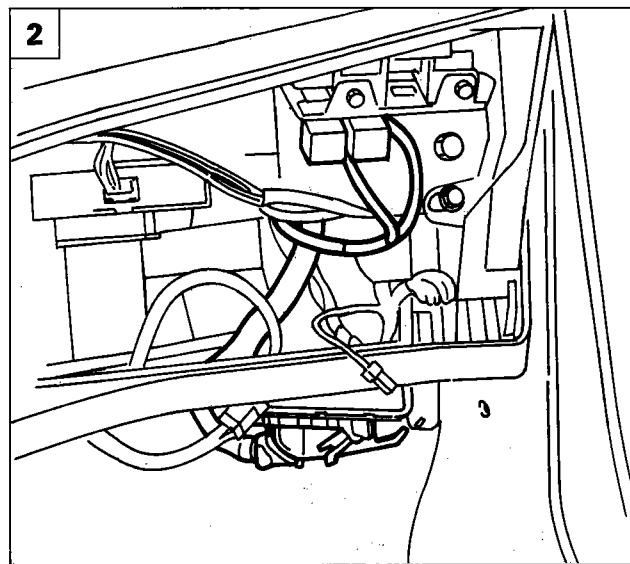


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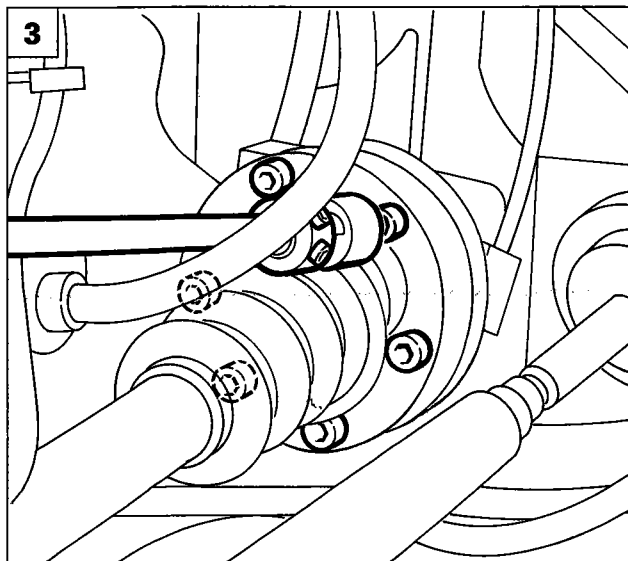




P4A09FX01



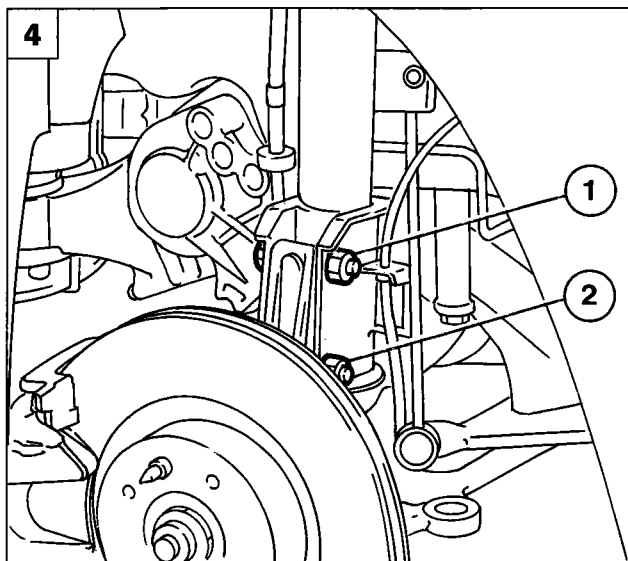
P4A09FX02



P4A09FX03

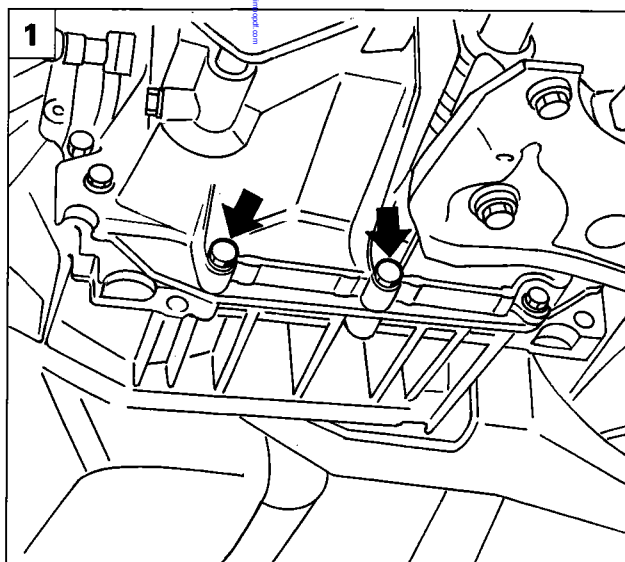


1. Working from inside the vehicle, remove the glove compartment by unscrewing the retaining bolts shown.
2. Disconnect connector from the i.e. control unit and withdraw the relay from its bracket. Then withdraw the engine wiring assembly and attach to the power unit.
3. Disconnect the half-axes by undoing the bolts securing the constant velocity joints to the gearbox flange.
4. Unscrew bolt (1) and loosen bolt (2) retaining the suspension pillar. Then turn the pillar outward to release the drive shaft from its attachment on the differential.



P4A09FX04

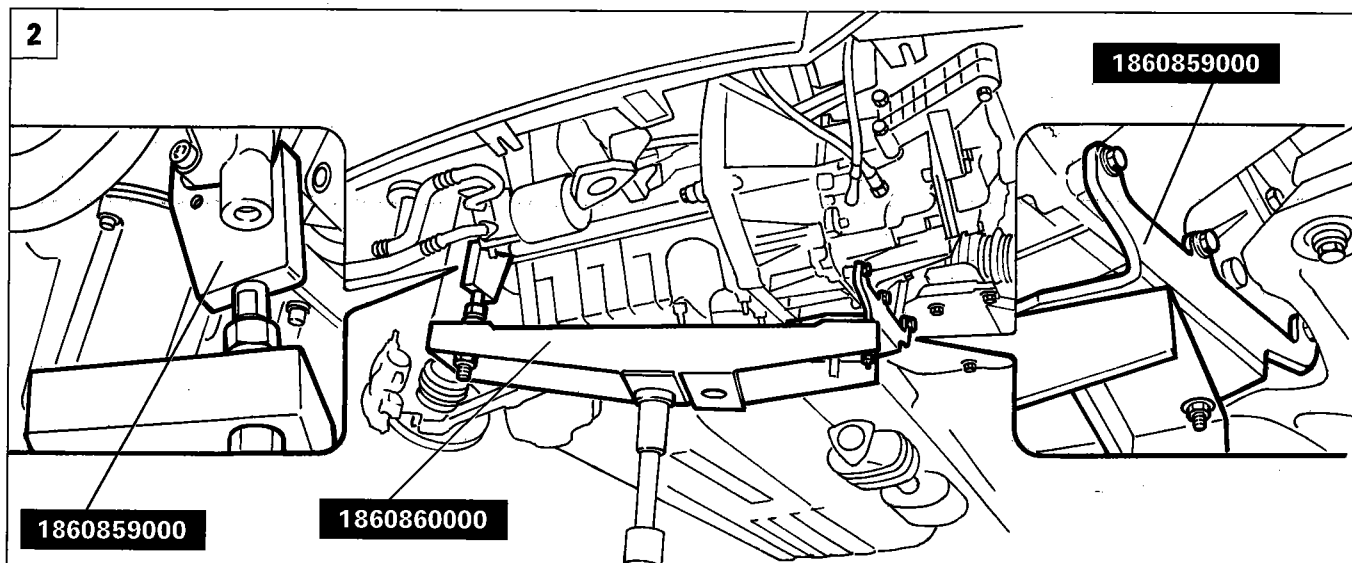
## 10.



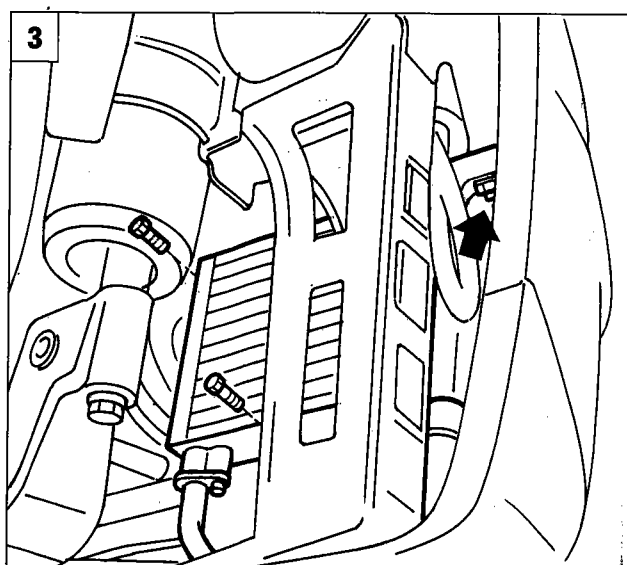
P4A10FX01



1. Remove the bolts indicated from the bell housing in order to position the tool used to remove the power unit.



P4A10FX02



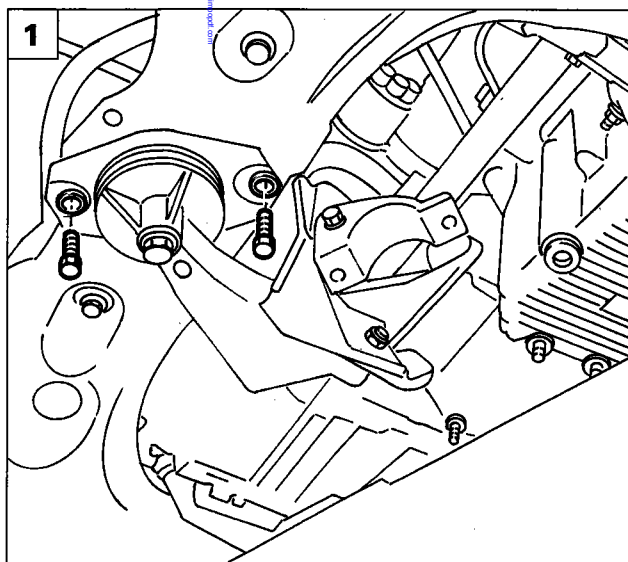
P4A10FX03

2. Position tool 1860860000 used to mount the power unit on the hydraulic jack and fasten to the power unit using the tools shown.

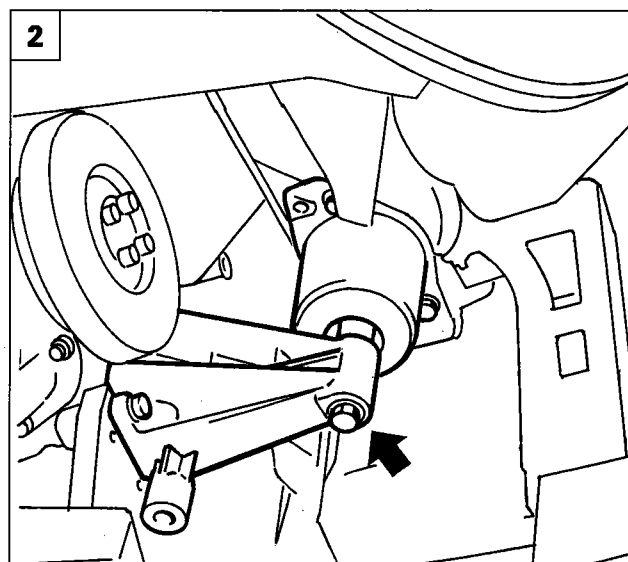


*The hydraulic jack must have a capacity of at least 1000 kg and it must be sufficiently high to allow the power unit to be removed from below. When calculating the height, consider the maximum height setting of the lift and the minimum height setting of the hydraulic jack.*

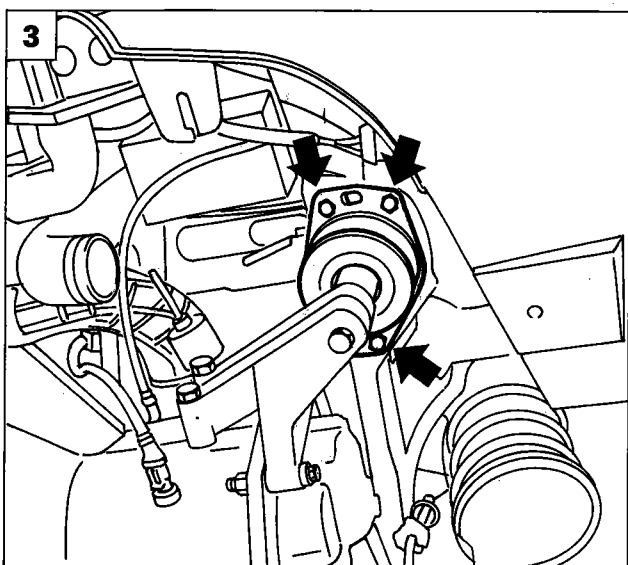
3. Remove the engine oil heat exchanger from the fastenings shown, then secure to the power unit.



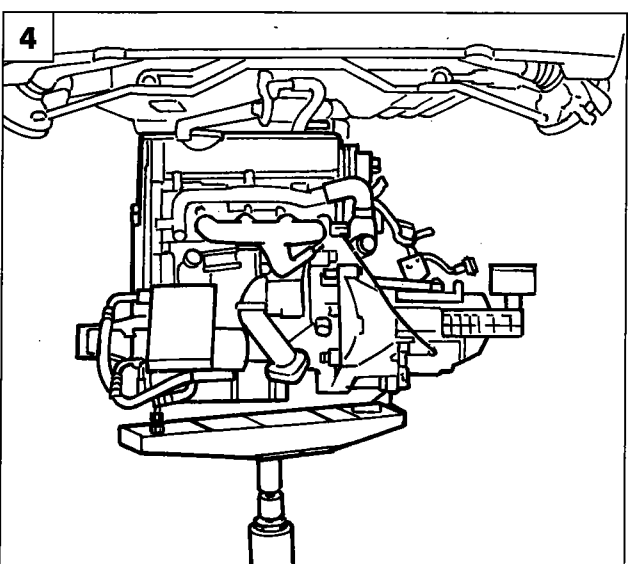
P4A11FX01



P4A11FX02



P4A11FX03



P4A11FX04



1. Remove the central power unit mount by unscrewing the bolts retaining it to the body.
2. Remove the timing end engine mount by unscrewing the central bolt.
3. Disconnect the gear end engine mount by unscrewing the retaining bolts shown.
4. Lower the hydraulic jack and remove the power unit from below the vehicle.



*Lower the hydraulic jack gradually and check that the power unit is correctly positioned and balanced on the mounting tool.*

- Position the power unit on a stand using a hydraulic hoist.



*Use a hydraulic hoist to move the power unit, once it has been released from the mounting tool.*

**NOTE** *To refit the power unit, carry out removal operations in reverse order.*

- *Prepare the engine bay to fit the power unit. Take care to arrange all electrical leads, pipes etc. so that they do not get in the way when the engine is refitted;*

### 10.

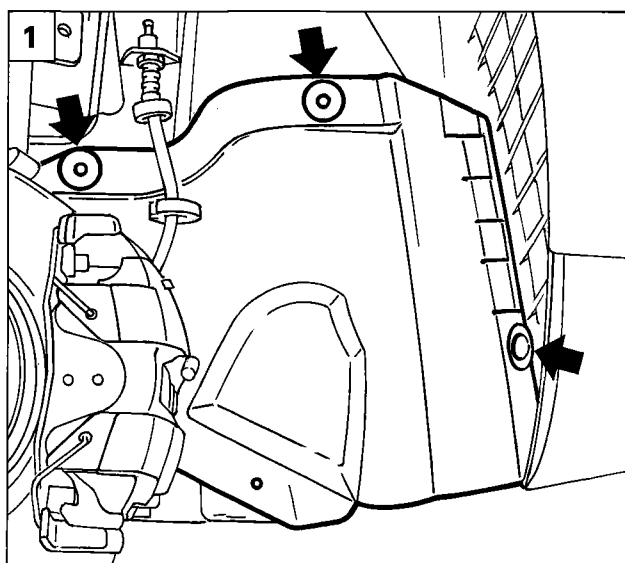
- Take great care not to damage individual components when the power unit is fitted
- When fitting the coolant lines, align groove on rubber hose with ridge on associated rigid sleeve. When filling the cooling system, refer to section on "Removing-refitting radiator".



Ensure that the power unit mounting points are properly secured.



Clutch pedal height.



P4A12FX01

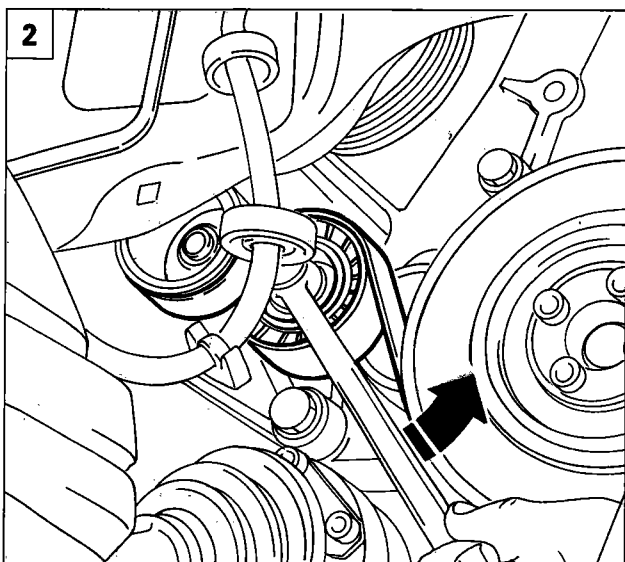


### REMOVING - REFITTING ALTERNATOR DRIVE BELT AND POWER STEERING PUMP

#### Removing

Position the vehicle on a lift, remove the right front wheel, disconnect the battery negative terminal and then proceed as follows.

1. Remove the wheel arch guard by unscrewing the retaining bolts shown. Use tool 1870077000 to prise up the stud shown.



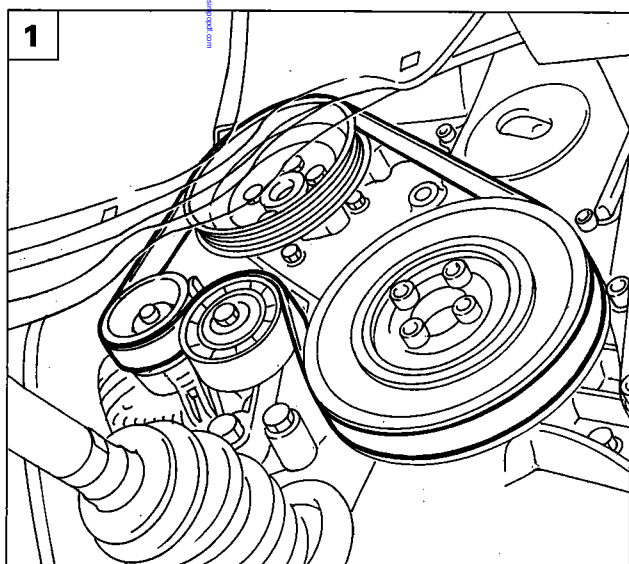
P4A12FX02



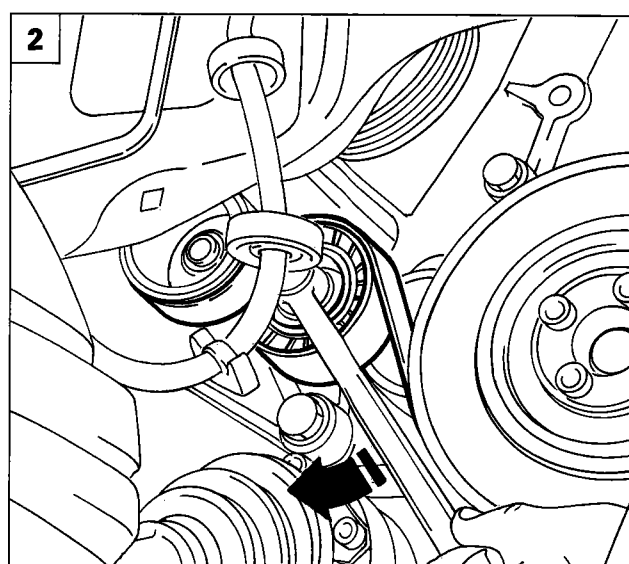
2. Turn the tensioning device in the arrowed direction and release belt tension before removing.



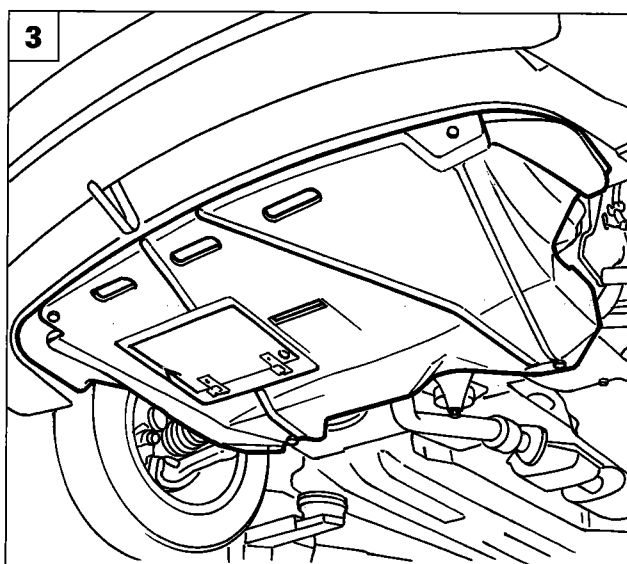
Check the condition of the drive belt. In particular, check for cracks, tears, surface wear (smooth or shiny in appearance) and dry or hard parts with consequent loss of grip. Replace belt if even one of the above defects is present.



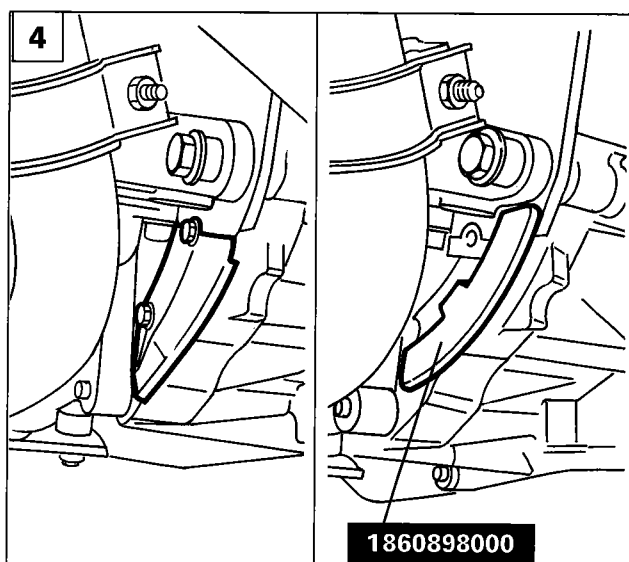
P4A13FX01



P4A13FX02



P4A01FX04



P4A13FX03

P4A13FX04



### Refitting

1. Fit the new belt as shown in the figure.



*Prevent the belt coming into contact with oil or solvents which could affect the elasticity of the rubber with consequent loss in grip.*

2. Return the tensioning device to the position shown in the figure. The preloaded tensioner spring will ensure the belt is correctly tensioned after the crankshaft has been turned a few times.

### REMOVING TIMING BELT

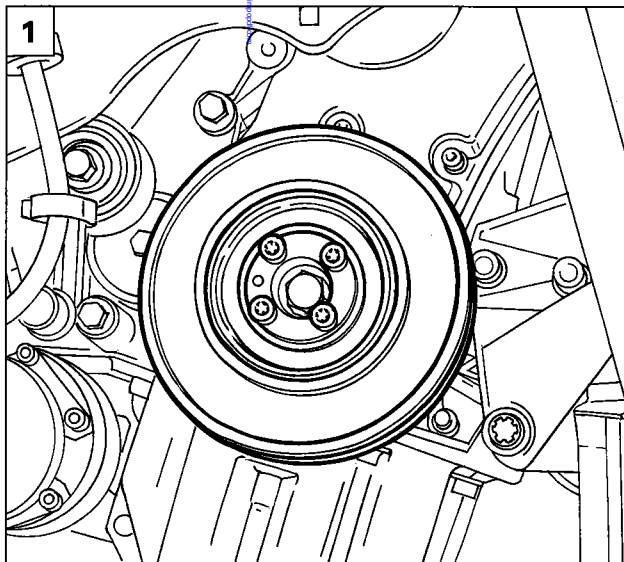


*Before removing the timing belt, the auxiliary belt must be removed as described previously.*

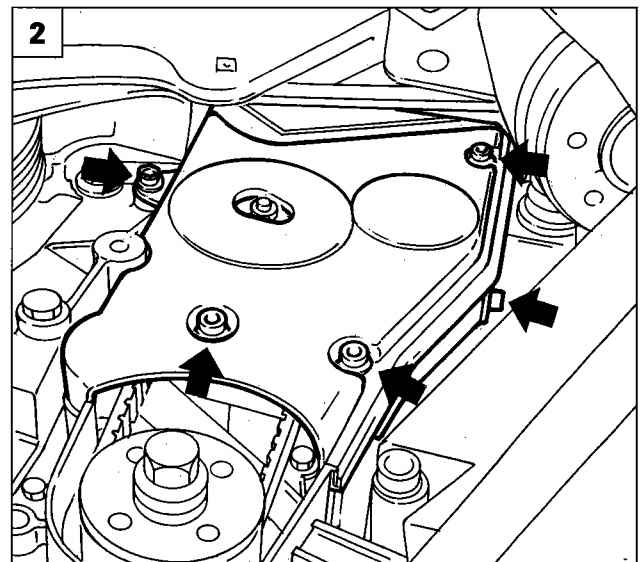
3. Remove the lower power unit guard.
4. Remove the gearbox guard by unscrewing the retaining bolts shown and position flywheel retainer 1860898000 to secure the flywheel in position.



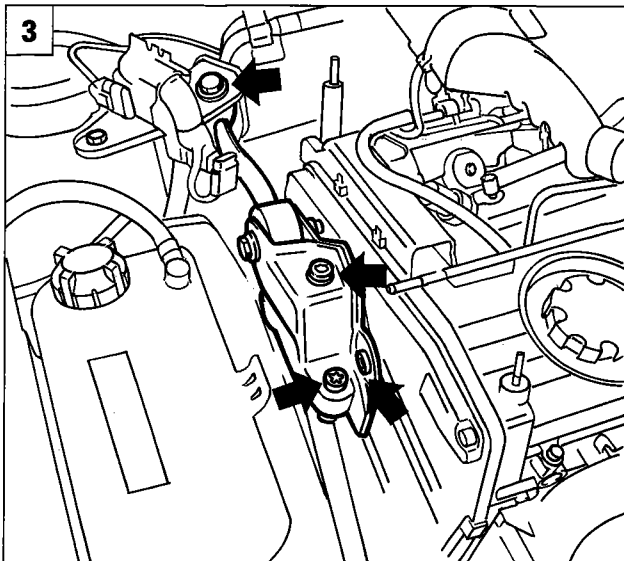
### 10.



P4A14FX01



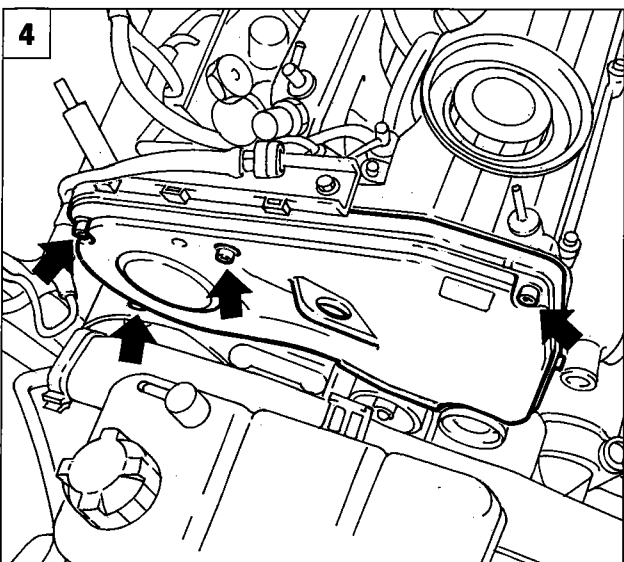
P4A14FX02



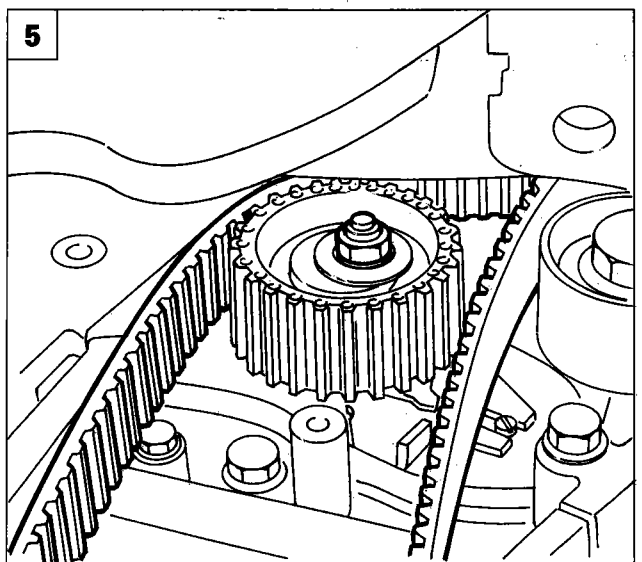
P4A06FX05



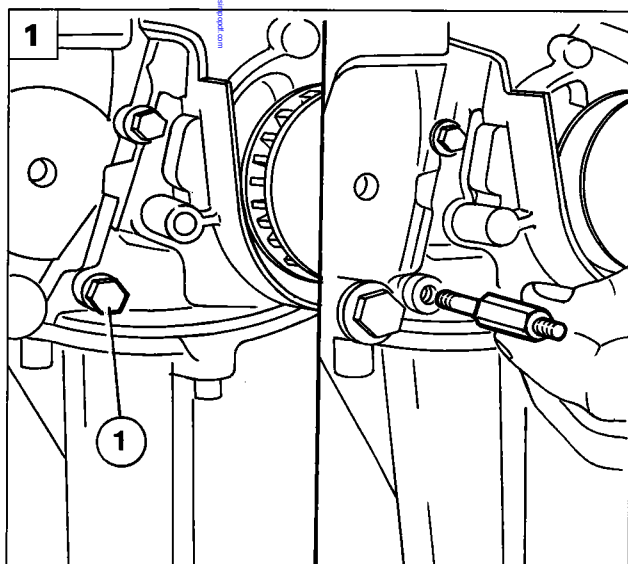
1. Remove the auxiliary drive pulley and the flywheel retainer described previously.
2. Remove the lower timing belt guard.
3. Unscrew the retaining bolts shown and remove the reaction rod complete with mounting bracket.
4. Remove the lower timing belt guard.
5. Loosen the tensioner nut, release belt tension and then remove.



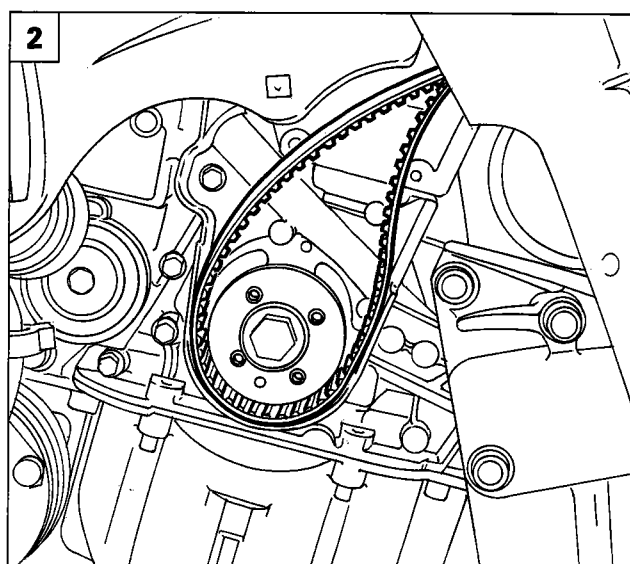
P4A14FX03



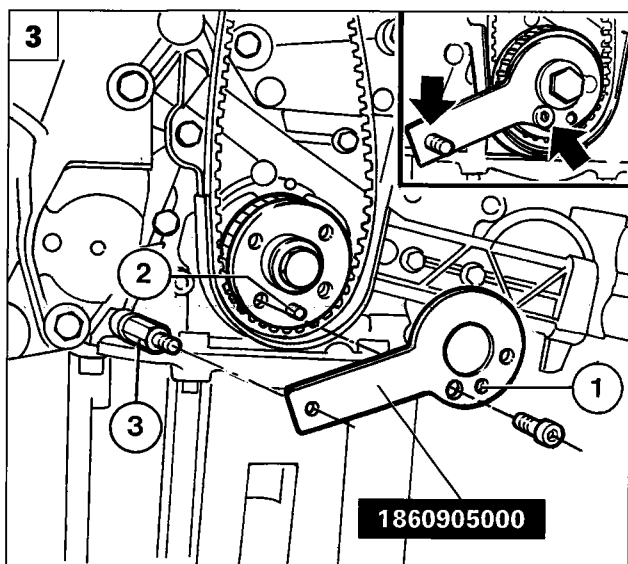
P4A14FX04



P4A15FX01



P4A15FX02

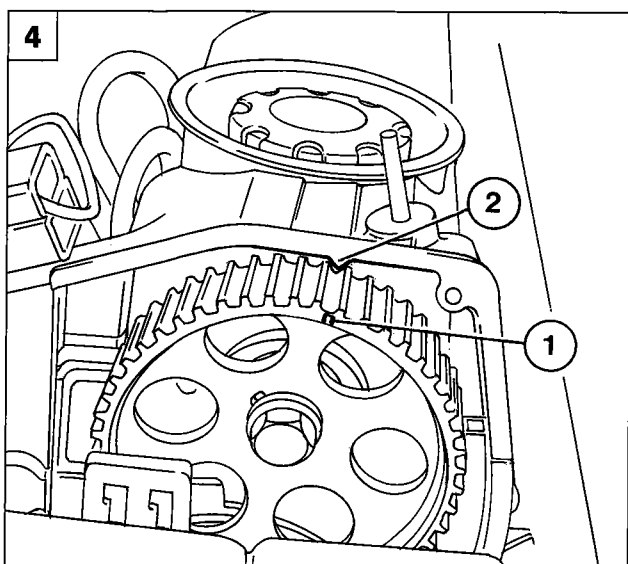


P4A15FX03



### REFITTING AND TENSIONING TIMING BELT

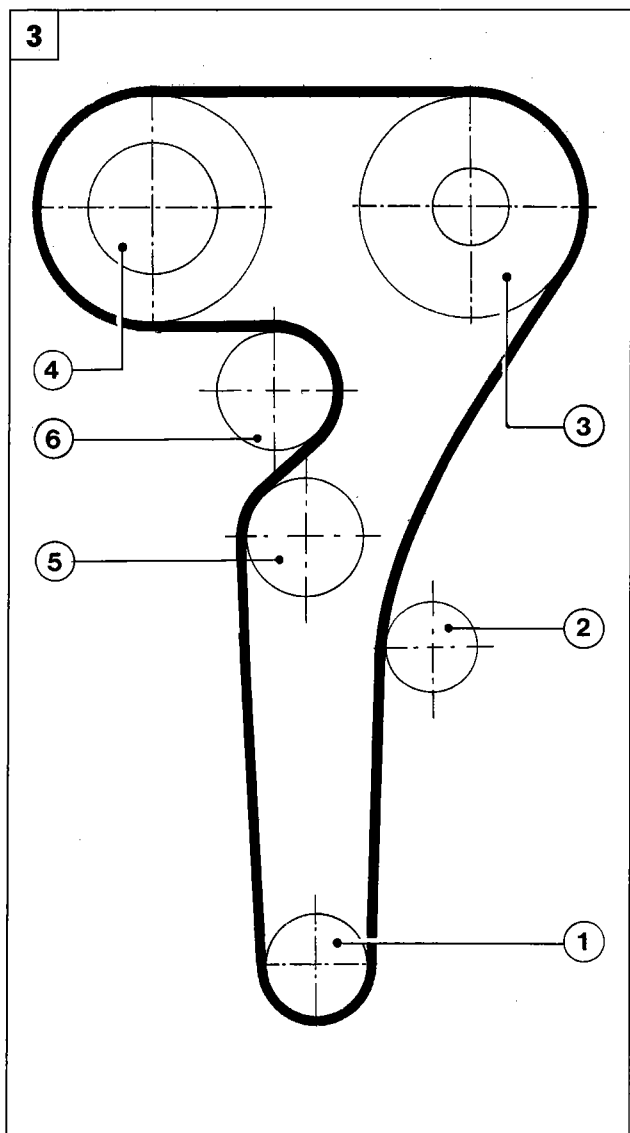
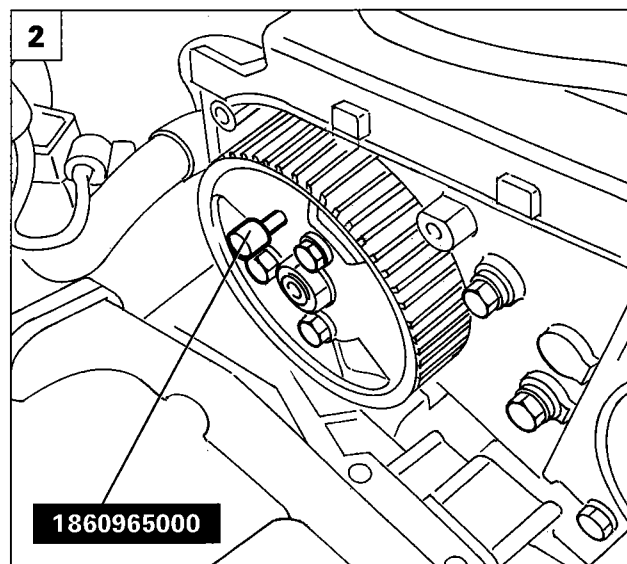
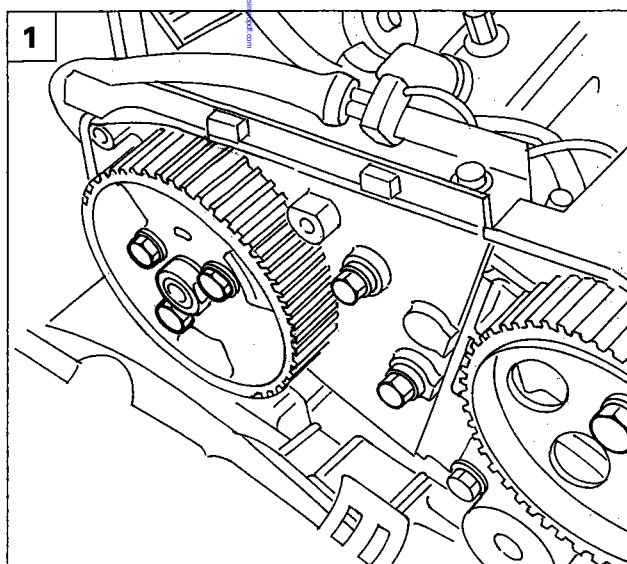
1. Remove bolt (1) retaining the oil pump and replace the bolt with the pin of tool 1860905000.
2. Fit the timing belt onto the crankshaft gear.
3. Position tool 1860905000 on the crankshaft gear and pin (3); turn the crankshaft through small movements until dowel (2) fits into hole (1). The first cylinder is set to T.D.C. in this position.
4. Use tool 1860831000 to turn the timing belt pulley until notch (1) on the pulley is aligned with notch (2) on the cam cover.



P4A15FX04

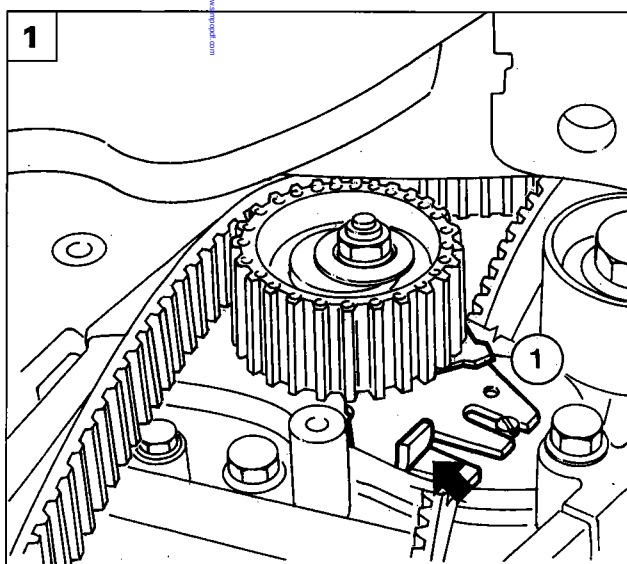


### 10.



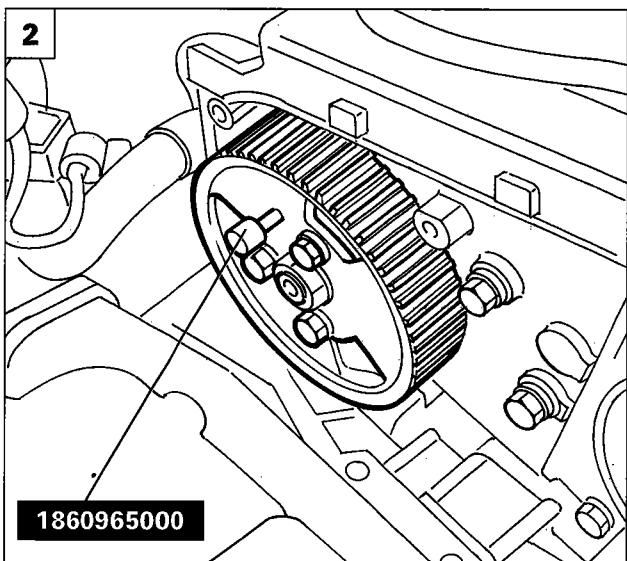
1. Loosen the three injection pump pulley retaining bolts.
2. Turn the injection pump pulley until pin 1860965000 fits into the point shown.
3. Finish fitting the timing belt by assembling components in the following order:

1. Crankshaft gear
2. Fixed guide pulley
3. Timing pulley
4. Injection pump pulley
5. Automatic tensioner
6. Coolant pump



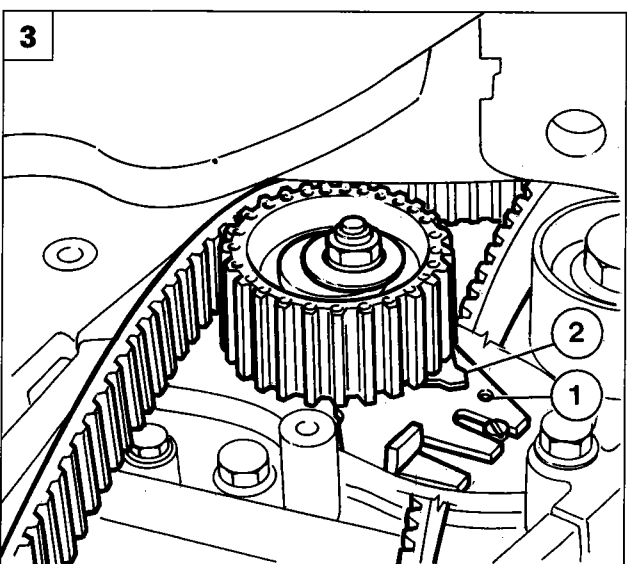
P4A17FX01

1. Apply a force at the point indicated on the automatic tensioner and move the tensioner mobile pointer to the position of greatest tension. Then lock the belt tensioner retaining nut.



P4A17FX02

2. Fasten the injection pump pulley by tightening the retaining bolts to the specified tightening torque and remove pin 1860965000 from its housing.



P4A17FX03

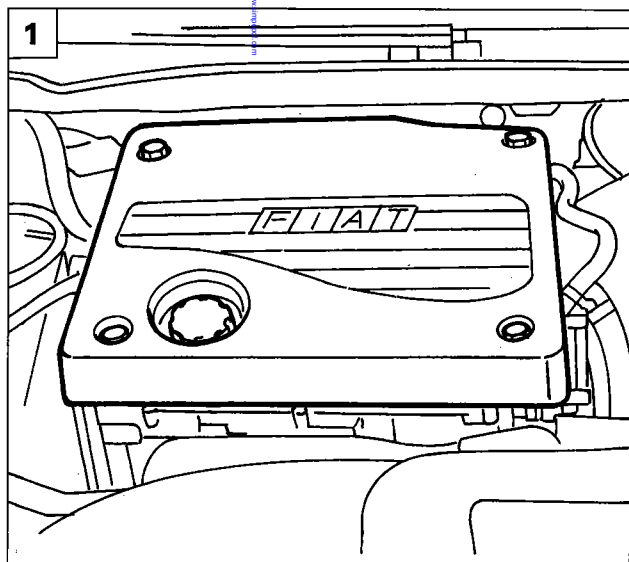
3. Turn the crankshaft through two turns in its normal direction of rotation, release the belt tensioner retaining nut and align fixed indicator (1) on the tensioner mount with the belt tensioner mobile indicator. Secure the tensioner nut and then tighten to the specified torque. Refit parts removed previously by carrying removal operations in reverse order.

# Engine

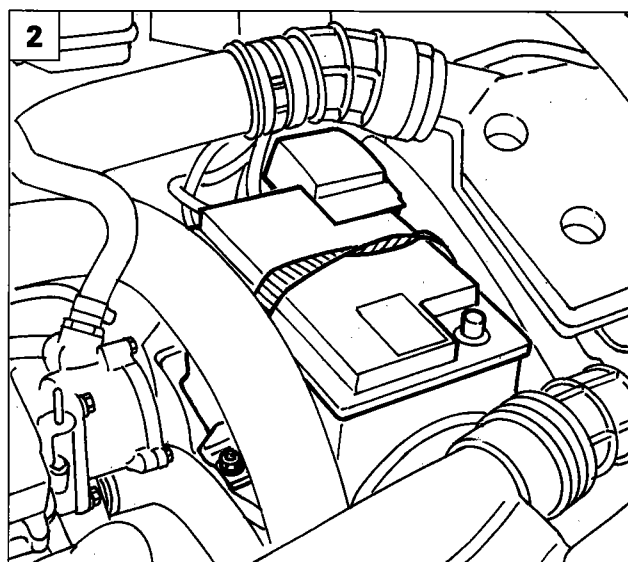
## Removing - refitting cylinder head

### 10.

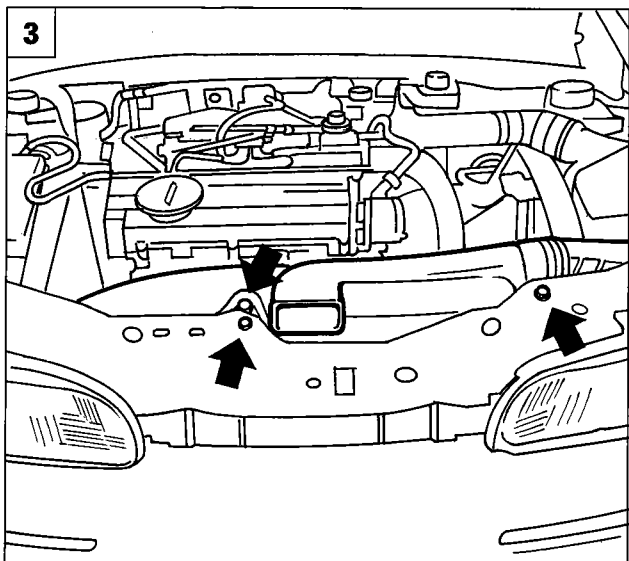
**Bravo-Brava** 1910 TD 100



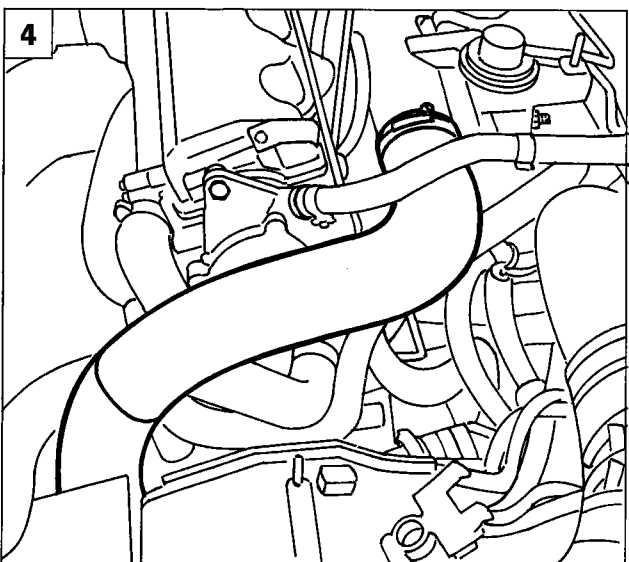
P4A01FX01



P4A01FX02



P4A01FX03



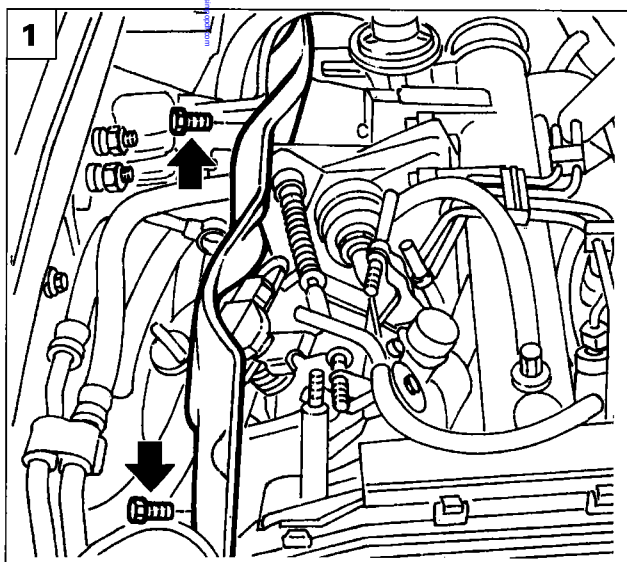
P4A03FX01



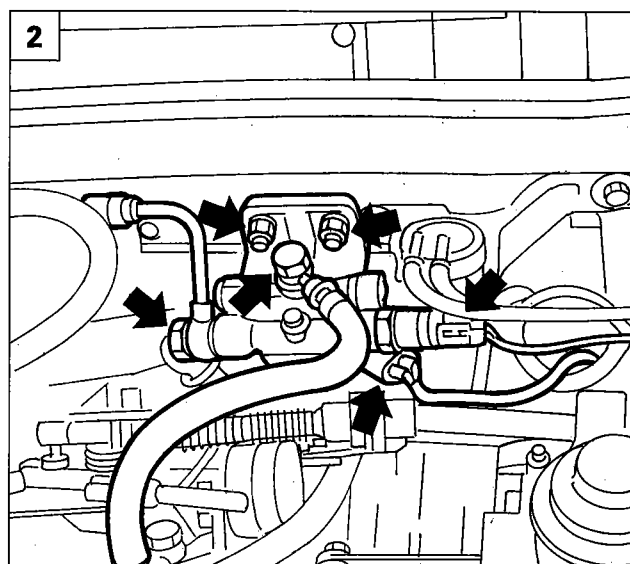
#### REMOVING CYLINDER HEAD

Place the vehicle on a lift, remove the front wheels, disconnect the battery negative terminal and then proceed as follows.

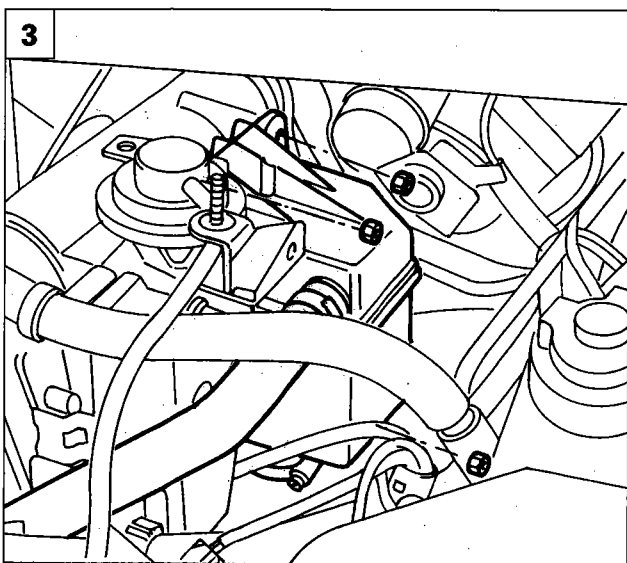
1. Remove the upper cylinder head protection by unscrewing the retaining nuts.
2. Disconnect the battery positive terminal (1), unscrew nut (2), raise bracket (3) and then remove the battery.
3. Unscrew the retaining bolts indicated to remove the air intake shown.
4. Loosen the clip shown and disconnect the air intake sleeve from the inlet manifold.



P4A06FX02



P4A19FX01



P4A19FX02



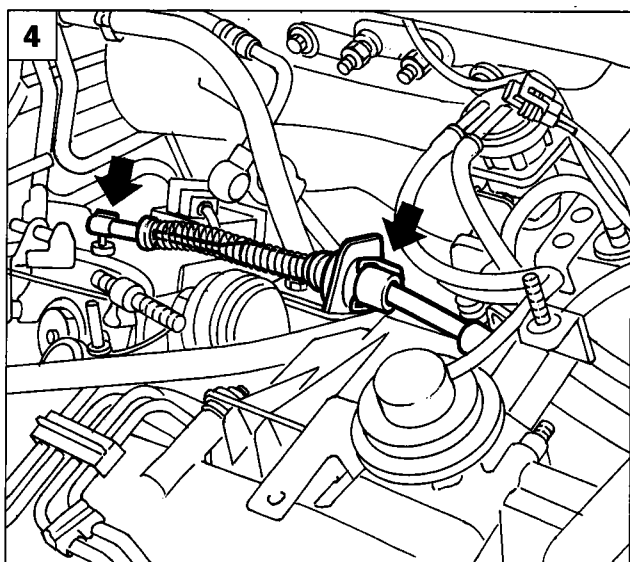
1. Unscrew both retaining screws and remove the partition shown.

2. Disconnect both electrical connections shown, unscrew the nuts, disconnect both fuel fittings and then remove the diesel filter.

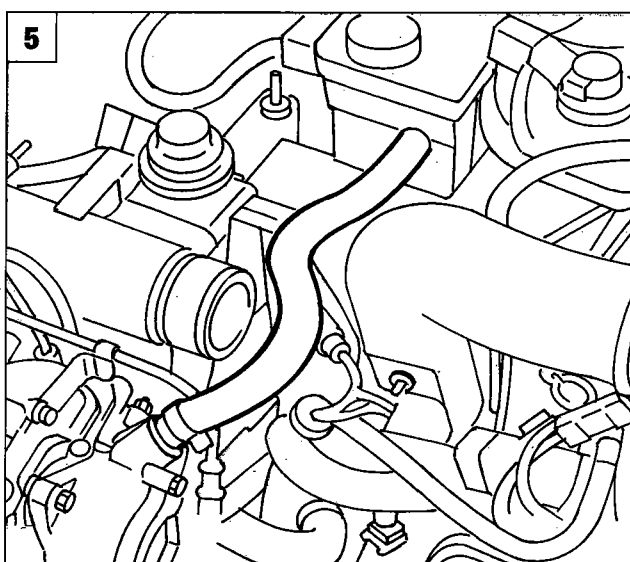
3. Loosen the clip and disconnect the pipe shown, then unscrew the retaining nuts shown in order to position the oil vapour separator to one side in the engine bay.

4. Disconnect the accelerator cable from the points indicated.

5. Disconnect the air pipe to the brake servo from the vacuum pump.

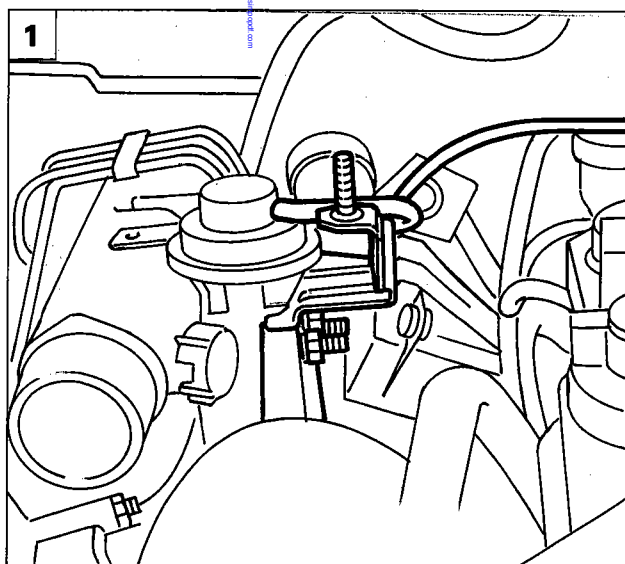


P4A06FX03

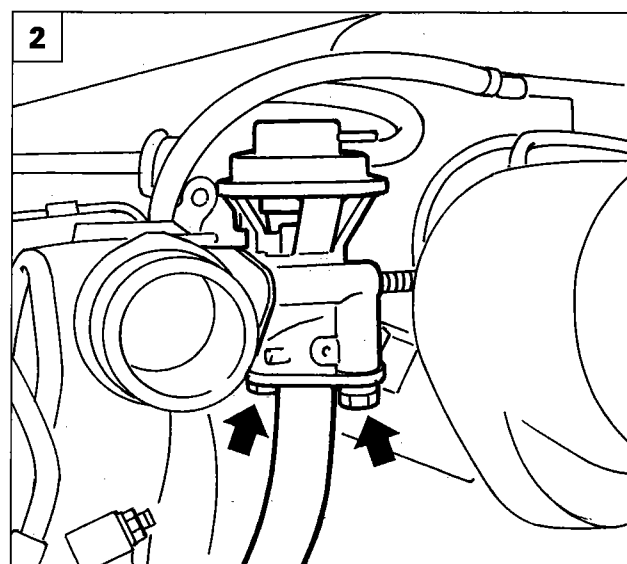


P4A19FX03

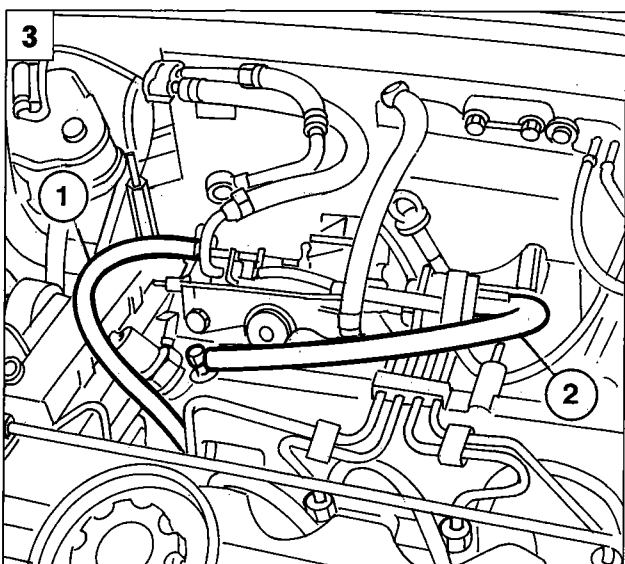
### 10.



P4A20FX01



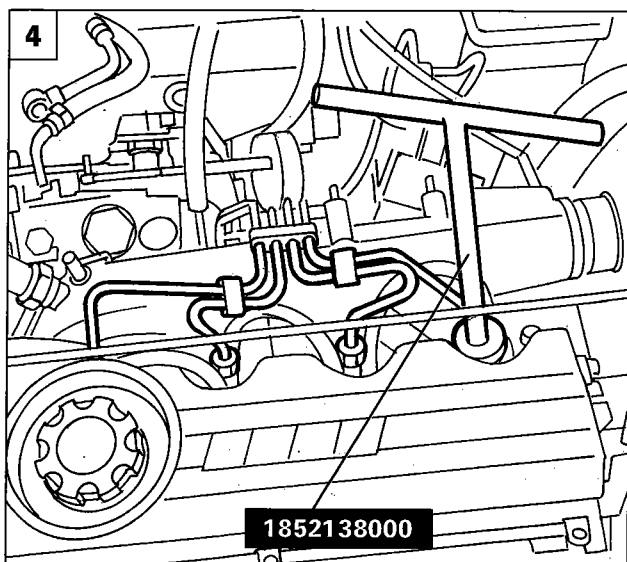
P4A20FX02



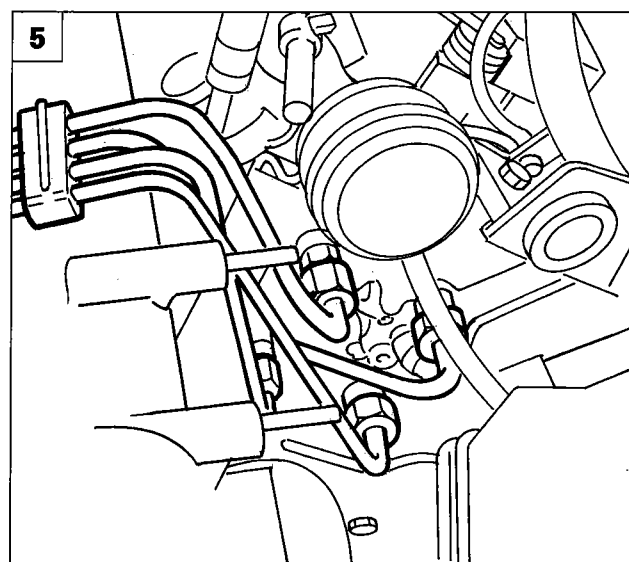
P4A20FX03



1. Disconnect the fuel vapour cut-off solenoid from the EGR by unscrewing the nuts indicated and remove the bracket shown.
2. Unscrew the bolts indicated, separate the EGR valve from the pipe and then remove.
3. Disconnect the fuel recovery line (1) from the fuel return sleeve and pipe (2) from the intake manifold.
4. Use wrench 1852138000 to unscrew the fittings of the diesel supply lines on the injectors.
5. Unscrew the diesel supply line fittings from the injection pump and then remove the pipes themselves.

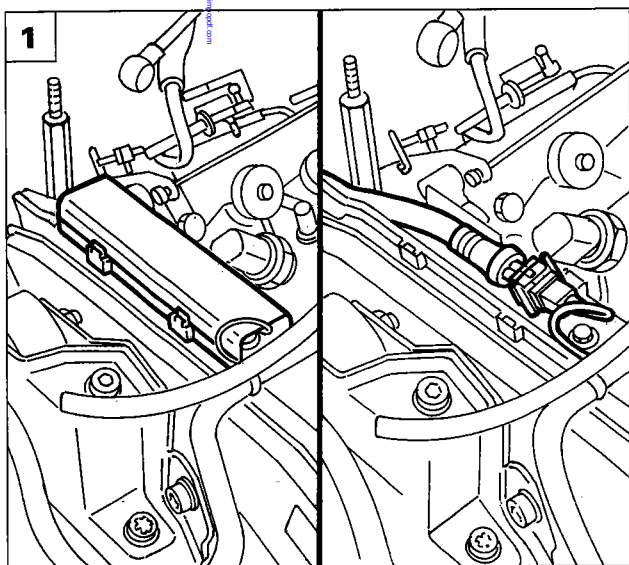


P4A20FX04

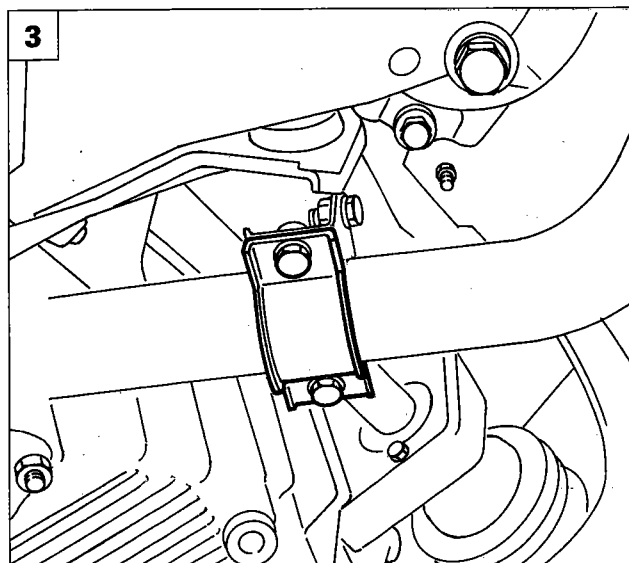
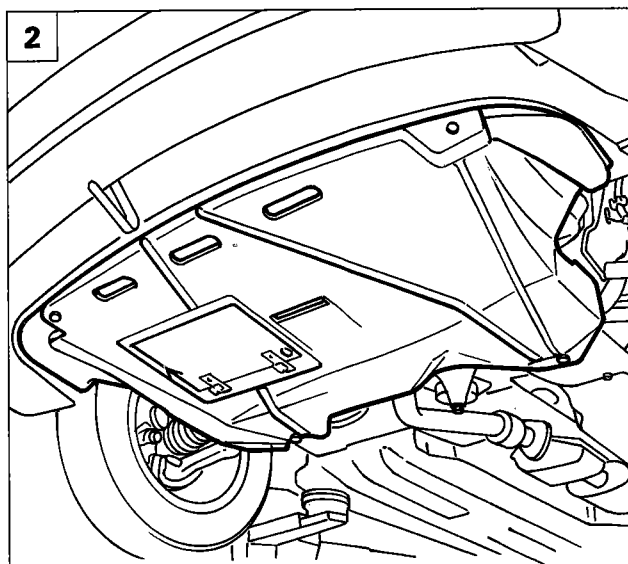


P4A20FX05





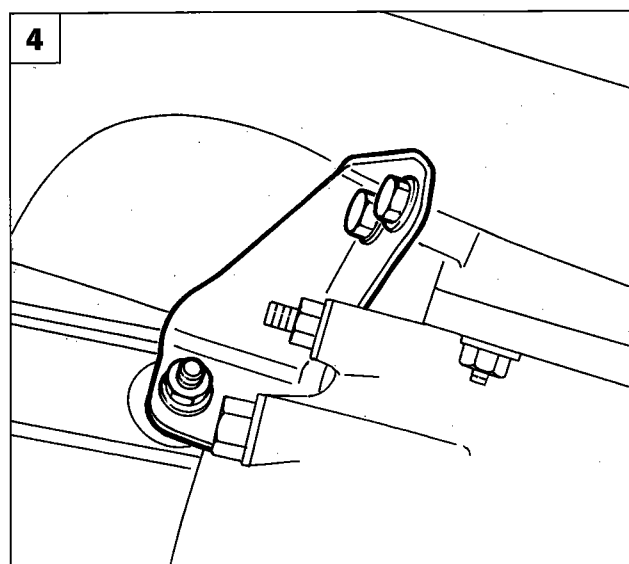
P4A21FX01



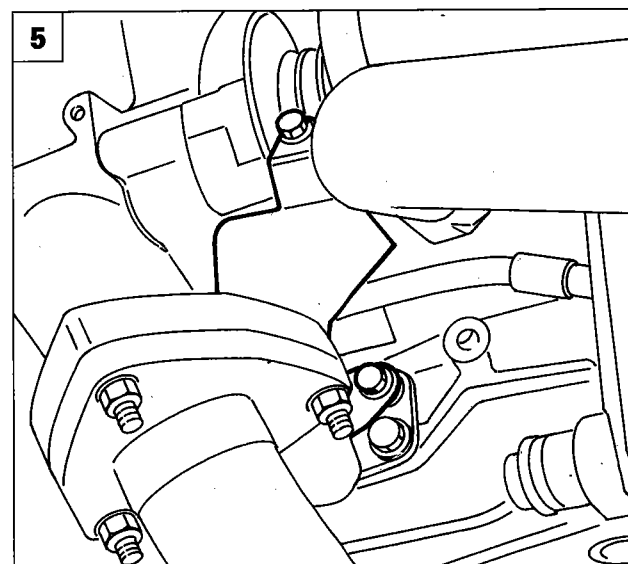
P4A21FX02



1. Open the wiring guard shown and disconnect the electrical connection of the pulse injector.
2. Raise the lift and remove the lower engine bay guard.
3. Unscrew the retaining bolts shown and release the exhaust pipe from the vibration-res start bracket shown.
- 4.5. Remove both brackets holding the turbine to the engine block.

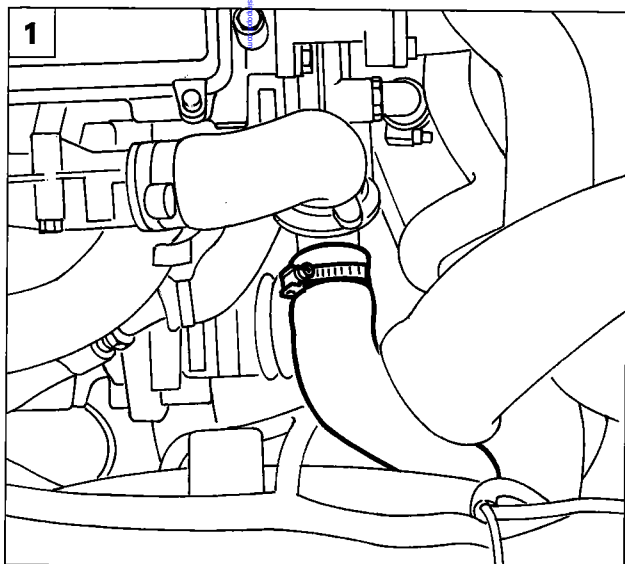


P4A21FX03

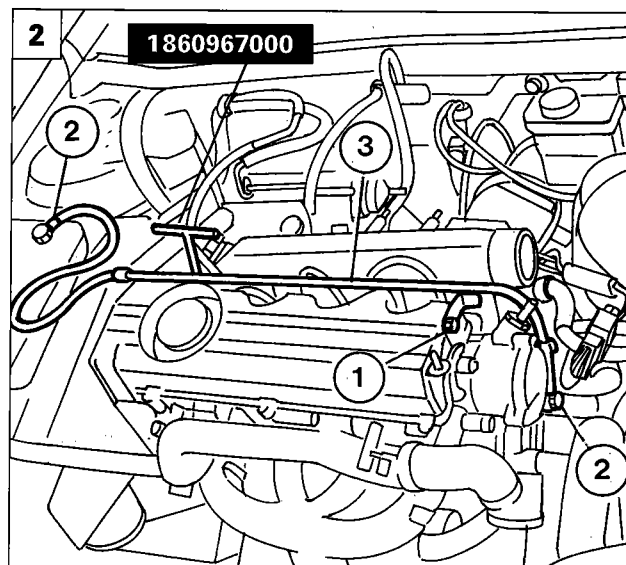


P4A21FX04

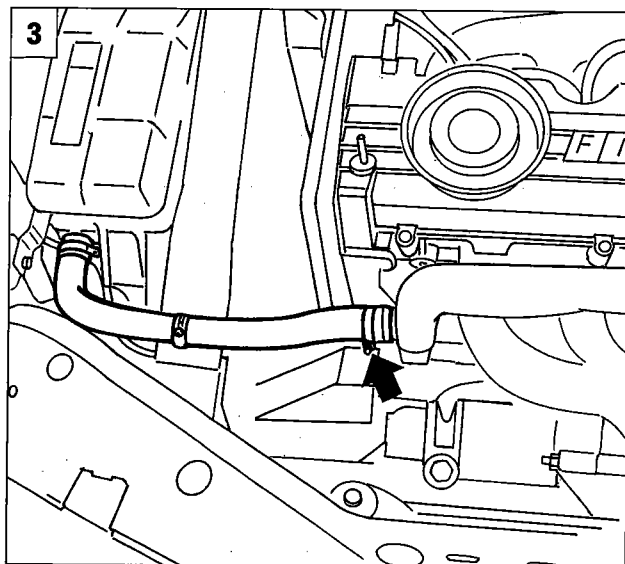
### 10.



P4A22FX01



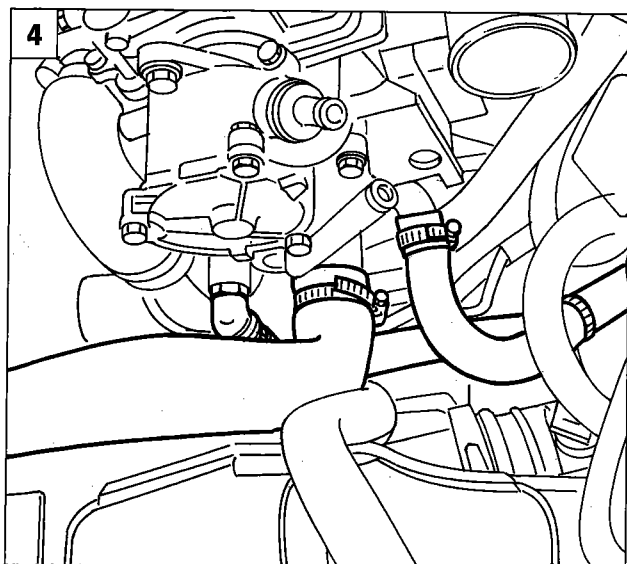
P4A22FX02



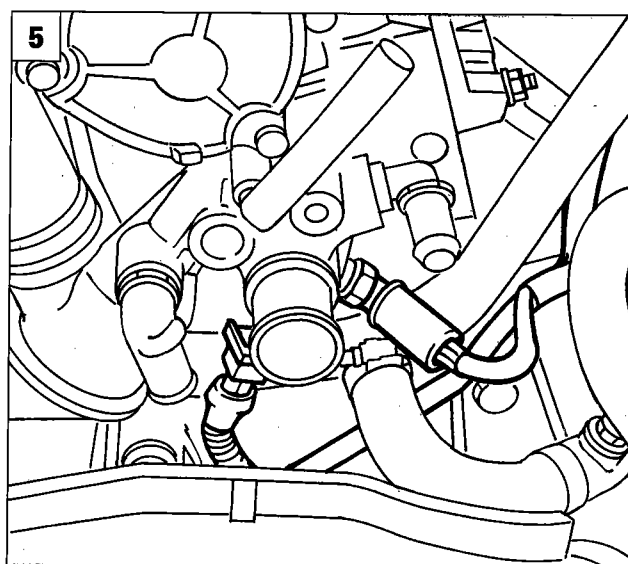
P4A22FX03



1. Position a suitable container to collect the coolant, then disconnect the pipe shown and drain the coolant.
2. Use tool 1860967000 to unscrew the fitting on the head, unscrew bolt (1), disconnect clips (2) and remove coolant pipe (3) from the cylinder head.
3. Disconnect the pipe shown from the cylinder head.
4. Disconnect the pipes shown from the thermostat.
5. Disconnect the sensor and coolant temperature sending unit electrical connections.

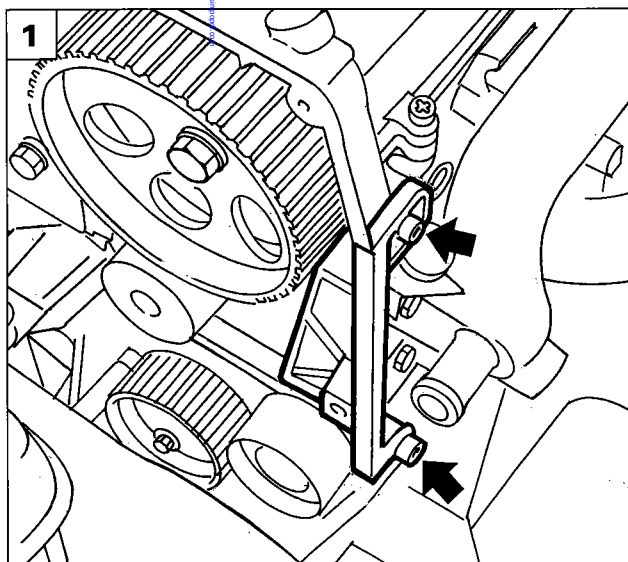


P4A22FX04

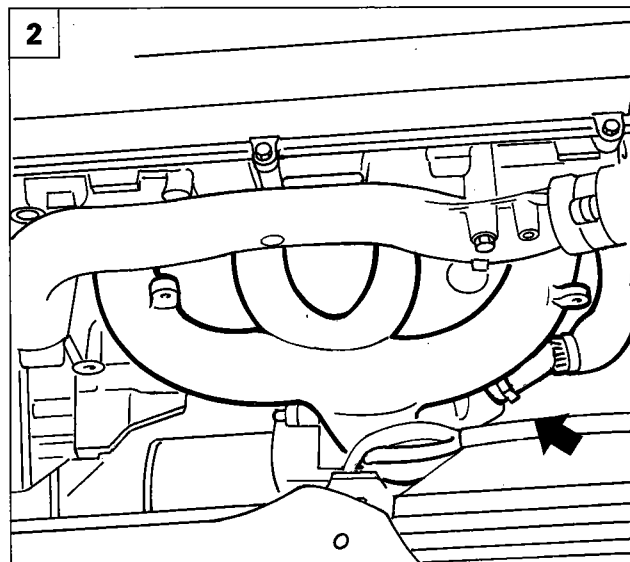


P4A22FX05

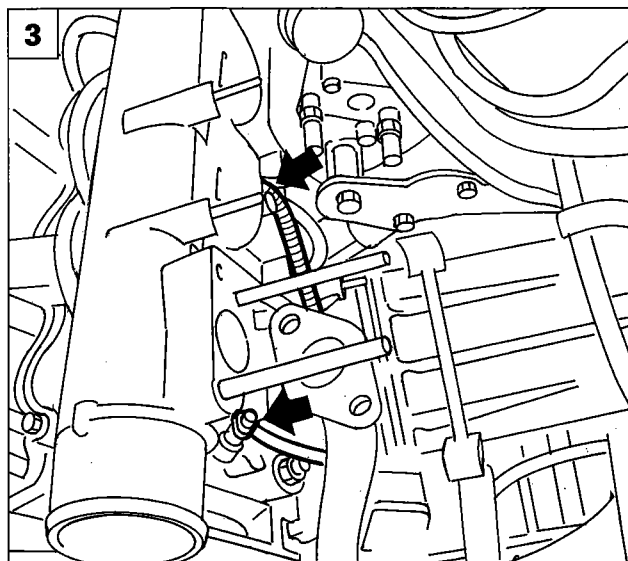




P4A23FX01



P4A23FX02



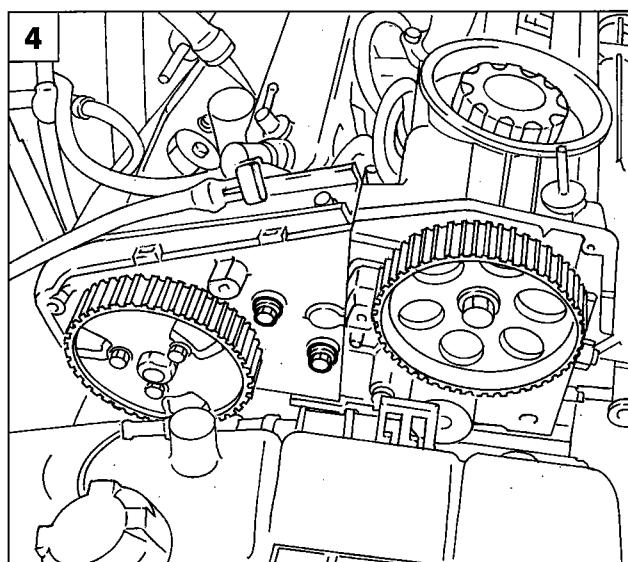
P4A23FX03



*Remove the auxiliary belt and the timing belt as described previously.*

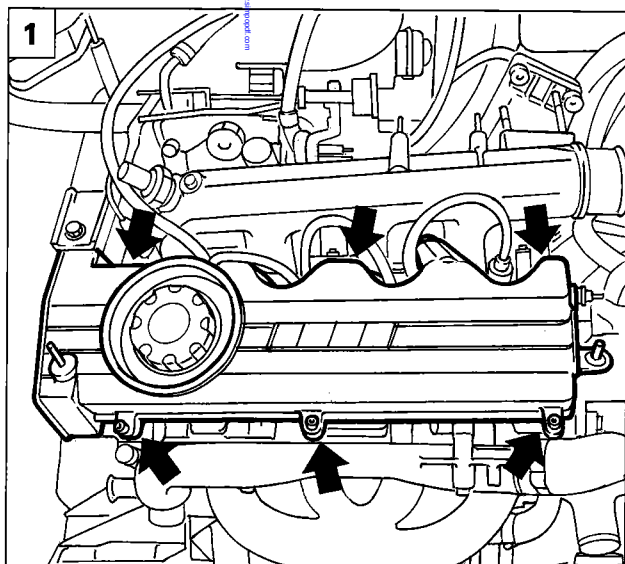


1. Unscrew the retaining bolts shown and remove the timing belt side cover.
2. Unscrew the bolts retaining the exhaust manifold to the cylinder head, unscrew the nut shown and prise the EGR valve rigid pipe from the manifold, then release the exhaust manifold from the pins.
3. Unscrew the nuts shown and disconnect the glow plug supply leads.
4. Unscrew the bolts retaining the intake manifold to the injection pump mount bracket.



P4A23FX04

### 10.

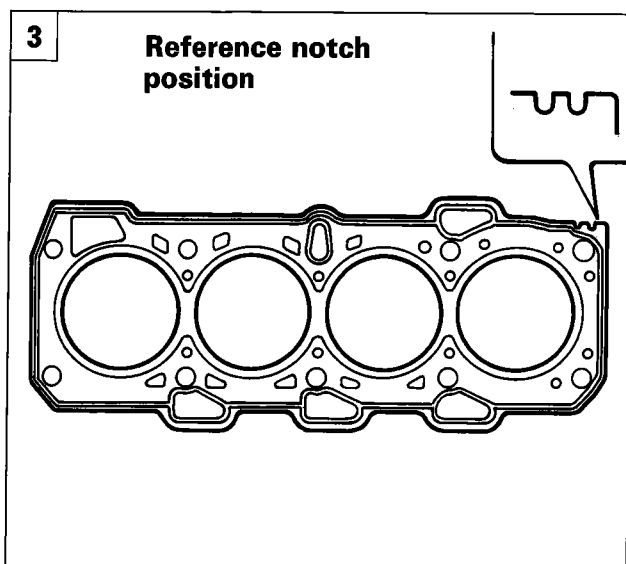
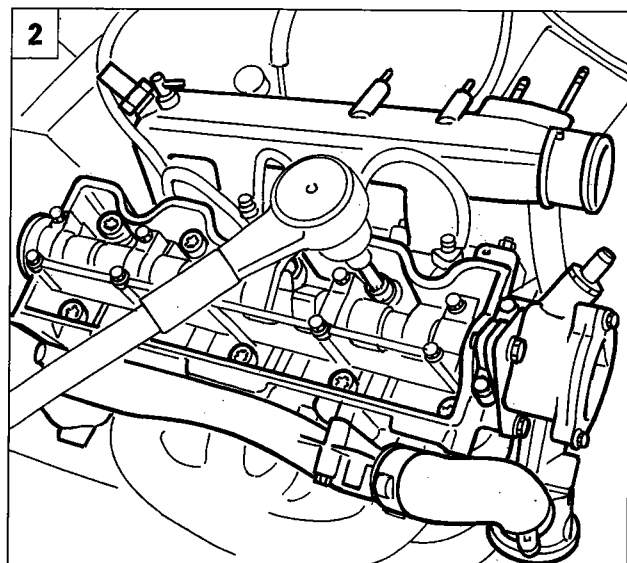


1. Remove the cam cover.
2. Use wrench 1852152000 to unscrew the bolts retaining the cylinder head to the engine block, then remove together with the intake manifold.

### FITTING CYLINDER HEAD GASKET

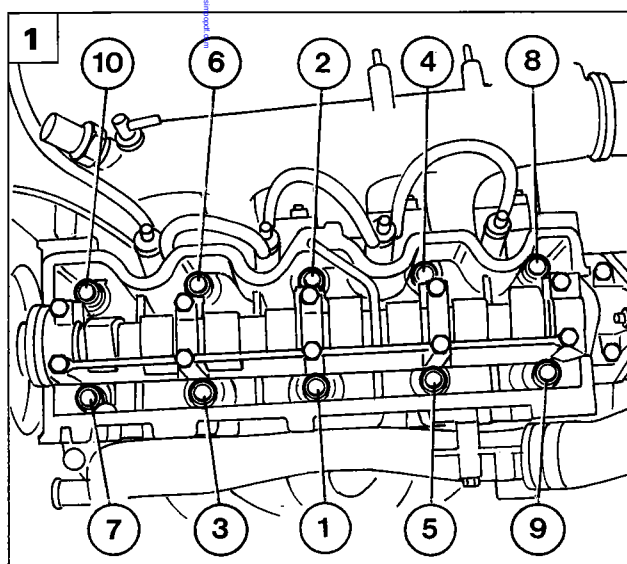
3. Check the amount by which the piston protrudes from the upper surface of the engine block and fit a cylinder head gasket of the thickness shown in the table in order to ensure the compression ratio remains as specified. Fit the gasket to the engine block by inserting the locating pins and ensure that the wording "ALTO" [TOP] is facing the operator.

| Average piston protrusion | Cylinder head gasket thickness | No. of notches |
|---------------------------|--------------------------------|----------------|
| up to 0.80 mm             | 1.6 mm                         | -              |
| 0.80 to 0.90 mm           | 1.7 mm                         | 1              |
| more than 0.90 mm         | 1.8 mm                         | 2              |



The cylinder head gasket is **AS-TADUR** type. This type of gasket is made from a special material which undergoes a process of polymerisation while the engine is running and therefore hardens considerably during use. The following conditions must be satisfied in order to ensure polymerisation occurs:

- keep the gasket sealed in its plastic bag;
- take out only shortly before fitting;
- do not oil the gasket or contaminate with oil. Ensure cylinder head and crankcase surfaces are thoroughly clean.

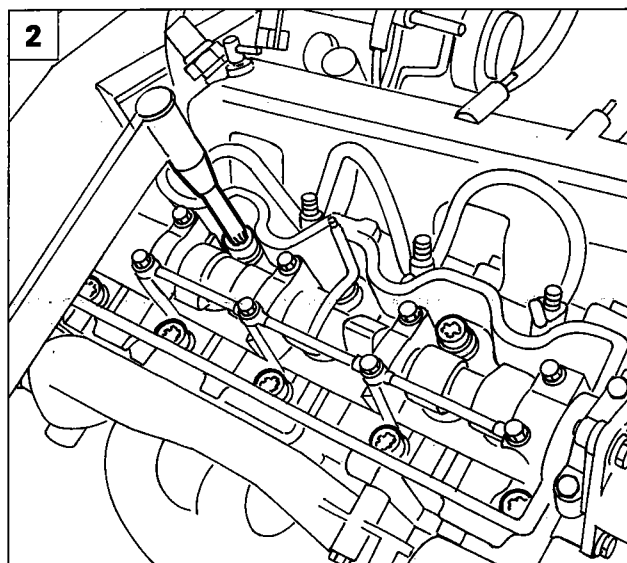


P4A25FX01



#### REFITTING AND TIGHTENING CYLINDER HEAD

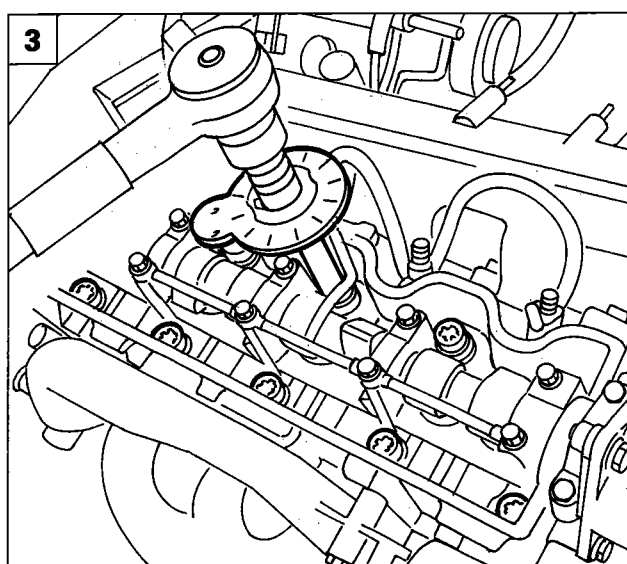
1. Position the cylinder head on the engine block, then tighten the retaining bolts to torque. Ensure that the tightening order shown in the figure is followed for each tightening stage.



P4A25FX02



2. Oil screws and washers and leave to drain for at least 30 minutes; screw in bolts to a torque of 2 daNm, then carry out final tightening to a torque of 6.5 daNm using wrench 1852154000.

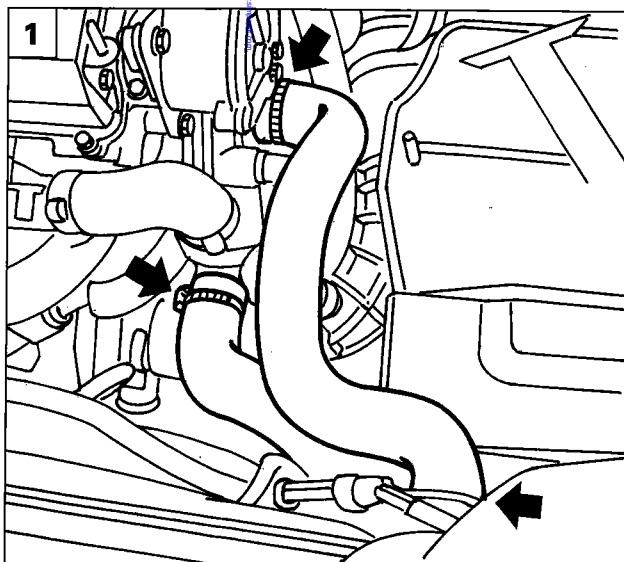


P4A25FX03



3. Tighten bolts through an angle of 270° in three different stages (90°+90°+90°) using wrench 1852154000 applied to tool 1860942000.

### 10.



P4A03FX02

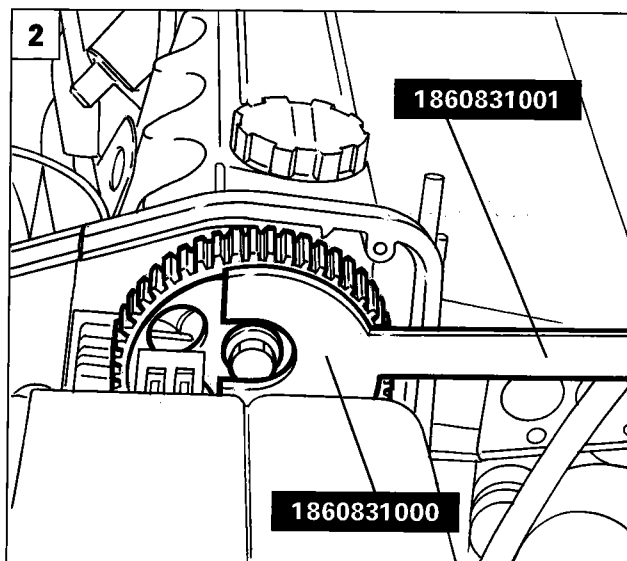


### REPLACING COOLANT PUMP



*Before removing the coolant pump, take off the auxiliary belt and the timing belt as described previously.*

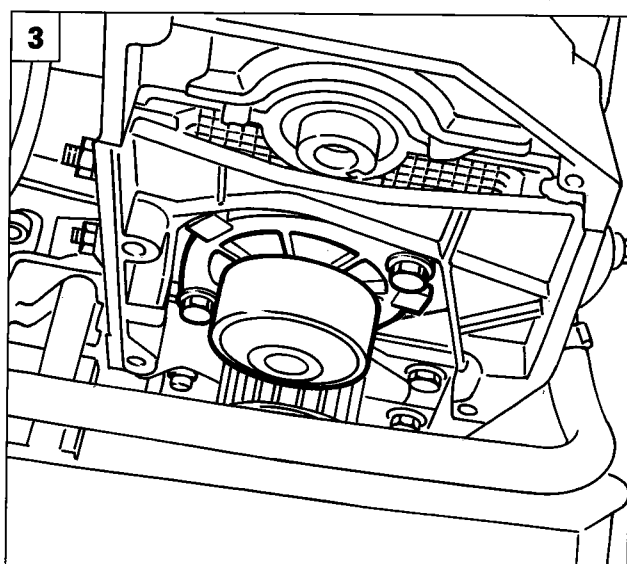
1. Position a suitable container to collect the coolant and disconnect the coolant sleeves shown from the points illustrated.



P4A26FX01



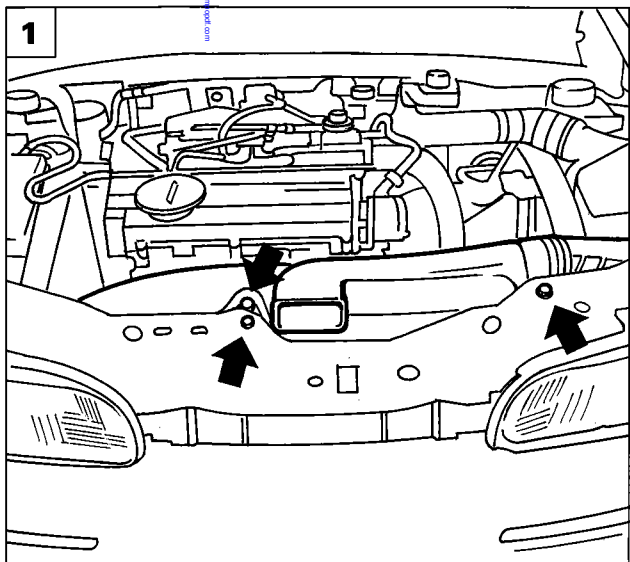
2. Use tools 1860831001 and 1860831000 to unscrew the camshaft pulley retaining nut.



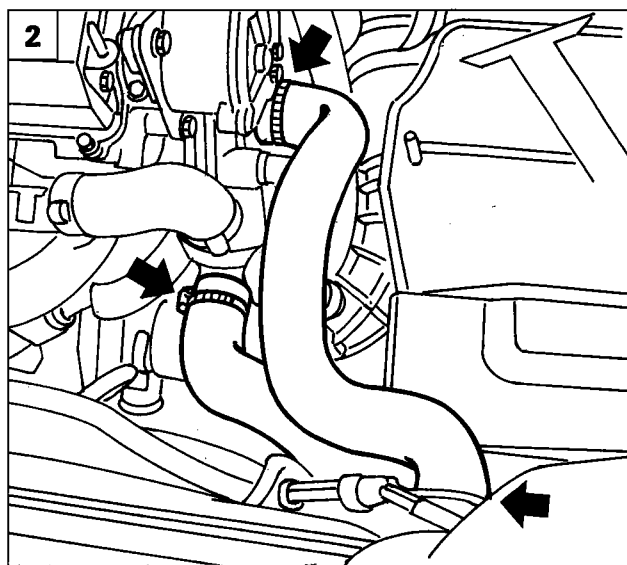
P4A26FX02



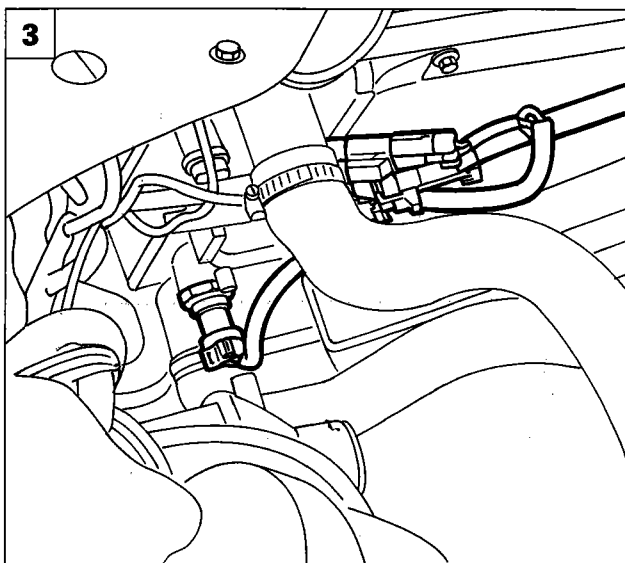
3. Remove the coolant pump from the cylinder head.



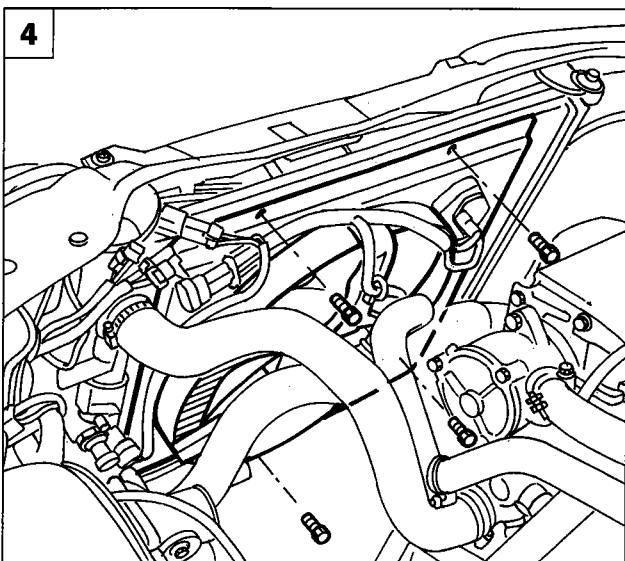
P4A01FX03



P4A03FX02



P4A27FX01



P4A27FX02

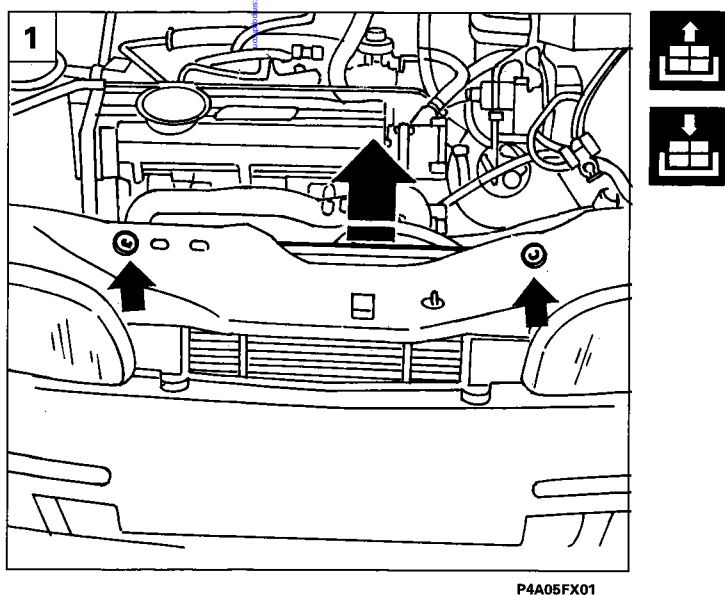
### REMOVING - REFITTING RADIATOR

Place the vehicle on a lift, remove the front wheels, disconnect the battery negative terminal and then proceed as follows.

1. Unscrew the retaining bolts shown and remove the air intake illustrated.
2. Position a container to collect the coolant and then disconnect the pipes shown to drain the coolant.
3. Disconnect the fan and thermostatic switch electrical connections.
4. Unscrew the bolts retaining the fan to the radiator (indicated in figure) and then remove the fan.



### 10.



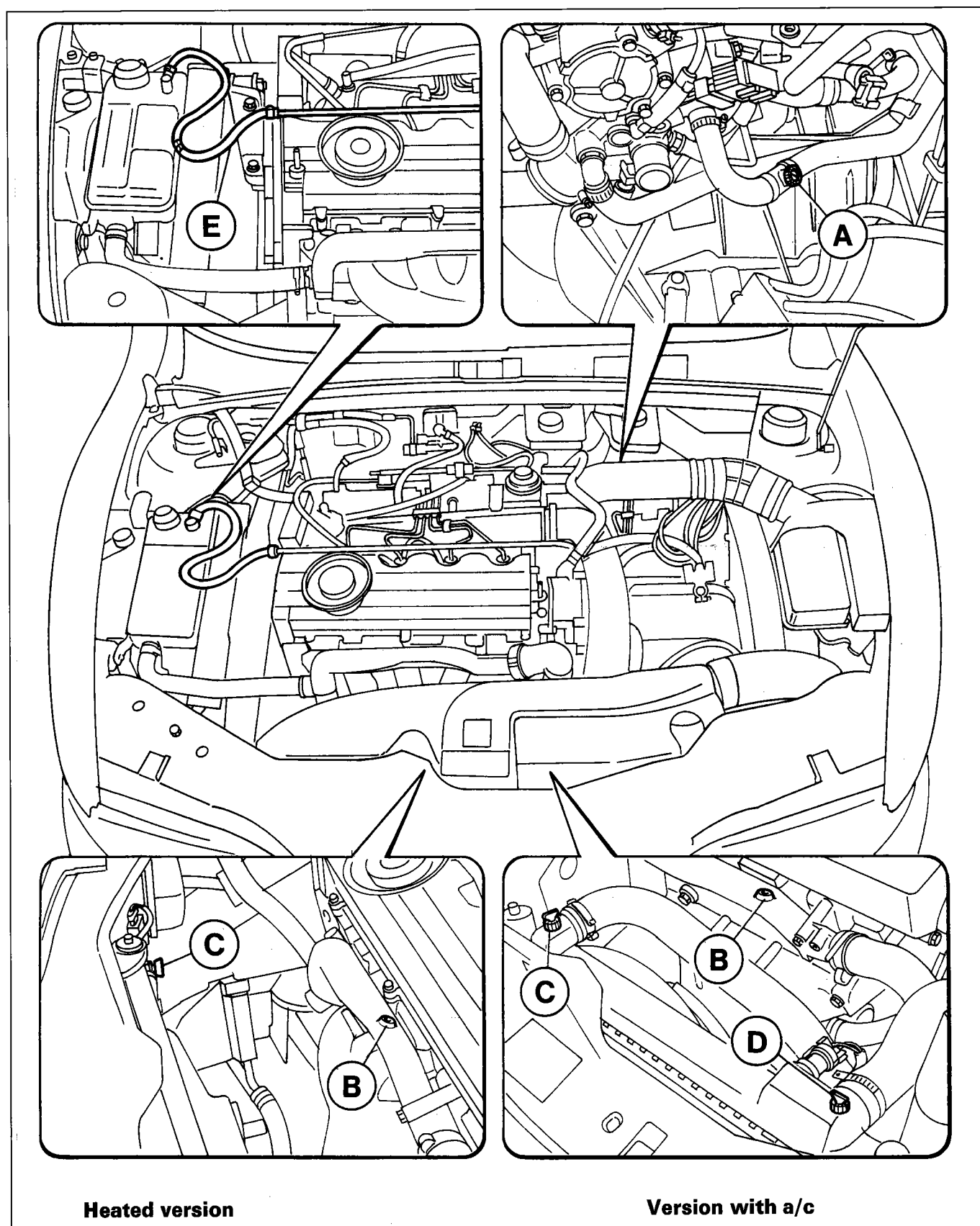
1. Unscrew the bolts retaining the radiator to the body, release from the lower pins and then remove from the upper part of the engine bay.

#### COOLING SYSTEM FILLING PROCEDURE (Heated and air conditioned version with 75 bhp and 100 bhp engines)

- Ensure all cooling system components (engine, heater, radiator etc.) are completely empty.
- Open bleed fitting (A) on the heater outlet sleeve, open bleed fitting (B) on the cylinder head rigid cooling pipe, and open bleed fitting (C) on the radiator. For versions with air conditioner, also open bleed fitting (D) on the radiator.
- Disconnect sleeve (E) connecting expansion tank/thermostat from the point indicated, blow compressed air into the sleeve to empty the pipe. Re-connect when this operation has been carried out.
- Slowly pour in coolant (mixture of 50% water and 50% paraflù) to fill the system until fluid emerges from bleed fitting (A) on the heater outlet sleeve, then close the bleed fitting.
- Carry on pouring in coolant until fluid emerges from bleed fitting (B) on the rigid pipe, then close the bleed fitting.
- Continue filling until fluid emerges from bleed fitting (C) on the radiator, then close. Close bleed fitting (D) at the same time as fitting (C) for air conditioned versions.
- Complete the operation by filling until the fluid reaches the level of the MAX notch on the expansion tank.
- Start the engine and allow to idle for about 2 or 3 minutes.
- Then pump the accelerator at regular intervals to increase the revs to about 3000 rpm. Add coolant to the expansion tank if necessary, but do not exceed the level of the MAX notch.
- Wait until the fan has come on at least twice and then turn off the engine.
- Allow the engine to cool and top up, if necessary, to a level between the MIN and MAX notches on the expansion tank.

**NOTE** If fluid boils while the engine is running as described above, interrupt the procedure in order to find the defective component responsible for the problem, and replace it. Then repeat the filling procedure.

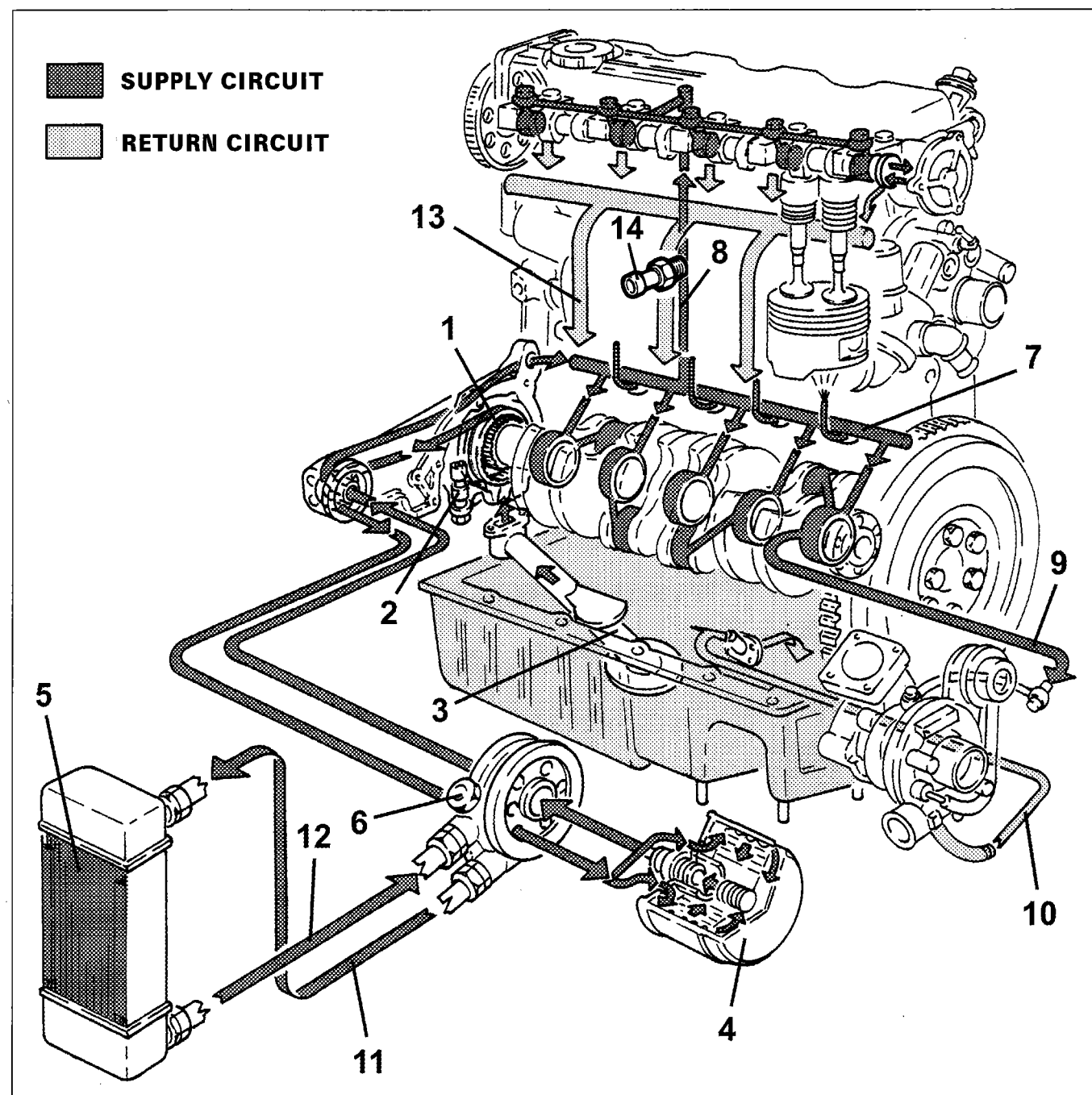
**Location of engine cooling circuit bleed fittings for 75 bhp and 100 bhp engines (heated and air conditioned version)**



P4A29FX01



DIAGRAM SHOWING ENGINE LUBRICATION SYSTEM



P4A31FX01

- |                                |                                                                 |
|--------------------------------|-----------------------------------------------------------------|
| 1. Oil pump                    | 9. Supply pipe to the turbocharger                              |
| 2. Oil pressure relief valve   | 10. Oil return pipe to the sump from the turbocharger           |
| 3. Float with gauze filter     | 11. Oil supply pipe from the thermostatic valve to the radiator |
| 4. Oil filter cartridge        | 12. Oil return pipe from the radiator to the thermostatic valve |
| 5. Engine oil cooling radiator | 13. Oil return to the sump                                      |
| 6. Thermostatic valve          | 14. Engine oil pressure warning light switch                    |
| 7. Main longitudinal duct      |                                                                 |
| 8. Supply duct to the camshaft |                                                                 |

Operation

The engine lubrication system is pressurized through a geared pump incorporated in the crankcase front cover and operated directly by the crankshaft.

A relief valve controls the system pressure.

During the intake, the oil is filtered through a gauze filter and later by a replaceable cartridge on the supply line.

A thermostatic valve fitted on the oil filter mounting has the following function:

- at a temperature of  $\leq 75^{\circ}\text{C}$ , the oil passes directly into the oil filter cartridge and then to the engine;
- at a temperature of  $\geq 90^{\circ}\text{C}$ , the thermostatic valve is open and allows the oil to pass into the cooling radiator to lower the temperature and ensure better lubrication.

A main longitudinal duct in the cylinder block-/crankcase allows the lubrication of the crankshaft, the pistons and the connecting rods.

A duct allows the lubrication of the cylinder head and all the engine timing system components.

Two special pipes allow the lubrication of the turbocharger.

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## **BOSCH 1.5.5 INTEGRATED INJECTION/IGNITION SYSTEM**

### **Introduction**

The BOSCH 1.5.5 system fitted on the 1242 16v ie engine belongs to the category of static advance, digital, electronic ignition systems integrated with phased, intermittent type electronic fuel injection systems.

The integrated system can be divided into the following sub systems:

ELECTRICAL/ELECTRONIC CIRCUIT  
AIR INTAKE CIRCUIT  
FUEL SUPPLY CIRCUIT  
EMISSION CONTROL DEVICES

The system is capable of detecting the following parameters by means of appropriate sensors:

- the engine rotation speed;
- the correct sequence of TDC in the explosion stroke for the cylinders (injection timing);
- the absolute pressure in the inlet manifold;
- the intake air temperature;
- the position and the variation speed of the accelerator butterfly;
- the temperature of the engine coolant;
- the possible presence of detonation;
- the speed of the vehicle;
- the battery voltage;
- the possible engagement of the air conditioning;
- the possible end of travel of the power assisted steering.

This information, usually in analogue format, is converted into digital signals by analogue/digital (A/D) converters so that they can be used by the control unit.

The management programme (software) is stored in the control unit memory and consists of a series of strategies, each of which manages a precisely defined system control function.

Through the use of the information (input) listed earlier, each strategy processes a series of parameters using data maps stored in special areas of the control unit memory and then operates the system actuators (output), which consist of devices which allow the engine to operate, such as:

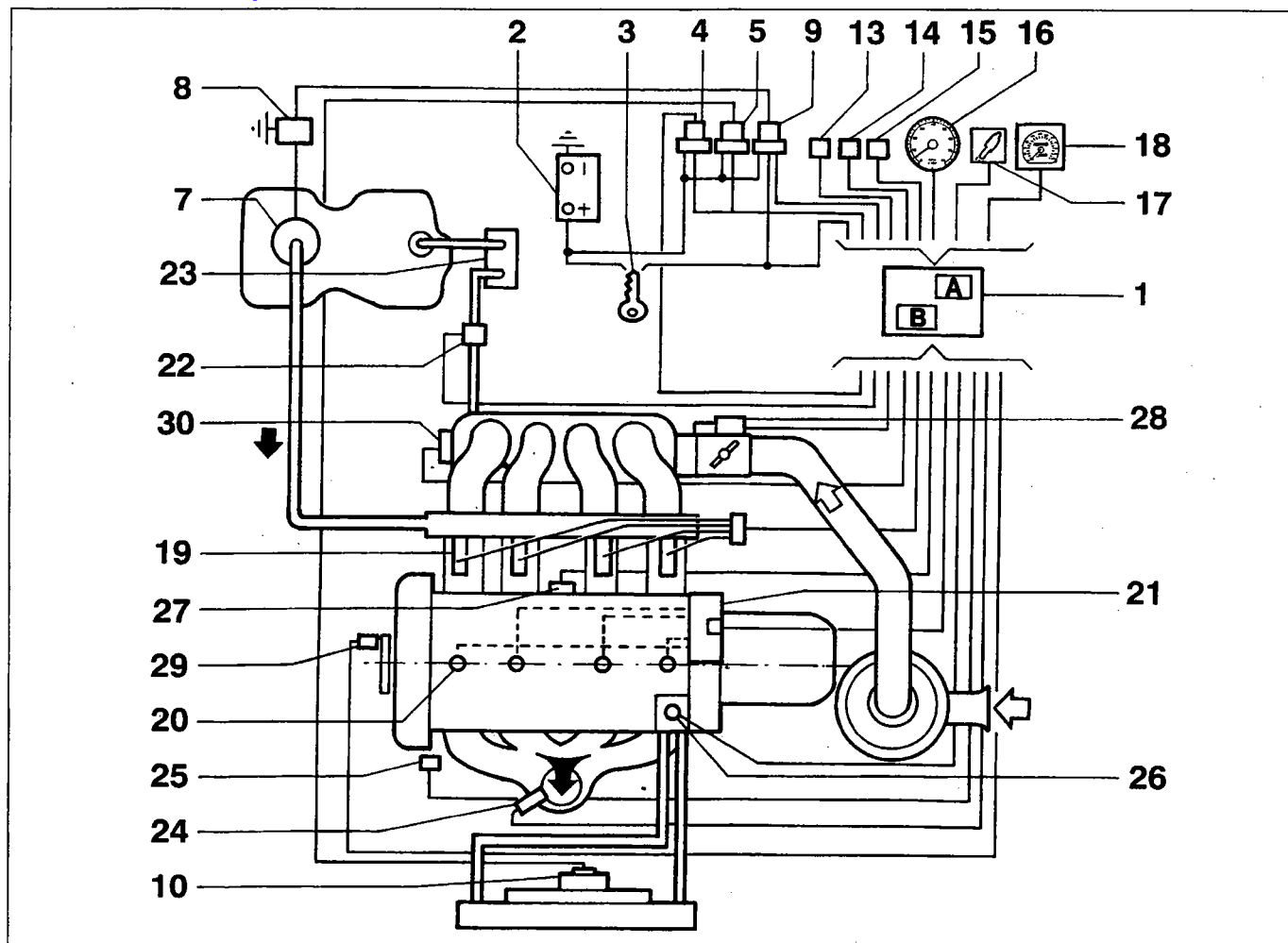
- injectors;
- ignition coil;
- relay feeds;
- implementation solenoid valves;
- interface with the vehicle (diagnostic warning light, diagnostic instrument, etc.).

**NOTE** *The BOSCH 1.5.5 injection/ignition system does not require any adjustment as it is the self-adjusting type.*

**NOTE** *In the drawings and diagrams, the numbers indicate the corresponding engine control unit pins (number/A for connector A, number/B for connector B).*

**10.**

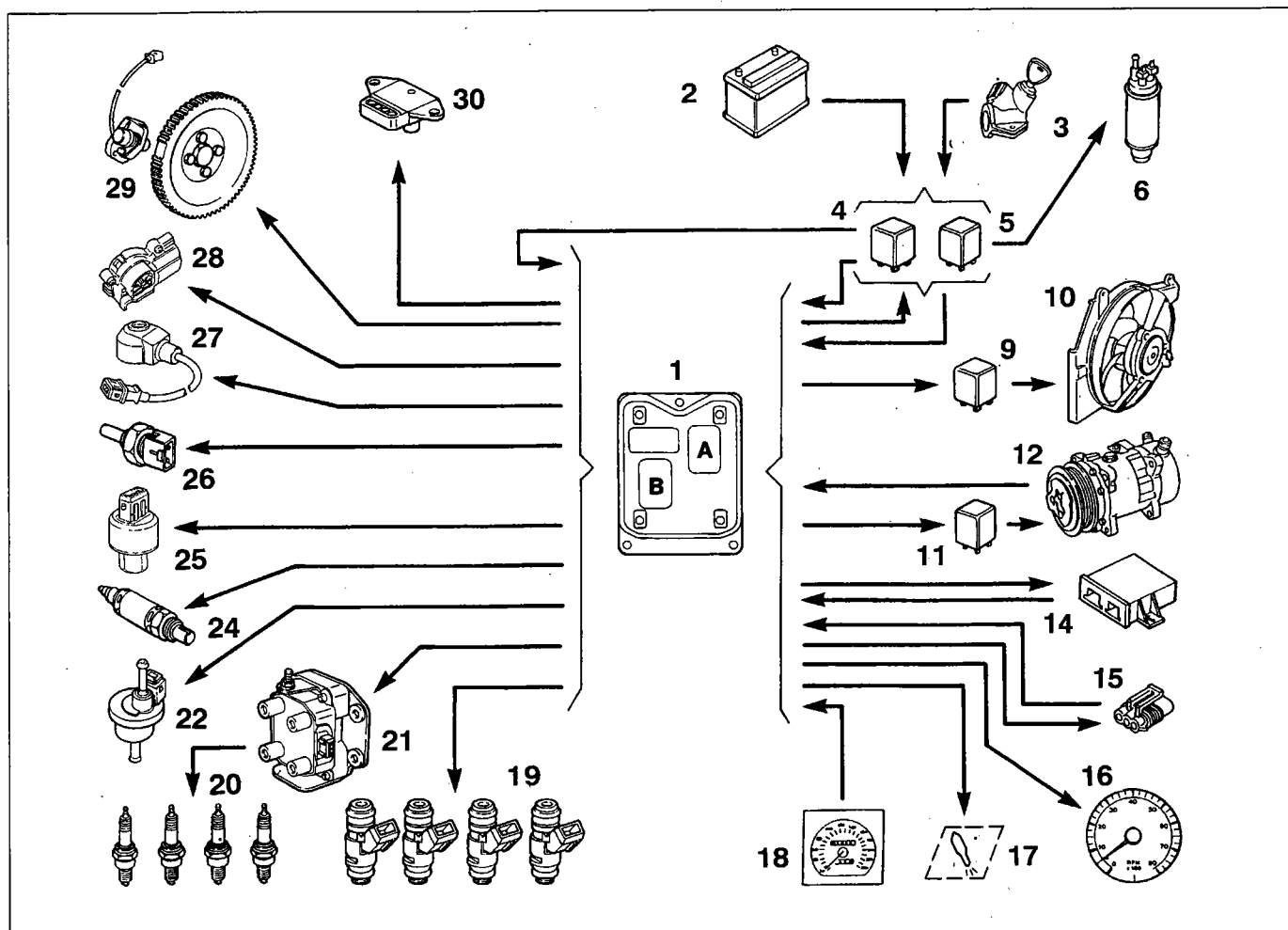
**BOSCH 1.5.5 INJECTION/IGNITION SYSTEM FUNCTIONAL DIAGRAM**



P4A02JJ01

- |                                                                            |                                                                   |
|----------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1. Engine control unit                                                     | 17. System failure light                                          |
| 2. Battery                                                                 | 18. Speedometer                                                   |
| 3. Ignition switch                                                         | 19. Injectors                                                     |
| 4. Engine control system relay                                             | 20. Spark plugs                                                   |
| 5. Electric fuel pump relay                                                | 21. Ignition                                                      |
| 7. Drip tray (including: electric pump, pressure regulator, filter, gauge) | 22. Charcoal filter solenoid valve                                |
| 8. Inertia switch                                                          | 24. Lambda sensor                                                 |
| 9. Radiator fan relay(s)                                                   | 25. Power assisted steering sensor                                |
| 10. Radiator fan                                                           | 26. Coolant temperature sensor                                    |
| 13. Climate control connection                                             | 27. Detonation sensor                                             |
| 14. CODE connection                                                        | 28. Engine idle adjustment actuator and butterfly position sensor |
| 15. Diagnostic equipment connection                                        | 29. Engine rpm and TDC sensor                                     |
| 16. Rev counter                                                            | 30. Absolute pressure and air temperature sensor                  |

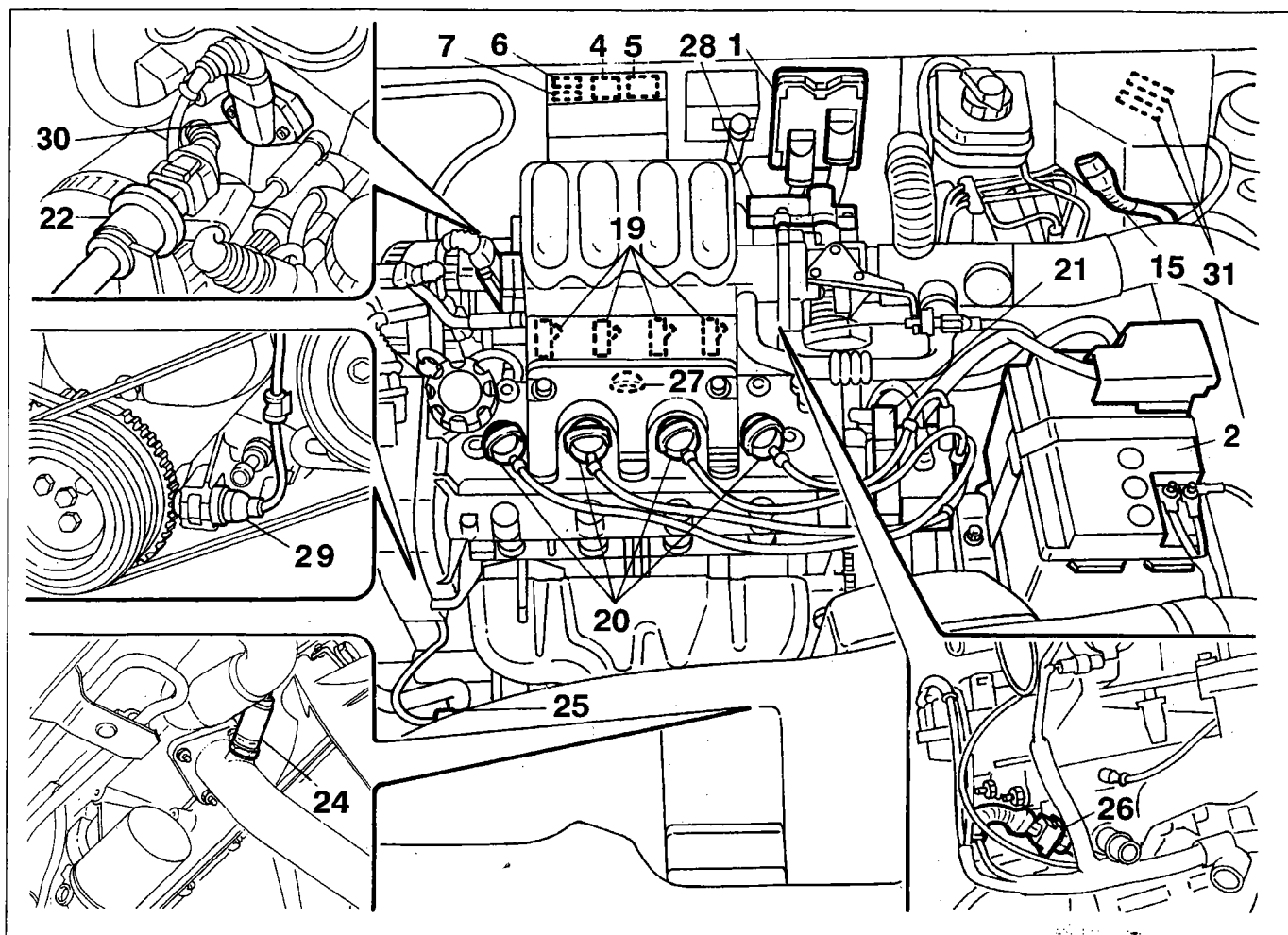
**DIAGRAM SHOWING INFORMATION ENTERING/LEAVING THE CONTROL UNIT AND BOSCH 1.5.5 INJECTION/IGNITION SYSTEM COMPONENTS**



P4A03JJ01

- |                                     |                                                                   |
|-------------------------------------|-------------------------------------------------------------------|
| 1. Engine control unit              | 18. Speedometer                                                   |
| 2. Battery                          | 19. Injectors                                                     |
| 3. Ignition switch                  | 20. Spark plugs                                                   |
| 4. Engine control system relay      | 21. Ignition                                                      |
| 5. Electric fuel pump relay         | 22. Charcoal filter solenoid valve                                |
| 6. Electric fuel pump               | 24. Lambda sensor                                                 |
| 9. Radiator fan relay(s)            | 25. Power assisted steering sensor                                |
| 10. Radiator fan                    | 26. Coolant temperature sensor                                    |
| 11. Compressor engagement relay     | 27. Detonation sensor                                             |
| 12. Compressor                      | 28. Engine idle adjustment actuator and butterfly position sensor |
| 14. CODE control unit               | 29. Engine rpm and TDC sensor                                     |
| 15. Diagnostic equipment connection | 30. Absolute pressure and air temperature sensor                  |
| 16. Rev counter                     |                                                                   |
| 17. System failure light            |                                                                   |

**LOCATION OF BOSCH 1.5.5 INJECTION/IGNITION SYSTEM COMPONENTS  
IN THE ENGINE COMPARTMENT**



P4A04JJ01

- |                                     |                                                                   |
|-------------------------------------|-------------------------------------------------------------------|
| 1. Engine control unit              | 22. Charcoal filter solenoid valve                                |
| 2. Battery                          | 24. Lambda sensor                                                 |
| 4. Engine control system relay      | 25. Power assisted steering sensor                                |
| 5. Electric fuel pump relay         | 26. Coolant temperature sensor                                    |
| 6. System fuse                      | 27. Detonation sensor                                             |
| 7. Electric pump fuse               | 28. Engine idle adjustment actuator and butterfly position sensor |
| 15. Diagnostic equipment connection | 29. Engine rpm and TDC sensor                                     |
| 19. Injectors                       | 30. Absolute pressure and air temperature sensor                  |
| 20. Spark plugs                     | 31. Main fuses (maxi-fuse)                                        |
| 21. Ignition                        |                                                                   |



## **SYSTEM MANAGEMENT STRATEGIES**

### **Operating principle**

Any engine operating point is identified by two parameters;

- rotation speed;
- engine load.

If these parameters are known by means of appropriate processing it is possible to calculate and then implement the injection (quantity of fuel supplied and timing with explosion stroke TDC), the ignition (correct ignition advance) and any other functions for each engine operating point.

In the BOSCH 1.5.5 system the rotation speed is measured directly via the relevant sensor whilst the engine load is determined indirectly, calculating "factor  $t_l$ " (representing the actual engine load) according to the absolute pressure and the temperature of the air, both measured in the inlet manifold.

Special maps are experimentally determined for the engine and the vehicle for the injection and the ignition, which (for a certain number of speed-load parameter pairs) contain the ignition advance and injection timing values required for the correct operation of the engine.

For any engine operating point not exactly included in those stored in the maps, the values are determined through mathematical interpolation from these figures.

The injection time values calculated are also corrected according to the signal coming from the Lambda sensor which, on the basis of suitable operating strategies, ensures that the mixture strength is constantly around the stoichiometric value.

The system is known as the "speed-density-Lambda" type because the injection time is basically determined from these three parameters.

All the particular operating situations which require adjustments to the ignition advance and injection timing values calculated are managed by the engine control unit on the basis of the signals coming from the various system sensors.

### **Management of the signals**

**NOTE** *These signals refer to the collection of signals coming from the sensor on the crankshaft which are characterized by a precise sequence which the control unit is capable of recognizing.*

During starting, the control unit recognizes the ignition and the injection timing which are vital for the subsequent operation of all the strategies.

This recognition takes place in two successive stages:

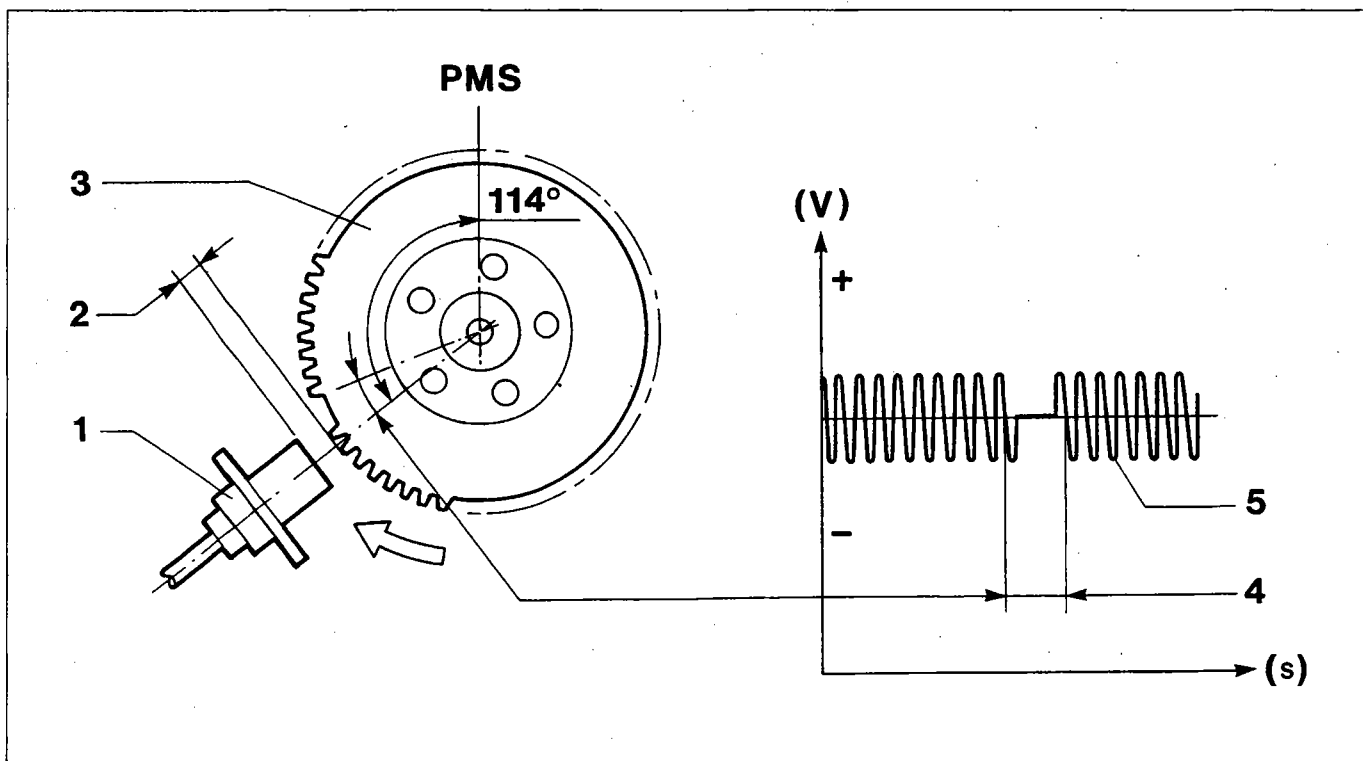
- by interpreting the succession of signals coming from the flywheel sensor, on the crankshaft, the control unit recognizes TDC for the pair of cylinders 1-4.
- using a particular strategy the control unit, by failing to operate a particular injector, is capable, by evaluating the consequent variation in speed (not perceptible to the driver) of recognizing which cylinder the injector which is not operated belongs to and therefore of determining the correct cylinder sequence (software timing).

### 10.

In particular, the signal is composed as follows.

There are sixty teeth on the flywheel, two of which have been removed to create discontinuity: the angle between the two consecutive teeth is therefore  $6^\circ$ :

The synchronism point is recognized at the end of the first tooth following the two missing teeth: the flywheel is fitted so that as the engine passes this tooth cylinders 1 and 4 are 17 teeth before TDC.



P4A06JJ01

1. Engine rpm and TDC sensor
2. Gap
3. Flywheel 60-2 teeth

4. Signal corresponding to two missing teeth
5. Flywheel signal (engine speed sensor)

## MANAGEMENT OF THE INJECTION

The injection management strategies are designed to provide the engine with the correct quantity of fuel at the desired moment according to the engine operating conditions.

The management of the injection basically consists of calculating the injection time, determining the injection phase and then the implementation by operating the injector.

The "basic" injection time is calculated by means of mathematical interpolation of the speed-load map: the figures contained in the map, which have been obtained experimentally, also depend on the characteristics of the injector.

The "final" injection time "is determined by means of a calculation algorithm in which the "basic" injection time is corrected by a series of coefficients which take into account the different engine operating conditions which are highlighted by the various system sensors.

### Controlling the mixture strength

**NOTE** The mixture strength is defined and the ratio is indicated by the greek letter  $\alpha$  (alfa).

$$\frac{\text{quantity of air drawn in by the engine}}{\text{quantity of fuel injected}}$$

The stoichiometric ratio is defined and the ratio is indicated by  $\alpha_{st}$ .

$$\frac{\text{theoretical quantity of air required to burn all the fuel injected}}{\text{quantity of fuel injected}}$$

The mixture strength is defined and the ratio is indicated by the greek letter  $\lambda$  (lambda):

$$\frac{\text{quantity of air drawn in by the engine}}{\text{theoretical quantity of air required to burn all the fuel injected}}$$

It can easily be deduced that  $\alpha_{st} = \lambda$ .

The stoichiometric ratio depends on the type of fuel: for current unleaded petrol it is about 14.7 - 14.8 and corresponds to a Lambda of 1:

A mixture is called *rich* when the quantity of air is lower than the stoichiometric figure and in that case the Lambda is  $\lambda < 1$ :

A mixture is called *poor* (or *lean*) when the quantity of air is higher than the stoichiometric figure and in that case the Lambda is  $\lambda > 1$ .

The strategy is designed to correct the "basic" injection times so that the mixture strength constantly oscillates at a high Hertz frequency:

**NOTE** 1 Hz = 1 oscillation per second

In

- cut-off conditions,

or

- in full load engine conditions,

or

- with the engine cold (coolant and air temperature below around 20 °C)

the strategy is disabled.

### Self-adjustment

The control unit is equipped with a self-adjustment function which has the task of memorizing any differences between the basic map and the corrections set by the Lambda sensor which occur repeatedly during operation. These differences (due to the ageing of the system and engine components) are permanently stored in the memory, allowing the adjustment of the system operation to the gradual alterations in the engine and components compared to when they were new.

The strategy is disabled during the opening of the charcoal filter solenoid valve. If the control unit is replaced, a road test must be carried out which allows the engine to reach operating temperature and the control unit to intervene (especially during stops whilst idling) imposing the self-adjustment function.

## **10.**

### **Starting and operation when cold**

During cold starting the management of the injection is simultaneous (full-group), i.e. not phased: this situation persists until the coolant reaches a certain temperature (about 0°C), after which the management becomes phased.

Whilst the starter motor is working the injection time is determined by a special map and depends on the temperature of the coolant: once the engine has been started up, the regular speed-load map is used for the calculations.

During operation when cold, since the mixture is naturally weakened as a result of the reduced evaporation and the strong condensation of the fuel on the internal walls of the inlet manifold, the "basic" injection time "is increased by a multiplication coefficient which depends on the engine temperature and speed.

### **Operation in full load conditions**

The strategy is enabled when the butterfly exceeds a certain level, which, in turn, depends on the engine speed.

In this situation the injection time is determined by a special map which depends on the engine load and speed conditions.

### **Operation in acceleration and deceleration conditions**

The acceleration and deceleration conditions are interpreted by the system as a transition stage between two conditions, setting off and arriving: this transition can be positive (acceleration) or negative (deceleration).

The transition management strategy is very complex, having to take a large number of factors into account.

In general, the injection time is increased for positive transitions and reduced for negative ones.

The extent of the correct basically depends on the variation in the engine load: however, other factors such as the speed of movement of the butterfly, the engine speed, the gear engaged (obtained from the ratio between the engine speed and the vehicle speed), the temperature of the engine (coolant and intake air) which are interconnected also have an impact.

The "basic" injection time is multiplied by a coefficient which is, in turn, the sum of two coefficients: the first takes into account the temperature of the engine and opening speed of the accelerator butterfly; the second depends on the engine rotation speed.

In particular, if the increase in the injection time is feasible at an injector which has just closed, the control unit reopens the injector (extra pulse), in order to compensate for the mixture strength extremely quickly: the subsequent injections are already increased on the basis of the coefficients mentioned previously.

### **Operation in cut off conditions**

The control unit enables the cut-off strategy when the temperature of the engine exceeds a certain level. The cut-off strategy is implemented when the control unit recognizes that the butterfly is in the minimum position (signal from the butterfly potentiometer): it is disabled when the engine is cold to avoid driveability problems.

The engine supply is re-enabled when the butterfly is recognized to be in a non closed position or when the engine speed goes below a level which depends on the coolant temperature.

### **Rotation speed restricter**

This strategy restricts the maximum speed which can be reached by the engine enabling the cut-off. There are two different cut-off thresholds:

- static restriction (the engine speed approaches the level slowly): maximum speed = 6670 [rpm];
- dynamic restriction (the speed approaches the level rapidly): maximum speed = 6500 [rpm];

### **Operation of electric fuel pump**

The electric fuel pump is operated by the engine control unit by means of a relay.

The pump is stopped:

- if the engine speed goes below 50 [rpm]
- after a certain time (about 5 seconds) if the ignition key is in the ON position and the engine has not been started up (timed inhibition);
- if the inertia switch has intervened.

### **Operation of injectors**

The operation of the injectors is the sequential, phased type. However, during cold starting, the injectors are operated in parallel up to a certain temperature.

The timing of the injectors varies according to the engine speed.

## **MANAGEMENT OF THE FIAT CODE ANTI-THEFT FUNCTION**

The system is equipped with an anti-theft function. This function is achieved through the presence of a special (FIAT CODE) control unit, capable of conversing with the engine control unit, and an electronic key equipped with a special transmitter for sending a recognition code.

Each time the key is turned to the OFF position, the Fiat CODE system completely deactivates the engine control unit.

When the key is turned to the ON position the following operations take place in order:

1. the engine control unit (whose memory contains a secret code) sends the FIAT CODE control unit a request to send the secret code to deactivate the immobilization of the functions;
2. the Fiat CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key;
3. the recognition of the secret code allows the immobilization of the engine control unit to be deactivated and normal operation resumed.

**NOTE** *If a FIAT CODE anti-theft system is fitted, during the fault diagnosis, DO NOT CARRY OUT the test using another engine control unit. In such a case, the Fiat CODE control unit would transfer the (unrecognized) recognition code to the test control unit which could then no longer be used on other vehicles.*

## 10.

### MANAGEMENT OF THE IGNITION

The management of the ignition basically consists of determining the desired ignition advance according to the engine operating conditions and its implementation through the operation of the power transistor located inside the control unit.

The "basic" advance value, calculated on the basis of the engine load and speed conditions, is then corrected according to the different engine operating conditions.

The primary winding for each coil receives the battery voltage via the relay and is connected to the power transistor incorporated in the engine control unit, whose transmitter is connected to earth, whilst base receives the operating voltage from the control unit.

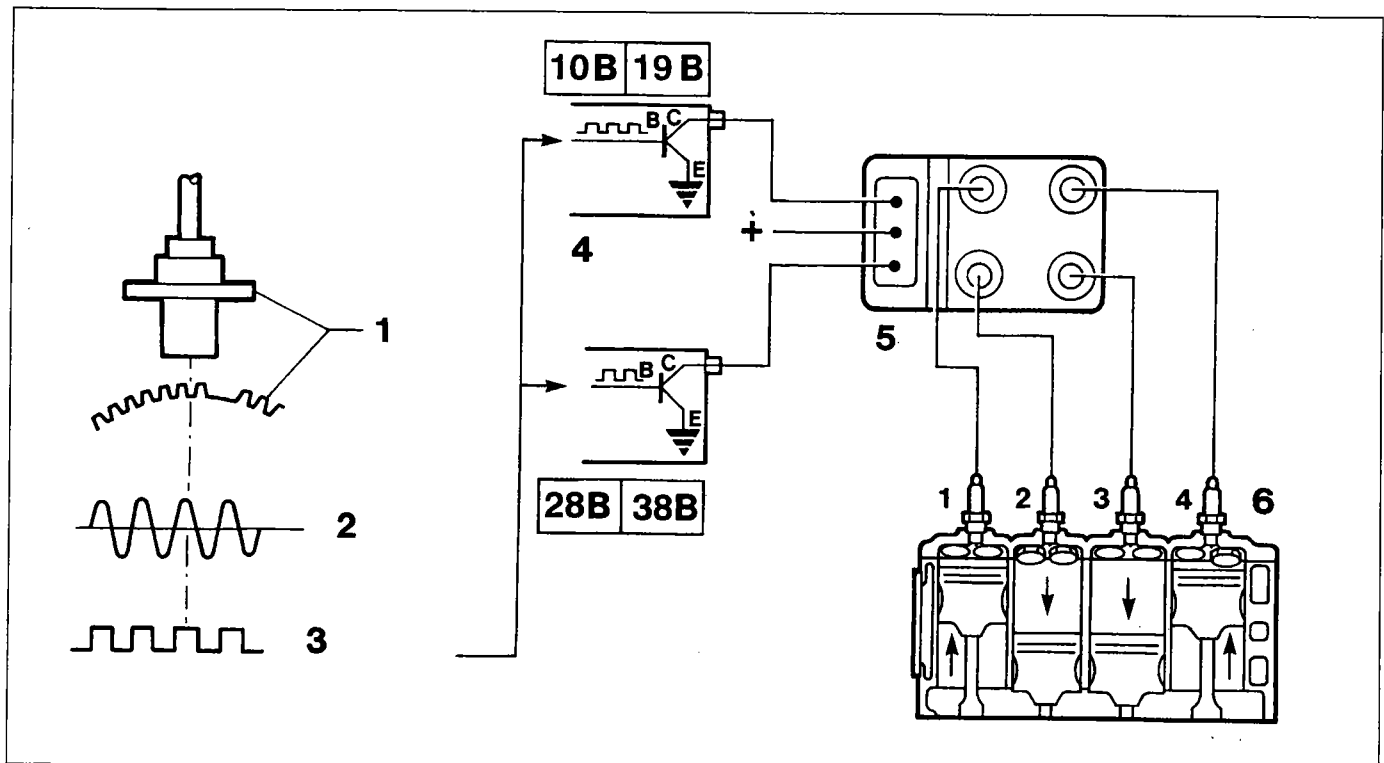
According to the engine rotation speed and the ignition advance to be implemented, the engine control unit establishes the moment for the start of the conduction of the primary winding, in such a way as to reach the desired current intensity (saturation) in the primary winding immediately before this current is interrupted.

This moment obviously varies in terms of the angle in relation to TDC for the explosion stroke for each cylinder and the greater the advance, the greater the engine rotation speed because the time required to saturate the current in the coil primary winding is more or less constant: it is determined using suitable coefficient stored in the memory (dwell management).

The moment for the start of conduction is also corrected on the basis of the battery voltage.

The engine control unit therefore determines the moment the current in the primary coil is interrupted transforming the advance degrees into the time required by the engine to cover this angle: this time constitutes the advance in relation to TDC for the explosion stroke with which the current is interrupted at the base of the transistor.

The moment the current at the base of the power transistor is interrupted, the connection to earth for the primary coil is interrupted and consequently there is a high tension discharge at the secondary winding.



P4A11JJ01

1. Engine rpm and TDC sensor and flywheel
2. Control unit input signal
3. Signal converter in the control unit (square wave)

4. Internal power module
5. Coil
6. Spark plugs



### Starting

During starting the normal management of the advance is not possible on account of the considerable fluctuations in the rotation speed which do not allow the dwell and the advance to be calculated correctly.

The control unit implements a fixed advance for the entire time the engine is driven by the starter motor.

### Operation at high temperatures

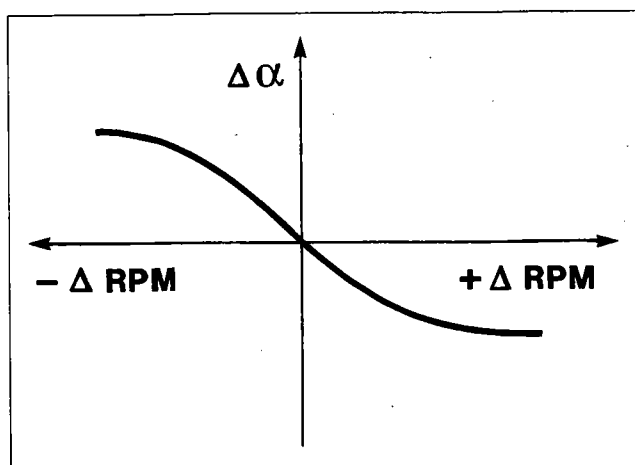
This strategy is enabled when the intake air temperature exceeds a certain level. The "basic" advance value is reduced according to this temperature.

### Operation in cut off conditions

The injection advance is reduced on entry into cut-off: from the moment the supply of fuel is restored, the advance gradually returns to the "basic" value.

### Operation during take-off

This strategy is designed to reduce the advance when the vehicle moves off from a stationary position.



P4A12JJ01

### Operation with the engine idling

When the engine is idling, the management of the advance is implemented independently of the "basic" advance.

The advance value during idling is corrected in a manner which is inversely proportional to the variation in the speed in relation to the pre-set speed which, in turn, depends on the temperature of the coolant.

In particular, the advance is increased if the speed decreases and is decreased if the speed increases, in order to ensure the stability of the actual speed.

- $\Delta\alpha$ : correction of the ignition advance during idling
- +  $\Delta$ RPM: the speed during idling is higher than the nominal speed
- $\Delta$ RPM: the speed during idling is lower than the nominal speed

### Control of the detonation

This strategy has the task of detecting the presence of the phenomenon of detonation, by processing the signal coming from the relevant sensor. The strategy continuously compares the signal coming from the sensor with a threshold, which is, in turn, constantly updated, to take into account background noise and the ageing of the engine.

If the system recognizes the presence of detonation, the strategy reduces the ignition advance, in steps of  $3^\circ$  up to a maximum of  $9^\circ$  until the phenomenon disappears. Later on, the advance is gradually restored either until the basic value is reached or until the phenomenon occurs again.

The strategy also has a self-adjustment function which memorizes the reductions in the advance which are continuously repeated to adapt the advance to the different conditions in which the engine finds itself (for example, the use of a low octane rating fuel). The strategy is capable of restoring the advance to the map value if the conditions which caused the reduction no longer exist.



## **10.**

### **MANAGEMENT OF THE ENGINE IDLE SPEED**

The general objective of this strategy is to keep the engine speed around the value memorized (engine warm: 800 [rpm]) the position assumed by the butterfly depends on the engine speed and the vehicle speed.

- Starting.

When the key is inserted, the butterfly assumes a position which depends on the temperature of the engine and the battery voltage (open-loop position).

- Engine running and accelerator pedal released.

The engine speed varies according to the temperature of the engine and is kept constant close to this value by altering the position of the butterfly to compensate for any fluctuations in the speed.

This takes place, in particular, when external loads are applied (power assisted steering, heated rear windscreen, etc).

If the air conditioning and the fans, both managed by the control unit, are switched on and the power assisted steering is in the end of travel position, which is signalled by a switch, the strategy manages the butterfly in advance of the engagement of the load.

- Normal driving.

Under these circumstances, the actuator is in the open-loop position.

- Deceleration.

In deceleration conditions outside of idling, the control unit controls the position of the butterfly through a special (dash-pot) curve, in other words it slows down the return of the butterfly towards the closed position; this produces a reduction in the braking effect of the engine.

In addition, if the vehicle is in deceleration conditions, the information concerning its speed correlated to the engine speed, makes it possible to manage the dash-pot effect in an optimum manner by adapting it to the gear engaged.

### **MANAGEMENT OF THE ACTIVE CHARCOAL FILTER SCAVENGING**

This strategy controls the position of the active charcoal filter solenoid valve in the following way:

- during starting, the solenoid valve remains closed, preventing the fuel vapours from enriching the mixture;
- after cold starting, the solenoid valve remains closed for the entire time the engine is warmin up;
- with the engine warm, the control unit operates the solenoid valve in duty-cycle to control the quantity of fuel vapours sent to the inlet (scavenging of the charcoal filter), according to the engine speed and load conditions. In particular, the system alternates scavenging and non-scavenging periods: the self-adjustment function is activated during the latter, but disabled during the scavenging stage.
- in cut-off conditions, the solenoid valve remains closed.

## **MANAGEMENT OF THE CLIMATE CONTROL SYSTEM**

The injection/ignition control unit is connected to the climate control system, because:

1. it receives the request to switch on the compressor and operate the appropriate interventions (additional air);
2. it gives the go ahead to switch on the compressor when the conditions required by the strategies have been verified;
3. it receives information on the state of the four stage pressure switch and operates the appropriate interventions (operation of the radiator fan).

As far as point 1 is concerned, if the engine is idling, the control unit increases the air flow rate, altering the position of the butterfly in advance of the engagement of the compressor and conversely it returns the butterfly to its normal position after the compressor is switched off.

The engine idle speed is also increased the entire time the compressor is activated (engine warm: 900 [rpm]).

As far as point 2 is concerned, the control unit automatically operates the disengagement of the compressor:

- for several seconds (timed disengagement):
  - in conditions where the engine power requirements are high (strong acceleration);
  - during vehicle take-off;
- as long as the following critical conditions persist:
  - temperature of the engine coolant above a certain level (engine overheating);
  - engine speed below 700 rpm.

# 10.

## MANAGEMENT OF THE RADIATOR FAN

**NOTE** Since the coolant temperature is detected by the appropriate sensor there is no longer a thermal contact on the radiator.

The engine control unit operates the engagement of the radiator fan according to the temperature of the coolant and whether or not there is a climate control system.

In the case of versions with climate control, there are two fan operating speeds, managed according to different logics, entirely independent of one another.

- According to the coolant temperature.

Low speed: this is switched on when the temperature of the coolant reaches  $T_1 = 96.5\text{ }^{\circ}\text{C}$ ;

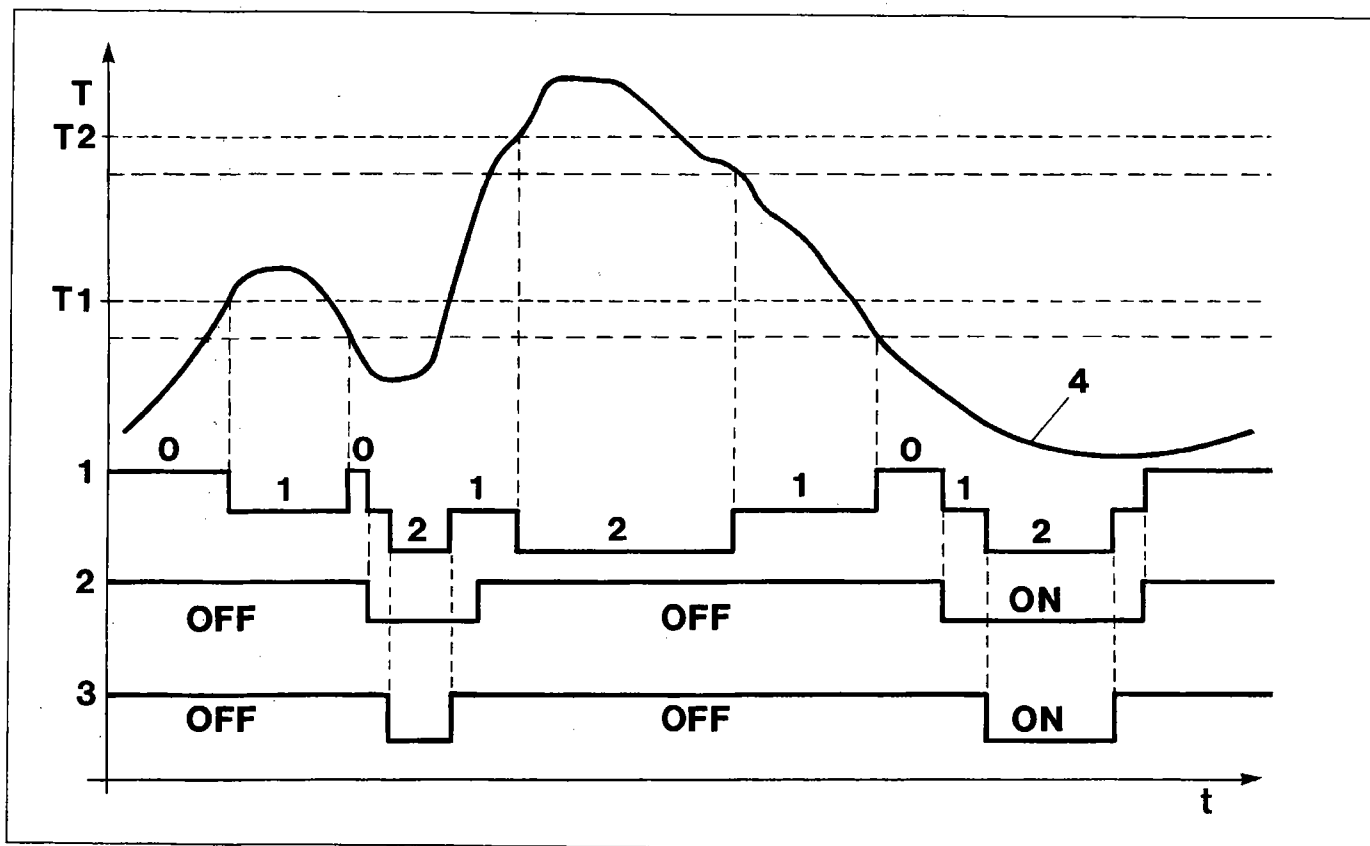
high speed: this is switched on when the temperature of the coolant reaches  $T_2 = 102\text{ }^{\circ}\text{C}$ .

The fan is switched off with a temperature hysteresis of around  $3\text{ }^{\circ}\text{C}$ .

- According to the condition of the four stage pressure switch.

Low speed: this is switched on when stage II of the pressure switch is triggered;

high speed: this is switched on when stage III of the pressure switch is reached.



P4A14JJ01

$T_1 = 96.5\text{ }^{\circ}\text{C}$   
 $T_2 = 102\text{ }^{\circ}\text{C}$

ON: pressure switch activated  
OFF: pressure switch deactivated

1. Fan state.  
0 = off  
1 = low speed  
2 = high speed
2. Four stage pressure switch level II
3. Four stage pressure switch level III
4. Engine coolant temperature progress

## DIAGNOSTICA

The system is equipped with an autodiagnostic function which is designed to verify an irregular state for the following components:

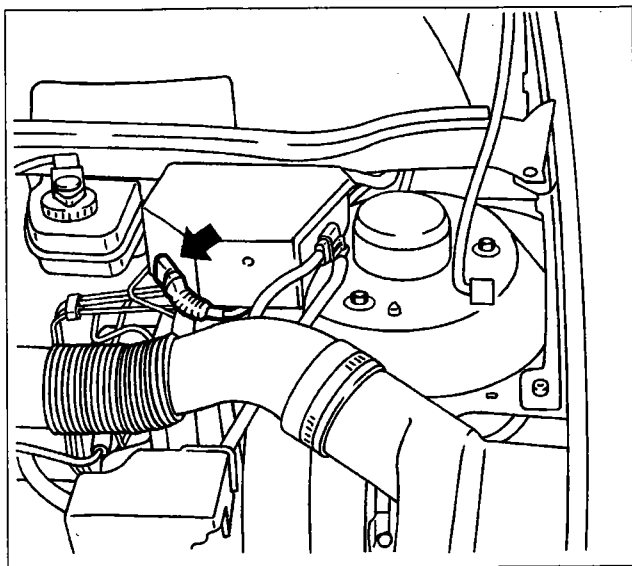
### Actuators

injectors  
coils  
charcoal filter solenoid valve  
engine idle adjustment actuator  
electric fuel pump relay  
climate control relays (if fitted)

### Sensors

engine speed sensor  
vehicle speed sensor  
Lambda sensor  
butterfly position sensor  
coolant temperature sensor  
detonation sensor

### Location of diagnostic connector



P4A15JJ01

If a fault is detected and confirmed, it is permanently stored in the memory and the relevant sensor is excluded from the system until normal operation has been restored.

The detection of a confirmed fault usually involves the warning light in the dashboard coming on: it goes out when the fault conditions no longer exist.

**NOTE** During starting, the warning light is:

- on for about 4 seconds,
- off for 0.1 seconds;
- kept on/off permanently according to whether or not "permanent" errors are present.

Working with the diagnostic equipment, it is possible to carry out a complete fault diagnosis of the system, which consists of three stages:

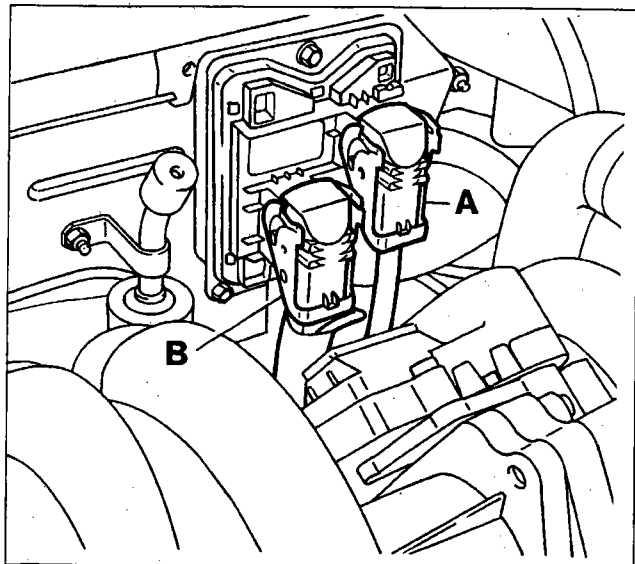
- display of a series of functional parameters (with the engine switched off or running);
- display of the errors and their cancelling;
- activation of certain actuators (active diagnosis).

### Recovery strategy

If a fault is detected with the sensors/actuators, the control unit, where possible, replaces the missing information, reconstructing it using software (recovery) to allow the operation of the engine.

# 10.

## ELECTRICAL/ELECTRONIC CIRCUIT



P4A16JJ01

### Wiring

The system has two distinct sets of wiring for the control unit connectors: the engine side wiring (B) which connects the components fitted on the engine to the engine control unit and the vehicle side wiring (A) which connects the other components to the control unit and constitutes the interface with the vehicle wiring.

#### vehicle side wiring (A)

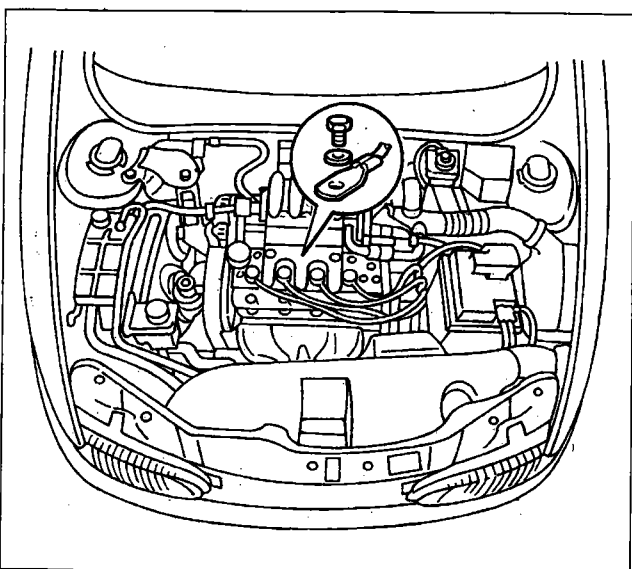
supply from the battery  
supply from the ignition switch  
fuses  
system relay feeds  
radiator fan relay(s)  
climate control compressor relay (if fitted)

CODE control unit connection  
control panel connection  
diagnostic equipment

#### engine side wiring (B)

engine speed sensor  
absolute pressure and air temperature sensor  
coolant temperature sensor  
detonation sensor  
Lambda sensor  
power assisted steering end of travel sensor  
injectors  
idle speed actuator/butterfly position sensor

ignition  
charcoal filter solenoid valve



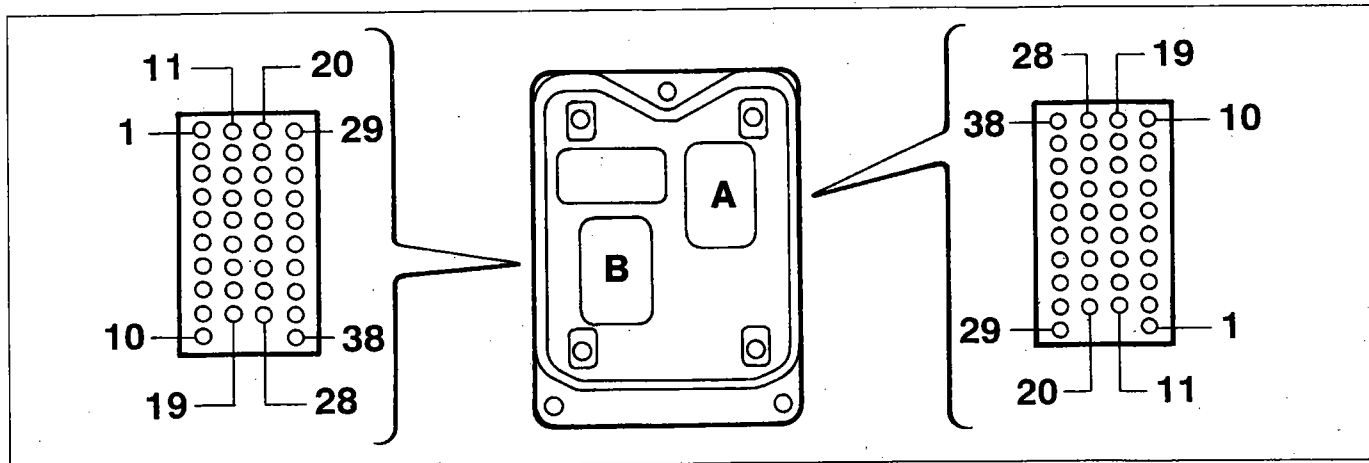
P4A16JJ02

### Layout of system earth points

In order to increase electro-magnetic compatibility and operational reliability, special care has been taken over the number and the location of the earth points, as can be seen the diagram:

- main earth directly on the battery negative;
- engine control system earth on the cylinder block/crankcase near the detonation sensor.

**BOSCH 1.5.5 SYSTEM CONTROL UNIT PIN-OUT**



P4A17JJ01

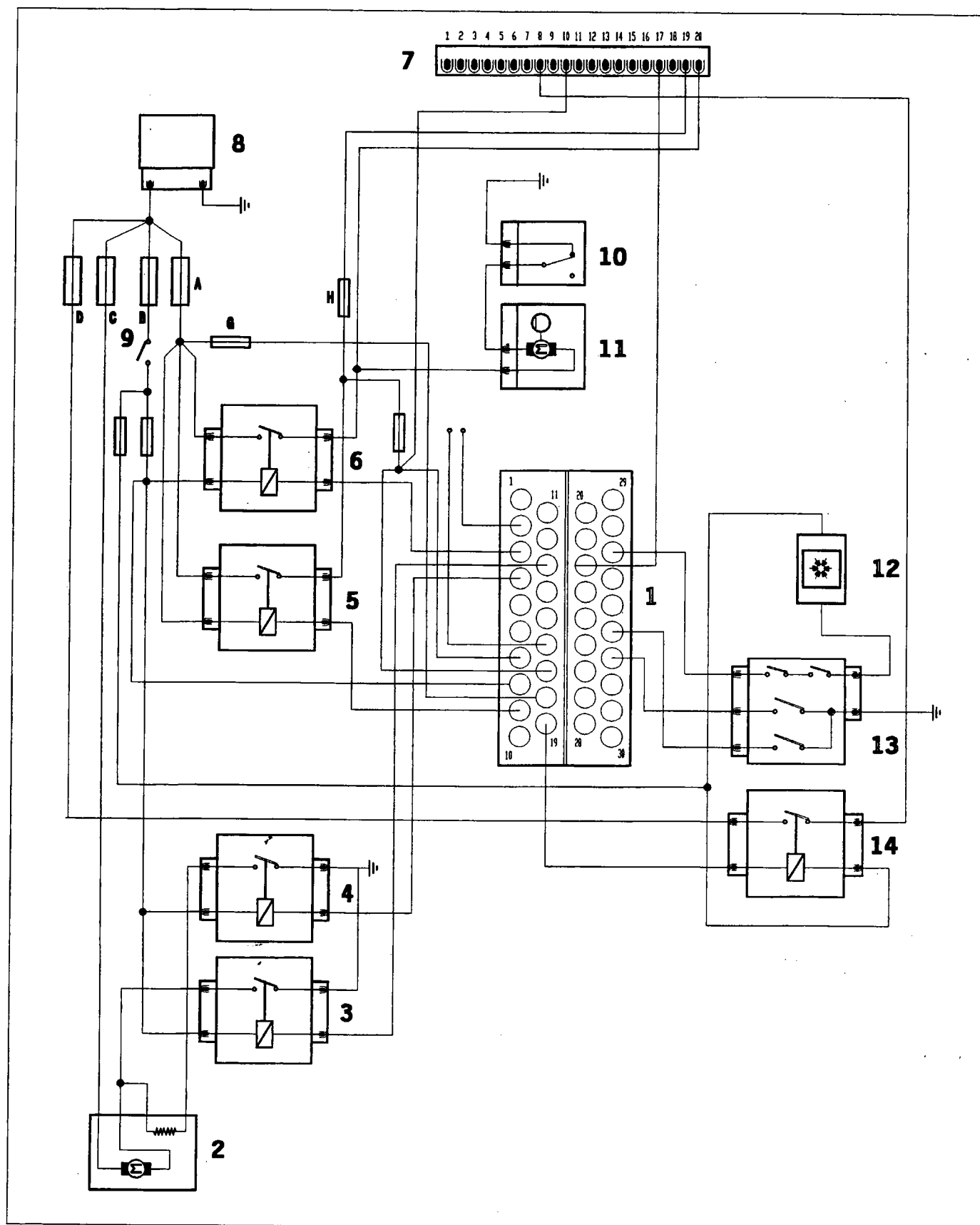
**Connector B (engine side)**

- 1 Sensors earth
- 2 Detonation sensor signal
- 3 Intake air temperature sensor signal
- 4 Butterfly position sensor signal
- 5 Coolant temperature sensor signal
- 6 Operation of injector for cylinder 1
- 7 Operation of injector for cylinder 4
- 8 Operation of Lambda sensor heater
- 9 N.c.
- 10 Operation of coil for cylinders 2/3
- 11 Detonation sensor earth
- 12 Absolute pressure sensor signal
- 13 Butterfly position sensor signal
- 14 N.c.
- 15 N.c.
- 16 Operation of injector for cylinder 3
- 17 Operation of injector for cylinder 2
- 18 N.c.
- 19 Operation of coil for cylinders 2/3
- 20 N.c.
- 21 Lambda sensor earth
- 22 Engine speed sensor positive
- 23 N.c.
- 24 N.c.
- 25 N.c.
- 26 Operation of idle speed actuator
- 27 N.c.
- 28 Operation of coil for cylinders 1/4
- 29 Sensor supply
- 30 Lambda sensor signal
- 31 N.c.
- 32 Engine speed sensor negative
- 33 N.c.
- 34 Operation of charcoal filter solenoid valve
- 35 Operation of idle speed actuator
- 36 N.c.
- 37 N.c.
- 38 Operation of coil for cylinders 1/4

**Connector A (vehicle side)**

- 1 N.c.
- 2 Operation of rev counter
- 3 Operation of fuel pump relay
- 4 Operation of high speed fan relay
- 5 N.c.
- 6 N.c.
- 7 Control unit supply from relay (+30)
- 8 Engine started signal (from ignition switch)
- 9 Operation of engine control system relay
- 10 N.c.
- 11 Line K
- 12 Operation of system failure light
- 13 Operation of low speed fan relay
- 14 N.c.
- 15 N.c.
- 16 CODE connection
- 17 Control unit supply from relay (+30)
- 18 Control unit supply (+30)
- 19 Operation of compressor relay (if fitted)
- 20 N.c.
- 21 N.c.
- 22 Power assisted steering sensor signal
- 23 N.c.
- 24 N.c.
- 25 N.c.
- 26 N.c.
- 27 Vehicle speed sensor signal
- 28 N.c.
- 29 N.c.
- 30 N.c.
- 31 Operation of compressor engagement
- 32 N.c.
- 33 N.c.
- 34 Four stage thermostat signal (if fitted)
- 35 Four stage thermostat signal (if fitted)
- 36 N.c.
- 37 N.c.
- 38 N.c.

**BOSCH 1.5.5 SYSTEM WIRING DIAGRAM**  
**Connector A (vehicle side)**



P4A18JJ01

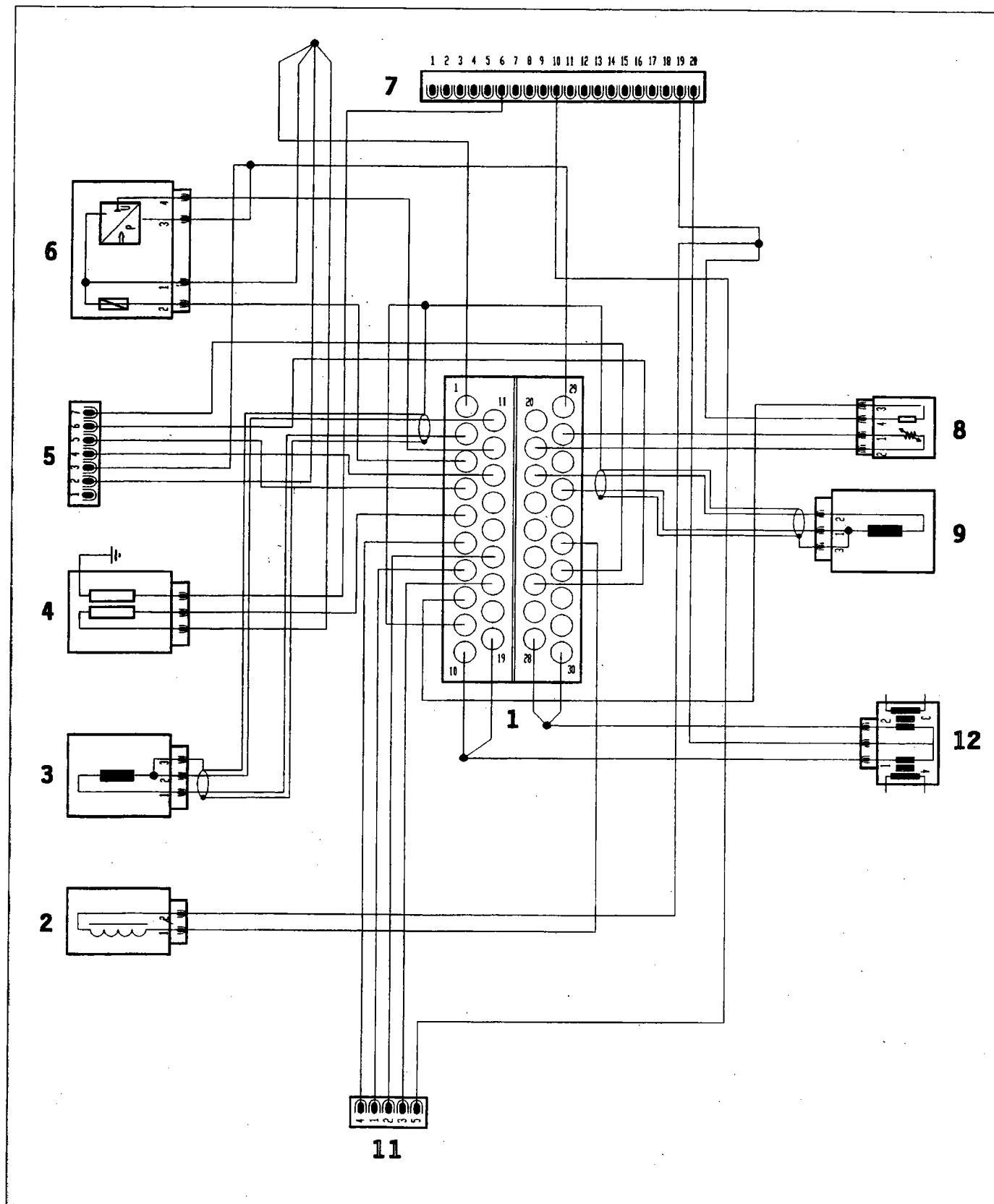


**Bosch 1.5.5 system wiring diagram key**  
**Connector A (vehicle side)**

1. Control unit
  2. Radiator fan
  3. Electric fan high speed relay
  4. Electric fan low speed relay
  5. Engine control system relay
  6. Fuel pump relay
  7. Front cable connection
  8. Battery
  9. Ignition switch
  10. Inertia switch
  11. Electric fuel pump
  12. Air conditioning control unit (on button)
  13. Four stage pressure switch
  14. Compressor relay
- 
- A. 30A fuse
  - B. 40A fuse
  - C. 40A fuse
  - D. 7.5A fuse
  - E. 7.5A fuse
  - F. 7.5A fuse
  - G. 7.5A fuse
  - H. 15A fuse
  - L. 15A fuse

**10.**

**BOSCH 1.5.5 SYSTEM WIRING DIAGRAM**  
**Connector B (engine side)**

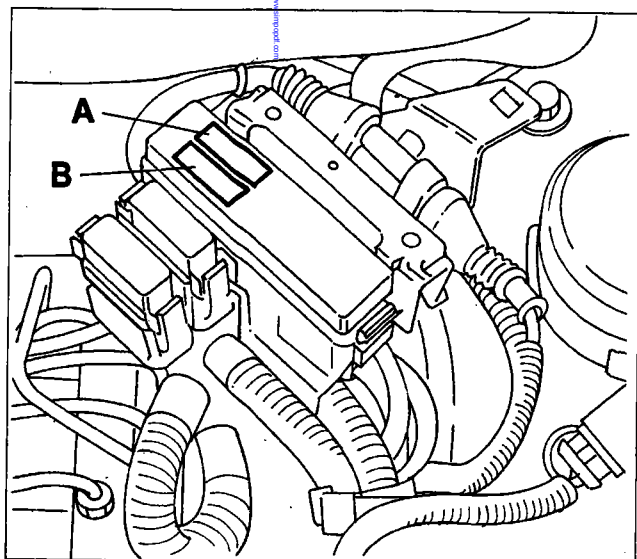


P4A20JJ01

**Bosch 1.5.5 system wiring diagram key**  
**Connector B (engine side)**

1. Control unit
2. Active charcoal filter solenoid valve
3. Detonation sensor
4. Coolant temperature sensor
5. Engine idle adjustment actuator/butterfly position sensor
6. Absolute pressure and air temperature sensor
7. Front cable connection
8. Lambda sensor
9. Engine speed sensor
10. Coil
11. Injector section

**10.**



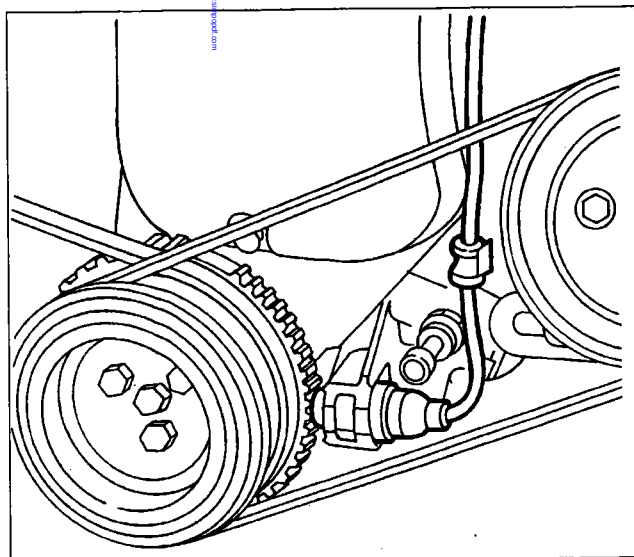
P4A22JJ01

**LOCATION OF FUSES AND RELAYS**

**NOTE** *For more information, see Group 55-Electrical equipment*

**Main fuses (maxi-fuse)**

- A. System fuse
- B. Fuse controlled by the ignition



P4A54JJ01

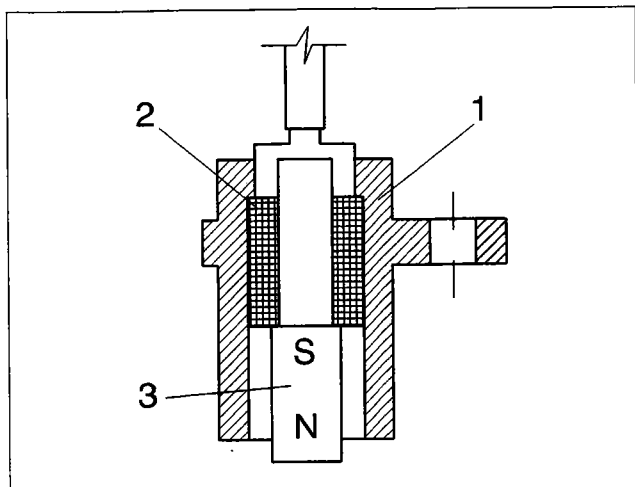
## ENGINE RPM AND TDC SENSOR

The engine rpm and TDC sensor (1) is fixed to the cylinder block/crankcase and is facing the flywheel on the crankshaft pulley.

### Operating principle

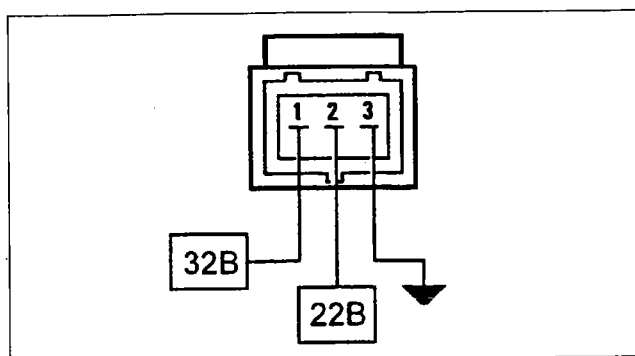
The sensor consists of a tubular casing (1) containing a permanent magnet (3) and an electrical winding (2). As a result of passing the flywheel teeth, the magnetic flow produced by the magnet (3) oscillations according to the variation in the gap.

These oscillations create an electro-motive force in the winding (2) producing an alternately positive voltage (tooth facing the sensor) and negative voltage (gap facing the sensor). The peak sensor output voltage depends, all other factors being equal, on the distance between the sensor and the tooth (gap).

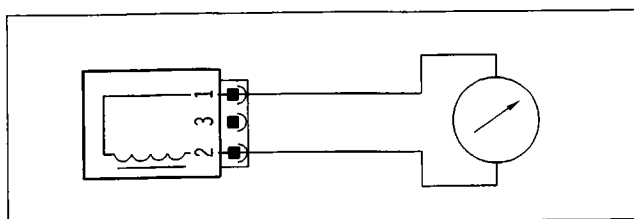


P4A29IJ02

### Wiring connector



P4A23JJ01

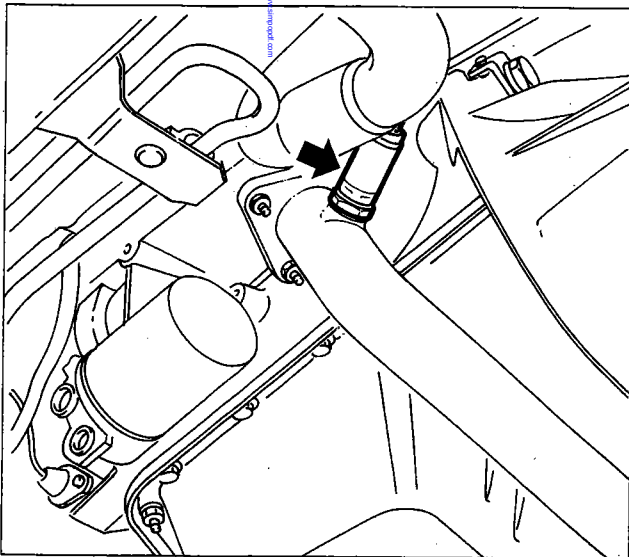


P4A30IJ03

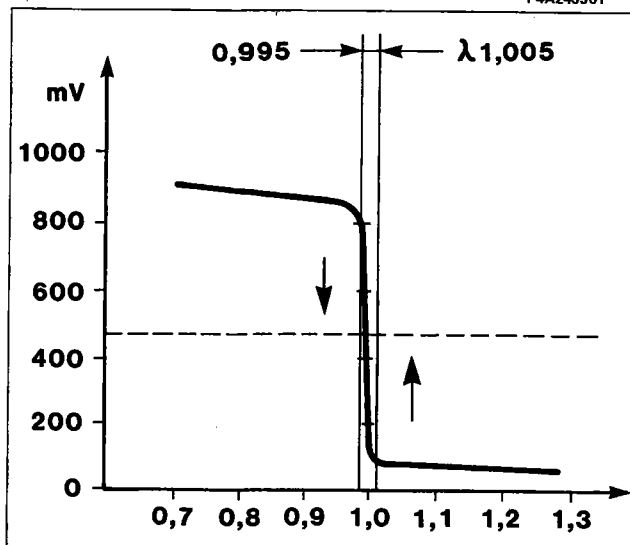
The sensor resistance can be measured by disconnecting the connector and connecting and ohmmeter to the sensor.

**Resistance: 9600+10% ohm at 20 °C**

# 10.



P4A24JJ01



P4A24JJ02

$\lambda=1$  Ideal mixture (stoichiometric)

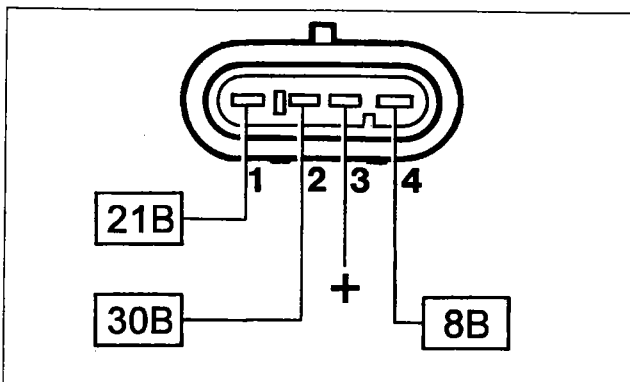
$\lambda < 1$  Lean mixture

Excess air; the CO values tend to be low

$\lambda > 1$  Rich mixture

Lack of air; the CO values tend to be high

## Wiring connector



P4A24JJ03

## LAMBDA SENSOR

The Lambda sensor measures the oxygen content in the exhaust gases: it is fitted on the exhaust pipe upstream of the catalytic silencer.

The sensor output signal is sent to the control unit for feedback correction of the mixture strength.

When the sensor provides a low signal (voltage below 200 mV), the control unit recognizes a lean mixture and increases the injection time; later, when the sensor signal is high (voltage above 800 mV), the control unit recognizes a rich mixture and decreases the injection time.

This sequence is repeated at a frequency in order of tens of Hertz so that the engine constantly operates with a mixture strength close to the stoichiometric ratio.

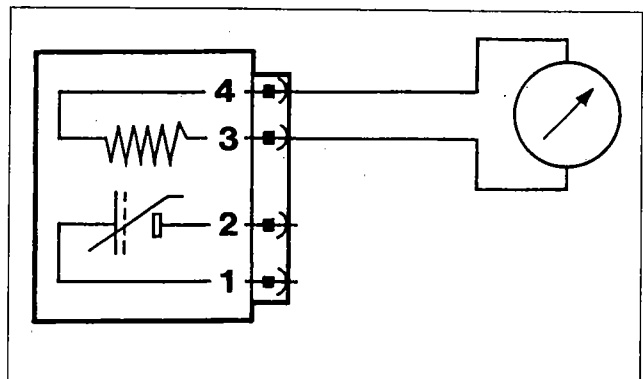
For temperatures below 300 °C, the ceramic material is not activated, therefore the sensor does not send plausible signals: to ensure rapid heating during starting and maintain the temperature during idling, the sensor is fitted with a heater with the electrical resistance always switched on.



*The sensor can rapidly be put out of action by the presence of even slight amounts of lead in the fuel.*

The sensor heater resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

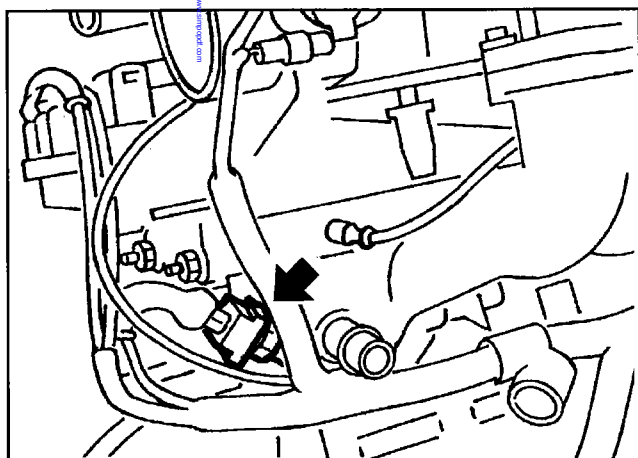
**Resistance: 4.5±0.5 ohm at 20 °C**



P4A24JJ04

# 10.

## ENGINE COOLANT TEMPERATURE SENSOR



4A26JJ01

### INJECTION NTC

| °C  | Ω     |
|-----|-------|
| -20 | 15970 |
| -10 | 9620  |
| 0   | 5975  |
| 10  | 3816  |
| 20  | 2500  |
| 25  | 2044  |
| 30  | 1679  |

### NTC INSTRUMENT

| °C  | Ω    |
|-----|------|
| 40  | 1150 |
| 50  | 807  |
| 60  | 576  |
| 70  | 418  |
| 80  | 309  |
| 90  | 231  |
| 100 | 176  |

| °C  | Ω           |
|-----|-------------|
| 80  | 300.8-313.2 |
| 90  | 226.3-234.1 |
| 100 | 172-177     |
| 110 | 132.9-136.1 |
| 120 | 103.6-106.6 |

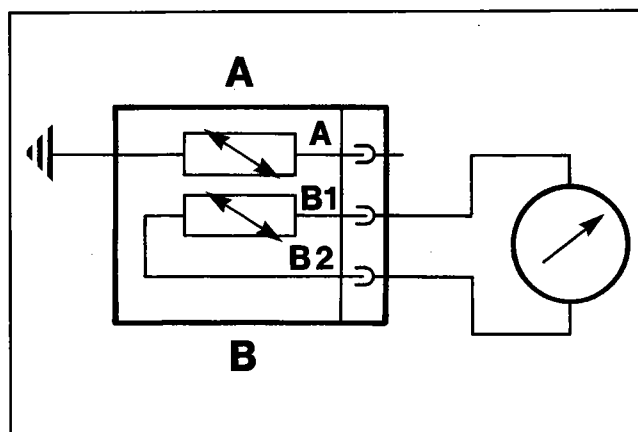
This sensor is fitted on the thermostat. It is made up of brass casing which affords protection for the actual resistive elements consisting of two NTC (Negative Temperature Coefficient) type thermistors whose electrical resistance decreases as the temperature increases).

The two thermistors are separate and provide information concerning the temperature to the instrument panel (A) and the engine management control unit (B), respectively.

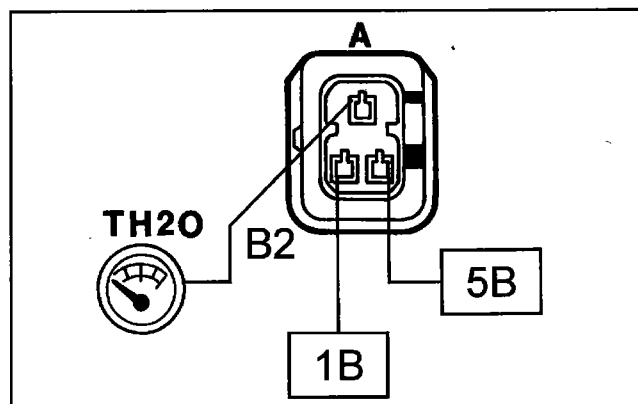
The reference voltage for the latter is 5 Volt: since the control unit intake circuit is designed as a voltage divider, the reference voltage is shared between a resistance in the control unit and the actual sensor.

As a result, the control unit is capable of evaluating the variations in the sensor resistance through the changes in voltage, thereby obtaining information concerning the temperature.

The table shows the progress of the sensor, which can be measured by disconnecting the connector and connecting an ohmmeter as illustrated in the diagram.



4A26JJ02

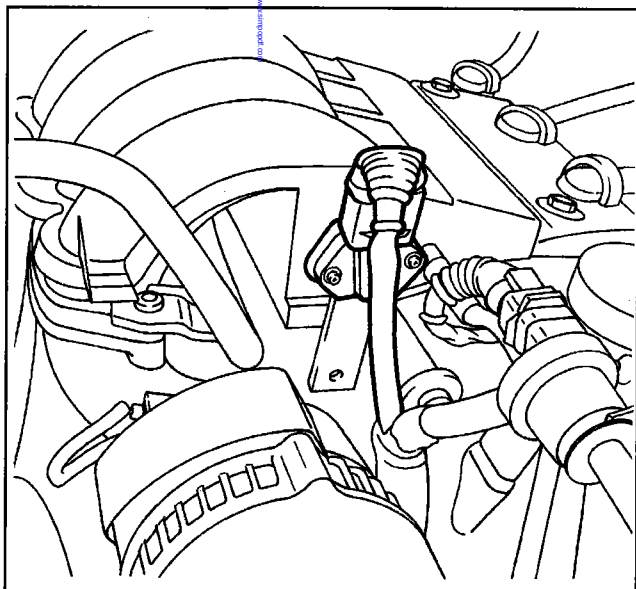


4A26JJ03

### Connector wiring



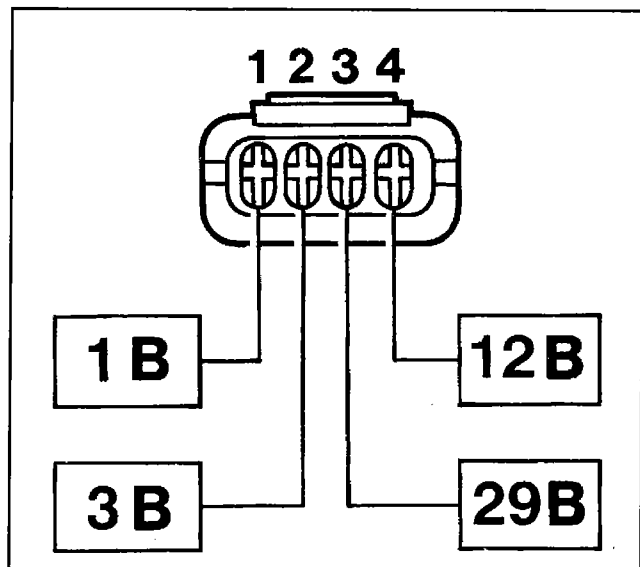
# 10.



4A27JJ01

## INTAKE AIR PRESSURE AND TEMPERATURE SENSOR

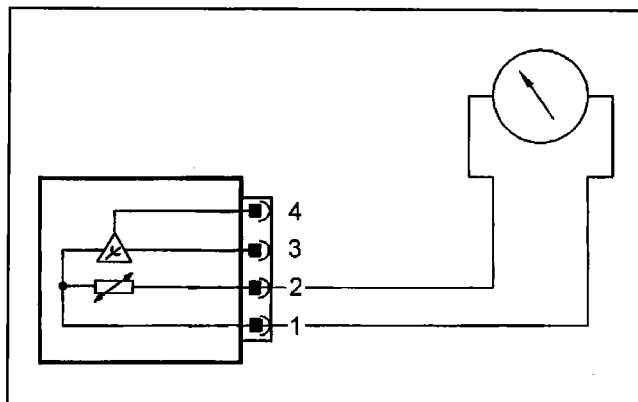
The intake air pressure and temperature sensor is an integrated component that measures pressure and temperature inside the inlet manifold. The injection control unit uses both items of information to define the amount of air taken in by the engine. This information is then used to compute injection time and ignition point. The sensor is fitted on the intake manifold.



4A26JJ01

| Temperature (°C) | Resistance (M) |
|------------------|----------------|
| -40              | 52600-38700    |
| -20              | 17500-13500    |
| 0                | 6500-5300      |
| 10               | 4200-3400      |
| 20               | 2700-2300      |
| 30               | 1850-1550      |
| 40               | 1300-1050      |
| 50               | 920-750        |
| 60               | 650-530        |
| 80               | 360-290        |
| 100              | 210-160        |

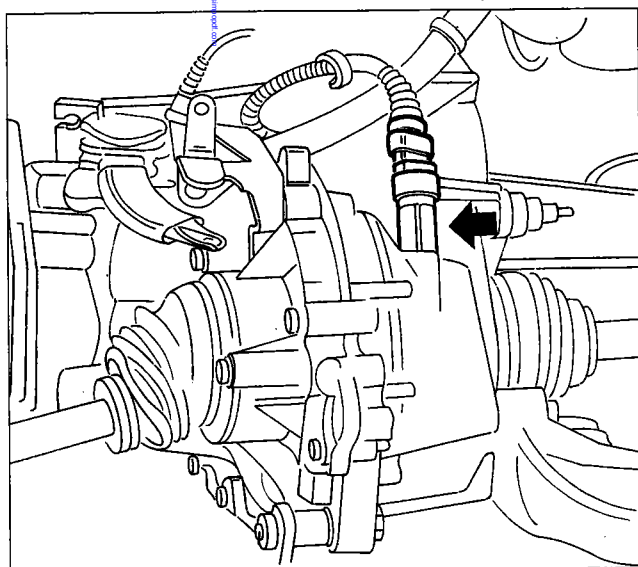
## Connector wiring



4A26JJ02

## Checking the resistance

The table shows resistance values that the temperature sensor (NTC thermistor) may assume as temperature changes. These values may be measured by connecting an ohmmeter as shown in the diagram.

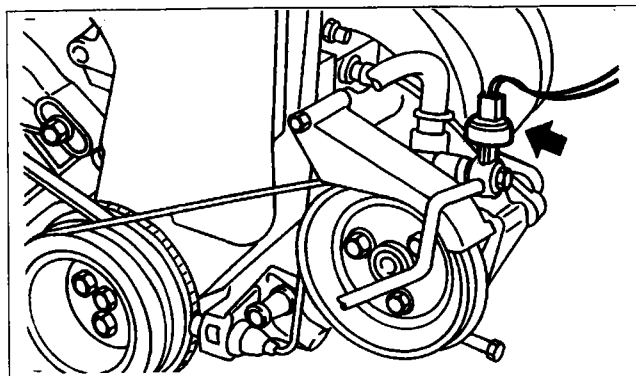


P4A43IJ01

### VEHICLE SPEED SENSOR

This sensor is positioned at the differential output, by the left driveshaft coupling and transmits information concerning the vehicle speed to the speedometer: the signal is then sent to the engine control unit.

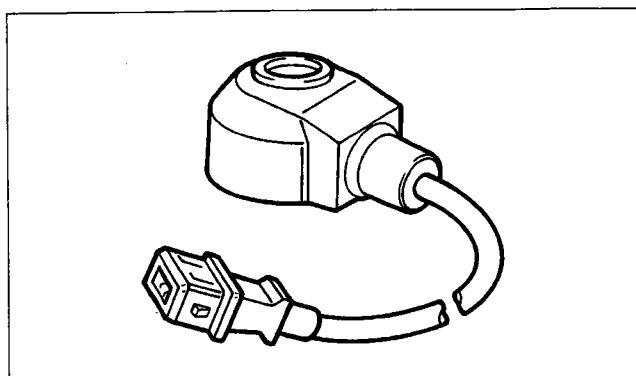
The sensor is the Hall effect type and is calibrated so that a given distance corresponds to each impulse: it is therefore possible to determine the speed of the vehicle on the basis of the frequency of the impulses.



P4A27JJ02

### POWER ASSISTED STEERING SENSOR

This sensor, fitted on the pump outlet high pressure pipe, consists of a pressure switch which closes when the hydraulic pressure exceeds a set value corresponding to the steering in the end of travel position: the information is used to managing the idle speed control actuator in advance of the absorption of power due to the steering.

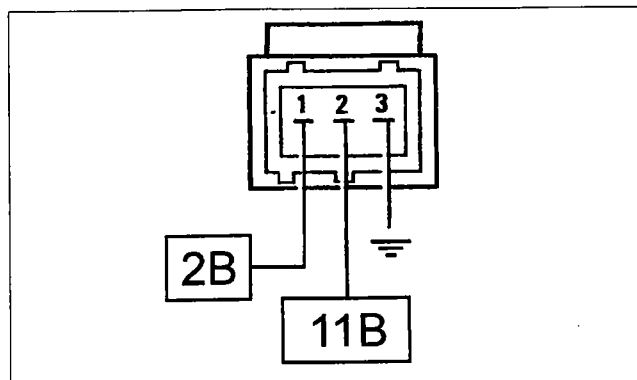


P4A27JJ03

### DETONATION SENSOR

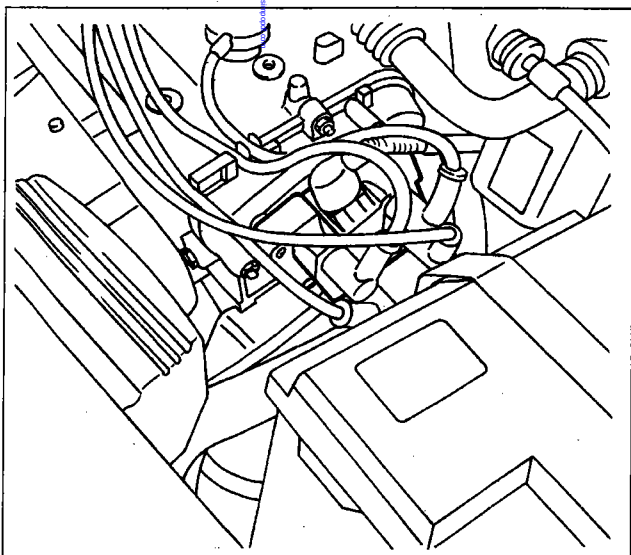
This is a piezoelectric type sensor fitted on the cylinder block/crankcase, symmetrical in relation to the pairs of cylinders 1-2 and 3-4. This position is determined by the need to detect the onset of detonation in the same way in all cylinders.

When the engine is knocking, vibrations of a particular frequency are produced in the cylinder block/crankcase which are transformed, by the sensor, into a voltage signal which is proportional to their intensity.

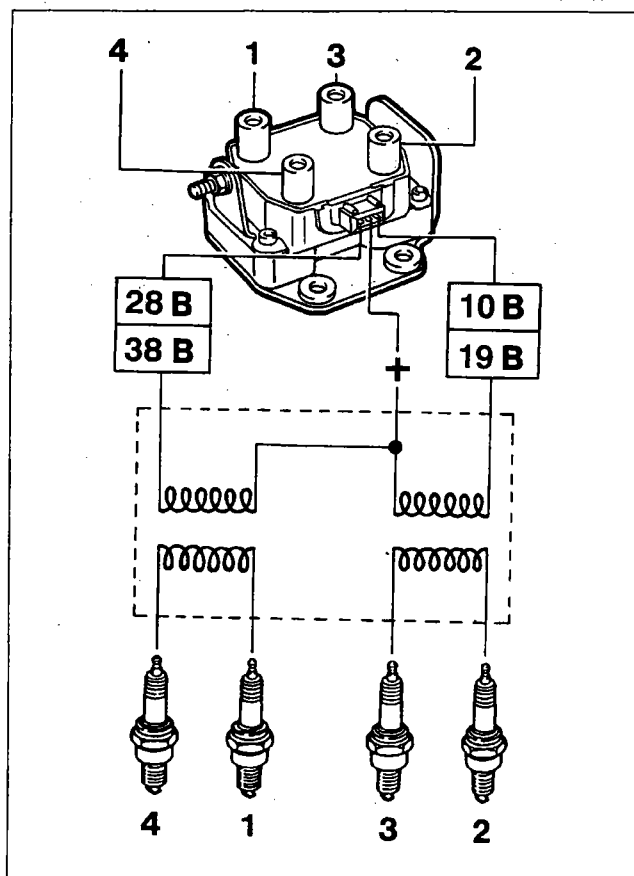


P4A27JJ04

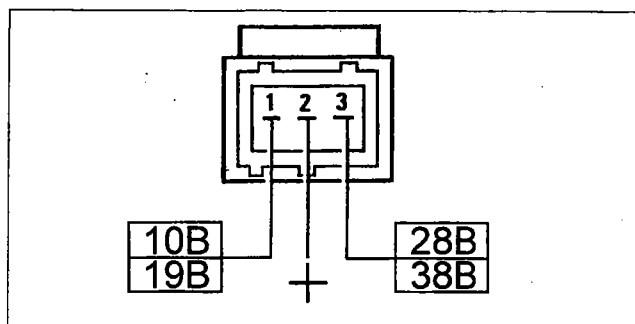
### Wiring connector



P4A28.IJ01



P4A28JJ02



**P4A28JJ03**

The ignition circuit is the inductive discharge, static advance type where the high tension is provided from two twin outlet coils fitted at the side of the cylinder head.

The coils used are the closed magnetic circuit type with the windings in a plastic container immersed in epoxide resin. Each coil is connected to the two spark plugs by means of high tension leads with dielectric properties.

In this type of coil the current in the secondary winding (discharge current) always has the same polarity; therefore one end of the circuit has a positive potential and the other a negative potential.

This implies that the discharge current in the secondary winding always flows in the same direction and therefore the sparks for the two cylinders connected to the coil strike in the opposite way:

- in the spark plug with the positive centre electrode the spark strikes from the earth electrode towards the centre one;
- in the spark plug with the negative centre electrode the spark strikes from the centre electrode towards the earth one.

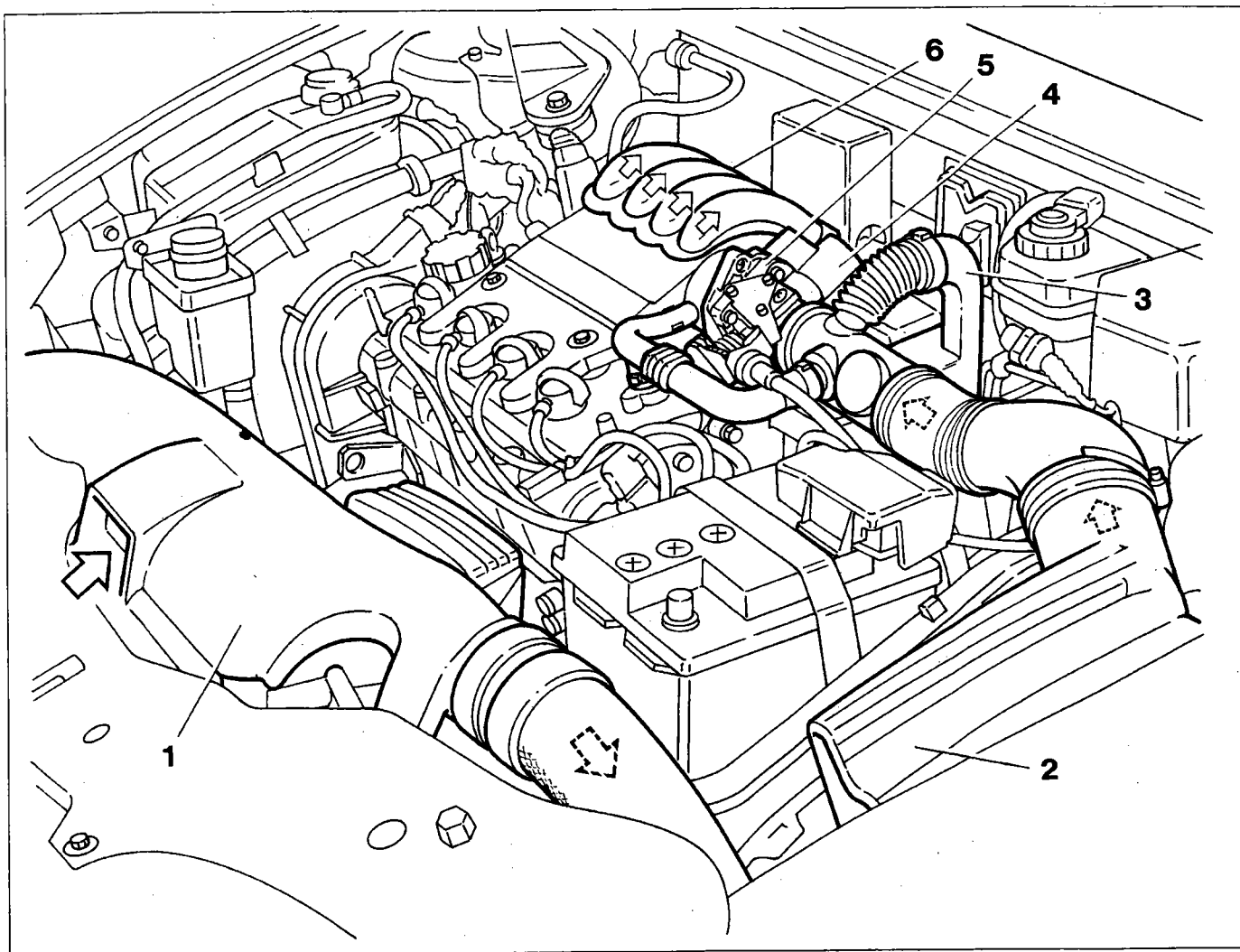
As a result the wear of the electrodes between the two spark plugs in question is different.

Since the intensity of the spark depends on the resistance between the electrodes (dielectric), whilst the spark in the cylinder in the cross-over stage is weak (lost spark), at almost atmospheric pressure in the cylinder at the end of the compression stroke, the spark is intense (working spark) by virtue of the high pressure in the chamber.

## Wiring connector

## INTAKE CIRCUIT

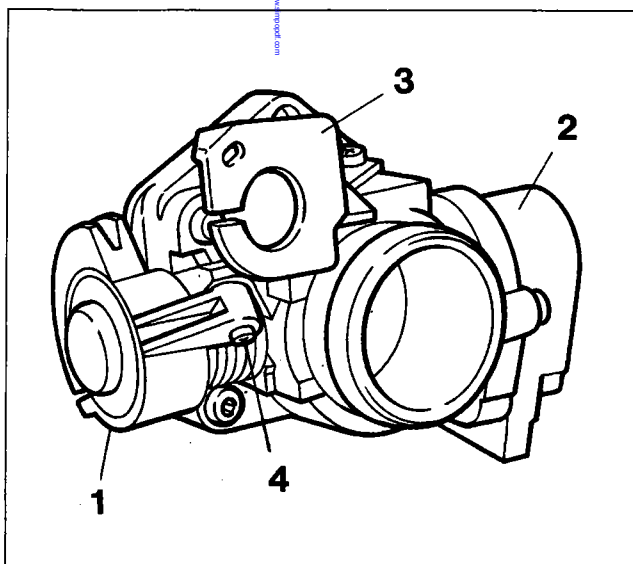
This consists of the various components which ensure that the air flow rate required by the engine is correctly directed in different operating conditions.



P4A29JJ01

1. Inlet vent
2. Air filter
3. Resonator
4. Engine idle speed adjustment actuator and butterfly position sensor
5. Butterfly casing
6. Inlet manifold

## 10.



P4A30JJ01

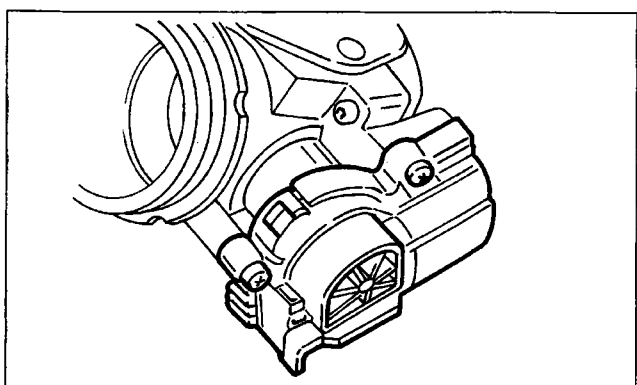
1. accelerator control lever
2. idle speed adjustment actuator and butterfly position sensor
3. accelerator cable adjustment bracket
4. anti-tamper screw

### BUTTERFLY CASING

The butterfly casing has the task of metering the quantity of air drawn in by the engine (and consequently the power developed) according to the driver's request via the accelerator.

The butterfly casing is fixed to the inlet manifold: the butterfly is opened by means of a lever which has a gradual opening law (small butterfly opening angles for a good part of the accelerator pedal travel and greater angles in the last part of the travel).

With the pedal completely released (engine decelerating or idling) the position of the butterfly is regulated by the engine idle adjustment actuator in order to be able to supply the additional air required according to the engine conditions. The actuator also includes the butterfly position sensor.



P4A30JJ02

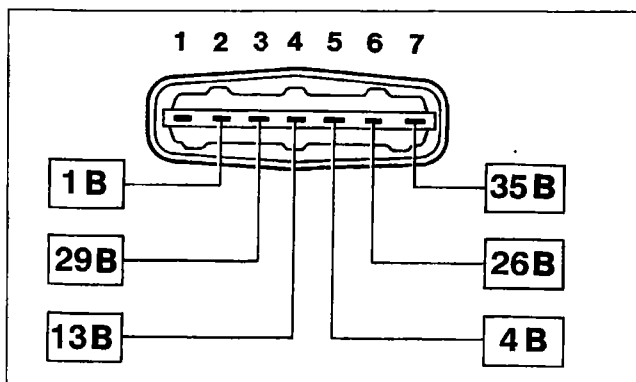
### ENGINE IDLE SPEED ACTUATOR AND BUTTERFLY POSITION SENSOR

The actuator, fitted on the butterfly casing, consists of a direct current motor operated by a circuit inside the engine control unit which regulates the position of the butterfly: it has the task of ensuring the additional air for the engine with the accelerator pedal released, under all circumstances when necessary (idling, deceleration, external loads applied).

The maximum actuator opening angle is around 30°.

The actuator contains a twin track potentiometer:

- the first track goes from the closed position to 30° and is used to control the butterfly with the accelerator pedal released;
- the second track goes from the closed position to the maximum butterfly opening position and is used for the normal engine management.



P4A30JJ03

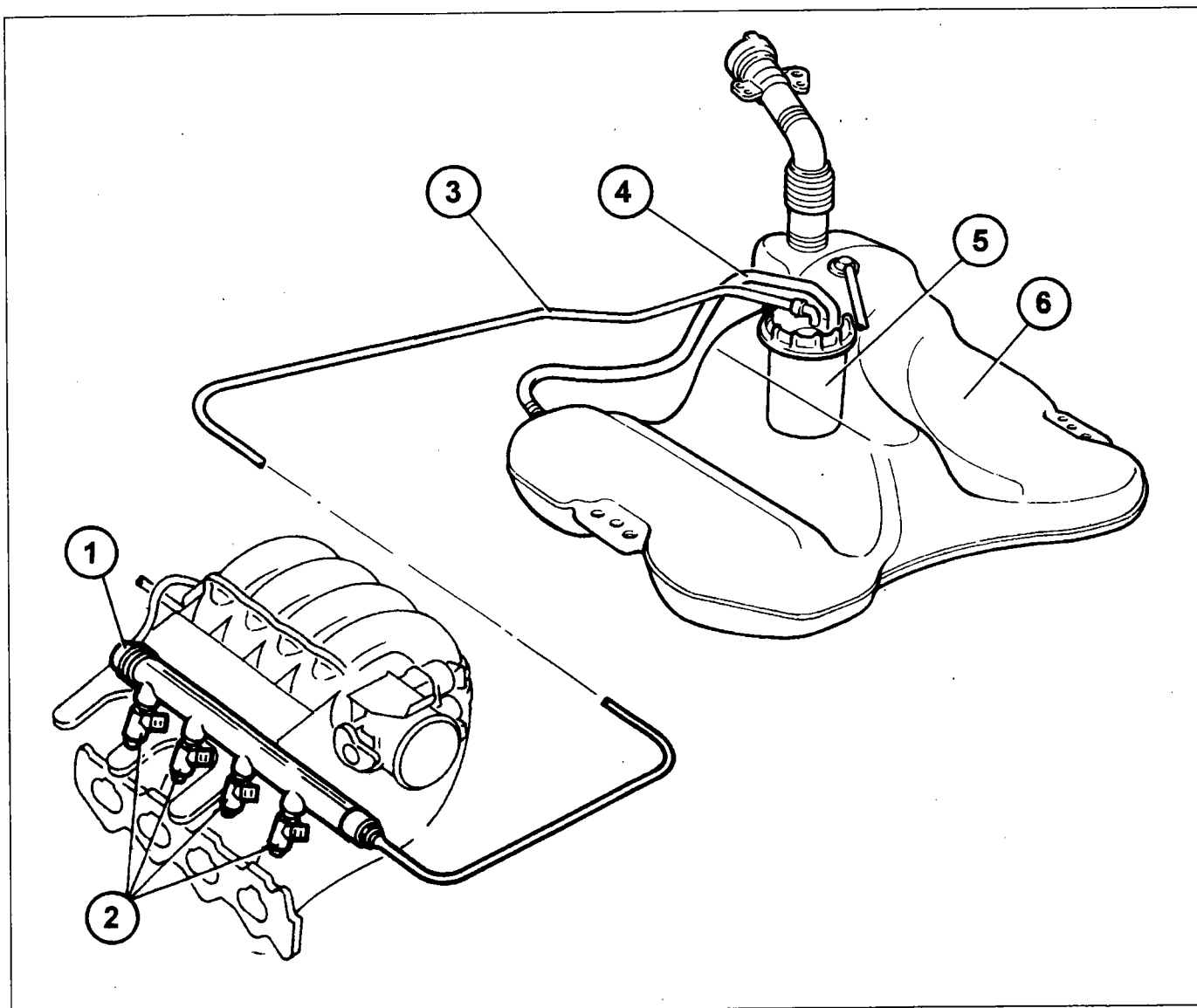
### Wiring connector

### FUEL SUPPLY CIRCUIT

This circuit consists of the following components:

- Fuel tank
- Drip tray complete with pump, filter, pressure regulator and gauge
- Supply pipe
- Returnless type fuel manifold complete with injectors

### FUEL CIRCUIT DIAGRAM

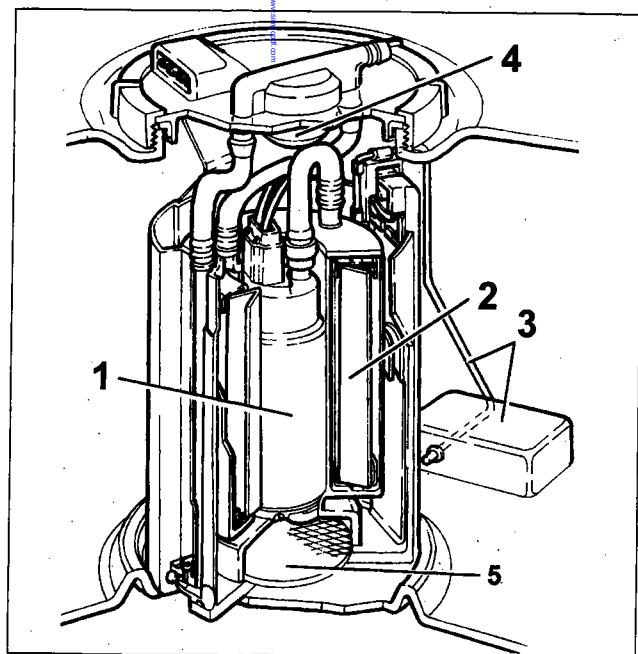


P4A31JJ01

1. Air bleed connector
2. Injectors connector
3. Supply pipe
4. Tank filler pipe
5. Drip tray complete with pump, filter, pressure regulator and gauge
6. Fuel tank



**10.**



1. Electric fuel pump
2. Fuel filter
3. Fuel gauge with float
4. Pressure regulator
5. Gauze pre-filter

**FUEL DRIP TRAY ASSEMBLY**

**Electric fuel pump**

The pump is housed inside the fuel tank on a special drip tray which also supports the fuel gauge and it has a filter on the pump inlet.

The pressure regulator is fitted on the pump supply.

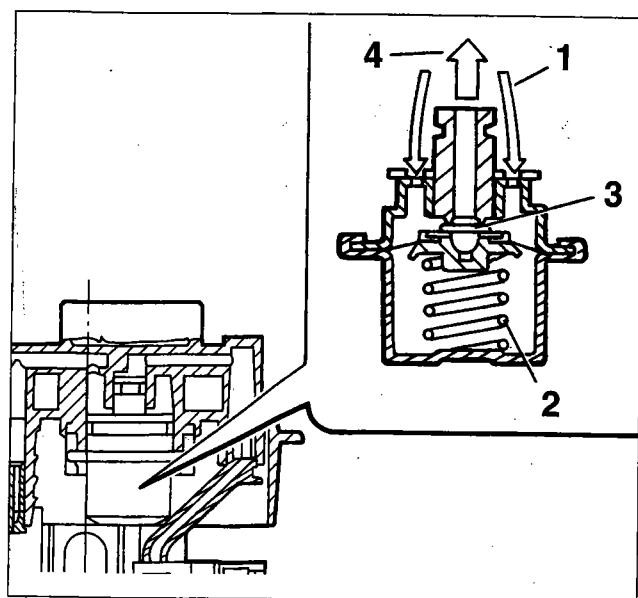
The pump is the single stage peripheral flow type and is designed to run on unleaded fuel.

The rotor is moved by a d.c. electric motor supplied by a relay and controlled by the control unit to ensure:

- that the pump cuts out if the engine speed goes below a minimum level;
- timed operation (about 5 seconds) each time the ignition key is turned to the ON position, even if the engine is not started up;
- operation with the engine started up.

The pump is fitted with an excess pressure valve which short circuits the supply with the inlet if the pressure in the supply circuit exceeds around 5 bar to prevent the electric motor from overheating.

In addition, a one-way valve in the supply, prevents the entire fuel circuit from being drained when the pump is not working.



**Fuel filter**

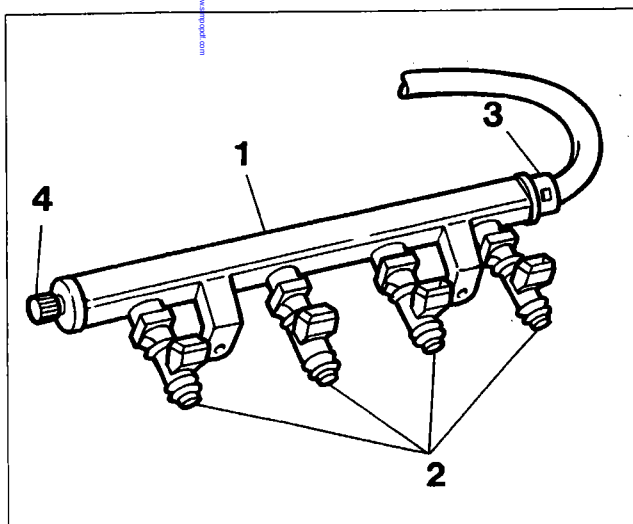
The fuel filter is in the housing surrounding the pump and does not require periodic replacement.

**Fuel pressure regulator**

This is a differential, diaphragm device, adjusted during manufacture to a pressure of  $3.50 \pm 0.05$  bar and located in the top part of the drip tray.

The fuel, under pressure (1), coming from the pump, exerts force on the valve (3), opposed by the calibrated spring (2). When the set pressure is overcome, the valve opens and the excess fuel (4) returns to the tank, thereby stabilizing the pressure in the circuit.





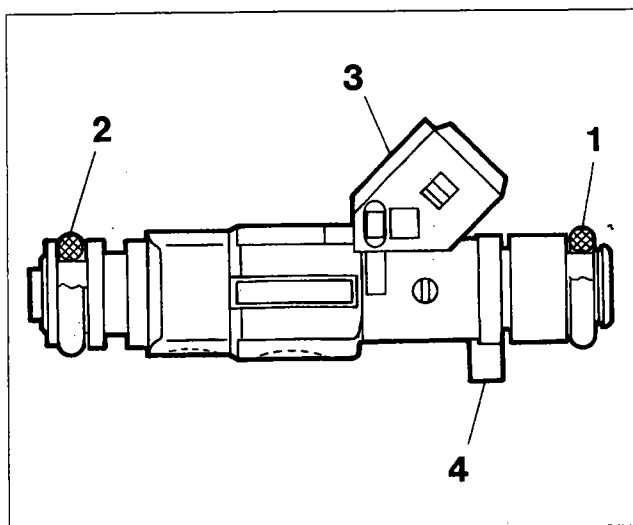
P4A33JJ01

### FUEL MANIFOLD

The fuel manifold, which has the task of distributing the fuel to the injectors, is made from die-cast aluminium and incorporates the housings for the injectors and the air bleed valve.

The fuel inlet has a rapid attachment. Since the system is the returnless type, there is no recirculation pipe.

1. Fuel manifold
2. Injectors
3. Fuel supply connector
4. Bleed valve



P4A33JJ02

### INJECTORS

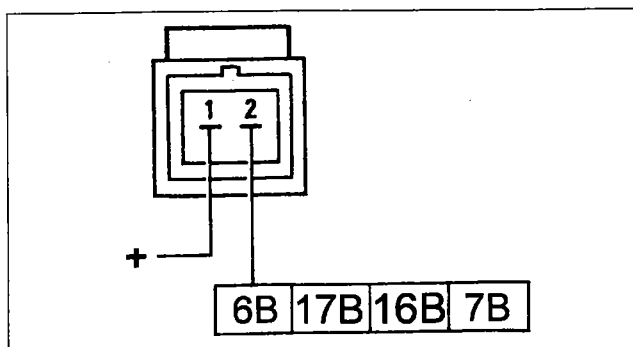
The injectors have the task of supplying the amount of fuel required for the operation of the engine: the fuel is injected into the inlet duct, immediately upstream of the inlet valve.

The injectors are the top-feed type and there is an electrical winding connected to the connector (3) terminals.

When the current passes through the winding, the magnetic field which is created attracts the shutter causing the opening of the injector and the flow of fuel.

There are two seals on the fuel manifold side (1) and the inlet manifold side (2).

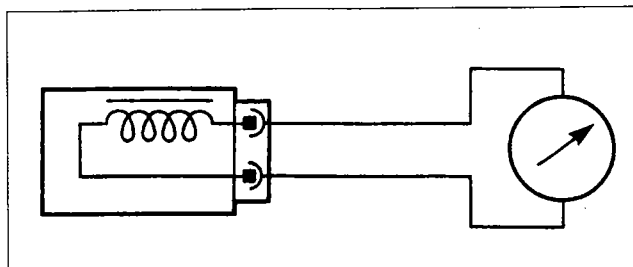
A reference (4) determines the angular position of the jets in relation to the inlet valves.



P4A33JJ03

### Wiring connector

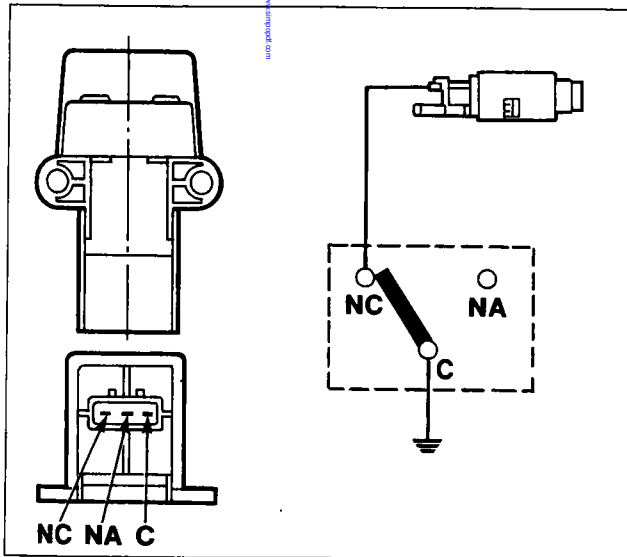
The injector resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.



P4A33JJ04

**Resistance value: 14.5±5% ohm.**

### 10.



#### INERTIA SAFETY SWITCH

The inertia switch has the task of interrupting the electrical supply for the electric fuel pump if the vehicle is subject to violent deceleration (an impact) to prevent the fuel from coming out and causing the vehicle to catch fire in case the fuel manifold or the supply pipe is damaged.

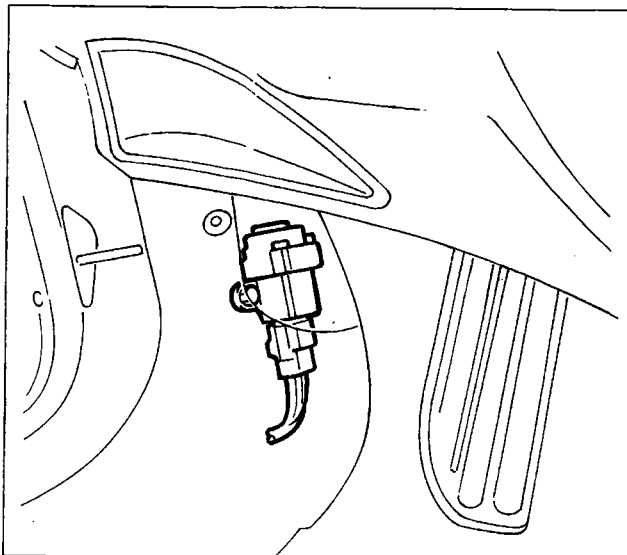
The switch consists of a steel ball in a conical shaped housing which is kept in position by the attraction force of a permanent magnet.

The ball can be released from the magnetic clip, due to the action of the acceleration from the inertia forces, and gradually come out of the conical housing with an upwards movement which depends on the angle of the cone.

There is a rapid release mechanism which forms a normally closed (NC) circuit. When it is struck by the ball, the mechanism changes position into a normally open (NA) circuit, thereby interrupting the electrical supply to the electric pump and causing it to cut out.

The calibration of the switch causes it to intervene at acceleration above 1.2 g (approx 11.7 m/s<sup>2</sup>, corresponding to an impact at a speed of around 25 kph).

To restore the connection to earth for the auxiliary electric pump, move the seat backwards and press the switch until the click is heard.



*After even an apparently slight impact, if there is a smell of fuel or there are noticeable leaks from the fuel system, do not turn the switch back on, but search for the cause of the problem and eliminate it to avoid fire hazards.*

*If this is not the case and there are no leaks and the vehicle is ready to be driven again, press the button to reactivate the electric pump.*

## EMISSION CONTROL DEVICES

The devices used for this purpose have two aims:

- to keep down the levels of pollutant substances in the exhaust, through the catalytic silencer;
- to eliminate the dispersion towards the outside of unburnt hydrocarbons, through the (fuel) anti-evaporation system and the (lubricant) oil vapour recirculation system.

## CATALYTIC SILENCER

The catalytic silencer is a device which makes it possible to simultaneously keep down the levels of the three main pollutants in the exhaust: unburnt hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx).

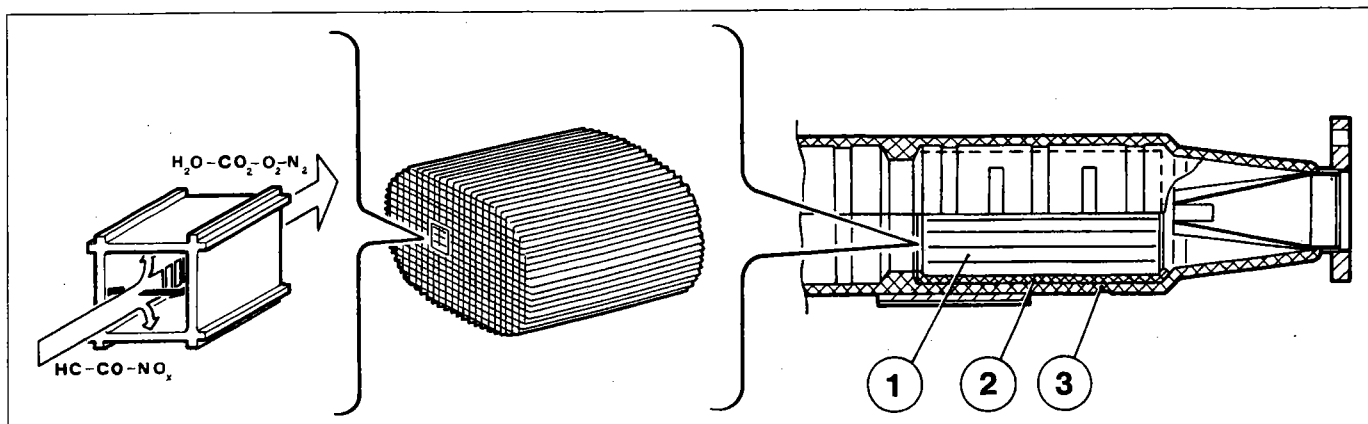
Two types of chemical reaction take place inside the catalyzer:

- oxidation of the CO and the HC, converted into carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O);
- reduction of the NOx, converted into Nitrogen (N<sub>2</sub>).

These reactions can take place extremely quickly thanks to the presence, inside the catalyzer structure (ceramic support), of a layer of active substances (platinum and rhodium) which greatly accelerate the conversion speed of the harmful substances.

The effectiveness of this conversion process is, however, affected by the fact that the mixture strength with which the engine is operating is constantly oscillating around the stoichiometric value, which is achieved thanks to the feed-back control carried out by the control unit on the basis of the Lambda sensor.

Lastly, the conversion processes are activated at temperatures in excess of 300-350 °C: it is therefore vital for the catalyzer to reach this temperature as quickly as possible in order to work properly.



P4A35JJ01

1. Ceramic monolith
2. Metal support
3. Steel outer casing



*When work has to be done near the catalytic silencer, the vehicle should be left to rest for some time because the operating temperature (inside) the catalyzer is between 500 and 850 °C.*

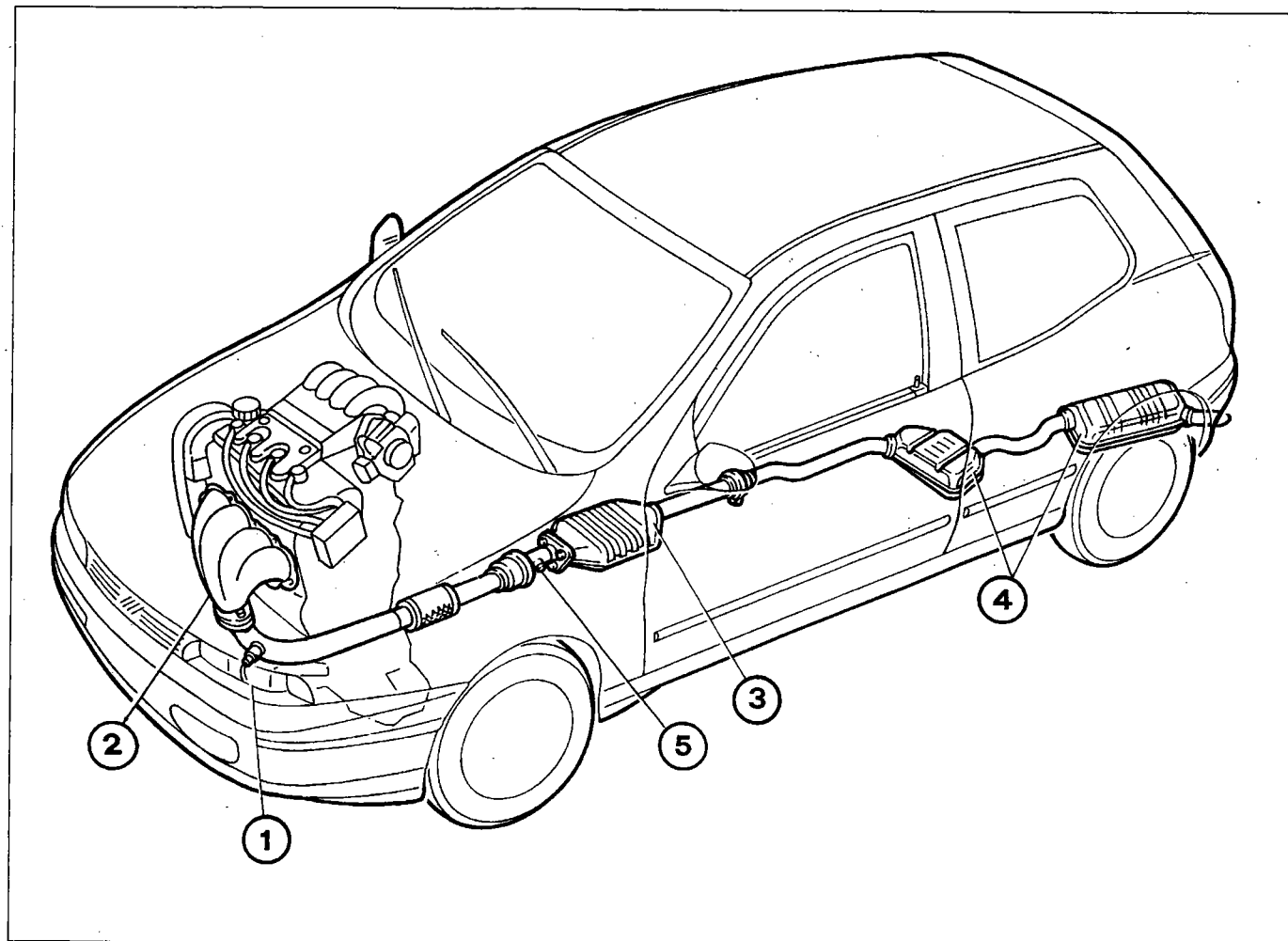


*There are basically two things which destroy the inside of the catalyzer:*

- *the presence of lead in the fuel, which lowers the degree of conversion to practically nil ("lead poisoning") and also irreparably damages the Lambda sensor;*
- *the presence of completely unburnt fuel in the exhaust gases, due to failed ignition, which causes an increase in temperature which melts the ceramic support. Consequently, the high tension leads should not be disconnected with the engine running for any reason: in the case of tests, the silencer should be replaced with an equivalent section of pipe.*

**10.**

**ENGINE EXHAUST ASSEMBLY DIAGRAM**

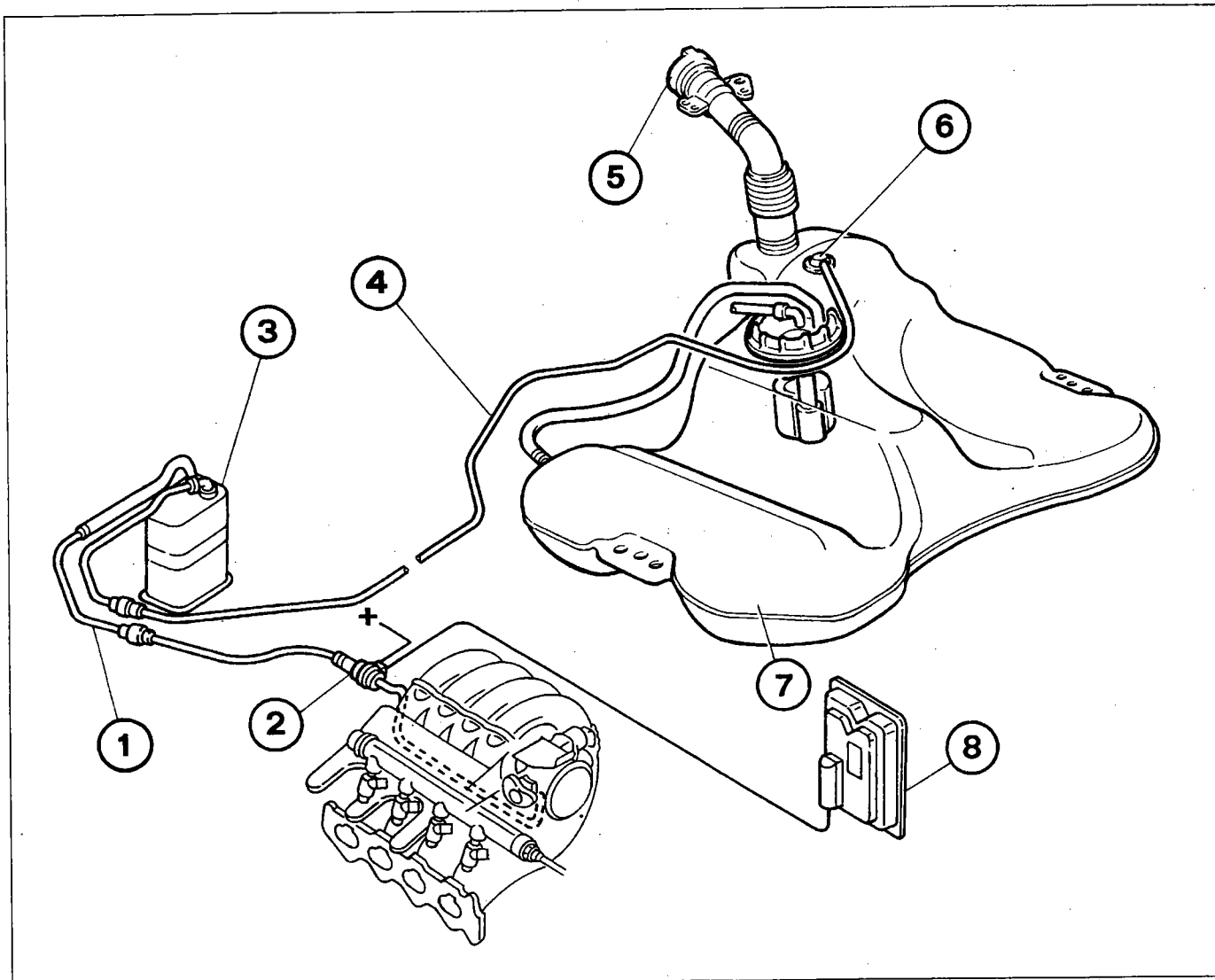


P4A36JJ01

**Key**

- 1. Lambda sensor
- 2. Exhaust manifold
- 3. Catalytic silencer
- 4. Silencer
- 5. CO intake

**DIAGRAM SHOWING ANTI-EVAPORATION CIRCUIT**



P4A37JJ01

The anti-evaporation system is designed to prevent the fuel vapours, consisting of the lightest particles of hydrocarbons which form in the tank from being discharged into the atmosphere.

- |                                                            |                                    |
|------------------------------------------------------------|------------------------------------|
| 1. vapour supply pipe to the butterfly casing              | 5. Safety and ventilation valve    |
| 2. Charcoal filter solenoid valve                          | 6. Multi-purpose valve             |
| 3. Charcoal filter                                         | 7. Tank                            |
| 4. Vapour supply pipe from the tank to the charcoal filter | 8. Injection/ignition control unit |

## 10.

### ANTI-EVAPORATION SYSTEM COMPONENTS

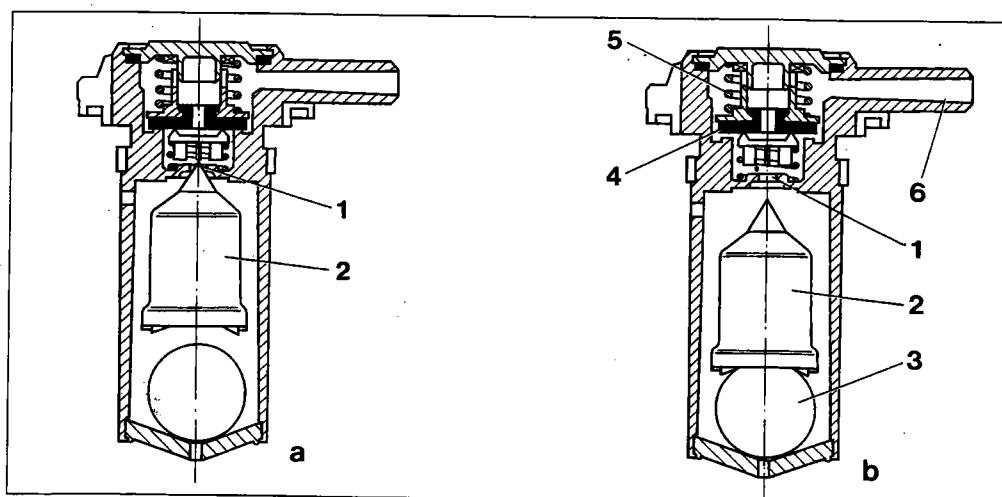
#### Multi-purpose valve

This valve is used to carry out various functions, namely:

- to prevent the flow of liquid fuel if the tank is too full or if the vehicle overturns in the case of an accident.
- to allow the breathing of the fuel vapours towards the active charcoal filter;
- to allow the ventilation of the tank if there is a vacuum inside.

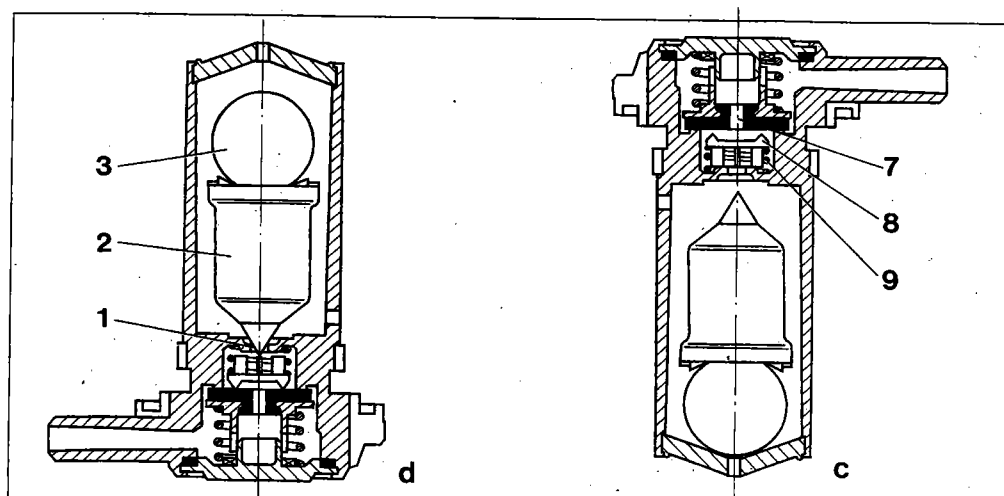
The valve consists of a float body (2), a heavy ball (3), a plate thrust against the valve body by a spring (5) and a shim (8) thrust against the plate (4) by the spring (9). The operation of the multi-purpose valve can be summed up in the following cases, depending on how full the fuel tank is:

- if the tank is full, the float (2) shutters the port (1) preventing the liquid fuel from reaching the active charcoal filter preventing it from being damaged;
- if the level of the fuel in the tank decreases, the float (2) goes down and rests on the ball (3) opening the port (1); when the pressure exerted by the fuel vapours on the plate (4) overcomes the spring (5) loading, a ring section opens between the actual plate and the valve body, allowing the fuel vapours to come out of the duct (6) and reach the active charcoal filter;

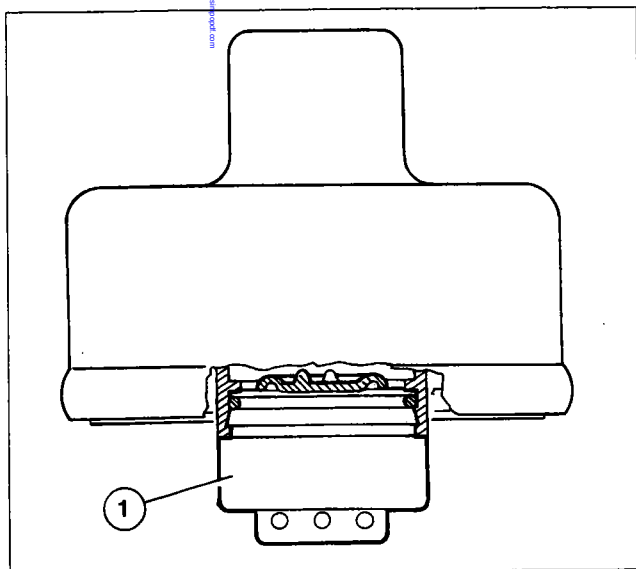


P4A42IJ01-02

- if the level of the fuel in the tank decreases to such an extent as to produce a vacuum inside the tank, this acts on the shim (8) and, overcoming the spring (9) loading, recalls it downwards allowing the ventilation of the tank through the port (7).
- if the vehicle overturns, irrespective of how full the tank is, the ball (3), weighing down on the float (2), pushes it against the port (1) preventing the escape of fuel which would be dangerous and create a fire hazard.



P4A42IJ03-04

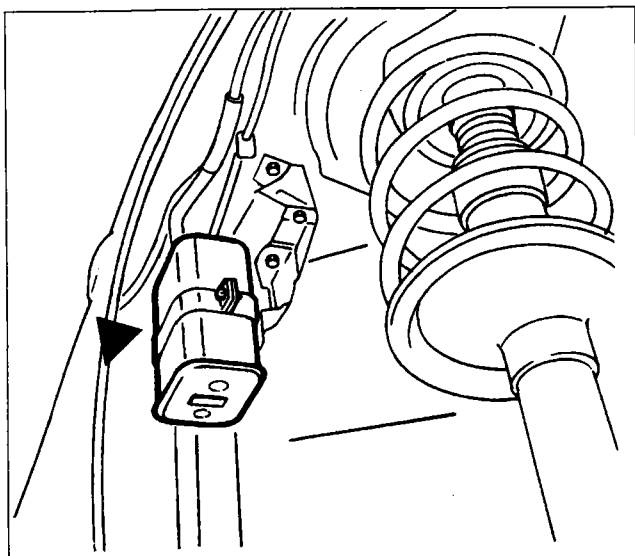


P4A43IJ03

### Safety and ventilation valve

This valve is located in the fuel filler cap and, depending on the pressure in the tank, carries out the following functions:

- When the pressure inside the fuel tank exceeds 0.13 - 0.18 bar, it allows the excess vapours to be discharged outwards (safety function).
- If, conversely, there is a vacuum of 0.020 - 0.030 bar in the tank, it allows the intake of air (ventilation function).



P4A39JJ01

### Charcoal filter

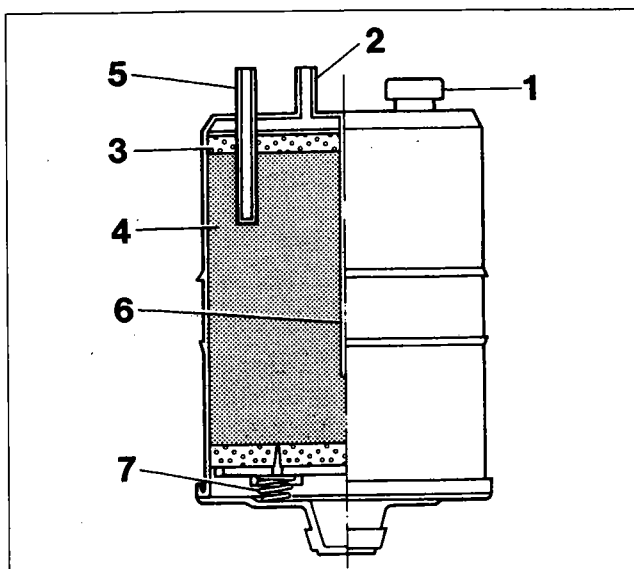
The charcoal filter is located in the right wheel arch; to gain access to it, remove the rear part of the right front wheel arch liner.

It consists of granules of charcoal (4) which trap the petrol vapours entering through the intake (5).

The scavenging air which enters through the intake (1), through the paper filter (3), comes into contact with the granules and directs them towards the outlet (2) and from there towards the cut-out valve.

The air, having entered through the intake (5), can also be recalled by the vacuum in the tank to ventilate the actual tank. The partition (6) ensures that the air drawn in comes into contact with all the granules of charcoal assisting the release of petrol vapours towards the inlet manifold.

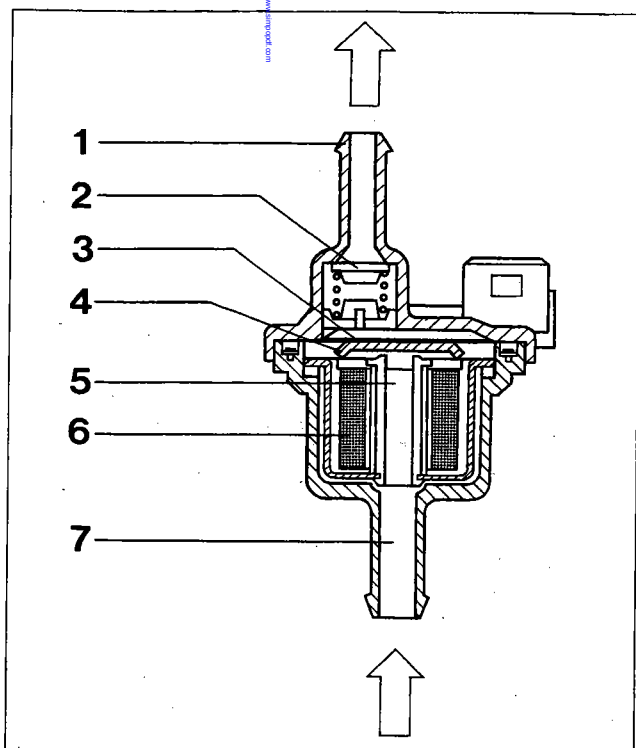
There are also two springs (7) which allow the mass of granules to expand when the pressure increases.



P4A43CJ02



# 10.



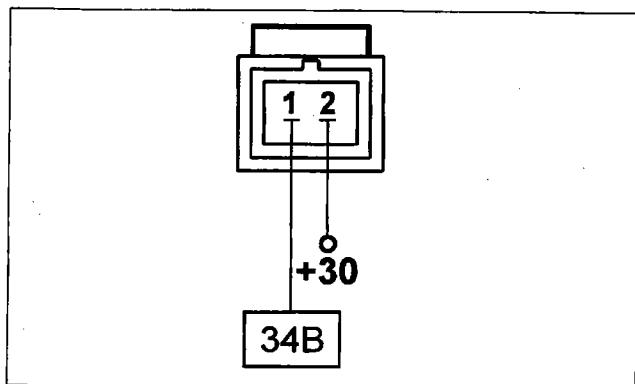
P4A36FJ03

## Charcoal filter solenoid valve

The function of this valve is to control the quantity of fuel vapours drawn in by the active charcoal filter and directed to the inlet manifold by means of the injection/ignition electronic control unit.

If this valve has no supply, it is closed, preventing the fuel vapours from excessively enriching the mixture.

1. Inlet connector
2. One-way valve
3. Spring
4. Shutter
5. Outlet opening
6. Solenoid valve
7. Outlet connector



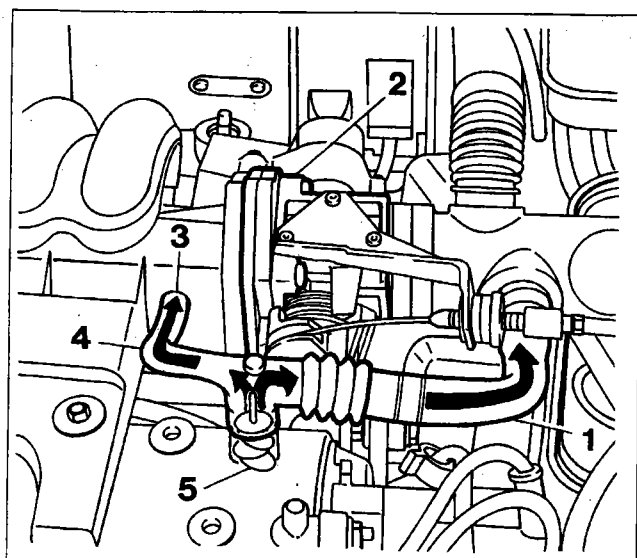
P4A40JJ02

## Wiring connector

## DIAGRAM SHOWING RECIRCULATION OF GASES COMING FROM THE ENGINE CRANKCASE (BLOW-BY)

This system controls the emission, from the cylinder block/crankcase, of the breather gases made up of air/petrol mixtures and burnt gases which escape through the piston ring seals, in addition to the lubricant oil vapours, recirculating them to the inlet.

With the accelerator butterfly open, the gases from the upper cover reach the main air intake pipe through the pipe (1) which contains a spark-out (5) to prevent combustion due to flame returns from the butterfly casing (2). With the accelerator butterfly closed (engine idling), the vacuum in the inlet manifold draws in the gases (in limited quantities) directly through the small pipe (4) and the calibrated port (3).



P4A40JJ01

## CHECKS, ADJUSTMENTS AND REPAIR OPERATIONS ON THE BOSCH 1.5.5 SYSTEM



*The following precautions should be observed when working on a vehicle equipped with the Bosch 1.5.5 system:*

- do not start up the engine when the electrical connectors are badly connected or slack at the battery poles;
- do not use a rapid battery charger to start the engine;
- never disconnect the battery from the electrical system with the engine running;
- in order to charge the battery it must be disconnected first from the electrical equipment;
- if the vehicle goes in a drying oven after painting at temperatures in excess of 80 °C, it is necessary to remove the engine control unit from the vehicle;
- do not connect/disconnect the control unit multiple connectors with the ignition switch in the ON position;
- always disconnect the negative battery lead before carrying out electrical welding on the vehicle.



*The system has a memory which is directly supplied by the battery, even with the ignition switched off, where the self-adjustment values are stored. Disconnecting the battery will involve the loss of this information which can only be learnt once again after a certain period: this operation should therefore be limited as far as possible.*

## CHECKING EMISSIONS CONCENTRATION

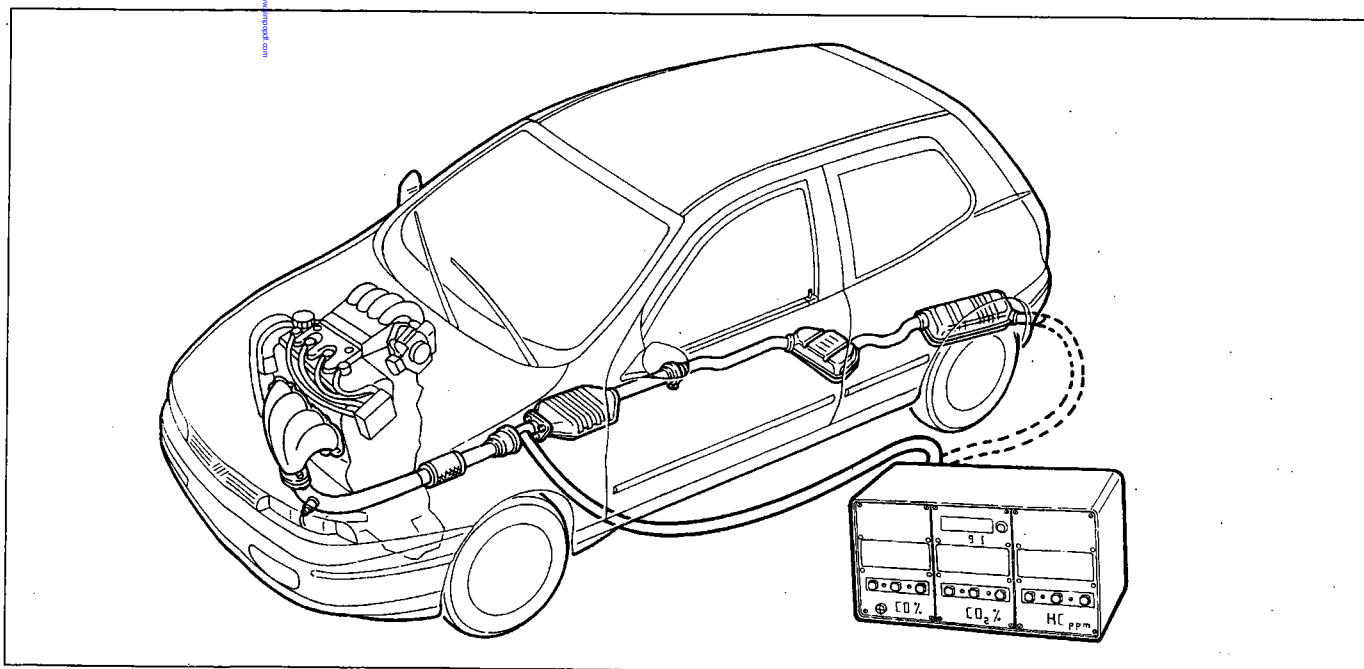
This system manages the advance, the carbon monoxide (CO) content and the idle air flow rate with no possibility for manual adjustment. However, a check on the content of the exhaust gases upstream and downstream of the catalyzer can provide useful indications on the injection/ignition system operating conditions, the engine parameters or the catalyzer.

### Checking idle concentration of CO and HC upstream of the catalytic silencer

To check the concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) upstream of the catalyzer, proceed as follows:

1. Undo the cap located on the exhaust pipe, upstream of the catalyzer, and tighten the tool in its place.
2. Connect a suitably calibrated CO-tester to the tool.
3. Start up the engine and let it reach operating temperature.
4. Check that the engine speed is correct.
5. Check that the idle concentration of CO is within the recommended values (see table); if this is not the case, check:
  - that the Lambda sensor is working properly, using the diagnostic equipment;
  - for the presence of air penetration in the area surrounding the Lambda sensor housing;
  - the injection and ignition system **(in particular the state of wear of the spark plugs)**.
6. In the same conditions, check that the HC concentration is below 500 p.p.m.
7. If these values are not found, tune the engine, paying particular attention to:
  - the valve gear timing;
  - the engine compression.

# 10.



P4A42JJ01

**Table summarizing pollutant emission tolerance values**

|                             | CO (%)  | HC (p.p.m.) | CO <sub>2</sub> (%) |
|-----------------------------|---------|-------------|---------------------|
| Upstream of the catalyzer   | 0,4 ÷ 1 | ≤ 500       | ≥ 12                |
| Downstream of the catalyzer | ≤ 0,35  | ≤ 90        | ≥ 13                |

## Checking concentration of CO and HC at the exhaust

The exhaust concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) is measured by inserting a suitably calibrated tester sensor at least 30 cm into the end of the exhaust pipe.

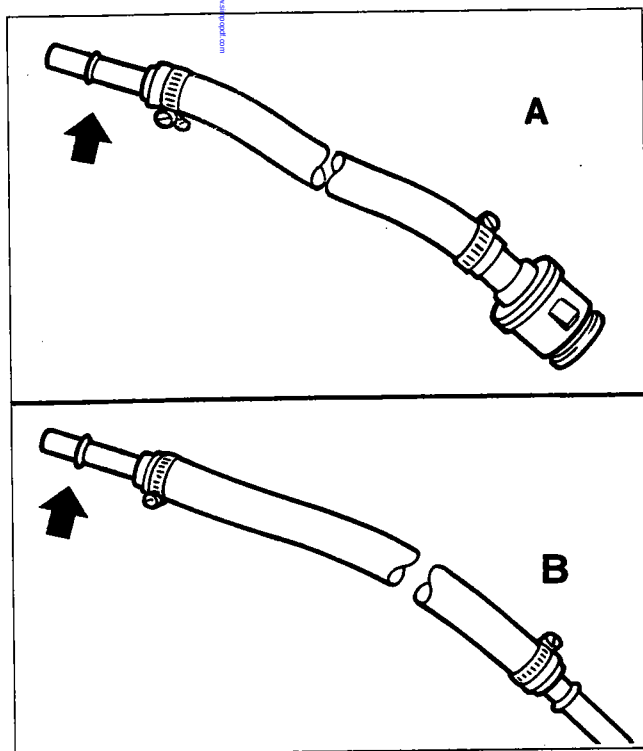
1. Check that the idle CO and HC concentrations correspond to the recommended figures (see table).
2. If the HC value is outside of the recommended limit, whilst that measured previously upstream of the catalyzer was correct, the engine parameters are correct and the cause of the problem should therefore be sought in the decreased efficiency of the catalyzer.

## CHECKING ENGINE IDLE SPEED

If the engine idle speed does not correspond with the one recommended, as the system is the self-adjusting type no adjustments can be carried out. It is therefore necessary to check that the accelerator linkage is correctly adjusted and the cause of the problem should be sought by carrying out a complete fault diagnosis using the diagnostic equipment.

## IGNITION ADVANCE CHECK

The diagnostic equipment must be used to check the ignition advance angles at the different speed.



### CHECKS ON THE FUEL SUPPLY CIRCUIT



*THESE OPERATIONS SHOULD BE CARRIED OUT IN THE PRESENCE OF A SUITABLE VAPOUR PURIFICATION AND EXHAUST SYSTEM.*

### Checking the fuel supply circuit pressure

Check the supply pressure and the seal of the fuel supply system following the instructions given below using equipment 1860955000, fitted with two adaptors which should be made as described below:

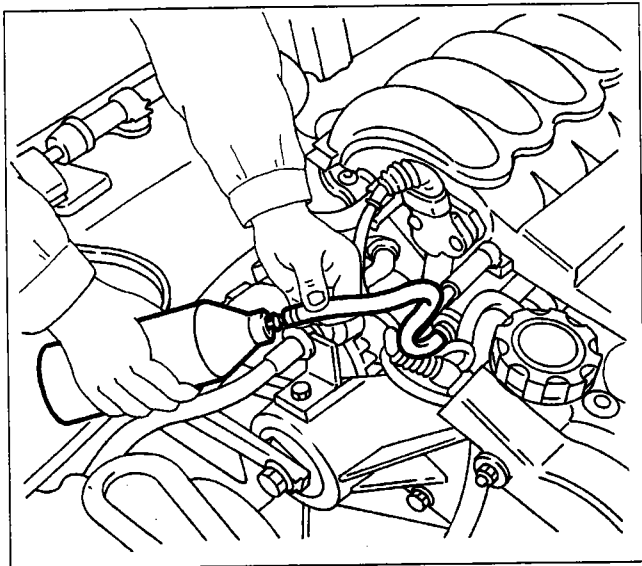


- adaptor (A): use a new type rapid attachment female terminal and a length of pipe contained in Kit no. 1860955003 and an old type rapid attachment male terminal contained in Kit no. 1860955001;
- adaptor (B): use a new type rapid attachment male terminal and a length of pipe contained in Kit no. 1860955003 and an old type rapid attachment male terminal contained in Kit no. 1860955001;

Configure the adaptors as illustrated in the diagram.



*The arrow indicates the the side to insert in the test equipment 1860955000 (pressure gauge)*



### Discharging the fuel pressure in the supply circuit

The fuel supply circuit is kept at a constant pressure of about 3.2 bar even with the engine switched off; therefore before carrying out any operations on the supply pipe, the pressure in the system must be discharged, using adaptor no. 1870684000 and a special container to collect the excess fuel in.

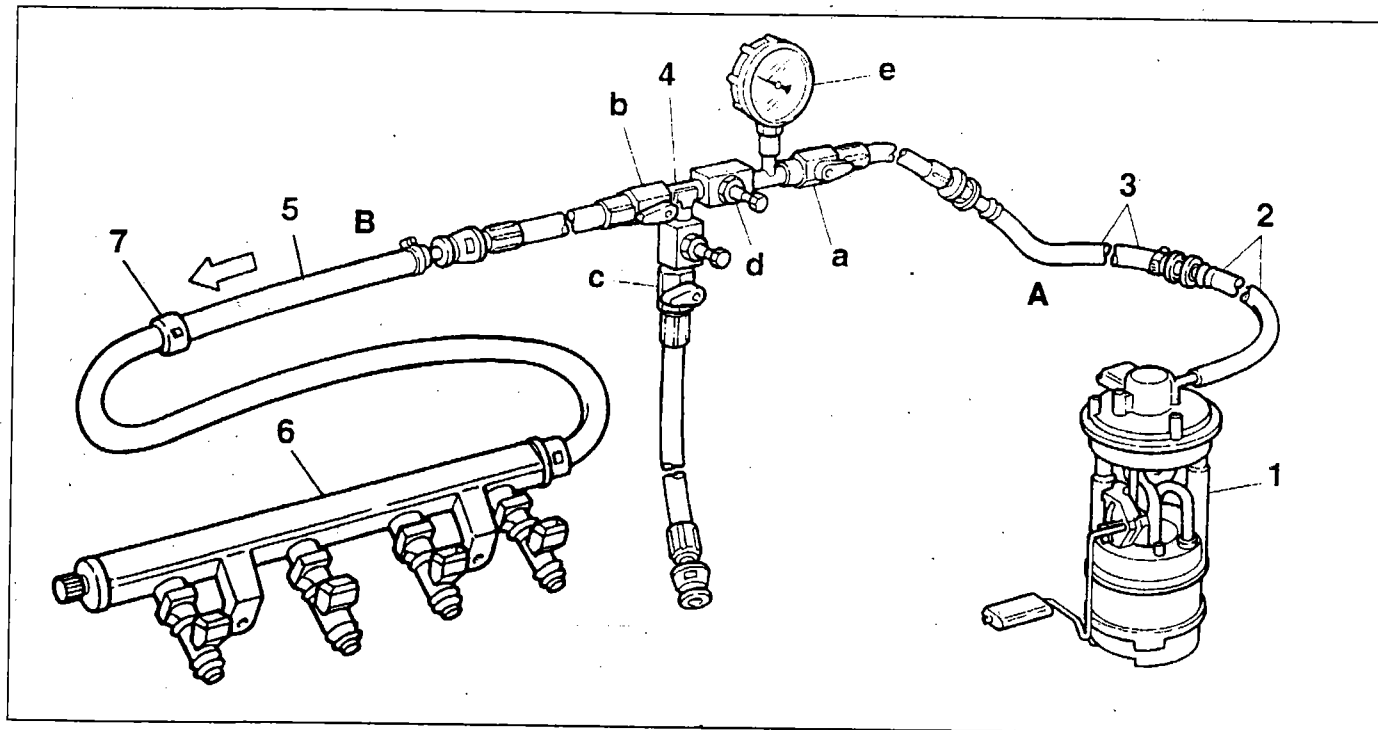
Proceed as described below:

- Remove the protective cover from the attachment on the fuel manifold;
- introduce the male end of the adaptor into the container and fit the rapid connector on the attachment on the fuel manifold, as illustrated in the diagram; in this way the small amount of excess fuel, which creates pressure, is discharged into the container and it is therefore possible to carry out the checks on the fuel supply system;
- disconnect the adaptor from the attachment and refit the protective cover.

### 10.

#### Checking fuel supply circuit pressure

Prepare the test equipment 1860955000 using the adaptors produced previously and fitted as illustrated in the diagram below placing the ball valves (a), (b) and (d) in the maximum open position and valve (c) in a closed position.



P4A44JJ01

- |                                  |                               |
|----------------------------------|-------------------------------|
| 1. Complete electric fuel pump   | 5. Adaptor (B)                |
| 2. Fuel supply pipe              | 6. Fuel manifold              |
| 3. Adaptor (A)                   | 7. Rapid attachment connector |
| 4. Test equipment no. 1860955000 |                               |

After having discharged the pressure, remove the end of the fuel supply pipe (2) from the rapid connector (7), following the instructions on the previous pages, connect it to the female connector of the adaptor (A), connect the new male end of the adaptor (B) to the rapid connector (7) and check that the connectors are correctly fitted.

Turn the ignition key to the ON position and observe whether the pressure on the gauge (e), after increasing to about 3.5 bar, settles down at around 3.2 bar (the fall in pressure is due to the fact that after operating for several seconds the pump is deactivated if the engine is not started up).

If there is a fall in pressure to below the values mentioned above, check the seal of the section of the system Upstream of the fuel manifold and check the seal of the injectors following the instructions given below.

#### Fuel supply pipe leakage test

Keep the test equipment in the position described in the previous paragraph, close valve (b), keeping valve (c) closed and valve (a) in the maximum open position.

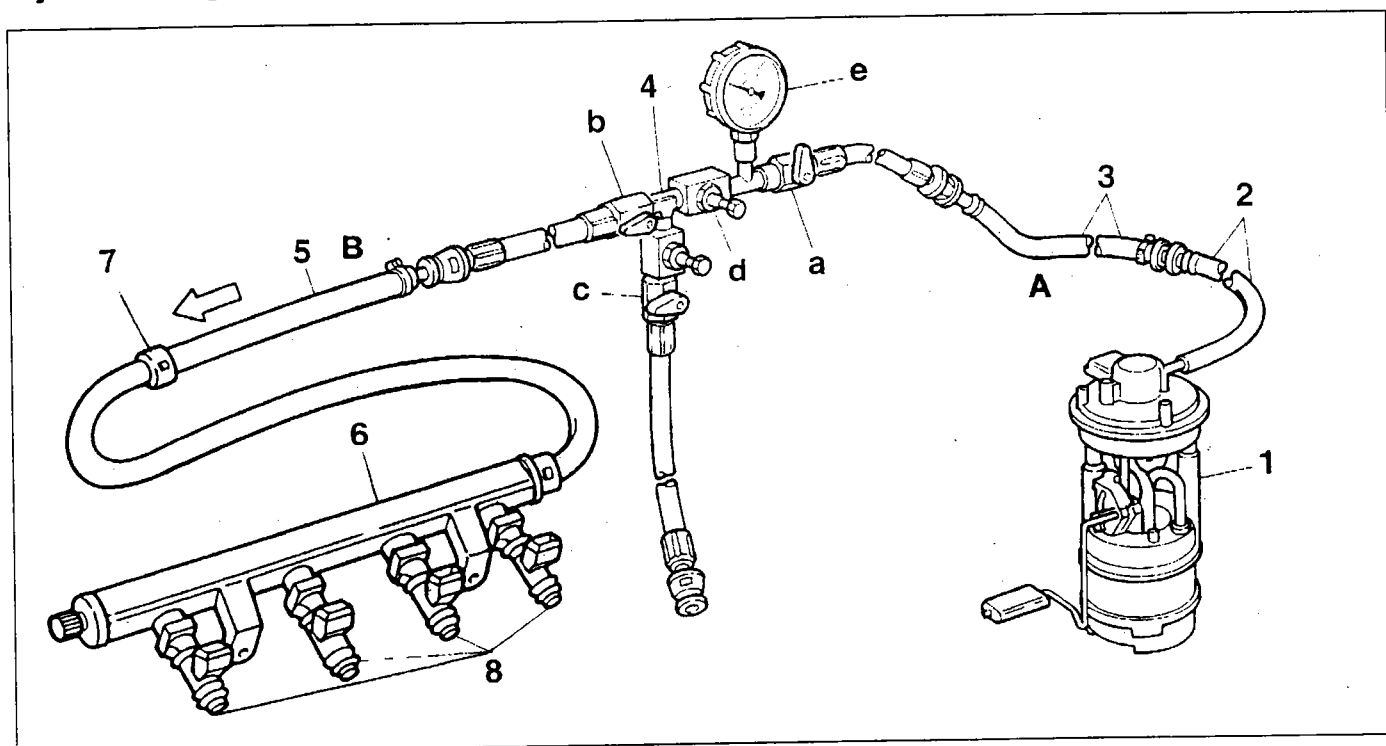
Turn the ignition key to the ON position and observe whether, after increasing to around 3.5 bar, the pressure on the gauge (e) settles down at around 3.2 bar (the decrease in pressure is due to the fact that after the pump has been working for several seconds it is deactivated if the engine is not started up).

If there is a decrease in pressure to below the values mentioned above, check the section of the system upstream of the manifold and if there are no leaks or damage to the fuel supply pipe, replace the electric fuel pump drip tray assembly because the pressure regulator is housed in the actual unit and CANNOT be replaced.

If, after repeating the check, the pressure exceeds the recommended figure and is considerably higher, replace the electric fuel pump because there are operating problems with the pressure regulator housed in it.

If the pressure corresponds to the recommended figure, check the seal of the fuel manifold and the injectors following the procedure described in the paragraph below.

### Injector leakage test



P4A45JJ01

1. Complete electric fuel pump
2. Fuel supply pipe
3. Adaptor (A)
4. Test equipment No. 1860955000

5. Adaptor (B)
6. Fuel manifold
7. Rapid attachment connector
8. Injectors

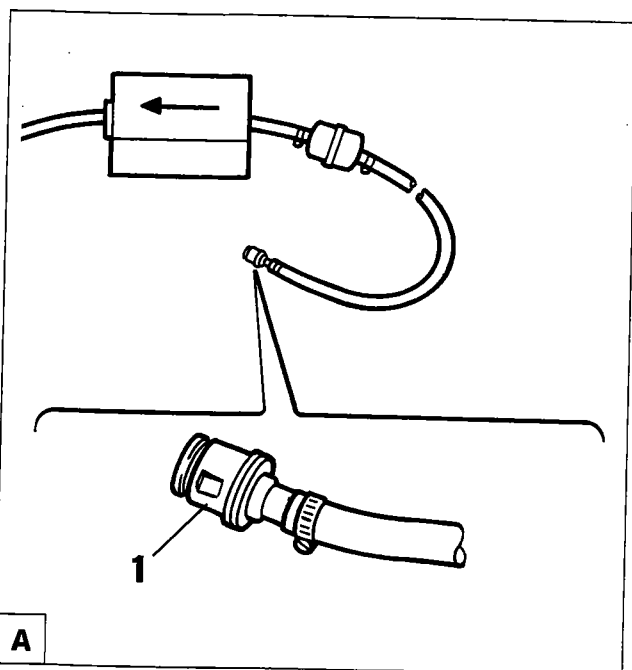
Keep the test equipment in the same position as described in the previous paragraph, place valve (b) in the maximum open position, keeping valve (c) closed and valve (a) in the maximum open position. Turn the ignition switch to the ON position and observe whether, after increasing to around 3.5 bar, the pressure on the gauge (e) settles down at a pressure of about 3.2 bar, then close valve (a) and check that the pressure remains constant for at least a minute; if this is not the case, there is a leak from one or more injectors.



### 10.

#### Removing the test equipment

- Remove the test equipment 1860955000 with the key in the OFF position, following these instructions:
- introduce the end of the pipe connected to the valve (c) into a suitable container;
  - open the valve (c) and drain the excess fuel into the container;
  - keep the pipe in the container and disconnect the end of the supply pipe from the female connector for the adaptor (A) keeping the connection upwards;
  - let the fuel in the pipes flow into the container;
  - disconnect the end of the adaptor (B) from the rapid connector and let the residual fuel flow from the pipes into the container;
  - reconnect the fuel supply pipe.



P4A46JJ01



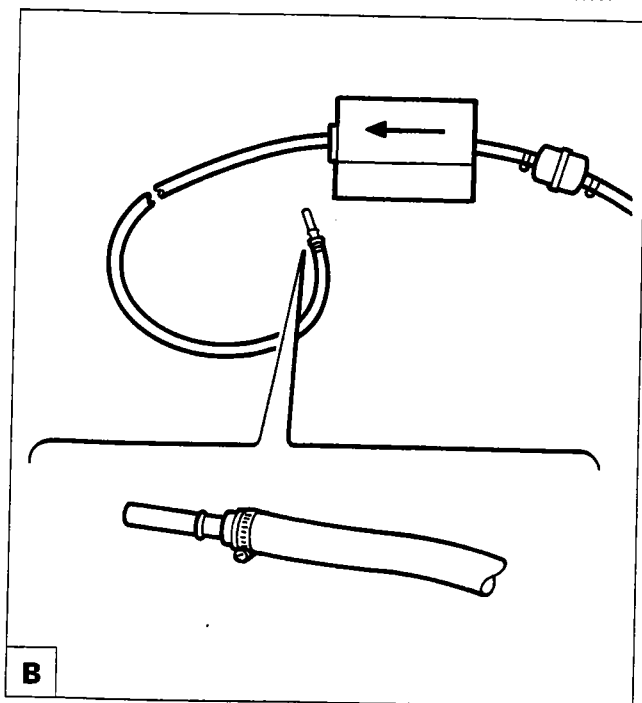
#### Checking fuel consumption using FLOWTRONIC equipment 1866149001

To carry out the check, the equipment should be configured with the connectors shown in the diagrams:

- A. supply pipe side
- B. fuel manifold side

If this has not been done, make the adjustment following the instructions given below:

- cut the end of the FLOWTRONIC equipment inlet pipe and replace it with a female rapid connector (1), contained in the Kit No. 1860955003, as illustrated in figure A;



P4A46JJ02



- cut the end of the FLOWTRONIC equipment outlet pipe and replace it with a male connector (2), contained in the Kit No. 1860955003, as illustrated in figure B.

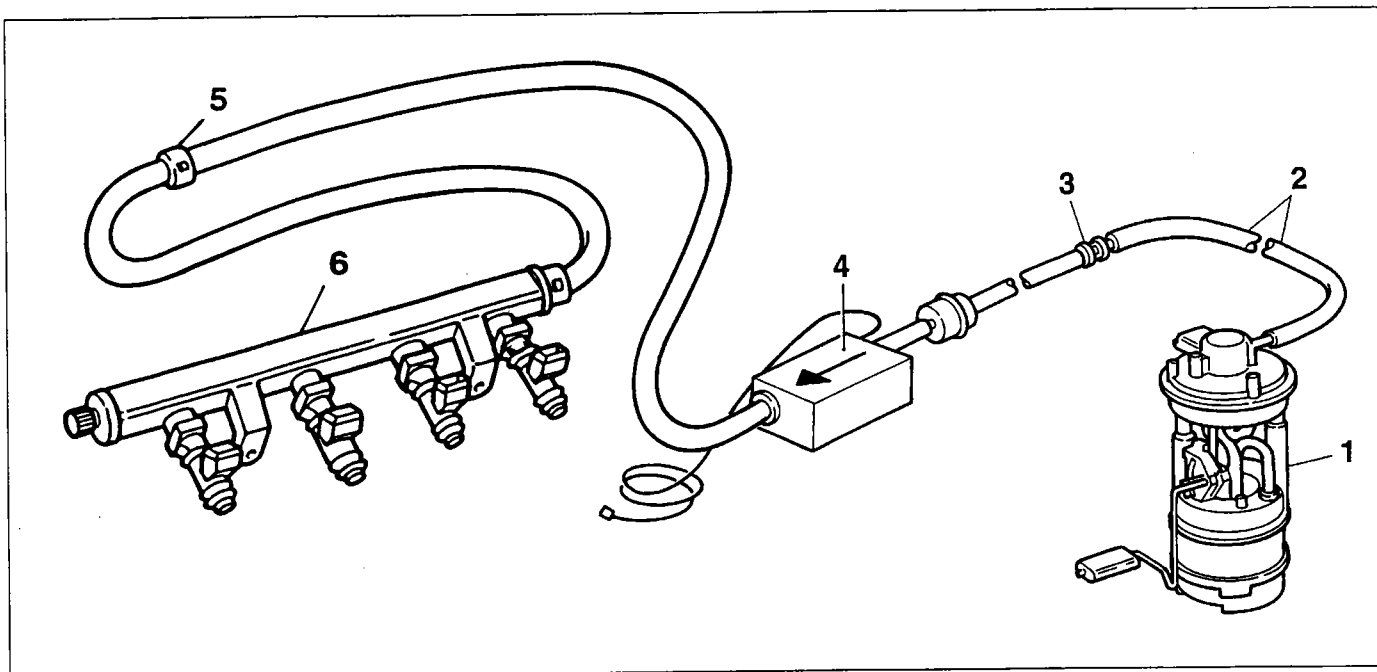


*The connectors removed should be recovered and kept for any future connections.*



## 10.

- discharge the fuel pressure inside the supply pipe and disconnect the pipe from the rapid connector, following the instructions in the previous paragraphs;
- attach the end of the supply pipe to the female rapid connector for the FLOWTRONIC equipment and the male connector to the rapid connector;
- position the equipment in the engine compartment, place the connecting electrical cable inside the vehicle and connect the actual equipment as described in the instructions which come with the equipment;
- proceed with the fuel consumption test in accordance with regulation 93/116 CE and check that the figures correspond with those given in section 00 - Technical data.



P4A47JJ01

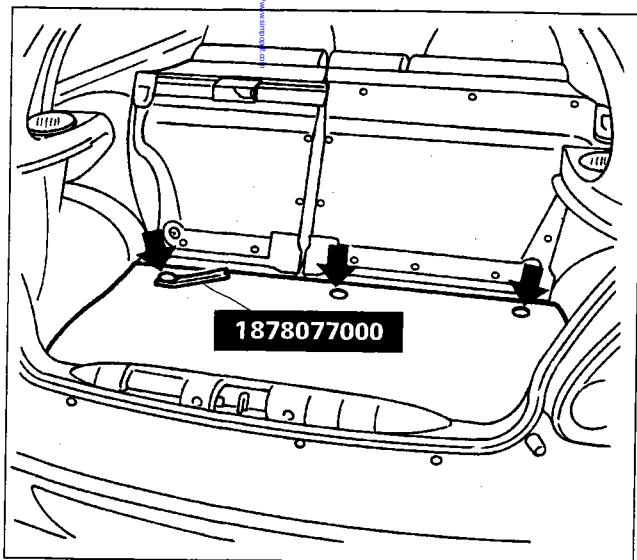
1. Complete electric fuel pump
2. Fuel supply pipe
3. Female rapid connector

4. FLOWTRONIC equipment
5. Rapid connector
6. Fuel manifold

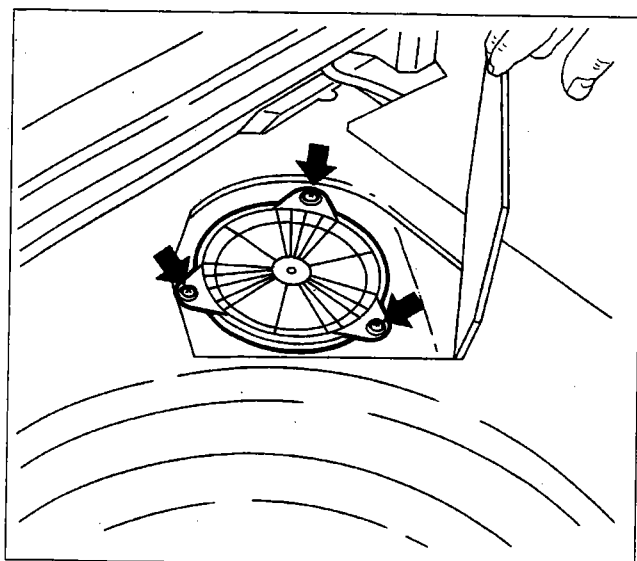
- carry out the fuel consumption road test in accordance with directive 93/116 CE (litres per 100 km):  
URBAN CYCLE - this includes a cold start, followed by a simulated urban journey;  
EXTRA-URBAN CYCLE - this includes frequent acceleration, in all the gears, simulating normal out of town usage; the speed varies between 0 and 120 kph;  
AVERAGE COMBINED CONSUMPTION - this involves 33% of the urban cycle and 67% of the extra-urban cycle;  
check that the figures measured correspond to those in the section "Introduction and technical data".

**NOTE** *Traffic conditions, driving styles, atmospheric conditions, trim levels / accessories, whether a roof rack is fitted, the presence of special equipment and the general state of the vehicle, can lead to fuel consumption figures which differ from those obtained using the procedures described above.*

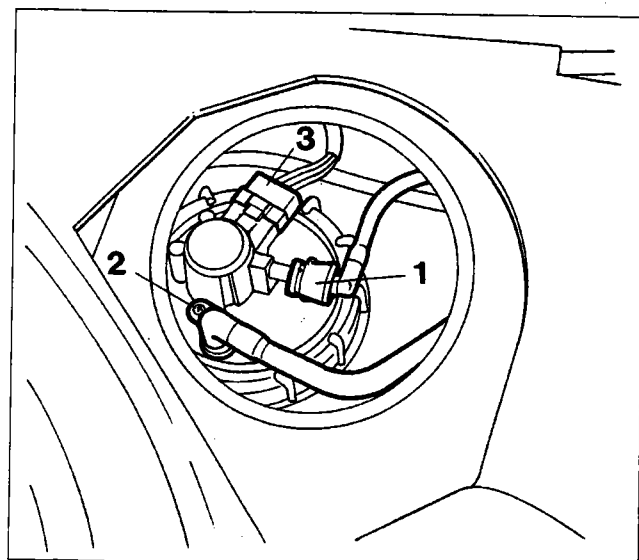
# 10.



P4A48JJ01



P4A48JJ02



P4A48JJ03

## FUEL DRIP TRAY ASSEMBLY

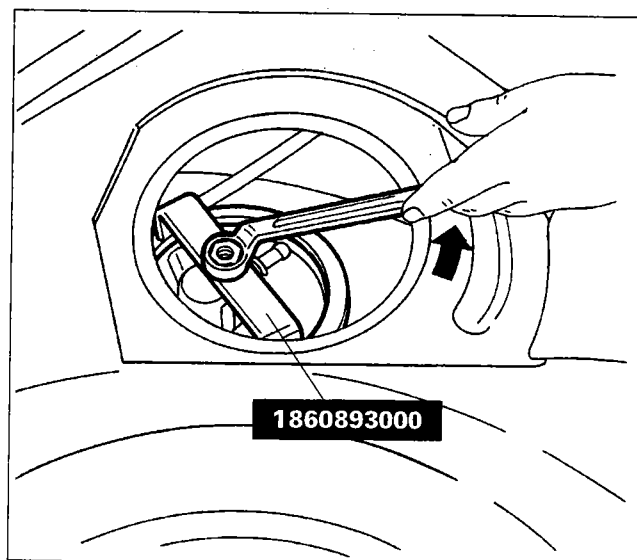
**NOTE** In order to extract the assembly from the tank, the fuel should not be higher than the halfway mark.

### Removing-refitting

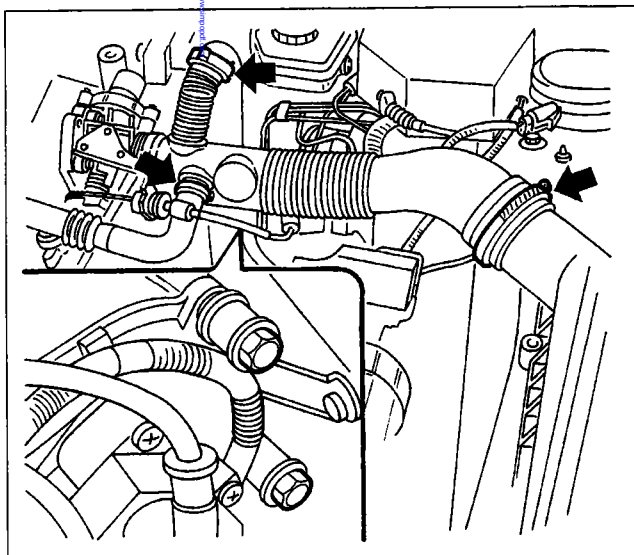
Proceed with removing the fuel drip tray assembly as follows:

- remove the buttons (arrow) fixing the luggage compartment lining using tool 187807700 and remove it, then lift up panel cover to gain access to the dust cover;
- undo the bolts (arrow) and remove the dust cover;
- disconnect the supply pipe (1), the breather pipe (2) and the electrical connector (3);
- using tool 1860893000 remove the ring nut securing the drip tray and extract the drip tray from the tank, taking care not to damage the seal.

When refitting, repeat the operations carried out for the removal in the reverse order; at the end, make sure that there are no fuel leaks.



P4A48JJ04



P4A49JJ01



## FUEL MANIFOLD AND INJECTORS

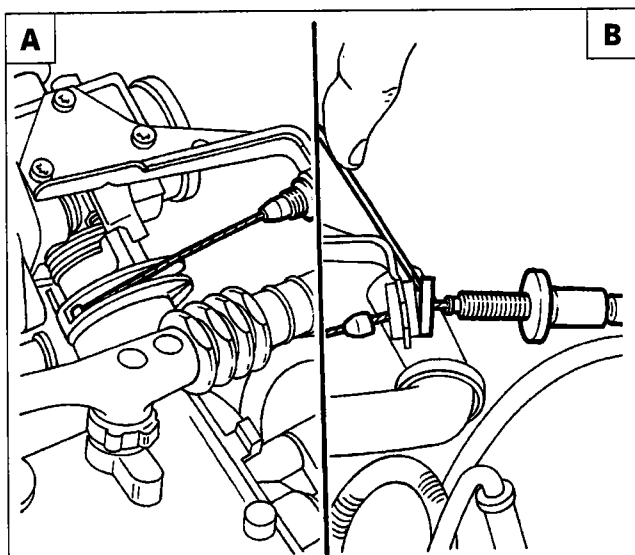


**NOTE** Before removing the manifold, discharge the pressure inside following the instructions given at the start of this chapter.

### Removing-refitting fuel manifold

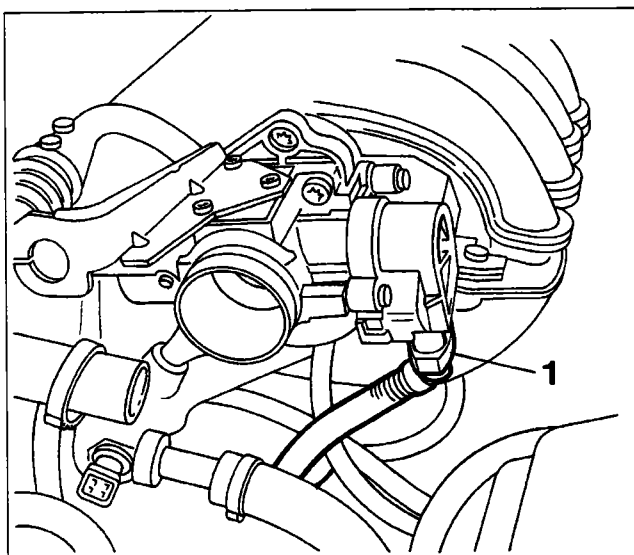
Proceed with removing the manifold as follows:

- remove the bands shown (arrow); then, undo the two bolts (detail) and remove the inlet hose complete with resonator;

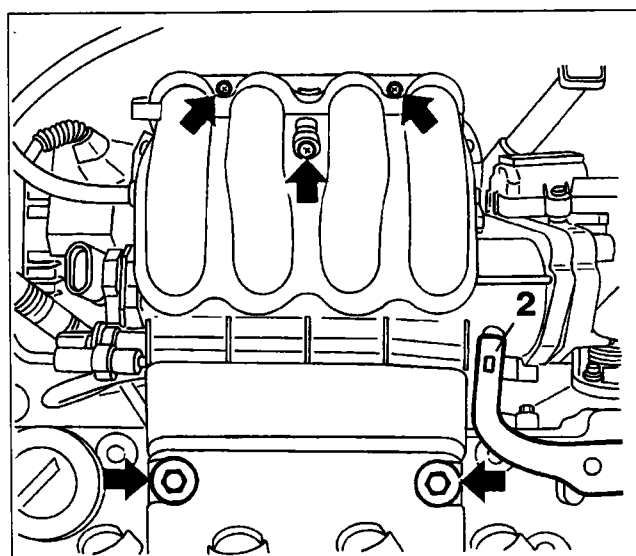


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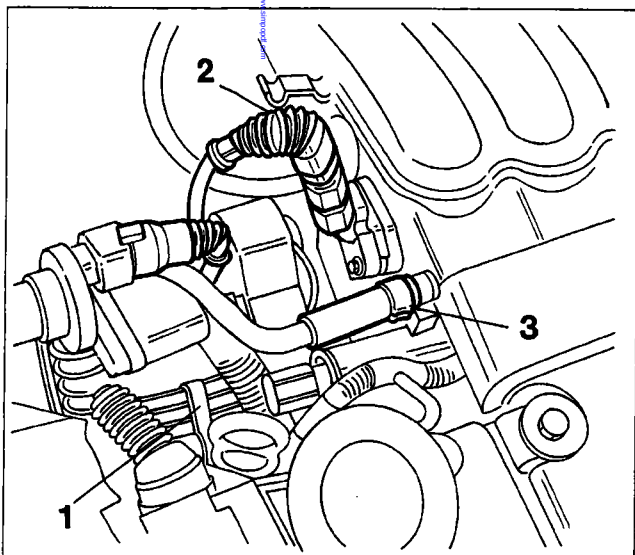
- rotating the accelerator lever, release the end of the accelerator cable from the lever (A) then remove the adjuster from the bracket (B) and move the accelerator cable away;
- disconnect the engine idle speed actuator connector (1);
- undo the bolts (arrow) fixing the upper half of the manifold and remove the vapour recirculation pipe (2).



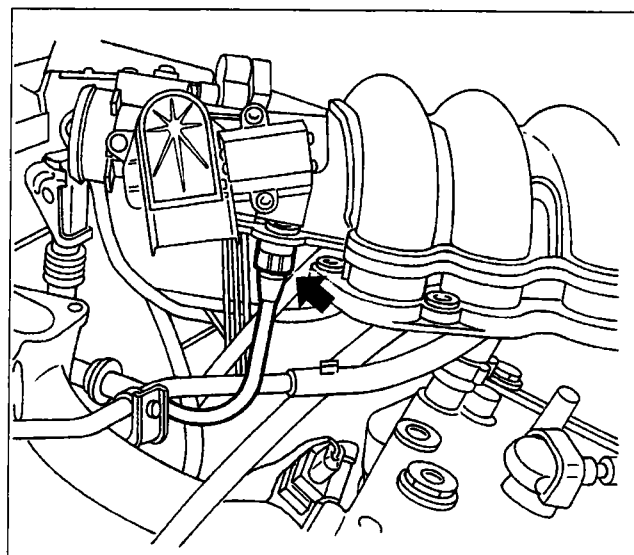
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P4A49JJ04



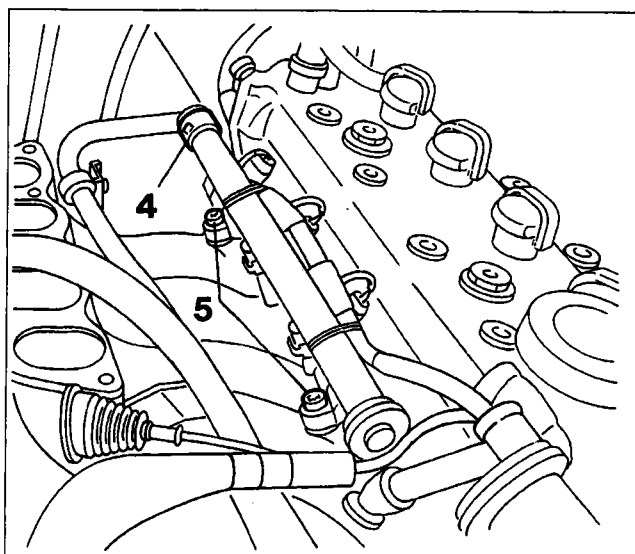
P4A50JJ01



P4A50JJ02

- disconnect the air temperature and pressure sensor connector (2) and the injectors cable connector (1) and remove the charcoal filter intake pipe (3);
- partly raise the half-manifold and remove the brake servo vacuum inlet pipe (arrow);
- disconnect the rapid connector (4), undo the fixing bolts (5) then remove the complete fuel manifold.

When refitting, repeat the operations described for the removal in the reverse order.



P4A50JJ03

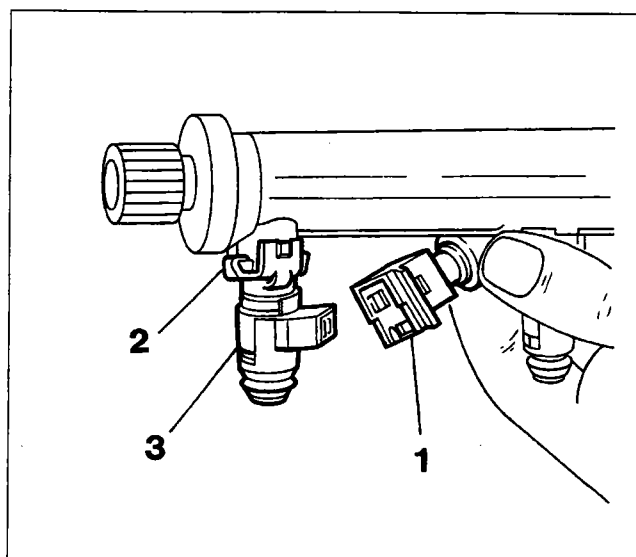


### Removing-refitting injectors



To remove the injectors, proceed as follows:

- Disconnect the electrical connection (1).
- Remove the safety clip (2).
- Remove the injector (3) which is a press fit.



P4A50JJ04



**Never act on the electrical connector to remove the injector.**

**Before refitting, check the condition of the seals.**

# 10.

## THROTTLE BODY

### Removing-refitting

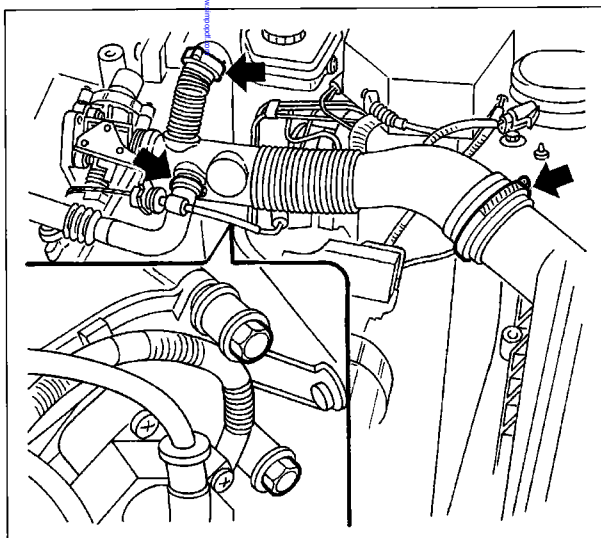
Proceed as follows to remove the throttle body:

- remove the collars indicated (arrowed), then unscrew both bolts (detail) and remove the intake sleeve with resonator;
- release the accelerator cable terminal from lever (A), then remove the adjustment block from bracket (B) and place the accelerator cable aside;
- disconnect the engine idle speed actuator connector (1);
- unscrew the four retaining bolts (arrowed) and remove the throttle body.

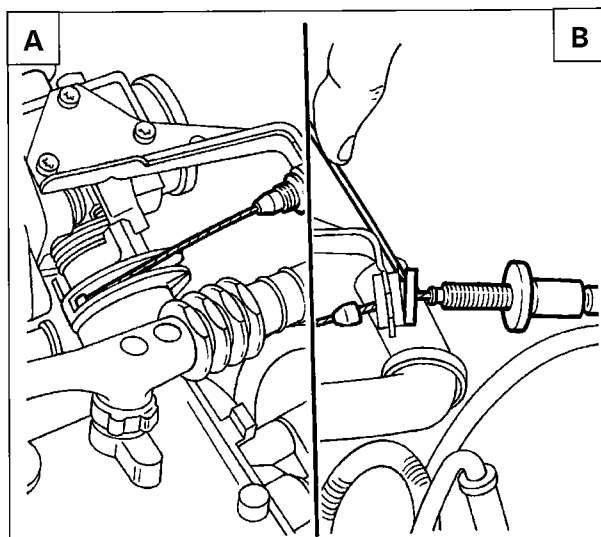
Reverse removal instructions to refit.

Adjust the accelerator cable as described in the following paragraph.

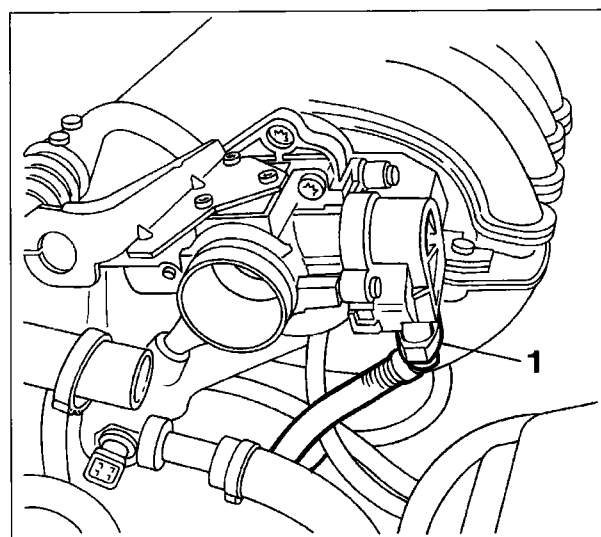
**NOTE** If the throttle body is replaced, connect a tester (Examiner) to the tester connection and run the required procedure to zero and self-learn engine idle adjustment actuator (M.D.S.) data



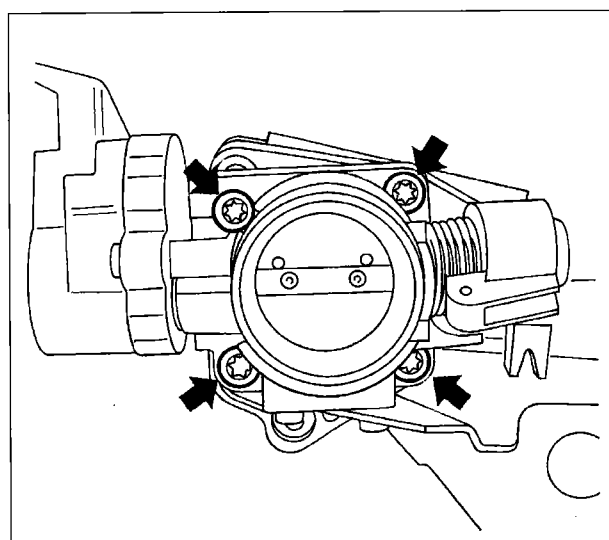
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### 10.

#### Zeroing

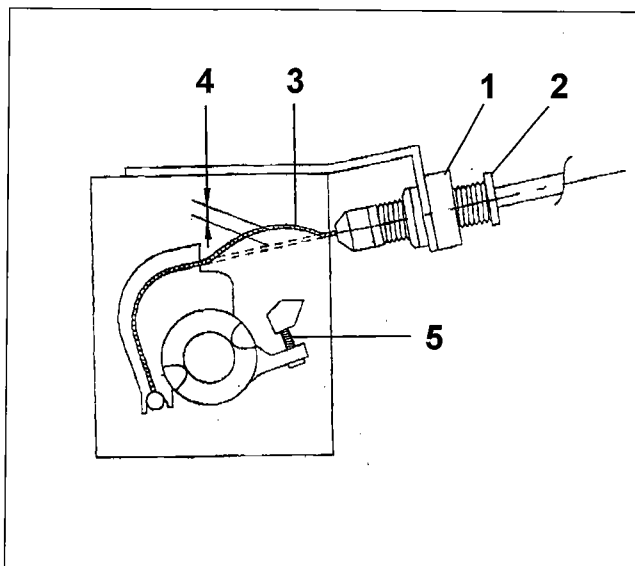
- Ensure the ignition key is turned off.
- Check that the climate control system is off, the accelerator pedal is not depressed and the accelerator cable is correctly adjusted (see next paragraph).
- Connect switch MPX 97 (tool 1806365000) to the tester connection and move the handle to position 3.
- Connect a tester (Examiner).
- Set the Examiner to "Control Unit Test" mode.
- Turn the ignition key on.
- Set the Examiner to "active test" mode, then select "Reset self-adaptive parameters" and "Idle actuator".
- Confirm reset and wait for the "Executed" message.
- Turn the ignition off and wait for 30 seconds.

#### Self-learning

- Turn the ignition on and wait for 30 seconds.
- Use the Examiner to re-establish communication with the engine control system.
- Set the Examiner to "Parameters" mode and select "Idle identification test - executed" and "Idle identification signals - synchronised" from the "Selection" menu.

**NOTE** *If at least one of the parameters is not as specified, turn the ignition off and repeat the procedure. If the parameter is still not as specified, check the test lead is connected properly and the equipment working properly.*

- Turn the ignition off and wait for 30 seconds.
- Start the engine without operating the accelerator pedal and wait for the fan to come on.
- Disconnect the tester.
- Carry out a test run for a few kilometres, then ensure idle speed is as specified when the engine is warm.



4F052PJ01

#### ACCELERATOR CONTROL CABLE

##### Adjustment

- slacken lock nut (1);
- adjust nut (2) to alter the clearance of accelerator cable (3) to achieve complete throttle closure (adjustment screw 5 in contact) and a cable clearance (4) of 5 mm with the pedal released.

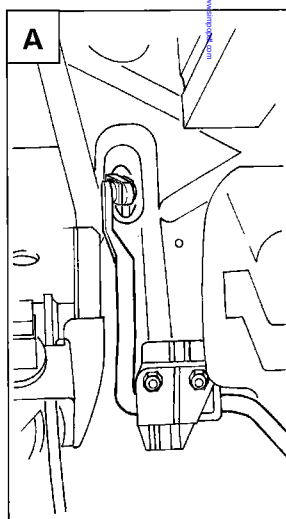
Proceed as follows:

**tighten** to reduce the clearance  
**loosen** to increase the clearance

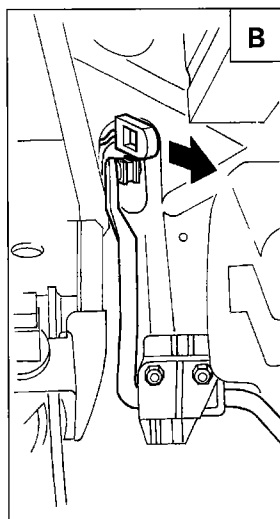
- tighten the locknut following adjustment

Once the cable has been adjusted to set idle speed, connect the tester to the appropriate connection and check that throttle opening is at least 80° with the pedal fully depressed.





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4F052PJ03



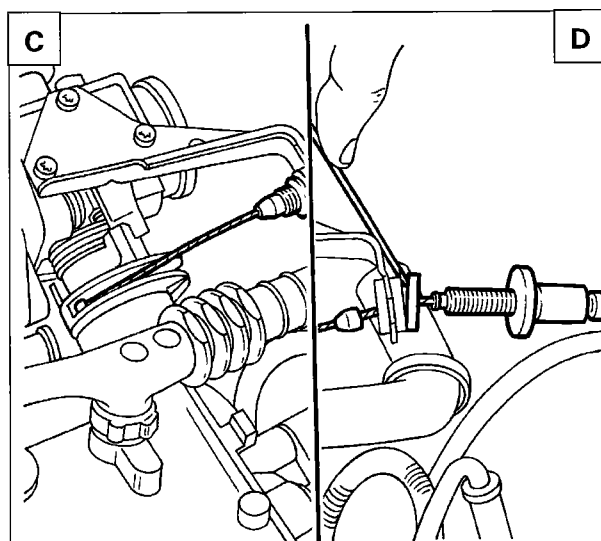
### Removing-refitting

Disconnect the accelerator cable as follows:



- working from inside the vehicle (A), disconnect the control cable from its anchorage on accelerator pedal (B);
- turn the accelerator lever to disengage the accelerator cable terminal from lever (C). Then remove the adjustment block from bracket (D) and move the accelerator cable aside.

Reverse removal instructions to refit.



4F049PJ02

### ENGINE IDLE ADJUSTMENT ACTUATOR/THROTTLE POSITION SENSOR

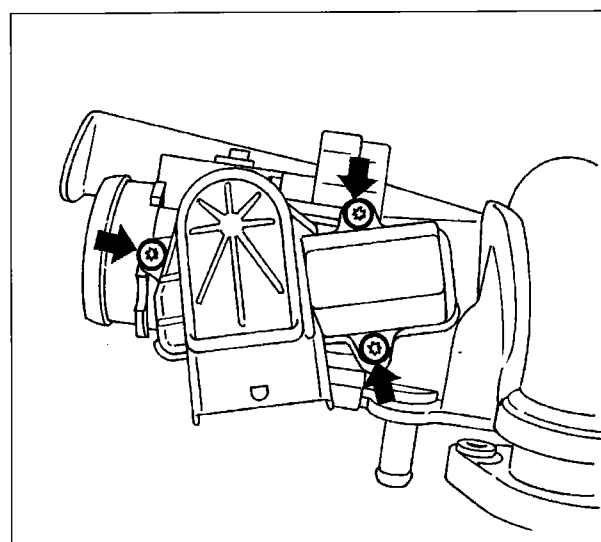
**NOTE** The engine idle adjustment actuator/throttle position sensor should be disconnected from the throttle body only in case of replacement because removing/refitting causes damage to certain components (e.g. internal sealing rings) and correct component operation cannot be guaranteed once the component is refitted.



### Removing-refitting

To remove the actuator, disconnect the connector and unscrew the retaining bolts (arrowed).

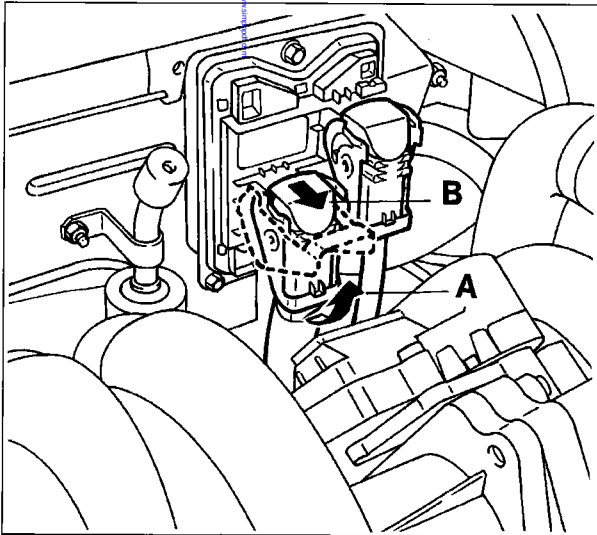
**NOTE** It is compulsory to zero and self-learn engine idle adjustment actuator (M.D.S) data as described in the "THROTTLE BODY" paragraph.



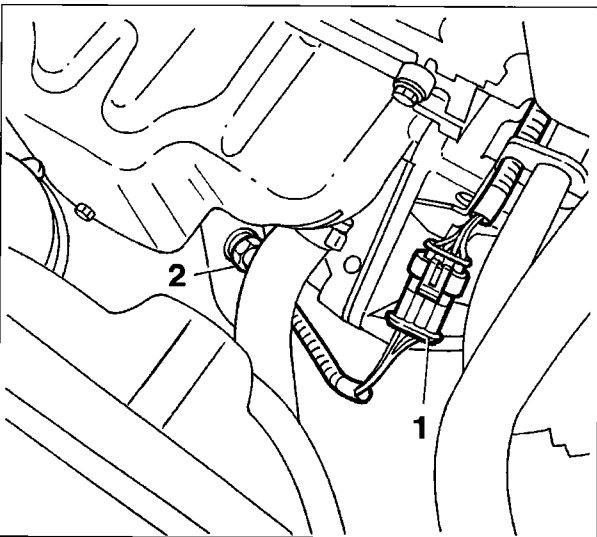
4F053PJ01



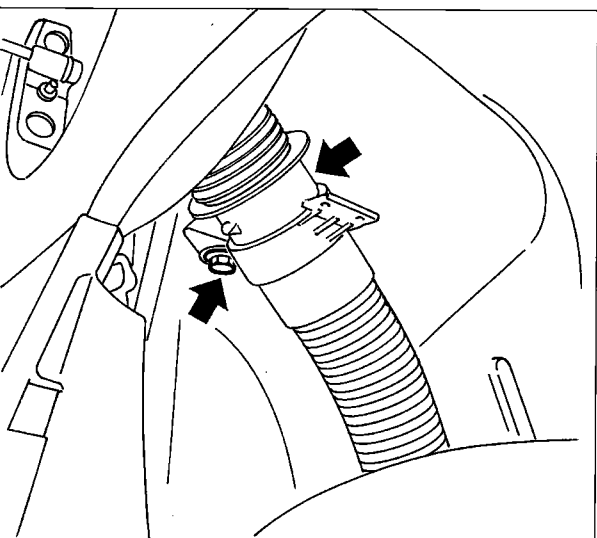
### 10.



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#### ENGINE CONTROL UNIT

##### Removing - refitting

Remove the control unit as follows:

- disconnect both connectors in two stages:
  - A) turn the metal hook up to release the connection;
  - B) pull away the connection;
- unscrew the control unit retaining bolts and remove.

Proceed as follows to refit the connector:

- move the connector into contact with the control unit;
- turn the metal hook until completely closed.

**NOTE** If the engine control unit is replaced, connect a tester (EXAMINER) to the tester connection and run the self-learning procedure for engine idle adjustment actuator (M.D.S) data as described in the "THROTTLE BODY" paragraph.



#### LAMBDA SENSOR

##### Removing - refitting

Disconnect electrical connection (1) and remove sensor (2) from its seat on the exhaust manifold.

When refitting, spread the threading with lubricant grease resistant to high temperature.

#### Engine RPM and TDC sensor

##### Removing-refitting

Disconnect the electrical connection.

Unscrew the retaining bolt and remove the sensor.



##### Check the gap

Check the distance between sensor and phonic wheel teeth (gap).

Gap: 0.5 - 1.5 mm



**NOTE** Whenever the sensor mount is serviced (e.g. gap not as specified, sensor not aligned etc.), the sensor must be correctly positioned and aligned with its mount as described in the engine service manual.

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## **BOSCH MOTRONIC ME 3.1 M.P.I. INTEGRATED INJECTION/IGNITION SYSTEM**

### **Introduction**

The Bosch Motronic system fitted on the 1998 5 cylinder 20 valve engine belongs to the category of static advance, inductive discharge, digital electronic ignition systems integrated with sequential, phased type electronic fuel injection systems.

This system has only one electronic control unit, a single set of wiring and one set of joint sensors. Its function is to inject the exact amount of petrol, into the engine inlet manifold, upstream of the inlet valves, designed to mix with the air introduced into the cylinder so that the correct mixture strength is formed.

The Motronic ME 3.1 guarantees efficient operation, ensuring optimum performance and fuel economy and a reduction in harmful emissions through a response in real time to the different engine operating conditions.

### **General description of the injection system**

There are basically two conditions which must always be satisfied in the preparation of the air/fuel mixture for the smooth running of the engine:

1. the metering (air/fuel ratio) should be kept as constant and as close as possible to the stoichiometric value, to ensure that combustion takes place quickly avoiding unnecessary fuel consumption;
2. the mixture should be composed of petrol vapours dispersed in the air as finely and uniformly as possible.

As far as the optimum metering, on the other hand, is concerned, it is calculated by the control unit after the following measurements have been taken:

- the exact quantity of intake air by the air flow meter;
- the engine rotation speed by the rpm sensor;
- the power request by the accelerator pedal potentiometer;
- the engine coolant temperature by the sensor on the thermostat support;
- the measurement of the oxygen content of the exhaust gases by the Lambda sensor.

This information is processed by a micro-calculator in the injection/ignition electronic control unit which determines the basic injection time through experimentally obtained values which are stored in a special memory in the above mentioned control unit.

### **General description of the ignition system**

The ignition system is the static advance, inductive discharge type (i.e. without a high tension distributor) with the power modules inside the electronic control unit.

The system has a single coil for each spark plug; the advantages of this solution are;

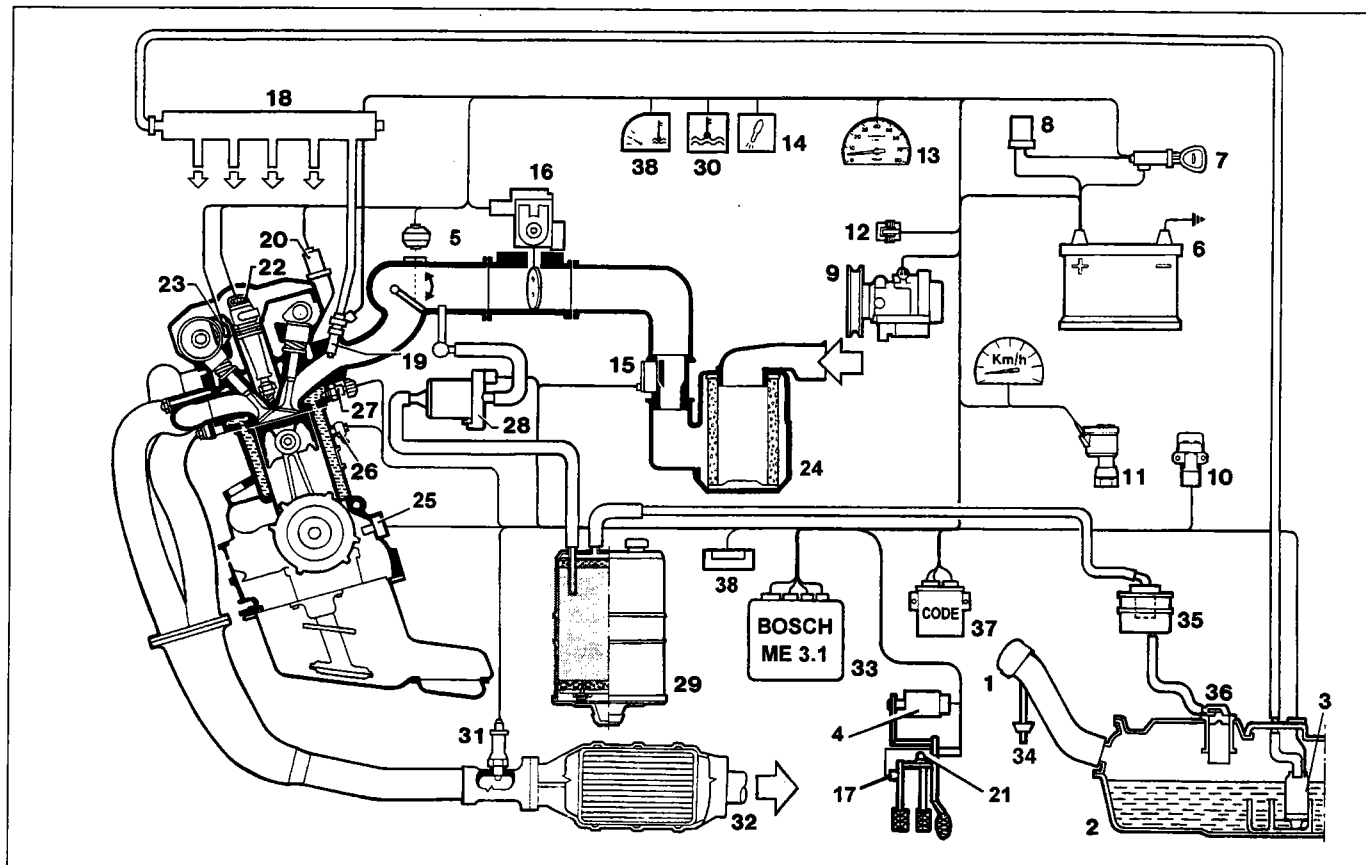
- less electrical overloading
- guarantee of constant discharge at each spark plug

The electronic control unit contains a memory where the entire series of optimum advance values which the engine can use for its operating range on the basis of the engine speed and load conditions are stored.

In the case of detonation, it is possible to selectively delay the ignition in the individual cylinder, recognized by the combination of values transmitted by the detonation and timing sensors.

# 10.

## INJECTION/IGNITION SYSTEM FUNCTIONAL DIAGRAM



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- |                                                          |                                       |
|----------------------------------------------------------|---------------------------------------|
| 1. Fuel tank filler cap                                  | 20. Phase transformer solenoid valve  |
| 2. Fuel tank                                             | 21. Brake pedal switch                |
| 3. Electric fuel pump with filter and pressure regulator | 22. Ignition coils                    |
| 4. Accelerator pedal potentiometer                       | 23. Engine timing sensor              |
| 5. Variable geometry manifold solenoid valve             | 24. Air filter                        |
| 6. Battery                                               | 25. Engine rpm sensor                 |
| 7. Ignition switch                                       | 26. Detonation sensors                |
| 8. System relay feed                                     | 27. Coolant temperature sensor        |
| 9. Climate control compressor                            | 28. Fuel vapour solenoid valve        |
| 10. Inertia switch                                       | 29. Charcoal filter                   |
| 11. Vehicle speed sensor                                 | 30. Coolant overheating warning light |
| 12. Diagnostic socket                                    | 31. Lambda sensor                     |
| 13. Rev counter                                          | 32. Catalytic silencer                |
| 14. System failure warning light                         | 33. Injection/ignition control unit   |
| 15. Air flow meter                                       | 34. Safety valve                      |
| 16. Butterfly casing electronic actuator                 | 35. Fuel vapour separator             |
| 17. Clutch pedal switch                                  | 36. Multi-purpose valve               |
| 18. Fuel manifold                                        | 37. Fiat CODE control unit            |
| 19. Injectors                                            | 38. Coolant temperature gauge         |

These values have been obtained experimentally, by means of a long series of practical tests carried out on prototypes at the engine test bench, to identify the advances which give the best compromise between the conflicting requirements of maximum power and a reduction in fuel consumption and harmful exhaust emissions.

These optimum advances have then been memorized in the system control unit. During the operation of the engine, the control unit is constantly informed of the (engine) speed and load conditions and on this basis it "selects" the optimum advance from its memory to strike the spark at the spark plug for the cylinder in the explosion stroke with the optimum advance.

In addition, the control unit corrects this value, depending on other factors such as the engine coolant temperature, intake air temperature, detonation and butterfly valve position, so that the ignition point is always optimum.

The information required by the control unit to operate the single coils is transmitted by means of electrical signals sent by the following sensors:

- a. **An rpm sensor** which produces a single phase alternating signal whose frequency indicates the engine speed.
- b. **An air flow meter** with a temperature sensor which, on the basis of the quantity/temperature of the air drawn in by the engine, transforms these figures into electrical signals, sending them to the electronic control unit.
- c. **Two detonation sensors** which, located in the upper part of the cylinder block/crankcase, one between cylinders 1 and 2 and the other between cylinders 4 and 5, respectively, allow the control unit to recognize the cylinder where detonation (or the onset of detonation) is taking place and only correct the ignition advance for the spark plug of the cylinder concerned.
- d. **An accelerator pedal potentiometer** which transforms the angular value of the actual pedal into an electrical signal allowing the control unit to recognize minimum, partial and full load conditions.

### Functions of the injection/ignition system

In addition to electronically controlling the moment of ignition and the air flow rate during idling, in order to allow the engine to run smoothly when the ambient parameters and loads applied vary, the control unit should control and manage the injection in such a way that the stoichiometric (air/fuel) ratio is always within the optimum value.

The electronic control unit establishes the operating «time» for the injectors using a relatively simple rule which can be summarized as follows.

Taking the physical properties of the fuel (viscosity and density) and the difference in pressure between the pressure of the fuel and the pressure in the inlet manifolds as constant, the quantity of fuel to be injected only depends on the injector «opening time».

The injection/ignition system basically carries out the following functions:

- |                                                    |                                                              |
|----------------------------------------------------|--------------------------------------------------------------|
| - adjustment of injection time;                    | - control of the detonation;                                 |
| - adjustment of ignition advance;                  | - control of the phase transformer;                          |
| - check on cold starting;                          | - check on the inlet manifold                                |
| - check on the enrichment during acceleration;     | - self-adjustment of the system;                             |
| - fuel cut-off during deceleration;                | - autodiagnosis;                                             |
| - check on engine idle speed;                      | - connection with the engine immobilizer device (Fiat CODE); |
| - restriction of the maximum engine speed;         | - management of the climate control system;                  |
| - control of combustion through the Lambda sensor; | - management of the radiator fans.                           |
| - fuel vapour recovery;                            |                                                              |



## **SYSTEM MANAGEMENT STRATEGIES**

### **Adjustment of the injection time**

Digital technology has made it possible to achieve optimum fuel economy and performance using programmed maps, stored inside the electronic control unit memory, dependent of the engine speed and load.

The control unit controls the injectors with great speed and precision, calculating the opening time on the basis of the engine load (speed and air flow rate), also taking into account the battery voltage and the temperature of the engine coolant.

The injection is sequential and phased for each cylinder (the moment of injection is not simultaneous for all the cylinders) and takes place at the optimum injection point.

### **Adjustment of ignition advance**

Thanks to a map stored in its memory, the control unit is capable of calculating the advance according to the engine load conditions (minimum, partial, full according to the engine speed and air flow rate), the temperature of the intake air and the temperature of the engine coolant.

It is possible to selectively delay the ignition at the cylinders required, recognized by means of the combination of values recorded by the detonation and cam angle sensors.

### **Check on the cold starting**

Under these circumstances there is a natural weakening of the mixture as a result of the poor turbulence of the particles of fuel at low temperatures, the reduced evaporation and the condensation on the internal walls of the inlet manifold, all of which is exacerbated by the increased viscosity of the lubricant oil.

The electronic control unit recognizes this condition and corrects the injection time on the basis of the signal for the temperature of the coolant, the temperature of the intake air, the battery voltage and the engine speed.

The ignition advance depends exclusively on the engine speed and the temperature of the engine coolant.

During cold starting the control unit controls an initial simultaneous (full-group) injection for all the injectors and after recognition of the reference on the flywheel, it switches to the normal, sequential, phased operation. Starting when warm takes place straightaway in a phased sequential manner.

### **Check on the enrichment of the mixture during acceleration**

The control unit detects the acceleration request from the signal supplied by the accelerator pedal potentiometer and, as a result, increases the injection times and modifies the opening of the butterfly valve to reach the desired engine speed quickly.

If in response to an acceleration request, the variation in the signal supplied by the air flow meter exceeds a pre-set increase, the control unit not only adapts the injection to the new requirements, but also further increases it for several seconds to improve the responsiveness.

### **Fuel cut-off during deceleration**

When the accelerator pedal is released and beyond a pre-set engine speed threshold, the injection control unit cuts off the supply to the injectors.

With no supply, the engine speed starts to decrease at a rate which depends on the vehicle driving conditions.

Before reaching the idle speed, the dynamics of the engine speed decrease are verified.

If they are above a certain value, the fuel supply is partly reactivated on the basis of a logic which involves the "gentle accompaniment" of the engine during idling.

Having reached this condition, the normal functions for idling and cut-off during deceleration are only reactivated when the fuel cut-off threshold is exceeded to prevent the engine from not running smoothly. The levels for restoring the supply and the cut-off vary according to the engine temperature. There is another fuel cut-off logic in the control unit which intervenes in partial deceleration conditions, in other words when the engine load is lower.

The function is only activated if the new condition persists for a pre-set time and after the ignition advance angle has been adjusted for the new situation.

### **Check on the engine idle speed**

The control unit recognizes the "idle" condition (accelerator pedal released) from the signal supplied by the accelerator pedal potentiometer and according to the signals from the brake and clutch pedal switches and the electrical consumers being switched on (climate control and radiator fan) and operates the butterfly valve motor to produce an idle speed of  $700 \pm 50$  rpm.

The idle is also corrected by varying the ignition angle because it has a quicker effect.

The correct self-learning of the minimum and maximum butterfly opening positions is therefore essential for the effective control of the idle speed; it should be carried out at least once in production and each time the engine control unit or the motorized butterfly casing are replaced.

The self-adjustment function allows the adjustment of the idle, in time, to any variations in the conditions of the components which manage the idle.

### **Restriction of the maximum engine speed (protection outside of revs)**

When the engine speed exceeds 6,800 rpm, the electronic control unit reduces the operating times of the injectors to prevent the engine from being overloaded, also protecting it outside of revs.

If the engine idle speed exceeds 7,000 rpm, the control unit activates the fuel cut-off function, restoring the operation of the injectors when the speed goes below a certain level.

### **Check on combustion using the Lambda sensor**

The Lambda sensor informs the control unit of the quantity of oxygen present in the exhaust and therefore the correct metering of the air/fuel mixture by means of a voltage signal at two levels corresponding to a lean mixture and a rich mixture, respectively.

To obtain an ideal mixture for the operation of the three-way catalyzer and keep emissions to a minimum, the petrol injected must be kept to a pre-established (stoichiometric) ratio in relation to the intake air, measured from the unit value of the Lambda parameter ( $=1$ ); in the case of a lean mixture it is  $>1$ , in the case of a rich mixture it is  $<1$ .

The Lambda sensor, in contact with the exhaust gases, produces an electrical signal whose voltage depends on the concentration of oxygen present in the actual gases:

- if the mixture is lean ( $>1$ ), the sensor provides a low voltage level ( $<200$  mV) and the control unit slightly increases the quantity of petrol injected;
- if the mixture is rich ( $<1$ ), the sensor provides a high voltage level ( $>800$  mV) and the control unit reduces the quantity of petrol injected.

The closed-loop management of the Lambda sensor allows the control unit to keep the Lambda value very close to the theoretical unitary value, also aided by suitable self-adjustment functions.

The control unit also manages the supply of the Lambda sensor heater. In effect, on the basis of the engine speed and load conditions, the control unit processes a forecast for the temperature of the exhaust gases and consequently controls the heater supply current, restricting it to the actual needs depending on the engine conditions.



# 10.

### Fuel vapour recovery

The fuel vapours (pollutant according to regulations) are sent to an active charcoal filter and from these to the engine where they are burnt; this takes place by means of a solenoid valve which is only operated by the control unit when the engine load condition is such as to allow correct combustion without the operation of the engine being "disturbed": in effect, the control unit compensates for this quantity of incoming petrol by reducing the supply to the injectors.

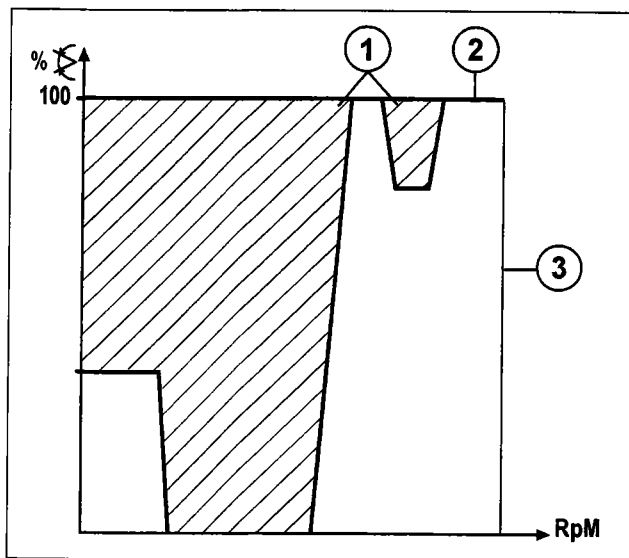
### Control of the detonation

This function is designed to detect the presence of the phenomenon of detonation (engine knock), by processing the signal coming from the appropriate sensors. The control unit continuously compares the signals coming from the sensors with a threshold value which is, in turn, constantly updated to take into account background noise and the ageing of the engine.

The control unit is therefore capable of detecting the presence of detonation (or the onset of detonation) and reduces the ignition advance (by 3° up to a maximum of about 9°), until the phenomenon disappears. Later on, the advance is gradually restored to the basic value.

In acceleration conditions, a higher threshold is used, to take into account the increased engine noise under these circumstances. The detonation control strategy is also equipped with a self-adjustment function which memorizes the reductions in the advance which are continuously repeated to adapt the map to the different conditions in which the engine finds itself.

### Control of the phase transformer



1. Transformer in ON position
2. Accelerator pedal fully depressed
3. Maximum speed limit

Obviously the control of the phase transformer operates with a hysteresis field, in other words the level at which the solenoid valve is activated is always higher than the level at which it is deactivated; this is designed to avoid balance conditions and too rapid a succession from one timing diagram to another with obvious operating problems.

### Check on the inlet manifold

The control unit controls the geometry of the inlet manifolds to optimize the quantity of air drawn in by the engine.

The control unit selects short ducts for speeds above 4500 RPM and high engine loads.

In other engine operating conditions, the control unit selects a configuration with long ducts.

The control unit controls the solenoid valve for the phase transformer hydraulic actuator (fitted on the camshaft, inlet side) by means of a relay.

The transformer has two operating positions:

- A. OFF position (power, reduced engine loads and idling), corresponding to the normal camshaft value;
- B. ON position (torque), corresponding to an 18° crankshaft advance for the camshaft.

The transformer, normally in the OFF position, is switched to the ON position according to the engine load and rotation speed, as illustrated in the diagram.

In any case, the ON position is only enabled for coolant temperatures above 40°C.

### Self-adjustment of the system

The control unit is equipped with a self-adjustment function which is designed to recognize the changes which take place in the engine due to the bedding in processes over a period of time and the ageing of both the components and the engine itself.

These changes are memorized in the form of modifications to the basic map and are designed to adapt the operation of the system to the gradual alterations to the engine and components compared with when new.

This adjustment function also makes it possible to compensate for inevitable differences (due to production tolerances) in any components which are replaced. This means that all vehicles can have the best results without special adjustment and control operations.

### Autodiagnosis

The ME 3.1 injection/ignition system is also equipped with an "**autodiagnostic**" function which memorizes any faults in the sensors and actuators, making it easier to identify and correct them. A fault is signalled by the warning light in the instrument panel coming on.

### Connection with the engine immobilizer device (Fiat CODE)

To increase protection against theft attempts, the vehicle has been equipped with an engine immobilizer system (Fiat CODE) which only allows the injection/ignition control unit to be activated by an electronic code.

Each time the key is turned to the OFF position, the FIAT CODE system completely deactivates the injection/ignition control unit.

If the ignition key is turned from OFF to ON, the following operations take place in order:

1. The injection/ignition control unit sends the Fiat CODE control unit a request for a secret code in order to deactivate the immobilizer function.
2. The Fiat CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key, which contains a special transponder.
3. The recognition of the secret code allows the de-activation of the immobilizer function and the injection/ignition control unit can activate the normal system management programme.

A special two-way serial line allows the exchange of data between the injection/ignition control unit and the Fiat CODE control unit.

If there is a fault with the Fiat CODE system, the engine can be started up using the emergency procedure.



*Given the presence of the Fiat CODE system **DO NOT** carry out tests using another injection/ignition control unit during the fault diagnosis and/or operating checks. In such a case, the Fiat CODE control unit would transfer the (unrecognized) recognition code to the test control unit which could then no longer be used on other vehicles.*

## 10.

### Management of the climate control system

The injection/ignition control unit is operationally connected to the climate control system, in that:

1. it receives a request to switch on the compressor from the climate control control unit via pin F6 and carries out the relevant operations (additional air);
2. it gives the go ahead to switch on the compressor via pin F13, when the conditions planned by the strategies are verified;
3. it receives information concerning the state of the four stage pressure switch from pins F9 and F41 and operates the appropriate interventions (operation of the radiator fan).

As far as point 1 is concerned,, if the engine is idling, the control unit increases the flow rate of the air passing through the motorized butterfly casing before the compressor is switched on and conversely it returns the actuator to the normal position after the compressor is switched off.

On the other hand, as far as point 2 is concerned, the control unit switches off the compressor automatically:

- for several seconds (timed disengagement):
  - when the engine power request conditions are high (strong acceleration);
  - during engine take-off;
- as long as the following critical conditions persist:
  - at engine coolant temperatures above a certain value;
  - at engine speeds above or below a certain threshold.

### Management of the radiator fan

The control unit directly controls the operation of the radiator fan according to the temperature of the engine coolant and the engagement of the climate control system.

The fan is switched on when the temperature exceeds 98°C (1st speed) and 101°C (2nd speed). It is switched off with a hysteresis of 2°C below the temperature threshold.

### AIR INTAKE CIRCUIT

The 1998 5 cylinder 20 valve engine is fitted with a special system of air inlet ducts. The manifold consists of two half shells and an internal rocker element (module) which, operated by a special pneumatic actuator, can assume two positions and alter the length of the inlet ducts (variable geometry).

In this way it is possible to produce give long (torque) ducts or five short (power) ducts.

The two different length ducts operate alternately allowing maximum thermal efficiency at different speeds.

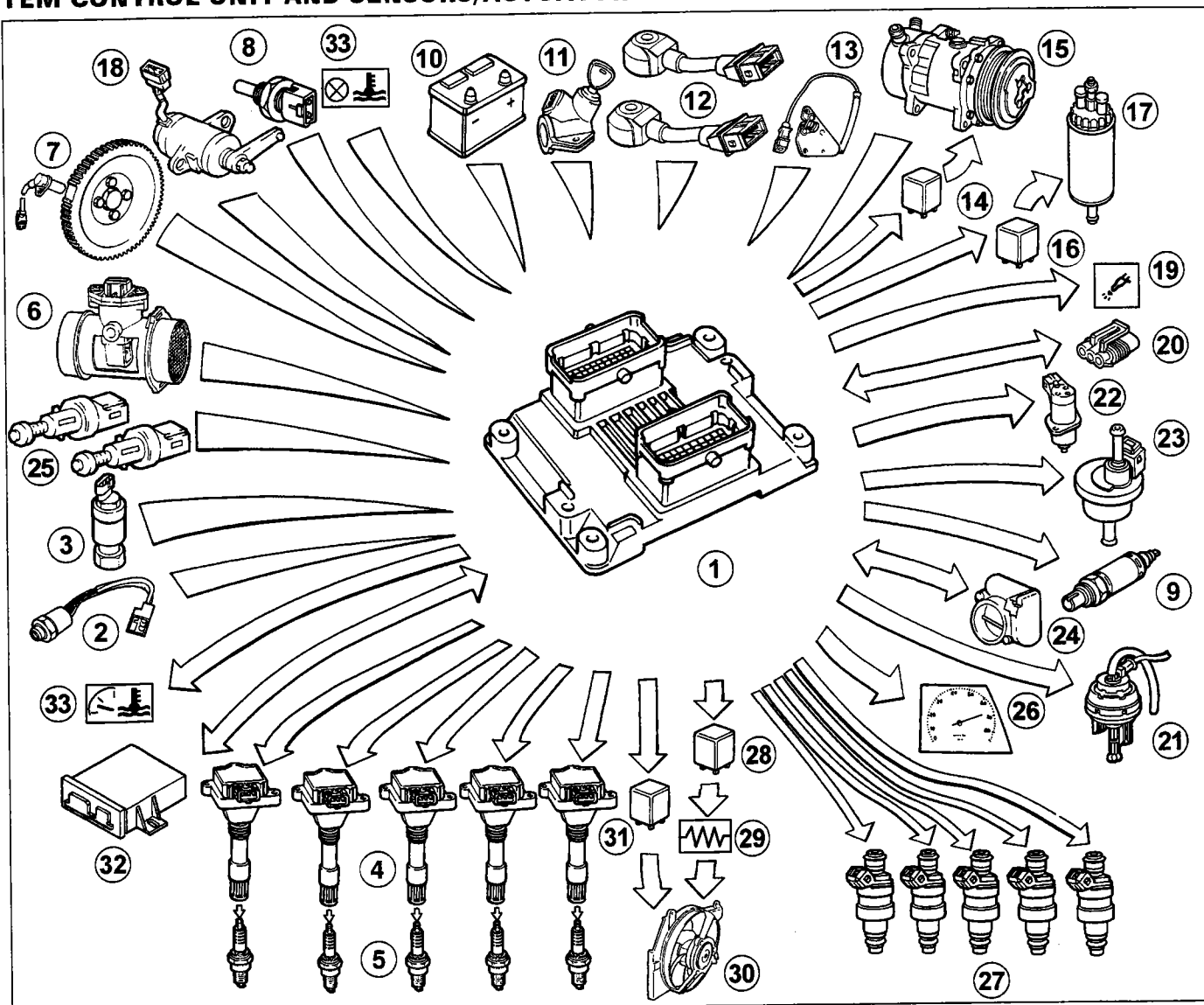
By selecting the appropriate length for the inlet duct it is possible to ensure that the fluctuations in the column of gas entering, due to the inlet, are timed with the movement of the valve, to increase the effect of the inertia of the gaseous mass in the cylinder.

It is therefore possible to achieve better thermal efficiency than normal.

The device obviously operates with a hysteresis field, in other words, the changes from a "power" duct and viceversa, do not always take place at the same engine speed

This is to avoid the possible creation of balance conditions and too rapid a succession from one length to another with obvious operating problems.

**DIAGRAM SHOWING INFORMATION ENTERING/LEAVING THE INJECTION/IGNITION SYSTEM CONTROL UNIT AND SENSORS/ACTUATORS**



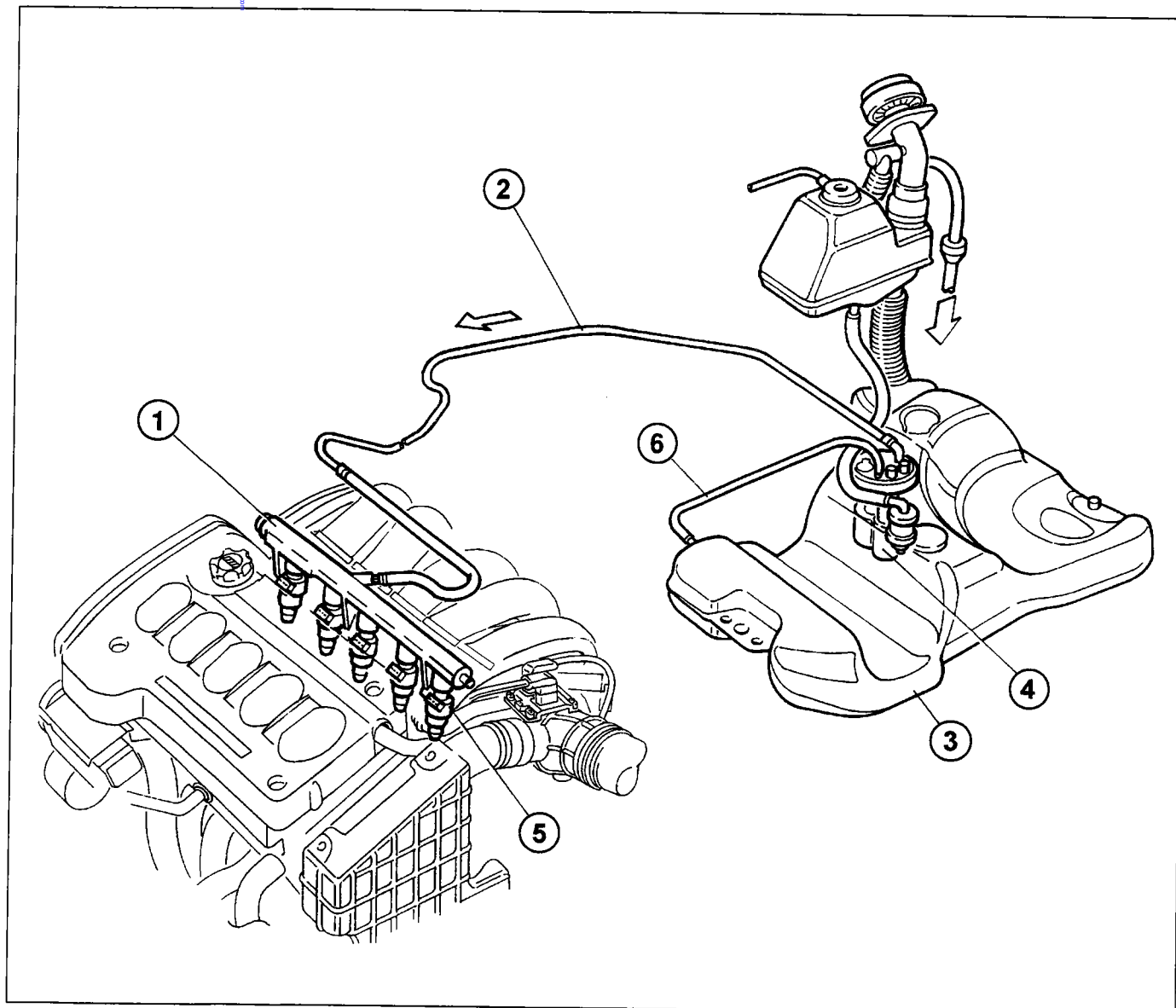
P4A09LJ01

1. Electronic control unit
2. Four stage pressure switch
3. Speedometer sensor
4. Coils
5. Spark plugs
6. Flow meter
7. Rpm sensor
8. Coolant temperature sensor
9. Lambda sensor
10. Battery
11. Ignition switch
12. Detonation sensors
13. Timing sensor
14. Air conditioning compressor relay
15. Climate control system
16. Electric fuel pump relay
17. Electric fuel pump
18. Accelerator pedal potentiometer
19. System failure warning light

20. Diagnostic socket
21. Variable geometry inlet manifold solenoid valve
22. Phase transformer solenoid valve
23. Fuel vapour solenoid valve
24. Butterfly casing actuator
25. Brake and clutch pedal switch
26. Rev counter signal
27. Injectors
28. Radiator fan 1st speed relay
29. Radiator fan 1st speed resistance
30. Radiator fan
31. Radiator fan 2nd speed relay
32. Fiat CODE control unit
33. Water temperature gauge

# 10.

## DIAGRAM SHOWING FUEL SUPPLY CIRCUIT



P4A10LJ01

- |                                      |                                                          |
|--------------------------------------|----------------------------------------------------------|
| 1. Fuel supply manifold              | 4. Electric fuel pump with filter and pressure regulator |
| 2. Fuel supply pipe to the injectors | 5. Injectors                                             |
| 3. Tank                              | 6. Breather pipe                                         |

The fuel is supplied by an electric pump immersed in the tank which draws in the fuel and sends it to the filter and from there to the injectors.

The fuel supply system is the returnless type, in other words with one single connecting pipe between the fuel tank and the engine.

This system makes it possible to:

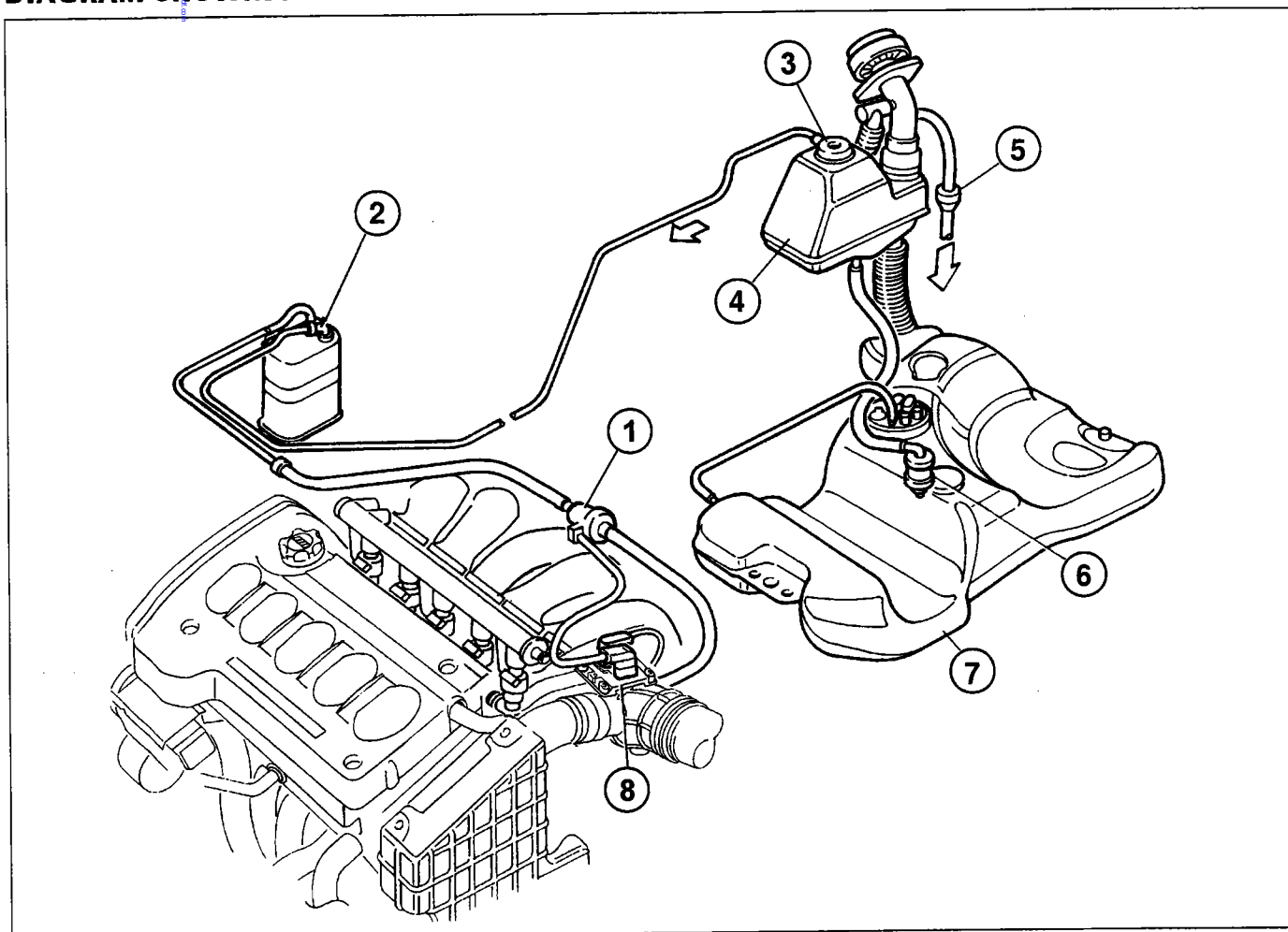
- keep the risk of the vehicle catching fire in the case of an accident to a minimum;
- reduce the emission of fuel vapours in the atmosphere.

The electric fuel pump is enclosed in a casing which also incorporates the fuel pressure regulator, the fuel gauge and the fuel filter.

The system is also fitted with an inertia switch which interrupts the supply from the electric fuel pump in the case of an impact.



**DIAGRAM SHOWING FUEL ANTI-EVAPORATION CIRCUIT**



P4A11LJ01

1. Fuel vapour cut out solenoid valve
2. Charcoal filter
3. Multi-purpose valve
4. Fuel vapour separator

5. Safety and ventilation valve
6. Float valve
7. Tank
8. Injection/ignition control unit

The anti-evaporation system is designed to prevent the fuel vapours, consisting of the lightest particles of hydrocarbons which form in the tank, from being discharged into the atmosphere.

The system works, above all, at high outside temperatures, when the temperature of the fuel increases and consequently the tendency towards evaporation increases; in this situation, there is an increase in the pressure inside the tank (7).

In particular, even when the tank (7) is full, when the vehicle is stationary, the float valves (6) remain open, as they are located higher than the breather pipe and therefore they allow the vapours to reach the separator (4), from where, when they condense, they mainly return to the tank (7).

In the case of spillage whilst driving or if the vehicle overturns, the float valves (6) close, preventing fuel from escaping.

When the pressure inside the tank reaches approximately 30-40 mbar, the multi-purpose valve (3) opens and the fuel vapours reach the charcoal filter (2). The valve (3) also allows an intake of air into the tank through the charcoal filter, for example after the level of the fuel decreases with the consequent vacuum created inside the tank.

With the engine running, the control unit (8) controls the fuel vapour cut out solenoid valve (1), which allows the intake of vapours by the engine and the consequent scavenging of the charcoal filter (2).

If, as a result of the malfunction of a component, the pressure inside the tank increases to dangerous levels, the safety valve (5), located near the cap, allows the pressure to be discharged outwards. If necessary, this valve can open in the other direction to ventilate the tank and prevent the vacuum reaching excessive levels.

### 10.

#### SYSTEM FOR RECIRCULATING GASES COMING FROM THE ENGINE CRANKCASE (BLOW-BY)

This system controls the emissions, from the cylinder block/crankcase, of the breather gases made up of air/petrol mixtures and burnt gases which escape from the piston seals, in addition to lubricant oil vapours, recirculating them to the inlet.

The breather gases, directed by special partitions, rise by the engine oil filler, then pass through the coils (7), under the tappet cover, where they lose some of the oil they contain which goes to the camshafts, through the pipe (6), in the form of droplets.

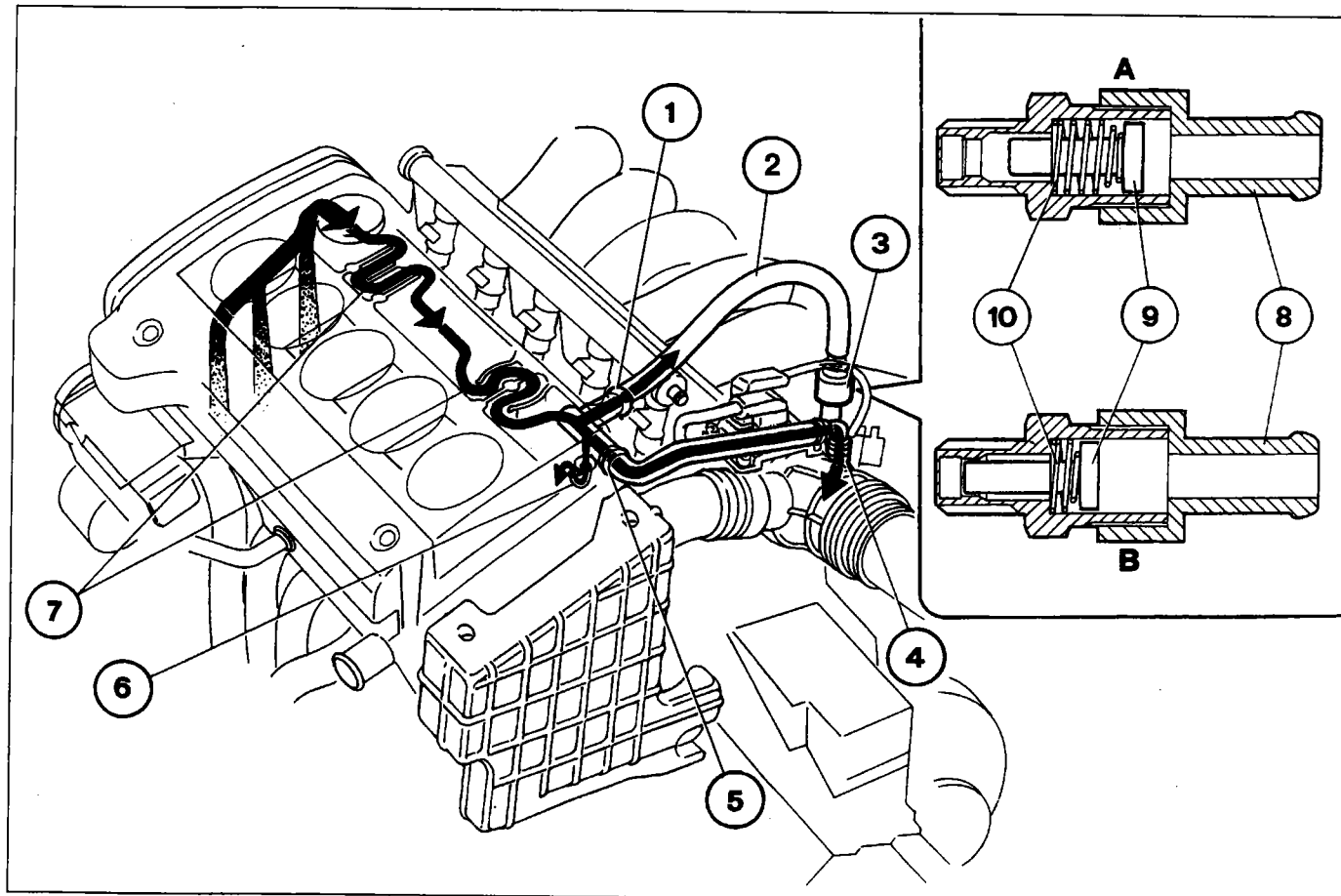
The pipe (6) is shaped like a siphon to prevent the escape of breather gases and only allow the recirculation of drops of oil.

With the butterfly open, the gases come out of the intake (5) and are sent, via the connector (4) on the air hose, upstream of the butterfly valve, to be drawn into the manifold.

With the butterfly closed, the vacuum in the inlet manifold draws in the gases through the intake (1) and they reach the connector (3) on the inlet manifold, via the pipe (2), which contains a PCV (Positive Crank Ventilation) relief valve (8) which shutters the inlet.

The PCV valve can, in effect, be modulated and the quantity of gases which pass through is proportional to the vacuum in the inlet manifold.

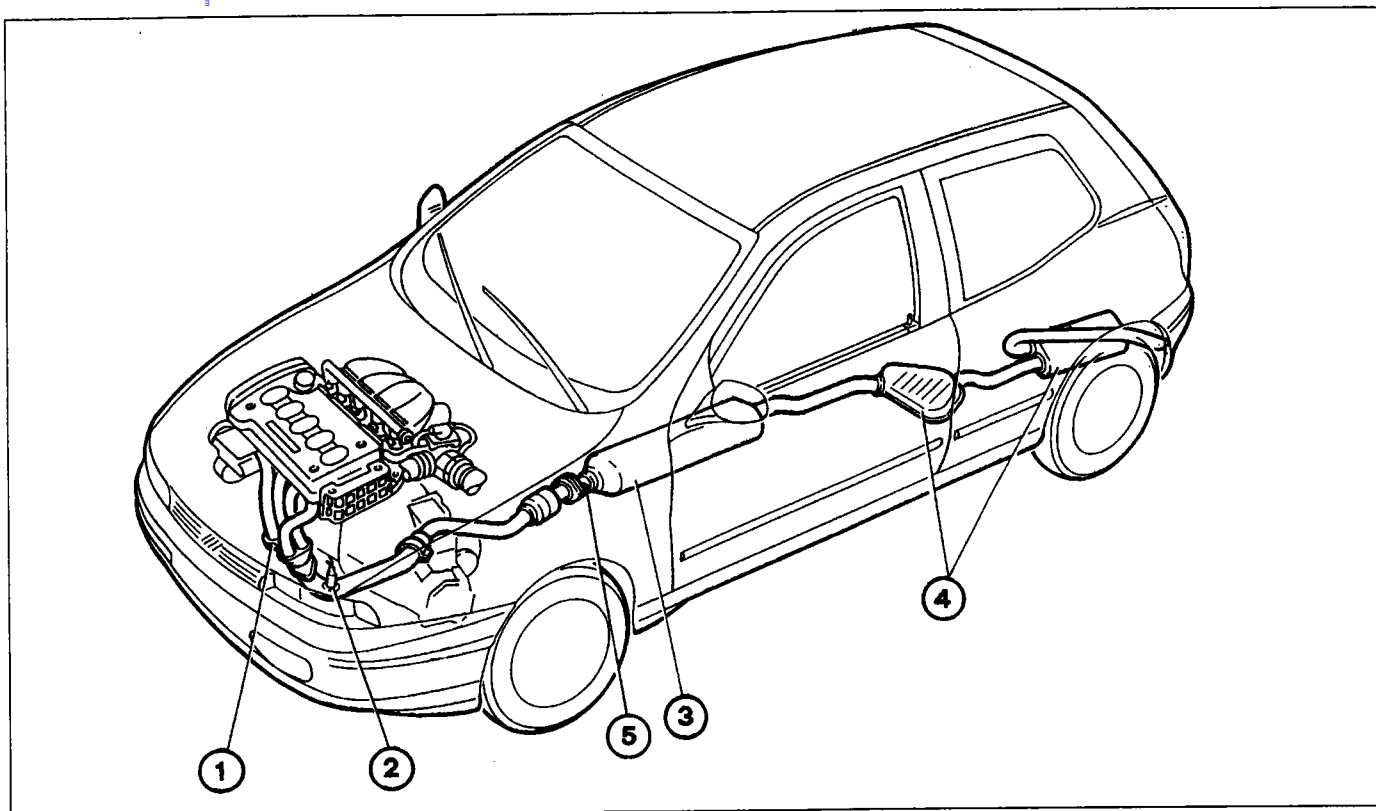
When the butterfly valve is completely open (condition A), the vacuum inside the inlet manifold is minimal, the spring (10) is fully extended and the PCV valve allows the maximum flow of breather gases. Conversely, with the butterfly completely closed (condition B), the vacuum inside the manifold is maximum, which causes the movement of the small piston (9) which shutters the section of the flow of breather gases inside the PCV valve thereby limiting the intake of the actual gases into the manifold.



P4A12LJ01



## ENGINE EXHAUST ASSEMBLY DIAGRAM



P4A13LJ01

1. Exhaust manifold
2. Lambda sensor

3. Catalytic silencer
4. Silencers
5. Presa CO

The control of the mixture strength, which is the closed-loop type, is activated by the Lambda sensor which measures the oxygen content of the exhaust gases upstream of the catalytic silencer.

The Lambda sensor measurements allow the electronic control unit to continuously correct the quantity of petrol injected keeping the air/fuel ratio constant.

This ensures the control of the harmful exhaust emissions, a job completed by the three way catalytic converter (catalytic silencer).

The efficient operation of the catalytic silencer and consequently containing the toxicity of the exhaust gases depends on the air/fuel ratio which the engine receives.

The three-way catalytic converter makes it possible to simultaneously keep down the levels of the three pollutant gases present in the exhaust gases: unburnt hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NOx).

Two types of chemical reaction take place inside the converter:

- oxidation of the CO and the HC, converted into carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O);
- reduction of the NOx, converted into Nitrogen (N<sub>2</sub>).

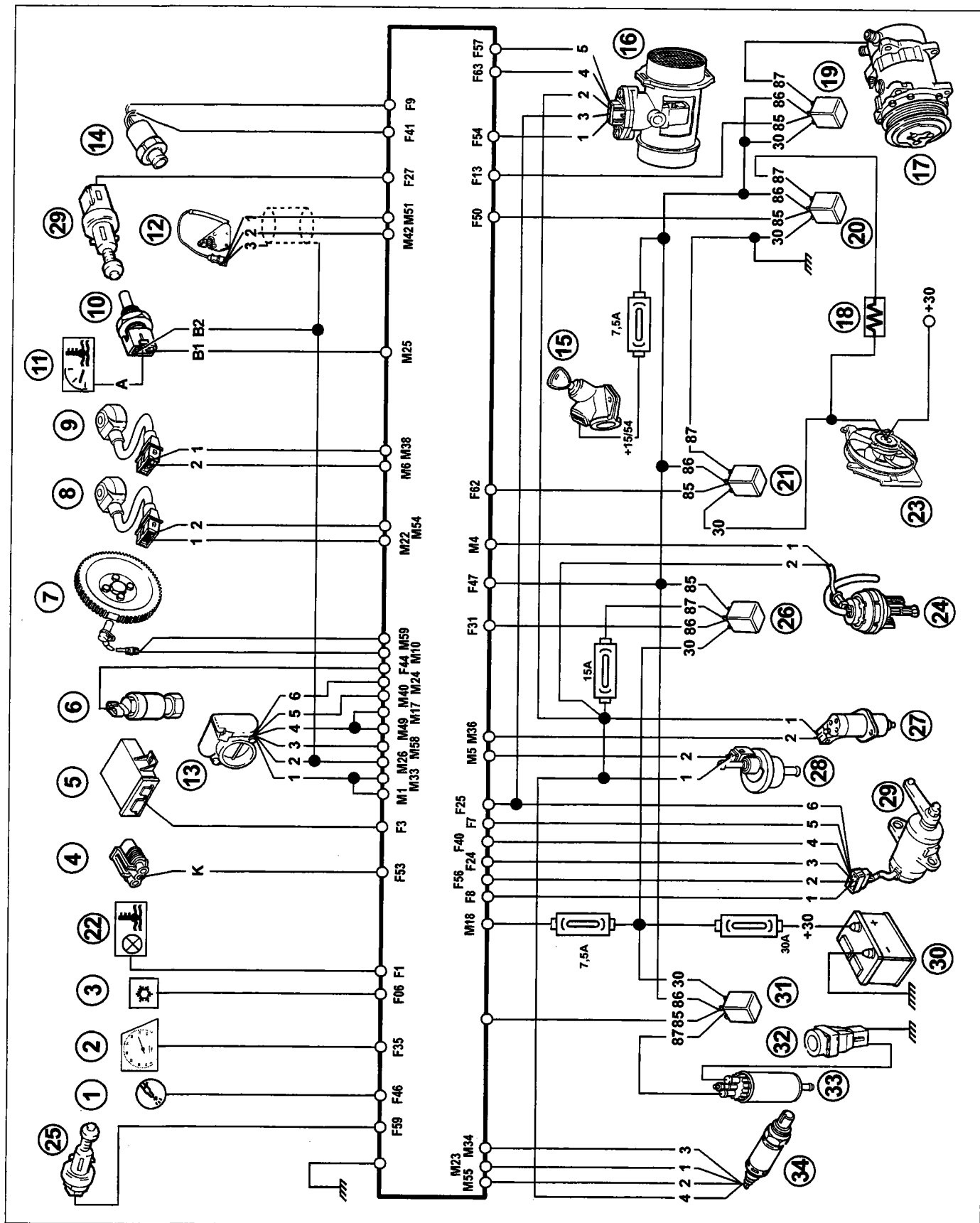
The following would put the catalytic converter out of use and make it irreparable:

- the presence of lead in the petrol which lowers the degree of conversion to such levels that the presence of the catalytic converter in the system is useless;
- the presence of unburnt petrol in the converter: in effect, a flow of petrol for 30s in an ambient of 800 °C (temperature inside the silencer) is sufficient to cause the catalyzer to melt and break.

It is vital for the injection/ignition system to be in perfect working order, therefore **the spark plug leads should never be disconnected with the engine running and, the catalytic converter should be replaced with an equivalent section of pipe in the case of tests.**

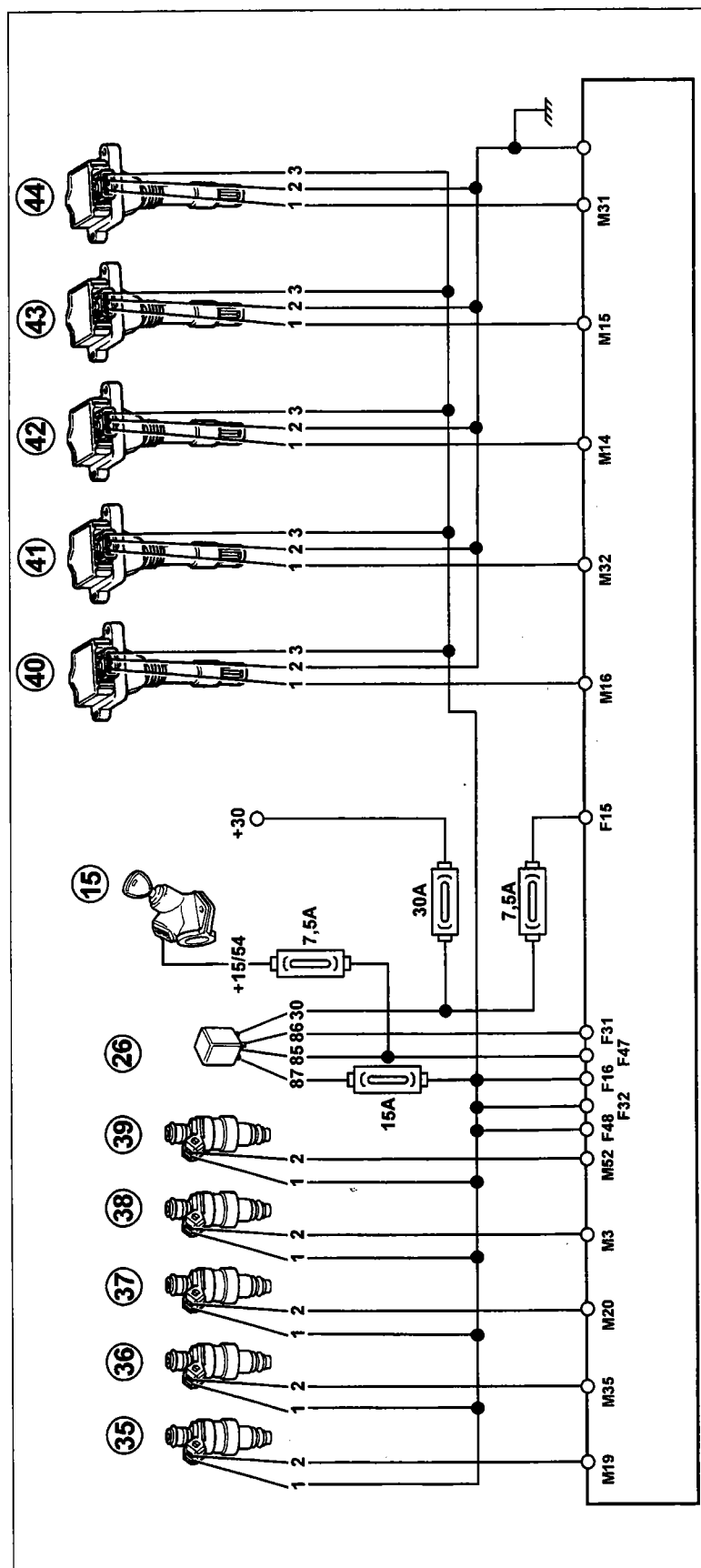
### 10.

#### INJECTION/IGNITION SYSTEM WIRING DIAGRAM



P4A14LJ01

**Connection between control unit/ignition coils and injectors**



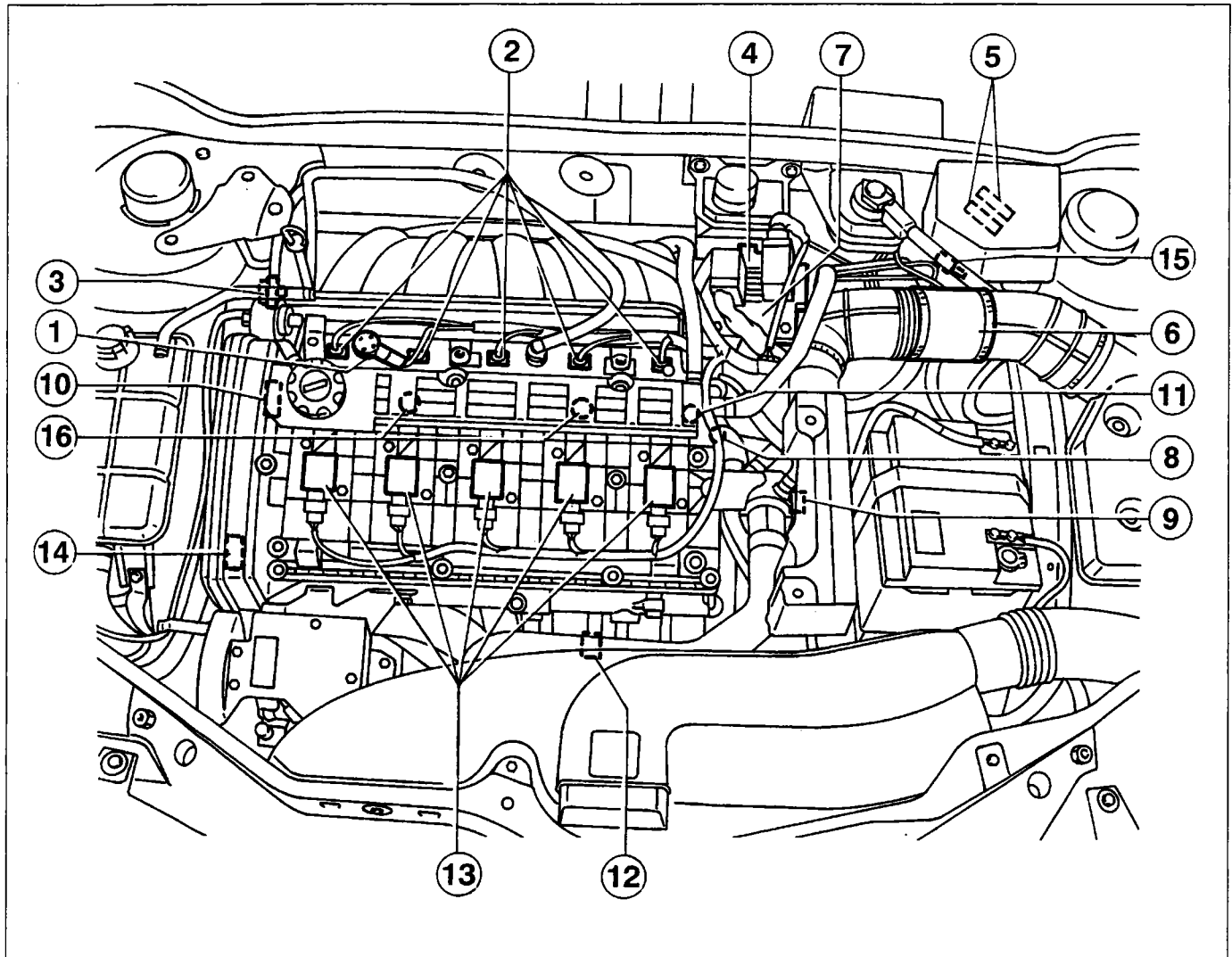
**Key:**

1. Injection/ignition system failure warning light
2. Rev counter signal
3. Engagement of climate control
4. Diagnostic socket
5. Fiat CODE control unit
6. Vehicle speed sensor
7. Rpm and TDC sensor
8. Detonation sensor 1
9. Detonation sensor 2
10. Coolant temperature sensor
11. Engine coolant temperature gauge
12. Timing sensor
13. Butterfly casing actuator
14. Four stage pressure switch
15. Ignition switch
16. Flow meter
17. Air conditioning compressor
18. Radiator fan 1st speed resistance
19. Air conditioning compressor electro-magnet coupling relay
20. Radiator fan 1st speed relay
21. Radiator fan 2nd speed relay
22. Coolant overheating warning light
23. Radiator fan
24. Variable geometry manifold fan
25. Clutch pedal switch
26. Injection/ignition system relay feed
27. Phase transformer solenoid valve
28. Fuel vapour solenoid valve
29. Brake pedal switch
30. Battery
31. Electric fuel pump and Lambda sensor relay
32. Inertia switch
33. Electric fuel pump
34. Lambda sensor
- 35-39. Injectors N°s 1 to 5
- 40-44. Ignition coils for cylinders N°s 1 to 5
45. Accelerator pedal potentiometer

P4A15LJ01

# 10.

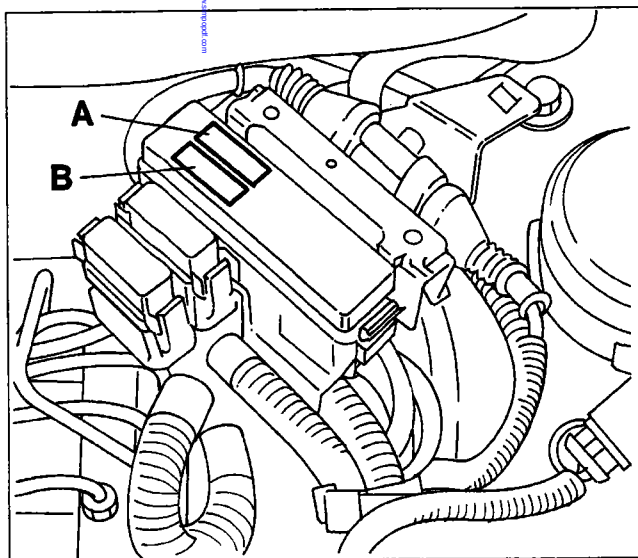
## LOCATION OF INJECTION/IGNITION SYSTEM COMPONENTS



P4A16LJ01

### Key

- |                                       |                                                        |
|---------------------------------------|--------------------------------------------------------|
| 1. Phase transformer solenoid valve   | 9. Vehicle speed sensor                                |
| 2. Injectors                          | 10. Variable geometry manifold actuator solenoid valve |
| 3. Fuel vapour cut out solenoid valve | 11. Rpm sensor                                         |
| 4. Injection/ignition control unit    | 12. Lambda sensor                                      |
| 5. General system protective fuse     | 13. Ignition coils                                     |
| 6. Flow meter/air temperature sensor  | 14. Timing sensor                                      |
| 7. Motorized butterfly casing         | 15. Diagnostic socket                                  |
| 8. Coolant temperature sensor         | 16. Detonation sensors                                 |



P4A22JJ01

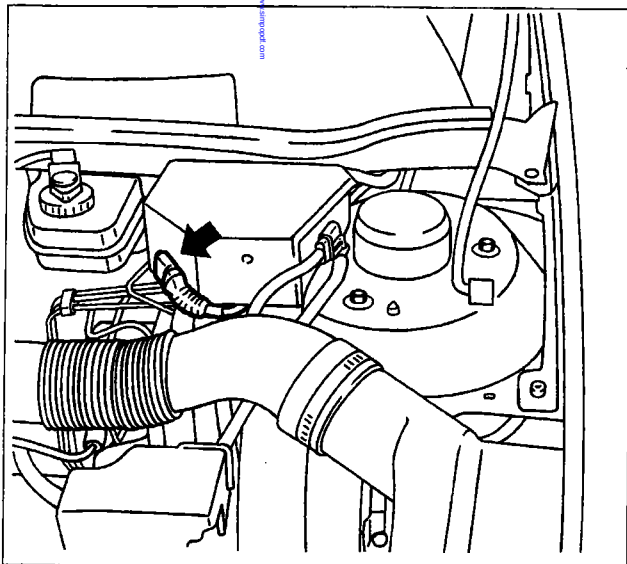
## FUSES AND RELAYS

**NOTE** For more information, see Group 55-Electrical equipment

### Main fuses (maxi-fuse)

- A. system fuse
- B. fuse controlled by the ignition

### 10.



P4A15JJ01

#### DIAGNOSTIC SOCKET

The exchange of data between the injection/ignition control unit and the diagnostic equipment takes place via a two direction serial line (line K) using the standard Bosch communication protocol.

The transmission is in positive logic and the coding takes place via the NRZ method (Non Return Zero) at a baud rate of 4.8 kbaud (208  $\mu$ s/bit  $\pm$ 5%)

#### Location of diagnostic socket

The arrow in the diagram shows the location of the diagnostic socket.

#### INJECTION/IGNITION SYSTEM COMPONENTS

The injection/ignition system basically consists of wiring, an electronic control unit (I.E. control unit) and the following sensors/actuators:

##### Sensors

- Speedometer sensor
- Rpm and T.D.C. sensor
- Detonation sensors
- Coolant temperature sensor
- Timing sensor
- Butterfly valve position sensor (integrated in the butterfly casing actuator)
- Intake air temperature sensor
- Intake air temperature and flow rate sensor (flow meter)
- Lambda sensor
- Accelerator pedal potentiometer
- Brake pedal switch
- Clutch pedal switch

##### Actuators

- Butterfly casing actuator
- Phase transformer solenoid valve
- Fuel vapour cut out solenoid valve
- Variable geometry manifold solenoid valve
- Electric fuel pump (including filter and pressure regulator)
- Injectors
- Ignition coils
- Spark plugs

#### INJECTION/IGNITION SYSTEM WIRING

The various system components are connected by two distinct sets of wiring.

The engine side wiring (connector M) connect the components fitted on the engine to the injection control unit; the vehicle side wiring (connector F) connects the other components to the control unit and constitutes the interface with the other vehicle wiring.

The two connectors (M and F) are the same and both have 64 pins, but due to the presence of special keys it is not possible to mix up the control unit connector wiring.

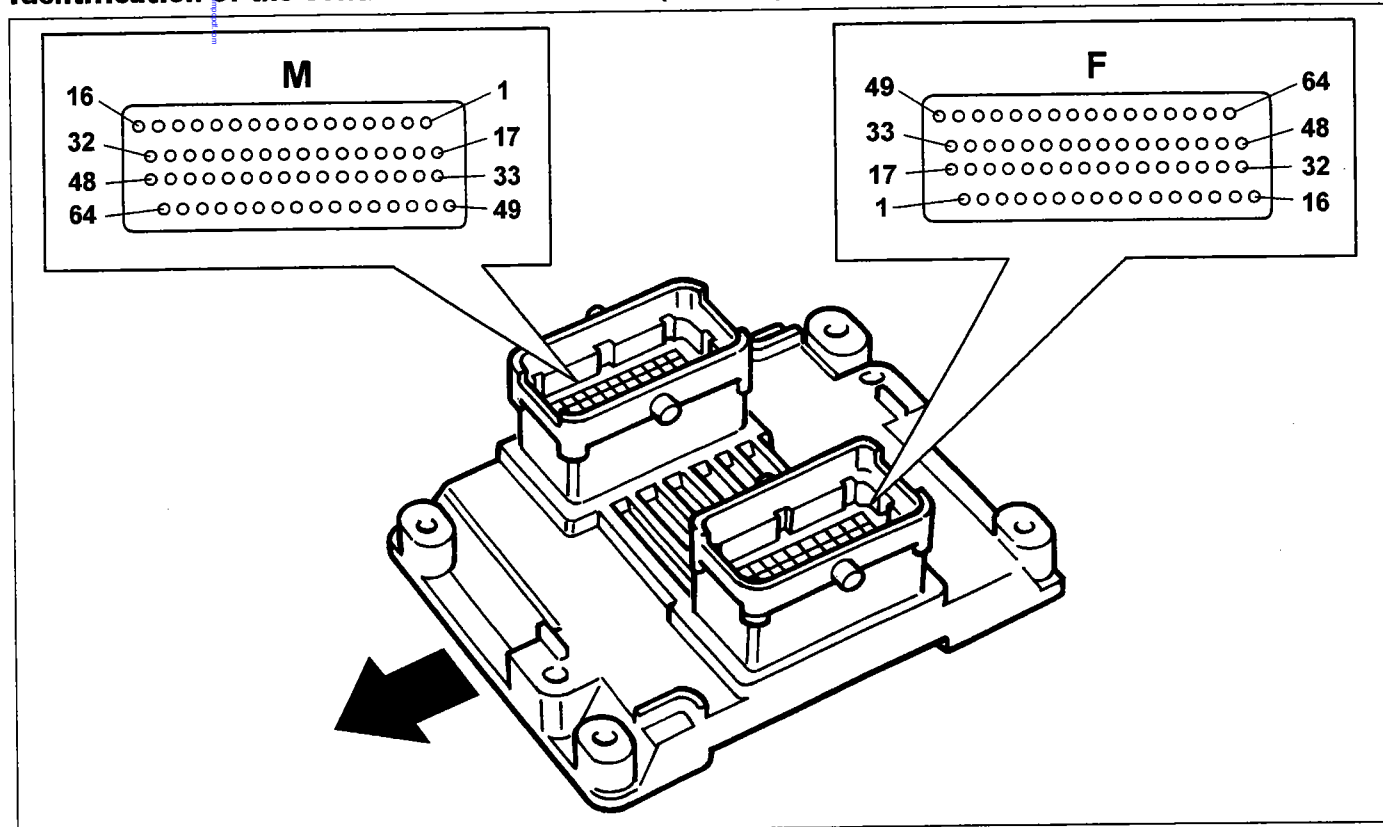
#### INJECTION/IGNITION ELECTRONIC CONTROL UNIT

The injection/ignition electronic control unit is located in the engine compartment, fixed to a bracket to the side of the inlet manifold.

The control unit processes the signals coming from the various sensors through the application of software algorithms and operates the actuators (in particular the injectors and the pressure regulator) in order to ensure the optimum engine operation.

The control unit is the "flash E.P.R.O.M." type which can be reprogrammed from the outside without involving the hardware.

**Identification of the control unit connections (Pin-out)**



P4A19LJ01

**Connector F**

1. Engine coolant overheating warning light
2. Not connected
3. Fiat CODE control unit
4. Not connected
5. Not connected
6. Request to engage climate control system compressor
7. Supply for accelerator pedal potentiometer 1
8. Signal for accelerator pedal potentiometer 1
9. Request to engage radiator fan low speed
10. Not connected
11. Not connected
12. Not connected
13. Engagement of climate control system compressor
14. Not connected
15. Supply from battery
16. Supply from relay
17. Not connected
18. Not connected
19. Not connected
20. Not connected
21. Not connected
22. Not connected
23. Not connected

**Connector M**

1. Butterfly casing motor (-)
2. Not connected
3. Injector for cylinder 4
4. Variable geometry manifold actuator
5. Fuel vapour cut out solenoid valve
6. Reference earth for detonation sensor 2
7. Not connected
8. Not connected
9. Not connected
10. Not connected
11. Not connected
12. Not connected
13. Not connected
14. Ignition coil for cylinder 3
15. Ignition coil for cylinder 4
16. Ignition coil for cylinder 1
17. Butterfly casing motor (+)
18. Not connected
19. Injector for cylinder 1
20. Injector for cylinder 3
21. Not connected
22. Detonation sensor 1 signal
23. Lambda sensor signal



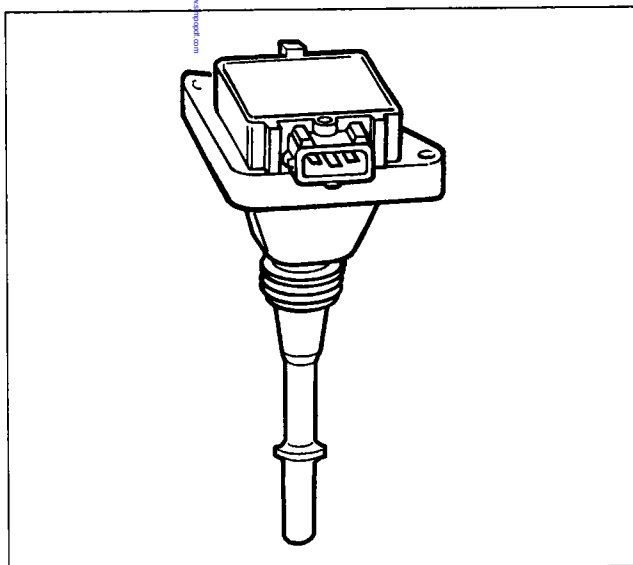
### 10.

#### Connector F

- 24. Accelerator pedal potentiometer 1 earth
- 25. Accelerator pedal potentiometer 2 earth and air flow meter
- 26. Not connected
- 27. Brake pedal switch
- 28. Not connected
- 29. Not connected
- 30. Electric fuel pump relay
- 31. Go ahead for fuel system relay
- 32. Supply from relay
- 33. Not connected
- 34. Not connected
- 35. Rev counter signal
- 36. Not connected
- 37. Not connected
- 38. Not connected
- 39. Not connected
- 40. Accelerator pedal potentiometer 2 signal
- 41. Request to engage radiator fan high speed
- 42. Not connected
- 43. Not connected
- 44. Vehicle speed signal
- 45. Not connected
- 46. Injection system failure
- 47. Supply from ignition switch
- 48. Supply from relay
- 49. Not connected
- 50. Go ahead to engage radiator fan low speed
- 51. Not connected
- 52. Not connected
- 53. Diagnostic socket, line K
- 54. Intake air temperature signal
- 55. Not connected
- 56. Accelerator pedal potentiometer 2 supply
- 57. Intake air quantity signal
- 58. Not connected
- 59. Clutch pedal switch
- 60. Not connected
- 61. Not connected
- 62. Go ahead to engage radiator fan high speed
- 63. Reference voltage for flow meter
- 64. Not connected

#### Connector M

- 24. Butterfly casing potentiometer 1 signal
- 25. Coolant temperature
- 26. Butterfly casing, temperature sensor potentiometers 1 and 2 reference earth
- 27. Not connected
- 28. Not connected
- 29. Not connected
- 30. Not connected
- 31. Ignition coil for cylinder 5
- 32. Ignition coil for cylinder 2
- 33. Butterfly casing motor (-)
- 34. Lambda sensor heater earth
- 35. Injector for cylinder 2
- 36. Phase transformer solenoid valve
- 37. Not connected
- 38. Detonation sensor 2 signal
- 39. Not connected
- 40. Butterfly casing potentiometer 2 signal
- 41. Not connected
- 42. Timing sensor signal
- 43. Not connected
- 44. Not connected
- 45. Not connected
- 46. Not connected
- 47. Not connected
- 48. Not connected
- 49. Butterfly casing motor (+)
- 50. Not connected
- 51. Timing sensor reference voltage
- 52. Injector for cylinder 5
- 53. Not connected
- 54. Detonation sensor 1 reference earth
- 55. Lambda sensor reference earth
- 56. Not connected
- 57. Not connected
- 58. Butterfly casing potentiometer 1 and 2 supply
- 59. Engine rpm sensor
- 60. Not connected
- 61. Not connected
- 62. Not connected
- 63. Not connected
- 64. Not connected



P4A21LJ01

### IGNITION COILS (0.221.504.014)

The ignition is the static advance electronic type with a single coil for each spark plug; this solution eliminates the high tension circuit, increasing reliability and safety and decreasing the risk of interference due to high tension leads and connections.

It involves a regular coil which raises the voltage of the impulse sent to the spark plugs: each individual coil, located in the cylinder head, supplies a spark plug directly without intermediate cables.

### Checking ignition coil primary circuit resistance

The resistance is checked by connecting an ohmmeter to the connector external pins ( 1 and 3):

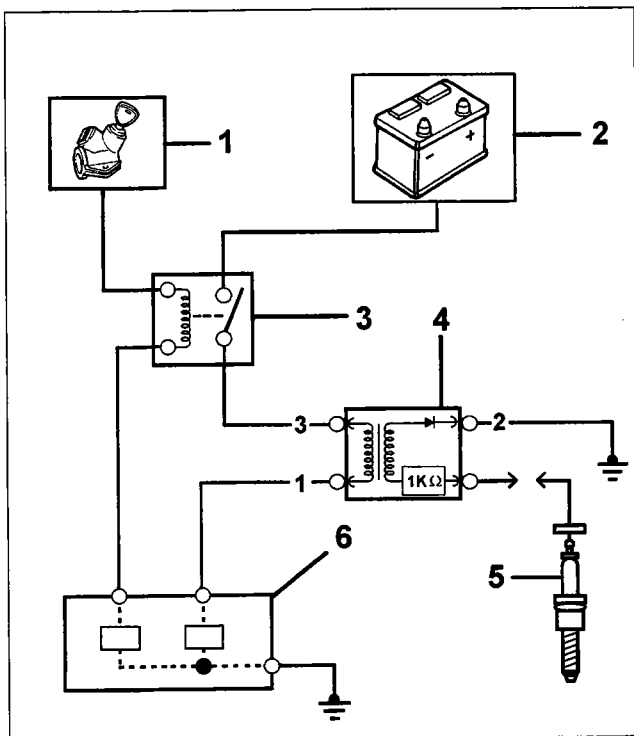
**Primary winding resistance: 0.73 ohm**

### Electrical specifications

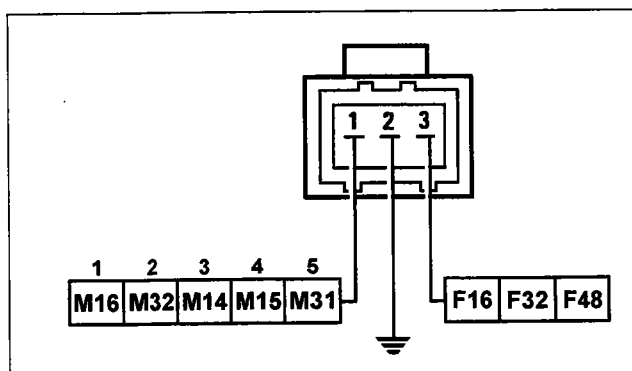
Primary winding inductance..... 2,5 mH  
Primary winding resistance..... 0,73  $\Omega$   
Anti-interference resistance ..... 1 K $\Omega$

### Diagram showing electrical connections

- A. Control signal
- X. Primary winding
- Y. Secondary winding
- 1. Supply from ignition switch
- 2. Single coil
- 3. Electronic control unit
- 4. Spark plug



P4A21LJ02

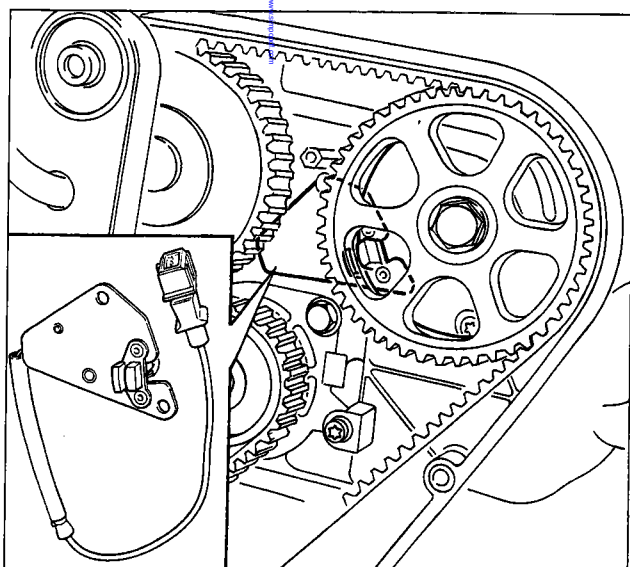


P4A21LJ03

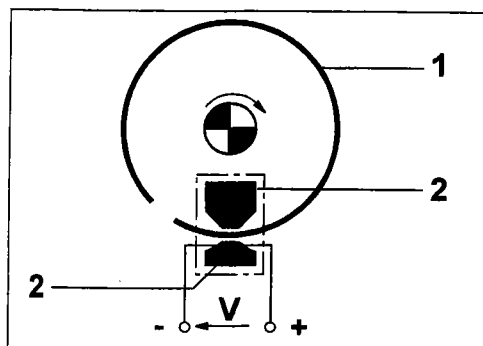
### Wiring connector

The numbers in the boxes, connected to pin 1, indicate the corresponding control unit pins arranged in the order of the cylinder numbers.

### 10.



P4A22LJ01



P4A22LJ02

1. Deflector (pulley ring)
2. Magnetic material

### Operating principle

A semi-conductor layer, which the current passes through, immersed in a normal magnetic field (lines of force perpendicular to the direction of the current) produces a difference in power, known as "HALL" voltage.

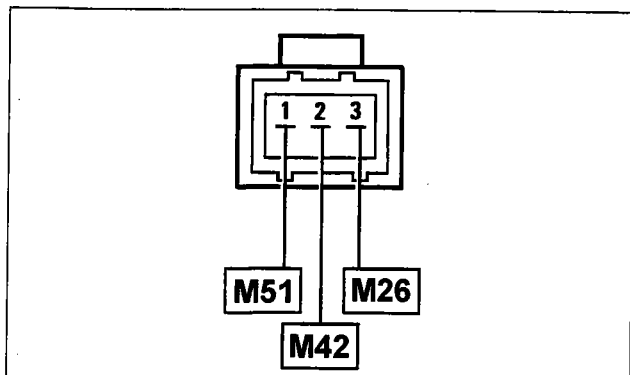
If the intensity of the current remains constant, then the voltage produced only depends on the intensity of the magnetic field; the intensity of the magnetic field only needs to vary periodically in order to produce a modulated electrical signal, whose frequency is proportional to the speed at which the magnetic field changes. To achieve this change, a metal ring (internal part of the pulley) with an opening passes through the sensor. As it moves the metal part of the ring covers the sensor, blocking the magnetic field with a consequent low output signal; conversely, when the opening is present and consequently there is a magnetic field, the sensor produces a high signal.

As a result the high signal alternates with the low signal once for every two revolutions of the engine, namely when cylinder N°1 is 78° before TDC.

This signal, together with the rpm and TDC signal, allows the control unit to recognize the cylinders and determine the injection point. For each engine revolution, the control unit checks that the timing signal is present; if this signal is missing for two consecutive revolutions, the control unit signals a fault (warning light in the instrument panel comes on) and the engine cannot be started up.

### Wiring connector

The numbers indicate the corresponding control unit pins



P4A22LJ03

### TIMING SENSOR (0.232.101.026)

In the Bosch Motronic ME 3.1 system the injection is the sequential, phased type, in other words the fuel is injected in sequence for each cylinder during the inlet stroke.

In order to achieve this, in addition to the rpm and TDC signal, the electronic control unit also uses a timing signal to determine the injection point.

The signal sent to the control unit is produced by a Hall effect sensor fitted by the camshaft drive pulley, exhaust side.

### Operating principle

### Removing-refitting

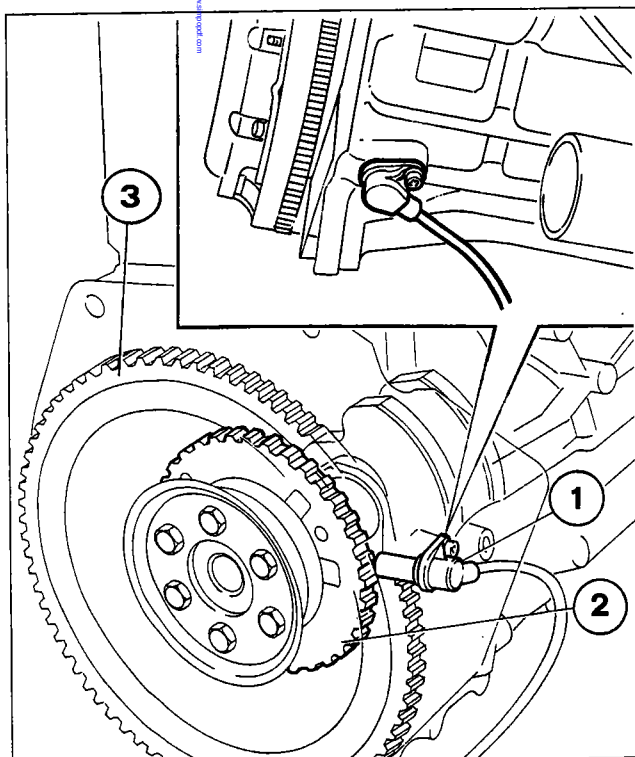
This operation involves the removal of the toothed belt from the timing drive and the exhaust side camshaft pulley.

When these operations have been carried out:

- disconnect the electrical connector;
- undo the fixing bolts and remove the sensor.

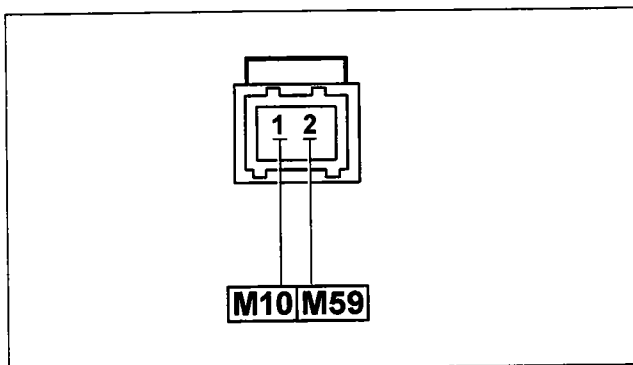
When refitting, reverse the order of the operations, following the instructions for refitting and tensioning the toothed belt.

**NOTE** The sensor does not require any type of adjustment.

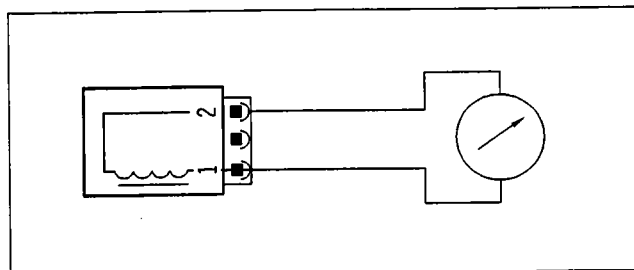


P4A23LJ01

1. Rpm sensor
2. Toothed pulley
3. Engine flywheel



P4A23LJ02



P4A23LJ03

### RPM AND TDC SENSOR (0.261.210.160)

This sensor which detects the engine speed and TDC is the inductive type, i.e. it operates through the variation of the magnetic field produced by the passing of the teeth on a toothed pulley (flywheel) inside the cylinder block/crankcase fixed to the crankshaft rear counter-weight. In this way the sensor is fixed to the cylinder block/crankcase and the gap and the angular position no longer need to be checked or adjusted.

The teeth which pass in front of the sensor alter the gap between the pulley and the sensor; the flow, which varies as a result, produces an alternating voltage whose frequency depends on the number of revs.

The flywheel consists of 58 teeth plus a space equivalent to the size of the two missing teeth.

The reference defined by the space of the two missing teeth constitutes the basis for detecting the synchronism point (TDC).

### Removing-refitting

Position the vehicle on a lift, then, working from the lower part of the vehicle:

- disconnect the electrical connector;
- undo the bolt fixing the sensor and remove it from its housing.

### Wiring connector

The sensor is connected to the electronic control unit (pins M10 and M59) by twisted cables covered with an anti-interference outer casing.

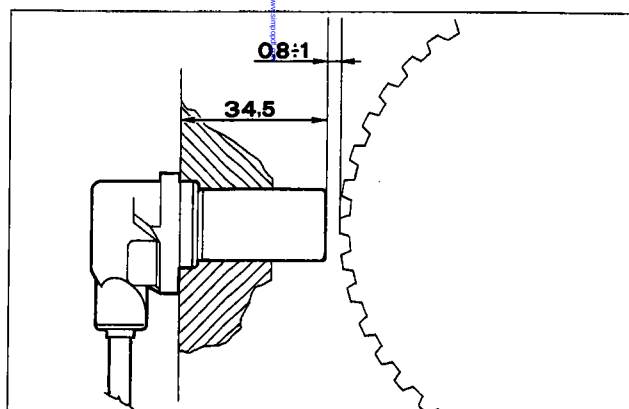
The numbers indicate the corresponding control unit pins

### Checking the resistance

The sensor resistance can be measured by disconnecting the connector and connecting an ohmmeter to the sensor.

**Resistance: 774-946 ohm at 20°C**

### 10.



P4A24LJ01



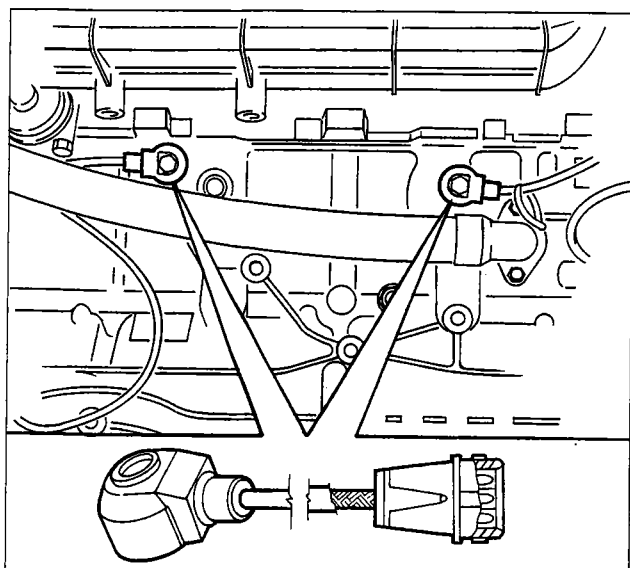
*When measuring the distance, it is vital to be at right angles to the flywheel and corresponding to a tooth and not a gap.*



#### Checking the gap

The rpm and TDC sensor is fixed directly to the cylinder block/crankcase and therefore the gap and the angular position do not need adjusting. If a fault is suspected, the gap can be checked as follows:

- remove the rpm and TDC sensor;
- check that the distance between the surface of the sensor and the flywheel tooth corresponds to the total length of the sensor probe (34.5mm) with the gap (0.8 - 1.5 mm).



P4A24LJ02

#### DETONATION SENSORS (0.261.231.131)

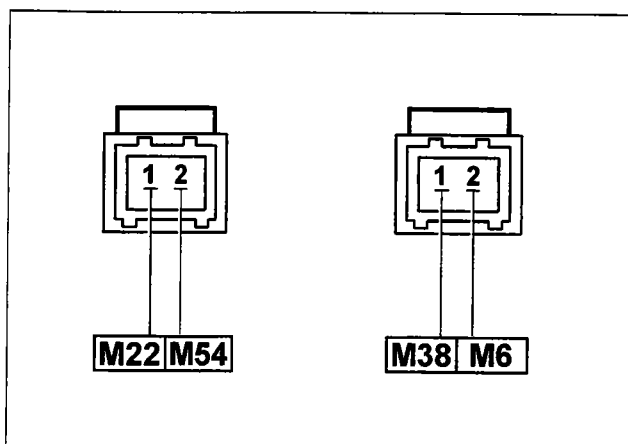
The detonation sensors are located in the monobloc under the inlet manifolds and between cylinders 1-2 and 4-5, respectively.

These sensors have a bush to prevent inappropriate torque tightening.

**If they are replaced, do not place washers or shims between the cylinder block/crankcase and sensor contact surfaces.**

When the engine is knocking (detonation), vibrations of a certain frequency are produced in the cylinder block/crankcase.

This phenomenon produces a mechanical ripercussion on a piezoelectric crystal which sends a signal to the control unit which, on the basis of this signal, reduces the ignition advance (by 3° up to a maximum of 9.7°) until the phenomenon disappears. Later, the advance is gradually restored to the basic value.



P4A24LJ03

#### Wiring connector

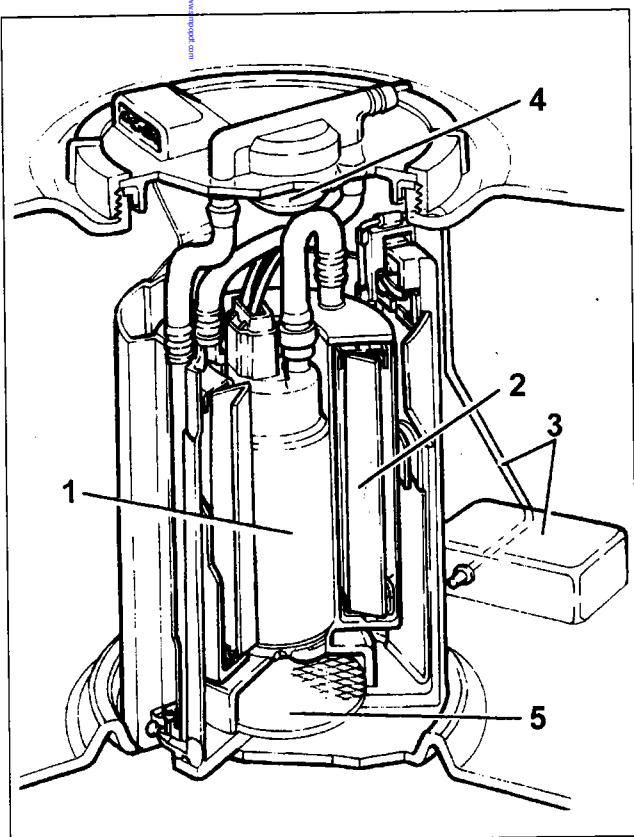
The sensors are connected to the electronic control unit (Pins M22/M54 and M38/M6) by twisted cables covered in an anti-interference outer casing.

The numbers indicate the corresponding control unit pins.

### ELECTRIC FUEL PUMP (0.580.313.011)

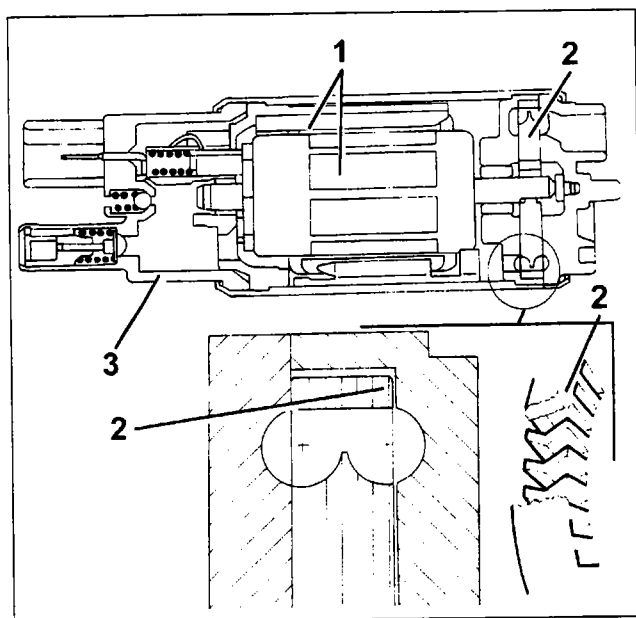
The electric fuel pump is located inside the fuel tank, in a special housing which also includes:

- the fuel pressure regulator;
- the fuel gauge;
- the fuel filter.



P4A25LJ01

1. Electric fuel pump;
2. Fuel filter;
3. Fuel gauge with float;
4. Pressure regulator;
5. Gauze pre-filter;



P4A25LJ02

The electric fuel pump has an electric motor with a permanent magnet (1), which operates the pump (2) impeller and a support cover (3) which contains the electrical and hydraulic connections.

The electric pump is the single stage type with high performance in low voltage and temperature conditions.

It has the following advantages compared with pumps which operate on the volumetric principle:

- lighter;
- smaller dimensions

### FUEL SUPPLY MANIFOLD

The fuel manifold is fixed to the inside of the inlet manifold and its function is to send the fuel to the injectors. The fuel manifold is made from die-cast aluminium and incorporates the housings for the injectors. The fuel inlet has a fixing with a bolt with a tapered seal.



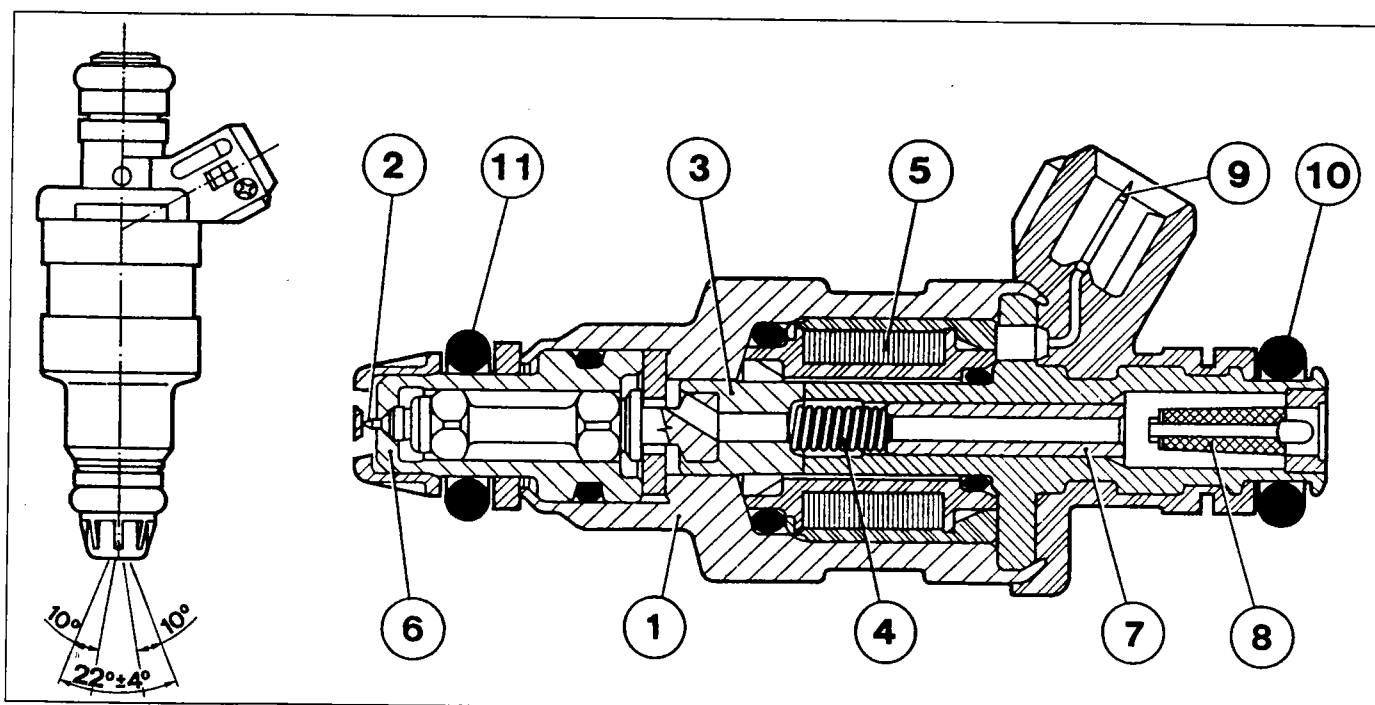
#### INJECTORS (0.280.155.770)

The twin jet type injectors are fitted on the inlet manifolds, immediately before the inlet valve. These injectors have been specially designed for engines with 4 valves per cylinder and allow the jets to be directed towards the two inlet valves.

The fuel jets comes out of the injector at a pressure of 3 bar and are instantly atomized forming two cones of around 10° each.

The operation of the injectors is the «sequential phased» type, i.e. the five injectors are operated according to the engine cylinder inlet sequence, whilst the supply can already start for each cylinder during the expansion stroke until the inlet stroke has already begun.

The injectors are fixed by the fuel manifold, which presses them into their housings in the inlet manifolds. In addition they are secured to the fuel manifold by means of «safety clips». Two rubber seals (10) and (11) ensure the seal on the inlet manifold and the fuel manifold.

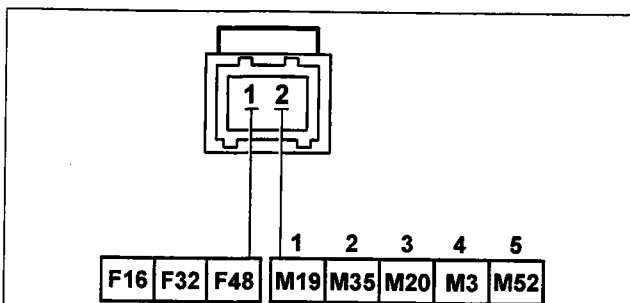


P4A26LJ01

- |                  |                      |                                 |
|------------------|----------------------|---------------------------------|
| 1. Injector body | 5. Winding           | 9. Electrical connection socket |
| 2. Needle        | 6. Injector nose     | 10. Fuel seal                   |
| 3. Magnetic core | 7. Adjustable spring | 11. Vacuum seal                 |
| 4. Coil spring   | 8. Fuel filter       |                                 |

#### Wiring connector

The numbers indicate the corresponding control unit pins arranged in the order of the cylinder numbers.

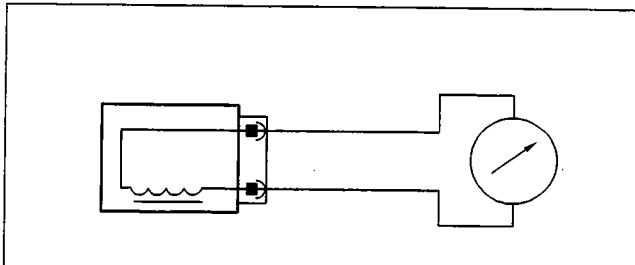


P4A26LJ02

#### Checking the resistance

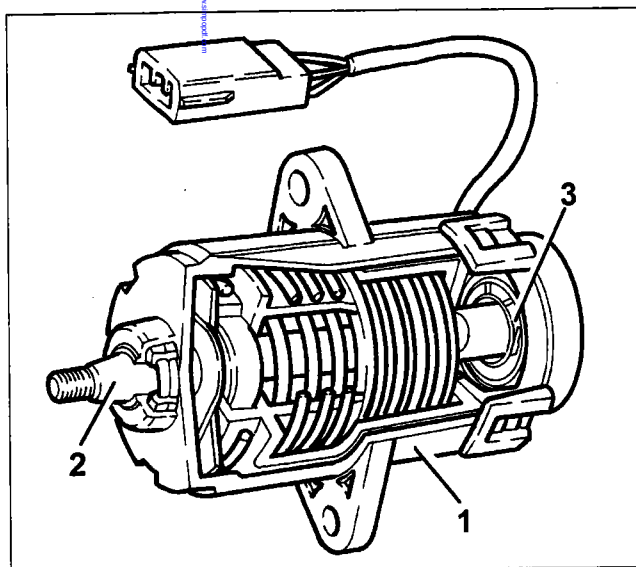
The injector resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

**Resistance value 16.2 ohm**

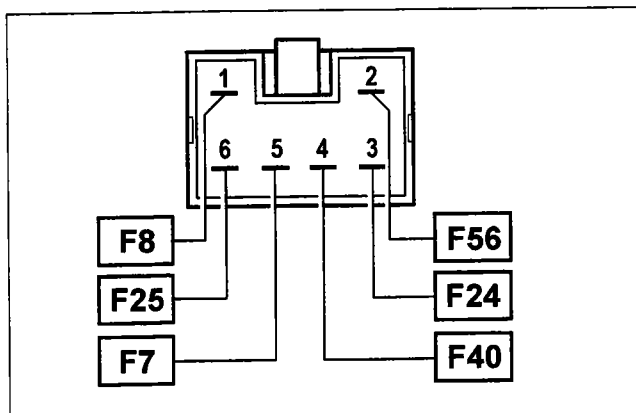


P4A26LJ03





P4A27LJ01



P4A27LJ02

### ACCELERATOR PEDAL POTENTIOMETER (0.281.002.203)

The position of the accelerator pedal is transformed into an electrical voltage signal and sent to the injection control unit by the potentiometer connected to the appropriate pedal.

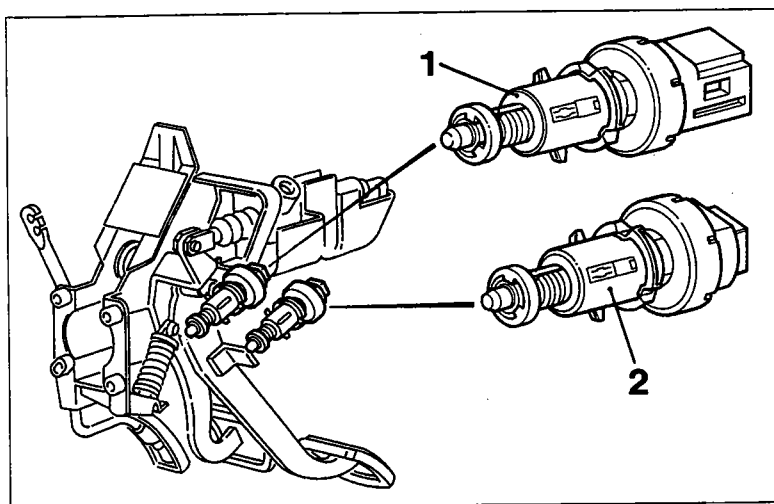
The accelerator pedal position signal is processed together with the information relating to the engine speed to obtain the injection times and pressure.

The sensor is made up of a casing (1) fixed to the pedals by a flange, which contains a shaft (2), in an axial position, connected to two potentiometers (3): one main one and one safety one.

A coil spring on the shaft guarantees the correct pressure resistance, whilst a second spring ensures the return on release.

#### Wiring connector

The numbers indicate the corresponding control unit pins



P4A27LJ03

### BRAKE PEDAL SWITCH

There is a switch (1) on the brake pedal which operates the brake lights; the same switch sends a signal to pin F27 of the injection control unit.

The "brake pedal pressed" signal is used by the control unit for:

- understanding that there is a deceleration situation;
- checking the plausibility of the signal coming from the accelerator potentiometer.

### CLUTCH PEDAL SWITCH

There is a switch (2), on the clutch pedal, connected to pin F59 of the injection control unit.

The "clutch pedal activated" signal is used by the injection control unit to distinguish the gear engaged and gear shift conditions.

## 10.

### AIR FLOW METER (0.281.002.199)

The flow meter is on the air inlet hose and is the "hot film" type.

The intake air temperature sensor is inside the flow meter.

The operation is based on a heated diaphragm placed in a measuring duct through which the intake air entering the engine flows.

The hot film diaphragm is kept at a constant temperature (about 120 °C above the temperature of the intake air) by the heating resistance. The mass of air passing through the measuring duct tends to remove heat from the diaphragm therefore, in order to keep the latter at a constant temperature, a current has to pass through the resistance.

This current, being proportional to the mass of air flowing to the engine, is measured by a suitable Wheatstone bridge and the signal obtained is sent to the injection control unit.

1. Covers
2. Electronic card
3. Sensor
4. Support plate
5. Support
6. Seal (O-Ring)
7. Temperature sensor

**NOTE** This flow meter directly measures the mass of air (and not the volume) thereby eliminating problems of temperature, altitude, pressure etc.

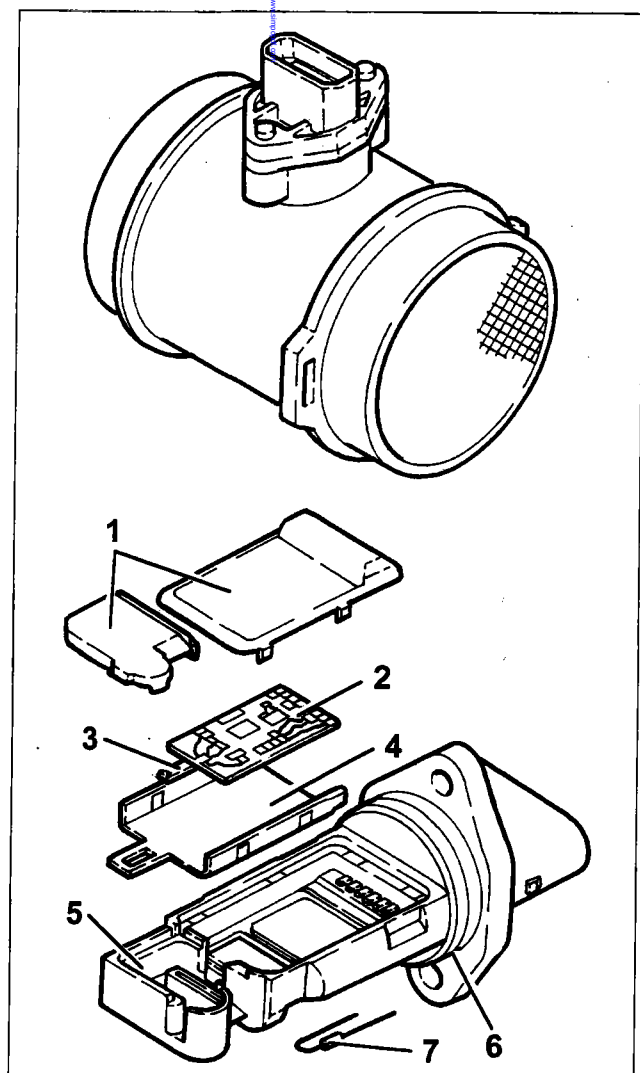
### Description of the operation

The Wheatstone bridge (made up of resistors R1,R2,R3,R4) is balanced when R3 is about 120 °C higher than the temperature of the air. The air which passes through the diaphragm removes heat from R3, then the bridge is unbalanced.

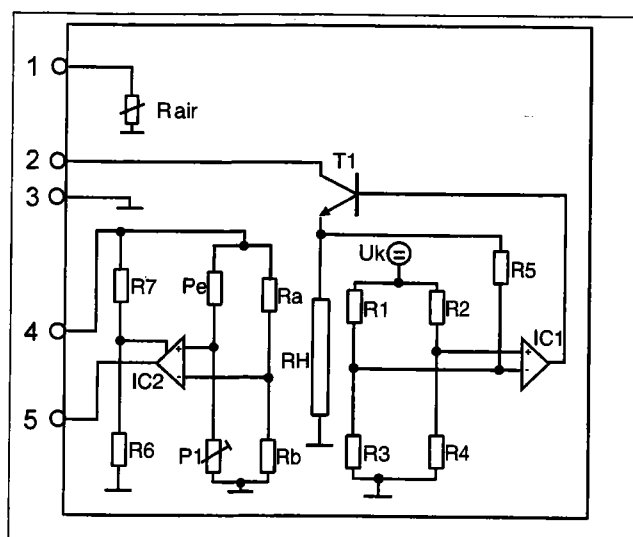
This situation is detected by the circuit at IC1 which operates the transistor T1, in a manner which is proportional to the bridge imbalance, which then allows more current to pass through Rh in order to heat R3 and restore the bridge balance.

Circuit IC2 measures the current passing through Rh.

This current, allows the equilibrium of the bridge to be maintained and is therefore proportional to the mass of air passing through the air flow meter.

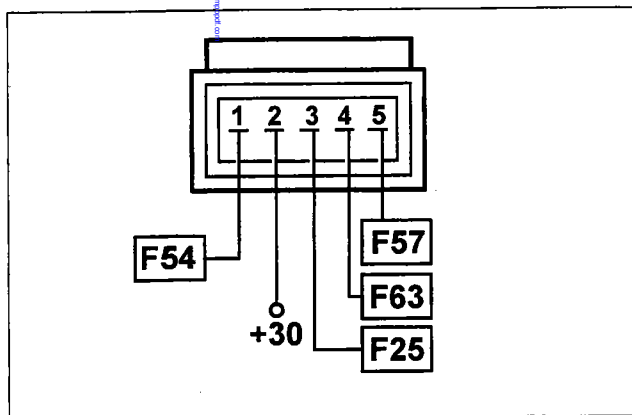


P4A28LJ01

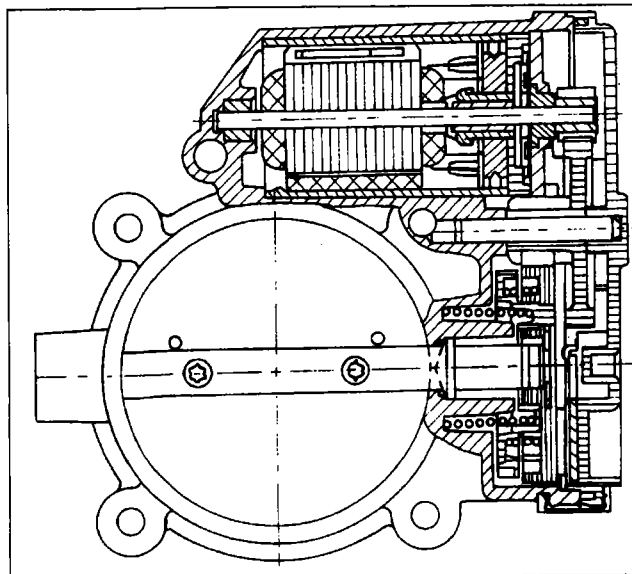


P4A28LJ02

1. Air temperature signal
2. Battery voltage
3. Mass
4. Reference voltage (5V)
5. Air flow rate signal



P4A29LJ01



P4A29LJ02

### Wiring connector

The numbers indicate the corresponding control unit pins.

### BUTTERFLY CASING ACTUATOR

The actuator is fixed to the inlet chamber and regulates the quantity of air drawn in by the engine.

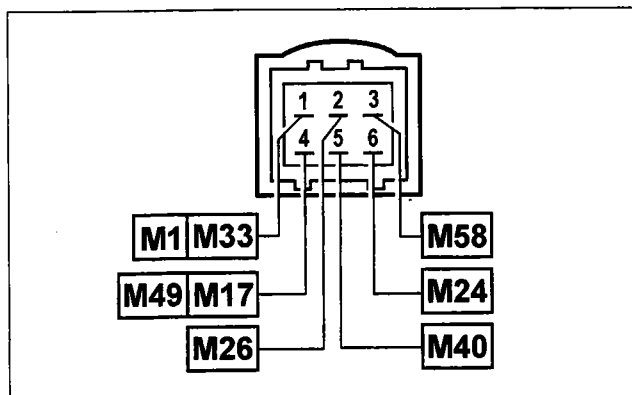
According to the signal coming from the accelerator pedal potentiometer, the injection control unit controls the opening of the butterfly by means of a direct current motor incorporated in the butterfly casing actuator.

The butterfly casing actuator is fitted with two potentiometers connected in parallel so that one controls the other and viceversa.

If there is a problem with the two potentiometers or if there is no supply, the control unit reduces the engine torque, according to the position of the accelerator pedal.

If the butterfly casing actuator or the injection control unit are replaced, the following "self-learning" procedure must be carried out:

- Place the ignition key in the ON position and keep it in this position for 30 secs
- Place the ignition key in the OFF position for 5 secs
- Return the key to the ON position and start up the engine

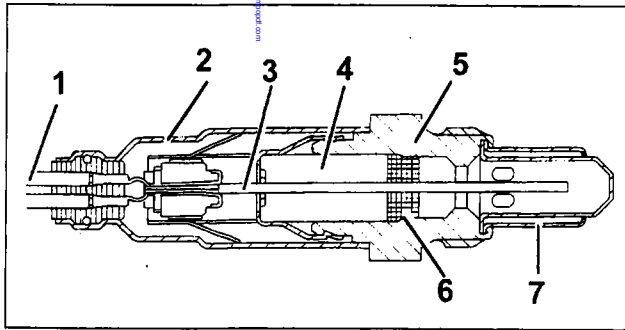


P4A29LJ03

### Wiring connector

The numbers indicate the corresponding control unit pins.

## 10.



P4A30LJ01

1. Connecting cable
2. Protective sleeve
3. Planar sensor element
4. Ceramic support pipe
5. Sensor housing
6. Ceramic seal
7. Protective pipe

### LAMBDA SENSOR (B.258.040.092)

The Lambda sensor is the "planar" type and is fitted on the front section of exhaust pipe and informs the injection control unit of the progress of the combustion (stoichiometric ratio).

To obtain an optimum mixture the quantity of air drawn in by the engine must equal the theoretical quantity for burning all the fuel injected.

In this case the Lambda factor ( $\lambda$ ) i.e. the ratio between the quantity of air drawn in and the theoretical quantity of air (required to burn all the fuel injected) is equal to 1.

Therefore:

$\lambda = 1$  ideal mixture

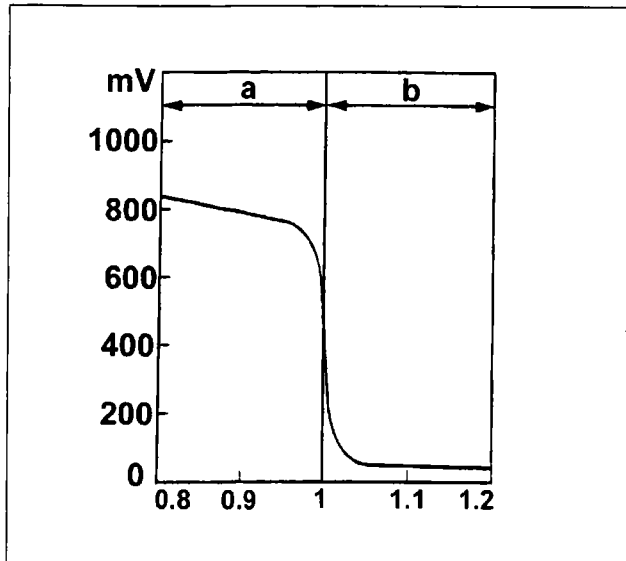
$\lambda > 1$  lean mixture

$\lambda < 1$  rich mixture

The Lambda sensor, in contact with the exhaust gases, produces an electrical signal, whose voltage value depends on the concentration of oxygen present in the actual gases. This voltage is characterized by a sharp variation when the composition of the mixture moves away from the value  $\lambda = 1$ .

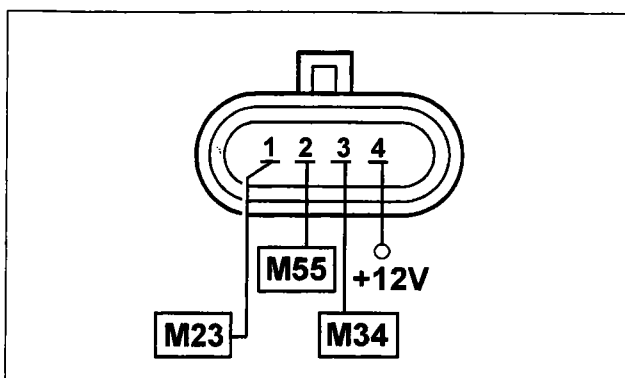
The heating of the Lambda sensor is managed by the injection control unit proportionally to the temperature of the exhaust gases. This prevents thermal shocks to the ceramic casing due to contact with the condensation water, present in the exhaust gases, with the engine cold.

The measuring cell and the heater are incorporated in the "planar" (stratified) ceramic element with the advantage of heating the cell rapidly to allow a closed loop control ( $=1$ ) within a few seconds of the engine being started up.



P4A30LJ02

- a. Rich mixture (lack of air)
- b. Lean mixture (excess air)



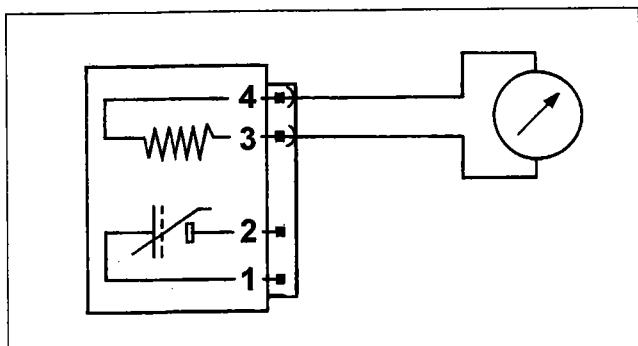
P4A30LJ03

### Wiring connector

The numbers indicate the corresponding control unit pins.



*The sensor can be rapidly put out of action by even small amounts of lead in the fuel.*



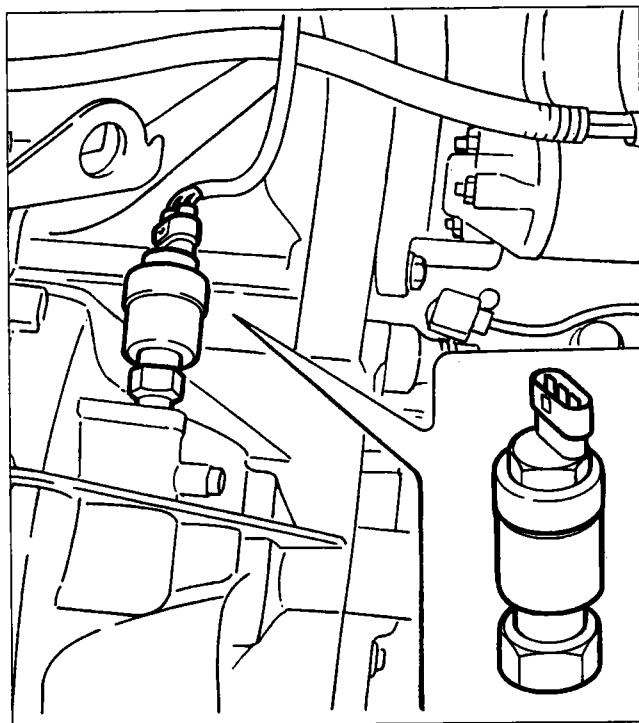
P4A31LJ01



### Checking the resistance

The resistance of the heater and the sensor can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

**Resistance = 500-1000 ohm at 20°C**



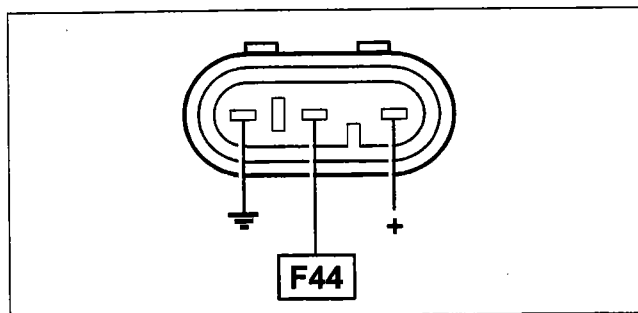
P4A31LJ02

### SPEEDOMETER SENSOR

The speedometer sensor (vehicle speed sensor) is positioned at the differential output, by the left driveshaft coupling and transmits information concerning the vehicle speed to the control unit: the signal is also used for the operation of the speedometer.

The sensor is the Hall effect type (see paragraph on "engine timing sensor") and is calibrated so that each impulse corresponds to a distance of one metre; it is possible to know the speed of the vehicle from the frequency of the impulses.

The control unit uses this information for improving the management of the engine idle adjustment actuator and for the CUT-OFF strategy.



P4A31LJ03

### Wiring connector

The numbers indicate the corresponding control unit pins

# 10.

## PHASE TRANSFORMER

In order to achieve a good compromise between good performance in terms of power at high speeds and good torque at low speeds, a phase transformer (with electronic operation and hydraulic implementation) has been fitted on this engine for the inlet camshaft.

This device makes it possible to vary the timing diagram (inlet stroke) according to the load required by the engine; this parameter is processed by the MOTRONIC control unit on the basis of the electrical signals received by the air flow meter and the rpm sensor and is sent as a command to the phase transformer solenoid valve.

The construction of the device involves a main assembly fitted on the inlet camshaft which is designed to alter the angular position of the actual shaft in relation to the drive pulley.

In addition, there is an implementation valve, operated by a solenoid valve, both on which are on the inlet manifold and are hydraulically connected to the main assembly by means of suitable ducts.

The operating principle is as follows:

- with the temperature of the coolant below 40 °C and when the engine is idling or the speed exceeds a pre-set level, the solenoid valve (1) is de-energized, therefore the valve body (2), thrust by the opposing spring (3), remains raised not allowing the oil, which is arriving from the duct (A), to reach the transformer.

In this case the timing of the inlet valves remains unaltered.

With the coolant temperature above 40 °C and the engine speed below a pre-set level with the butterfly angle greater than around 8°, the solenoid valve (1) is energized, thereby pushing the valve body (2) downwards. In this position, the oil, coming from the duct (A), enters the piston chamber (B) and from there flows through a special port into the duct (C) inside the latter.

The oil can only leave the above mentioned duct through the upper port (in contact with the oil supply duct to the transformer (D)) because the lower port is not in contact with the drainage duct (E) as the valve body (2) is lowered.

The oil passes through ducts (D) and (F), reaches the chamber (G) moving axially towards the engine and the piston (4), which has helical teeth on the outside, is forced to rotate in a clockwise direction (seen from the timing side) on account of the above mentioned axial movement.

Its rotation is transmitted, by means of a straight toothed splining, to the pinion (5) which, bolted on to the threaded element of the camshaft (6), transmits the rotation to the shaft, altering the timing of the inlet valves with an advance of 9°.

When the solenoid valve is de-energized, the valve body (2) returns to the initial position, interrupting the flow of oil under pressure to the chamber (G), but allowing the return of oil to the drainage, thanks to the force of the opposing spring (7).

An additional duct guarantees the lubrication of the camshaft bearing even when the device is not activated.

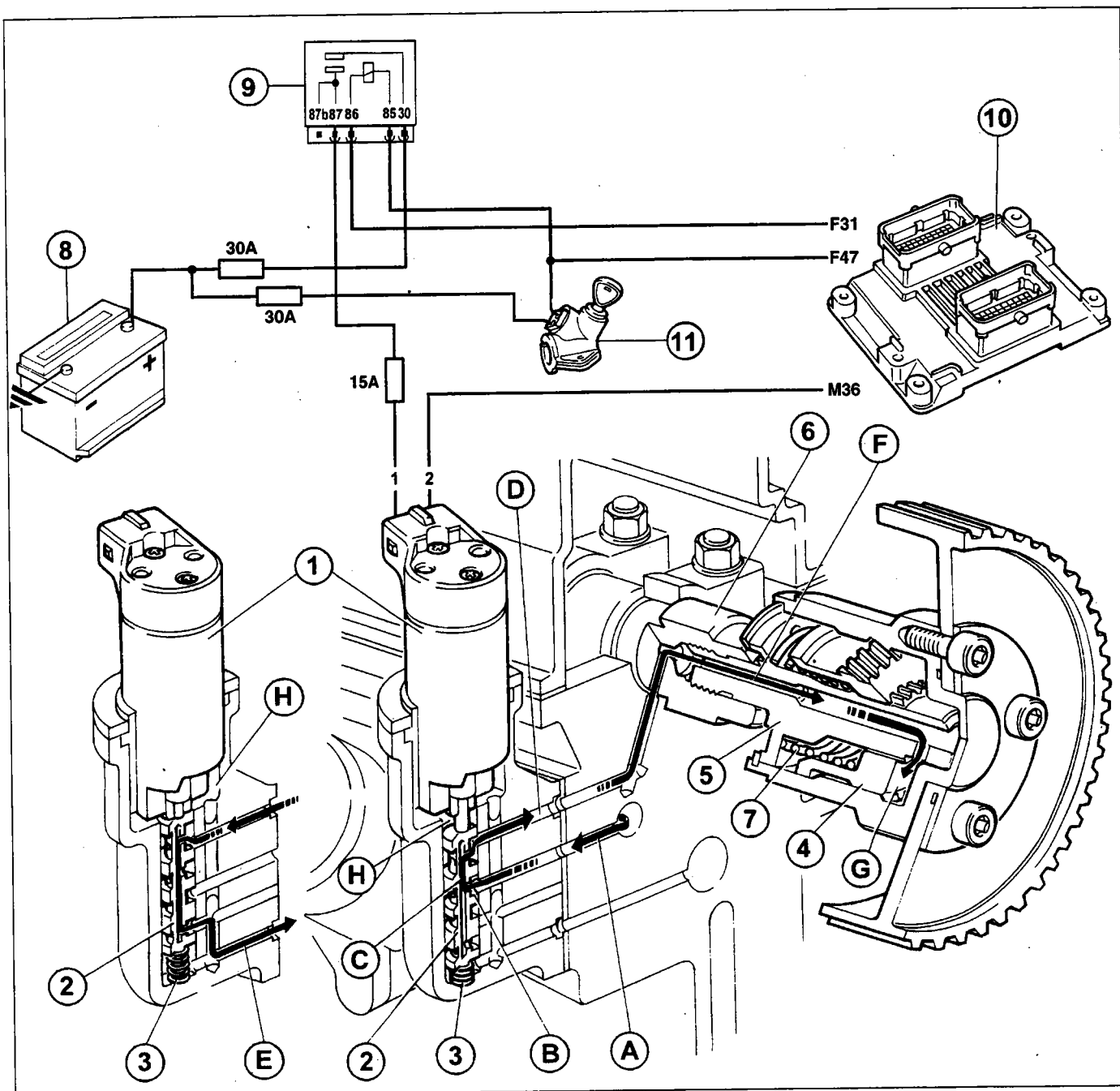
The oil which reaches chamber (H) of the solenoid valve through seepage, is discharged through the drainage duct (E).

## Recovery

In the case of a problem with the solenoid valve, the final stage (driver) in the control unit is deactivated.



Diagram showing operation of the phase transformer

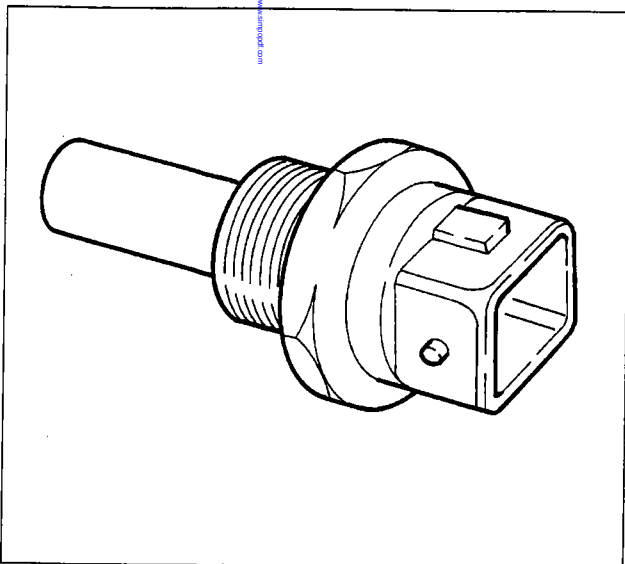


P4A33LJ01

- |                      |                                     |
|----------------------|-------------------------------------|
| 1. Solenoid valve    | 7. Piston spring                    |
| 2. Valve body        | 8. Battery                          |
| 3. Valve body spring | 9. Injection/ignition system relay  |
| 4. Piston            | 10. Injection/ignition control unit |
| 5. Pinion            | 11. Ignition switch                 |
| 6. Camshaft element  |                                     |



## 10.



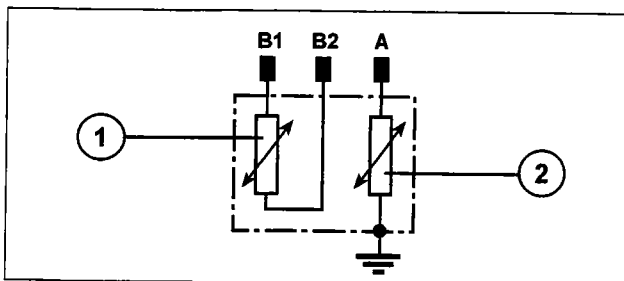
P4A34LJ01

### COOLANT TEMPERATURE SENSOR

(Jaeger 402.183.01)  
(Elth 2690350)

The sensor is fitted on the thermostat casing; it is made up of a brass casing which acts as protection against the actual resistive elements made up of two NTC thermistors (Negative Temperature Coefficient, where the electrical resistance of the sensor decreases as the temperature increases). The two NTCs are distinct and provide temperature information to the specific gauge in the Instrument panel and to the injection/ignition control unit. The reference voltage for the NTC element for the injection system is 5 Volt; since the control unit inlet circuit is designed as a voltage divider, this voltage is shared between a resistance in the control unit and the sensor NTC resistance. As a result, the control unit is capable of evaluating the changes in voltage and obtaining temperature information in this way.

1. NTC for injection system
2. NTC for gauge in Instrument panel



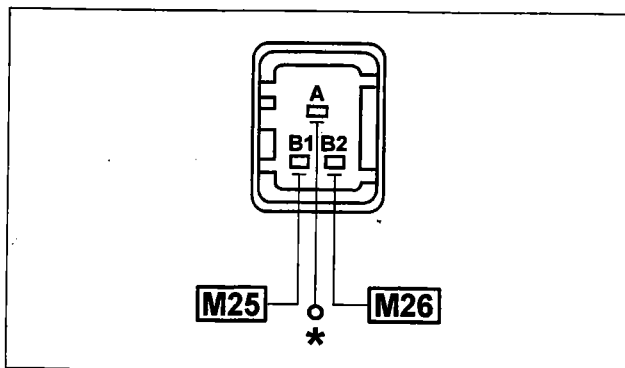
P4N34LJ02

#### NTC INJECTION

|     | $\Omega$ | $^{\circ}\text{C}$ | $\Omega$ |
|-----|----------|--------------------|----------|
| -20 | 15970    | 40                 | 1150     |
| -10 | 9620     | 50                 | 807      |
| 0   | 5975     | 60                 | 576      |
| 10  | 3816     | 70                 | 418      |
| 20  | 2500     | 80                 | 309      |
| 25  | 2044     | 90                 | 231      |
| 30  | 1679     | 100                | 176      |

#### NTC INSTRUMENT

| $^{\circ}\text{C}$ | $\Omega$ |
|--------------------|----------|
| 60                 | 512÷602  |
| 90                 | 184÷208  |
| 120                | 76÷88    |



P4A34LJ03

\* Connection to the coolant temperature gauge in the Instrument panel

### Recovery

The last value detected is taken as valid or a fixed values of 80 °C if the temperature of the intake air is above a given level. The self-adjustment of the mixture strength is inhibited. The radiator fan is activated. The self-adjustment of the idle is inhibited.

### Checking the resistance

The table at the side contains the resistance values which the NTC elements can assume according to the temperature. These values can be measured by by disconnecting the connector and connecting an ohmmeter to sensor pins.

### Removing-refitting

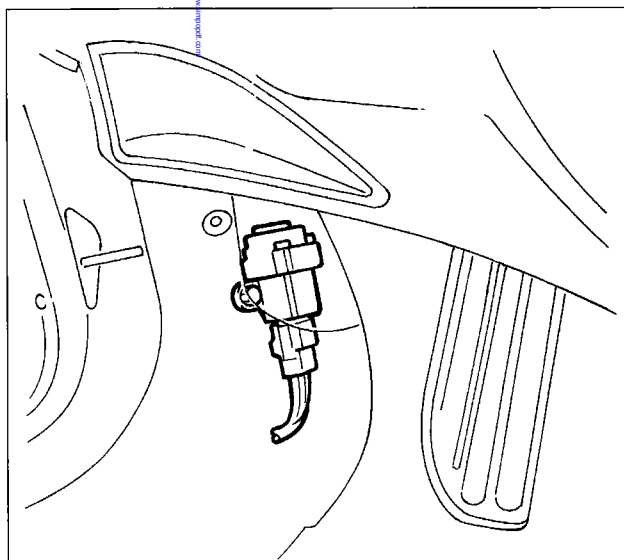
Disconnect the electrical connection and remove the sensor



**Tightening torque 2.2 da Nm.**

### Wiring connector

The numbers indicate the respective control unit pins



P4A34JJ02

### INERTIA SWITCH

In order to increase the safety of the occupants, in the case of an impact, the vehicle is equipped with an inertia switch located inside the passenger compartment, fixed to the left side panel.

This sensor reduces the risk of fire (as a result of fuel escaping) deactivating the auxiliary electric pump which supplies the injection circuit.

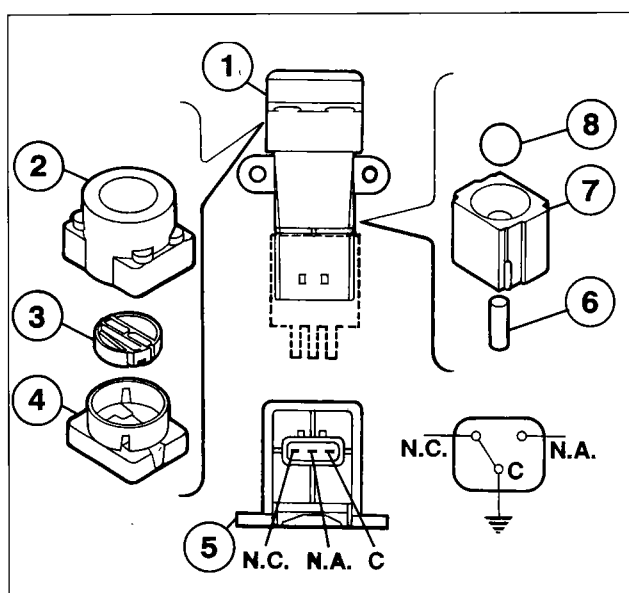
The inertia switch consists of a steel ball fitted in a (tapered) housing and kept in position by the attraction force of a permanent magnet.

If the vehicle is involved in a violent crash, the ball is released from the magnetic clip and opens the normally closed (NC) electrical circuit) interrupting the connection to earth for the electric pump and as a result the supply to the injection system.

To restore the connection to earth for the auxiliary electric pump, the seat must be moved backwards and the switch pressed until it is heard to click.



*Even after an apparently slight impact, if there is a smell of fuel or there are leaks from the fuel system, do not turn the inertia switch back on, but first search for the cause of the problem and remedy it to prevent the risk of fire.*



P4A35LJ01

### Inertia switch components

1. Complete inertia sensor
  2. Outer casing
  3. Button
  4. Upper side
  5. Engagement side
  6. Permanent magnet
  7. Permanent magnet housing
  8. Steel ball
- C. Common terminal  
N.C. Normally closed contact  
N.A. Normally open contact

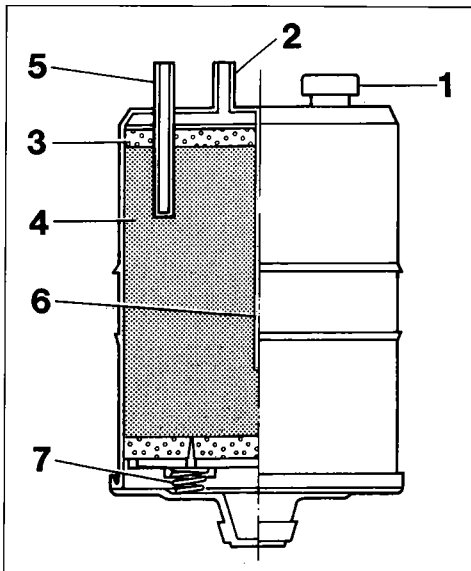
# 10.

## ANTI-EVAPORATION SYSTEM COMPONENTS

### Charcoal filter and fuel vapour cut out solenoid valve

These components form part of the fuel vapour recovery and anti-evaporation system. The charcoal filter is located in the right wheel arch and the rear section of the right front wheel arch liner has to be removed to gain access to it.

The cut out solenoid valve is located in the engine compartment under the inlet manifold.



P4A36LJ01

### Charcoal filter

This consists of charcoal granules (4) which trap the petrol vapours entering through the inlet (5).

The air which enters through the intake (1), passes through the paper filter (3), comes into contact with the charcoal granules removing the petrol vapours and directing them towards the outlet (2) and from there to the cut out solenoid valve.

The air, having entered through the intake (5), can also be recalled by the vacuum in the tank for ventilating it. The partition (6) ensures that the air drawn in comes into contact with all the granules of charcoal assisting the release of the petrol vapours to the inlet manifold.

There are also two springs (7) which allow the expansion of the mass of granules when the pressure increases.

### Vapour cut out solenoid valve (0.280.142.340)

The function of this valve is, by means of the electronic control unit, to control the quantity of petrol vapours drawn in by the charcoal filter and directed to the inlet manifold.

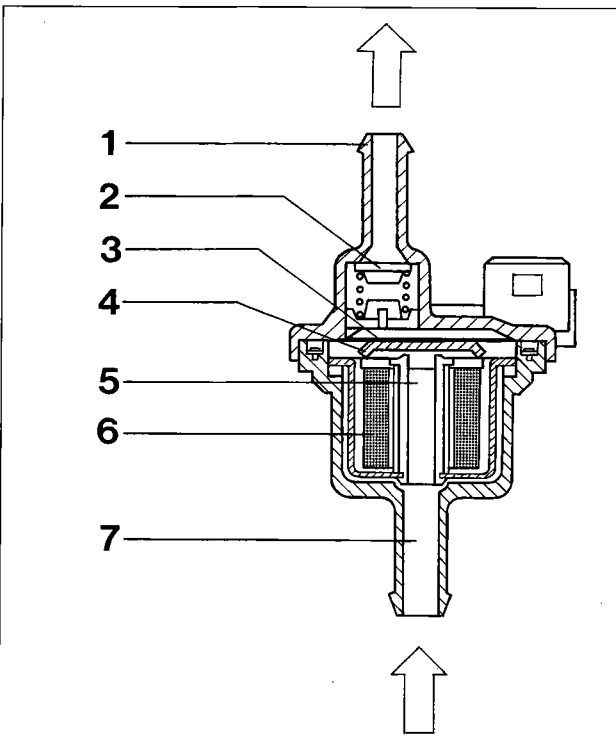
If this valve is not supplied, it is open; by turning the key to the ON position, it closes, in preparation for operation. In effect, if energized the solenoid valve (6) attracts the shutter (4) which, overcoming the spring (3) loading, closes the port (5) preventing the flow of petrol vapours.

The operation is controlled by the electronic control unit in the following way:

- during starting the solenoid valve remains closed, preventing the petrol vapours from excessively enriching the mixture;
- with the engine started up, the electronic control unit sends the solenoid valve a signal which modulates the opening.

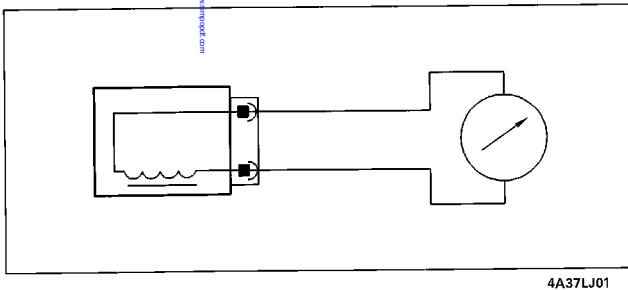
In this way the control unit controls the quantity of petrol vapours sent to the inlet, avoiding substantial variations (especially during idling) in the mixture strength.

**NOTE** The solenoid valve must be fitted in the correct position: the arrow on the casing should be pointing towards the vacuum pick up on the inlet manifold.



P4A36LJ02

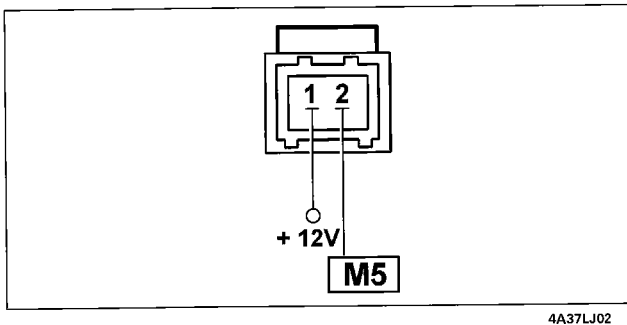
1. Inlet connector
2. One-way valve
3. Spring
4. Shutter
5. Outlet port
6. Electro-magnet
7. Outlet connector



### Checking the resistance

The resistance of the solenoid valve can be measured by disconnecting the connector and connecting an ohmmeter as illustrated in the diagram.

**Resistance: 17.5-23.5 ohm at 20 °C**



### Wiring connector

The numbers indicate the corresponding control unit pins

## CHECKS - ADJUSTMENTS AND REPAIR OPERATIONS ON THE BOSCH MOTRONIC ME 3.1 INJECTION/IGNITION SYSTEM IN ADDITION TO THE FAULT DIAGNOSIS



**WHEN WORKING ON A VEHICLE EQUIPPED WITH A MOTRONIC INJECTION/IGNITION SYSTEM, OBSERVE THE FOLLOWING PRECAUTIONS:**

- do not start up the engine with the terminals for the electrical connections not properly connected or slack at the battery poles;
- do not use a rapid battery charger to start the engine;
- never disconnect the battery from the on board system with the engine running;
- when recharging the battery, disconnect it first from the system;
- if the vehicle goes into a drying oven after painting, at temperatures in excess of 80 °C, then the injection/ignition electronic control unit must be removed first;
- never connect or disconnect the electronic control unit multiple connector with the ignition switch in the ON position;
- always disconnect the negative battery lead before carrying out electrical welding on the vehicle.

*It should be remembered that this system has a memory which is always supplied (stand-by memory) which contains all the self-adjustment figures. If the battery is disconnected then this information is lost and can only be acquired again after a certain length of time so this operation should be carried out as infrequently as possible.*

If the engine control unit or the motorized butterfly casing is being replaced, the self-learning procedure must be carried out for the return spring inside the butterfly casing and maximum/minimum motorized butterfly valve angular positions.

## 10.

### Learning procedure

**NOTE** During the learning procedure, from the moment the ignition is turned to the ON position until the end of the procedure, do not press the accelerator pedal, the brake pedal or the clutch pedal.

Manual learning:

- Turn the ignition key to the ON position.
- Wait for 60 seconds; during this period the return spring inside the butterfly casing and the maximum/minimum angular positions of the motorized butterfly valve are checked.
- Turn the ignition key to the OFF position.
- Wait for 10 seconds; during this period the values acquired are recorded in the control unit EEPROM.

Learning with diagnostic equipment signal "learning ended with positive outcome".

- Connect the diagnostic equipment.
- Place the ignition key in the ON position.
- Wait until the diagnostic equipment gives the positive learning outcome signal.
- Turn the ignition key to the OFF position.
- Wait until the diagnostic equipment signals that the procedure is over.

### ENGINE IDLE SPEED CHECK

If the engine idle speed is not  $750 \pm 50$  rpm and the injection/ignition control unit is the self-regulating type, then it is not possible to carry out any adjustments, therefore it is necessary to check that the accelerator linkage is correctly adjusted and the cause of the problem should be sought by carrying out a complete fault diagnosis using the diagnostic equipment.

### CHECKING CONCENTRATION OF POLLUTANT EMISSIONS

Through the self-adjustment of the system, the Motronic ME 3.1 system guarantees a continuous check on the idle speed and CO percentage, thereby making any outside adjustment operations superfluous (there are no adjustment screws). However, a check on the content of the exhaust gases, downstream to the catalyzer, can provide precious information on the operating conditions of the injection/ignition system, the engine parameters or the catalyzer.

#### Checking idle CO and HC concentration upstream of the catalytic silencer

To check the concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) upstream of the catalyzer, proceed as follows:

1. Undo the cap or nut on the exhaust pipe, upstream of the catalyzer and tighten the tool in its place.
2. Connect a suitably calibrated CO tester probe to the tool.
3. Start up the engine and let it reach operating temperature.
4. Check that the speed corresponds to the recommended figure.
5. Check that the idle CO concentration is within the recommended figures given in the table overleaf; if this is not the case, it is necessary to check:
  - that the Lambda sensor is working properly, using the diagnostic equipment;
  - for the presence of air penetration in the area surrounding the Lambda sensor housing;
  - the injection and ignition system ( **in particular, the wear of the spark plugs** ).
6. In the same conditions, check that the concentration of HC is below 600 p.p.m.
7. If these values are not measured, check the engine tuning, paying particular attention to:  
the ignition advance value - the valve clearances - the valve gear timing - the engine compression.

### Checking exhaust concentration of CO and HC

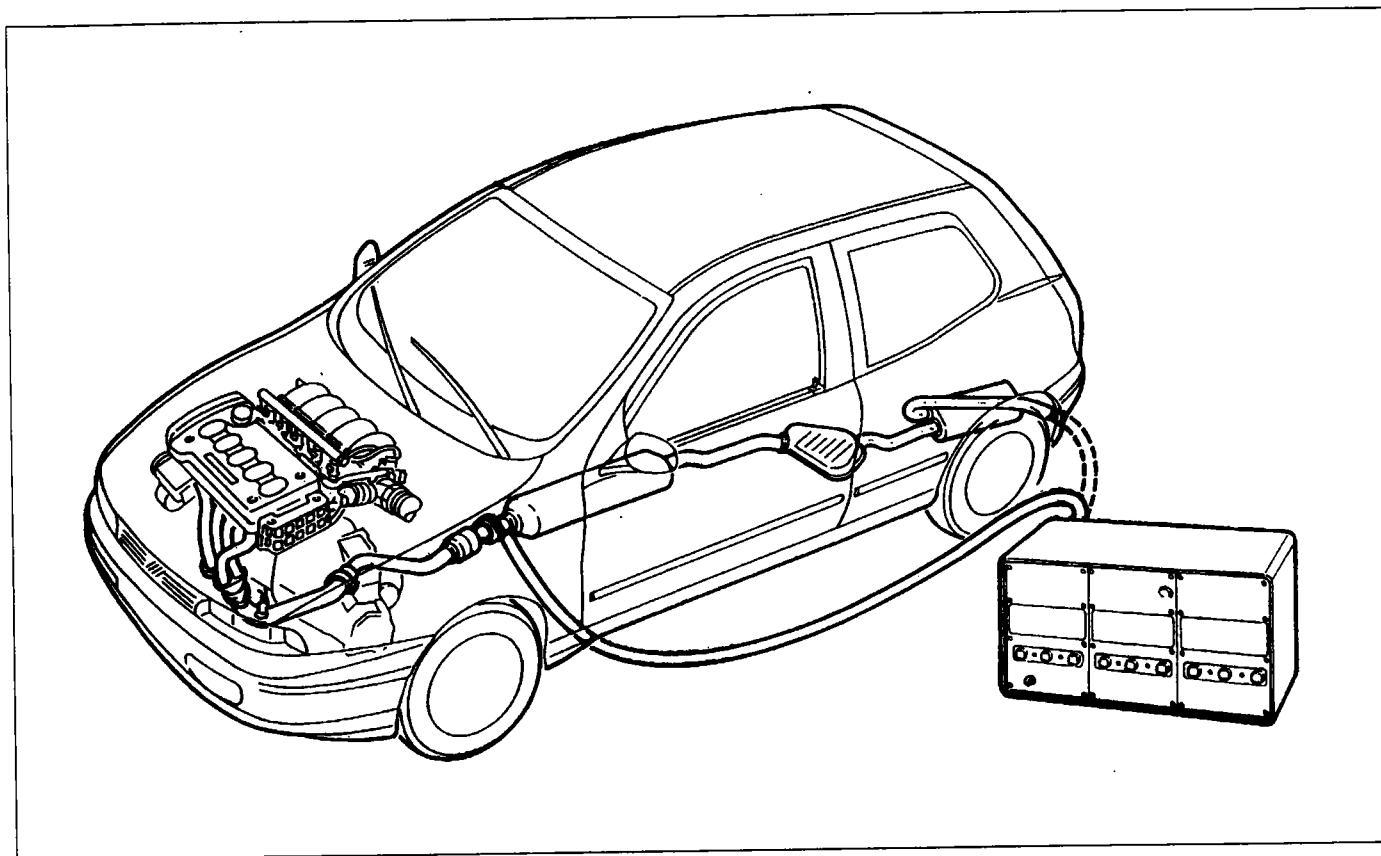
The exhaust concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) is measured by inserting a suitably calibrated CO tester probe at least 30 cm into the end of the exhaust pipe as shown in the diagram.

If the shape of the end of the exhaust pipe is such that the sensor cannot be fully introduced, a special extension pipe which guarantees the seal in the join area must be added.

1. Check that the idle CO and HC concentrations are the same as those in the table.
2. If the HC value differs from the recommended limit, whilst that measured previously upstream of the catalyzer was correct, the engine parameters are correct and the cause of the problem should therefore be sought in the decreased efficiency of the catalyzer.

**Table summarizing pollutant emission tolerance figures**

|                             | CO (%)  | HC (p.p.m.) | CO <sub>2</sub> (%) |
|-----------------------------|---------|-------------|---------------------|
| Upstream of the catalyzer   | 0,4 ÷ 1 | 600         | ≥ 12                |
| Downstream of the catalyzer | ≤ 0,35  | ≤ 90        | ≥ 13                |



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## 10.

### DIAGNOSTICS

The complete fault diagnosis of the system can be carried out through an active dialogue using the diagnostic equipment.

If a fault is detected with the sensors, the electronic control unit replaces the data coming from the faulty sensor with pre-memorized (recovery) data to allow the operation of the engine. If a fault is detected it is permanently stored in the memory and the sensor is excluded from the system until the signal is compatible once again.

The same procedure is applied if the fault involves an actuator or control flap. The detection of a fault and the replacement with recovery data involves the signalling of the fault by the specific warning light in the instrument panel coming on.

The following parameters can, in the case of a failure, be managed by the control unit: flow meter, coolant temperature sensor, butterfly casing actuator, Lambda sensor, air temperature sensor, battery voltage and detonation sensors. In the case of faults in the control unit, the rpm sensor or the electric fuel pump, the system does not identify the fault and the vehicle stops. On request, the operator can read the faults on the control unit using the diagnostic equipment.

#### Detecting faults

This is done whilst carrying out the basic function through which the sensor/actuator is managed.

#### Memorizing the error and the structure of the errors memory

Errors are memorized in the control unit in the order in which they occur. The location, type of error and environmental conditions (specific for each type of error) are measured the moment the fault is detected for all errors. There is also a frequency counter.

#### Classification of the defect

If a defect is recognized for the first time or the error state persists for a time  $t > 0.5s$ , the defect is memorized as "permanent". If this defect later disappears, it is memorized as "intermittent" and "not present". If it then reappears, it is memorized as "intermittent", but becomes "present".

The classification of a fault as "permanent" activates the recovery functions; when the fault disappears the normal reading or implementation function is resumed.

Several types of fault are classified as "important", i.e. in terms of anti-pollution regulations. The presence of these faults is signalled to the driver by the failure warning light in the instrument panel coming on.

#### Frequency counter

Each error is assigned a frequency counter, which is used to determine the moment in which a fault no longer present has been memorized. The first time a fault is detected, the counter is set at 10. If the fault disappears, the counter remains at the current value. If it reappears, it is increased by 1 (with an upper limit 50).

The counter is decreased each time the engine is started up and the fault has not reappeared. If the counter reaches zero, the fault is automatically cancelled from the memory.

If the counter has decreased and the fault reappears, the counter returns to 10 (if it was already above 10, it is not altered).

#### Signalling a fault

The failure warning light comes on when a defect is memorized as "present" and "important".

The delay time between detecting the fault and the warning light coming on is 0.1 seconds; the delay time between the fault disappearing from the memory and the warning light going out is 4 seconds.

The warning light comes on each time the ignition key is turned to the ON position. If "important" faults are already present, the warning light goes out after 4 seconds.



### Cancelling errors

When the frequency counter reaches 0, the fault and the parameters associated with it are cancelled.  
The immediate cancelling of the entire errors memory takes place through the "cancel errors memory" command sent by the diagnostic equipment.

### Connector with the diagnostic equipment

The diagnostic socket to which the diagnostic equipment (Examiner or SDC station) is connected is located at the front of the engine compartment on the right hand side (see diagram on page 18).

The exchange of data between the control unit and the diagnostic equipment takes place via a two-way serial line (line K) using the standard Bosch communication protocol.

The diagnostic equipment can supply the following information:

- display of the errors;
- display of the engine parameters;
- active diagnosis

### List of errors

| Description                  | Nature of the errors                                                                      |
|------------------------------|-------------------------------------------------------------------------------------------|
| Rpm sensor                   | Signal loss                                                                               |
| Air temperature sensor       | Implausible signal                                                                        |
| Coolant temperature sensor   | C.A.-C.C.                                                                                 |
| Battery                      | Voltage not plausible                                                                     |
| Lambda sensor                | C.C.                                                                                      |
| Injector                     | C.A.-C.C.                                                                                 |
| Butterfly casing actuator    | Potentiometer signal not plausible                                                        |
| Petrol vapour solenoid valve | C.C.                                                                                      |
| Relays actuators             | C.A.-C.C.                                                                                 |
| Control unit                 | Faults in the operation of the microprocessor or the control unit memories are signalled. |
| Flow meter                   | Implausible signal                                                                        |
| Timing sensor                | Implausible signal                                                                        |
| Detonation sensor            | Implausible signal                                                                        |
| Speedometer sensor           | Missing or implausible signal                                                             |
| Phase transformer            | C.C.                                                                                      |
| Electric fuel pump           | C.C.                                                                                      |
| Fiat CODE                    | Code not recognized or not received                                                       |

## 10.

### Parameters displayed

Engine rpm  
Injection time  
Advance  
Intake air temperature  
Coolant temperature  
Butterfly valve opening angle  
Battery voltage  
Lambda sensor  
Self-adjustment  
Flow meter  
Engine knock (detonation)  
Vehicle speed  
Petrol vapour cut out solenoid valve  
Fiat CODE  
Atmospheric pressure

### Active diagnosis

The following tests can be activated using the diagnostic equipment:

- Phase transformer
- Injector
- Failure warning light
- Petrol vapour solenoid valve
- Air conditioning
- Idle speed actuator
- Cancelling errors.

### Recovery

If there are faults with the sensors, the control unit replaces the figure transmitted by the sensor with a Recovery value which, depending on the different problems, is either stored in the control unit memory or is constructed specially using the other information available in order to allow the vehicle to reach a Service Centre.

### Permanent memory

The control unit is equipped with a «permanent» type memory (EEPROM), i.e. it keeps a record of the error even when the cause of the problem no longer exists and if the ignition is switched OFF and a «volatile» memory (RAM) where the information concerning the error is lost as soon as the cause of the problem ceases.

This also allows the more effective identification of error of an occasional nature.

Before ending the fault diagnosis, the contents of the «permanent» memory should be cancelled using the diagnostic equipment in Active diagnosis.

The contents of the «permanent» errors memory can be cancelled in the following ways:

- 1 - Using the diagnostic equipment in active diagnosis.

If this is not the case, when the diagnostic equipment is reconnected, the errors already examined will be signalled.

- 2 - If the cause of the error is longer present and the engine has been started up 5 times (running for at least 20 minutes) with an interval of at least 2 minutes between each starting up.



*Disconnecting the control unit from the system, even for very long periods, does not cancel the contents of the «permanent» memory.*

|                                                                                                 |           |
|-------------------------------------------------------------------------------------------------|-----------|
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| - Timing sensor                                                                                 | 12        |
| - Air flow meter                                                                                | 12        |
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| - Fuel temperature sensor                                                                       | 14        |
| - Fuel pressure sensor                                                                          | 14        |
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## **FUEL SYSTEM**

### **INTRODUCTION**

The Fiat Bravo and Brava 1.9 JTD are equipped with a 4 cylinder in line 1920 cc turbodiesel engine with two valves per cylinder, a counter-balance shaft, an overhead camshaft, supercharged by a turbocharger with an intercooler and with electronic fuel injection.

The fuel system ensures the correct operation of the engine and can be divided into the following circuits:

- fuel supply circuit with common rail type injection;
- air supply circuit;
- exhaust circuit;
- oil vapour recirculation circuit from the crankcase;
- exhaust gas recirculation circuit (EGR).

The optimum operation of the various fuel system "circuits" is achieved through an electronic control system managed by a special control unit.

The main feature of the fuel system is the common rail type injection of the fuel. This is a high pressure electronic injection system for direct injection fast diesel engines.

The main features of the common rail system are:

- availability of high injection pressures (up to 1350 bar);
- possibility of modulating these pressures (from a minimum of 150 bar up to a maximum of 1350 bar) independent of the engine rotation speed and load;
- capacity to operate at high engine speeds (up to 6000 rpm);
- precision injection operation (advance and duration of the injection);
- reduction in fuel consumption;
- reduction in emissions.

### **FUEL SYSTEM MANAGEMENT STRATEGIES**

There is a management programme (software) in the control unit memory which consists of a series of strategies, each of which manages a precise system control function.

By using information supplied by the various sensors (input), each strategy processes a series of parameters, using maps stored in special areas of the control unit memory and then operates the system actuators (output) which are the devices which allow the operation of the engine.

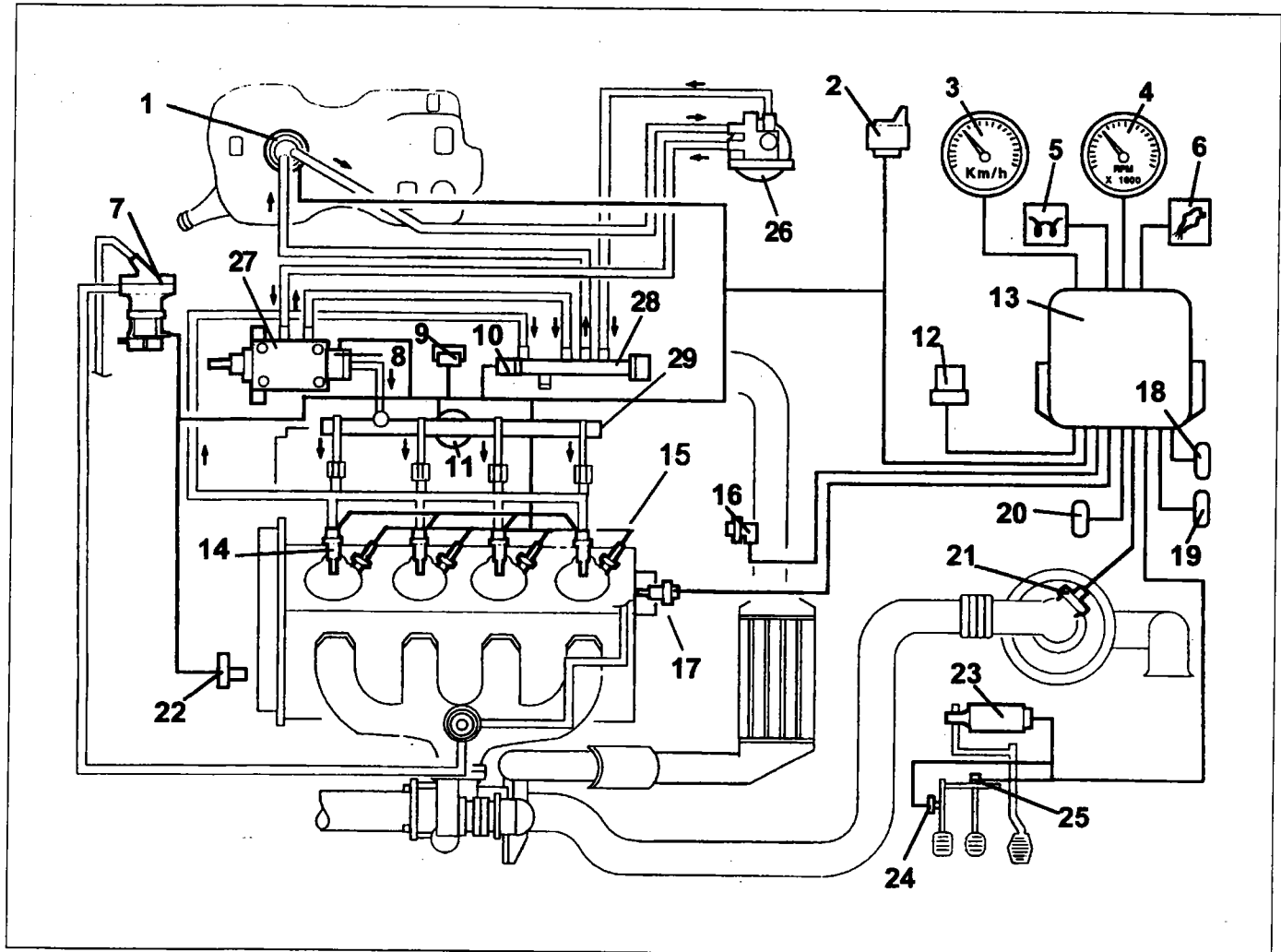
The main aim of the management strategies is to determine the exact quantity of fuel which should be injected into the cylinders at one time (injection advance) and the pressure to achieve the best engine behaviour in terms of power, consumption, fumes, emissions and driveability.

The main system management strategies are, basically, as follows:

- control of quantity of fuel injected;
- control of injection advance;
- control of injection pressure;
- control of auxiliary electric fuel pump;
- control of injection during deceleration (Cut-off);
- control of idle speed;
- control of maximum speed restriction;
- control of maximum torque restriction;
- control of fuel temperature;
- control of engine coolant temperature;
- control of heater plugs;
- control of exhaust fumes;
- control of exhaust gas recirculation (EGR);
- control of engagement of climate control system;
- control of engine immobilizer function (Fiat CODE);
- autodiagnosis.

# 10.

## FUNCTIONAL DIAGRAM SHOWING FUEL SYSTEM



P4A02KJ01

- |                                           |                                        |
|-------------------------------------------|----------------------------------------|
| 1. Auxiliary electric fuel pump           | 17. Engine coolant temperature sensor  |
| 2. Heater plugs control unit              | 18. Climate control system connector   |
| 3. Vehicle speed                          | 19. Diagnostic socket                  |
| 4. Rev counter                            | 20. Fiat CODE system connector         |
| 5. Heater plugs warning light             | 21. Flow meter                         |
| 6. Infocenter (system failure indication) | 22. Timing sensor                      |
| 7. EGR valve modulator                    | 23. Potentiometer on accelerator pedal |
| 8. Pressure regulator                     | 24. Switch on clutch pedal             |
| 9. Excess pressure sensor                 | 25. Switch on brake pedal              |
| 10. Fuel temperature sensor               | 26. Fuel filter                        |
| 11. Fuel pressure sensor                  | 27. Pressure pump                      |
| 12. Injection system relay                | 28. Return manifold (low pressure)     |
| 13. Electronic control unit               | 29. Supply manifold (high pressure)    |
| 14. Injectors                             |                                        |
| 15. Heater plugs                          |                                        |
| 16. Rpm sensor                            |                                        |

### **Controlling the quantity of fuel injected**

On the basis of the signals coming from the accelerator pedal potentiometer, the flow meter and the rpm sensor, the control unit operates the fuel pressure regulator and the injectors, as appropriate. The timing and consequently the injection sequence, is determined by the starting of the engine using the signals coming from the rpm sensor and the timing sensor (synchronization stage); later, the injection timing is implemented using only the rpm sensor signal and the injection sequence 1-3-4-2.

The control unit inhibits the injection in the following cases:

- fuel pressure value above 1500 bar;
- fuel pressure value below 120 bar;
- engine speed above 6000 rpm.

At operating temperature the maximum duration of the injection (injector opening time) is 1500 ns, whilst during starting it can reach 3000 ns.

### **Control of injection advance**

The electronic control unit determines the injection advance mainly on the basis of the quantity of fuel to be injected.

Later on, the injection advance is corrected according to the temperature of the engine coolant and the speed in order to compensate, whilst the engine is warming up, for the increase in the ignition delay due to the low temperatures in the combustion chambers.

### **Control of injection pressure**

This check is especially important because the injection pressure affects the following parameters:

- the quantity of fuel introduced into the cylinders for the duration of the injection time;
- the atomization of the fuel injected;
- the penetration of the jet;
- the delay between the electrical operation of the injector and the effective start and end of injection.

The above mentioned parameters have a considerable effect on the behaviour of the engine, especially as far as the power supplied, exhaust emissions, noise and driveability are concerned.

On basis of the engine load, the injection control unit operates the pressure regulator to ensure a line pressure which is always optimum.

With the engine cold, the injection pressure is corrected on the basis of the engine coolant temperature and speed in order to satisfy the engine requirements at different operating temperatures.

### **Control of the auxiliary electric fuel pump**

The auxiliary electric fuel pump, immersed in the tank, is supplied by the injection control unit via a relay when the ignition key is in the ON position.

The supply to the electric pump is inhibited when one of the following conditions occurs:

- after the ignition key has been in the ON position for a certain length of time and the engine has not been started up;
- if the inertia switch has been operated.

### **Control of injection during deceleration (cut-off)**

The cut-off strategy is implemented when the injection control unit receives the information from the potentiometer that the accelerator pedal is released.

Under these circumstances, the control unit removes the supply to the injectors and reactivates before the idle speed is reached.

#### Control of the idle speed

On the basis of the signals coming from the rpm sensor and the engine coolant temperature sensor, the injection control unit controls the pressure regulator and varies the operating times for the injectors to keep the idle speed stable.

Under certain circumstances, in order to control the idle speed, the control unit also takes the battery voltage into account.

#### Control of the maximum speed restriction

According to the engine speed, the injection control unit restricts the maximum speed through two types of intervention:

- as the maximum speed is approached, it decreases the quantity of fuel injected, reducing the line pressure;
- when 6000 rpm is exceeded, it inhibits the operation of the injectors.

#### Control of the maximum torque restriction

Depending on the engine speed, the injection control unit calculates the torque limit and maximum permissible fumes parameters based on pre-defined maps stored in the memory.

It then corrects the above parameters using engine coolant temperature and vehicle speed data and uses the values obtained in this way for metering the quantity of fuel to be injected involving the pressure regulator and the injectors.

#### Control of fuel temperature

The injection control unit is constantly informed of the temperature of the fuel by the sensor on the return manifold.

If the temperature of the fuel exceeds a certain level (about 110 °C), the control unit reduces the line pressure acting on the pressure regulator and leaving the injection times unaltered.

#### Control of engine coolant temperature

The injection control unit is constantly informed of the temperature of the engine coolant by the sensor on the thermostat.

If the temperature of the engine coolant exceeds certain values, the control unit implements the following strategies:

- it reduces the quantity of fuel injected acting on the pressure regulator and the injectors (power reduction);
- it operates the engine cooling radiator fan.

#### Control of heater plugs

The injection control unit controls the operation of the heater plugs control unit so that the temperature in the combustion chambers is at a level which assists the self-ignition of the fuel and consequently facilitates starting.

In effect the injection control unit controls the operation of the heater plugs control unit for a certain length of time both before starting (pre-heating) and after starting (post-heating) and also controls the coming on of the warning light in the instrument panel.

The pre-heating and post-heating times plus the coming of the heater plugs warning light all vary according to the temperature of the engine coolant.



### **Control of exhaust fumes**

Through this function the injection control unit limits any exhaust fumes which could occur during strong acceleration.

In order to satisfy this requirement, the control unit processes the signals supplied by the accelerator pedal potentiometer, the rpm sensor and the intake air quantity sensor (flow meter) and operates the fuel pressure regulator and the injectors to correctly meter the quantity of fuel to be injected.

### **Control of exhaust gas recirculation**

On the basis of the signals supplied by the rpm, intake air quantity, engine coolant temperature and accelerator pedal position sensors, the injection control unit calculates the operating times for the EGR solenoid valve so that the exhaust gases are partly recirculated in certain engine operating conditions.

### **Control of engagement of air conditioning system**

The injection control unit manages the operation of the air conditioning system compressor electromagnetic coupling following a logic aimed at preventing operating conditions which would adversely affect engine performance.

When the compressor is switched on, the injection control unit increases the quantity of fuel during idling so that the engine can meet the request for more power and interrupts the supply to the compressor in the following conditions:

- request for high power for the engine (strong acceleration);
- excessive engine coolant temperature.

### **Control of engine immobilizer function**

The system is equipped with an engine immobilizer function. This function is achieved through the presence of a special control unit (Fiat CODE), capable of dialogue with the injection control unit and an electronic key, with a special transmitter for sending a recognition code.

Each time the key is turned to the OFF position, the Fiat CODE system completely deactivates the injection control unit.

When the ignition key is placed in the ON position, the following operations take place in order:

1. the injection control unit (whose memory contains a secret code) sends the Fiat CODE control unit a request for the latter to send the secret code to deactivate the immobilizer function;
2. the Fiat CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key;
3. the recognition of the secret code allows the de-activation of the injection control unit immobilizer function and normal operation to be resumed.

### **Autodiagnosis**

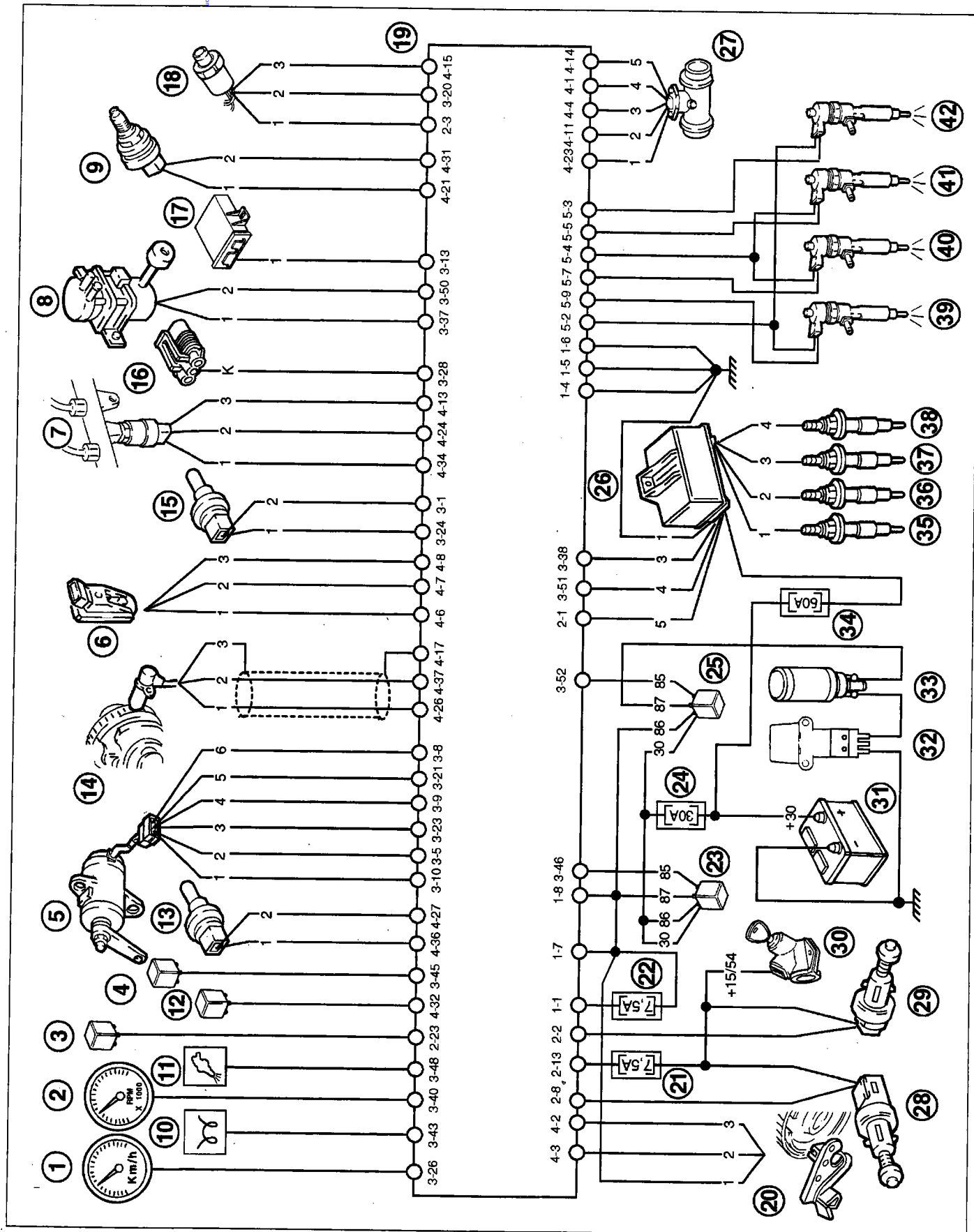
The complete electronic fault diagnosis of the injection system can be carried out by connecting the special equipment (EXAMINER or SDC station) to the diagnostic socket.

The system is also equipped with an autodiagnostic function which recognizes, memorizes and signals any failures.

If a fault is detected at the sensors or actuators, the signal reconstruction (recovery) strategies are immediately activated to ensure the operation of the engine at an acceptable level. The vehicle can therefore be driven to a Service Centre to have the appropriate repairs carried out.

# 10.

## INJECTION SYSTEM WIRING DIAGRAM



P4A06KJ01

**Key to injection system wiring diagram components**

1. Vehicle speed
2. Rev counter
3. Engine cooling fan low speed relay
4. Radiator fan high speed activation relay
5. Potentiometer on accelerator pedal
6. Excess pressure sensor
7. Fuel pressure sensor
8. EGR system modulator solenoid
9. Fuel pressure regulator
10. Glow plug preheating warning light on control panel
11. Injection system failure warning light
12. Air conditioner control relay
13. Coolant temperature sensor
14. RPM sensor
15. Fuel temperature sensor
16. Tester connection
17. Fiat CODE control unit
18. Four stage pressure switch
19. Injection electronic control unit
20. Timing sensor
21. Fuse (7.5A) protecting injection control unit (+15 power supply from ignition switch)
22. Fuse (7.5A) protecting injection control unit (+30 power supply from battery)
23. Injection system main relay
24. 30A fuse protecting injection system
25. Auxiliary fuel pump supply relay
26. Glow plug preheating control unit
27. Intake air flow and temperature sensor (debimeter)
28. Brake pedal switch
29. Clutch pedal switch
30. Ignition switch
31. Battery
32. Inertia switch
33. Auxiliary fuel pump (submerged in tank)
34. 60A fuse protecting glow plug control unit
35. Cylinder no.1 glow plug
36. Cylinder no.2 glow plug
37. Cylinder no.3 glow plug
38. Cylinder no.4 glow plug
39. Cylinder no.1 injector
40. Cylinder no.2 injector
41. Cylinder no.3 injector
42. Cylinder no.4 injector

### 10.

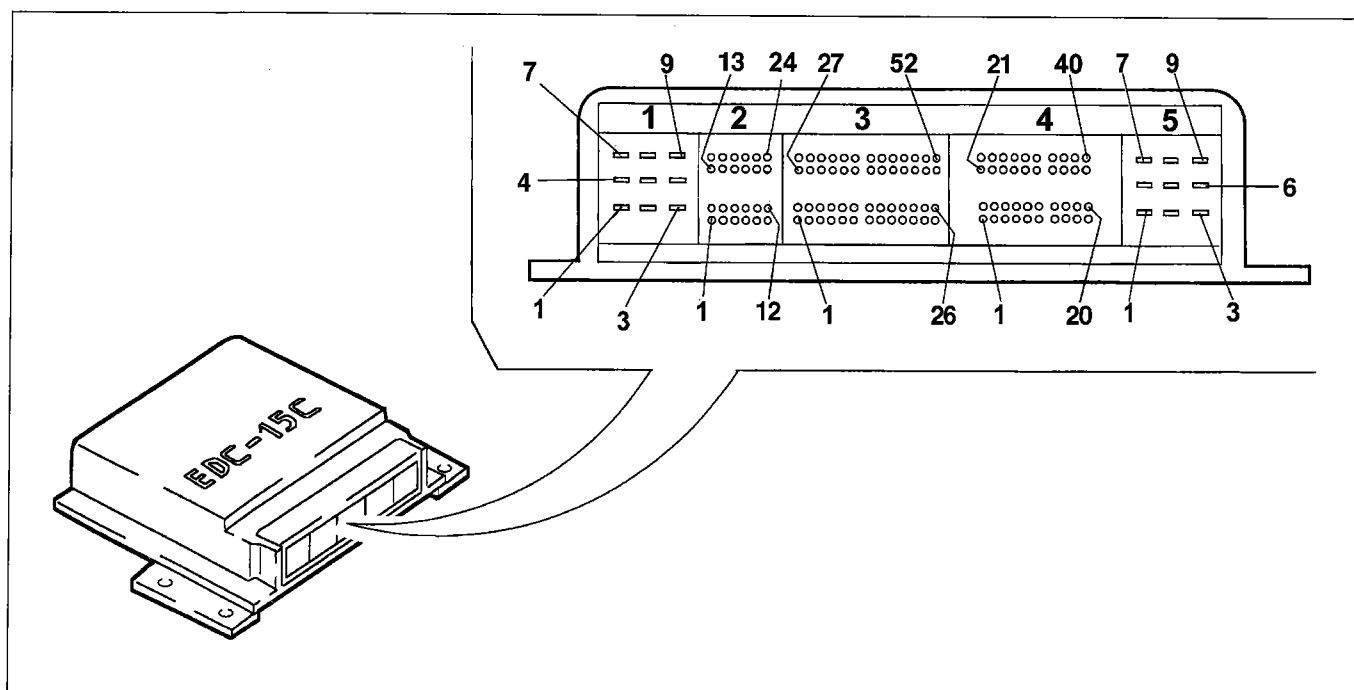
#### INJECTION ELECTRONIC CONTROL UNIT

The injection control unit processes signals from the various sensors by applying software algorithms and controls the actuators accordingly (particularly the injectors and pressure regulator) to achieve the best possible engine service conditions.

The control unit is "flash E.P.R.O.M." type, i.e. it can be reprogrammed from outside without any need to adjust the hardware.

The injection control unit contains a built-in absolute pressure sensor and is connected to the wiring by a 134 pin connector

#### Identifying injection control unit connections (pin-out)



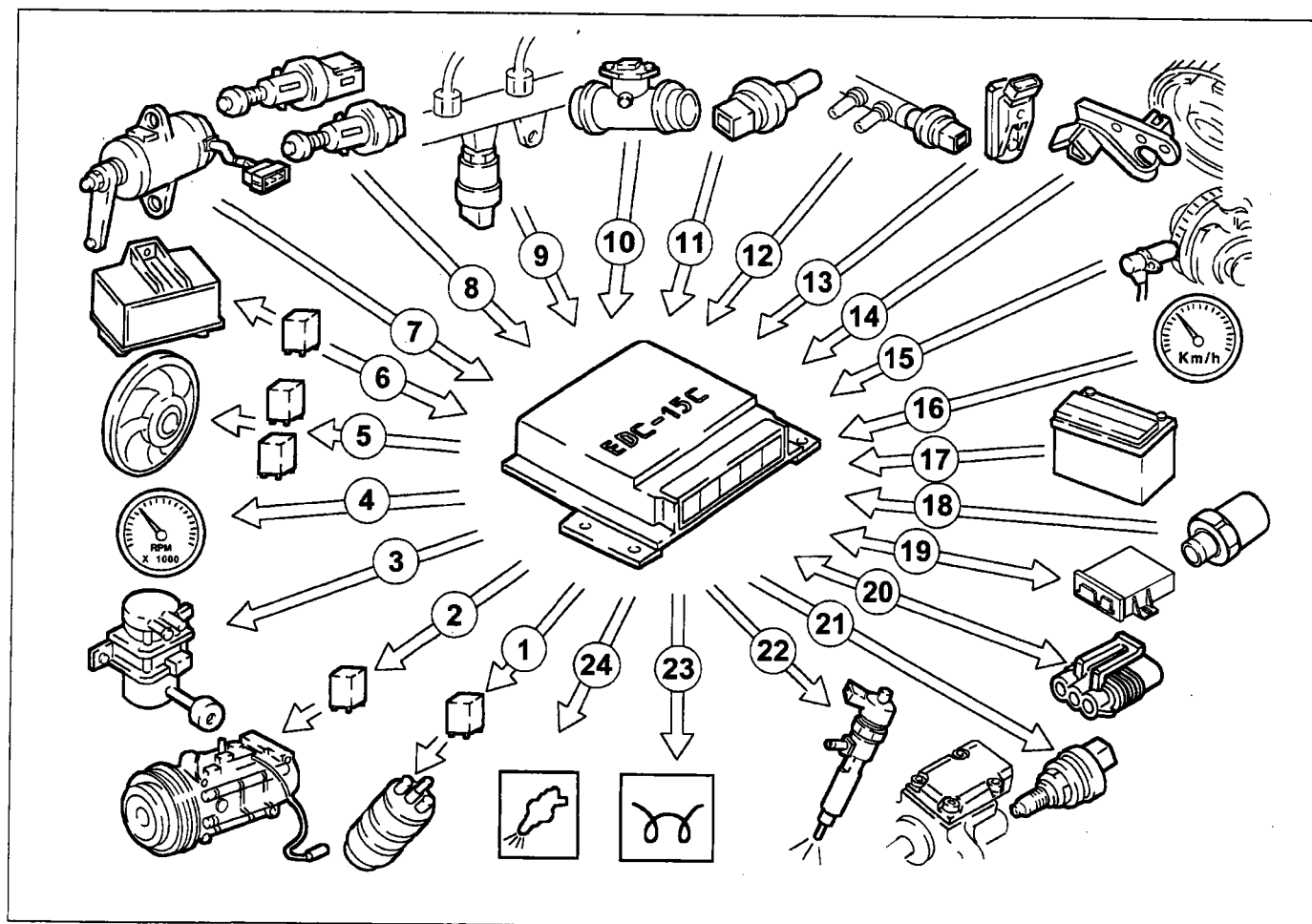
4A08KJ01

- |                                                |                                                |
|------------------------------------------------|------------------------------------------------|
| 1-01 Battery positive (+30) from main relay    | 2-09 Not connected                             |
| 1-02 Not connected                             | 2-10 Not connected                             |
| 1-03 Not connected                             | 2-11 Not connected                             |
| 1-04 Earth                                     | 2-12 Not connected                             |
| 1-05 Earth                                     | 2-13 Positive (+15) from ignition switch       |
| 1-06 Earth                                     | 2-14 Not connected                             |
| 1-07 Battery positive (+30) from main relay    | 2-15 Not connected                             |
| 1-08 Battery positive (+30) from main relay    | 2-16 Not connected                             |
| 1-09 Not connected                             | 2-17 Not connected                             |
| 2-01 Glow plug timer signal                    | 2-18 Not connected                             |
| 2-02 Clutch pedal switch                       | 2-19 Not connected                             |
| 2-03 Climate control system activation request | 2-20 Not connected                             |
| 2-04 Not connected                             | 2-21 Not connected                             |
| 2-05 Not connected                             | 2-22 Not connected                             |
| 2-06 Not connected                             | 2-23 Low radiator fan speed activation request |
| 2-07 Not connected                             | 2-24 Not connected                             |
| 2-08 Brake pedal switch                        | 3-01 Fuel temperature sensor earth             |
|                                                | 3-02 Not connected                             |
|                                                | 3-03 Not connected                             |

- 3-04 Not connected
- 3-05 Accelerator pedal potentiometer 1 supply
- 3-06 Not connected
- 3-07 Not connected
- 3-08 Accelerator pedal potentiometer 2 earth
- 3-09 Accelerator pedal potentiometer 2 signal
- 3-10 Accelerator pedal potentiometer 1 signal
- 3-11 Not connected
- 3-12 Not connected
- 3-13 Fiat CODE control unit
- 3-14 Not connected
- 3-15 Not connected
- 3-16 Not connected
- 3-17 Not connected
- 3-18 Not connected
- 3-19 Not connected
- 3-20 Go ahead to engage climate control from four stage pressure switch
- 3-21 Accelerator pedal potentiometer 2 supply
- 3-22 Not connected
- 3-23 Accelerator pedal potentiometer 1 earth
- 3-24 Fuel temperature sensor signal
- 3-25 Not connected
- 3-26 Vehicle speed signal (from ABS)
- 3-27 Not connected
- 3-28 Diagnostic socket connection (line K)
- 3-29 Not connected
- 3-30 Auxiliary electric fuel pump supply (immersed in the tank)
- 3-31 Not connected
- 3-32 Not connected
- 3-33 Not connected
- 3-34 Not connected
- 3-35 Not connected
- 3-36 Not connected
- 3-37 EGR modulating solenoid valve supply
- 3-38 Heater plugs timer control
- 3-39 Not connected
- 3-40 Rpm signal to the rev counter
- 3-41 Not connected
- 3-42 Not connected
- 3-43 Heater plugs warning light
- 3-44 Not connected
- 3-45 Request to engage engine radiator fan high speed
- 3-46 Main relay go ahead
- 3-47 Not connected
- 3-48 Injection system failure
- 3-49 Not connected
- 3-50 EGR modulating valve earth
- 3-51 Heater plugs timer control
- 3-52 Auxiliary electric pump relay feed go ahead
- 4-01 Flow meter supply
- 4-02 Timing sensor earth
- 4-03 Timing sensor signal
- 4-04 Flow meter earth
- 4-05 Not connected
- 4-06 Excess pressure sensor signal
- 4-07 Excess pressure sensor earth
- 4-08 Excess pressure sensor supply
- 4-09 Not connected
- 4-10 Not connected
- 4-11 Flow meter supply
- 4-12 N.C.
- 4-13 Fuel pressure sensor supply
- 4-14 Flow meter signal
- 4-15 Four stage pressure switch
- 4-16 Not connected
- 4-17 Rpm sensor screening
- 4-18 Not connected
- 4-19 Not connected
- 4-20 Not connected
- 4-21 Fuel pressure regulator
- 4-22 Not connected
- 4-23 Air temperature sensor signal
- 4-24 Fuel pressure sensor signal
- 4-25 Not connected
- 4-26 Rpm sensor signal
- 4-27 Engine coolant temperature sensor earth
- 4-28 Not connected
- 4-29 Not connected
- 4-30 Not connected
- 4-31 Fuel pressure regulator
- 4-32 Climate control system relay
- 4-33 Not connected
- 4-34 Fuel pressure sensor earth
- 4-35 Not connected
- 4-36 Engine coolant temperature sensor signal
- 4-37 Rpm sensor earth
- 4-38 Not connected
- 4-39 Not connected
- 4-40 Not connected
- 5-01 N.C.
- 5-02 Supply for injectors for cylinders 1 and 4
- 5-03 Operation of injector for cylinder no. 4
- 5-04 Supply for injectors for cylinders no. 2 and 3
- 5-05 Operation of injector for cylinder no. 3
- 5-06 Not connected
- 5-07 Operation of injector for cylinder no. 2
- 5-08 N.C.
- 5-09 Operation of injector for cylinder no. 1

# 10.

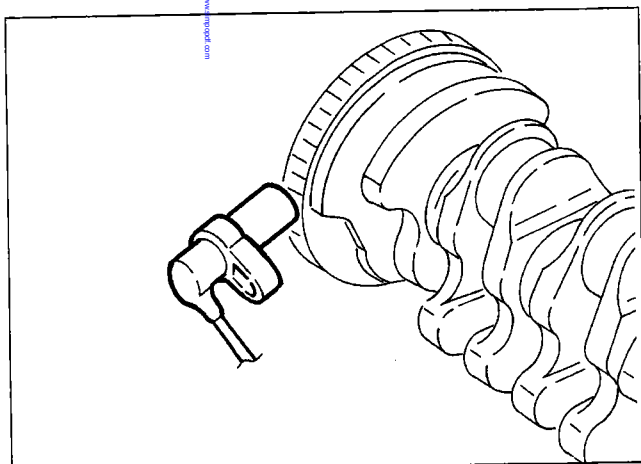
## DIAGRAM SHOWING INFORMATION ENTERING/LEAVING THE INJECTION CONTROL UNIT AND SENSORS/ACTUATORS



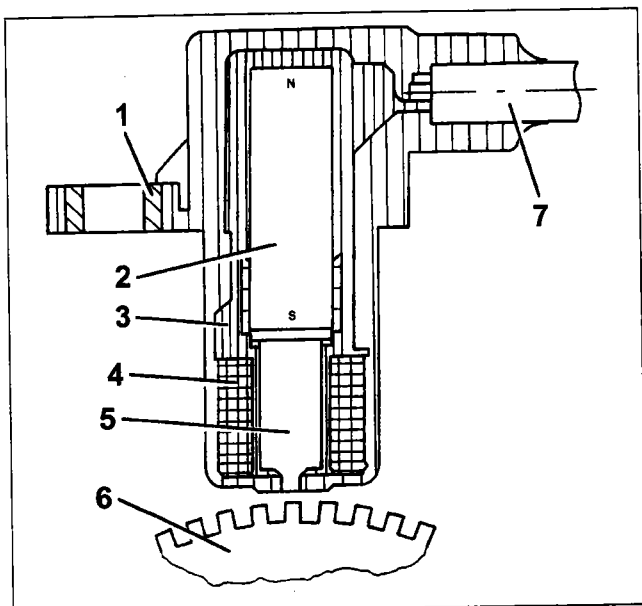
P4A10KJ01

- |                                                             |                                |
|-------------------------------------------------------------|--------------------------------|
| 1. Auxiliary electric fuel pump                             | 13. Excess pressure sensor     |
| 2. Climate control compressor                               | 14. Timing sensor              |
| 3. EGR modulating valve                                     | 15. Rpm sensor                 |
| 4. Rev counter                                              | 16. Vehicle speed              |
| 5. Engine radiator fans                                     | 17. Battery                    |
| 6. Heater plugs control unit                                | 18. Four stage pressure switch |
| 7. Accelerator pedal potentiometer                          | 19. Fiat CODE control unit     |
| 8. Brake and clutch pedal switches                          | 20. Diagnostic socket          |
| 9. Fuel pressure sensor                                     | 21. Fuel pressure regulator    |
| 10. Intake air temperature and quantity sensor (flow meter) | 22. Injectors                  |
| 11. Engine coolant temperature sensor                       | 23. Heater plugs warning light |
| 12. Fuel temperature sensor                                 | 24. Injection system failure   |

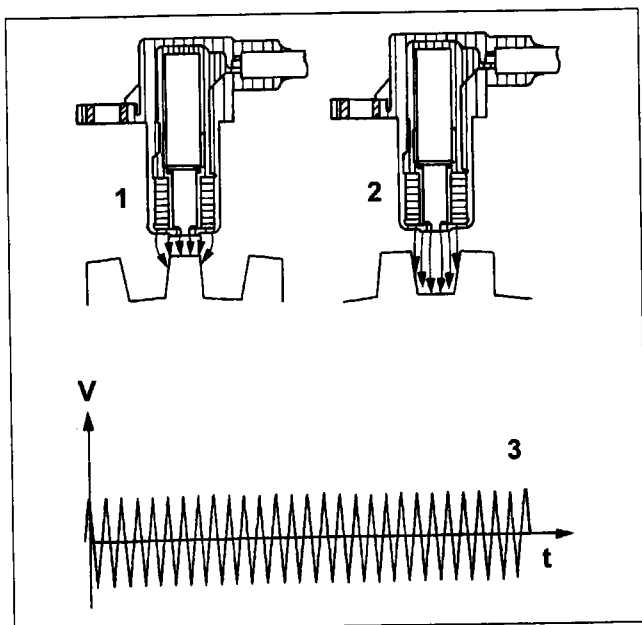




P4A11KJ01



P4A11KJ02



P4A11KJ03

## RPM SENSOR

The rpm sensor is fitted on the cylinder block-/crankcase facing the flywheel on the crankshaft.

The sensor is the inductive type, in other words it operates through the variation in the magnetic field produced by the teeth on the flywheel (60-2 teeth) passing in front of the sensor element.

The injection control unit uses the rpm sensor signal to determine the crankshaft angular position and speed.

## Operation

The passage from full to empty due to whether or not there is a tooth, determines a variation in the magnetic flow sufficient to produce an alternating voltage from the counting of the teeth on the flywheel.

The peak rpm sensor output voltage depends, all things being equal, on the distance between the sensor and the flywheel teeth.

1. Metal bush
2. Permanent magnet
3. Sensor body
4. Winding
5. Core
6. Flywheel
7. Electrical connection

To obtain the correct signals, the recommended distance between the flywheel and the sensor (gap) should be between 0.8 and 1.5 mm.

This distance cannot be adjusted therefore if the gap is outside of the tolerance, check the condition of the sensor and the flywheel.

**Winding resistance: 860 Ohm  $\pm 10\%$  at 20 °C**

1. Maximum magnetic flow
2. Minimum magnetic flow
3. Alternating voltage



## 10.

### TIMING SENSOR

This Hall effect type sensor is fitted on the cylinder and is facing the camshaft pulley (exhaust). There is an opening in the pulley which allows the timing sensor to detect the engine timing position and signal it to the injection control unit.

The injection control unit uses the timing sensor signal to recognize TDC at the end of the compression stroke.

#### Operation

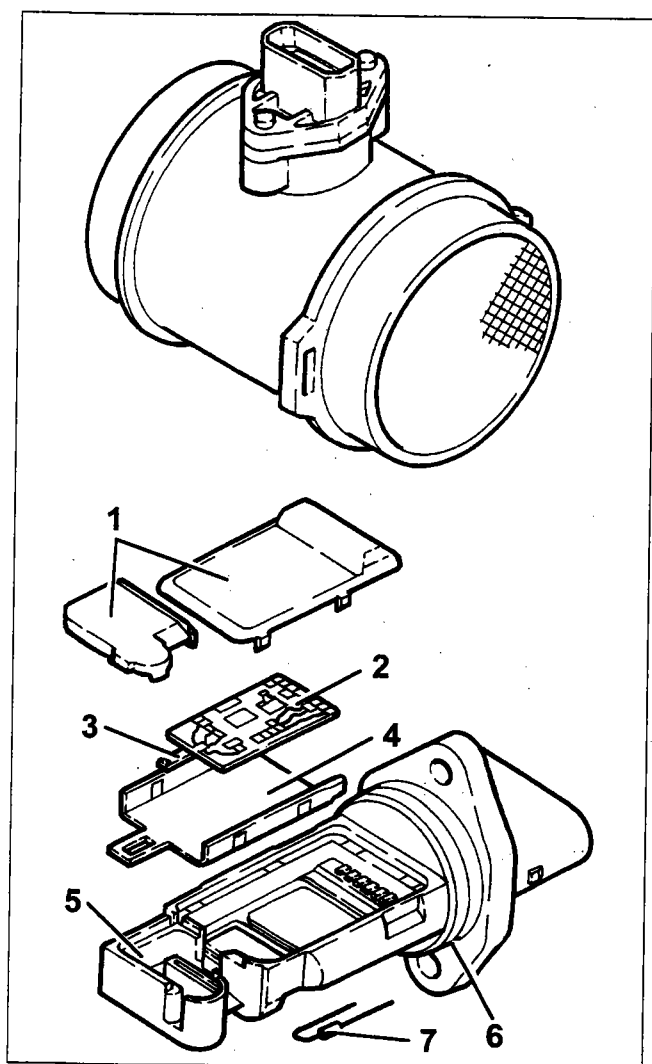
A semiconductor layer, through which a current flows, immersed in a normal magnetic field (lines of force perpendicular to the direction of the current), produces a difference in power known as Hall voltage.

If the intensity of the current remains constant, the voltage produced only depends on the intensity of the magnetic field; therefore if the intensity of the magnetic field simply varies periodically this produces a modulated electrical signal, whose frequency is proportional to the speed at which the magnetic field changes.

To produce this change, a metal ring (inner part of the pulley) with an opening passes through the sensor.

As it moves, the metal part of the ring covers the sensor blocking the magnetic field with a consequent low output signal; conversely, by the opening where the magnetic field is present, the sensor produces a high signal.

This signal, together with the signals relating to the rpm and TDC, allow the injection control unit to recognize the position of the pistons and determine the injection point.



P4A12KJ01

### AIR FLOW METER

The flow meter is located on the air inlet hose and is the hot film type.

The intake air temperature sensor is incorporated inside the flow meter.

#### Operation

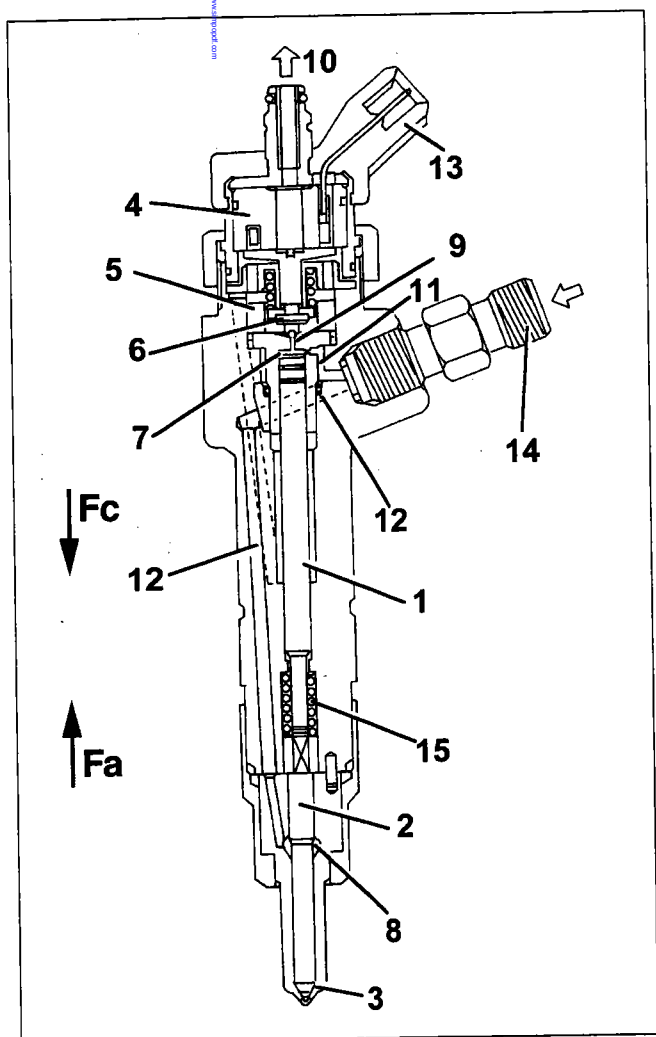
The operating principle is based on a heated diaphragm in a measuring duct through which the intake air which enters the engine flows.

The hot film diaphragm is kept at a constant temperature (about 120 °C higher than the temperature of the inlet air) by the heating resistance.

The mass of air passing through the measuring duct tends to remove heat from the diaphragm therefore, in order to keep the latter at a constant temperature, a current is passed through the resistance.

This current, being proportional to the mass of air which flows to the engine, is measured using a Wheatstone bridge and the signal obtained is sent to the injection control unit.

1. Covers
2. Electronic card
3. Sensor
4. Support plate
5. Support
6. Seal (O-Ring)
7. Temperature sensor



1. Pressure rod
2. Pin
3. Jet
4. Coil
5. Valve
6. Shutter with ball
7. Control area
8. Supply volume
9. Control volume
10. Fuel outlet connector (low pressure)
11. Control manifold
12. Supply manifold
13. Electrical connection
14. Fuel inlet connector (high pressure)
15. Spring

## INJECTORS

The injectors, fitted on the cylinder head, are the electro-magnetic type, operated directly by the injection control unit.

The injectors are equipped with a high pressure supply duct and a recirculation pipe at ambient pressure; the supply duct is connected to the supply manifold (rail) with pipes designed to withstand the high operating pressures.

The injector can be divided into two parts:

- actuator/nozzle consisting of a pressure rod (1), pin (2) and jet (3);
- solenoid valve consisting of a coil (4) and valve (5).

## Operation

The operation of the injectors can be divided into three stages:

### 1. rest position

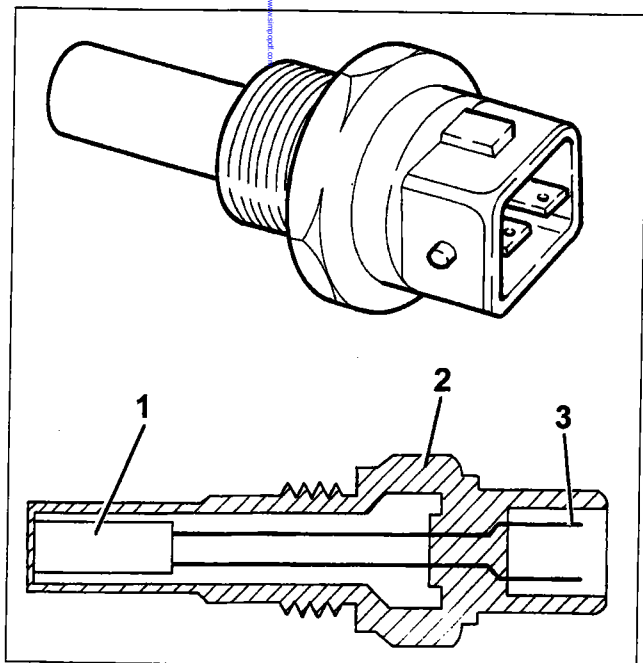
The coil (4) is de-energized and the shutter (6) is in the closed position and does not allow the introduction of fuel into the cylinder:  $F_c > F_a$  where  $F_c$  is the force produced by the pressure which acts on the control area (7) of the pressure rod (1) and  $F_a$  is the force produced by the pressure acting on the supply volume (8).

### 2. start of injection

The coil (4) is energized and raises the shutter (6). The fuel flows from the control volume (9) to the return manifold causing a decrease in pressure in the control area (7). At the same time, the line pressure through the supply manifold (12) exerts a force  $F_a > F_c$  on the supply volume (8) raising the pin (2) with the consequent introduction of fuel into the cylinders.

### 3. end of injection

The coil (4) is de-energized and returns the shutter (6) to the closed position which restores a balance which returns the pin (2) to the closed position and consequently the injection ends.



P4A14KJ01

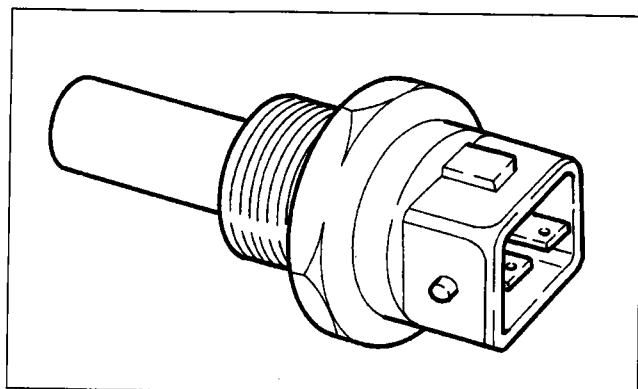
### ENGINE COOLANT TEMPERATURE SENSOR

This sensor is fitted on the thermostat and detects the temperature of the engine coolant by means of an NTC thermistor with a negative resistance coefficient.

The sensor is produced using semiconductor technology, therefore if the temperature of the sensor element increases as the temperature of the coolant increases, the resistance value decreases as a result.

As the variation in the resistance is not linear, the same increase in temperature is greater at lower temperatures than at higher temperatures.

1. NTC resistance
2. Sensor body
3. Electrical connector

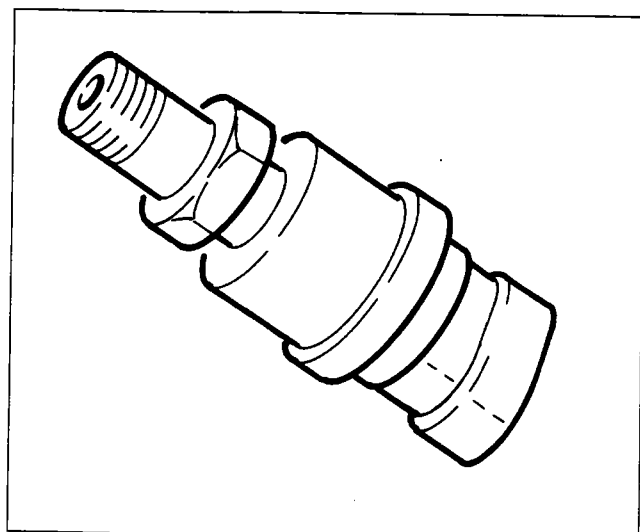


P4A14KJ02

### FUEL TEMPERATURE SENSOR

This sensor is fitted on the return manifold and detects the temperature of the fuel through an NTC thermistor which has a negative resistance coefficient.

For the operation of the sensor, refer to the previous description dealing with the coolant temperature sensor.

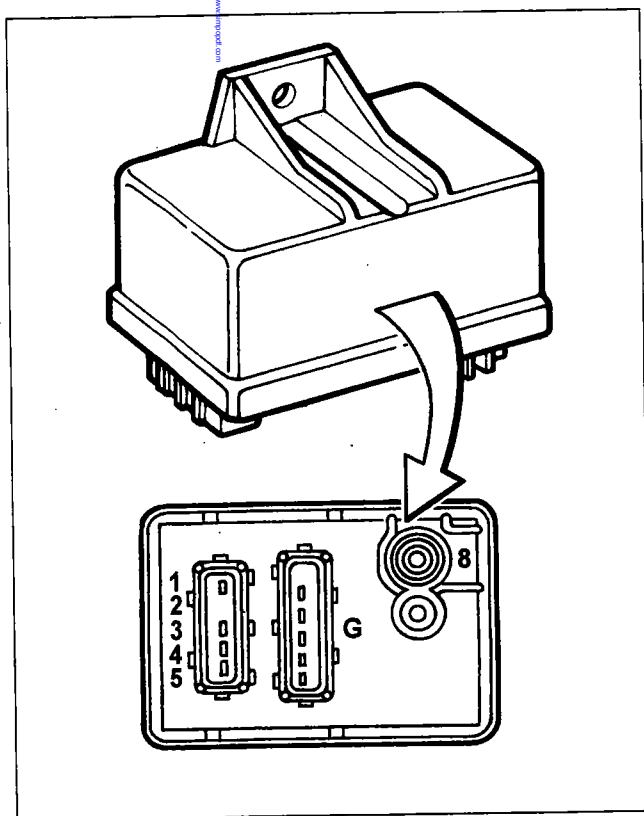


P4A14KJ03

### FUEL PRESSURE SENSOR

This sensor is fitted in the centre of the fuel supply manifold (rail) and has the task of supplying the injection control unit with a return ("feed-back") signal for:

- regulating the injection pressure;
- regulating the duration of the injection.



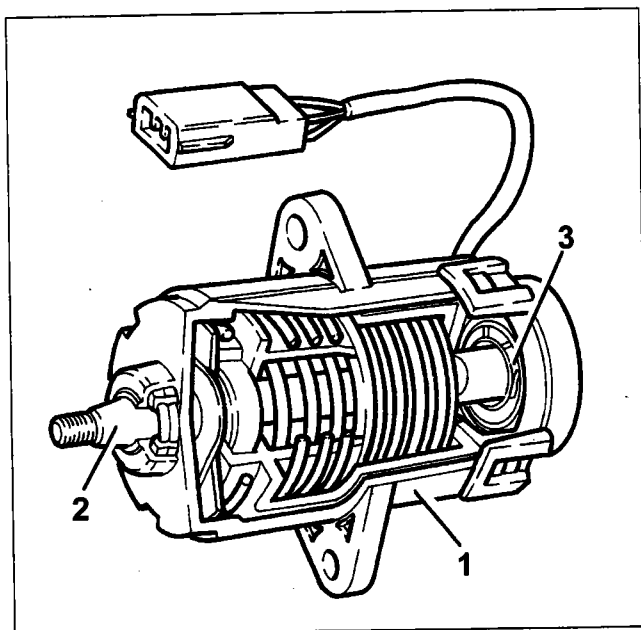
P4A15KJ01

### HEATER PLUGS CONTROL UNIT

The operation of the heater plugs takes place through the heater plugs control unit under the direct control of the injection control unit. There is an "intelligent" relay inside the heater plugs control unit which sends feed-back to the injection control unit which is thereby informed of any failure in the heater plugs control unit or a short circuit to earth of the heater plugs.

The diagram illustrates the connectors at the base of the heater plugs control unit and the pin-out:

1. Earth
2. Connected to earth
3. Injection control unit (pin 3-38)
4. Injection control unit (pin 3-51)
5. Injection control unit (pin 2-1)
8. Battery positive (+30)
- G. Heater plugs (only 4 outlets are used)



P4A15KJ02

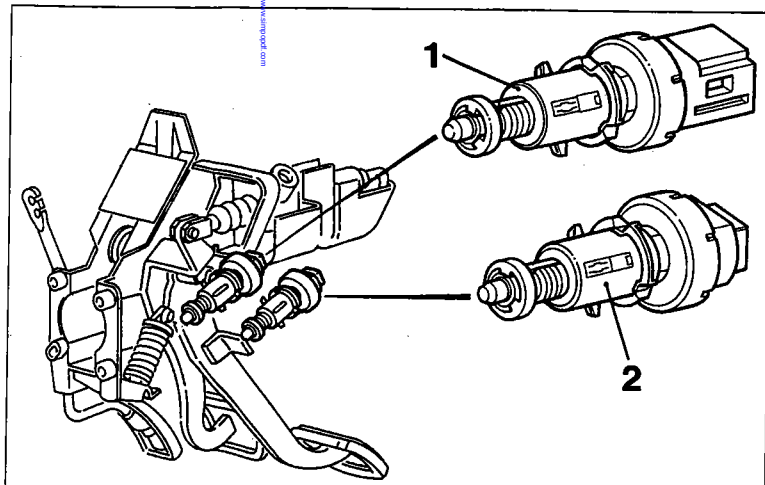
### ACCELERATOR PEDAL POTENTIOMETER

The position of the accelerator pedal is transformed into an electrical voltage signal and is sent to the injection control unit by the potentiometer connected to the pedal.

The accelerator pedal position signal is processed together with the information relating to the speed to obtain the injection times and pressure.

The sensor is made up of a casing (1) fixed to the pedals by a flange, which contains a shaft (2), in an axial position, connected to the two potentiometers (3): one main one and one safety one.

There is a coil spring on the shaft which ensures the correct resistance to the pressure, whilst a second spring ensures the return on release.



P4A16KJ01

### **BRAKE PEDAL SWITCH**

There is a switch (1) on the brake pedal which operates the brake lights; the same switch sends a signal to pin 2-8 of the injection control unit.

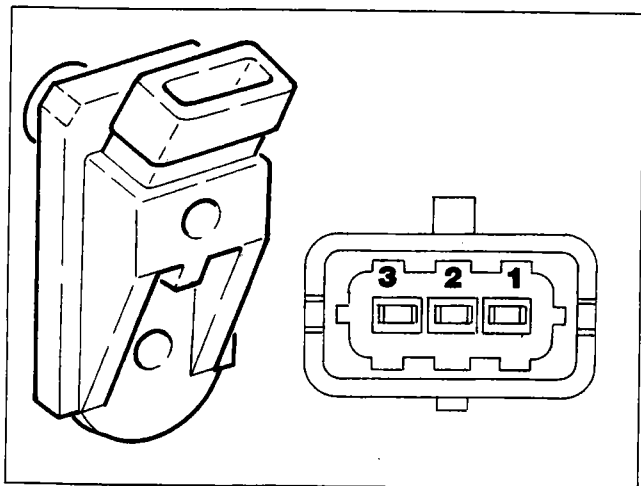
The "brake pedal pressed" signal is used by the control unit:

- for understanding that there is a deceleration situation;
- for checking the plausibility of the signal coming from the accelerator potentiometer.

### **CLUTCH PEDAL SWITCH**

There is a switch (2) on the clutch pedal connected to pin 2-2 of the injection control unit.

The "clutch pedal operated" signal is used by the injection control unit to distinguish the gear engaged and gear shift conditions.



P4A16KJ02

### **EXCESS PRESSURE SENSOR**

This sensor is fitted on the inlet manifold and the signal transmitted to the injection control unit is used for:

- regulating the injection pressure;
- regulating the duration of the injection.

The diagram at the side shows the sensor and the electrical connector with the pin-out:

1. Pressure signal
2. Earth
3. Supply

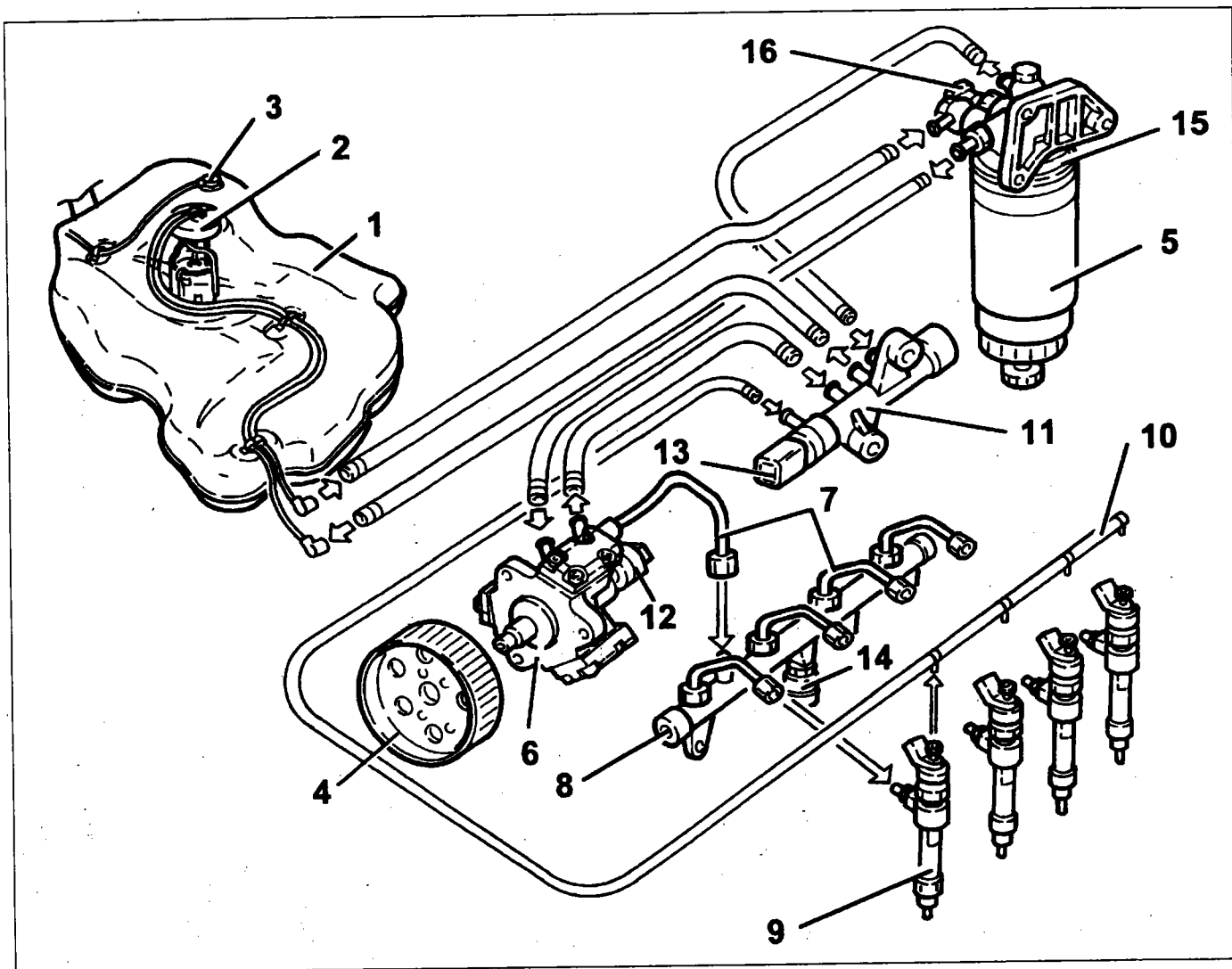
### **ATMOSPHERIC PRESSURE SENSOR**

The atmospheric pressure sensor is incorporated inside the injection electronic control unit and has the task of measuring the atmospheric pressure in order to correct the air flow rate value measured and the reference air flow rate for controlling the EGR function.

## FUEL SUPPLY CIRCUIT

The fuel supply circuit is operationally divided into a low pressure circuit and a high pressure circuit. The low pressure circuit consists of a tank, multi-purpose valve, auxiliary electric pump immersed in the tank and return manifold.

The high pressure circuit consists of a radialjet pressure pump, supply manifold and injectors.

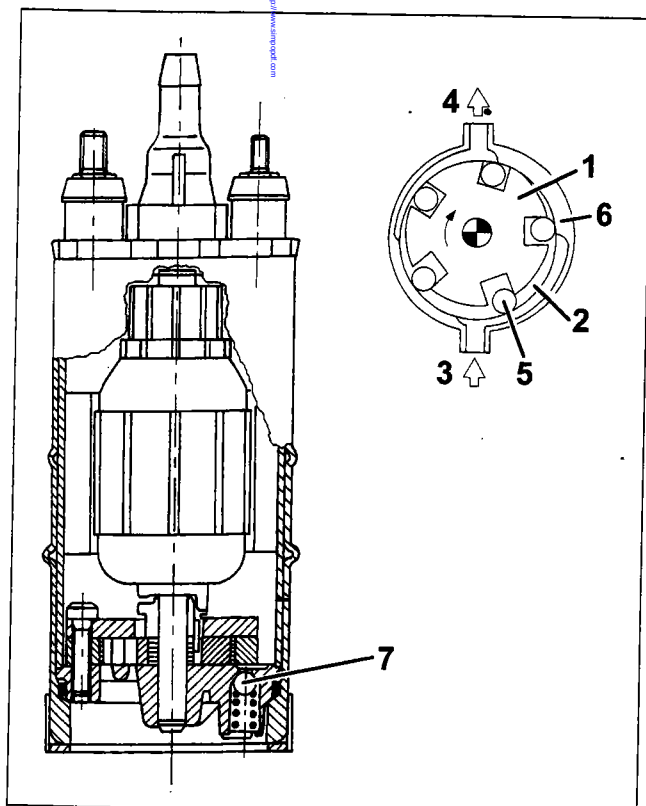


P4A17KJ01

- |                                                                         |                                                        |
|-------------------------------------------------------------------------|--------------------------------------------------------|
| 1. Fuel tank                                                            | 9. Injectors                                           |
| 2. Immersed (auxiliary) electric pump assembly complete with fuel gauge | 10. Fuel recirculation pipe (return for the injectors) |
| 3. Multi-purpose valve                                                  | 11. Return manifold                                    |
| 4. Pressure pump drive pulley                                           | 12. Pressure regulator                                 |
| 5. Diesel filter cartridge                                              | 13. Fuel temperature sensor                            |
| 6. Pressure pump                                                        | 14. Fuel pressure sensor                               |
| 7. High pressure pipes                                                  | 15. Diesel heater                                      |
| 8. Supply manifold (rail)                                               | 16. Thermal switch                                     |



## 10.



P4A18KJ01

1. Impeller
2. Volumes
3. Inlet port
4. Supply port
5. Rollers
6. Outer ring
7. Excess pressure valve

### IMMERSED (AUXILIARY) ELECTRIC PUMP AND FUEL GAUGE

This assembly is basically composed of:

- a roller type electric pump;
- a fuel level gauge;
- a fuel filter

The electric pump immersed in the fuel is the volumetric roller type with a motor with brushes and permanent magnets.

The impeller (1), driven by the electric motor, creates volumes (2) which move from the inlet port (3) to the supply port (4).

These volumes are defined by rollers (5) which, during the rotation of the motor, adhere to the outside ring (6).

The electric pump has two valves: one single-acting valve to prevent the fuel circuit from being drained (when the pump is not working); the second excess pressure valve (7) which recirculates the supply with the inlet when the pressure exceeds 5 bar.

### FUEL FILTER

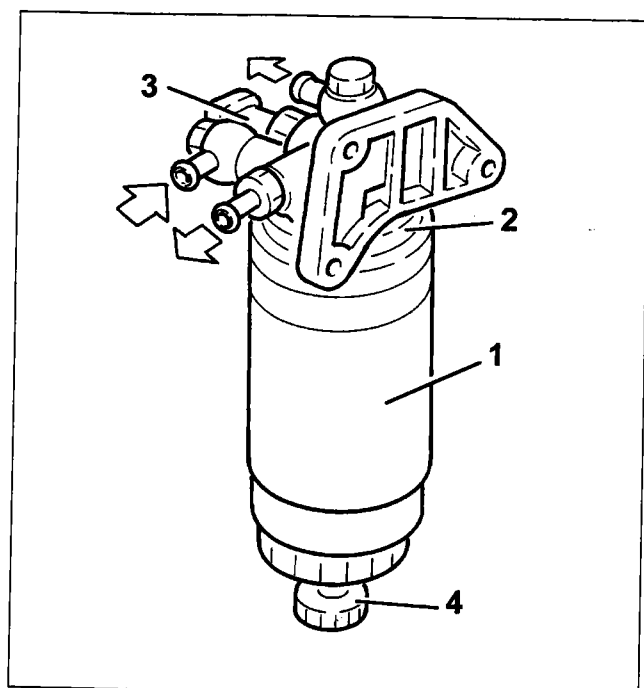
The fuel filter is located in the engine compartment, fixed to the inlet manifold.

The filter is the cartridge type with a filter element (1) made up of a pack of paper discs with a filtering surface area of around 5300 cm<sup>2</sup> and a filtering capacity of 4 - 5 mm.

The filter has a fuel pre-heating device (2) controlled by a thermal switch (3) fitted on the actual filter.

When the temperature of the diesel is below 6 °C, an electrical resistance heats it up to a maximum of 15 °C before sending it to the pressure pump.

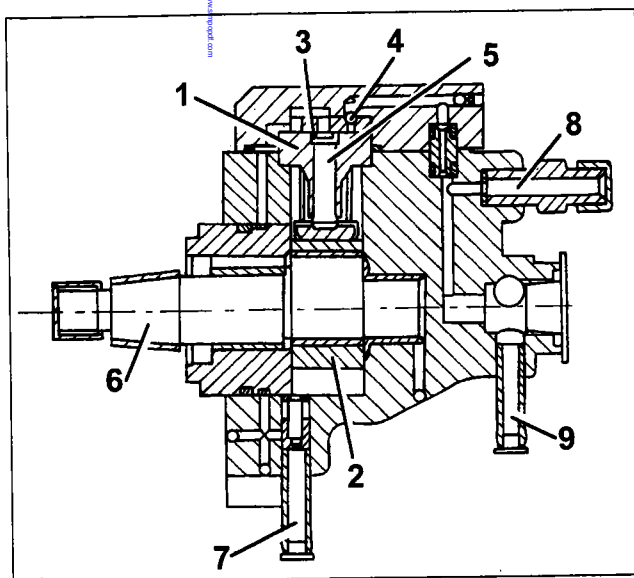
There is a plug (4) bolted to the base of the fuel filter cartridge for draining the water.



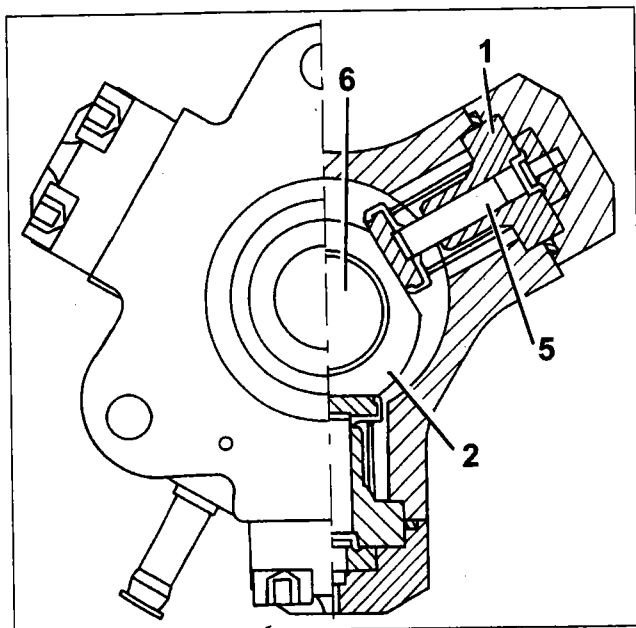
P4A18KJ02

1. Filter cartridge
2. Diesel pre-heating device
3. Thermal switch
4. Water drain plug

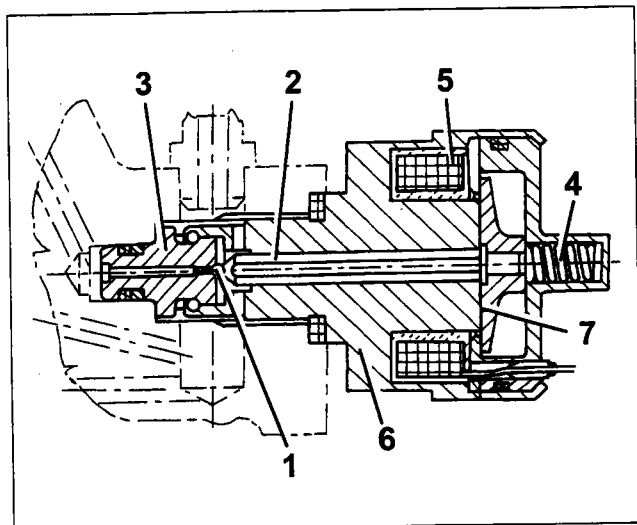




P4A19KJ01



P4A19KJ02



P4A19KJ03

## PRESSURE PUMP

The pressure pump is the radialjet type with three radial pistons (total capacity 0.657 cc) and is operated by the timing belt.

Each pumping unit consists of:

- a piston (5) operated by a cam (2) fixed to the pump (6) shaft;
- an inlet valve with a shim (3);
- a supply ball valve (4).

The pressure pump should receive a pressure of at least 0.5 bar; for this reason, the fuel system is equipped with an auxiliary electric pump immersed in the tank.

The pressure pump is lubricated and cooled by the same diesel fuel through ducts and is capable of supplying a maximum pressure of 1350 bar.

1. Cylinder
2. Cam
3. Inlet valve
4. Supply ball valve
5. Piston
6. Pump shaft
7. Diesel inlet connector - low pressure - from fuel filter
8. Diesel supply connector - high pressure - to manifold (rail)
9. Diesel supply connector - low pressure - re-circulation

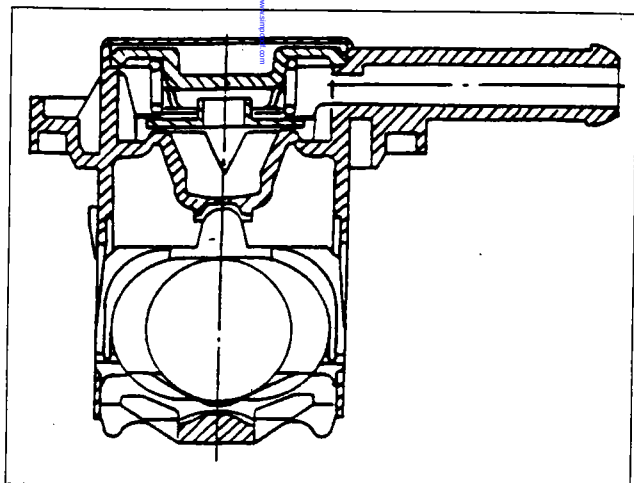
## FUEL PRESSURE REGULATOR

The fuel pressure sensor is fitted on the pressure pump and, operated directly by the injection control unit, regulates the supply pressure of the fuel to the injectors.

The pressure regulator basically consists of the following components:

1. Shutter with ball
2. Pin
3. Valve
4. Pre-loading spring
5. Coil
6. Casing
7. Keeper

## 10.



P4A20KJ01

### **MULTI-PURPOSE VALVE**

The multi-purpose valve is located on the fuel tank and carries out the following tasks:

- pressurizing the tank
- ventilation
- seal in case of overturn

#### **Pressurizing the tank**

The tank pressure is kept at between 55 and 75 mbar through a small valve resting on the edge.

This valve is supported by a steel plate and has an opposing spring.

When the pressure in the tank exceeds the recommended value, it overcomes the resistance of the spring and allows the valve to rise, allowing the flow of vapours.

When the pressure returns to within the limits, the valve closes.

#### **Ventilation**

In certain operating conditions, a vacuum may be created in the tank due to:

- heat variations;
- fuel consumption.

The function of the valve, in this case, is to restore the pressure inside the tank by drawing in air.

Any irregularity in this function can cause misfiring or the vehicle to come to a halt through problems with the supply of the electric pump.

#### **Seal in the case of overturning (roll-over)**

The roll-over function is designed to prevent fuel coming out of the tank if the vehicle turns over or is at an angle.

During normal operation (round bends, acceleration, braking, etc.) the fuel splashes around in the tank and could escape.

The extreme sensitivity of this valve to roll-over prevents fuel from escaping.

### **SUPPLY MANIFOLD (RAIL)**

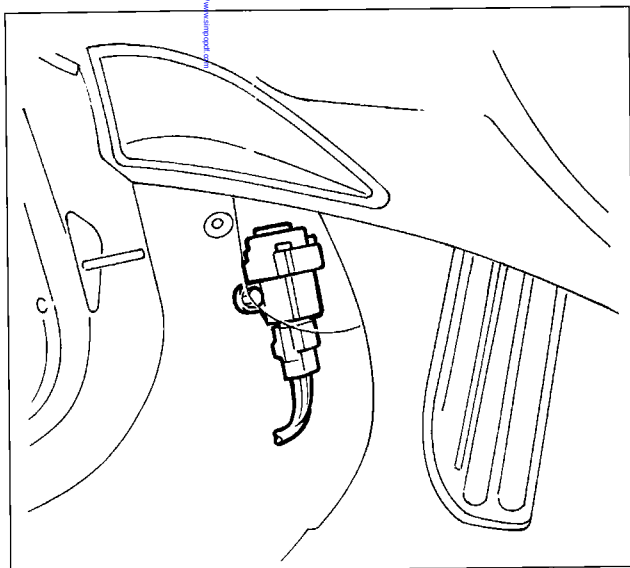
The supply manifold (rail) is fitted on the cylinder head, inlet side.

It dampens the fuel pressure fluctuations due mainly to the:

- operation of the pressure pump;
- opening of the injectors.

The fuel pressure sensor is fitted in the centre of the supply manifold.

The (high pressure) hydraulic connections are through special steel pipes.



P4A34JJ02

### INERTIA SAFETY SWITCH

In order to increase the safety of the occupants, in the case of an impact, the vehicle is equipped with an inertia switch located inside the passenger compartment, fixed to the left of the side panel.

This sensor reduces the risk of fire (as a result of fuel escaping) by deactivating the auxiliary electric pump which supplies the injection circuit.

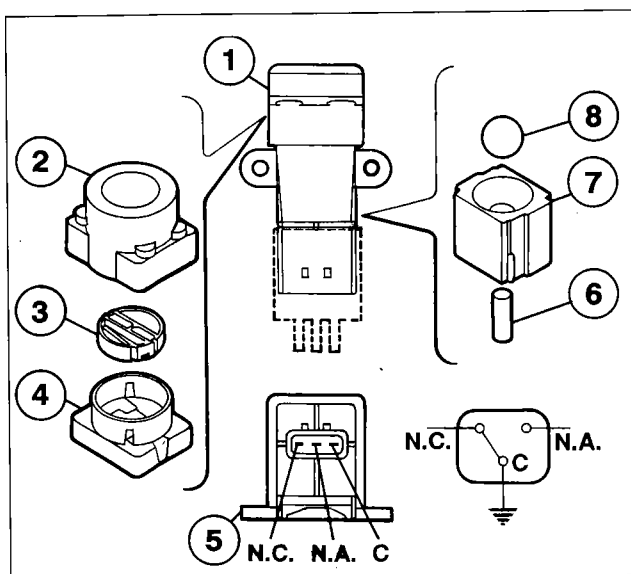
The inertia switch consists of a steel ball fitted in a (tapered) housing and kept in position by the attraction force of a permanent magnet.

If the vehicle is involved in a violent crash, the ball is released from the magnetic clip and opens the normally closed (N.C.) electrical circuit interrupting the connection to earth for the auxiliary electric pump and, as a result, the supply to the injection system.

To restore the connection to earth for the auxiliary electric pump, the seat must be moved backwards and the switch pressed until it is heard to click.



*Even after an apparently minor impact, if there is a smell of fuel or there are leaks from the fuel system, do not turn the inertia switch back on, but search first for the cause of the problem and remedy it to avoid the risk of fire.*



P4A35LJ01

### Inertia switch components

1. Complete inertia sensor
2. Outer casing
3. Button
4. Upper side
5. Engagement side
6. Permanent magnet
7. Permanent magnet housing
8. Steel ball

C Common terminal  
N.C. Normally closed contact  
N.A. Normally open contact

## 10.

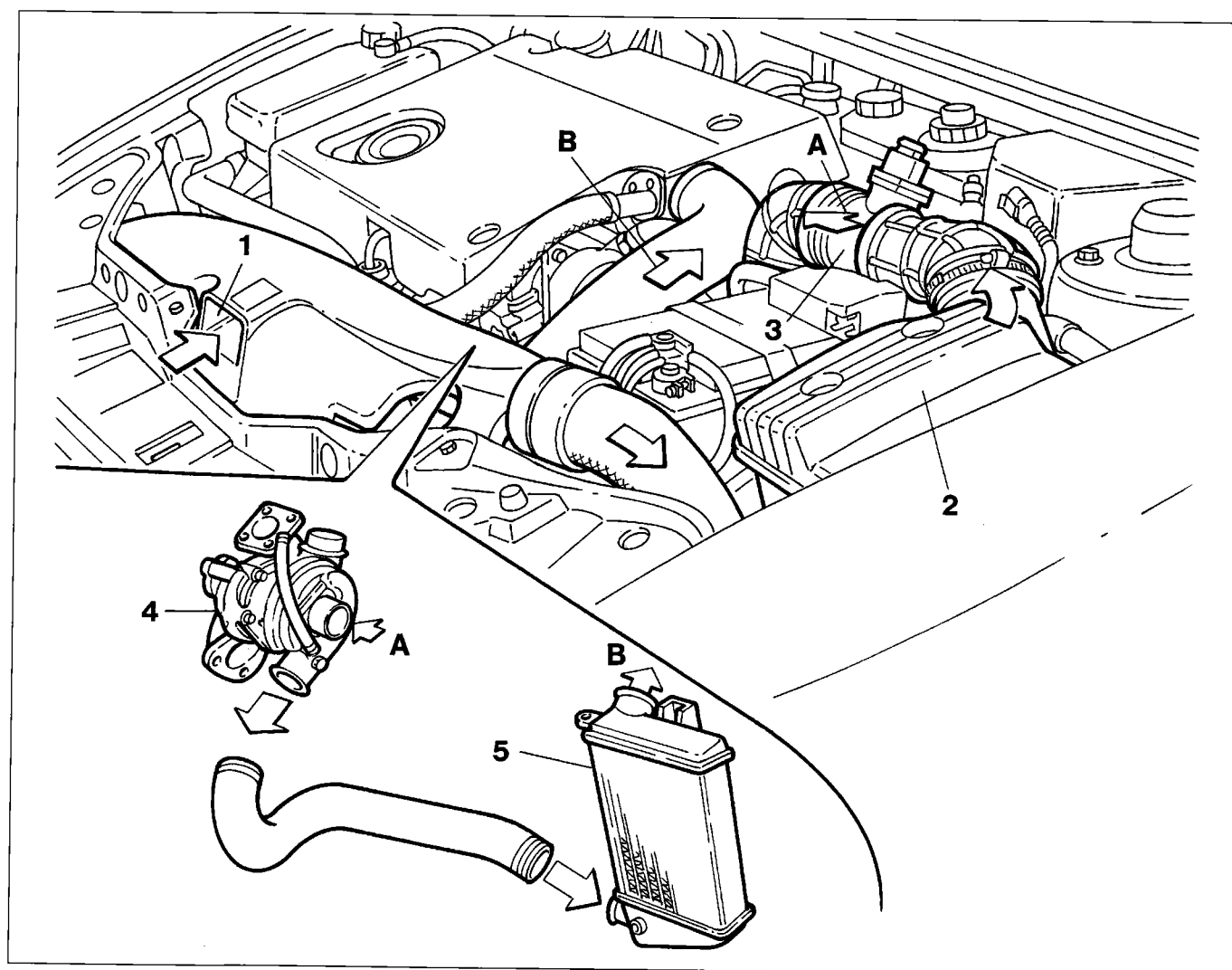
### AIR SUPPLY CIRCUIT

The air supply circuit is supercharged by means of a variable geometry GARRET turbocharger and an intercooler.

The turbocharger is the reduced inertia type, based on a new supercharging concept where the use of the turbocharger is designed to increase the torque in the most frequently used range (e.g. low speeds).

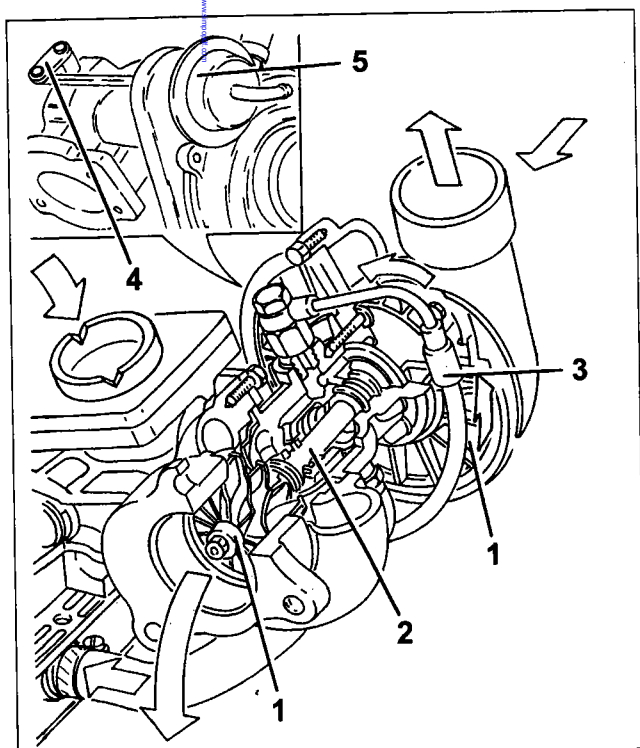
The intake air, after having passed through the filter (1), is compressed by the turbocharger (4) operated by exhaust gases, cooled by the heat exchanger (intercooler) (5) and sent to the inlet manifold (6) from where it is distributed to the cylinders.

**Diagram showing air supply circuit**



P4A22KJ01

- |                          |                                         |
|--------------------------|-----------------------------------------|
| 1. Inlet vent            | 4. Turbocharger                         |
| 2. Air filter            | 5. Air/air heat exchanger (intercooler) |
| 3. Intake air flow meter | A. To the turbocharger                  |
|                          | B. To the inlet manifold                |



P4A23KJ01

### TURBOCHARGER

It is basically made up of two impellers (1) fitted on one shaft (2), which rotates on floating bearings lubricated via a duct (3) from the engine lubrication circuit.

The oil used discharges part of the large amount of heat given off by the exhaust gases at the turbine.

There is a waste-gate valve (4), operated by a pneumatic actuator (5), on the turbocharger, which shuts the flow of exhaust gases to the turbine, according to the engine power/torque request.

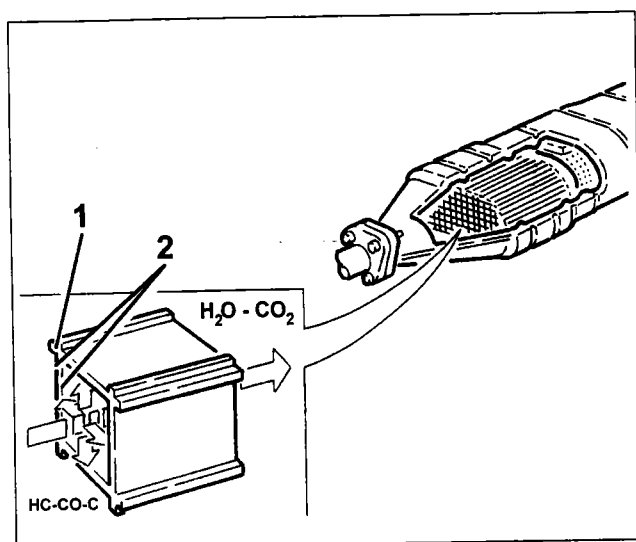
1. Impellers
2. Shaft
3. Lubrication
4. Waste-gate valve
5. Actuator

### EXHAUST GAS CIRCUIT

The engine exhaust gases flow through the manifold to the turbocharger and, through a pipe, to the oxidizing catalytic converter and then to the silencer.

Special protection limits the heat given off towards the bodyshell.

### EMISSION CONTROL DEVICES



P4A23KJ02

### CATALYTIC CONVERTER

The catalytic converter is a post-treatment device for oxidizing the CO, HC and particle matter, transforming them into carbon dioxide (CO<sub>2</sub>) and water vapour (H<sub>2</sub>O).

The catalyzer consists of a ceramic honeycomb structure (1), whose cells are impregnated with platinum (2), which acts as a catalyst for the oxidation reactions.

The exhaust gases which pass through the cells heat the catalyzer, triggering off the conversion of the pollutants into inert compounds.

The chemical reaction of the oxidation of the CO, HC and particle matter is effective at temperatures of between 200 °C and 350 °C.

Above 350 °C, the sulphur contained in the diesel fuel starts to oxidize, producing sulphur dioxide and sulphur trioxide.

# 10.

## EXHAUST GAS RECIRCULATION CIRCUIT (EGR - Exhaust Gas Recirculation)

This system makes it possible to send part of the exhaust gases to the inlet in certain engine operating conditions.

This dilutes the fuel mixture with the inert gases lowering the peak temperature in the combustion chamber; this contains the formation of nitrogen oxides (NOx), giving a reduction of 30-50% at the exhaust.

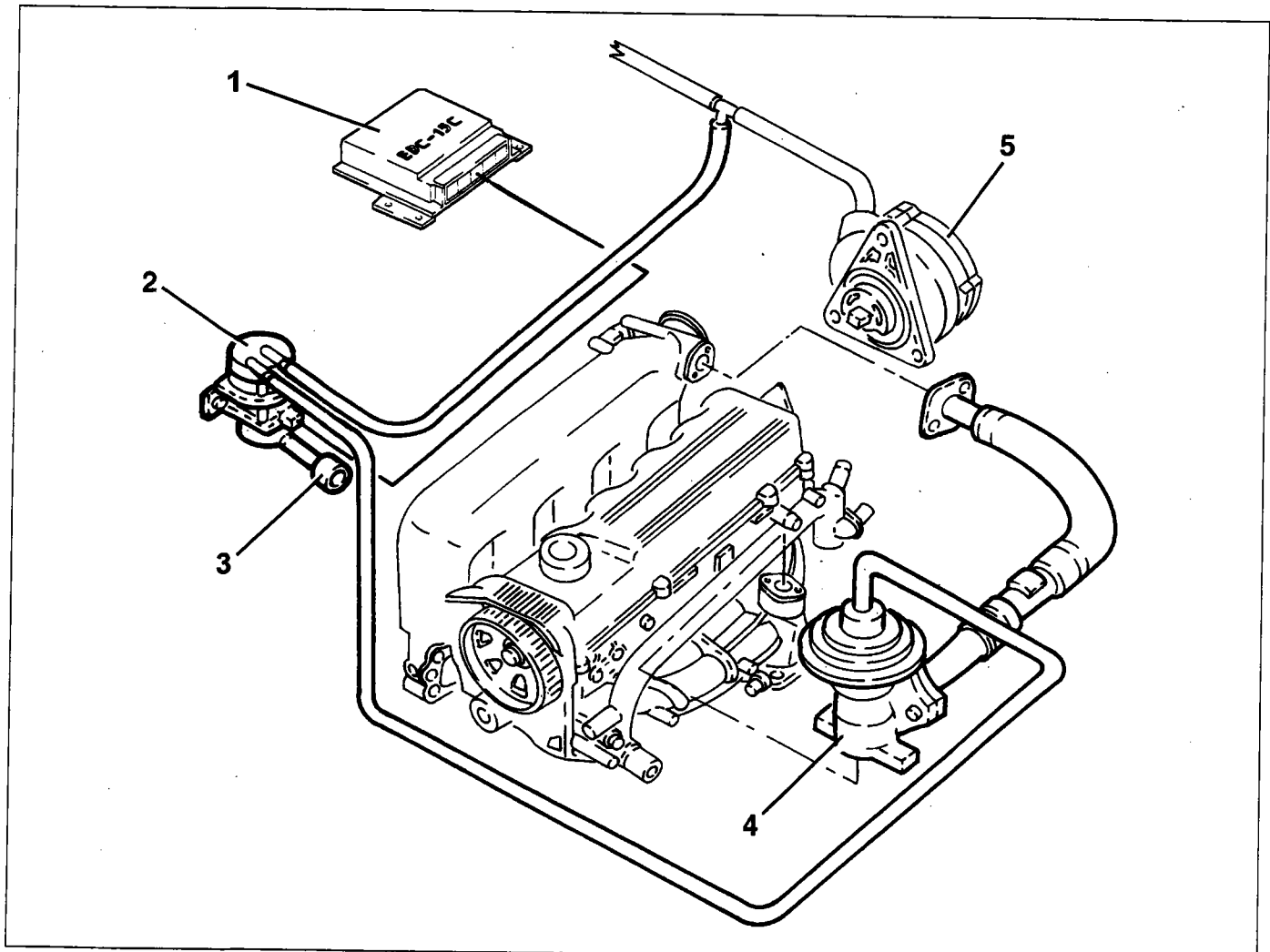
The recirculation of exhaust gases is only allowed at medium-low loads, when the air/fuel ratio is very high and the operation of the engine is not adversely affected by the presence of inert gases in place of the air.

The recirculation is controlled by the injection control unit (1) which, basically according to the signals from the accelerator pedal potentiometer, the rpm sensor and the engine coolant temperature sensor, supplies an output signal for operating the modulating valve (2).

On the basis of the signal received, the latter, connected to the atmosphere by means of a small filter (3), transmits a lesser or greater vacuum, coming from the brake servo vacuum pump (5), to the EGR valve (4).

If the vacuum is sufficient, the valve (4) opens placing the exhaust manifold in contact with the inlet manifold.

**Diagram showing exhaust gas recirculation**



P4A24KJ01

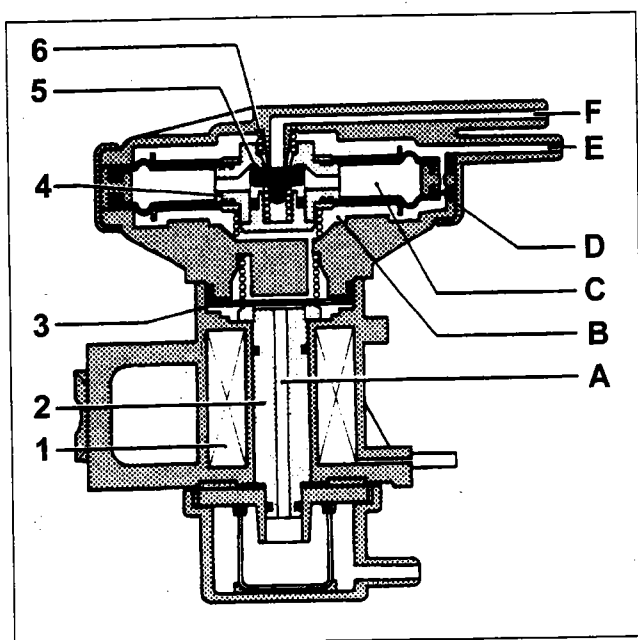


## EGR MODULATING VALVE

The vacuum coming from the vacuum pump for the brake servo reaches the chamber (E) from the duct (F) (case I), because the force of the spring (6) acts on the moving element (4) and the valve (5) allows its passage.

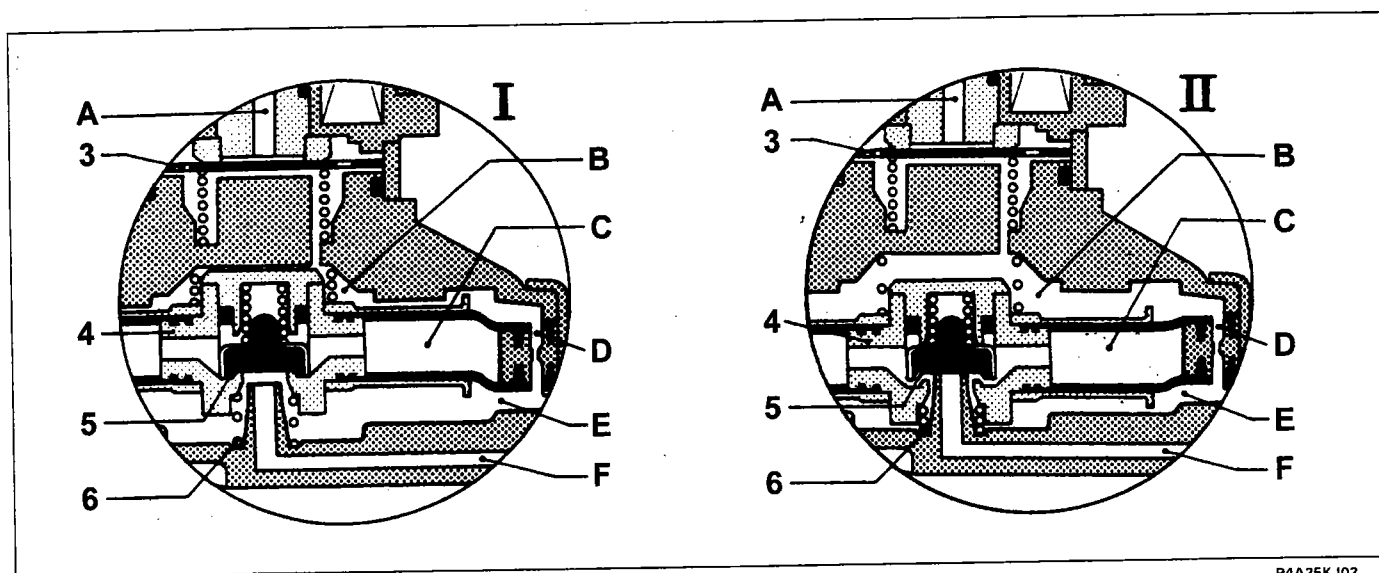
The vacuum then affects the chamber (B), through the compensation port (D) and the surface of the shutter (3).

When the forces acting on the disc (3) are in equilibrium, the atmospheric pressure in the duct (A) enters the chamber (B), moving the moving element downwards (case II), so that the valve (5) shutter closes the duct (F) and places chamber (E) in contact with chamber (C) at atmospheric pressure, decreasing the value of the vacuum in the duct (E).



P4A25KJ01

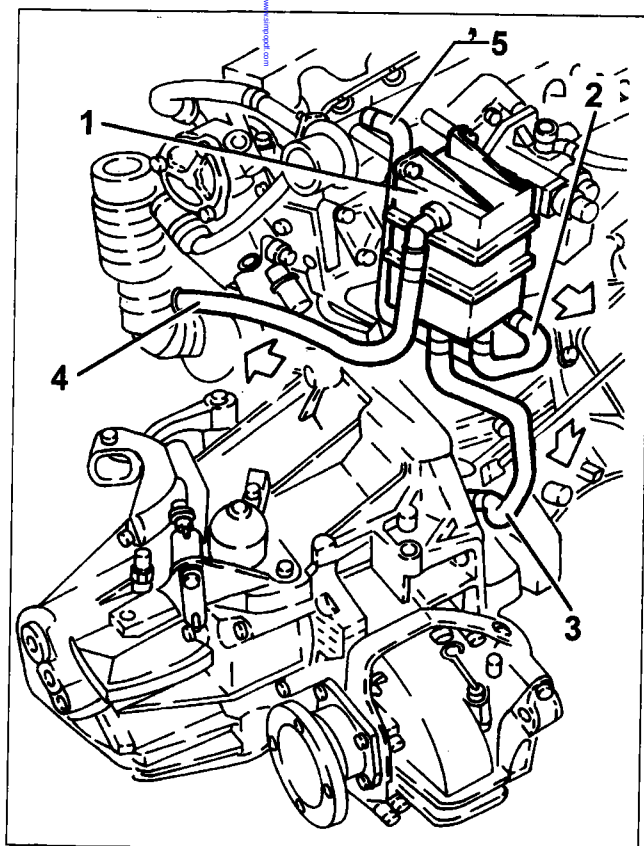
The decreased vacuum value or the increase in the absolute pressure in the chamber (E) raises the moving element (4) (case I), closing the passage (C) and placing the valve (5) in the ideal condition (E in contact with F) and the cycle is repeated.



P4A25KJ02



# 10.



P4A26KJ01

## **RECIRCULATION CIRCUIT FOR VAPOURS COMING FROM THE CRANKCASE (BLOW-BY)**

The crankcase emissions are composed of mixtures of air/diesel and exhaust gases which escape from the piston rings, in addition to lubricant oil vapours.

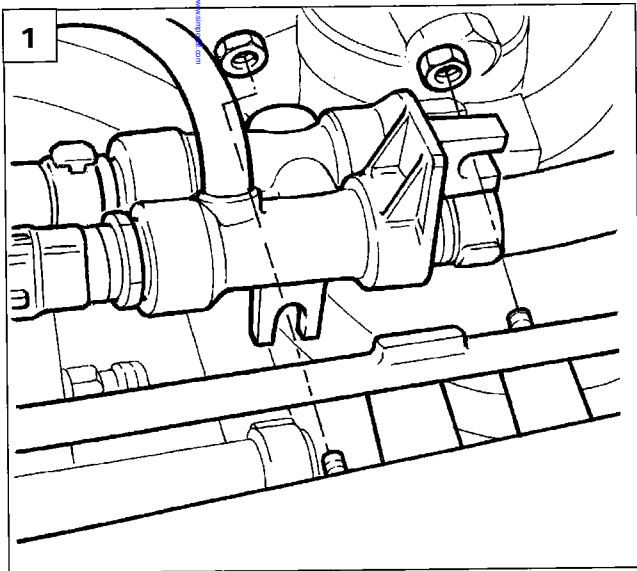
They are defined as blow-by or breather gases.

The breather gases coming from both the crankcase (2) and the cylinder head (5) reach the separator (1).

In the separator (1) the gases lose some of the oil dissolved in them which return to the sump via the pipe (3) in the form of drops.

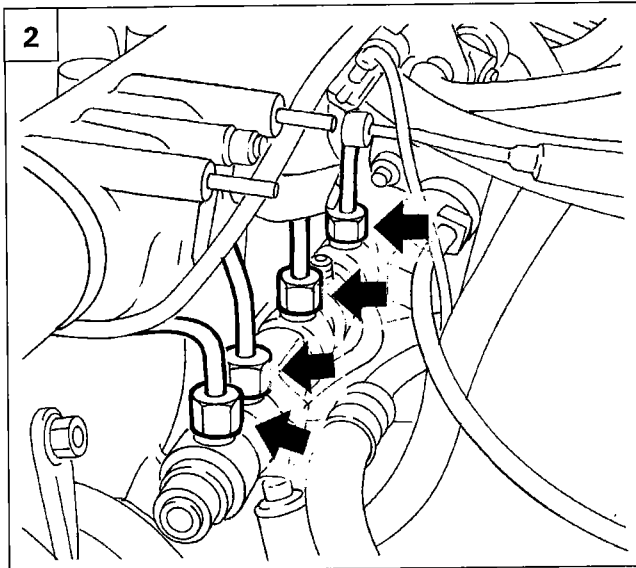
The remaining gases, on the other hand, are directed, through the pipe (4) to the intake circuit.

**10.**



P4A29KJ01

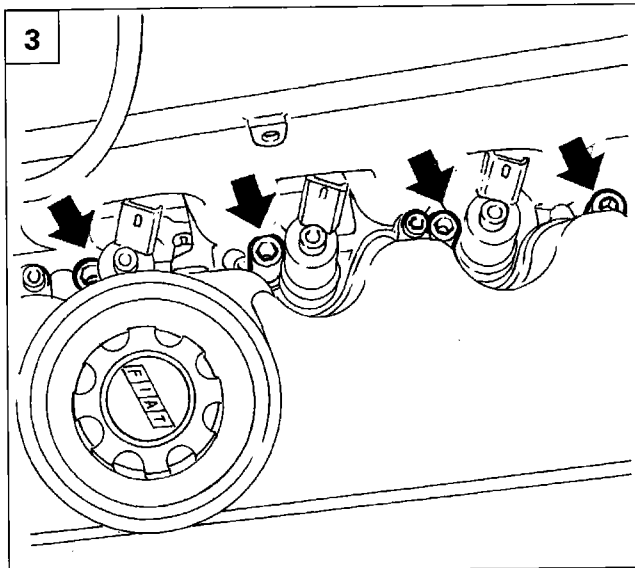
1. Remove the return manifold by loosening both retaining nuts



P4A29K.J02



2. Undo the manifold end pipe fittings from the rail leading to the injectors and remove them

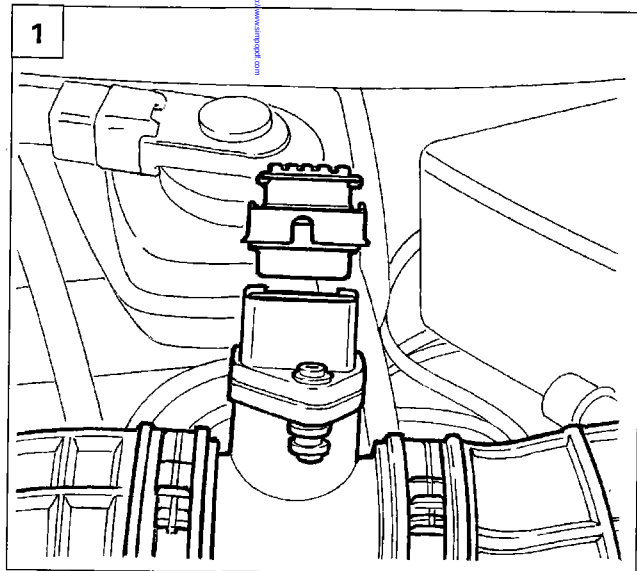


**P4A29KJ03**

3. Undo the retaining nuts and remove firstly the bracket and then the injectors.

**NOTE** When refitting, carry out removal procedure in reverse order. Tighten the fittings between return manifold and injectors to the specified torque of 2 daNm

### 10.

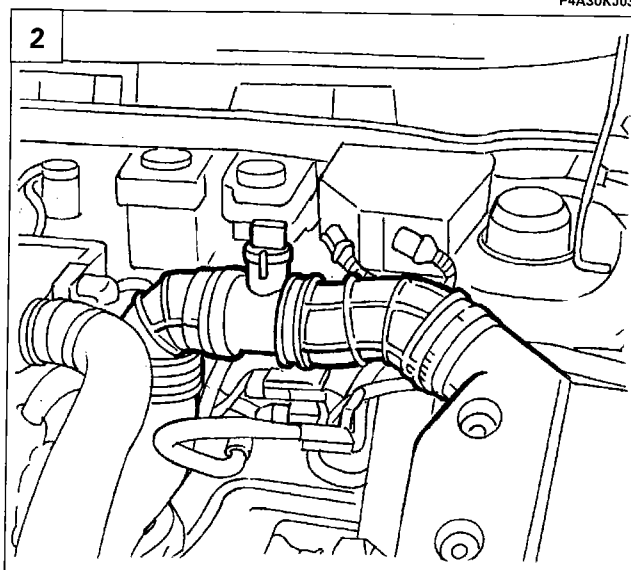


P4A30KJ03

#### REMOVING-REFITTING RAIL

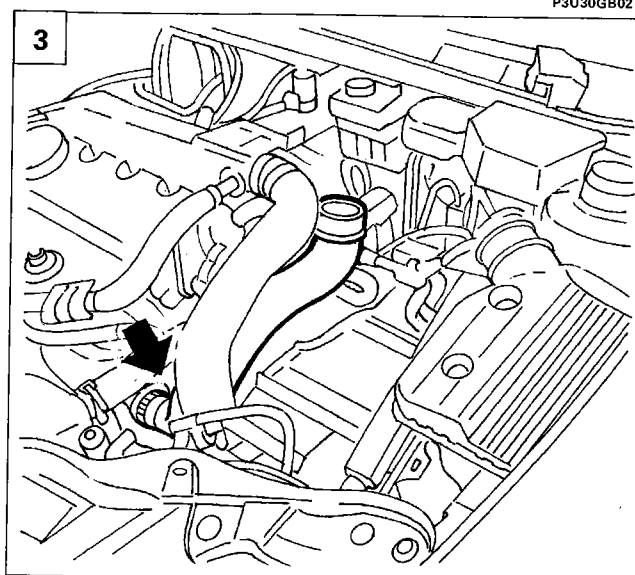
- Disable the alarm (if present) by means of the switch under the junction unit cover.
- Disconnect the terminals and remove the battery

1. Disconnect the flow meter electrical connection.



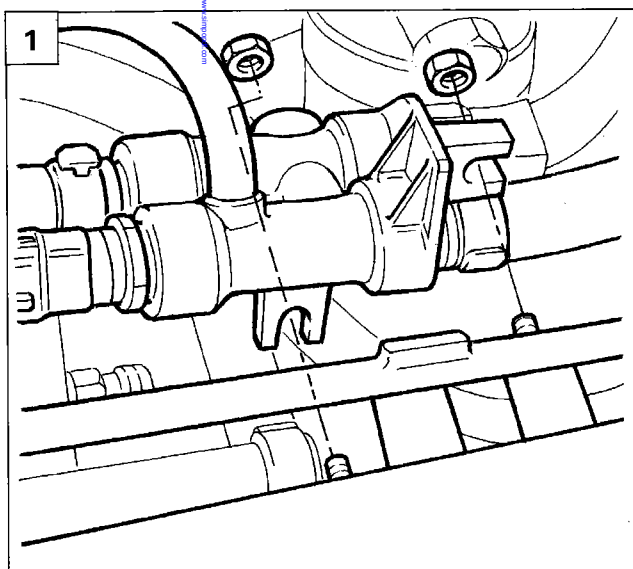
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2. Loosen the collars and remove the first pipe section between the air filter case and turbocharger.

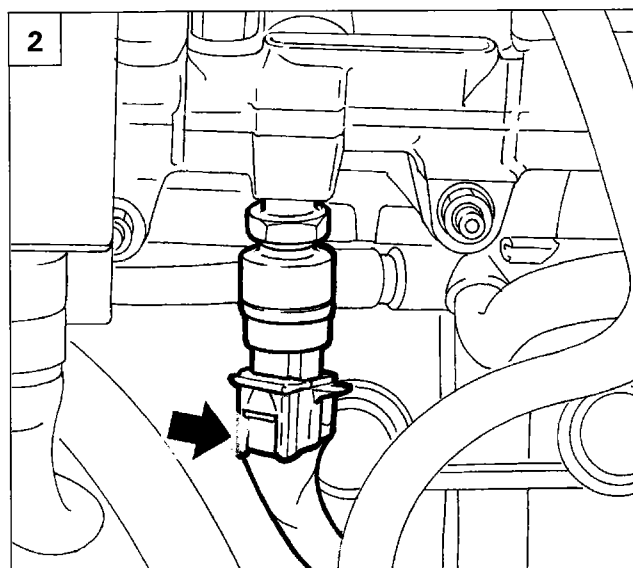


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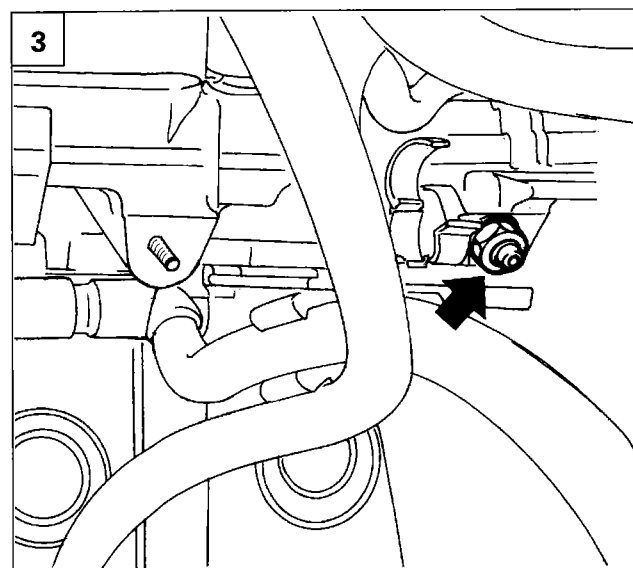
3. Loosen the bands and remove the second pipe section between the air cleaner case and turbocharger.



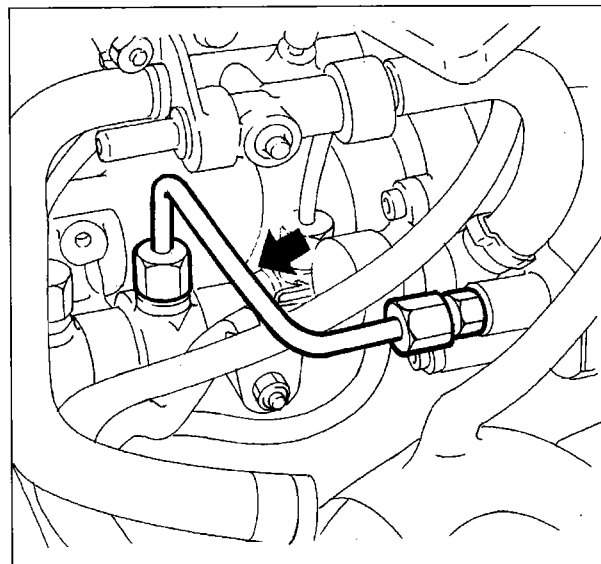
P4A29KJ01



P4A29KJ02



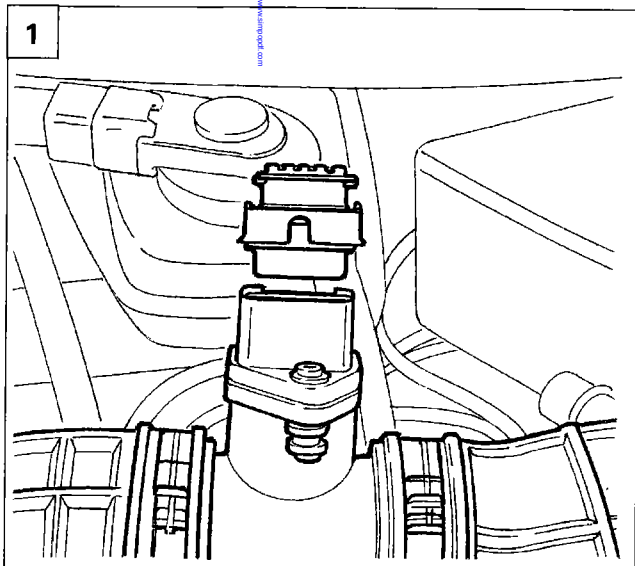
P4A29KJ03



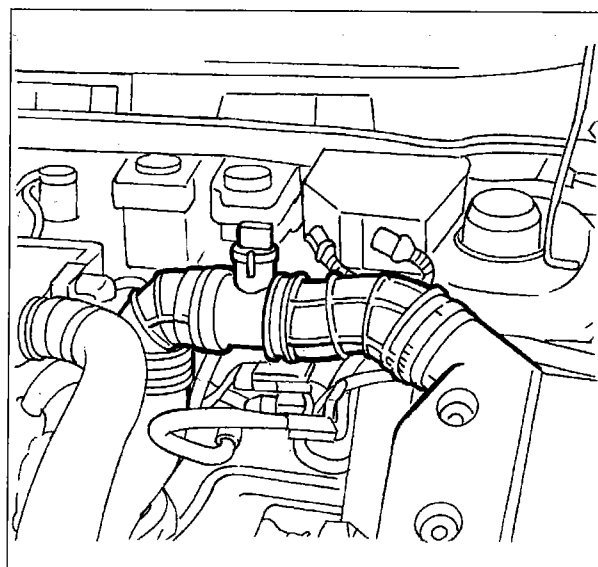
1. Remove the return manifold by loosening both retaining nuts.
2. Remove the fuel delivery pipe from the pressure pump to the rail pipe.
3. Disconnect the electrical connection from the fuel pressure sensor
4. Unscrew the remaining nut securing the rail and remove.

**NOTE** To refit, carry out removal instructions in reverse order. Tighten the fittings of pipes between return manifold and injectors and of the fuel delivery pipe from the pressure pump to the specified torque of 2 daNm.

### 10.



P4A30KJ03



P4A30KJ04

#### REMOVING-REFITTING GLOW PLUGS

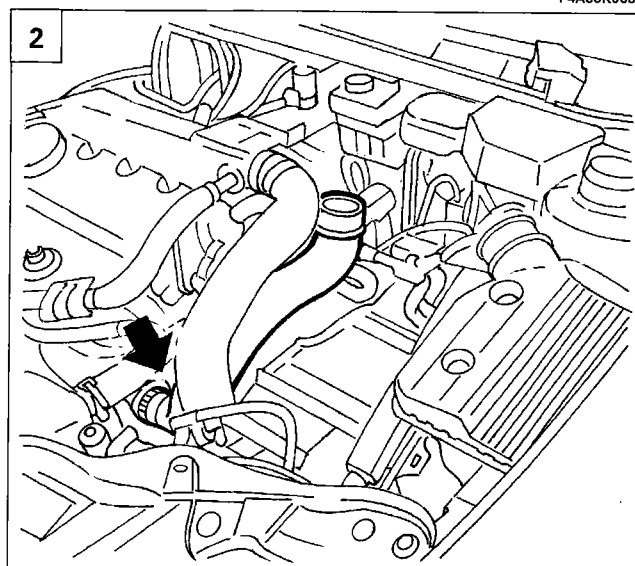
- Disable the alarm (if present) by means of the switch beneath the junction unit cover.
- Disconnect the terminals and remove the battery.

1. Disconnect the electrical connection for the flow meter.

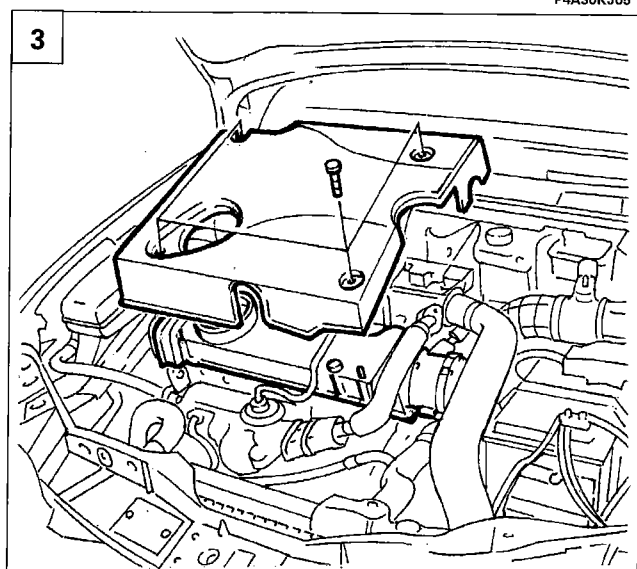
2. Loosen the collars and remove the first section of piping between air cleaner casing and turbocharger.

3. Remove the second section of piping between air cleaner casing and turbocharger.

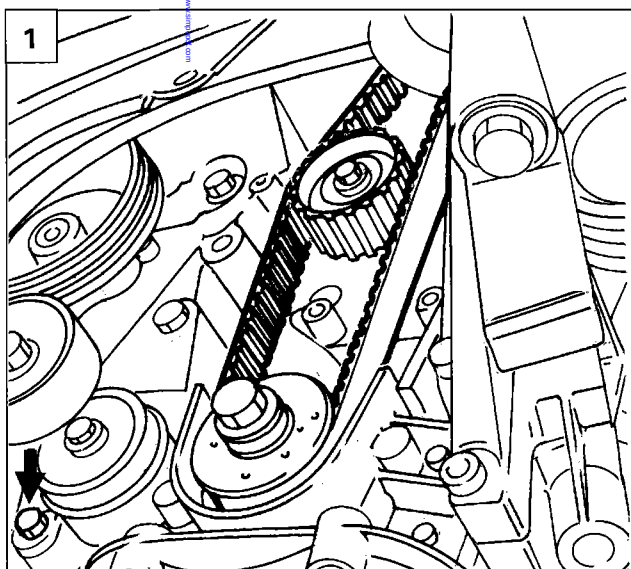
4. Undo the retaining bolts and remove the upper engine protection cover.



P4A30KJ05



P4A27KJ01



P4A41KJ01

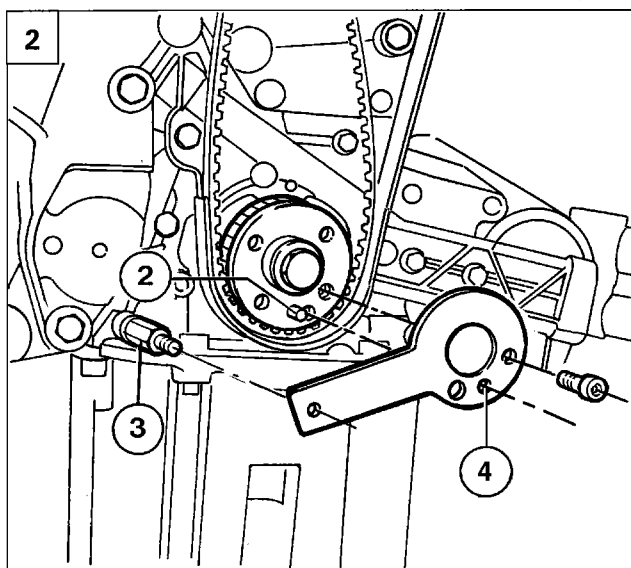


### Refitting

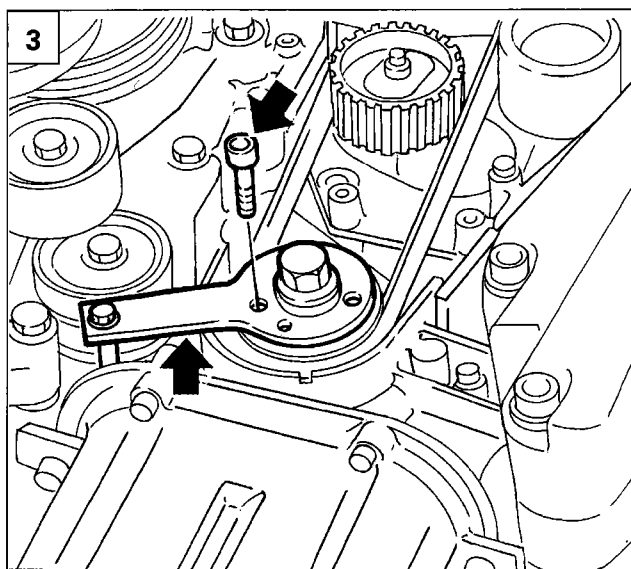
Reverse procedure described for removal to the point where the pressure pump is refitted. Then refit and tension the timing belt and auxiliary drivebelt.

*Check that the timing belt and auxiliary drivebelt do not show signs of cracking or wear that could impair operation.*

*Tighten the fittings of the pipes carrying fuel from the pressure pump to the rail to a torque of 2 daNm*



P4A41KJ02



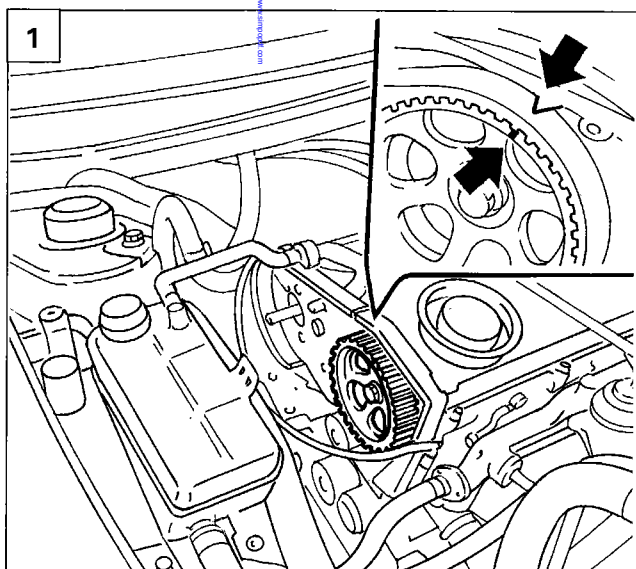
P4A41KJ03

### Fitting and tensioning timing drive belt

1. Fit the timing belt to the crankshaft gear provisionally and remove the bolt indicated from the oil pump.
2. Position tool 1860905000 on the crankshaft drive gear and pin (3); turn the crankshaft through small movements until locating dowel (2) fits into hole (4) on the tool. In this position, cylinder no. 1 is exactly aligned with TDC.
3. Secure the tool to the crankshaft drive gear using the bolt shown.



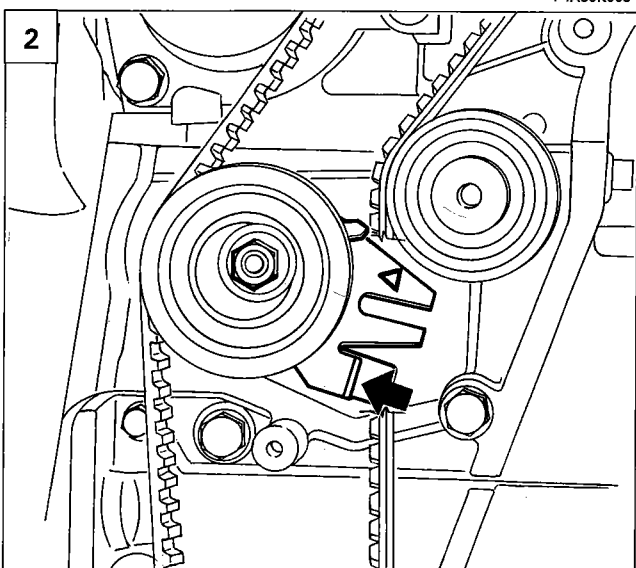
# 10.



P4A30KJ03

Lower the lift

1. Turn the toothed drive pulley to align the timing notches.

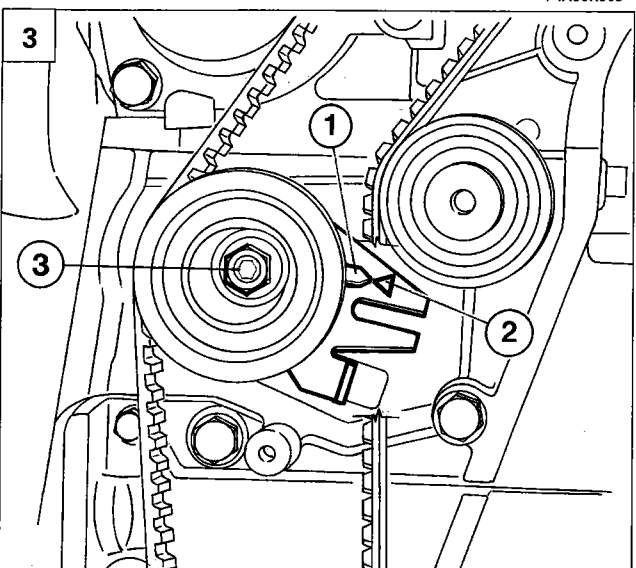


P4A30KJ05



Raise the lift and finish fitting the timing belt.  
Check the timing.

2. Use a screwdriver to apply a force to the automatic tensioner to adjust the tensioner to maximum tension. Then tighten the tensioner bolt to the mount. Remove tool 1860905000 and turn the engine through two revolutions in its normal direction of rotation.



P4A27KJ01

3. Loosen the nut securing tensioner (3) and apply leverage with a screwdriver so the tensioner does not go completely slack. Then align mobile pointer (1) on the tensioner with fixed reference (2). Then tighten tensioner bolt (3) to the specified torque.



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Fuel System 1910 TD 100

Fuel System 98 1581 16v

**FUEL SYSTEM**

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## INJECTION PUMP

The Lucas FT09 injection pump has been specifically designed for indirect injection diesel engines with special innovative features which ensure optimum engine running in all operating conditions; in particular, it allows a decrease in consumption, harmful emissions and noise levels.

The function of the injection pump is to accurately meter the quantity of fuel and to inject it at high pressure into the combustion chamber for each cylinder at a precise moment in the engine cycle; the quantity of fuel metered is therefore atomized at high pressure by the injector.

It is vital for the injection pump to be working accurately and reliably because the cycle is repeated thousands of times per minute; therefore variations in the injection point (advance) or the quantity of fuel injected (metering) are not permissible for the entire life of the engine.

The injection pump is characterized by being rather small in size; it is the rotary distributor type, compact in structure and does not require any external lubrication because it is lubricated by the filtered diesel fuel with which it is always filled during operation.

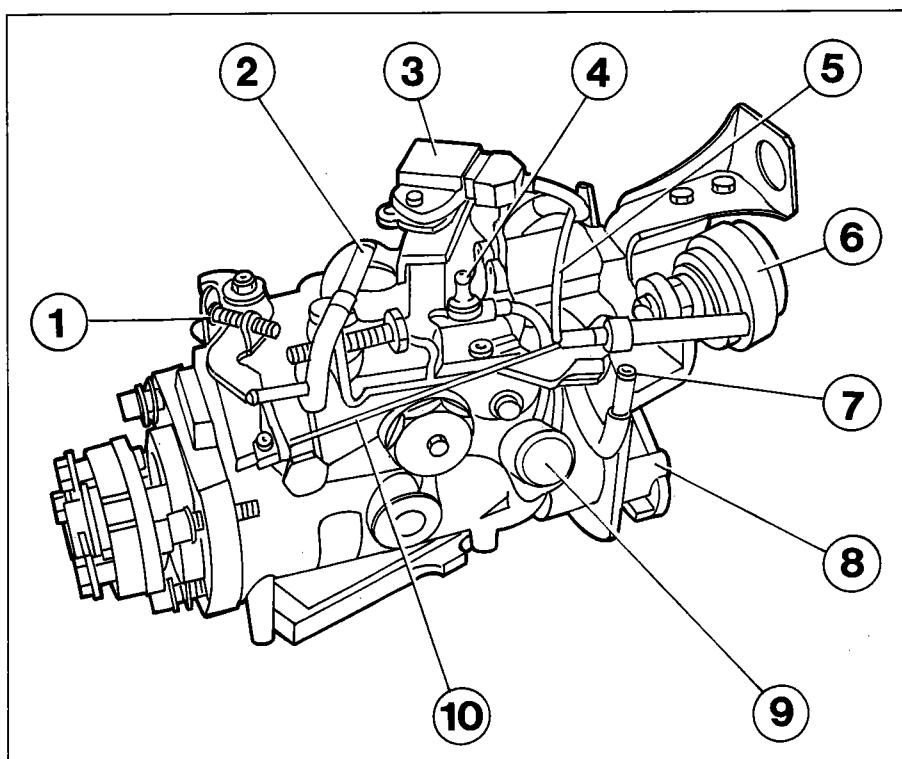
The internal pressure prevents penetration of dust, water or other foreign bodies which would be harmful to its operation; in addition the special design of the hydraulic circuits prevent the accumulation of air.

To facilitate both starting and the supply of full power, irrespective of the climate conditions, the pump is equipped with an automatic flow rate supplement system which increases the amount of fuel injected. The pump comprises a single pumping element, made up of two opposing pistons, which is an integral part of the distribution rotor. The rotor, in turn, rotates inside a unit known as the hydraulic head. Each piston comes into contact with the internal lobes of a cam seal by means of an assembly made up of a roller and a roller carrier plate.

The adoption of a single pumping element ensures a uniform supply of fuel for each cylinder and dispenses with balancing the supplies, an operation which is otherwise strictly necessary in all pumps fitted with separate pumping elements.

The fuel, carefully metered during the intake stage into the pumping element, is distributed to each injector at the exact moment thanks to a system of ports in the hydraulic head and the rotor.

When it receives the command from the electronic control unit, the pump can alter the injection advance and is therefore capable of adjusting the start of the injection in the engine cycle so that it takes place at the optimum time in all operating conditions.



The pump is also equipped with a mechanical centrifugal regulator to accurately check the engine speed.

1. Idle speed adjustment screw
2. Connector for diesel return pipe to the tank
3. Accelerator control lever position sensor
4. Accelerator control lever
5. Electro-stop valve anti-tamper cover
6. Fast idle device
7. Connector for diesel supply pipe from the filter
8. Connector for diesel supply pipe to the injectors
9. Advance actuator
10. Fast idle control cable

P4A05EJ01

# 10.

## Operating principle

The fuel, taken from the tank (11) and filtered by the filter (12), reaches the transfer pump (7) which has the task of further increasing the pressure of the fuel.

Through the effect of the transfer pump pressure regulator valve (2), this pressure increases in a fairly linear manner as the engine speed increases.

The valve (2) also has the task of shortcircuiting the transfer pump (7) during priming.

From the transfer pump the fuel reaches the meter (6) which determines the quantity of fuel to be sent to the pumping element (4) and consequently the capacity for the injectors.

The position of the meter (6) is controlled by the speed regulator (13) and depends on the position of the accelerator pedal.

The pumping element comprises two small opposing pistons which slide radially in the rotor and are operated, by means of rollers and sliding plates, by the profile of a cam seal.

The pistons do not have return springs because they are thrust outwards by centrifugal force and the pressure of the fuel entering the supply stage.

The rollers which operate the pistons come into contact with the cam profile at different points according to the greater or lesser stroke during the supply stage.

This stroke depends on the quantity of fuel entering the pumping chamber, regulated by the meter and the expansion time of the pumping pistons dictated by the rotation speed of the pump.

During the injection stage the piston control rollers come into contact with the cam seal cams; the pistons themselves are thrust inwards causing an increase in pressure and consequently injection.

At the end of the injection stage, the pistons are thrust outwards creating a decrease in pressure, the fuel is no longer supplied and the valve (5) closes the supply pipe.

In addition to closing the supply pipe, the valve (5) has the function of instantly lowering the pressure in the pipe which is in contact with the injector (10) and therefore cuts off the injection promptly to prevent the injector from dripping.

The maximum quantity of fuel which can be introduced into the pumping element (4) each cycle is determined by a maximum flow rate regulator.

The pressure inside the pumping element (4) is kept at a constant value by the pressure valve (9).

The solenoid valve (8), operated by the electronic control unit, makes it possible to alter the advance for the start of the pump delivery increasing it when the engine load exceeds a given level.

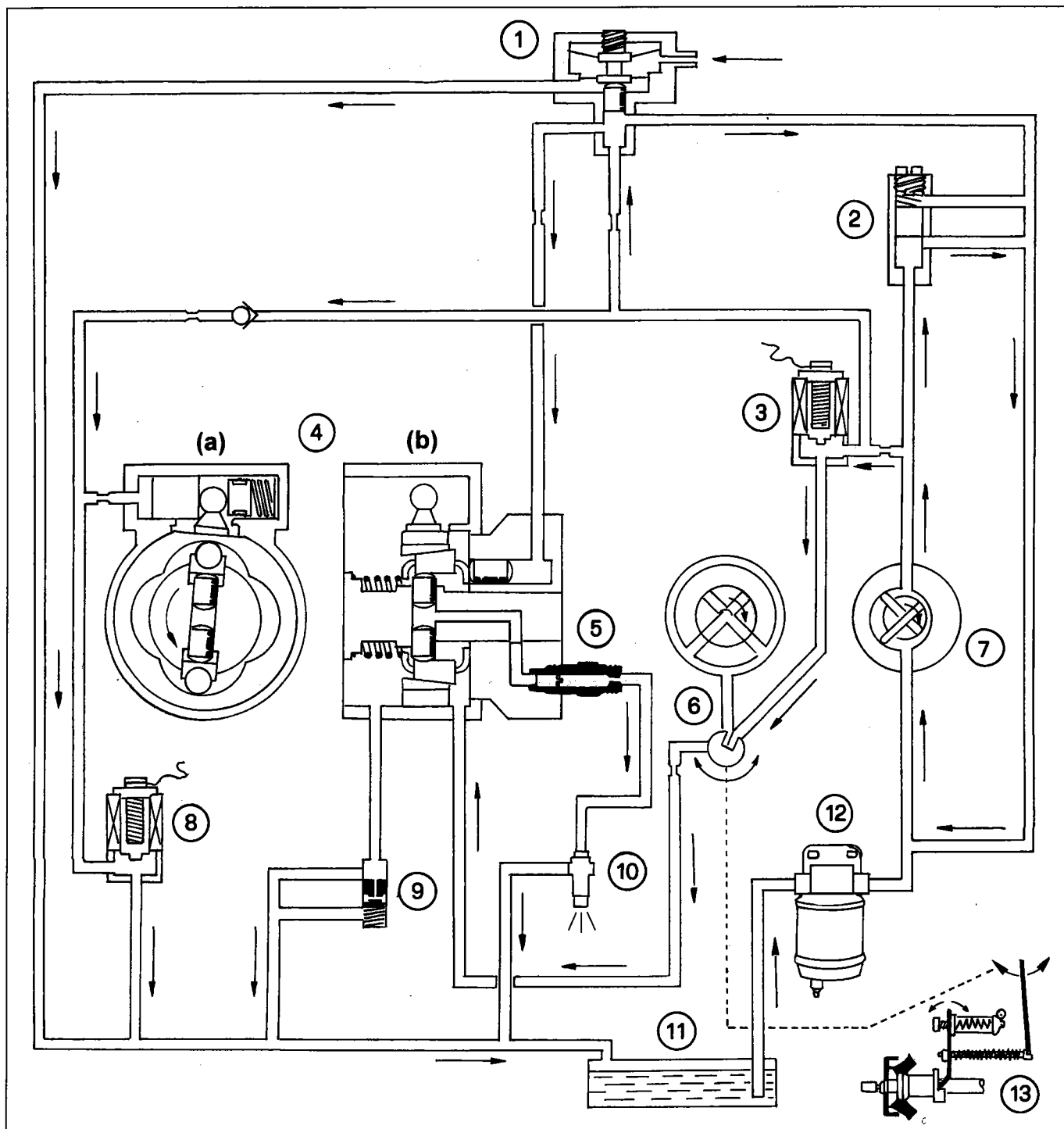
The engine cut out solenoid valve (electrostop) (3) is suitably protected by a special anti-tamper cover.

During the operation of the engine, the solenoid valve remains energized allowing the flow of fuel from the transfer pump (7) to the supply duct.

When the key is turned to switch off the engine, the solenoid valve is de-energized cutting off the flow of fuel; the meter supply chamber is no longer supplied and the engine cuts out.



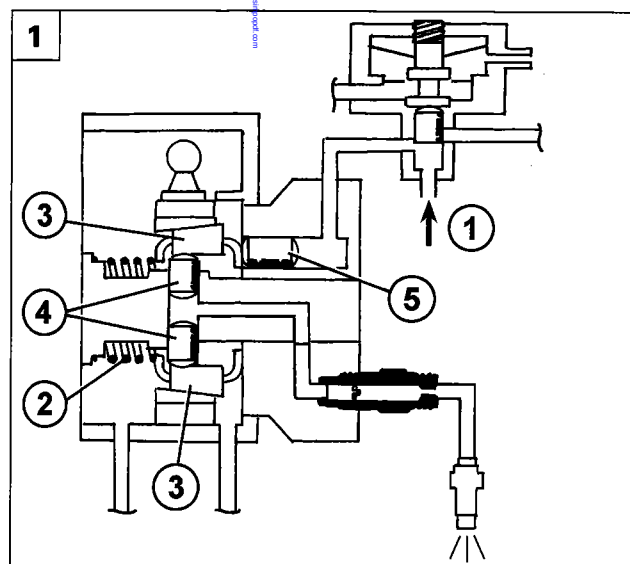
**FUEL CIRCUIT DIAGRAM**



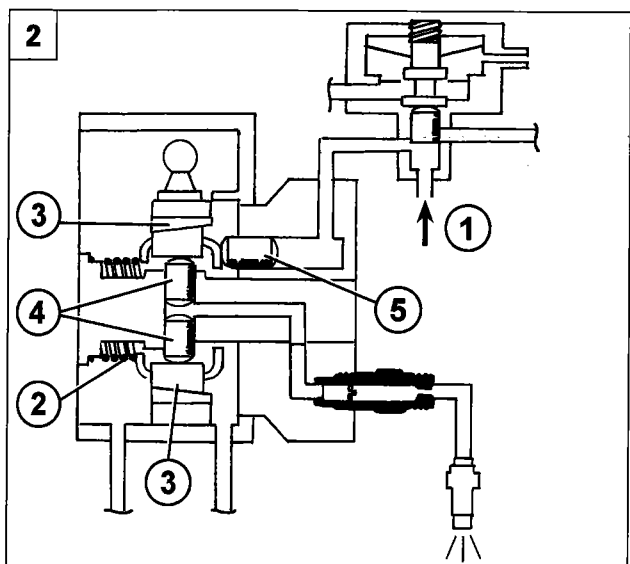
P4A07EJ01

1. Supercharging control valve
2. Transfer pressure regulator valve
3. Engine cut out solenoid valve (Electrostop)
4. Pumping element
  - (a) front section view
  - (b) side section view
5. Supply valve
6. Meter

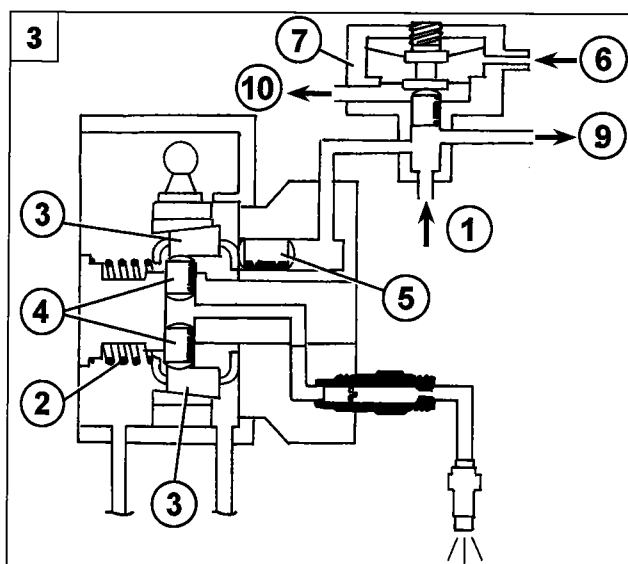
7. Transfer pump
8. Advance actuator solenoid valve
9. Pressure valve
10. Injectors
11. Tank
12. Filter
13. Speed regulator



P4A08EJ01



P4A08EJ02



P4A08EJ03

### Flow rate supplement

In order to facilitate both starting up the engine and the supply of full power, a system is fitted which, by altering the stroke of the pumping element pistons, allows an increase in the maximum fuel flow rate.

The three following operating modes are of special interest:

#### 1) Operation during starting

Whilst the engine is being started up, the intake transfer pressure (1) is relatively low which allows the spring (2) to overcome the force exerted by the pistons (5) and extend in such a way as to move the sliding plates (3) outwards.

Under these circumstances the pistons (4) are in contact with the shorter side of the plates (3) with a consequent increase of the stroke and therefore also the value of the maximum flow rate.

#### 2) Operation with turbocharger not operating

During normal operation, the intake transfer pressure (1) is greater than the opposing force exerted by the spring (2) and this allows the pistons (5) to move the sliding plates (3) inwards.

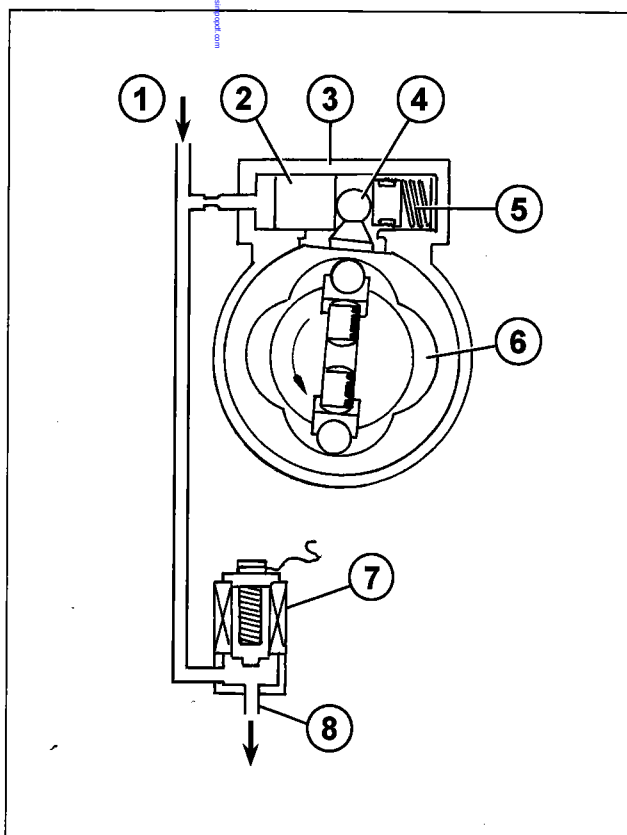
In this way the pistons (4) are in contact with the longer side of the plates (3) with a consequent decrease in the stroke and consequently the value of the maximum flow rate.

#### 3) Operation with turbocharger working

The operation of the turbocharger causes an intake pressure (6) at the control valve (7) which causes the movement of an internal piston which places the transfer pressure inlet duct (8) in contact with the return ducts (9 and 10).

The decrease in pressure at the piston (5), allows the spring (2) to overcome the pressure of the inlet fuel (1).

The extending of the spring (2) causes the movement of the plates (3) with a consequent increase of the piston (4) stroke and the value of the fuel flow rate..



P4A09EJ01

1. Fuel inlet
2. Small piston
3. Cylinder
4. Pin
5. Spring
6. Cam seal
7. Solenoid valve
8. Fuel outlet

### Adjusting injection advance

The injection advance adjustment system makes it possible to vary the start of the injection so that it takes place at the optimum time in all engine operating conditions.

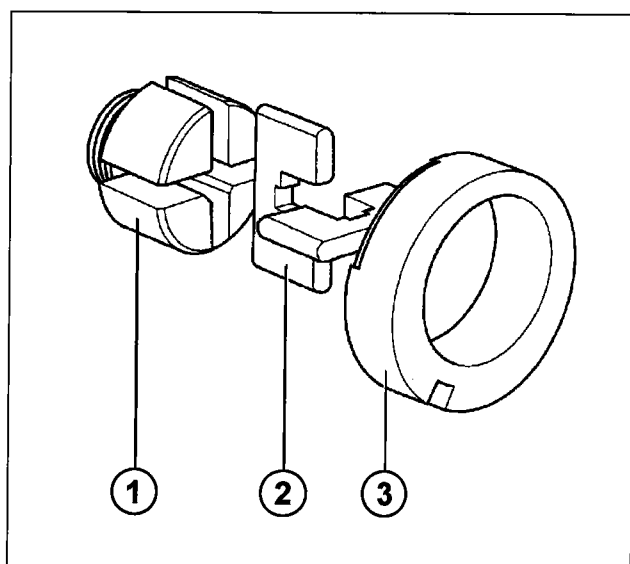
The system comprises a small piston (2) which slides in the cylinder (3) and is opposed by the spring (5).

This piston is connected to the cam seal (6) by means of a threaded pin with a spherical head (4).

If the solenoid valve (7) is not activated, the transfer pressure (1), acting on the piston (2), moves the actual piston overcoming the resistance of the spring (5) and causes the rotation of the cam seal (6), through the pin (4), in relation to the pump control shaft, towards the maximum advance position.

The activation of the solenoid valve (7) allows the fuel to flow towards the vehicle tank via the return pipe (8). This causes a decrease in the pressure acting on the piston (2) allowing the spring (5) to extend fully and, rotate the cam seal towards the minimum advance position by means of the pin (4).

In this way by varying the solenoid valve (7) opening/closing frequency, the electronic control unit modulates the value of the pressure acting on the piston (2) thereby continuously regulating the start of the injection.



P4A09EJ02

1. Transfer pump rotor
2. Brushes
3. Elliptical seal

### Transfer pump

The transfer pump, which is the volumetric type (inlet and pressure), consists of a rotor (1), an elliptical seal (3) and two rigid brushes (2).

During rotation, the brushes (2) slide in the rotor (1) following the profile of the elliptical seal (3) which is offset in relation to the rotor. As the volume in the chamber increases, a vacuum is created upstream of the blade with the consequent intake of fuel from the tank; the volume decreases downstream of the vane and consequently the fuel in the circuit is supplied under pressure.



# 10.

## Transfer pump regulating valve

The transfer pump regulating valve is housed in the hydraulic head and carries out three distinct functions:

- creating the transfer pressure;
- controlling this pressure by maintaining a precise relationship between the transfer pressure and the rotation speed;
- pressurizing the fuel metering circuit each time it proves necessary.

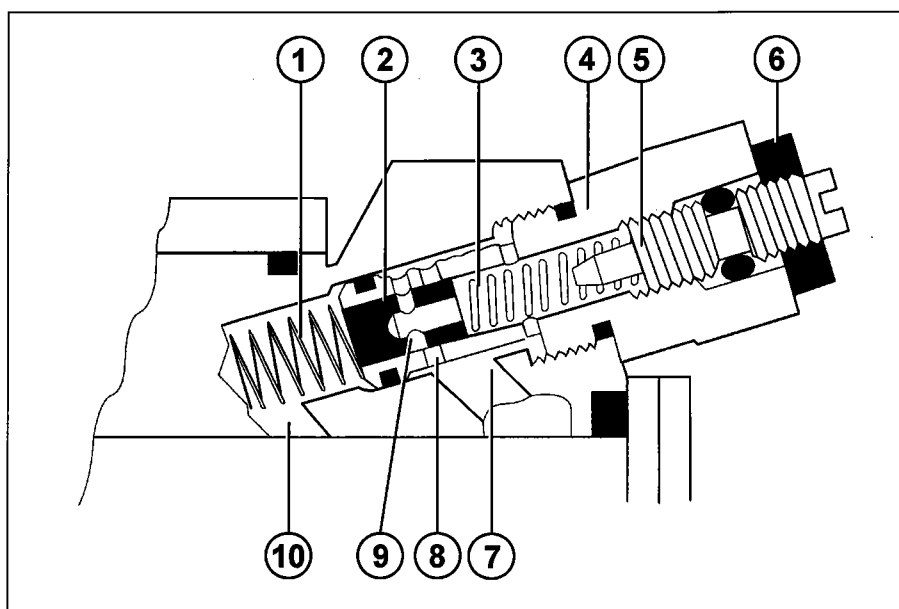
The regulating valve consists of a valve casing (4) which contains a piston (2) and a spring (3). The force applied by the spring (3) can be adjusted by means of an external screw (5) and is opposed by another spring (1) which keeps the piston (2) in its original position.

Increasing the rotation speed of the transfer pump, increases the flow rate and consequently also increases the pressure acting on the piston (2).

When the piston (2) moves it compresses the regulating spring (3) and gradually places the ports (8) and (9) in contact allowing the fuel to return to the transfer pump inlet via the passage (7).

By increasing and decreasing the opening for the ports (8) and (9), the valve makes it possible to regulate the transfer pressure value.

The valve also has the function of filling the transfer pump to ensure priming during the starting stage. During this stage the lack of inlet pressure allows the spring (3) to extend and move the piston (2) which compresses the spring (1); the fuel in the connector (7) enters through the port (8) and, passing through the piston (2), comes out of the duct (10) reaching the transfer pump.



P4A10EJ01

1. Opposing spring
2. Transfer pump regulating piston
3. Regulating spring
4. Regulating valve body
5. Transfer pump adjustment screw
6. Lock nut
7. Regulated fuel return passage to the transfer pump
8. Adjustment port
9. Filling port
10. Fuel inlet from the transfer pump

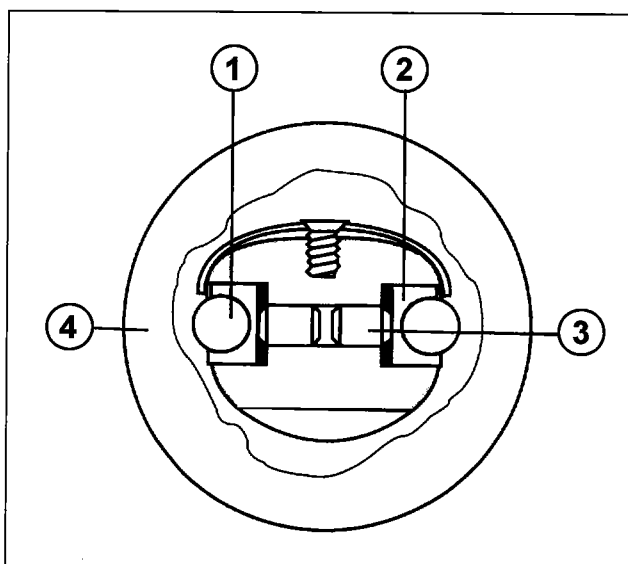
### Hydraulic head

The functions of metering, pumping and distributing take place in the main section of the injection pump, known as the hydraulic head.

The hydraulic head is composed of two groups:

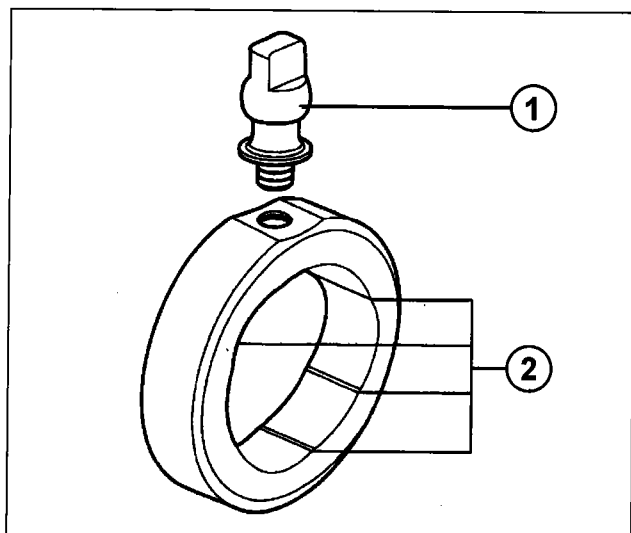
- the hydraulic head stator;
- the distributor rotor, made up of a single element and two pumping pistons.

The distributor rotor is coupled with the housing in the hydraulic head, whilst the pumping pistons are coupled with the housings in the rotor. This means that these parts are not interchangeable with others but constitute a single assembly.



P4A11EJ01

1. Roller
2. Roller carrier
3. Small piston
4. Cam seal



P4A11EJ02

1. Cam seal
2. Cam seal bolt

The fuel subject to the transfer pressure enters one of the ports in the hydraulic head; the opening of this port is controlled by the movement of the metering valve connected to the mechanical regulator.

During the charging cycle, two ports in the rotor are aligned with two filling ports for the head stator. A metered quantity of fuel, regulated by the metering valve, enters the pumping element and moves the pumping pistons (3) away, pushing the group formed by the roller (1) and the roller carrier (2) outwards. By rotating the rotor interrupts the alignment between the charging and filling ports (end of charging cycle).

By continuing the rotation, one of the fuel supply ports coincides with one of the high pressure outlets.

### Cam seal

The internal surface of the cam seal has lobes (1) which are diametrically opposite and is machined with precision.

The shape of the lobes causes the pressure movement in the pump, determines the duration of the injection stage and standardizes the supply cycles.

The cam seal bolt (2) connects the latter to the injection advance adjustment system.

When the pump starts the injection cycle, the two roller and roller carrier units which are in contact with the pistons, start to move inwards under the force of the two opposing lobes.

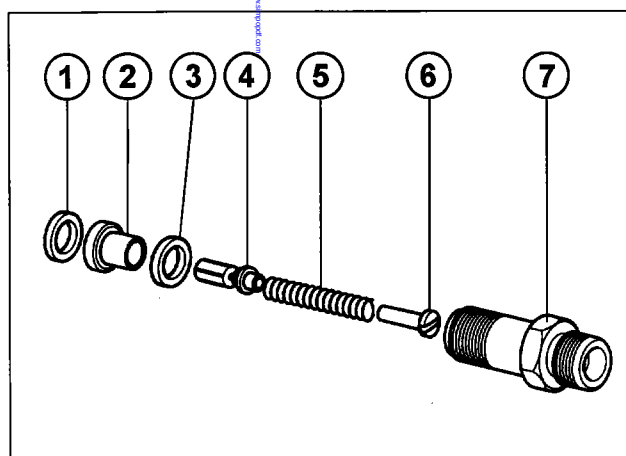
This is the start of the injection.

Whilst the rotor continues to rotate, the rollers move upwards, until they reach the top of the lobes.

This marks the end of the injection.

Continuing the injection cycle, the rollers lose contact with the cam seal and the hydraulic head rotor returns to the low pressure condition ready for a new pressurizing cycle.

### 10.



P4A12EJ01

1. Washer
2. Valve body
3. Washer
4. Supply valve
5. Spring
6. Spring guide
7. High pressure outlet connector

#### High pressure supply valves

The supply valves are enclosed between the high pressure outlet connectors (7) and the head stator.

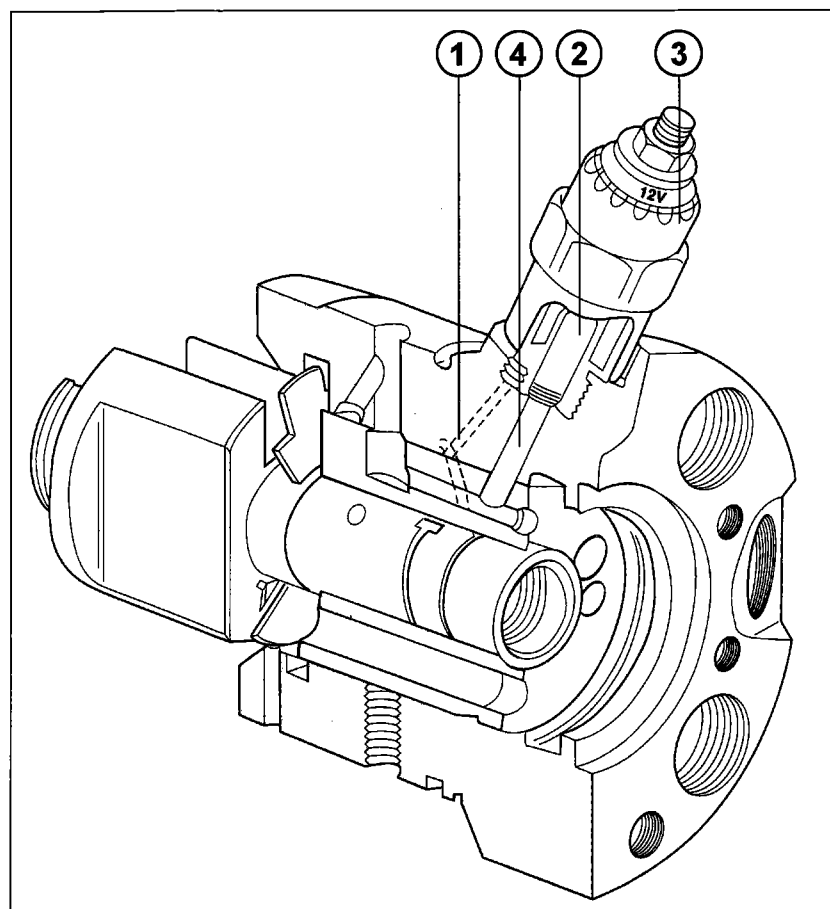
The seal between the valve casing, the head and the connector is achieved by means of two steel washers (1 and 3).

The assembly consists of a valve body (2) and a valve (4) matched together.

The maximum movement of the supply valve is restricted by the spring guide (6).

The spring (5) thrusts the valve (4) against the valve body (2), keeping it in its seat.

At the end of the injection cycle, the supply valves "recall" a certain amount of fuel from the high pressure pipes to ensure the rapid closing of the nozzles and, combined with the cam seal profile, the maintenance of the residual pressure in these high pressure pipes.



P4A12EJ02

#### Cut out solenoid

The engine can be made to cut out by completely removing the supply.

This is achieved by means of a solenoid valve (3) bolted onto the hydraulic head which operates between the flow of transfer pressure (1) and the flow of the metering valve (4).

The cut out solenoid, also known as the Electrostop, is directly connected to the Fiat CODE system and for this reason it is suitably protected by an anti-tamper cover.

1. Passage for transfer pressure
2. Piston
3. Solenoid assembly
4. Passage of fuel towards the metering valve

### Supercharging control valve

The function of the supercharging control valve is to adjust the value of the maximum fuel flow rate according to the variations in the pressure of the intake air created by the turbocharger.

The supercharging control valve is composed of a valve body (1) which contains a piston (2) which rests on a spacer (3).

There are two different size diaphragms (4) at each side of the spacer (3).

The supercharging pressure, produced by the turbocharger, enters between the two diaphragms via the connector (7).

The supercharging valve is fitted in the transfer pressure circuit somewhere between the transfer pump and the supplementary flow rate device.

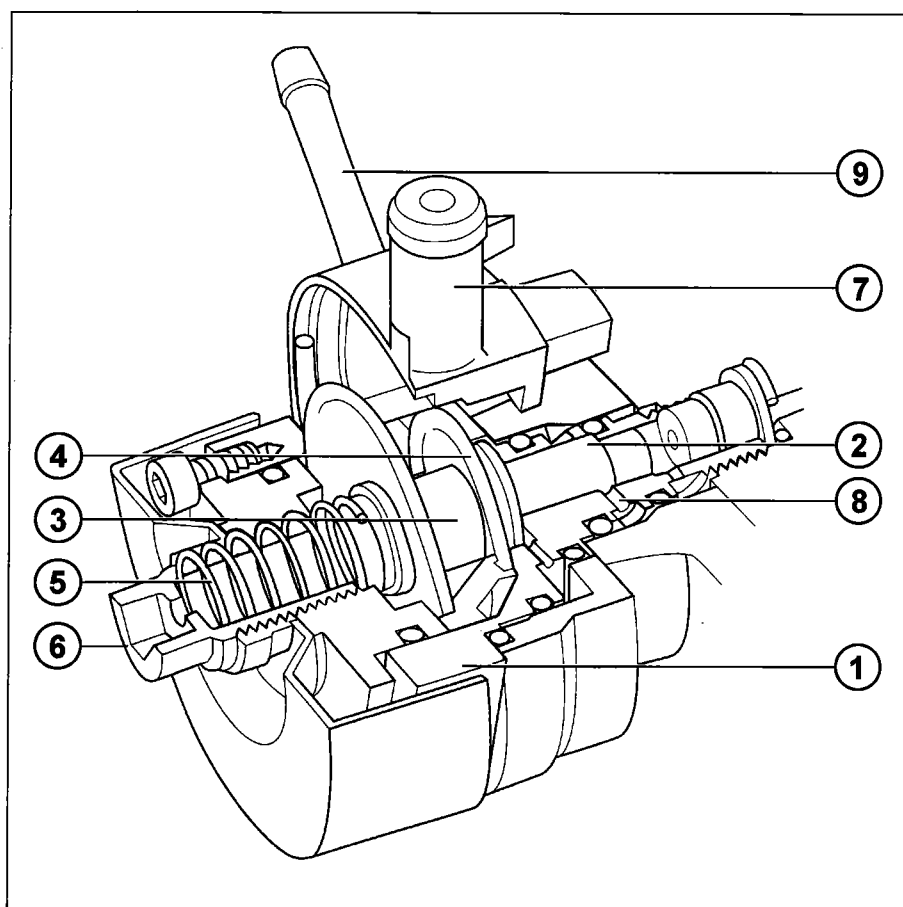
It varies the pressure acting on the supplementary device pistons according to the pressure of the air supplied by the turbocharger.

On accelerating the engine speed increases and consequently so too does the pressure produced by the turbocharger which reaches the supercharging control valve gradually moving the diaphragms (4) which compress the spring (5).

The valve piston (2) moves opening the discharge port (8) producing a drop in pressure behind the supplementary flow rate device pistons.

Under these circumstances the supplementary device spring can gradually thrust the system towards the "supplement engaged" position.

This movement allows the control valve piston (2) to gradually open a port (8) which allows the fuel to be discharged via the diesel return pipes to the vehicle tank and makes it possible to reduce the pressure which builds up upstream of the supplementary device pistons.



1. Valve body
2. Piston
3. Spacer
4. Diaphragms
5. Spring
6. Adjustment screw
7. Connector for the supercharging pressure
8. Discharge of the transfer pressure
9. Recovery connector

P4A13EJ01

## 10.

### Speed regulator

The speed regulator connects the accelerator lever (1) to the metering valve (7). Its function is to control the idle speed (and the fast idle) and the maximum engine speed.

The minimum/maximum regulator unit (mini/maxi device) (2) consists of a pre-loaded spring housed in a steel tube which connects the accelerator lever (1) to the upper part of the regulator plate (3). The regulator plate, in turn, causes the metering valve (7) to rotate by means of a connecting rod (5).

A spring (14), fixed to the front section of the regulator plate, controls the idle speed.

The mass carrier (10), which is fixed to the control shaft (11), contains a certain number of masses (9) subject to a centrifugal force which varies according to the engine rotation speed.

In idling conditions the centrifugal force acting on the masses is weak and the regulator plate is balanced between the force exerted by the masses (9) and the force of the spring (14) resting on the idle shaft.

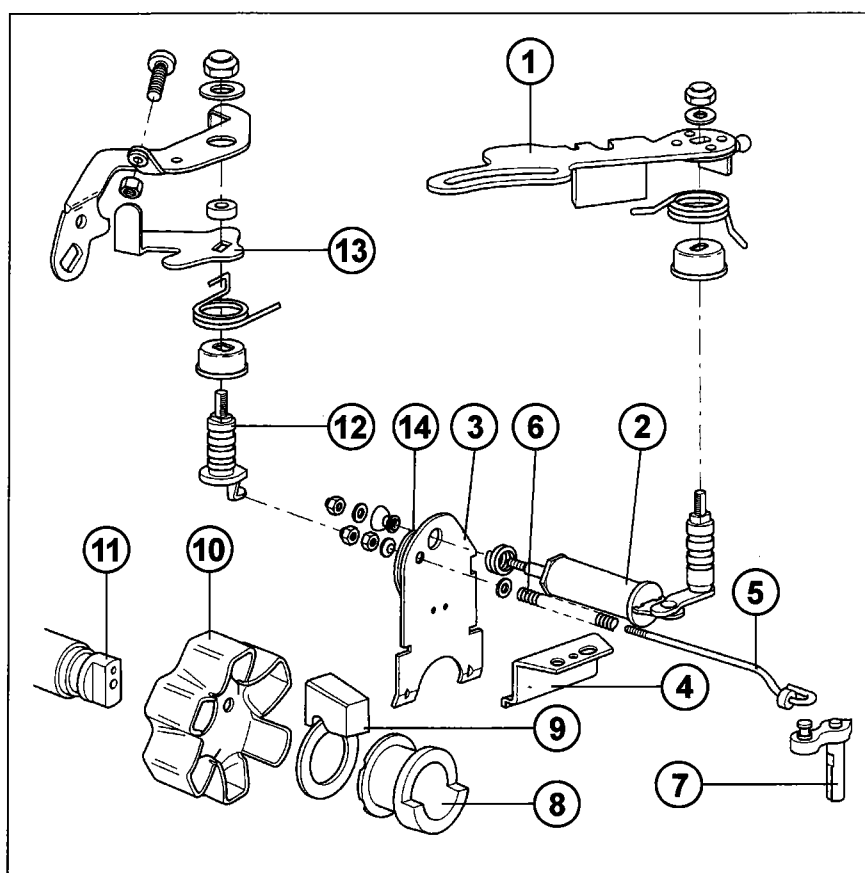
During acceleration, the accelerator lever (1) moves the metering valve (7), via the regulator rod (5), towards the completely open position.

The centrifugal force exerted by the masses increases, but remains lower than the pre-loading of the mini/maxi device (2) spring.

This means that the connection between the metering valve (7) and the accelerator lever (1) is direct.

During the adjustment stage, or when the speed reached increases the centrifugal force of the masses to such an extent as to overcome the mini/maxi device spring pre-loading force, the regulator controls the position of the metering valve (7).

In this case the connection between the metering valve (7) and the accelerator lever (1) is no longer direct.



1. Accelerator lever
2. Mini/maxi device
3. Regulator plate
4. Regulator bracket
5. Regulator rod
6. Regulator rod spring
7. Metering valve
8. Regulator sleeve
9. Regulator masses
10. Mass carrier
11. Drive shaft
12. Idle shaft
13. Idle lever
14. Idle spring

P4A14EJ01

**ELECTRICAL/ELECTRONIC CIRCUIT**

The electrical/electronic circuit for the fuel system basically comprises wiring, an electronic control unit and the following sensors and actuators:

- Rpm sensor
- Coolant temperature sensor
- Air flow meter
- Intake air temperature sensor
- Instrument injector
- Accelerator lever position sensor
- Fast idle solenoid valve
- Pre-heating control unit

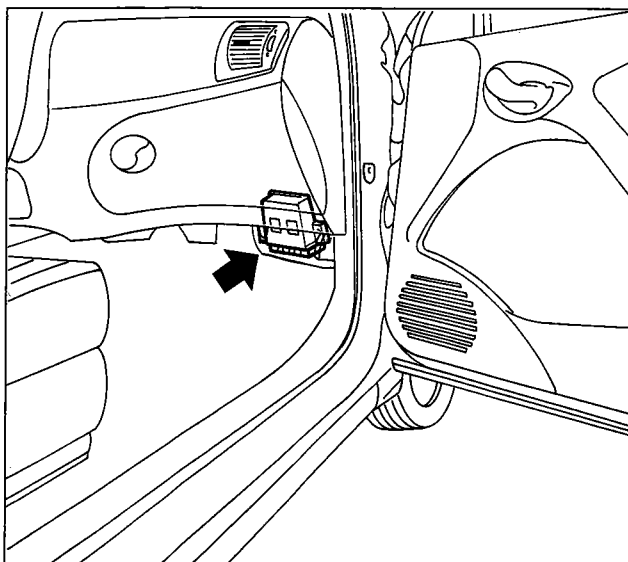
**Electronic control unit**

The electronic control unit (ECU) is located below the glove compartment (right side) and is connected to the wiring by means of a 25 pin connector.

It receives all the information relating to the engine running conditions transmitted by the various sensors in addition to atmospheric pressure information obtained by means of a sensor inside the actual control unit.

Through this data and with the aid of special programmes, the control unit is capable of carrying out the following operating strategies:

- injection advance management
- fast idle management
- exhaust gas recirculation management
- air conditioning system management
- heater plugs pre/post heating management



P4A15EJ01

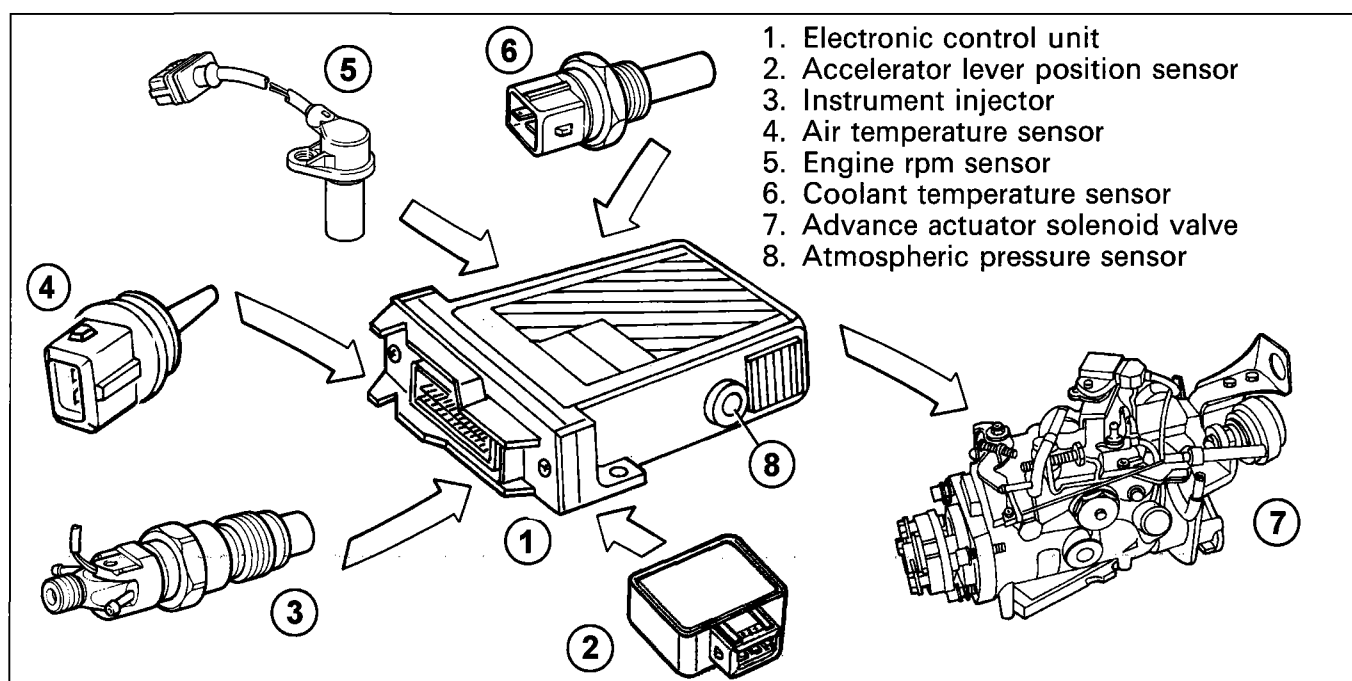
**Location of electronic unit**



## 10.

### INJECTION ADVANCE MANAGEMENT

By means of information relating to the engine speed/TDC, accelerator lever position, atmospheric pressure, temperature of the intake air and temperature of the engine coolant, the electronic control unit calculates the optimum injection advance value and compares it with the actual value transmitted by the instrument injector and, if necessary, it operates the advance actuator solenoid valve so that the start of the injection always takes place at the most appropriate moment for all engine operating conditions.

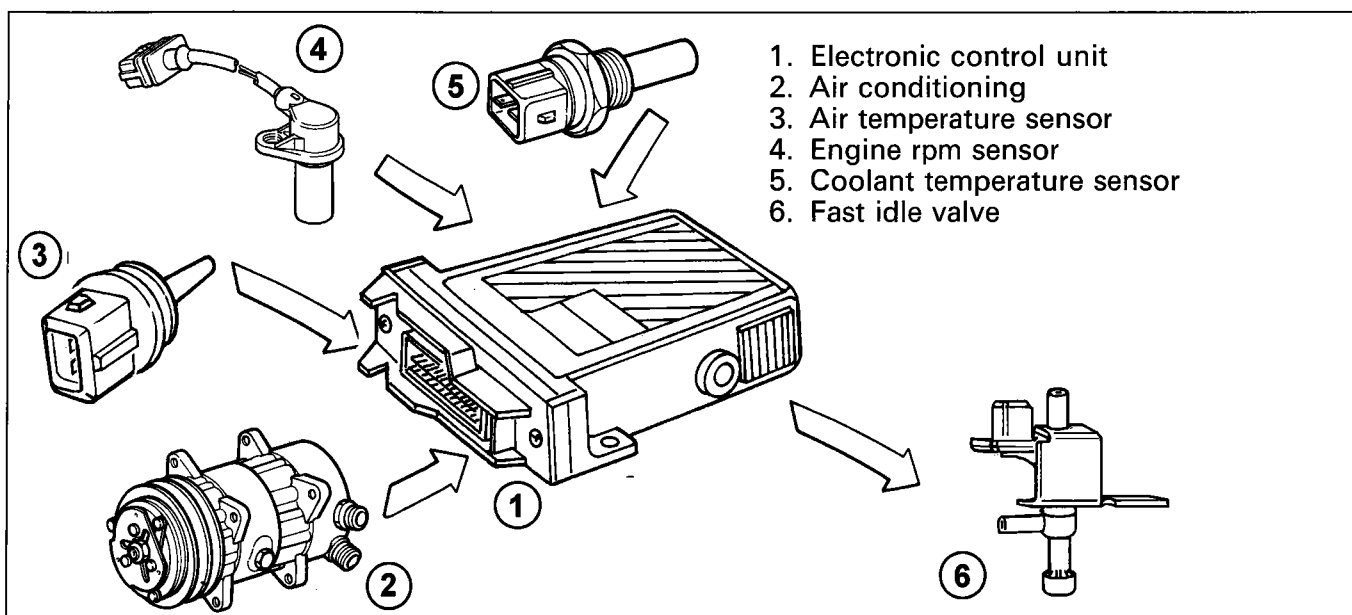


P4A16EJ01

### FAST IDLE MANAGEMENT

The engagement of the fast idle function is implemented by the control unit when at least one of the following conditions prevail:

1. intake air temperature below 25 °C and engine coolant temperature below 55 °C;
2. air conditioning compressor on;
3. engine speed below 750 rpm.

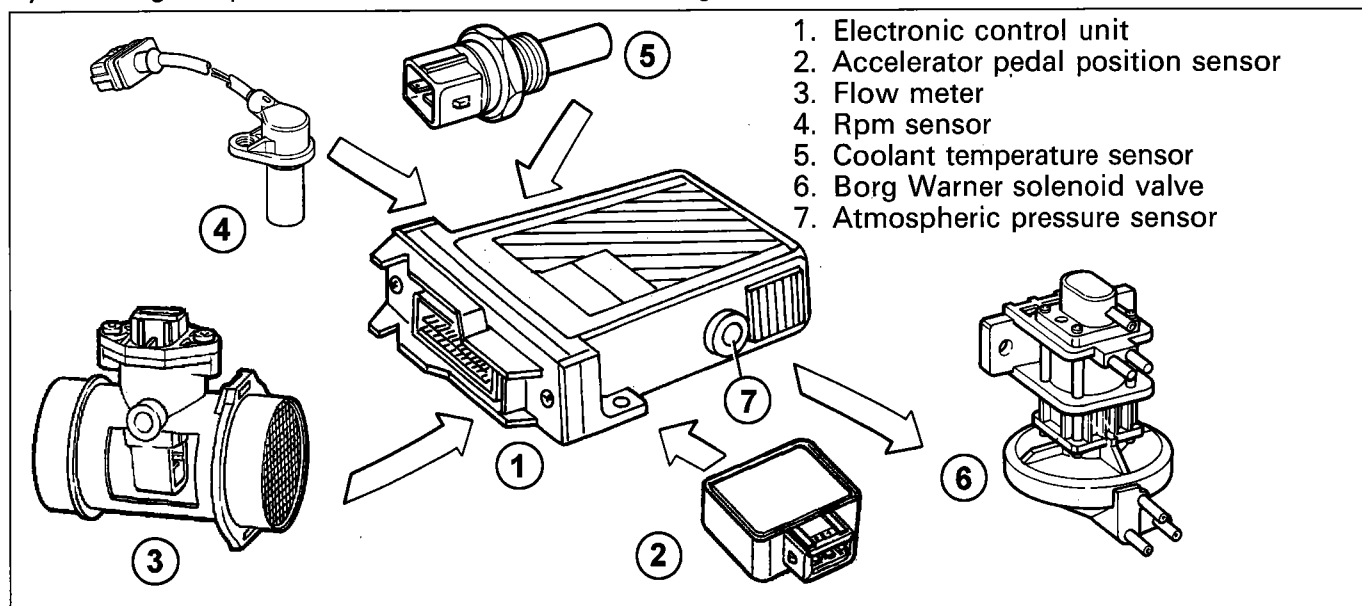


P4A16EJ02



## EXHAUST GAS RECIRCULATION MANAGEMENT

The electronic control unit calculates the weight ratio between the "clean" intake air and the quantity of burnt gases which can be returned to the intake. Depending on the engine load, the temperature of the coolant, the atmospheric pressure and the quantity of intake air, the electronic control unit operates the Borg Warner solenoid valve which, in turn, activates the EGR valve, by means of a vacuum signal, thereby allowing the partial recirculation of the exhaust gases.



P4A17EJ01

## AIR CONDITIONING SYSTEM MANAGEMENT

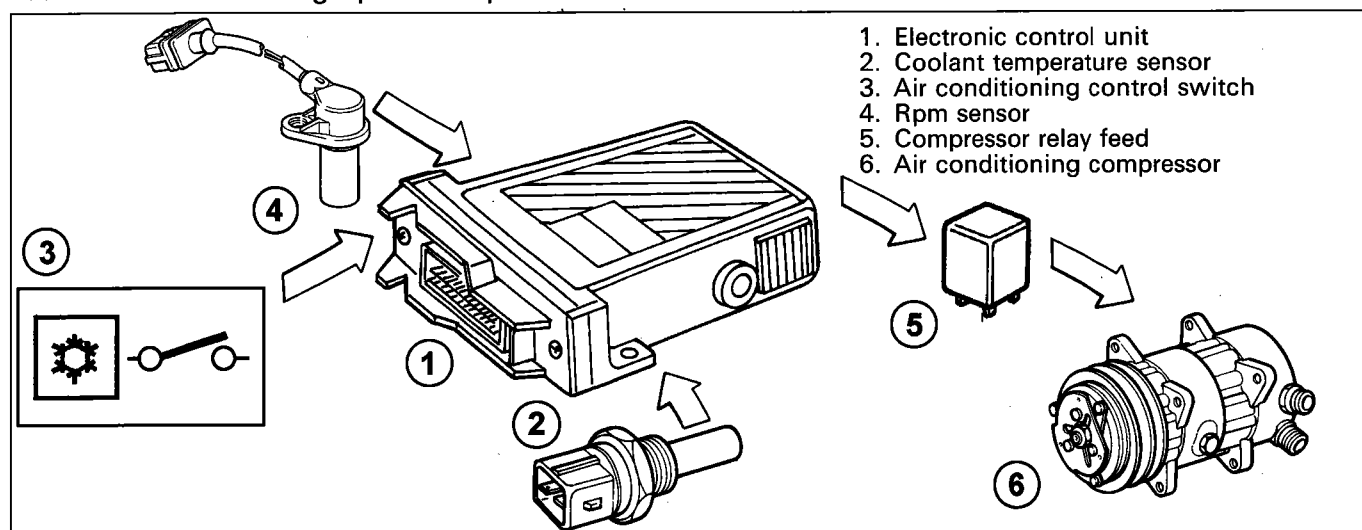
When the air conditioning is switched on, the compressor absorbs power from the engine which, when idling, tends to cut out. In order to prevent this problem, the control unit activates the fast idle function described previously.

Another function carried out by the control unit is that of interrupting the compressor supply if one of the following conditions occurs:

1. Coolant temperature more than 110 °C;
2. Exceeding of a certain rpm level (around 4500);
3. High engine power request (strong acceleration).

In conditions 1 and 2 the supply is restored when the coolant temperature or engine rpm values go below the intervention level.

In condition 3 the interruption is only momentary and the supply is automatically restored after several seconds even in the high power request still exists.



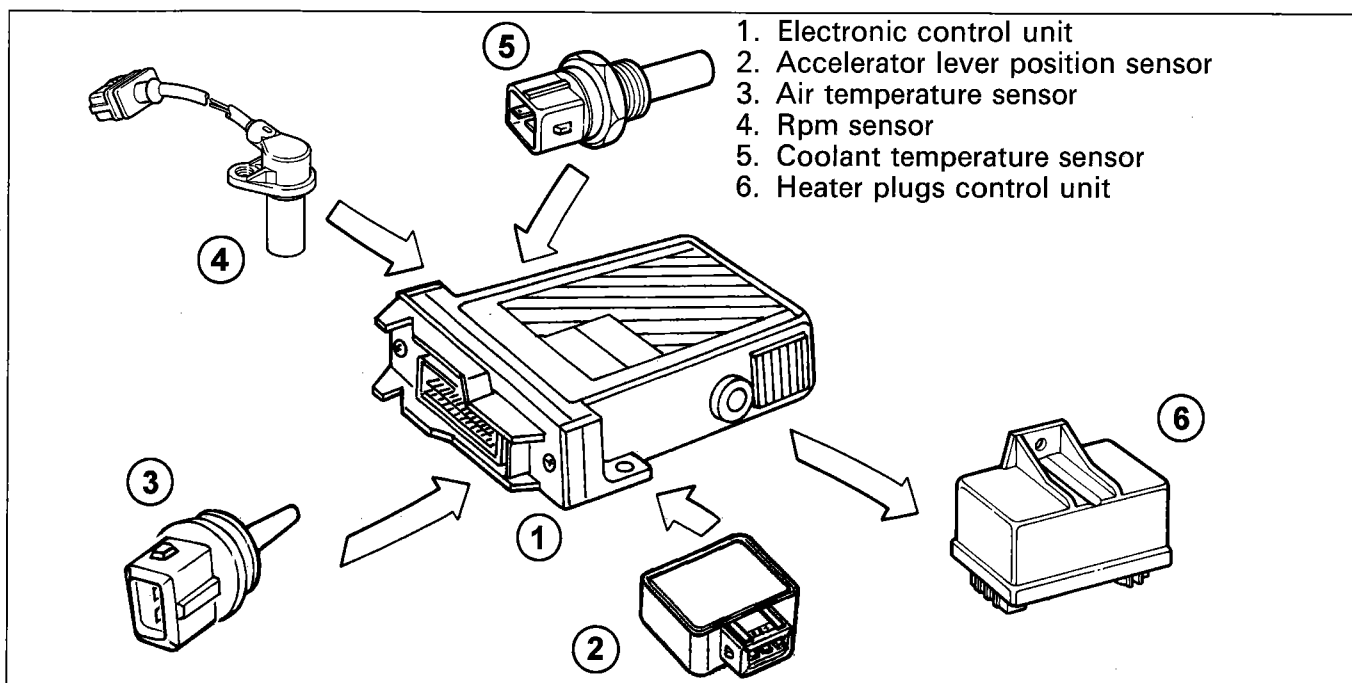
P4A17EJ02

### 10.

#### HEATER PLUGS PRE/POST HEATING MANAGEMENT

The electronic control unit directly controls the heater plugs control unit managing the pre and post heating times mainly according to the values for the engine coolant temperature and the intake air temperature.

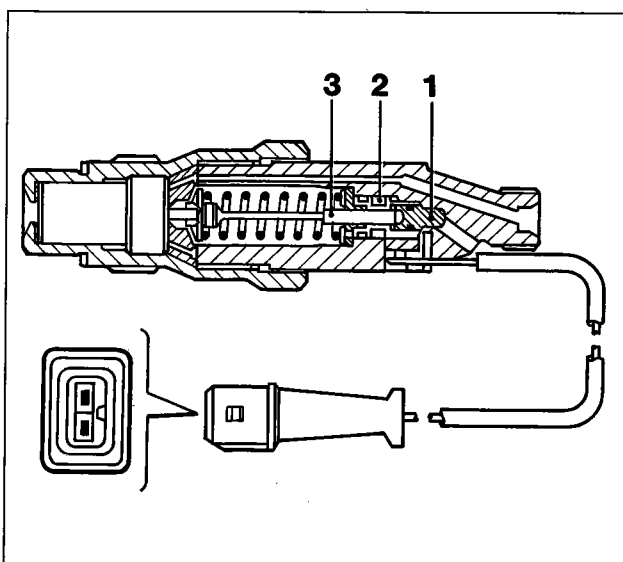
In order to calculate the post-heating times, the control unit also assesses the accelerator lever position and rpm values, decreasing these times if there is a high engine power request.



P4A18EJ01

#### Instrument injector

The instrument injector informs the electronic control unit of the actual injection advance (start of the injection stage or of the start of the movement of the needle valve).



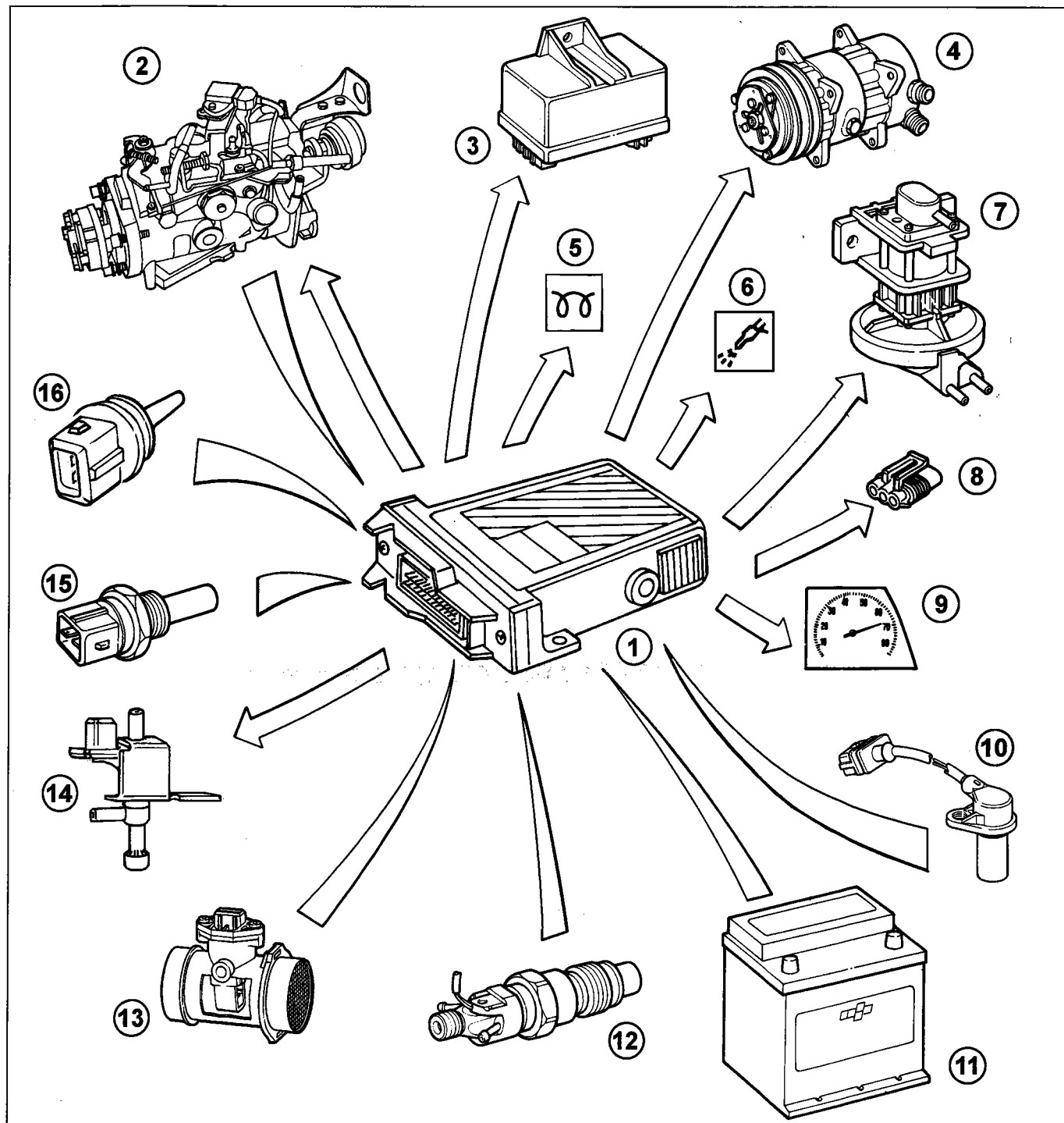
P4A18EJ02

According to the signal the control unit corrects the advance set by the injection actuator until the nominal value is reached.

The injector is fitted on the cylinder (1) and is equipped with a device for recognizing the exact moment of the start of the injection stage and with wiring for sending a signal and informing the electronic control unit.

Inside the injector there is a coil (2), a needle valve (3) and an adjustment pin (1). The coil is electrically supplied and produces a magnetic flow which affects the needle valve (3). When the latter initiates the opening of the nozzle for injecting the fuel, this causes a variation in the magnetic flow in the coil (2) which the control unit recognizes as the start of the injection and on which the advance adjustment strategy is based.

**SIGNALS ARRIVING AT AND LEAVING THE CONTROL UNIT/SENSORS AND ACTUATORS**

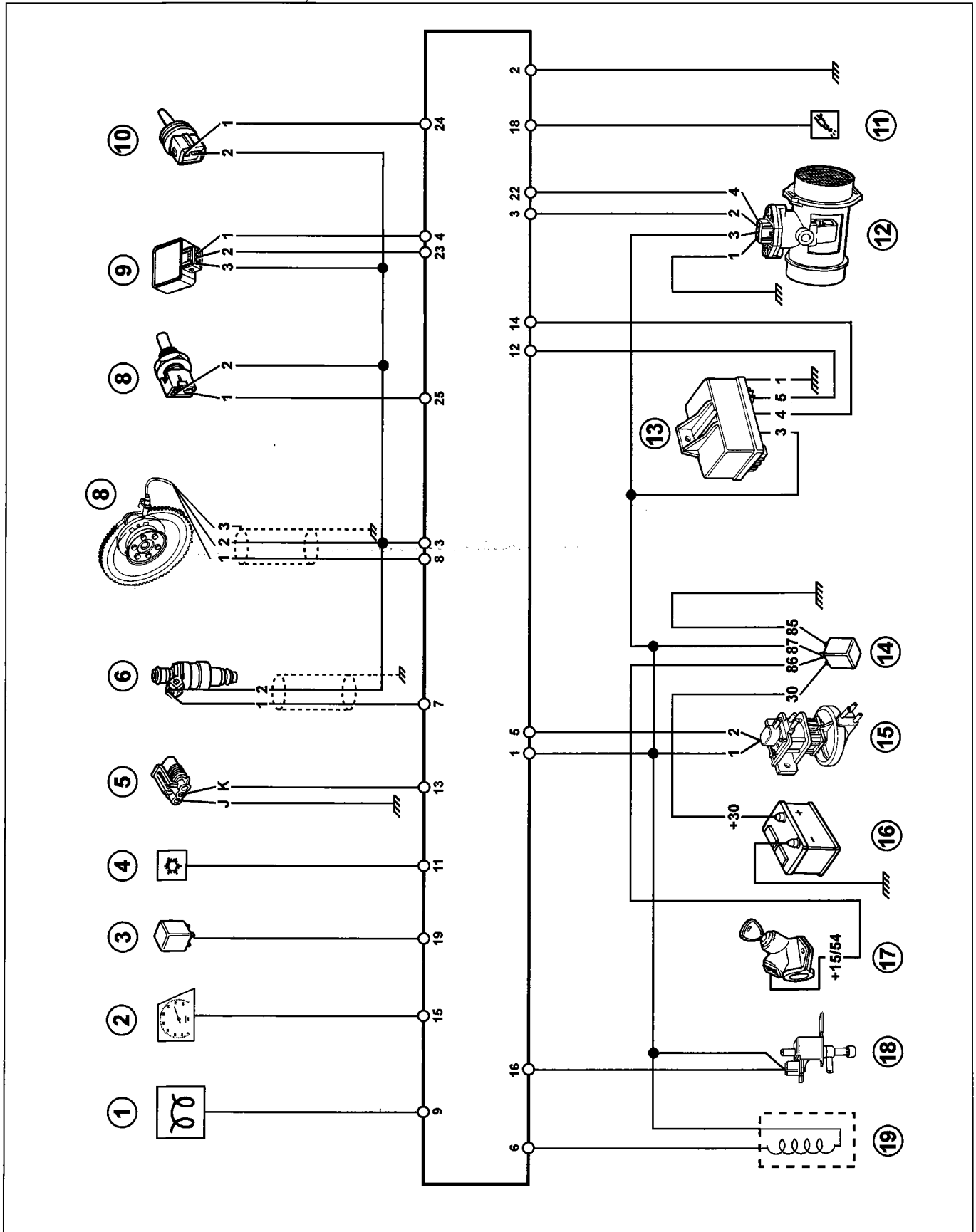


P4A19EJ01

- |                                           |                                |
|-------------------------------------------|--------------------------------|
| 1. Electronic control unit                | 9. Rev counter                 |
| 2. Injection pump                         | 10. Engine rpm sensor          |
| 3. Heater plugs control unit              | 11. Battery                    |
| 4. Climate control system                 | 12. Instrument injector        |
| 5. Heater plugs warning light             | 13. Air flow meter             |
| 6. Injection system failure warning light | 14. Fast idle valve            |
| 7. Borg Warner solenoid valve             | 15. Coolant temperature sensor |
| 8. Diagnostic socket                      | 16. Air temperature sensor     |

# 10.

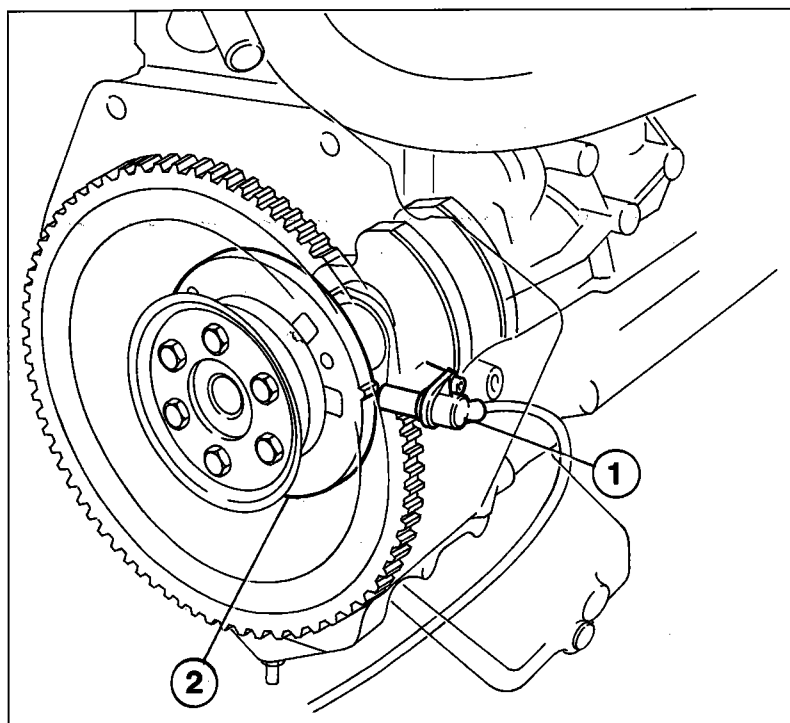
## WIRING DIAGRAM



P4A20EJ01

**Wiring diagram key**

- |                                            |                                            |
|--------------------------------------------|--------------------------------------------|
| 1. Heater plugs warning light              | 11. Injection system failure warning light |
| 2. Rev counter signal                      | 12. Flow meter                             |
| 3. Climate control relay                   | 13. Pre-heating control unit               |
| 4. Climate control on button               | 14. System relay feed                      |
| 5. Fiat/Lancia Tester diagnostic socket    | 15. Fuel vapour solenoid valve             |
| 6. Instrument injector                     | 16. Battery                                |
| 7. Rpm and TDC sensor                      | 17. Ignition switch                        |
| 8. Coolant temperature sensor              | 18. Fast idle valve                        |
| 9. Fuel introduction lever position sensor | 19. Advance adjustment device solenoid     |
| 10. Intake air temperature sensor          |                                            |

**Engine rpm sensor and flywheel****Features:**

Gap  
 $0,8 \div 1,5 \text{ mm}$

Winding resistance  
 $860 \text{ ohm} \pm 10\% \text{ at } 20^{\circ}\text{C}$

- 1. Rpm sensor
- 2. Flywheel

The engine rpm sensor is fitted on the crankcase and is facing a flywheel, located inside the crankcase and fixed to the crankshaft.

The flywheel has 2 reference dowels at  $180^{\circ}$  from one another, on the outer part of the circumference.

When these dowels or teeth pass under the sensor, as a result of the variation of the gap, this causes a variation in the magnetic flow which produces a current in the coil windings in the sensor.

This signal, sent to the control unit, allows the engine speed to be detected.

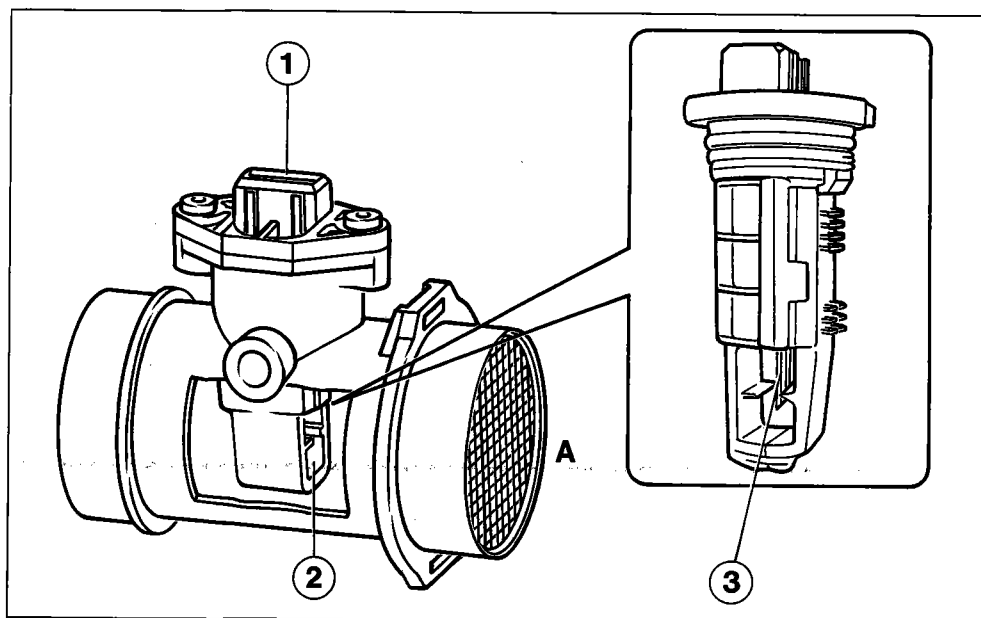
## 10.

### Air flow meter

The air flow meter is the "heated film" type; the operating principle is based on a heated diaphragm which is placed in a measuring channel through which the intake air which enters the engine flows. The film diaphragm is kept at a constant temperature ( $\sim 120^{\circ}\text{C}$  higher than the temperature of the air) by the heating resistance which is in contact with it.

The mass of air which passes through the measuring channel tends to remove heat from the diaphragm therefore, in order to keep it at a constant temperature, a certain current should flow through the heating resistance; this current is measured by a suitable Wheatstone bridge.

The current measured is therefore proportional to the mass of air flowing through.



- 1. Connector
- 2. Measuring channel
- 3. Hot film sensor
- A= Air intake

P4A22EJ01

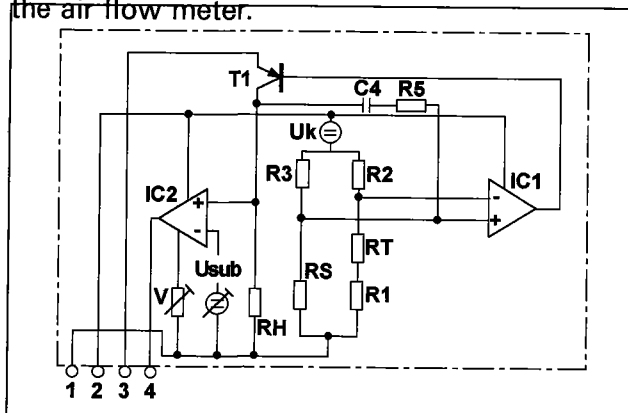
**NOTE** This flow meter directly measures the mass of air (and not the volume) thereby eliminating problems of temperature, altitude, pressure, etc.

### Description of the operation

The Wheatstone bridge (made up of  $R_3$ ,  $R_2$ ,  $R_s$ ,  $R_t+R_1$ ) is in equilibrium when  $R_s$  is at around  $120^{\circ}\text{C}$  higher than the temperature of the air.

The air which passes through the diaphragm removes heat from  $R_s$ , therefore the bridge is not in equilibrium. This situation is detected by the circuit at IC1, which operates transistor T1 in a manner which is proportional to the imbalance of the bridge with the result that more current passes through  $R_h$  to heat up  $R_s$  and the equilibrium of the bridge is restored.

Circuit IC2 measures the current which passes through  $R_h$ . This current makes it possible to maintain the equilibrium of the bridge and is consequently proportional to the mass of air which passes through the air flow meter.

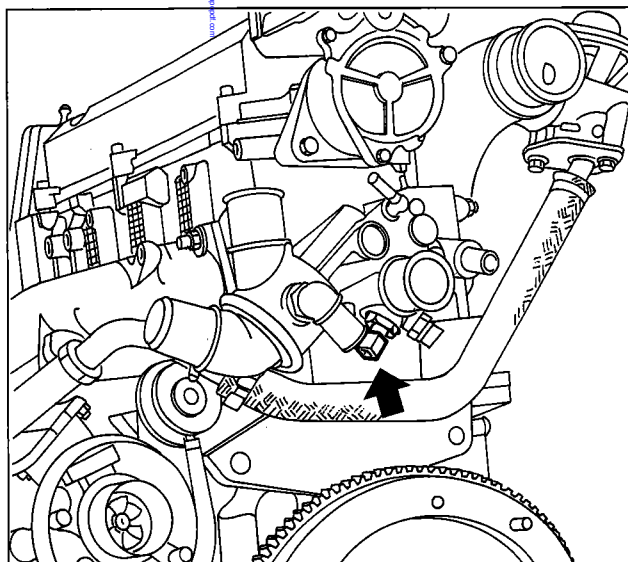


P4A22EJ02

Air flow meter wiring diagram



**Coolant temperature sensor**

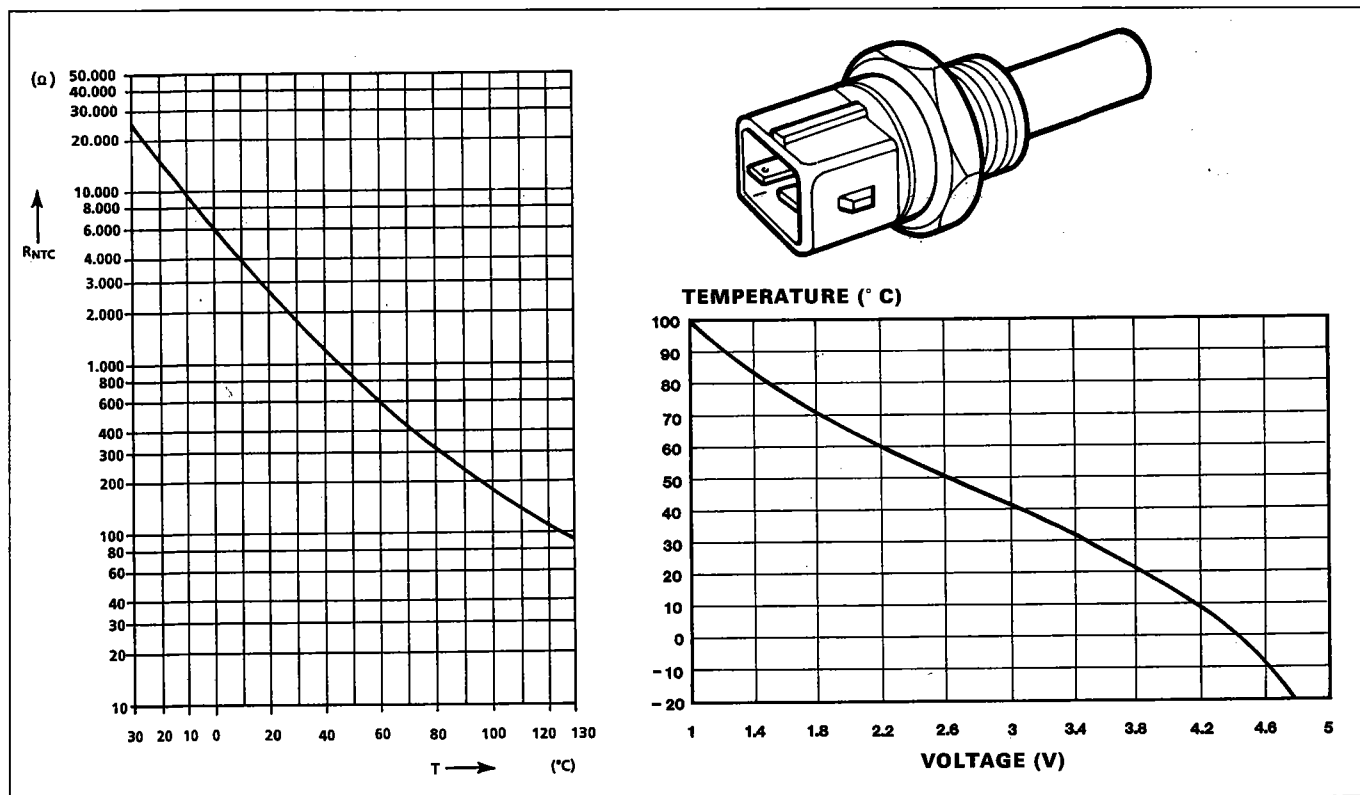


P4A23EJ01

The temperature of the engine coolant is measured by a sensor which comprises an NTC resistor where the resistance varies in a manner which is inversely proportional to the temperature, as illustrated in the diagram.

The control unit detects the variation in voltage proportional to the current intensity circulating in the sensor.

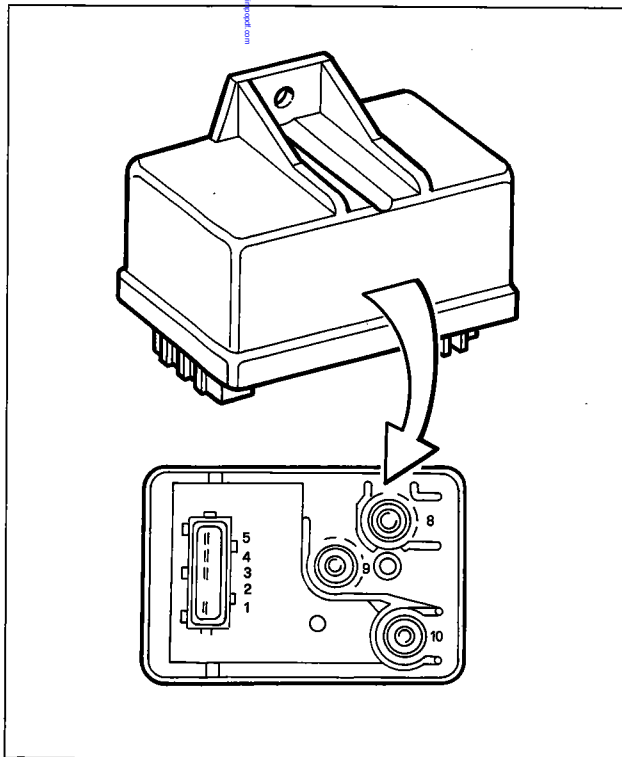
The sensor should be fitted taking care not to exceed the tightening torque of 15 Nm



P4A23EJ02



# 10.



P4A24EJ01

## Pre-heating control unit

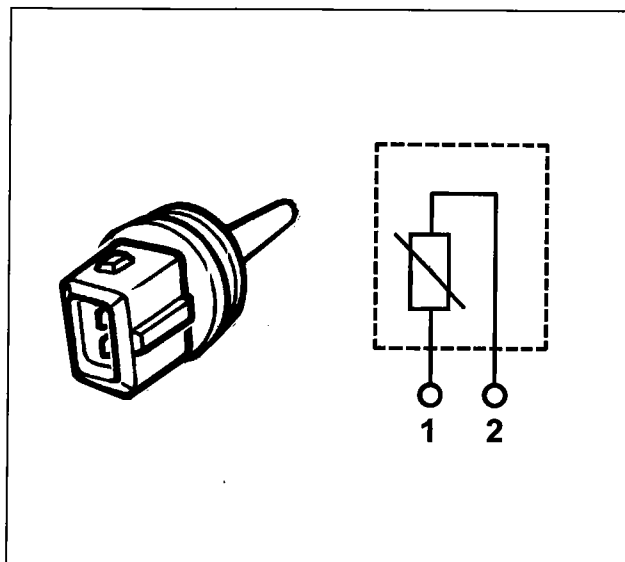
The operation of the heater plugs takes place via the pre-heating control unit, under the direct control of the electronic control unit.

There is an "intelligent" relay inside which sends a return response (feed-back) to the injection control unit which is informed in this way of any failures of the pre-heating control unit or short circuit to earth of the heater plugs.

The diagram shows the connectors on the pre-heating control unit base and the relevant pin-out.

## Connections

1. Vehicle earth
2. Not connected
3. Ignition switch (+15)
4. Electronic control unit (pre-post heating activation)
5. Electronic control unit (fault diagnosis)
8. Battery positive
9. Heater plugs
10. Heater plugs



P4A24EJ02

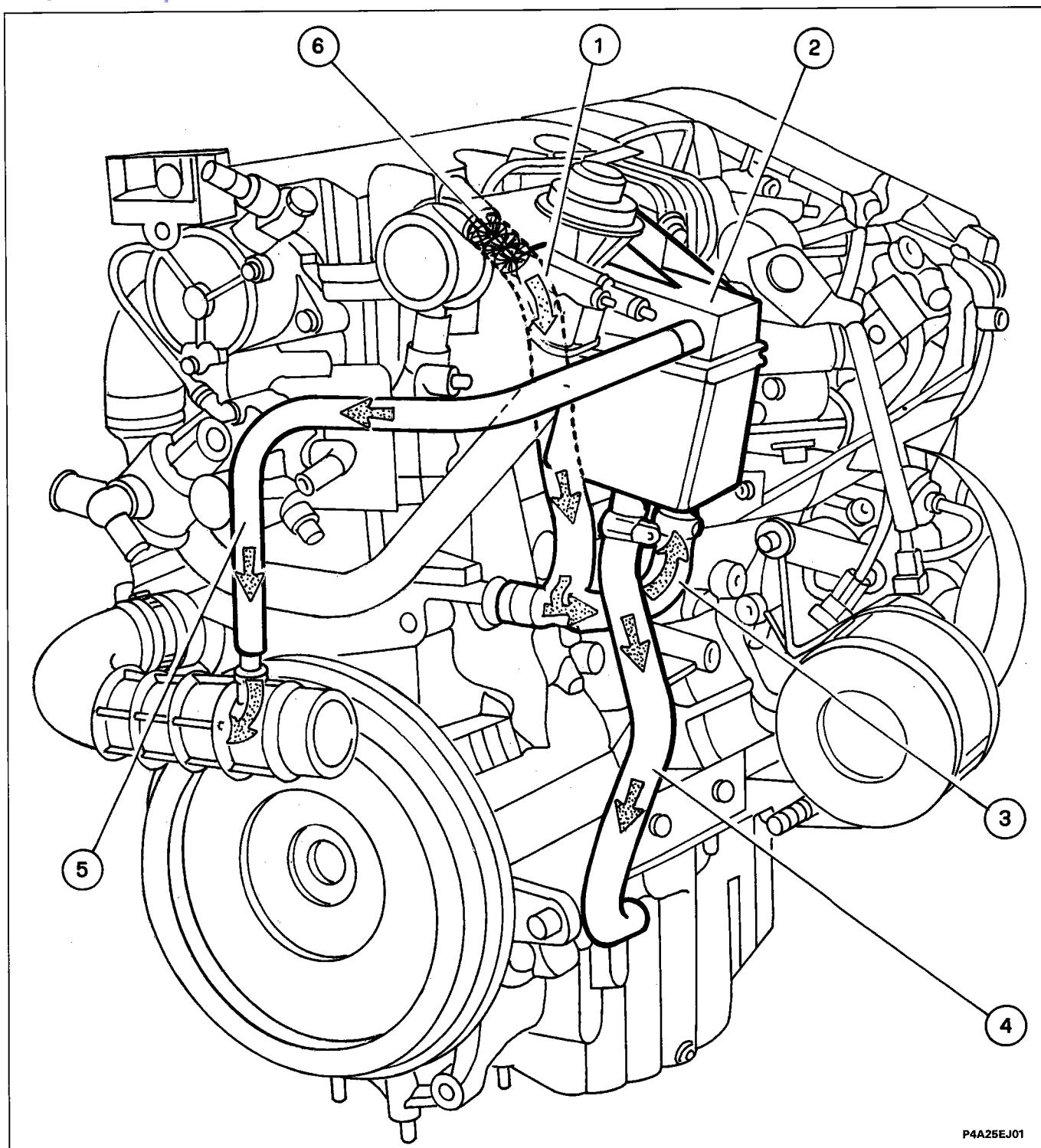
## Air temperature sensor

The intake air temperature sensor is, on this version, separate from the air flow meter: it comprises a standard NTC (Negative Temperature Coefficient) where the electrical resistance decreases as the temperature increases.

Since the control unit intake circuit is designed as a voltage divider, this voltage is divided between a resistance in the control unit and the sensor NTC resistance.

As a result the control unit is capable of evaluating the variations in the sensor resistance through the changes in voltage and thereby obtain information concerning the temperature.

**DIAGRAM SHOWING RECIRCULATION OF GASES COMING FROM THE ENGINE CRANKCASE (BLOW-BY)**



P4A25EJ01

The engine crankcase emissions are composed of a mixture of air, diesel fuel and burnt gases which escape from the piston seals in addition to lubricant oil vapours. They are defined as blow-by or breather gases.

The breather gases coming from both the cylinder block/crankcase and the cylinder head through the pipe (3), reach the separator (2) where, following the vortex action to which they are subjected, they lose part of the oil dissolved in them which returns to the sump through the pipe (4) in the form of droplets.

The remaining gases, on the other hand, are directed, via the pipe (5), to the inlet circuit.

There is a spark-out (6) fitted inside the gas outlet pipe (1) on the cylinder head to prevent combustion due to flame returns.

### 10.

#### EXHAUST GAS RECIRCULATION SYSTEM (E.G.R. - Exhaust Gas Recirculation)

This system makes it possible to send part of the exhaust gases to the inlet in certain engine operating conditions.

This dilutes the fuel mixture with the inert gases lowering the peak temperature in the combustion chamber: in this way the formation of nitrous oxides (NOx) is contained, with a 30 ÷ 50 % at the exhaust.

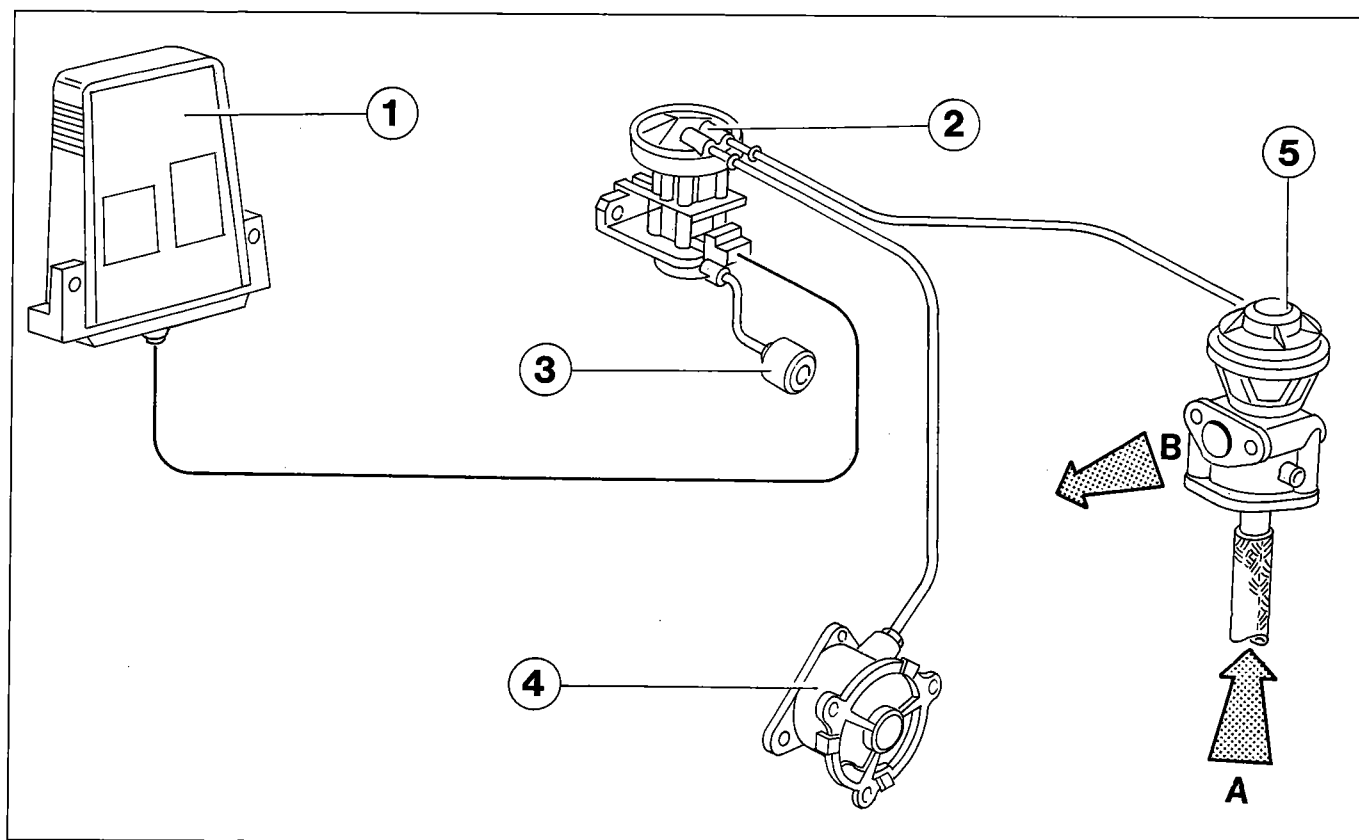
The recirculation of burnt gases is only possible at medium to low loads, when the air/fuel ratio is very high and the operation of the engine is not penalized by the presence of inert gases in place of the air.

The recirculation system is operated by the electronic control unit (1) which receives input signals from the potentiometer at the accelerator control lever (on the injection pump) and from the rpm and engine coolant temperature sensors and provides an output signal to operate the Borg Warner E.G.R. solenoid valve (2).

The latter, connected to the atmosphere via a small filter (3), transmits a lesser or greater vacuum, according to the signal received, coming from the special brake servoc vacuum pump (4) to the Pierburg E.G.R. valve (5).

If the vacuum is sufficient, this valve opens, placing the exhaust manifold in contact with the inlet manifold.

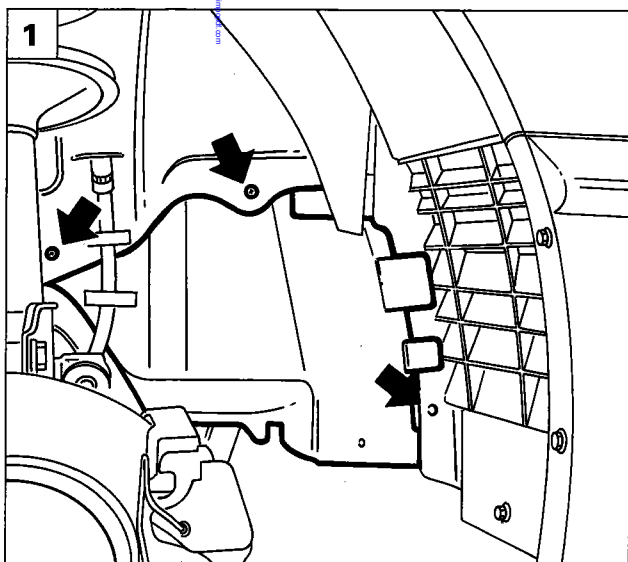
The quantity of gases recirculated can therefore be varied by regulating the opening of the E.G.R. valve continuously, using the maps stored in the control unit memory relating to the degree of opening according to the signals received.



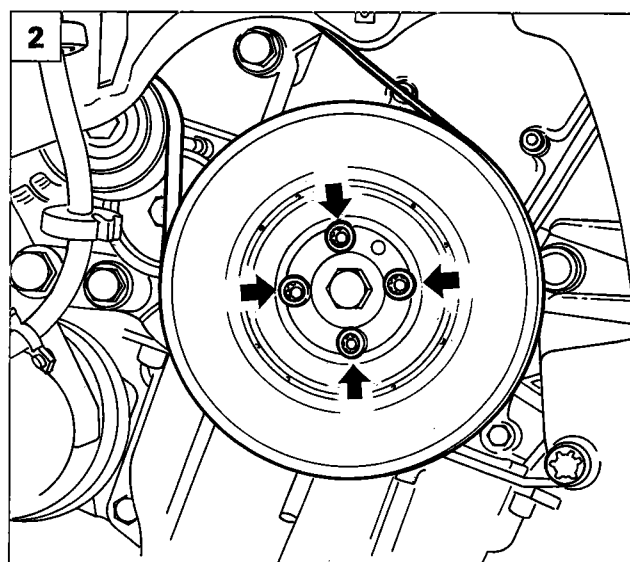
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1. Electronic control unit
2. Borg Warner modulating valve
3. Filtrino presa atmosferica

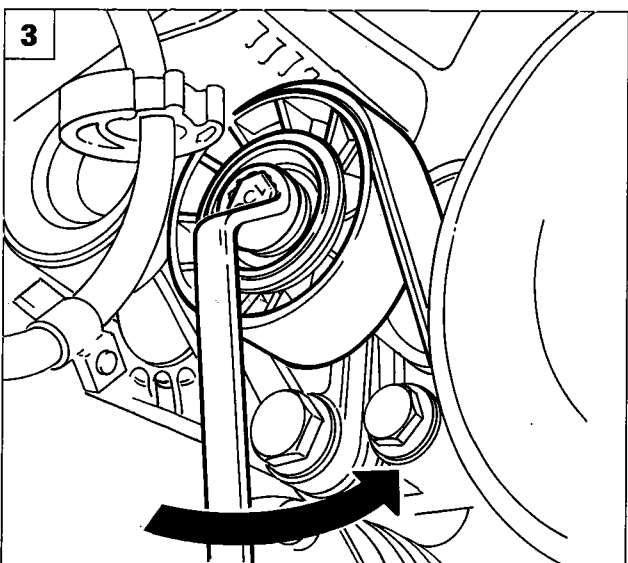
4. Brake servo vacuum pump
5. E.G.R. valve
- A. Gases coming from the exhaust manifold
- B. Gases sent to the inlet



P4A27EJ01



P4A27EJ02



P4A27EJ03

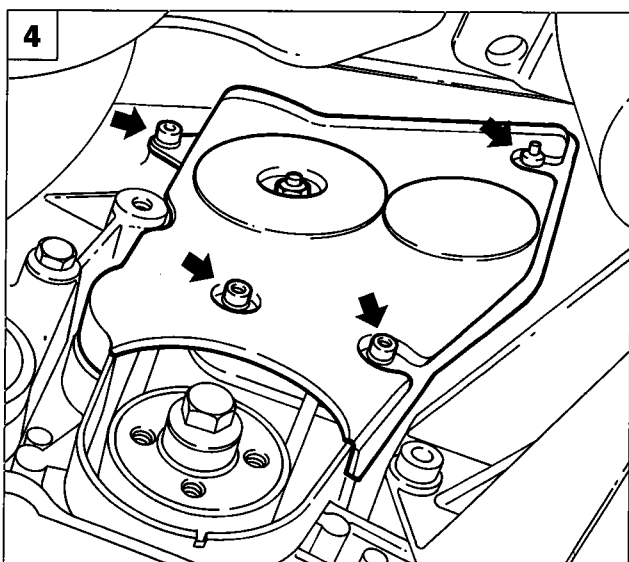


### REMOVING-REFITTING INJECTION PUMP



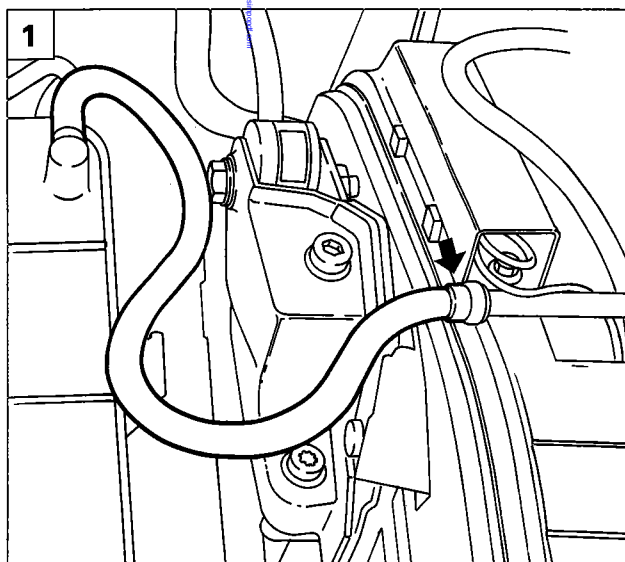
Position the vehicle on a lift, disconnect the positive battery terminal, remove the right front wheel and proceed as follows:

1. Remove the bolts shown and remove the right front wheel arch liner.
2. Loosen the bolts shown which fix the auxiliary shaft drive pulley.
3. Act on the automatic tensioner to loosen the tension at the auxiliary shaft drive belt, then remove the belt.
4. Remove the lower protection for the timing drive belt.

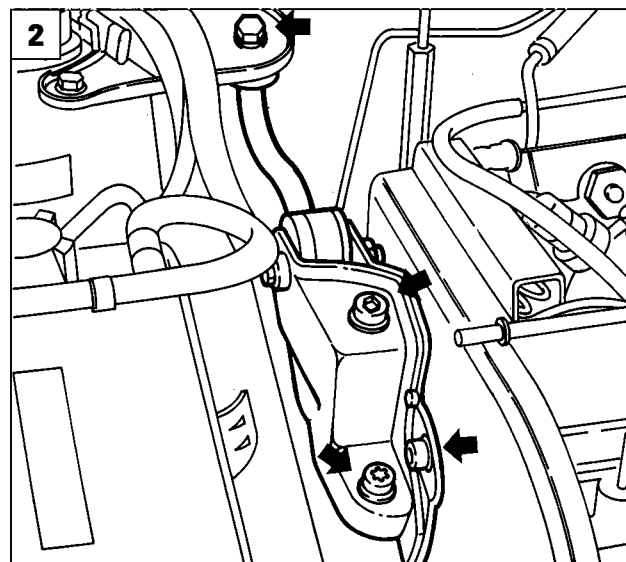


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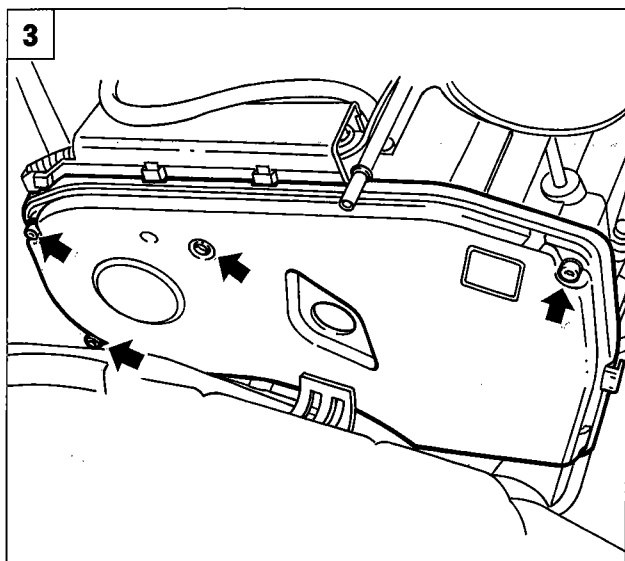
## 10.



P4A28EJ01



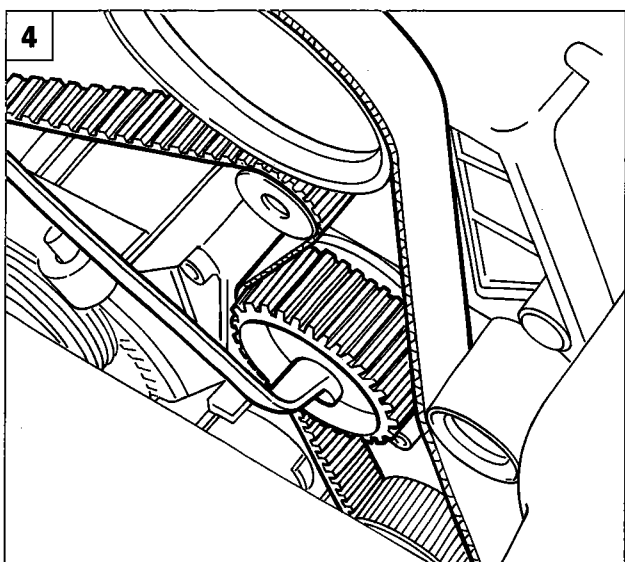
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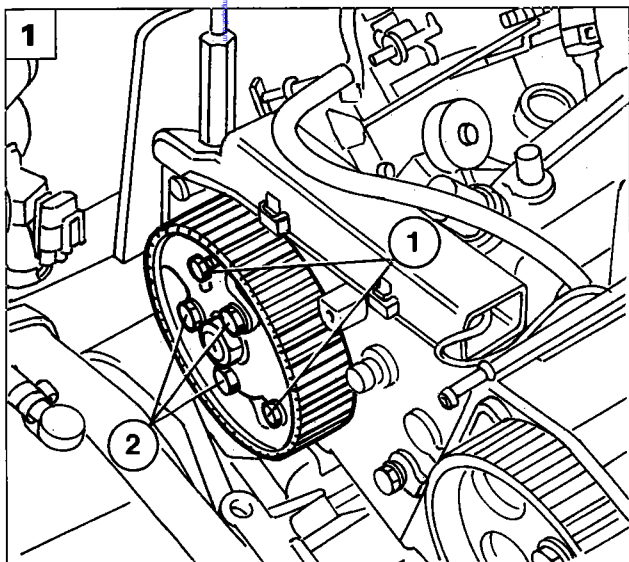


1. Disconnect the engine coolant pipe after having loosened the fixing band.
2. Undo the bolts shown, then remove the reaction connecting rod and the mounting bracket (engine side).
3. Undo the fixing bolts and remove the timing belt upper shield.
4. Loosen the nut securing the timing belt tensioning device, then remove the actual belt.

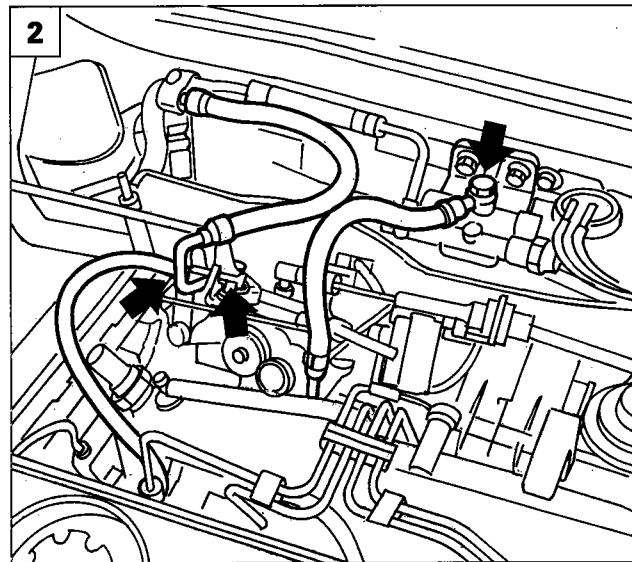


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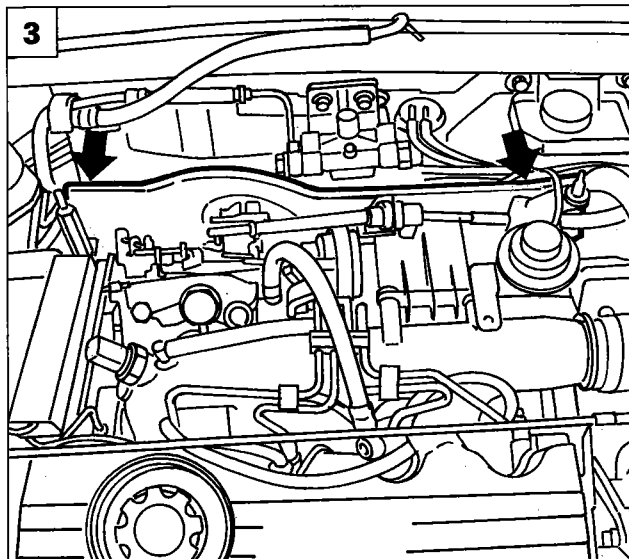




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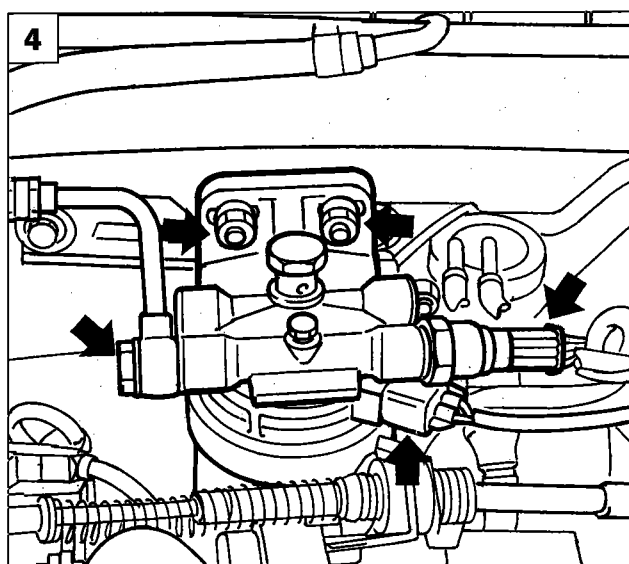
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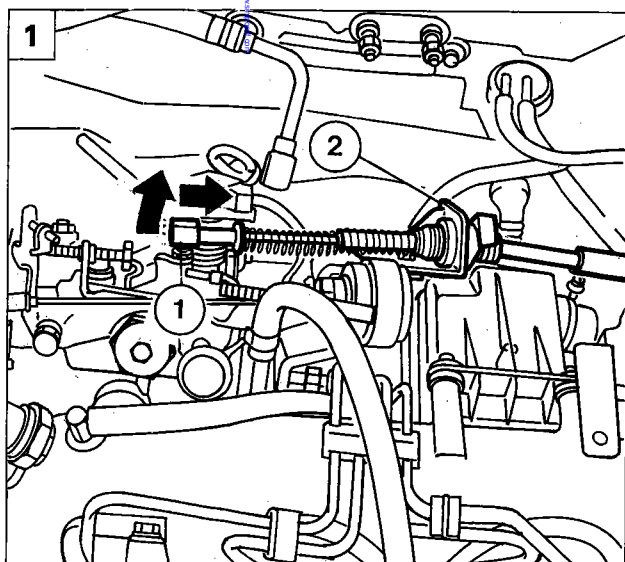


1. Stop the rotation of the injection pump drive pulley by tightening the two service bolts (1) in the special openings in the pump support, then undo the bolts (2) fixing the pulley, undo the bolts (1) and remove the pulley.
2. Acting at the points shown, disconnect the diesel supply pipes from the filter to the pump, the diesel return pipes from the pump to the tank and the diesel return pipes from the injectors to the pump.
3. Undo the fixing bolts and remove the sound insulation shield.
4. Disconnect the electrical connections, disconnect the diesel supply pipe between the tank and the filter, undo the fixing nuts and remove the diesel filter.

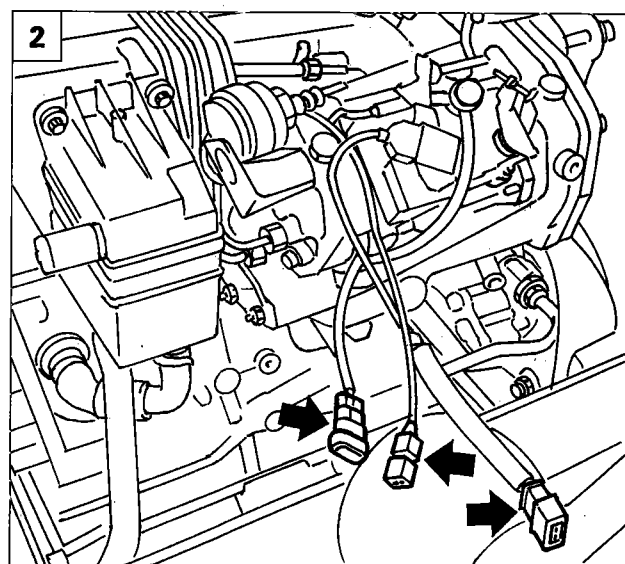


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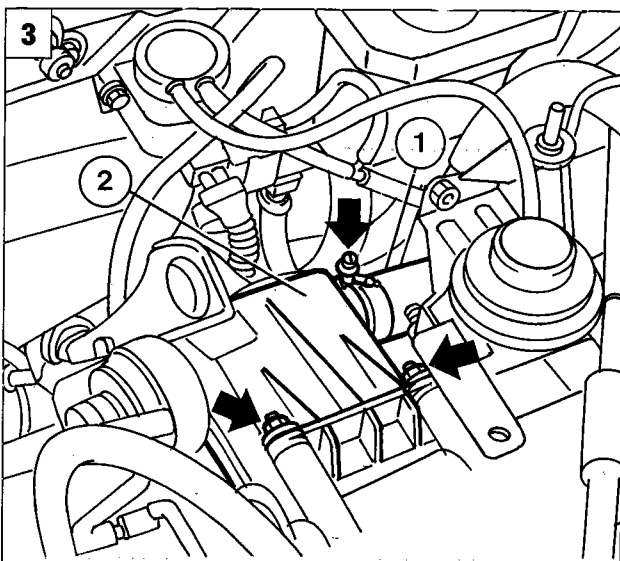
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P4A30EJ02



P4A30EJ03

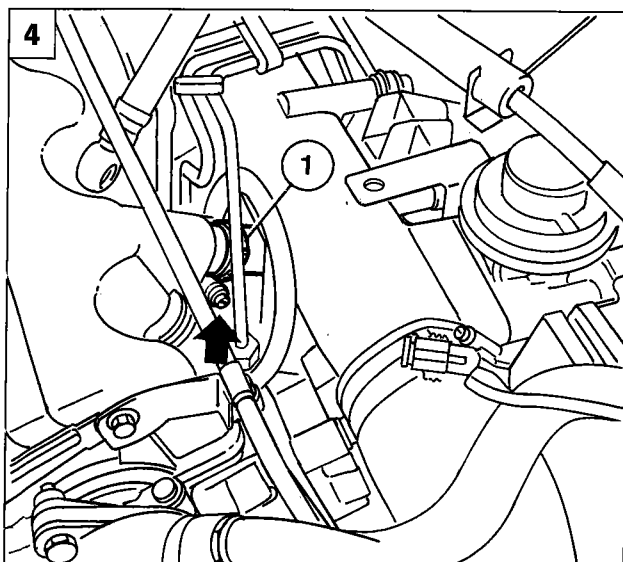


1. Let the band (1) slide in the direction shown by the arrow, then remove the accelerator cable from the injection pump releasing it from the attachment pin and removing it from the mounting and adjustment bracket (2).

2. Disconnect the electrical connections shown

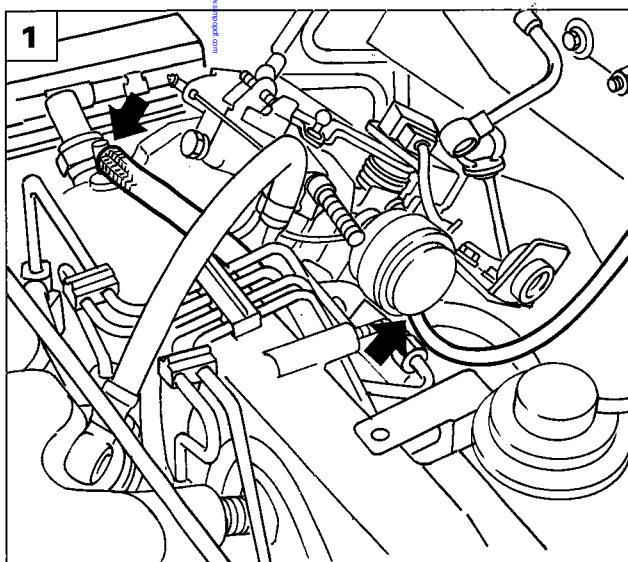
3. Disconnect the pipe (1) from the oil vapour separator (2). Undo the nuts fixing the separator (2); a third nut (not illustrated) is at the lower side of the separator.

4. Disconnect the pipe (1) which connects the oil vapour separator to the tappet cover and move the actual separator towards the engine compartment rear partition.

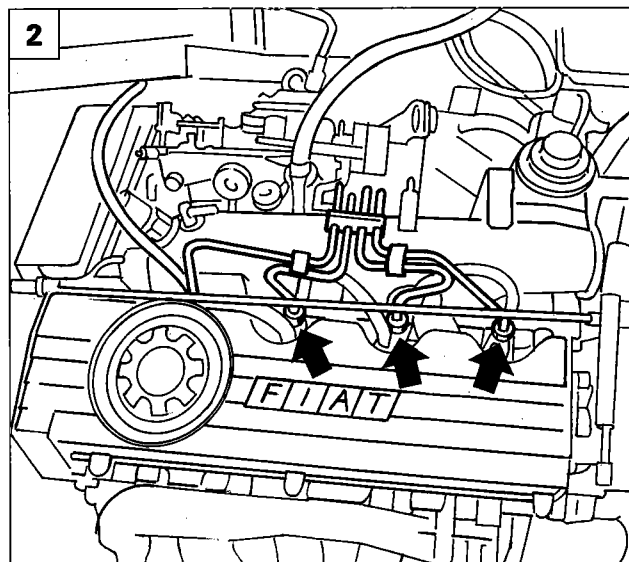


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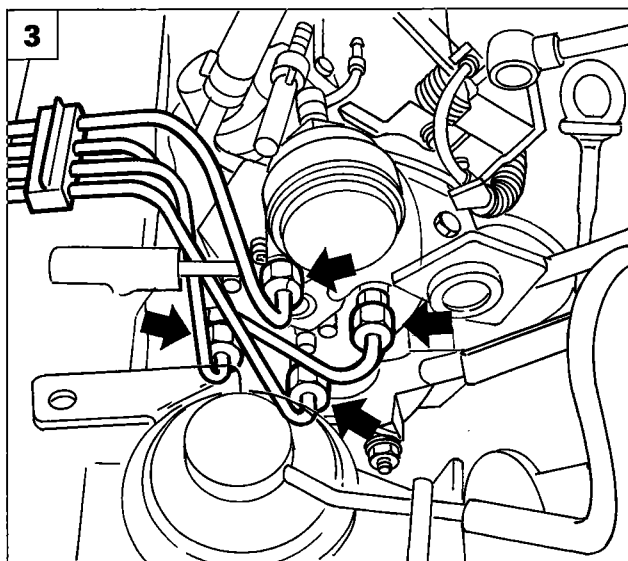




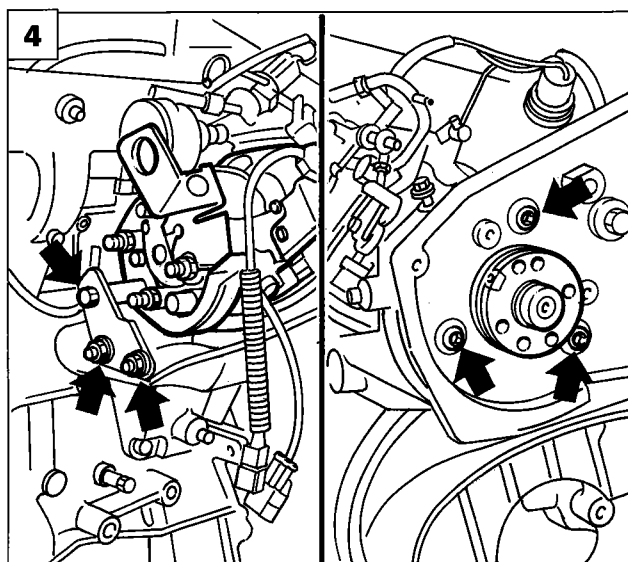
P4A31EJ01



P4A31EJ02



P4A31EJ03



P4A31EJ04



1. Disconnect the vacuum pipe from the inlet manifold and from the fast idle actuator acting at the points shown.
2. Using spanner 1852138000 undo the connectors for the fuel supply pipes at the injectors.
3. Undo the connectors shown at the pump using a spanner and remove the fuel supply pipes.
4. Remove the injection pump acting on the fixings shown in the diagram;



*To refit the injection pump reverse the order of the operations carried out for the removal with the exception of the timing belt.*

*Before refitting the timing belt it is necessary to check the timing and then the tension of the belt as specified in the paragraph "Replacing timing belt" in the chapter "Removing-refitting power unit".*



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## **M.MARELLI-WEBER I.A.W.-49F INTEGRATED FUEL INJECTION-IGNITION**

### **Introduction**

The I.A.W.-49F system fitted to the 1581 i.e. 16v engine belongs to the group of digital electronic ignition systems with static advance and static timing, integrated with an electronic fuel injection system of the intermittent multiple synchronized type.

The identification codes of the system are as follows, depending on the version:

- I.A.W.-49F.B4 for version with manual gearbox
- I.A.W.-49F.L2 for version with automatic transmission.

This system thus has only one control unit, a single set of wiring and a set of sensors common to both systems.

Its function is to inject into the engine's inlet port, upstream of the inlet valves, an exact quantity of petrol to be mixed with the air introduced into the cylinder, so as to obtain a correct mixture strength.

The I.A.W.-49F system ensures efficient operation thus optimizing performance and consumption, and reducing harmful emissions, by providing a response in real time to the engine's different operating conditions.

The system can be divided into the following sub-systems:

- Electrical/electronic system
- Air intake system
- Fuel supply system
- Emission control systems

Via suitable sensors, the system can measure the following parameters:

1. instantaneous engine rpm;
2. the position of each pair of pistons in relation to TDC of cylinder 1;
3. air intake temperature;
4. angular position of the throttle valve;
5. engine coolant temperature;
6. actual mixture strength (via the Lambda probe);
7. pressure in the inlet manifold;
8. vehicle speed;
9. battery voltage;
10. when the air conditioner (if present) is switched on;
11. the presence of any knocking.

This information, generally analogue, is converted into digital signals by the analogue/digital converters (A/D) in order to be used by the control unit.

Finally, it is important to note that the I.A.W.-49F fuel injection-ignition does not require any adjustment as it is self-adjusting and self-adapting.

### **SYSTEM MANAGEMENT STRATEGIES**

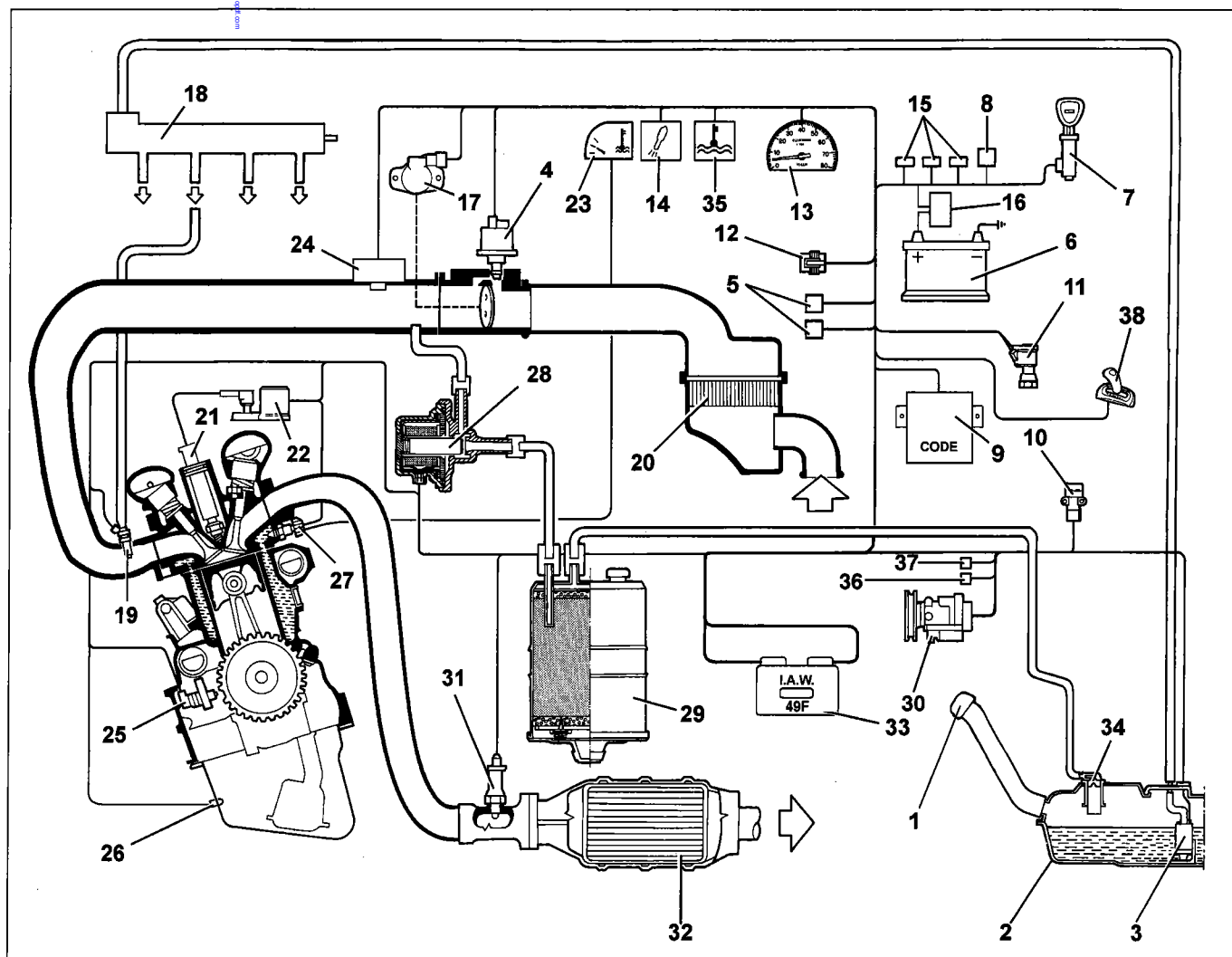
The management program (software) resides in the control unit's memory; it consists of a series of strategies, each of which manages a precise control function of the system.

By using the information (inputs) listed above, each strategy works out a series of parameters, based on the data maps stored in appropriate areas of the control unit's memory, and then drives the system's actuators (outputs), the devices which enable the engine to operate, namely:

1. fuel injectors;
2. ignition coils;
3. various types of solenoids;
4. electric fuel pump;
5. engine idle speed actuator;
6. control relays.

# 10.

## FUNCTIONAL DIAGRAM OF FUEL INJECTION-IGNITION



P4A02J01

- |                                                        |                                            |
|--------------------------------------------------------|--------------------------------------------|
| 1. Safety and ventilation valve                        | 21. Spark plugs                            |
| 2. Fuel tank                                           | 22. Ignition coils                         |
| 3. Electric fuel pump                                  | 23. Coolant temperature gauge              |
| 4. Engine idle actuator                                | 24. Air temperature and pressure sensor    |
| 5. Relays controlling radiator fan high and low speeds | 25. Rpm and T.D.C. sensor                  |
| 6. Battery                                             | 26. Knock sensor                           |
| 7. Ignition switch                                     | 27. Coolant temperature sensor             |
| 8. Fuel injection relay                                | 28. Fuel vapour cut-off solenoid           |
| 9. Fiat CODE control unit                              | 29. Activated charcoal filter              |
| 10. Inertial switch                                    | 30. Air conditioner compressor             |
| 11. Vehicle speed sensor                               | 31. Lambda probe                           |
| 12. Diagnostic socket                                  | 32. Catalytic converter                    |
| 13. Rev counter                                        | 33. Fuel injection - ignition control unit |
| 14. Fuel injection fault warning light                 | 34. Multi-function valve                   |
| 15. Fuses protecting fuel injection - ignition system  | 35. Coolant overheating warning light      |
| 16. Main fuse box                                      | 36. Air conditioner compressor relay       |
| 17. Throttle valve position sensor                     | 37. Air conditioner relay                  |
| 18. Fuel supply manifold                               | 38. Automatic transmission                 |
| 19. Fuel injectors                                     |                                            |
| 20. Air cleaner                                        |                                            |

The management strategies ensure the best ignition advance and fuel delivery, thus providing the correct mixture strength at all times as the engine load and environmental conditions vary.

The system management strategies are basically as follows:

- management of fuel injection;
- management of ignition;
- management of engine starting block function (Fiat CODE);
- management of radiator fan;
- management of engine idle control;
- management of fuel vapour recirculation;
- management of fault diagnosis;
- management of climate control system.

### **MANAGEMENT OF FUEL INJECTION**

The fuel injection management strategy aims to supply to the engine the correct quantity of fuel at the required instant, in accordance with the engine's operating conditions.

The fuel injection-ignition uses a "SPEED DENSITY-LAMBDA" indirect measuring system, which measures angular speed of rotation, density of intake air and mixture strength control (feedback control).

In practice, the system uses the ENGINE SPEED (rpm) and AIR DENSITY (pressure and temperature) data to measure the quantity of air drawn in by the engine.

The quantity of air drawn in by each cylinder for each engine cycle depends not only on the density of the air drawn in, but also on the unit cylinder capacity and the volumetric efficiency.

Air density is the density of the air drawn in by the engine and calculated in accordance with the absolute pressure and temperature, both measured in the inlet manifold.

Volumetric efficiency is the parameter relating to the cylinder fill coefficient measured in accordance with experimental tests conducted on the engine throughout its operating range, and subsequently stored in the electronic control unit's memory.

After establishing the quantity of air drawn in, the system must provide the quantity of fuel in accordance with the desired mixture strength.

The end-of-injection or delivery timing pulse is contained in a map stored in the control unit's memory, and varies depending on the engine speed and pressure in the inlet manifold. In effect these are processing operations carried out by the control unit to control the sequential opening and timing of the four injectors, one per cylinder, for the length of time strictly necessary for forming an air-petrol mixture as close as possible to the stoichiometric ratio.

The fuel is injected directly in the manifold near the inlet valves at a differential pressure of about 3 bar.

The speed (rpm) and air density (pressure and temperature) are used to measure the quantity of intake air; when this has been determined, the quantity of fuel is metered in accordance with the desired mixture strength. The other sensors present in the system (coolant temperature, throttle valve position, battery voltage, etc.) enable the electronic control unit to correct the basic strategy for all the particular operating conditions of the engine.

Making the air-fuel ratio fluctuate around stoichiometric values is the essential condition for both correct and long-lasting operation of the catalytic converter, and for reducing polluting emissions.

### 10.

The stoichiometric ratio is obtained using a heated Lambda probe. This probe, by means of constant analysis of oxygen present in the exhaust gases, informs the control unit which, on the basis of data memorized in it, can correct in real time the mixture strength (air-petrol) if it is not stoichiometric.

This system has no method of recording the engine idle speed and CO level in the exhaust gases, or of the throttle valve position.

#### Mixture strength control (feedback control)

**NOTE** The following ratio is defined as mixture ratio, and it is indicated by the letter  $\alpha$  (alpha):

$$\alpha = \frac{\text{quantity of air drawn in by engine}}{\text{quantity of injected fuel}}$$

The following ratio is defined as stoichiometric mixture and is indicated by  $\alpha_{st}$ :

$$\alpha_{st} = \frac{\text{quantity of theoretical air for burning all the injected fuel}}{\text{quantity of injected fuel}}$$

The following ratio is defined as mixture strength and is indicated by the Greek letter  $\lambda$  (lambda):

$$\lambda = \frac{\text{quantity of air drawn in by the engine}}{\text{quantity of theoretical air for burning all the injected fuel}}$$

It is easy to observe that  $\alpha/\alpha_{st} = \lambda$ .

The stoichiometric ratio depends on the type of fuel: for the current non-ethylated (unleaded) petrols, it is about 14.7 - 14.8, which corresponds to a Lambda strength = 1 (ratio 14.8:1 means that 14.8 parts air are required to burn 1 part petrol).

The mixture is rich when the quantity of air is less than the stoichiometric value, and in this case  $\lambda \leq 1$ ;

The mixture is weak when the quantity of air is greater than the stoichiometric value, and in this case  $\lambda \geq 1$ ;

The strategy has the function of correcting the "basic" fuel injection times so that the mixture strength fluctuates continuously between 0.98 and 1.02.

The oscillation frequency varies depending on the engine load and speed; it is in the region of a few Hertz (about 0.5 - 4 Hertz).

#### NOTE

1 Hz = 1 oscillation per second

In the following conditions:

- cut-off,
- throttle 60% open (at low engine speeds this value is lower)
- engine temperature below 25 °C

the strategy is disabled.



### Self-adaptivity

The control unit has a strength self-adaptivity function, which memorizes any deviations between basic mapping and corrections imposed by the Lambda probe which may arise persistently during operation. These deviations (due to ageing of the components of the system and engine) are memorized permanently, allowing the operation of the system to adapt to the gradual alterations of the engine and components in relation to the characteristics when new. To delete the corrections memorized, use the appropriate function on the diagnostic equipment. The corrections are **NOT** lost even if the battery or control unit are disconnected.

The strategy is disabled during the period when the fuel vapour cut-off solenoid is open. If the control unit is replaced, it is advisable to run the engine at idle speed for a few minutes (hot engine) to allow the control unit to re-memorize the corrections. Corrections at speeds higher than idle speed are memorized during normal driving conditions.

The control unit also has a self-adaptivity function which corrects the opening of the idle speed actuator at idle speed on the basis of variations due to leaks from the throttle body or natural ageing of the engine. This specific correction is lost if the battery or control unit are disconnected.

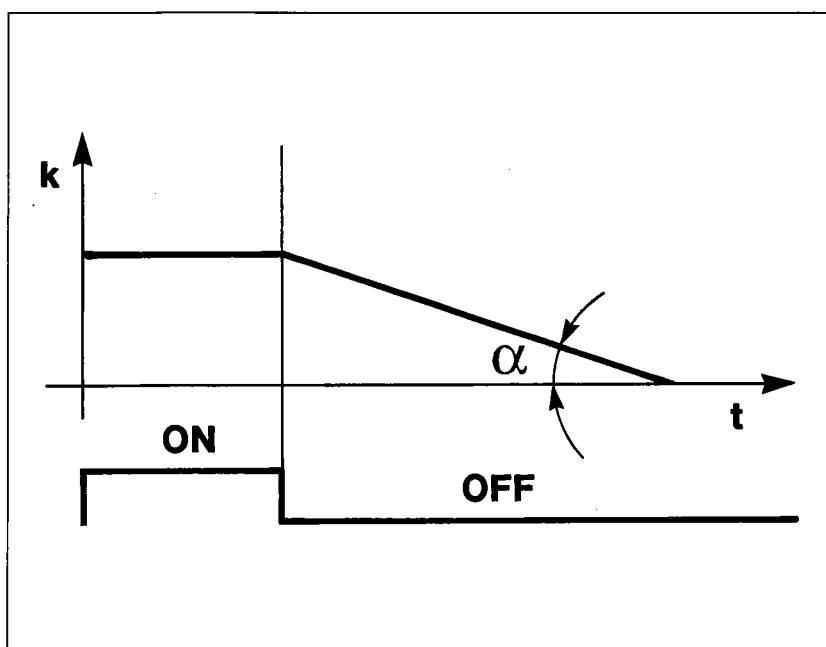
### Starting and post-starting

During starting, it is not possible to recognize instantaneously the engine timing, and so it is not possible to effect phased fuel injection for the first injection of each cylinder.

During the first few engine revolutions, a first simultaneous injection (full group) is effected because significant fluctuations in engine speed do not permit correct calculation of the injection timing; only after does injection become phased.

The "basic" injection time is increased by a multiplicative coefficient for as long as the engine is driven by the starter motor.

After starting, the coefficient is gradually reduced until it disappears within a particular time period which is all the longer the lower the engine temperature.



$k$  : enrichment coefficient

$t$  : time

$\alpha$  : decrease in relation to engine temperature

ON: engine driven (crank)

OFF: engine started (run)

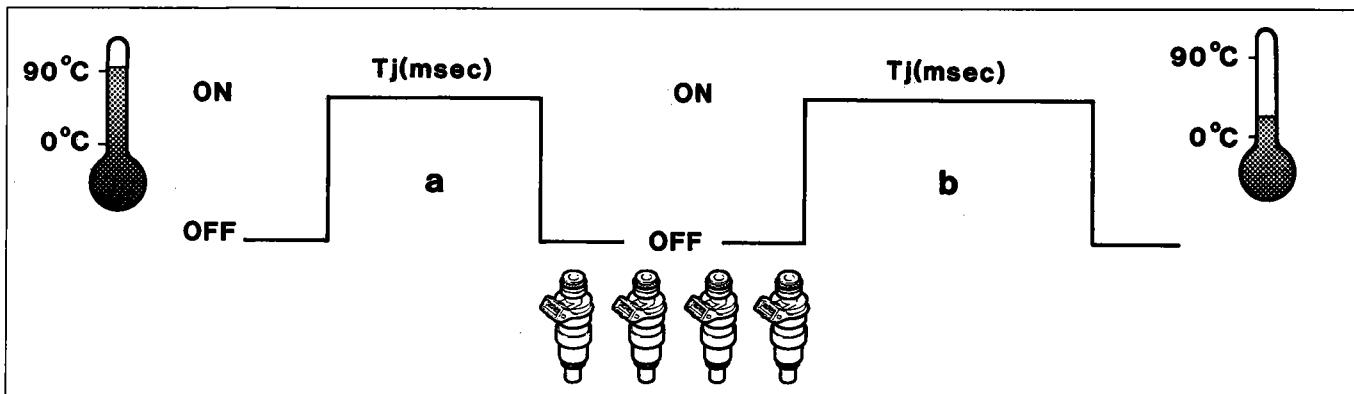
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## 10.

### Operation when cold

Under these conditions, the mixture is naturally weakened by poor turbulence of the fuel particles at low temperature, low evaporation and high condensation on the inner walls of the inlet manifold, all heightened by the greater viscosity of the lubricating oil which, as is known, at low temperature increases the resistance to rolling of the engine's mechanical components.

The electronic control unit recognizes this condition and corrects the fuel injection time on the basis of the coolant temperature signal.



P4A06IJ01

Consequently:

- At very low temperatures, the fuel injector remains open for longer (tj) graph (b), with a low air/petrol ratio (rich mixtures).
- The more the engine temperature increases, the shorter the fuel injector's opening time, (tj) graph (a), consequently the higher the air/petrol ratio (poor mixtures).

During the engine warming-up period, the electronic control unit also drives the stepper motor which determines the quantity of air necessary for ensuring the engine's self-sufficient speed.

The idle speed is decreased proportionally as the temperature increases until the nominal value is obtained ( $850 \pm 30$  rpm) when the engine is up to temperature. The electronic control unit, by driving the stepper motor, keeps the idle speed constant even when the electrical and mechanical loads vary.

### Connection with the automatic transmission

The control unit adjusts the engine idle speed in accordance with the load which occurs when the selector lever is moved to a gear ratio and transmits to the automatic transmission control unit information relating to the reduction in torque (pin 36), coolant temperature (pin 5) and throttle valve position (pin 16).

The control unit reduces the torque delivered by the engine (mainly by intervening on the ignition advance) during gear changes, when it receives an appropriate signal from the automatic transmission control unit (pin 49).

### Operation at full load

Under full load conditions, the basic injection time must be increased to obtain the maximum power delivered by the engine.

The full load condition is detected by the control unit via values supplied by the throttle position and absolute pressure sensors.

On the basis of this information, the control unit makes the appropriate correction, increasing the basic injection time.

### Operation in deceleration

During this stage of use of the engine, two strategies are superimposed:

1. A negative transient strategy for maintaining a stoichiometric quantity of fuel supplied to the engine (less pollution).

This stage is recognized by the control unit when the throttle potentiometer signal changes from a high voltage value to a lower value.

2. A strategy for soft accompaniment at low speed (dash-pot) to attenuate the variation of delivered torque (less engine braking).

When the potentiometer signal indicates closed throttle and the idle speed is high, the control unit, acting on the engine idle speed actuator, gradually decreases the air flow passing through the by-pass.

### Barometric correction

The atmospheric pressure varies in accordance with altitude, causing a variation in the volumetric efficiency such as to require correction of the basic strength (injection time).

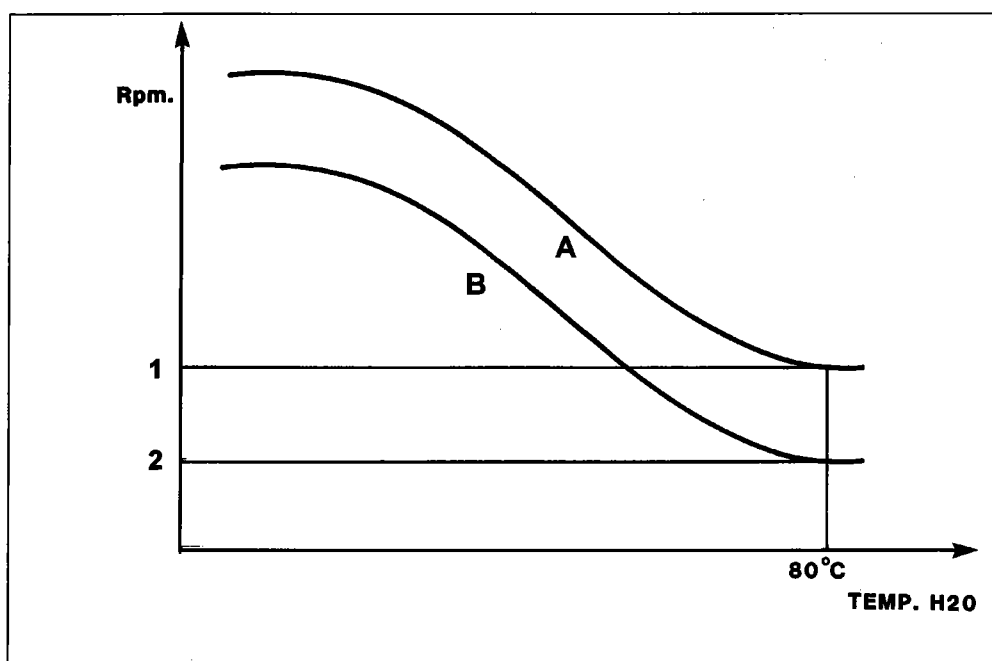
The correction of the injection time will depend on the variation in altitude and will be updated automatically by the electronic control unit whenever the engine is switched off and under particular conditions of throttle valve position and engine speed (typically at low rpm and throttle wide open) (dynamic adjustment of barometric correction).

### Operation in cut-off

The fuel cut-off strategy is effected when the control unit recognizes the throttle valve in idle position (signal from throttle potentiometer) and the engine idle speed exceeds 1350 rpm (1750 rpm for version with automatic transmission). The control unit enables the cut-off only when the engine temperature exceeds 0° C.

The recognition of the throttle valve in a non-closed position of the engine idle speed below 1270 rpm (1650 rpm for version with automatic transmission) re-enables the fuel supply to the engine.

For very high engine speeds, cut-off is also effected when the throttle valve is not fully closed, but with particularly low pressure in the inlet manifold (partial cut-off).



Version with manual gearbox

1. 1350 rpm
2. 1270 rpm

Version with automatic transmission

1. 1750 rpm
2. 1650 rpm

A. entry into cut-off

B. exit from cut-off

P4A07IJ01

## 10.

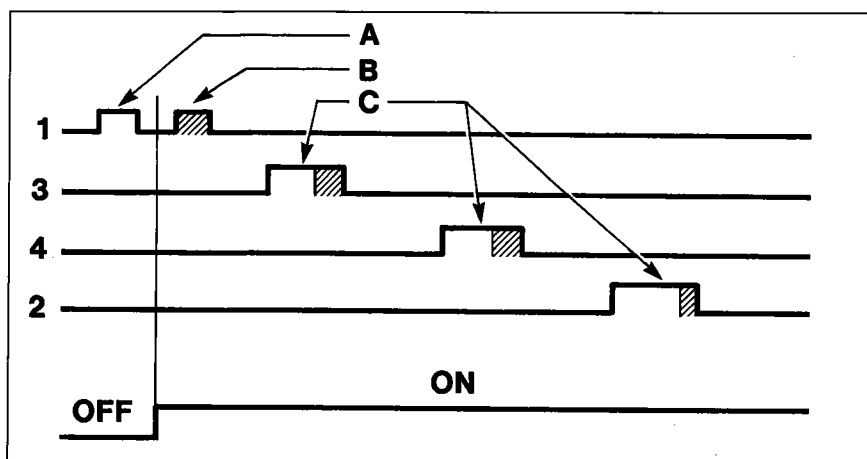
### Operation in acceleration

In this stage, the control unit increases as appropriate the quantity of fuel required by the engine (to obtain the maximum torque) in accordance with signals coming from the following components:

- throttle potentiometer;
- absolute pressure sensor;
- rpm and TDC sensor.

The "basic" injection time is multiplied by a coefficient in accordance with the temperature of the engine coolant, how quickly the throttle opens and the pressure increase in the inlet manifold.

If the sudden variation in injection time is calculated when the injector is already closed, the control unit re-opens the injector (extra pulse) to be able to compensate the strength as quickly as possible; subsequent injections are instead increased in accordance with the above-mentioned coefficients.



P4A08IJ01

A. normal injection time

B. re-opening of injector  
(extra pulse)

C. injection time including  
enrichment

OFF. engine at stationary  
speed

ON. engine in transient

### Over-rev protection

When the engine speed exceeds for over 10 seconds the value of 6700 rpm or instantaneously the "limit" value of 6900 rpm imposed by the manufacturer, the engine is in "critical" operating conditions.

When the electronic control unit recognizes that the above-mentioned speed has been exceeded, it inhibits the driving of the fuel injectors.

When the rpm returns to a non-critical value, driving of the injectors is resumed.

### Electric fuel pump operation

The electric fuel pump is driven by the engine control unit via a relay.  
The pump is stopped:

- if the engine falls below 50 rpm;
- after a certain period (about 5 seconds) with the ignition on without the engine being started (time-lagged enablement);
- if the inertial switch has intervened.

### Fuel injector operation

The injectors are driven in a phased sequential manner. However, during starting, the injectors are first driven in parallel (full-group).

The injector phasing varies in accordance with the engine speed and intake air pressure in order to improve cylinder filling with advantages in terms of consumption, driveability and pollution.

## MANAGEMENT OF IGNITION

The ignition circuit is of the static type with inductive discharge, i.e. without high tension distributor with power modules located inside the fuel injection-ignition electronic control unit.

The system has two double-output high tension coils combined in a single container and connected directly to the spark plugs.

The primary winding of each coil is connected to the power relay (so is supplied by the battery voltage) and to the pins of the electronic control unit for the earth connection.

After the engine has started, the electronic control unit manages the basic advance obtained from special mapping in accordance with the following input parameters:

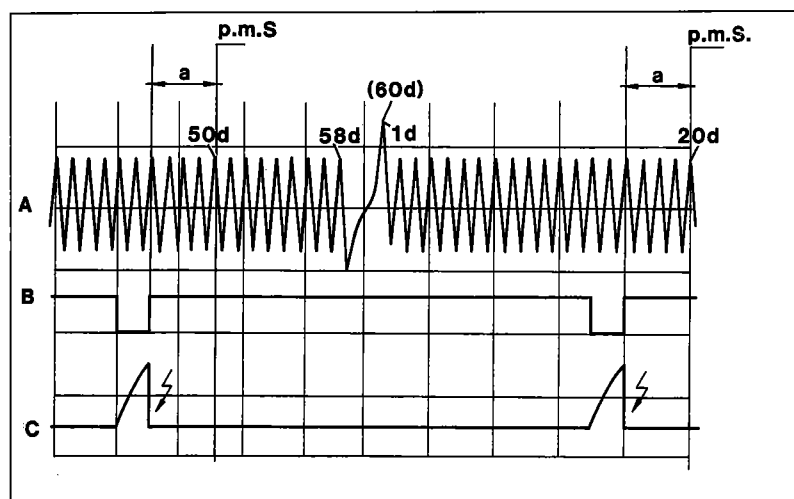
- engine speed (rpm);
- absolute pressure value (mmHg) measured in the inlet manifold.

This advance is corrected in accordance with the temperature of the coolant and intake air.

The value of the advance angle is also corrected under the following conditions:

- during starting;
- in transient acceleration and deceleration periods;
- under cut-off conditions;
- to stabilize the idle speed;
- if there is engine knocking;
- when required by the automatic transmission control unit (gear change).

In order for the ignition system to function correctly, the electronic control unit must recognize the signal picture.



- A. Rpm sensor signal
- B. Power control
- C. Current circulating in the primary winding of a coil
- a. Ignition advance relating to the cylinder TDC

P4A09IJ01

The interval or variation of the signal caused by the absence of 2 teeth on the phonic wheel, between the 58th and 1st teeth (also called synchronization tooth) which occurs for every rotation of the crankshaft pulley, is the reference signal which allows the electronic control unit to recognize an advance of 114° in relation to TDC of the pair of pistons 1-4 corresponding to the leading edge of the 20th tooth.

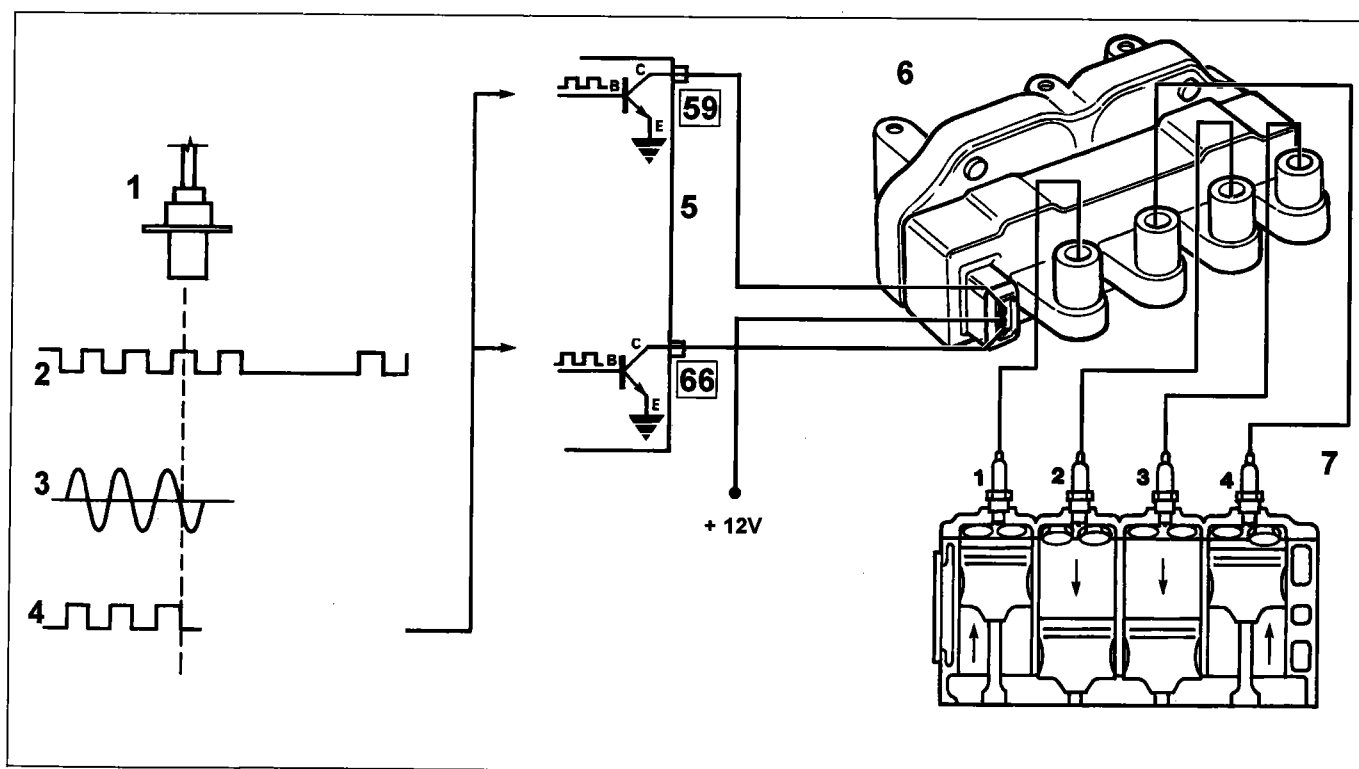
After acquiring the correct signal picture with reference to the TDC signal through the power module (internal) (5), the electronic control unit (see figure on next page) establishes the point of commencement of conduction (supply) of the primary circuits of the coils (6).

## 10.

The leading edge of the signal (graph B-figure on preceding page) thus represents the moment when alternative conduction of the primary windings "could" occur. This point is established solely by the control unit's power module. The conduction time required by the H.T. coils for storing energy is also defined by the DWELL management strategy. It depends on the time taken by the current in the primary circuit of the coil to reach 6A, on the battery voltage and the calculation algorithm carried out by the microprocessor which uses coefficients stored in an appropriate memory; all this naturally depends on the engine rpm.

With reference to the figure on the preceding page, the falling edge of the signal, (B) end-of-conduction point (or fall to zero of the current), is instead a "categoric order" to stop the current circulating in the primary winding, and it represents the point of ignition advance (a) calculated by the computer (the advance - (a) - varies depending on the rpm).

The control unit thus manages both the advance of the spark to the various cylinders in relation to top dead centre, and the conduction time required by the coil for storing energy, alternately controlling the two power stages which permit current to circulate in the primary windings (pins 59 and 66) of the coils (6) for sufficient time to guarantee a nominal 6 A.



P4A10J01

### Functional diagram of the ignition

1. RPM and TDC sensor.
2. Phonic wheel.
3. Signal picture taken from phonic wheel (60-2) teeth.  
The TDCs correspond to teeth 20 and 50.
4. Succession of rectangular wave form signals of constant amplitude.
5. Ignition power module (inside the control unit).
6. Ignition coils.
7. Spark plugs

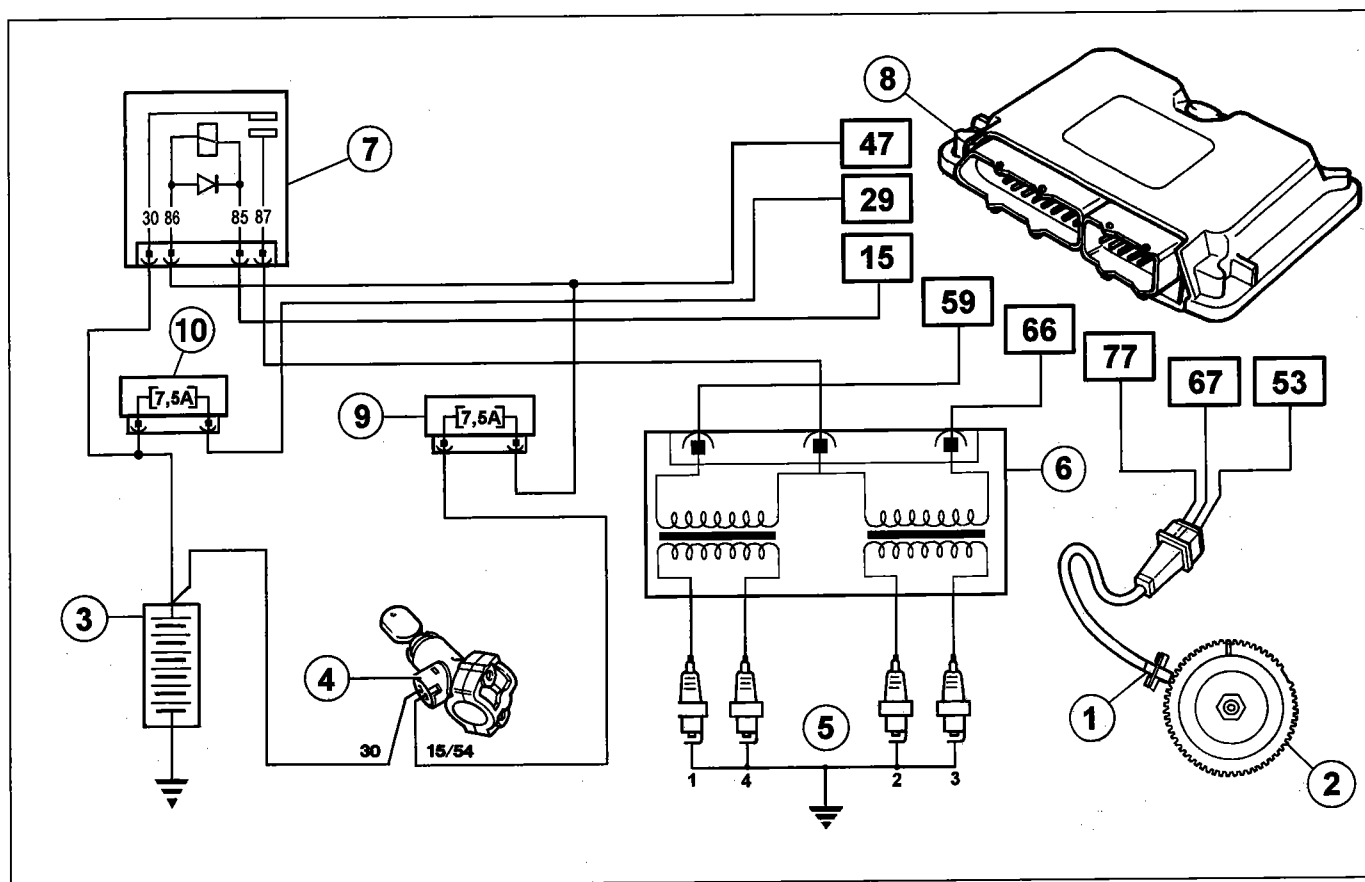
**NOTE** The numbers in squares indicate the corresponding control unit pins.

In the instant when the control unit stops driving one of the two power stages, the passage of current is interrupted. This causes, by induction, an increase in voltage (up to 30kV without load) on the secondary winding.

When examining the voltages required for the spark between the plug electrodes, it may be noted that in the cylinder at the compression stroke, this voltage is high (over 10kV) while in the cylinder in the exhaust stroke the voltage is low (about 5kV).

The high voltage distribution is static, i.e. characterized by the absence of a rotor arm and cap, and thus the distributor is in effect eliminated. This offers a considerable advantage to the system as it is known that the insulation characteristics of the rotor arm and cap play a fundamental role; any dispersion of insulation towards earth can be detrimental to ignition, especially during winter or in heavy rain.

The spark plugs of cylinders 1-4 and 2-3 are connected directly (two by two) by high tension cables to the terminals of the coil's secondary winding, and their connection may be considered to be serial as the cylinder head joins them. This solution is also called "lost spark" as the energy accumulated by the coil will be almost exclusively discharged on the electrodes of the spark plug located in the cylinder under compression, allowing the mixture to be ignited. The other spark is naturally not used, as there is no mixture to be ignited in the cylinder, only an environment of used gas at the exhaust stage.



4A11J01

- |                                        |                                                          |
|----------------------------------------|----------------------------------------------------------|
| 1. Rpm and TDC sensor                  | 7. Fuel injection relay                                  |
| 2. Crankshaft pulley with phonic wheel | 8. Fuel injection-ignition electronic control unit       |
| 3. Battery                             | 9. Fuel injection-ignition system fuse                   |
| 4. Ignition switch                     | 10. Fuse protecting fuel injection-ignition control unit |
| 5. Spark plugs                         |                                                          |
| 6. Ignition coils                      |                                                          |



## 10.

### Knock control

The purpose of this strategy is to detect the presence of knocking, by processing the signal coming from the relevant sensor. The strategy continuously compares the signal coming from the sensor with a threshold, which in turn is constantly updated to take account of background noise and ageing of the engine.

If the system recognizes the presence of knocking, the strategy reduces the ignition advance until the phenomenon disappears. The advance is then gradually restored to the basic value or until the phenomenon arises again. In particular, increases in advance are made gradually, while decreases are made immediately.

Under conditions of acceleration, the strategy uses a higher threshold, to take account of the increased noise of the engine in this condition.

The strategy also has a self-adaptive function which memorizes, in a non-permanent manner, decreases in advance that are repeated continuously, so as to adjust the advance to the different conditions of the engine (e.g. use of low octane number fuel). The strategy can restore the advance to the threshold value stored in memory when the conditions that gave rise to the decrease in advance disappear.

### MANAGEMENT OF THE ENGINE STARTING BLOCK FUNCTION (FIAT CODE)

The system has an engine starting block function. This function is carried out by a specific control unit (Fiat CODE), which can dialogue with the fuel injection-ignition control unit, and an electronic key, which has a special transmitter for sending a recognition code.

Whenever the ignition is switched off, the Fiat CODE system completely disables the fuel injection-ignition control unit.

When the ignition is switched on, the following operations take place:

- 1 - the fuel injection control unit (whose memory contains a secret code) sends a request to the Fiat CODE control unit to send the secret code to disable the function block;
- 2 - the Fiat CODE control unit responds by sending the secret code only after first receiving the recognition code transmitted by the ignition key;
- 3 - recognition of the secret code permits the disablement of the block on the fuel injection-ignition electronic control unit and the normal operation of the latter.

**NOTE** *Because of the presence of the Fiat CODE system, during fault diagnosis and/or operating checks, **DO NOT CARRY OUT** tests using another fuel injection-ignition control unit. If you do, the Fiat CODE control unit would transfer the (unknown) recognition code to the test control unit, which would then be unusable on other vehicles.*

### MANAGEMENT OF RADIATOR FAN

The control unit checks the operation of the radiator fan directly, in accordance with the engine coolant temperature and whether the climate control system is switched on.

The fan comes on when the temperature exceeds 97 °C (1st speed) and 102 °C (2nd speed). It is switched off with a hysteresis of 3 °C below the threshold for switching on.

The high and low speed functions are managed by the intervention of specific relays located in the control unit of the climate control system, and controlled by the control unit.

## MANAGEMENT OF ENGINE IDLE CONTROL

The general aim of the strategy is to keep the engine idle speed around the value stored in memory (hot engine: 850 rpm): the position assumed by the actuator depends on the engine conditions:

### Starting stage

When the ignition is switched on, the actuator assumes a position in relation to the engine coolant temperature and battery voltage (open loop position).

### Warming-up stage

The rpm is corrected mainly in relation to the coolant temperature.

With the engine up to temperature, depends on the signal coming from the engine rpm sensor; when external loads are switched on, the control unit manages the steady idle.

### Deceleration stage

Under overrun conditions above idle speed, the control unit controls the position of the engine idle actuator by means of a particular flow curve (curva di dash-pot), i.e. it slows down the return of the shutter towards its sealing seat, thus optimizing the engine braking effect.

## MANAGEMENT OF FUEL VAPOUR RECIRCULATION

The strategy controls the position of the cut-off solenoid as follows:

- during starting, the solenoid remains closed, preventing the fuel vapours from making the mixture excessively rich; this condition remains until the coolant reaches a temperature of 65° C;
- when the engine is up to temperature, the electronic control unit sends the solenoid a square-wave signal (duty cycle control) which modulates its opening.

In this way the control unit controls the quantity of fuel vapours sent to the inlet manifold, thus preventing significant changes in mixture strength.

In the operating conditions listed below:

- throttle valve in closed position
- speed below 1500 rpm
- pressure in inlet manifold below a limit value calculated by the control unit in accordance with the rpm

solenoid control is inhibited, and the solenoid is kept in the closed position; this is to improve the engine's operation.

## MANAGEMENT OF FAULT DIAGNOSIS

A complete electronic diagnosis of the fuel injection-ignition is obtained by connecting the appropriate equipment (EXAMINER or SDC station) to the diagnostic socket.

The system also comprises a self-test function which recognizes, stores in memory and indicates any faults.

If a fault is detected on sensors or actuators, signal reconstruction (recovery) strategies are immediately activated to ensure engine operation at an acceptable level without impairing its functionality. It is thus possible to drive the vehicle to a repair garage for the appropriate operations.

# 10.

## MANAGEMENT OF CLIMATE CONTROL SYSTEM

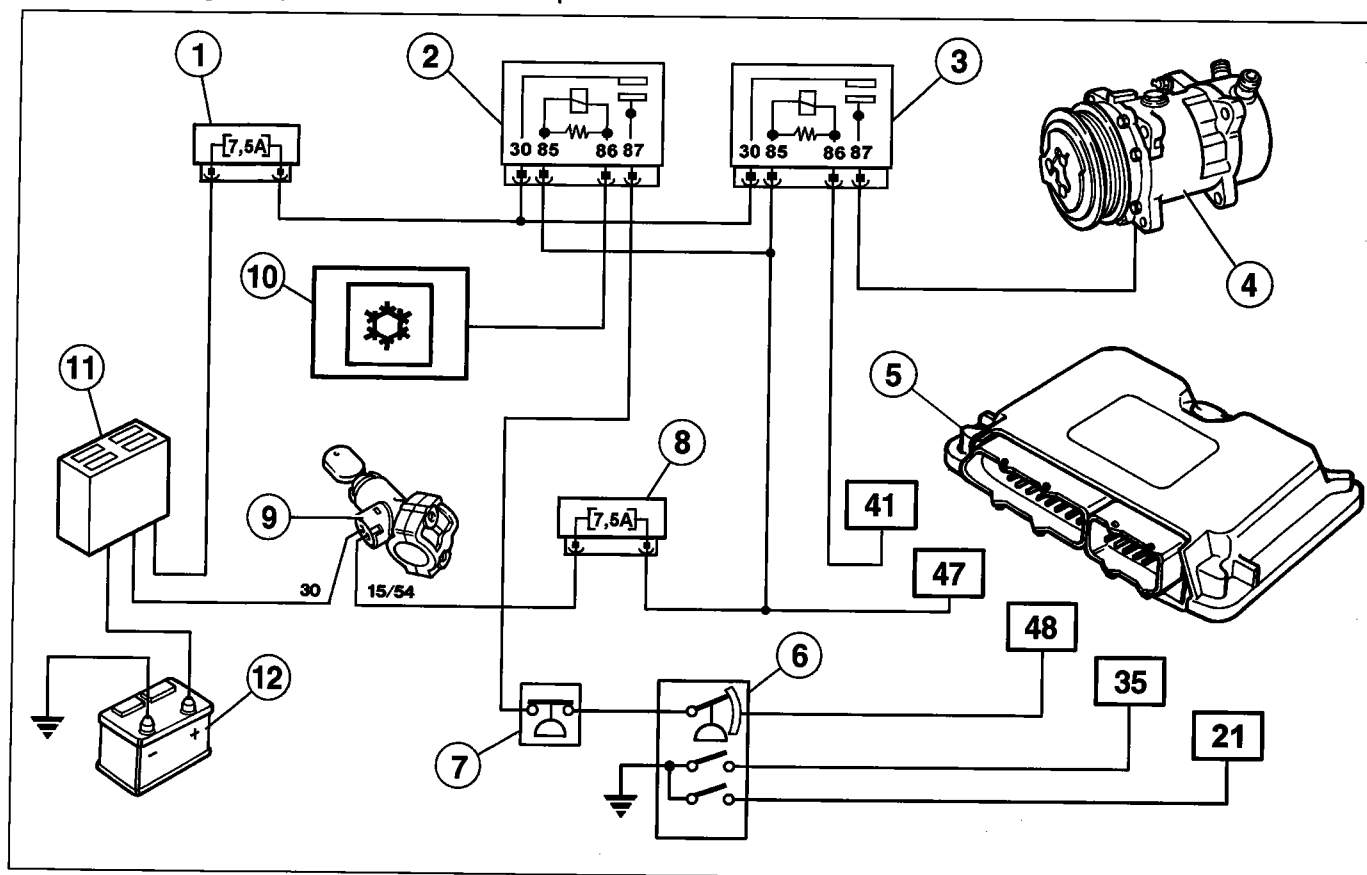
The fuel injection-ignition control unit is connected functionally to the climate control system, as:

1. it receives the request to switch on the compressor and makes the necessary interventions (extra air);
2. it gives enablement to the switching on of the compressor through pin 41, when the conditions envisaged by the strategies arise;
3. it receives information on the status of the four-stage pressure switch from pins 21, 35 and 48 (for cars with three-stage pressure switch, only from pins 35 and 48) and carries out the relevant interventions (controls radiator fan).

As regards point 1, if the engine is idling, the control unit increases the flow rate of the air passing from the idle actuator in advance of the switching on of the compressor, and vice versa it returns the actuator to the normal position retarded in relation to the disconnection of the compressor.

As regards point 2, the control unit automatically controls the disconnection of the compressor:

- for a few seconds (time-lagged disconnection):
  - when there is a high requirement for engine power (strong acceleration);
  - on engine pickup;
- for as long as the following critical conditions remain:
  - if the engine coolant temperature exceeds a particular threshold
  - for an engine speed of below 750 rpm.

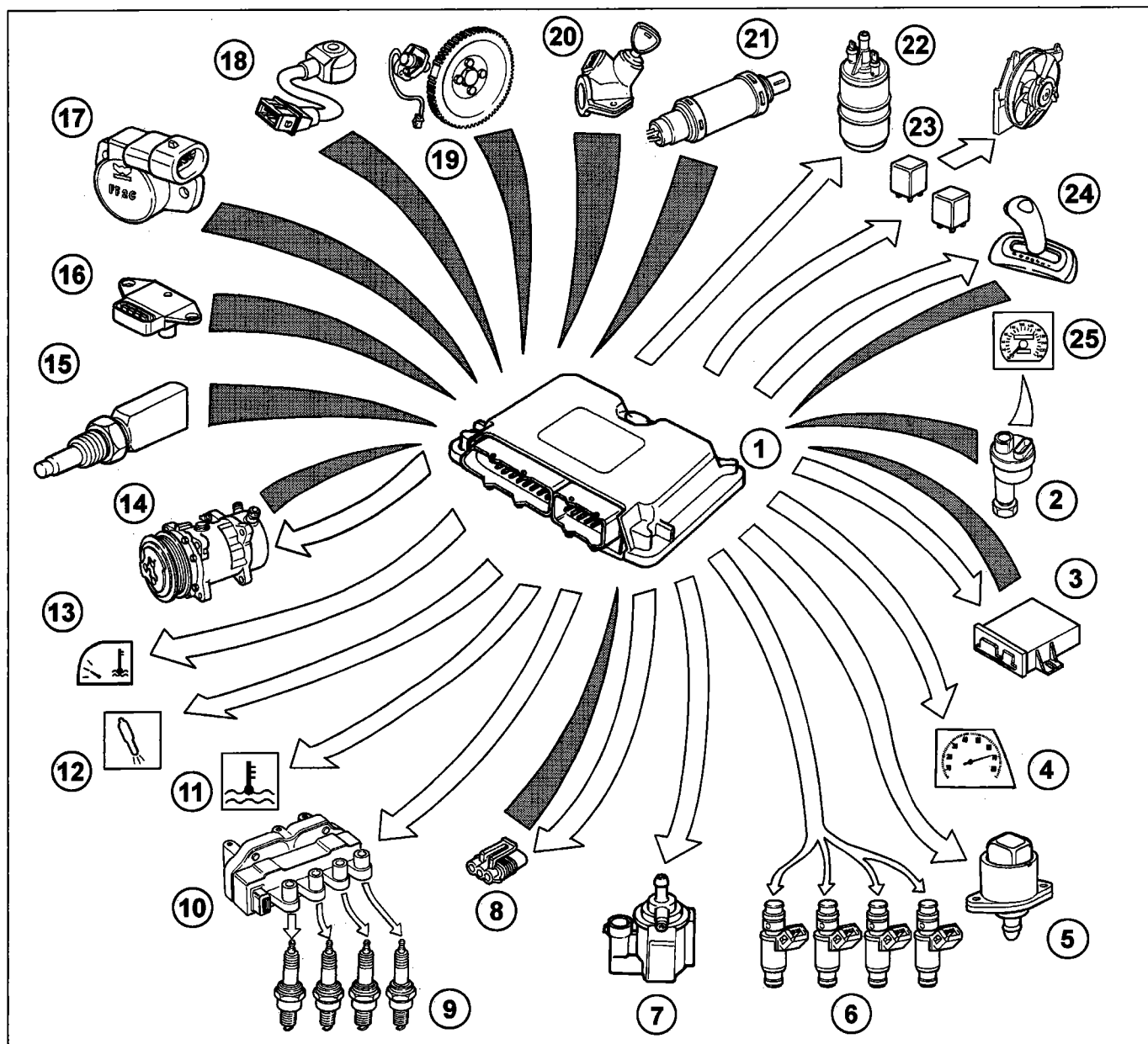


P4A14IJ01

- |                                                        |                                              |
|--------------------------------------------------------|----------------------------------------------|
| 1. Air conditioner fuse                                | 7. Anti-frost sensor                         |
| 2. Air conditioner relay                               | 8. Fuel injection-ignition control unit fuse |
| 3. Relay supplying compressor electromagnetic coupling | 9. Ignition switch                           |
| 4. Compressor                                          | 10. Air conditioner control unit             |
| 5. Fuel injection-ignition control unit                | 11. Power fuse box                           |
| 6. Pressure switch                                     | 12. Battery                                  |

# 10.

## DIAGRAM OF INPUT/OUTPUT INFORMATION BETWEEN CONTROL UNIT AND SENSORS/ACTUATORS OF THE FUEL INJECTION-IGNITION

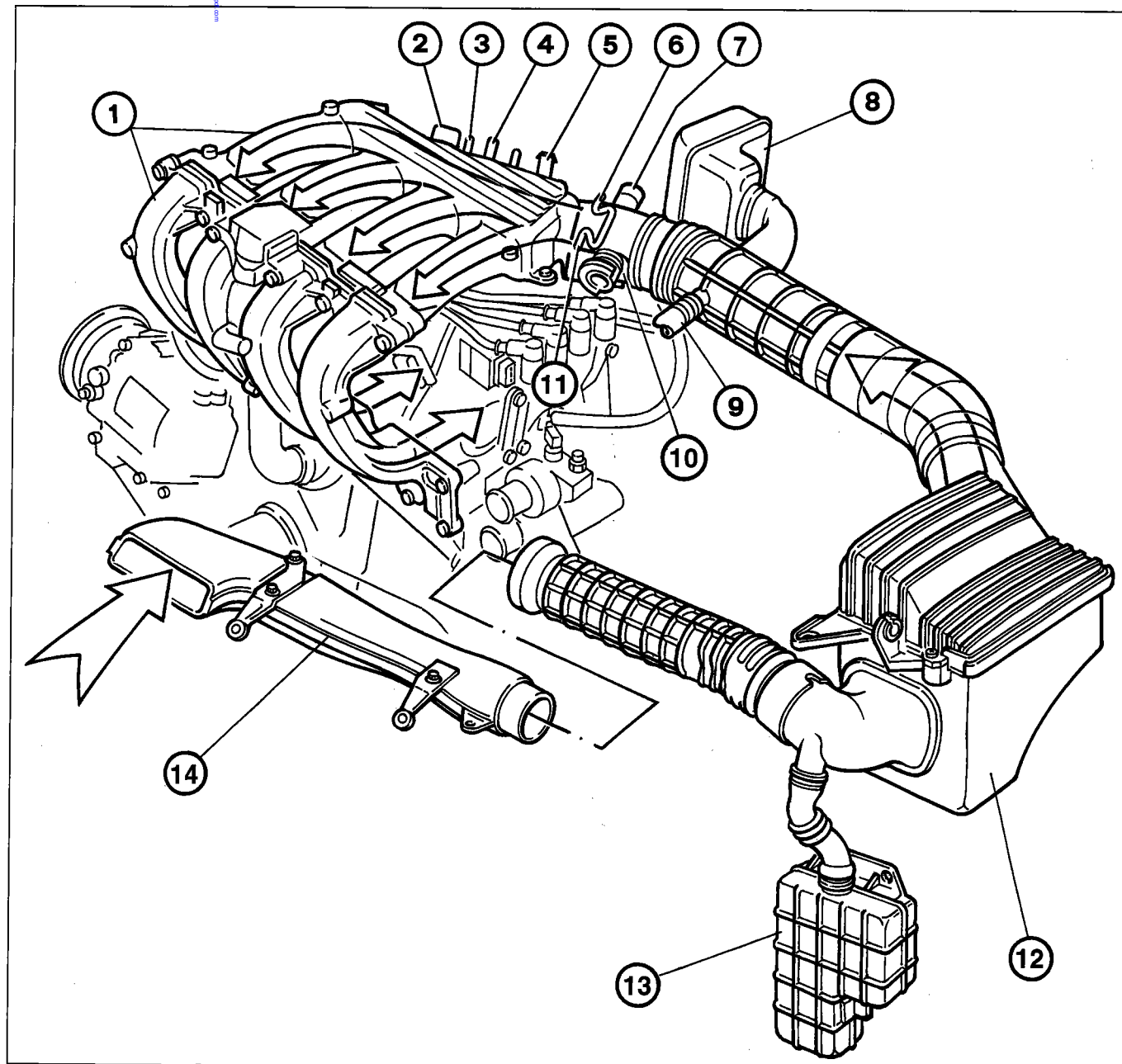


P4A15IJ01

- |                                              |                                                         |
|----------------------------------------------|---------------------------------------------------------|
| 1. Electronic control unit                   | 14. Air conditioner                                     |
| 2. Speedometer sensor                        | 15. Engine coolant temperature sensor                   |
| 3. Fiat CODE control unit                    | 16. Intake air temperature and pressure sensor          |
| 4. Rev counter                               | 17. Throttle valve position sensor                      |
| 5. Engine idle speed actuator                | 18. Knock sensor                                        |
| 6. Fuel injectors                            | 19. Rpm and TDC sensor                                  |
| 7. Fuel vapours solenoid                     | 20. Ignition switch                                     |
| 8. Diagnostic socket                         | 21. Lambda probe                                        |
| 9. Spark plugs                               | 22. Electric fuel pump                                  |
| 10. Ignition coils                           | 23. Relays controlling radiator fan high and low speeds |
| 11. Engine coolant overheating warning light | 24. Automatic transmission                              |
| 12. Fuel injection fault warning light       | 25. Speedometer / mileometer                            |
| 13. Coolant temperature gauge                |                                                         |

# 10.

## DIAGRAM OF AIR INTAKE SYSTEM



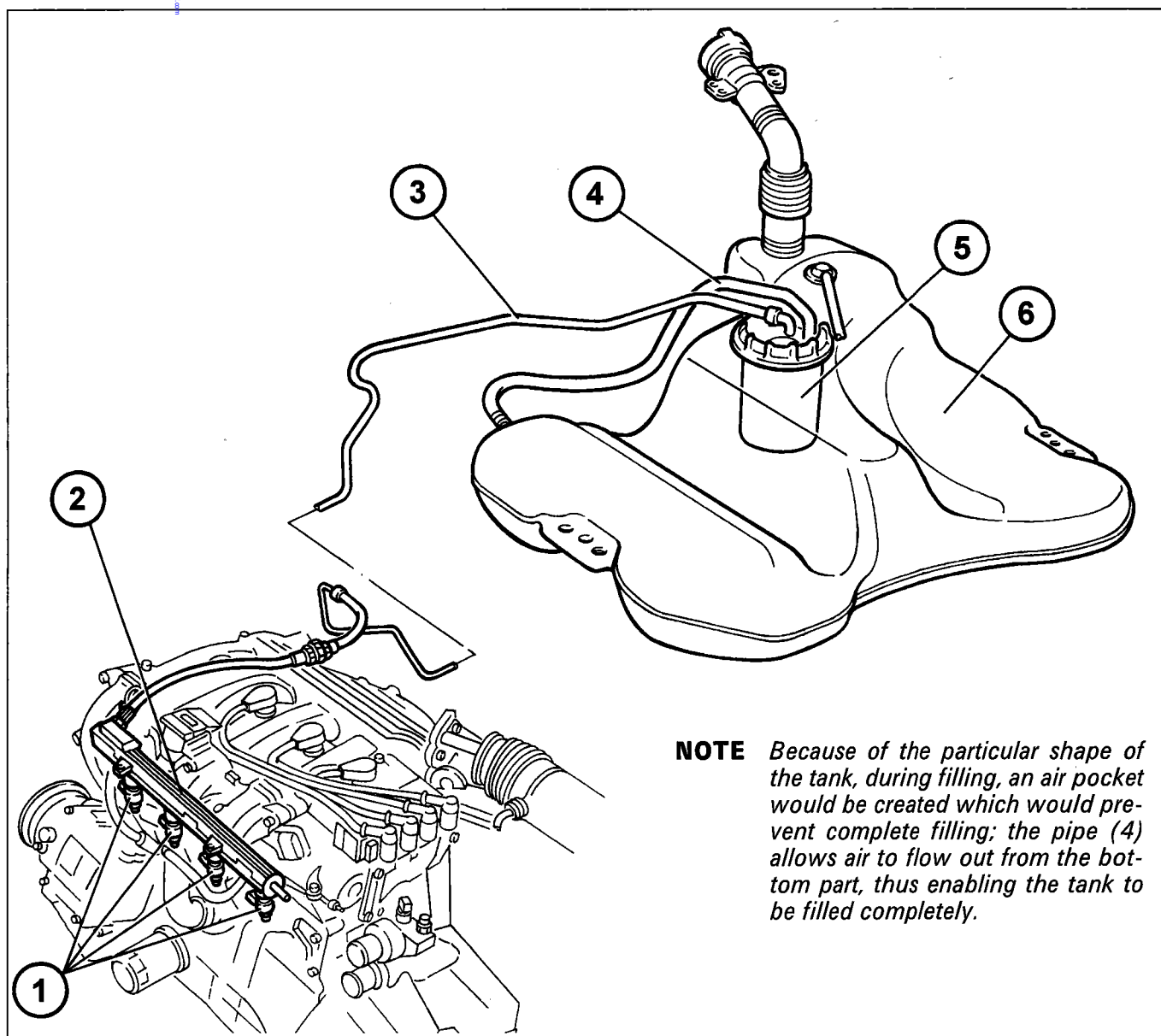
P4A16IJ01

The air intake system comprises various components which convey the necessary air flow to the engine under the various operating conditions.

- |                                                                                                    |                                                                         |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 1. Inlet manifold                                                                                  | 7. Engine idle speed actuator                                           |
| 2. Intake air pressure and temperature sensor                                                      | 8. Top resonator                                                        |
| 3. Connection for fuel anti-evaporation system                                                     | 9. Main inlet for crankcase gases                                       |
| 4. Inlet connection for crankcase gases (blow-by) for recirculation of exhaust gases during idling | 10. Throttle body                                                       |
| 5. Brake servo connection                                                                          | 11. Connection for engine coolant inlet pipe, for heating throttle body |
| 6. Connection for engine coolant outlet pipe                                                       | 12. Air cleaner                                                         |
|                                                                                                    | 13. Bottom resonator                                                    |
|                                                                                                    | 14. Inlet vent                                                          |



**DIAGRAM OF FUEL SUPPLY SYSTEM**



**NOTE** Because of the particular shape of the tank, during filling, an air pocket would be created which would prevent complete filling; the pipe (4) allows air to flow out from the bottom part, thus enabling the tank to be filled completely.

P4A17J01

1. Fuel injectors
2. Fuel supply manifold
3. Fuel delivery pipe to injectors

4. Vent pipe
5. Electric fuel pump with filter and pressure regulator
6. Tank

The fuel is fed into the system by an electric pump immersed in the tank, which draws in the fuel and sends it to the filter and then to the fuel injectors.

The fuel supply system is of the "returnless" type, i.e. with only one connecting pipe between the fuel tank and engine.

This system makes it possible to:

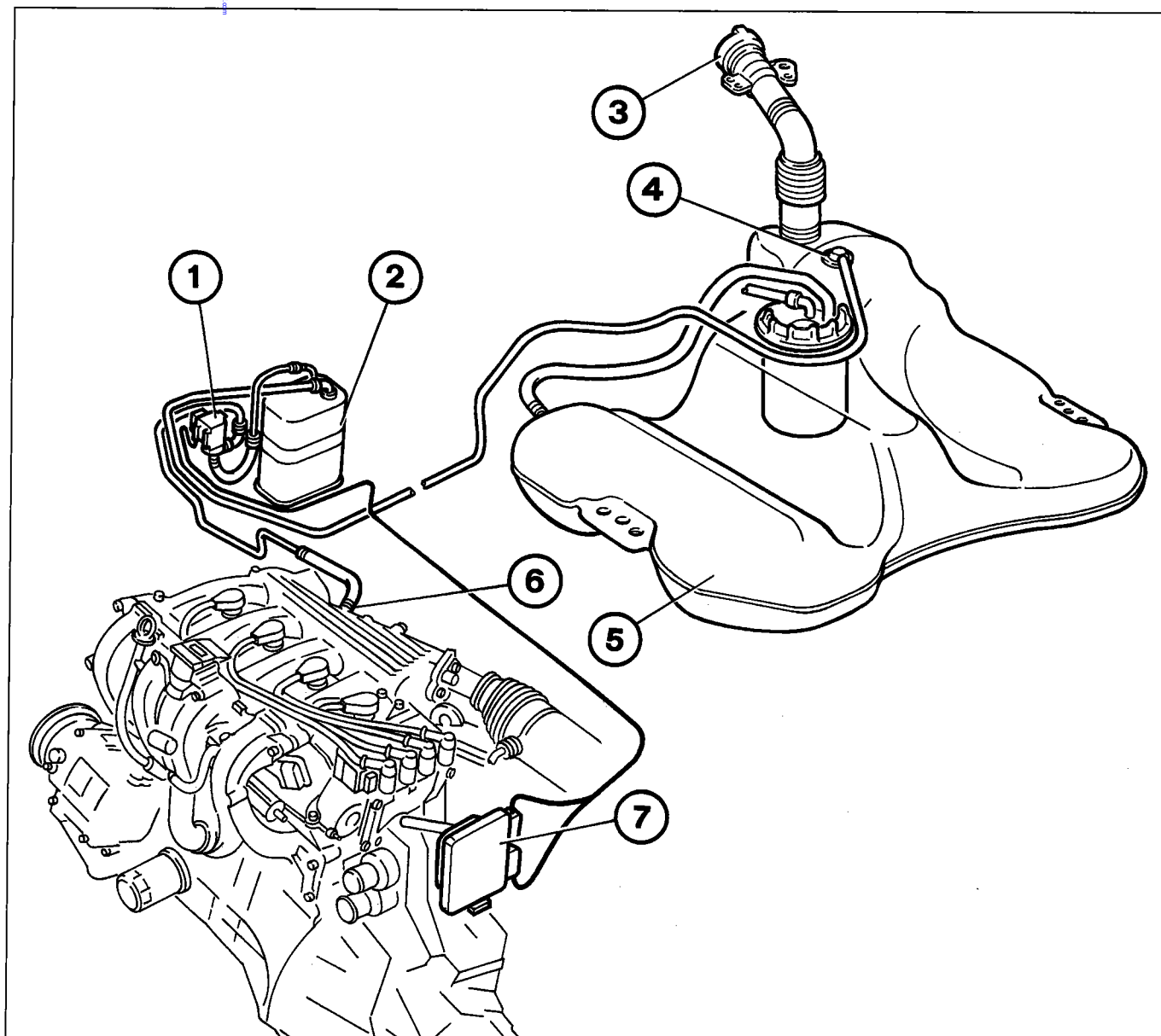
- minimize the possibility of the vehicle catching fire in the event of an accident;
- reduce fuel vapour emissions into the atmosphere.

The fuel pump is enclosed in the cage which also incorporates the fuel pressure regulator, fuel gauge sender and fuel filter.

The system also has an inertial switch which cuts off the supply from the fuel pump in the event of a crash.

# 10.

## DIAGRAM OF FUEL EVAPORATION CONTROL SYSTEM



P4A18IJ01

- |                                 |                                                   |
|---------------------------------|---------------------------------------------------|
| 1. Petrol vapour cut-off valve  | 5. Tank                                           |
| 2. Activated charcoal filter    | 6. Fuel vapour inlet connection in inlet manifold |
| 3. Safety and ventilation valve | 7. Fuel injection-ignition control unit           |
| 4. Multi-function valve         |                                                   |

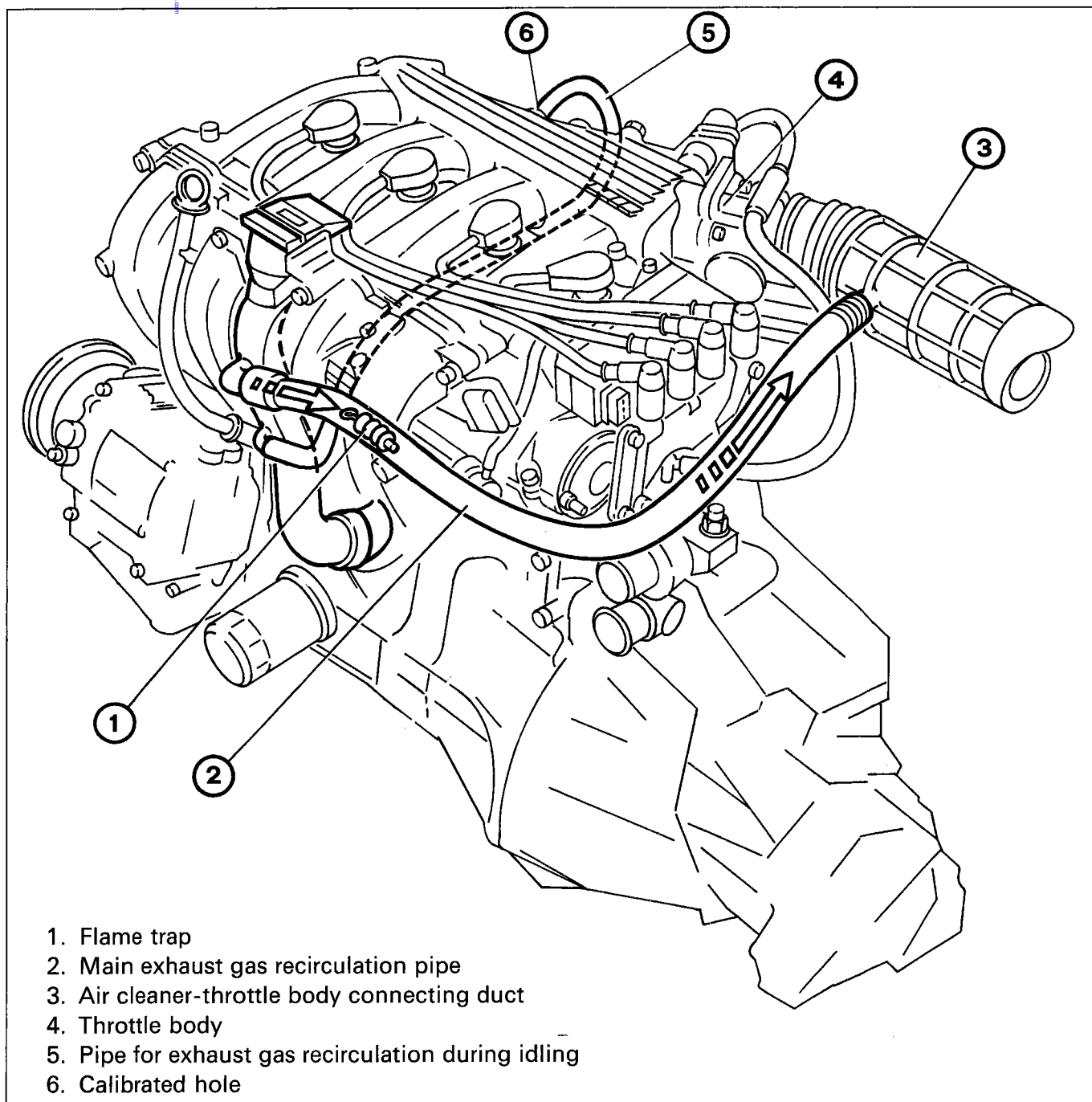
The tank ventilation system is of the "closed" type.

This system prevents the petrol vapours which form in the tank or fuel supply system from discharging into the atmosphere and releasing the light hydrocarbons (HC) they contain, thus causing pollution.

The system consists of a tank (5), a multi-function valve (4) for controlling the vapour flow, a two-way safety and ventilation valve (3) located in the fuel filler, an activated charcoal filter (2) and a vapour cut-off valve (1) which is controlled by the control unit (7).



**DIAGRAM OF CRANKCASE GAS RECIRCULATION SYSTEM (BLOW-BY)**



P4A19IJ01

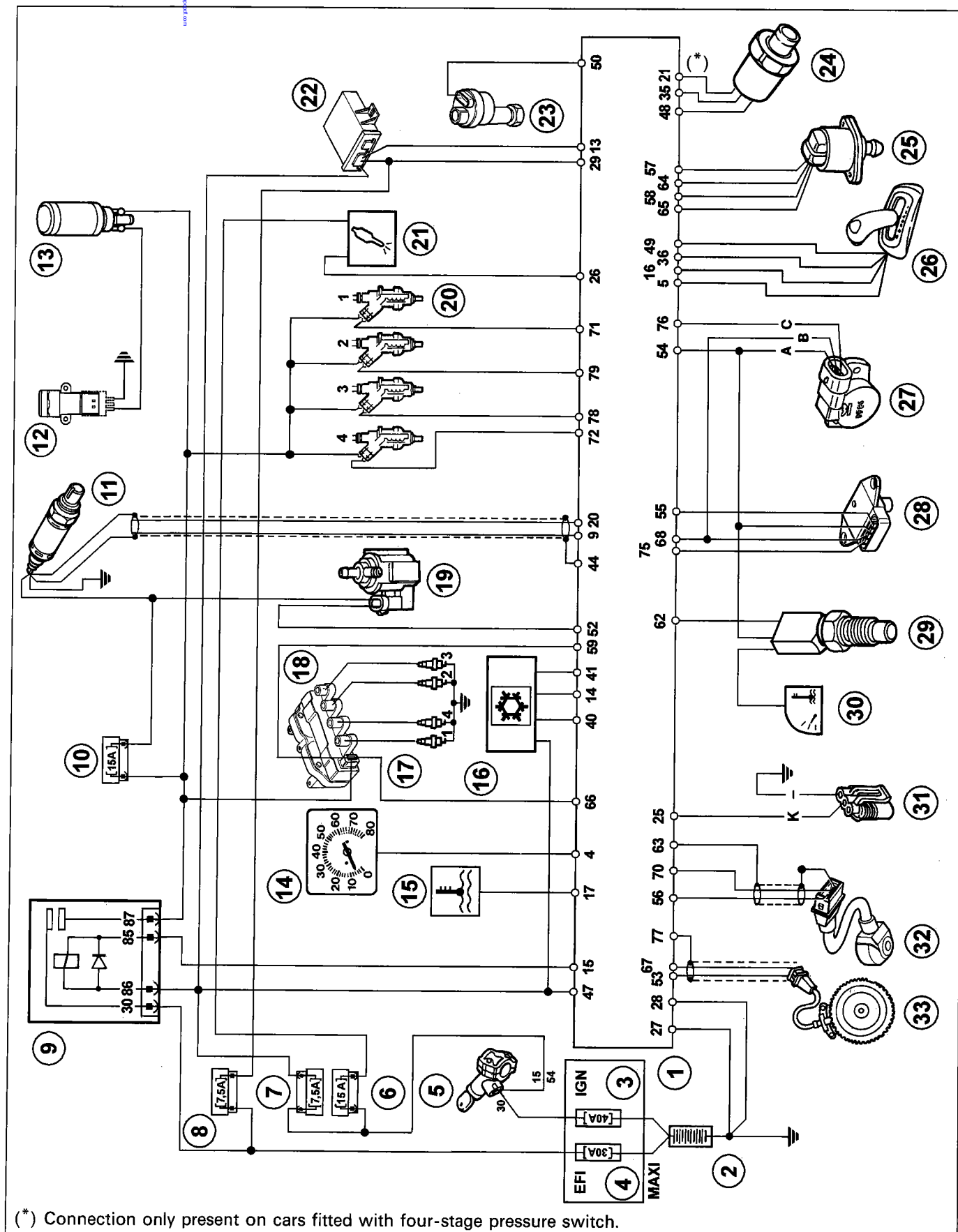
The system controls the emissions, from the crankcase, of the vent gases which consist of air-petrol mixtures and burnt gases leaking through the piston rings, and also lubricating oil vapours, and recirculates them to the inlet.

With the throttle valve open, the vent gases coming from the crankcase reach the connecting duct between the air cleaner-throttle body (3) through the pipe (2), inside which there is a flame trap (1) to prevent combustion phenomena due to flame returns from the throttle body (4).

With the throttle valve closed (engine idling), the vacuum in the inlet manifold draws in the gases (in a small quantity) directly through the pipe (5) and calibrated hole (6).

### 10.

#### WIRING DIAGRAM OF FUEL INJECTION-IGNITION



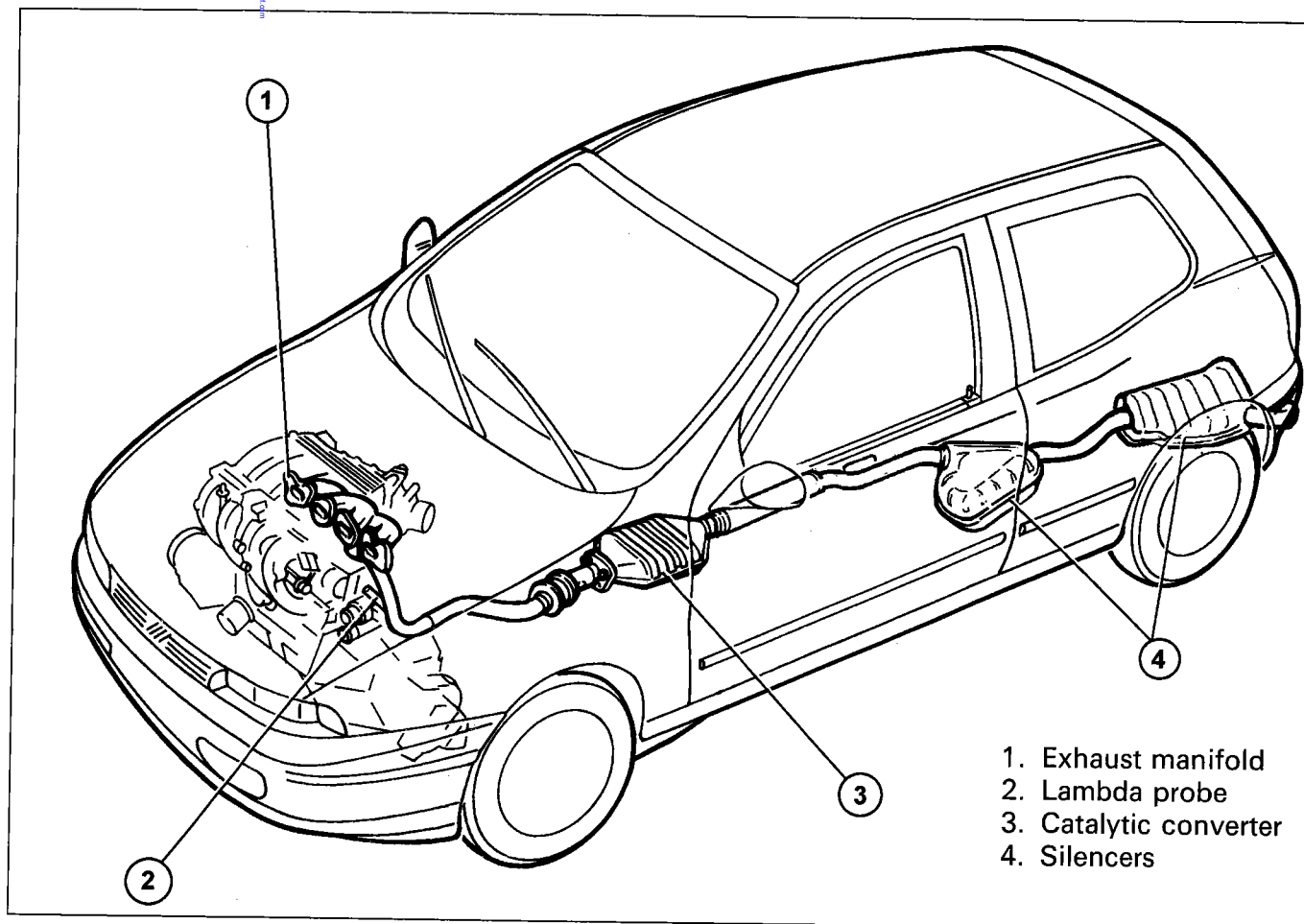
P4A20IJ01

**Key to components on fuel injection-ignition wiring diagram**

1. Fuel injection-ignition electronic control unit
2. Battery
3. 40A main fuse protecting ignition-dependent devices
4. 30A main fuse protecting fuel injection-ignition
5. Ignition switch
6. 15A fuse protecting fuel injection fault warning light
7. 7.5A fuse protecting various components of fuel injection and supply (+15) to fuel injection control unit
8. 7.5A fuse supplying (+30) fuel injection control unit
9. Relay supplying electric fuel pump, lambda probe, fuel vapour cut-off solenoid, ignition coils and fuel injectors
10. 15A fuse protecting lambda probe and fuel vapour cut-off solenoid
11. Lambda probe
12. Inertial switch
13. Electric fuel pump
14. Rev counter
15. Engine coolant overheating warning light
16. Air conditioner control unit and relays controlling radiator fan high and low speeds
17. Spark plugs
18. Ignition coils
19. Fuel vapour cut-off solenoid
20. Fuel injectors
21. Fuel injection-ignition fault warning light
22. Fiat CODE control unit
23. Vehicle speed sensor
24. Pressure switch (the pressure switch may be three or four stage)
25. Engine idle actuator (stepper motor)
26. Automatic transmission control unit
27. Throttle valve position sensor
28. Intake air temperature and pressure sensor
29. Coolant temperature sensor
30. Coolant temperature gauge
31. Diagnostic socket
32. Knock sensor
33. Rpm and TDC sensor

## 10.

### DIAGRAM OF EXHAUST ASSEMBLY



P4A22IJ01

On the I.A.W. system, the closed-loop control of the mixture strength is activated by the Lambda sensor which measures the oxygen content present in the exhaust gases upstream of the catalytic converter.

The Lambda probe's measurements enable the electronic control unit to make continuous corrections of the mixture strength, keeping the air/fuel ratio constant.

In this way, there is control of the harmful emissions in the exhaust, which is completed by the trivalent catalytic converter.

The efficient operation of the catalytic converter and consequently reduction in toxicity of the exhaust gases depends on the air/fuel ratio with which the engine is supplied.

The trivalent catalytic converter simultaneously reduces the three polluting gases present in the exhaust gases: unburnt hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx).

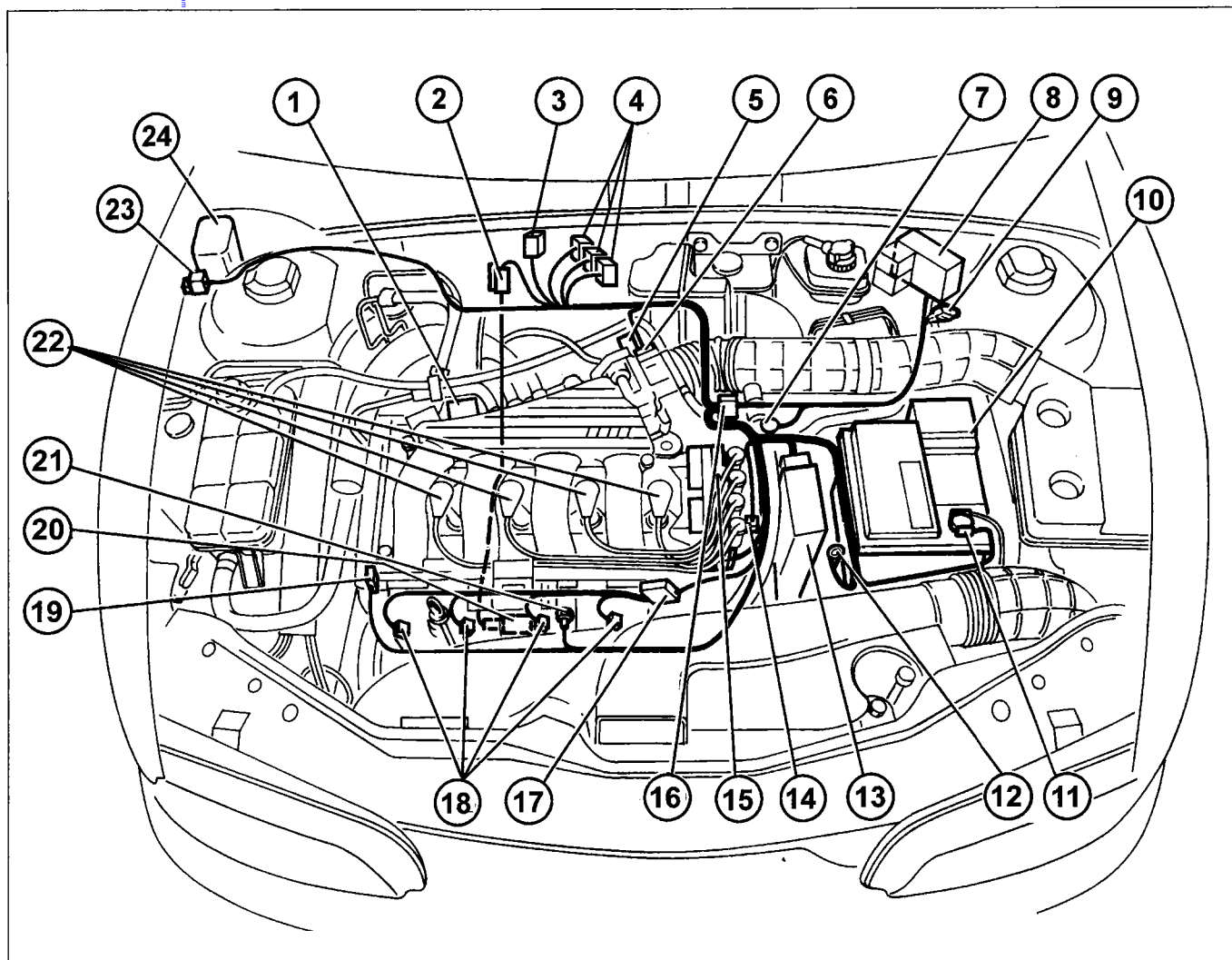
Two types of chemical reactions take place inside the converter:

- oxidation of the CO and HC, converted into carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O)
- reduction of NOx, converted into nitrogen (N<sub>2</sub>).

The causes which quickly and irreparably put the catalytic converter out of use are:

- presence of lead in petrol, which reduces the level of conversion such that its presence in the system is futile;
- presence of unburnt petrol in the converter; a flow of petrol lasting 30 s in an environment of 800°C (silencer's internal temperature) is sufficient to cause the converter to melt and break. It is absolutely necessary for the ignition system to be working perfectly, so **under no circumstances should the spark plugs be removed when the engine is running; during tests, the silencer must be replaced with an equivalent piece of pipe.**

**LOCATION OF INJECTION/IGNITION SYSTEM COMPONENTS**

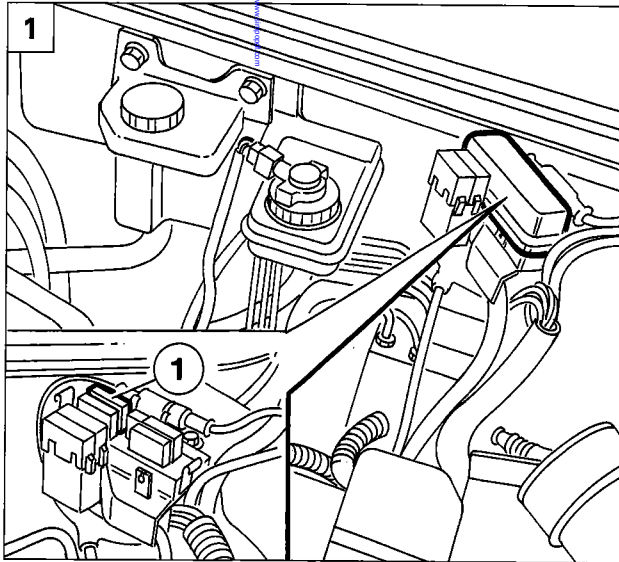


P4A23IJ01

**Components key**

- |                                                           |                                                 |
|-----------------------------------------------------------|-------------------------------------------------|
| 1 Intake air pressure and temperature sensor              | 13 Injection/ignition control unit              |
| 2 Lambda sensor coupling                                  | 14 Coolant temperature sensor                   |
| 3 Injection system relay                                  | 15 Ignition coils                               |
| 4 Protective fuses                                        | 16 Join between injection cable and front cable |
| 5 Engine idle speed actuator                              | 17 Injectors cable coupling                     |
| 6 Butterfly valve position sensor                         | 18 Injectors                                    |
| 7 Vehicle speed sensor                                    | 19 Rpm and TDC sensor                           |
| 8 30A general system protective fuse                      | 20 Lambda sensor                                |
| 9 Diagnostic socket                                       | 21 Detonation sensor                            |
| 10 Battery                                                | 22 Spark plugs                                  |
| 11 Earth at negative battery terminal                     | 23 Fuel vapour cut out solenoid valve           |
| 12 Connection between injection earth and bodyshell earth | 24 Charcoal filter                              |

## 10.



P4A24IJ01

### INJECTION/IGNITION SYSTEM RELAY AND FUSES

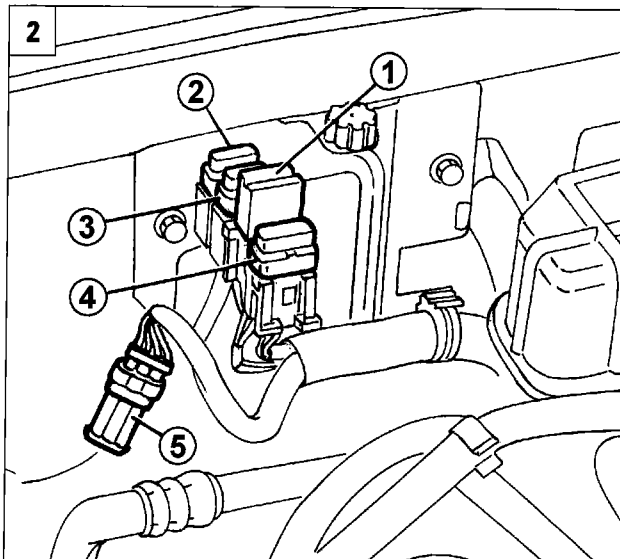
#### General system protective fuse (fig. 1)

The general fuse (30A) protecting the injection/ignition system (1) is housed inside the power fuse box; to gain access to it, remove the cover releasing it from the side clips.

#### Fuses and relay (fig. 2)

The following components are housed on a bracket positioned against the rear wall of the engine compartment:

1. System relay
2. 7.5A fuse protecting +15/54 supply
3. 7.5A fuse protecting +30 supply
4. 15A fuse protecting Lambda sensor and fuel vapour solenoid valve



P4A24IJ02

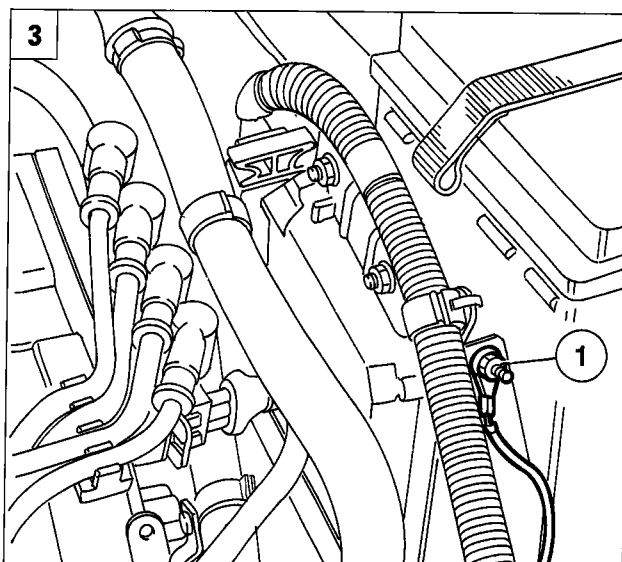
#### EARTH POINTS (fig. 3)

In order to improve electro-magnetic compatibility and operational reliability, the earth points have been positioned as follows:

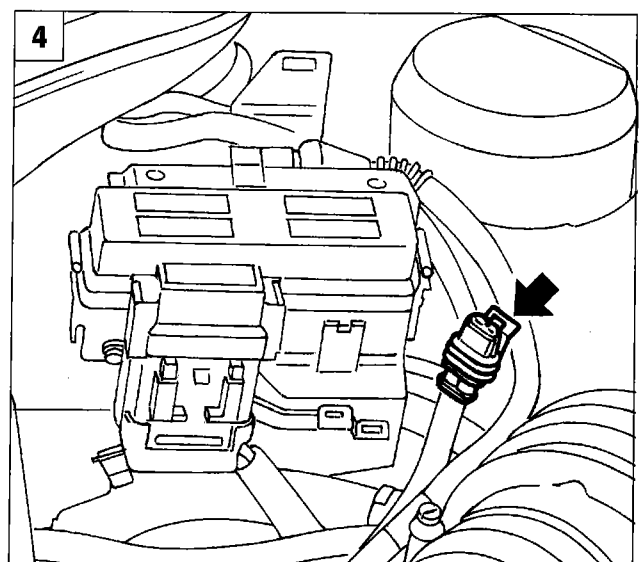
- The main earth for the injection/ignition system is directly connected to the negative battery terminal.
- The earth for the injection/ignition control unit housing (1) is connected to the bodysheet earth on the control unit mounting bracket.

#### DIAGNOSTIC SOCKET (fig. 4)

The diagnostic socket for connecting the special equipment (SDC station or EXAMINER) is positioned at the side of the power fuse box.



P4A24IJ03



P4A24IJ04



## COMPONENTS OF THE FUEL INJECTION-IGNITION

The fuel injection-ignition mainly comprises wiring, an electronic control unit and the following sensors and actuators:

### Sensors

- Rpm and TDC sensor
- Knock sensor
- Throttle position sensor
- Coolant temperature sensor
- Intake air pressure and temperature sensor
- Vehicle speed sensor
- Lambda probe

### Actuators

- Engine idle speed actuator
- Electric fuel pump
- Fuel vapour cut-off solenoid
- Fuel injectors
- Ignition coils

## FUEL INJECTION-IGNITION WIRING

The various components of the system are connected by a single wiring loom with various types of connectors, laid in special runs mounted on the engine (prewiring).

## FUEL INJECTION-IGNITION ELECTRONIC CONTROL UNIT

The electronic control unit of the fuel injection-ignition used on this version is specific and connected to the electrical wiring by means of two connectors, the top connector with 52 pins and the bottom connector with 28 pins.

It is a digital microprocessor unit characterized by a high calculation capacity, precision, reliability, versatility, low energy consumption and absence of maintenance.

The task of the electronic control unit is to process the signals coming from the various sensors by applying software algorithms, and to control the actuators (in particular the fuel injectors, ignition coils and idle speed actuator) in order to achieve the best possible engine operation.

The structure of the electronic control unit is characterized by the following parts:

- Data acquisition and coding section
- Microprocessor
- ROM memory
- RAM memory
- EEPROM memory
- Drivers

### a. Data acquisition and coding section

It consists of a set of electronic components (A/D converters) assigned to receiving the data in the form of analogue electrical signals. The signals are then converted into digital signals, processed and stored.



## 10.

### b. Microprocessor

This electronic component calculates and manages the acquired data; in this respect it should be considered an actual computer mainly responsible for the following: interrogating the memories, comparing the data being processed with the sample data and managing the actuator control circuits.

### c. ROM (Read Only Memory)

This contains all the programs necessary for the operation of the microprocessor; moreover, as it is permanently programmed before installation in the control unit, its data can be read but not modified.

The ROM is a storage component, so even if the battery terminals are disconnected, the instructions it contains remain stored in memory.

### d. RAM (Random Access Memory)

The RAM is a transition memory in which the data, in addition to being read, can also be stored in memory.

It is used for both temporary storage of input data in order to render them available for subsequent processing, and also for the storage of signals for coding operating faults, which can arise on the sensors, actuators or certain functions of the control unit.

The RAM is divided into two sections: the first is volatile and is allocated to data storage; it is enabled when the ignition is on and cancelled when the ignition is switched off.

The non-volatile section (RAM STAND-BY) is used to store in memory the self-adapting corrections of the aperture during idling, of the engine idle actuator and the angle position of the fully closed throttle valve. It is also assigned to memorizing the engine parameters and adapting them over time; this means that the control unit, using mainly the Lambda probe's signal, modifies and stores in memory a corrective factor of the injection time which influences the mixture strength.

To be maintained, the self-adapting corrections of the idle speed actuator require the continuous presence of the battery supply (memory in STAND-BY).

If the battery, double relay or control unit connector are disconnected, the parameters are reset. Normal use of the car will restore the adaptation process and the memorization of the new parameters.

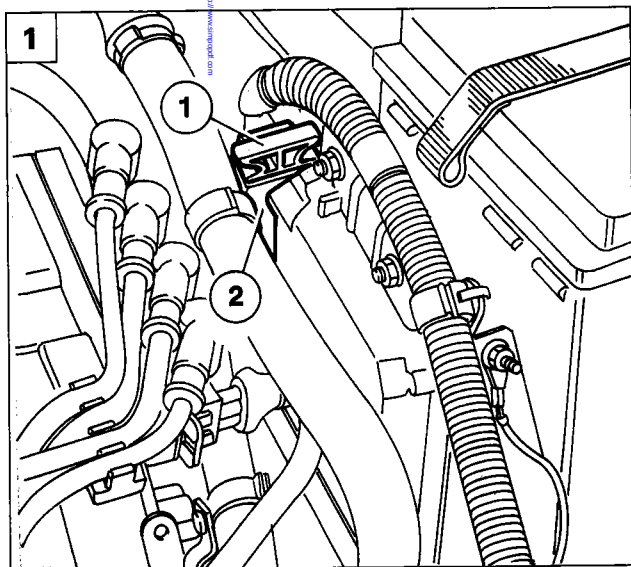
### e. EEPROM (Electrical Erasable Programmable Read Only Memory)

This is a particular type of memory which can be deleted electrically and reprogrammed several times. Its functions include receiving from the STAND-BY RAM records of faults arising during engine operation, and transmitting this information via the diagnostic socket to the diagnostic equipment (EXAMINER or SDC station). To delete confirmed faults, use the diagnostic equipment in active diagnosis.

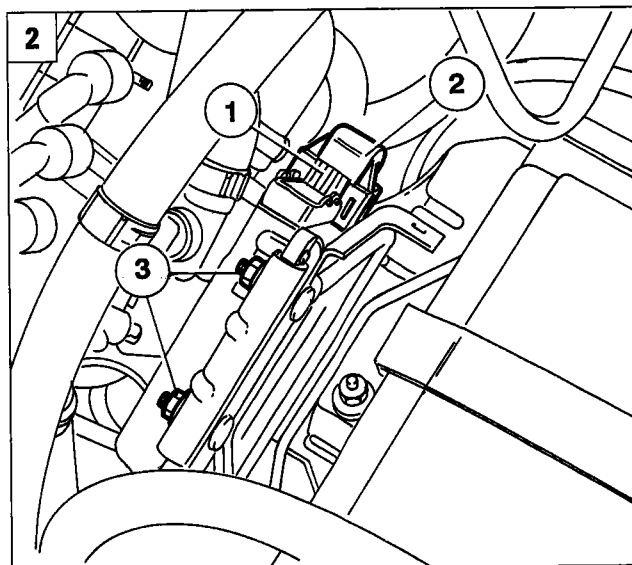
The presence of a non-volatile memory also means that data relating to system faults are stored even if the battery is disconnected, and also indications of faults even after the latter disappear.

### f. Drivers (final power stages for driving the actuators)

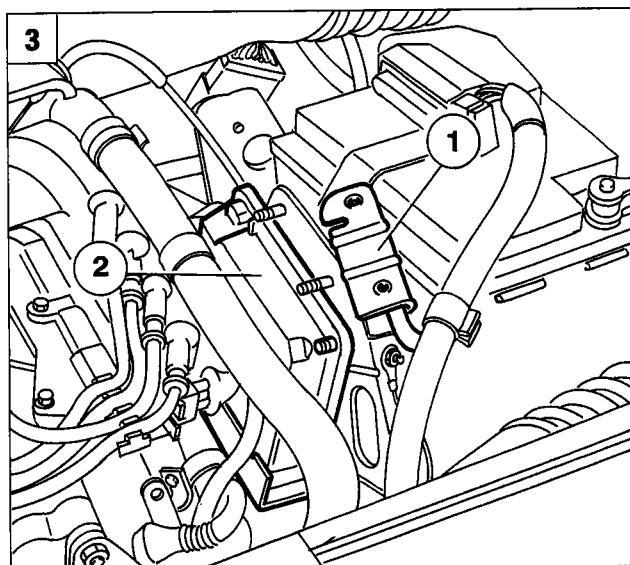
These are circuits driven directly by the microprocessor and the specific integrated circuit, and they serve to supply the actuators, namely: fuel injectors, idle control motor, fuel vapour cut-off valve and fuel pump relay.



P4A27IJ01



P4A27IJ02



P4A27IJ03



### Removing-refitting

1. Pull the locking device (1) upwards and disconnect the top connector (2).
2. Pull the locking device (1) downwards and disconnect the bottom connector (2) then undo the nuts (3).
3. Remove the bracket (1) and move it aside, then remove the fuel injection-ignition electronic control unit (2).



*Under no circumstances may fuel injection control units be exchanged between different vehicles to check whether they are working.*



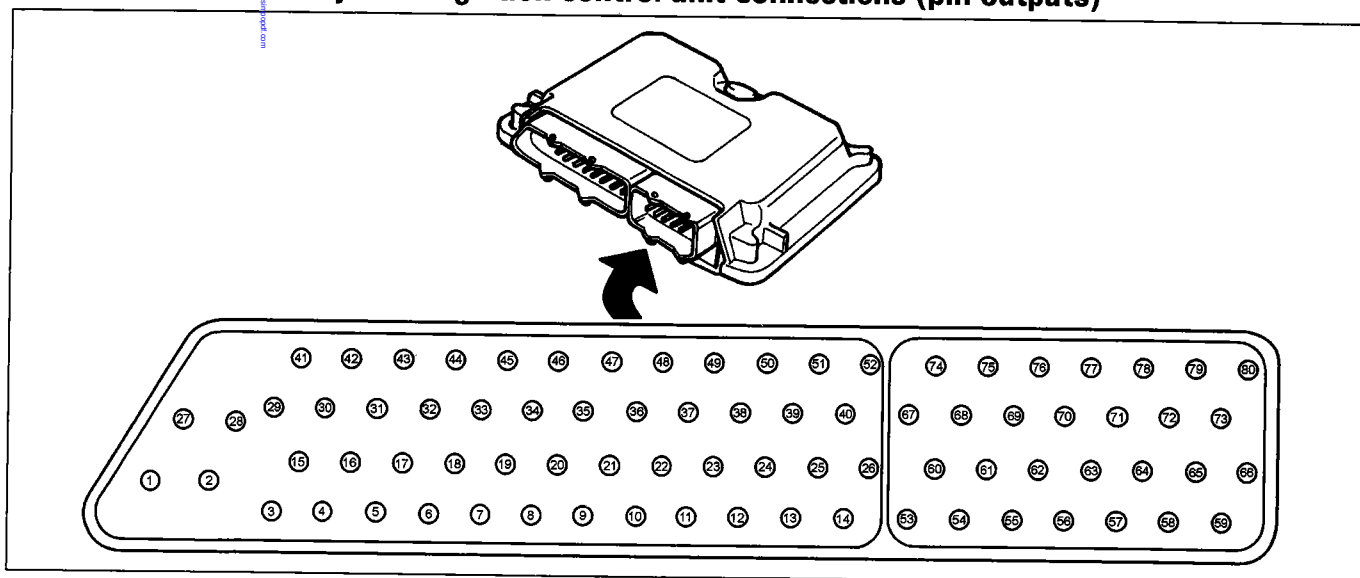
*During diagnosis, before replacing the control unit, make sure that the component under examination is really not working, as when a new control unit is supplied, the secret code of the Fiat CODE system is memorized, rendering the control unit totally unusable on other cars.*



*Voltage may be present on unconnected pins, so no connection should be made otherwise there will be the risk of short circuit with damage to the control unit.  
The multi-connector should be inserted and withdrawn with the ignition off (key removed).*

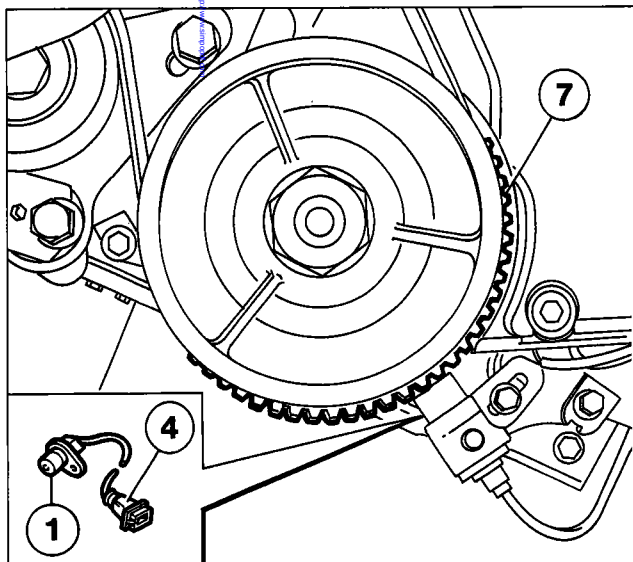
### 10.

#### Identification of fuel injection-ignition control unit connections (pin outputs)



P4A28IJ01

- |                                                                     |                                                                                                 |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1-3. Not connected                                                  | 49. Automatic transmission control unit (gear change signal)                                    |
| 4. Rev counter signal                                               | 50. Vehicle speed signal                                                                        |
| 5. Automatic transmission control unit (coolant temperature signal) | 51. Not connected                                                                               |
| 6-8. Not connected                                                  | 52. Fuel vapours solenoid                                                                       |
| 9. Lambda probe (negative)                                          | 53. Rpm sensor (positive)                                                                       |
| 10-12. Not connected                                                | 54. Earth of coolant temperature, air pressure/temperature and throttle valve position sensors. |
| 13. Fiat CODE control unit                                          | 55. Intake air temperature                                                                      |
| 14. Radiator fan high speed control (versions with air conditioner) | 56. Knock sensor (positive)                                                                     |
| 15. Fuel injection relay enablement                                 | 57. Engine idle speed actuator                                                                  |
| 16. Automatic transmission control unit (throttle valve angle)      | 58. Engine idle speed actuator                                                                  |
| 17. Engine coolant overheating warning light                        | 59. Ignition coils (cylinders 1-4)                                                              |
| 18-19. Not connected                                                | 60. Supply to throttle valve position sensor                                                    |
| 20. Lambda probe (positive)                                         | 61. Not connected                                                                               |
| 21. 4-stage pressure switch                                         | 62. Coolant temperature sensor (positive)                                                       |
| 22-24. Not connected                                                | 63. Knock sensor cables shielding                                                               |
| 25. Diagnostic socket (line k)                                      | 64. Engine idle speed actuator                                                                  |
| 26. Fuel injection fault warning light                              | 65. Engine idle speed actuator                                                                  |
| 27-28. Earth                                                        | 66. Ignition coils (cylinders 2-3)                                                              |
| 29. Fused supply (+30)                                              | 67. Rpm sensor (negative)                                                                       |
| 30-34. Not connected                                                | 68. Supply to intake air temperature/pressure sensor                                            |
| 35. Signal requesting radiator fan low speed                        | 69. Not connected                                                                               |
| 36. Automatic transmission control unit (torque reduction signal)   | 70. Knock sensor (negative)                                                                     |
| 37-39. Not connected                                                | 71. Cylinder no. 1 fuel injector                                                                |
| 40. Radiator fan low speed control (versions with air conditioner)  | 72. Cylinder no. 4 fuel injector                                                                |
| 41. Air conditioner compressor relay                                | 73-74. Not connected                                                                            |
| 42-43. Not connected                                                | 75. Intake air pressure signal                                                                  |
| 44. Lambda probe cables shielding                                   | 76. Throttle valve position signal                                                              |
| 45-46. Not connected                                                | 77. Rpm sensor cables shielding                                                                 |
| 47. Supply (+15)                                                    | 78. Cylinder no. 3 fuel injector                                                                |
| 48. Request to switch on air conditioner                            | 79. cylinder no. 2 fuel injector                                                                |
|                                                                     | 80. Not connected                                                                               |



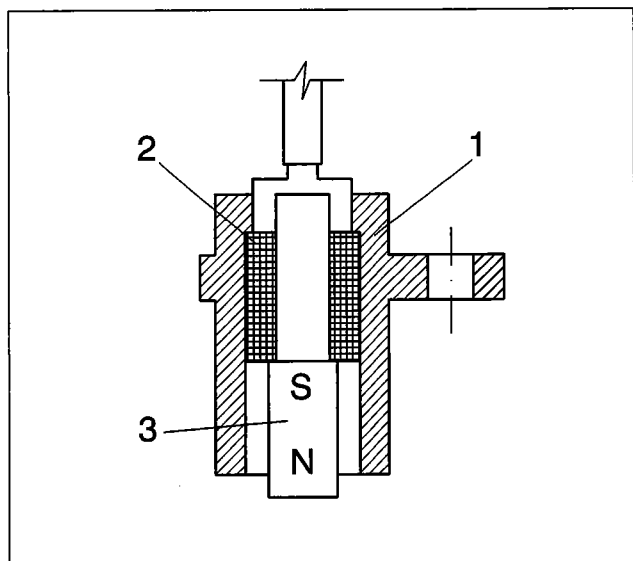
P4A29IJ01

### RPM AND TDC SENSOR (Jaeger CVM02)

The sensor (1) for rpm and reference of the crankshaft angle (identification of TDC) is secured to the engine block and is opposite the phonic wheel (7) located on the crankshaft pulley.

#### Principle of operation

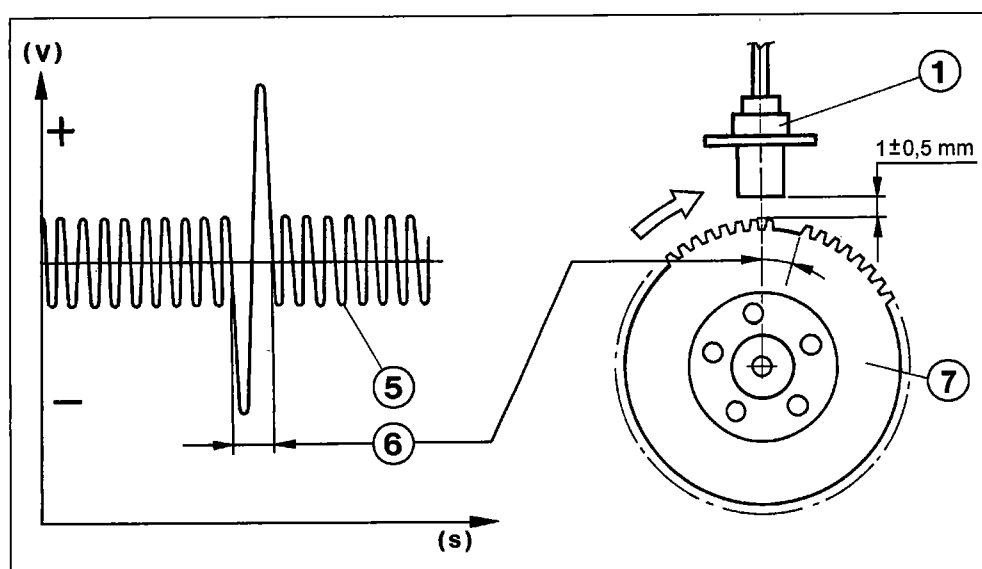
The sensor consists of a tubular case (1) containing a permanent magnet (3) and electrical winding (2). The magnetic flow created by the magnet (3) causes oscillations following the change of gap, because of the passage of the teeth of the phonic wheel.



P4A29IJ02

These oscillations induce an electromotive force in the winding (2) at the ends of which there is a voltage which is alternately positive (tooth opposite the sensor) and negative (gap opposite the sensor). Provided all other factors are equal, the peak output voltage from the sensor depends on the distance between sensor and tooth (gap).

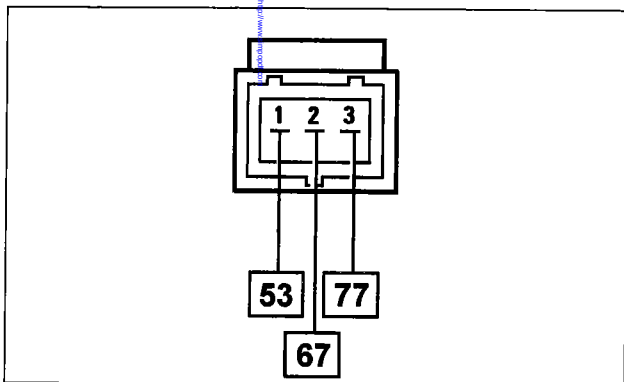
The phonic wheel has sixty teeth, two of which are removed to create a reference; the pitch of the wheel thus corresponds to an angle of  $6^\circ$  ( $360^\circ$  divided by 60 teeth). The point of synchronization is recognized at the end of the first tooth following the two missing teeth; when this space passes under the sensor, the engine is with the piston pair 1-4 at  $114^\circ$  before TDC.



P4A29IJ03

1. Sensor
2. Winding
3. Permanent magnet
4. Sensor connector
5. Output signal
6. Signal corresponding to the two missing teeth
7. Crankshaft pulley with phonic wheel

## 10.



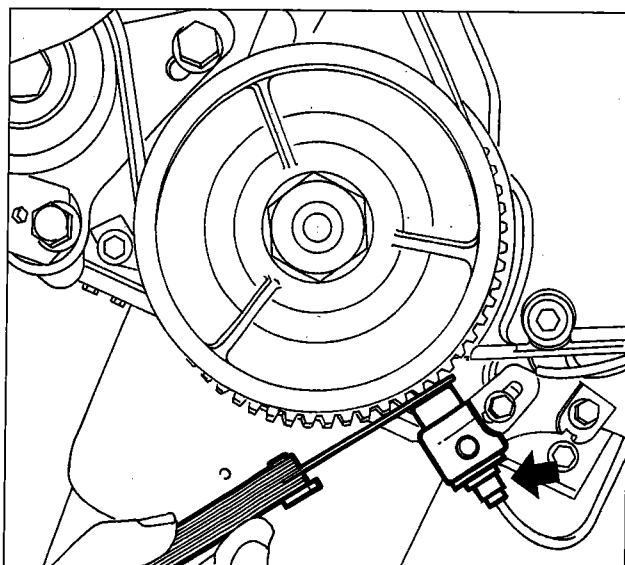
P4A30IJ01

### Wiring connector

The sensor is connected to the control unit by means of twisted cables covered by a shielded anti-interference sheath.

- Pin 1 - Signal
- Pin 2 - Earth
- Pin 3 - Shielding

**NOTE** The numbers in boxes indicate the corresponding control unit pins.



P4A30IJ02



### Removing-refitting

Disconnect the wiring connector.



Undo the screw indicated and remove the sensor.

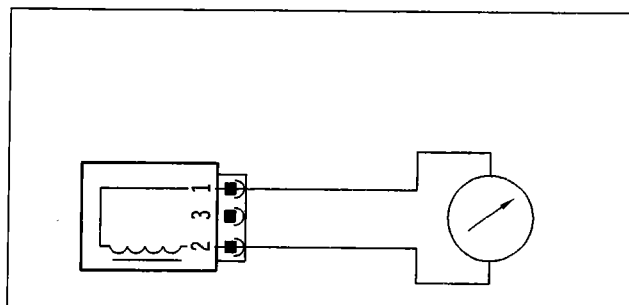


### Checking the gap

Check the distance between the sensor and phonic wheel teeth (gap).

**Gap: 0.5 - 1.5 mm**

**NOTE** If work has to be done on the rpm and TDC sensor mounting (e.g. gap outside tolerance limits, sensor misaligned, etc.), the procedure must be carried out for correct positioning of the sensor and its mounting, and setting its timing, as described in the engine overhaul manual (publication no. 504.589/20).



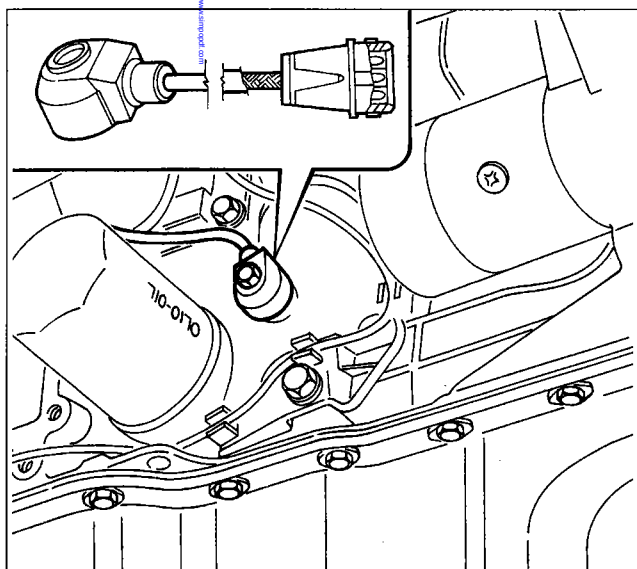
P4A30IJ03



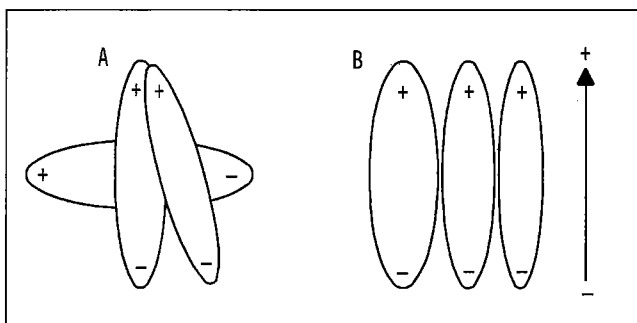
### Checking resistance

The sensor's resistance can be measured by disconnecting the connector and connecting an ohmmeter to the ends of the sensor.

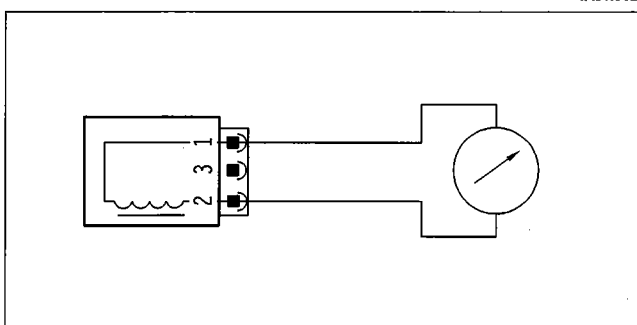
**Resistance 1134 - 1386 ohm at 20 °C**



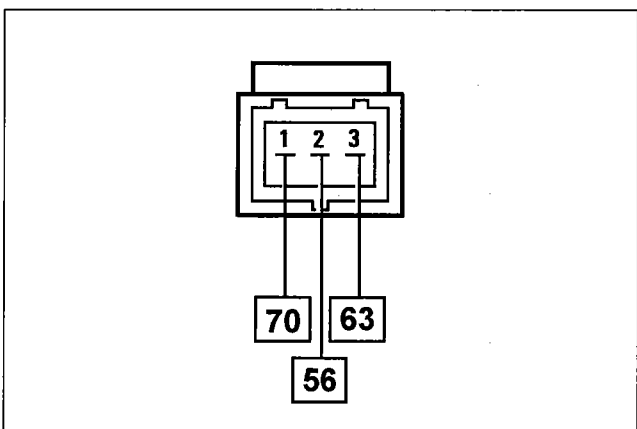
4A311J01



4A311J02



4A301J03



4A311J03

## KNOCK SENSOR (KNE-03)

This sensor is the piezoelectric type and is fitted on the cylinder block/crankcase in a position which is symmetrical in relation to the pairs of cylinders 1-2 and 3-4.

This position is determined by the need to detect the onset of knock in the same way for all cylinders.

When there is engine knock, vibrations of a particular frequency are produced.

The effect generates mechanical repercussions on a piezoelectric crystal that sends a signal to a control unit. The control unit then reduces the ignition advance on the basis of this signal until the effect disappears. The advance is then gradually restored to the baseline value.

## Principle of operation

The molecules in a quartz crystal are electrically polarised.

Under rest conditions (A), the molecules are not aligned in any particular direction.

When the crystal is subject to pressure or impact (B), the molecules line up and the degree to which they align is directly proportional to the pressure on the crystal. This alignment creates a voltage at the crystal terminals.

A. Rest position

B. Position under pressure

## Checking the resistance

The sensor resistance can be measured by disconnecting the connector and connecting an ohmmeter to the sensor terminals

**Resistance 532 - 588 ohm at 20°C**

## Connector wiring

The sensor is connected to the control unit by twisted cables covered in a shielded non-interference sheath.

Pin 1 - Earth

Pin 2 - Signal

Pin 3 - Shielding

The numbers in boxes indicate the corresponding control unit pins.

## Removing-refitting

Disconnect the electrical connection, undo the knock sensor retaining bolt and remove.



## 10.

### THROTTLE BODY

The throttle body meters the quantity of air drawn in by the engine (and consequently the power developed) according to the driver's request via the accelerator.

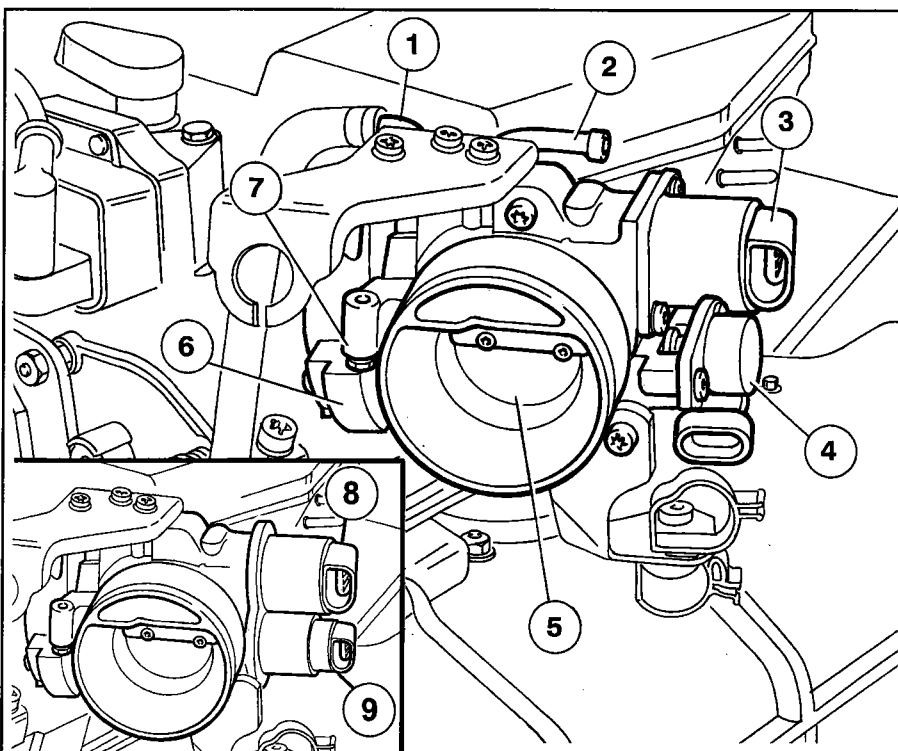
The throttle body is secured to the intake manifold by four bolts: the butterfly is opened by means of linkage where small butterfly opening angles correspond to the pedal being slightly pressed and large angles correspond to it being greatly depressed.

With the pedal completely released (engine decelerating or idling) the necessary additional air is supplied by the engine idle adjustment actuator: under these circumstances, the throttle opening lever is in the end of travel position against an anti-tamper screw which prevents the throttle from getting stuck in a closed position.

To prevent condensation and ice formation that could arise during certain exterior conditions, i.e. low temperature and/or high humidity, the throttle body is heated by recycling a small amount of coolant from the engine thermostat through a chamber inside the body.

The throttle valve position sensor and engine idle speed actuator are fitted to the throttle body.

In the pre-modification version, the engine idle actuator and throttle valve position sensor are bolted to the throttle body. In the post-modification version, they are built into the throttle body.



*The anti-tamper screw is adjusted by flushing in the factor and should never be tampered with.*

4A321J01

1. Engine coolant delivery pipe attachment
2. Engine coolant return pipe attachment
3. Engine idle speed actuator bolted to the throttle body (pre-modification solution)
4. Throttle valve position sensor bolted to the throttle body (pre-modification solution)
5. Throttle valve
6. Throttle opening linkage
7. Throttle valve adjustment and antitamper screw (do not tamper with)
8. Engine idle speed actuator built into the throttle body (post-modification solution)
9. Throttle valve position sensor built into the throttle body (post-modification sensor)



## THROTTLE VALVE POSITION SENSOR

- A.** Sensor used on premodification cars  
**B.** Sensor used on postmodification cars

The sensor consists of a potentiometer with its mobile part controlled by the throttle valve spindle.

The potentiometer is enclosed in a plastic container. In solution **A** adopted on premodification models, the potentiometer case is fitted with two tabs. These have two UNSLOTTED holes to anchor and position the sensor in relation to the throttle valve. In solution **B** adopted on post-modification cars, the sensor is integral with the throttle body.

A three-pin socket (ABC) on the container ensures an electrical connection to the electronic injection-ignition control unit

During operation, the electronic control unit supplies the potentiometer with a voltage of 5 Volts. The parameter measured for injection management is throttle position from idle to full opening.

The output voltage tells the control unit how far the throttle valve is opened and it corrects mixture concentration accordingly.

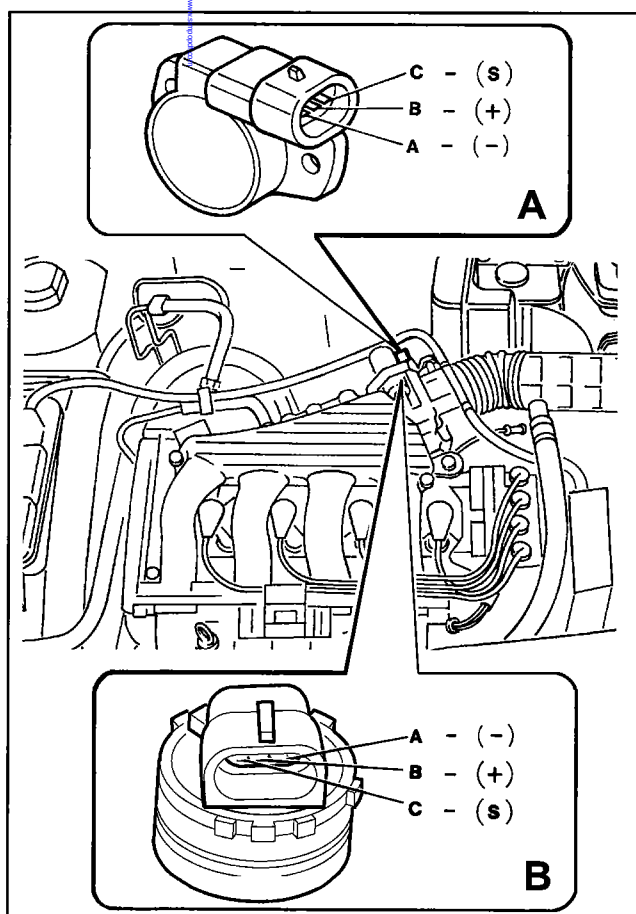
When the throttle is closed, a voltage signal is sent to the control unit, which recognises idle and cut-off (discerning between them on the basis of engine rpm).

The potentiometer is linear (single ramp type). Its main features are as follows:

Effective electrical angle:  $90^\circ \pm 2^\circ$

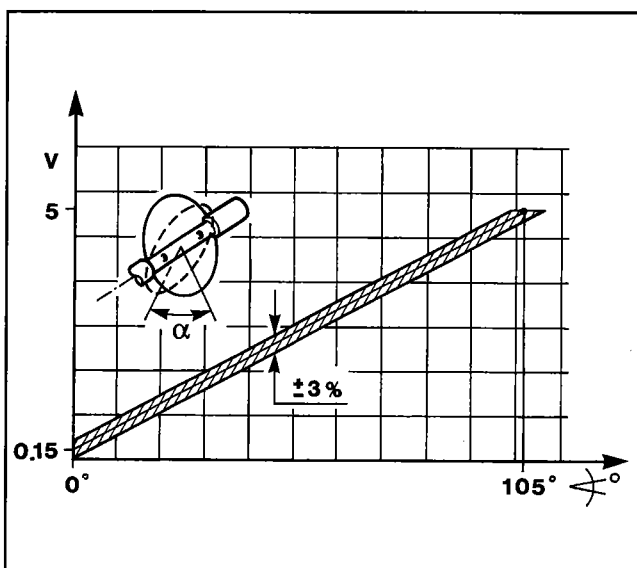
Total mechanical travel:  $110^\circ \pm 8^\circ$

Service temperature range:  $-30^\circ\text{C} - +125^\circ\text{C}$



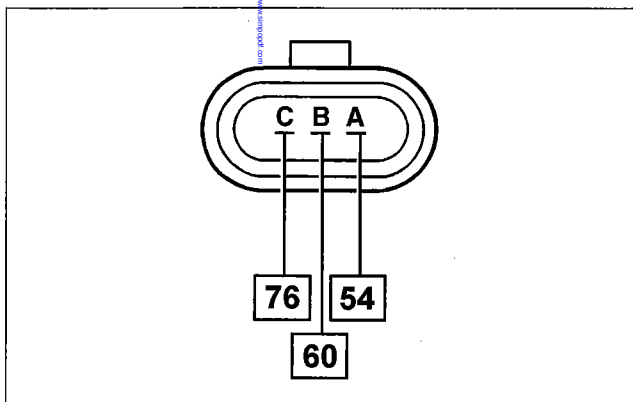
4A33JJ01

The following graph shows sensor voltage output for different throttle opening angles.

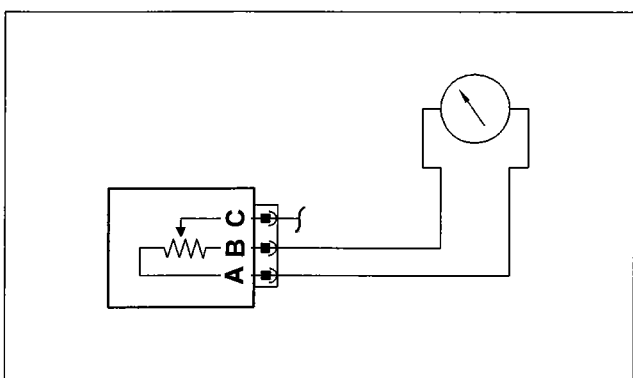


4A33JJ02

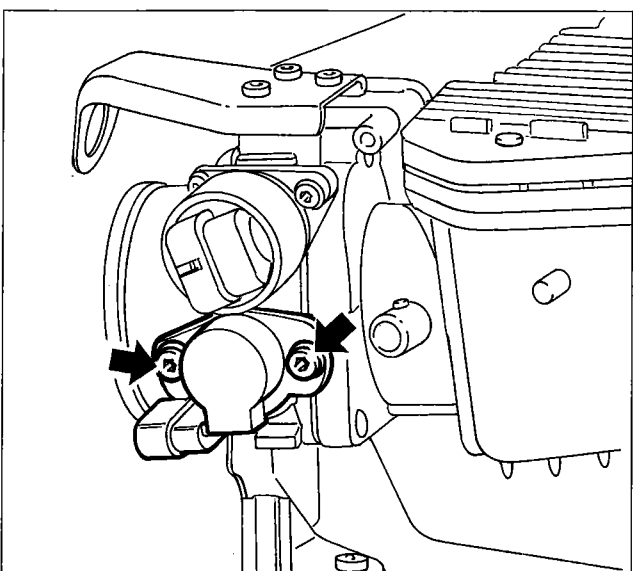
# 10.



4A34IJ01



4A34IJ02



4A34IJ03

## Wiring connectors

The numbers in squares indicate the corresponding control unit pins.

- Pin A - Earth
- Pin B - Positive
- Pin C - Signal

## Checking the resistance

Sensor resistance may be measured as follows:

- connect an ohmmeter across sensor pins A and B and check a fixed resistance of 1200 ohms;
- check an ohmmeter between sensor pins A and C and check that resistance varies from 0 to 1200 ohm  $\pm$  20% when the throttle is moved.

## Recovery

The system assumes a value calculated on the basis of rpm and pressure in the inlet manifold. If the pressure sensor fails at the same time, a throttle opening of about 50° is assumed as a fixed value.

Strategies to gradually decrease rpm at idle speed (dashpot) are blocked.

Idle speed self-adaption is blocked.

Mixture concentration self-adaption is blocked.

## Removing-refitting

### Procedure for premodification cars

Disconnect the electrical connection, undo the two fixing bolts and remove the sensor.

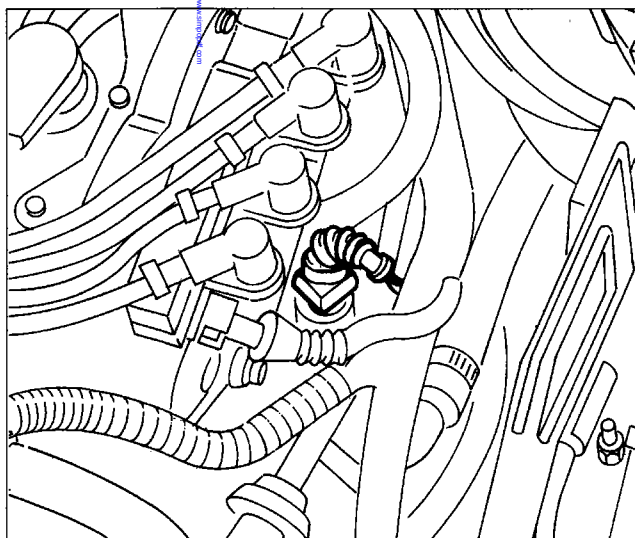
**NOTE** The sensor is secured to the throttle body by two tabs with two non-slotted holes. Sensor angular position does not require adjustment because the control unit recognises throttle closed or fully open positions by means of special self-adaptive algorithms.

**NOTE** Whenever the potentiometer bolts are loosened or removed, they must be replaced because the threads are covered by a light layer of loctite. This secures the bolt once only.

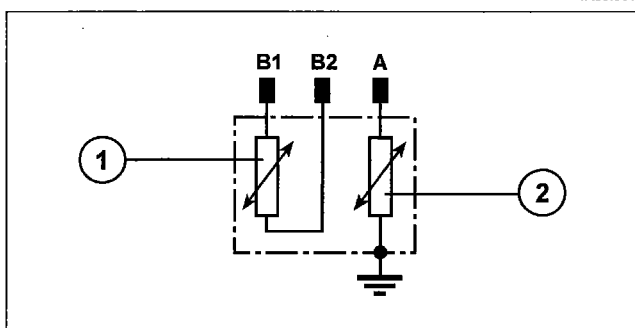
**NOTE** On post-modification cars, the throttle valve position sensor is built into the throttle body.

## 10.

### ENGINE COOLANT TEMPERATURE SENSOR



4A35IJ01



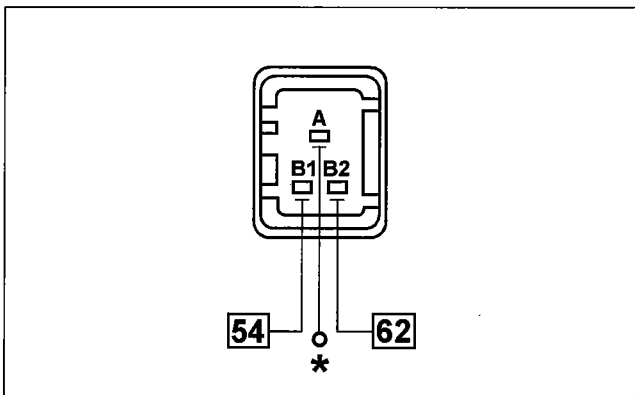
4A35IJ02

#### INJECTION NTC

| °C  | Ω     | °C  | Ω    |
|-----|-------|-----|------|
| -20 | 15970 | 40  | 1150 |
| -10 | 9620  | 50  | 807  |
| 0   | 5975  | 60  | 576  |
| 10  | 3816  | 70  | 418  |
| 20  | 2500  | 80  | 309  |
| 25  | 2044  | 90  | 231  |
| 30  | 1679  | 100 | 176  |

#### NTC INSTRUMENT

| °C  | Ω       |
|-----|---------|
| 60  | 512-602 |
| 90  | 184-208 |
| 120 | 76-88   |



4A35IJ03

\* Connection to coolant temperature gauge on instrument panel

The sensor is fitted on the thermostat case; It is made up of brass casing which affords protection for the actual resistive elements consisting of two NTC (Negative Temperature Coefficient) type thermistors whose electrical resistance decreases as the temperature increases).

The two NTC thermistors are separate and supply temperature information to a specific indicator on the instrument panel and the injection-ignition control unit.

The reference voltage for the injection system NTC element is 5 Volt: since the control unit intake circuit is designed as a voltage divider, the reference voltage is shared between a resistance in the control unit and the actual sensor. As a result, the control unit is capable of evaluating the variations in the sensor resistance through the changes in voltage, thereby obtaining information concerning the temperature.

1. NTC for injection system
2. NTC for indicator on instrument panel

#### Recovery

Assumes last temperature reading or a fixed value of 80°C if intake air temperature exceeds a certain value.

Mixture concentration self-adaption is inhibited.

The radiator fan is activated  
Idle self-adaption is inhibited

#### Checking the resistance

The table alongside shows resistance values that the NTC elements may assume as temperature changes. These values can be measured by disconnecting the connector and connecting an ohmmeter across the sensor pins.

#### Removing-refitting

Disconnect the electrical connection and remove the sensor.

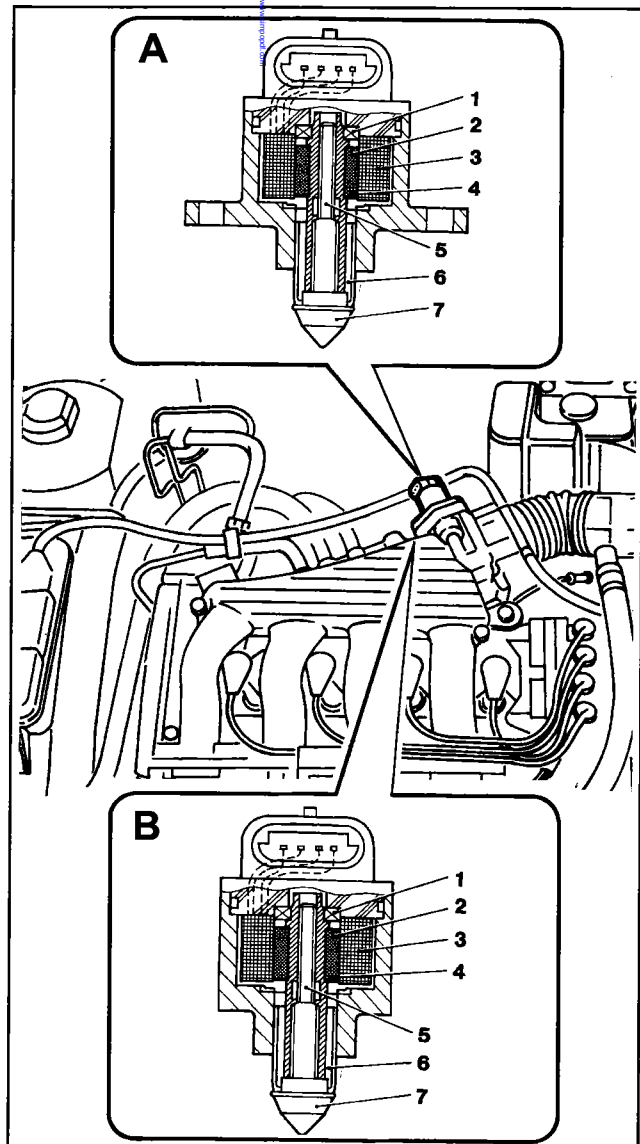


**Tightening torque 2.2 daNm**

#### Connector wiring

The numbers in boxes indicate the respective control unit pins.

# 10.



## ENGINE IDLE SPEED ACTUATOR (step motor)

- |               |                      |
|---------------|----------------------|
| 1. Bearing    | 5. Screw             |
| 2. Worm screw | 6. Anti-turn grooves |
| 3. Coils      | 7. Plunger           |
| 4. Magnet     |                      |

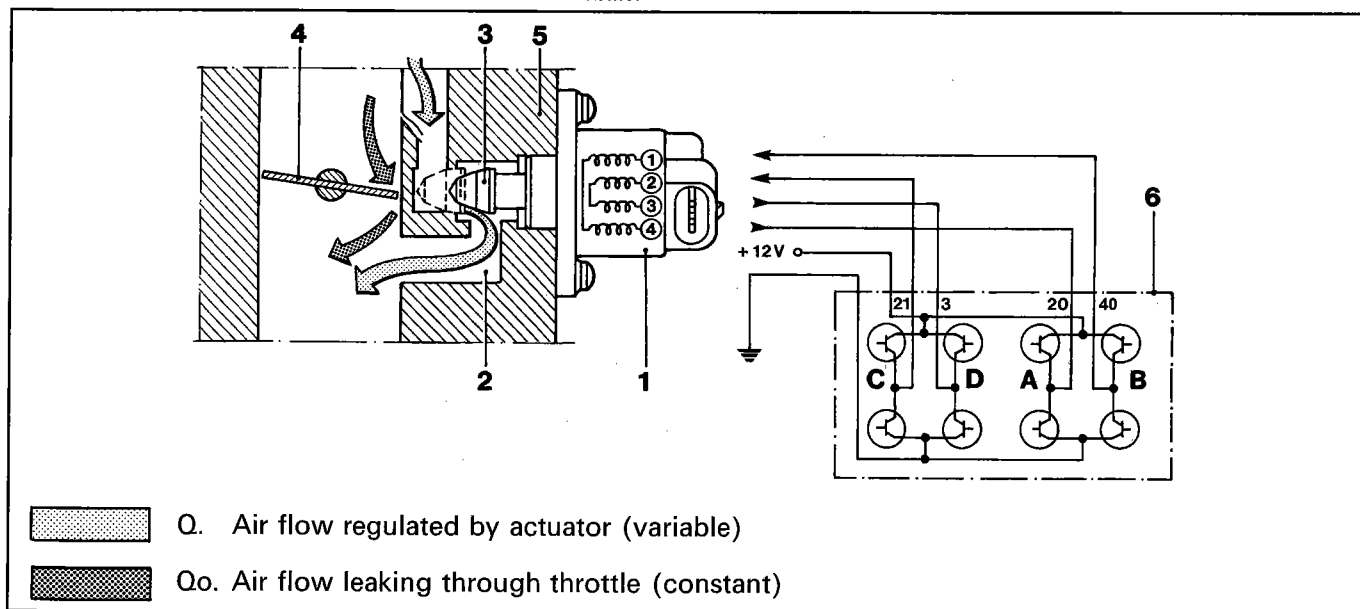
- A. Actuator used on premodification cars  
B. Actuator used on postmodification cars

The actuator is secured to the throttle body and consists of:

- an electric stepp motor with two windings in the stator and a rotor which includes a certain number of pairs of permanent magnetic poles;
- a worm screw type reduction gear which converts rotary motion into rectilinear motion.

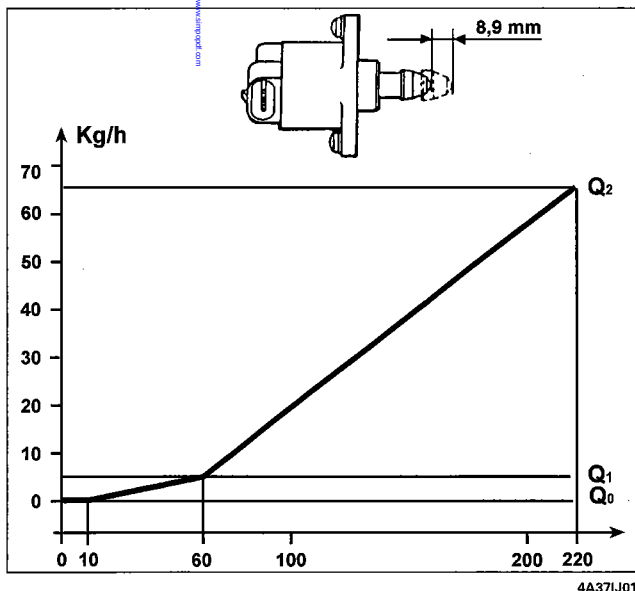
To run at idle speed, i.e with throttle (4) fully closed, the engine needs a certain amount of air ( $Q_0$ ) and fuel to overcome internal friction and maintain its speed of rotation. The amount of air ( $Q_0$ ) that leaks thorough closed throttle (4) with the engine idling must be increased while the engine is warming up or when external services or loads are activated (e.g. automatic air conditioner etc.) by an additional quantity of air ( $Q$ ) to allow the engine to maintain a constant rpm. To achieve this result, the system uses a step motor (1) secured to throttle body (5) and controlled by a drive circuit (6) located inside the injection-ignition control unit. The motor drives a push-rod equipped with a plunger (3), which alters the cross section of by pass duct (2) and thus the amount of air ( $Q_0 + Q$ ) taken up by the engine. To control this type of action, the control unit uses angular engine speed and coolant temperature signals from the relevant sensors.

4A36IJ01



4A36IJ02

## 10.



The step motor is very precise and offers high resolution (about 220 steps per second). Pulses sent by the electronic control unit to the engine are converted from rotary motion into linear movement (about 0.04 mm/step) via a worm screw mechanism. The plunger then works to alter the cross section of the by pass port.

The constant minimum air flow ( $Q_0$ ) due to air leaking beneath the throttle valve is adjusted during production and ensured by a tamperproof cap. Maximum air flow ( $Q_2$ ) occurs when the plunger is fully retracted (about 220 steps corresponding to 8.9 mm).

Air flow follows the law shown in the graph alongside for intermediate values.

### Motor strategy

The number of working steps depends on engine condition:

- Ignition stage  
When the ignition key is inserted, the control unit makes the step motor take up a position dependent upon coolant temperature and battery voltage.
- Warm-up stage  
RPM is adjusted according to coolant temperature
- With engine warm:  
Idle management depends on a signal from the engine rpm sensor. The control unit manages sustained idle mode when external loads are activated.
- During deceleration  
The electronic control unit identifies deceleration stage from throttle potentiometer position. It controls step motor position via the idle flow law (dashpot law), i.e. it slows the return of plunger (3) to its seat so that a quantity of air bypassed from hole (2) reaches the motor and reduces levels of pollutants in exhaust gases.

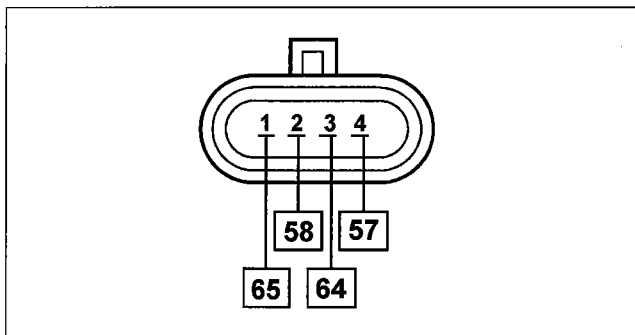
### Recovery

Actuator operation disabled, fuel vapour recirculation self-adaptation inhibited and speed limited to 1200 rpm.

### Removing-refitting engine idle speed actuator (step motor)

Procedure for premodification cars

- disconnect the battery negative terminal.
- unscrew both retaining bolts and withdraw the actuator;
- check the condition of the o-ring and remove any impurities from the seat in the case;
- refit the actuator and check that the plunger fits properly into its seat without forcing.



4A371J02



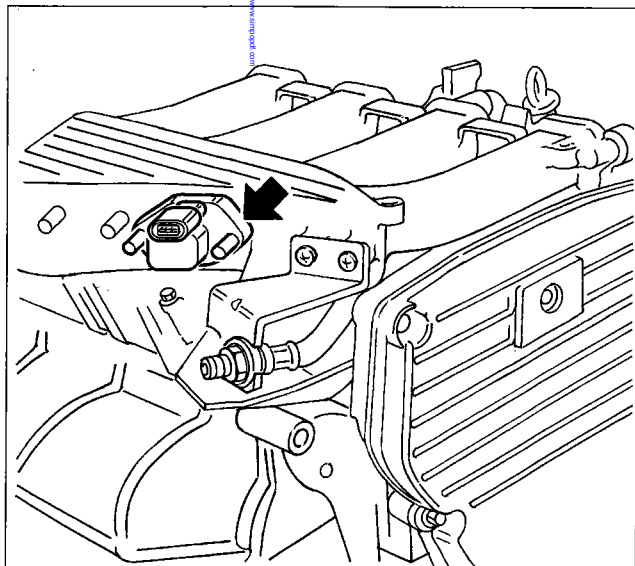
**Step motor bolt tightening torque 0.35 - 0.45da Nm**

**NOTE** The engine idle speed actuator is built into the throttle body in postmodification cars.

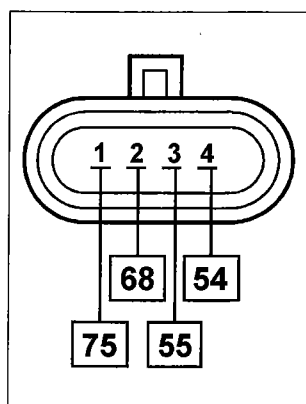
### Connector wiring

The numbers in squares indicate the control unit pins.

## 10.



4A38IJ01



4A38IJ02

Pin 1 - Air pressure signal

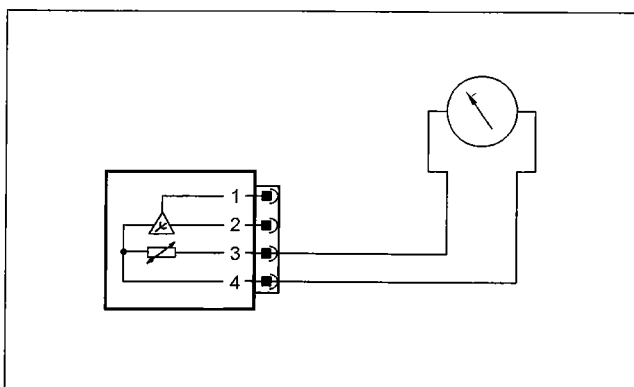
Pin 2 - Positive

Pin 3 - Air temperature signal

Pin 4 - Negative

### Connector wiring

The numbers indicate the corresponding control unit pins



4A38IJ03

### Checking the resistance

The table alongside shows resistance values that the temperature sensor (NTC thermistor) may assume with changing temperature. These values may be measured by connecting an ohmmeter across sensor pins 3 and 4.

### INTAKE AIR PRESSURE AND TEMPERATURE SENSOR (T-PRT 03)

The intake air pressure and temperature sensor is a built-in component that measures the temperature and pressure of air inside the intake manifold. The injection control unit uses both items of information to define the amount of air taken in by the engine. This information is then used to compute injection time and ignition point. The sensor is fitted to the inlet manifold.

### Self-diagnosis and recovery

The self-diagnostic system monitors both sensor output signals.

It identifies the following for both signals:

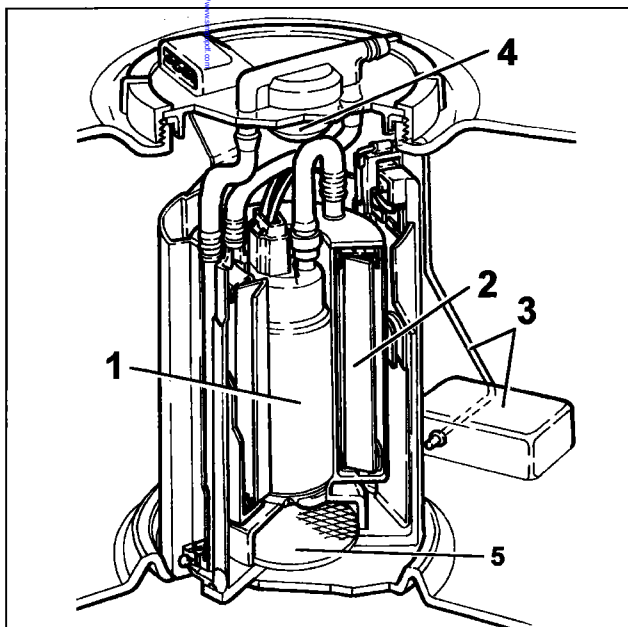
- Short circuit to earth.
- Short circuit to positive and reference voltage.
- Circuit open/broken.

When the sensor pressure signal is cut off, the throttle potentiometer signal and engine rpm signals are used to computer injection time and ignition point. The injection control unit processes these signals to reconstruct the missing signal. If the air temperature sensor fails, the injection control unit uses the last reading as a recovery value or, if the fault is present when the engine is started, it uses a fixed value of 45°C and mixture self-adaptation is disabled.

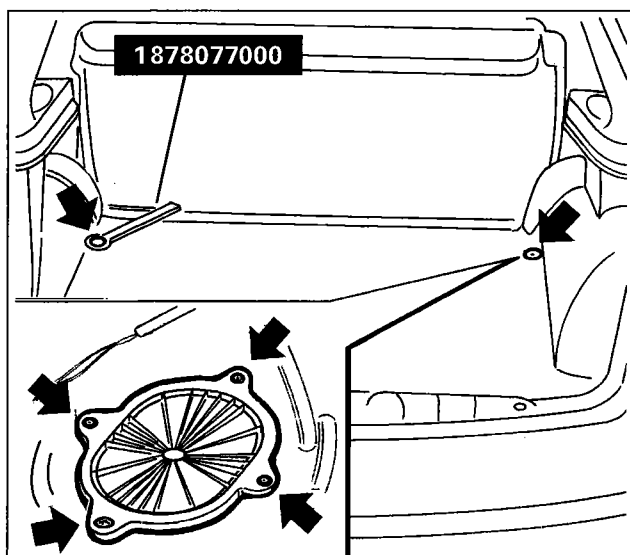
If the pressure sensor faults, a fixed value of 1024 mBars is used.

| Temperature (°C) | Resistance (Ω) |
|------------------|----------------|
| -40              | 49933 ± 13.6%  |
| -20              | 15701 ± 10.8%  |
| 0                | 5959 ± 8.5%    |
| 10               | 3820 ± 7.4%    |
| 20               | 2509 ± 6.5%    |
| 25               | 2051 ± 6.0%    |
| 30               | 1686 ± 6.0%    |
| 40               | 1157 ± 5.9%    |
| 50               | 810 ± 5.8%     |
| 60               | 578 ± 5.7%     |
| 80               | 309 ± 5.5%     |
| 100              | 176 ± 5.4%     |

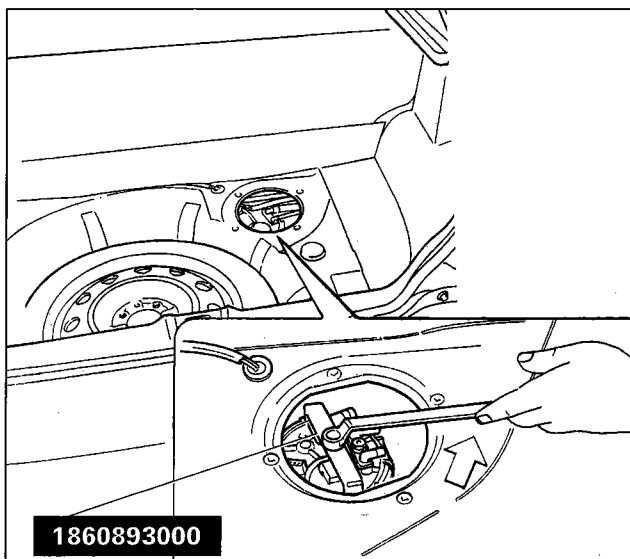




P4A39IJ01



P4A39IJ02



P4A39IJ03

### **ELECTRIC FUEL PUMP (ESS 291)**

The electric pump assembly basically comprises:

- an electric fuel pump (1);
- a fuel filter (2);
- a float type level indicator (3);
- a diaphragm pressure regulator (4);
- a mesh prefilter (5).

The fuel pump is of the single-stage type with peripheral flow, with high performance under low voltage and temperature conditions. The advantages compared with pumps which operate on the positive-displacement principle are its lighter weight and small dimensions.

### **Removing-refitting electric fuel pump**

The electric pump is located in the tank; to remove it:

Remove the attachment buttons (arrowed) using tool 1878077000.

Lift the boot carpet.

Undo the screws (arrowed) and remove the dust cover.

Disconnect the wiring connection for the pump and fuel gauge sender unit.

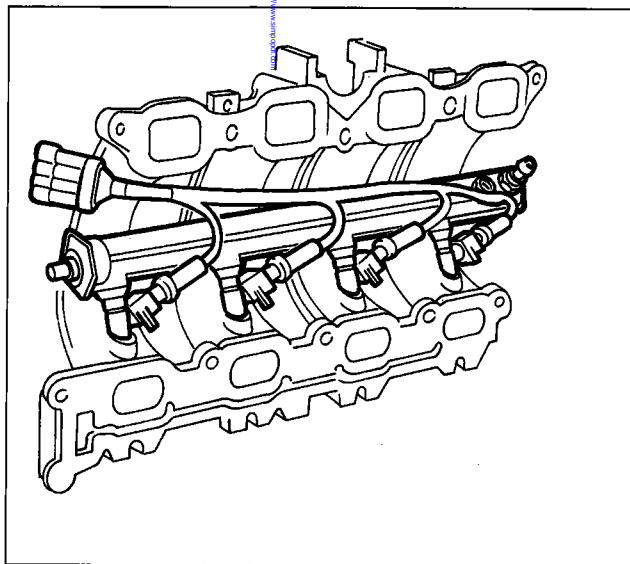
Disconnect the fuel delivery pipe.

Undo the ring nut securing the fuel pump to the tank using tool 1860893000 and a ring spanner.

Remove the electric fuel pump assembly.



## 10.

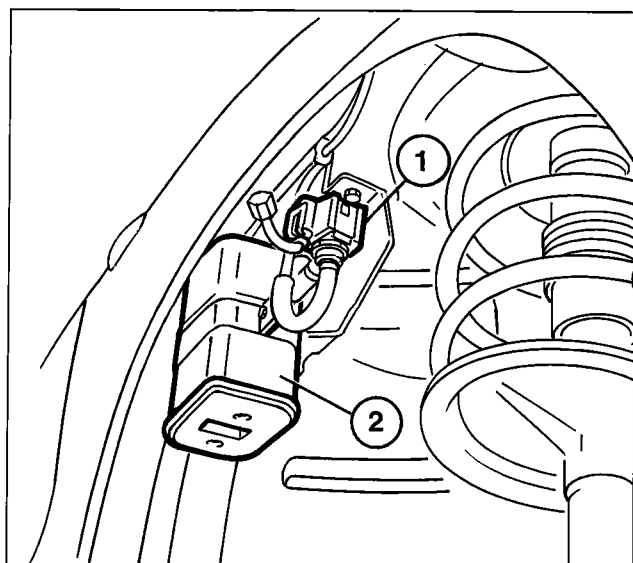


### FUEL MANIFOLD (CB 168)

The fuel manifold is secured to the inside of the inlet manifold, and its function is to send fuel to the fuel injectors.

The fuel manifold is die-cast aluminium and it comprises the seats for the fuel injectors.

The fuel inlet comprises a tapered sealing screw.

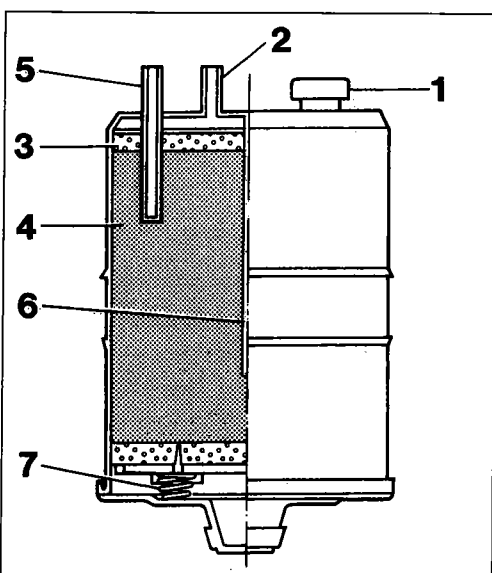


### CHARCOAL FILTER AND FUEL VAPOUR CUT-OFF VALVE

These components form part of the fuel vapour anti-evaporation and recycling system. They are located in the right wheelarch, and to access them the rear section of the trim in the front right wheelarch should be removed.

1. Fuel vapour cut-off solenoid

2. Charcoal filter



### Charcoal filter

This consists of charcoal granules (4) which retain the fuel vapours entering through the connection (5).

The scrubbing air which enters through the connection (1), passing through the paper filter (3), envelops the charcoal granules, removing the petrol vapours and conveying them towards the outlet (2) and then to the cut-off valve.

The air, which comes in through the connection (5), can also be recalled by the vacuum in the tank, so ventilating it. The partition (6) ensures that the scrubbing air drawn in envelops all the charcoal granules, encouraging the release of petrol vapours to the inlet manifold.

There are also two springs (7) which allow expansion of the mass of granules when the pressure increases.

### Fuel vapour cut off solenoid (EC1)

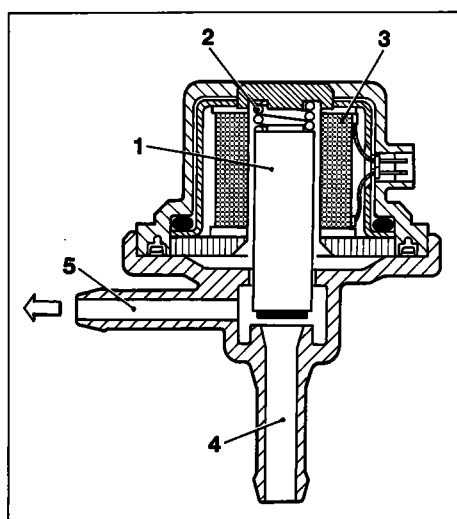
The function of this valve is to control, via the fuel injection-ignition electronic control unit, the quantity of fuel vapours drawn in by the activated charcoal filter and directed to the inlet manifold.

If there is no supply, this valve is in the closed position, preventing the fuel vapours from making the mixture excessively rich.

Its operation is controlled by the electronic fuel injection-ignition as follows:

- during starting, the solenoid remains closed, preventing the fuel vapours from making the mixture too rich; this condition remains until the coolant reaches a pre-established temperature (about 65 °C)
- with the engine up to temperature, the electronic control unit sends a square-wave signal to the solenoid, which modulates aperture depending on the full/empty ratio of the signal.

In this way the control unit controls the quantity of fuel vapours sent to the inlet manifold, thus avoiding significant changes in mixture strength.



P4A41IJ01

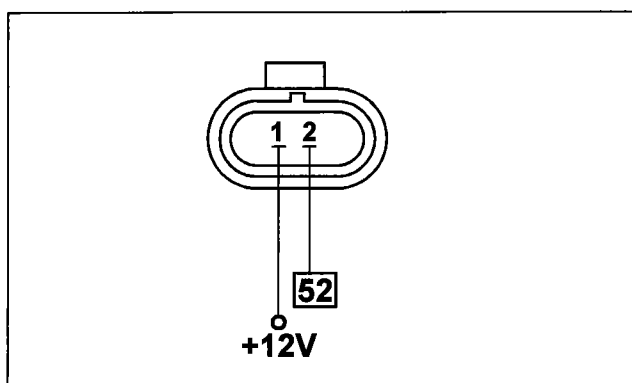
In the operating conditions listed below:

- throttle in idle position
- engine speed below 1500 rpm
- bottom inlet manifold pressure at a limit value calculated by the control unit in accordance with the rpm

the solenoid control is inhibited, and the solenoid is kept in the closed position, to improve engine operation.

### Longitudinal section of fuel vapour cut-off valve

1. Valve core.
2. Counter spring.
3. Magnetic winding.
4. Pipe connected to inlet manifold.
5. Pipe connected to activated charcoal filter.



P4A41IJ02

### Wiring connector

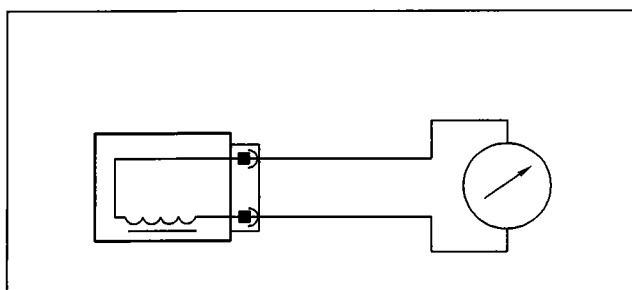
The numbers in boxes indicate the corresponding control unit pins.

### Recovery

Solenoid control is inhibited.

Self-adaptivity of fuel vapour recirculation is inhibited.

Self-adaptivity of mixture strength is inhibited.



P4A41IJ03



### Checking the resistance

The solenoid's resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the figure.

**Resistance: 17.5 - 23.5 ohm to 20 °C**

# 10.

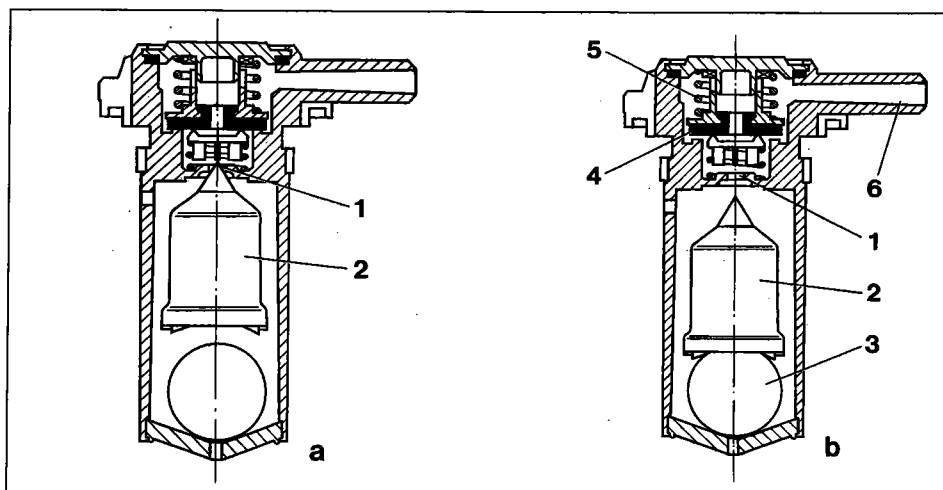
## MULTI-FUNCTION VALVE (SIRIO 0175.00)

This valve is used for carrying out various functions, such as:

- prevent the passage of liquid fuel, when the tank is too full or if the vehicle overturns in an accident;
- permit the venting of fuel vapours towards the activated charcoal filter;
- permit ventilation of the tank if it contains a vacuum.

The valve consists of a float (2), a heavy ball (3), a plate (4) pushed home against the valve body by the spring (5), a shim (8) pushed home against the plate (4) by the spring (9). The operation of the multi-function valve may be summarized in the following cases, depending on how full the fuel tank is:

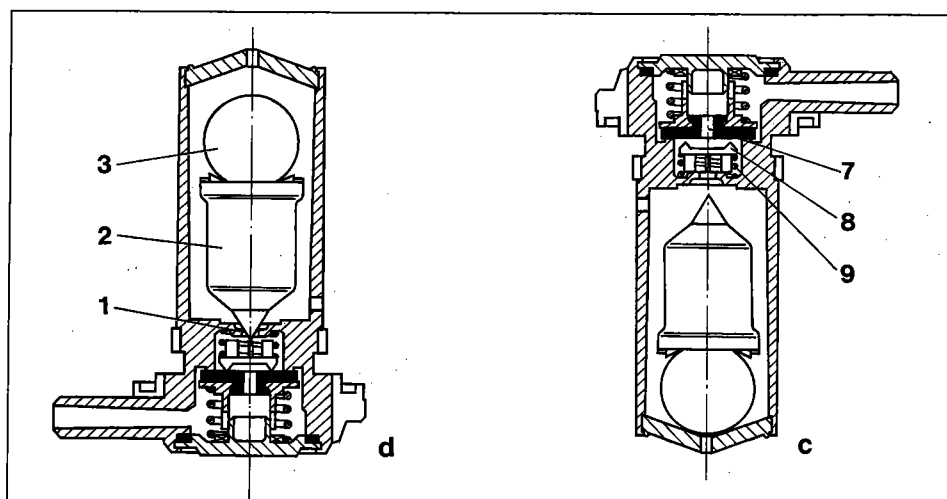
- a. if the tank is full, the float (2) blocks the hole (1), preventing the liquid fuel from reaching the activated charcoal filter, thus preventing damage to the latter;
- b. if the fuel level falls, the float (2) descends and rests on the ball (3), opening the hole (1); when the pressure exerted by the fuel vapours on the plate (4) exceeds the load of the spring (5), a ring-shaped gap opens between the plate and the valve casing, which allows the fuel vapours to emerge from the pipe (6) and reach the activated charcoal filter;



P4A42IJ01

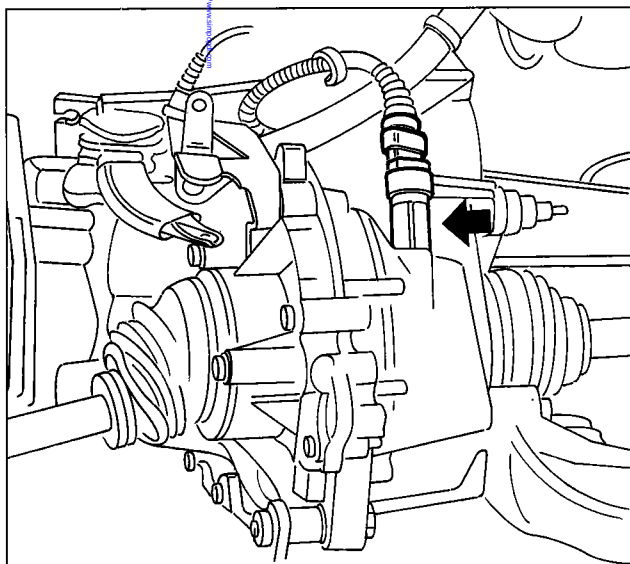
P4A42IJ02

- c. if the reduction in fuel level in the tank is such that it creates a vacuum in the tank, this vacuum acts on the plate (8) and, overcoming the load on the spring (9), recalls it downwards, allowing the tank to ventilate through the hole (7);
- d. if the vehicle overturns, however full the tank is, the ball (3), weighing down on the float (2), pushes the latter against the hole (1), preventing dangerous leakage of fuel and resulting risk of fire.



P4A42IJ03

P4A42IJ04

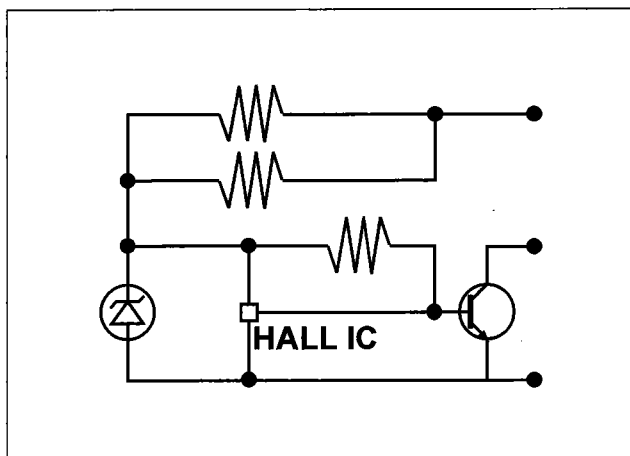


P4A43IJ01

### VEHICLE SPEED SENSOR (SOGECO)

The sensor is positioned at the differential output, near the left drive shaft coupling, and it transmits to the control unit the vehicle speed information: the signal is also used for the operation of the speedometer.

The sensor is of the Hall-effect type (see "timing sensor" sub-section), and transmits 16 pulses/revolution; thus the vehicle speed can be obtained on the basis of the pulse frequency.



P4A43IJ02



### Removing - refitting

Disconnect the wiring connection and remove the sensor.



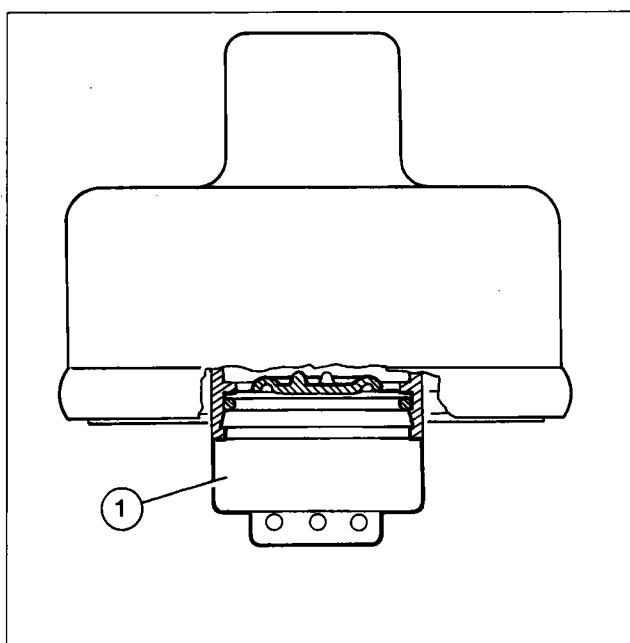
**Tightening torque 0.8 daNm**

### Wiring diagram

### SAFETY AND VENTILATION VALVE

This valve is located in the fuel filler and it performs the following functions depending on the pressure in the tank:

- When the pressure inside the fuel tank exceeds 0.13 - 0.18 bar, it discharges the surplus vapours to the outside (safety function).
- If instead there is a vacuum in the tank of 0.020 - 0.030 bar, it allows air to enter (ventilation function).



P4A43IJ03

## 10.

### FUEL INJECTORS (IWP 064)

The fuel injectors are of the double jet "top-feed" type (with spray angled in relation to the injector axis). They are specific to engines with 4 valves per cylinder, and enable the jets to be directed towards the two inlet valves.

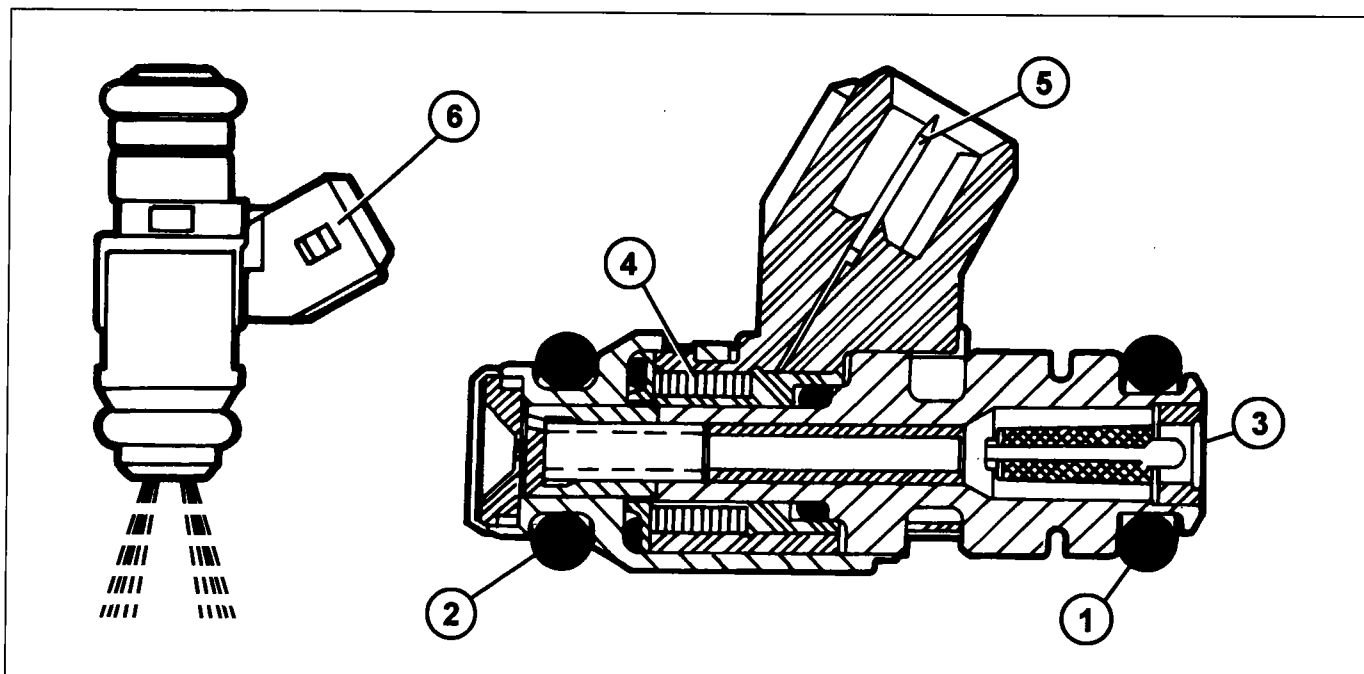
The jets of fuel at a differential pressure of 3 bar emerge from the injector, are instantly atomized and form two propagation cones.

The control logic of the injectors is of the "phased sequential type"; in other words the four injectors are driven in accordance with the intake sequence of the engine's cylinders, while delivery may start for each cylinder at the expansion stage up until the intake stage already started.

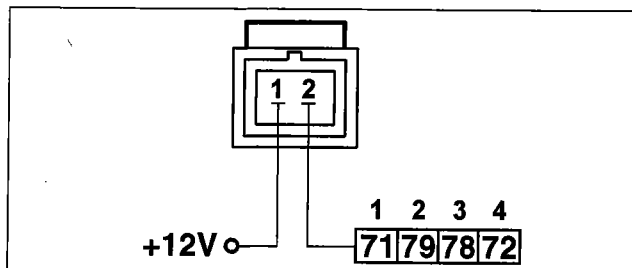
The injectors are fixed by the fuel manifold, which presses them into their seatings in the inlet pipes. They are also anchored to the fuel manifold by means of "safety stops". Two Viton rubber rings (1) and (2) ensure the seal on the inlet pipe and fuel pipe.

The fuel is supplied from the top (3) of the injector, whose body contains the winding (4) connected to the terminals (5) of the wiring connector (6).

**NOTE** During removal and refitting, do not apply stresses exceeding 120 N on the connector (6) of the injector in order not to impair its operation.



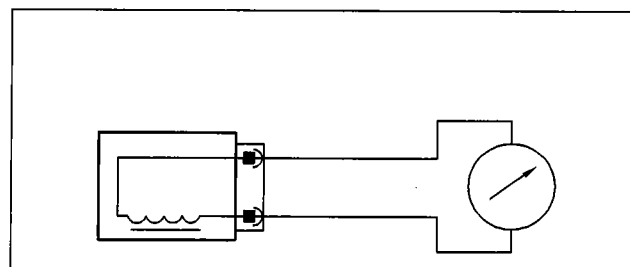
#### Wiring connector



P4A44IJ02

**NOTE** The numbers in boxes indicate the corresponding control unit pins positioned in the order of cylinder numbers.

#### Check the resistance

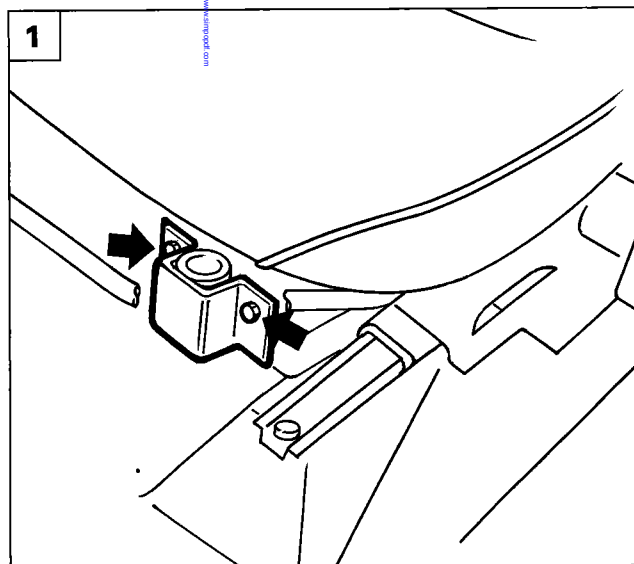


P4A44IJ01

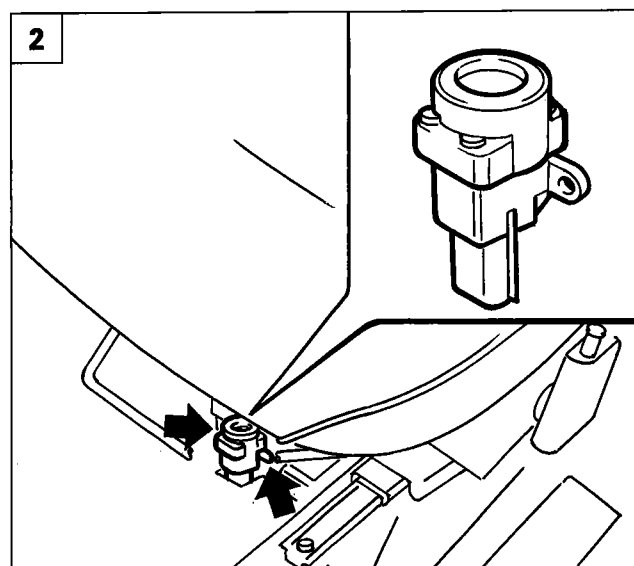
P4A41IJ03

The injector's resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the figure.

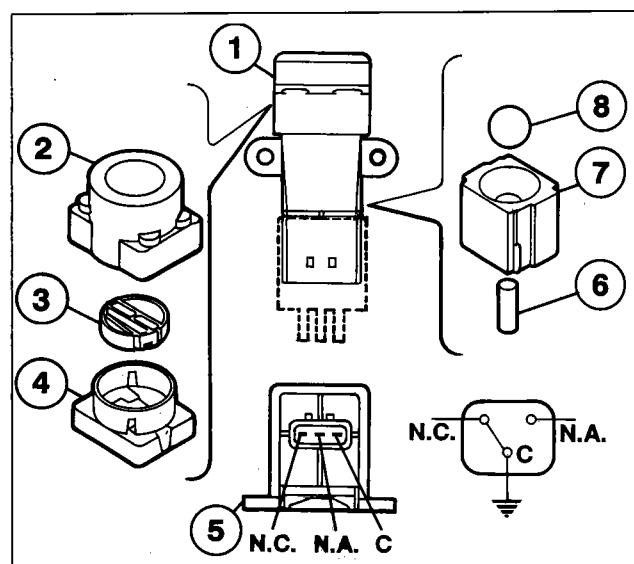
**Resistance: 13.7 - 15.2 ohm at 20 °C**



P4A45IJ01



P4A45IJ02



P4A45IJ03



## INERTIAL SAFETY SWITCH



In order to increase the safety for the vehicle's occupants in a crash, the car has an inertial switch located in the interior compartment under the driver's seat.

This sensor reduces the possibility of fire (caused by fuel leaking from the fuel injection system) by disabling the fuel pump which feeds the injection circuit.

The switch consists of a steel ball mounted in a housing (conical seating) and held in position by the force of attraction of a permanent magnet.

In the event of a violent crash of the vehicle, the ball is released from the magnetic stop and it opens the normally closed (N.C.) electrical circuit, interrupting the earth connection of the fuel pump and consequently the feed to the fuel injection system.



To restore the fuel pump's earth connection, push back the seat and press on the switch until you hear it engage.

## Removing-refitting

1. Push the driver's seat back fully, undo the bolts indicated and remove the plastic cover.
2. Undo the bolts indicated, disconnect the wiring connection and remove the switch.



*After a crash, even if apparently minor, if the smell of fuel is perceived or there are leaks from the fuel system, do not reset the switch until you have found and eliminated the fault, in order to avoid the risk of fire.*

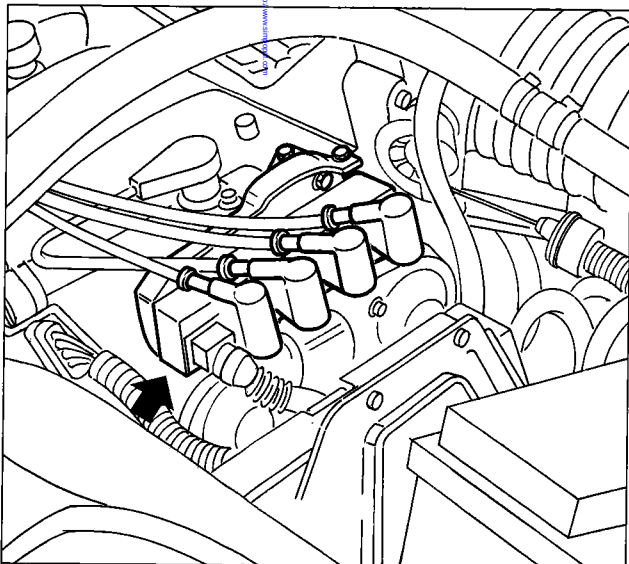
## Components constituting the inertial switch

1. Complete inertial switch
2. Sheath
3. Button
4. Top
5. Engagement side
6. Permanent magnet
7. Permanent magnet seating
8. Steel ball

C= Shared terminal  
N.C. Normally closed  
N.A. Normally open



# 10.

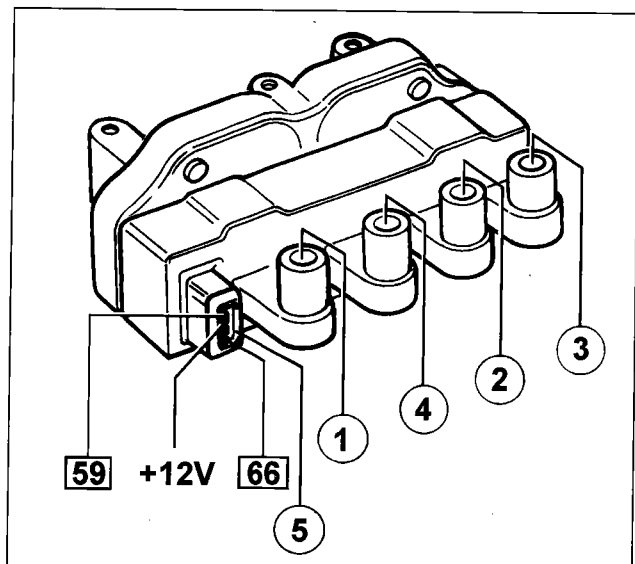


P4A46IJ01

## IGNITION COILS (Bae 920A) (Beru 0.040.100.029)

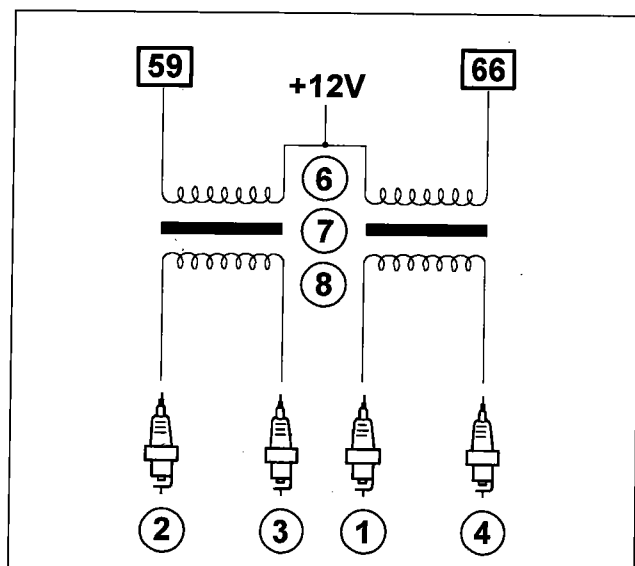
The coils are bracketed onto the camshaft covers; they are of the closed magnetic circuit type, formed by a segment pack whose central core, broken by a thin gap, carries both windings.

The windings are located in a moulded plastic container and encapsulated in an epoxy resin and quartz compound which gives them exceptional dielectric, mechanical and thermal properties, as they can withstand high temperatures. The vicinity of the primary to the magnetic core reduces magnetic flow losses, ensuring maximum connection to the secondary.



P4A46IJ02

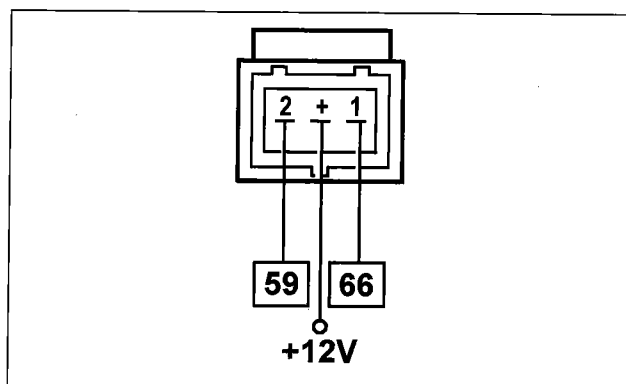
1. H.T. connector for cylinder 1 plug
2. H.T. connector for cylinder 2 plug
3. H.T. connector for cylinder 3 plug
4. H.T. connector for cylinder 4 plug
5. L.T. connector for control unit connection
6. Primary circuit
7. Gap
8. Secondary circuit



P4A46IJ03

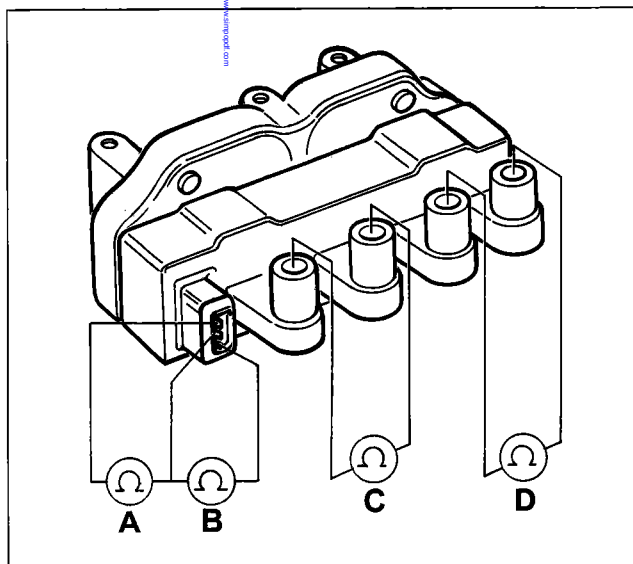
## Wiring connector

**NOTE** The numbers in boxes indicate the corresponding control unit pins.



P4A46IJ04





P4A471J01



### Checking winding resistance

#### Primary circuit (A cylinders 1-4, B cylinders 2-3)

Place the leads of an ohmmeter in contact with the positive terminal (central pin) and negative terminal (pin 1 for circuit A and pin 2 for circuit B).

The resistance of the primary circuit read on the instrument must be between 0.44 and 0.53 ohm at 23°C.

#### Secondary circuit (C cylinders 1-4, D cylinders 2-3)

Connect the leads of an ohmmeter between the two high-tension output terminals.

The resistance of the secondary circuit read on the instrument must be between 4500 and 5500 ohm at 23 °C.



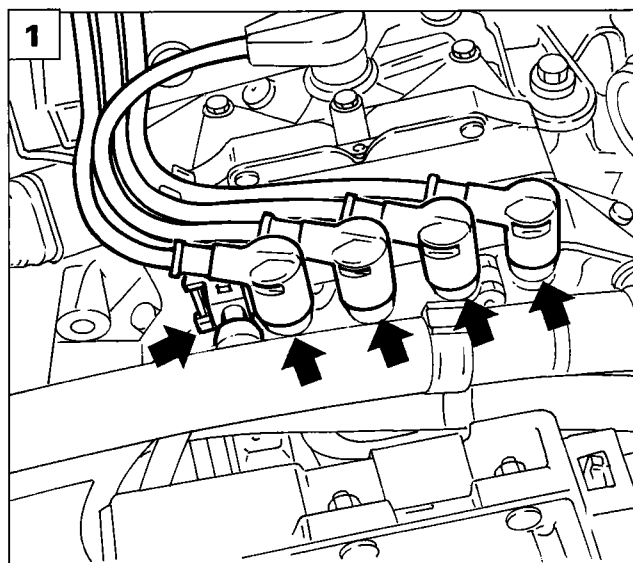
### Recovery

Inhibition of the injectors corresponding to the cylinders where there is no ignition.

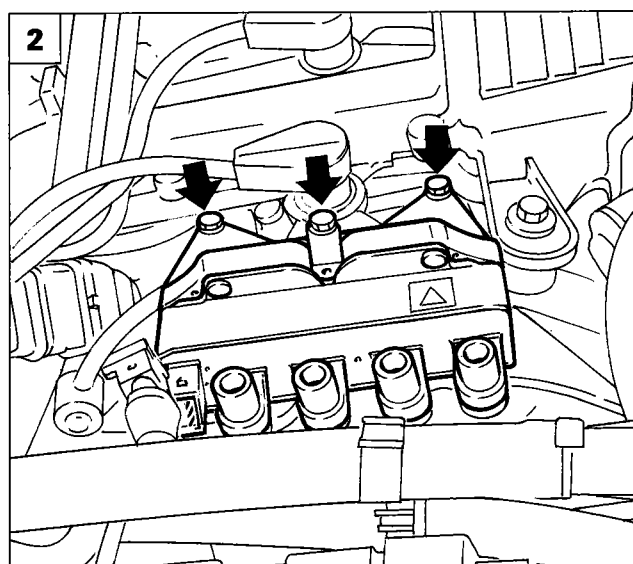
Open-loop check of mixture strength.

If there is a short circuit to positive, the command in progress is disabled and there is a retry.

In the case of open circuit or short circuit to earth, a fixed charge time is assumed.



P4A471J02



P4A471J03



### Removing refitting

1. Disconnect the high-tension cables and wiring connector from the ignition coils assembly.
2. Undo the bolts (arrowed) and remove the ignition coils.

## 10.

### LAMBDA PROBE (NTK 0ZA334-A1)

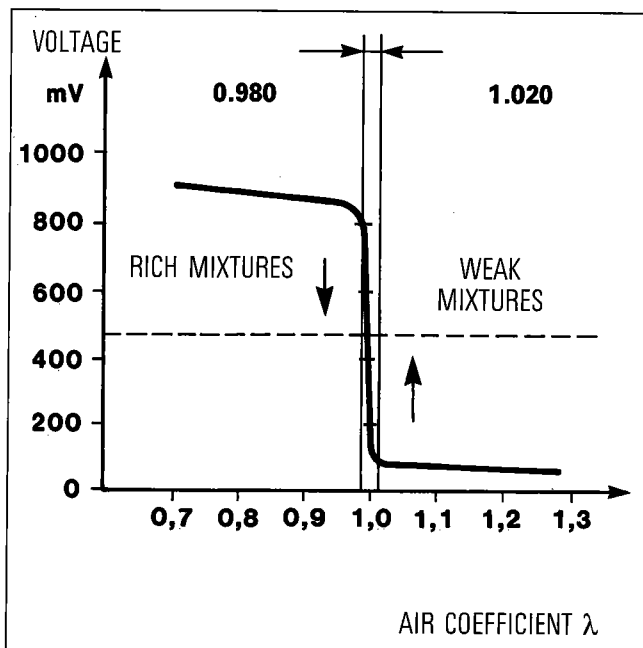
This is the sensor which measures the oxygen content in the exhaust gases.

The sensor's output signal is sent to the electronic control unit to adjust the air-petrol mixture, in order to maintain the mixture's stoichiometric ratio as close as possible to the theoretical value.

To obtain an optimum mixture, the quantity of fuel injected must be as close as possible to the theoretical quantity which would be required to be fully burnt in relation to the quantity of air drawn in by the engine.

In this case the Lambda ( $\lambda$ ) factor is 1; in fact:

$$\lambda = \frac{\text{QUANTITY OF AIR DRAWN IN}}{\text{QUANTITY OF THEORETICAL AIR REQUIRED TO BURN ALL THE INJECTED FUEL}}$$



P4A48IJ01

$\lambda = 1$  Ideal mixture

The CO is within legal limits

$\lambda \geq 1$  Weak mixture

Excess air; the CO tends to be low

$\lambda \leq 1$  Rich mixture

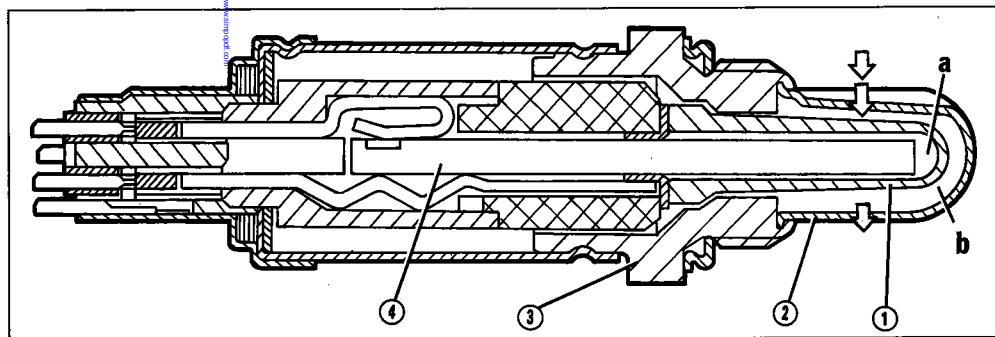
Lack of air; the CO tends to be high

**NOTE** While the coefficient  $\lambda$  expresses the excess or shortfall of air supplied to the engine in relation to the value theoretically required, the air-petrol mixture is a ratio between these two substances which, combined together, react chemically. For today's engines, this means that they require 14.7-14.8 parts of air to burn 1 part petrol.

The probe is mounted upstream of the catalytic converter.

This consists of a ceramic casing (1) based on zirconium dioxide, covered with a thin layer of platinum closed at one end, inserted in a protective pipe (2) and housed in a metal casing (3), which provides further protection and permits assembly onto the exhaust manifold. The outer part (B) of the ceramic is exposed to the exhaust gas current, while the inner part (A) communicates with the ambient air.

The operation of the probe is based on the fact that at temperatures exceeding 300°C, the ceramic material becomes a conductor of oxygen ions. Under these conditions, if the quantity of oxygen on the two sides (A and B) of the probe is in different percentages, a voltage variation between the two ends is generated, which is an indicator of the difference in quantity of oxygen in the two environments (air side and exhaust gas side).



P4A49IJ01

- a. Electrode (+) in contact with the external air
- b. Electrode (-) in contact with the exhaust gases
- 1. Ceramic casing
- 2. Protective pipe
- 3. Metal casing
- 4. Heating element

When the probe provides a low voltage level (below 200 mV), the control unit recognizes that the mixture strength is weak ( $\lambda \gg 1$ ) and increases the quantity of fuel injected. When the probe provides a high voltage level (over 800 mV), the control unit recognizes that the mixture strength is rich ( $\lambda \ll 1$ ) and reduces the quantity of fuel injected.

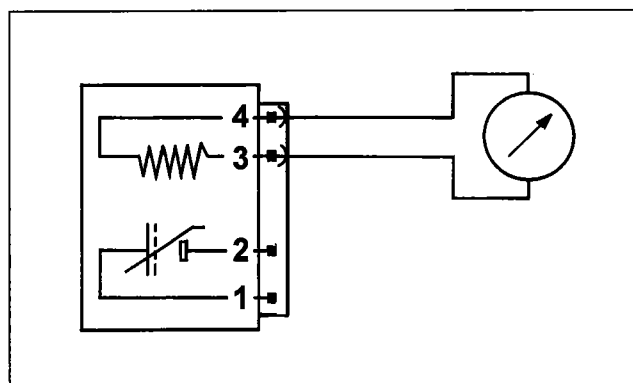
The Lambda probe thus varies the injection times so that the engine operates with a Lambda coefficient constantly fluctuating between about 0.980 and 1.020.

For temperatures below 300°C the ceramic material is not active, so the probe does not send usable signals and a particular circuit present in the control unit blocks the closed loop adjustment of the mixture strength during the warming up of the probe.

To ensure that operating temperature is quickly reached, the probe has a heating element (4) supplied by the battery.



*The probe can be quickly put out of service by even small quantities of lead in the fuel.*



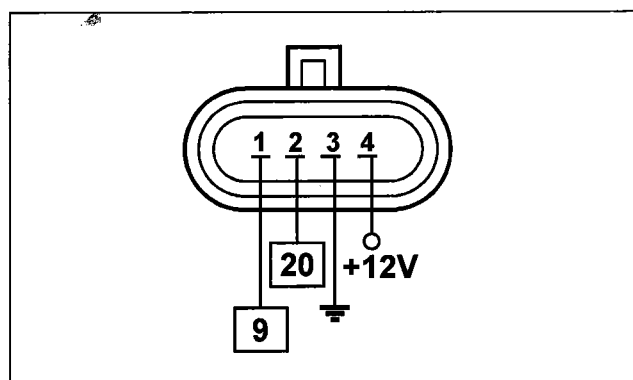
P4A49IJ02



### Checking the resistance

The resistance of the heater and probe can be measured by disconnecting the connector and connecting an ohmmeter as shown in the figure.

**Heater resistance = 4.3 - 4.7 ohm**



P4A49IJ03

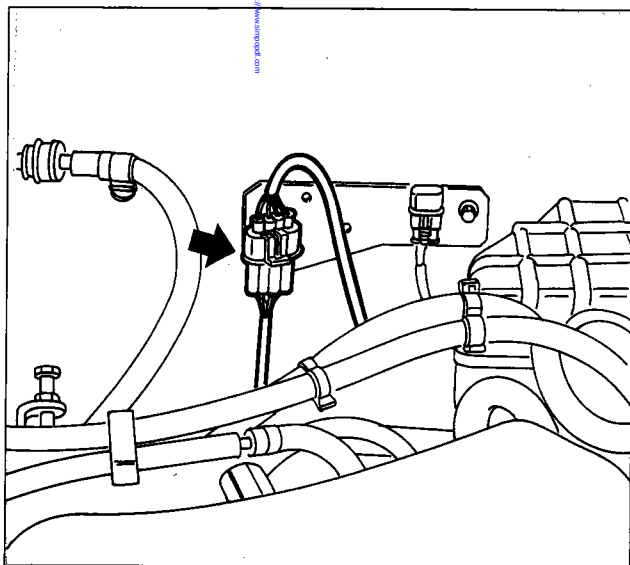
### Recovery

The Lambda data are ignored (open loop).

### Wiring connector

The numbers in boxes indicate the corresponding control unit pins.

## 10.

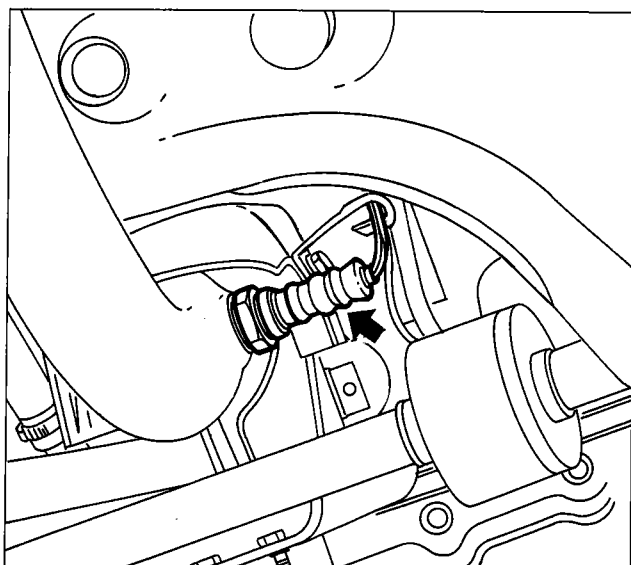


P4A50IJ01



### Removing - refitting lambda probe

- Place the car on ramps.
- Disconnect the battery's negative cable.
- Disconnect the wiring connector installed against the rear wall of the engine compartment.



P4A50IJ02



Remove the Lambda probe from its seating on the exhaust pipe.



When refitting, smear **ANTISEIZE MATERIA-BORON NITRIDE N.G.K. SPARK PLUG CO-LTD.** grease on the threaded part.



**Tightening torque 3.5 - 4.5 daNm**

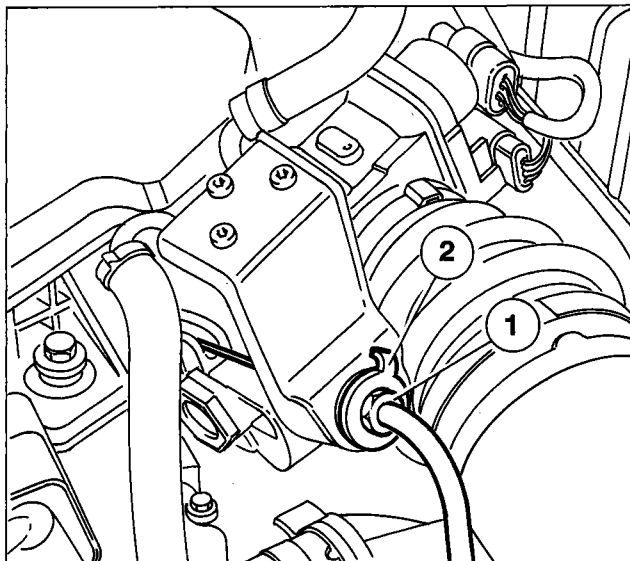
**CHECKS - ADJUSTMENTS AND REPAIRS ON THE FUEL INJECTION/IGNITION**



**THE FOLLOWING INSTRUCTIONS SHOULD BE FOLLOWED WHEN WORKING ON A CAR FITTED WITH I.A.W. FUEL INJECTION-IGNITION:**

- do not start the engine when the electrical connectors are connected incorrectly or are loose on the battery terminals;
- do not use a fast battery charger to start the engine;
- never disconnect the battery from the on-board network with the engine running;
- to fast charge the battery, first disconnect the latter from the on-board network;
- if the car is placed in a drying oven after painting at temperatures exceeding 80°C, remove the fuel injection-ignition electronic control unit;
- do not connect or disconnect the control unit's multi-connector with the ignition on;
- always disconnect the battery negative before carrying out electric arc welding on the car.

*Remember that this system has a permanently supplied memory which stores the learnt self-adaptivity values of the engine idle speed actuator. Disconnecting the battery will lead to the loss of this information, so should be done as little as possible.*



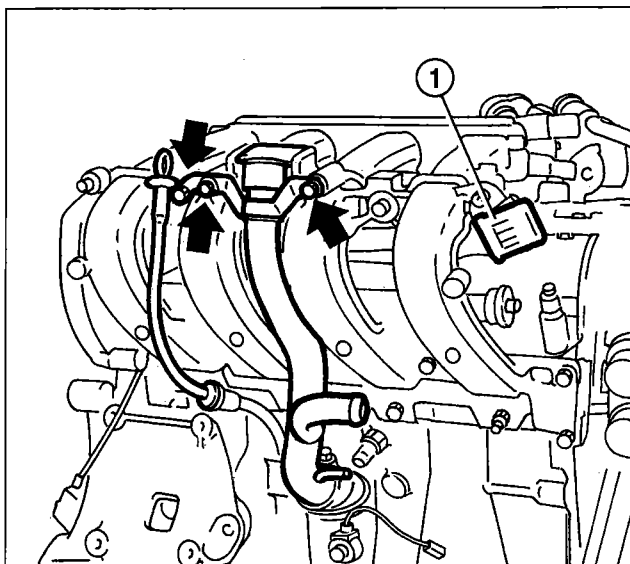
P4A51IJ01



**ADJUSTING THROTTLE CABLE**

The throttle cable is adjusted by undoing the nut (1) and moving the clip (2).

Position the clip (2) so that the head of the throttle cable enters freely in the slot without changing the idle speed, then lock the nut (1).



P4A51IJ02

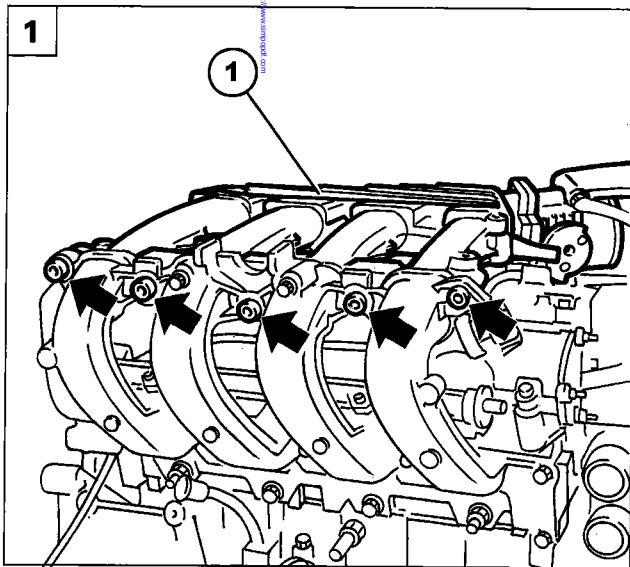


**REMOVING-REFITTING FUEL MANIFOLD AND FUEL INJECTORS**

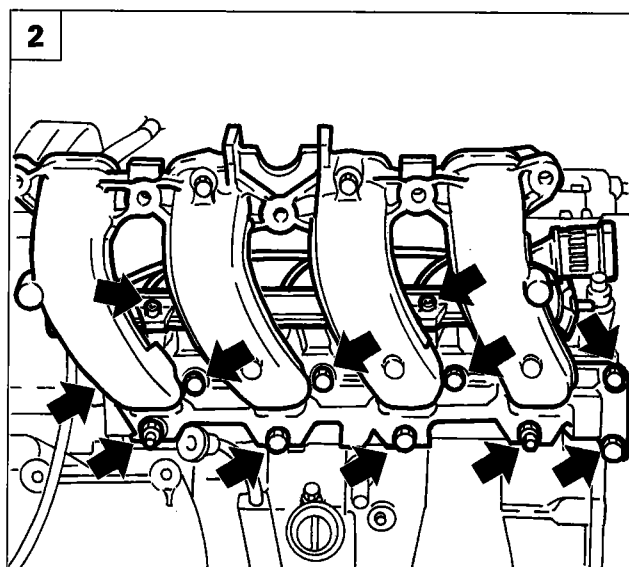


Remove the first section of the oil dipstick and oil filler pipe, then disconnect the injector cable connector (1).

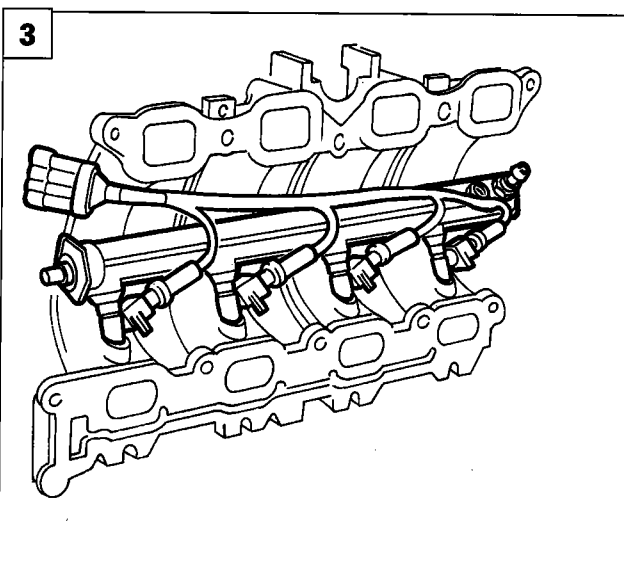
## 10.



P4A52IJ01



P4A52IJ02



P4A40IJ01

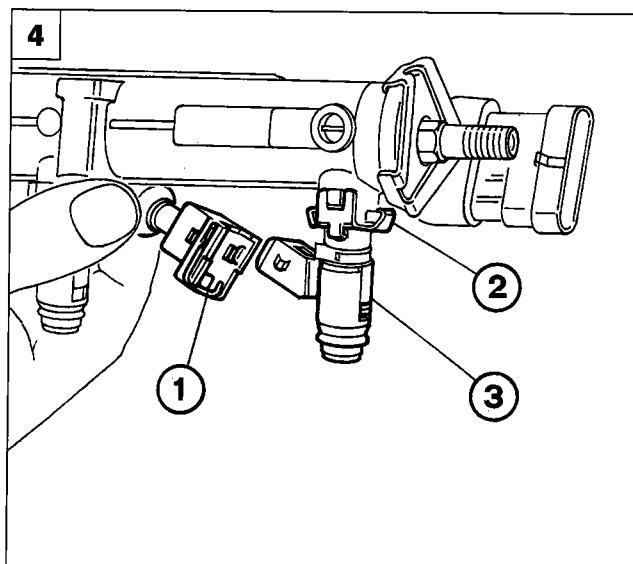


1. Undo the bolts jointing the two sections of the inlet manifold and remove the first section (1).
2. Undo the bolts securing the fuel supply manifold and the bolts securing the second section of the inlet manifold to the engine block, and remove it.
3. Remove the fuel pipe and remove the manifold complete with fuel injectors.
4. Then remove the fuel injectors as follows:
  - Disconnect the electrical connector (1).
  - Remove the safety clip (2).
  - Remove the fuel injector (3), which is a press fit.

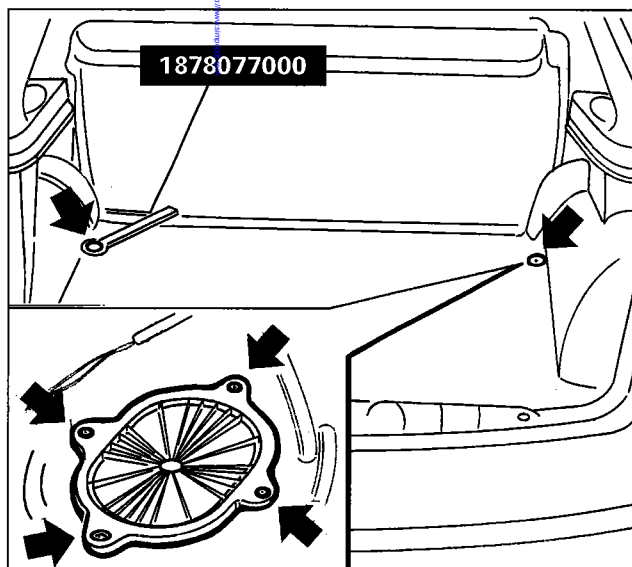


Never pull the electrical connector to remove the injector.

Before refitting, check the condition of the seals.



P4A52IJ03



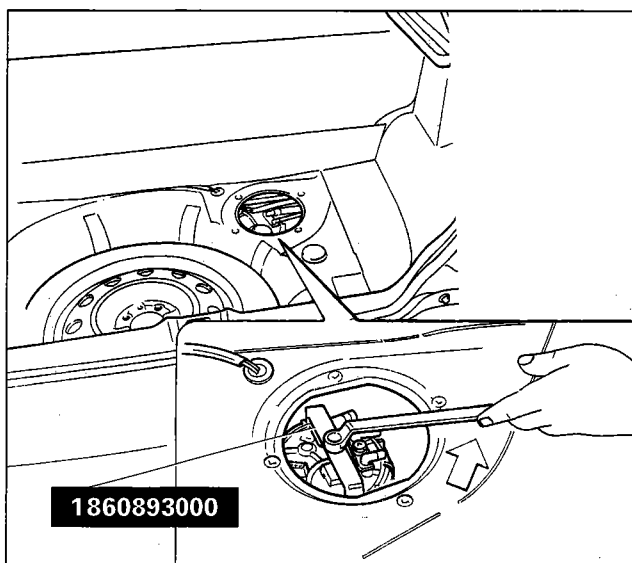
P4A39IJ02



## REMOVING-REFITTING FUEL TANK

Before removing-refitting the tank, drain the fuel, place the car on ramps and disconnect the battery's negative pole. Then proceed as follows:

- Lift the boot trim after removing the retaining buttons using the wrench 1878077000. Remove the protective cover shown in the insert by undoing the attachment screws.

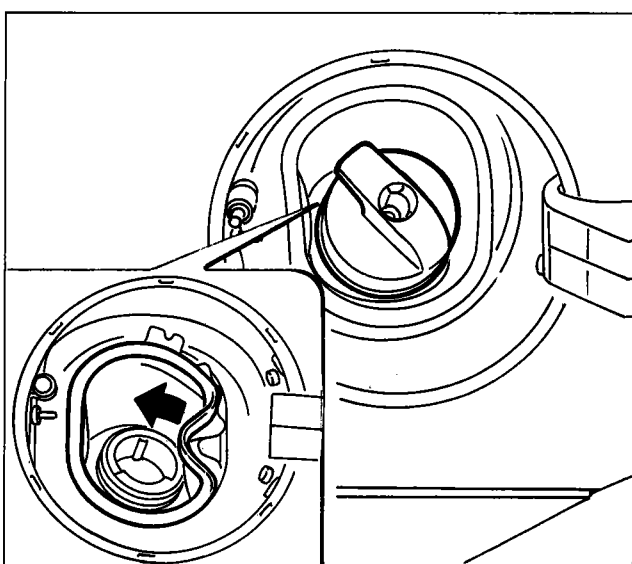


P4A39IJ03



- Disconnect the wiring connections from the pump and fuel gauge sender unit. Disconnect the vent pipe (1) by undoing the retaining nut, and the fuel return pipe (2) and delivery pipe (3) by undoing the retaining clips.

- Undo the ring nut securing the electric pump to the tank using tool 1860893000 together with a ring spanner.



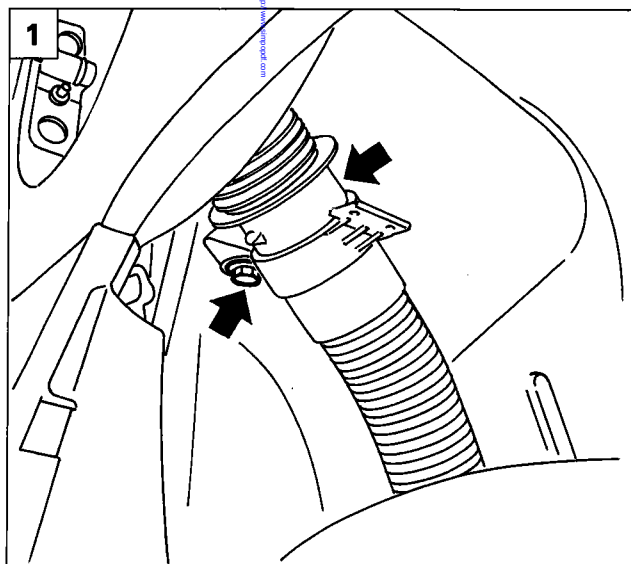
P4A53IJ01



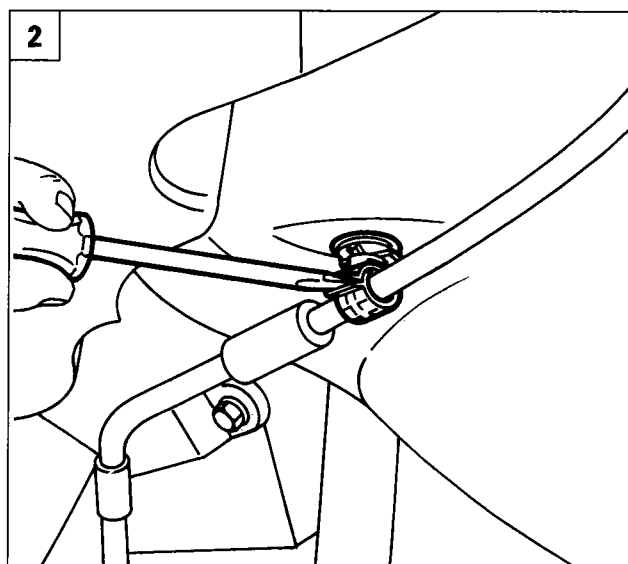
- Undo the cap and remove the fuel filler gaiter from its seating.



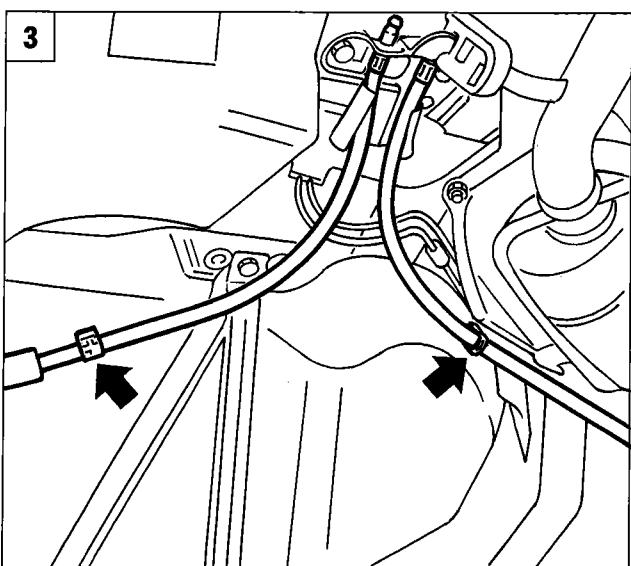
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P4A54IJ02



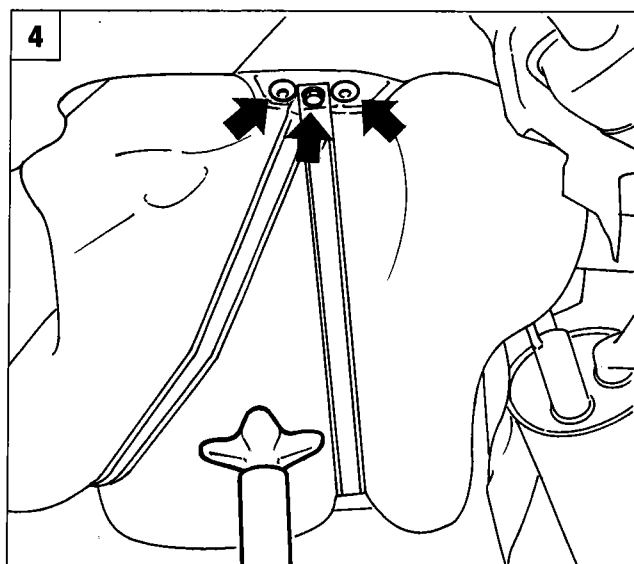
P4A54IJ03



1. Remove the bolt (arrowed) and plug securing the fuel filler to the bodywork.

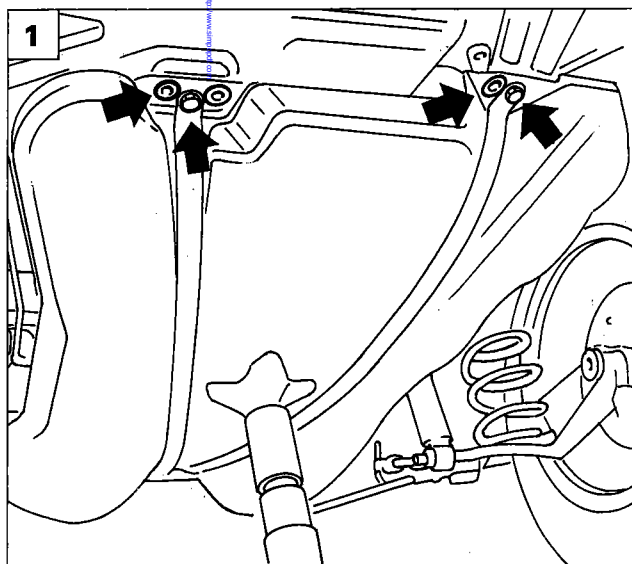
2-3. Open the clips shown by the arrows and release the handbrake cables from the attachments on the fuel tank.

4. Place a suitable hydraulic jack under the tank, to support it during removal-refitting. Then remove the bolt and front plugs securing the tank to the bodywork.

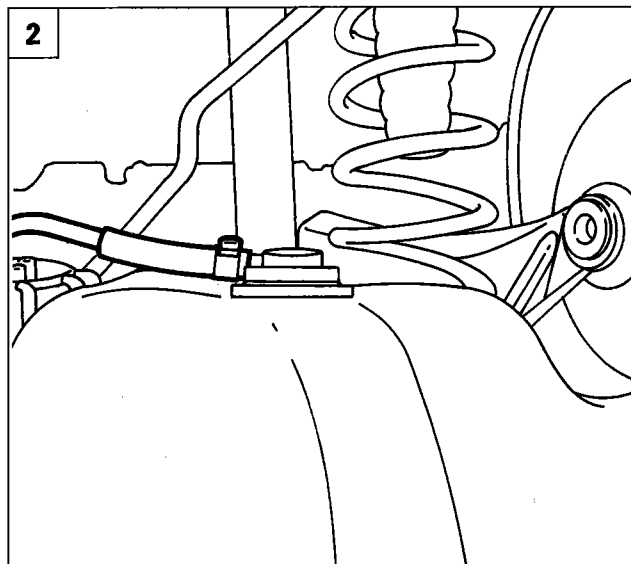


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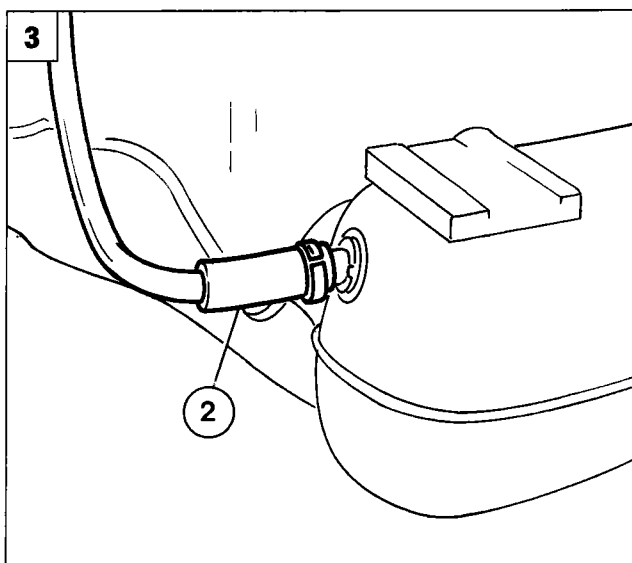
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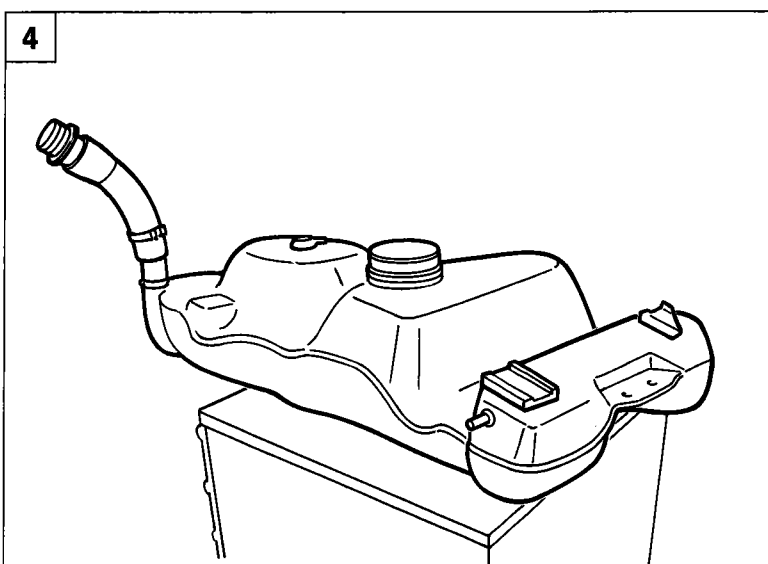
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P4A55IJ03



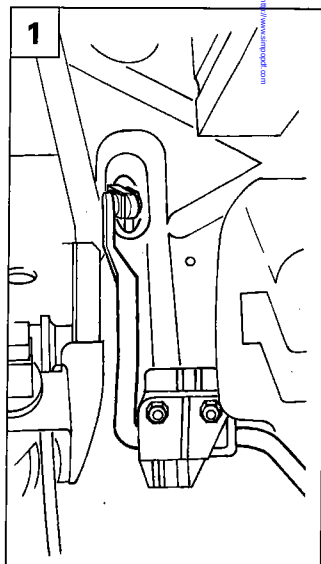
1. Remove the bolts and rear plugs securing the tank to the bodywork.
2. Gradually lower the hydraulic jack, checking that the tank is correctly balanced, then disconnect the fuel vapour recovery pipe.
3. If necessary, also disconnect the vent pipe (2) on the tank.



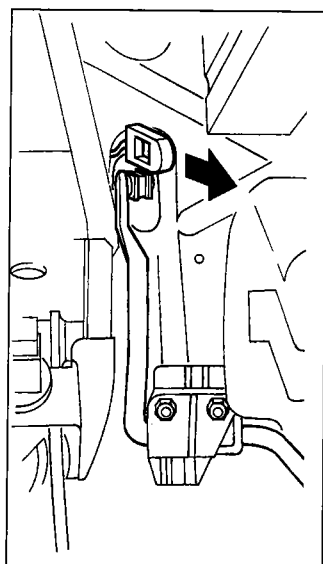
P4A55IJ04

4. Fuel tank.

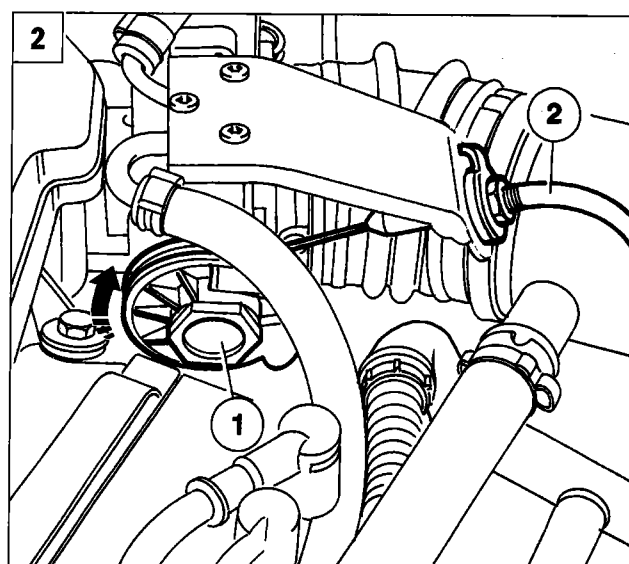
## 10.



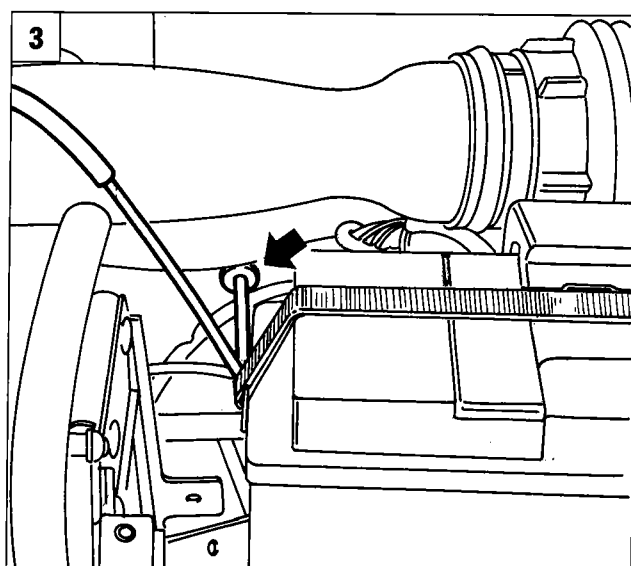
P4A56IJ01



P4A56IJ02



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P4A56IJ04



### REMOVING-REFITTING THROTTLE CABLE

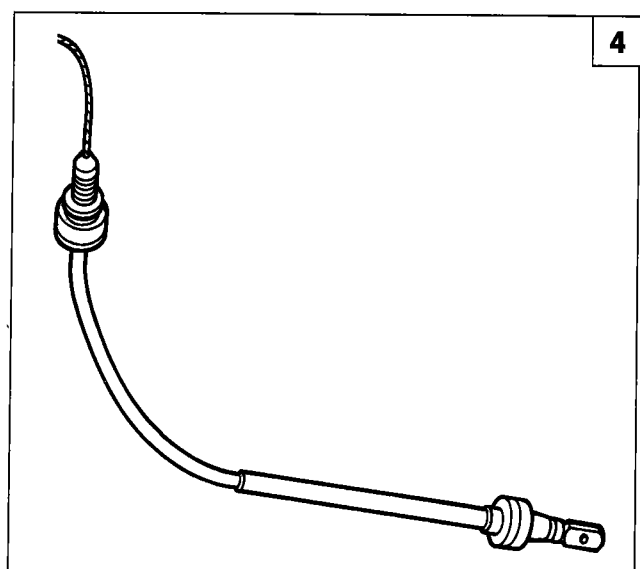
Disconnect the battery lead then proceed as described below:

1. Working from inside the car, disconnect the throttle cable from its attachment on the accelerator pedal.
2. In the engine compartment, rotate the throttle valve lever (1) and disconnect the throttle cable. Then withdraw the cable (2) from the mounting bracket.
3. Withdraw the rubber buffer from the anchorage hole on the bulkhead wall, and withdraw the complete throttle cable.

4. Complete throttle cable.



*When fitting, adjust the throttle cable as described in the "Adjusting throttle cable" section.*



P4A56IJ05

## CHECKING ENGINE IDLE SPEED

If the engine idle speed is not  $850 \pm 50$  rpm, and as the fuel injection-ignition is self adjusting, no adjustments can be made, so it is not necessary to check the correct adjustment of the throttle linkage. Faults should therefore be sought by means of full diagnosis using the Fiat/Lancia Tester.

## CHECKING CONCENTRATION OF POLLUTING EMISSIONS

Via the self-adaptivity of the system, the fuel injection-ignition ensures continuous control of the idle speed and CO level, thus rendering any external adjustment unnecessary (there are no adjustment screws). However, a relative check on the contents of the exhaust gases upstream and downstream of the catalytic converter can give useful information on the operating conditions of the fuel injection-ignition, the engine parameters or the catalytic converter.

### Checking CO and HC concentration during idling upstream of the catalytic converter

To check the concentrations of carbon monoxide (CO) and unburnt hydrocarbons (HC) upstream of the catalytic converter, proceed as follows:

1. Undo the plug or nut located on the exhaust pipe, upstream of the catalytic converter, and screw in the tool.
2. Connect the probe of a suitably calibrated CO tester to the tool.
3. Start the engine and bring it up to temperature.
4. Check that the rpm is correct.
5. Check that the CO concentration during idling is as specified in the table below; if not, check:
  - the correct operation of the Lambda probe using the Fiat/Lancia Tester;
  - the presence of air leaks in the area surrounding the Lambda probe seating;
  - the fuel injection and ignition system (**especially the state of wear of the spark plugs**).
6. Check under the same conditions that the HC concentration is below 600 p.p.m.
7. If these values are not found, tune the engine, checking the following in particular:
  - ignition advance;
  - valve clearances;
  - timing;
  - engine compression.

### Table of tolerances for polluting emissions

|                         | CO (%)      | HC (p.p.m.) | CO <sub>2</sub> (%) |
|-------------------------|-------------|-------------|---------------------|
| Upstream of catalyzer   | 0.4 - 1     | 600         | $\geq 12$           |
| Downstream of catalyzer | $\leq 0.35$ | $\leq 90$   | $\geq 13$           |

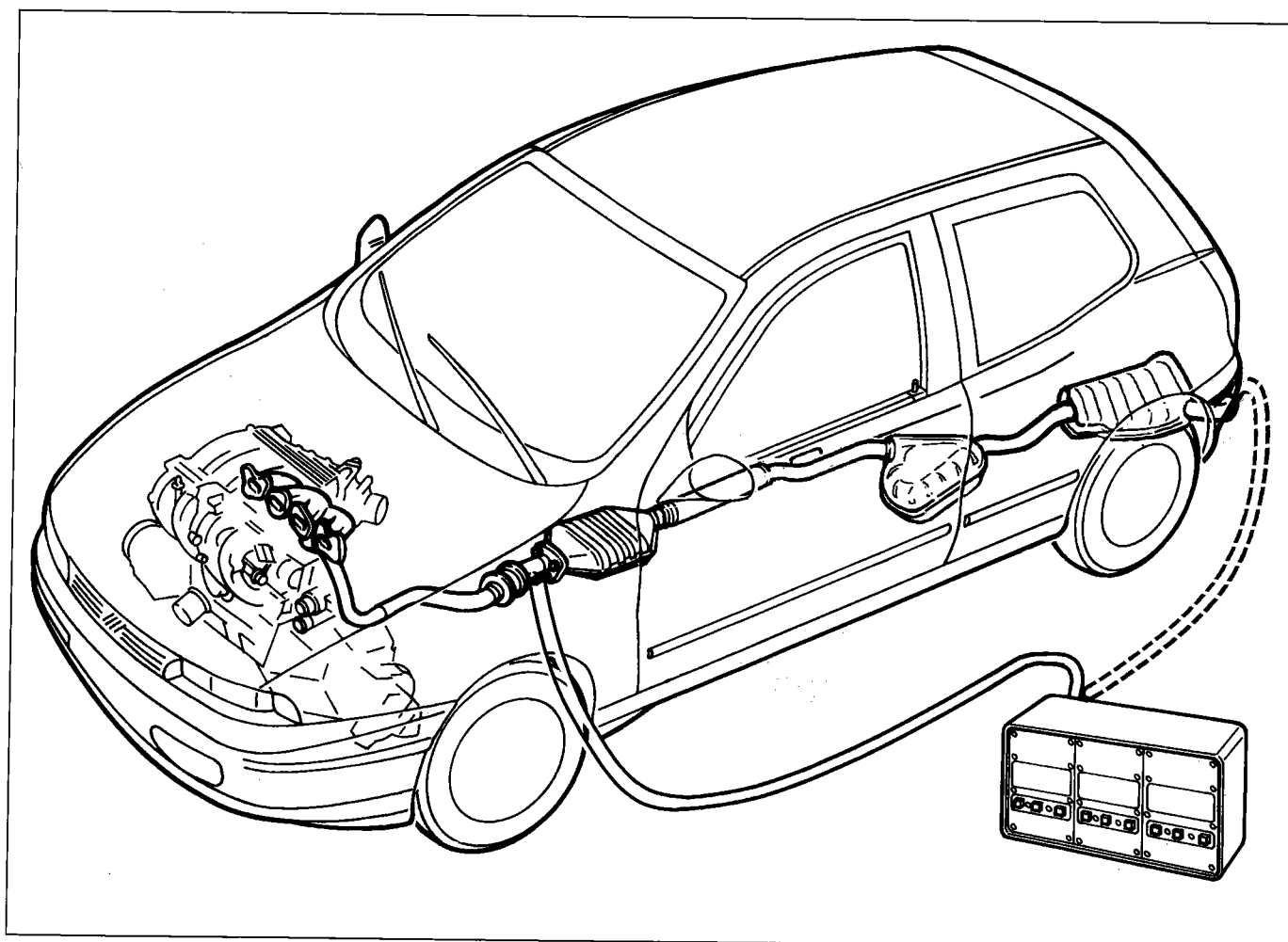
## 10.

### Checking CO and HC concentration in the exhaust

The concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) in the exhaust is measured by inserting the probe of a suitably calibrated CO tester in the end of the exhaust pipe for at least 30 cm, as shown in the figure.

If the shape of the end of the exhaust pipe will not allow the probe to be inserted fully, add an appropriate extension tube which seals properly at the join.

1. Check that the CO and HC concentrations during idling are as specified in the table.
2. If the HC value is outside the specified limit, while the measurement upstream of the catalytic converter was correct, the engine parameters should be considered to be correct, and so the cause of the fault should be sought in reduced efficiency of the catalytic converter.

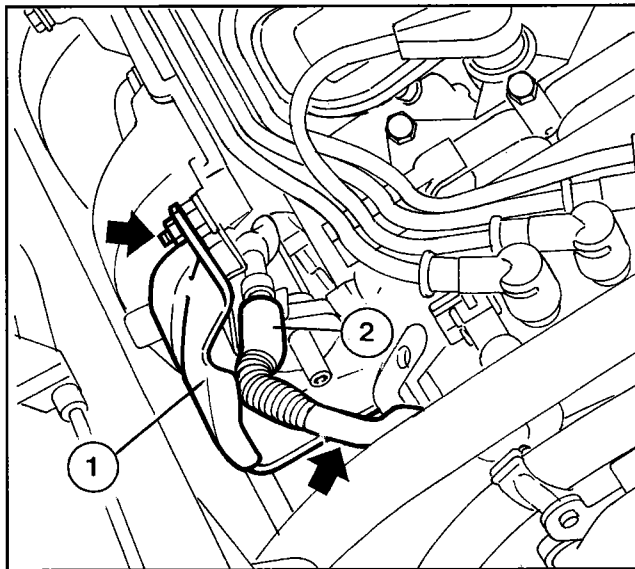


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**Bravo- B**  
**1998 range**

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**CHECKS TO**



4A59IJ01

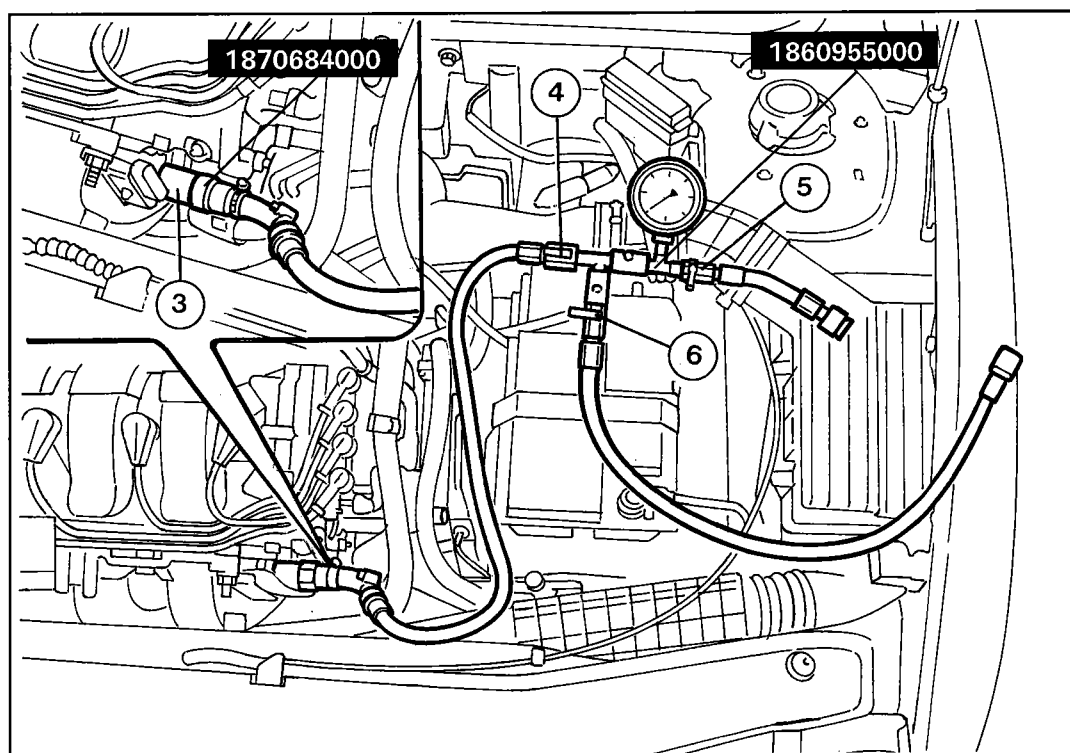
## Checking fuel supply pressure

Check fuel supply pressure as follows:

- unscrew the nuts indicated by the arrows and remove bracket (1);
- disconnect the injector supply connector (2);
- set cock (4) of tool 1860955000 to open position and cocks (5) and (6) to closed position;
- position tool 1860955000 and connect to the fuel manifold using adaptor 1870684000 (3). Then reconnect injectorsupply connector (2);

**NOTE** Tool 1860955000 comes with adaptors for connection to various types of injection system. Before connecting the system, set up the equipment using the appropriate adaptors.

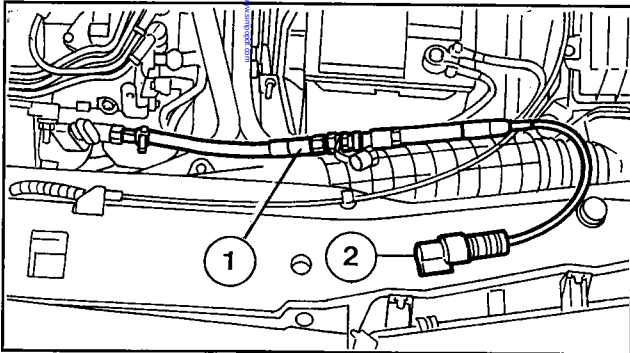
- start the engine and check that the reading on the pressure gauge remains stable at 3.5 bar  $\pm$  0.2 bar, then turn off the engine.
- operate the fuel pump with the engine off using a tester and running the fuel pump test while in active diagnosis mode.
- check the pressure is stable at 3.5  $\pm$  0.2 bar;
- disconnect device 1860955000 from the fuel manifold and refit bracket (1).



44591-102



## 10.



**Checking fuel supply pressure using a tester.**

Fuel supply pressure can also be checked using an EXAMINER or SDC. In this case, remove the protective bracket as described in the previous paragraph, connect the tester to transducer (2), which must be connected to the fuel manifold by means of fitting (1).

### Testing fuel consumption

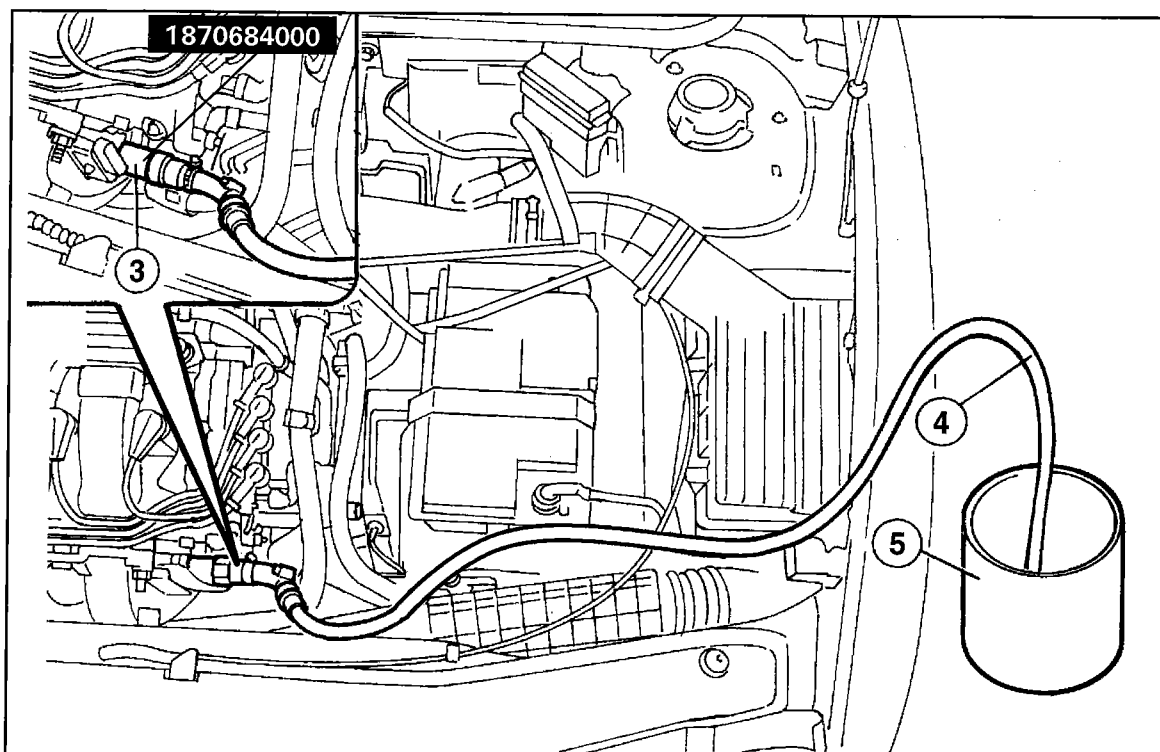
Test fuel consumption as follows:

- remove the protective bracket and disconnect the injector supply connector as described in the previous paragraph on fuel supply pressure testing;



the fuel supply circuit is maintained at a constant pressure of 3.5 bars even with the engine off. Before disconnecting the delivery pipe, it is therefore necessary to drain pressurised fuel as described below

- obtain a suitable container(5) and insert pipe (4) into it;
- connect the other end of pipe (4) to the fuel manifold using special adaptor 1870684000 (3);
- drain off fuel under pressure into container (5);
- disconnect fuel manifold adaptor (3) and pipe (4), then reconnect the injector supply connector;





- disconnect the fuel delivery pipe from the quick-fit connector located against the rear wall of the engine compartment and, using the connectors of the test equipment 1860955000, make the connections to the Flowtronic device (1806149001) as follows:

1. Cut and withdraw the end (A) of the connector (2), then connect the end (B) to the connector of the rigid pipe (3) and the end (A) to the inlet pipe into the Flowtronic (4).
2. Insert the connector (5) into a piece of pipe (6) and lock it with a metal clip, then connect the end (A) to the pipe (1) previously disconnected and the end (B) to the outlet pipe from the Flowtronic device (4).

- carry out a fuel consumption road test in accordance with the Directive 93/116/CE (litres x 100 km):

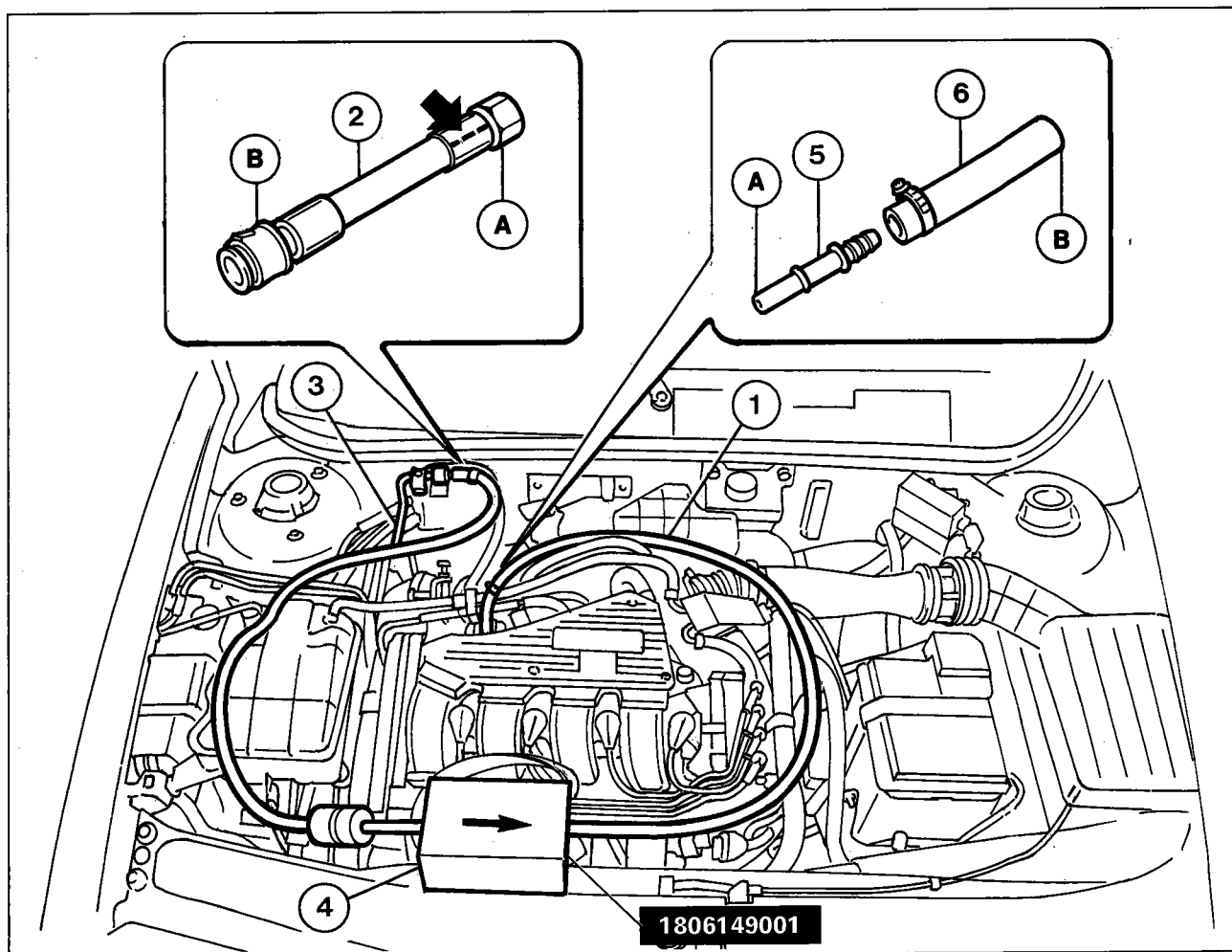
URBAN CYCLE - includes one cold start, followed by a simulated varied urban journey.

OUT-OF-TOWN CYCLE - includes frequent accelerations, in all gears, simulating normal out-of-town use of the vehicle; the speed varies between 0 and 120 km/h.

AVERAGE COMBINED CONSUMPTION - includes 37% urban cycle and 63% out-of-town cycle.

**NOTE** *The type of journey, traffic situations, style of driving, weather conditions, level of fittings/extras/accessories, presence of roof rack, presence of special equipment and the general condition of the vehicle can lead to different fuel consumption values from those measured by the above-mentioned procedures.*

- check that the values measured correspond to those given in the "Introduction and technical data" section.



P4A61J01

## 10.

### FAULT DIAGNOSIS

Full diagnosis of the fuel injection-ignition is possible by active dialogue with the Examiner or SDC station.

If faults in the sensors are detected, the electronic control unit replaces the data coming from the faulty sensor with pre-memorized data (**recovery**) to allow the engine to continue operating.

Detection of the fault leads to its permanent storage in memory and the exclusion of the sensor from the system until the signal becomes compatible again.

The same procedure is applied if the fault affects an actuator or its control port. The detection of the fault and the replacement with recovery data leads to indication of a fault by the warning light on the instrument panel coming on.

The devices which, in the event of a fault, can be managed by recovery from the control unit are:

- Idle speed actuator
- Ignition coils
- Fuel vapour recirculation solenoid
- Air temperature and pressure sensor
- Coolant temperature sensor
- Knock sensor
- Throttle position sensor
- Lambda probe

In the event of faults in the control unit or rpm sensor, the system, even though it detects the fault, cannot replace it with recovery data and the car stops. The faults can be detected in the memory of the control unit using the Examiner or SDC station.

### Error recognition and memorization

The error is detected via a system of validations which operates as follows.

When an error is detected, this is checked for a certain period of time to avoid possible interference on the diagnostic line. If the fault passes this stage, it is considered to be present and is stored in RAM (filtered error). It is then checked that the error remains present for a further period of time (called validation time); if this stage is also passed, the error is finally memorized (validated error) and the fault warning light comes on. The stage of writing the error in EEPROM takes place after the ignition is switched off.

### Error frequency counter

A frequency counter is assigned to each error in order to determine the moment when a fault which is no longer present was memorized. On first detection of a validated error, the counter is set to a fixed set value.

The counter is decremented whenever the car is started without the fault reappearing. If the counter reaches zero, the fault is automatically deleted from EEPROM.

### Error deletion

Errors can be deleted from EEPROM in two ways:

- by means of the diagnostic equipment (Examiner or SDC station), in active diagnosis
- by resetting the error frequency counter.

**NOTE** *Disconnecting the control unit from the system, even for long periods, does not delete data recorded in the EEPROM.*

### Management of the system fault warning light

To check its operation, the control unit lights up the warning light and leaves it on for about 4 seconds whenever the ignition is switched on. The warning light then comes on whenever there is a validated error, i.e. for as long as the fault situation remains, and it goes out when the fault disappears.

### Communications between control unit and diagnostic equipment

In the engine compartment, there is a socket for connecting the diagnostic equipment.

The data exchange between control unit and diagnostic equipment takes place by means of a bidirectional diagnostic line (line K) and the communication protocol follows the Key Word 2000 standard. Data transmission takes place in NRZ positive logic at a baud rate of 10400 Baud.

The diagnostic equipment can provide the following information:

- Display of engine parameters;
- Display of errors;
- Active diagnosis.

### Parameters displayed

|                                                              |                                            |
|--------------------------------------------------------------|--------------------------------------------|
| Engine rpm                                                   | Mixture strength correction (Lambda probe) |
| Fuel injection time                                          | Vehicle speed                              |
| Absolute pressure in the inlet manifold                      | Self-adaptivity                            |
| Intake air temperature                                       | Error counter                              |
| Engine coolant temperature                                   | Ignition coil charging time (Dwell)        |
| Throttle valve aperture angle                                |                                            |
| Battery voltage                                              | Petrol vapours solenoid                    |
| Number of open/close steps of the engine idle speed actuator | Start counter                              |
| Advance                                                      | Engine load                                |
|                                                              | Fiat CODE                                  |

### List of errors

|                            |                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rpm sensor                 | Absence of signal                                                                                                                                                                                                             |
| Throttle potentiometer     | A.C.-D.C.                                                                                                                                                                                                                     |
| Absolute pressure sensor   | A.C.-D.C.                                                                                                                                                                                                                     |
| Air temperature sensor     | A.C.-D.C.                                                                                                                                                                                                                     |
| Coolant temperature sensor | A.C.-D.C.                                                                                                                                                                                                                     |
| Battery                    | Supply > 16.2V                                                                                                                                                                                                                |
|                            | Supply < 6V                                                                                                                                                                                                                   |
| Lambda probe               | Implausible signal                                                                                                                                                                                                            |
|                            | D.C.                                                                                                                                                                                                                          |
| Fuel injectors             | A.C.-D.C.                                                                                                                                                                                                                     |
| Ignition coils             | A.C.-D.C.                                                                                                                                                                                                                     |
| Idle speed actuator        | A.C.-D.C.                                                                                                                                                                                                                     |
| Fuel vapours solenoid      | A.C.-D.C.                                                                                                                                                                                                                     |
| Actuators relays           | A.C.-D.C.                                                                                                                                                                                                                     |
| Control unit               | Operating faults in the microprocessor or control unit memories are indicated.                                                                                                                                                |
| Self-adaptive parameters   | It is indicated whether the limits of self-adaptivity of the control unit have been reached. This indicates that the engine conditions are too far beyond the standards, so the causes should be sought in mechanical faults. |
| Speed sensor               | Implausible signal                                                                                                                                                                                                            |
|                            | Speed exceeds maximum speed                                                                                                                                                                                                   |
| Knock sensor               | A.C.-D.C.                                                                                                                                                                                                                     |
| Fiat CODE                  | Code not recognized or not received                                                                                                                                                                                           |

### 10.

#### Active diagnosis

During active diagnosis, some components can be activated and some particular functions can be carried out, for example the error deletion command, as shown in the table below.

In active diagnosis, the ignition must be on and, only for some functions, the engine must be running.

#### Function/Actuator

#### Method of activation

Electric fuel pump

Activation of the relay for 30 s

Fuel injectors

Activation for 4 ms per s 5 times

Ignition coils

Activation for 2 ms per s 5 times

Error deletion command

Deletion of validated errors

Fuel vapours solenoid

Activation for 20 ms per s 7 times

Rev counter

Activation at 125 Hz for 2 s

Air conditioner relay

Activation of the relay for 30 s

Fuel injection fault warning light

Activation of the warning light for 30 s

Coolant overheating warning light

Activation of the warning light for 10 s

Engine idle speed actuator

Activation for 32 steps forwards/backwards

Fiat CODE

Recovery procedure to permit engine starting

Radiator fan

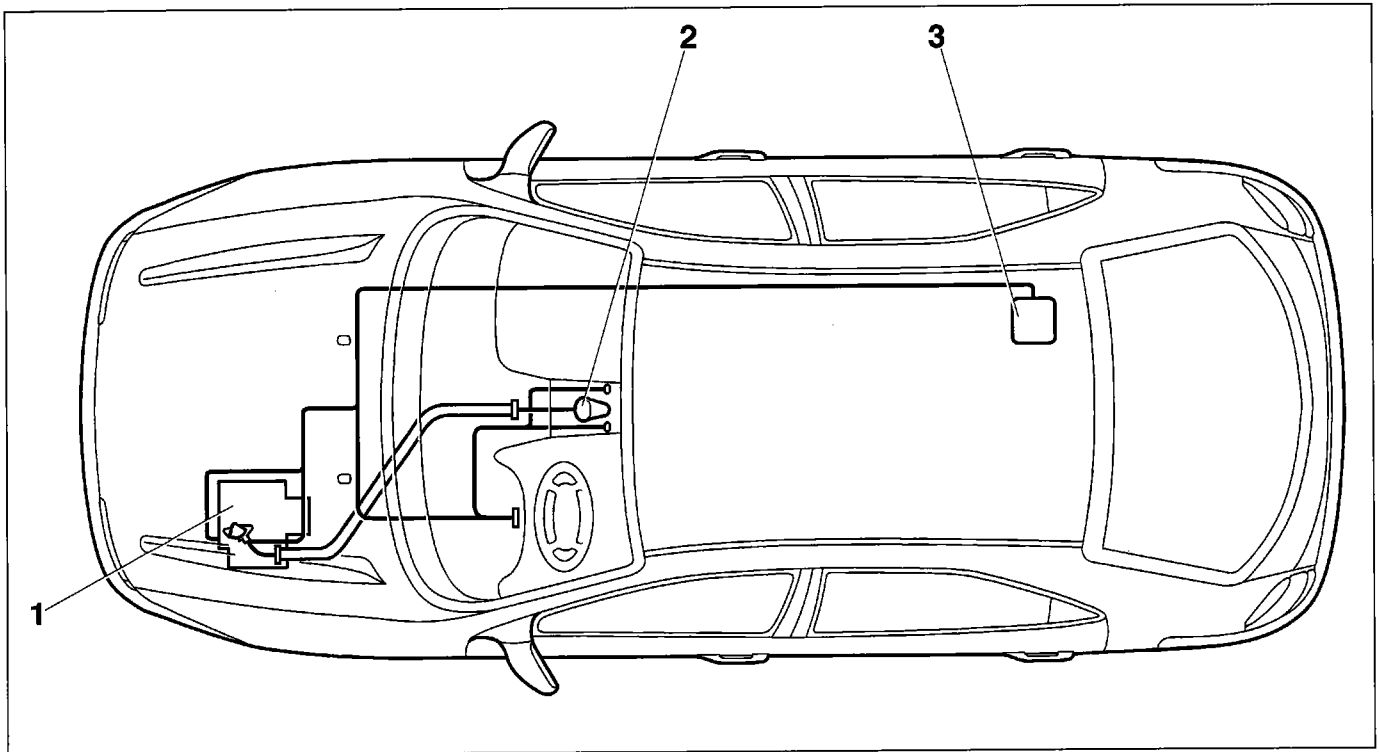
Activation for 10 s at both high and low speeds



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**DESCRIPTION****Introduction**

The Fiat Brava 1581 16v Torque uses an AISIN 60-40 LE automatic gearbox and differential unit, 4-speed version AW 596/Y024, specially designed for front-wheel drive vehicles with transverse-mounted engine, fitted with an electronic control system connected to the engine management control unit.



P4A01AB01

1. Gearbox-differential unit
2. Selector lever
3. Control module

The automatic transmission electronic control logic resides in an "intelligent" control unit (or control module), located under the cushion of the rear seat on the right.

The control module is connected to the various sensors/actuators located on the gearbox, engine and dashboard, the control unit of the fuel injection/ignition for exchanging information relating to the engine and the instrument panel for displaying the operating conditions.

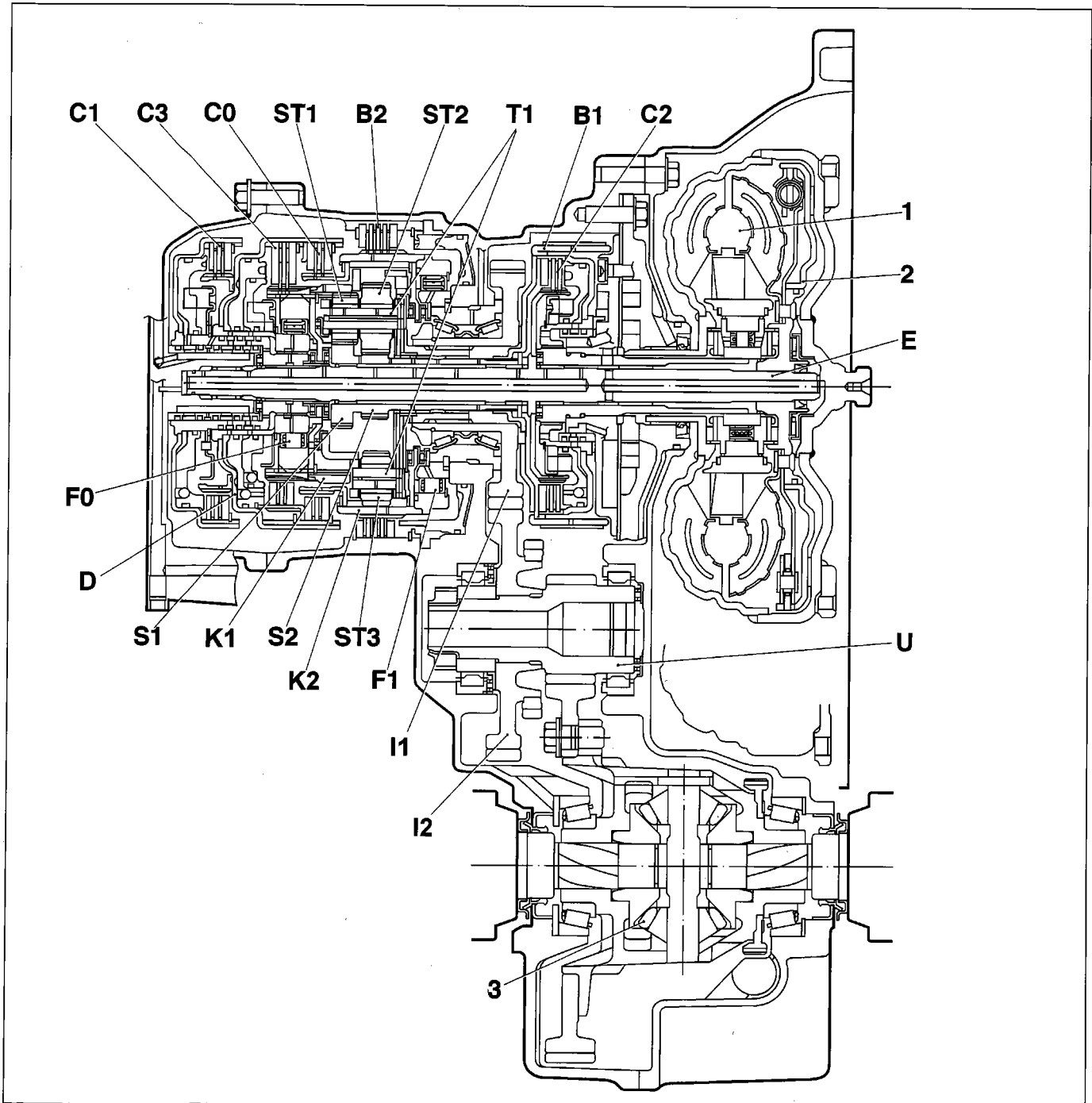
The mechanical unit of the automatic transmission comprises:

- an oleodynamic torque converter, with a lock-up clutch which locks the converter in the higher ratios;
- two epicyclic gears, located on the main shaft;
- a band brake B1, a multiple disc brake B2 and four multiple disc clutches, operated hydraulically; there are also two free wheels, which lock the various gearing components to obtain the four forward gears and reverse gear;
- a parking lock, consisting of a gear with ratchet gear which locks the gearbox when the gear lever is in the P (Park) position.

The control module interacts in the hydraulic operation of the gearbox, issuing the appropriate operating commands to the clutches and brakes via four solenoids, contained in a valve unit located at the front of the automatic transmission.

### 21-27.

#### Cross section of automatic transmission and differential



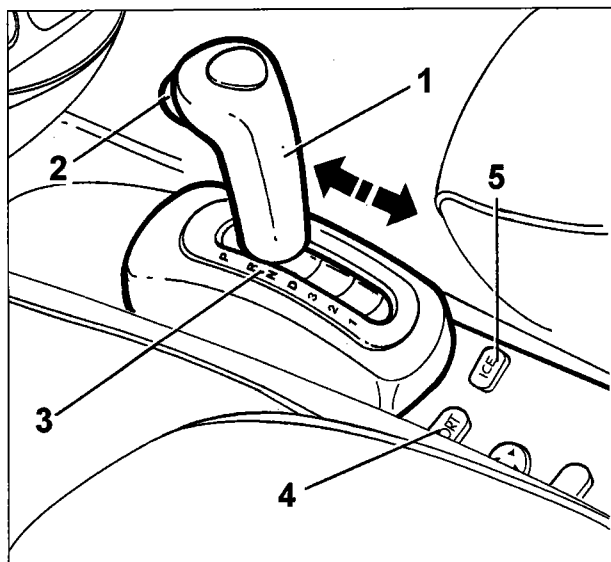
- |                          |                                              |
|--------------------------|----------------------------------------------|
| 1. Torque converter      | F1. Free wheel                               |
| 2. Lock-up clutch        | I1. Main shaft motion output gear            |
| 3. Differential          | I2. Layshaft gear                            |
| B1. Band brake           | K1. Epicyclic gear set P1 crown wheel        |
| B2. Multiple disc brake  | K2. Epicyclic gear set P2 crown wheel        |
| C0. Multiple disc clutch | S1. Epicyclic gear set P1 sun gear           |
| C1. Multiple disc clutch | S2. Epicyclic gear set P2 sun gear           |
| C2. Multiple disc clutch | ST1. Epicyclic gear set P1 planet gear       |
| C3. Multiple disc clutch | ST2. Epicyclic gear set P2 planet gear       |
| D. Clutch carrier drum   | ST3. Epicyclic gear set P2 outer planet gear |
| E. Motion input shaft    | T1. P1 and P2 epicyclic gear train carrier   |
| F0. Free wheel           | U. Relay shaft                               |

P4A02AB01



## SELECTOR LEVER

To select a gear, use the selector lever located on the central console, which comprises a safety button (2) to protect against accidental gear engagements. It is connected to the automatic transmission via a flexible cable, and it acts on the valve unit and on an electrical device through which a coded electrical signal indicating the lever's position (P, R, N, D, 3, 2, 1) is transmitted to the control module.



P4A03AB01

1. Selector lever
2. Safety button (to prevent accidental gear engagement)
3. Lever position display
4. NORMAL/SPORT button (this is for switching over from NORMAL mode to SPORT mode and vice versa)
5. ICE button (for driving on slippery roads)

The following positions may be set using the selector lever:

|                          |                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------|
| <b>P</b> <i>Park</i>     | The drive wheels are locked (the engine can be started)                                                 |
| <b>R</b> <i>Reverse</i>  | Reverse ratio (the reversing lights come on)                                                            |
| <b>N</b> <i>Neutral</i>  | Neutral position (the engine can be started)                                                            |
| <b>D</b> <i>Drive</i>    | Automatic operation of the gearbox on all four ratios                                                   |
| <b>3</b> <i>3rd gear</i> | Automatic operation of the gearbox on the first 3 gears (the change to 4th gear is inhibited)           |
| <b>2</b> <i>2nd gear</i> | Automatic operation of the gearbox on the first 2 ratios (the change to 3rd and 4th gears is inhibited) |
| <b>1</b> <i>1st gear</i> | Operation only in 1st gear (with engine braking effect)                                                 |

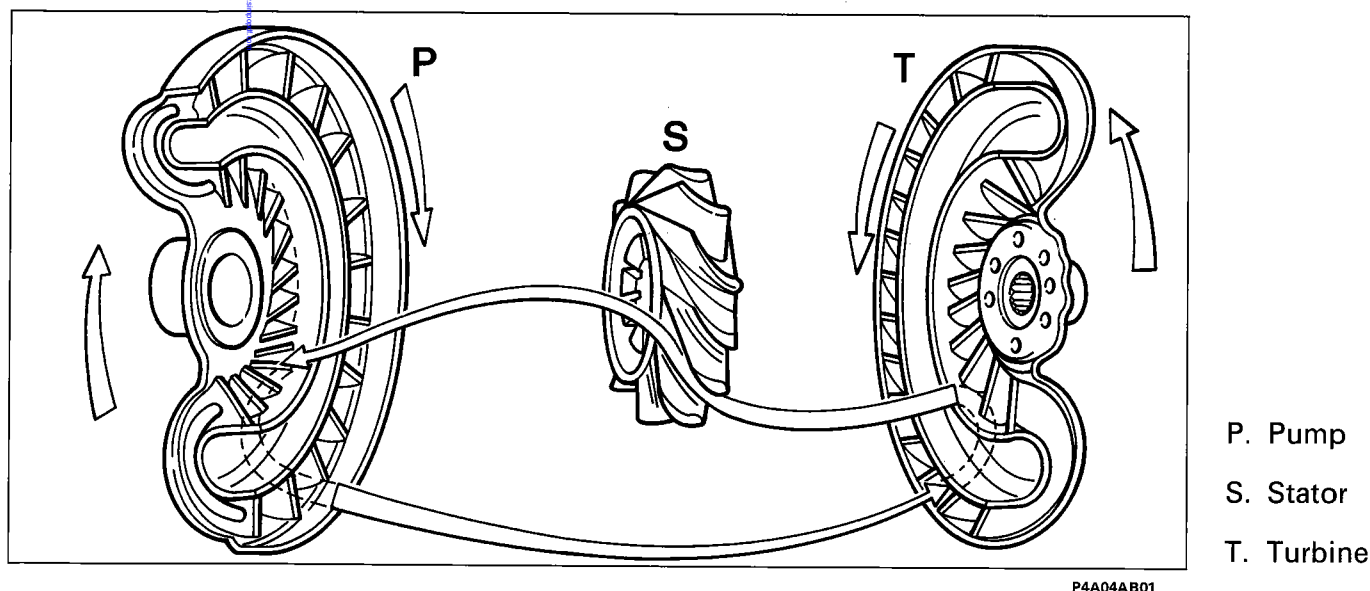
## TORQUE CONVERTER

The purpose of the torque converter is to hydraulically transmit power from the engine to the gearbox, and to increase the torque when the vehicle is accelerating. The rotary motion is transmitted to the epicyclic gearing through two shafts:

- the gearbox main shaft which engages in the hub of the converter turbine.
- the layshaft which engages on the lock-up clutch;

The converter comprises (see figure on next page) a pump P connected to the crankshaft, a turbine T connected to the gearbox main shaft, and a stator S connected to the gearbox outer casing. The converter is filled completely with oil which, because of the kinetic energy impressed upon it by the pump, permits the transmission of the driving torque.

### 21-27.



**NOTE** *The torque converter does not sustain any kind of wear as there is no mechanical connection between the driven part and the driving part.*

The impeller P is connected to the crankshaft and, rotating in a clockwise direction, acts as a pump, transmitting its energy to the oil.

The centrifugal force pushes the oil towards the periphery of the impeller, where it flows at high speed towards the turbine T. Here the oil's kinetic energy impresses a clockwise rotary movement to the turbine. The oil then passes through the stator S, where it is diverted in accordance with an angle which permits it return to the pump with high efficiency. The stator is connected to the gearbox casing by means of a free wheel engagement system, which prevents its rotation in an anti-clockwise direction and provides a reaction torque, proportional to the oil flow diversion, which is added to that of the turbine.

The ratio between the torque acting on the turbine and that provided by the pump is known as the torque multiplication ratio and is proportional to the difference in speed of rotation between the pump and turbine.

With the wheels stopped, the torque is around double that delivered by the engine.

As the turbine speed increases, the torque multiplication decreases continuously and tends to reach the ratio of 1:1, corresponding to a turbine speed of 85-90% of the pump speed. When the turbine and pump speeds are almost the same, the stator is enveloped by an oil flow directed at an angle which makes it change its direction of rotation and, as it is not blocked by the free wheel, it rotates in a clockwise direction without impediment and the torque converter behaves like a simple hydraulic joint.

### LOCK-UP CLUTCH

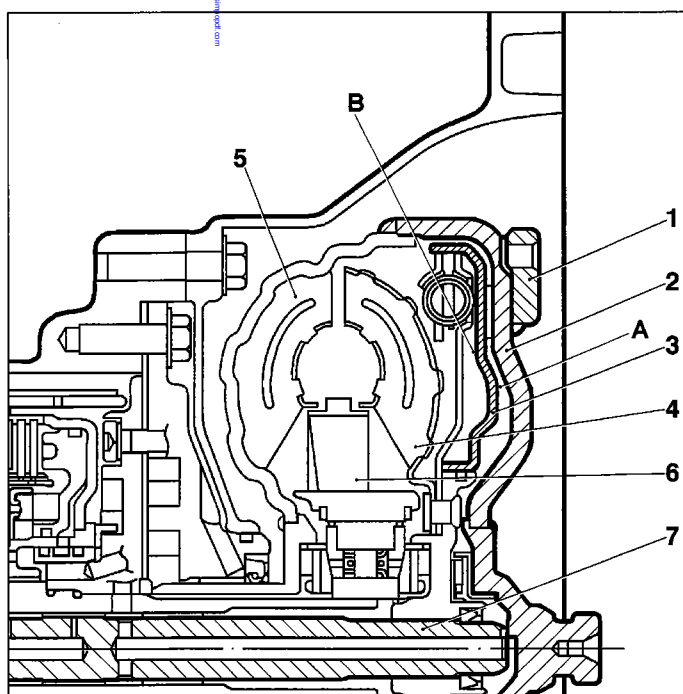
In first, second and reverse gears, the driving torque is transmitted by the torque converter.

In third and fourth gears, the torque is transmitted first hydraulically by the converter, and secondly mechanically via the lock-up clutch. The lock-up clutch, by connecting the pump to the converter's turbine when the speed increases, eliminates the internal slipping of the converter and provides a mechanical coupling between the engine and the gearbox main shaft.

The locking of the torque converter allows the performance of the transmission to be improved at high speeds, leading to a reduction in fuel consumption on long motorway journeys.

The lock-up clutch is switched on by the control module via the lock-up solenoid SL, at the higher gears (3rd and 4th gears), when it is no longer necessary to multiply the driving torque supplied by the torque converter.

The solenoid SL opens, discharging the oil pressure from the chamber A, while the pressure in the converter continues to act on the face B: the clutch, fitted on the turbine hub, is then pushed against the casing connected to the converter's pump, thus locking the converter.



1. Flywheel attachments
2. Casing connected to pump
3. Lock-up clutch
4. Turbine
5. Pump
6. Stator
7. Motion input shaft

### OIL PUMP

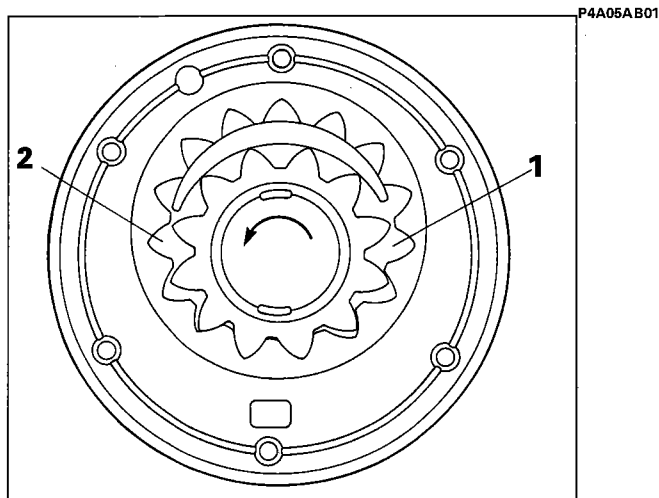
The oil pump used for the AISIN automatic transmission is of the inner gear type. It is located between the torque converter and gearbox casing, and is driven directly by the converter pump impeller.

The functions of the oil pump are as follows:

- to provide the necessary pressure to the hydraulic control system and the gearbox control components (clutches and brakes);
- to send an oil flow into the torque converter case in order to cool it and to be able to operate the lock-up clutch;
- to lubricate the moving components of the gearbox;
- to circulate oil in the cooling system.

### Structure of the oil pump

1. Inlet side
2. Delivery side



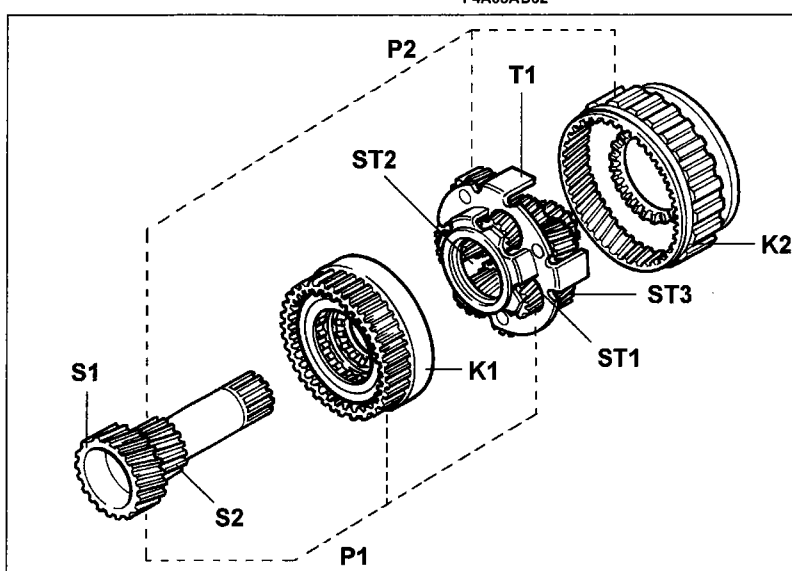
### EPICYCLIC GEARS

The AISIN automatic transmission uses two epicyclic gear sets for obtaining the five transmission ratios (4 forward gears + reverse gear).

The rear gear set P1 is a simple epicyclic gear set comprising a sun gear S1, four planet gears ST1 and a crownwheel K1. The front gear set P2 consists of an epicyclic gear set comprising a sun gear S2, four inner planet gears ST2, four outer planet gears ST3 and a crownwheel K2. The shafts of the planet gears ST1, ST2 and ST3 are attached to the gear train carrier T1.

### Epicyclic gear sets P1 and P2

- K1. Crownwheel of P1
- K2. Crownwheel of P2
- S1. Sun gear of P1
- S2. Sun gear of P2
- ST1. Planet gears of P1
- ST2. Inner planet gears of P2
- ST3. Outer planet gears of P2
- T1. Gear train carrier



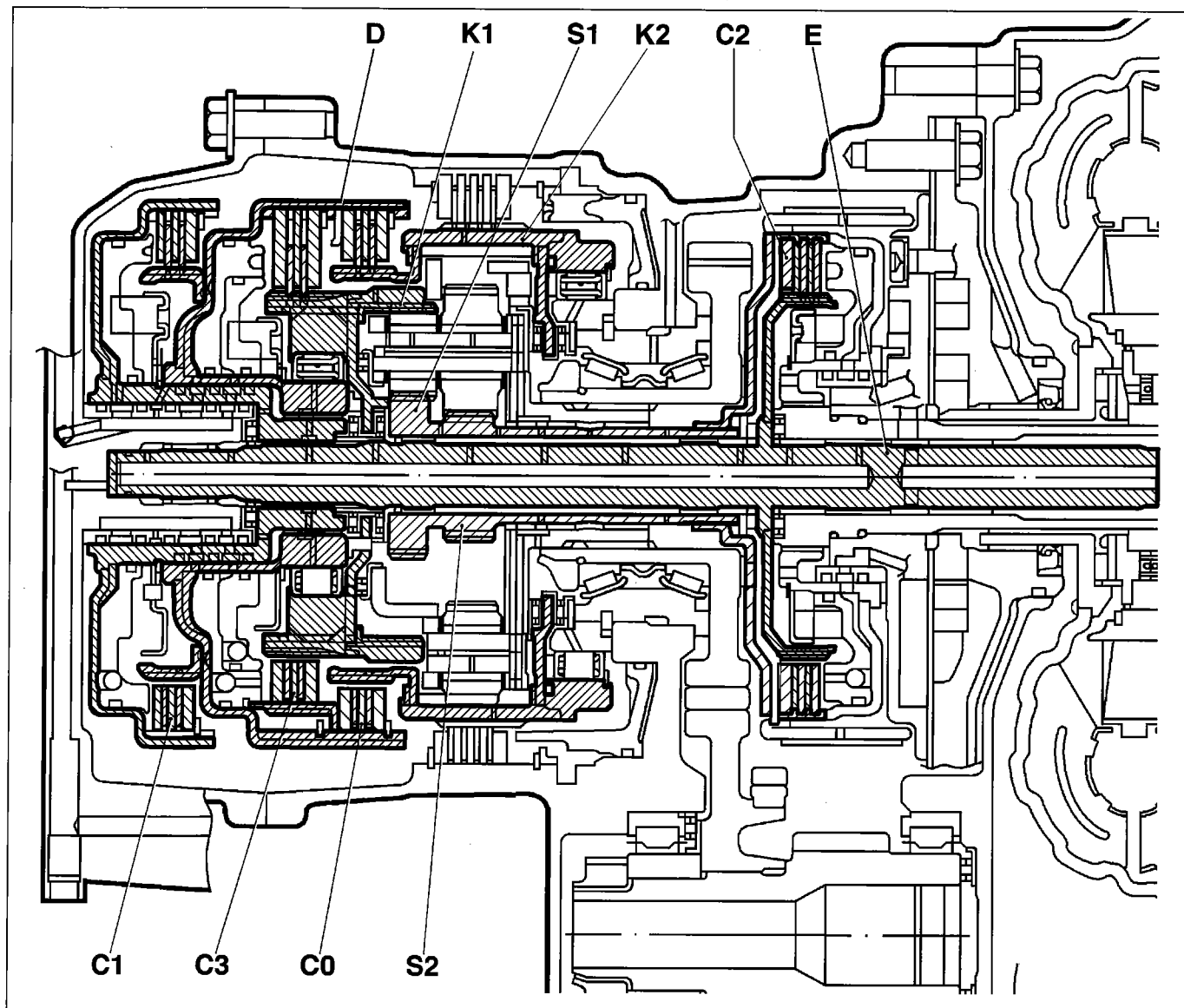
## 21-27.

### CONTROL COMPONENTS

The control components of the automatic transmission consist of clutches, multiple disc brakes, band brakes and free wheels, which prevent the relative rotation between two components of the epicyclic gear sets, or between one of them and the outer casing, to achieve the four forward gears and reverse gear.

#### Clutches

Four clutches are used in the AISIN automatic transmission, and they are all of the multiple disc type. They are activated by the valve assembly located in the gearbox hydraulic control system.



P4A06AB01

When engaged, the clutch C1 couples the gearbox input shaft E to the clutch carrier drum D.

When engaged, the clutch C2 couples the gearbox input shaft E with the shaft E on which there are the two sun gears S1 and S2 of the gear sets P1 and P2.

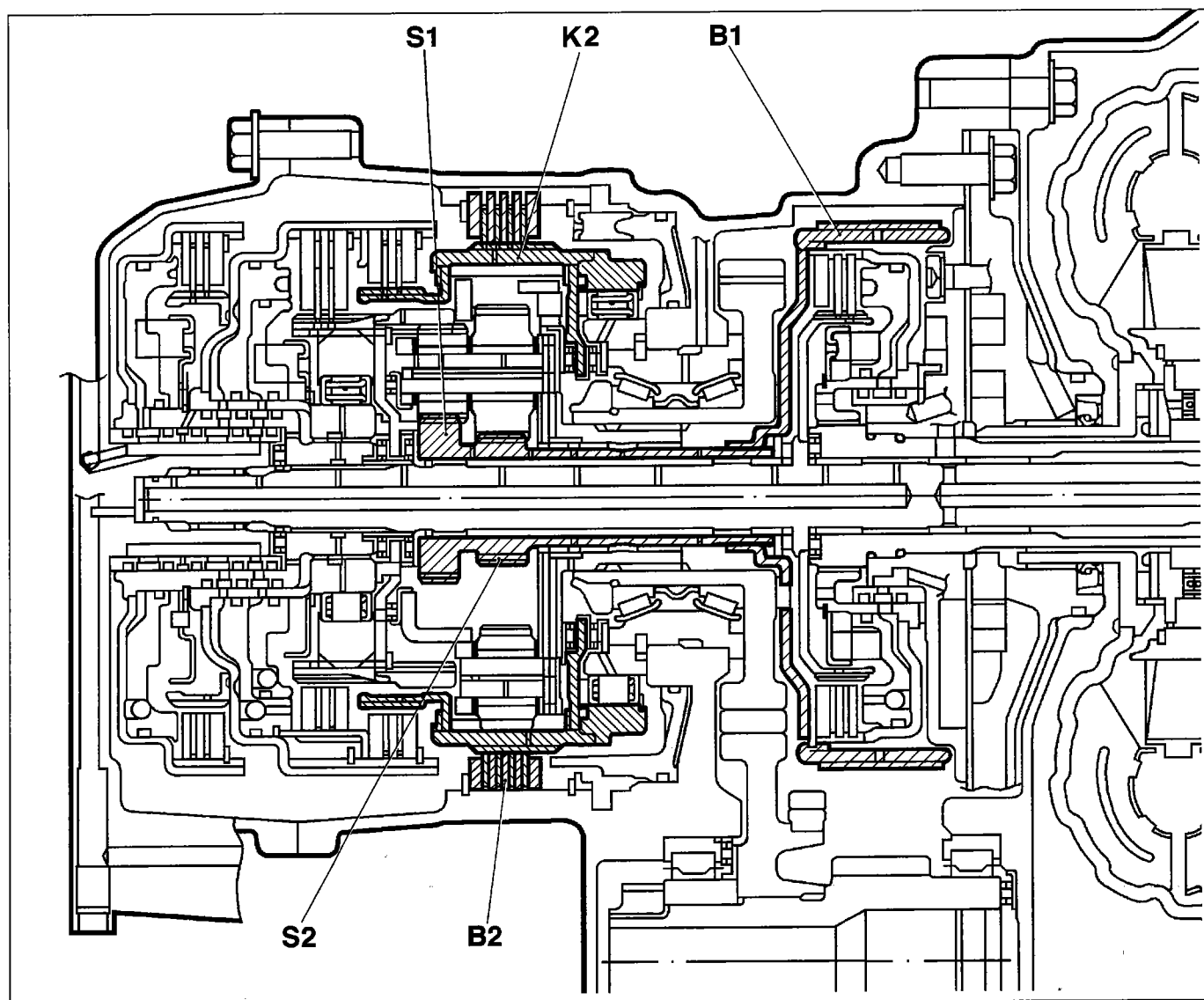
When engaged, the clutch C3 couples the clutch carrier drum D with the crownwheel K1 of the epicyclic gear set P1; in this way the crownwheel K1 receives motion from the gearbox input shaft E through C1-C3.

When engaged, the clutch C0 couples the clutch carrier drum D with the crownwheel K2 of the epicyclic gear set P2; in this way the crownwheel K2 receives the motion from the gearbox input shaft E through C1-C0.

### Brakes

There are two brakes in the AISIN automatic transmission, one of the multiple disc type (B2), and one band brake (B1).

They are activated by the valve assembly located in the gearbox hydraulic control unit.



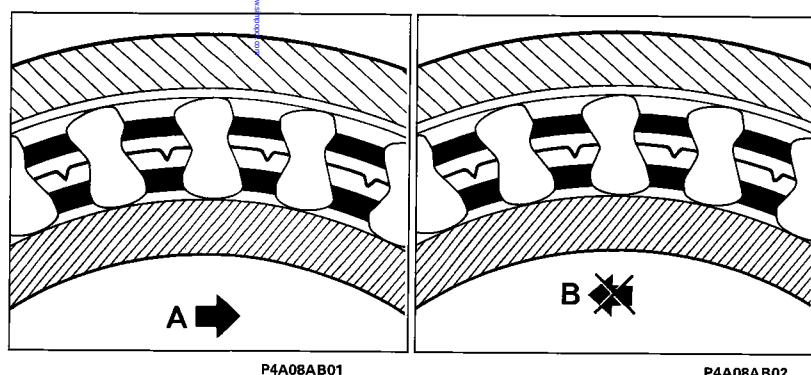
P4A07AB01

The band brake B1 blocks the rotation of the sun gears S1 and S2 (connected to each other), which form part of the gear sets P1 and P2.

The multiple disc brake B2 blocks the rotation of the crownwheel K2 of the gear set P2.



### 21-27.

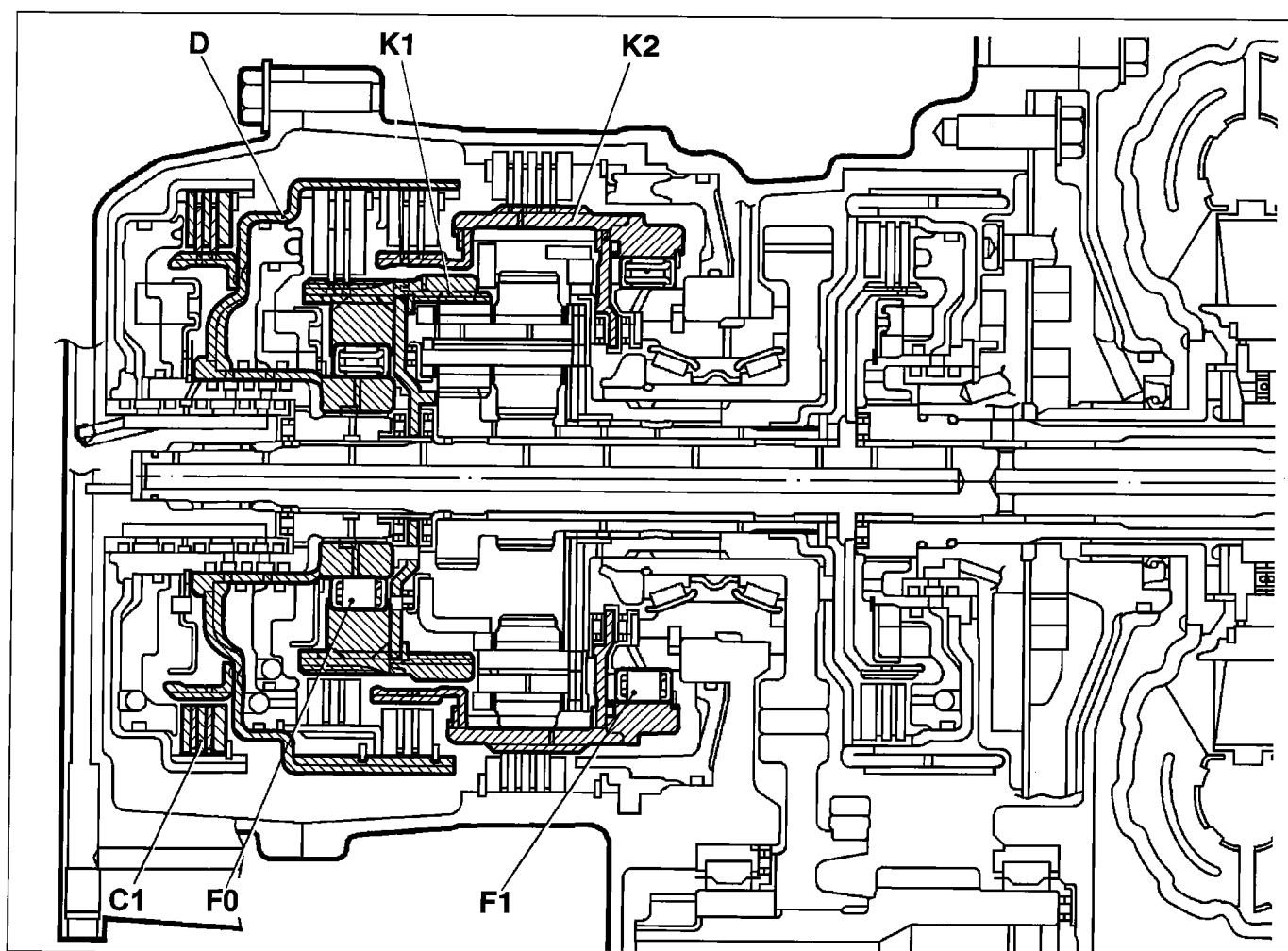


#### Free wheels

The free wheels consist of two concentric races and a cage enclosing a set of asymmetrical pawls, which permit the relative rotation of the two races in a particular direction (A), while in the opposite direction the pawls jam, preventing relative rotation and providing a reaction torque.

The roller clutch F0 connects the clutch carrier drum D and crownwheel K1 of the gear set P1 when the clutch C1 is active, and the motion comes from the gearbox input shaft.

The roller clutch F1 prevents the anti-clockwise rotation of the crownwheel K2 of the gear set P2.



P4A08AB03

#### HYDRAULIC CONTROL SYSTEM

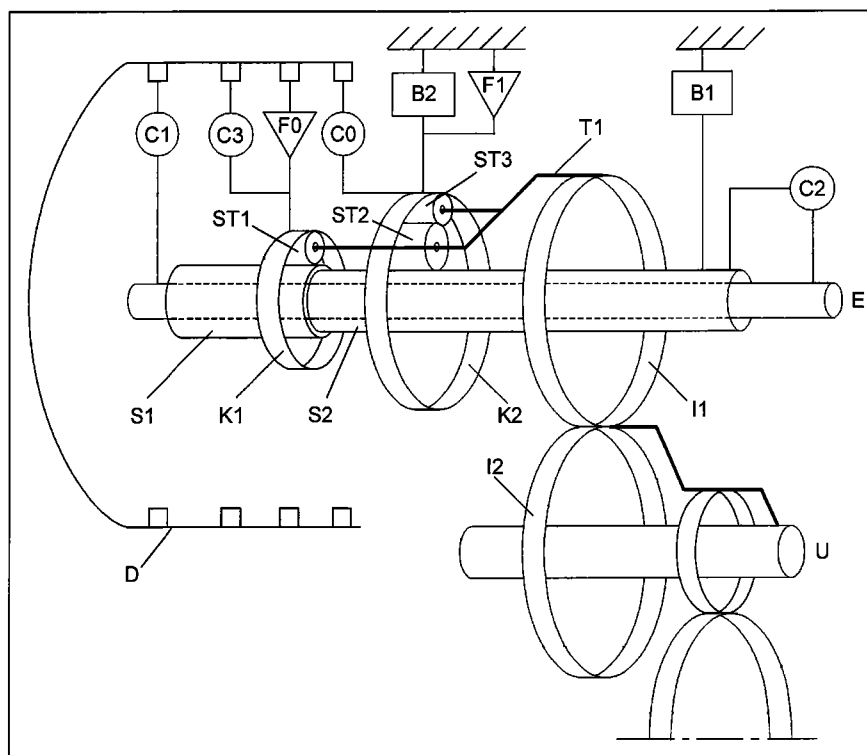
The operation of the automatic transmission is made possible by the operation of the clutches and brakes, via hydraulic actuators driven by valves which move in accordance with the commands issued by the control module. The feed is provided by a gear pump, driven directly by the engine through the torque converter.

A cooling radiator and fan controlled by a thermal switch keeps the oil temperature within pre-established limits.

#### TRANSMISSION OF MOTION

The diagram below illustrates in a simplified manner the composition of the gear sets and control components (clutches, brakes and free wheels) of the gearbox.

The same wiring diagram will be used on the following pages to illustrate the intervention of the various control components during the different stages of operation.



- B1. Band brake
- B2. Multiple disc brake
- C0. Multiple disc clutch
- C1. Multiple disc clutch
- C2. Multiple disc clutch
- C3. Multiple disc clutch
- D. Clutch carrier drum
- E. Motion input shaft
- F0. Free wheel
- F1. Free wheel
- I1. Main shaft motion output gear
- I2. Layshaft gear
- K1. Crownwheel - epicyclic gear set P1
- K2. Crownwheel - epicyclic gear set P2
- S1. Sun gear - epicyclic gear set P1
- S2. Sun gear - epicyclic gear set P2
- ST1. Planet gear for epicyclic gear set P1
- ST2. Inner planet gear for epicyclic gear set P2
- ST3. Outer planet gear for epicyclic gear set P2
- T1. P1 and P2 epicyclic gear train carrier
- U. Relay shaft

P4A09AB01

The table below gives the conditions of activation of the components depending on the gear engaged and the position of the selector lever.

| Selector lever position | Gear engaged | Control solenoids |    |    | Clutches |    |    |    | Brakes |    | Free wheels |    |
|-------------------------|--------------|-------------------|----|----|----------|----|----|----|--------|----|-------------|----|
|                         |              | S1                | S2 | SL | C1       | C2 | C3 | C0 | B1     | B2 | F1          | F0 |
| P                       | Park         | ○                 |    |    |          |    | ○  |    |        |    |             |    |
| R                       | Reverse (*)  | ○                 |    |    |          | ○  | ○  |    |        | ○  |             |    |
|                         | Neutral (**) |                   | ○  |    |          | ○  | ○  |    |        |    |             |    |
| N                       | Neutral      | ○                 |    |    |          |    | ○  |    |        |    |             |    |
| D                       | 1st          | ○                 |    |    | ○        |    | ○  |    |        |    | ○           | ○  |
|                         | 2nd          | ○                 | ○  |    | ○        |    | ○  |    | ○      |    |             | ○  |
|                         | 3rd          |                   | ○  | ○  | ○        |    | ○  | ○  |        |    |             | ○  |
|                         | 4th          |                   |    | ○  | ○        |    |    | ○  | ○      |    |             |    |
| 3                       | 1st          | ○                 |    |    | ○        |    | ○  |    |        |    | ○           | ○  |
|                         | 2nd          | ○                 | ○  |    | ○        |    | ○  |    | ○      |    |             | ○  |
|                         | 3rd          |                   | ○  | ○  | ○        |    | ○  | ○  |        |    |             | ○  |
| 2                       | 1st          | ○                 |    |    | ○        |    | ○  |    |        |    | ○           | ○  |
|                         | 2nd          | ○                 | ○  |    | ○        |    | ○  |    | ○      |    |             | ○  |
|                         | 3rd          |                   | ○  | ○  | ○        |    | ○  | ○  |        |    |             | ○  |
| 1                       | (1st) ●      | ○                 |    |    | ○        |    | ○  |    |        | ○  | ○           | ○  |
|                         | (2nd) ●      | ○                 | ○  |    | ○        |    | ○  |    | ○      |    |             | ○  |

**NOTE** ○ = Solenoid activated (\*) Speed ≤ 7km/h (\*\*) Speed > 7km/h (●) Intermediate selection in manual scale.



### 21-27.

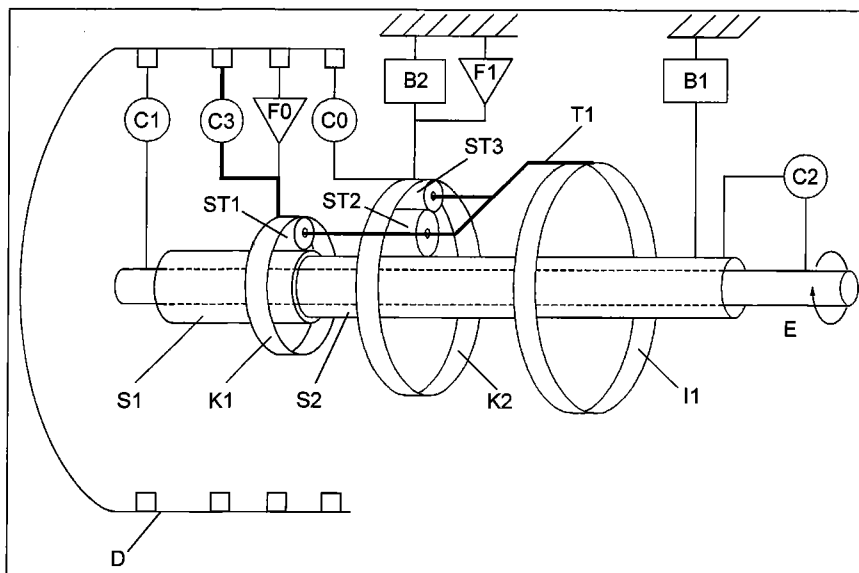
#### Neutral (selector lever on position **N**)

The gearbox input shaft **E** rotates in a clockwise direction.

The clutch **C3** couples the crownwheel **K1** to the clutch carrier drum **D**, to permit the transmission of motion without delays or stresses, caused by the simultaneous engagement of several clutches and brakes, when the selector lever is positioned on **R** or **D** (1st gear).

The multiple disc clutches **C1 - C0 - C2** and brakes **B2 - B1** are disengaged, so the epicyclic gear sets **P1** and **P2** do not receive motion, thus isolating the differential relay shaft **U** from the gearbox input shaft **E**.

**NOTE** The parking lock is off, so the planet gears **ST1 - ST2 - ST3** are free to rotate around the sun gears **S1** and **S2**, allowing the vehicle to move if it is on a slope.



P4A10AB01

#### Park (selector lever on position **P**)

The control components are as described for position **N**, with the sole difference that the parking lock (ratchet **P**) is engaged, preventing the vehicle from moving.

#### First gear (selector lever on position **1**)

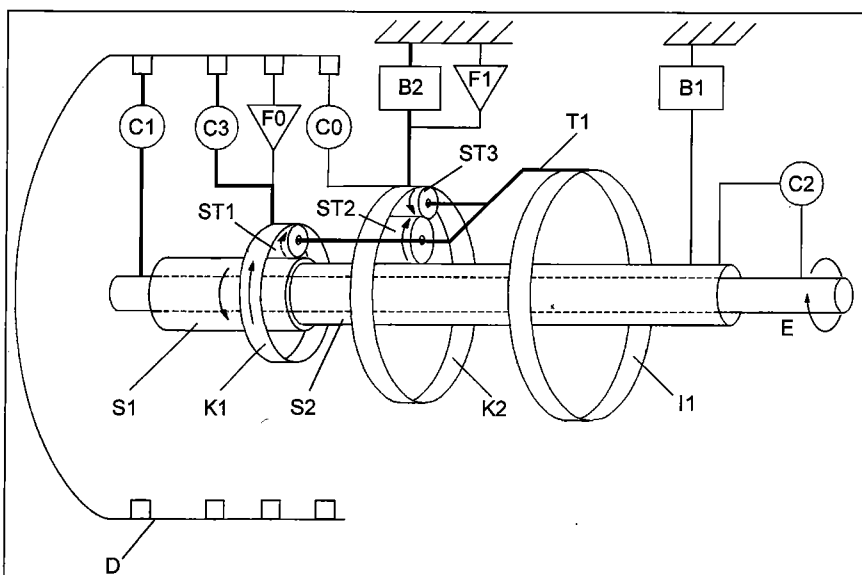
The gearbox input shaft **E** rotates in a clockwise direction.

The crownwheel **K1** is coupled to the input shaft **E** by the engagement of the multiple disc clutch **C1**, the clutch carrier drum **D** and the clutch **C3** (already engaged with **N** or **P** selected).

The clutch **C3** locks the free wheel **F0**. The crownwheel **K2** is locked to the gearbox casing by the engagement of the multiple disc brake **B2**. The brake **B2** locks the free wheel **F1**. The planet gears **ST1**, driven by the crownwheel **K1** of the epicyclic gear set **P1**, rotate in a clockwise direction and via the sun gears **S1** and **S2** transmit motion, reduced and in a clockwise direction, to the planet gears **ST2** of the epicyclic gear set **P2**.

The planet gears **ST3**, driven by the planet gears **ST2**, rotate in an anti-clockwise direction and, by the reaction on the locked crownwheel **K2**, shift and rotate in clockwise direction the gear train carrier **T1** and gear **I1**.

The gear **I1** transmits motion to the wheels via the gear **I2** and the differential relay shaft **U**.



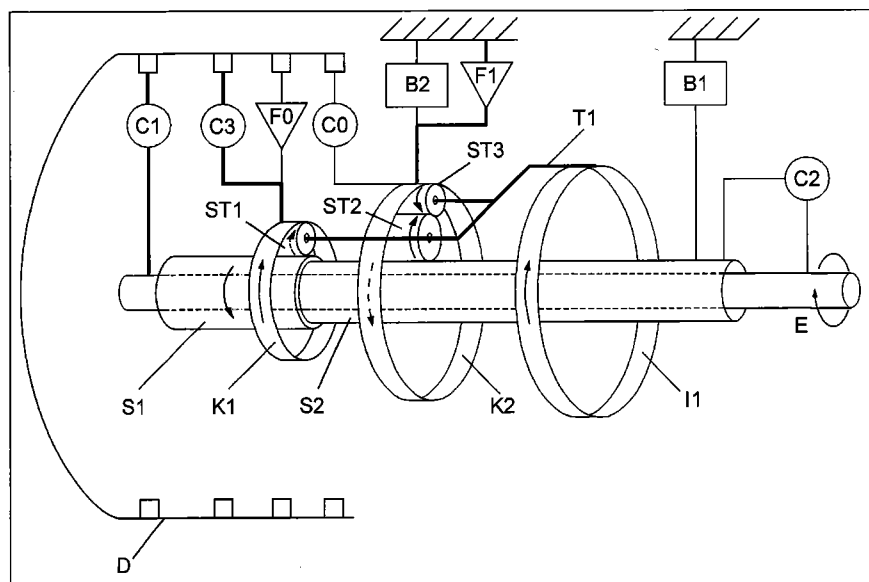
P4A10AB02

**NOTE** Engaging the brake **B1** in 1st and reverse allows the engine to brake the vehicle in deceleration.

#### First gear (selector lever on position **D-3-2**)

With the selector lever on one of the three positions, the gearbox functions in the same way and with the same transmission ratio as with the selector lever at position **1**, with the only difference that the crown-wheel **K2** of the front gear set **P2** is not locked by the brake **B2**.

As the torque which acts on the crownwheel **K2** is much higher than that acting on the gear train carrier **T1**, the crownwheel would rotate in an anti-clockwise direction, but the free wheel **F1** prevents this rotation, permitting transmission of motion to the gear train carrier and so to the differential relay shaft **U**, as in the previous case.



P4A11AB01

However, in this case there is no engine braking effect, as the crownwheel **K2** can rotate freely in a clockwise direction, allowing the gear train carrier **T1** to rotate at a higher speed than that imposed by the transmission ratio.

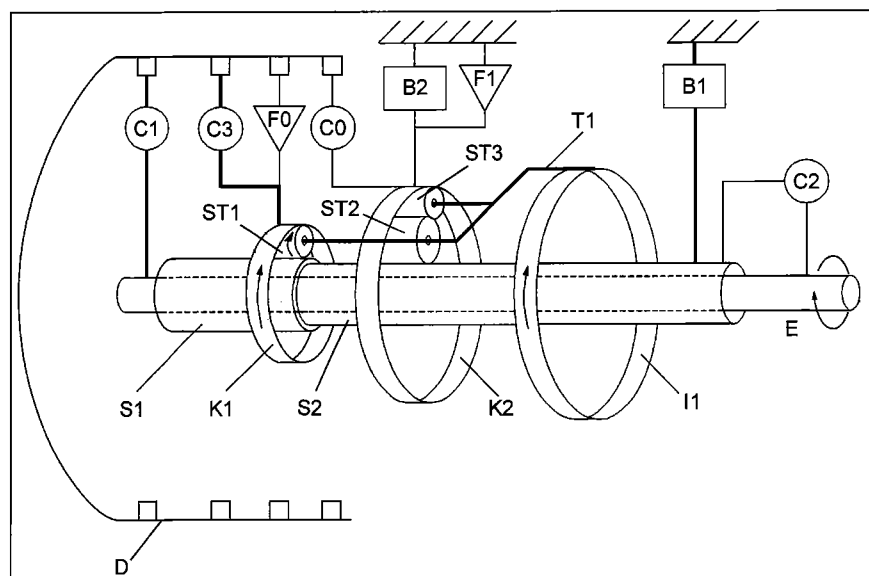
#### Second gear (selector lever on position **D-3-2-1\***)

##### \* selected manually (recovery)

The gearbox input shaft **E** rotates in a clockwise direction.

The crownwheel **K1** is coupled to the input shaft **E** by the engagement of the multiple disc clutch **C1**, clutch carrier drum **D** and clutch **C3** (already engaged with **N** or **P** selected).

The clutch **C3** locks the free wheel **F0**.



P4A11AB02

The sun gear **S1** is locked to the gearbox casing by the engagement of the band brake **B1**.

The planet gears **ST1**, driven by the crownwheel **K1** of the epicyclic gear set **P1**, rotate in a clockwise direction, shifting onto the locked sun gear **S1**; they then transmit motion in a clockwise direction to the gear train carrier **T1** and the gear **I1** coupled to it.

The gear **I1** transmits motion to the wheels via the gear **I2** and the differential relay shaft.

### 21-27.

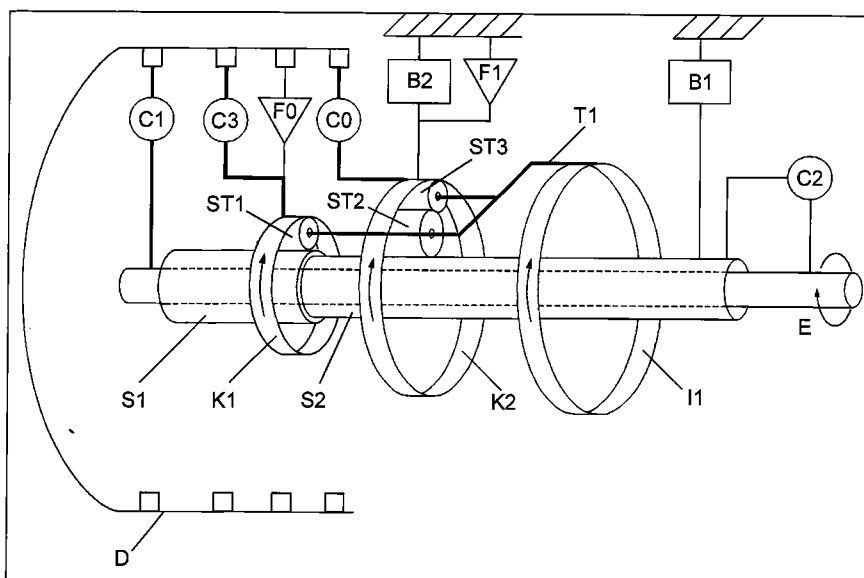
#### Third gear (selector lever on position **D-3**)

The gearbox input shaft **E** rotates in a clockwise direction.

The crownwheels **K1** and **K2** are coupled to the input shaft **E** by the engagement of the clutch **C1**, clutch carrier drum **D** and the clutches **C3** and **C0**.

The clutch **C3** locks the free wheel **F0**.

The epicyclic gear sets **P1** (**S1 - ST1 - K1**) and **P2** (**S2 - ST2 - ST3 - K2**) lock onto each other when their transmission ratios are different.



P4A12AB01

The planet gears **ST1**, **ST2** and **ST3**, locked, drive the gear train carrier **T1** in a clockwise direction at the same speed as the input shaft **E** (ratio 1:1).

The gear **I1** transmits motion to the wheels via the gear **I2** and the differential relay shaft **U**.

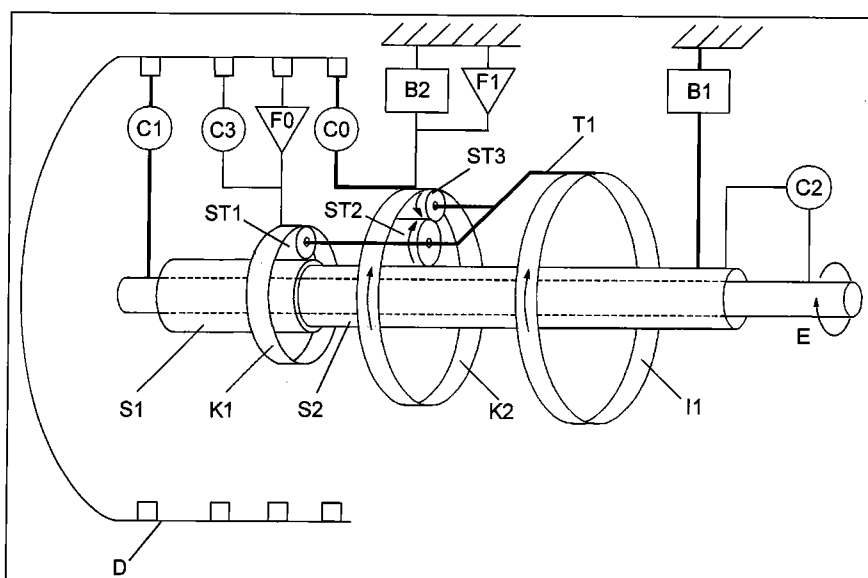
#### Fourth gear (selector lever on position **D**)

The gearbox input shaft **E** rotates in a clockwise direction.

The crownwheel **K2** is coupled to the input shaft **E** by the engagement of the multiple disc clutch **C1**, the clutch carrier drum **D** and the clutch **C0**.

The free wheel **F0** allows the crownwheel **K1** to rotate in a clockwise direction.

The sun gear **S2** is locked on the gearbox casing by the engagement of the band brake **B1**.



P4A12AB02

The planet gears **ST2**, driven by the crownwheel **K2** via the planet gears **ST3**, shift onto the locked sun gear **S2**, rotating the gear train carrier **T1** in a clockwise direction. The clockwise shift of the gear train carrier **T1** makes the planet gears **ST2** rotate in a clockwise direction on the locked sun gear **S2** and the planet gears **ST3** in an anti-clockwise direction.

The anti-clockwise rotation of the planet gears **ST3** on the crownwheel **K2** achieves a further increase in clockwise rotation of the gear train carrier **T1**.

The result is that the speed of the gear train carrier **T1** and the gear **I1** is higher than that of the driving crownwheel **K2**, obtaining 4th gear.

**Reverse** (selector lever on position **R**)

The gearbox input shaft **E** rotates in a clockwise direction.

The sun gears **S1** and **S2** are coupled by the input shaft **E**, by the engagement of the multiple disc clutch **C2**.

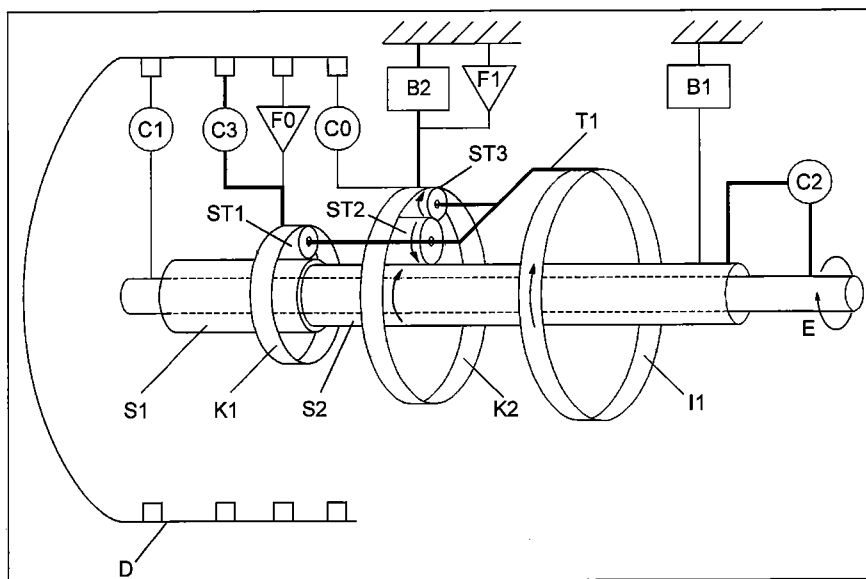
The clutch **C3** locks the free wheel **F0** and couples the crownwheel **K1** to the clutch carrier drum **D**.

The crownwheel **K2** is locked to the gearbox casing via the multiple disc brake **B2**.

The brake **B2** locks the free wheel **F1**.

The sun gear **S2**, coupled to the input shaft **E**, transmits motion anti-clockwise to the planet gears **ST2** and clockwise to the planet gears **ST3**.

The planet gears **ST3**, rotating clockwise, shift onto the locked crownwheel **K2**, thus making the gear train carrier **T1** and gear **I1** rotate anti-clockwise, obtaining reverse gear.



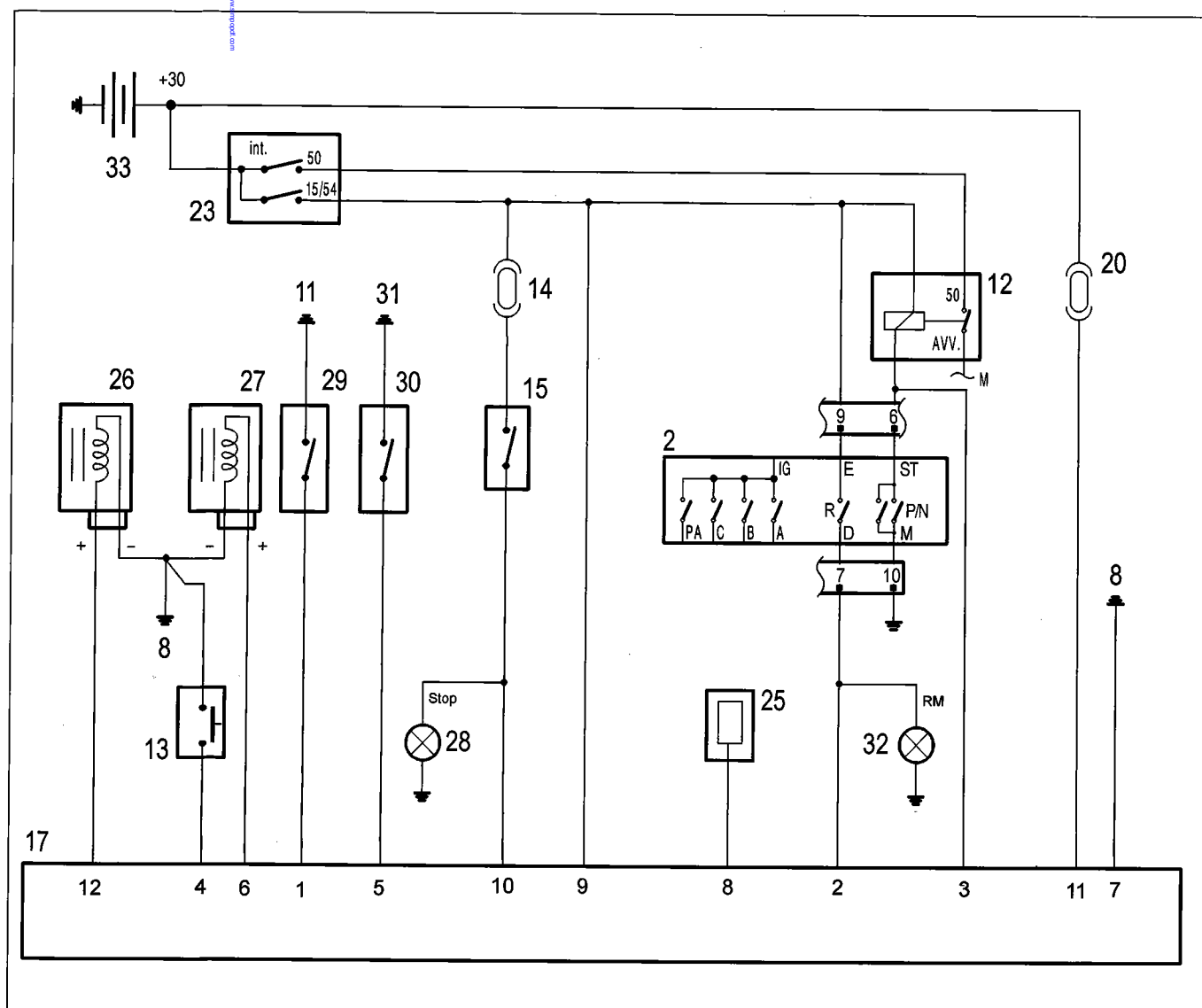
P4A13AB01

**SAFETY CONTROL UNIT**

The safety functions of the AISIN automatic transmission are managed by a special electronic control unit and may be divided into two categories:

1. warning functions, which cause a buzzer to sound when:
  - the selector lever is shifted to position R;
  - a front door is opened when the selector lever is at a position other than P;
  - the engine is switched off with the selector lever in a position other than P;
2. functions which oblige the driver to carry out particular actions to allow:
  - the selector lever to be moved from position P with the engine running only with the brake pedal pressed;
  - the ignition key to be withdrawn only with the selector lever in position P.

### 21-27.



P4A14AB01

### Wiring diagram of safety control unit connections

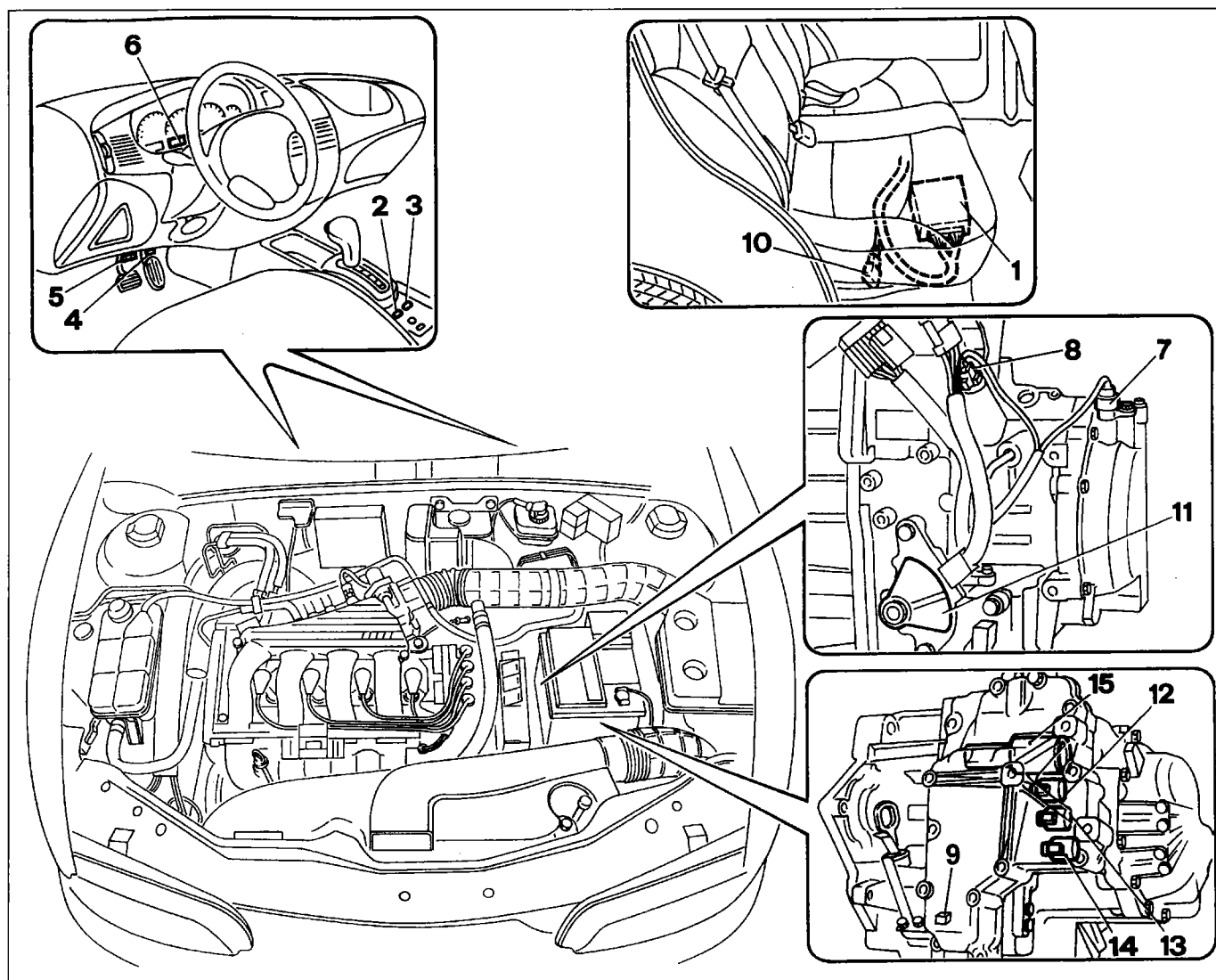
- |                                                           |                                                                           |
|-----------------------------------------------------------|---------------------------------------------------------------------------|
| 2. Selector lever position sensor                         | 26. Ignition switch solenoid                                              |
| 8. Rear earth                                             | 27. Shift-lock solenoid                                                   |
| 11. Left dashboard earth                                  | 28. STOP lights                                                           |
| 12. Starter motor relay                                   | 29. Front left button controlling courtesy light and door open indicator  |
| 13. PARK position additional switch                       | 30. Front right button controlling courtesy light and door open indicator |
| 14. 15A fuse protecting STOP lights                       | 31. Right dashboard earth                                                 |
| 15. STOP lights switch                                    | 32. Reversing lights                                                      |
| 17. Automatic transmission safety electronic control unit | 33. Battery                                                               |
| 20. 5A fuse protecting control module                     |                                                                           |
| 23. Ignition switch                                       |                                                                           |
| 25. Speedometer signal generator                          |                                                                           |

#### ELECTRONIC CONTROL SYSTEM

The electronic control system of the AISIN automatic transmission comprises a control module, some switches and sensors which inform the control module of the different operating conditions and four actuators which receive commands from the control module and interact with the hydraulic control system to obtain the engagement of the different gears.

The control module also sends signals to the instrument panel and exchanges information with the fuel injection/ignition control unit and diagnostic socket.

#### Location on the car of the control system components of the AISIN AW 596/Y024 automatic transmission



P4A15AB01

1. Transmission control module
2. NORMAL/SPORT mode switch
3. ICE mode switch
4. Kick-down switch
5. Stop lights switch
6. Instrument panel
7. Main shaft rpm sensor (black)
8. Vehicle speed sensor (grey)

9. Gearbox oil temperature sensor
10. Diagnostic socket
11. Selector lever position sensor
12. Gear engagement solenoid S1
13. Gear engagement solenoid S2
14. Lock-up clutch solenoid SL
15. Pressure control solenoid STH

## 21-27.

### CONTROL MODULE

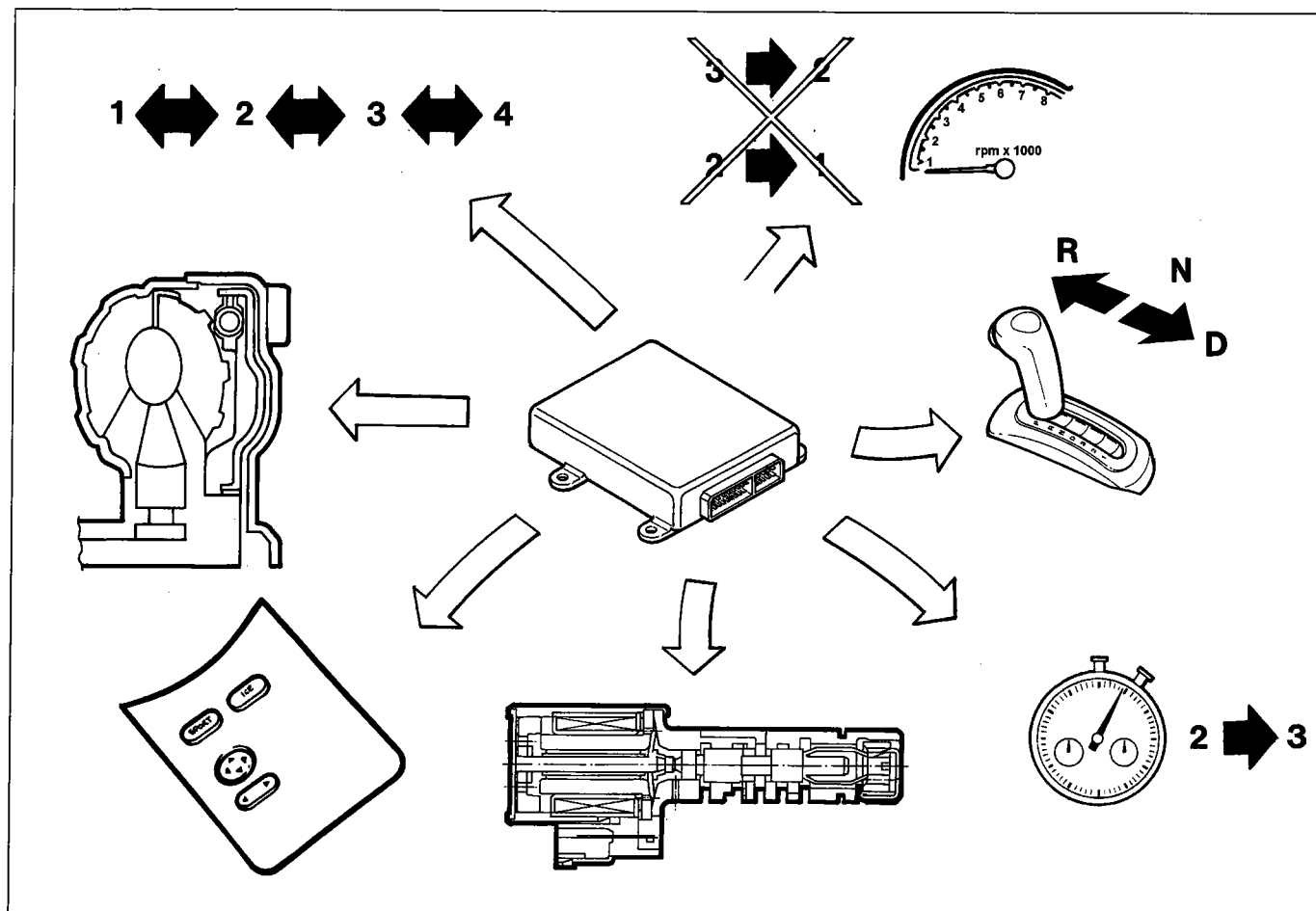
The control module contains the electronic control logic of the automatic transmission, where the various functions are memorized, and is located under the rear seat.

The control module receives information concerning the operation of the automatic transmission from the various switches and sensors located on the gearbox, engine and dashboard, and issues the appropriate commands to four solenoids contained in a valve assembly located at the front of the automatic transmission, and to the fuel injection/ignition electronic control unit for reducing the driving torque under particular operating conditions.

### Control module functions

In accordance with the commands received from the driver via the various switches and also the signals coming from the sensors concerning the operating conditions, the control module ensures the correct operation of the gearbox by means of the following functions:

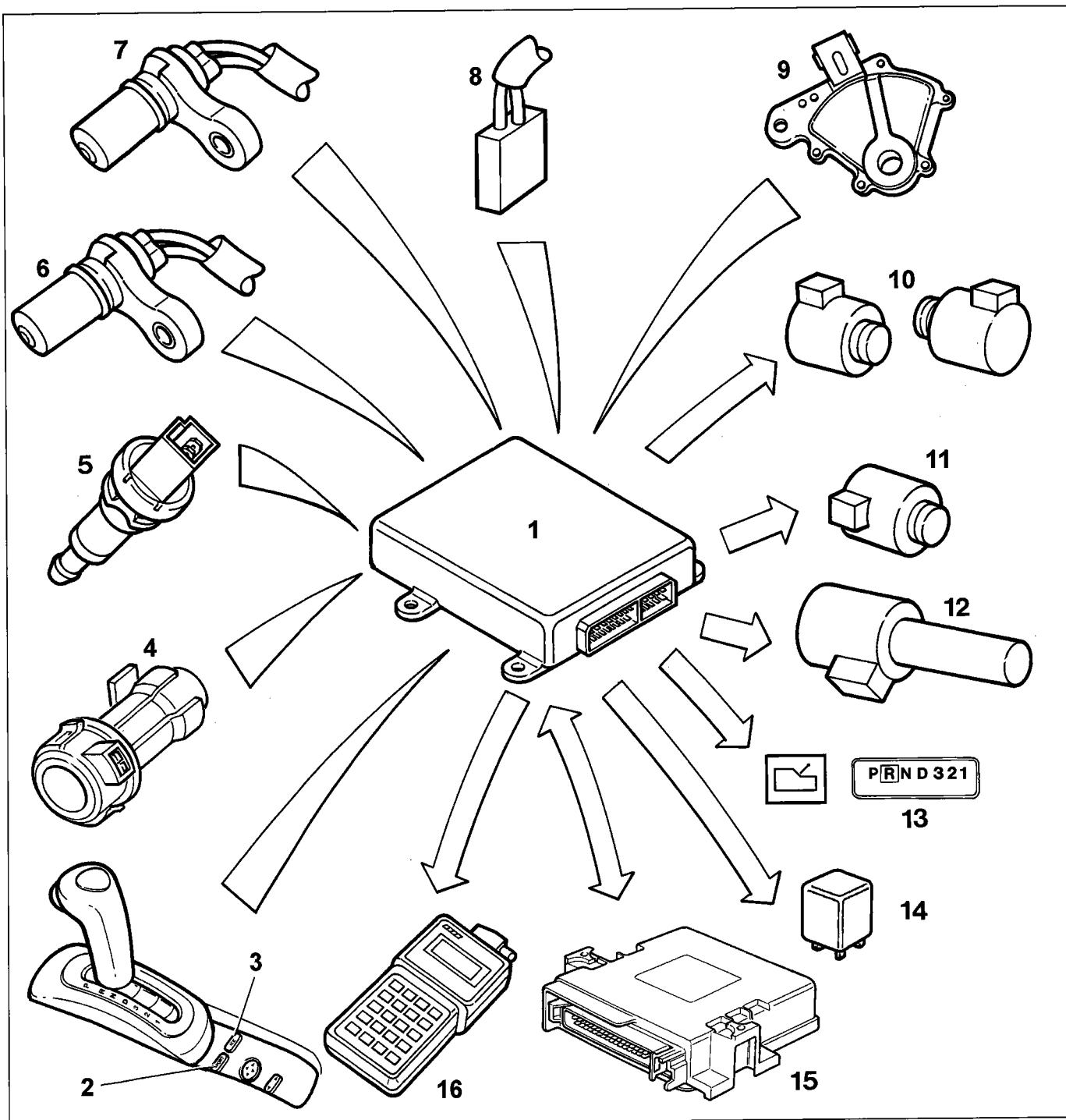
- actuation of gear changes,
- locking of torque converter (lock-up function),
- execution of driving mode,
- hydraulic pressure variations,
- check on gear change times,
- check on gear changes,
- safety function,
- self-test function.



P4A16AB01



Diagram of input and output information to/from control module



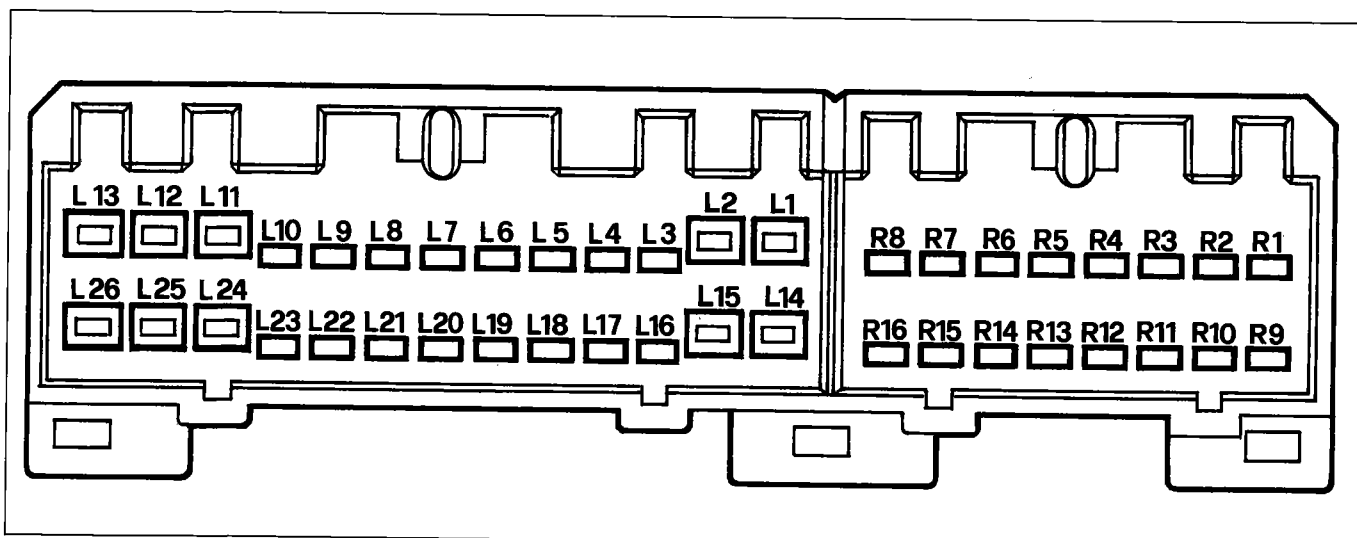
P4A17AB01

1. Control module
2. NORMAL/SPORT mode switch
3. ICE mode switch
4. Kick-down switch
5. Stop lights switch
6. Main shaft rpm sensor
7. Vehicle speed sensor
8. Gearbox oil temperature sensor
9. Selector lever position sensor

10. Gear engagement solenoids S1 and S2
11. Lock-up clutch solenoid SL
12. Pressure control solenoid STH
13. Instrument panel
14. Gearbox oil cooling fan relay
15. Fuel injection-ignition control unit
16. Diagnostic socket

## 21-27.

### Identification of control module connections



P4A18AB01

### View of connector side of control module

| Pin | Connection                                                                               | Pin | Connection                                  |
|-----|------------------------------------------------------------------------------------------|-----|---------------------------------------------|
| R1  | Input for throttle aperture signal (fuel injection/ignition control unit pin 44)         | L1  | Pressure control STH solenoid (-)           |
| R2  | Earth for speed sensor cables                                                            | L2  | Earth on car                                |
| R3  | Main shaft rpm sensor (-)                                                                | L3  | Selector lever position sensor (A)          |
| R4  | Vehicle speed sensor (-)                                                                 | L4  | NC                                          |
| R5  | NORMAL/SPORT mode switch                                                                 | L5  | Gearbox oil temperature sensor (-)          |
| R6  | Kick-down switch                                                                         | L6  | NC                                          |
| R7  | Selector lever position switch (C)                                                       | L7  | NC                                          |
| R8  | NC                                                                                       | L8  | Earth on vehicle                            |
| R9  | Output for torque reduction signal (fuel injection/ignition control unit pin 32)         | L9  | STOP lights switch                          |
| R10 | Input for engine coolant temperature signal (fuel injection/ignition control unit pin 5) | L10 | Display on instrument panel                 |
| R11 | Main shaft rpm sensor (+)                                                                |     | - Selector lever position                   |
| R12 | Vehicle speed sensor (+)                                                                 |     | - Driving mode                              |
| R13 | NC                                                                                       |     | - Fault/high gearbox oil temperature sensor |
| R14 | ICE mode switch                                                                          | L11 | Pressure control solenoid STH (+)           |
| R15 | NC                                                                                       | L12 | Battery positive                            |
| R16 | Selector lever position sensor (PA)                                                      | L13 | Solenoid S1                                 |
|     |                                                                                          | L14 | NC                                          |
|     |                                                                                          | L15 | NC                                          |
|     |                                                                                          | L16 | Selector lever position sensor (B)          |
|     |                                                                                          | L17 | NC                                          |
|     |                                                                                          | L18 | Gearbox oil temperature sensor (+)          |
|     |                                                                                          | L19 | Gearbox oil cooling fan relay               |
|     |                                                                                          | L20 | NC                                          |
|     |                                                                                          | L21 | Diagnostic socket earth (line G)            |
|     |                                                                                          | L22 | Diagnostic socket (line L)                  |
|     |                                                                                          | L23 | Diagnostic socket (line K)                  |
|     |                                                                                          | L24 | Lock-up clutch solenoid SL                  |
|     |                                                                                          | L25 | Key-dependent positive (MAR)                |
|     |                                                                                          | L26 | Solenoid S2                                 |

### OPERATING STRATEGIES

#### Actuation of gear changes

The change from one gear to the higher or lower gear depends on the accelerator pedal position, the vehicle speed, the engine's characteristic parameters and the driving mode selected by the driver.

The control module sends an ON/OFF signal to the solenoids S1 and S2.

They consent or prevent the oil from reaching the brakes and clutches necessary for obtaining the different transmission ratios, changing their condition from ON to OFF and vice versa as shown in the table below.

| Gear | Solenoid S1 | Solenoid S2 |
|------|-------------|-------------|
| 1st  | ON          | OFF         |
| 2nd  | ON          | ON          |
| 3rd  | OFF         | ON          |
| 4th  | OFF         | OFF         |

The 3rd-4th gear change is prevented when the engine coolant temperature is below 75°C.

The control module has specific gear change programs memorized for each driving mode (NORMAL, SPORT, ICE), which will be described on the following pages in the section relating to the driving modes.

#### Locking of torque converter (lock-up function)

The engagement of the lock-up clutch for locking the torque converter depends on the gear engaged, the accelerator pedal position, the vehicle speed and the selected driving mode.

The control module sends a duty-cycle signal to the lock-up control solenoid SL, which discharges the oil pressure in the chamber on the flywheel side, causing the clutch to be engaged and the converter to be locked.

The control module has two specific programs for locking the torque converter memorized for the NORMAL and SPORT driving strategies, while for the ICE strategy the torque converter is not locked. These programs are described on the following pages in the section concerning the driving modes.

The converter is not locked under the following conditions:

1. when the control system receives a fault signal from one of the components and executes the recovery strategy;
2. when the brake pedal is pressed and the gearbox input speed is below a certain value;
3. when the throttle valve is closed (accelerator pedal not pressed) and the vehicle speed is below 125 km/h with the selector lever on position D;
4. when the engine coolant temperature is below 75°C.

During the 3rd-4th gear change, with lock-up clutch engaged, the control module sends to the solenoid SL a signal with variable duty cycle, so as to temporarily disengage the lock-up clutch, to improve the quality of the gear change.

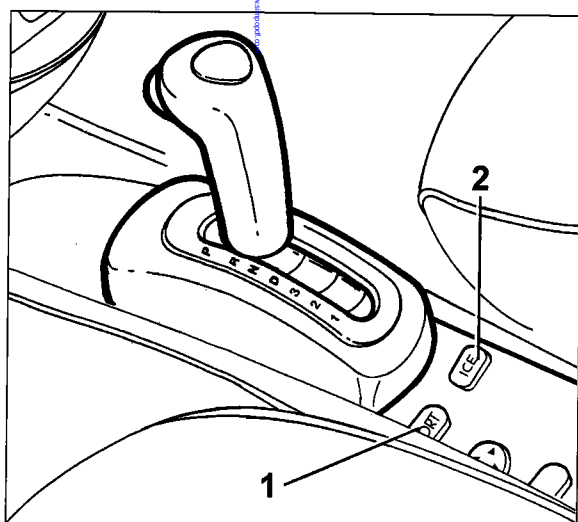
#### Execution of driving mode

The control module is designed to control the operation of the automatic transmission in accordance with three different driving modes.

The three driving modes allow the driver to select the different capabilities of the automatic transmission in accordance with the momentary requirements of use:

- NORMAL to obtain the maximum driving comfort, while minimizing fuel consumption;
- SPORT to obtain the maximum performance of the vehicle;
- ICE to increase driving safety under slippery conditions.

### 21-27.



P4A20AB01

At every start-up, the system is set to the NORMAL mode.

When the NORMAL/SPORT pushbutton (1) is pressed, the NORMAL mode is changed to SPORT mode and vice versa.

When the ICE pushbutton (2) is pressed (with the lever in position D), the system uses the ICE mode and excludes the other two modes. When the NORMAL/SPORT button is pressed, the NORMAL strategy is resumed.

1. NORMAL/SPORT pushbutton switch
2. ICE pushbutton

The change from one strategy to the other may be done at any time during driving. The selected strategy is displayed beside the indication of the selector lever position on the instrument panel.



P4A20AB02

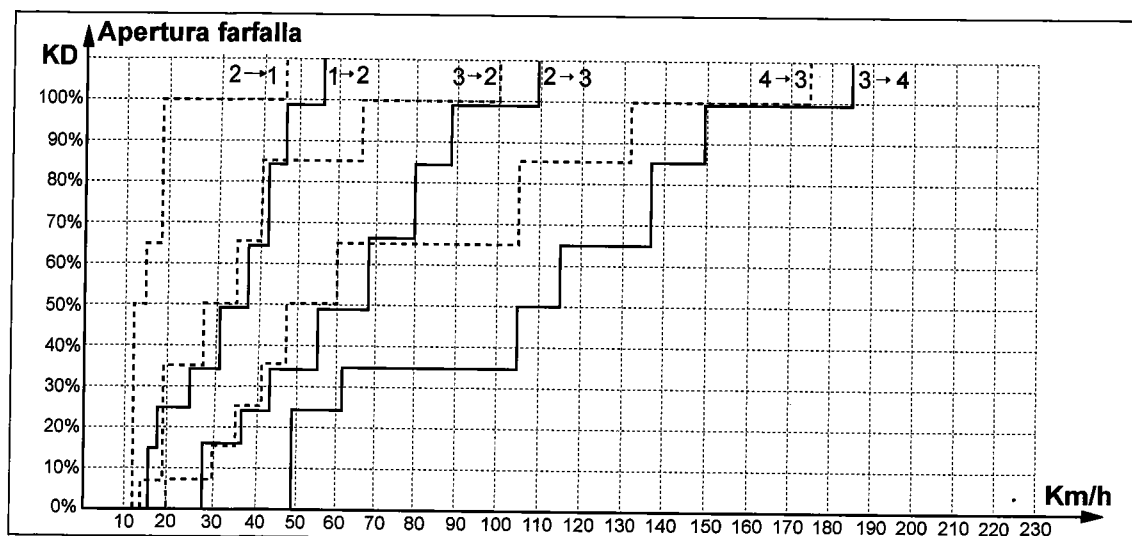
**Display of the operating strategy used and the selector lever position**

The behaviour of the AISIN automatic transmission, in accordance with the driving mode (NORMAL, SPORT or ICE) used, is described below.

The characteristic curves of change between the four ratios and the locking of the lock-up clutch are shown, both during progression and during reduction of the ratio (scaling), expressed as a function of the percentage of aperture of the throttle valve and the vehicle speed.

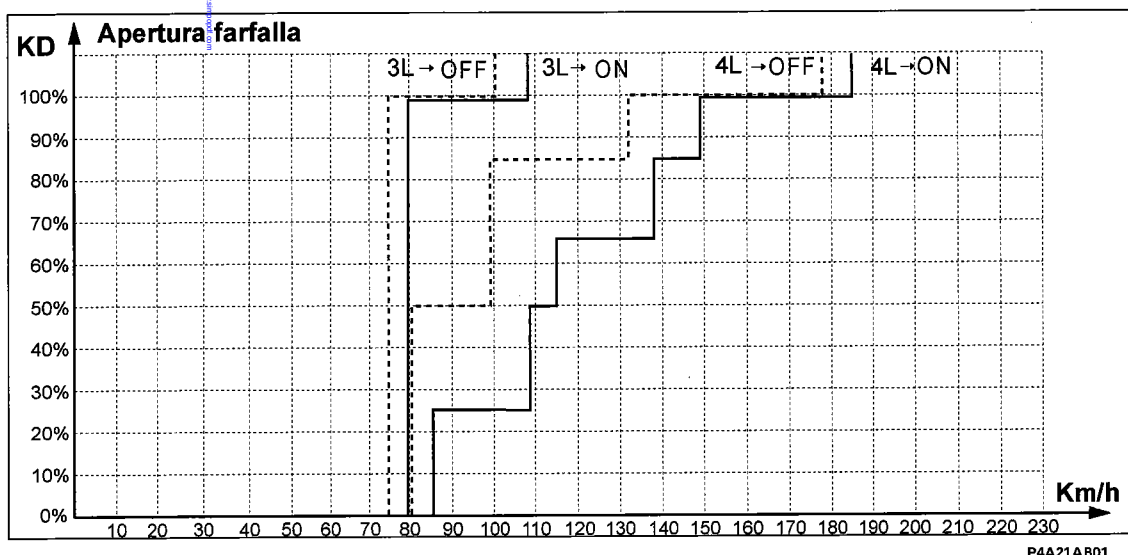
#### Operation with NORMAL strategy

The NORMAL strategy is selected by the control module whenever the engine is started up. With this operating strategy, very gentle operation is ensured, aimed at optimizing driving comfort and economy of operation.



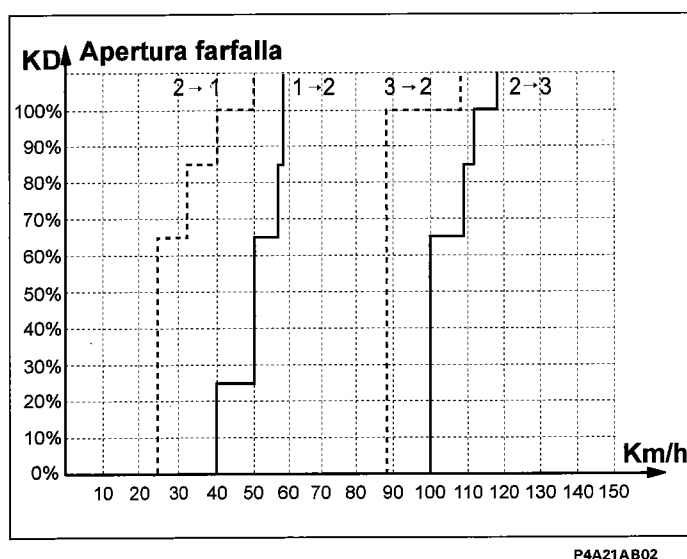
P4A20AB03

**Gear change program**



**Loci-up program**

### Operation in SPORT mode

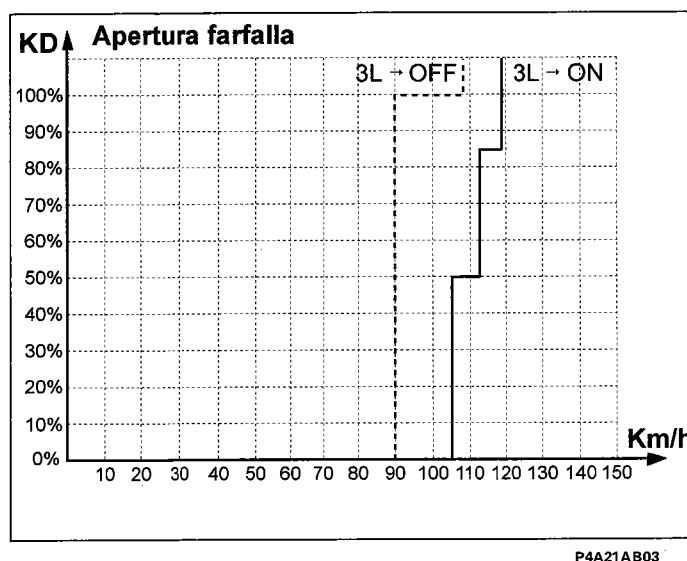


The control module switches to SPORT mode when the NORMAL/SPORT pushbutton located on the left of the selector lever is pressed.

This mode of use of the gearbox is designed to make full use of the power so as to obtain maximum performance from the vehicle; for the same aperture of the throttle valve, the changes to the higher ratios are automatically shifted to a higher engine speed.

The SPORT mode does not use 4th gear (cruising gear).

### Gear change program



The SPORT mode is excluded in the following cases:

1. if the NORMAL/SPORT pushbutton is pressed again;
2. if the ICE pushbutton switch is pressed;
3. operation under recovery conditions.

### Lock-up program

**Apertura farfalla**

**KD**

**Km/h**

**Gear change program**

3 → 2

4 → 3

2 → 3

3 → 4

100%

90%

80%

70%

60%

50%

40%

30%

20%

10%

0%

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230

P4A22AB01

| Selected driving mode | Selector lever position | Ratio selected on departure | Automatic management                                                                 |                                                                                      |   |   |
|-----------------------|-------------------------|-----------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---|---|
|                       |                         |                             | 1                                                                                    | 2                                                                                    | 3 | 4 |
| NORMAL                | D                       | 1st                         |  |                                                                                      |   |   |
|                       | 3                       | 1st                         |  |                                                                                      |   |   |
|                       | 2                       | 1st                         |  |                                                                                      |   |   |
|                       | 1                       | 1st                         |   |                                                                                      |   |   |
| SPORT                 | 3                       | 1st                         |  |                                                                                      |   |   |
|                       | 2                       | 1st                         |  |                                                                                      |   |   |
|                       | 1                       | 1st                         |   |                                                                                      |   |   |
| ICE                   | D                       | 2nd                         |                                                                                      |  |   |   |



#### Hydraulic pressure variations

The pressures in the hydraulic system are regulated by the control module, in order to achieve the following functions:

- increase in line pressure when cold;
- reduction in line pressure in the N-R change;
- modulation of driving pressure.

#### Increase in line pressure when cold

With the selector lever at position N, when the transmission oil temperature is below 10°C and the vehicle speed is below 7 km/h, the control module sends a signal for a period of 5 seconds to the solenoid STH, to increase the line pressure, so enabling the N-D and N-R engagement time to be reduced.

This function is excluded in the following cases:

- transmission oil temperature over 20°C;
- vehicle speed over 7 km/h;
- selector lever position other than N.

#### Reduction of line pressure in N-R change

When the selector lever is moved from position N to position R, the control module sends a signal to the solenoid STH to control the line pressure.

This makes the line pressure fall, so as to reduce the jolt caused by the engagement of reverse gear.

#### Modulation of driving pressure

The driving pressure of the hydraulic valves (throttle pressure) is increased by the control module, depending on the aperture of the throttle valve and the vehicle speed.

#### Control of gear change times

Comparing the ratios between the input and output speeds, provided by the main shaft rpm sensor and vehicle speed sensor respectively, with the memorized values of the transmission ratios of the different gears, the control module assesses the time used for the gear changes.

#### Controlling gear changes

In an automatic transmission, the engagement of gears causes jolts resulting from the sudden variation in transmission ratios; these are more pronounced when engaging 1st gear and reverse gear, which permit higher transmission ratios.

These jolts caused by the engagement of 1st gear and reverse gear are inconveniently perceptible for the occupants and also cause stresses on the gearbox gears.

To reduce these stresses and improve driving comfort, the AISIN automatic transmission uses the following features:

- engagement of 1st gear or reverse gear with a reduction in driving torque (garage function);
- N-D change with pitch control (squat);
- N-R change with reduction in line pressure.

#### Engagement of 1st gear or reverse gear (garage function)

When the selector lever is moved as follows:

- from P or N to R;
- from N to D (3-2-1);

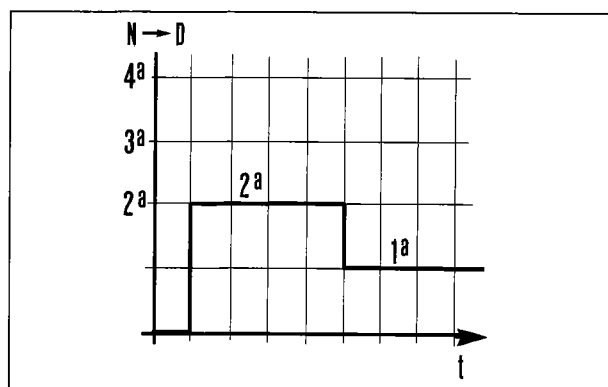
with this function the control module sends a signal to the fuel injection-ignition control unit so as to reduce the driving torque, reducing the jolt caused by the engagement of 1st gear or reverse gear.



## 21-27.

### N-D change with pitch control (squat)

When the selector lever is moved from position N to position D, the control module temporarily engages 2nd gear, and then changes to 1st gear. In this way the jolt caused by the engagement of 1st gear and the resulting pitching movement of the vehicle are reduced.



P4A24AB01

This function only intervenes if the following conditions arise simultaneously:

- brake pedal pressed (stop lights on);
- throttle valve closed (throttle aperture 0%);
- vehicle speed below 7 km/h;
- driving mode is NORMAL or SPORT;
- when the selector lever is moved from position N to position D.

### Inhibition of reverse gear

With the selector lever at position R, with a vehicle speed of over 7 km/h, the control module sends a signal to the gear change solenoids (solenoid 1 not activated -OFF- and solenoid 2 activated -ON-) inhibiting reverse gear.

The inhibition of reverse is deactivated in the following cases:

- vehicle speed below 5 km/h;
- selector lever position other than R.

### Self-test

The electronic control system constantly monitors the sensors, control solenoids and all the other electronic components, in order to detect faults and malfunctions immediately; these errors are memorized in the control module and can be read using the FIAT/LANCIA Tester.

### Error detection conditions

The control module can detect errors in the various components only under particular conditions. With the ignition set to ON or START, and in all other conditions, the following errors can be detected:

- error in gear change solenoid S1;
- error in gear change solenoid S2;
- error in lock-up clutch control solenoid SL;
- error in pressure control solenoid STH;
- error in selector lever position sensor;
- error in throttle position sensor;
- error in kick-down switch;
- error checking transmission of driving torque reduction signal;
- error in gearbox oil temperature sensor when it still indicates an oil temperature of below 10°C after the engine coolant has reached 75°C.

With the engine running, the following are detected:

- error in battery voltage;
- error in coolant temperature sensor after a period of 10 minutes.

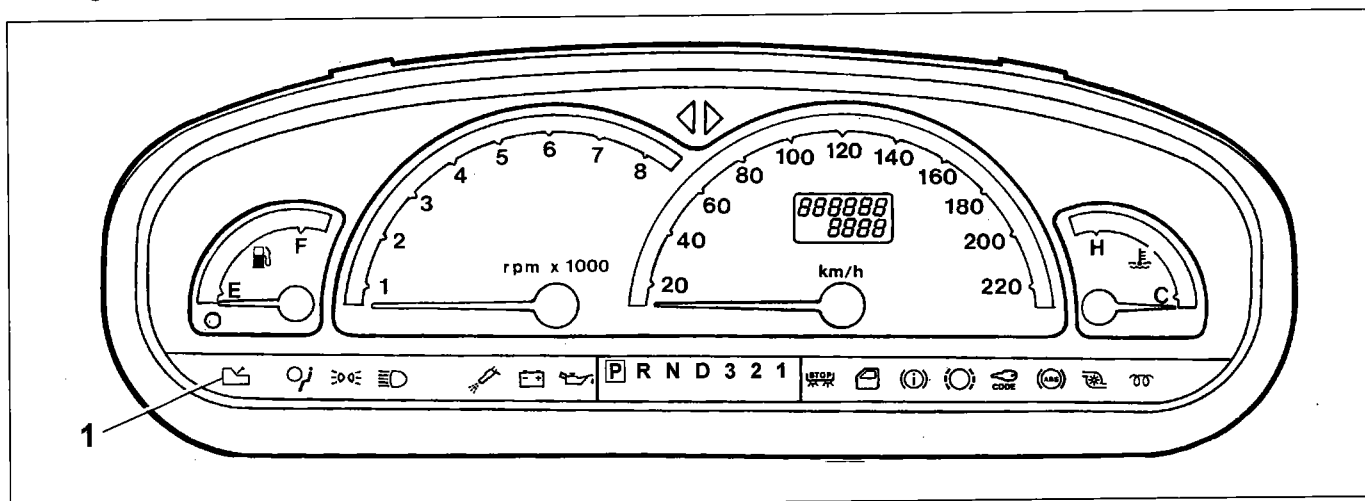
With the vehicle moving, the following are detected:

- error in main shaft rpm sensor;
- error in vehicle speed sensor;
- error in transmission ratio, when the ratio between the main shaft rpm and vehicle speed differs for more than one second from the memorized transmission ratios;
- error in gearbox mechanism, when the gear change time exceeds 1.3 seconds or when the change down to a lower ratio is effected at a higher speed than the maximum permitted speed.

### Memorization of errors

In the case of significant faults, the red warning light (1) on the instrument panel comes on.

If the gearbox oil temperature is over 150°C, the red warning light (1) remains permanently on.



P4A25AB01

For each error, the control module memorizes:

- the component which caused the error (e.g. pressure control solenoid);
- the classification of the error (Present or Intermittent);
- the type of error (A.C./D.C. GND/D.C. Vbatt/etc.).

### Error deletion

The errors memorized by the control module can be deleted by active diagnosis with the FIAT/LANCIA Tester or by disconnecting the battery for over 10 seconds.

### Recovery strategies

If the control module detects a fault, the red warning light on the instrument panel flashes to warn the driver and, at the same time, the appropriate recovery strategy is activated to allow the car to reach the nearest Authorized Garage.

### Main components

If the control module has memorized one of the following errors:

- errors in gear change solenoids S1 or S2;
- error in pressure control solenoid STH;
- error in selector lever position sensor;
- error in throttle position sensor;
- error in main shaft rpm sensor;
- error in vehicle speed sensor;
- error in transmission ratio;
- error in checking transmission of driving torque reduction signal;
- error in battery voltage;
- error in gearbox mechanism;

### 21-27.

The recovery strategy involves the deactivation of all the solenoids, so no automatic gear changes are effected, the torque converter is not locked and the hydraulic pressure is not varied. The vehicle can travel because each position of the selector lever corresponds to the engagement of a particular transmission ratio, by the movement of the hydraulic distributor.

| Selector lever position | R       | D   | 3   | 2   | 1   |
|-------------------------|---------|-----|-----|-----|-----|
| Gear engaged            | Reverse | 4th | 4th | 3rd | 1st |

#### Lock-up control solenoid

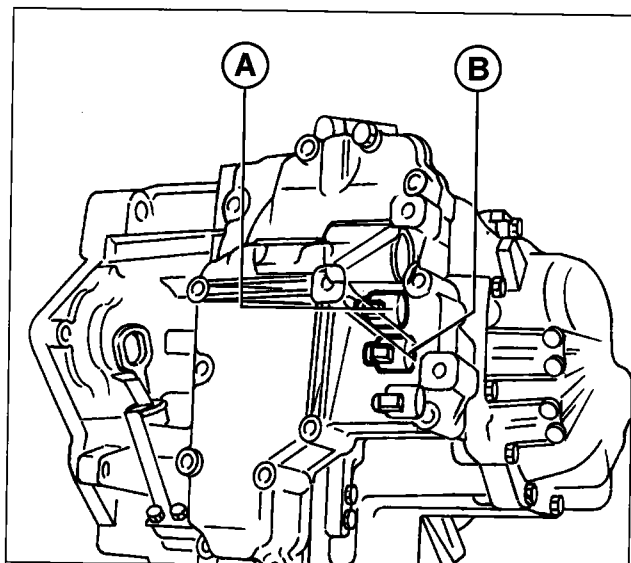
In the case of error, the torque converter locking function is disabled.

#### Coolant temperature sensor

In the case of error, a substitutive value of 75°C is assigned.

#### Kick-down switch

In the case of error, it is considered ON if the throttle valve aperture is greater than 73.5%, OFF if it less than 70%.

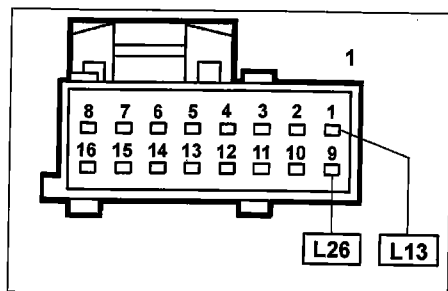


P4A26AB01

#### GEAR CHANGE SOLENOIDS

The gear change solenoids S1 (A) and S2 (B) are located at the front of the gearbox and they manage the gear changes. The solenoids are actually normally closed (N.C.) electrovalves which, receiving a signal from the control module, change their position to allow the engagement of the different transmission ratios, in accordance with the following table.

| Gear | Solenoid S1 | Solenoid S2 |
|------|-------------|-------------|
| 1st  | ON          | OFF         |
| 2nd  | ON          | ON          |
| 3rd  | OFF         | ON          |
| 4th  | OFF         | OFF         |

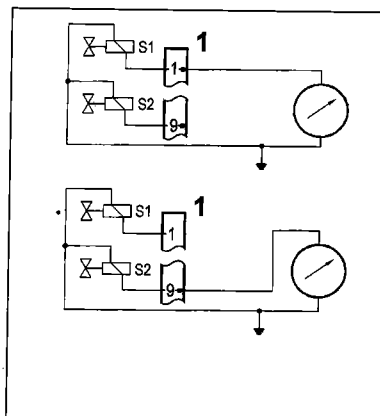


P4A26AB04

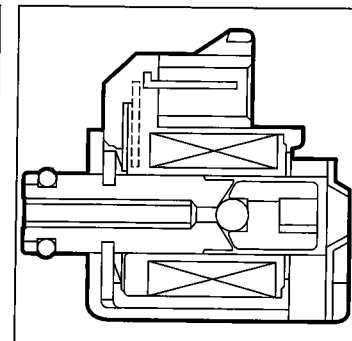
#### Gearbox sensors/actuators connector (view of contact side)

The resistance of the gear change solenoids S1 and S2 can be measured by disconnecting the connector and connecting an ohmmeter as shown in the figure.

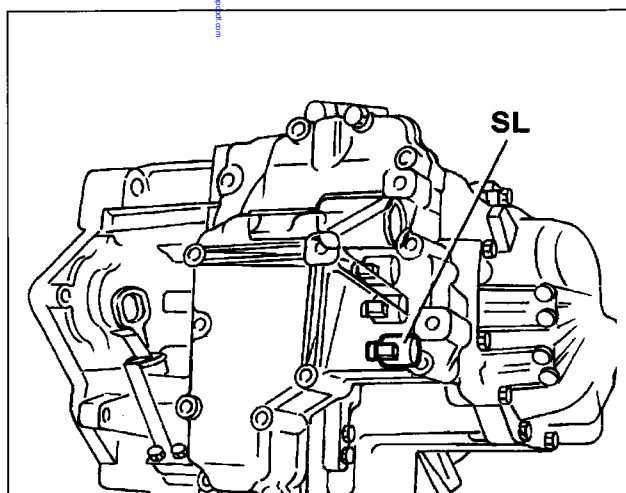
**Resistance: 13 ± 2 ohm at 20°C**



P4A26AB03



P4A26AB02

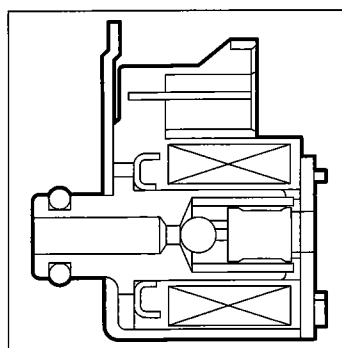


P4A27AB01

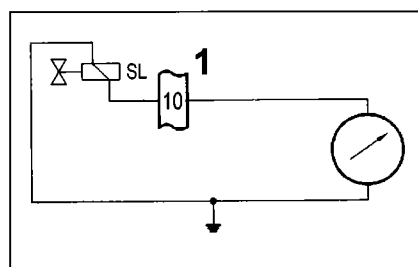
### LOCK-UP CLUTCH CONTROL SOLENOID

The lock-up clutch control solenoid SL is located at the front of the gearbox and manages the locking of the torque converter.

The solenoid, controlled by a duty cycle signal sent by the control module, intercepts the passage of oil, discharging the pressure which acts on the rear face of the clutch. The clutch, fitted on the turbine hub, is pushed by the pressure in the converter acting on its front face, against the casing joined to the converter pump, so locking it.



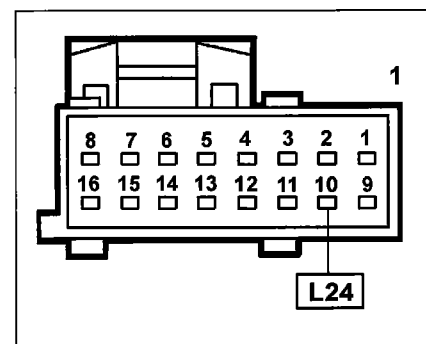
P4A27AB02



P4A27AB03

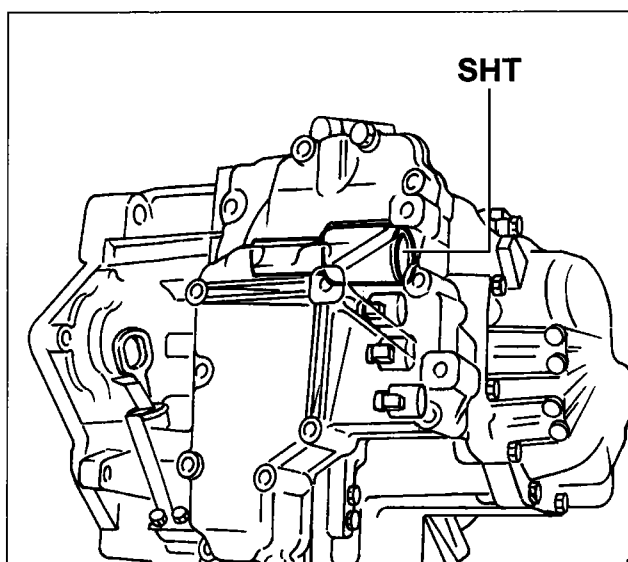
**Resistance:  $13 \pm 2$  ohm at  $20^{\circ}\text{C}$**

The resistance of the lock-up clutch control solenoid SL can be measured by disconnecting the connector and connecting an ohmmeter as shown in the figure.



P4A27AB04

**Gearbox sensors/actuator connector (view of contact side)**



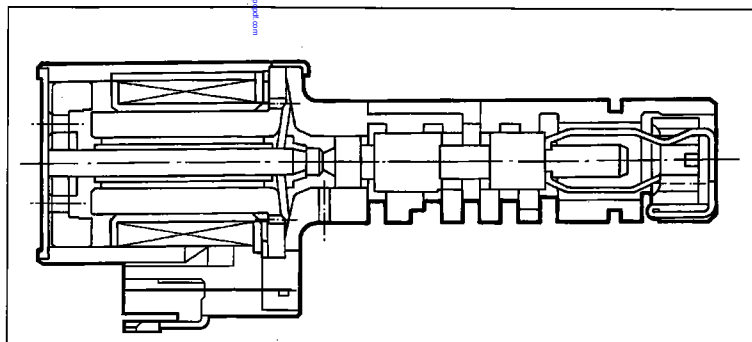
P4A27AB05

### PRESSURE CONTROL SOLENOID

The line pressure control solenoid STH is located at the front of the gearbox and it manages the changes in hydraulic pressures.

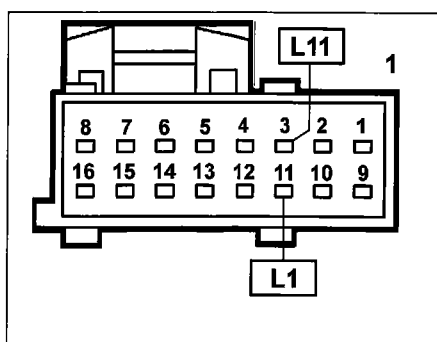
The solenoid, also controlled by a duty cycle signal sent by the control module, regulates the hydraulic pressure acting on the brakes and clutches in order to reduce the gear engagement times when cold and the jolting on engagement of reverse.

The solenoid also regulates the pressure driving the hydraulic valves in accordance with the throttle valve aperture and the vehicle speed.



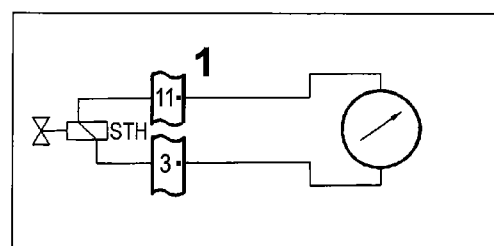
P4A28AB01

The resistance of the line pressure control solenoid STH can be measured by disconnecting the connector and connecting an ohmmeter as shown in the figure.



P4A28AB02

**Gearbox sensors/actuators connector (view of contact side)**

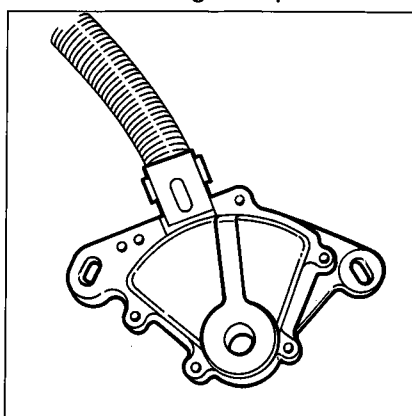


P4A28AB03

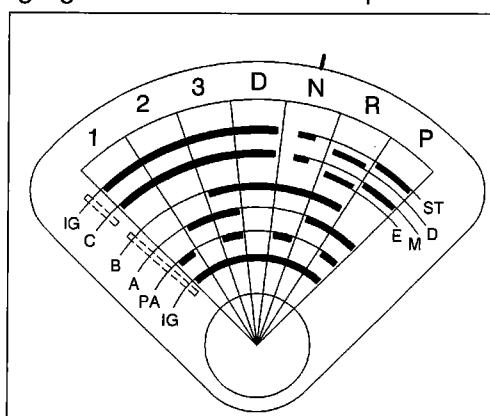
**Resistance:  $3.5 \pm 0.2$  ohm at  $25^{\circ}\text{C}$**

## SELECTOR LEVER POSITION SENSOR

The sensor, located at the top of the gearbox casing, detects the position of the selector lever (to which it is connected mechanically) and informs the control module via an appropriate electrical signal. The module lights up the warning light on the instrument panel.



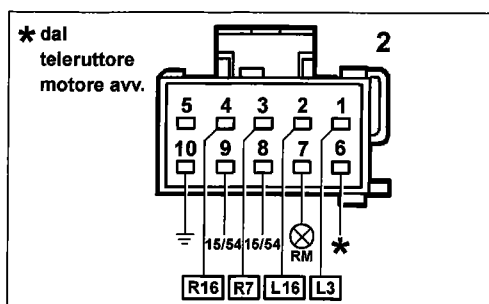
P4A28AB04



P4A28AB05

The sensor also switches on the reversing lights when reverse is engaged, and enables the starter motor only when the selector lever is at position N or P.

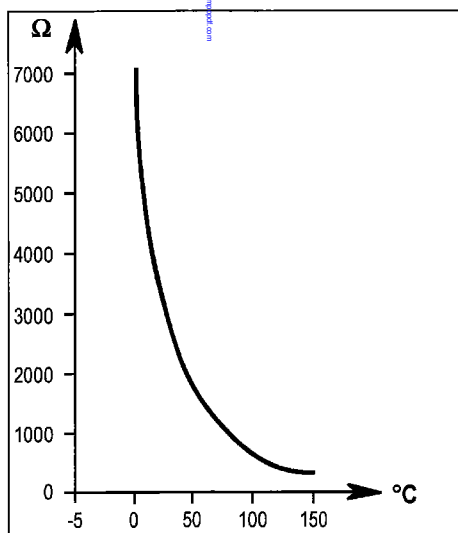
The combination output signals present on the various terminals of the sensor is shown in the following table.



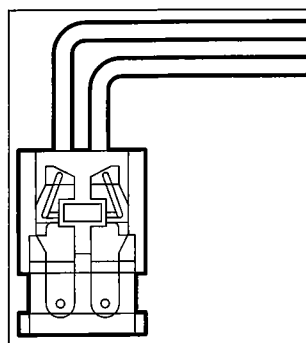
P4A28AB06

**Lever position sensor connector (view of contact side)**

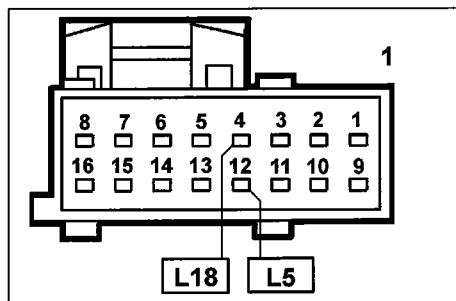
| Connectors | Start. |    | REVERSE |   |    |   |   |   |    |
|------------|--------|----|---------|---|----|---|---|---|----|
| Terminals  | 6      | 10 | 7       | 9 | 8  | 1 | 2 | 3 | 4  |
| Signals    | ST     | M  | D       | E | IG | A | B | C | PA |
| P          | ●      | ●  |         |   | ●  | ● |   |   | ●  |
| R          |        |    | ●       | ● | ●  | ● | ● |   |    |
| N          | ●      | ●  |         |   | ●  |   | ● |   | ●  |
| D          |        |    |         |   | ●  |   | ● | ● |    |
| 3          |        |    |         |   | ●  | ● | ● | ● | ●  |
| 2          |        |    |         |   | ●  | ● |   | ● |    |
| 1          |        |    |         |   | ●  |   |   | ● | ●  |



P4A29AB01



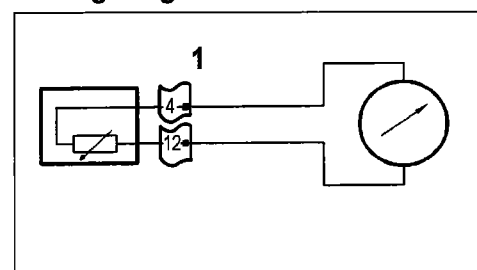
P4A29AB02



P4A29AB03

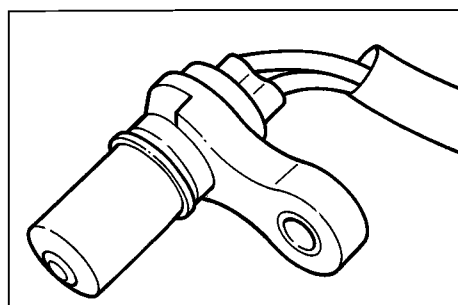
**Gearbox sensors/actuators connector  
(view of contact side)**

### Wiring diagram



P4A29AB04

**Resistance:**  $6445 \pm 645 \text{ ohm at } 10^{\circ}\text{C}$   
 $247 \pm 16 \text{ ohm at } 110^{\circ}\text{C}$   
 $111 \pm 6 \text{ ohm at } 145^{\circ}\text{C}$



P4A29AB05

### MAIN SHAFT RPM AND VEHICLE SPEED SENSOR

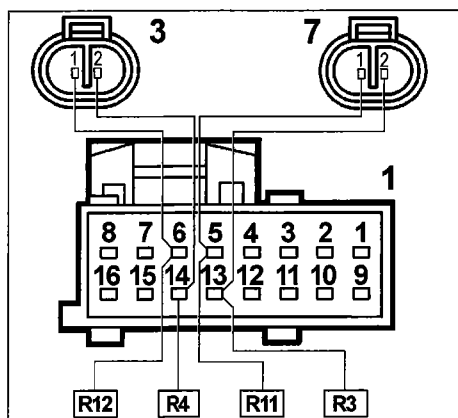
The two magnetic induction sensors located on the gearbox casing allow the control module to check the correct operation of the gearbox with regard to transmission ratios and gear change times, and to conduct diagnoses on the operation of the sensors.

The main shaft rpm sensor detects the speed of rotation of the gearbox main shaft, connected to the torque converter turbine, via a 20-tooth phonic wheel on the outer surface of the clutch C1.

The sensor sends to the control module a pulse signal (20 pulses per shaft revolution) proportional to the input speed of rotation of the gearbox.

The vehicle speed sensor detects the speed of rotation of the gearbox layshaft, connected to the differential pinion, by means of a 12-tooth phonic wheel constituted by the parking lock gear.

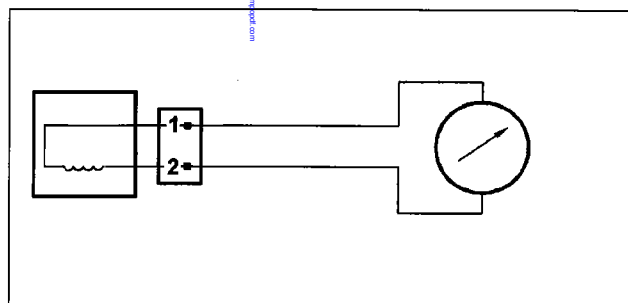
The sensor sends the control module a pulse signal (12 pulses per shaft revolution) proportional to the output speed of rotation of the gearbox, i.e. to the vehicle speed. This signal is used to effect the gear changes.



P4A29AB06

**Gearbox sensors/actuators connector (view of contact side)**

### 21-27.

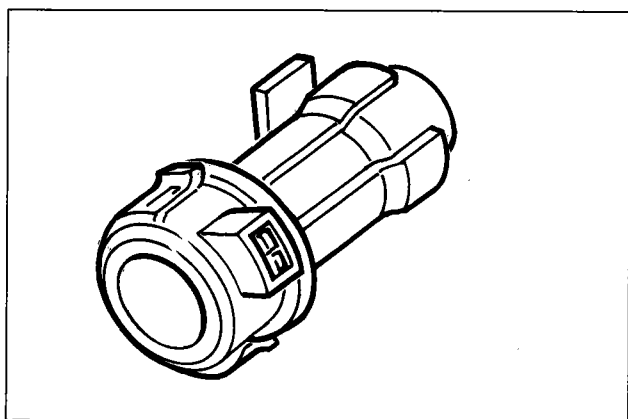


P4A30AB01

The resistance of the main shaft rpm and vehicle speed sensors can be measured by disconnecting the connectors and connecting an ohmmeter as shown in the figure.

**Resistance of main shaft rpm sensor:  $430 \pm 43$  ohm at  $20^{\circ}\text{C}$**

**Resistance of vehicle speed sensor:  $720 \pm 72$  ohm at  $20^{\circ}\text{C}$ .**



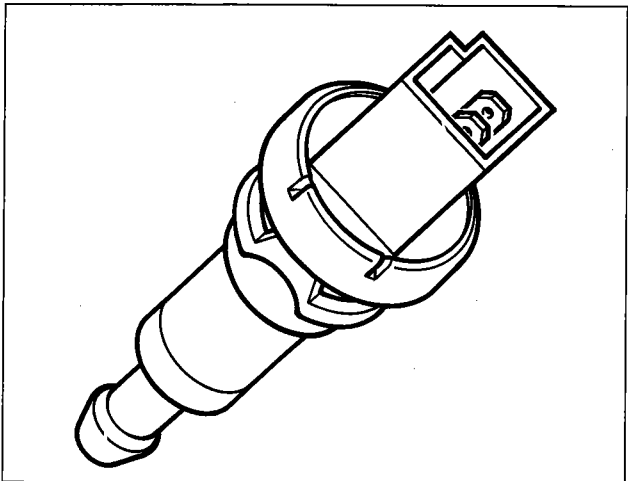
P4A30AB02

#### KICK-DOWN SWITCH

The kick-down switch is installed on the accelerator pedal and is operated when the accelerator pedal is pressed beyond a certain travel.

When the switch is operated, the control module (terminal R6) scales the transmission ratio in accordance with the vehicle speed, adhering to the selected gear change program.

With the switch at the ON position, the control unit effects the gear changes at higher engine speeds.



P4A30AB03

#### STOP LIGHTS SWITCH

The switch, mounted on the pedal assembly, is closed when the brake pedal is pressed, causing the STOP lights to come on and supplying the L9 terminal of the control module to exclude the torque converter lock-up function when the brake pedal is pressed.

#### THROTTLE VALVE POSITION SIGNAL

The throttle valve position signal is acquired by the fuel injection/ignition control unit, which detects it via the potentiometer installed on the throttle body.

The automatic transmission control unit uses this signal (PWM type with variable duty cycle), receiving it directly from the fuel injection/ignition control unit.

#### ENGINE COOLANT TEMPERATURE SIGNAL

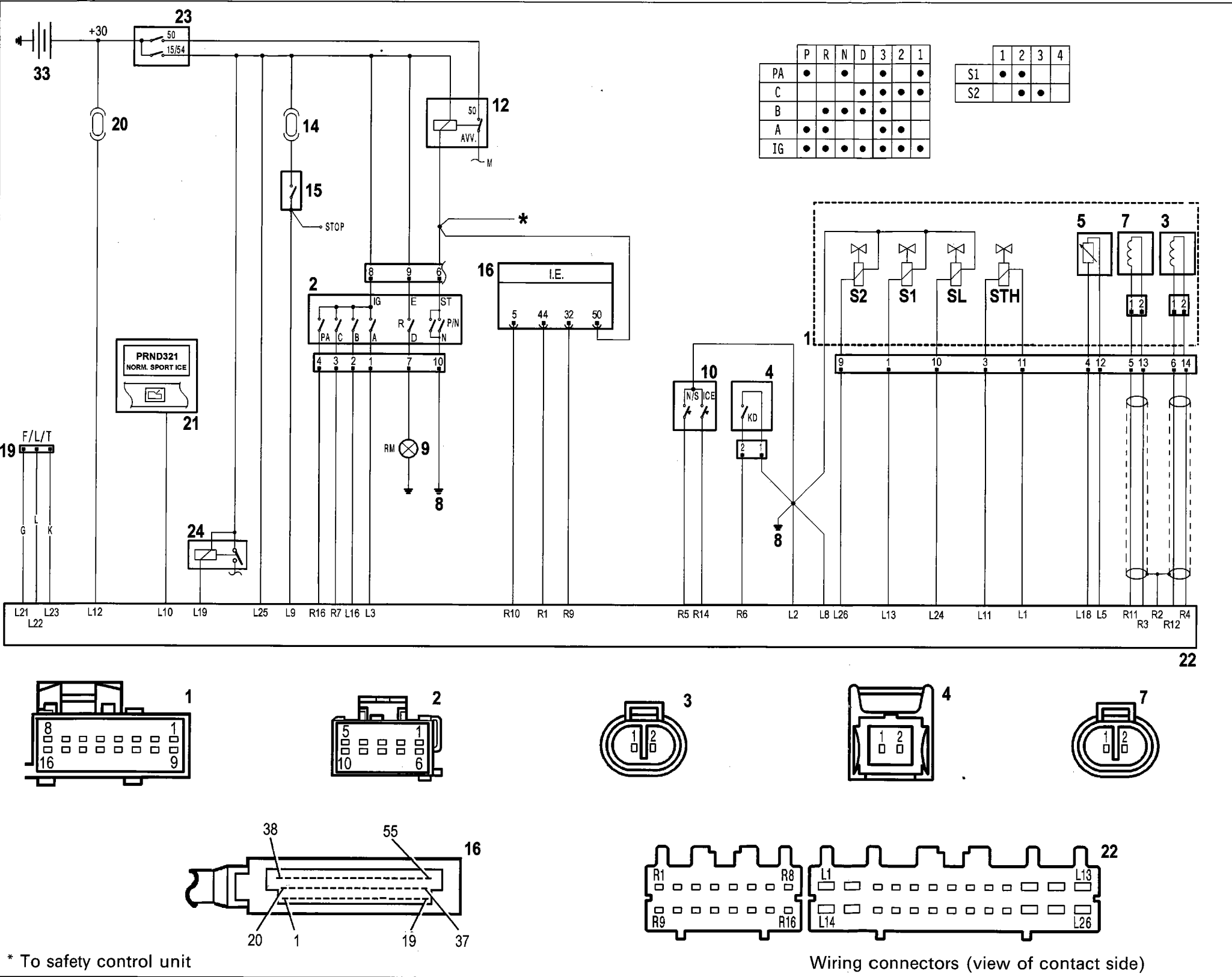
The engine coolant temperature signal is received by the fuel injection-ignition control unit, which detects it via an NTC sensor located on the thermostat body.

The automatic transmission control unit uses an ON/OFF type signal generated by the fuel injection/ignition control unit; the signal is changed over at a coolant temperature of  $75^{\circ}\text{C}$ .



Auto transmission and differential  
Description and operation  
21-27.

WIRING DIAGRAM



## Description and operation

## 21-27.

### DIAGNOSIS

Operating problems in the AISIN electronic automatic transmission may be caused by the engine, control system or automatic transmission itself.

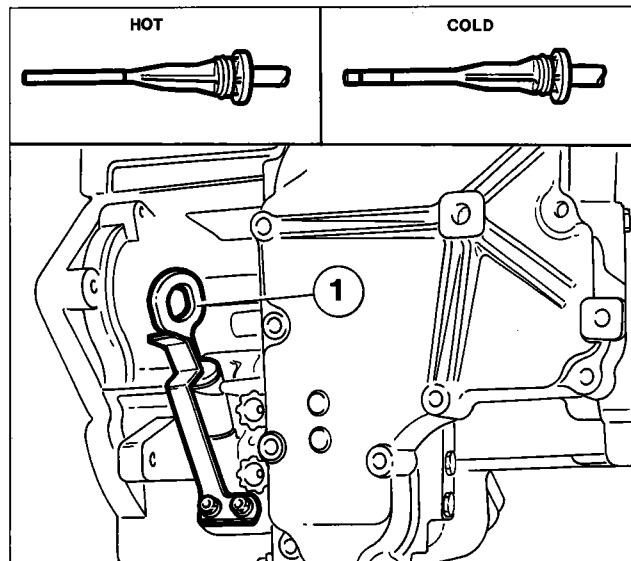
The fault-finding procedure begins with very simple operations, carried out in order of difficulty, initially aimed at establishing whether the fault depends on the engine, control system or gearbox.

Electrical faults are revealed by the self-test function of the control module, by the flashing of the red light on the instrument panel.

### Preliminary tests

#### Checking oil level

**NOTE** *The gearbox oil level must be checked with the engine and gearbox at normal operating temperatures (gearbox oil: 70 - 80°C), so the vehicle must be driven for a suitable period of time before the check.*



P4A32AB01

To check the level of the gearbox oil, proceed as follows:

- park the vehicle on flat ground and apply the handbrake;
- with the engine idling, gently move the selector lever from position P to position 1, then return it to P;
- withdraw the dipstick (1) and clean it;
- insert the dipstick fully into its seating;
- withdraw the dipstick again and check that the oil level lines up with the notch on the side of the stick marked HOT.

If the oil level is low, identify and eliminate the leaks, then top up the level.

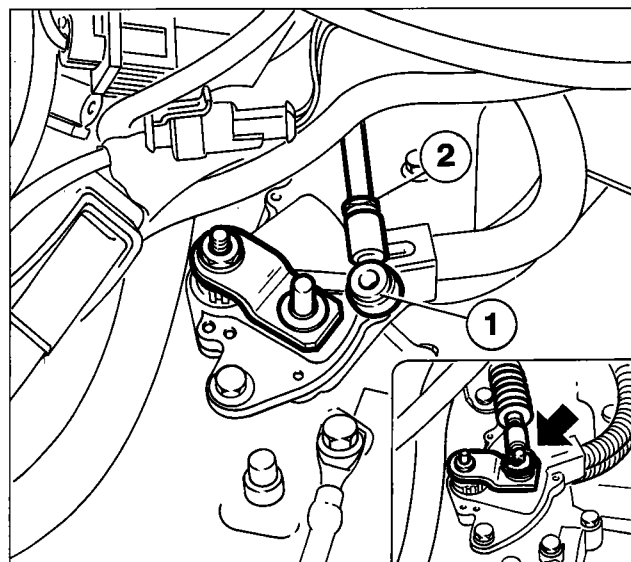
Also check the condition of the oil; if it is black or smells burnt, it should be changed.

#### Checking selector lever position

When the selector lever is moved from position N to the other positions, check that it moves freely without stiffness into any position, and that the position indicator on the instrument panel indicates the correct position.

#### Checking starter switch

If the engine does not start when the selector lever is at position N or P, or vice versa it starts when the lever is in a position other than N or P, the selector lever control cable must be adjusted as described on page 45, by adjusting the head (1) and locking it with the locknut (2). Finally check the correct position of the selector lever position sensor as described on page 47.



P4A32AB02

**Checking idle speed**

Check that the idle speed is correct.

**Tests with FIAT/LANCIA Tester**

Guided fault finding on the electrical part can be conducted by connecting the FIAT/LANCIA Tester with M39-A memory to the control module's diagnostic socket.

Full diagnosis of the system consists of three stages:

1. display of a set of operating parameters (with the engine running);
2. display of errors and elimination of the causes (guided diagnosis);
3. activation of the actuators (active diagnosis).

**1. Display of operating parameters**

The following operating parameters are displayed:

- selector lever position;
- gear engaged;
- vehicle speed;
- throttle valve angle of aperture;
- STH pressure control solenoid;
- kick-down switch;
- brake pedal contact;
- engine coolant temperature;
- gearbox oil temperature;
- gearbox main shaft rpm;
- driving torque reduction function;
- battery voltage.

**2. Display of errors and elimination of causes (guided diagnosis)**

At the beginning of diagnosis, the F/L Tester reads the errors memorized by the control module.

When an error is detected, the F/L Tester emits an acoustic signal and displays a message relating to the error.

A list of the possible causes of the error is then displayed.

After all the necessary repairs or replacements have been carried out and all the faults eliminated, the errors will be automatically deleted by the F/L Tester.

Guided diagnosis can also be carried out by checking step by step the efficiency of the circuits and operation of the various sensors/switches.

Once the faults have been eliminated, a road test should be carried out with the engine and gearbox up to temperature for at least 10 minutes, and then the F/L Tester should be used to check that there are no faults in the system.

**3. Activation of actuators (active diagnosis)**

The following actuators can be activated by a command sent from the F/L Tester, with the engine off and the selector lever at position N:

- gear change solenoids S1 and S2;
- lock-up clutch control solenoid SL;
- line pressure control solenoid STH.

This test is useful for checking the operation of the actuators, as the ticking caused by the internal movement of the solenoids can be heard.

Errors memorized by the control module can also be deleted under active diagnosis (provided they are no longer present or the conditions are not recreated).

**NOTE** *Errors can also be deleted by disconnecting the battery for over 10 seconds.*

## Description and operation

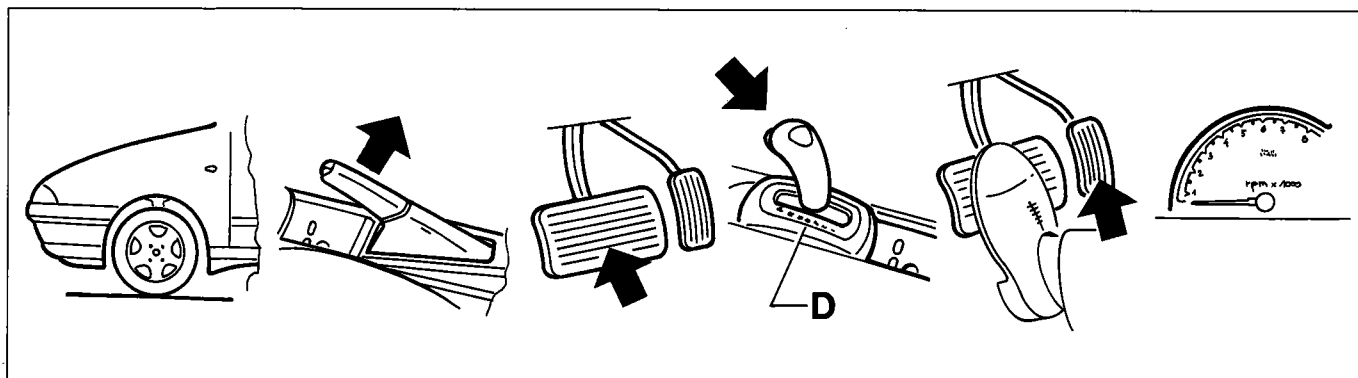
## 21-27.

### Stall speed test

This test serves to check the performance of the transmission and engine, and is conducted by measuring the maximum rpm that can be reached by the engine with the selector lever at position D and R.



*The duration of the stall speed test must not exceed 5 seconds.*



P4A34AB01

To conduct the stall speed test, proceed as follows:

- chock the vehicle by placing wedges under the wheels;
- apply the handbrake fully;
- start the engine and bring it up to temperature;
- press the brake pedal down hard with the left foot;
- move the selector lever to position D;
- press the accelerator pedal down fully with the right foot and quickly read the maximum speed reached by the engine.

**Stall speed: 2300 ± 150 rpm**

Repeat the sequence of operations, but moving the selector lever to position R.

**Stall speed: 2300 ± 150 rpm**

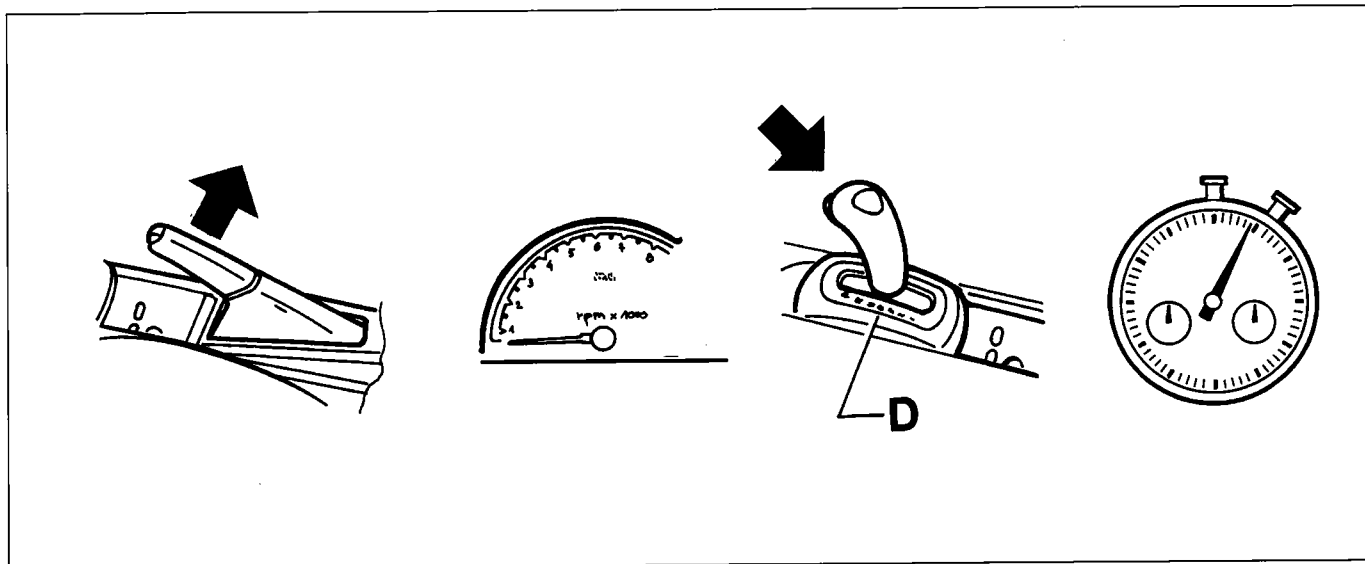
| Stall speed                                 | Possible causes                                                                                                                                                    |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lower than specified value in both D and R  | <ul style="list-style-type: none"><li>* Insufficient engine power</li><li>* Incorrect operation of free wheel on stator of torque converter</li></ul>              |
| Higher than specified value in D            | <ul style="list-style-type: none"><li>* Insufficient line pressure</li><li>* Clutch C1 and C3 slipping</li><li>* Incorrect operation of free wheel F1</li></ul>    |
| Higher than specified value in R            | <ul style="list-style-type: none"><li>* Insufficient line pressure</li><li>* Clutch C2 slipping</li><li>* Clutch C3 slipping</li><li>* Brake B2 slipping</li></ul> |
| Higher than specified value in both D and R | <ul style="list-style-type: none"><li>* Insufficient line pressure</li><li>* Clutch C3 slipping</li></ul>                                                          |

#### Gear engagement time test

This test is for checking the condition of clutches C2 and C3 and the brake B2, and is conducted by measuring the time taken to engage first gear or reverse gear.



*To obtain a reliable result, carry out several measurements and take the average value. Allow one minute to pass between two consecutive measurements.*



P4A35AB01

To measure the gear engagement time, proceed as follows:

- apply the handbrake fully;
- start the engine, warm it up to temperature and check that the idle speed is correct;
- move the selector lever from position N to D;
- using a chronometer, measure the time elapsing between the movement of the selector lever and perception of engagement of 1st gear.

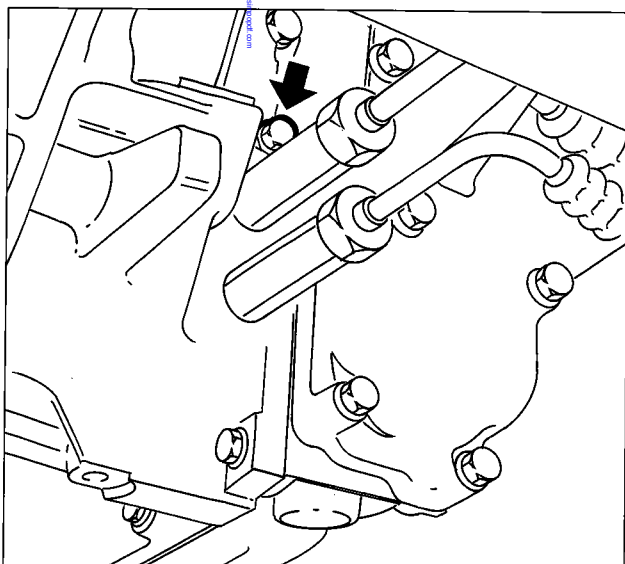
#### N-D engagement time: less than 0.7 s

Repeat the sequence of operations, except moving the selector lever from position N to R.

#### N-R engagement time: less than 1.2 s

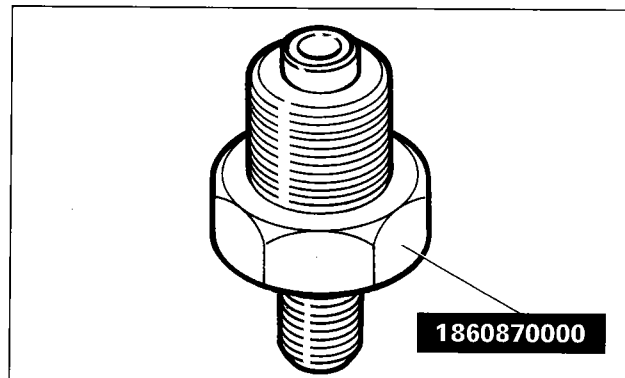
| Engagement time                         | Possible causes                                                                                                                                                         |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Higher than specified value from N to D | <ul style="list-style-type: none"> <li>* Insufficient line pressure</li> <li>* Clutches C1 and C3 slipping</li> <li>* Incorrect operation of free wheel F1</li> </ul>   |
| Higher than specified value from N to R | <ul style="list-style-type: none"> <li>* Insufficient line pressure</li> <li>* Clutch C2 slipping</li> <li>* Clutch C3 slipping</li> <li>* Brake B2 slipping</li> </ul> |

### 21-27.



P4A36AB01

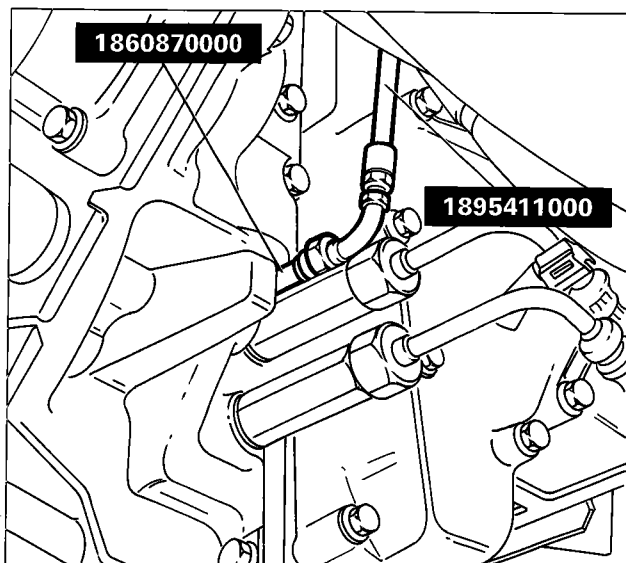
#### Hydraulic test



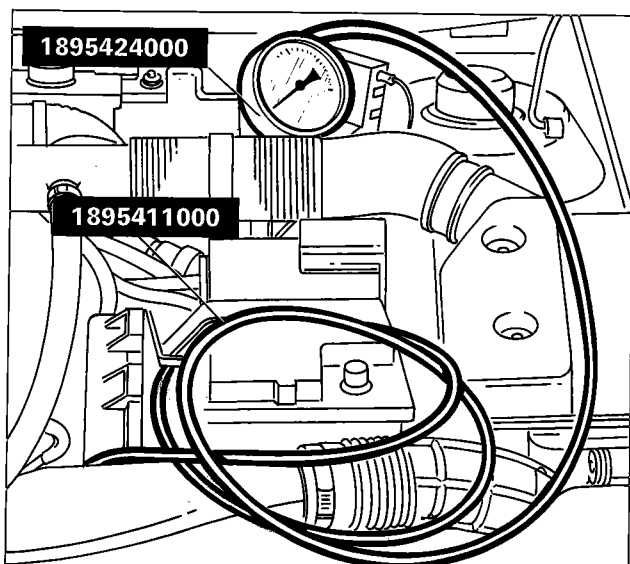
P4A36AB02

To measure the line pressure, proceed as follows:

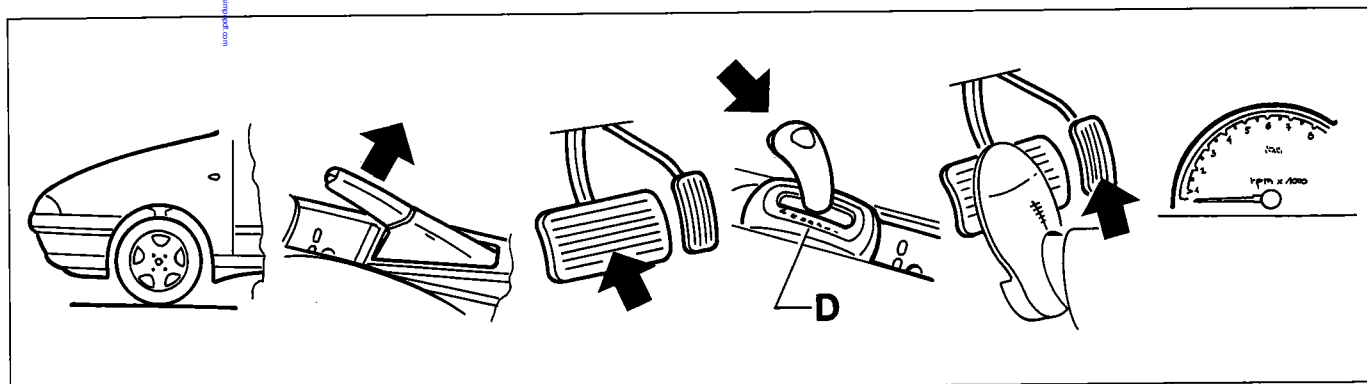
- place the car on ramps, then working from under the vehicle remove the gearbox oil screw plug and screw in its place the connector 1860870000;
- pass the pipe 1895411000 from the top of the engine compartment so as to connect one end of the pipe to the connector 1860870000, and connect the other end to the pressure gauge 1895424000. Position it so that it is visible from the driver's seat;



P4A36AB03



P4A36AB04



P4A34AB01

- chock the vehicle by placing wedges under the wheels;
- apply the handbrake fully;
- press the brake pedal down hard with the left foot;
- start the engine, warm it up to temperature and check that the idle speed is correct;
- move the selector lever to position D;
- read the measurement of the line pressure during idling;
- fully press the accelerator pedal with the right foot and quickly read the line pressure at the engine's stall speed.



*The stall speed test must not exceed 5 seconds in duration.*

Repeat the last two operations with the selector lever on position R.

| Speed  | Position D (and 1-2-3)                            | Position R (and N-P)                              |
|--------|---------------------------------------------------|---------------------------------------------------|
| Idling | 3.7 - 4.3 bar<br>3.8 - 4.4 kg/cm <sup>2</sup>     | 5.4 - 6.3 bar<br>5.5 - 6.4 kg/cm <sup>2</sup>     |
| Stall  | 10.8 - 12.5 bar<br>11.0 - 12.8 kg/cm <sup>2</sup> | 14.1 - 16.9 bar<br>14.4 - 17.2 kg/cm <sup>2</sup> |

| Line pressure                               | Possible causes                                                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------|
| Higher than specified value in both D and R | Fault in pressure control solenoid<br>Regulating valves faulty                    |
| Less than specified value in both D and R   | Fault in pressure control solenoid<br>Regulating valves faulty<br>Oil pump faulty |
| Less than specified value only in D         | Leaks in hydraulic circuit in forward gears                                       |
| Less than specified value only in R         | Leaks in hydraulic circuit in reverse and neutral                                 |



### Road tests

These tests are for checking that the automatic transmission is working correctly under actual conditions of use.



*Carry out the following tests with the gearbox oil at normal operating temperature.*

#### Test in position D with NORMAL or SPORT driving mode

Move the selector lever to position D and carry out the following tests with the accelerator pedal in two fixed positions, corresponding to 50% and 100% of the throttle valve aperture.

##### A) Changes to higher gears

Make sure that the gear changes 1-2, 2-3 and 3-4 occur at the correct points of the gear change program (see diagrams on pages 20, 21 and 22).

##### B) Jolts and slipping

In the same way, check that the jolts and slipping caused by the gear changes 1-2, 2-3 and 3-4 are normal.

##### C) Locking lock-up clutch

At a speed of about 85 km/h, gently press the accelerator pedal and check that the engine rpm does not change suddenly.

##### D) Vibrations and noises

Check under normal driving conditions that there are no vibrations or unusual noises.

##### E) Kick-down operation

Proceeding in second, third and fourth gears, with the selector lever on position D, fully press the accelerator pedal to close the kick-down switch and check that the limit speeds for the changes 2-1, 3-2 and 4-3 conform to the gear change program.

##### F) Engine brake

Driving in fourth gear, move the selector lever sequentially from position D to positions 3, 2 and 1 and perceive the engine braking effect at each of these gear changes.

#### Tests in position 3, 2 and 1 with NORMAL or SPORT driving mode

The above tests are repeated for each selector lever position.

#### Test in position R

Move the lever to position R, fully press the accelerator pedal to start the vehicle, checking that the slipping is normal.

#### Test in position P

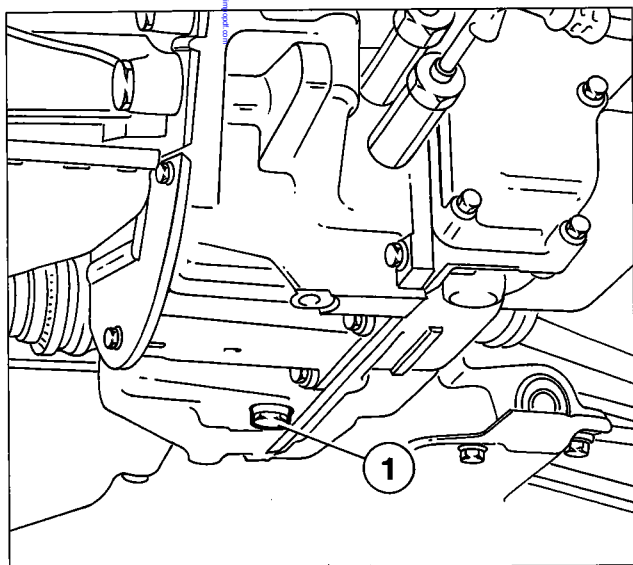
Stop the vehicle on a downhill slope, and after moving the lever to position P, release the brake pedal. Check that the locking pawl prevents the vehicle from moving.

#### Test with manual operation of the gearbox

Disconnect the control module connectors. Test the vehicle on the road, making sure that whenever the selector lever is moved, the gear changes take place in accordance with the table below.

| Selector lever position | P    | R       | N       | D   | 3   | 2   | 1   |
|-------------------------|------|---------|---------|-----|-----|-----|-----|
| Gear engaged            | Park | Reverse | Neutral | 4th | 4th | 3rd | 1st |

**NOTE** *With the selector lever at position N, the vehicle must not move spontaneously on a flat road. With the selector lever at position P, the locking pawl must stop the vehicle moving even on a downhill road.*



P4A39AB01

### CHANGING GEARBOX OIL

#### Draining

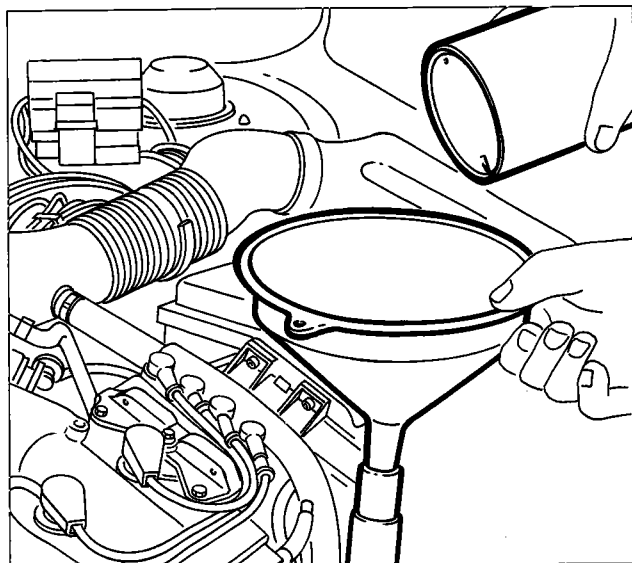
Drain the gearbox oil after a road journey so that the oil reaches operating temperature.

Then carry out the following operations:

- undo the plug (1) and allow the oil to drain;
- retighten the plug (1) after replacing the seal, and tighten it to a torque of between 2.35-5.49 daNm.

#### Filling

Withdraw the dipstick and, using a clean funnel so as not to contaminate the oil, pour in the required quantity of gearbox oil. To facilitate the operation, remove the air cleaner. After filling, check that there are no leaks from the drain plug.



P4A39AB02

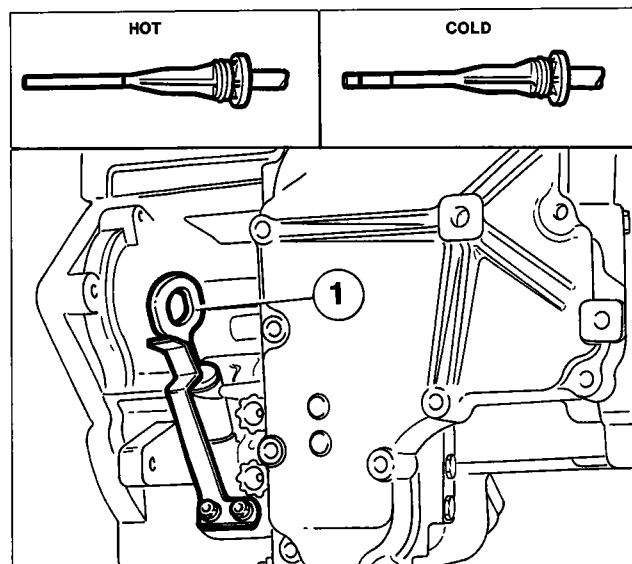
**Periodical oil change: 3 litres- 2.7 kg**  
**Recommended gearbox oil: TUTELA GI/2**

### CHECKING OIL LEVEL

**NOTE** The gearbox oil level must be checked with the engine and gearbox at normal operating temperature (gearbox oil temperature: 70 - 80°C), so the vehicle must be driven for an appropriate period of time before the check.

To check the gearbox oil level, proceed as follows:

- park the vehicle on flat ground and apply the handbrake;
- with the engine idling, gently move the selector lever from position P to position 1, then return it to P;
- withdraw the dipstick (1) and clean it;
- insert the stick fully into its seating;
- again withdraw the dipstick and check that the oil level lines up with the notch on the side of the stick marked HOT.



P4A32AB01



If the check has to be conducted at a low oil temperature, check that the oil level is within the notch on the side of the dipstick marked COLD. If possible, recheck the oil level at the correct temperature (70 - 80 °C).

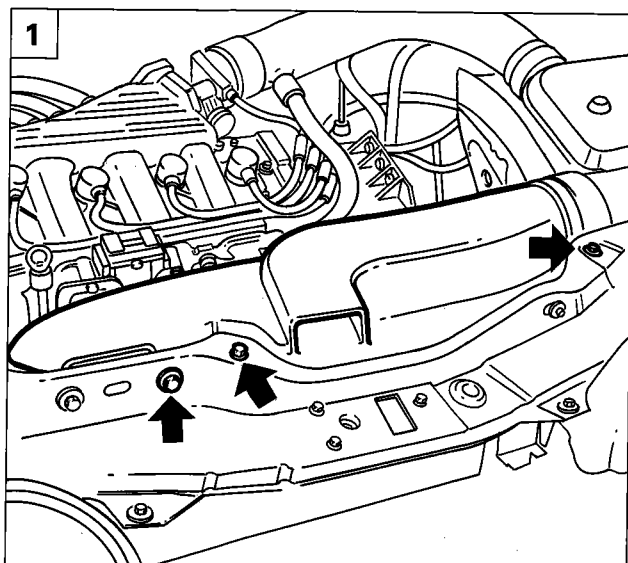
## 21-27.



*Also check the condition of the oil, and in particular that there is no white contamination caused by contact with the coolant from the oil cooling circuit, and that there are no metal particles due to wear of internal components or a burnt smell.*

### WARNINGS

- If the oil level is low, there may be a reduction in the line pressure owing to the fact that the oil pump draws in air, resulting in malfunctioning of the transmission.
- If the oil level is higher than normal, there may be oil leaks from the vent pipe.
- Contamination of the oil with water or the use of an oil with different characteristics from the recommended oil causes higher consumption and malfunction of the transmission.



P4A40AB01

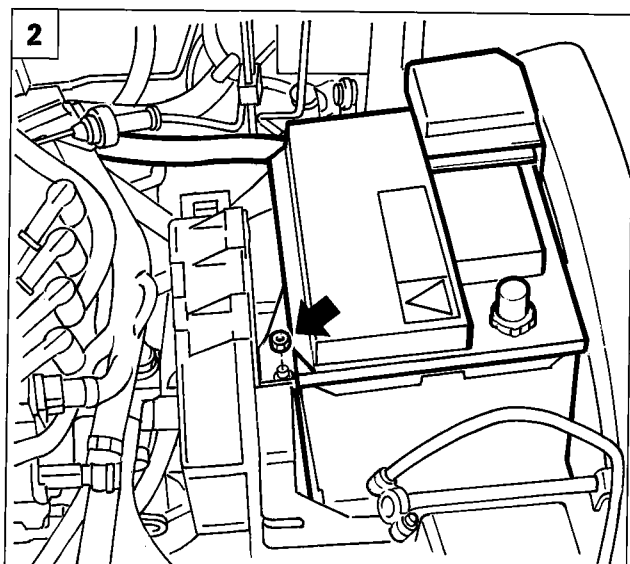


### GEAR CHANGE CABLE

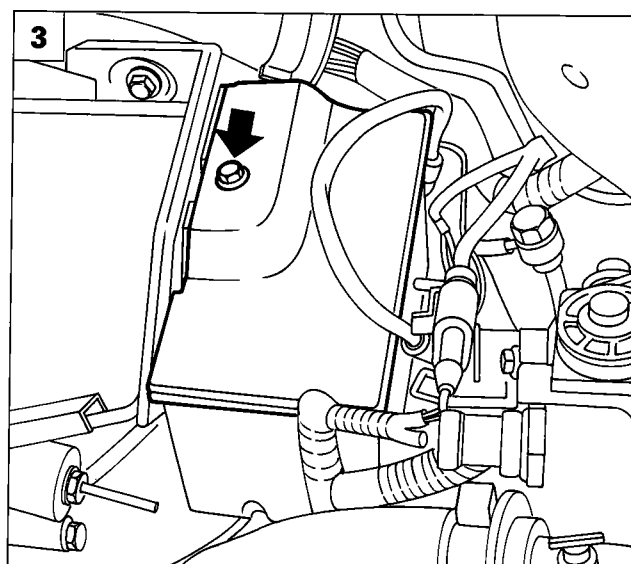
#### Removing

Disconnect the battery's negative cable, then proceed as described below:

1. Remove the air intake duct by undoing the bolts shown in the figure, which secure it to the front cross panel.
2. Lift the cover protecting the battery positive pole and disconnect the cable; undo the nut securing the battery to the cage, then remove the battery from the engine compartment.
3. Remove the cover from the relay and fuse box by undoing the screw indicated.

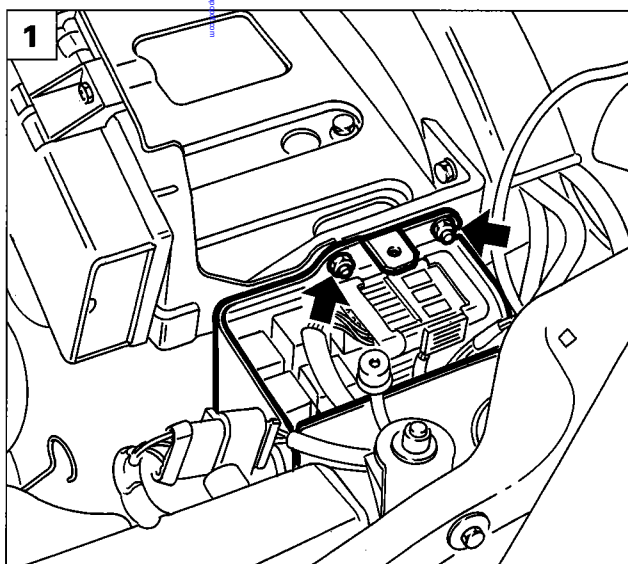


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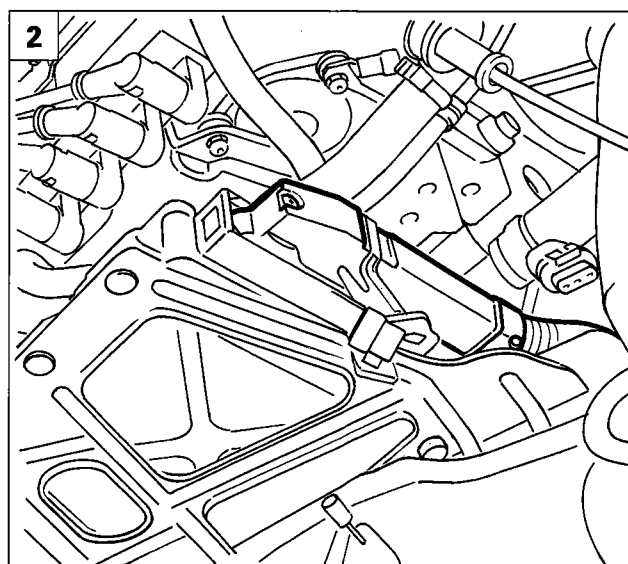


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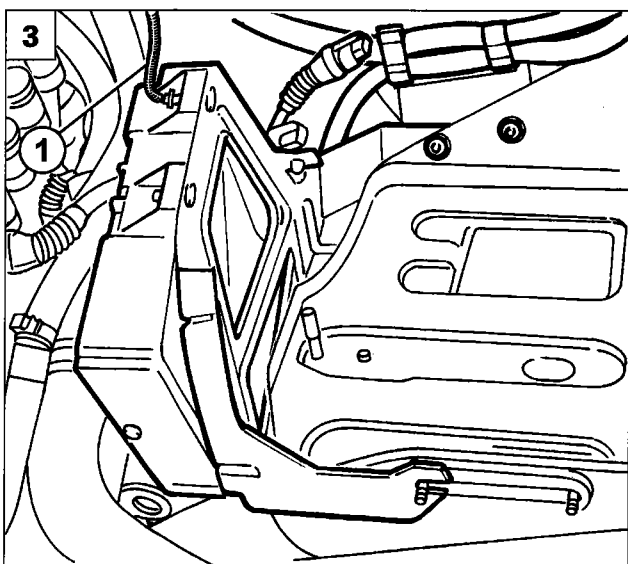




P4A41AB01



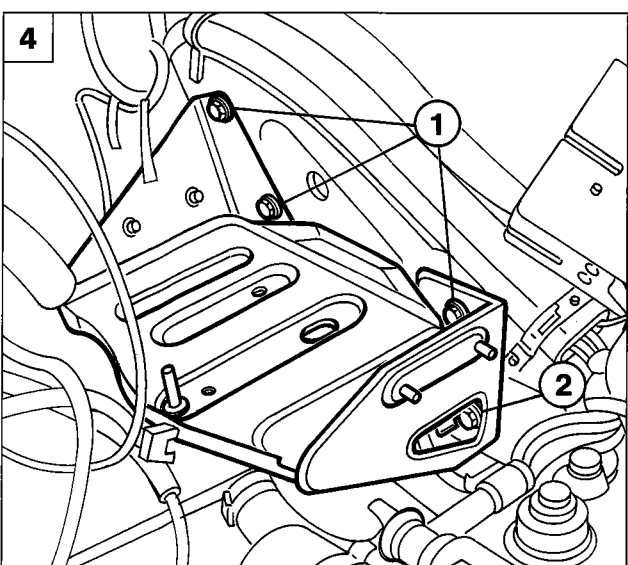
P4A41AB02



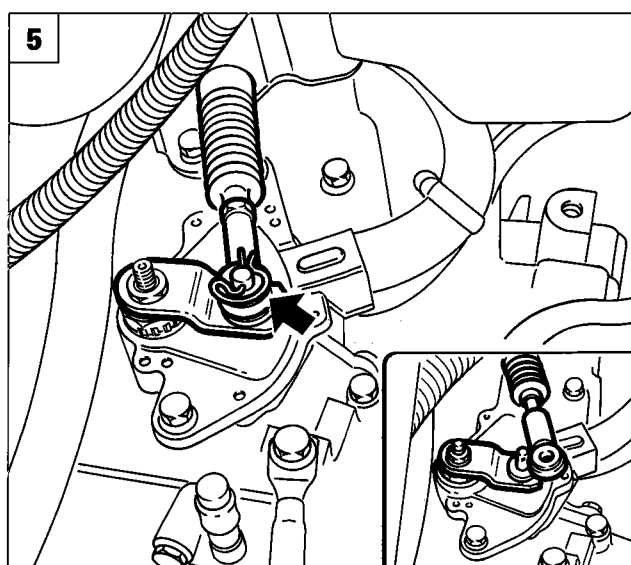
P4A41AB03



1. Remove the nuts securing the relay and fuse box to the battery cage, then move the box over to one side.
2. Disconnect the i.e. control unit supply connector.
3. Disconnect the earth cable (1), remove the nuts securing the i.e. control unit mounting bracket, then remove the control unit from the engine compartment. The nuts indicated also secure the starter motor supply wiring and the front cable/fuel injection cable connection.
4. Remove the bolts (1) and slacken the bolt (2) securing the battery cage to the body shell. Before removing the cage, disconnect the cable clip underneath.
5. Remove the split pin and washer shown in the figure; lift the gear change cable head so as to disconnect it from the gear change lever position sensor.

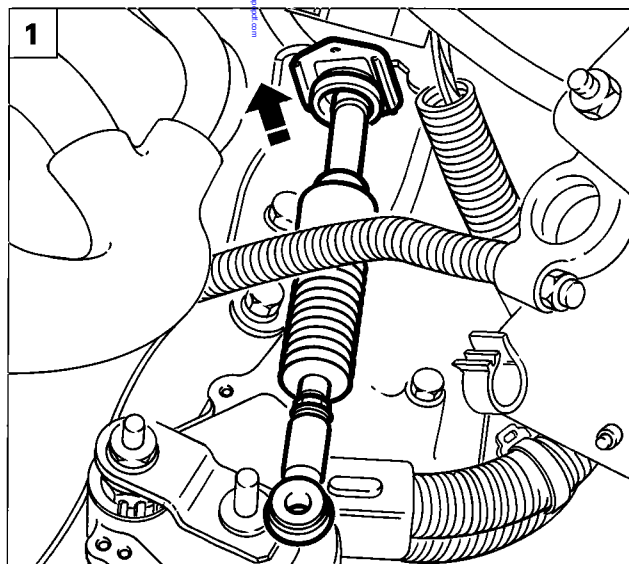


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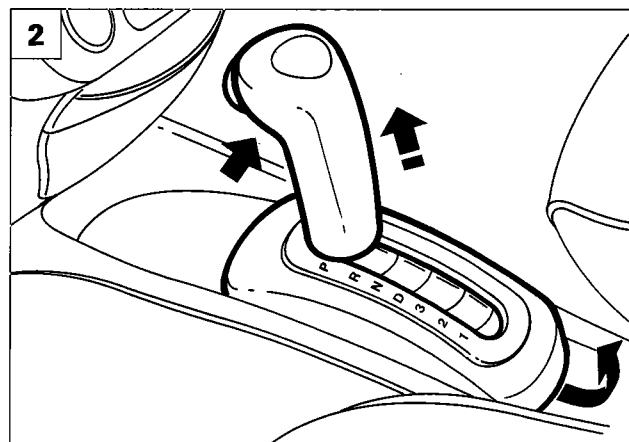


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### 21-27.



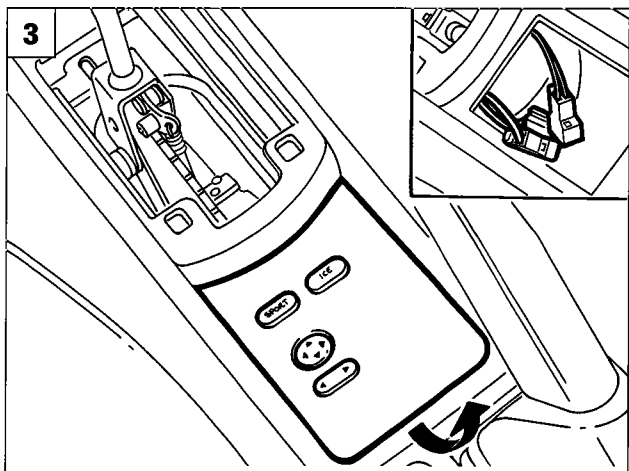
P4A42AB01



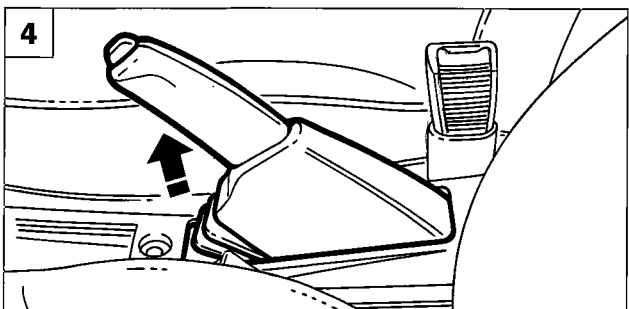
P4A42AB02

1. Lift the gearbox control cable retaining bracket to release it from the mounting bracket.
2. Working from inside the car, position the selector lever on P, remove the retaining bolt on the front of the selector lever handle and then withdraw the handle upwards, then remove the selector lever position indicator panel.
3. Release the driving mode switch panel, disconnect the electrical connectors and withdraw the panel.
4. Remove the plastic trim from the handbrake lever; slacken the tension from the relevant cable and disconnect the wiring connector for the handbrake on indicator.

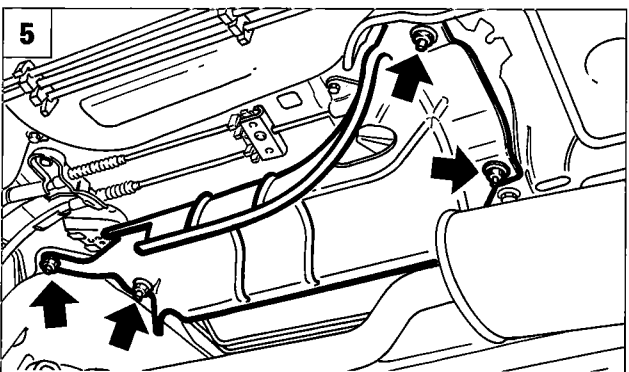
Place the car on ramps and carry out the following operations from under the car:



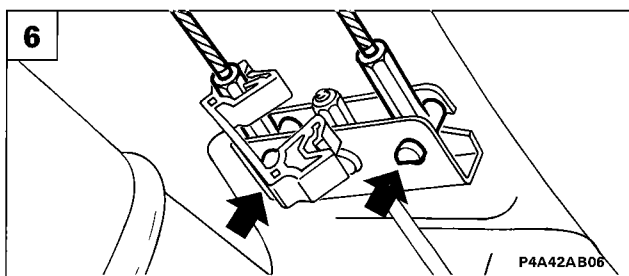
P4A42AB03



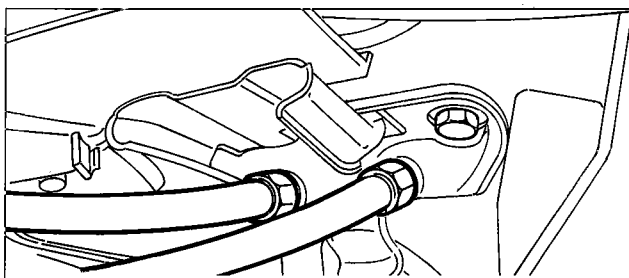
P4A42AB04



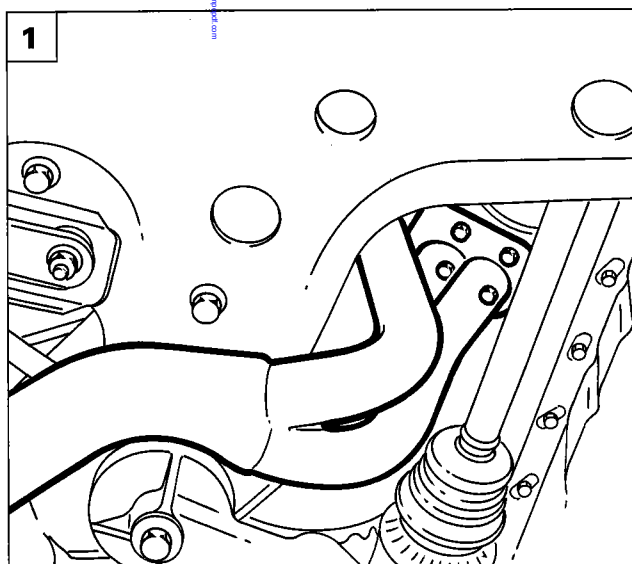
P4A42AB05



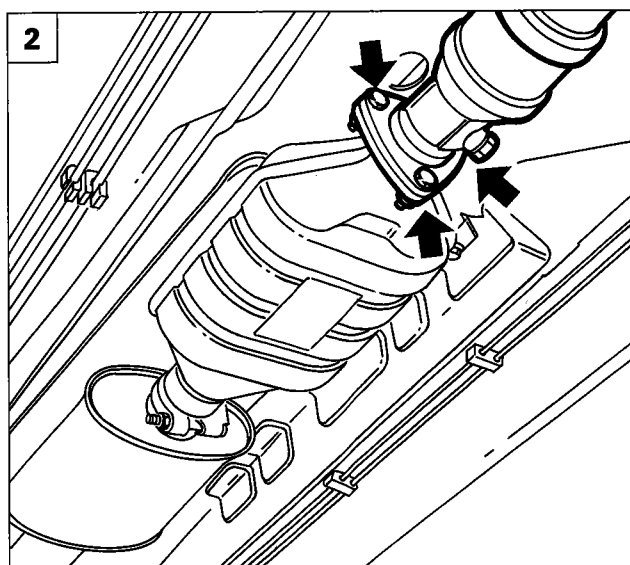
P4A42AB06



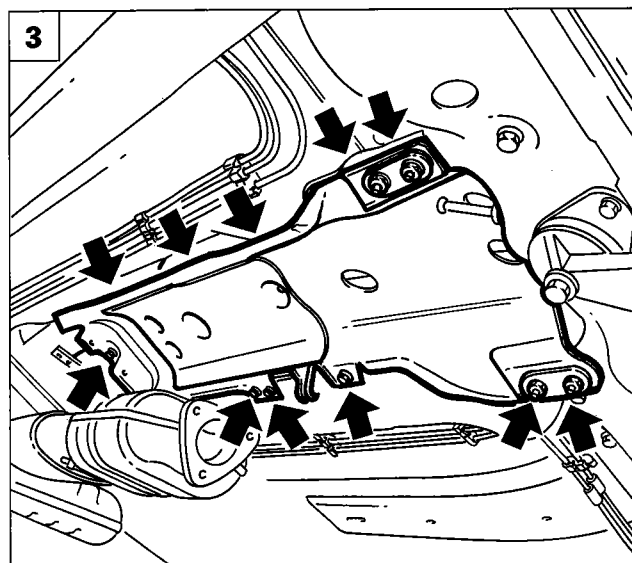
P4A42AB07



P4A43AB01



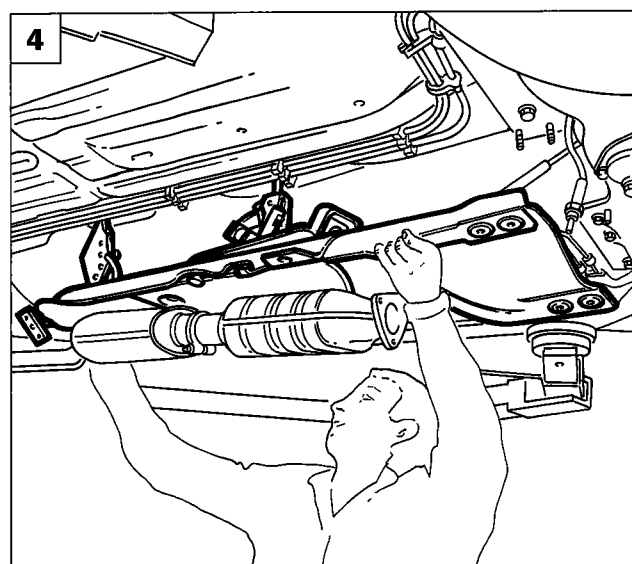
P4A43AB02



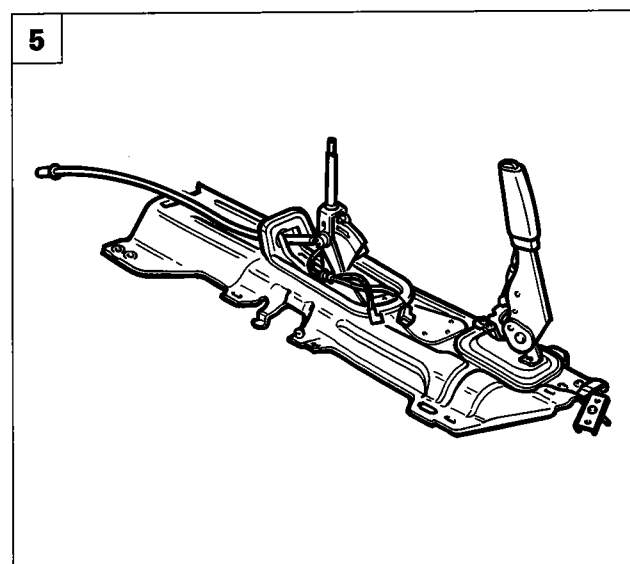
P4A43AB03



1. Disconnect the Lambda probe wiring connector, then disconnect the first section of the exhaust pipe from the exhaust manifold.
2. Remove the first section of the exhaust pipe by undoing the attachments to the catalytic converter.
3. Undo the bolts securing the gear change internal linkage mounting and handbrake to the body shell.
4. Withdraw the internal gear change linkage mounting downwards.
5. Internal linkage assembly.

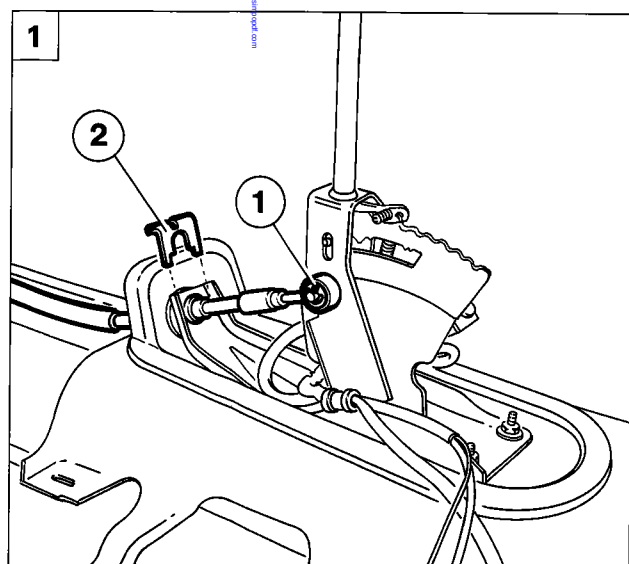


P4A43AB04

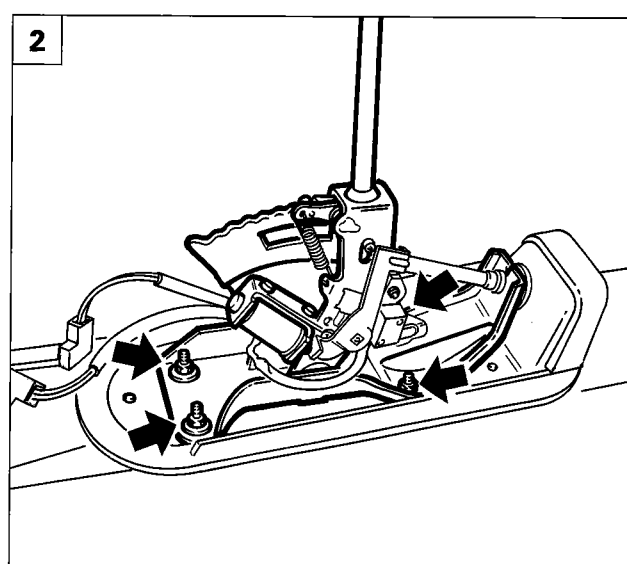


P4A43AB05

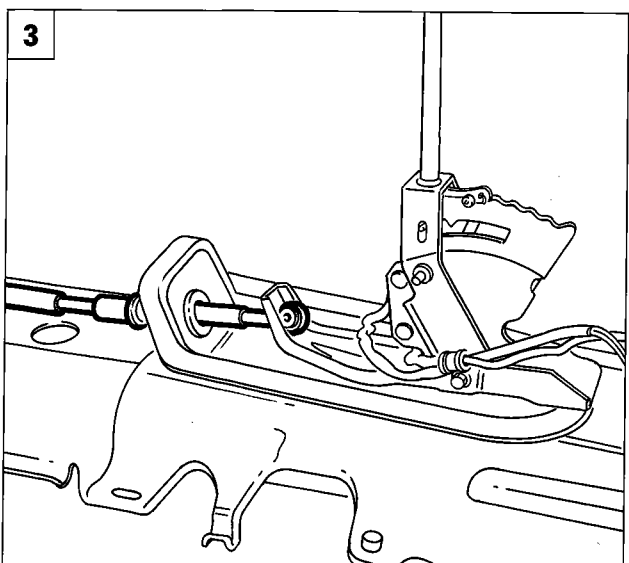
## 21-27.



P4A44AB01



P4A44AB02



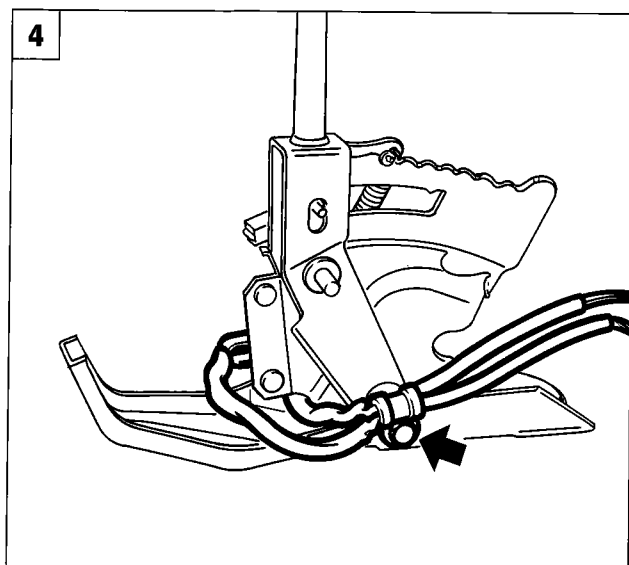
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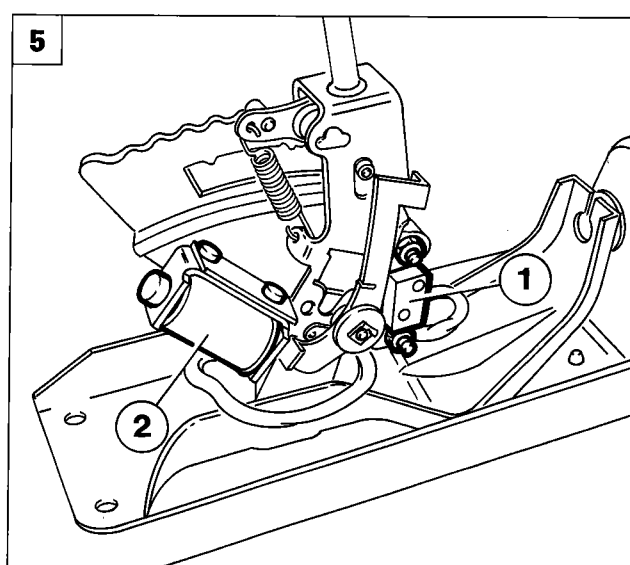
1. Remove the split pin (1) and bracket (2) securing the gear change cable to the selector lever.
2. Undo the nuts securing the selector lever mounting and remove the mounting.
3. Disconnect the gear change cable from the selector lever mounting; then replace the cable.

### Dismantling selector lever

4. Undo the bolt securing the clip retaining the supply cables to the shift-lock device and additional PARK position switch.
5. Undo the nuts securing the additional PARK position switch (1); if the shift-lock device (2) has to be worked on, undo the bolts shown in the figure.

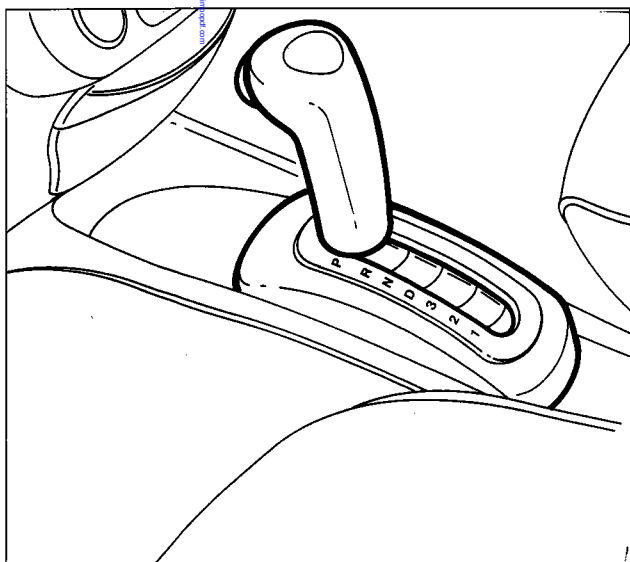


P4A44AB04



P4A44AB05





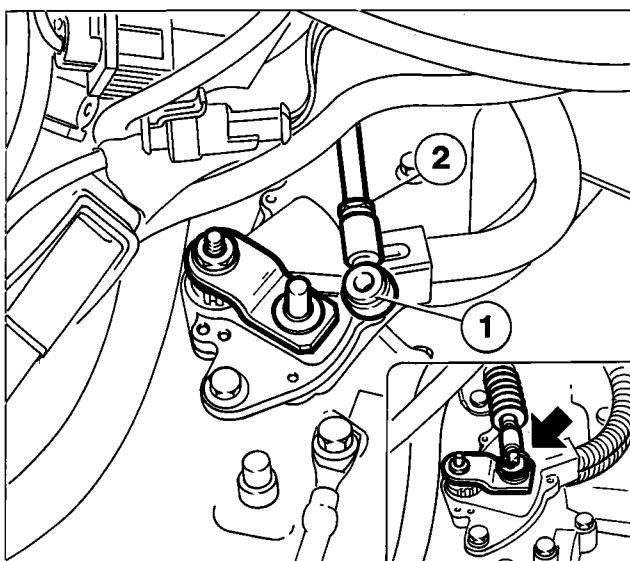
P4A45AB01



### Refitting

Refit the gear change cable and selector lever by reversing the procedure for removal, bearing in mind the following:

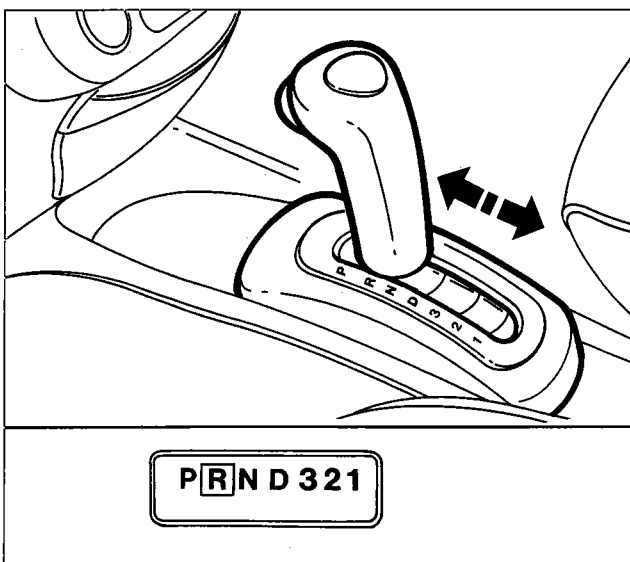
- check that the gear change lever is positioned at P (lever fully forward);
- check that the selector lever is also set to position P;



P4A32AB02

- fit the gear change cable head (1) to the lever located on the gearbox. If the cable length needs to be adjusted, adjust the head (1) by screwing it or unscrewing it on the threaded part of the cable, then lock it with the nut (2). Finally fit the washer and split pin;

- operate the selector lever and check that, at each position, you can hear the gear change lever clicking into position.



P4A45AB02

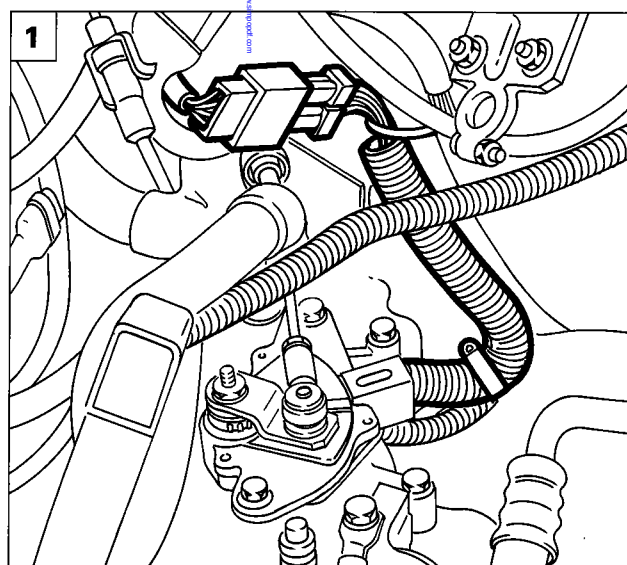


Complete the assembly by securing the battery cage, i.e. control unit, battery and air intake duct.

Finally carry out the following checks:

- the engine must only start with the selector lever in position P or N;
- each position of the selector lever must be accompanied by the relevant indications on the indicator panel and instrument panel display.

## 21-27.



P4A46AB01

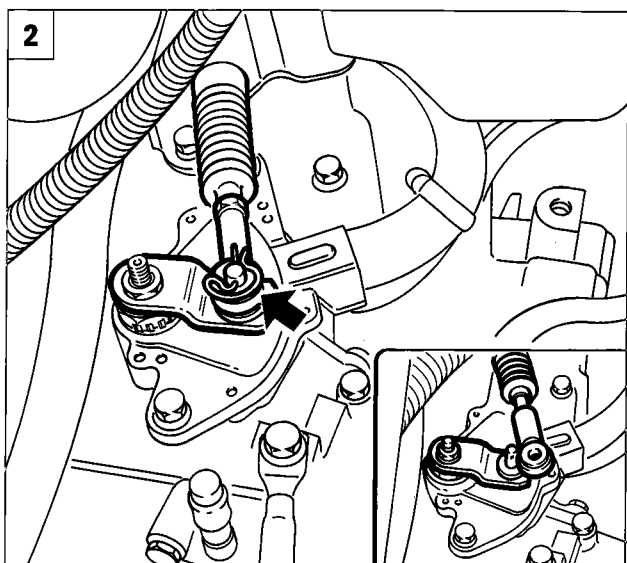


### GEAR CHANGE LEVER POSITION SENSOR

#### Removing

Remove the air intake duct, battery, relay and fuse box (move it to one side) the i.e. control unit and battery cage, as described for the removal of the gear change cable, position the selector lever at P, then carry out the following operations:

1. Disconnect the wiring connector from the gear change lever position sensor.



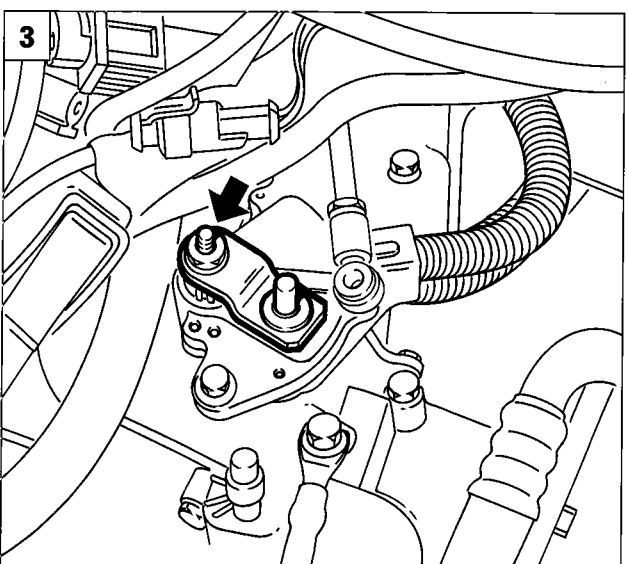
P4A41AB05



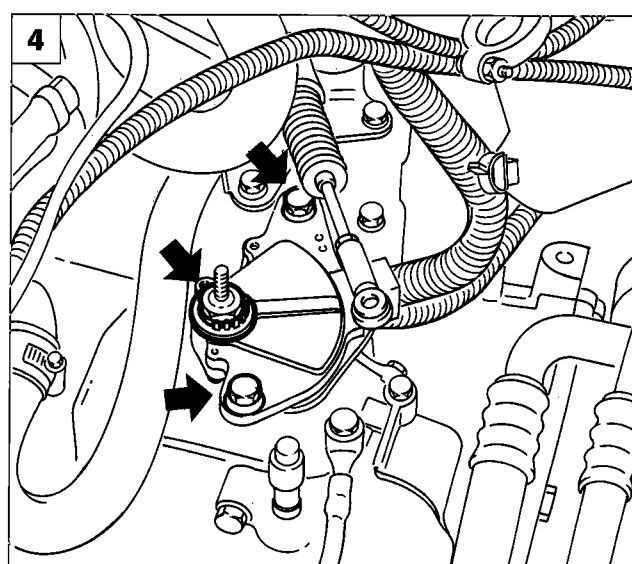
2. Remove the split pin and washer so as to disconnect the gear change cable from the lever on the sensor.

3. Undo the nut securing the lever to the sensor, then remove the lever.

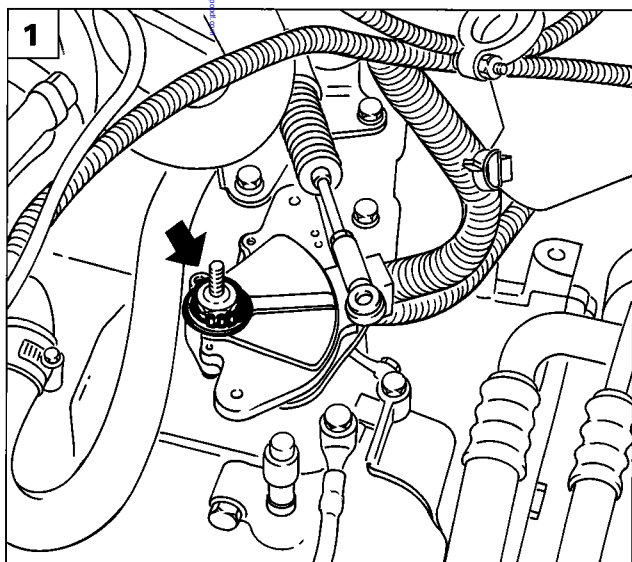
4. Release the central nut from the washer and remove the nut, then undo the two side bolts securing the sensor and remove the sensor.



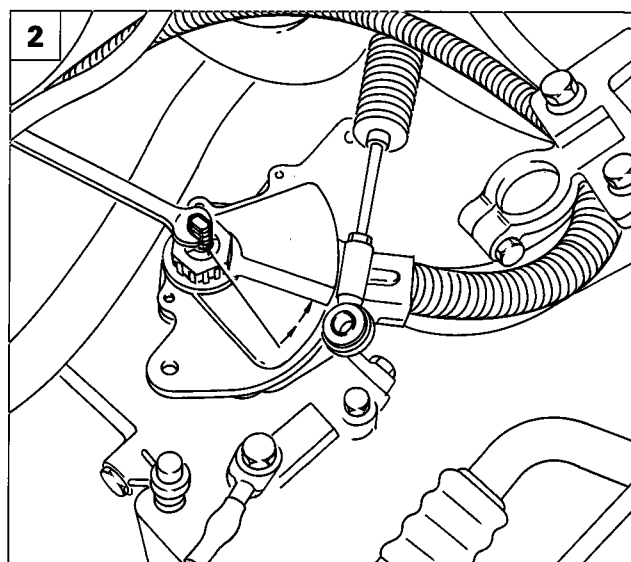
P4A46AB02



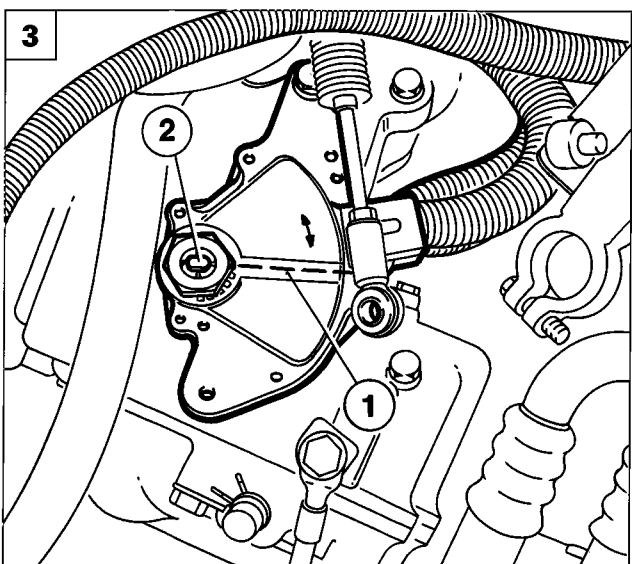
P4A46AB03



P4A47AB01



P4A47AB02



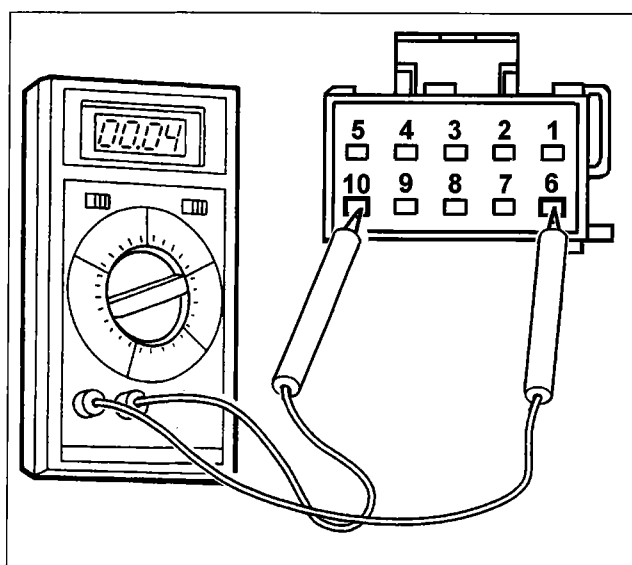
P4A47AB03



### Refitting

Refit the selector lever position sensor as follows:

1. position the sensor, tighten the central nut and lock it with the washer;
2. from position P (fully rotated in a clockwise direction) move the pin of the lever to position N (rotating the pin two notches in an anti-clockwise direction);
3. rotate the sensor so that the projection on the top surface (1) lines up with the side machining on the pin (2), then lock the sensor in this position by tightening the two side screws.

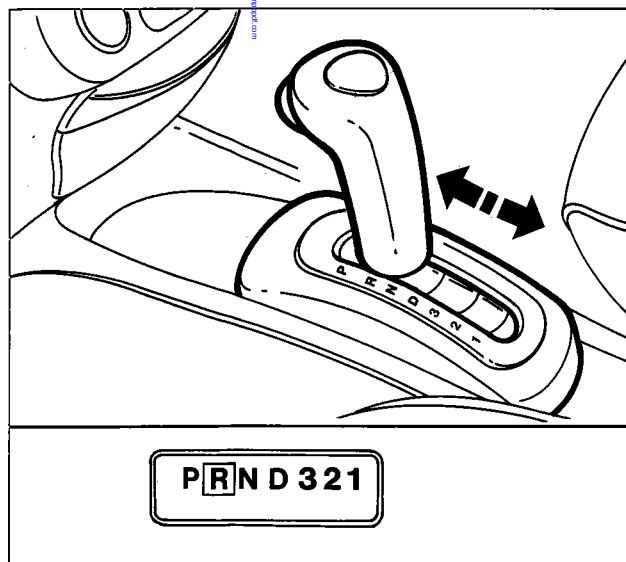


P4A47AB04



*It is advisable to position the sensor using an ohmmeter connected between terminals 6 and 10 of the supply connector. Rotate the sensor to the centre of the area in which the ohmmeter detects continuity (contacts N and P closed), then tighten the sensor screws.*

## 21-27.



P4A45AB02



Finish refitting the selector lever position sensor by reversing the procedure for removal. Finally carry out the following checks:

- the engine must only start with the selector lever in position P or N;
- each position of the selector lever must be accompanied by the relevant indications on the indicator panel and instrument panel display.

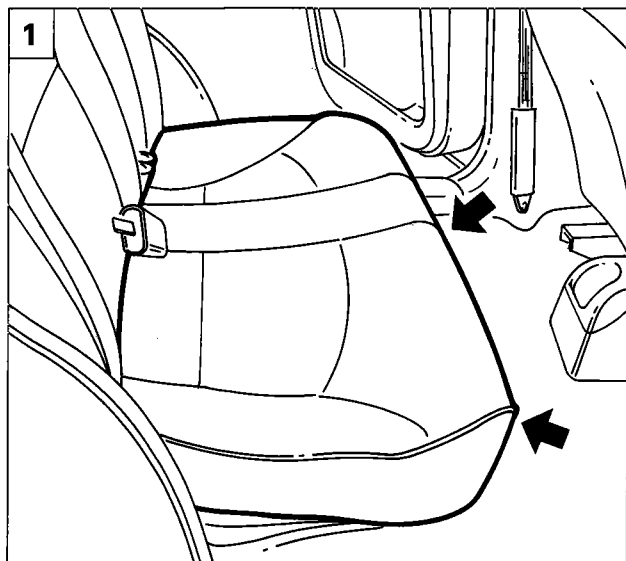
### REMOVING-REFITTING GEAR CHANGE CONTROL UNIT (CONTROL MODULE)

The gear change control unit is located under the rear seat cushion, on the right. Before proceeding with removal, disconnect the battery's negative pole, then:

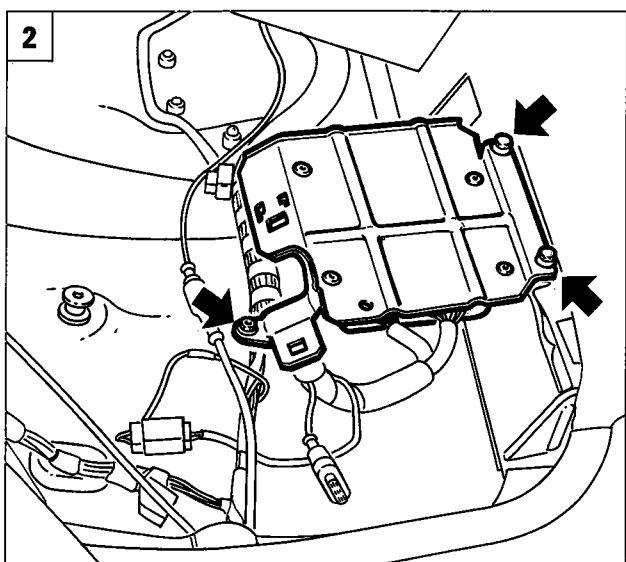
1. Remove the rear seat cushion by undoing the bolts securing the retaining brackets to the body shell.
2. Lift the trim under the rear seat cushion, then remove the bolts and nut securing the control unit mounting bracket to the body shell.
3. Rotate the control unit mounting bracket, disconnect the supply wiring, then undo the nuts securing the control unit to the bracket.

### WARNINGS

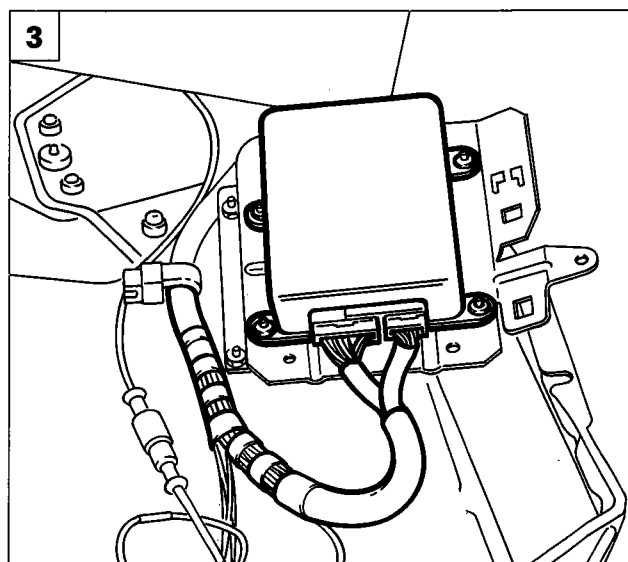
- Handle the control unit carefully to avoid any impact.
- Do not remove the control unit cover or try to dismantle it.
- Do not touch the connector pins directly.
- Insert the connector fully into the control unit until it clicks.



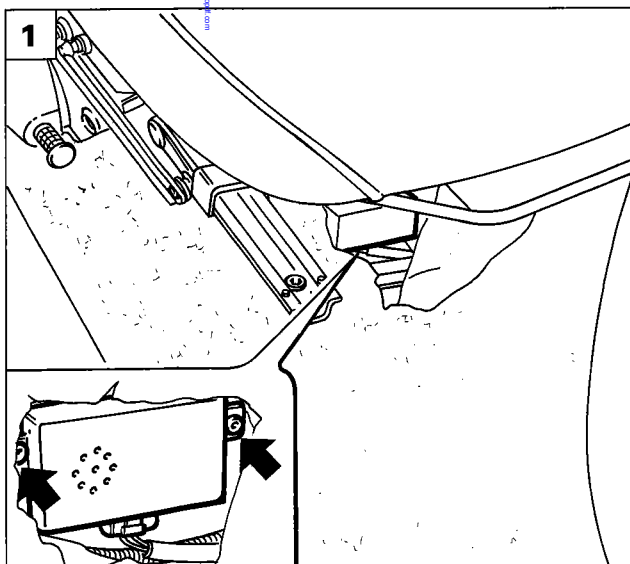
P4A48AB01



P4A48AB02



P4A48AB03



P4A49AB01

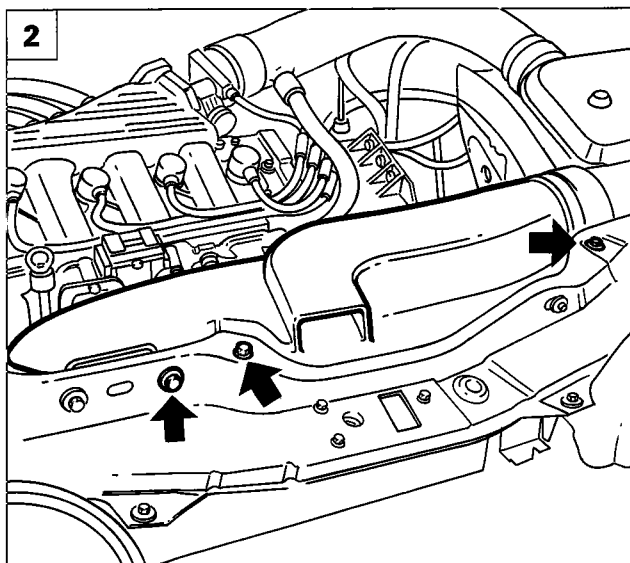


**REMOVING-REFITTING SAFETY CONTROL UNIT**



The safety control unit is located under the front passenger's seat. To remove it, first disconnect the battery's negative pole, then proceed as described below:

1. Push the front passenger's seat fully back so as to gain access to the safety control unit. Undo the bolts securing the control unit to the body shell, disconnect the supply wiring connector, then remove the control unit.



P4A40AB01

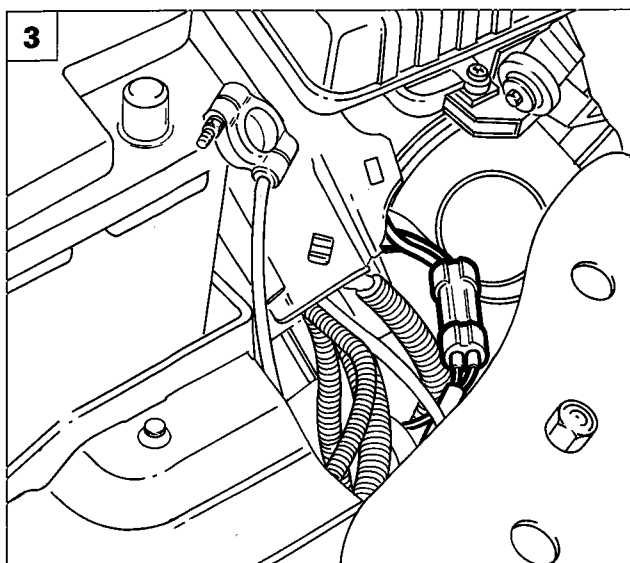


**REMOVING-REFITTING GEARBOX OIL COOLING RADIATOR AND FAN**

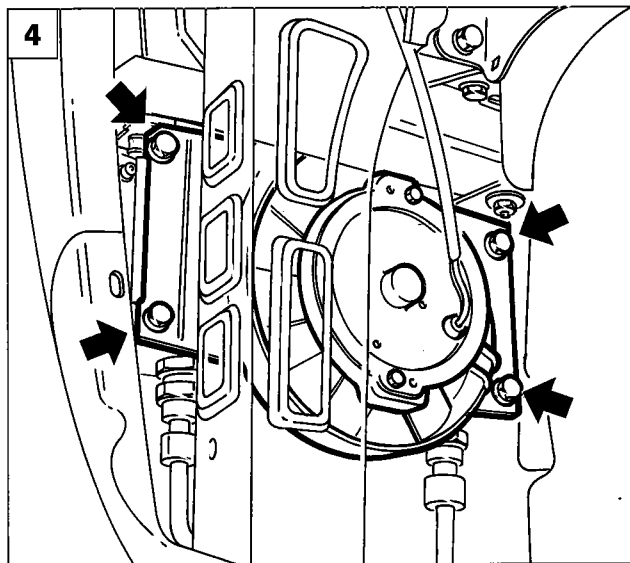


Place the car on ramps, disconnect the battery's negative pole, remove the front left wheel, drain the gearbox oil and then proceed as described below:

2. Remove the air intake duct by undoing the bolts shown in the figure, securing it to the front cross panel.
3. Disconnect the cooling fan supply wiring connector.
4. Raise the car and, working from the left wheelarch, undo the bolts securing the cooling fan, then remove the fan.



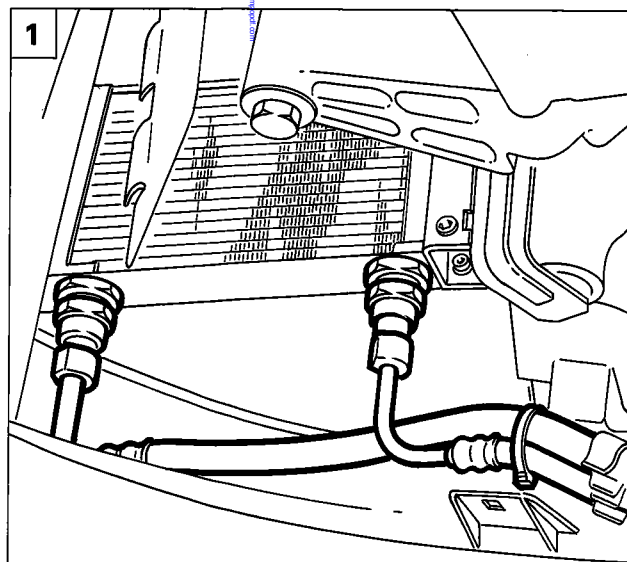
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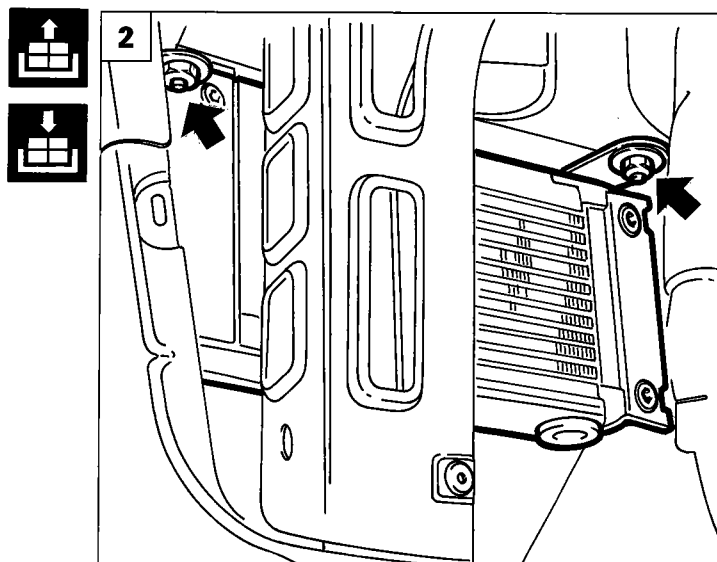
P4A49AB03



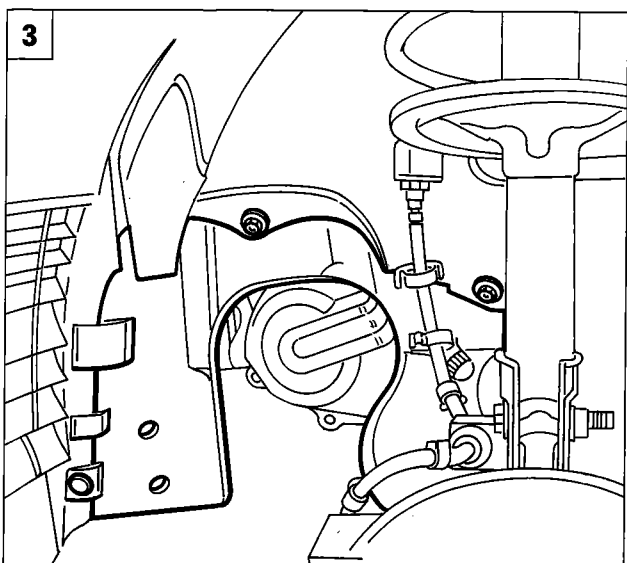
### 21-27.



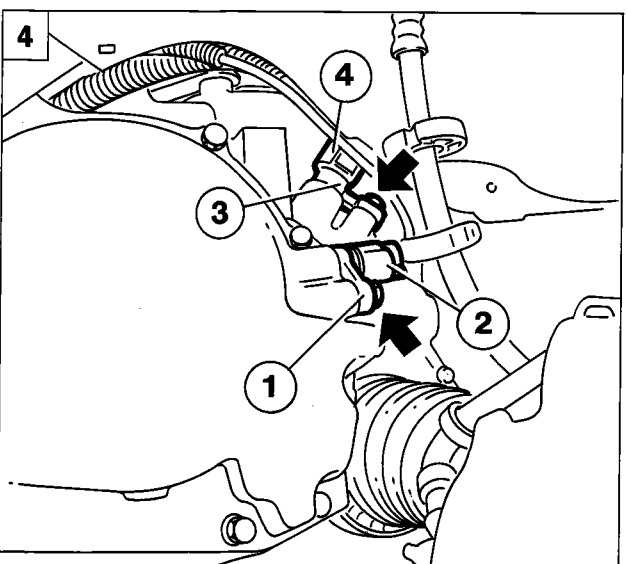
P4A50AB01



P4A60AB02



P4A50AB03



P4A50AB04

1. To remove the gearbox oil cooling radiator, first remove the fan, then disconnect the coolant inlet and outlet pipes from the radiator.
2. Undo the nuts shown in the figure, securing the radiator.  
To refit, reverse the procedure for removal, topping up the gearbox oil to the correct level.

#### MAIN SHAFT RPM SENSOR - VEHICLE SPEED SENSOR

##### Removing-refitting

Place the car on ramps, disconnect the battery's negative pole, remove the front left wheel, then:

3. Remove the left wheelarch trim in order to gain access to the sensors.
4. To remove the main shaft rpm sensor (1) (black), disconnect the relevant supply connector (2), then undo the bolt securing the sensor to the gearbox casing and remove the sensor by pulling it upwards.  
To remove the vehicle speed sensor (3) (grey), disconnect the supply connector (4), then undo the bolt securing the sensor to the gearbox casing and remove the sensor.

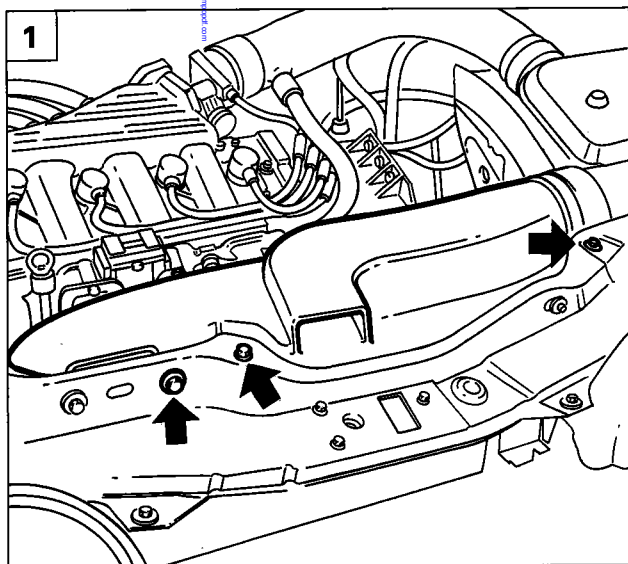
Check the resistance between the terminals:

- Main shaft rpm sensor: 387 - 473  $\Omega$
- Vehicle speed sensor: 648 - 792  $\Omega$

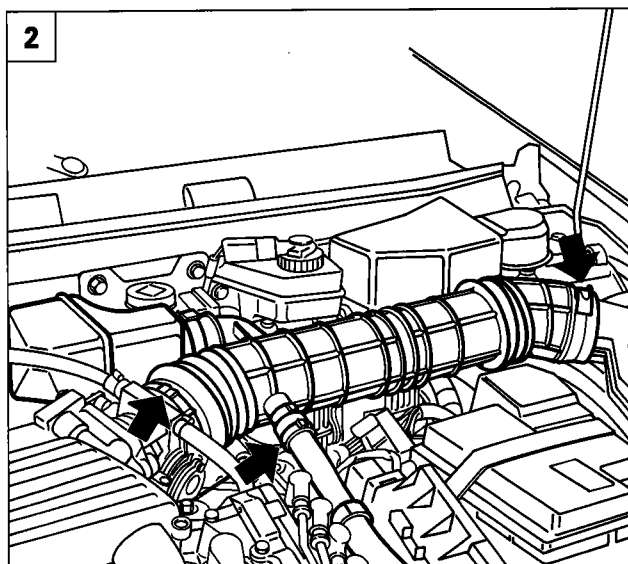
If the resistance is not within these values, replace the sensor concerned.



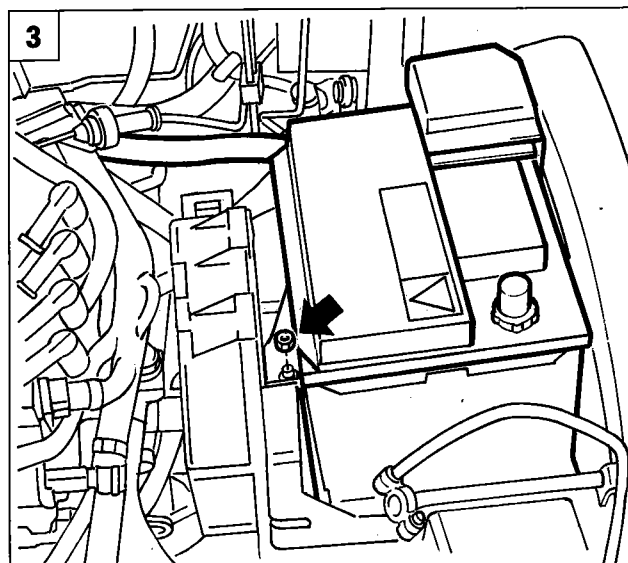
*Always replace the seal; smear it with grease to avoid damage during fitting.*



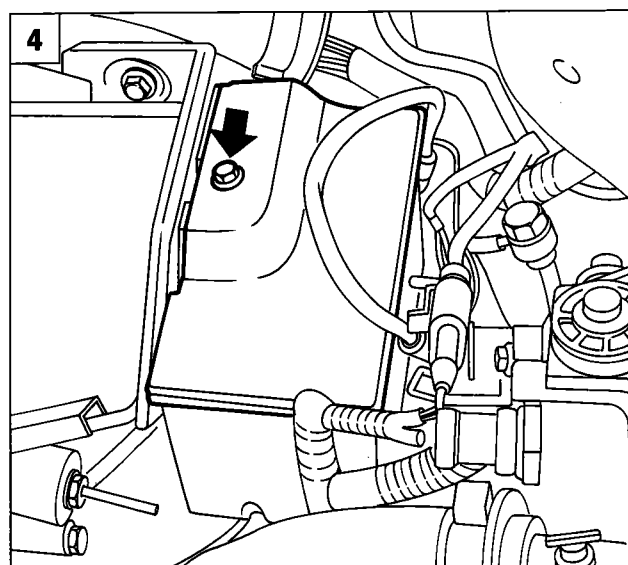
P4A40AB01



P4A51AB01



P4A40AB02



P4A40AB03

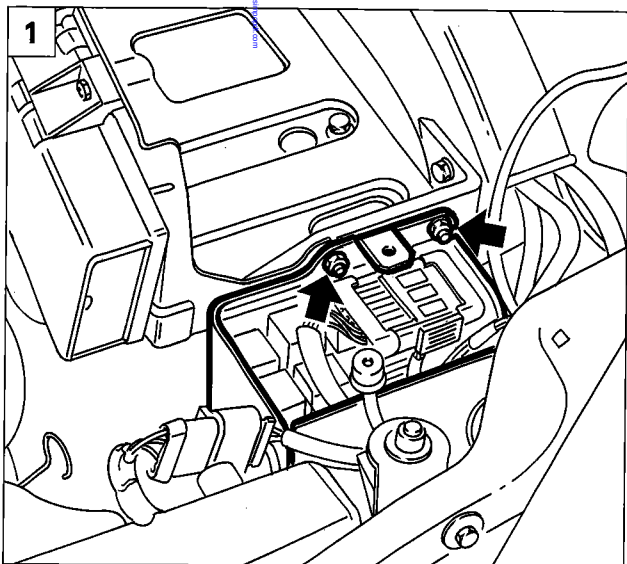


### REMOVING-REFITTING GEARBOX

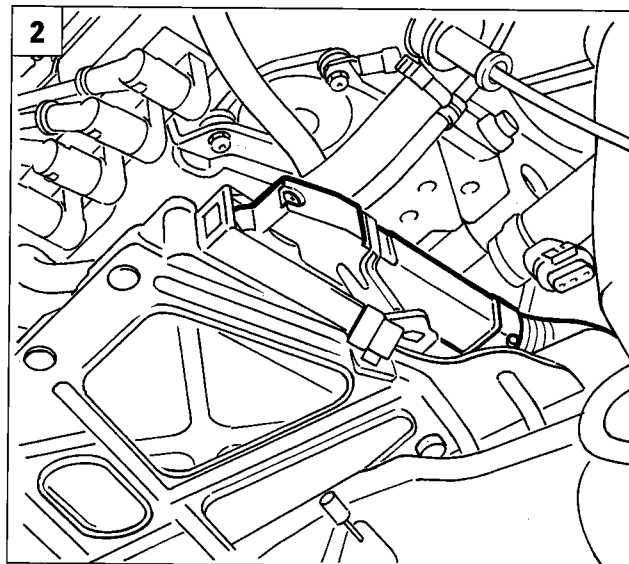
Place the car on ramps, disconnect the battery's negative pole, remove the front wheels and drain the gearbox oil, then proceed as described below:

1. Remove the air intake duct by undoing the bolts shown in the figure, securing it to the front cross panel.
2. Remove the air inlet pipe by undoing the clips shown in the figure, then remove it from the engine compartment complete with resonator.
3. Left the cover protecting the battery's positive pole and disconnect the cable; undo the nut securing the battery to the cage, then remove the battery from the engine compartment.
4. Remove the relay and fuse box cover by undoing the bolt indicated.

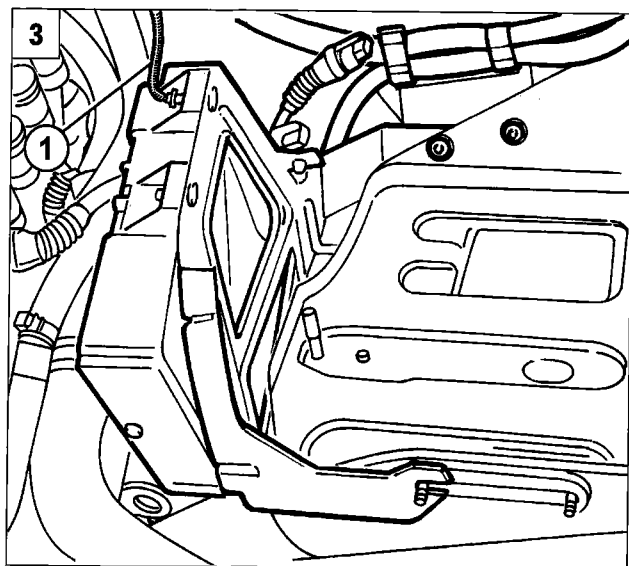




P4A41AB01



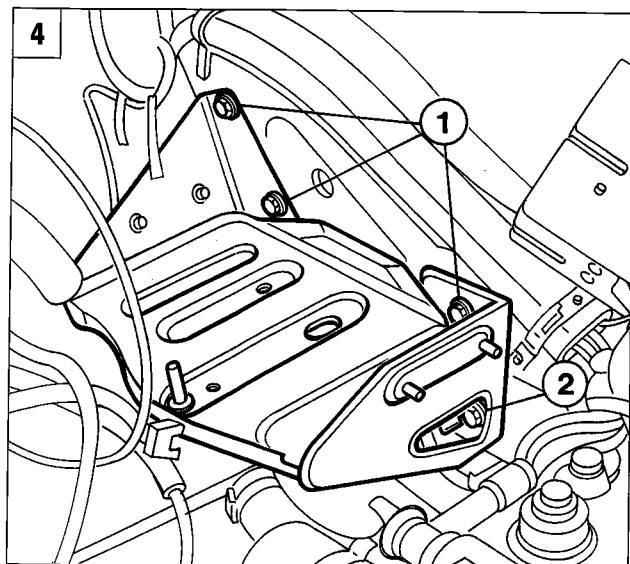
P4A52AB01



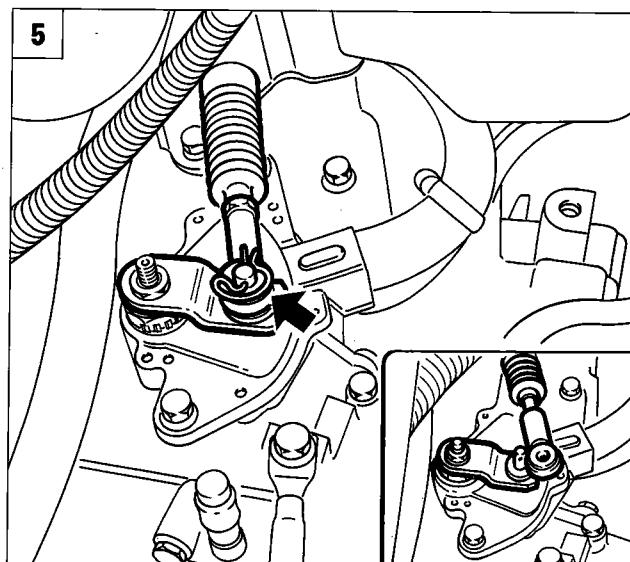
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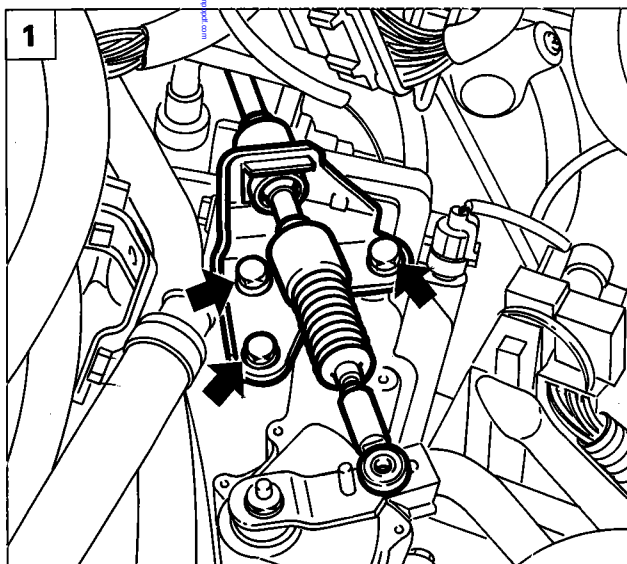
1. Remove the nuts securing the fuse and relay box to the battery cage, then move the box over to one side.
2. Disconnect the i.e. control unit supply connector.
3. Disconnect the earth cable (1), remove the nuts securing the i.e. control unit mounting bracket, then remove the control unit from the engine compartment. The nuts indicated also secure the starter motor supply cables and the front cable/fuel injection cable connection.
4. Remove the bolts (1) and slacken the bolt (2) securing the battery cage to the body shell. Before removing the cage, disconnect the cable retaining clip underneath.
5. Remove the split pin and washer shown in the figure; lift the gear change control cable head so as to disconnect it from the gear change lever position sensor.



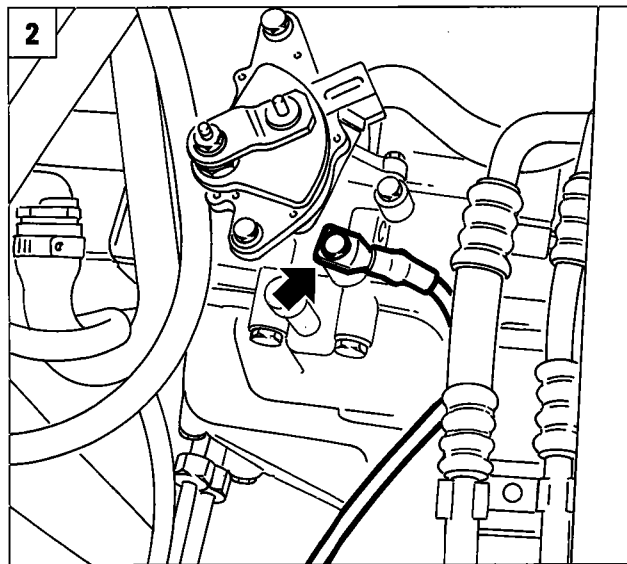
P4A41AB04



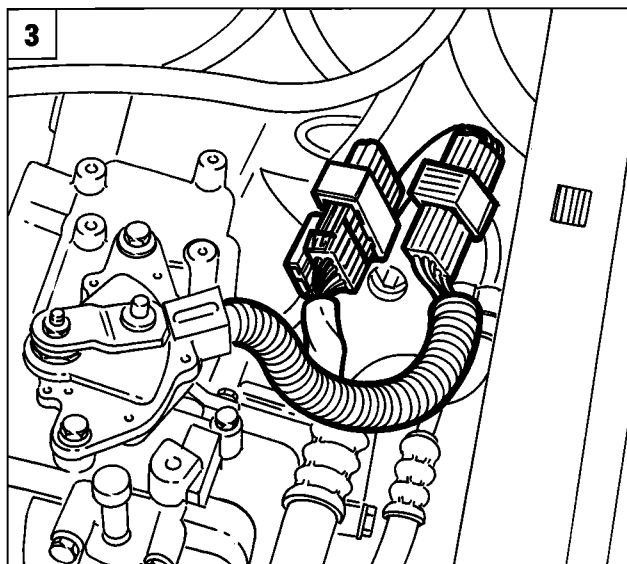
P4A41AB05



P4A53AB01



P4A53AB02



P4A53AB03



1. Remove the nuts securing the gear change control cable mounting bracket, and move it over to one side.

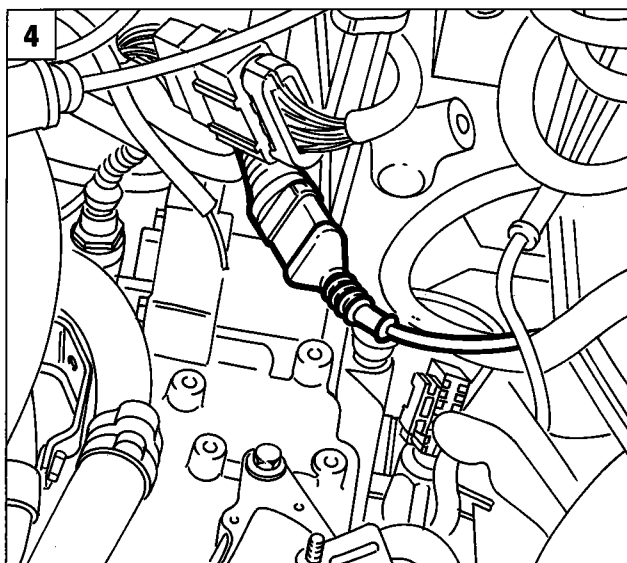


2. Disconnect the earth cable shown in the figure, from the gearbox.

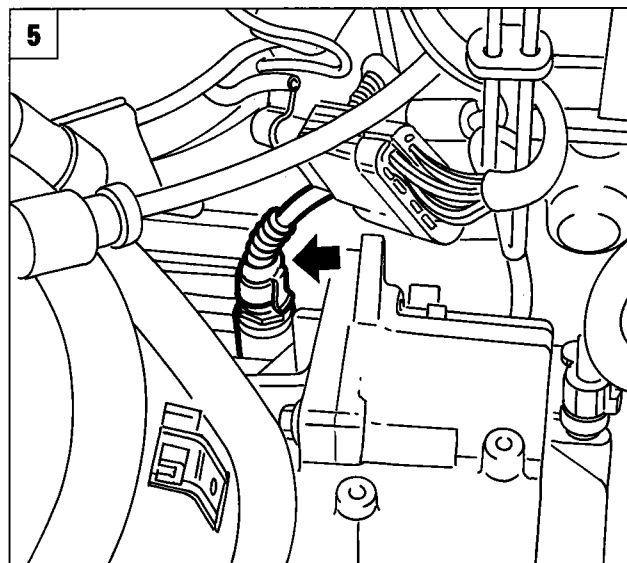
3. Disconnect the connectors shown in the figure of the selector lever position sensor and solenoids (gear change, lock-up clutch control and pressure control) after releasing them from the retaining clips.

4. Disconnect the connector shown in the figure.

5. Disconnect the speedometer drive cable.



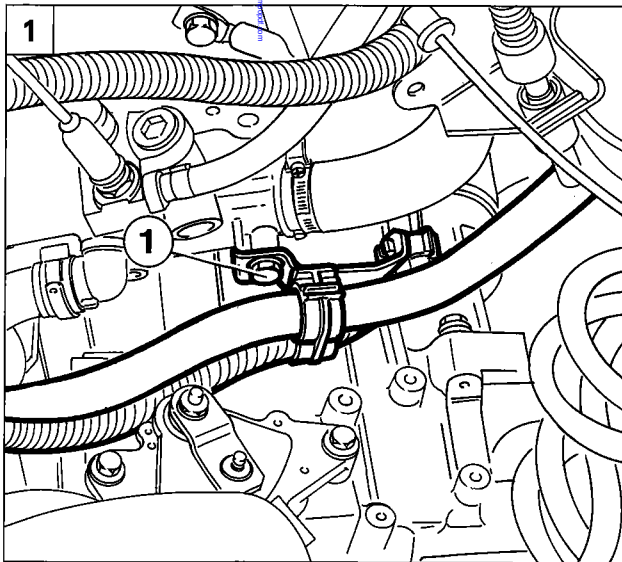
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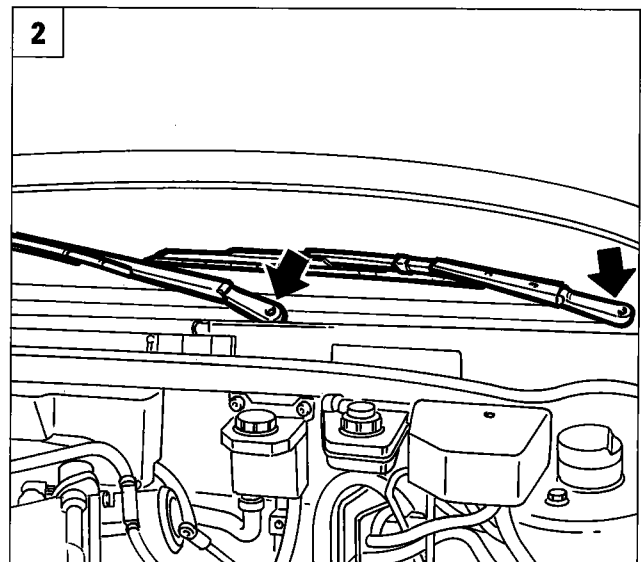
P4A53AB05

## Removing-refitting

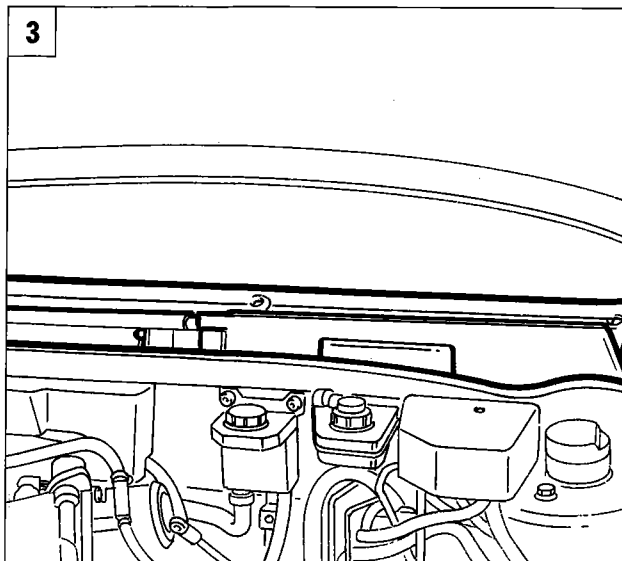
### 21-27.



P4A54AB01



P4A54AB02



P4A54AB03



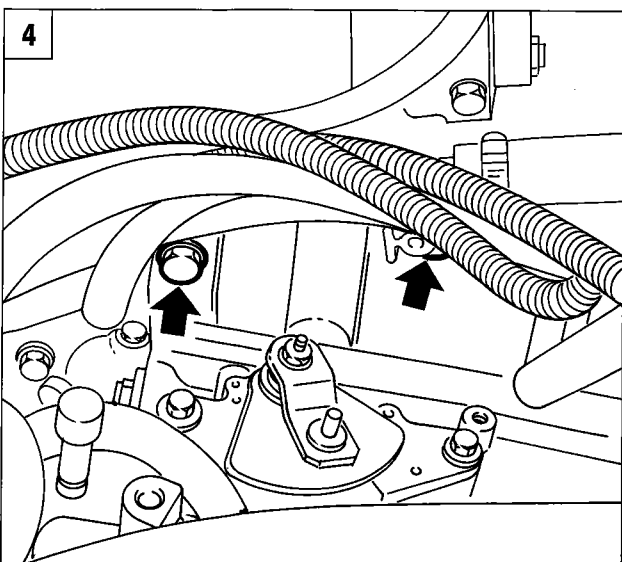
1. Remove the bolt (1) securing the retaining bracket for the pipes shown in the figure.

2. Remove the windscreen wiper arms (right and left) by undoing the central fixing nut, after removing the protective cap.

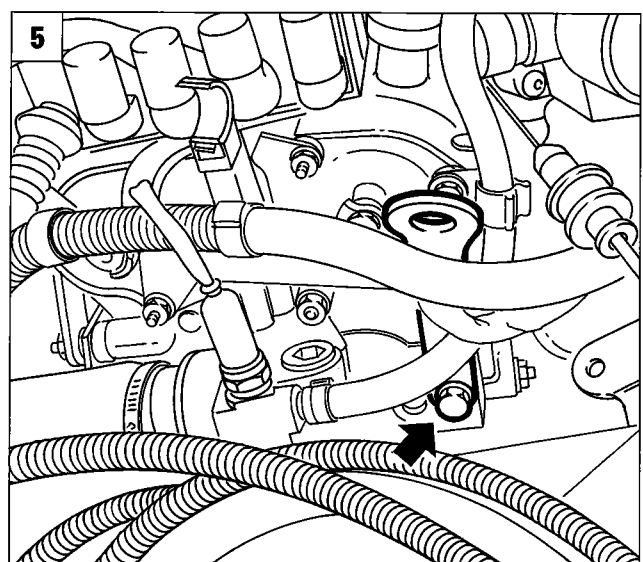
3. Remove the plastic covers from the space under the windscreen, to allow the engine support tool to be installed during removal and refitting of the gearbox.

4. Remove the gearbox top mountings.

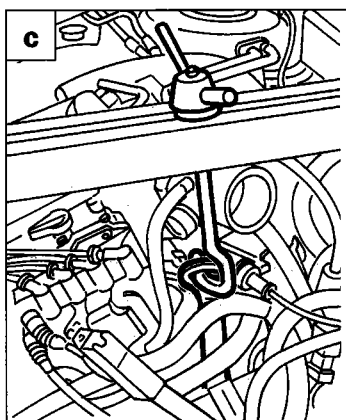
5. Fit a suitable supporting eye at the point shown in the figure, to hook up the power unit during removal of the gearbox.



P4A54AB04



P4A54AB05

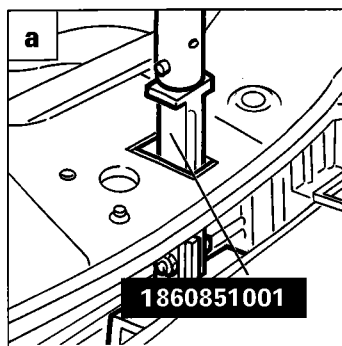


P4A55AB02

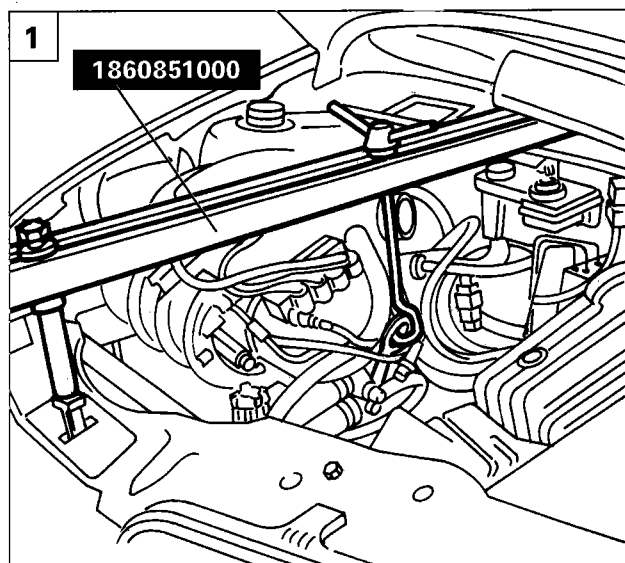


1. Fit the engine support crossbeam 1860851000 and the special adaptor 1860851001 at the appropriate mounting points.

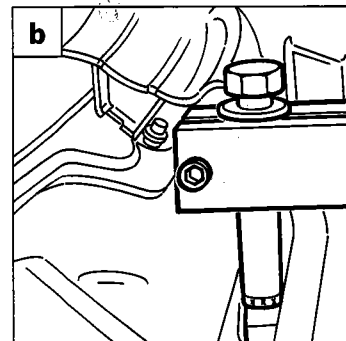
- a. Front mounting: fit the tool in the bonnet catch seating, so that it rests on the front cross member.
- b. Rear mounting: fit the tool level with the central reinforcement of the fire-proof bulkhead.
- c. Secure the cross member hook to the eye positioned previously, near the thermostat.



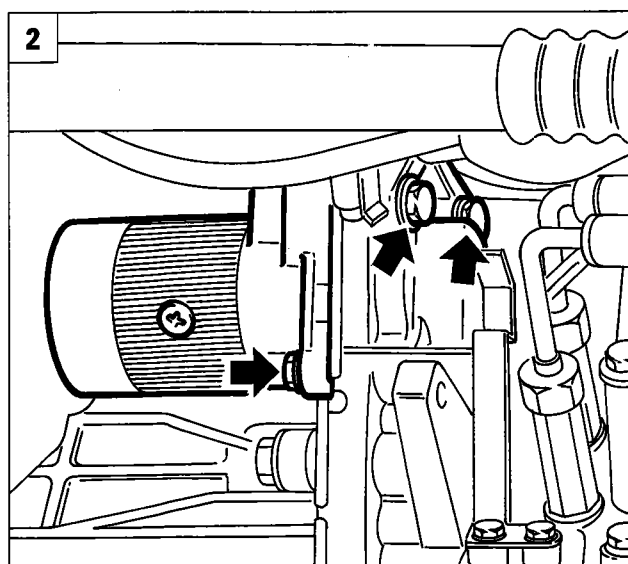
P4A55AB03



P4A55AB01



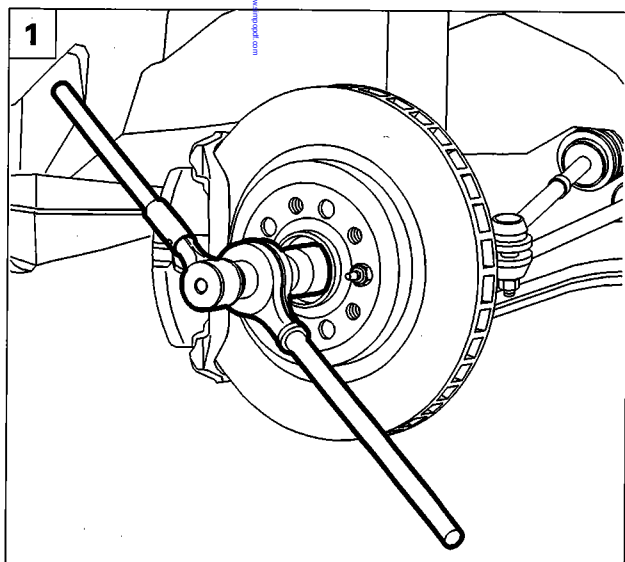
P4A55AB04



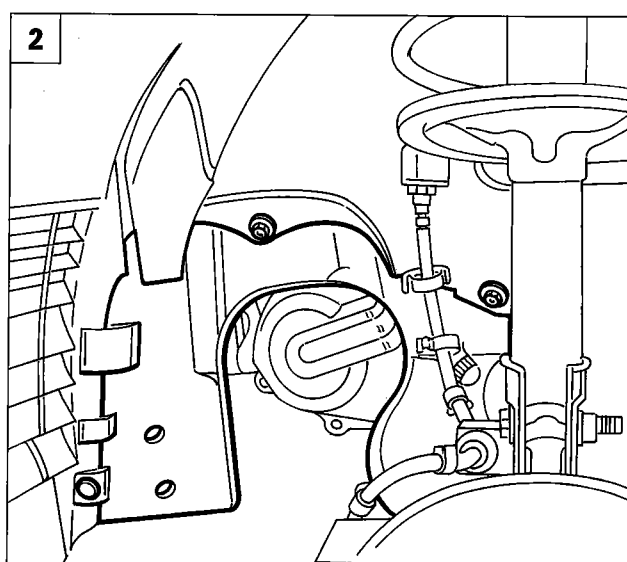
P4A55AB05

2. Remove the starter motor by undoing its bolts; then move the starter motor to one side, securing it, taking care not to damage the supply cables.

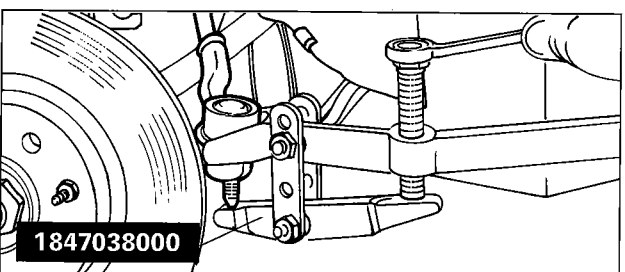
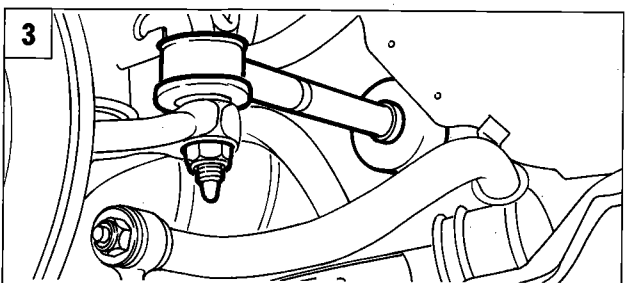




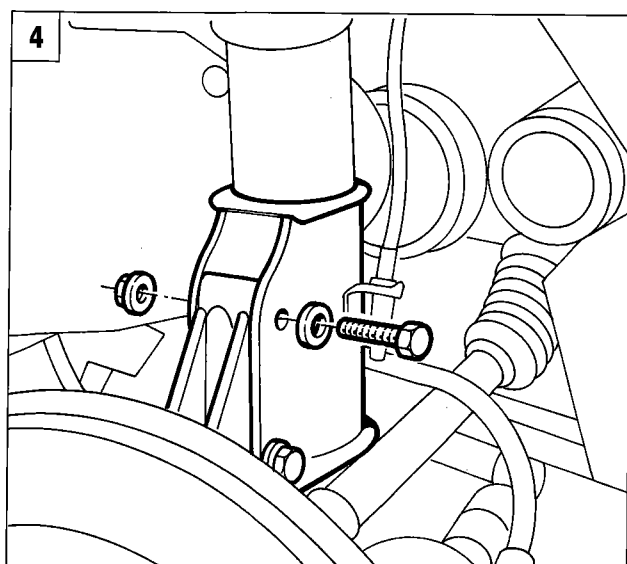
P4A56AB01



P4A56AB02



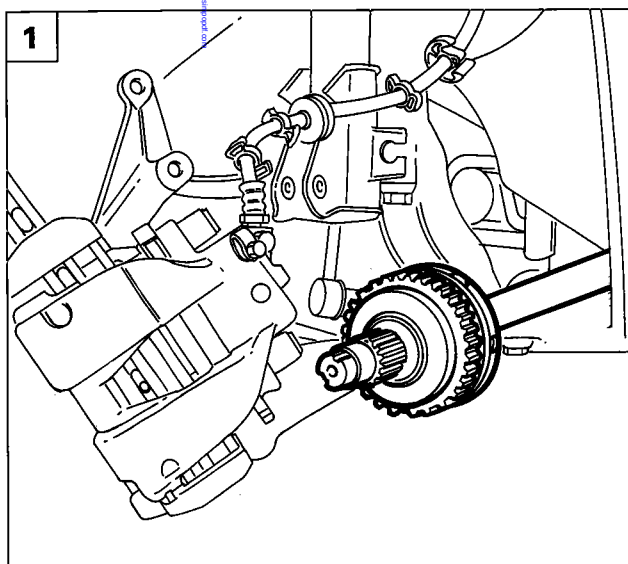
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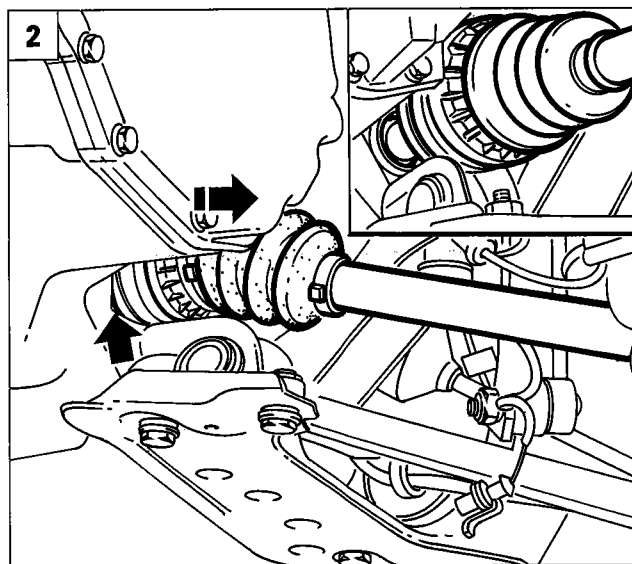
P4A56AB04



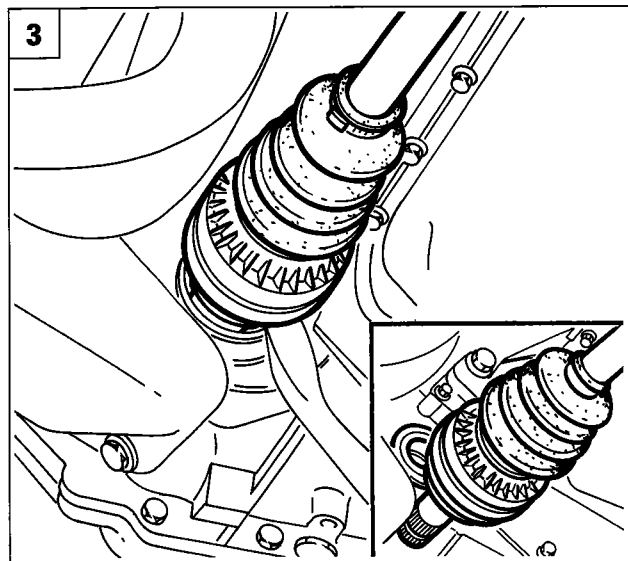
1. Relieve the staking then remove the wheel hub nut (gearbox side and timing gear side).
2. Remove the plastic wheelarch trim on the gearbox side by undoing the screws and retaining button shown in the figure. To remove the trim, also disconnect the brake pad wear sensor connector (repeat the operation on the other side).
3. Remove the nut securing the track rod end to the vertical link, then remove the latter from the vertical link arm using the puller 1847038000 (repeat the procedure on the other track rod end).
4. Remove the bolts securing the vertical link (gearbox side and timing gear side) to the shock absorber.



P4A57AB01



P4A57AB02



P4A57AB03



1. Rotate the vertical link so as to withdraw the drive shaft from the wheel hub (repeat the procedure for the other drive shaft).



2. Disconnect the drive shaft on the gearbox side from the differential, levering on the anchorage point, and move it away from the working area.

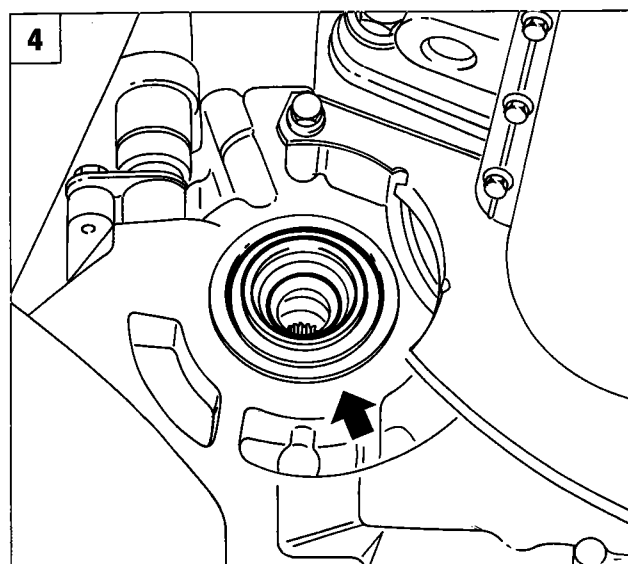
3. Disconnect the drive shaft on the timing gear side from the differential, levering on the anchorage point.

4. Differential oil seals.

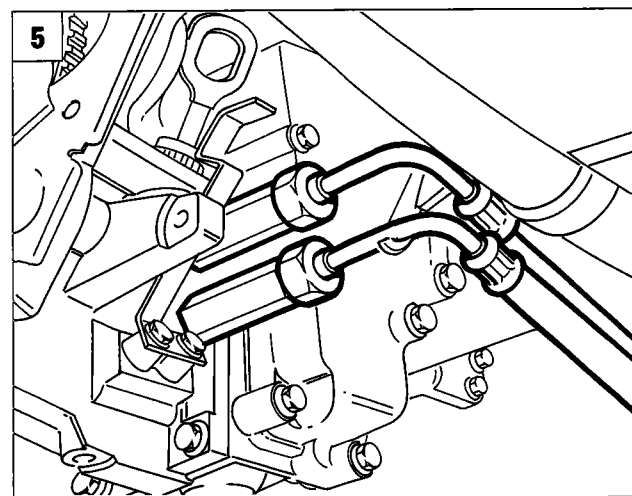


*When withdrawing the drive shafts, take care not to damage the differential seals. Withdraw them perfectly horizontally.*

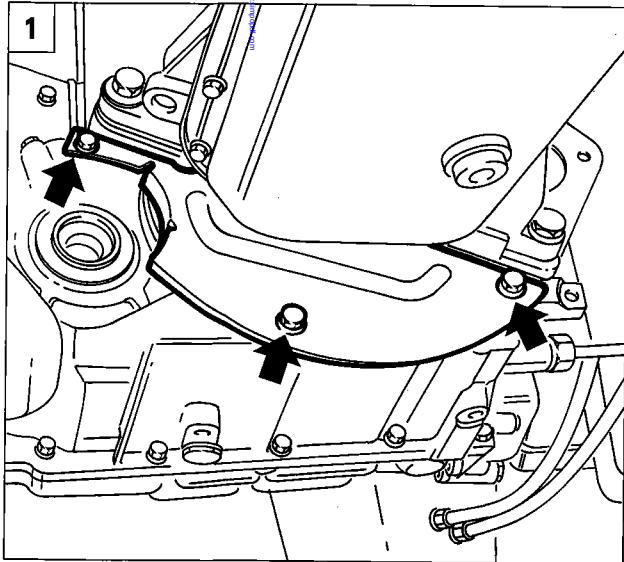
5. Remove the connectors shown in the figure in order to disconnect the oil pipes from the gearbox. Then place the pipes over to one side.



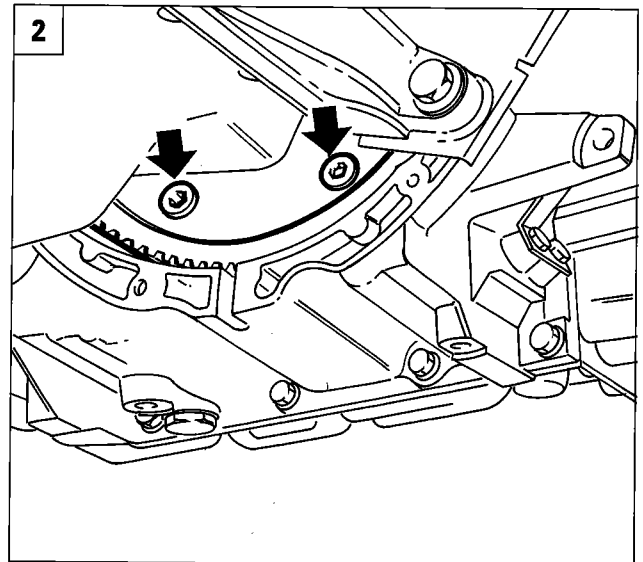
P4A57AB04



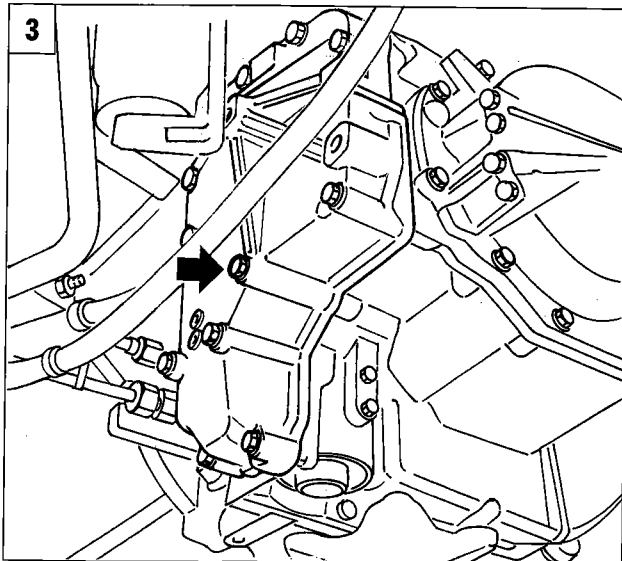
P4A57AB05



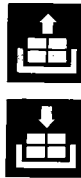
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P4A58AB02



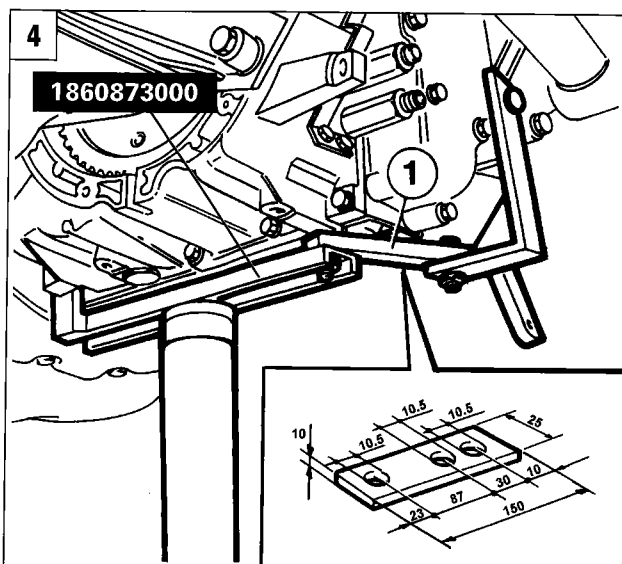
P4A58AB03



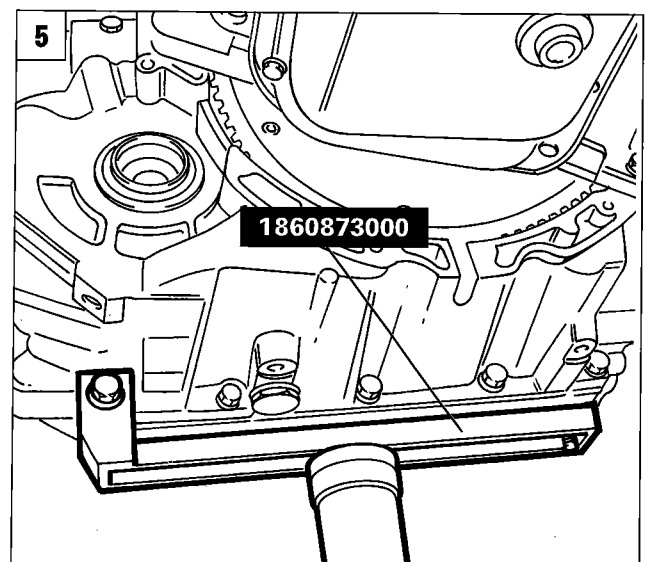
1. Remove the guard shown in the figure from the bottom of the gearbox.
2. Remove the bolts securing the converter to the flywheel. First undo the two visible bolts, then turn the crankshaft to gain access to the remaining bolts (total of 6).

3. Undo the bolt shown in the figure from the valve assembly cover to allow the gearbox support tool to be installed.

- 4-5. Place the gearbox support tool 1860873000 on a hydraulic jack, then secure it to the gearbox at the points shown in the figure. To fit the tool correctly, also fit a bracket (1), to be manufactured on site, of the dimensions shown in the insert (dimensions in mm).

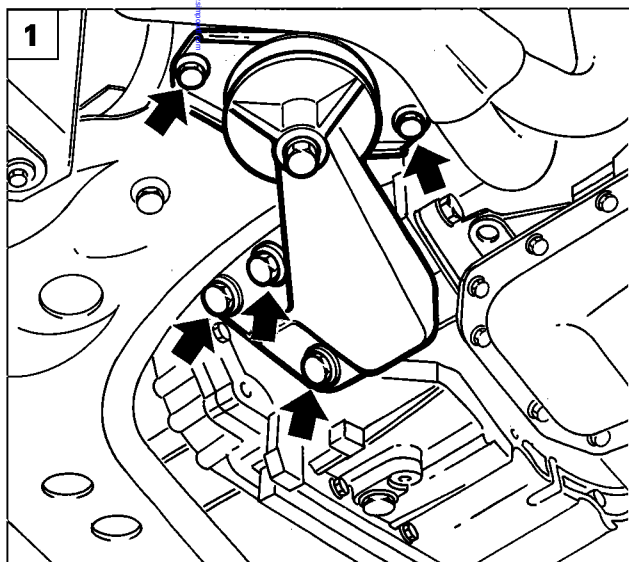


P4A58AB04

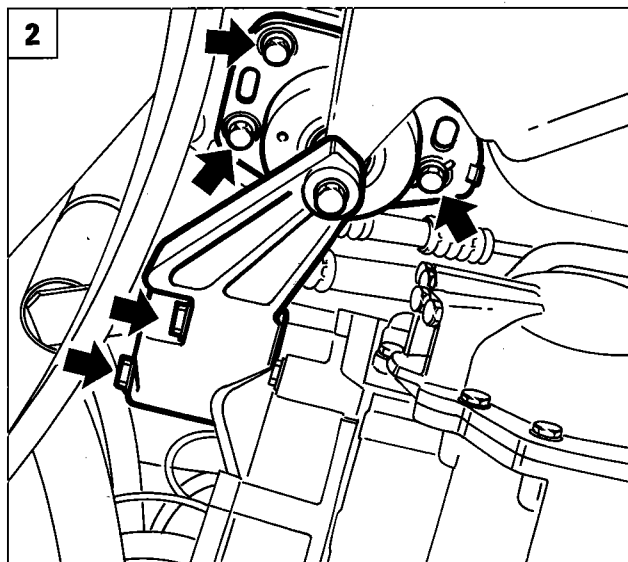


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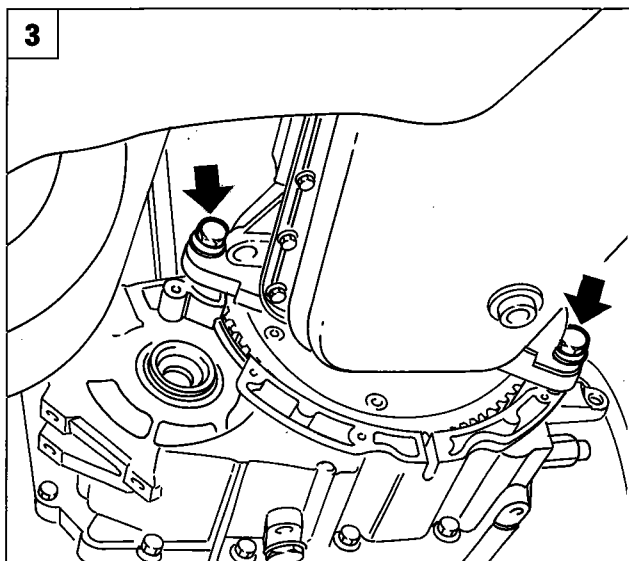




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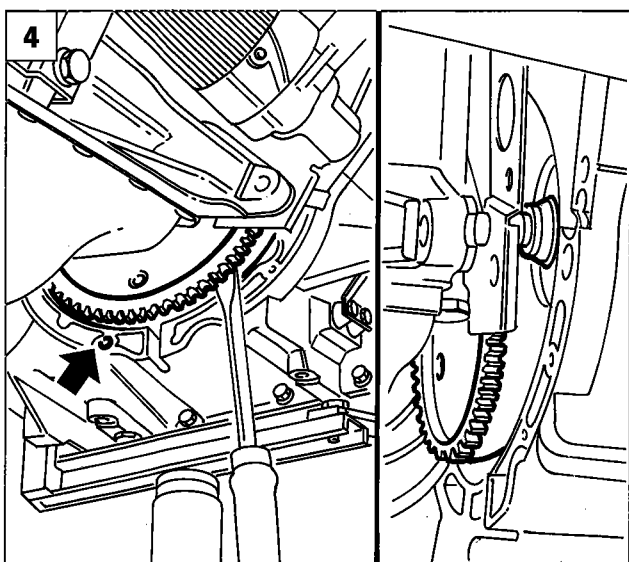


P4A59AB02



P4A59AB03

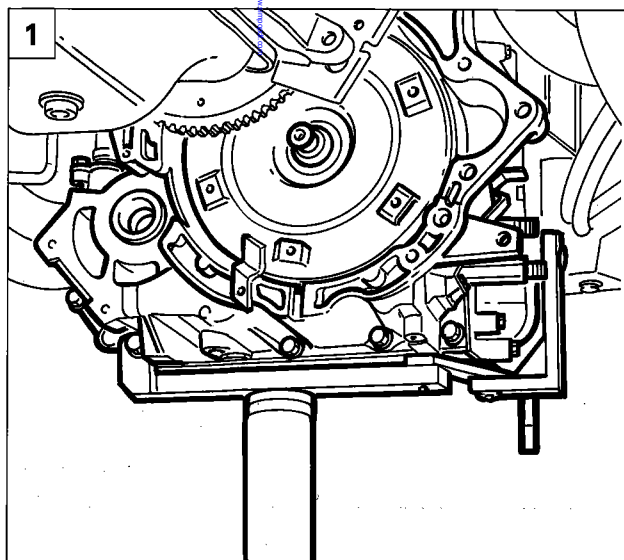
1. Remove the power unit central mounting by undoing the bolts shown in the figure.
2. Remove the power unit mounting on the gearbox side by undoing the bolts shown in the figure.
3. Remove the bottom bolts securing the gearbox to the engine.
4. Gently separate the bellhousing from the engine, then manoeuvre the converter back into its seating. For greater safety, fit a bracket, to be manufactured on site, screwing it into the seat of the bolt securing the gearbox bottom guard, to prevent the converter falling out of its seating.



P4A59AB04

## Removing-refitting

### 21-27.



P4A60AB01

1. Manoeuvre the hydraulic jack as appropriate to release the gearbox from the surrounding parts. Gradually lower the jack and withdraw the gearbox.



*Take particular care to prevent the converter falling out of its seating.*



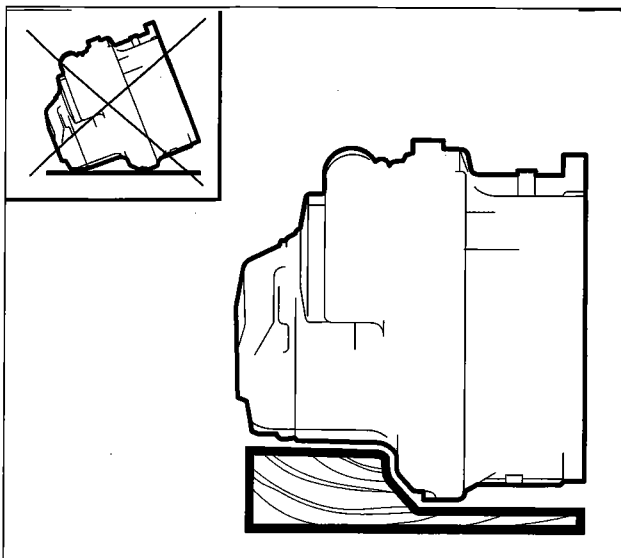
*When refitting, fit the gear change control cable, then carry out the checks described for removal of the cable.*

**NOTE** *Top up the gearbox oil level and check that there are no leaks from the drain plug (tighten to 2.35 - 5.49 daNm).*

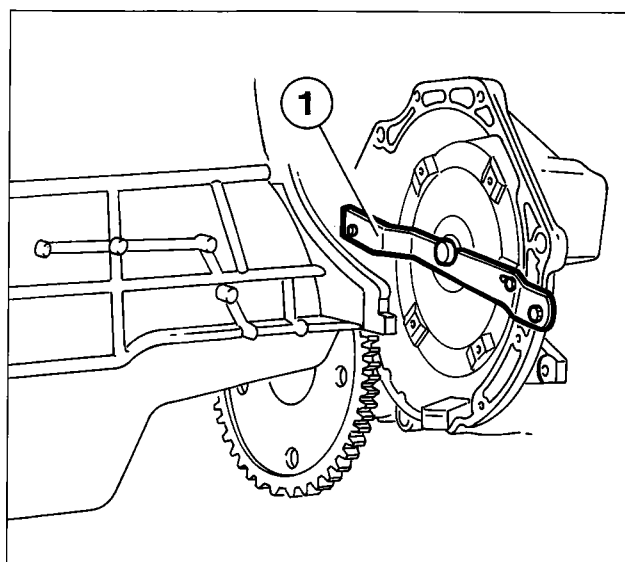
## PRECAUTIONS

After releasing the cable from the support tool, do not place it directly on the floor, to avoid damaging its structure and the external components. Interpose a suitably shaped wooden wedge.

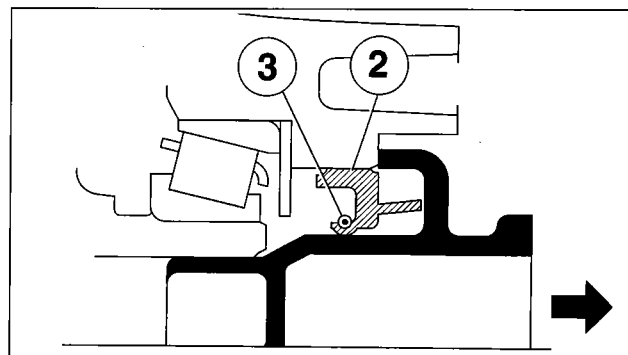
If the gearbox is replaced, before fitting the new transmission, remove the bracket (1) in the converter seating and the plugs on the differential outlet, fitted to stop foreign bodies entering the gearbox. Remove the above-mentioned plugs perfectly horizontally, to avoid damaging the oil seals (2) on the differential and to prevent the spring (3) inside the seals from falling out.



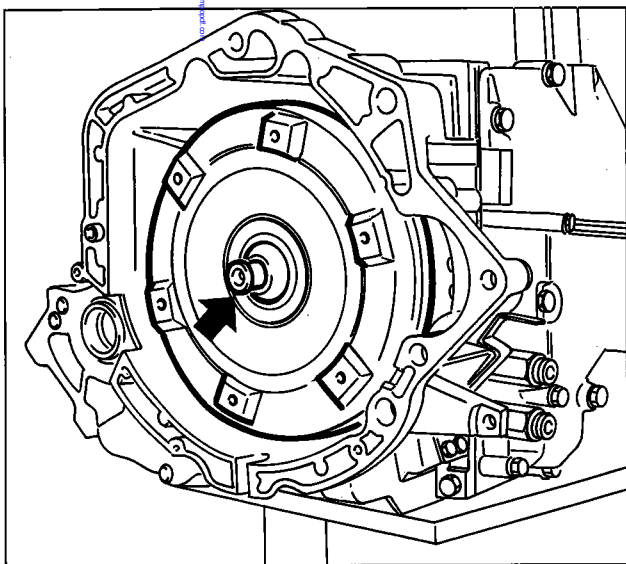
P4A60AB02



P4A60AB03

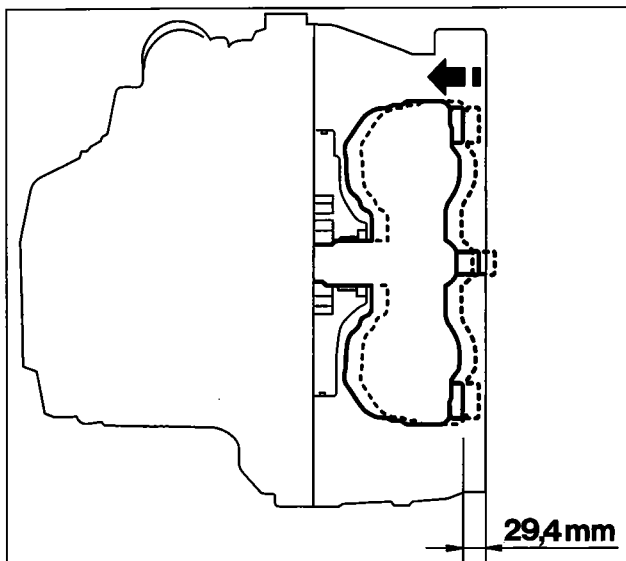


P4A60AB04



P4A61AB01

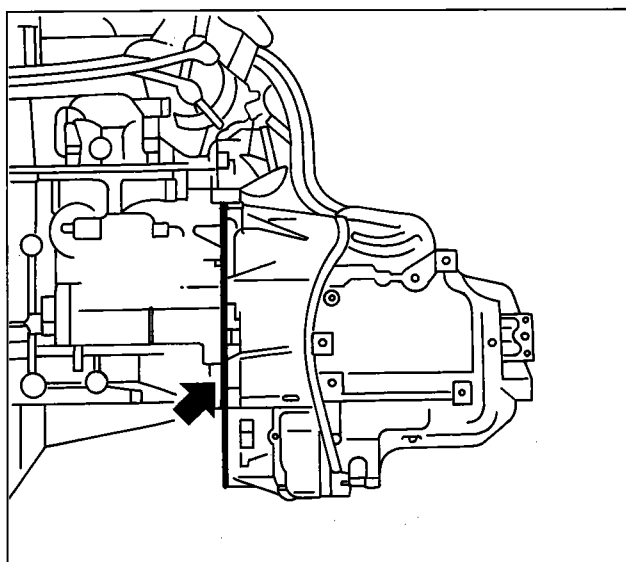
Do not damage the converter centring nose while fitting the gearbox. If the point is damaged, it could fail to fit onto the crankshaft correctly, and consequently damage the converter and oil pump.



P4A61AB02

Before fitting the transmission, make sure that the converter is fitted properly on the oil pump. If it is not fitted properly, the bush and oil pump gearing could be damaged.

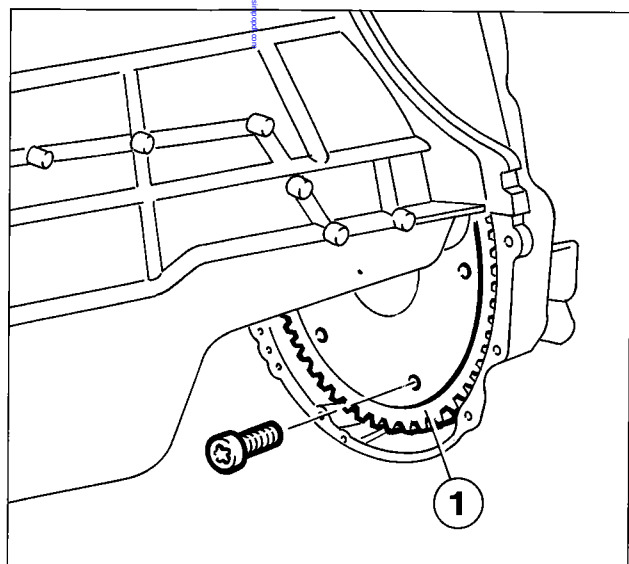
Make sure that the distance between the holes of the bolts securing the converter to the flywheel and the gearbox front surface is 29.4 mm.



P4A61AB03

When fitting the gearbox, check that the centring pins are positioned correctly, and also check that there is no gap between the contact line between the engine and gearbox casing.

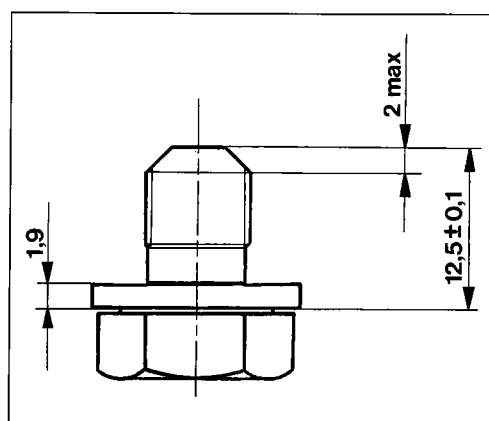
### 21-27.



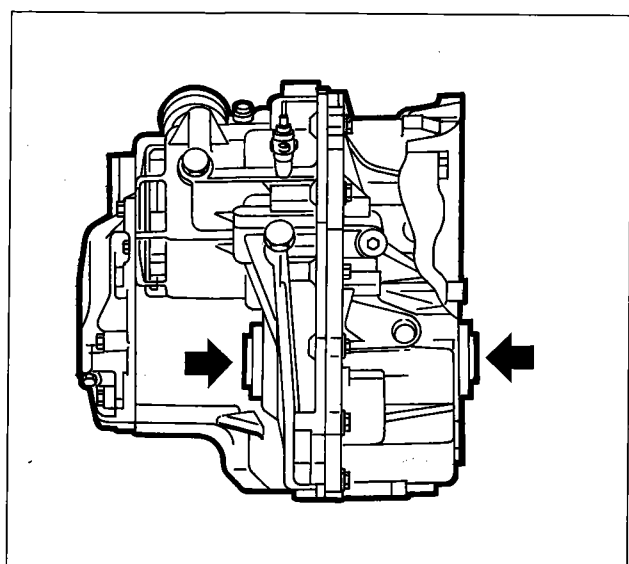
P4A62AB01

When coupling the converter to the flywheel, use bolts of the correct length (M8x1.25 bolts with tapered shakeproof washer drawing 46450230, of the dimensions indicated in the figure) and make sure that they are not mixed up with other bolts.

1. Bolts which are too long could damage the other end of the converter and deform the clutch seal.
2. Bolts which are too short may not withstand the input torque and could break.



P4A62AB02

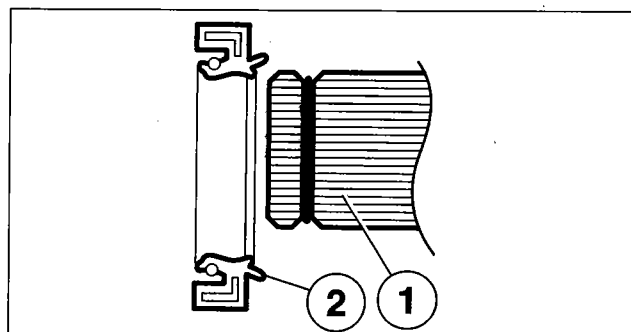


P4A62AB03

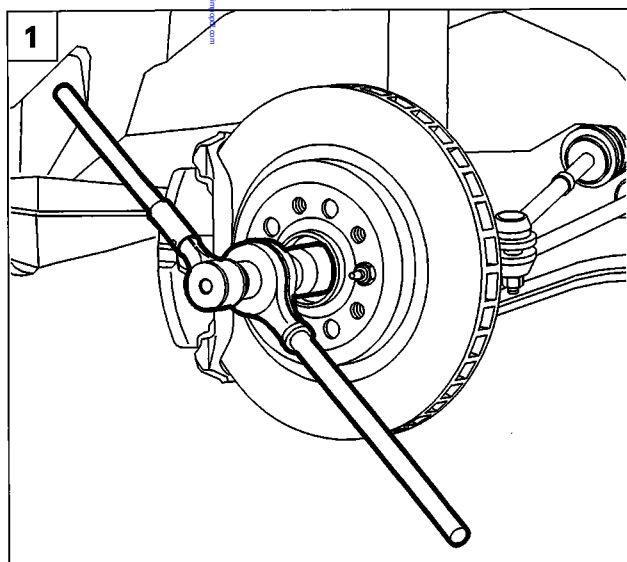
When fitting the drive shafts, take particular care not to damage the differential oil seal (2) on the splined part (1) of the drive shaft. Insert the drive shaft perfectly horizontally. If the seal is damaged, it could cause oil leaks.



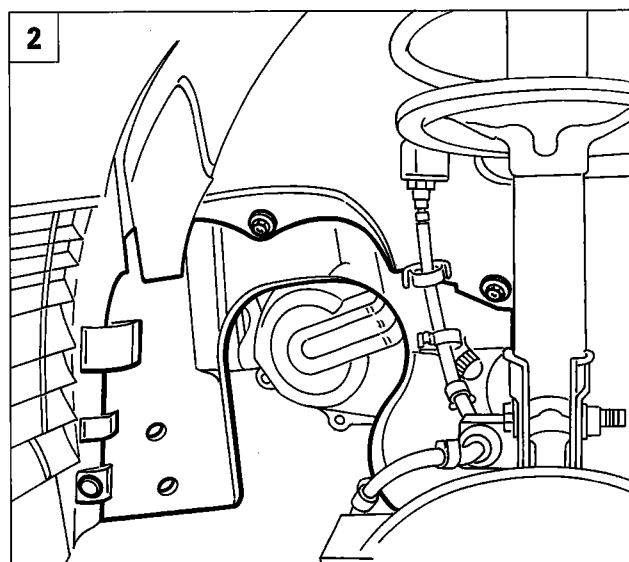
*Make sure that the drive shaft is clean before assembly to avoid foreign bodies entering into the differential.*



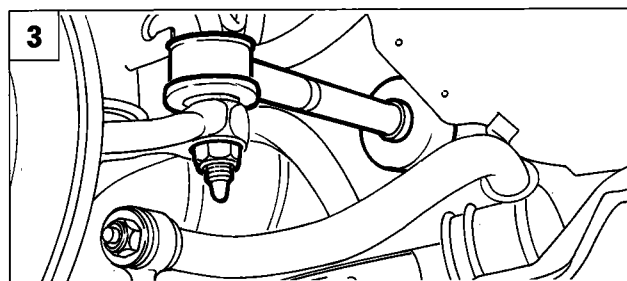
P4A62AB04



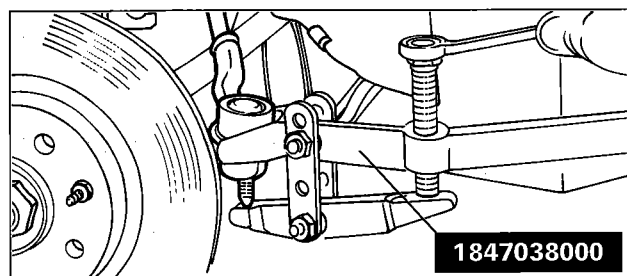
P4A56AB01



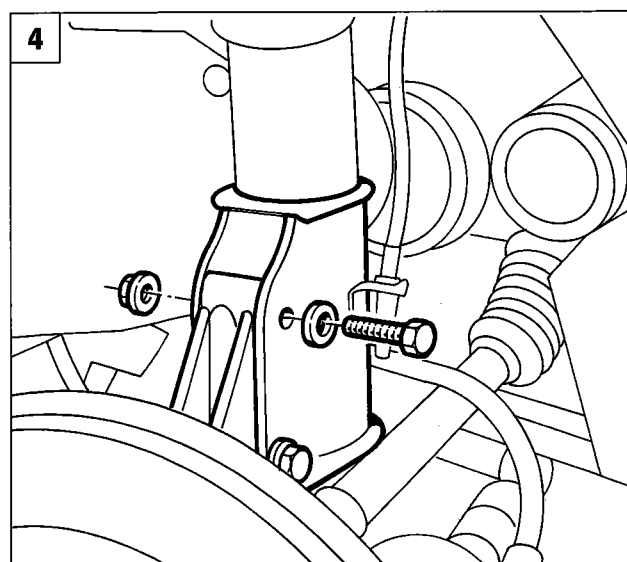
P4A50AB03



P4A56AB02



P4A56AB03



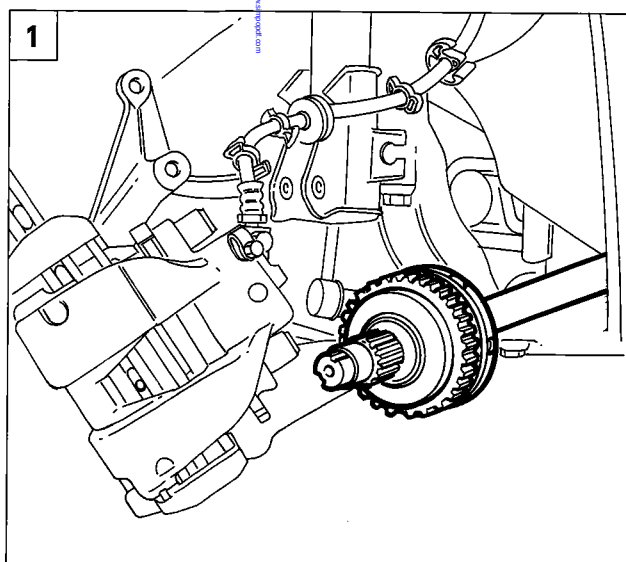
P4A56AB04



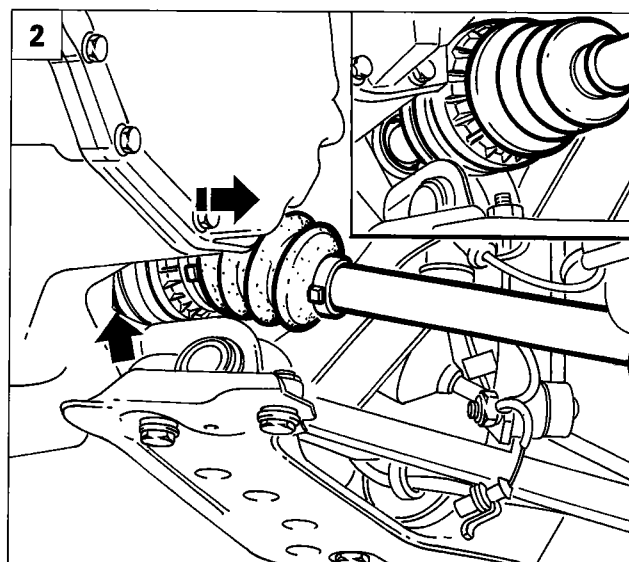
### REMOVING-REFITTING

Place the vehicle on ramps, remove the front wheels, drain the gearbox oil and then proceed as described below:

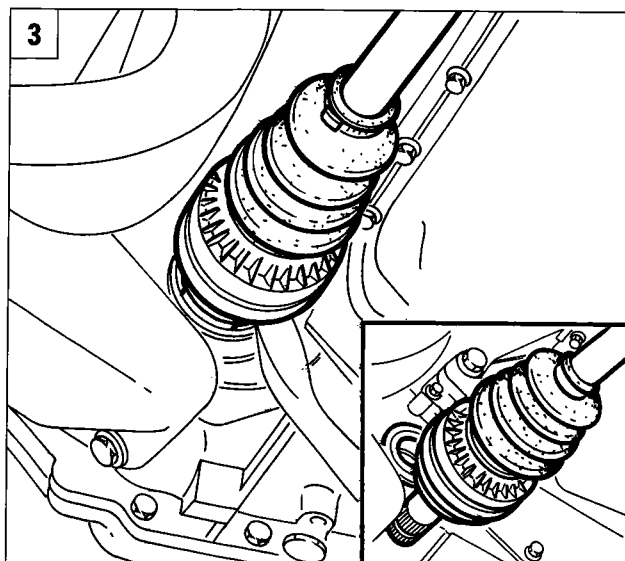
1. Relieve the staking then remove the wheel hub nut (gearbox side and timing gear side).
2. Remove the wheelarch plastic trim on the gearbox side by undoing the bolts and retaining button shown in the figure. To remove the trim, also disconnect the brake pad wear sensor (repeat the procedure for the other side).
3. Remove the nut securing the track rod end to the vertical link, then remove the latter from the vertical link arm using the puller 1847038000 (repeat the procedure on the other track rod end).
4. Remove the bolts securing the vertical link (gearbox side and timing gear side) to the shock absorber.



P4A57AB01



P4A57AB02



P4A57AB03



1. Rotate the vertical link in order to withdraw the drive shaft from the wheel hub (repeat the procedure for the other side).

2. Disconnect the drive shaft on the gearbox side from the differential, levering on the anchorage point.

3. Disconnect the drive shaft on the timing gear side from the differential, levering on the anchorage point.

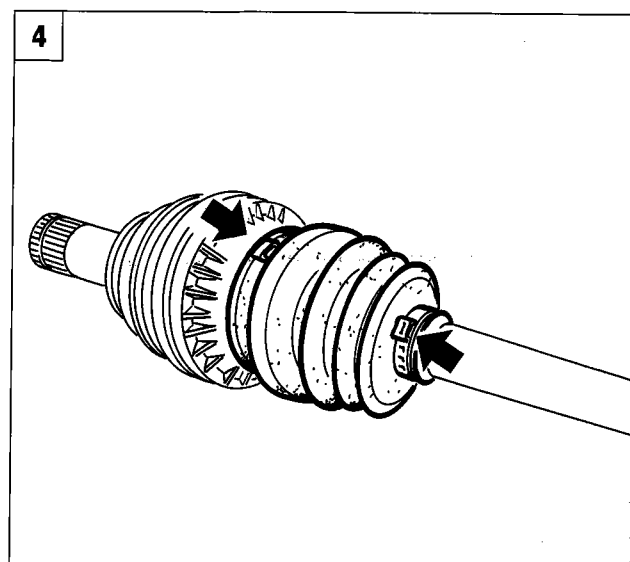
**NOTE** When refitting, reverse the procedure for removal, tightening the wheel hub nut to the specified torque.



To remove and refit the drive shafts, bear in mind the warnings mentioned under removing-refitting the gearbox.

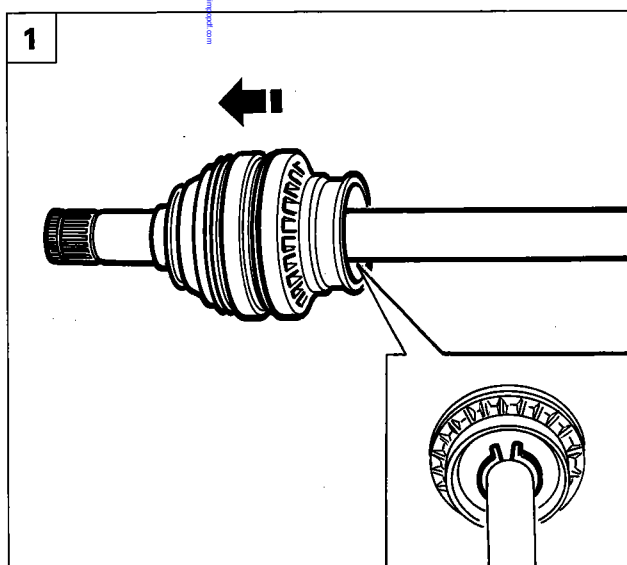
#### DISMANTLING-REASSEMBLY

4. Place the drive shaft in a vice, then remove the clips retaining the protective gaiter on the sliding joint on the gearbox side.

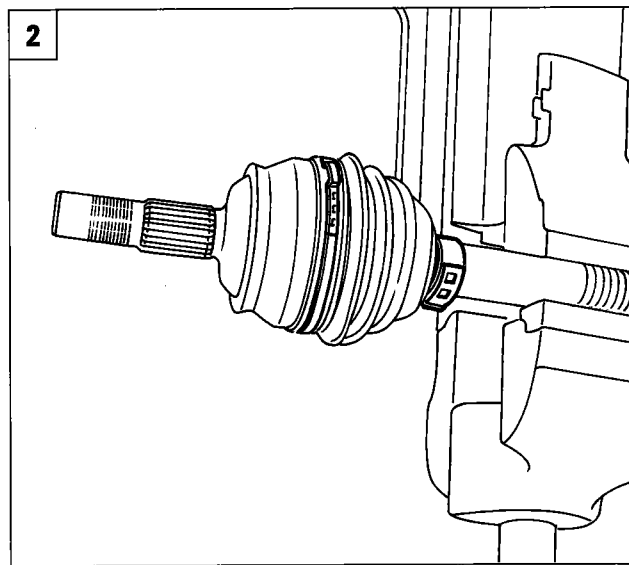


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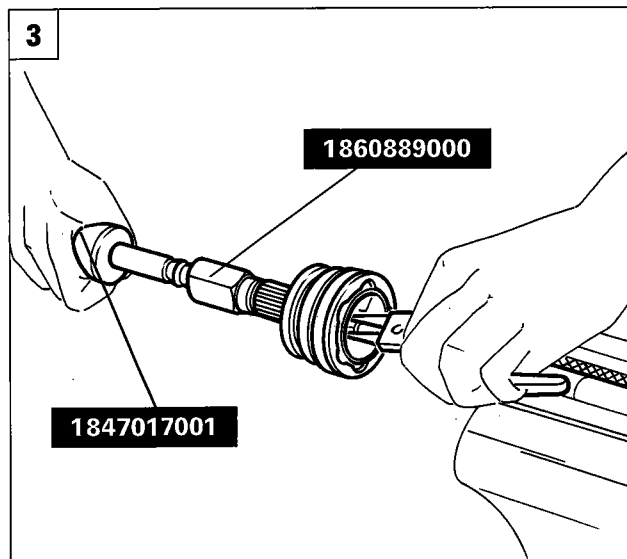




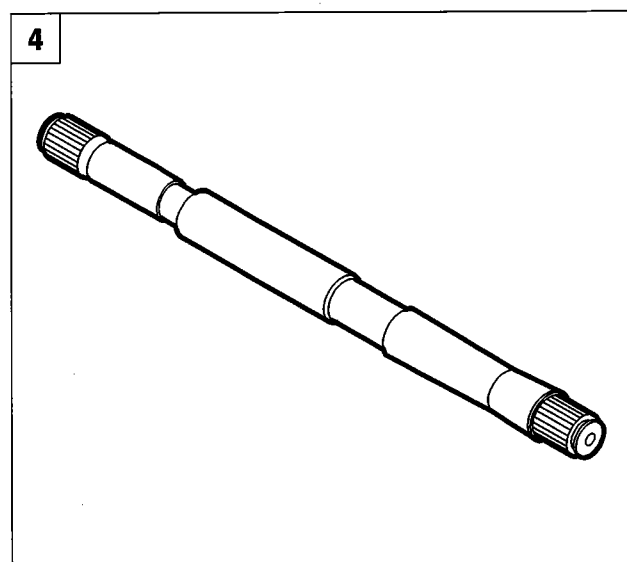
P4A65AB01



P4A65AB02



P4A65AB03



P4A65AB04



1. Remove the circlip retaining the sliding joint (gearbox side), then remove the joint by withdrawing it from the drive shaft.



2. Undo the clips retaining the protective gaiter on the constant velocity joint on the wheel side, then remove the gaiter from the side opposite the drive shaft.

3. Degrease the inside of the constant velocity joint. Using tools 1847017001 and 1860889000, and holding the circlip inside the joint at the same time, remove the joint from the drive shaft.

4. Check that the drive shaft is not deformed or out of true, and that the surface in contact with the seal is not worn.

### REFITTING



When refitting, reverse the procedure described for removal.

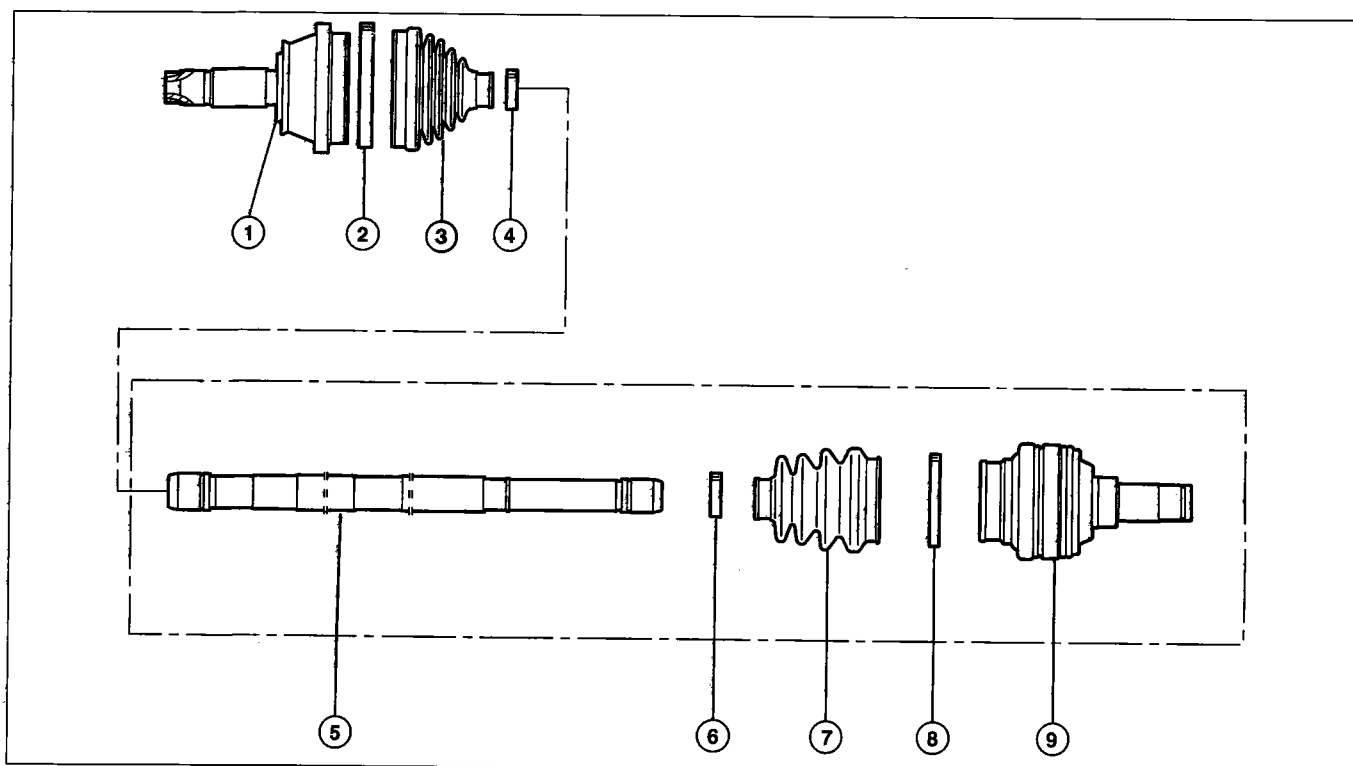
Whenever a gaiter is removed, it is advisable to replace it, and it is important to fill both the constant velocity joint or sliding joint and the gaiter with TUTELA MRM2 grease.



| Drive shaft-joint coupling, wheel side |        |                      |        |
|----------------------------------------|--------|----------------------|--------|
| Shaft classification                   |        | Joint classification |        |
| Category                               | Colour | Category             | Colour |
| 2                                      | Green  | 2                    | Green  |
| 3                                      | White  | 3                    | White  |

When refitting, the constant velocity joints must be coupled to the shaft as indicated in the table. Conduct a final check on the joint, to make sure that there are no signs of seizure or scoring.

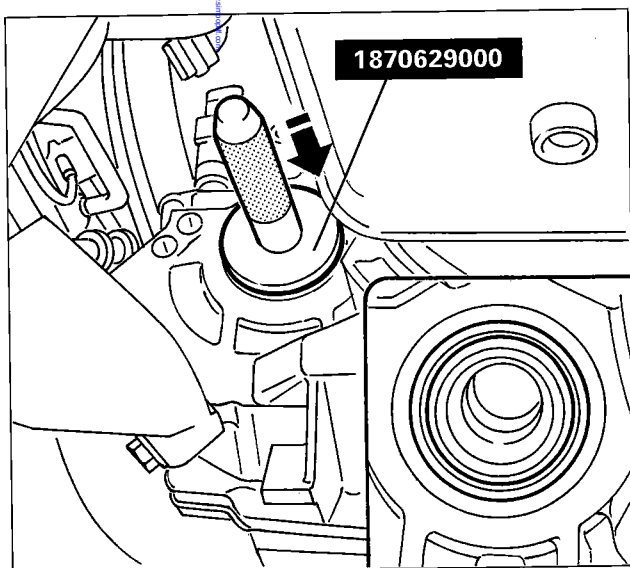
## TRANSMISSION COMPONENTS



P4A66AB01

1. Constant velocity joint
- 2-4. Clips retaining constant velocity joint protective gaiter
3. Constant velocity joint protective gaiter
5. Drive shaft

- 6-8. Clips retaining sliding joint protective gaiter (gearbox side)
7. Sliding joint protective gaiter (gearbox side)
9. Sliding joint



P4A67AB01

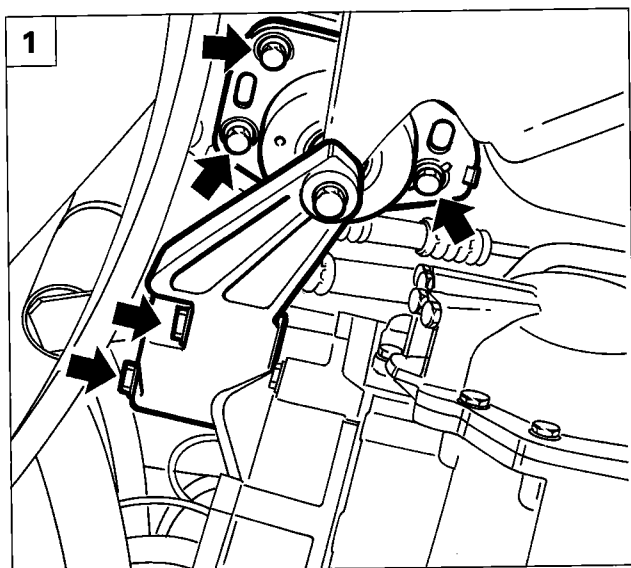
### Replacing differential oil seal

Disconnect the drive shaft from the differential as described above, then remove the oil seal from the differential, using a screwdriver as a lever.

When refitting, use the drift 1870629000 with an appropriate handle.



*Operate with care to avoid damaging the oil seal and causing leaks.*



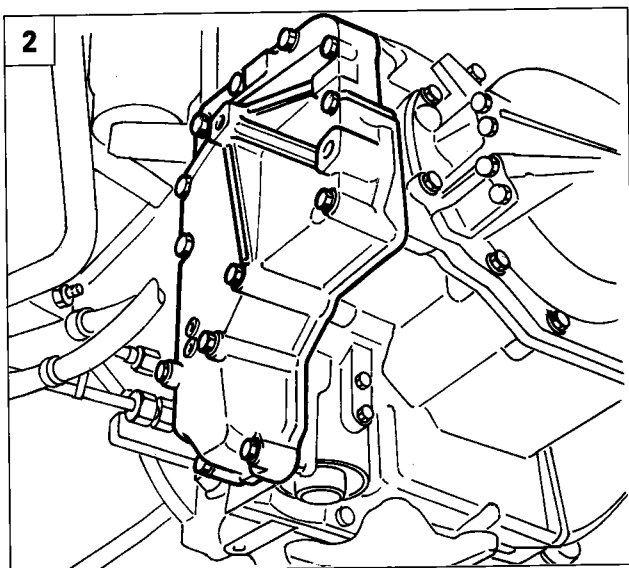
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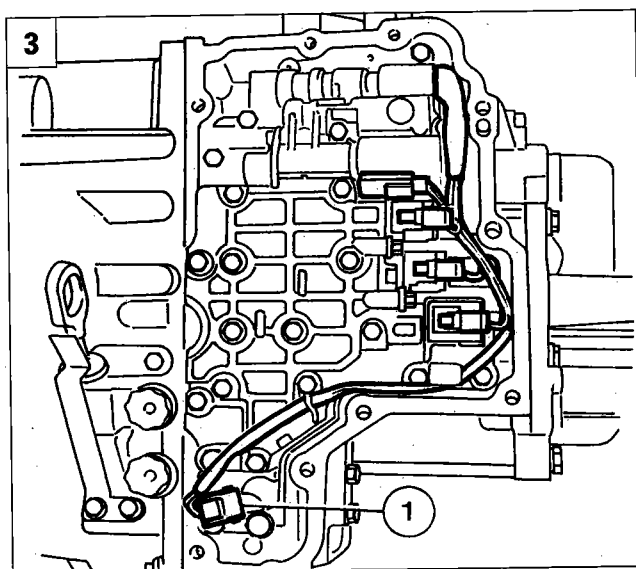
### REMOVING-REFITTING VALVE ASSEMBLY

Place the car on ramps, disconnect the battery's negative pole, drain the gearbox oil, then proceed as described below, working from under the vehicle:

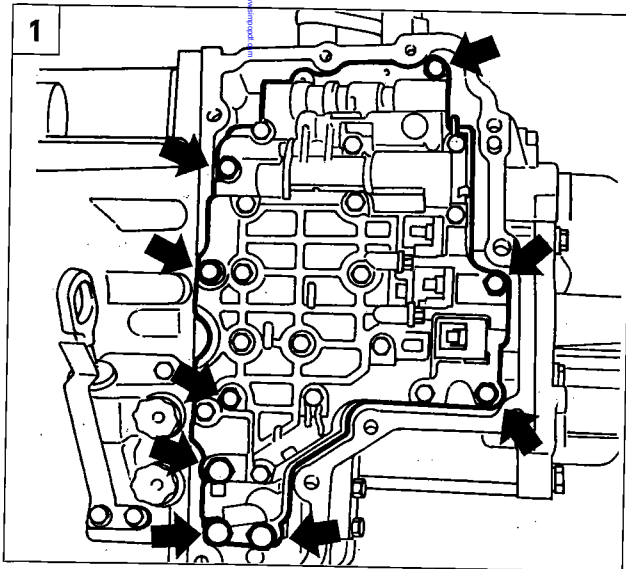
1. Place a hydraulic jack under the bellhousing, then remove the power unit mounting on the gearbox side to allow the valve assembly cover to be removed.
2. Undo the bolts securing the valve assembly cover and remove the cover.
3. Disconnect the valve assembly solenoid supply connectors, disengage the gearbox oil temperature sensor (1) from its mounting bracket and move the wiring aside.



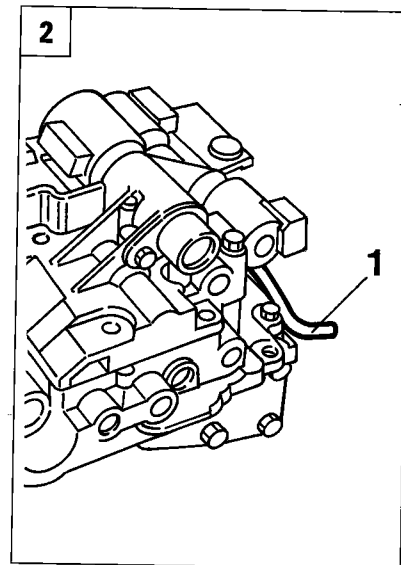
P4A67AB02



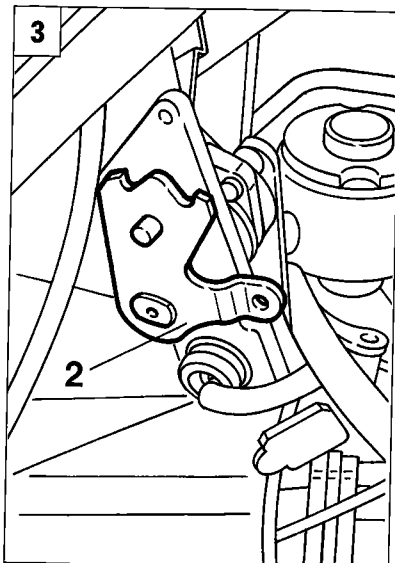
P4A67AB03



P4A68AB01



P4A68AB02



P4A68AB03



1. Undo the bolts shown in the figure securing the valve assembly, then remove the complete assembly.

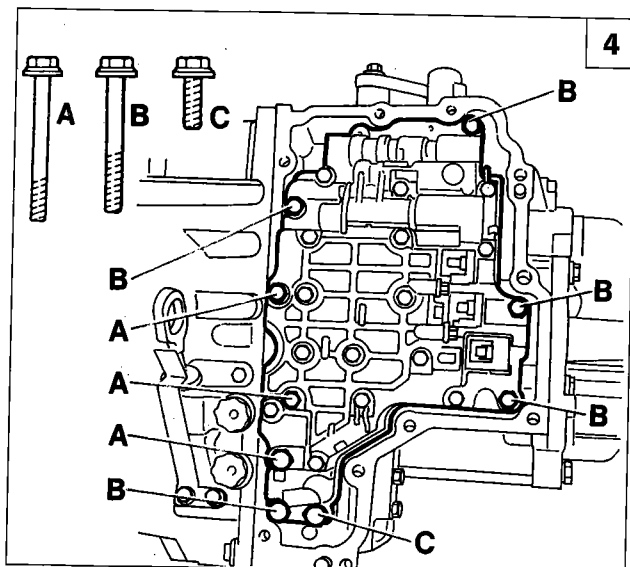
#### Refitting

- 2-3. Insert the lever (1) of the selector valve in the hole of the lever (2).
4. Position the valve assembly and tighten the fixing bolts. Connect the solenoid supply connectors and fit the gearbox oil temperature sensor on the mounting bracket.

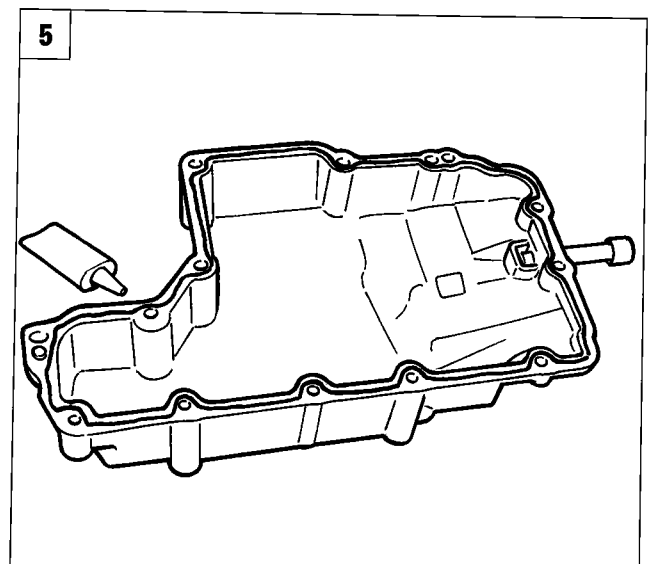


*The valve assembly bolts are of different lengths. Arrange the bolts as shown in the figure.*

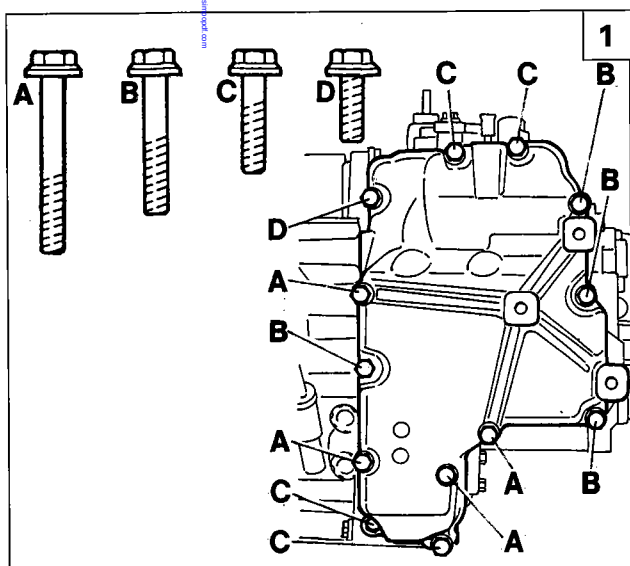
5. Using solvent, clean off any sealant residues from the valve assembly cover. Apply a bead of silicone sealant 1-1.5 mm thick along the edge of the cover, cleaning off any surplus inside the cover.



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P4A68AB05



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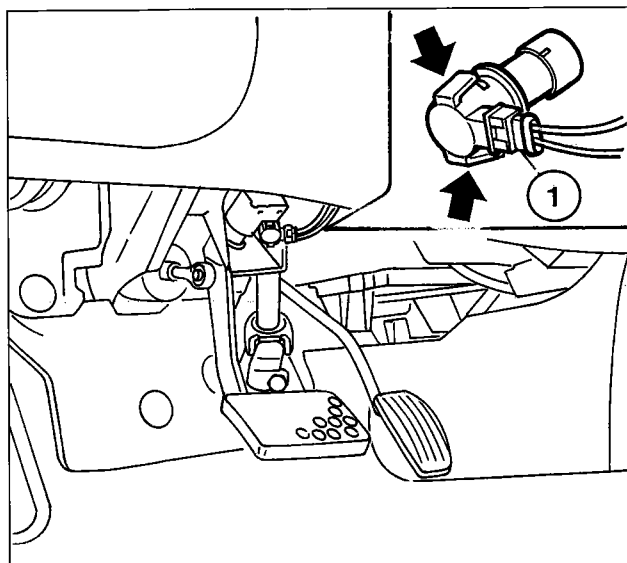
1. Fit the valve assembly cover and tighten the bolts.



*The bolts securing the valve assembly cover are of different lengths. Arrange the bolts as shown in the figure and tighten them to a torque of 1.96 - 2.74 daNm.*

**NOTE** *Fit the gearbox oil drain plug and tighten to a torque of 2.35-5.49 daNm. Top up the oil level, then check that there are no oil leaks from the valve assembly cover or drain plug.*

Finish refitting the valve assembly by reversing the procedure for removal.



P4A69AB02

#### KICK-DOWN SWITCH

The kick-down switch is located on the accelerator pedal. To remove this switch, release the lugs which secure the switch to the mounting bracket. Disconnect the supply connector (1), then replace the switch.



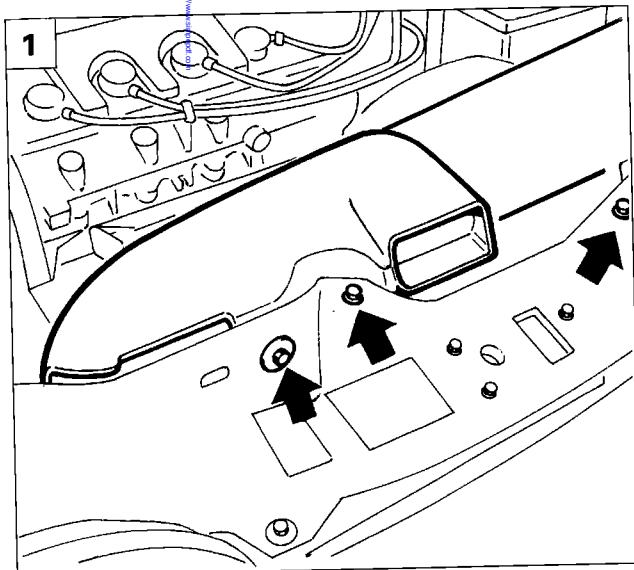
*It is virtually essential to replace the kick-down switch if it is removed, as the retaining lugs could break during removal.*

### REMOVING-REFITTING 1

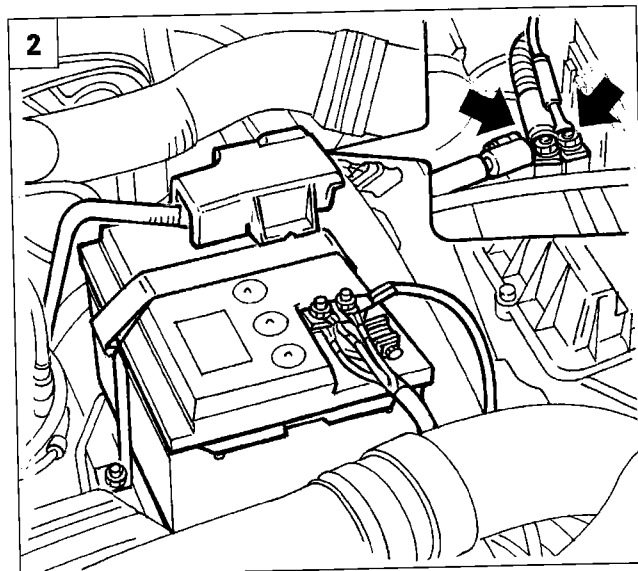
- Removing 1
- Refitting 1
- Drive shafts 7

### EXTERNAL CONTROLS 8

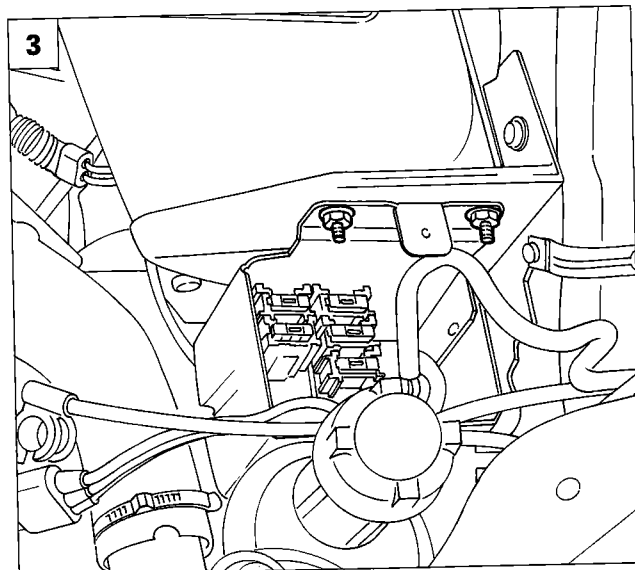
- Diagram showing external gearbox controls 8
- Removing-refitting 9
- Dismantling at the bench 12



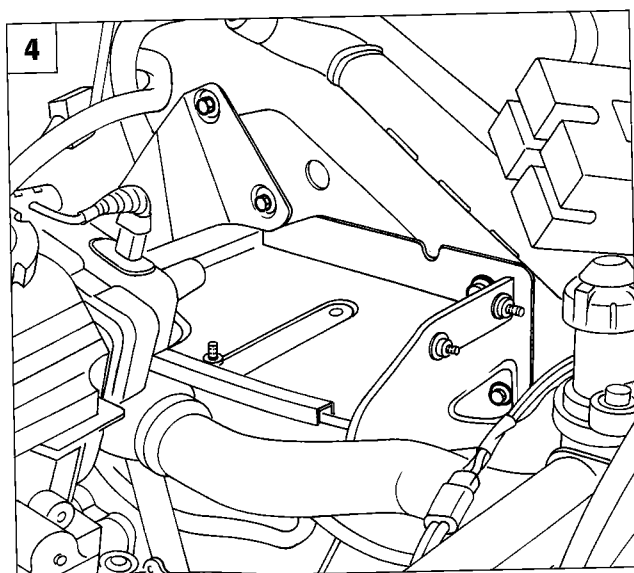
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## REMOVING-REFITTING



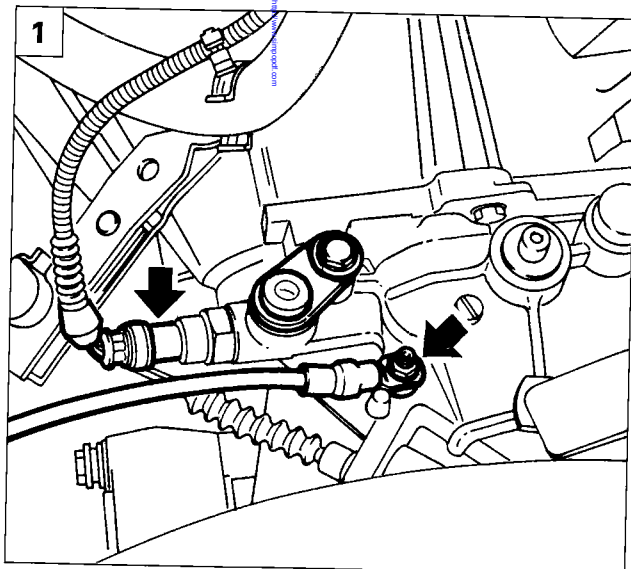
### Removing

Position the vehicle on a lift, remove the front wheels then proceed as described below:

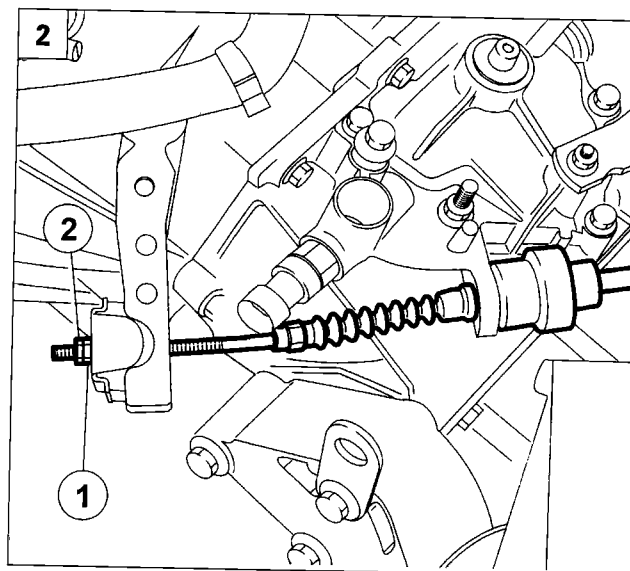
1. Undo the three fixing bolts and remove the air intake disconnecting it firstly from the air filter.
2. Disconnect the negative battery lead, remove the protective cover for the positive pole, disconnect the terminal and separate the latter from the starter motor supply leads; undo the nut securing the battery to the drip tray, then remove the latter from the engine compartment.
3. Undo the bolt securing the relay casing cover and remove it, then undo the nuts fixing the casing to the battery drip tray and place the casing at the side.
4. Remove the battery drip tray undo the bolts fixing it to the bodyshell.



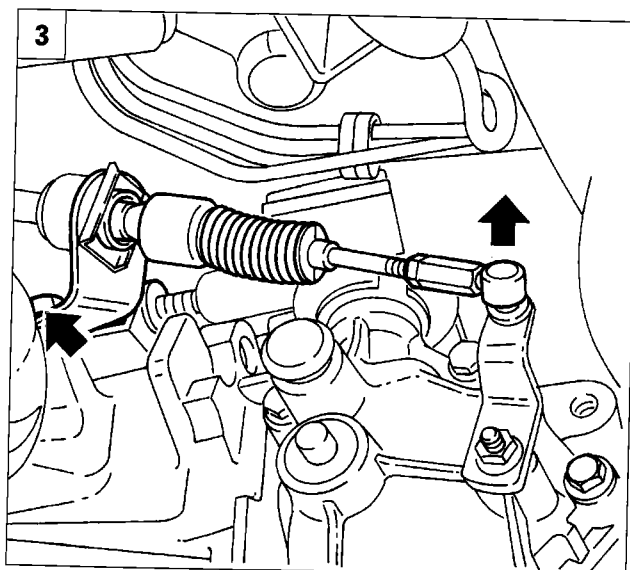
### 21.27



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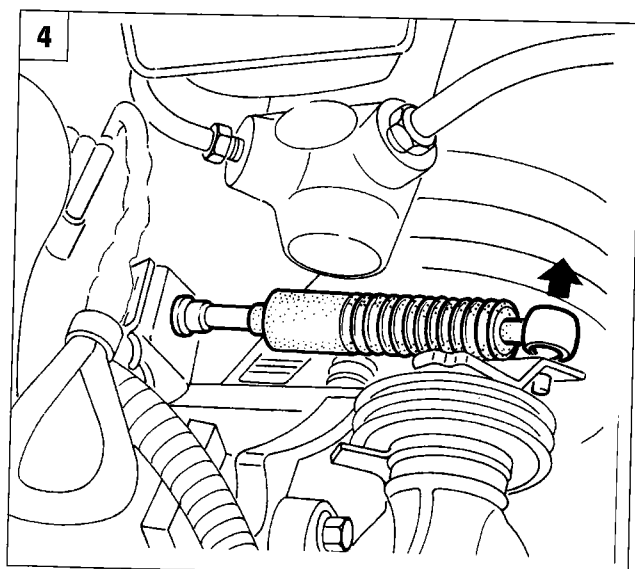
P4A02BB02



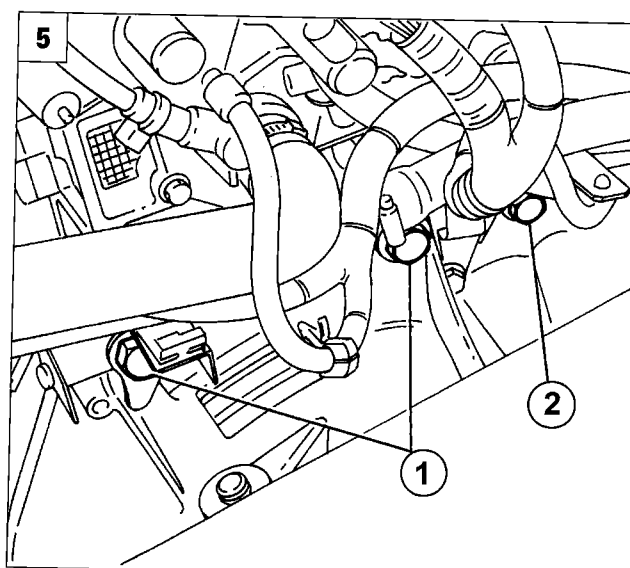
P4A02BB03



1. Disconnect the connector for the reversing lights switch and the earth cable.
2. Acting on the nut (1) and the lock nut (2), disconnect the clutch cable from the control lever.
3. Disconnect the end of the gear engagement cable and undo the bolts fixing the mounting bracket.
4. Disconnect the end of the gear selection cable, then move the selection and engagement cables to the side of the engine compartment.
5. Undo the upper bolts (1) fixing the gear-box to the engine and the bolt (2) fixing the starter motor to the gearbox.

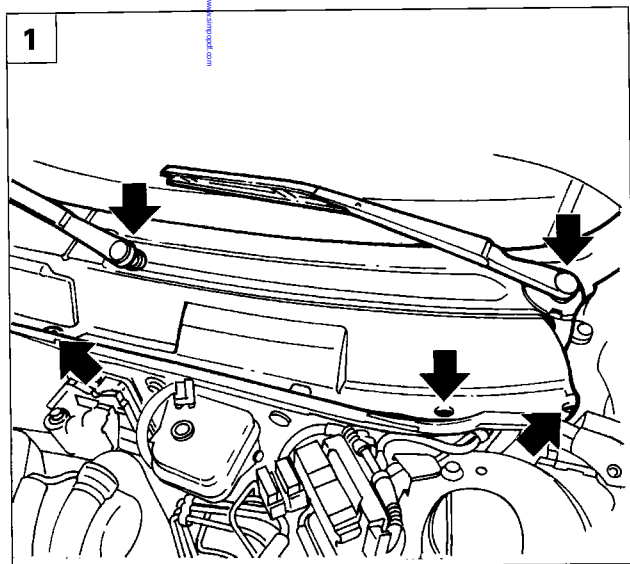


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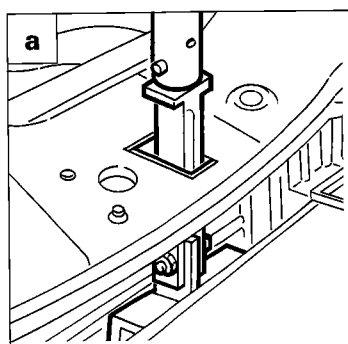
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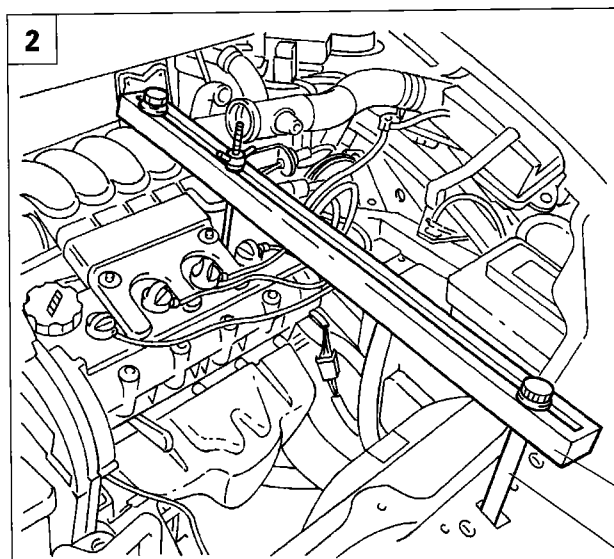


P4A03BB01

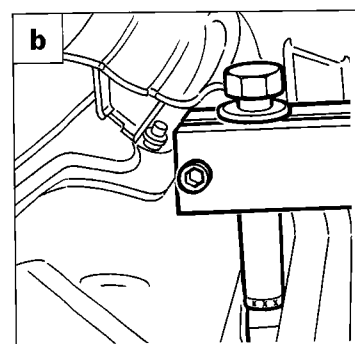
1. Remove the wiper arms, then remove the plastic shield for the pollen filter acting on the special bolts illustrated in the diagram.



P4A03BB02



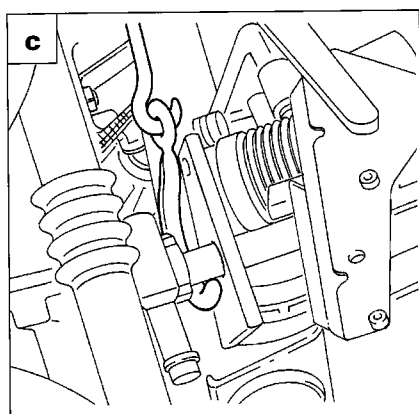
P4A03BB03



P4A03BB04

**1860851000**

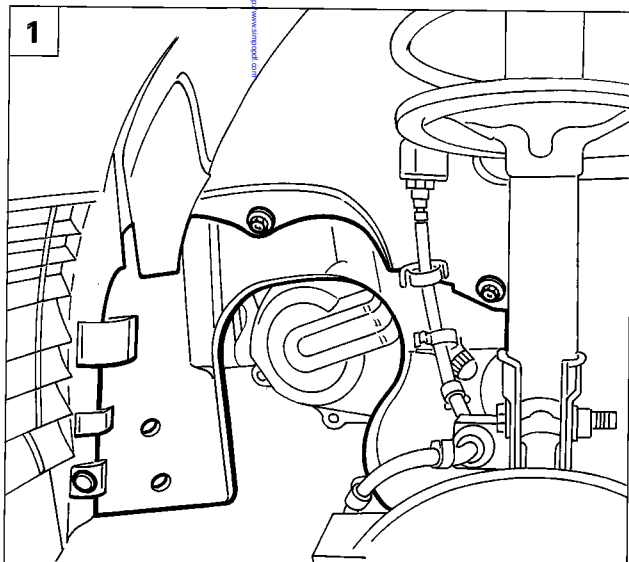
**1860851001**



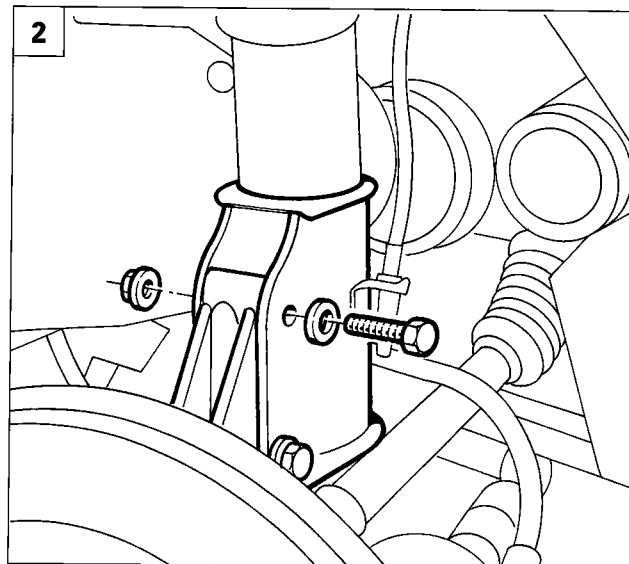
P4A03BB05

2. Position the cross member 1860851000 for supporting the engine at the points illustrated.
  - a. Front support: fit the tool in the housing in the bonnet lid lock so that it rests on the front cross member.
  - b. Rear support: position the tool by the centre reinforcement for the flame partition.
  - c. Fix the hook for the cross member to the heater water supply pipe so that the engine is resting in the centre.

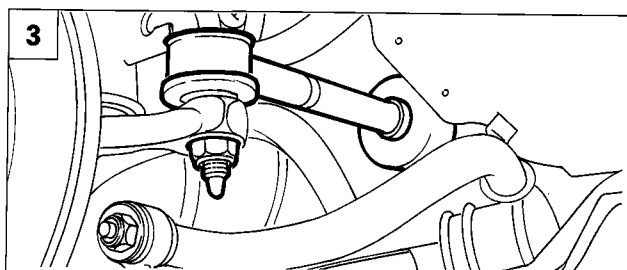
### 21.27



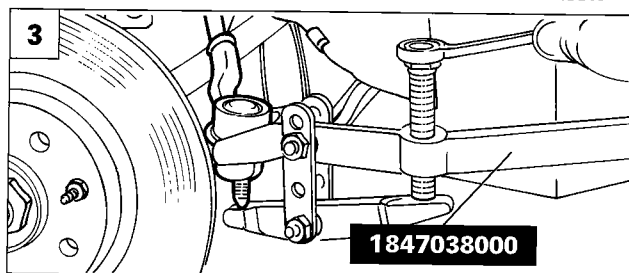
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P4A04BB02



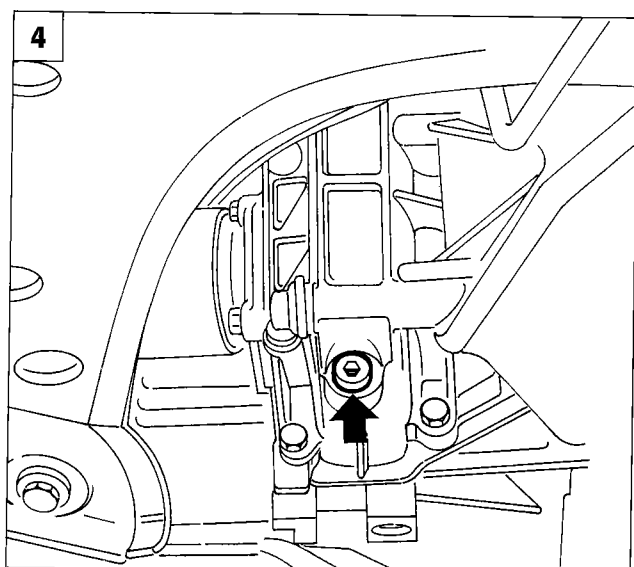
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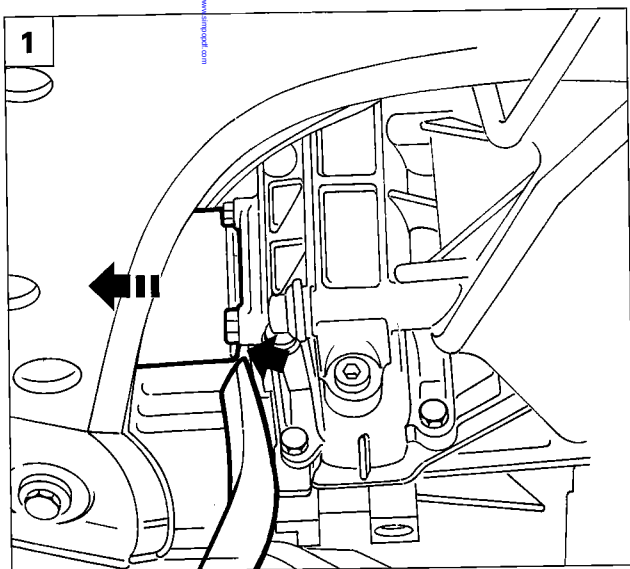
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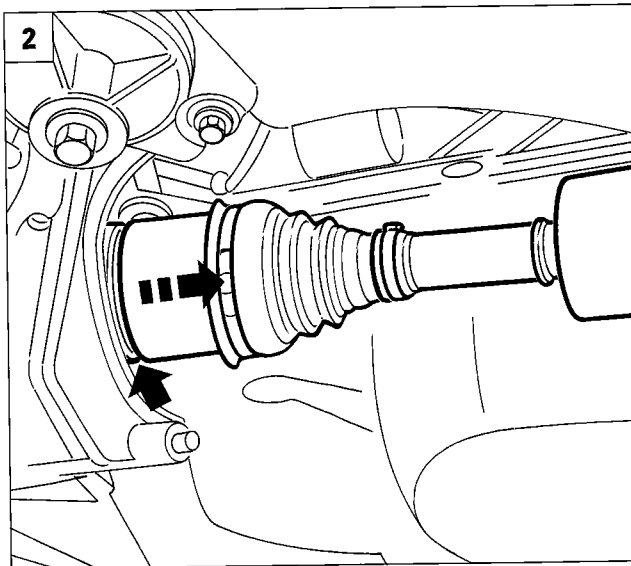
1. Remove the button fixing the dust shield to the bodyshell, then undo the bolts and release the shield from the housing. Repeat the operation for the dust shield on the other side.
2. Remove the bolts fixing the shock absorber to the steering knuckle and rotate the steering knuckle towards the inside, releasing the brake pipe from the shock absorber. Repeat the operation on the other side.
3. Undo the fixing nut the steering track rod end to the steering knuckle, then, using tool 1847038000, disconnect it from the steering knuckle. Repeat the operation for the steering track rod end on the other side.
4. Position a container for recovering the transmission fluid, then undo the plug shown and drain the oil from the gearbox.



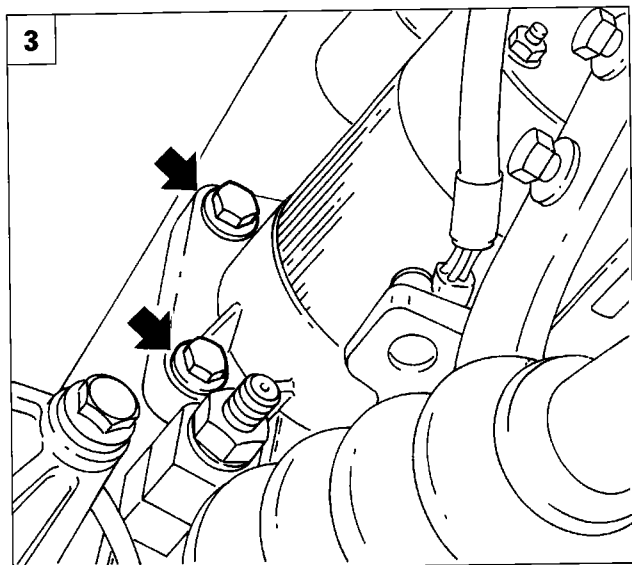
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P4A05BB01



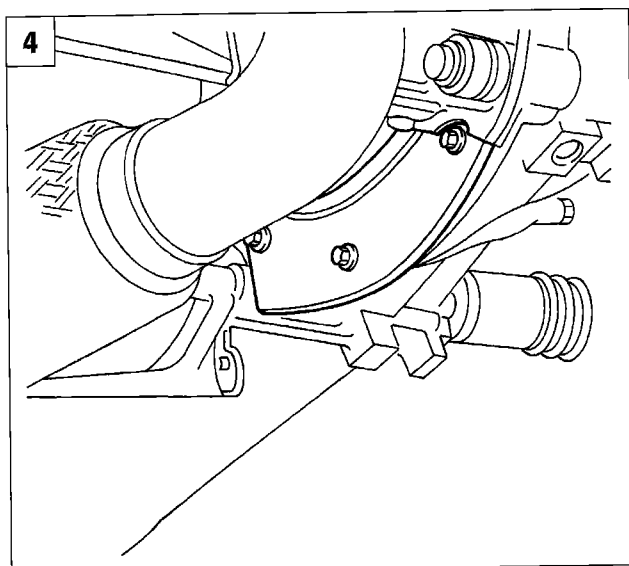
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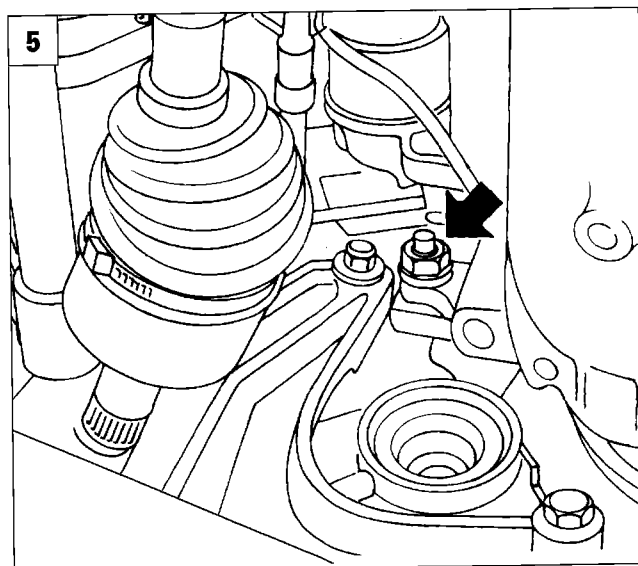
P4A05BB03



1. Disconnect the gearbox side drive shaft from the differential using leverage at the engagement point and move it away from the work area.
2. Disconnect the timing side drive shaft using leverage at the engagement point; then move the driveshaft away from the work area.
3. Undo the lower bolts fixing the starter motor to the gearbox, disconnect the electrical connections then remove the actual starter motor.
4. Remove the engine flywheel shield acting on the fixing bolts.
5. Undo the bolt fixing the gearbox to the engine.

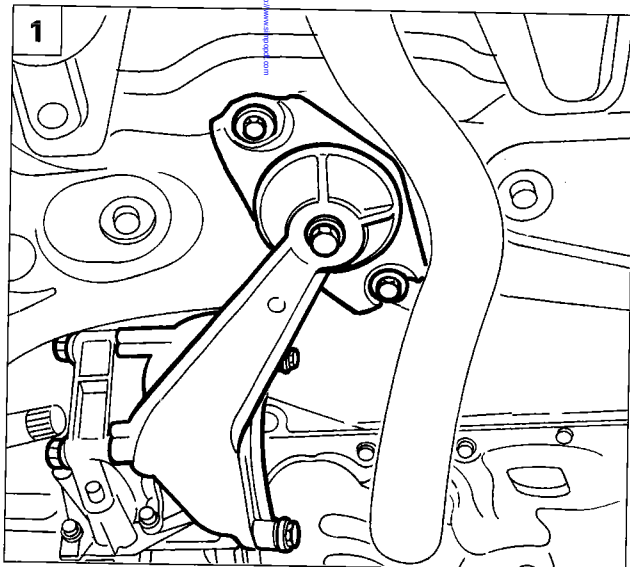


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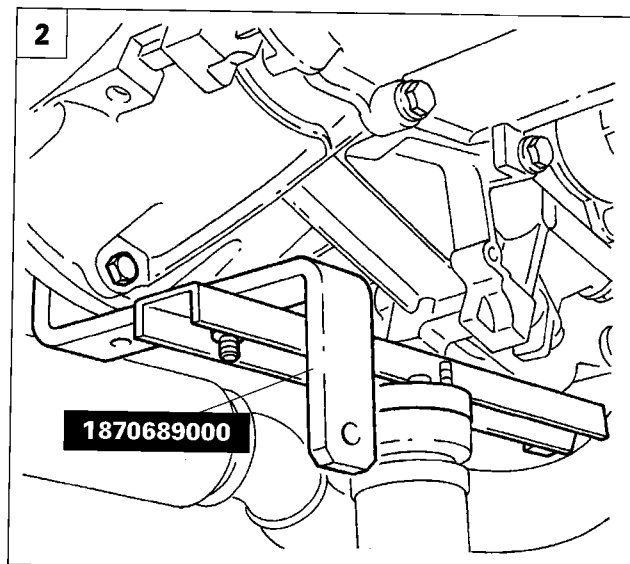


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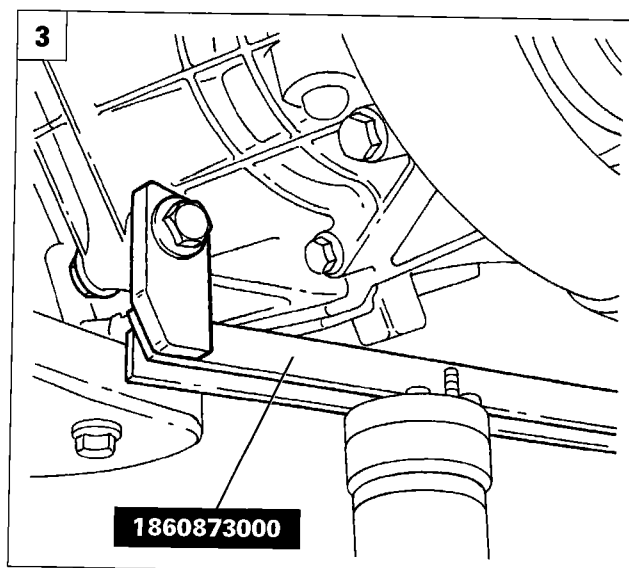
### 21.27



P4A06BB01



P4A06BB02



P4A06BB03



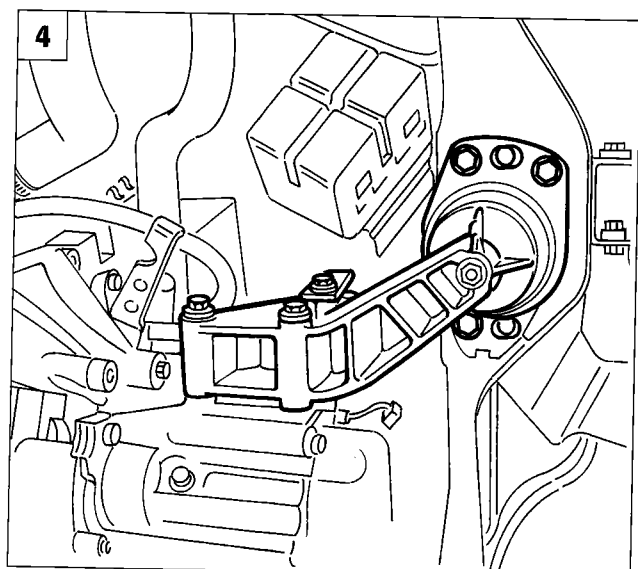
1. Remove the centre power unit support from the bodyshell and the gearbox.



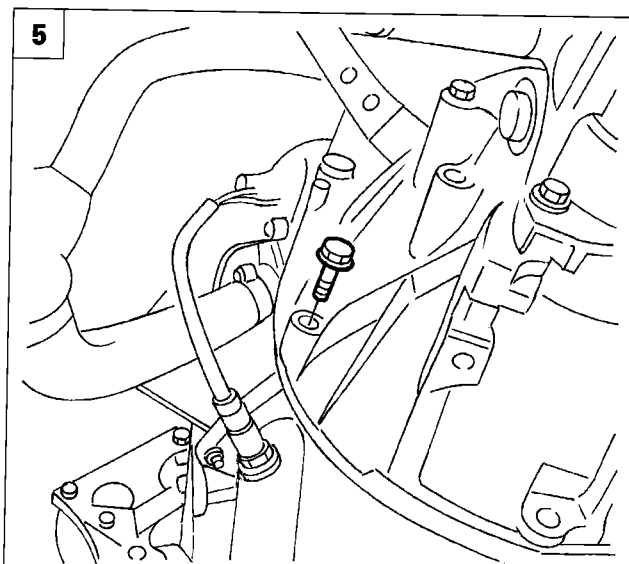
2.3 Position the tool illustrated for supporting the gearbox during the removal operation.

4. Remove the power unit mounting, gearbox side from the bodyshell and the gearbox.

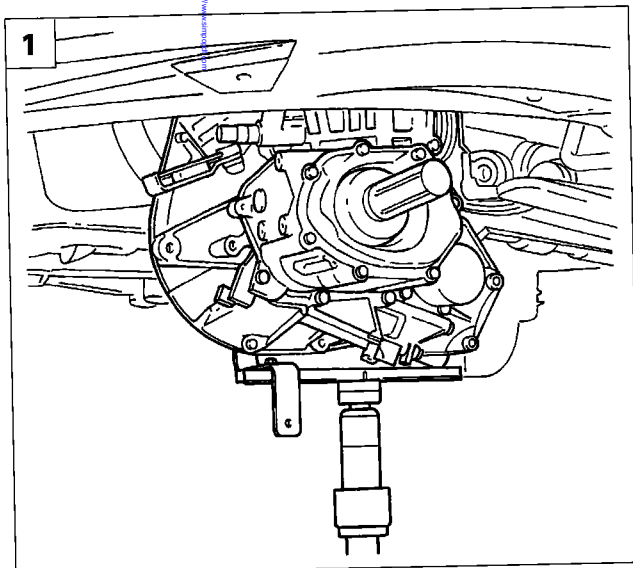
5. Undo the remaining bolt fixing the gearbox to the engine.



P4A06BB04



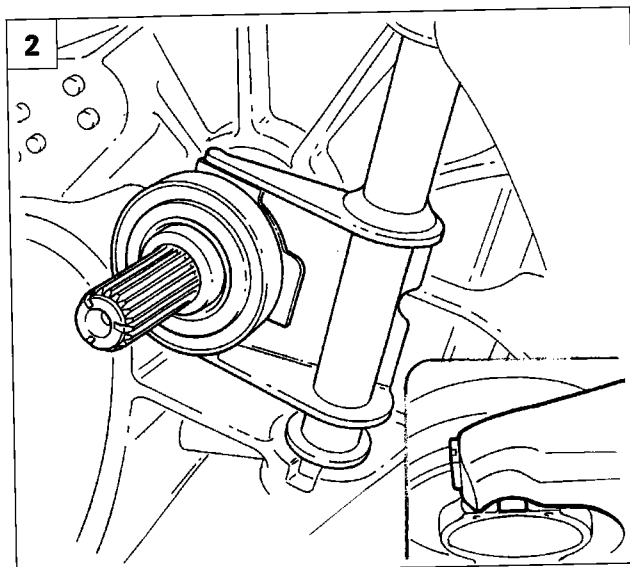
P4A06BB05



P4A07BB01



1. Using the hydraulic jack, suitably manoeuvre the gearbox so that it is released from the centering pins, then remove it from the engine compartment slowly lowering the hydraulic jack.



P4A07BB02

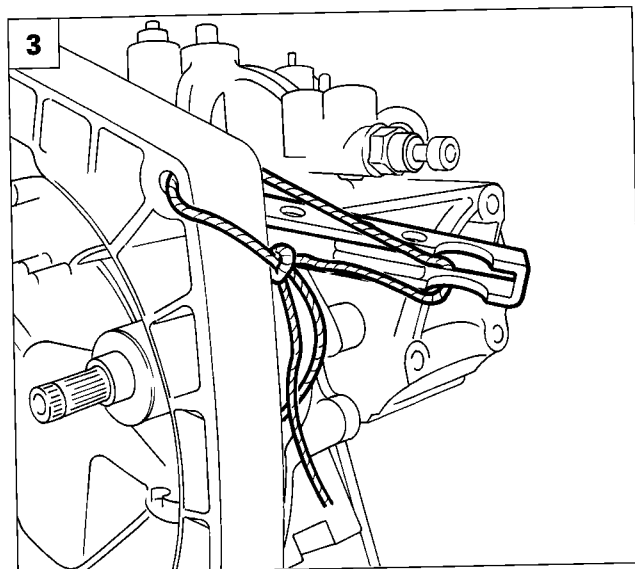


### Refitting



*Before refitting the gearbox - differential unit, it is necessary to check that the thrust bearing has remained in the bell housing and is not interfering with the clutch. Carry out the operations described below:*

2. Check that the thrust bearing is correctly matched with the gearbox main shaft control lever, checking that the teeth on the thrust bearing mesh with the control lever as shown in the diagram.



P4A07BB03



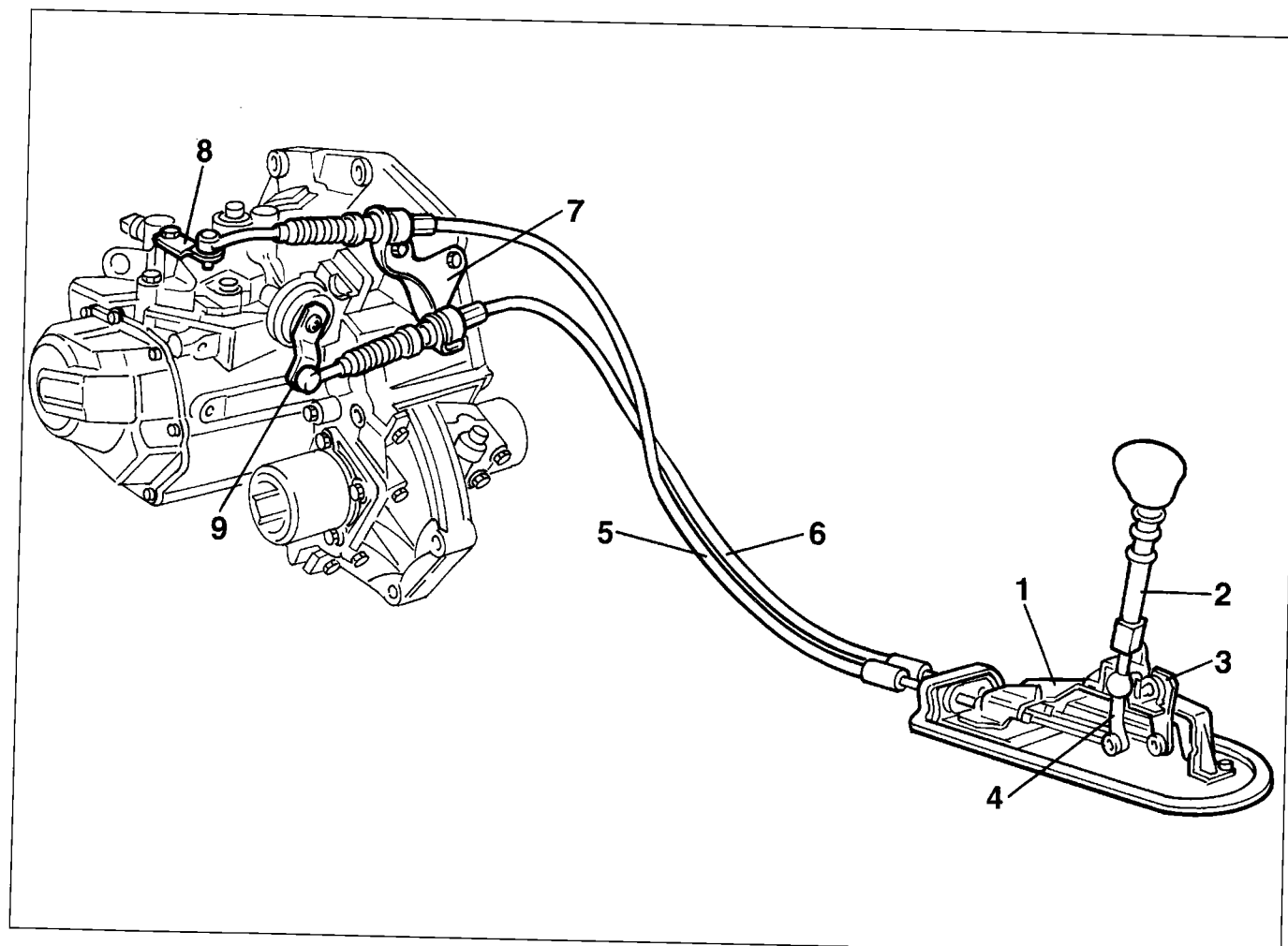
3. Fix the clutch release lever, in a fully retracted position, on the bell housing, then, using the hydraulic jack move the gearbox - differential unit near the clutch, centre it on the special references and fix it to the engine. For future operations, reverse the order of the operations carried out for the removal.

### DRIVE SHAFTS

For the removing-refitting and the dismantling of the drive shafts, refer to the "Drive shafts" paragraph for the 1370 12v version.

### 21.27

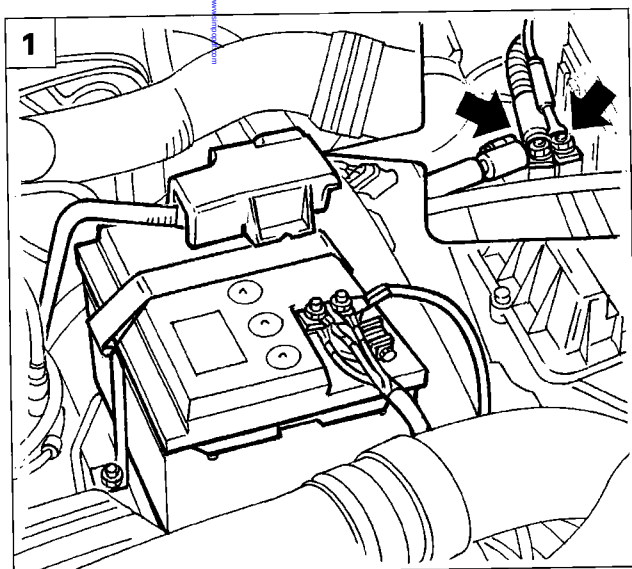
#### DIAGRAM SHOWING EXTERNAL GEAR-BOX CONTROLS



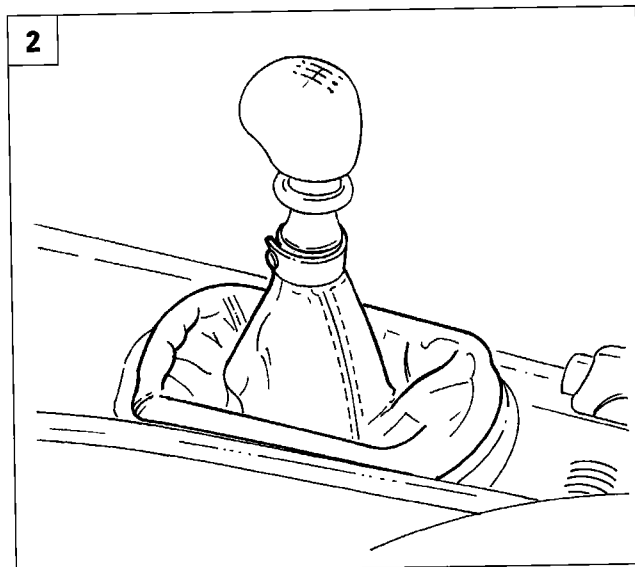
P4A08BB01

- |                                |                                  |
|--------------------------------|----------------------------------|
| 1. External controls support   | 6. Gear selector cable           |
| 2. Gear lever                  | 7. Cable mounting bracket        |
| 3. Selector linkage on lever   | 8. Selector linkage on gearbox   |
| 4. Engagement linkage on lever | 9. Engagement linkage on gearbox |
| 5. Gear engagement cable       |                                  |

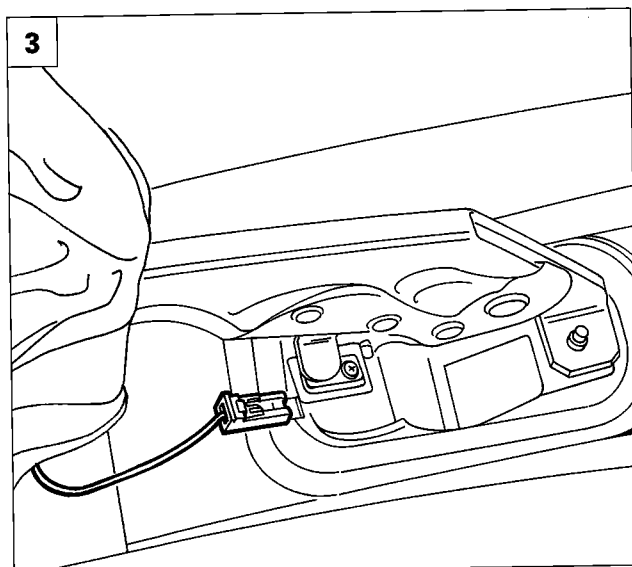




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P4A09BB02



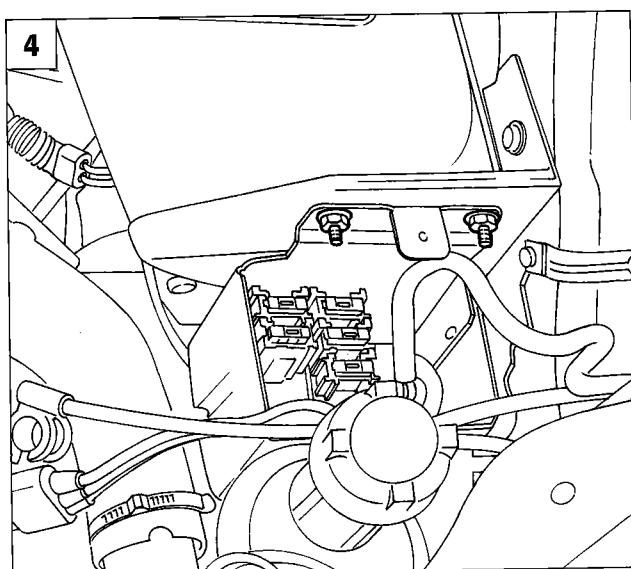
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## REMOVING-REFITTING

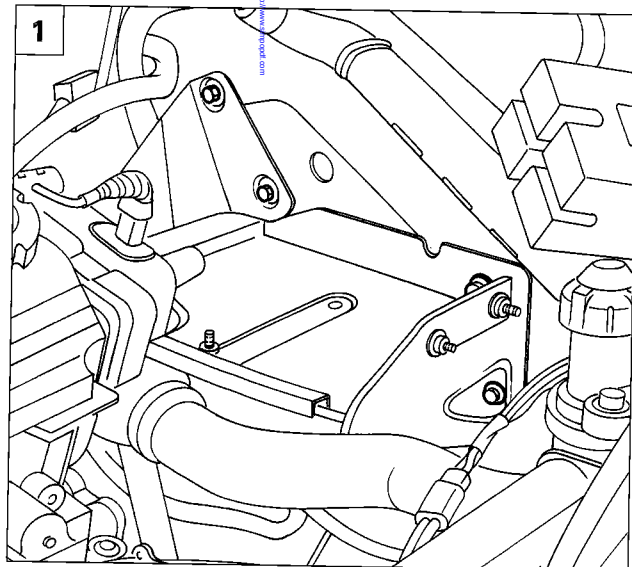
Position the vehicle on a lift, and proceed with the removal of the external controls as described below.

1. Disconnect the negative battery lead, remove the protective cover for the positive pole, disconnect the terminal and separate the latter from the starter motor supply leads; undo the nut securing the battery to the drip tray, then remove the latter from the engine compartment.
2. Remove the gear lever cover from the vehicle interior.
3. Remove the handbrake protective boot, then disconnect the electrical connection underneath.
4. Undo the bolt securing the relay casing cover and remove it, then undo the nuts fixing the casing to the battery drip tray and place the casing at the side.

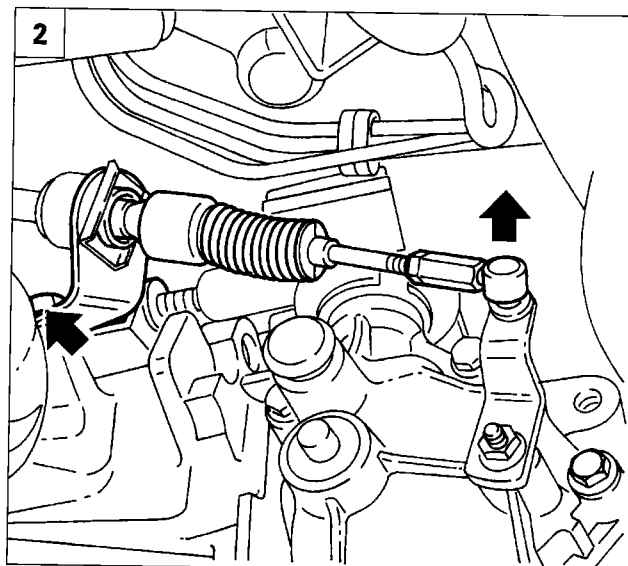


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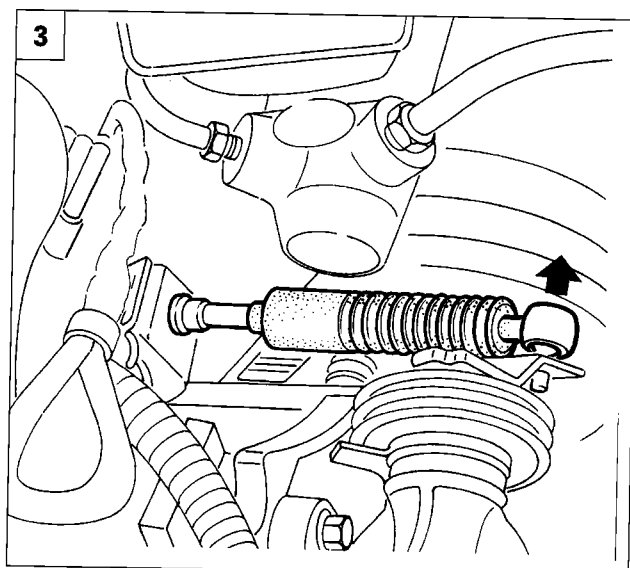




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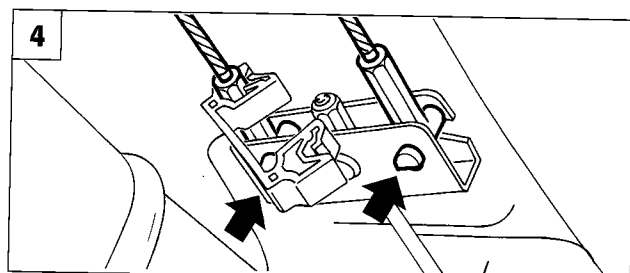
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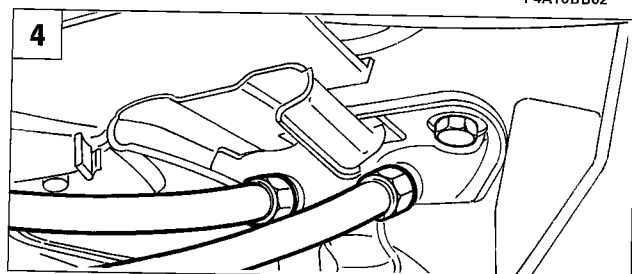
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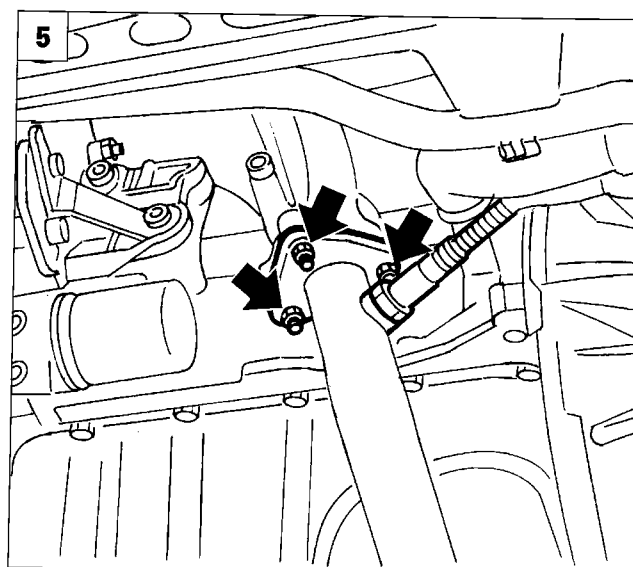
1. Remove the battery drip tray under the bolts fixing it to the bodyshell.
2. Disconnect the end of the gear engagement cable and undo the bolts fixing it to the mounting bracket.
3. Disconnect the end of the gear selector cable, then move the gear selector and engagement cable assembly to the side of the engine compartment.
4. Raise the vehicle and disconnect the handbrake cables from the support and release them from the bracket.
5. After having disconnected the electrical connection for the Lambda sensor, undo the bolts fixing the exhaust pipe to the manifold.



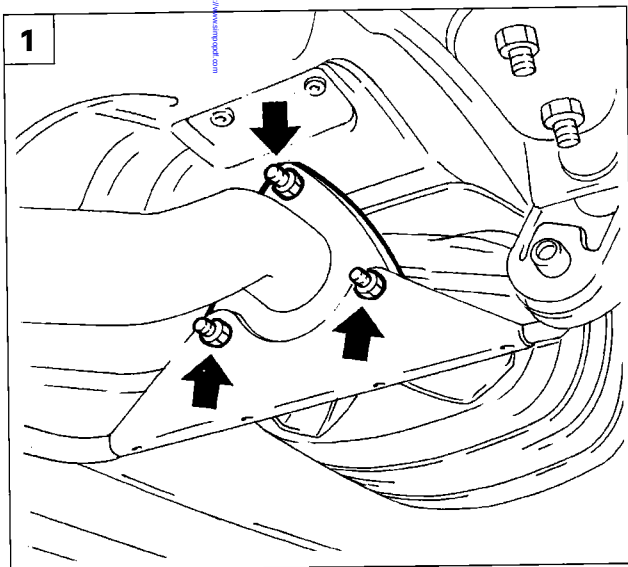
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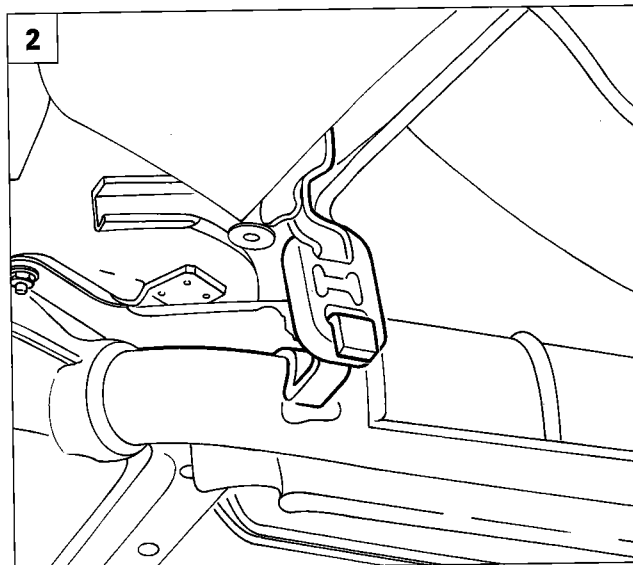
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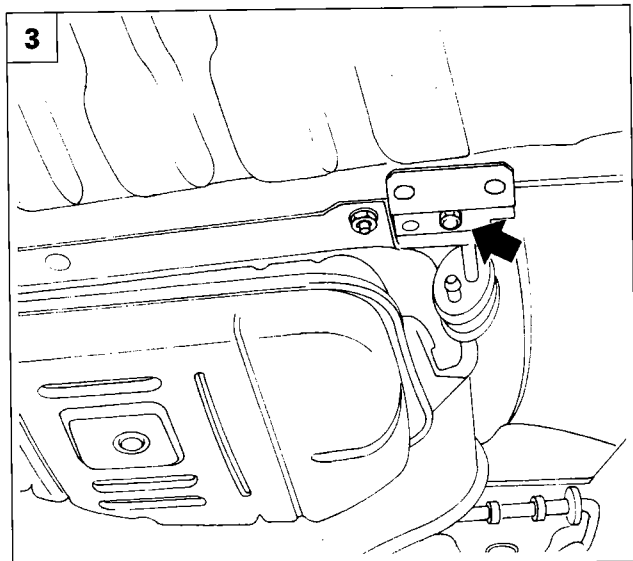
P4A10BB04



P4A11BB01



P4A11BB02



P4A11BB03



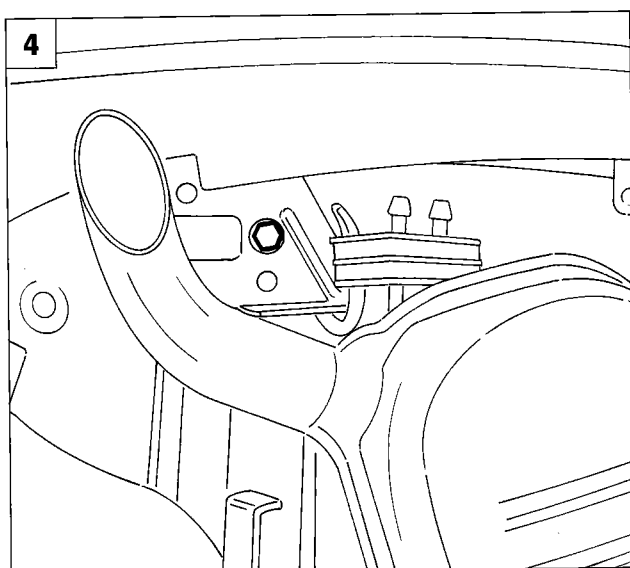
1. Undo the nuts fixing the first section of the exhaust pipe to the catalytic converter, then remove the pipe.

2. Release the exhaust pipe from the rubber mounting shown in the diagram.

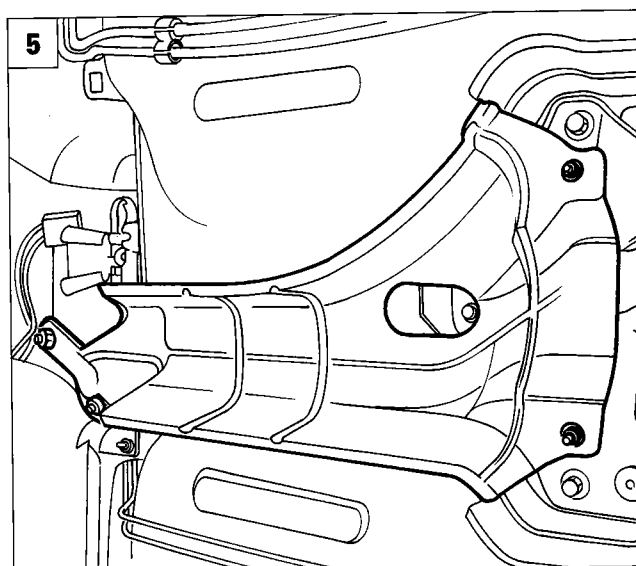
3. Undo the bolt fixing the exhaust pipe front mounting bracket.

4. Undo the bolt fixing the exhaust pipe rear mounting bracket, then extract it from the vehicle.

5. Remove the heat shield acting on the fixings illustrated.

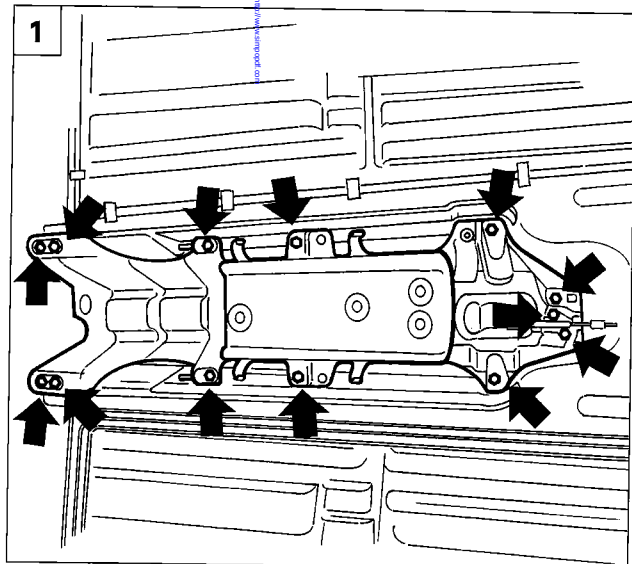


P4A11BB04

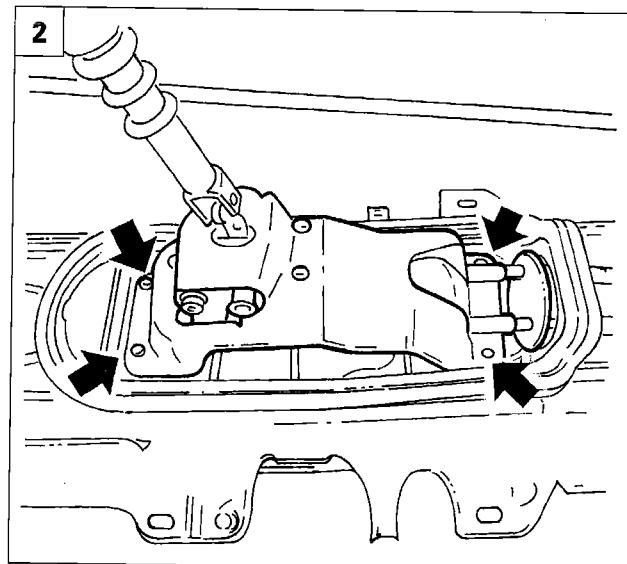


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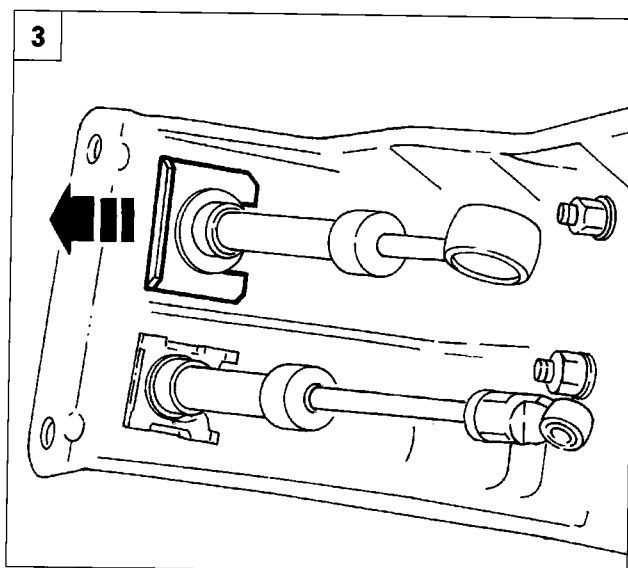
### 21.27



P4A12BB01



P4A12BB02



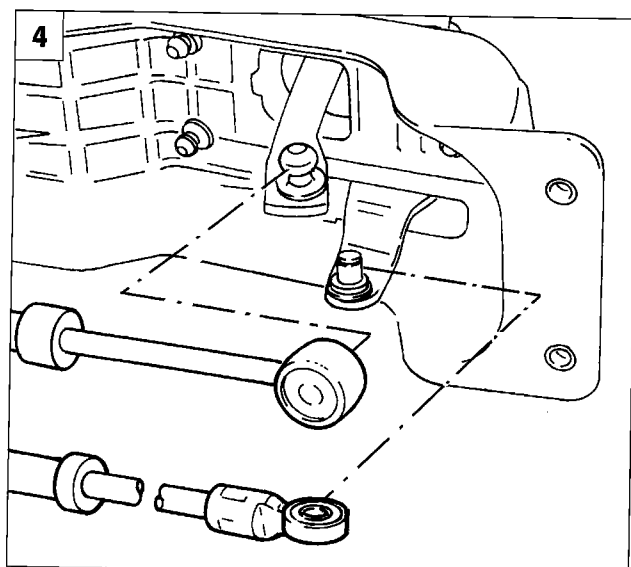
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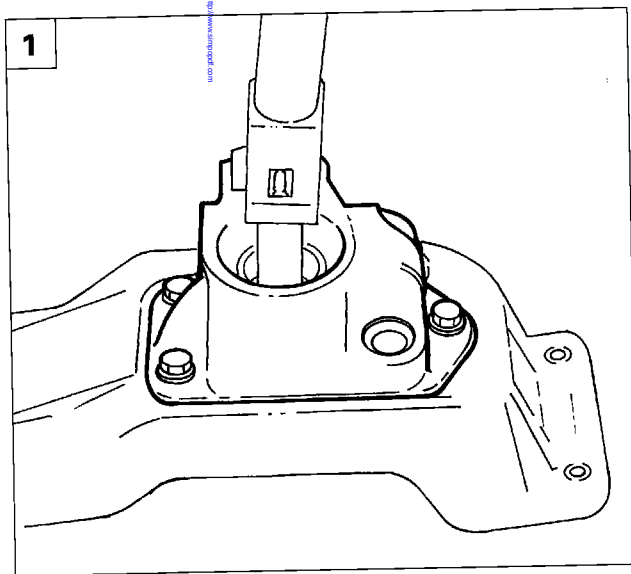
1. Undo the front and rear bolts fixing the support for the external gearbox controls and handbrake.
- Carefully lower the external controls support assembly from its housing, then remove the cables from the engine compartment and extract the assembly from the vehicle.

### DISMANTLING AT THE BENCH

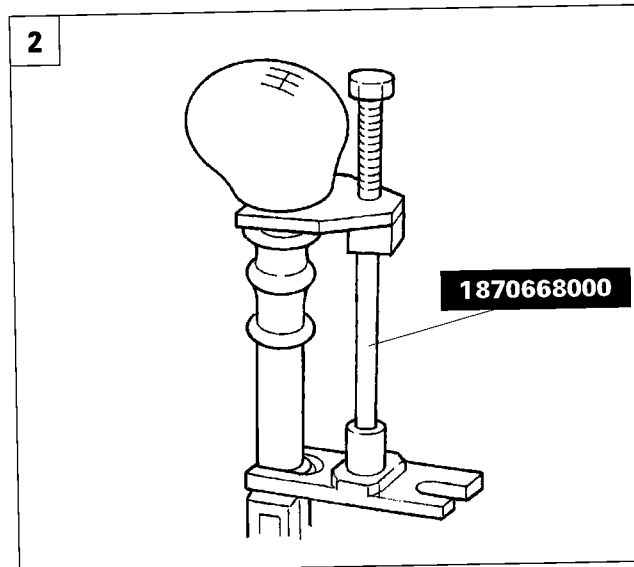
2. Remove the gear lever assembly, undoing the bolts, then remove the rubber cable cover.
3. Remove the two clips securing the cables to the lever support.
4. Disconnect the cables from the lever support: the engagement one is a press fit and the selector one is fixed by a circlip.



P4A12BB04



P4A13BB01



P4A13BB02

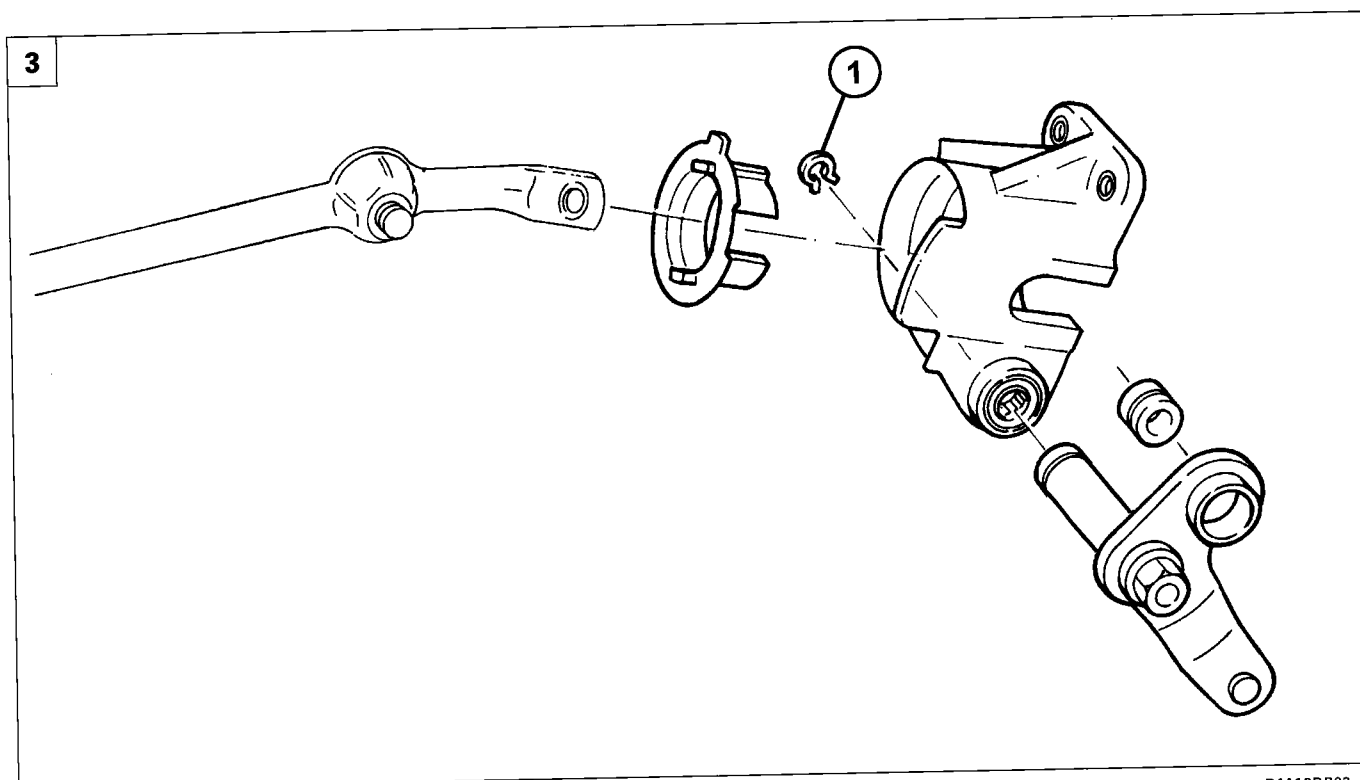


1. Remove the gear lever mechanism, undoing the bolts fixing it to the support.



2. Using tool 1870668000, remove the knob from the gear lever, the internal spring and the reverse gear inhibitor outer sleeve.

3. Remove the circlip (1) and dismantle the gear lever mechanism.



P4A13BB03



**ELECTRONIC  
BRAKE FORCE  
DISTRIBUTION (EBD)**

**1**

- Wiring diagram showing braking system with ABS **3**
- Description of the EBD function (Electronic Brake - force Distribution) **3**
- EBD operation **4**
- ABS system failure warning light **5**
- EBD function failure signal **5**
- Wiring diagram of ABS system integrated with EBD function **6**
- Fault diagnosis **6**

**VARIANTS FOR 98 RANGE**

- Wheel rpm (active) sensors **7**

**ELECTRONICALLY OPERATED BRAKE FORCE DISTRIBUTION DEVICE (EBD)**

The Teves MK20 ABS system, described in the relevant chapter of this manual, is coupled with the EBD function (Electronic Brake-force Distribution), which electro-hydraulically controls the distribution of the pressure sent to the brakes between the front and rear axles.

This function is controlled by the ABS electronic control unit which uses the same sensors and actuators as the ABS circuit to calculate and implement the distribution of the braking pressure.

The introduction of this function makes the use of the conventional mechanical load proportioning valve superfluous and it is removed from the rear brake hydraulic circuit.

In addition, the optimum exploitation of the rear brakes is ensured as the device is capable of constantly sending the ideal braking pressure to prevent the rear wheels from locking.

The diagrams overleaf illustrate the location of the device components, the majority of which are the same as on the ABS system.

**Key for diagrams showing braking system with ABS integrated with EBD function**

Hydraulic circuit for right front and left rear brake

Hydraulic circuit for left front and right rear brake

1. Hydraulic control unit with electronic control unit incorporated
2. Brake pump
3. Brake servo
4. Brake fluid reservoir
5. Rpm sensors for front wheels
6. Front disc brakes
7. Warning light signalling ABS system failure
8. Brake lights switch
9. Handbrake lever
10. Handbrake warning light or low brake fluid level
11. Rpm sensors for rear wheels
12. Rear drum brakes (excluding 1998 20v)
13. Rear disc brakes (only for 1998 20v)



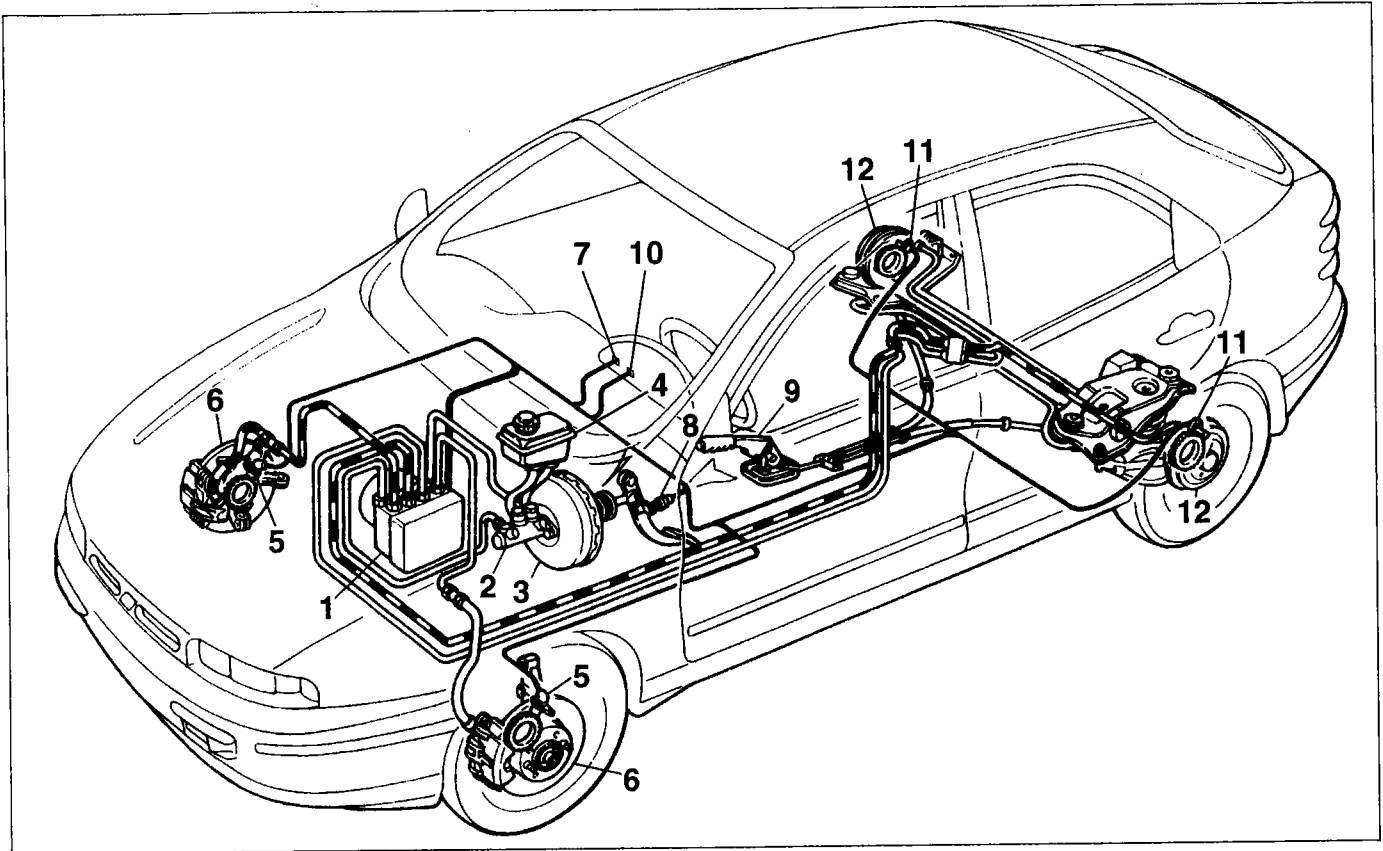
# Braking system

EBD device

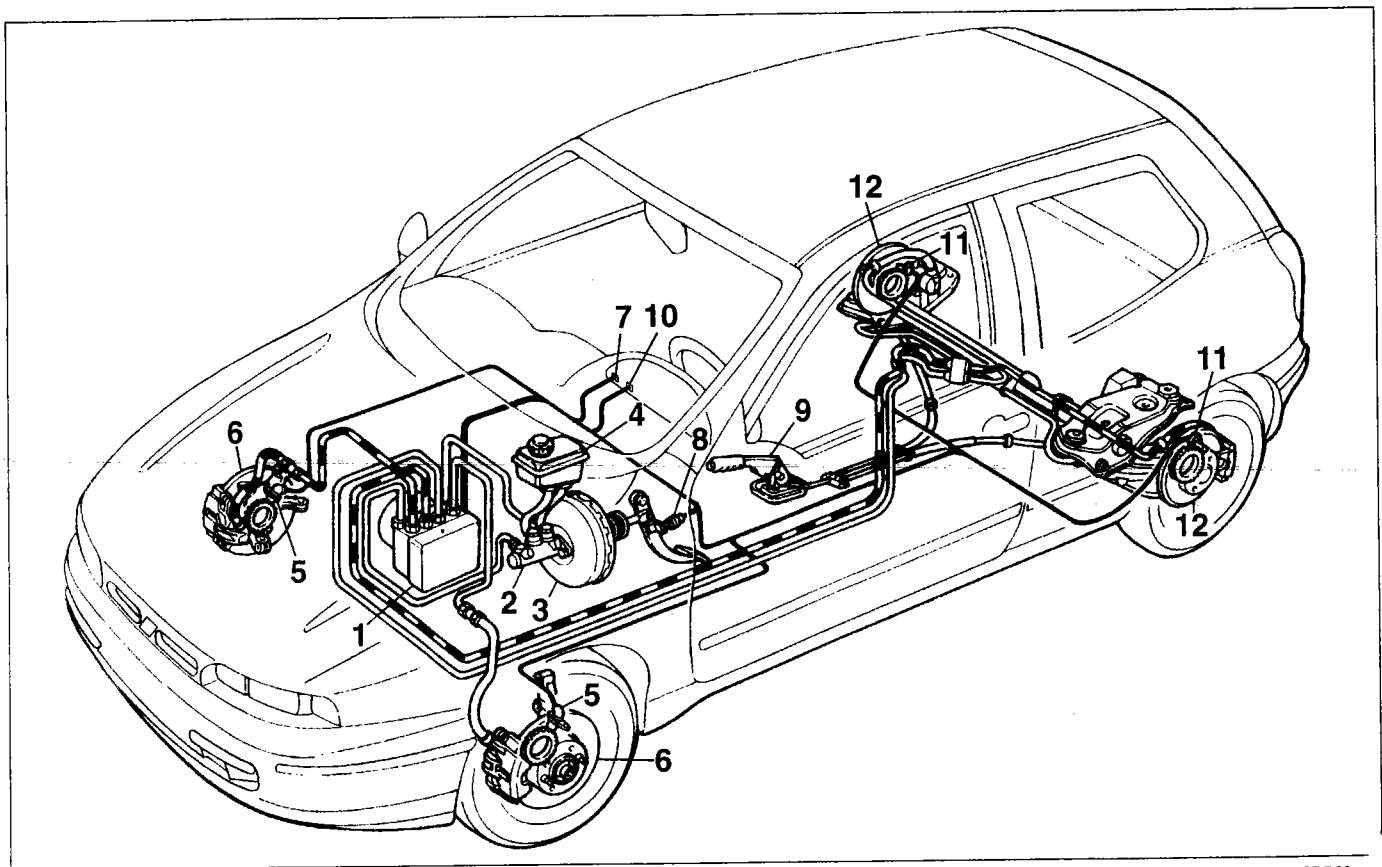
**Bravo-Brava**

**33.**

Diagrams showing braking system with ABS system integrated with EBD function



P4A02BD01



P4A02BD02

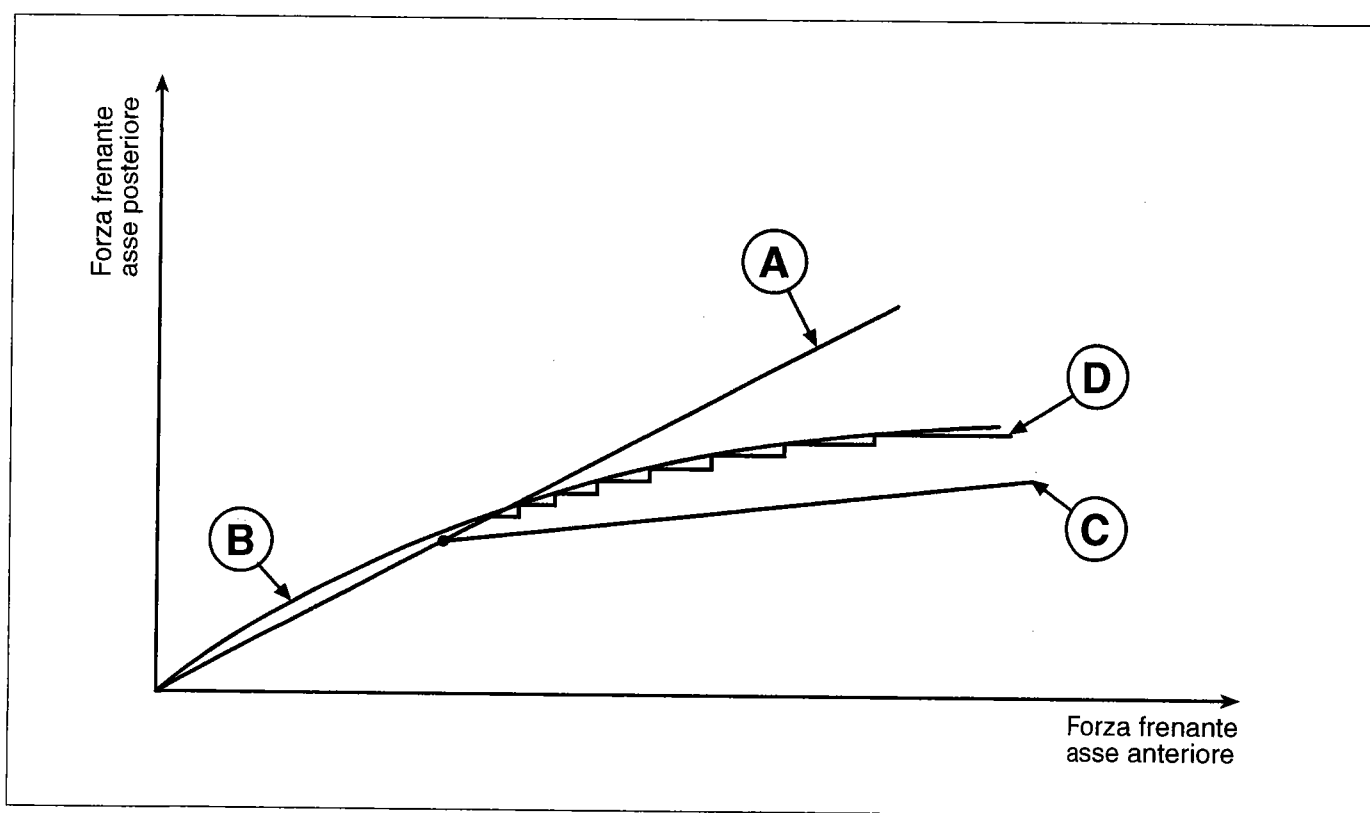
### Description of the EBD function (Electronic Brake-force Distribution)

The introduction of the EBD function to the ABS system allows the distribution of the brake force between the front and rear axles using a specific electronic control unit function.

With this in mind, the electronic control unit constantly compares the speed of the front and rear wheels by means of speed sensors and controls the hydraulic unit in order to prevent the rear wheels from locking, always ensuring maximum adhesion to the ground in all load conditions.

The EBD function makes the use of the hydraulic load proportioning valve acting on the rear axle load superfluous so it has therefore been removed from the braking circuit.

The graph below illustrates the operation of the EBD device (curve D) in relation to the pressure in the braking system (curve A), the ideal braking pressure for the rear axle (curve B) and the reduction in the braking pressure for the rear axle normally implemented by the conventional load proportioning valve (curve C).



P4A03BD01

A. Distribution implemented by the braking system

C. Distribution implemented by the mechanical load proportioning valve

B. Ideal distribution

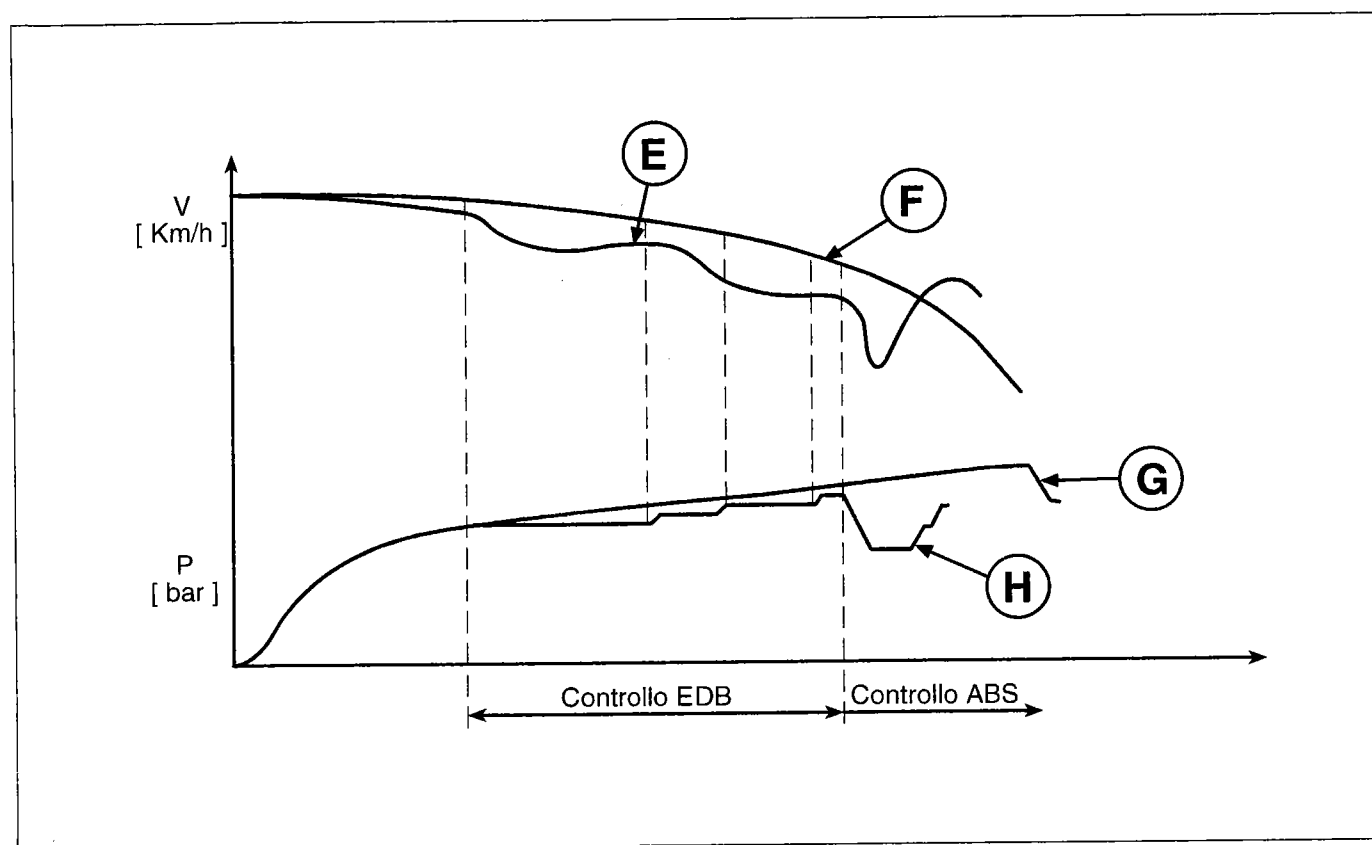
D. EBD control

As it can be noted, the EBD function for the ABS system is capable of adapting to the ideal pressure curve, always taking advantage of the adhesion available in all braking conditions.

### 33.

The integration of the EBD function into the normal implementation logic of the ABS system allows the simultaneous operation of the two strategies; as a result, the system normally intervenes to keep the "creeping" of the rear wheels within values very close to the ideal ones with the possibility, however, of intervening with the ABS strategy when one rear wheel tends to lock (for example on a surface with poor adhesion).

The graph below illustrates the braking pressure implementation strategy, operated by the electronic control unit, according to the input data, represented by the signal for the rotation speed of the wheels of the two axes.



P4A04BD01

E. Rear wheel speed

G. Front wheel pressure

F. Front wheel speed

H. Rear wheel pressure

#### Operation of the EBD device

The braking pressure for the rear axle is implemented by the control unit in a similar way to the description of the operation of the ABS system during the pressure increase, maintenance and reduction stages.

### ABS failure warning light

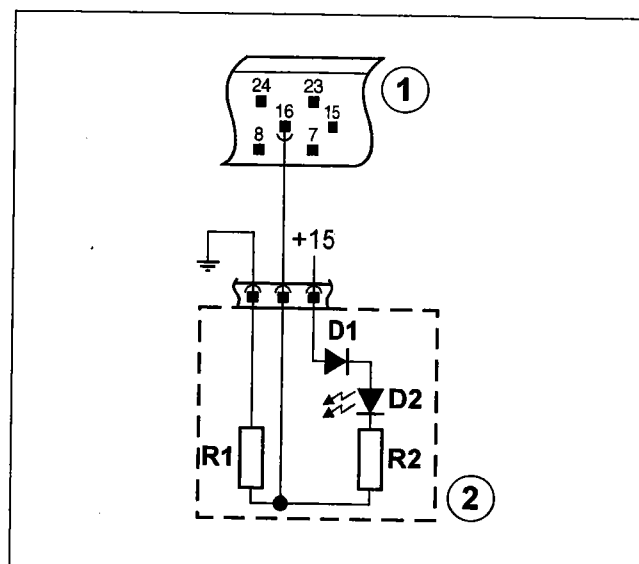
On vehicles equipped with ABS and an EBD device, there is a special ABS failure warning light.

The new type of warning light, known as "INTELLIGENT", comprises an LED (D2) controlled by an electronic circuit which, as illustrated in the diagram at the side, allows the warning light to come on both if there is an actual failure in the ABS system and if the connection between pin 16 of the control unit (1) and the instrument panel (2) is interrupted or short circuited to earth.

D1: Protective diode

D2: LED

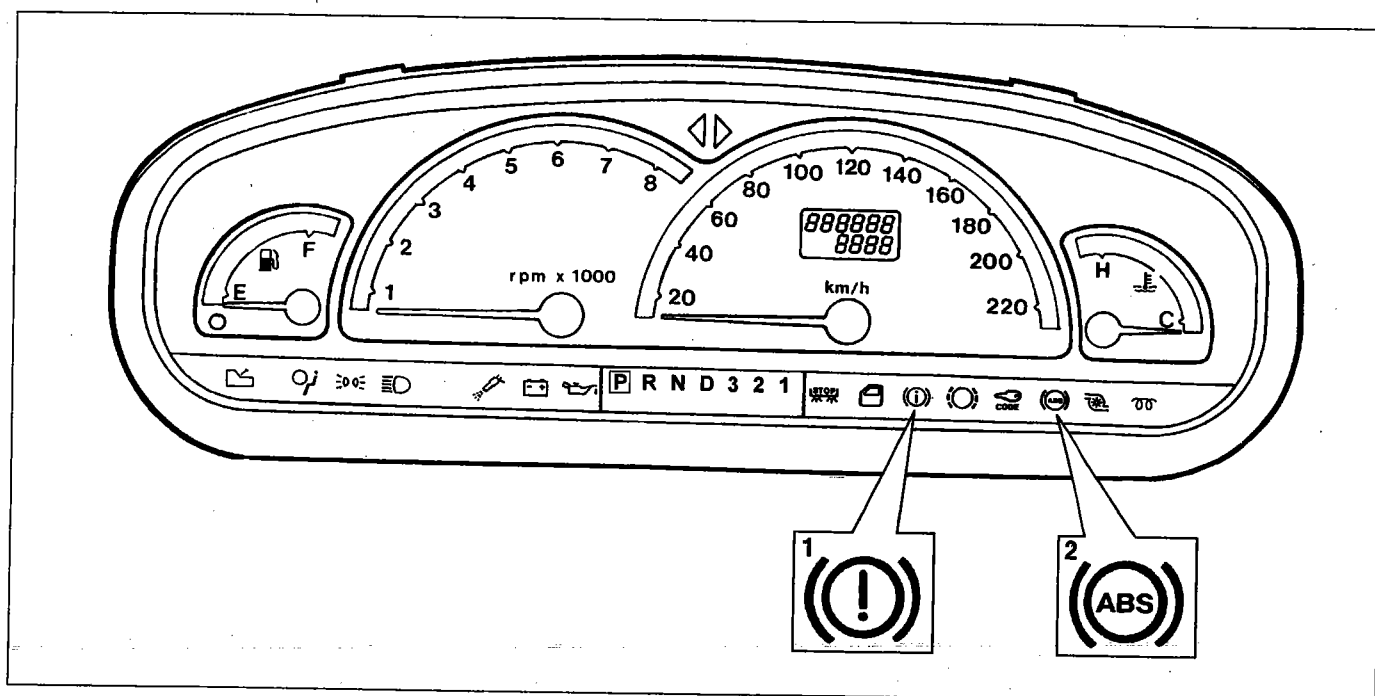
R1 and R2: Load resistances



P4A05BD01

### EBD function failure signal

A failure in the EBD function is signalled simultaneously by the braking system failure warning light (1) in the dashboard and the ABS system failure warning light (2) both coming on.



P4A05BD02

The warning light (1) in the dashboard coming on without the ABS warning light (2) coming on means that there is not an EBD malfunction, but that there is a different fault (low brake fluid level, handbrake applied).

Conversely, the ABS warning light only coming on without the warning light (1) coming on, indicates a failure in the ABS system as described in the relevant chapter of this manual without the operation of the EBD device being adversely affected.

If there is a failure in the EBD function, the distribution of the brake force between the front and rear axles starts to fail with the consequent risk of the rear wheels locking during braking.

The wiring diagram for the ABS system with EBD only varies from the wiring diagram for the ABS system on its own through the addition of the connection of the ABS control unit with the braking system warning light (low brake fluid level/handbrake applied).



1. Electronic control unit
2. Left rear rpm sensor (RL)
3. Left front rpm sensor (FL)
4. Right front rpm sensor (FR)
5. Right rear rpm sensor (RR)
6. 10A protective fuse
7. 60A protective fuse
8. Braking system failure warning light
9. Protective fuse (40A) for consumers controlled by ignition
10. Battery
11. Ignition switch
12. Diagnostic socket
13. Brake lights switch
14. ABS warning light
15. Junction unit

It is possible to search for and identify any faults in the ABS system components by connecting one of the following instruments to the diagnostic socket:

- The ABS system with EBD does not have a blink-code function, as a result of which the fault diagnosis can only be carried out using one of the instruments mentioned above.

**WHEEL RPM (ACTIVE) SENSORS**

The ABS Bosch 5.3 system adopted on the 98 range, uses new design sensors known as "active" for detecting the speed of the wheels.

The operation of "active sensors" is based on the variation of the internal electrical resistance according to the intensity and the direction of the lines of force of an external magnetic field, producing a square wave signal whose frequency varies according to the rotation speed of the wheel, but whose range is constant.

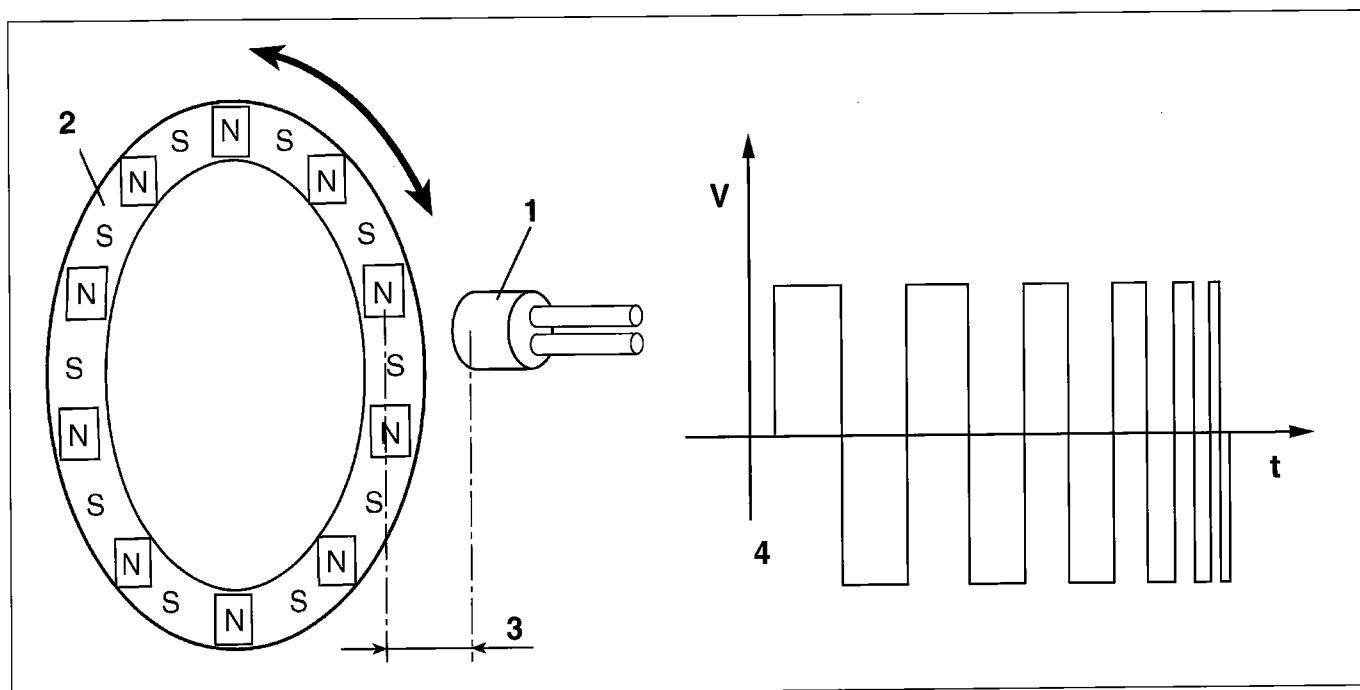
The external magnetic field is produced by a so-called "multi-polar ring", consisting of an elastomer equipped with a certain quantity of magnetic particles which, by means of a special magnetization technique, are positioned in such a way as to form different magnets with alternating North - South polarities around the circumference.

The multi-polar ring can be fitted on the wheel bearing seal or on the (rear wheel) hub.

The sensor is supplied by the ABS electronic control unit and produces a square wave signal whose range is almost constant and whose frequency is proportional to the rotation speed of the wheel.

The use of this new type of sensor offers the following advantages compared with traditional magnetic induction type sensors:

- less sensitivity to the distance between the sensor and the magnetic ring;
- improved immunity to electro-magnetic fields;
- the capacity of the sensor to measure the speed of the wheel down to zero (rather than 2.5 kph for passive sensors);
- a reduction in the weight and size on the vehicle.



P4A07BD01

1. Active sensor body
2. Multi-polar ring
3. Gap
4. Example of an output signal from the wheel rpm sensor

### 33.

The recommended distance (gap), to obtain the correct signals, between the end of the sensor and the multi-polar ring should be between:

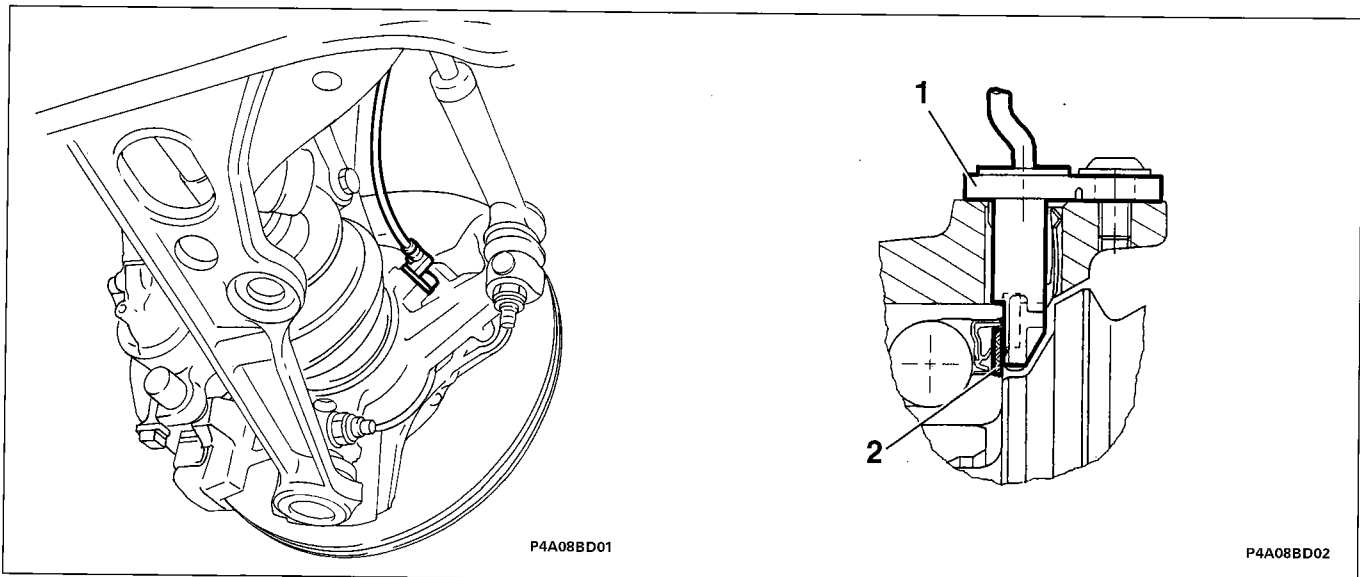
**0.16 - 1.71 mm for the front wheels**

**0.37 - 1.13 mm for the rear wheels**

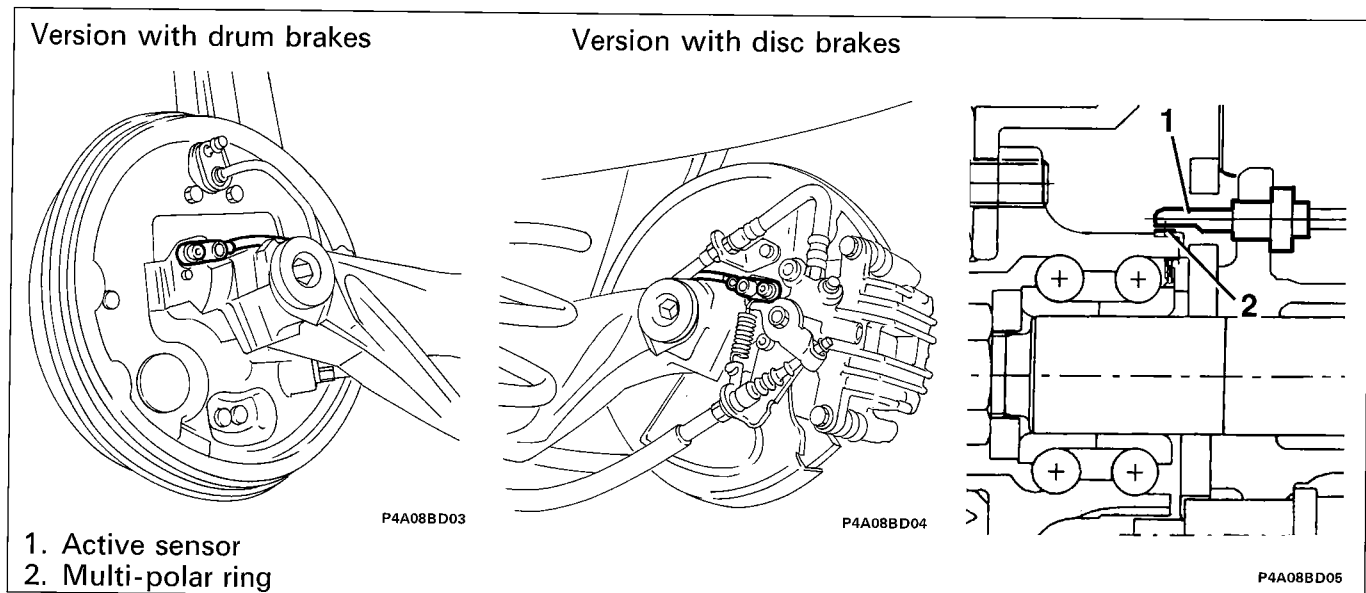
This distance cannot be adjusted therefore if the gap measured is outside of the tolerance, check the condition of the sensor and the multi-polar ring.

**NOTE** Each time an rpm sensor is fitted, it should be lubricated with water-repellant grease, to avoid the effects of heat variations, over a period of time, causing deterioration and making it difficult to extract.

#### Positioning of front wheel sensor



#### Positioning of rear wheel sensor





**CLIMATE CONTROL**

|                                                               |    |
|---------------------------------------------------------------|----|
| - Foreword                                                    | 1  |
| - Thermostatically adjusted climate control                   | 1  |
| - Operating logic                                             | 2  |
| - Controls                                                    | 3  |
| - Connection with the engine control unit                     | 4  |
| - System components                                           | 6  |
| - Autodiagnosis                                               | 11 |
| - Duct/distributor assembly                                   | 13 |
| - Location of climate control system components               | 16 |
| - SCROLL compressor SCS08                                     | 17 |
| - Operation of the electronic control unit for the compressor | 19 |
| - Maintenance and service operations                          | 20 |
| - Draining the system                                         | 24 |
| - Compressor                                                  | 25 |

**ADDITIONAL HEATER**

|                                     |    |
|-------------------------------------|----|
| - Introduction                      | 27 |
| - Location of components on vehicle | 29 |

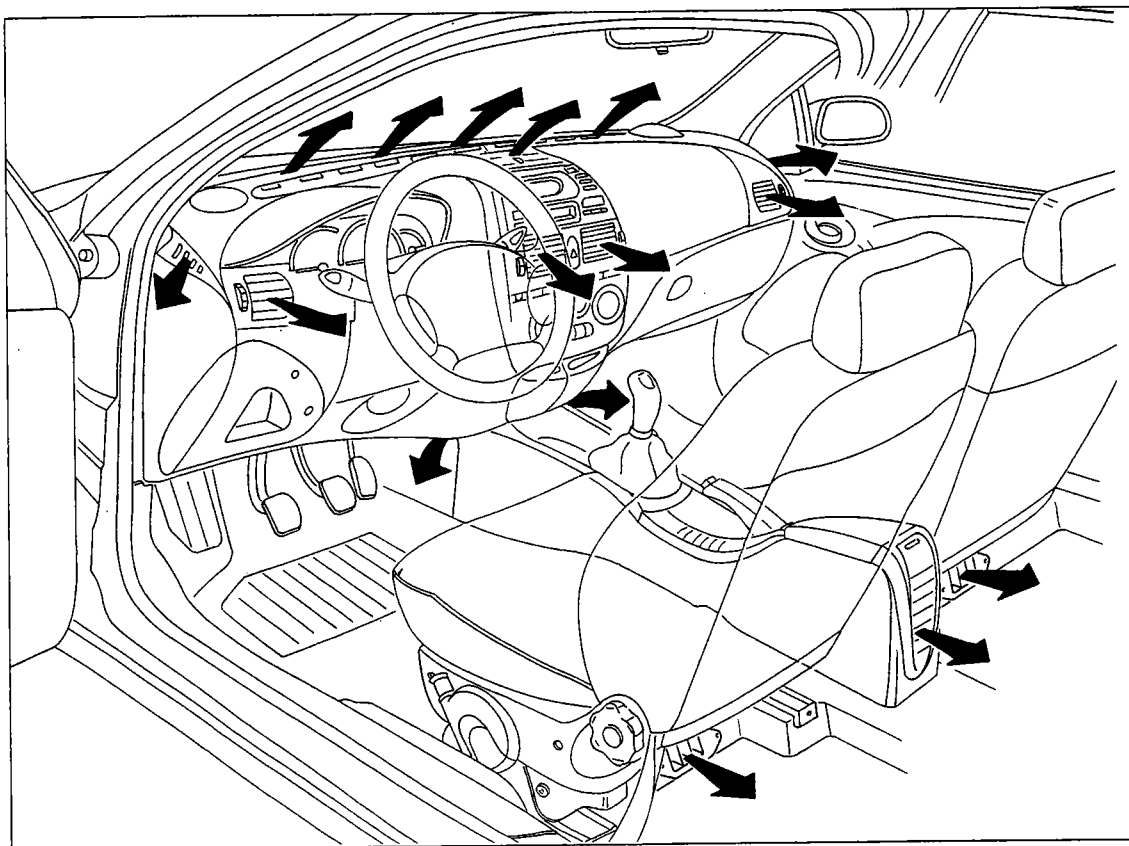


*For anything not dealt with, refer to the previous edition (print no. 506.670/01)*

### INTRODUCTION

The climate control system in the vehicle passenger compartment may consist of one of the following systems:

- THERMOSTATICALLY ADJUSTED CLIMATE CONTROL
- MANUALLY OPERATED HEATER



P4A01CH01

### THERMOSTATICALLY ADJUSTED CLIMATE CONTROL

The system with thermostatic adjustment has SEMI-AUTOMATIC CONTROL of the vehicle climate control system;

In effect, it automatically manages the following, according to the desired temperature requested for the passenger compartment:

- air temperature at the vents
- fan speed (continuous variation)

Manual operation, on the other hand, is required for:

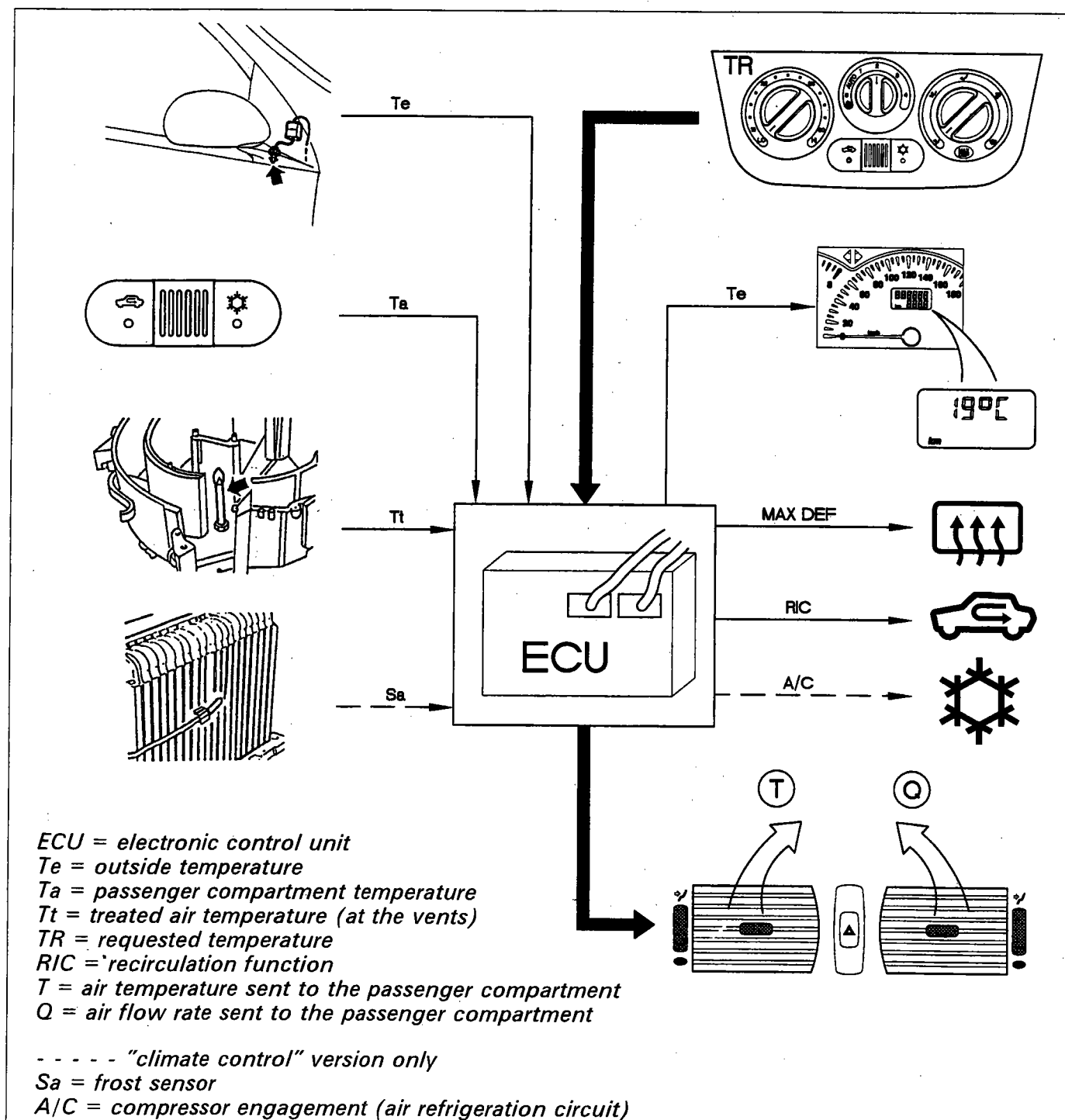
- fixed fan speed (4 speeds)
- engaging the compressor (air refrigeration circuit)
- engaging the air recirculation
- "MAX DEF" function

Lastly, the adjustment of the distribution of the air flows to the various air vents is totally manual (by means of bowden cables).

### 50.

#### OPERATING LOGIC

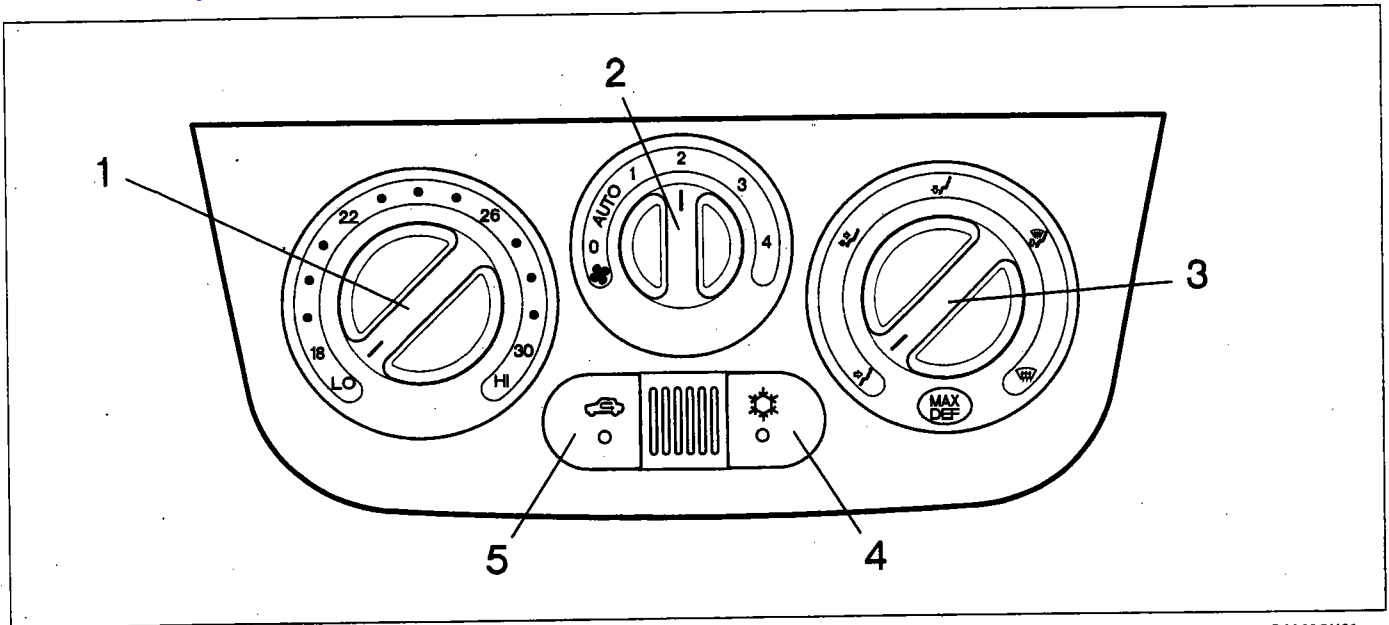
A special electronic control unit manages the automatic operation of the system controlling the thermodynamic parameters to ensure a comfortable climate (temperature and humidity) for the vehicle occupants.



P4A02CH01

According to the requests received and the temperature conditions detected, the control unit carries out/sets certain functions aimed at adjusting the temperature of the passenger compartment to meet the requirements.

### CONTROLS



P4A03CH01

The left knob (1) is for selecting the REQUESTED TEMPERATURE (between 18 and 30 °C): it is connected to a potentiometer which detects the various angular positions and transmits a signal to the electronic control unit for a total of 15 different positions (one per degree centigrade) with two extreme positions "LO" and "HI" corresponding to the maximum cold and maximum hot settings, respectively.

The centre knob (2) is for adjusting the AIR VENTILATION: it is also connected to a potentiometer which detects the various angular positions and sends a signal to the electronic control unit. There are four possible air flow rates which can be set manually (1, 2, 3 and 4), whilst in the "AUTO" position the system itself automatically selects the most suitable flow rate for reaching or maintaining the desired temperature.

**NOTE** Position "0" indicates minimal ventilation: the fan is off and there is only a slight flow of air at the vents.  
With the compressor on, the fan is always "forced" at the first speed, even with the knob at "0".

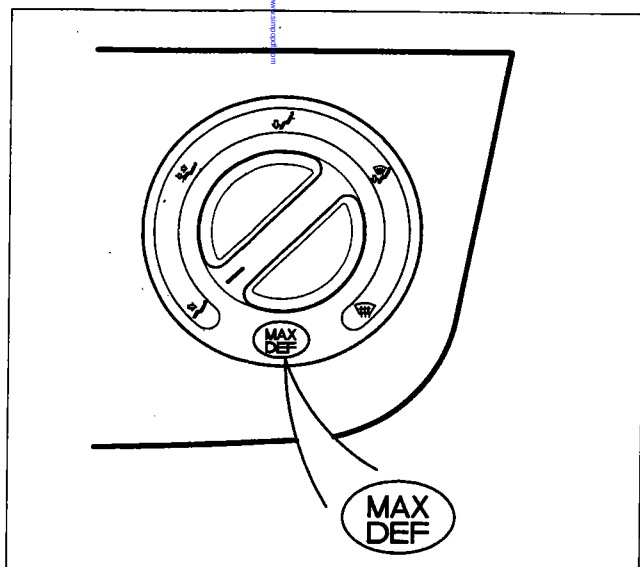
**NOTE** There are two different maps inside the control unit which correlate the air flow rate and the speed of the fan: the pollen filter on the outside air inlet ensures that the flow rate is lower - in relation to the fan speed - in the "dynamic air" condition compared with the "recirculation" condition.

The right knob (3) is for selecting the FLOW DISTRIBUTION for the air towards the passenger compartment and is achieved in five different ways: the selection is made manually via a cable which controls the movement of the distribution flaps.

Pressing button (4) enables the operation of the COMPRESSOR (air refrigeration circuit); if the button is released, the operation ceases. Engagement is entirely manual: the compressor is only always enabled in the "MAX DEF" setting even with the button released.

Pressing button (5) engages the AIR RECIRCULATION function inside the passenger compartment; releasing the button produces a "dynamic" air flow from the outside. Engagement is entirely manual: the recirculation function is only excluded in the "MAX DEF" setting even if the button is pressed.

### 50.

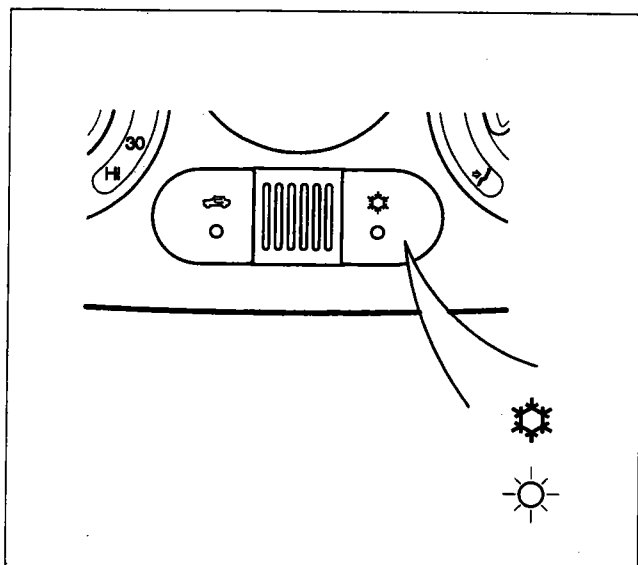


P4A04CH01

#### "MAX-DEF" Function

With the distribution knob turned completely in a clockwise direction the "MAX DEF" rapid demisting function is activated by a special microswitch. This function involves:

- maximum air flow rate
- mixture with maximum heat available
- recirculation switched off, whatever position the button (5) is in
- compressor enabled, whatever position the button (4) is in
- signal requesting engagement of heated rear windscreen : this engagement is managed by the integrated services control unit (see Group 55)



P4A04CH02

#### Compressor engagement

When the button shown in the diagram is pressed this enables the OPERATION OF THE COMPRESSOR (air refrigeration circuit); if the button is released, the operation ceases.

The effective engagement of the compressor, however, depends on the following conditions:

- outside temperature below 5°C: (switches off below 4°C and switches on again above 6°C)
- temperature detected by the frost sensor: (switches off below 3.5°C and switches on again above 5°C)

It should be remembered that the compressor can also be switched off through the intervention of the four stage pressure switch or the engine control unit. This logic depends on the different engine management control units, as detailed below:

#### CONNECTION WITH THE ENGINE CONTROL UNIT

The electronic control unit for the climate control system sends a command signal to the engine control unit giving the go ahead required for engaging the compressor.

There are two different types of connection according to the type of engine control unit

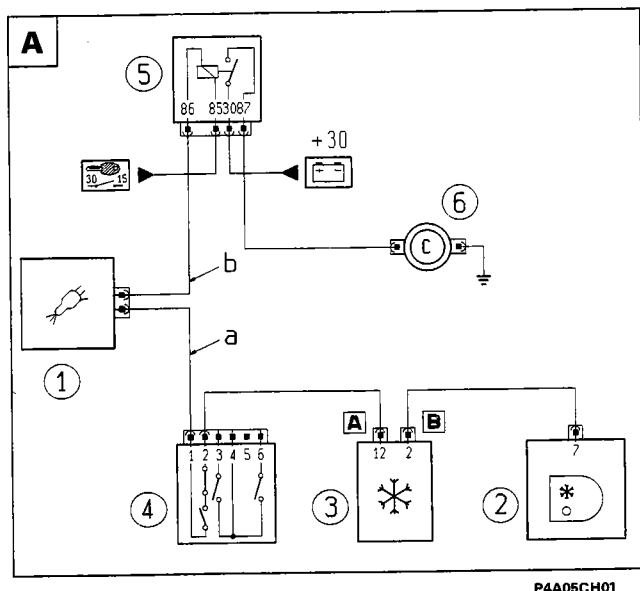
**A:** 1242 - 1581 - 1998 - 1910 JTD engines

**B:** 1910 TD 75 engine (Soft)

**NOTE** For the 1747 version, refer to the details in the previous edition (print no.506.670/01).

**NOTE** For the 1910 TD 75 version, which does not have an engine control unit, the go ahead for operating the compressor is given by a special thermal switch and by the EGR control unit, as well as the four stage pressure switch.

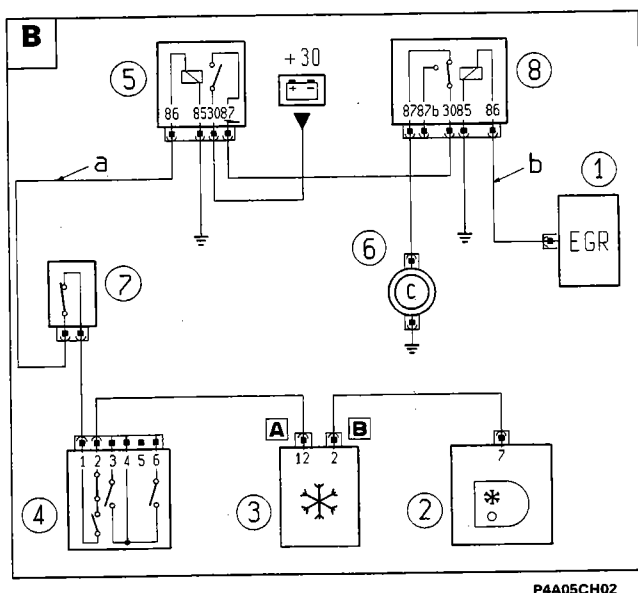
**Case A:** the engine management control unit (1) receives the signal to engage the compressor (a) directly from the control switch (2): the same signal also arrives as a go ahead (b) after having passed through the climate control control unit (3) and the four stage pressure switch (4): if the pressure is in the refrigeration circuit is not correct, this signal is, in effect, interrupted. Lastly, if other particular exclusion conditions exist (e.g. maximum power request, idling, etc.), then the control unit (1) sends the command (c) to engage the compressor (6) via the relay (5).



**1242 - 1581 - 1998 - 1910 JTD Engines**

1. Injection control unit
2. Climate control controls
3. Climate control control unit
4. Four stage pressure switch
5. Compressor relay
6. Compressor

**Case B:** the signal (a) to engage the compressor is sent, from the control switch (2), via the climate control control unit (3), the four stage pressure switch (4) and the thermal switch (7), to the compressor engagement relay (5). If the conditions for disengaging the compressor (6) exist, (for example maximum power request, idle speed, etc.), then a signal (b) is sent by the EGR control unit (1) to a remote control switch (8) and the compressor is switched off.



**1910 TD 75 engine (Soft)**

1. EGR control unit
2. Climate control controls
3. Climate control control unit
4. Four stage pressure switch
5. Compressor relay
6. Compressor
7. Thermostatic switch on water pump
8. Remote control switch for disengaging compressor

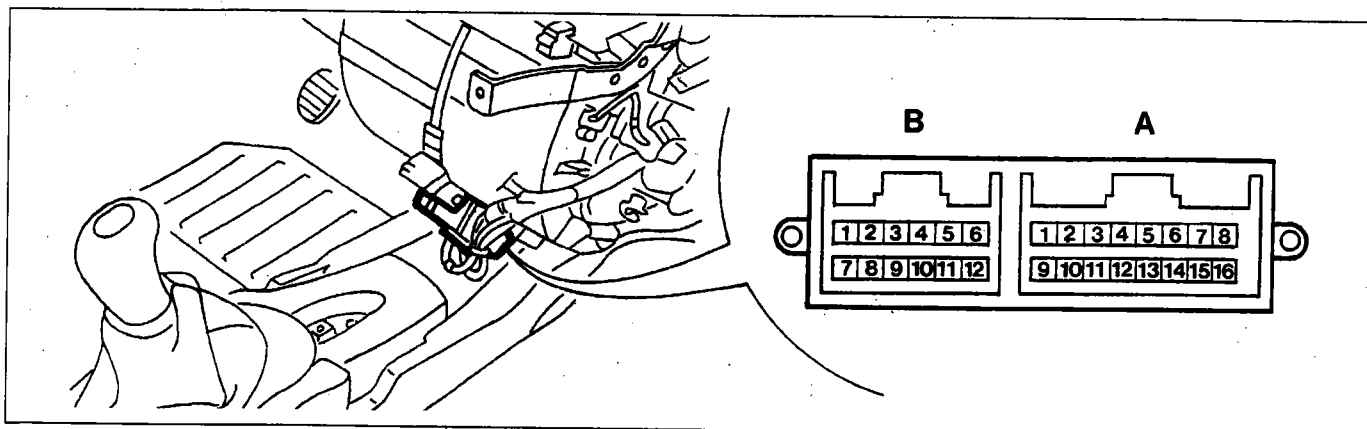
# 50.

## SYSTEM COMPONENTS

### Electronic control unit

The electronic control unit manages the automatic operation of the system controlling the thermodynamic parameters to produce a comfortable climate (temperature and humidity) for the occupants of the vehicle.

It is located in the lower part of the duct-distributor assembly, fixed to it by two bolts and is easily accessible from the passenger compartment. The connector for the diagnostic equipment is found next to it.



**Connector B**

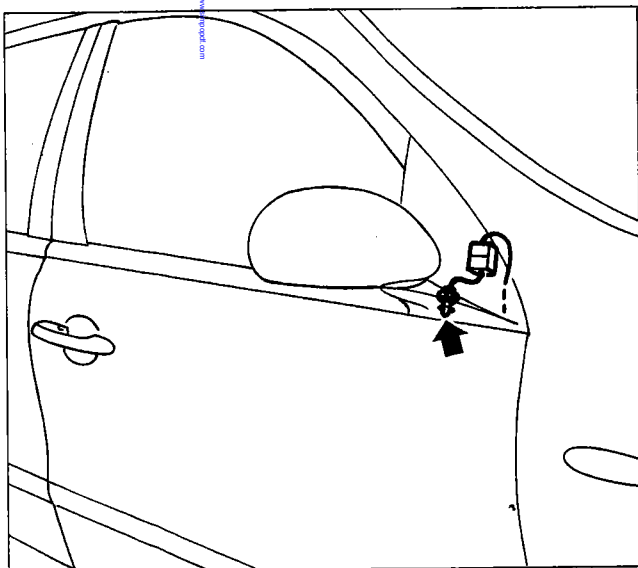
| TERMINAL | FUNCTION                            |
|----------|-------------------------------------|
| 1        | "MAX DEF"                           |
| 2        | Compressor engagement               |
| 3        | Earth (NOT USED)                    |
| 4        | Ventilation potentiometer           |
| 5        | Requested temperature potentiometer |
| 6        | Treated temperature sensor          |
| 7        | Engagement of recirculation         |
| 8        | Diagnostic line K                   |
| 9        | Diagnostic line L                   |
| 10       | Potentiometer supply - 5V -         |
| 11       | +30 from battery                    |
| 12       | Earth for sensors                   |

**Connector A**

P4A06CH01

| TERMINAL | FUNCTION                                 |
|----------|------------------------------------------|
| 1        | Earth (NOT USED)                         |
| 2        | Passenger compartment temperature sensor |
| 3        | Outside temperature sensor               |
| 4        | N.C.                                     |
| 5        | Mixture actuator feed-back               |
| 6        | Frost sensor                             |
| 7        | Instrument panel display                 |
| 8        | Fan operation                            |
| 9        | Earth for electric fan                   |
| 10       | Mixture control (LO) - 5V -              |
| 11       | Mixture control (MI) - 5V -              |
| 12       | Compressor operation                     |
| 13       | +15 from key                             |
| 14       | Recirculation engagement control - 5V -  |
| 15       | Recirculation exclusion control - 5V -   |
| 16       | Rearscreen                               |



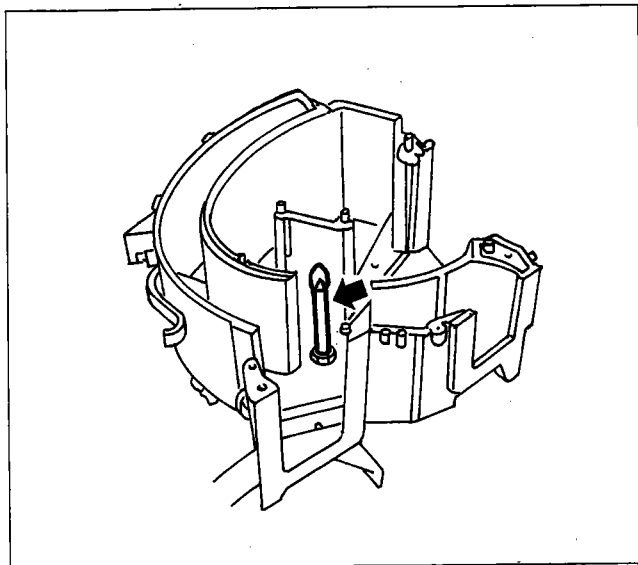


P4A07CH01

### Outside air temperature sensor

It is on the right external rear view mirror.

It consists of an NTC sensor where the resistance decreases with the temperature - (R at 25°C = 10 kOhm), with an operating range of between -30°C and +50°C

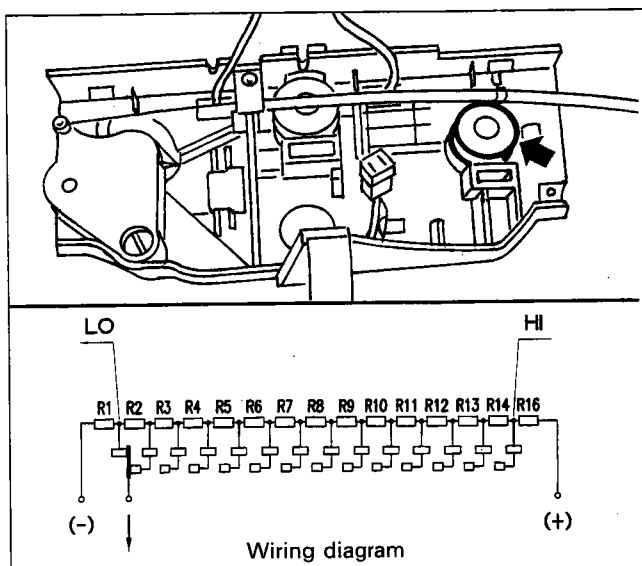


P4A07CH02

### Treated air temperature sensor

It is inside the distributor assembly immediately upstream of the distribution flaps for the air flows to the various vents.

It consists of an NTC sensor (R at 25°C = 10 kOhm), with an operating range of between 0°C and +80°C



P4A07CH03

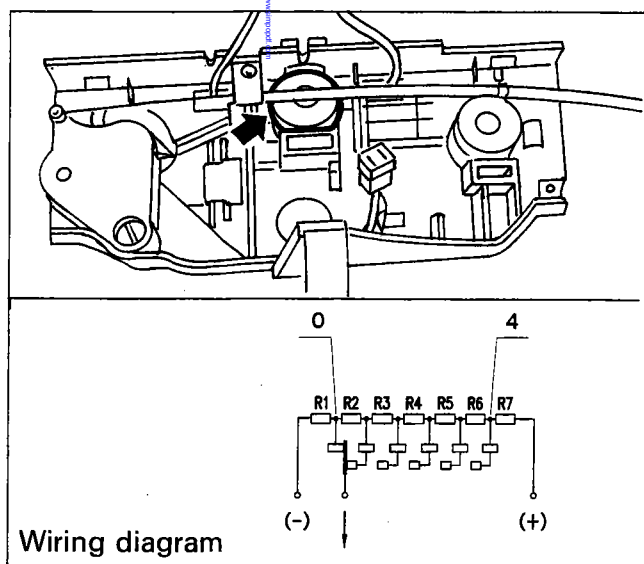
### Requested temperature potentiometer

This potentiometer is connected to the temperature knob and detects the various angular positions, sending a signal to the electronic control unit for a total of 15 different positions (one for each degree centigrade) with two extreme positions "LO" and "HI".

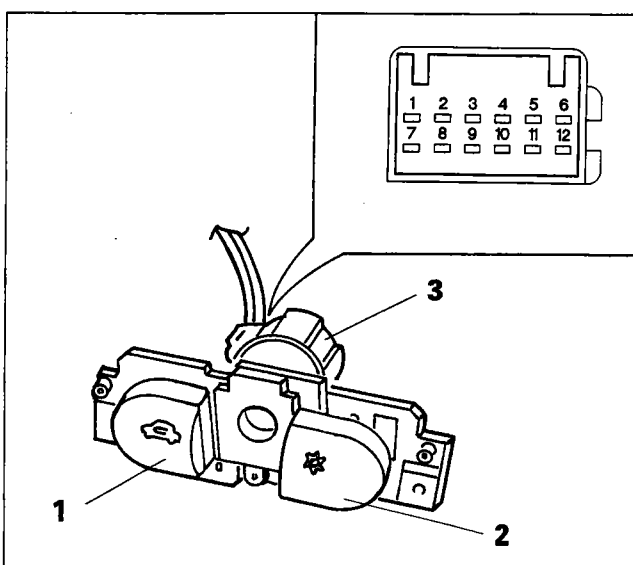
It receives a 5V supply from the control unit and has a controlled earth and gives a signal which corresponds to the position of the knob:

$R1 - R16 = 681 \text{ Ohm} \pm 1\%$

### 50.



P4A08CH01



P4A08CH02

1. Recirculation function switch
2. Compressor enablement switch
3. Passenger compartment temperature sensor

### Requested air flow rate potentiometer

This potentiometer is connected to the air ventilation knob and detects the various angular positions, sending a signal to the electronic control unit: there are four possible air flow rates which are set manually (1, 2, 3 e 4), plus an "AUTO" position and "0".

It receives a 5V supply from the control unit and has a controlled earth and gives off a signal corresponding to the position of the knob:

$R1-R7 = 1500 \text{ Ohm} \pm 1\%$

### Recirculation function switch

Pressing this switch engages the recirculation function which is managed completely manually:

### Compressor enablement switch (air refrigeration circuit)

Pressing this switch enables the operation of the compressor (air refrigeration circuit).

### Passenger compartment temperature sensor

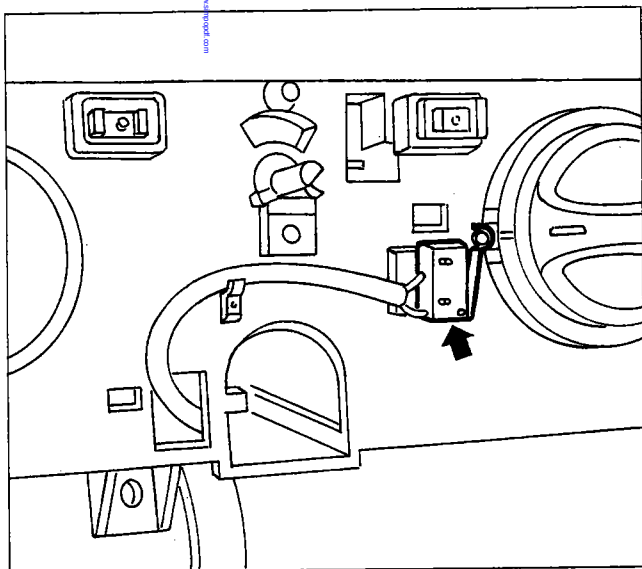
This is located in the climate control control panel between the recirculation and compressor switches.

It consists of an NTC sensor ( $R$  at  $25^\circ\text{C} = 2.2 \text{ kOhm}$ ), with an operating range of between  $+5^\circ\text{C}$  and  $+45^\circ\text{C}$ . The sensor is "ventilated", in other words it incorporates a small fan which is always supplied so that the temperature reading is not affected by stagnant air inside the dashboard giving a misleading picture.

These last three components make up a single element which is connected by a single connector.

| Terminal | FUNCTION                                            |
|----------|-----------------------------------------------------|
| 1        | Motor for ventilated sensor (+)                     |
| 2        | Motor for ventilated sensor (-)                     |
| 3        | Earth for passenger compartment temperature sensor  |
| 4        | Signal for passenger compartment temperature sensor |
| 5        | MAX-DEF                                             |
| 6        | N.C.                                                |

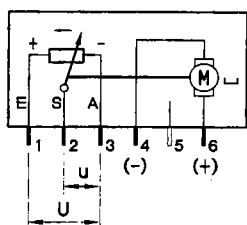
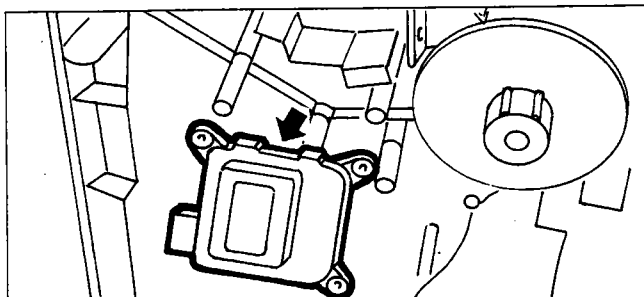
| Terminal | FUNCTION                      |
|----------|-------------------------------|
| 7        | Compressor operation          |
| 8        | Warning lights operation (NC) |
| 9        | +15                           |
| 10       | Ideogram lights (+)           |
| 11       | Ideogram lights (-)           |
| 12       | Recirculation control         |



P4A09CH01

### MAX DEF function switch

A special switch activates the MAX DEF function: it is located on the distribution knob: it is an N.A. contact which is closed with the knob completely turned in a clockwise direction.



Wiring diagram

P4A09CH02

### Mixture electrical actuator

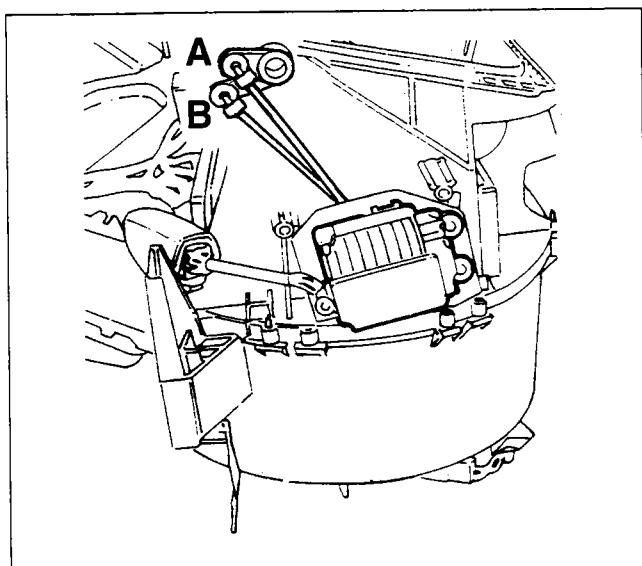
The adjustment of the temperature of the treated air is carried out through the actuator which mixes the hot air and the cold air acting on the flap which either does or does not send the flow of air entering the heater radiator, through which the hot water coming from the engine passes through.

A motor with a 12 V supply controls the rotary movement of a drive pin which acts directly on the mixture flap. A potentiometer detects the actual position and acts as "feed-back" to the control unit.

*Total rotation angle between max. hot and max. cold = 62°*

*Ratio  $u/U$  for max. hot = 0.707*

*Ratio  $u/U$  for max. cold = 0,26*



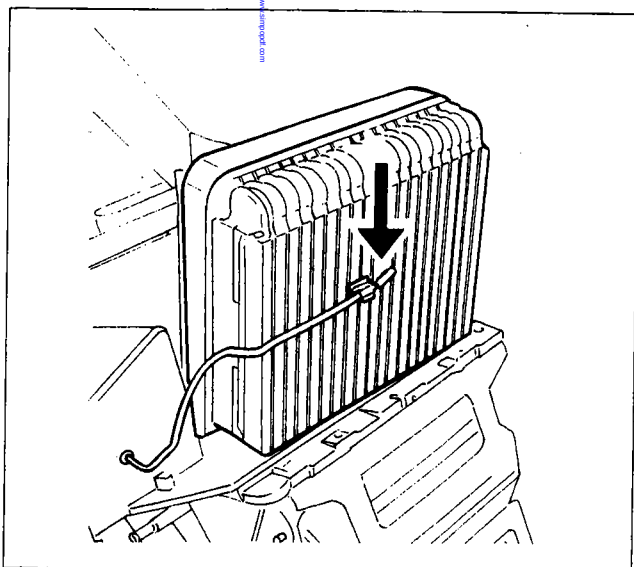
P4A09CH03

### Electrical recirculation actuator

The outside air intake flap is rotated by means of the recirculation actuator which acts on the flap itself moving from position (A) "dynamic air" to position (B) "recirculation". There are NO intermediate positions.

A motor with a 12 V supply controls the rotary movement of a drive pin which acts directly on the flap. Reversing the polarity results in a movement in the opposite direction.

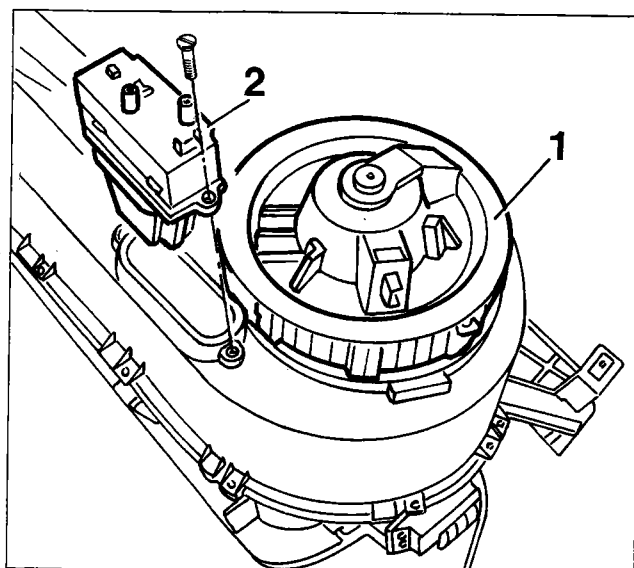
50.



P4A10CH01

### Frost sensor

The frost sensor is located inside the duct-distributor assembly, fitted directly on the evaporator and detects the temperature warning the control unit, if necessary, to switch off the compressor to avoid freezing. It consists of NTC sensor ( $R$  at  $25^{\circ}\text{C} = 10 \text{ k}\Omega$ ), with an operating range of between  $-5^{\circ}\text{C}$  and  $+25^{\circ}\text{C}$ .

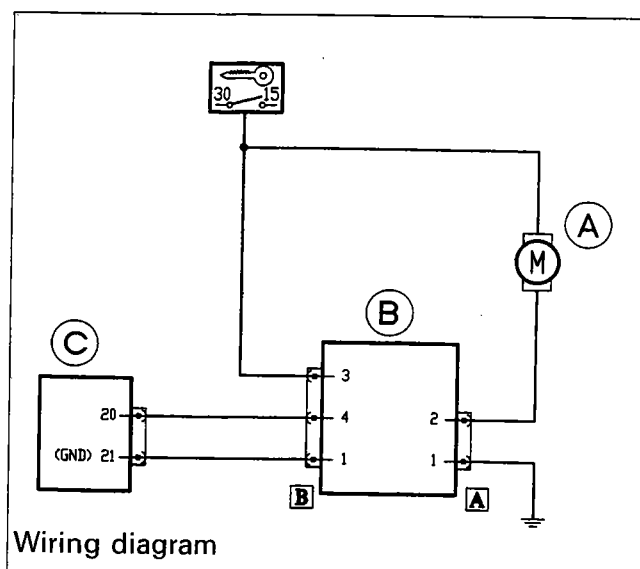


P4A10CH02

### Electric fan with electronic speed regulator

This fan which sends the outside or recirculation air towards the duct-distributor receives a 12 V supply and is operated at different speeds continuously by an electronic regulator positioned nearby.

1. Electric fan
2. Electronic regulator



Wiring diagram

P4A10CH03

The electronic regulator receives an input signal from the control unit and transforms it into a continuously variable power earth signal to operate the fan.

- A. Electric fan
- B. Electronic regulator
- C. Electronic control unit

## AUTODIAGNOSIS

Using suitable control logics for the sensors and adjustment with "self-learning" for the actuators, the electronic control unit is capable of recording and storing a series of problems and faults which can occur in the system.

When confronted with these problems, the control unit continues to manage the operation of the system replacing any incorrect values detected with appropriate recovery values which ensure a minimum level of operation for the system even if it is not ideal.

Two types of errors are memorized:

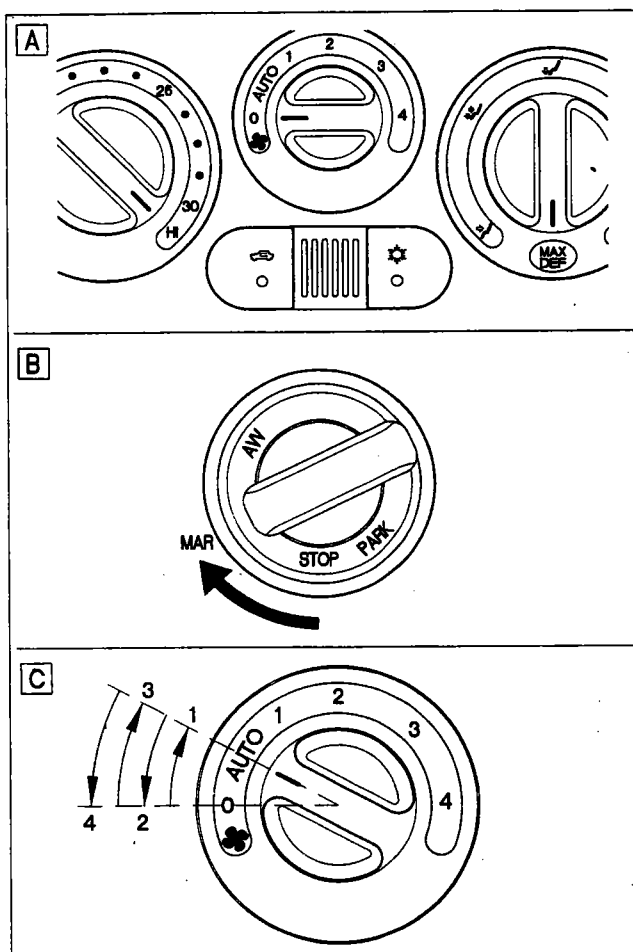
- occasional errors, which are zeroed when the key is turned OFF
- permanent errors: if an error occurs more than 5 times in a certain period it is considered permanent and is stored in the control unit memory; these errors are NOT zeroed when the key is turned OFF, but only after a specific external command (diagnostic equipment).

The control unit has two methods for reading errors it is storing:

- by means of the diagnostic equipment
- through the display in the on board panel enabled by reading the outside temperature.

As an error detected by the control unit occurs (even an occasional type error), the words "Error Cli" appear on the on board panel display to indicate that the system has memorized a fault.

By pressing the "outside temperature" button in the centre of the dashboard if these words remain, this means that the error involves the outside temperature sensor, if, on the other hand the correct temperature value appears, this means that the error relates to other system components and it is then possible to identify the fault memorized through the following procedure;



- Turn the left knob completely in a clockwise direction (HI position)
- Turn the right knob completely in a clockwise direction (MAX DEF position)
- Turn the centre knob (to position 0)

- Turn the ignition key from the OFF position to the ON position

- Within 10 seconds, turn the centre knob, placing it in the following positions:  
"0" - "AUTO" - "0" - "AUTO" - "0"

P4A11CH01

### 50.

At this point the control unit will send a series of messages to the on board panel display: an error code, in accordance with the table below, will be displayed in place of "Cli".

| MALFUNCTIONS WHICH CAN BE DETECTED                                      | DISPLAY CODE |
|-------------------------------------------------------------------------|--------------|
| C.C. to treated temperature sensor earth                                | 12           |
| C.A. or C.C. indistinguishable treated temperature sensor               | 14           |
| C.C. to outside temperature sensor earth                                | 32           |
| C.A. or C.C. indistinguishable outside temperature sensor               | 34           |
| C.C. to passenger compartment temperature sensor earth                  | 42           |
| C.A. or C.C. indistinguishable passenger compartment temperature sensor | 44           |
| C.C. to frost sensor earth                                              | 52           |
| C.A. or C.C. indistinguishable frost sensor                             | 54           |
| Mixture actuator malfunction                                            | 65           |
| C.C. to requested temperature potentiometer earth                       | 82           |
| C.A. or C.C. indistinguishable requested temperature potentiometer      | 84           |
| C.C. to ventilation potentiometer earth                                 | 92           |
| C.A. or C.C. indistinguishable ventilation potentiometer                | 94           |
| C.C. to mixture earth feedback                                          | B2           |
| C.A. or C.C. indistinguishable mixture feedback                         | B4           |
| Fan operation malfunction                                               | D5           |
| C.C. to 5 V supply earth                                                | E2           |
| C.C. to + battery supply 5V                                             | E3           |

If several errors are present, they are displayed every 3 seconds.  
Having concluded all the errors, the milometer is displayed once again.

If the codes differ from those mentioned above, bear in mind that the first figure or letter identifies the component, whilst the second figure identifies the type of fault, namely:

1. Open circuit - 2. Short circuit to earth - 3. Short circuit to + battery - 4. Short circuit and open circuit indistinguishable - 5. General actuator malfunction.



*If a system fault diagnosis is carried out **AFTER A REPAIR OPERATION** which have involved disconnecting the battery and/or control unit, it is necessary to:*

- turn the ignition switch to the ON position,
- wait for around **30 seconds**: the control unit will carry out a "self-learning" cycle,
- return the ignition key to the OFF position,
- carry out fault diagnosis as illustrated and described previously.



## DUCT / DISTRIBUTOR ASSEMBLY

The assembly illustrated in cross section in the diagram below is the main component of the system and consists of a duct (1) and a heater-distributor assembly (2).

The duct (1) consists of two parts, a lower one and an upper one; the right part of the latter is shaped in such a way that it matches perfectly with the right upper surface of the dashboard (area below the windscreen by the bulkhead between the engine compartment and the passenger compartment) which it is in contact with.

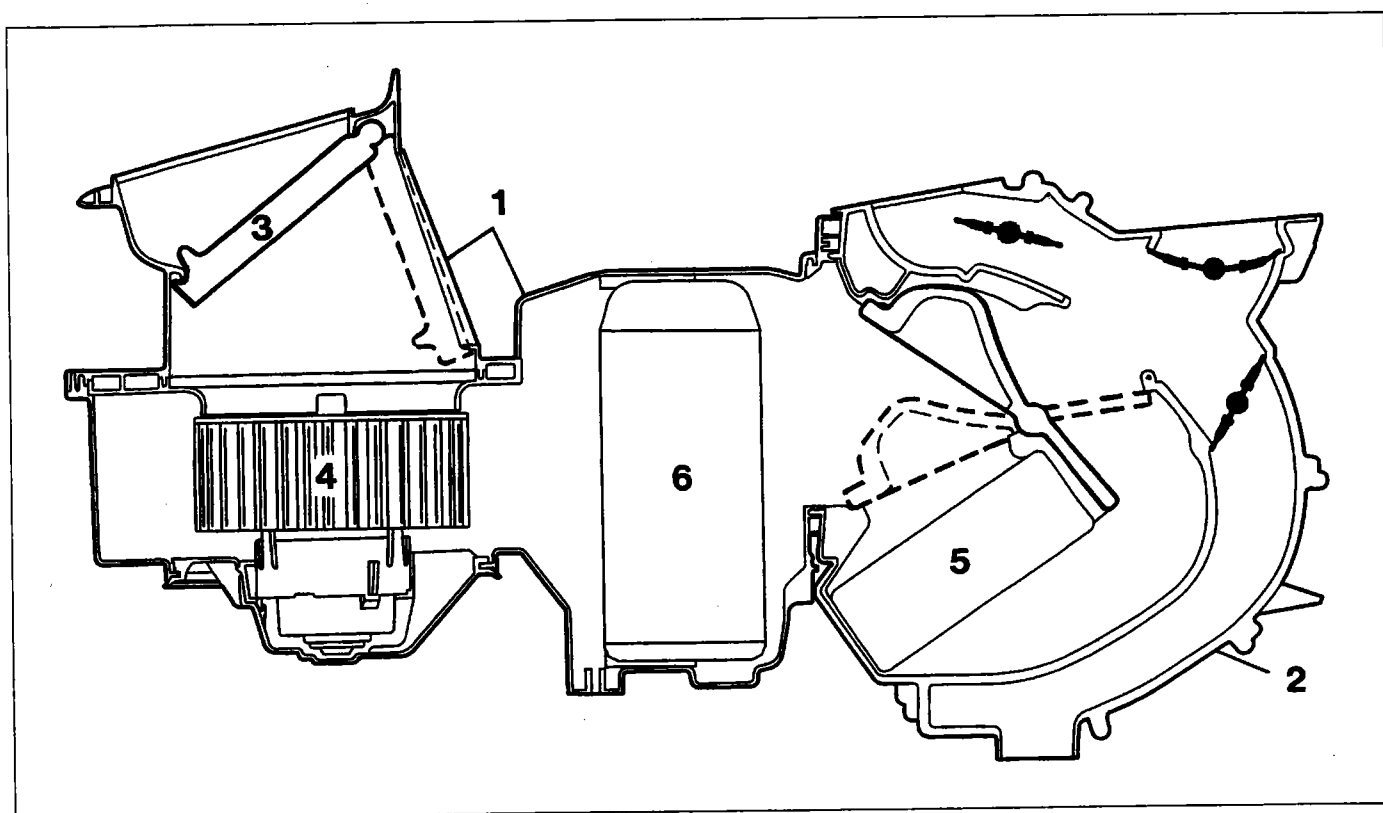
There are two rectangular shaped openings in the upper part of the duct at the top on the right side; the first is in an almost horizontal position matching with the one in the dashboard and therefore in contact with the outside ambient, whilst the other one is facing the passenger in an almost vertical position, allowing the intake of air in the passenger compartment.

There is a flap (3) fitted on the inside of the duct, at the top, which is directed by a special actuator which can take up a position between closed and one of the above mentioned two openings.

There is an electric fan (4) fitted inside the duct in the lower part by the above mentioned openings which, when supplied at different voltages, can rotate at different speeds.

The heater-distributor assembly basically consists of a casing which houses the following, in order:

- a mixture flap in the centre which, directed by a knob via a cable either does or does not allow the entire air flow introduced by the fan (4) or part of it to come into contact with the finned surface of the heater radiator (5);
- the heater radiator (5) in the centre at the bottom, with inlet and outlet connectors projecting beyond the right side surface of the above mentioned assembly;
- four flaps, at the top and the front, which, directed by a knob via a special actuator, a toothed sector and a splined disc with a distribution function, either shutter or completely close the section of the internal ducts which direct the air to the footwell vents, the front vents and the vents for demisting the windscreen.



P4A13CH01

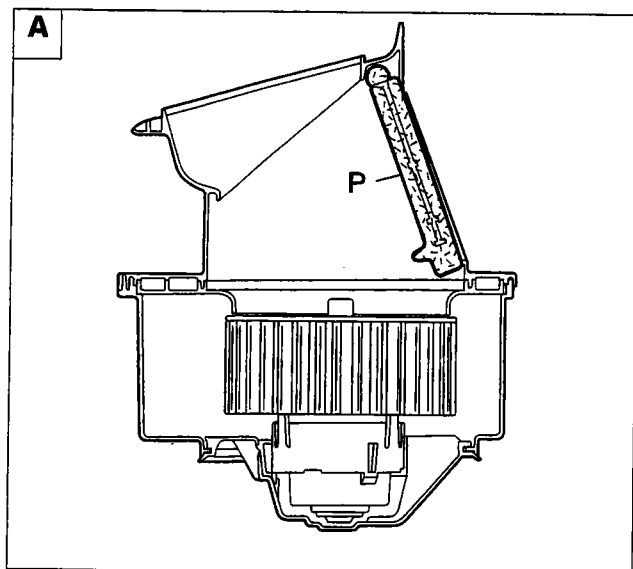
The evaporator (6) is located between the duct (1) and the distributor (2).



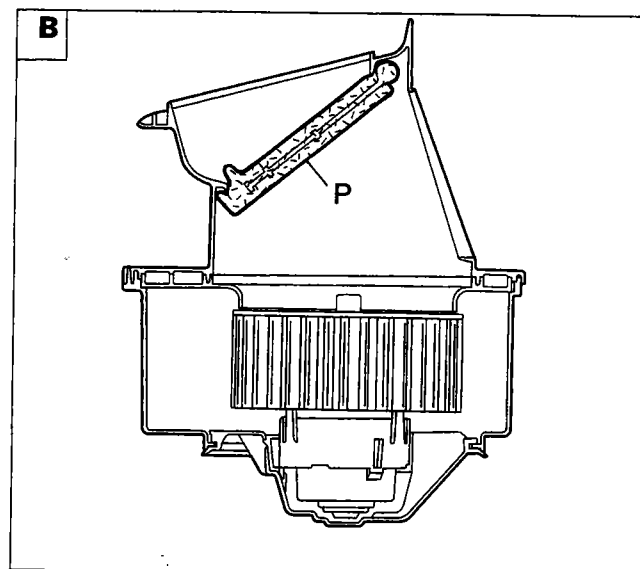
### 50.

#### Dynamic / recirculation air

The special actuator rotates the air intake flap (P) between the two extreme positions: the one in figure A closes the internal air intake and consequently the electric fan only draws in outside air; the latter is inhibited and recirculation air is drawn in if the flap is positioned as illustrated in figure B.



P4A14CH01



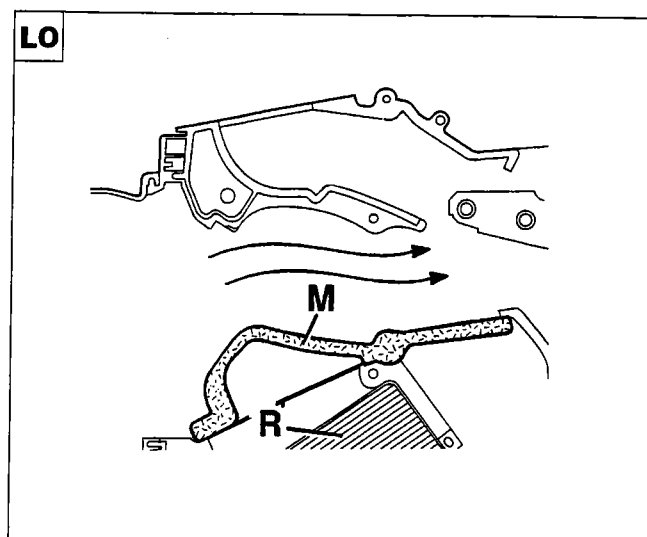
P4A14CH02

#### Hot/cold air mixing

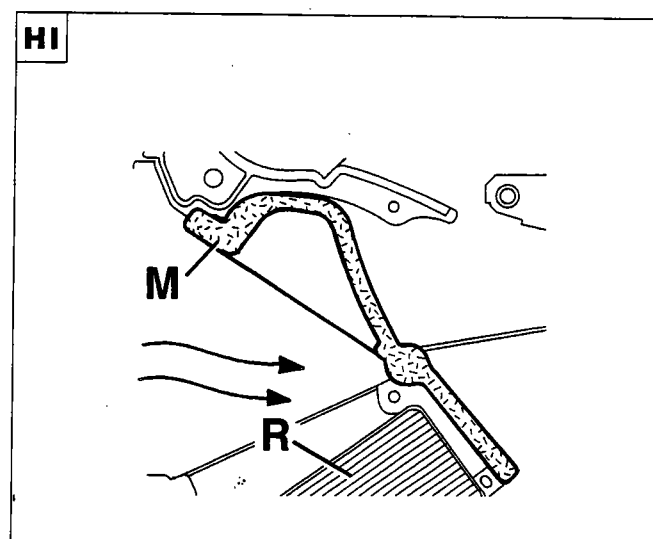
The special actuator rotates the flap (M) between the extreme positions (LO) and (HI). In the (LO) position, the flow of air drawn in by the fan is distributed to the various vents without undergoing any variation in temperature because it is impossible to come into contact with the heater radiator (R) finned surface.

When the mixture flap is in the limit position (HI) the entire flow of air introduced by the electric fan has to come into contact with the heater radiator fins with hot air at the maximum possible temperature being distributed to the various vents.

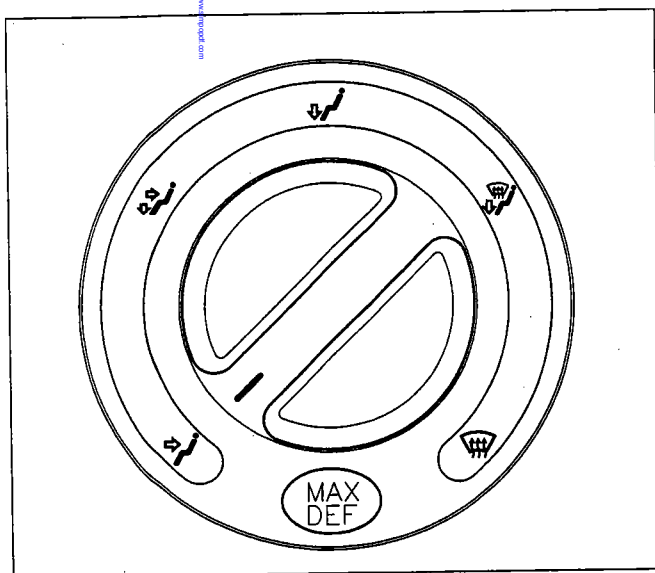
When the mixture flap is in an intermediate position between the two positions mentioned above, only part of the air flow introduced by the electric fan comes into contact with the heater fins.



P4A14CH03



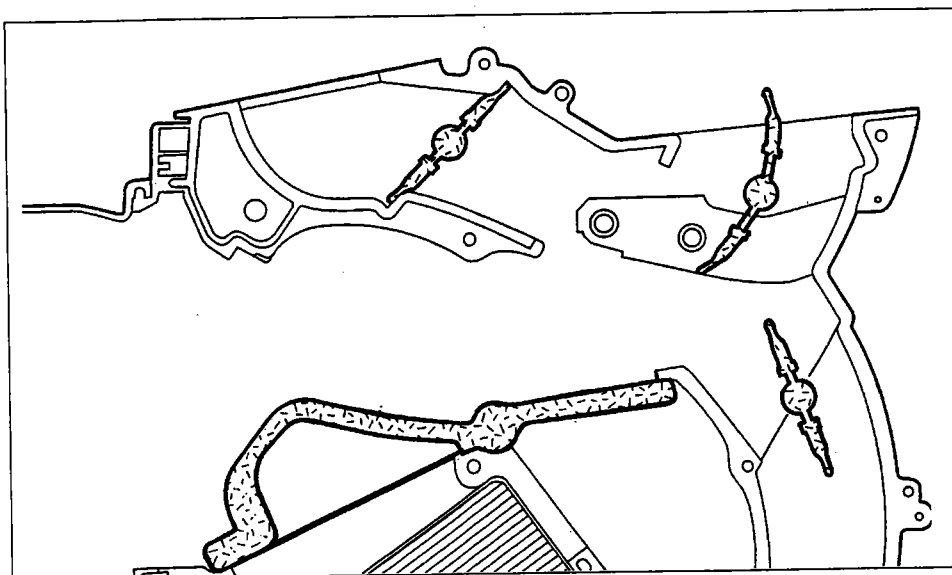
P4A14CH04



P4A15CH01

### Air distribution

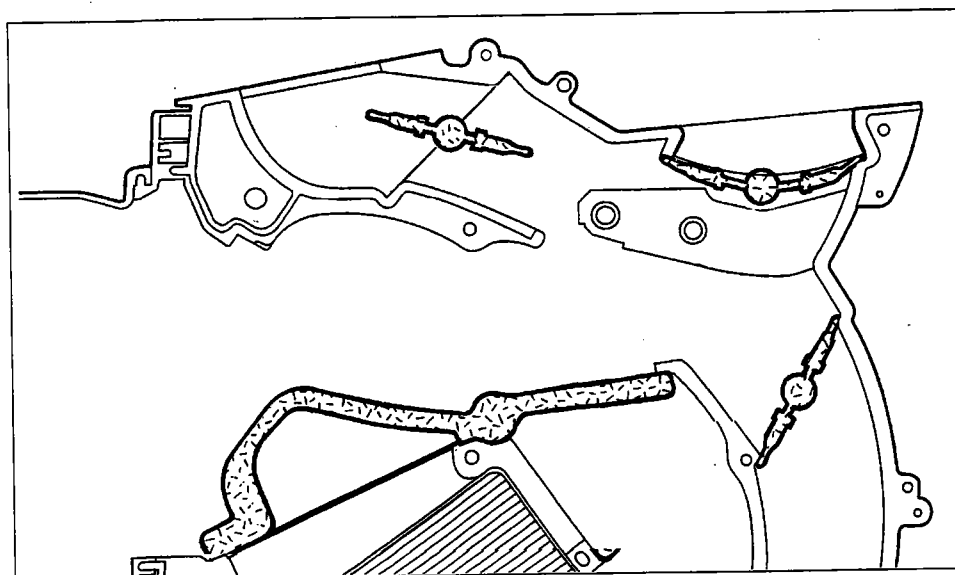
By turning the right knob in a clockwise direction the four flaps are rotated so that the air is distributed as illustrated on the various ideograms, i.e. starting from to the front vents only, ending with the windscreen vents, as illustrated in the diagrams below.



P4A15CH02



**View of positioning of the various distribution flaps when the knob is rotated completely in an anti-clockwise direction**



P4A15CH03



**View of positioning of the various distribution flaps when the knob is rotated completely in a clockwise direction**

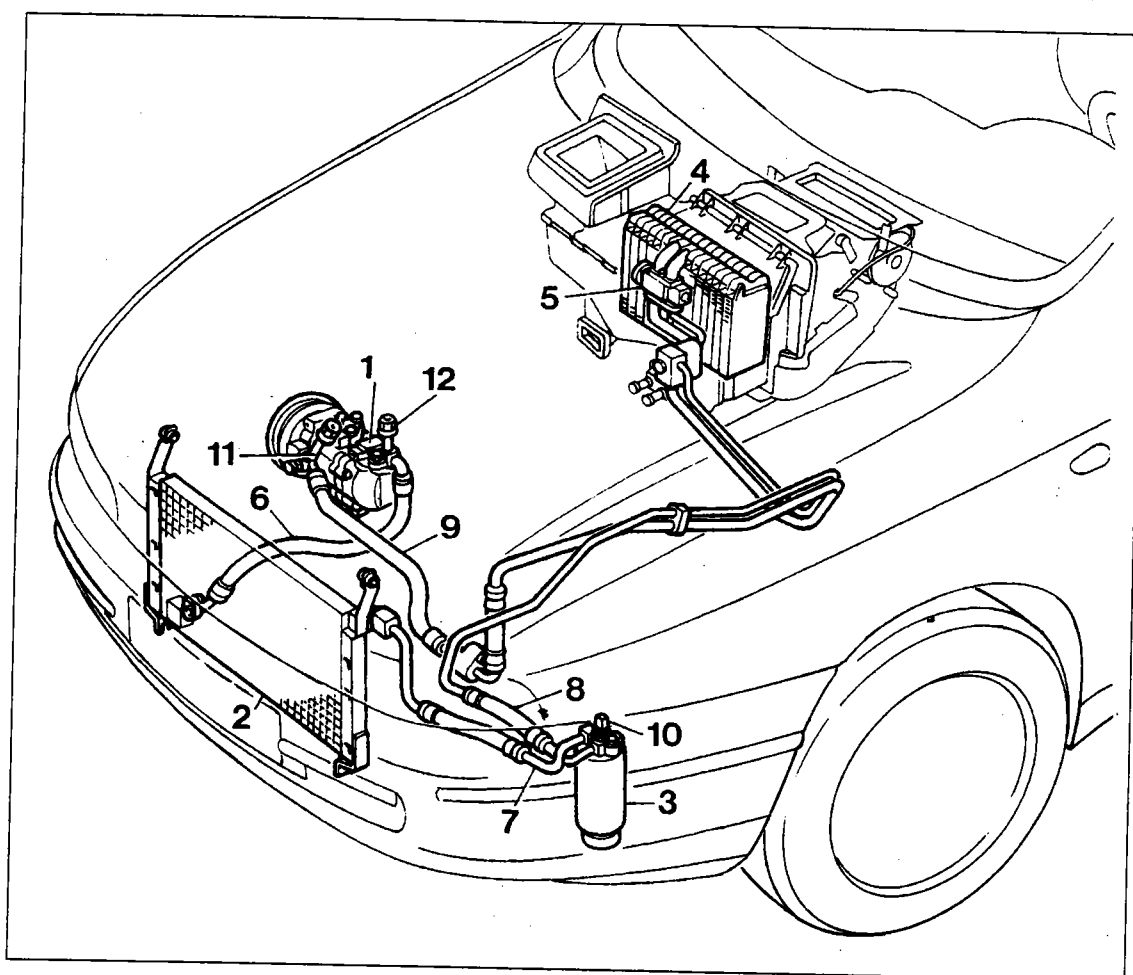
### 50.

#### LOCATION OF CLIMATE CONTROL SYSTEM COMPONENTS

The climate control system consists of the following components:

- a variable flow rate compressor (SKROLL for 1242 16v and 1910 JTD versions - NIPPONDENSO TV 12SC for other versions) which is fixed to the engine by brackets;
- a condenser which is a heat exchanger fitted in front of the engine coolant radiator;
- a drier filter which is located near the left side of the condenser;
- an evaporator which is the second heat exchanger for the system and is located in the above mentioned assembly;
- an expansion valve which is fitted on the evaporator inlet duct;
- various rigid and flexible pipes which connect the various system components;
- a three stage pressure switch which is fitted on the drier filter.

There are two small pipes, fitted to the high and low pressure pipes, with a needle valve which is designed to drain and repressurize the system.



P4A16CH01

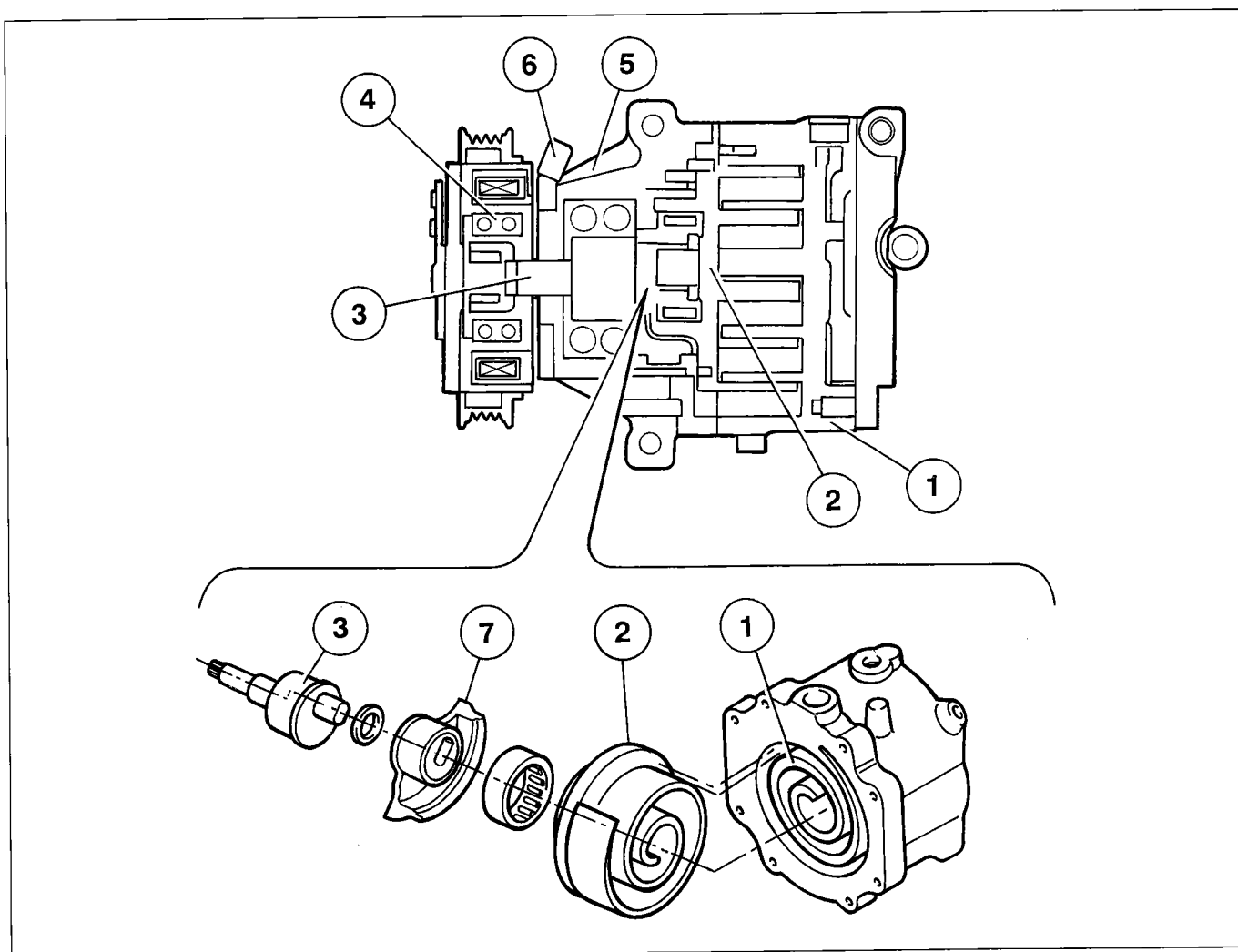
- |                                            |                                                                                  |
|--------------------------------------------|----------------------------------------------------------------------------------|
| 1. Compressor                              | 8. Pipe between filter and evaporator                                            |
| 2. Condenser                               | 9. Pipe between evaporator and compressor                                        |
| 3. Drier filter                            | 10. Three stage pressure switch                                                  |
| 4. Evaporator                              | 11. Needle valve for draining the system (low pressure side)                     |
| 5. Expansion valve                         | 12. Needle valve for draining and repressurizing the system (high pressure side) |
| 6. Pipe between compressor and condenser   |                                                                                  |
| 7. Pipe between condenser and drier filter |                                                                                  |

**SCROLL SCS08 COMPRESSOR**

The compressor used on this vehicle is the scroll type and is equipped with a system which deactivates it when the evaporator reaches temperatures where freezing may take place. The compressor consists of a fixed scroll (1) which has a casing and an orbital scroll (2); the movement of the two scrolls, which takes place through the camshaft (3) connected to the pulley, produces a chamber in which the volume decreases during rotation allowing compression.

The adoption of this compressor, consisting of only two moving parts, has resulted in the following advantages:

- no seals are required;
- there are no leaks, either radial or axial;
- low load losses through the absence of internal valves and pipes;
- the wear of the spirals produces an improved seal of the side panels of the actual spirals;
- the absence of valves, knocking and impulses reduces noise levels.



P4A17CH01

1. Fixed scroll (casing)
2. Orbital scroll
3. Camshaft
4. Camshaft seal

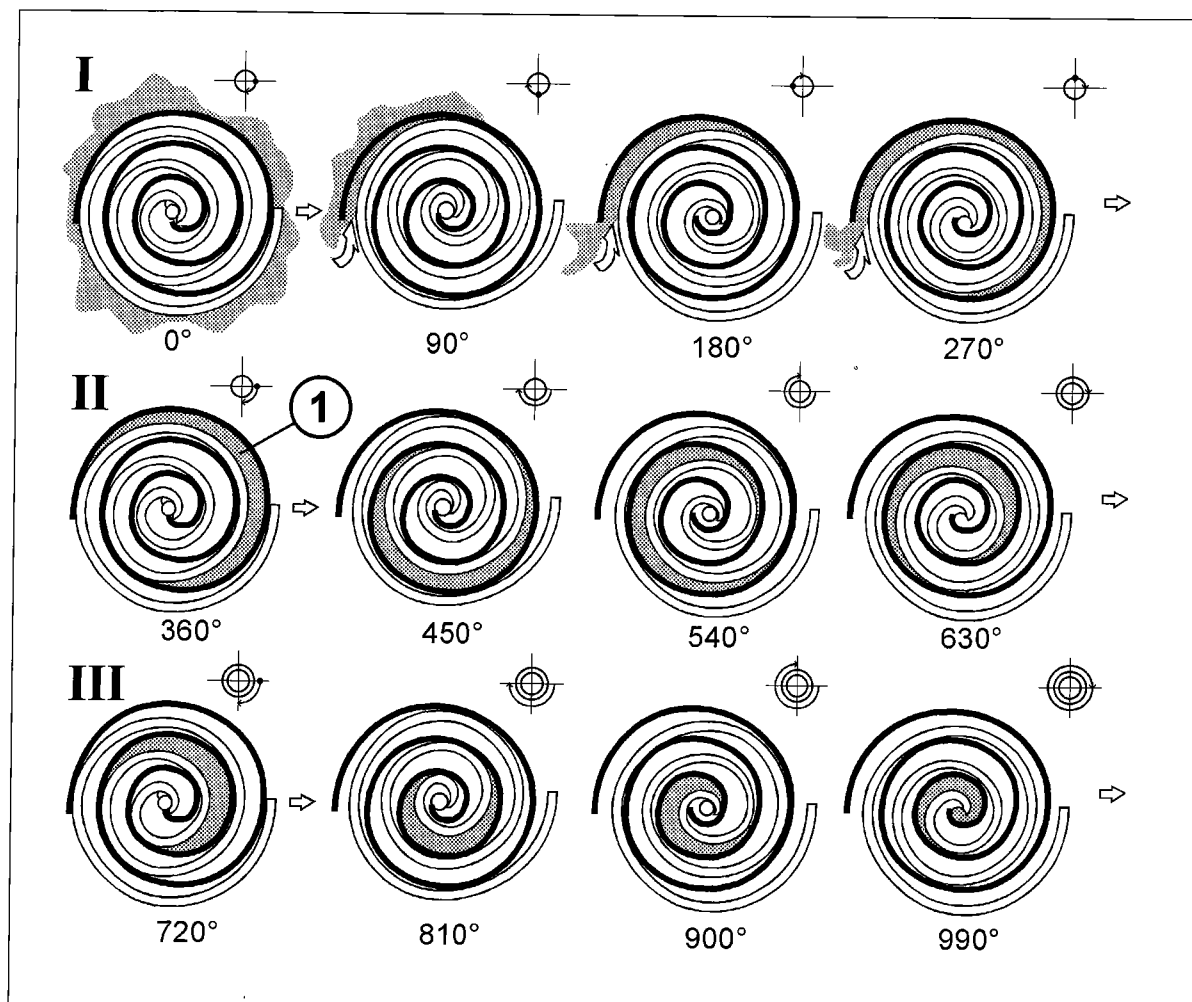
5. Shield
6. Compressor supply electrical connection
7. Balancing mass

### 50.

#### Compression mechanism

The contact between the compressor fixed scroll and the orbital scroll produces a chamber (1) in which the gas is imprisoned with the volume tending to gradually decrease as the orbital scroll rotates. As shown in the sequence illustrated, the compression chamber is alternately open for the supply of gas, closed for transportation and open once again (at the outlet connector) for the discharge of the gas under pressure.

The volume defined by the two scrolls decreases determining the compression mechanism for the gas stored. The pressure gradually increases until the gas arrives at the centre zone where operating pressure is reached; at this point the gas is released through the outlet connector to the condenser.



P4A18CH01

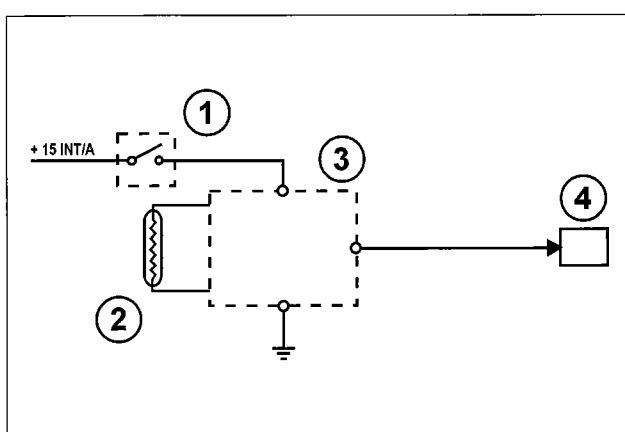
The sequence illustrates the different gas compression stages; the compression takes place after three complete revolutions of the orbital scroll. Naturally, the cycle is continuous therefore the moment a compression stroke takes place, a gas inlet stroke occurs simultaneously and the previous phase ends with the escape of the gas under pressure.

**OPERATION OF THE COMPRESSOR ELECTRONIC CONTROL UNIT**

The system for activating/deactivating the compressor is operated by an electronic control unit (electronic thermostat) (3), which acts on the compressor clutch according to the temperature of the evaporator, measured by an N.T.C. type sensor (2).

If the temperature of the evaporator reaches values below 3.5 °C, the electronic unit releases the compressor coupling relay and consequently the compressor coupling.

The compressor coupling is disengaged if the driver accelerates fully and when the engine temperature reaches 107 °C, to prevent overheating. These control operations are carried out by the fuel injection control unit.



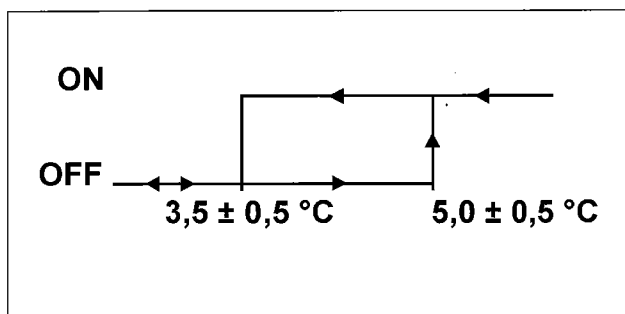
P4A19CH01

1. Air conditioning on switch
2. Air temperature sensor on the evaporator
3. Compressor electronic control unit (electronic thermostat)
4. Four stage pressure switch

**Air temperature sensor on the evaporator**

The temperature sensor is an N.T.C. resistance and is kept in place, by means of a retaining spring, on the evaporator fins, on the downstream side of the air flow and is not accessible from the outside.

The control unit which deactivates the compressor according to the temperature of the air measured at the evaporator outlet is calibrated as follows:



P4A19CH02

In particular, the control unit activates the coupling when the temperature of the air exceeds 5.0 ± 0.5 °C and deactivates it when the temperature goes below 3.5 ± 0.5 °C.

### 50.

#### MAINTENANCE AND SERVICE OPERATIONS

##### Lubricant oil



*The compressor is lubricated by about  $80 \pm 20$  cc of ND8 oil. Only this type of oil (ND8) should be used for topping up or oil changes.*

In case of service operations which involve replacing some of the system components such as the condenser or the evaporator, 40 cc of oil must be added for each of the parts replaced. If the compressor is being replaced, it is available as spares with the recommended quantity of oil. For this reason, before fitting it on the vehicle the amount of oil corresponding to that remaining in the system must be removed first. In order to do this it is necessary to:

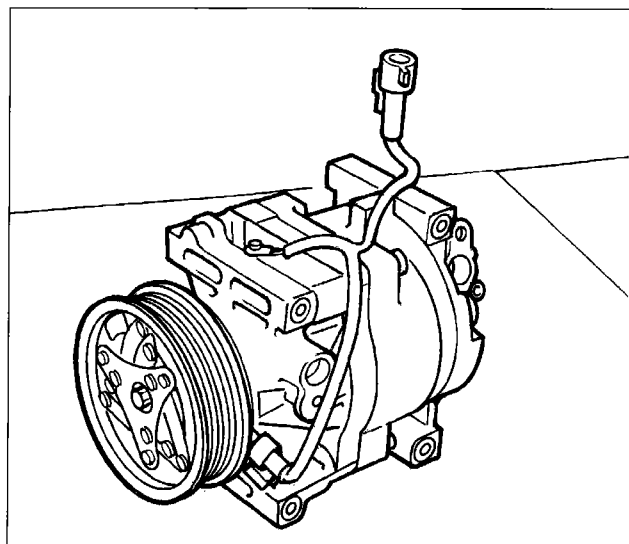


*The compressor is available as spares pressurized with nitrogen to prevent dampness and impurities from entering; therefore when refitting, remove the inlet and outlet connector plugs slowly with the compressor positioned exactly as illustrated in the diagram below (with the cover facing upwards).*

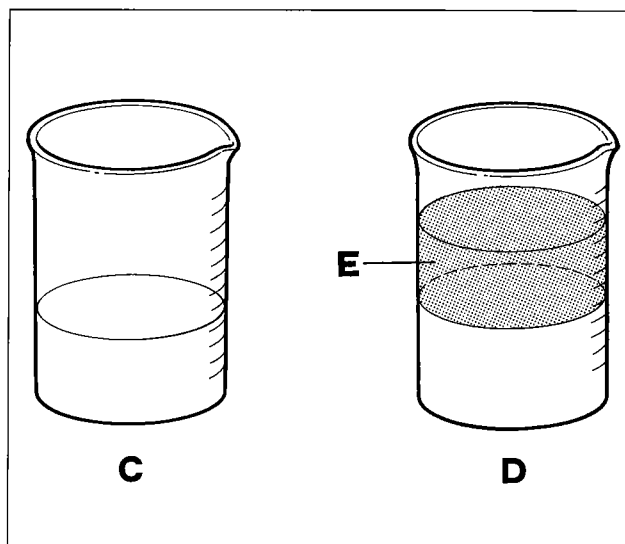
1. Pour the quantity of oil in the compressor which is being replaced into a graduated test tube (C) taking care to let it drain well.
2. Pour the quantity of oil in the new compressor into a graduated test tube (D) taking care to let it drain well.
3. Remove the excess quantity of oil (E) corresponding to the difference between the quantity of oil in test tube (C) and test tube (D) ( $E = D - C$ ).



*The oil is extremely hygroscopic: avoid leaving the containers open. Avoid leaving the compressor or any other component disconnected from the system for longer than is necessary. Do not tilt the compressor or turn it upsidedown.*



P4A20CH01



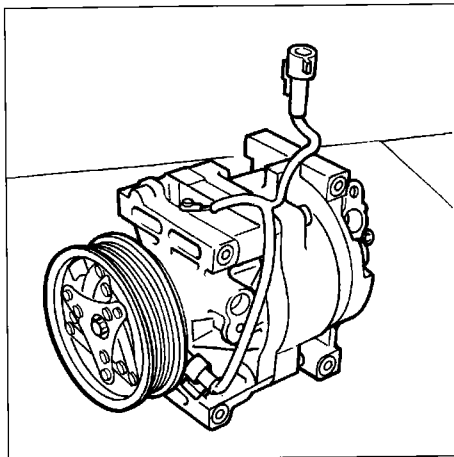
P4A20CH02

#### Determining the quantity of lubricant oil to be introduced into the compressor





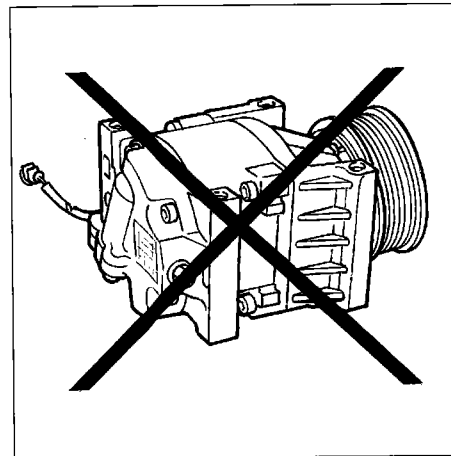
*Any time the compressor is removed or moved, it should be positioned with the cover facing upwards as illustrated in fig. 1 to prevent oil leaks and the fouling of the compressor.*



P4A21CH01



P4A21CH02



P4A21CH03

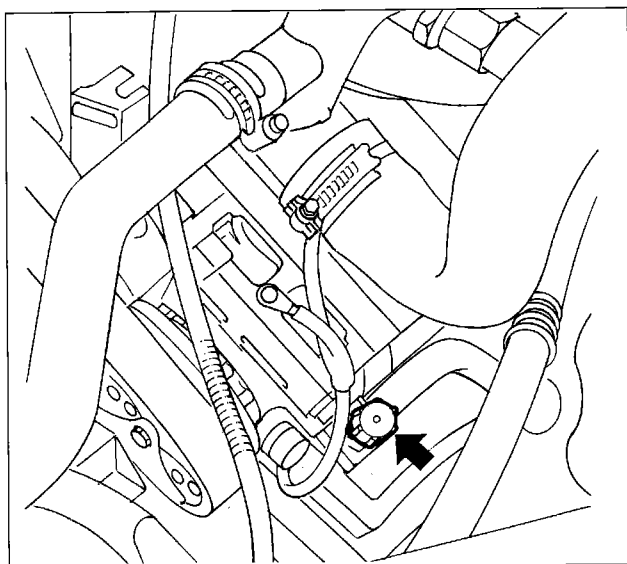


*Before carrying out operations which could cause the escape of refrigerant fluid, the air conditioning system must be drained. Protective gloves and goggles should be worn during this operation.*

*In order to facilitate the draining operation, the engine and the system should be left to run for at least 10 - 15 minutes.*

**NOTE** *If the O-ring seals are being replaced, use green or black coloured seals, making sure that they are current production ones which are resistant to R134A fluid. Do not, under any circumstances, use old production black seals because they are permeable.*

**NOTE** *If the system pipes are dismantled, it is advisable to seal the disconnected ends of the pipes with suitable plugs if they are not going to be refitted immediately to prevent dampness or foreign bodies from entering.*



P4A21CH04

### Connecting the equipment to the vehicle air conditioning system

Carry out the following operations in order:

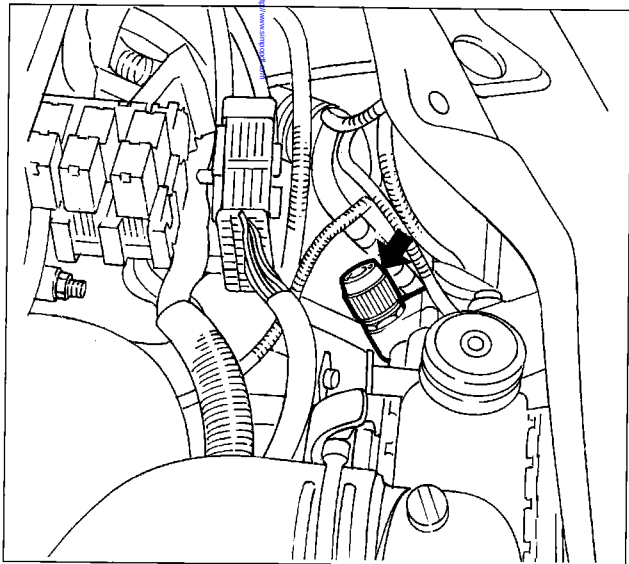
- Check that the equipment taps are closed and that the electrical control knobs are in position 0 (off), then engage the connector for the light blue flexible pipe with the needle valve on the section of pipe which connects the evaporator to the compressor.

# Auxiliary units

## Manually operated climate control

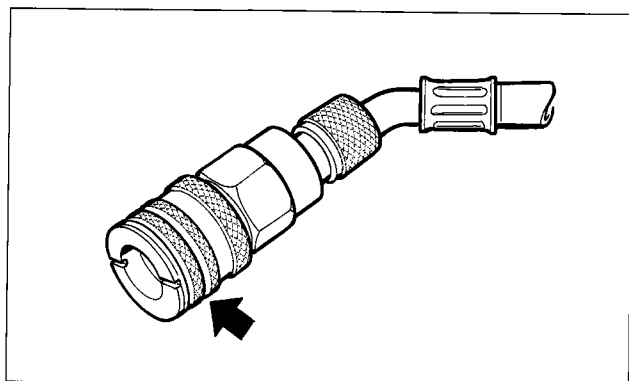
### 50.

**Bravo-Brava**  
98 range



P4A22CH01

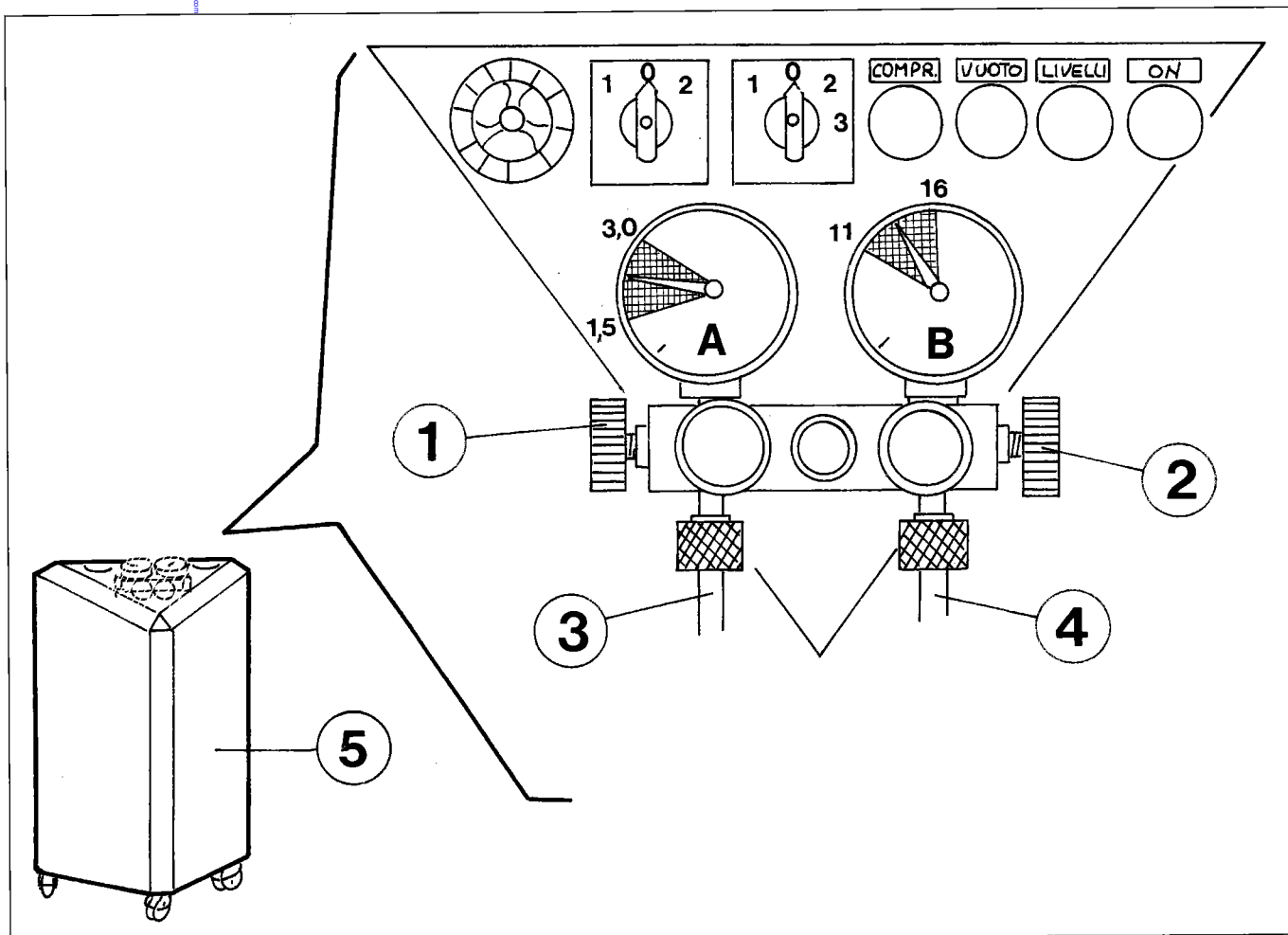
- Attach the connector for the red flexible pipe to the needle valve on the four stage pressure switch connector.



P4A22CH02

**NOTE** *Move the ring nut shown by the arrow completely upwards before fitting the connector on the needle valve.*

### Checking air conditioning system pressure



P4A23CH01

(A) low pressure circuit gauge  
(B) high pressure circuit gauge

1. Low pressure tap (LOW)
2. High pressure tap (HIGH)
3. Light blue low pressure pipe
4. Red high pressure pipe
5. Cleaner 134 equipment

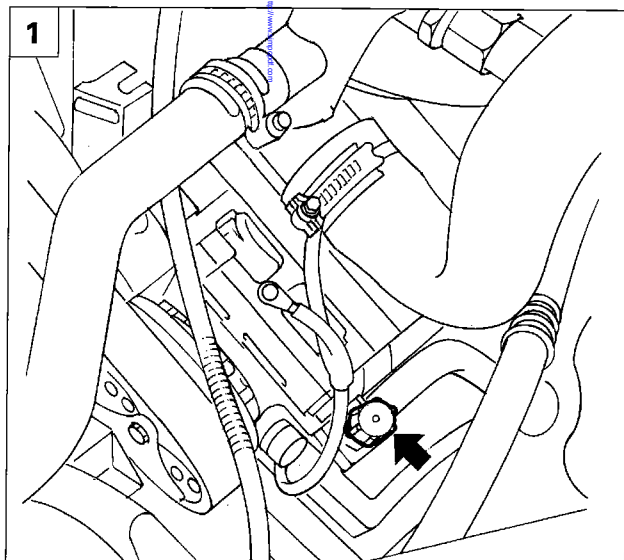
The pressure is checked using the Cleaner 134 equipment with the engine running (rotation speed of around 1500 rpm) and the outside temperature 20 - 28 °C, after having connected the pipes as illustrated on the previous page; under these circumstances the pressure gauge readings should be:

**low pressure circuit (pressure gauge A): 1.5 - 3.0 bar**

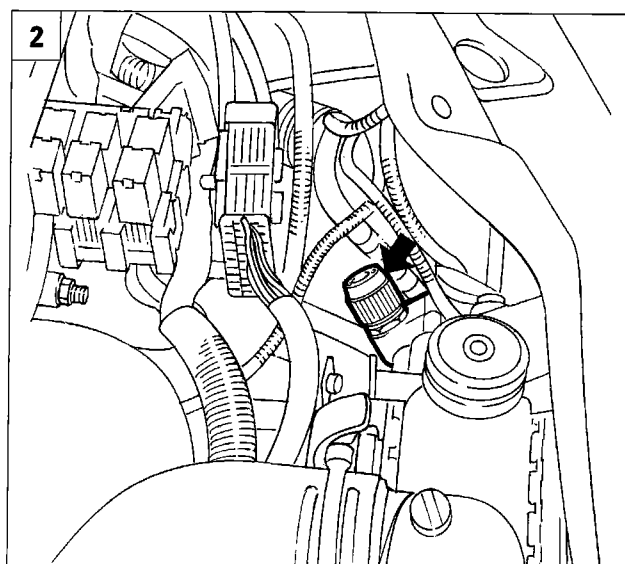
**high pressure circuit (pressure gauge B): 11 - 16 bar**

**NOTE** *The radiator/condenser cooling fan is switched on at a high pressure circuit pressure of 15 - 16 bar.*

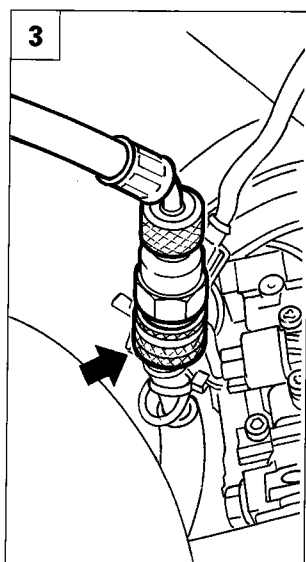
**Quantity of R 134 A refrigerant fluid contained in the system: 650 ± 25 cc.**



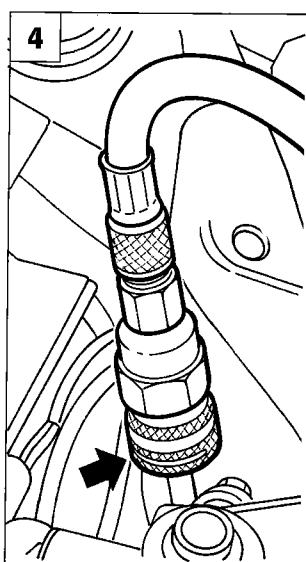
P4A21CH04



P4A22CH01



P4A24CH01



P4A24CH02

### DRAINING THE SYSTEM



*Before carrying out any operation which could result in R 134 A fluid escaping, the climate control system must be drained.*

*During the operation of draining the system, wear protective gloves and goggles for protection against contact with any jets of R 134 A fluid.*

In order to facilitate the draining of the fluid from the vehicle air conditioning system, the engine should be started up and the system left to run for 10-15 minutes before commencing the draining operations.

To drain the vehicle climate control system, use the Cleaner 134 equipment manufactured by ICF and carry out the following operations:

1. Undo the plug for the needle valve (low pressure side) which is at the end of a pipe on the pipe which connects the evaporator to the compressor.
2. Undo the plug for the needle valve (high pressure side) which is at the end of a pipe which is an integral part of the connector, at the end of the pipe which connects the condenser to the drier filter.
- 3.4. Fit the rapid attachment connector for the ends of the blue (low pressure side) and red (high pressure side) flexible connecting pipes for the Cleaner R134 equipment on the above mentioned needle valves; then carry out the operations for recovering and recycling the refrigerant fluid described and illustrated in the Bravo-Brava 2nd volume Manual (print no. 506.670/01).

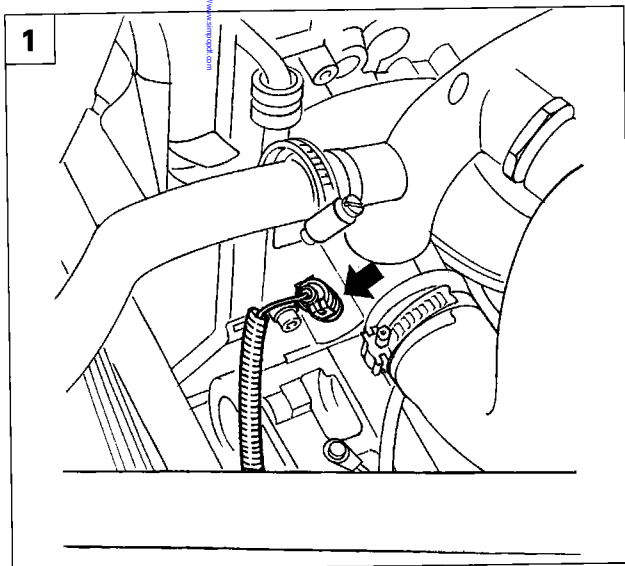
**NOTE** *To improve safety, the rapid attachment connectors for the pipes connected to the equipment and the needle valves have different diameters: the low pressure side ones are larger and the high pressure side ones are smaller. Before attaching the rapid attachment connectors to the needle valves, the knurled ring nut shown by the arrow must be moved upwards.*

## COMPRESSOR

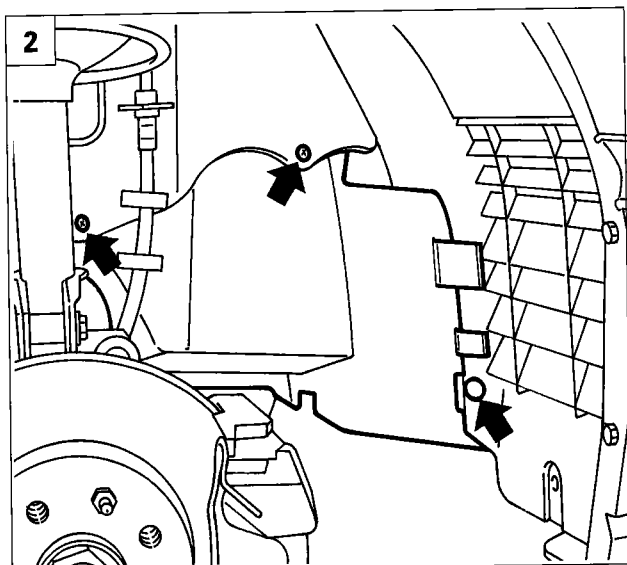
### Removing

1. Position the vehicle on a lift, disconnect the negative battery lead and drain the climate control system, carry out the following operations in order:
  - disconnect the connector and release it from the retaining band;
2. raise the vehicle and remove the right front wheel, remove the clip and undo the bolts shown in the diagram, fixing the wheel arch liner to the bodyshell.
3. Undo the bolts shown in the diagram and remove the lower shield from the engine compartment.
4. Acting on the belt tensioning device, loosen the tension of the single engine components drive belt; release the belt from the pulleys and remove it.

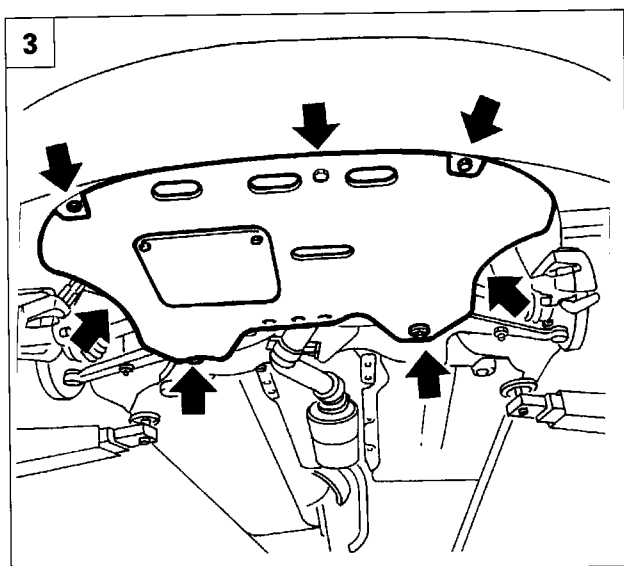
**NOTE** Avoid the belt coming into contact with oil or solvents which could affect the elasticity of the rubber with a consequent loss of grip. Also check that there are no cracks or cuts on the belt or else it will have to be replaced.



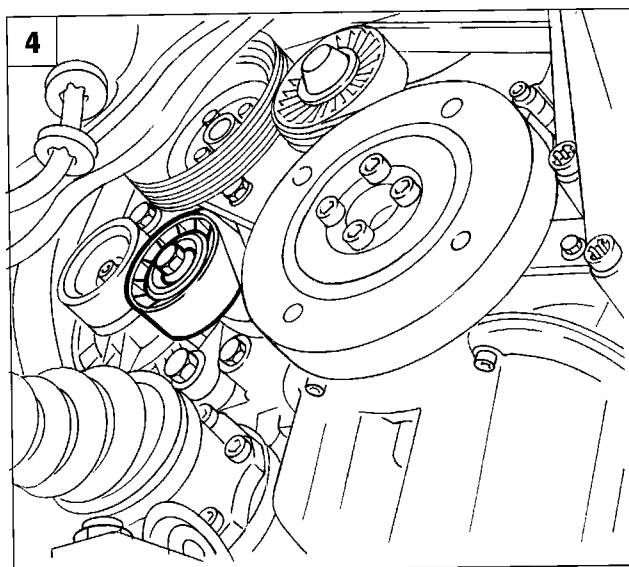
P4A25CH01



P4A25CH02

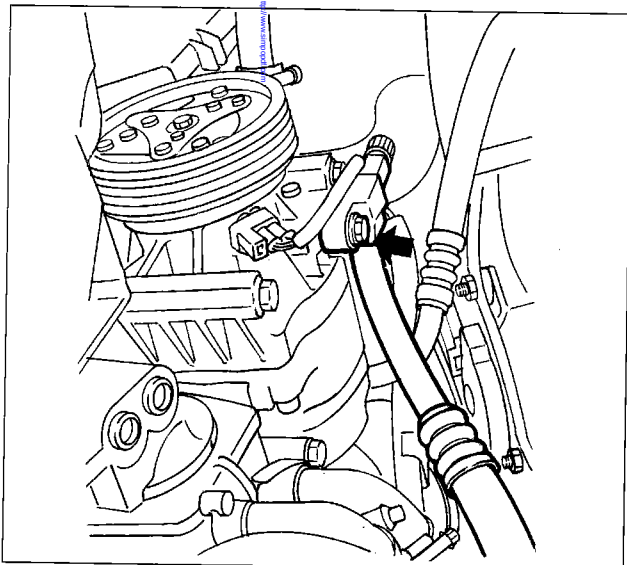


P4A25CH03



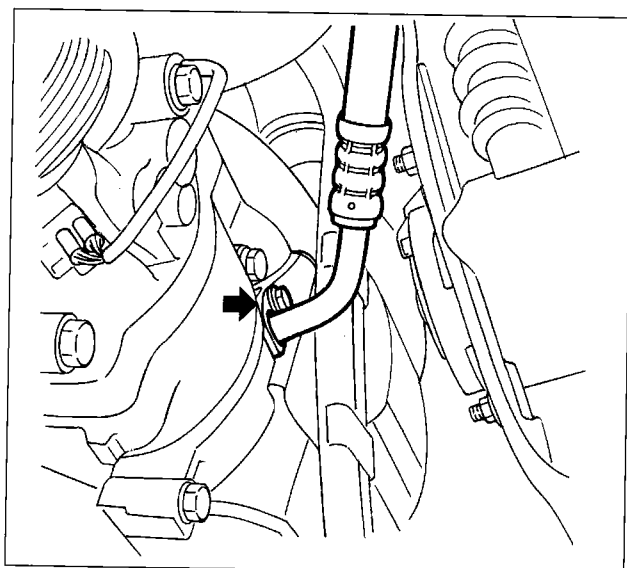
P4A25CH04

**50.**



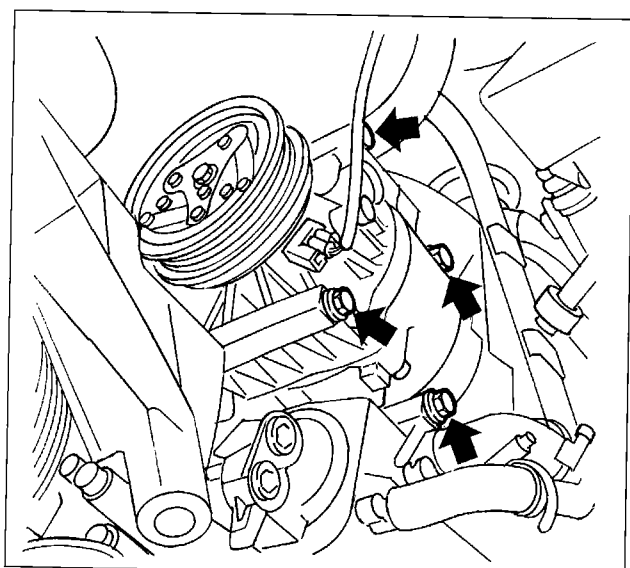
P4A26CH01

- Undo the bolt shown in the diagram and release the pipe from the compressor inlet duct;
- seal both the end of the pipe and the compressor duct using suitable plugs;



P4A26CH02

- undo the bolt shown and release the pipe from the compressor supply duct;
- seal both the end of the pipe and the compressor duct using suitable plugs;



P4A26CH03

- undo the bolts shown in the diagram and remove the compressor;

**Refitting**

To refit, simply reverse the order of the operations carried out for the removal.



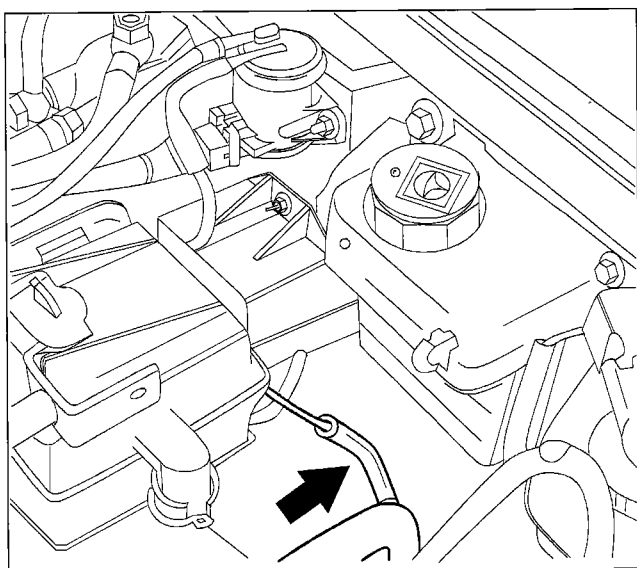
## INTRODUCTION

The heating inside the vehicle via the heater unit is insufficient, with the engine cold, especially in the case of diesel engines which reach operating temperature more slowly.

An additional heating system is offered for these engines which is activated when the engine is first running until a certain temperature is reached.

The system consists of an additional heating device, located on the engine coolant supply pipe to the heater unit.

This device contains three spark plugs which are very similar to those used for pre-heating the combustion chamber.



P4A27CH01

**Location of car interior coolant heater plugs**

The additional heater containing the three heater plugs is located on the coolant supply pipe to the heater unit.

The coolant temperature sensor is located on the same pipe, immediately upstream towards the engine thermostat.

The three relays are connected by the diesel filter, on a special bracket fixed to the engine compartment bulkhead.

The system control unit is located under the dashboard, behind the glove compartment.

## Operating logic

The operation of the heater plugs is controlled by an electronic control unit which operates one, two or three heater plugs thereby giving a supply 200W, 400W or 600W

This control logic depends on:

- the temperature of the coolant leaving the engine;
- the power level available;
- the engine speed.

The first information is supplied by a special temperature sensor located on the supply pipe towards the heater; the control logic deactivates the heater plugs when the temperature of the coolant coming from the engine exceeds 70 °C.

The control unit also takes into account the parameter of the temperature of the air in the engine compartment; it is not measured by a special sensor, but is assumed to be the same as the temperature of the coolant during starting; the switching off figure decreases from 70 °C to 65 °C if the temperature of the air is assumed to be greater.



### 50.

The second piece of information is the electrical power available and is obtained from the battery voltage value; if the voltage is above 12.8 V, the operation of the heater plugs is enabled, below this figure one, two or all three heater plugs are gradually deactivated.

This parameter is checked every 10 seconds in order to keep the power absorbed constantly under control so that the battery is not run down.

The information concerning the engine speed is used to prevent the operation of the heater plugs with the engine switched off, the enabling takes place at around 660 rpm.

The supply of one, two or three heater plugs is operated by two relays:

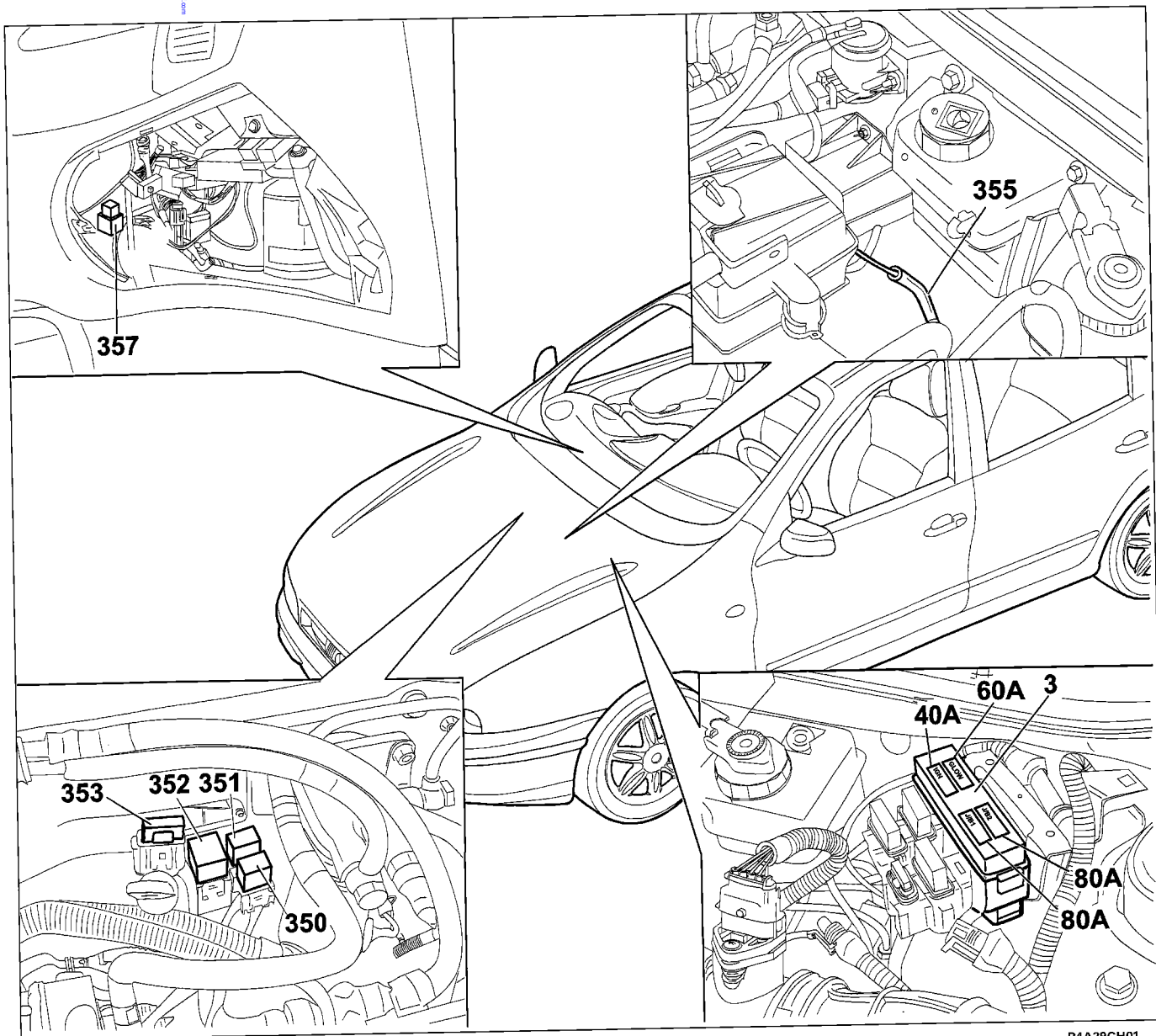
1st level is activated by the first relay.

2nd level is activated by the second relay.

3rd level is activated by both relays.

There is a third relay/remote control safety switch which interrupts the supply for the heater plugs if the earth contact is not correct; the metal device containing the heater plugs is, in effect, connected to the engine earth by means of a special cable loom; if this connection is interrupted, the relay stops the current supply to the heater plugs.

**LOCATION OF COMPONENTS ON VEHICLE**



P4A29CH01

**Components key**

- 3. Power fuse box
- 350. Relay for heating passenger compartment coolant
- 351. Safety relay for heating passenger compartment coolant
- 352. Relay for heating passenger compartment coolant

- 353. 70A protective fuse for passenger compartment coolant heater plugs
- 355. Passenger compartment coolant heater plugs
- 357. Passenger compartment coolant heater plugs control unit

**RADIO**

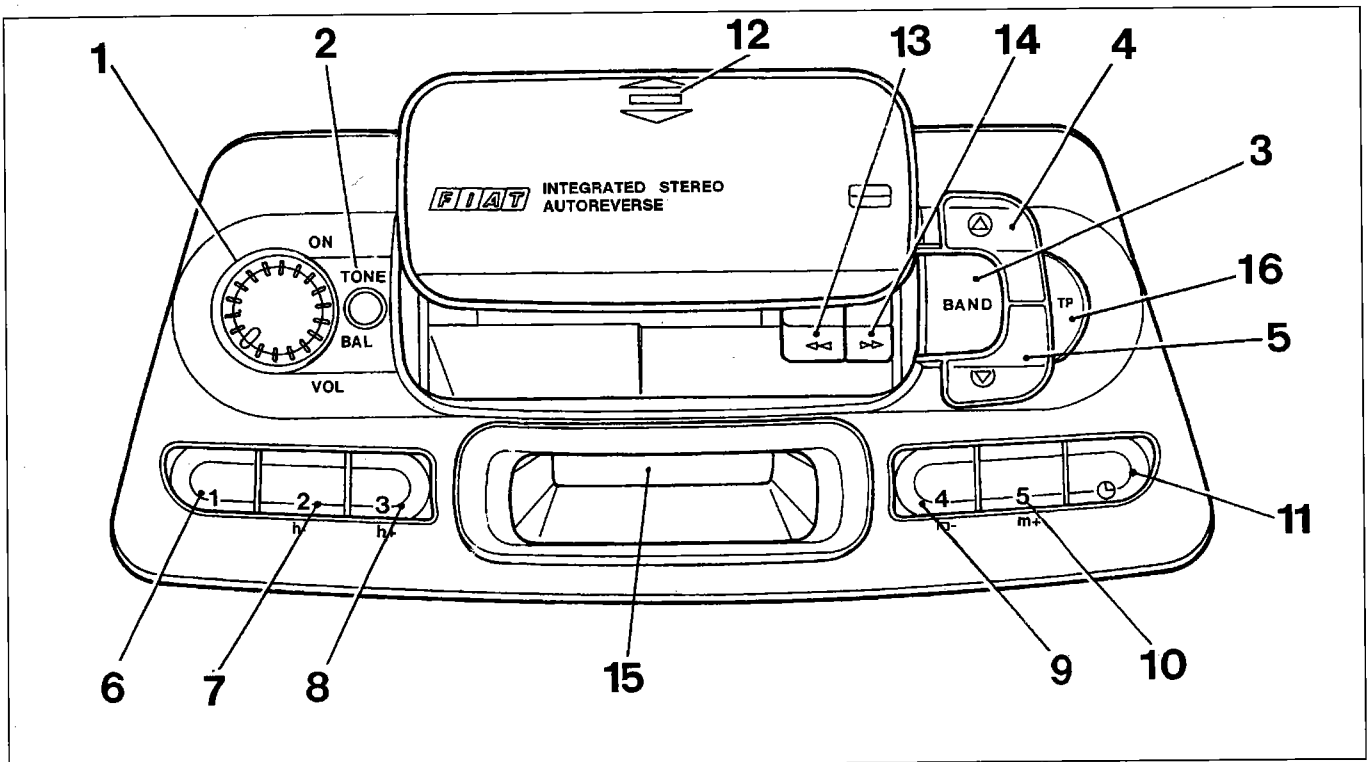
|                                                                       |    |
|-----------------------------------------------------------------------|----|
| - AD 185M radio cassette player                                       | 1  |
| - Description of operation of model AD 185M radio                     | 2  |
| - Switching radio on                                                  | 2  |
| - Adjusting volume                                                    | 2  |
| - Adjusting tone                                                      | 2  |
| - Adjusting balance                                                   | 2  |
| - Selecting frequency range                                           | 3  |
| - Tuning automatic search                                             | 3  |
| - Tuning manual search                                                | 3  |
| - Manual memorization of a station                                    | 4  |
| - Listening to a memorized station                                    | 5  |
| - Automatic memorization of 5 stations in the FM-RDS band (Autostore) | 5  |
| - Cassette player                                                     | 6  |
| - Fast forward winding of cassette tape                               | 7  |
| - Fast rewind of cassette tape                                        | 7  |
| - Autoreverse function                                                | 8  |
| - Equalization                                                        | 8  |
| - Clock function                                                      | 8  |
| - Display information                                                 | 10 |
| - Care and maintenance                                                | 10 |



**AD 185 M RADIO AND CASSETTE PLAYER**

Some versions of the cars are fitted as standard with a radio which comprises the following main components:

- non-removable AD 185 M radio and cassette player which is located at the centre of the instrument panel; its front, customized for FIAT, is fully integrated in the line of the dashboard;
- two loudspeakers located on the inside panels of the front doors;
- fishpole aerial located at the front centre of the car roof.

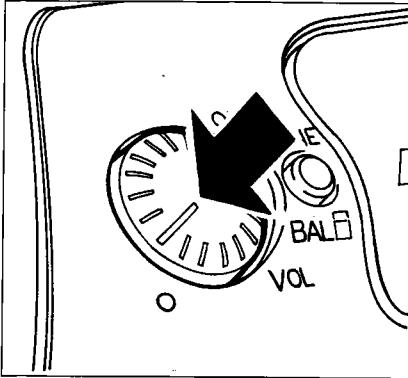


P4A01CL01

1. Knob for switching on the radio and adjusting the volume;
2. Cylindrical knob for adjusting the tone and adjusting the sound balance between the two loudspeakers;
3. Wave band selection button (FM1 - FM2 - MW - LW);
4. Button for automatic or manual search in order of increasing frequency of transmitting stations.
5. Button for automatic or manual search in order of decreasing of transmitting stations.
6. Button for preselecting transmitter no. 1 - selection of priority of indication of time / radio frequency on display.
7. Button for preselecting transmitter no. 2 - adjustment of hours in decreasing order.
8. Button for preselecting transmitter no. 3 - adjustment of hours in increasing order.
9. Button for preselecting transmitter no. 4 - adjustment in increasing order of minutes.
10. Button for preselecting transmitter no. 5 - adjustment in decreasing order of minutes.
11. Button for switching between displaying radio frequency / time and for selecting time adjustment.
12. Spot on which to press the door covering the cassette insertion slot, in order to lift the door.
13. Button for fast rewind of the cassette tape and for ejecting the tape from its seating (press together with button 14).
14. Button for fast forward winding of the cassette tape and for ejecting the tape from its seating (press together with button 13).
15. Display of wave band / frequency of station being listened to / stereo transmission / search sensitivity / time.
16. Button for selecting Traffic Program mode.

### DESCRIPTION OF OPERATION OF MODEL AD 185 M RADIO

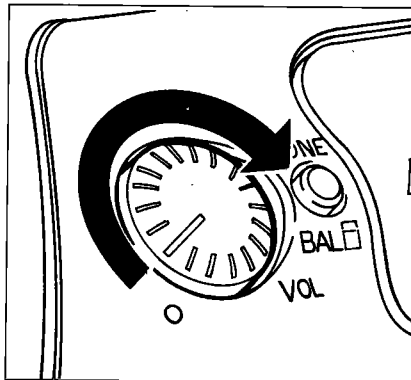
#### SWITCHING RADIO ON



P4A048L02

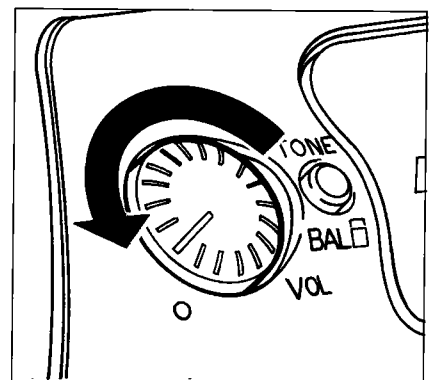
Press the button

#### ADJUSTING VOLUME



P4A048L03

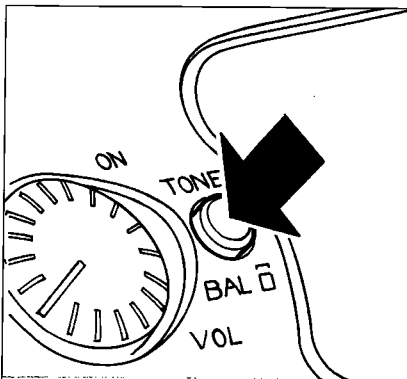
Increase volume



P4A048L04

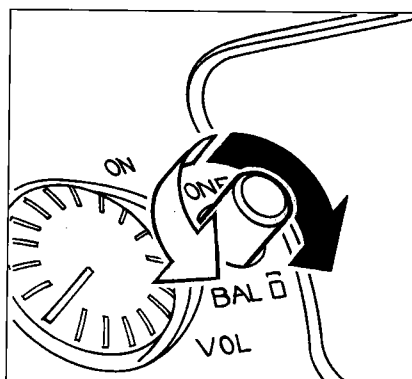
Decrease volume

#### ADJUSTING TONE



P4A048L05

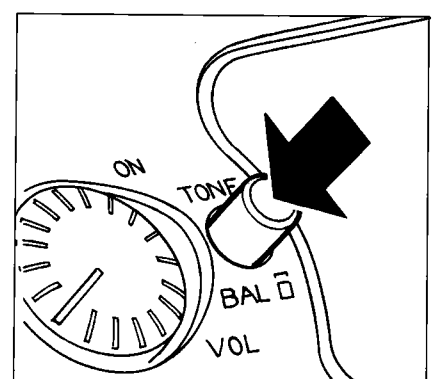
Press the button



P4A048L06

(●) Emphasize high tones

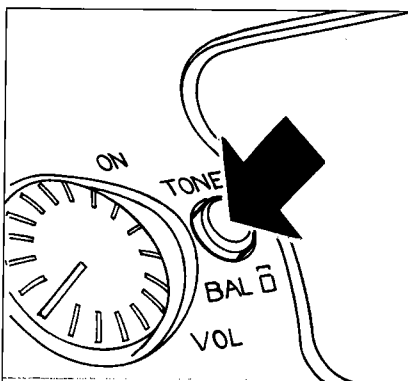
(○) Emphasize low tones



P4A048L07

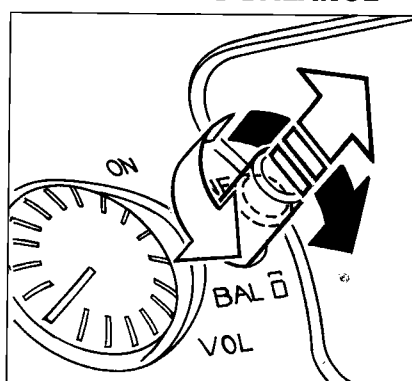
Press the button again after completing the adjustment

#### ADJUSTING BALANCE



P4A048L08

Press the button

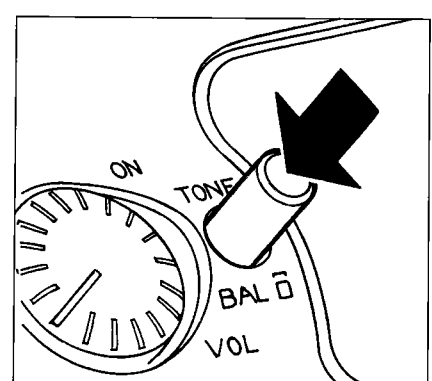


P4A048L09

Withdraw the button until it clicks

(●) Emphasize sound from right loudspeaker

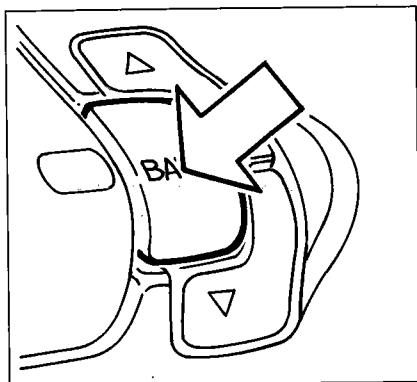
(○) Emphasize sound from left loudspeaker



P4A048L10

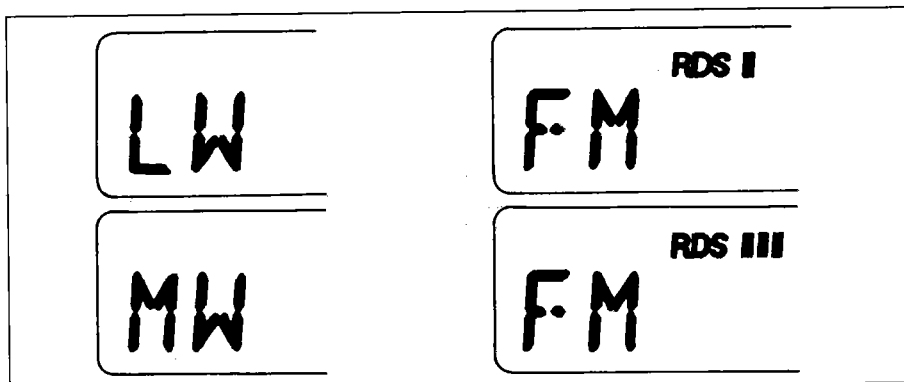
Press the button again after completing the adjustment

### SELECTING FREQUENCY RANGE



P4A048L11

Briefly press the button several times until the display shows the abbreviation of the desired frequency band.



P4A03CL01

**LW**=Long wave  
**MW**=Medium wave

**FM** = frequency modulation  
**FM-RDS** = Divided into three sub-bands with the indications RDS I, RDS II, RDS III for stations which transmit in RDS.

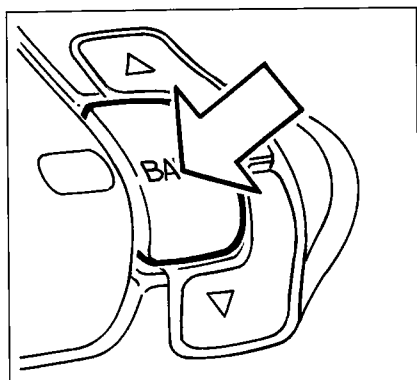
### NOTE RDS FUNCTION (Radio Data System)

The RDS system permits, with the enabled transmitters, automatic tuning of the optimum frequency of the selected station; you can therefore continue listening to the station without having to change frequency when you change zone. Naturally it must be possible to receive the station in question in the area you are passing through.  
The name of the station transmitting in RDS appears on the display.

### MEMORIZATION OF LAST STATION LISTENED TO

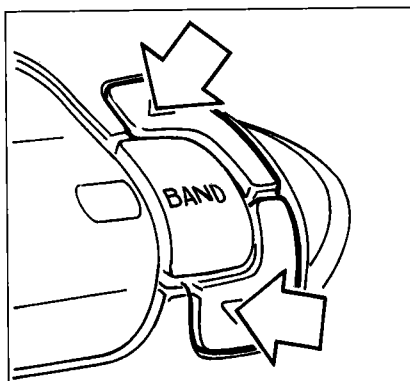
This takes place automatically for each frequency band which is tuned when you switch on the radio or change frequency band.

### TUNING AUTOMATIC SEARCH



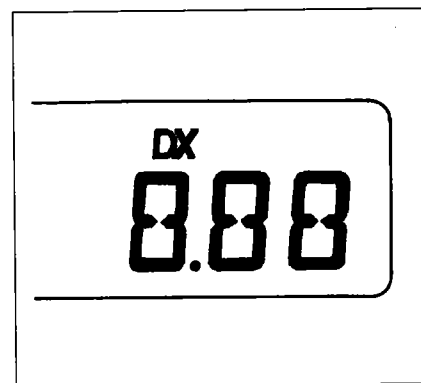
P4A03CL02

Briefly press the button several times until you select the desired frequency band.



P4A03CL03

Briefly press one of the two tuning buttons.



P4A03CL04

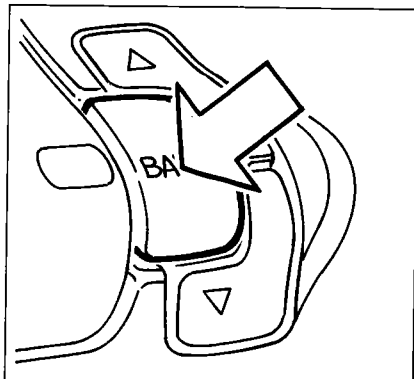
The sensitivity of the search increases in the 2nd and 3rd re-scan of the entire range of frequencies: from the 3rd pass, the letters DX appear on the display.  
To immediately select the maximum search sensitivity, keep one of the two above-mentioned buttons pressed until the letters DX are displayed.



Do not keep the button pressed for long, otherwise manual tuning search would be selected in the LW, MW or FM bands.

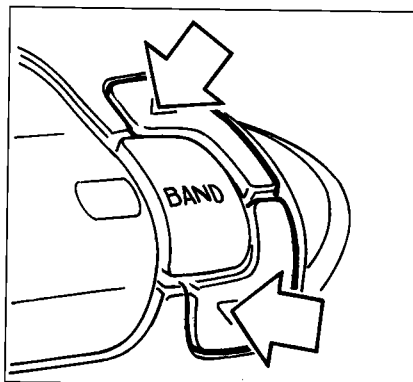
### 55.

#### TUNING - MANUAL SEARCH



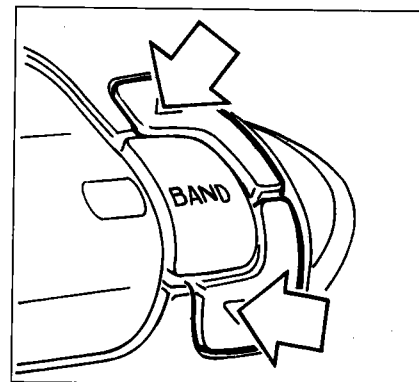
P4A03CL02

Briefly press the button several times until the desired frequency band is selected.



P4A03CL03

Keep one of the buttons pressed until the letters "MAN" appear flashing on the display.



Press (\*\*) one of the two buttons again to select the desired station.

(\*\*) Press the button briefly to change frequency gradually and in stages, and press the button for longer for a fast frequency change.

**NOTE** The manual search function is NOT active for the FM-RDS bands.

After 60 seconds, or after pressing one of the buttons illustrated below and identified by the numbers 1 to 5, you pass from automatic tuning mode and the letters "MAN" flashing on the display disappear.

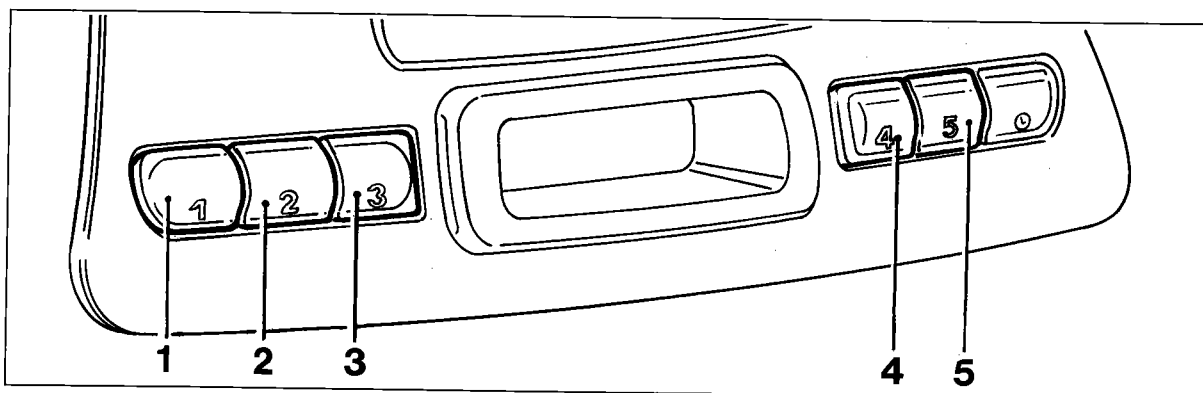
If one of the five buttons is pressed, the radio is tuned to the station previously memorized with that button.

**NOTE** When the frequency band is selected, you change from manual to automatic search.

#### MANUAL MEMORIZATION OF A STATION

You can memorize the station you are listening to within the selected frequency band by using of the 5 numbered buttons (figure below), which must be pressed until the station is again heard and the number of the button pressed appears on the display.

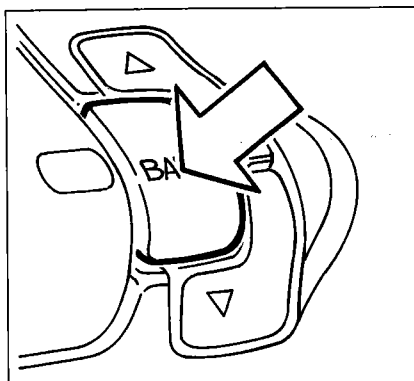
The settings remain memorized even if there is a cut in the supply to the radio.



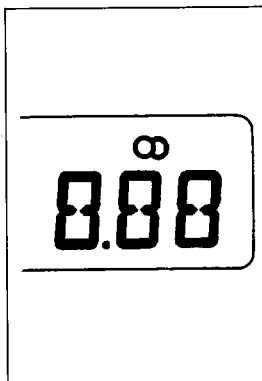
P4A048L16



### LISTENING TO A MEMORIZED STATION



P4A03CL02

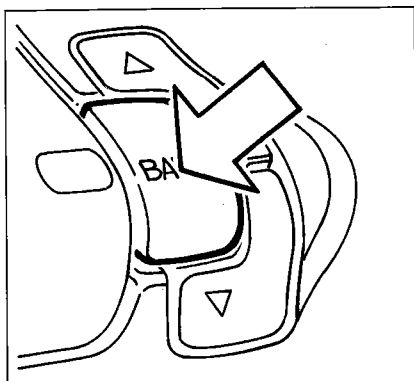


P4A05CL01

After selecting the desired frequency range by means of quick presses on the BAND button, briefly press one of the five buttons (see figure at bottom of previous page) for memorizing the stations, and the number of the latter appears on the display.

When the tuned station transmits programmes in stereo, the symbol 00 appears on the display (see figure), but if the incoming signal is weak, the reproduction is automatically changed from stereo a mono.

### AUTOMATIC MEMORIZATION OF 5 STATIONS IN THE FM-RDS BAND (AUTOSTORE)



In this mode you can memorize up to five stations for each of the three bands FMRDS I, FMRDS II and FMRDS III.

Proceed as follows:

- Press the BAND button until the desired band is selected.
- Keep the BAND button pressed until the tape is switched off and the letters "AST" are displayed.

The buttons numbered 1 to 5 (see figure at bottom of preceding page) automatically memorize the stations which have a strong signal at that moment in the selected band.

A maximum of two re-scans of the entire range of frequencies are executed, with increasing search sensitivity, and this operation is concluded when tape is switched on again and the letters AST disappear. The radio is tuned to the station memorized on button 1.

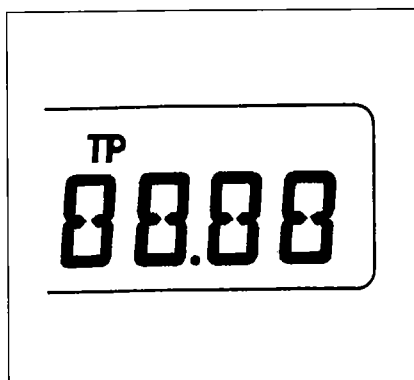
### TP function (Traffic Program)

Some stations belonging to the RDS I, RDS II and RDS III bands also transmit information on the traffic conditions.

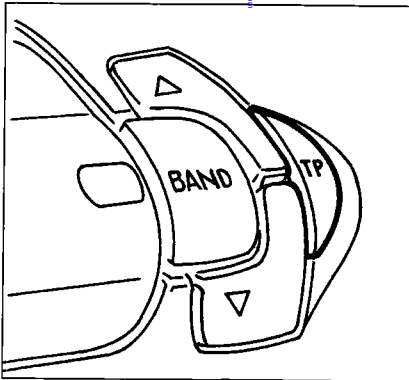
With the TP (Traffic Program) function you can:

- a) search only the RDS stations which transmit traffic information;
- b) receive traffic information even if the cassette player is in operation;
- c) receive traffic information at a pre-set minimum volume even with the radio volume set to zero.

**NOTE** Instructions are given below for carrying out each of the operations described in points a), b) and c) above.



P4A05CL02



P4F06CL01

#### Point a)

- Select an RDS I, RDS II or RDS III band as described above;
- briefly press the "TP" button so that the letters "TP" are displayed.

If the outgoing transmitter is not enabled to supply traffic information, the radio will automatically tune to the nearest transmitter enabled to do so.

If you wish to search other stations enabled for the service, press the tuning buttons (A).

To memorize the transmitters with the "TP" function activated, carry out the memorization operations (see "Memorization of a station" sub-section).

As an alternative to manual memorization, keep the "BAND" button pressed until the cassette is switched off, to effect automatic memorization (see "Automatic memorization in the FM-RDS band - Autostore")

#### Point b)

If you wish to receive traffic information, before inserting the cassette tape, tune to an RDS TP transmitter. If traffic information is transmitted from the latter during listening of the tape, the tape will automatically stop temporarily and will resume automatically when the message has finished.

#### Point c)

You can receive traffic information even if you are not listening to the radio. After tuning to an RDS TP transmitter and setting the volume to zero, if that transmitter transmits traffic information, it will be heard at a pre-set minimum volume.



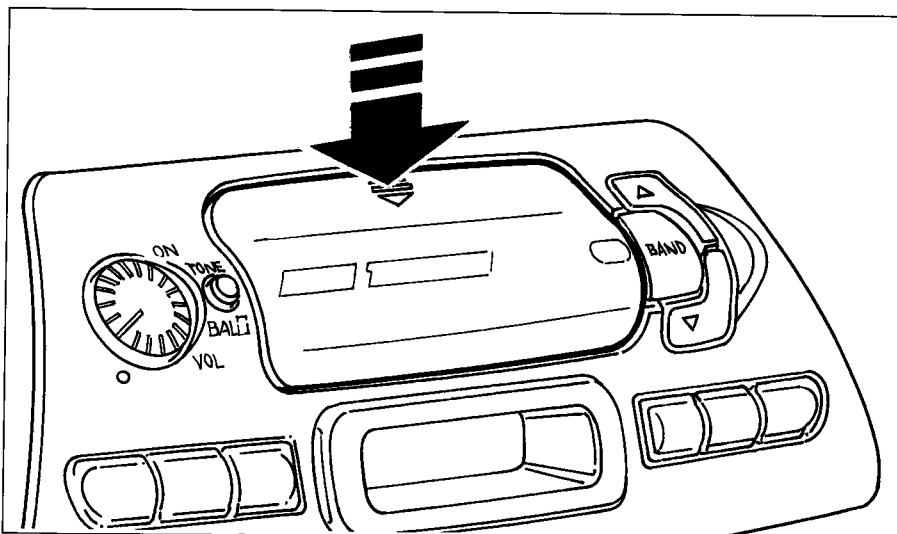
*In some countries there are stations which do not transmit traffic information, even with the TP function activated.*

#### EON (Enhanced Other Network) function

In some countries there are circuits which group together several transmitters enabled to transmit traffic information.

In these cases, listening to the programme of the RDS TP will be temporarily interrupted to receive traffic information, whenever this information is transmitted by one of the transmitters on the same circuit.

To exclude the EON function, press the "TP" button briefly.

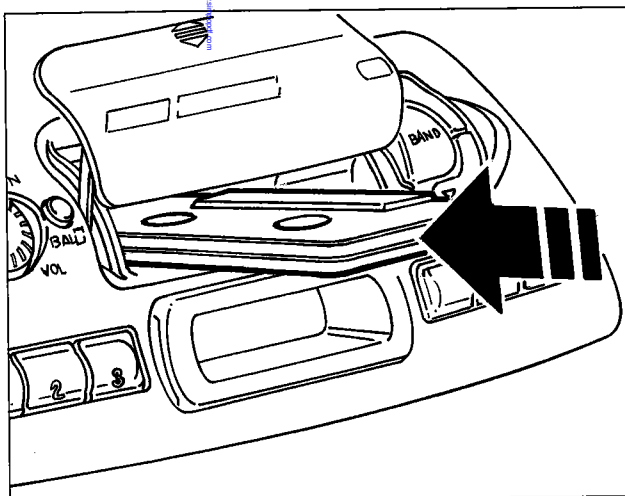


P4F048L19

#### CASSETTE PLAYER

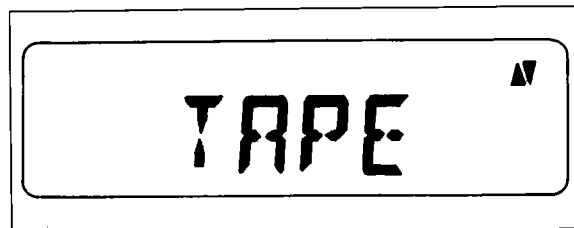
##### Cassette tape reproduction

Press vertically on the two arrows at the top of the door on the tape insertion slot, until you hear the click of the clip disengaging.



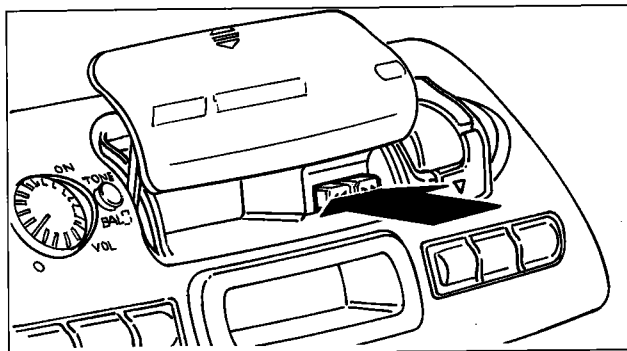
P4A048L20

Insert the cassette tape fully into its slot until it clicks into position; if the radio is on, it automatically starts playing the tape and the word "TAPE" appears on the display.



P4A07CL01

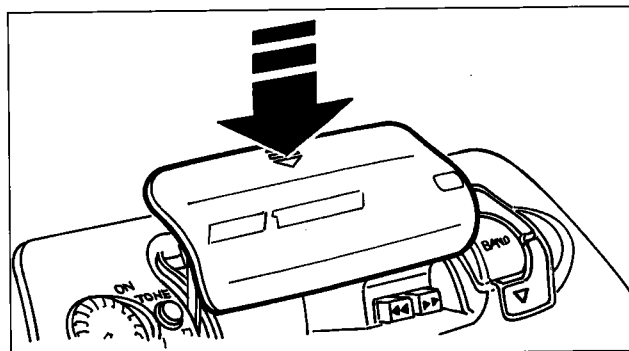
If the radio is switched off during listening of the tape and is then switched on again, the tape automatically starts at the point where it was interrupted.



P4A048L22

To change to radio, press simultaneously the buttons shown in the figure, which cause the cassette tape to be ejected from its compartment. The word "TAPE" disappears from the display and the radio is switched on.

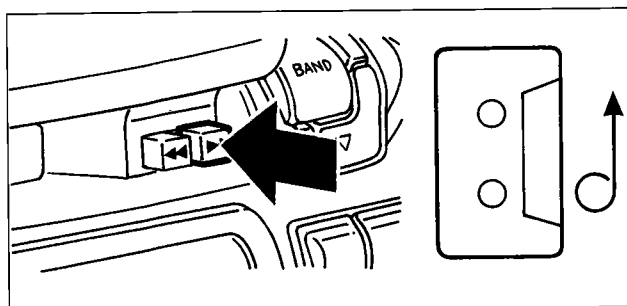
The cassette tape can be ejected even if the radio is off.



P4A048L23

To close the cassette compartment, press vertically on the arrows at the top of the door, until the lock clicks.

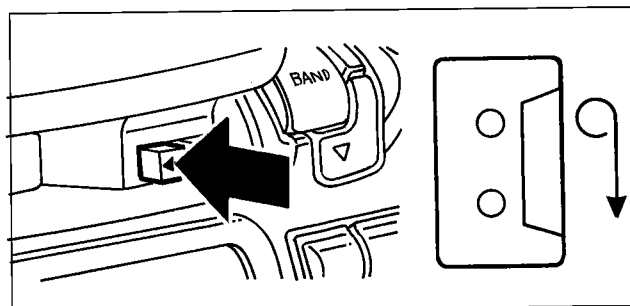
### **FAST FORWARD WINDING OF THE CASSETTE TAPE**



P4A048L24

Fully press the button indicated

### **FAST REWIND OF THE CASSETTE TAPE**

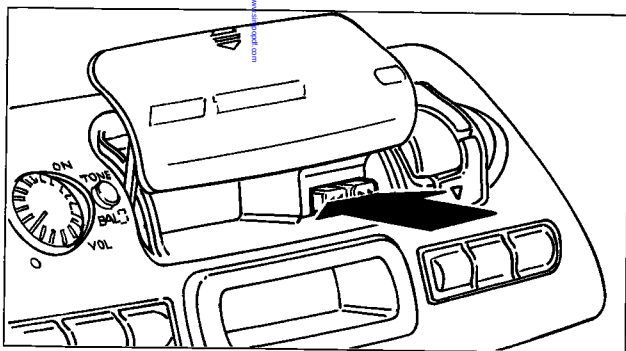


P4A048L25

Fully press the button indicated

To stop the forward winding or rewinding of the cassette tape, gently press the button next to the one previously pressed.

### 55.



#### AUTOREVERSE FUNCTION

At the end of the tape, the side of the tape is changed automatically (Autoreverse).

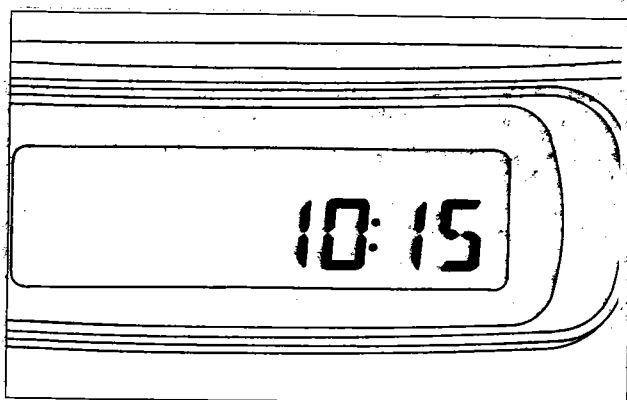
The side of the tape being listened to is shown on the display.

To change the side of the tape, gently press the buttons shown in the figure until you hear a click.

#### EQUALIZATION

The equalization of the cassette reader is automatically selected to read chromium tapes (CrO<sub>2</sub>).

#### CLOCK FUNCTION



The clock function displays hours and minutes. A colon, between the hours and minutes, flashes at a frequency of once a second. The clock is still displayed when the radio is off.

#### Display modes

When the radio is on, two display modes are possible, with these characteristics:

##### Mode 1 (M1)

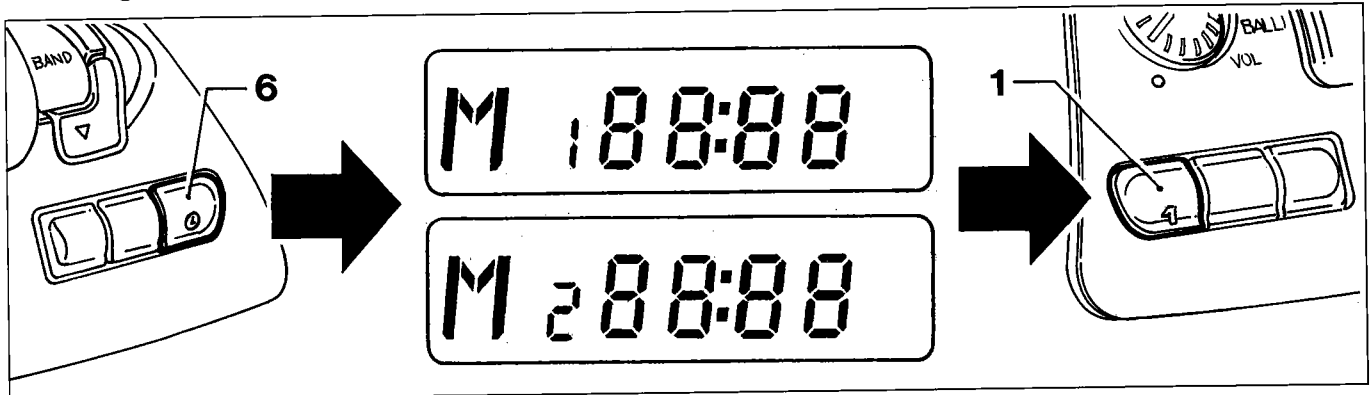
The clock is displayed instead of the radio messages (priority to clock function). When the radio is switched on without a cassette being inserted, or when a radio station is selected or a cassette is inserted with the radio on, the relevant message is displayed for about 10 seconds, after which the clock is again displayed.

##### Mode 2 (M2)

The messages relating to the radio function are displayed instead of the clock (priority to radio function).

When the radio is switched on, it automatically selects the mode present just before switching off.

**Selecting display modes**

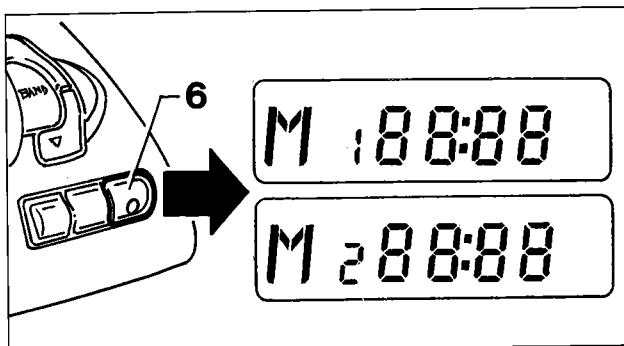


P4A048L29

Proceed as follows:

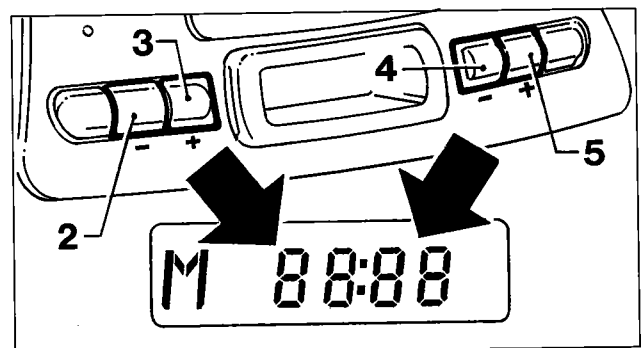
- keep the button (6) pressed until the colon between the hours and minutes stops flashing, and the letters "M1" or "M2" appear depending on the selected display mode;
- press the (1) button to select the other display mode;
- briefly press the button (6) again to confirm the selection; the colon between the hours and minutes starts flashing again and the letters "M1" or "M2" disappear.

**Setting correct time**



P4A048L30

Keep the button (6) pressed until the colon between the hours and minutes stops flashing and the letters "M1" or "M2" appear depending on the selected display mode;



P4A048L31

Adjust the hours and minutes on the display as follows:

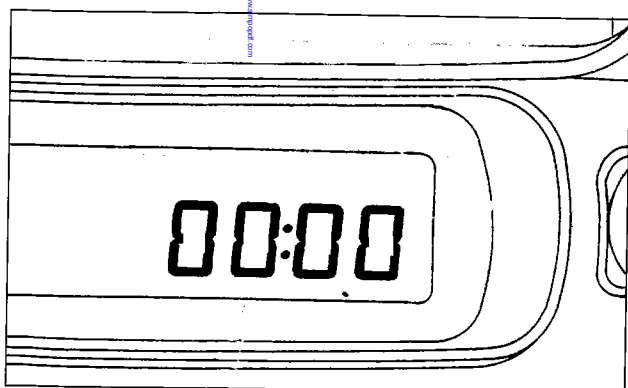
- to decrease the hours press button (2);
- to increase the hours press button (3);
- to decrease the minutes press button (4);
- to increase the minutes press button (5).

If the buttons (2-3-4-5) are pressed briefly, the hours and minutes are increased/decreased by one unit. Press the buttons for longer to change the hours/minutes display quickly. Once the correct time has been set, press the button (6) briefly again; this starts from 0 seconds so the clock can be set accurately. The colon between the hours and minutes starts flashing again and the letters "M1" or "M2" disappear.

**Changing priority between display of time/frequency**

Briefly press the button (6) to switch between the display of the clock and the messages relating to the radio function, for a duration of 10 seconds; after which the indication which has priority depending on the selected display mode with reappear automatically.

55.

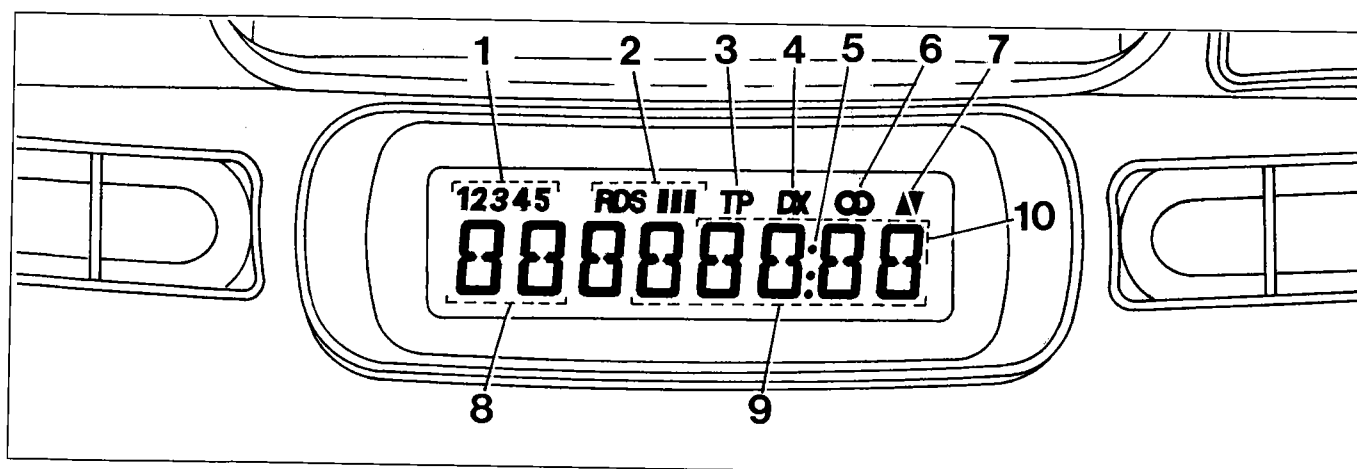


P4A10CL01

### Power cut

If the power supply to the radio is cut off (even for a few minutes), when it is reconnected, the display shows "00 : 00" with the digits flashing and the colon fixed, indicating that the clock has to be reset.

### DISPLAY INFORMATION



P4A10CL02

- |                                                              |                                                                         |
|--------------------------------------------------------------|-------------------------------------------------------------------------|
| 1. Number of preselected transmitting station.               | 7. Direction of feed of cassette (in cassette playing function).        |
| 2. Indication of RDS sub-bands.                              | 8. Distinctive letters of wave band.                                    |
| 3. Selection of Traffic Program mode.                        | 9. Numbers indicating tuning frequency with decimal point of frequency. |
| 4. Symbol of sensitivity of search of transmitting stations. | 10. Hours and minutes (in clock function).                              |
| 5. Colon between hours and minutes (in clock function).      |                                                                         |
| 6. Symbol indicating listening to transmission in stereo.    |                                                                         |

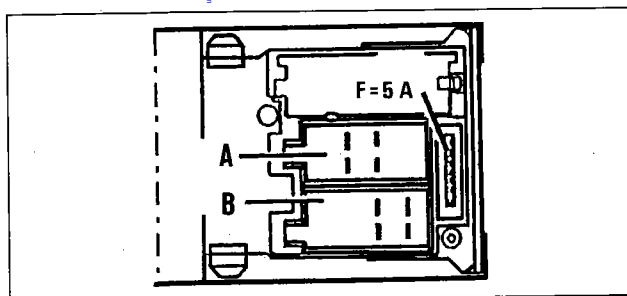
### CARE AND MAINTENANCE

Never expose the cassettes to heat or to direct sunlight, and always put them back in their boxes after use. It is recommended that you use high-quality tapes, and not longer than C-90 in order to ensure excellent reproduction at all times.

Clean the trim cover only with a soft anti-static cloth. Detergents and polishes could damage the surface.

Impurities on the reading head coming from the tapes could, over a period of time, cause a reduction in the high tones during reproduction. It is therefore advisable to clean the reproduction head periodically with a special non-abrasive head-cleaning cassette.

### Rear view of radio



P4A11CL01

### TECHNICAL CHARACTERISTICS

|                        |                             |
|------------------------|-----------------------------|
| No. of output channels | 2                           |
| Musical output power   | About 8W peak (per channel) |
| Nominal output power   | About 4W RMS                |
| Load impedance         | 4 Ohm                       |

### CONNECTOR A SEATING

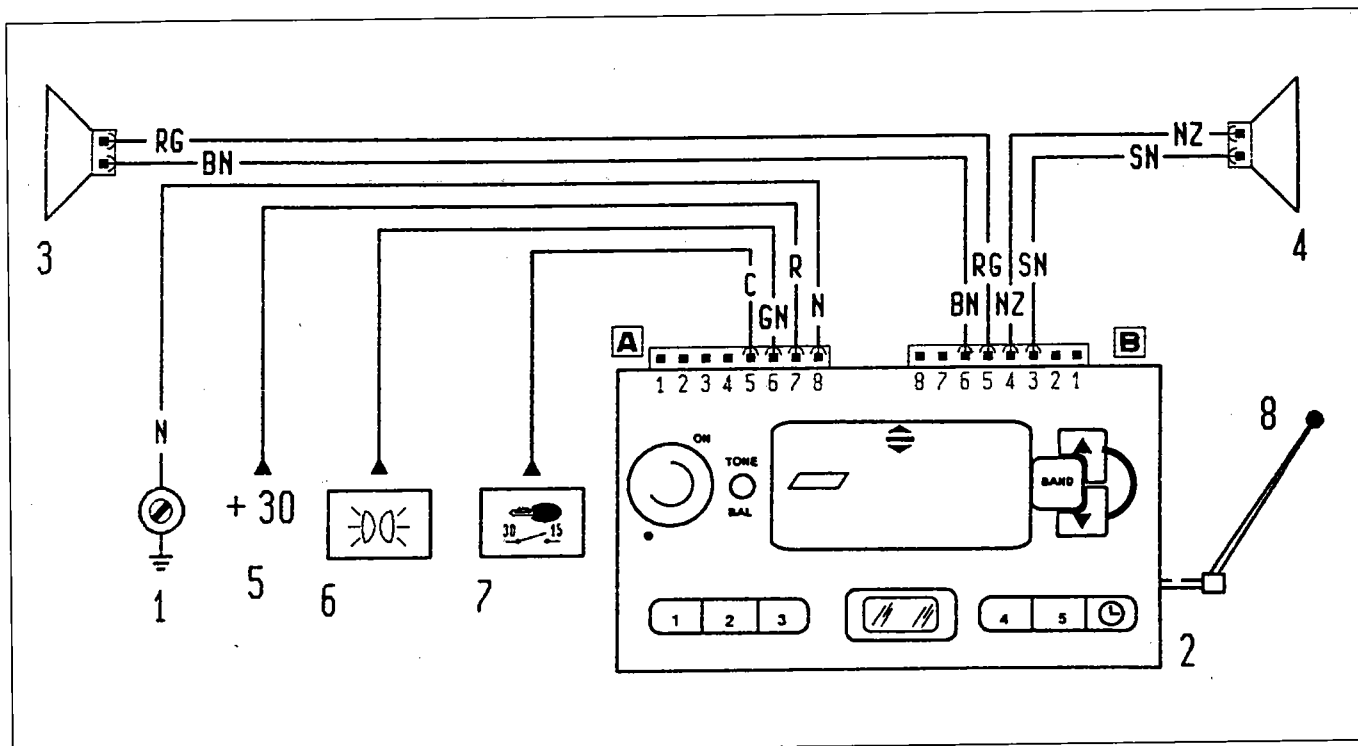
| N° | Connection          |
|----|---------------------|
| 5  | Key dependent (+15) |
| 6  | Lighting            |
| 7  | Supply (+30)        |
| 8  | Earth               |

### CONNECTOR B SEATING

| N° | Connection        |
|----|-------------------|
| 3  | Right loudspeaker |
| 4  | Right loudspeaker |
| 5  | Left loudspeaker  |
| 6  | Left loudspeaker  |

**NOTE** The terminals not mentioned in the tables are not connected.

### Wiring diagram



P4A11CL02

1. Earth on right dashboard
2. Radio
3. Loudspeaker on left door
4. Loudspeaker on right door

5. Battery supply (+ 30)
6. Lighting supply
7. Key supply (+ 15)
8. Fishpole aerial



|                    |    |
|--------------------|----|
| - Wiring diagrams  | 1  |
| - Connector blocks | 31 |
| - Key              | 36 |

Electrical system

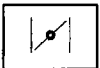
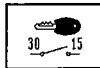
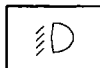
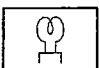
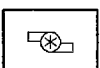
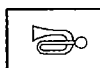
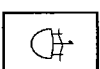
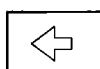
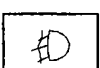
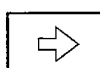
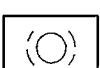
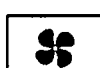
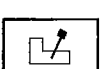
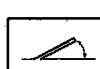
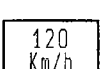
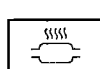
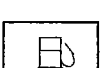
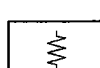
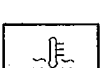
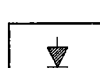
Wiring diagrams

Bravo-Brava

55.

| NAME                                                                                                                                                                                                                                                                                                                           | Bravo            |                   |                  |                   |                   | Brava            |                   |                  |                   |                   |                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------|------------------|-------------------|-------------------|------------------|-------------------|------------------|-------------------|-------------------|-------------------|
|                                                                                                                                                                                                                                                                                                                                | S                |                   | SX               |                   | GT                | S                |                   | SX               |                   | EL                | ELX               |
|                                                                                                                                                                                                                                                                                                                                | 1910<br>(75 bhp) | 1910<br>(100 bhp) | 1910<br>(75 bhp) | 1910<br>(100 bhp) | 1910<br>(100 bhp) | 1910<br>(75 bhp) | 1910<br>(100 bhp) | 1910<br>(75 bhp) | 1910<br>(100 bhp) | 1910<br>(100 bhp) | 1910<br>(100 bhp) |
| Version with air conditioner<br>Engine cooling system - Water temperature gauge                                                                                                                                                                                                                                                | 5                | 5                 | 5                | 5                 | 5                 | 5                | 5                 | 5                | 5                 | 5                 | 5                 |
| Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel in-<br>jection fault warning light - Fiat CODE system fault warning light - Rev counter                                                                                                      |                  | 9                 |                  | 9                 | 9                 |                  | 9                 |                  | 9                 | 9                 | 9                 |
| Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel in-<br>jection fault warning light - Fiat CODE system fault warning light - Rev counter                                                                                                      | 13               |                   | 13               |                   |                   | 13               |                   | 13               |                   |                   |                   |
| Version without air conditioner<br>Engine cooling system - Water temperature gauge - Car interior ventilation                                                                                                                                                                                                                  | 17               | 17                | 17               | 17                | 17                | 17               | 17                | 17               | 17                | 17                | 17                |
| Windscreen wash/wipe - Rear window wash/wipe - Electric horns - Heated rear window and warning light - Headlamp washer                                                                                                                                                                                                         | 21               | 21                | 21               | 21                | 21                | 21               | 21                | 21               | 21                | 21                | 21                |
| Air conditioner                                                                                                                                                                                                                                                                                                                | 29               | 25                | 29               | 25                | 25                | 29               | 25                | 29               | 25                | 25                | 25                |
| Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage<br>counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pade wear warning<br>light - Heater plugs warning light - Rev counter | 33               | 33                | 33               | 37                | 37                | 33               | 33                | 33               | 33                | 41                | 41                |
| Instrument panel connections                                                                                                                                                                                                                                                                                                   | 45               | 45                | 45               | 49                | 49                | 45               | 45                | 45               | 45                | 53                | 53                |

**Electrical symbols**

|                                                                                     |                                        |                                                                                     |                                     |                                                                                       |                                      |
|-------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------|
|    | Side lights                            |    | Choke (starter)                     |    | Ign. switch discharge                |
|    | Main beam headlamps                    |    | Water in fuel filter                |    | Dipped headlamps                     |
|    | Heated seat                            |    | Plug preheating                     |    | Indicators with central door locking |
|    | Seat belts                             |    | Turbo compressor pressure           |    | Electric horns                       |
|    | Heated rear window                     |    | Rear fog lamps                      |    | Left indicator                       |
|  | Handbrake on and low brake fluid level |  | Front fog lamps                     |  | Right indicator                      |
|  | A.B.S.                                 |  | Brake pad wear                      |  | Engine cooling system                |
|  | Hazard                                 |  | Turbo compressor pressure           |  | Windscreen wiper                     |
|  | Indicators                             |  | Auto transmission fluid temperature |  | Electric sunroof                     |
|  | Handbrake on and low brake fluid       |  | Speed limits                        |  | Catalytic converter temperature      |
|  | Recharging                             |  | Fuel gauge                          |  | Resistor                             |
|  | Engine oil pressure                    |  | Coolant temperature                 |  | Diode                                |

P4A001N01

# 55.

## Electrical symbols

|                                                                                     |                                   |                                                                                     |                                              |                                                                                       |                                     |
|-------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|
|    | Warning light                     |    | Trip computer control                        |    | Differential lock                   |
|    | Bulb                              |    | Electronic fuel injection                    |    | Auto transmission fluid temperature |
|    | Fuse                              |    | Engine oil level                             |    | Temperature                         |
|    | Switch open                       |    | Brake fluid level<br>(Japan version)         |    | Anti-theft device                   |
|    | Selector switch                   |    | Doors open                                   |    | Electric windows                    |
|  | Button open                       |  | Door locking                                 |  | Earth                               |
|  | Coil-controlled switch<br>(Relay) |  | Sport function controlled damping suspension |  | No. plate lights                    |
|  | Engine                            |  | Transistor                                   |  | Pulse (Timer) generator             |
|  | Rear window wiper                 |  | Air Bag                                      |  | Analogue clock                      |
|  | Headlamp washer                   |  | A.B.S. (Japan version)                       |  | Digital clock                       |
|  | Windscreen wash/wipe              |  | Car stop fault                               |  | Speedometer                         |
|  | Rear wash/wipe window             |  | Windscreen wiper                             |  | Rev counter                         |

P4A002N01

**Electrical symbols**



Digital speedometer



Digital rev counter



Digital fuel gauge



Analogue fuel gauge



Analogue coolant temperature gauge



Econometer



Digital coolant temperature gauge



Engine oil temperature



Engine oil pressure gauge



Voltmeter

P4A003N01

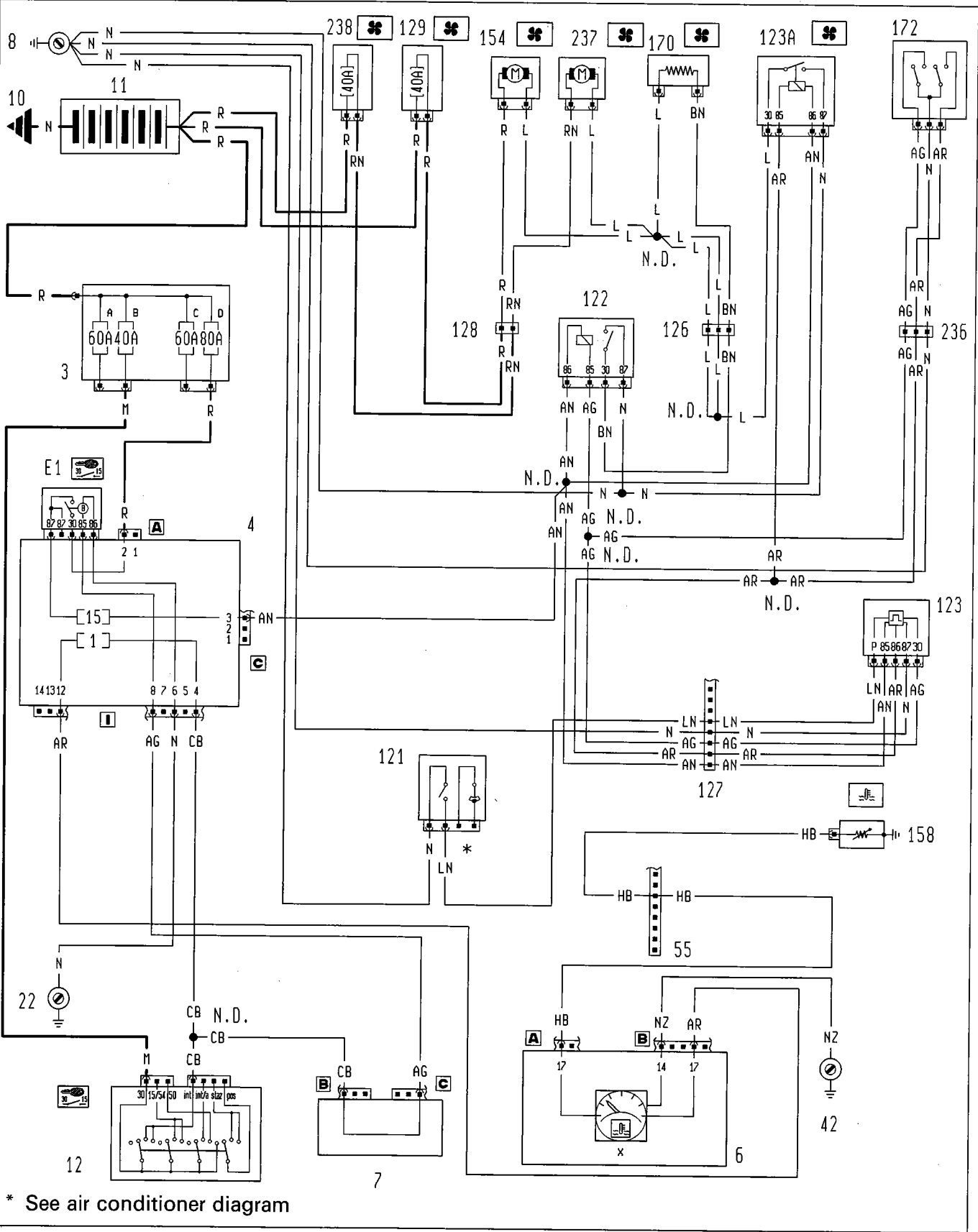
### Explanation to reading wiring diagram



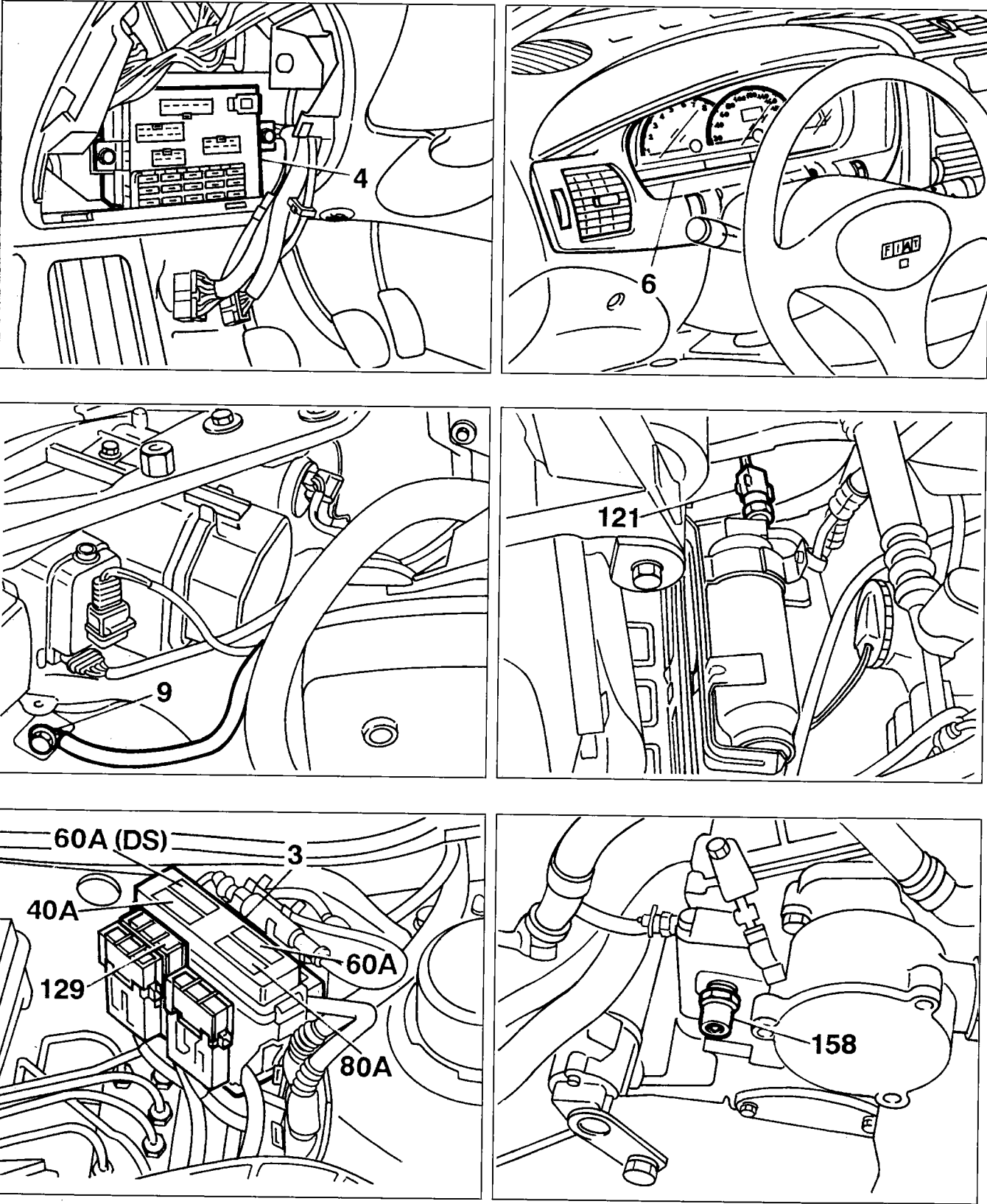
- A Component number
- B Connection number
- C Connector identification on component
- D Connecting pin number
- E Ultrasound-soldered joint taped into wiring loom

Electrical system  
Wiring diagrams  
55.

Version with air conditioner  
Engine cooling system - Water temperature gauge - (See key following diagrams)



Location of components



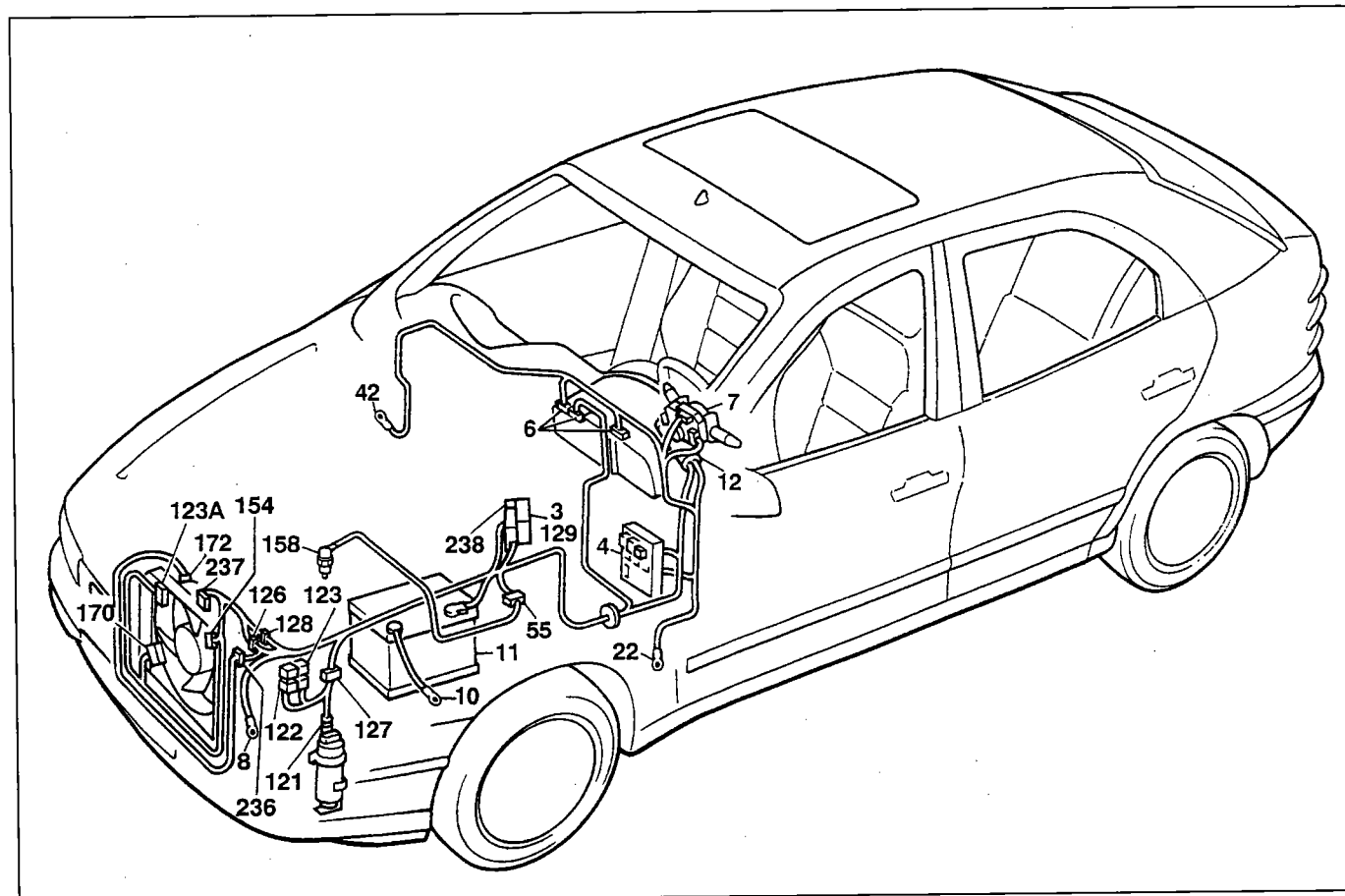
P4A05ZL01

4A06ZL

P4A026N02



### 55.



P4A07ZL01

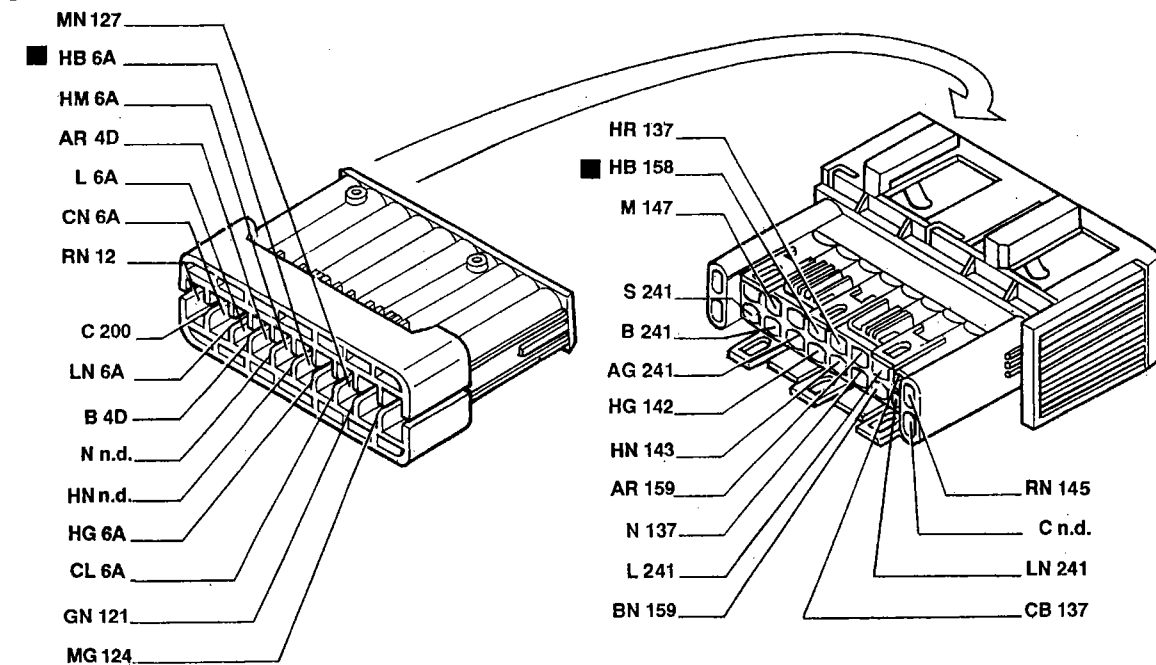
Version with air conditioner

Engine cooling system - Water temperature gauge

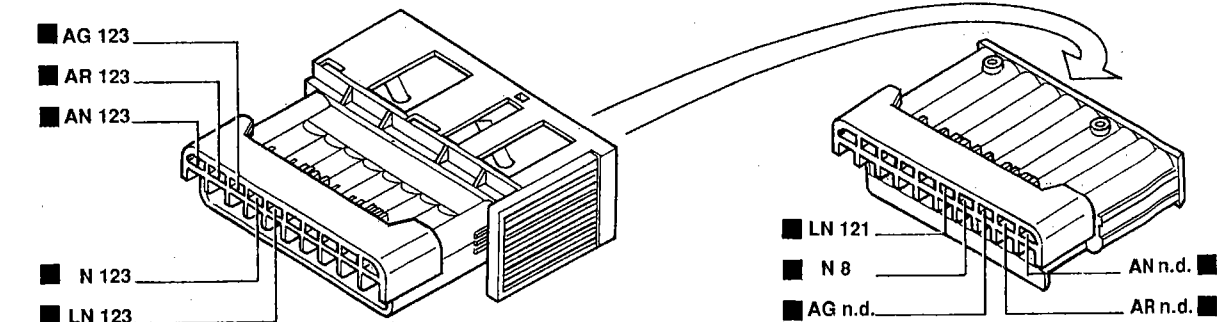
#### Key to components

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>3 Power fuse box:<br/> A 60A fuse protecting fuel injection system<br/> B 40A fuse protecting ignition system<br/> C 60A fuse protecting additional optional extras<br/> D 80A fuse protecting fuse and relay unit</p> <p>4 Fuse and relay unit:<br/> E1 Ignition switch discharge relay</p> <p>6 Instrument panel:<br/> X Water temperature gauge</p> <p>7 Stalk unit</p> <p>8 Front left earth</p> <p>10 Battery earth on body shell</p> <p>11 Battery</p> <p>12 Ignition switch</p> <p>22 Left dashboard earth</p> <p>42 Right dashboard earth</p> <p>55 Front/engine cables connection</p> <p>121 Three-stage pressure switch</p> <p>122 Engine cooling fan low speed control relay</p> | <p>123 Engine cooling fan high speed timer</p> <p>123A Engine cooling fan high speed control relay</p> <p>126 Front/air conditioner cables connection</p> <p>127 Connection between front left cables/cable on relay bracket</p> <p>128 Front/air conditioner cables connection</p> <p>129 40A power fuse protecting engine cooling fan</p> <p>154 Engine cooling fan</p> <p>158 Coolant temperature sensor for instrument</p> <p>170 Engine cooling fan limiting resistor</p> <p>172 Two-stage thermostat</p> <p>236 Front/air conditioner cables connection</p> <p>237 Additional engine cooling fan</p> <p>238 40A power fuse protecting engine cooling fan</p> <p>N.D. Ultrasound-soldered joint taped in wiring loom</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

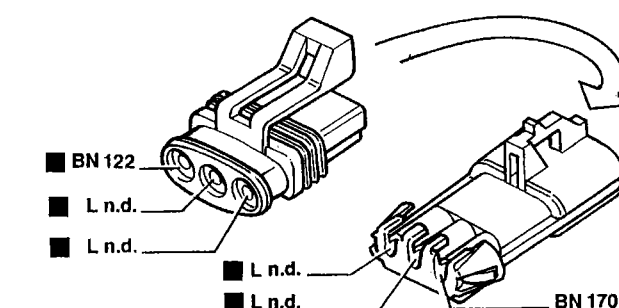
#### 55 Front/engine cables connection



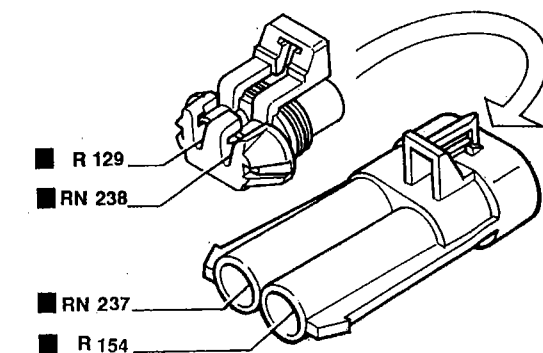
#### 127 Connection between front left cables/cable on relay bracket



#### 126 Front/air conditioner cables connection



#### 128 Front/air conditioner cables connection

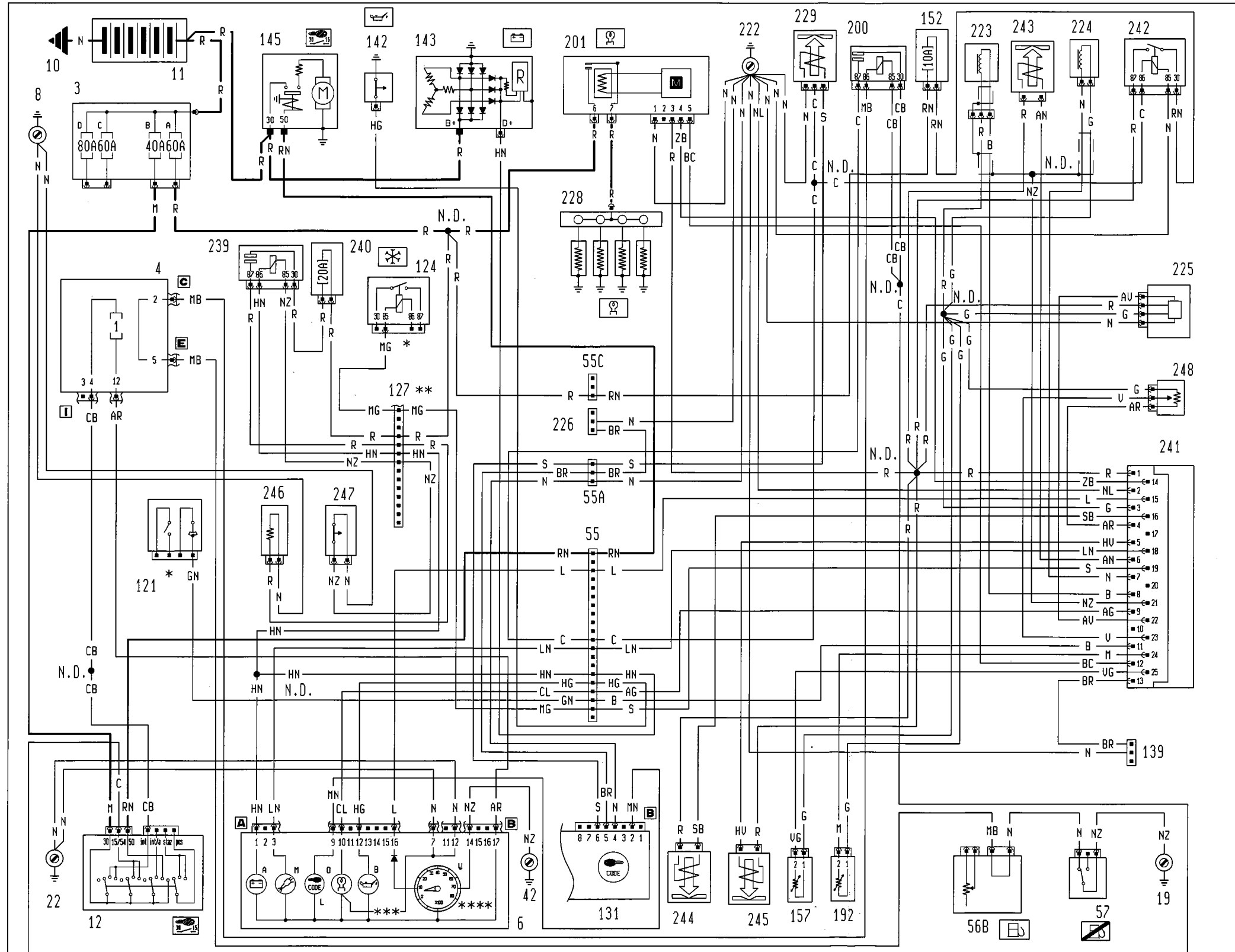


P4A08ZL01

The cables involved in the wiring diagram are marked with a solid square

Model: 1910 100 BHP

Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system fault warning light - Rev counter - (See key following diagrams)



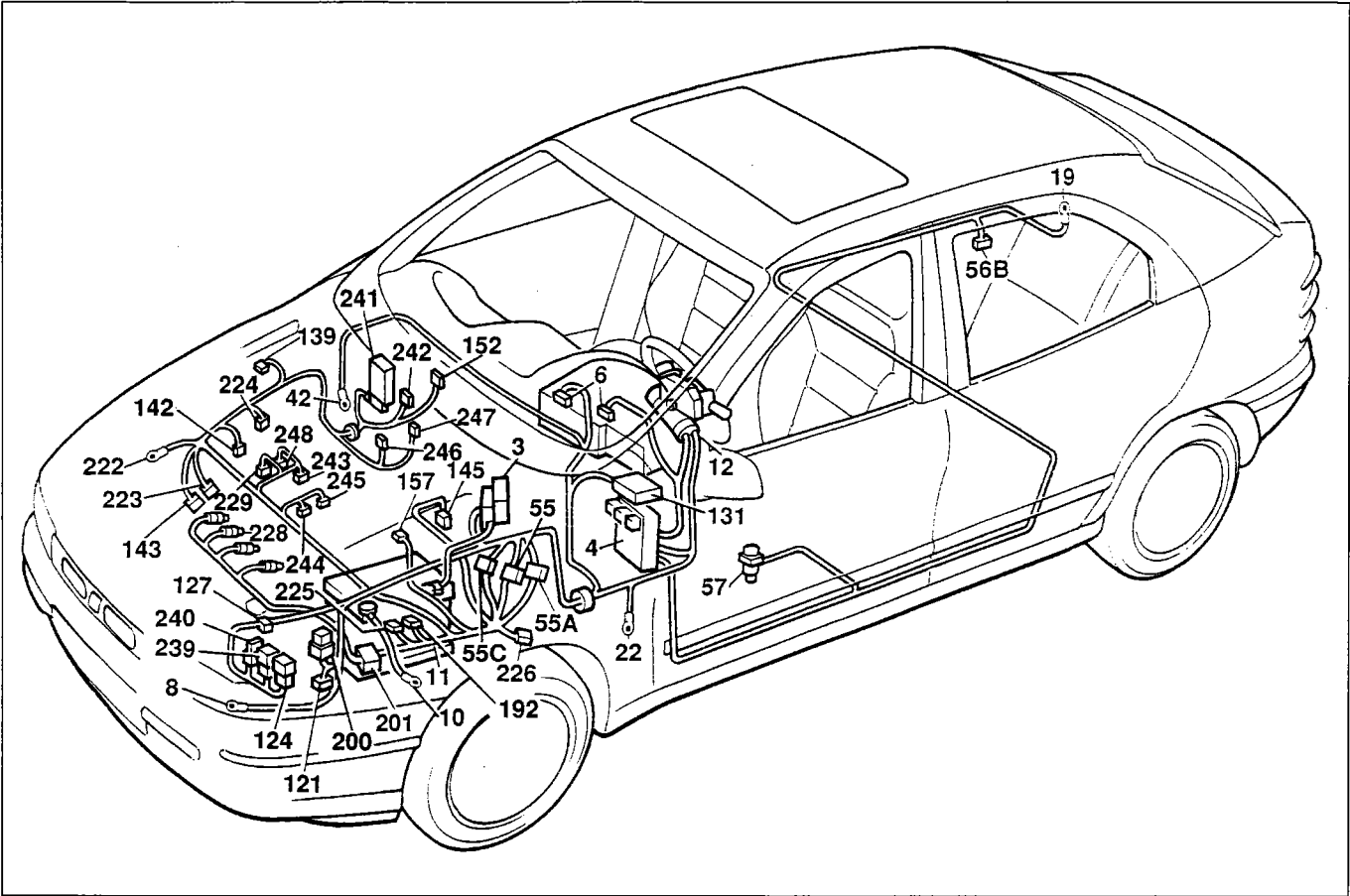
\* See air conditioner wiring diagram

\*\* Not present on versions with heater

\*\*\* Variant connection for S version

\*\*\*\* Not present on S version

55.



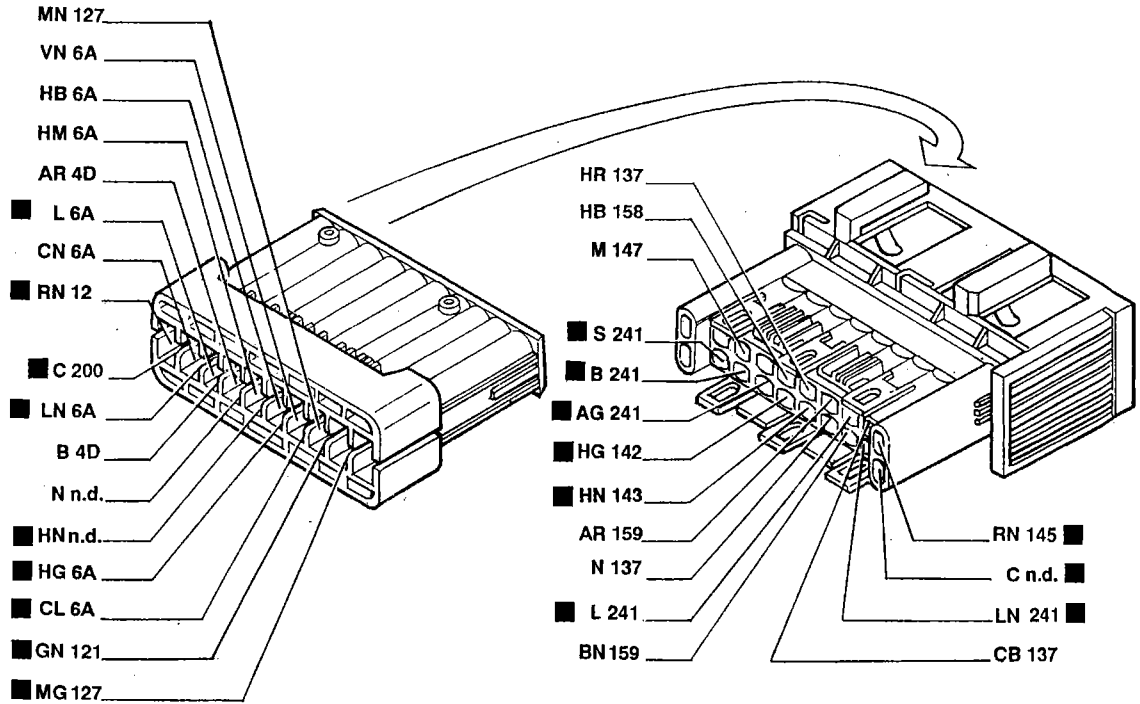
Model: 1910 100 BHP  
Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system warning light - Rev counter

Key to components

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fuse box:<br>A 60A fuse protecting fuel injection system<br>B 40A fuse protecting fuel injection system<br>C 60A fuse protecting additional optional extras<br>D 80A fuse protecting fuse and relay unit<br>4 Fuse and relay unit<br>6 Instrument panel:<br>A Low generator charge warning light<br>B Low engine oil pressure warning light<br>L Fiat CODE system fault warning light<br>M Fuel injection fault warning light<br>O Plug preheating warning light<br>W Rev counter<br>8 Front left earth<br>10 Battery earth on body shell<br>11 Battery<br>12 Ignition switch<br>19 Rear right earth<br>22 Left dashboard earth<br>42 Right dashboard earth<br>55 Front/engine cables connection<br>55A Front left/engine cables connection<br>55C Front left/engine cables connection<br>56B Fuel gauge sender unit<br>57 Inertial switch<br>121 Three-stage pressure switch<br>124 Air conditioner compressor control relay<br>127 Connection between front left cables/cable on relay bracket<br>131 Fiat CODE electronic control unit<br>139 Diagnostic socket for fuel injection | 142 Low oil pressure warning light switch<br>143 Alternator<br>145 Starter motor<br>152 10A fuse protecting fuel injection<br>157 Water temperature sensor for fuel injection<br>192 Air temperature sensor<br>200 Inertial switch relay<br>201 Plug preheating control unit<br>222 Earth for fuel system<br>223 Wheel speed sensor<br>224 Instrumented fuel injector<br>225 Flowmeter<br>226 Diagnostic socket for Fiat CODE system<br>228 Heater plugs<br>229 Engine cut-off electrostop<br>239 Heated diesel filter relay<br>240 20A fuse protecting heating diesel filter relay<br>241 Fuel pump electronic control unit<br>242 Fuel injection relay<br>243 Engine advance adjustment solenoid<br>244 Fast idle solenoid<br>245 E.G.R. solenoid<br>246 Heated fuel filter<br>247 Heated fuel filter thermal contact<br>248 Potentiometer on fuel pump<br>N.D. Ultrasound-soldered joint taped in wiring loom |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

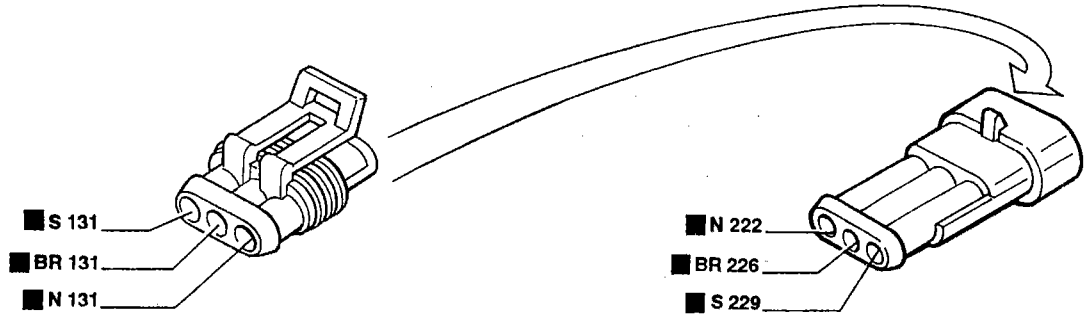
55

Front/engine cables connection



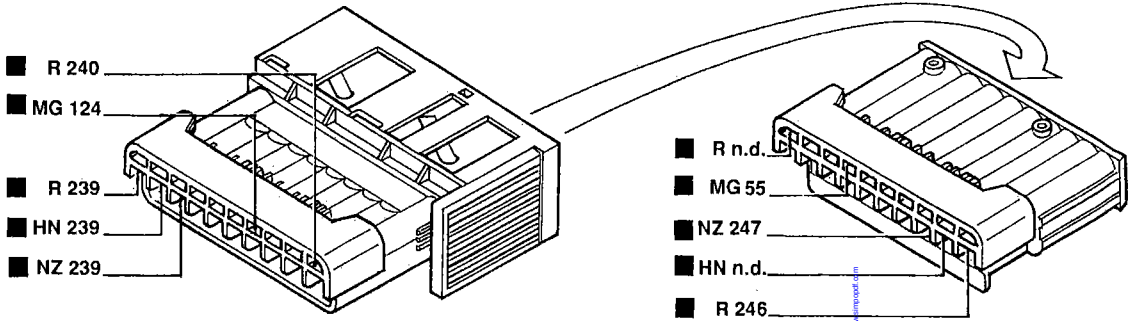
55A

Front left/engine cables connection



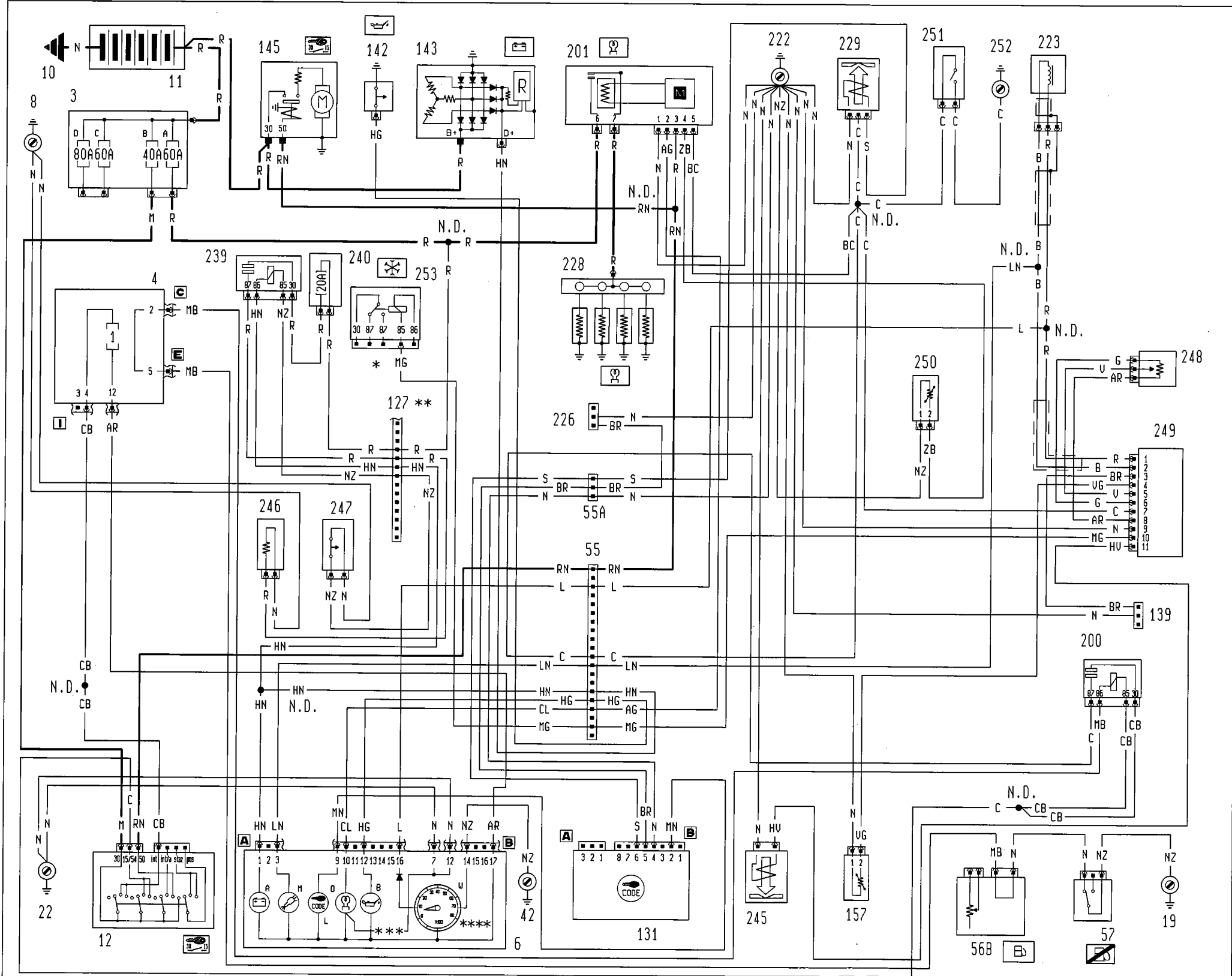
127

Connection between front left cables/cable on relay bracket



Version: 1910 75 BHP

Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE fault system warning light - Rev counter (See key following diagrams)



\* See air conditioner diagram

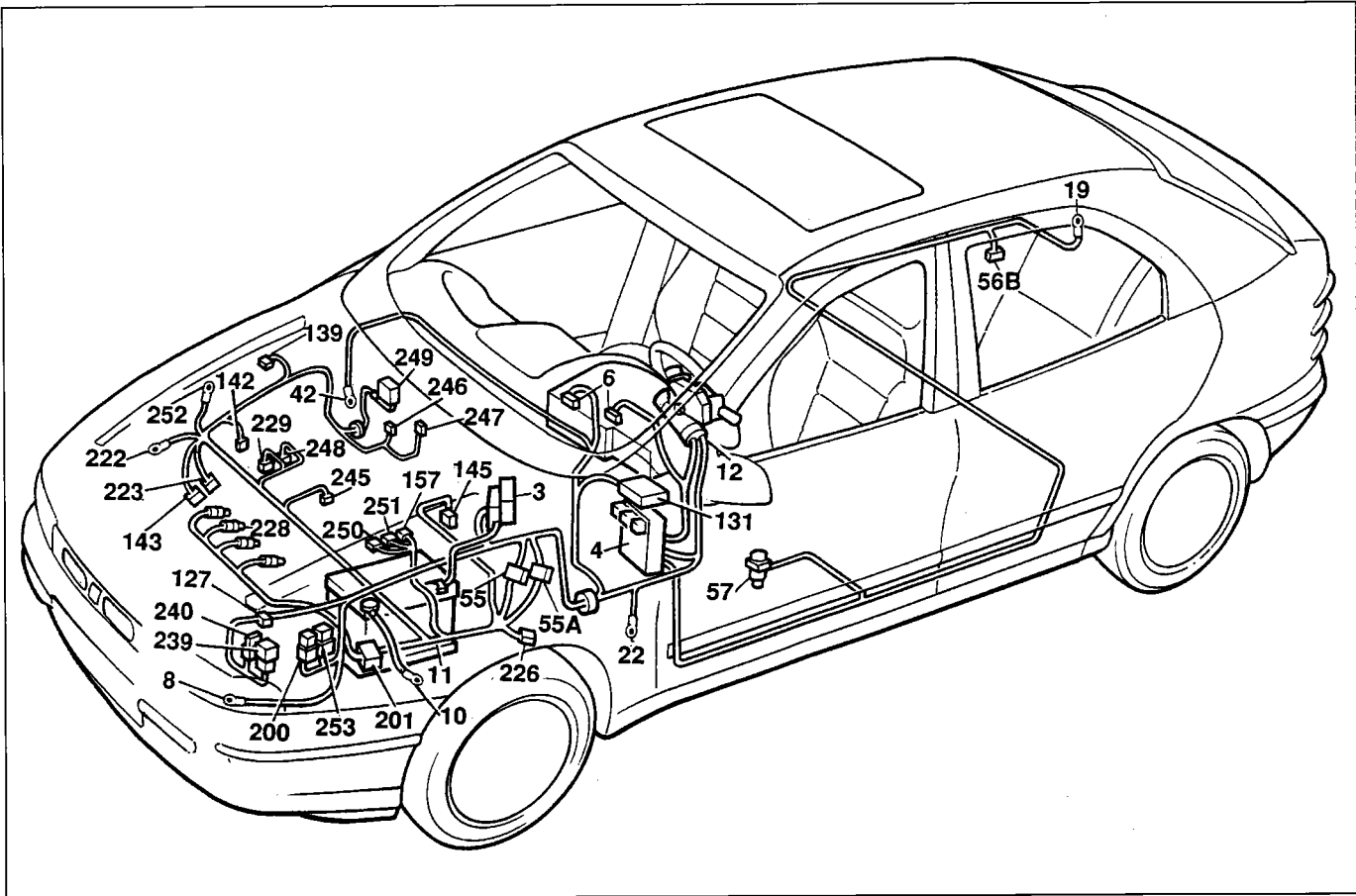
\*\* Not present on versions with heater

\*\*\* Variant connection for S version

\*\*\*\* Not present on S version



55.



Model: 1910 75 BHP  
Starting system - Recharging system and warning light - Low engine oil pressure warning light - Heater plugs warning light - Fuel injection fault warning light - Fiat CODE system fault warning light - Rev counter

Key to components

- 3 Power fuse box:  
A 60A fuse protecting fuel injection system  
B 40A fuse protecting ignition system  
C 60A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit

4 Fuse and relay unit

6 Instrument panel:  
A Low generator charge warning light  
B Low engine oil pressure warning light  
L Fiat CODE system fault warning light  
M Fuel injection fault warning light  
O Heater plug warning light  
W Rev counter

8 Front left earth

10 Battery earth on body shell

11 Battery

12 Ignition switch

19 Rear right earth

22 Left dashboard earth

42 Right dashboard earth

55 Front/engine cables connection

55A Front left/engine cables connection

56B Fuel gauge sender

57 Inertial switch

127 Connection between front left cables/cable on relay bracket

131 Fiat CODE electronic control unit

139 Diagnostic socket for fuel injection
- 142 Low oil pressure warning light switch

143 Alternator

145 Starter motor

157 Water temperature sensor for fuel injection

200 Inertial switch control relay

201 Plug preheating control unit

222 Earth for fuel system

223 Wheel speed sensor

226 Diagnostic socket for Fiat CODE system

228 Heater plugs

229 Engine cut-off electrostop

239 Heated diesel filter relay

240 20A fuse protecting heated diesel filter relay

245 E.G.R. solenoid

246 Heated fuel filter

247 Heated fuel filter thermal contact

248 Potentiometer on fuel pump

249 E.G.R. electronic control unit

250 Water temperature sensor for preheating control unit

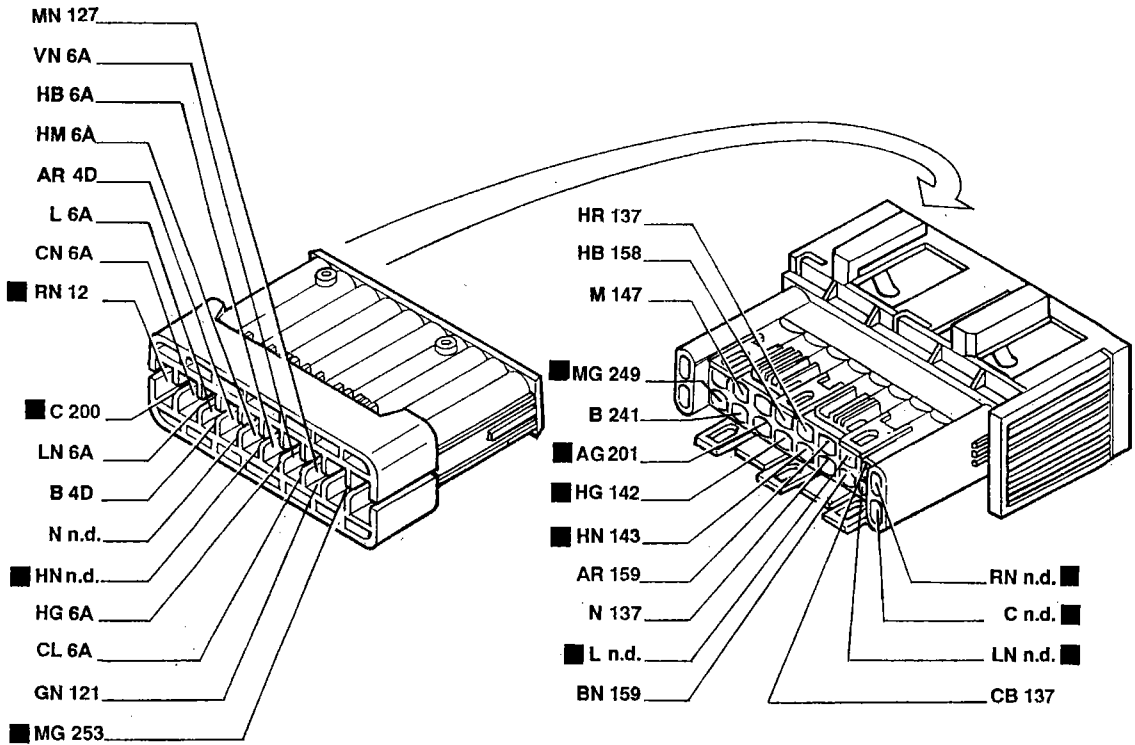
251 K.S.B. thermal switch

252 K.S.B. earth

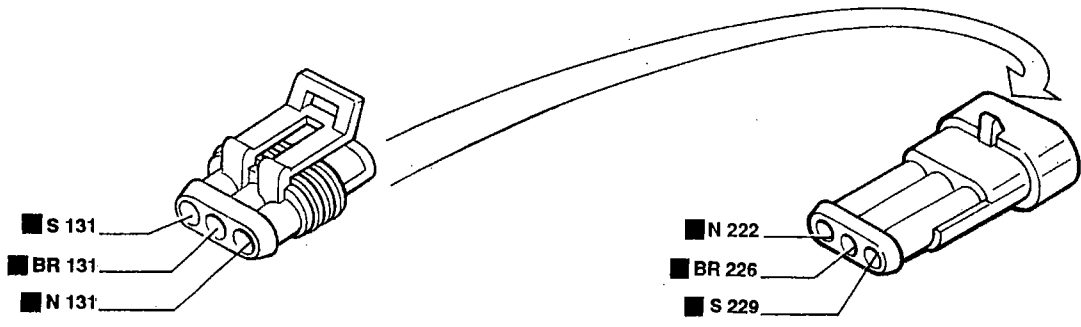
253 Relay for switching off compressor

N.D. Ultrasound-soldered joint taped in wiring loom

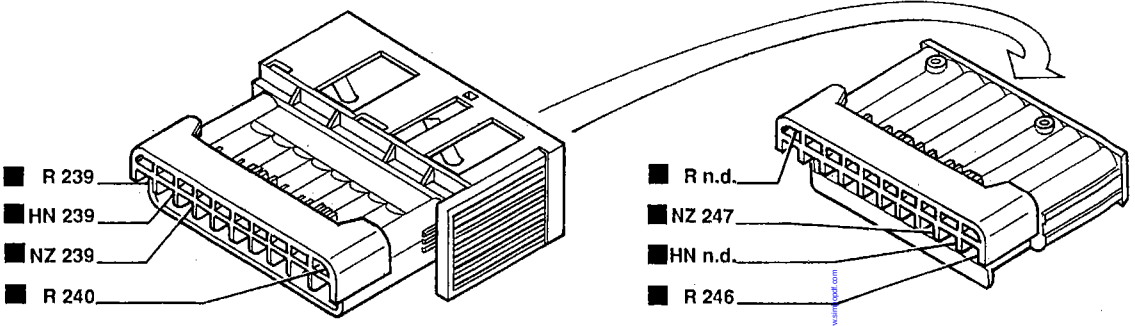
55 Front/engine cables connection



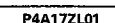
55A Front left/engine cables connection



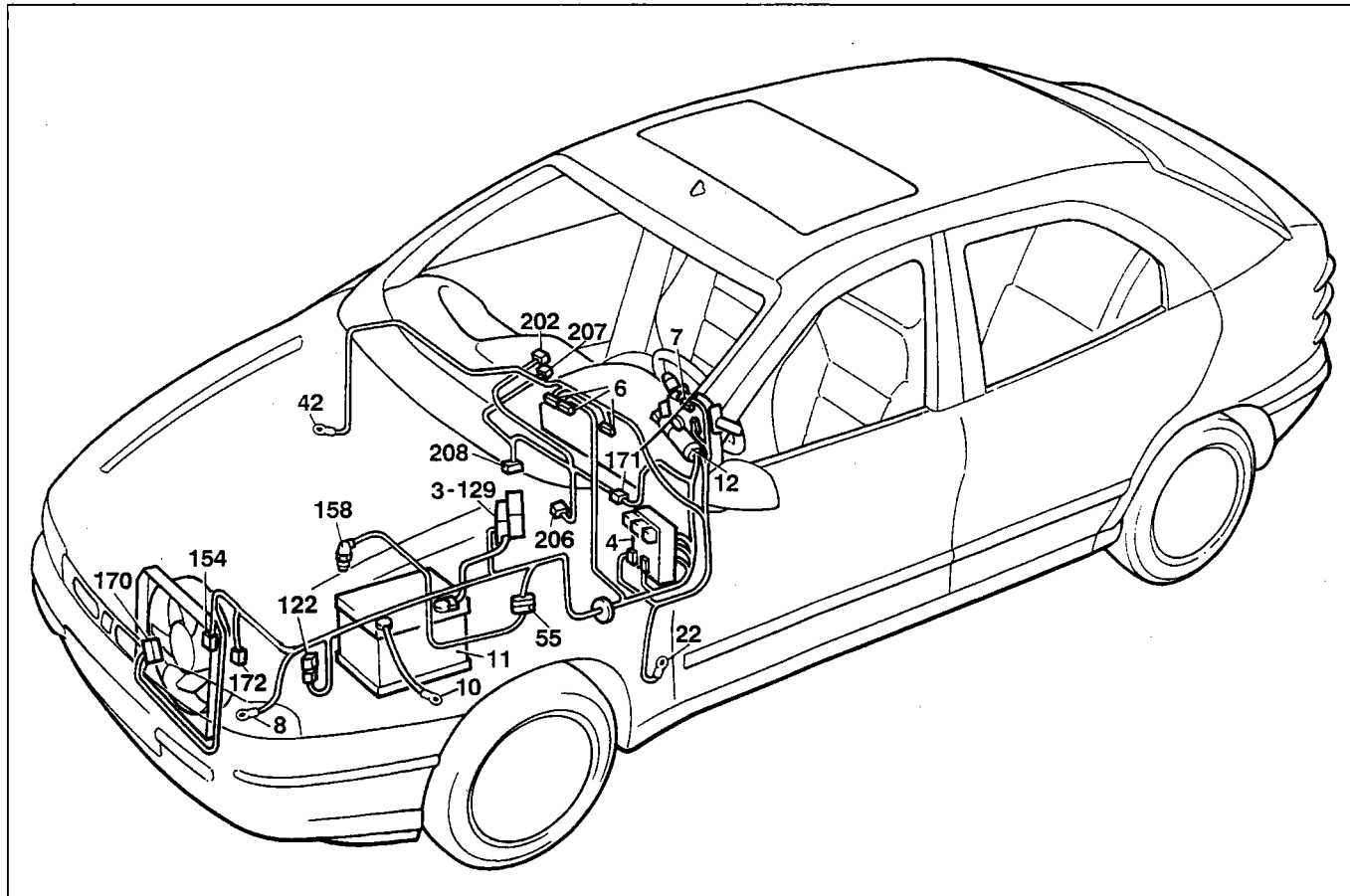
127 Connection between front left cables/cable on relay bracket



**Engine cooling system - Water temperature gauge - Car interior ventilation - (See key following diagrams)**



55.



Version without air conditioner

P4A19ZL01

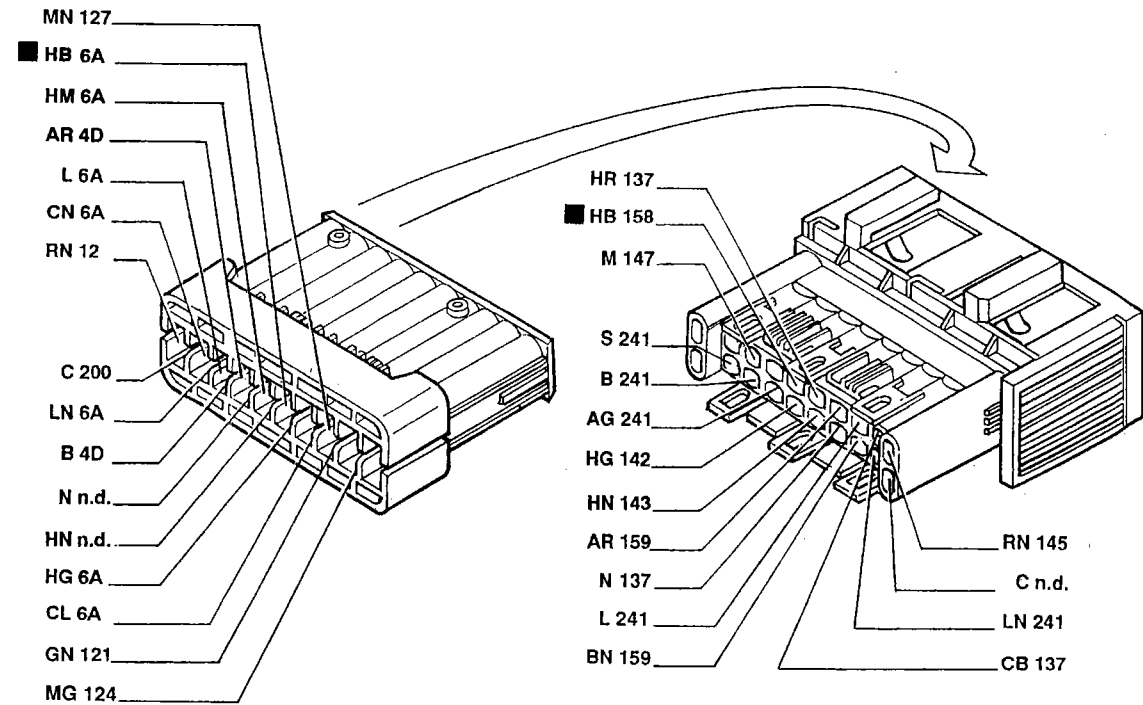
Engine cooling system - Water temperature gauge - Car interior ventilation

### Key to components

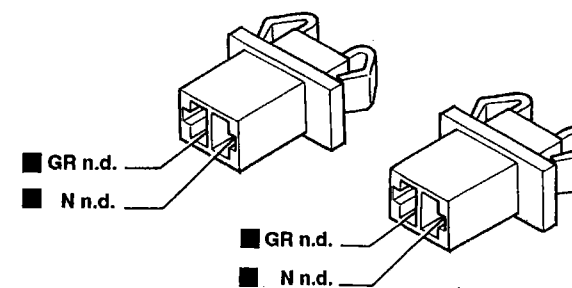
- |                                                  |                                                          |
|--------------------------------------------------|----------------------------------------------------------|
| 3 Power fuse box:                                | 154 Engine cooling fan                                   |
| A 60A fuse protecting fuel injection system      | 158 Coolant temperature sensor for gauge                 |
| B 40A fuse protecting ignition system            | 170 Engine cooling fan limiting resistor                 |
| C 60A fuse protecting additional optional extras | 171 Heater unit                                          |
| D 80A protecting fuse and relay unit             | 172 Two-stage thermostat                                 |
| 4 Fuse and relay unit                            | 202 Bulbs for heater/air conditioner unit                |
| E1 Ignition switch discharge relay               | 206 Heater/air conditioner electric fan                  |
| 6 Instrument panel:                              | 207 Speed control switch for heater/air conditioner unit |
| X Coolant temperature gauge                      | 208 Limiting resistor for heater/air conditioner unit    |
| 7 Stalk unit                                     |                                                          |
| 8 Front left earth                               |                                                          |
| 10 Battery earth on body shell                   |                                                          |
| 11 Battery                                       |                                                          |
| 12 Ignition switch                               |                                                          |
| 22 Left dashboard earth                          |                                                          |
| 42 Right dashboard earth                         |                                                          |
| 55 Front/engine cables connection                |                                                          |
| 122 Engine cooling fan low speed relay           |                                                          |
| 129 40A power fuse protecting engine cooling fan |                                                          |

N.D. Ultrasound-soldered joint taped in wiring loom

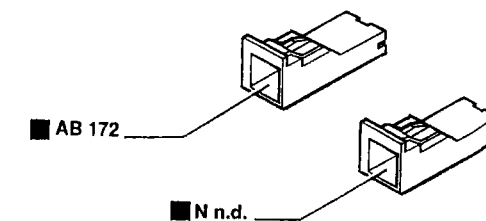
### 55 Front/engine cables connection



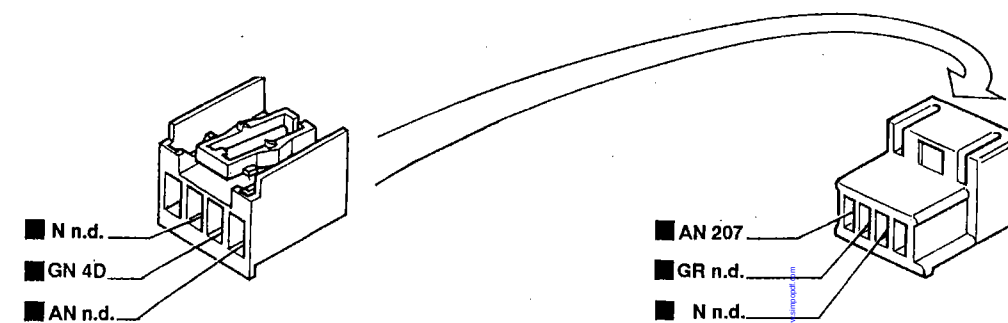
### 202 Bulbs for illuminating symbols on heater/air conditioner controls



### 170 Resistor for engine cooling fan



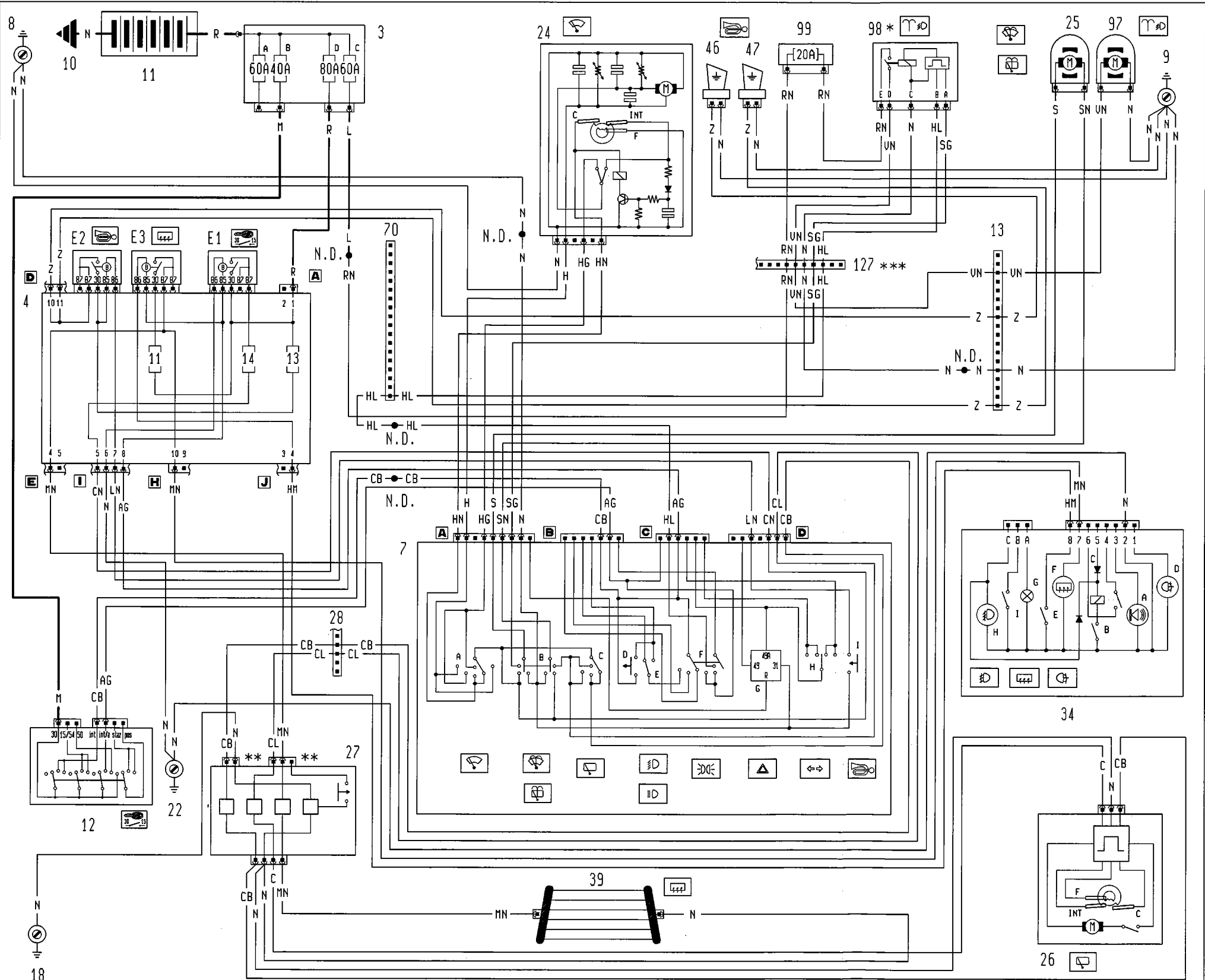
### 171 Heater cables connection



P4A20ZL01



Windscreen wash/wipe - Rear window wash/wipe - Electric horns - Heated rear window and warning light - Headlamp washer - (See key following diagrams)

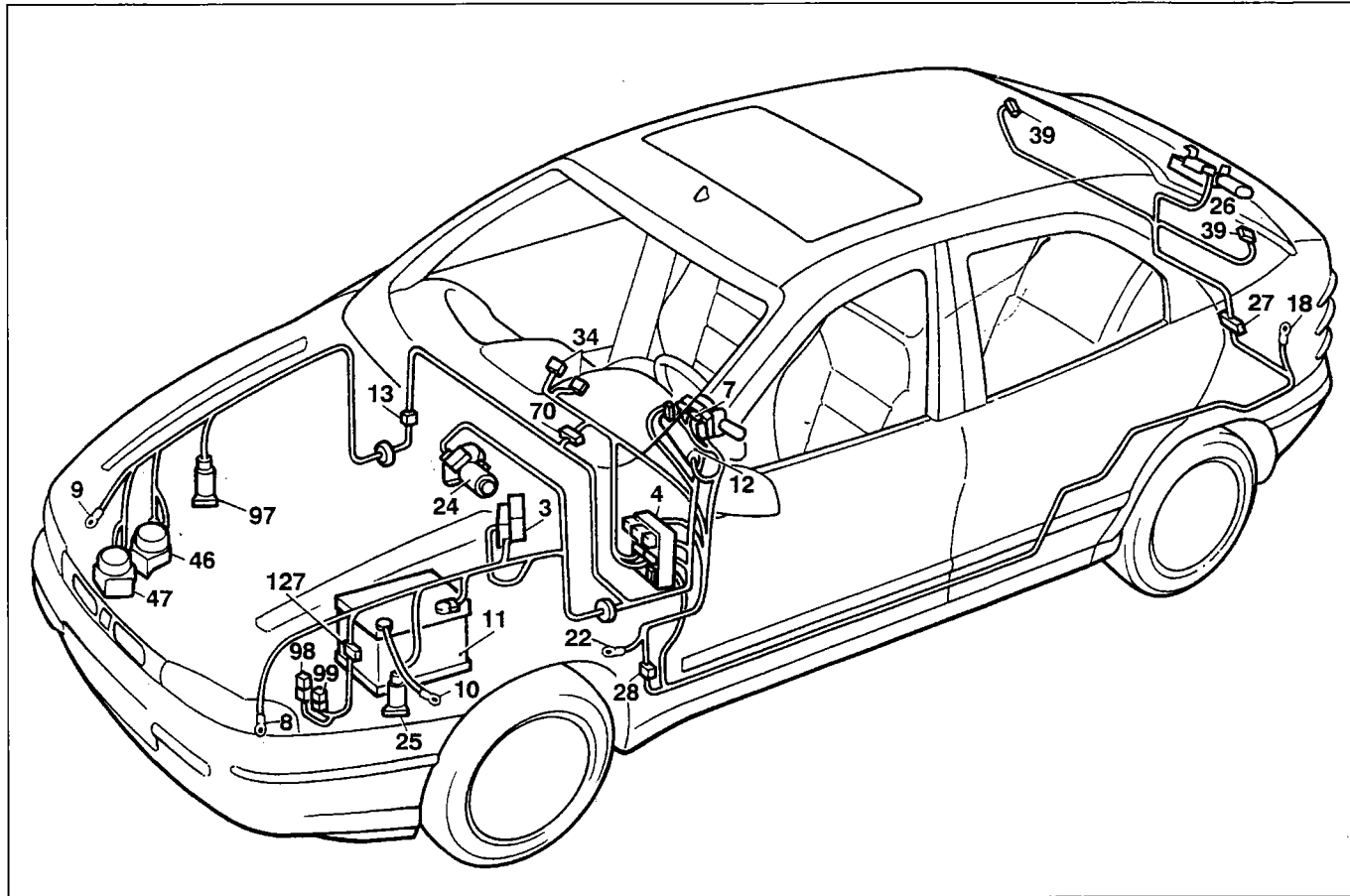


\* Not present on S version

\*\* Single connector for Bravo version

\*\*\* Not present on versions with heater

### 55.



P4A23ZL01

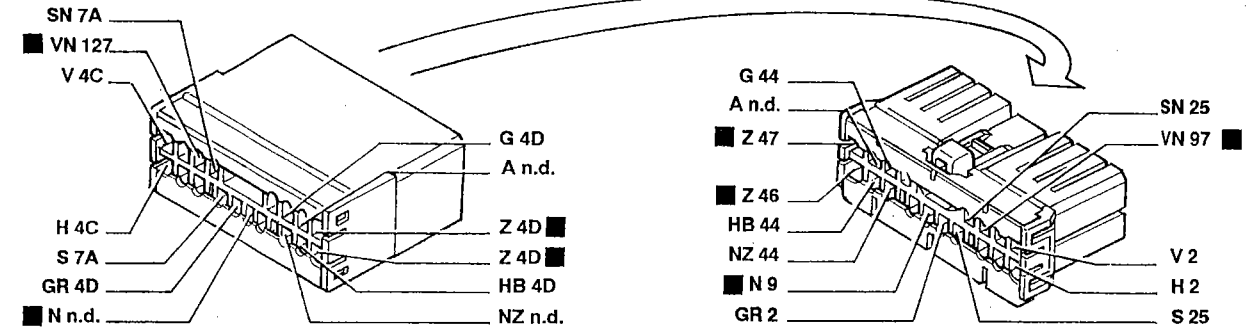
Windscreen wash/wipe - Rear window wash/wipe - Electric horns - Heated rear window and warning light - Headlamp washer

#### Key to components

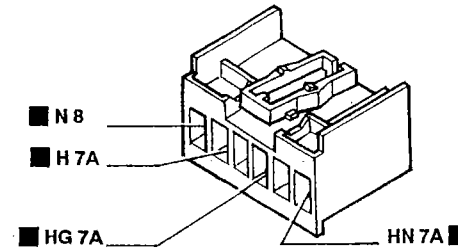
- |                                                                  |                                                                      |
|------------------------------------------------------------------|----------------------------------------------------------------------|
| 3 Power fuse box:                                                | 25 Windscreen/rear window wash pump                                  |
| A 60A fuse protecting fuel injection system                      | 26 Rear window wiper motor                                           |
| B 40A fuse protecting fuel injection                             | 27 Rear connections contact assembly with built-in boot light switch |
| C 60A fuse protecting additional optional extras                 | 28 Dashboard/longitudinal cables connection                          |
| D 80A fuse protecting fuse and relay unit                        | 34 Switches control unit:                                            |
| 4 Fuse and relay unit:                                           | A Alarm on warning light                                             |
| E1 Ignition switch discharge relay                               | B Rear fog lamps switch                                              |
| E2 Horn relay                                                    | C Rear fog lamps relay                                               |
| E3 Heated rear window relay                                      | D Rear fog lamps warning light                                       |
| 7 Stalk unit:                                                    | E Heated rear window switch                                          |
| A Windscreen wiper speed control switch                          | F Heated rear window warning light                                   |
| B Windscreen wash/headlamp wash/rear window wash controls/switch | G Symbol light on switch assembly                                    |
| C Rear window wiper switch                                       | H Front fog lamps warning light                                      |
| D Flasher button                                                 | I Front fog lamps switch                                             |
| E Dipped beam/main beam switch                                   | 39 Heated rear window                                                |
| F Side lights switch                                             | 46 Left horn                                                         |
| G Indicators/hazard lights intermittent switch                   | 47 Right horn                                                        |
| H Direction indicators switch                                    | 70 Dashboard/front cables connection                                 |
| I Horn button                                                    | 97 Headlamp washer pump                                              |
| 8 Front left earth                                               | 98 Headlamp washer intermittent switch                               |
| 9 Front right earth                                              | 99 20A fuse protecting headlamp washer                               |
| 10 Battery earth on body shell                                   | 127 Front left cables/cable on relay bracket                         |
| 11 Battery                                                       |                                                                      |
| 12 Ignition switch                                               |                                                                      |
| 13 Front right/left cables connection                            |                                                                      |
| 18 Rear left earth                                               |                                                                      |
| 22 Left dashboard earth                                          |                                                                      |
| 24 Windscreen wiper motor                                        |                                                                      |

N.D. Ultrasound-soldered joint taped in wiring loom

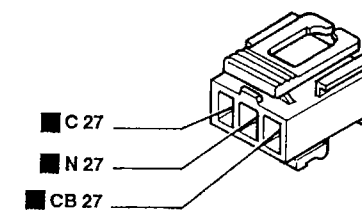
#### 13 Front right/left cables connection



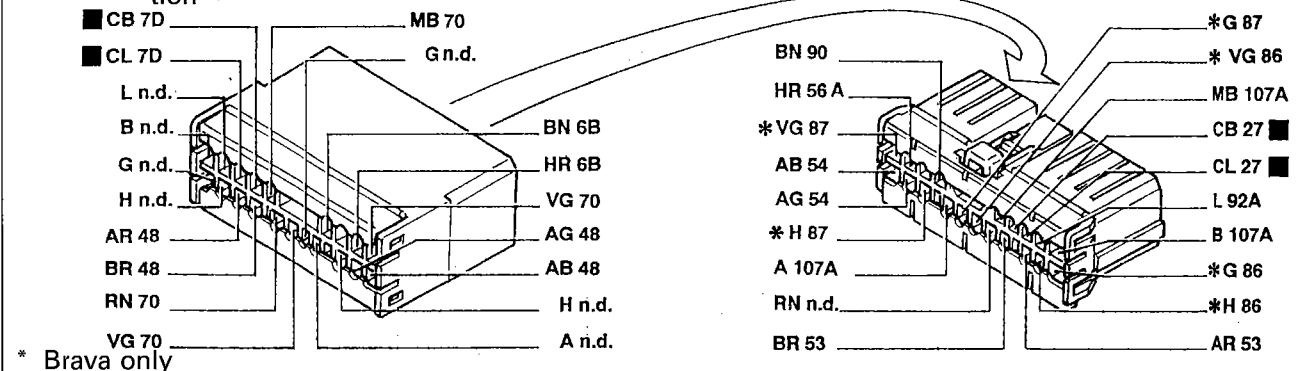
#### 24 Windscreen wiper motor



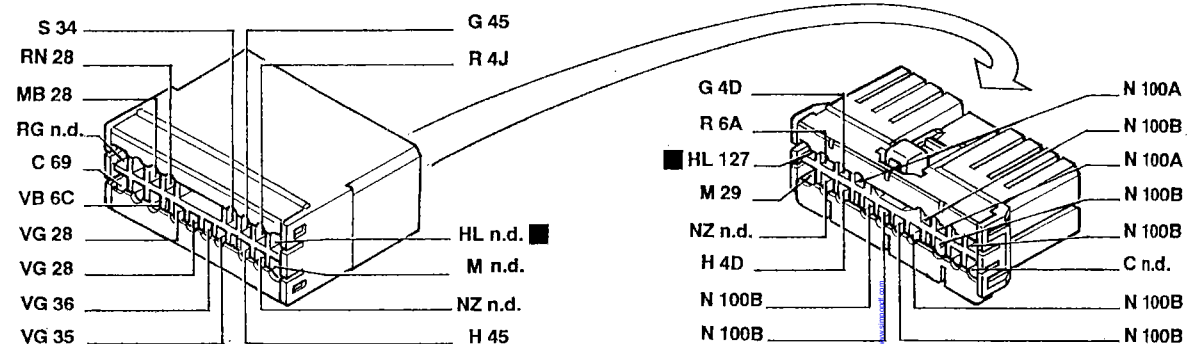
#### 26 Rear window wiper motor



#### 28 Dashboard/longitudinal cables connection



#### 70 Dashboard/front cables connection

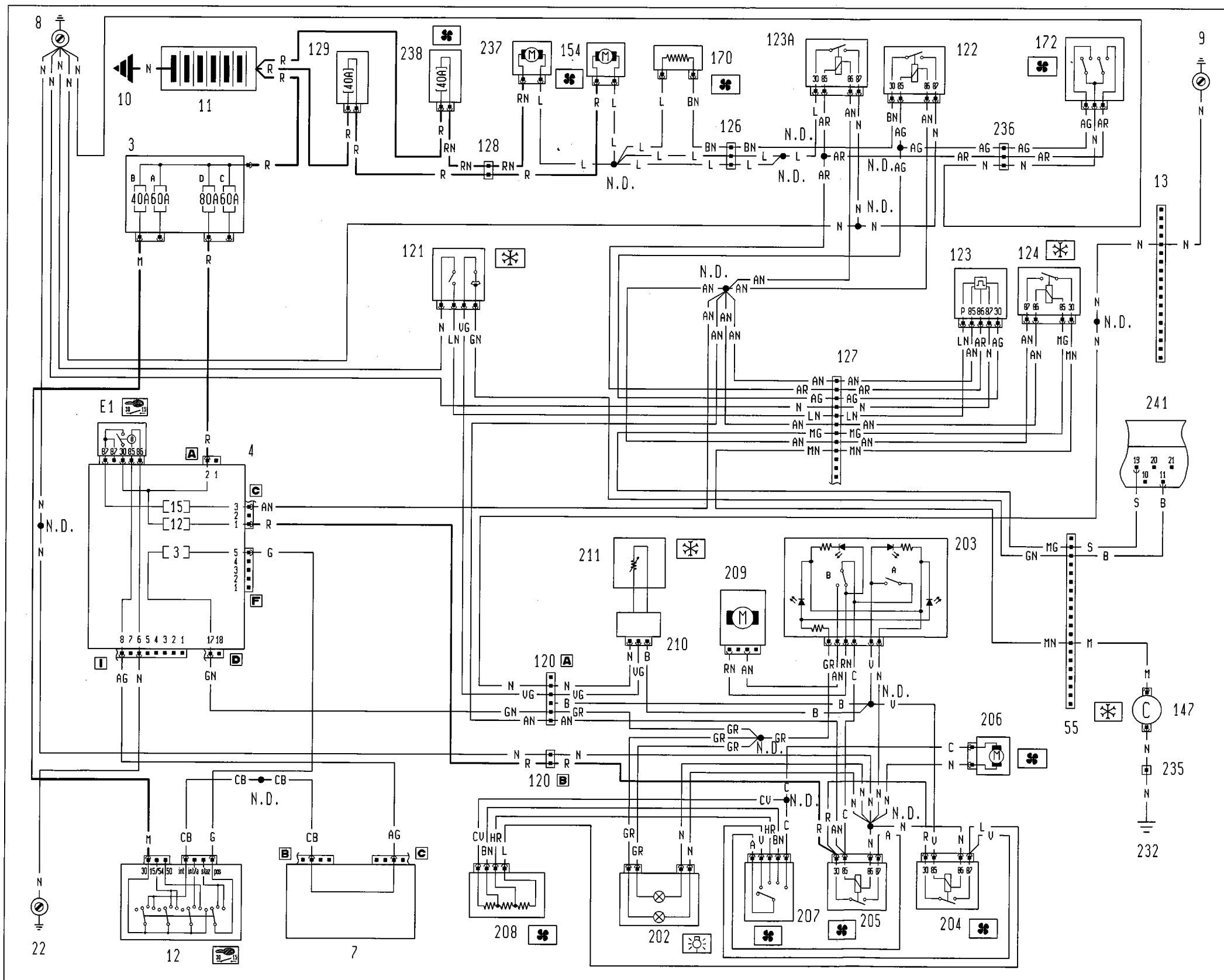


The cables involved in the wiring diagram are marked with a solid square

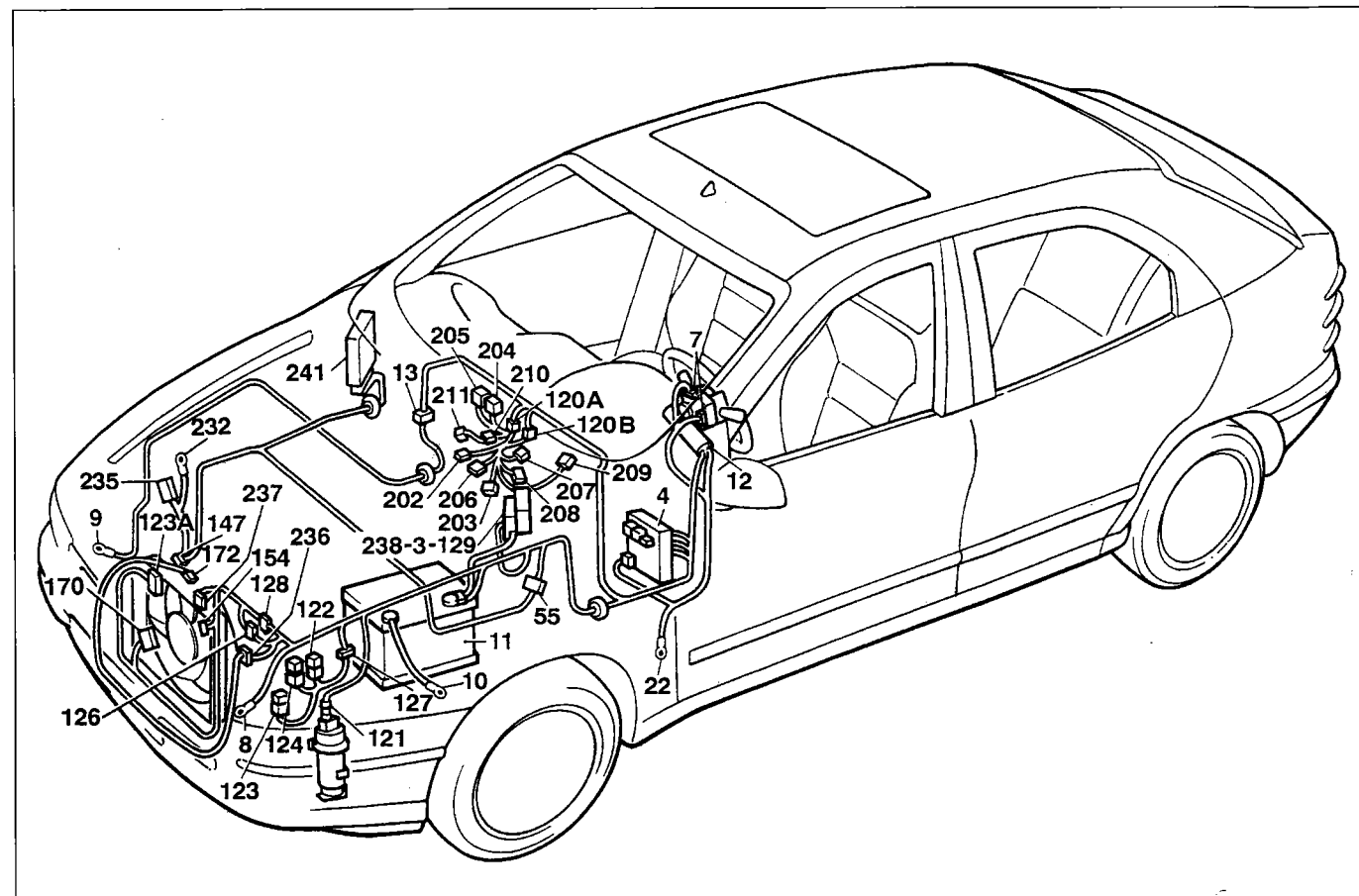
P4A24ZL01

Model: 1910 100 BHP

Air conditioner - (See key following diagrams)



### 55.



P4A27ZL01

Version: 1910 100 BHP

Air conditioner

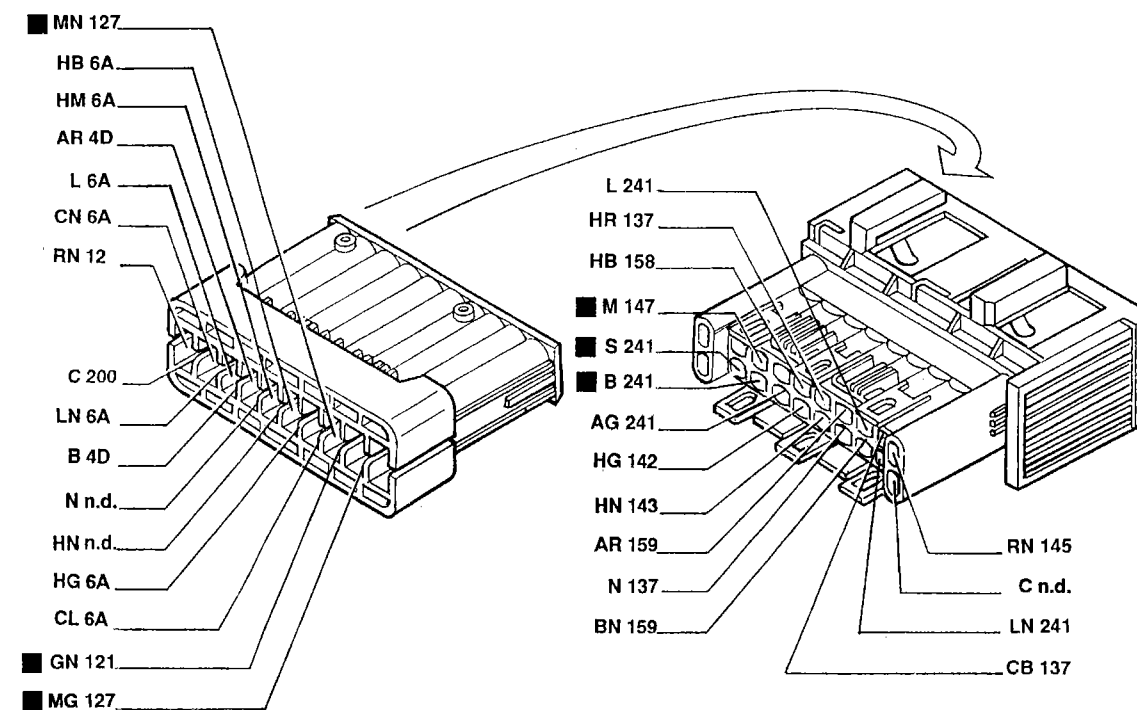
Key to components

- 3 Power fuse box:
  - A 60A fuse protecting fuel injection system
  - B 40A fuse protecting ignition system
  - C 60A fuse protecting additional optional extras
  - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:
  - E1 Ignition switch discharge relay
- 7 Stalk unit
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 22 Left dashboard earth
- 55 Front/engine cables connection
- 120 Air conditioner cables connection
- 121 Three-stage pressure switch
- 122 Engine cooling fan low speed control relay
- 123 Engine cooling fan high speed timer
- 123A Engine cooling fan high speed relay
- 124 Air conditioner compressor relay
- 126 Front/air conditioner cables connection
- 127 Connection between front left cables/cable on relay bracket
- 128 Front/air conditioner cables connection

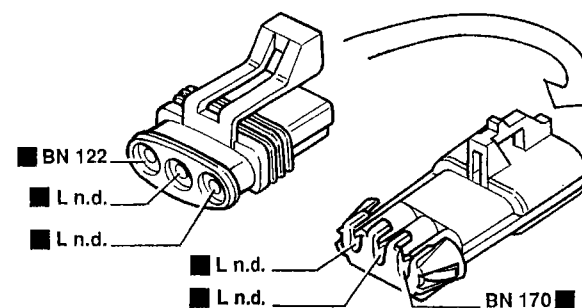
- 129 40A power fuse protecting engine cooling fan
- 147 Compressor for air conditioner
- 154 Engine cooling fan
- 170 Cooling fan limiting resistor
- 172 Two-stage thermostat
- 202 Bulbs for lighting heater/air conditioner unit
- 203 Air conditioner controls:
  - A Switch for switching on air conditioner
  - B Switch controlling air conditioner recirculation
- 204 Relay controlling air conditioner electric fan 1st speed
- 205 Air conditioner fan relay
- 206 Heater/air conditioner electric fan
- 207 Switch controlling speed of heater/air conditioner
- 208 Limiting resistor for heater/air conditioner
- 209 Actuator controlling external air/recirculation flap
- 210 Electronic thermostat cables connection
- 211 Electronic thermostat (N.T.C.)
- 232 Compressor earth
- 235 Air conditioner compressor cables connection
- 236 Front/air conditioner cables connection
- 237 Additional engine cooling fan
- 238 40A fuse protecting engine cooling fan
- 241 Fuel pump electronic control unit

N.D. Ultrasound-soldered joint taped in wiring loom

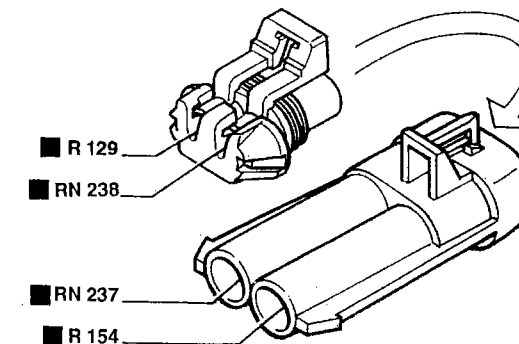
#### 55 Front/engine cables connection



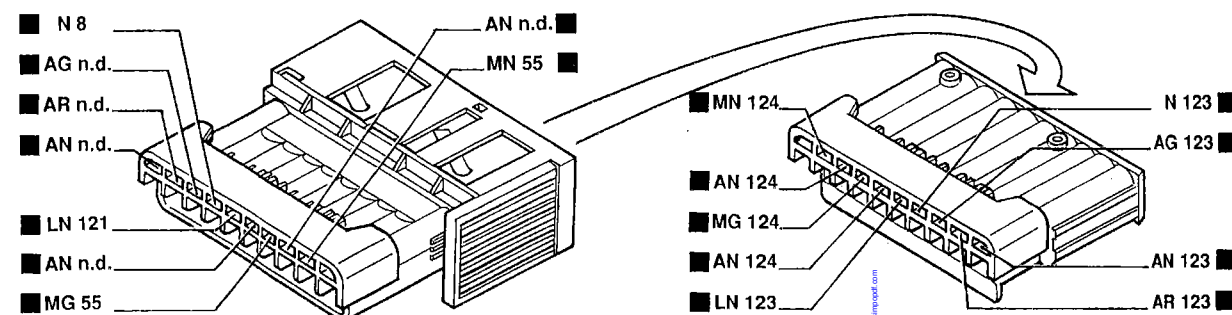
#### 126 Front/air conditioner cables connection



#### 128 Front/air conditioner cables connection



#### 127 Connection between front left cables/cable on relay bracket



The cables involved in the wiring diagram are marked with a solid square

P4A28ZL01

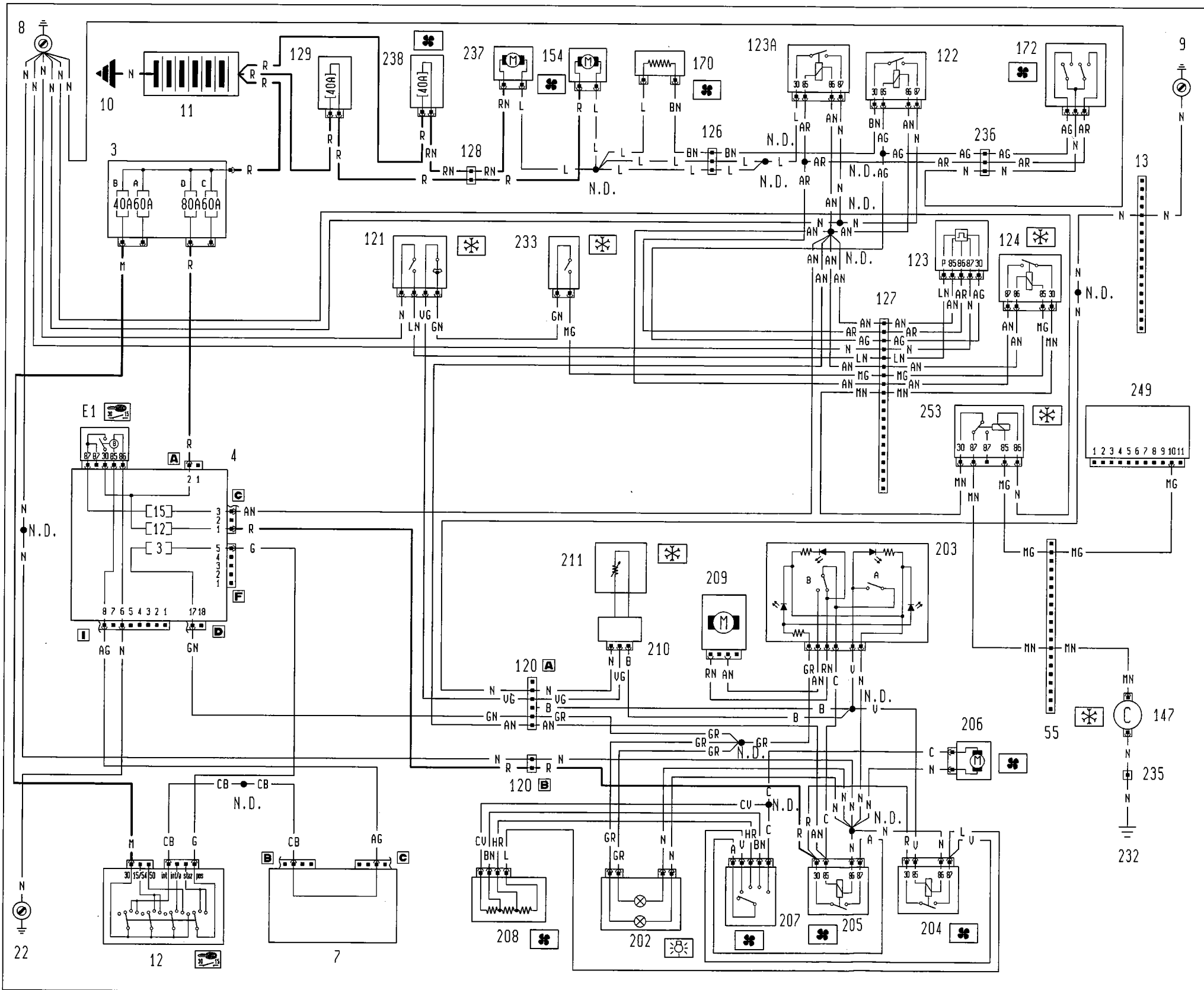
# Electrical system

## Wiring diagrams

### 55.

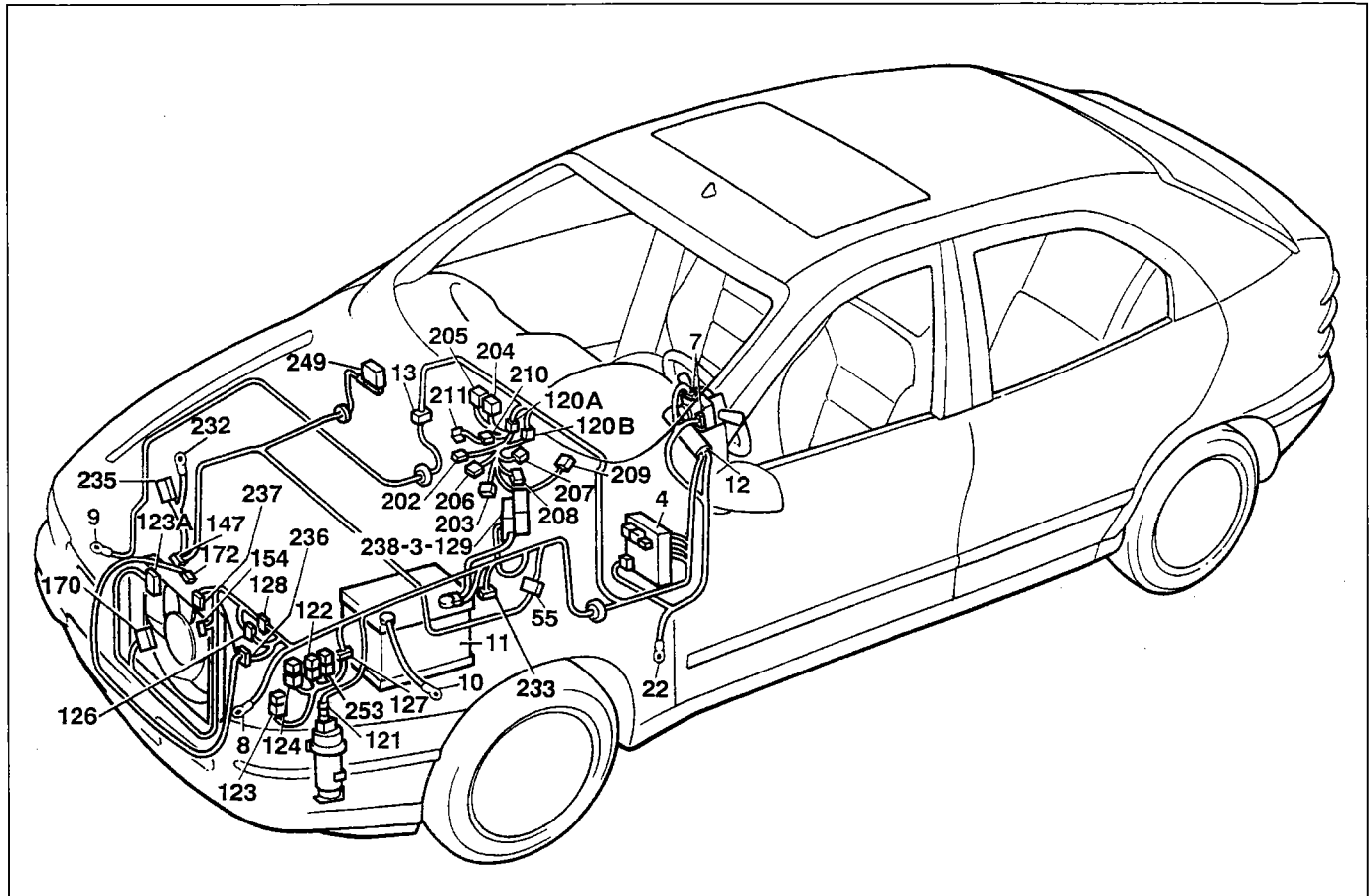
Model: 1910 75 BHP

Air conditioner - (See key following diagrams)





55.



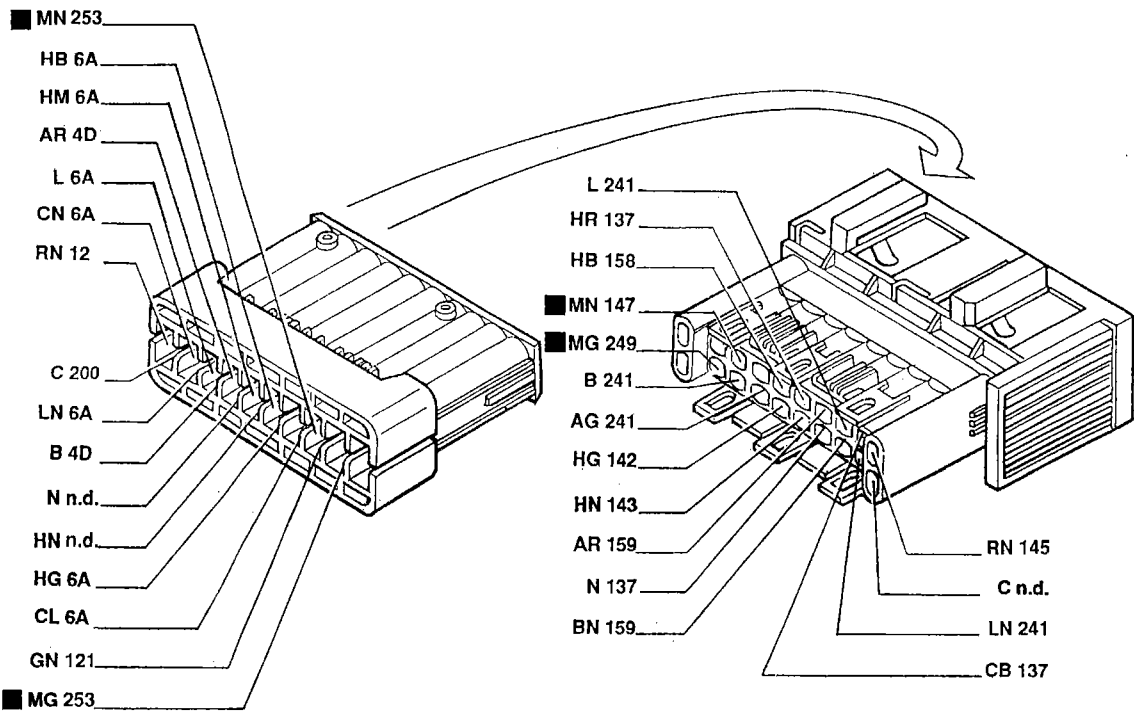
Model: 1910 75 BHP

Air conditioner

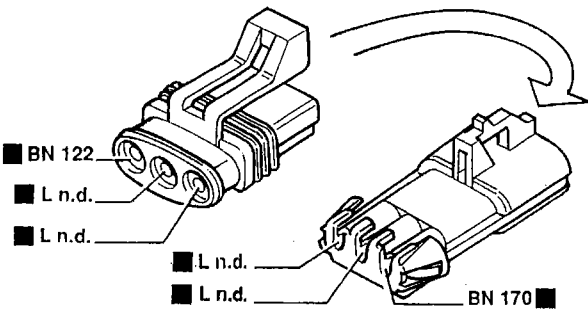
Key to components

- 3 Power fuse box:  
A 60A fuse protecting fuel injection system  
B 40A fuse protecting ignition system  
C 60A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:  
E1 Ignition switch discharge relay
- 7 Stalk unit
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 22 Left dashboard earth
- 55 Front/engine cables connection
- 120 Air conditioner cables connection
- 121 Three-stage pressure switch
- 122 Engine cooling fan low speed relay
- 123 Engine cooling fan high speed timer
- 123A Engine cooling fan high speed relay
- 124 Air conditioner compressor relay
- 126 Front/air conditioner cables connection
- 127 connection between front left cables/cable on relay bracket
- 128 Front/air conditioner cables connection
- 129 40A power fuse protecting engine cooling fan
- 147 Compressor for air conditioner
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistor
- 172 Two-stage thermostat
- 202 Bulbs lighting heater/air conditioner unit
- 203 Air conditioner controls:  
A Switch for switching on air conditioner  
B Air conditioner recirculation switch
- 204 Air conditioner fan 1st speed relay
- 205 Air conditioner fan relay
- 206 Heater/air conditioner electric fan
- 207 Heater/air conditioner speed control switch
- 208 Limiting resistor for heater/air conditioner
- 209 Actuator controlling exterior air/recirculation flap
- 210 Electronic thermostat cables connection
- 211 Electronic thermostat (N.T.C.)
- 232 Compressor earth
- 233 Thermostat on coolant pump
- 235 Air conditioner compressor cables connection
- 236 Front/air conditioner cables connection
- 237 Additional engine cooling fan
- 238 40A fuse protecting engine cooling fan
- 249 E.G.R. electronic control unit
- 253 Relay switching off compressor
- N.D. Ultrasound-soldered joint taped in wiring loom

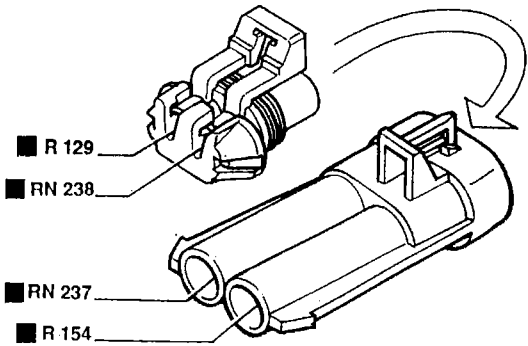
55 Front/engine cables connection



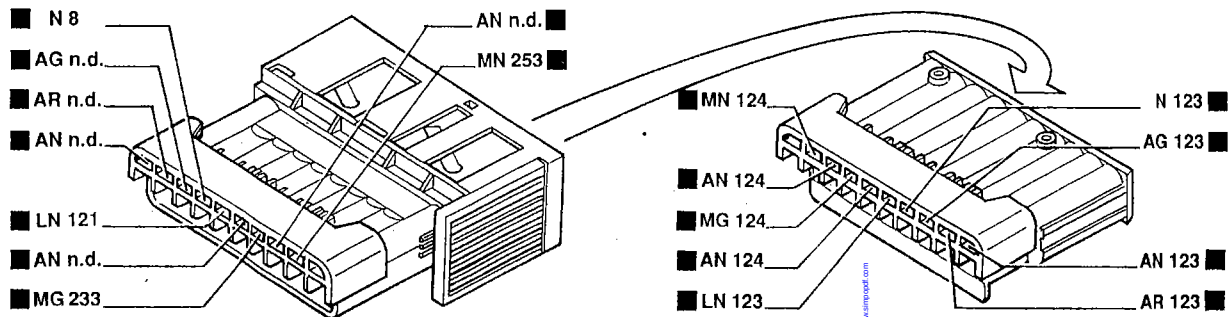
126 Front/air conditioner cables connection



128 Front/air conditioner cables connection



127 Connection between front left cables/cable on relay bracket



The cables involved in the wiring diagram are marked with a solid square

P4A32ZL01

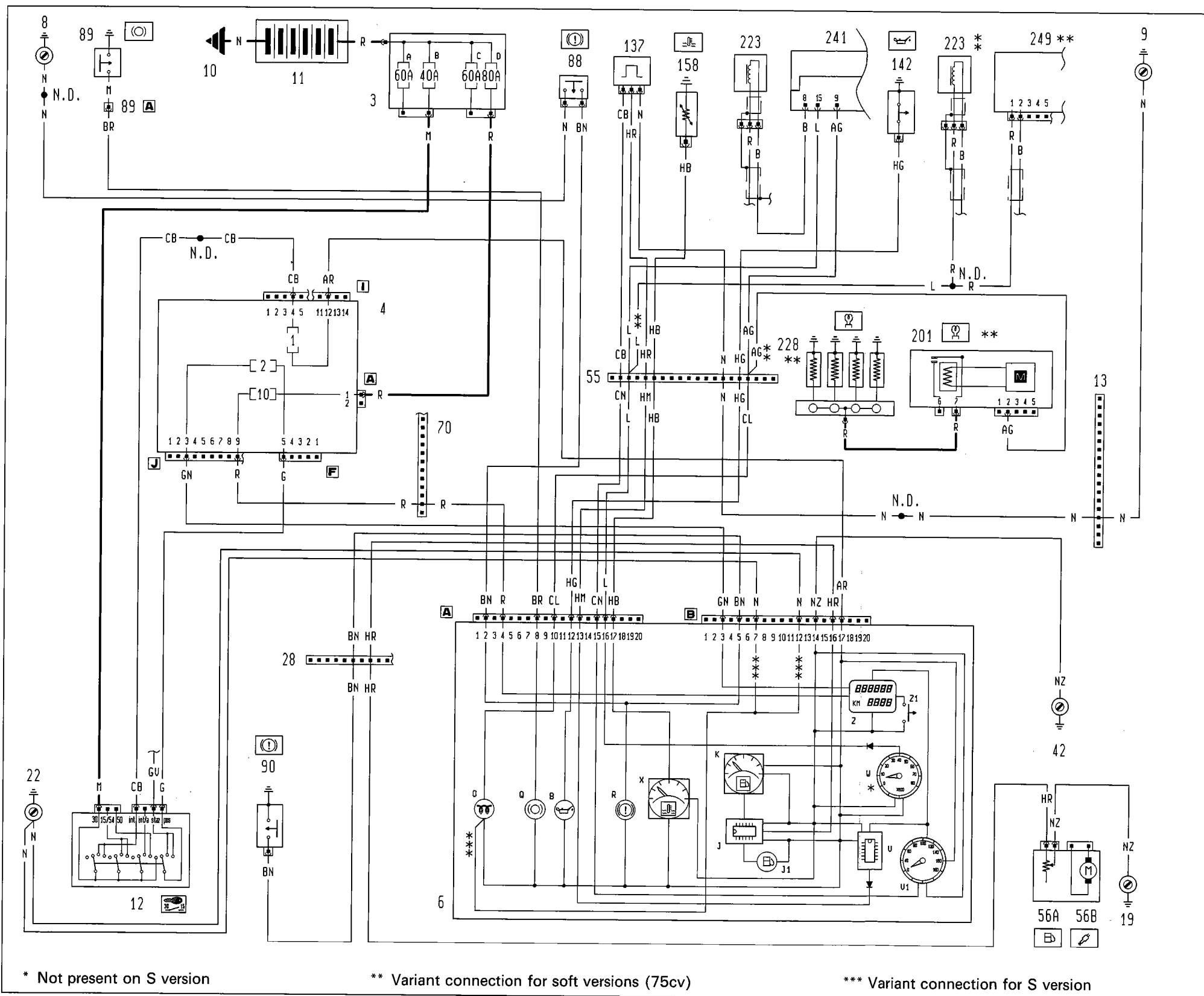
# Electrical system

## Wiring diagrams

### 55.

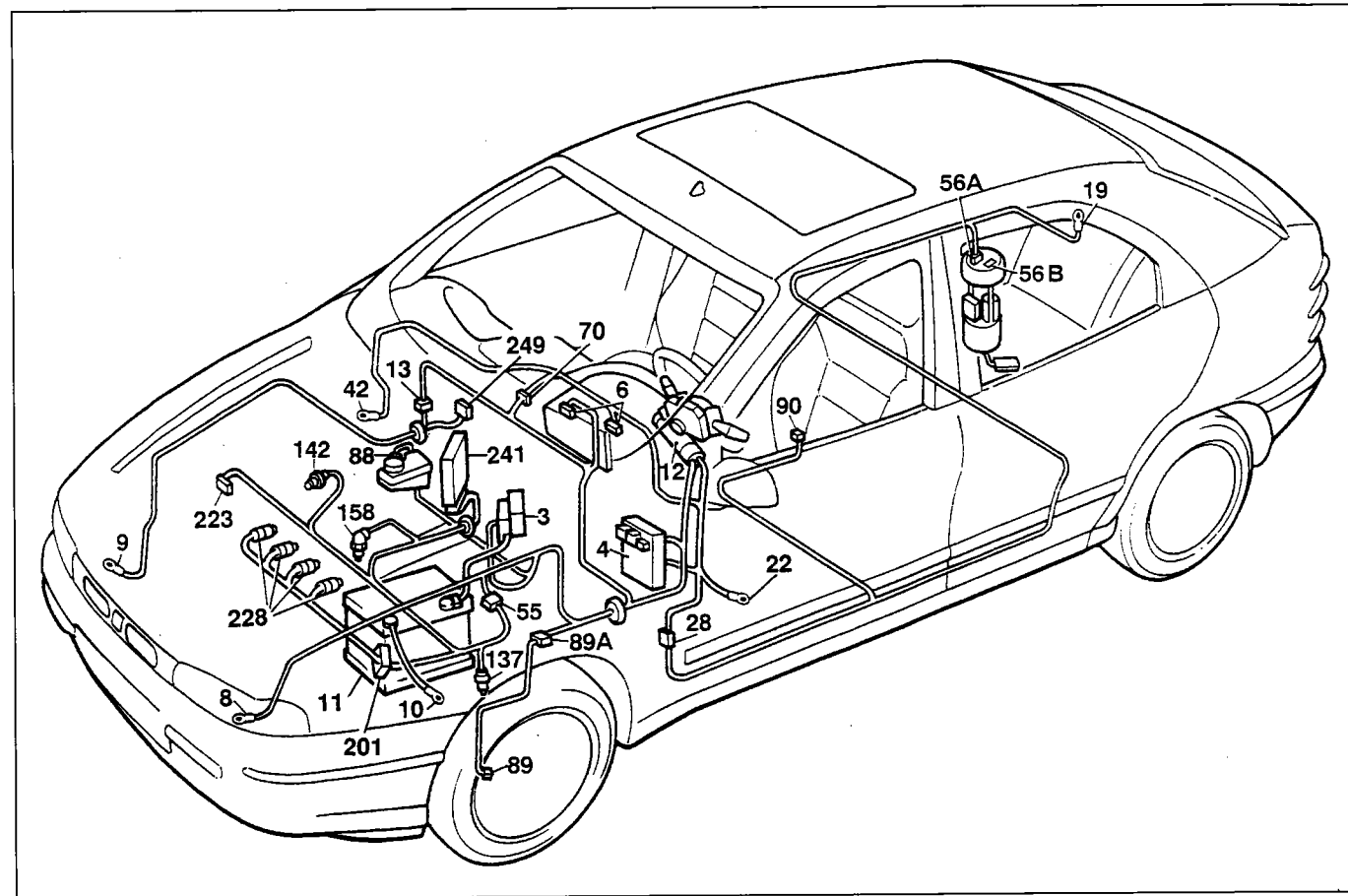
Version: S -SX

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter - (See key following diagrams)





### 55.



P4A35ZL01

Version: S - SX

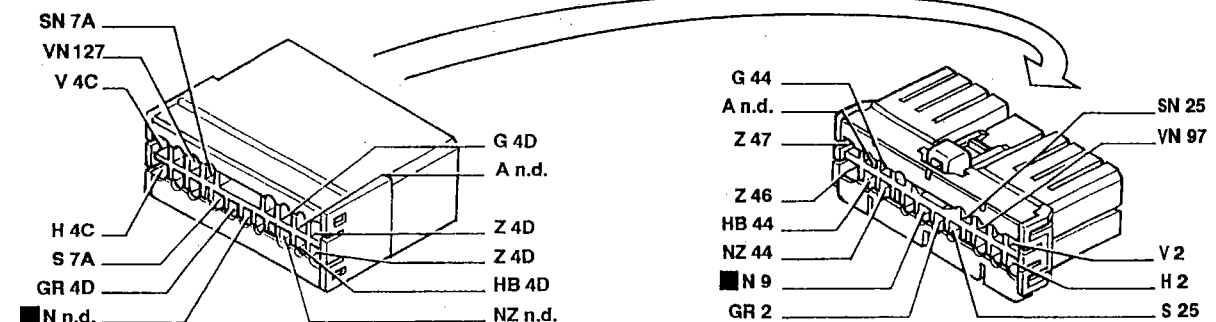
Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge- Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter

#### Key to components

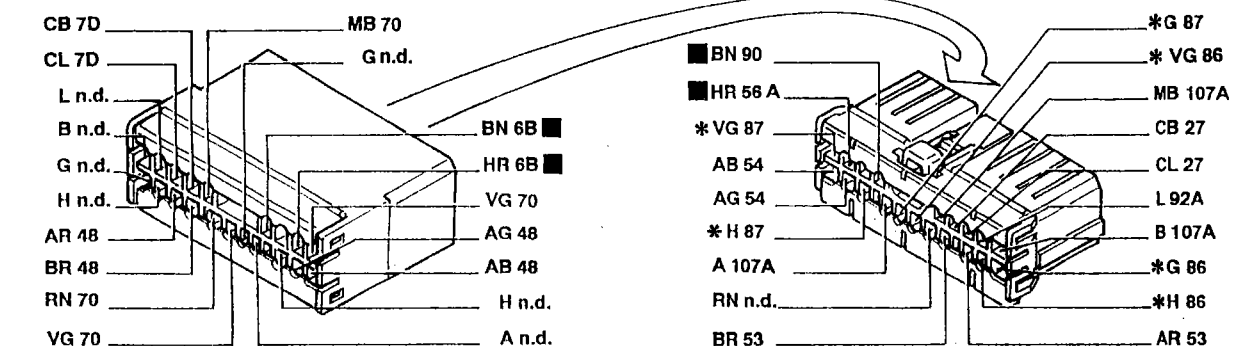
- |                                                      |                                                  |
|------------------------------------------------------|--------------------------------------------------|
| 3 Power fuse box:                                    | 13 Front/left cables connection                  |
| A 60A fuse protecting fuel injection system          | 19 Rear right earth                              |
| B 40A fuse protecting ignition system                | 22 Left dashboard earth                          |
| C 60A fuse protecting additional optional extras     | 28 Dashboard/longitudinal cables connection      |
| D 80A fuse protecting fuse and relay unit            | 42 Right dashboard earth                         |
| 4 Fuse and relay unit                                | 55 Front/engine cables connection                |
| 6 Instrument panel:                                  | 56 Fuel gauge sender assembly                    |
| B Low engine oil pressure warning light              | A Fuel level sensor                              |
| J Fuel reserve circuit control module                | B Electric fuel pump                             |
| J1 Low fuel level warning light                      | 70 Dashboard/front cables connection             |
| K Fuel gauge                                         | 88 Low brake fluid level sensor                  |
| O Heater plugs warning light                         | 89 Left brake pad wear sensor                    |
| Q Front brake pad wear warning light                 | 89A Left brake pad wear sensor cables connection |
| R Handbrake on / low brake fluid level warning light | 90 Handbrake on warning light switch             |
| V Speedometer control module                         | 137 Vehicle speed sensor                         |
| V1 Speedometer                                       | 142 Low oil pressure warning light switch        |
| W Rev counter                                        | 158 Coolant temperature sensor for gauge         |
| X Coolant temperature gauge                          | 201 Plug preheating control unit                 |
| Z Trip recorder / mileage counter                    | 223 Wheel speed sensor                           |
| Z1 Trip recorder reset button                        | 228 Heater plugs                                 |
| 8 Front left earth                                   | 241 Fuel pump electronic control unit            |
| 9 Front right earth                                  | 249 E.G.R. electronic control unit               |
| 10 Battery earth on body shell                       |                                                  |
| 11 Battery                                           |                                                  |
| 12 Ignition switch                                   |                                                  |

N.D. Ultrasound-soldered joint taped in wiring loom

#### 13 Front right/left cables connection

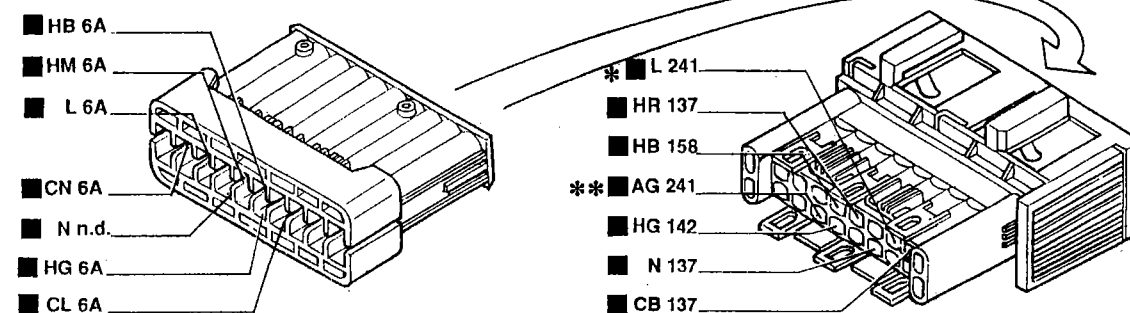


#### 28 Dash./longitudinal cables connection



\* Brava only

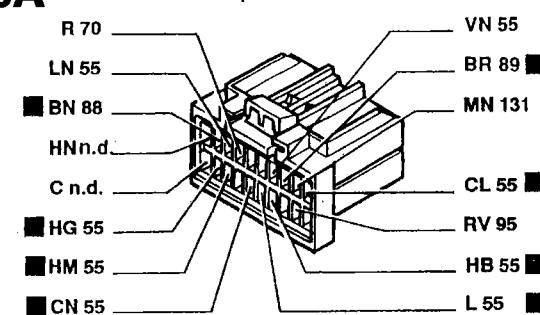
#### 55 Front/engine cables connection



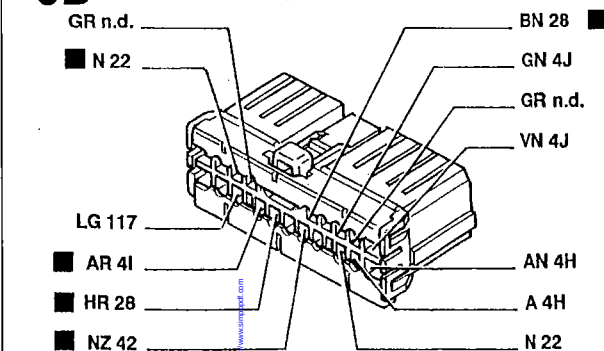
\* N.D. for soft version (75cv)

\*\* 201 for soft version (75cv)

#### 6A Instrument panel



#### 6B Instrument panel

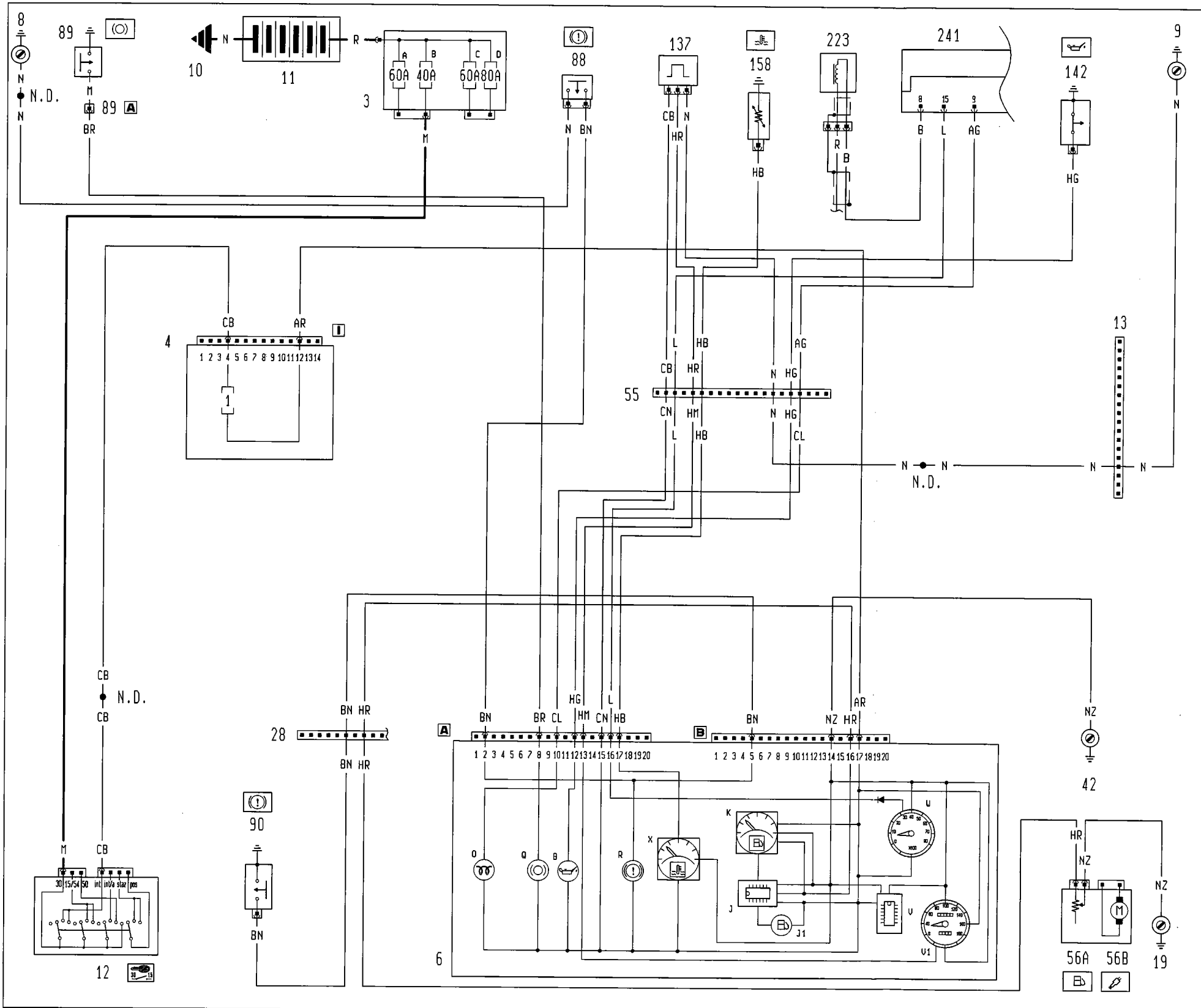


The cables involved in the wiring diagram are marked with a solid square

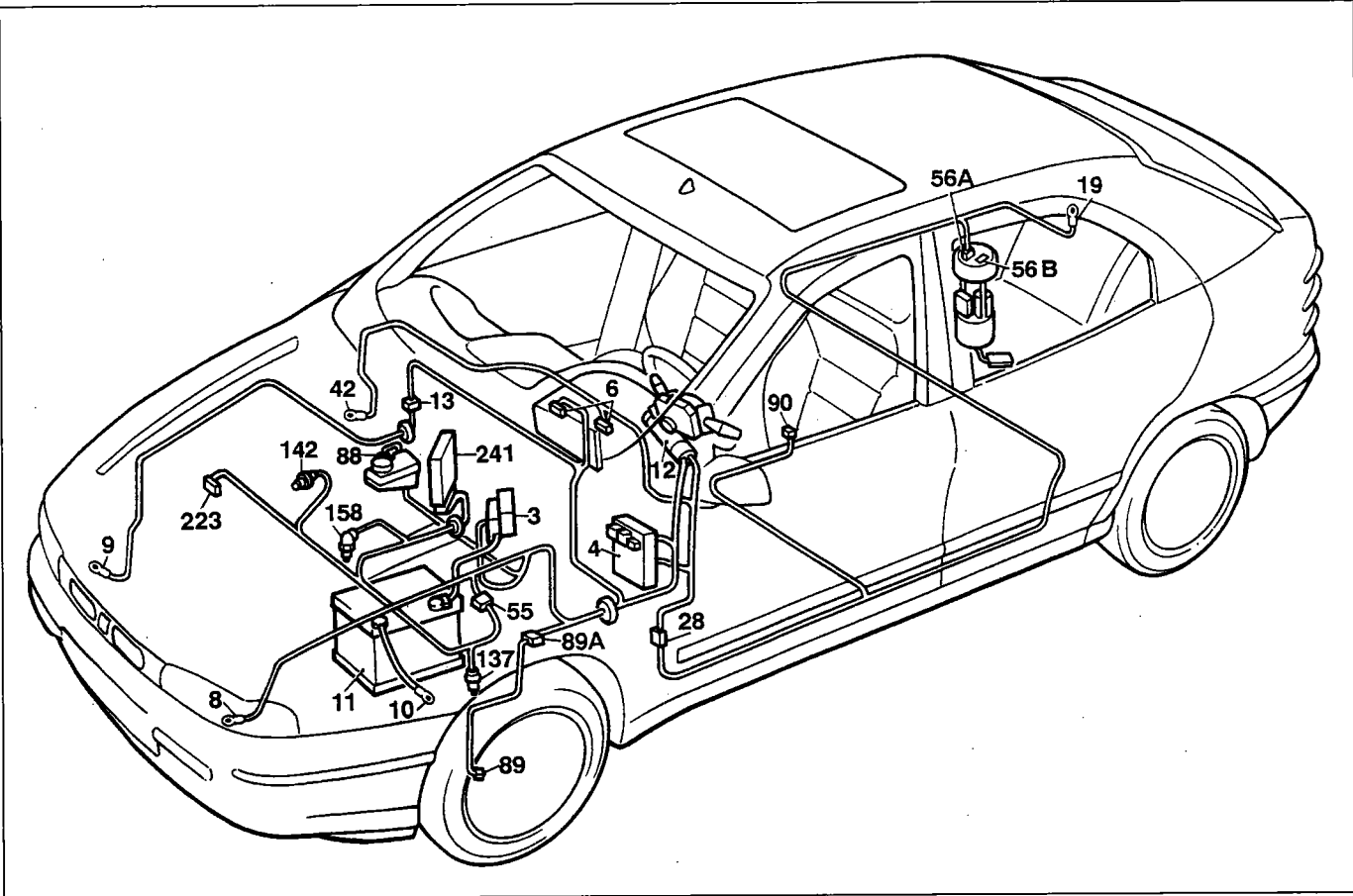
P4A36ZL01

Version: SX - GT

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter - (See key following diagrams)



55.



P4A39ZL01

Version: SX - GT

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Water temperature gauge- Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter

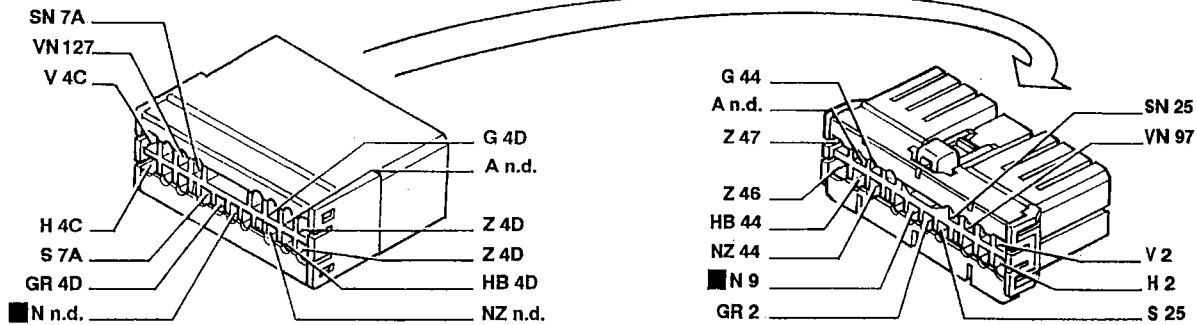
Key to components

- 3 Power fuse box:  
A 60A fuse protecting fuel injection system  
B 40A fuse protecting ignition system  
C 60A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit  
4 Fuse and relay unit  
6 Instrument panel:  
B Low engine oil pressure warning light  
J Fuel reserve circuit control module  
J1 Low fuel level warning light  
K Fuel gauge  
O Heater plugs warning light  
Q Front brake pad wear warning light  
R Handbrake on / low brake fluid level warning light  
V Speedometer control module  
V1 Speedometer  
W Rev counter  
X Coolant temperature gauge  
8 Front left earth  
9 Front right earth  
10 Battery earth on body shell  
11 Battery  
12 Ignition switch

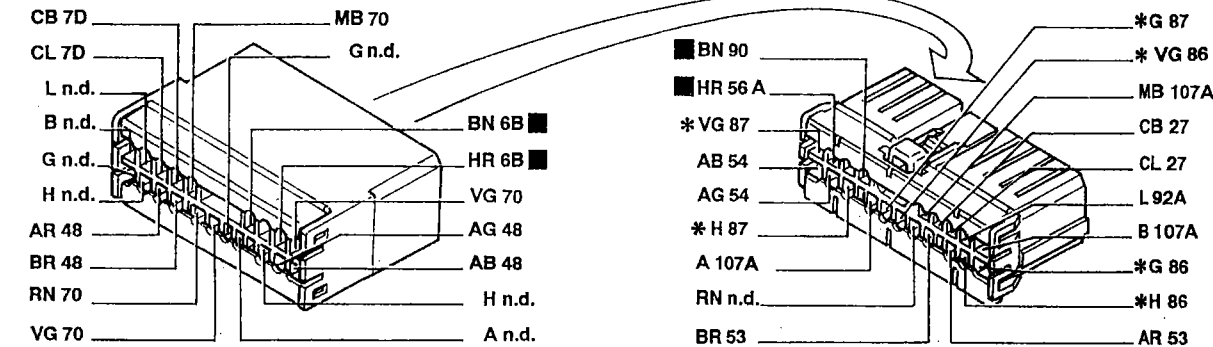
- 13 Front right/left cables connection  
19 Rear right earth  
28 Dashboard/longitudinal cables connection  
42 Right dashboard earth  
55 Front/engine cables connection  
56 Fuel gauge sender assembly  
A Fuel level sensor  
B Electric fuel pump  
88 Low brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Handbrake on warning light switch  
137 Vehicle speed sensor  
142 Low oil pressure warning light switch  
158 Coolant temperature sensor for gauge  
223 Wheel speed sensor  
241 Fuel pump electronic control unit  
N.D. Ultrasound-soldered joint taped in wiring loom

4A39ZL

13 Front right/left cables connection

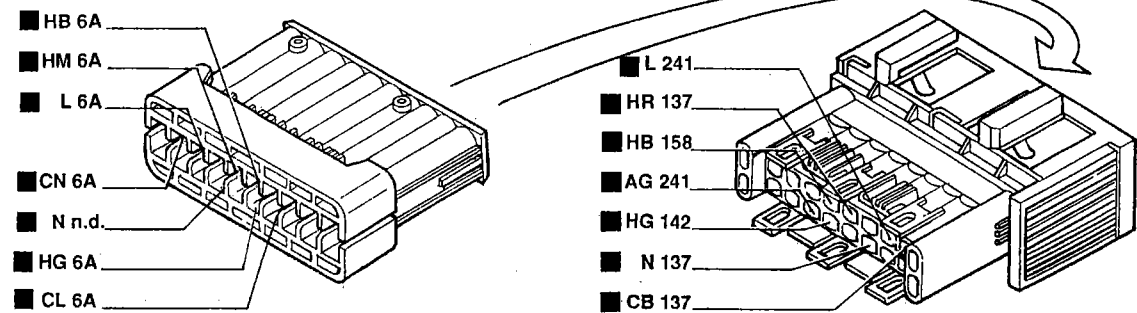


28 Dash./longitudinal cables connection

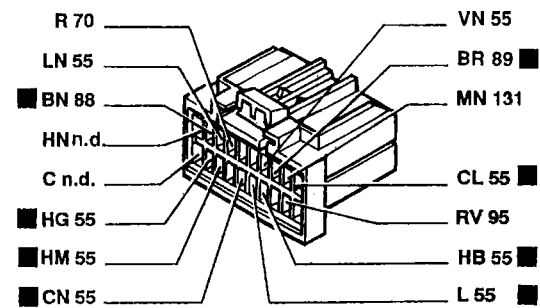


\* Brava only

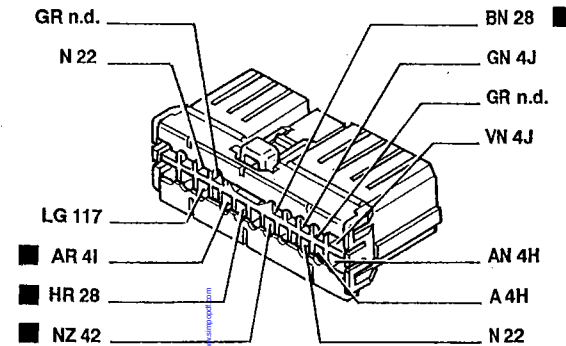
55 Front/engine cables connection



6A Instrument panel



6B Instrument panel



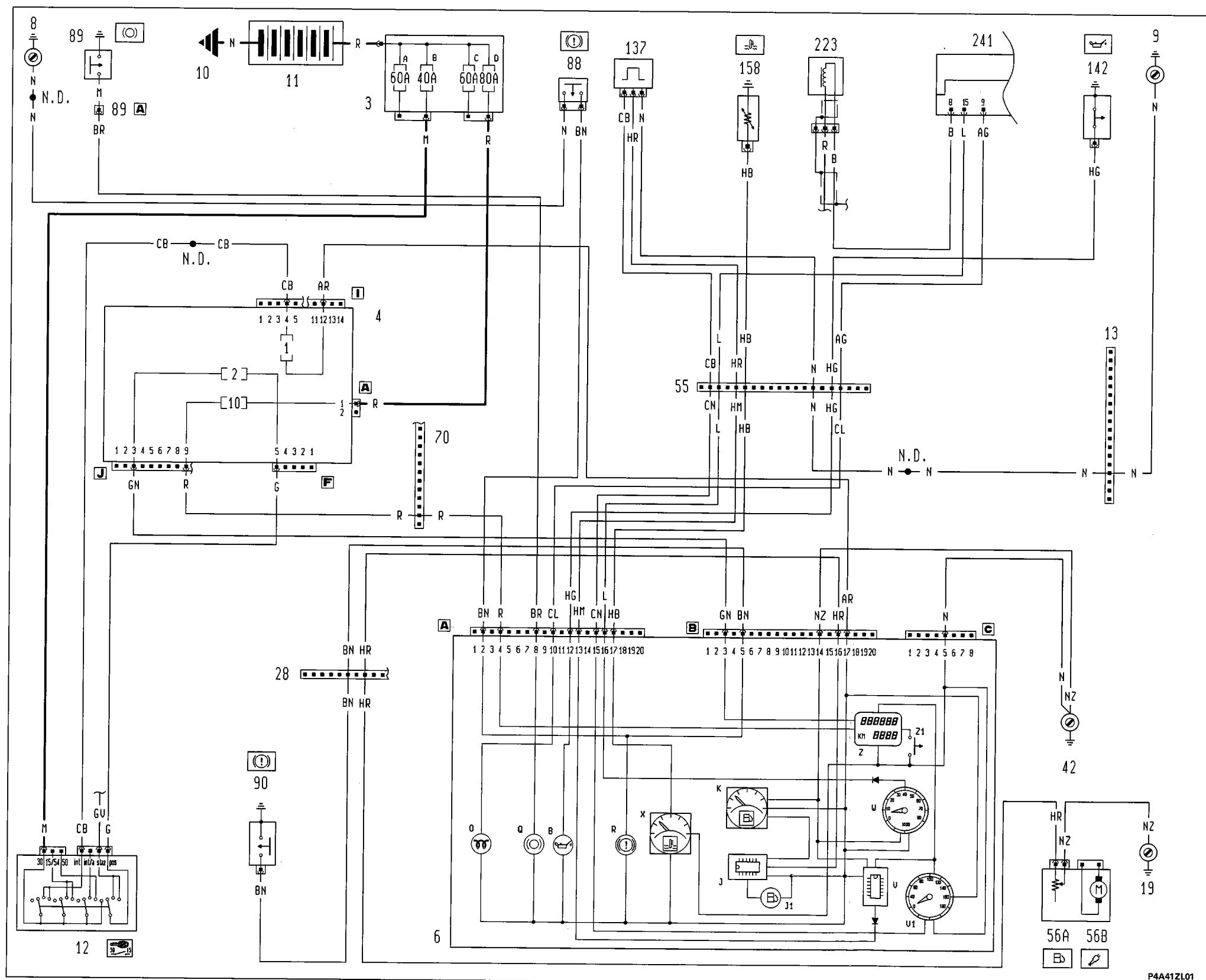
The cables involved in the wiring diagram are marked with a solid square

P4A40ZL01

4A40ZL

Version: EL - ELX

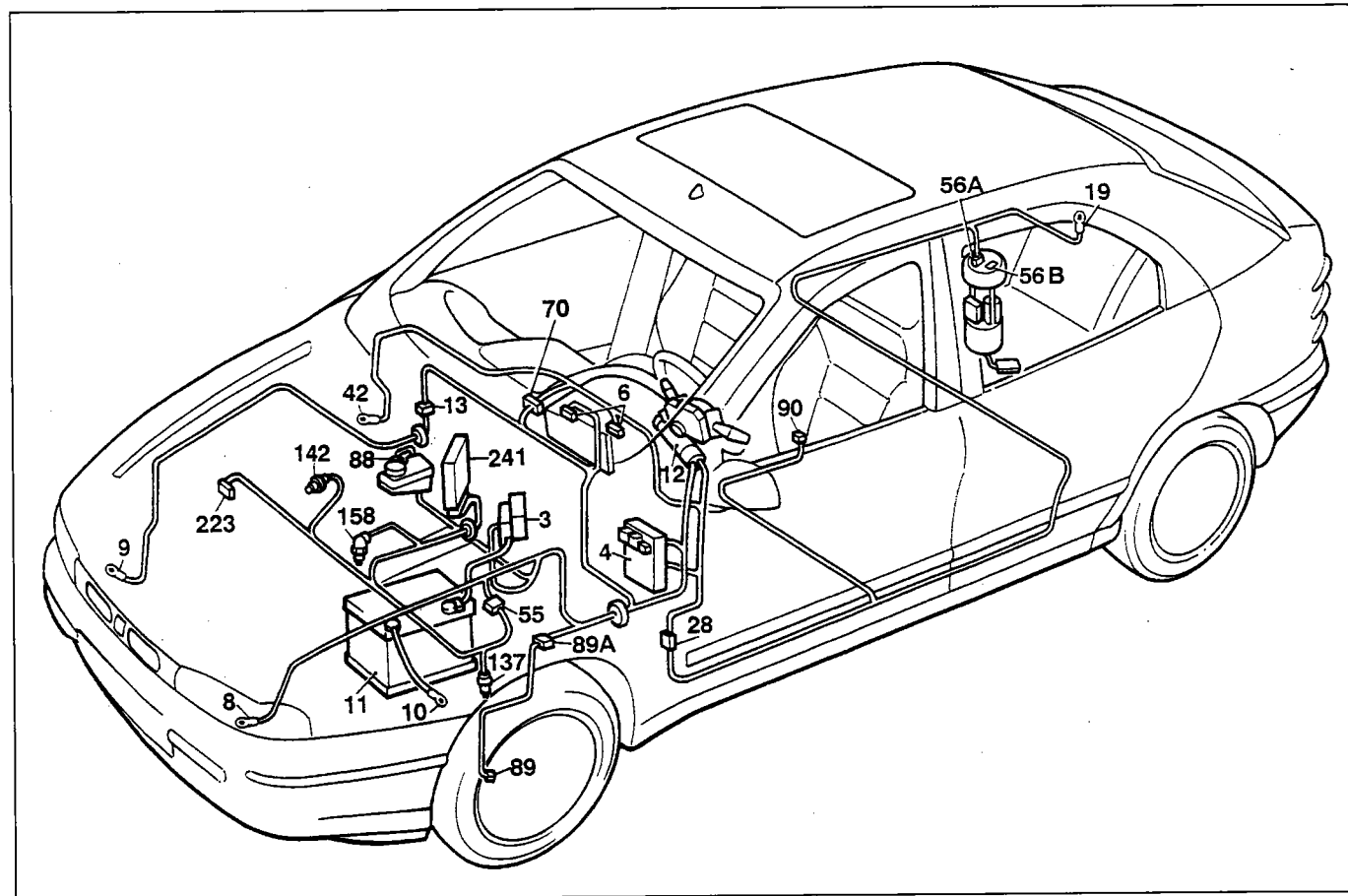
Fuel level gauge and reserve warning light - Handbrake on / low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter - (See key following diagrams)



P4A41ZL01



### 55.



P4A43ZL01

Version: EL - ELX

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/mileage counter and relevant reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Heater plugs warning light - Rev counter

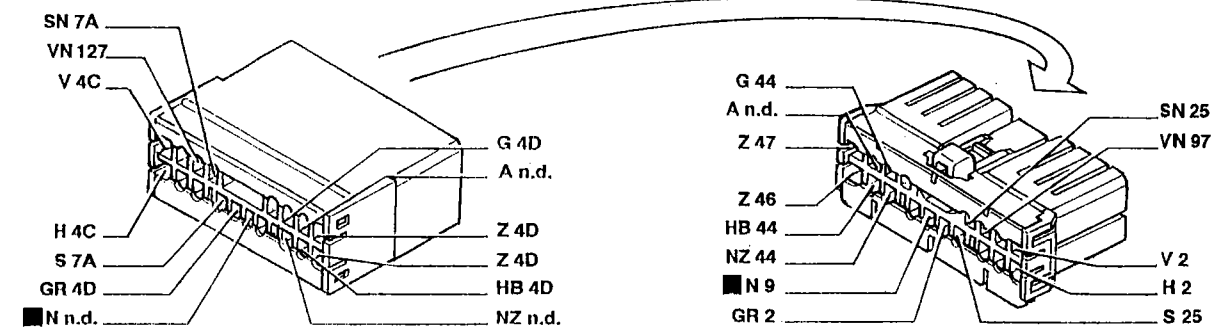
#### Key to components

- 3 Power fuse box:  
 A 60A fuse protecting fuel injection system  
 B 40A fuse protecting ignition system  
 C 60A fuse protecting additional optional extras  
 D 80A fuse protecting fuse and relay unit  
 4 Fuse and relay unit  
 6 Instrument panel:  
 B Low engine oil pressure warning light  
 J Fuel reserve circuit control module  
 J1 Low fuel level warning light  
 K Fuel gauge  
 O Heater plugs warning light  
 Q Front brake pad wear warning light  
 R Handbrake on / low brake fluid level warning light  
 V Speedometer control module  
 V1 Speedometer  
 W Rev counter  
 X Coolant temperature gauge  
 Z Trip recorder/mileage counter  
 Z1 Trip recorder reset button  
 8 Front left earth  
 9 Front right earth  
 10 Battery earth on body shell  
 11 Battery  
 12 Ignition switch

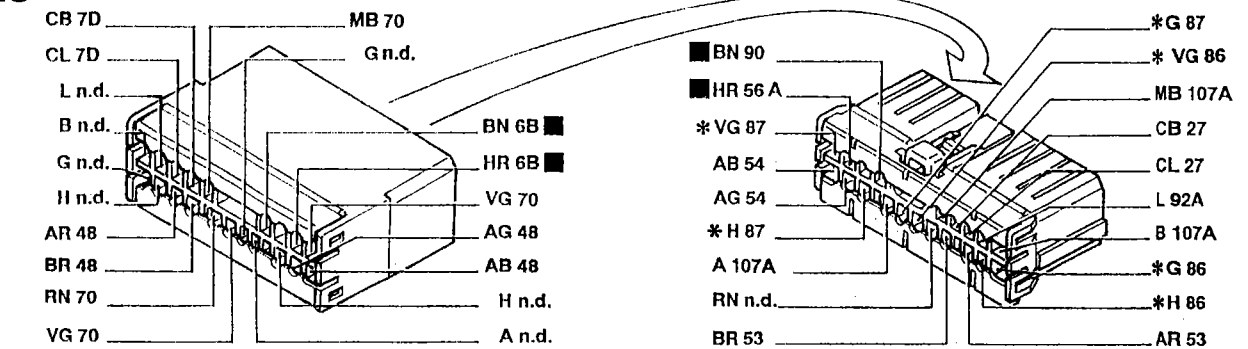
- 13 Front right/left cables connection  
 19 Rear right earth  
 28 Dashboard/longitudinal cables connection  
 42 Right dashboard earth  
 55 Front/engine cables connection  
 56 Fuel gauge controller  
 A Fuel level sensor  
 B Electric fuel pump  
 70 Dashboard/front cables connection  
 88 Low brake fluid level sensor  
 89 Left brake pad wear sensor  
 89A Left brake pad wear sensor cables connection  
 90 Handbrake on warning light switch  
 137 Vehicle speed sensor  
 142 Low oil pressure warning light switch  
 158 Coolant temperature sensor for gauge  
 223 Wheel speed sensor  
 241 Fuel pump electronic control unit

N.D. Ultrasound-soldered joint taped in wiring loom

#### 13 Front right/left cables connection

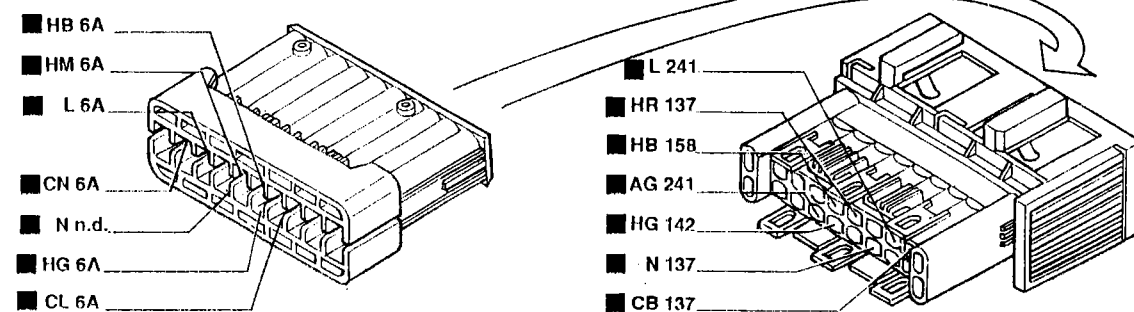


#### 28 Dash./longitudinal cables connection

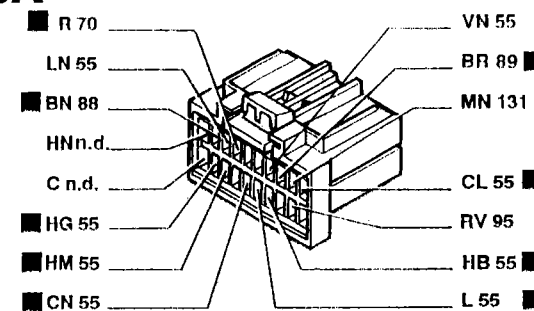


\* Brava only

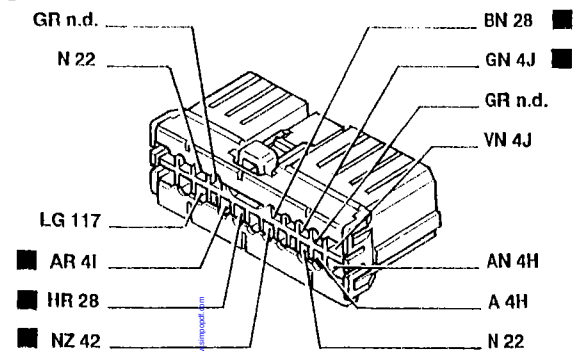
#### 55 Front/engine cables connection



#### 6A Instrument panel



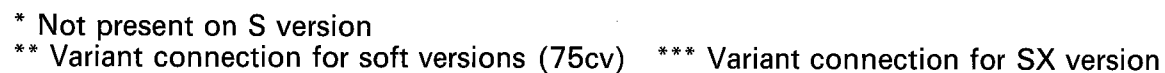
#### 6B Instrument panel



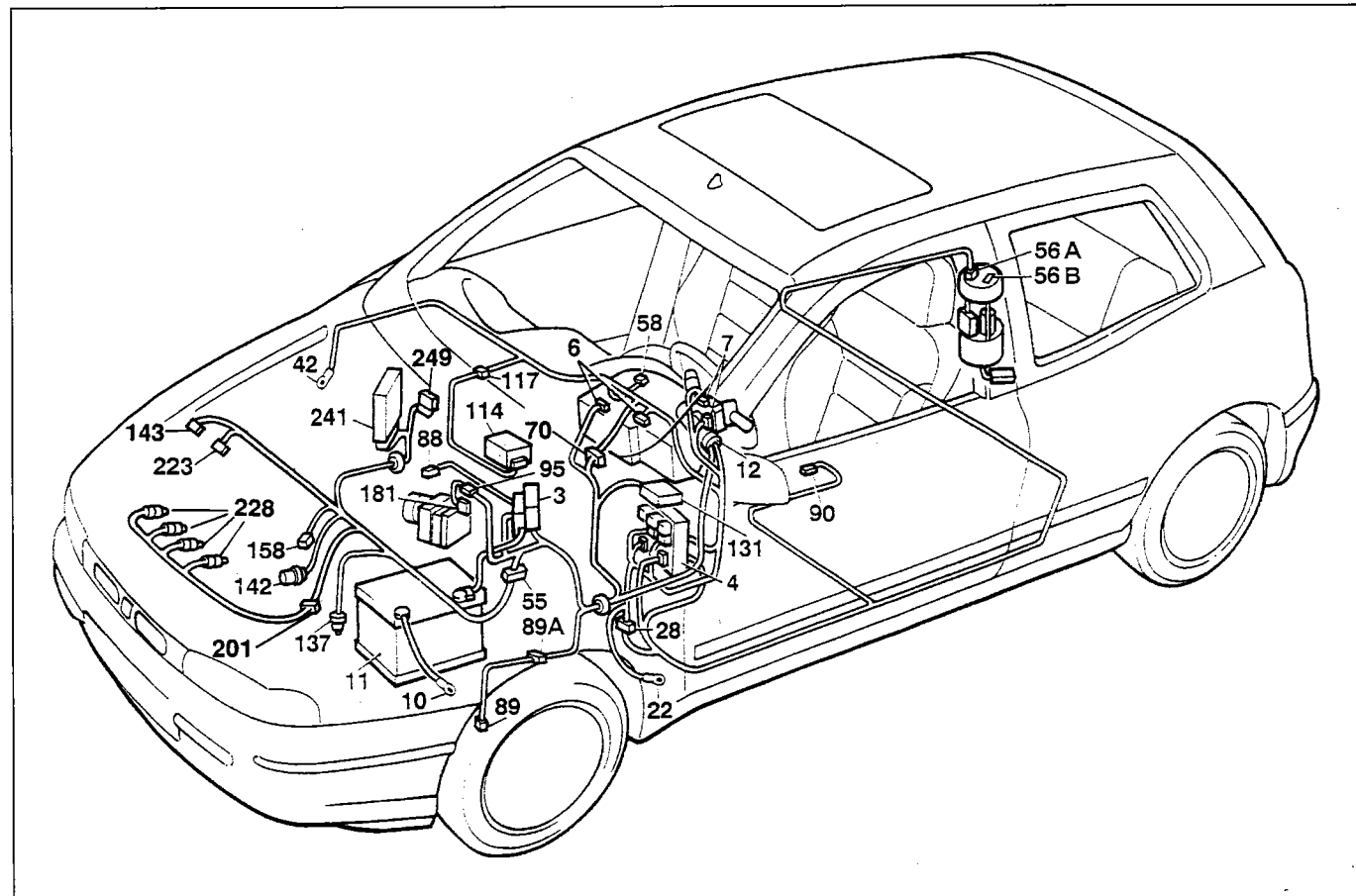
The cables involved in the wiring diagram are marked with a solid square

P4A44ZL01

**Instrument panel connections - (See key following diagrams)**



### 55.



P4A47ZL01

Version: S - SX

#### Instrument panel connections

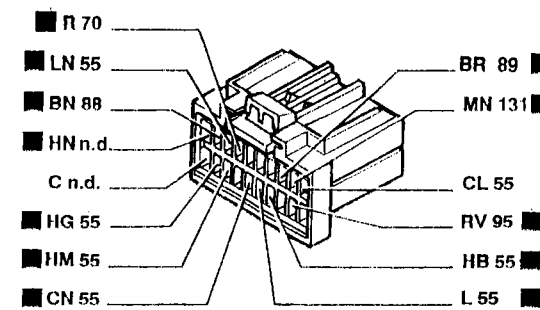
#### Key to components

- 3 Power fuse box:  
 A 60A fuse protecting fuel injection system  
 B 40A fuse protecting ignition system  
 C 60A fuse protecting additional extras  
 D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:  
 A Low generator charge warning light  
 B Low engine oil pressure warning light  
 C Left direction indicator warning light  
 D Right direction indicator warning light  
 E Side lights warning light  
 F Instrument panel symbol lights  
 G Main beam headlamps warning light  
 H Air Bag fault warning light  
 I ABS fault warning light  
 J Fuel reserve circuit control module  
 K Low fuel level warning light  
 L Fuel gauge  
 M Fiat CODE system fault warning light  
 N Fuel injection fault warning light  
 O Heater plugs warning light  
 P Front brake pad wear warning light  
 Q Handbrake on / low brake fluid level warning light  
 R Speedometer control module  
 S Speedometer  
 T Rev counter  
 U Coolant temperature gauge  
 V Trip recorder / mileage counter  
 W Trip recorder reset button
- 7 Stalk unit:  
 D Headlamp flasher button  
 E Dipped beam/main beam headlamps switch  
 F Side lights switch  
 H Direction indicators switch

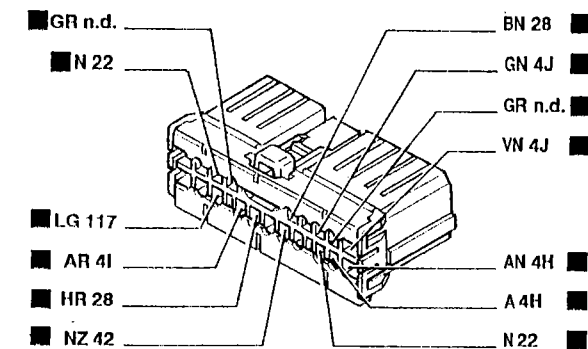
- 10 Battery earth on body shell  
 11 Battery  
 12 Ignition switch  
 22 Left dashboard earth  
 28 Dashboard/longitudinal cables connection  
 42 Right dashboard earth  
 55 Front/engine cables connection  
 56 Fuel gauge controller  
 A Fuel level sensor  
 B Electric fuel pump  
 58 Lighting brightness adjustment rheostat  
 70 Dashboard/front cables connection  
 88 Low brake fluid level sensor  
 89 Left brake pad wear sensor  
 89A Left brake pad wear sensor cables connection  
 90 Handbrake on warning light switch  
 95 Front cables/A.B.S. cables connection  
 114 Air Bag electronic control unit  
 117 Air Bag/dashboard cables connection  
 131 Fiat CODE electronic control unit  
 137 Vehicle speed sensor  
 142 Low oil pressure warning light switch  
 143 Alternator  
 158 Coolant temperature sensor for gauge  
 181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)  
 201 Plug preheating control unit  
 223 Wheel speed sensor  
 228 Heater plugs  
 241 Fuel pump control unit  
 249 E.G.R. electronic control unit

N.D. Ultrasound-soldered joint taped in wiring loom

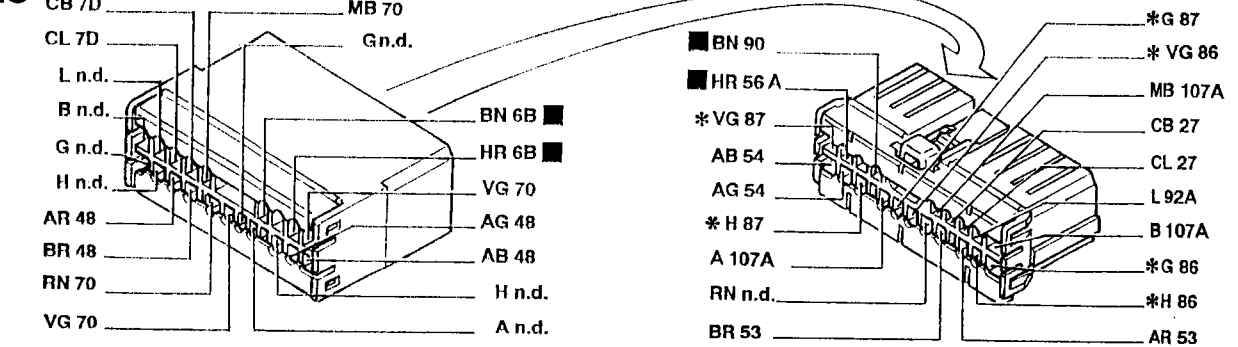
#### 6A Instrument panel



#### 6B Instrument panel

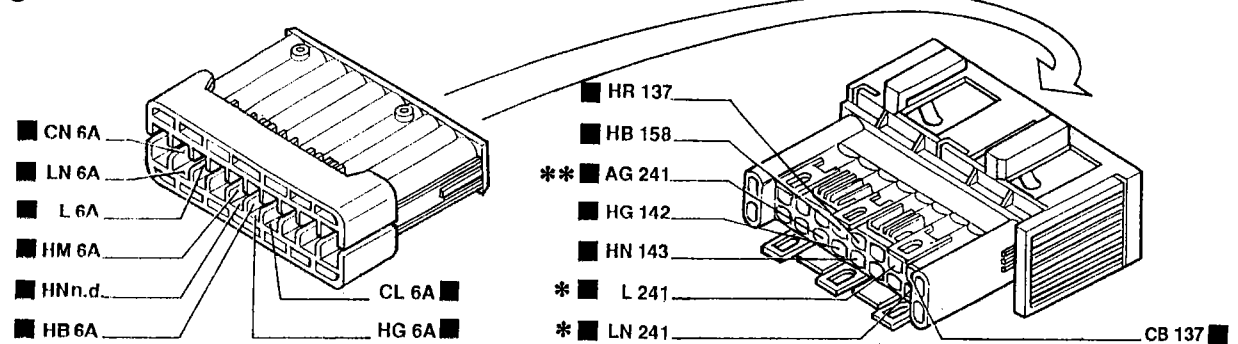


#### 28 Dashboard/longitudinal cables connection



\* Brava only

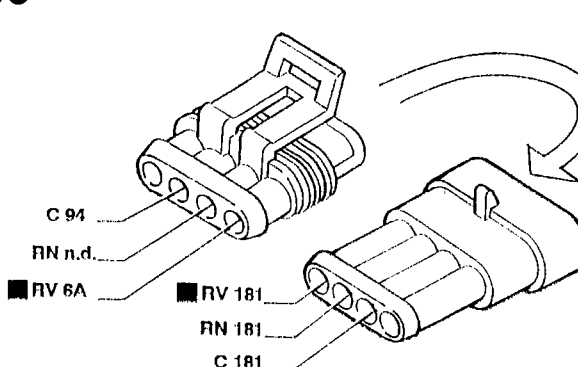
#### 55 Front/engine cables connection



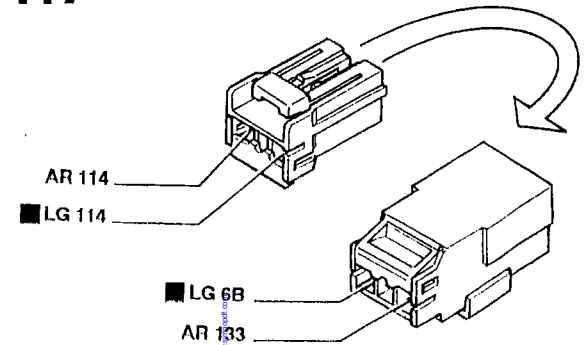
\* N.D. for soft version (75cv)

\*\* 201 for soft version (75cv)

#### 95 Front cables/A.B.S. cables connection



#### 117 Air Bag/dashboard cables connection

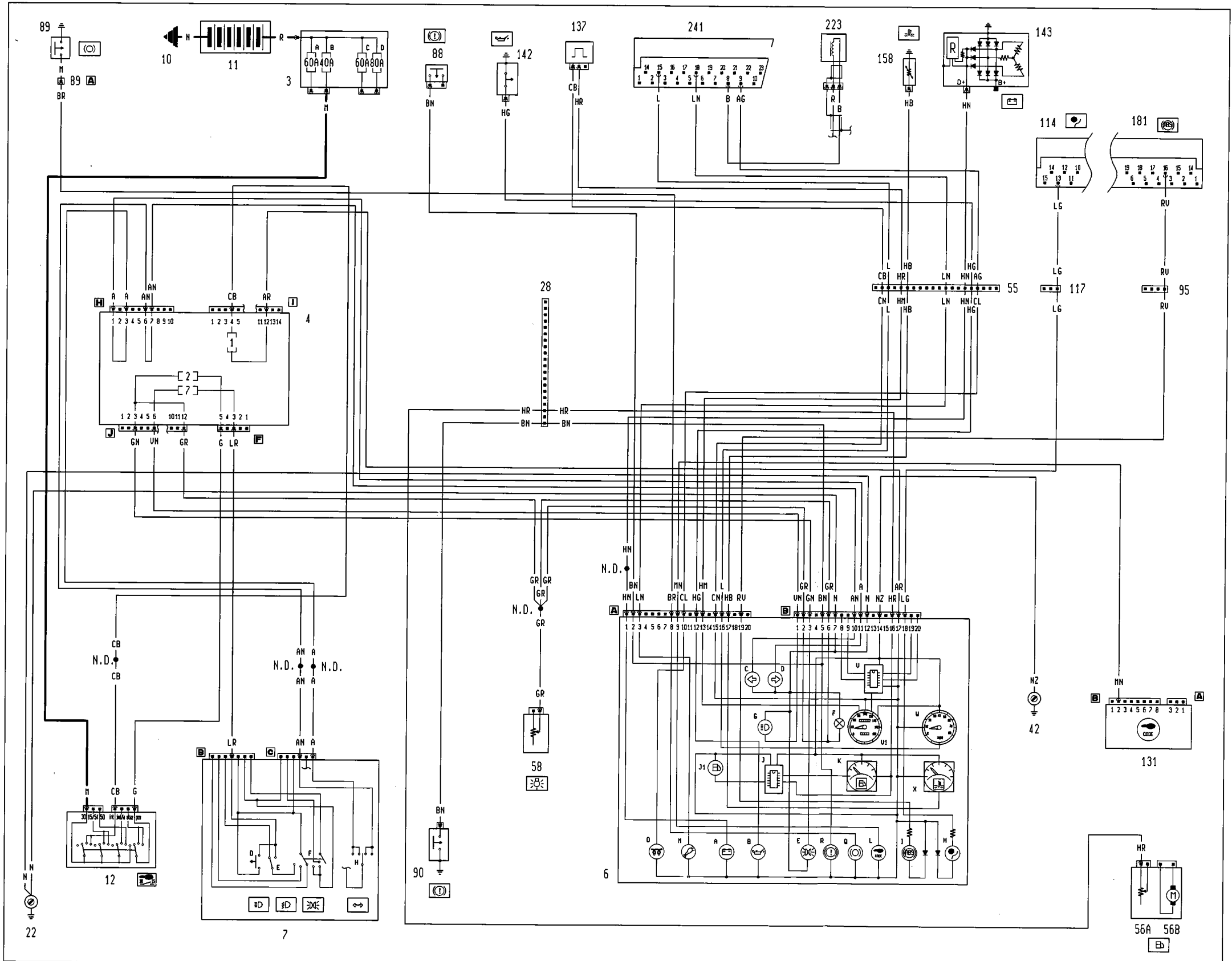


P4A48ZL01

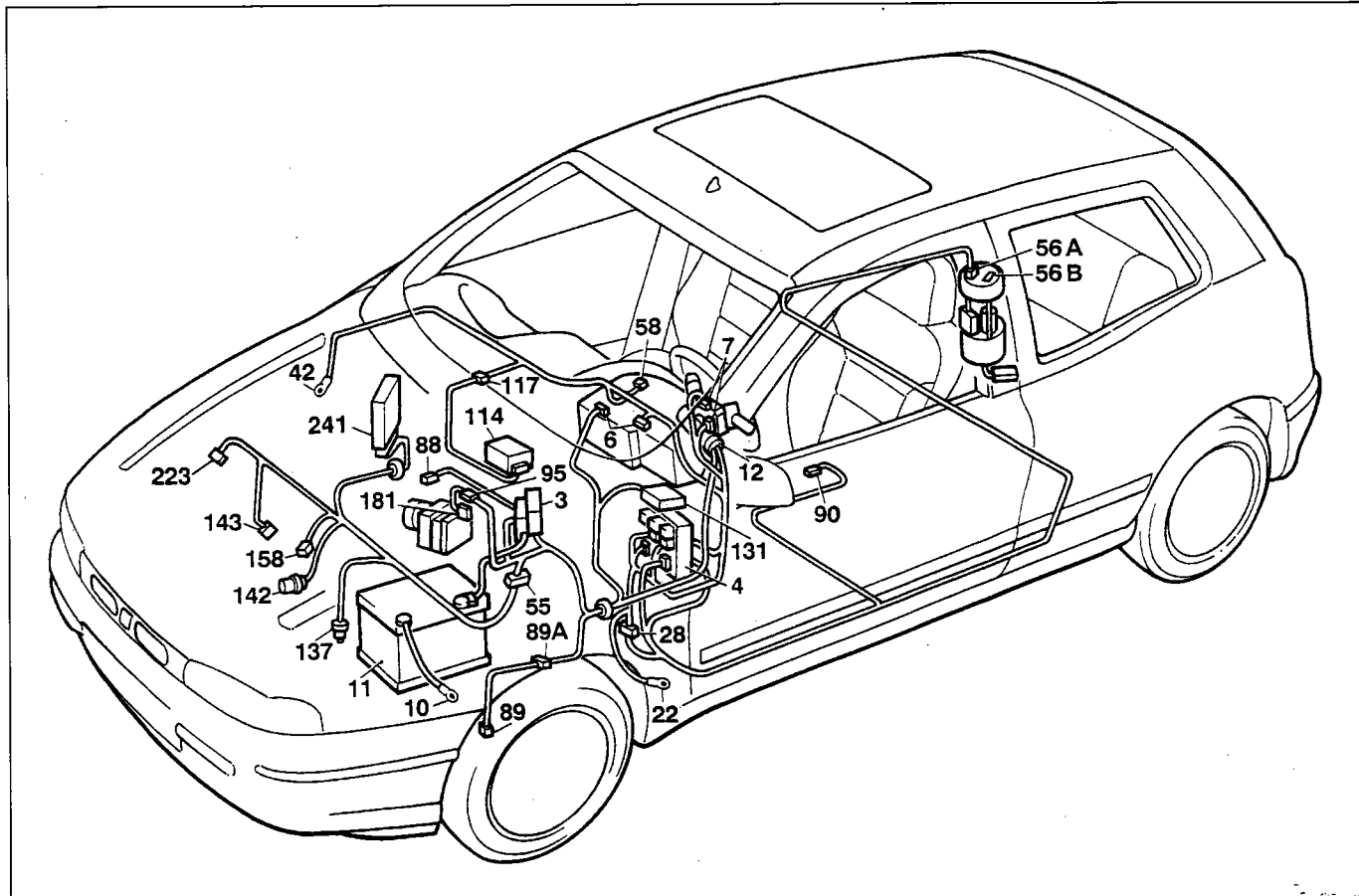


**Version: SX - GT**

**Instrument panel connections - (See key following diagrams)**



### 55.



P4A51ZL01

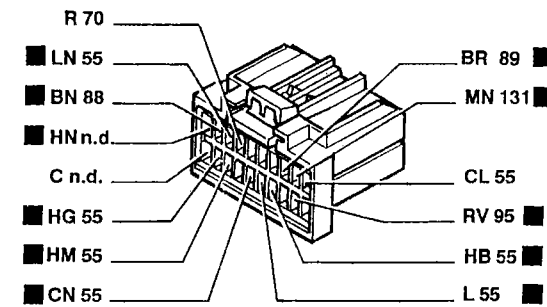
Version: SX - GT

#### Instrument panel connections

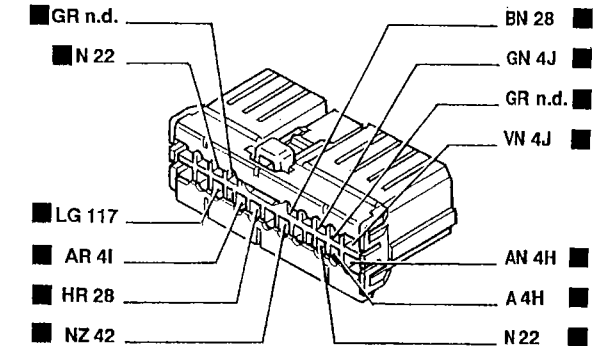
##### Key to components

- 3 Power fuse box:  
 A 60A fuse protecting fuel injection system  
 B 40A fuse protecting ignition system  
 C 60A fuse protecting additional optional extras  
 D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:  
 A Low generator charge warning light  
 B Low engine oil pressure warning light  
 C Left direction indicator warning light  
 D Right direction indicator warning light  
 E Side lights warning light  
 F Instrument panel symbol lights  
 G Main beam headlamps warning light  
 H Air Bag fault warning light  
 I Anti-lock braking system fault warning light  
 J Fuel reserve circuit control module  
 J1 Low fuel level warning light  
 K Fuel gauge  
 L Fiat CODE fault warning light  
 M Fuel injection fault warning light  
 O Heater plugs warning light  
 Q Front brake pad wear warning light  
 R Handbrake on / low brake fluid warning light  
 V Speedometer control module  
 V1 Speedometer  
 W Rev counter  
 X Coolant temperature gauge
- 7 Stalk unit:  
 D Headlamp flasher button  
 E Dipped beam/main beam headlamps switch  
 F Side lights switch  
 H Direction indicators switch
- 10 Battery earth on body shell  
 11 Battery  
 12 Ignition switch  
 22 Left dashboard earth  
 28 Dashboard/longitudinal cables connection  
 42 Right dashboard earth  
 55 Front/engine cables connection  
 56 Fuel gauge controller  
 A Fuel level sensor  
 B Electric fuel pump  
 58 Lighting brightness adjustment rheostat  
 88 Low brake fluid level sensor  
 89 Left brake pad wear sensor  
 89A Left brake pad wear sensor cables connection  
 90 Handbrake on warning light switch  
 95 Front cables/anti-lock braking system (A.B.S.) connection  
 114 Air Bag electronic control unit  
 117 Air Bag/dashboard cables connection  
 131 Fiat CODE electronic control unit  
 137 Vehicle speed sensor  
 142 Low oil pressure warning light switch  
 143 Alternator  
 158 Coolant temperature sensor for gauge  
 181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)  
 223 Wheel speed sensor  
 241 Fuel pump electronic control unit
- N.D. Ultrasound-soldered joint taped in wiring loom

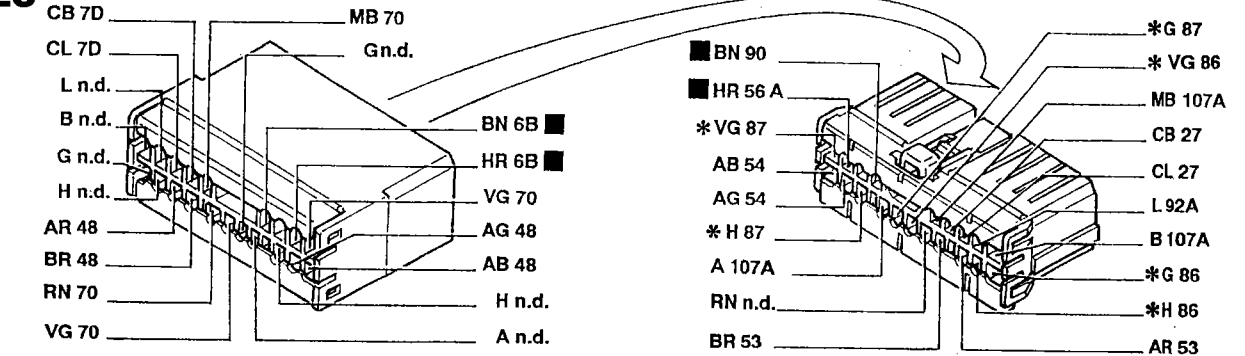
#### 6A Instrument panel



#### 6B Instrument panel

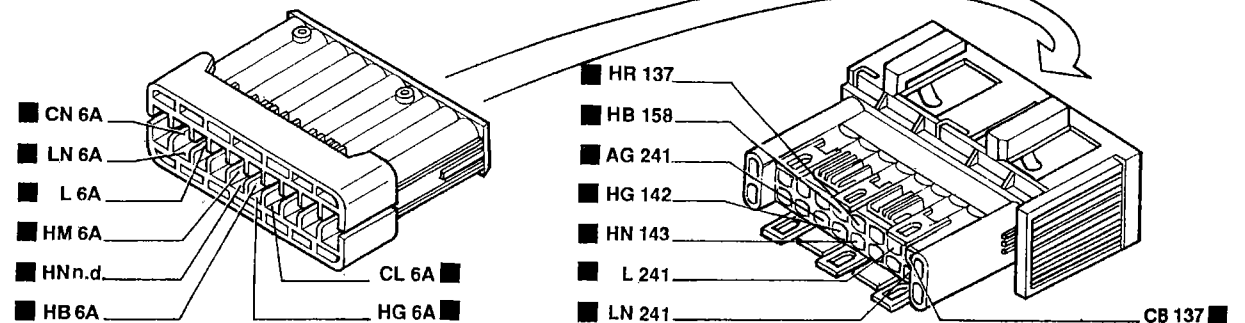


#### 28 Dashboard/longitudinal cables connection

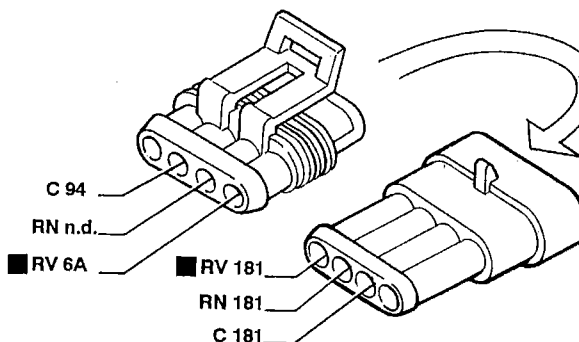


\* Brava only

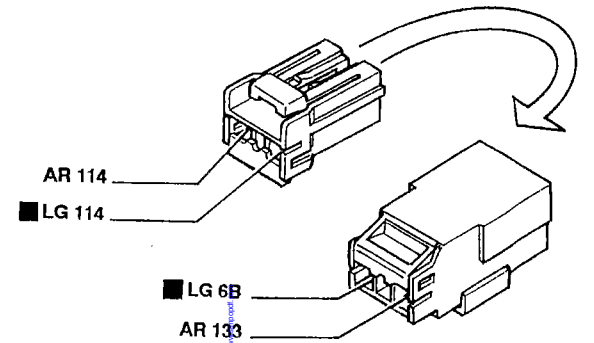
#### 55 Front/engine cables connection



#### 95 Front cables/anti-lock braking system (A.B.S.) cables connection



#### 117 Air Bag/dashboard cables connection



P4A52ZL01

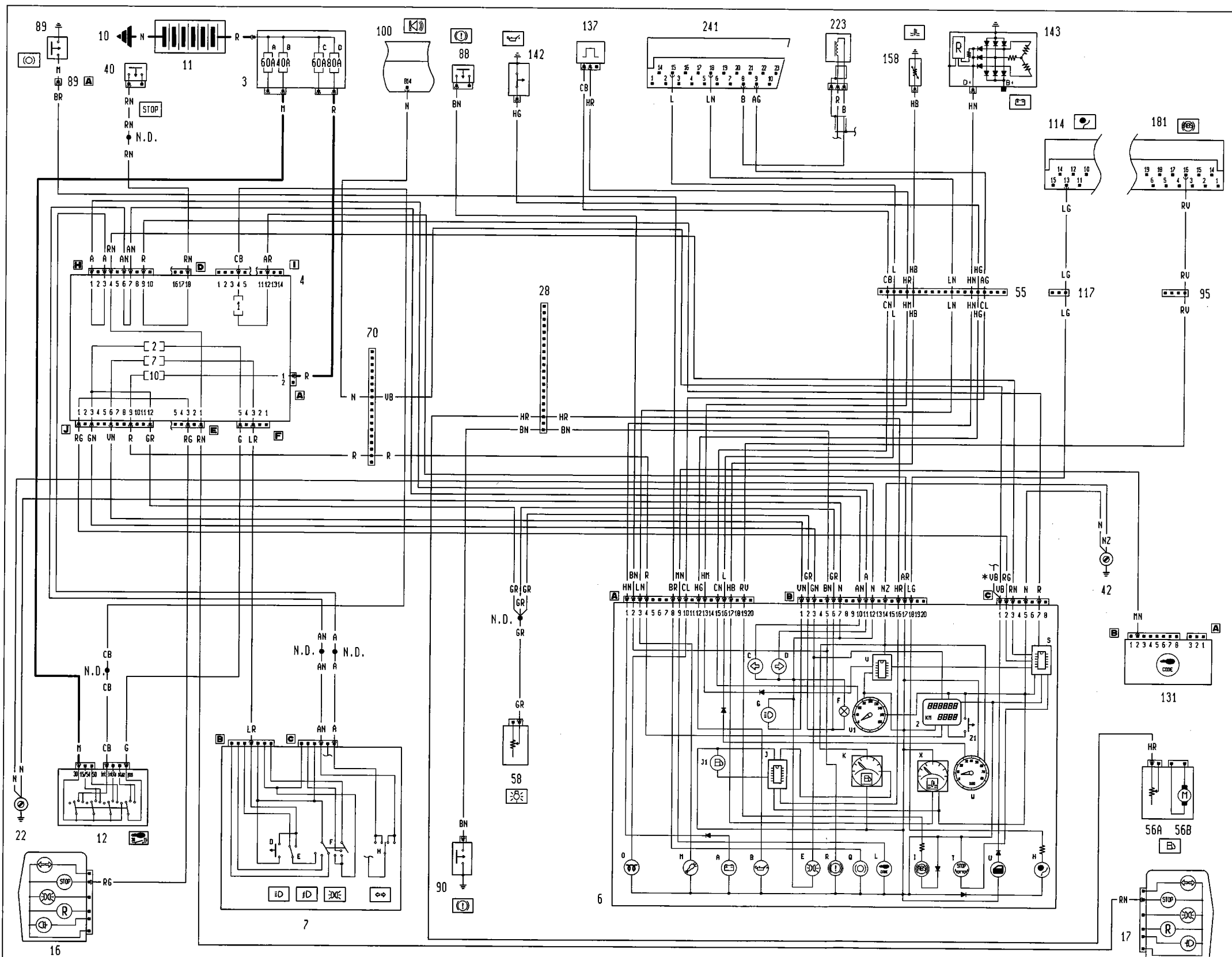
# Electrical system

## Wiring diagrams

### 55.

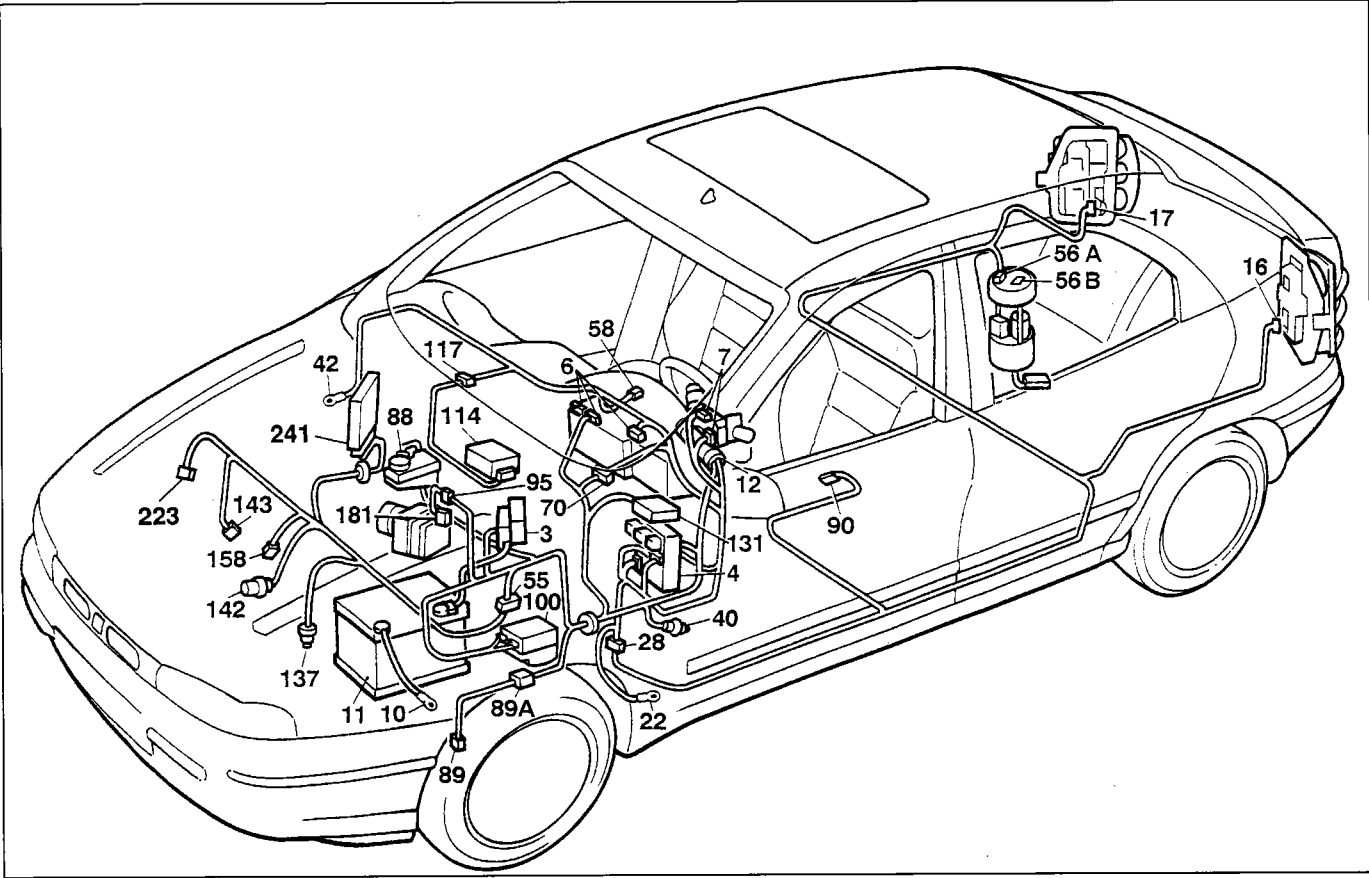
Version: EL - ELX

Instrument panel connections - (See key following diagrams)



\* Variant connection for versions without alarm (see door locking)

55.



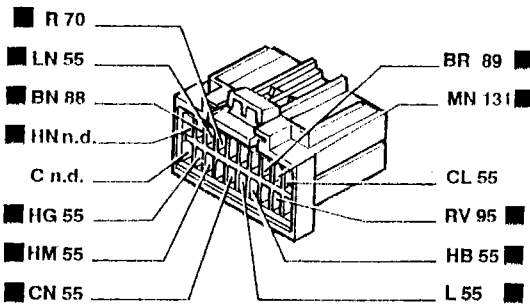
P4A55ZL01

Version: EL - ELX  
Instrument panel connections  
Key to components

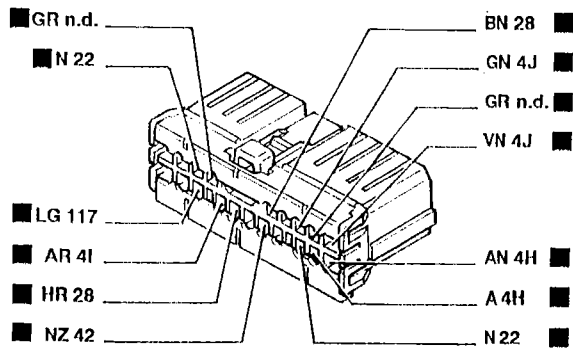
- 3 Power fuse box:  
A 60A fuse protecting fuel injection system  
B 40A fuse protecting ignition system  
C 60A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit  
4 Fuse and relay unit  
6 Instrument panel:  
A Low generator charge warning light  
B Low engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel symbol lights  
G Main beam headlamps warning light  
H Air Bag fault warning light  
I Anti-lock braking system fault warning light  
J Fuel reserve circuit control module  
J1 Low fuel level warning light  
K Fuel gauge  
L Fiat CODE system fault warning light  
M Fuel injection fault warning light  
O Heater plugs warning light  
Q Front brake pad wear warning light  
R Handbrake on/low brake fluid level warning light  
S Stop lights fault indicator electronic control module  
T Stop lights fault warning light  
U Doors open warning light  
V Speedometer control module  
V1 Speedometer  
W Rev counter  
X Coolant temperature gauge  
Z Trip recorder/mileage counter  
Z1 Trip recorder reset button

7 Stalk unit:  
D Flasher button  
E Dipped beam/main beam headlamps switch  
F Side lights switch  
H Direction indicators switch  
10 Battery earth on body shell  
11 Battery  
12 Ignition switch  
16 Rear left lights cluster  
17 Rear right lights cluster  
22 Left dashboard earth  
28 Dashboard/longitudinal cables connection  
40 Stop lights switch  
42 Right dashboard earth  
55 Front/engine cables connection  
56 Fuel gauge controller  
A Fuel level sensor  
B Electric fuel pump  
58 Lighting brightness adjustment rheostat  
70 Dashboard/front cables connection  
88 Low brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Handbrake on warning light switch  
95 Front cables/anti-lock braking system (A.B.S.) cables connection  
100 Alarm electronic control unit  
114 Air Bag electronic control unit  
117 Air Bag/dashboard cables connection  
131 Fiat CODE electronic control unit  
137 Vehicle speed sensor  
142 Low oil pressure warning light switch  
143 Alternator  
158 Coolant temperature sensor for gauge  
181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)  
223 Wheel speed sensor  
241 Fuel pump electronic control unit
- N.D. Ultrasound-soldered joint taped in wiring loom

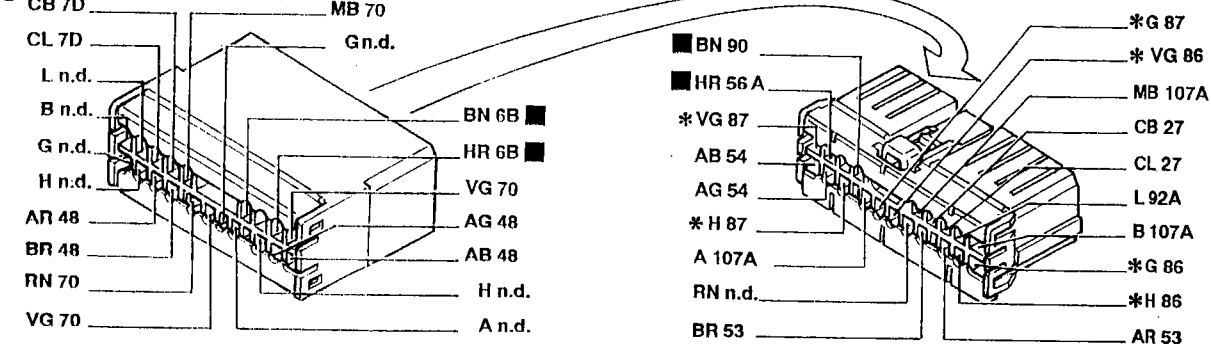
6A Instrument panel



6B Instrument panel

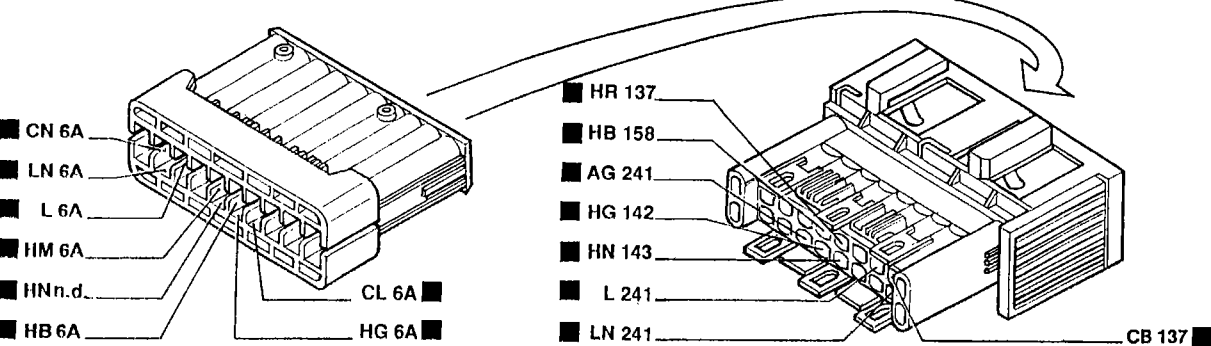


28 Dashboard/longitudinal cables connection

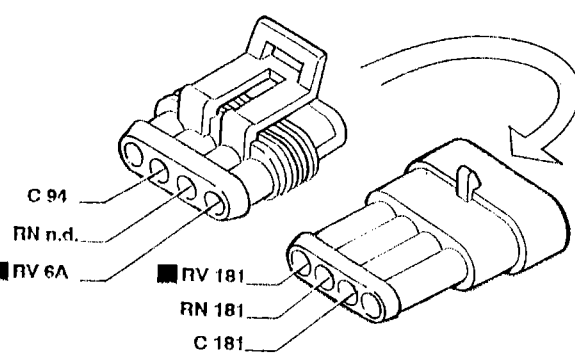


\* Brava only

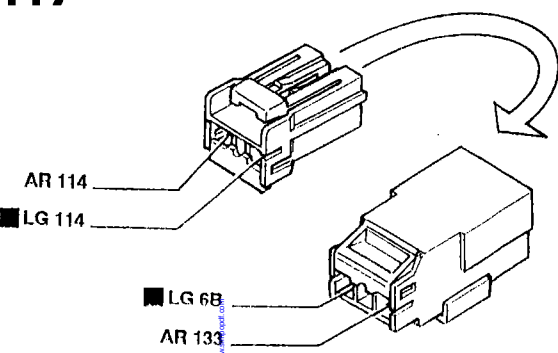
55 Front/engine cables connection



95 Front/anti-lock braking system (A.B.S.) cables connection



117 Air Bag/dashboard cables connection



P4A56ZL01

## CONNECTOR BLOCKS \*

|                                                     |      |
|-----------------------------------------------------|------|
| INTRODUCTION                                        | page |
| Interpretation of the codes on the connector blocks | 58   |
| Wiring colour code                                  | 58   |
| Connector blocks                                    | 59   |

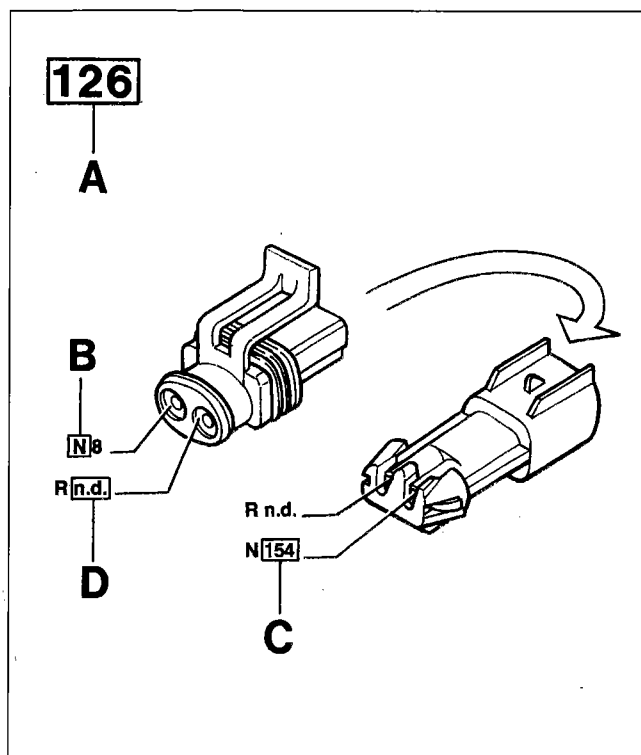
\* With regard to the 1910 Turbo D engine, the connector blocks have been added from the previous publication; for aspects not covered, refer to the Bravo-Brava publication no. 506.670/02.



## 55.

### INTRODUCTION

#### Interpretation of the codes on the connector blocks



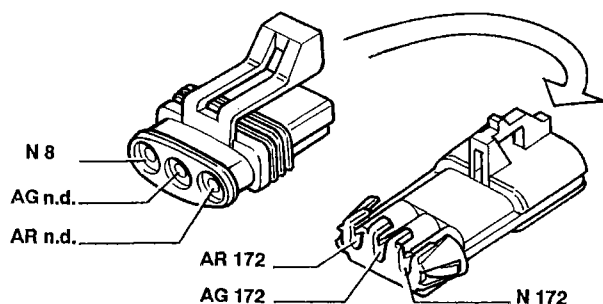
P4A58ZL01

- A** Connector block identification number referring to the wiring diagrams
- B** Cable colour identification code
- C** Identification number of the cable's destination block
- D** The abbreviation n.d. identifies an ultrasound-soldered joint taped into the wiring loom

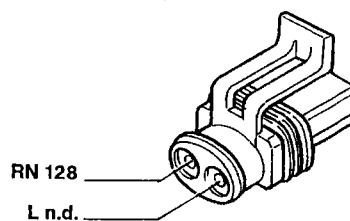
#### Cable colour codes

|           |                   |           |                   |           |              |
|-----------|-------------------|-----------|-------------------|-----------|--------------|
| <b>A</b>  | Light blue        | <b>BG</b> | White-Yellow      | <b>LB</b> | Blue-White   |
| <b>B</b>  | White             | <b>BL</b> | White-Blue        | <b>LG</b> | Blue-Yellow  |
| <b>C</b>  | Orange            | <b>BN</b> | White-Black       | <b>LN</b> | Blue-Black   |
| <b>G</b>  | Yellow            | <b>BR</b> | White-Red         | <b>LR</b> | Blue-Red     |
| <b>H</b>  | Grey              | <b>BV</b> | White-Green       | <b>LV</b> | Blue-Green   |
| <b>L</b>  | Blue              | <b>BZ</b> | White-Purple      | <b>MB</b> | Brown-White  |
| <b>M</b>  | Brown             | <b>CA</b> | Orange-Light blue | <b>MN</b> | Brown-Black  |
| <b>N</b>  | Black             | <b>CB</b> | Orange-White      | <b>NZ</b> | Black-Purple |
| <b>R</b>  | Red               | <b>CN</b> | Orange-Black      | <b>RB</b> | Red-White    |
| <b>S</b>  | Pink              | <b>GN</b> | Yellow-Black      | <b>RG</b> | Red-Yellow   |
| <b>V</b>  | Green             | <b>GL</b> | Yellow-Blue       | <b>RN</b> | Red-Black    |
| <b>Z</b>  | Purple            | <b>GR</b> | Yellow-Red        | <b>RV</b> | Red-Green    |
| <b>AB</b> | Light blue-White  | <b>GV</b> | Yellow-Green      | <b>SN</b> | Pink-Black   |
| <b>AG</b> | Light blue-Yellow | <b>HG</b> | Grey-Yellow       | <b>VB</b> | Green-White  |
| <b>AN</b> | Light blue-Black  | <b>HN</b> | Grey-Black        | <b>VN</b> | Green-Black  |
| <b>AR</b> | Light blue-Red    | <b>HR</b> | Grey-Red          | <b>VR</b> | Green-Red    |
| <b>AV</b> | Light blue-Green  | <b>HV</b> | Grey-Green        | <b>ZB</b> | Purple-White |

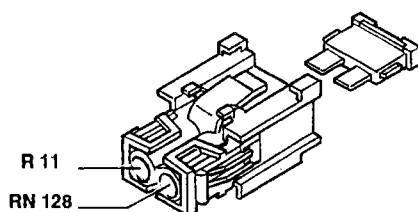
**236** Front/air conditioner cables connection



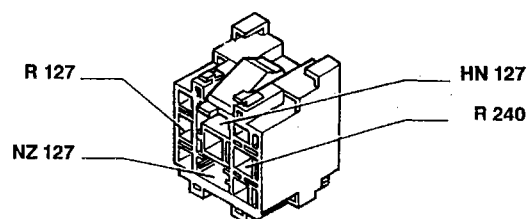
**237** Additional engine cooling fan



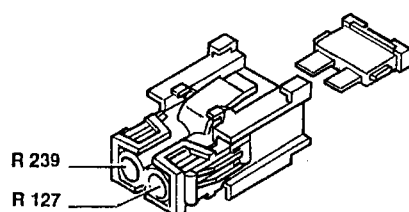
**238** 40A fuse protecting engine cooling fan



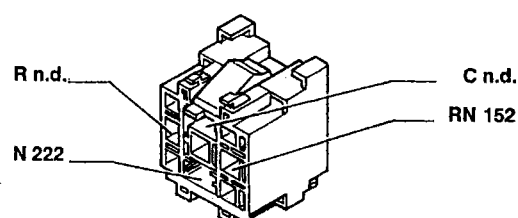
**239** Heated diesel filter control relay



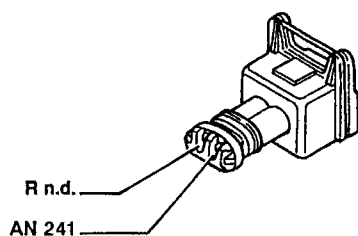
**240** 20A fuse protecting heated diesel filter control relay



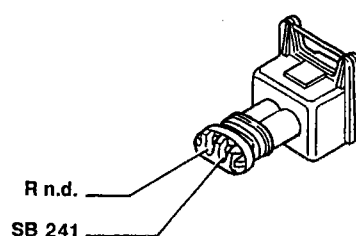
**242** Fuel injection control relay



**243** Engine advance adjustment solenoid



**244** Fast idle adjustment solenoid

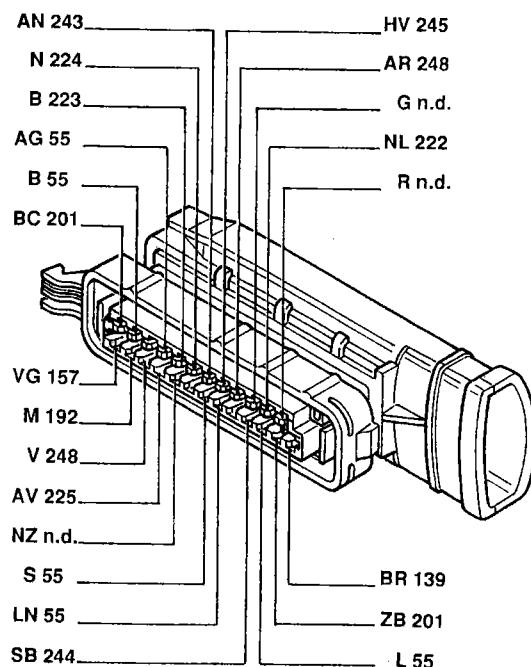


P4A59ZL01

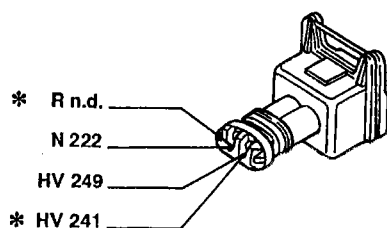


**55.**

### 241 Fuel pump electronic control unit

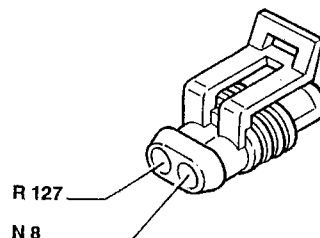


### 245 E.G.R. solenoid

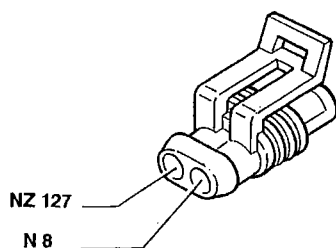


\* Variant connections for 100 BHP version

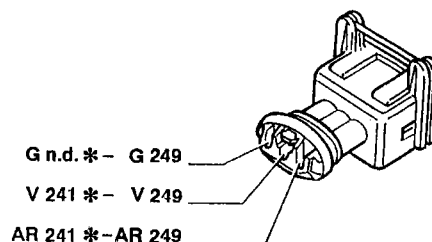
### 246 Heated fuel filter



### 247 Heated fuel filter thermal contact



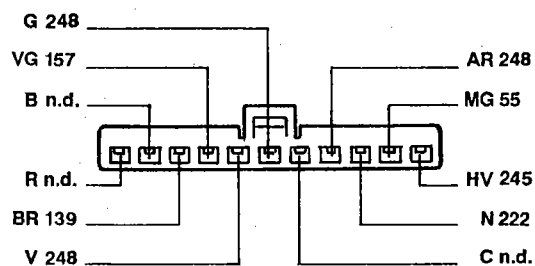
### 248 Potentiometer on fuel pump



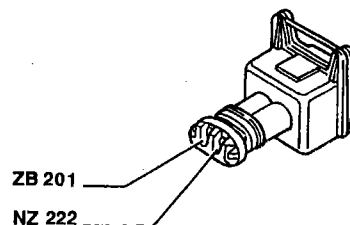
\* Variant connections for 100 BHP version

P4A60ZL01

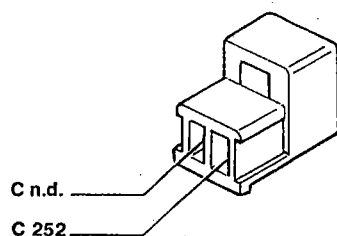
**249** E.G.R. electronic control unit



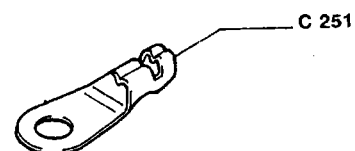
**250** Water temperature sensor for preheating control unit



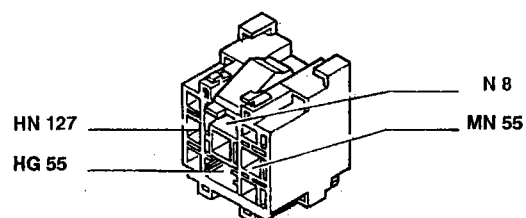
**251** Thermal switch for K.S.B.



**252** Earth for K.S.B. device



**253** Relay for switching off compressor



#### Key to components:

- 3 Power fuse box:
  - A 60A fuse protecting fuel injection system
  - B 40A fuse protecting ignition system
  - C 60A fuse protecting additional optional extras
  - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:
  - E1 Ignition switch discharge relay
  - E2 Horn relay
  - E3 Heated rear window relay
- 6 Instrument panel:
  - A Low generator charge warning light
  - B Low engine oil pressure warning light
  - C Left direction indicator warning light
  - D Right direction indicator warning light
  - E Side lights warning light
  - F Instrument panel symbol lights
  - G Main beam headlamps warning light
  - H Air Bag fault warning light
  - I Anti-lock braking system fault warning light
  - J Fuel reserve circuit control module
  - J1 Low fuel level warning light
  - K Fuel gauge
  - L Fiat CODE fault warning light
  - M Fuel injection fault warning light
  - O Heater plugs warning light
  - Q Front brake pad wear warning light
  - R Handbrake on / low brake fluid level warning light
  - S Stop lights fault indicator electronic control module
  - T Stop lights fault warning light
  - U Door open warning light
  - V Speedometer control module
  - V1 Speedometer
  - W Rev counter

- X Water temperature gauge
- Z Trip recorder/mileage counter
- Z1 Trip recorder reset button
- 7 Stalk unit:
  - A Windscreen wiper speed switch
  - B Windscreen wash/headlamp wash/rear window wash switch
  - C Rear window wiper switch
  - D Headlamp flasher button
  - E Dipped beam/main beam headlamps
  - F Side lights switch
  - G Indicators/hazard lights intermittent switch
  - H Direction indicators switch
  - I Horn button
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 18 Rear left earth
- 19 Rear right earth
- 22 Left dashboard earth
- 24 Windscreen wiper motor
- 25 Windscreen/rear window washer pump
- 26 Rear window wiper motor
- 27 Rear connections contact assembly with built-in boot light switch
- 28 Dash./longitudinal cables connection
- 34 Switch controls unit:
  - A Alarm on warning light
  - B Rear fog lamps switch
  - C Rear fog lamps relay
  - D Rear fog lamps warning light
  - E Heated rear window switch
  - F Heated rear window warning light
  - G Switch controls unit symbol light
  - H Front fog lamps warning light
  - I Front fog lamps switch
- 39 Heated rear window
- 42 Right dashboard earth
- 46 Left horn
- 47 Right horn
- 55 Front/engine cables connection
- 55A Front left/engine cables connection
- 55C Front left/engine cables connection

56 Fuel gauge controller  
 A Fuel level sensor  
 B Electric fuel pump  
 57 Inertial switch  
 58 Lighting brightness adjustment rheostat  
 70 Dash./front cables connection  
 88 Low brake fluid level sensor  
 89 Left brake pad wear sensor  
 89A Left brake pad wear sensor cables connection  
 90 Handbrake on warning light switch  
 95 Front/anti-lock braking system (A.B.S.) cables connection  
 97 Headlamp washer pump  
 98 Headlamp washer intermittent switch  
 99 20A fuse protecting headlamp washer  
 114 Air Bag electronic control unit  
 117 Air Bag/dashboard cables connection  
 120 Air conditioner cables connection  
 121 Three-stage pressure switch  
 122 Engine cooling fan low speed relay  
 123 Engine cooling fan high speed timer  
 123A Engine cooling fan high speed relay  
 124 Air conditioner compressor relay  
 126 Front/air conditioner cables connection  
 127 Connection between front left cables/cable on relay bracket  
 128 Front/air conditioner cables connection  
 129 40A power fuse protecting engine cooling fan  
 131 Fiat CODE electronic control unit  
 137 Car speed sensor  
 139 Diagnostic socket for fuel injection  
 142 Low oil pressure warning light switch  
 143 Alternator  
 145 Starter motor  
 147 Compressor for air conditioner  
 152 10A fuse protecting fuel injection  
 154 Engine cooling fan  
 157 Water temperature sensor for fuel injection  
 158 Water temperature sensor for gauge  
 170 Engine cooling fan limiting resistor  
 171 Heater unit

172 Two-stage thermostat  
 181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)  
 192 Air temperature sensor  
 200 Inertial switch relay  
 201 Plug preheating control unit  
 202 Heater/air conditioner light bulbs  
 203 Air conditioner controls:  
 A Switch for switching on air conditioner  
 B Air conditioner recirculation control switch  
 204 Engine cooling fan 1st speed control relay  
 205 Air conditioner fan control relay  
 206 Heater/air conditioner fan  
 207 Heater/air conditioner speed control switch  
 208 Heater/air conditioner limiting resistor  
 209 Actuator controlling exterior air/recirculation  
 210 Electronic thermostat cables connection  
 211 Electronic thermostat (N.T.C.)  
 222 Earth for fuel system  
 223 Wheel speed sensor  
 224 Instrumented fuel injector  
 225 Flowmeter  
 226 Diagnostic socket for Fiat CODE system  
 228 Heater plugs  
 229 Engine cut-out electrostop  
 232 Compressor earth  
 233 Thermostat on coolant pump  
 235 Air conditioner compressor cables connection  
 236 Front/air conditioner cables connection  
 237 Additional engine cooling fan  
 238 40A fuse protecting engine cooling fan  
 239 Heated diesel filter relay  
 240 20A fuse protecting heated diesel filter relay  
 241 Fuel pump electronic control unit  
 242 Fuel injection control relay  
 243 Engine advance adjustment solenoid  
 244 Fast idle solenoid  
 245 E.G.R. solenoid  
 246 Heated fuel filter  
 247 Heated fuel filter thermal contact

248 Potentiometer on fuel pump  
 249 E.G.R. electronic control unit  
 250 Water temperature sensor for preheating control unit  
 251 K.S.B. thermal switch  
 252 K.S.B. earth.  
 253 Relay for switching off compressor  
 N.D. Ultrasound-soldered joint taped into wiring loom

# **Cable colour code:**

|           |                   |
|-----------|-------------------|
| <b>A</b>  | Light blue        |
| <b>B</b>  | White             |
| <b>C</b>  | Orange            |
| <b>G</b>  | Yellow            |
| <b>H</b>  | Grey              |
| <b>L</b>  | Blue              |
| <b>M</b>  | Brown             |
| <b>N</b>  | Black             |
| <b>R</b>  | Red               |
| <b>S</b>  | Pink              |
| <b>V</b>  | Green             |
| <b>Z</b>  | Purple            |
| <b>AB</b> | Light blue-White  |
| <b>AG</b> | Light blue-Yellow |
| <b>AN</b> | Light blue-Black  |
| <b>AR</b> | Light blue-Red    |
| <b>AV</b> | Light blue-Green  |
| <b>BG</b> | White-Yellow      |
| <b>BL</b> | White-Blue        |
| <b>BN</b> | White-Black       |
| <b>BR</b> | White-Red         |
| <b>BV</b> | White-Green       |
| <b>BZ</b> | White-Purple      |
| <b>CA</b> | Orange-Light blue |
| <b>CB</b> | Orange-White      |
| <b>CN</b> | Orange-Black      |
| <b>GN</b> | Yellow-Black      |
| <b>GL</b> | Yellow-Blue       |
| <b>GR</b> | Yellow-Red        |
| <b>GV</b> | Yellow-Green      |
| <b>HG</b> | Grey-Yellow       |
| <b>HN</b> | Grey-Black        |
| <b>HR</b> | Grey-Red          |
| <b>HV</b> | Grey-Green        |
| <b>LB</b> | Blue-White        |
| <b>LG</b> | Blue-Yellow       |
| <b>LN</b> | Blue-Black        |
| <b>LR</b> | Blue-Red          |
| <b>LV</b> | Blue-Green        |
| <b>MB</b> | Brown-White       |
| <b>MN</b> | Brown-Black       |
| <b>NZ</b> | Black-Purple      |
| <b>RB</b> | Red-White         |
| <b>RG</b> | Red-Yellow        |
| <b>RN</b> | Red-Black         |
| <b>RV</b> | Red-Green         |
| <b>SN</b> | Pink-Black        |
| <b>VB</b> | Green-White       |
| <b>VN</b> | Green-Black       |
| <b>VR</b> | Green-Red         |
| <b>ZB</b> | Purple-White      |

page

|                                   |    |
|-----------------------------------|----|
| - Electrical symbols              | 1  |
| - How to read the wiring diagrams | 4  |
| - Wiring diagrams                 | 5  |
| - Key to wiring diagrams          | 37 |

55.

| NAME                                                                                                                                                                                                                                                                                                   | Bravo    |          | Brava    |          |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|
|                                                                                                                                                                                                                                                                                                        | S        | SX       | S        | SX       | EL       | ELX      |
|                                                                                                                                                                                                                                                                                                        | 1581 16v | 1581 16v | 1581 16v | 1581 16v | 1581 16v | 1581 16v |
| Side lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights -                                                                                                                                                                  | 5        | 5        | 5        | 5        | 5        | 5        |
| Front fog lamps and warning light - Rear fog lamps and warning light                                                                                                                                                                                                                                   | 7        | 7        | 7        | 7        | 7        | 7        |
| Version with air conditioner<br>Engine cooling system - Water temperature gauge                                                                                                                                                                                                                        | 9        | 9        | 9        | 9        | 9        | 9        |
| Anti-lock braking system (A.B.S.) and fault warning light - Hand brake on/low brake fluid level warning light                                                                                                                                                                                          | 11       | 11       | 11       | 11       | 11       | 11       |
| Fiat-CODE system and fault warning light                                                                                                                                                                                                                                                               | 13       | 13       | 13       | 13       | 13       | 13       |
| Starting - Electronic ignition and fuel injection - Recharging and warning light - Low engine oil pressure warning light - Fuel injection fault warning light - Rev counter                                                                                                                            | 15       | 15       | 15       | 15       | 15       | 15       |
| Model without air conditioner<br>Engine cooling system - Water temperature gauge - Car interior ventilation                                                                                                                                                                                            | 17       | 17       | 17       | 17       | 17       | 17       |
| Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights                                                                                                                                                                                        | 19       | 19       | 19       | 19       | 21       | 21       |
| Fuel level gauge and reserve warning light - Hand brake on/low brake fluid level warning light - Speedometer - Trip recorder/total mileage counter and trip recorder reset button - Water temperature gauge - Low engine oil pressure warning light - Rev counter - Front brake pad wear warning light | 23       | 23       | 23       | 23       | 25       | 25       |
| Air conditioner                                                                                                                                                                                                                                                                                        | 27       | 27       | 27       | 27       | 27       | 27       |
| Courtesy light - Symbol illumination                                                                                                                                                                                                                                                                   | 29       | 29       | 29       | 29       | 29       | 29       |
| Instrument panel connections                                                                                                                                                                                                                                                                           | 31       | 31       | 31       | 31       | 33       | 33       |
| Diagnostic socket connections                                                                                                                                                                                                                                                                          | 35       | 35       | 35       | 35       | 35       | 35       |

**Electrical symbols**

|                                                                                     |                                         |                                                                                     |                                     |                                                                                       |                                               |
|-------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------|
|    | Side lights                             |    | Choke (starter)                     |    | Switch discharge                              |
|    | Main beam                               |    | Water in fuel filter                |    | Dipped headlamps                              |
|    | Heated seat                             |    | Heater plug                         |    | Indicators flashing with central door locking |
|    | Seat belts                              |    | Compressor turbo pressure           |    | Electric horns                                |
|    | Heated rear window                      |    | Rear fog lamps                      |    | Left indicator                                |
|  | Hand brake on and low brake fluid level |  | Front fog lamps                     |  | Right indicator                               |
|  | A.B.S.                                  |  | Brake pad wear                      |  | Engine cooling                                |
|  | Hazard warning                          |  | Compressor turbo pressure           |  | Windscreen wiper                              |
|  | Indicators                              |  | Auto transmission fluid temperature |  | Electric sunroof                              |
|  | Handbrake on and low brake fluid level  |  | Speed limits                        |  | Catalytic converter temperature               |
|  | Recharging                              |  | Fuel gauge                          |  | Heating element                               |
|  | Engine oil pressure                     |  | Engine coolant temperature gauge    |  | Diode                                         |

P4A01EL01



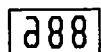
### 55.

#### Electrical symbols

|                                                                                     |                                |                                                                                     |                                                |                                                                                      |                                     |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------|
|    | Warning light                  |    | Trip computer control                          |    | Differential lock                   |
|    | Bulb                           |    | Electronic injection                           |    | Auto transmission fluid temperature |
|    | Fuse                           |    | Engine oil level                               |    | Temperature                         |
|    | Switch open                    |    | Brake fluid level (Japan version)              |    | Anti-theft device                   |
|    | Selector switch                |    | Doors open                                     |    | Electric windows                    |
|  | Button open                    |  | Central locking                                |  | Earth                               |
|  | Coil-controlled switch (Relay) |  | Sport function on electronic suspension system |  | No. plate lights                    |
|  | Motor                          |  | Transistor                                     |  | Pulse generator (Timer)             |
|  | Rear window wiper              |  | Air Bag                                        |  | Analogue clock                      |
|  | Headlamp washer                |  | A.B.S. (Japan version)                         |  | Digital clock                       |
|  | Screen wash/wipe               |  | Car stop fault                                 |  | Speedometer                         |
|  | Rear win. wash/wipe            |  | Windscreen wiper                               |  | Rev counter                         |

P4A02EL01

### Electrical symbols



Digital speedometer



Digital rev counter



Digital fuel gauge



Analogue fuel gauge



Analogue coolant temperature gauge



Econometer



Digital coolant temperature gauge



Engine oil temperature



Engine oil pressure gauge

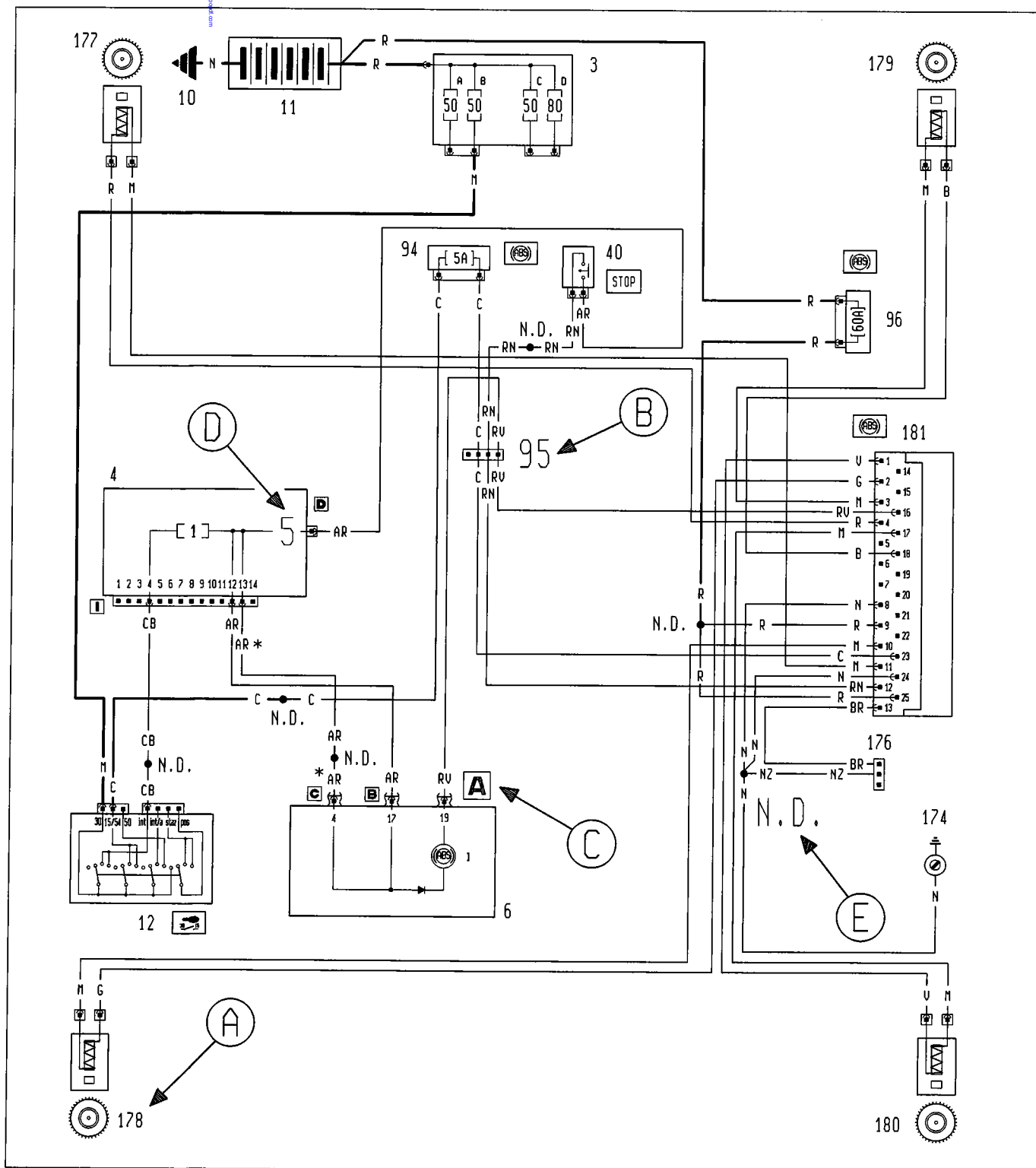


Voltmeter

P4A03EL01

### 55.

#### How to read the wiring diagrams



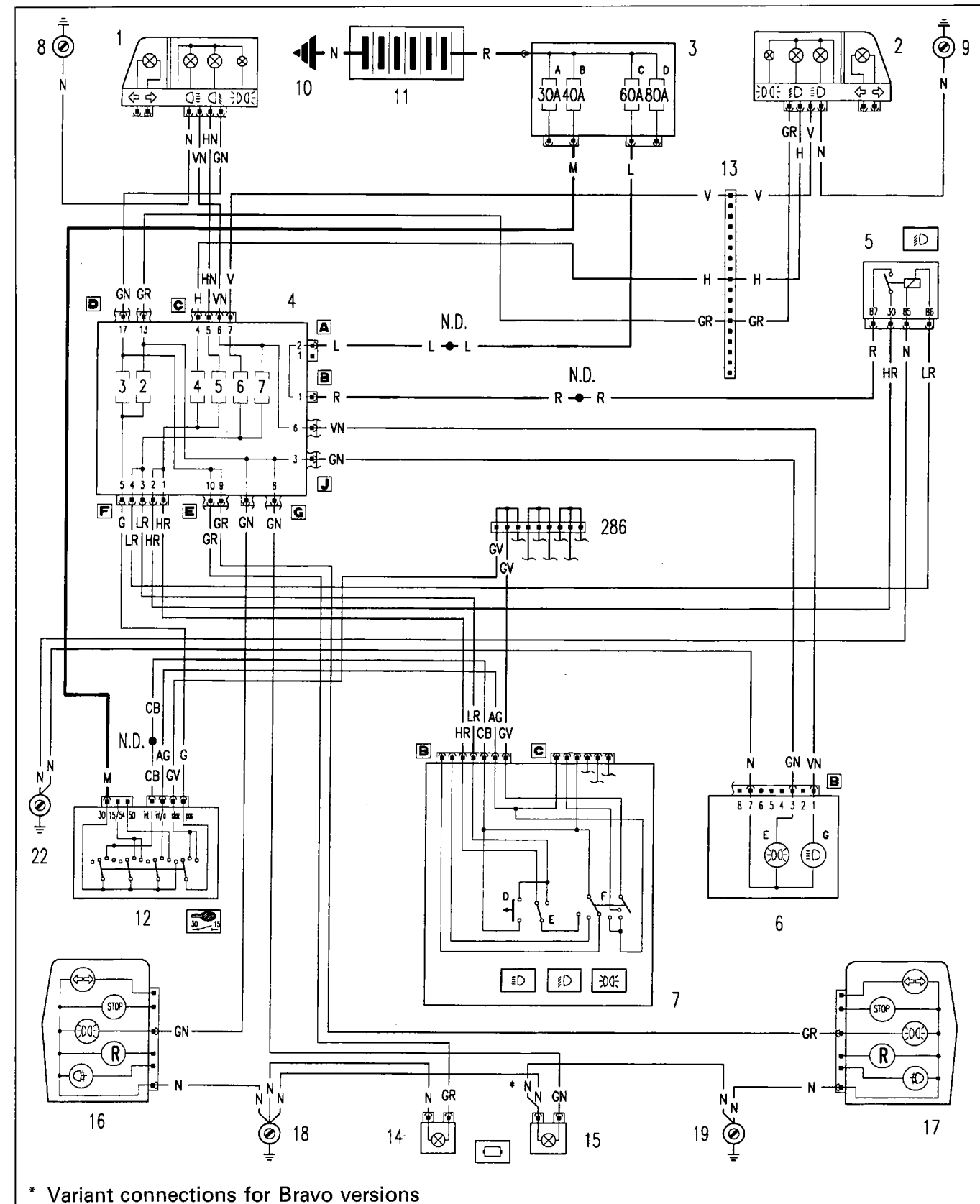
P4A04EL01

#### Key to references

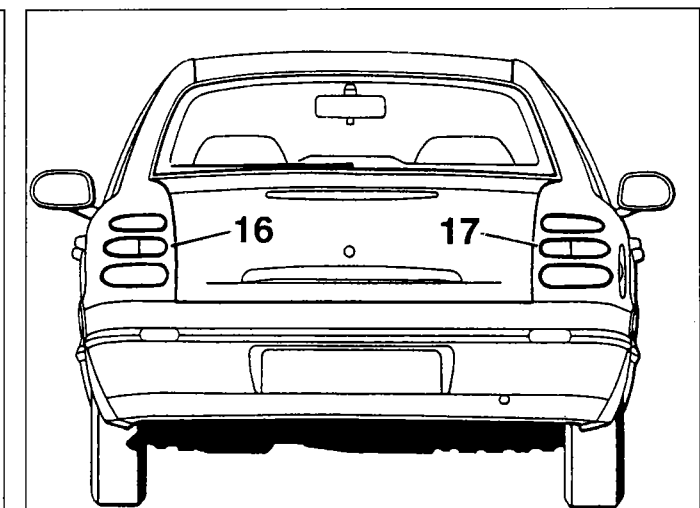
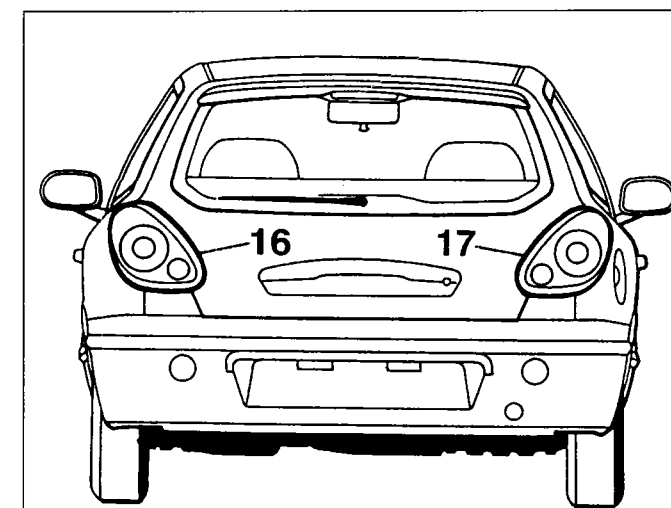
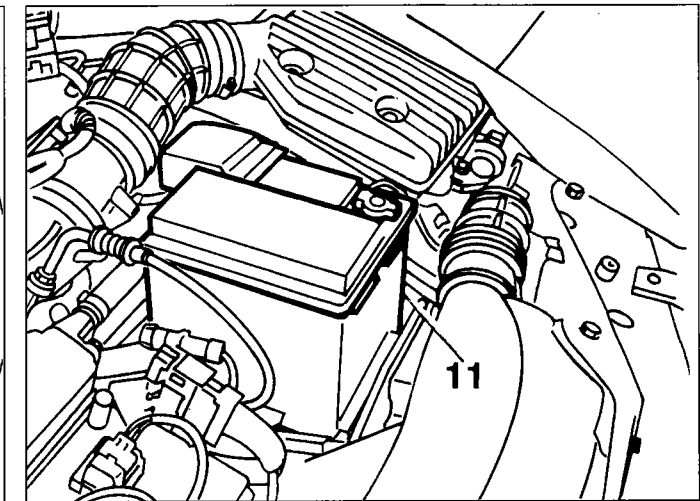
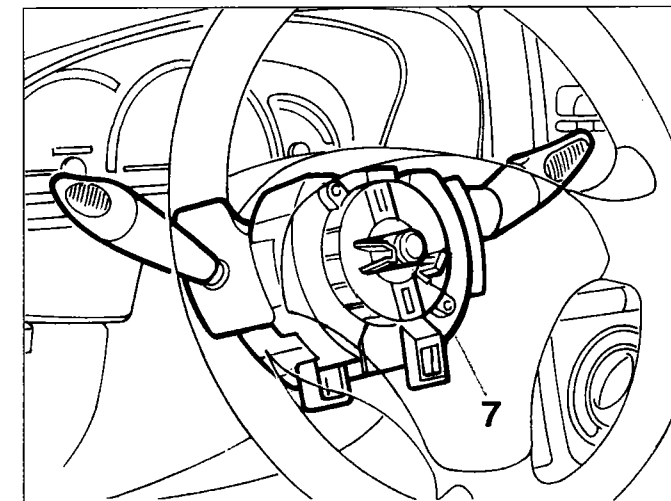
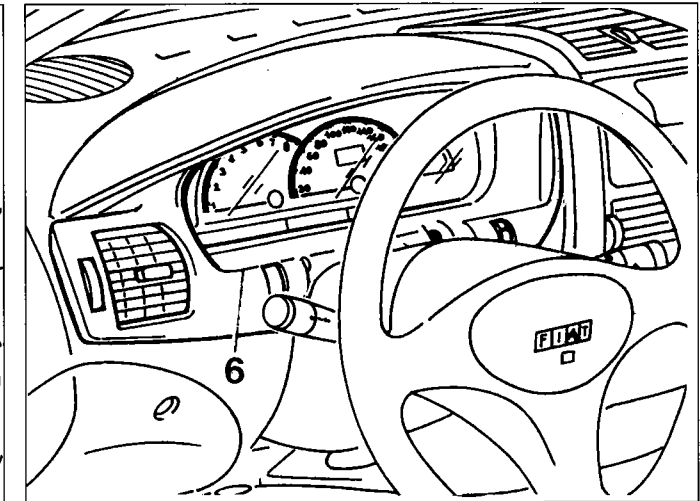
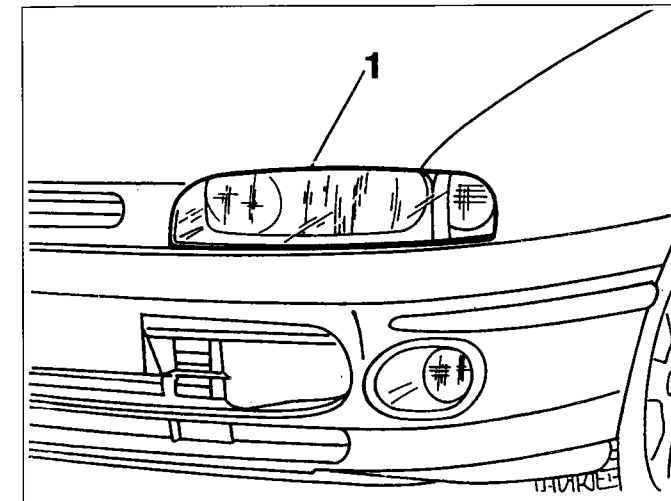
- A Component number
- B Connection number
- C Identification of connector on component
- D Connecting pin number
- E Ultrasound-soldered joint taped in wiring loom

Side lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights -  
Number plate lights -

Location of components

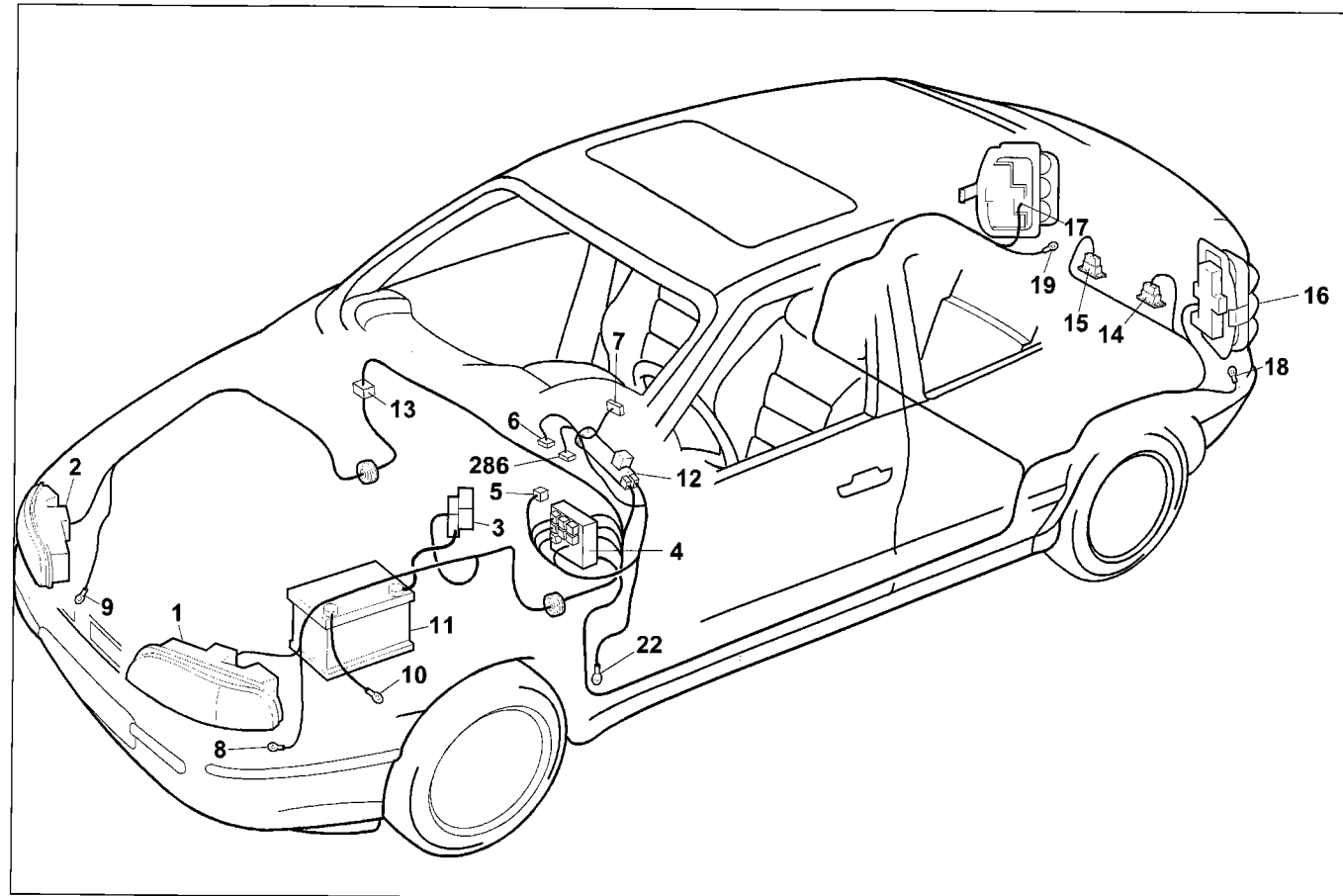


P4A05EL01



P4A06EL01

### 55.



P4A07EL01

Side lights and warning lamp - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights

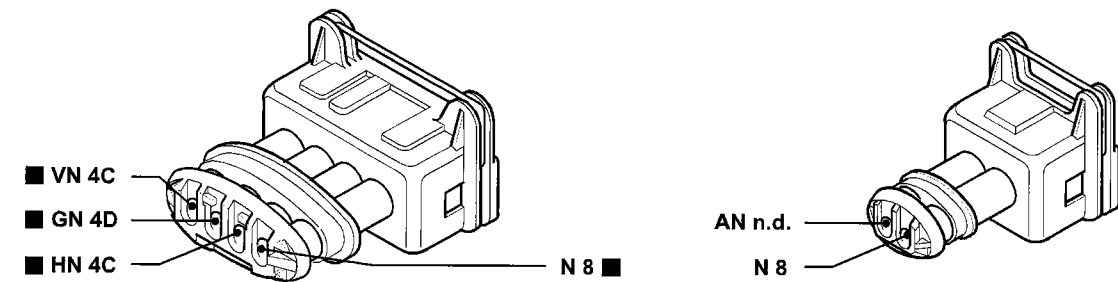
#### Key to components

- 1 Front left lights cluster
- 2 Front right lights cluster
- 3 Power fuse box:
  - A 30A fuse protecting fuel injection
  - B 40A fuse protecting ignition
  - C 60A fuse protecting additional optional extras
  - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 5 Dipped beam relay
- 6 Instrument panel:
  - E Side lights warning light
  - G Main beam headlamps warning light
- 7 Stalk unit:
  - D Flasher button
  - E Main beam/dipped beam headlamps stalk
  - F Side lights stalk
- 8 Front left earth
- 9 Front right earth

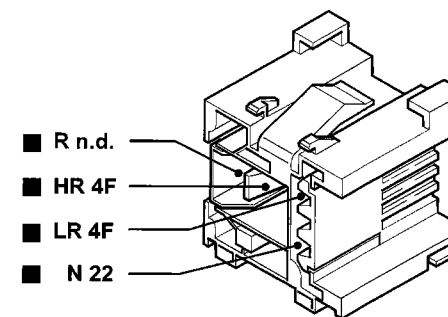
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Connection between front right/left cables
- 14 Left number plate light
- 15 Right number plate light
- 16 Rear left lights cluster
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 22 Left dashboard earth
- 286 Short-circuiting connection

N.D. Ultrasound-soldered joint taped in wiring loom

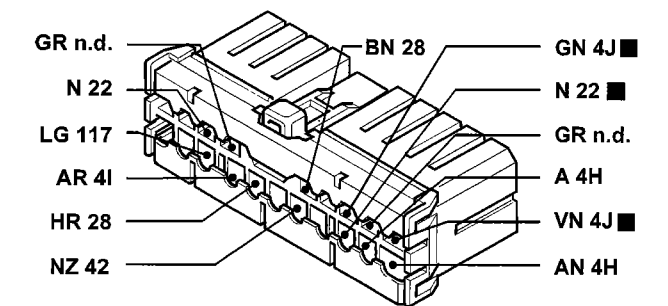
#### 1 Front left lights cluster



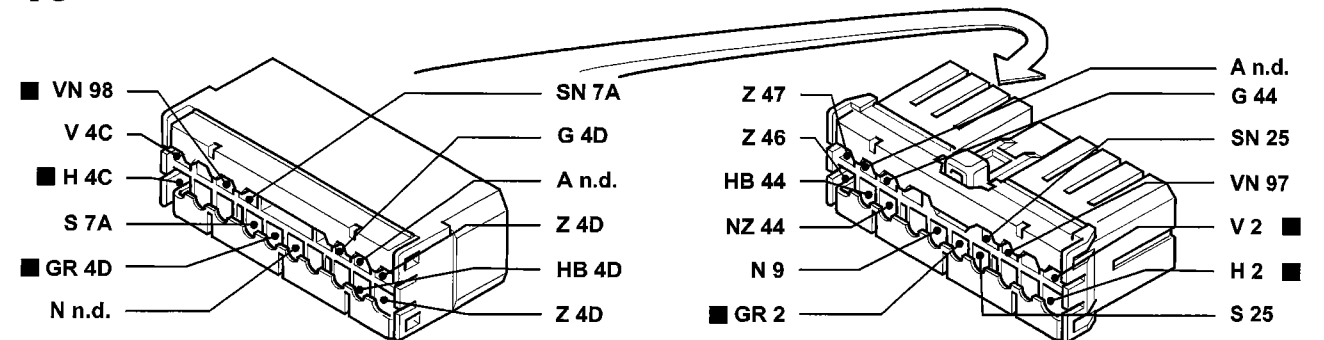
#### 5 Dipped beam relay



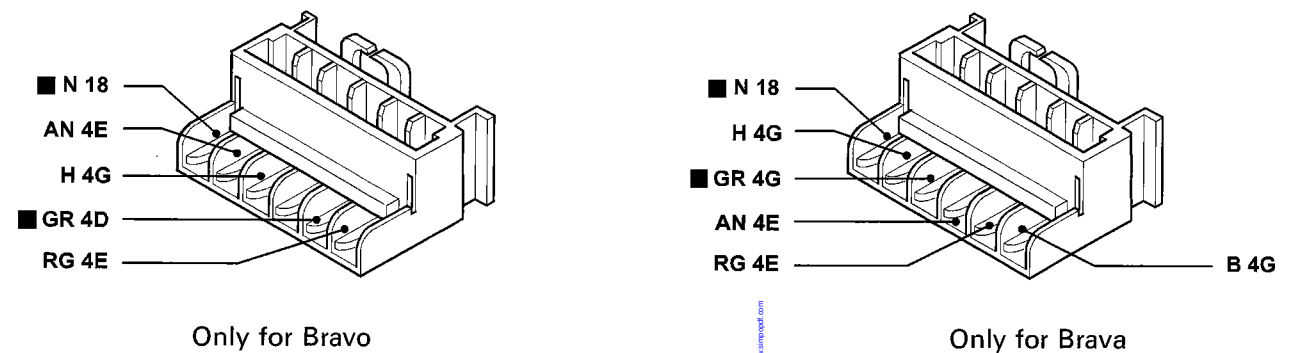
#### 6B Instrument panel



#### 13 Connection between front right/left cables



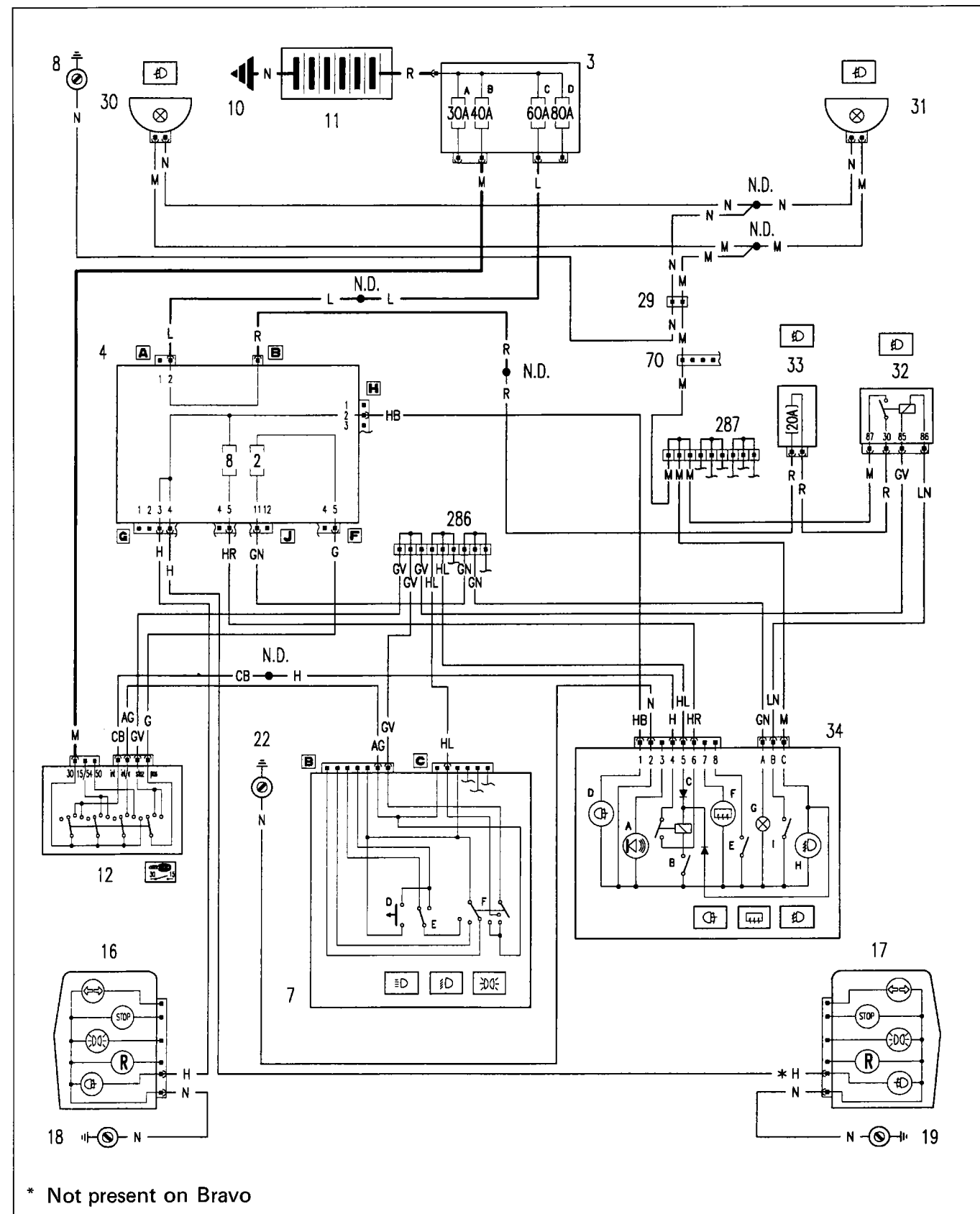
#### 16 Rear lights cluster



■ The cables involved in the wiring diagram are marked by a solid square

P4A08EL01

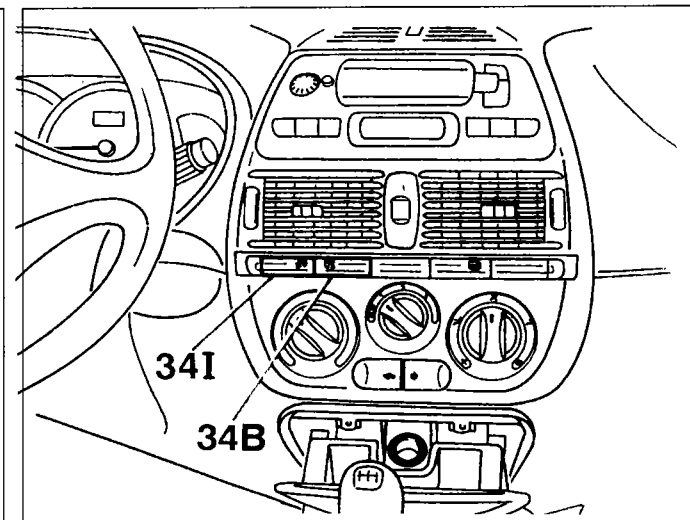
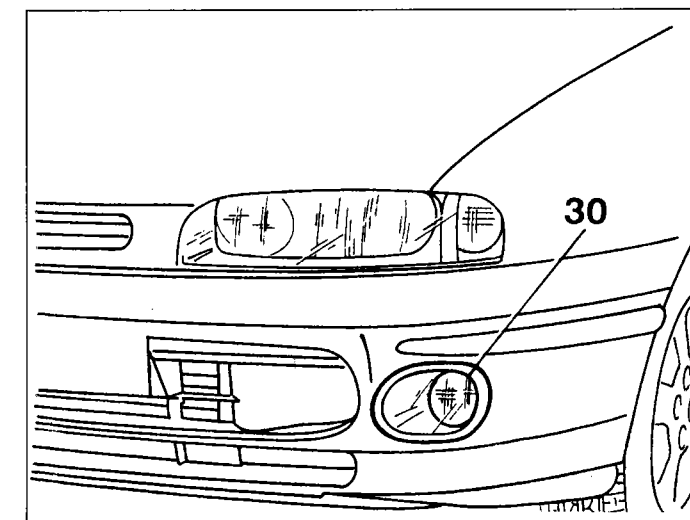
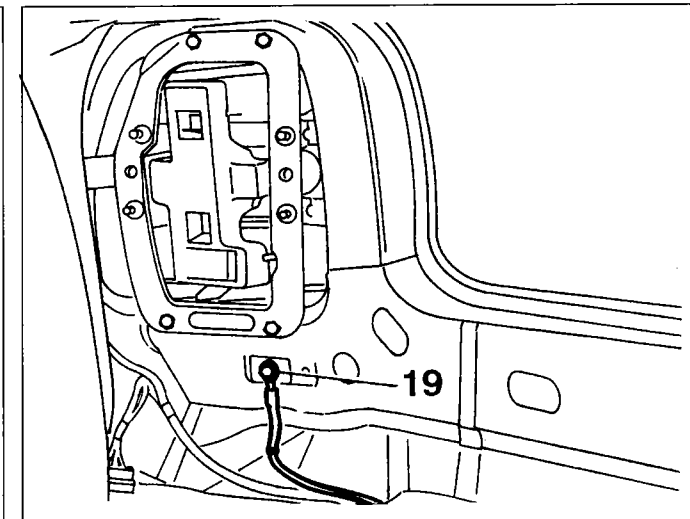
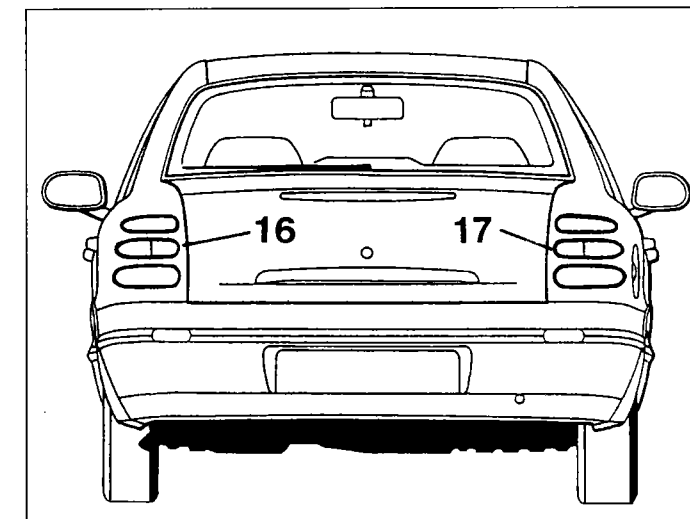
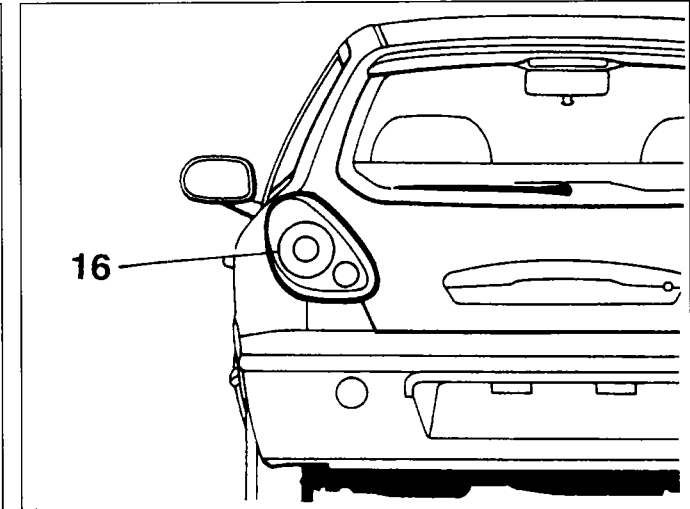
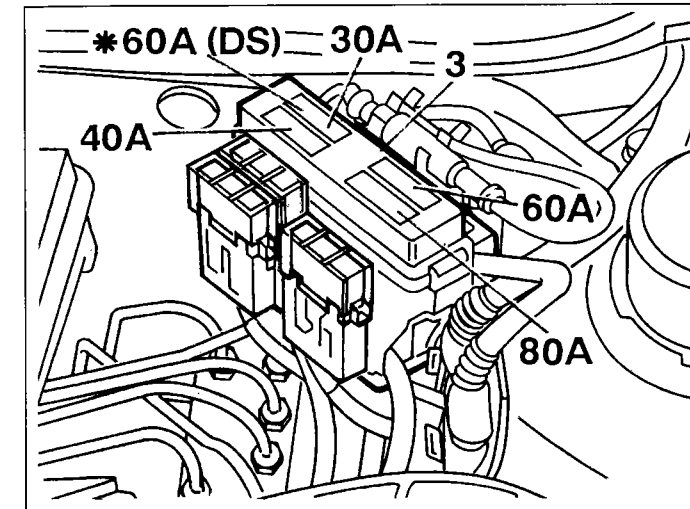
Front fog lamps and warning light - Rear fog lamps and warning light



\* Not present on Bravo

P4A09EL01

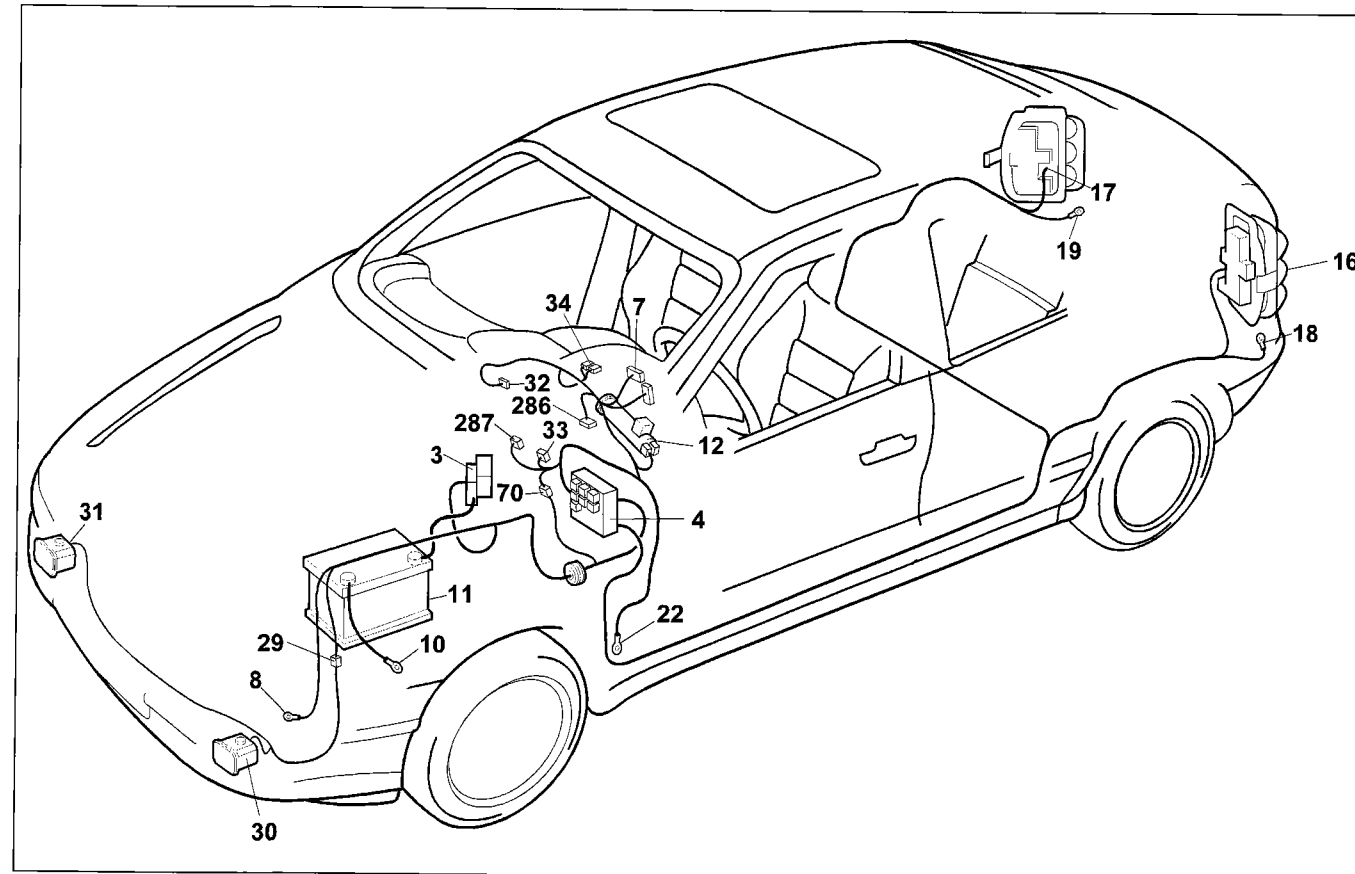
Location of components



P4A10EL01



### 55.



P4A11EL01

#### Front fog lamps and warning light - Rear fog lamps and warning light

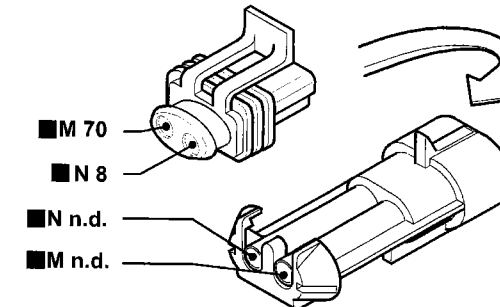
##### Key to components

- 3 Power fuse box:
  - A 30A fuse protecting fuel injection
  - B 40A fuse protecting ignition
  - C 60A fuse protecting additional optional extras
  - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 7 Stalk unit:
  - D Flasher button
  - E Dipped beam/main beam headlamps stalk
  - F Side lights stalk
- 8 Front left earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 16 Rear left lights cluster
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 22 Left dashboard earth
- 29 Front/front fog lamps cables connection
- 30 Front left fog lamp

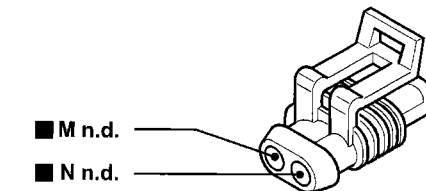
- 31 Front right fog lamp
- 32 Front fog lamp relay
- 33 20A fuse protecting front fog lamps
- 34 Switch controls unit:
  - A Alarm on warning light
  - B Rear fog lamps switch
  - C Rear fog lamps relay
  - D Rear fog lamps warning light
  - E Heated rear window switch
  - F Heated rear window warning light
  - G Switch controls unit symbol light
  - H Front fog lamps warning light
  - I Front fog lights switch
- 70 Dashboard/front cables connection
- 286 Short-circuiting connection
- 287 Short-circuiting connection

N.D. Ultrasound-soldered joint taped in wiring loom

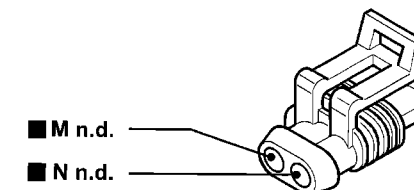
#### 29 Front/front fog lamps cables connection



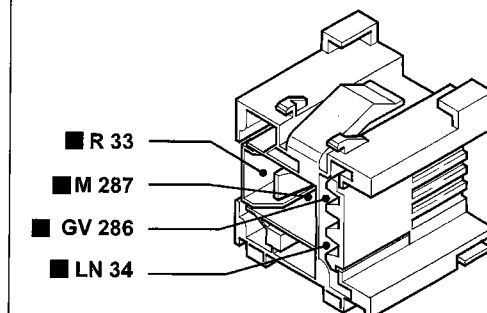
#### 30 Front left fog lamp



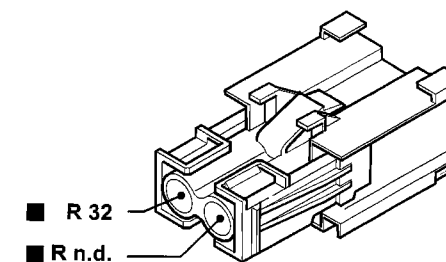
#### 31 Front right fog lamp



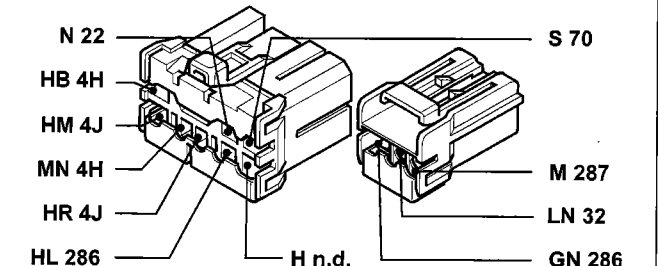
#### 32 Front fog lamp relay



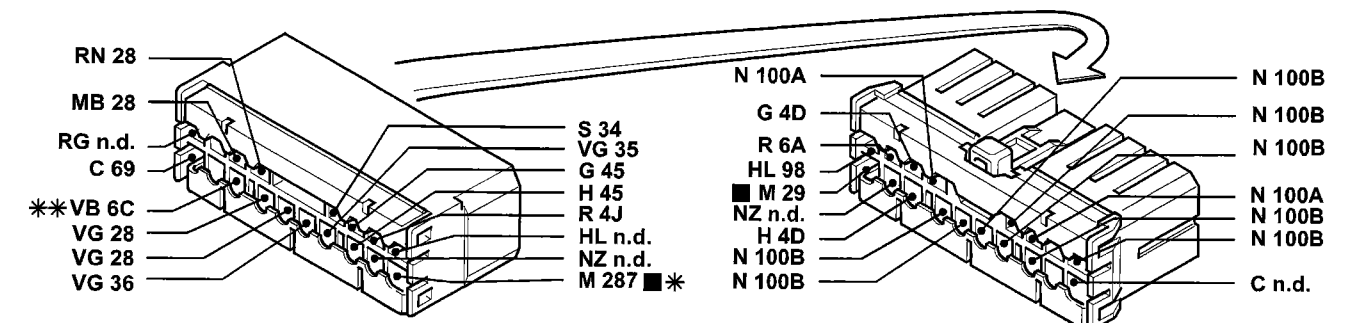
#### 33 20A fuse protecting front fog lamps



#### 34 Switches controls unit



#### 70 Dashboard/front cables connection



\* Not present on S version

\*\* Applies only to EL/ELX version

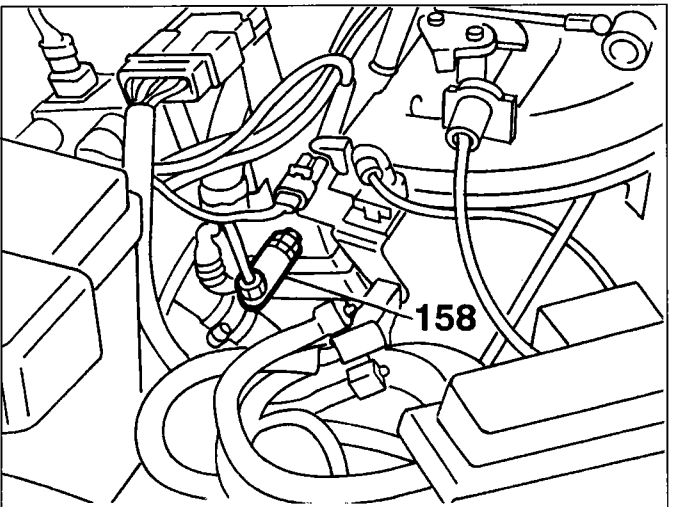
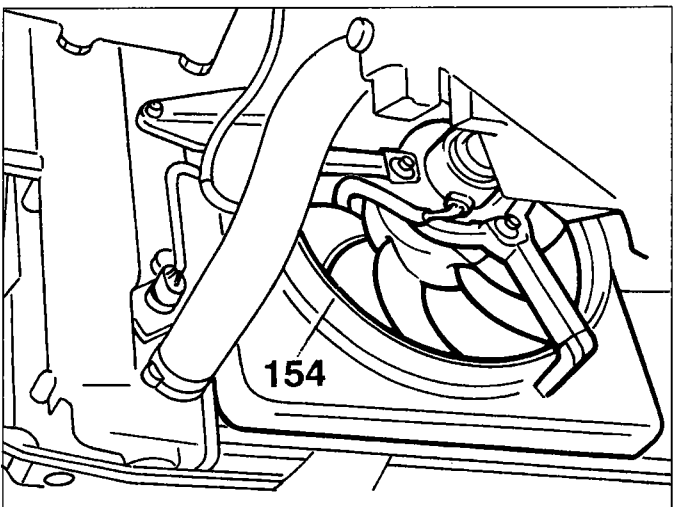
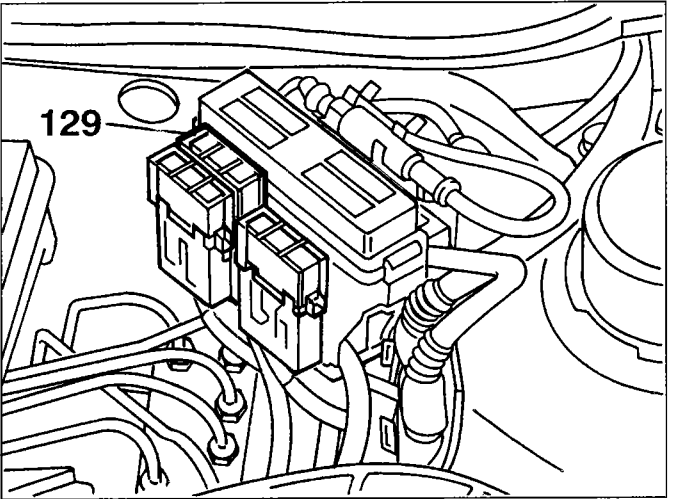
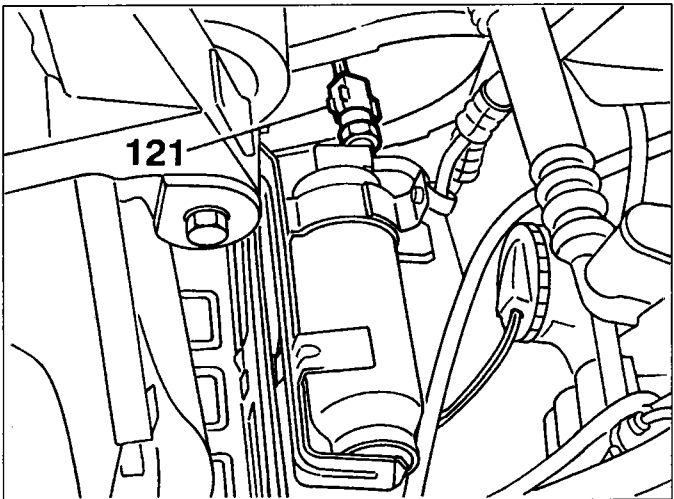
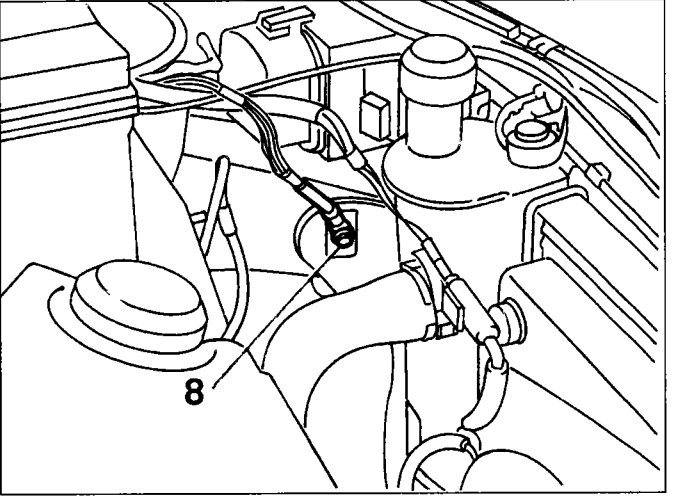
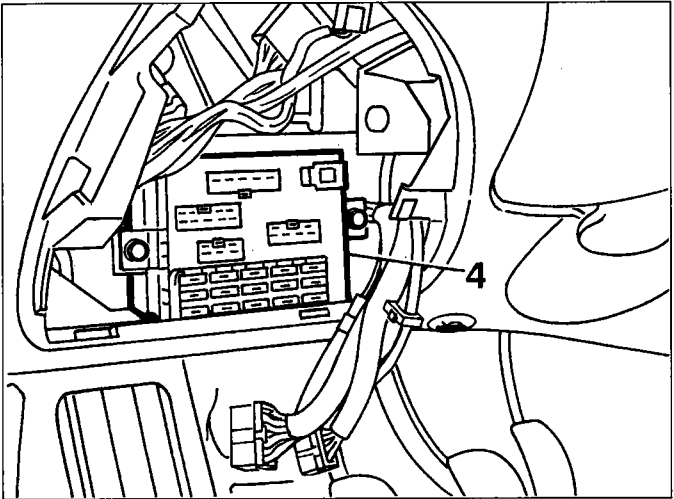
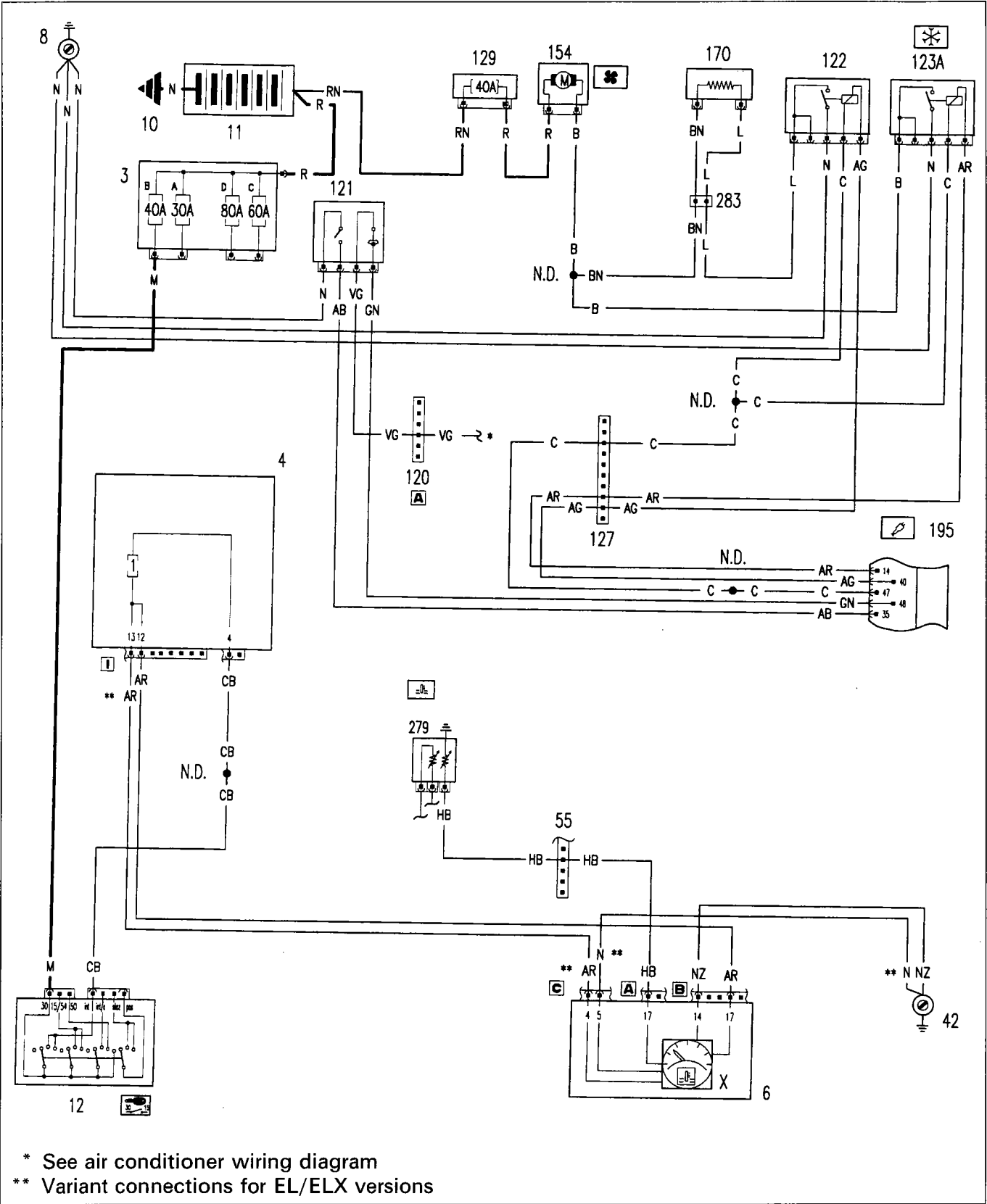
■ The cables involved in the wiring diagram are marked with a solid square

P4A12EL01



Version with air conditioner  
Engine cooling system - Water temperature gauge

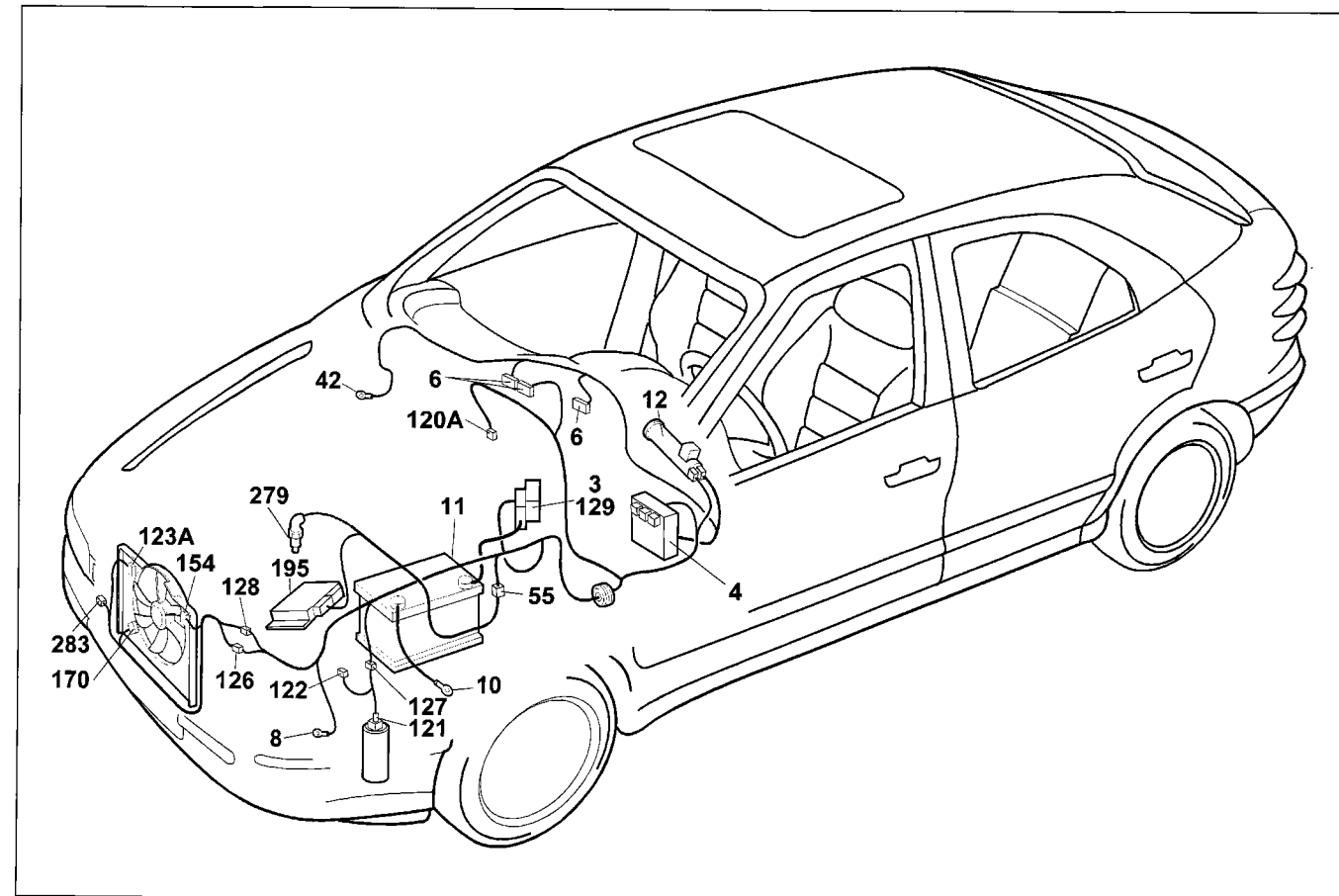
Location of components



P4A13EL01

P4A14EL01

55.



P4A16EL01

Version with air conditioner

Engine cooling system - Water temperature gauge

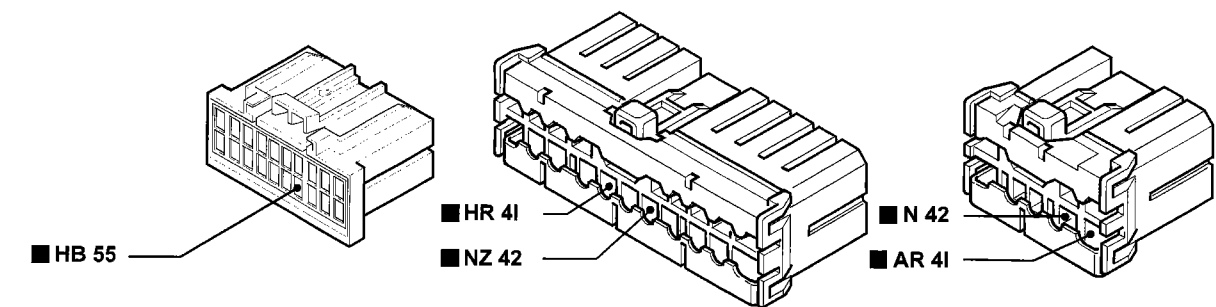
### Key to components

- 3 Power fuse box:  
30A fuse protecting fuel injection  
B 40A fuse protecting ignition  
C 60A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit:  
E1 Ignition switch discharge relay
- 6 Instrument panel:  
X Water temperature gauge
- 8 Front left earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 42 Right dashboard earth
- 55 Connection between front cables/fuel gauge control
- 120 Air conditioner
- 121 Three-stage pressure switch

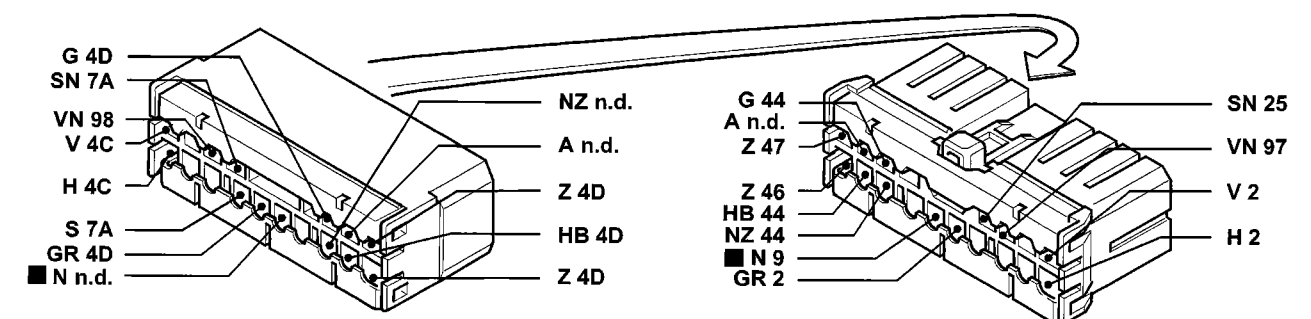
- 122 Engine cooling fan low speed control relay
- 123A Engine cooling fan high speed control relay
- 127 Connection between front left cables/cable on relay carrier bracket
- 128 Front/air conditioner cables connection
- 129 50A power fuse protecting engine cooling fan
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistor
- 195 Ignition/fuel injection electronic control unit (1581)
- 279 Engine coolant temperature double sender unit
- 283 Front cable/resistor connection

N.D. Ultrasound-soldered joint taped in wiring loom

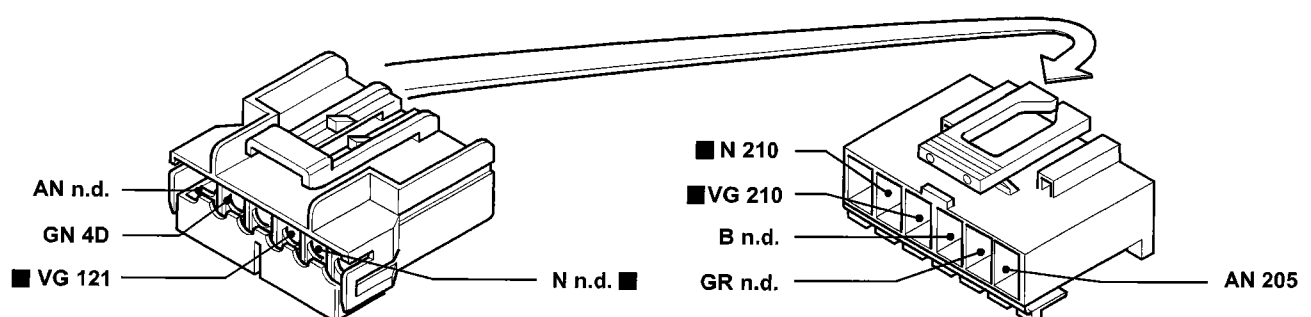
### 6 A - B - C Instrument panel



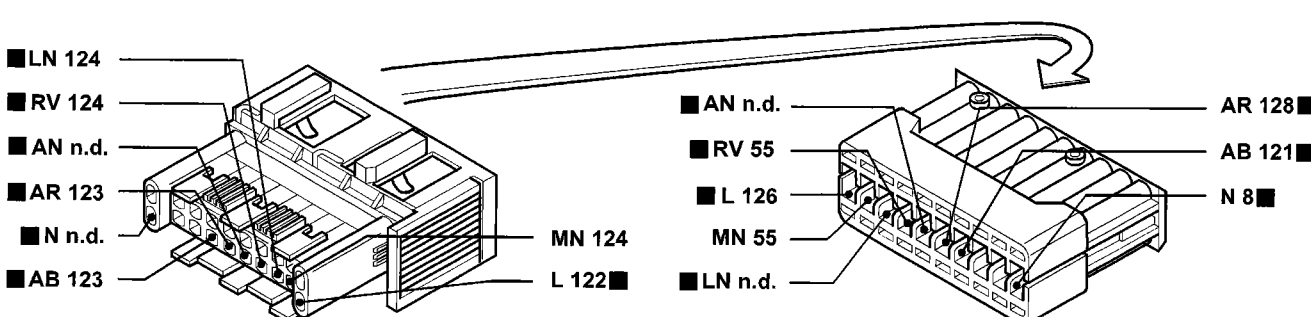
### 13 Front right/left cables connection



### 120 Air conditioner cables connection



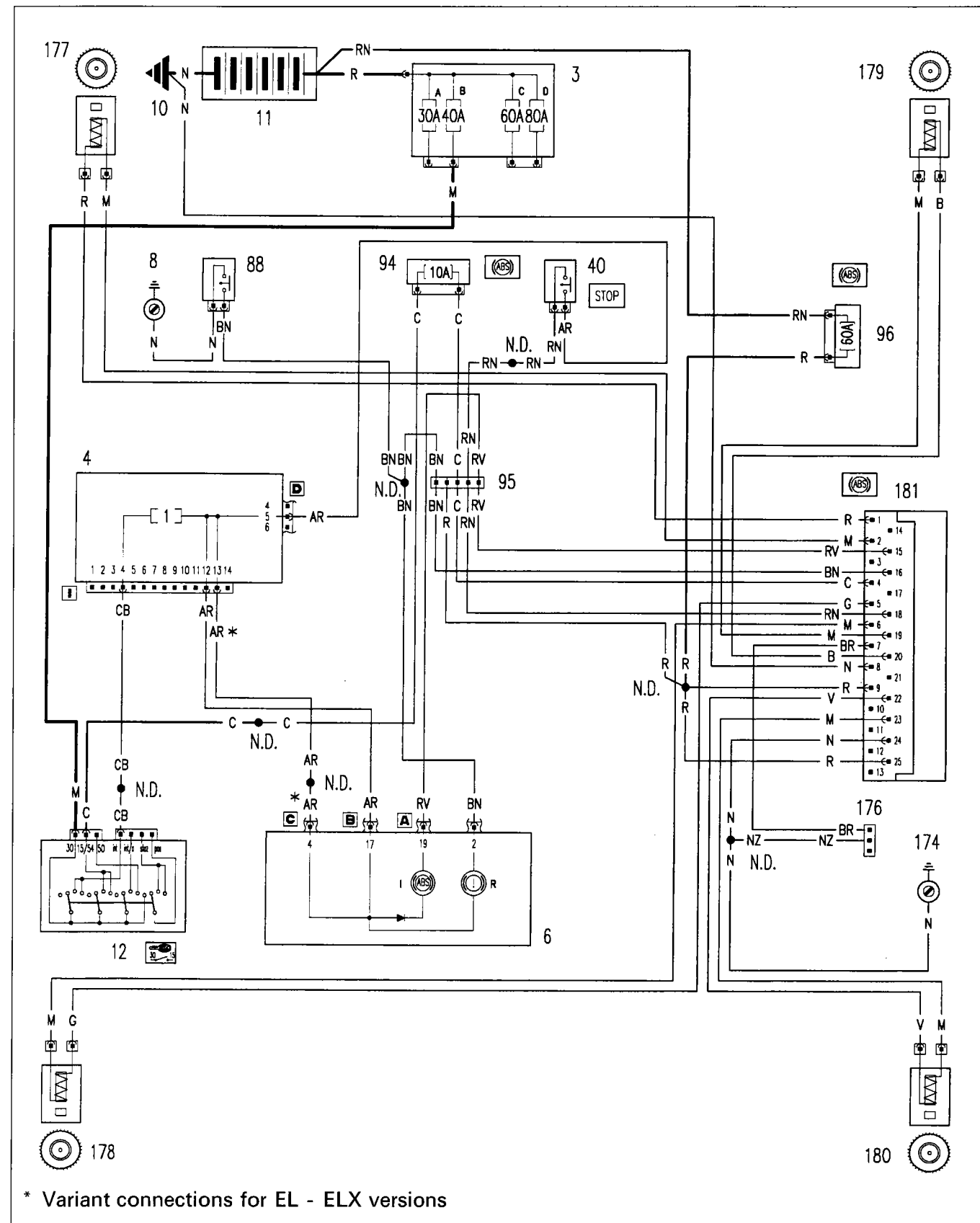
### 127 Connection between front left cables/cable on relay carrier bracket



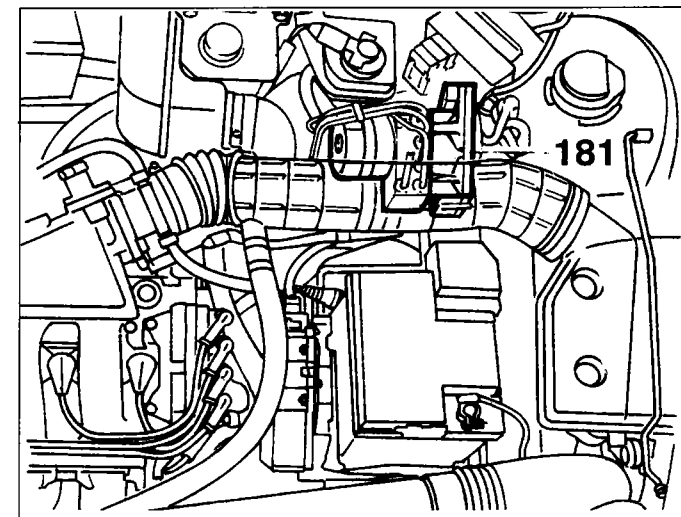
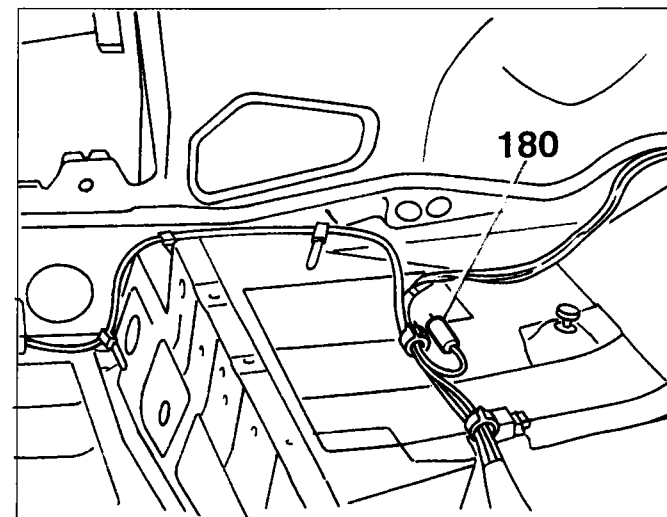
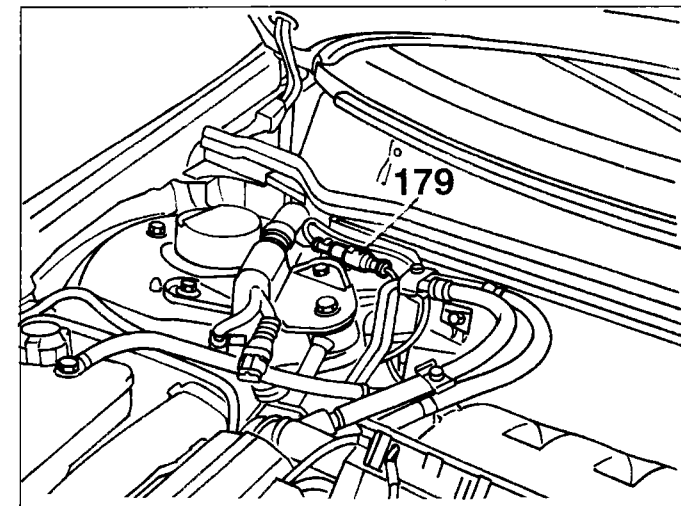
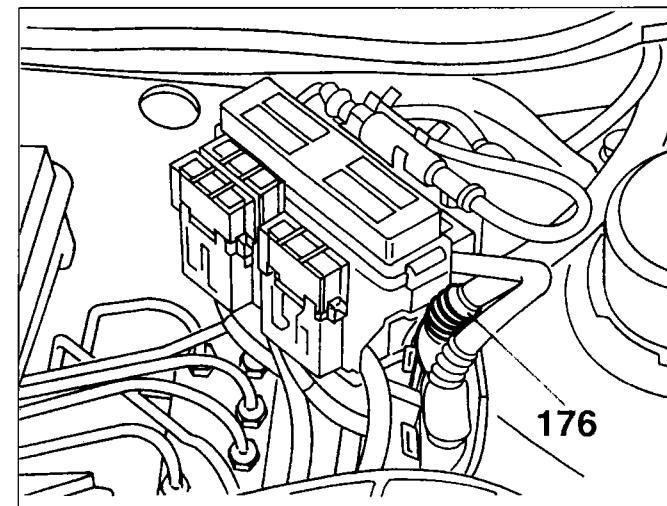
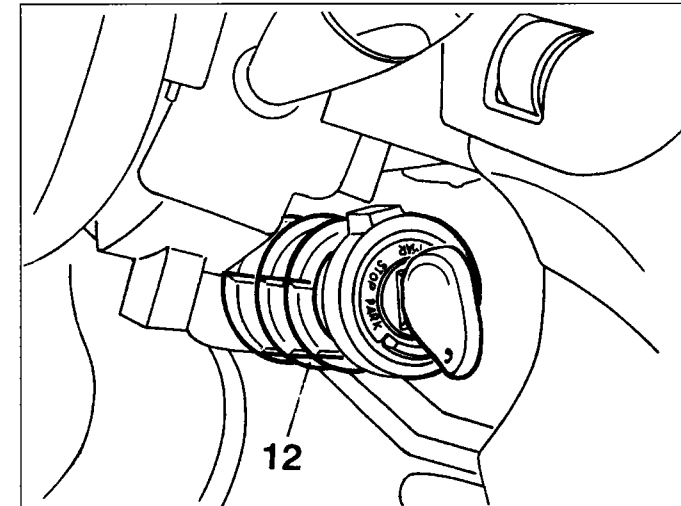
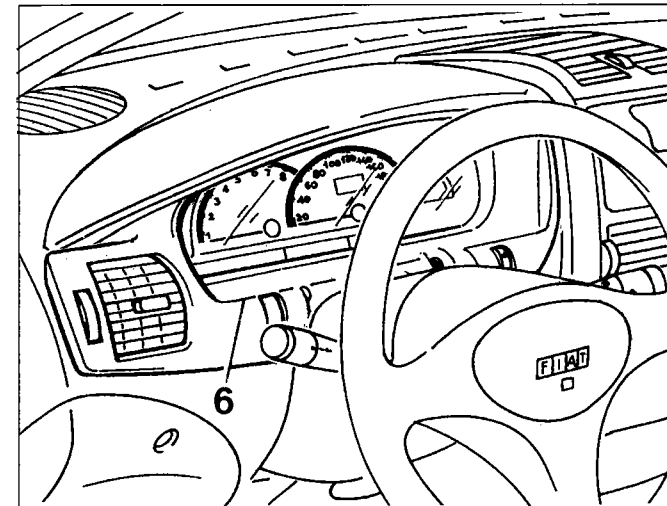
P4A16EL01

Anti-lock braking system (A.B.S.) and fault warning light - Hand brake on/low brake fluid level warning light

Location of components



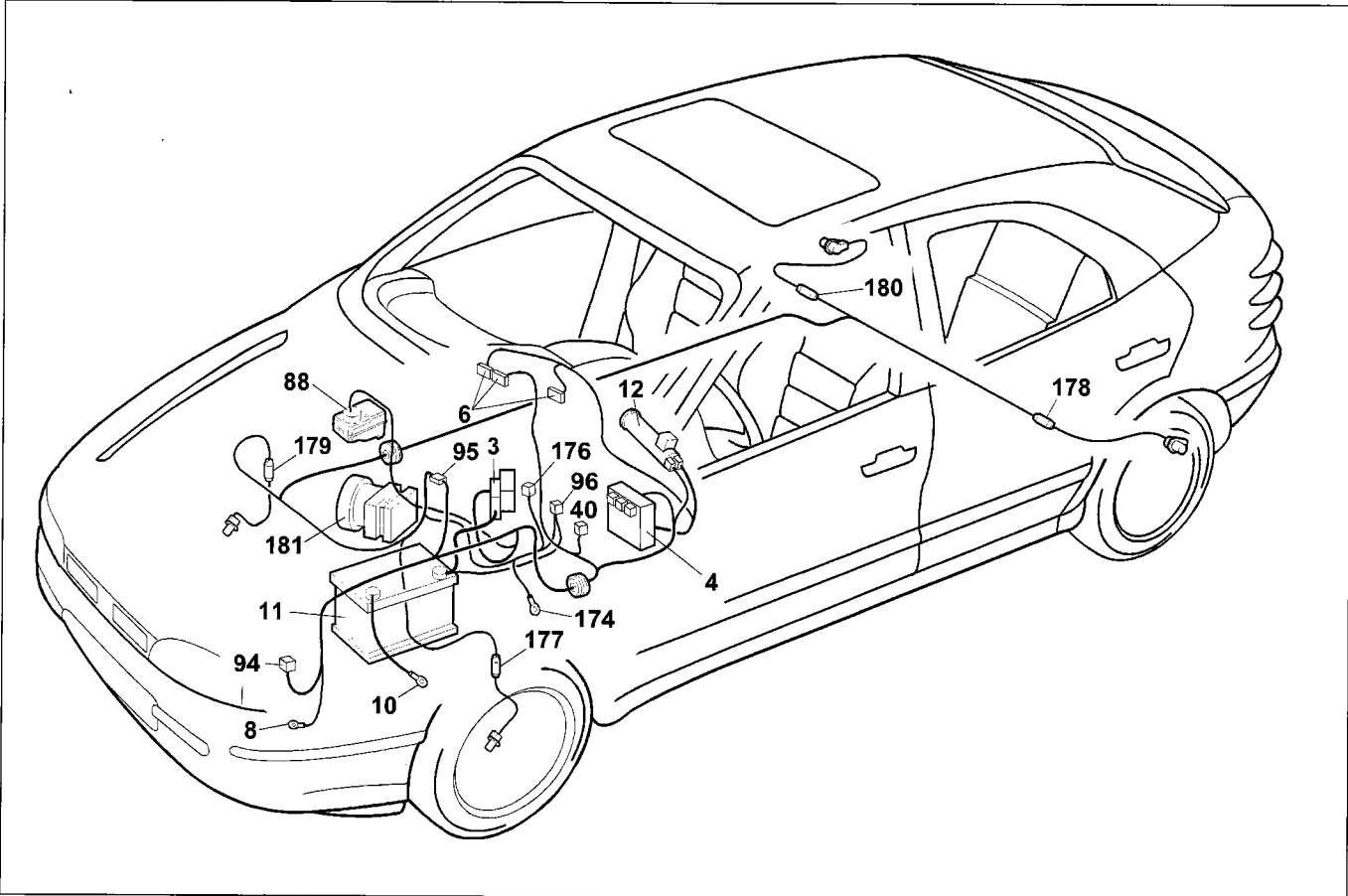
P4A17EL01



P4A18EL01



55.



P4A19EL01

Anti-lock braking system (A.B.S.) and fault warning light - Hand brake on/low brake fluid level warning light

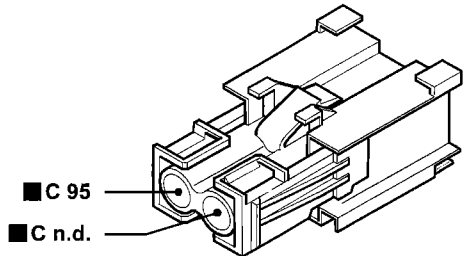
Key to components

- 3 Power fuse box:  
A 50A fuse protecting fuel injection  
B 50A fuse protecting ignition  
C 50A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit  
4 Fuse and relay unit  
6 Instrument panel:  
I Hand brake on/low brake fluid warning light  
8 Front right earth  
10 Battery earth on body shell  
11 Battery  
12 Ignition switch  
40 Stop lights switch  
88 Low brake fluid level sensor  
94 5A fuse protecting anti-lock braking system (A.B.S.)  
95 Front cables/anti-lock braking system (A.B.S.) connection

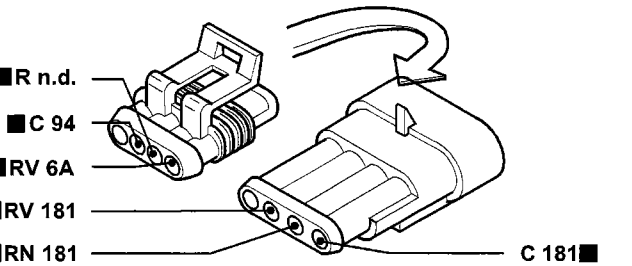
- 96 60A fuse protecting electrical system  
174 Power earth for anti-lock braking system (A.B.S.)  
176 Diagnostic socket for anti-lock braking system (A.B.S.)  
177 Sensor on front left wheel for anti-lock braking system (A.B.S.)  
178 Sensor on rear left wheel for anti-lock braking system (A.B.S.)  
179 Sensor on front right wheel for anti-lock braking system (A.B.S.)  
180 Sensor on rear right wheel for anti-lock braking system (A.B.S.)  
181 Anti-lock braking system (ABS) electronic control unit.)

N.D. Ultrasound-soldered joint taped in wiring loom

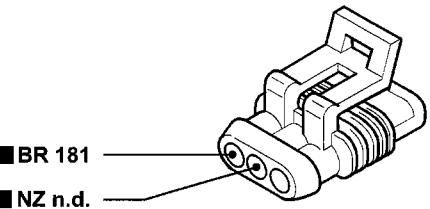
94 5A fuse protecting anti-lock braking system (A.B.S.)



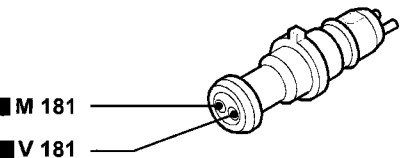
95 Front cables/anti-lock braking system (A.B.S.) connection



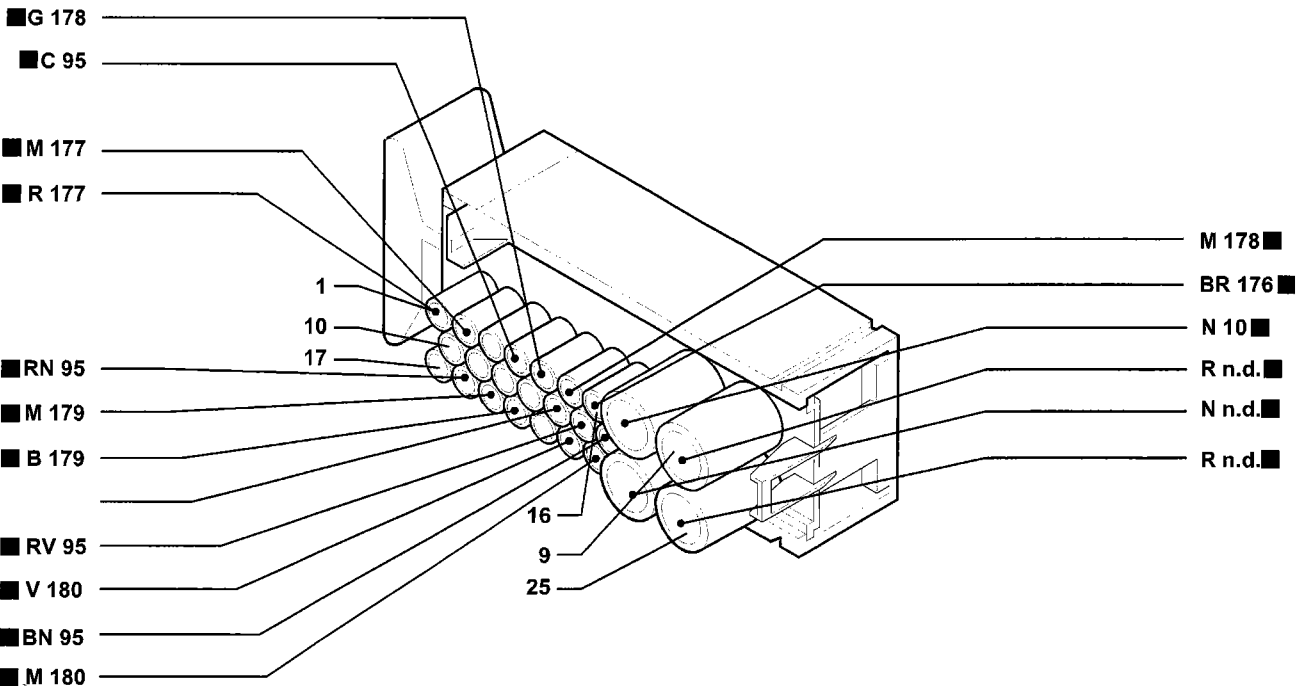
176 Diagnostic socket for anti-lock braking system (A.B.S.)



180 Sensor on rear right wheel for anti-lock braking system (A.B.S.)



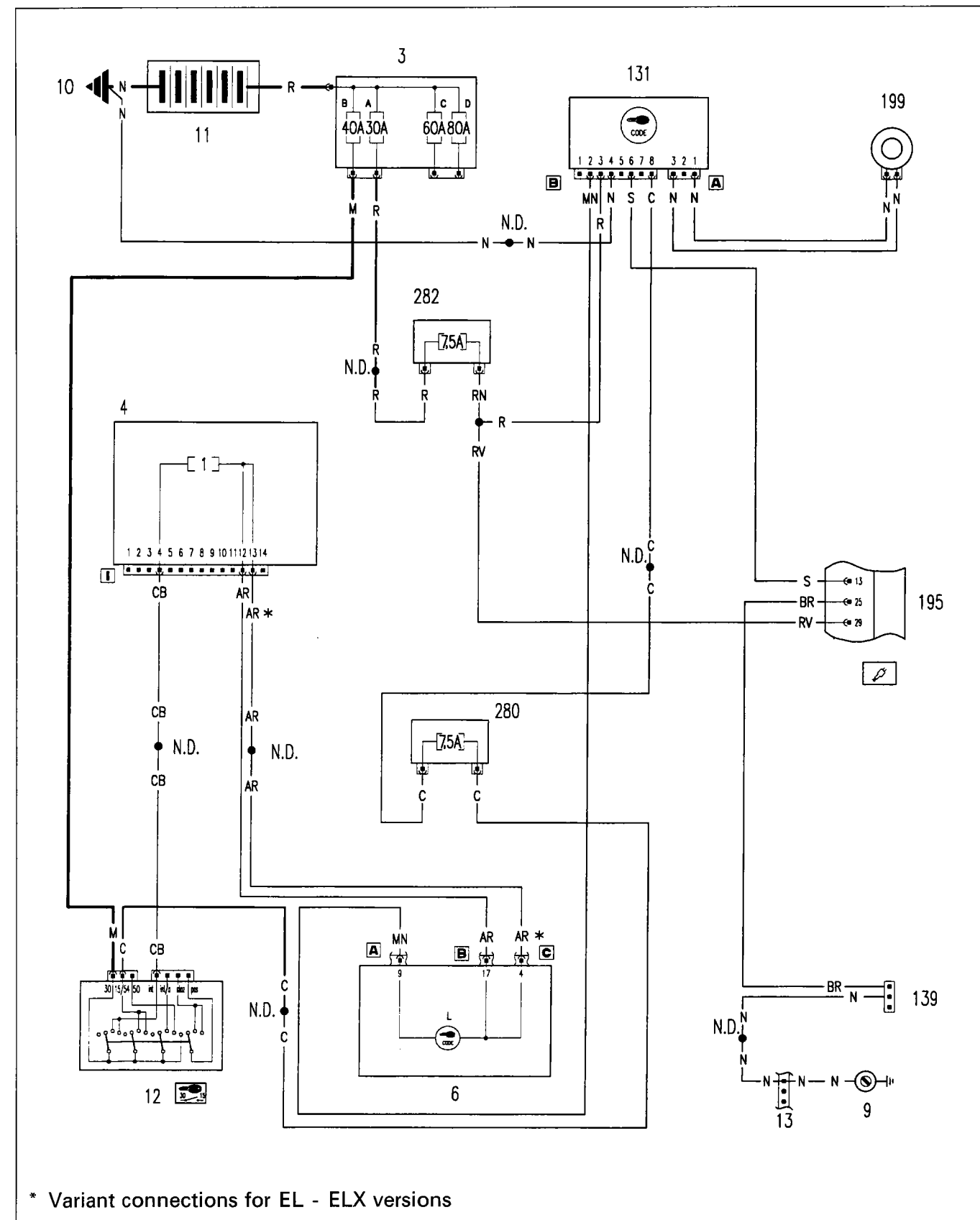
181 Anti-lock braking system (ABS) electronic control unit



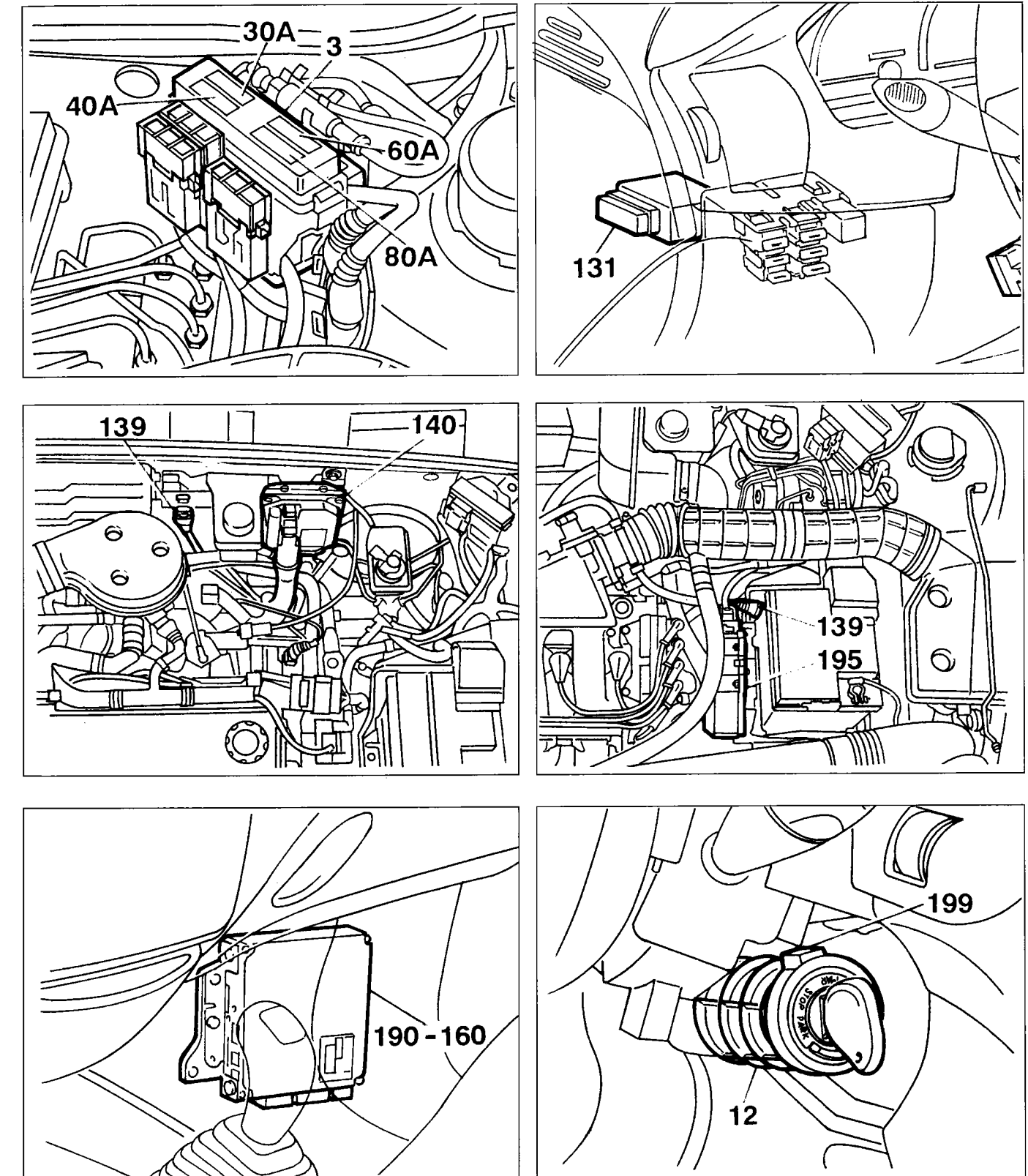
■ The cables involved in the wiring diagram are marked with a solid square

P4A20EL01

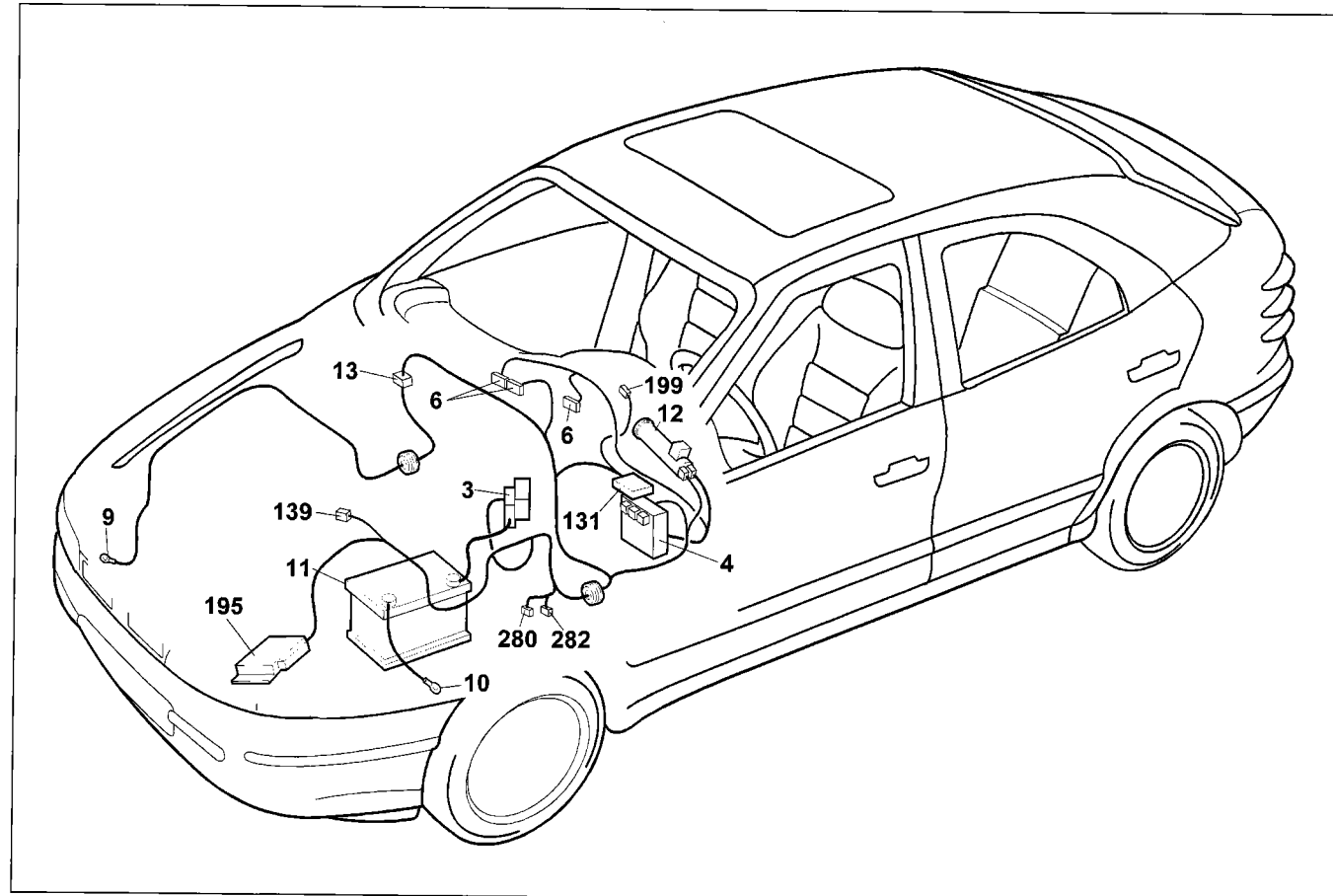
#### Fiat-CODE system and fault warning light



#### Location of components



### 55.



P4A23EL01

#### Fiat-CODE system and fault warning light

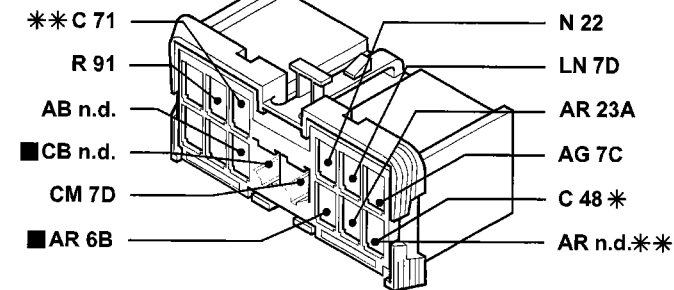
##### Key to components

- 3 Power fuse box:  
 A 30A fuse protecting fuel injection  
 B 40A fuse protecting ignition  
 C 60A fuse protecting additional optional extras  
 D 80A fuse protecting fuse and relay unit  
 4 Fuse and relay unit  
 6 Instrument panel:  
 L Fiat-CODE fault warning light  
 9 Front right earth  
 10 Battery earth on body shell  
 11 Battery  
 12 Ignition switch  
 13 Right/left cable connection

- 131 Fiat-CODE electronic control unit  
 139 Diagnostic socket for fuel injection  
 195 Ignition/fuel injection electronic control unit (1581)  
 199 Aerial for Fiat-CODE system  
 280 7.5 A fuse protecting ignition switch  
 282 7.5 A fuse protecting Fiat-CODE/electronic fuel injection

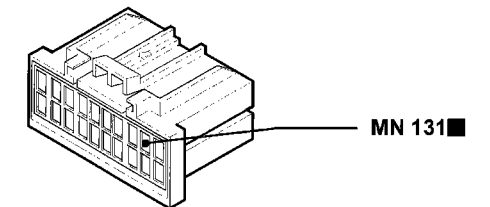
N.D. Ultrasound-soldered joint taped in wiring loom

#### 4I Fuse and relay unit

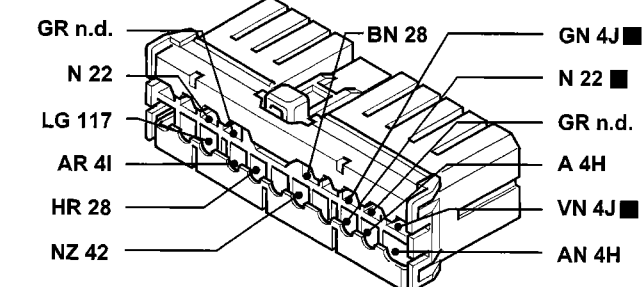


\* Applies only to S/SX version  
 \*\* Applies only to EL/ELX version

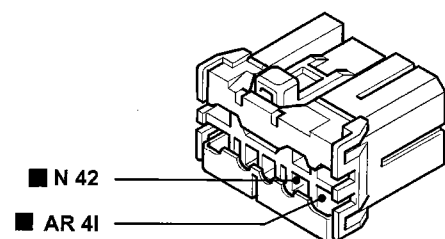
#### 6A Instrument panel



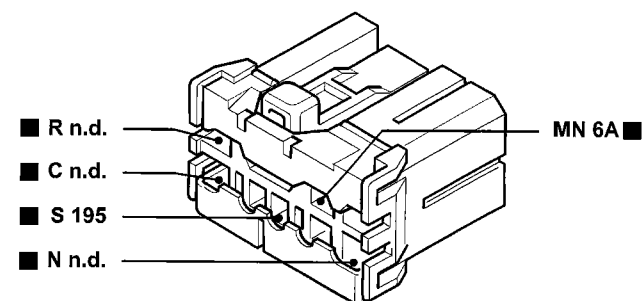
#### 6B Instrument panel



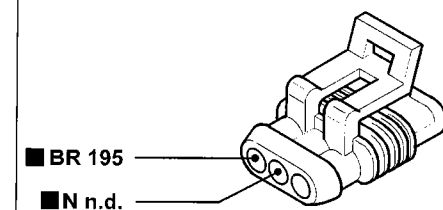
#### 6C Instrument panel



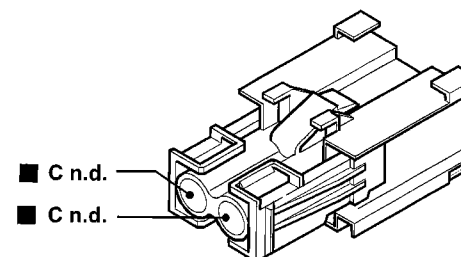
#### 131 Fiat-CODE electronic control unit



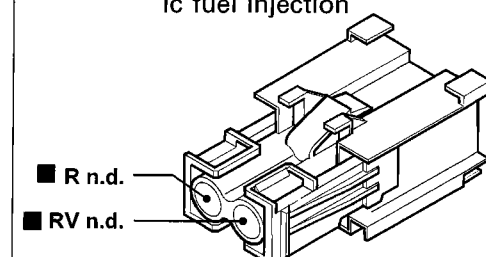
#### 139 Diagnostic socket for fuel injection



#### 280 7.5A fuse protecting ignition switch



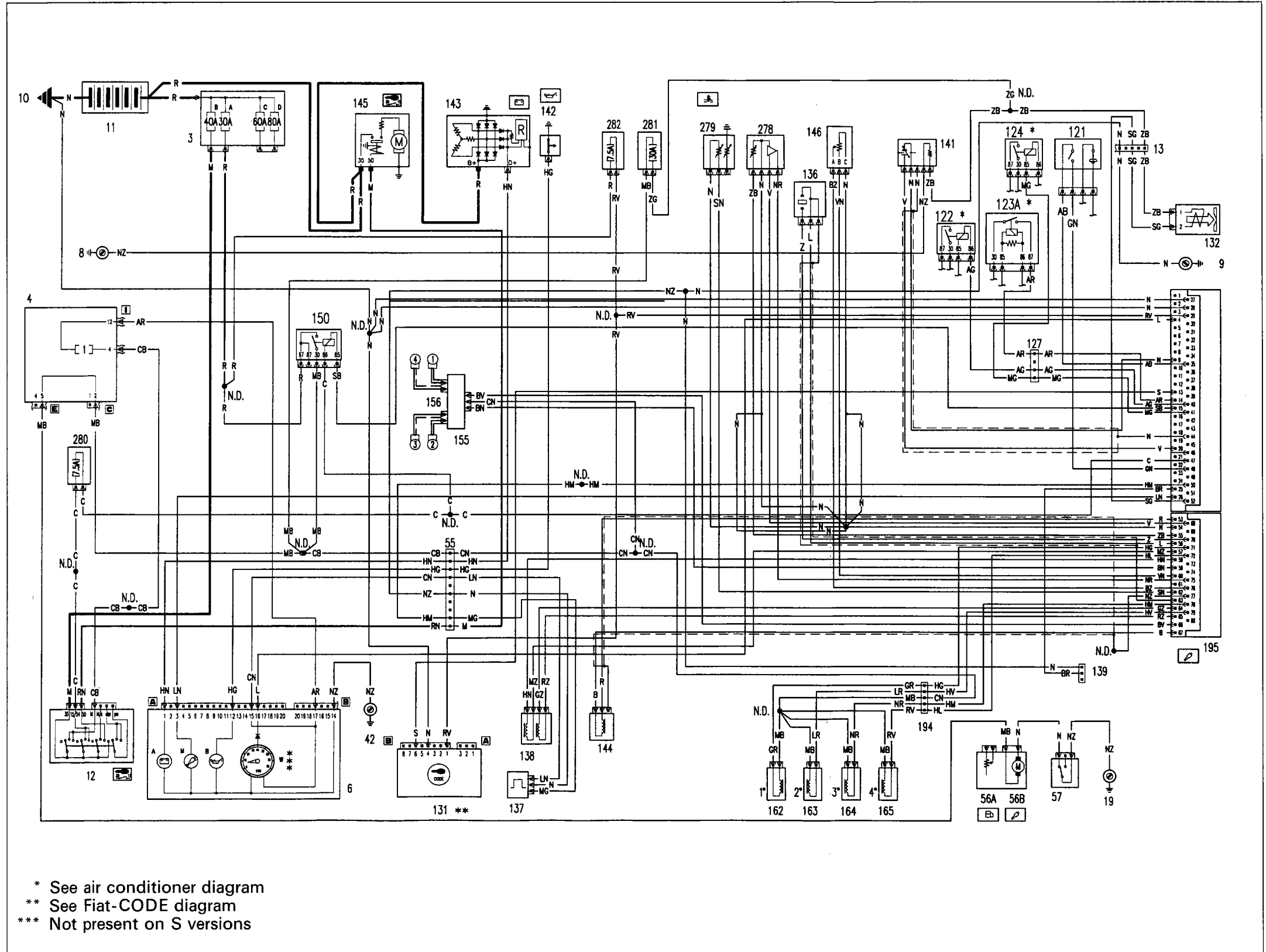
#### 282 7.5A fuse protecting Fiat-CODE/electronic fuel injection



P4A24EL01

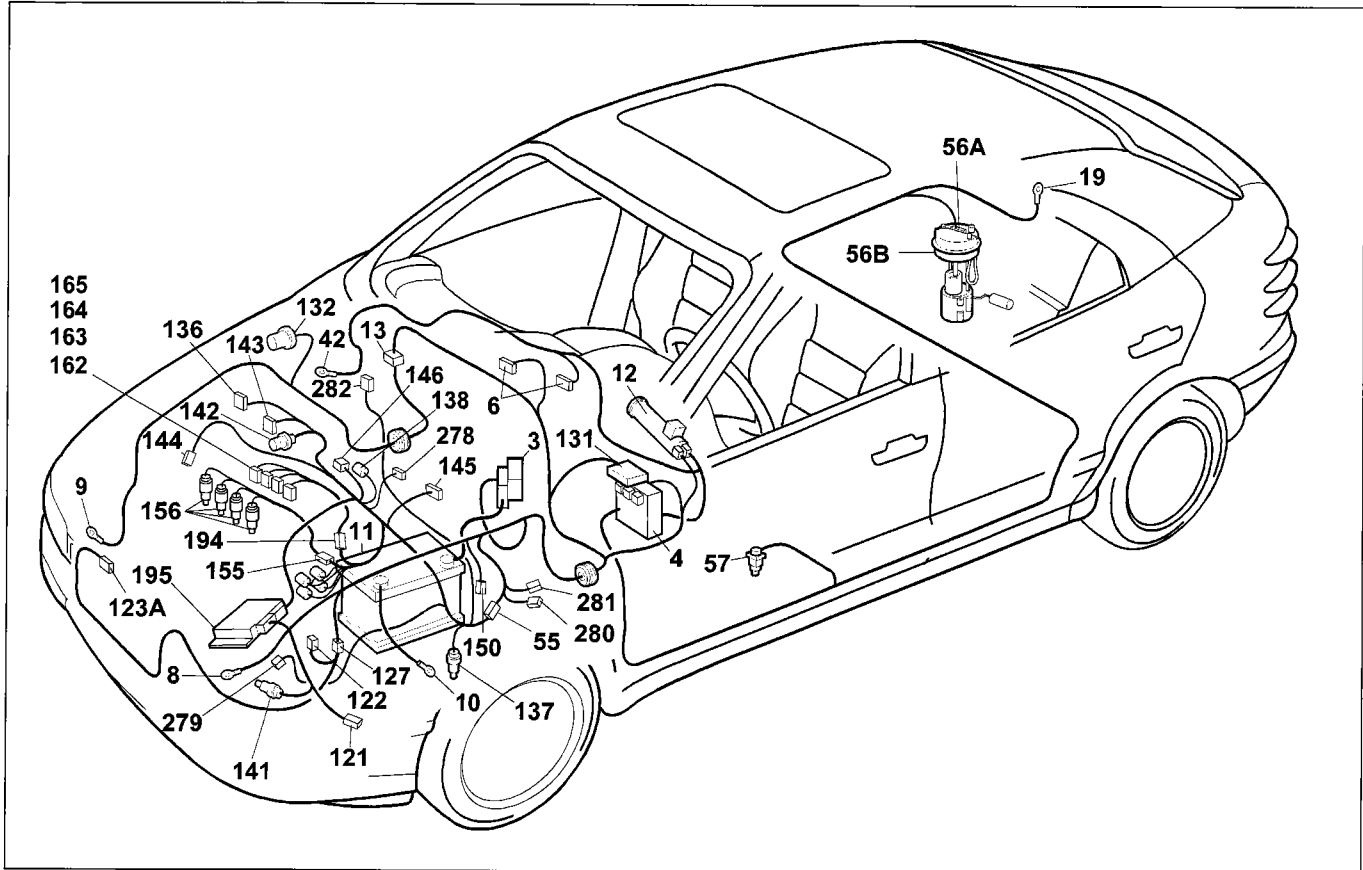
■ The cables involved in the wiring diagram are marked with a solid square

Starting - Electronic ignition and fuel injection - Recharging and warning light - Low engine oil pressure warning light -  
Fuel injection fault warning light - Rev counter





55.



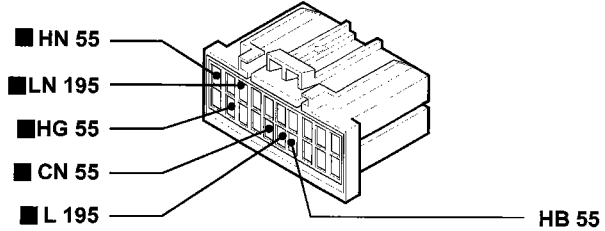
P4A27EL01

Starting - Electronic ignition and fuel injection - Recharging and warning light - Low engine oil pressure warning light - Fuel injection fault warning light - Rev counter

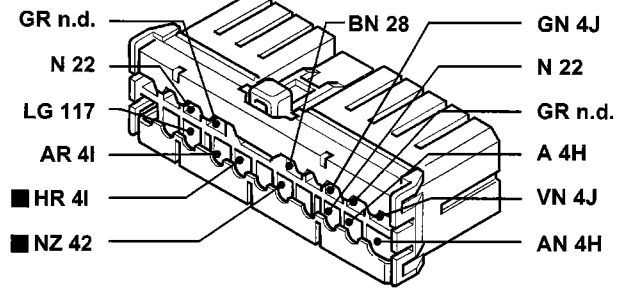
Key to components

- |                                                                                                                                                                                              |                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fuse box:<br>A 30A fuse protecting fuel injection<br>B 40A fuse protecting ignition<br>C 60A fuse protecting additional optional extras<br>D 80A fuse protecting fuse and relay unit | 139 Diagnostic socket for fuel injection<br>141 Heated Lambda probe<br>142 Low oil pressure warning light switch                                                            |
| 4 Fuse and relay unit                                                                                                                                                                        | 143 Alternator                                                                                                                                                              |
| 6 Instrument panel:<br>A Low generator recharging warning light<br>B Low engine oil pressure warning light<br>M Fuel injection fault warning light<br>W Rev counter                          | 144 Rpm and T.D.C. sensor<br>145 Starter motor<br>146 Potentiometer on throttle valve<br>150 Fuel injection control relay<br>155 Ignition coils assembly<br>156 Spark plugs |
| 9 Front right earth                                                                                                                                                                          | 162 Fuel injector (1st)                                                                                                                                                     |
| 10 Battery earth on body shell                                                                                                                                                               | 163 Fuel injector (2nd)                                                                                                                                                     |
| 11 Battery                                                                                                                                                                                   | 164 Fuel injector (3rd)                                                                                                                                                     |
| 12 Ignition switch                                                                                                                                                                           | 165 Fuel injector (4th)                                                                                                                                                     |
| 13 Front right/left cables connection                                                                                                                                                        | 194 Fuel injection cables/fuel injector flange connection                                                                                                                   |
| 19 Rear right earth                                                                                                                                                                          | 195 Ignition/fuel injection electronic control unit (1581)                                                                                                                  |
| 42 Right dashboard earth                                                                                                                                                                     | 278 Integrated air temperature/pressure sender unit                                                                                                                         |
| 55 Front cables/fuel gauge control connection                                                                                                                                                | 279 Engine coolant temperature double sender unit                                                                                                                           |
| 56 Fuel gauge control unit<br>A Fuel gauge sensor<br>B Electric fuel pump                                                                                                                    | 280 7.5A fuse protecting ignition switch<br>281 30A fuse protecting Lambda probe/canister solenoid                                                                          |
| 57 Inertial switch                                                                                                                                                                           | 282 7.5 A fuse protecting Fiat-CODE/electronic injection                                                                                                                    |
| 121 Three-stage pressure switch                                                                                                                                                              |                                                                                                                                                                             |
| 131 Fiat-CODE electronic control unit                                                                                                                                                        |                                                                                                                                                                             |
| 132 Petrol vapours cut-off solenoid (canister)                                                                                                                                               |                                                                                                                                                                             |
| 136 Knock sensor                                                                                                                                                                             |                                                                                                                                                                             |
| 137 Car speed sensor                                                                                                                                                                         |                                                                                                                                                                             |
| 138 Idle adjustment actuator                                                                                                                                                                 |                                                                                                                                                                             |

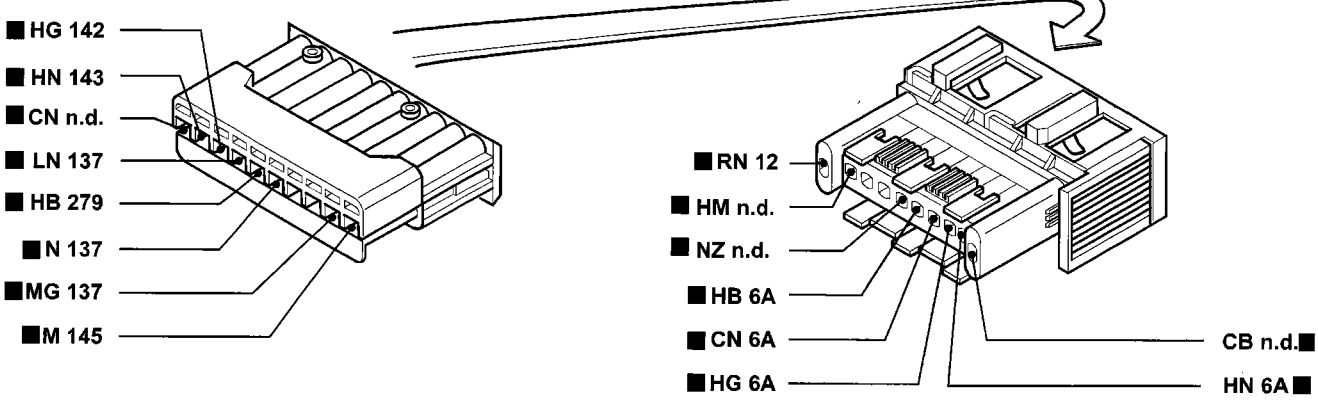
6A Instrument panel



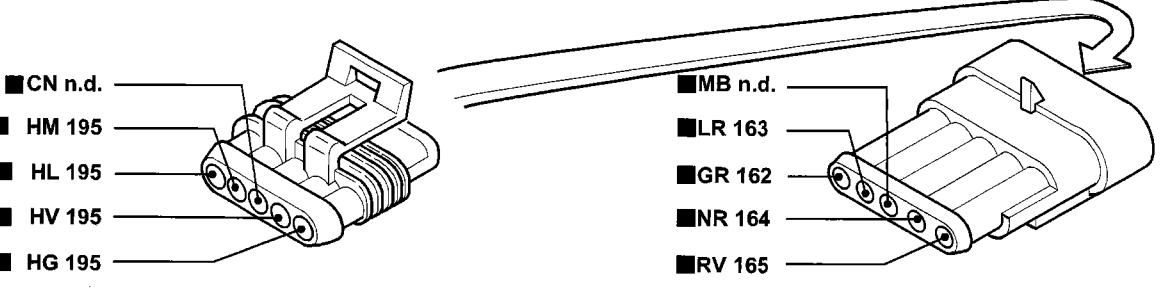
6B Instrument panel



55A Front left/engine cables connection



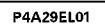
194 Fuel injection cables/injector flange connection



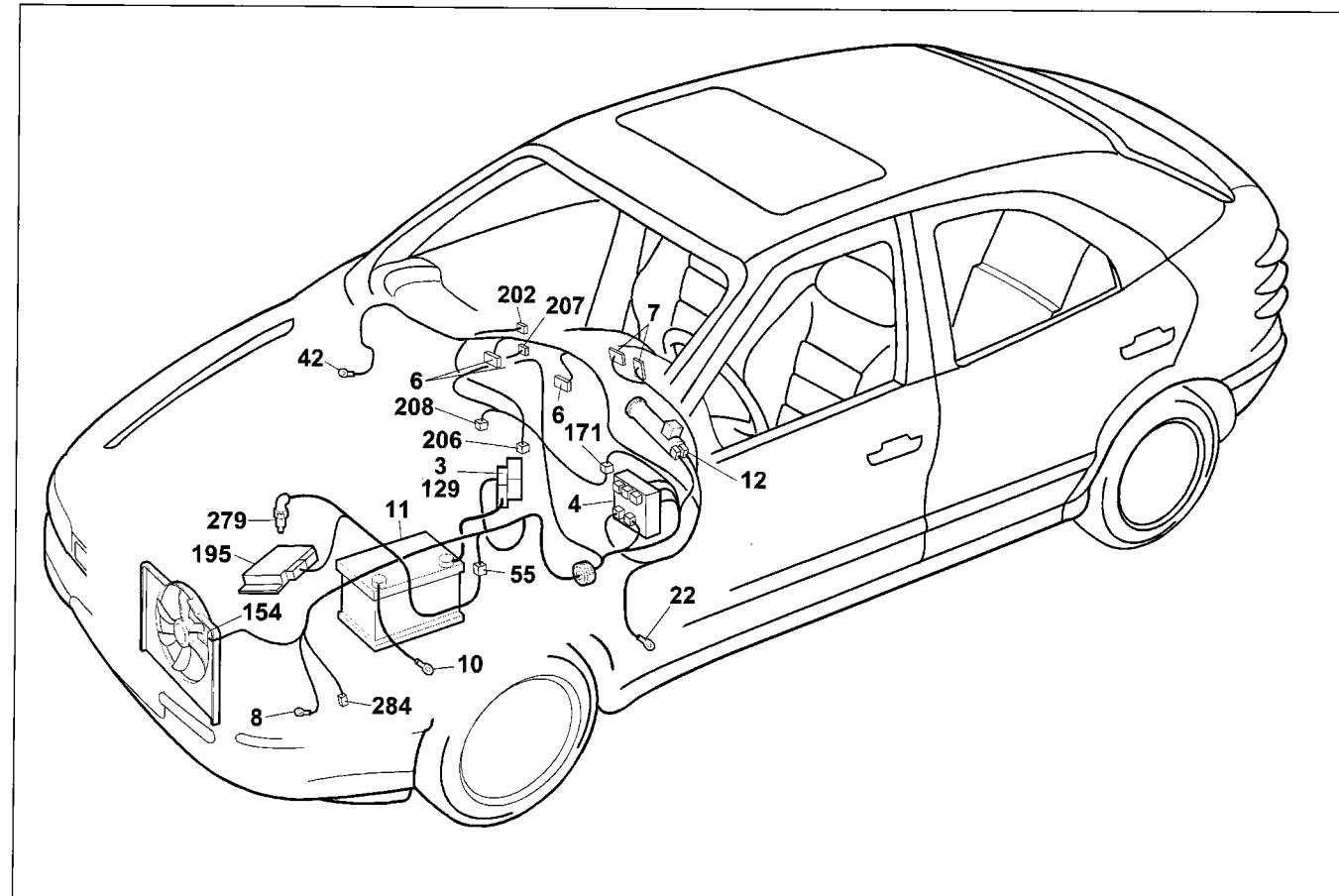
P4A28EL01

■ The cables involved in the wiring diagram are marked with a solid square

**Engine cooling system - Water temperature gauge - Car interior ventilation**



### 55.



P4A31EL01

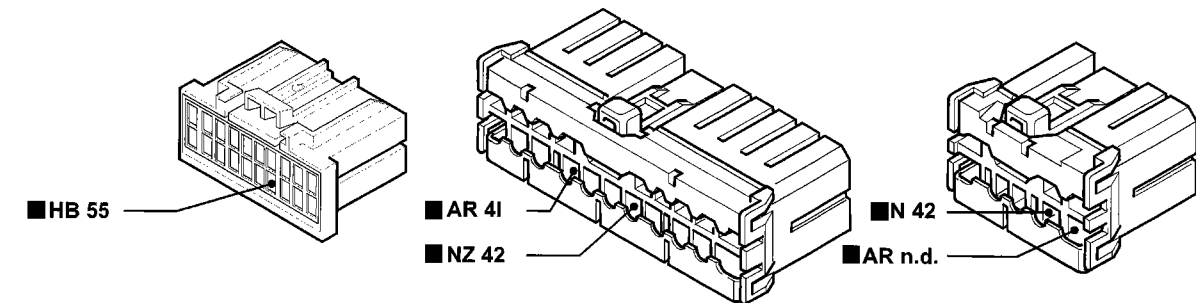
#### Engine cooling system - Water temperature gauge - Car interior ventilation

##### Key to components

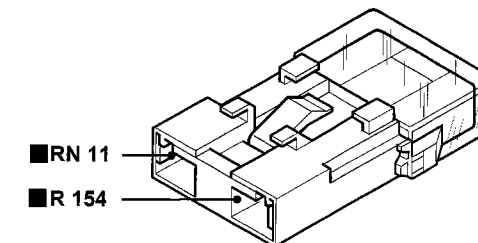
- |                                                  |                                                            |
|--------------------------------------------------|------------------------------------------------------------|
| 3 Power fuse box:                                | 129 50A power fuse protecting engine cooling fan           |
| A 30A fuse protecting fuel injection             | 154 Engine cooling fan                                     |
| B 40A fuse protecting ignition                   | 171 Heater unit                                            |
| C 60A fuse protecting additional optional extras | 195 Ignition/fuel injection electronic control unit (1581) |
| D 80A fuse protecting fuse and relay unit        | 202 Heater/air conditioner light bulbs                     |
| 4 Fuse and relay unit                            | 206 Heater/air conditioner electric fan                    |
| E1 Ignition switch discharge relay               | 207 Heater/air conditioner speed control switch            |
| 6 Instrument panel:                              | 208 Limiting resistor for heater/air conditioner           |
| X Coolant temperature gauge                      | 279 Engine coolant temperature double sender unit          |
| 7 Stalk unit                                     | 284 Engine cooling fan relay                               |
| 8 Front left earth                               |                                                            |
| 10 Battery earth on body shell                   |                                                            |
| 11 Battery                                       |                                                            |
| 12 Ignition switch                               |                                                            |
| 22 Left dashboard earth                          |                                                            |
| 42 Right dashboard earth                         |                                                            |
| 55 Front cables/fuel gauge control connection    |                                                            |

N.D. Ultrasound-soldered joint taped in wiring loom

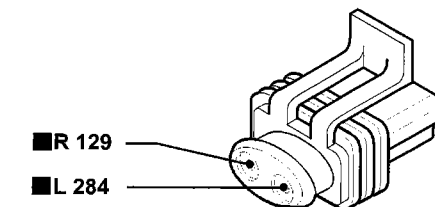
#### 6A - 6B - 6C Instrument panel



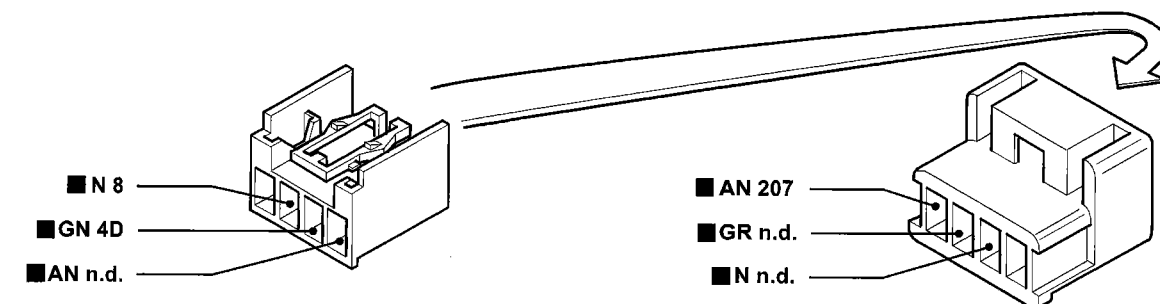
#### 129 50A power fuse protecting engine cooling fan



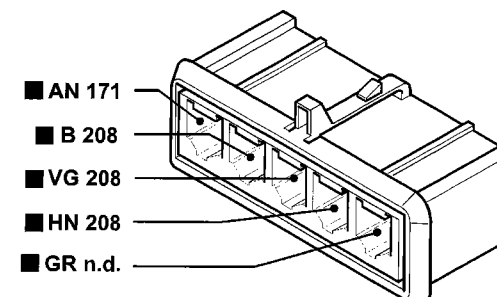
#### 154 Engine cooling fan



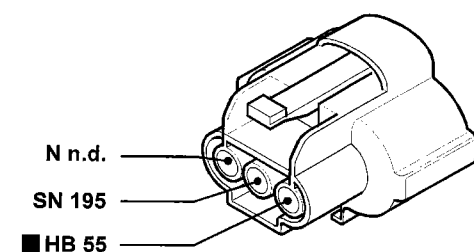
#### 171 Heater unit cables connection



#### 207 Electric fan speed control switch



#### 279 Engine coolant temperature double sender unit

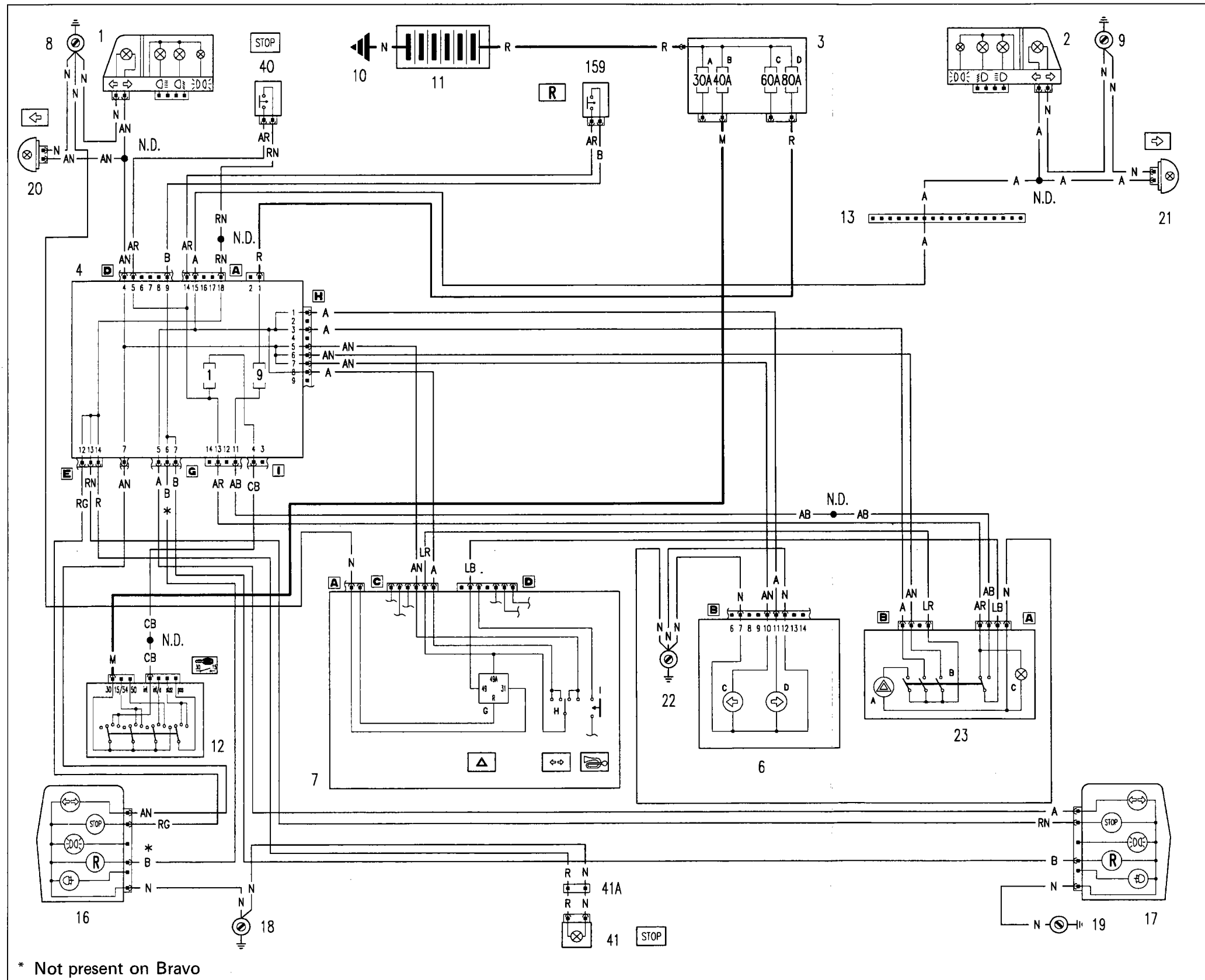


P4A32EL01

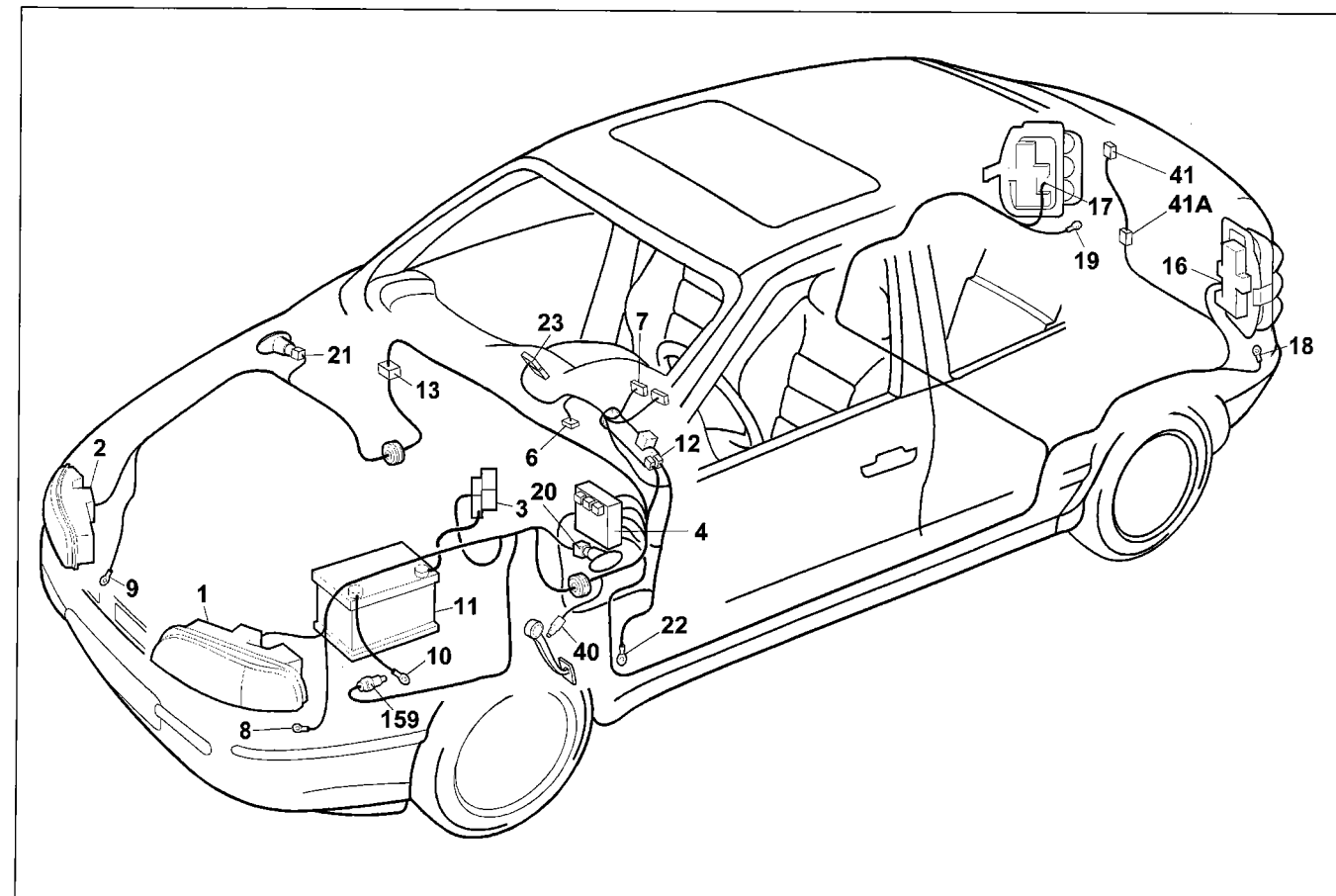
■ The cables involved in the wiring diagram are marked with a solid square

Version: S - SX

Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights



### 55.



Version: S - SX

P4A35EL01

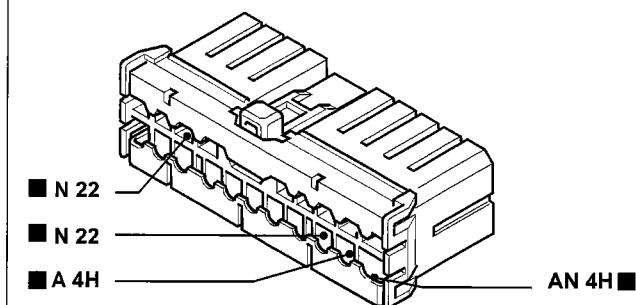
Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights

#### Key to components

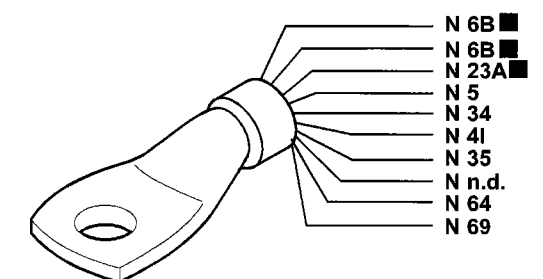
- |                                                  |                                                  |
|--------------------------------------------------|--------------------------------------------------|
| 1 Front left lights cluster                      | 17 Rear right lights cluster                     |
| 2 Front right lights cluster                     | 18 Rear left earth                               |
| 3 Power fuse box:                                | 19 Rear right earth                              |
| A 30A fuse protecting fuel injection             | 20 Front left side repeater                      |
| B 40A fuse protecting ignition                   | 21 Front right side repeater                     |
| C 60A fuse protecting additional optional extras | 22 Left dashboard earth                          |
| D 80A fuse protecting fuse and relay unit        | 23 Hazard lights switch unit                     |
| 4 Fuse and relay unit                            | A Hazard warning lights warning lamp             |
| 6 Instrument panel:                              | B Hazard lights control switch                   |
| C Left direction indicator warning light         | C Hazard lights unit symbol light                |
| D Right direction indicator warning light        | 40 Stop lights switch                            |
| 7 Stalk unit:                                    | 41 Additional stop light                         |
| H Direction indicators stalk                     | 41A Additional stop light rear cables connection |
| I Horn button                                    | 159 Reversing lights switch                      |
| 8 Front left earth                               |                                                  |
| 9 Front right earth                              |                                                  |
| 10 Battery earth on body shell                   |                                                  |
| 11 Battery                                       |                                                  |
| 12 Ignition switch                               |                                                  |
| 13 Front right/left cables connection            |                                                  |
| 16 Rear left lights cluster                      |                                                  |

N.D. Ultrasound-soldered joint taped in wiring loom

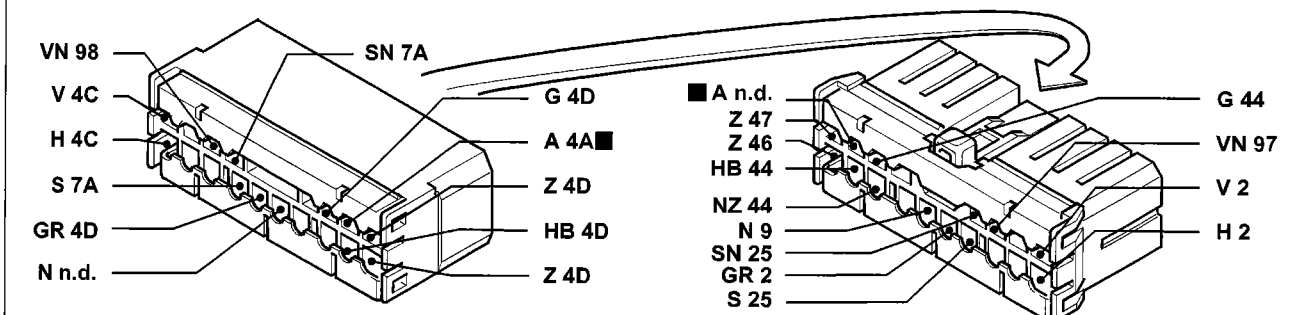
#### 6A Instrument panel



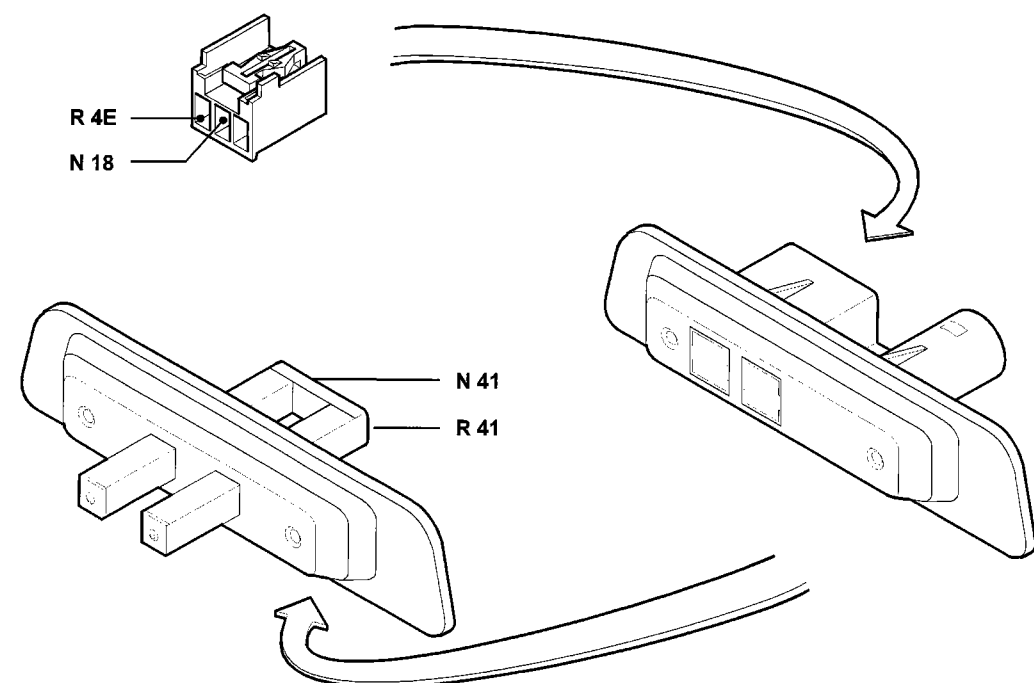
#### 22 Left dashboard earth



#### 13 Front right/left cables connection



#### 41A Additional stop light rear cables connection



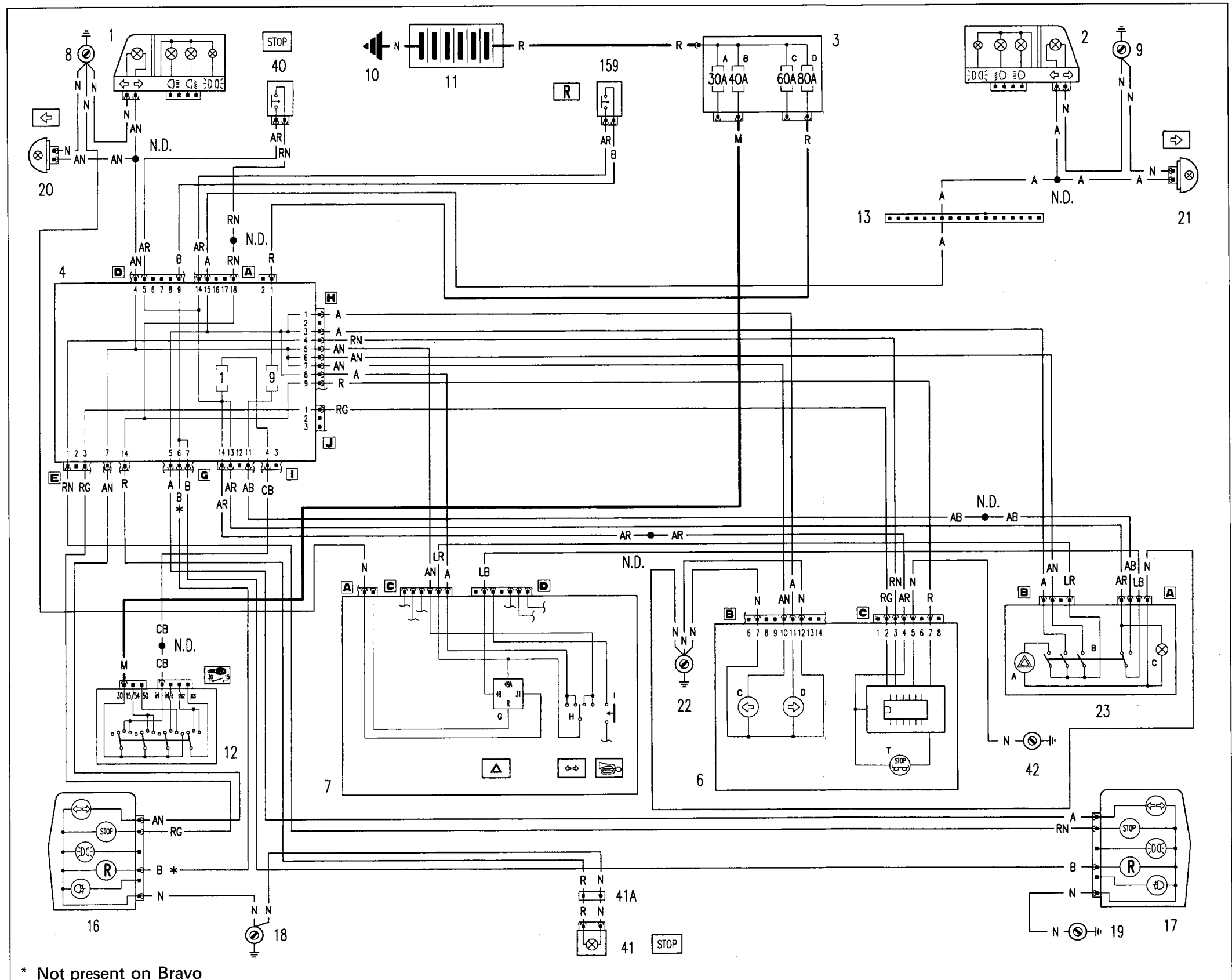
P4A36EL01

■ The cables involved in the wiring diagram are marked with a solid square



Version: EL - ELX

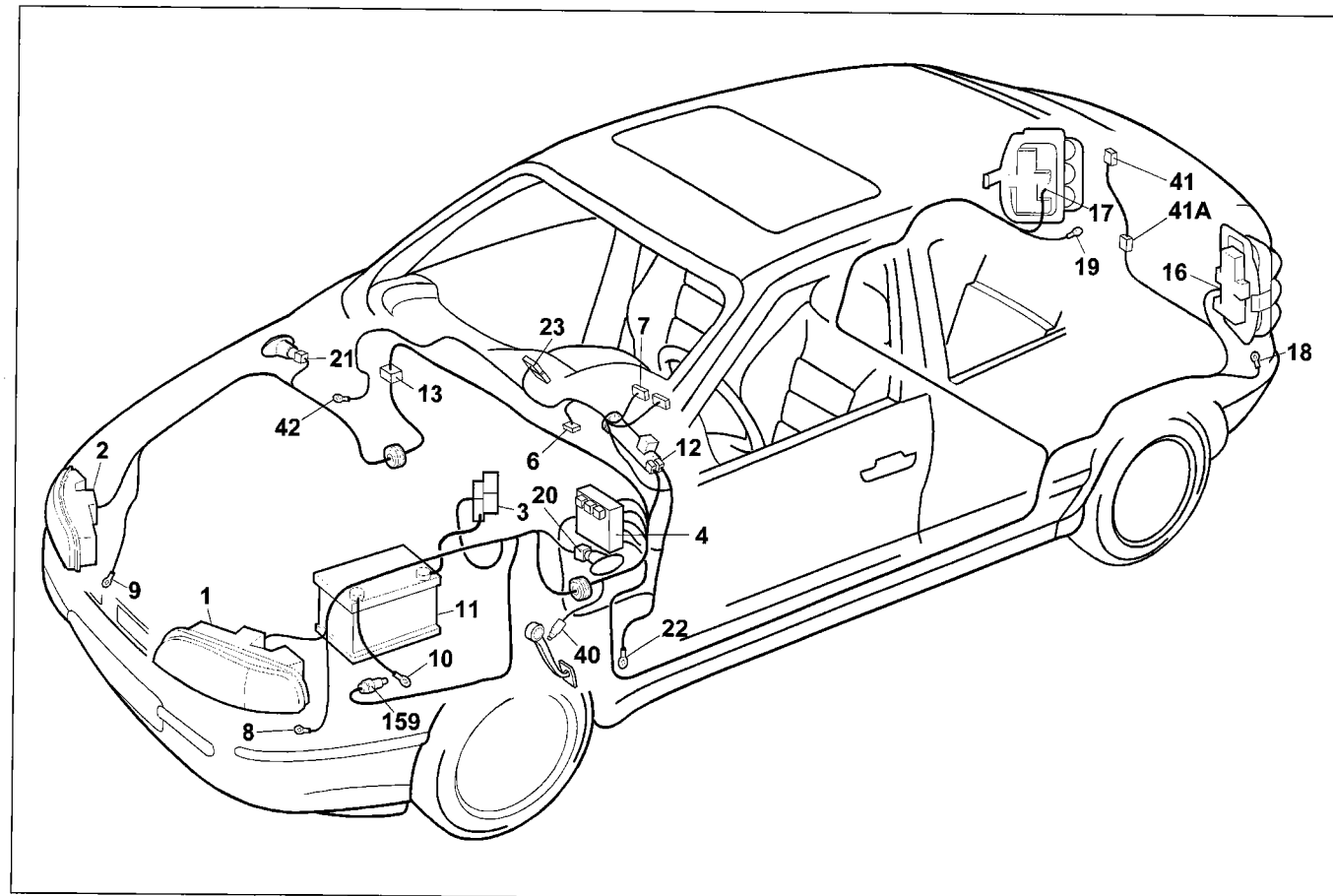
Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights



\* Not present on Bravo

P4A37EL01

**55.**



Version: EL - ELX

P4A39EL01

Direction indicators and warning lamp - Hazard warning lights and warning lamp - Stop lights - Reversing lights

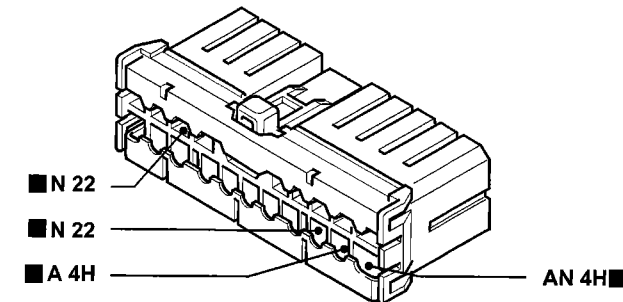
### Key to components

- 1 Front left lights cluster
- 2 Front right lights cluster
- 3 Power fuse box:
  - A 30A fuse protecting fuel injection
  - B 40A fuse protecting ignition
  - C 60A fuse protecting additional optional extras
  - D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:
  - C Left direction indicator warning light
  - D Right direction indicator warning light
  - T Stop lights fault warning light
- 7 Stalk unit:
  - H Direction indicators stalk
  - I Horn button
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 16 Rear left lights cluster

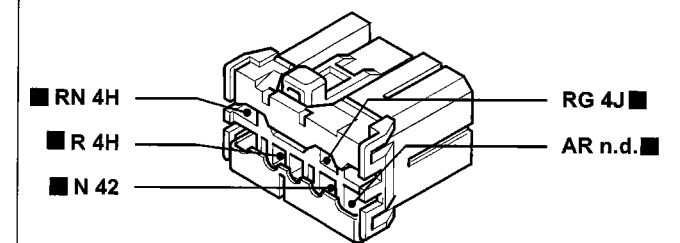
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 20 Front left side repeater
- 21 Front right side repeater
- 22 Left dashboard earth
- 23 Hazard warning lights switch unit
  - A Hazard warning lights warning lamp
  - B Hazard warning lights switch
  - C Hazard warning lights unit symbol light
- 40 Stop lights switch
- 41 Additional stop light
- 41A Additional stop light rear cables connection
- 42 Right dashboard earth
- 159 Reversing lights switch

N.D. Ultrasound-soldered joint taped in wiring loom

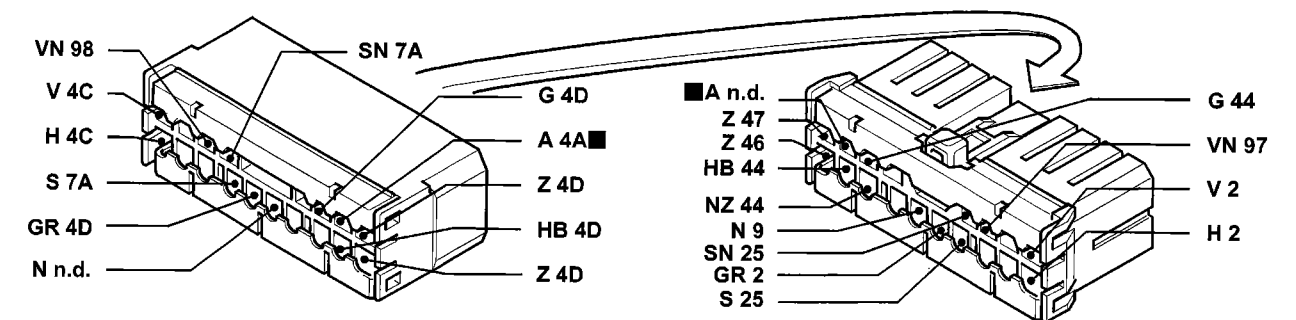
### 6B Instrument panel



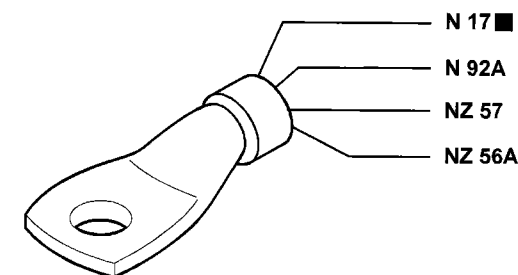
### 6C Instrument panel



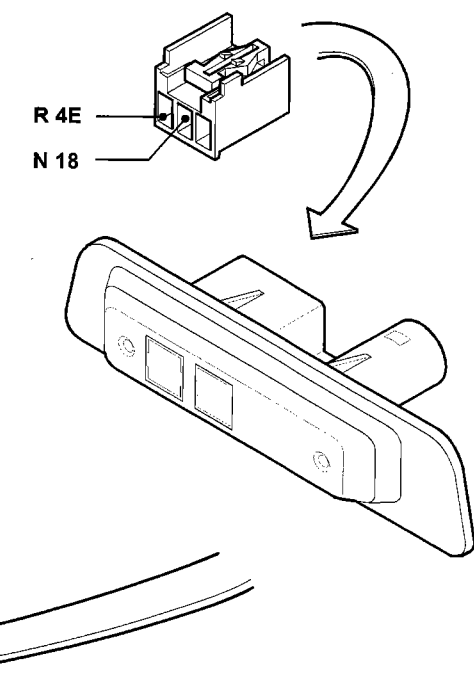
### 13 Front right/left cables connection



### 19 Rear right earth



### 41A Additional stop light rear cables connection



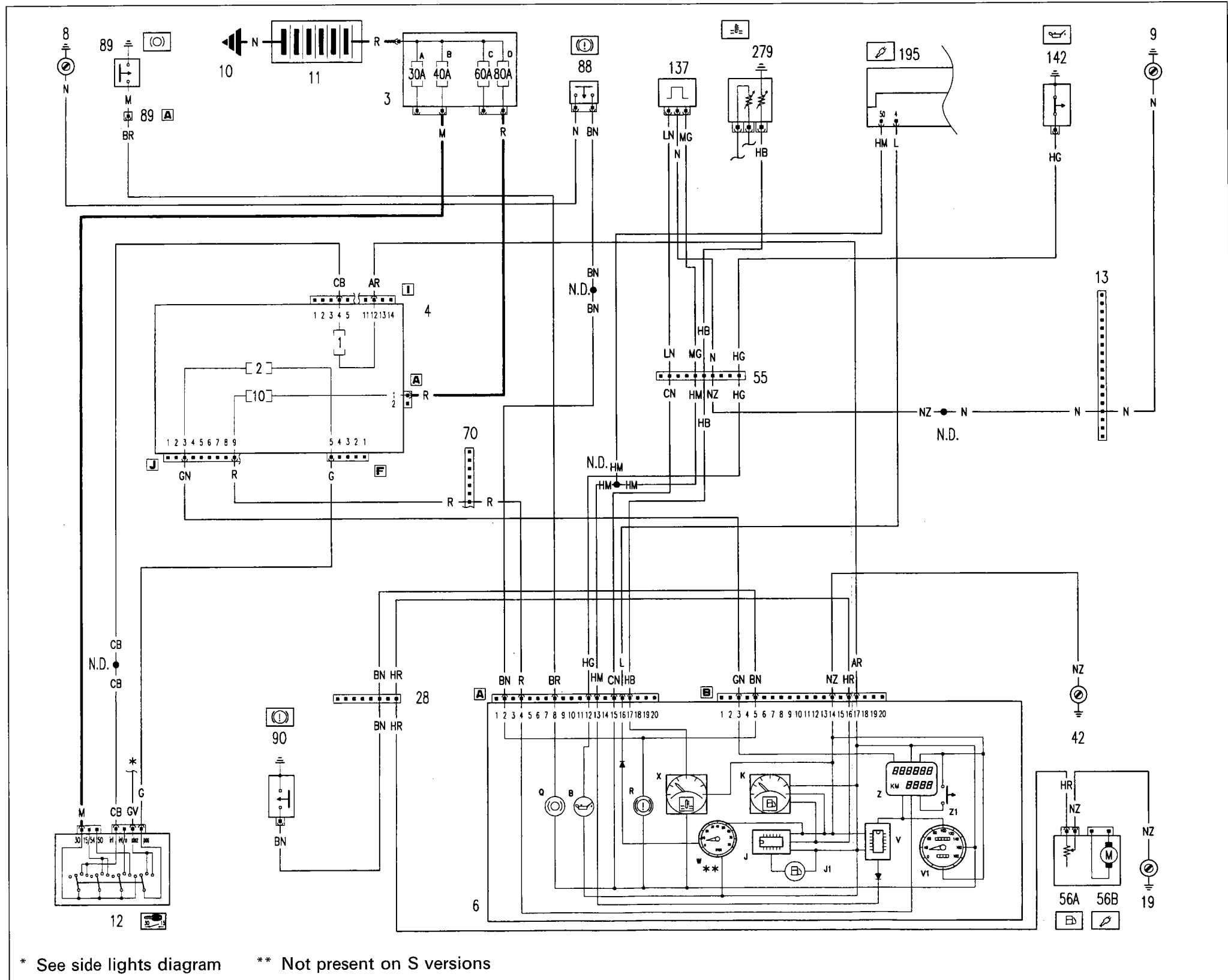
■ The cables involved in the wiring diagram are marked with a solid square

P4A40EL01

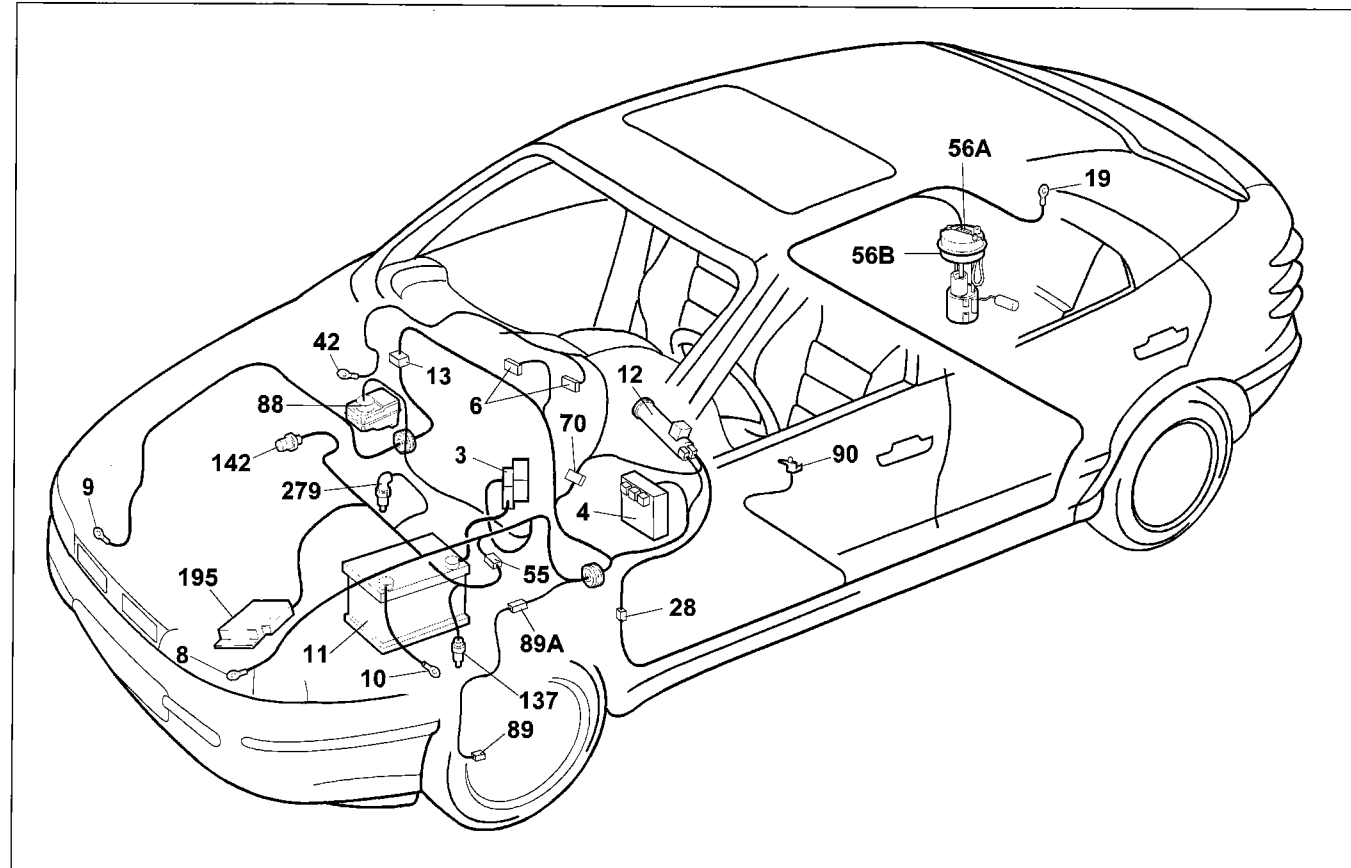


Version: S - SX

Fuel level gauge and reserve warning light - Handbrake on/low brake fluid level warning light - Speedometer - Trip recorder/total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Rev counter - Front brake pad wear warning light



### 55.



P4A43EL01

Version: S - SX

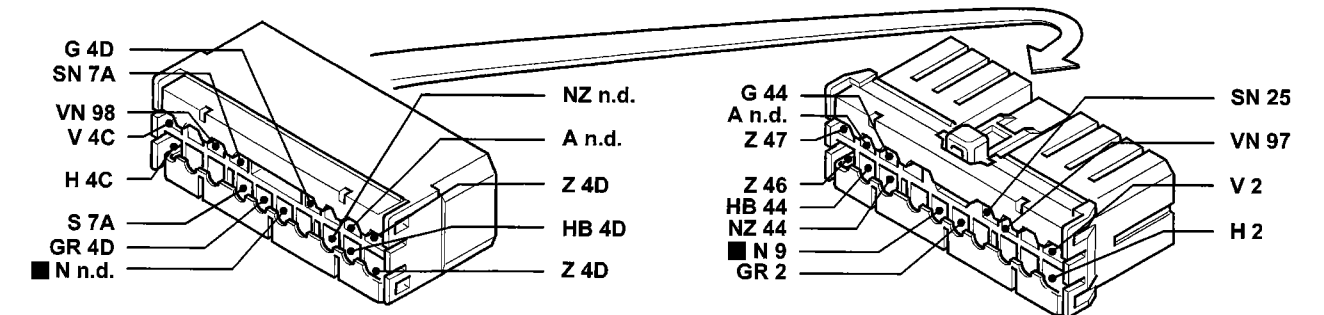
Fuel level gauge and reserve warning light - Hand brake on/low brake fluid warning light - Speedometer - Trip recorder/-total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Rev counter - Front brake pad wear warning light

#### Key to components

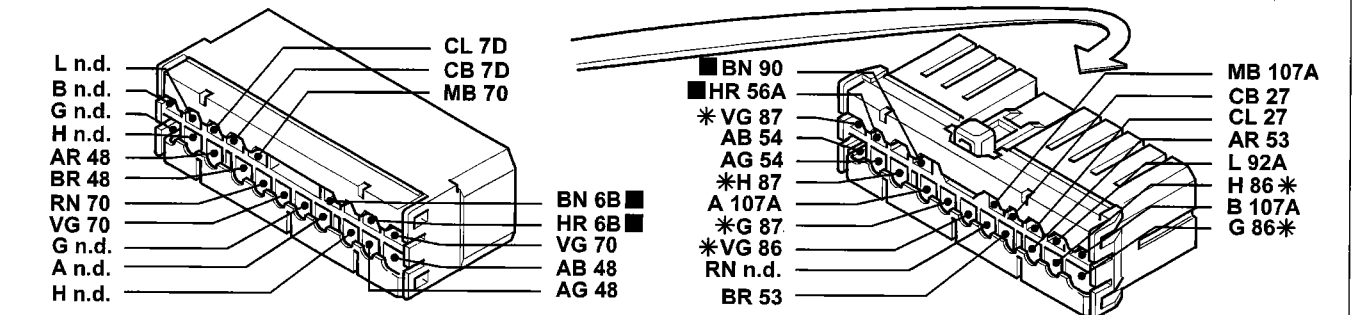
- |                                                                                                                                                                                                                                                           |                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fuse box:<br>A 30A fuse protecting fuel injection<br>B 40A fuse protecting ignition<br>C 60A fuse protecting additional optional extras<br>D 80A fuse protecting fuse and relay unit                                                              | 13 Front right/left cables connection<br>19 Rear right earth<br>28 Dashboard/longitudinal cables connection<br>42 Right dashboard earth<br>55 Front cables/fuel gauge control connection |
| 4 Fuse and relay unit                                                                                                                                                                                                                                     | 56 Fuel gauge control unit<br>A Fuel gauge sensor<br>B Electric fuel pump                                                                                                                |
| 6 Instrument panel:<br>B Low engine oil pressure warning light<br>J Fuel reserve circuit control module<br>J1 Low fuel level warning light<br>K Fuel gauge<br>Q Front brake pad wear warning light<br>R Hand brake on/low brake fluid level warning light | 70 Dashboard/front cables connection<br>88 Low brake fluid level sensor<br>89 Left brake pad wear sensor<br>89A Left brake pad wear sensor cables connection                             |
| V Speedometer control module<br>V1 Speedometer<br>W Rev counter<br>X Coolant temperature gauge<br>Z Trip recorder/total mileage counter<br>Z1 Trip recorder reset button                                                                                  | 90 Handbrake on warning light switch<br>137 Vehicle speed sensor<br>142 Low oil pressure warning light switch                                                                            |
| 8 Front left earth<br>9 Front right earth<br>10 Battery earth on body shell<br>11 Battery<br>12 Ignition switch                                                                                                                                           | 195 Ignition/fuel injection electronic control unit (1581)<br>279 Engine coolant temperature double sender unit                                                                          |

N.D. Ultrasound-soldered joint taped in wiring loom

#### 13 Front right/left cables connection

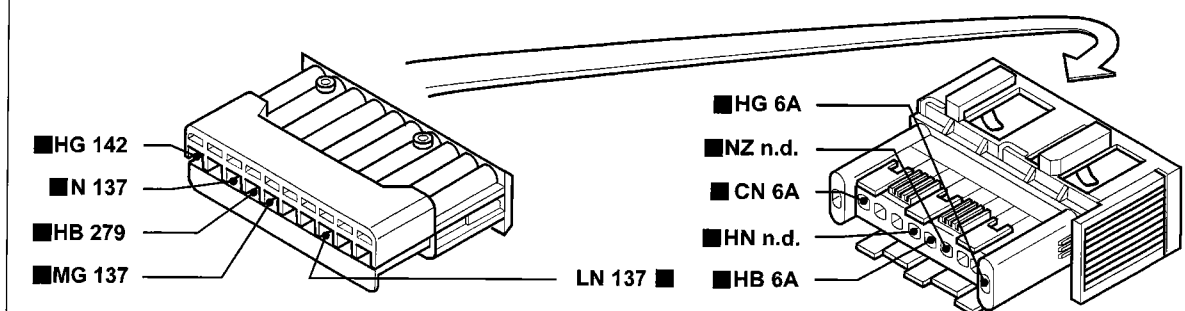


#### 28 Dashboard/longitudinal cables connection

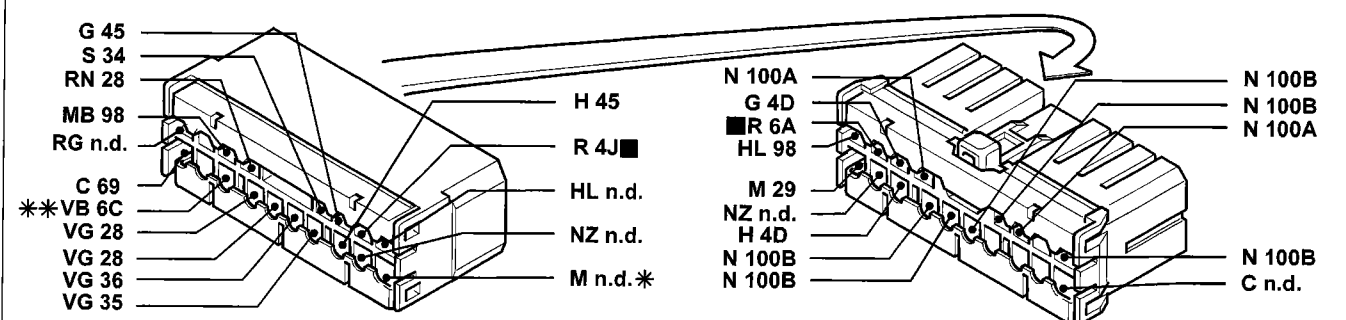


\* Only for Brava

#### 55 Front/engine cables connection



#### 70 Dashboard/front cables connection



\* Not present on S version

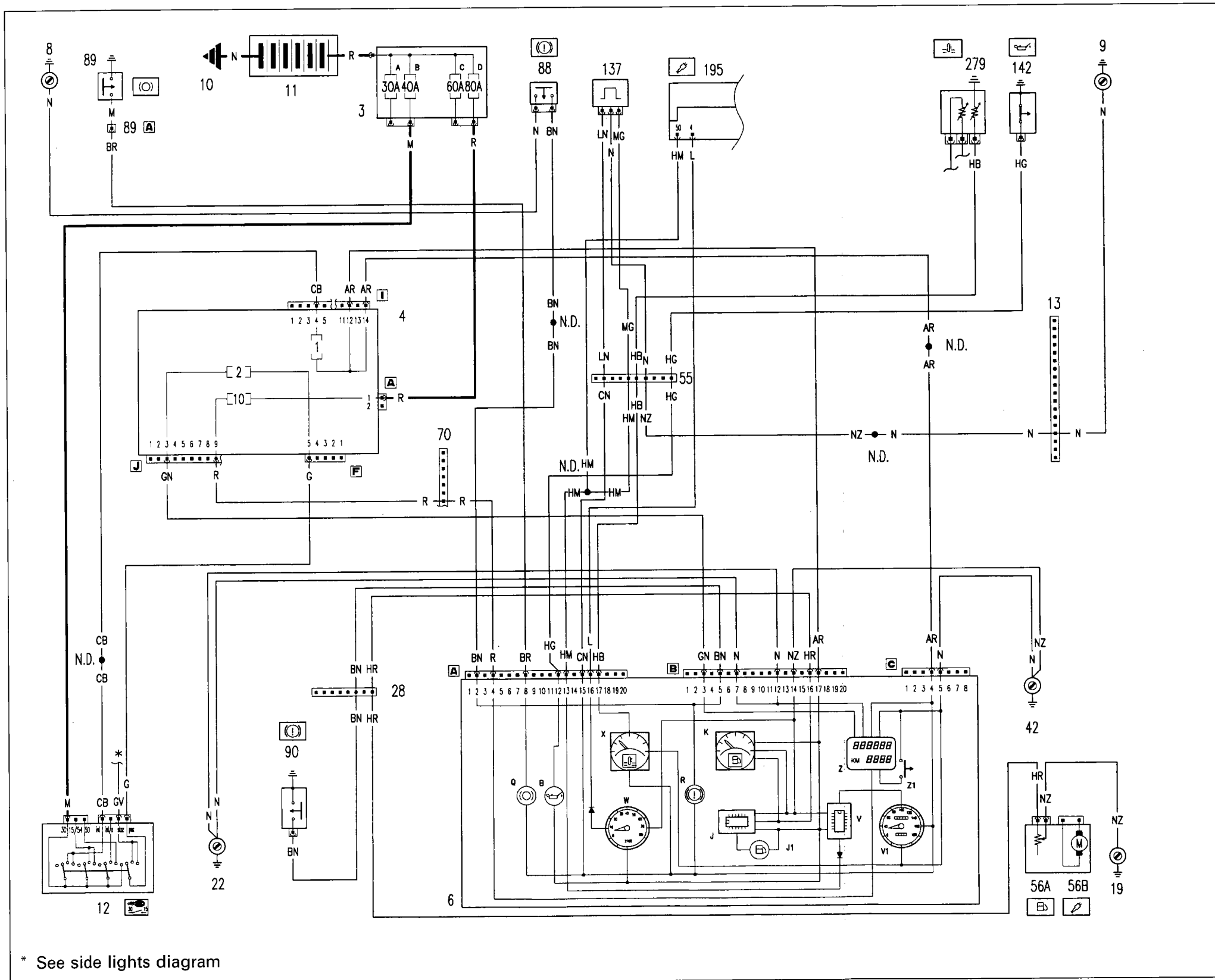
\*\* Applies to EL/ELX version

■ The cables involved in the wiring diagram are marked with a solid square

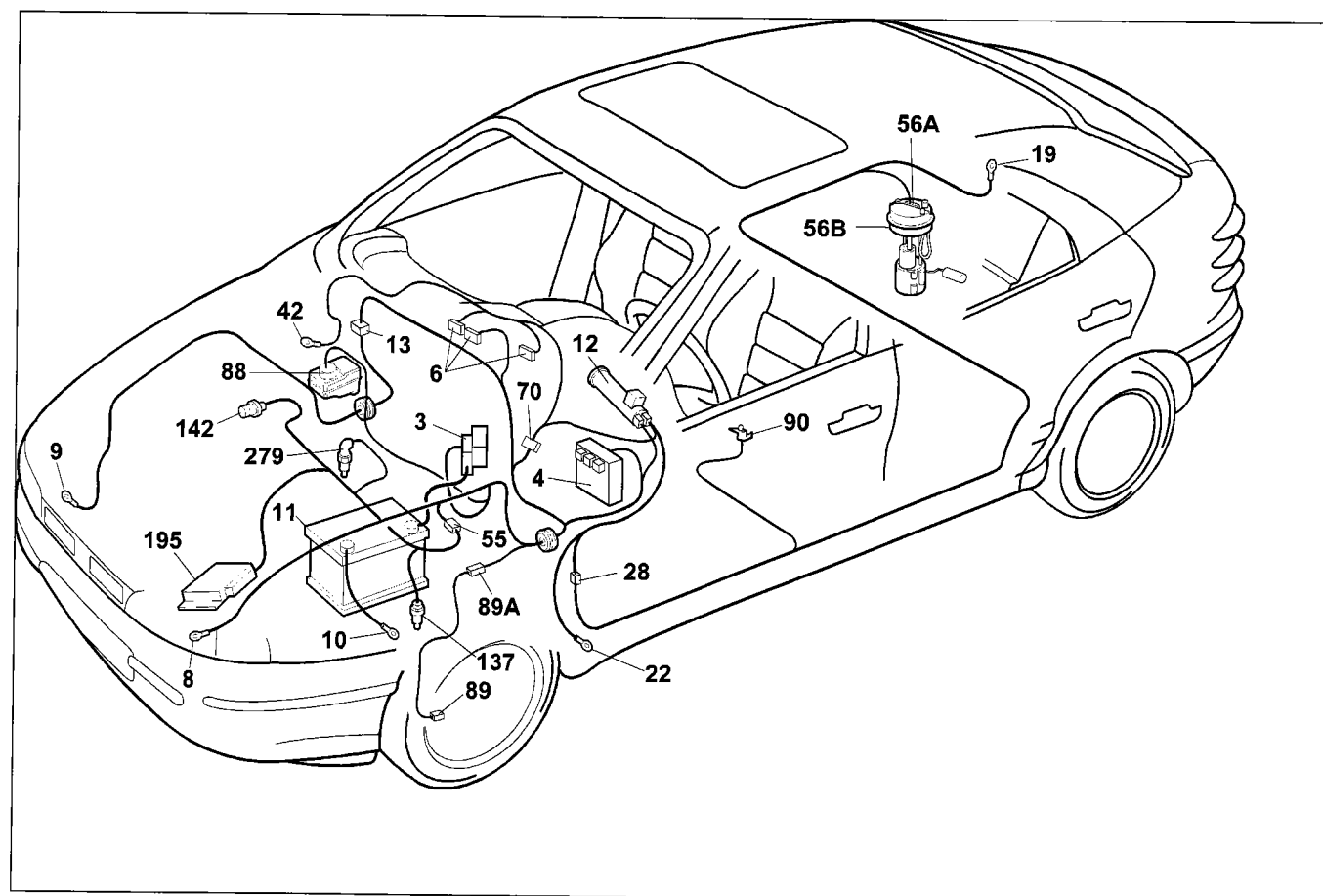
P4A44EL01

Version: EL - ELX

Fuel level gauge and reserve warning light - Hand brake on/low brake fluid warning light - Speedometer - Trip recorder/total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Rev counter -



P4A45EL01



**Version: EL - ELX**

P4A47F1.01

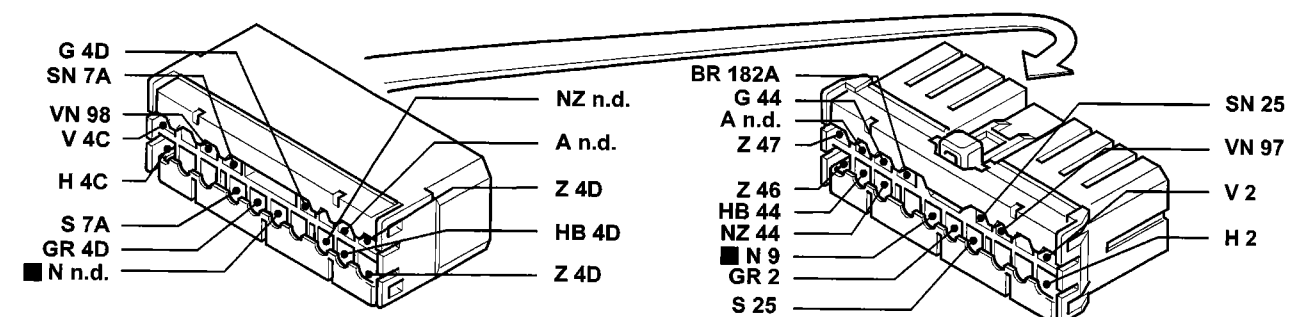
**Fuel level gauge and reserve warning light - Hand brake on/low brake fluid level warning light - Speedometer - Trip recorder/total mileage counter and reset button - Water temperature gauge - Low engine oil pressure warning light - Front brake pad wear warning light - Rev counter**

### Key to components

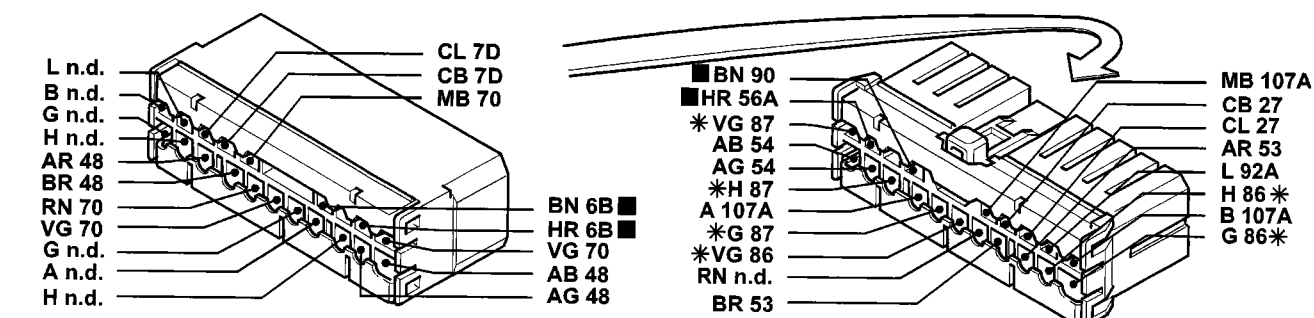
- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>3 Power fuse box:           <ul style="list-style-type: none"> <li>A 30A fuse protecting fuel injection</li> <li>B 40A fuse protecting ignition</li> <li>C 60A fuse protecting additional optional extras</li> <li>D 80A fuse protecting fuse and relay unit</li> </ul> </li> <li>4 Fuse and relay unit</li> <li>6 Instrument panel:           <ul style="list-style-type: none"> <li>B Low engine oil pressure warning light</li> <li>J Fuel reserve circuit control module</li> </ul> </li> <li>J1 Low fuel level warning light           <ul style="list-style-type: none"> <li>K Fuel gauge</li> <li>Q Front brake pad wear warning light</li> <li>R Hand brake on/low brake fluid warning light</li> </ul> </li> <li>V Speedometer control module</li> <li>V1 Speedometer</li> <li>W Rev counter           <ul style="list-style-type: none"> <li>X Coolant temperature gauge</li> <li>Z Trip recorder/total mileage counter</li> </ul> </li> <li>Z1 Trip recorder reset button</li> <li>8 Front left earth</li> <li>9 Front right earth</li> <li>10 Battery earth on body shell</li> <li>11 Battery</li> <li>12 Ignition switch</li> </ul> | <ul style="list-style-type: none"> <li>13 Front right/left cables connection</li> <li>19 Rear right earth</li> <li>22 Left dashboard earth</li> <li>28 Dashboard/longitudinal cables connection</li> <li>42 Right dashboard earth</li> <li>55 Front cables/fuel gauge control connection</li> <br/> <li>56 Fuel gauge control unit           <ul style="list-style-type: none"> <li>A Fuel gauge sensor</li> <li>B Electric fuel pump</li> </ul> </li> <li>70 Dashboard/front cables connection</li> <li>88 Low brake fluid level sensor</li> <li>89 Left brake pad wear sensor</li> <li>89A Left brake pad wear sensor cables connection</li> <br/> <li>90 Handbrake on warning light switch</li> <li>137 Car speed sensor</li> <li>142 Low oil pressure warning light switch</li> <br/> <li>195 Ignition/fuel injection electronic control unit (1581)</li> <br/> <li>279 Engine coolant temperature double sender unit</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

N.D. Ultrasound-soldered joint taped in wiring loom

### 13 Front right/left cables connection

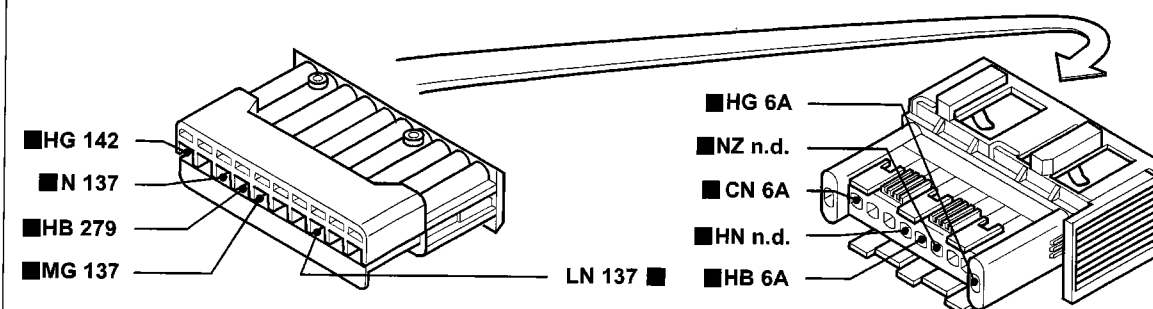


## 28 Dashboard/longitudinal cables connection

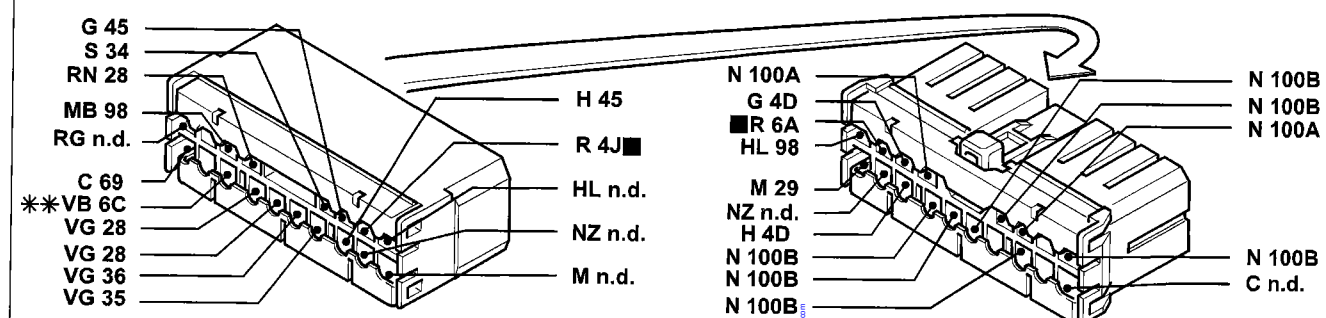


\* Only for Brava

## 55 Front/engine cables connection



## 70 Dashboard/front cables connection



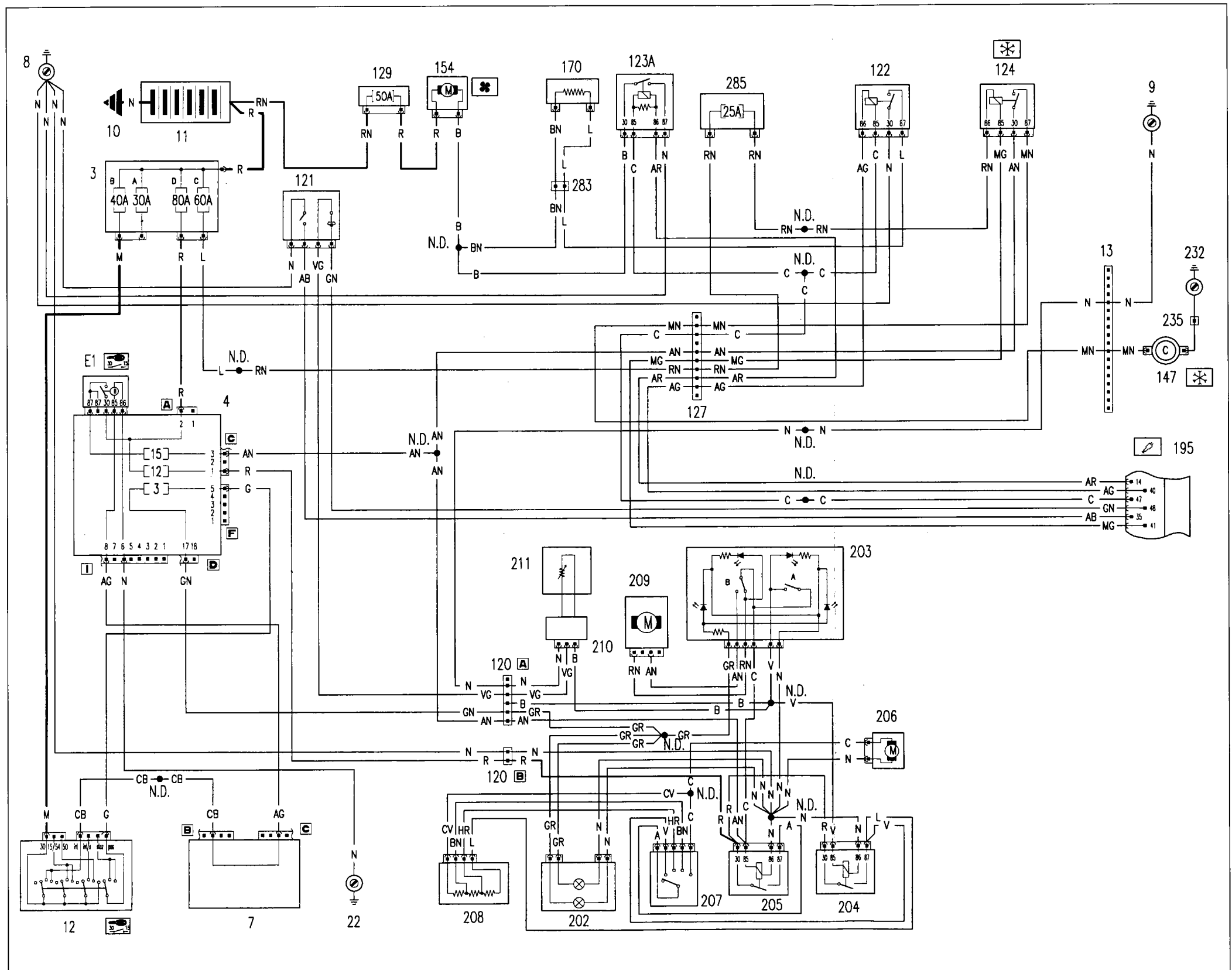
\* Not present on S version

\*\* Applies to EL/ELX version

- The cables involved in the wiring diagram are marked with a solid square

P4A48EL01

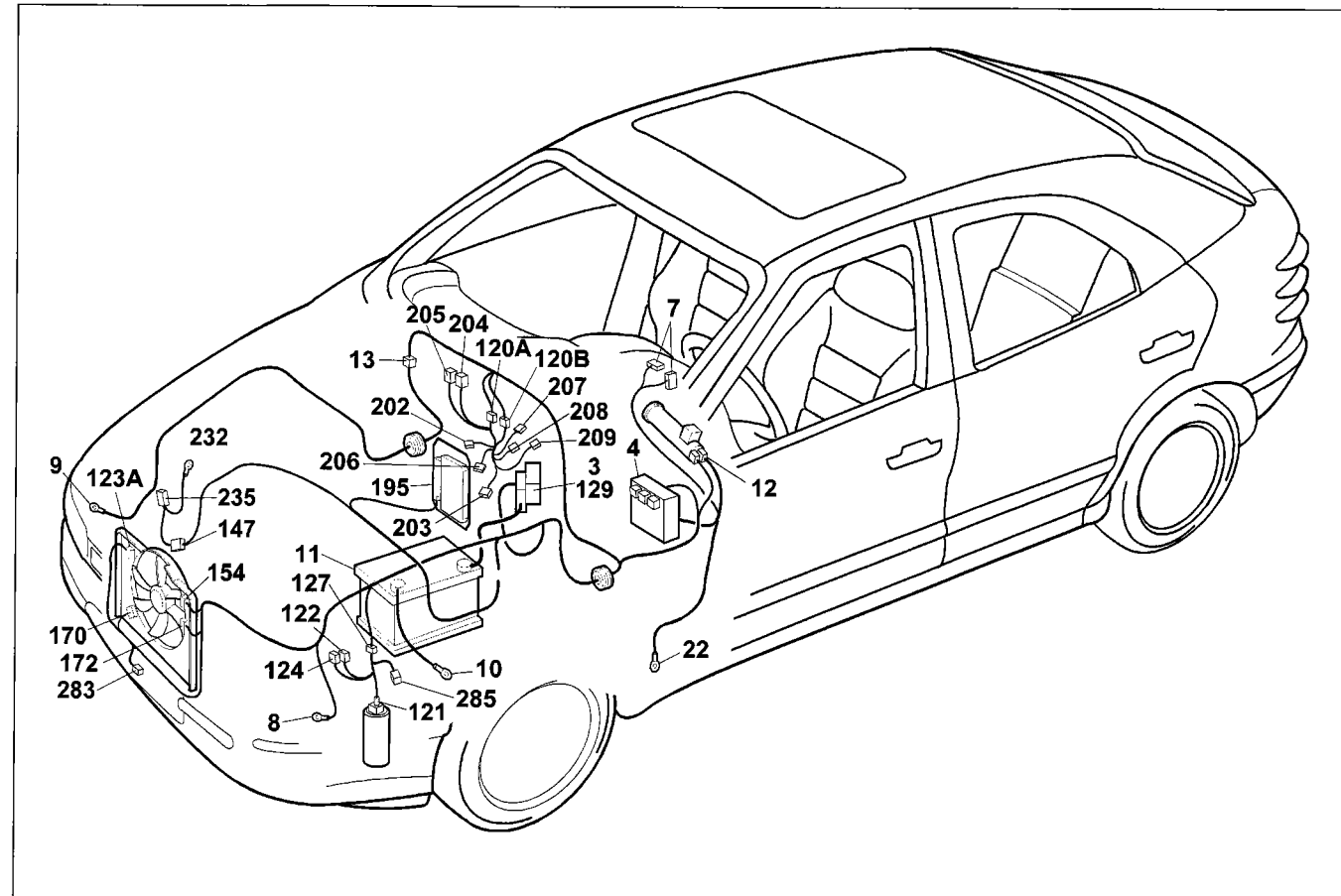
**Air conditioner**



P4A49EL01



### 55.



P4A51EL01

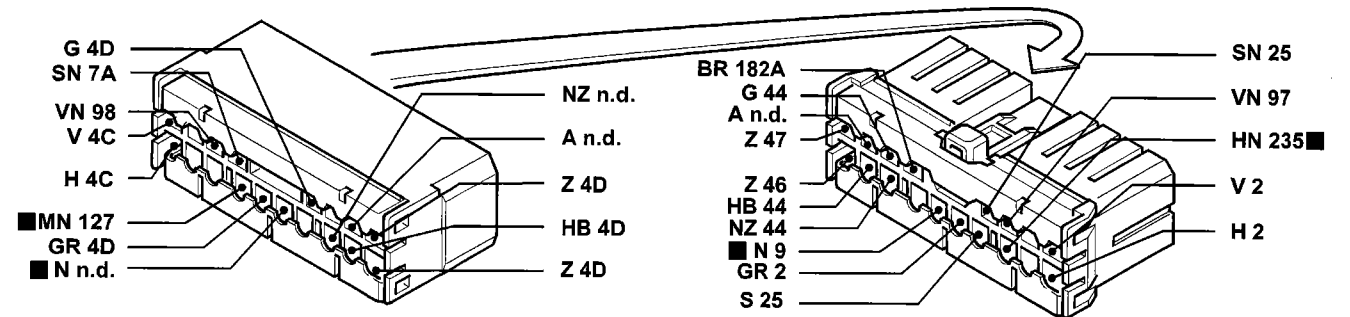
#### Air conditioner

#### Key to components

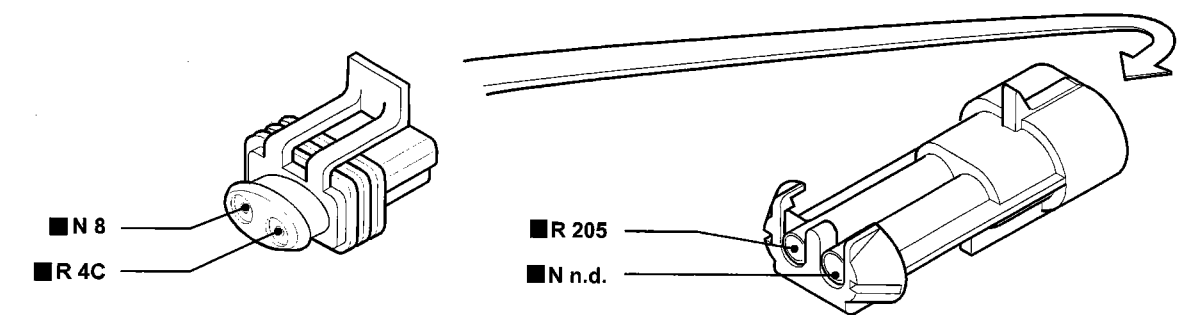
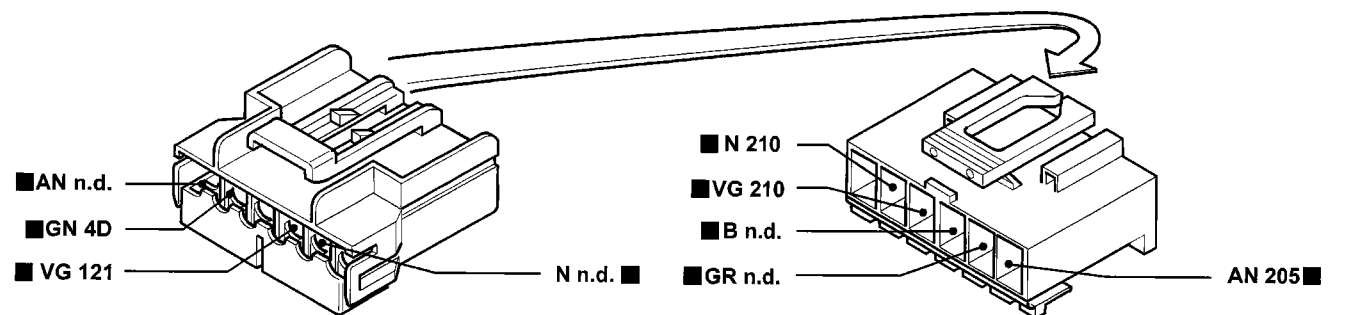
- |                                                                         |                                                            |
|-------------------------------------------------------------------------|------------------------------------------------------------|
| 3 Power fuse box:                                                       | 170 Engine cooling fan limiting resistor                   |
| A 30A fuse protecting fuel injection                                    | 195 Ignition/fuel injection electronic control unit (1581) |
| B 40A fuse protecting ignition                                          | 02 Heater/air conditioner light bulbs                      |
| C 60A fuse protecting additional optional extras                        | 203 Air conditioner controls unit:                         |
| D 80A fuse protecting fuse and relay unit                               | A Switch for switching on air conditioner                  |
| 4 Fuse and relay unit:                                                  | B Switch for air conditioner recirculation                 |
| E1 Ignition switch discharge relay                                      | 204 Air conditioner fan 1st speed control relay            |
| 7 Stalk unit                                                            | 205 Air conditioner fan relay                              |
| 8 Front left earth                                                      | 206 Heater/air conditioner electric fan                    |
| 9 Front right earth                                                     | 207 Heater/air conditioner speed control switch            |
| 10 Battery earth on body shell                                          | 208 Limiting resistor for heater/air conditioner           |
| 11 Battery                                                              | 209 External/recirculation air flap actuator               |
| 12 Ignition switch                                                      | 210 Electronic thermostat cables connection                |
| 13 Front right/left cables connection                                   | 211 Electronic thermostat (N.T.C.)                         |
| 22 Left dashboard earth                                                 | 232 Earth for compressor                                   |
| 120 Air conditioner cables connection                                   | 235 Air conditioner compressor cables connection           |
| 121 Three-stage pressure switch                                         | 283 Front cable/resistor cable connection                  |
| 122 Engine cooling fan low speed relay                                  | 285 25A fuse protecting headlamp washer/compressor relay   |
| 123A Engine cooling fan high speed relay                                |                                                            |
| 124 Air conditioner compressor control relay                            |                                                            |
| 127 Connection between front left cables/cable on relay carrier bracket |                                                            |
| 129 50A power fuse protecting engine cooling fan                        |                                                            |
| 147 Compressor for air conditioner                                      |                                                            |
| 154 Engine cooling fan                                                  |                                                            |

N.D. Ultrasound-soldered joint taped in wiring loom

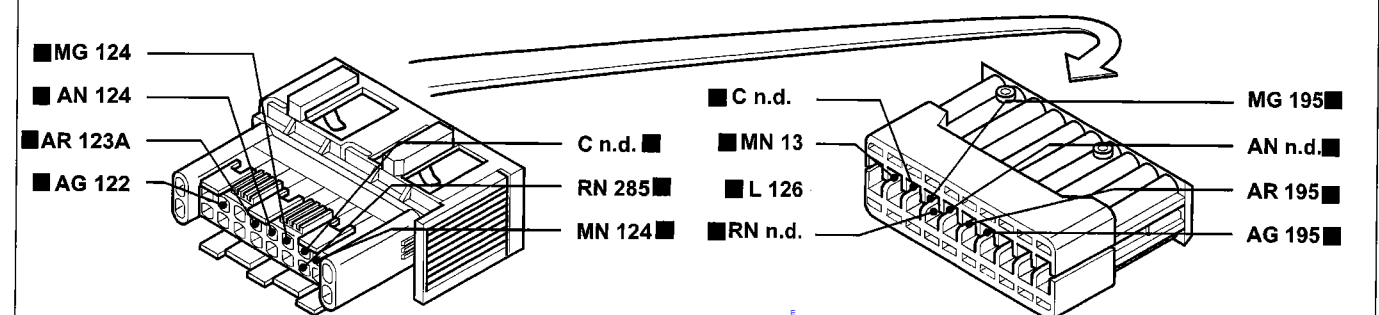
#### 13 Front right/left cables connection



#### 120 Air conditioner cables connection

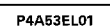


#### 127 Connection between front left cables/cable on relay carrier bracket



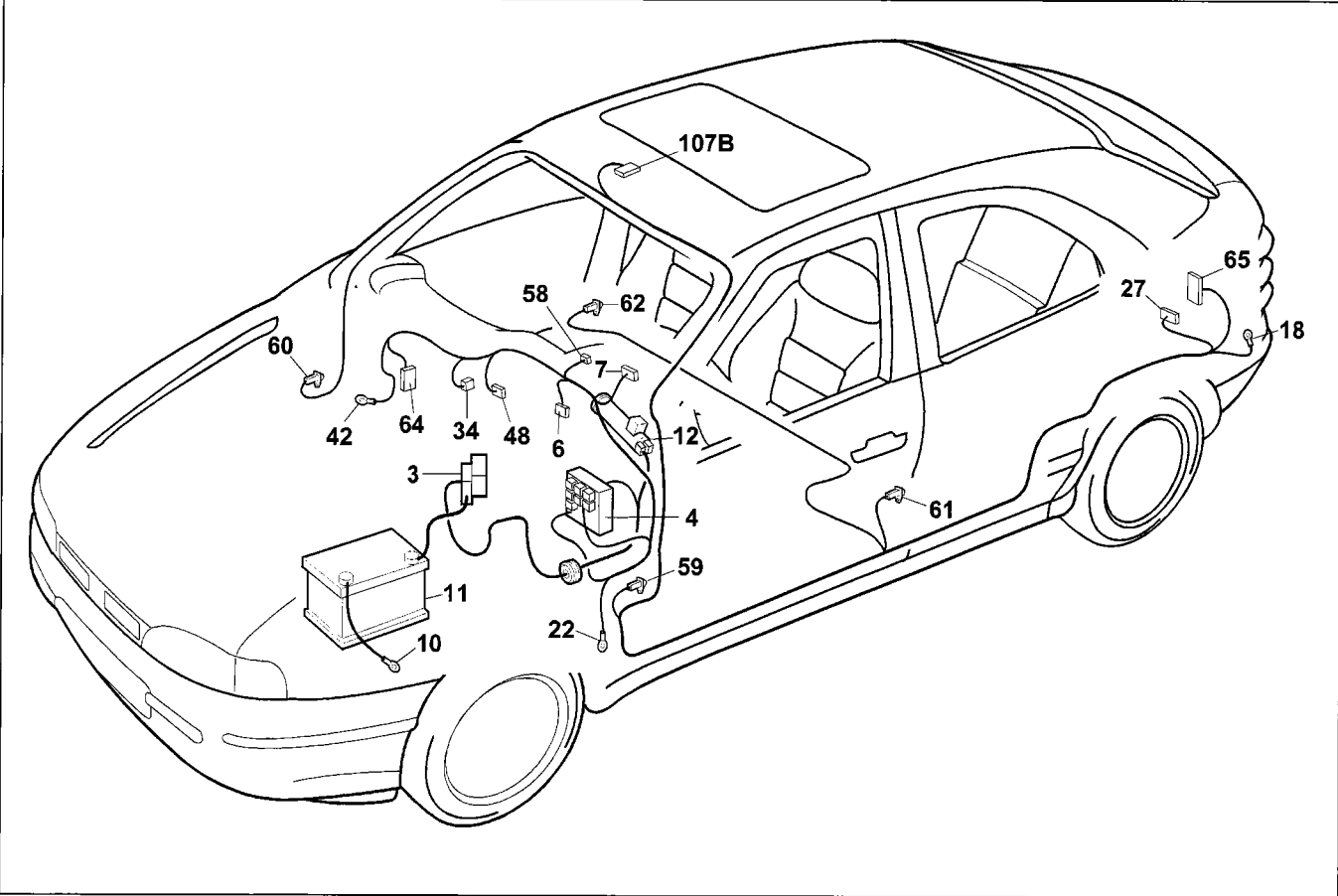
P4A52EL01

■ The cables involved in the wiring diagram are marked with a solid square





55.



Courtesy light - Symbol illumination

Key to components

- 3 Power fuse box:  
A 30A fuse protecting fuel injection  
B 40A fuse protecting ignition  
C 60A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit  
4 Fuse and relay unit  
6 Instrument panel:  
F Instrument panel symbol lights  
7 Stalk unit:  
D Flasher button  
E Main beam/dipped beam headlamps stalk  
F Side lights stalk  
10 Battery earth on body shell  
11 Battery  
12 Ignition switch  
18 Rear left earth  
22 Left dashboard earth  
27 Rear connections contact assembly with built-in boot light  
34 Switch controls unit:  
A Anti-theft "on" warning light  
B Rear fog lamps control switch  
C Rear fog lamps relay  
D Rear fog lamps warning light  
E Heated rear window switch  
F Heated rear window warning light

G Switch controls unit symbol light  
H Front fog lamps warning light  
I Front fog lights switch  
42 Right dashboard earth  
48 Radio with clock  
58 Lighting brightness adjustment rheostat  
59 Courtesy light button on front left pillar  
60 Courtesy light button on front right pillar  
61 Courtesy light button on rear left pillar  
62 Courtesy light button on rear right pillar  
64 Glove compartment light with built-in switch  
65 Boot light / anti-theft device "on"  
69 Cigarette lighter  
107B Car interior courtesy light  
286 Short-circuiting connection

N.D. Ultrasound-soldered joint taped in wiring loom

6B Instrument panel

■ GR n.d.

■ N 22

LG 117

AR 4I

HR 28

NZ 42

BN 28

GN 4J

N 22

GR n.d.

A 4H

VN 4J

AN 4H

22 Left dashboard earth

N 6B

N 6B

N 23A

N 5

N 34

N 4I

N 35 \*

N n.d.

N 69

\* Only for ELX version

58 Courtesy light brightness adjustment rheostat

■ GN 4J

■ GR n.d.

59 Courtesy light button on front left pillar

■ BR n.d.

■ N n.d.

62 Courtesy light button on front right pillar

■ BR n.d.

■ N n.d.

64 Glove compartment light bulb with integrated switch

■ R 4J

■ N 42

65 Boot light bulb/anti-theft device "on"

■ RN n.d.

■ RN 4G

107B Car interior courtesy light

■ N n.d.

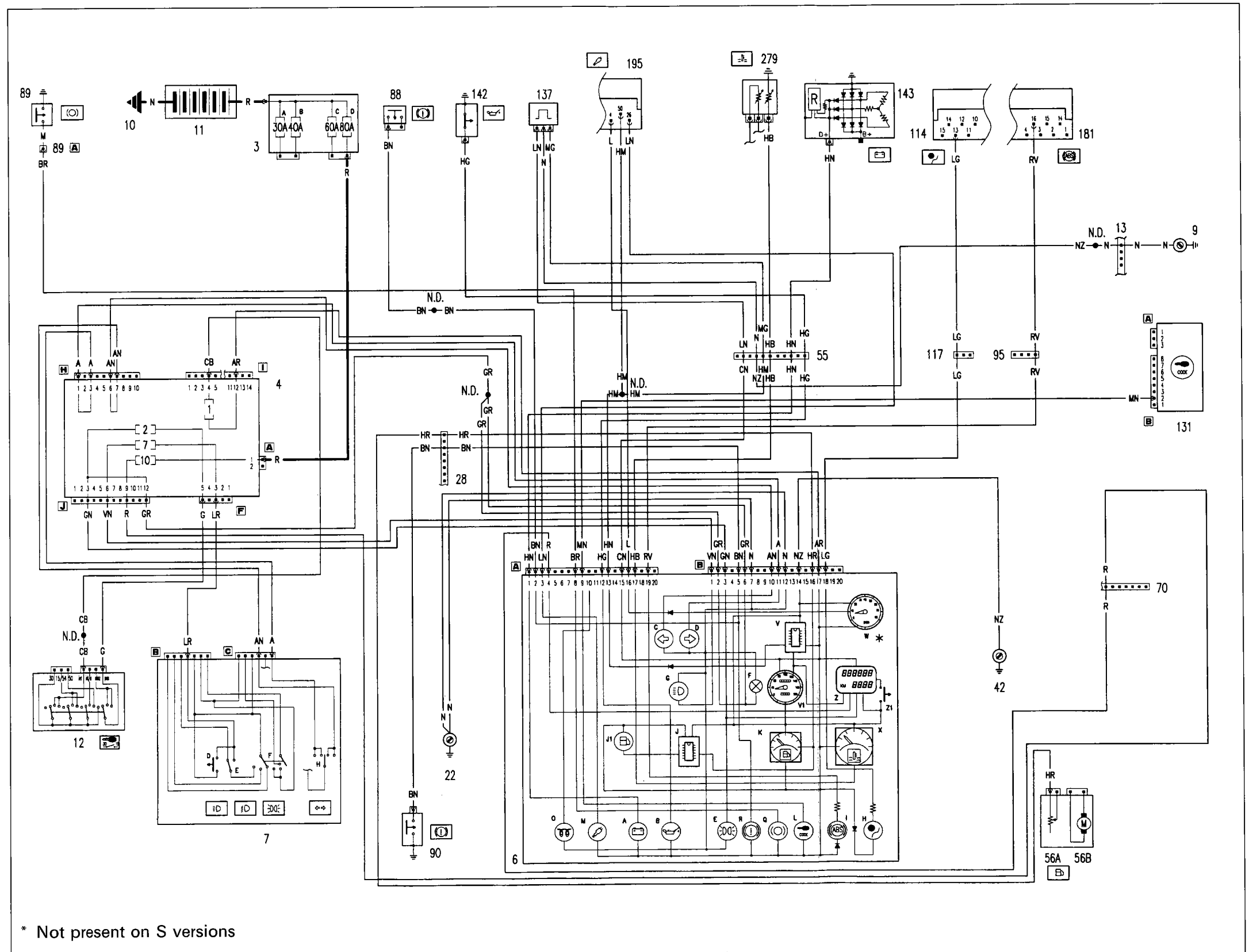
■ BR n.d.

■ RN 4G

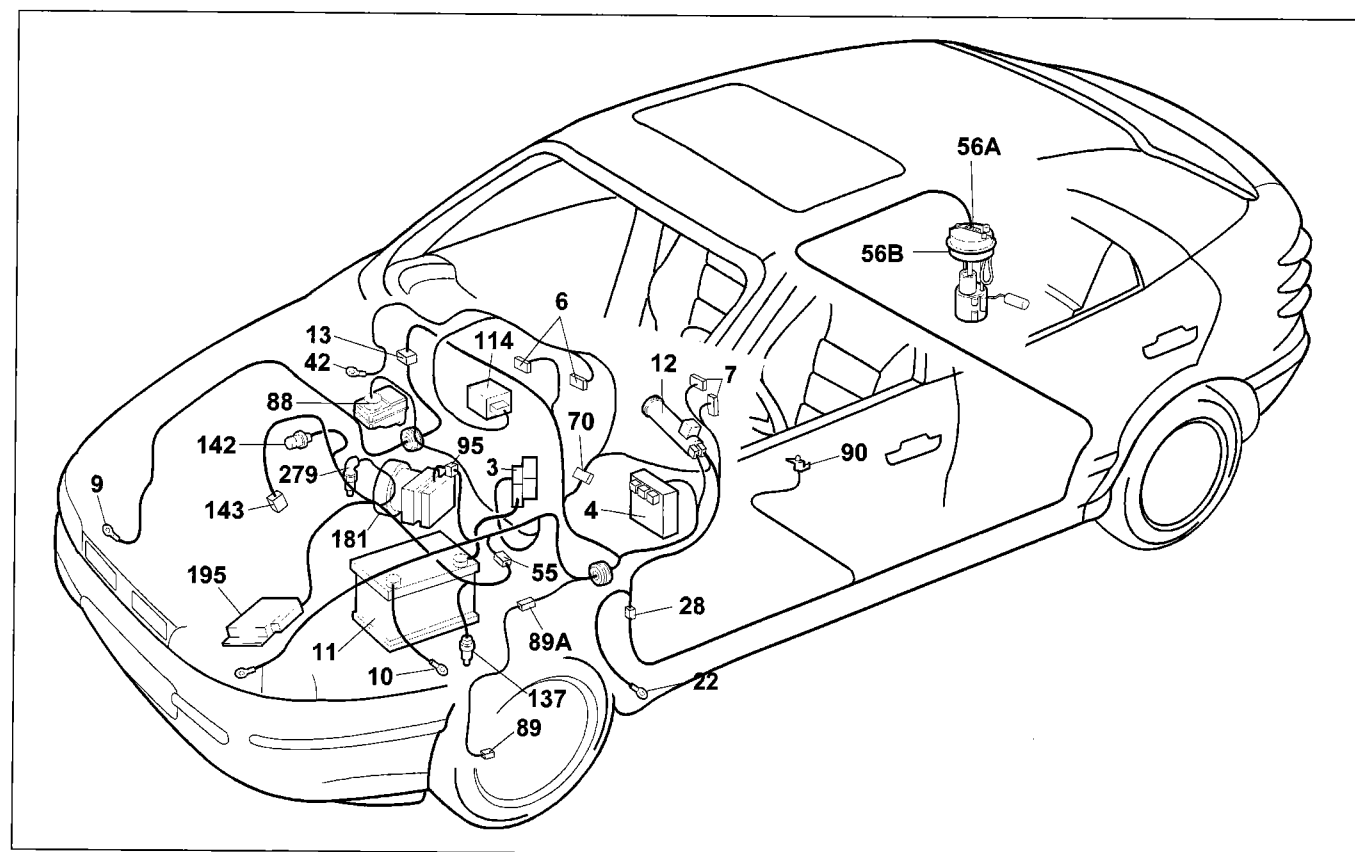
■ The cables involved in the wiring diagram are marked with a solid square

Version: S - SX

**Instrument panel connections**



P4A57EL01

**Version: S - SX**

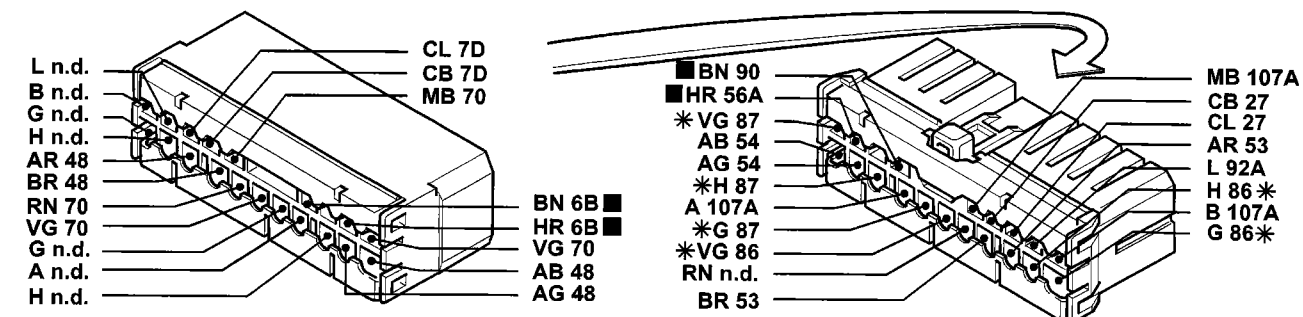
### Instrument panel connections

### Key to components

- |                                                       |                                                                         |
|-------------------------------------------------------|-------------------------------------------------------------------------|
| 3 Power fuse box:                                     | 9 Front right earth                                                     |
| A 30A fuse protecting fuel injection                  | 10 Battery earth on body shell                                          |
| B 40A fuse protecting ignition                        | 11 Battery                                                              |
| C 60A fuse protecting additional optional extras      | 12 Ignition switch                                                      |
| D 80A fuse protecting fuse and relay unit             | 13 Front left/right cables connection                                   |
| 4 Fuse and relay unit                                 | 22 Left dashboard earth                                                 |
| 6 Instrument panel:                                   | 28 Dashboard/longitudinal cables connection                             |
| A Low generator recharging warning light              | 42 Right dashboard earth                                                |
| B Low engine oil pressure warning light               | 55 Front/fuel gauge control cables connection                           |
| C Left direction indicator warning light              | 56 Fuel gauge control unit                                              |
| D Right direction indicator warning light             | A Fuel level sensor                                                     |
| E Side lights warning light                           | B Electric fuel pump                                                    |
| F Instrument panel symbol lights                      | 70 Dashboard/front cables connection                                    |
| G Main beam headlamps warning light                   | 88 Low brake fluid level sensor                                         |
| H Air Bag system fault warning light                  | 89 Left brake pad wear sensor                                           |
| I Anti-lock braking system fault warning light        | 89A Left brake pad wear sensor cables connection                        |
| J Fuel reserve circuit control module                 | 90 Handbrake on warning light switch                                    |
| J1 Low fuel level warning light                       | 95 Front cables/anti-lock braking system (A.B.S.) connection            |
| K Fuel gauge                                          | 114 Air Bag electronic control unit                                     |
| L Fiat-CODE system fault warning light                | 117 Air Bag/dashboard cables connection                                 |
| M Petrol/diesel fuel injection fault warning light    | 131 Fiat CODE electronic control unit                                   |
| Q Front brake pad wear warning light                  | 137 Car speed sensor                                                    |
| R Hand brake on / low brake fluid level warning light | 142 Low oil pressure warning light switch                               |
| V Speedometer control unit                            | 143 Alternator                                                          |
| V1 Speedometer                                        | 181 Electrohydraulic control unit for anti-lock braking system (A.B.S.) |
| W Rev counter                                         | 195 Ignition/fuel injection electronic control unit (1581)              |
| X Coolant temperature gauge                           | 279 Engine coolant temperature double sender unit                       |
| Z Trip recorder / total mileage counter               |                                                                         |
| Z1 Trip recorder reset button                         |                                                                         |
| 7 Stalk unit:                                         |                                                                         |
| D Flasher button                                      |                                                                         |
| E Main beam/dipped beam headlamps stalk               |                                                                         |
| F Side lights stalk                                   |                                                                         |
| H Direction indicators stalk                          |                                                                         |
|                                                       | N.D. Ultrasound-soldered joint taped in wiring loom                     |

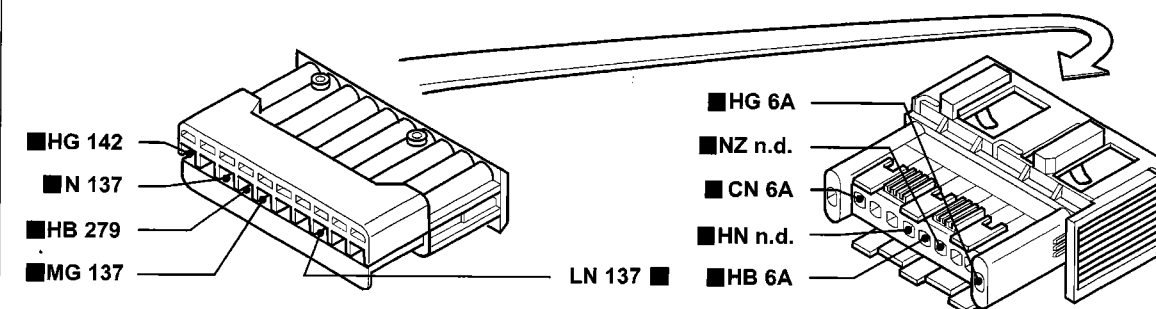
N.D. Ultrasound-soldered joint taped in wiring loom

## 28 Dash./longitudinal cables connection

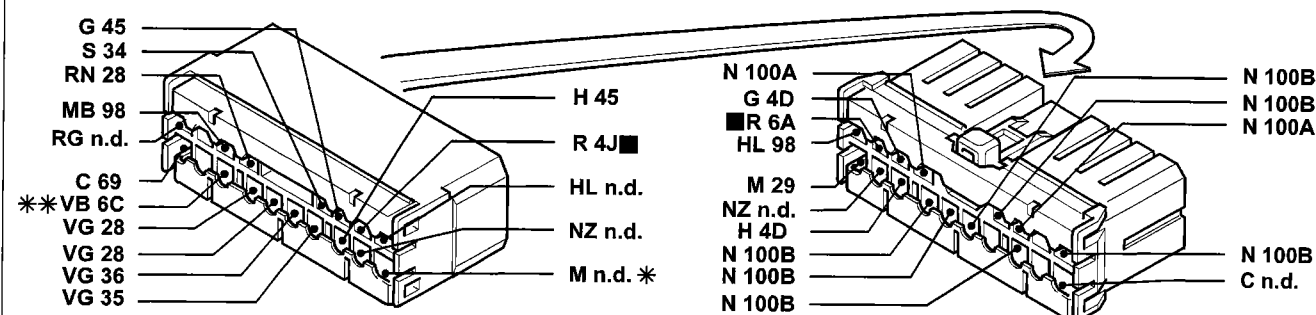


\* Only for Brava

## 55 Front/engine cables connection



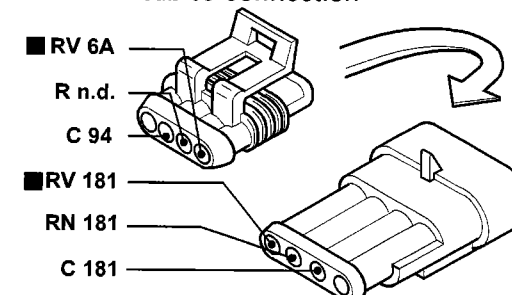
## 70 Dashboard/front cables connection



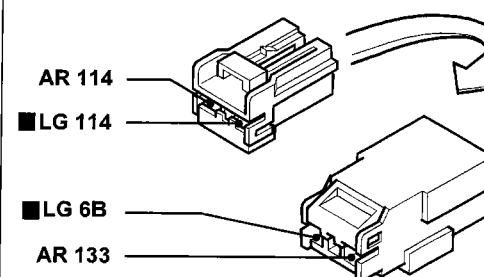
\* Not present on S version

**\*\* Applies only to EL/ELX version**

**95** Front/anti-lock braking system (A.B.S.) cables connection



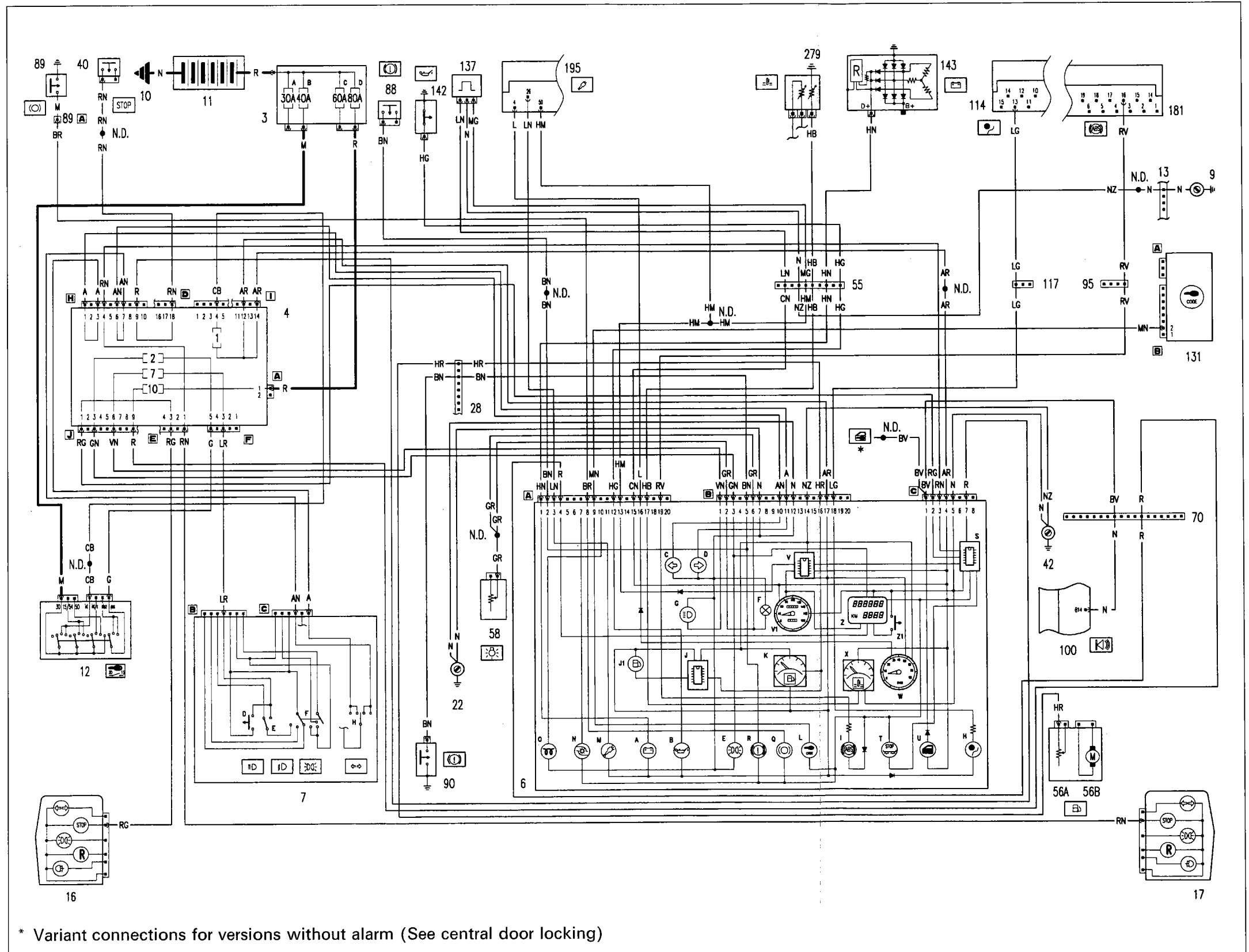
## 117 Air Bag/dashboard cables connection



- The cables involved in the wiring diagram are marked with a solid square

Version: EL - ELX

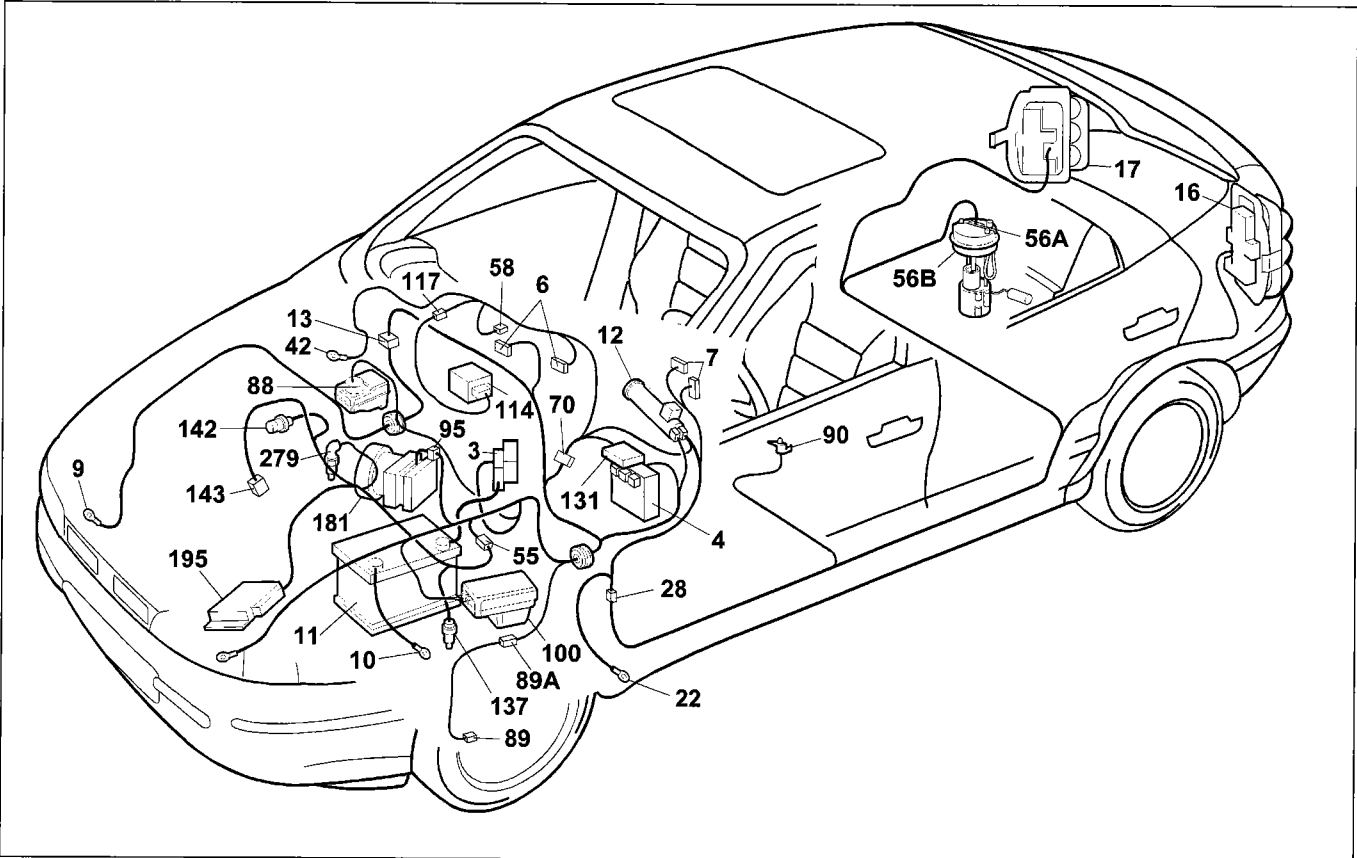
Instrument panel connections



P4A61EL01



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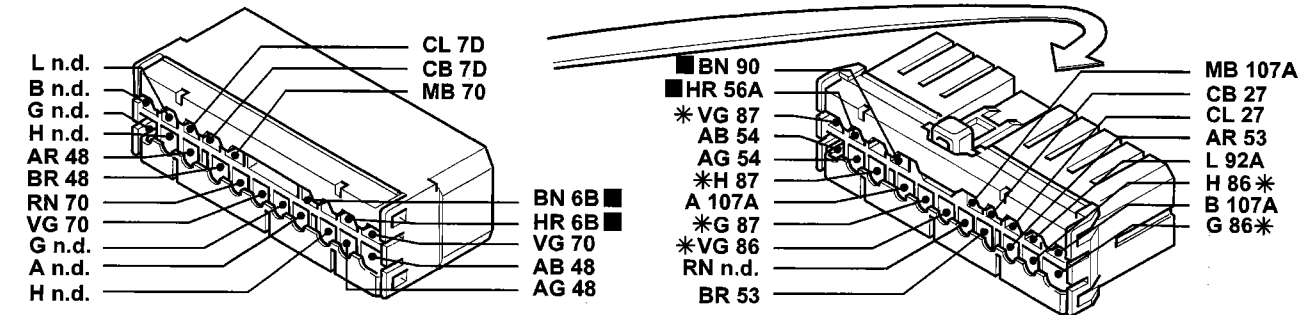
Version: EL - ELX  
Instrument panel connections

Key to components

- 3 Power fuse box:  
A 30A fuse protecting fuel injection  
B 40A fuse protecting ignition  
C 60A fuse protecting additional optional extras  
D 80A fuse protecting fuse and relay unit
- 4 Fuse and relay unit
- 6 Instrument panel:  
A Low generator recharging warning light  
B Low engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel symbol lights  
G Main beam headlamps warning light  
H Air Bag fault warning light  
I Anti-lock braking system fault warning light  
J Fuel reserve circuit control module  
J1 Low fuel level warning light  
K Fuel gauge  
L Fiat-CODE system fault warning light  
M Fuel injection fault warning light  
N Maximum turbocharging pressure warning light  
O Heater plugs warning light  
Q Front brake pad wear warning light  
R Hand brake on/low brake fluid level warning light  
S Electronic module for car stop lights fault indicator system
- T Stop lights fault warning light  
U Door open warning light  
V Speedometer control module  
V1 Speedometer  
W Rev counter  
X Water temperature gauge  
Z Trip recorder / total mileage counter  
Z1 Trip recorder reset button
- 7 Stalk unit:  
D Flasher button

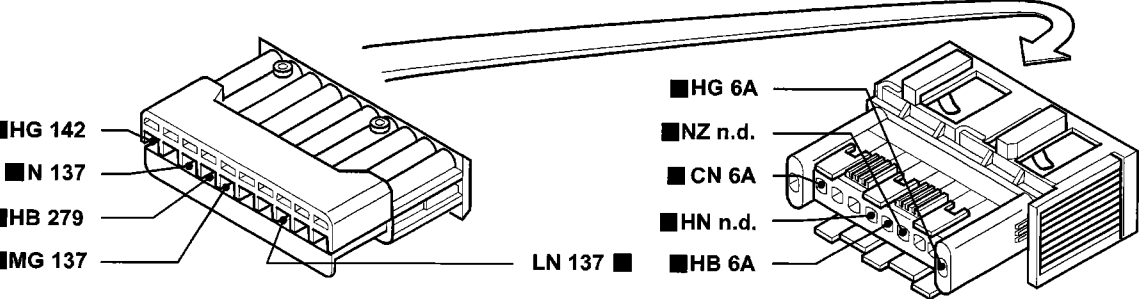
- E Main beam/dipped beam headlamps stalk  
F Side lights stalk  
H Direction indicators stalk
- 9 Front right earth  
10 Battery earth on body shell  
11 Battery  
12 Ignition switch  
13 Front right/left cables connection  
16 Rear left lights cluster  
17 Rear right lights cluster  
22 Left dashboard earth  
28 Dashboard/longitudinal cables connection  
40 Stop lights switch  
42 Right dashboard earth  
55 Front/fuel gauge control cables connection  
56 Fuel gauge control unit  
A Fuel level sensor  
B Electric fuel pump  
58 Lighting brightness adjustment rheostat  
70 Dashboard/front cables connection  
88 Low brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Handbrake on warning light switch  
95 Front/anti-lock braking system (A.B.S.) cables connection  
100 Alarm system electronic control unit  
114 Air Bag electronic control unit  
117 Air Bag/dashboard cables connection  
131 Fiat-CODE electronic control unit  
137 Car speed sensor  
142 Low engine oil pressure indicator switch  
143 Alternator  
181 Electronic control unit for anti-lock braking system (A.B.S.)  
195 Ignition/fuel injection electronic control unit (1581)
- 279 Engine coolant temperature double sender unit  
N.D. Ultrasound-soldered joint taped in wiring loom

28 Dash./longitudinal cables connection

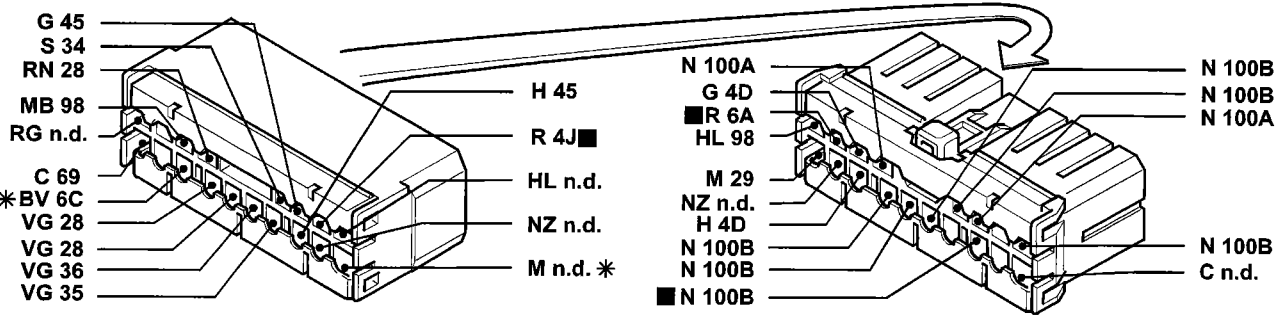


\* Only for Brava

55 Front/engine cables connection



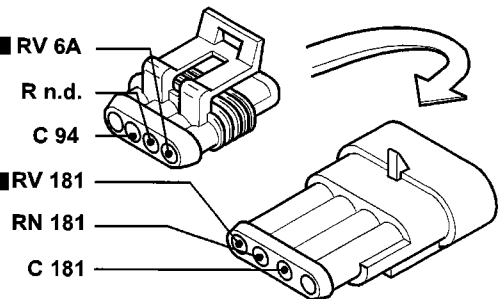
70 Dashboard/front cables connection



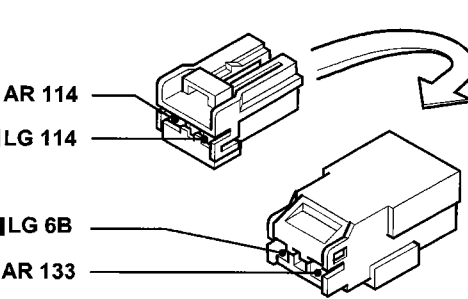
\* Not present on S version

\*\* Applies only to EL/ELX version

95 Front/anti-lock braking system (A.B.S.) cables connection

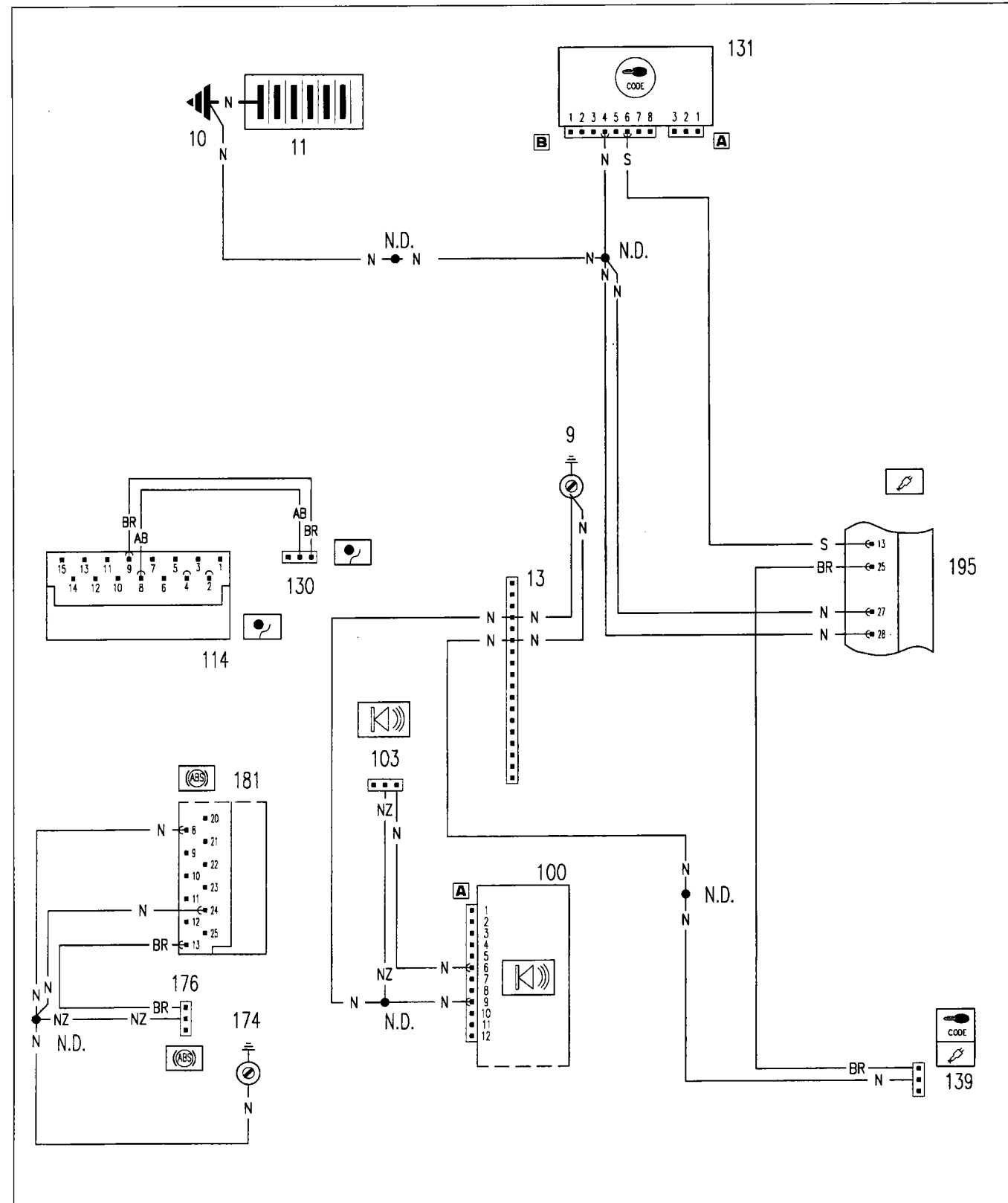


117 Air Bag/dashboard cables connection

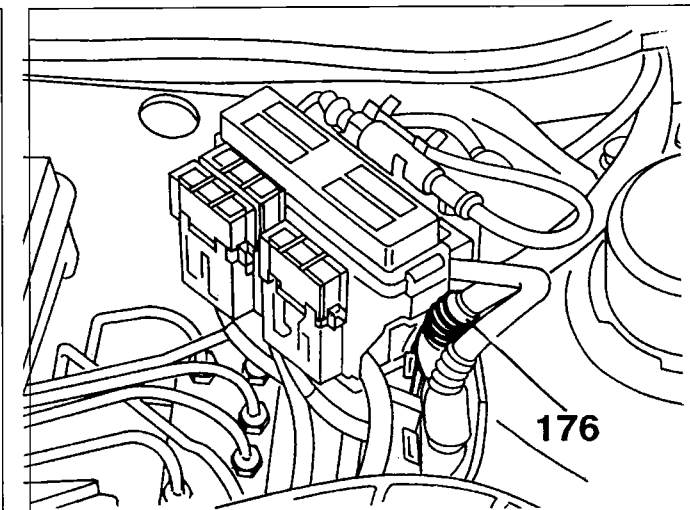
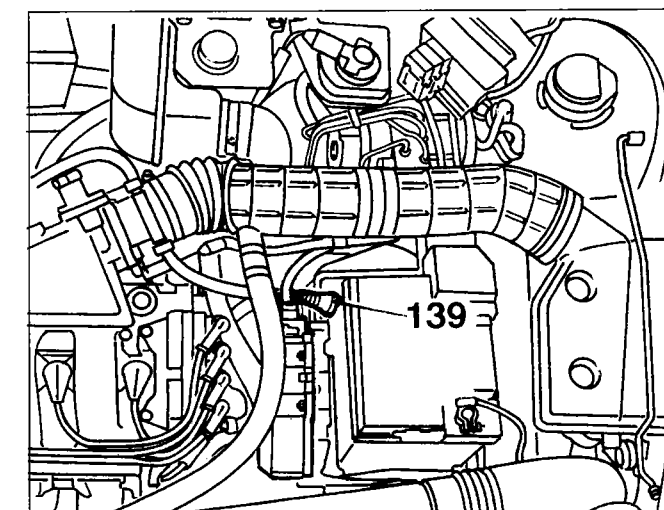
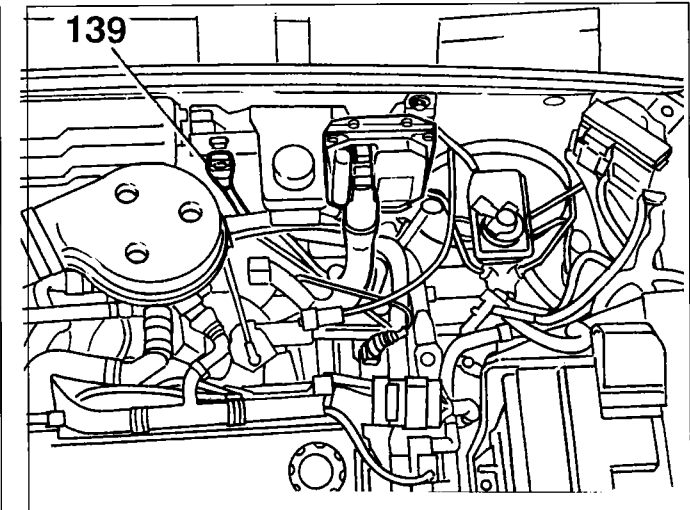
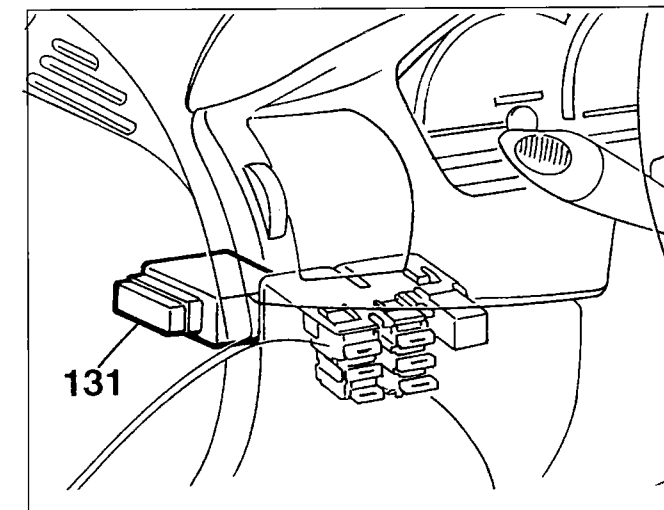
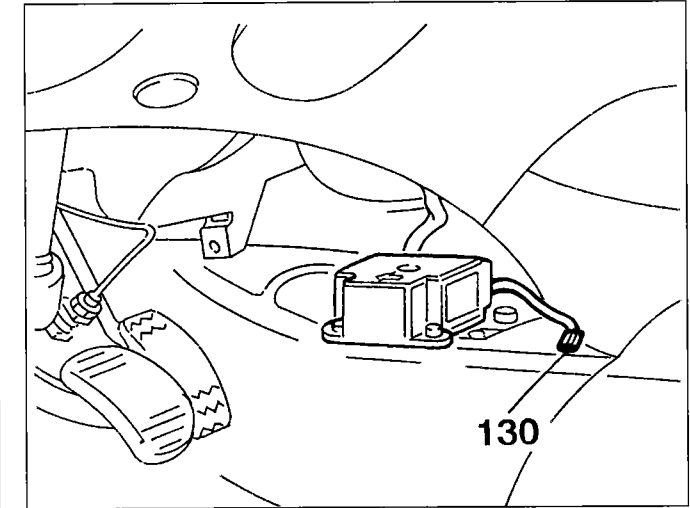
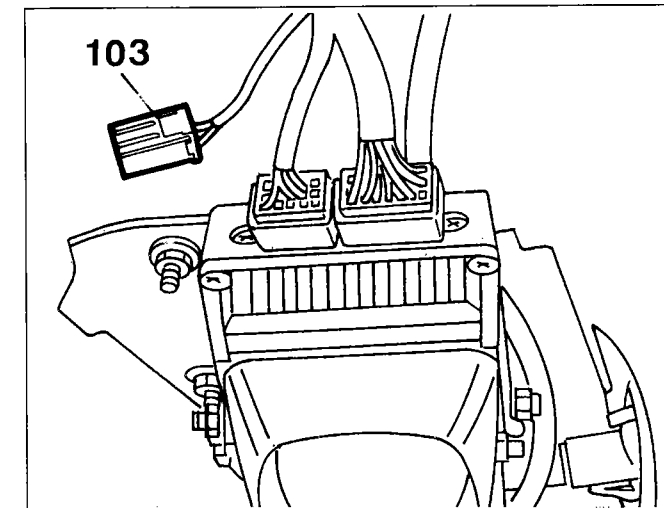


■ The cables involved in the wiring diagram are marked with a solid square

### Location of components

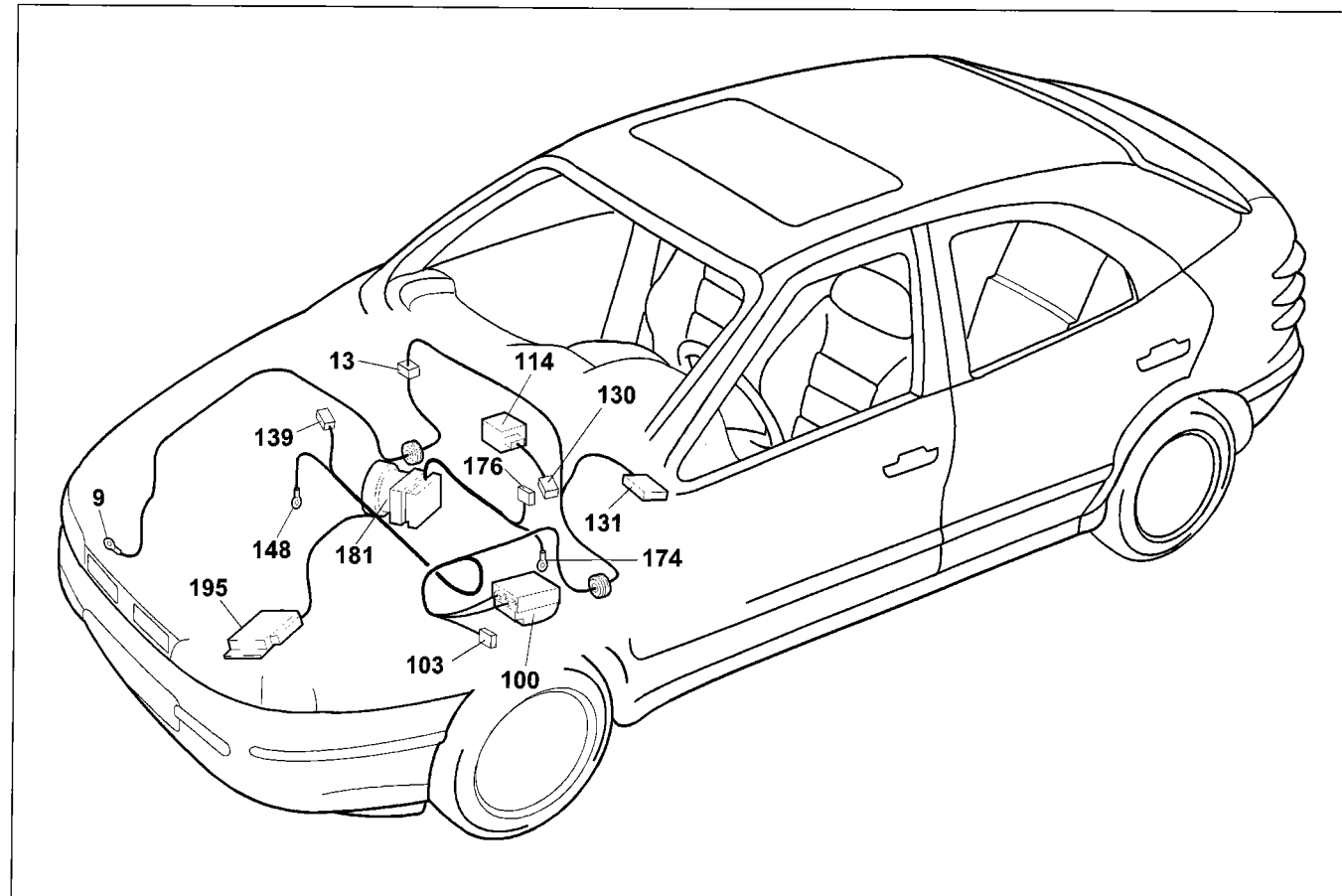


P4A65EL01



P4A66EL01

### 55.



P4A67EL01

#### Diagnostic socket connections

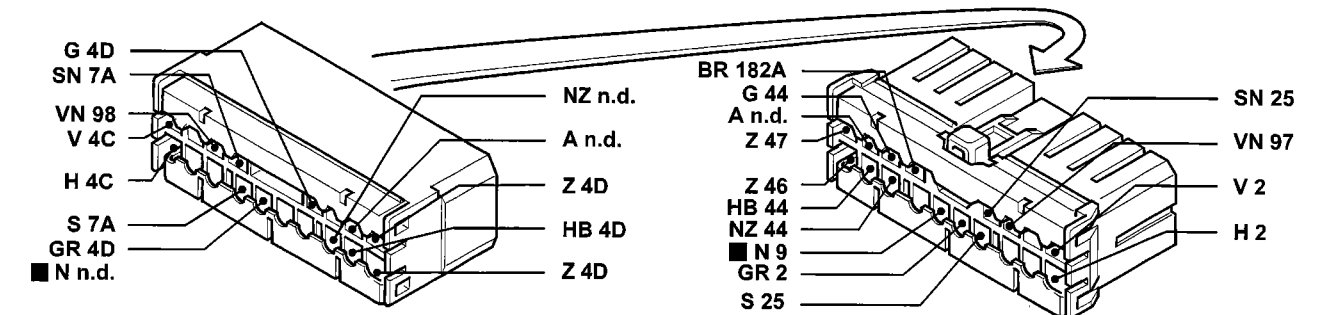
#### Key to components

- 9 Front right earth
- 10 Battery earth on body shell
- 13 Front right/left cables connection
- 100 Alarm electronic control unit
- 103 Diagnostic socket for alarm
- 114 Air Bag electronic control unit
- 130 Diagnostic socket for Air Bag system
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for fuel injection
- 148 Earth for electronic fuel injection
- 174 Power earth for anti-lock braking system (A.B.S.)

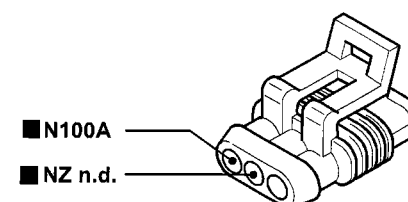
- 176 Diagnostic socket for anti-lock braking system (A.B.S.)
- 181 Anti-lock braking system (ABS) electronic control unit.
- 195 Ignition/fuel injection electronic control unit (1581)

N.D. Ultrasound-soldered joint taped in wiring loom

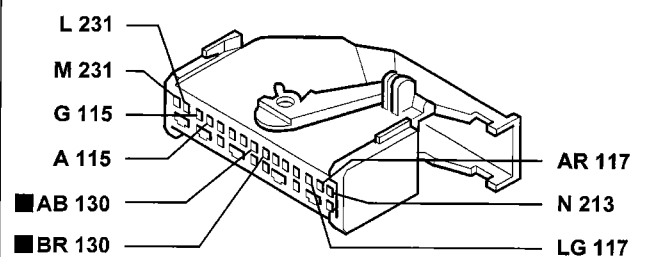
#### 13 Front right/left cables connection



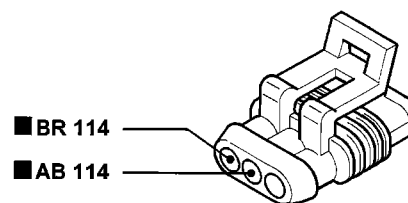
#### 103 Diagnostic socket for alarm



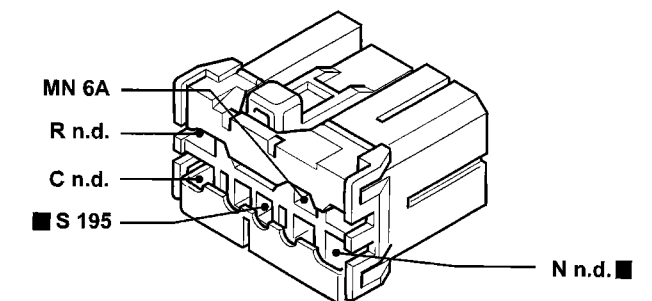
#### 114 Air Bag electronic control unit



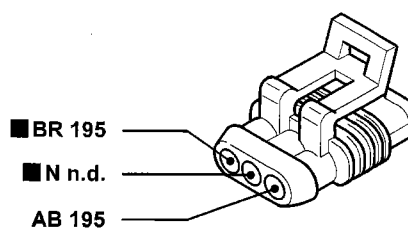
#### 130 Diagnostic socket for Air-bag system



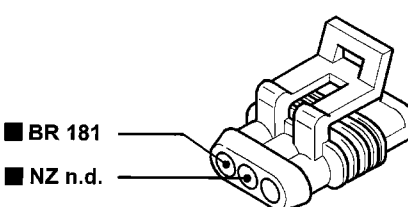
#### 131 Fiat-CODE electronic control unit



#### 139 Diagnostic socket for fuel injection



#### 176 Diagnostic socket for A.B.S



■ The cables involved in the wiring diagram are marked with a solid square

P4A68EL01



Key to components

- 1 Front left lights cluster
  - 2 Front right lights cluster
  - 3 Power fuse box
    - A 50A fuse protecting fuel injection (60A for D versions)
    - B 50A fuse protecting ignition
    - C 50A fuse protecting additional optional extras
    - D 80A fuse protecting fuse and relay unit
  - 4 Fuse and relay unit:
    - E1 Ignition switch discharge relay
  - 5 Dipped beam relay
  - 6 Instrument panel:
    - A Low generator recharging warning light
    - B Low engine oil pressure warning light
    - C Left direction indicator warning light
    - D Right direction indicator warning light
    - E Side lights warning light
    - F Instrument panel symbol lights
    - G Main beam headlamps warning light
    - H Air Bag system fault warning light
    - I Anti-lock braking system fault warning light
    - J Fuel reserve circuit control module
  - J1 Low fuel level warning light
  - K Fuel gauge
  - L Fiat CODE fault warning light
  - M Petrol fuel injection fault warning light
  - Q Front brake pad wear warning light
  - R Hand brake on / low brake fluid warning light
  - light Car stop lights fault warning light
  - V Speedometer control module
  - V1 Speedometer
  - W Rev counter
  - X Water temperature gauge
  - Z Trip recorder / total mileage counter
  - Z1 Trip recorder reset button
- 7 Stalk unit:
- A Windscreen wiper speed control stalk
  - B Windscreen wiper headlamp washer/rear window wiper stalk
  - C Rear window wiper switch
  - D Flasher button

- E Dipped beam/main beam headlamps stalk
- F Side lights stalk
- H Direction indicators stalk
- I Horn button
- 8 Front left earth
- 9 Front right earth
- 10 Battery earth on body shell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 14 Left number plate light
- 15 Right number plate light
- 16 Rear left lights cluster
- 17 Rear right lights cluster
- 18 Rear left earth
- 19 Rear right earth
- 20 Front left side repeater
- 21 Front right side repeater
- 22 Left dashboard earth
- 23 Hazard lights switch unit
  - A Hazard warning lights warning lamp
  - B Hazard warning lights switch
  - C Hazard warning lights symbol light
- 27 Contact assembly for rear connections with integrated boot light switch
- 28 Dash./longitudinal cables connection
- 29 Front/front fog lamps cables connection
- 30 Front left fog lamp
- 31 Front right fog lamp
- 32 Front fog lamp relay
- 33 20A fuse protecting front fog lamps
- 34 Switch controls unit:
  - A Anti-theft device "on" warning light
  - B Rear fog lights switch
  - C Rear fog lights relay
  - D Rear fog lamps warning light
  - E Heated rear window switch
  - F Heated rear window warning light
  - G Switch controls unit symbol light
  - H Front fog lamps warning light
  - I Front fog lights switch
- 40 Stop lights switch
- 41 Additional stop light
- 41A Additional stop light rear cables connection
- 42 Right dashboard earth
- 48 Radio with clock
- 55 Front/fuel gauge control cables connection
- 56 Fuel gauge control unit
  - A Fuel level sensor
  - B Electric fuel pump

- 57 Inertial switch  
58 Lighting brightness adjustment rheostat  
59 Courtesy light button on front left pillar  
60 Courtesy light button on front right pillar  
61 Courtesy light button on rear left pillar  
62 Courtesy light button on rear right pillar  
64 Glove compartment light with integrated switch  
65 Boot light bulb/anti-theft device "on"  
69 Cigarette lighter  
70 Dashboard/front cables connection  
88 Low brake fluid level sensor  
89 left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Handbrake on warning light switch  
94 5A fuse protecting anti-lock braking system (A.B.S.)  
95 Front/anti-lock braking system (A.B.S.) cables connection  
96 60A power fuse protecting electrical system  
100 Anti-theft electronic control unit  
107B Car interior courtesy light  
103 Diagnostic socket for anti-theft device  
114 Air Bag electronic control unit  
117 Air Bag/dashboard cables connection  
120 Air conditioner cables connection  
121 Three-stage pressure switch  
122 Engine cooling fan low speed relay  
123A Engine cooling fan high speed relay  
124 Air conditioner compressor relay  
127 Connection between front left cables/cable on relay carrier bracket  
128 Front/air conditioner cables connection  
129 50A power fuse protecting engine cooling fan  
130 Diagnostic socket for Air Bag  
131 Fiat-CODE electronic control unit  
136 Knock sensor  
137 Vehicle speed sensor  
138 Idle adjustment actuator  
139 Diagnostic socket for fuel injection  
141 Heated Lambda probe  
142 Low oil pressure warning light switch  
143 Alternator  
144 Rpm and T.D.C. sensor  
145 Starter motor  
146 Potentiometer on throttle valve  
147 Compressor for air conditioner  
148 Earth for electronic fuel injection  
150 Fuel injection relay  
154 Engine cooling fan  
155 Ignition coils assembly  
156 Spark plugs  
159 Reversing lights switch  
162 Fuel injector (1st)  
163 Fuel injector (2nd)  
164 Fuel injector (3rd)  
165 Fuel injector (4th)  
170 Engine cooling fan limiting resistor  
171 Heater  
174 Power earth for anti-lock braking system (A.B.S.)  
176 Diagnostic socket for anti-lock braking system (A.B.S.)  
177 Sensor on front left wheel for anti-lock braking system (A.B.S.)  
178 Sensor on rear left wheel for anti-lock braking system (A.B.S.)  
179 Sensor on front right wheel for anti-lock braking system (A.B.S.)  
180 Sensor on rear right wheel for anti-lock braking system (A.B.S.)  
181 Electrohydraulic control unit for anti-lock braking system (A.B.S.)  
194 Injection/injector flange cables connection  
195 Ignition/fuel injection electronic control unit (1581)  
199 Aerial for Fiat CODE system  
202 Heater/air conditioner light bulbs  
203 Air conditioner controls:  
A Air conditioner recirculation switch  
B Air conditioner "on" switch  
204 Air conditioner fan 1st speed relay  
205 Air conditioner fan relay  
206 Heater/air conditioner fan  
207 Heater/air conditioner speed control switch  
208 Limiting resistor for heater/air conditioner  
209 External/recirculation air flap actuator

- 210 Electronic thermostat cables connection  
211 Electronic thermostat (N.T.C.)  
232 Earth for compressor  
235 Air conditioner compressor cables connection  
278 Integrated air temperature/pressure sender unit  
279 Engine coolant temperature double sender unit  
280 7.5A fuse protecting ignition switch  
281 30A fuse protecting Lambda probe/canister solenoid  
282 7.5A fuse protecting Fiat-CODE/electronic fuel injection  
283 Front cable/resistor connection  
284 Engine cooling fan relay  
285 25A fuse protecting headlamp washer/compressor  
286 Short-circuiting connection  
287 Short-circuiting connection  
288 Short-circuiting connection  
289 Short-circuiting connection

#### Cable colour codes

|           |                   |           |              |
|-----------|-------------------|-----------|--------------|
| <b>A</b>  | Light blue        | <b>GN</b> | Yellow-Black |
| <b>B</b>  | White             | <b>GL</b> | Yellow-Blue  |
| <b>C</b>  | Orange            | <b>GR</b> | Yellow-Red   |
| <b>G</b>  | Yellow            | <b>GV</b> | Yellow-Green |
| <b>H</b>  | Grey              | <b>HG</b> | Grey-Yellow  |
| <b>L</b>  | Blue              | <b>HN</b> | Grey-Black   |
| <b>M</b>  | Brown             | <b>HR</b> | Grey-Red     |
| <b>N</b>  | Black             | <b>HV</b> | Grey-Green   |
| <b>R</b>  | Red               | <b>LB</b> | Blue-White   |
| <b>S</b>  | Pink              | <b>LG</b> | Blue-Yellow  |
| <b>V</b>  | Green             | <b>LN</b> | Blue-Black   |
| <b>Z</b>  | Purple            | <b>LR</b> | Blue-Red     |
| <b>AB</b> | Light blue-White  | <b>LV</b> | Blue-Green   |
| <b>AG</b> | Light blue-Yellow | <b>MB</b> | Brown-White  |
| <b>AN</b> | Light blue-Black  | <b>MN</b> | Brown-Black  |
| <b>AR</b> | Light blue-Red    | <b>NZ</b> | Black-Purple |
| <b>AV</b> | Light blue-Green  | <b>RB</b> | Red-White    |
| <b>BG</b> | White-Yellow      | <b>RG</b> | Red-Yellow   |
| <b>BL</b> | White-Blue        | <b>RN</b> | Red-Black    |
| <b>BN</b> | White-Black       | <b>RV</b> | Red-Green    |
| <b>BR</b> | White-Red         | <b>SN</b> | Pink-Black   |
| <b>BV</b> | White-Green       | <b>VB</b> | Green-White  |
| <b>BZ</b> | White-Purple      | <b>VN</b> | Green-Black  |
| <b>CA</b> | Orange-Light blue | <b>VR</b> | Green-Red    |
| <b>CB</b> | Orange-White      | <b>ZB</b> | Purple-White |
| <b>CN</b> | Orange-Black      |           |              |

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#### FIAT CODE

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#### SERVICE CONTROL UNIT

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### PROTECTION AND SAFETY DEVICES

All the vehicle fuel lines have been designed taking into account the most up to date directives dealing with safety and protection, especially the risk of fire.

There are two main types of protection:

- active protection, aimed at reducing possible causes of problems "at the source";
- passive protection, aimed at keeping the effects of a possible problem to a minimum.

The first category includes care design of the cables, their positioning and securing along appropriately shielded and protected routes.

Suitable modifications have been made to the alternator and starter motor cables, with the adoption of protective covers; a protective outer sheath has also been adopted for some sections of cable which are particularly exposed.

The passive protection includes all operations, which have always been adopted on vehicles, to reduce high currents (overloading or short circuits).

The size of all the system fuses is based on the nominal absorption of the simultaneous loads and is designed to guarantee operation in the case of a short circuit.

Through the adoption of a fuse box containing four maxi fuses, plus other located outside, it is possible to protect all the supplies, with the sole exception of the cable which connects the battery to the starter motor and the one which connects the latter to the alternator; these cables are protected by an additional outer casing.

"MAXI" fuse box **A**:

**EFI**: electronic injection fuse (petrol)

**GLOW**: heater plugs fuse (diesel)

**IGN**: ignition switch fuse

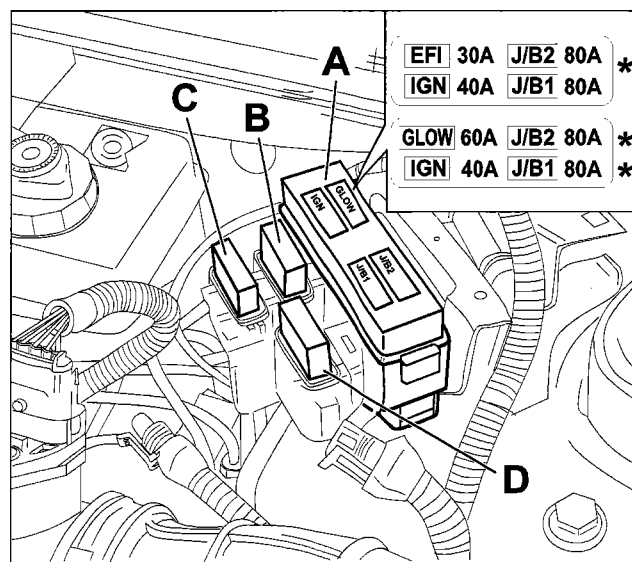
**J/B2**: general supply fuse

**J/B1**: general supply fuse

next to the box:

**B**: fan fuse (see table)

| ENGINE                          | VERSION         | AMP |
|---------------------------------|-----------------|-----|
| <b>242 16v - 1581 16v /C.A.</b> | Heated          | 30  |
|                                 | Air conditioned | 40  |
| <b>1747 - 1998 20v</b>          | Heated          | 40  |
|                                 | Air conditioned | 50  |
| <b>1910 TD SOFT</b>             | Heated          | 40  |
|                                 | Air conditioned | 40  |
| <b>1910 JTD</b>                 | Heated          | 50  |
|                                 | Air conditioned | 40  |



P4A01HL01

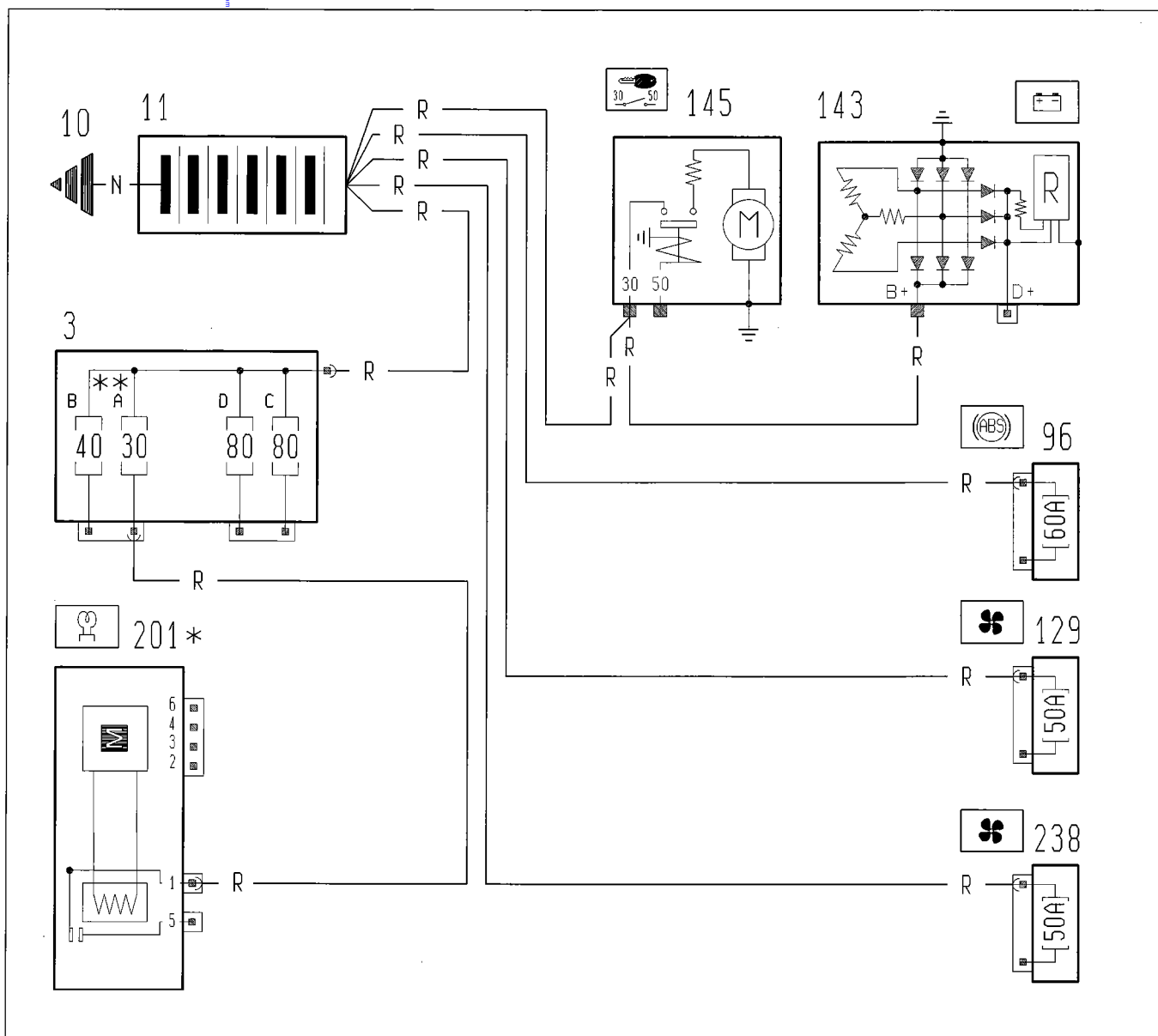
**C**: 40A fuse for air conditioning for 1910 JTD only

**D**: 60A fuse for ABS

\* petrol versions  
\*\* Diesel versions

# 55.

Diagram showing device with hot cables



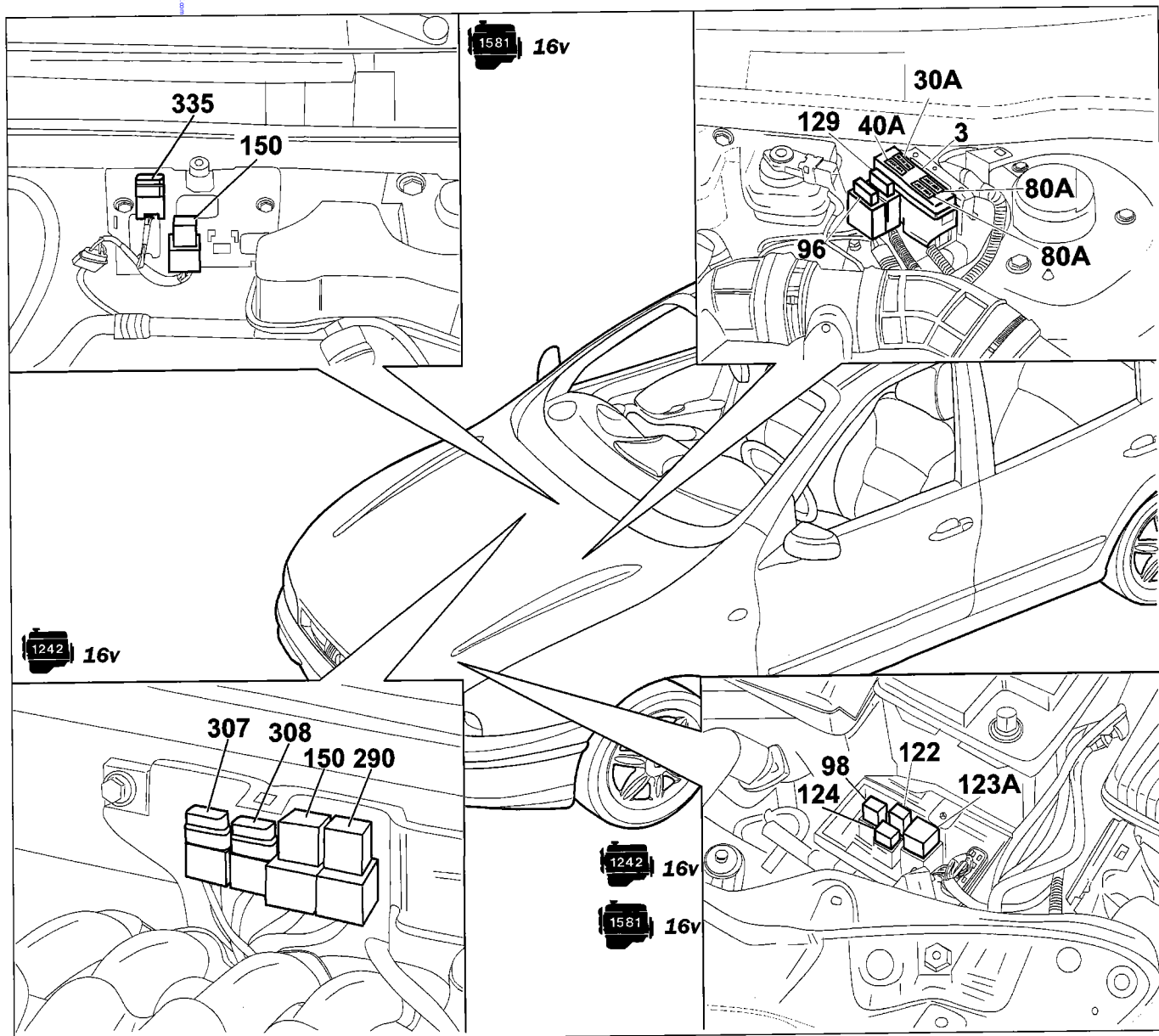
P4A02HL01

- 3. Power fuse box
- 10. Earth for battery on bodyshell
- 11. Battery
- 96. 60A power fuse protecting electrical equipment
- 129. Power fuse protecting engine cooling fan (See air conditioning - engine cooling wiring diagrams for relevant engine types)
- 143. Alternator
- 145. Starter motor
- 201. Heater plugs control unit
- 238. Power fuse protecting engine cooling fan (See air conditioning - engine cooling wiring diagrams for relevant engine types)

\* Exists only for the Turbo Diesel versions

\*\* 60A fuse for Turbo Diesel versions



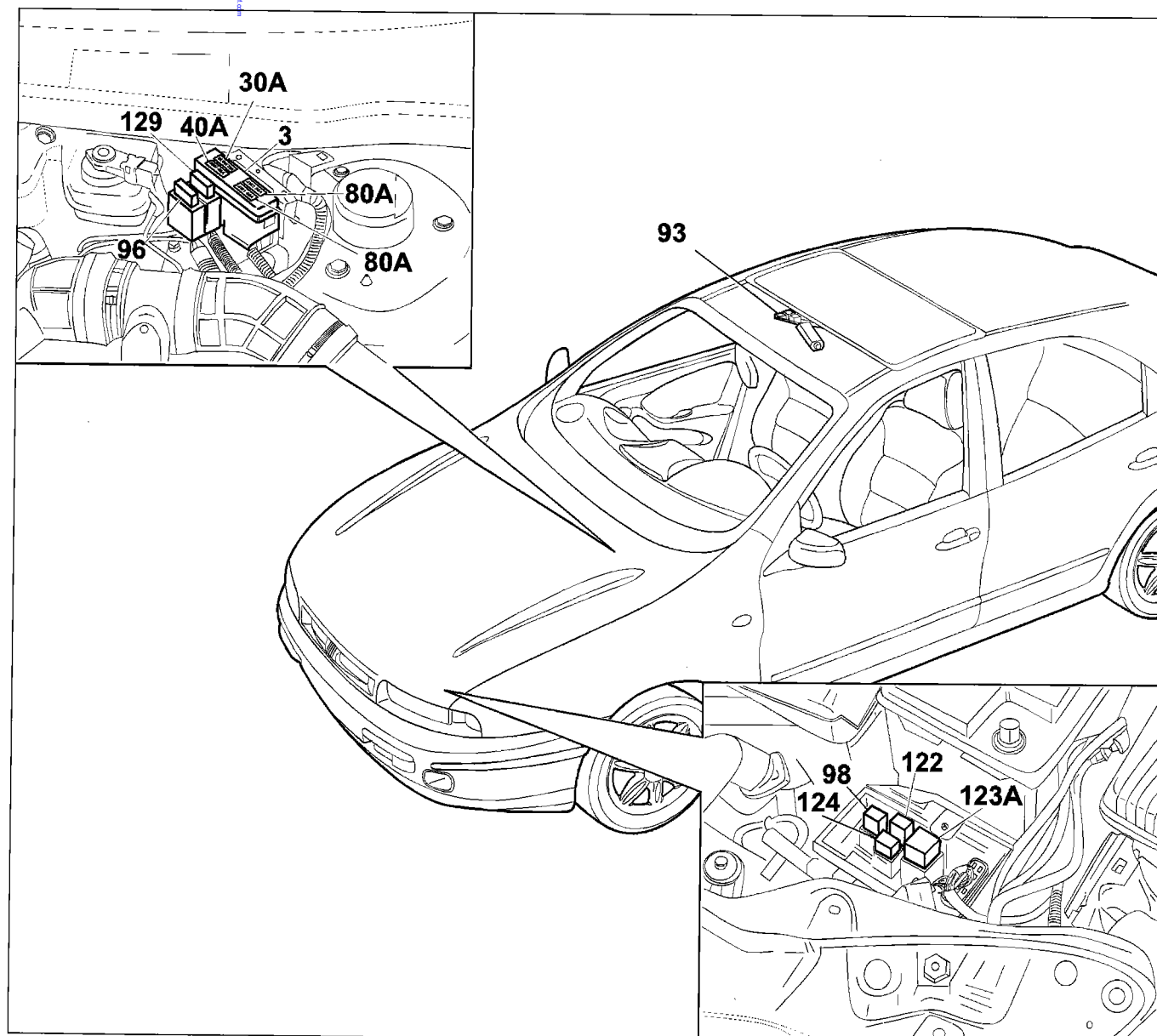
**LOCATION OF RELAYS AND FUSES ON VEHICLE (Engine compartment 1242 16v - 1581 16v)**

P4A03HL01

- 3. Power fuse box
- 96. A.B.S. system protective power fuse
- 98. Preparation for headlamp washer intermittent device
- 122. Engine cooling fan low speed relay
- 123A. Engine cooling fan high speed relay
- 124. Air conditioning compressor relay
- 129. Power fuse protecting engine cooling fan
- 150. Injection system relay feed
- 290. Electric fuel pump relay feed
- 307. I.E. system protective fuse (1242 16v)
- 308. 15A fuse protecting canister solenoid valve
- 335. 15A fuse protecting Lambda sensor

### 55.

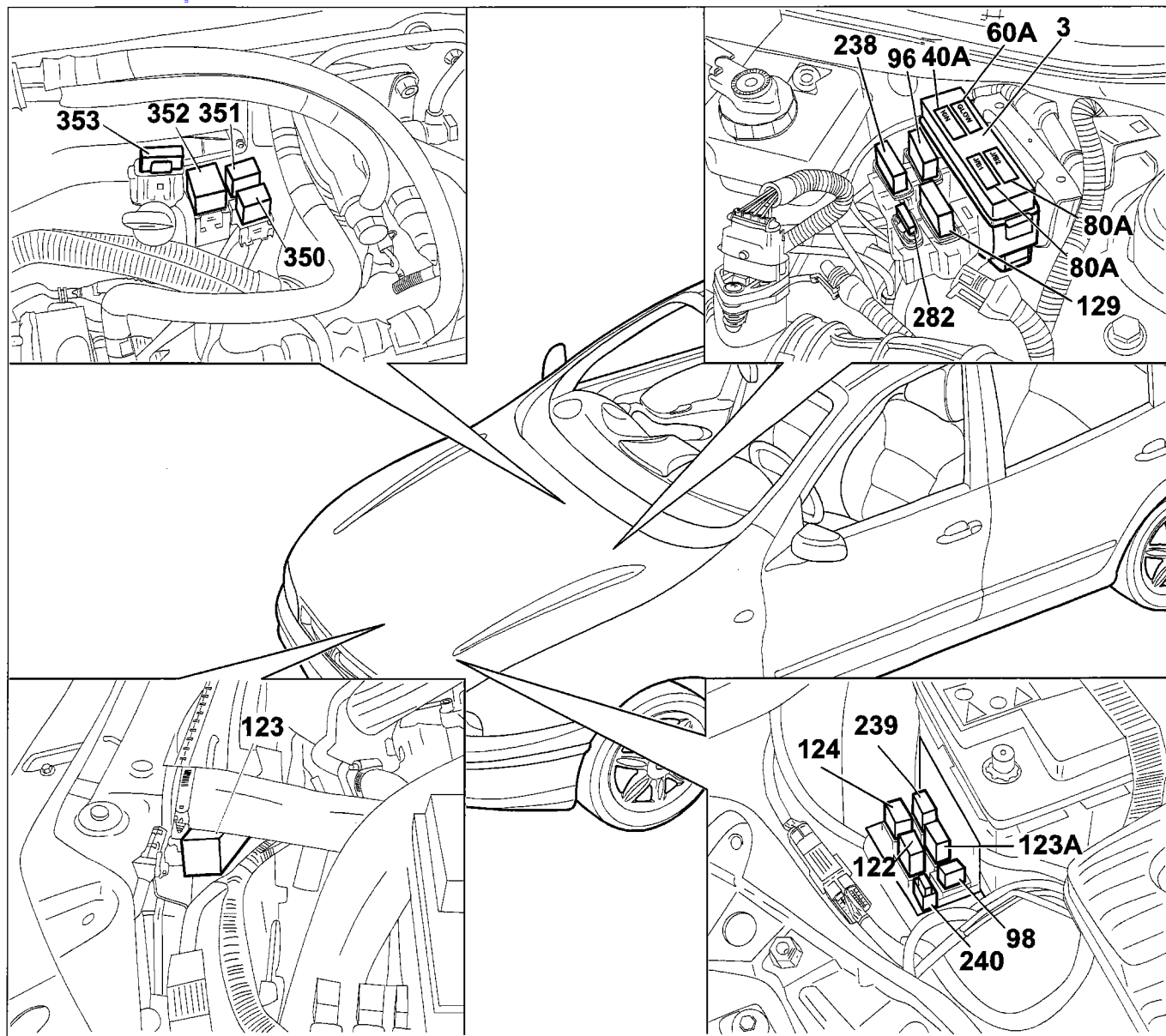
#### LOCATION OF RELAYS AND FUSES ON VEHICLE (Engine compartment 1998 20v)



P4A04HL01

- 3. Power fuse box
- 93. Electrically operated sun roof control unit (all versions and engine types)
- 96. Power fuse protecting A.B.S. system
- 98. Preparation for headlamp washer intermittent device
- 122. Engine cooling fan low speed relay
- 123A. Engine cooling fan high speed relay
- 124. Air conditioning compressor relay
- 129. Power fuse protecting engine cooling fan

### LOCATION OF RELAYS AND FUSES ON VEHICLE (Engine compartment 1910 JTD)

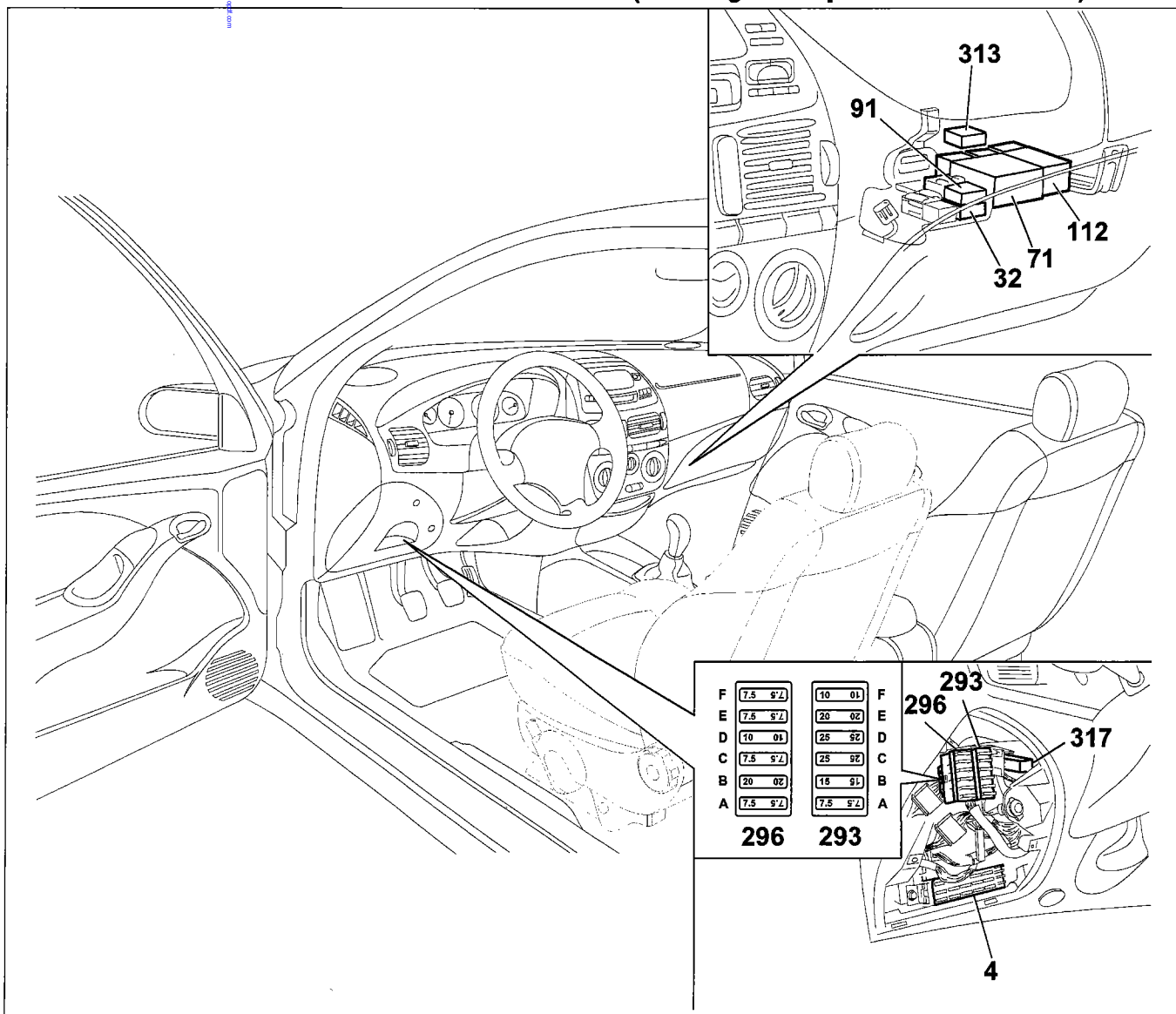


P4A05HL01

- |                                                         |                                                                     |
|---------------------------------------------------------|---------------------------------------------------------------------|
| 3. Power fuse box                                       | 239. Diesel preheating protective relay (1910 JTD)                  |
| 96. A.B.S. system protective power fuse                 | 240. Diesel pre-heating protective fuse (1910 JTD)                  |
| 98. Preparation for headlamp washer intermittent device | 282. Fiat CODE- I.E. control unit 30A protective fuse               |
| 122. Engine cooling fan low speed relay                 | 350. Passenger compartment coolant heating relay                    |
| 123. Engine cooling fan high speed timer                | 351. Passenger compartment coolant heating safety relay             |
| 123A. Engine cooling fan high speed relay               | 352. Passenger compartment coolant heating relay                    |
| 124. Air conditioning compressor relay                  | 353. 70A fuse protecting passenger compartment coolant heater plugs |
| 129. 50A protective power fuse for engine cooling fan   |                                                                     |
| 238. Protective power fuse for 2nd engine cooling fan   |                                                                     |

# 55.

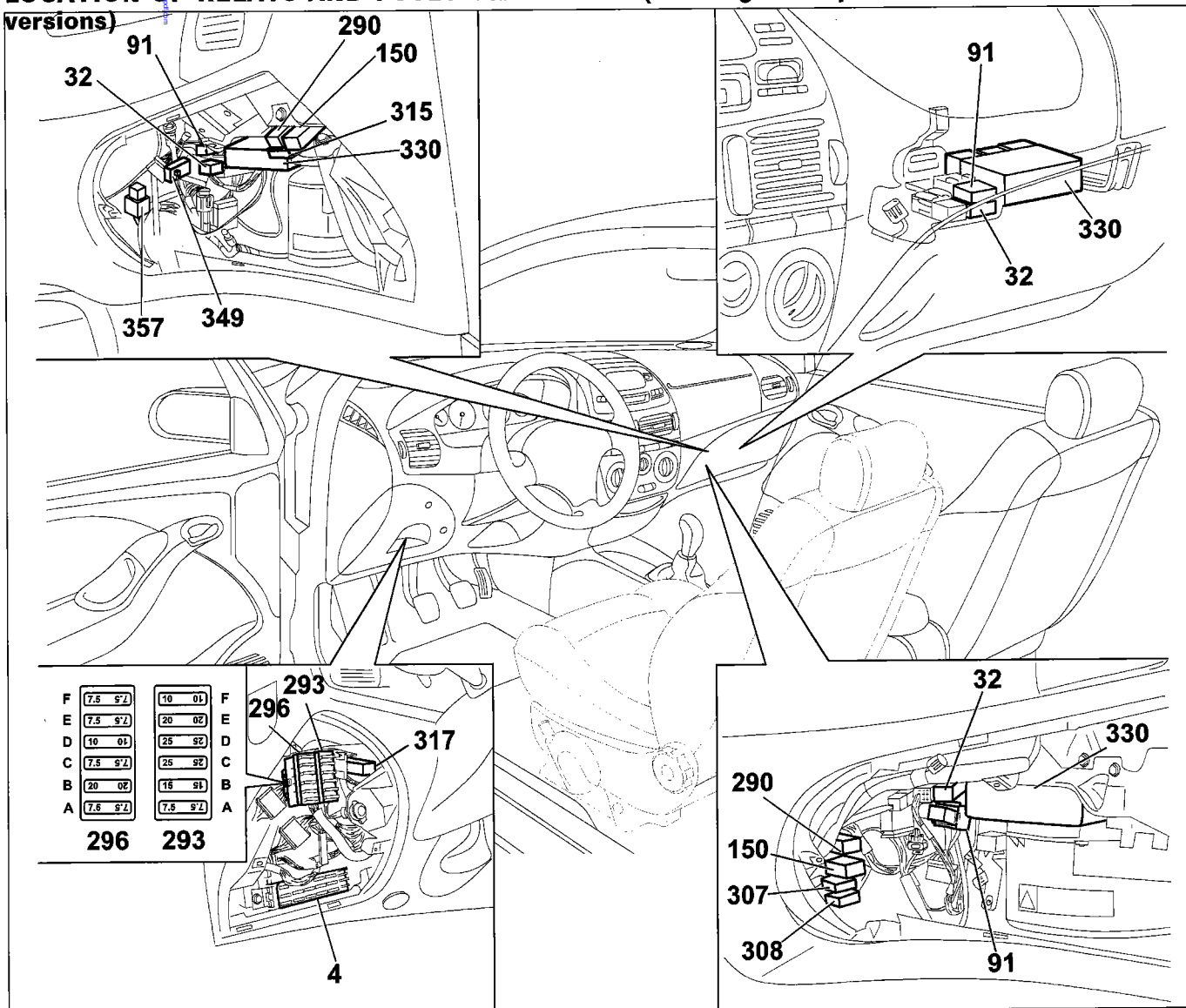
### LOCATION OF RELAYS AND FUSES ON VEHICLE (Passenger compartment SX version)



P4A06HL01

- 4. Junction unit
- 32. Fog lights relay
- 71. Electric front windows control unit
- 91. Power relay controlled by the ignition
- 112. Central door locking control unit
- 293. Fuse carrier base on dashboard cable
  - A 7.5A fuse protecting switch panel light, radio phone, radio, electric mirrors
  - B 15A fuse protecting fog lamps maintenance relay
  - C Spare
  - D 25A fuse protecting central locking control unit
  - E 20A protective fuse current socket, cigar lighter, electric seats
- 296. Fuse carrier base on front cable
  - F 10A fuse protecting EURO-BAG
  - A 7.5A fuse protecting cooling system/I.E., alarm, automatic transmission
  - B 20A fuse protecting windscreen wiper
  - C 7.5A fuse protecting Fiat-CODE, cooling system/I.E.
  - D 10A fuse protecting anti-lock braking system (A.B.S.)
  - E 7.5A fuse protecting climate control system
  - F 7.5A fuse protecting electronic injection
- 313. Relay for reversing air conditioning signal
- 317. Main beam headlamps maintenance relay

### LOCATION OF RELAYS AND FUSES ON VEHICLE (Passenger compartment GT-ELX-HSX-HGT versions)



P4A07HL01

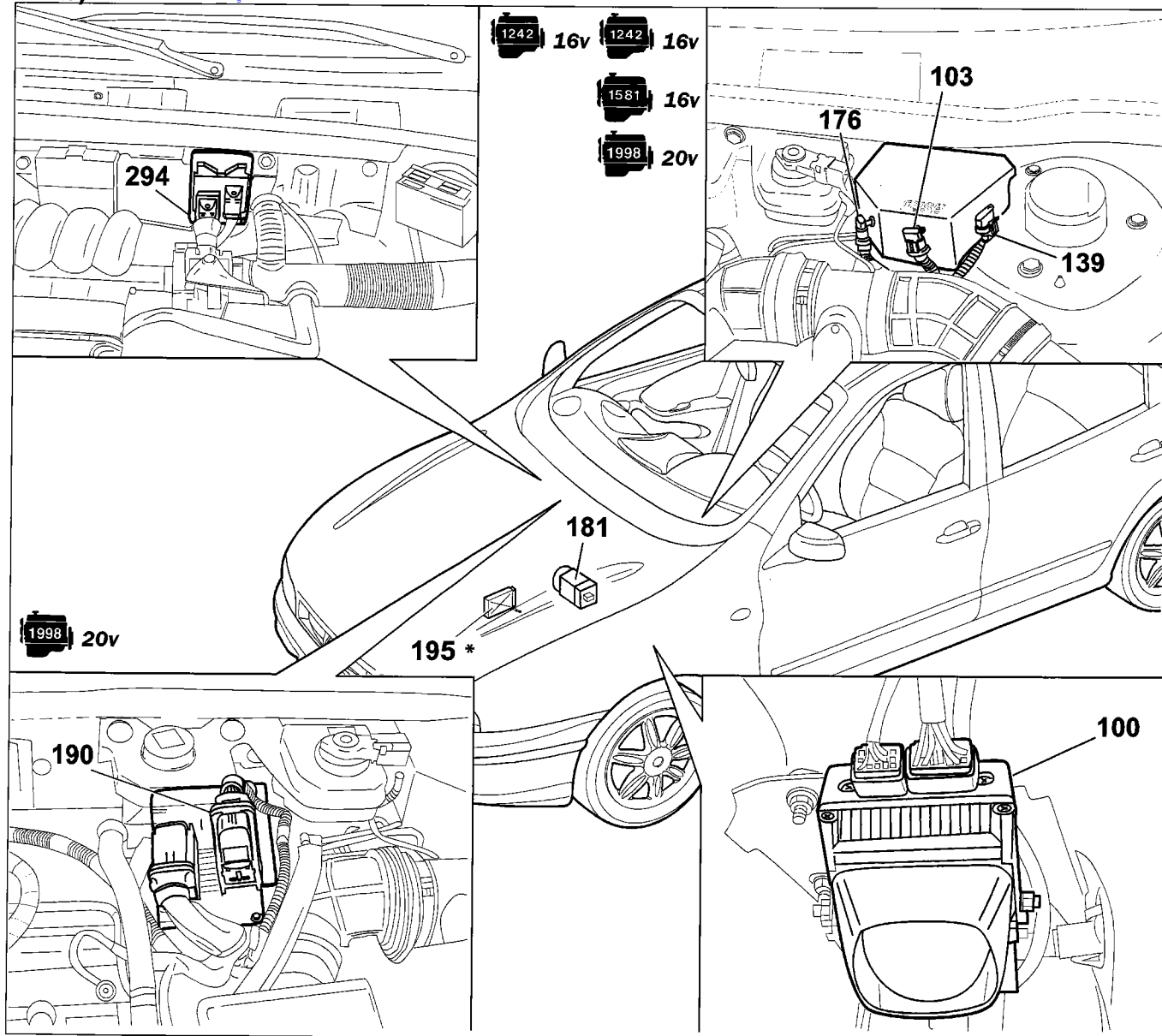
- 4. Junction unit
- 32. Fog lights relay
- 91. Power relay controlled by the ignition
- 150. Injection system relay feed
- 290. Electric fuel pump relay feed
- 293. Fuse carrier base on dashboard cable
  - A 7.5A fuse protecting switch panel light, radio phone, radio, electric mirrors
  - B 15A fuse protecting fog lamps maintenance relay
  - C 25A fuse protecting electric windows
  - D 25A fuse protecting A.B.I. control unit
  - E 20A fuse protecting current socket, cigar lighter, electric seats, electrically operated sun roof
  - F 10A fuse protecting EUROBAG
- 296. Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/I.E., alarm, automatic transmission

- B 20A fuse protecting windscreen wiper
- C 7.5A fuse protecting Fiat-CODE, cooling system/I.E.
- D 10A fuse protecting anti-lock braking system (A.B.S.)
- E 7.5A fuse protecting climate control system
- F 7.5A fuse protecting electronic injection/Fiat-CODE
- 307. 15A fuse protecting injection system
- 308. 15A fuse protecting canister solenoid valve
- 315. 7.5A fuse protecting electronic injection control unit 1910 TD JTD
- 317. Main beam headlamps maintenance relay
- 330. A.B.I. control unit. (Alzacristalli Bloccaporte Integrato - Integrated Central locking electric windows)
- 349. Engine oil control unit
- 357. Passenger compartment coolant heater plugs control unit



# 55.

### LOCATION OF CONTROL UNITS AND DIAGNOSTIC SOCKETS (Engine compartment- petrol versions)

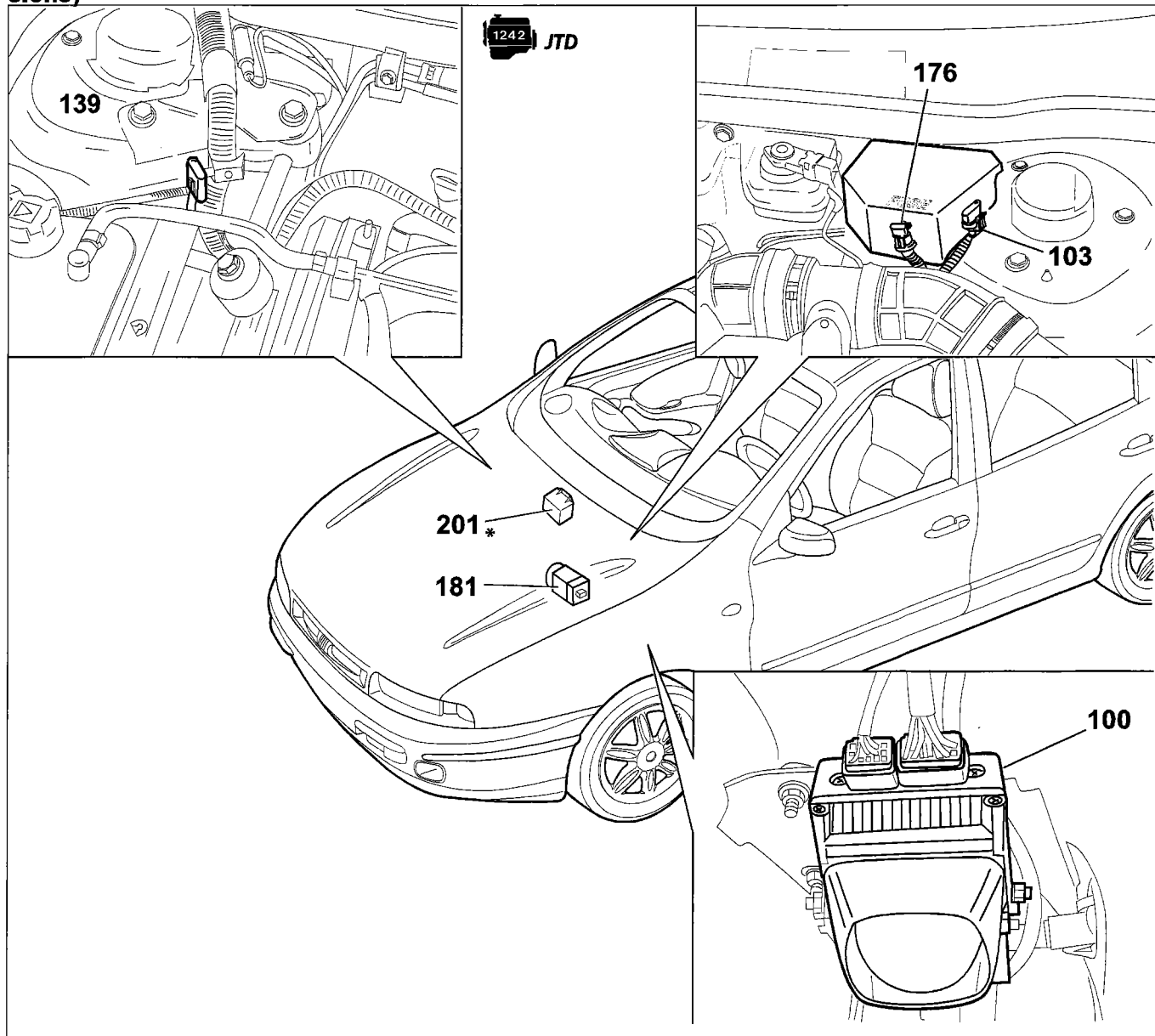


P4A08HL01

- |                                                                   |  |
|-------------------------------------------------------------------|--|
| 100. Alarm device electronic control unit                         |  |
| 103. Diagnostic socket for alarm                                  |  |
| 139. Diagnostic socket for injection system                       |  |
| 176. Diagnostic socket for anti-lock braking system (A.B.S.)      |  |
| 181. Electro-hydraulic control unit for anti-lock brakes (A.B.S.) |  |
| 190. Injection/ignition electronic control unit (1998) 20v        |  |
| 195. Injection/ignition electronic control unit (1581) 16v        |  |
| 294. Injection/ignition electronic control unit (1242) 16v        |  |



### LOCATION OF CONTROL UNITS AND DIAGNOSTIC SOCKETS (Engine compartment Diesel versions)



\* Engine 1910 JTD

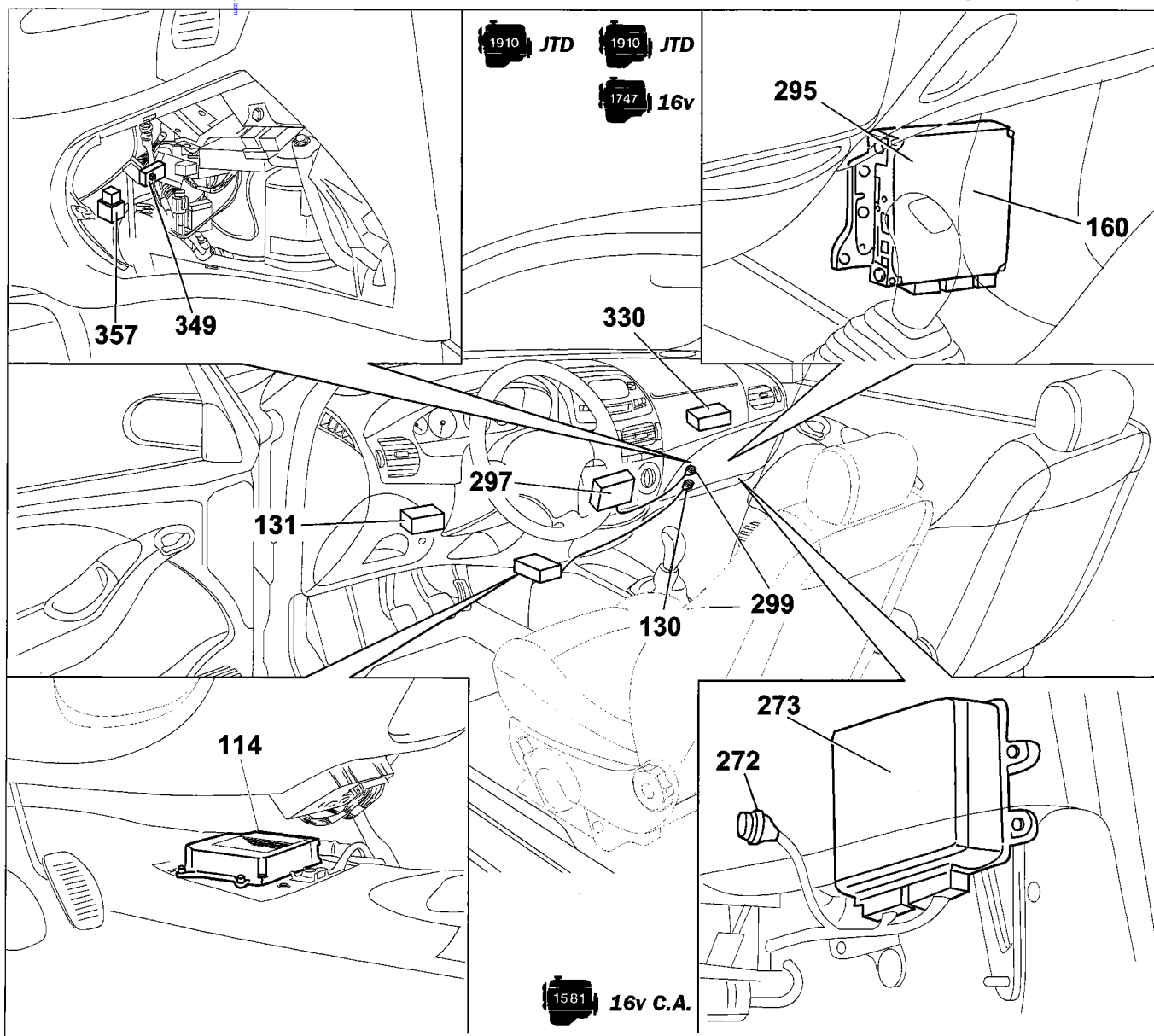
P4A09HL01

- 100. Alarm device electronic control unit
- 103. Diagnostic socket for alarm
- 139. Diagnostic socket for injection system (1910 JTD)
- 176. Diagnostic socket for anti-lock braking system (A.B.S.)

- 181. Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 201. Heater plugs control unit (1910 JTD)

# 55.

## LOCATION OF CONTROL UNITS AND DIAGNOSTIC SOCKETS (Passenger compartment)

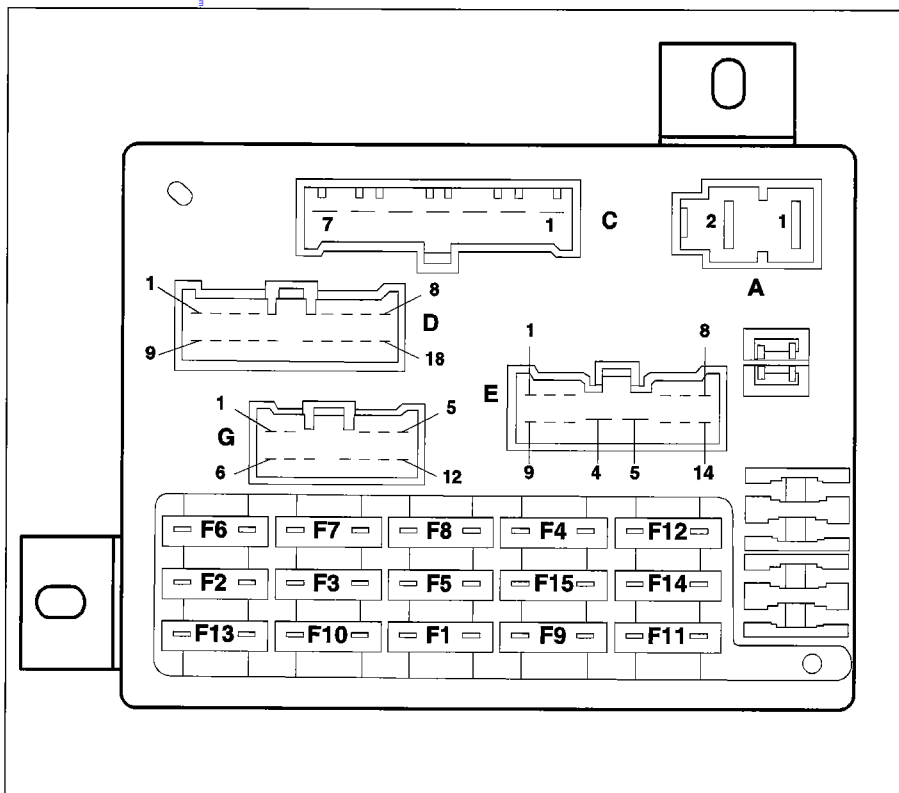


P4A10HL01

- 114. EURO-Bag electronic control unit
- 130. Diagnostic socket for EURO-Bag
- 131. Fiat CODE electronic control unit
- 160. Injection/ignition electronic control unit 1747 16v
- 272. Automatic transmission diagnostic socket
- 273. Automatic transmission control unit

- 295. Injection/ignition electronic control unit 1910 JTD
- 297. Climate control control unit
- 299. Diagnostic socket for climate control system
- 330. A.B.I. control unit (Alzacristalli Bloccaporte Integrato - Integrated Central locking electric windows)
- 349. Engine oil control unit
- 357. Passenger compartment coolant heater plugs control unit

### JUNCTION UNIT

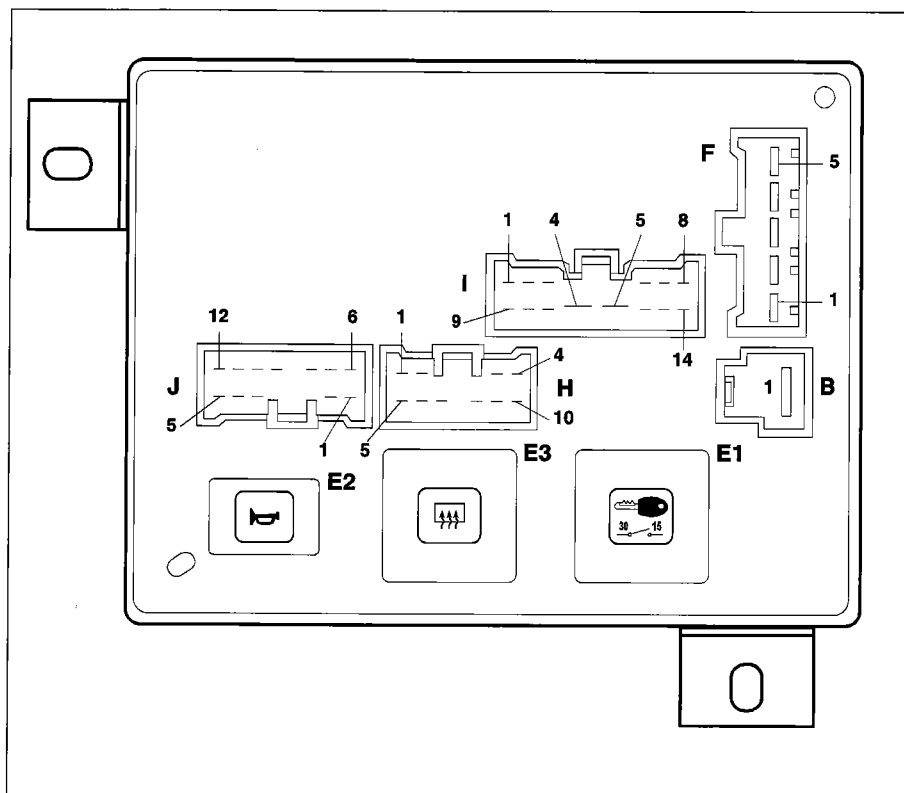


**Front view of the junction unit and identification of fuses**

P4A11HL01



*The connectors cannot be connected incorrectly as they are each a particular shape. The identification letters for the connectors are the same as those used in the wiring diagrams*



**Rear view of the junction unit and Location of relays**

- E1. Ignition discharge relay during starting
- E2. Heated rear windscreen relay
- E3. Horn relay

P4A11HL02

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### List of fuses and main circuits protected

| Fuse No. | Amp. | Ideo-gram                                                                           | Circuit protected                                                                                                                                                                                                                                                      | Fuse No. | Amp. | Ideo-gram                                                                            | Circuit protected                                                                                                                                                                                                        |
|----------|------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | 10   | SERVIZI SERVICES                                                                    | Reversing lights - Brake lights - Additional brake light (if fitted) - Direction repeater - Instrument panel supply - Check supply (where fitted) - Control for electric mirrors (where fitted) - Radio supply - Remote control (+ signal controlled by the ignition). | 6        | 10   |    | Right main beam headlamp.                                                                                                                                                                                                |
|          |      |                                                                                     |                                                                                                                                                                                                                                                                        | 7        | 10   |    | Left main beam headlamp - Main beam headlamps warning light.                                                                                                                                                             |
|          |      |                                                                                     |                                                                                                                                                                                                                                                                        | 8        | 20   |    | Rear fog lamps.                                                                                                                                                                                                          |
|          |      |                                                                                     |                                                                                                                                                                                                                                                                        | 9        | 10   |    | Hazard warning lights flasher.                                                                                                                                                                                           |
|          |      |                                                                                     |                                                                                                                                                                                                                                                                        | 10       | 10   | SERVIZI SERVICES                                                                     | Interior light - Luggage compartment light - Clock supply - Remote control receiver supply (where fitted) - Radio supply - Glove compartment light - Anti-theft device (+ signal from battery).                          |
| 2        | 10   |    | Right front side light - Left rear side light - Right no. plate light - Radio lights - Instrument lights and side light warning light - Cigar lighter light - Switch panel light.                                                                                      | 11       | 30   |  | Heated rear windscreen - Heated rear windscreen warning light - Mirror defrosting (where fitted).                                                                                                                        |
|          |      |                                                                                     |                                                                                                                                                                                                                                                                        | 12       | 30   |  | Engine fan (versions with air conditioning).                                                                                                                                                                             |
|          |      |                                                                                     |                                                                                                                                                                                                                                                                        | 13       | 20   |  | Horns.                                                                                                                                                                                                                   |
| 3        | 10   |  | Left front side light - Heating/air conditioning controls light - Right rear side light - Left no. plate light.                                                                                                                                                        | 14       | 20   |  | Windscreen wiper - Rear screen wiper - Windscreen/rear screen electric washer pump - Headlamp washer intermittent device.                                                                                                |
|          |      |                                                                                     |                                                                                                                                                                                                                                                                        | 15       | 20   |  | Climate control fan motor and resistance for determining fan speed - Relays for before and second condenser and radiator fan speed and delay for engaging 2nd speed - Air conditioning compressor relay - Cigar lighter. |
| 4        | 10   |  | Left dipped headlamp.                                                                                                                                                                                                                                                  |          |      |                                                                                      |                                                                                                                                                                                                                          |
| 5        | 10   |  | Right dipped headlamp - Headlamp alignment.                                                                                                                                                                                                                            |          |      |                                                                                      |                                                                                                                                                                                                                          |

### Additional fuses

To gain access to these fuses, the junction unit shield must be removed, following the instructions given on page 16.

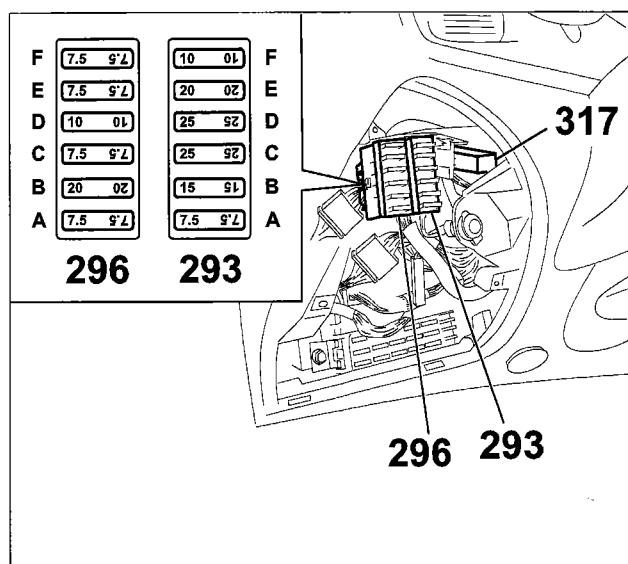
The fuses are:

293. Fuse carrier base on dashboard cable
- A 7.5A fuse protecting switch panel light, radio phone, radio, electric mirrors
  - B 15A fuse protecting fog lamps maintenance relay
  - C Spare
  - D 25A fuse protecting central locking control unit
  - E 20A fuse protecting current socket, cigar lighter, electric seats
  - F 10A fuse protecting EURO-BAG

296. Fuse carrier base on front cable

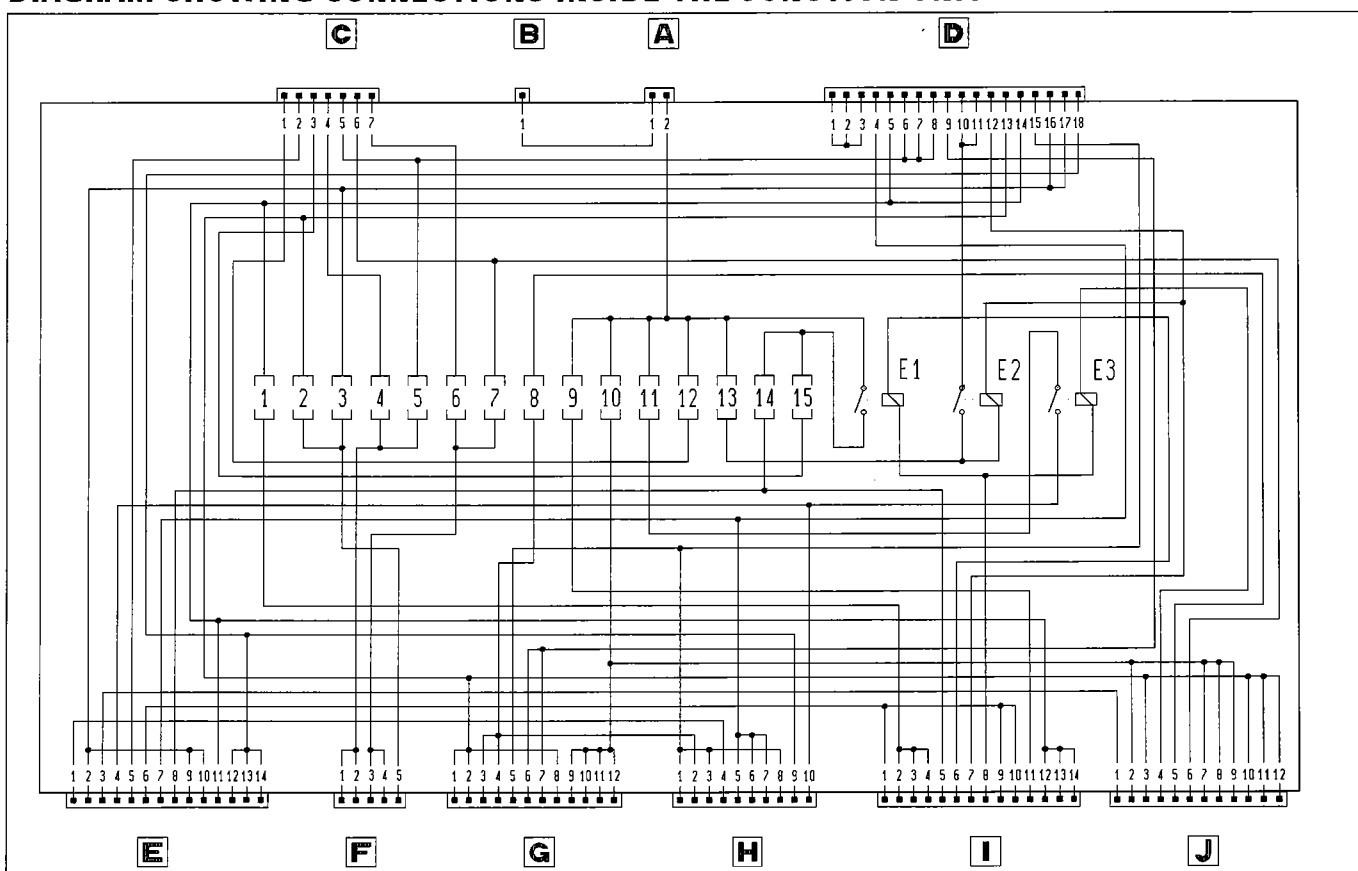
- A 7.5A fuse protecting cooling system/I.E., alarm, automatic transmission
- B 20A fuse protecting windscreen wiper
- C 7.5A fuse protecting Fiat-CODE, cooling system/I.E.

- D 10A fuse protecting anti-lock braking system (A.B.S.)
- E 7.5A fuse protecting climate control system
- F 7.5A fuse protecting electronic injection



P4A13HL01

### DIAGRAM SHOWING CONNECTIONS INSIDE THE JUNCTION UNIT



E1. Ignition discharge relay during starting  
E2. Horn relay

E3. Heated rear windscreen relay

P4A13HL02

### 55.

#### DESCRIPTION OF CABLES AND CONNECTORS

| CONNECTOR A |              |                          |
|-------------|--------------|--------------------------|
| Term. No.   | Cable colour | Circuit concerned        |
| 1           | R            | +30 supply from fuse box |
| 2           | BR           | +30 supply from fuse box |

| CONNECTOR C |              |                                                                                |
|-------------|--------------|--------------------------------------------------------------------------------|
| Term. No.   | Cable colour | Circuit concerned                                                              |
| 1           | R            | Car interior fan supply (with air conditioning), air conditioning control unit |
| 2           | MB           | Electric fuel pump operation, inertia switch                                   |
| 3           | AN           | Heating/air conditioning system speed control switch                           |
| 4           | H            | Right dipped headlamp                                                          |
| 5           | HN           | Left dipped headlamp, headlamp washer go ahead.                                |
| 6           | VN           | Left main beam headlamp                                                        |
| 7           | V            | Right main beam headlamp                                                       |

| CONNECTOR E |              |                                                    |
|-------------|--------------|----------------------------------------------------|
| Term. No.   | Cable colour | Circuit concerned                                  |
| 1           | RN           | Right rear brake light (versions with Check Panel) |
| 2           | -            | N.C.                                               |
| 3           | RG           | Left rear brake light (versions with Check Panel)  |
| 4           | MN           | Rearscreen supply                                  |
| 5           | MB           | Electric fuel pump, inertia switch                 |
| 6           | AG           | Multi-purpose switch for electric mirrors          |
| 7           | AN           | Left rear direction indicator                      |
| 8           | -            | N.C.                                               |
| 9           | GR           | Right rear side light (without Check Panel)        |
| 10          | GR           | Left no. plate light (without Check Panel)         |
| 11          | -            | N.C.                                               |
| 12          | RG           | Left brake light (without Check Panel)             |
| 13          | RN           | Right brake light (without Check Panel)            |
| 14          | R            | Additional brake light                             |

| CONNECTOR B |              |                       |
|-------------|--------------|-----------------------|
| Term. No.   | Cable colour | Circuit concerned     |
| 1           | R            | Services supply (OPT) |

| CONNECTOR D |              |                                                |
|-------------|--------------|------------------------------------------------|
| Term. No.   | Cable colour | Circuit concerned                              |
| 1           | G            | Left headlamp alignment                        |
| 2           | G            | Right headlamp alignment                       |
| 3           | G            | Headlamp alignment control                     |
| 4           | AN           | Front and left side direction indicator        |
| 5           | AR           | Brake lights operation                         |
| 6           | HB           | Left headlamp alignment supply                 |
| 7           | HR           | Headlamp alignment supply - Headlamp wash/wipe |
| 8           | HB           | Right headlamp alignment supply                |
| 9           | B            | Reversing lights operation                     |
| 10          | Z            | Horns                                          |
| 11          | Z            | Horns                                          |
| 12          | -            | N.C.                                           |
| 13          | GR           | Right front side light                         |
| 14          | AR           | Engine oil level control unit                  |
| 15          | A            | Front and right side direction indicator       |
| 16          | GN           | Heater unit/air conditioning lights            |
| 17          | GN           | Heater unit/air conditioning controls light    |
| 18          | RN           | Brake lights operation                         |

| CONNECTOR F |              |                                              |
|-------------|--------------|----------------------------------------------|
| Term. No.   | Cable colour | Circuit concerned                            |
| 1           | H            | Main beam headlamps maintenance relay        |
| 2           | -            | N.C.                                         |
| 3           | LR           | Main beam h/lamps op. (st. col. switch unit) |
| 4           | LR           | Headlamp alignment go ahead                  |
| 5           | G            | Ignition switch                              |



**CONNECTOR G**

| Term. No. | Cable colour | Circuit concerned                         |
|-----------|--------------|-------------------------------------------|
| 1         | GN           | Left rear side light                      |
| 2         | GV           | Multi-purpose switch for electric mirrors |
| 3         | -            | N.C.                                      |
| 4         | -            | N.C.                                      |
| 5         | A            | Right rear direction indicator            |
| 6         | B            | Left reversing light                      |
| 7         | B            | Right reversing light                     |
| 8         | GN           | Right no. plate light                     |
| 9         | RN           | Supply for rear courtesy light            |
| 10        | RN           | Supply for lug. comp. courtesy light      |
| 11        | RN           | Supply for front courtesy light           |
| 12        | RN           | Supply for rear courtesy light            |

**CONNECTOR H**

| Term. No. | Cable colour | Circuit concerned                                         |
|-----------|--------------|-----------------------------------------------------------|
| 1         | A            | Right direction indicator warning light                   |
| 2         | CZ           | Central door locking control unit                         |
| 3         | A            | Hazard warning lights operation                           |
| 4         | RN           | Instrument panel (device signalling brake lights failure) |
| 5         | AN           | Right direction indicator control                         |
| 6         | AN           | Hazard warning lights control                             |
| 7         | AN           | Left direction indicator warning light                    |
| 8         | A            | Left direction indicator control                          |
| 9         | BR           | Instrument panel (device signalling brake lights failure) |
| 10        | MB           | Safety switch for electric mirrors                        |

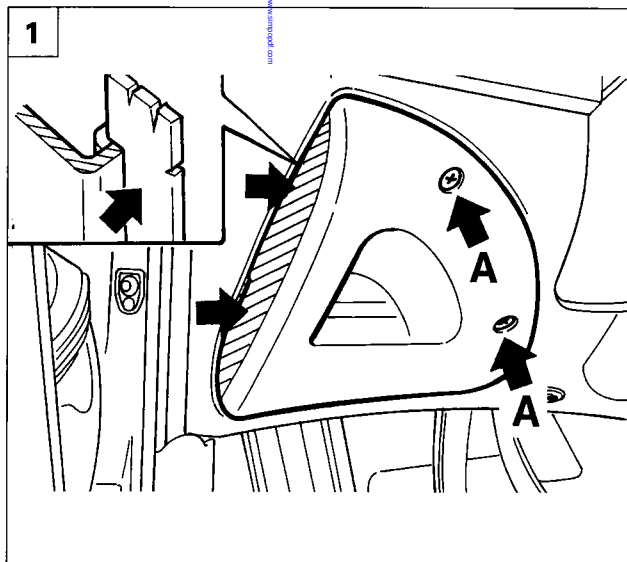
**CONNECTOR I**

| Term. No. | Cable colour | Circuit concerned                        |
|-----------|--------------|------------------------------------------|
| 1         | -            | N.C.                                     |
| 2         | -            | N.C.                                     |
| 3         | -            | N.C.                                     |
| 4         | CB           | Ignition switch                          |
| 5         | CN           | Steering column switch unit              |
| 6         | N            | Earth                                    |
| 7         | LN/R         | Horns signal                             |
| 8         | AN           | +15 supply from key (excluding starting) |
| 9         | AG           | Right external rear view mirror          |
| 10        | AG           | Left external rear view mirror           |
| 11        | RG           | Hazard warning lights switch unit        |
| 12        | AR           | Supply for instrument panel              |
| 13        | AR           | Hazard warning lights switch unit        |
| 14        | AR           | Supply for instrument panel              |

**CONNECTOR J**

| Term. No. | Cable colour | Circuit concerned                                                                             |
|-----------|--------------|-----------------------------------------------------------------------------------------------|
| 1         | R G/GN       | Left brake light (versions with Check Panel)                                                  |
| 2         | RV           | Alarm supply                                                                                  |
| 3         | GN           | Side lights warning light, switch panel light, auto. trans. controls light                    |
| 4         | HM/HV        | Heated rear windscreen control                                                                |
| 5         | R/LR         | Control for rear fog lamps, electric window supply, rear view mirrors, radio, central locking |
| 6         | VN           | Main beam headlamps warning light, main beam headlamps relay                                  |
| 7         | R            | Instrument panel                                                                              |
| 8         | R            | Glove compartment light supply                                                                |
| 9         | R            | Instrument panel supply                                                                       |
| 10        | GN           | Radio with clock                                                                              |
| 11        | GN           | Switch control unit                                                                           |
| 12        | G R/GN       | Cigar lighter light - Instrument panel light dimmer                                           |

### 55.



P4A16HL01

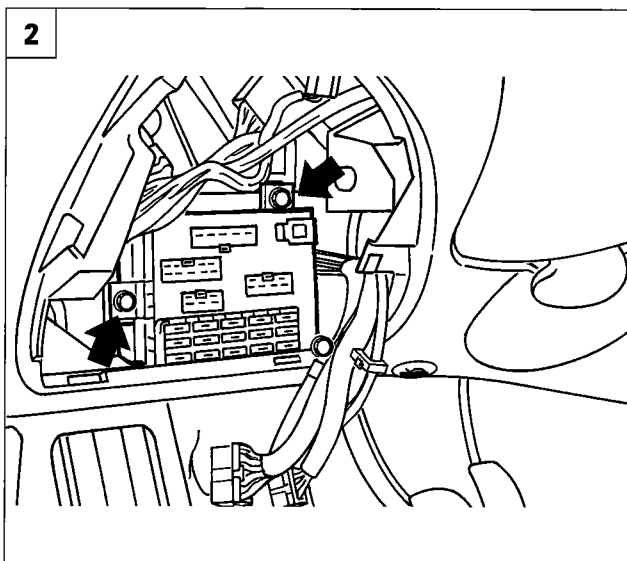


### REMOVING-REFITTING JUNCTION UNIT AND SHIELD



#### Removing control unit shield

1. Undo the bolts (A) using the ignition key or a suitable screwdriver; exert slight pressure on the left side of the shield in the direction shown by the arrows to facilitate the release of the two side retaining tabs, then remove the shield.
2. After having removed the shield, disconnect the connectors from the front of the control unit and undo the bolts fixing the control unit to the dashboard. Move the control unit aside, disconnect the connectors from the rear and remove the control unit from the dashboard.



P4A16HL02



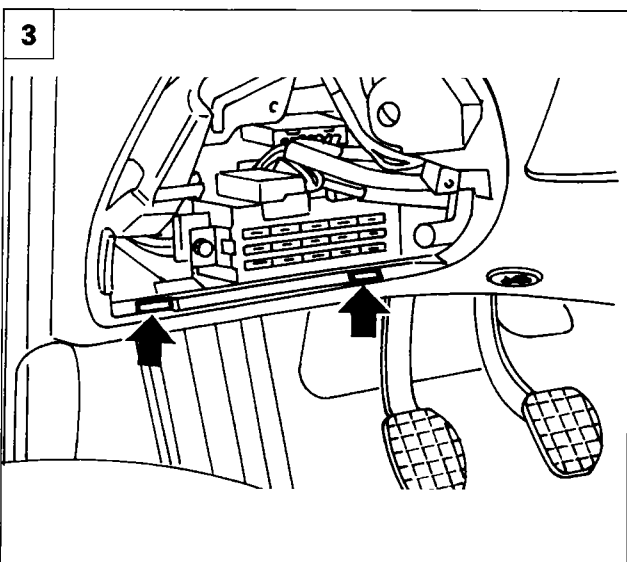
*Suitably reverse the operations carried out for the removal*

#### Refitting control unit shield

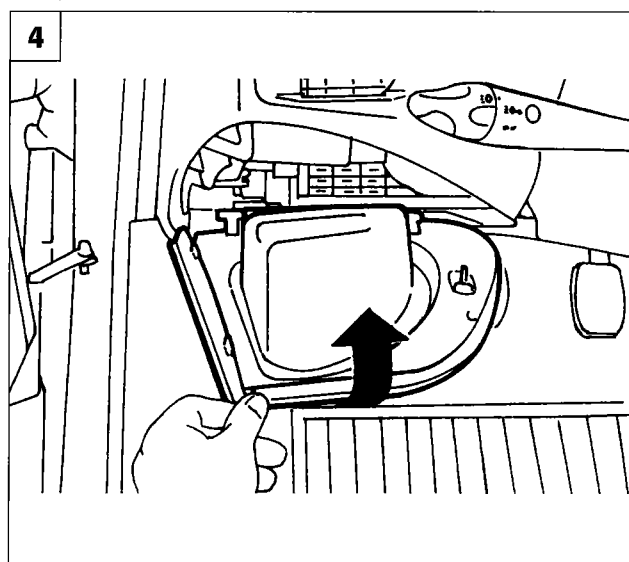
3. Position the shield in the housing in the dashboard, inserting the centering tabs located on the lower part.
4. Turn the shield upwards, until it is contact with the dashboard.

Complete the refitting, proceeding as follows (see figure 1):

- position the two bolts (A) in their housings and tighten them by several turns;
- taking great care, exert slight pressure on the left side of the shield (at both the side and the front) so that the two side retaining tabs are fully inserted in the dashboard;
- tighten the bolts (A).

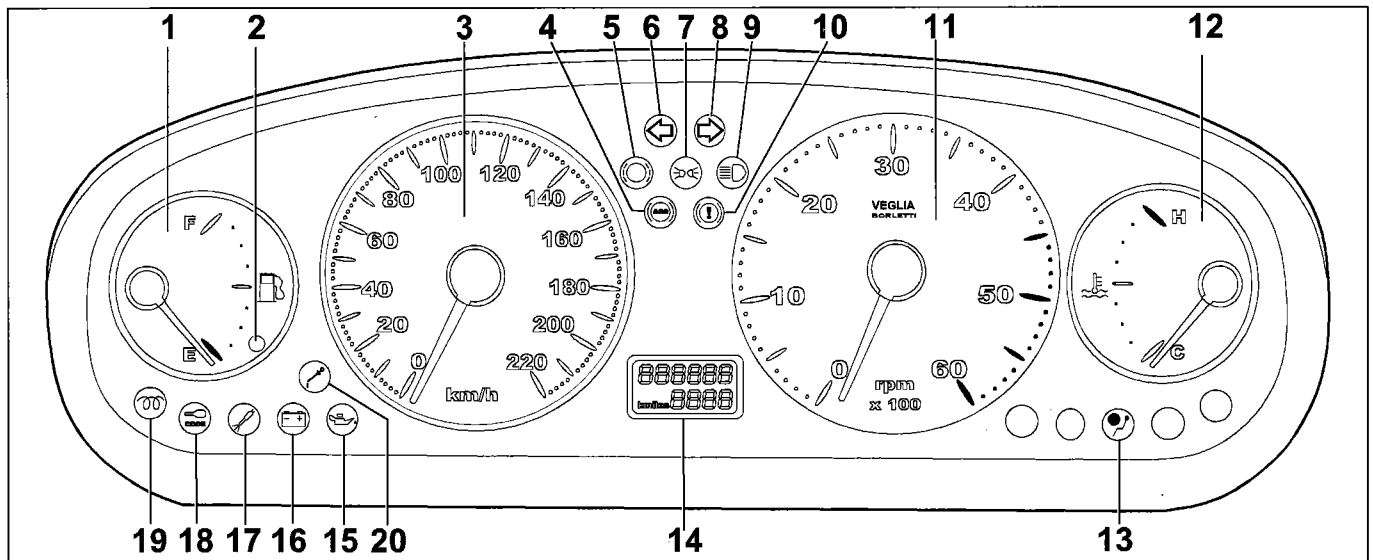


P4A16HL03



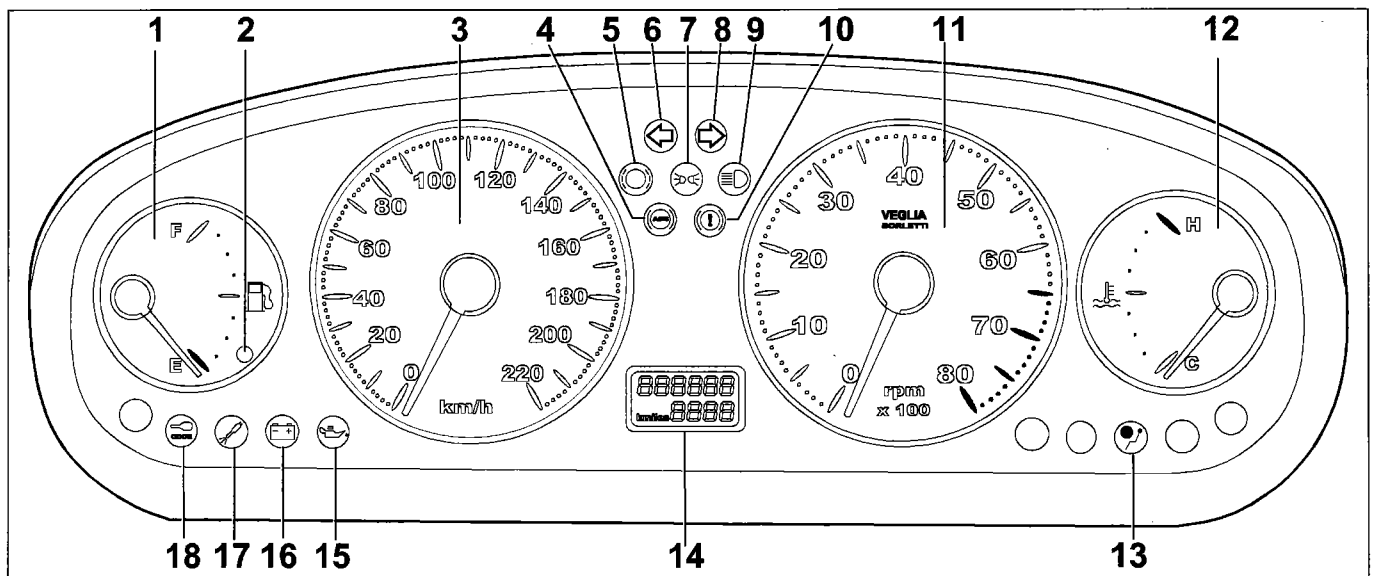
P4A16HL04

VEGLIA BORLETTI CONTROL PANEL TURBO DIESEL VERSION FOR OUTFITS: SX, (75CV SOFT), SX, GT, HSX (105BHP JTD)



4A17HL01

VEGLIA BORLETTI CONTROL PANEL PETROL VERSIONS FOR OUTFITS: SX, GT, HSX



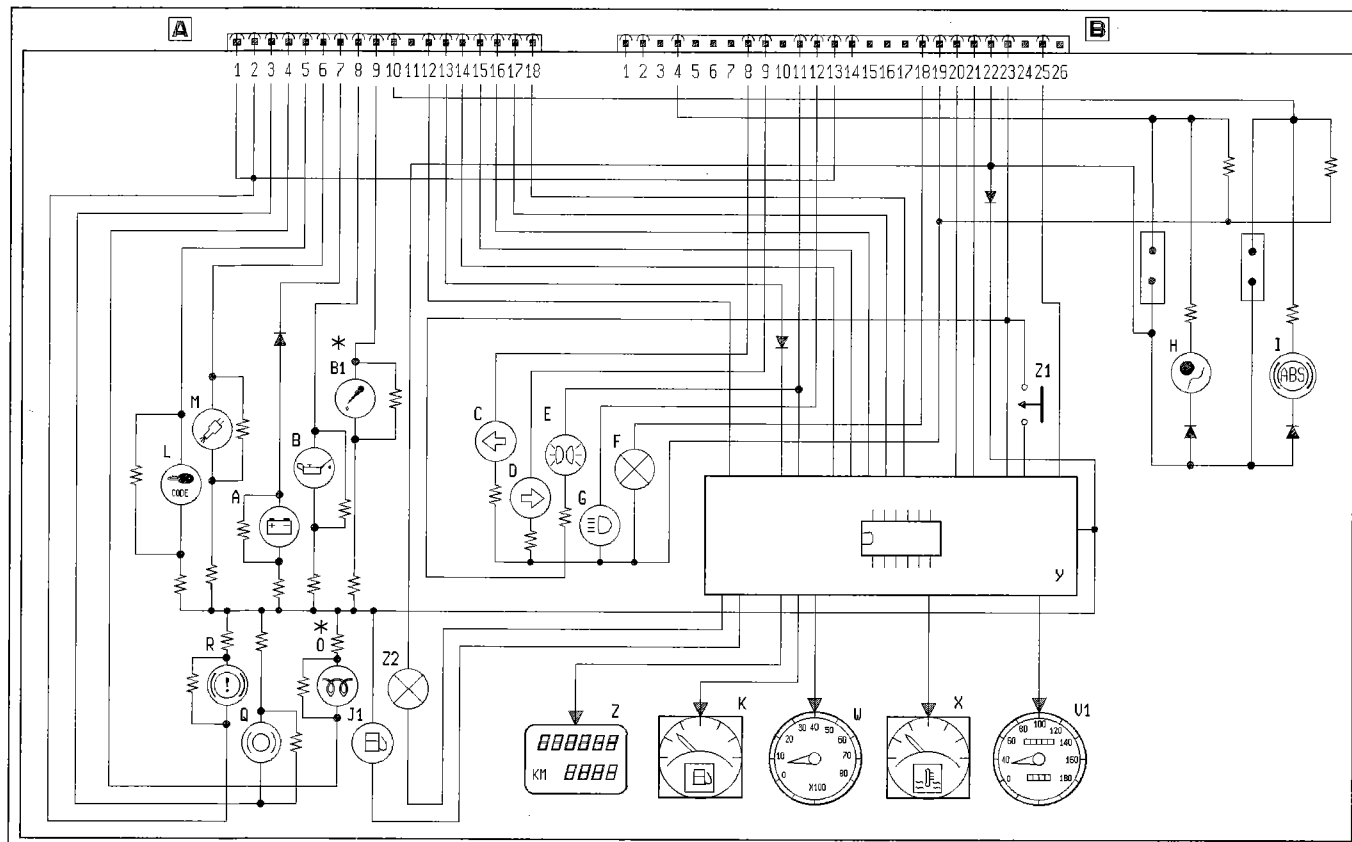
4A17HL02

### Front side of control panel

- |                                                                    |                                                                           |
|--------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1. Fuel gauge                                                      | 14. Odometer                                                              |
| 2. Fuel reserve warning light                                      | 15. Low engine oil pressure warning light                                 |
| 3. Speedometer                                                     | 16. Battery recharging warning light                                      |
| 4. A.B.S. failure warning light                                    | 17. Injection system failure warning light (not present for 1910 SOFT TD) |
| 5. Brake pad wear warning light                                    | 18. FIAT CODE system failure warning light                                |
| 6. Left direction indicator warning light                          | 19. Glow plug warning light (only for TD versions)                        |
| 7. Side lights warning light                                       | 20. Insufficient engine oil level warning light (only for JTD versions)   |
| 8. Right direction indicator warning light                         |                                                                           |
| 9. Main beam headlamps warning light                               |                                                                           |
| 10. Handbrake applied/insufficient brake fluid level warning light |                                                                           |
| 11. Rev counter                                                    |                                                                           |
| 12. Engine coolant temperature gauge                               |                                                                           |
| 13. EURO BAG system failure warning light                          |                                                                           |

### 55.

Wiring diagram for outfits PETROL SX, GT, HSX and TURBO DIESEL SX, GT, HSX (105BHP JTD)



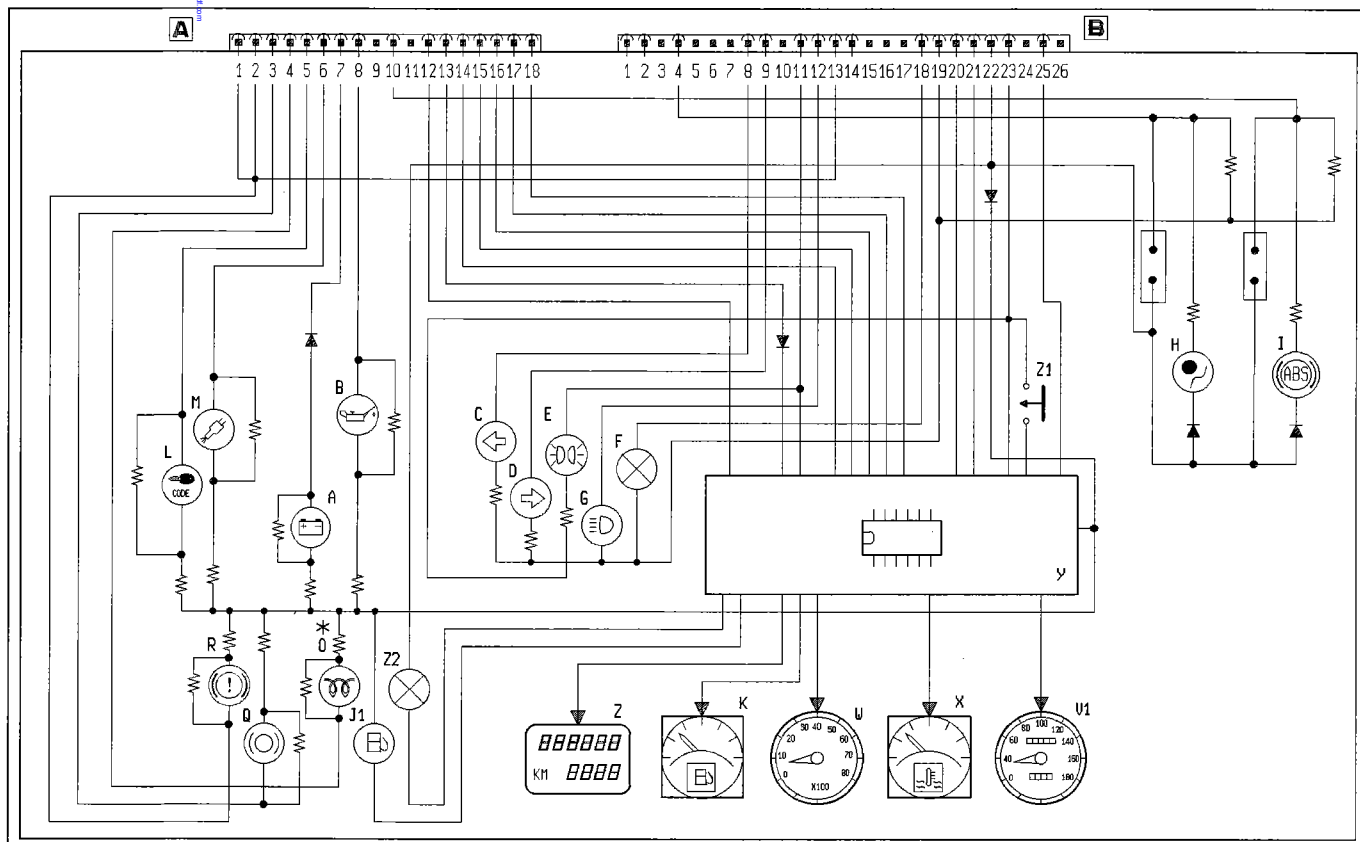
\*Present for Turbo Diesel JTD versions

4A18HL01

#### 6. Instrument panel:

- A Battery recharging warning light
- B Low engine oil pressure warning light
- B1 Insufficient engine oil level warning light (only for 1910 JTD)
- C Left direction indicator warning light
- D Right direction indicator warning light
- E Side lights warning light
- F Instrument panel ideogram light
- G Main beam headlamps warning light
- H EURO BAG system failure warning light
- I Anti-lock brakes failure warning light
- J1 Fuel reserve warning light
- K Fuel gauge
- L Fiat-CODE failure warning light
- M Petrol/Diesel injection system failure warning light
- O Glow plug warning light (only for 1910 JTD)
- Q Front brake pad wear warning light
- R Handbrake applied/insufficient brake fluid level warning light
- V1 Speedometer
- W Rev counter
- X Engine coolant temperature gauge
- Y Electronic module
- Z Milometer/trip meter display
- Z1 Trip meter zeroing button
- Z2 Z2 Trip counter display light

Wiring diagram for TURBO DIESEL SX outfits (75 bhp SOFT)



\*Present for Turbo Diesel versions (75 bhp SOFT)

4A18HL02

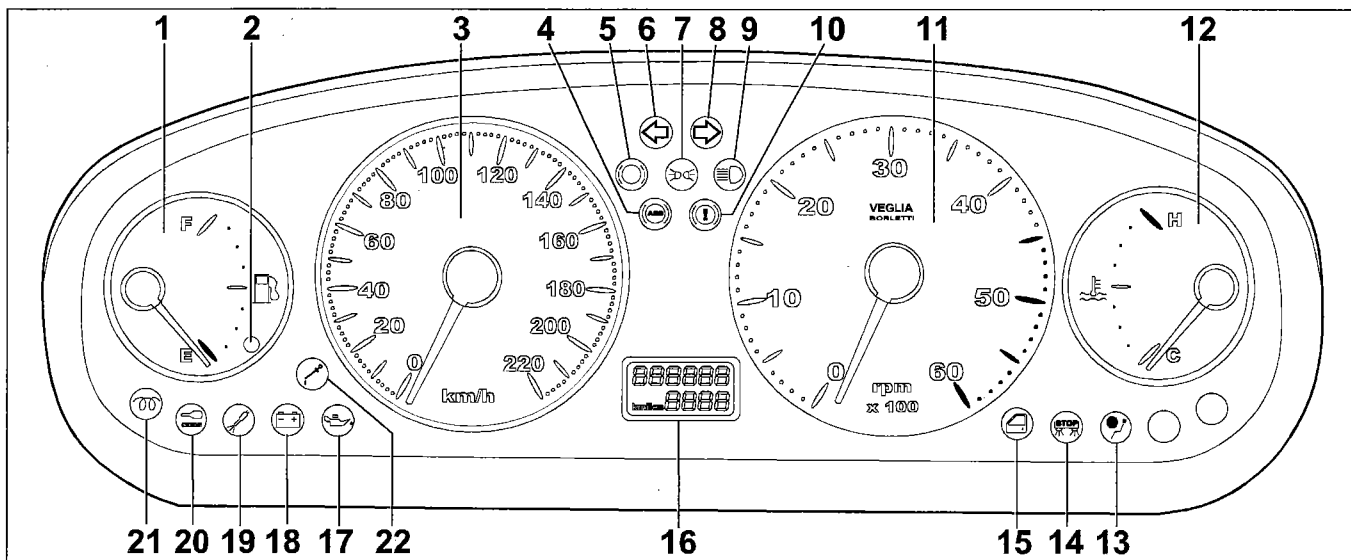
6. Instrument panel:

- A Battery recharging warning light
- B Low engine oil pressure warning light
- C Left direction indicator warning light
- D Right direction indicator warning light
- E Side lights warning light
- F Instrument panel ideogram light
- G Main beam headlamps warning light
- H EURO BAG system failure warning light
- I Anti-lock brakes failure warning light
- J1 Fuel reserve warning light
- K Fuel gauge
- L Fiat-CODE failure warning light
- M Petrol/Diesel injection system failure warning light
- O Glow plug warning light
- Q Front brake pad wear warning light
- R Handbrake applied/insufficient brake fluid level warning light
- V1 Speedometer
- W Rev counter
- X Engine coolant temperature gauge
- Y Electronic module
- Z Milometer/trip meter display
- Z1 Trip meter zeroing button

Z2 Trip counter display light

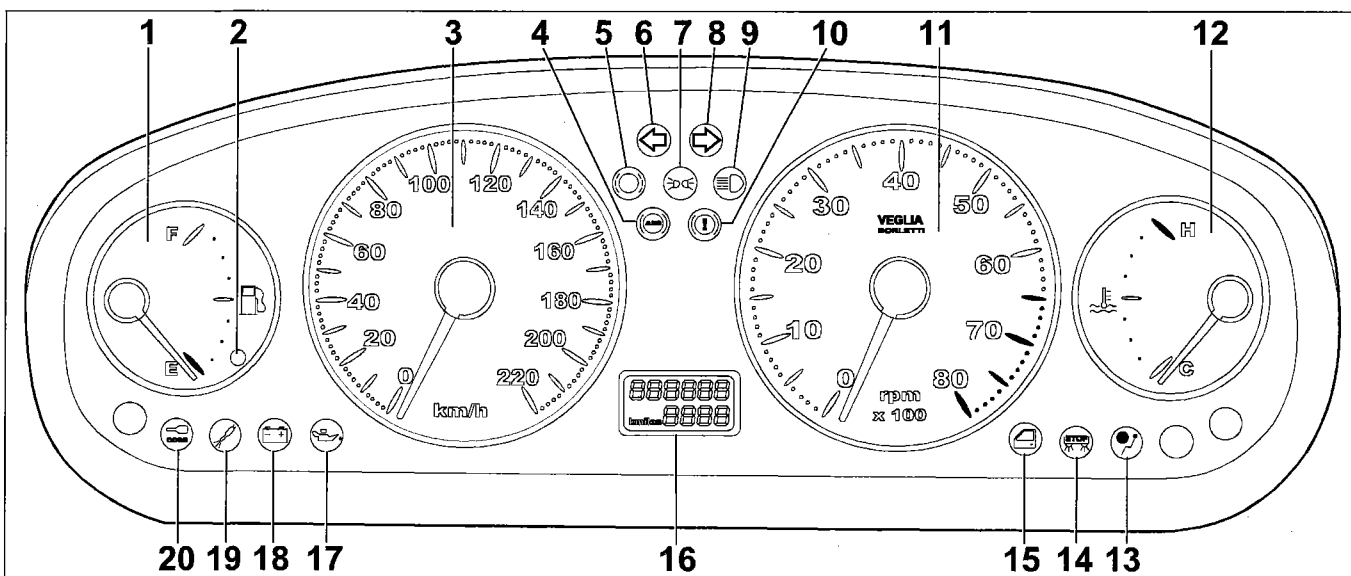
### 55.

VEGLIA BORLETTI CONTROL PANEL TURBO DIESEL VERSION FOR OUTFITS: ELX (105CV JTD)



4A18HL03

VEGLIA BORLETTI CONTROL PANEL PETROL VERSIONS FOR OUTFITS: ELX



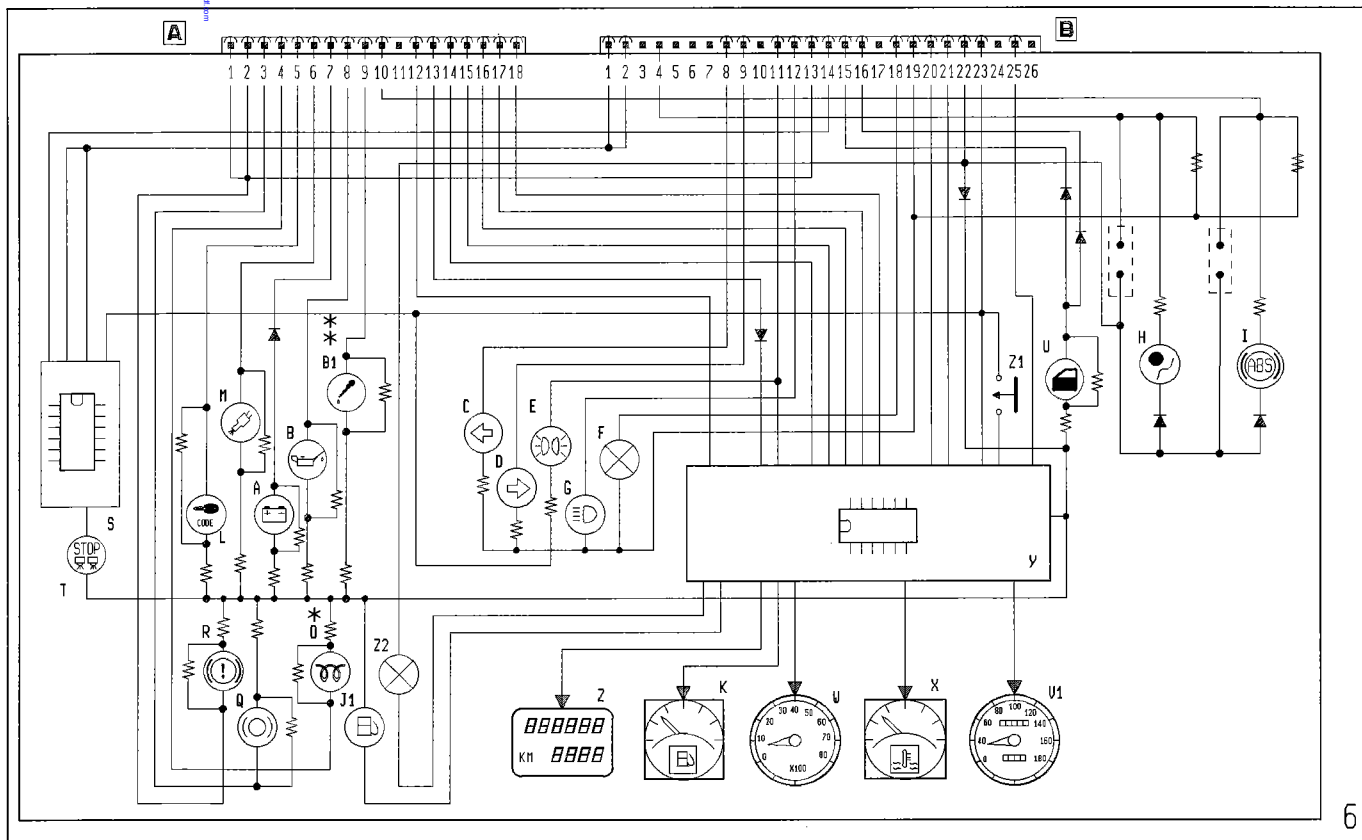
4A18HL04

### Control panel front side

- |                                                                    |                                                                         |
|--------------------------------------------------------------------|-------------------------------------------------------------------------|
| 1. Fuel gauge                                                      | 15. Doors open warning light                                            |
| 2. Fuel reserve warning light                                      | 16. Odometer                                                            |
| 3. Speedometer                                                     | 17. Low engine oil pressure warning light                               |
| 4. A.B.S. failure warning light                                    | 18. Battery recharging warning light                                    |
| 5. Brake pad wear warning light                                    | 19. Injection system failure warning light                              |
| 6. Left direction indicator warning light                          | 20. Fiat CODE system failure warning light                              |
| 7. Side lights warning light                                       | 21. Glow plug warning light (only for JTD versions)                     |
| 8. Right direction indicator warning light                         | 22. Insufficient engine oil level warning light (only for JTD versions) |
| 9. Main beam headlamps warning light                               |                                                                         |
| 10. Handbrake applied/insufficient brake fluid level warning light |                                                                         |
| 11. Rev counter                                                    |                                                                         |
| 12. Engine coolant temperature gauge                               |                                                                         |
| 13. EURO BAG system failure warning light                          |                                                                         |
| 14. Brake lights failure warning light                             |                                                                         |



### Wiring diagram for PETROL ELX and TURBO DIESEL (105bhp JTD) ELX outfits



\*Present for Turbo Diesel 1910 JTD versions

\*\* Present only for Turbo Diesel versions (105bhp JTD)

4A18HL05

#### 6. Instrument panel:

- A Battery recharging warning light
- B Low engine oil pressure warning light
- B1 Insufficient engine oil level warning light (only for JTD)
- C Left direction indicator warning light
- D Right direction indicator warning light
- E Side lights warning light
- F Instrument panel symbol light
- G Main beam headlamps warning light
- H EURO BAG system failure warning light
- I Anti-lock brakes failure warning light
- J1 Fuel reserve warning light
- K Fuel gauge
- L Fiat-CODE failure warning light
- M Petrol/Diesel injection system failure warning light
- O Glow plug warning light (only for JTD)
- Q Front brake pad wear warning light
- R Handbrake applied/insufficient brake fluid level warning light
- S Brake lights failure electronic module
- T Brake lights failure warning light
- U Doors open warning light
- V1 Speedometer

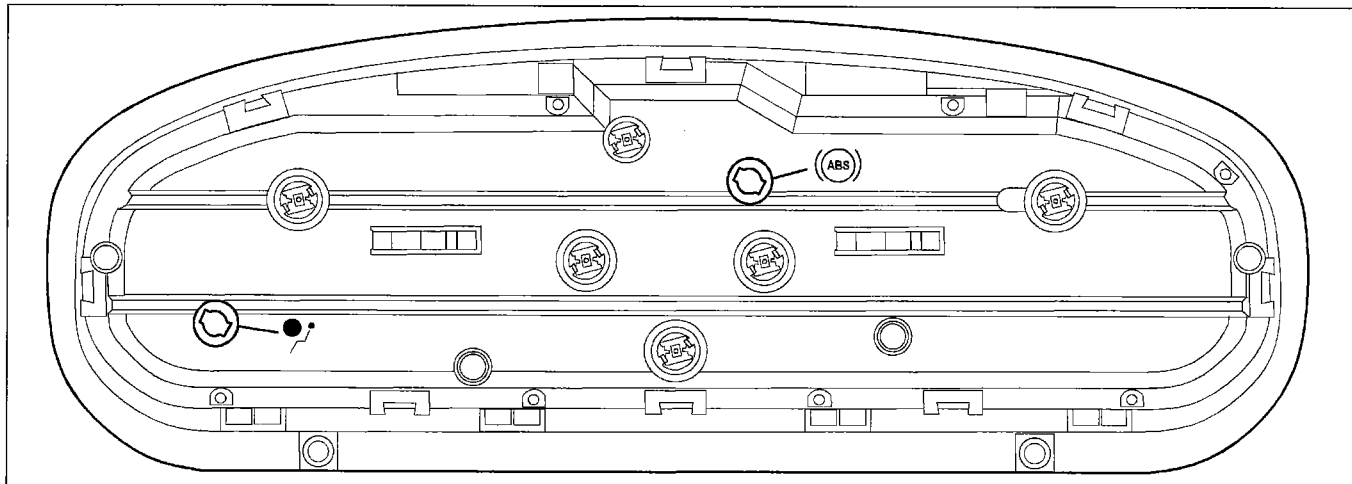
- W Rev counter
- X Engine coolant temperature gauge
- Y Electronic module
- Z Milometer/trip meter display
- Z1 Trip meter zeroing button
- Z2 Trip counter display light

### 55.

#### Operations to be carried out when replacing control panel

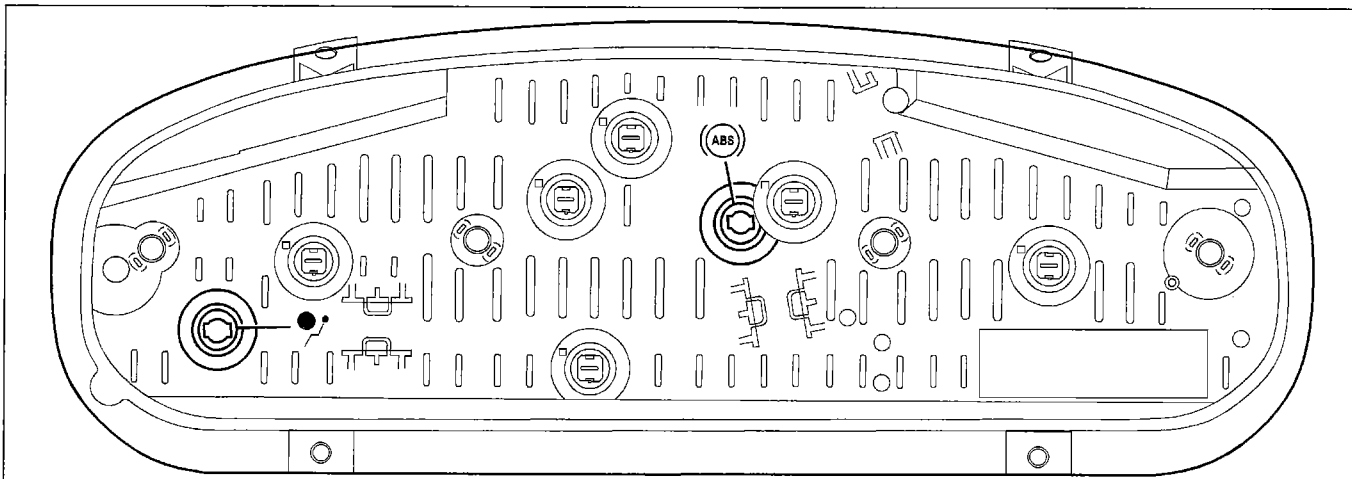
New instrument panels come with caps in place of the ABS and AIR-BAG device warning lights. The caps must therefore be replaced with the relevant warning lights if one or both devices are present.

#### Location of caps on VEGLIA BORLETTI instrument panel



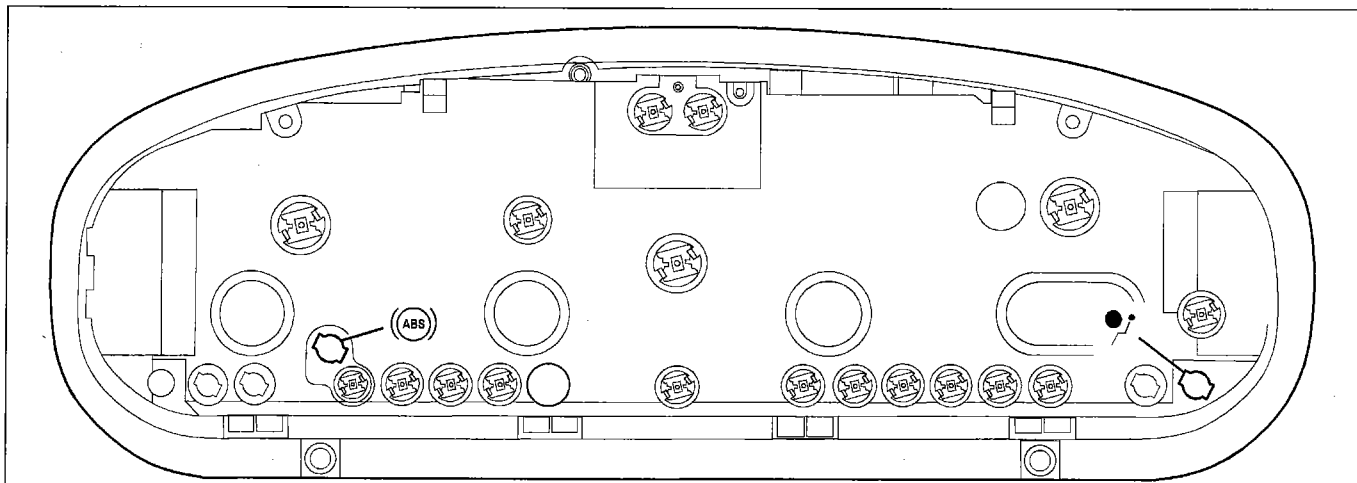
4A18HL06

#### Location of caps on NSI instrument panel

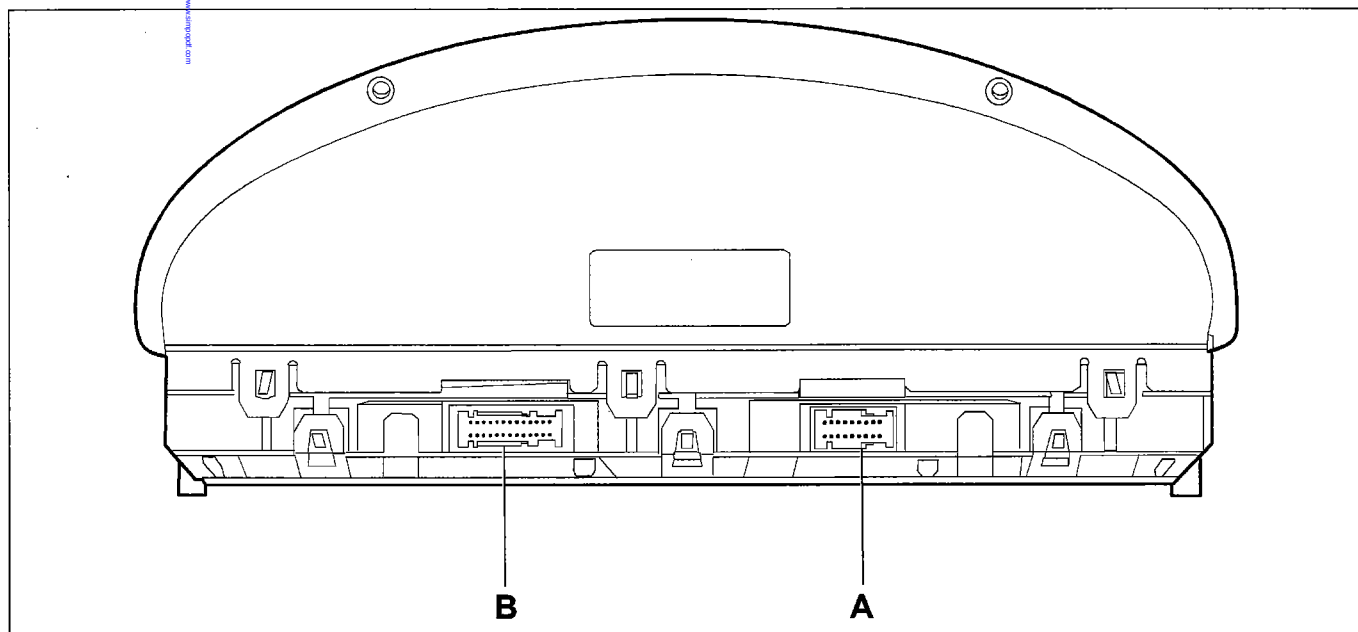


4A18HL07

#### Location of caps on VEGLIA BORLETTI instrument panel with automatic transmission

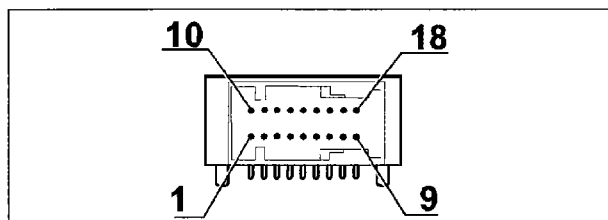


4A18HL08



4A19HL01

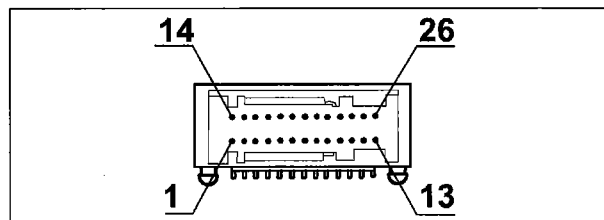
Rear side (connector seats are shown)



4A19HL02

Connector A on left front lead

| No. pin | Wiring colours | Circuit involved                                                      |
|---------|----------------|-----------------------------------------------------------------------|
| 1       | M              | Electronic brake distributor failure (EBD)                            |
| 2       | BN             | Brake fluid level                                                     |
| 3       | BR             | Brake lining wear                                                     |
| 4       | CL             | Glow plug preheating (Turbo Diesel versions)                          |
| 5       | MN             | Fiat CODE                                                             |
| 6       | LN             | Injection failure (not present for Turbo Diesel 75 BHP SOFT versions) |
| 7       | HN             | Generator                                                             |
| 8       | HG             | Low engine oil pressure                                               |
| 9       | VG             | Low engine oil level (1910 JTD versions)                              |
| 10      | RV             | ABS system failure                                                    |
| 11      | -              | Not connected                                                         |
| 12      | HL             | Speedometer signal                                                    |
| 13      | R              | + 30 battery                                                          |
| 14      | CN             | Speedometer generator supply                                          |
| 15      | HB             | Engine coolant temperature                                            |
| 16      | SB             | Outdoor temperature serial signal                                     |
| 17      | HM             | Speedometer signal                                                    |
| 18      | L              | Rev counter signal                                                    |



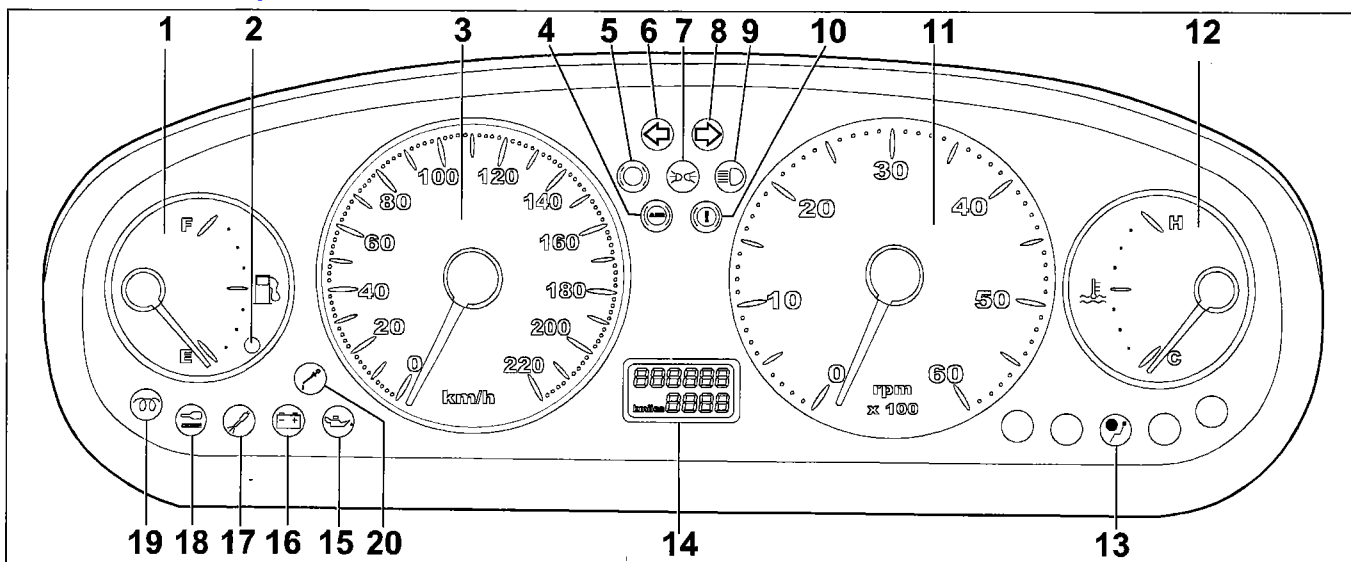
4A19HL03

Connector B on facia lead

| No. pin | Wiring colour | Circuit involved              |
|---------|---------------|-------------------------------|
| 1       | RG            | Left car brake light failure  |
| 2       | BR            | Brake light                   |
| 3       | -             | Not connected                 |
| 4       | LG            | Euro-bag device failure       |
| 5       | -             | Not connected                 |
| 6       | -             | Not connected                 |
| 7       | -             | Not connected                 |
| 8       | AN            | Left turn signal              |
| 9       | A             | Right turn signal             |
| 10      | -             | Not connected                 |
| 11      | GN            | Side lights                   |
| 12      | VN            | Main beam headlamps           |
| 13      | BN            | Handbrake on                  |
| 14      | RN            | Right car brake light failure |
| 15      | -             | Not connected                 |
| 16      | -             | Not connected                 |
| 17      | -             | Not connected                 |
| 18      | GR            | Instrument panel light        |
| 19      | N             | Earth (lighting)              |
| 20      | HR            | Fuel level                    |
| 21      | VB            | Outdoor temperature display   |
| 22      | AR            | + 15                          |
| 23      | NZ            | Electronic earth              |
| 24      | -             | Not connected                 |
| 25      | HM            | Speedometer signal            |
| 26      | -             | Not connected                 |

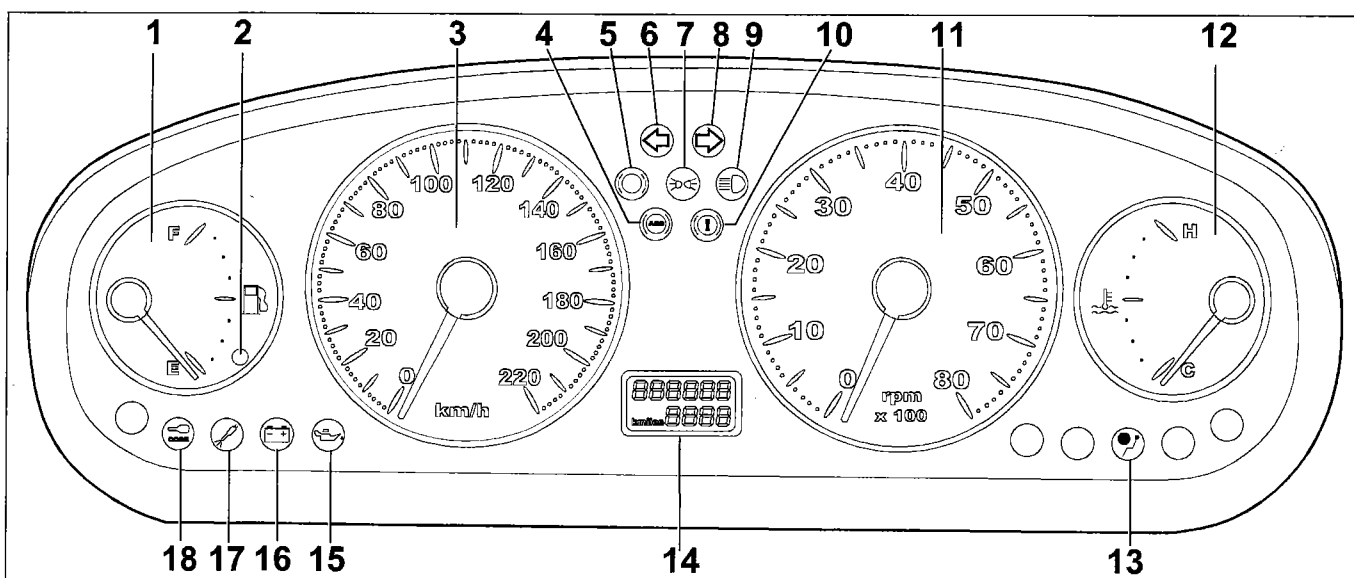
### 55.

**TURBO DIESEL VERSION NSI CONTROL PANEL FOR OUTFITS: SX, (75BHP SOFT), SX, GT, HSX (105C V JTD)**



4A20HL01

**PETROL VERSION NSI CONTROL PANEL FOR OUTFITS: SX, GT, HSX**

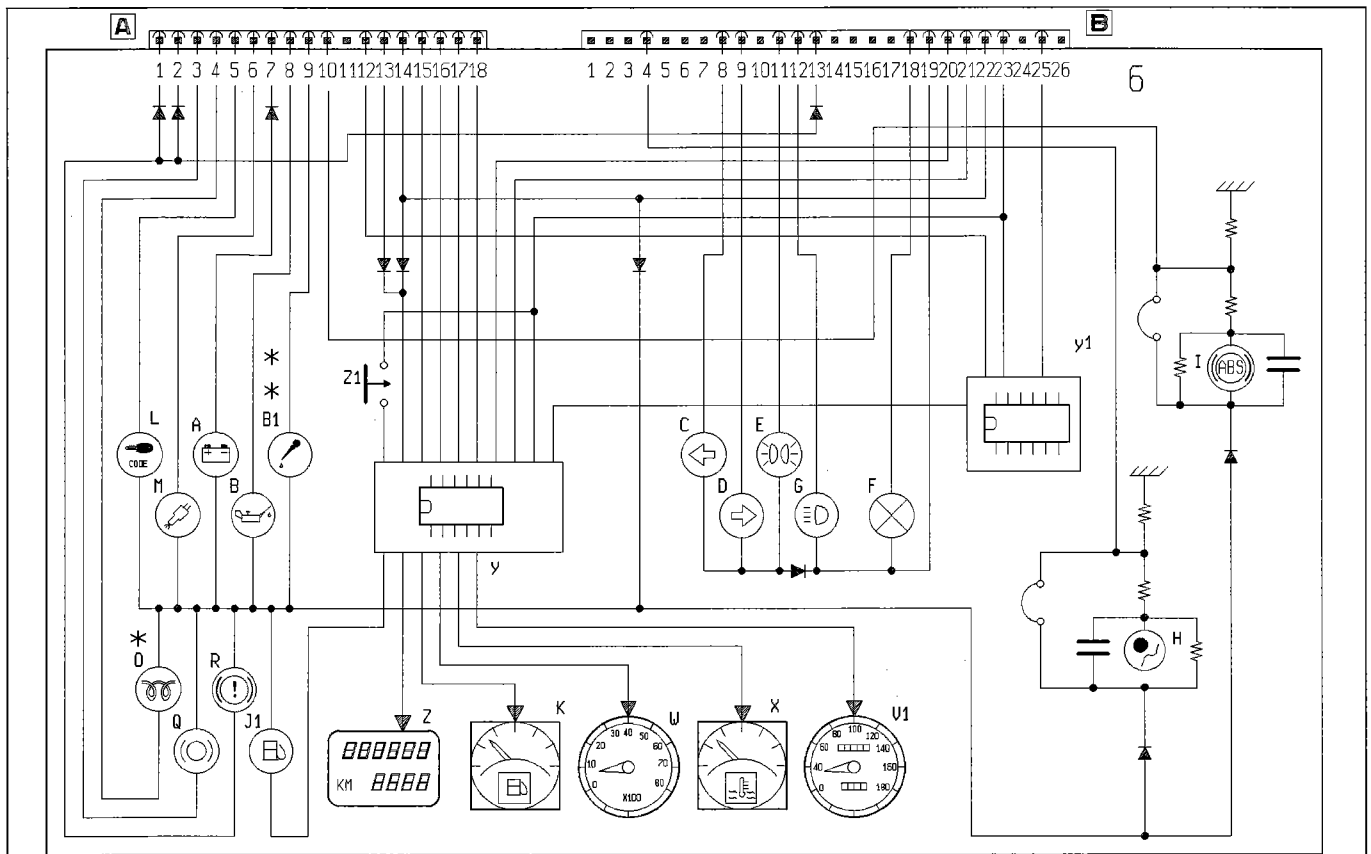


4A20HL02

### Control panel front side

- |                                                                    |                                                                           |
|--------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1. Fuel level gauge                                                | 13. EURO BAG system failure warning light                                 |
| 2. Fuel reserve warning light                                      | 14. Odometer                                                              |
| 3. Speedometer                                                     | 15. Low engine oil pressure warning light                                 |
| 4. A.B.S. failure warning light                                    | 16. Battery recharging warning light                                      |
| 5. Brake pad wear warning light                                    | 17. Injection system failure warning light (not present for 1910 SOFT TD) |
| 6. Left direction indicator warning light                          | 18. Fiat CODE system failure warning light                                |
| 7. Side lights warning light                                       | 19. Glow plug warning light (only for TD versions)                        |
| 8. Right direction indicator warning light                         | 20. Insufficient engine oil level warning light (only for JTD versions)   |
| 9. Main beam headlamps warning light                               |                                                                           |
| 10. Handbrake applied/insufficient brake fluid level warning light |                                                                           |
| 11. Rev counter                                                    |                                                                           |
| 12. Engine coolant temperature gauge                               |                                                                           |

Wiring diagram for outfits PETROL SX, GT, HSX and TURBO DIESEL SX (75BHP SOFT), SX, GT, HSX (105BHP JTD)



\* Present for Turbo Diesel versions (75BHP SOFT)

\*\* Present only for Turbo Diesel versions (105BHP JTD)

4A21HL01

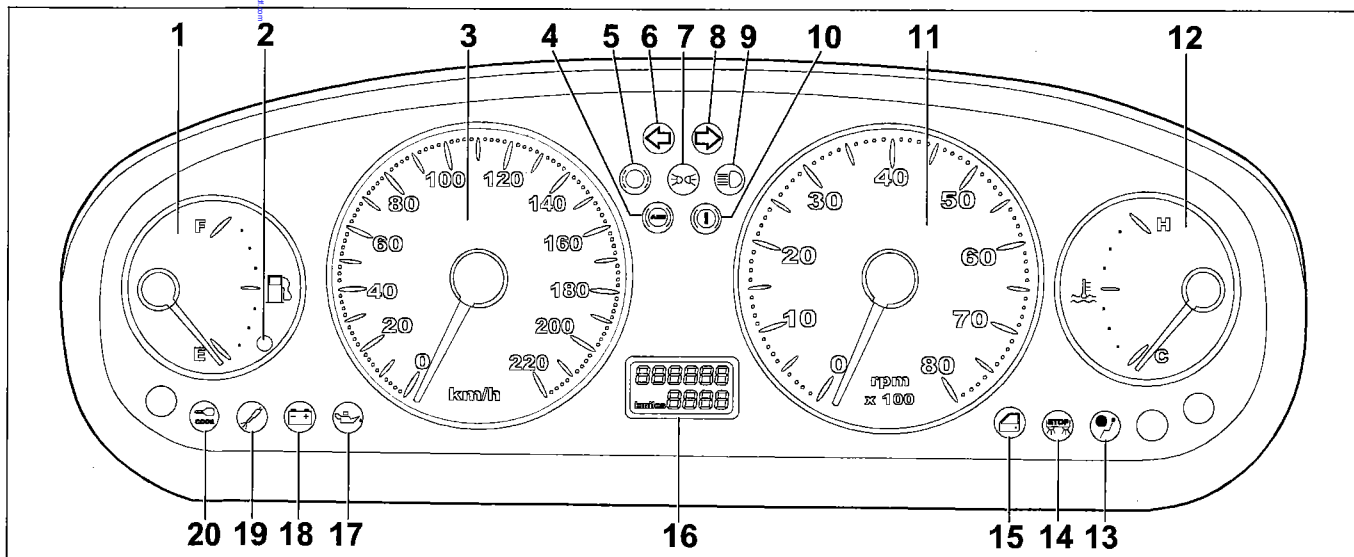
### 6. Instrument panel:

- A Battery recharging warning light
- B Low engine oil pressure warning light
- B1 Low engine oil pressure warning light
- C Left direction indicator warning light
- D Right direction indicator warning light
- E Side lights warning light
- F Instrument panel ideogram light
- G Main beam headlamps warning light
- H EURO BAG system failure warning light
- I Anti-lock brakes failure warning light
- J1 Fuel reserve warning light
- K Fuel gauge
- L Fiat-CODE failure warning light
- M Injection system failure warning light
- O Glow plug warning light (only for Turbo Diesel)
- Q Front brake pad wear warning light
- R Handbrake applied/insufficient brake fluid level warning light

- V1 Speedometer
- W Rev counter
- X Engine coolant temperature gauge
- Y Electronic module
- Y1 Speed control module
- Z Milometer/trip meter display
- Z1 Trip meter zeroing button
- Z2 Trip counter display light

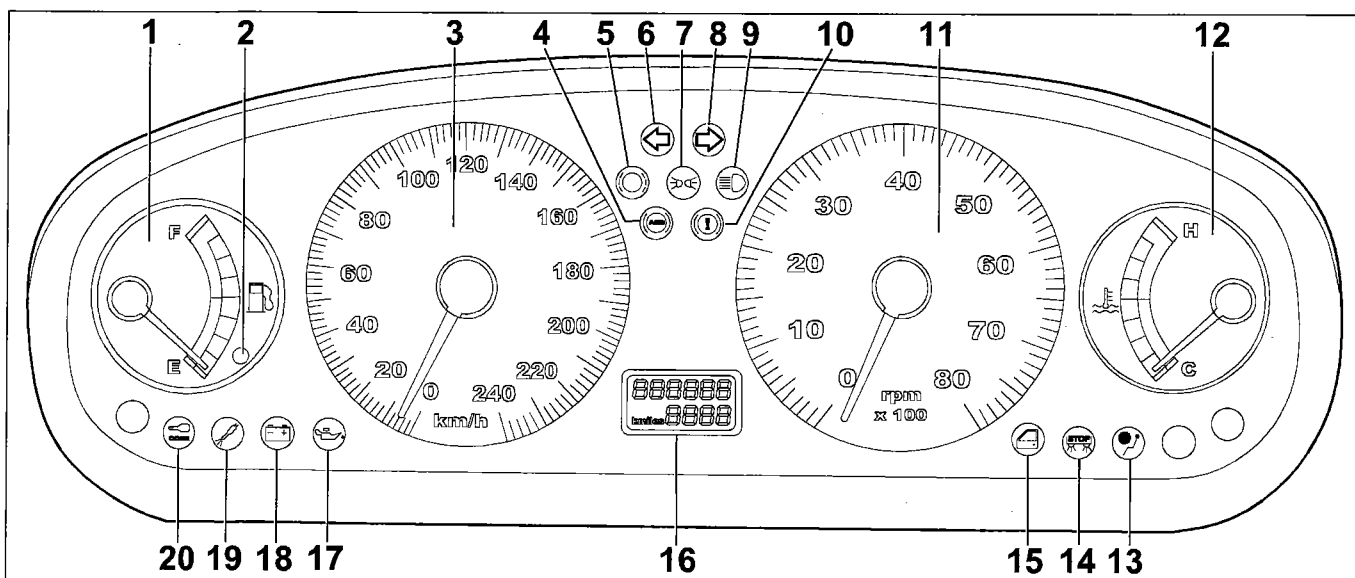
### 55.

#### PETROL VERSION NSI CONTROL PANEL FOR OUTFITS: ELX



4A22HL01

#### PETROL VERSION NSI CONTROL PANEL FOR OUTFITS: HGT



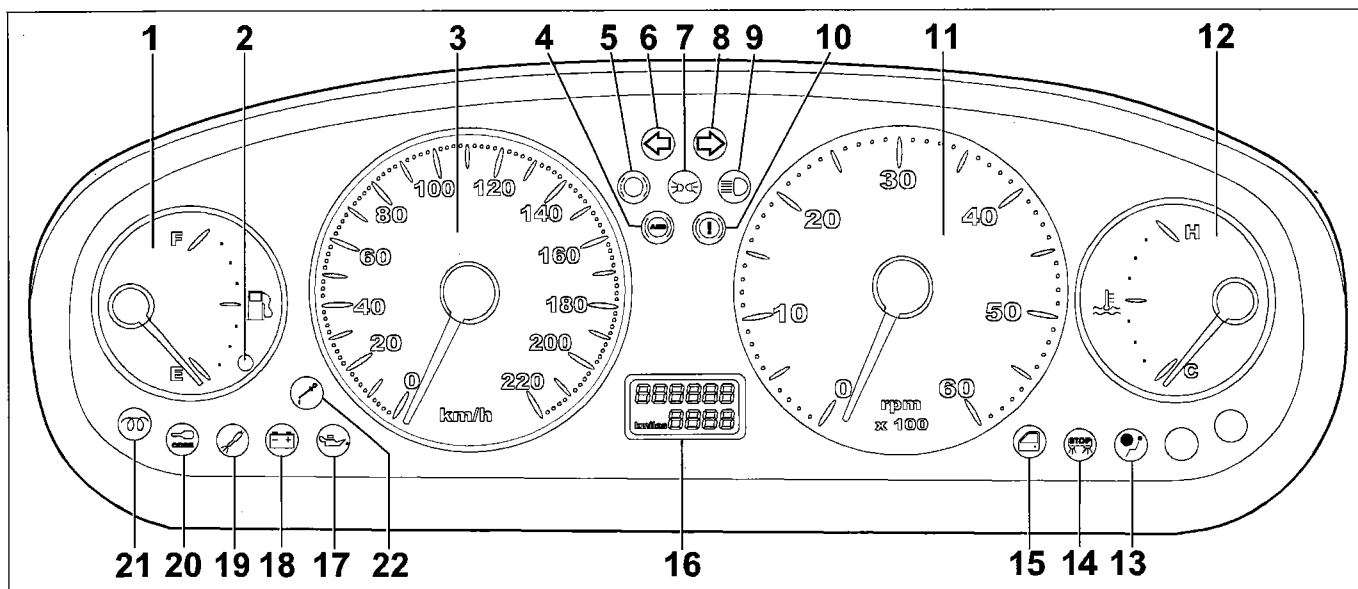
4A22HL02

#### Control panel front side

- |                                                                    |                                            |
|--------------------------------------------------------------------|--------------------------------------------|
| 1. Fuel gauge                                                      | 12. Engine coolant temperature gauge       |
| 2. Fuel reserve warning light                                      | 13. EURO BAG system failure warning light  |
| 3. Speedometer                                                     | 14. Brake lights failure warning light     |
| 4. A.B.S. failure warning light                                    | 15. Doors open warning light               |
| 5. Brake pad wear warning light                                    | 16. Odometer                               |
| 6. Left direction indicator warning light                          | 17. Low engine oil pressure warning light  |
| 7. Side lights warning light                                       | 18. Battery recharging warning light       |
| 8. Right direction indicator warning light                         | 19. Injection system failure warning light |
| 9. Main beam headlamps warning light                               | 20. Fiat CODE system failure warning light |
| 10. Handbrake applied/insufficient brake fluid level warning light |                                            |
| 11. Rev counter                                                    |                                            |



**TURBO DIESEL VERSION NSI CONTROL PANEL FOR OUTFIT:  
ELX (105BHP JTD)**



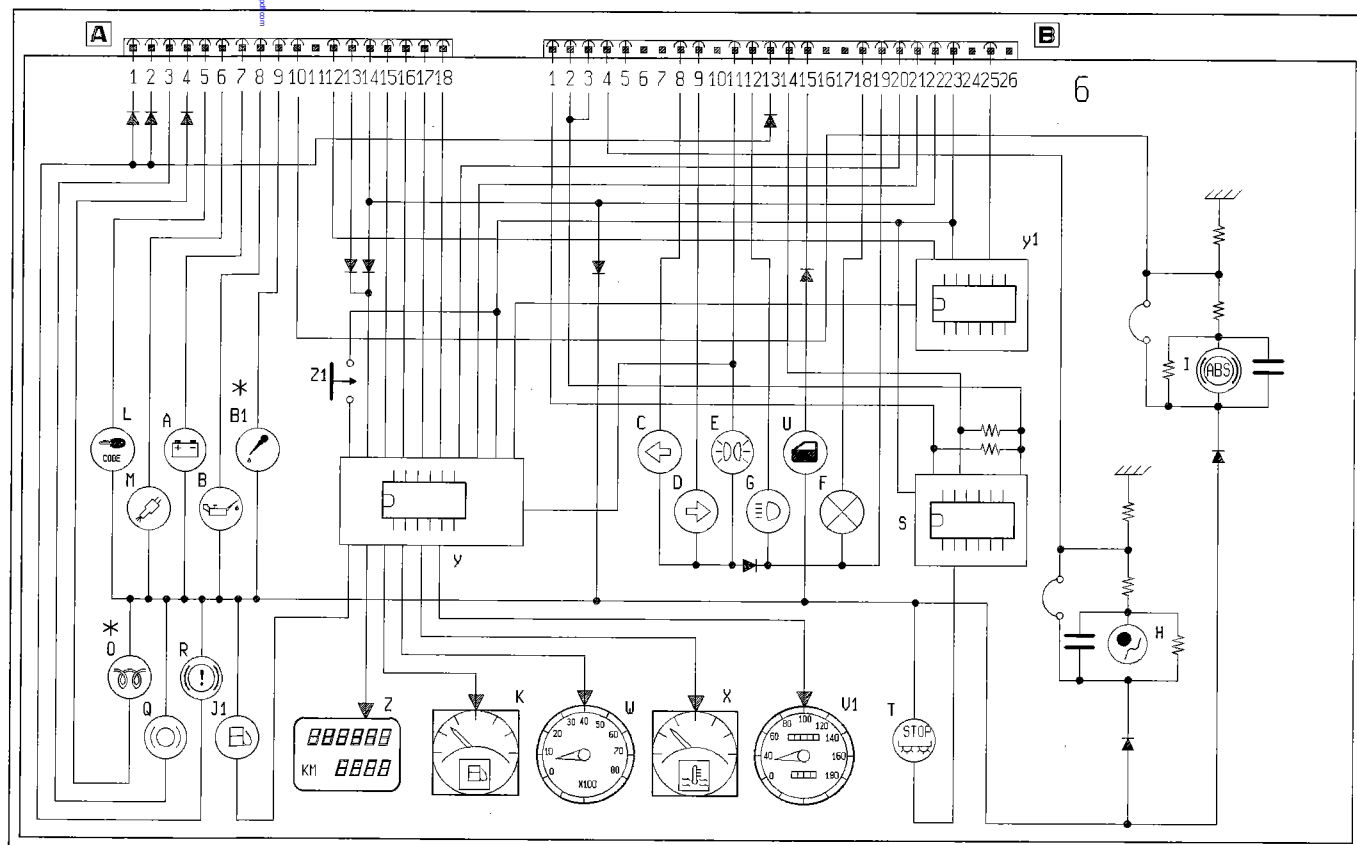
4A22HL03

**Control panel front side****Key**

- |                                                                    |                                            |
|--------------------------------------------------------------------|--------------------------------------------|
| 1. Fuel gauge                                                      | 13. EURO BAG system failure warning light  |
| 2. Fuel reserve warning light                                      | 14. Brake lights failure warning light     |
| 3. Speedometer                                                     | 15. Doors open warning light               |
| 4. A.B.S. failure warning light                                    | 16. Odometer                               |
| 5. Brake pad wear warning light                                    | 17. Low engine oil pressure warning light  |
| 6. Left direction indicator warning light                          | 18. Battery recharging warning light       |
| 7. Side lights warning light                                       | 19. Injection system failure warning light |
| 8. Right direction indicator warning light                         | 20. Fiat CODE system failure warning light |
| 9. Main beam headlamps warning light                               | 21. Glow plug warning light                |
| 10. Handbrake applied/insufficient brake fluid level warning light | 22. Engine oil warning light               |
| 11. Rev counter                                                    |                                            |
| 12. Engine coolant temperature gauge                               |                                            |

### 55.

#### Wiring diagram for SX - GT outfits

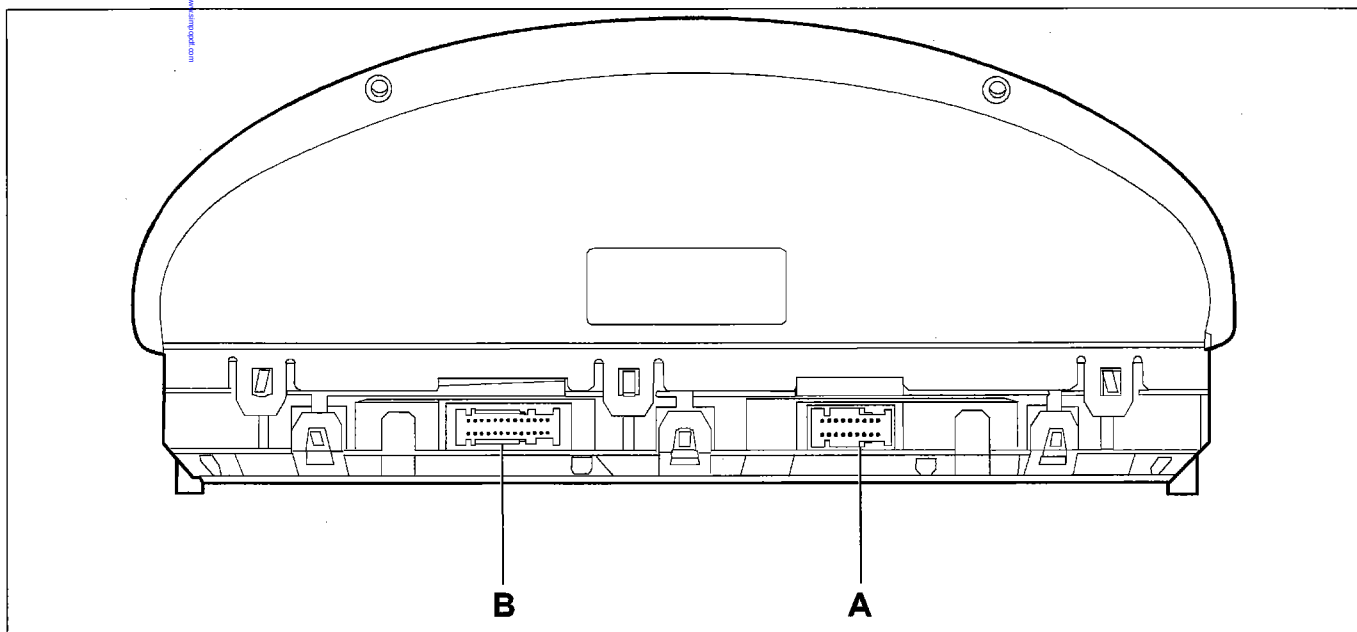


\* Present for 1910 JTD versions

4A22HL04

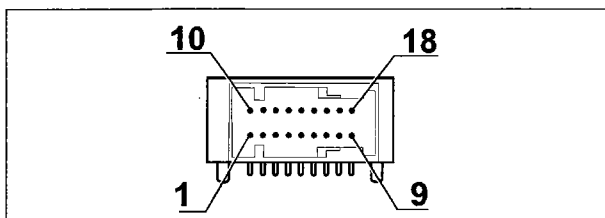
#### 6. Instrument panel:

- |                                                                        |                                                                  |
|------------------------------------------------------------------------|------------------------------------------------------------------|
| A Battery recharging warning light                                     | O Glow plug warning light (only for JTD versions)                |
| B Low engine oil pressure warning light                                | Q Front brake pad wear warning light                             |
| B1 Insufficient engine oil level warning light (only for JTD versions) | R Handbrake applied/insufficient brake fluid level warning light |
| C Left direction indicator warning light                               | S Brake lights failure electronic module                         |
| D Right direction indicator warning light                              | T Brake lights failure warning light                             |
| E Side lights warning light                                            | U Doors open warning light                                       |
| F Instrument panel ideogram light                                      | V1 Speedometer                                                   |
| G Main beam headlamps warning light                                    | W Rev counter                                                    |
| H EURO BAG system failure warning light                                | X Engine coolant temperature gauge                               |
| I Anti-lock brakes failure warning light                               | Y Electronic module                                              |
| J1 Fuel reserve warning light                                          | Y1 Speed control module                                          |
| K Fuel gauge                                                           | Z Milometer/trip meter display                                   |
| L Fiat-CODE failure warning light                                      | Z1 Trip meter zeroing button                                     |
| M Petrol/Diesel injection system failure warning light                 | Z2 Trip counter display light                                    |

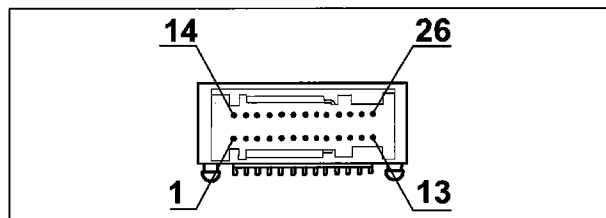


4A23HL01

Rear side (connector sockets are shown)



4A23HL02



4A23HL03

Connector A on left front lead

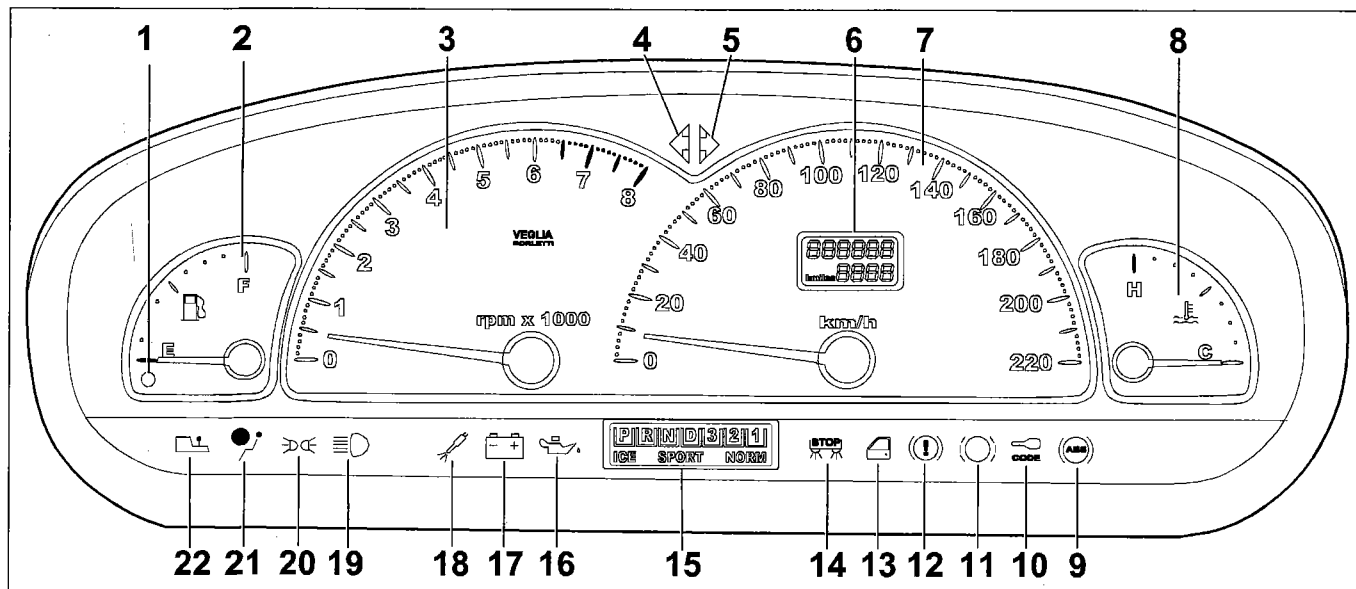
| No. pin | Wiring Colour | Circuit involved                                                      |
|---------|---------------|-----------------------------------------------------------------------|
| 1       | M             | Electronic brakeforce distributor (EBD) failure                       |
| 2       | BN            | Brake fluid level                                                     |
| 3       | BR            | Brake lining wear                                                     |
| 4       | CL            | Glow plug preheating (Turbo Diesel versions)                          |
| 5       | MN            | Fiat CODE                                                             |
| 6       | LN            | Injection failure (Not present for Turbo Diesel 75 BHP SOFT versions) |
| 7       | HN            | Generator                                                             |
| 8       | HG            | Insufficient engine oil pressure                                      |
| 9       | VG            | Insufficient engine oil level (not present for HGT)                   |
| 10      | RV            | ABS failure                                                           |
| 11      | -             | Not connected                                                         |
| 12      | HL            | Speedometer signal                                                    |
| 13      | R             | + 30 battery                                                          |
| 14      | CN            | Speedometer generator power supply                                    |
| 15      | HB            | Engine coolant temperature                                            |
| 16      | SB            | Outdoor temperature serial signal                                     |
| 17      | HM            | Speedometer signal                                                    |
| 18      | L             | Rev counter signal                                                    |

Connector B on facia lead

| No. pin | Wiring Colour | Circuit involved                |
|---------|---------------|---------------------------------|
| 1       | RG            | Left car brake light failure    |
| 2       | BR            | Brake light                     |
| 3       | -             | Not connected                   |
| 4       | LG            | Euro-Bag device failure         |
| 5       | BL            | Passenger Euro-bag deactivated  |
| 6       | -             | Not connected                   |
| 7       | -             | Not connected                   |
| 8       | AN            | Left turn signal                |
| 9       | A             | Right turn signal               |
| 10      | -             | Not connected                   |
| 11      | GN            | Side lights                     |
| 12      | VN            | Main beam headlamps             |
| 13      | BN            | Handbrake on                    |
| 14      | RN            | Right car brake light failure   |
| 15      | BH            | Doors open                      |
| 16      | NR            | Boot open (not present for ELX) |
| 17      | -             | Not connected                   |
| 18      | GR            | Instrument panel light          |
| 19      | N             | Earth (lighting)                |
| 20      | HR            | Fuel level                      |
| 21      | VB            | Outdoor temperature display     |
| 22      | AR            | + 15                            |
| 23      | NZ            | Electronic earth                |
| 24      | -             | Not connected                   |
| 25      | HM            | Speedometer signal              |
| 26      | -             | Not connected                   |

### 55.

PETROL VERSION VEGLIA BORLETTI CONTROL PANEL FOR OUTFIT:  
SX, ELX (1581 WITH AUTOMATIC TRANSMISSION)



4A24HL01

### Front side of control panels

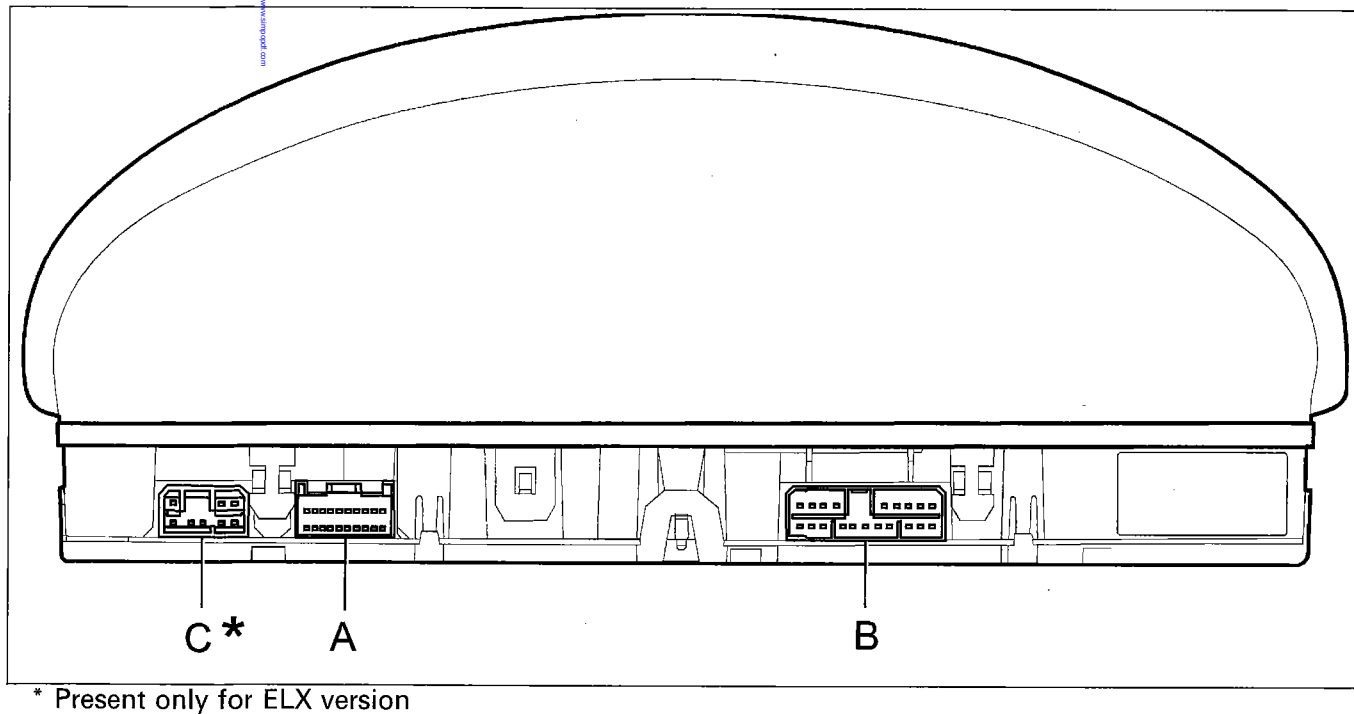
#### Key

- |                                                                    |                                                         |
|--------------------------------------------------------------------|---------------------------------------------------------|
| 1. Fuel reserve warning light                                      | 13. Doors open warning light                            |
| 2. Fuel gauge                                                      | 14. Brake lights failure warning light                  |
| 3. Rev counter                                                     | 15. Automatic transmission warning light                |
| 4. Left direction indicator warning light                          | 16. Low engine oil pressure warning light               |
| 5. Right direction indicator warning light                         | 17. Battery recharging warning light                    |
| 6. Odometer                                                        | 18. Injection system failure warning light              |
| 7. Speedometer                                                     | 19. Main beam headlamps warning light                   |
| 8. Engine coolant temperature gauge                                | 20. Side light failure warning light                    |
| 9. A.B.S. failure warning light                                    | 21. EURO BAG system failure warning light               |
| 10. Fiat CODE system failure warning light                         | 22. Automatic transmission system failure warning light |
| 11. Brake pad wear warning light                                   |                                                         |
| 12. Handbrake applied/insufficient brake fluid level warning light |                                                         |

4A25H101

W Rev counter  
X Engine coolant temperature gauge  
Z Milometer/trip meter display  
Z1 Trip meter zeroing button

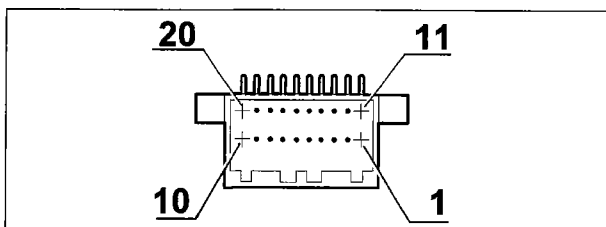
55.



\* Present only for ELX version

4A26HL01

Rear side (connector sockets are shown)

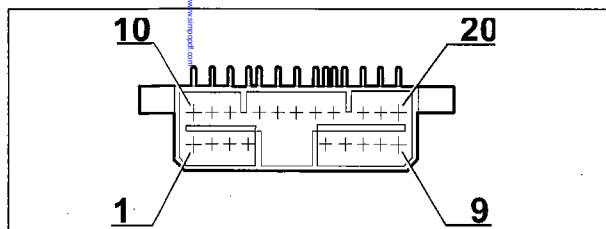


4A26HL02

Connector A on left front lead

| No. pin | Wiring Colour | Circuit involved                   |
|---------|---------------|------------------------------------|
| 1       | HN            | Generator                          |
| 2       | BN            | Brake fluid level                  |
| 3       | LN            | Injection failure                  |
| 4       | R             | +30 battery                        |
| 5       | -             | Not connected                      |
| 6       | -             | Not connected                      |
| 7       | -             | Not connected                      |
| 8       | BR            | Brake lining wear                  |
| 9       | MN            | Fiat CODE                          |
| 10      | -             | Not connected                      |
| 11      | -             | Not connected                      |
| 12      | HG            | Insufficient engine oil pressure   |
| 13      | HM            | Speedometer signal                 |
| 14      | -             | Not connected                      |
| 15      | CN            | Speedometer generator power supply |
| 16      | L             | Rev counter signal                 |
| 17      | HB            | Engine coolant temperature         |
| 18      | -             | Not connected                      |
| 19      | RV            | ABS system failure                 |
| 20      | -             | Not connected                      |



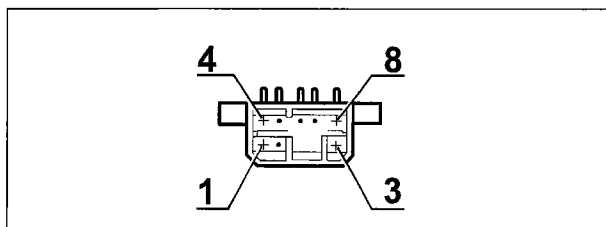


4A27HL01

**Connector B on facia lead**

| No. pin | Wiring Colour | Circuit involved       |
|---------|---------------|------------------------|
| 1       | VN            | Main beam headlamps    |
| 2       | GR            | Instrument panel light |
| 3       | GN            | Side lights            |
| 4       | -             | Not connected          |
| 5       | BN            | Handbrake on           |
| 6       | -             | Not connected          |
| 7       | N             | Earth                  |
| 8       | HG            | Speedometer output 1   |
| 9       | -             | Not connected          |

| No. pin | Wiring Colour | Circuit involved              |
|---------|---------------|-------------------------------|
| 10      | AN            | Left turn signal              |
| 11      | A             | Right turn signal             |
| 12      | -             | Not connected                 |
| 13      | ZN            | Automatic transmission signal |
| 14      | NZ            | Electronic earth              |
| 15      | -             | Not connected                 |
| 16      | HR            | Fuel level                    |
| 17      | AR            | + 15                          |
| 18      | LG            | Euro-bag device failure       |
| 19      | -             | Not connected                 |
| 20      | -             | Not connected                 |



4A27HL02

**Connector C**

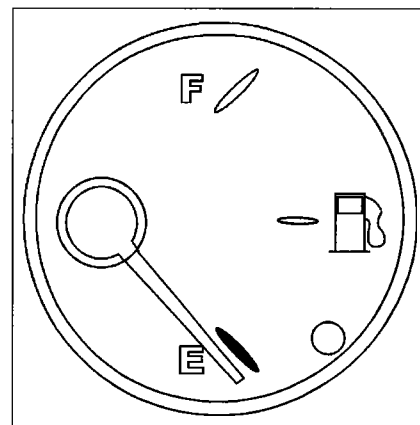
| No. pin | Wiring Colour | Circuit involved          |
|---------|---------------|---------------------------|
| 1       | BH            | Boot open                 |
| 2       | RG            | Left brake light failure  |
| 3       | RN            | Right brake light failure |
| 4       | AR            | + 15 battery              |
| 5       | N             | Electronic earth          |
| 6       | -             | Not connected             |
| 7       | BR            | Brake light               |
| 8       | -             | Not connected             |

### 55.

The following tables contain values for checking the various gauge positions: fuel level and coolant level

#### FUEL GAUGE

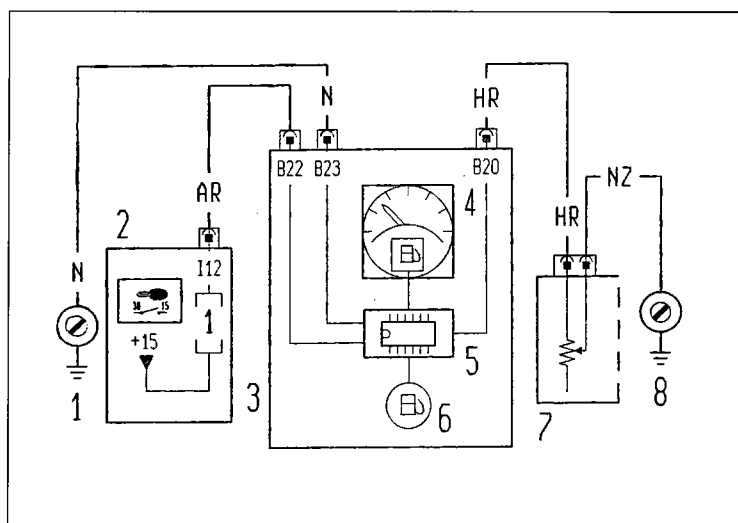
| Values for checking settings |               |
|------------------------------|---------------|
| Pointer position             | Value in Ohms |
| 4/4 (F)                      | $16 \pm 6$    |
| 1/2                          | $140 \pm 5$   |
| Start of reserve             | $240 \pm 5$   |
| 0 (E)                        | $292.5 \pm 9$ |



4A28HL01

#### Electrical operating diagram Fuel gauge

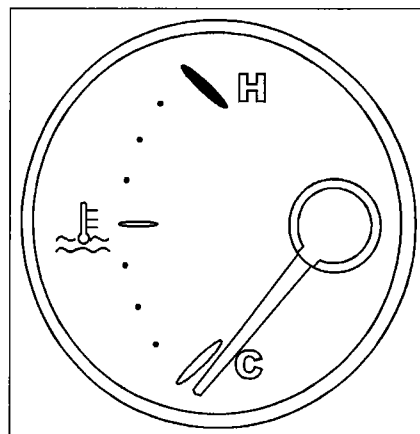
1. Left dashboard earth
2. Junction unit
3. Instrument panel
4. Fuel gauge
5. Fuel gauge control module
6. Fuel reserve warning light
7. Fuel level gauge
8. Right rear earth



4A28HL02

#### COOLANT TEMPERATURE GAUGE ENGINE COOLANT

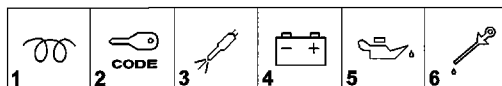
| Temperature of Coolant (°C) | Sensor Value (Ohms)                        | Pointer position |
|-----------------------------|--------------------------------------------|------------------|
| 50                          | $820 \pm 36$                               | 0°               |
| 80 - 100                    | $273 - 143$ <sup>+11</sup> / <sub>-4</sub> | 45°              |
| 130                         | $62 \pm 4$                                 | 90°              |



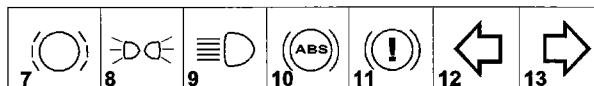
4A28HL03

### WARNING LIGHTS

Warning lights for Turbo Diesel and petrol versions with outfits: SX; HSX; GT.



4A29HL01



4A29HL02

1. Glow plug warning light (only for turbodiesel versions)
2. Fiat-CODE failure warning light
3. Injection system failure warning light
4. Battery recharging warning light
5. Low engine oil pressure warning light
6. Insufficient engine oil level warning light (only for JTD versions)

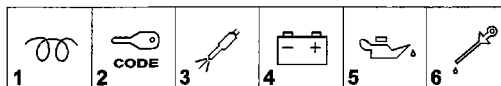
7. Brake pad wear warning light
8. Side lights warning light
9. Main beam headlamps warning light
10. A.B.S. failure warning light
11. Handbrake applied/insufficient brake fluid level warning light
12. Left direction indicator warning light
13. Right direction indicator warning light



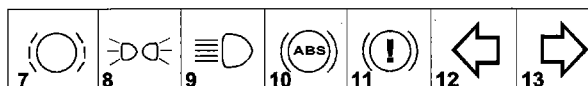
4A29HL03

14. Passenger side EURO BAG system failure warning light

Warning lights for turbo diesel and petrol versions with outfit: ELX.



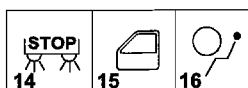
4A29HL04



4A29HL05

1. Glow plug warning light (only for turbodiesel versions)
2. Fiat-CODE failure warning light
3. Injection system failure warning light
4. Battery recharging warning light
5. Low engine oil pressure warning light
6. Insufficient engine oil level warning light (only for JTD versions)

7. Brake pad wear warning light
8. Side lights warning light
9. Main beam headlamps warning light
10. A.B.S. failure warning light
11. Handbrake applied/insufficient brake fluid level warning light
12. Left direction indicator warning light
13. Right direction indicator warning light



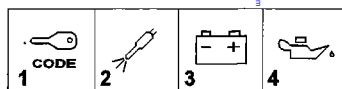
4A29HL06

14. Brake lights failure warning light

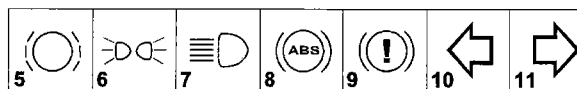
15. Doors open warning light
16. EURO BAG system failure warning light

### 55.

#### Warning lights for petrol version with outfit: HGT



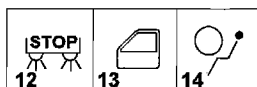
4A30HL01



4A30HL02

1. Fiat-CODE failure warning light
2. Injection system failure warning light
3. Battery recharging warning light
4. Low engine oil pressure warning light
5. Brake pad wear warning light

6. Side lights warning light
7. Main beam headlamps warning light
8. A.B.S. failure warning light
9. Handbrake applied/insufficient brake fluid level warning light
10. Left direction indicator warning light
11. Right direction indicator warning light

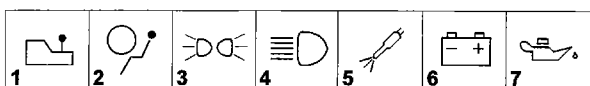


4A30HL03

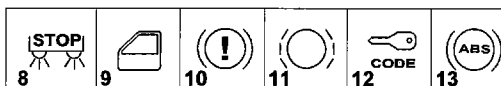
12. Brake lights failure warning light
13. Doors open warning light

14. Passenger side EURO BAG off warning light

#### Warning lights for 1581 version with automatic transmission and outfits: SX, ELX.



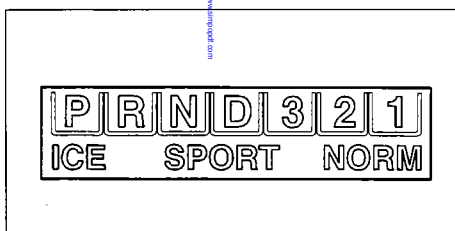
4A30HL04



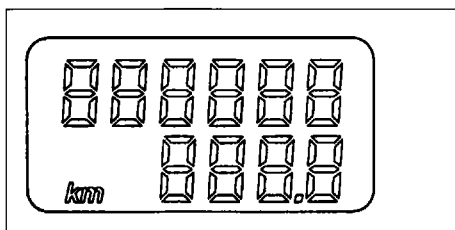
4A30HL05

1. Automatic transmission system failure warning light
2. EURO BAG system failure warning light
3. Side lights warning light
4. Main beam headlamps warning light
5. Injection system failure warning light
6. Battery recharging warning light

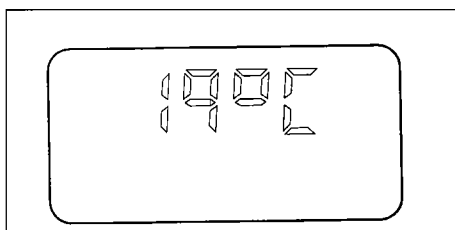
7. Low engine oil pressure warning light
8. Brake lights failure warning light (not present for SX versions)
9. Doors open warning light (not present for SX versions)
10. Handbrake applied/insufficient brake fluid level warning light
11. Brake pad wear warning light
12. Fiat-CODE failure warning light
13. A.B.S. failure warning light



P4A31HL01



P4A31HL02



P4A31HL03

### AUTOMATIC TRANSMISSION GEARS INDICATOR

On versions with automatic transmission it indicates the gear engaged and the selection mode

### MILOMETER

With the ignition ON, the milometer displays the total or partial mileage (by pressing the special button).

If the button is pressed for longer than 0.7 seconds, the trip meter is zeroed

### OUTSIDE TEMPERATURE

On versions fitted with climate control it is possible, by pressing the button in the console for at least 1 second, to display the outside temperature (in °C), which is shown for about 10 seconds; the instrument automatically returns to the milometer function.

If the outside temperature is below +3°C, it is displayed FLASHING for about 10 seconds in order to attract the driver's attention to the possibility of it being icy.

When the 10 seconds have elapsed, the display automatically returns to the milometer state for 20 seconds and then the outside temperature is flashed for 10 seconds.

The sequence described above is known as the "warning cycle".

This takes place only once after the detection of an outside temperature below +3°C and can only be repeated after the outside temperature goes above 6 °C and then below 3 °C.

With the ignition ON and the outside temperature below 3 °C the instrument displays the "warning cycle" for the first 10 seconds.

If, during the first 10 seconds after the ignition is switched on, the outside temperature button is pressed, the "warning cycle" does not take place and the switching to the outside temperature state is immediate.

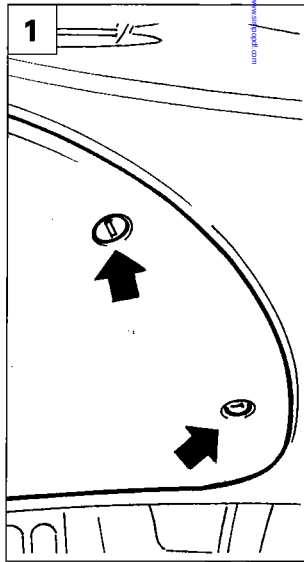
Pressing the zeroing button during the warning cycle has the following effect:

Pressing the button for 1 second whilst the temperature is displayed causes the "warning cycle" to stop; pressing it for 1 second during the 20 seconds when the mileage is displayed causes the zeroing of the trip meter, but does not interrupt the "warning cycle".

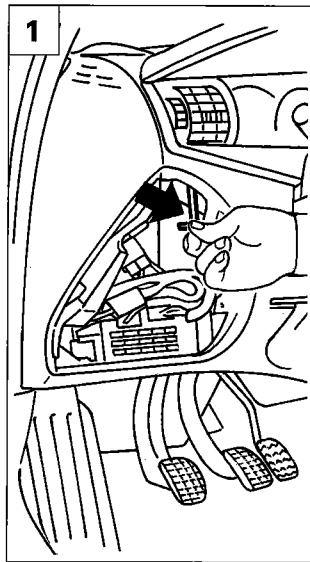


*The milometer display is also used to carry out a fault diagnosis of the thermostatically adjusted air conditioning electronic system (see group 50)*

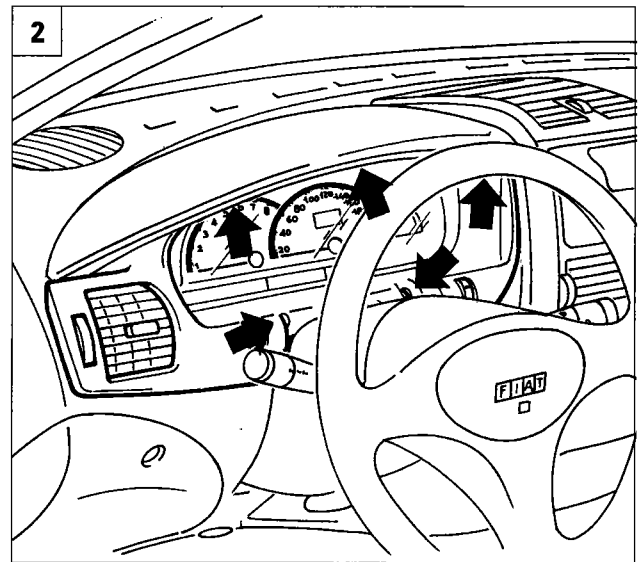
# 55.



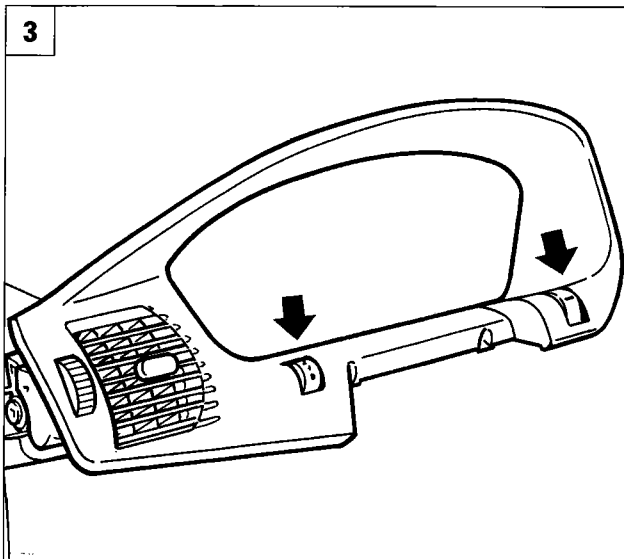
P4A32HL01



P4A32HL02



P4A32HL03



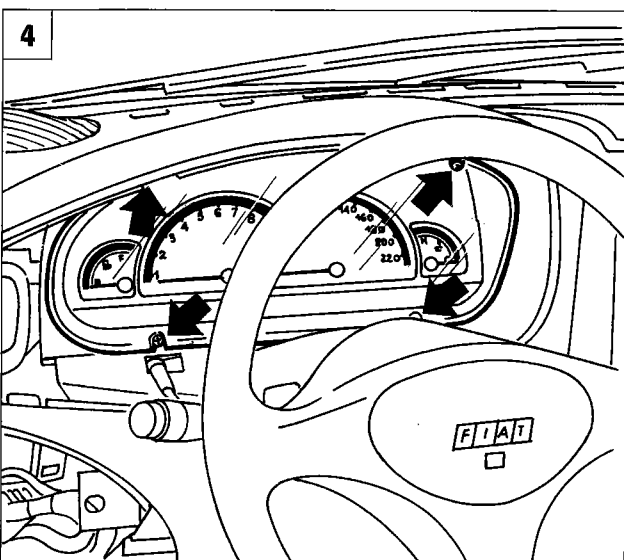
P4A32HL04



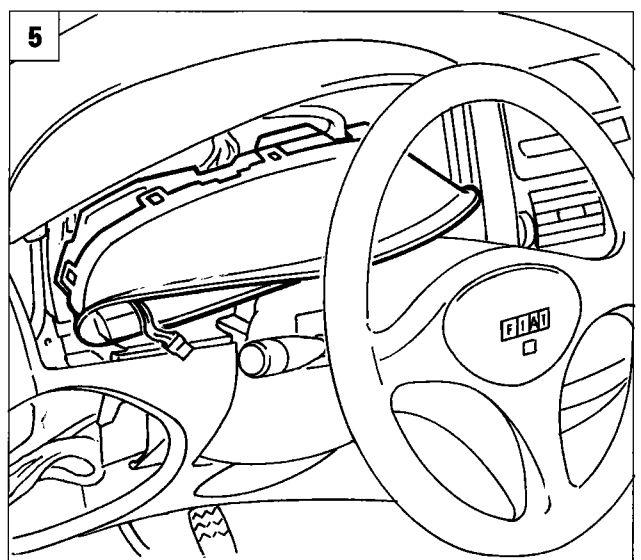
### REMOVING-REFITTING

Remove the steering column upper and lower covers and then proceed as described below:

1. Remove the protective cover for the junction unit. Undo the outer bolt fixing the instrument panel frame.
2. Undo the outer bolts fixing the instrument panel frame.
3. Extract the frame from the dashboard after having disconnected the connector for the headlamp dimmer (shown by the arrow).
4. Undo the bolts fixing the instrument panel to the dashboard.
5. Disconnect the two electrical connections for the instrument panel and remove it from the vehicle.

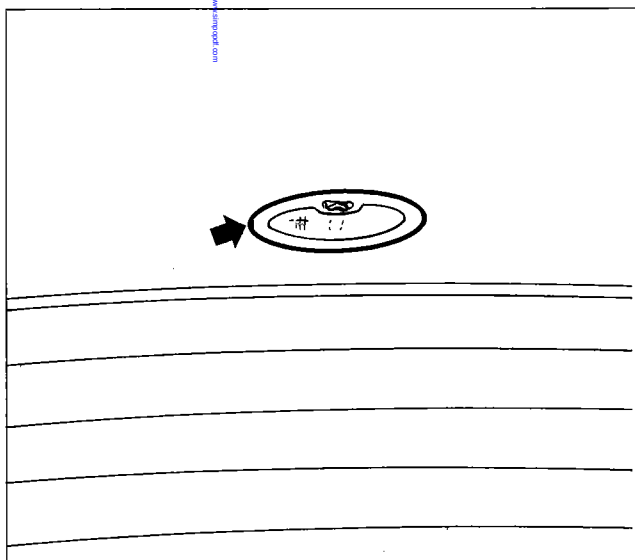


P4A32HL05



P4A32HL06



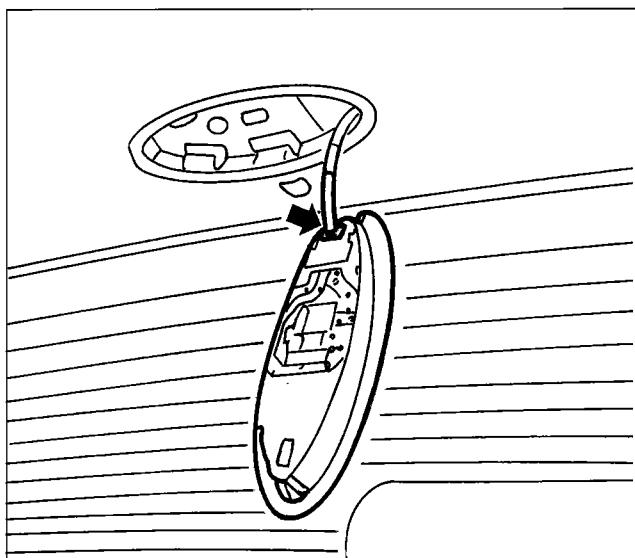


P4A33HL01



#### REMOVING-REFITTING REAR COURTESY LIGHT AND REPLACING BULB

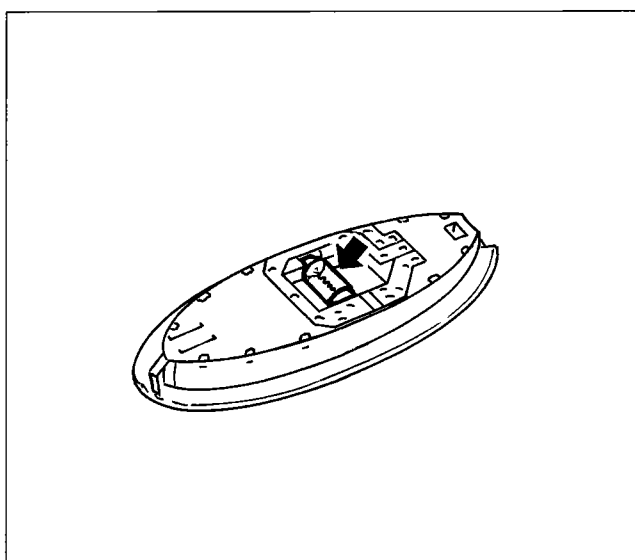
- Using a screwdriver in the side slit, remove the courtesy light from its housing;



P4A33HL02



- disconnect the connector and remove the courtesy light;

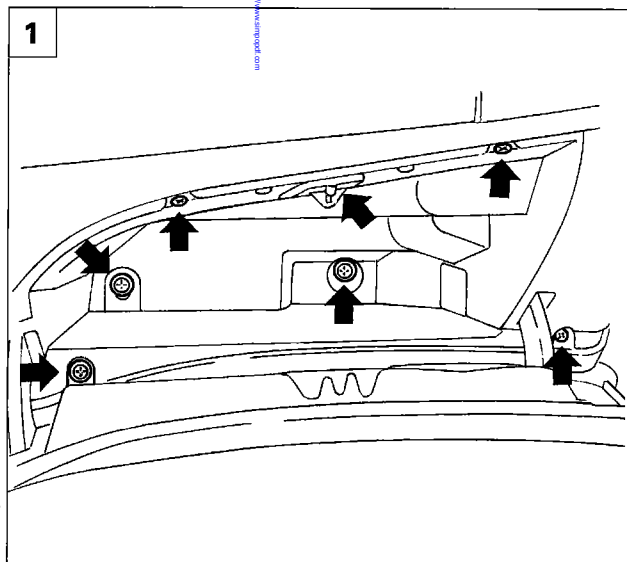


P4A33HL03



- release the bulb from the flexible tabs and remove it.

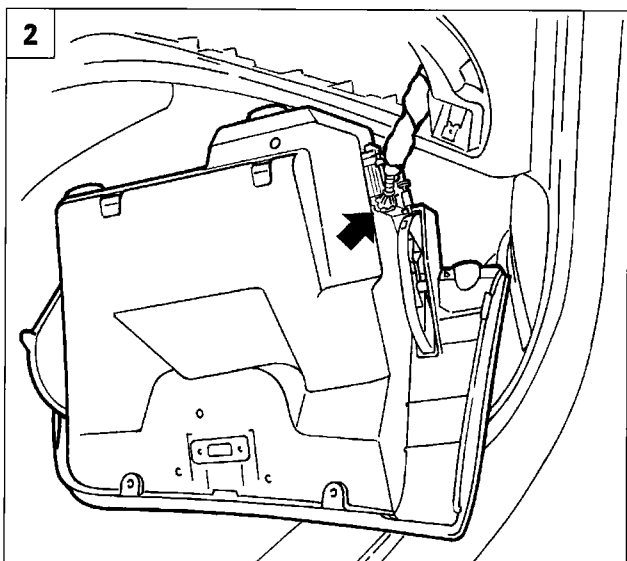
# 55.



P4A34HL01

### LOCATION OF ADDITIONAL FUSES - RE- LAYS (dashboard - passenger side)

1. Undo the bolts shown in the diagram and extract the glove compartment from its housing;



P4A34HL02

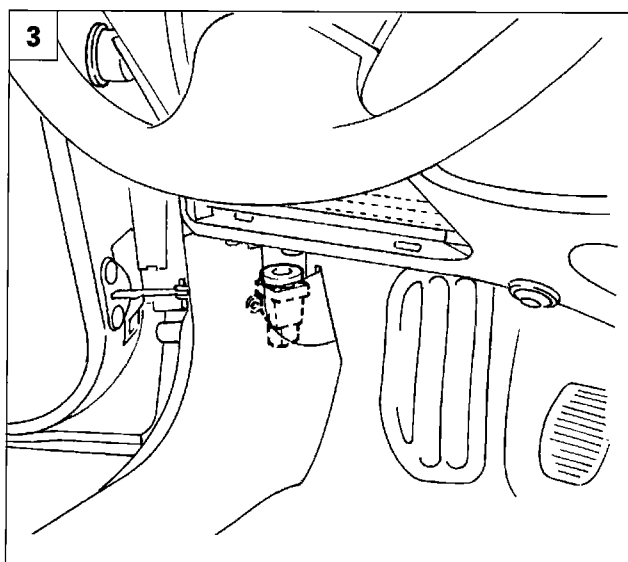
2. disconnect the electrical connector and remove the glove compartment from the vehicle, behind which the additional re-lays and fuses are located.

### INERTIA SWITCH

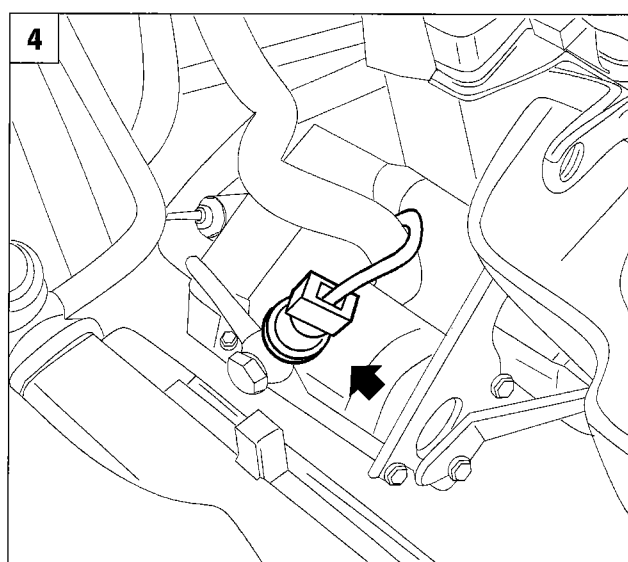
3. The inertia switch is located inside the vehicle under the dashboard on the driver's side

### POWER ASSISTED STEERING PUMP SENSOR

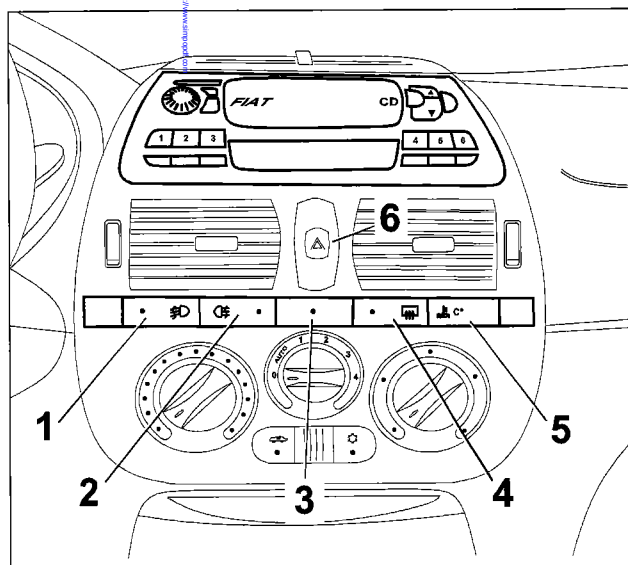
4. Location of power assisted steering pump sensor (valid for 1242 versions only)



P4A34HL03



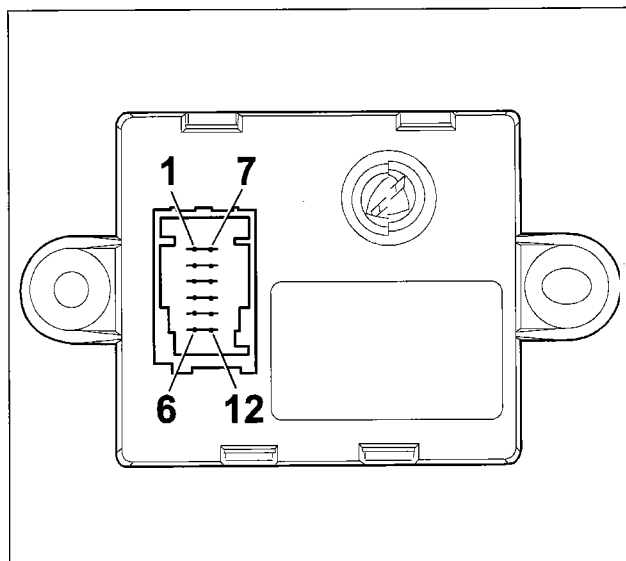
P4A34HL04



P4A35HL01

### CONTROL BUTTONS IN THE DASH-BOARD

1. Front fog lights (where fitted);
2. Rear fog lamps;
3. LED signalling "alarm on" (where fitted);
4. Button for switching heated rear wind-screen on/off;
5. Button for outside temperature display
6. Button for switching hazard warning lights on/off



P4A35HL02

### ENGINE OIL LEVEL CONTROL UNIT

| PIN No. | 12 way connector         |
|---------|--------------------------|
| 1       | Key                      |
| 2       | + Battery                |
| 3       | GND                      |
| 4       | Sensor earth             |
| 5       | Sensor positive          |
| 6       | Outlet for warning light |
| 7       | Spare                    |
| 8       | Test                     |
| 9       | Magneti Marelli Test     |
| 10      | Spare                    |
| 11      | Spare                    |
| 12      | Spare                    |

The 1919 JTD version is fitted with a warning light signalling the engine oil level operated by a control unit located behind the glove compartment.

The warning lights in the instrument panel carry out a self-test lasting about 2 seconds when the ignition is switched on.

If the engine oil level is below the minimum level, the electronic control unit switches on the warning light for 30 seconds at a frequency of 2 Hz.

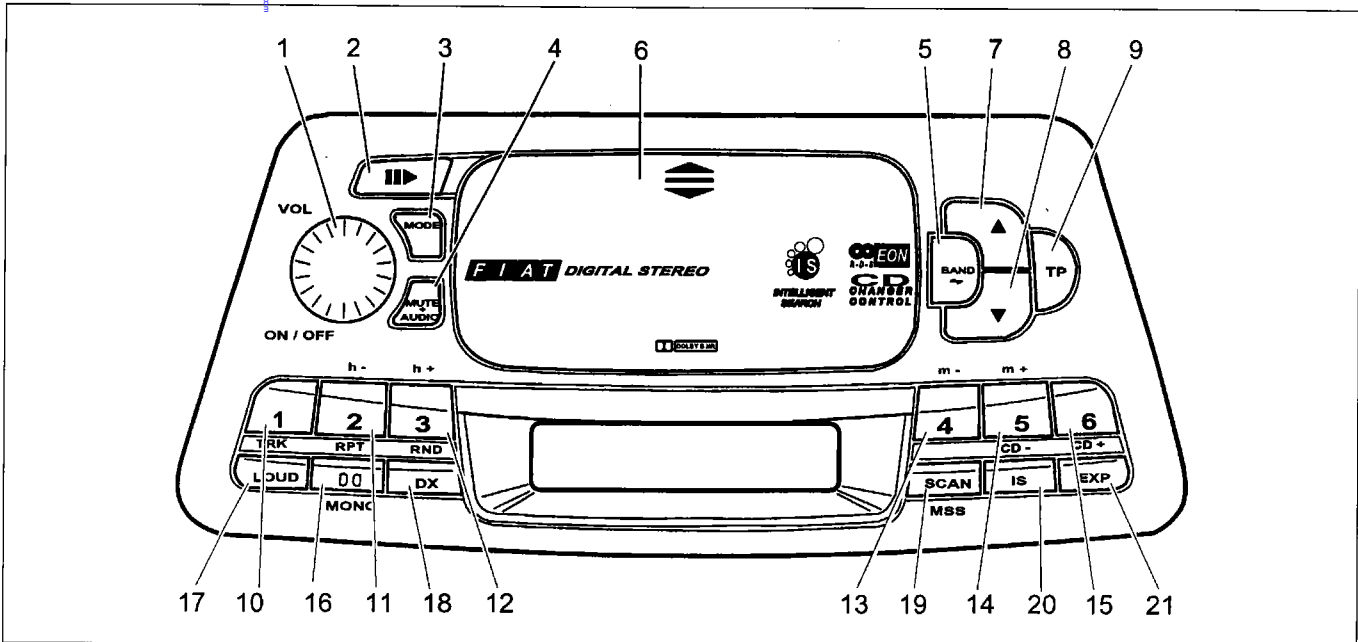
In the case of a sensor short circuit or open circuit, there will be a signal consisting of 2 flashes at a frequency of 2 Hz, a pause of 2 seconds and 2 flashes at 2 Hz with the cycle repeated 10 times in 30 seconds.

With the voltage below 8.5 V, the control unit displays the engine oil level memorized at the last reading via the warning light.

With the engine oil level below the minimum level, the warning light remains on constantly for 30 seconds.

# 55.

## AD 182 H2 RADIO CASSETTE PLAYER



P4A36HL01

4. VOL control: switching on/off of radio, adjustment of high/low tones and Balance/Fader functions
2. Cassette eject button
3. MODE button: selection of Radio, Audiocassette player and CD player functions; temporary pause in listening to audiocassette
4. AUDIO-MUTE control: selection of Bass, Treble, Balance and Fader functions; MUTE function
5. BAND button: selection of FM1, FM2, FM3, MW and LW bands; change side of audiocassette; section of AUTOSTORE function
6. Audiocassette housing
- 7.8. Buttons for recalling contents of IS memory; RDS transmitter search; manual transmitter search; TP function volume setting; selection of PTY programmes; changing of audiocassette or CD track; fast forward/rewind of CD or audiocassette; sections of EXPERT control level adjustments
9. TP button: selection of Traffic Program (TP) function and Types of programmes function (PTY); selection of Alternative Frequencies (AF) function
10. Switch for programming station N1: selection of TRACK REPEAT function
11. Switch for programming station N2: CD player TRACK REPEAT function
12. Switch for programming station N3: selecting TRACK RANDOM function; setting time (hour); introducing secret code figures
13. Switch for programming station N4: selecting TP function volume; setting minutes; deactivating clock synchronization with RDS TIMER signals; selecting LNR function; setting on volume; selecting radio suppressing function when "HANDS-FREE" phone is fitted; adjusting telephone input sensitivity; keying in secret code figures; switching off BOOSTER delay
14. Switch for programming station N5: selecting TP function volume; selecting previous CD; activating synchronization of clock with RDS TIMER signals; switching off LNR function; setting on volume; switching on BOOSTER delay; deactivating audio suppressing function when HANDS-FREE system is fitted; selecting telephone input sensitivity; keying in secret code
15. Switch for programming station N6: selecting previous CD
16. DOLBY function button
17. LOUDNESS function on/off button
18. Button for setting sensitivity for radiophone station search.
19. SCAN/MSS button: activating/deactivating of audiocassette player MSS function; activating/deactivating of CD player SCAN function
20. IS button: tuning and automatic "intelligent" search
21. EXP button: activating EXPERT control level

**GENERAL DESCRIPTION**

The vehicle is available, on request, with a radio system consisting of the following main components:

- radio cassette player (which cannot be removed) model AD 182 H2 fitted in place of the previous version in the centre of the instrument panel. The personalized front section is fully integrated with the line of the dashboard;
- six speakers, two of which are located at the sides in the upper part of the dashboard, two positioned as in the previous system in the inner panels of the front doors and, lastly, two located at the sides of the rear parcel shelf;
- aerial located in the front centre section of the roof.
- cable for connection with compact disc player (CD), if fitted;

The AD 182 H2 radio cassette player contains the following functions:

**Radio section**

- PLL tuning with FM/MW/LW frequency bands
- RDS (Radio Data System) with TP (Traffic Program) - EON functions
- Automatic / manual station tuning
- Manual programming of 6 stations on FM1, FM2, FM3 bands and MW and LW bands
- Automatic programming of transmitters through Autostore function at buttons 1,2,3,4,5,6 on FM1, FM2, FM3, MW and LW bands
- DX automatic function (Distant: maximum sensitivity in searching for radio stations)
- Automatic programming (Autostore)

**Audiocassette function**

- Autoreverse
- Tape fast forward or rewind
- Music Search System function (automatic search for previous / next track)
- DOLBY B (noise reduction circuit) (\*)

**Compact Disc section** (if a CD player is fitted)

- Disc selection (Disc No.)
- Track selection (forwards / backwards)
- Track scanning (SCAN function)
- Fast forward or rewind (TRACK FAST function)
- Track repetition (TRACK REPEAT)
- Track repetition (REPEAT function)
- Track repetition in random order (TRACK RANDOM function)

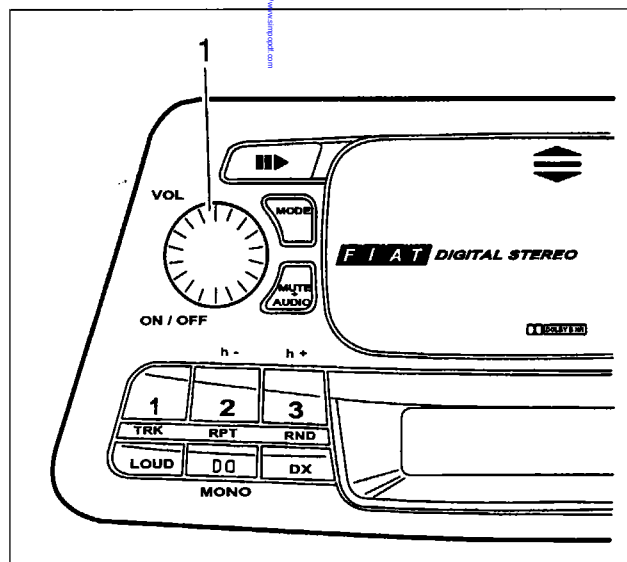
**Audio section**

- Loudness Function
- Mute Function
- Pause Function
- Separate adjustment of high / low tones
- Right / left and front / rear channels balance
- Radio on / off logic selection
- TP function volume level pre-setting

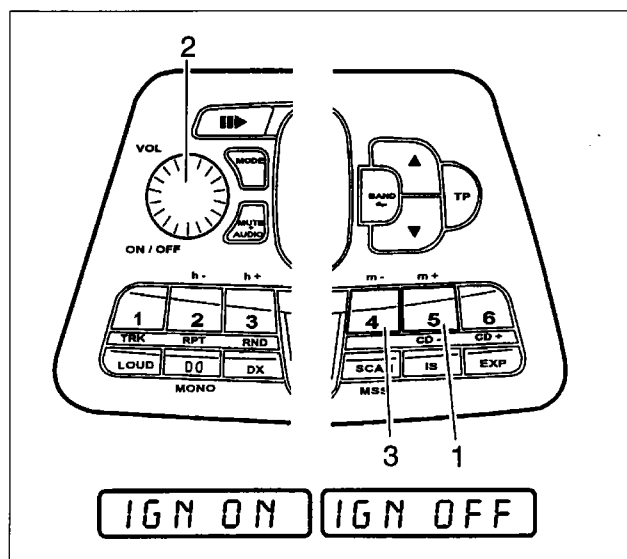
**Clock section**

- Adjustment of hours / minutes
- Expert control level section
- Anti-theft protection

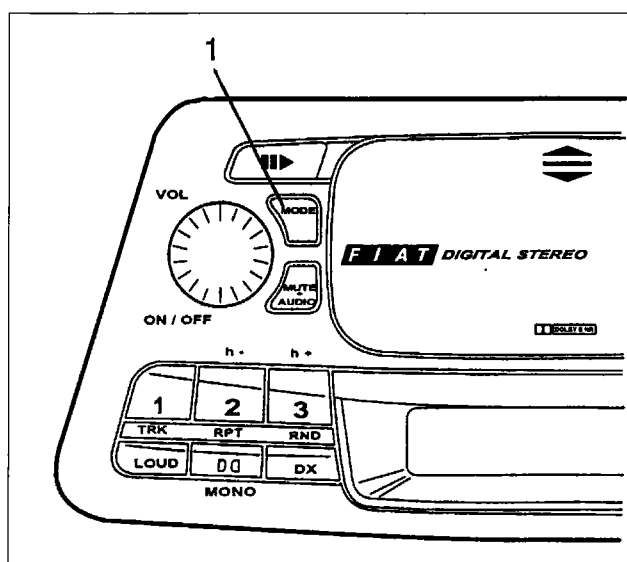
(\*) *The DOLBY noise reduction circuit is manufactured, under licence, by Dolby Laboratories Licensing Corporation. DOLBY and the double D symbol are the registered trade marks.*



P4A38HL01



P4A38HL02



P4A38HL03

## OPERATION

### Switching on the radio

Press the VOL control (1) once: the radio should come on. If the radio is on when the engine is switched off, it switches off automatically after about 20 minutes.

### Switching on/off with engine started up/switched off

The radio contains a switching on logic which, if activated, allows the radio to be switched on/off at the same time as the engine is started up/switched off.

If the logic is activated: when the engine is started up/switched off, the radio is automatically switched on/off;

If the logic is not activated: the switching on/off of the engine takes place independently of the switching on/off of the radio.

To activate this logic, keep the button 5 for selecting stations (1) with the radio switched off pressed until the words "IGN ON" appear on the display, then switch on the radio using the VOL control (2).

**The logic is only activated when the radio is switched on via the VOL control.**

To deactivate this logic, keep the button 4 for selecting stations (3) with the radio switched off pressed until the message "IGN OFF" appears on the display.

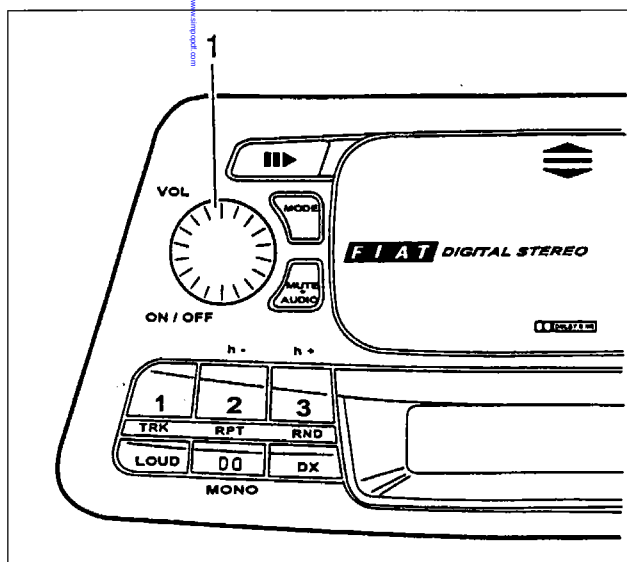
### Selecting radio/audiocassette/Compact Disc functions

Press the MODE button (1) repeatedly to cyclically select one of the following functions:

- RADIO, the displays will temporarily show the message "RADIO"
- AUDIOCASSETTE (if switched on previously), the display will temporarily show the message "TAPE A" or "TAPE B"
- COMPACT DISC (if a Compact Disc player is fitted), the display will show the message "MCD"

**NOTE** The functions which cannot be selected are automatically excluded.





P4A39HL01

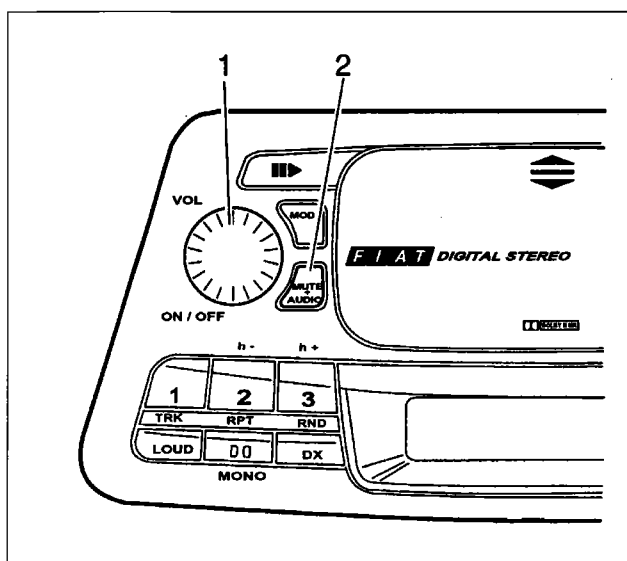
### Pause function

If another function (such as for example the radio) is selected whilst listening to an audiocassette or a Compact Disc, the reproduction is halted and on returning to the "Audio-cassette" or "Compact Disc" mode it continues from where it left off. If another function is selected whilst listening to the radio, when returning to the "Radio" mode, the last station selected is tuned into.

### Adjusting the VOLUME

The desired volume is adjusted using the VOL control (1).

The volume level, between "VOL 00" and "VOL 31" is shown on the display during the adjustment.



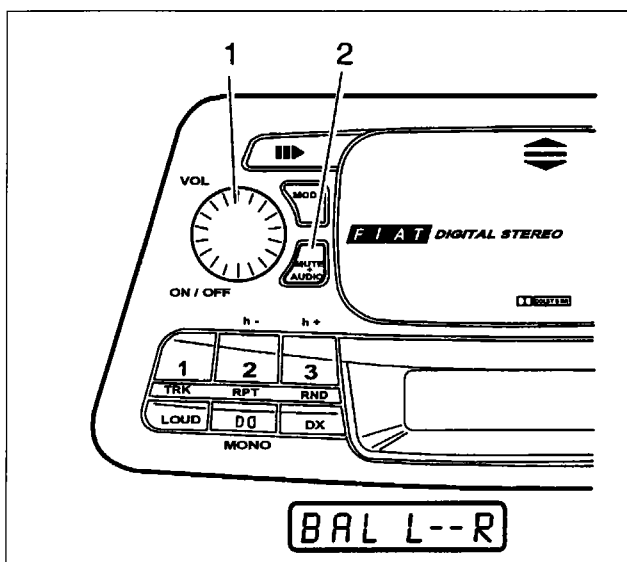
P4A39HL02

### Adjustment of LOW and HIGH tones (BASS and TREB)

Select the "BASS" or "TREB" function by pressing the AUDIO button (2) briefly once or more.

Having selected the function, adjust the desired sound using the VOL control (1).

To restore the basic adjustment, press the AUDIO button (2) for about 3 seconds until the message "00" or "---" appears on the display.



P4A39HL03

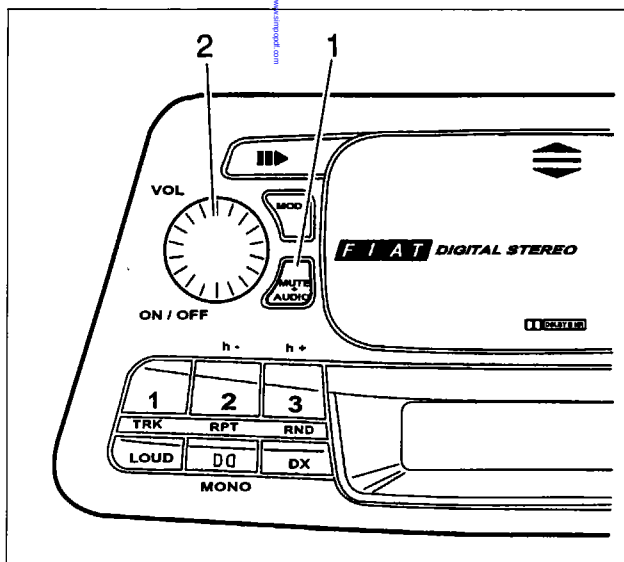
### Adjusting the BALANCE between the left and right speakers

The balance is the "volume ratio" between the left and right speakers.

The adjustment is possible by pressing the AUDIO button (2) briefly several times to select the "BALANCE" function. The display will show the message "BAL L- -R". The desired balance can be obtained by regulating the VOL control (1).

The values which can be selected range from 00 to 31. To restore the basic setting, press the AUDIO button (2) for about 3 seconds until the message "00" or "- -" appears on the display.

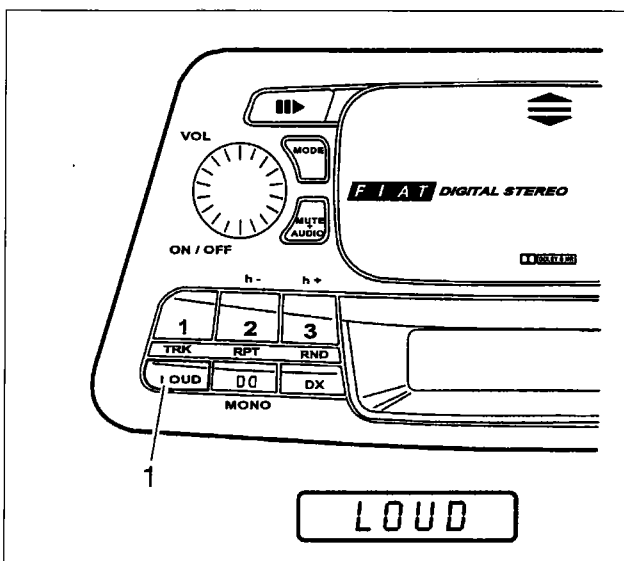
# 55.



P4A40HL01

### Adjustment of balance between front and rear speakers (FADER)

By selecting the FADER function it is possible to modify the "distribution of the volume" between the front and rear speakers. The FADER function is selected by pressing the AUDIO button (1) once or more until the message "FAD 0" appears on the display. The VOL control (2) is used to adjust the intensity of the sound, accentuating the sound coming from the front speakers or from the rear speakers.



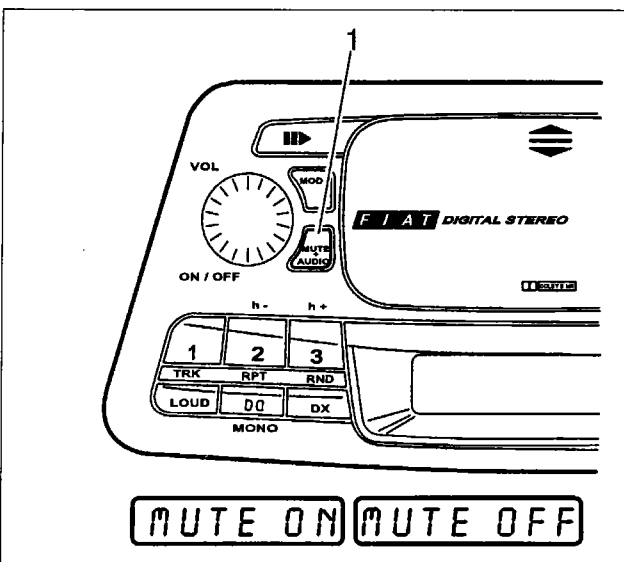
P4A40HL02

### LOUDNESS function

The LOUDNESS function involves improving the sound with the volume turned down. By pressing the LOUD button (1) this function is activated and the message "LOUD" appears on the display. To deactivate the function activated previously, simply press the LOUD button (1) again.

### MUTE function

By pressing the AUDIO button (1) for about 3 seconds, the MUTE function is selected and the message "MUTE ON" appears on the display (diagram below). To deactivate this function, the AUDIO button has to be pressed again. The message "MUTE OFF" will appear on the display. When the Mute function is selected, the radio no longer sends any signals to the speakers.



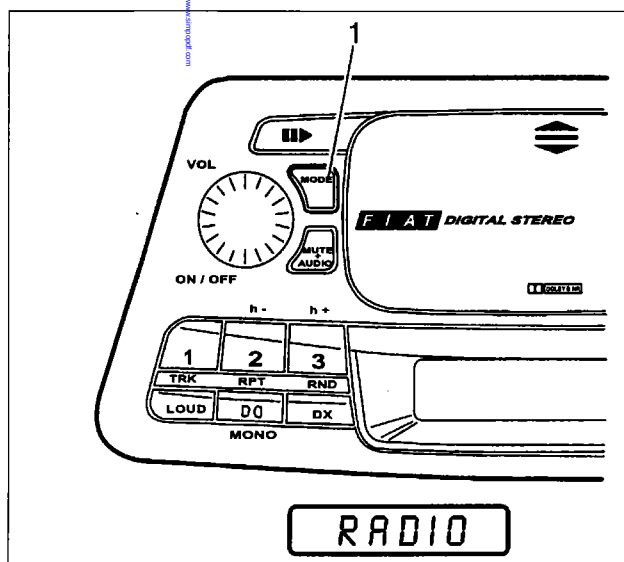
P4A40HL03

### RADIO function



Reception conditions vary constantly whilst driving. Reception can be interfered with by the presence of mountains, buildings or bridges, especially when the transmitter is far away.

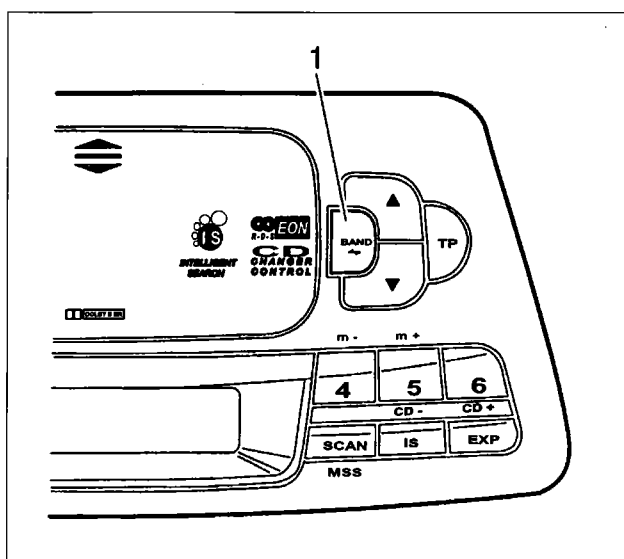
**NOTE** When the "RADIO" function is activated, the last station listened to before switching off is received.



P4A41HL01

### Selecting a function

As soon as the system is switched on, the radio is played. To select the Radio function whilst listening to a cassette or a Compact Disc, press the MODE button (1) repeatedly until the word "RADIO" appears on the display.



P4A41HL02

### Selecting a band

By pressing the BAND button (1) briefly several times it is possible to select the available bands. The display shows the message for the band selected. The possible messages are:

- "FM1", "FM2", "FM3" for FM frequency bands
- "MW", medium wave, "LW", long wave, for AM bands.

### Automatic intelligent turning (IS function)

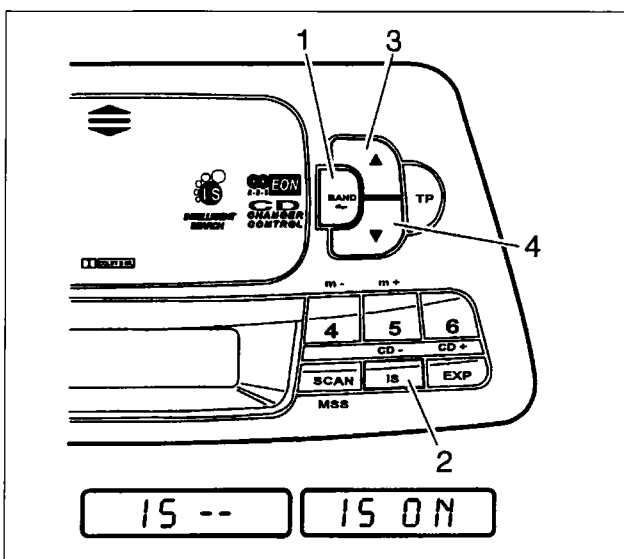
Using the BAND button (1) select the "FM1", "FM2" or "FM3" range.

Press the IS button (2) briefly for the intelligent automatic search.

At the end of the search the RDS programmes are memorized first and then the transmitters according to their transmission power in the radio IS memory. The IS memory is capable of storing up to 30 transmitters. If reception is not possible, it remains constantly activated; to interrupt it, press one of the station selection buttons (1,2,3,4,5,6).

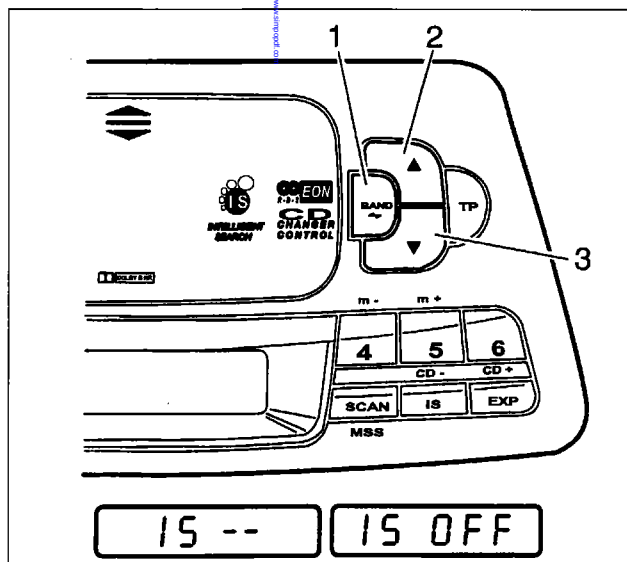
To recall the transmitters stored in the IS memory, select the IS operating mode by pressing one of the buttons "▲" "▼" (3,4) for about 3 seconds until the message "IS - -" is shown on the display and then "IS ON".

By pressing one of the "▲" "▼" buttons briefly it is possible to gradually recall the transmitters memorized.



P4A41HL03

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P4A42HL01

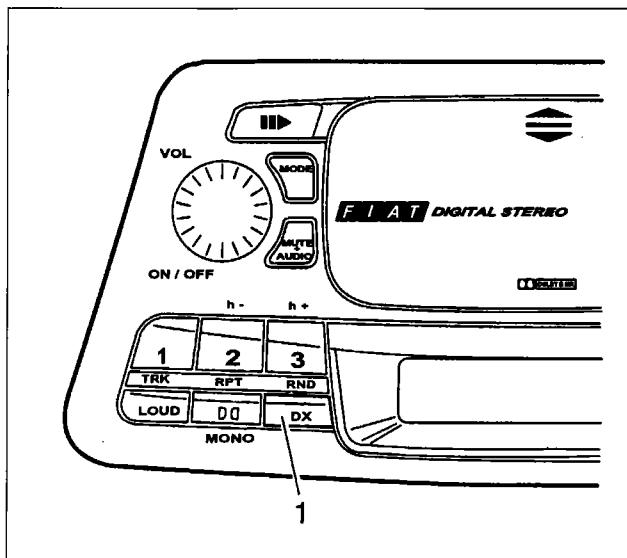
### Automatic tuning into RDS transmitters

Select the FM or AM frequency desired using the BAND control (1).

The IS function should not be activated for this type of selection. If the IS function is switched on, press one of the "▲" "▼" buttons (2,3) for about 3 seconds until the message "IS - -" and then "IS OFF" appears on the display.

Pressing one of the "▲" "▼" buttons (2,3) briefly starts the automatic search.

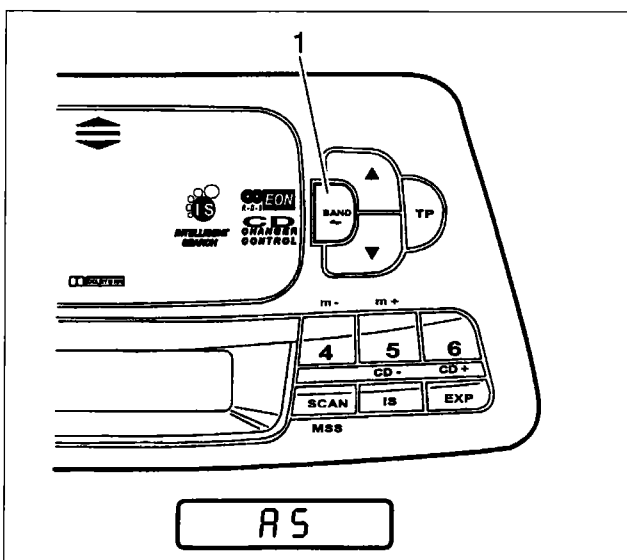
When an (RDS) transmitter with an identification code is found, it can be seen on the display.



P4A42HL02

### DX Function

The DX function makes it possible to choose the sensitivity with which to search for radio transmitters. With the DX function activated, the radio only selects stations above a certain power level. With the DX function deactivated, radio stations with lower power levels are also selected. To activate the DX function, press the button (1); the function is then deactivated if the same button is pressed again.



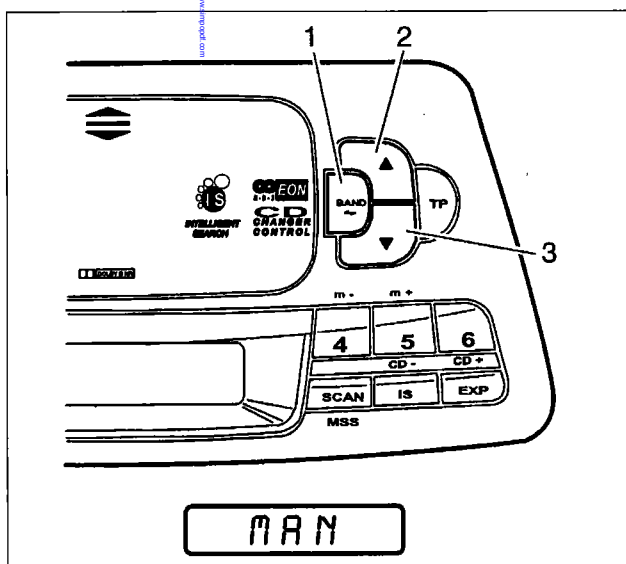
P4A42HL03

### Automatic memorizing of transmitters (AUTOSTORE Function)

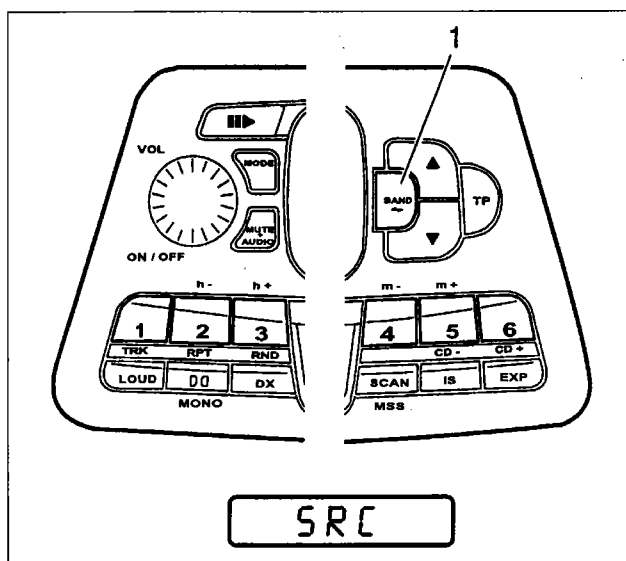
Select the frequency desired using the BAND control (1). The message on the display will show the frequency range selected.

Press the BAND control for about 6 seconds. The display will show firstly the message "AS" and then the scanning of the frequencies.

When the scanning of the frequency range is over, the six most powerful transmitters are available with the buttons (1,2,3,4,5,6).



P4A43HL01



P4A43HL02

### Manual programming of a transmitter

Select the frequency by repeatedly pressing the BAND control (1). The display will show the band selected: "FM1", "FM2", "FM3", "MW" or "LW".

Press one of the buttons "▲" "▼" (2,3) for about 6 seconds until the message "MAN" appears on the display and the radio frequency is tuned in. It is possible to alter the tuning frequency using the "▲" "▼" buttons.

The station being listened to can be memorized in the frequency range selected using the frequency selection buttons (1,2,3,4,5,6). To programme it press the pre-selected frequency selection button until the radio can be heard once again.

The manual tuning can be concluded at any time by pressing one of the frequency selection buttons or if no buttons are pressed for sixty seconds.

### Listening to programmed stations

Proceed as follows:

1. Select the desired band using the BAND control (1).
2. Briefly press one of the frequency selection buttons (1,2,3,4,5,6).

The display will show the button pressed and the transmitter code if it is an RDS transmitter.

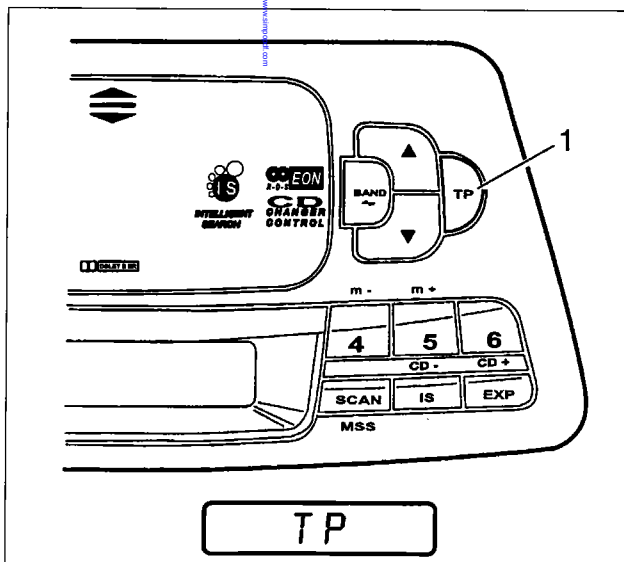
If the transmitter selected offers an RDS service and the reception is not good, the radio will search for an alternative frequency. The display will show "SRC" during the search.

### TP Function (TRAFFIC PROGRAM)

Several stations belonging to RDS1, RDS2 bands also broadcast traffic news. With the TP (Traffic Program) function it is possible to:

- a) search for RDS stations only broadcasting traffic news;
- b) receive traffic news even if the cassette player or Compact Disc player are working;
- c) receive traffic news at a pre-set quiet volume even with radio volume at zero.

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P4A44HL01

**NOTE** Below are the instructions for carrying out each of the operations illustrated in points a), b) and c) mentioned previously.

#### Point a)

To select a transmitter with a traffic news service, press the TP button (1) briefly. The message "TP" will appear on the display. If the transmitter is not enabled to provide traffic news, the radio will automatically tune into the nearest enabled transmitter and broadcast it.

Several transmitters, providing a traffic news service, can be programmed using the station selection buttons. Follow the instructions in the "Tuning into and programming a transmitter" paragraph, pressing the TP button at the beginning to activate the TP function.

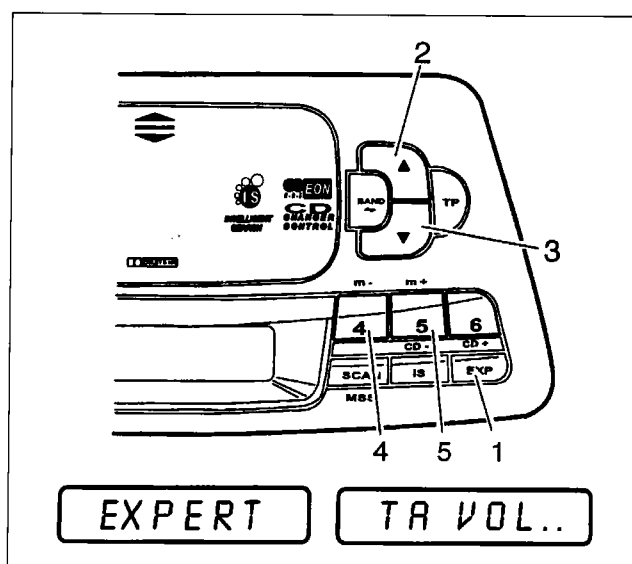
As an alternative to the manual programming, it is possible to follow the instructions in the "Automatic transmitter programming (AUTOSTORE)" paragraph, pressing the TP button at the beginning to activate the TP function.

#### Point b)

If you wish to receive traffic news, before inserting the audio cassette or Compact Disc, tune into an RDS TP transmitter. If, whilst listening to a cassette or a Compact Disc, there is a traffic news flash, the reproduction of the tape or the Compact Disc will be temporarily halted and then resumed automatically afterwards.

#### Point c)

It is possible to receive traffic news even when not listening to the radio. After having tuned into an RDS TP transmitter and set the volume level at zero, if this transmitter broadcasts traffic news, it can be heard at a pre-set low volume.



P4A44HL02

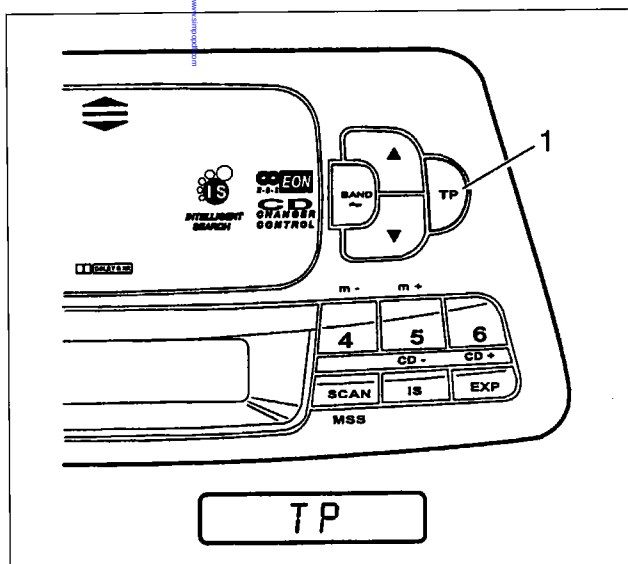


*In some countries there are radio stations which, even though the TP function is activated, do not transmit traffic news.*

#### Setting TP function volume level (Traffic Program)

To select the volume for the traffic news, press the EXP button (1) until the message "EXPERT" appears on the display. Then press the "▲" (2), "▼" (3) buttons until the display shows the message "TA VOL..". Using buttons 4 (4) and 5 (5) it is possible to select the desired volume. The volume can vary from 5 to 31.





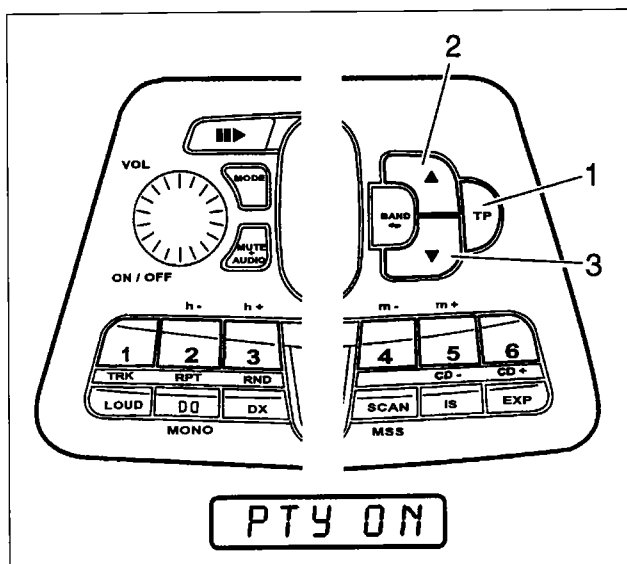
P4A45HL01

### EON Function (ENHANCED OTHER NETWORK)

In some countries there are networks which group together several transmitters enabled to broadcast traffic news.

In these cases listening to an RDS TP station programme will be temporarily interrupted to receive traffic news each time it is transmitted by one of the broadcasters on the same network.

To exclude this function (EON), press the "TP" button (1) briefly; the LED under the button will go out.



P4A45HL02

### PTY Function

Several transmitters offer the "Types of programme" (PTY) service in the FM range. The PTY function can be used to automatically select a transmitter offering a certain type of programme, for example, classical music.

### PTY automatic search

The search can be carried out by allocating 6 types of programmes, selected at will, to the station selection buttons (1,2,3,4,5,6) or by selecting the type of programme from the list memorized and then starting the search. For further details, refer to the paragraphs below.

### Programming desired types of programmes using the station selection buttons

Press the TP button (1, in the diagram above) for about 6 seconds until the display shows the message "PTY ON". Select the type of programme desired using the "▲" (2), "▼" (3) buttons.

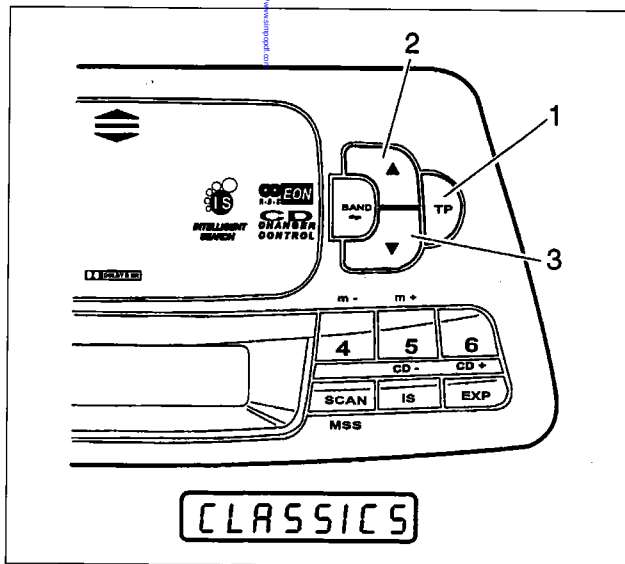
Having identified the type of programme desired, for example, classical music "CLASSICS", press the station selection button (1,2,3,4,5,6) desired for more than 2 seconds. The type of programme selected will be associated with the button pressed.

Each station selection button makes it possible to listen to a particular type of programme by repeating the procedure described above.

To start the automatic search for a transmitter broadcasting a certain type of programme, press the TP button (1) again for about 6 seconds.

The display will show the message "PTY ON". The press the station selection button for the type of programme desired. The display will show the type of programme selected. The automatic search can be initiated by pressing one of the "▲" (2), "▼" (3) buttons for about 2 seconds. The search is interrupted when a transmitter broadcasting the type of programme desired is found.

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P4A46HL01

### List of types of programme available

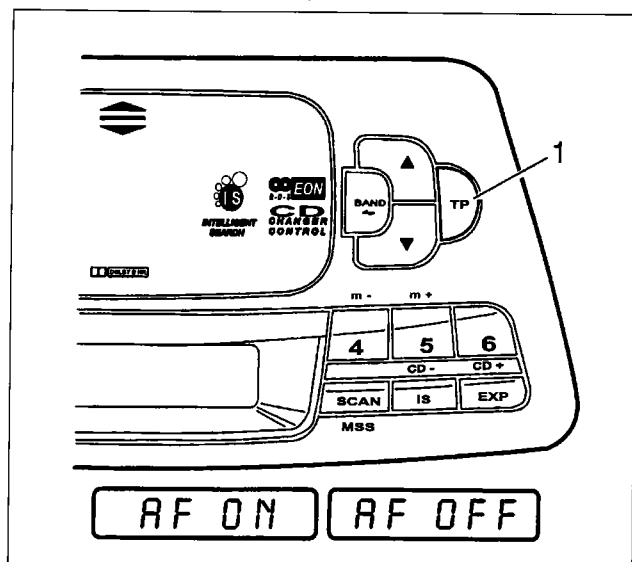
The types of programme offered by a radio station can change according to the programme broadcast.

NEWS News and current events  
 AFFAIRS Politics and current affairs  
 INFO Special information programmes  
 SPORT Sport  
 EDUCATE Education  
 DRAMA Drama and literature  
 CULTURE Culture, church and religion  
 SCIENCE Science  
 VARIED Variety  
 POP Pop music (hits)  
 ROCK M Rock music  
 EASY M Light music  
 LIGHT M Light classical music  
 CLASSICS Classical music  
 OTHER M Music programmes which cannot be classified (e.g. folk)

### Tuning into the type of programme using the list

Activate the PTY function by pressing the TP (1) button for about 6 seconds until the display shows the message "PTY ON". By repeatedly pressing one of the "▲" "▼" (2,3) buttons, the display will gradually show the types of programme available from the list. Having identified the type of programme desired, press one of the " " " " buttons for about 2 seconds to start the automatic search. The search stops when the radio tunes into a transmitter broadcasting the type of programme selected. The display will show the type of programme, for example "CLASSICS".

WEATHER Weather forecasts  
 FINANCE Financial news  
 CHILDREN Childrens broadcasts  
 SOCIAL A Social information  
 RELIGION Religion/philosophy broadcasts  
 PHONE IN Phone ins  
 TRAVEL Travel information  
 LEISURE Leisure, hobby and pastimes  
 JAZZ Jazz music  
 COUNTRY Country music  
 NATIONAL National broadcasts  
 OLDIES Golden Oldies  
 FOLK M Folk music  
 DOCU Special services  
 NO PTY No identification code for the type of programme



P4A46HL02

### Alternative frequencies (AF)

If an RDS programme is being received, which is broadcast by several transmitters at different frequencies, the radio will automatically switch to the frequency with the best reception.

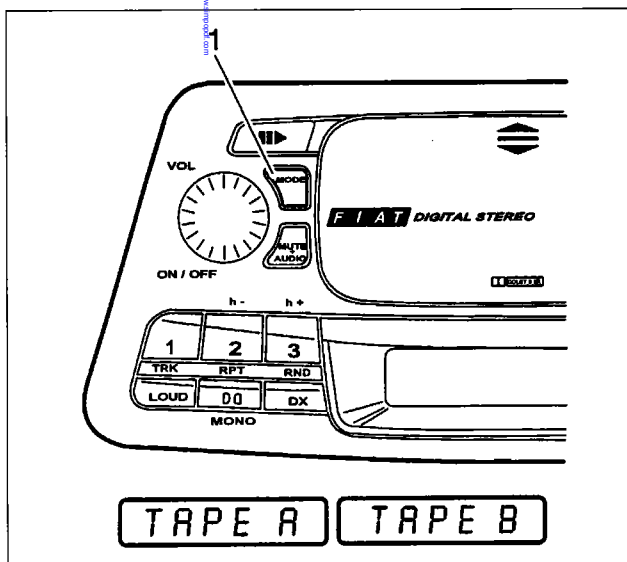
To activate the AF function, press the TP button (1) until the display shows the message "AF ON".

To deactivate the AF function, press the TP button (1) until the display shows the message "AF OFF".

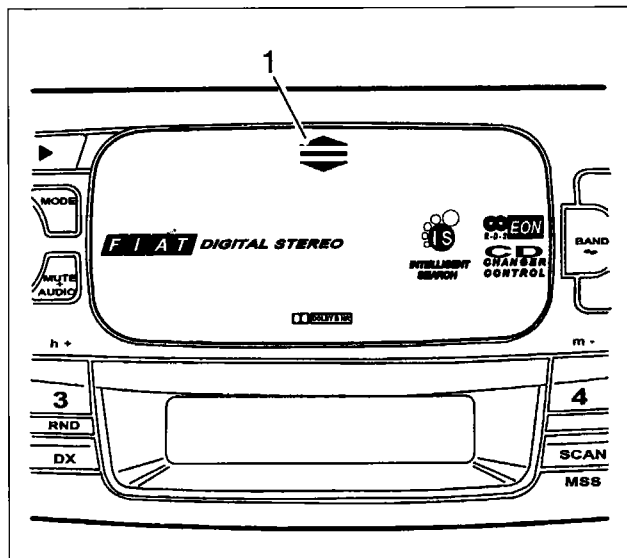
## AUDIO CASSETTE PLAYER

### Activating the audio cassette player

The radio is fitted with an audio cassette player which can be activated by introducing a cassette directly or, when a cassette is already inserted, by repeatedly pressing the MODE button (1) until the display shows the message "TAPE A" or "TAPE B". Both sides of the tape can be listened to without having to extract it (AUTOREVERSE function).



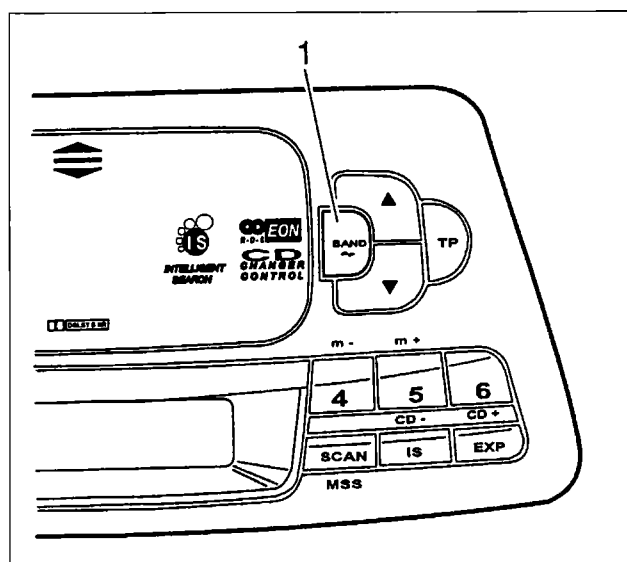
P4A47HL01



P4A47HL02

### Inserting an audio cassette

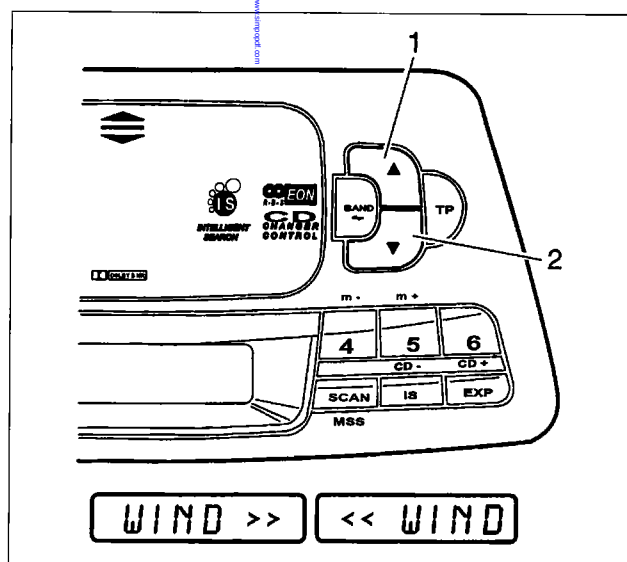
Open the protective flap for the cassette player by pressing the button (1). Fully insert the audio cassette, by hand, until the radio automatically switches to playing it. To close the audio cassette housing, press the button (1) vertically, closing the flap until the retaining spring can be heard clicking.



P4A47HL03

### Changing the side of the tape listened to

When the audio cassette housing contains a cassette and message "TAPE A" or "TAPE B" appears on the display, press the BAND (1) control briefly. When the end of the tape is reached the side is automatically switched. The messages "TAPE A" and "TAPE B" refer to the upper and lower sides of the cassette, respectively.

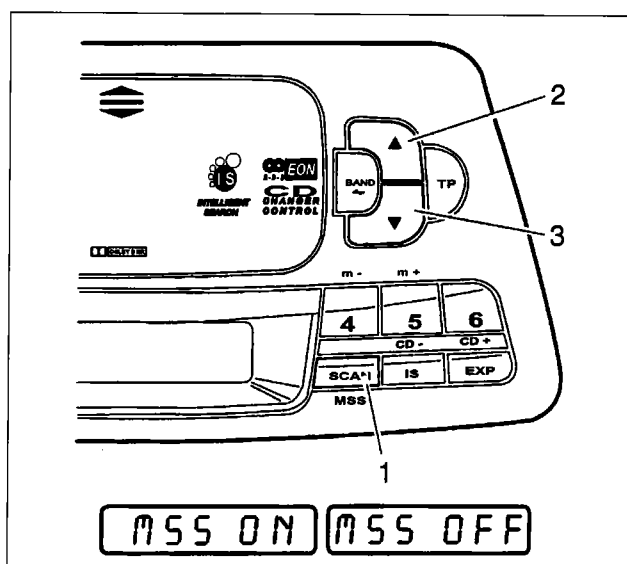


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### Fast forward/rewind

Whilst listening, briefly press the "▲" (1) or "▼" (2) button to fast forward or rewind the tape. During this operation the display will show the message "WIND" or "«WIND". To interrupt this function, briefly press the "▲" (1) or "▼" (2) button. Having interrupted the function, the cassette player will automatically start the reproduction of the cassette.

When the rewinding or forwarding of the tape is complete, the player will be ready for the automatic reproduction of the same side or the other side of the cassette.



P4A48HL02

### Search for previous/next track (MUSIC SEARCH SYSTEM function)

This makes it possible to skip or repeat one or more music tracks when there are pauses of at least three seconds between them.

To activate this function, press the MSS button (1) during operation of the cassette. The message "MSS ON" will appear on the display.

To move onto the next track, press the "▲" (2) button, whilst to move to the previous track, press the "▼" (3) button.

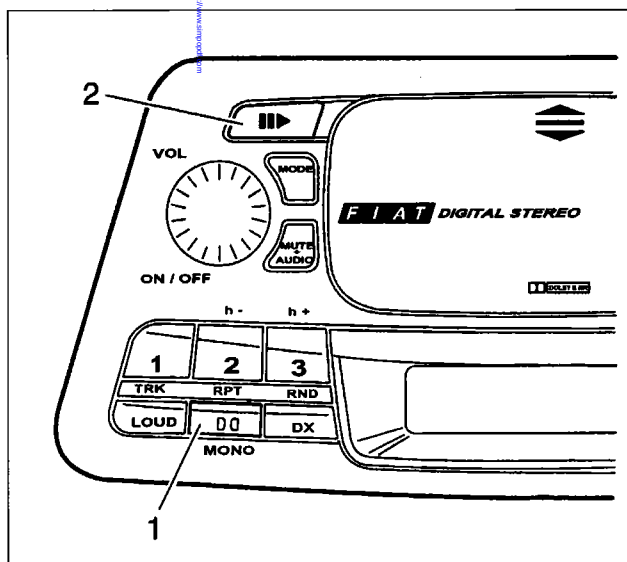
By pressing the "▲" button or the "▼" button repeatedly, the same number of tracks as the number of times the buttons has been pressed are skipped.

To deactivate the MSS function, press the "MSS" button (1) whilst listening to the cassette. The message "MSS OFF" will appear on the display.



*The search for previous/next track function may not be correctly activated with the following types of tape:*

- tapes recorded at low levels (for example, weak sound and imperfect recording);
- tapes with conversations;
- tapes with blank sections of tape lasting less than 3 seconds;
- tapes with long periods of silence in the recording;
- tapes which do not have blank sections of tape (for example, live recordings);
- tapes with a lot of background noise in the blank sections.



P4A49HL01

### DOLBY B Function

Press the button (1) to activate / deactivate the Dolby B function (noise limited device produced under licence by the "Dolby Laboratories Licensing Corporation") (\*).

When the Dolby function is activated the symbol appears on the display.

(\*) *Dolby and the (double D symbol) are the registered trade marks of the above company.*

### Audio cassette ejection

To eject the cassette from the housing, slide the control (2) to the right until the exit.

- After ejection, the word "TAPE" appears on the display and the radio operates, tuned into the last station listened to.



*The audio cassette cannot be ejected with the radio switched off.*

### Temporary halt whilst listening to a cassette

It is possible to temporarily stop listening to a cassette by pressing the MODE button; listening to a cassette can be resumed by pressing it again.



*Never expose audio cassettes to heat or direct sunlight, always store them in their container after use.*

*It is advisable to use good quality tapes not longer than C-90 in order to ensure optimum reproduction.*

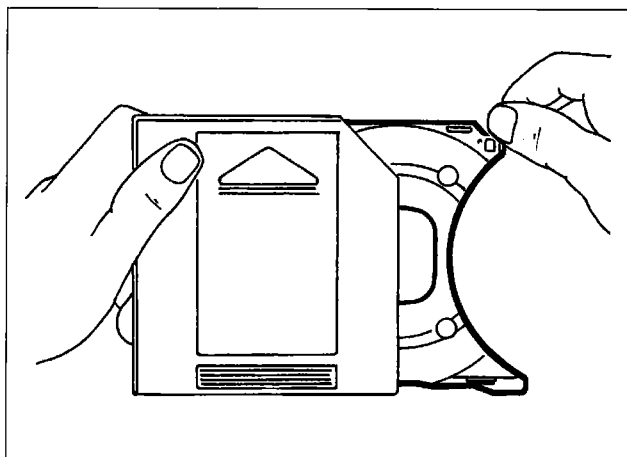
*Impurities on the head caused by tapes can, in time, cause a deterioration in the high tones during reproduction, therefore it is advisable to clean the head periodically using a special, non abrasive, cleaner.*

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#### COMPACT DISC PLAYER FUNCTION

Vehicles equipped with AD 182 H2 radios, have the preparation for the installation of a Compact Disc (CD) player, which consists of a multi-polar cable ending in the luggage compartment on the left side. A kit is available from Linea Accessori FIAT which includes a Compact Disc player, an additional multi-polar connecting cable and a mounting bracket.

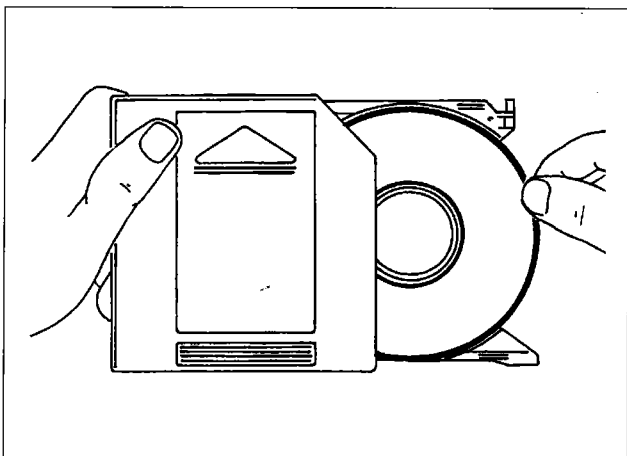
The player is supplied with a special loader which can hold up to 6 Compact Discs.



P4A50HL01

#### Filling the Compact Disc loader

- Extract a support for each Compact Disc that you wish to play;



P4A50HL02

- insert the Compact Disc with the label or the printed section facing the support.



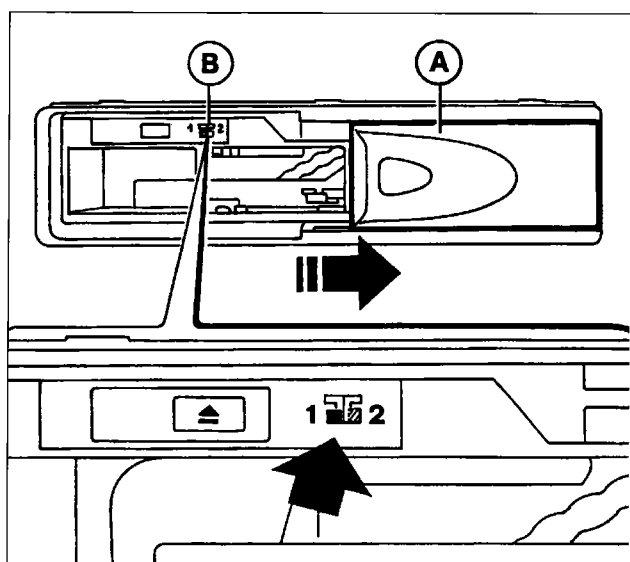
*If the Compact Disc has been positioned incorrectly, it cannot be played.*

#### Inserting the loader in the Compact Disc player

**NOTE** *The player cannot play 8 cm Compact Discs (unless a special adaptor, available from HI-FI shops, is fitted).*

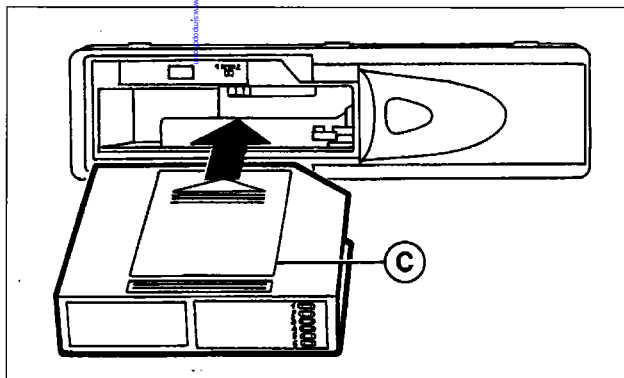
To insert the loader in the Compact Disc player, proceed as described below:

- slide the flap A towards the right, as illustrated in the diagram, until it is not locked;
- check that the switch B is in position "1";

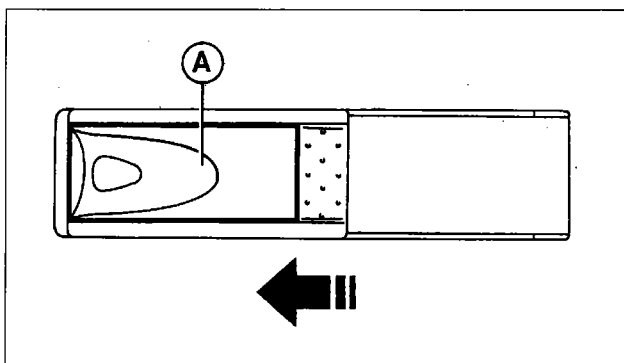


P4A50HL03

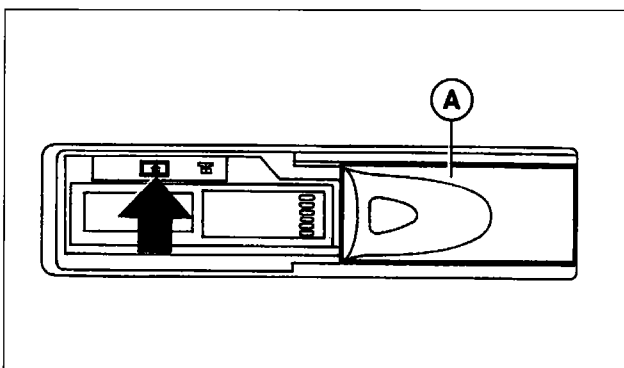




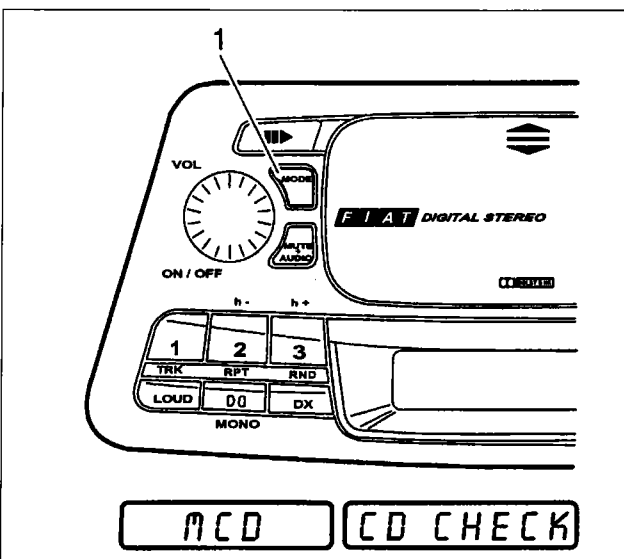
P4A51HL01



P4A51HL02



P4A51HL03



P4A51HL04

- insert the loader C in the Compact Disc player with the side with the label (see arrow) facing upwards;

- close the sliding flap A after having inserted the loader to prevent the entry of foreign bodies or dust into the player.

### Extracting the loader from the Compact Disc player

Proceed as described below:

- slide the flap A to the right, as illustrated in the diagram, until it is not locked;
- press the eject button, shown by the arrow, on the Compact Disc player.

### Removing Compact Discs from the loader

Remove the discs and supports from the loader, in order.

### Compact Disc reproduction

To play Compact Discs (CD) already inserted previously in the player, press the "MODE" button (1) repeatedly until "MCD" appears on the display.

If this function is selected, after each insertion in the loader, the words "CD CHECK" appear on the display, whilst the connections and the contents of the loader are examined. Whilst listening the following appear on the display: "CD", the number of the track (for example "T03" = third track), the time of reproduction (e.g. "03:14" = 3 minutes and 14 seconds) and the number of the CD (for example "4").

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#### Possible error messages

If the loader has not been introduced or has not been inserted correctly in the Compact Disc player, the word "MAGAZINE" will appear on the display.

If the loader does not contain any Compact Discs, the words "NO CD" will appear on the display.

If a Compact Disc is damaged or has been introduced incorrectly into the loader, the word "SURFACE" will appear on the display.

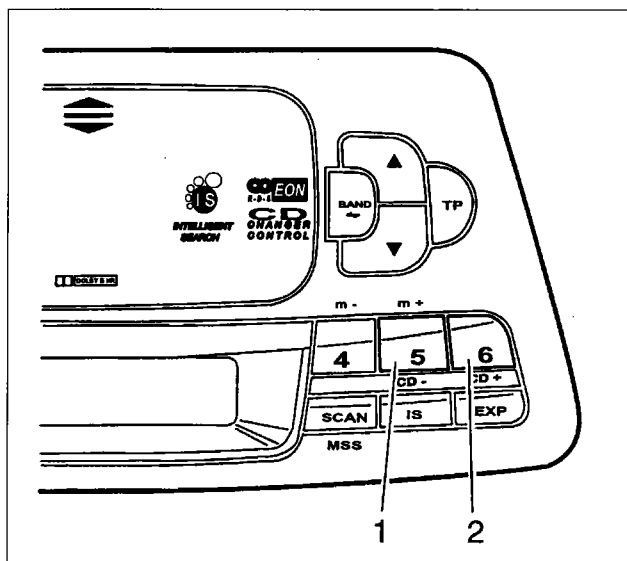
If there is a break in the connection with the Compact Disc player, the words "NO COMMU" will appear on the display.

In the case of a mechanical fault with the CD player, the word "MECHANIC" will appear on the display.

If the Compact Disc player has overheated, the words "TOO HOT" will appear on the display.

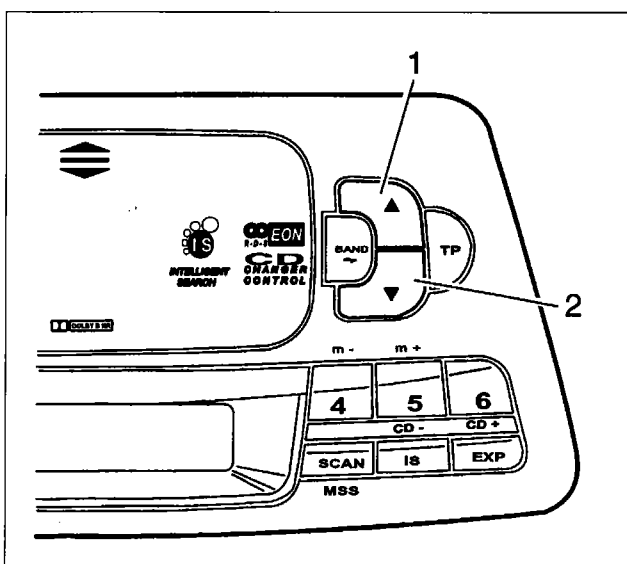


*If the last condition mentioned above occurs, it is advisable to switch off the CD player for a while.*



#### Disc selection

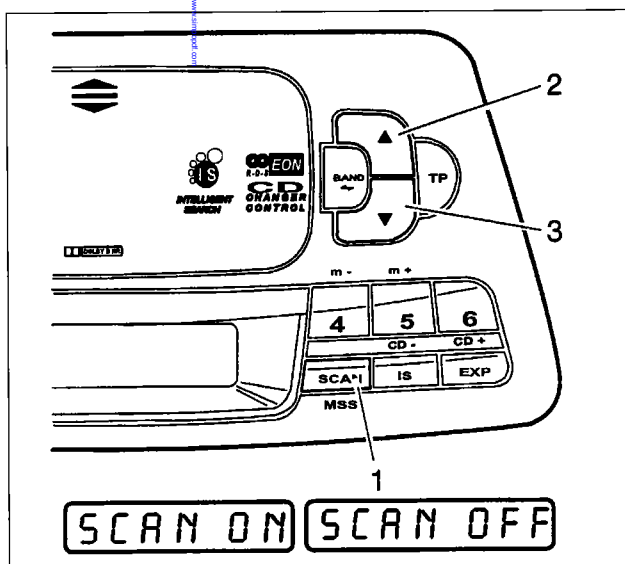
Press the station selection button 5 (1) or 6 (2) briefly and repeatedly until the number of the desired CD appears on the display. Using station selection button 6 it is possible to move on to the next CD, whilst button 5 locates the previous one.



#### Track search (forwards/backwards)

Press button "▲" (1) or "▼" (2) repeatedly until the number of the desired track appears on the display.

Button "▲" is used for selecting the next track, whilst button "▼" is used for listening to the same track again or, if pressed repeatedly, for selecting previous tracks.



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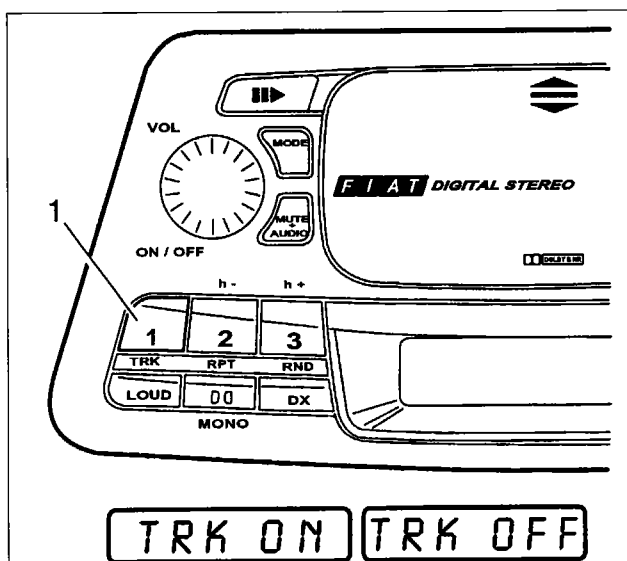
### Scanning tracks on CD selected (SCAN function)

By pressing the SCAN button (1) briefly, the display shows the "SCAN ON" message and the player plays all the tracks on the CD selected for 10 seconds each.

To disable the SCAN function, switched on previously, press the SCAN button (1) briefly. The display shows the message "SCAN OFF".

### Fast forward and rewind (TRACK FAST function)

To listen during the track fast function at a lower volume, press button "▲" (2) for winding forward or button "▼" (3) for rewinding, and keep it pressed.



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### Track repeat (TRACK REPEAT function).

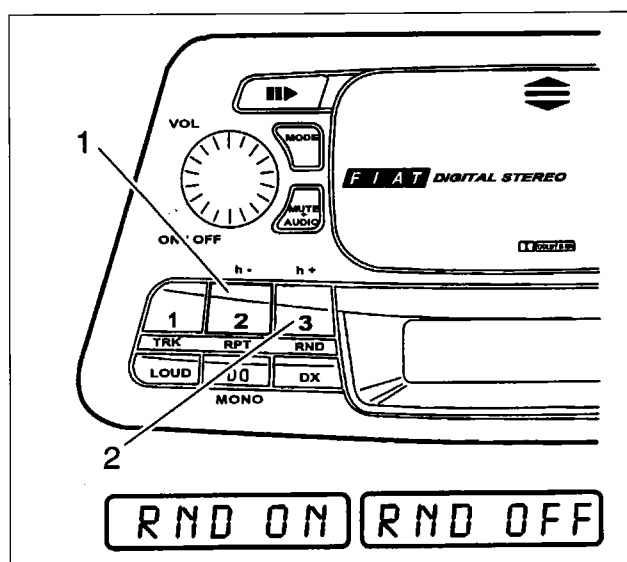
To repeat the track being listened to, press the station selection button (1). The message "TRK ON" will appear on the display. By pressing the station selection button 1 (1) again, the TRACK REPEAT function selected previously will be disabled.

The message "TRK OFF" will appear on the display.

### Repeating tracks from the CD selected (REPEAT function)

To repeat the CD being listened to, press the station selection button 2 (1). The message "RPT CD" will appear on the display.

To end the repetition of the CD, press the station selection button 2 (1) again. The message "RPT MAG" will appear on the display. The reproduction of the CD ends when the player plays the last track of the CD.



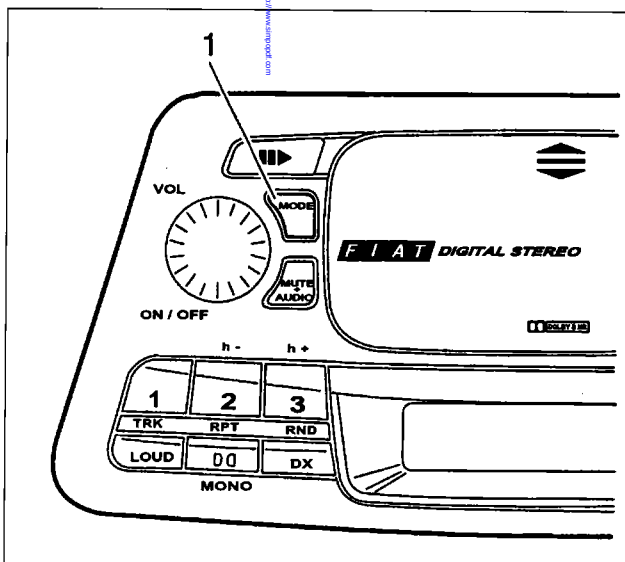
P4A53HL03

### Repetition of tracks in a random sequence (TRACK RANDOM function)

To start the search for the random sequence of tracks, press station selection button 3 (2) briefly. The message "RND ON" will appear on the display.

To end the search for the random track sequence, press the station selection button 3 (2). The message "RND OFF" will appear on the display.

# 55.



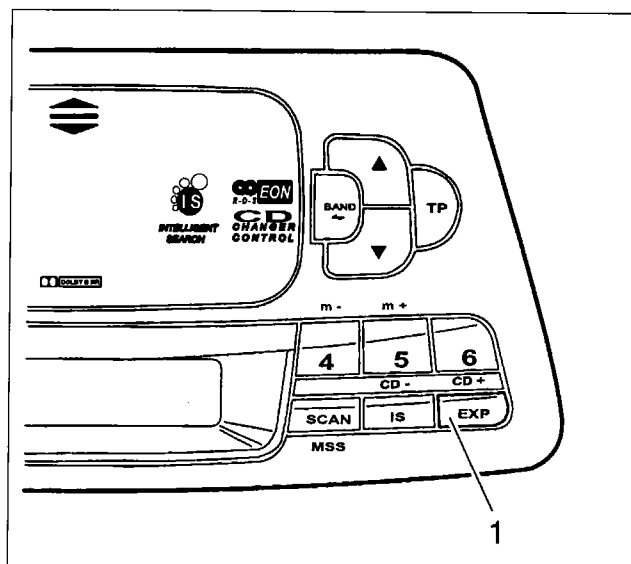
P4A54HL01

Once all the tracks have been played, another Compact Disc is selected and so on. Once all the discs have been played, the random reproduction starts again in the same way.

**NOTE** If the "CD Repeat" mode has been selected previously, only the random reproduction of all the tracks on the disc selected will take place.

### End of CD player operation

By pressing the MODE button (1) listening to the CD player and the radio is ended and the RADIO configuration is restored.



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### Display of the CD player state

By pressing the EXP button (1) briefly, any special function activated, for example "TRK ON", is displayed.



*Never expose discs to sources of heat or direct sunlight, always place them back in their container after use.*

*Compact Discs should be protected from dust and the surface of the discs should never be fingered or the sound will be adversely affected.*

*If the surface of a disc is dirty, it should be cleaned using a dry cloth, working from the centre outwards. Do not insert damaged or distorted discs in the magazine.*

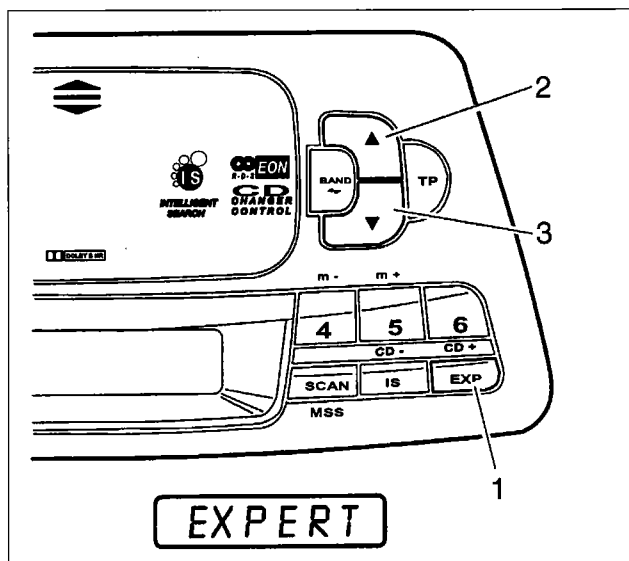
**EXPERT control level**

It is possible, using the EXPERT additional level, to carry out various adjustments which may be required only once (for example setting the exact time) or occasional adjustments (for example the minimum volume adjustment for listening to the traffic news).

**List of possible EXPERT adjustments**

The following adjustments can be carried out through the EXPERT control level:

1. Setting the time
2. Switching the clock RDS synchronization on/off
3. Minimum volume for traffic news
4. LRN on/off
5. Switching automatic change of regional programme on/off
6. Limiting on volume
7. BDLY delay for switching Booster connected on/off
8. Switching on/off via the vehicle ignition switch
9. Suppressing the audio function during car phone operation
10. Telephone input sensitivity
11. SCV
12. Code adjustment



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**Selecting and modifying adjustments via the EXPERT control level**

Premere il tasto EXP (1) fino a quando il display visualizza il messaggio "EXPERT". Selezionare mediante i tasti "▲" "▼" (2,3) la regolazione che si desidera effettuare.

Premendo i tasti opportuni di selezione delle frequenze, è possibile impostare il livello desiderato.

I tasti di selezione delle frequenze interessati dipendono dalla regolazione che si desidera effettuare.

Per la loro identificazione si rimanda ai paragrafi successivi relativi alle singole regolazioni possibili.

Per concludere la regolazione premere nuovamente il tasto "▲" (2) o "▼" (3) oppure il tasto EXP (1), per circa 3 secondi.

**Setting the TIME**

The frequency selection buttons needed for adjusting the time are:

Buttons 2 and 3 for setting the hour

Buttons 4 and 5 for setting the minutes

To start the clock precisely, press the EXP button briefly.

**Synchronizing the clock**

The clock can be synchronized with the RDS TIMER signals emitted by the transmitters.

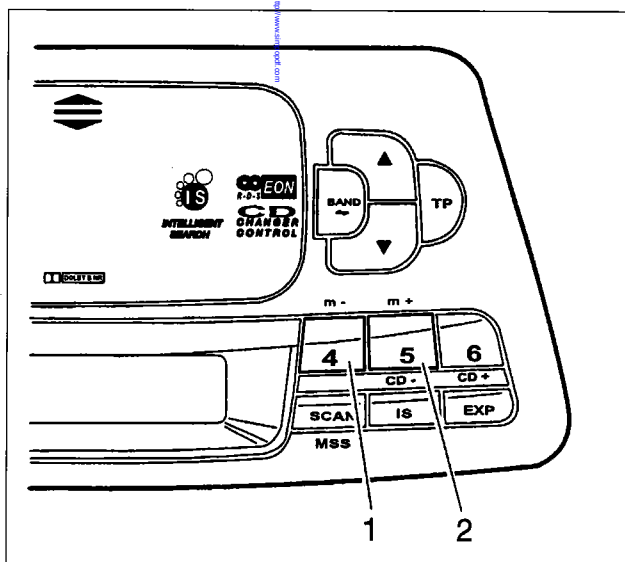
The necessary frequency selection buttons are;

button 5 for activating the synchronization

button 4 for deactivating the synchronization

By pressing frequency selection button 5 the display will show the message "SYNC ON", whilst pressing frequency selection button 4 afterwards, will produce the message "SYNC OFF" on the display.

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#### Minimum listening volume for traffic news

The desired level can be set using the frequency selection buttons 4 (1) and 5 (2) to increase or decrease the volume, respectively. During the adjustment, the message "TAVOL YY" will appear on the display where YY refers to the level of the volume set.

#### Switching LNR function on/off (RADIO function)

This allows the search for RDS transmitters broadcasting traffic news to be switched on or off. The frequency selection buttons for the switching on and off are buttons 4 (1) and 5 (2), respectively. The messages "LRN ON" and "LRN OFF", respectively appear on the display when the function is switched on or off (see diagram).

#### Automatic programme change (REGIONAL)

When the RDS programme consists of different regional transmissions, the radio may switch between these transmissions, selecting the one with the strongest signal.

The frequency selection buttons needed are button 5 (1) for switching the function on and button 4 (2) for switching it off.

The messages displayed are "RES ON" when the function is switched on and "RES OFF" when the function is switched on (see diagram).

#### Limiting the switching on volume

It is possible to select the level of the volume when the radio is switched on using frequency selection buttons 4 (1) and 5 (2), respectively, for increasing or decreasing the volume.

When buttons 4 or 5 are pressed the message "ONVOL xx" appears on the display where the level of the volume set appears in place of xx (see diagram).

#### Delay in switching on/off for BOOSTER (BDLY)

To switch the Booster delay on or off, press frequency selection buttons 4 (1) and 5 (2), respectively. The message on the display will be "BDLY ON" or "BDLY OFF" (see diagram).

#### Switching on/off using the vehicle ignition switch

See "Switching on radio" paragraph.



### Suppression of audio function during car phone operation

To switch the radio function on or off, when a radio phone system is fitted in the vehicle, press frequency selection buttons 4 and 5, respectively.

The messages "PHONE OFF" and "PHONE ON", respectively, will appear on the display when the function is on or off.

When the function is on and a phonecall is received, the radio will automatically be deactivated and the dialogue will be reproduced via the speakers.

### Telephone input sensitivity

The telephone input sensitivity can be regulated using frequency selection button 4 or 5.

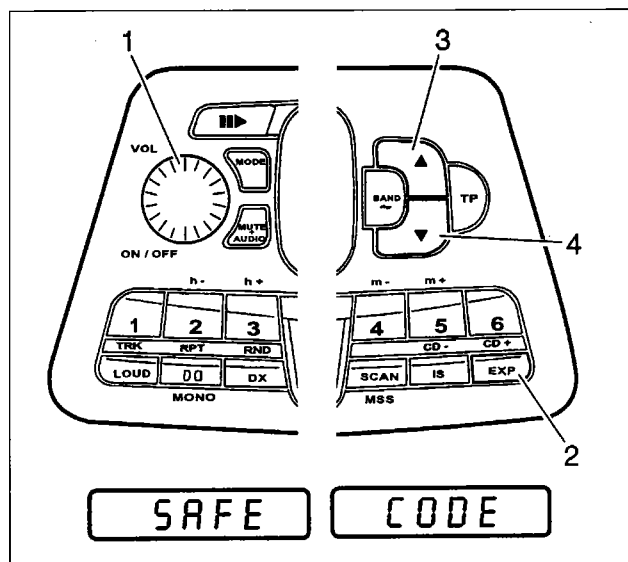
The messages "PHONE 00" or "PHONE 03", respectively will appear on the display for low or high sensitivity.

### Adjusting the volume according to the speed

For safety reasons, this adjustment should be carried out by suitably trained personnel.

### Activating the code

See paragraphs dealing with anti-theft protection



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### ANTI-THEFT PROTECTION

The radio is equipped with an anti-theft protection system consisting of a 4 digit secret code.

The protection system makes it impossible to use the radio after it has been extracted from the dashboard if it is stolen.

#### Secret code

The 4 digit secret code is on the "Security Code Card" which is given at the same time as the "Fiat Code Card". The secret code should be kept in a safe place (for example, together with the vehicle documents), **but not in the vehicle.**

### Entering the secret code for the first time

Switch on the radio by pressing the VOL control (1).

Press the EXP button (2) and press the "▲" "▼" (3,4) buttons until the message "SAFE" or "CODE" appears on the display (SAFE if the code is activated, CODE if it is deactivated).

Introduce the code using the frequency selection buttons 2,3,4,5.

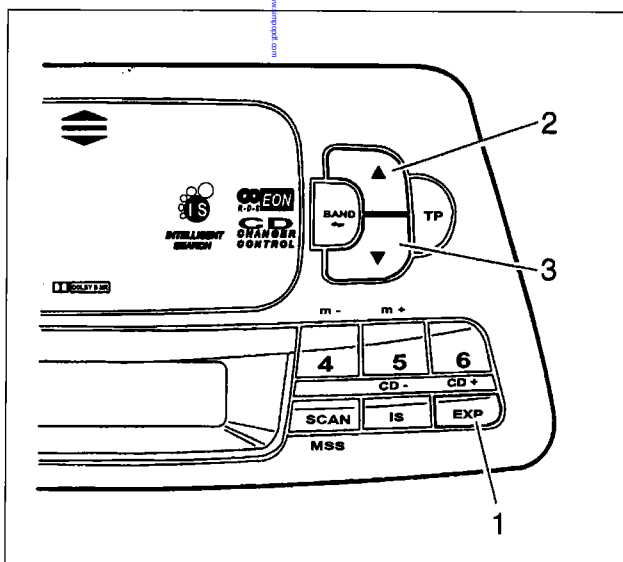
If, for example, the code is 1703, press the frequency selection buttons as follows:

- press button 2 once for digit 1, the display will show "1 - - -"
- press button 3 seven times for digit 7, the display will show "17 - -"
- press button 4 once for digit zero, the display will show "170 -"
- press button 5 three times for digit 3, the display will show the entire code.

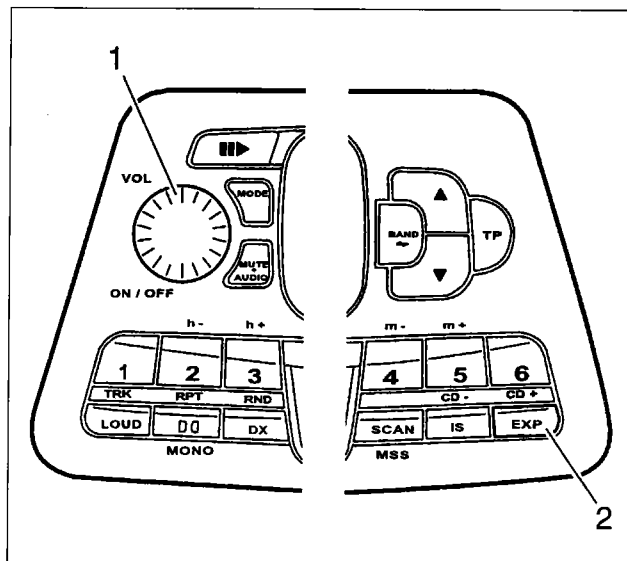
Having set the code in the display, confirm it by pressing the EXP button (2) until the message "SAFE" appears on the display. The code should be activated.

To switch off the EXPERT function, press the EXP button (2) for about 3 seconds until the message "EXIT" appears on the display.

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### Deactivating the code

The code has to be deactivated before removing the radio.

To deactivate the code, proceed as described below:

Press the EXP button (1) and press the "▲" "▼" buttons (2,3) until the message "SAFE" appears on the display.

Briefly press the frequency selection button 2 (4); the message "I - - -" will appear on the display.

Key in the code following the instructions in the earlier example.

Confirm the code by pressing the EXP button briefly until the message "CODE" appears on the display.

The code is no longer activated.

If an incorrect code has been entered, the message "SAFE" will appear on the display; the entire procedure should be repeated to deactivate the code.

### Restoring the operation of the radio by entering the code

When the radio is disconnected from the positive supply, with the safety code activated, it is electronically protected. In order to be used again, the code must be introduced following the procedure described below:

Switch on the radio using the VOL control (1); the message "SAFE" will appear on the display followed by "I - - -".

Key in the code following the previous example.

Confirm the code by briefly pressing the EXP button (2).

After around 3 seconds the radio will start to work.

If an incorrect code is introduced, the message "SAFE" will appear on the display again. To enter the correct code, repeat the procedure from the beginning, following the waiting periods.

After each failed attempt the radio logic introduces a waiting period during which the radio does not respond to the commands. These waiting periods are:

- 1st attempt waiting period 21 seconds
- 2nd attempt waiting period 1.5 minutes
- 3rd attempt waiting period 5.5 minutes
- 4th attempt waiting period 22 minutes
- 5th attempt waiting period 1.5 hours
- 6th attempt waiting period 6.0 hours
- 7th attempt waiting period 24 hours
- 8th attempt waiting period 24 hours

The radio should not be switched on during the waiting period.

### TECHNICAL INFORMATION

#### Aerial

The vehicle is fitted with an aerial located in the roof.

#### Electrically operated aerial and external amplifier (available on request)

The radio is prepared for an automatic electric aerial (which comes out the moment the radio is switched on and goes back in when it is switched off) and an external amplifier.

The switching voltage for the aerial is at contact 5 (connector "A") of the radio and the switching voltage for the amplifier is at contact 3 (connector "A").

The switching voltage for both outputs is + 12 V with a maximum current of 0.5 A.

#### Speakers for radio equipment

The acoustic equipment consists of:

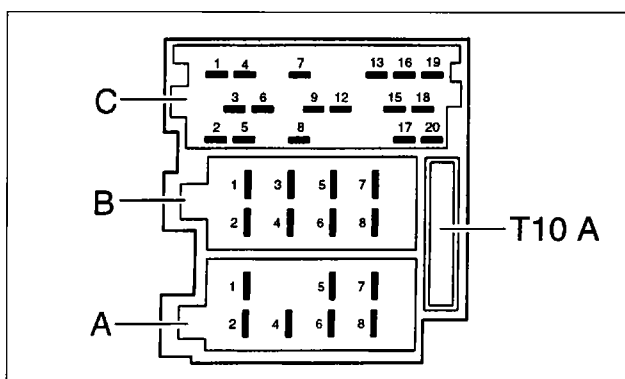
- 2 elliptical diffusers 130 x 180 mm with a power of 30 W max. each;
- 2 tweeter-dome fluid-iron diffusers with a power of 40 W max. each;
- 2 130 mm diffusers with a power of 30 W max. each.

#### Fuses

The radio has a 10 A protective fuse.

#### Connections

This paragraph describes the connector at the rear of the radio.



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#### Supply voltages

##### Contacts at blade A:

##### A8 Connection for earth

Connect to terminal 31 (earth) of the vehicle.

##### A7 Connection for 12 V supply voltage

Connect to terminal 30 (continuous positive) of the vehicle.

##### A6 Connection for instrument lights

Contact not connected: no lights with radio switched off if the instrument lights are switched on.

##### A5 12 V switching voltage output (max 0.5 A)

Present at the contact at blades A5 when the radio is on.

For automatic aerial (extension/retraction), aerial amplifier (supply voltage) etc.

##### A4 Connection for ignition voltage of +12 V

Connect to terminal 15 of the vehicle, if the radio is going to be switched on and off by the ignition.

Connection A4 may also not be wired. In this case, the radio should come on and off via the **VOL control**.

With the engine switched off the equipment switches off after about 20 minutes

##### A2 Phone-Mute connection for car phone or receiver/transmitter

The radio audio function is deactivated during the operation of the car phone or receiver/transmitter.

The message "PHONE" appears on the display.

Contact A2 should be earthed from the telephone/receiver-transmitter mute outlet

##### A1 SCV (+) connection "for adjusting volume according to the speed."

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#### Speakers

##### Blade contacts B

Maximum power at speakers 4 : 4 x 20 W.

Front speaker:

B3 right +

B4 right -

B5 left +

B6 left -

Rear speaker:

B1 right +

B2 right -

B7 left +

B8 left -



*The connections for the speakers should not be electrically connected to each other and should not be earthed!*

#### Additional connections

##### Blade contacts C

Line output

Possibility of connection for power amplifier (Booster) or activated speaker.

C1 Left rear speaker +

C2 Right rear speaker +

C3 Earth -

C4 Left front speaker -

C5 Right front speaker -

C6 Switching voltage for power amplifier: on/off (max 0.3 A)

Steering remote control:

C8 Earth

C9 Remote control

Telephone input:

Possibility of connection for car phone or receiver-transmitter (listening through radio).

C7 Telephone NF

C12 Telephone earth NF

Disc change connections: +

C13 CD bus control line

C15 CD bus earth

C16 Supply voltage of +12 V for disc changer

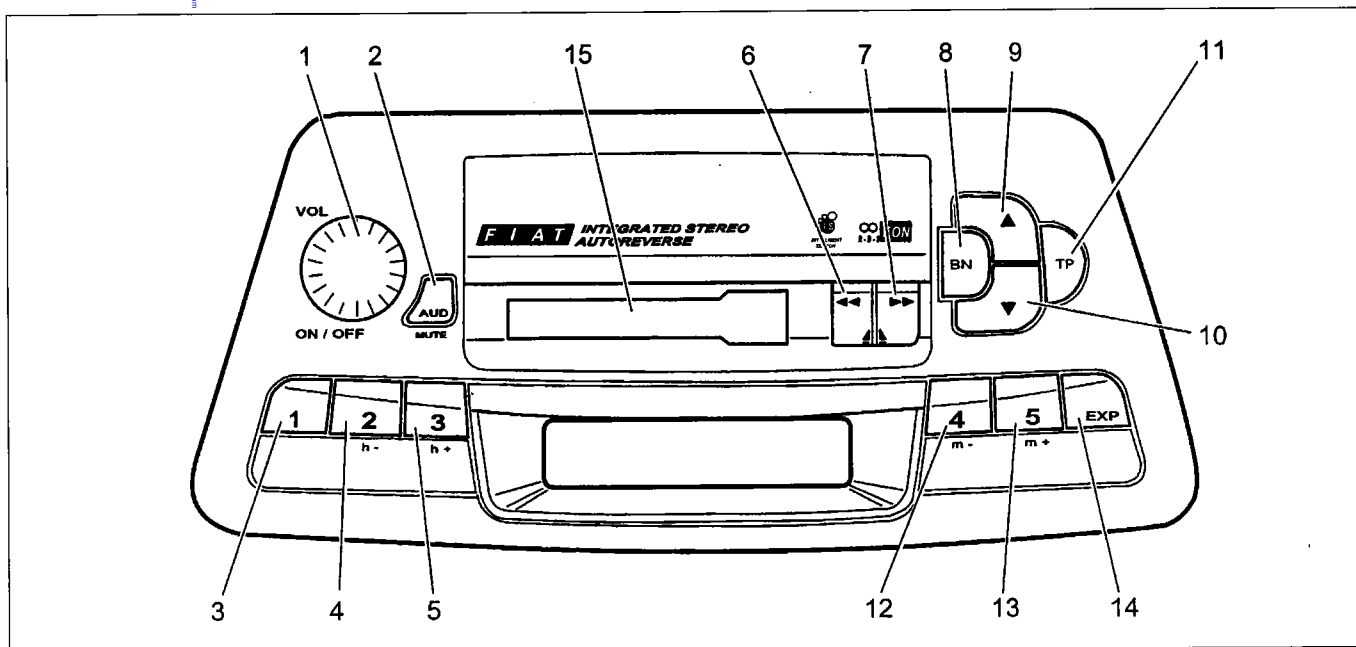
C17 Switching voltage for disc changer

C18 CD earth NF

C19 CD NF on the left

C20 CD NF on the right

### RADIO CASSETTE PLAYER AD 182 M



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1. VOL control: radio on/off, level adjustment Bass, Treble, Balance, Fader.
2. AUD-MUTE button: function selection Bass, Treble, Balance, Fader, MUTE activation.
3. N1 station programming button.
4. N2 station programming button, for setting the time.
5. N3 station programming button, for setting the hour.
6. Audio cassette fast rewind button.
7. Audio cassette fast forward button.
8. BN button: for selecting FM1, FM2, FM3, MW, LW frequencies; for starting IS automatic search, for selecting AUTOSTORE function.
- 9-10. For recalling IS memory, for RDS transmitters automatic search, for manual tuning into transmitters, for setting the type of programme, for selecting the type of adjustment from the EXPERT menu.
11. TP button: for selecting the TP function, for selecting AF alternative frequencies, for acting the PTY function.
12. N4 station programming button, for altering EXPERT adjustments.
13. N5 station programming button, for altering EXPERT adjustments.
14. EXP button: for activating EXPERT control level.
15. Audio cassette housing.

### 55.

#### GENERAL DESCRIPTION

The vehicle is available, on request, with a radio system, consisting of the following main components:

- radio cassette player (which cannot be removed) model AD 182 M which is fitted in place of the previous version in the centre of the instrument panel with the personalized front section completely integrated with the line of the dashboard.
- four speakers, two of which are located at the sides in the top part of the instrument panel, with the other two in the same position as on the previous system, in the front doors;
- aerial in the centre front section of the roof.

The AD 182 M radio cassette player features the following functions:

#### Radio section

- PLL turning with FM/MW/LW bands
- RDS (Radio Data System) with TP (Traffic Program) - EON functions
- Automatic/manual station tuning
- Manual programming of 5 stations on FM1, FM2, FM3 bands and MW and LW band
- Automatic programming of transmitters via the AUTOSTORE function with buttons 1,2,3,4,5 on the FM1, FM2, FM3, MW and LW bands
- Automatic IS search tuning

#### Audio cassette section

- Autoreverse
- Tape fast forward and rewind

#### Audio section

- Loudness function
- Mute function
- Pause function
- Separate low/high tone adjustment
- Right/left and front/rear channel balancing
- Radio on/off logic selection
- Pre-setting of TP function volume level.

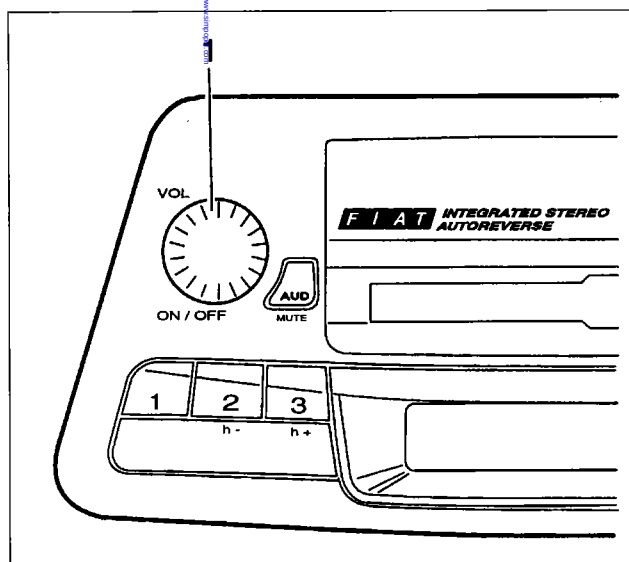
#### Clock section

- Adjustment of hours/minutes

#### EXPERT control level section

- |                                       |                                            |
|---------------------------------------|--------------------------------------------|
| - Setting of time                     | - FADER function                           |
| - RDS synchronization of the time     | - Volume limitation                        |
| - Traffic news minimum volume         | - BDLY function                            |
| - LRN                                 | - On/off through ignition                  |
| - Regional programme automatic change | - Audio mute during operation of car phone |
| - LOC function                        | - Telephone input sensitivity              |
| - MONO function                       |                                            |
| - LOUDNESS function                   |                                            |





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## OPERATION

### Switching on the radio

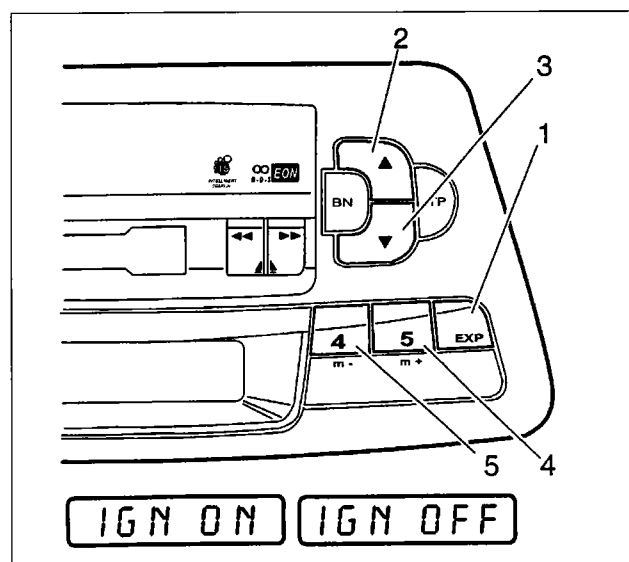
Press the VOL control (1) once: the radio should come on. If the radio is on when the engine is switched off, it will switch off automatically about 20 minutes later.

### Switching on/off when the engine is switched on/off

The radio possesses a switching on logic which, if activated, allows the radio to be turned on/off at the same time as the engine is started up/switched off.

If the logic is activated: when the engine is started up/switched off, the radio is automatically turned on/off;

If the logic is not activated: the radio will switch on/off irrespective of whether the engine is switched on/off.



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Press the EXP button (1) for about 3 seconds until the message "EXPERT" appears on the display.

Select the on/off adjustment via the ignition switch using the "▲" (2) and "▼" (3) buttons. Press frequency selection button 5 (4) to activate the function or, if activated previously, press frequency selection button 4 (5) to deactivate it.

The messages "IGN ON" and "IGN OFF", respectively will appear on the display when the function is activated or deactivated.

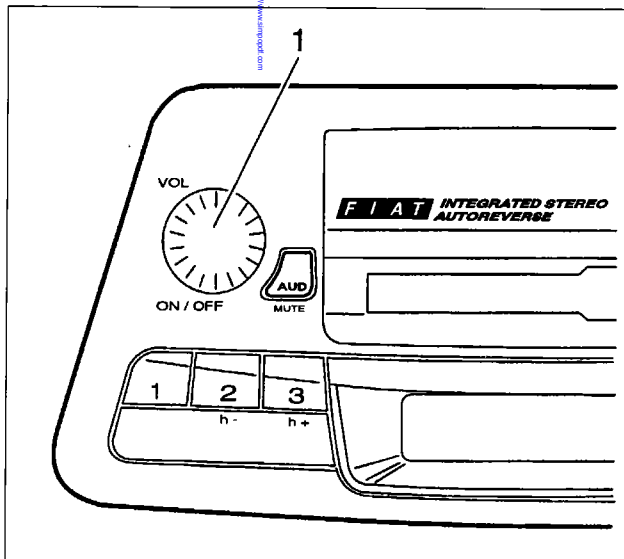
**NOTE** The procedure described above should be carried out with the ignition switched on.

If you wish to turn on the radio after it has been switched off using the ignition switch, press the VOL control.

### Pause function

If the "Radio" function is selected whilst listening to a cassette, the reproduction is interrupted and on returning to the "Audio cassette" mode it is resumed from where it left off. If the "Audio cassette" function is selected whilst listening to the radio, on returning to the "Radio" mode, the last station selected is tuned into.

55.

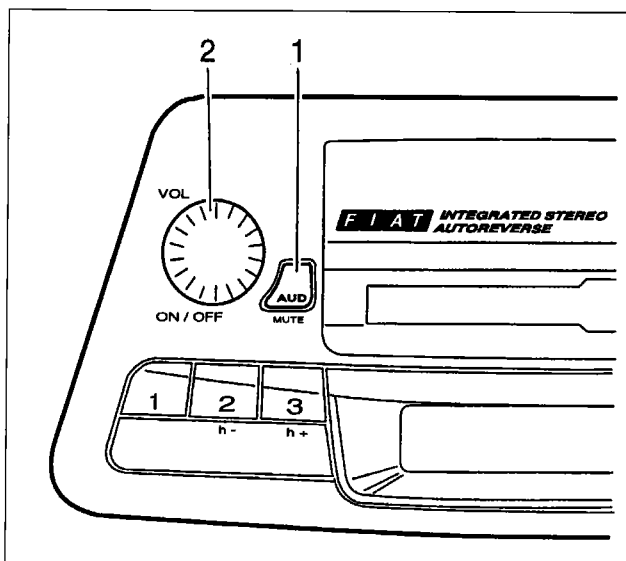


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### VOLUME adjustment

The volume can be adjusted via the VOL control (1).

The volume level, between "VOL 00" and "VOL 31" is displayed during the adjustment.



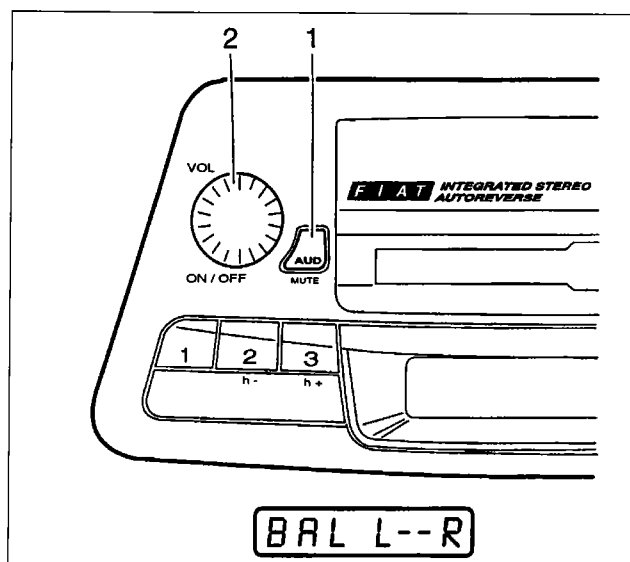
P4A64HL02

### Adjustment of LOW and HIGH tones (BASS and TREBLE)

Select the "Bass" or "Treb" function by pressing the AUD button (1) briefly.

Having selected the function, adjust the sound via the VOL control (2).

To restore the basic adjustment, press the AUD button for about 3 seconds until the message "00" or "--" appears on the display.



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### Adjustment of balance between left and right speakers (BALANCE)

The balance is the "volume ratio" between the left and right speakers. The adjustment can be made by pressing the AUD button (1) several times briefly to select the "BALANCE" function. The message "BAL L- -R" will appear on the display. The VOL control (2) can be used to adjust the balance levels. The values which can be selected range from 0 to 15.

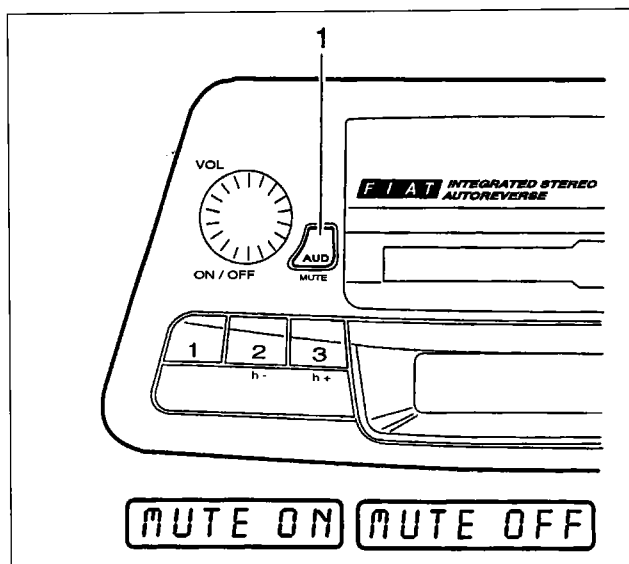
To restore the basic adjustment, press the AUDIO button for about 3 seconds until the message "00" or "--" appears on the display.

### Adjusting the balance between the front and rear speakers (FADER)

Consult the "EXPERT control level" section and the point dealing with the "FADER function" for the adjustment.

### Loudness function

Consult the "EXPERT control level" section and the point dealing with the "LOUDNESS function" for the adjustment.



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### MUTE function

By pressing the AUD button (1) for about 3 seconds the MUTE function is selected and the message "MUTE ON" appears on the display.

To deactivate this function the AUD button must be pressed again. The message "MUTE OFF" will appear on the display.

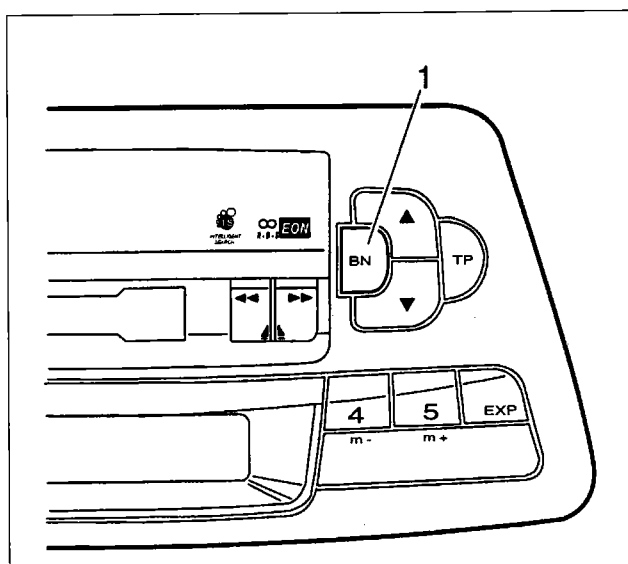
When the Mute function is selected, the radio no longer sends any signals to the speakers.

### RADIO FUNCTION



*Reception conditions vary constantly whilst driving. Reception can be interfered with by the presence of mountains, buildings or bridges, especially when the broadcasting transmitter is far away.*

**NOTE** When the "RADIO" function is activated, the last station listened to before switching off is received.



P4A65HL02

### Function selection

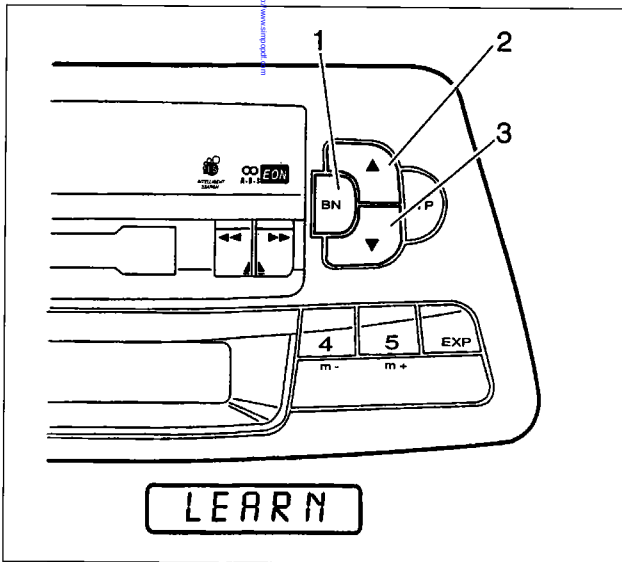
As soon as the radio is switched on, the radio is heard.

### Selecting the band

By pressing the BN button (1) briefly several times it is possible to select the frequency bands available. The message for the range selected will appear on the display. The possible messages are:

"FM1", "FM2", "FM3" for FM frequency ranges  
 "MW", medium wave, "LW", long wave, for AM ranges

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### Automatic intelligent search tuning (IS function)

Using the BN button (1), select the "FM1", "FM2" or "FM3" band.

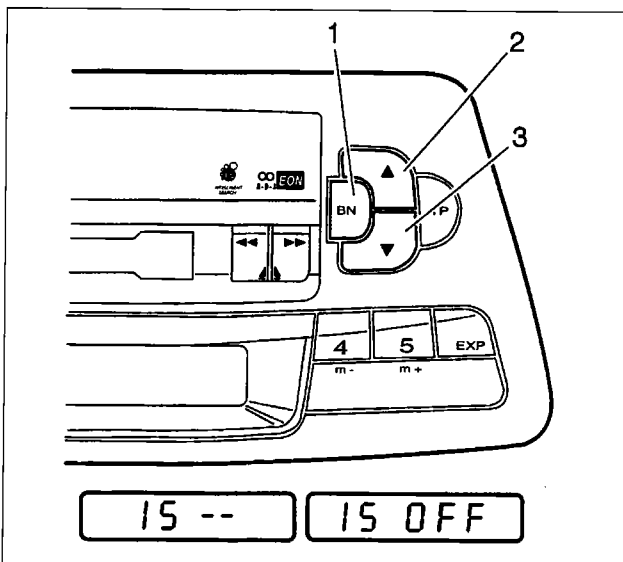
Press the BN button (1) for about 3 seconds to activate the search; the message "LEARN" will appear on the display.

At the end of the search first the RDS programmes and then the transmitters according to their transmission power in the radio IS memory are programmed. The IS memory can store up to 30 transmitters.

If no reception is possible, the reception does remain continuously activated; to interrupt it, press one of the station selection buttons (1,2,3,4,5,).

To recall transmitters programmed in the IS memory, select the IS operating mode by pressing one of the "▲" "▼" buttons (2,3) for about 3 seconds until the message "IS - -" appears on the display, followed by "IS ON". By pressing one of the "▲" "▼" buttons briefly it is possible to recall the transmitters programmed.

To deactivate the IS function, press one of the "▲" "▼" buttons briefly until the message "IS OFF" appears on the display.



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### RDS transmitters automatic search tuning

Select the FM or AM frequency desired using the BN button (1).

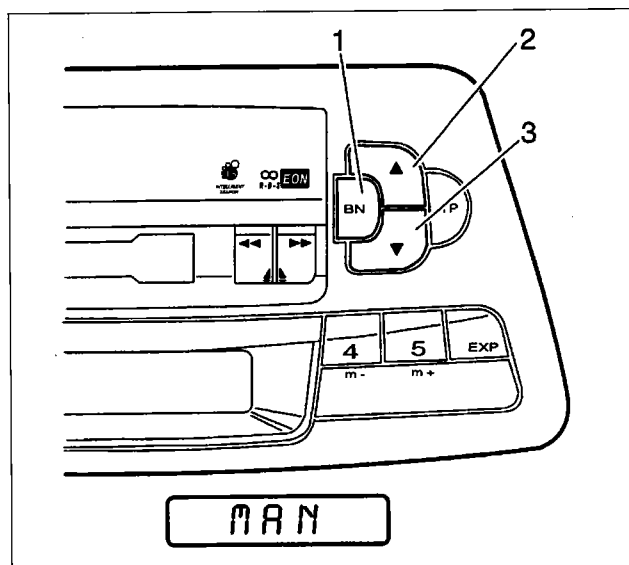
The IS function should not be activated for this type of selection.

If the IS function is switched on, press either button "▲" (2) or "▼" (3) for about 3 seconds until the message "IS - -" appears on the display followed by "IS OFF".

Pressing one of the buttons "▲" (2) or "▼" (3) briefly starts the automatic search. When a transmitter with an identification code is found (RDS transmitter) it is shown on the display. If the transmitter is going to be programmed in a selector button (1,2,3,4,5), press the pre-selected button for about 2 seconds. The radio audio function will be interrupted until the programming has been completed.

### Manual transmitter tuning and programming

Select the frequency range by pressing the BAND (1) button repeatedly. The message on the display will depend on the band selected "FM1", "FM2", "FM3", "MW" or "LW".

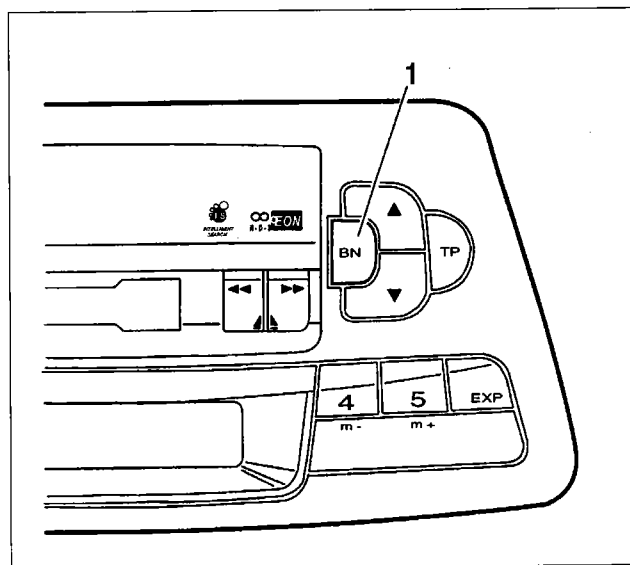


P4A67HL01

Having selected the band, press one of the "▲" "▼" buttons (2,3) for about 6 seconds until the message "MAN" and the frequency tuned into appears on the display. Using the "▲" "▼" buttons it is now possible to alter the tuning frequency in 50 Hz steps for FM ranges and 1kHz for AM frequencies.

The station being listened to can be programmed in the frequency range selected using the frequency selection buttons. At the end of the programming, press the selection button for the frequency until the sound can be heard once again.

The manual tuning can be ended at any time by pressing one of the frequency selection buttons or if none of the buttons has been pressed for 60 seconds.



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### Listening to programmed stations

Select the desired band using the BN button (1). Press one of the frequency selection buttons briefly.

The display will show the button pressed and the transmitter code if it is an RDS transmitter.

If the transmitter selected offers an RDS service and the reception is not good, the radio will search for an alternative frequency. During the search for the alternative frequency the display will show "SRC".

### TP function (Traffic Program)

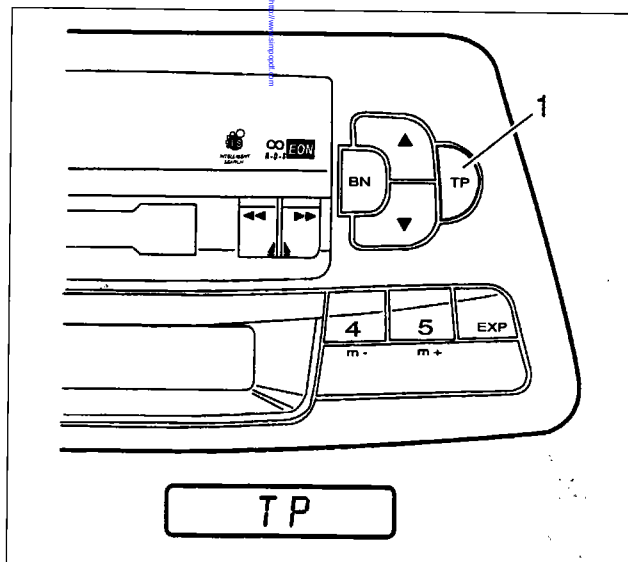
Several stations on RDS1, RDS2 bands also broadcast traffic news.

With the TP function (Traffic Program) it is possible to:

- a) carry out the search for RDS stations only transmitting traffic news;
- b) receive traffic news even if the cassette player is working;
- c) receive traffic news at a pre-set minimum volume even with the radio volume control at zero.

**NOTE** Below are the instructions for carrying out each of the operations illustrated in points a), b) and c) previously.

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#### Point a)

To select a transmitter with a traffic news service, press the TP (1) button briefly. The message "TP" will appear on the display.

If the transmitter is not enabled to provide traffic news, the radio will automatically tune into the closed enabled broadcaster and transmit it.

Several transmitters, providing a traffic news service, can be programmed using the station selection buttons. Follow the instructions in the "Transmitter manual tuning and programming" paragraph, initially pressing the TP button to activate the TP function.

As an alternative to the manual programming, it is possible to follow the instructions in the "Transmitter automatic programmein (AUTOSTORE)" paragraph.

#### Point b)

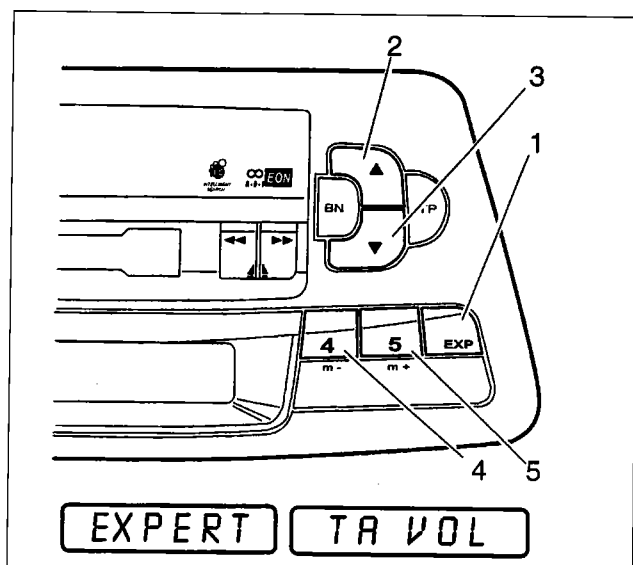
If you wish to receive traffic news, before inserting the audio cassette, tune into an RDS TP transmitter. If traffic news is broadcast whilst listening to a cassette, the reproduction of the tape will be temporarily halted and resumed automatically when the news flash is over.

#### Point c)

Even when not listening to the radio it is possible to receive traffic news. After having tuned into an RDS TP transmitter and set the volume at zero, if this transmitter broadcasts traffic news it can be heard at a pre-set minimum volume.



*In some countries there are radio stations which, even if the TP function is activated, do not transmit traffic news.*



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#### Pre-setting volume level for TP function (Traffic Program)

To select the volume for listening to traffic news, press the EXP button (1) until the message "EXPERT" appears on the display. Then press the "▲" "▼" buttons (2,3) until the message "TA VOL" appears on the display. Using buttons 4 (4) and 5 (5) it is possible to select the desired volume. The volume ranges between 5 and 31.



**EON function (Enhanced Other Network)**

In some countries there are networks which group together several transmitters able to broadcast traffic news.

In these cases, when listening to a programme on an RDS TP station, it will be temporarily interrupted to receive traffic news flashes each time one of the broadcasters on the same network transmit them.

To exclude this function (EON), press the "TP" button briefly (the LED under the button will go out).

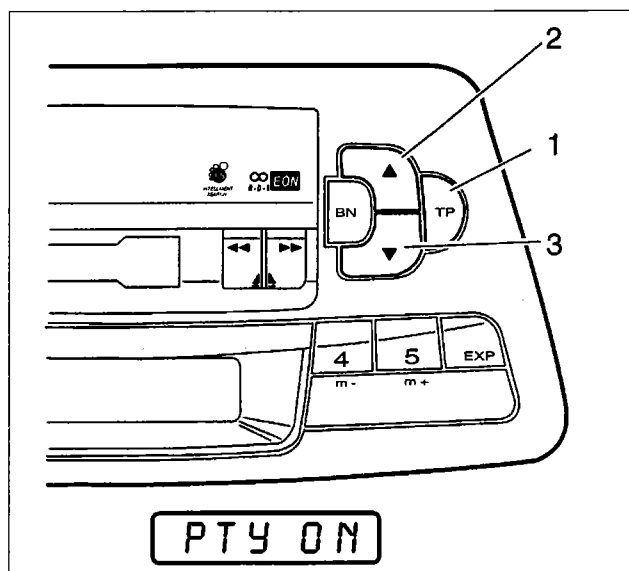
**PTY function**

Several transmitters in the FM range offer a "Type of Programme" service (PTY). The PTY function can be used to automatically select a transmitter offering a certain type of programme, for example classical music.

**PTY autoamtic search**

The search can be carried out by allocating 5 types of programme, selected at will, to the station selection buttons 1,2,3,4,5 or by selecting the type of programme from the list memorized and then starting the search.

For more details, see the paragraphs below.



P4A69HL01

**Programming the types of programme desired in the station selection buttons**

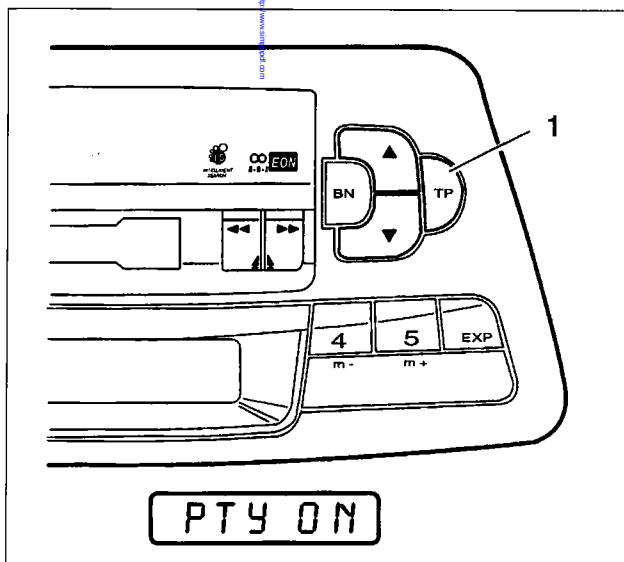
Press the TP button (1) for about 6 seconds until the message "PTY ON" appears on the display. Select the type of programme desired using buttons "▲" "▼" (2,3).

Having identified the type of programme desired, for example classical music "CLASSIC", press the station selection button (1,2,3,4,5) desired for more than 2 seconds. The type of programme selected is associated with the button.

Each selection button can be associated with a particular type of programme by repeating the procedure described above.

To start the automatic search for a transmitter broadcasting a certain type of programme, press the TP button again for about 6 seconds. The message "PTY ON" will appear on the display. Then press the station selection button for the type of programme desired. The display will show the type of programme selected. The automatic search can be started by pressing one of the buttons "▲" "▼" again for about 2 seconds. The search is interrupted when the first transmitter broadcasting the type of programme desired is found.

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### Tuning into the type of programme using the list

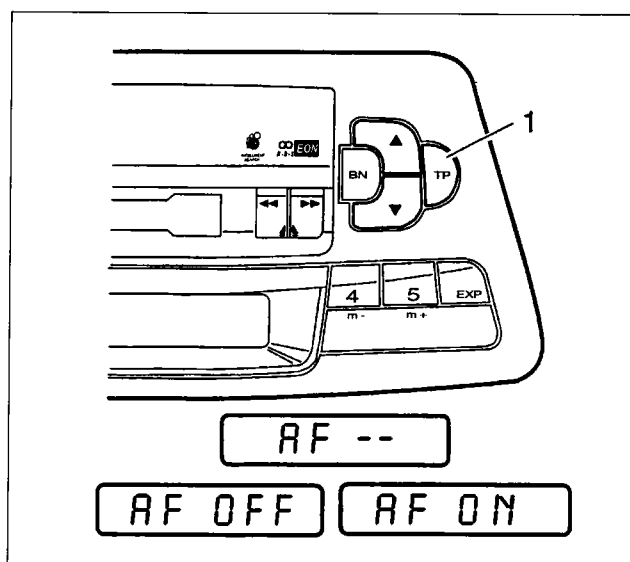
Activate the PTY function by pressing the TP button (1) for about 6 seconds until the message "PTY ON" appears on the display.

By repeatedly pressing one of the "▲" "▼" buttons (2,3) the display will show the types of programme contained in the list. Having identified the type of programme desired, press one of the "▲" "▼" buttons for about 2 seconds to start the automatic search. The search is halted when the radio tunes into a transmitter broadcasting the type of programme selected.

### List of types of programme available

NEWS News and current events  
 AFFAIRS Politics and current affairs  
 INFO Special information programmes  
 SPORT Sport  
 EDUCATE Education  
 DRAMA Drama and literature  
 CULTURE Culture, the church and religion  
 SCIENCE Science  
 VARIED Variety  
 POP Pop music (hits)  
 ROCK M Rock music  
 EASY M Light music  
 LIGHT M Light classical music  
 CLASSICS Classical music  
 OTHER M Music programmes which cannot be classified (e.g. folk)

WEATHER Weather forecasts  
 FINANCE Financial news  
 CHILDREN Childrens programmes  
 SOCIAL A Social information  
 RELIGION Religion and philosophy programmes  
 PHONE IN Phone ins  
 TRAVEL Travel news  
 LEISURE Leisure, hobbies and pastimes  
 JAZZ Jazz music  
 COUNTRY Country music  
 NATIONAL National broadcasts  
 OLDIES Golden Oldies  
 FOLK M Folk music  
 DOCU Special services  
 NO PTY No identification code for the type of programme



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### Alternative frequencies (AF function)

If an RDS programme is received, which is broadcast by several transmitters on different frequencies, the radio will automatically switch to the frequency with the best reception.

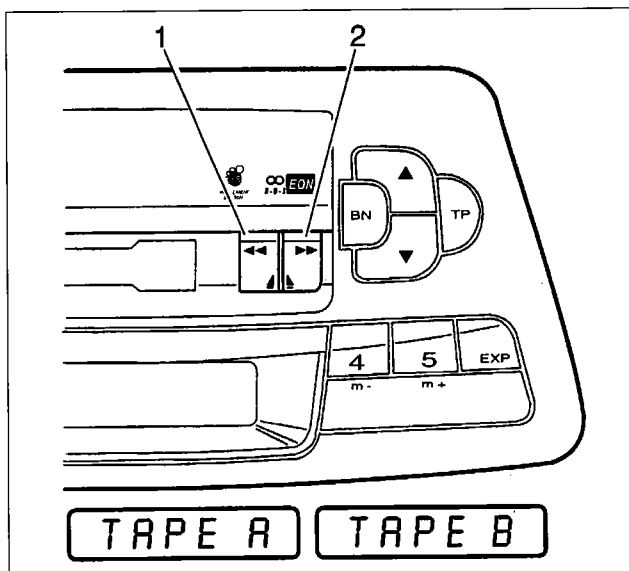
The function is activated at the time of supply. To deactivate the AF function, press the TP button (1) for about 3 seconds until the message "AF - -" followed by "AF OFF" appears on the display. To activate the AF function again, press the TP button until the message "AF OFF" followed by "AF ON" appears on the display.

**AUDIO CASSETTE PLAYER****Activating the audio cassette player.**

The radio system is fitted with an audio cassette player which can be activated by introducing an audio cassette directly into the special housing.

Both sides of the tape can be listened to without extracting the cassette and turning it over.

To start playing an audio cassette, insert it in the special housing, pushing it by hand until it goes in automatically and starts playing.

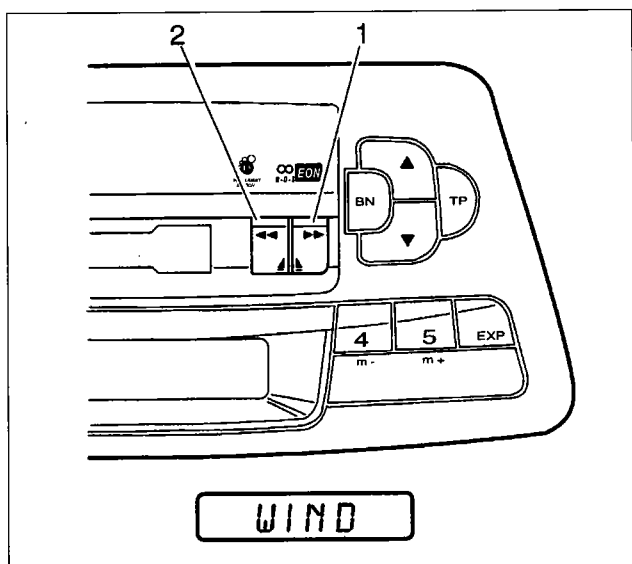


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**Changing the side of the cassette being listened to.**

When there is a cassette in the housing and the message "TAPE A" or "TAPE B" appears on the display, briefly press buttons (1) and (2) simultaneously.

The player will play the other side of the tape. The messages "TAPE A" and "TAPE B" mean the upper side and the lower side of the audio cassette, respectively.



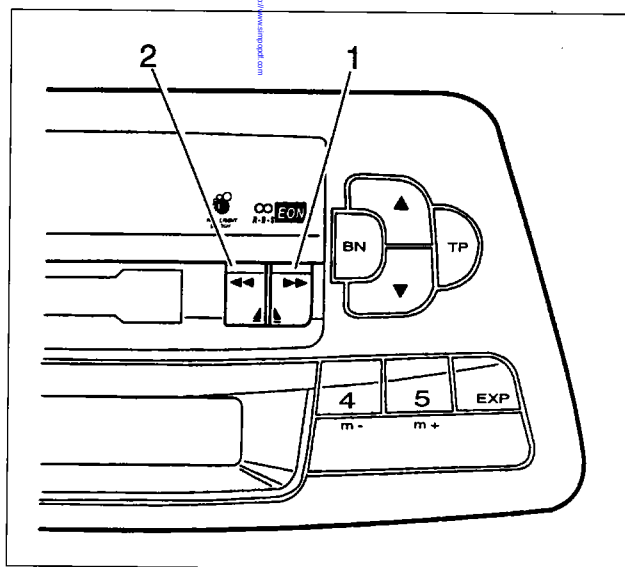
P4A71HL02

**Fast forward and rewinding**

Whilst listening, briefly press button (1) or (2) to fast forward or rewind the audio cassette, respectively. The message on the display during this operation will be "WIND". To interrupt this function, briefly press button (1) or (2). Having interrupted the function, the audiocassette player will automatically resume the reproduction of the cassette.

When the tape has been fast forwarded or re-wound, the player will resume the automatic reproduction of the same side or the other side.

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### Ejecting the cassette.

To eject the cassette from the audiocassette housing, briefly press buttons 1 and 2 simultaneously.

After the audio cassette has been ejected, the message "TAPE" will appear on the display and the radio will operate, tuned into the last transmitter listened to.

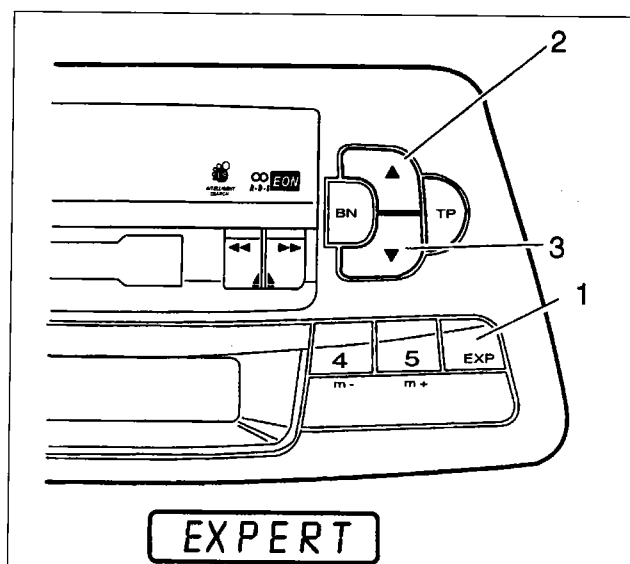
### EXPERT control level

Using the EXPERT additional level it is possible to carry out different adjustments which may only be necessary once, for example, setting the exact time, or occasional adjustments such as, for example, the adjustment of the minimum volume for traffic news.

### List of possible EXPERT adjustments

The following adjustments can be carried out using the EXPERT control level:

1. Setting the time
2. Switching the clock RDS tuning on/off
3. Traffic news minimum volume
4. LRN on/off
5. Regional programme automatic change on/off
6. LOC on/off
7. MONO on/off
8. LOUDNESS on/off
9. FADER on/off
10. Limiting volume when switching on
11. BDLY delay in switching BOOSTER connected on/off
12. Switching on/off via ignition
13. Audio mute during operation of car phone
14. Telephone input sensitivity



### Selecting and modifying the adjustments using the EXPERT control level.

Press the EXP button (1) until the message "EXPERT" appears on the display.

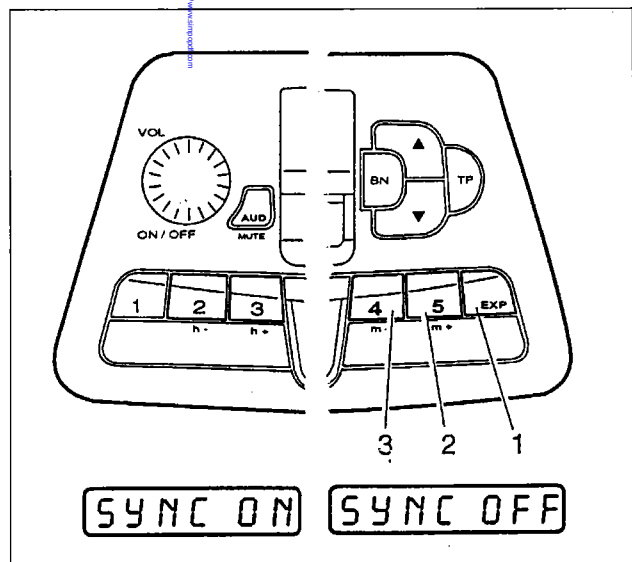
Using buttons "▲" (2) and "▼" (3) select the desired adjustment.

By pressing the frequency selection buttons it is possible to set the desired level.

The frequency selection buttons involved depend on the desired adjustment.

For their identification, refer to the paragraphs which follow dealing with the individual possible adjustments.

To end the adjustment, press the EXP button for about 3 seconds.



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### Setting the TIME

The frequency selection buttons required for the adjustment of the hour are:

Buttons 2 and 3 for setting the hour

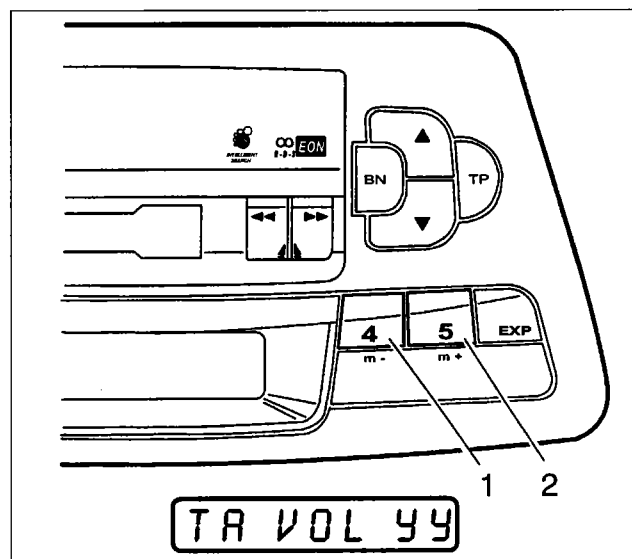
Buttons 4 and 5 for setting the minutes

To start the clock with precision, press the EXP button (1) briefly.

### Synchronizing the clock

This allows the clock to be synchronized with the RDS TIMER signals transmitted by the broadcaster.

By pressing frequency selection button 5 (2) the message on the display will be "SYNC ON", whilst if frequency selection button 4 (3) is pressed the message "SYNCH OFF" will appear on the display.

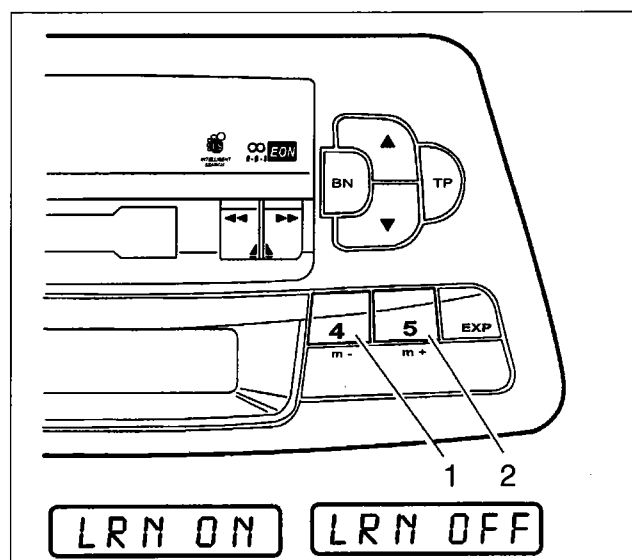


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### Minimum volume for listening to traffic news

The desired level can be set using frequency selection buttons 4 (1) and 5 (2) to increase or decrease the volume, respectively.

During the adjustment, the message "TAVOL YY" will appear on the display where YY refers to the volume level set.

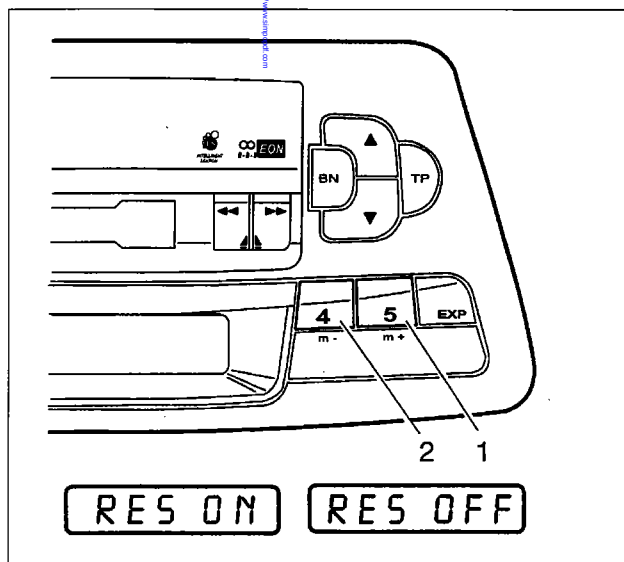


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### Switching LNR on/off (radio function)

This makes it possible to switch the search for RDS traffic new broadcasters on or off. The frequency selection buttons for switching it on and off are buttons 4 (1) and 5 (2), respectively.

The messages "LRN ON" and "LRN OFF" respectively, will appear on the display when the function is switched on or off.



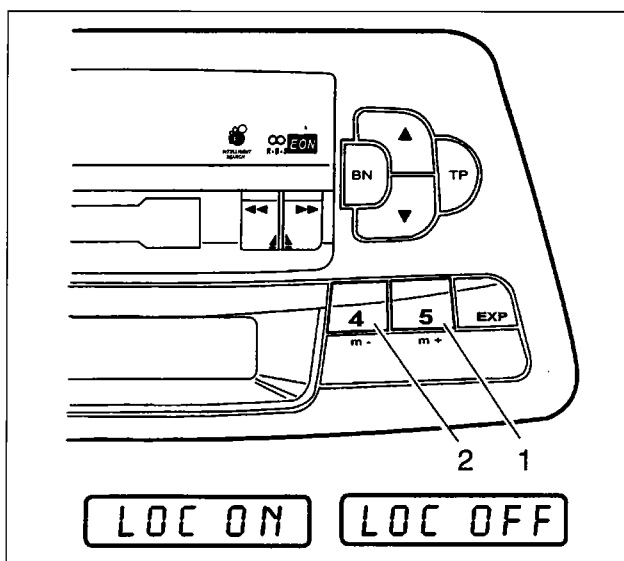
P4A74HL01

#### Automatic programme change (REGIONAL)

When the RDS programme consists of various regional broadcasts, the radio may switch between transmitters, selecting the one with the most powerful signal.

The frequency selection buttons required are button 5 (1) for switching the function on and button 4 (2) for switching it off.

The messages displayed will be "RES ON" when the function is switched on and "RES OFF" when the function is switched off.



P4A74HL02

#### LOC function

This makes it possible to search for FM frequencies according to their transmission power.

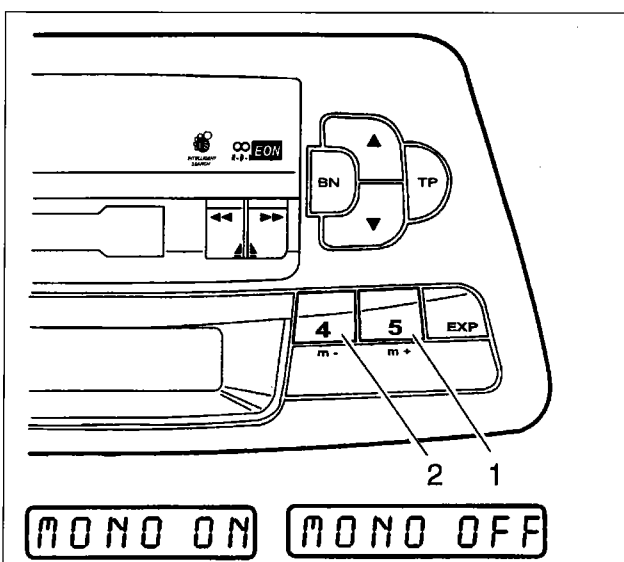
With the LOC function selected, the radio system searches for the most power broadcasting stations whilst if the function is not selected the search is also extended to less powerful transmissions.

To activate the LOC function, press the frequency selection button 5 (1) until the message "LOC ON" appears on the display. To deactivate the function selected previously, press frequency selection button 4 (2) until the message "LOC OFF" appears on the display.

#### MONO function

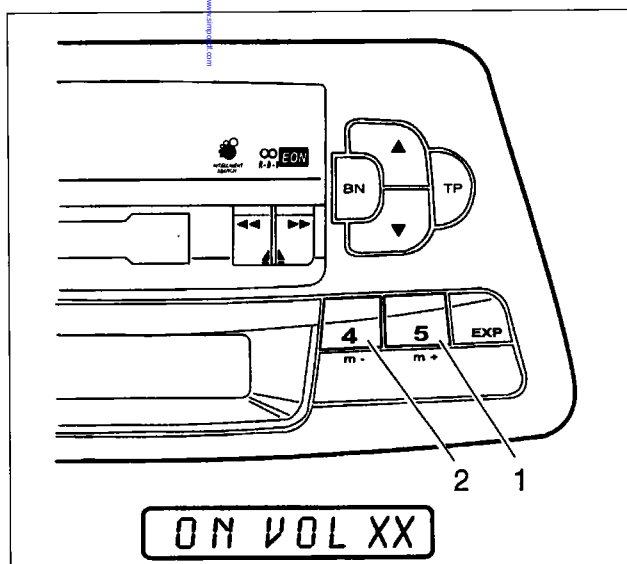
The MONO function makes it possible to set the radio equipment to stereo or mono reproduction. In the case of a stereo broadcast, there are two different channels, whilst in the case of a MONO broadcast there is one channel only. For good quality sound, the setting should correspond to the type of transmission (Stereo or MONO).

To select the MONO function, press frequency selection button 5 (1) until the message "MONO ON" appears on the display. To deactivate the MONO function, press the frequency selection button (2) until the message "MONO OFF" appears on the display.



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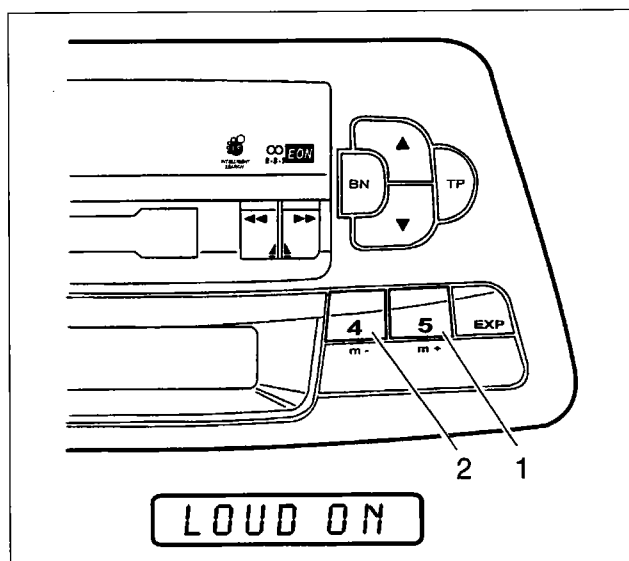




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### Limiting the volume on switching on

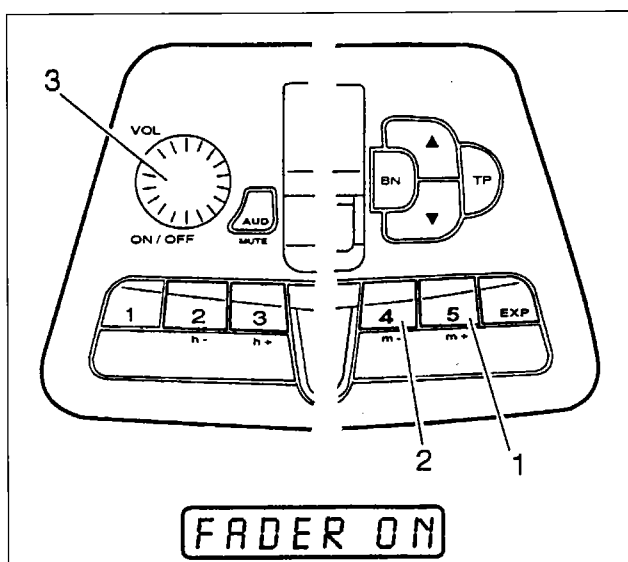
It is possible to select the volume at which the radio is switched on using frequency selection buttons 5 (1) and 4 (2), respectively to increase or reduce the volume. By pressing buttons 4 or 5 the message "ON VOL xx" will appear on the display where the level of the volume set will appear in place of xx.



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### LOUDNESS function

The LOUDNESS function makes it possible to improve the quality of the sound at a reduced volume. To activate the LOUDNESS function, press frequency selection button 5 (1) until the message "LOUD ON" appears on the display. To deactivate the LOUDNESS function, activated previously, press frequency selection button 4 (2).

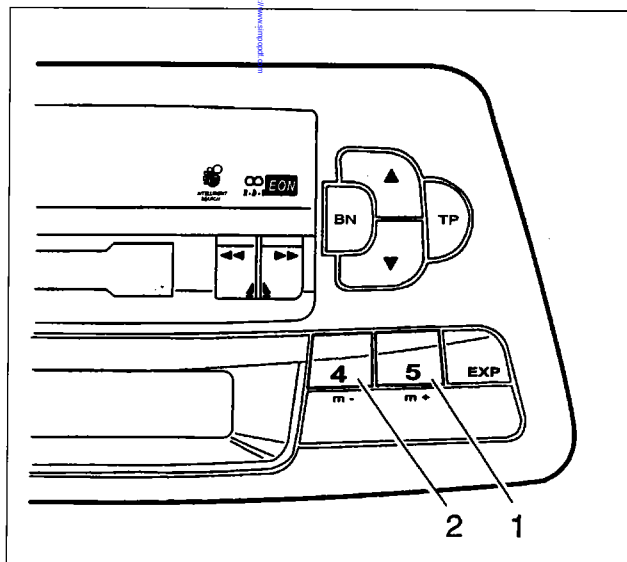


P4A75HL03

### FADER function

By selecting the "FADER" function it is possible to alter the distribution of the volume between the front and rear speakers. To select the FADER function, press frequency selection button 5 (1) until the message "FADER ON" appears on the display. To deactivate the function, press frequency selection button 4 (2). The VOL control (3) is used to regulate the intensity of the sound, emphasizing the sound coming from the front speakers or from the rear speakers.

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#### Delay in switching BOOSTER on/off (BD-LY)

To switch the Booster delay on or off, press frequency selection buttons 5 (1) and 4 (2), respectively.

The message "BOLY ON" or "BOLY OFF" will appear on the display.

#### Switching on and off via the ignition

See paragraph on "Switching on radio".

#### Audio mute function during the operation of the car phone

To switch the radio on or off, when the vehicle is equipped with a car phone system, press frequency selection buttons 4 and 5, respectively.

The messages "PHONE OFF" and "PHONE ON", respectively will appear on the display when the function is off or on.

When the function is switched on and a telephone call is received, the radio is automatically deactivated and the conversation is relayed through the speakers.

#### Telephone input sensitivity

The telephone input sensitivity can be adjusted using frequency selection button 4 or 5.

The messages "PHONE 00" or "PHONE 03", respectively are displayed for lesser or greater sensitivity.

### TECHNICAL INFORMATION

#### Aerial

The vehicle has an aerial located on the roof.

#### Electrically operated aerial and external amplifier (available on request)

The radio is prepared for an automatic electrically operated aerial (it is raised the moment the radio is switched on and is lowered when it is switched off) and an external amplifier.

The switching voltage for the aerial is at contact 5 of connector "A" for the radio and the switching voltage for the amplifier is at contact 3 of connector "A".

The switching voltage for both outlets is + 12 V with a maximum current of 0.5 A.

#### Speakers for AD182H radio equipment

The acoustic system consists of:

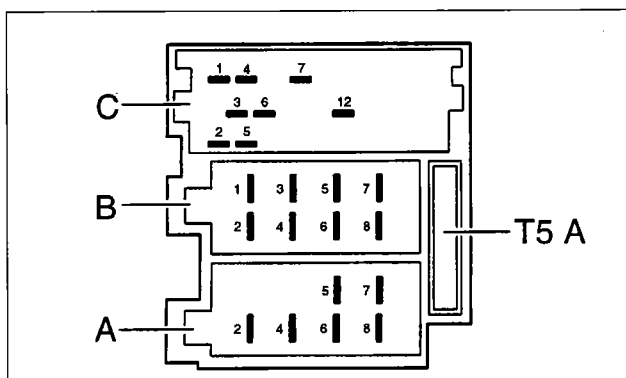
- 2 ferro-fluid tweeter-dome diffusers with a power of 40 W max. each;
- 2 130 mm diffusers with a power of 30 W max. each.

#### Fuses

The radio has a 10 A protective fuse.

### Connections

This paragraph contains the connect at the rear of the radio equipment.



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### Supply voltages

#### Blade contacts A:

##### A8 Connection for earth

Connect to terminal 31 (earth) of the vehicle.

##### A7 Connection for 12 V supply voltage

Connect to terminal 30 (continuous positive) of the vehicle.

##### A6 Connection for instrument light

Contact not connected: no light with the radio switched off if the instrument light is on.

##### A5 Output switching voltage of +12 V (max 0.5 A)

Present at A5 blade contact when the radio is on.

For automatic aerial (extended/retracted), aerial amplifier (supply voltage).

##### A4 Connection for voltage of +12 V

Connect to terminal 15 of the vehicle if the radio is going to be switched on and off via the ignition.

Connection A4 may also be not wired. In this case, the radio should come on and off via the **VOL control**.

With the engine switched off, the equipment is switched off about 20 minutes later

##### A2 Phone-Mute connection for car phone or receiver-transmitter

The radio audio function is deactivated during the operation of the car phone or the receiver-transmitter.

The message "PHONE" appears on the display.

Contact A2 should be earthed from the mute outlet of the telephone/receiver-transmitter!

### Speakers

#### Blade contacts B

Maximum power at speakers 4 : 4 x 20 W or 2 x 15 W

Connection for 4 x 20 W

Front speaker:

B3 right +

B4 right -

B5 left +

B6 left -

Rear speaker:

B1 right +

B2 right -

B7 left +

B8 left -

Connection for 2 x 15 W

B3 right +

B2 right -

B5 left +

B8 left -

When operating with 2 x 15 W the FADER should be switched off in the EXPERT Menu

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The connections for the speakers should not be electrically connected to each other or earthed!

### Additional connections

#### Blade contacts C

Line output

Possibility of connection for power amplifier (Booster) or speaker activated.

C1 Left rear speaker +

C2 Right rear speaker +

C3 Earth -

C4 Left front speaker -

C5 Right front speaker -

C6 Switching voltage for power amplifier:  
on/off (max 0.3 A)

Steering remote control:

C8 Earth

C9 Remote control

Telephone input:

Possibility of connection for car phone or receiver-transmitter (listening through the radio).

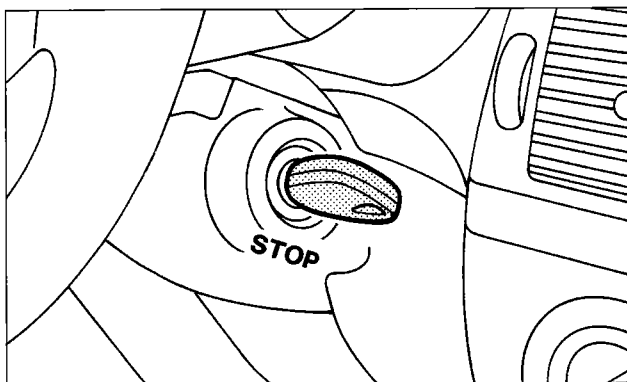
C7 Telephone NF

**PROGRAMMING IGNITION KEYS (only on 1910 JTD version)**

**For anything not dealt with in the pages which follow, refer to the Fiat CODE system described in the Fiat Bravo-Brava Service Manual II° volume (print no. 506.670/01)**

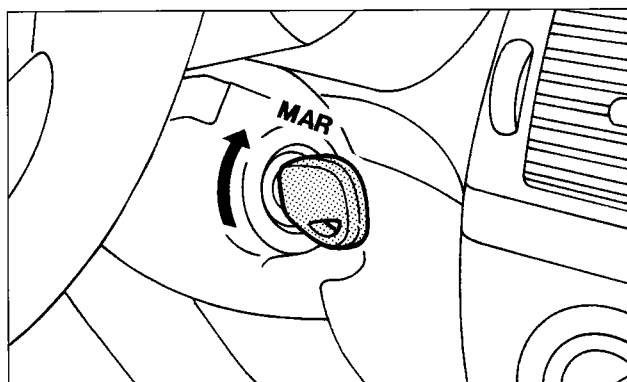


*On the version in question, as a result of a different CODE system software configuration, the specific procedure described below must be followed.  
At least two main keys are required in addition to the MASTER key.*



P4A79HL01

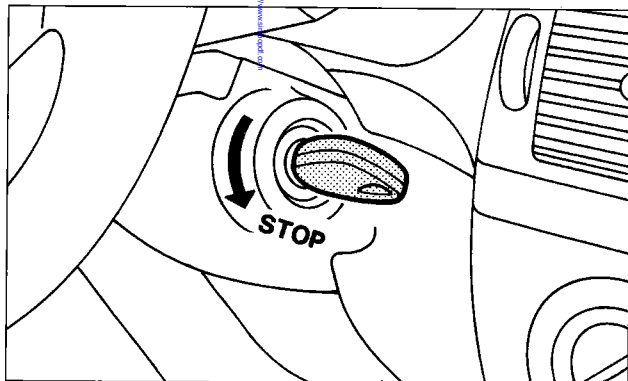
Insert the (wine) MASTER key in the ignition switch in the OFF position.



P4A79HL02

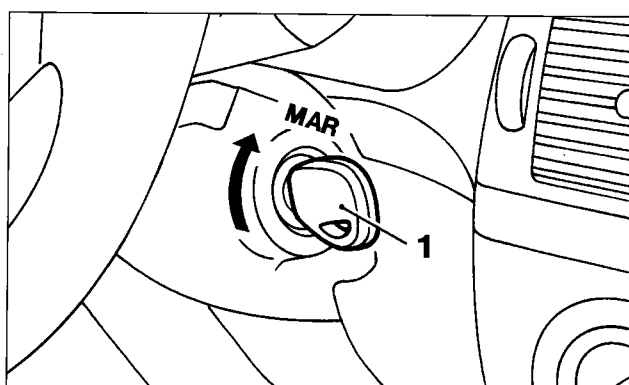
Turn the MASTER key to the ON position (+15), the CODE warning light should come on for 0.7 secs.

### 55.



P4A80HL01

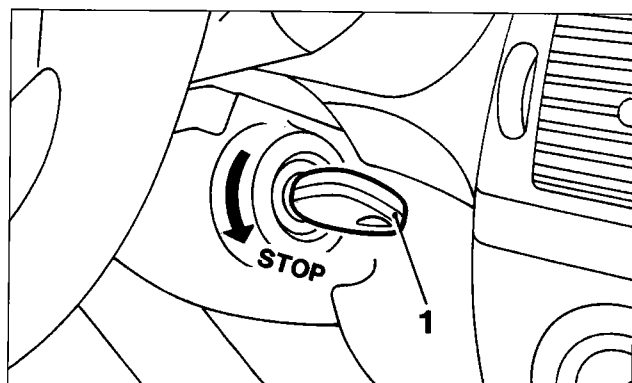
When the CODE warning light goes out, turn the MASTER key to the OFF position and extract it.



P4A80HL02

Within 10 seconds:

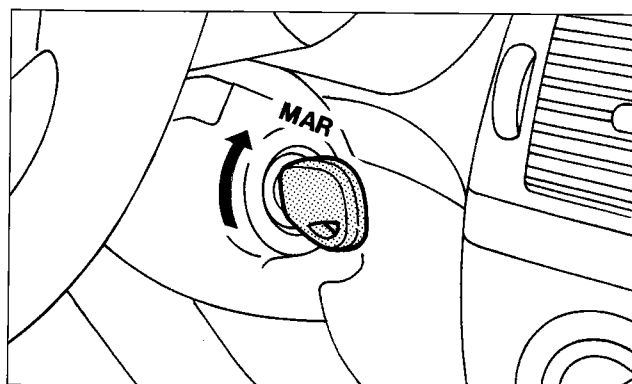
- insert a new key (1) in the ignition and turn it to the ON position (+15), the CODE warning light should come on for 0.7 secs.



P4A80HL03

- When the CODE warning light goes out, turn the key (1) to the OFF position and extract it.

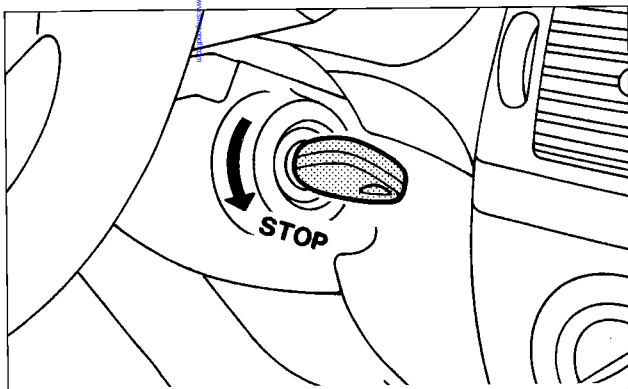
Repeat the operations, as for the key (1), for the second key and for all the keys to be programmed.



P4A79HL02

Within 10 seconds:

- insert the MASTER key once again in the ignition and turn it to the ON position (+15), the CODE warning light should come on for 0.7 secs.

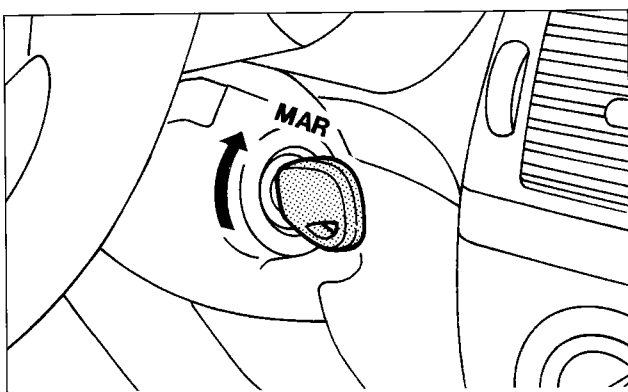


P4A80HL01

When the CODE warning light goes out, turn the MASTER key to the OFF position, leaving it in this position for between 4 to 9 secs.

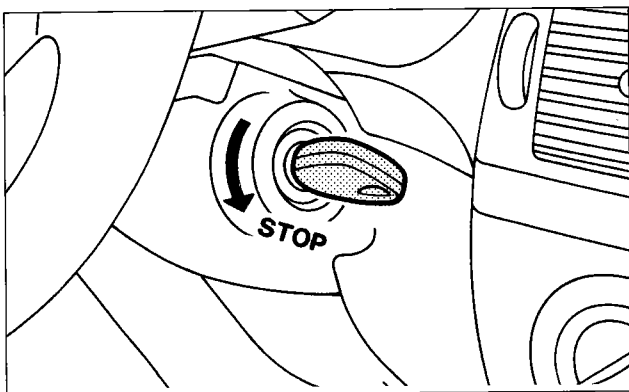


*Do not leave the MASTER key in the OFF position for longer than 10 secs because all the codes programmed will be cancelled.*

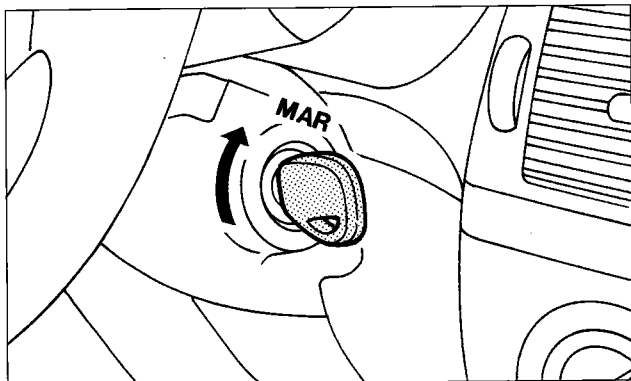


P4A79HL02

Turn the MASTER key to the ON position (+15), the CODE warning light should come on for 0.7 secs.



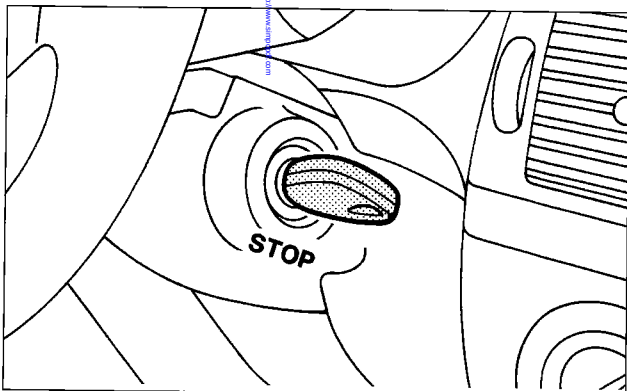
When the CODE warning light goes out, turn the MASTER key to the OFF position.



Repeat the two previous operations until, when the MASTER key is turned to the ON position, the CODE warning light rather than coming on for 0.7 seconds remains on constantly.



### 55.



P4A79HL01

Place the MASTER key in the OFF position, extract it and return it, the key programming procedure is over.

If the procedure has been carried out correctly, i.e. as far as the timing and operations are concerned, if the ignition key is placed in the ON position, the CODE warning light will go out after coming on initially for 0.7 seconds, otherwise it will start to flash in rapidly (1.6 Hz); if this is the case, the programming procedure must be repeated.



*If a mistake is made (at any time) during the programming procedure, place the ignition key in the ON position for longer than 2 seconds or in the OFF position for longer than 10 seconds, then start the key programming procedure again.*

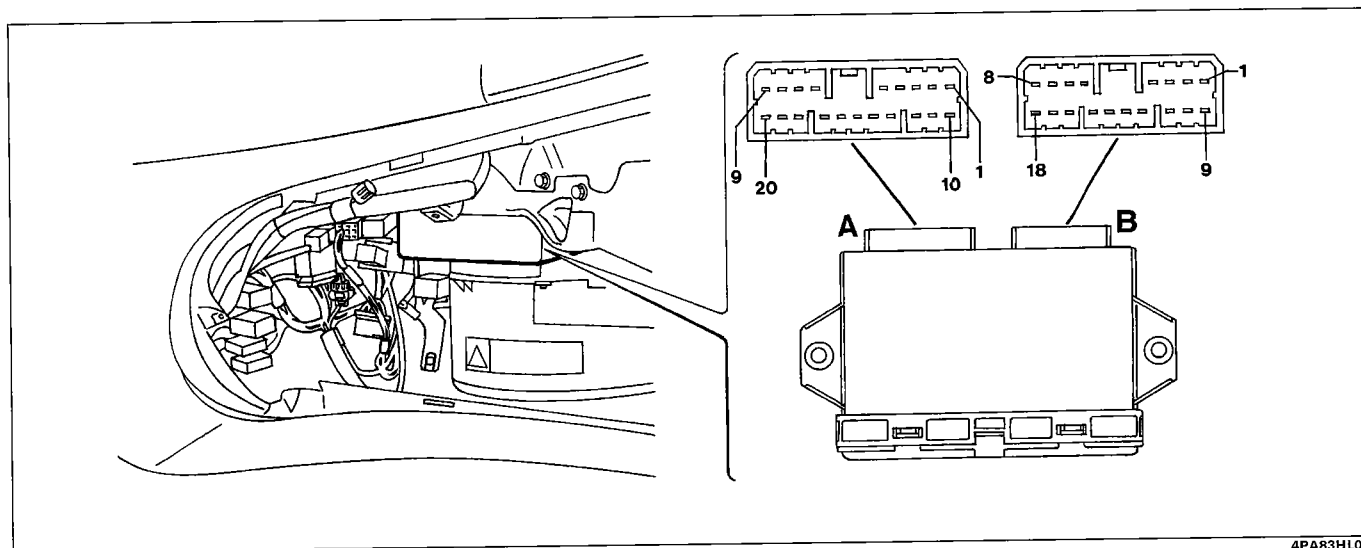
### INTEGRATED SERVICES ELECTRONIC CONTROL UNIT

A single electronic control unit known as the ABI (Alzacristalli Bloccaporte Integrati - Integrated electric window and door lock) located beneath the right facia trim controls a set of functions and controls that are normally controlled by several different components.

The various functions are as follows:

- Front electric window operation;
- Door lock/release;
- Timed passenger compartment lighting;
- Timed activation of heated rear window and door mirror demisters.

### Location of ABI control unit



4PA83HL01

### Control unit signals

#### Connector A:

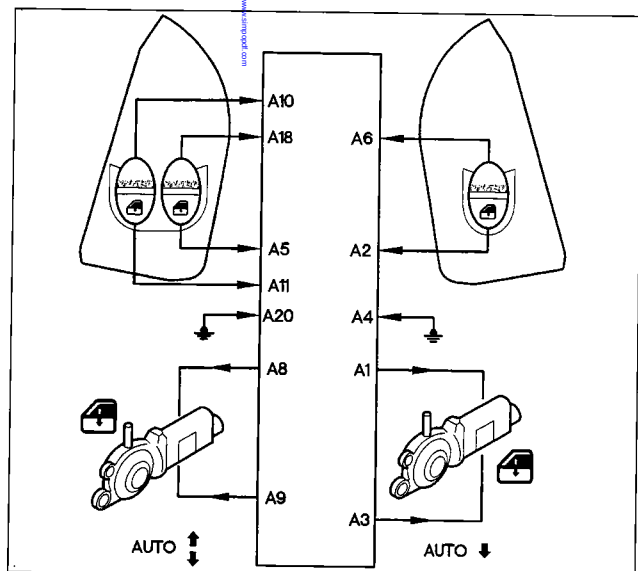
- 1 Supply to passenger side window motor - raise
- 2 Passenger side window motor control - lower
- 3 Supply to passenger side window motor - lower
- 4 Passenger side window earth
- 5 Passenger side window control from driver's side - lower
- 6 Passenger side window motor control - raise
- 7 N.C.
- 8 Supply to driver side window motor - raise
- 9 Supply to driver side window motor - lower
- 10 Driver side window motor control - raise
- 11 Driver side window motor control - lower
- 12 Lock control from remote control unit
- 13 Release control from remote control unit
- 14 N.C.
- 15 Power supply (+30)
- 16 Power supply (+30)
- 17 N.C.
- 18 Passenger side window control from driver's side - raise
- 19 N.C.
- 20 Driver's side window earth

#### Connector B:

- 1 Timed ear courtesy light power supply
- 2 Driver side front door switch for interior lights
- 3 Passenger side front door switch for interior lights
- 4 Door lock motor power supply (release)
- 5 Door lock motor power supply (lock)
- 6 N.C.
- 7 Power supply (+15)
- 8 Power supply (+30)
- 9 Heated rear window relay power supply
- 10 Timed front courtesy light power supply
- 11 Outlet for heated rear window warning light
- 12 Driver side rear door switch for interior lights
- 13 Electronic earth and door lock
- 14 Heated rear window control
- 15 Lock command from front locks (from key or switches)
- 16 Release command from front locks (from key or switches)
- 17 Heated rear window control from climate control system (MAX DEF)

Passenger side rear door switch for interior lights

### 55.



P4F12AL01

### FRONT ELECTRIC WINDOW OPERATION

Operation is automatic for window raise and lower on the driver side, but only for lowering on the passenger side.

Operation is manual when key operating time is from 60 to 300 milliseconds.

Operation is automatic when key operating time exceeds 300 milliseconds.

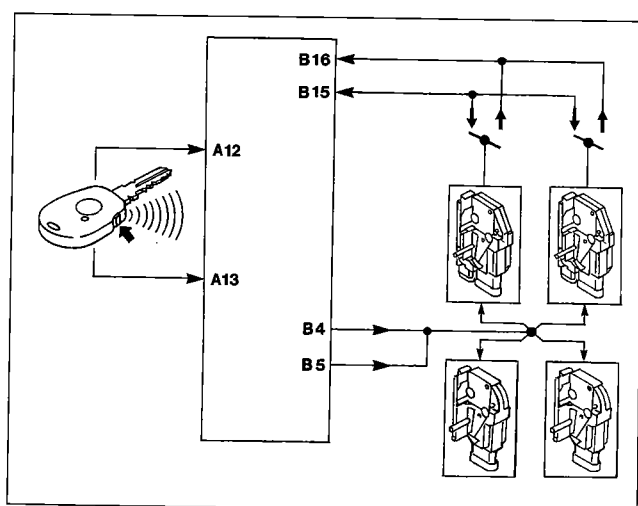
The window stops when the key is operated in the opposite direction.

### Safety systems

The window stops (i.e. motor electrical supply is cut off) when the glass reaches the upper or lower end stop or if an obstacle gets in the way and blocks the glass. This is regulated by controlling the self-adaptive motor direct current.

The electronic control unit behaves as follows:

- If the motor control signal cuts out during operation, the control unit deactivates the system within a maximum time of 500 milliseconds. This interruption occurs when the controlled current taken up by the electric window motor drops to less than 0.8 A.
- If the control buttons are faulty (short-circuit or keys stuck down), control operation is inhibited at the time of control unit activation until the defect disappears (or the key is released) for longer than 60 milliseconds;
- if the buttons are pressed for longer than 12 seconds, motor operation is inhibited; if the descending key is short-circuited or pressed for longer than 30 seconds, the control is inhibited so that the glass can be closed.



P4A048HL01

### DOOR LOCK/RELEASE

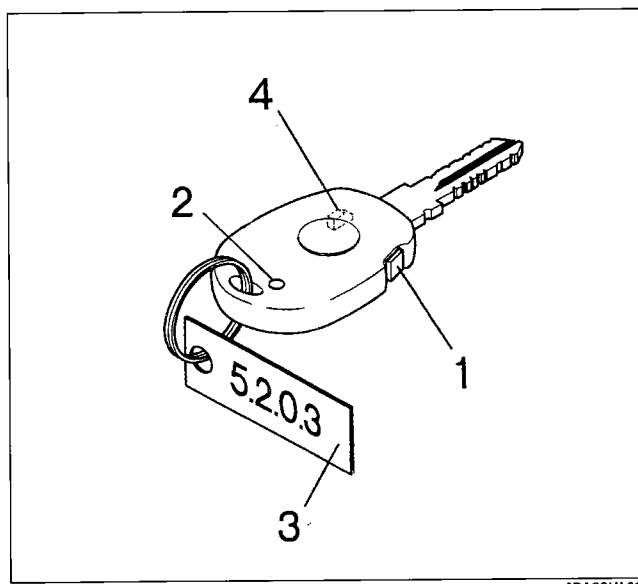
The locks are operated simultaneously upon a control from the key, the front door switches (knobs) or via the remote control (see next page).

**NOTE** Locking takes place only with the doors properly closed and the locks locked. Conversely, release takes place with the doors properly closed and the doors locked.

**CENTRAL DOOR LOCKING/OPENING**

Software in the electronic control unit runs a series of safety checks:

- It reads switch position at the end of each operation. If this position does not agree with the action carried out, a repulsion takes place. Everything is as normal if it agrees with the action carried out. Repulsion takes place after a locking manoeuvre and after a release manoeuvre.
- If the motors are commanded to lock and the operation is not carried out together, i.e. the commands do not agree or a door is open (in the case of the lock manoeuvre alone, the circuit carries out an opposite manoeuvre to attempt to realign the lock;
- if the control unit records several consecutive, complete lock/unlock manoeuvres, the system cuts in to operate the manoeuvre limiter. The system therefore remains inhibited in released position for 30 seconds.
- the system cuts off operation if battery voltage drops below 9 V.

**DOOR OPENING/CLOSURE REMOTE CONTROL**

**NOTE** *The remote control, not available as standard, is built into the ignition key.*

Whenever the control button (1) is pressed, the sender unit sends a radio code with action radius of about 10 metres to the receiver in the courtesy light.

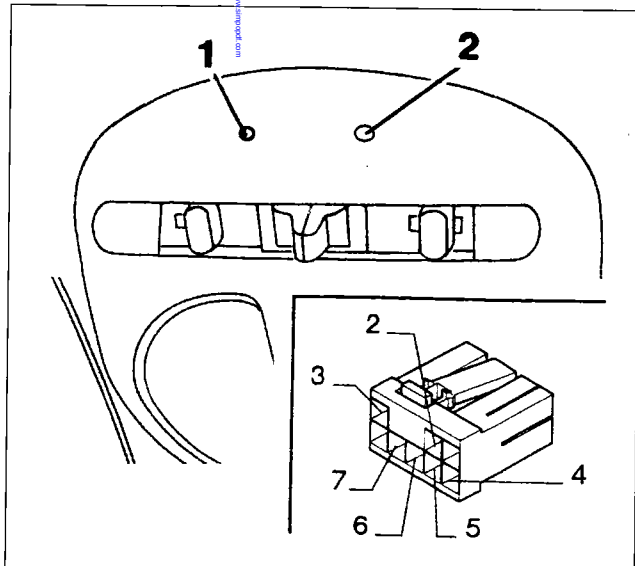
1. Control button
2. Repeater led
3. Password code card
4. Transponder (used by invisible Fiat CODE)

**NOTE** *Each key with remote control unit has a plate (3) with a 4-figure password to protect against unauthorised programming (protected programming). The Dealer must remove the plate at the time of sale and place it on the back of the Code Card (refer to the Fiat CODE chapter). If the plates are lost, the remote control can still be used but NEW REMOTE CONTROL UNITS cannot be stored (see next page). if this is necessary, replace the receiver on the courtesy light and the keys (to obtain the plates).*

**RECEIVER**

The receiver, built into the courtesy light, is an electronic device that receives a signal from the remote control. This performs door opening/closure functions. Each receiver may be programmed with one or more remote controls (up to eight) and store the relevant codes. A green led (1) on the receiver lights up when the signal is received, while a button (2) is used to store the code. When fitted in the cars, receivers contain a UNIVERSAL code that is used to carry out end of production line tests using a remote control unit with a universal code. When the car is delivered to the customer, the receiver must be personalised by replacing the UNIVERSAL code with codes for remote control units provided with the car (see PROGRAMMING on the next page).

### 55.



P4F039L04

1. Green led
2. Store button

#### Receiver connector

1. Not connected
2. Provision for alarm system
3. Positive from battery (+30)
4. Earth
5. Door release
6. Door lock
7. Ignition-operated positive (+15)
8. Not connected

#### SIMPLIFIED PROGRAMMING

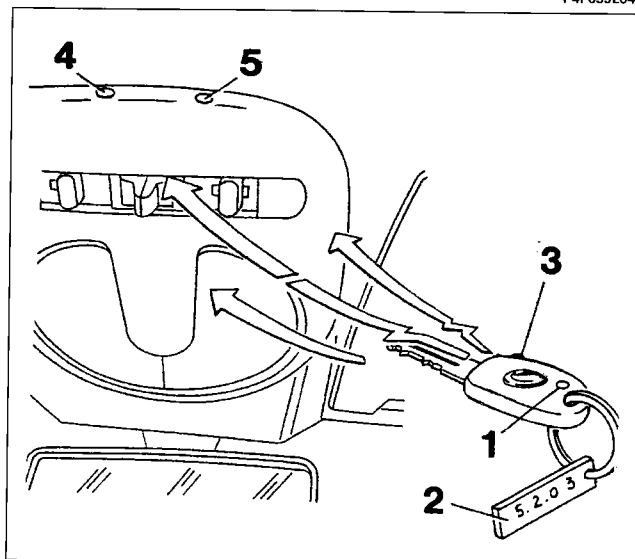
A remote control unit must always be stored with the ignition key remove or in STOP or PARK position

With this programming system, any number of remote control codes are recognised but only the last 8 remain stored by the alarm system as follows:

1. press and hold down button (5) on the receiver built into the courtesy light. The adjacent LED (4) should flash.
2. Hold button (5) down and press remote control unit key (3).
3. Then release key (3) when the light of led (4) on the receiver should become fixed.
4. Then release button (5) on the courtesy light at the end of the cycle.
5. The remote control unit is now programmed.

**NOTE** Repeat the operations below to store the next remote control units.

6. If the receiver led stops flashing and goes off (when the remote control key is pressed), the receiver memory is closed. Use PROTECTED PROGRAMMING to store the remote control unit code.



P4F039L05

1. Red LED on remote control unit
2. Password code, 4-figure
3. Control button on sender unit
4. Green LED on courtesy light
5. Programming button

#### PROTECTED PROGRAMMING

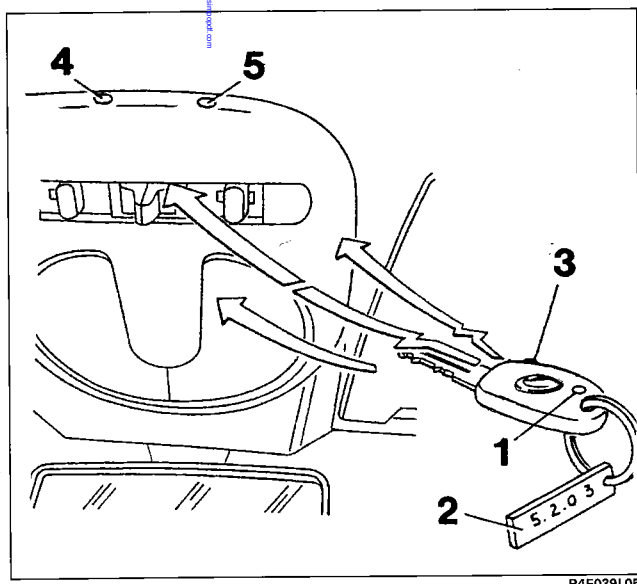
If the memory is closed, further remote control codes can be entered only after opening the memory.

#### OPENING MEMORY AND STORING A NEW REMOTE CONTROL UNIT

##### Opening the memory

To open the memory, carry out the following operations in rapid succession:

1. Press button (5) on the receiver for about 1 second. LED (4) flashes as long as the button is pressed.
2. Release the button; after about 3 seconds, the LED emits a short flash to indicate that the first figure of the password can be entered.



Press button (5) as many times as is indicated by the first figure of the Password (e.g. if the Password is 5.2.0.3, press 5 times). Whenever the button is operated, LED (4) lights up briefly to give visual confirmation.

1. Red LED on remote control unit
2. Password code (4-figure)
3. Control button on remote control unit
4. Green LED on courtesy light
5. Programming button

4. About 3 seconds after the last press on the button (the fifth in this case), the LED emits another flash to ask for the next figure to be entered.
5. Repeat the process from poen 3 to enter all four figures (do not press if the figure is "0" but wait for the next request).
6. If the Password has been correctly entered (memory open) the LED begins to flash (for about 10 seconds). If it comes on with a fixed light (for about 10 seconds), repeat the cycle from point 1.

#### **Storing a new remote control unit.**

7. While LED (4) is flashing, press and hold down button (5). Led (4) continues to flash.
8. Press key (3) of the new remote control unit until the light on the green LED (4) on the courtesy light becomes fixed.
9. Then release key (3) of the remote control unit when the light on LED (4) on the courtesy light becomes fixed;
10. then release button (5) on the courtesy light when the programming cycle is concluded.
11. The remote control unit is then programmed.



*The memory closes again after storing the new remote control unit.*

#### **TIMED PASSENGER COMPARTMENT LIGHTING**

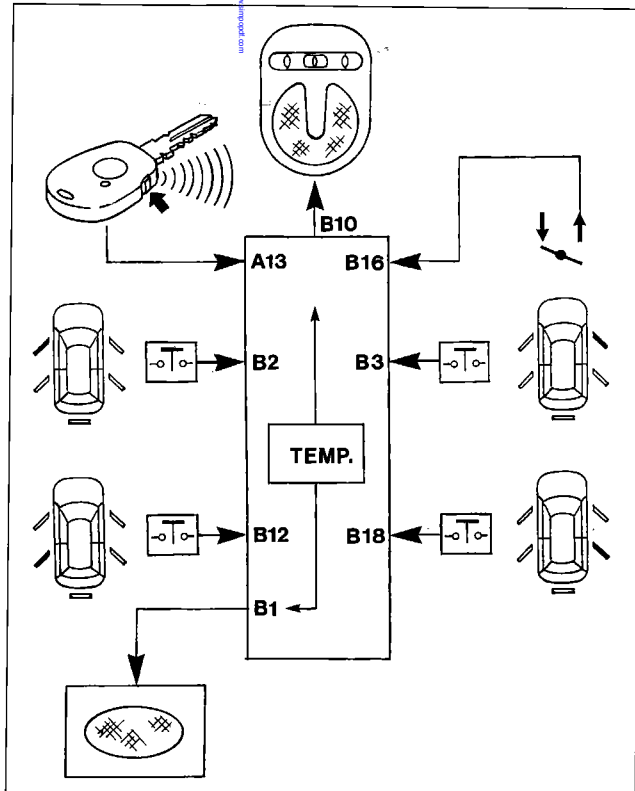
When the door is released by key or remote control unit, both front and rear passenger compartment lights are operated on a timer as follows:

- after any of the doors is opened (i.e. door open switches operated), a door release command is given or the ignition key is removed, timers are enabled that come on that gradually turn on all car courtesy lights from zero to maximum intensity within 3 seconds. At the end of the timed period, all car courtesy lights are turned off gradually from maximum intensity to zero within 3 seconds. Whenever a door is open, the current timer is re-initialised.

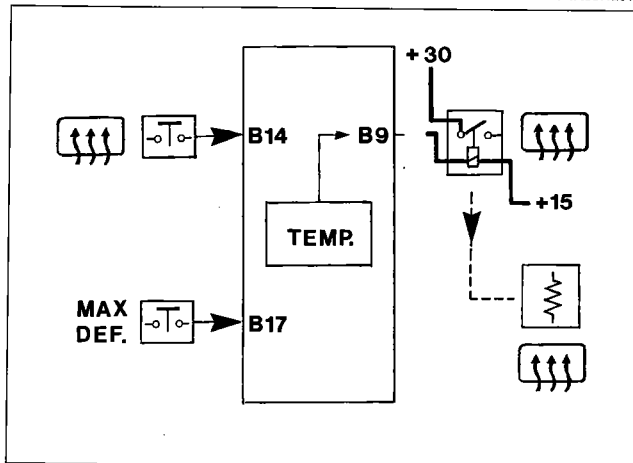
Timers are as follows:

- 6 seconds from door release by means of a key from outside the car, by remote control unit or via safety button inside the passenger compartment. This timer does not work with the ignition key on.

### 55.



P4A88HL01



P4A88HL02

- 6 second when the door is reclosed to allow the driver to enter the car and turn the ignition key on;
- 6 seconds when the door is reclosed to allow the driver to enter the car and insert the ignition key. The timer locks when the ignition is turned on;
- 6 seconds when the ignition key is taken out;
- 3 minutes to prevent the battery charging if the door is accidentally left open.

**NOTE** When any of the doors is opened, the timer begins again from zero.

### TIMED OPERATION OF THE HEATED REAR WINDOW (and door mirrors)

The control unit operates the heated rear window (and the door mirrors demister coils) on a timer as follows:

- key turned ON;
- an activation signal is received from the switch on the facia;
- an activation signal is received from the air conditioner (MAX DEF)

The power supply ceases if:

- the key is turned to STOP or taken out
- a deactivation signal is received from the switch on the facia;
- a MAX DEF function deactivation signal is received.

If one of these two signals is not received, the timer keeps the coils activated for 20 MINUTES, but a specific system is applied:

- the power supply stays on AT ALL TIMES for the first 10 MINUTES;
- During the SUBSEQUENT TEN MINUTES, the power is cut off if battery voltage drops below 11.6 V (and is restored if voltage rises to more than 13V).

Once the first 20 minutes of operation have elapsed, the heated rear window relay control working cycle is 2 minutes active and 2 minutes deactive until the heated rear window control switch is turned off. During the active stage, battery voltage affects operation as described previously. When the rear window remains active, the warning light is turned on.

**NOTE** A command from the facia switch always takes priority over the MAX DEF function, i.e. if the rear window is turned on using the MAX DEF command and the facia switch is pressed, the heated rear window will go off.





Bravo/Brava

**Click here to choose chapter**

Intro & TechData

Engine

Clutch

Braking system

Steering

Auxiliary Units

Electrical Equipment

Bodywork

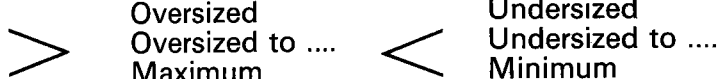
Back

This supplement contains the main rules to be followed for the repair and maintenance of the right hand drive version of **Fiat Bravo and Fiat Brava cars**.

For further information, consult the left hand drive version of the Fiat Bravo and Fiat Brava manual.

## COMPOSITION OF RIGHT HAND DRIVE VERSION

| Publication no. | Sections  | Number of pages | Notes                                                |
|-----------------|-----------|-----------------|------------------------------------------------------|
| <b>508.876</b>  | <b>10</b> | 1 - 4           | 1370 12v engine fuel system                          |
|                 |           | 5 - 7           | 1910 TD 75 engine fuel system                        |
|                 | <b>18</b> | 1 - 8           | Components and operation<br>1370 12 clutch operation |
|                 |           | 9 - 11          | 1910 TD 75 clutch operation                          |
|                 | <b>33</b> | 1 - 12          | 1370 12v clutch operation                            |
|                 |           | 13 - 17         | 1910 TD 75 clutch operation                          |
|                 | <b>41</b> | 1 - 7           | Operation                                            |
|                 | <b>50</b> | 1 - 4           | Heater with manual controls                          |
|                 | <b>55</b> | 1 - 7           | Removal and refitting                                |
|                 | <b>70</b> | 1 - 15          | Removal and refitting                                |

|                                                                                     |                                                                      |                                                                                      |                                                                                          |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|    | Remove<br>Disconnect                                                 |     | Intake                                                                                   |
|    | Refit<br>Connect                                                     |     | Exhaust                                                                                  |
|    | Disassemble<br>Dismantle                                             |     | Operation                                                                                |
|    | Refit<br>Compose                                                     |    | Tolerance<br>Weight difference                                                           |
|    | Tighten to torque                                                    |     | Preload                                                                                  |
|    | Tighten to torque<br>plus angle                                      |     | Rotate                                                                                   |
|    | Fully tighten                                                        |     | Compression<br>ratio                                                                     |
|   | Stake nut                                                            |    | Select<br>categories                                                                     |
|  | Adjust<br>Regulate                                                   |  | Oversized<br>Oversized to ....<br>Maximum<br>Undersized<br>Undersized to ....<br>Minimum |
|  | Visual check<br>Check                                                |   | Rpm                                                                                      |
|  | Attention                                                            |   | Ratio                                                                                    |
|  | Lubricate<br>Damp                                                    |   | Pressure                                                                                 |
|  | Change<br>Original parts                                             |   | Temperature                                                                              |
|  | Bleed braking<br>system air                                          |   | Temperature < 0°C<br>Cold<br>Winter                                                      |
|  | Surfaces to be machined<br>After machining                           |   | Temperature > 0°C<br>Warm<br>Summer                                                      |
|  | Interference<br>Press-fit                                            |   | Windscreen wiper<br>with pump<br>washer fluid                                            |
|  | Dimension to measure<br>Measurement - Check<br>Thickness - Clearance |   | Rearscreen wash/wipe<br>with pump<br>rear washer fluid                                   |
|  | Rolling torque                                                       |   | Engine                                                                                   |

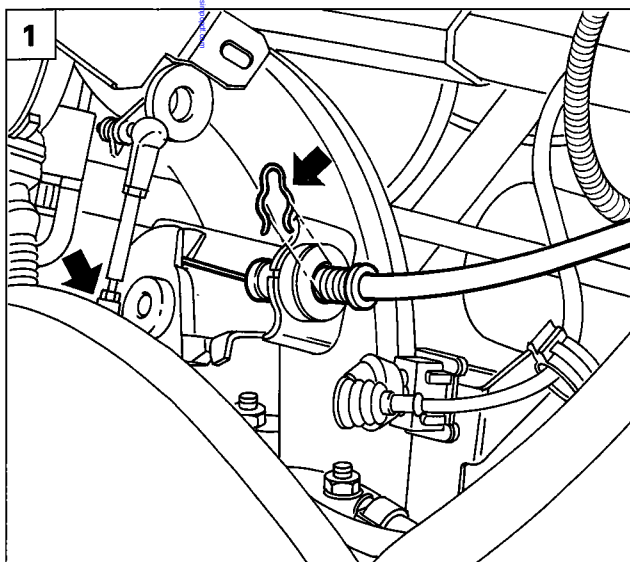
#### FUEL SYSTEM



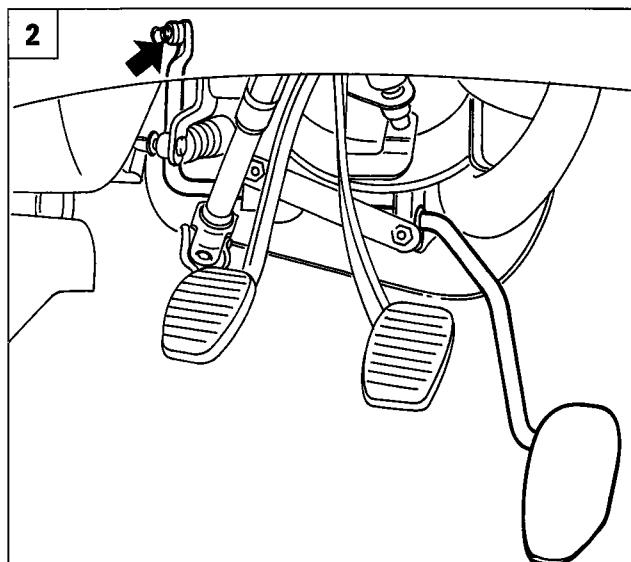
- Removing-refitting accelerator cable 1
- Removing-refitting accelerator pedal 3



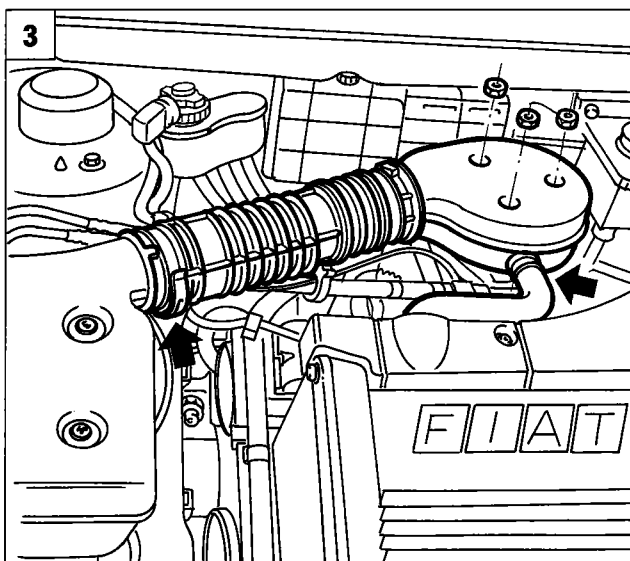
- Removing-refitting accelerator cable 5
- Removing-refitting accelerator pedal 7



P4A01DA01



P4A01DA02



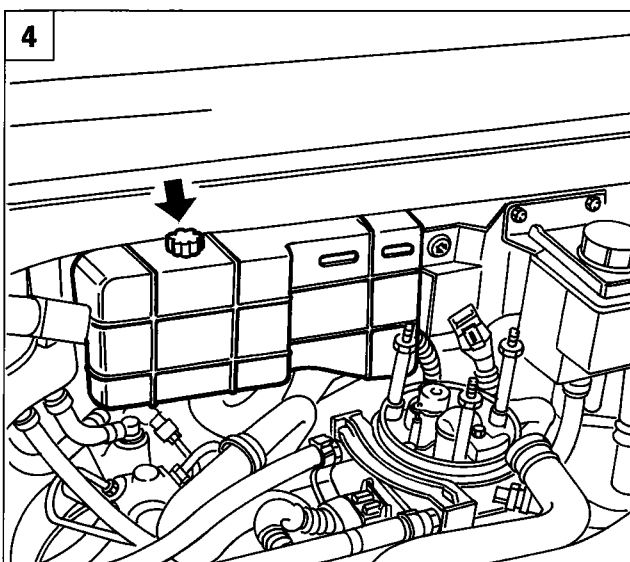
P4A01DA03



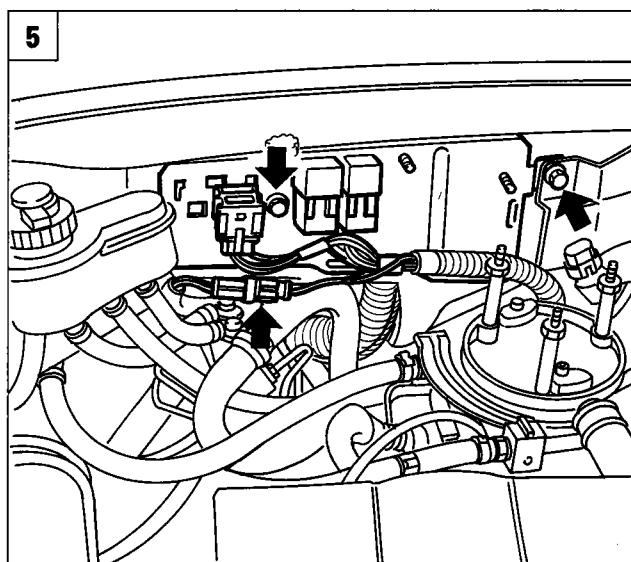
### REMOVING-REFITTING ACCELERATOR CABLE

Disconnect the battery negative terminal, then proceed as follows:

1. In the engine bay, turn the throttle valve control lever and release the accelerator cable. Remove the clip, then withdraw the cable from the bracket.
2. Working from inside the car, remove the left foot rest, then disconnect the control cable from the anchorage on the accelerator pedal.
3. Remove the pipe connecting the air cleaner to the butterfly valve case.
4. Remove the relay unit protective cover.
5. Unscrew the relay bracket retaining bolts and position unit to one side.

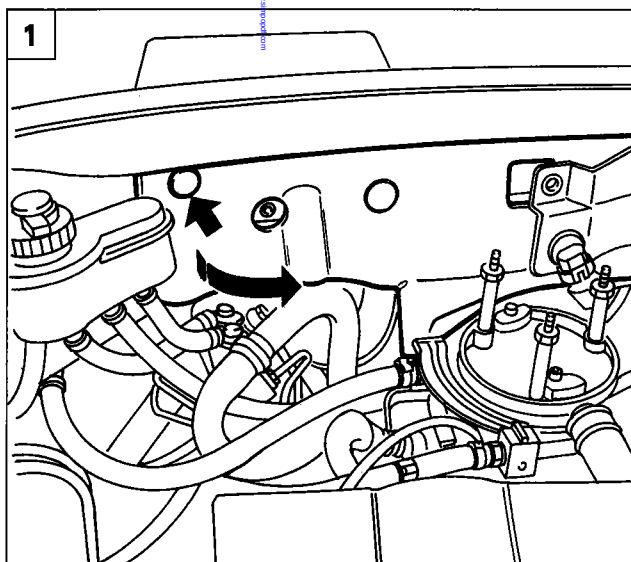


P4A01DA04

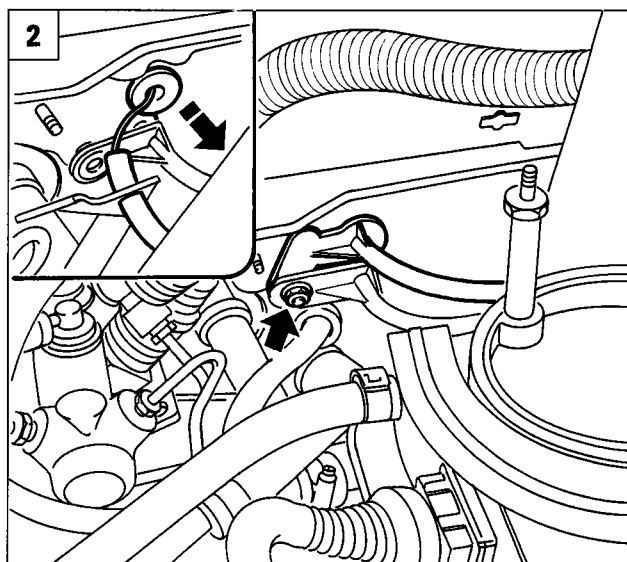


P4A01DA05

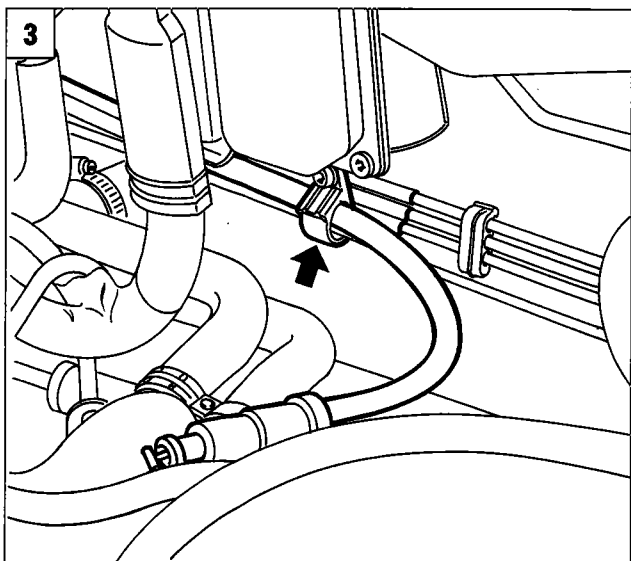
### 10.



P4A02DA01



P4A02DA02



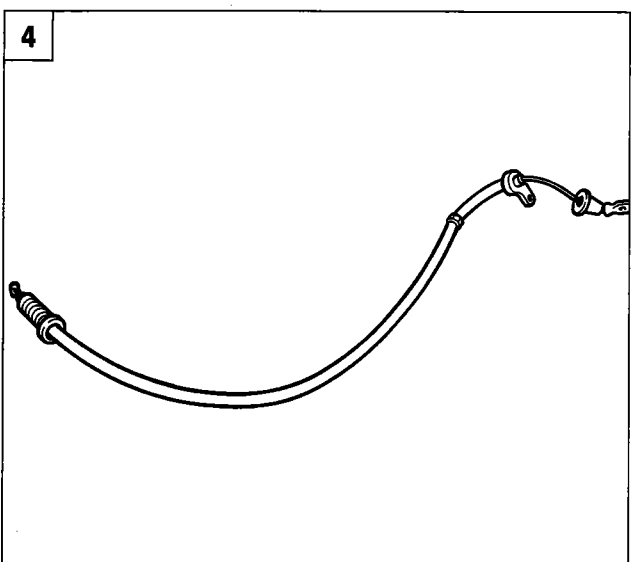
P4A02DA03



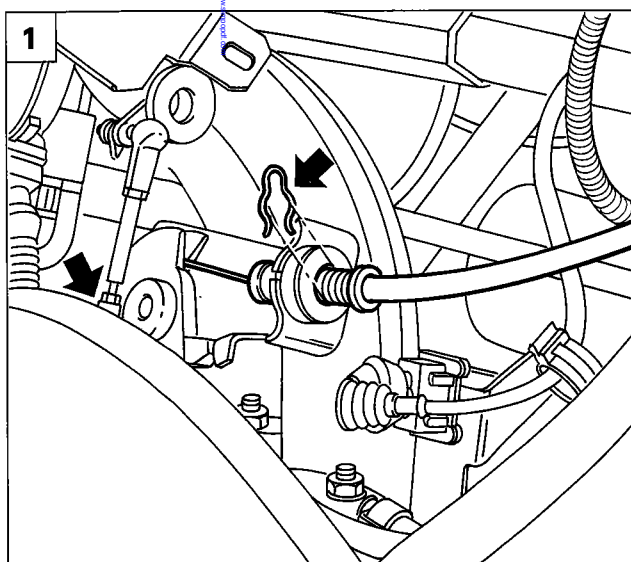
1. Remove the stud shown in the figure and move the lining of the bulkhead between engine bay and passenger compartment to one side.
2. Unscrew the bolt retaining the accelerator cable ducting device, on the bulkhead between engine bay and passenger compartment. Also remove the underlying rubber block in order to free the hole and allow removal of the cable.
3. Release the accelerator cable from the retaining clip located beneath the injection control unit.
4. Withdraw the cable through the hole in the bulkhead between engine bay and passenger compartment and remove from the engine bay.



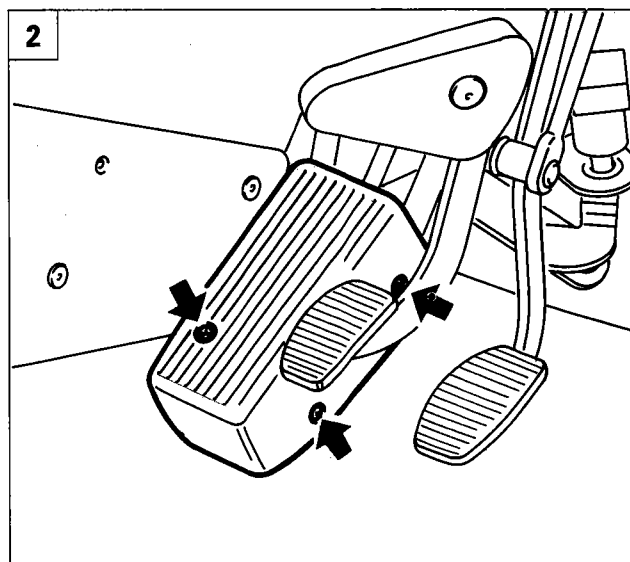
*When refitting, adjust the cable as described in the paragraph "Adjusting throttle cable" in Section 10 "Fuel system" for the left hand drive version.*



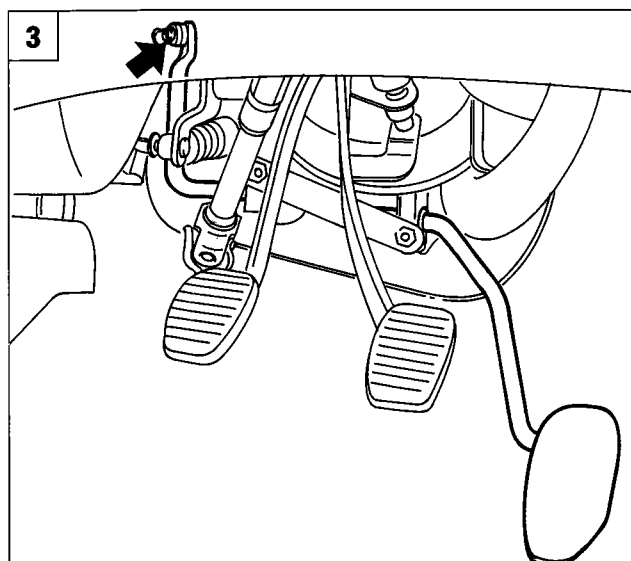
P4A02DA04



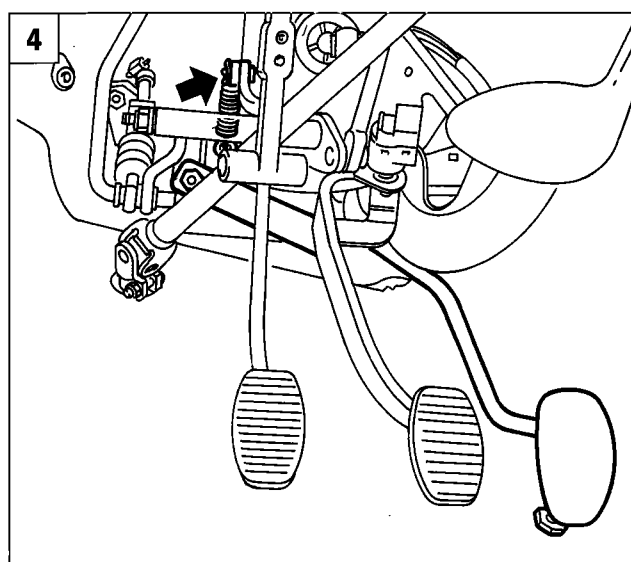
P4A01DA01



P4A03DA01



P4A01DA02



P4A03DA02



### REMOVING-REFITTING ACCELERATOR PEDAL

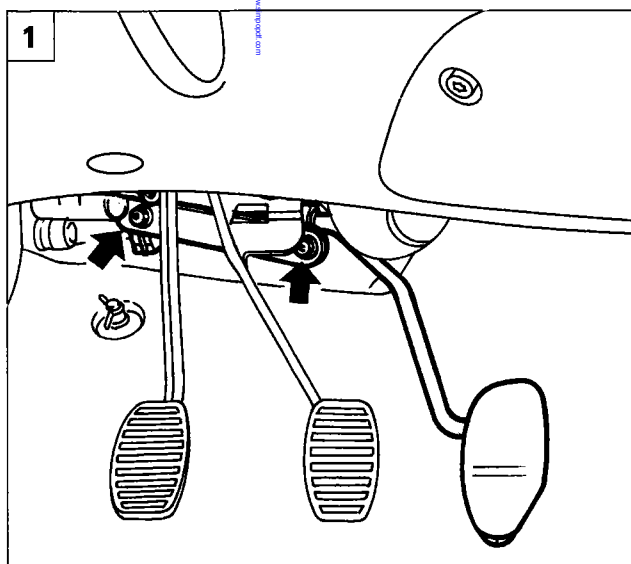


Disconnect the battery negative terminal, then proceed as follows:

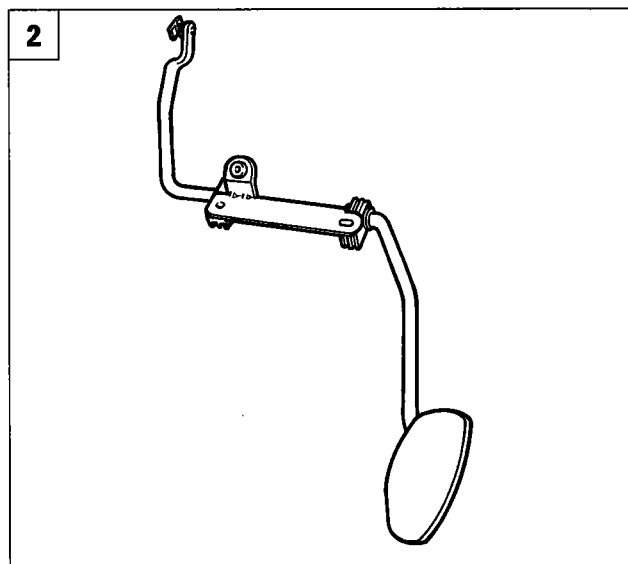
1. In the engine bay, turn the throttle valve lever and release the accelerator cable. Remove the clip and withdraw the cable from the bracket. This operation is necessary to facilitate removal of the accelerator cable from the control pedal.
2. Working from inside the car, remove the left foot rest by undoing the retaining bolts shown in the figure.
3. Disconnect the control cable from the anchorage on the accelerator pedal.
4. Disconnect the clutch pedal reaction spring (attached to the accelerator pedal bracket) by removing the roll pin indicated.



# 10.



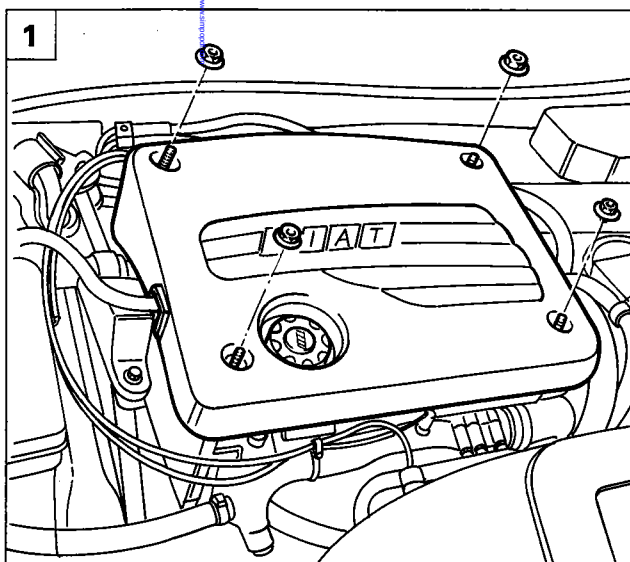
P4A04DA01



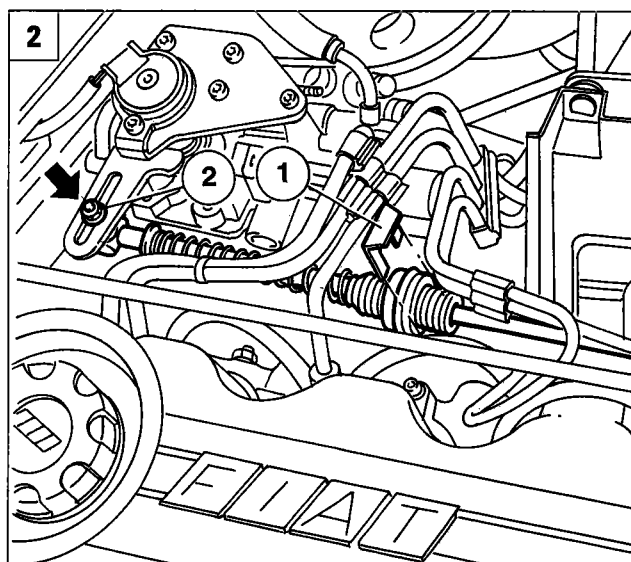
P4A04DA02

- 1-2. Unscrew both nuts retaining the accelerator pedal bracket, then remove from the car.

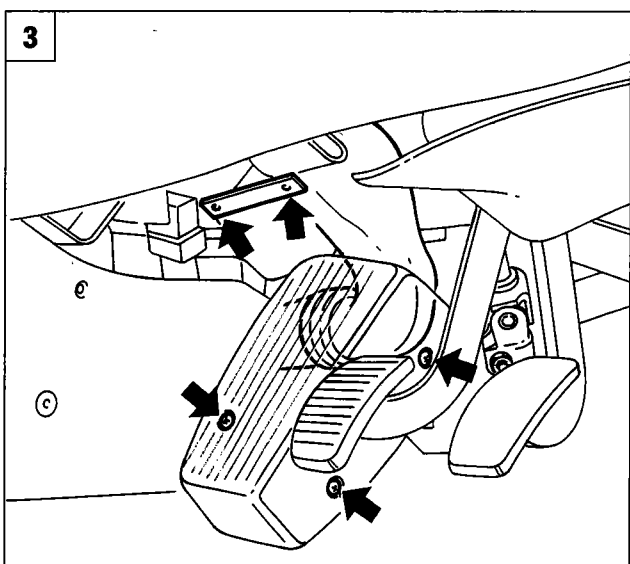
# 10.



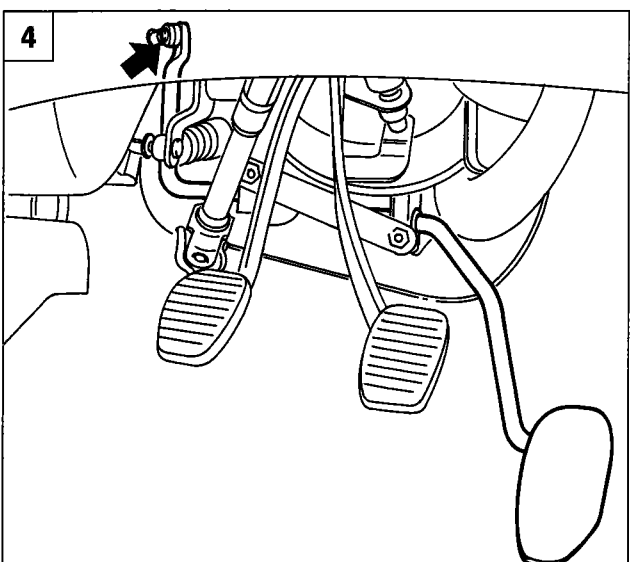
P4A05DA01



P4A05DA02



P4A05DA03



P4A01DA02



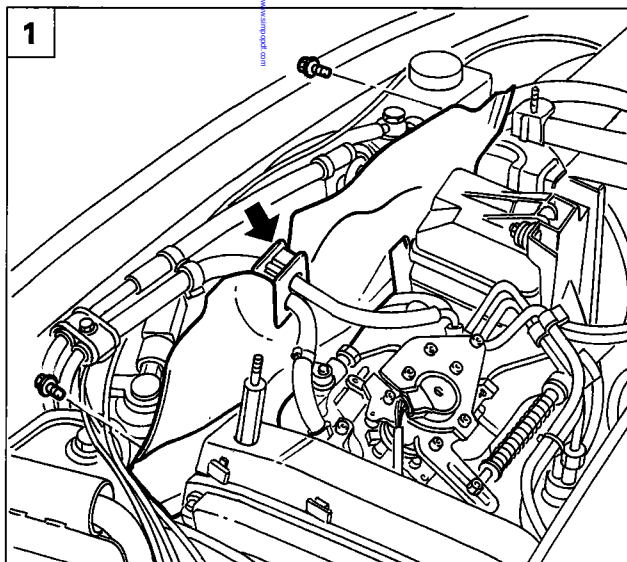
## REMOVING-REFITTING ACCELERATOR CABLE

Disconnect the battery negative terminal, then proceed as follows:

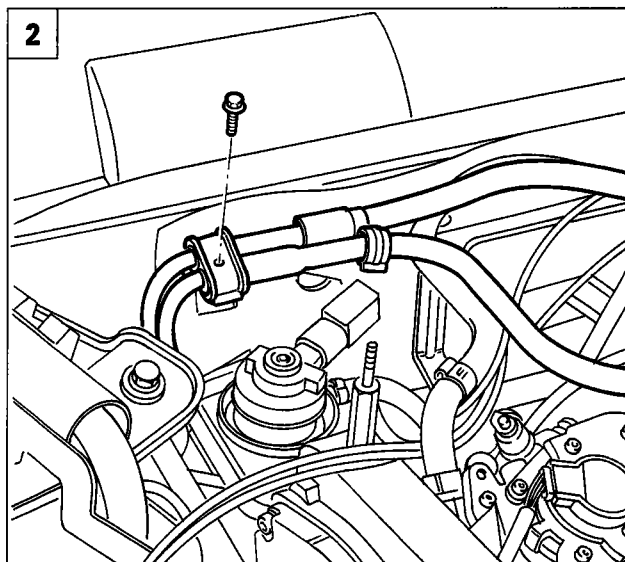


1. Remove the upper cam cover protection.
2. In the engine bay, release the accelerator cable by taking out retaining clip (1) and unscrewing nut (2).
3. Working from inside the car, remove the left foot rest and unscrew the bracket retaining the air hose shown. Disconnect the pipe from below to allow access to the cable anchorage on the accelerator pedal.
4. Disconnect the control cable from its anchorage on the accelerator pedal.

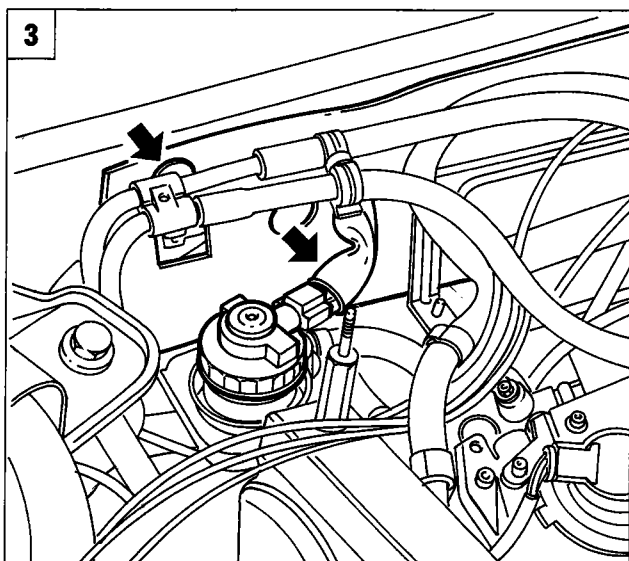
## 10.



P4A06DA01



P4A06DA02



P4A06DA03



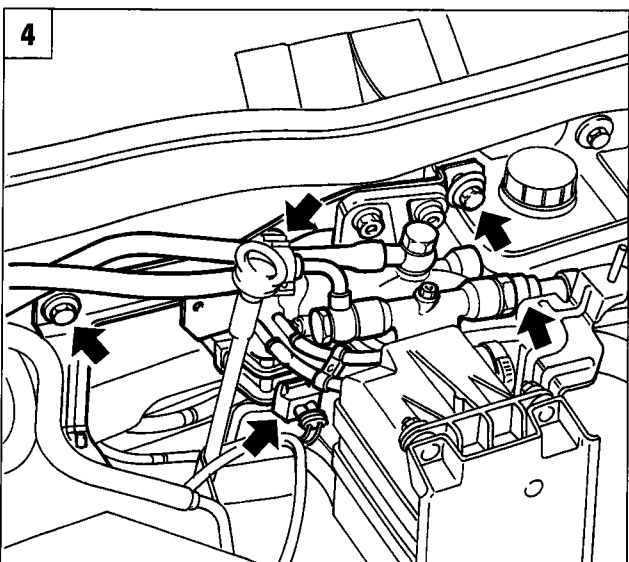
1. Remove the trim shown in the figure by undoing the retaining bolts and releasing the diesel lines from the retaining clip.

2. Remove the bolt retaining the bracket joining the fuel lines.

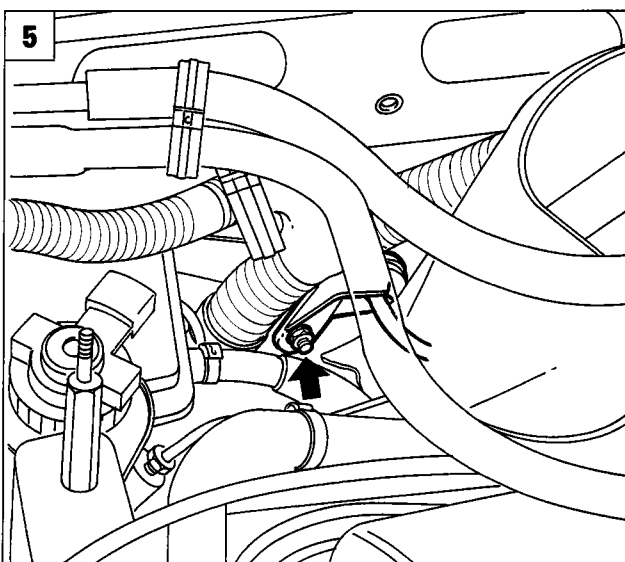
3. Disconnect the connector of the brake and clutch fluid level sensor, then remove the stud retaining the lining of the bulkhead between engine bay and cabin, and move the lining to one side.

4. Unscrew the bolts retaining the diesel filter bracket, disconnect the connections shown and position the bracket to one side.

5. Move the lining of the bulkhead between engine bay and cabin further to one side, then unscrew the nut retaining the accelerator cable to the bulkhead, remove the underlying rubber guide and withdraw the accelerator cable.



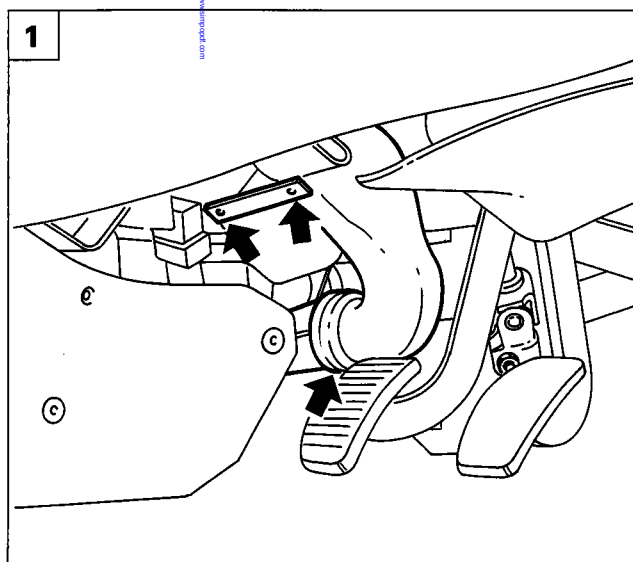
P4A06DA04



P4A06DA05

## 10.

### REMOVING-REFITTING ACCELERATOR CONTROL PEDAL



P4A07DA01

1. Proceed as described for the 1370 12v engine, but remove the air pipe bracket shown in the figure in order to release the pipe and gain access to the accelerator cable anchorage on the pedal.



**COMPONENTS AND OPERATION**

- Clutch with hydraulic release mechanism 1

**CLUTCH OPERATION**

- Removing-refitting clutch pedal 2
- Removing-refitting clutch pump 3
- Removing-refitting pipe connecting clutch pump-slave cylinder 6
- Removing-refitting master cylinder 7
- Bleeding 8



- Removing-refitting clutch pump 9
- Removing-refitting pipe connecting clutch pump-slave cylinder 10
- Removing-refitting slave cylinder 11

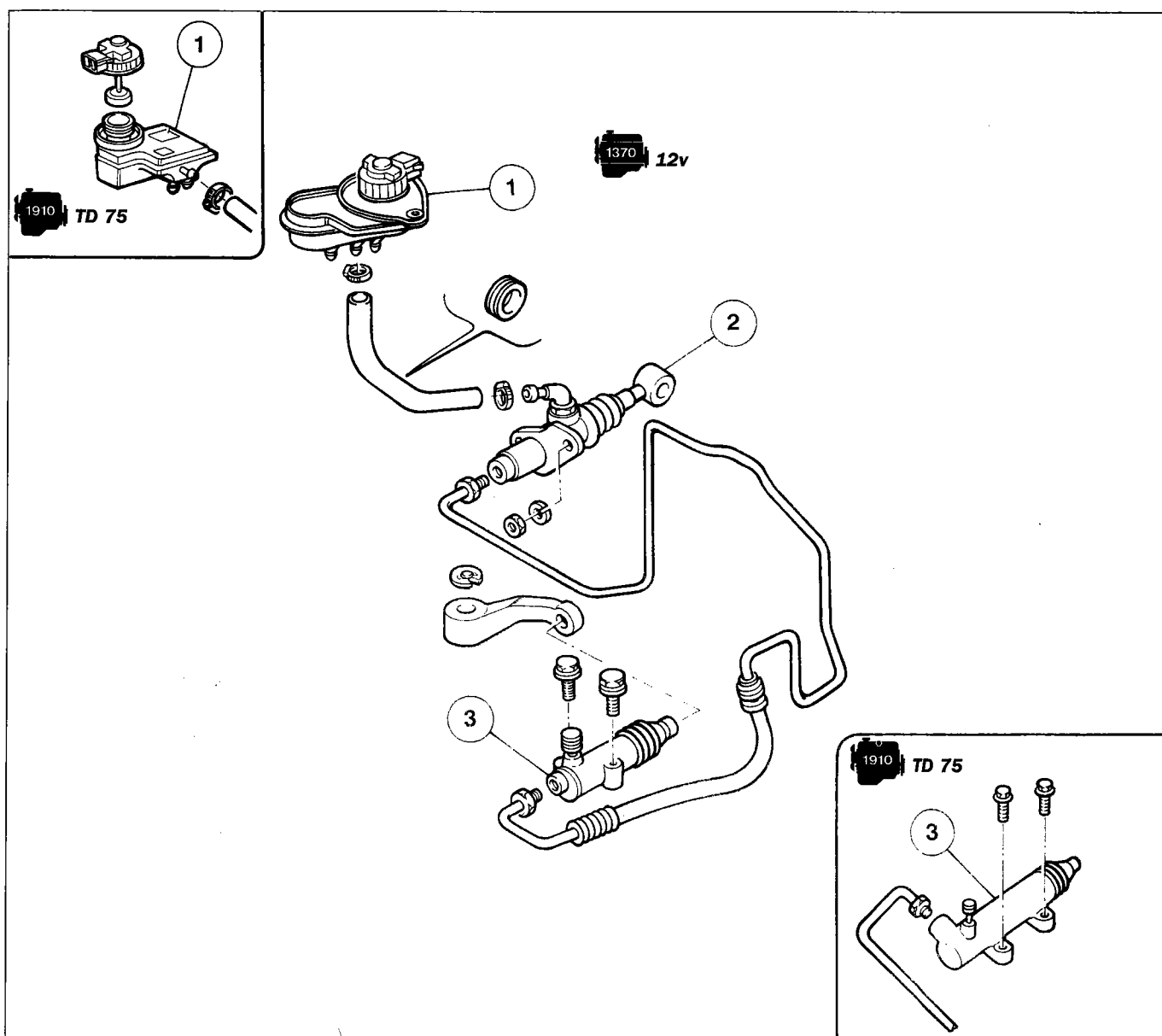
### CLUTCH WITH HYDRAULIC RELEASE MECHANISM

Right hand drive versions are fitted with a hydraulic clutch release device. This device consists of a reservoir shared with the braking system (1), a pump (2) fastened to the pedal assembly and a slave cylinder (3) fastened to the clutch bell housing.

This hydraulic device is more efficient and reliable than the mechanical device. Clutch operation is also smoother and less jerky, particularly when high torques are transmitted.

The car is more comfortable to drive, because fewer vibrations are transmitted to the power unit due to the damping effect of the fluid.

The adoption of this device eliminates the need for periodic adjustment because play is eliminated and wear on the driven plate is taken up automatically.

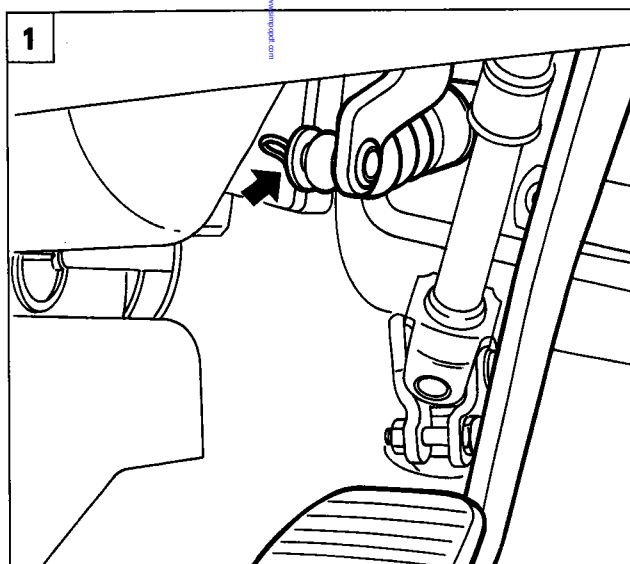


### Operation

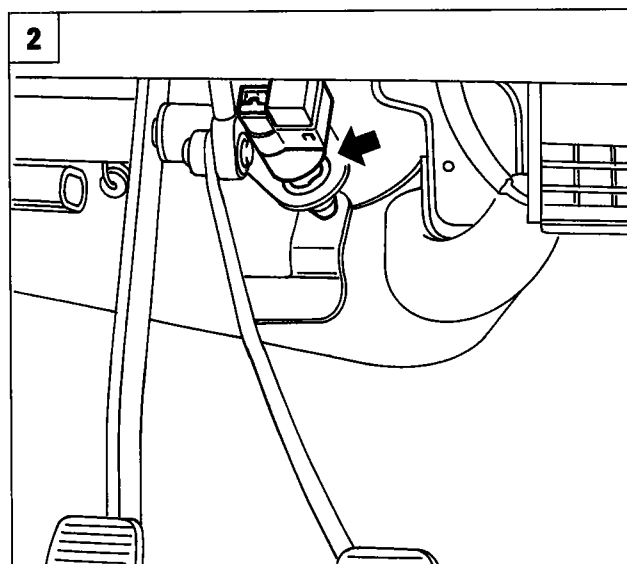
The clutch is single, dry plate type, with a hydraulic release device and thrust bearing constantly in touch with the thrust spring. The driven plate is controlled by pressure exercised by a diaphragm spring.



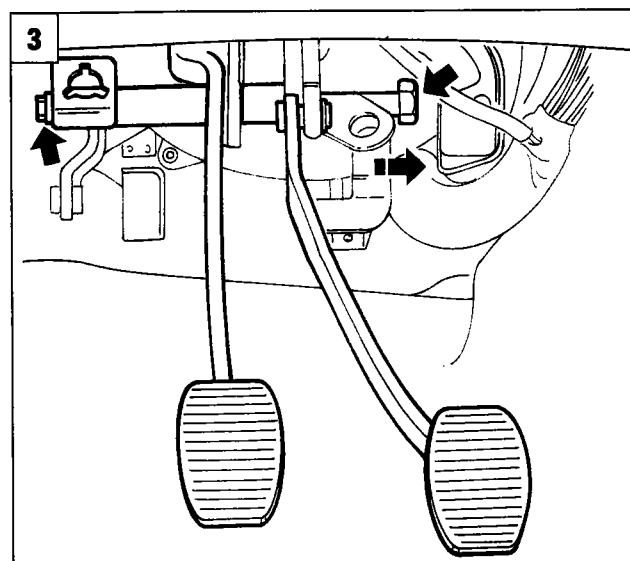
## 18.



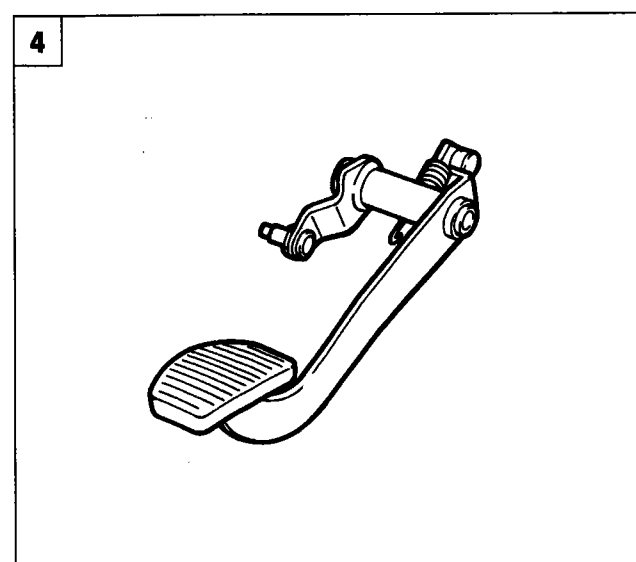
P4A10DA01



P4A10DA02



P4A10DA03



P4A10DA04

### REMOVING-REFITTING CLUTCH PEDAL



*Before removing the clutch pedal, remove the accelerator pedal as described in "Section 10 - Fuel system".*

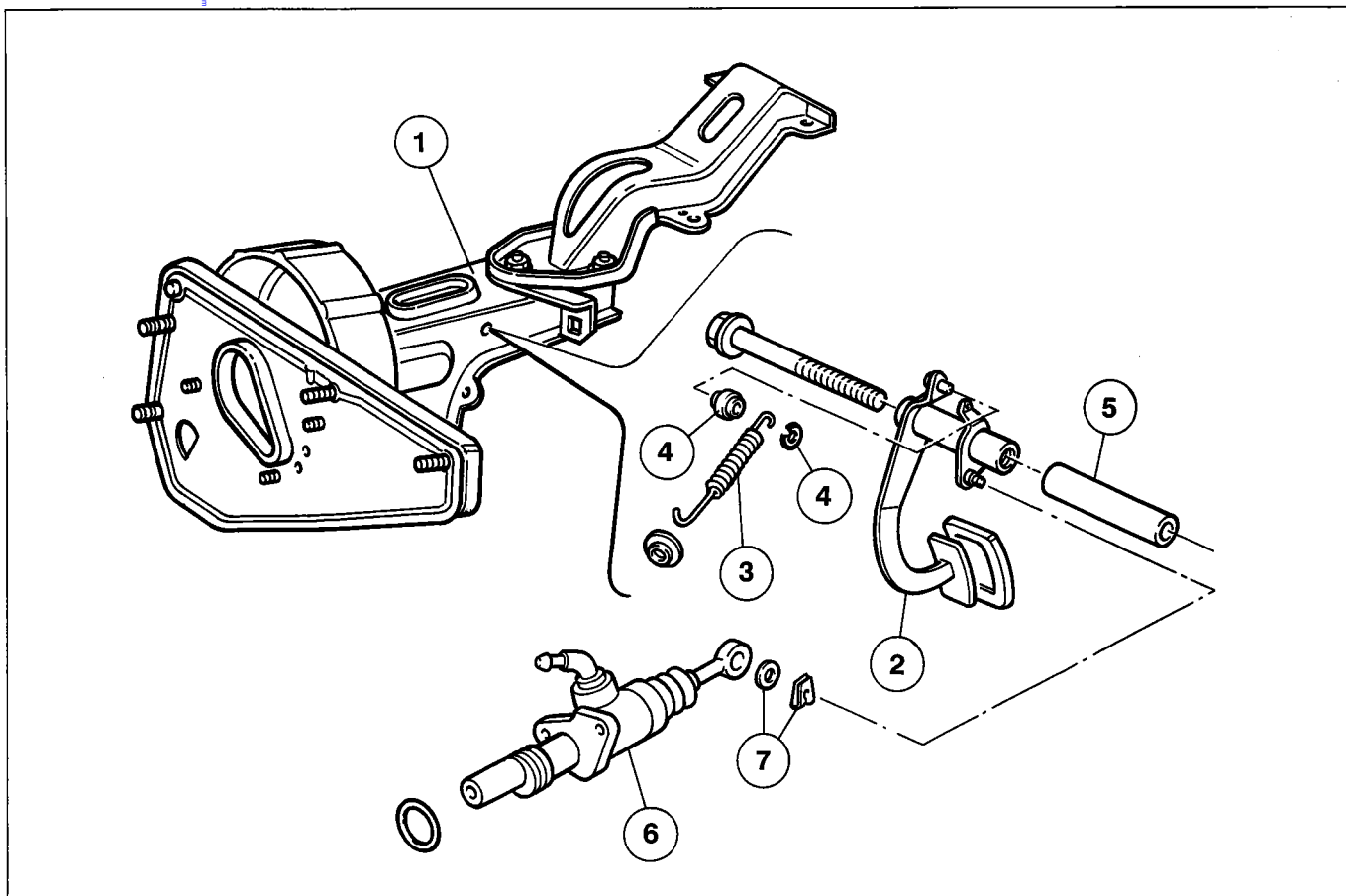
1. Remove the roll pin retaining the clutch pump rod to the pedal.
2. Remove the car brake light switch to facilitate access to the clutch and brake pedal retaining bolt.
3. Unscrew the bolt retaining the clutch and brake pedal, withdraw in the arrowed direction until the clutch pedal is released.



*If brake pedal removal is not required, do not take the bolt retaining the clutch and brake pedal any further out.*

4. Release the clutch pedal from the clutch pump rod and remove from the pedal unit.

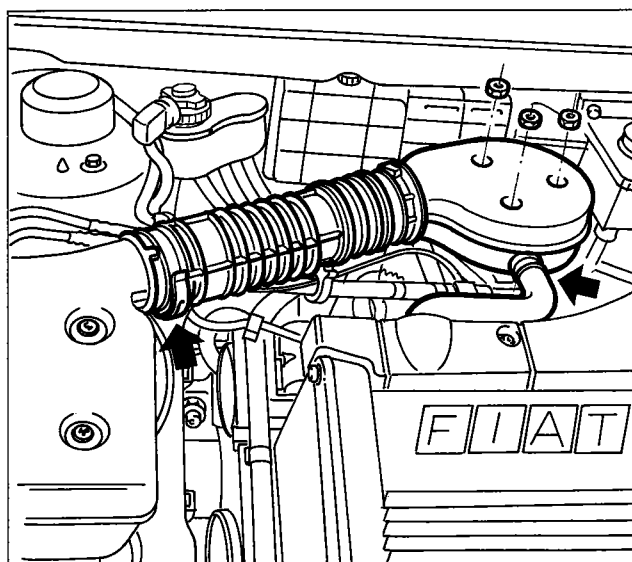
**Components of clutch pedal**



P4A11DA01

1. Pedal unit
2. Clutch pedal
3. Clutch pedal return spring
4. Roll pin and bush retaining spring to clutch pedal

5. Bush
6. Clutch pump
7. Roll pin and washer retaining clutch pump rod to pedal



P4A01DA03

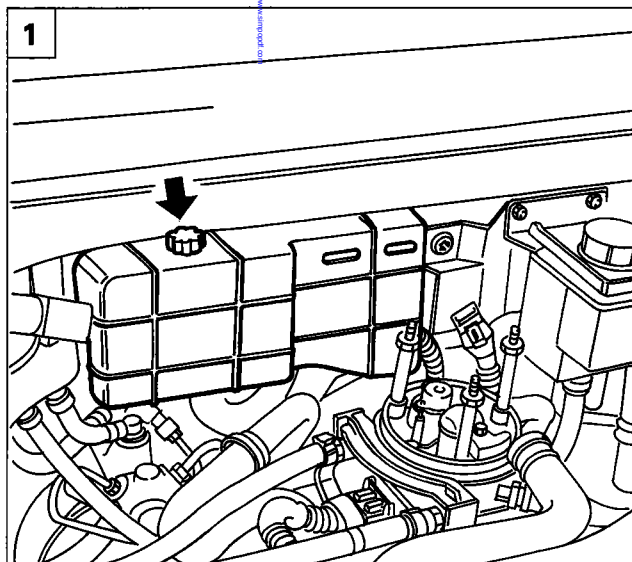


**REMOVING-REFITTING CLUTCH PUMP**

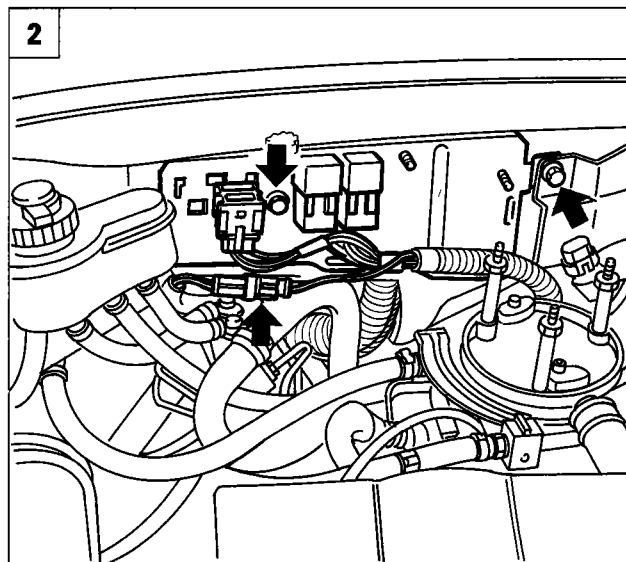
1. Remove pipe connecting air cleaner to butterfly valve case by undoing the fastenings shown in the figure.

4A11DA

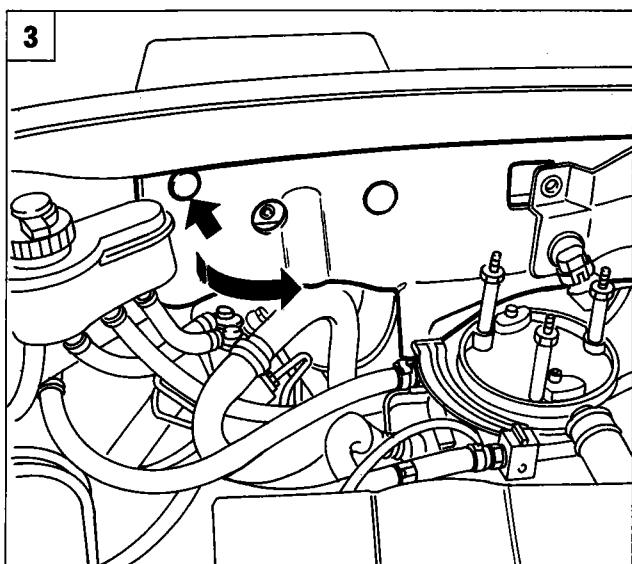
### 18.



P4A01DA04



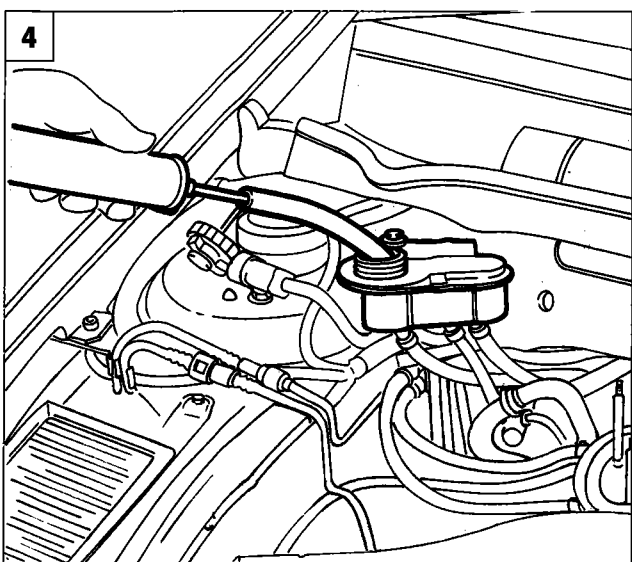
P4A01DA05



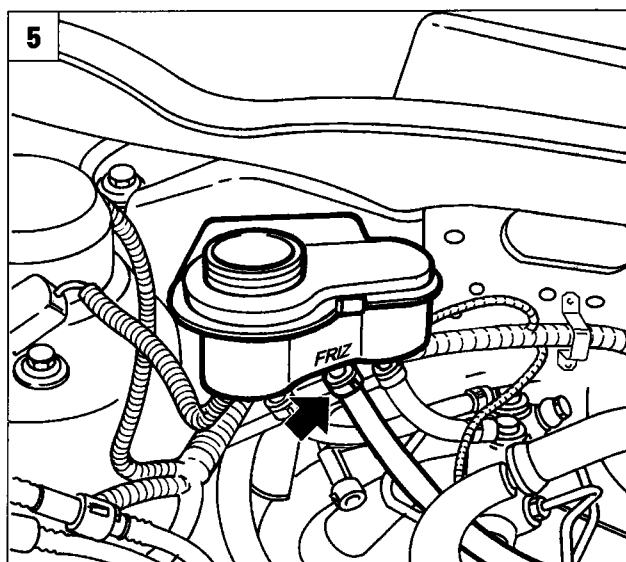
P4A02DA01



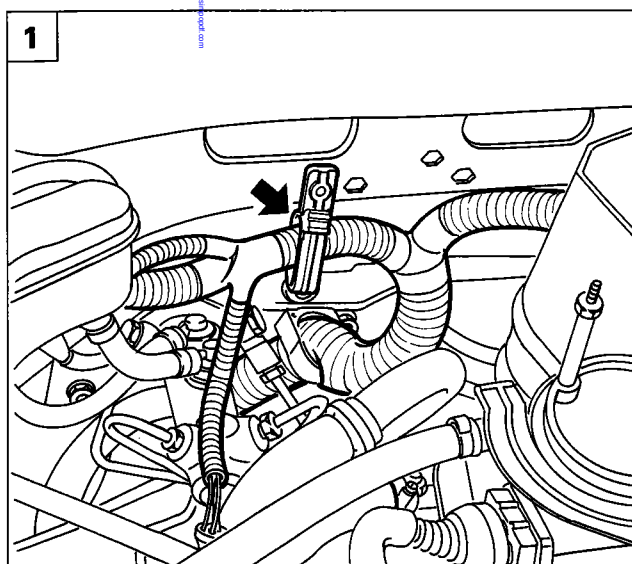
1. Remove the relay protective cover.
2. Unscrew both nuts retaining the relay bracket, disconnect the connection indicated and position the bracket to one side.
3. Remove the stud retaining the lining of the bulkhead between lining to one side.
4. Drain the brake and clutch fluid from the reservoir after disconnecting the level gauge connector and removing the reservoir cap.
5. Disconnect the central line connected to the clutch pump, marked "FRIZ", from the reservoir.



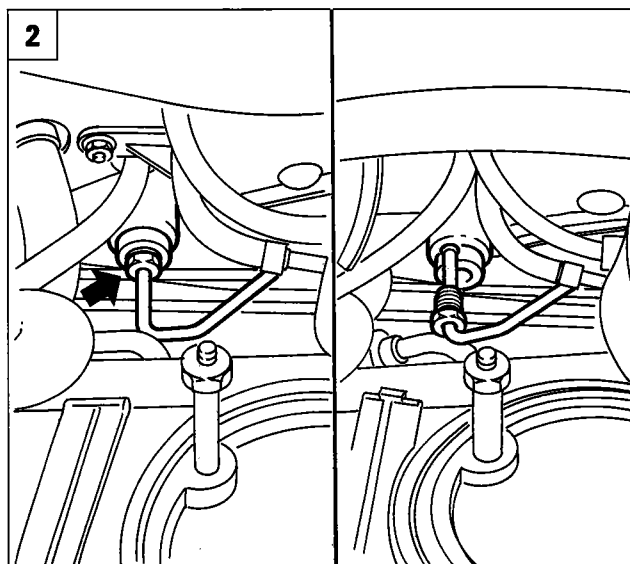
P4A12DA04



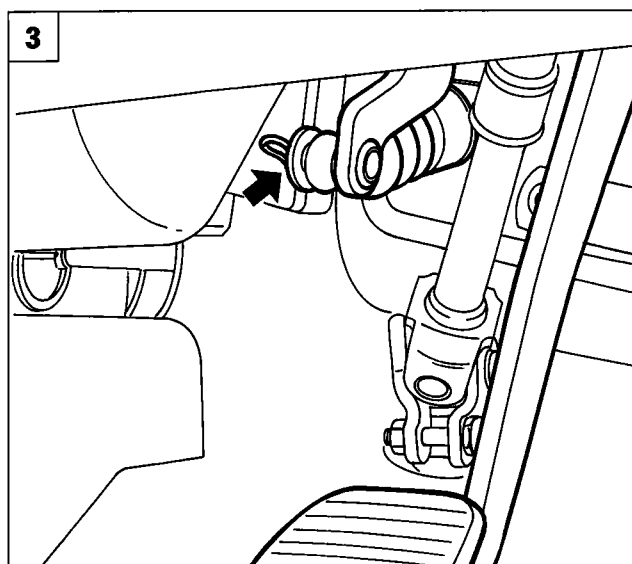
P4A12DA05



P4A13DA01



P4A13DA02



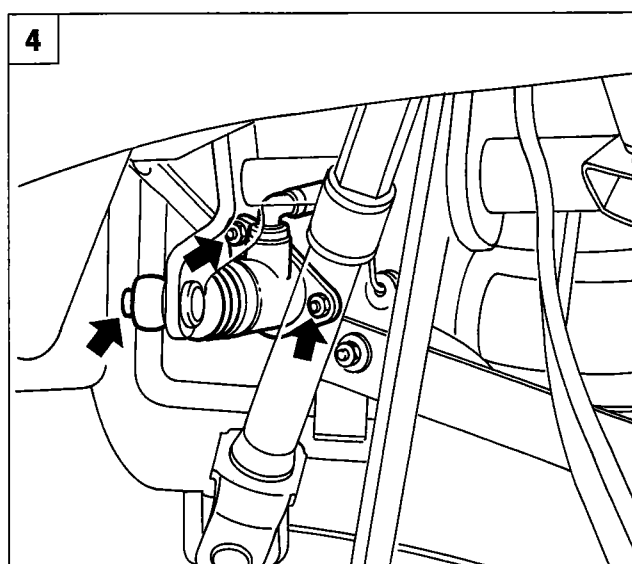
P4A10DA01



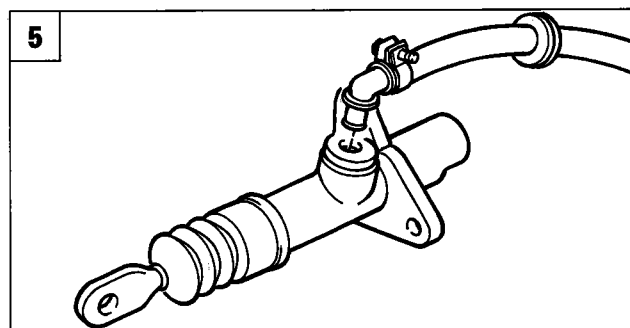
1. Release the injection wiring bundle from the retaining clip to allow access to the fitting of the pipe connected to the slave cylinder on the clutch pump.
2. Disconnect the fitting of the pipe connecting clutch pump - slave cylinder.
3. Working from inside the car, remove the roll pin retaining the clutch pump rod to the pedal.
4. Unscrew the nuts retaining the clutch pump to the body take out slightly in order to release the rod from the clutch pedal, then remove complete with connection pipe leading to the reservoir.
5. Working on the bench, separate the clutch pump from the pipe connected to the reservoir.



*Reverse disassembly instructions to assemble. To refit the pump connection line to the reservoir, first position the rubber fitting over the hole in the body, and then thread the pipe from inside the car into the engine bay.*

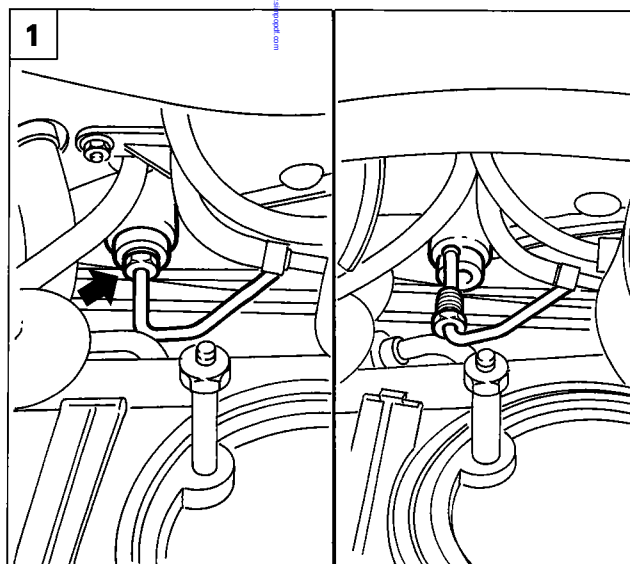


P4A13DA03

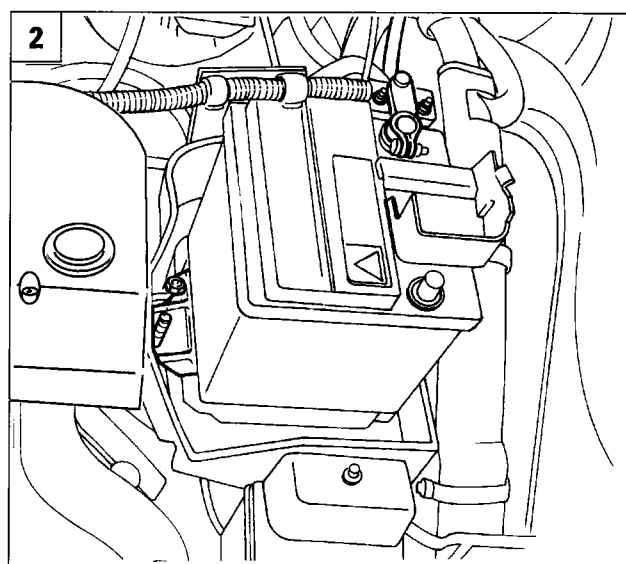


P4A13DA04

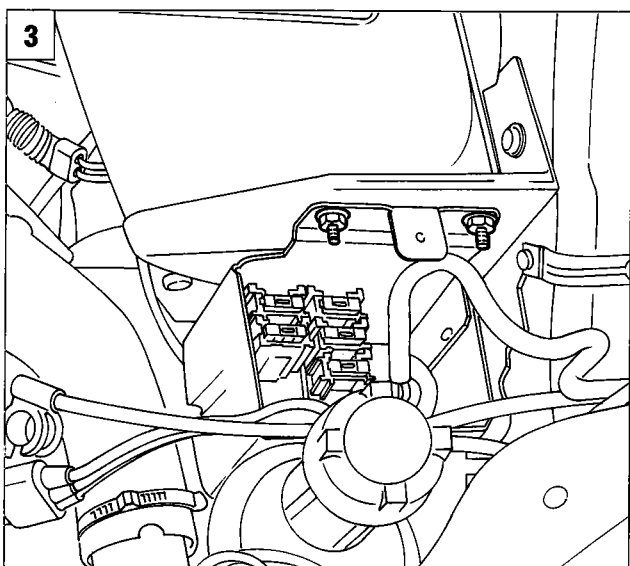
### 18.



P4A13DA02



P4A14DA01



P4A001B03

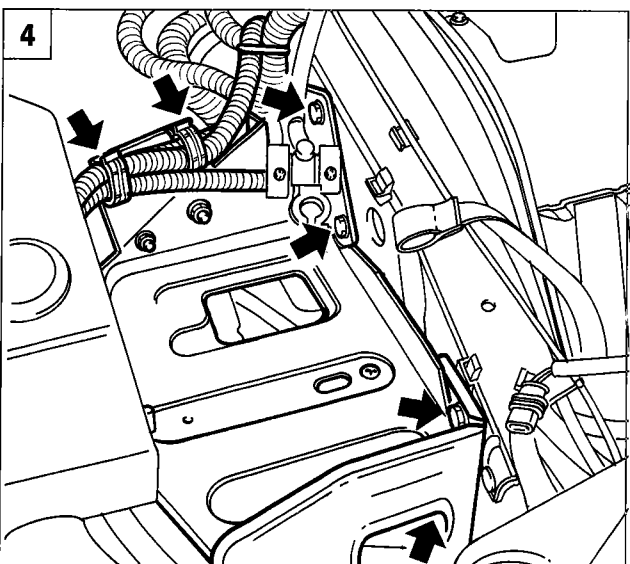


#### REMOVING-REFITTING PIPE CONNECTING CLUTCH PUMP - SLAVE CYLINDER



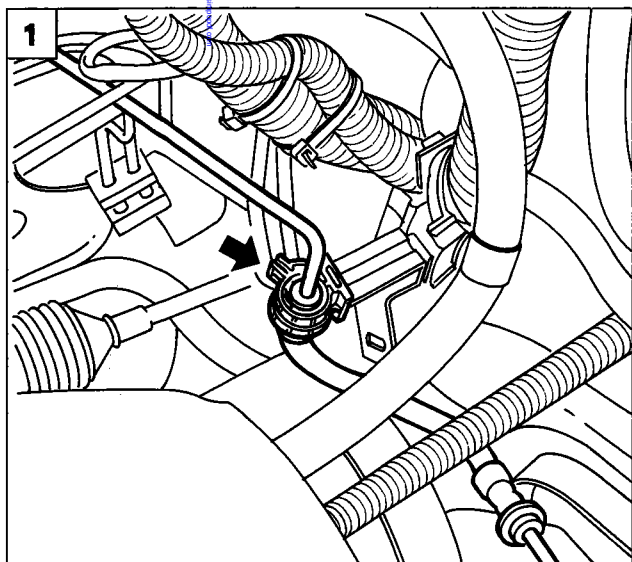
*Working inside the engine bay, remove the same parts as removed to disconnect the clutch pump to gain access to the fitting of the line connected to the slave cylinder on the pump.*

1. Unscrew the fitting of the line connecting the pump to the slave cylinder on the clutch pump.
2. Disconnect the leads from the battery negative terminals, then remove by unscrewing the nut securing the retaining bracket.
3. Remove the relay box cover, then unscrew the nut retaining the box to the battery cradle and position to one side.
4. Release the electrical leads shown in the figure from their retaining clips, then remove the battery cradle by undoing the retaining bolts indicated.

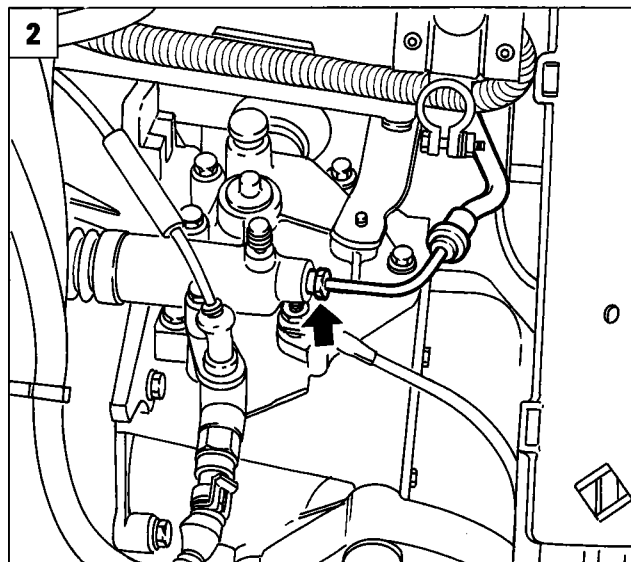


P4A14DA02

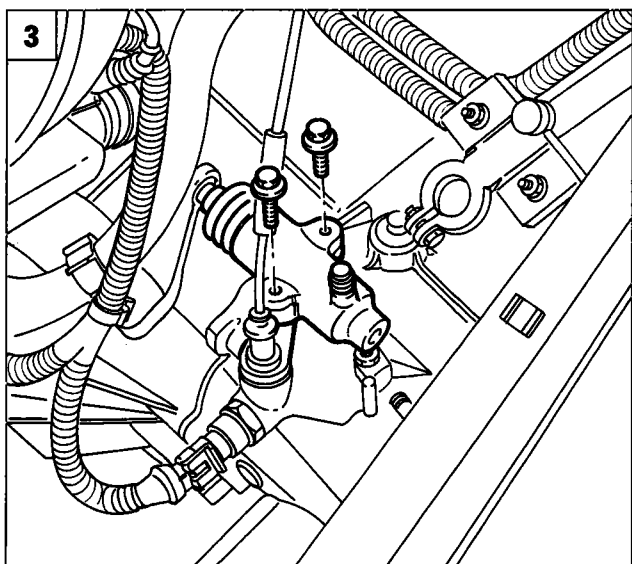




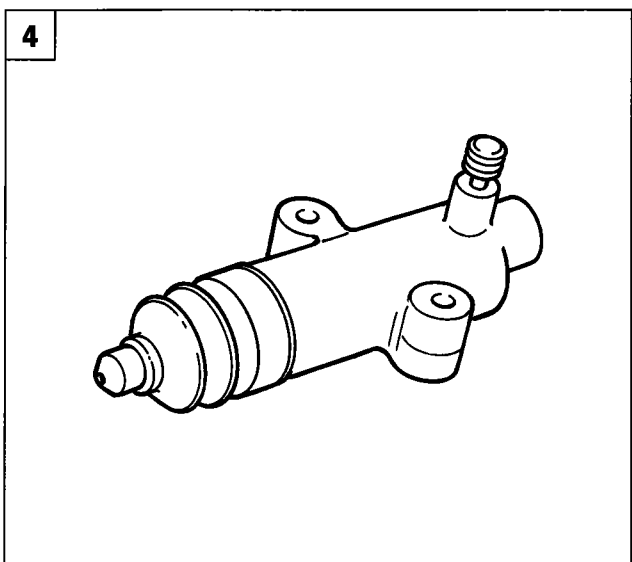
P4A15DA01



P4A15DA02



P4A15DA03



P4A15DA04

4A15DA



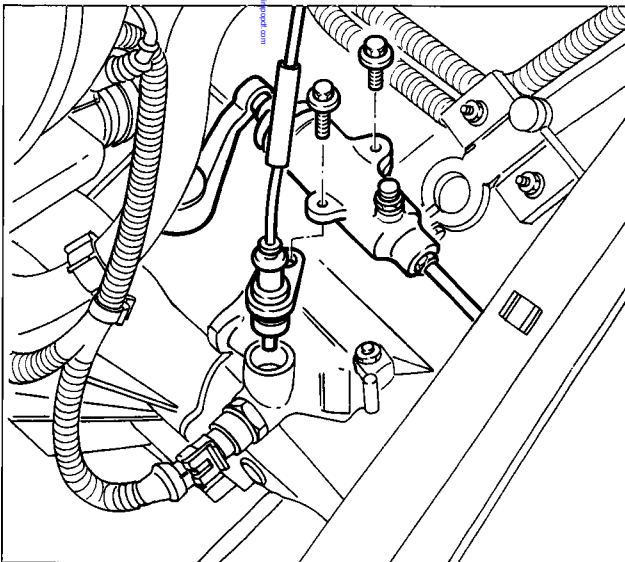
1. Release the pipe connecting clutch pump - slave cylinder from the retaining clip shown in the figure.
2. Disconnect the pipe fitting on the slave cylinder and then remove the pipe.

### REMOVING-REFITTING SLAVE CYLINDER

Remove: battery, relay box, battery cradle as described for removal of the clutch pump connection pipe - slave cylinder. Also disconnect the pipe connecting clutch pump - slave cylinder on the slave cylinder.

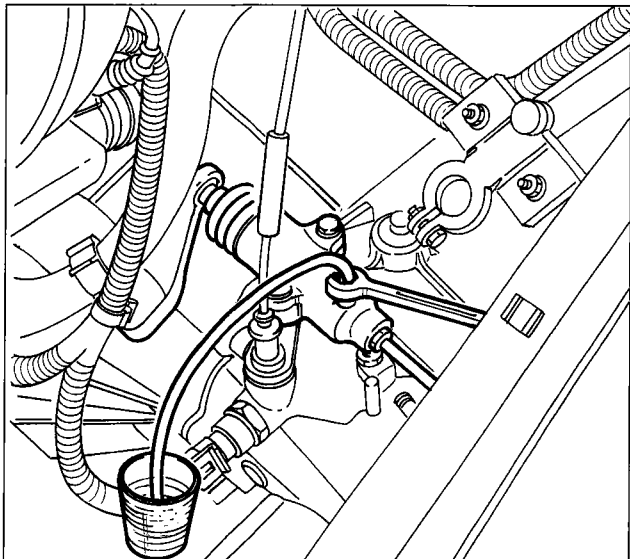
- 3-4. Unscrew the bolts retaining the slave cylinder and remove from the engine bay.

### 18.



P4A16DA01

**NOTE** Proceed as described for the left hand drive version to remove the reverse inhibitor, Note, however, that the bolt retaining the inhibitor also secures the clutch slave cylinder; remove the latter without disconnecting the fittings. It will now be possible to disconnect the reverse inhibitor as shown in the figure.



P4A16DA02

### BLEEDING

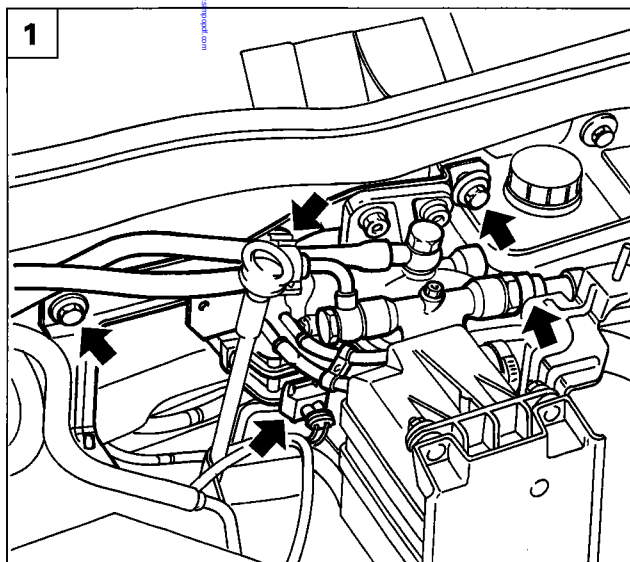
Connect the end of a hose to the clutch slave cylinder bleed screw and insert the opposite end in a suitable container. Fill the brake and clutch fluid reservoir, then bleed the clutch system by loosening the bleed screw on the slave cylinder. Simultaneously press down the clutch pedal and allow it to return slowly. Repeat the operation until all air bubbles have been removed. With the clutch pedal pressed to the floor, tighten the bleed screw and remove the pipe.



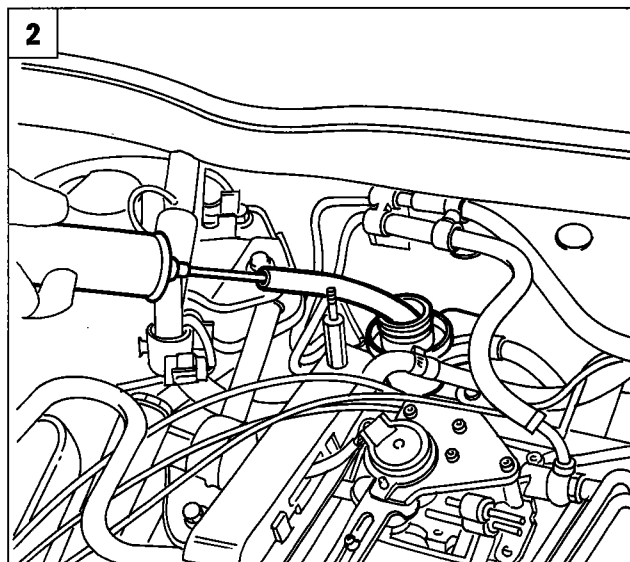
*During the bleeding operation, keep the fluid level in the tank above the MIN mark. Do not reuse fluid drained during the disassembly and bleed stages.*

Top up the fluid level in the reservoir and refit the cap. Lastly, check the efficiency of the hydraulic clutch system.

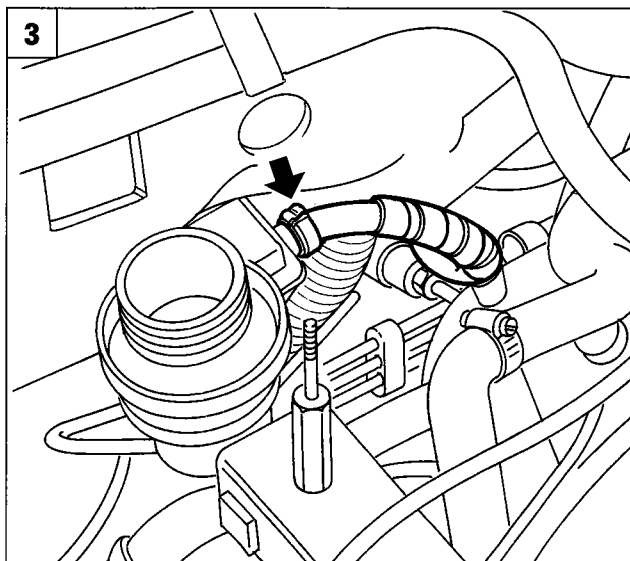




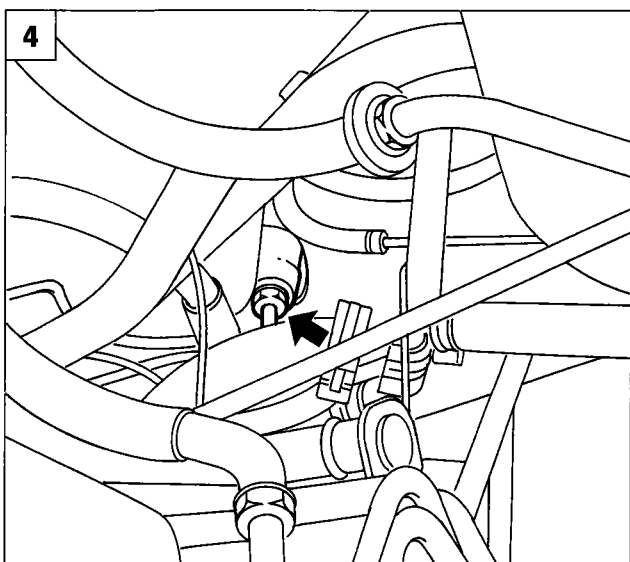
P4A06DA04



P4A17DA01



P4A17DA02

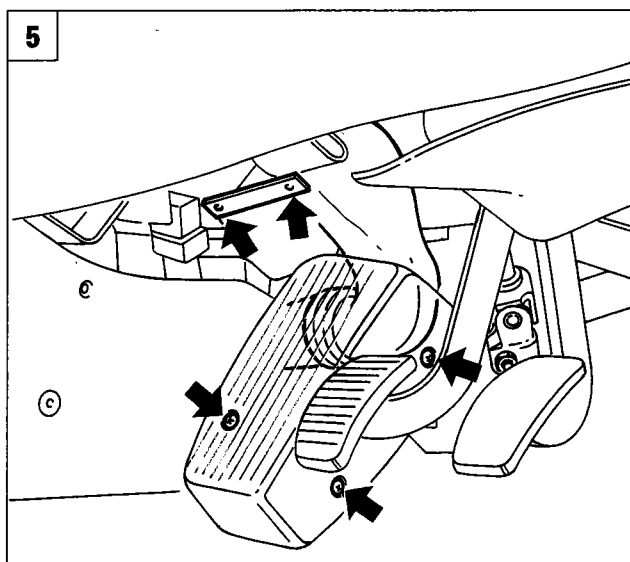


P4A17DA03



### REMOVING-REFITTING CLUTCH PUMP

1. After removing the upper cam cover protection and the guard in front of the brake and clutch fluid reservoir, unscrew the bolts retaining the diesel filter bracket, disconnect the connectors indicated and position the bracket to one side without disconnecting the diesel lines.
2. Drain the brake and clutch fluid from the reservoir.
3. Disconnect the pipe connected to the clutch pump from the brake and clutch fluid reservoir.
4. Disconnect the fitting of the line connected to the slave cylinder from the clutch pump.
5. From inside the car, remove the left foot rest and disconnect the air pipe from the points indicated, then position to one side.

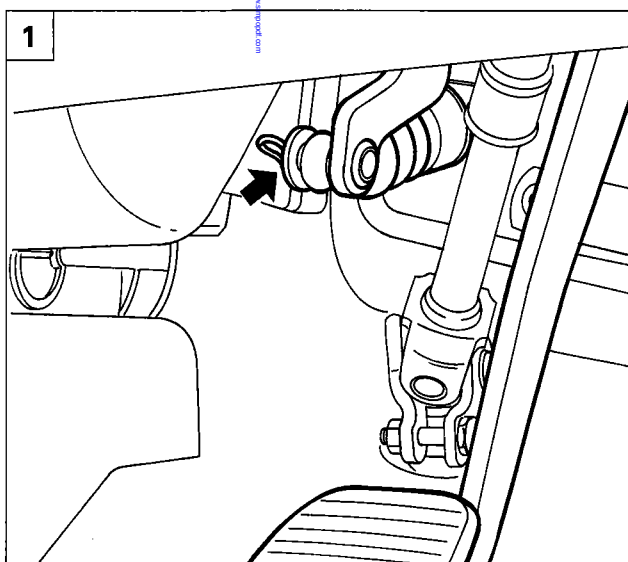


P4A05DA03

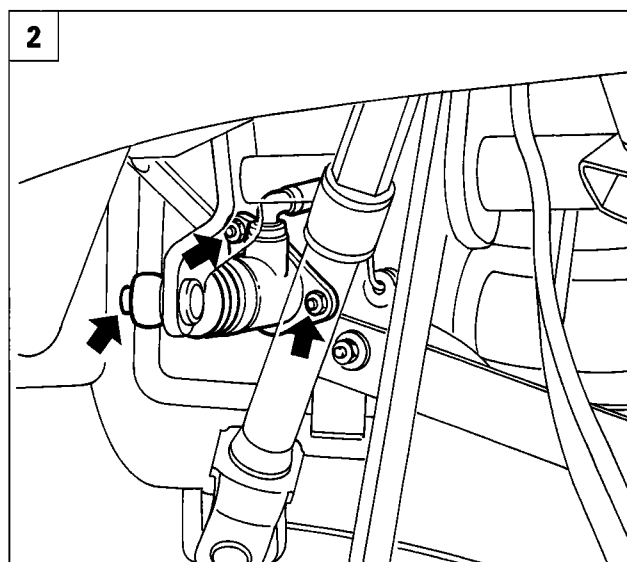
# Clutch

## Clutch operation

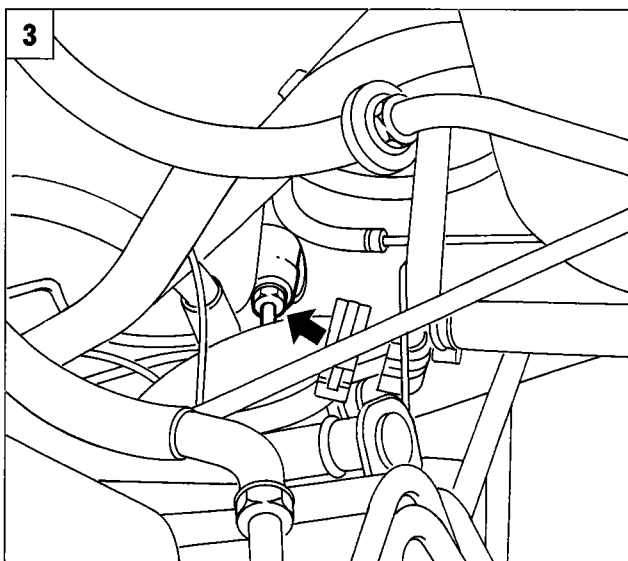
### 18.



P4A10DA01



P4A13DA03



P4A17DA03

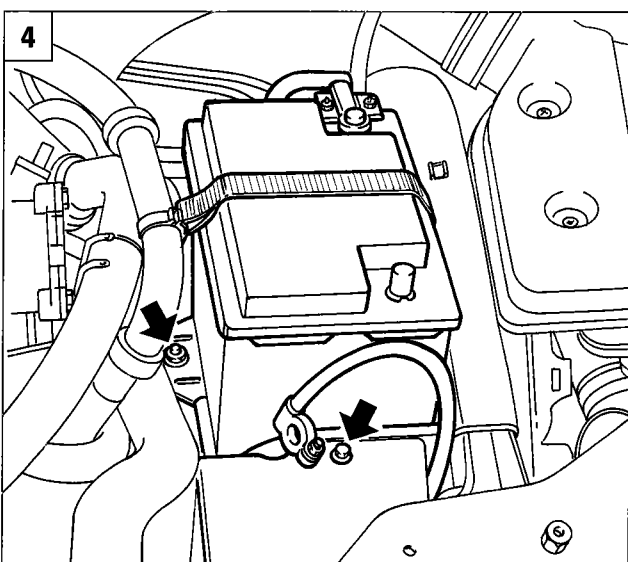


1. Working from inside the car, remove the roll pin retaining the clutch pump rod to the pedal.
2. Unscrew the bolts retaining the clutch pump to the body, remove slightly to release the rod from the clutch pedal, then remove complete with pipe connected to the reservoir. At the bench, separate the clutch pump from the pipe connected to the reservoir.

#### REMOVING-REFITTING PIPE CONNECTING CLUTCH PUMP TO SLAVE CYLINDER

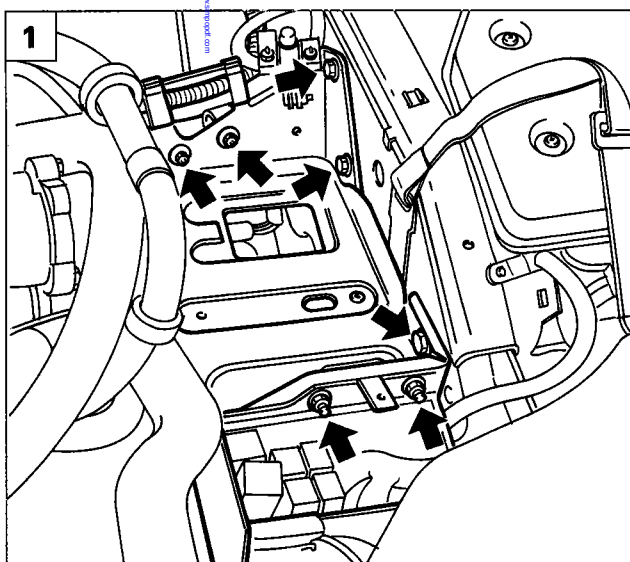


*Remove the upper cam cover protection and the guard in front of the brake and clutch fluid reservoir, then unscrew the bolts retaining the diesel filter bracket and drain the brake and clutch fluid from the reservoir, as described in the previous paragraph.*

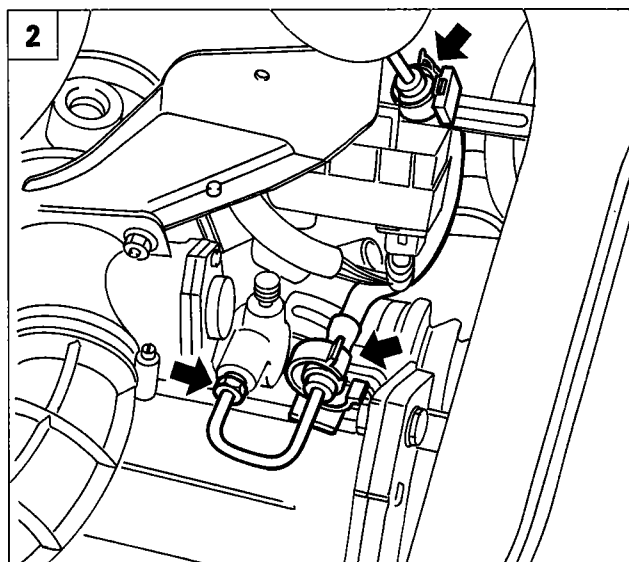


P4A18DA01

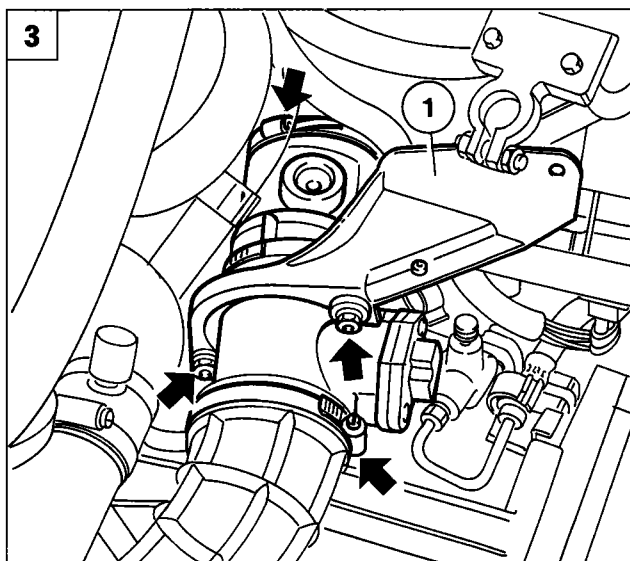
3. Unscrew the fitting of the pipe connecting the pump to the slave cylinder on the clutch pump.
4. Disconnect the battery terminal leads and remove the battery from the engine bay after detaching from the bracket. Also remove the relay box cover.



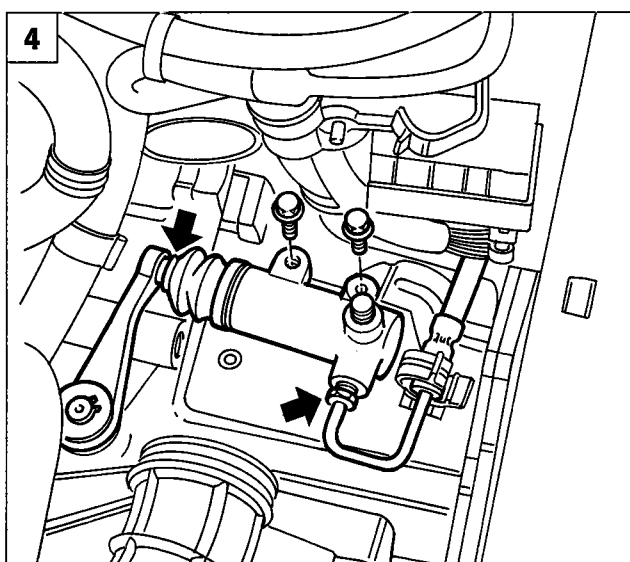
P4A19DA01



P4A19DA02



P4A19DA03



P4A19DA04



1. Release the relay box from the battery cradle by undoing the retaining bolts. Then remove the cradle by undoing the bolts indicated and disconnecting the wiring bundle.

2. Unscrew the fitting of the pipe connected to the clutch pump on the slave cylinder, detach the pipe from the retaining clips and remove from the car.

### REMOVING-REFITTING SLAVE CYLINDER



*Drain the brake and clutch fluid, remove the battery, the cradle and the relay box as described in the previous paragraph.*

3. Undo nuts retaining bracket (1) and remove; disconnect the clips indicated and remove the flow meter in order to gain access to the underlying slave cylinder.

4. Disconnect the fitting of the pipe connected to the clutch pump, then unscrew the slave cylinder retaining bolts and remove from the car.



*Bleeding clutch system*



### HYDRAULIC OPERATION

- Components of hydraulic braking system 1
- Removing-refitting brake pedal 2

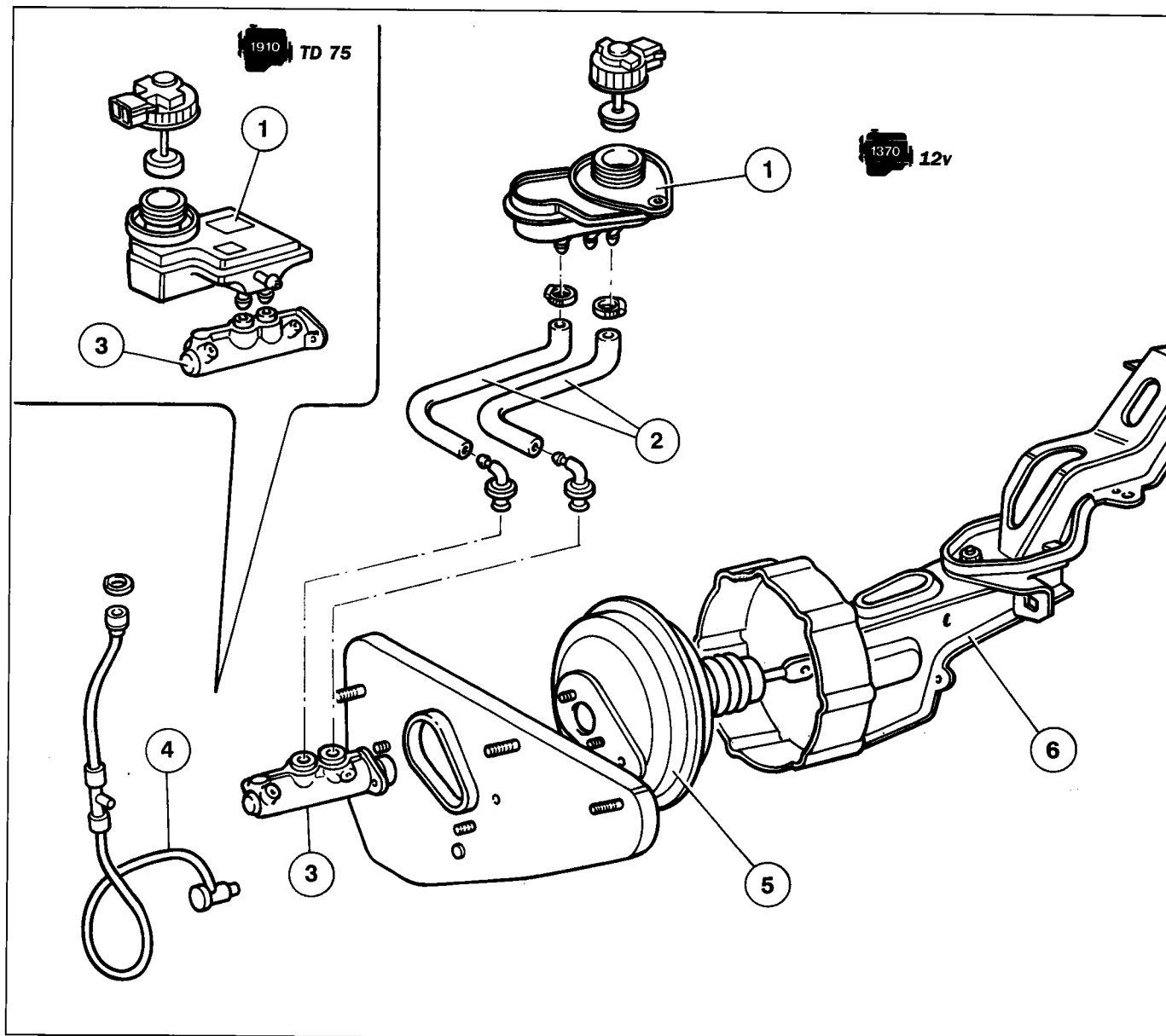


- Brake-clutch fluid reservoir 3
- Removing-refitting brake pump 4
- Removing-refitting servo brake 6
- Removing-refitting pedal unit 10
- Removing-refitting brake servo vacuum inlet pipe 12
- Removing-refitting one-way valve 12



- Brake-clutch fluid reservoir 13
- Removing-refitting brake pump 14
- Removing-refitting servo brake 15
- Removing-refitting brake servo vacuum inlet pipe and one-way valve 17

**COMPONENTS OF HYDRAULIC BRAKING SYSTEM**



P4A21DA01

- |                                                  |                            |
|--------------------------------------------------|----------------------------|
| 1. Brake fluid reservoir                         | 4. Brake servo vacuum pipe |
| 2. Pipe connecting brake fluid reservoir to pump | 5. Servo brake             |
| 3. Brake pump                                    | 6. Complete pedal mount    |

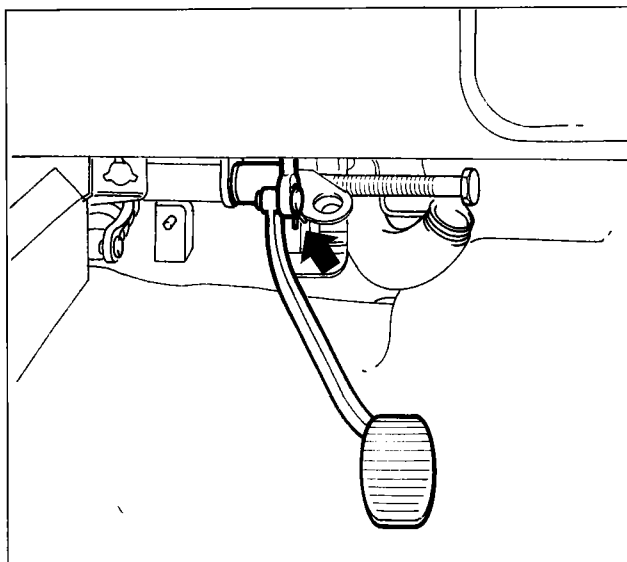
According to the version, the brake fluid reservoir may be connected to the pump by pipes or may be fitted directly to the brake pump.

### 33.

#### REMOVING-REFITTING BRAKE PEDAL

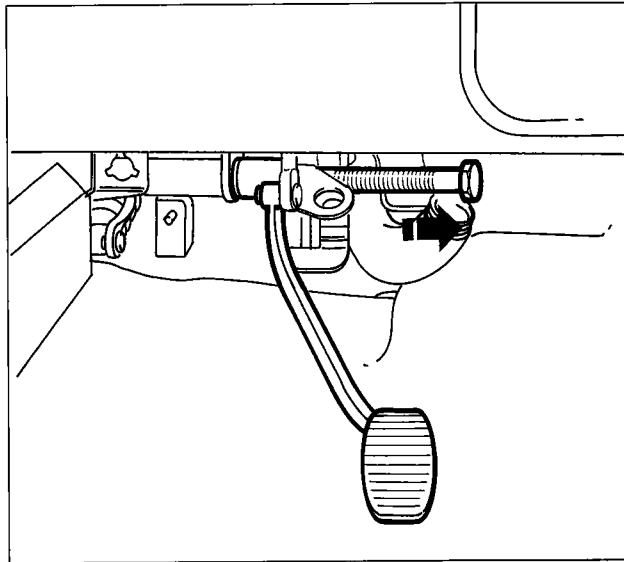


Before removing the brake pedal, remove the clutch pedal as described in "Section 18" of the right hand drive supplement.



P4A22DA01

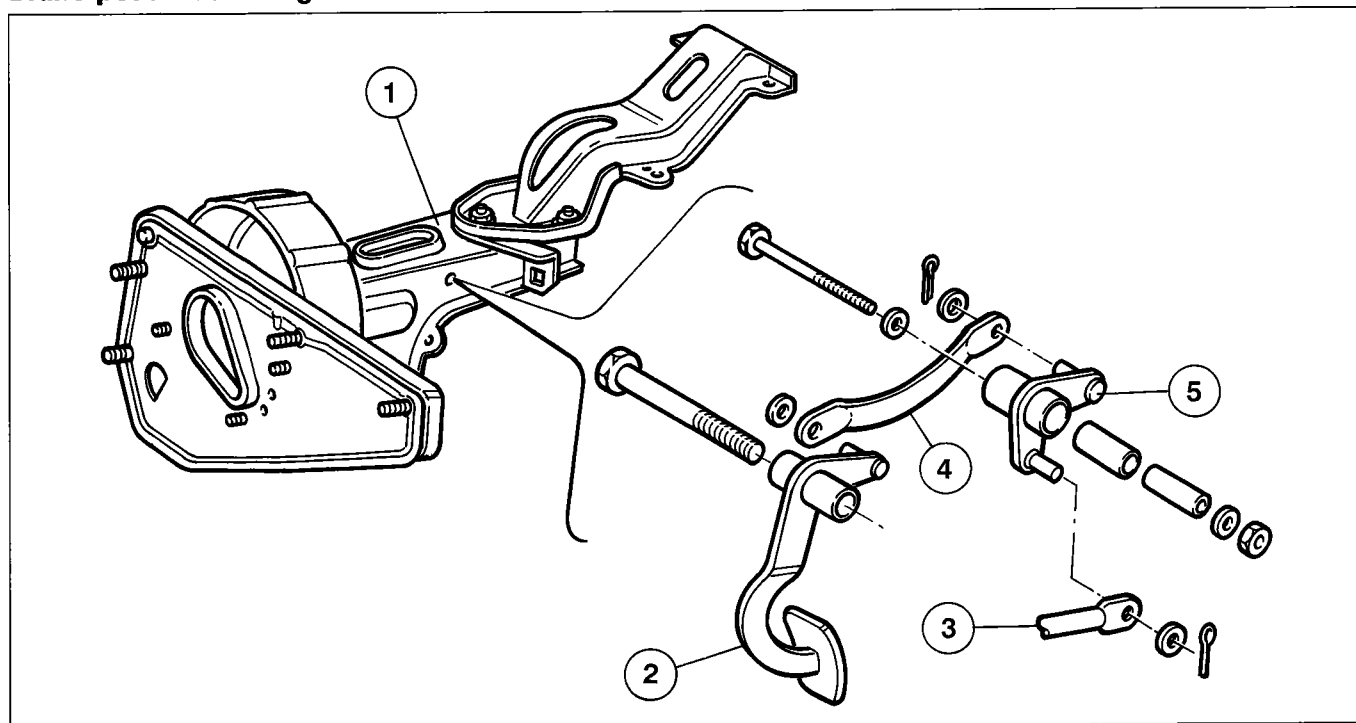
1. Remove the roll pin retaining the brake servo rod transmission on the brake pedal.



P4A22DA02

2. Remove clutch and brake pedal retaining bolt completely and then remove the pedal from the car.

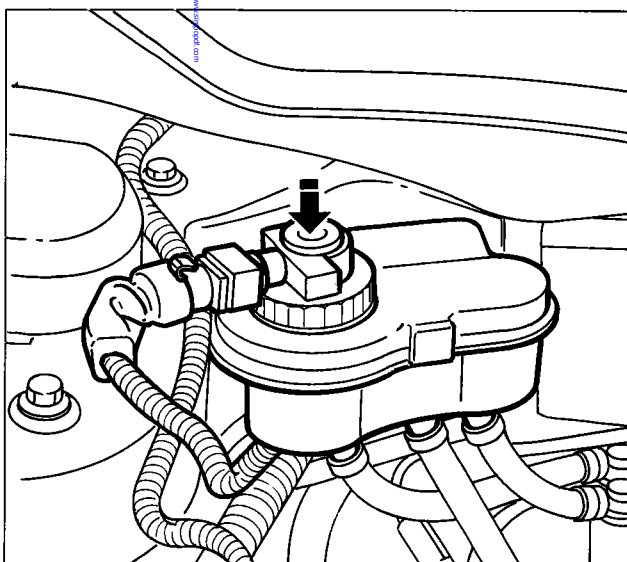
#### Brake pedal fastening details



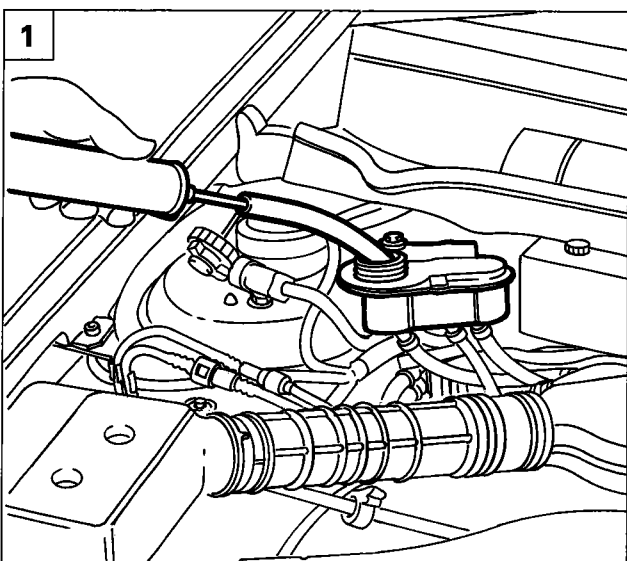
P4A22DA03

1. Pedal unit
2. Brake pedal
3. Brake servo rod
4. Transmission connecting brake pedal - brake servo rod
5. Device for anchoring brake servo rod and transmission to brake pedal

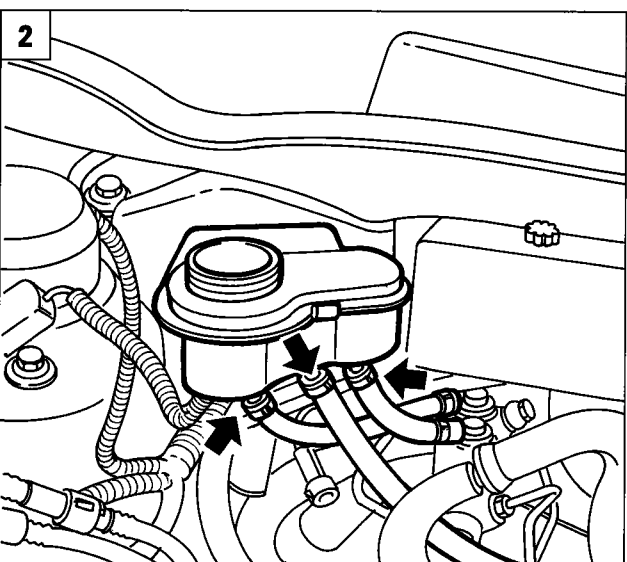




P4A23DA01



P4A23DA02



P4A23DA03

## BRAKE-CLUTCH FLUID RESERVOIR

### Checking low brake fluid warning light

**NOTE** At intervals, check warning light operation by pressing down on the top edge of the reservoir cover (arrowed). The brake system warning light should come on when the ignition is turned to MAR.

### Removing-refitting

Proceed as follows to remove the brake fluid reservoir:

1. Disconnect the connector of the fluid level sensor and remove the reservoir cap, then drain the brake fluid from the reservoir using a syringe.
2. Disconnect both brake pipes and the hydraulic clutch pipe from the reservoir.
3. Unscrew the bolt retaining the reservoir to the body and remove from the vehicle.



Take care the fluid remaining in the reservoir does not leak out.

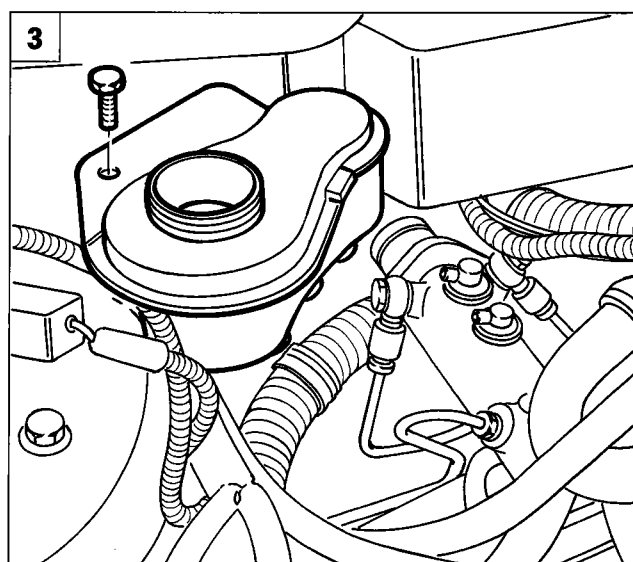
**NOTE** Carry out removal operations in reverse order to refit the brake and clutch reservoir.



Before filling the tank, ensure it is extremely clean.

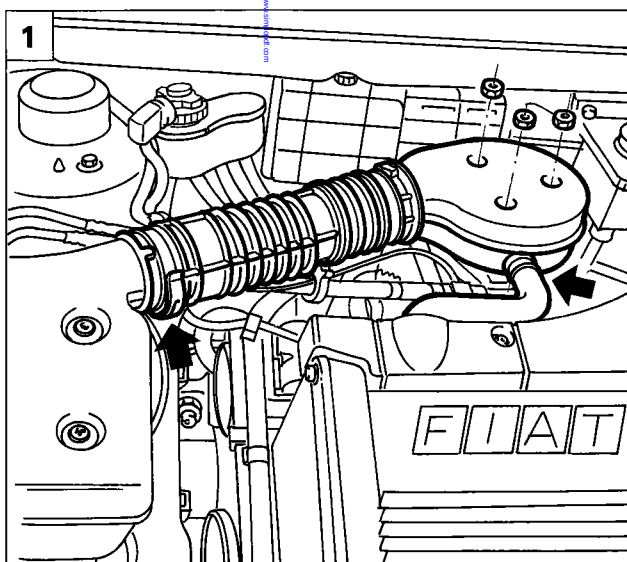


Bleeding hydraulic brake and clutch system

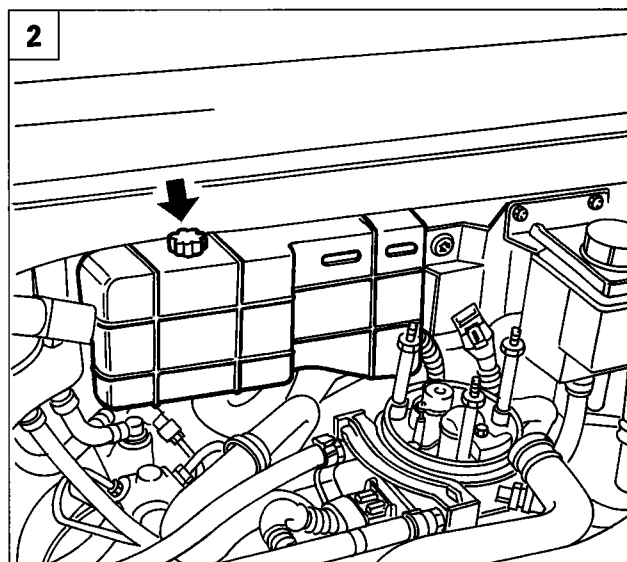


P4A23DA04

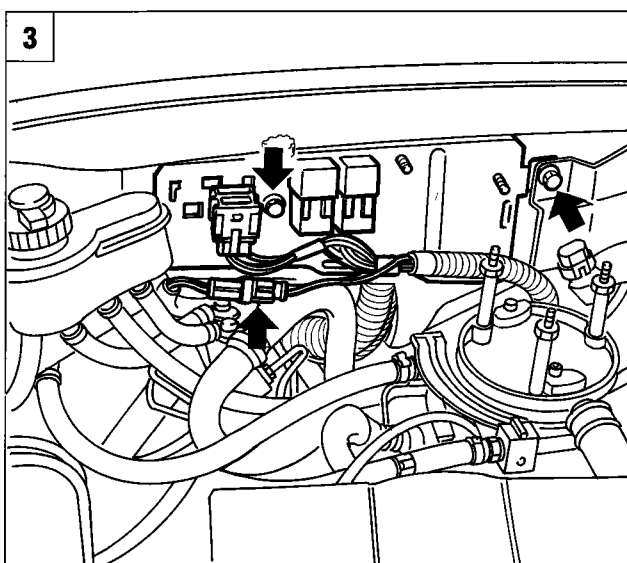
### 33.



P4A01DA03



P4A01DA04



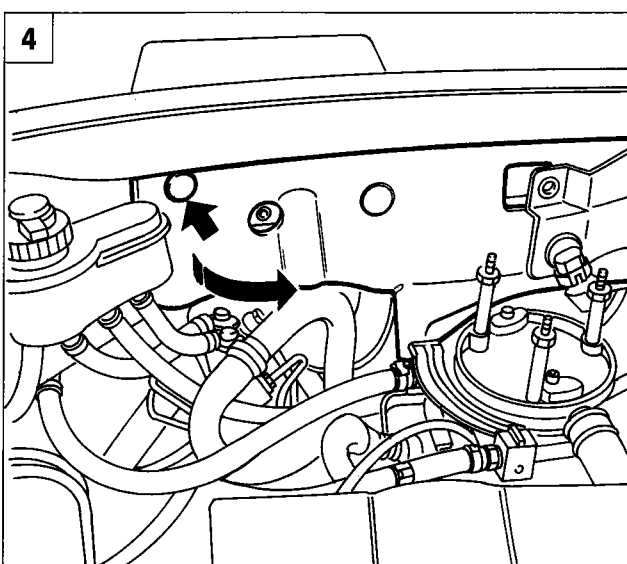
P4A01DA05



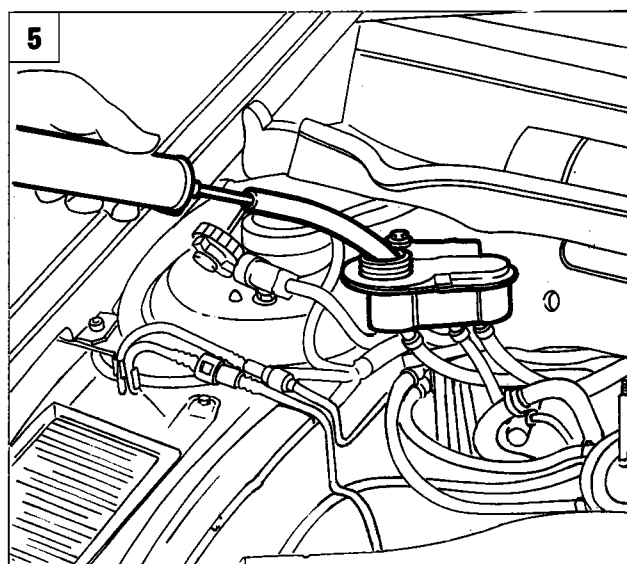
### REMOVING-REFITTING BRAKE PUMP

Proceed as follows to remove the brake pump:

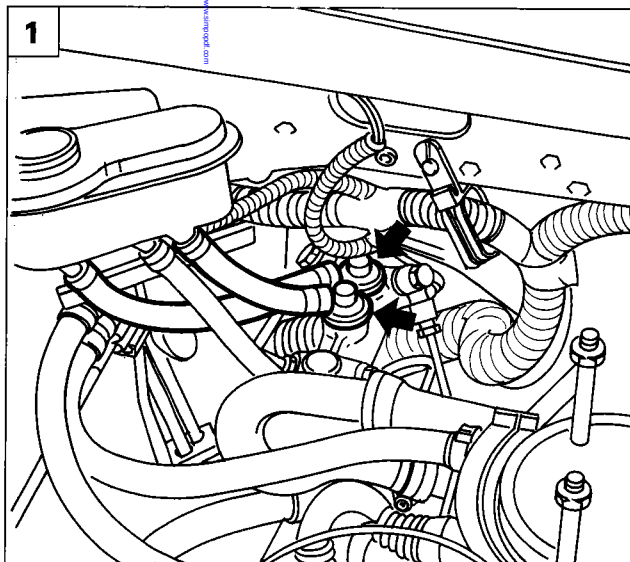
1. Disconnect the pipe connecting air cleaner to butterfly valve cause by undoing the fastenings indicated in figure.
2. Remove the relay cover.
3. Remove the relay bracket by undoing the bolts retaining it to the body, disconnect connector indicated and move the bracket to one side.
4. Remove the retaining stud of the lining of the bulkhead between lining to one side.
5. Remove the cap from the brake and clutch fluid reservoir after disconnecting the fluid level sensor connector. Then drain the fluid from the reservoir.



P4A02DA01

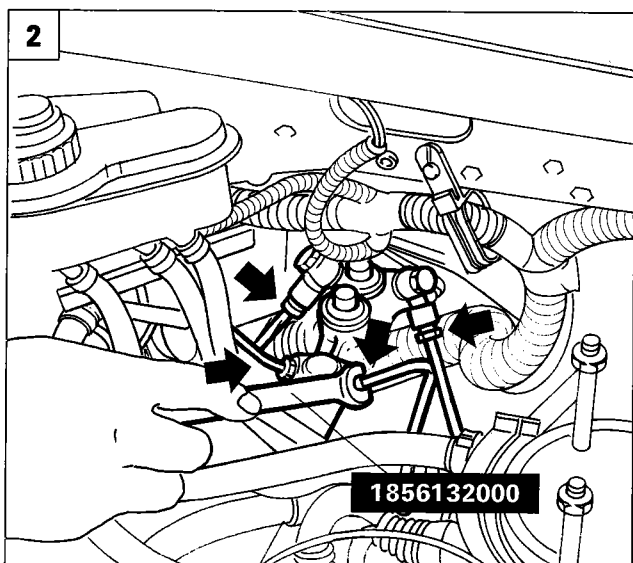


P4A12DA04



P4A25DA01

1. Disconnect the brake fluid inlet pipes from the reservoir from the brake pump.



P4A25DA02

2. Use wrench 1856132000 to disconnect the brake pipe fittings from the brake pump.

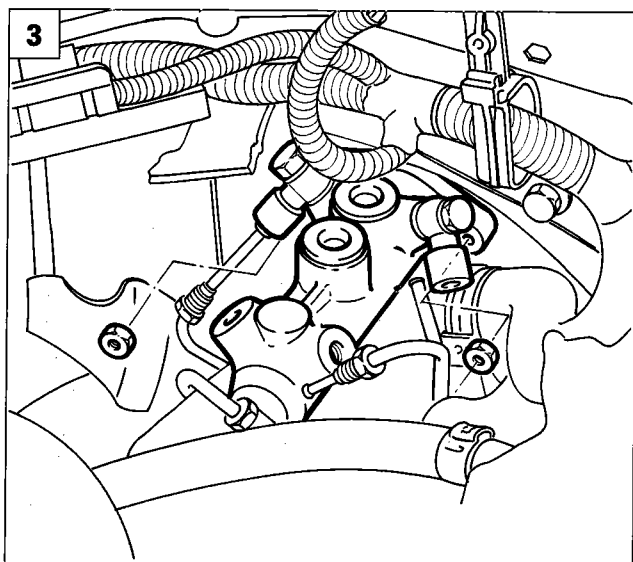


*Bleeding brake system*

3. Unscrew both nuts retaining the brake pump to the brake servo, then remove the pump from the car.

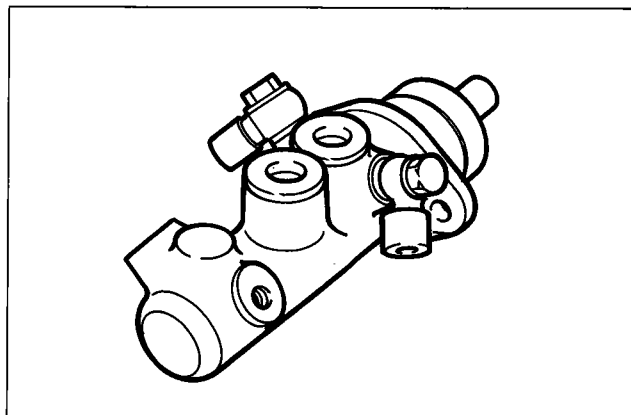


*Reverse removal instructions to refit, making sure that the brake pump is properly fitted to the brake servo rod and washer.*



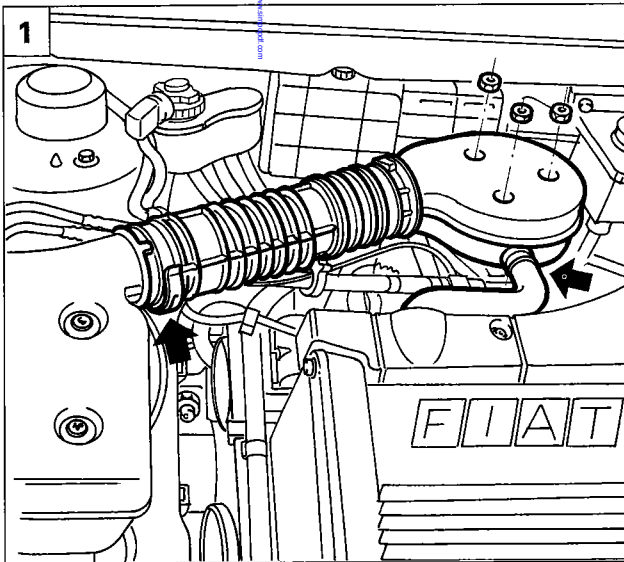
P4A25DA03

4A25DA

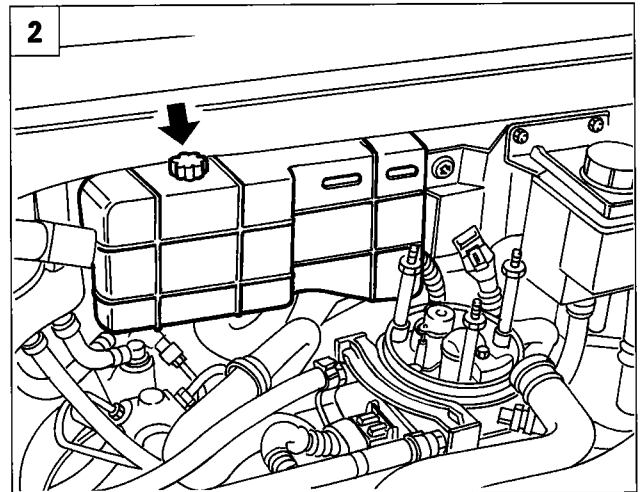


P4A25DA04

### 33.



P4A01DA03



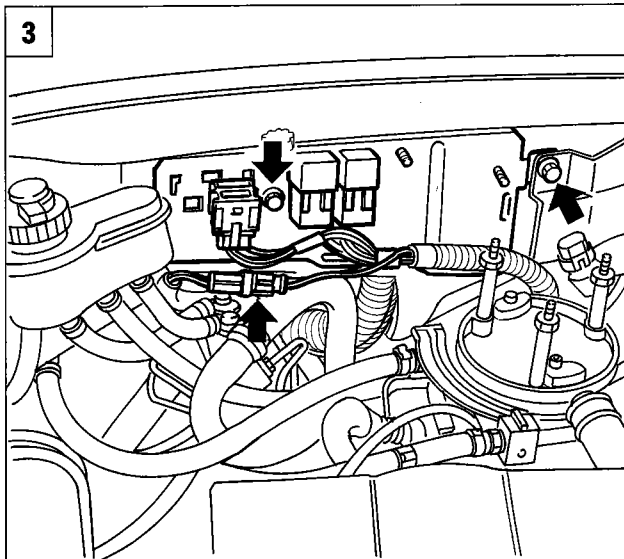
P4A01DA04

#### REMOVING-REFITTING SERVO BRAKE

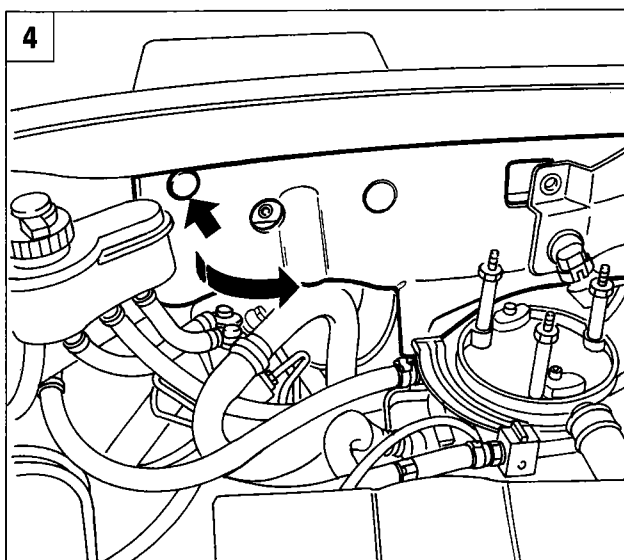


*On right hand drive vehicles, the brake servo is positioned inside the cabin under the pedal unit. To take out, remove the facia trim as described in Section 70, then proceed as follows.*

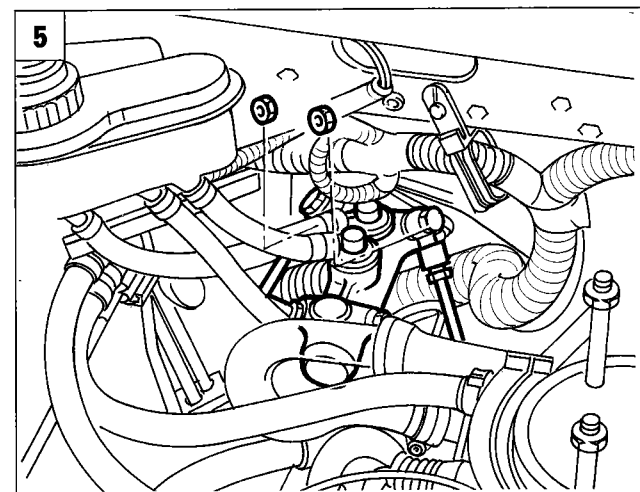
1. Working from the engine bay, remove the sleeve connecting air cleaner and butterfly valve case.
2. Remove the protective relay cover located on the bulkhead between engine bay and cabin by undoing the bolt indicated.
3. Remove the relay bracket by undoing the bolts retaining it to the body, disconnect connector indicated and move the bracket to one side.
4. Remove the retaining stud and move the lining of the bulkhead between engine bay and cabin to one side.
5. Undo both nuts retaining the brake pump to the brake servo.



P4A01DA05

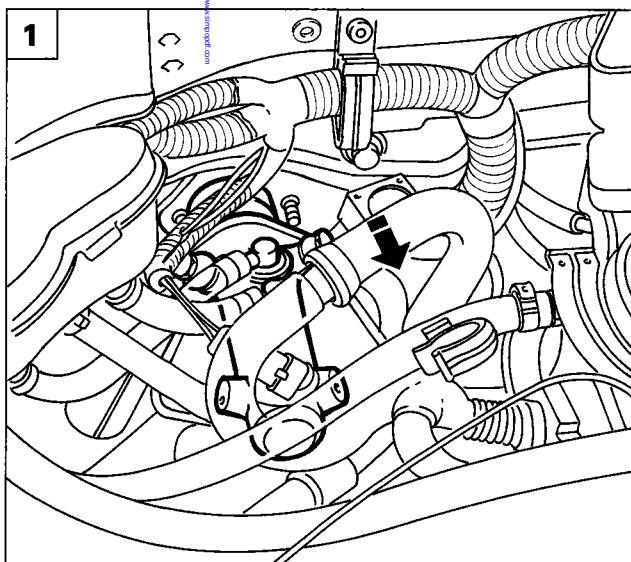


P4A02DA01

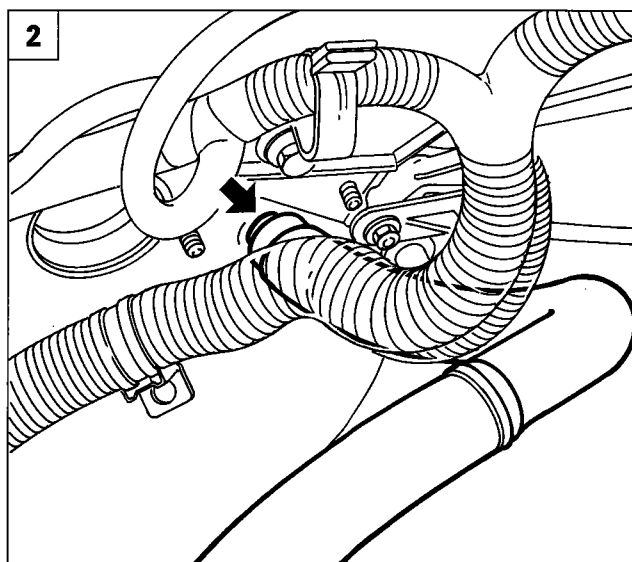


P4A26DA01

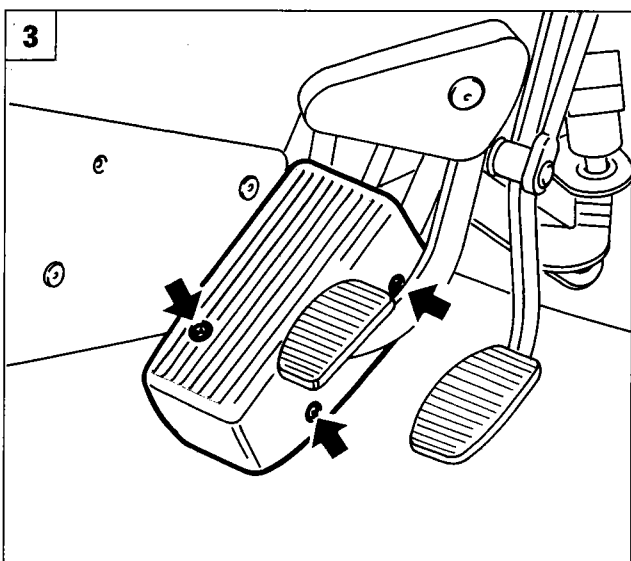




P4A27DA01



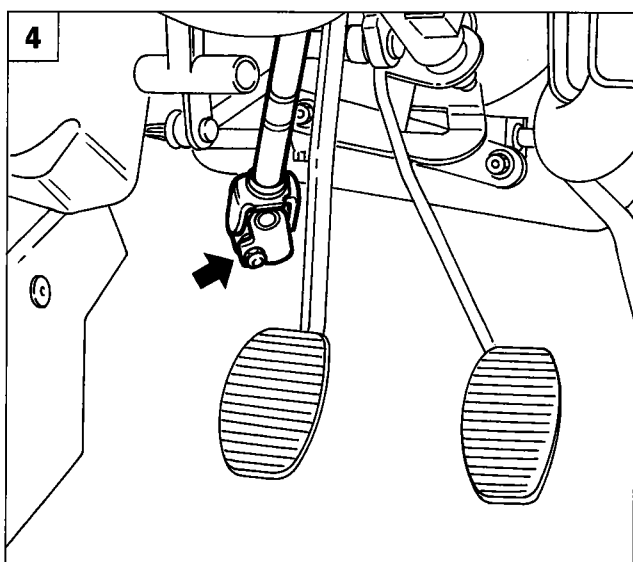
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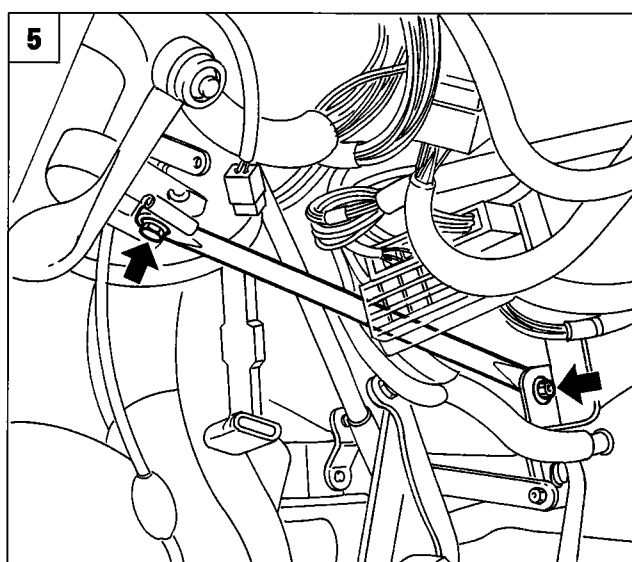
P4A03DA01



1. Remove the brake pump without disconnecting the connected brake lines, in order to release the brake servo rod from the pump.
2. Release the injection wiring bundle from the retaining clip, then disconnect the vacuum intake line from the brake servo.
3. Working from inside the cabin, remove the left foot rest, located beside the clutch pedal.
4. Remove the bolt retaining the lower steering column to the power steering box pinion.
5. Remove the steering column reinforcement bar by unscrewing the retaining bolts indicated in the figure.

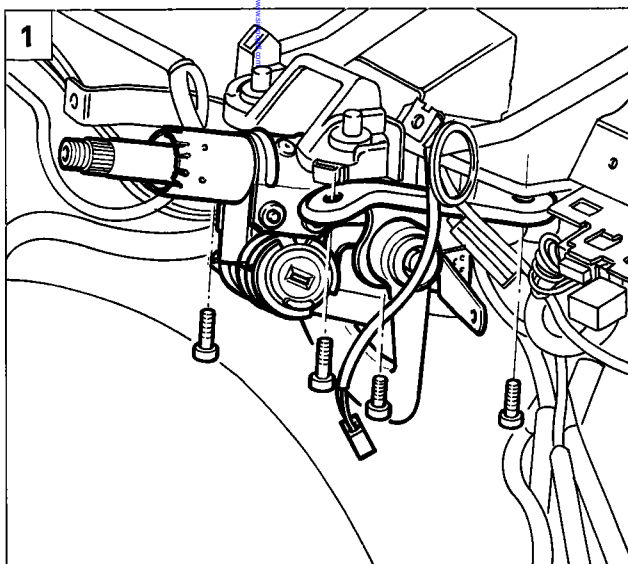


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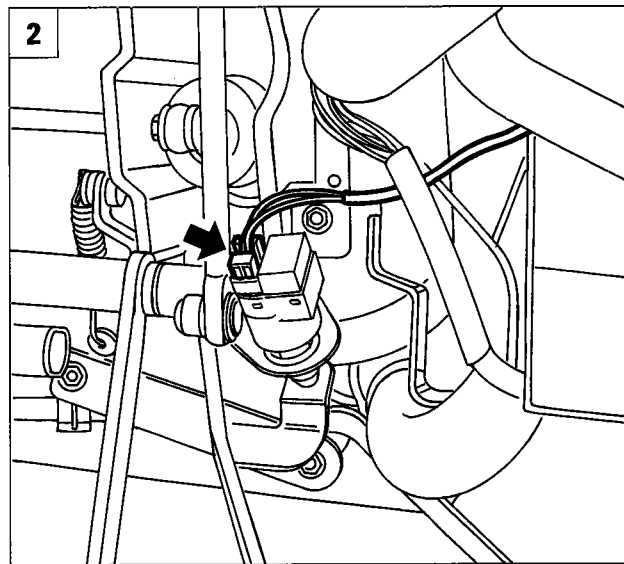


P4A27DA04

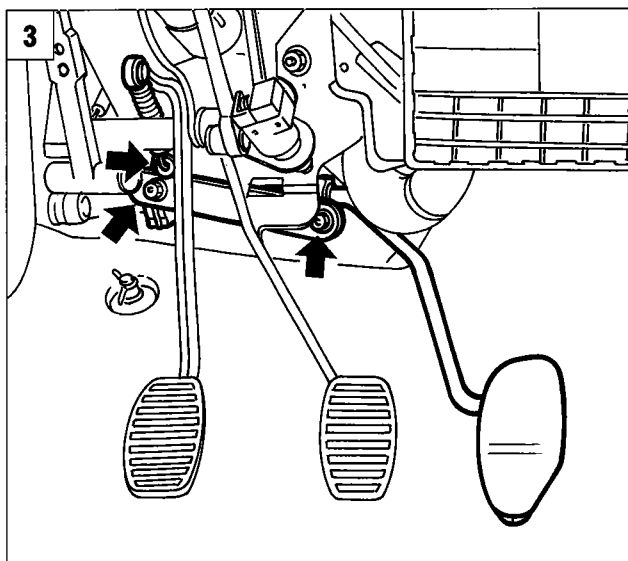
### 33.



P4A28DA01



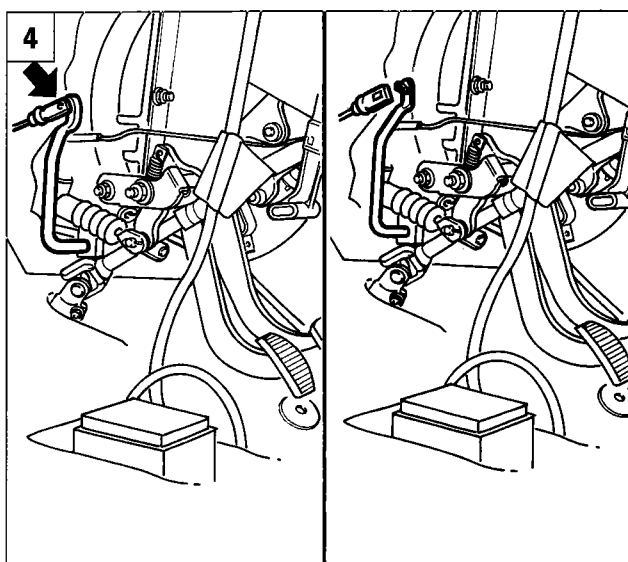
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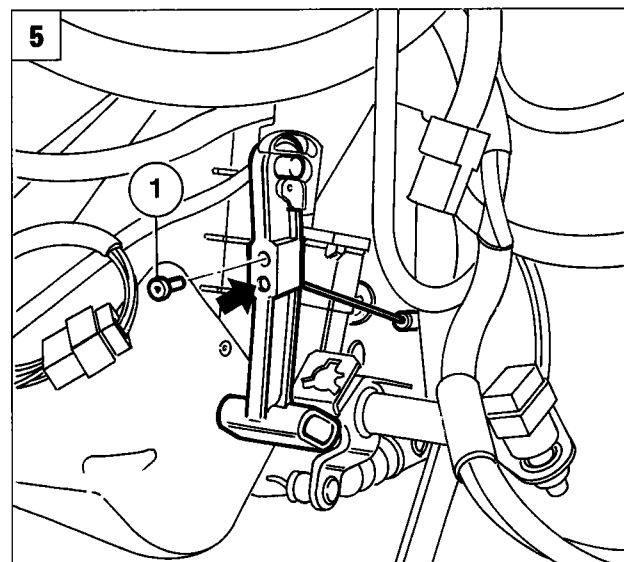
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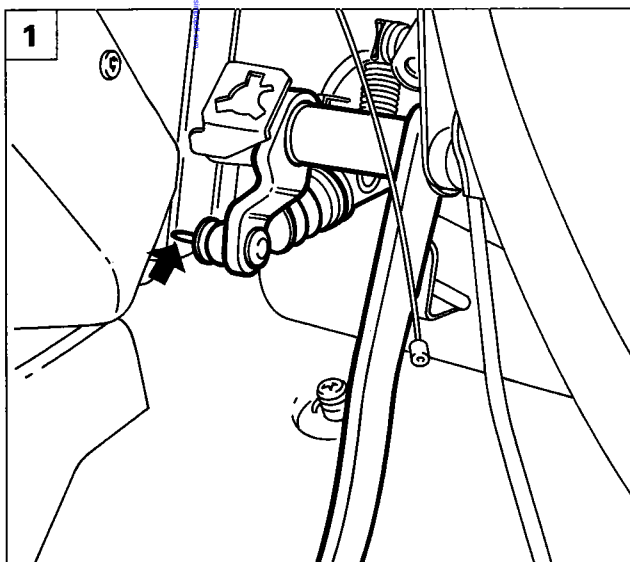
1. Disconnect electrical connection from the ignition, then unscrew the bolts fastening the steering column and remove from the car.
2. Disconnect the braking light switch connector.
3. Unscrew both nuts retaining the accelerator pedal retaining bracket and release the clutch pedal return spring from the bracket.
4. Disconnect the control cable from its anchorage on the accelerator pedal, then remove the accelerator pedal from the vehicle.
5. Remove rubber fitting (1) from the bonnet opening lever and then release the end of the opening cable from its seat and take out through the housing hole of rubber fitting (1).



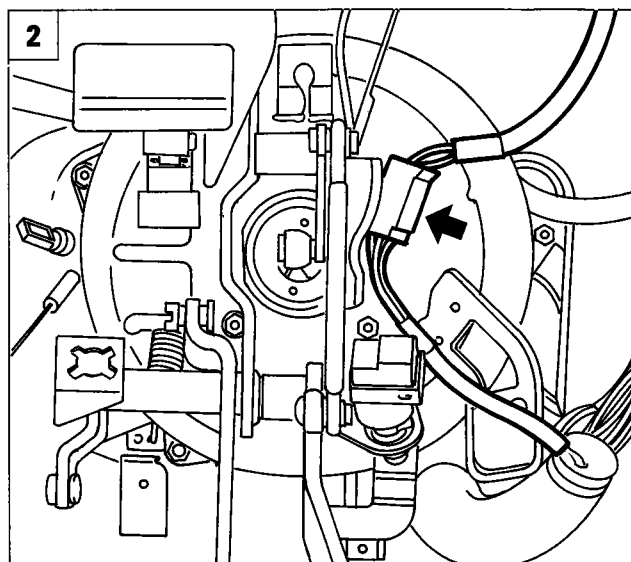
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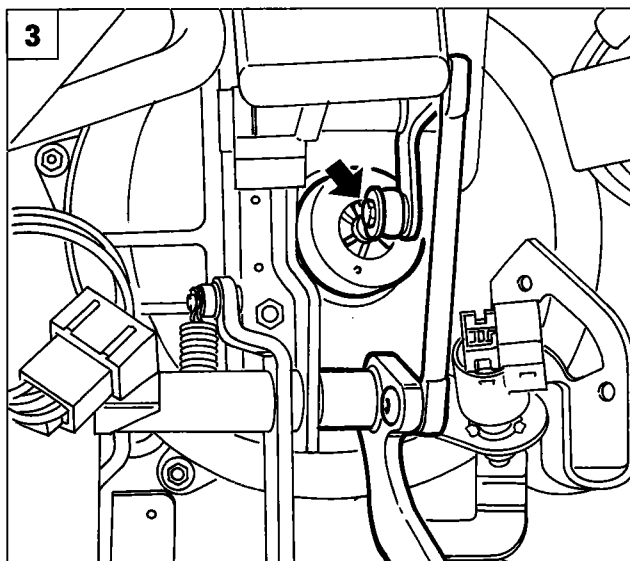
P4A28DA05



P4A29DA01



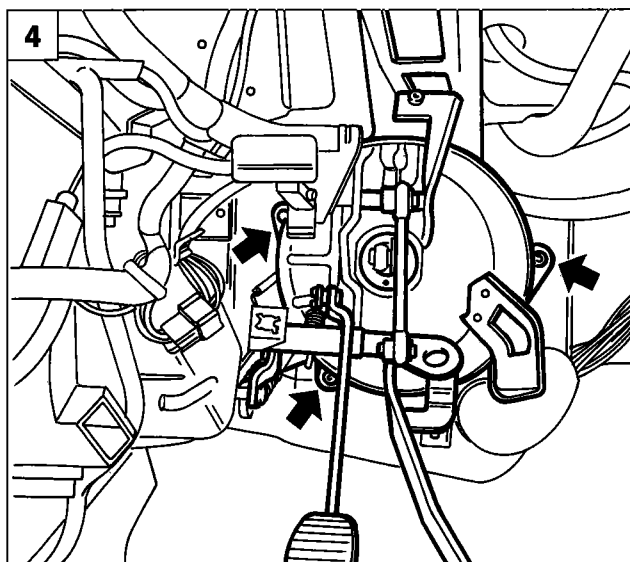
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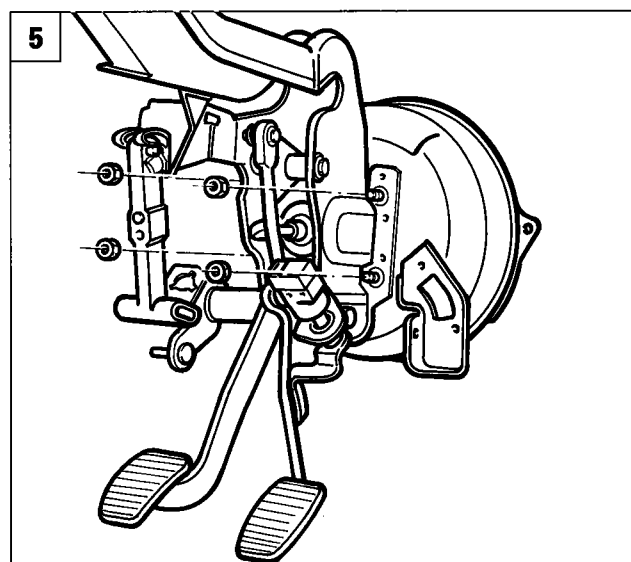
P4A29DA03



1. Remove the roll pin retaining the clutch pump rod on the control pedal.
2. Release the electrical connector shown in the figure from the pedal mount.
3. Remove the roll pin retaining the brake servo rod to the control pedal transmission.
4. Remove nuts retaining the pedal unit to the body, then remove the pedal unit and servo brake from the body by releasing the clutch pedal from the clutch pump rod.
5. At the bench, unscrew the four bolts retaining the brake servo to the pedal unit.



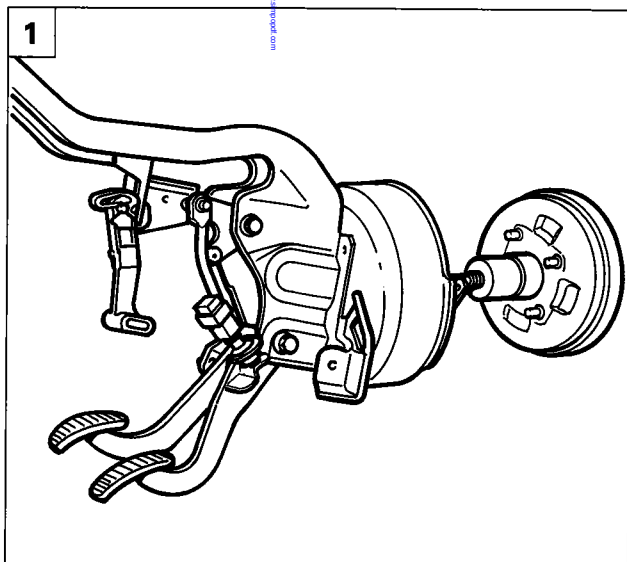
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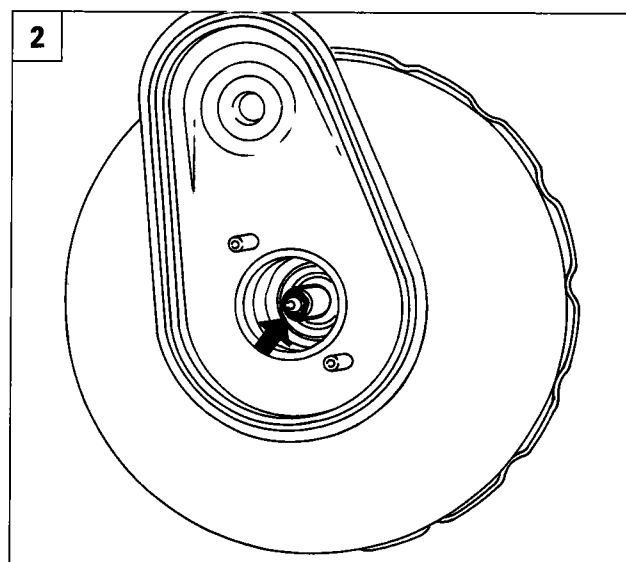
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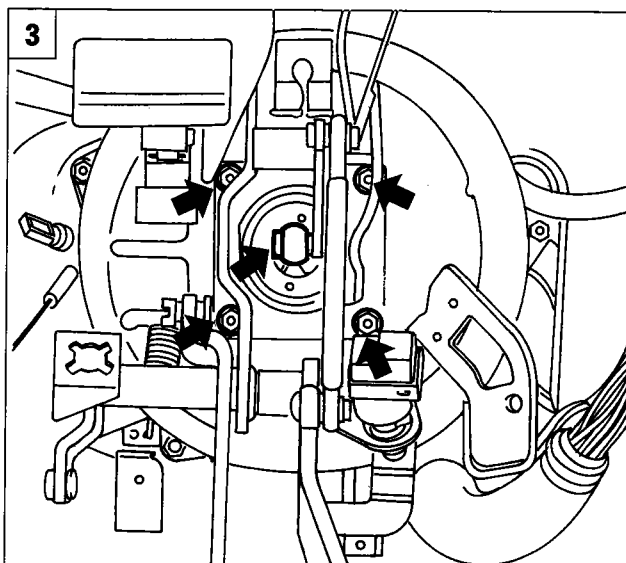
### 33.



P4A30DA01



P4A30DA02



P4A30DA03



1. Separate the brake servo from the pedal unit by releasing the brake servo rod from the transmission on the control pedal.

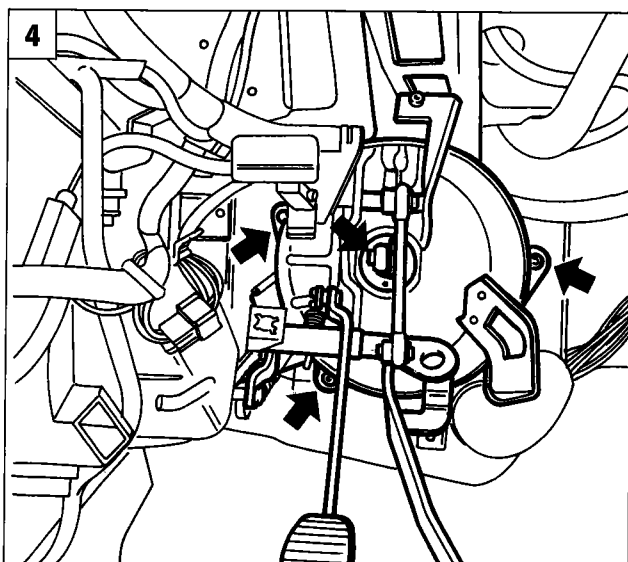
#### Refitting

2. Reverse removal instructions to refit. Take care to position the control rod and washer in their correct place on the brake servo, to ensure that they do not come out of place when fitting the brake pump.

#### REMOVING-REFITTING PEDAL UNIT

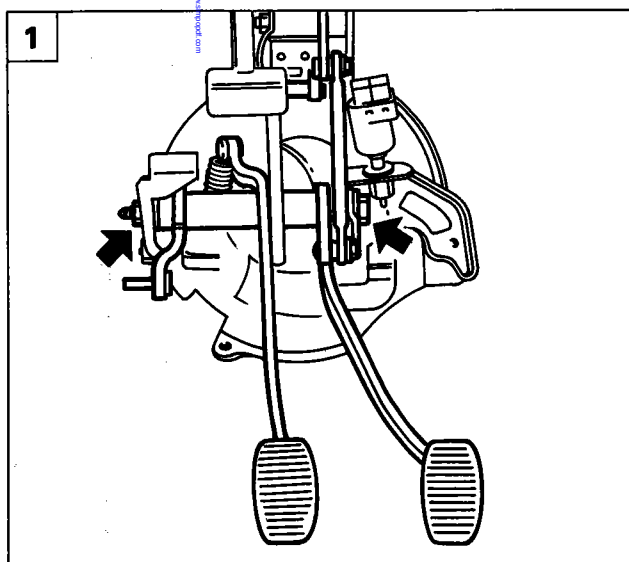


*Proceed as described for the brake servo removal to remove the pedal unit. Note that the brake pump need not be removed from the brake servo and vacuum intake pipe. Before removing the pedal assembly, unscrew the nuts retaining the brake servo to the pedal mount as shown in the figure.*

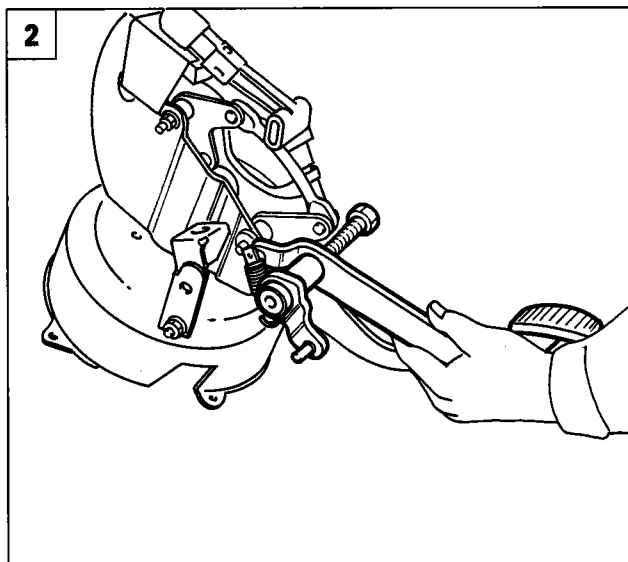


P4A30DA04

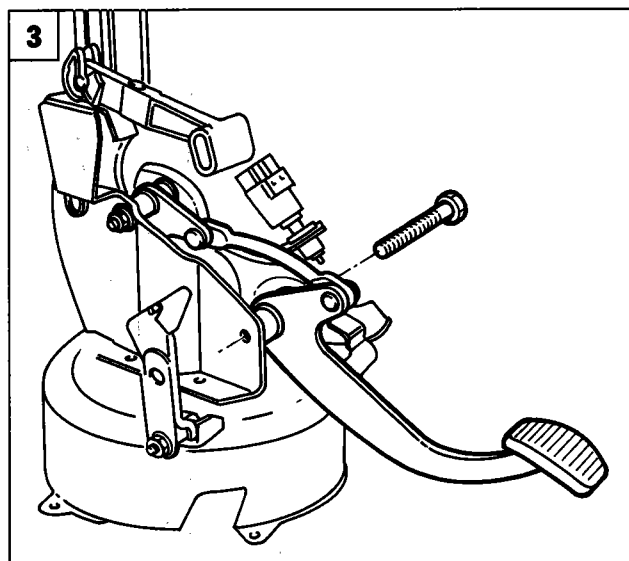
3. Unscrew nuts retaining the brake servo to the pedal mount and remove the roll pin securing the brake servo rod to the brake pedal transmission.
4. Undo nuts securing the pedal mount and remove from the car after releasing the brake servo rod from the transmission on the control pedal.



P4A31DA01



P4A31DA02

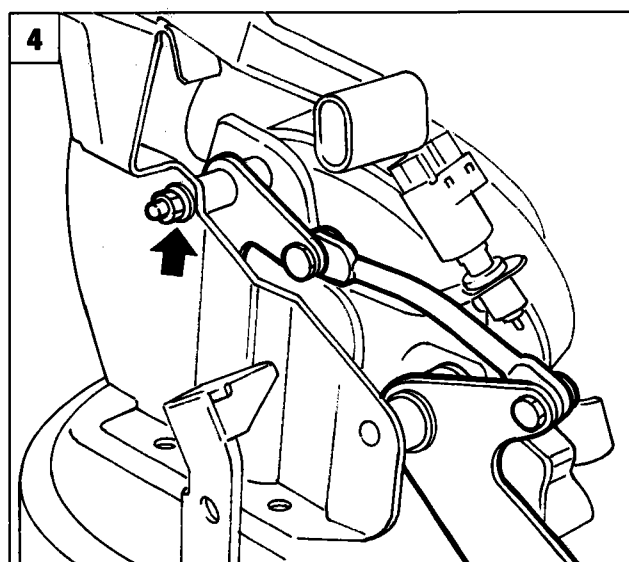


P4A31DA03

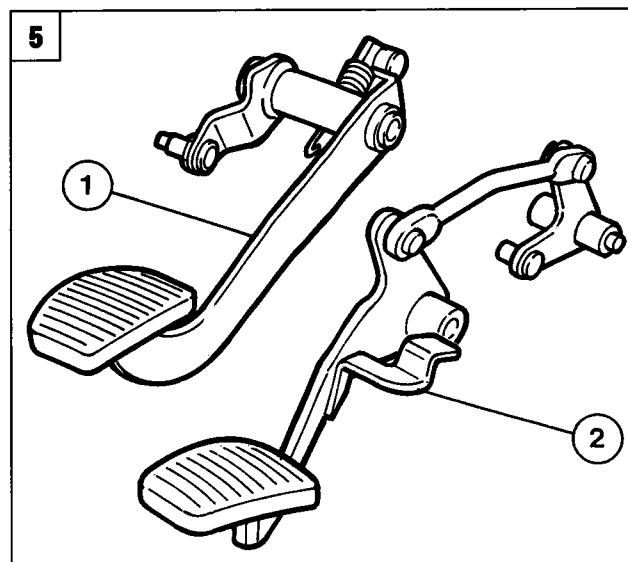


**Dismantling pedal assembly at the bench**

1. Unscrew bolt retaining the clutch and brake pedals.
2. Pull out the bolt retaining the clutch and brake pedals until the clutch pedal comes off, then remove.
3. Pull the bolt out further until the brake pedal comes off too.
4. Unscrew bolt retaining the brake pedal transmission anchoring the brake servo rod, then remove the pedal.
5. View of pedals:  
1. Clutch pedal - 2. Brake pedal.

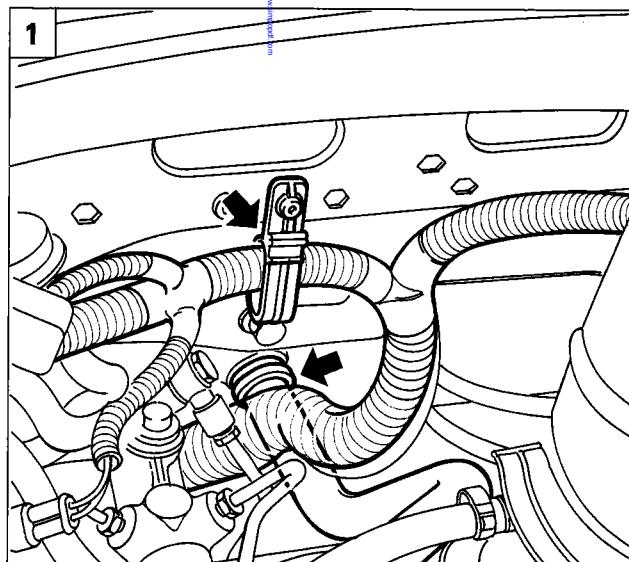


P4A31DA04

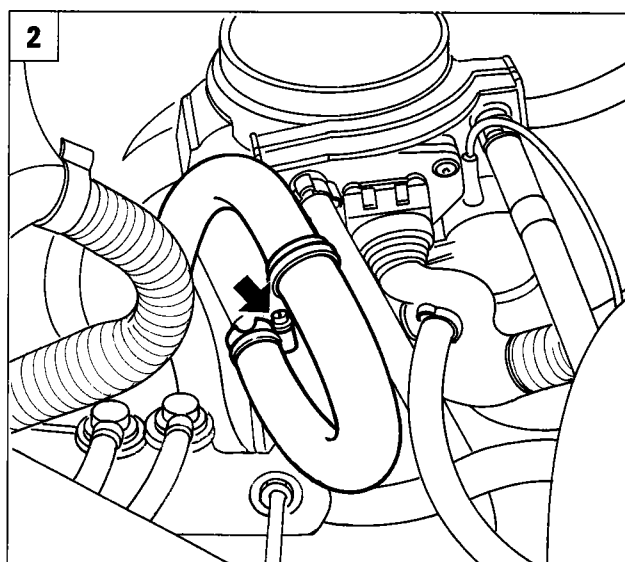


P4A31DA05

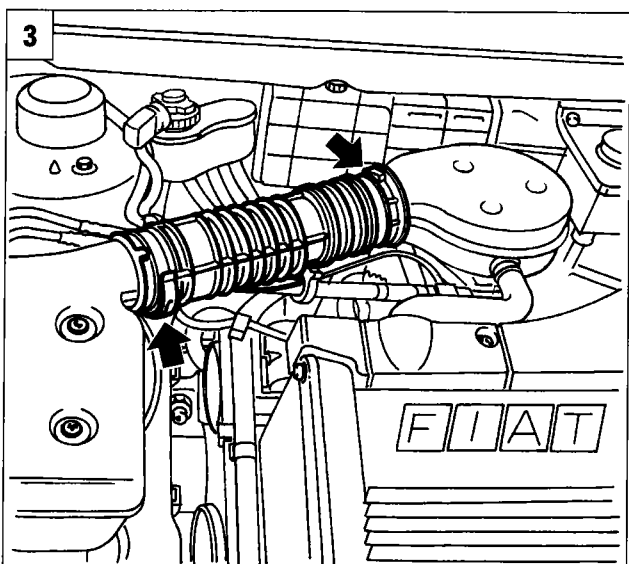
### 33.



P4A32DA01



P4A32DA02



P4A32DA03

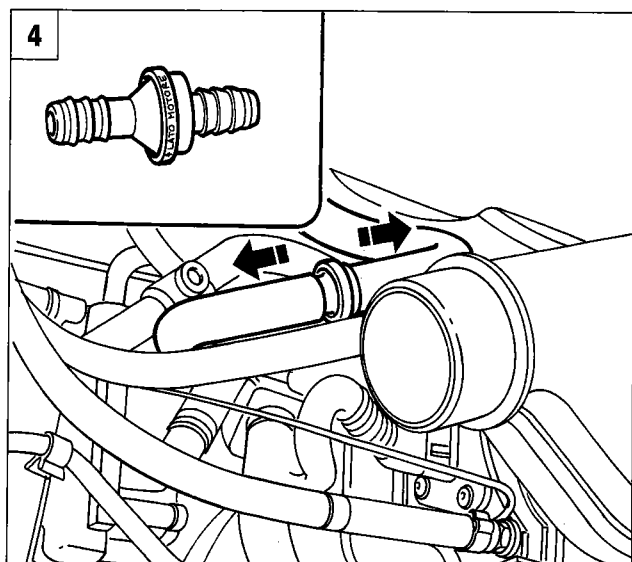


#### REMOVING-REFITTING BRAKE SERVO VACUUM INPUT PIPE



*Remove the pipe connecting the air cleaner to the butterfly valve case, the relay cover and the relay bracket, move the lining of the bulkhead between engine bay and cabin, as described for removal of the brake servo, then proceed as follows.*

1. Release the injection wiring bundle from the retaining clip, then disconnect the vacuum intake pipe from the brake servo.
2. Unscrew clip retaining the vacuum intake pipe to the engine and remove the pipe.



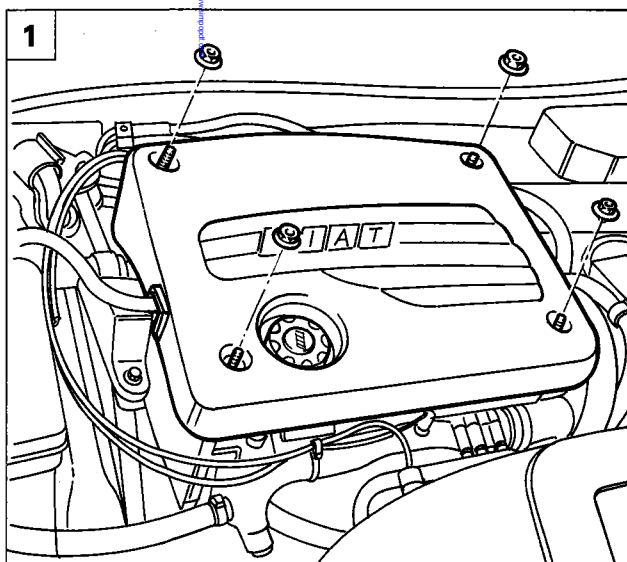
P4A32DA04

#### REMOVING-REFITTING ONE-WAY VALVE

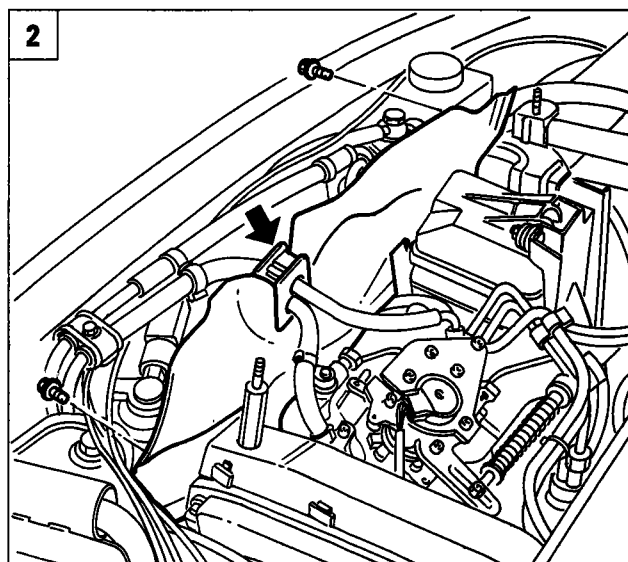
3. Remove the pipe connecting air cleaner at butterfly valve case by undoing the clip indicated in figure.
4. Remove the one-way valve from both parts of the brake servo vacuum intake pipe.



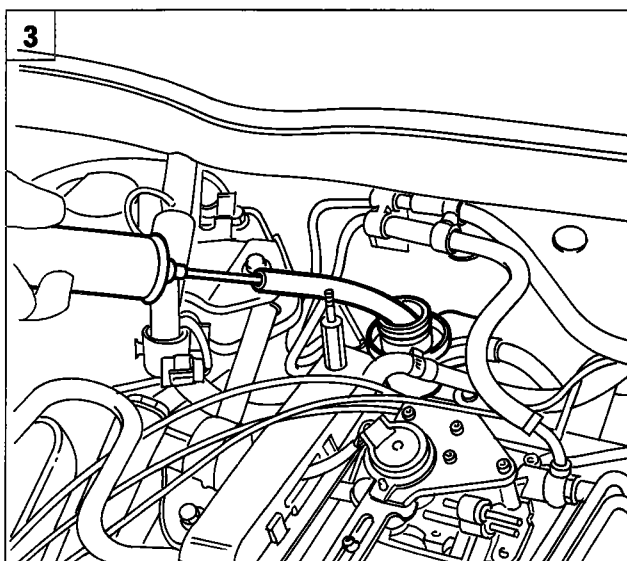
*When fitting a new one-way valve, take care to position properly with the engine end arrow turned toward the engine.*



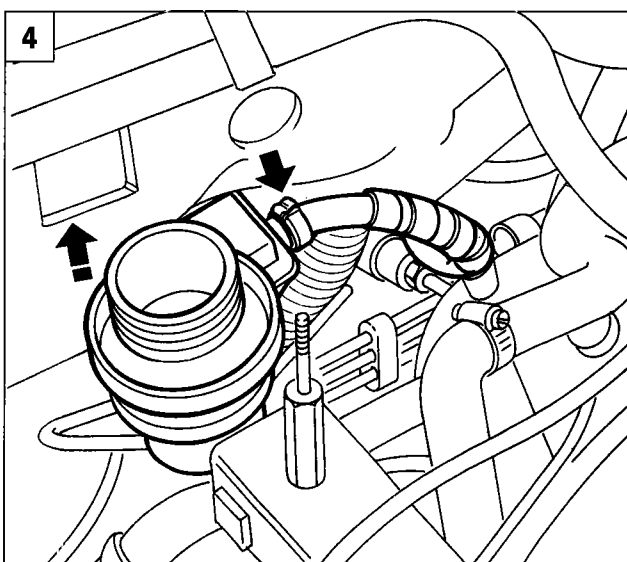
P4A05DA01



P4A06DA01



P4A17DA01



P4A33DA01



## BRAKE-CLUTCH FLUID RESERVOIR

### Removing-refitting

1. Remove the upper cam cover protection.
2. Release the diesel lines from the retaining clip, then remove the trim shown in the figure by undoing the retaining bolts.
3. Disconnect fluid level sensor connector and remove the reservoir cap, then drain the brake fluid from the reservoir using a syringe.
4. Disconnect the hydraulic clutch line from the reservoir, then separate the reservoir from the brake pump and lift out.



*Ensure fluid remaining in the reservoir does not leak out.*

**NOTE** Carry out brake and clutch fluid reservoir removal operations in reverse order to re-fit.

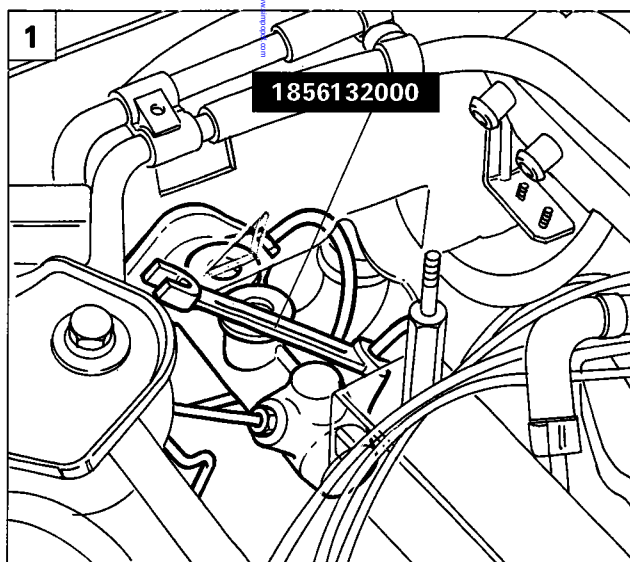


*Ensure the reservoir is extremely clean before filling.*



*Bleeding hydraulic brake and clutch system*

### 33.



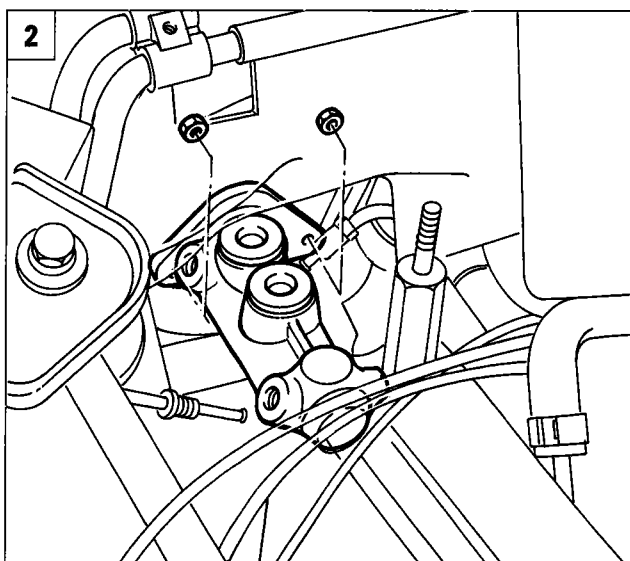
P4A34DA01

#### REMOVING-REFITTING BRAKE PUMP



Carry out operations described for removal of the brake and clutch fluid reservoir (1910 TD), but without disconnecting the hydraulic clutch and placing the reservoir to one side.

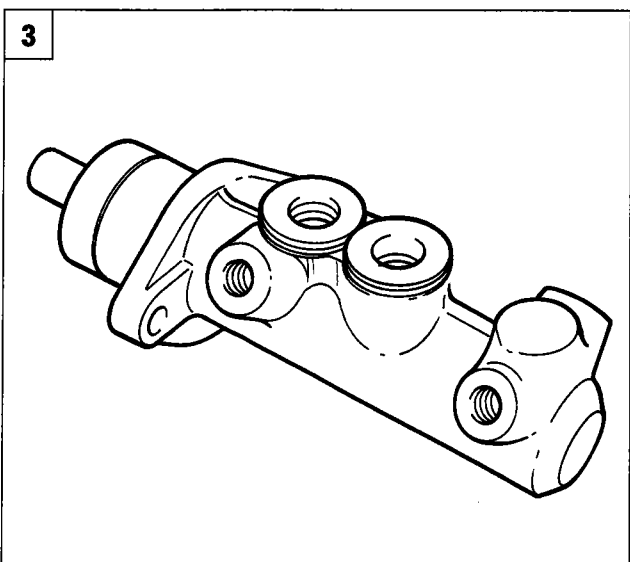
1. Use wrench 1856132000 to disconnect the brake line fittings from the brake pump.



P4A34DA02



Bleeding brake system



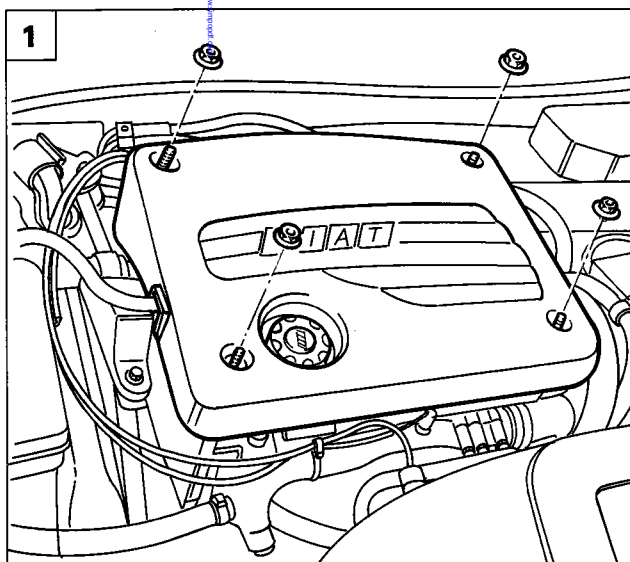
P4A34DA03

- 2-3. Unscrew both nuts retaining the brake pump to the brake servo, then remove the pump from the car.

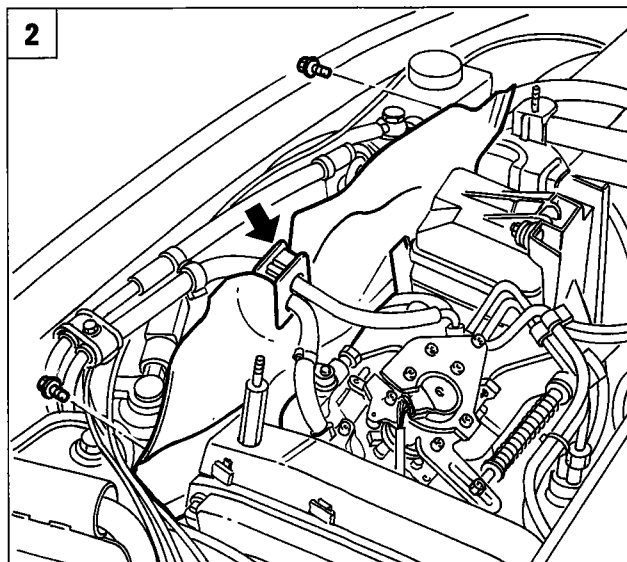


Reverse removal instructions to refit, taking care to fit the brake pump properly to the brake servo rod and washer.

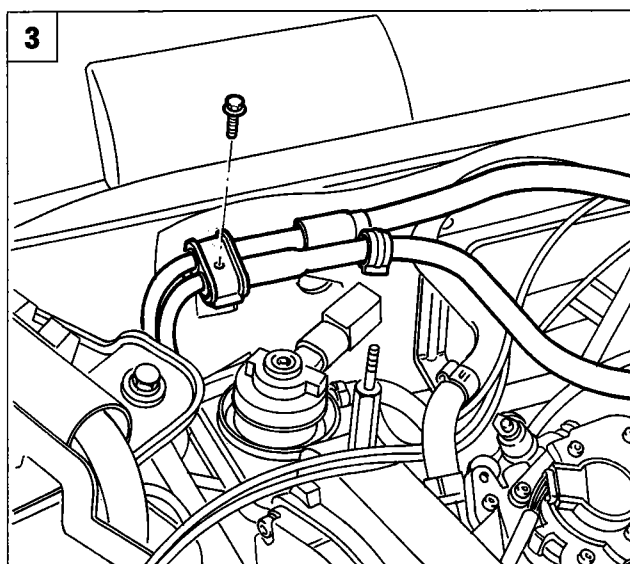




P4A05DA01



P4A06DA01

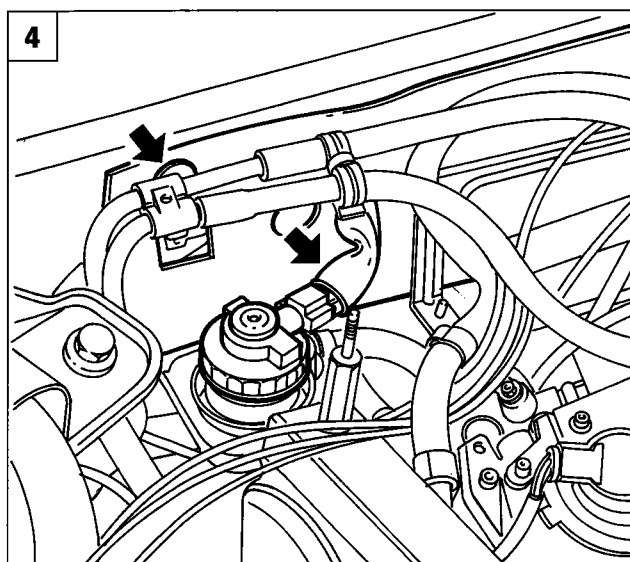


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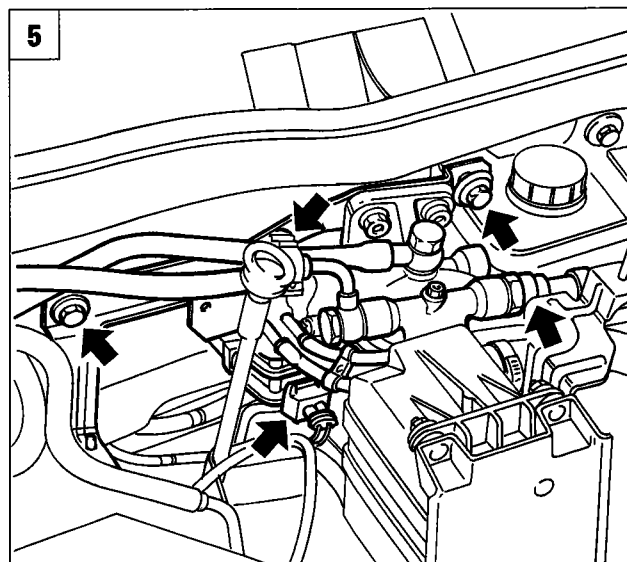


### REMOVING-REFITTING SERVO BRAKE

1. Remove the upper cam cover protection.
2. Release the diesel lines from the retaining clip, then remove the trim shown in the figure by undoing the retaining bolts.
3. Unscrew bolts retaining the diesel line retaining bracket.
4. Disconnect the brake and clutch fluid level sensor, then remove the stud retaining the lining of the bulkhead between engine bay and cabin, then move the lining to one side.
5. Unscrew the bolts fastening the diesel filter bracket, disconnect the connections shown and position the bracket to one side.

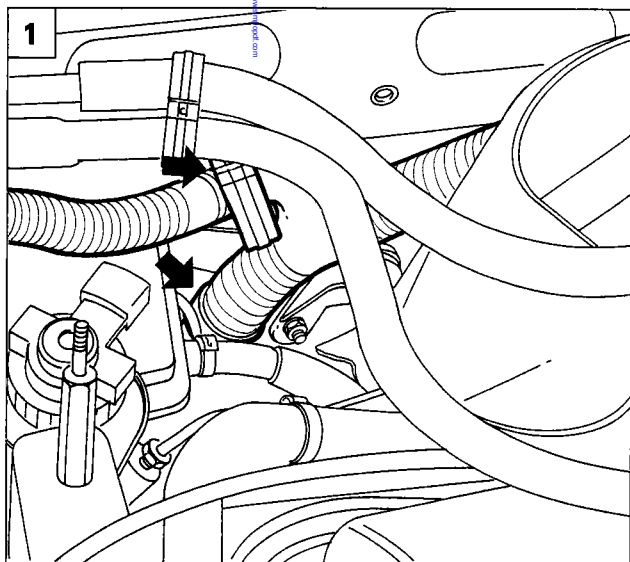


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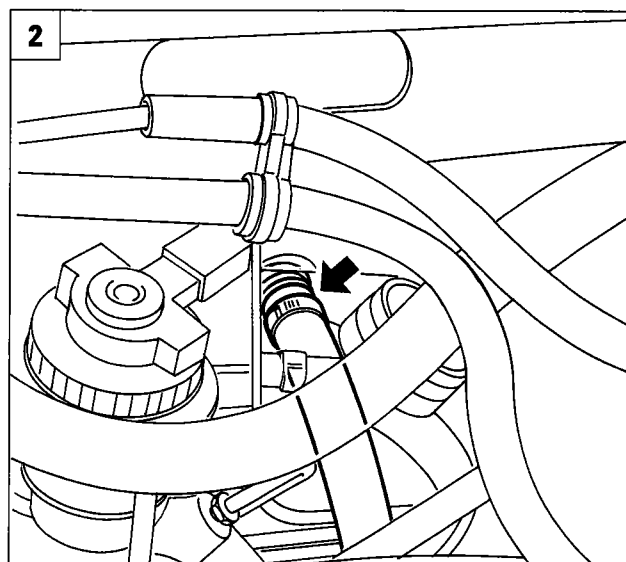


P4A06DA04

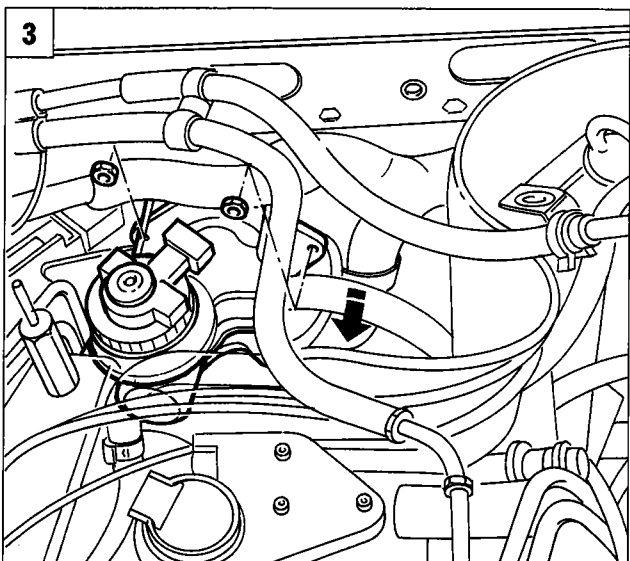
### 33.



P4A36DA01



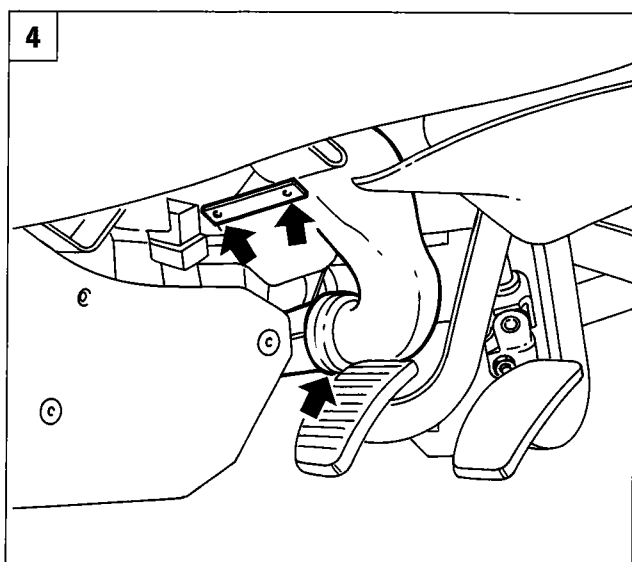
P4A36DA02



P4A36DA03



1. Release the EGR control unit wiring bundle from the clips shown.
2. Move the lining of the bulkhead between engine bay and cabin further to one side, then disconnect the vacuum inlet pipe from the brake servo.
3. Undo nuts securing the brake pump to the brake servo, then take the pump out slightly without disconnecting the brake lines.

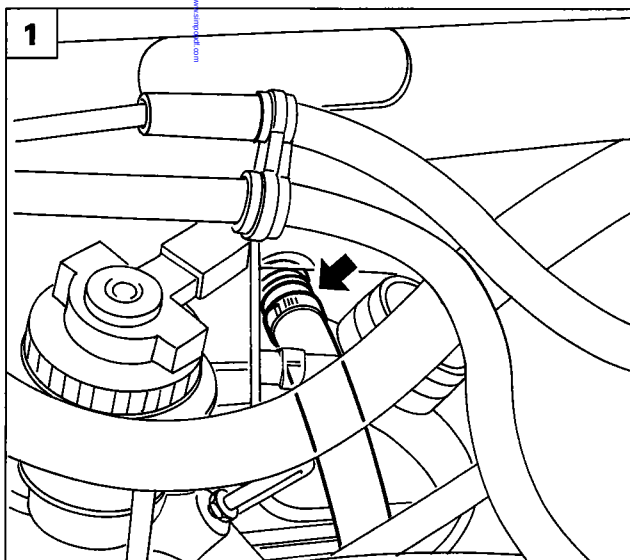


P4A07DA01

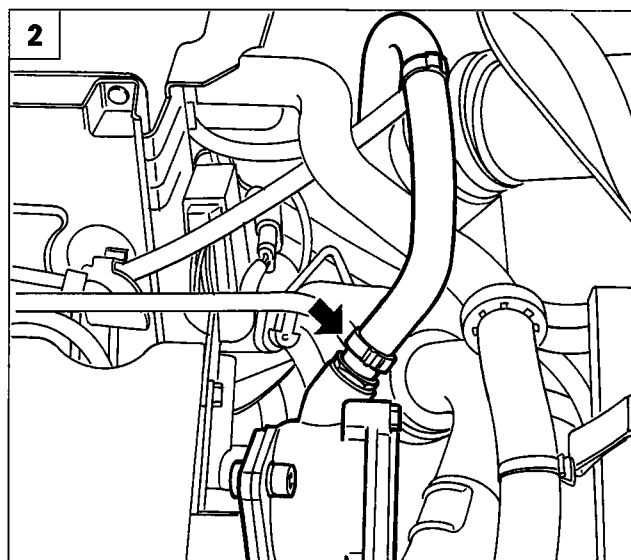


*Continue by removing parts from inside the car and then removing the brake servo as described for the 1370 12v version. Note that the air line shown in the figure alongside must also be disconnected for the 1910 TD version.*

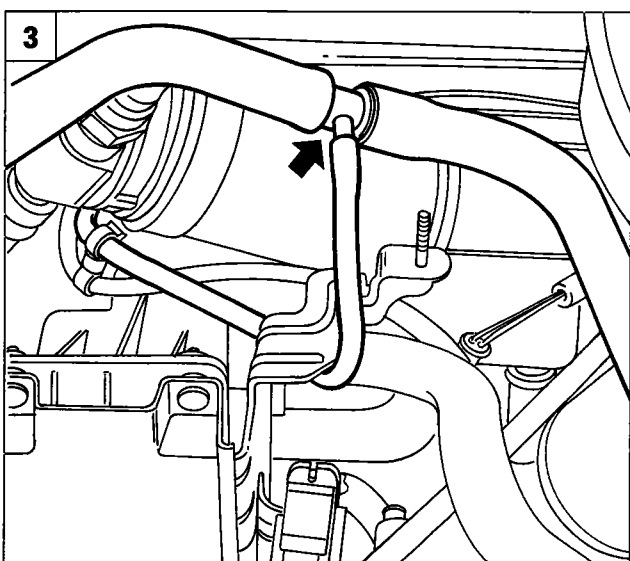




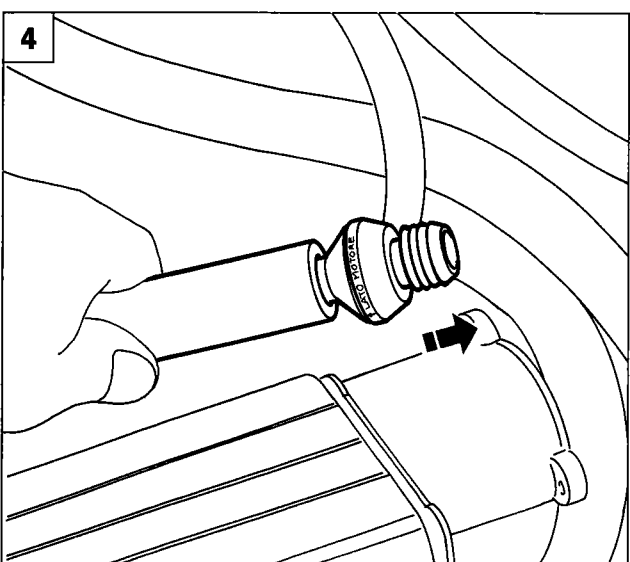
P4A36DA02



P4A37DA01



P4A37DA02



P4A37DA03



### REMOVING-REFITTING BRAKE SERVO VACUUM INLET PIPE AND ONE-WAY VALVE



*Proceed as described for the brake servo inside the engine bay, but without disconnecting the brake pump from the brake servo.*

1. Disconnect the vacuum inlet pipe from the brake servo.
2. Disconnect the clip retaining the vacuum inlet pipe from the vane vacuum pump.
3. Disconnect the pipe indicated in the figure from vacuum inlet pipe, then remove the pipe.
4. Separate the one-way valve from the vacuum inlet pipe. When refitting, position the valve with the wording LATO MOTORE turned toward the engine.



**OPERATION**

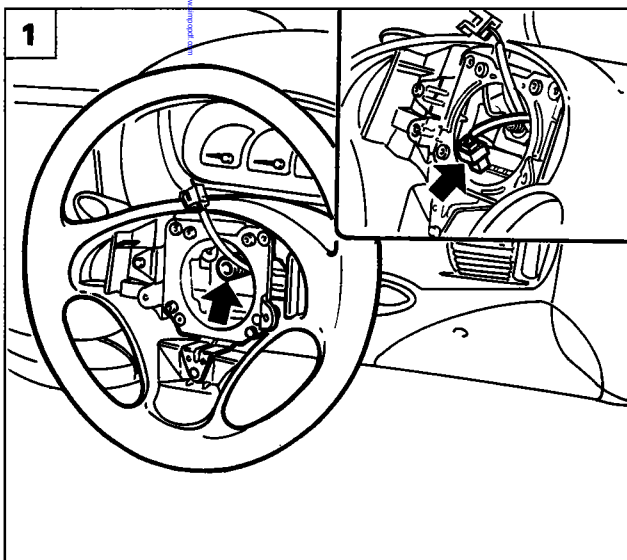
- Steering wheel - Removing-refitting 1
- Stalk unit release - Removing-refitting 1
- Steering column - Removing-refitting 2
- Rack and pinon power steering box -  
Removing-refitting 3

 **12v**

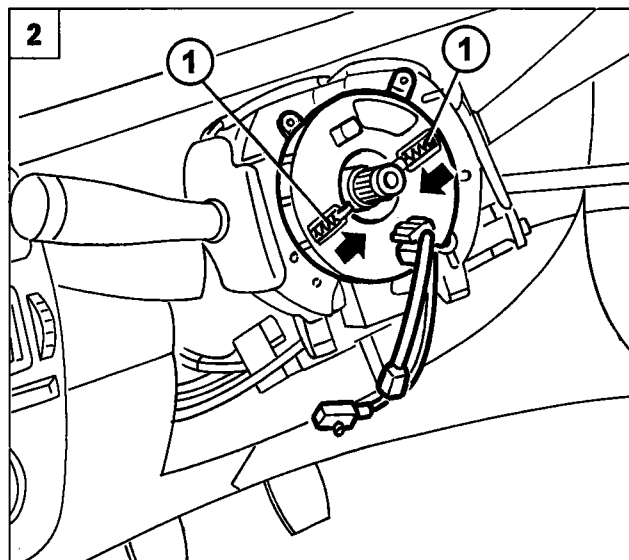
- Components of power steering system 6

 **TD 75**

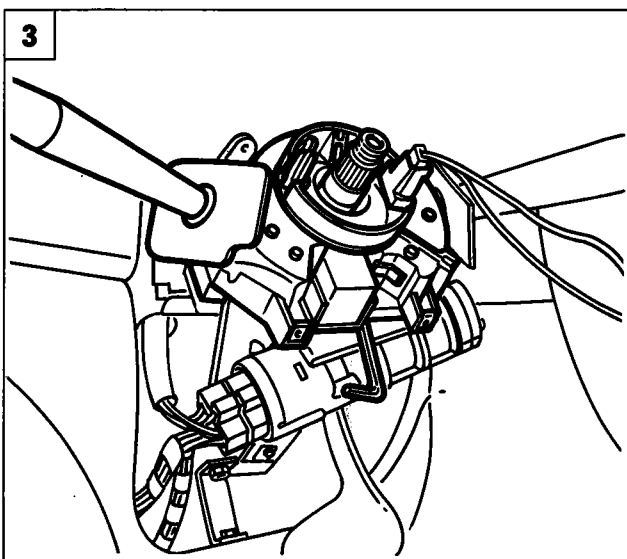
- Components of power steering system 7



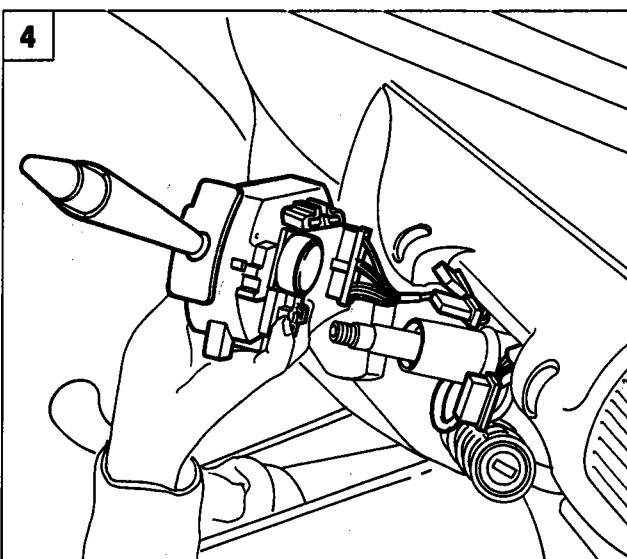
P4A39DA01



P4A39DA02



P4A39DA03



P4A39DA04

4A39DA



### STEERING WHEEL Removing-refitting



*Remove the air bag module from the steering wheel as described in Section 55.*

1. Unscrew the nut retaining the steering wheel to the steering column, the disconnect the horn electrical connection and remove the steering wheel.
2. Mark the positions of the steering wheel hub and steering columns and remove the steering wheel.



*During the operation, take care NOT TO STRIKE THE STEERING WHEEL.*



*The clock spring is fitted with a safety clip to prevent the lower and upper plates turning in relation to one another when the steering wheel is not fitted in the car. This is achieved by springs (1), which close as shown in the figure.*



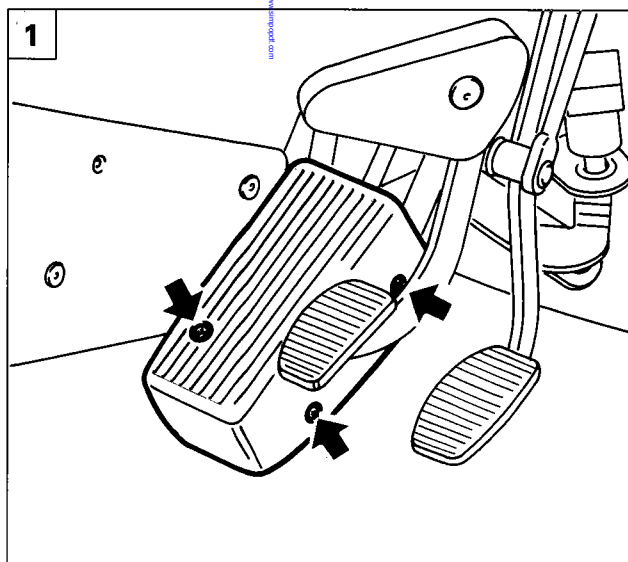
*Remove the clock spring as described in Section 55.*

### STALK UNIT-RELEASE Removing-refitting

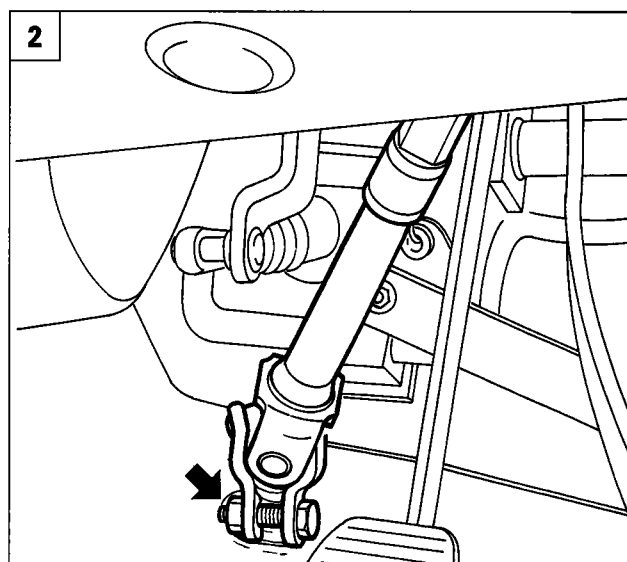
Remove the stalk unit-release as follows:

3. Use a socket wrench to loosen the bolt of the stalk unit-release retaining collar and withdraw.
4. Disconnect electrical connectors from the stalk unit-release and remove.

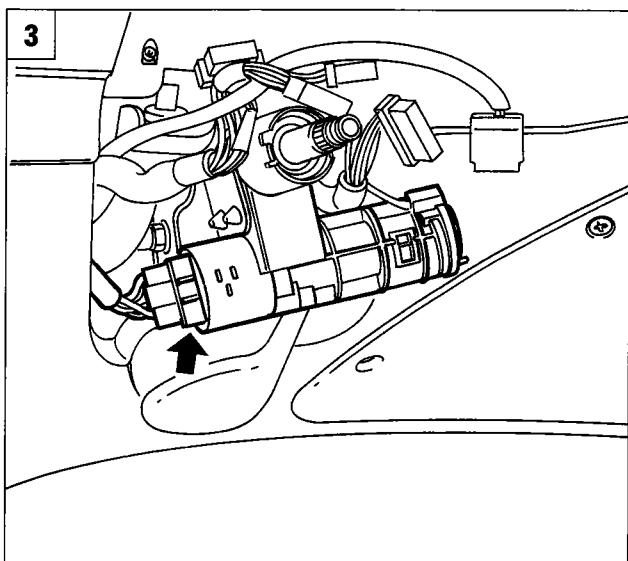
### 41.



P4A03DA01



P4A40DA01



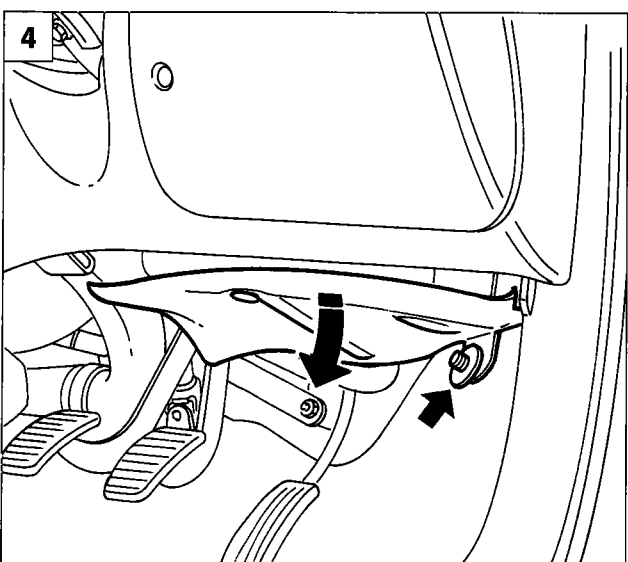
P4A40DA02



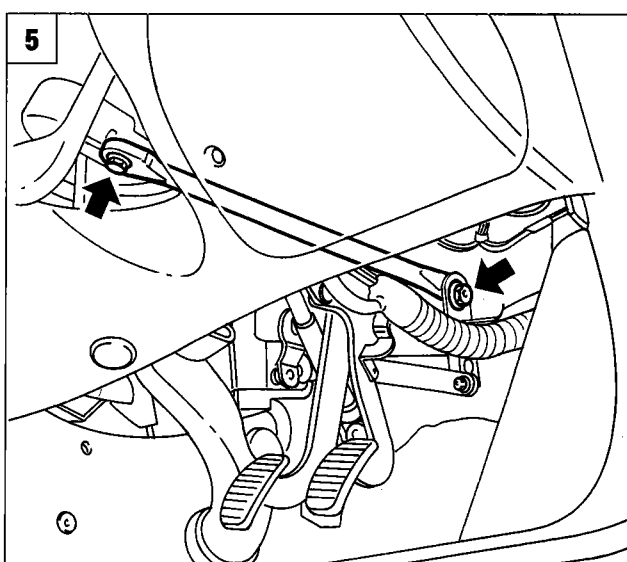
#### STEERING COLUMN Removing-refitting

Proceed as follows to remove the steering column:

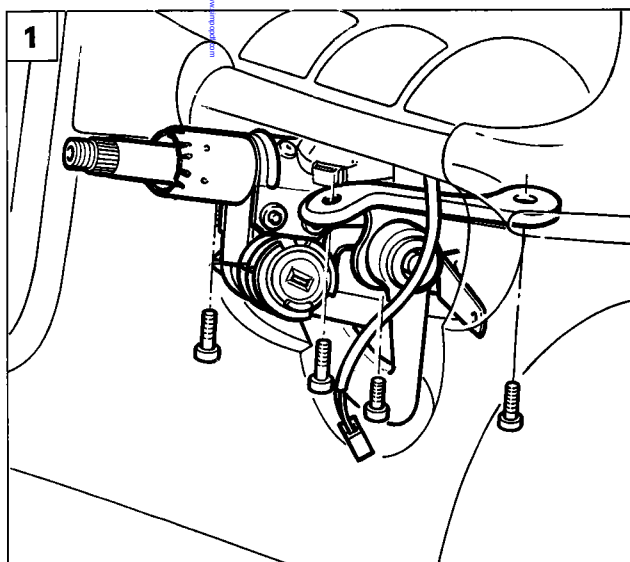
1. Remove the left foot rest located beside the clutch pedal.
2. Unscrew bolt retaining the lower steering column shaft to the power steering box pinion.
3. Disconnect the ignition connector.
4. Remove the lower junction unit protection.
5. Remove the steering column reinforcement bar by unscrewing the retaining bolts indicated in figure.



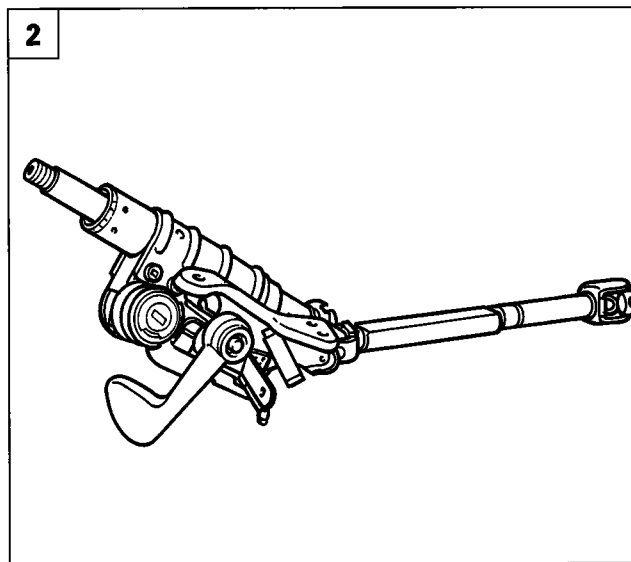
P4A40DA03



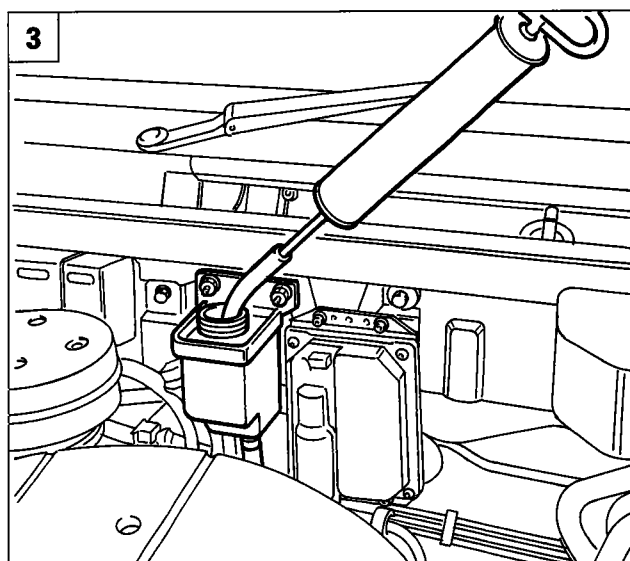
P4A40DA04



P4A41DA01



P4A41DA02



P4A41DA03

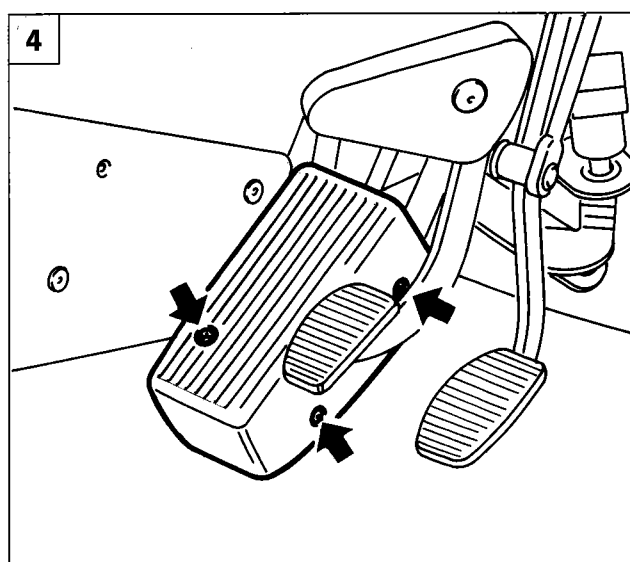


1-2. Unscrew the bolts fastening the steering column mount to the body and remove the steering column together with the lower shaft.

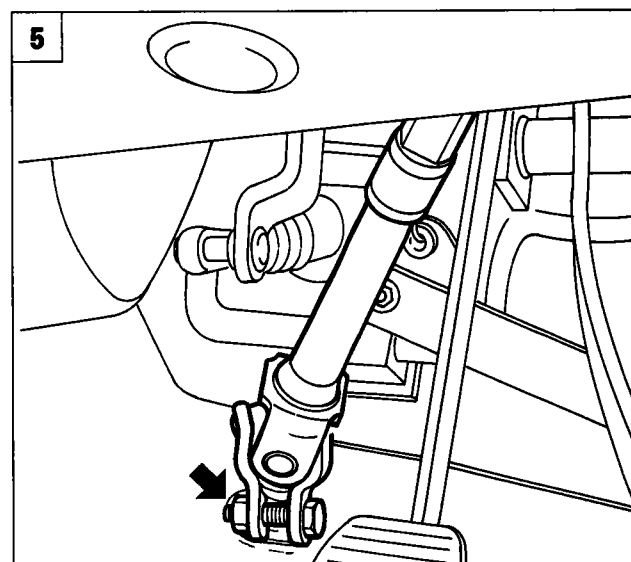
### RACK AND PINION POWER STEERING BOX

#### Removing-refitting

3. Disconnect the negative battery terminal lead, position the car on a lift, then drain the power steering fluid from the reservoir using an appropriate syringe.
4. Remove the left foot rest located alongside the clutch pedal.
5. Unscrew bolt retaining the lower steering shaft to the power steering box pinion.

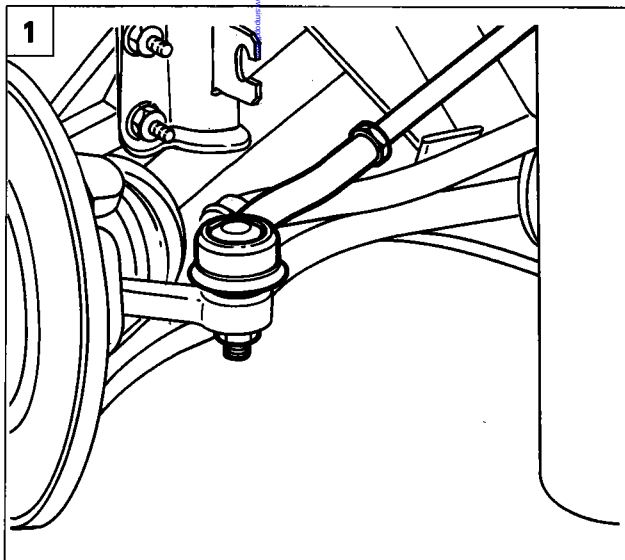


P4A03DA01

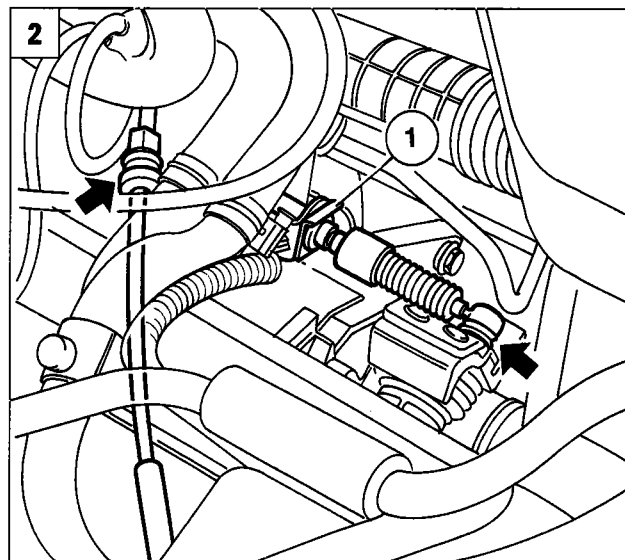


P4A40DA01

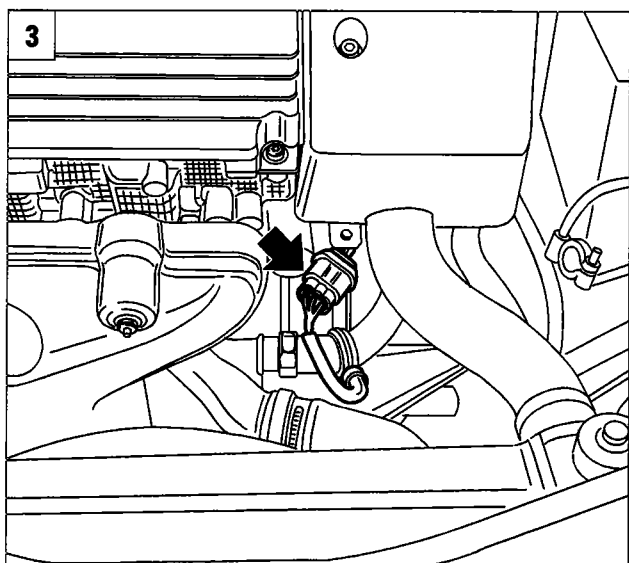
## 41.



P4A42DA01



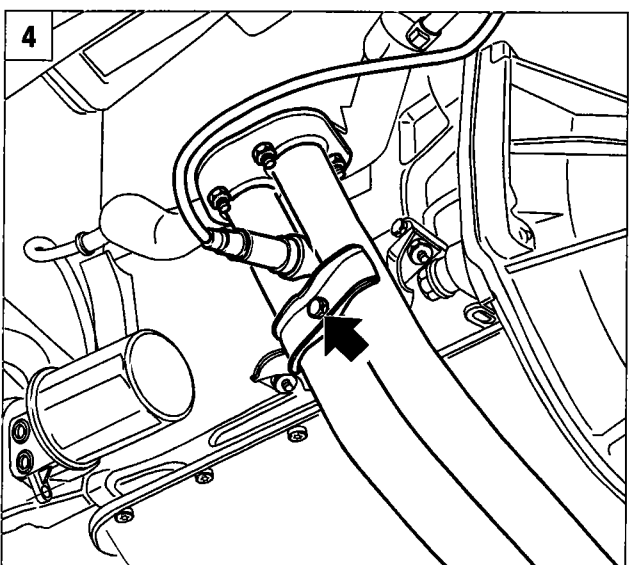
P4A42DA02



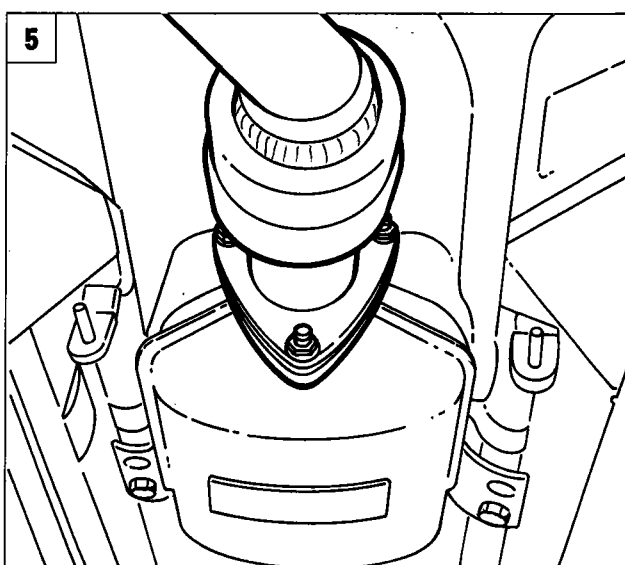
P4A42DA03



1. Remove the front wheels, then unscrew the bolts retaining the steering link heads (right and left) to the pillars and remove from the pillars using extractor 1847038000.
2. Release the reverse inhibition lead from the retaining clip, then lift clip (1) and disconnect the gear selection bowden cable head.
3. Disconnect electrical connection of the lambda probe.
4. Remove the bracket retaining the first exhaust pipe section to the crankcase.
5. Unscrew bolts retaining the first exhaust pipe section to the catalytic converter.

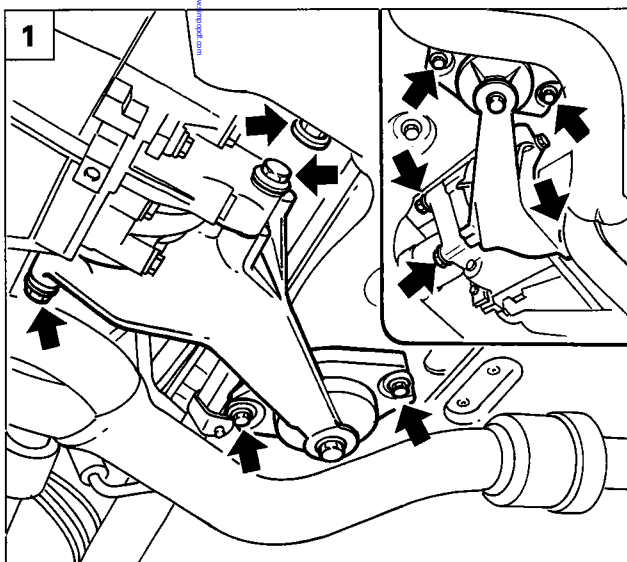


P4A42DA04

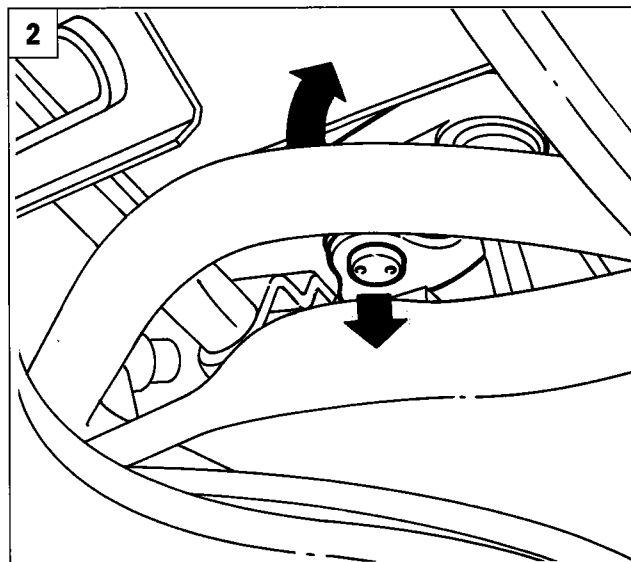


P4A42DA05

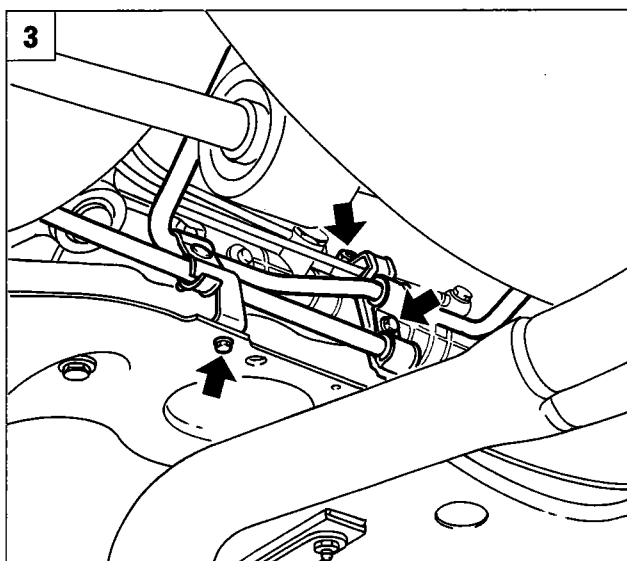




P4A43DA01



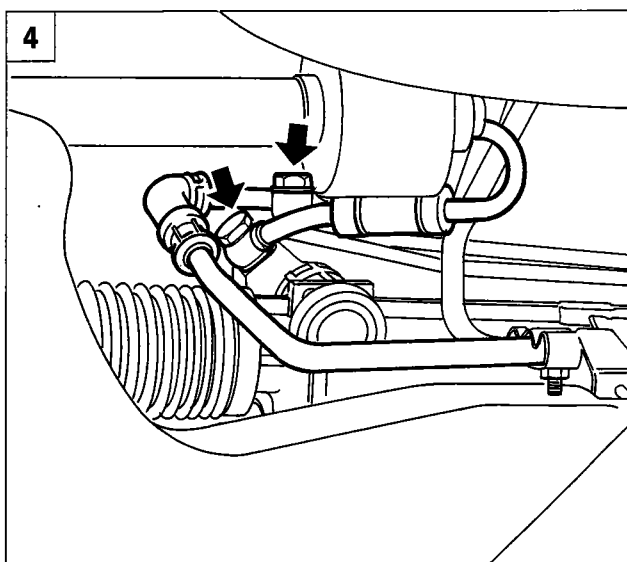
P4A43DA02



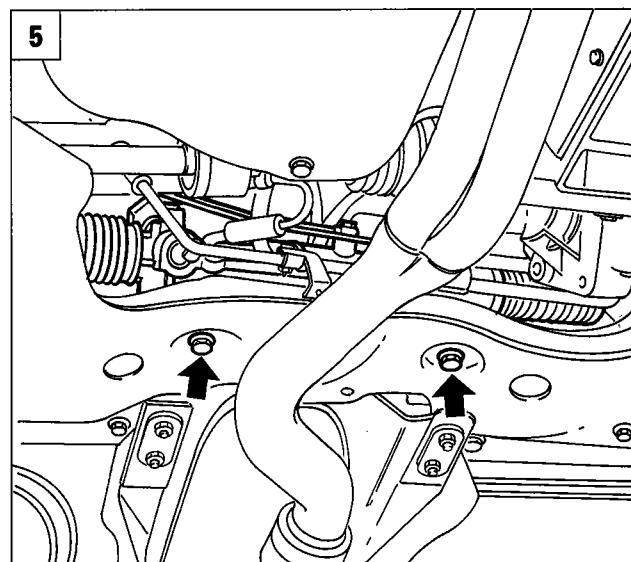
P4A43DA03



1. Position a hydraulic jack beneath the engine and then unscrew the bolts retaining the central engine mount and remove.
2. Prise off the head anchoring the gear lever to the transmission mount, working from the lower rear of the engine bay.
3. Unscrew the nuts and bolt shown in the figure, which retain the power steering fluid return line brackets to the reservoir.
4. Disconnect the fitting for the inlet line for fluid under pressure from the pump and the fitting of the fluid return line to the reservoir.
5. Unscrew the bolts fastening the power steering box to the front beam.

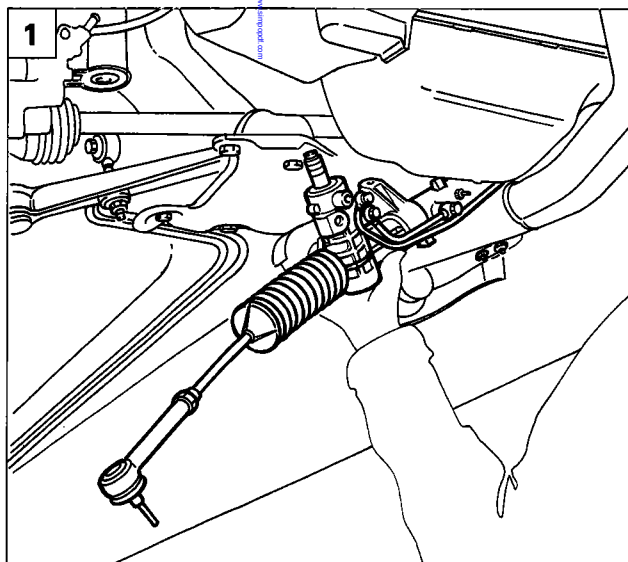


P4A43DA04



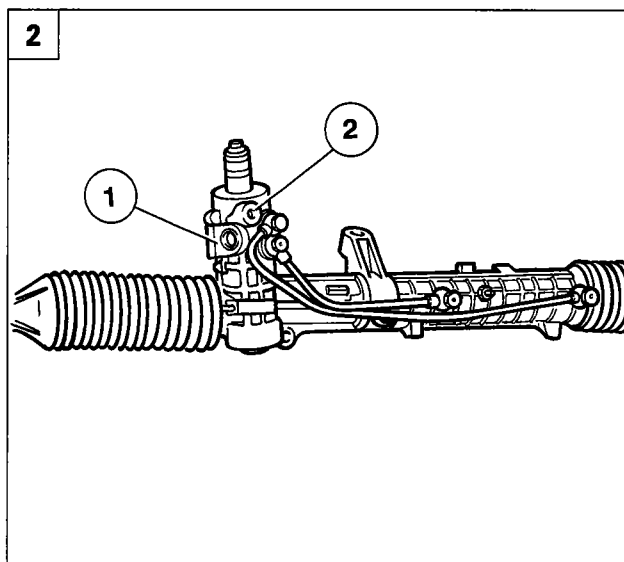
P4A43DA05

## 41.



P4A44DA01

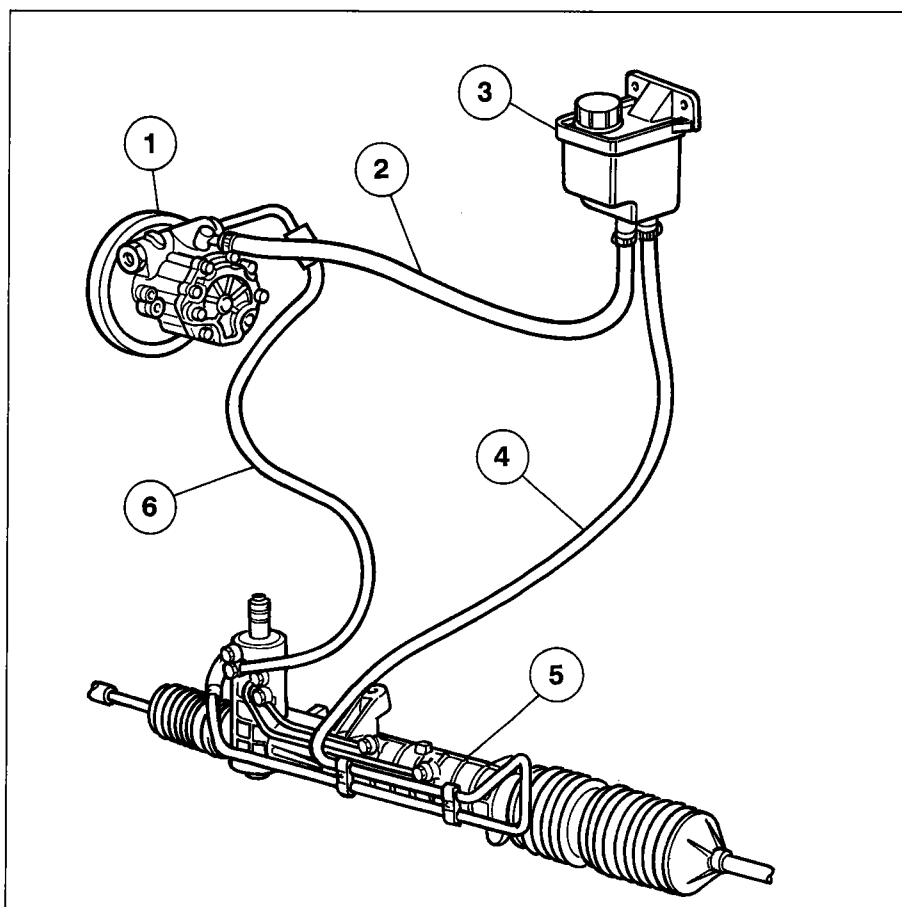
1. Remove the power steering box from the vehicle, by moving the entire assembly toward the gearbox end and taking out from the middle as shown in the figure.



P4A44DA02

2. Power steering box
  1. Fitting for pipe carrying fluid under pressure from the pump
  2. Fitting for fluid return line to reservoir

## COMPONENTS OF POWER STEERING SYSTEM

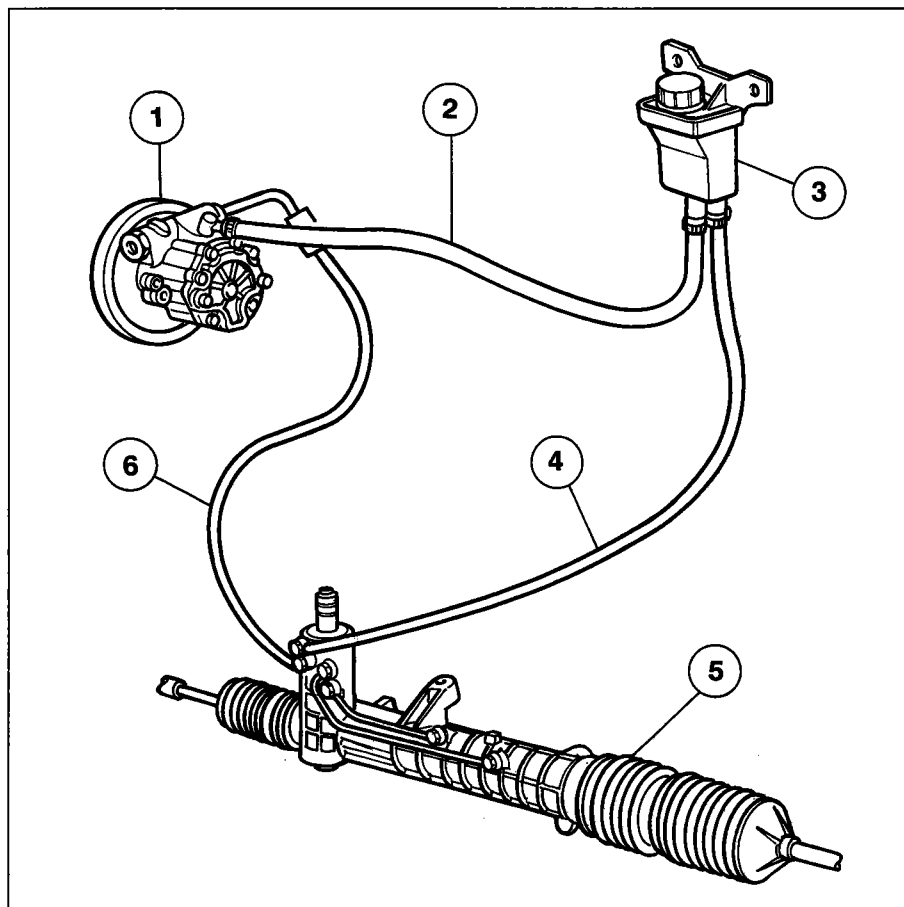


P4A44DA03



1. Pump
2. Fluid delivery line to pump
3. Power steering fluid reservoir
4. Fluid return line to reservoir
5. Power steering box
6. Pipe carrying fluid under pressure from pump

**COMPONENTS OF POWER STEERING SYSTEM**



1910 TD 75

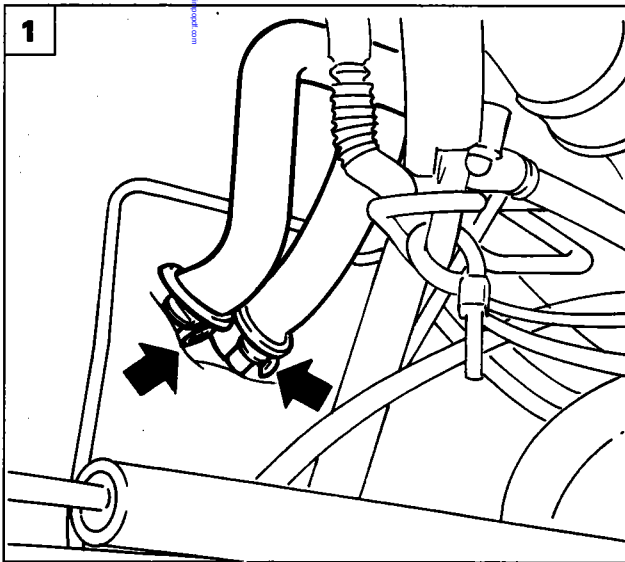
1. Pump
2. Fluid delivery line to pump
3. Power steering fluid reservoir
4. Fluid return line to reservoir
5. Power steering box
6. Pipe carrying fluid under pressure from pump

P4A45DA01

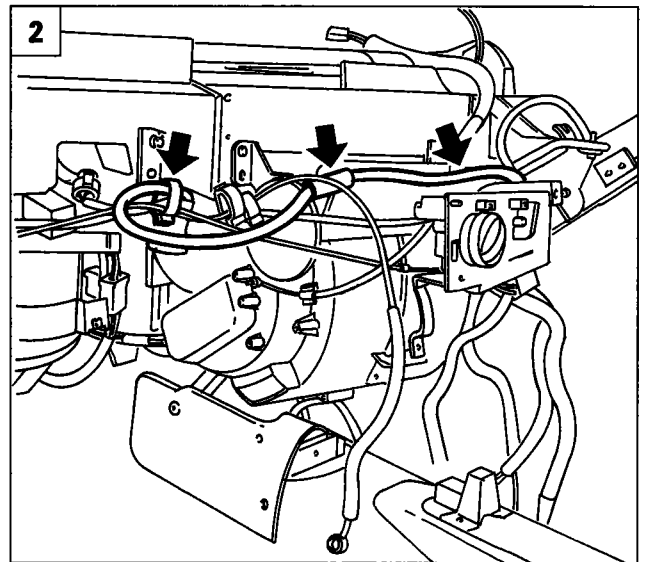


### HEATER WITH MANUAL CONTROLS

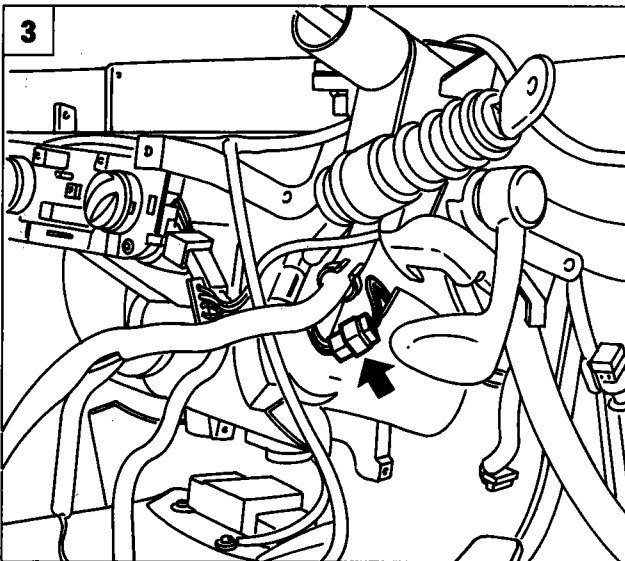
- Distributor heater assembly - Removing-refitting 1
- Removing-refitting cabin fan 3



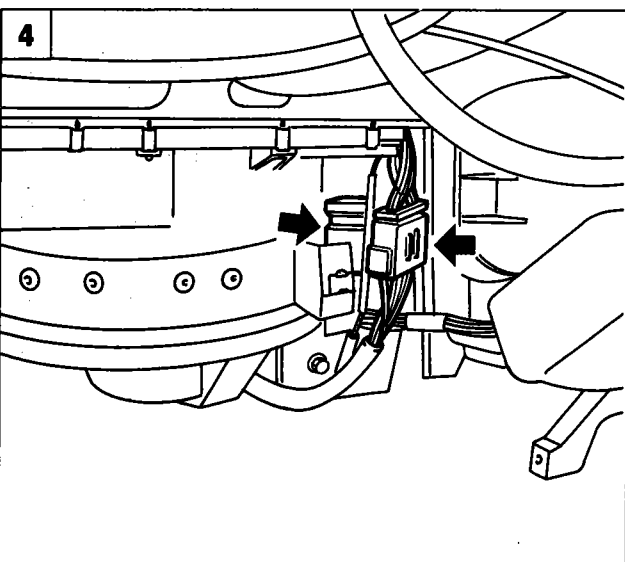
P4A47DA01



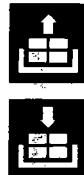
P4A47DA02



P4A47DA03



P4A47DA04



## DISTRIBUTOR HEATER ASSEMBLY

### Removing-refitting



*Drain the cooling system, then remove the facia and central tunnel trim as described in Section 70.*

1. Working from the lower rear of the engine bay, loosen both clips arrowed in the figure and disconnect both rubber pipes from the metal ends of the heater radiator.
2. Release the air bag lead from the retaining brackets.
3. Disconnect electrical connection located alongside the clutch pedal.
4. Disconnect electrical connections located alongside the cabin fan.

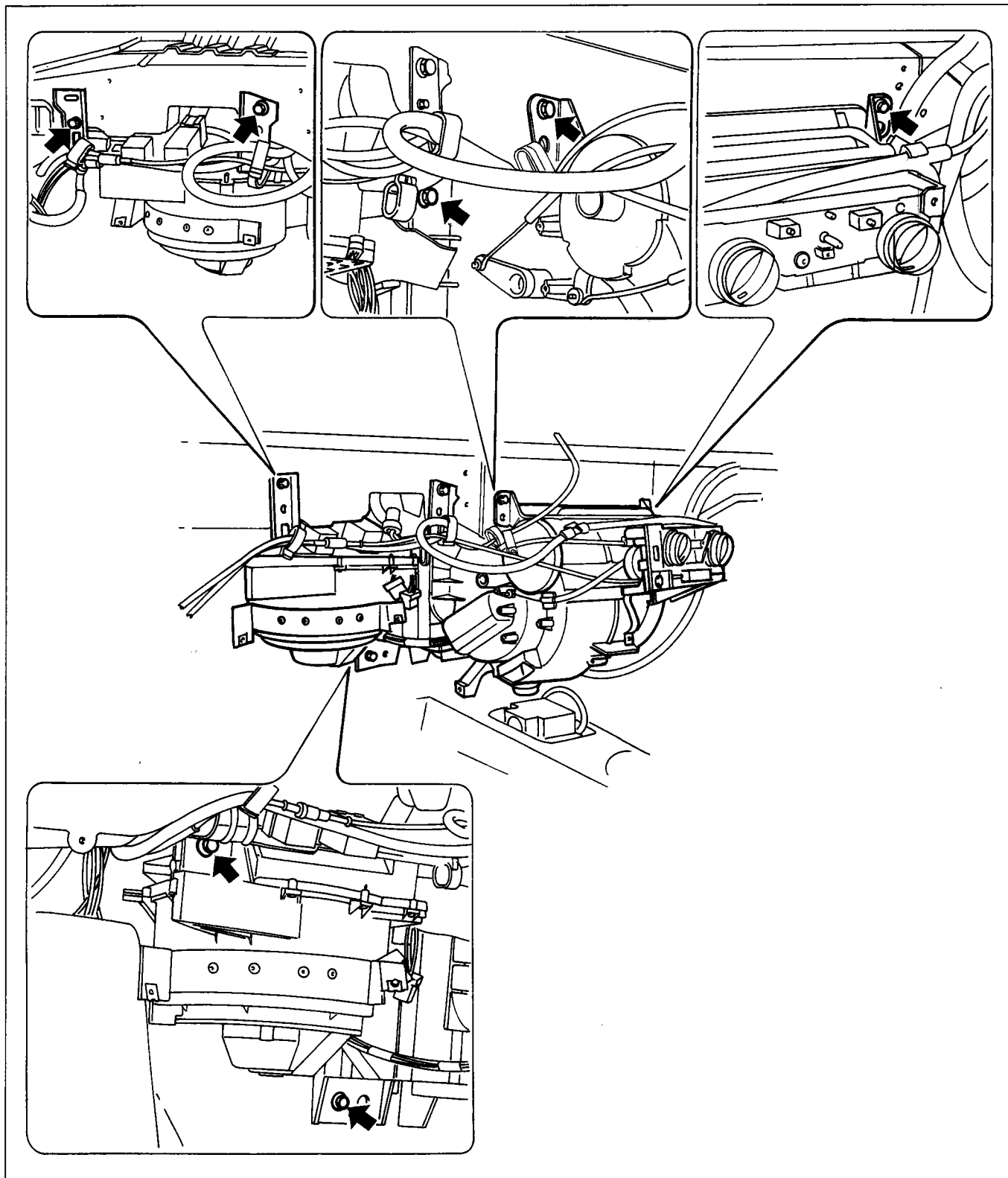
# Auxiliary units

## Heater with manual controls

**Bravo-Brava**

### 50.

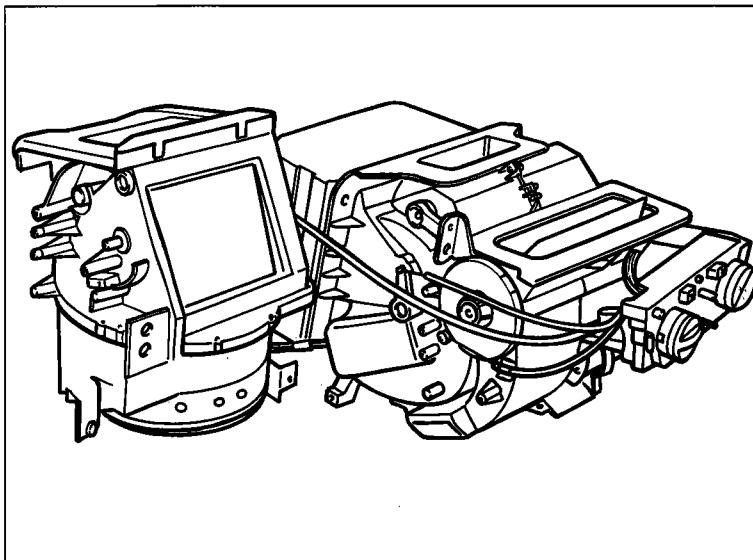
Unscrew bolts indicated in figure which secure the heater-distributor assembly to the body, then remove the assembly from the car.



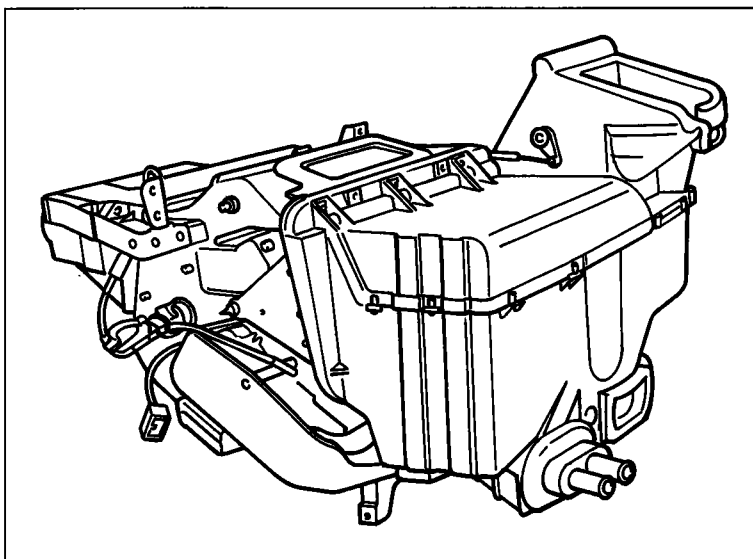
P4A48DA01



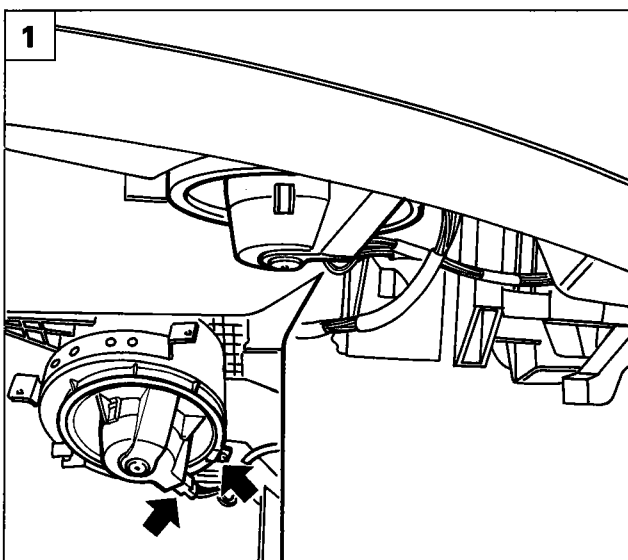
**View of the heater-distributor unit**



P4A49DA01



P4A49DA02

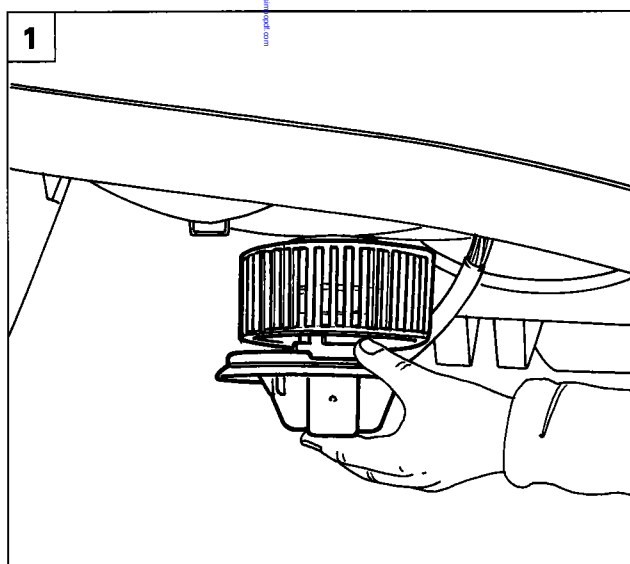


P4A49DA03

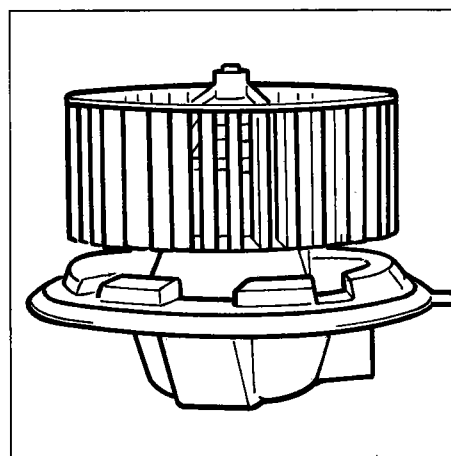
**REMOVING-REFITTING CABIN FAN**

1. Disconnect the battery negative terminal, then work from the lower left part of the facia to disconnect the supply connector and remove the fan cover retaining bolt.

### 50.



P4A50DA01



P4A50DA02

1. Remove the cabin fan from the lower left hand side of the facia.

**LOCATION OF WIRING**

- Perspective view of facia wiring 1

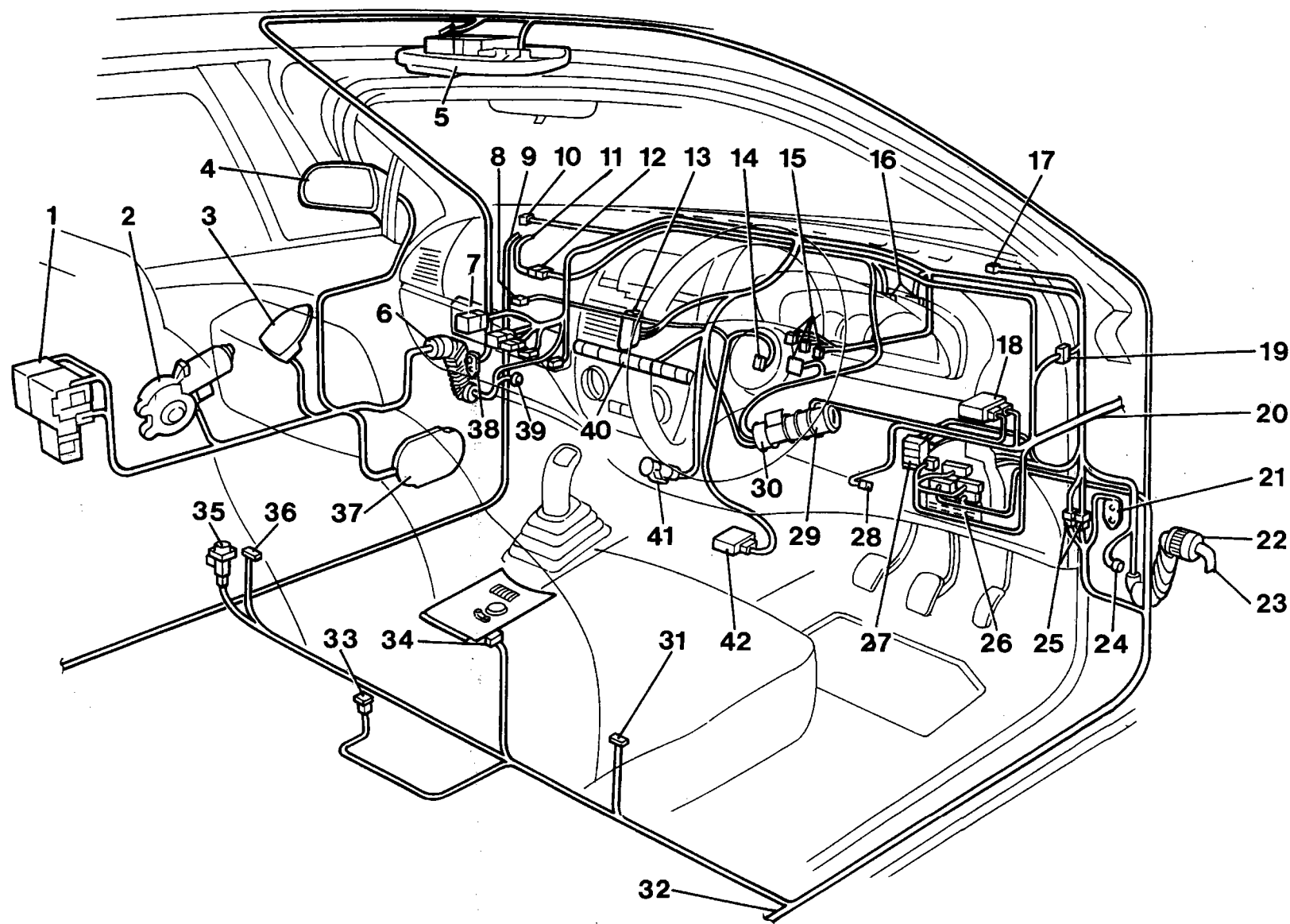
**INSTRUMENT PANEL**

- Instrument panel 3
- Removing-refitting 4

**AIR BAG**

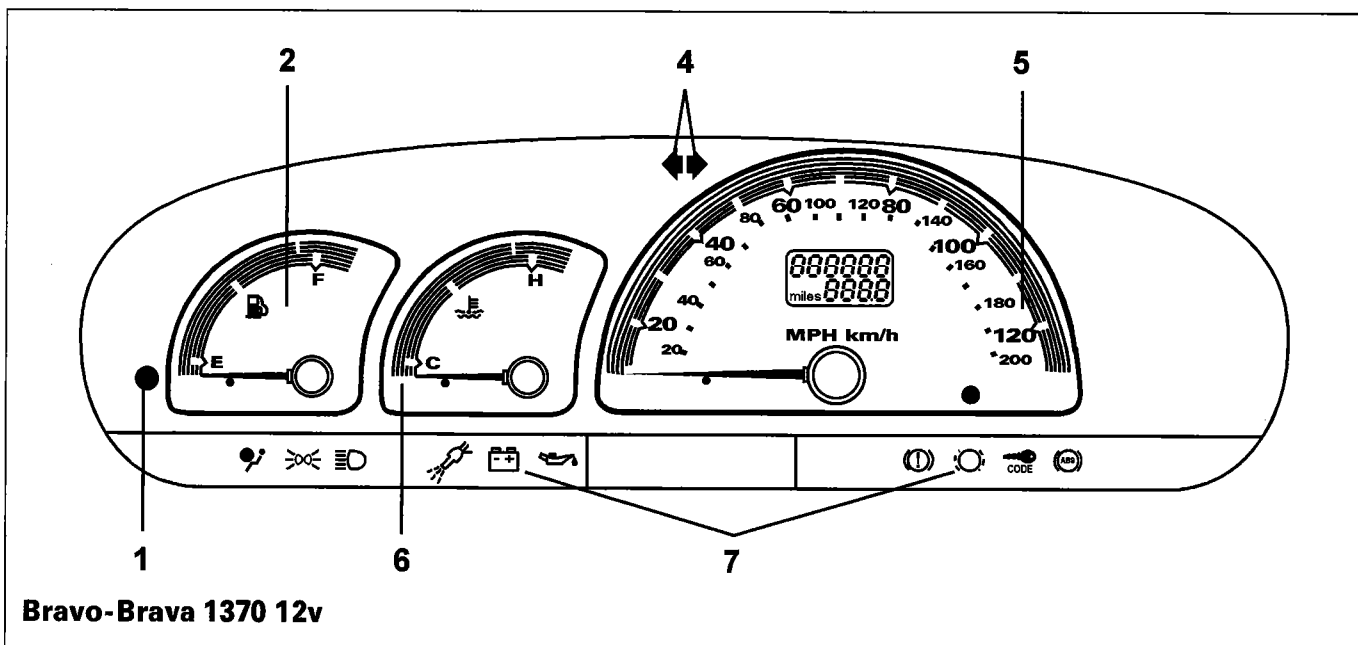
- Removing-refitting driver's air bag 5
- Removing-refitting clock spring 6

**PERSPECTIVE VIEW OF FACIA WIRING**

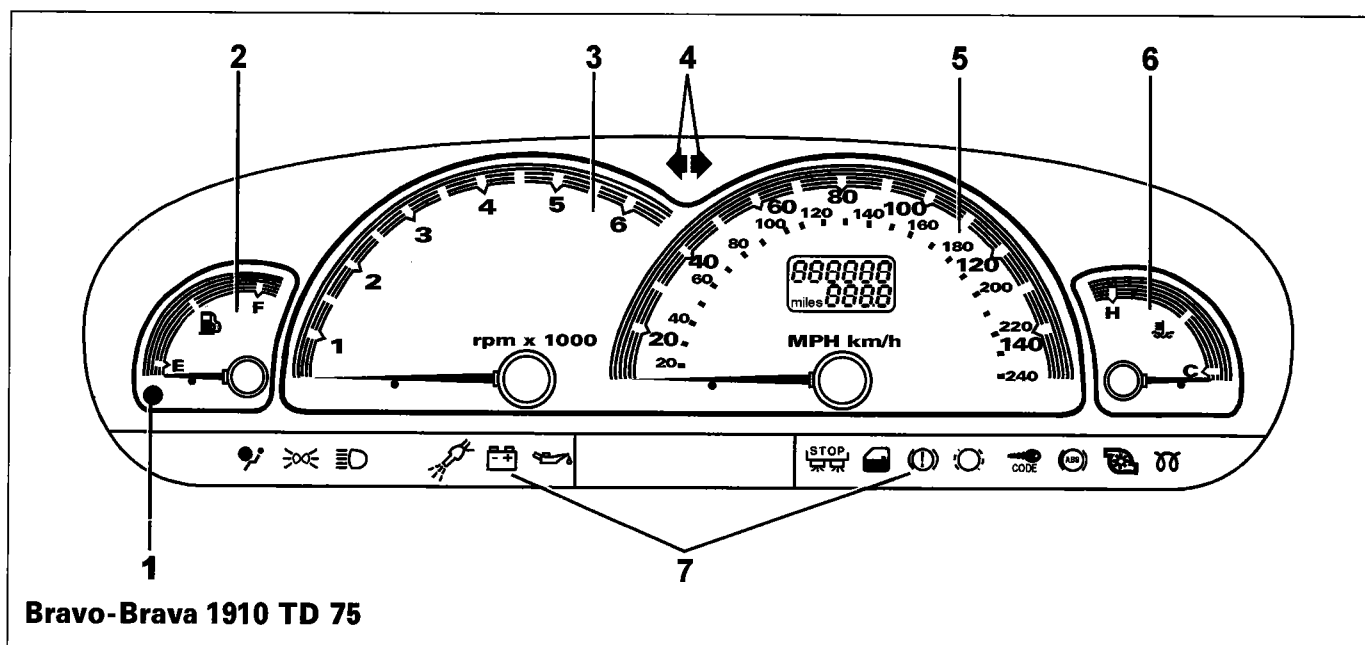


- |                                                           |                                                 |                                                                             |
|-----------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------|
| 1. Front left door lock                                   | 14. Driver's Air Bag                            | 29. Fiat CODE antenna                                                       |
| 2. Left front window motor                                | 15. Stalk unit                                  | 30. Ignition switch                                                         |
| 3. Push button for electric front windows on left armrest | 16. Instrument panel                            | 31. Rear cables/driver's heated seat connection                             |
| 4. Left external rear view mirror                         | 17. Front right speaker (tweeter)               | 32. Rear cable                                                              |
| 5. Front courtesy light                                   | 18. Fiat CODE electronic control unit           | 33. Hand brake on warning light switch                                      |
| 6. Dashboard/front left door cables connection            | 19. Dashboard/front cables connection           | 34. Push button unit for electrically-adjustable external rear view mirrors |
| 7. Fuses bracket under glove box                          | 20. Front right cable                           | 35. Inertial switch                                                         |
| 8. Passenger's Air Bag                                    | 21. Courtesy lights front right switch          | 36. Rear cables/passenger's heated seat connection                          |
| 9. A.B.S. cables                                          | 22. Dashboard/front right door cable connection | 37. Loud speaker on front left door                                         |
| 10. Front left speaker (Tweeter)                          | 23. Front right door cable                      | 38. Courtesy lights front left switch                                       |
| 11. Front left cable                                      | 24. Right dashboard earth                       | 39. Left dashboard earth                                                    |
| 12. Front right/left cables connection                    | 25. Dashboard/rear cables connection            | 40. Switch control assembly                                                 |
| 13. Hazard warning lights switch unit                     | 26. Fuse and relay unit                         | 41. Cigarette lighter                                                       |
|                                                           | 27. Fuses on auxiliary bracket                  | 42. Air Bag electronic control unit                                         |
|                                                           | 28. Stop lights switch                          |                                                                             |

### INSTRUMENT PANEL



P4A53DA01

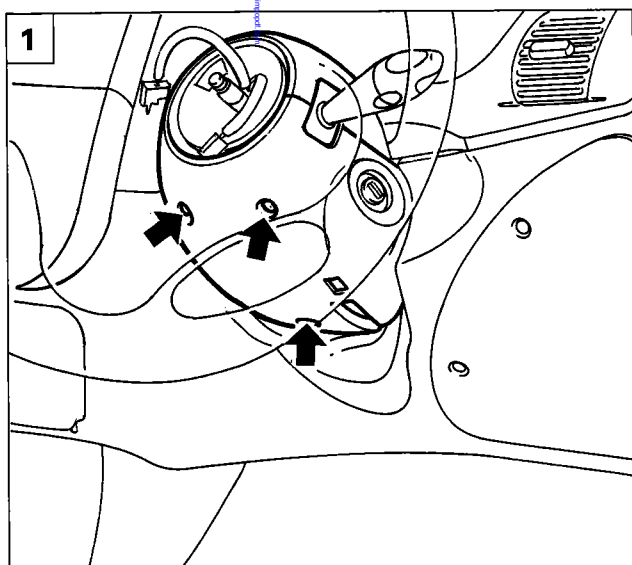


P4A53DA02

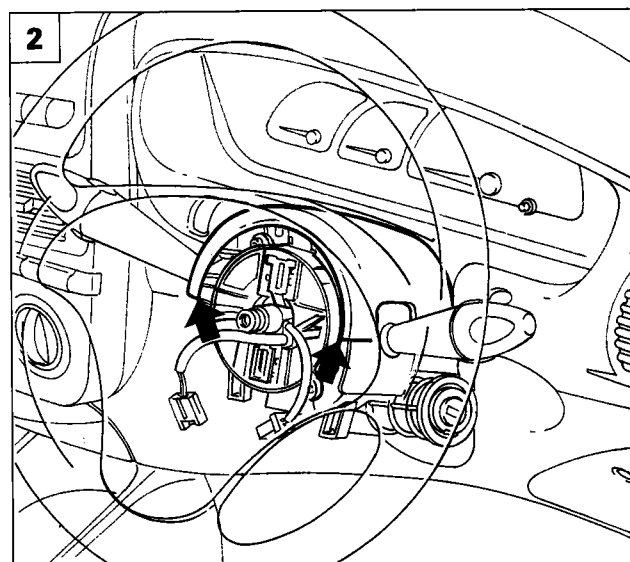
1. Fuel reserve warning light
2. Fuel level gauge
3. Rev counter
4. Turn signal warning lights

5. Speedometer and dual mileometer (total and trip counter)
6. Coolant temperature gauge
7. Warning lights

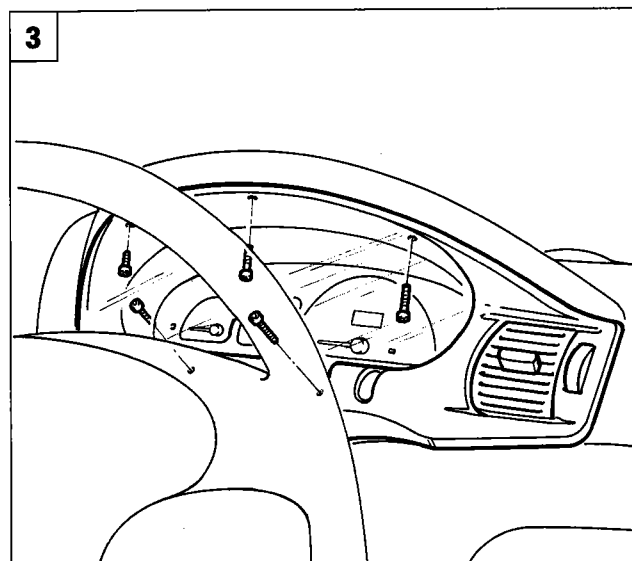
### 55.



P4A54DA01



P4A54DA02

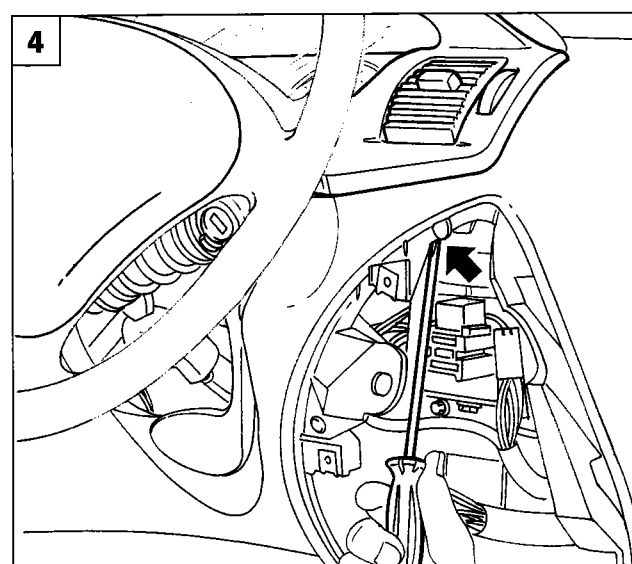


P4A54DA03

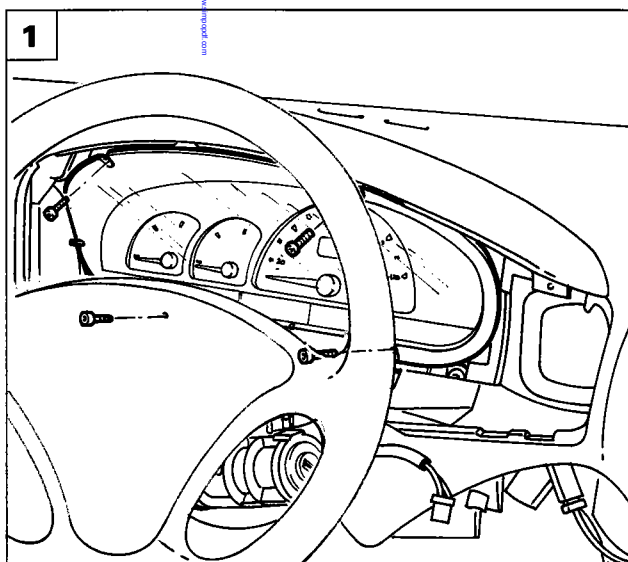


### REMOVING-REFITTING

1. Disconnect the battery negative terminal, then remove the lower steering column trim by undoing the bolts indicated in the figure.
2. Remove the upper steering column trim in order to allow removal of the lower control panel frame screws.
3. Unscrew the bolts fastening the outside of the control panel frame.
4. Remove the junction unit protective cover. Unscrew the outer control panel frame retaining screw. Remove the frame from the fascia and disconnect the lighting dimmer and headlamp beam alignment connectors.

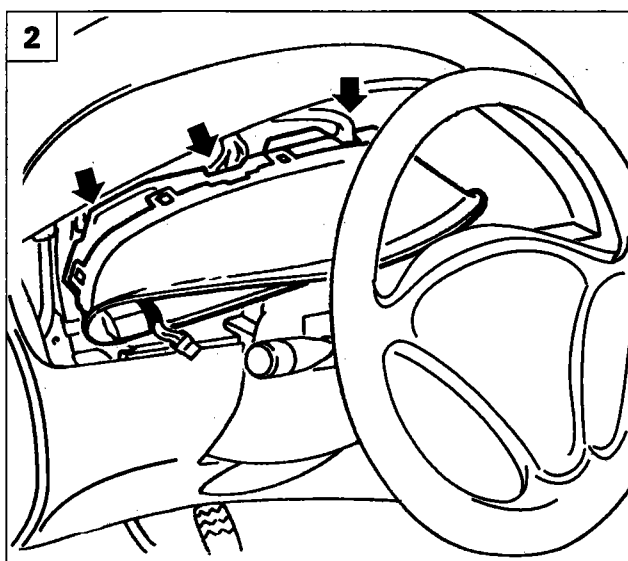


P4A54DA04



P4A55DA01

1. Unscrew screws fastening control panel to fascia.



P4A55DA02

2. Disconnect electrical connections for the instrument panel and remove from the car.

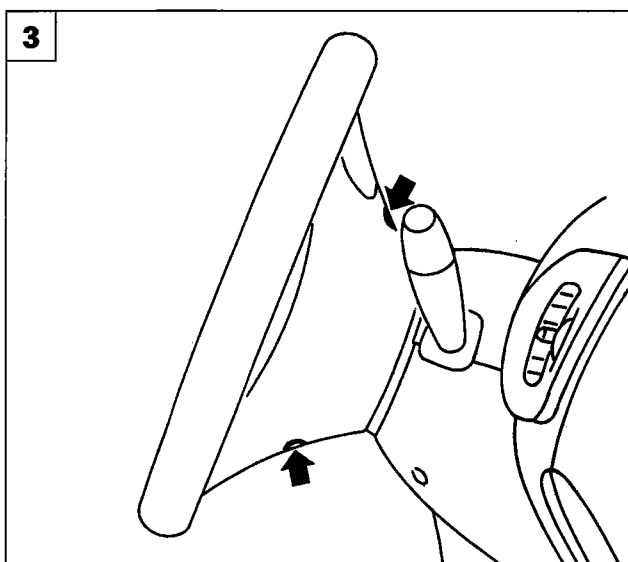
**NOTE** Reverse order of removal operations to refit.

### REMOVING-REFITTING DRIVER'S SIDE AIR BAG



*The air bag modules must be removed and refitted with the ignition key turned to "STOP" and removed, and the battery positive and negative terminal and properly insulated. Wait for 10 minutes before continuing.*

**TAKE CARE TO OBSERVE ALL THE SAFETY RULES SET OUT IN THE CHAPTER ON "AIR BAG And PRE-TENSIONERS" IN THE MANUAL FOR THE LEFT HAND DRIVE VERSION**

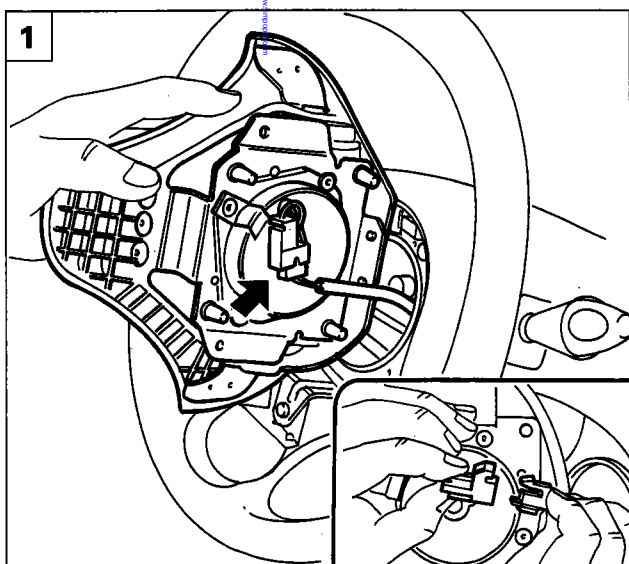


4A55DA

P4A55DA03

3. Unscrew both hexagonal-headed socket screws indicated. Turn the steering wheel to gain access to each screw.

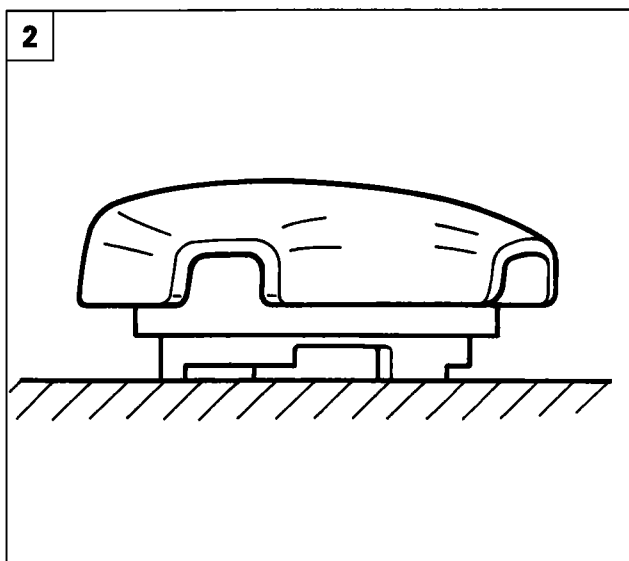




P4A56DA01

1. Move the air bag module slightly. Carefully disconnect connector indicated, taking care not to pull by the wire but by the connector case. Then remove the air bag module and rest on the work bench with the cover uppermost.

**NOTE** For safety reasons, when the module connector is disconnected the two terminals automatically short circuit; a special spring-loaded device keeps both terminals connected.



P4A56DA02



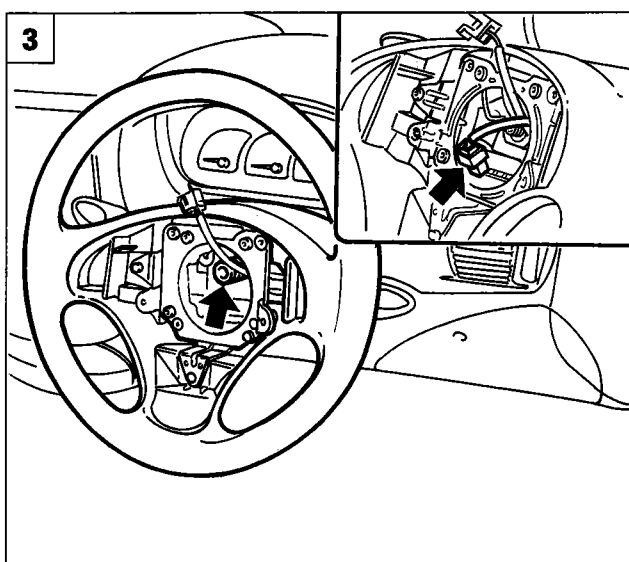
2. Replace the module in the appropriate cabinet. The diagram shows how the module should be positioned.

**NOTE** Carry out removal operations in reverse order to refit.



**DO NOT CONNECT THE BATTERY UNTIL INSTALLATION IS COMPLETE**

**NOTE** After the operation, check the system using a Fiat/Lancia Tester.



P4A39DA01

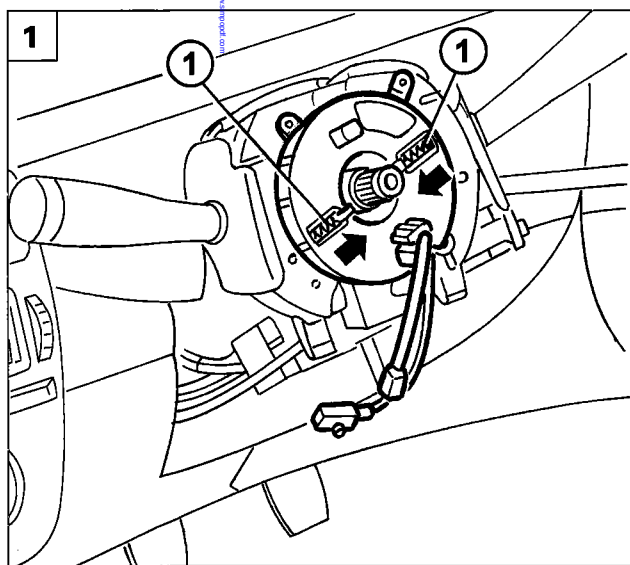
### REMOVING-REFITTING CLOCK SPRING



Remove the driver's air bag as described on the previous page and observing the SAFETY REGULATIONS described.

All the following operations must be carried out with the WHEELS ALIGNED WITH THE LONGITUDINAL ACCESS OF THE VEHICLE (wheels straight). Secure the steering wheel if necessary.

3. Remove the horn connector from its seat and disconnect, then unscrew the bolt retaining the steering wheel to the steering column.



P4A39DA02

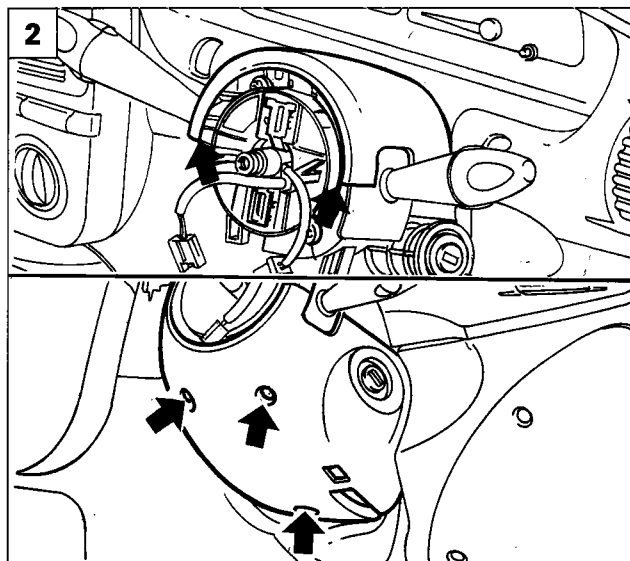
1. Mark the respective positions of the steering wheel hub and steering column, and remove the steering wheel.



*During the operation, take care NOT TO STRIKE THE STEERING WHEEL.*



*The device is fitted with a safety catch to prevent the upper and lower plates turning in relation to one another when the steering wheel is not fitted in the car. To achieve this, springs (1) close as shown in the figure.*



P4A57DA01

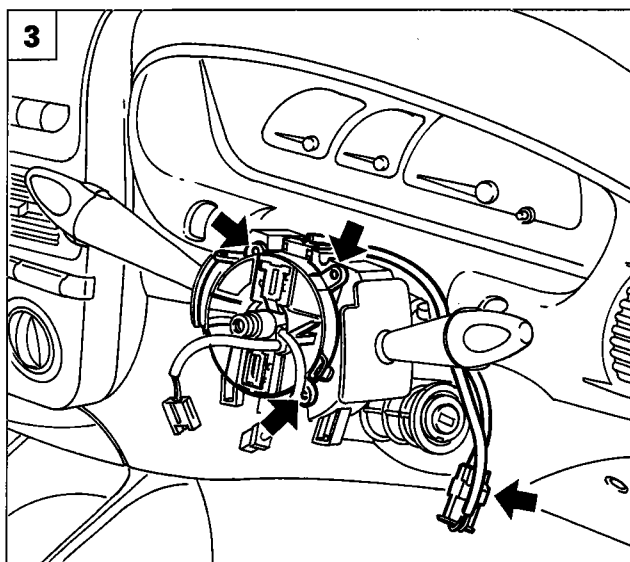
2. Unscrew the bolts fastening the upper and lower steering column guards.

3. Disconnect the connection connecting the clock spring to the Air Bag lead (yellow). Undo the three clock spring bolts and then remove.



*Once the steering wheel has been removed, the clock spring is blocked so that the lower and upper plates cannot turn..*

*If the upper plate of the clock spring should turn in relation to the lower for any reason, so that the position upon removal is lost, the CLOCK SPRING MUST BE REPLACED. Once the clock spring has been removed, carefully secure the device to prevent the two plates from turning accidentally.*



P4A57DA02

4A57DA



*Reverse order of removal operations to refit. When refitting the steering wheel, tighten the nut securing it to the steering column to a torque of 5 daNm.*

page

## INTERIOR TRIM

- Dashboard - General exploded view 1
- General view of retainers 2
- Removing-refitting dashboard 3

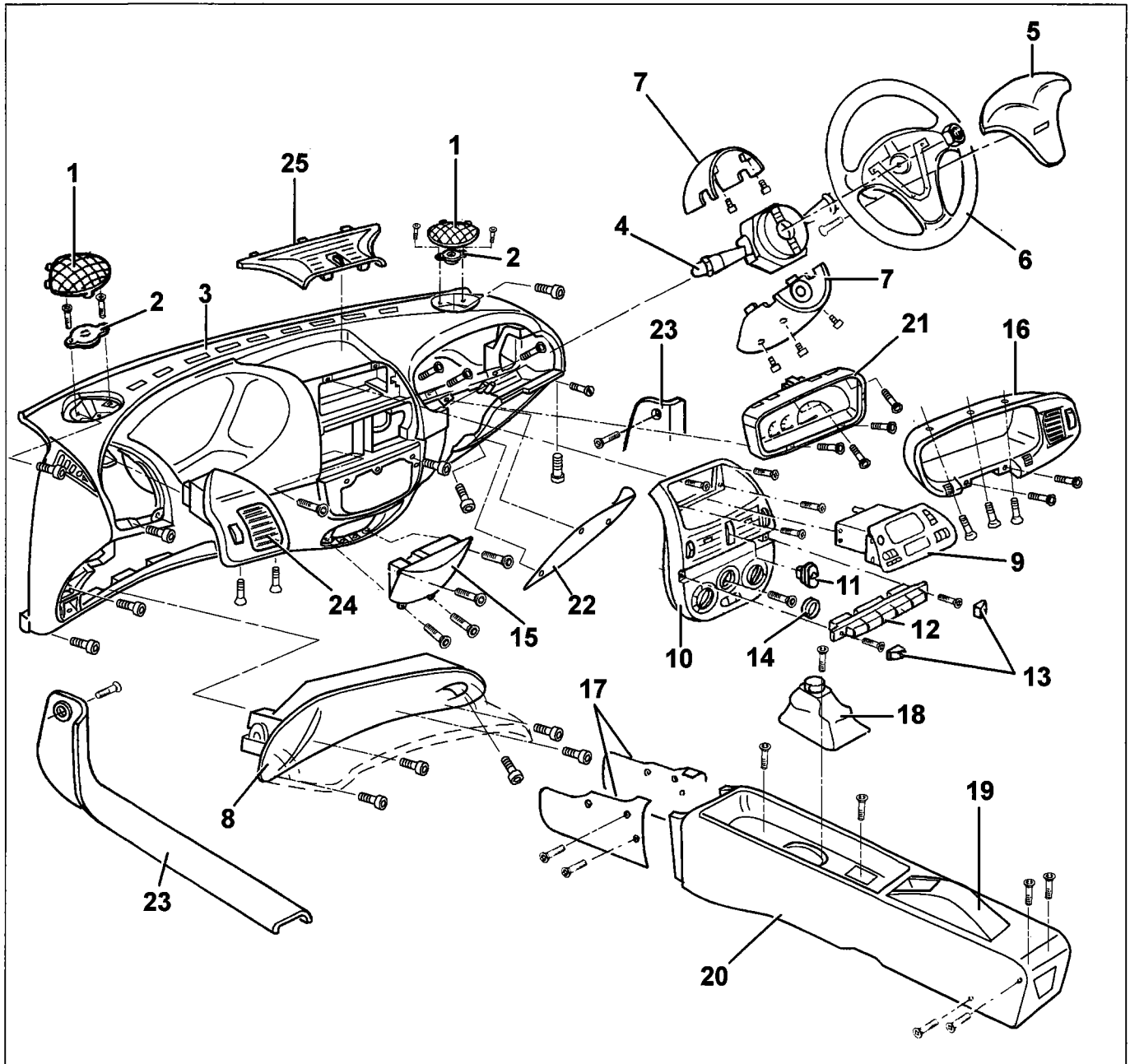
### 12v

- Removing-refitting bonnet opening cable 11

### TD 75

- Removing-refitting bonnet opening cable 13

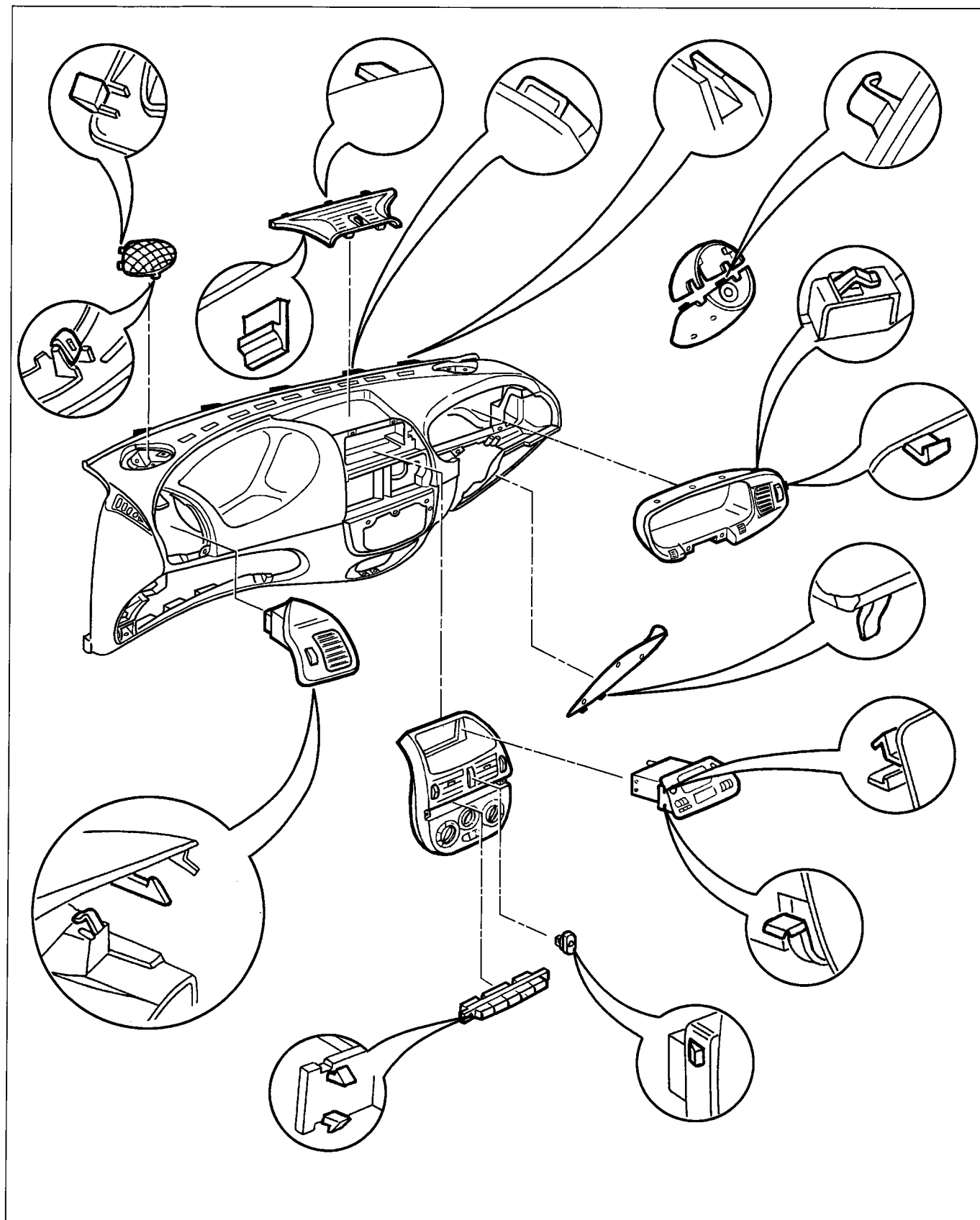
### DASHBOARD - GENERAL EXPLODED VIEW



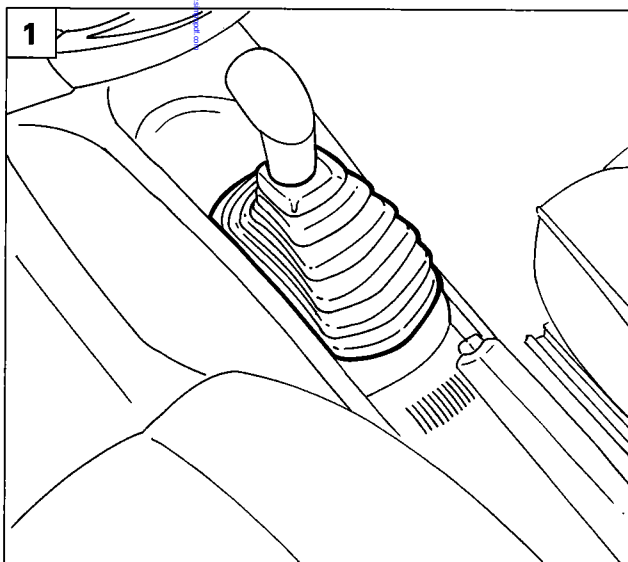
P4A69DA01

1. Speaker grille
2. Speaker
3. Instrument facia
4. Stalk unit
5. Horn/air bag protection
6. Steering wheel
7. Halves
8. Glove compartment
9. Car radio
10. Central panel
11. Hazard warning switch
12. Switch unit
13. Panels

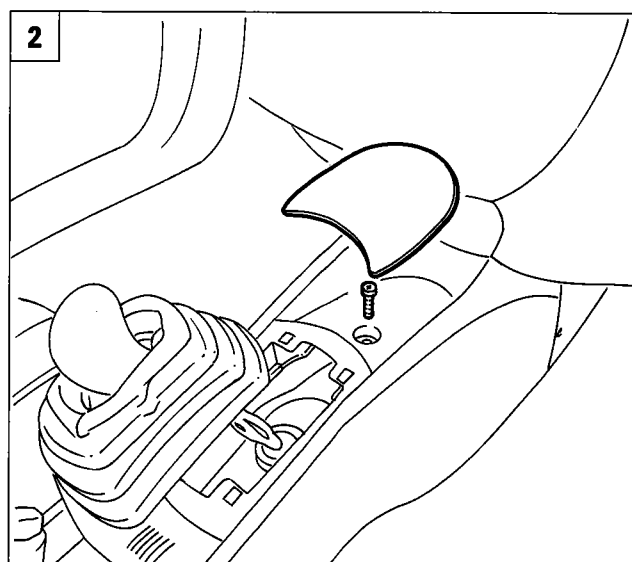
14. Fan control knob
15. Ashtray/cigar lighter unit
16. Control panel frame
17. Protecting
18. Gear lever boot
19. Handbrake lever boot
20. Tunnel cover console
21. Instrument panel
22. Junction unit protection
23. Door sill trims)
24. Left ventilation outlet
25. Upper grille



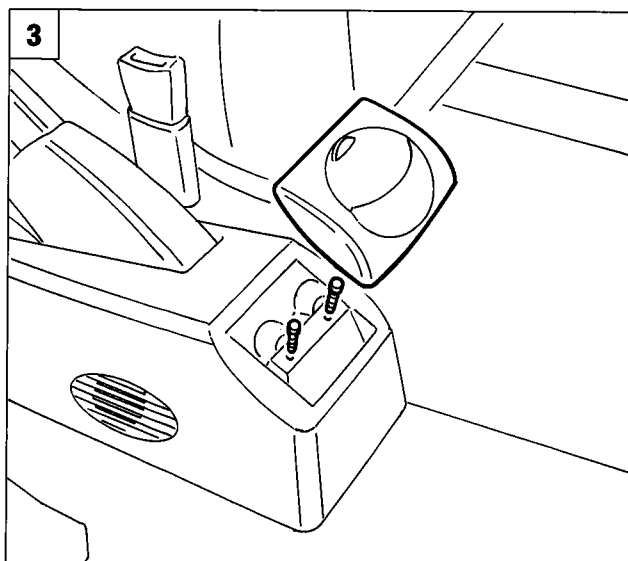
P4A60DA01



P4A61DA01



P4A61DA02



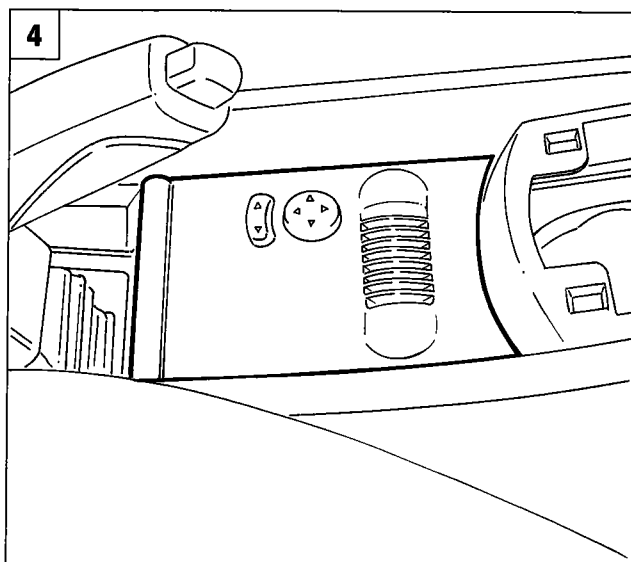
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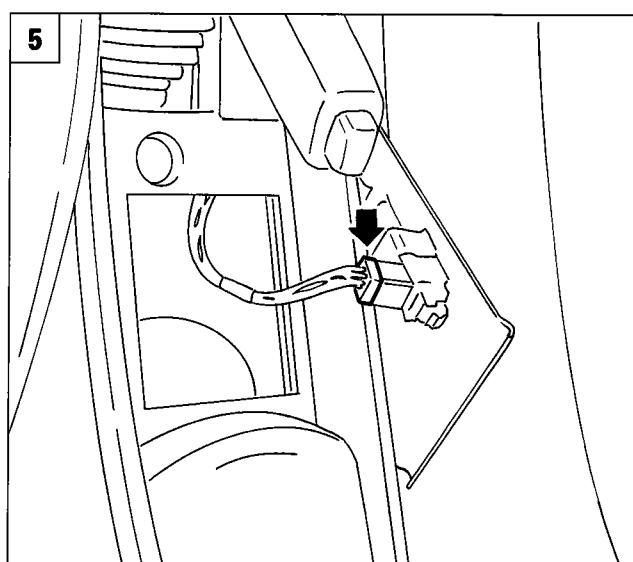
### MOVING-REFITTING DASHBOARD

Disconnect the battery negative terminal, then remove the stalk unit from the car as described in section 41 - Steering.

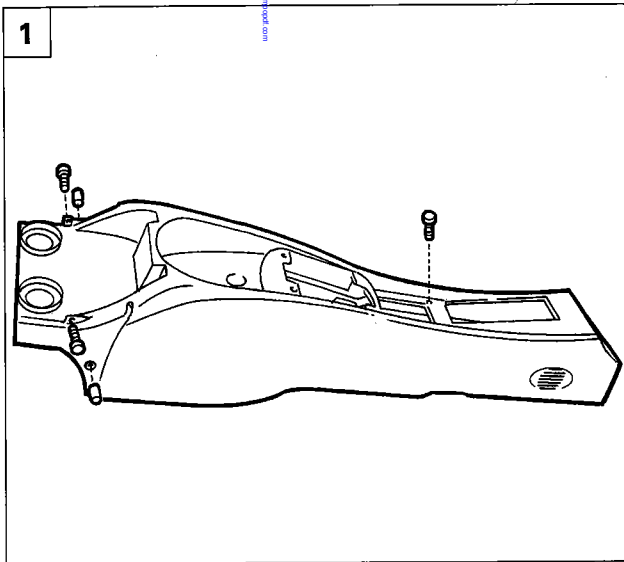
1. Prise up the protective gear lever boot.
2. Lift the luggage compartment trim shown in the figure and unscrew the bolt underneath.
3. Remove the rear ashtray by lifting out and unscrew the underlying central tunnel retaining bolts.
4. Undo the retaining tabs to lift the door mirror control panel.
5. Disconnect supply connector for the electric door mirrors and remove the panel.



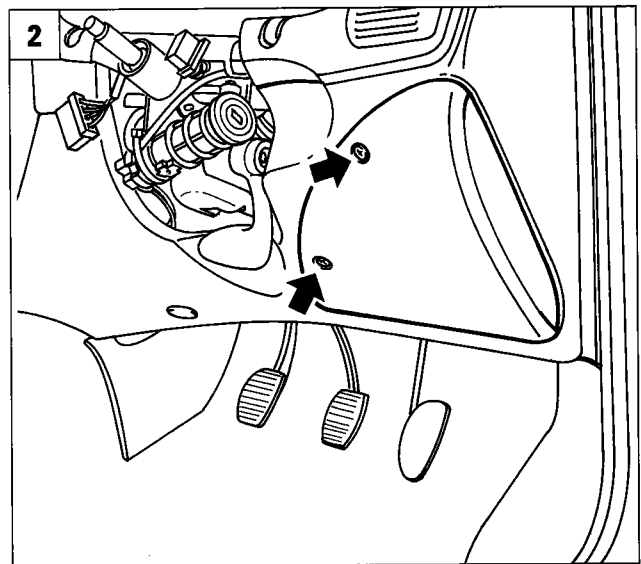
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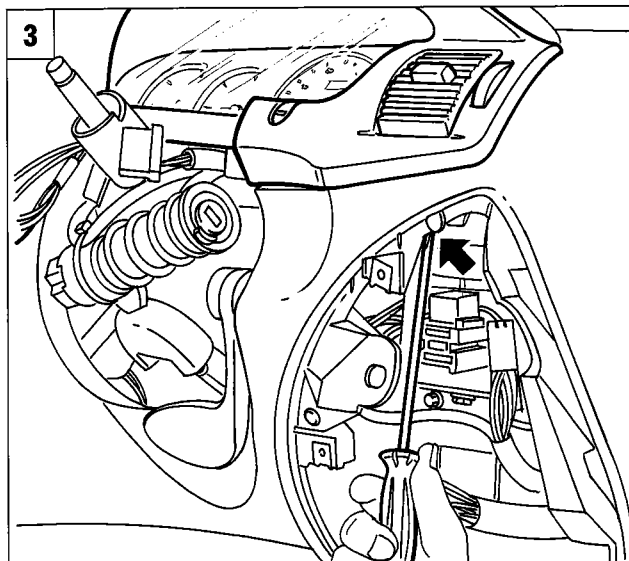
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P4A62DA01



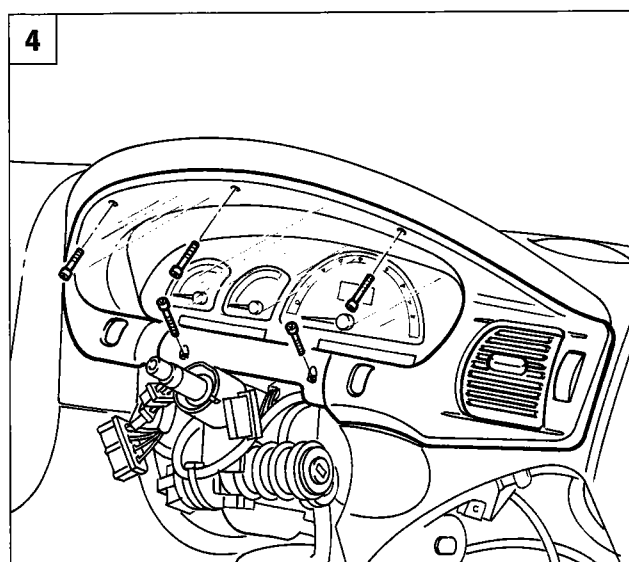
P4A62DA02



P4A62DA03

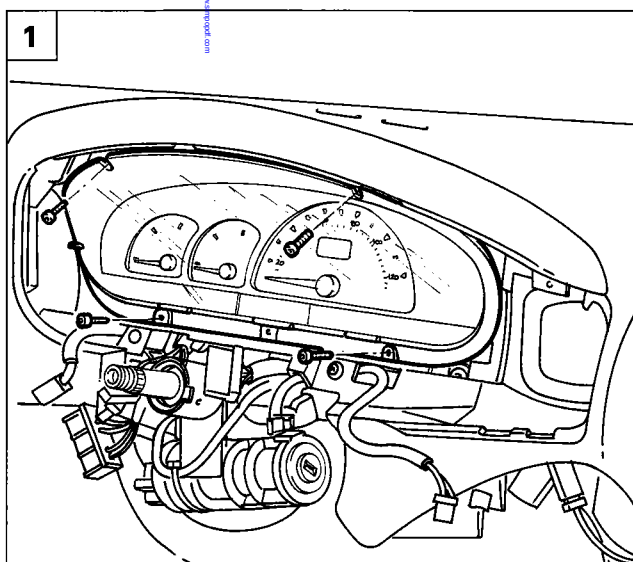


1. Remove the clips, unscrew the bolts shown and remove the tunnel trim from the car. Lift the parking brake lever fully to allow removal of the trim.
2. Remove the junction unit protection by undoing the fastenings shown in the figure.
3. Working from inside the junction unit housing compartment, unscrew screw retaining the instrument panel frame.
4. Unscrew the bolts indicated, then move the instrument panel slightly to one side, disconnect the headlamp alignment adjuster and instrument light dimmer connections and then remove the frame.

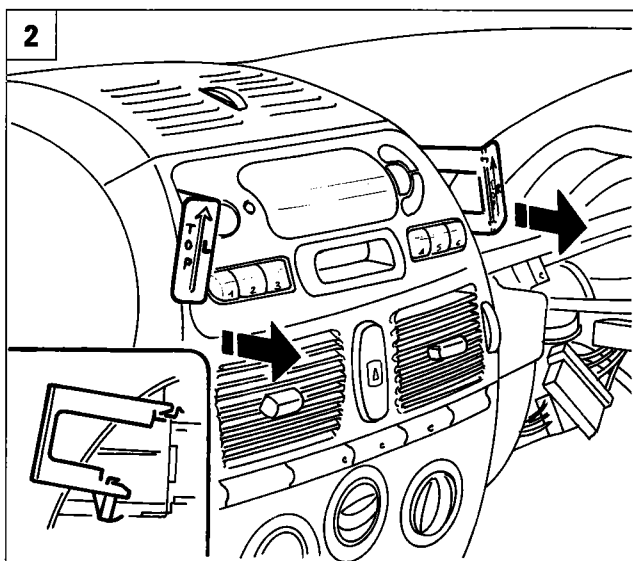


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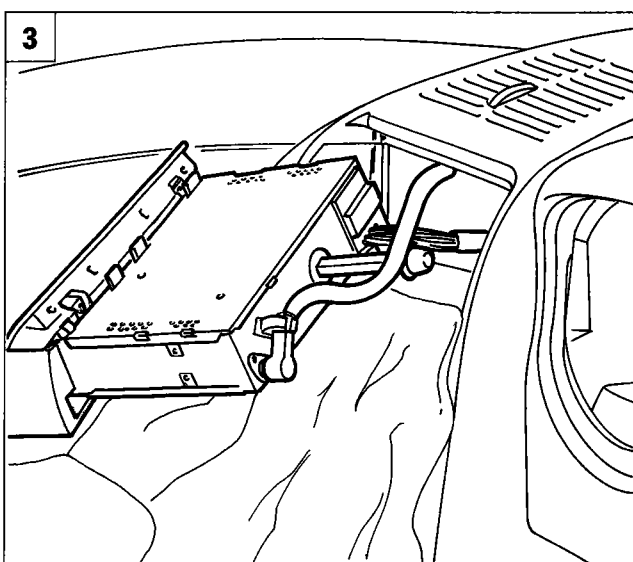




P4A63DA01



P4A63DA02



P4A63DA03

1. Unscrew the retaining bolts indicated, disconnect the connectors on the rear of the instrument panel, then remove from the instrument facia.
2. Remove the car radio with the aid of tools 1860897000.



*Tool 1860897000 is made up of a left hand part and a right hand part, marked L and R respectively. The correction direction of use of each part is indicated by means of an arrow (TOP).*



*It is advisable to work from the passenger side to facilitate removal operations.*

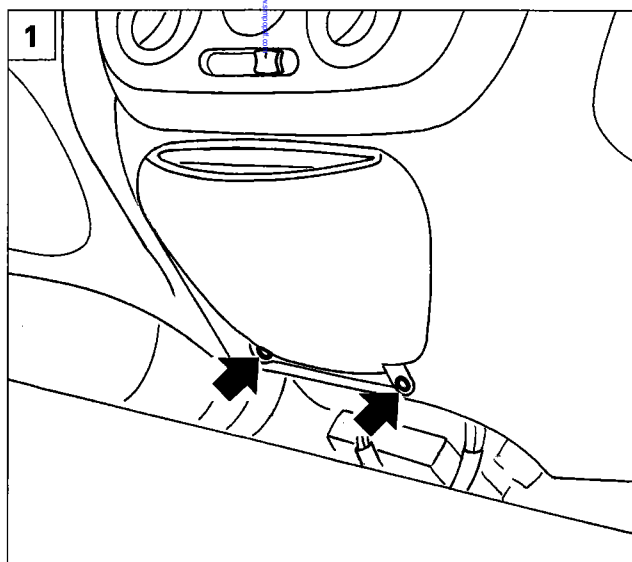
Move the car radio slightly to the left and carefully fit right hand part (R) of tool 1860897000 until it clicks into the radio clips. Use right hand part (R) to pull out the right hand side of the radio slightly, move it to the right and carefully fit the left hand part (L) of tool 1860897000 until it clicks into the radio clips. Grasp both sides of the tool and pull the radio out partly, then release both parts of tool 1860897000 from the radio.



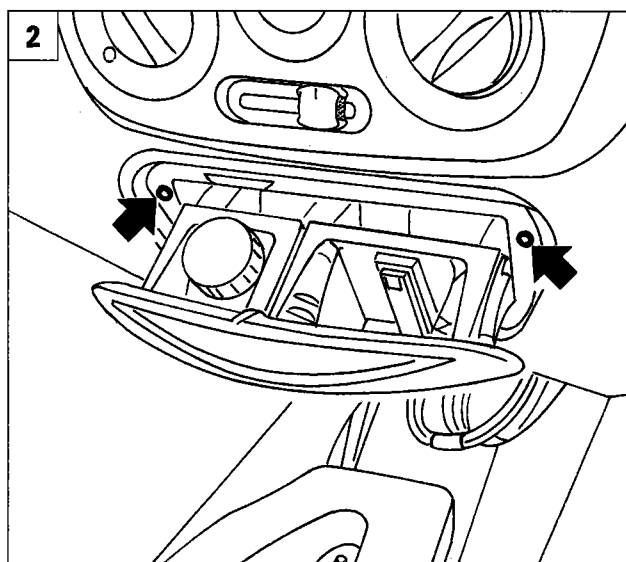
*Do NOT remove the radio by pulling from the glove compartment, but only by using both parts of tool 1860897000 and following the procedure described previously.*

3. Protect the area of the instrument facia below the radio using a cloth, pull out the radio fully and disconnect the supply leads and aerial lead.

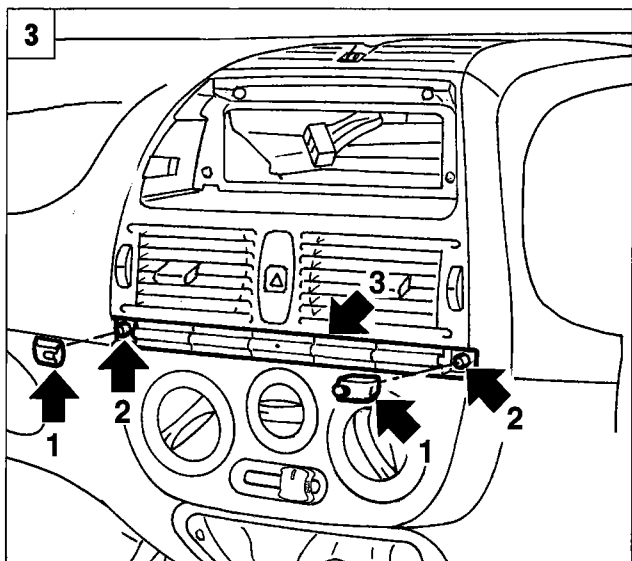
## 70.



P4A64DA01

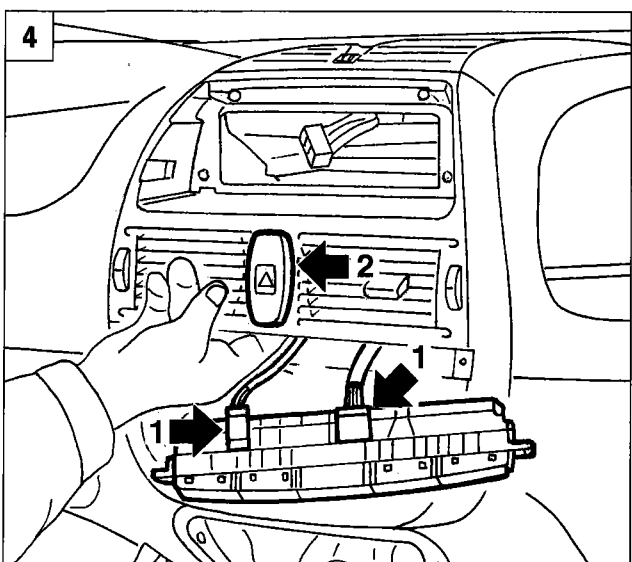


P4A64DA02

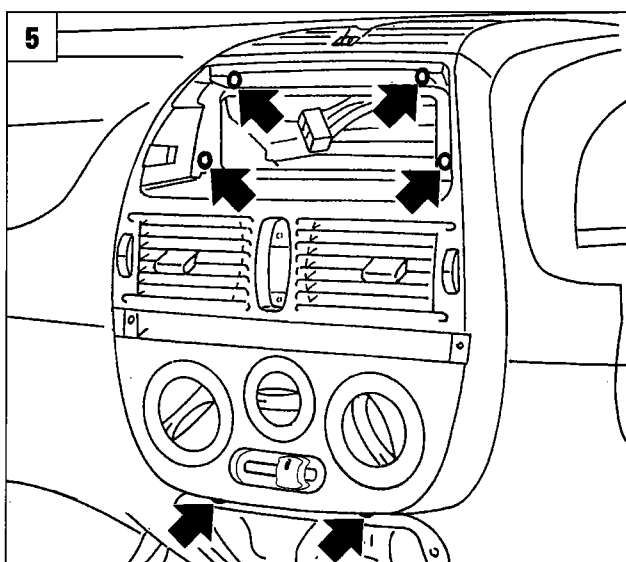


P4A64DA03

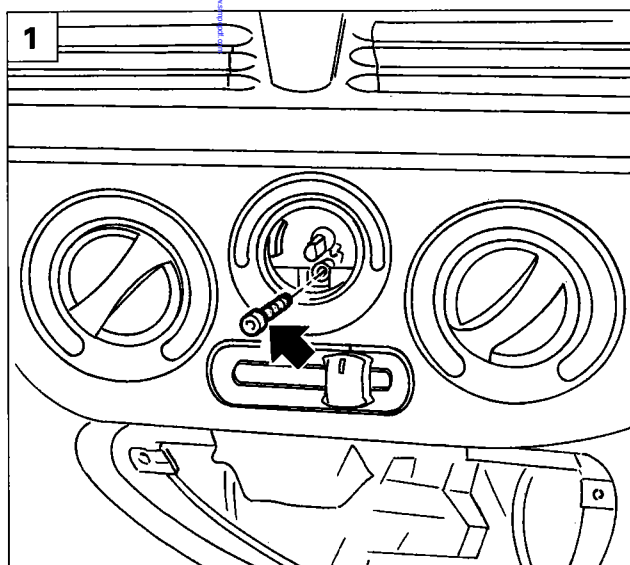
1. Unscrew the lower screws securing the ashtray to the instrument facia.
2. Unscrew bolts indicated in figure, disconnect connector for the cigar lighter/lighting and remove the ashtray.
3. Use a screwdriver to prise up panel (1). Unscrew screws (2) and pull switch unit (3) out slightly.
4. Disconnect connectors (1) and remove the switch unit. Proceed as described in the figure to remove hazard warning light switch (2) and disconnect both connectors.
5. Unscrew the bolts fastening the heater and control panel.



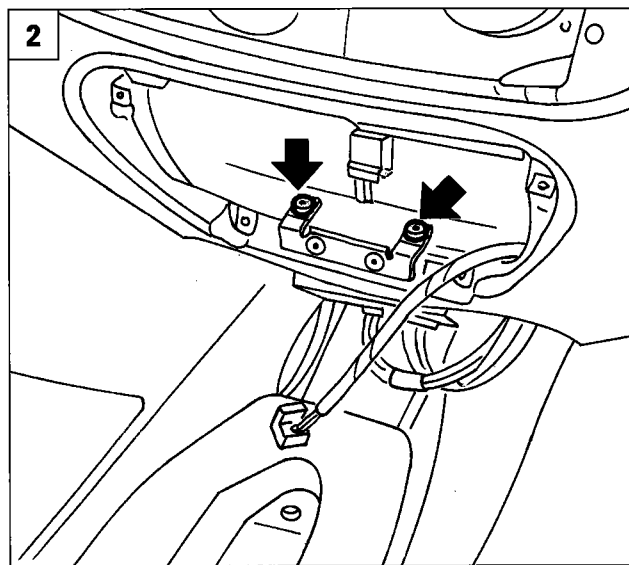
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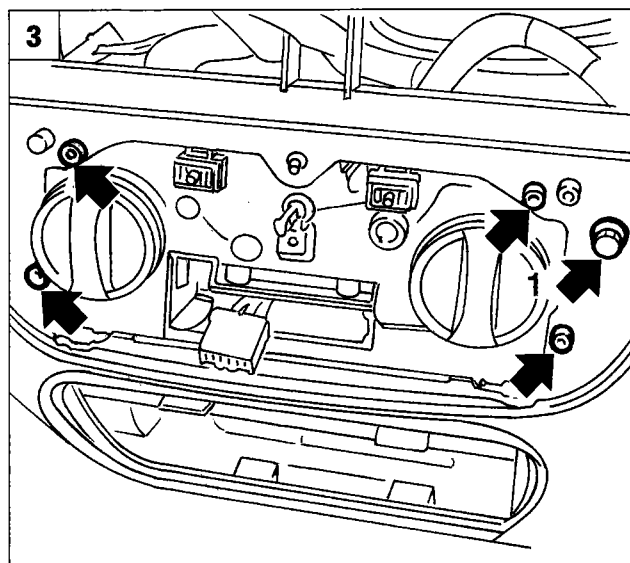
P4A64DA05



P4A65DA01



P4A65DA02



P4A65DA03



1. Remove the central fan control knob, unscrew the underlying screw and disconnect the heater and switch control panel by disconnect the underlying supply connector.

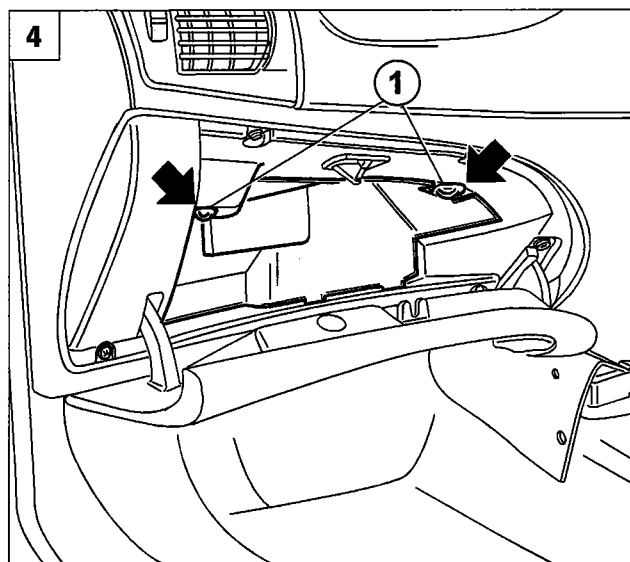


2. Unscrew the bolts fastening the instrument facia, located in the ashtray compartment.

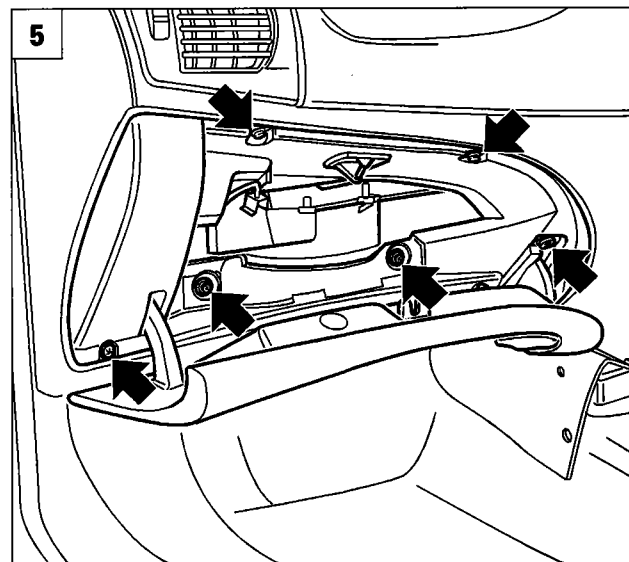
3. Unscrew the bolts fastening the instrument facia to the heater and screw (1).

4. Work from inside the glove compartment to undo clips (1) and remove the compartment lining.

5. Unscrew the bolts indicated, which retain the glove compartment, and pull out slightly.

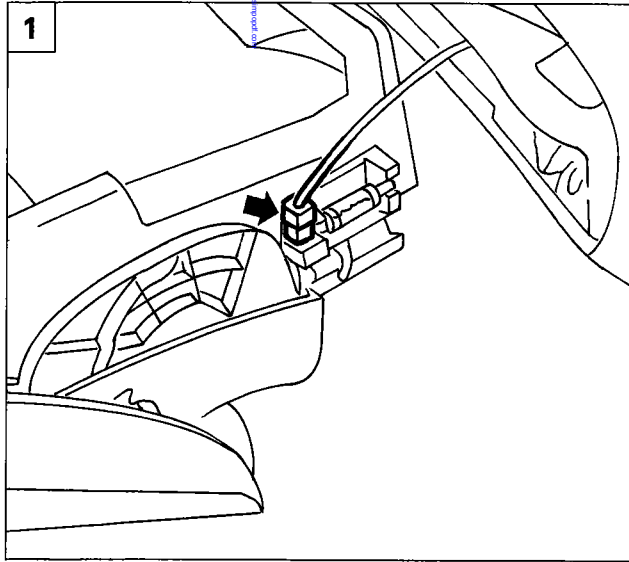


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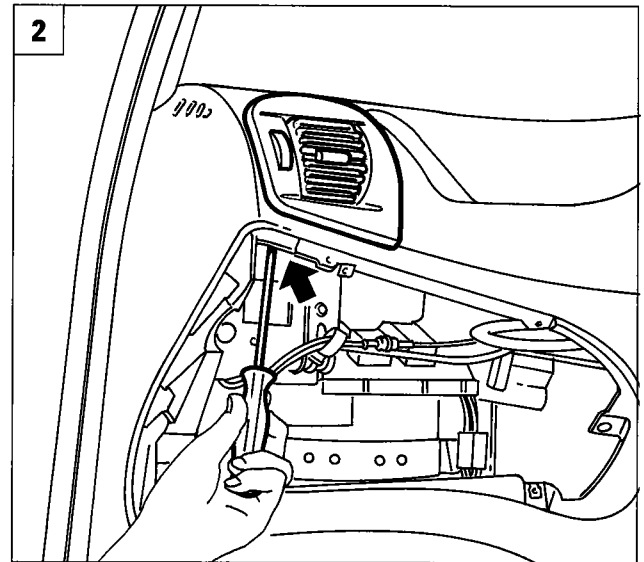


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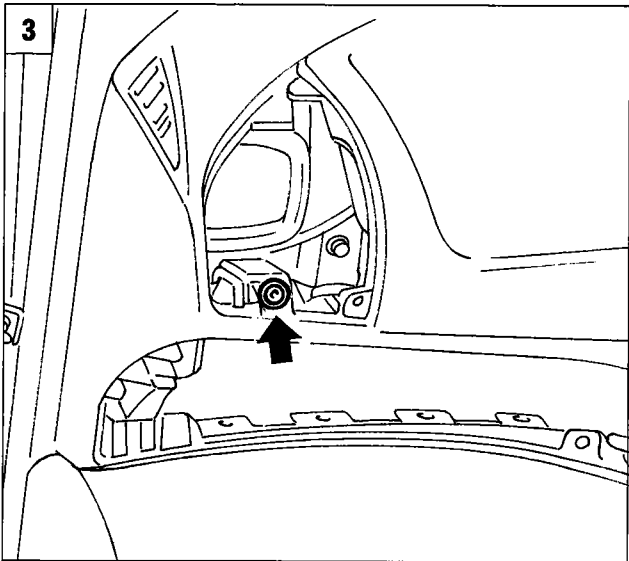
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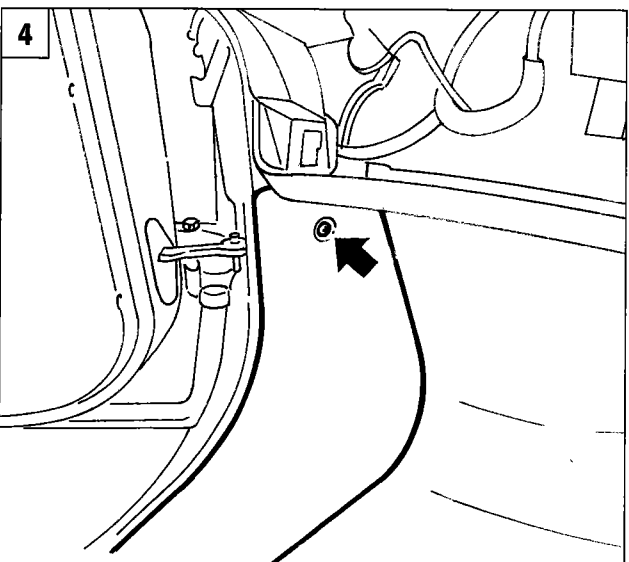
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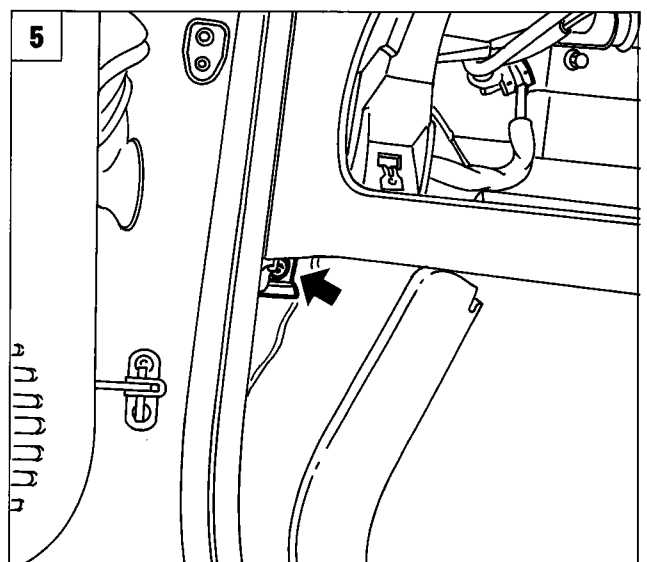
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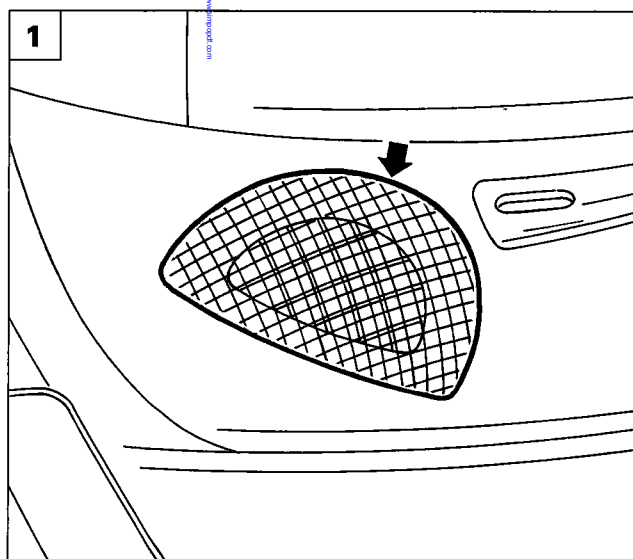
1. Disconnect connector of the glove compartment light, then remove the light from the car.
2. Unscrew the bolts fastening the left ventilation outlet, then remove.
3. Unscrew the screw indicated, which secures the left hand side of the instrument facia.
4. Unscrew the screw indicated and move the door sill trim away on both sides of the car.
5. Unscrew the lower bolt retaining the instrument facia to the body on both sides.



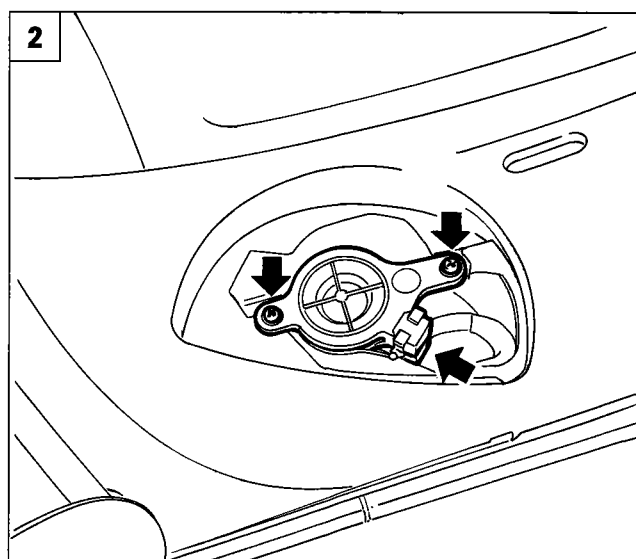
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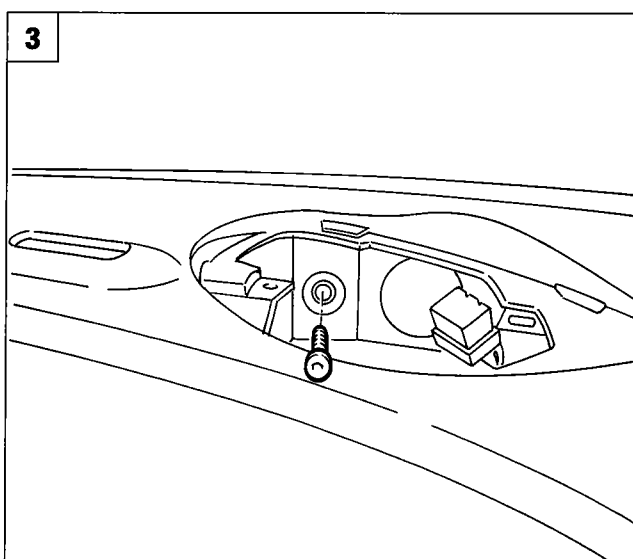
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P4A67DA01



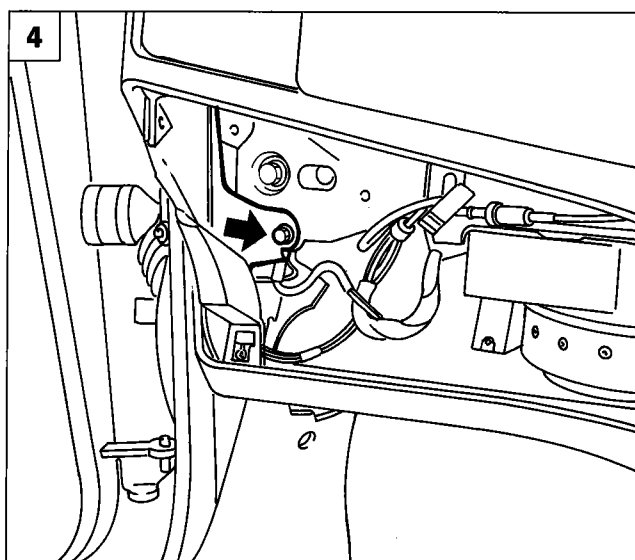
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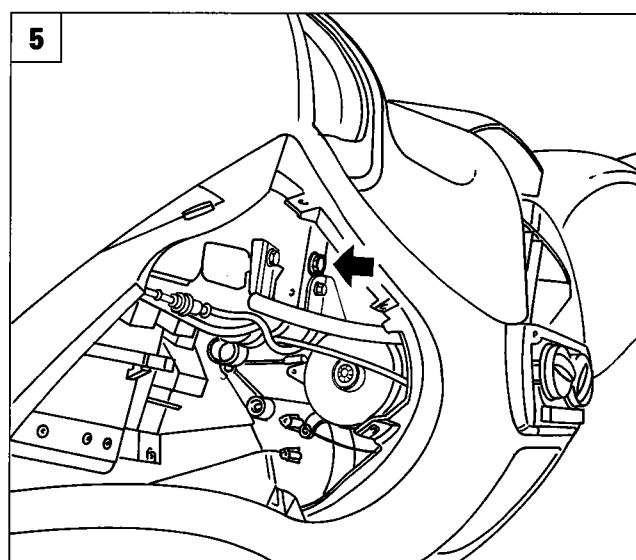
P4A67DA03



1. Undo the retaining tabs and remove the left and right speaker grilles on the fascia.
2. Disconnect the right and left speakers by unscrewing the retaining bolts and disconnecting the connectors.
3. Unscrew screw located in the right and left speaker compartment, which secures the instrument fascia to the body.
4. Remove the bolt retaining the instrument fascia to the body, on the left side.
5. Remove the central bolt securing the instrument fascia to the body.



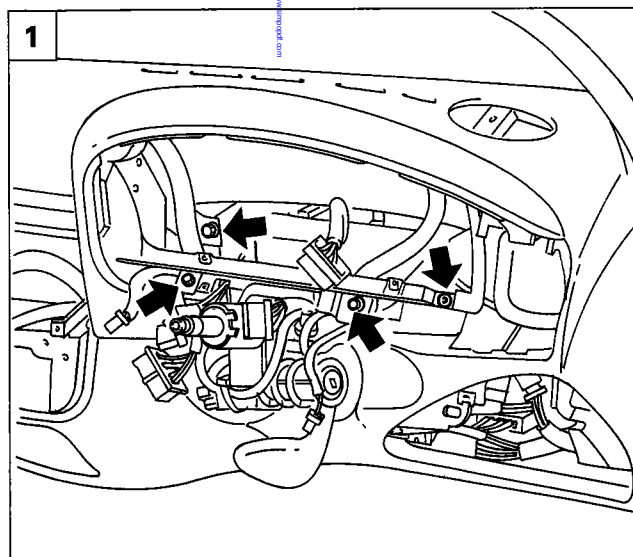
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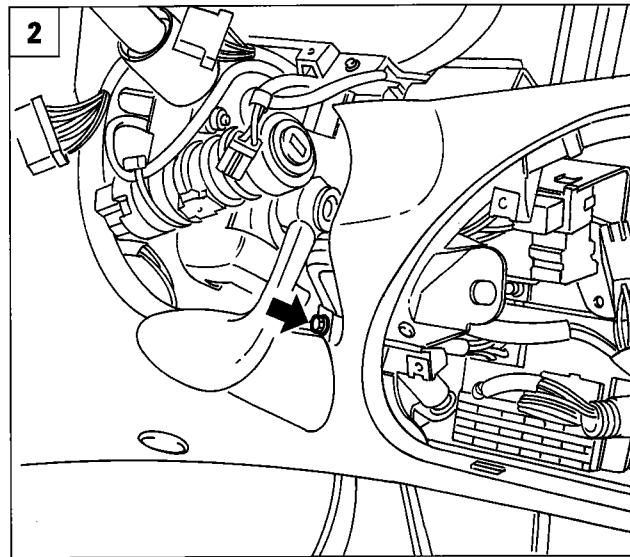
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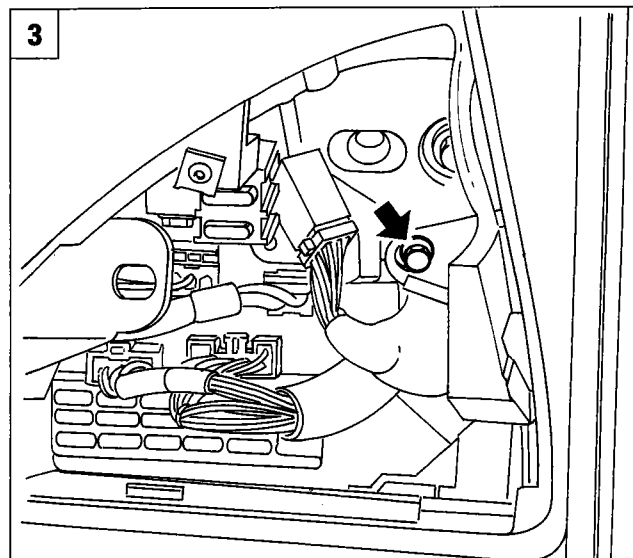
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P4A68DA01



P4A68DA02



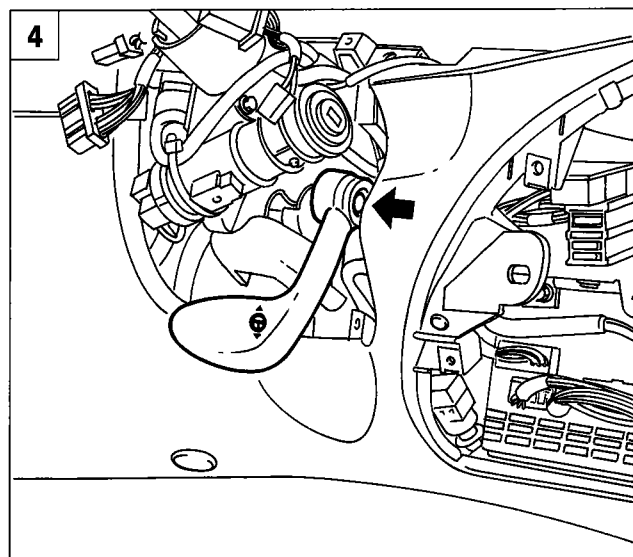
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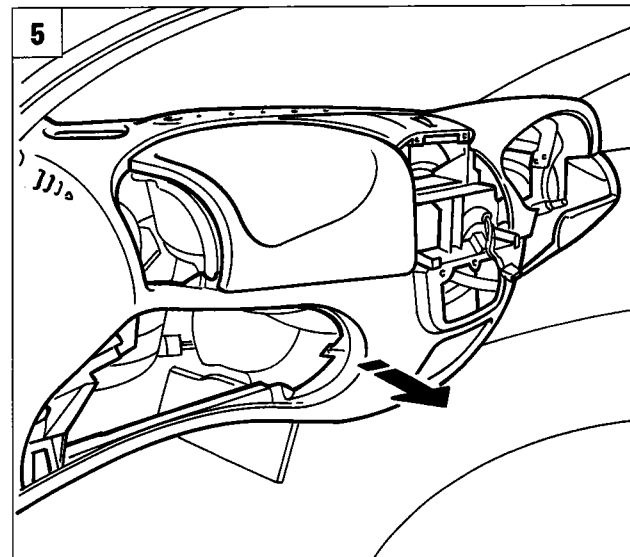
1. Unscrew the bolts fastening instrument fascia to the front beam.
2. Unscrew screw retaining the fascia, located near the steering wheel adjustment lever.
3. Remove the instrument fascia retaining screw on the right hand side near the junction unit.
4. Loosen the bolt retaining the steering wheel adjustment lever in order to facilitate removal of the instrument fascia.
5. Remove the instrument fascia with the aid of a second operator.



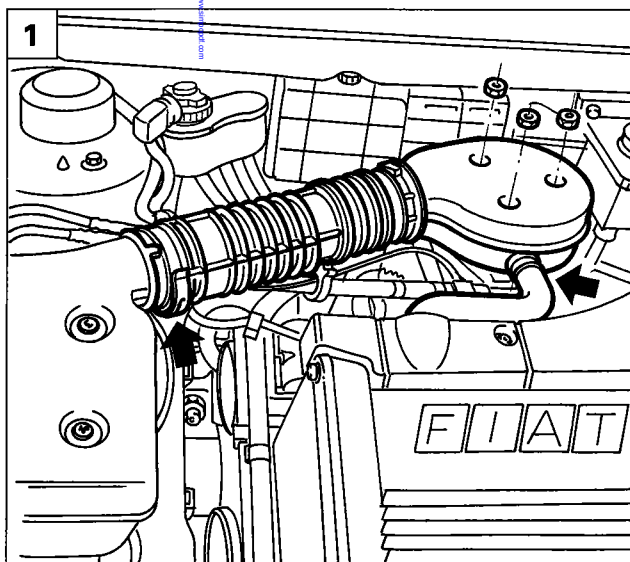
*Reverse removal operations to refit.*



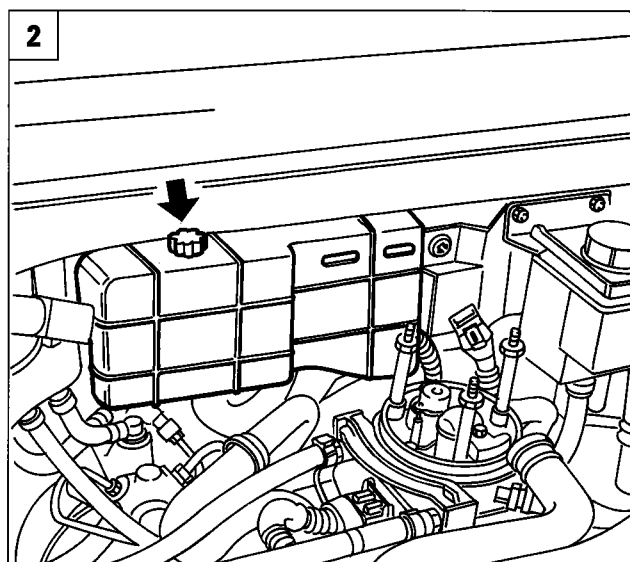
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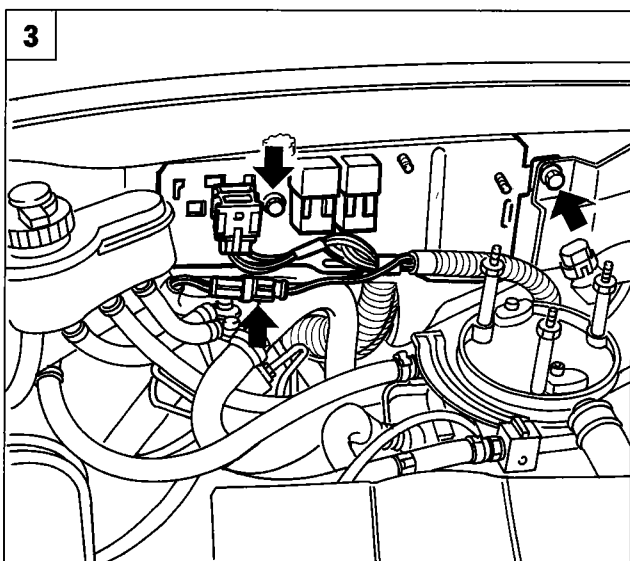
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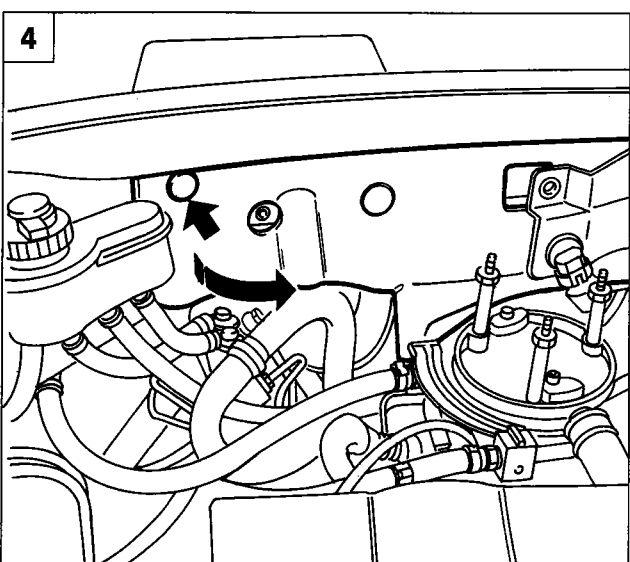


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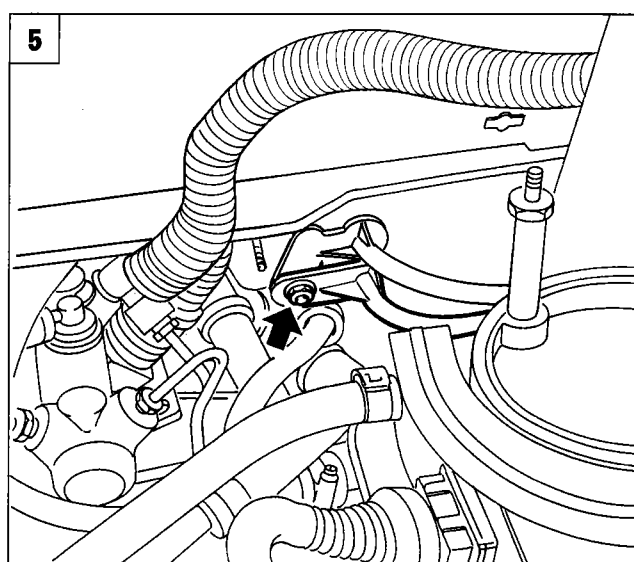


### REMOVING-REFITTING BONNET OPENING CABLE

1. Remove the pipe connecting air cleaner to butterfly valve case.
2. Remove the relay unit protective cover.
3. Unscrew the bolts fastening the relay bracket and position to one side.
4. Remove the stud shown in figure and move the lining of the bulkhead between engine bay and cabin to one side.
5. Unscrew nut retaining the bonnet opening cable to the bulkhead between engine bay and passenger compartment. Remove the underlying guide block.



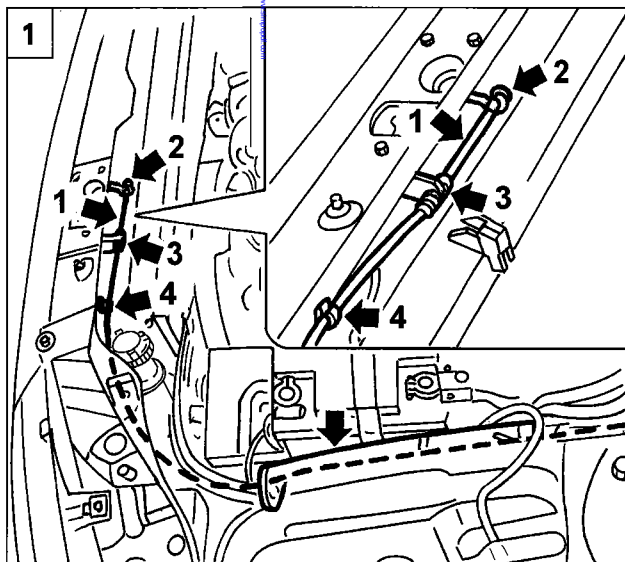
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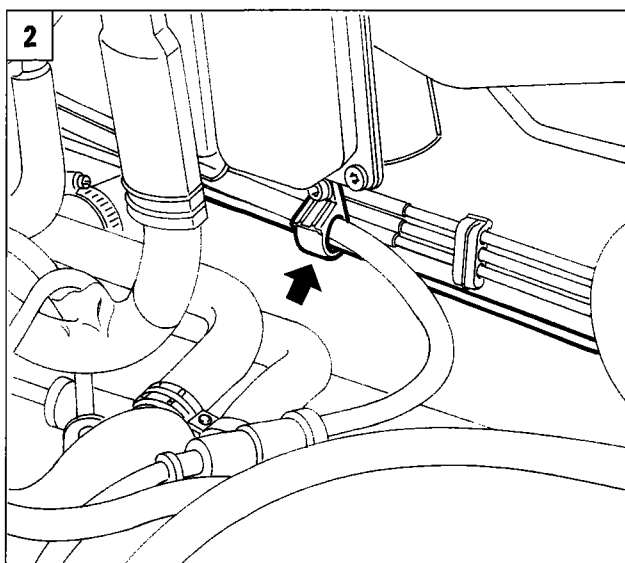


### 70.



P4A70DA01

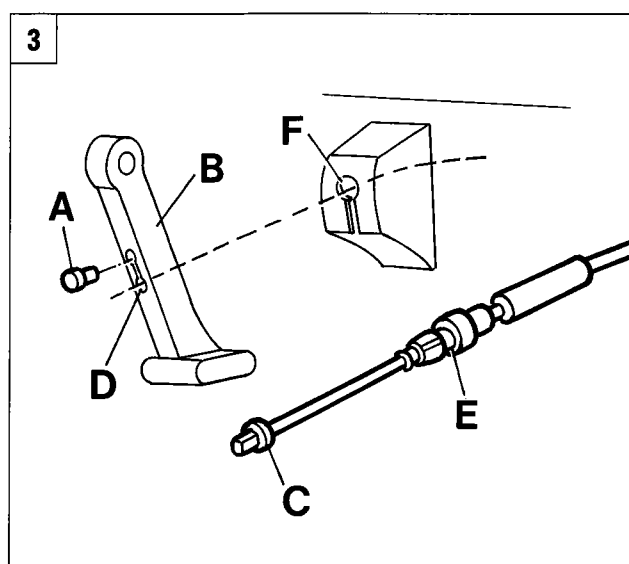
1. Disconnect bonnet opening cable (1) from the seats of fastenings (2) and (3) and from the retaining clip (4).



P4A70DA02

2. Release the bonnet opening cable from the retaining clip located beneath the injection control unit.

3. Working from beneath the steering wheel, remove cap (A) from bonnet opening lever (B), then release the end (C) of the opening cable from seat (D). Release opening cable fastener (E) from seat (F) on the body.

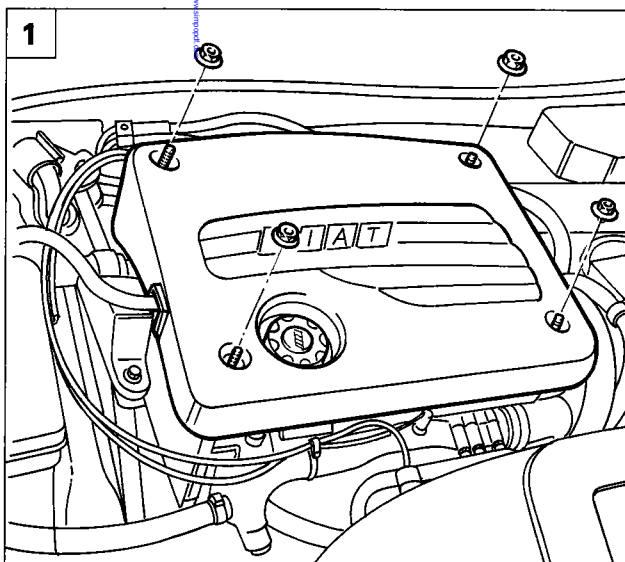


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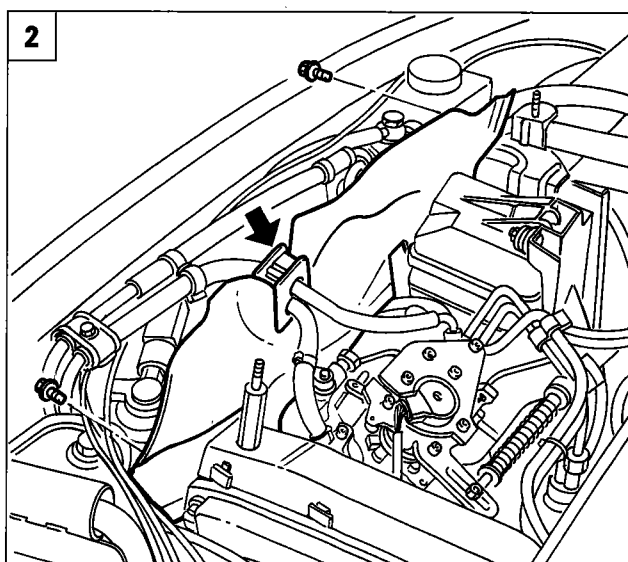


*Fasten the opening cable to a probe in order to facilitate refitting through the bulkhead between engine bay and cabin.  
Withdraw and disconnect the bonnet opening cable.*

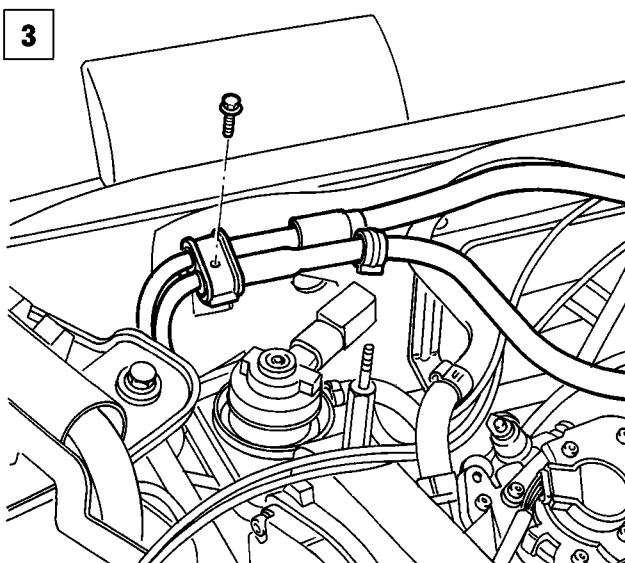
**NOTE** Reverse order of removal operations to refit.



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P4A06DA01

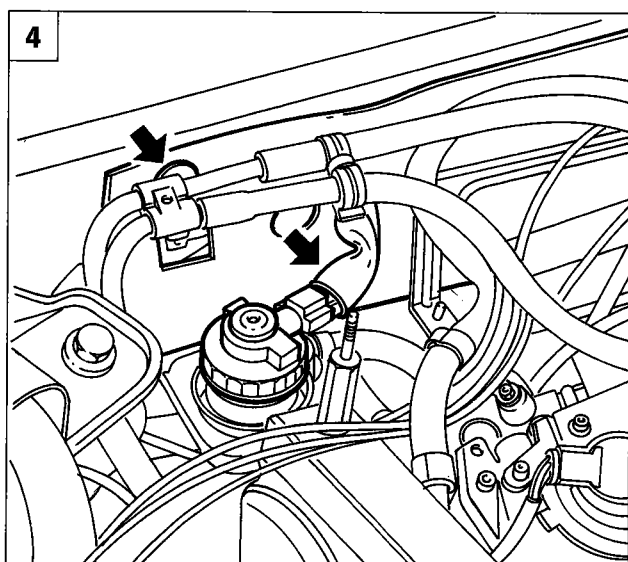


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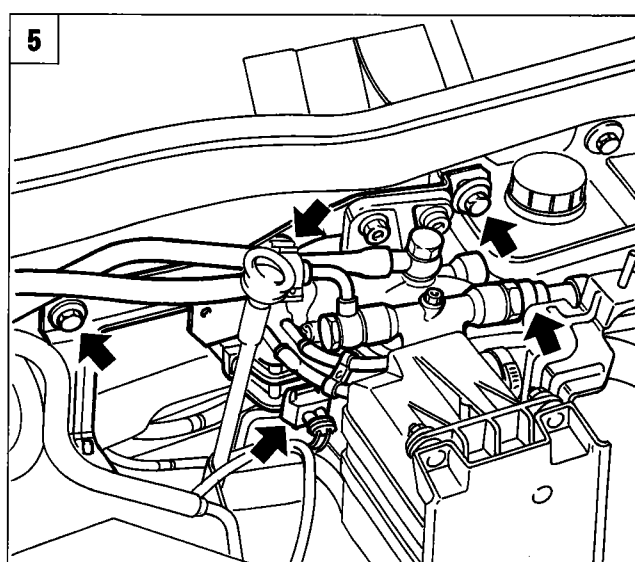


### REMOVING-REFITTING BONNET OPENING CABLE

1. Remove the upper cam cover protection.
2. Remove the trim shown in the figure by undoing the retaining bolt and releasing the diesel lines from the retaining clip.
3. Remove the bolt retaining the fuel line connection bracket.
4. Disconnect connector of the brake and clutch fluid level sensor, then remove the stud retaining the lining of the bulkhead between engine bay and cabin, then move the trim to one side.
5. Unscrew the bolts fastening the diesel filter bracket, disconnect connections shown and place the bracket to one side.

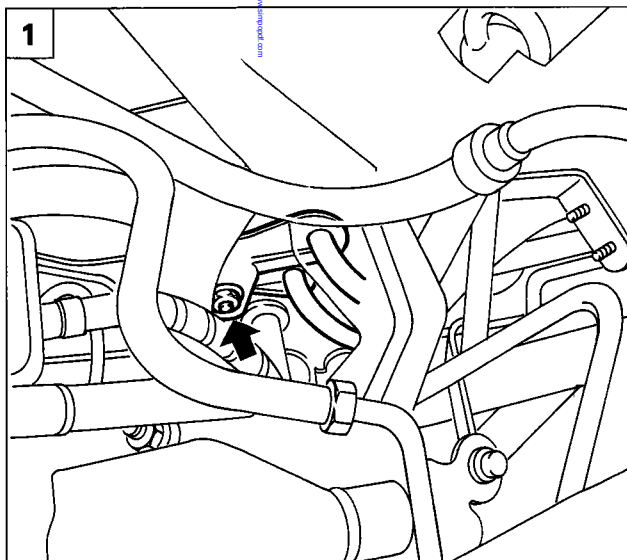


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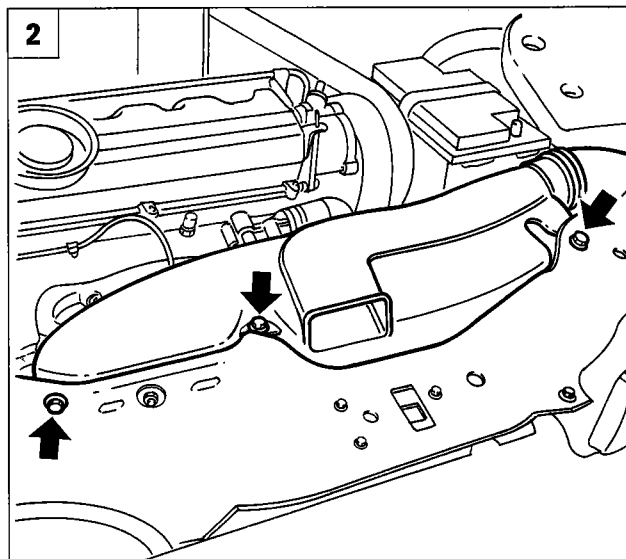


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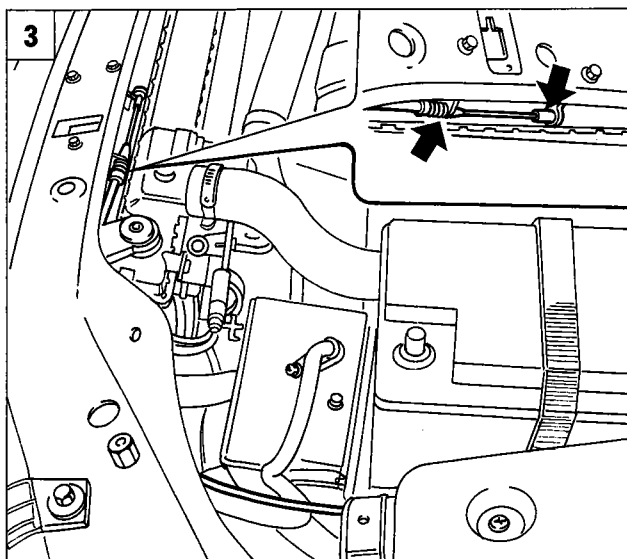
## 70.



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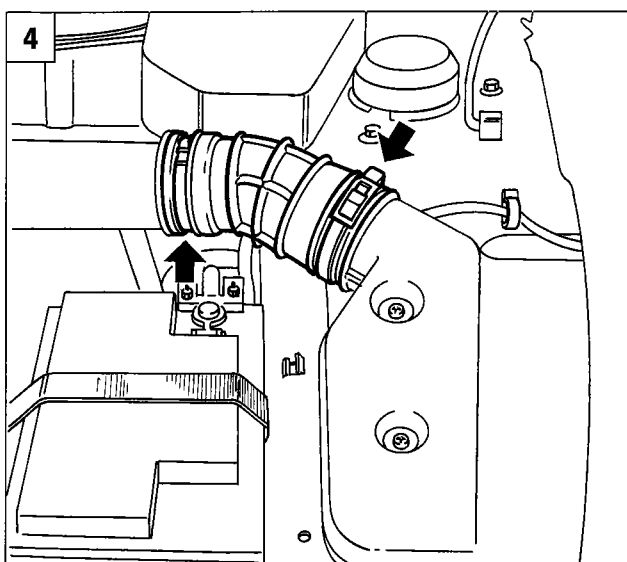
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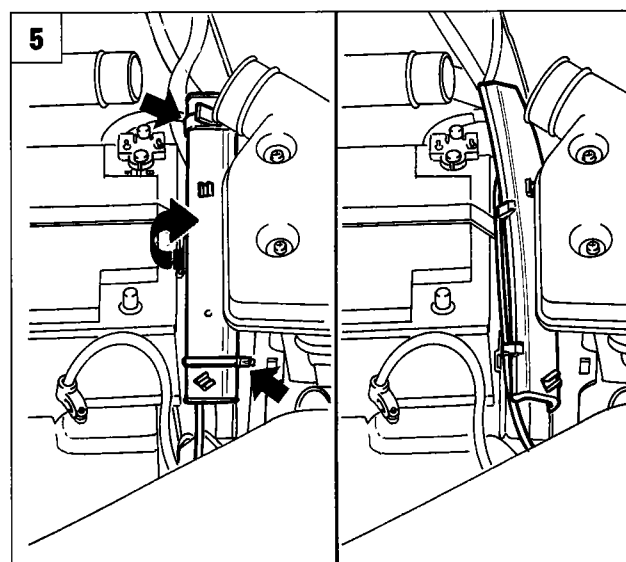
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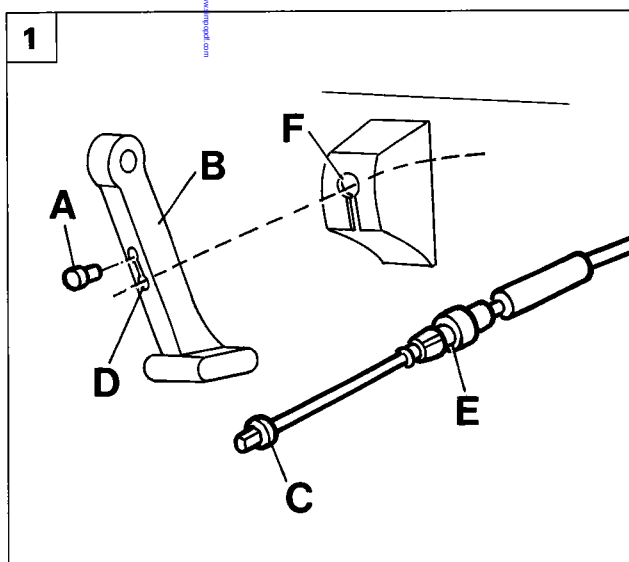
1. Move the lining of the bulkhead between engine bay and cabin further, then remove the nut retaining the bonnet opening cable to the above bulkhead.
2. Remove the air duct by undoing the fasteners indicated in figure.
3. Disconnect the bonnet opening cable from the retainer seats and the retaining clip.
4. Disconnect the air sleeve from the filter.
5. Open the cable duct and remove the bonnet opening cable.



P4A72DA04



P4A72DA05



P4A70DA03

1. Working from beneath the steering wheel, remove plug (A) from bonnet opening lever (B) , then disconnect end (C) of the opening cable from seat (D). Release opening cable fastener (E) from seat (F) on the body.



*Fasten the opening cable to a probe in order to facilitate refitting through the bulkhead between engine bay and passenger compartment. Withdraw and disconnect the bonnet opening cable by releasing from the retaining clip.*

**NOTE** *Reverse order of removal operations to refit.*

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Bravo/Brava

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**TECHNICAL SERVICE MANUAL COMPOSITION**

As of January 2001, the **Bravo-Brava 4th volume** manual is composed of the following sections

| Print N°                       | Sections  | Page No(s)                                                       | Notes                                                                                                                                      |
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| <b>506.670/18</b><br>(II/1999) | <b>10</b> | 1 - 35                                                           | Engine  16V 1998 range - Removing-refitting               |
|                                | <b>55</b> | 1 - 249                                                          | Electrical equipment wiring diagrams for 98 range versions (*)                                                                             |
| <b>506.670/19</b><br>(XI/1999) | <b>55</b> | 1 - 38                                                           | Electrical equipment: Air Bag new features - Side                                                                                          |
| <b>506.670/20</b><br>(V/1999)  | <b>00</b> | 1 - 9                                                            | Technical data  16V 1999 update                          |
|                                | <b>10</b> | 1 - 54                                                           | Fuel system  16V 1999 update                             |
|                                | <b>55</b> | 25 - 26<br>249                                                   | Update to wiring diagrams - 1998 range                                                                                                     |
|                                | <b>55</b> | 1 - 41                                                           | Electrical equipment wiring diagrams  16V 1999 update |
| <b>506.670/21</b><br>(X/1999)  | <b>10</b> | 33 - 34                                                          | Removal-refitting update  16V 1998 range              |
|                                |           | 1 - 2                                                            | Fuel System update  16V 1999 update                   |
|                                | <b>55</b> | 1 - 8                                                            | Updated Air Bag with new features (98 range)                                                                                               |
|                                |           | 23 - 25<br>83 - 86<br>177 - 178<br>201 - 204<br>229 - 230<br>249 | 98 range wiring diagrams update                                                                                                            |

(\*) (\*)These wiring diagrams replace the diagrams in the 3rd volume manual update - print no. 506.670/16 which should therefore be disposed of

| Print N°                      | Sections  | Page No(s) | Notes                              |
|-------------------------------|-----------|------------|------------------------------------|
| <b>506.670/22</b><br>(I/2001) | <b>00</b> | 1 - 38     | 2000 range technical data          |
|                               | <b>10</b> | 1 - 8      | 1242 8 valvole Euro 3 fuel system  |
|                               |           | 1 - 8      | 1596 16 valvole Euro 3 fuel system |
|                               |           | 1 - 36     | 1910 JTD Euro 3 fuel system        |
|                               | <b>55</b> | 1 - 28     | Radio System                       |
|                               |           | 1 - 115    | 2000 range Euro 3 wiring diagrams  |



**TECHNICAL SERVICE MANUAL COMPOSITION**

At present, October 1999, the **Bravo-Brava 4th volume** manual is composed of the following booklets:

| Print N°                       | Sections  | Page No(s)                                                       | Notes                                                                                                                                      |
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| <b>506.670/18</b><br>(II/1999) | <b>10</b> | 1 - 35                                                           | Engine  16V 98 range – Removing-refitting                 |
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| <b>506.670/19</b><br>(XI/1999) | <b>55</b> | 1 - 38                                                           | Electrical equipment: Air Bag new features - Side Bag                                                                                      |
| <b>506.670/20</b><br>(V/1999)  | <b>00</b> | 1 - 9                                                            | Technical data  16V 1999 update                          |
|                                | <b>10</b> | 1 - 54                                                           | Fuel system  16V 1999 update                             |
|                                | <b>55</b> | 25 - 26<br>249                                                   | Update to wiring diagrams - 1998 range                                                                                                     |
|                                | <b>55</b> | 1 - 41                                                           | Electrical equipment wiring diagrams  16V 1999 update |
| <b>506.670/21</b><br>(X/1999)  | <b>10</b> | 33 - 34                                                          | Removing-refitting update  16V 98 range               |
|                                |           | 1 - 2                                                            | Fuel system update  16V (99 update)                   |
|                                | <b>55</b> | 1 - 8                                                            | Update for Air Bag new features 98 range                                                                                                   |
|                                |           | 23 - 25<br>83 - 86<br>177 - 178<br>201 - 204<br>229 - 230<br>249 | 98 range wiring diagrams update                                                                                                            |
|                                |           | 17 - 29                                                          | Update for instrument panels 98 range                                                                                                      |

(\*) These wiring diagrams replace those which are part of the 3rd volume manual update - print no. 506.670/16 which should therefore be disposed of

**TECHNICAL SERVICE MANUAL COMPOSITION**

As of May 1999, the **Bravo-Brava volume 4** manual is composed of the following parts

|                                 |           |                |                                                                                                                                             |
|---------------------------------|-----------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>506.670/18</b><br>(II/1999)  | <b>10</b> | 1 - 35         | Engine  16V 98 range - Removing-refitting                  |
|                                 |           | 27 - 44        | Fuel system  JTD 98 range - Removing-refitting components. |
|                                 | <b>55</b> | 1 - 249        | Electrical equipment wiring diagrams for 98 range versions (*)                                                                              |
| <b>506.670/19</b><br>(III/1998) | <b>55</b> | 1 - 38         | Electrical equipment: Air Bag new features - Side Bag                                                                                       |
| <b>506.670/20</b><br>(V/1999)   | <b>00</b> | 1 - 9          | Technical data  16V 1999 update                            |
|                                 | <b>10</b> | 1 - 54         | Fuel system  16V 1999 update                              |
|                                 | <b>55</b> | 25 - 26<br>249 | Update to wiring diagrams - 1998 range                                                                                                      |
|                                 | <b>55</b> | 1 - 41         | Electrical equipment wiring diagrams  16V 1999 up-date |

(\*)These wiring diagrams replace diagrams in the volume 3 manual update - print no. 506.670/16 which should therefore be disposed of

## SERVICE MANUAL COMPOSITION

At present, March 1999, the **Bravo-Brava 4<sup>th</sup> volume** manual is composed of the following booklets

|                                 |           |         |                                                                                                                                             |
|---------------------------------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>506.670/18</b><br>(II/1999)  | <b>10</b> | 1 - 35  | Engine  16V 98 range - Removing-refitting                  |
|                                 |           | 27 - 44 | Fuel system  JTD 98 range - Removing-refitting components. |
|                                 | <b>55</b> | 1 - 249 | Electrical equipment wiring diagrams for 98 range versions (*)                                                                              |
| <b>506.670/19</b><br>(III/1998) | <b>55</b> | 1 - 38  | Electrical equipment: Air Bag new features - Side Bag                                                                                       |

(\*)These wiring diagrams replace those which are part of the 3rd volume manual update - print no. 506.670/16 which should therefore be disposed of

Simpop PDF Merge and Split Unregistered Version - <http://www.simpopdf.com>

Intro & Techdata 99

Intro & Techdata 2000

### INTRODUCTION

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### TECHNICAL DATA

#### ENGINE 16V

|                                           |   |
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| - Cylinder head and valve gear components | 6 |
| - Fuel system                             | 7 |

#### ELECTRICAL EQUIPMENT

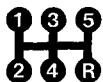
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*This section contains the specific technical data relating to the 1747 16v version with a returnless fuel system, for anything not dealt with, refer to the Bravo-Brava 1st volume manual.*

**00.0**

|                                                                                   | CHASSIS     | ENGINE     | VERSION            | 3 Door | 5 Door | GEARBOX                                                                             |
|-----------------------------------------------------------------------------------|-------------|------------|--------------------|--------|--------|-------------------------------------------------------------------------------------|
|                                                                                   |             |            |                    |        |        |  |
|  | ZFA 182 000 | 182 A2 000 | 182 AC 1AA 03      | ☆      |        | ☆                                                                                   |
|                                                                                   |             |            | 182 BC 1AA 13      |        | ☆      |                                                                                     |
|                                                                                   |             |            | 182 BC 1AA 13B (●) |        | ☆      |                                                                                     |

(●) Versions for specific markets (Germany)

| ENGINE TYPE |  16V |
|-------------|-----------------------------------------------------------------------------------------|
|-------------|-----------------------------------------------------------------------------------------|

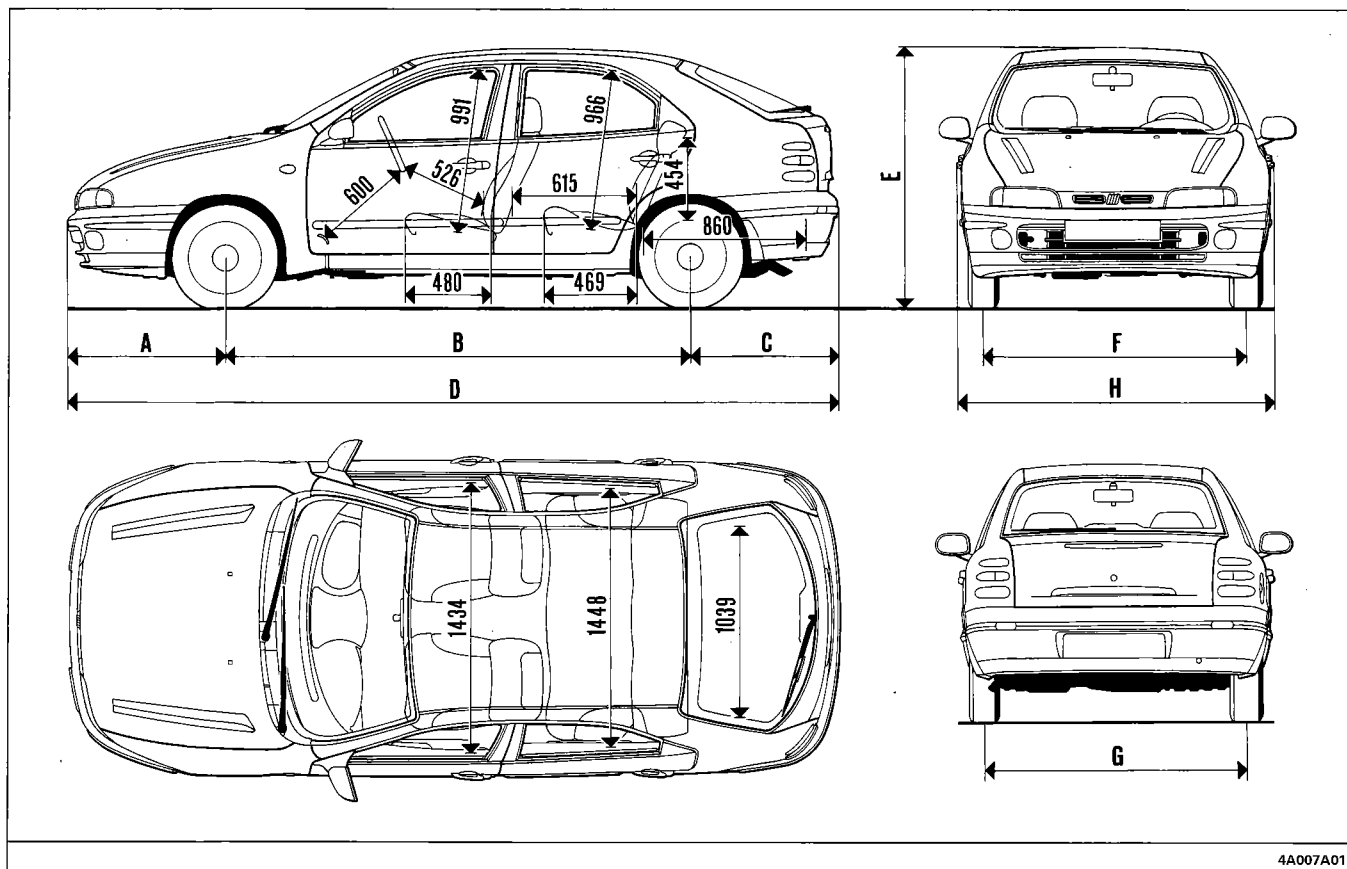
**WEIGHTS (in kg)**

| WEIGHTS (in kg)                                                                     |                                                                                                                                                                                      |      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|  | 3 door                                                                                                                                                                               | 1100 |
|                                                                                     | 5 door                                                                                                                                                                               | 1130 |
|  | 500 =   3 door | 1600 |
|  | 550 =   5 door | 1680 |

**NOTE FOR VERSIONS WITH ACCESSORIES:** In the presence of special equipment (non standard air conditioning, sun roof, trailer towing device, etc.), the empty weight increases and therefore the carrying capacity may decrease in relation to the maximum permissible loads.

### 00.

#### 5-DOOR VERSION

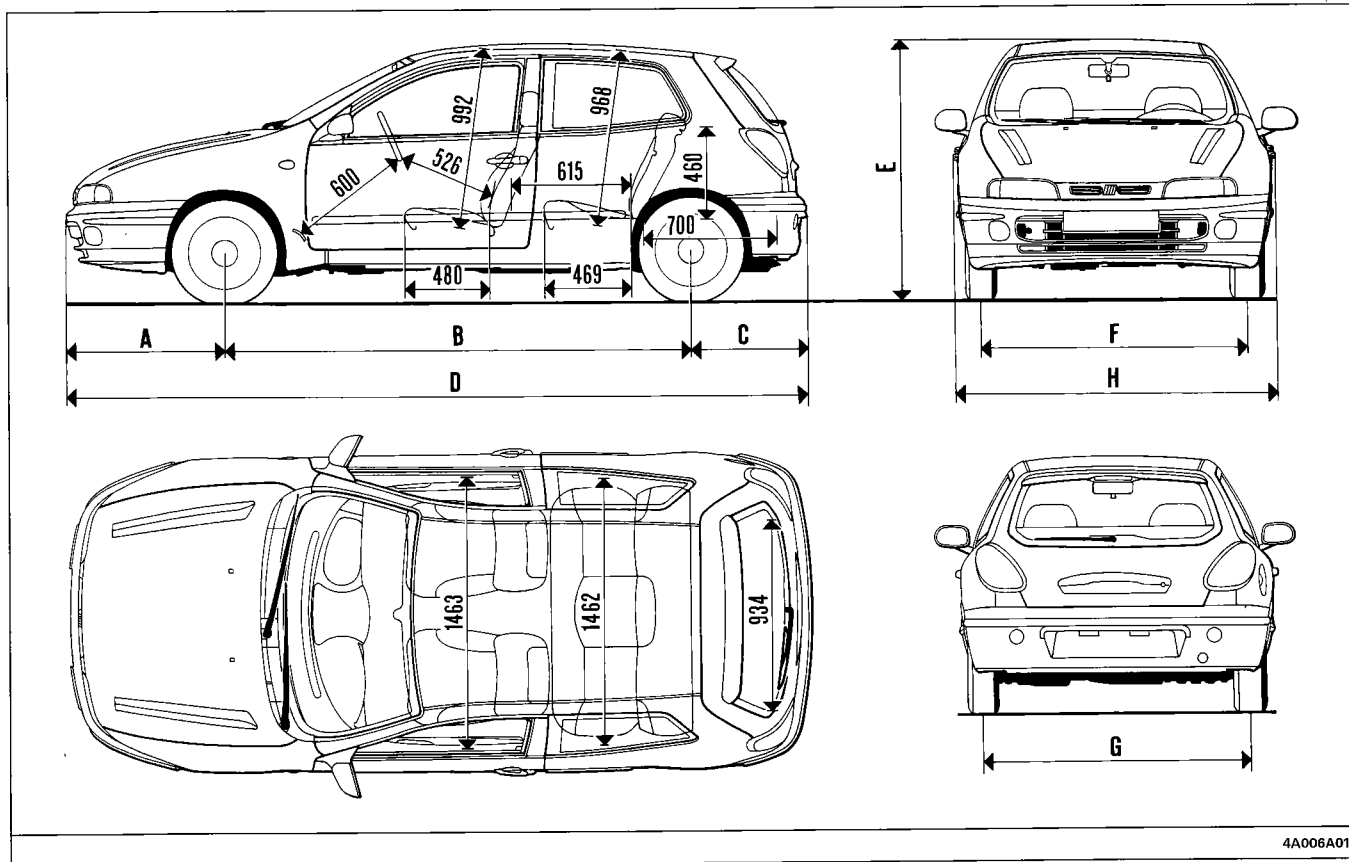


4A007A01

| Engine version                                                                          | Wheel rim      | DIMENSIONS (mm) |      |     |      |      |      |      |      |
|-----------------------------------------------------------------------------------------|----------------|-----------------|------|-----|------|------|------|------|------|
|                                                                                         |                | A               | B    | C   | D    | E    | F    | G    | H    |
|  16V | 5½Jx14"»3<br>7 | 858             | 2540 | 789 | 4187 | 1412 | 1451 | 1453 | 1741 |
|                                                                                         | 6Jx14"»43      |                 |      |     |      |      | 1439 | 1441 |      |



**3 DOOR VERSION**



4A006A01

| Engine type                                                                             | Wheel rim | DIMENSIONS (mm) |      |     |      |      |      |      |      |
|-----------------------------------------------------------------------------------------|-----------|-----------------|------|-----|------|------|------|------|------|
|                                                                                         |           | A               | B    | C   | D    | E    | F    | G    | H    |
|  16V | 6Jx14"43  | 858             | 2540 | 627 | 4025 | 1415 | 1439 | 1441 | 1755 |
|                                                                                         | 6Jx15"40  |                 |      |     |      |      | 1445 | 1447 |      |

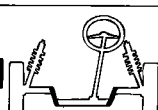
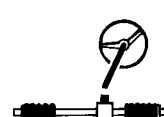
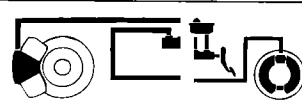
# Technical data

## Capacities

**Bravo-Brava**  16V  
99 update

00.0

3 DOOR VERSION

| Description                                                                                                                                                                                                                                                              |                                                                                   | Unit                                                                                                                                                                                                                                                                                                                                       |                                                                                     | Quantity                                                                             |                                                                                                                                                                              |                                                     |       |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------|------|
|                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                                                                                                                                                                                                                                                                            |                                                                                     | dm <sup>3</sup> (l)                                                                  | (kg)                                                                                                                                                                         |                                                     |       |      |
|  Petrol ≥ O.R. 95<br>Unleaded                                                                                                                                                           |                                                                                   |                                                                                                                                                                                                                                                           |                                                                                     | 60                                                                                   | -                                                                                                                                                                            |                                                     |       |      |
|  50%<br>+<br> (▲)<br> |  |     |                                                                                     | 7.4                                                                                  | -                                                                                                                                                                            |                                                     |       |      |
|                                                                                                                                                                                                                                                                          |  |                                                                                                                                                                                                                                                                                                                                            |                                                                                     | Total capacity<br>of cooling system                                                  | 7.3                                                                                                                                                                          | -                                                   |       |      |
| <br><b>Petrol engines</b><br><br>SELENIA 20K<br>(SAE 10 W/40)                                                                                                                           |                                                                                   | Total capacity                                                                                                                                                                                                                                            |                                                                                     | 5.5                                                                                  | 4.7                                                                                                                                                                          |                                                     |       |      |
|                                                                                                                                                                                                                                                                          |                                                                                   |  <br>Partial capacity<br>(periodic replacement)                                                                                                                        |                                                                                     | 4.8<br>(4,5 ●)                                                                       | 4.3<br>(4,0 ●)                                                                                                                                                               |                                                     |       |      |
|  a = TUTELA<br>ZF 75 Synth                                                                         |                                                                                   |                                                                                                                                                                      |                                                                                     | 1.98                                                                                 | 1.8                                                                                                                                                                          |                                                     |       |      |
|  a =<br><br>b =                                                                                                                                                                       | TUTELA<br>GI/A                                                                    | a                                                                                                                                                                                                                                                                                                                                          |  |  | a                                                                                                                                                                            | -                                                   | 1,0   |      |
|                                                                                                                                                                                                                                                                          | K 854                                                                             | b                                                                                                                                                                                                                                                                                                                                          |                                                                                     |                                                                                      | b                                                                                                                                                                            | -                                                   | 1.0   |      |
|  b =                                                                                                                                                                                  | TUTELA<br>MRM2                                                                    | c                                                                                                                                                                                                                                                                                                                                          |  |                                                                                      | c                                                                                                                                                                            | -                                                   | 0.003 |      |
|  TUTELA<br>TOP 4                                                                                                                                                                      |                                                                                   | <br><br>Total capacity                                                                                                                                                                                                                                  |                                                                                     | without<br>ABS                                                                       | 0.40                                                                                                                                                                         | -                                                   |       |      |
|                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                                                                                                                                                                                                                                                                            |                                                                                     | with<br>ABS                                                                          | 0.54                                                                                                                                                                         | -                                                   |       |      |
|  H <sub>2</sub> O + E<br><br>AREXONS                                                                                                                                                  |                                                                                   |                                                                                                                                                                                                                                                         | 3%                                                                                  |   |  +  | 2.5-5<br>(6.4<br>with<br>headlam<br>p wash-<br>ers) | -     |      |
|                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                                                                                                                                                                                         | ~ - 10°C                                                                            |                                                                                      |                                                                                                                                                                              |                                                     |       | 50%  |
|                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                                                                                                                                                                                                                                                                            | ~ - 20°C                                                                            |                                                                                      |                                                                                                                                                                              |                                                     |       | 100% |

(▲) Distilled water  
(●) Engine sump only

|                                                                                                                                                                                                                                                                       |                                                                                     |  16V |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------|
|                                                                                                                                                                                                                                                                       |                                                                                     | 3 door                                                                                  | 5 door |
| <p>Speed km/h<br/>(average load)</p>                                                                                                                                                 |    | 50                                                                                      |        |
|                                                                                                                                                                                                                                                                       |    | 87                                                                                      |        |
|                                                                                                                                                                                                                                                                       |    | 128                                                                                     |        |
|                                                                                                                                                                                                                                                                       |    | 169                                                                                     |        |
|                                                                                                                                                                                                                                                                       |   | 193                                                                                     | 190    |
|                                                                                                                                                                                                                                                                       |  | 50                                                                                      |        |
| <p>Fuel consumption figures<br/>in accordance with standard<br/>93/116/CE (litres/100 km)</p>   | Urban                                                                               | 11.3                                                                                    | 11.5   |
|                                                                                                                                                                                                                                                                       | Extra-urban                                                                         | 6.5                                                                                     | 6.6    |
|                                                                                                                                                                                                                                                                       | Combined                                                                            | 8.3                                                                                     | 8.4    |
| CO <sub>2</sub> exhaust emissions (g/km)                                                                                                                                                                                                                              |                                                                                     | 197                                                                                     | 193    |

The consumption and emission figures in the table are measured in accordance with the new directive 93/116/CE in force since January 1996.

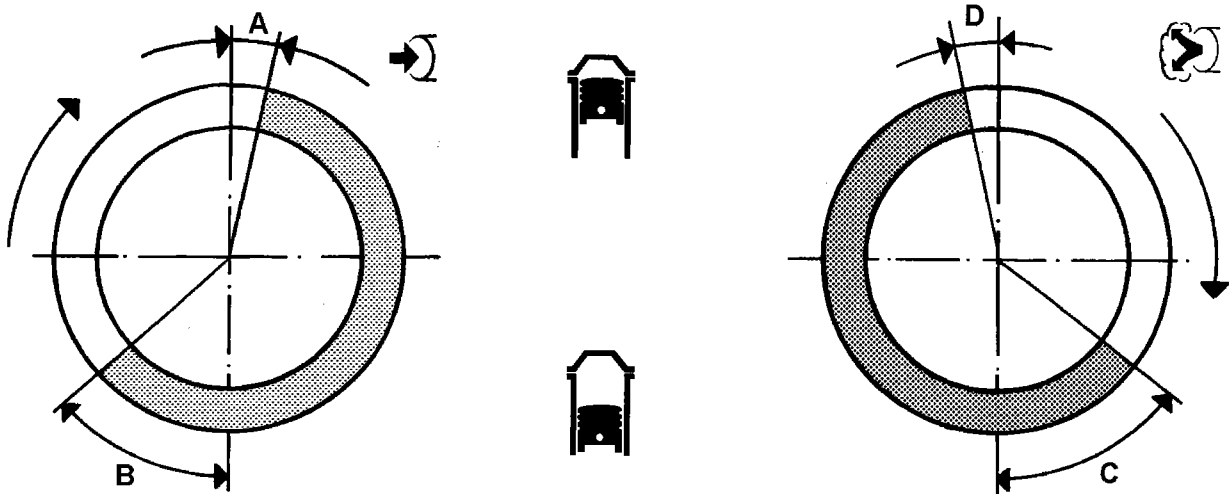
This directive involves a realistic determination of fuel consumption aimed at the daily use of the vehicle. The following procedures are followed to measure the fuel consumption:

- urban cycle: begins with a cold start then the normal urban usage is simulated;
- extra-urban cycle: the driving includes frequent acceleration in all gears corresponding to the normal usage of the vehicle; the driving speed varies between 0 and 120 km/h;
- average combined consumption: this is calculated by including about 37% of the urban cycle and 63% of the extra-urban cycle.

The type of route, traffic conditions, driving style, weather conditions, trim level/equipment/accessories, presence of special equipment and the state of the vehicle in general can lead to different fuel consumption figures from those established using the above mentioned procedures.

The CO<sub>2</sub> exhaust emissions (in g/km) are measured during the average combined cycle.

TIMING DIAGRAMS



P3N07DA01

TIMING ANGLES



|   |         |                                                                                     |                  |     |
|---|---------|-------------------------------------------------------------------------------------|------------------|-----|
| A | Inlet   |  | opens before TDC | 0°  |
|   |         |                                                                                     | closes after BDC | 27° |
| C | Exhaust |  | opens before BDC | 29° |
| D |         |                                                                                     | closes after TDC | 2°  |

**INTEGRATED ELECTRONIC  
INJECTION/IGNITION SYSTEM COMPONENTS**



|                                                             |                                            |
|-------------------------------------------------------------|--------------------------------------------|
| Electronic control unit                                     | HITACHI MFI – 155<br>HITACHI MFI – 160 (*) |
| Injector                                                    | Marelli IWP 006                            |
| Fuel pressure regulator (incorporated in the electric pump) | Marelli RPM 84                             |
| Coolant temperature sensor                                  | Jaeger 40218301<br>Eth 2690350             |
| Electric fuel pump                                          | Marwall ESS 276                            |
| Lambda sensor                                               | NTK OZA 341-A1                             |
| Idle actuator                                               | HITACHI GL 108771                          |
| Butterfly valve position sensor (potentiometer)             | HITACHI GL212875                           |
| Fuel vapour solenoid valve                                  | Marelli EC1                                |
| Top Dead Centre and rpm sensor                              | HITACHI RS – 314                           |
| Knock sensor                                                | NGK KNE 03-A                               |
| Timing sensor                                               | Bosch B.232.101.037                        |
| Butterfly casing                                            | HITACHI M646 WA                            |

(\*) Specific version for German market

# Technical data

**Bravo- Brava**  16V

**Electrical equipment: electronic injection- ignition**

**1999 update**

**00.10**

## INTEGRATED ELECTRONIC INJECTION-IGNITION SYSTEM



|              |               |
|--------------|---------------|
| Make         | HITACHI MFI-1 |
| Firing order | 1 - 3 - 4 - 2 |

## IGNITION COIL (1 PER SPARK PLUG)

|                                               |                  |
|-----------------------------------------------|------------------|
| Make                                          | HITACHI GL212875 |
| Type                                          | Ge 215492        |
| Ohmic resistance of primary winding at 20°C   | Ω 0.66           |
| Ohmic resistance of secondary winding at 20°C | Ω -              |

## TOP DEAD CENTRE AND RPM SENSOR

|                                                           |                             |
|-----------------------------------------------------------|-----------------------------|
| Make and type                                             | HITACHI GE 110492<br>RS-314 |
| Sensor winding resistance at 20°C                         | Ω 513 - 627                 |
| Distance (gap) between sensor and crankshaft pulley tooth | mm 0.4 - 1.2                |

## KNOCK SENSOR

|               |              |
|---------------|--------------|
| Make and type | NTK KNE 03-A |
|---------------|--------------|

## TIMING SENSORS AND CYLINDER IDENTIFICATION

|               |                     |
|---------------|---------------------|
| Make and type | Bosch B 232.101.037 |
|---------------|---------------------|

## ADVANCE ON ENGINE

|                                   |         |
|-----------------------------------|---------|
| With engine idling (850 ± 50/min) | 9° ± 1° |
|-----------------------------------|---------|

## SPARK PLUGS

|               |                                   |
|---------------|-----------------------------------|
| Make and type | NGK BKR6EKC<br>Champion – RC8 BYC |
| Thread        | M14 x 1.25                        |
| Electrode gap | mm 0.8                            |

| Tool number | NAME OF TOOL | ENGINE TYPE                                                                             |
|-------------|--------------|-----------------------------------------------------------------------------------------|
|             |              |  16V |

ENGINE

|            |                                    |   |
|------------|------------------------------------|---|
| 1860955000 | Fuel consumption test equipment    | ● |
| 1870684000 | Petrol pressure drainage connector | ● |
| 1860875000 | Tool for timing camshafts          | ● |





**INTRODUCTION**

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| - Performance – Fuel consumption | 4 |
| - Capacities                     | 5 |
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**TECHNICAL DATA****ENGINE**  **16v**  **16v**

|                                                                  |    |
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**ENGINE**  **JTD**

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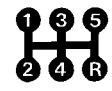
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|---------------|----|
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|                                                                                   | CHASSIS   | ENGINE   | VERSION     | 3<br>Door | 5<br>Door | GEARBOX                                                                             |
|-----------------------------------------------------------------------------------|-----------|----------|-------------|-----------|-----------|-------------------------------------------------------------------------------------|
|                                                                                   |           |          |             |           |           |  |
|  | ZFA182000 | 188A5000 | 182AT1AA 25 | ●         |           | ●                                                                                   |
|                                                                                   |           |          | 182BT1AA 26 |           | ●         |                                                                                     |
|  |           | 182B6000 | 182AU1AA 27 | ●         |           | ●                                                                                   |
|                                                                                   |           |          | 182BU1AA 28 |           | ●         |                                                                                     |
|  |           | 182B9000 | 182AV1AA 29 | ●         |           | ●                                                                                   |
|                                                                                   |           |          | 182BV1AA 30 |           | ●         |                                                                                     |

**NOTE** *This section only deals with the 2000 range CEE F3 versions.  
For subjects not dealt with, refer to the Bravo-Brava Manual print n° 506.670 and subsequent updates.*

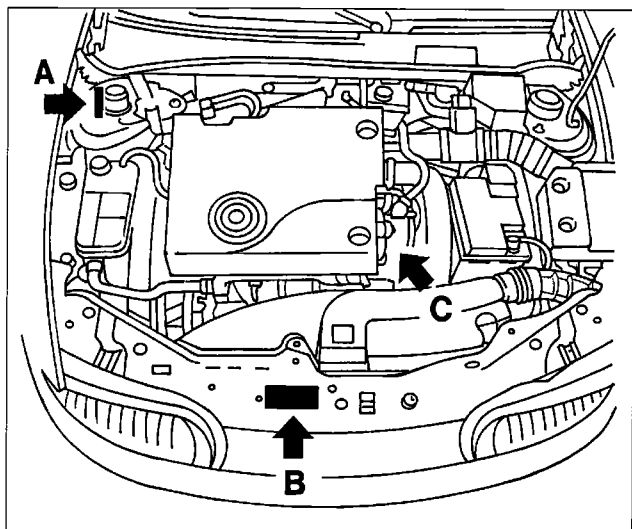
# Introduction

## Identification data

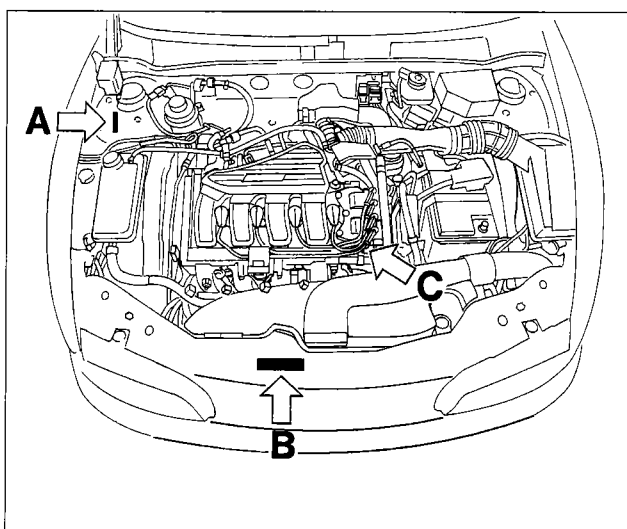
**Bravo- Brava**

**2000 range**

**00.0**



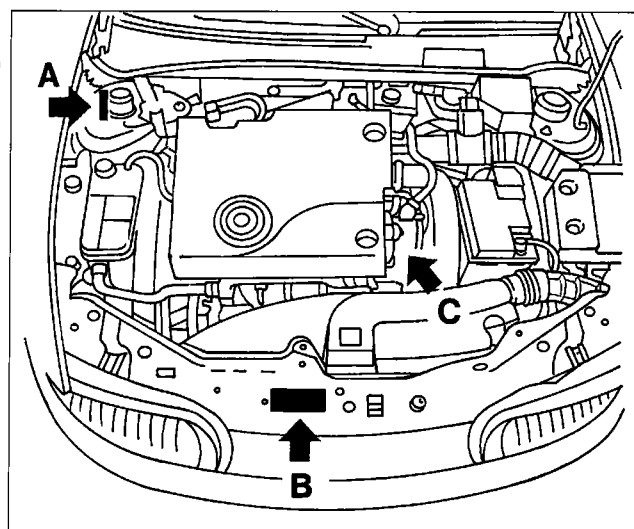
4A02HA03



4F002PA01

**A Vehicle type identification code and chassis number**

**C Engine type and number.**



4A02HA02

**B V.I.N. Plate**  
(EEC regulations)

|                                 |      |                 |
|---------------------------------|------|-----------------|
| FIAT                            | A    |                 |
|                                 | B    |                 |
|                                 | C    | D               |
|                                 | E    | kg              |
|                                 | F    | kg              |
|                                 | 1- G | kg              |
|                                 | 2- H | kg              |
|                                 | N    | MOTORE - ENGINE |
| VERSIONE - VERSION              |      | L               |
| N° PER RICAMBI<br>N° FOR SPARES |      | M               |

4A002A02

- A. Manufacturer's name
- B. Type approval number
- C. Vehicle type identification code
- D. Chassis manufacture number
- E. Maximum authorized weight of the vehicle fully laden
- F. Maximum authorized weight of vehicle fully laden plus trailer
- G. Maximum authorized weight on first axle (front)
- H. Maximum authorized weight on second axle (rear)
- I. Engine type
- L. Bodywork version code
- M. Spares number
- N. Correct value of smoke absorption coefficient (for Diesel engines only)

**WEIGHTS**  
(values expressed in kg)

| ENGINE TYPE                                                                                                                                                                       |                                                                                          |  1242 16v |  1596 16v |  1910 JTD |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                                                                                                  | 3 door                                                                                   | 1010                                                                                        | 1050                                                                                         | 1170                                                                                         |
|                                                                                                                                                                                   | 5 door                                                                                   | 1040                                                                                        | 1090                                                                                         | 1195                                                                                         |
|  +500 = (510)*  | 3 door                                                                                   | 1510                                                                                        | 1550                                                                                         | 1680                                                                                         |
|                                                                                                                                                                                   | 5 door                                                                                   | 1570                                                                                        | 1630                                                                                         | 1735                                                                                         |
| Maximum permitted loads on the axles (■)                                                                                                                                          |  3 door | 850                                                                                         | 850                                                                                          | 920                                                                                          |
|                                                                                                                                                                                   |  5 door | 850                                                                                         | 850                                                                                          | 920                                                                                          |
|                                                                                                                                                                                   |  3 door | 850                                                                                         | 850                                                                                          | 920                                                                                          |
|                                                                                                                                                                                   |  5 door | 850                                                                                         | 850                                                                                          | 920                                                                                          |
| Maximum permissible load on the roof                                                                                                                                              |                                                                                          | 80                                                                                          | 80                                                                                           | 80                                                                                           |
| Load on the tow hook ball (trailer with braking system)                                                                                                                           | Idle                                                                                     | —                                                                                           | —                                                                                            | —                                                                                            |
|                                                                                                                                                                                   | Maximum                                                                                  | 70                                                                                          | 70                                                                                           | 70                                                                                           |
|                                                                                                | Without braking system                                                                   | 400                                                                                         | 400                                                                                          | 400                                                                                          |
|                                                                                                                                                                                   | With braking system                                                                      | 1000                                                                                        | 1100                                                                                         | 1300                                                                                         |

(<) Loads which should never be exceeded

(\*) For 5 door version (Brava)

**NOTE FOR VERSIONS WITH ACCESSORIES:** If special equipment is fitted (non standard air conditioning, trailer towing device, etc.), the weight when empty will increase and therefore the payload may decrease in relation to the maximum permitted loads.

00.0

| ENGINE TYPE                                                                                                                                                  |                                                                                   |  16v |  16v |  JTD |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <br>Speed km/h (average load)                                               |  | 42                                                                                     | 52                                                                                      | 36                                                                                      |
|                                                                                                                                                              |  | 76                                                                                     | 90                                                                                      | 63                                                                                      |
|                                                                                                                                                              |  | 121<br>(110)*                                                                          | 132                                                                                     | 97                                                                                      |
|                                                                                                                                                              |  | 167<br>(145)*                                                                          | 175                                                                                     | 136                                                                                     |
|                                                                                                                                                              |  | 170                                                                                    | 184<br>(180)*                                                                           | 184<br>(182)*                                                                           |
|                                                                                                                                                              |  | 43                                                                                     | 53                                                                                      | 36                                                                                      |
| <br>Maximum climable gradient fully laden                                  |                                                                                   | 37                                                                                     |                                                                                         |                                                                                         |
| <br>Fuel consumption<br>in accordance with 1999/100/CE<br>(litres/100 km) | Urban cycle                                                                       | 9.4<br>9.5*                                                                            | 10.3<br>10.4*                                                                           | 7.2<br>7.3*                                                                             |
|                                                                                                                                                              | Non urban cycle                                                                   | 5.3<br>5.4*                                                                            | 5.8<br>5.9*                                                                             | 4.4<br>4.5*                                                                             |
|                                                                                                                                                              | Combined cycle                                                                    | 6.8<br>6.9*                                                                            | 7.5<br>7.6*                                                                             | 5.4<br>5.5*                                                                             |
| CO <sub>2</sub> exhaust emissions (g/km)                                                                                                                     |                                                                                   | 162<br>164*                                                                            | 177<br>179*                                                                             | 143<br>146*                                                                             |

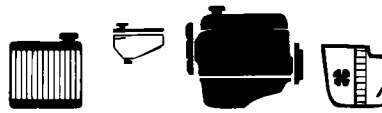
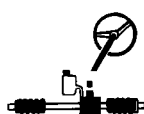
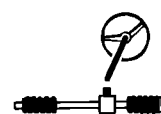
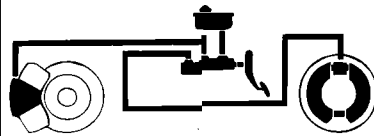
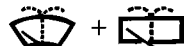
The fuel consumption figures in accordance with directive 1999/100/CE have been defined during the course of homologation tests which include:

- an urban cycle which includes a cold start followed by a simulated urban cycle.
- a non urban cycle which includes frequent acceleration in all gears simulating normal out of town usage of the vehicle, the speed should vary between 0 and 120 km/h.
- the average combined consumption includes 37% of the urban cycle and 63% of the non-urban cycle.

The type of route, traffic conditions, driving style, weather conditions, trim level/equipment/accessories, presence of special equipment and the state of the vehicle in general can lead to different fuel consumption figures from those established using the above mentioned procedures.

The CO<sub>2</sub> exhaust emissions (in g/km) are measured during the average combined cycle.

(\*) 5 Door version (Brava)

| Description                                                                                                                                                                                                                            |                                                                                                                                                                                           | Parts                                                                                                   |                                        | Quantity            |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------|------|
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           |                                                                                                         |                                        | dm <sup>3</sup> (l) | (kg) |
| <br>Petrol ≥ O.N. 95<br>Unleaded<br><br>Diesel                                                                                                        |                                                                                                          | 1242 16v                                                                                                | 58                                     | –                   |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1596 16v                                                                                                | 58                                     | –                   |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1910 JTD                                                                                                | 60                                     | –                   |      |
| <br>50%<br>+<br>(▲)<br>                                              | <br>Total capacity of<br>of cooling system                                                              | 1242 16v                                                                                                | 6.0<br>(5.6)(■)                        | –                   |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1596 16v                                                                                                | 7.0<br>(6.7)(■)                        | –                   |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1910 JTD                                                                                                | 6.3<br>(6.5)(■)                        | –                   |      |
| <br><b>Petrol engines:</b><br><br>SELENIA 20K<br>(SAE 10 W/40) (*)<br><br><b>Diesel Engines</b><br><br>SELENIA<br>Turbo Diesel<br>(SAE 10 W/40) (**) | <br>Total capacity                                                                                       | 1242 16v                                                                                                | 3.1                                    | 2.75                |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1596 16v                                                                                                | 4                                      | 3.5                 |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1910 JTD                                                                                                | 4.8                                    | 4.23                |      |
| <br><b>TUTELA CAR</b><br>ZC 75<br>SYNTH                           | <br>Partial capacity<br>(periodic replacement)                                                          | 1242 16v                                                                                                | 2.8<br>(2.5)(●)                        | 2.5<br>(2.25)(●)    |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1596 16v                                                                                                | 3.5<br>(3.4)(●)                        | 3.1<br>(3.0)(●)     |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1910 JTD                                                                                                | 4.3<br>(4)(●)                          | 3.75<br>(3.55)(●)   |      |
| <br><b>TUTELA CAR</b><br>ZC 75<br>SYNTH                          | <br>               | 1242 16v                                                                                                | 1.65                                   | 1.5                 |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1596 16v                                                                                                | 1.98                                   | 1.8                 |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 1910 JTD                                                                                                |                                        |                     |      |
| <br>a = <b>TUTELA</b><br>GI/A<br><br><br>b = <b>K 854</b>        | <br>a<br><br><br>b | a                                                                                                       | –                                      | 1.2                 |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | b                                                                                                       | –                                      | 0.8                 |      |
| <br><b>TUTELA TOP 4</b>                                                                                                                             | <br>without ABS<br><br>with ABS<br><br>Total capacity                                                  | 0.40                                                                                                    |                                        | –                   |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | 0.45                                                                                                    |                                        | –                   |      |
| <br>+                                                            | <br>             | <br>3%               | 5<br>(6.4 with<br>headlamp<br>washers) |                     | –    |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | <br>~ - 10°C<br>50%  |                                        |                     |      |
|                                                                                                                                                                                                                                        |                                                                                                                                                                                           | <br>~ - 20°C<br>100% |                                        |                     |      |

(\*) For temperatures below -20°C the use of SELENIA PERFORMER SAE 5W-30 is recommended

(\*\*) For temperatures below -15°C the use of SELENIA WR DIESEL SAE 5W-40 is recommended

(■) For versions with air conditioning

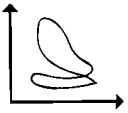
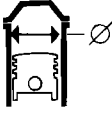
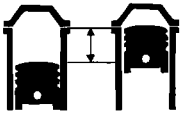
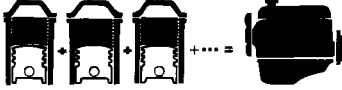
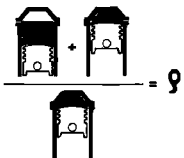
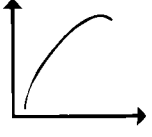
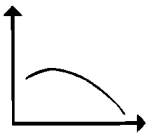
(●) Engine sump only

(▲) Distilled water



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|                               |                                                                                                      |                                                               |
|-------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>SELENIA 20K</b>            | SAE 10W-40 synthetic multigrade engine oil.<br>Exceeds specifications ACEA A3-96/CCMC G5 and API SJ. |                                                               |
| <b>SELENIA PERFORMER</b>      | SAE 5W-30 synthetic multigrade engine oil.<br>Exceeds specifications ACEA A1 and API SJ.             | Temperatures below - 20°C                                     |
| <b>SELENIA TURBO DIESEL</b>   | SAE 10W-40 synthetic multigrade engine oil.<br>Exceeds specifications ACEA B3 and API CD.            |                                                               |
| <b>SELENIA WR DIESEL</b>      | SAE 5W-40 synthetic multigrade engine oil.<br>Exceeds specifications ACEA B3 and API CF.             | Temperatures below - 15°C                                     |
| <b>TUTELA CAR ZC 75 SYNTH</b> | SAE 75W-80EP oil. Satisfies standards MIL-L-2105 D LEV and API GL5.                                  | Manual gearboxes and differentials.                           |
| <b>TUTELA GI/A</b>            | ATF DEXRON II D LEV type oil, SAE 10W for hydraulic power assisted steering.                         | Hydraulic power assisted steering                             |
| <b>TUTELA MRM2</b>            | Water repellent, lithium soap based grease containing molybdenum disulphide, consistency NLGI = 2    | Constant velocity joints                                      |
| <b>TUTELA TOP 4</b>           | Synthetic fluid, NHTSA n° 116 DOT 4 ISO 4925, SAE J-1703 and CUNA NC 956-01.                         | Hydraulic brakes and hydraulically operated clutches          |
| <b>DP1</b>                    | Mixture of alcohol, water and surface active agents CUNA NC 956-11                                   | To be used undiluted or diluted in wind-screen washer systems |
| <b>Paraflu<sup>11</sup></b>   | Anti-freeze for cooling systems with mono-ethylene glycol base CUNA NC 956-16                        | Cooling circuits. Percentage to be used 50% up to -35°C       |
| <b>DIESEL MIX</b>             | Additive for diesel fuel with protective action for Diesel engines                                   | To be mixed with diesel fuel (25 cc per 10 litres)            |

| SPECIFICATIONS                                                                      |                       |                                          |  |  16v |  16v |
|-------------------------------------------------------------------------------------|-----------------------|------------------------------------------|--|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|    | Cycle                 | OTTO 4 stroke                            |  |                                                                                        |                                                                                         |
|                                                                                     | Timing                | twin overhead camshafts                  |  |                                                                                        |                                                                                         |
|                                                                                     | Type of fuel system   | Integrated electronic injection/ignition |  |                                                                                        |                                                                                         |
|                                                                                     |                       |                                          |  | BOSCH ME 7.3H4                                                                         | Weber-Marelli                                                                           |
|    | No. of cylinders      |                                          |  | 4                                                                                      | 4                                                                                       |
|    | Cylinder liner (bore) | mm                                       |  | 70.80                                                                                  | 80.50                                                                                   |
|   | Stroke                | mm                                       |  | 78.86                                                                                  | 78.40                                                                                   |
|  | Capacity              | cm <sup>3</sup>                          |  | 1242                                                                                   | 1596                                                                                    |
|  | Compression ratio     |                                          |  | 10.6±0.2                                                                               | 10.5±0.15                                                                               |
|  | Max torque CEE        | kW (bhp)                                 |  | 59 (80)                                                                                | 76 (103)                                                                                |
|                                                                                     |                       | rpm                                      |  | 5000                                                                                   | 5750                                                                                    |
|  | Max torque CEE        | daNm (kgm)                               |  | 11.4 (11.6)                                                                            | 14.5 (14.8)                                                                             |
|                                                                                     |                       | rpm                                      |  | 4000                                                                                   | 4000                                                                                    |

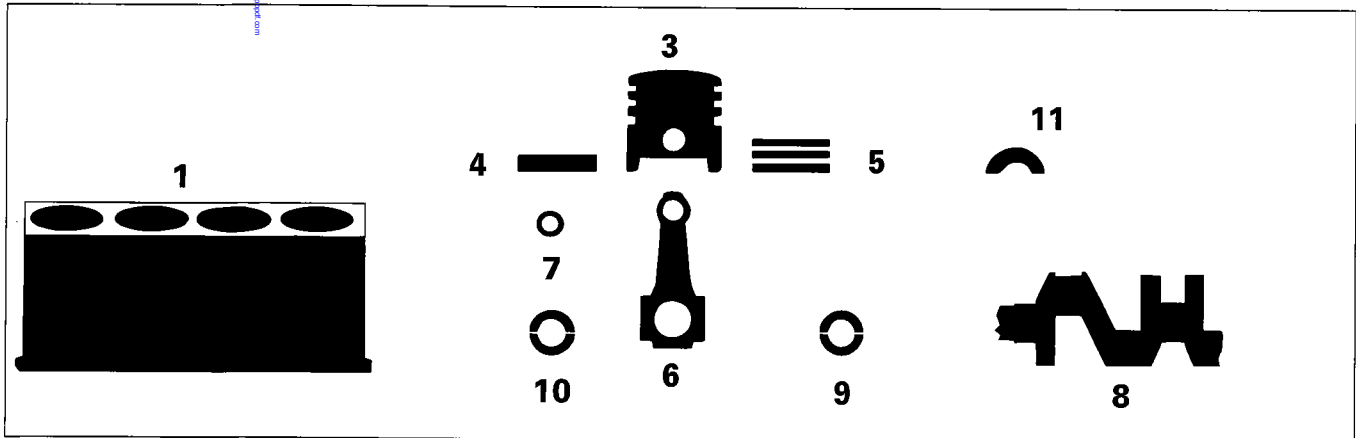
# Technical Data

**Bravo-Brava**

Engine: cylinder block/crankcase, crankshaft and associated

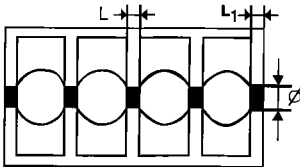
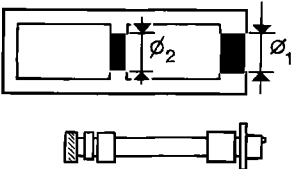
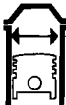
2000 range

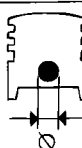
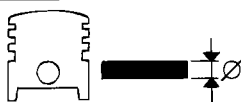
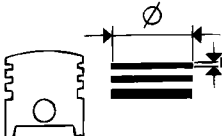
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## DESCRIPTION

Values in mm

|                                                                                                                             |                |                 |               |               |
|-----------------------------------------------------------------------------------------------------------------------------|----------------|-----------------|---------------|---------------|
| <br>Main journals                         | L              | 19.140-19.200   | —             |               |
|                                                                                                                             | L <sub>1</sub> | —               | 22.140-22.200 |               |
|                                                                                                                             | Ø {            | 1               | 51.705-51.709 | 54.507-54.520 |
|                                                                                                                             |                | 2               | 51.709-51.713 |               |
|                                                                                                                             |                | 3               | 51.713-51.717 |               |
| <br>Auxiliary shaft bush housings        | Ø <sub>1</sub> | —               | 38.700-38.730 |               |
|                                                                                                                             | Ø <sub>2</sub> | —               | 35.036-35.066 |               |
|  Cylinder liner/bore                     | Ø (A)          | A 70.800-70.810 | 80.500-80.510 |               |
|                                                                                                                             | B              | 70.810-70.820   | 80.510-80.520 |               |
|                                                                                                                             | C              | 70.820-70.830   | 80.520-80.530 |               |
| <br>Piston                               | X              | 6               | 9.7           |               |
|                                                                                                                             | Ø { (A)        | A               | 70.760-70.770 | 80.452-80.462 |
|                                                                                                                             |                | B               | 70.770-70.780 | 80.459-80.471 |
|                                                                                                                             |                | C               | 70.780-70.790 | 80.468-80.478 |
| Ø                                        |                | 0.4             |               |               |
| <br>Difference in weight between pistons | ± 5 g          |                 |               |               |

|             |                                                                                     |                                                   |                                                                                     |  16v            |  16v |             |
|-------------|-------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------|
| DESCRIPTION |                                                                                     |                                                   |                                                                                     | Values in mm                                                                                      |                                                                                         |             |
| 3-1         |    | Piston<br>Cylinder liner                          | $\varnothing$ <div><div>A</div><div>B</div><div>C</div></div>                       | 0.030-0.050                                                                                       | 0.038-0.058                                                                             |             |
|             |                                                                                     |                                                   |                                                                                     |                                                                                                   | 0.039-0.061                                                                             |             |
|             |                                                                                     |                                                   |                                                                                     |                                                                                                   | 0.042-0.062                                                                             |             |
| 3           |    | Gudgeon pin housing                               | $\varnothing$                                                                       | 17.982-17.986                                                                                     | 20.997-21.001                                                                           |             |
| 4           |    | Gudgeon pin                                       | $\varnothing$                                                                       | 17.970-17.974                                                                                     | 20.990-20.995                                                                           |             |
|             |                                                                                     |                                                   |                                                                                     | $\varnothing$    | 0.2                                                                                     |             |
| 4-3         |   | Gudgeon pin – Housing                             |                                                                                     | 0.008-0.016                                                                                       | 0.002-0.011                                                                             |             |
| 3           |  | Piston ring<br>grooves                            |  | 1                                                                                                 | 1.190-1.230                                                                             | 1.225-1.245 |
|             |                                                                                     |                                                   |                                                                                     | 2                                                                                                 | 1.190-1.230                                                                             | 1.210-1.230 |
|             |                                                                                     |                                                   |                                                                                     | 3                                                                                                 | 2.490-2.530                                                                             | 2.010-2.030 |
| 5           |  | Piston rings                                      | $L$ <div><div>1</div><div>2</div><div>3</div></div>                                 | 1                                                                                                 | 1.170-1.190                                                                             | 1.175-1.190 |
|             |                                                                                     |                                                   |                                                                                     | 2                                                                                                 | 1.175-1.190                                                                             | 1.175-1.190 |
|             |                                                                                     |                                                   |                                                                                     | 3                                                                                                 | 2.475-2.490                                                                             | 1.975-1.990 |
|             |                                                                                     |                                                   |                                                                                     | $\varnothing$  | 0.2-0.4-0.6                                                                             |             |
| 5-3         |  | Piston rings<br>Piston ring grooves               |  | 1                                                                                                 | 0-0.06                                                                                  | 0.035-0.070 |
|             |                                                                                     |                                                   |                                                                                     | 2                                                                                                 | 0-0.055                                                                                 | 0.020-0.055 |
|             |                                                                                     |                                                   |                                                                                     | 3                                                                                                 | 0-0.055                                                                                 | 0.020-0.055 |
| 5-1         |  | Opening at end of<br>grooves<br>in cylinder liner |  | 1                                                                                                 | 0.200-0.400                                                                             | 0.150-0.350 |
|             |                                                                                     |                                                   |                                                                                     | 2                                                                                                 | 0.250-0.450                                                                             | 0.200-0.400 |
|             |                                                                                     |                                                   |                                                                                     | 3                                                                                                 | 0.200-0.450                                                                             | 0.200-0.450 |
| 6           |  | Small end bush or<br>pin housing                  | $\varnothing_1$                                                                     | 17.939-17.956                                                                                     | 23.939-23.972                                                                           |             |
|             |  | Big end bearing<br>pins                           | $\varnothing_2$                                                                     | 45.128-45.138                                                                                     | 48.630-48.642                                                                           |             |

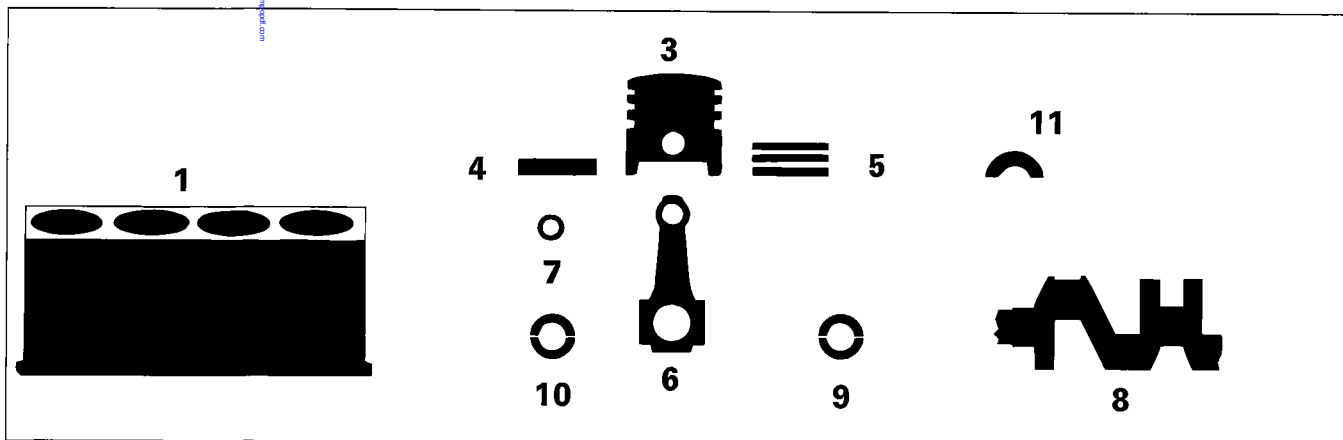
# Technical Data

**Bravo- Brava**

Engine: cylinder block/crankcase, crankshaft and associated

2000 range

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1242 16v

1596 16v

## DESCRIPTION

Values in mm

|     |  |                                 |    |    |               |               |
|-----|--|---------------------------------|----|----|---------------|---------------|
| 7   |  | Small end bush                  |    | Ø1 | —             | 24.016-24.041 |
|     |  |                                 |    | Ø2 | —             | 21.004-21.009 |
| 4-7 |  | Gudgeon pin –<br>Small end bush |    |    | —             | 0.009-0.019   |
| 7-6 |  | Small end bush<br>Bush housing  |    |    | —             | 0.044-0.102   |
| 8   |  | Main journals                   | Ø1 | 1  | 47.982-47.988 | 50.794-50.800 |
|     |  |                                 |    | 2  | 47.988-47.994 | 50.787-50.793 |
|     |  |                                 |    | 3  | 47.994-48.000 | 50.780-50.786 |
|     |  | Crank pins                      | Ø2 | A  | 41.990-42.008 | 45.518-45.523 |
|     |  |                                 |    | B  | —             | 45.510-45.517 |
|     |  |                                 |    | C  | —             | 45.503-45.509 |
|     |  |                                 |    | L  | —             | 26.975-27.025 |
| 9   |  | Crankshaft bearings             | L  | 1  | 1.836-1.840   | 1.840-1.844   |
|     |  |                                 |    | 2  | 1.843-1.847   | 1.844-1.848   |
|     |  |                                 |    | 3  | 1.848-1.852   | 1.850-1.854   |
|     |  |                                 |    |    | 0.254-0.508   |               |
|     |  |                                 |    |    | Ø FIAT <      |               |

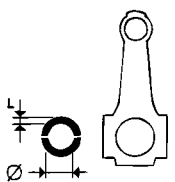
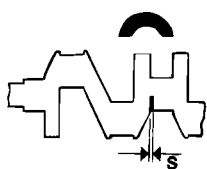
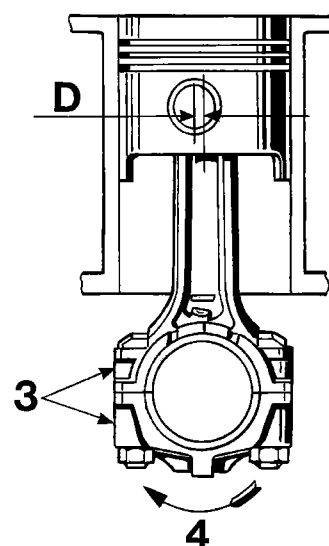
|             |                                                                                                                       |  8v |  16v |
|-------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| DESCRIPTION |                                                                                                                       | Values in mm                                                                          |                                                                                         |
| <b>9-8</b>  |  Crankshaft bearings - Main journals | 0.025-0.040                                                                           | 0.019-0.046                                                                             |
| <b>10</b>   | Big end bearings<br>                 | L<br>1.544-1.548                                                                      | 1.537-1.541                                                                             |
|             |                                                                                                                       |                                                                                       | 1.540-1.544                                                                             |
|             |                                                                                                                       |                                                                                       | 1.544-1.549                                                                             |
|             |                                      | 0.254 - 0.508                                                                         |                                                                                         |
| <b>10-8</b> |  Crankshaft bearings - Main journals | A                                                                                     | 0.024-0.060                                                                             |
|             |                                                                                                                       | B                                                                                     | —                                                                                       |
|             |                                                                                                                       | C                                                                                     | —                                                                                       |
| <b>11</b>   | Thust washers<br>                  | S                                                                                     | 2.310-2.360                                                                             |
|             |                                                                                                                       | 0.127                                                                                 |                                                                                         |
| <b>11-8</b> |  Crankshaft endfloat               | 0.055-0.265                                                                           | 0.055-0.265                                                                             |

Diagram showing fitting of connecting rod-piston assembly and direction of rotation in engine

- Area where number of cylinder liner/bore to which connecting rod belongs is stamped
- Direction of rotation of engine  
(The arrow shows the direction of rotation of the engine as seen from the timing side)

Value (in mm) of offset between connecting rod axis and piston axis

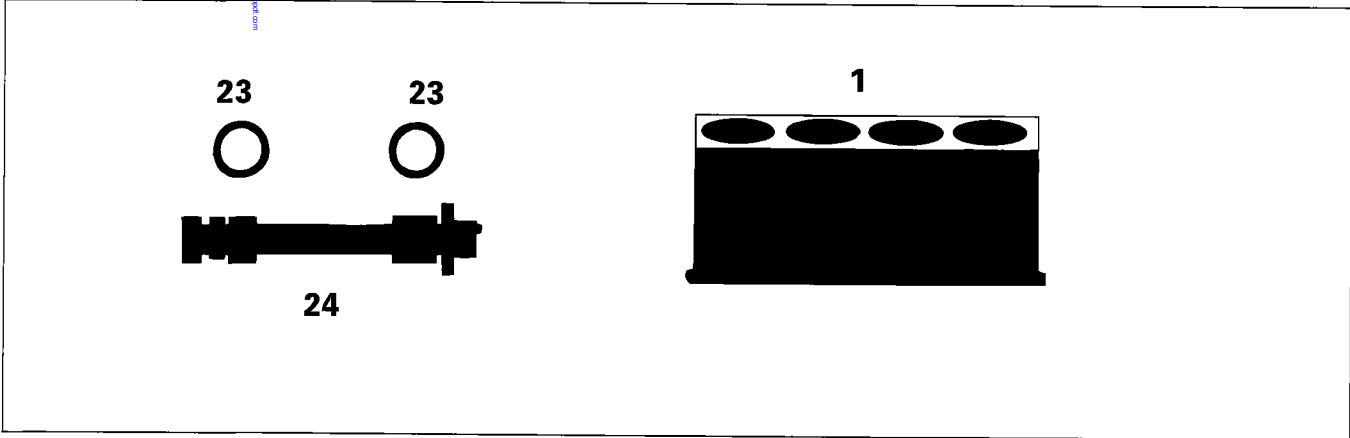
D=0.85-1.15 (for 1242 16v)



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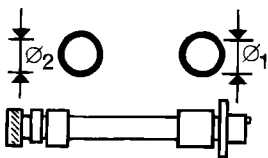
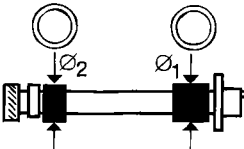


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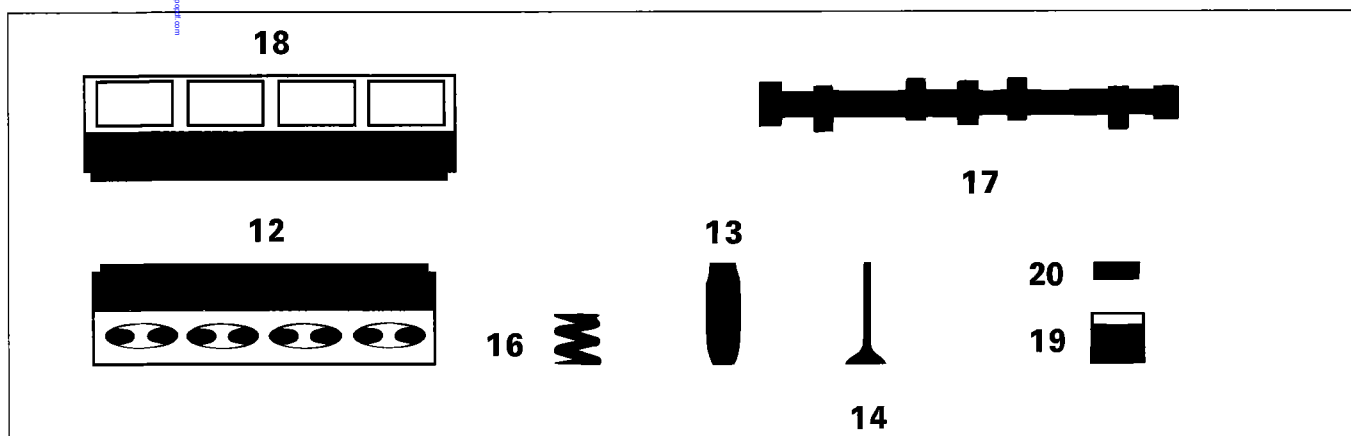


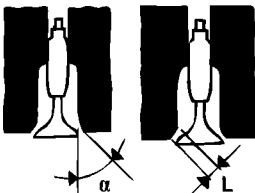
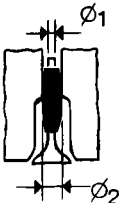
DESCRIPTION

Values in mm

|       |                                                                                     |                                                                                        |               |
|-------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------|
| 23    |   | Ø1    | 35.664-35.684 |
|       |                                                                                     | Ø2  | 32.000-32.020 |
| 24    |  | Ø1                                                                                     | 35.593-35.618 |
|       |                                                                                     | Ø2                                                                                     | 31.940-31.960 |
| 23-1  |  | should always be interference                                                          |               |
| 24-23 |  | Ø1                                                                                     | 0.046-0.091   |
|       |                                                                                     | Ø2                                                                                     | 0.040-0.080   |





|                                                                                     |                                                                                                                                                                                        |                                                                                                      |  8v                                                                                      |  16v |                |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------|
| DESCRIPTION                                                                         |                                                                                                                                                                                        |                                                                                                      | Values in mm                                                                                                                                                               |                                                                                         |                |
| 12                                                                                  |                                                                                                      | Valve guide bore<br>in cylinder head                                                                 | Ø                                                                                                                                                                          | 9.959-9.989                                                                             | 12.950-12.977  |
|                                                                                     |                                                                                                     | Valve seat                                                                                           | α {                                                                                     | 45°±20'                                                                                 | 45°±5'         |
|                                                                                     |                                                                                                                                                                                        |                                                                                                      |                                                                                         | 45°±20'                                                                                 | 45°±5'         |
|                                                                                     |                                                                                                                                                                                        |                                                                                                      | L {                                                                                     | 1,5                                                                                     | about 2        |
|  |                                                                                                                                                                                        |                                                                                                      |                                                                                                                                                                            |                                                                                         |                |
|  | Volume of combustion<br>chamber in cylinder<br>head                                                                                                                                    | cm <sup>3</sup>                                                                                      | 12.28                                                                                                                                                                      | 33.3 (●)                                                                                |                |
| 13                                                                                  |                                                                                                     | Valve guide                                                                                          | Ø <sub>1</sub>                                                                          | 6.022-6.040                                                                             | 7.022-7.040    |
|                                                                                     |                                                                                                                                                                                        | Ø <sub>2</sub> {  | 10.010-10.030                                                                                                                                                              | 13.010-13.030                                                                           |                |
|                                                                                     | Ø <sub>2</sub>   |                                                                                                      |                                                                                                                                                                            | —                                                                                       | 0.05-0.10-0.25 |
| 13-12                                                                               |                                                                                                     | Valve guide<br>Seat in cylinder head                                                                 | <br> | 0.049-0.051                                                                             | 0.033-0.080    |

(●) Indicative value

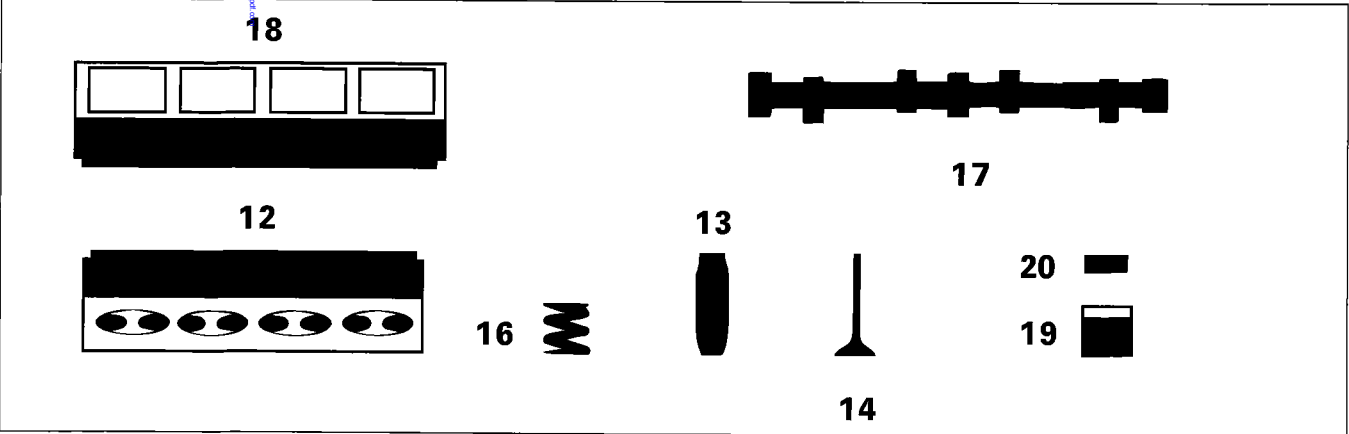
# Technical Data

Engine: cylinder head and valve gear timing components

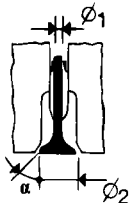
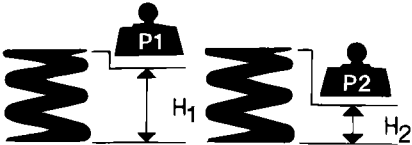
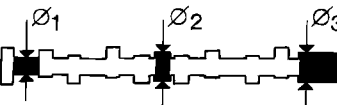
Bravo- Brava

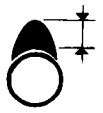
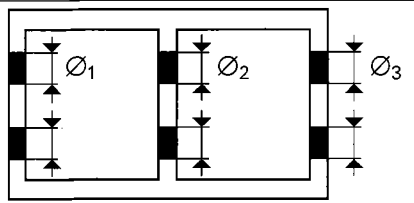
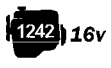
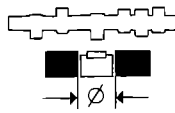
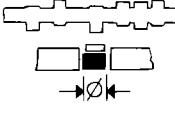
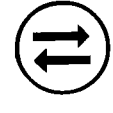
2000 range

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## DESCRIPTION

|                   |                                                                                     |                                                                                     |                                                                                                                                                                            |                 |                 |               |
|-------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|---------------|
| 14                |   | Valves                                                                              |                                                                                          | Ø <sub>1</sub>  | 5.974-5.992     | 6.982-7.000   |
|                   |                                                                                     |                                                                                     |                                                                                                                                                                            | Ø <sub>2</sub>  | 22.250-22.550   | 30.200-30.500 |
|                   |                                                                                     |                                                                                     |                                                                                                                                                                            | α               | —               | 45° 30' ± 5'  |
|                   |                                                                                     |                                                                                     |                                                                                         | Ø <sub>1</sub>  | 5.974-5.992     | 6.974-6.992   |
|                   |                                                                                     |                                                                                     |                                                                                                                                                                            | Ø <sub>2</sub>  | 22.250-22.550   | 29.750-30.050 |
|                   |                                                                                     |                                                                                     |                                                                                                                                                                            | α               | —               | 45° 30' ± 5'  |
| 14-13             |  | Valve<br>Valve guide                                                                | <br> | 0.030-0.066     | 0.022-0.058     |               |
|                   |                                                                                     |                                                                                     |                                                                                                                                                                            |                 | 0.030-0.066     |               |
| 16                |  | Valve spring                                                                        | P <sub>1</sub>                                                                                                                                                             | 22.5 daN        | 25.00-28.00 daN |               |
|                   |                                                                                     |                                                                                     | H <sub>1</sub>                                                                                                                                                             | 31              | 34.6            |               |
|                   |                                                                                     |                                                                                     | P <sub>2</sub>                                                                                                                                                             | 42.3 daN        | 59.2-65.0 daN   |               |
|                   |                                                                                     |                                                                                     | H <sub>2</sub>                                                                                                                                                             | 23              | 26              |               |
| 17a               |  |  | Ø <sub>1</sub>                                                                                                                                                             | 35.000-35.015   | 29.944-29.960   |               |
|                   |                                                                                     |                                                                                     | Ø <sub>2</sub>                                                                                                                                                             | 48.000-48.015   | 52.400-52.415   |               |
|                   |                                                                                     |                                                                                     | Ø <sub>3</sub>                                                                                                                                                             | 49.000 - 49.015 | 52.800-52.815   |               |
| 17b               |  |  | Ø <sub>4</sub>                                                                                                                                                             | —               | 53.200-53.215   |               |
|                   |                                                                                     |                                                                                     | Ø <sub>5</sub>                                                                                                                                                             | —               | 53.600-53.615   |               |
| Camshaft bearings |                                                                                     |                                                                                     |                                                                                                                                                                            |                 |                 |               |

|                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  8v  16v |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| DESCRIPTION                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Values in mm                                                                                                                                                                  |               |
| <b>17</b>  Cam lift                                                                                                                                            | <br>                                                                                                                                                                                                                                                                          | 7.5                                                                                                                                                                           | 8.5           |
|                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 7.5                                                                                                                                                                           | 8             |
| <b>12</b><br><b>17a</b>  Camshaft bearings<br>Cylinder head supports                                                                                           | Ø <sub>1</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.030-0.070                                                                                                                                                                   | —             |
|                                                                                                                                                                                                                                                 | Ø <sub>2</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.030-0.070                                                                                                                                                                   |               |
|                                                                                                                                                                                                                                                 | Ø <sub>3</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.030-0.070                                                                                                                                                                   |               |
| <b>18</b> <br> Camshaft supports in camshaft housing                         |  Ø <sub>1</sub>                                                                                                                                                                                                                                                                                                                                                | 35.045-35.070                                                                                                                                                                 | 29.989-30.014 |
|                                                                                                                                                                                                                                                 | Ø <sub>2</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                  | 48.045-48.070                                                                                                                                                                 | 52.445-52.470 |
|                                                                                                                                                                                                                                                 |  Ø <sub>3</sub>                                                                                                                                                                                                                                                                                                                                              | 49.045-49.070                                                                                                                                                                 | 52.845-52.870 |
|                                                                                                                                                                                                                                                 | Ø <sub>4</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                  | —                                                                                                                                                                             | 53.245-53.270 |
|                                                                                                                                                                                                                                                 | Ø <sub>5</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                  | —                                                                                                                                                                             | 53.645-53.670 |
|  Tappet housings                                                                                                                                             | Ø                                                                                                                                                                                                                                                                                                                                                                                                                                               | 28.400-28.421                                                                                                                                                                 | 33.000-33.025 |
| <b>17-18</b>  Camshaft bearings<br>Camshaft housing supports                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                 | —                                                                                                                                                                             | 0.030-0.070   |
| <b>19</b>  Tappet                                                                                                                                            | Ø                                                                                                                                                                                                                                                                                                                                                                                                                                               | 28.354-28.370                                                                                                                                                                 | 32.959-32.975 |
| <b>19-18</b>  Tappet - Housing in<br>camshaft housing                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.046-0.051                                                                                                                                                                   | 0.025-0.066   |
| <b>17-20</b>  clearance for<br>timing check<br><br> operational clearance | <br><br><br><br> | 0.45                                                                                                                                                                          |               |
|                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Hydraulic tappets                                                                                                                                                             |               |

# Technical Data

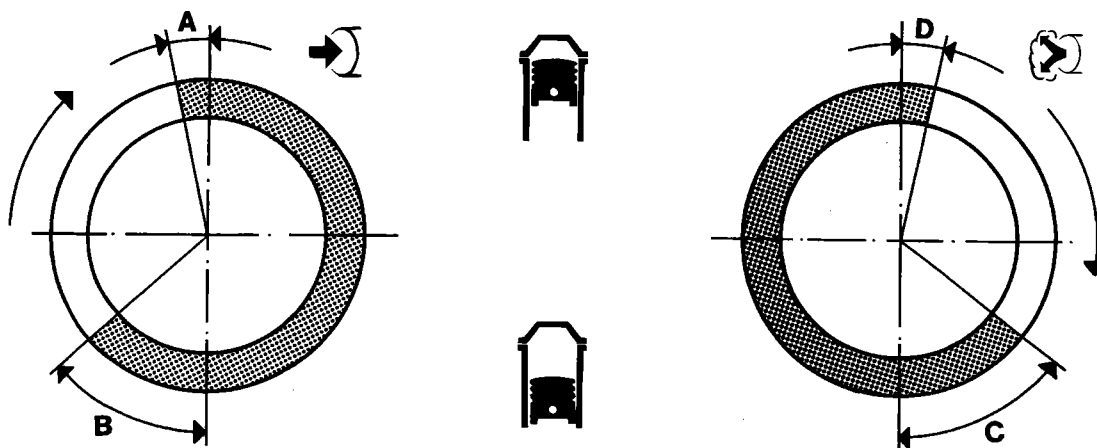
Engine: cylinder head and valve gear timing components

**Bravo-Brava**

2000 range

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## TIMING DIAGRAMS

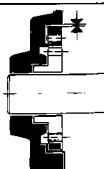
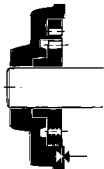
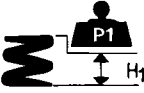


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## TIMING ANGLES

|          |         |                  | 16v | 16v |
|----------|---------|------------------|-----|-----|
| <b>A</b> | Inlet   | opens before TDC | 0°  | 0°  |
| <b>B</b> |         | closes after BDC | 32° | 34° |
| <b>C</b> | Exhaust | opens before BDC | 32° | 24° |
| <b>D</b> |         | closes after TDC | 0°  | 0°  |



|                                                                                                                                                                                                                                                             |                                                        |  16v |  16v |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------|
| LUBRICATION                                                                                                                                                                                                                                                 |                                                        | Values in mm                                                                           |                                                                                         |          |
| Engine lubrication circuit                                                                                                                                                                                                                                  |                                                        | forced circulation, via lobe geared pump with cartridge filter in series               | forced circulation, via geared pump with cartridge oil filter in series                 |          |
| Oil pump                                                                                                                                                                                                                                                    |                                                        | lobe gears                                                                             | geared, located in the crankshaft front cover                                           |          |
| Pump operation                                                                                                                                                                                                                                              |                                                        | by crankshaft                                                                          | by chain driven by crankshaft                                                           |          |
| Oil pressure relief valve                                                                                                                                                                                                                                   |                                                        | incorporated in crankshaft front cover                                                 |                                                                                         |          |
| Full flow filter                                                                                                                                                                                                                                            |                                                        | —                                                                                      | cartridge                                                                               |          |
| Insufficient oil pressure sender unit                                                                                                                                                                                                                       |                                                        | —                                                                                      | electrical                                                                              |          |
|                                                                                                                                                                           | between pump casing housing and driven gear            | 0.100 - 0.210                                                                          | —                                                                                       |          |
|                                                                                                                                                                          | between edge of gears and pump casing                  | —                                                                                      | 0.110 - 0.180                                                                           |          |
|                                                                                                                                                                          | between the upper edge of the gears and the pump cover | 0.025-0.070                                                                            | —                                                                                       |          |
|                                                                                                                                                                          | between upper edge of gears and pump casing            | —                                                                                      | 0.040 - 0.106                                                                           |          |
| Full flow filter                                                                                                                                                                                                                                            |                                                        | cartridge                                                                              |                                                                                         |          |
| Insufficient oil pressure sender unit                                                                                                                                                                                                                       |                                                        | electrical                                                                             |                                                                                         |          |
|                                                                                                                                                                          | Between drive gear and driven gear                     | 0.030                                                                                  |                                                                                         |          |
|    | when idling                                            | >0.7 bar                                                                               | >1 bar                                                                                  |          |
| Operating pressure at a temperature of 100°C                                                                                                                                                                                                                |                                                        | at 4000 rpm                                                                            | >4 bar                                                                                  | >4.5 bar |
|                                                                                                                                                                          | P <sub>1</sub>                                         | 11.73 - 12.51 daN                                                                      | 9.0-9.8 daN                                                                             |          |
| Oil pressure relief valve spring                                                                                                                                                                                                                            |                                                        | H <sub>1</sub>                                                                         | 35                                                                                      | 31       |

# Technical Data

Engine: cooling system – fuel system

**Bravo-Brava**

2000 range

00.10

## COOLING SYSTEM



|                                                           |                                                                                                     |            |                |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------|----------------|
| Cooling circuit                                           | coolant circulation via centrifugal pump, radiator, expansion tank and fan operated by control unit |            |                |
| Water pump operated                                       | by belt                                                                                             |            |                |
| Engagement of fan controlled by control unit              |                    | 1st stage  | 90° ÷ 94°C     |
|                                                           |                                                                                                     | 2nd stage  | 95° ÷ 99°C (●) |
|                                                           |                    | 1st stage  | 85° ÷ 89°C     |
|                                                           |                                                                                                     | 2nd stage  | 90° ÷ 94°C (●) |
| Engine coolant thermostat                                 | opens                                                                                               | 81° ÷ 85°C |                |
|                                                           | max opening                                                                                         | 103°C      | 99°-103°C      |
|                                                           | valve travel                                                                                        | 9.5 mm     |                |
| Fitting clearance between impeller vanes and pump casing  |                  | –          | 0.3-1.1 mm     |
| Pressure for checking system water tightness              | 0.98 bar                                                                                            |            |                |
| Pressure for checking exhaust valve on expansion tank cap | 0.98 bar                                                                                            |            |                |

(●) For versions with air conditioning

## FUEL SYSTEM

|                                 |                                                                |                                                                   |
|---------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------|
| Make                            | Integrated electronic injection/ignition<br>MPI-BOSCH ME 7.3H4 | Integrated electronic injection/ignition<br>MPI IAW Weber-Marelli |
| Electric                        | electrical immersed in the tank                                |                                                                   |
| Output                          | ≥ 110 l/h                                                      | ≥ 120 l/h                                                         |
| Fuel pressure regulator setting | 3 bar                                                          |                                                                   |

**ELECTRONIC INJECTION SYSTEM COMPONENTS**

|                                                                  |  16v |  16v |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Injection/ignition system electronic control unit                | Bosch ME7.3H4                                                                          | I.A.W. 4EF.B1                                                                           |
| Throttle case                                                    | –                                                                                      | M. Marelli 46 SXF2                                                                      |
| Idle adjustment actuator                                         | DV-E5                                                                                  | M. Marelli IB 02                                                                        |
| Absolute pressure sensor                                         | Bosch 0.261.230.030                                                                    | M. Marelli TPRT 05                                                                      |
| Injector                                                         | Bosch 0.280.155.816                                                                    | M. Marelli IWP 109                                                                      |
| Fuel pump                                                        | MSS 071                                                                                | Marwall ESS 291                                                                         |
| Fuel pressure regulator                                          | RPM 40                                                                                 | Marwall RPM 84                                                                          |
| Engine coolant temperature sensor                                | SYLEA 402.386.01                                                                       | SYLEA 402.386.01                                                                        |
| Lambda sensor                                                    | Bosch LSF 4.2 (*) (●)                                                                  | NTK OZA 534 (*)                                                                         |
|                                                                  |                                                                                        | NTK OZA 532 (●)                                                                         |
| Fuel vapour solenoid valve                                       | –                                                                                      | M. Marelli EC2                                                                          |
| Detonation sensor                                                | –                                                                                      | NGK KNE 11                                                                              |
| Timing sensor                                                    | Bosch PG 3.5                                                                           | SYLEA SFA 200                                                                           |
| Top Dead Centre and rpm sensor                                   | Bosch DG6                                                                              | M. Marelli CVM 02                                                                       |
| Throttle valve position sensor                                   | –                                                                                      | M. Marelli IPF 2C                                                                       |
| Fuel filter                                                      | FI 03                                                                                  | Marwall FA 5325 IN                                                                      |
| Ignition coil                                                    | Bosch 0.221.503.407                                                                    | Champion BAE 920A                                                                       |
| Dual relay for electric pump and injection-ignition control unit | NDRS 240103                                                                            | –                                                                                       |

(\*) Upstream of the catalyzer

(●) Downstream of the catalyzer



# Technical Data

Engine

**Bravo- Brava**

2000 range

00.10

Scanned with CamScanner

## SPECIFICATIONS

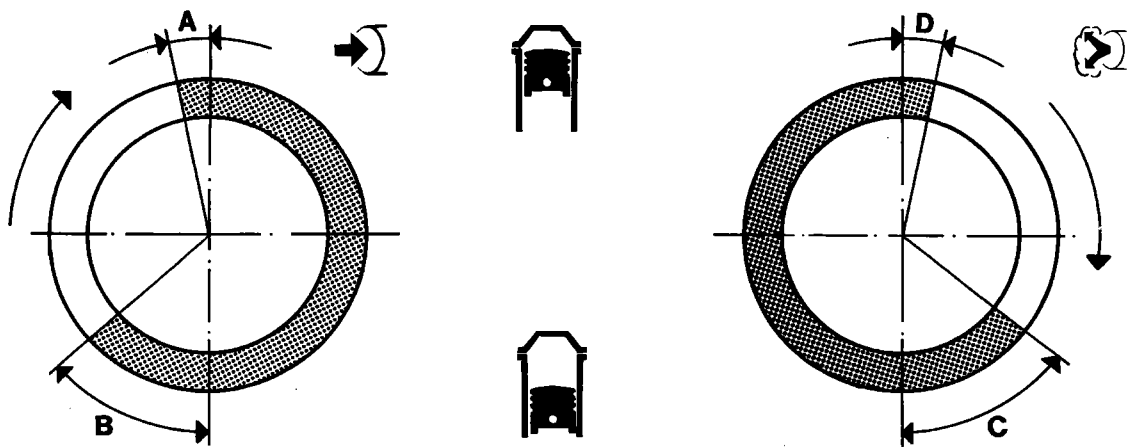


|                                 |                       |                                               |             |
|---------------------------------|-----------------------|-----------------------------------------------|-------------|
|                                 | Cycle                 | DIESEL 4 stroke                               |             |
|                                 | Timing                | Single overhead camshaft                      |             |
|                                 | Type of fuel system   | Direct injection – Turbocharger + intercooler |             |
|                                 | No. of cylinders      | 4                                             |             |
|                                 | Cylinder liner (bore) | mm                                            | 82          |
|                                 | Stroke                | mm                                            | 90.4        |
|                                 | Capacity              | cm <sup>3</sup>                               | 1910        |
|                                 | Compression ratio     | 18.45±0.45                                    |             |
| Total combustion chamber volume |                       | cm <sup>3</sup>                               | 27.35       |
|                                 | Max torque CEE        | kW (bhp)                                      | 74 (100)    |
|                                 |                       | rpm                                           | 4000        |
|                                 | Max torque CEE        | daNm (kgm)                                    | 20.0 (20.4) |
|                                 |                       | rpm                                           | 1500        |

CYLINDER HEAD GASKET  JTD

| Average-maximum piston projection (mm) | Cylinder head gasket size (mm) | N° of cylinder head gasket references |
|----------------------------------------|--------------------------------|---------------------------------------|
| 0.014-0.104                            | 0.770-0.870                    | 0                                     |
| 0.105-0.205                            | 0.870-0.970                    | 1                                     |
| 0.206-0.294                            | 0.970-1.070                    | 2                                     |

TIMING DIAGRAMS



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|          |                                                                                             |                     |     |
|----------|---------------------------------------------------------------------------------------------|---------------------|-----|
| <b>A</b> | Inlet    | opens before T.D.C. | 0°  |
| <b>B</b> |                                                                                             | closes after B.D.C. | 32° |
| <b>C</b> | Exhaust  | opens before B.D.C. | 40° |
| <b>D</b> |                                                                                             | closes after T.D.C. | -2° |

# Technical Data

## Engine: supercharging - fuel system

**Bravo- Brava****2000 range****00.10**

**SUPERCHARGING** Turbocharger operated by exhaust gases with waste-gate pressure valve and air/air heat exchanger (intercooler)

### COOLING SYSTEM

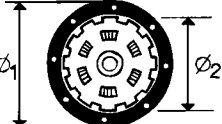
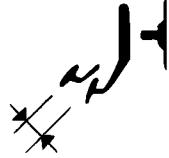


|                                |              |
|--------------------------------|--------------|
| Turbocharger: type             | Garret GT 14 |
| Maximum supercharging pressure | 1 bar        |

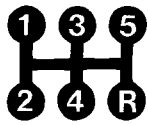
### BOSCH COMMON RAIL ELECTRONIC FUEL SYSTEM COMPONENTS



|                                   |                                                  |
|-----------------------------------|--------------------------------------------------|
| Control unit                      | Bosch 0.281.010.341                              |
| Flow meter                        | Bosch 0.281.002.309                              |
| Engine coolant temperature sensor | SYLEA 402.386.01                                 |
| Diesel temperature sensor         | Bosch 0.281.002.209                              |
| Rpm sensor                        | Bosch 0.281.002.214<br>or<br>Bosch 0.281.002.474 |
| Timing sensor                     | Bosch 0.281.002.213                              |
| Turbocharger pressure sensor      | Bosch 0.281.002.215                              |
| Fuel pressure sensor              | Bosch 0.281.002.405                              |
| Injector                          | Bosch 0.445.110.068                              |
| Pre-heating control unit          | Bosch 0.281.003.018                              |
| Heater plugs                      | Bosch 0.250.202.036                              |
| E.G.R. solenoid valve             | Pierburg 7.22946.04                              |
| Intake throttle solenoid valve    | Pierburg 7.28286.00                              |
| Waste gate solenoid valve         | Pierburg 7.28148.00                              |
| Fuel pressure regulator           | Bosch 0.281.002.488                              |

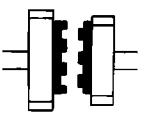
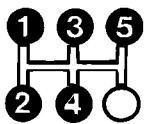
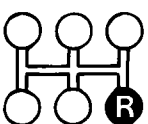
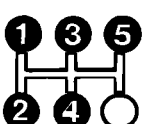
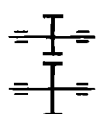
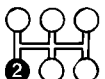
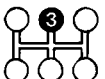
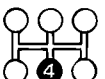
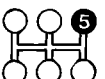
|                                                                                                                                                           |                                                                                   |  16v                                |  16v |  JTD |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                                                                                                                                                           |                                                                                   | Values in mm                                                                                                         |                                                                                         |                                                                                         |
| Make                                                                                                                                                      |                                                                                   | <br>dry, single plate with bearing |                                                                                         |                                                                                         |
| Operating mechanism                                                                                                                                       |  | <br>Spring                        |                                                                                         |                                                                                         |
| Spring loading                                                                                                                                            | daN                                                                               | 400                                                                                                                  | 450                                                                                     | 500                                                                                     |
| <br>Driven disc                                                        | Ø <sub>1</sub>                                                                    | 190                                                                                                                  | 200                                                                                     | 230                                                                                     |
|                                                                                                                                                           | Ø <sub>2</sub>                                                                    | 134                                                                                                                  | 137                                                                                     | 155                                                                                     |
| <br>Distance between pedal in end of travel position and rest position |                                                                                   | 144.5                                                                                                                | 170±10                                                                                  | 144.5                                                                                   |
| Clutch release                                                                                                                                            |                                                                                   | hydraulic                                                                                                            | mechanical                                                                              | hydraulic                                                                               |

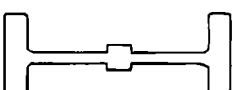
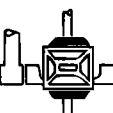
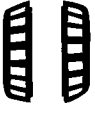
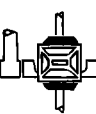
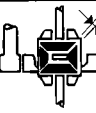
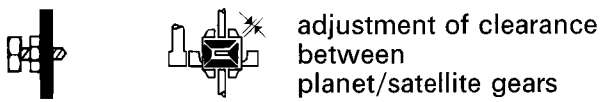
00.21-27

|                                                                                       |                                                                                         |                                                                                         |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  16v |  16v |  JTD |
|    |                                                                                         |                                                                                         |

| Make | C.514.5.13 | C.513.5.13 | C.510.5.17 |
|------|------------|------------|------------|
|------|------------|------------|------------|

### GEARBOX

|                                                                                                                                                                                        |                                                                                                              |                                                                                       |       |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------|-------|
| <br>Synchronizers                                                                                     | spring ring (Porsche type)  | —                                                                                     |       |       |
|                                                                                                                                                                                        | baulk ring                  |    |       |       |
| <br>Gears                                                                                           | straight toothed           |   |       |       |
|                                                                                                                                                                                        | helical toothed           |  |       |       |
|  <br>Gear ratios |                           | 3.909                                                                                 | 3.909 | 3.909 |
|                                                                                                                                                                                        |                           | 2.158                                                                                 | 2.238 | 2.238 |
|                                                                                                                                                                                        |                           | 1.345                                                                                 | 1.444 | 1.444 |
|                                                                                                                                                                                        |                           | 0.974                                                                                 | 1.029 | 1.029 |
|                                                                                                                                                                                        |                           | 0.829                                                                                 | 0.816 | 0.767 |
|                                                                                                                                                                                        |                           | 3.818                                                                                 | 3.909 | 3.909 |

| DIFFERENTIAL                                                                                                                               |                                                                                                                          |  16v                       |  16v  |  JTD        |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|                                                           |  Ratio crown wheel and pinion reduction | 3.867<br>(15/58)                                                                                             | 3.353<br>(17/57)                                                                         | 3.053<br>(19/58)                                                                               |
|                                                           |  Ratio at the wheels                    |  15.116                     |  13.107 |  11.934       |
|                                                                                                                                            |                                                                                                                          |  8.345                      |  7.504  |  6.833        |
|                                                                                                                                            |                                                                                                                          |  5.201                      |  4.842  |  4.408        |
|                                                                                                                                            |                                                                                                                          |  3.766                      |  3.450  |  3.141        |
|                                                                                                                                            |                                                                                                                          |  3.206                      |  2.736  |  2.342        |
|                                                                                                                                            |                                                                                                                          |  14.764                     |  13.107 |  11.934       |
|  Differential internal housing bearing                   |                                                                                                                          |  conical roller bearings |                                                                                          |                                                                                                |
|  Adjustment of bearing pre-loading                      |                                                                                                                          |  by shims               |                                                                                          |                                                                                                |
|  Thickness of shims                                     |                                                                                                                          | 0.05                                                                                                         |                                                                                          | 1.70 - 2.60                                                                                    |
|                                                                                                                                            |                                                                                                                          | 0.10                                                                                                         |                                                                                          | 2.00 - 3.00                                                                                    |
|  Interference to obtain exact bearing pre-loading       |                                                                                                                          | bearings not loaded = 0.12<br>bearings loaded (350 daN) = 0.08                                               |                                                                                          |                                                                                                |
|  Clearance planet/satellite gears                       |                                                                                                                          | ≤0.10                                                                                                        |                                                                                          |                                                                                                |
|  adjustment of clearance between planet/satellite gears |                                                                                                                          | No adjustment is carried out                                                                                 |                                                                                          |  by shims |
|  Thickness of shims                                     |                                                                                                                          | 0.05                                                                                                         |                                                                                          | 0.80-1.25                                                                                      |

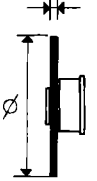
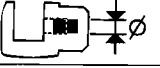
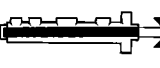
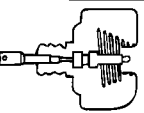
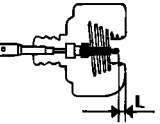
00.33

1242 16v

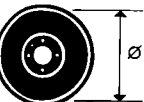
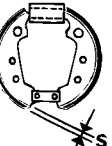
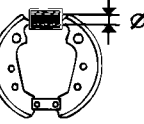
1596 16v

1910 JTD

### FRONT BRAKES

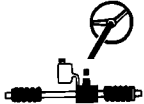
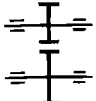
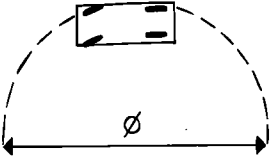
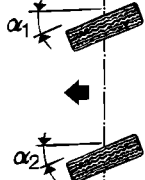
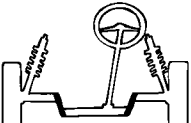
|                                                                                     |                                                                          |               |                                                                                   | Values in mm                                |               |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------|---------------------------------------------|---------------|
|    | Disc                                                                     | $\varnothing$ |                                                                                   | 257                                         | 257           |
|                                                                                     |                                                                          | S             |  | 11.80-12.10                                 | 19.80-20.10   |
|                                                                                     |                                                                          |               |  | 11.10                                       | 18.55         |
|                                                                                     |                                                                          |               | allowed                                                                           | 10.20                                       | 18.20         |
|    | Brake pads                                                               | S             | allowed                                                                           | 1,5                                         |               |
|    | Caliper                                                                  | $\varnothing$ |                                                                                   | 54                                          |               |
|    | Master cylinder (pump)                                                   | $\varnothing$ |                                                                                   | 22.225 (7/8")                               | 22.225 (7/8") |
|   | Brake servo                                                              |               |                                                                                   | Iso-Vac 8" vacuum acting on all four wheels |               |
|  | Distance of hydraulic piston push rod from master cylinder support plate | L             |                                                                                   | 22.45-22.65                                 |               |

### REAR BRAKES

|                                                                                     |                          |               |                                                                                     |                                    |               |               |
|-------------------------------------------------------------------------------------|--------------------------|---------------|-------------------------------------------------------------------------------------|------------------------------------|---------------|---------------|
|  | Drum                     | $\varnothing$ |  | 203.10-203.40<br>180.00-180.25 (*) | 203.10-203.40 | 203.10-203.40 |
|                                                                                     |                          |               |  | 180.95                             | 204.10        | 204.10        |
|                                                                                     |                          |               | allowed                                                                             | 181.35                             | 204.70        | 204.70        |
|  | Shoes                    | S             | allowed                                                                             | 1,5                                |               |               |
|  | Cylinders                | $\varnothing$ |                                                                                     | 22.00                              |               |               |
|  | Load proportioning valve |               |                                                                                     | acting on the rear wheels          |               |               |
|                                                                                     | Ratio (reduction)        |               |                                                                                     | 0.36                               |               |               |

(\*) Version without ABS



|                                                                                                              |                                                                                                                |  16v                                 |  16v |  JTD |
|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Make                                                                                                         |                                                                                                                | <br>rack and pinion power assisted |                                                                                         |                                                                                         |
| <br>Ratio                   | <br>no. of turns lock to lock | 3                                                                                                                     |                                                                                         |                                                                                         |
|                                                                                                              | <br>rack travel               | 142±1.5 mm                                                                                                            |                                                                                         |                                                                                         |
| <br>Minimum turning circle |                                                                                                                | 10.4 m                                                                                                                |                                                                                         |                                                                                         |
| <br>Steering angle        | outer wheel $\alpha_1$                                                                                         | 31°30' ±30'                                                                                                           |                                                                                         |                                                                                         |
|                                                                                                              | inner wheel $\alpha_2$                                                                                         | 38°15' ±30'                                                                                                           |                                                                                         |                                                                                         |
| <br>Steering column       |                                                                                                                | <br>with 2 universal joints      |                                                                                         |                                                                                         |

# Technical Data

## Wheels

## Bravo- Brava

2000 range

00.44

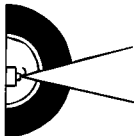
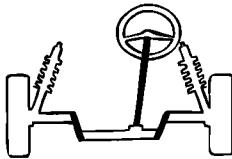
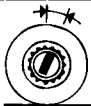
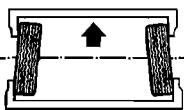
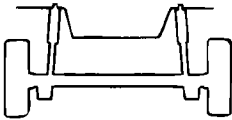
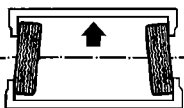
| ENGINE TYPE                                                                                  | <br>Wheel rim type | <br>Tubeless, radial type tyre | <br>Pressure tyres in bar |            |              |            |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------|--------------|------------|
|                                                                                              |                                                                                                     |                                                                                                                 | Front                                                                                                       |            | Rear         |            |
|                                                                                              |                                                                                                     |                                                                                                                 | average load                                                                                                | heavy load | average load | heavy load |
|  1242 16v   | Bravo<br>5½Jx14 H2-37<br>6Jx15 H2-40                                                                | 175/65 R14-82T                                                                                                  | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H                                                                                                  | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 175/65 R14-82Q (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              | Brava<br>5½Jx14 H2-37<br>6Jx15 H2-40<br>6Jx14 H2-43                                                 | 175/65 R14-82T                                                                                                  | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H                                                                                                  | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 175/65 R14-82Q (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|  1596 16v | Bravo<br>5½Jx14 H2-37<br>6Jx14 H2-43<br>6Jx15 H2-40                                                 | 185/60 R14-82H                                                                                                  | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H                                                                                                  | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 185/60 R14-82T (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              | Brava<br>5½Jx14 H2-37<br>6Jx14 H2-43<br>6Jx15 H2-40                                                 | 175/65 R14-82T                                                                                                  | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H                                                                                                  | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 175/65 R14-82Q (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.2          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H (M+S) (●)                                                                                        | 2.2                                                                                                         | 2.3        | 2.3          | 2.5        |
|  1910 JTD | Bravo<br>5½Jx14 H2-37<br>6Jx14 H2-43<br>6Jx15 H2-40                                                 | 185/60 R14-82H                                                                                                  | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H                                                                                                  | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 185/60 R14-82T (M+S) (●)                                                                                        | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H (M+S) (●)                                                                                        | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              | Brava<br>5½Jx14 H2-37<br>6Jx14 H2-43<br>6Jx15 H2-40                                                 | 185/60 R14-82H                                                                                                  | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H                                                                                                  | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 185/60 R14-82T (M+S) (●)                                                                                        | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
|                                                                                              |                                                                                                     | 185/55 R15-81H (M+S) (●)                                                                                        | 2.3                                                                                                         | 2.3        | 2.3          | 2.5        |
| SPARE WHEEL (*)                                                                              | 4.00Bx14 H-43                                                                                       | 105/70 R14-84M                                                                                                  | 4.2                                                                                                         |            |              |            |
|                                                                                              |                                                                                                     | 135/80 R14-80P                                                                                                  | 2.8                                                                                                         |            |              |            |
|                                                                                              | 4.00Bx15 H-35                                                                                       | 115/70 R15-90M(▲)                                                                                               | 4.2                                                                                                         |            |              |            |

(\*) Speed limit: 80 km/h

(●) Winter tyres

(▲) For versions with optional 15" alloy wheels

**WHEEL GEOMETRY**

|                                                                                                         |                              |                                                                                     |                                                                                                            |  |
|---------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--|
|                                                                                                         |                              |    | <br>unladen vehicle (■) |  |
| <br>Front suspension   | camber (**)                  |    | $-7' \pm 30'$                                                                                              |  |
|                                                                                                         | caster (**)                  |    | $2^{\circ}50' \pm 30'$                                                                                     |  |
|                                                                                                         | toe in                       |    | $-1 \div 1 \text{ mm}$                                                                                     |  |
|                                                                                                         | Offset front wheels (▲)      |                                                                                     | $0^{\circ}$                                                                                                |  |
| <br>Front suspension | camber (**)                  |   | $-0^{\circ}46' \pm 30'$                                                                                    |  |
|                                                                                                         | toe in (**)                  |  | 0-4                                                                                                        |  |
|                                                                                                         | Thrust angle rear wheels (▲) |                                                                                     | $0^{\circ}$                                                                                                |  |

(\*\*) Angles cannot be adjusted

(■) With the tyres inflated to the correct pressure and the vehicle in running order with 5 litres of fuel

(▲) Angular values, which cannot be adjusted, used for the correct alignment of the vehicle

# Technical Data

## Front suspension

**Bravo- Brava**

**2000 range**

### 00.44

**Front suspension** independent, Mac Pherson type with forged steel track control arms secured to an auxiliary crossmember. Offset coil springs and double acting, telescopic, hydraulic dampers. Anti-roll torsion bar.

| Coil springs                                                         |                                | ENGINE TYPE           |  8v |  16v |  JTD |
|----------------------------------------------------------------------|--------------------------------|-----------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Diameter of wire                                                     | mm                             |                       | 12.3±0.05                                                                             | 12.3±0.05                                                                               | 12.7±0.05<br>(12.9±0.05)*                                                               |
| Number of coils                                                      |                                |                       | 3.75                                                                                  |                                                                                         |                                                                                         |
| Direction of coil                                                    |                                |                       | clockwise                                                                             |                                                                                         |                                                                                         |
| Height of spring released                                            | mm                             |                       | 437.4 (449)*                                                                          | 449 (461)*                                                                              | 474 (449)*                                                                              |
| Height of spring under a load of:                                    | 289-319 daN<br>(306-332 daN) * | mm                    | 192                                                                                   | —                                                                                       | —                                                                                       |
|                                                                      | 306-332 daN<br>(320-346 daN)*  | mm                    | —                                                                                     | 192                                                                                     | —                                                                                       |
|                                                                      | 352±382 daN<br>(366±396 daN)*  | mm                    | —                                                                                     | —                                                                                       | 192                                                                                     |
| The springs are divided into two categories, identifiable by a mark: |                                |                       |                                                                                       |                                                                                         |                                                                                         |
| yellow (1) for those under a load of:                                | 304 daN<br>(319 daN)*          | having a height of mm | >192                                                                                  | —                                                                                       | —                                                                                       |
|                                                                      | 319 daN<br>(333.5 daN)*        | having a height of mm | —                                                                                     | >192                                                                                    | —                                                                                       |
|                                                                      | 367 daN<br>(381 daN)*          | having a height of mm | —                                                                                     | —                                                                                       | >192                                                                                    |
| green (1) for those under a load of:                                 | 304 daN<br>(319 daN)*          | having a height of mm | ≤192                                                                                  | —                                                                                       | —                                                                                       |
|                                                                      | 319 daN<br>(333.5 daN)*        | having a height of mm | —                                                                                     | ≤192                                                                                    | —                                                                                       |
|                                                                      | 367 daN<br>(381 daN)*          | having a height of mm | —                                                                                     | —                                                                                       | ≤192                                                                                    |

(1) Springs of the same type must be fitted.

(\*) For vehicles with air conditioning

### Shock absorbers

|                                |    |                  |
|--------------------------------|----|------------------|
| Type:                          |    | low pressure gas |
| Open (start of damping action) | mm | 518 ±2.5         |
| Closed (metal against metal)   | mm | 361 ±2.5         |
| Stroke                         | mm | 157              |

### Anti-roll bar

|                        |    |    |    |    |
|------------------------|----|----|----|----|
| Anti-roll bar diameter | mm | 22 | 22 | 23 |
|------------------------|----|----|----|----|

**Rear suspension** independent with spheroid cast iron track control arms. Coil springs and shock absorbers with vulcanized bushes. Anti-roll torsion bar. Rigid H-shaped auxiliary frame consisting of a transverse tubular element and two pressed side members connected to each other.

**Coil springs**

|                                                                      |   | VERSIONS                      | BRAVO                                                                                  |                          |                                                                                        | BRAVA |                                                                                          |     |                                                                                          |            |                                                                                          |     |                                                                                          |     |
|----------------------------------------------------------------------|---|-------------------------------|----------------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------|-----|
|                                                                      |   |                               |  1242 | 16v                      |  1596 | 16v   |  1910 | JTD |  1242 | 16v        |  1596 | 16v |  1910 | JTD |
| Coil springs                                                         |   |                               |                                                                                        |                          |                                                                                        |       |                                                                                          |     |                                                                                          |            |                                                                                          |     |                                                                                          |     |
| Diameter of wire                                                     |   |                               | mm                                                                                     |                          | 11.15±0.05<br>(11.35±0.05)*                                                            |       |                                                                                          |     |                                                                                          | 11.35±0.05 |                                                                                          |     |                                                                                          |     |
| Number of coils                                                      |   |                               |                                                                                        |                          | 4.25                                                                                   |       |                                                                                          |     |                                                                                          | 4.25       |                                                                                          |     |                                                                                          |     |
| Direction of coil                                                    |   |                               |                                                                                        |                          | clockwise                                                                              |       |                                                                                          |     |                                                                                          |            |                                                                                          |     |                                                                                          |     |
| Height of spring released                                            |   |                               | mm                                                                                     |                          | 311 (310)*                                                                             |       |                                                                                          |     |                                                                                          | 310        |                                                                                          |     |                                                                                          |     |
| Height of spring under a load of:                                    | { | 273-295 daN<br>(289-313 daN)* |                                                                                        | mm                       | 194                                                                                    |       |                                                                                          |     |                                                                                          | –          |                                                                                          |     |                                                                                          |     |
|                                                                      |   | 289-313 daN                   |                                                                                        | mm                       | –                                                                                      |       |                                                                                          |     |                                                                                          | 194        |                                                                                          |     |                                                                                          |     |
| The springs are divided into two categories, identifiable by a mark: |   |                               |                                                                                        |                          |                                                                                        |       |                                                                                          |     |                                                                                          |            |                                                                                          |     |                                                                                          |     |
| yellow (1) for those under a load of:                                | { | 284 daN<br>(301 daN)*         |                                                                                        | having a height of<br>mm | >194                                                                                   |       |                                                                                          |     |                                                                                          | –          |                                                                                          |     |                                                                                          |     |
|                                                                      |   | 301 daN                       |                                                                                        | having a height of<br>mm | –                                                                                      |       |                                                                                          |     |                                                                                          | >194       |                                                                                          |     |                                                                                          |     |
| green (1) for those under a load of:                                 | { | 284 daN<br>(301 daN)*         |                                                                                        | having a height of<br>mm | ≤194                                                                                   |       |                                                                                          |     |                                                                                          | –          |                                                                                          |     |                                                                                          |     |
|                                                                      |   | 301 daN                       |                                                                                        | having a height of<br>mm | –                                                                                      |       |                                                                                          |     |                                                                                          | ≤194       |                                                                                          |     |                                                                                          |     |

(1) Springs of the same category must be fitted.

(\*) For 1910 JTD vehicles with air conditioning.

**Shock absorbers**

|                                 |    |                  |          |
|---------------------------------|----|------------------|----------|
| Type: double acting, telescopic |    | low pressure gas |          |
| Open (start of damping action)  | mm | 322.5 ±2         | 322.5 ±2 |
| Closed (metal against metal)    | mm | 223 ±2           | 223 ±2   |
| Travel                          | mm | 99.5             | 99.5     |

**Anti-roll bar**

|                        |    |     |
|------------------------|----|-----|
| Anti-roll bar diameter | mm | 17S |
|------------------------|----|-----|

# Technical Data

## Electrical system

**Bravo- Brava**

**2000 range**

**00.55**

|                          |  16v |  16v |
|--------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>STARTER MOTOR</b>     | M. Marelli E80F-12V-0,9 kW                                                            | Bosch DW-12V-1.1 kW<br>Valeo DGRA-12V-1.3 kW(▲)                                         |
| <b>ALTERNATOR</b>        | M. Marelli A115I-14V-38/65A<br>M. Marelli A115I-14V-85A(●)                            | Bosch KCB1-14V-45/80A<br>Bosch KCB2-14V-50/90A(●)                                       |
| <b>VOLTAGE REGULATOR</b> | Built in electronic                                                                   |                                                                                         |
| <b>BATTERY</b>           | 12V – 40Ah – 200A<br>12V – 50Ah – 250A(*)                                             | 12V-50Ah-250A                                                                           |
| <b>IGNITION SYSTEM</b>   | M.P.I integrated electronic injection/ignition<br>Bosch ME7.3H4                       | I.A.W. 4EF.B1 integrated electronic injection/ignition                                  |
| <b>IGNITION COIL</b>     | Bosch 0.221.503.407                                                                   | Champion BAE 920 A                                                                      |
| <b>SPARK PLUGS</b>       | NGK DCPR8E-N                                                                          | NGK BKR5EZ<br>Champion RC10YCC                                                          |

- (\*) For vehicles equipped with alarm system  
 (●) For vehicles with air conditioning  
 (▲) Supplied as an alternative



|                                                       |                                                                            |
|-------------------------------------------------------|----------------------------------------------------------------------------|
| <b>STARTER MOTOR</b>                                  | BOSCH DIAM 78.5-12V-2,0kW                                                  |
| <b>ALTERNATOR</b>                                     | M. Marelli A115IM – 14V – 55/105A<br>M. Marelli A127IM – 14V – 70/120A (●) |
| <b>VOLTAGE REGULATOR</b>                              | Built in electronic                                                        |
| <b>BATTERY</b>                                        | 12V-60Ah-380A                                                              |
| <b>HEATER PLUGS<br/>ELECTRONIC CONTROL UNIT</b>       | BOSCH 0.281.003.018                                                        |
| <b>ELECTRONIC CONTROL UNIT<br/>ENGINE FUEL SYSTEM</b> | BOSCH 0.281.010.341                                                        |
| <b>HEATER<br/>PLUGS</b>                               | BOSCH 0.250.202.036                                                        |

(●) For vehicles with air conditioning



# Technical Data

Electrical equipment: starting

**Bravo- Brava**

**2000 range**

**00.55**

## STARTER MOTOR



|                                              |                                   |                            |                                                       |           |
|----------------------------------------------|-----------------------------------|----------------------------|-------------------------------------------------------|-----------|
| Make                                         | M. Marelli<br>E80F-12V-<br>0.9 kW | Bosch<br>DW-12V-1.1 kW     | BOSCH DIAM<br>78.5-2.0 kW<br>(with reduction<br>unit) |           |
| Voltage                                      | V                                 | 12                         |                                                       |           |
| Rated power                                  | kW                                | 0.9                        | 1.1                                                   | 2.0       |
| Rotation, pinion side                        | clockwise                         |                            |                                                       |           |
| No. of pole                                  | 4                                 | 6                          | 6                                                     |           |
| Energizing                                   | series                            |                            | permanent<br>magnets                                  |           |
| Engagement                                   | free wheel                        |                            |                                                       |           |
| Operation                                    | solenoid                          |                            |                                                       |           |
| Endfloat of armature shaft                   | mm                                | 0.1-0.5                    |                                                       |           |
| <b>Data for bench test</b>                   |                                   |                            |                                                       |           |
| Operating test (*):                          |                                   |                            |                                                       |           |
| current                                      | A                                 | 180 (200)                  | —                                                     | 500       |
| speed                                        | rpm                               | 1720 (2200)                | —                                                     | 1950      |
| voltage                                      | V                                 | 9.5 (9.8÷10)               | —                                                     | 7.30      |
| torque developed                             | daNm                              | 0.37 (0.38)                | —                                                     | 1.30      |
| Engagement test (*):                         |                                   |                            |                                                       |           |
| current                                      | A                                 | 324 (440)                  | —                                                     | 1200      |
| voltage                                      | V                                 | 7.1 (7.6)                  | —                                                     | 5.5       |
| torque developed                             | daNm                              | ≥0.97 (≥1.25)              | —                                                     | 3.0       |
| Free running test (*):                       |                                   |                            |                                                       |           |
| current                                      | A                                 | 40 (44-48)                 | —                                                     | 70-80     |
| voltage                                      | V                                 | 11.4 (11.4-11.5)           | —                                                     | 11.5      |
| speed                                        | rpm                               | 8500-9000<br>(11400-12300) | —                                                     | 5450-5750 |
| Relay                                        | { pull in Ω                       | 0.30-0.32 (0.32)           | —                                                     | 0.4       |
| Winding resistance (*)                       |                                   | hold in Ω                  | 1.2-1.3 (1.09)                                        | —         |
| <b>Lubrication</b>                           |                                   | VS <sup>+</sup> SAE 10W    |                                                       |           |
| Internal engagement splines and shaft bushes |                                   |                            |                                                       |           |
| Engagement sleeve and intermediate disc      |                                   | TUTELA MR3                 |                                                       |           |

(\*) Data obtained at a temperature of 20°C.

**NOTE** When overhauling it is not necessary to undercut the insulator between the commutator bars.

### ALTERNATOR

|                                                |   |  |  |  |
|------------------------------------------------|---|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Make                                           |   | M. Marelli<br>A115I – 14V –<br>38/65A                                             | Bosch<br>KCB1 – 14V –<br>45/80A                                                     | M. Marelli<br>A115IM – 14V –<br>55/105A                                             |
|                                                |   | M. Marelli<br>A115I – 14V – 85A                                                   | Bosch<br>KCB2 – 14V –<br>50/90A(●)                                                  | M. Marelli<br>A127IM – 14V –<br>70/120A                                             |
| System rated voltage                           | V | 14                                                                                | 14                                                                                  | 14                                                                                  |
| Max current                                    | A | 65 (85)(●)                                                                        | 80 (90)(●)                                                                          | 105 (120)(●)                                                                        |
| Rated current at 1800 rpm                      | A | 38                                                                                | 45 (50)(●)                                                                          | 55 (70)(●)                                                                          |
| Rated current at 6000 rpm                      | A | 65 (85)(●)                                                                        | 80 (90)(●)                                                                          | 100 (120)(●)                                                                        |
| Winding resistance between the slip rings (*)  | Ω | 2.4                                                                               | 2.66-2.94<br>(2.47-2.73)(●)                                                         | 2.6                                                                                 |
| Direction of rotation (seen from control side) |   | clockwise                                                                         |                                                                                     |                                                                                     |
| Power diode rectifiers                         |   | pre-constructed bridge                                                            |                                                                                     |                                                                                     |

(\*) Data obtained at an ambient temperature of 20°C

(●) For vehicles with air conditioning

### VOLTAGE REGULATOR

|                               |     | Built in electronic |      |           |
|-------------------------------|-----|---------------------|------|-----------|
| Make                          |     | RTM 151 A           | BR 1 | RTM 151 B |
| Alternator speed for test     | rpm | 7000                |      |           |
| Thermal stabilization current | A   | –                   |      |           |
| Test current                  | A   | –                   |      |           |
| Regulation voltage (*)        | V   | 14.05-14.35         |      |           |

(\*) Data obtained at an ambient temperature of 23°C

# Technical Data

Electrical equipment: electronic injection/ignition

**Bravo- Brava**

2000 range

**00.55**

## INTEGRATED ELECTRONIC INJECTION/IGNITION INJECTION/IGNITION SYSTEM



|              |               |
|--------------|---------------|
| Make         | Bosch ME7.3H4 |
| Firing order | 1 – 3 – 4 – 2 |

## IGNITION COIL WITH 4 HIGH TENSION INTAKES

|                                               |                      |
|-----------------------------------------------|----------------------|
| Make                                          | Bosch                |
| Type                                          | 0.221.503.407        |
| Ohmic resistance of primary winding at 20°C   | $\Omega$ 0.45-0.55   |
| Ohmic resistance of secondary winding at 20°C | $\Omega$ 12000-14600 |

## TOP DEAD CENTRE AND RPM SENSOR

|                                                           |                  |
|-----------------------------------------------------------|------------------|
| Make and type                                             | Bosch DG6        |
| Sensor winding resistance at 20°C                         | $\Omega$ 486÷594 |
| Distance (gap) between sensor and crankshaft pulley tooth | mm 0.8±1.5       |

## ENGINE ADVANCE

|                                |       |
|--------------------------------|-------|
| With engine idling (820±50rpm) | 9°±4° |
|--------------------------------|-------|

## SPARK PLUGS

|               |              |
|---------------|--------------|
| Make and type | NGK DCPR8E-N |
| Thread        | M14×1.25     |
| Electrode gap | mm 0.8       |

**ELECTRONIC INTEGRATED  
INJECTION/IGNITION SYSTEM**


|              |                                    |
|--------------|------------------------------------|
| Make         | I.A.W. M.P.I. Weber Marelli 4EF.B1 |
| Firing order | 1 – 3 – 4 – 2                      |

**IGNITION COIL WITH 4 HIGH TENSION INTAKES**

|                                               |           |
|-----------------------------------------------|-----------|
| Make                                          | Champion  |
| Type                                          | BAE 920 A |
| Ohmic resistance of primary winding at 20°C   | Ω 0.580   |
| Ohmic resistance of secondary winding at 20°C | Ω 9100    |

**TOP DEAD CENTRE AND RPM SENSOR**

|                                                           |                   |
|-----------------------------------------------------------|-------------------|
| Make and type                                             | M. Marelli CVM 02 |
| Sensor winding resistance at 20°C                         | Ω 575÷750         |
| Distance (gap) between sensor and crankshaft pulley tooth | mm 0.5÷1.5        |

**DETONATION SENSOR**

|      |        |
|------|--------|
| Make | NGK    |
| Type | KNE 11 |

**SPARK PLUGS**

|               |                                |
|---------------|--------------------------------|
| Make and type | NGK BKR5EZ<br>Champion RC10YCC |
| Thread        | M14×1.25                       |
| Electrode gap | mm 0.8                         |

# Technical Data

Electrical equipment: electronic injection

**Bravo- Brava**

2000 range

**00.55**

## BOSCH COMMON RAIL ELECTRONIC FUEL SYSTEM



|                          |                     |
|--------------------------|---------------------|
| Make                     | Bosch 0.281.010.341 |
| Spontaneous firing order | 1 – 3 – 4 – 2       |

## PRE-HEATING CONTROL UNIT

|      |               |
|------|---------------|
| Make | Bosch         |
| Type | 0.281.003.018 |

## TOP DEAD CENTRE AND RPM SENSOR

|                                                              |                                                  |
|--------------------------------------------------------------|--------------------------------------------------|
| Make and type                                                | Bosch 0.281.002.214<br>or<br>Bosch 0.281.002.474 |
| Sensor winding resistance at 20°C $\Omega$                   | 774 - 946                                        |
| Distance (gap) between sensor and crankshaft pulley tooth mm | 0.8 - 1.5                                        |

## TIMING SENSOR

|      |               |
|------|---------------|
| Make | Bosch         |
| Type | 0.281.002.213 |

## HEATER PLUGS

|                                   |                     |
|-----------------------------------|---------------------|
| Make and type                     | Bosch 0.250.202.036 |
| Thread                            | M12×1.25            |
| Electrical gap at 20°C m $\Omega$ | 700                 |

Engine 2000 1242 16v

Engine 2000 1596 16v

Engine 2000 1910 JTD

Engine 99 1747 16v

## **Removing-Refitting**

Engine 98 1242 16v Removing-Refitting

Engine 98 1910 JTD Removing-Refitting

**FUEL SYSTEM**

|                                                                     |   |
|---------------------------------------------------------------------|---|
| - Engine management system                                          | 1 |
| - Location of components in engine compartment                      | 1 |
| - Engine management control unit                                    | 2 |
| - Throttle casing                                                   | 2 |
| - Procedure for learning motorized throttle valve angular positions | 3 |
| - Timing sensor                                                     | 3 |
| - Exhaust manifold with catalytic converter                         | 4 |
| - Exhaust manifold heat shield                                      | 5 |
| - Front Lambda sensor                                               | 5 |
| - Rear Lambda sensor                                                | 6 |
| - Accelerator pedal potentiometer                                   | 7 |
| - Accelerometer on timing side engine support                       | 7 |



## ENGINE MANAGEMENT SYSTEM

### Foreword

The Bravo-Brava 1242 16v vehicle is equipped with a 4 cylinder in line, 16 valve, 1242 cc engine with a twin overhead camshaft and Marelli IAW 4EF integrated electronic injection/ignition system.

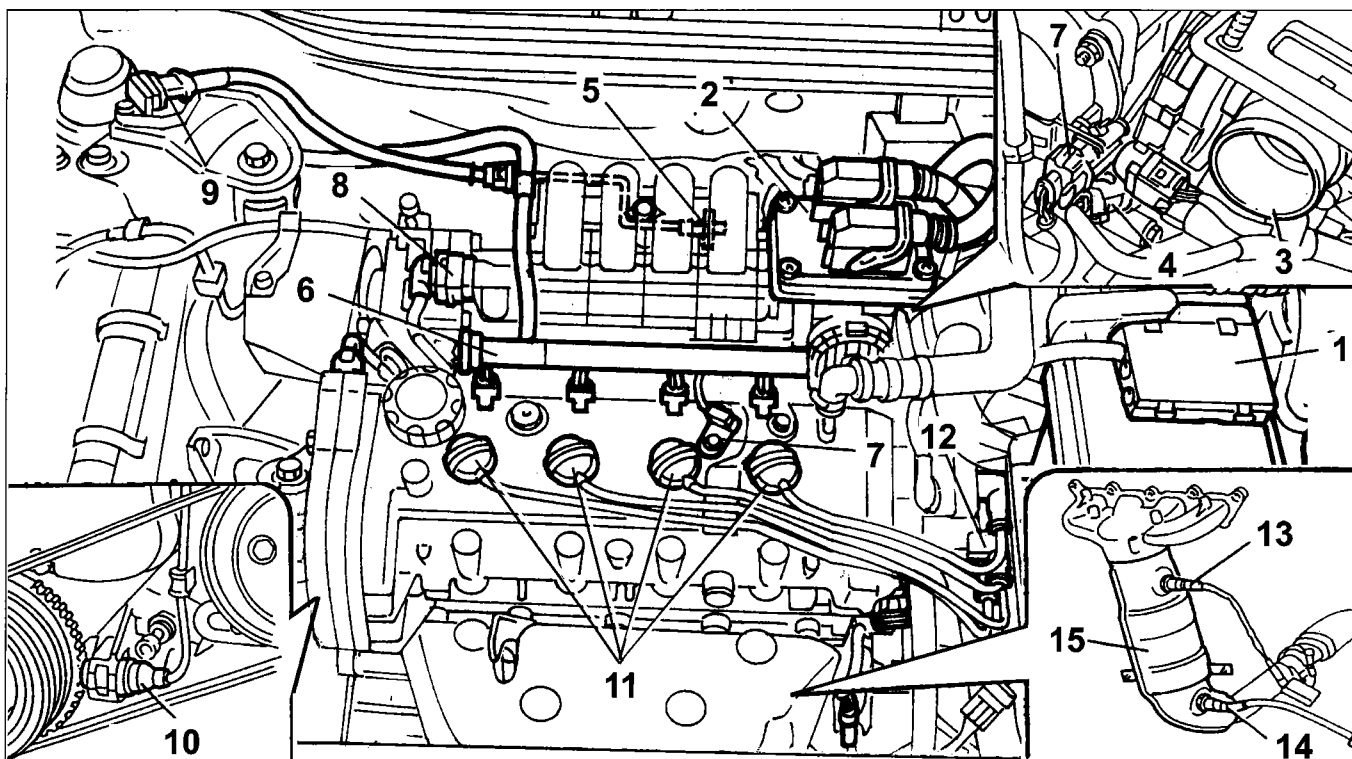
The fuel system differs from the one described for the 1242 16v "99 range" version through the inclusion of several variants designed to make it compatible with the EEC Stage 3 EOBD regulations.

The main modifications to the system can be summarized as follows:

- New engine management control unit with ME7.3H4 code.
- Motorized throttle casing with potentiometer on accelerator pedal.
- Adoption of accelerometer on right front shock absorber attachment turret.
- Catalytic converter near the exhaust manifold to take maximum advantage of the heat of the gases.
- Two Lambda sensors, one upstream (front) and one downstream (rear) which check the quality of the exhaust gases and the operation of the catalyzer.
- Adoption of timing sensor on inlet side timing pulley.
- Adoption of rapid connectors for anti-evaporation system pipes.
- Cap on fuel filler with attachment cable.

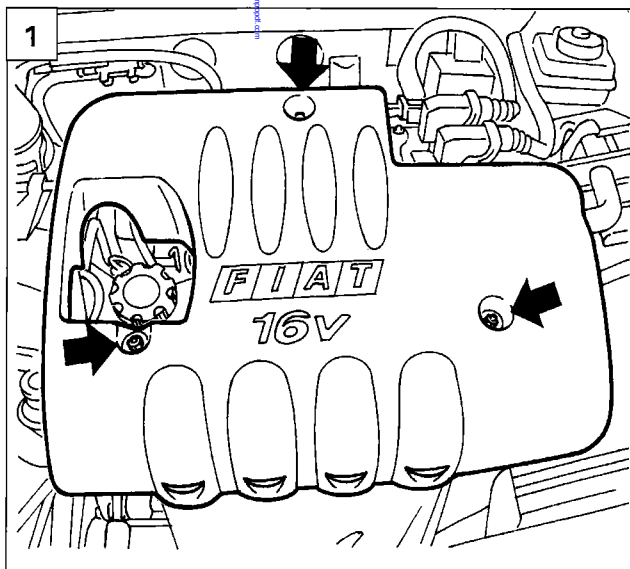
For further information on the fuel system, refer to publication print no. 507137.

### LOCATION OF COMPONENTS IN ENGINE COMPARTMENT

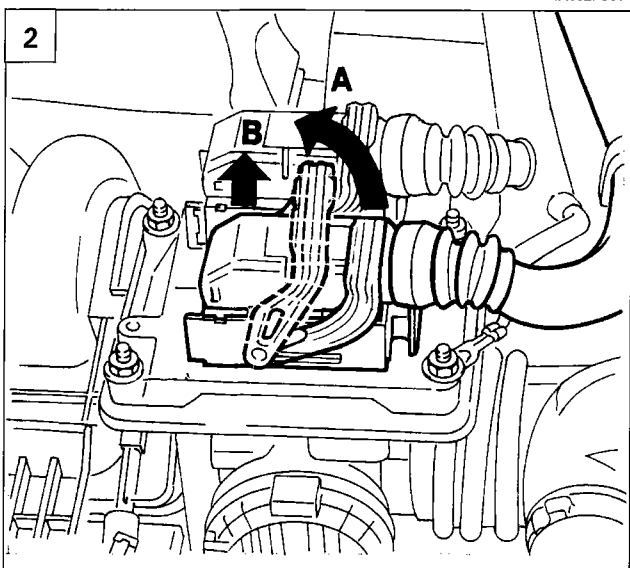


- |                                                 |                              |
|-------------------------------------------------|------------------------------|
| 1. Voltage and fuse box (battery link)          | 11. Spark plugs              |
| 2. Engine management control unit               | 12. Ignition coil            |
| 3. Motorized throttle casing (MDS)              | 13. Upstream Lambda sensor   |
| 4. Engine coolant temperature sensor            | 14. Downstream Lambda sensor |
| 5. Charcoal filter solenoid valve               | 15. Catalytic silencer       |
| 6. Fuel manifold complete with injectors        |                              |
| 7. Engine timing sensor                         |                              |
| 8. Air temperature and absolute pressure sensor |                              |
| 9. Bodyshell acceleration sensor                |                              |
| 10. Engine speed and TDC sensor                 |                              |

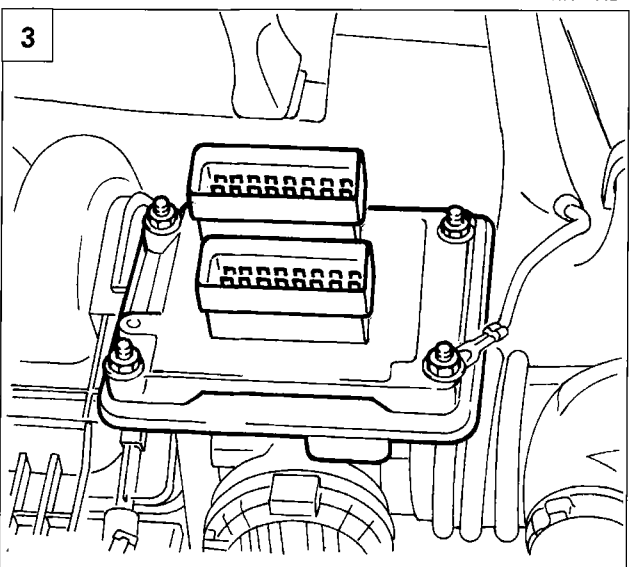
# 10.



4A002PJ01



4A002PJ02



4A002PJ03

## ENGINE MANAGEMENT CONTROL UNIT

### Removing-refitting

- Disconnect the negative battery terminal.
- 1. Detach the engine sound insulation
- 2. Disconnect the control unit electrical connections, proceeding in two stages:
  - A) Turn the metal hook up to release the connection;
  - B) Move the connector away vertically in relation to the control unit.
- 3. Undo the bolts fixing the control unit and remove it.

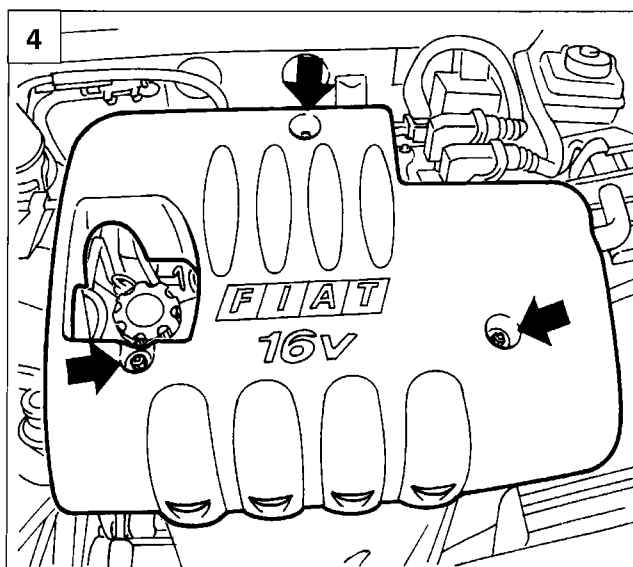
Proceed as follows to refit the connector:

- move the connector into contact with the control unit;
- turn the metal hook until completely closed;
- at the end of the refitting, carry out the throttle valve angular position learning procedure as described in the appropriate paragraph.

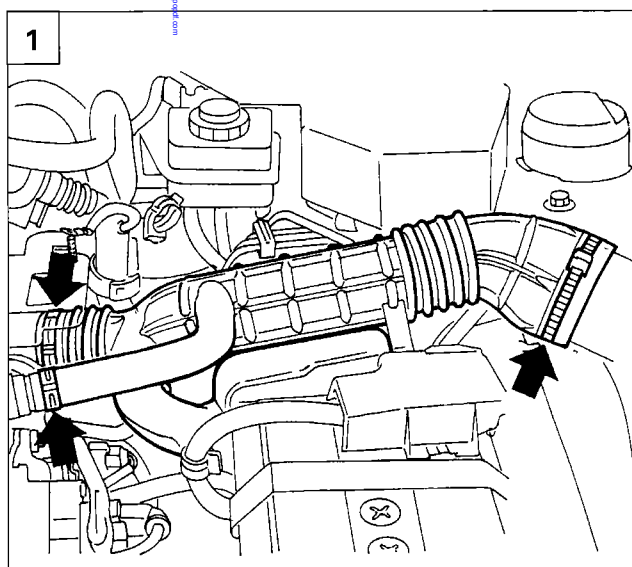
## THROTTLE CASING

### Removing-refitting

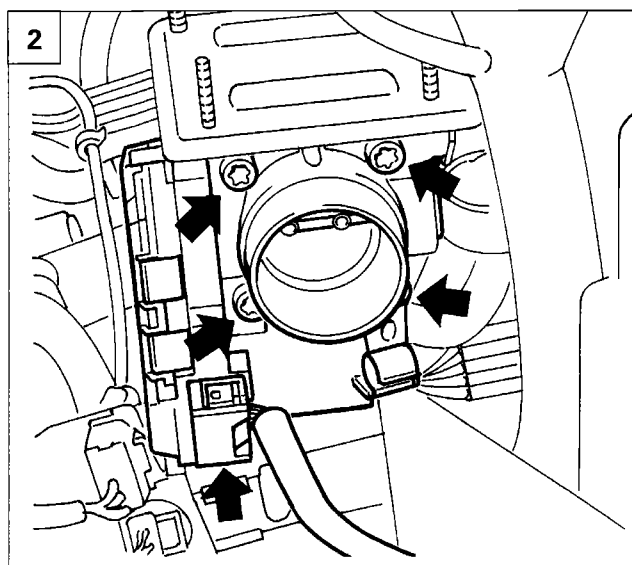
- Disconnect the negative battery terminal.
- 4. Detach the engine sound insulation.
- Disconnect the engine management control unit as described in the appropriate paragraph.



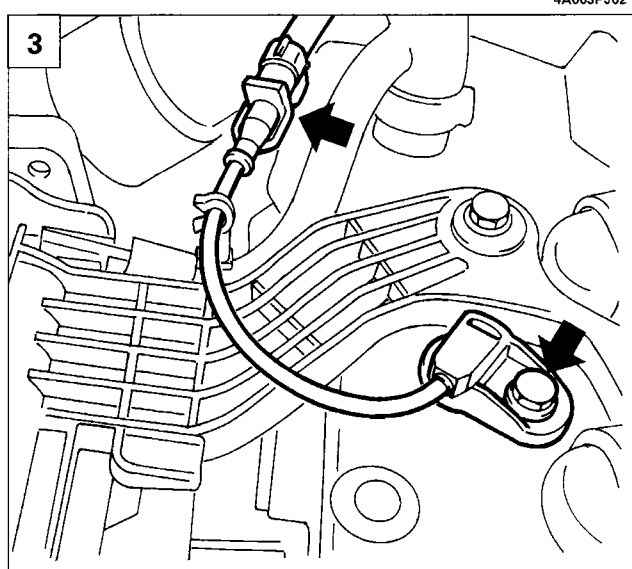
4A002PJ01



4A003PJ01



4A003PJ02



4A003PJ03

1. Disconnect the air pipe from the filter casing to the throttle casing, complete with resonator, after having loosened the bands.
  2. Disconnect the electrical connection for the throttle actuator, undo the fixing bolts and detach the throttle casing.
- at the end of the refitting operation, carry out the throttle valve angular position learning procedure as described in the appropriate paragraph.

### MOTORIZED THROTTLE VALVE ANGULAR POSITION LEARNING PROCEDURE.

#### Procedure with diagnostic equipment

- Connect the diagnostic equipment (Examiner or Examiner Plus) to the standardized socket and turn the ignition switch to the ON position (engine off).
- Wait during the throttle casing check until the diagnostic equipment confirms the positive result of the learning procedure.
- Turn the ignition switch OFF and check that the diagnostic equipment signals the end of the procedure.

#### Manual procedure

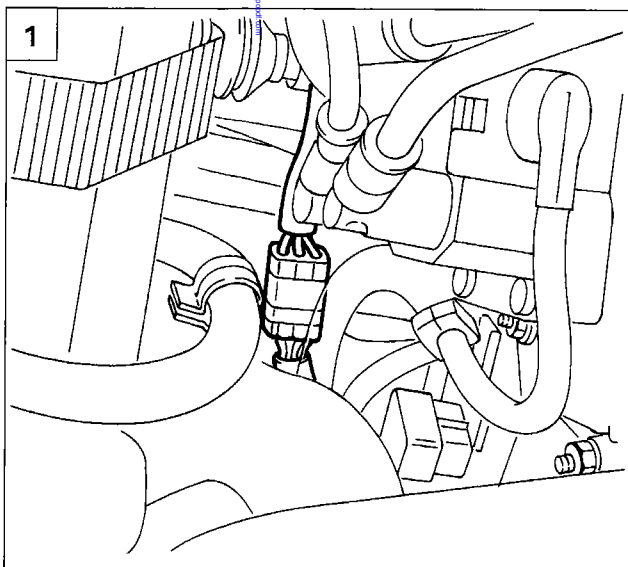
- Turn the ignition switch to the ON position (engine off).
- Wait for 45 seconds (the time whilst the control unit carries out the learning procedure).
- Turn the ignition key to the OFF position.

### TIMING SENSOR

#### Removing-refitting

- Disconnect the negative battery terminal.
  - Detach the engine sound insulation
3. Disconnect the electrical connection, undo the fixing bolt and detach the timing sensor.

## 10.



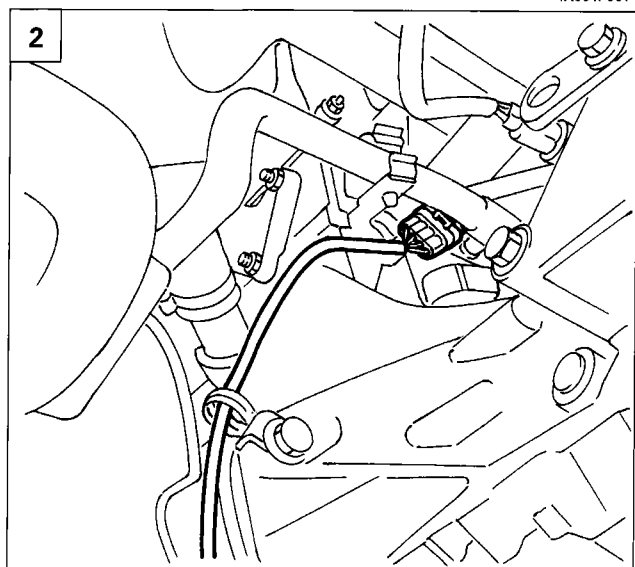
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### EXHAUST MANIFOLD WITH CATALYTIC CONVERTER

#### Removing-refitting

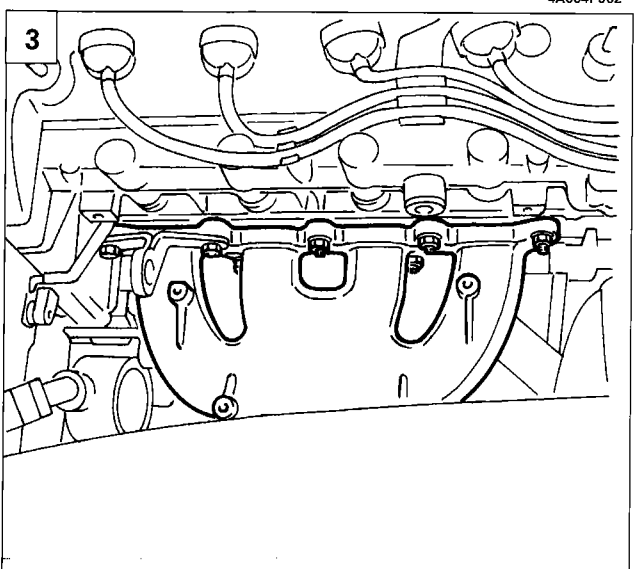
- Position the vehicle on a lift.
  - Disconnect the negative battery terminal.
  - Detach the exhaust manifold heat shield as described in the appropriate paragraph.
1. Disconnect the electrical connection for the front Lambda sensor and release the wiring from the bands.



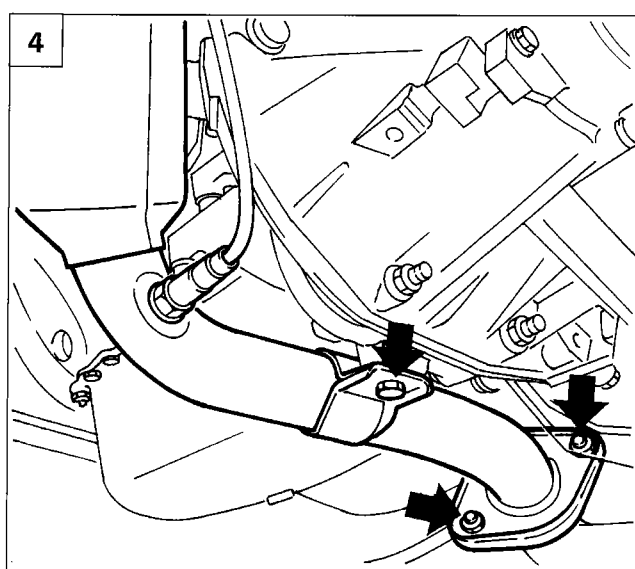
4A004PJ02



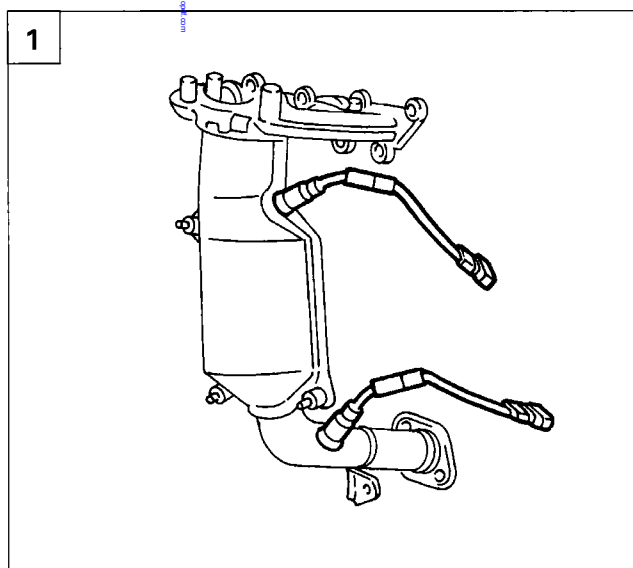
2. Disconnect the electrical connection for the rear Lambda sensor and release the wiring from the retaining bands.
3. Undo the nuts fixing the manifold to the cylinder head.
4. Undo the nuts fixing the catalytic converter to the rear section of the exhaust manifold, undo the bolt for the mounting bracket and detach the exhaust manifold with the catalytic converter.



4A004PJ03



4A004PJ04



4A005PJ01

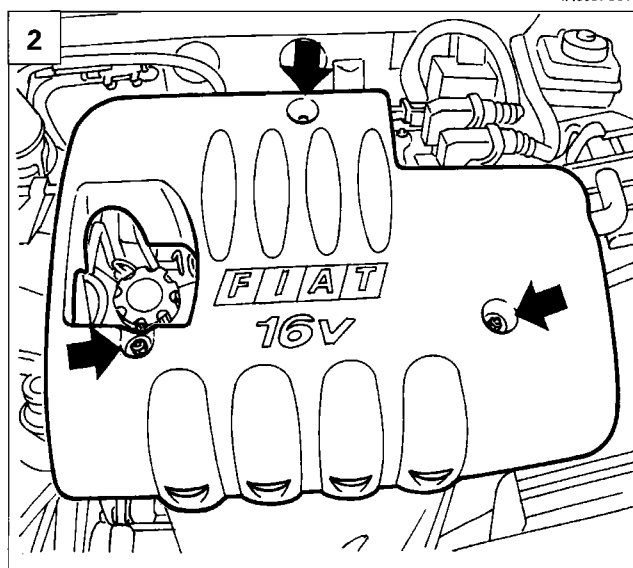


1. At the bench, separate the two Lambda sensors (front and rear) from the exhaust manifold and catalytic converter.

- When refitting, position the sensors and tighten them to torque avoiding exerting force on the components in order not to damage them irreparably.



*Apply graphite grease to the sensor thread (e.g. Bosch 5 964080112).*



4A002PJ01



## EXHAUST MANIFOLD HEAT SHIELD

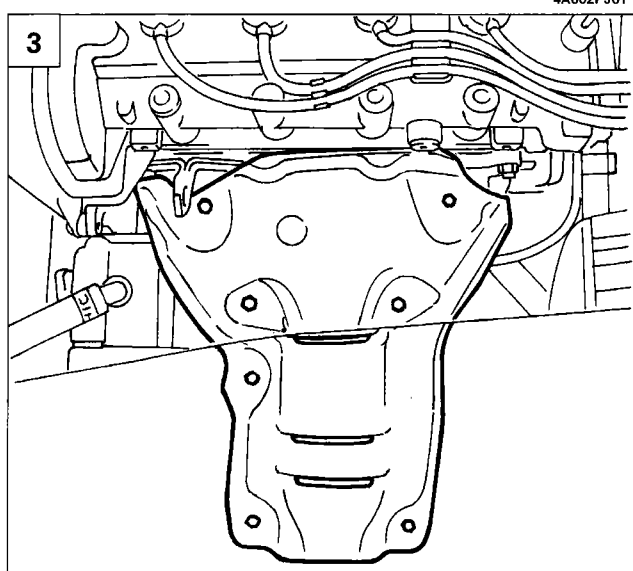
### Removing-refitting

2. Detach the engine sound insulation
3. Remove the fixing bolts and detach the heat shield.

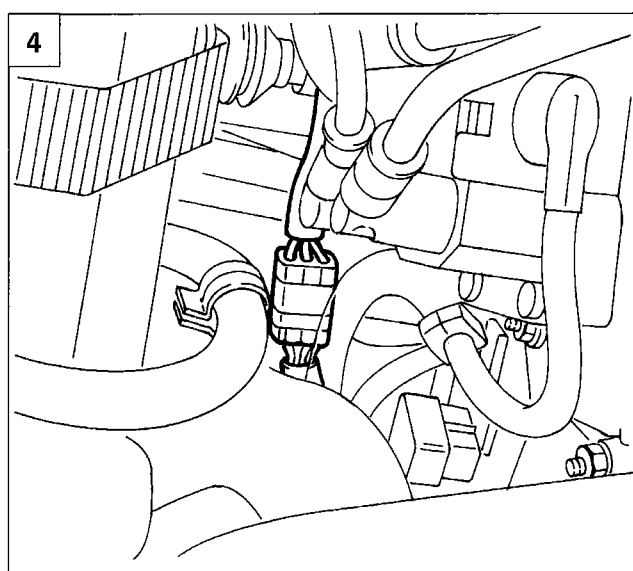
## FRONT LAMBDA SENSOR

### Removal.

- Disconnect the negative battery terminal.
- Detach the engine sound insulation.
- 4. Disconnect the electrical connection for the front Lambda sensor, release the wiring from the securing bands.



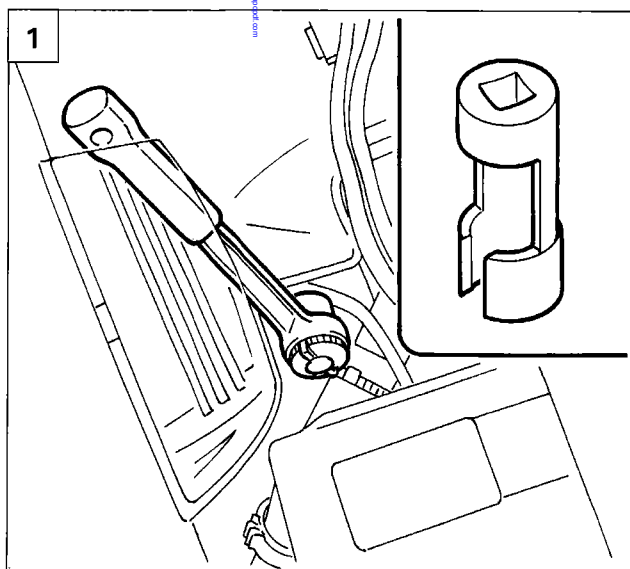
4A005PJ03



4A004PJ01



### 10.



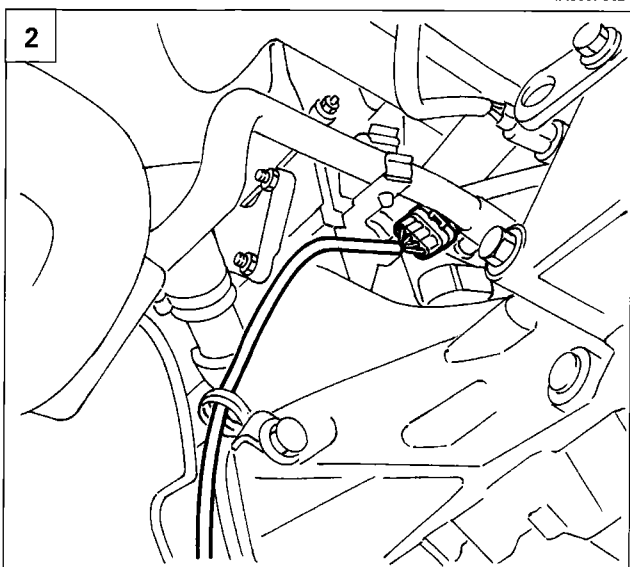
4A006PJ02



1. Using a USAG 875 type spanner or similar tool, detach the Lambda sensor.

#### REFITTING

- Position the sensor and tighten it to torque avoiding exerting force on the component in order not to damage it irreparably. Apply graphite grease to the sensor thread (e.g. Bosch 5 964080112).
- Connect the connector and restore the fastenings for the Lambda sensor cable.



4A004PJ02



#### REAR LAMBDA SENSOR

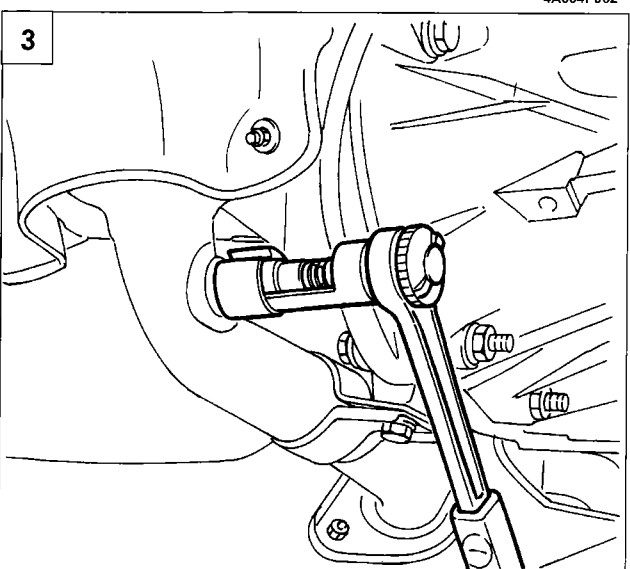
##### Removal.

- Position the vehicle on a lift.
  - Disconnect the negative battery terminal.
2. Disconnect the electrical connection for the rear Lambda sensor and release the wiring from the retaining bands.

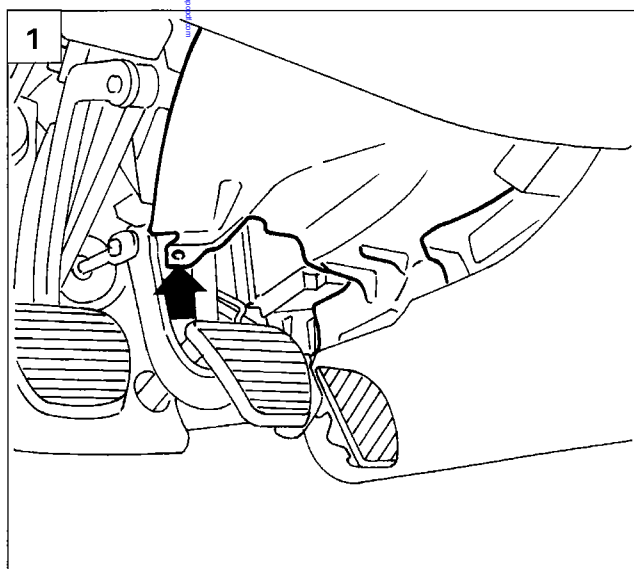
3. Raise the vehicle and detach the Lambda sensor.

#### REFITTING

- Position the sensor and tighten it to torque avoiding exerting force on the component in order not to damage it irreparably. Apply graphite grease to the sensor thread (e.g. Bosch 5 964080112).
- Connect the connector and restore the fastenings for the Lambda sensor cable.



4A006PJ04



4A007PJ01



### ACCELERATOR PEDAL POTENTIOMETER

#### Removing-refitting

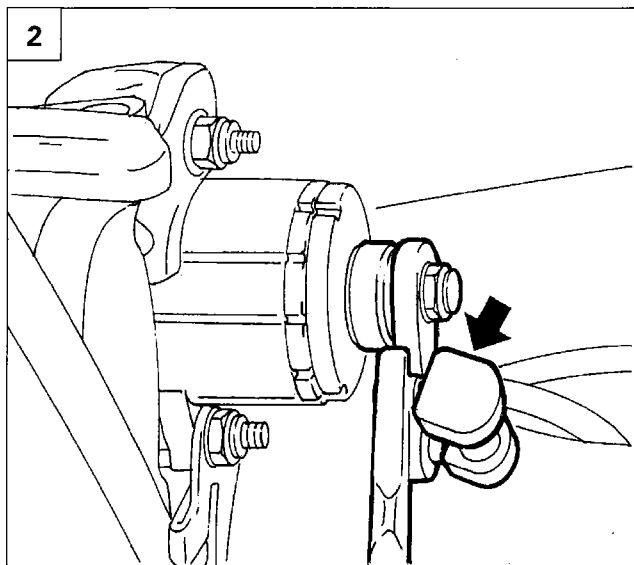
- Disconnect the negative battery terminal.
- 1. Remove the shield under the dashboard located by the pedals.
- 2. Remove the potentiometer idler rod from the accelerator pedal.
- 3. Undo the nuts fixing the potentiometer to the mounting bracket and detach the potentiometer after having disconnected the connector.



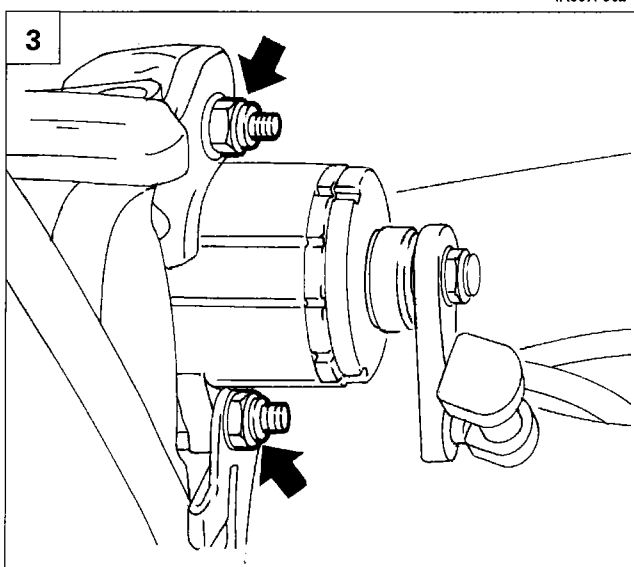
### ACCELEROMETER ON TIMING SIDE ENGINE SUPPORT

#### Removing-refitting

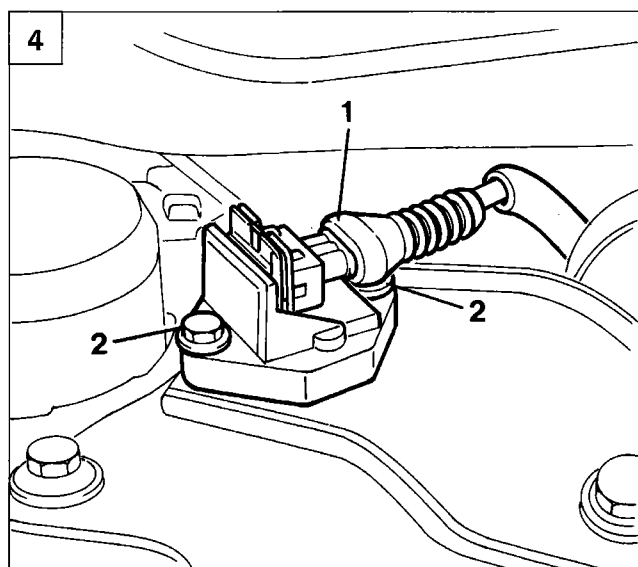
- Disconnect the negative battery terminal.
- 4. Disconnect the electrical connection (1), then undo the fixing bolts (2a) and detach the accelerometer.



4A007PJ02



4A007PJ03



4A007PJ04





**FUEL SYSTEM**

|                                                                              |   |
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| - Catalytic converter                                                        | 5 |
| - Exhaust manifold                                                           | 6 |
| - Electric fuel pump with level sender unit                                  | 8 |
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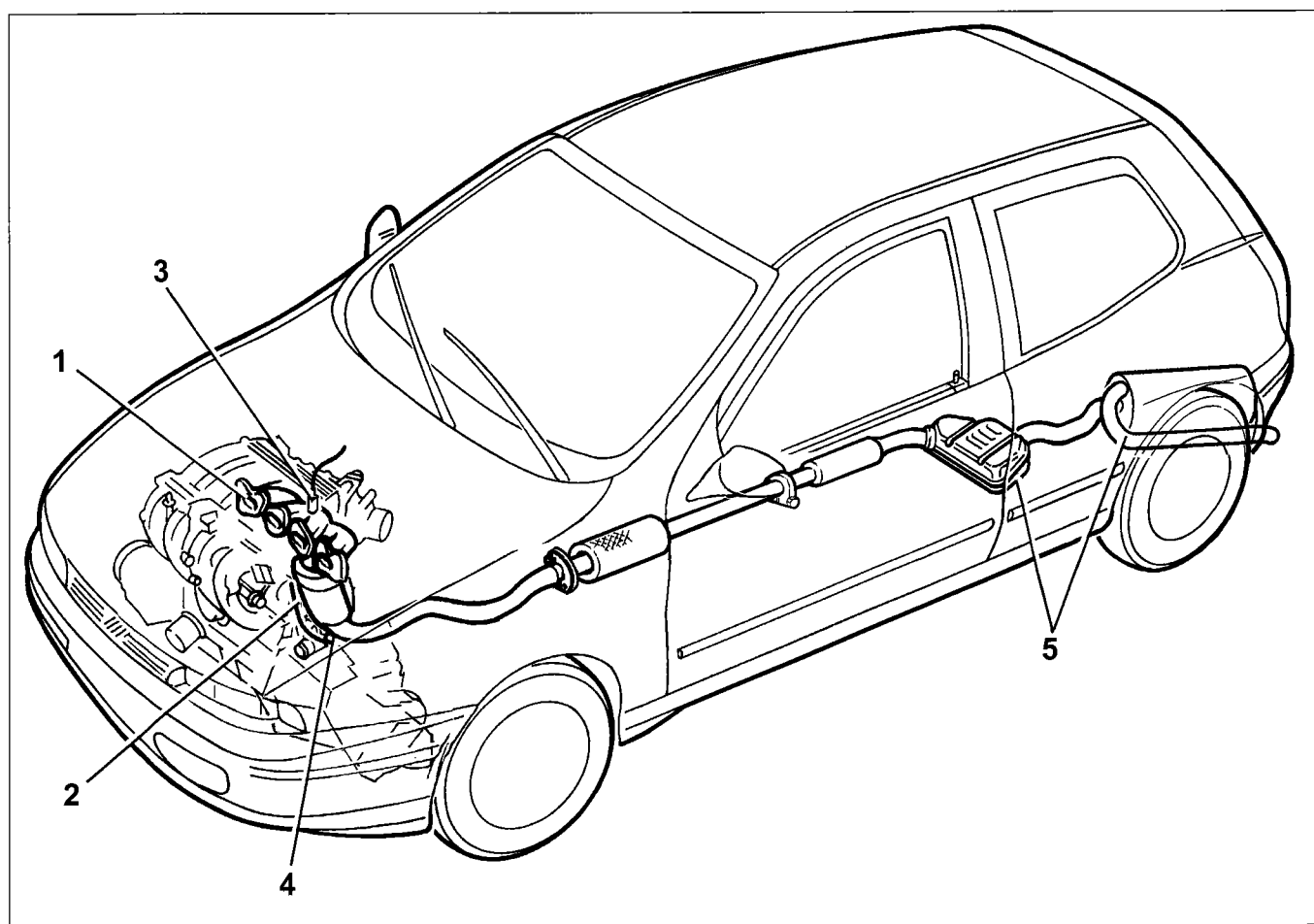
## ENGINE MANAGEMENT SYSTEM

### Foreword

The Bravo-Brava 1596 16v versions are equipped with a 4 cylinder in line, 16 valve, 1596 cc engine with a twin overhead camshaft and Marelli IAW 4EF integrated electronic injection/ignition system. The fuel system differs from the one described for the 1581 16v "99 range" version through the inclusion of several variants designed to make it compatible with the EEC Stage 3 EOBD regulations. The main modifications to the system can be summarized as follows:

- Engine management control unit with IAW 4EF code
- Catalytic converter near the exhaust manifold to take maximum advantage of the heat of the gases.
- Two Lambda sensors, one upstream (front) and one downstream (rear) which check the quality of the exhaust gases and the operation of the catalyzer.
- Adoption of timing sensor on inlet side timing pulley.

### DIAGRAM SHOWING ENGINE EXHAUST SYSTEM



4A0010J01

### Key

1. Exhaust manifold
2. Catalytic converter
3. Front Lambda sensor
4. Rear Lambda sensor
5. Silencers

### 10.

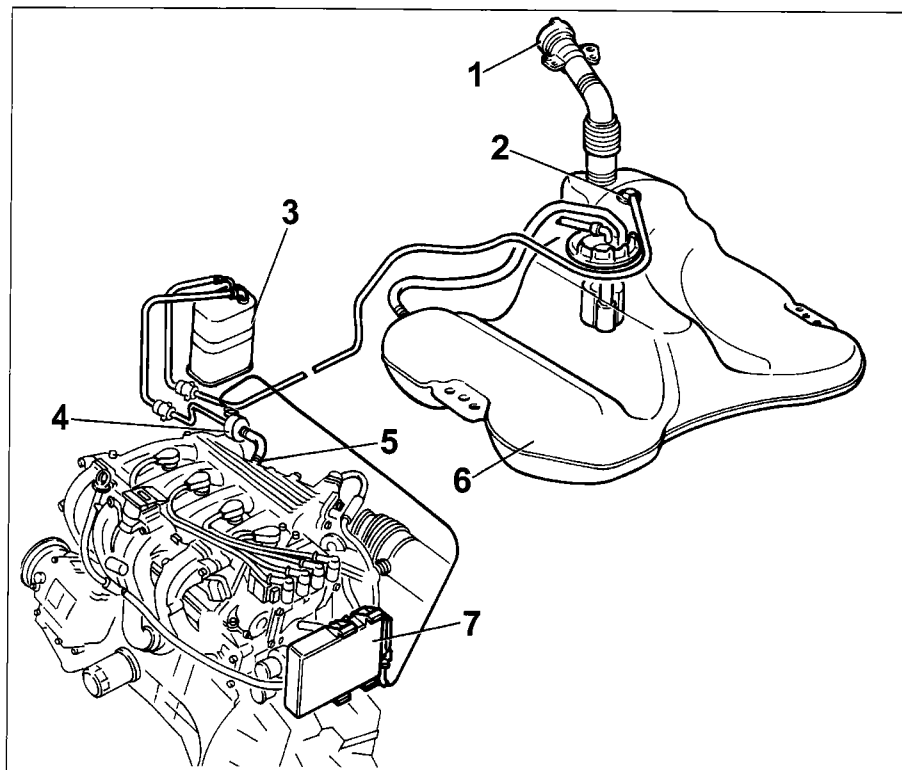
#### FUEL ANTI-EVAPORATION SYSTEM

Compared with previous versions, the fuel anti-evaporation system has several improvements aimed at fuel vapours.

In particular, the following measures have been adopted:

- Multi-purpose valve fitted to the tank to prevent spillage.
- New anti-evaporation solenoid valve and adoption of rapid type connectors for anti-evaporation system pipes.
- Cap on fuel filter with attachment cable.

For further information on the fuel system, refer to publication: 507.135.



#### Key

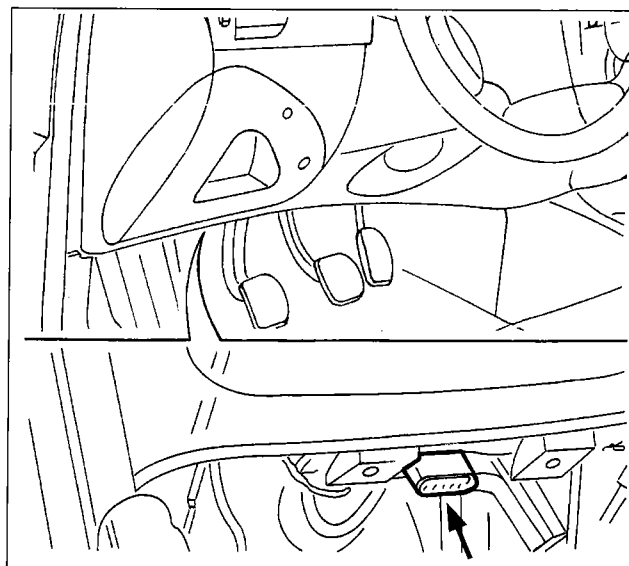
1. Filler
2. Multi-purpose valve
3. Active charcoal filter
4. Anti-evaporation solenoid valve
5. Fuel vapour intake on inlet manifold
6. Fuel tank
7. Engine management control unit

4A0020J01

#### LOCATION OF DIAGNOSTIC SOCKET

The diagnostic socket for the analysis of the engine management system is located under the junction unit in the dashboard. This socket also carries out the function of connecting the diagnostic equipment (Examiner or other instruments) for other electronic control units present on the vehicle.

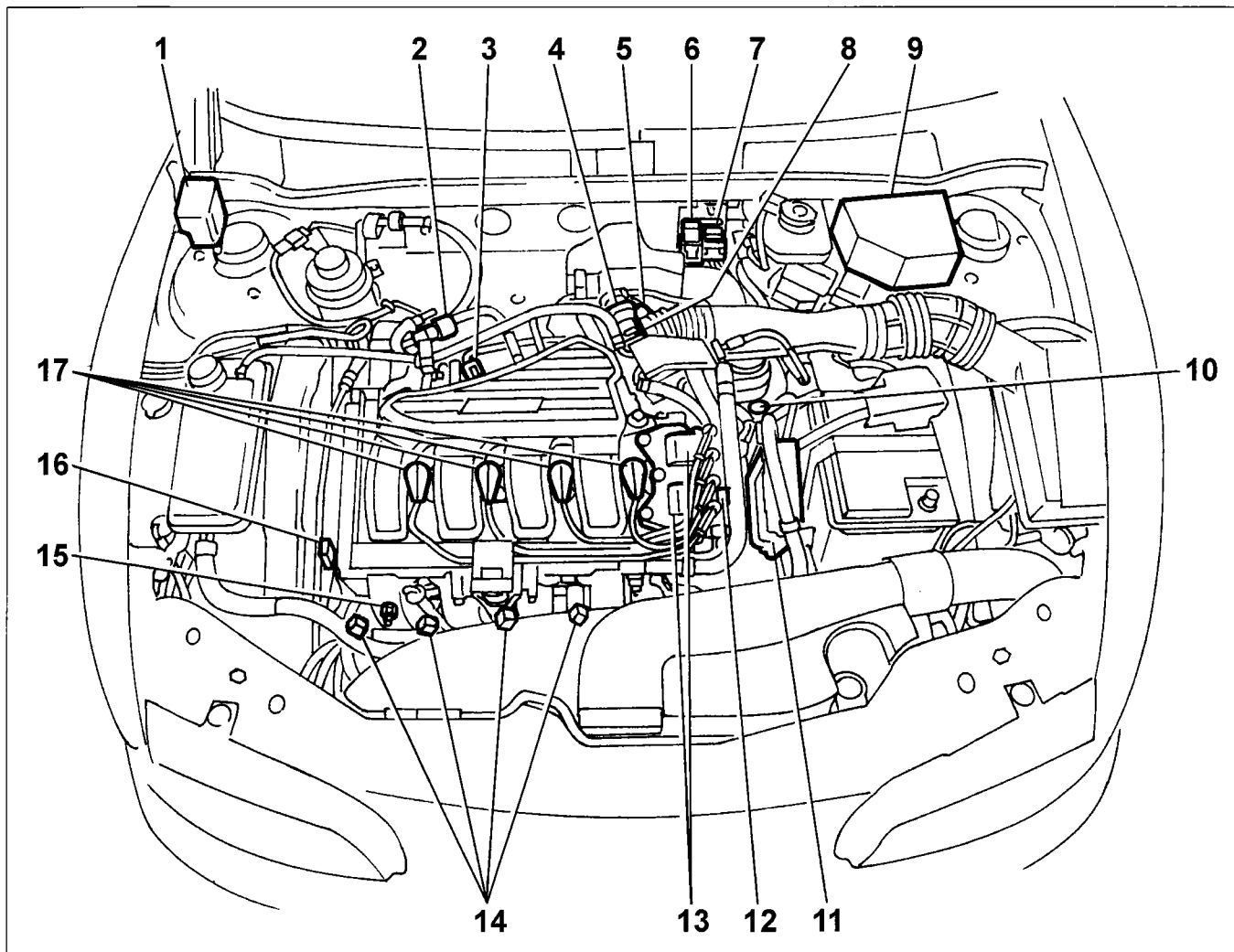
It is a 16-way "standardized" diagnostic socket which can be connected to the diagnostic equipment using an "MPX97" adaptor.



4A0020J02

## 10.

### LOCATION OF INJECTION/IGNITION SYSTEM COMPONENTS IN THE ENGINE COMPARTMENT



4A0030J01

#### Key

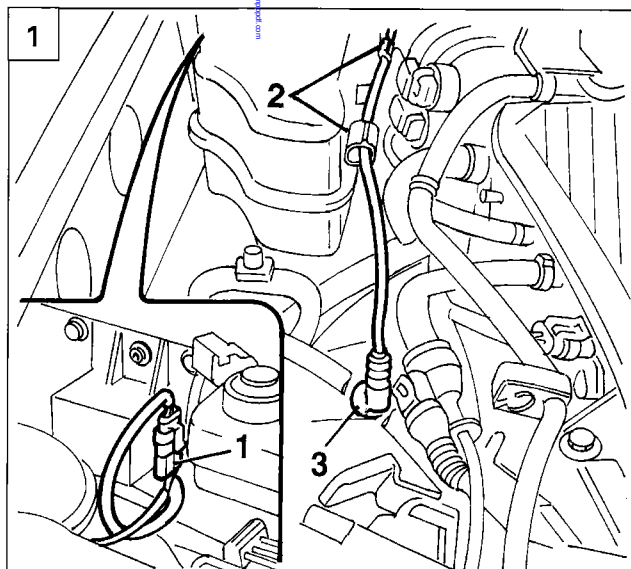
- |                                                             |                                           |
|-------------------------------------------------------------|-------------------------------------------|
| 1. Active charcoal filter                                   | 9. I.E. system protective maxi-fuse (EFI) |
| 2. Anti-evaporation solenoid valve                          | 10. Speedometer sensor                    |
| 3. Intake air temperature and pressure sensor               | 11. Engine management control unit        |
| 4. Engine idle adjustment stepping motor on throttle casing | 12. Coolant temperature sensor            |
| 5. Throttle valve position sensor on throttle casing        | 13. Ignition coil                         |
| 6. System relay feed                                        | 14. Injectors                             |
| 7. Protective fuse                                          | 15. Rpm and TDC sensor                    |
| 8. Throttle case                                            | 16. Timing sensor                         |
|                                                             | 17. Spark plugs                           |

#### FLYWHEEL SELF-LEARNING

Each time the battery is disconnected the flywheel self-learning procedure must be carried out as described below:

- Connect the diagnostic equipment (Examiner or Examiner Plus) and carry out the active diagnosis "Zeroing flywheel self-learning".
- Let the engine warm up (temperature above 80 °C) from idling. Accelerate up to 5000 rpm. (constant) for about 2-3 seconds and release. Carry out this operation 3 times in succession.

## 10.



4A004QJ01



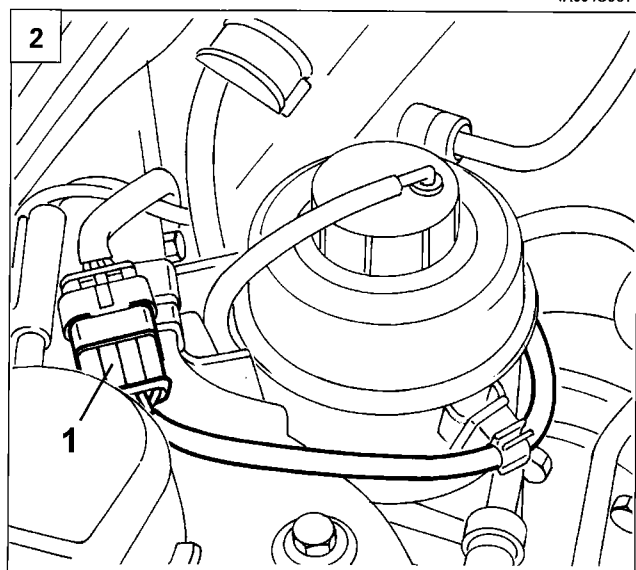
### FRONT LAMBDA SENSOR

#### Removal.

- Disconnect the negative battery terminal.
- 1. Disconnect the electrical connection (1a), release the wiring from the retaining band (2) and detach the Lambda sensor (3).

#### Refitting

- Position the sensor and tighten it to torque avoiding exerting force on the component in order not to damage it irreparably. Apply graphite grease to the sensor thread (e.g. Bosch 5 964080112).



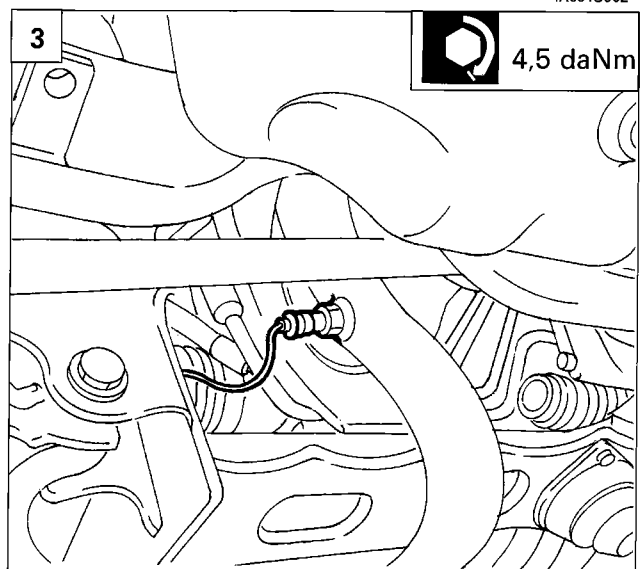
4A004QJ02



### REAR LAMBDA SENSOR

#### Removal.

- Position the vehicle on a lift
- Disconnect the negative battery terminal
- 2. Disconnect the electrical connection (1) and release the wiring from the retaining bands.



4A004QJ03

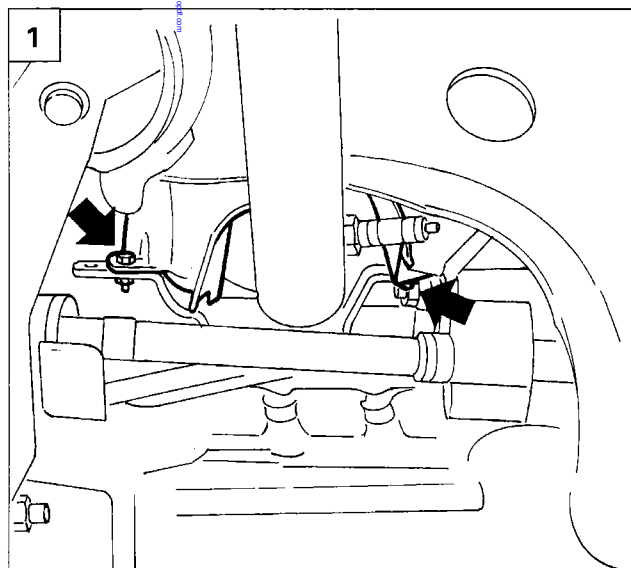
- 3. Raise the vehicle and detach the rear Lambda sensor.

#### Refitting

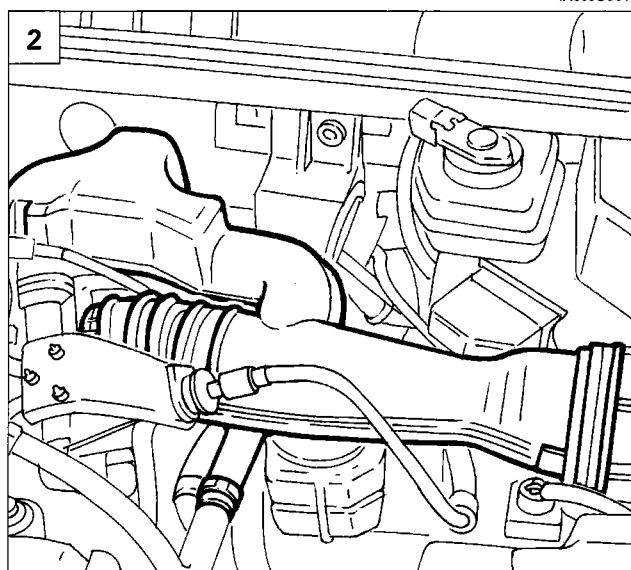
- Position the sensor and tighten it to torque avoiding exerting force on the component in order not to damage it irreparably. Apply graphite grease to the sensor thread (e.g. Bosch 5 964080112).
- Connect the connector and renew the fastenings for the Lambda sensor cable.

# 10.

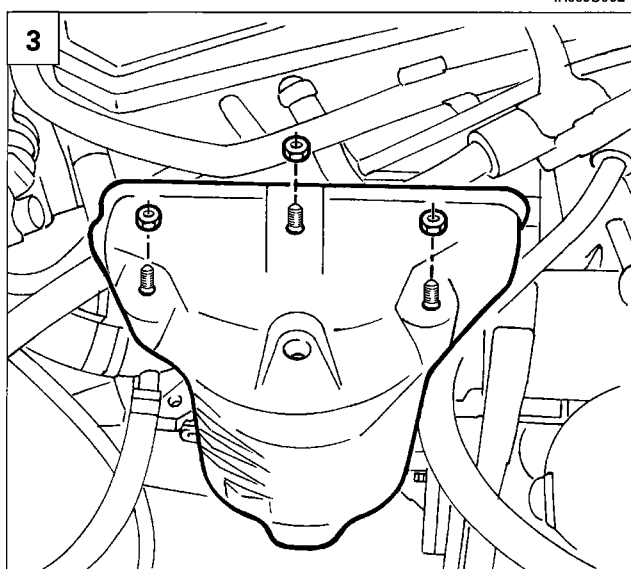
## CATALYTIC CONVERTER HEAT SHIELD



4A0050J01



4A0050J02



4A0050J03



### Removing-refitting

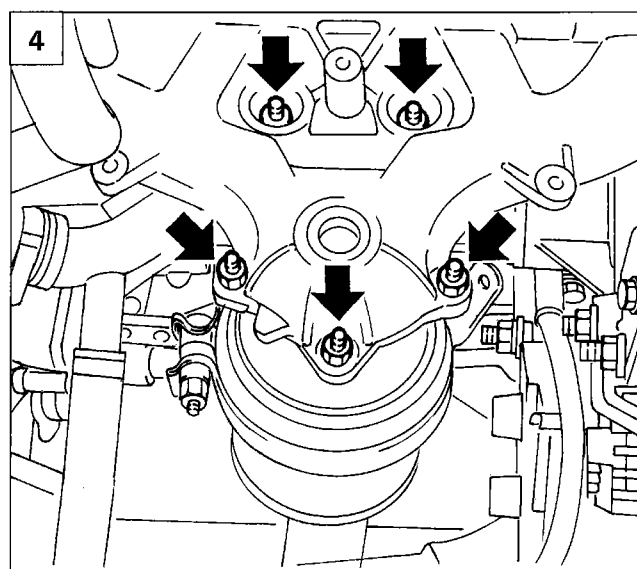
- Position the vehicle on a lift and disconnect the negative battery terminal.
- 1. Raise the vehicle and undo the bolts shown in the diagram which secure the heat shield at the bottom.
- Lower the vehicle and detach the front Lambda sensor as described in the appropriate paragraph.
- 2. Loosen the bands shown and detach the air hose from the filter to the throttle casing, complete with resonator.
- 3. Undo the upper nuts fixing the heat shield and detach the latter.



## CATALYTIC CONVERTER

### Removing-refitting

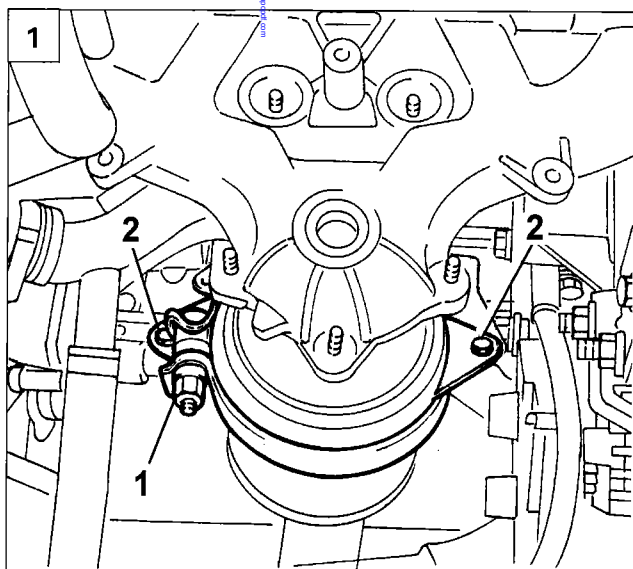
- Position the vehicle on a lift and disconnect the negative battery terminal.
- Detach the front Lambda sensor as described in the appropriate paragraph.
- Detach the catalytic converter heat shield as described in the relevant paragraph.
- 4. Undo the nuts fixing the catalytic converter to the exhaust manifold.



4A0050J04



### 10.



1. Loosen the band securing the catalyzer by adjusting the bolt (1) and undo the bolts (2) fixing the band to the bracket.

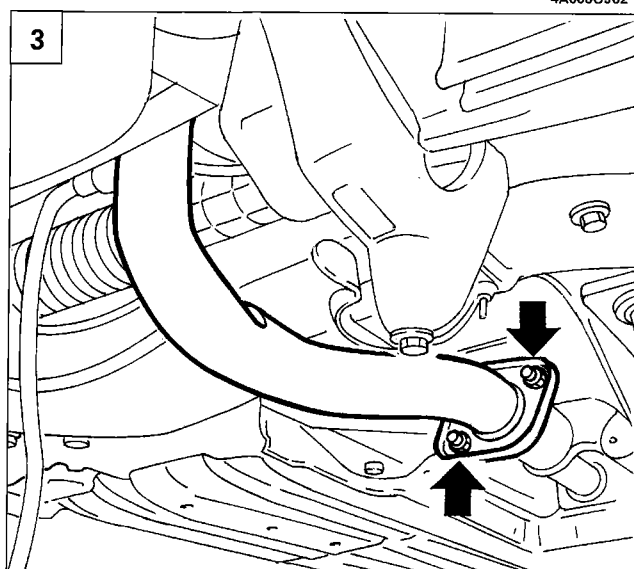
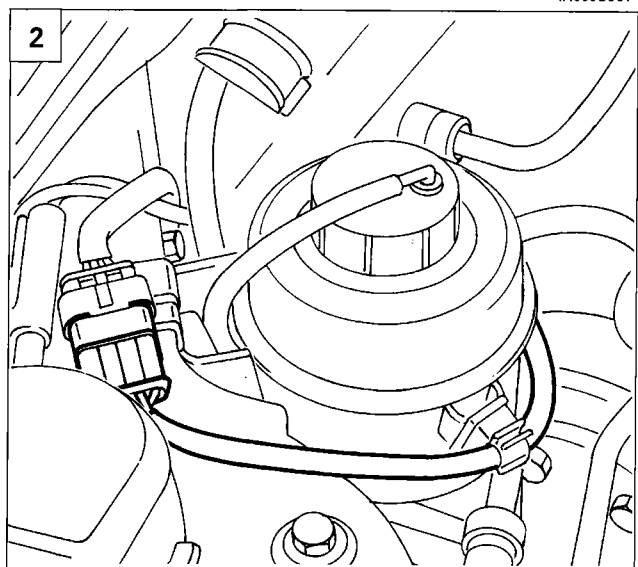
2. Disconnect the connector for the rear Lambda sensor and release the cable from the securing bands along the routing.

3. Raise the vehicle, undo the bolts fixing the catalytic converter to the rear exhaust pipe and detach the converter, complete with rear Lambda sensor.

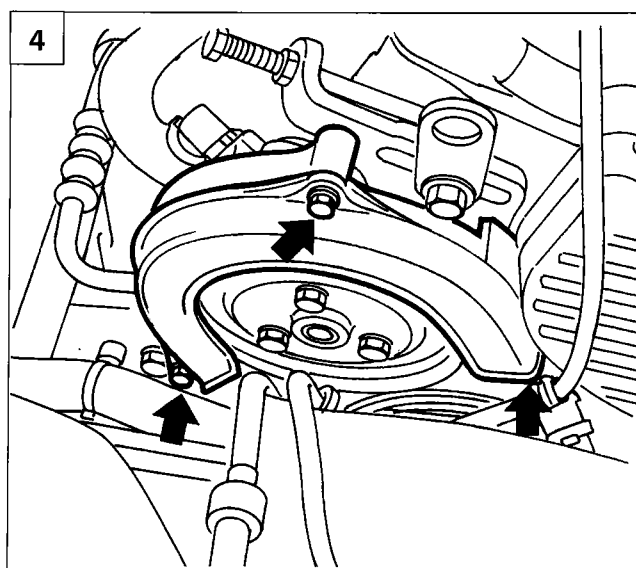
### EXHAUST MANIFOLD

#### Removing-Refitting

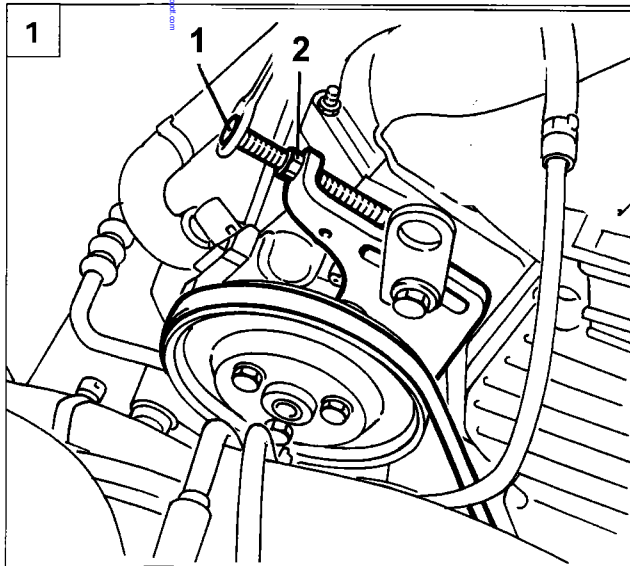
- Position the vehicle on a lift, disconnect the negative battery terminal and detach the following components, as described in the relevant paragraphs:
  - Front Lambda sensor
  - Catalytic converter heat shield
  - Catalytic converter.
4. Remove the protection for the power assisted steering pump drive belt.



4A0060J03



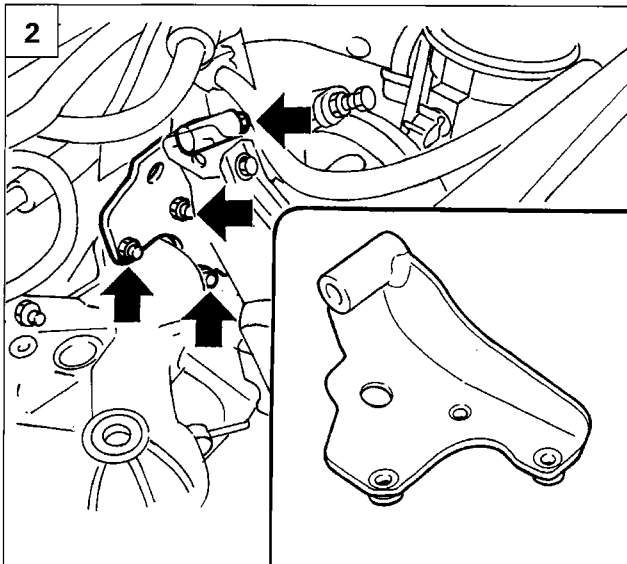
4A0060J04



4A0070J01

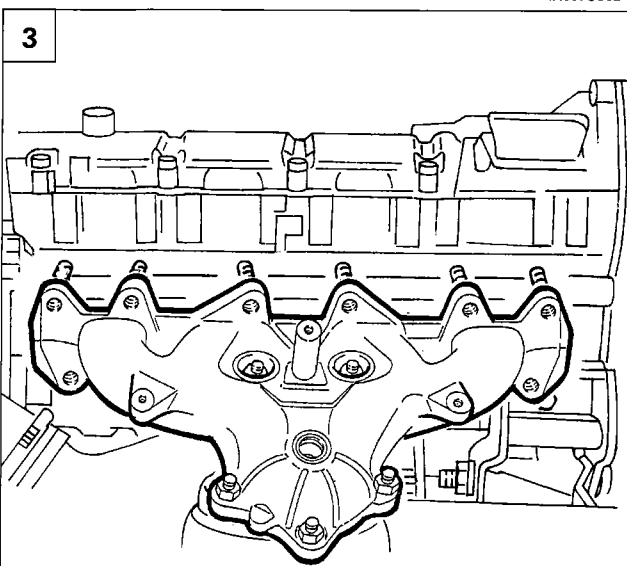


1. Loosen the belt tension by adjusting the lock nut (2) and the adjustment screw (1); then release the belt from the pulley.



4A0070J02

2. Undo the bolts fixing the bracket for the power assisted steering pump mounting and detach the pump.



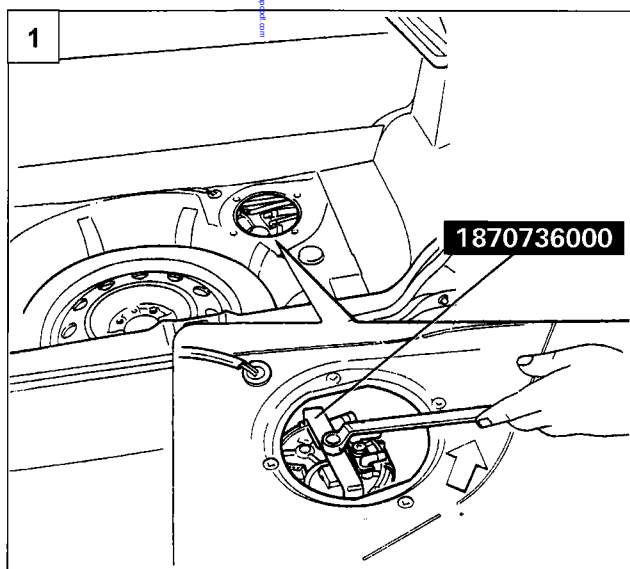
4A0070J03

3. Undo the nuts fixing it to the cylinder head and detach the exhaust manifold.

### Refitting

To refit, reverse the order of the operations carried out for the removal; tension the power assisted steering pump drive belt acting on the adjustment screw; using tool 189576200, check that the tension is between 32 and 45 daN.

### 10.



#### ELECTRIC FUEL PUMP WITH LEVEL SENDER UNIT

##### Removing-refitting

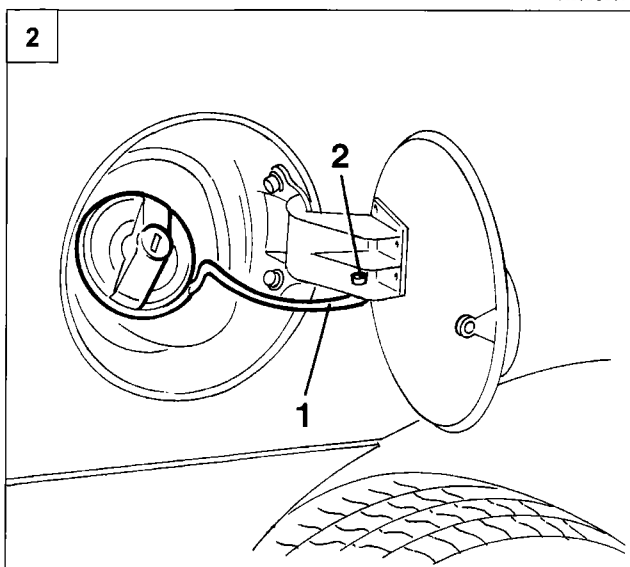
- Disconnect the negative battery terminal.
- Lift up the luggage compartment lining and remove the fuel pump protective cover.
- Disconnect the electrical connection for the electric pump assembly and the fuel supply and breather pipes.

1. Undo the ring nut fixing the electric fuel pump to the tank using tool 1870736000. The gasket on the tank housing should be replaced each time the pump drip tray is removed-refitted.

**NOTE** *The position of the fuel pump is fixed and is established by a notch in the tank housing which should correspond to the projection on the pump drip tray.*

#### FUEL TANK CAP

2. The fuel tank cap is secured to the bodys-hell by means of a cord. If it is replaced, undo the cap and release the cord seal (1) from the pin (2).



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| - Clutch pedal switch                                                              | 17   |                                                                  |      |
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## FUEL SYSTEM

### INTRODUCTION

Bravo and Brava 1.9 JTD cars are equipped with a 4 cylinder in line, 1910 cc turbodiesel engine with two valves per cylinder, an overhead camshaft, turbocharger and intercooler and electronic injection.

The fuel system ensures correct engine operation and can be divided into the following subsystems:

- Fuel feed circuit with common rail injection;
- air feed circuit;
- exhaust circuit;
- blow by vapour recirculation circuit;
- Exhaust Gas Recirculation (EGR) circuit

Operation of the various circuits making up the fuel system is optimised by an electronic control system managed by a special control unit.

The main feature of the fuel system is common rail fuel injection. Common rail is a higher pressure electronic injection system for fast direct injection diesel engines.

The main features of the common rail system are as follows:

- availability of high injection pressures (up to 1350 bars);
- possibility of modulating these pressures (from a minimum of 150 bars to a maximum of 1350 bars) independently of engine speed (rpm) and engine load;;
- ability to operate at high engine speeds (up to 6000 rpm);
- precise injection control (injection advance and duration);
- reduced fuel consumption;
- reduced emissions.

### FUEL SYSTEM MANAGEMENT STRATEGIES

The management program (software) is stored inside the control unit memory and consists of a series of strategies, each of which manages a precise system control function.

Through the use of information provided by the various sensors (input), each strategy processes a set of parameters based on data stored in special control unit memory areas. It then controls system actuators (output), i.e. the devices that allow the engine to operate.

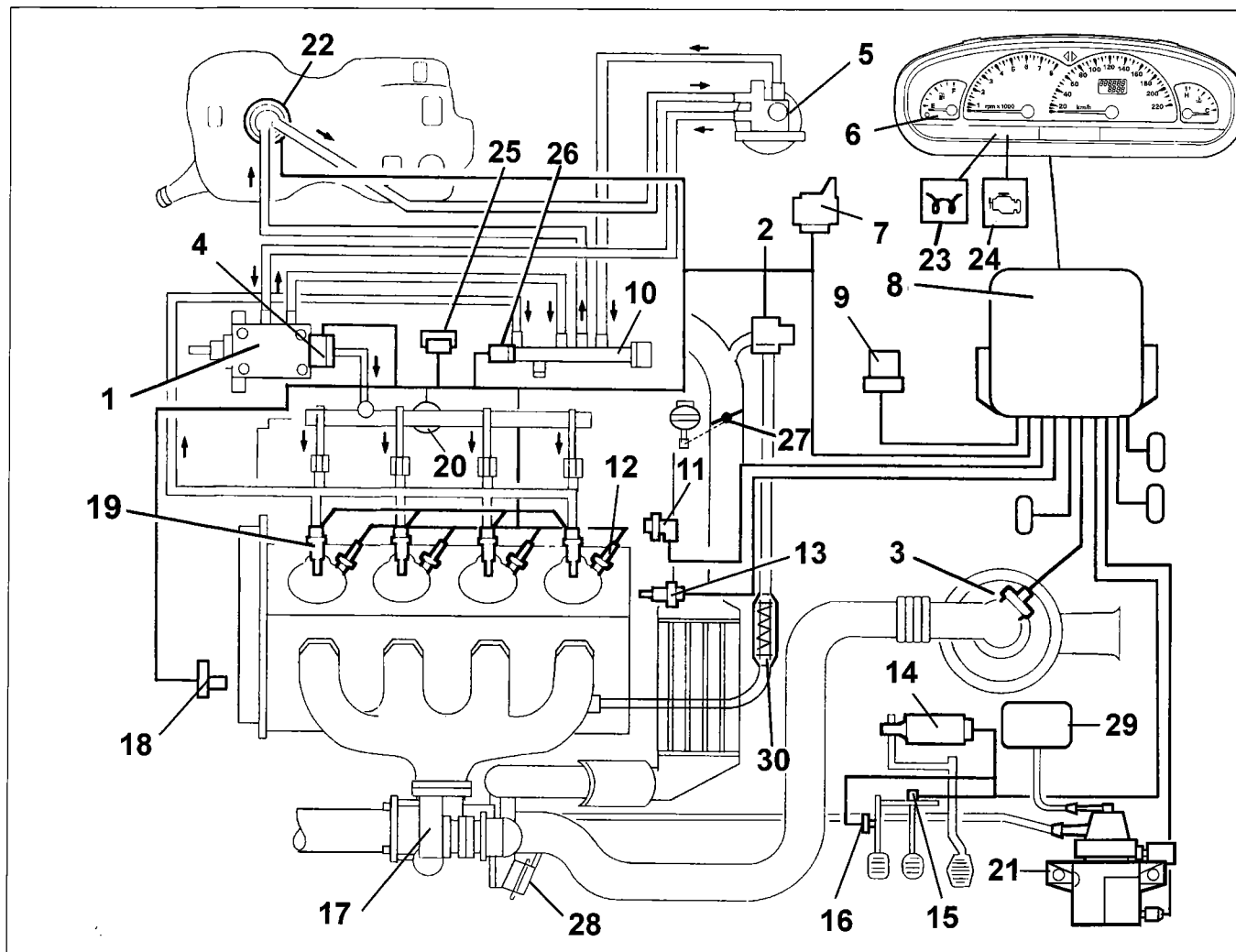
The main purpose of these management strategies is to determine the exact amount of fuel to be injected into the cylinders with timing (injection advance) and pressure designed to achieve the best possible engine performance in terms of power, fuel consumption, fumes, emissions and handling.

The main system management strategies are essentially as follows:

- control of injected fuel quantity;
- control of injection advance;
- control of injection pressure;
- control of auxiliary fuel pump;
- control of injection during over-run (cut-off);
- control of idle speed;
- control of maximum speed limitation;
- control of maximum torque limitation;
- control of fuel temperature;
- control of engine coolant temperature;
- control of air turbocharging pressure;
- control of glow plugs;
- control of exhaust fumes;
- control of exhaust gas recirculation (EGR);
- control of climate control system activation;
- control of engine immobiliser operation (Fiat CODE);
- self-diagnosis

### 10.

#### FUEL SYSTEM OPERATING DIAGRAM



4A002QJ01

- |                                                     |                                        |
|-----------------------------------------------------|----------------------------------------|
| 1. Pressure pump                                    | 22. Auxiliary fuel pump                |
| 2. Electrically-controlled EGR valve                | 23. Glow plug preheating warning light |
| 3. Flow meter                                       | 24. System failure warning light       |
| 4. Pressure regulator                               | 25. Pressure relief sensor             |
| 5. Fuel filter                                      | 26. Fuel temperature sensor            |
| 6. Instrument panel                                 | 27. Throttle valve                     |
| 7. Glow plug preheating control unit                | 28. Wastegate actuator                 |
| 8. Electronic control unit                          | 29. Vacuum tank                        |
| 9. Injection system relay                           | 30. Exhaust gas heat exchanger         |
| 10. Return manifold (low pressure)                  |                                        |
| 11. Rpm sensor                                      |                                        |
| 12. Glow plugs                                      |                                        |
| 13. Engine coolant temperature sensor               |                                        |
| 14. Potentiometer on accelerator pedal              |                                        |
| 15. Brake pedal switch                              |                                        |
| 16. Clutch pedal switch                             |                                        |
| 17. Turbocharger                                    |                                        |
| 18. Timing sensor                                   |                                        |
| 19. Injectors                                       |                                        |
| 20. Fuel pressure sensor                            |                                        |
| 21. Variable geometry turbocharger control solenoid |                                        |

### **Control of injected fuel quantity**

The control unit controls the fuel pressure regulator and injectors on the basis of output signals from the accelerator pedal potentiometer, flow meter and rpm sensor.

The timing and thus the injection sequence are determined when the engine is started up using signals from the rpm and timing sensor (synchronisation stage); injection timing is then implemented using the rpm sensor signal alone and considering a injection sequence of 1-3-4-2.

The control unit inhibits injection in the following cases:

- fuel pressure level greater than 1500 bars;
- fuel pressure level lower than 120 bars;
- engine speed higher than 6000 rpm.

When the engine has warmed up, maximum injection duration (injector opening time) is 1500 ns, but it can reach 3000 ns during the start-up stage.

### **Control of injection advance**

The electronic control unit determines injection advance mainly on the basis of the quantity of fuel to be injected.

The injection advance is then corrected on the basis of coolant temperature and speed in order to compensate for ignition delays due to low temperatures in the combustion chamber during warm-up.

The optimum injection point is also processed to ensure driving comfort and emission limits laid down by Euro 3 legislation.

### **Control of injection pressure**

This control is of particular importance because injection pressure influences the following parameters:

- amount of fuel taken into the cylinders for the same injection time duration;
- injected fuel nebulation;
- spray penetration;
- lag between electrical control to injection and actual injection start and end times.

The above parameters engine behaviour significantly, particularly in terms of power output, exhaust emissions, noise levels and handling.

The injection control unit controls the pressure governor on the basis of engine load to obtain an optimal line pressure at all times.

When the engine is cold, injection pressure is corrected on the basis of engine speed and engine coolant temperature to meet engine needs at different operating temperatures.

### **Control of auxiliary fuel pump**

The auxiliary fuel pump submerged in the tank is supplied by the injection control unit by means of a relay when the ignition key is turned on.

Fuel supply to the pump is inhibited when one of the following condition occurs:

- when the ignition has been turned on for a certain length of time without the engine running;
- if the inertia switch cuts in.

### **Control of injection during over-run (cut-off)**

The fuel cut-off strategy is implemented when the injection control unit receives information that the accelerator pedal has been released from the potentiometer.

Under these conditions, the control unit cuts off the fuel supply to the injectors and restores it before idle speed is reached.



## 10.

### Control of idle speed

On the basis of signals from the rpm sensor and engine coolant temperature sensor, the injection control unit controls the pressure governor and alters the injector control times to maintain idle speed stable at all times.

Under certain conditions, the idle speed control unit also considers battery voltage.

### Control of maximum speed limitation

According to rpm level, the injection control unit limits maximum speed by means of two types of intervention:

- as maximum speed approaches, it reduces the amount of fuel injected to reduce line pressure;
- when maximum speed is exceeded, it inhibits operation of the auxiliary pump and injectors.

### Control of maximum torque limitation

On the basis of rpm level, the injection control unit computes limit torque and maximum permitted fume index parameters on the basis of predefined, stored maps.

It then corrects the above parameters using engine coolant temperature and car speed data. The resulting values are then used to modulate the amount of fuel to be injected by adjusting the pressure regulator and injectors.

### Control of fuel temperature

The injection control unit is kept constantly informed of fuel temperature by a sensor on the return manifold.

If fuel temperature exceeds a set value (about 110 °C), the control unit reduces line pressure by adjusting the pressure governor, leaving injection times unaltered.

### Control of coolant temperature

The injection control unit is constantly informed of coolant temperature by a sensor on the thermostat.

If engine coolant temperature or air conditioning fluid pressure exceeds certain levels, the control unit performs the following actions:

- It reduces the amount of fuel injected by adjusting the pressure governor and injectors (power reduction);
- it controls the engine radiator cooling fan.

### Control of glow plugs

The injection control unit controls operation of the glow plug preheating control unit to bring the temperature in the combustion chambers up to levels that promote fuel self-ignition and thus make start-up easier.

The control unit controls the operation of the glow plug control unit for a certain time both before (preheating) and after (postheating) engine start-up and also controls activation of the warning light on the control panel.

Preheating, postheating and glow plug warning light activation times vary according to engine coolant temperature.

### **Control of exhaust fumes**

The injection control unit uses this function to limit any exhaust fumes that could arise during fast speed changes.

To satisfy this requirement, the control unit processes signals from the accelerator pedal potentiometer, rpm sensor and intake air quantity sensor (debimeter) and controls the fuel pressure regulator and injectors to modulate the amount of fuel to be injected.

### **Control of exhaust gas recirculation**

On the basis of signals supplied by the rpm, intake air quantity, coolant temperature and accelerator pedal position sensors, the injection control unit computes the time taken to control the electric EGR valve to obtain partial recirculation of exhaust gas under certain engine operating conditions and thus meet Euro3 emission control requirements.

### **Control of air conditioning system activation**

The injection control unit controls the air conditioning system compressor electromagnetic coupling in accordance with a strategy designed to avoid operating conditions that would impair engine performance.

- When the compressor is activated, the injection control unit increases the amount of fuel at idle speed to adjust the engine to the higher power demand and temporarily cut off the power supply to the compressor under conditions of high engine power demand (fast acceleration).

### **Control of engine immobiliser**

The system is fitted with an engine immobiliser. This function depends on the presence of a special (FIAT CODE) control unit, capable of dialogue with the engine management control unit and an electronic key, equipped with a special transmitter for sending a recognition code.

Each time the key is turned to the OFF position, the FIAT CODE system completely deactivates the engine management control unit.

When the key is turned to the ON position, the following operations take place, in order:

1. the engine management control unit (whose memory contains a secret code) sends the FIAT CODE control unit a request to send the secret code to deactivate the immobilizer function;
2. the FIAT CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key;
3. the recognition of the secret code allows the immobilizing function imposed on the engine management control unit to be deactivated and normal operation resumed.

### **Self-diagnosis**

Full electronic diagnosis of the injection system is achieved by connecting a tester (EXAMINER or EXAMINER PLUS) to the standard tester input (EOBD).

The system is equipped with a self-diagnostics function that recognises, memorises and indicates any faults.

If a fault is detected in the sensors or actuators, signal reconstruction strategies are immediately implemented (recovery) to ensure the engine operates at an acceptable level without affecting operation. The car can then be driven to a service outlet for repair.

### 10.

The control unit self-diagnostic system checks signals from the sensors and compares them with permitted limit values:

- fault indication upon start-up
  - warning light on for 4 seconds indicates test stage
  - warning light off after 4 seconds indicates no faults in components that could alter values required by emission control regulations
  - warning light on after 4 seconds indicates fault.
- fault indication during operation
  - warning light on indicates fault
  - warning light off indicates no fault in components that could alter values required by emission control regulations.
- recovery
  - the control unit defines recovery type on each occasion according to the faulty component type
  - recovery parameters are controlled by non-faulty components.

#### Control of cylinder balance when idling

On the basis of signals from sensors, the injection control unit controls the evenness of torque at idle speed by altering injector control times.

#### Control of judder

On the basis of signals from the sensors, the injection control unit corrects the amount of fuel to be injected with the aim of improving handling by reducing jerkiness during driving.

The correction is achieved by adjusting the fuel pressure regulator and altering injector control times.

#### Control of electric balance

On the basis of battery voltage, the injection control unit alters idle speed to ensure sufficient current delivery by the alternator under conditions of high power uptake by appliances.

Idle speed is altered by adjusting fuel pressure and altering injector control times.

#### Control of turbocharger wastegate

At various engine service speeds, the injection control unit processes the signal from the turbo sensor and determines the amount of fuel to be injected by adjusting the fuel pressure governor and injector control times.

The control unit also controls the opening of the wastegate on the turbocharger via the control solenoid in order to optimise performance under all service conditions.

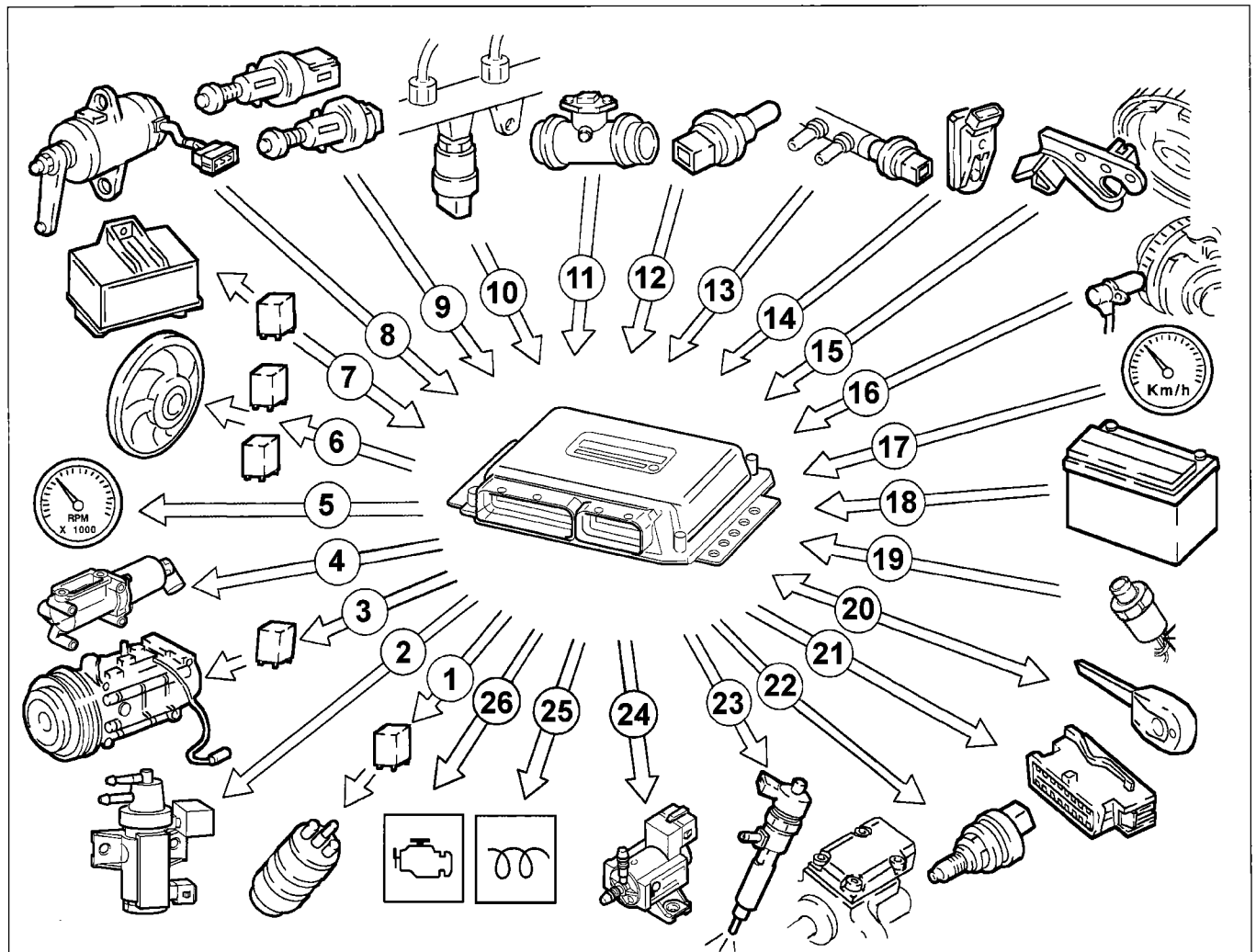
#### Control of throttle closure upon engine power-off

When the engine is turned off (ignition turned to OFF), the injection control unit controls closure of the throttle valve on the air intake port by means of a solenoid.

This action limits annoying engine shake as the engine is turned off

# 10.

## DIAGRAM SHOWING INFORMATION FLOW BETWEEN THE INJECTION CONTROL UNIT AND SENSORS/ACTUATORS

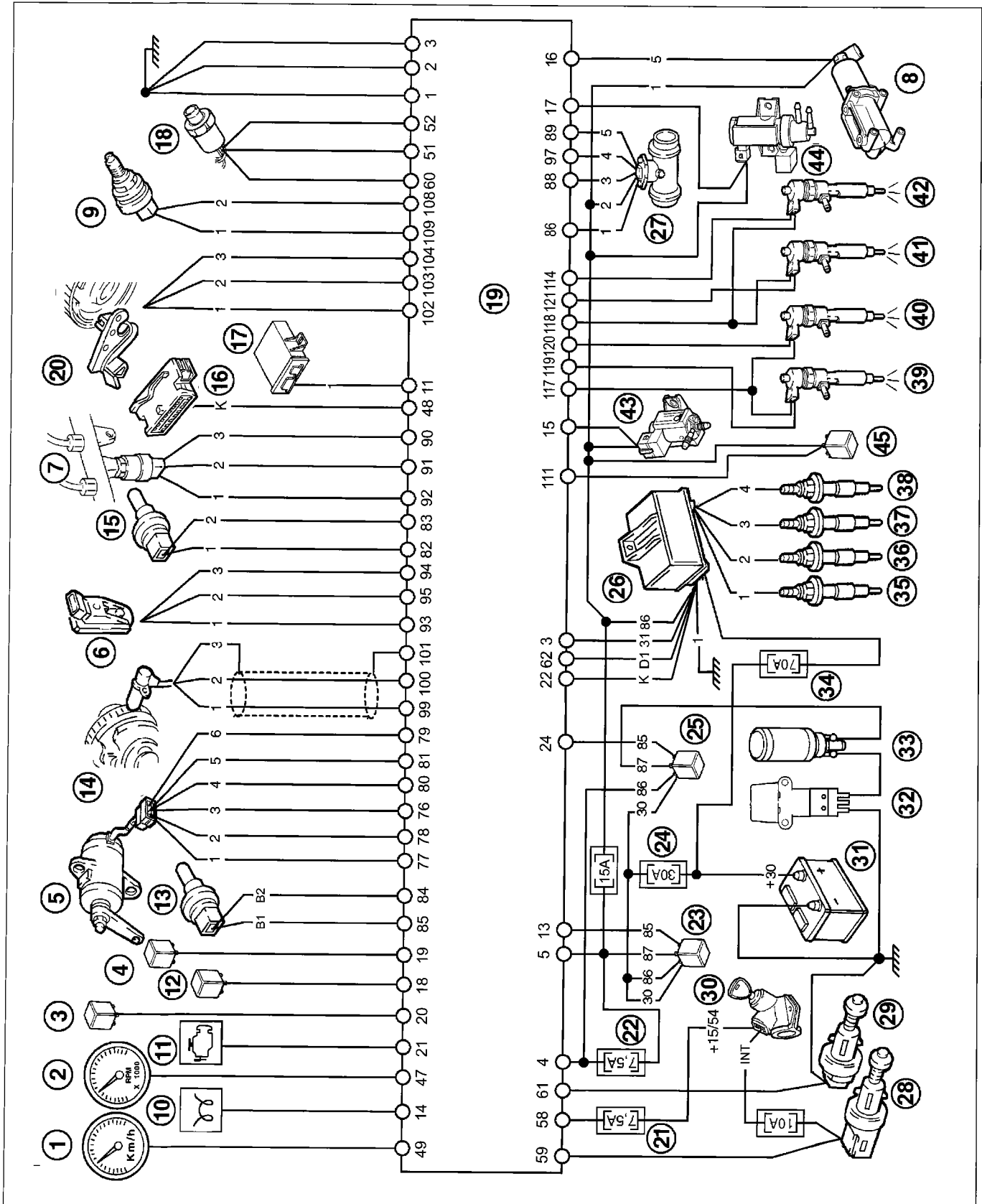


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- |                                                        |                                            |
|--------------------------------------------------------|--------------------------------------------|
| 1. Auxiliary fuel pump                                 | 20. Fiat CODE control unit                 |
| 2. Turbocharger wastegate control solenoid             | 21. Tester input                           |
| 3. Climate control compressor                          | 22. Fuel pressure regulator                |
| 4. Electric EGR valve                                  | 23. Injectors                              |
| 5. Rev counter                                         | 24. Throttle valve control solenoid        |
| 6. Engine radiator fan                                 | 25. Glow plug preheating warning light     |
| 7. Glow plug preheating control unit                   | 26. Injection system failure warning light |
| 8. Potentiometer on accelerator pedal                  |                                            |
| 9. Brake and clutch pedal switches                     |                                            |
| 10. Fuel pressure sensor                               |                                            |
| 11. Intake air flow and temperature sensor (debimeter) |                                            |
| 12. Coolant temperature sensor                         |                                            |
| 13. Fuel temperature sensor                            |                                            |
| 14. Pressure relief sensor                             |                                            |
| 15. Timing sensor                                      |                                            |
| 16. Rpm sensor                                         |                                            |
| 17. Vehicle speed signal                               |                                            |
| 18. Battery                                            |                                            |
| 19. Four stage pressure switch                         |                                            |

# 10.

## INJECTION SYSTEM WIRING DIAGRAM



4A008QJ01

**Compents of injection system wiring diagram**

1. Vehicle speed
2. Rev counter
3. Engine radiator fan low speed relay
4. Radiator fan high speed activation relay
5. Potentiometer on accelerator pedal
6. Timing sensor
7. Fuel pressure sensor
8. EGR system modulator solenoid
9. Fuel pressure regulator
10. Glow plug preheating warning light on control panel
11. Injection system failure warning light
12. Air conditioning system relay
13. Coolant temperature sensor
14. Rpm sensor
15. Fuel temperature sensor
16. Diagnostic socket
17. Fiat CODE control unit
18. Four stage pressure switch
19. Injection electronic control unit
20. Pressure relief sensor
21. 7.5A fuse protecting electronic injection system (+15 power supply from ignition switch)
22. 7.5A fuse protecting electronic injection system (+30 power supply from ignition switch)
23. Main injection system relay
24. 30A fuse protecting injection system
25. Auxiliary fuel pump relay
26. Glow plug preheating control unit
27. Intake air flow and temperature sensor (debimeter)
28. Brake pedal switch
29. Clutch pedal switch
30. Ignition switch
31. Battery
32. Inertia switch
33. Auxiliary fuel pump (submerged in tank)
34. 60A fuse protecting glow plug control unit
35. Cylinder no. 1 glow plug
36. Cylinder no. 2 glow plug
37. Cylinder no. 3 glow plug
38. Cylinder no. 4 glow plug
39. Cylinder no. 1 injector
40. Cylinder no. 2 injector
41. Cylinder no. 3 injector
42. Cylinder no. 4 injector
43. Throttle valve control solenoid
44. Turbocharger wastegate control solenoid
45. Diesel filter heater relay

## 10.

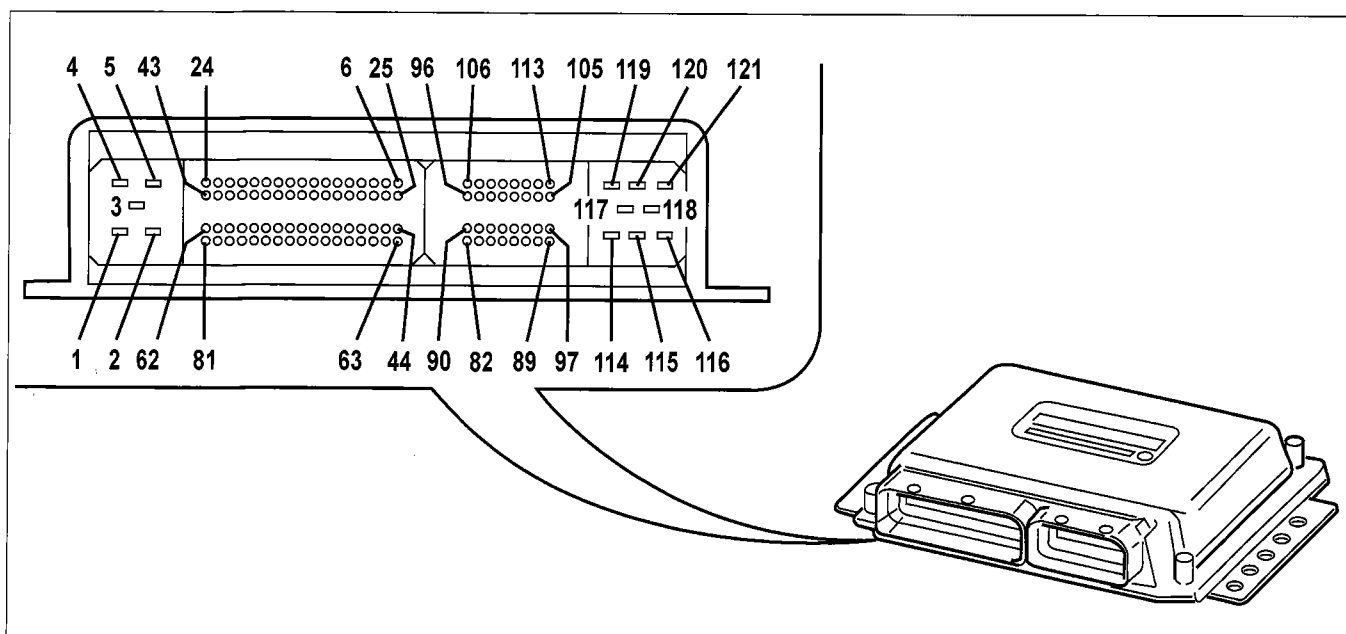
### ELECTRONIC INJECTION CONTROL UNIT

The control unit processes signals from the various sensors by applying software algorithms and controls the actuators accordingly (particularly the injectors and pressure regulator) to achieve the best possible engine service conditions.

The control unit is "flash E.P.R.O.M." type, i.e. it can be reprogrammed from outside without any need to adjust the hardware.

The injection control unit contains a built-in absolute pressure sensor and is connected to the wiring by means of a 121 pin connector.

#### Control unit connection identification (PIN-out)



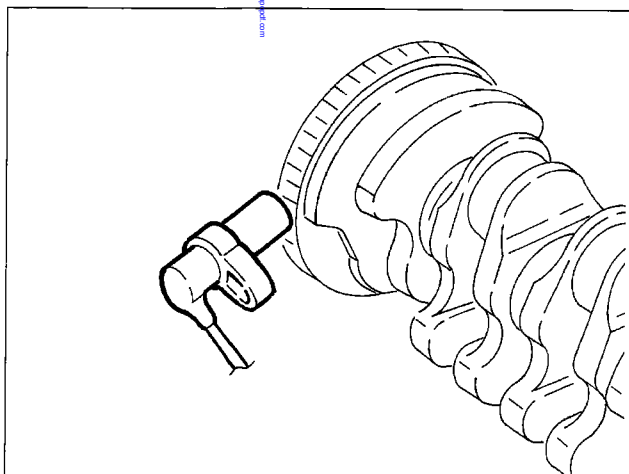
4A010QJ01

- |                                     |                              |
|-------------------------------------|------------------------------|
| 1 Permissible                       | 24 Auxiliary fuel pump relay |
| 2 Permissible                       | 25 Not connected             |
| 3 Permissible                       | 26 Not connected             |
| 4 Actuator power supply             | 27 Not connected             |
| 5 Injector/ECU power supply         | 28 Not connected             |
| 6 Not connected                     | 29 Not connected             |
| 7 Not connected                     | 30 Not connected             |
| 8 Not connected                     | 31 Not connected             |
| 9 Not connected                     | 32 Not connected             |
| 10 Not connected                    | 33 Not connected             |
| 11 Fiat CODE                        | 34 Not connected             |
| 12 Not connected                    | 35 Not connected             |
| 13 Injection relay                  | 36 Not connected             |
| 14 Glow plug control                |                              |
| 15 Throttle body solenoid           |                              |
| 16 EGR valve                        |                              |
| 17 Waste gate solenoid valve        |                              |
| 18 Air conditioner relay            |                              |
| 19 Radiator fan high speed relay    |                              |
| 20 Radiator fan low speed relay     |                              |
| 21 Diagnostic warning light control |                              |
| 22 Glow plug activation control     |                              |
| 23 Not connected                    |                              |



- |                                                   |                                            |
|---------------------------------------------------|--------------------------------------------|
| 37 Not connected                                  | 91 Fuel pressure sensor (pin 2)            |
| 38 Not connected                                  | 92 Fuel pressure sensor (pin 1)            |
| 39 Not connected                                  | 93 Turbo pressure sensor (pin 1)           |
| 40 Not connected                                  | 94 Turbo pressure sensor (pin 3)           |
| 41 Not connected                                  | 95 Turbo pressure sensor (pin 2)           |
| 42 Not connected                                  | 96 Not connected                           |
| 43 Not connected                                  | 97 Air flow meter (pin 4)                  |
| 44 Not connected                                  | 98 Not connected                           |
| 45 Not connected                                  | 99 RPM sensor (pin 1)                      |
| 46 Not connected                                  | 100 RPM sensor (pin 2)                     |
| 47 Engine rpm signal output                       | 101 RPM sensor (pin 3)                     |
| 48 Diagnostic line k                              | 102 RPM sensor (pin 1)                     |
| 49 Vehicle speed signal input                     | 103 Timing sensor (pin 2)                  |
| 50 Not connected                                  | 104 Timing sensor (pin 3)                  |
| 51 Activation signal from 4-stage pressure switch | 105 Not connected                          |
| 52 Activation signal from 3-stage pressure switch | 106 Not connected                          |
| 53 Not connected                                  | 107 Not connected                          |
| 54 Not connected                                  | 108 Fuel pressure regulator                |
| 55 Not connected                                  | 109 Fuel pressure regulator                |
| 56 Not connected                                  | 110 Not connected                          |
| 57 Not connected                                  | 111 Heater relay control Fuel filter       |
| 58 Key ON signal                                  | 112 Not connected                          |
| 59 Brake switch                                   | 113 Not connected                          |
| 60 Air conditioner activation request             | 114 Cylinder 4 injector control            |
| 61 Clutch switch                                  | 115 Not connected                          |
| 62 Glow plug diagnosis                            | 116 Not connected                          |
| 63 Not connected                                  | 117 Cylinder 1 and 2 injector power supply |
| 64 Not connected                                  | 118 Cylinder 3 and 4 injector power supply |
| 65 Not connected                                  | 119 Cylinder 1 injector control            |
| 66 Not connected                                  | 120 Cylinder 2 injector control            |
| 67 Not connected                                  | 121 Cylinder 3 injector control            |
| 68 Not connected                                  |                                            |
| 69 Not connected                                  |                                            |
| 70 Not connected                                  |                                            |
| 71 Not connected                                  |                                            |
| 72 Not connected                                  |                                            |
| 73 Not connected                                  |                                            |
| 74 Not connected                                  |                                            |
| 75 Not connected                                  |                                            |
| 76 Accelerator pedal 1 earth                      |                                            |
| 77 Accelerator pedal 1 signal                     |                                            |
| 78 Accelerator pedal 1 power supply               |                                            |
| 79 Accelerator pedal 2 earth                      |                                            |
| 80 Accelerator pedal 2 signal                     |                                            |
| 81 Accelerator pedal 2 power supply               |                                            |
| 82 Diesel temperature sensor (pin 1)              |                                            |
| 83 Diesel temperature sensor (pin 2)              |                                            |
| 84 Coolant temperature sensor (pin 1)             |                                            |
| 85 Coolant temperature sensor (pin 2)             |                                            |
| 86 Air flow meter (pin 1)                         |                                            |
| 87 Not connected                                  |                                            |
| 88 Air flow meter (pin 3)                         |                                            |
| 89 Air flow meter (pin 5)                         |                                            |
| 90 Fuel pressure sensor (pin 3)                   |                                            |

### 10.



4A012QJ01

#### RPM SENSOR

The rpm sensor is fitted to the engine crankcase and faces the phonic wheel on the crankshaft.

The sensor is inductive type, i.e. it works by varying a magnetic field generated when the phonic wheel teeth (60-2 teeth) pass in front of the sensor element.

The injection control unit uses the rpm sensor signal to determine crankshaft speed and angular position.

#### Operation

The changeover from full to empty due to the presence or absence of teeth sets up a magnetic flux change sufficient to generate an induced alternating voltage proportional to the number of teeth on the phonic wheel. The peak sensor output voltage value, all things being equal, depends on the distance between the sensor and the tooth (gap).

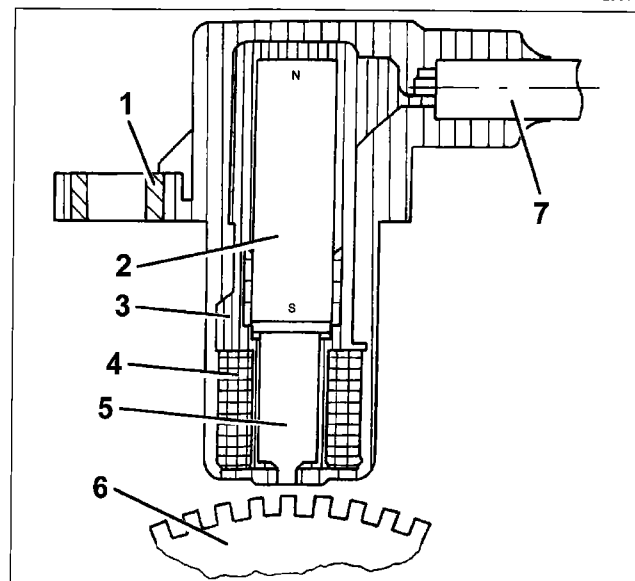
1. Steel bush
2. Permanent magnet
3. Sensor case
4. Winding
5. Core
6. Phonic wheel
7. Electrical connection

To obtain the correct signal, the specified gap between phonic wheel and sensor should be between 0.8 and 1.5 mm

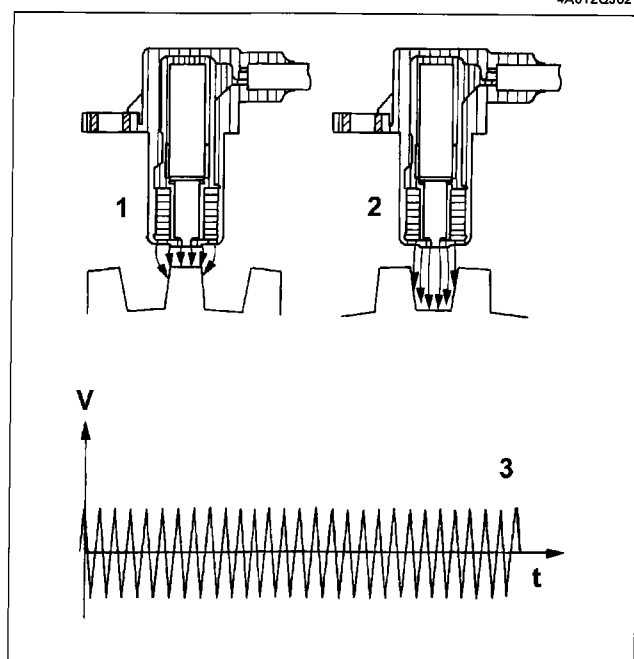
This distance is not adjustable. When the gap is not as specified, check the condition of the sensor and phonic wheel.

#### Winding resistance 860 Ohm $\pm 10\%$ at 20 °C

1. Maximum magnetic flux
2. Minimum magnetic flux
3. Induced alternate voltage



4A012QJ02



4A012QJ03

### TIMING SENSOR

The Hall effect sensor is fitted to the cylinder head and faces the camshaft pulley.

An opening on the pulley allows the timing sensor to detect the engine timing position and indicate it to the injection control unit.

The injection control unit uses the timing sensor signal to detect TDC at the end of compression.

### Operation

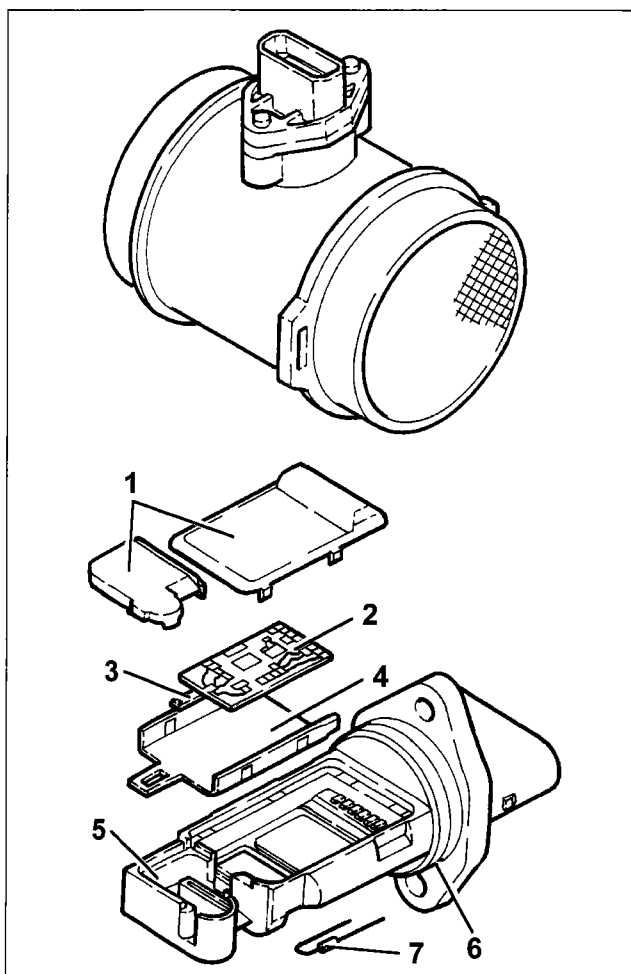
A semi-conductor layer, through which a current passes, immersed in a magnetic field (lines of force perpendicular to the direction of the current), produces a difference in power, known as Hall voltage.

If the intensity of the current remains constant, the voltage produced only depends on the intensity of the magnetic field. The intensity of the field can simply be altered periodically to produce a modulated electrical signal. Signal frequency is proportional to the speed with which the magnetic field changes.

To achieve this change, the sensor is crossed by a metal ring (inner part of the pulley) with an opening.

When it moves, the metal part of the ring covers the sensor to magnetic field and the output signal is therefore low; Conversely, the sensor generates a high signal at the opening when the magnetic field is present.

This signal, together with the rpm and TDC signals, allows the injection control unit to identify piston position and determine injection point.



### AIR FLOW METER (DEBIMETER)

The debimeter is located on the air intake sleeve and is hot film type.

The debimeter contains an intake air temperature sensor.

### Operation

The principle of operation is based on a heated membrane fitted into a measurement channel through which engine intake air flows.

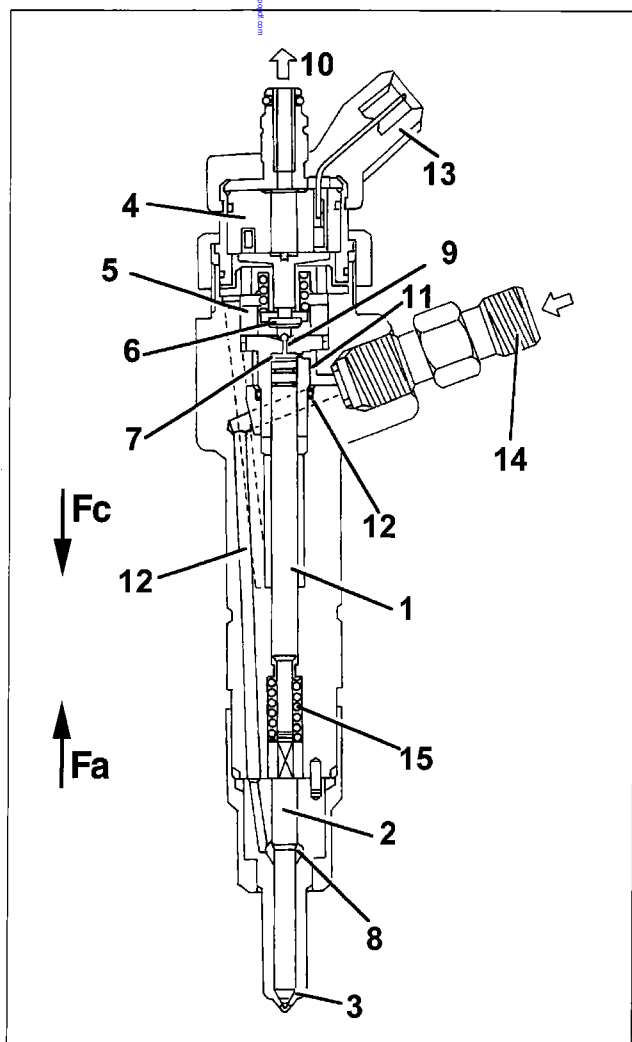
The hot film membrane is maintained at a constant temperature (about 120 °C higher than incoming air) by the heater coil.

The mass of air flowing through the measurement channel tends to take heat from the membrane. To keep the membrane at constant temperature, a certain current level must flow through the resistance.

Because this current is proportional to the mass of air that flows to the engine, it can be measured with a Wheatstone bridge and the resulting signal is sent to the injection control unit.

1. Covers
2. Electronic card
3. Sensor
4. Mounting plate
5. Mount
6. O-ring
7. Temperature sensor

### 10.



4A014QJ01

1. Pressure rod
2. Pin
3. Nozzle
4. Coil
5. Pilot valve
6. Ball plunger
7. Control area
8. Supply volume
9. Control volume
10. Fuel outlet connector (low pressure)
11. Control port
12. Supply port
13. Electrical connection
14. Fuel input connector (high pressure)
15. Spring

### INJECTORS

The injectors are fitted to the cylinder head and are electromagnetic in type. They are controlled directly by the injection control unit.

The injectors come with a high-pressure supply port and a recirculation pipe at environmental pressure; The supply port is connected to a delivery manifold (rail) with pipes designed to withstand the high service pressures.

The injector can be divided into two parts:

- Actuator/spray made up of a pressure rod (1), pin (2) and nozzle (3);
- control solenoid made up of coil (4) and pilot valve (5).

### Operation

Injector operation may be divided into three stages:

#### 1. rest position

Coil (4) is deactivated and plunger (6) is in closed position to prevent fuel entering the cylinder:  $F_c > F_a$  where  $F_c$  is the force generated by pressure acting on the control area (7) of pressure rod (1) and  $F_a$  is the force due to the pressure acting on supply volume (8).

#### 2. Start of injection

Coil (4) is excited and causes plunger (6) to rise. Fuel flows from control volume (9) to the return manifold to bring about a pressure drop in control area (7). Simultaneously, line pressure through supply port (12) exerts a force  $F_a > F_c$  on supply volume (8) to cause pin (2) to rise and thus allow fuel into the cylinders.

#### 3. end of injection

Coil (4) is deactivated and causes plunger (6) to return to closed position. The resulting balance of forces makes pin (2) return to rest position and injection therefore ends.

## 10.

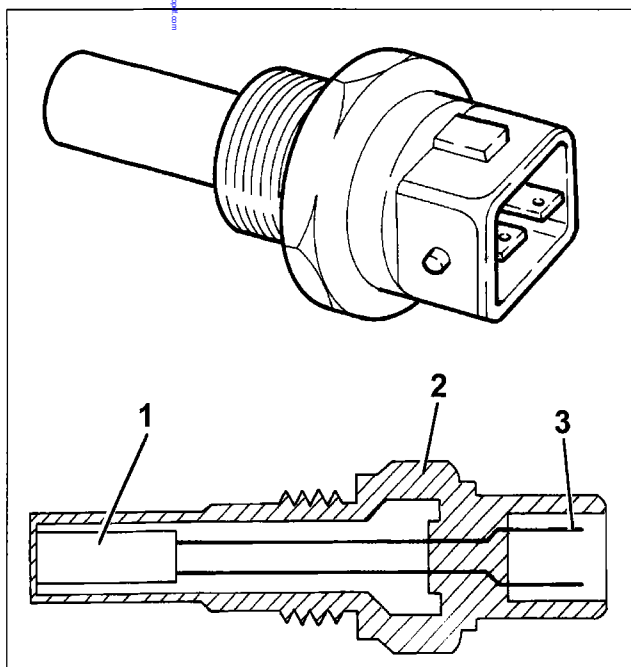
### ENGINE COOLANT TEMPERATURE SENSOR

The sensor is fitted to the thermostat and measures the temperature of the engine coolant by means of an NTC thermistor with a negative resistance coefficient.

Because the sensor is made using semiconductor technology, the resistance falls if sensor element temperature rises with increasing coolant temperature.

Because resistance does not change in linear manner, it is higher at low temperatures than at high temperatures for the same temperature increase.

1. NTC resistance
2. Sensor case
3. Electrical connector

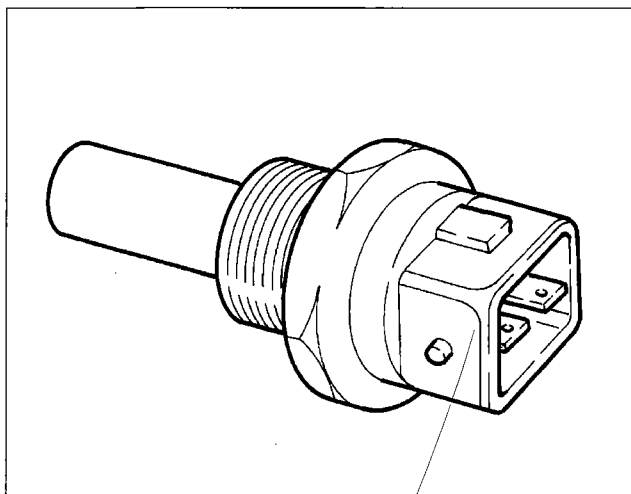


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### FUEL TEMPERATURE SENSOR

The sensor is fitted on the return manifold and measures fuel temperature by means of an NTC thermistor with a negative resistance coefficient.

Refer to the previous description of the coolant temperature sensor for sensor operation.

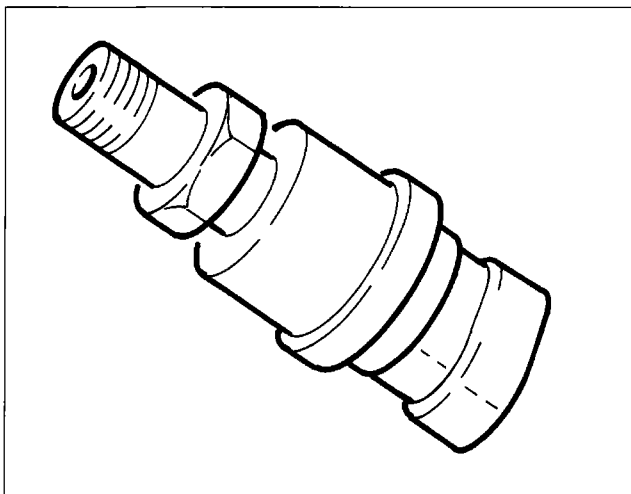


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### FUEL PRESSURE SENSOR

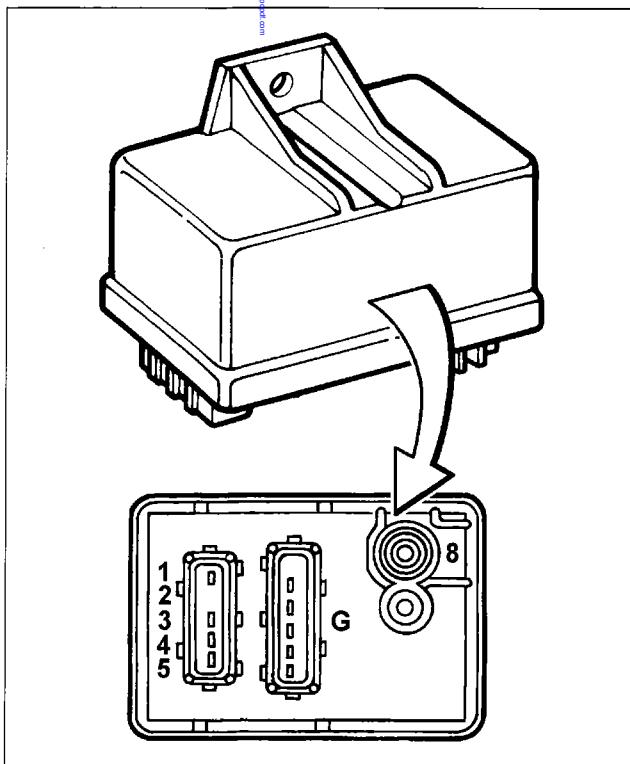
The sensor is fitted in the middle of the fuel delivery manifold (rail) and is responsible for providing a return signal (feedback) to the control unit in order to:

- adjust injection pressure;
- regulator injection duration.



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**10.**



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**GLOW PLUG PREHEATING CONTROL UNIT**

The glow plugs are controlled by means of a preheating control unit under the direct control of the injection control unit.

The preheating control unit contains a smart relay that sends a return response (feedback) to the injection control unit, which is thus informed of faults in the preheating control unit or glow plug short-circuits to earth.

The figure shows the connectors on the base of the preheating control unit and the pin-out

1. Permissible
2. Injection control unit (pin 22)
3. Power supply from main injection relay
4. Not connected
5. Injection control unit (pin 62)
8. Positive from battery (+30)
- G. Glow plugs (only four outputs are used)

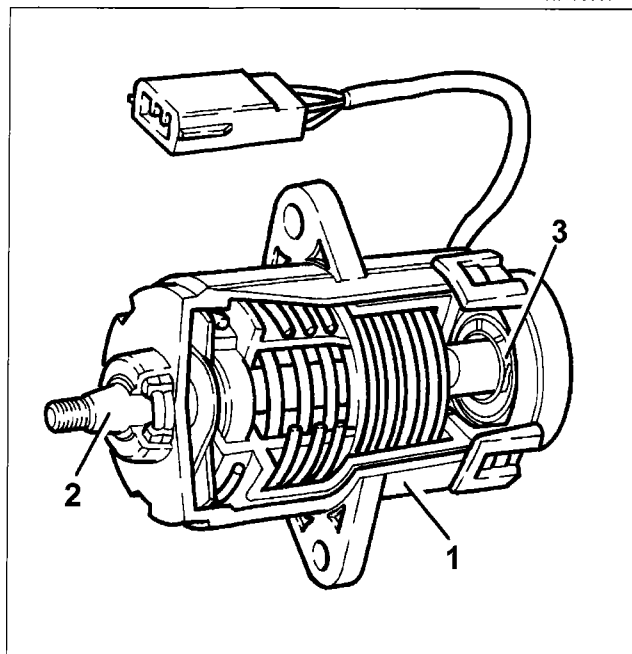
**ACCELERATOR  
PEDAL POTENTIOMETER**

Accelerator pedal position is converted to an electrical voltage signal and sent to the injection control unit by a potentiometer connected to the accelerator pedal.

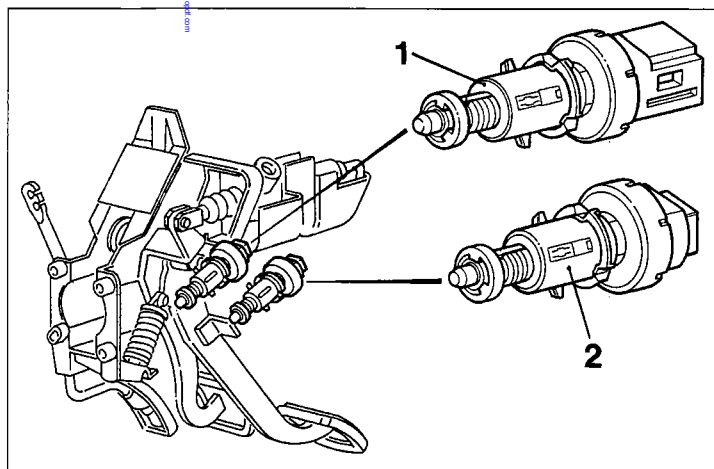
Accelerator pedal position is processed together with rpm information to provide injection times and pressure.

The sensor consists of a case (1) secured to the pedal by a flange, which contains an axially-positioned shaft (2) connected to two potentiometers (3): main and safety potentiometers.

A coil spring on the shaft ensures the correct resistance to pressure while a second spring ensures return upon release.



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### TEST

A switch (1) on the brake pedal controls the car brake lights; the same switch sends a signal to pin 59 of the injection control unit

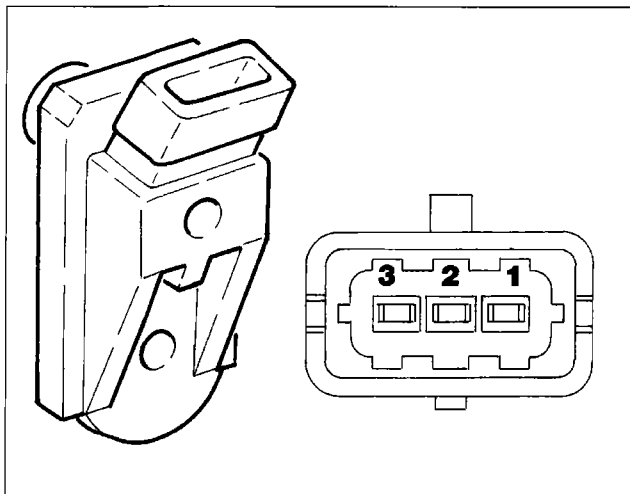
The control unit uses the "brake pedal depressed" signal to:

- detect a situation of over-run;
- check the plausibility of the signal from the accelerator potentiometer

### CLUTCH PEDAL SWITCH

A switch (2) on the clutch pedal is connected to pin 61 of the injection control unit.

The injection control unit uses the "brake pedal operated" signal to distinguish gear engaged and gear shift conditions.



4A017QJ02

### PRESSURE RELIEF SENSOR

The sensor is fitted to the intake manifold and the signal sent to the injection control unit is used to:

- adjust injection pressure;
- adjust injection duration.

The figure alongside shows the sensor and electrical connector with the following pin-out:

1. pressure signal
2. Permissible
3. Fuel feed system

### ATMOSPHERIC PRESSURE SENSOR

The atmospheric pressure signal is built into the injection control unit. It is responsible for measuring atmospheric pressure in order to correct measured air flow and reference air flow values to control the EGR function.



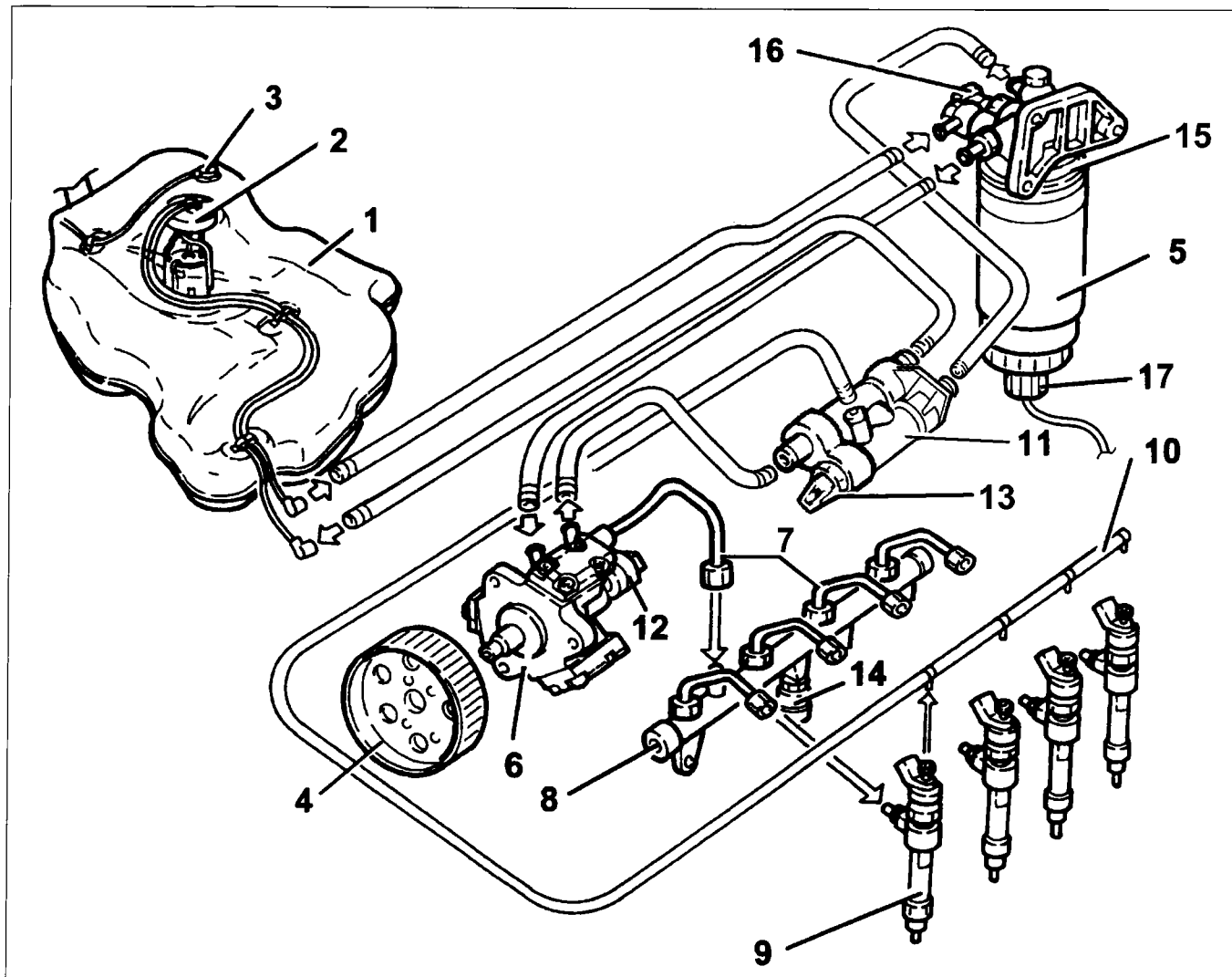
### 10.

#### FUEL SUPPLY CIRCUIT

Operationally-speaking, the fuel supply circuit is divided into a low pressure circuit and a high pressure circuit.

The low pressure circuit consists of a tank, multifunction valve, auxiliary fuel pump submerged in the tank and a return manifold.

The high pressure circuit consists of a radialjet pressure pump, delivery manifold and injectors.



4A018QJ01

- |                                                                  |                                                        |
|------------------------------------------------------------------|--------------------------------------------------------|
| 1. Fuel tank                                                     | 14. Fuel pressure sensor                               |
| 2. Submerged fuel pump (auxiliary) with fuel level gauge control | 15. Diesel heater                                      |
| 3. Multifunction valve                                           | 16. Fuel temperature sensor                            |
| 4. Pressure pump control pulley                                  | 17. Sensor indicating presence of water in fuel filter |
| 5. Diesel filter cartridge                                       |                                                        |
| 6. Pressure pump                                                 |                                                        |
| 7. High pressure pipe                                            |                                                        |
| 8. Delivery manifold (rail)                                      |                                                        |
| 9. Injectors                                                     |                                                        |
| 10. Fuel recirculation pipe (injector return)                    |                                                        |
| 11. Return manifold                                              |                                                        |
| 12. Pressure regulator                                           |                                                        |
| 13. Fuel temperature sensor                                      |                                                        |

## 10.

### SUBMERGED FUEL PUMP ASSEMBLY (AUXILIARY) AND LEVEL GAUGE CONTROL

The assembly consists mainly of:

- a roller-type fuel pump;
- a fuel level gauge;
- a fuel filter

The submerged fuel pump is volumetric type with rollers and a motor with brushes and permanent magnet excitation.

Impeller (1) is driven by the electric motor to turn and create volumes (2) that move from intake port (3) to outlet port (4).

These volumes are delimited by rollers (5) that adhere to outer race (6) as the motor turns.

The pump is fitted with two valves: a check valve to prevent the fuel circuit emptying (with the pump off); a second pressure relief valve (7) that short-circuits the outlet to the inlet when pressures exceed 5 bars.

### FUEL FILTER

The fuel filter is located in the engine bay.

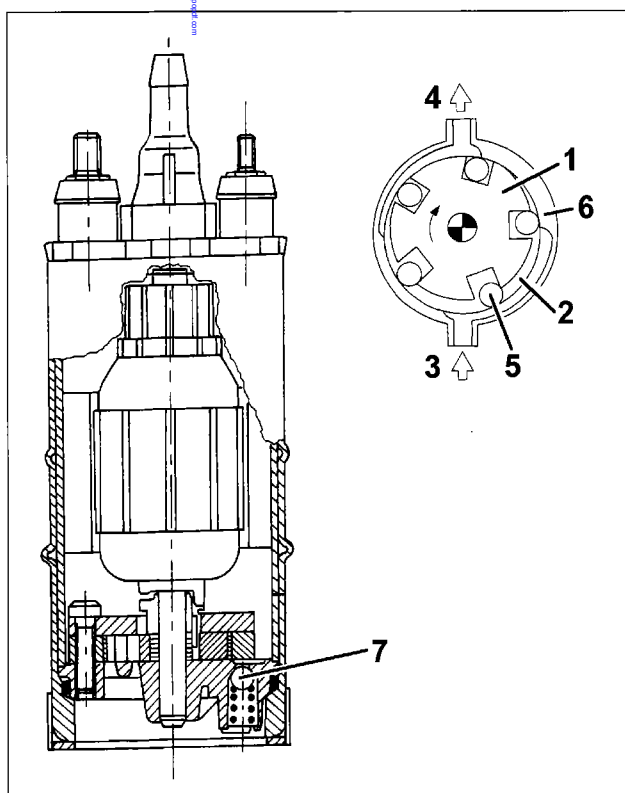
The filter is cartridge type with a filter element (1) made up of a pack of paper discs with a filtering area of some 5300 cm<sup>2</sup> and a filter gauge of 4 - 5 microns.

The filter is equipped with a fuel preheating device (2) controlled by the engine control unit via a relay.

The control unit activates or deactivates the diesel filter on the basis of a diesel temperature signal sent by sensor (3) on the filter.

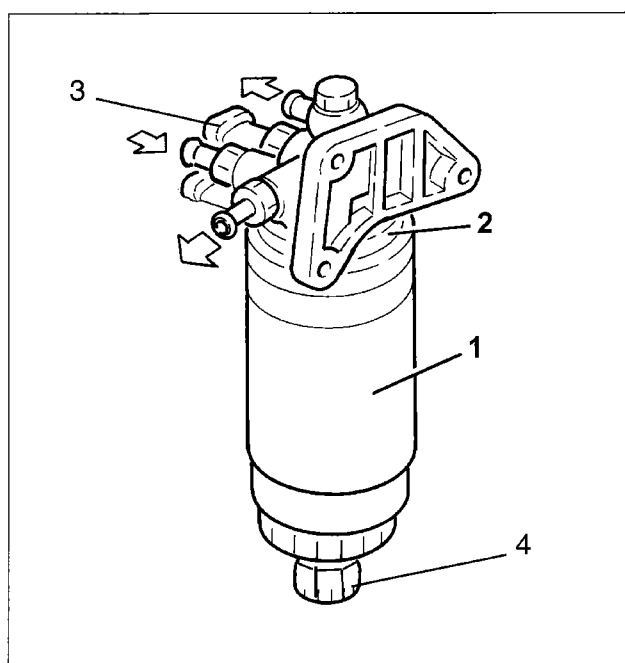
A plug (4) screwed to the base of the fuel filter cartridge is used to drain off the water. The plug incorporates a sensor for the detection of water in the diesel filter connected to a warning light on the instrument panel.

1. Filter cartridge
2. Diesel preheating device
3. Diesel temperature sensor
4. Water drain plug with sensor to detect presence of water in diesel filter



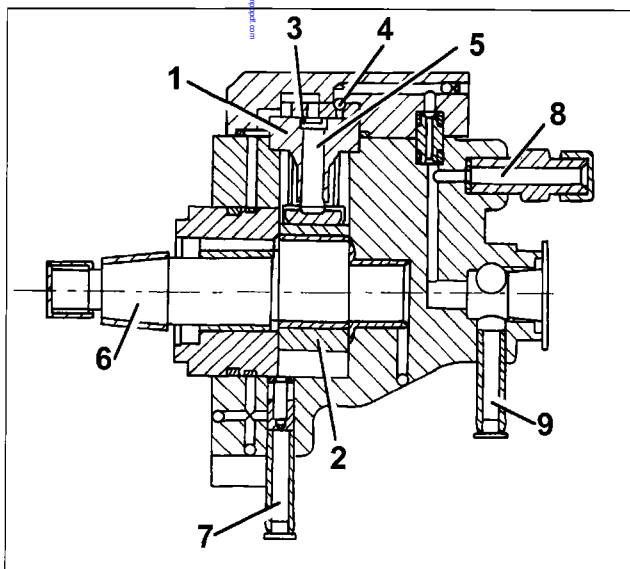
4A019QJ01

1. Impeller
2. Volumes
3. Intake port
4. Outlet port
5. Rollers
6. Outer race
7. Pressure relief valve

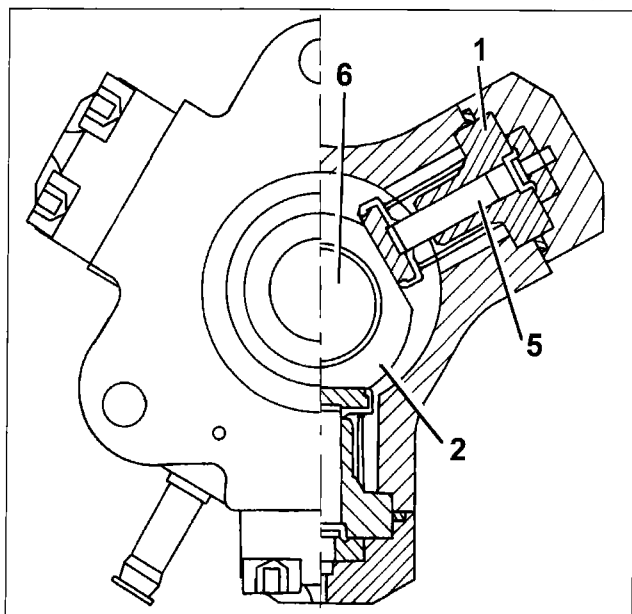


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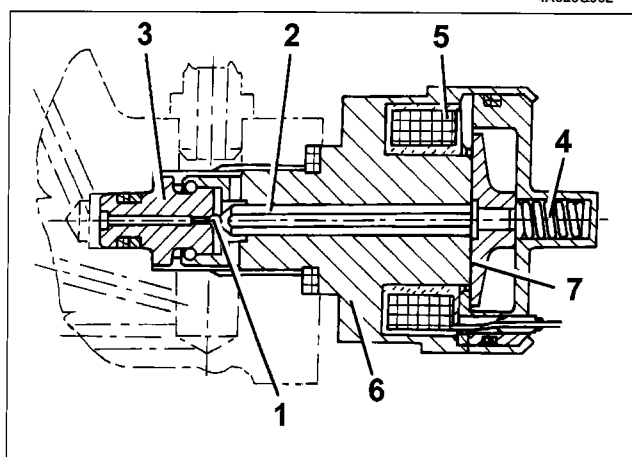
### 10.



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#### PRESSURE PUMP

The pressure pump is radialjet type with three radial pistons (total capacity 0.657 cc). It is controlled by a timing belt with or without timing requirements.

Each pump unit consists of:

- a piston (5) operated by a cam (2) integral with the pump shaft (6);
- a plate-type intake valve (3);
- a delivery ball valve (4).

The pressure pump must be supplied at a pressure of at least 0.5 bars; and for this reason the fuel system is equipped with an auxiliary pump submerged in the tank.

The pressure pump is lubricated and cooled by the diesel fuel via channels and is able to deliver a maximum pressure of 1350 bars.

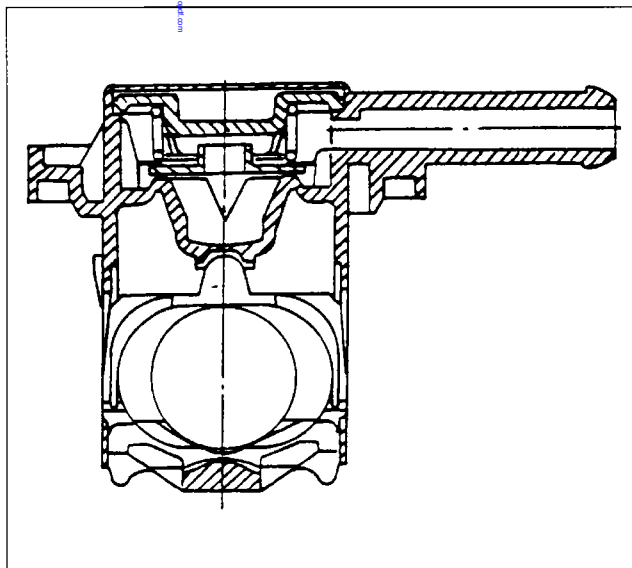
1. Cylinder
2. Cam
3. Plate-type intake valve
4. Ball-type delivery valve
5. Piston
6. Pump shaft
7. Diesel intake connection - low pressure - from fuel filter
8. Diesel delivery connection - high pressure - to manifold (rail)
9. Diesel delivery connection - low pressure - recirculation

#### PRESSURE REGULATOR SENSOR

The fuel pressure regulator is fitted to the pressure pump and controlled directly by the injection control unit. It regulates fuel feed pressure to the injectors.

The pressure regulator consists mainly of the following parts:

1. Ball plunger
2. Pin
3. Valve
4. Preload spring
5. Coil
6. Body
7. Anchor



4A021.QJ01

### MULTIFUNCTION VALVE

The multifunction valve is located on the fuel tank and performs the following functions:

- tank pressurisation
- ventilation
- seal if the car rolls over

#### Tank pressurisation

Tank pressurisation is maintained at a level between 55 and 75 mbars by means of a valve mounted on a sealing rim.

The valve is supported by a steel plate and held in place by a spring.

When tank pressure exceeds a specified level, it overcomes spring resistance and allows the valve to rise so that vapours can flow out.

When the pressure returns to within specified limits, the valve closes again

#### Ventilation

Under certain car service conditions, a vacuum may build up in the tank due to the effect of:

- heat changes;
- fuel consumption

in this case, the valve's function is to make up pressure inside the tank by letting air into the tank.

If this function is not performed correctly, the car may judder or stall due to difficulties in supplying the pump.

#### Seal if the car rolls over

The roll-over function prevents fuel emerging from the tank if the car rolls over or tilts to a great extent. During normal car operation (bends, acceleration, braking etc.), the fuel slops about and may emerge. The highly-sensitive roll-over valve prevents this happening.

#### DELIVERY MANIFOLD (RAIL)

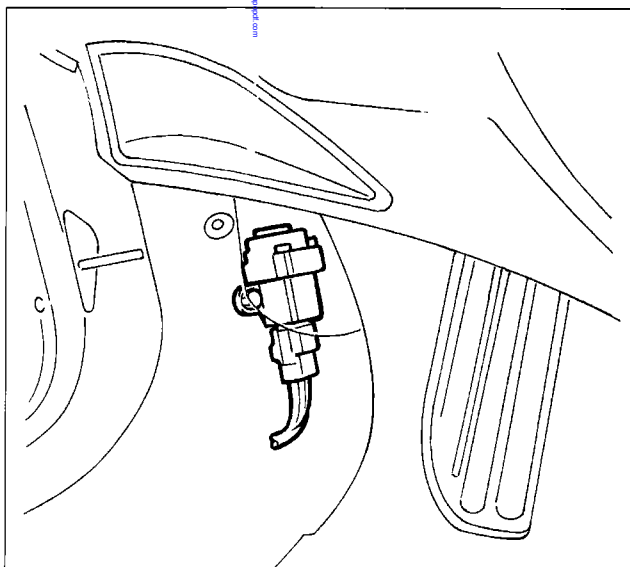
The delivery manifold (rail) is fitted to the cylinder head on the intake side.

Its volume damps fuel pressure fluctuations due mainly to:

- operation of the pressure pump;
- injector opening.

A fuel pressure sensor is fitted in the middle of the delivery manifold. Hydraulic connections (high pressure) are via special steel pipes.

### 10.



4A022QJ01

#### INERTIA SAFETY SWITCH

To increase car occupant safety in the case of impact, the car is fitted with an inertia switch located inside the passenger compartment secured to the inside of the left panel.

This sensor reduces the possibility of fire (due to emerging fuel) by deactivating the auxiliary fuel pump that supplies the injection circuit.

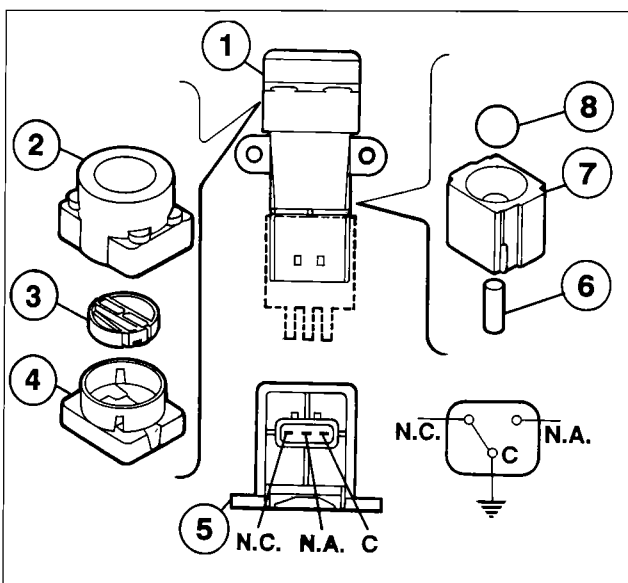
The switch consists of a steel ball, fitted in a tapered housing, kept in place by the attraction force of a permanent magnet.

In the case of violent impact, the ball is released from the magnetic detent and opens the normally closed (NC) electrical circuit to cut off the auxiliary fuel pump connection to earth, and as a consequence the supply to the injection system.

To restore the auxiliary pump earth connection, move back the seat and press the switch until a click is heard.



*Even after an apparently slight impact, if there is a smell of fuel or there are leaks from the fuel system, do not turn the switch back on, but search for the fault and remedy it to prevent the risk of fire.*



4A022QJ02

#### Inertia switch components

1. Inertia switch assembly
2. Sheath
3. Button
4. Upper side
5. Engagement side
6. Permanent magnet
7. Permanent magnet seat
8. Steel ball

C. Shared terminal  
N.C. Normally closed contact  
N.A. Normally open contact

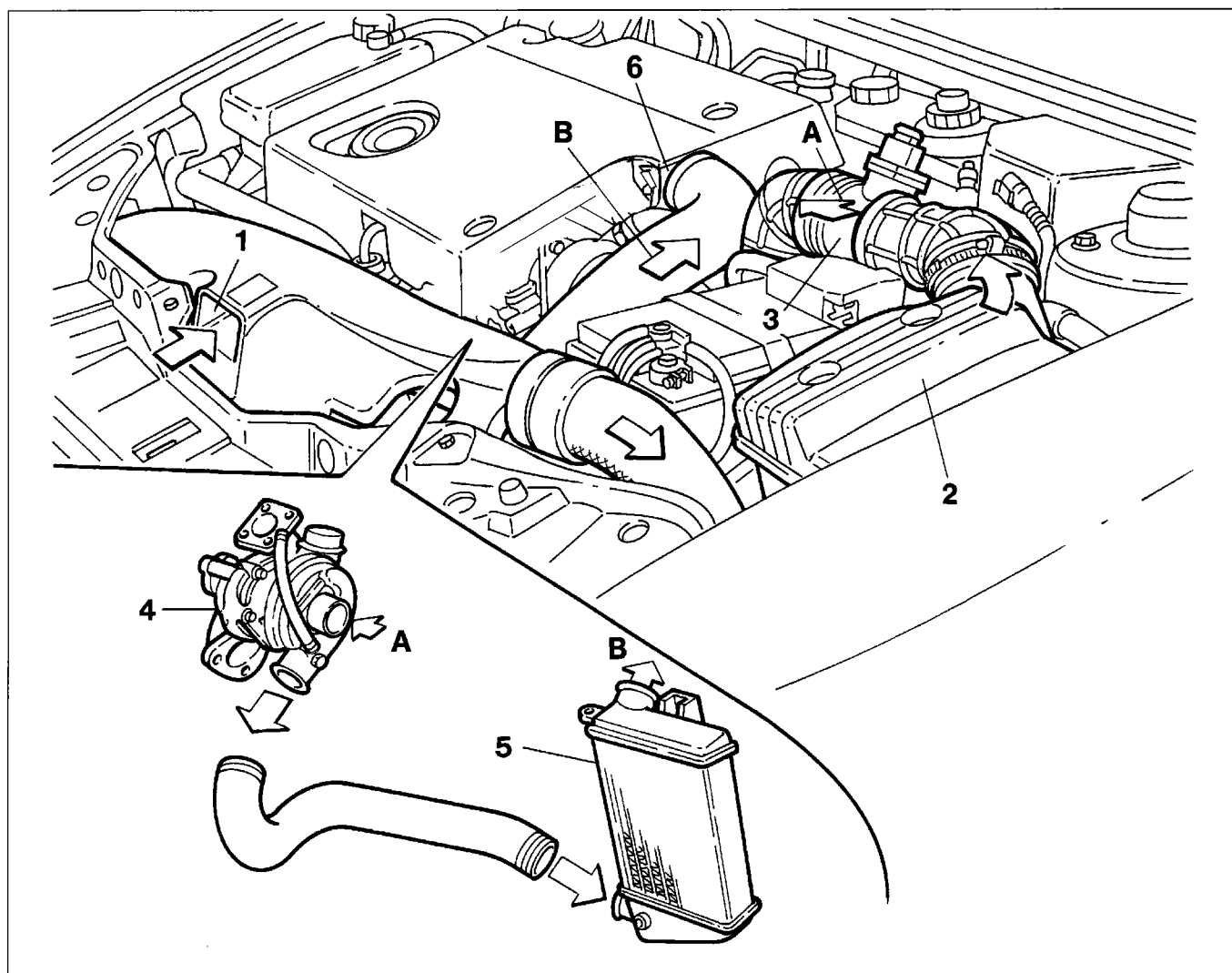
### AIR INTAKE CIRCUIT

The air intake circuit is turbocharged by means of a turbocharger with wastegate controlled by the engine management unit and an intercooler.

The turbocharger is low inertia type. Its design is based on a new principle of turbocharging whereby the turbocharger aims to increase torque within the range of most frequent use (e.g. at low speeds).

After passing through the filter (1), intake air is compressed by the exhaust gas-drive turbocharger (4), cooled by intercooler (5) and sent to throttle body (6) and the intake manifold from where it is distributed to the cylinders.

#### Air intake circuit diagram



4A023QJ01

1. Intake vent
2. Air filter
3. Intake air flow meter (debimeter)
4. Turbocharger
5. Air-air intercooler
  - A. To turbocharger
  - B. To intake manifold
6. Throttle body

## 10.

### THROTTLE CASING

To reduce engine noise during shut-down, a throttle has been added to the intake port with the aim of closing off the air flow to the cylinders.

Throttle valve opening or closure is controlled by an engine control unit (5) that manages a control actuator (3) on throttle body (4) via solenoid (2).

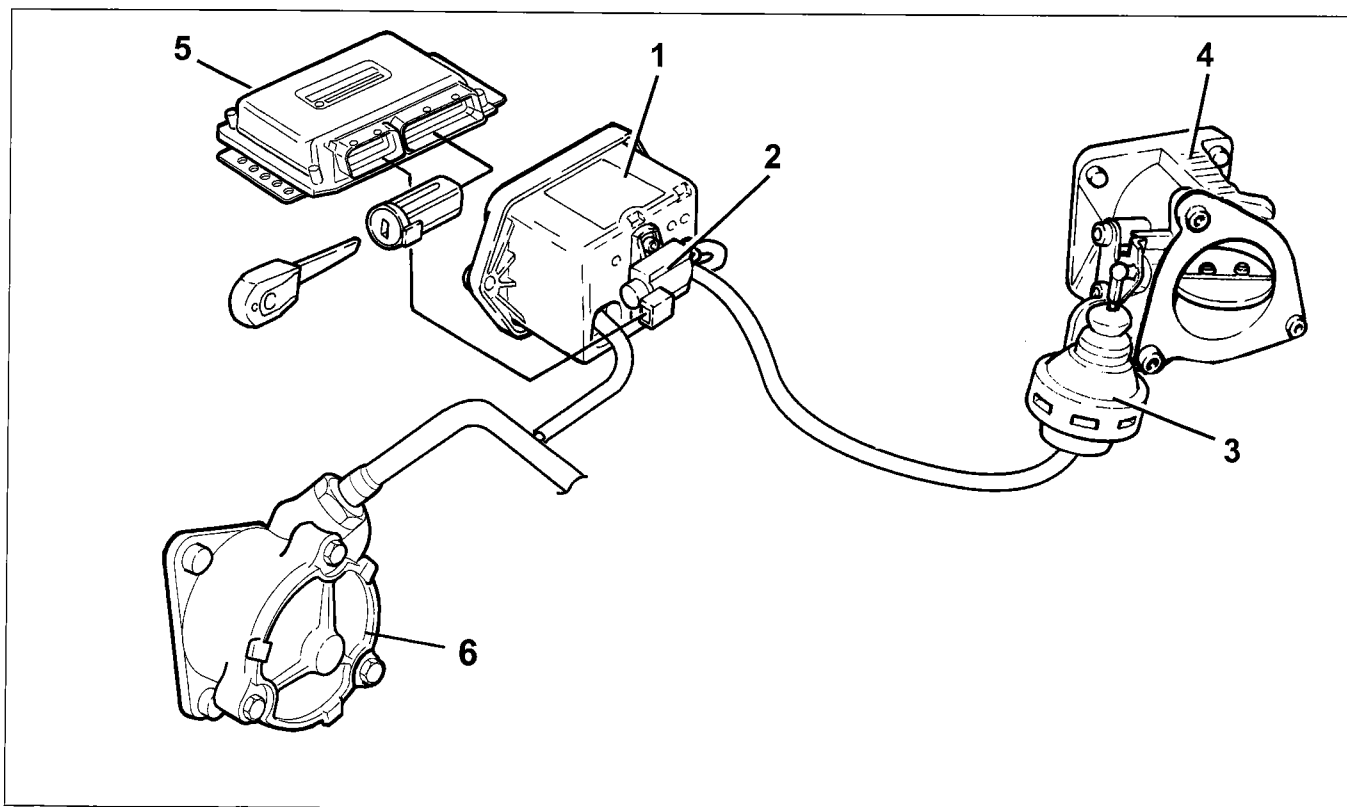
#### Operation

When the engine is off, the throttle is open because no vacuum is present.

When the engine is running, the throttle is open because the Pierburg solenoid is not activated and prevents the vacuum reaching the pneumatic actuator.

A vacuum builds up in the tank during engine operation.

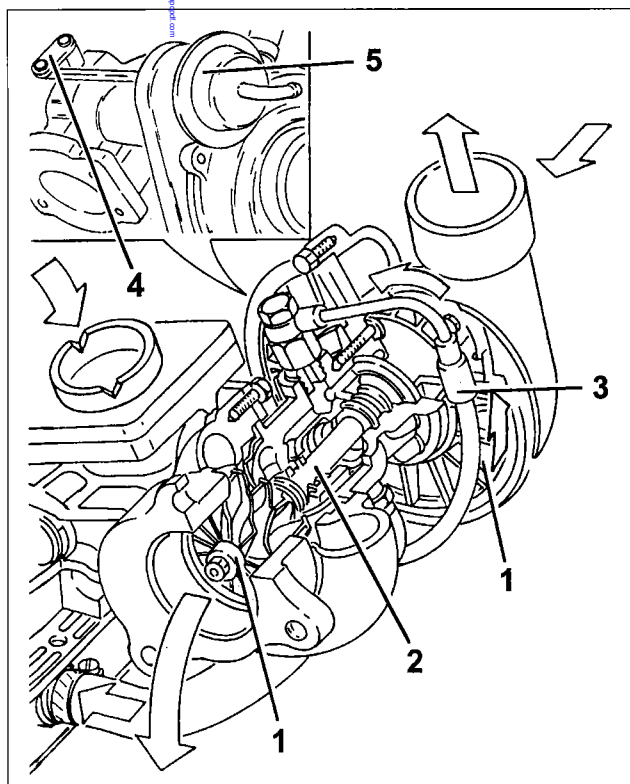
During engine shut-down (when the ignition key is turned OFF), the control unit keeps the actuator supply relay activated for a further 4 or 5 seconds and simultaneously earths the Pierburg valve. The Pierburg valve opens to send the vacuum that has built up in the vacuum tank to the pneumatic actuator, which closes the throttle to cut off the flow of air to the cylinders.



4A024QJ01

1. Vacuum tank;
2. Pierburg solenoid controlling throttle body actuator;
3. Pneumatic actuator on throttle body
4. Throttle case
5. Engine control unit
6. Vacuum pump





4A025QJ01

### TURBOCHARGER

This consists essentially of two impellers (1) fitted to the same shaft (2), which rotates on floating bearings lubricate via a branch (3) of the engine lubrication system.

The oil used dissipates a proportion of the great quantity of heat given up by the exhaust gas to the turbine.

The turbocharger is fitted with a wastegate (4) controlled by a pneumatic actuator (5), which partially restricts the passage of exhaust gases to the turbine according to engine power/torque requirements.

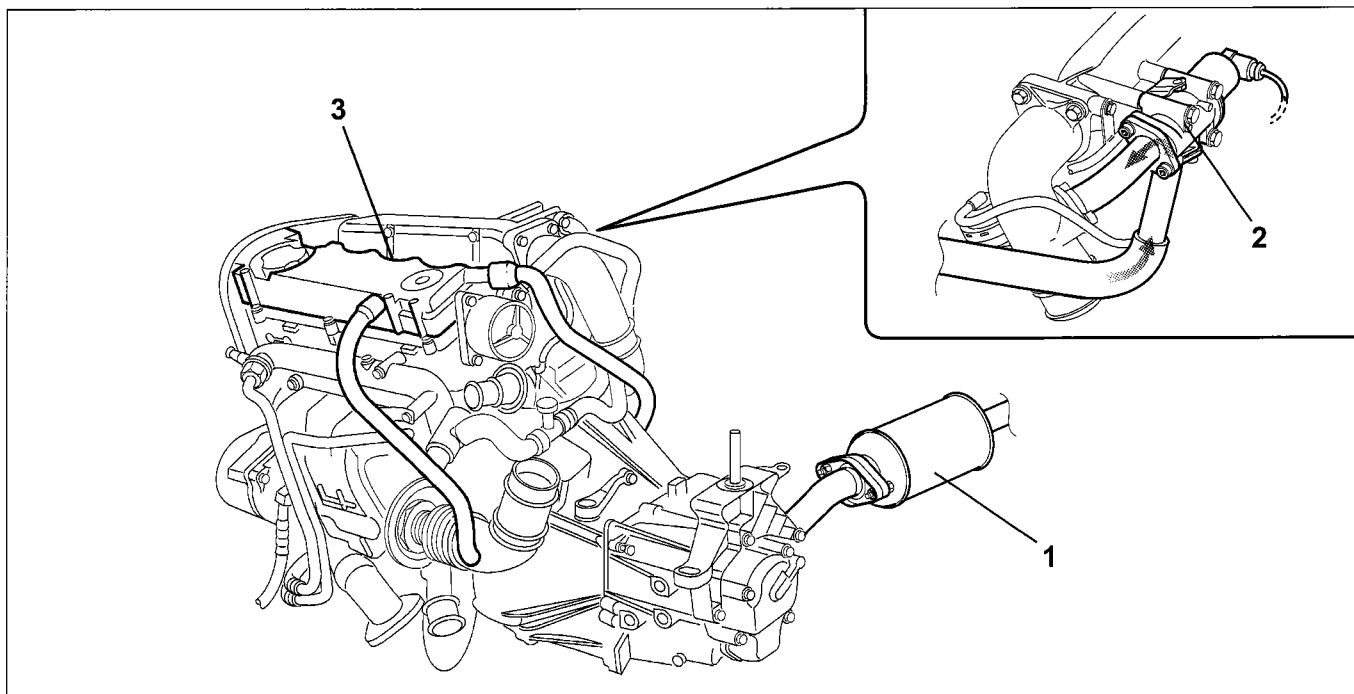
The pneumatic actuators is controlled by the engine control unit via a solenoid.

1. Impellers
2. Shaft
3. Lubrication
4. Wastegate
5. Actuator

### EMISSION CONTROL DEVICES

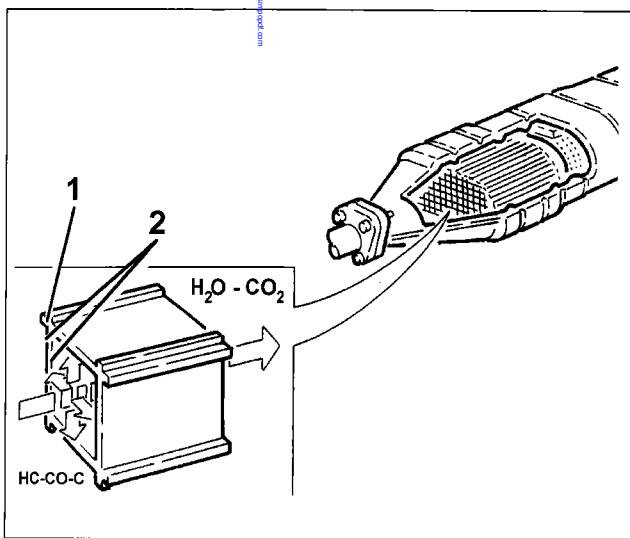
The car is equipped with devices designed to reduce polluting emissions in accordance with Euro 3 requirements:

- Oxidising catalytic converter (1)
- Exhaust gas recirculation circuit (EGR) (2)
- Crankcase blow-by vapour recirculation circuit (3).



4A025QJ02

### 10.



#### OXIDISING CATALYTIC CONVERTER

The oxidising catalytic converter is a post-treatment device used to oxidise CO, HC and particulate and convert them to carbon dioxide (CO<sub>2</sub>) and water vapour (H<sub>2</sub>O).

The catalytic converter consists of a ceramic honeycomb case (1) with its chambers impregnated with platinum, a substance that catalyses oxidation reactions.

Exhaust gases flow through the chambers and heat the catalytic converter where they trigger the conversion of pollutants to inert compounds.

The chemical reaction involved in oxidising the CO, HC and particulate is effective at temperatures between 200 °C and 350 °C.

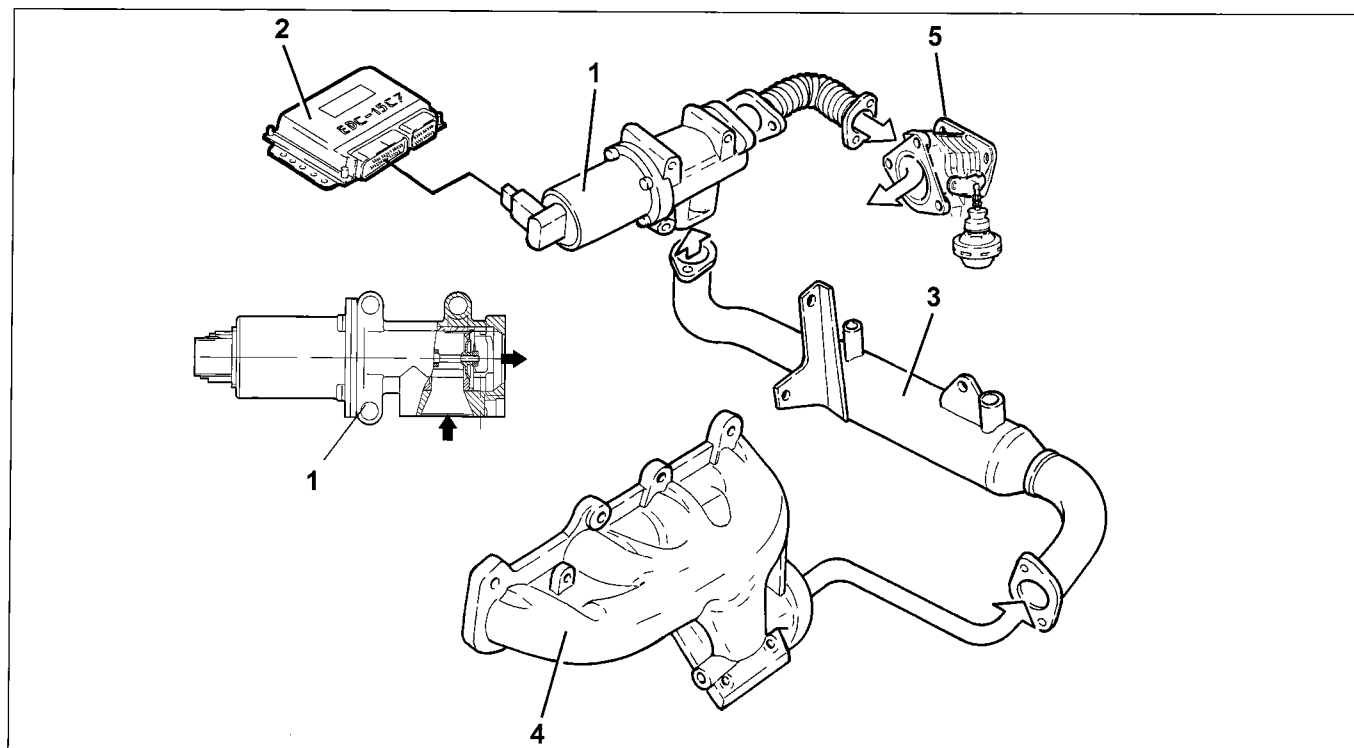
Above 350 °C, the sulphur in the diesel begins to oxidise to produce sulphur dioxide and sulphuric acid.

#### EXHAUST GAS RECIRCULATION CIRCUIT (EGR)

This system sends a proportion of exhaust gases to the intake under certain engine service conditions. This dilutes the fuel mixture with inert gases to lower peak temperature in the combustion chamber; This helps limit the formation of nitrogen oxides (NO<sub>x</sub>) and reduces exhaust levels by 30-50%.

The EGR valve consists of:

- a Pierburg EGR solenoid (1) operated by engine management unit (2)
- a pipe from the exhaust manifold (4) (from which the exhaust gases flow)
- an air-water heat exchanger (3) (that lowers exhaust gas temperature)
- a pipe connected to throttle body (5) to which exhaust gases are admitted



### Operation

With coolant temperature  $> 20^{\circ}\text{C}$  and engine speeds between 800 and 3000 rpm, the engine management unit controls the EGR solenoid by means of a square wave signal.

Changes in this signal allow the EGR coil to move a plunger and thus modulate the flow of exhaust gas from the exhaust manifold to the intake manifold; this achieves two results:

- less air is taken in
- combustion temperature is lowered (due to the presence of inert gases), thus reducing the formation of NOx (nitrogen oxides).

The engine management control unit is constantly informed of recirculation gas quantity via data from the debimeter. If the intake of a given quantity of air ( $Q_{am}$ ) is required for a given rpm and the level sent by the debimeter ( $Q_{ar}$ ) is lower, the difference ( $Q_{gr}$ ) is the amount of gas recirculated.

$$Q_{am} - Q_{ar} = Q_{gr}$$

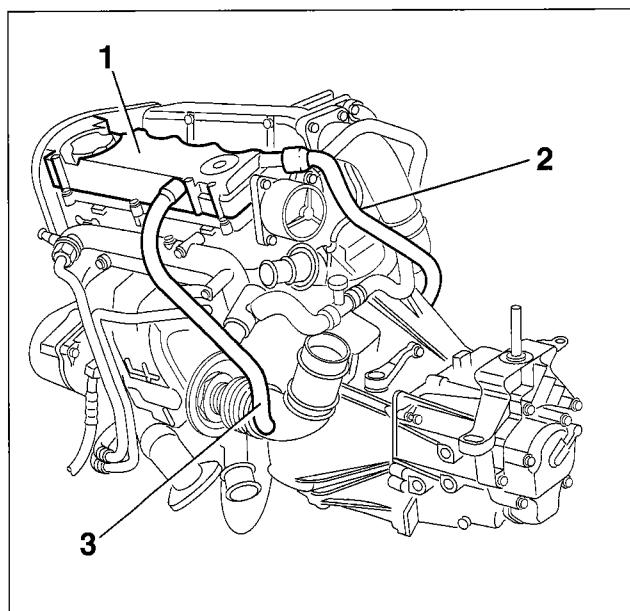
$Q_{am}$  = stored theoretical air quantity

$Q_{ar}$  = actual air quantity

$Q_{gr}$  = recirculated gas quantity

An atmospheric pressure signal is used in controlling the EGR valve to detect when the car is being driven at altitude. The recirculation gas quantity can then be reduced to prevent engine fumes.

### CRANKCASE VAPOUR RECIRCULATION SYSTEM (BLOW-BY)



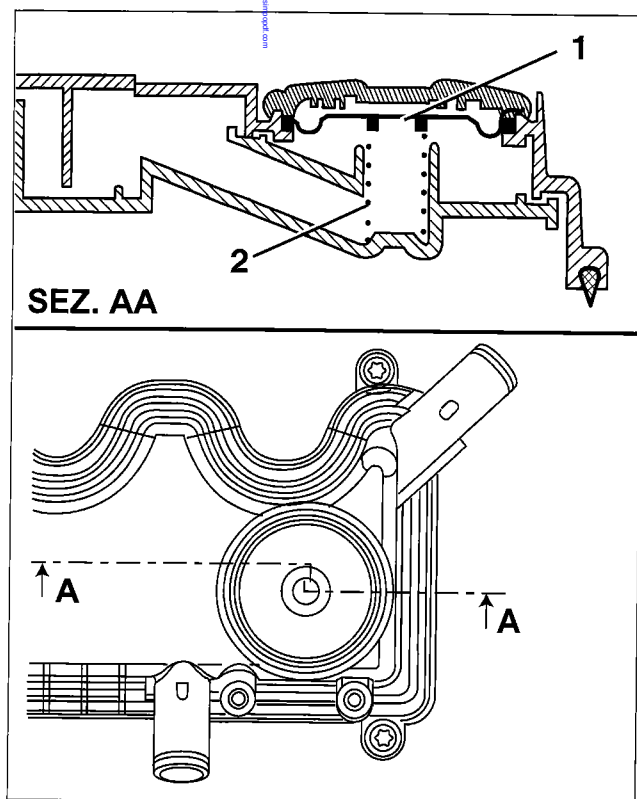
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Oil vapour emission control is carried out by a separator (1) (function performed by the cam cover), which collects vapours released from the crankcase in pipe (2).

The temperature difference between the separator and oil vapours brings about partial condensation.

The condensed vapours are sent through pipe (3) to the turbocharger air intake sleeve.

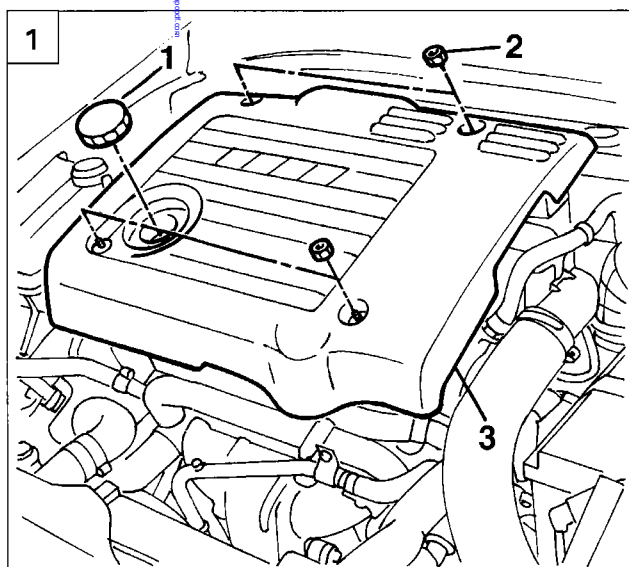
### 10.



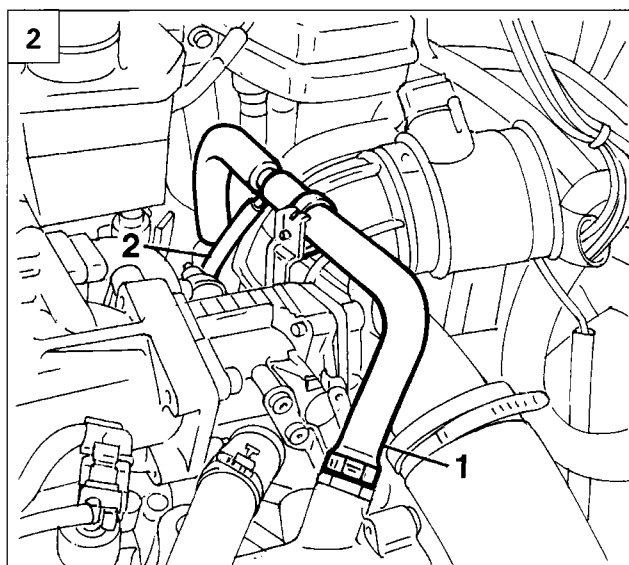
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A regulation valve made up of a spring (1) and membrane (2) on the cam cover prevents anomalous intake effects.

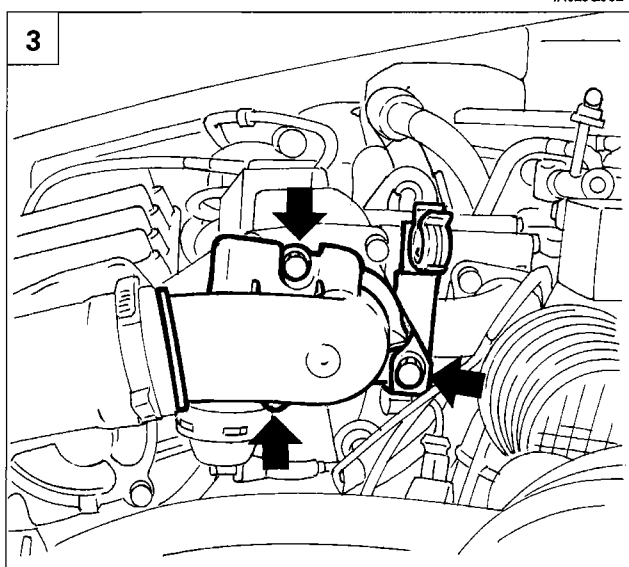
When the vacuum level inside the cam cover exceeds a specified limit, the membrane moves down to block the port from the crank-case.



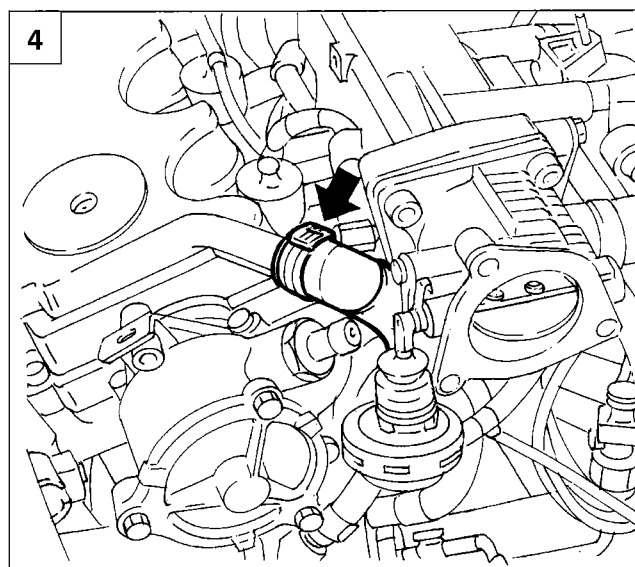
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## THROTTLE CASING

### Removing-refitting

- Remove the battery from the engine bay, then proceed as follows:

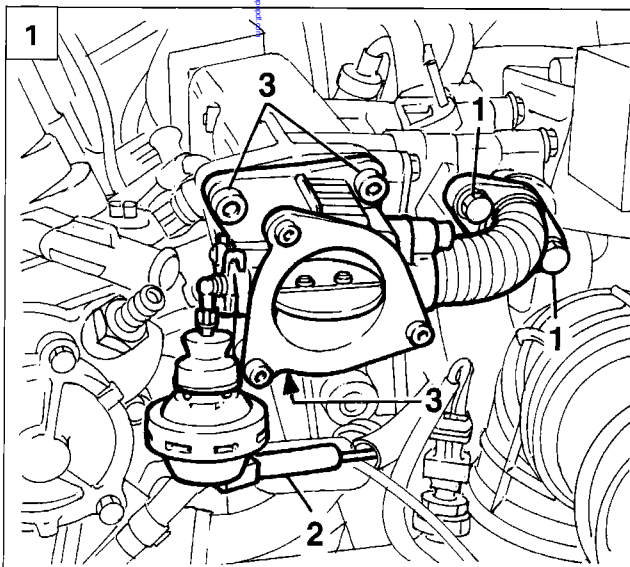
1. Remove the engine oil filler cap (1), then unscrew retaining bolts (2) and remove the soundproofing cover (3).

2. Disconnect vacuum intake pipe (1) from the vacuum pump by undoing the retaining band, then disconnect pipe (2) connected to the vacuum tank.

3. Unscrew the bolts securing the pipe connecting the throttle body and intercooler connection sleeve.

4. Disconnect the oil vapour recovery pipe from the cam cover by undoing the retaining band.

### 10.



1. Unscrew bolts (1) securing the expansion coupling to the EGR valve, disconnect pipe (2) connecting the pneumatic valve to the solenoid, then unscrew bolts (3) and remove the throttle body.

2. Working at the bench, unscrew bolts (1) and separate the expansion coupling from the throttle body. Pneumatic valve (2) is secured to the throttle body.

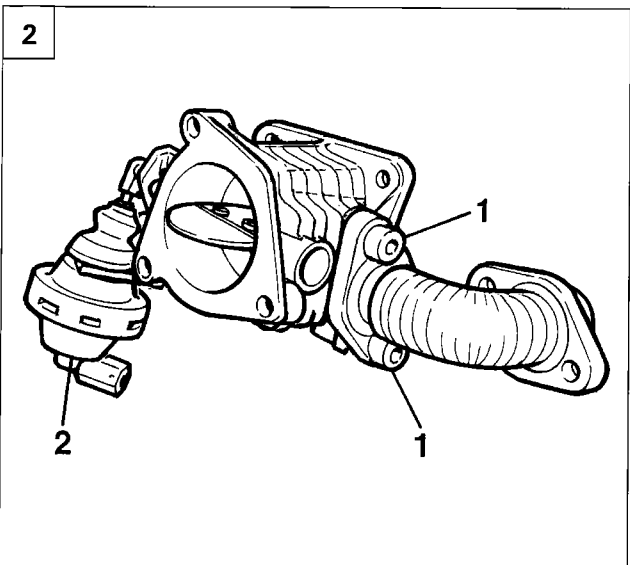
### ELECTRIC EGR VALVE

#### Removing-refitting

- Remove the throttle body as described in the previous paragraph.

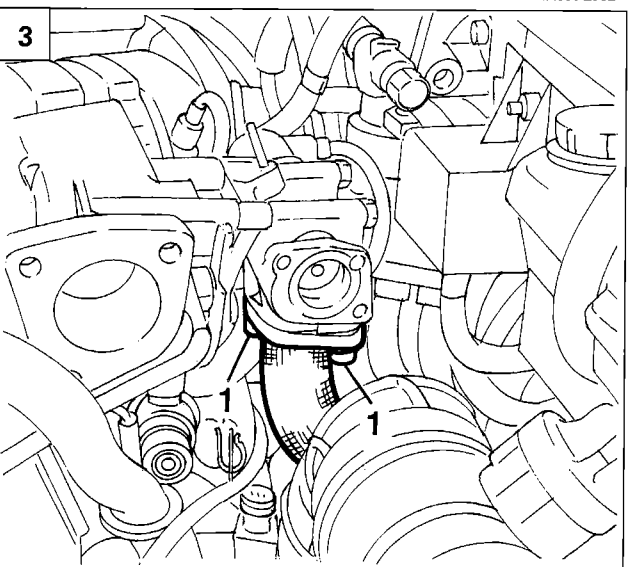
3. Loosen the bolts(1) securing the EGR connection pipe to the heat exchanger.

4. Disconnect the EGR valve self-regulation motor electrical connection; Unscrew bolts (2) securing the EGR valve to the intake manifold, then lift the valve and remove the bolts securing the connection pipe to the heat exchanger (loosened previously).

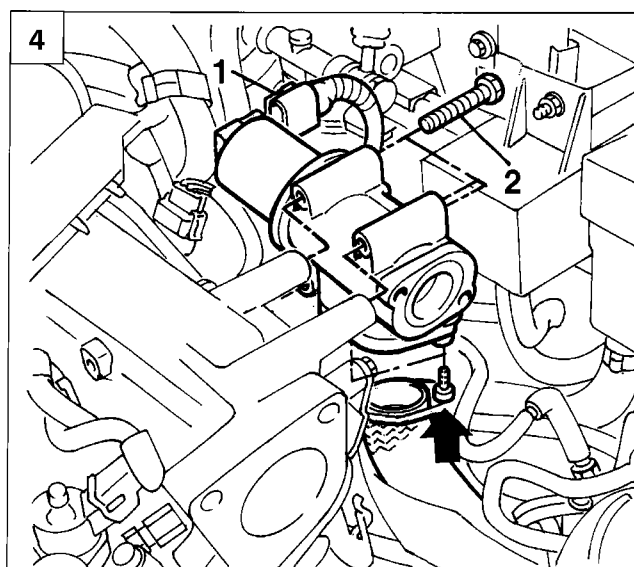


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# 10.

## EGR VALVE SELF-ADJUSTMENT MOTOR

### Removing-refitting

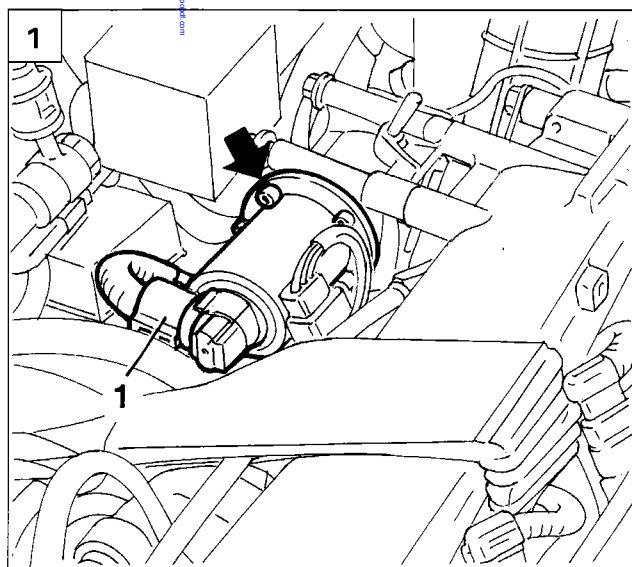
- disconnect the negative battery lead, then remove the soundproofing cover proceed as described in the previous paragraphs:

1. Disconnect the electrical connection (1), then undo the bolts securing the EGR valve self-adjustment motor and remove.

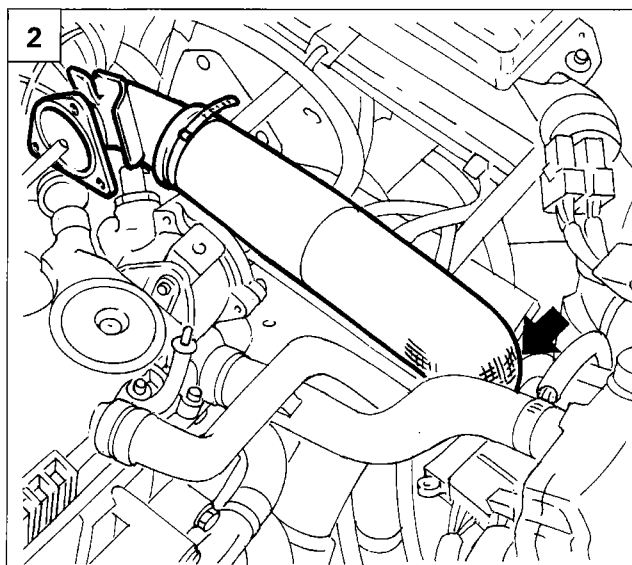
## EGR VALVE HEAT EXCHANGER

### Removing-refitting

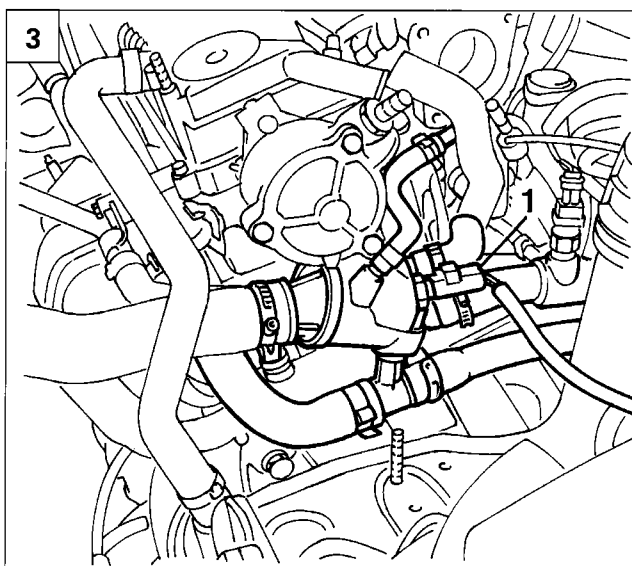
- Remove the throttle body and electric EGR valve as described in the previous paragraphs.
- 2. Remove the sleeve connecting the throttle body to the intercooler.
- drain the engine coolant.
- 3. Disconnect the pipes shown in the figure from the thermostat by undoing the retaining bands, then disconnect the coolant temperature sensor electrical connection (1).
- 4. Undo the bolts securing the heat exchanger pipe to the exhaust manifold.



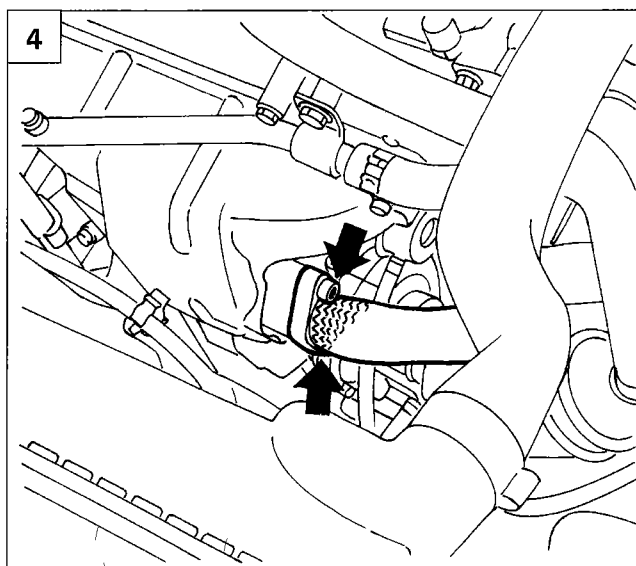
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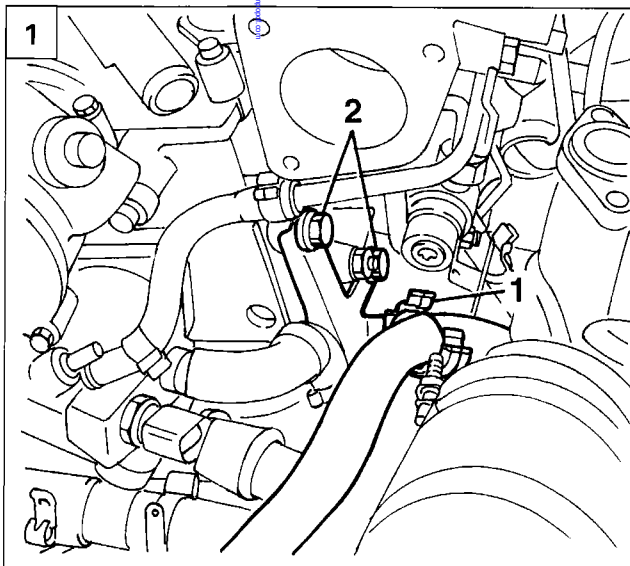
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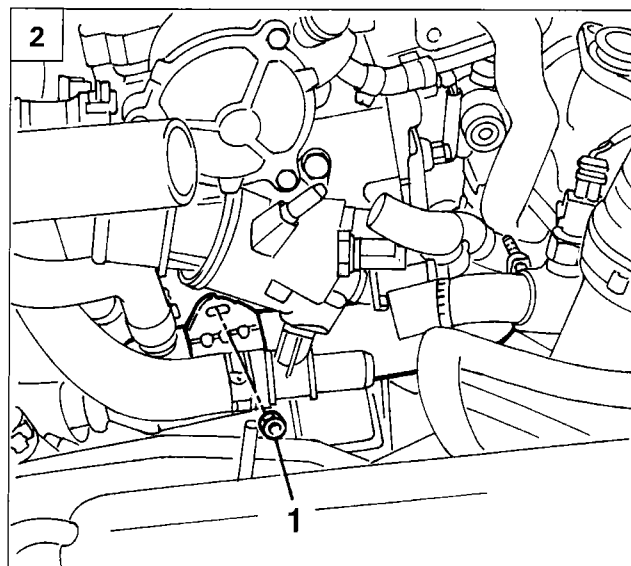
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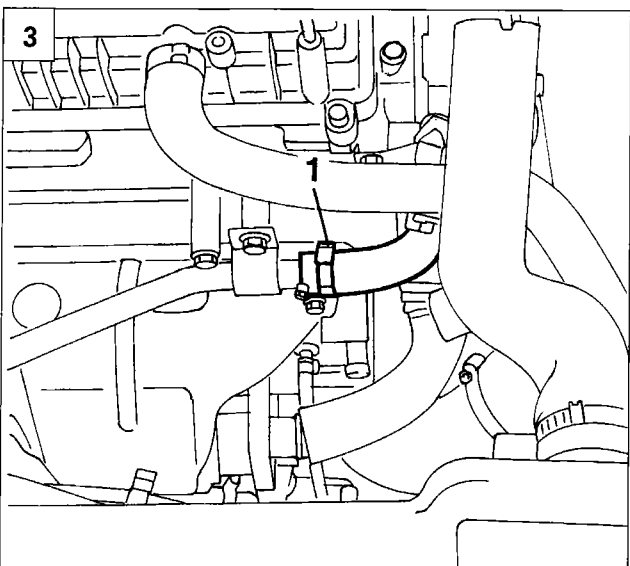
### 10.



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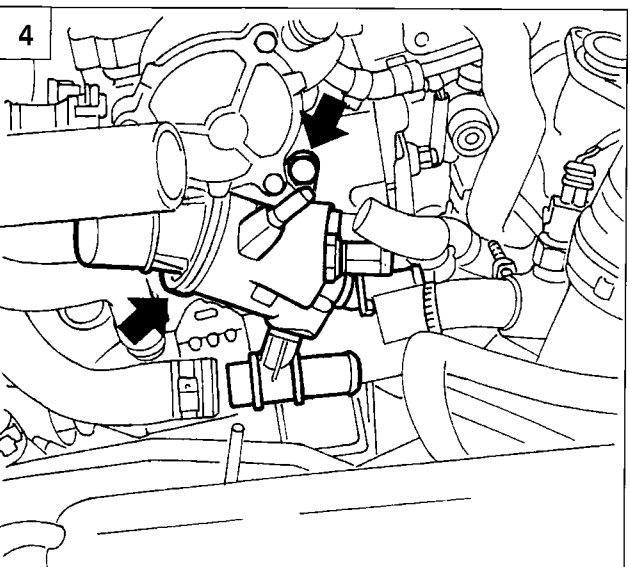
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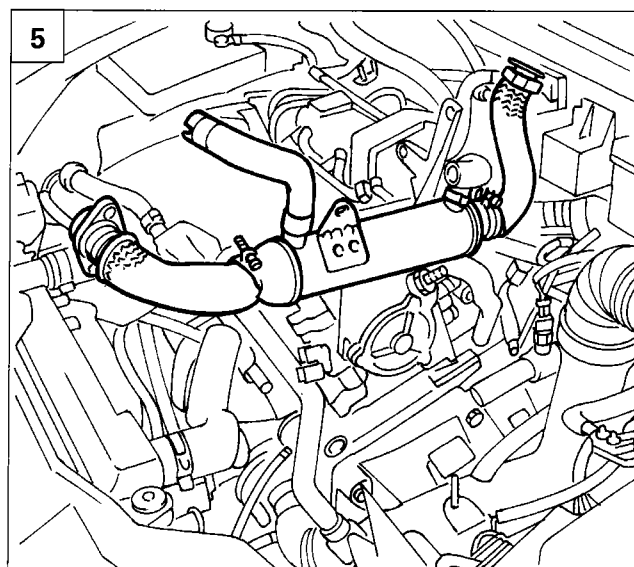
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1. Open band (1) securing the oil vapour recovery pipe, then unscrew bolts (20) securing the EGR valve heat exchanger bracket.
2. Unscrew nut (1) located beneath the thermostat, which secures the heat exchanger.
3. Disconnect band (1) securing the heat exchanger coolant pipe.
4. Unscrew the bolts shown in the figure and remove the thermostat to allow the heat exchanger to be removed.
5. Remove the heat exchanger from the engine bay.



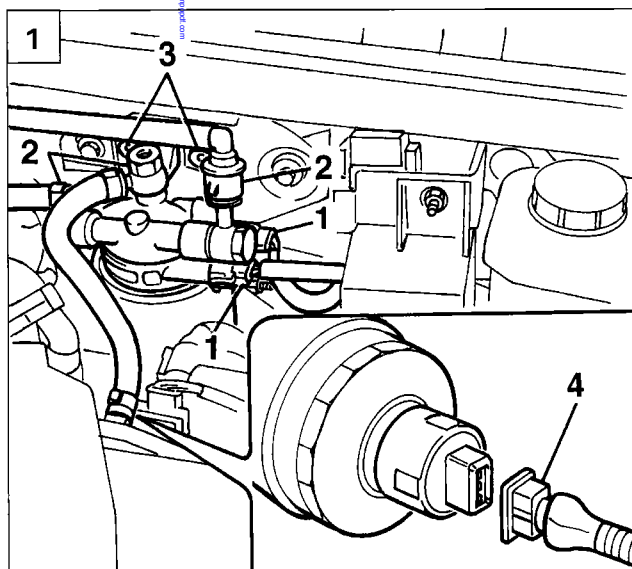
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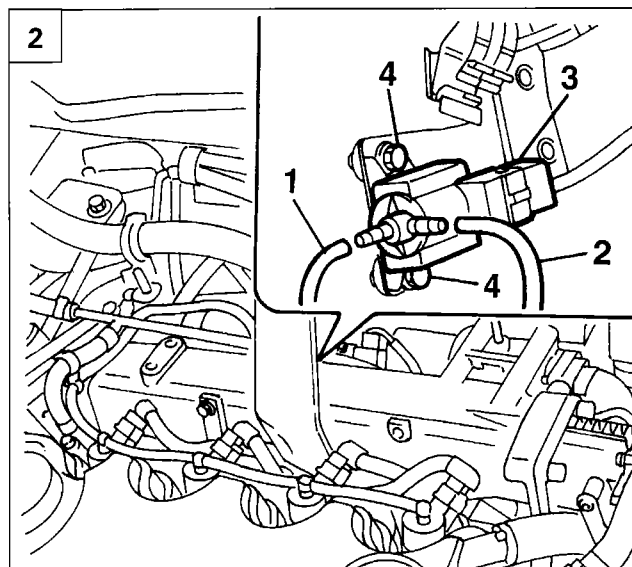
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## 10.

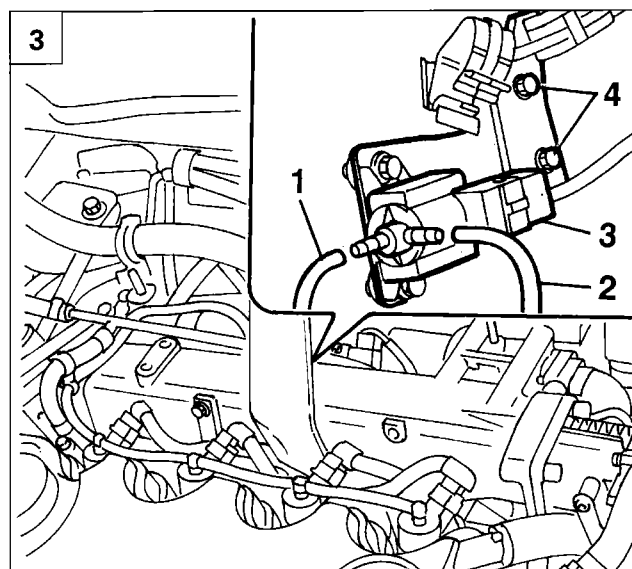
### SOLENOID ON VACUUM TANK FOR THROTTLE BODY PNEUMATIC VALVE



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#### Removing-refitting

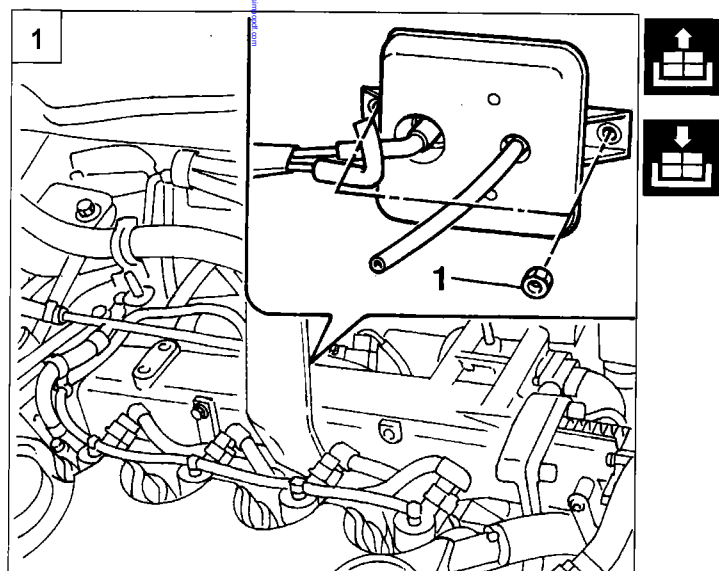
- Disconnect the negative battery lead, then remove the soundproofing cover as described in the previous paragraphs.
- 1. Disconnect electrical connections (1) and inlet and outlet pipes to the tank and delivery pipe to the pump on the fuel filter, then unscrew nuts (3) securing the fuel filter mount. Lift the filter and disconnect the electrical connection for the sensor for detecting the presence of water in diesel.
- Release the pipe delivering power steering fluid from tank to pump from the retaining band.
- 2. Disconnect pipe (1) connected to the vacuum tank and pipe (2) connected to the vacuum intake pipe on the solenoid. Disconnect the electrical connection (3), then undo retaining bolts (4) and remove the solenoid.

### VACUUM TANK

#### Removing-refitting

- Disconnect the negative battery lead, then remove the soundproofing cover and fuel filter as described in the previous paragraphs.
- Disconnect the pipe carrying power steering fluid from tank to pump from the retaining band.
- 3. Disconnect pipe (1) connected to the vacuum tank and pipe (2) connected to the vacuum intake pipe on the solenoid. Disconnect the electrical connector (3), then unscrew retaining bolts (4) and remove the bracket together with the throttle body pneumatic valve solenoid.

### 10.



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1. Unscrew retaining nuts (1) and remove the vacuum tank.

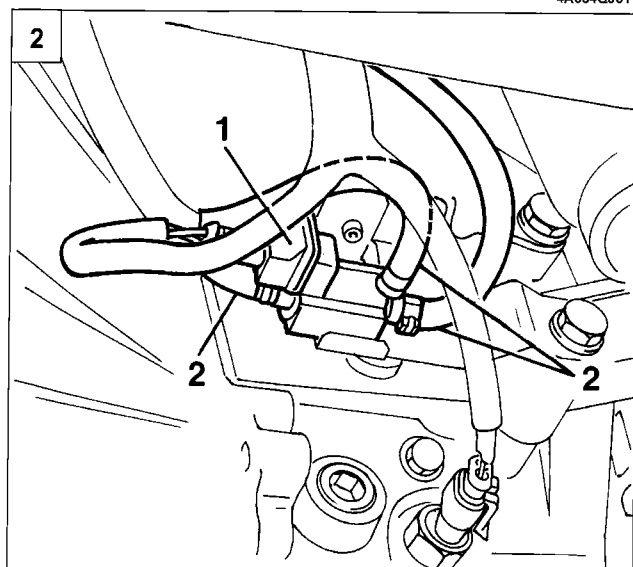
### TURBO PRESSURE CONTROL SOLENOID Removing-refitting

- Position the vehicle on a lift and disconnect the negative battery lead. .
2. Working from below the car, disconnect electrical connector (1) and pipes (2).
  3. Press the retaining tab on the rear of the bracket and withdraw the solenoid.

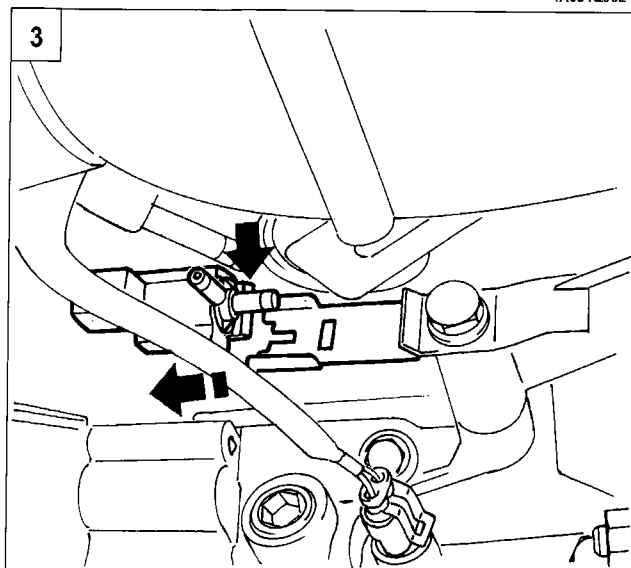
### FUEL FILTER

#### Removing-refitting

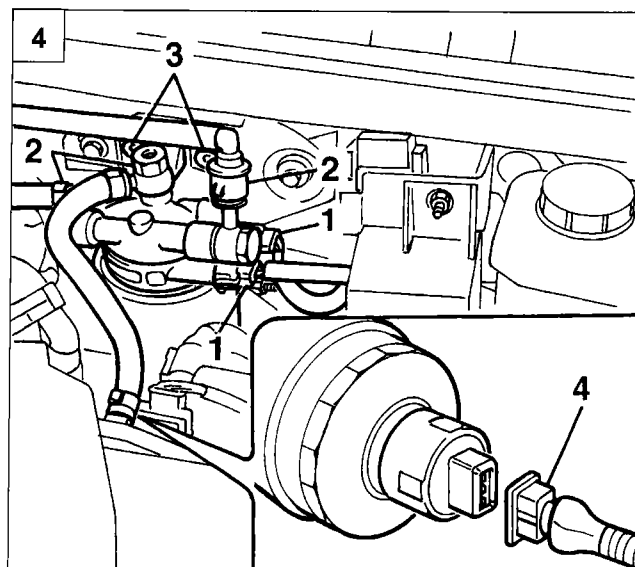
4. Disconnect electrical connections (1) and tank inlet and outlet and pump delivery pipes (2) on the fuel filter, then undo nuts (3) securing the fuel filter mount. Lift the filter and disconnect electrical connection (4) to the sensor for detecting the presence of water in diesel.



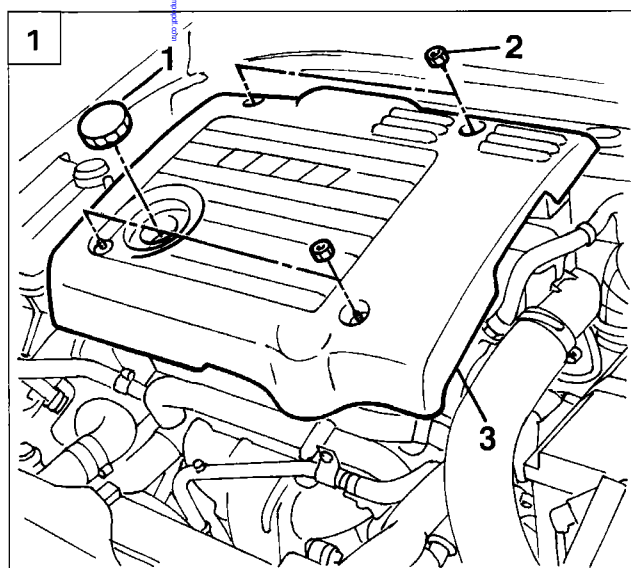
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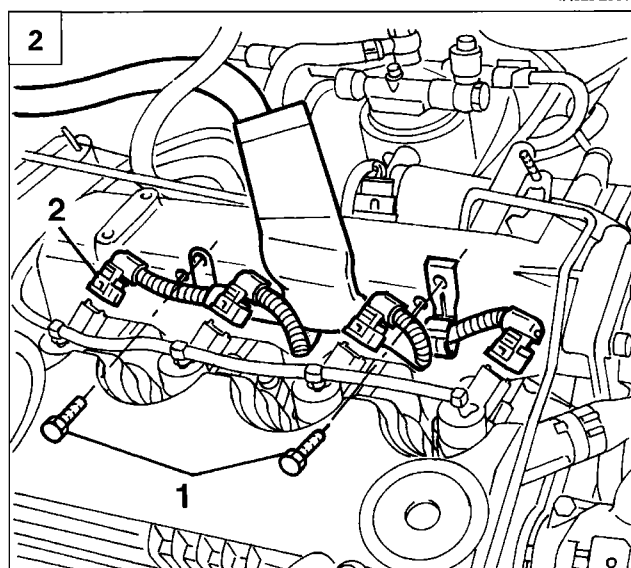
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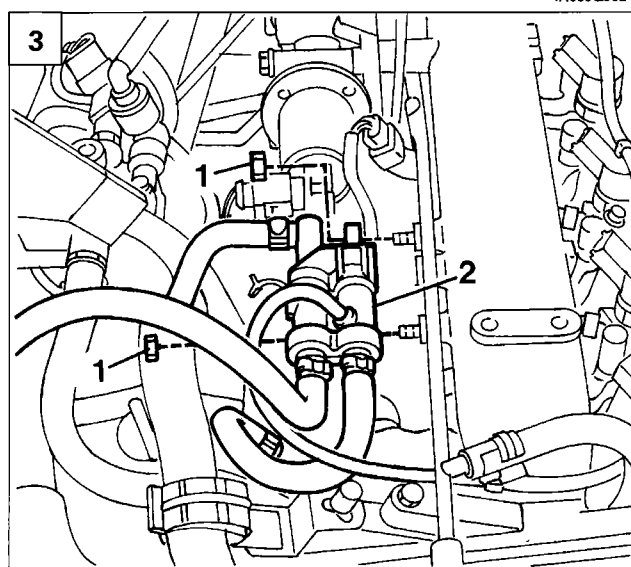
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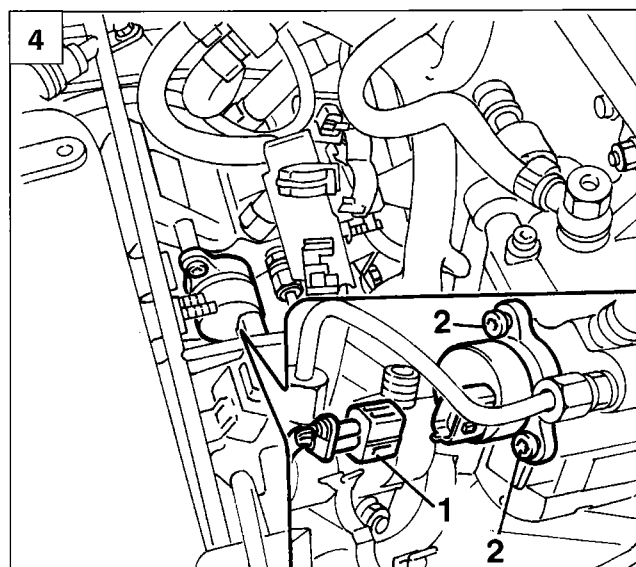
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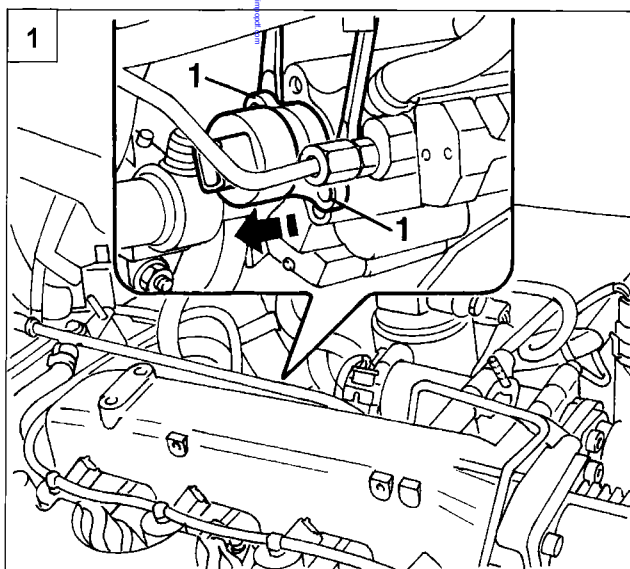
## PRESSURE REGULATOR

**NOTE** *Keep everything scrupulously clean when removing-refitting the pressure regulator.*

### Removal.

- Remove the guard under the engine if the vehicle is fitted with one.
- 1. Remove the engine oil filler cap (1), then unscrew retaining nuts (2) and remove soundproofing cover (3).
- 2. Undo bolts (1) securing the injector wiring retaining bands. Disconnect the injector electrical connectors (2) and place the wiring to one side.
- Release the injection wiring harness from the retaining bands.
- 3. Undo nuts (1) securing the fuel return manifold pipe (2) to the intake manifold. Place the fuel return manifold pipe to one side.
- 4. Disconnect the pressure regulator electrical connector (1), then unscrew bolts (1) securing the regulator to the pump.

### 10.



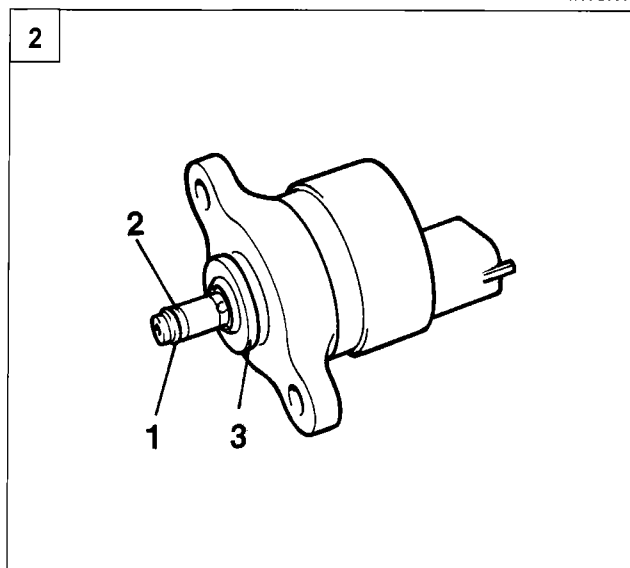
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1. Grasp the outer regulator case, pull out partly and simultaneously turn so that tabs (1), which contain holes for the retaining bolts, are positioned horizontally.

**NOTE** Do not hold the pressure regulator by its electrical connector.

Insert the blades of 2 screwdrivers at the point of tabs (1) and carefully prise up to remove the pressure regulator.

**NOTE** Do not use screwdrivers or other tools on the seals between regulator and pressure pump.



4A036QJ02

2. Pressure regulator

1. High pressure sealing ring (black or green)
2. Antiextrusion sealing ring (white)
3. Low pressure sealing ring (black)

**NOTE** If the high pressure sealling ring should get left inside the pump case by accident, turn the ignition key ON (engine off); this will operate the pump spindle and a small amount of fuel will emerge together with the sealing ring.

**NOTE** Never use any tool to remove the high pressure sealing because the pump inner surface could become damaged.

### Refitting

- Draw off any impurities in the pump case.
- Check the condition of the three sealing rings before installation and ensure they are correctly positioned.
- Slightly moisten the outer surface of the three sealing rings using vaseline. Never lubricate any other surfaces of the pressure regulator.
- Insert the pressure regulator in its seat on the pump by pressing lightly and simultaneously turning the regulator until it comes into contact with the pump surface.

**NOTE** Never use a hammer or other tools to fit the pressure regulator in its seat.

- Insert both bolts securing the pressure regulator to the pump case and tighten to a torque of  $0.9 \pm 0.1$  daNm.
- Reconnect the electrical connector and finish refitting the remaining parts by reversing the removal instructions.



|                                                                                                                         | page |                                                                                     | page |
|-------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|------|
| <b>HITACHI INTEGRATED INJECTION/IGNITION SYSTEM</b>                                                                     | 1    | <b>INTAKE CIRCUIT</b>                                                               | 33   |
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| - Butterfly position sensor                                                                                             | 28   |                                                                                     |      |
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| - Detonation sensor                                                                                                     | 30   |                                                                                     |      |
| - Ignition coil                                                                                                         | 31   |                                                                                     |      |
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## INTRODUCTION

The integrated system can be divided into the following subsystems:

## EMISSION CONTROL DEVICES

1. the engine rotation speed;
2. the position of each pair of pistons in relation to TDC for cylinder 1;
3. the air flow rate drawn in by the engine;
4. the accelerator butterfly position and speed variation;
5. the temperature of the engine coolant;
6. the effective mixture strength (through the Lambda sensor signal);
7. the possible presence of detonation;
8. car speed;
9. battery voltage;
10. air conditioner compressor on or off.

- the engine rotation speed, measured in revs per minute (rpm);
- the engine load, which consists of the quantity of air drawn in by each cylinder.
- This quantity is calculated on the basis of the flow rate of the intake air and is represented by the parameter TP, measured in milliseconds (ms).

Using the information (input) listed previously, each strategy processes a series of parameters, based on maps of data stored in special areas of the control unit memory and then controls the system actuators (output) which are the devices which allow the engine to operate, namely:

1. injectors;
2. ignition coil;
3. various type solenoid valves;
4. fuel pump
5. control relays.

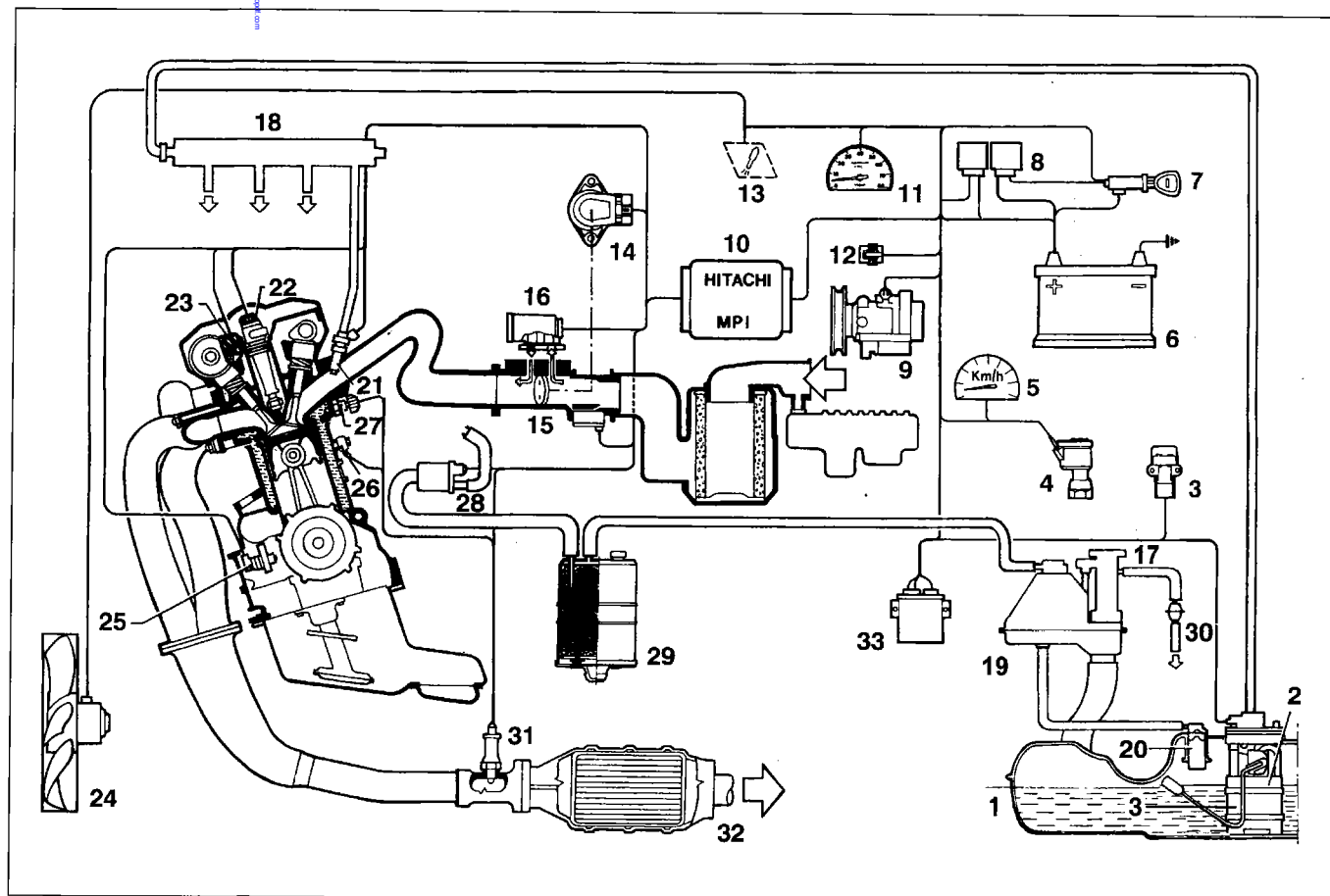
**NOTE** *The HITACHI injection/ignition system does not require any type of adjustment as it is the self-regulating and self-adjusting type.*

**NOTE** *The numbers in the drawings and diagrams indicate the corresponding HITACHI engine control unit pins (the number followed by A indicates connector A, the number followed by B indicates connector B).*



# 10.

## INJECTION/IGNITION SYSTEM OPERATING DIAGRAM

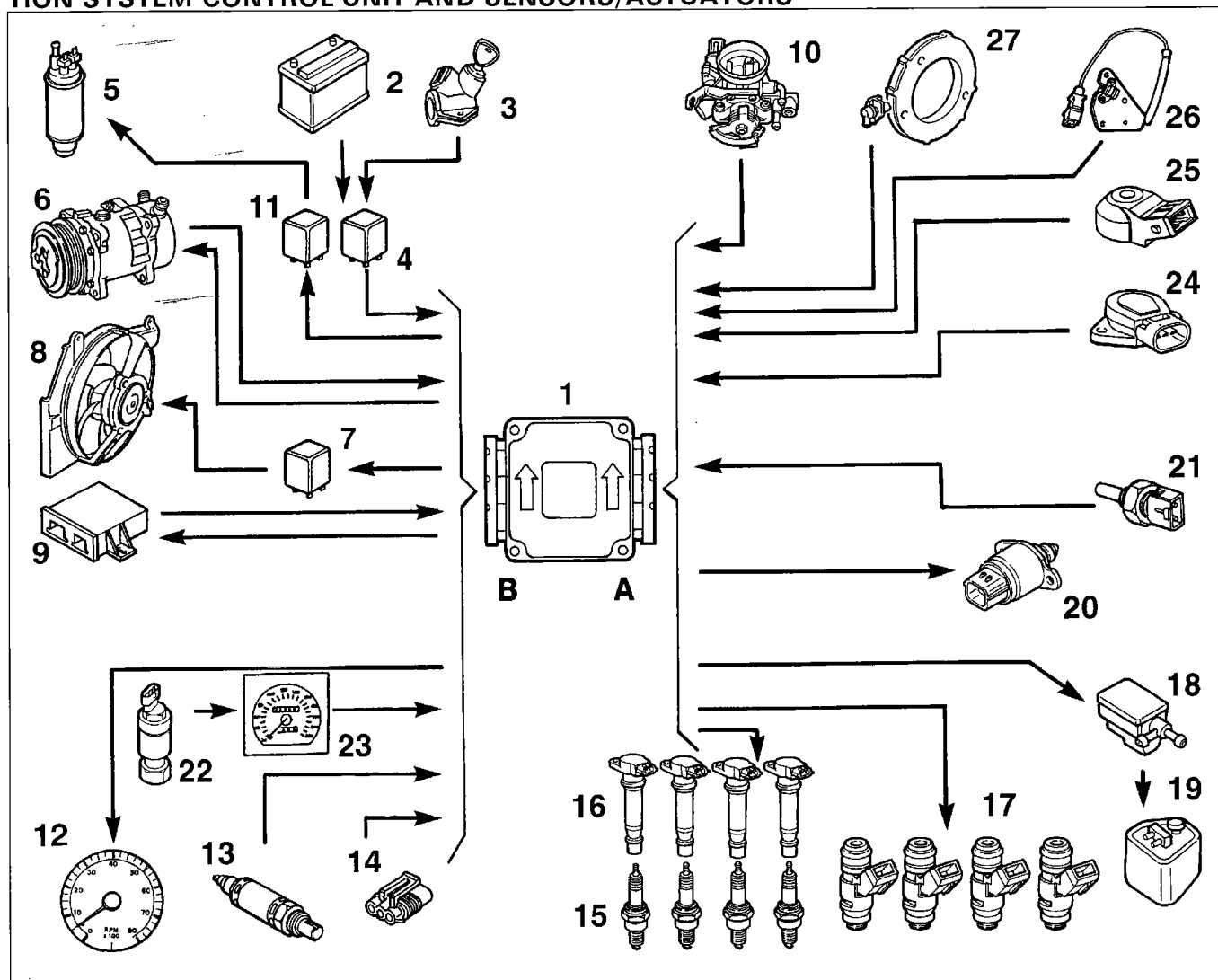


4F002OJ01

- |                                                                                    |                                    |
|------------------------------------------------------------------------------------|------------------------------------|
| 1. Fuel tank                                                                       | 22. Coil                           |
| 2. Drip tray including: electric fuel pump, pressure regulator, filter, fuel gauge | 23. Engine timing sensor           |
| 3. Inertia switch                                                                  | 24. Radiator fan                   |
| 4. Vehicle speed sensor                                                            | 25. Engine rpm sensor              |
| 5. Speedometer                                                                     | 26. Knock sensor                   |
| 6. Battery                                                                         | 27. Coolant temperature sensor     |
| 7. Ignition key                                                                    | 28. Charcoal filter solenoid valve |
| 8. I.E. system relays                                                              | 29. Carbon filter                  |
| 9. Climate control compressor                                                      | 30. Safety and ventilation valve   |
| 10. HITACHI engine control unit                                                    | 31. Lambda sensor                  |
| 11. Rev counter                                                                    | 32. Catalytic silencer             |
| 12. Diagnostic equipment connector                                                 | 33. FIAT CODE control unit         |
| 13. System failure warning light                                                   |                                    |
| 14. Butterfly position sensor                                                      |                                    |
| 15. Butterfly casing with air flow meter integrated                                |                                    |
| 16. Engine idle adjustment actuator                                                |                                    |
| 17. Filler cap with safety valve                                                   |                                    |
| 18. Fuel manifold                                                                  |                                    |
| 19. Fuel vapour separator                                                          |                                    |
| 20. Rollover valve                                                                 |                                    |
| 21. Injector                                                                       |                                    |

# 10.

DIAGRAM SHOWING INFORMATION ENTERING/LEAVING THE HITACHI INJECTION/ IGNITION SYSTEM CONTROL UNIT AND SENSORS/ACTUATORS



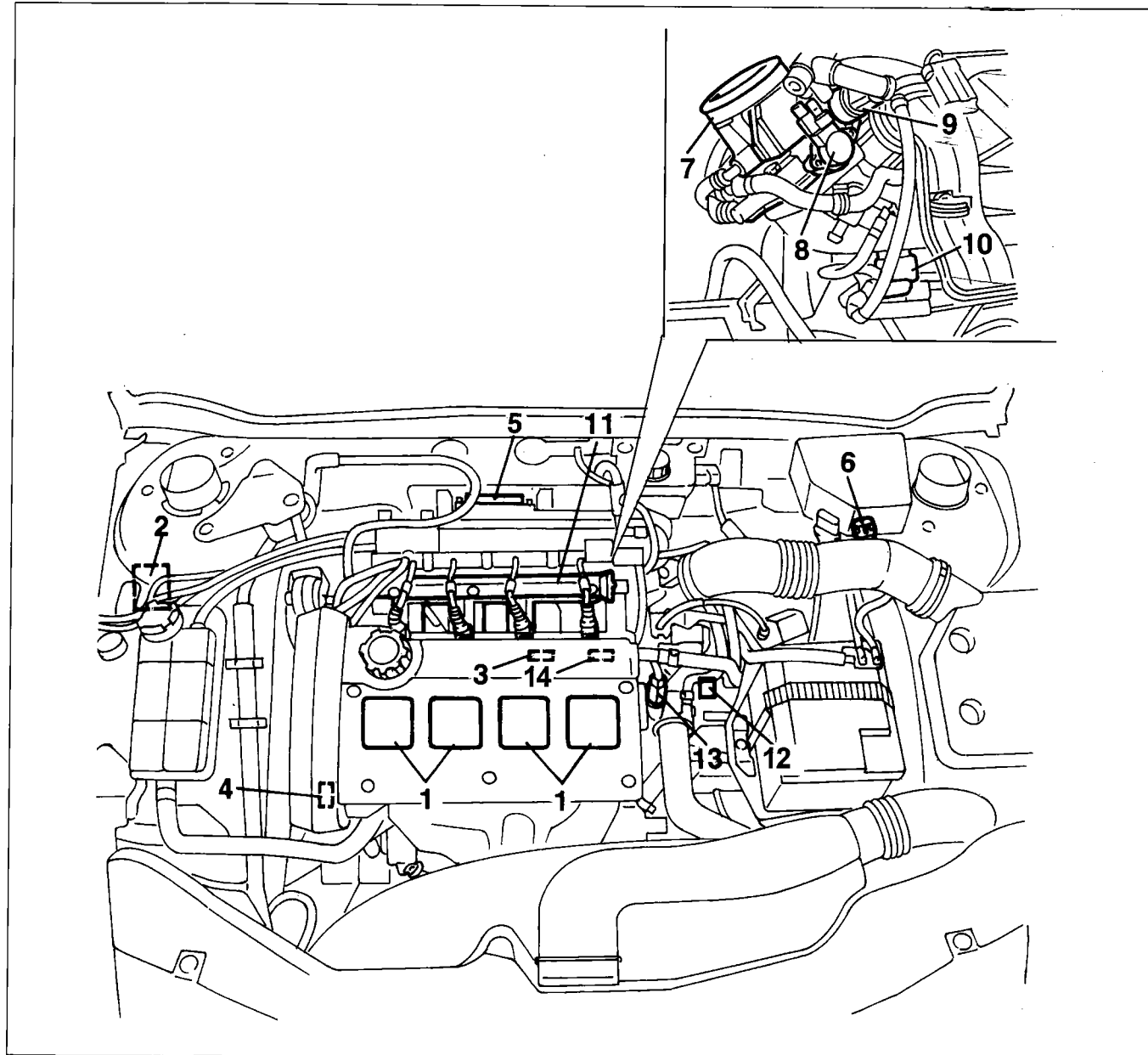
4F0030J01

1. HITACHI engine control unit
2. Battery
3. Ignition switch
4. Fuel system relay
5. Electric fuel pump
6. Climate control system
7. Radiator fan relay
8. Radiator fan
9. FIAT-CODE control unit
10. Air flow meter
11. Electric fuel pump relay
12. Rev counter
13. Lambda sensor
14. Diagnostic equipment connector

15. Spark plugs
16. Coils
17. Injectors
18. Charcoal filter solenoid valve
19. Charcoal filter
20. Idle speed adjustment stepping motor
21. Coolant temperature sensor
22. Vehicle speed sensor
23. Speedometer
24. Butterfly position sensor
25. Detonation sensor
26. Engine timing sensor
27. Engine rpm sensor

## 10.

### LOCATION OF HITACHI INJECTION/IGNITION SYSTEM COMPONENTS IN THE ENGINE COMPARTMENT



P3N04GJ01

- |                                         |                                    |
|-----------------------------------------|------------------------------------|
| 1. Ignition coils                       | 8. Butterfly valve position sensor |
| 2. Charcoal filter                      | 9. Idle speed adjustment actuator  |
| 3. Detonation sensor                    | 10. Charcoal filter solenoid valve |
| 4. Engine timing sensor                 | 11. Fuel manifold with injectors   |
| 5. Hitachi engine control unit          | 12. Vehicle speed sensor           |
| 6. Diagnostic socket                    | 13. Coolant temperature sensor     |
| 7. Butterfly casing with air flow meter | 14. Engine rpm sensor              |

## SYSTEM MANAGEMENT STRATEGIES

### MANAGEMENT OF THE SIGNALS

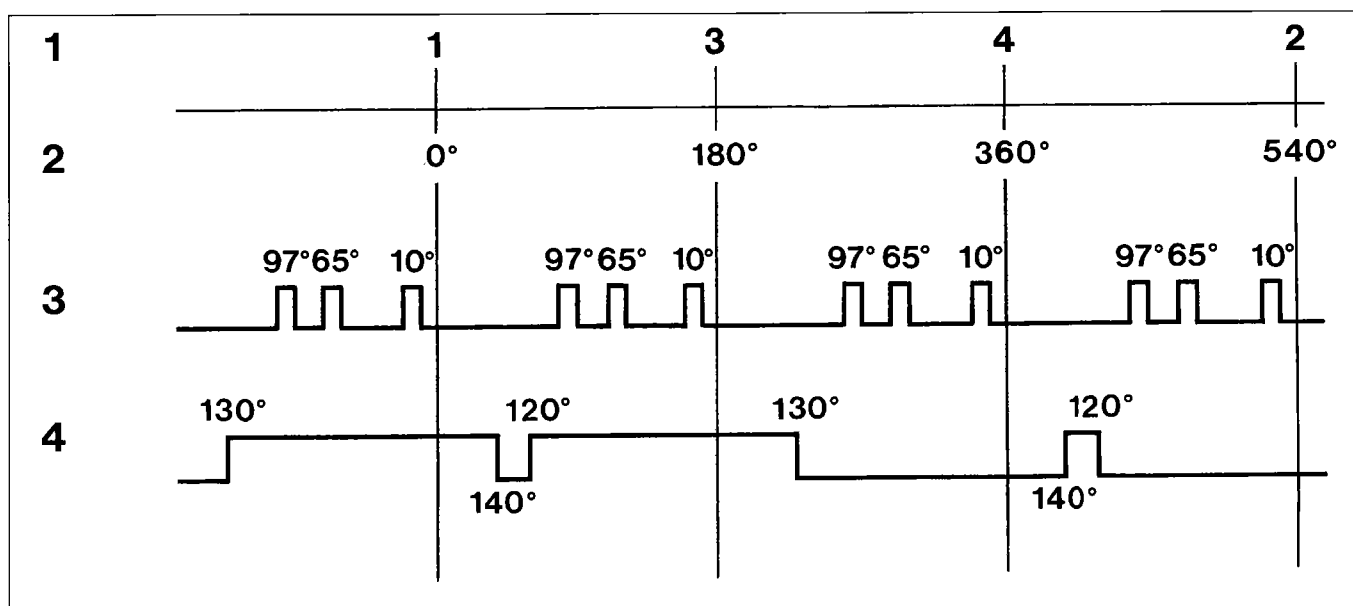
During starting, the control unit recognizes the injection and ignition timing which are fundamental for the subsequent operation of all strategies.

This recognition is implemented on the basis of the interpretation of the signals coming from the flywheel sensor on the crankshaft and the engine timing sensor on the camshaft.

**NOTE** *The term signals refers to the collection of signals coming from the sensor on the crankshaft and the one on the camshaft which, having a precise reciprocal position, provide the control unit with a synchronized sequence of signals which the control unit is capable of recognizing.*

In particular, the signals are made up as follows:

- flywheel on the crankshaft: it is equipped with two symmetrical sets of teeth, arranged 10°, 65° and 97° in advance of each TDC;
- wheel on the camshaft: it is fitted with two long inspections windows and one short one, whose width and position are such as to provide the signal as illustrated in the diagram.



4F0040J01

1. Cylinder TDC
2. Crankshaft angles
3. Crankshaft flywheel signal (engine rpm sensor)
4. Camshaft wheel signal (engine timing sensor)

**NOTE** *The numerical values for the signals indicate the crankshaft advance angles in relation to the next TDC.*

## 10.

### MANAGEMENT OF THE INJECTION

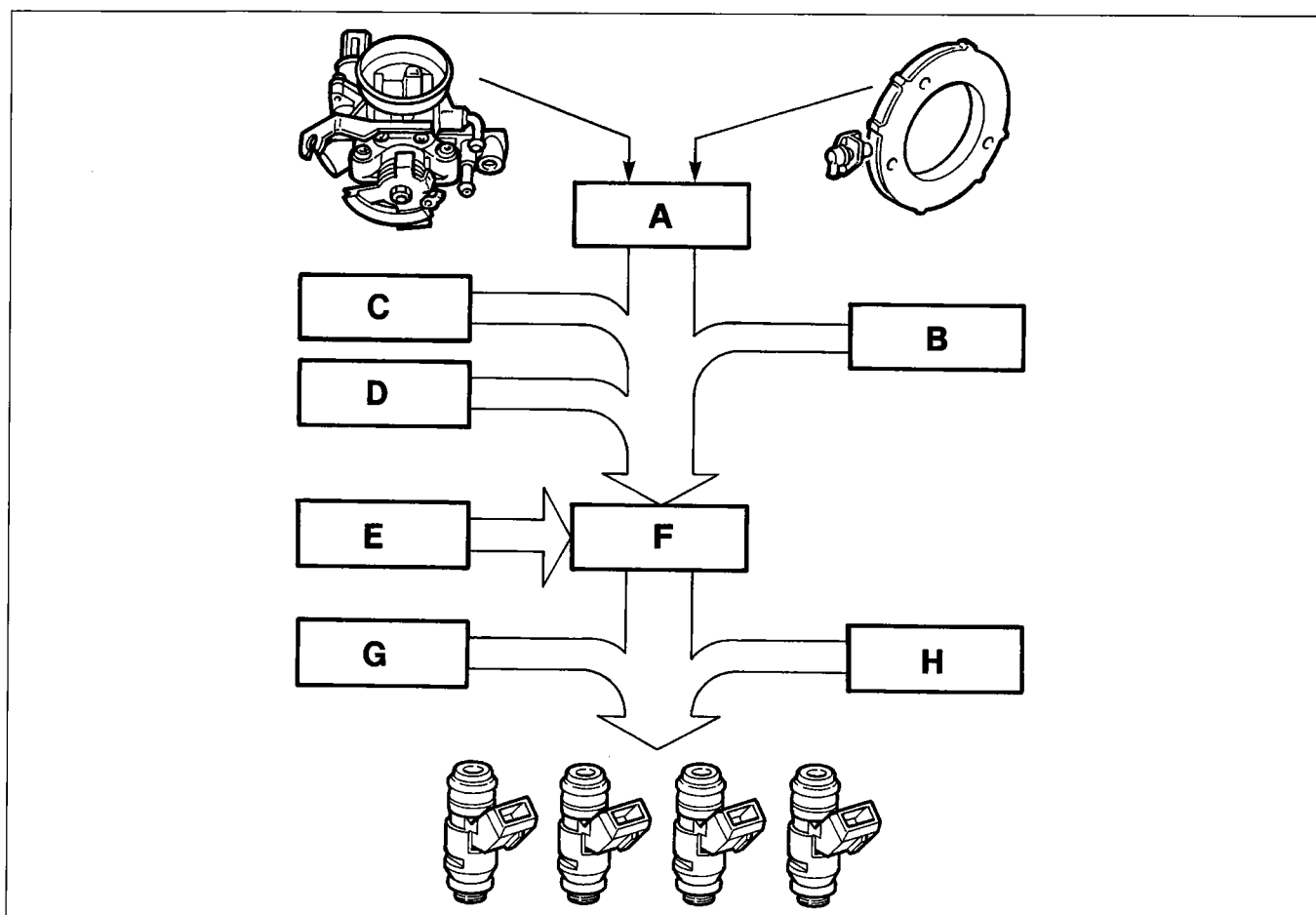
The injection management strategies are designed to provide the engine with the correct quantity of fuel at the desired time according to the engine operating conditions.

**NOTE** *The presence of the flow meter allows the direct measurement of the mass of air drawn in, making the presence of the intake air temperature sensor superfluous.*

The management of the injection basically consists of calculating the injection time, determining the injection phase and the subsequent implementation via the operation of the injector.

The "basic" injection time depends on the specifications of the injector and corresponds to the quantity of fuel to be injected into each cylinder. The latter is, in turn, determined by multiplying the quantity of air drawn in by each cylinder (calculated on the basis of the quantity of intake air and the engine rotation speed) for the desired mixture strength in relation to the engine operating point.

The final injection time is determined by means of a calculation algorithm in which the "basic" time is corrected by a series of coefficients which take into account the different engine operating conditions which are highlighted by the various sensors present in the system.



4F0050J01

A: "basic" injection time  
B: correction coefficient:  
low engine temperature  
high engine temperature  
starting and post-starting  
butterfly fully open  
deceleration  
acceleration

C: feed-back mixture control  
D: self-adjustment  
E: cut-off  
F: intermediate injection time  
G: extra-pulse  
H: non phased injection management

### Control of the mixture strength (feed-back control)

**NOTE** This is defined as the mixture strength and the following ratio is denoted by the Greek letter  $\alpha$  (alfa):

$$\frac{\text{quantity of air drawn in by the engine}}{\text{quantity of fuel injected}}$$

This is defined as the stoichiometric mixture and the ratio is defined by  $\alpha_{st}$ :

$$\frac{\text{theoretical quantity of air required to burn all the fuel injected}}{\text{quantity of fuel injected}}$$

This is defined as the mixture strength and the ratio is defined by the Greek letter  $\lambda$  (lambda):

$$\frac{\text{quantity of air drawn in by the engine}}{\text{theoretical quantity of air required to burn all the fuel injected}}$$

It is easy to deduce that  $\alpha / \alpha_{st} = \lambda$ .

The stoichiometric ratio depends on the type of fuel: for current unleaded petrol (lead-free) it is around 14.7 - 14.8, which corresponds to a Lambda of 1.

A mixture is known as *rich* ( ) when the quantity of air is below the stoichiometric level and in this case the Lambda is  $< 1$ :

a mixture is known as *poor* (or *weak*) when the quantity of air is higher than the stoichiometric level and in this case the Lambda is  $> 1$ .

The strategy is designed to correct the "basic" injection times so that the mixture strength constantly fluctuates at high frequency between 0.98 and 1.02.

The fluctuation frequency varies according to the engine load and speed: it is in the order of tens of Hertz.

**NOTE** 1 Hz = 1 fluctuation per second

In the following conditions:

- cut-off,
- butterfly opening of more than 70° and high engine load,
- engine temperature below 25°C,
- the strategy is disabled.

### Self-adjustment

The control unit is equipped with a self-adjustment function which has the task of memorizing any differences between the basic map and the corrections imposed by the Lambda sensor which may persistently occur during operation. These differences (due to the ageing of the system and engine components) are permanently memorized, allowing the adaptation of the system operation to the gradual alterations in the engine and the components compared with when they were new.

The strategy is disabled whilst the charcoal filter solenoid valve is open.

If the control unit is replaced, the vehicle must be road tested allowing the engine to reach operating temperature and the control unit to intervene in the self-adjustment mode (especially during idling stops).

## 10.

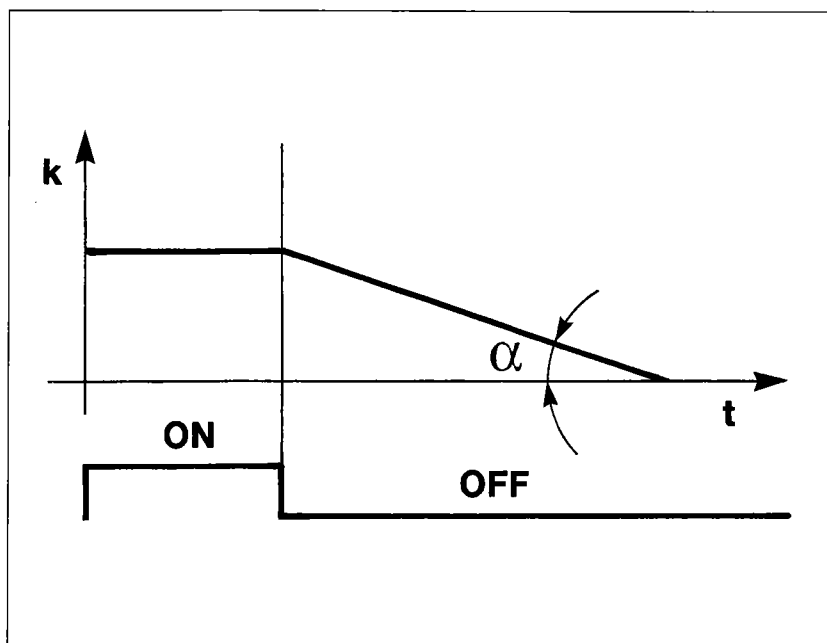
### Starting and post-starting

During starting, it is not possible to recognize the engine timing and consequently it is not possible to implement the phased injection.

During the initial revolutions of the engine, an initial full-group injection is carried out (also because the considerable fluctuations in the rotation speed do not allow the injection phase to be calculated correctly) and then the injection becomes the phased type.

The "basic" injection time is increased by a multiplication coefficient for the entire time the engine is driven by the starter motor.

When the engine has been started up, the coefficient is gradually reduced until it disappears after a certain time; the lower the engine temperature, the longer this period.



$K$ :  
 $t$ :  
 $\alpha$ :  
ON:  
OFF:

time enrichment coefficient  
engine temperature function  
decrease  
engine driven (crank)  
engine started (run)

4F0070J01

### Operation when cold

Under these circumstances there is a natural weakening of the mixture as a result of the reduced evaporation and the strong condensation of the fuel on the internal walls of the intake manifold: in addition, the increased viscosity of the lubrication oil causes an increase in the passive resistance of the engine.

The "basic" injection time is corrected by a multiplication coefficient which depends on the engine temperature and speed.

### Operation in full load conditions

This strategy is enabled when the butterfly opening exceeds  $70^\circ$ .

The "basic" injection time is multiplied by a coefficient (depending on the engine speed) equal to around 1.1.

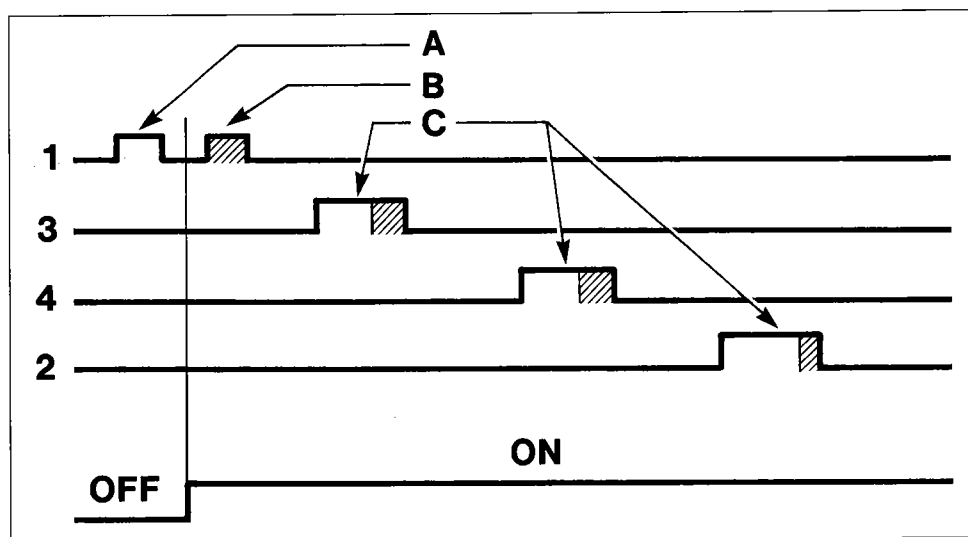


### Operation in acceleration conditions

During this stage, the control unit increases the quantity of fuel supplied.

The "basic" injection time is multiplied by a coefficient which depends on the temperature of the engine and the opening speed of the accelerator butterfly (average value 1.2).

If the sharp variation in the injection time is calculated when the injector is already closed, the control unit reopens the injector (extra pulse) in order to compensate the mixture strength as quickly as possible: the subsequent injections are, on the other hand, already increased on the basis of the coefficients mentioned previously.



4F0080J01

- A: normal injection time
- B: injector reopening (extra-pulse)
- C: injection time including enrichment
- OFF: engine at stationary speed
- ON: engine in transition

### Operation in deceleration conditions

During this stage a negative transition strategy is implemented to decrease the quantity of fuel supplied: the "basic" injection time is multiplied by a coefficient which depends on the temperature of the engine and the engine speed and load conditions in the moment immediately preceding the start of deceleration.

### Operation in cut-off conditions

The cut-off strategy is implemented when the control unit recognizes that the butterfly is in the idle position (signal from the butterfly potentiometer) and the engine speed is above 1600 rpm (with the engine warm).

The supply to the engine is re-enabled when the butterfly is in a not closed position or when the engine speed goes below 1200 rpm (with the engine warm).

## 10.

### Rotation speed restricter

This strategy restricts the maximum speed which can be reached by the engine, gradually enabling the cut-off, as illustrated in the table.  
Maximum speed: 7150 rpm

| <div>Cylinders</div> <div>mode</div> | 1 | 2 | 3 | 4 |
|--------------------------------------|---|---|---|---|
| 1 cylinder                           | 0 |   |   |   |
| 2 cylinders                          | 0 |   |   | 0 |
| 3 cylinders                          | 0 |   | 0 | 0 |
| 4 cylinders                          | 0 | 0 | 0 | 0 |

### Electric fuel pump operation

The electric fuel pump is operated by the engine management control unit via a relay.

The pump cuts out:

- if the engine speed goes below 50 rpm;
- after a certain period (around 5 seconds) with the ignition switch in the ON position if the engine is not started up (timed go ahead);
- if the inertia switch is activated.

### Operation of injectors

The operation of the injectors is the sequential, phased type. However, during starting, the injectors are operated once, in parallel.

The timing of the injectors can be varied according to the engine speed.

### MANAGEMENT OF THE FIAT CODE ANTI-THEFT FUNCTION

The system is fitted with an anti-theft function. This function depends on the presence of a special (FIAT CODE) control unit, capable of dialogue with the engine management control unit and an electronic key, equipped with a special transmitter for sending a recognition code.

Each time the key is turned to the OFF position, the FIAT CODE system completely deactivates the engine management control unit.

When the key is turned to the ON position, the following operations take place, in order:

1. the engine management control unit (whose memory contains a secret code) sends the FIAT CODE control unit a request to send the secret code to deactivate the immobilizer function;
2. the FIAT CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key;
3. the recognition of the secret code allows the immobilizing function imposed on the engine management control unit to be deactivated and normal operation resumed.

**NOTE** *The presence of the FIAT CODE anti-theft system means that it is not advisable, during the fault diagnosis, to carry out tests using another engine management control unit. In such a case, the FIAT CODE control unit would transfer the (unrecognized) recognition code to the test control unit which could then no longer be used on any other vehicles.*

## MANAGEMENT OF THE IGNITION

The ignition management strategies are designed to strike the spark with the desired advance according to the engine operating conditions.

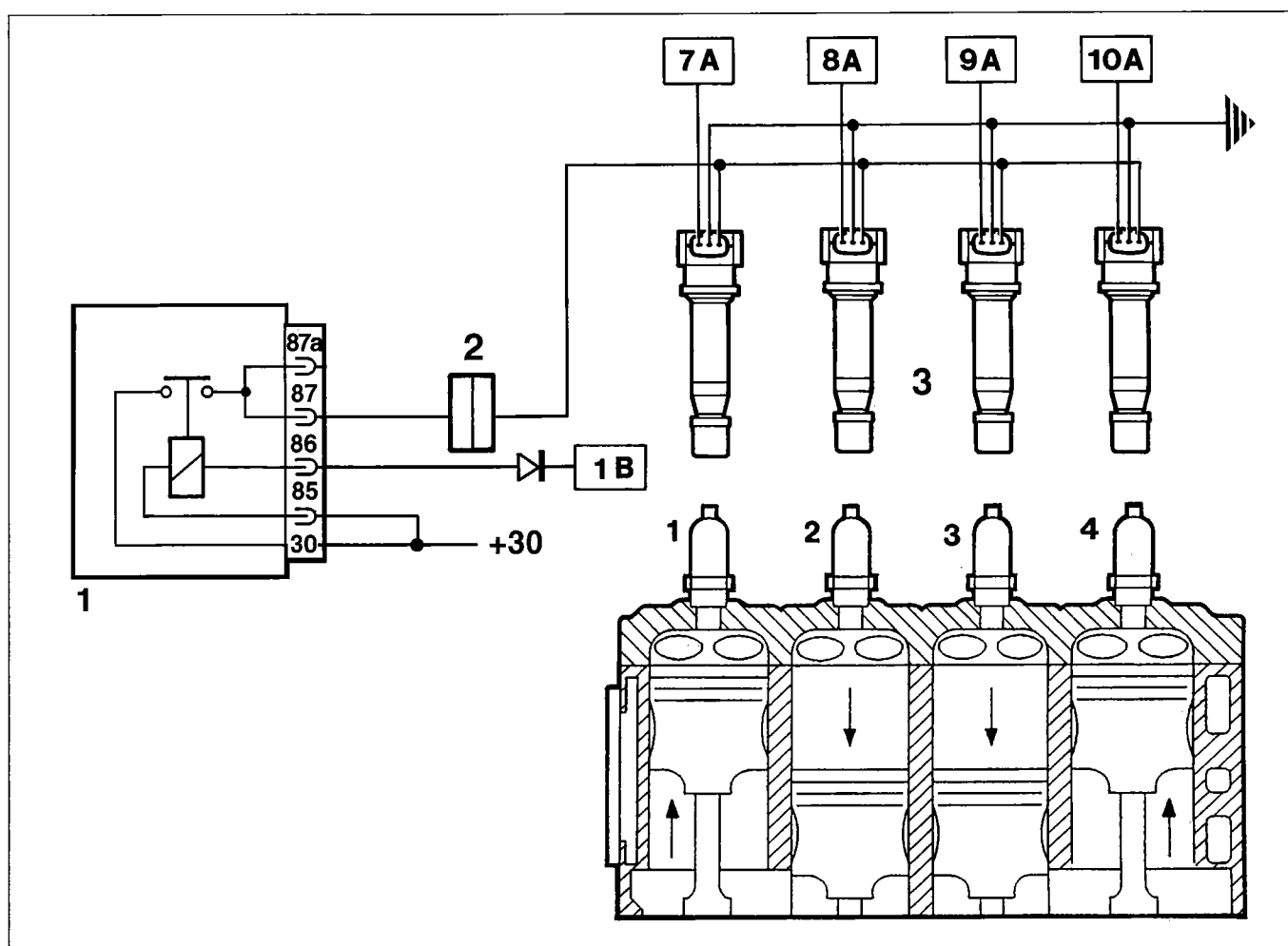
The management of the ignition basically consists of determining the ignition advance and implementing it through the operation of the power transistor incorporated in each coil.

The "basic" advance value, calculated according to the intake air flow rate and the engine speed, is then corrected according to the different engine operating conditions.

The control unit determines the start of the conduction of the current in the primary coil winding according to the engine rotation speed.

This angle of this moment, obviously, varies in relation to TDC of the explosion stroke for each cylinder and the greater the engine rotation speed, the greater the advance, since the (dwell) time required to saturate the current in the coil primary winding is more or less constant.

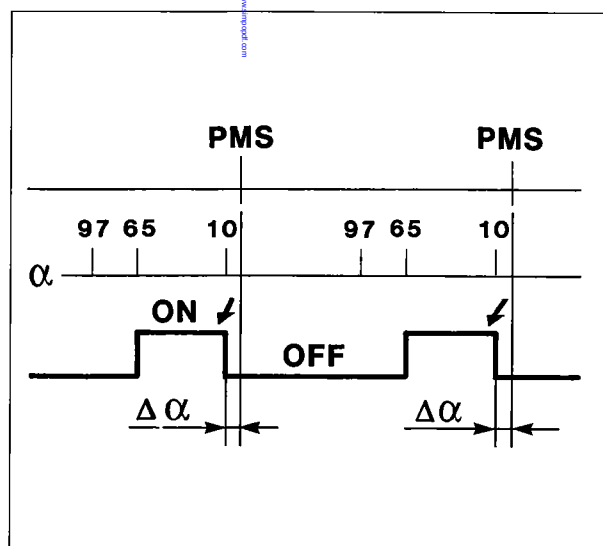
The moment of the start of conduction is corrected according to the battery voltage.



4F0100J01

1. Fuel system relay
2. Interface connector
3. Single ignition coil (pencil-coil)

### 10.



4F0110J01

- $\alpha$ : crankshaft flywheel square signals
- $\Delta\alpha$ : fixed ignition advance (10° engine)
- ON: coil conduction activated
- OFF: coil conduction deactivated

#### Starting

During starting, it is not possible to carry out the normal management of the advance because the considerable fluctuations in the rotation speed do not allow the dwell and advance to be calculated correctly.

The advance is therefore managed taking the following as a reference:

- for the start of conduction, the tooth at 65°;
- for the ignition advance, the tooth at 10°.

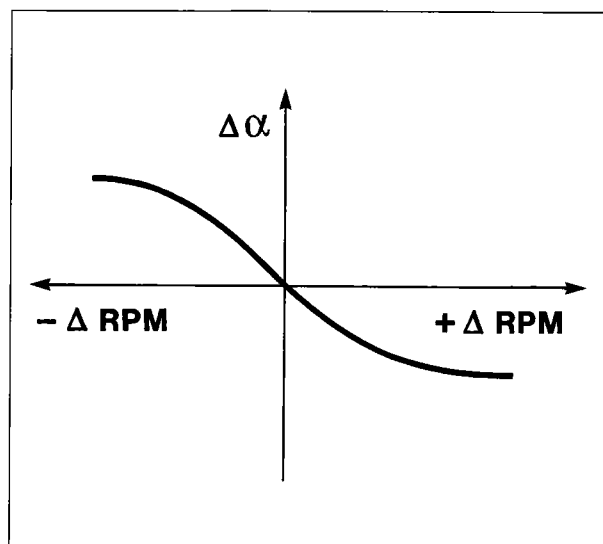
Consequently, there is a fixed advance of 10° for the entire time the engine is driven by the starter motor.

#### Operation when cold

Whilst the engine is running when cold, an additional advance correction is implemented: the increase in the advance compared with the map value is inversely proportional to the temperature of the engine.

#### Operation in cut-off conditions

The ignition advance is increased on entry into cut-off conditions: from the moment the fuel supply is re-enabled, the advance is gradually returned to the "basic" value.



4F0110J02

- $\Delta\alpha$ : ignition advance correction whilst idling
- + $\Delta\text{RPM}$ : the idle speed exceeds the nominal value
- $\Delta\text{RPM}$ : the idle speed is below the nominal value

#### Operation with engine idling

When the engine is idling, the management of the advance is implemented independently of the "basic" advance.

The advance value whilst idling, which varies according to the temperature of the coolant (10° with the engine warm), is corrected according to the variation in the speed in relation to the pre-set speed, which also depends on the temperature.

In particular, the advance is increased if the speed decreases and is reduced if the speed increases in order to guarantee the stability of the actual speed.

### Control of detonation

This strategy has the task of detecting the presence of detonation by processing the signal coming from the appropriate sensor. The strategy continuously compares the signal coming from the sensor with a threshold value which is, in turn, constantly updated to take into account background noise and the ageing of the engine.

If the system recognizes the presence of detonation, the strategy reduces the ignition advance, in steps of 2°, up to a maximum of 7°, until the phenomenon disappears. Later, the advance is gradually restored to the basic value or until the onset of the phenomenon. In particular, the increases in the advance are implemented gradually, whilst the decreases are implemented immediately.

In acceleration conditions, the strategy uses a higher threshold to take into account the increased engine noise under these circumstances.

The strategy is also equipped with a self-adaptation function which temporarily memorizes the reductions in the advance which are continuously repeated in order to adjust the advance to the different conditions in which the engine finds itself (for example, the use of a low octane rating fuel). The strategy is capable of restoring the advance to the map value if the conditions which caused the reduction no longer exist.

## **10.**

### **MANAGEMENT OF THE ENGINE IDLE CONTROL**

The general aim of this strategy is to keep the engine speed around the programmed value (engine warm: 850 rpm): the position assumed by the actuator depends on the engine speed and vehicle speed conditions.

#### **Starting stage**

When the key is inserted, the position assumed by the actuator depends on the engine temperature and the battery voltage (open-loop position).

#### **Engine started with accelerator pedal released**

The engine speed varies according to the temperature of the engine and is constantly kept close to this value by altering the position of the shutter to compensate for any fluctuations in the speed. This takes place especially when external loads are applied (power assisted steering, heated rear wind-screen, etc.).

If the fans and the air conditioning, both managed by the control unit, are switched on, the strategy manages the actuator in advance of the actual engagement.

#### **Normal driving**

In these conditions the actuator is in the open-loop position.

#### **Deceleration**

In deceleration conditions outside of idling, the control unit controls the position of the actuator by means of a special flow rate (dash-pot) curve, in other words it slows down the return of the shutter towards its housing, thereby reducing the braking effect of the engine.

### **MANAGEMENT OF THE CHARCOAL FILTER SCAVENGING**

This strategy controls the position of the charcoal filter solenoid valve in the following way:

- during starting, the solenoid valve remains closed preventing the fuel vapours from enriching the mixture; this condition persists until the engine coolant temperature reaches 25°C;
- with the engine at operating temperature, the control unit operates the solenoid valve in duty-cycle to control the quantity of fuel vapours sent to the inlet according to the engine speed and load conditions.

In the following operating conditions:

- butterfly in closed position,
- engine speed below 1250 rpm,
- engine load below a pre-set level,
- the operation of the solenoid valve is disabled, keeping it in a closed position.

## MANAGEMENT OF THE CLIMATE CONTROL SYSTEM

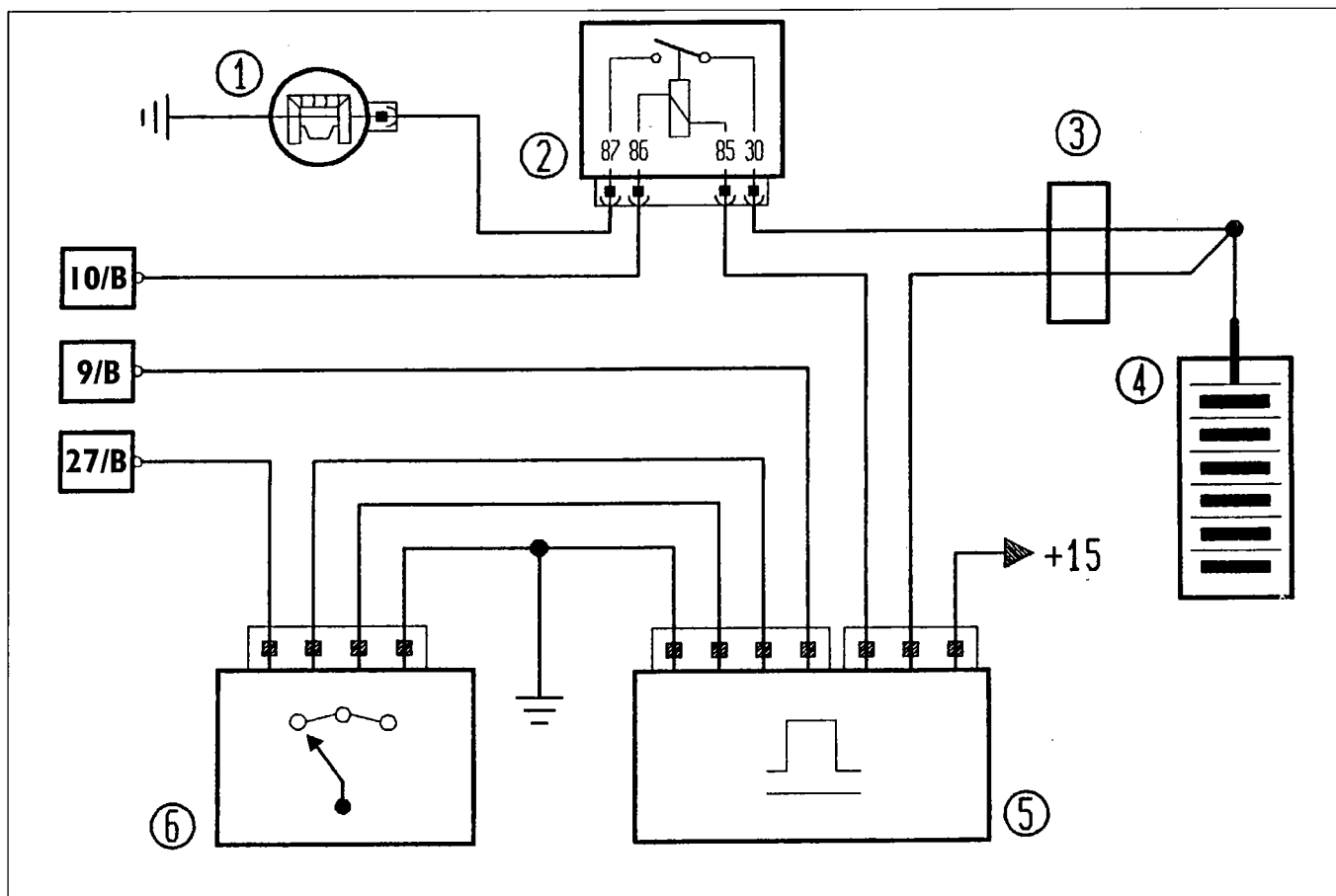
The Hitachi engine management control unit is functionally connected to the climate control system, namely:

1. it receives the request to switch on the compressor, via pin 9/B and operates the appropriate interventions (additional air);
2. it gives the go ahead to switch on the compressor, via pin 10/B, when the strategy conditions are verified;
3. it receives information concerning the state of the three stage pressure switch, from pin 27/B, and operates the appropriate interventions (radiator fan operation).

As far as point 1 is concerned, if the engine is idling, the control unit increases the air flow rate going from the idle actuator in advance of the engagement of the compressor and, viceversa, returns the actuator to its normal position after the compressor has been switched off.

As far, on the other hand, as point 2 is concerned, the control unit automatically switches off the compressor:

- for 6 secs (timed disengagement):
  - when the butterfly opening exceeds 70°,
  - during vehicle take-off;
- as long as the following critical conditions persist:
  - at engine coolant temperatures above 114°C,
  - at engine speeds below 750 rpm.



4F0140J01

1. Compressor
2. Compressor relay feed
3. Fuse box

4. Battery
5. Climate control unit
6. Three stage pressure switch

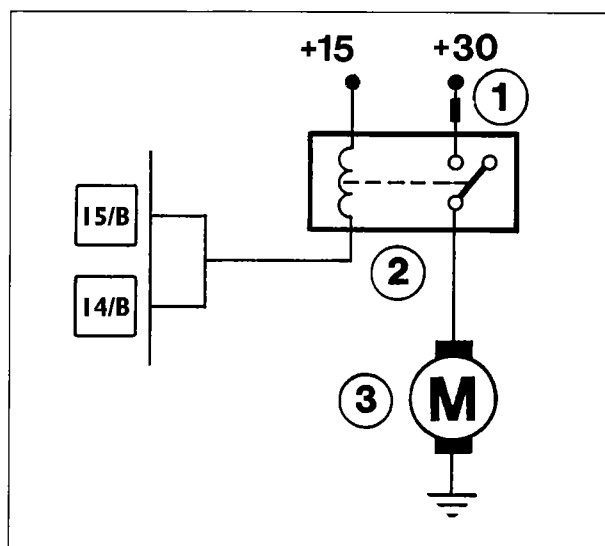


# 10.

## MANAGEMENT OF THE RADIATOR FANS

The control unit controls the operation of the radiator fans directly depending on the temperature of the engine coolant and whether or not a climate control system is fitted.

**NOTE** *Since the temperature of the engine is measured by the appropriate sensor, the thermal contact on the radiator is no longer present.*

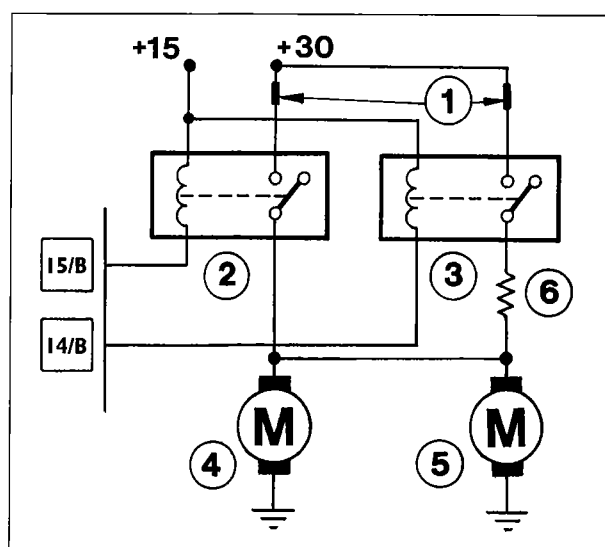


4F0150J01

### Version without climate control

There is only one fan which comes on when the temperature of the coolant exceeds 95°C. It is switched off with a hysteresis of 2°C in relation to the temperature level.

- 1. Fuse
- 2. Fan relay
- 3. Fan



4F0150J02

### Version with climate control

There are two fans: one low speed fan and one high speed fan.

**NOTE** *When the high speed fan comes on, the low speed fan comes on at the same time.*

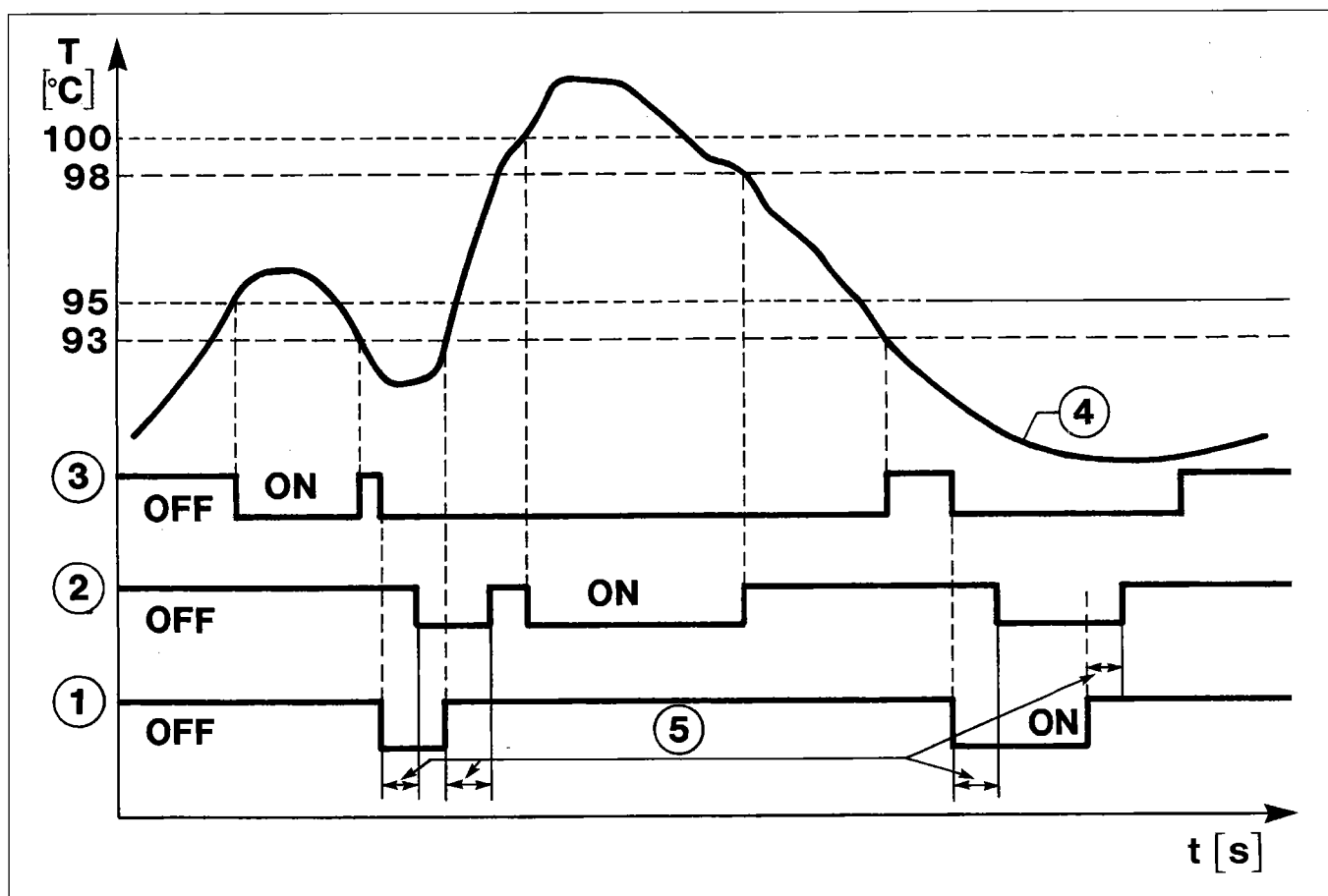
- 1. Fuse
- 2. High speed fan relay
- 3. Low speed fan relay
- 4. High speed fan
- 5. Low speed fan
- 6. Load resistance

**Functional diagram showing engagement of fans for version with air conditioning**

Low speed fan: it switches on when the temperature of the coolant reaches 95°C.

High speed fan: it switches on when the temperature of the coolant reaches 100°C: the first fan is only switched off after the second one.

The engagement of the fans also depends on the state of the three stage pressure switch in the climate control system which causes the engagement of the first fan and, with a certain delay, that of the second and the subsequent disengagement.



4F0160J01

1. Condition of three stage pressure switch
2. Condition of high speed fan
3. Condition of low speed fan
4. Progress of engine coolant temperature
5. Delay in three stage pressure switch engagement/disengagement

ON: fan/pressure switch activated  
OFF: fan/pressure switch deactivated

## 10.

### DIAGNOSTICS

The system is equipped with an autodiagnostic function which is designed to check for any irregularities in the following components:

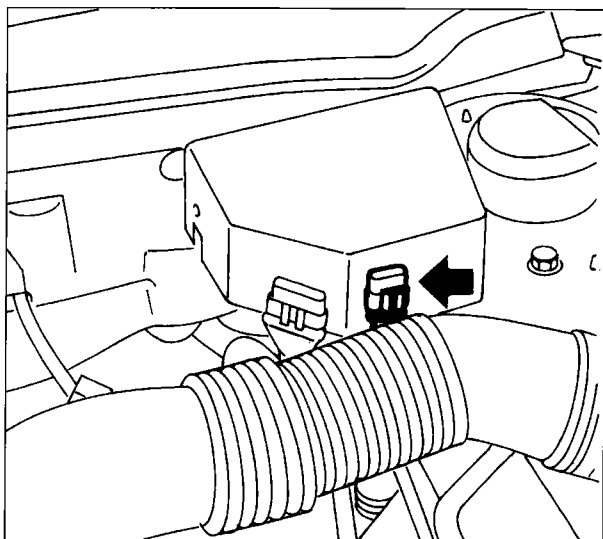
#### Actuators

injectors  
coils  
charcoal filter solenoid valve  
stepping motor for adjusting engine idle  
electric fuel pump relay  
climate control compressor relay

#### Sensors

engine rpm sensor  
engine timing sensor  
air flow meter  
Lambda sensor  
coolant temperature sensor  
detonation sensor  
butterfly position sensor  
vehicle speed sensor

#### Location of diagnostic connector



P3N18GJ01

The detection and confirmation of a fault, involves it being permanently memorized as well as the appropriate sensor being excluded from the system until correct operation is restored. The detection of a confirmed fault usually involves: the warning light in the dashboard coming on: the warning light goes out when the fault conditions no longer exist.

**NOTE** During starting, the light is:

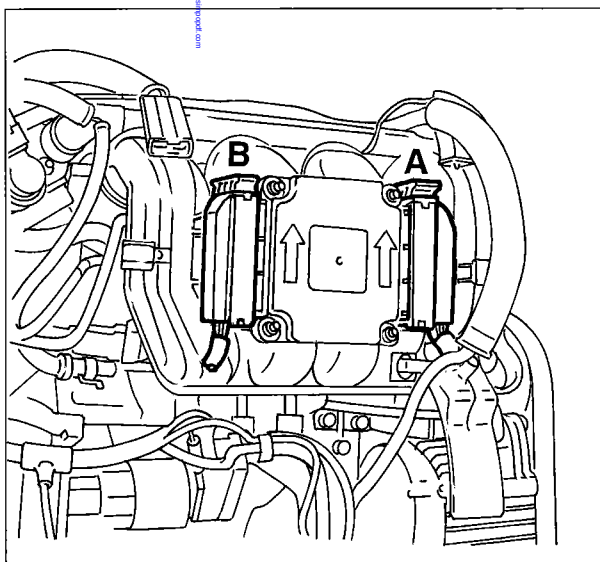
- on for 1 second
- off for 0.1 seconds
- on for 0.5 seconds
- kept on/off definitively according to whether "permanent" errors are present/not present.

Using the diagnostic equipment it is possible to carry out a complete fault diagnosis of the system, which consists of three stages:

display of a series of functional parameters (with the engine switched off or running);  
display of the errors and their cancelling;  
activation of some actuators (active diagnosis).

#### Recovery strategy

If a fault is detected in the sensors/actuators, the control unit, where possible, replaces the missing data, reconstructing it using software (recovery) to allow the operation of the engine.



4F0180J01

*engine side wiring (A)*

butterfly position sensor  
coolant temperature sensor  
air flow meter  
engine rpm sensor  
engine timing sensor  
vehicle speed sensor  
detonation sensor  
injectors  
coils  
idle speed stepping motor  
charcoal filter solenoid valve

## ELECTRICAL/ELECTRONIC CIRCUIT

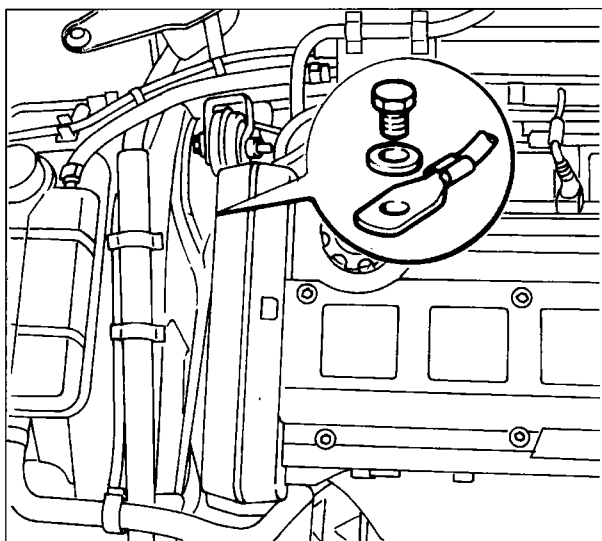
### Wiring

The system has two distinct sets of wiring. The engine side wiring (A) connects the components fitted on the engine to the engine management control unit, whilst the vehicle side wiring (B), on the other hand, connects the other components to the control unit and acts as an interface with the other vehicle wiring systems.

**NOTE** *The two connectors are the same, therefore if the control unit is being dismantled the fitting position (arrow) must be observed to prevent them being mixed up.*

*vehicle side wiring (B)*

electric fuel pump  
twin relay  
radiator fan relay  
climate control compressor relay (if fitted)  
fuses  
Lambda sensor  
diagnostic equipment  
FIAT CODE control unit  
instrument panel connection  
supply from battery  
supply from ignition switch



P3N19GJ02

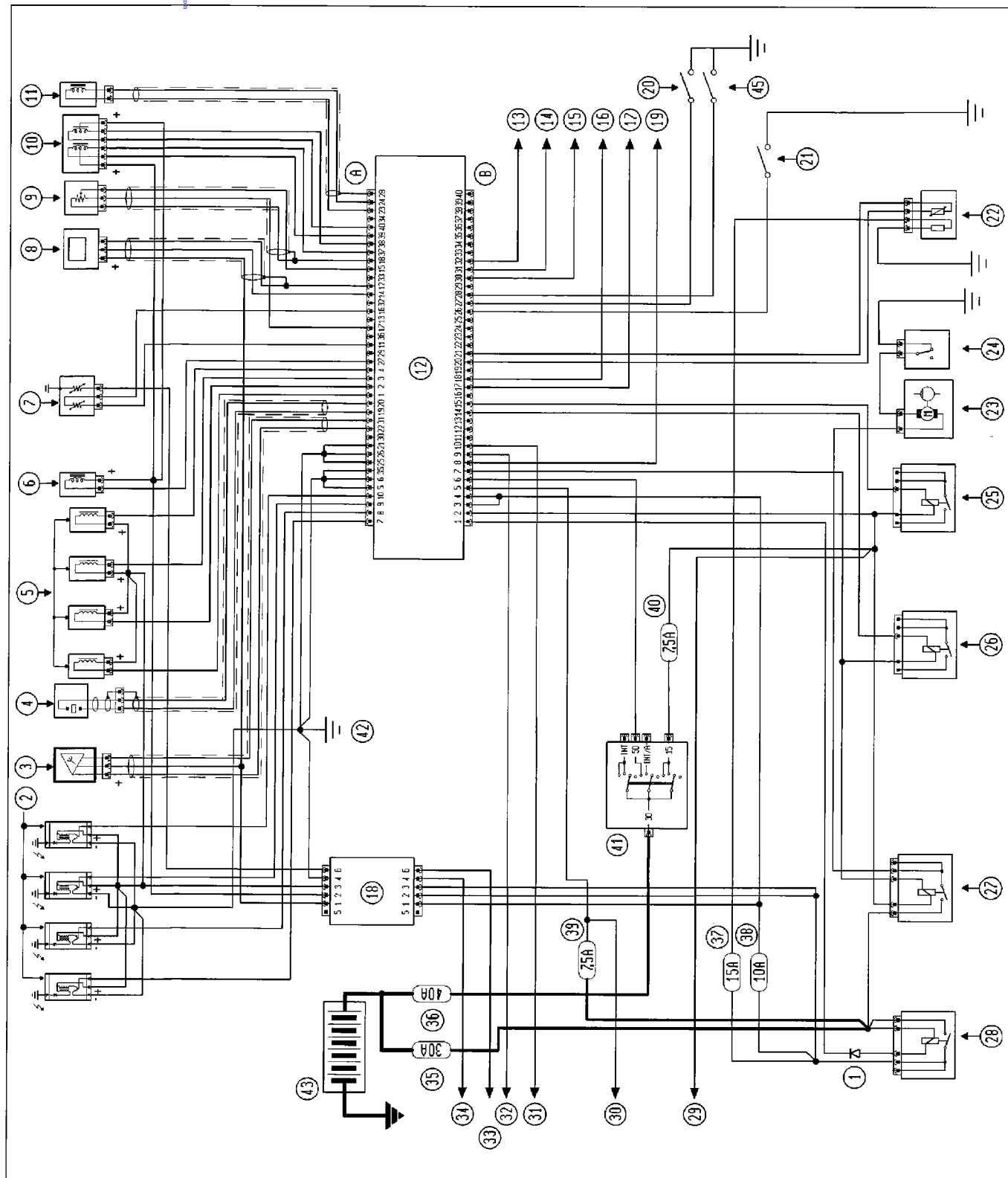
### Location of system earth points

In order to increase electro-magnetic compatibility and functional reliability, special care has been taken over the number and the location of the earth points, as illustrated in the diagram below:

main earth directly on the battery negative;  
engine control system earth on the timing side power unit support.

# 10.

## HITACHI SYSTEM WIRING DIAGRAM



3N21GJ01

**Hitachi system wiring diagram key**

- |                                                                                         |                                                                     |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1. Anti-inversion diode                                                                 | 25. High speed fan relay operation (if fitted)                      |
| 2. Pencil coils                                                                         | 26. Low speed fan relay operation                                   |
| 3. Engine timing sensor                                                                 | 27. Electric fuel pump relay                                        |
| 4. Detonation sensor                                                                    | 28. I.E. fuel system relay                                          |
| 5. Injectors                                                                            | 29. Supply (+15) for FIAT CODE                                      |
| 6. Charcoal filter solenoid valve                                                       | 30. Supply (+30) for FIAT CODE                                      |
| 7. Engine coolant temperature sensor                                                    | 31. Climate control compressore relay operation (if fitted)         |
| 8. Air flow meter                                                                       | 32. Climate control compressor engagement request input (if fitted) |
| 9. Butterfly position sensor                                                            | 33. Engine coolant temperature gauge signal                         |
| 10. Idle speed adjustment actuator                                                      | 34. Engine earth for FIAT CODE                                      |
| 11. Engine rpm sensor                                                                   | 35. Fuse A (30 A)                                                   |
| 12. Engine management control unit                                                      | 36. Fuse B (50 A)                                                   |
| 13. Line K                                                                              | 37. Fuse C (15 A)                                                   |
| 14. Memory reprogramming                                                                | 38. Fuse D (10 A)                                                   |
| 15. FIAT CODE control unit connection                                                   | 39. Fuse E (7.5 A)                                                  |
| 16. Vehicle speed input                                                                 | 40. Fuse F (7.5 A)                                                  |
| 17. Rev counter operation                                                               | 41. Ignition switch                                                 |
| 18. Interface connector                                                                 | 42. Engine earth                                                    |
| 19. System failure light operation                                                      | 43. Battery                                                         |
| 20. Input from climate control three stage thermostat (if fitted)                       | 44. Input from climate control 4 stage thermostat (if fitted)       |
| 21. Trim level selection (connected to earth only for versions without climate control) |                                                                     |
| 22. Lambda probe                                                                        |                                                                     |
| 23. Electric fuel pump                                                                  |                                                                     |
| 24. Inertia switch                                                                      |                                                                     |

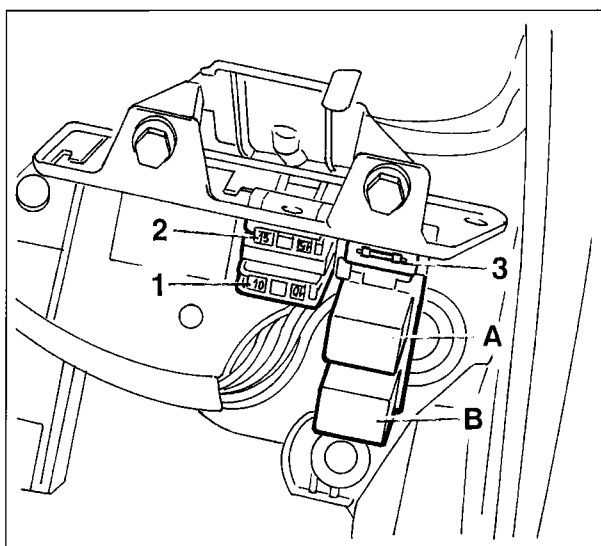
**SYSTEM RELAYS**

With the ignition key in the ON position (+15), the energizing coils for both relays are supplied, closing the power contacts.

Relay (A) supplies the electric fuel pump, receiving its voltage directly from the battery.

Relay (B) ensures the multiple supply of the control unit and the various system sensors and actuators, both directly and via the connector blocks.

**NOTE** *The layout of the relays (A) and (B) and the fuses (1) and (2) can vary according to production requirements. The recognition should be made according to the electrical connections.*

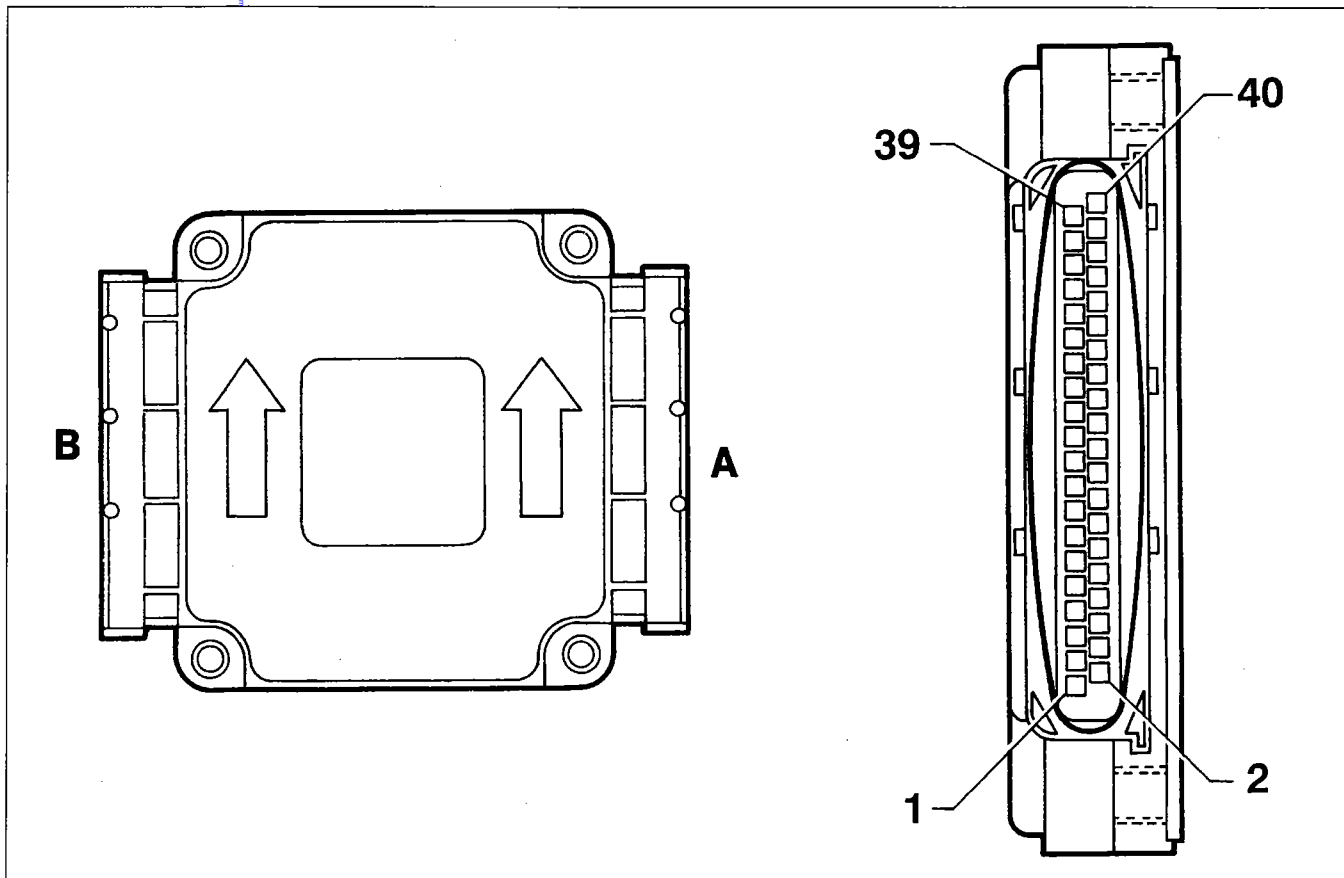


4F0210J02

- A. Electric fuel pump relay
- B. System supply relay
- 1. 10A fuse
- 2. 15A fuse
- 3. Anti-inversion diode

# 10.

## HITACHI SYSTEM CONTROL UNIT PIN-OUT



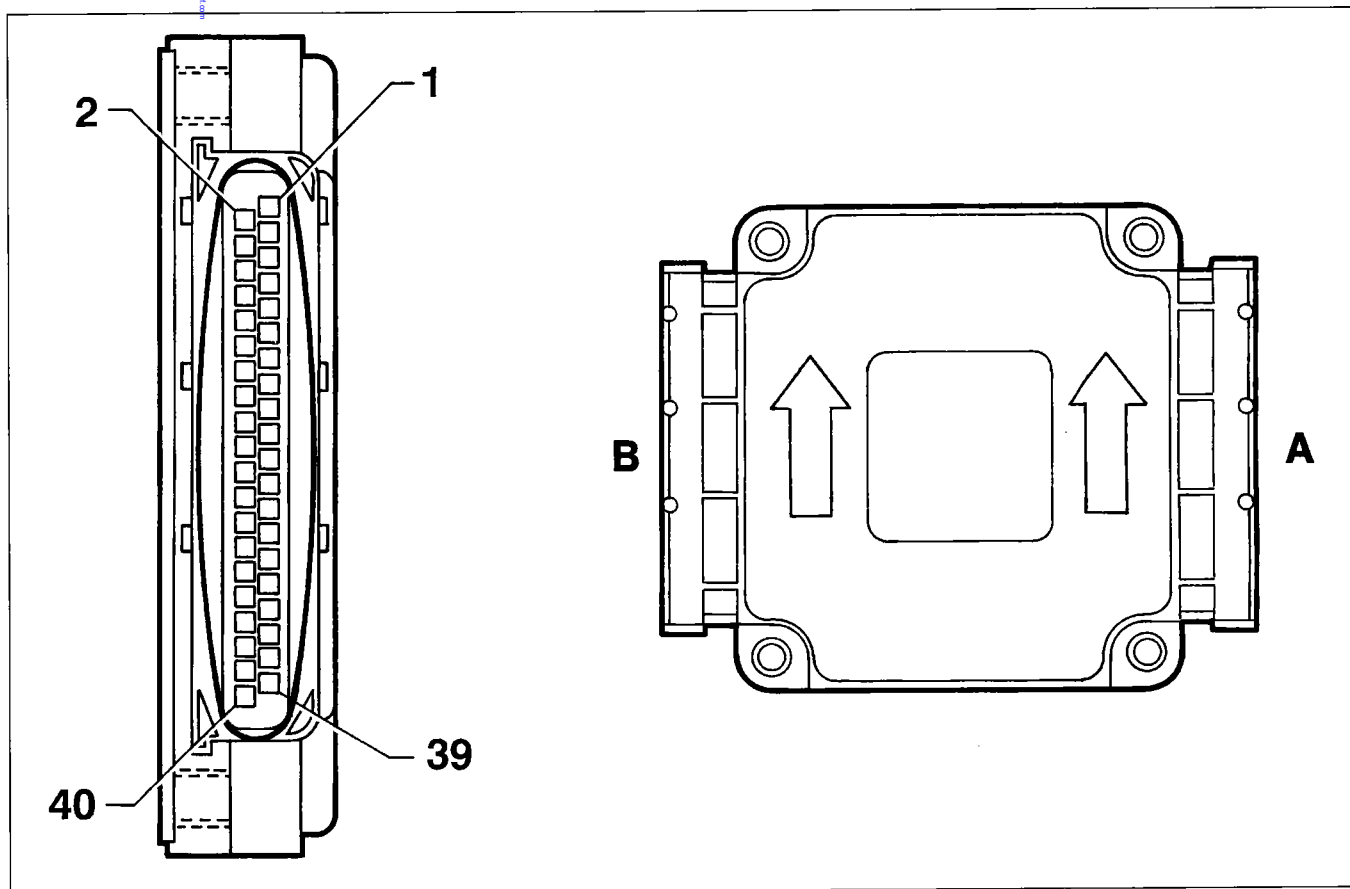
4F0200J01

### Connector A

- |                                       |                                              |
|---------------------------------------|----------------------------------------------|
| 1. Cylinder 1 injector operation      | 21. Container earth                          |
| 2. Cylinder 2 injector operation      | 22. Engine timing sensor signal              |
| 3. Cylinder 3 injector operation      | 23. Engine rpm sensor positive               |
| 4. Cylinder 4 injector operation      | 24. Engine rpm sensor negative               |
| 5. Ignition earth                     | 25. A/D converter earth                      |
| 6. Power earth (1)                    | 26. Coil earth                               |
| 7. Cylinder 1 coil operation          | 27. Charcoal filter solenoid valve operation |
| 8. Cylinder 2 coil operation          | 28. Engine rpm sensor screening              |
| 9. Cylinder 3 coil operation          | 29. N.C.                                     |
| 10. Cylinder 4 coil operation         | 30. N.C.                                     |
| 11. Coolant temperature earth         | 31. Engine timing sensor earth               |
| 12. Air flow meter earth              | 32. N.C.                                     |
| 13. N.C.                              | 33. N.C.                                     |
| 14. Air flow meter signal             | 34. N.C.                                     |
| 15. Butterfly position sensor signal  | 35. Power earth (2)                          |
| 16. Coolant temperature sensor signal | 36. N.C.                                     |
| 17. Butterfly position sensor supply  | 37. Idle speed actuator operation phase 1    |
| 18. Butterfly position signal earth   | 38. Idle speed actuator operation phase 2    |
| 19. Detonation sensor signal          | 39. Idle speed actuator operation phase 3    |
| 20. Detonation sensor earth           | 40. Idle speed actuator operation phase 4    |



**HITACHI SYSTEM CONTROL UNIT PIN-OUT**

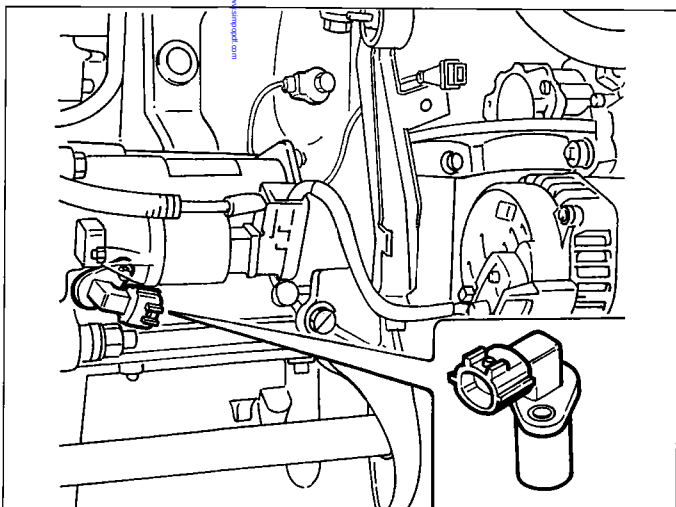


4F0210J01

**Connector B**

- |                                                              |                                                                               |
|--------------------------------------------------------------|-------------------------------------------------------------------------------|
| 1. System relay feed operation                               | 20. Lambda probe signal                                                       |
| 2. Control unit supply (+15)                                 | 21. Lambda sensor negative                                                    |
| 3. Power supply 1                                            | 22. N.C.                                                                      |
| 4. Power supply 2                                            | 23. N.C.                                                                      |
| 5. Control unit supply (+30)                                 | 24. N.C.                                                                      |
| 6. Engine started signal from ignition key +50               | 25. N.C.                                                                      |
| 7. Fuel pump relay feed                                      | 26. Trim level selection (to earth only for versions without climate control) |
| 8. System failure light operation                            | 27. Three stage thermostat signal (only for versions with climate control)    |
| 9. Air conditioning compressor engagement signal (if fitted) | 28. N.C.                                                                      |
| 10. Air conditioning compressor relay feed (if fitted)       | 29. N.C.                                                                      |
| 11. N.C.                                                     | 30. Connection with FIAT CODE                                                 |
| 12. N.C.                                                     | 31. Reprogramming                                                             |
| 13. N.C.                                                     | 32. Line K                                                                    |
| 14. Low speed fan relay feed                                 | 33. N.C.                                                                      |
| 15. High speed fan relay feed                                | 34. N.C.                                                                      |
| 16. N.C.                                                     | 35. N.C.                                                                      |
| 17. Rev counter operation                                    | 36. N.C.                                                                      |
| 18. Vehicle speed sensor signal                              | 37. N.C.                                                                      |
| 19. N.C.                                                     | 38. N.C.                                                                      |
|                                                              | 39. N.C.                                                                      |
|                                                              | 40. N.C.                                                                      |

# 10.



3N26GJ01

## ENGINE RPM SENSOR

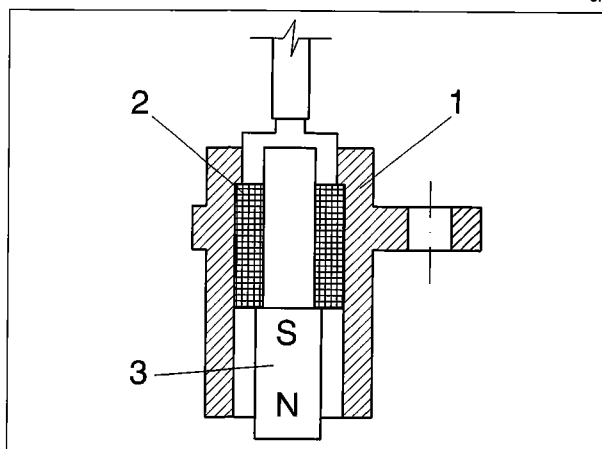
This sensor is secured to the crankcase: the flywheel is in one piece with a crankshaft crank.

### Operating principle

The sensor consists of a tubular casing (1) which contains a permanent magnet (3) and an electrical winding (2):

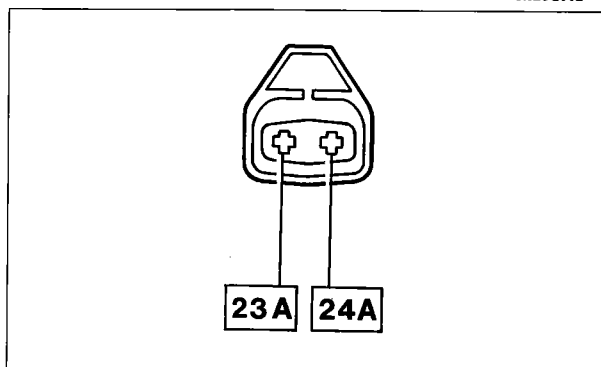
As a result of the flywheel teeth passing, the magnetic flow created by the magnet (3) undergoes fluctuations produced by the variation in the gap.

These fluctuations produce an electro-motive force in the winding (2) where an alternately positive (tooth opposite the sensor) and negative (gap opposite the sensor) voltage is produced: see paragraph on "signal management". The peak sensor output voltage value, all things being equal, depends on the distance between the sensor and the tooth (gap).

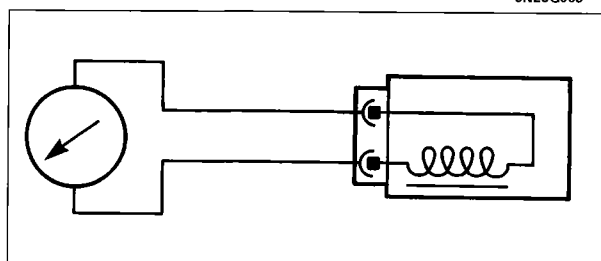


3N26GJ02

### Wiring connector



3N26GJ03

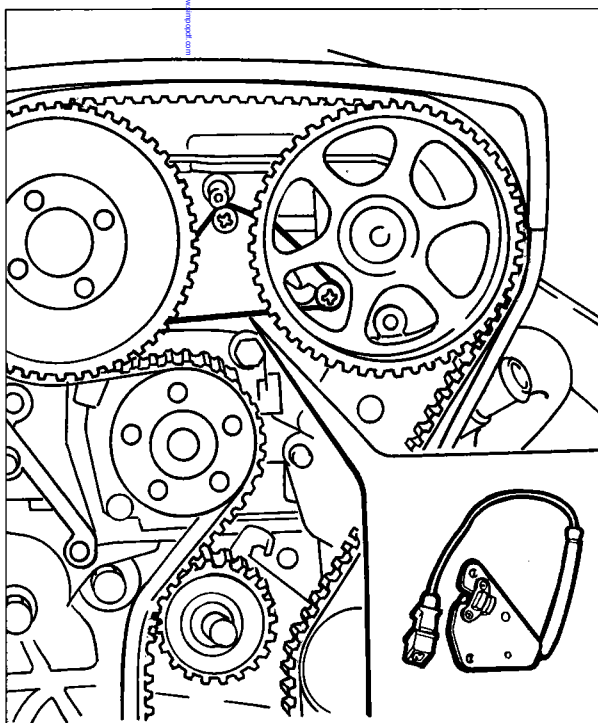


3N26GJ04

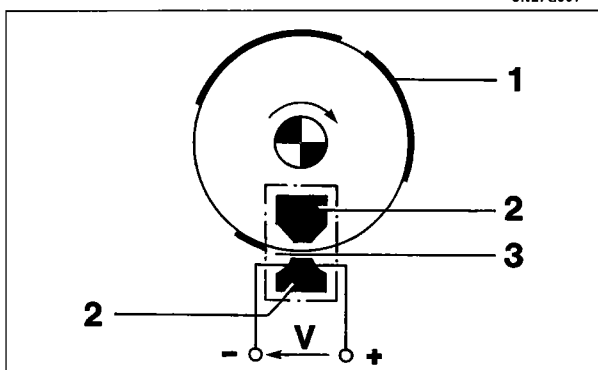
The sensor winding resistance can be measured by disconnecting the connector and connecting an ohmmeter to the sensor terminals

**Resistance:  $570 \pm 57$  ohm at  $20^{\circ}\text{C}$**

## ENGINE TIMING SENSOR



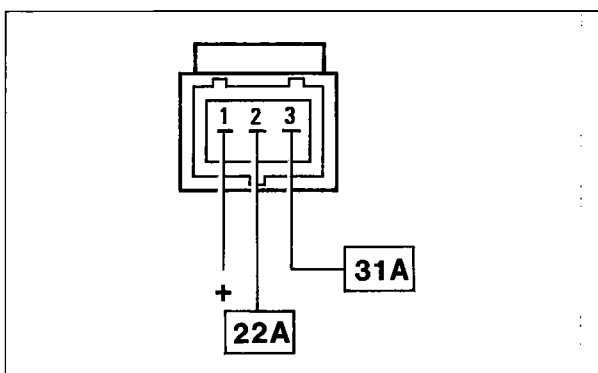
3N27GJ01



3N27GJ02

1. Deflector
2. Magnetic material
3. Gap

### Wiring connector



3N27GJ03

The engine timing signal, together with the engine rpm and TDC signal, allows the control unit to recognize the order of the cylinders to implement phased injection. This signal is produced by a Hall effect sensor, fitted by the exhaust camshaft drive pulley.

**NOTE** *The angular position of the sensor cannot be adjusted in any way.*

### Operating principle

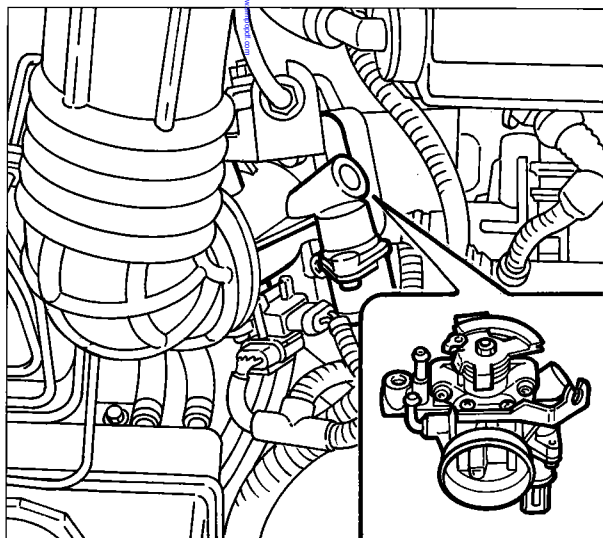
A semi-conductor layer, through which a current passes, immersed in a magnetic field (lines of force perpendicular to the direction of the current), produces a difference in power, known as Hall voltage.

If the intensity of the current remains constant, the voltage produced only depends on the intensity of the magnetic field. The intensity of the field can simply be altered periodically to produce a modulated electrical signal.

In practice, to achieve this change, the sensor is passed through a metal ring (in one piece with the inner part of the timing pulley) which has a series of openings: as it moves, when the ring covers the sensor, it stops the magnetic field and the signal remains low, whilst when there is an opening, the field is enclosed and the signal becomes high.

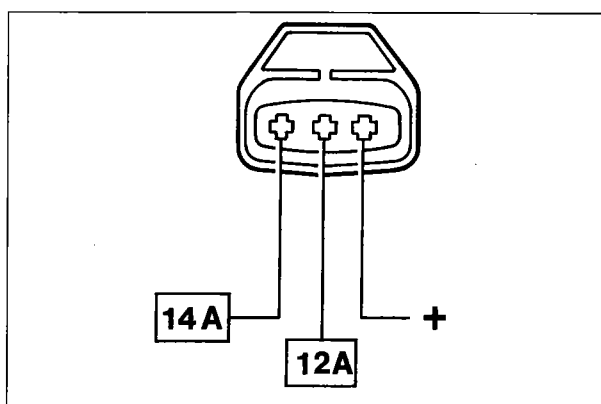
The alternating of the signals depends therefore on the succession of the openings (see chapter on "signal management").

## 10.



3N28GJ01

### Wiring connector



3N28GJ02

### AIR FLOW METER

The air flow meter is the hot film type, incorporated in the butterfly casing.

The top part has a duct, parallel to the main flow, which contains the heated filament.

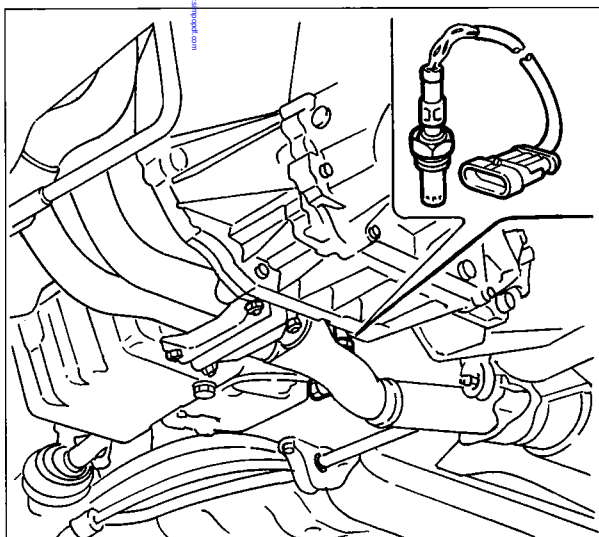
Part of the flow of intake air is introduced into the duct and, after passing through it, comes out the opposite side, returning to the main flow.

As a result, only part of the mass of air which passes through the flow meter is measured: this quantity is, however, proportional to the overall mass which passes through the flow meter.

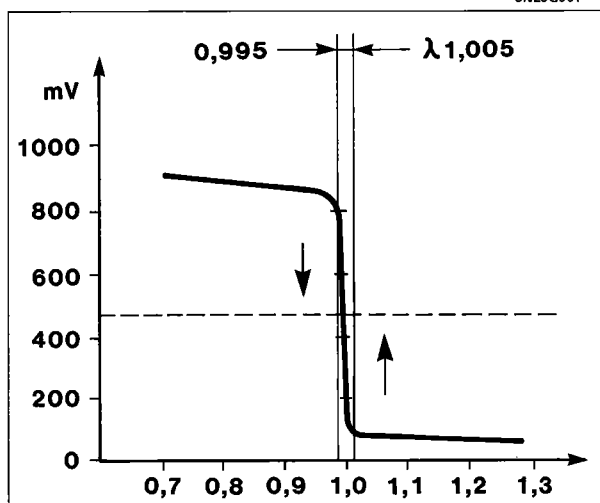
The flow meter output electrical voltage is therefore representative of the total flow rate.

This type of flow meter has two advantages compared with the full flow type:

- considerable insensitivity to the pulsation of the columns of air, especially present at low speeds and heavy loads;
- less fouling of the filament, thanks to the reduced mass of air which comes into contact with it; as a result, the control unit has no wire cleaning strategy (burn-in).



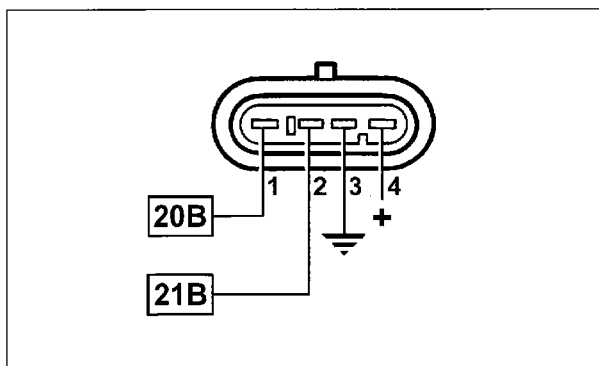
3N29GJ01



3N29GJ02

$\lambda = 1$  Ideal mixture (stoichiometric)  
 $\lambda > 1$  Lean mixture  
 Excess air, the CO values tend to be low  
 $\lambda < 1$  Rich mixture  
 Lack of air; the CO values tend to be high

#### Wiring connector



3N29GJ04

#### LAMBDA SENSOR

The Lambda sensor measures the oxygen content in the exhaust gases: it is fitted on the exhaust pipe, upstream of the catalytic silencer. The sensor output signal is sent to the control unit for a feed-back correction of the mixture strength.

When the sensor supplies a low signal (voltage below 200 mV) the control unit recognizes a weak mixture and increases the injection time; later on, when the sensor signal is high (voltage above 800 mV), the control unit recognizes a rich mixture and decreases the injection time.

This sequence is repeated at a frequency in the order of tens of Hertz so that the engine operates with a mixture strength constantly fluctuating around the stoichiometric ratio.

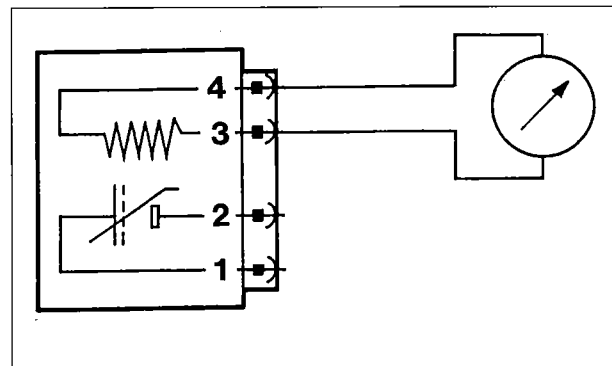
At temperatures below 300°C the ceramic material is not activated, therefore the sensor does not send reliable signals: to ensure rapid heating during starting and maintain the temperature whilst idling, the sensor is equipped with a heater with an electrical resistance which is always on.



*The sensor can be rapidly put out of action by the presence of even slight amounts of lead in the petrol.*

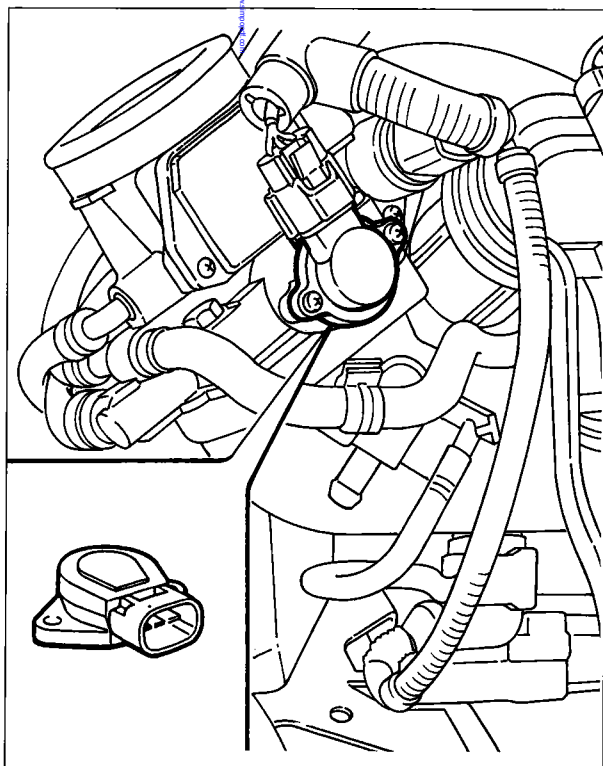
The sensor heater resistance can be measured by disconnecting the connector and connecting an ohmmeter as illustrated in the diagram.

**Resistance:  $4.5 \pm 0.5$  ohm at 20°C**



3N29GJ03

## 10.

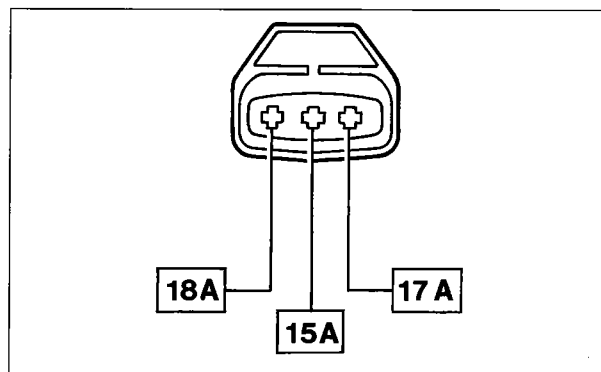


3N30GJ01

### BUTTERFLY POSITION SENSOR

This consists of a single track potentiometer with the moving part rotated by the accelerator butterfly shaft.

### Wiring connector



3N30GJ02

# 10.

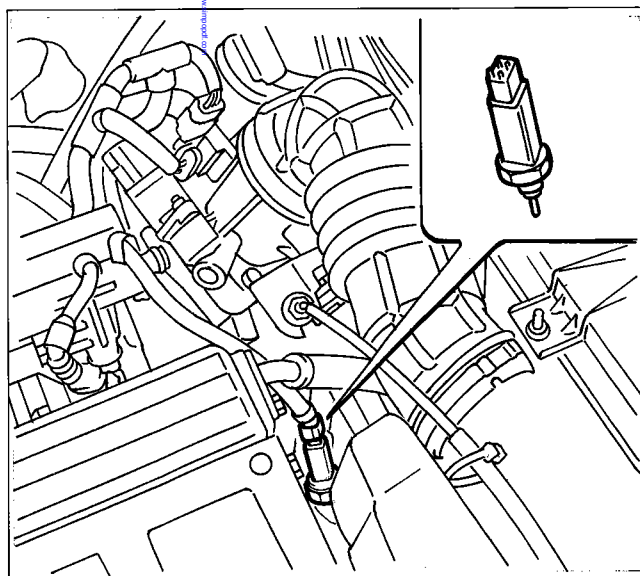
## ENGINE COOLANT TEMPERATURE SENSOR

This sensor is fitted on the thermostat. It consists of a brass casing which affords protection for the actual resistive elements, comprising two NTC type thermistors (Negative Temperature Coefficient, where the electrical resistance decreases as the temperature increases).

The two thermistors are distinctive and provide information concerning the temperature to the instrument panel (A) and the engine management control unit (B), respectively.

The reference voltage for the latter is 5 Volt: since the control unit intake circuit is designed as a voltage divider, the reference voltage is shared between a resistance in the control unit and the actual sensor.

As a result, the control unit is capable of evaluating the variations in the sensor resistance through the changes in voltage, thereby obtaining information concerning the temperature.



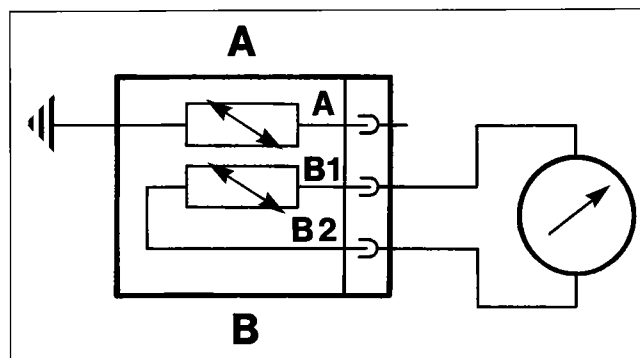
3N32GJ01

### INJECTION NTC

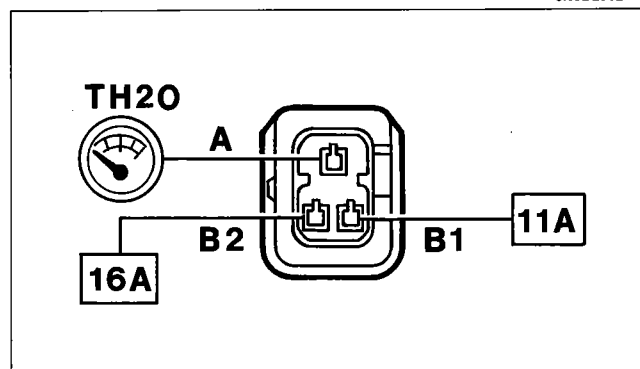
| °C  | Ω     | °C  | Ω    |
|-----|-------|-----|------|
| -20 | 15971 | 40  | 1152 |
| -10 | 9620  | 50  | 807  |
| 0   | 5975  | 60  | 576  |
| 10  | 3816  | 70  | 418  |
| 20  | 2502  | 80  | 309  |
| 25  | 2044  | 90  | 231  |
| 30  | 1679  | 100 | 176  |

### INSTRUMENT NTC

| °C  | Ω       |
|-----|---------|
| 60  | 512-602 |
| 90  | 184-208 |
| 120 | 76-88   |



3N32GJ02



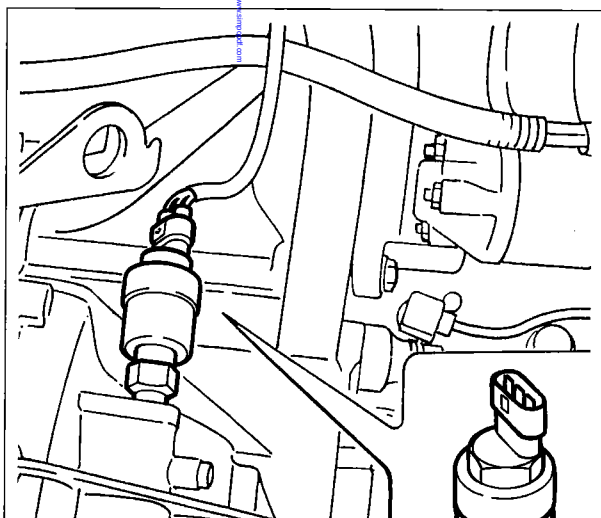
3N32GJ03

The table shows the progress of the sensor, which can be measured by disconnecting the connector and connecting an ohmmeter as illustrated in the diagram.

### Wiring connector

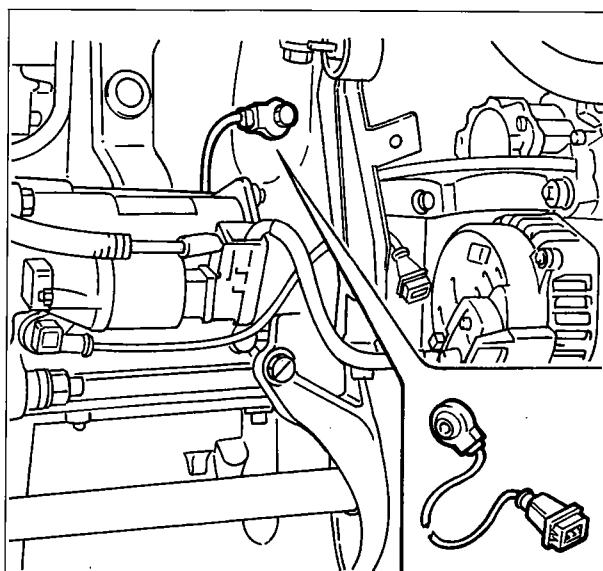


### 10.



3N33GJ05

Connector wiring

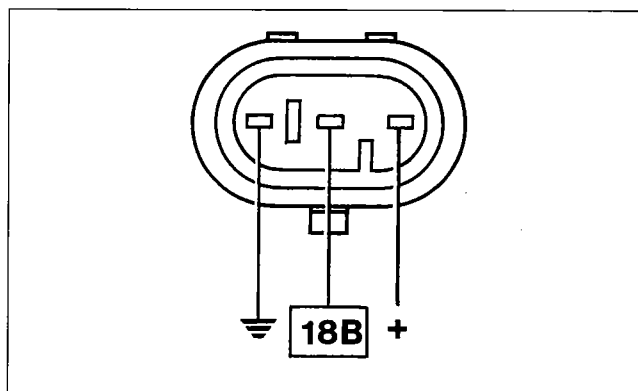


3N33GJ04

Wiring connector

#### VEHICLE SPEED SENSOR

This sensor is positioned at the differential output, by the left driveshaft coupling, and transmits information concerning the vehicle speed to the control unit: the signal is also used for the operation of the speedometer. The sensor is the Hall effect type (see paragraph on "engine timing sensor") and is calibrated so that a distance of one metre corresponds to each impulse: it is therefore possible to deduce the speed of the vehicle from the frequency of the impulses.



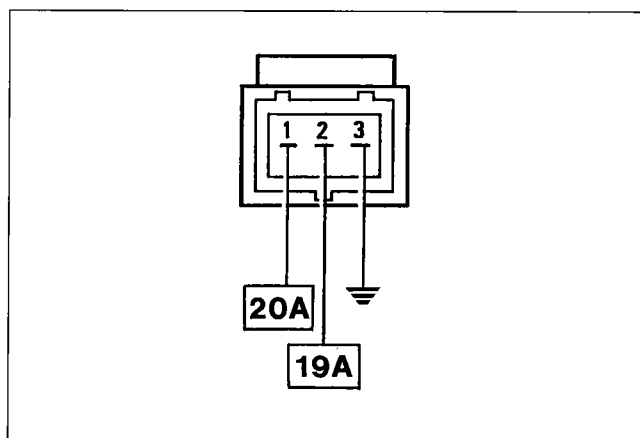
3N33GJ01

#### DETONATION SENSOR

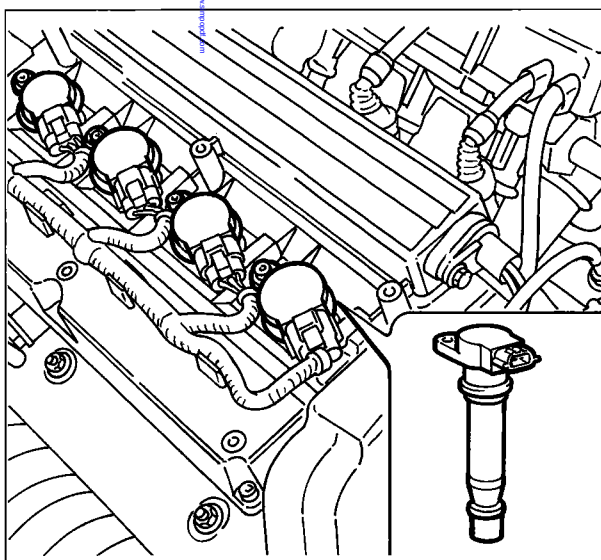
This sensor is the piezoelectric type and is fitted on the cylinder block/crankcase in a position which is symmetrical in relation to the pairs of cylinders 1-2 and 3-4.

This position is determined by the need to detect the onset of detonation in the same way for all cylinders.

When there is engine "knock", vibrations of a particular frequency are produced which are transformed by the sensor into a voltage signal, proportional to their intensity.

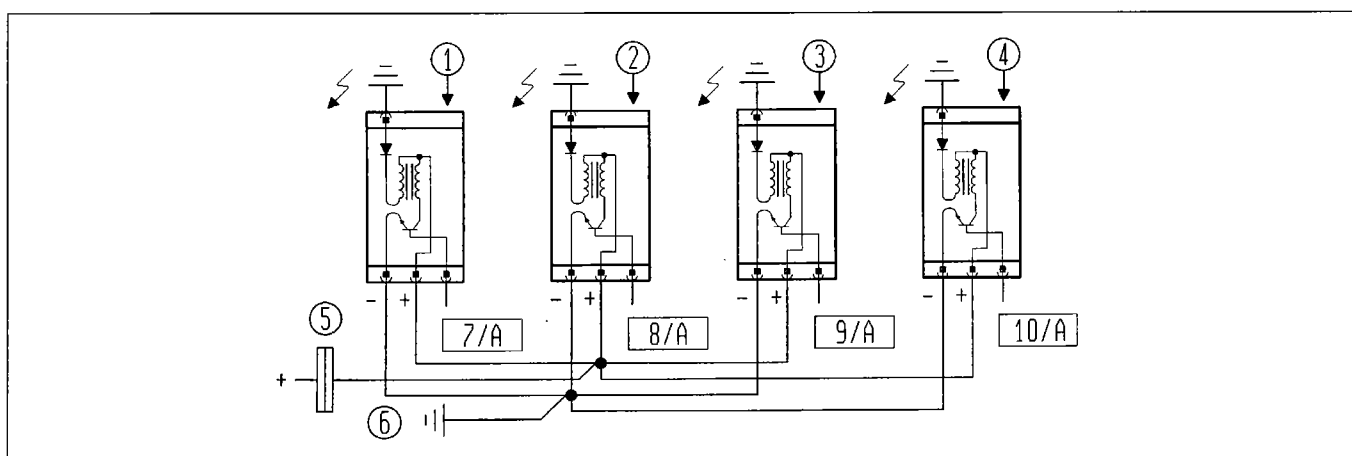


3N33GJ02



3N34GJ01

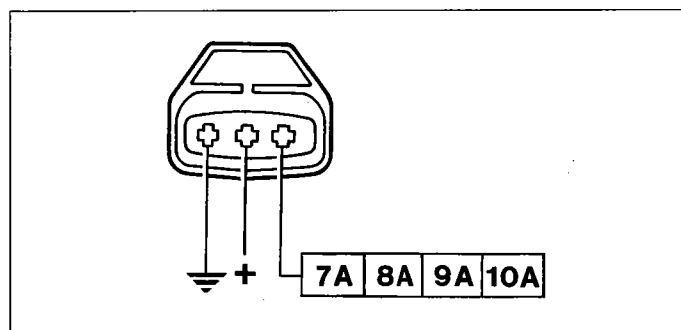
Interrupting the current to the base of the transistor interrupts the connection to earth of the primary winding and, as a result, causes a high tension discharge at the secondary winding. The optimum ignition advance is calculated by the control unit according to the engine speed and load conditions and is implemented in the form of time between the TDC for the explosion stroke and the moment the supply for the coil primary circuit is interrupted.



3N34GJ02

### Wiring connector

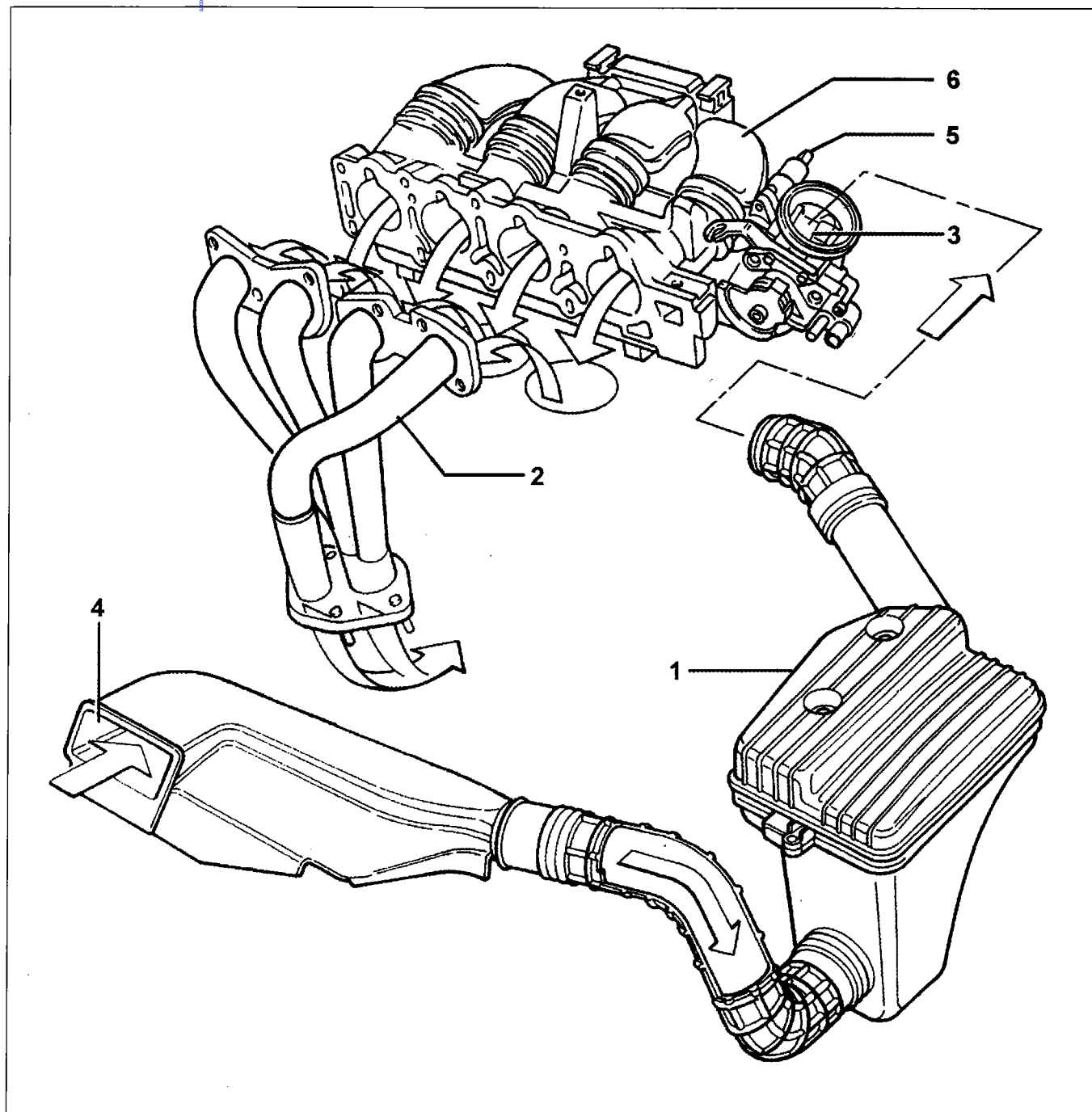
1. Cylinder 1 coil
2. Cylinder 2 coil
3. Cylinder 3 coil
4. Cylinder 4 coil
5. Interface connector
6. Engine earth



3N34GJ03

## 10.

### AIR INTAKE CIRCUIT DIAGRAM



4F0320J01

1. Air filter
2. Exhaust manifold
3. Butterfly casing with air flow meter
4. Intake vent
5. Engine idle adjustment actuator
6. Intake manifold

## INTAKE CIRCUIT

The intake circuit consists of the following components:

- air filter and hoses;
- acoustic resonators fitted in parallel to the intake hose (two upstream and one downstream of the filter);
- intake manifold on which the fuel manifold, complete with injectors, the engine management control unit and the charcoal filter solenoid valve are fitted
- butterfly casing, incorporated with the air flow meter, on which the butterfly position sensor, the PCV valve for the oil vapour recirculation circuit and the engine idle adjustment actuator are fitted.

## BUTTERFLY CASING

The butterfly casing has the task of metering the quantity of air drawn in by the engine (and consequently the power developed) according to the driver's request via the accelerator and it is incorporated with the air flow meter.

The butterfly casing is secured to the intake manifold by four bolts: the butterfly is opened by means of linkage where small butterfly opening angles correspond to the pedal being slightly pressed and large angles correspond to it being greatly depressed.

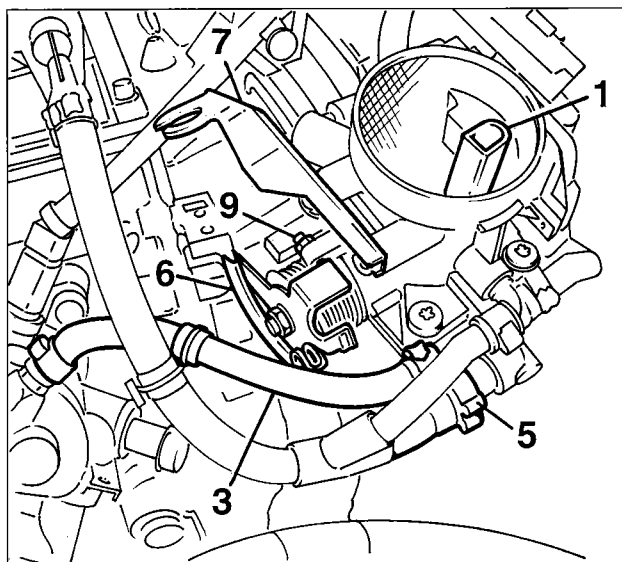
With the pedal completely released (engine decelerating or idling) the necessary additional air is supplied by the engine idle adjustment actuator: under these circumstances, the butterfly opening lever is in the end of travel position against an anti-tamper screw which prevents the butterfly from getting stuck in a closed position.

To prevent the formation of ice near the butterfly and the opening connected to the PCV valve, the butterfly casing is heated by a small amount of water coming from the engine thermostat circulating in a chamber inside the actual casing.

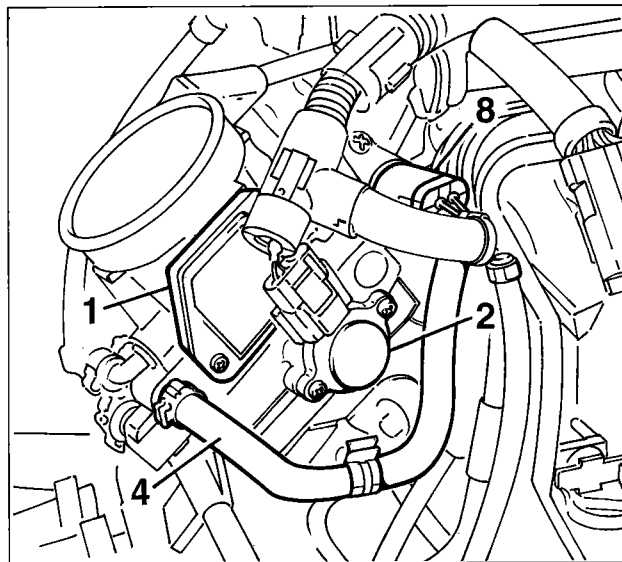
The PCV valve for the oil vapour recirculation system and the butterfly position sensor are also fitted on the butterfly casing.



*The anti-tamper screw is adjusted during the fluxing operation in the factor and should never be tampered with.*



3N36GJ01

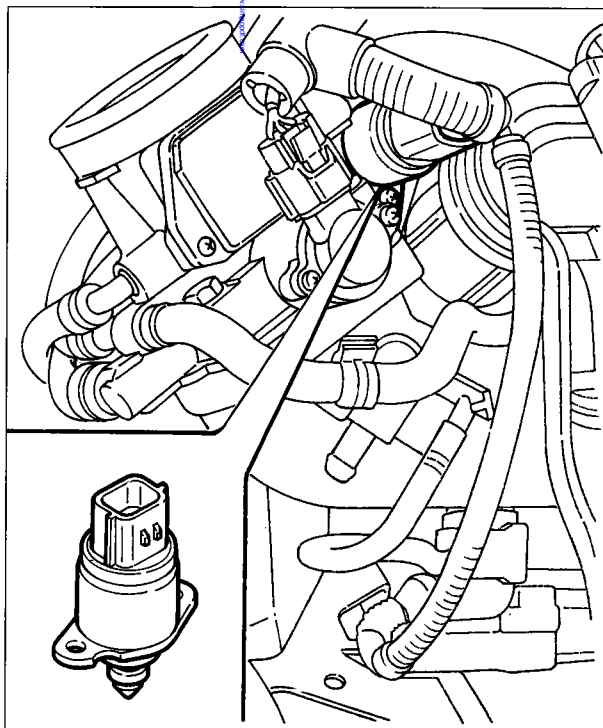


3N36GJ02

1. Air flow meter
2. Butterfly position sensor
3. Engine coolant inlet

4. Engine coolant outlet
5. PCV valve

## 10.



3N37GJ01

### ENGINE IDLE SPEED ADJUSTMENT ACTUATOR

The actuator, fitted on the butterfly casing, intercepts a flow of air which, drawn in upstream of the butterfly, is returned downstream: it has the task of providing the engine with additional air when the butterfly is closed in all conditions when this is deemed necessary (idling, deceleration).

A stepping motor is used to achieve this; it is fixed to the butterfly casing and operated by a circuit inside the engine management control unit.

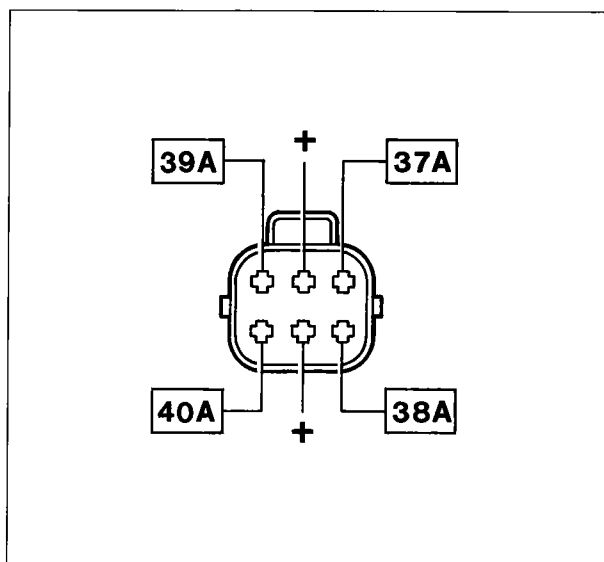
### Operating principle

The actuator consists of:

- an electric stepping motor with two windings in the stator and a rotor which includes a certain number of pairs of permanent magnetic poles;
- a screw-female screw type reduction gear which transforms the rotary motion into rectilinear motion.

The stepping motor is operated by the engine management control unit which, combining the offset and the direction in which the current flows through the windings, causes the rotation of the rotor, in both directions, through a certain number of steps.

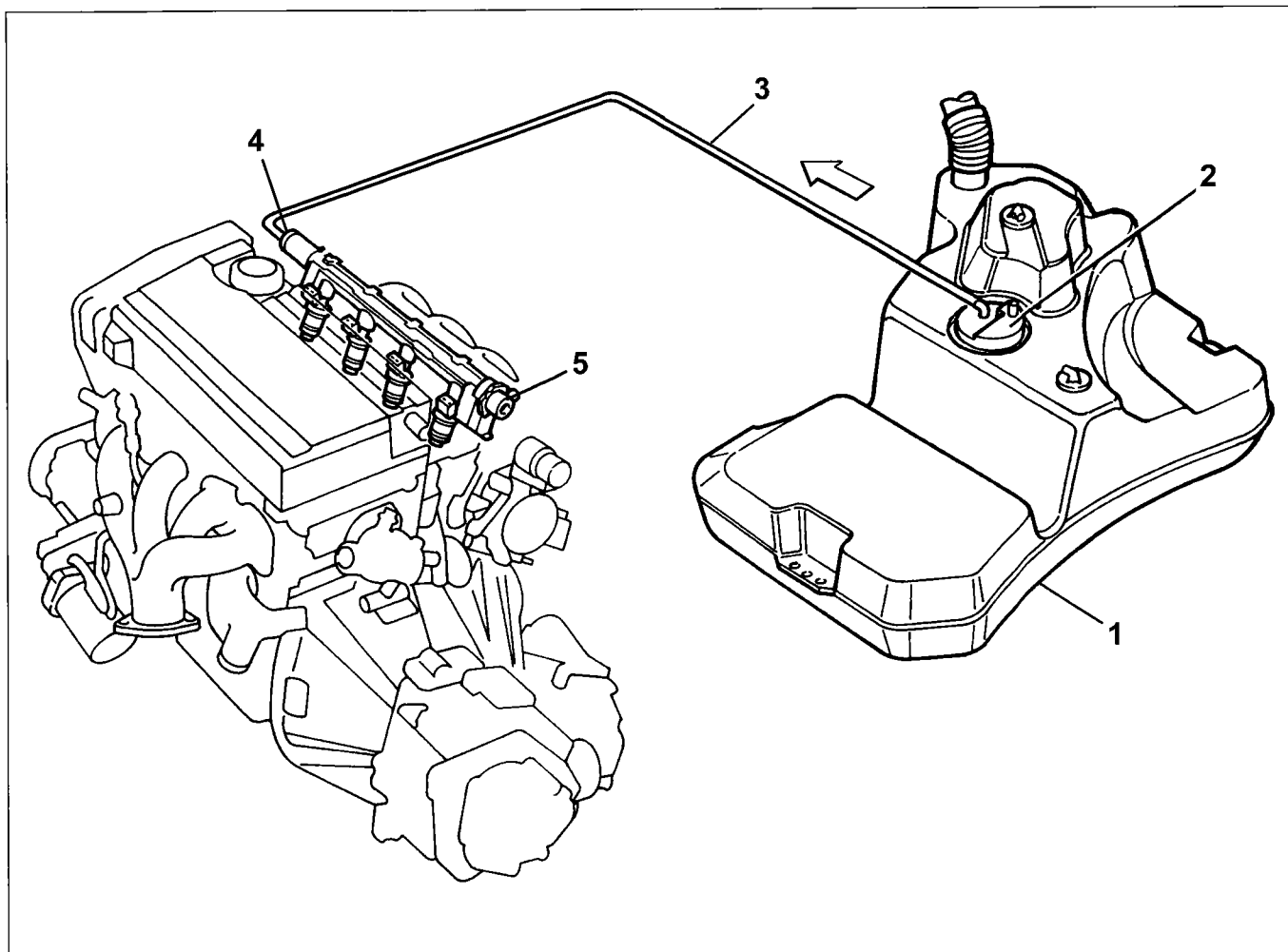
The screw-female screw coupling causes the movement of a stem fitted with a tapered shutter which alters the section of the by-pass duct and, as a result, the quantity of air drawn in by the engine to obtain the desired speed even when outside loads are applied (air conditioning, fans, power assisted steering, etc.).



3N37GJ02

### Wiring connector

**FUEL CIRCUIT DIAGARM**



4F0350J01

1. Fuel tank
2. Drip tray complete with pump, filter, pressure regulator and gauge float
3. Supply pipe
4. Returnless type fuel manifold
5. Air bleed connector

**FUEL SUPPLY CIRCUIT**

This circuit consists of the following components:

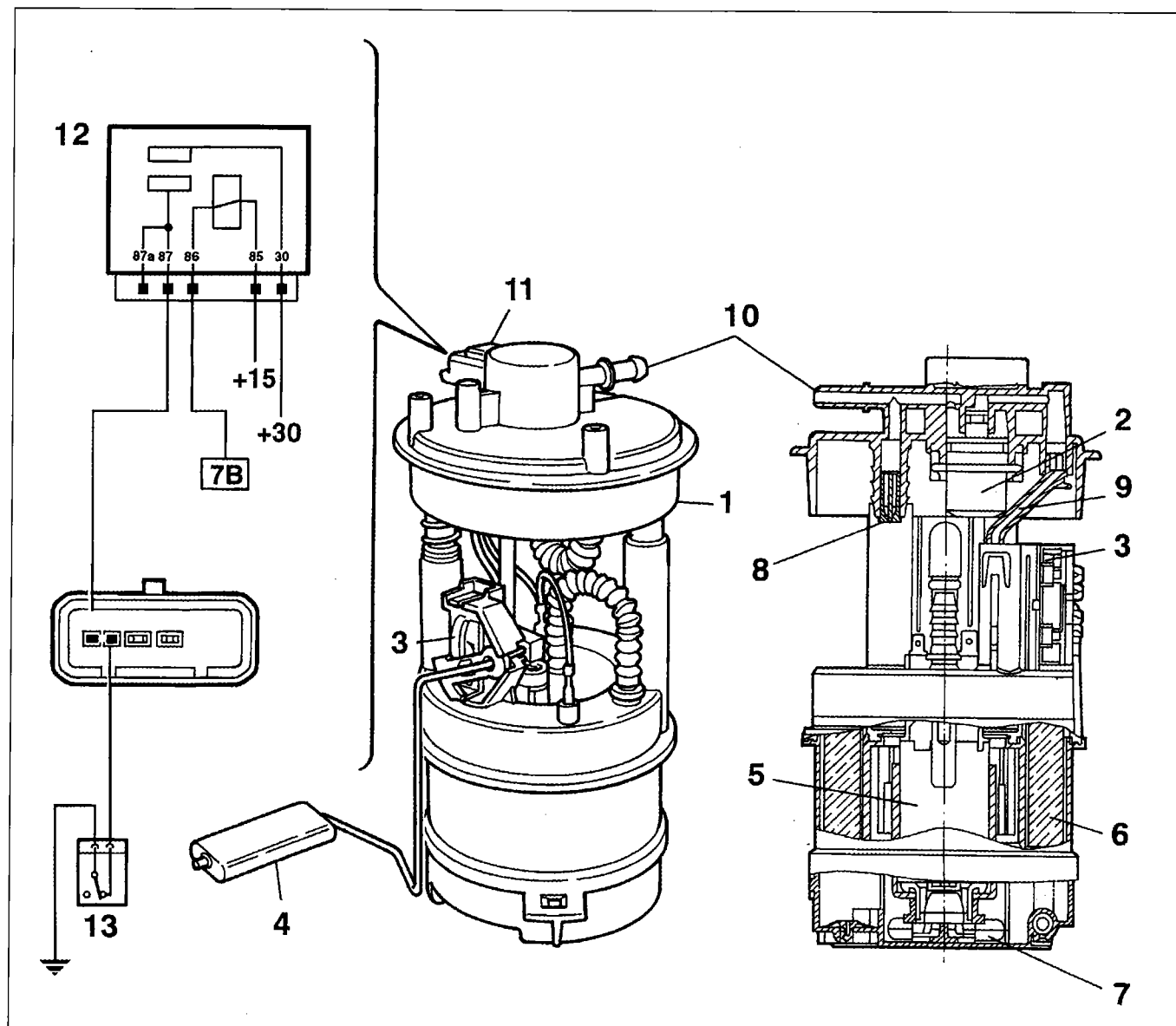
- Fuel tank
- Drip tray complete with pump, filter, pressure regulator and gauge float
- Supply pipe
- Returnless type fuel manifold complete with injectors

### 10.

#### FUEL DRIP TRAY ASSEMBLY

##### Electric fuel pump

The pump is housed inside the fuel tank, on a special drip tray, which also supports the gauge and is equipped with a gauze filter at the pump inlet. The pressure regulator is also fitted on the pump supply.



3N40GJ01

1. Complete drip tray
2. Pressure regulator
3. Gauge
4. Float
5. Electric pump
6. Fuel filter
7. Pre-filter

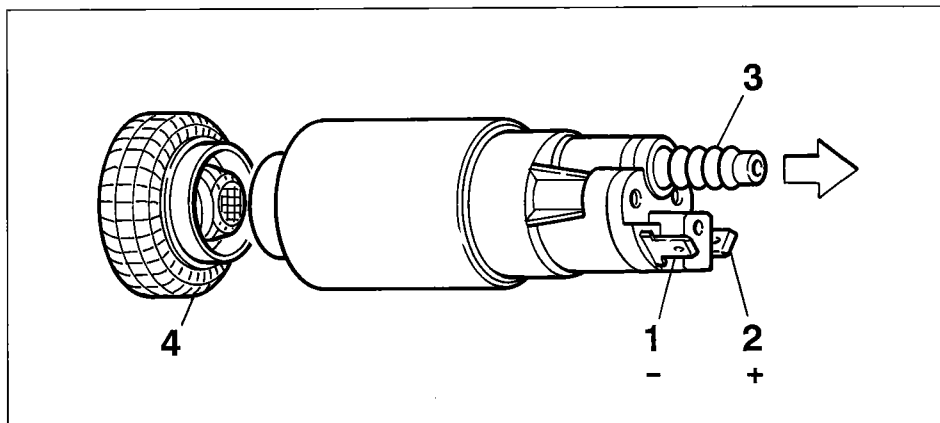
8. One-way valve
9. Internal fuel return
10. Fuel supply
11. Electrical connector
12. Relay
13. Inertia switch



## 10.

The pump is the volumetric type and is designed to run on unleaded fuel. The rotor is driven by a d.c. electric motor receiving the battery voltage directly from the twin relay on the command of the control unit in order to ensure that:

- the pump cuts out if the engine speed goes below a minimum level (about 450 rpm);
- the timed operation (around 15 seconds) each time the ignition key is turned to the ON position without the engine being started up;
- operation when the engine is started up.



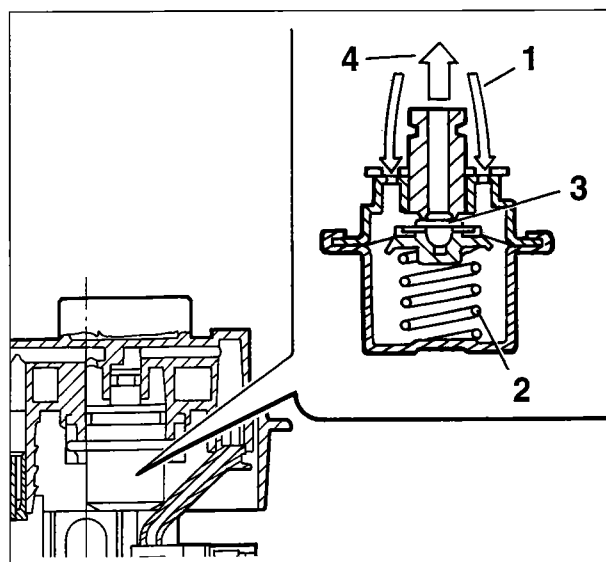
1. Negative
2. Fuel system
3. Supply
4. Pre-filter

The pump is equipped with an excess pressure valve which short circuits the supply with the inlet if the pressure in the supply circuit exceeds 5 bar to prevent the electric motor from overheating. In addition, a one-way valve, fitted in the supply, prevents the entire fuel circuit from draining when the pump is not working.

The pump nominal flow rate varies according to the speed of the rotor and therefore the supply voltage.

### Fuel filter

The fuel filter is housed in the casing which surrounds the pump and does not require periodic replacement.



### Fuel pressure regulator

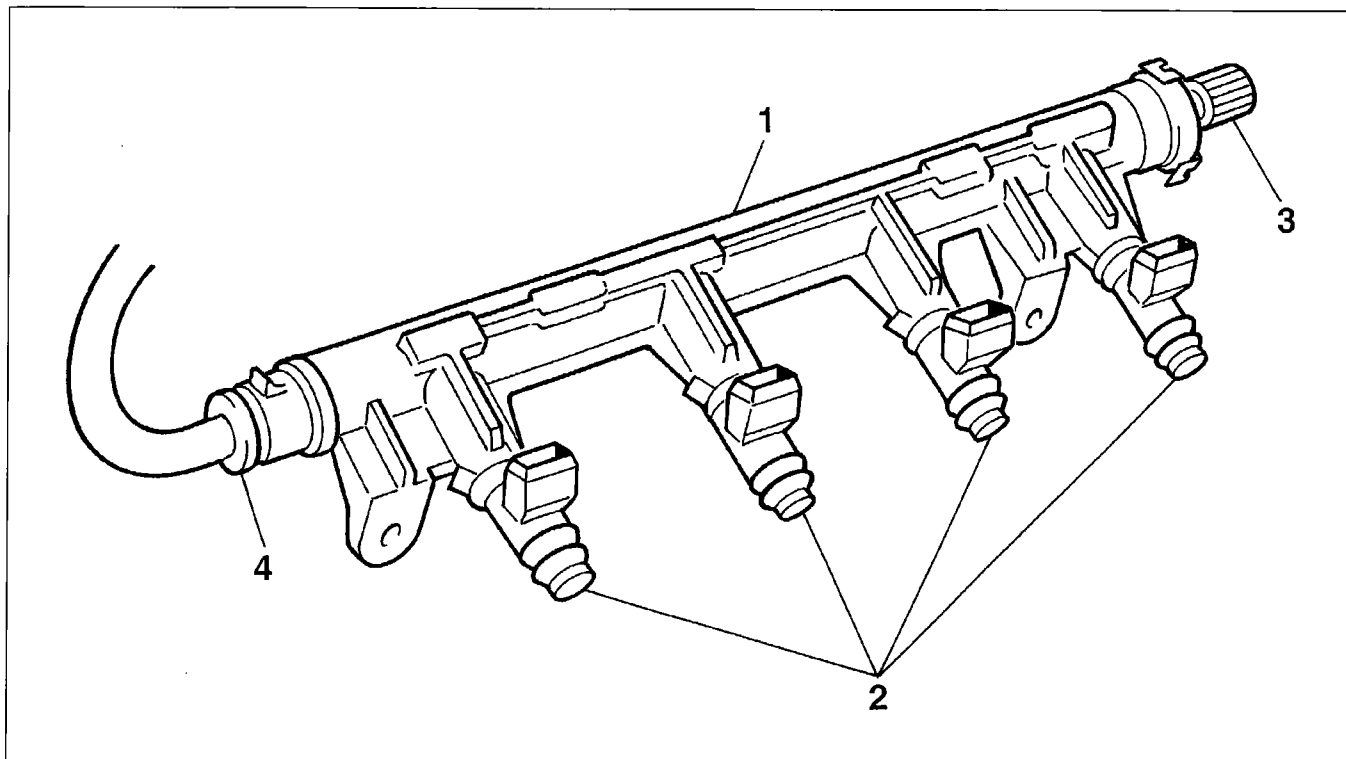
This is a differential diaphragm device, regulated at the factory to a pressure of  $3.50 \pm 0.05$  bar and located in the top part of the drip tray.

The pressurized fuel (1), coming from the pump, exerts a force on the valve (3) opposed by a calibrated spring (2). When the calibration pressure is exceeded, the valve opens and the excess fuel (4) returns to the tank, thereby stabilizing the pressure in the circuit.

## 10.

### FUEL MANIFOLD

The fuel manifold, which is designed to distribute the fuel to the injectors, is produced by aluminium die-casting and incorporates the seats for the injectors and the bleed valve. The fuel inlet is secured by a tapered, sealed bolt. Since the system is the returnless type, there is no re-circulation pipe.



3N42GJ02

1. Fuel manifold
2. Injectors
3. Bleed valve
4. Fuel supply connector

# 10.

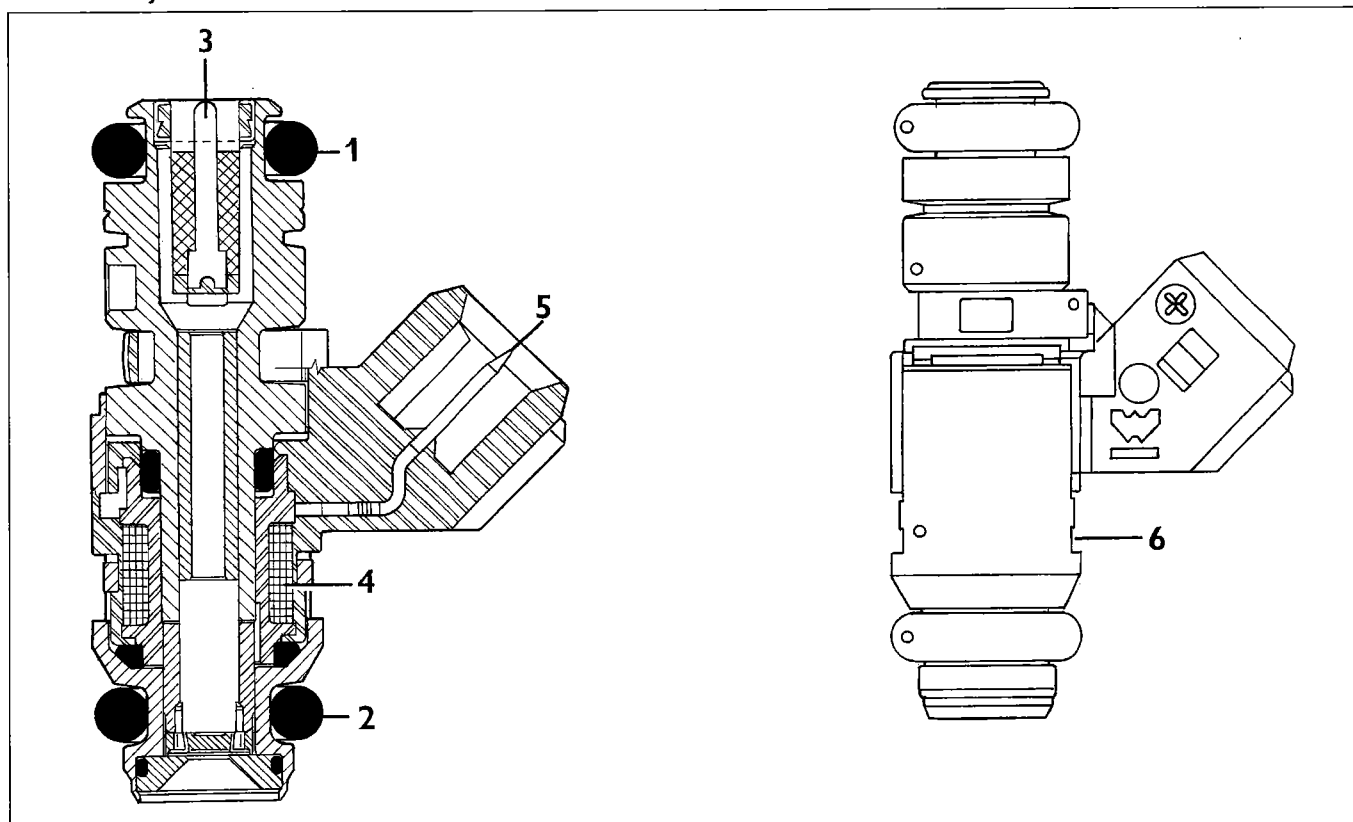
## INJECTORS

The injector has the task of supplying the quantity of fuel needed for the operation of the engine: the fuel is injected into the intake manifold, immediately upstream of the inlet valves.

The injector is the twin jet, top-feed type, with the supply (3) of fuel at the top where the electrical winding (4) connected to the connector terminals (5) is also housed.

When the current passes through the winding, the magnetic field which is produced attracts the shutter causing the opening of the injector and the flow of fuel.

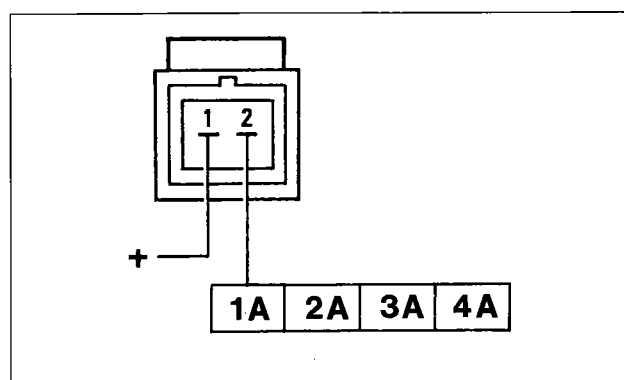
Two seals guarantee the seal on the fuel manifold side (1) and the intake manifold side (2). A reference (6) determines the angular position of the injector in relation to the inlet duct to ensure the correct direction of the jets in relation to the inlet valves.



3N43GJ01

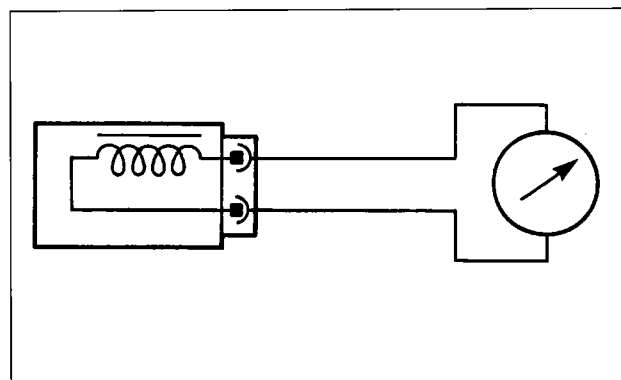
The injector resistance can be measured by disconnecting the connector and connecting an ohmmeter as illustrated in the diagram.

## Wiring connector



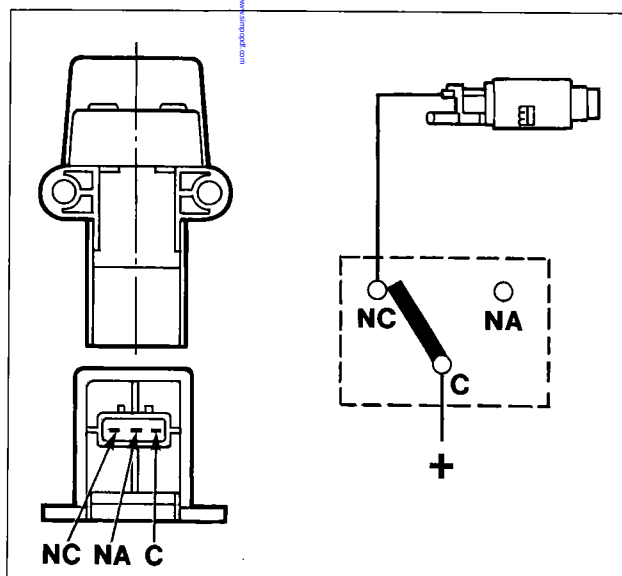
3N43GJ02

**Resistance value:  $14.5 \pm 5\%$  ohm**

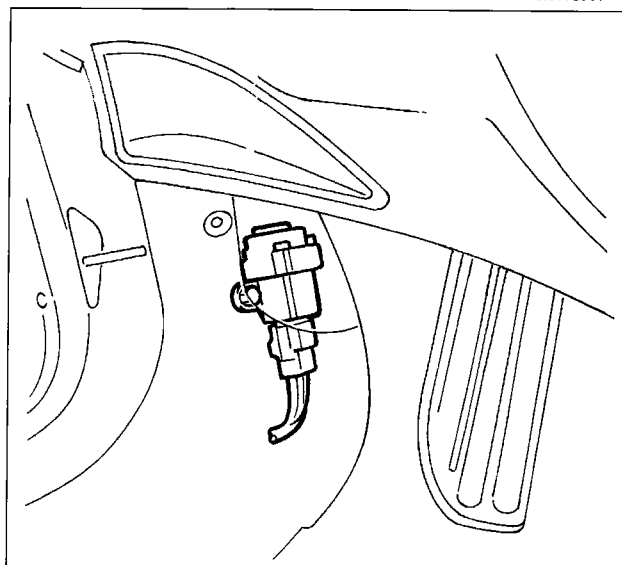


3N43GJ03

### 10.



3N44GJ01



4A34JJ02

1. Inertia sensor
2. Button for restoring operation of fuel pump

#### INERTIA SAFETY SWITCH

In order to improve safety for the occupants of the vehicle in the case of an impact, the vehicle is fitted with an inertia switch located under the dashboard on the driver's side, secured to the left panel near the bonnet release.

The inertia switch has the task of interrupting the electrical supply to the electric fuel pump if the vehicle undergoes violent deceleration (impact) to prevent fuel from escaping and creating a fire hazard in case the fuel manifold or the supply pipe are damaged.

The switch consists of a steel ball, fitted in a conical shaped housing, kept in place by the attraction force of a permanent magnet.

As a result of the acceleration due to the inertia forces, the ball can be released from the magnetic clip and gradually come out of its conical housing with an upwards movement which depends on the angle of the cone.

There is a rapid release mechanism located above the ball which forms a normally closed (NC) circuit. When the mechanism is struck by the ball it changes position to a normally open (NA) circuit, thereby interrupting the electric supply to the pump and causing it to cut out.

The calibration of the switch causes it to operate at accelerations of above 1.2 g (about 11.7 m/s<sup>2</sup>, corresponding to an impact at a speed of about 25 Km/h).

The switch can be reset by pressing the top button protected by a flexible cover.



*After even an apparently slight impact, if there is a smell of fuel or there are leaks from the fuel system, do not turn the switch back on, but search for the fault and remedy it to prevent the risk of fire.*

*If this is not the case, if there are no leaks and the vehicle can be driven again, press the button to reactivate the fuel pump.*

## EMISSION CONTROL DEVICES

The devices used for this purpose have two aims:

- to keep down the levels of pollutant substances in the exhaust via the catalytic silencer;
- to eliminate the dispersion of unburnt hydrocarbons into the atmosphere, by means of the (fuel) anti-evaporation system and the (lubricant) oil vapour recirculation system.

### CATALYTIC SILENCER

The catalytic silencer is a device which makes it possible to simultaneously reduce the levels of the three main pollutant compounds present at the exhaust: unburnt hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NO<sub>x</sub>).

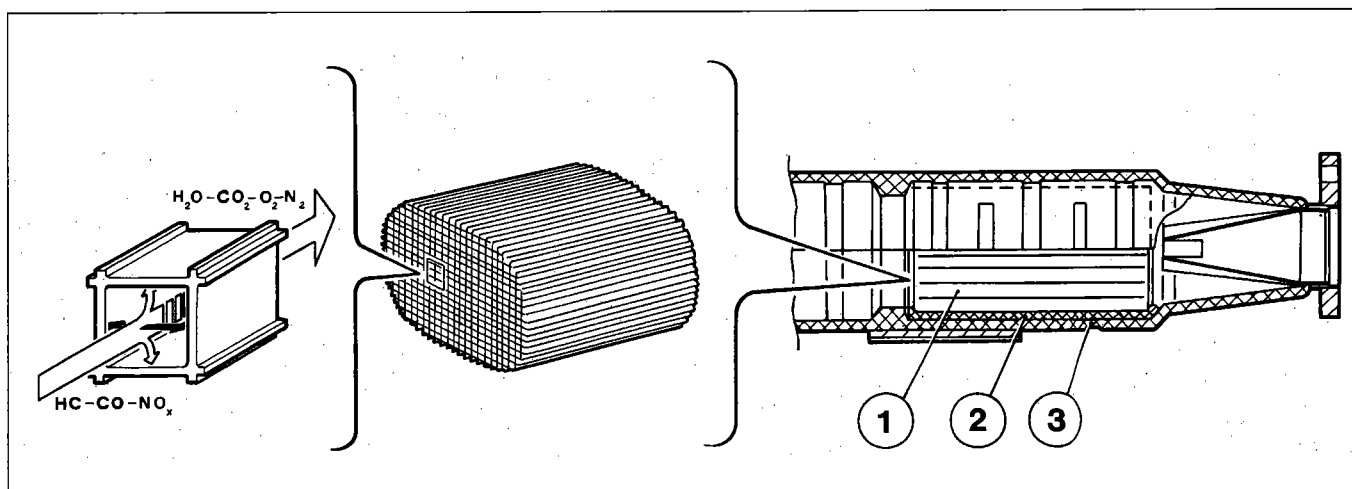
Two types of chemical reaction take place inside the catalyzer:

- oxidation of the CO and HC, converted into carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O);
- reduction of the NO<sub>x</sub>, converted into nitrogen (N<sub>2</sub>O).

These reactions take place extremely quickly thanks to the presence, inside the catalyzer structure (ceramic support) of a layer of active substances (platinum and rhodium) which greatly accelerate the conversion speed of the harmful substances.

The efficiency of this conversion process is affected by the fact that the mixture strength on which the engine runs is continuously fluctuating around the stoichiometric value which is achieved through the feedback control carried out by the control unit using the Lambda sensor signals.

Lastly, the conversion processes are activated at temperatures in excess of 300 - 350°C: it is therefore vital for the catalyzer to reach this temperature as quickly as possible in order to be able to work properly.



3N45GJ01

1. Ceramic structure
2. Metal support
3. Outer steel casing



*When operations have to be carried out in the vicinity of the catalytic silencer, the vehicle must be left to rest for a while since the operating temperature inside the catalyzer is between 500 and 850°C.*



*There are basically two things which can destroy the inside of the catalyzer, namely:*

- *the presence of lead in the fuel which lowers the degree of conversion to practically zero ("lead poisoning") and irreparably damages the Lambda sensor as well;*
- *the presence of completely unburnt fuel in the exhaust gases, due to failed ignition, which causes an increase in temperature which leads to the ceramic support melting. As a result, the connector for the coils should not be disconnected, for any reason, with the engine running: in the case of tests, the silencer must be replaced, as a precaution, with a suitable length of pipe.*

## 10.

### FUEL ANTI-EVAPORATION SYSTEM

The anti-evaporation system is designed to prevent fuel vapours, comprising the lightest particles of hydrocarbons, which basically form in the tank, from being discharged into the atmosphere.

The system consists of the tank, the vapour separator, two float valves, a two-way ventilation valve, the charcoal filter and a charcoal filter solenoid valve, operated by the control unit. The cap contains a two-way safety valve.

#### Operating principle

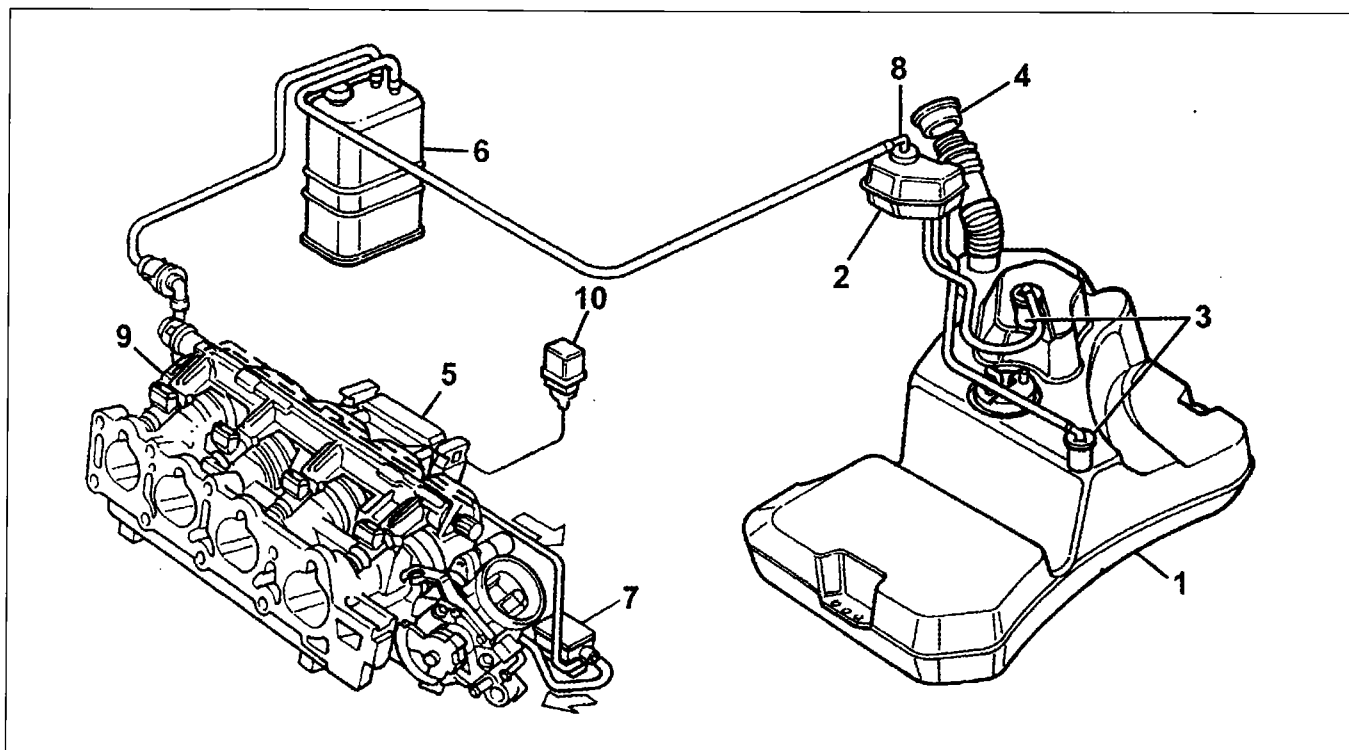
The system operates, especially at high outside temperatures, when the temperature of the fuel increases and, as a result, the tendency to evaporation increases: in this situation, the pressure inside the tank increases.

In particular, even with the tank (1) full, the two float valves (3) remain open as they are positioned higher than the breather pipe and therefore always allow the fuel vapours to reach the separator (2), thereby preventing fuel from escaping.

The fuel vapours reach the charcoal filter (6) when the pressure inside the tank causes the opening of the ventilation valve (8). This valve also allows an intake of air into the tank via the charcoal filter if it proves necessary when the level of the fuel decreases.

When the engine is running, the control unit operates the charcoal filter solenoid valve which allows the intake of vapours by the engine and the consequent scavenging of the charcoal filter.

If, as a result of the malfunction of one of the components, the pressure inside the tank increases to dangerous levels, the safety valve, located in the cap (4), allows the pressure to be discharged outwards. If necessary, this valve can open in the opposite direction to ventilate the tank and prevent the vacuum from becoming too great.



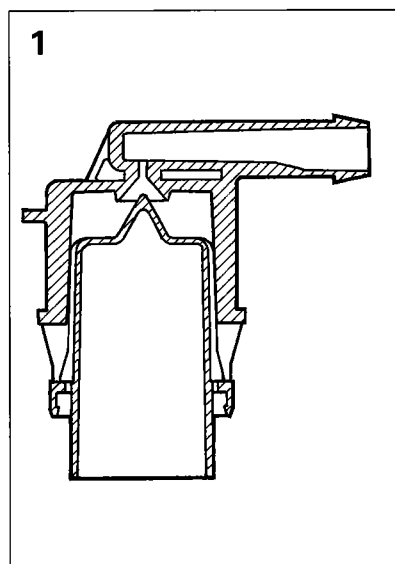
- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. Fuel tank                      | 6. Charcoal filter                |
| 2. Vapour separator               | 7. Charcoal filter solenoid valve |
| 3. Float valve                    | 8. Safety and ventilation valve   |
| 4. Plug with safety valve         | 9. Intake manifold                |
| 5. Engine management control unit | 10. System relay feed             |

### Float valve

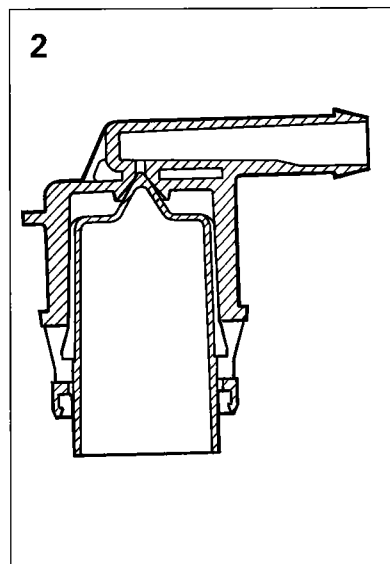
The float valve is designed to allow the flow of vapours towards the separator, without, however, allowing the escape of liquid fuel.

The valve contains a float, one end of which, being suitably shaped, closes the actual valve outlet port, in the following conditions:

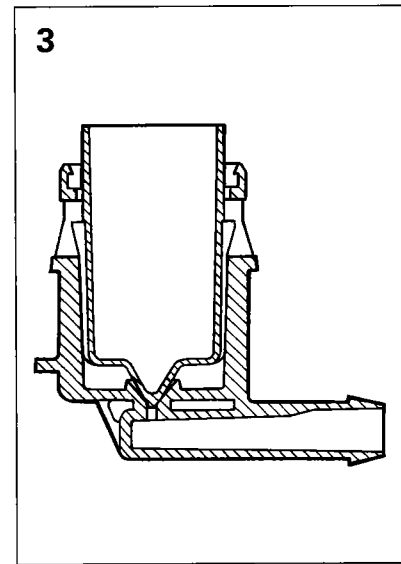
strong lateral acceleration (vehicle taking a bend) or longitudinal acceleration (vehicle braking) with the movement of the mass of fuel as a result of the inertia forces;  
vehicle overturned.



3N48GJ01

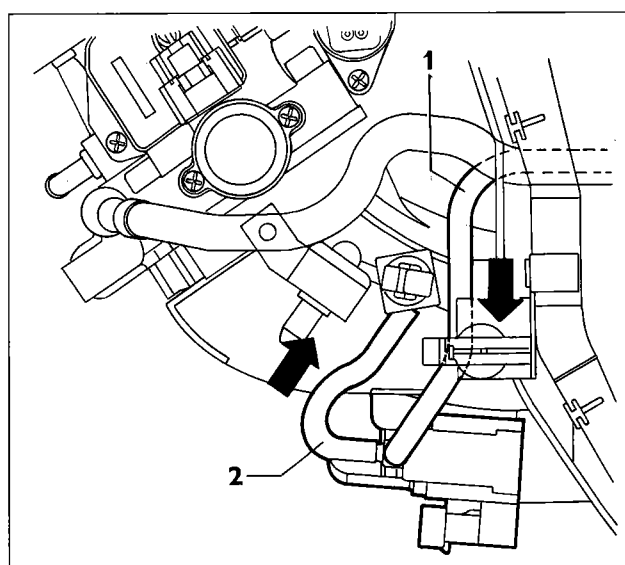


3N48GJ02



3N48GJ03

1. Normal operating conditions: valve open
2. The fuel pushes the float upwards as a result of strong acceleration: valve closed;
3. Vehicle overturned: valve closed



3N49GJ03

### Charcoal filter solenoid valve

This valve, the normally closed type, controls the flow of vapours reaching the inlet manifold and is operated by the control unit in a duty-cycle.

1. From the charcoal filter
2. To the intake manifold



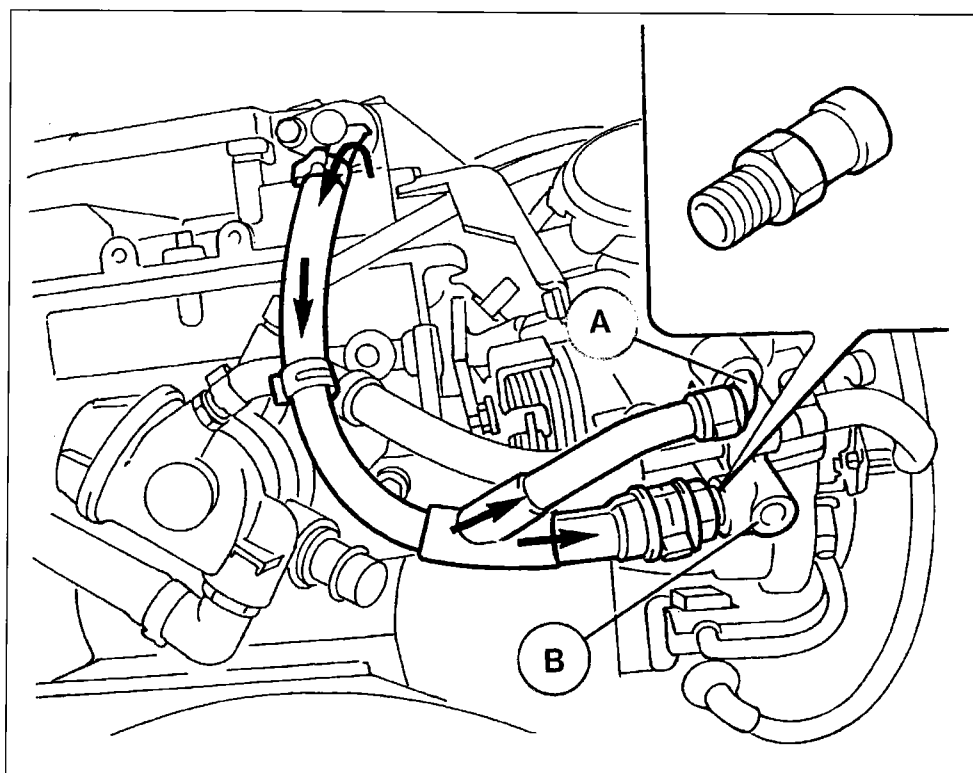
## 10.

### EXHAUST GAS RECIRCULATION SYSTEM (BLOW-BY)

This system controls the emission from the crankcase of breather gases, consisting of mixtures of air, fuel vapours and unburnt gases which escape from the piston seals and lubricant oil vapours, recirculating them to be burnt by the engine.

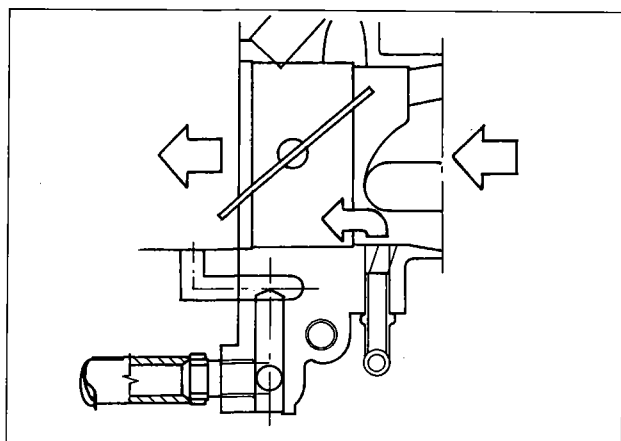
The breather gases coming from the crankcase reach the cylinder head and are directed to two different intakes:

- at medium-high accelerator butterfly openings, the gases are drawn in by the duct immediately downstream of the air flow meter (detail A);
- at small butterfly openings (and, in particular, with the engine idling or decelerating), the gases are drawn in through the PCV (Positive Crank Ventilation) valve fitted on the butterfly casing, downstream of the actual butterfly (detail B).



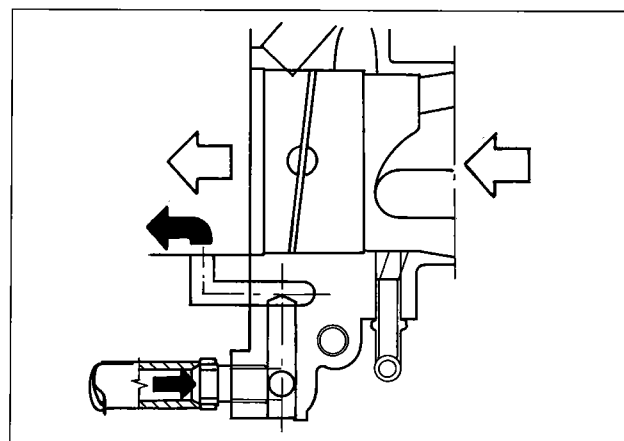
3N50GJ01

**Detail A**



3N50GJ02

**Detail B**



3N50GJ03

## CHECKS, ADJUSTMENTS AND REPAIR OPERATIONS ON THE HITACHI MPI SYSTEM



*When working on a vehicle equipped with a Hitachi MPI system, the following precautions must be observed:*

- do not start up the engine with the battery leads not properly connected or slack at the battery terminals;*
- do not use a rapid battery charger to start the engine;*
- never disconnect the battery from the electrical system with the engine running;*
- the battery must be disconnected from the electrical system before recharging it;*
- if the vehicle has to go in a drying oven after painting at temperatures in excess of 80°C, the engine management control unit must be removed first;*
- never connect/disconnect the control unit multiple connector with the ignition switch in the ON position;*
- always disconnect the negative battery lead before carrying out electrical welding on the vehicle.*



*The system contains a memory, supplied directly by the battery, even with the ignition switched off, where the values acquired during the self-adaptation are memorized. Disconnecting the battery means that this data is lost and can only be acquired again after a certain length of time: this operation should therefore be carried out as infrequently as possible.*

**NOTE** *If the Hitachi MPI system components are being replaced:*

- Butterfly casing and flow meter*
- Engine idle speed actuator*
- Butterfly position sensor*
- Engine management control unit*
- Lambda probe*

*The negative battery terminal must be disconnected to reset the self-adaptation memory which could, with new components, involve the failure of the engine to start or irregular behaviour when it is first started up.*

## CHECKING EMISSION CONCENTRATIONS

This system manages the advance, the carbon monoxide (CO) content and the idle air flow rate and cannot be adjusted manually in any way.

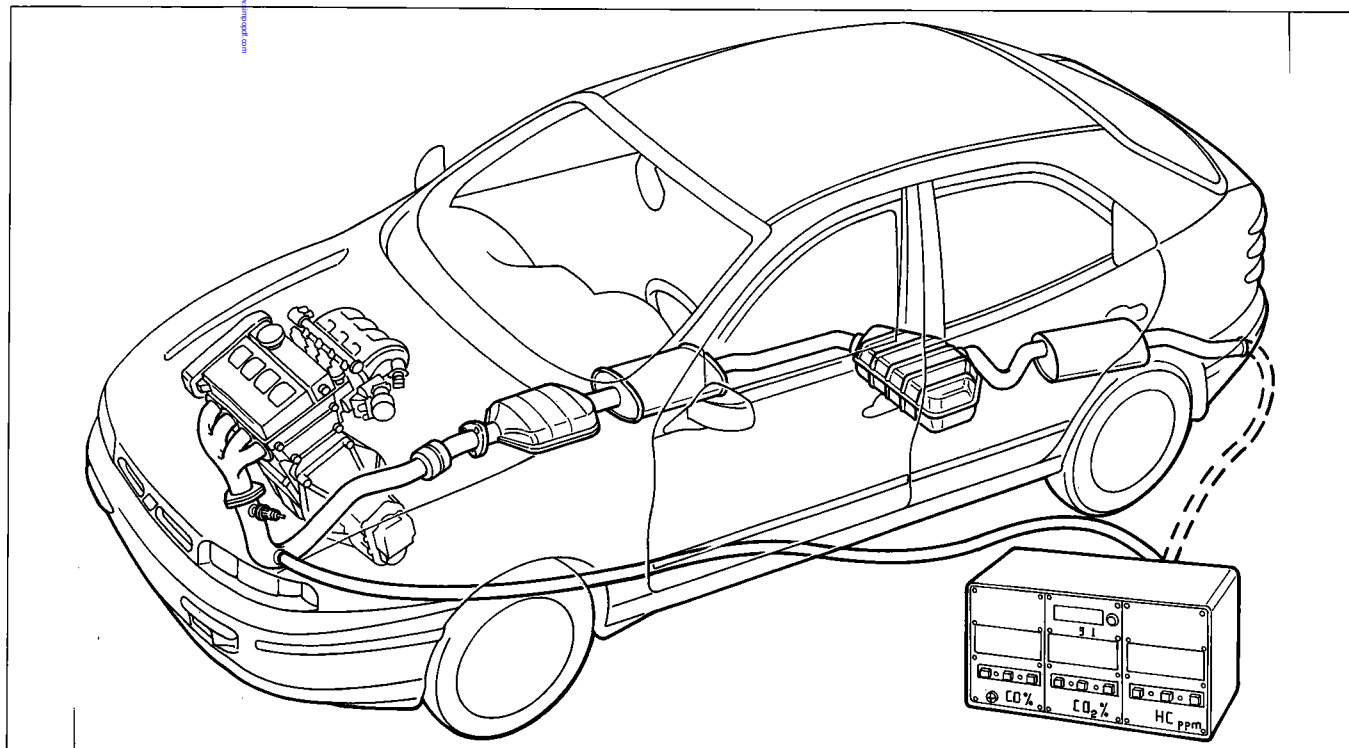
However, a check on the content of the exhaust gases, upstream and downstream of the catalyzer, can provide useful information on the operating conditions of the injection/ignition system, the engine parameters and the catalyzer.

### Checking idle CO and HC concentration upstream of the catalytic silencer

To check the concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) upstream of the catalyzer, proceed as follows:

1. Undo the cap on the exhaust pipe, upstream of the catalyzer, and tighten the tool in its place.
2. Connect a suitably calibrated CO-tester probe to the tool.
3. Start up the engine and let it reach operating temperature.
4. Check that the revs correspond to the recommended figure.
5. Check that the CO idle concentration is within the recommended limits (see table); if this is not the case, it is necessary to check:
  - that the Lambda sensor is working properly, using the diagnostic equipment;
  - for the presence of air penetration in the area surrounding the Lambda sensor housing;
  - the injection and ignition system (**in particular, the state of wear of the spark plugs**).
6. In the same conditions, check that the HC concentration is below 500 p.p.m.
7. If the figures measured do not correspond, tune the engine, checking the following, in particular:
  - the valve gear timing;
  - the engine compression.

# 10.



**Table summarizing pollutant emission tolerance figures**

|                             | CO (%) | HC (p.p.m.) | CO <sub>2</sub> (%) |
|-----------------------------|--------|-------------|---------------------|
| Upstream of the catalyzer   | 04 - 1 | < 500       | > 12                |
| Downstream of the catalyzer | < 0.35 | < 90        | > 13                |

## Checking exhaust concentration of CO and HC

The concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) at the exhaust is measured by inserting a suitably calibrated tester at least 30 cm into the end of the exhaust pipe.

1. Check that the idle CO and HC concentrations correspond to the recommended figures (see table).
2. If the HC figures are outside of the recommended limits, whilst those measured previously, upstream of the catalyzer were okay, then the engine parameters are correct and the cause of the problem should therefore be sought in the decreased efficiency of the catalyzer.

## CHECKING ENGINE IDLE SPEED

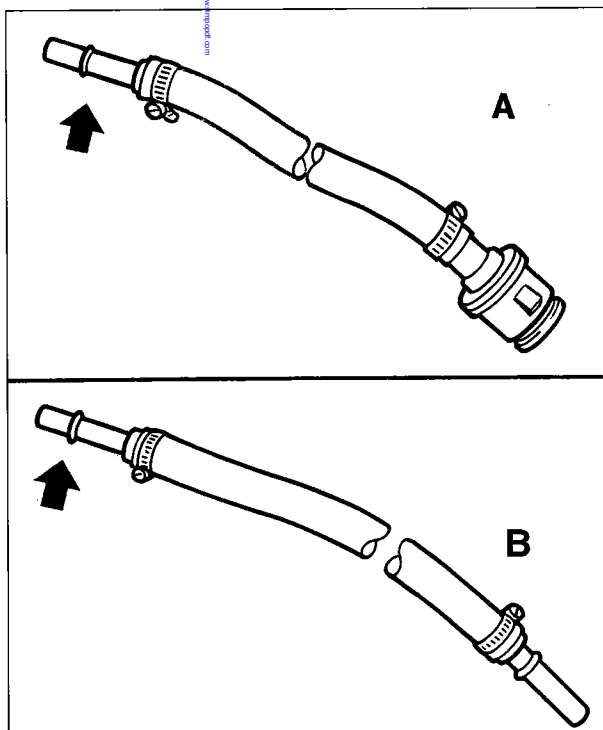
If the engine idle speed does not correspond to the recommended figure and the system is the self-adjusting type, then no adjustments can be carried out: it is therefore necessary to check that the accelerator linkage is correctly adjusted and the cause of the problem should be sought by carrying out a complete fault diagnosis using the diagnostic equipment.

## CHECKING IGNITION ADVANCE

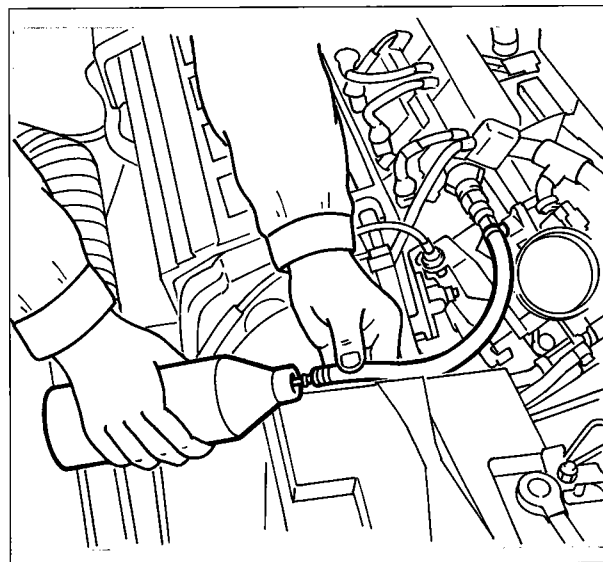
The diagnostic equipment must be used to check the ignition advance angles at different speeds.

## 10.

### CHECKS ON FUEL SUPPLY CIRCUIT



3N53GJ01



3N53GJ02



*These operations should be carried out with a suitable vapour purification and extraction system present.*

#### Checking fuel supply circuit pressure

Check the supply pressure and the seal of the fuel system following the instructions given below using equipment 18609055000, fitted with two adaptors which can be made in the following way:

- adaptor (A) use a new type rapid attachment female terminal and a length of pipe contained in Kit no. 1860955003 and an old type rapid attachment male terminal contained in Kit no. 186095501;
- adaptor (B) use a new type rapid attachment male terminal and a length of pipe contained in Kit no. 1860955003 and an old type rapid attachment male terminal contained in Kit no. 186095501;

Configure the adaptors as illustrated in the diagram.



*The arrow indicates the side to fit the test equipment 1860955000 (pressure gauge).*

#### Draining fuel pressure in the supply circuit

The fuel supply circuit is kept at a constant pressure of around 3.2 bar even with the engine switched off; therefore, before carrying out any operations on the supply pipe, the pressure must be drained from the system, using adaptor no. 1870684000 and a suitable container for collecting the excess fuel.

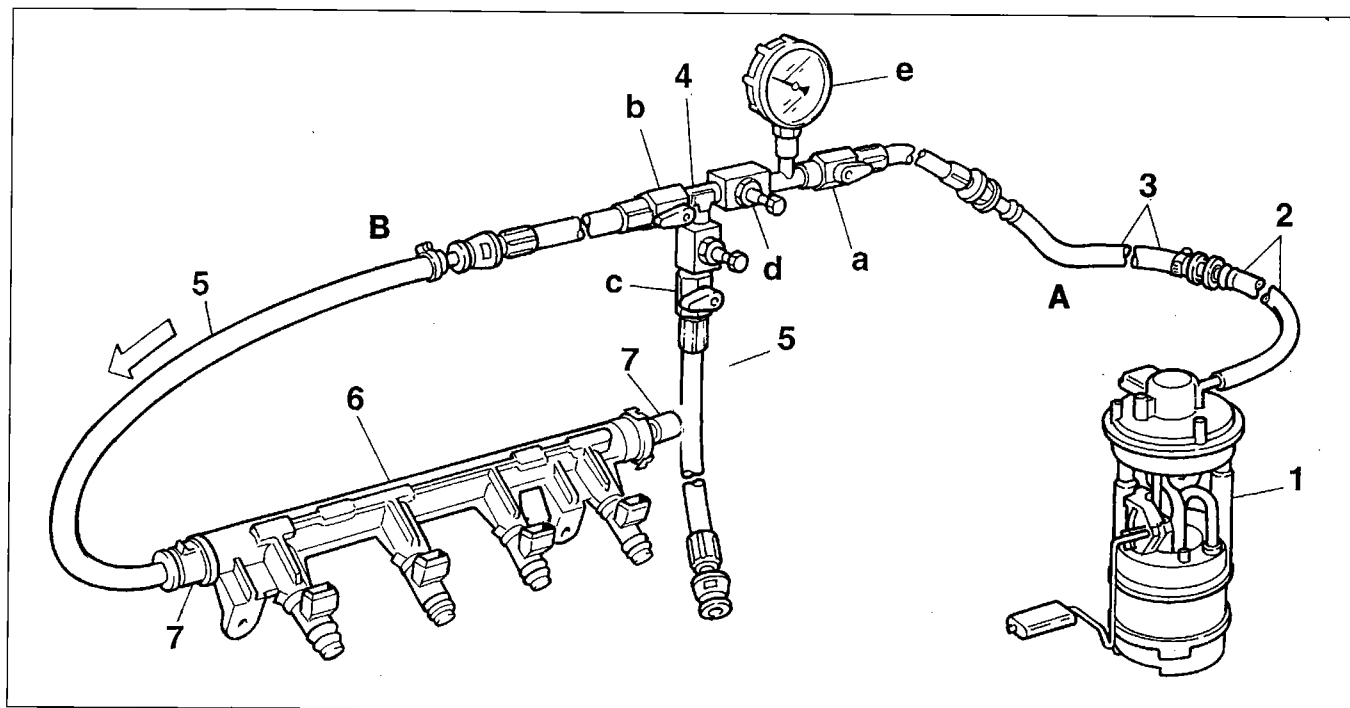
Proceed as described below:

- Remove the inlet hose from the butterfly casing;
- Remove the protective cover from the attachment on the fuel manifold;
- introduce the male end of the adaptor inside the container and fit the rapid connector to the attachment on the fuel manifold, as illustrated in the diagram; in this way, the small amount of excess fuel, which produces pressure, will be drained into the container and it will therefore be possible to carry out the test procedures on the fuel supply system;
- disconnect the adaptor from the attachment and refit the protective cover.

### 10.

#### Checking fuel supply circuit pressure

Conform the test equipment 1860955000, using the adaptors constructed previously and fitted as illustrated in the diagram below, placing ball valves (a), (b) and (d) in the fully open position and valve (c) in the closed position.



3N54GJ01

- |                                  |                                           |
|----------------------------------|-------------------------------------------|
| 1. Complete electric pump        | 5. Adaptor (B)                            |
| 2. Fuel supply pipe              | 6. Fuel manifold                          |
| 3. Adaptor (A)                   | 7. Rapid attachment connector on manifold |
| 4. Test equipment no. 1860955000 |                                           |

After having discharged the pressure, detach the end of the fuel supply pipe (2) from the rapid connector (7) on the manifold, following the instructions given on the previous pages, connect it to the adaptor (A) female connector, connect the new male terminal of the adaptor (B) to the rapid connector on the fuel manifold (7) and check that the connectors are correctly fitted.

Turn the ignition key to the ON position and check the pressure gauge (e) to see whether the pressure, after having increased to around 3.5 bar, then settles down at around 3.2 bar (the fall in pressure is due to the fact that if the engine is not started up after the pump has been working for several seconds, it is then deactivated).

If there is a decrease in pressure beyond the above mentioned values, check the seal in the section of the system upstream of the fuel manifold and check the seal of the injectors following the instructions given below.

#### Checking seal of fuel supply pipe

Keep the test equipment as described in the previous paragraph, close valve (b), keeping valve (c) closed and valve (a) in the fully open position.

Turn the ignition key to the ON position and check on the pressure gauge (e) that the pressure, after having increased to a value of around 3.5 bar, then settles down at around 3.2 bar (the decrease in pressure is due to the fact that if the engine is not started up after the pump has been running for several seconds it is then deactivated).

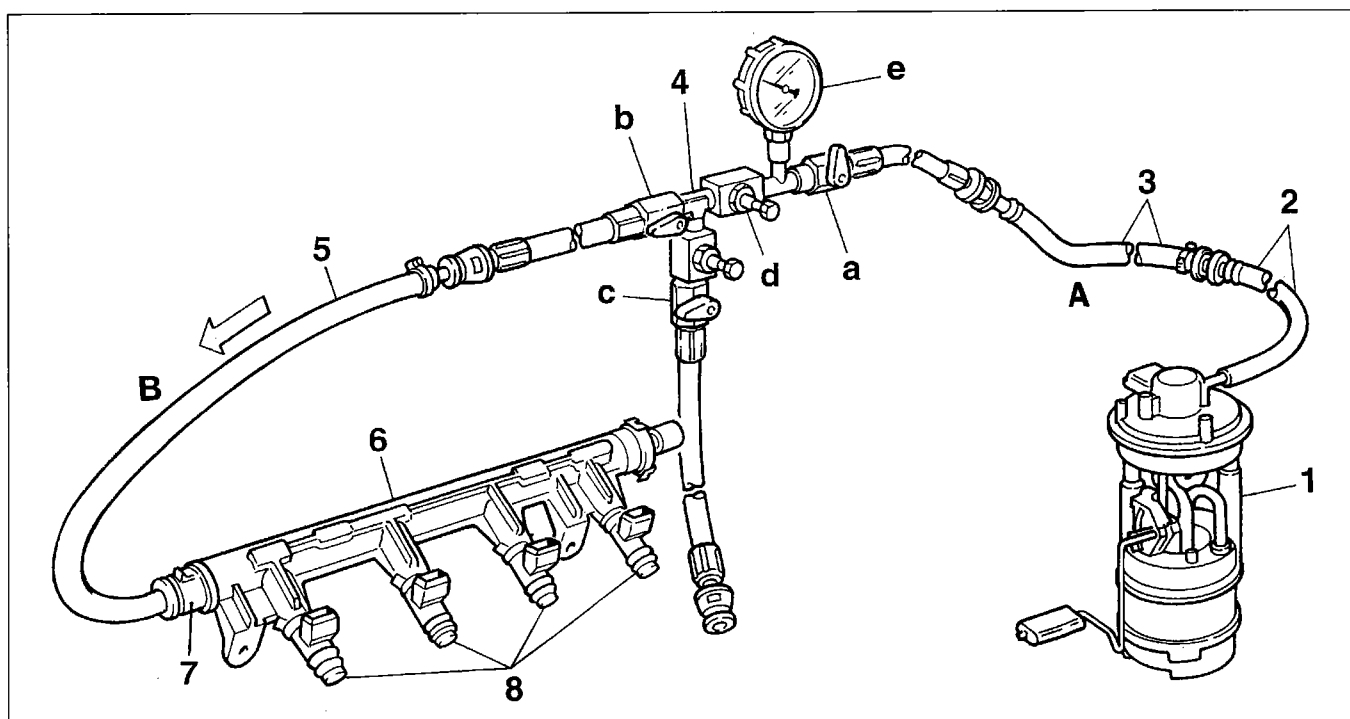
## 10.

### Checking injector seal

If there is a fall in pressure beyond the above mentioned values, check the seal of the section of the system upstream of the manifold and, if there are no leaks or damage to the fuel supply pipe, replace the electric fuel pump assembly because, as described in the paragraph dealing with the electric pump, the pressure regulator is housed in the actual assembly and CANNOT be replaced.

If the pressure, after having repeated the check, exceeds the recommended figure and is considerably higher, replace the fuel pump because there are problems with the operation of the pressure regulator which it houses.

### Checking injector seal



3N55GJ01

- |                                  |                                    |
|----------------------------------|------------------------------------|
| 1. Complete electric pump        | 5. Adaptor (B)                     |
| 2. Fuel supply pipe              | 6. Fuel manifold                   |
| 3. Adaptor (A)                   | 7. Rapid connector on the manifold |
| 4. Test equipment no. 1860955000 | 8. Injectors                       |

Keep the test equipment as described in the previous paragraph, place valve (b) in the fully open position, keeping valve (c) closed and valve (a) in the fully open position.

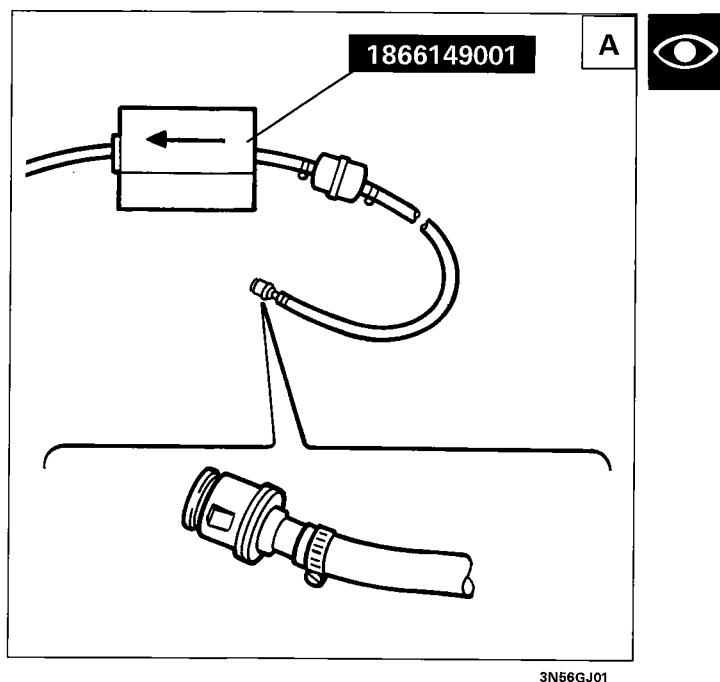
Turn the ignition key to the ON position and check on the pressure gauge (e) that the pressure, after having increased to around 3.5 bar, then settles down at about 3.2 bar, then close valve (a) and check that the pressure remains constant for at least a minute; if this is not the case, one or more of the injectors is leaking.

### 10.

#### Removing test equipment

Remove the test equipment 186955000 with the ignition switched OFF, following the instructions given below:

- place the end of the pipe connected to the valve (c) in a suitable container;
- open the valve (c) and drain the excess fuel into the container;
- keep the pipe in the container and disconnect the end of the supply pipe from the female connector of the adaptor (A) keeping the attachment upwards;
- let the fuel in the pipes flow into the container;
- disconnect the end of the adaptor (B) from the connector on the fuel manifold and let the remaining fuel flow out of the pipes into the container;
- reconnect the fuel supply pipe to the fuel manifold.



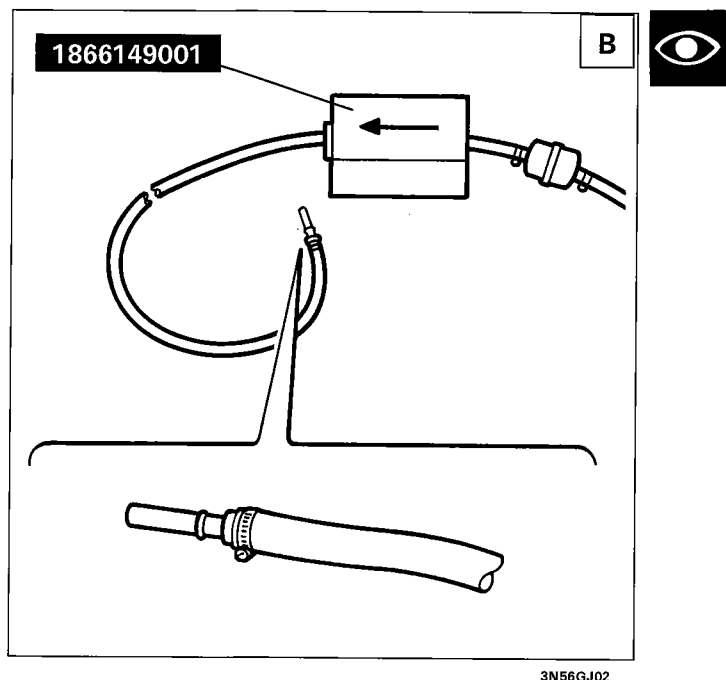
#### Checking fuel consumption using FLOWTRONIC equipment 1866149001

In order to carry out the check, the equipment should be configured with the connectors shown in the diagrams:

- A. supply pipe side
- B. fuel manifold side

If this is not the case, carry out the adjustment, proceeding as described below:

- cut the end of the FLOWTRONIC equipment inlet pipe and replace it with a female rapid connector (1) contained in Kit no. 1860955003, as illustrated in figure A;



- cut the end of the FLOWTRONIC equipment outlet pipe and replace it with a male connector (2), contained in Kit no. 1860955003, as illustrated in figure B.

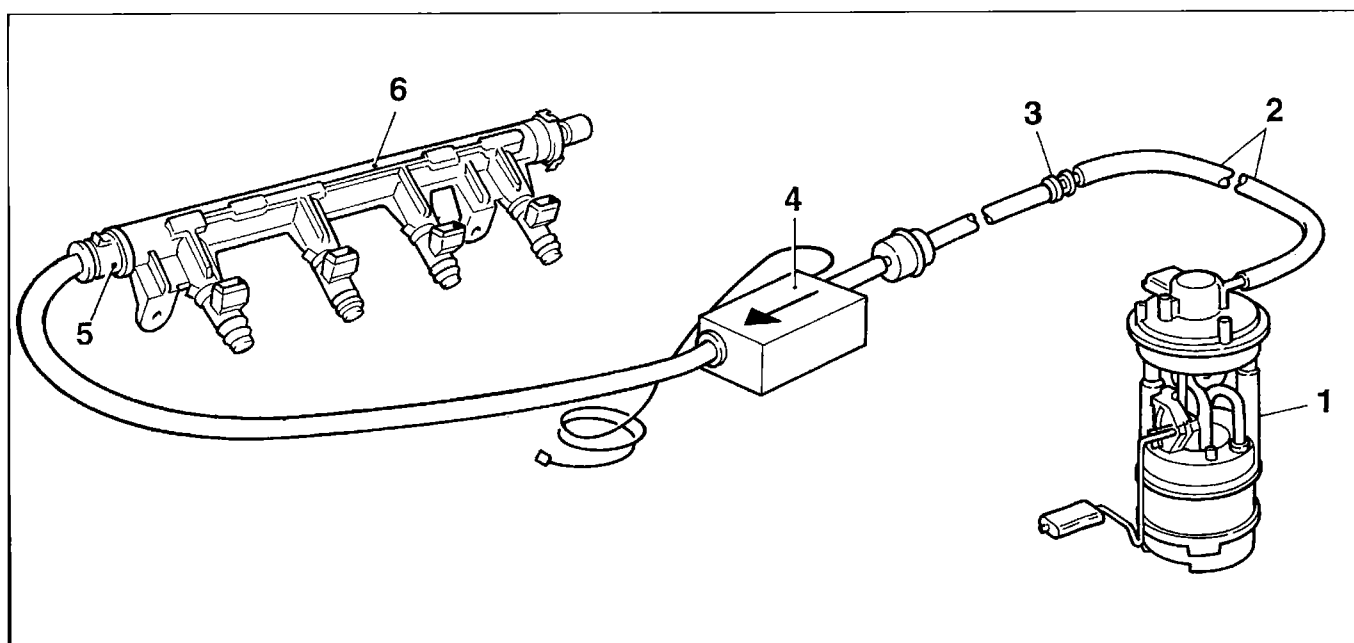


*The connectors removed should be recovered and kept for any subsequent connections*



## 10.

- discharge the fuel pressure inside the supply pipe and disconnect the pipe from the fuel manifold, following the instructions given in the previous paragraphs;
- engage the end of the supply pipe with the FLOWTRONIC equipment female rapid connector and the male attachment with the rapid connector on the fuel manifold;
- position the equipment in the engine compartment, place the connecting electrical cable inside the vehicle and connect the actual equipment as described in the instructions which come with the equipment.
- check the consumption figures, in accordance with standards 93/116 CE and check that the figures correspond with those in section 00 - Technical Data.



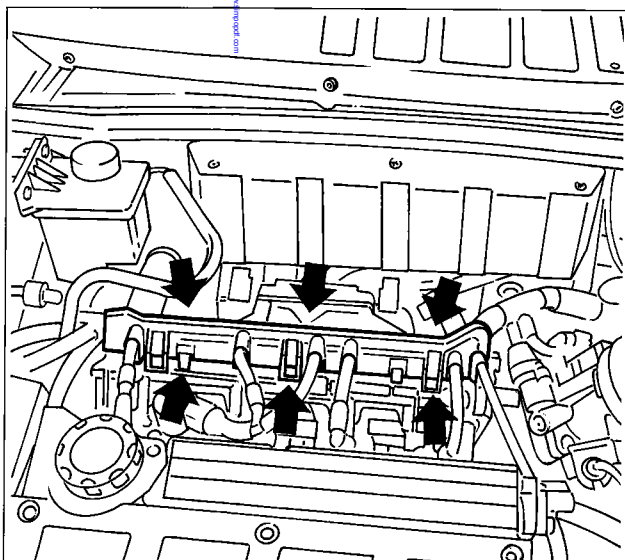
3N57GJ01

- |                           |                         |
|---------------------------|-------------------------|
| 1. Complete electric pump | 4. FLOWTRONIC equipment |
| 2. Fuel supply pipe       | 5. Male terminal        |
| 3. Female rapid connector | 6. Fuel manifold        |

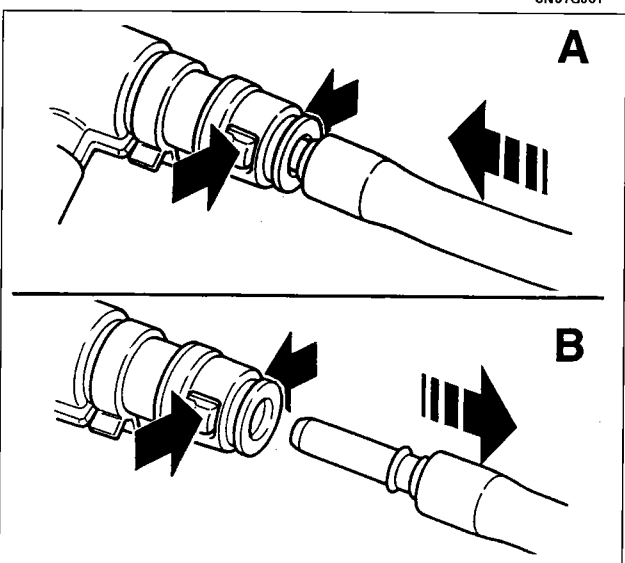
- carry out the consumption road test in accordance with directive 93/116 CE (litres per 100 km):
- URBAN CYCLE - this includes a cold start, followed by a simulated urban cycle;
- EXTRA-URBAN CYCLE - this includes frequent acceleration, in all gears, simulating normal out of town usage of the vehicle; the speed should vary between 0 and 120 km/h;
- AVERAGE COMBINED CONSUMPTION - this includes 33% of the urban cycle and 67% of the extra-urban cycle;
- check that the figures measured correspond to those in the "Introduction and Technical Data" section.

**NOTE** *The type of route, traffic conditions, driving style, weather conditions, trim level/equipment/ accessories, whether or not a roof rack is fitted, the presence of special equipment and the state of the vehicle in general can lead to different fuel consumption figures from those obtained using the above mentioned procedures.*

### 10.



3N61GJ01



3N61GJ02

#### FUEL MANIFOLD AND INJECTORS

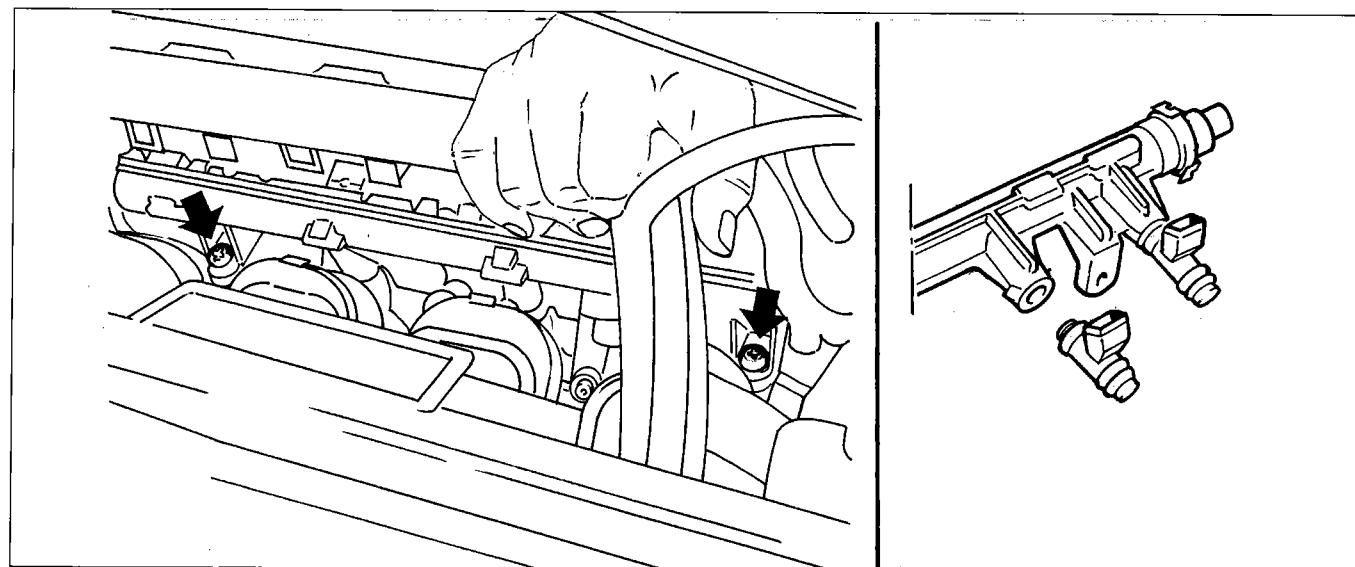


*Before removing the manifold, drain the pressure inside it as described at the beginning of this chapter.*

Remove the manifold, proceeding as follows:

- release the front and rear springs (arrow) attaching the cable holder duct to the manifold;
- disconnect the electrical connectors from the injectors and the phase transformer and move the duct released previously aside;
- disconnect the fuel supply pipe (1) from the manifold, working in two stages:
  - A. press the retaining springs, at the same time pushing the end of the pipe, in the direction shown, to release the housing;
  - B. keep the springs pressed and extract the end from the manifold;
- undo the two bolts (arrow) fixing the manifold and remove it.

The injectors do not have clips: to remove them, simply release them from their housing (see detail).



3N61GJ03

## 10.

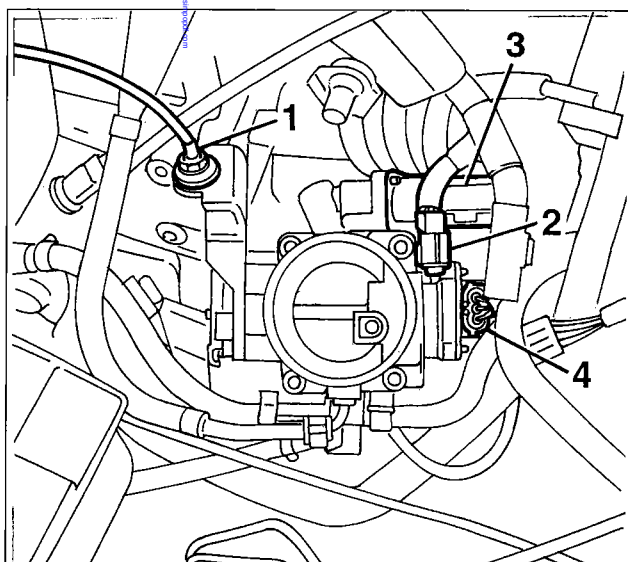
### BUTTERFLY CASING

**NOTE** *The butterfly casing and the air flow meter form a single assembly.*

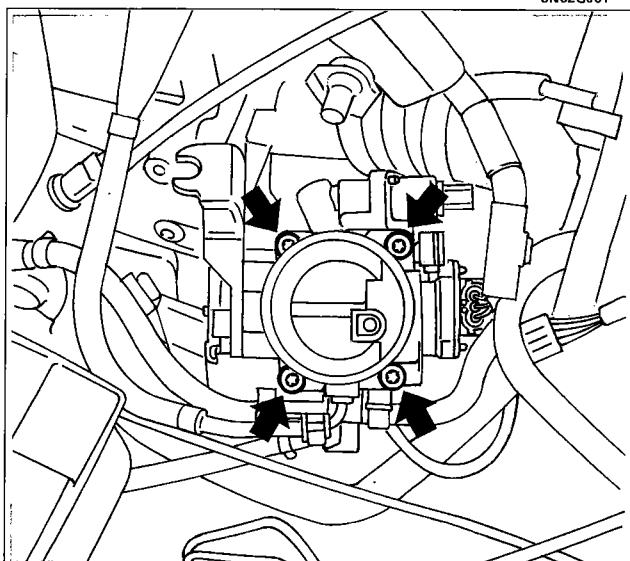
#### Removing-refitting

Proceed with the removal of the butterfly casing as follows:

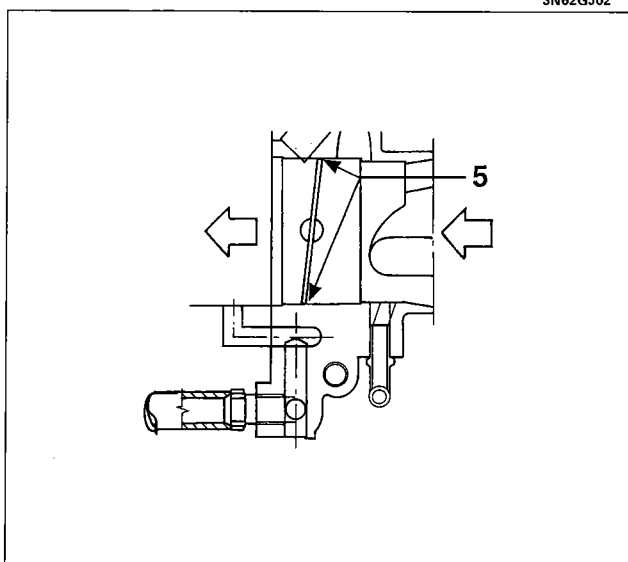
- remove the inlet hose from the butterfly casing, loosening the retaining bands;
- remove the accelerator cable (1), completely undoing the connector on the adjustment bracket and releasing the cable from the lever on the butterfly casing;
- disconnect the electrical connectors from the butterfly position sensor (2), the idle speed adjustment solenoid valve (3) and the air flow meter (4);
- remove both connecting pipes from the PCV valve;
- undo the four bolts (arrow) fixing the butterfly casing to the inlet manifold;
- remove the coolant connecting pipes from the inlet and outlet pipes, sealing them appropriately.



3N62GJ01



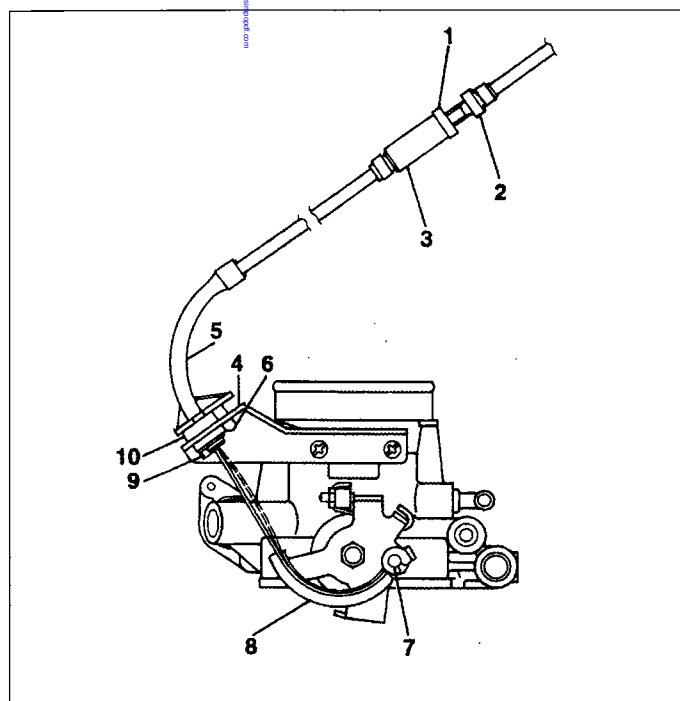
3N62GJ02



3N62GJ04

**NOTE** *Do not remove the layer (5) of molybdenum disulphide applied to the edge of the butterfly.*

## 10.



### ACCELERATOR CABLE

#### Removing

- Working from inside the vehicle, disconnect the accelerator cable from the fastening on the pedal.
- Loosen the accelerator cable, acting on the adjustment screw (2), then release the end of the cable (7) from the pulley (8).
- Remove the clip (9) and remove the cable from the mounting bracket, then remove the accelerator cable.

#### Refitting

- Fit the rubber mounting (10) in the special housing in the bracket (4).
- Fit the flexible cable (5) in the rubber mounting (10), positioning it so that the reference pin (6) on the cable fits in the special opening in the bracket (4).
- Wind the accelerator cable around the pulley (8) and fit the end (7) in the special housing.
- Fit the clip (9) in the groove at the end of the flexible cable (5).
- Reconnect the accelerator cable to the fastening on the pedal.

#### Adjustment

- Acting on the adjustment nut (2), adjust the accelerator cable clearance so that, with the pedal released, the butterfly closes completely (pulley in end of travel position at the adjustment screw) and the clearance (4) at the cable is about 5 mm. At the end of the adjustment, tighten the ring nut (1) against the dust cover (3), by hand.
- If the accelerator cable is being replaced, connect the diagnostic equipment to the special socket and check, with the pedal fully depressed, that the butterfly opening angle is between 80° and 84° (98-99%). If the measurement does not correspond to the figures given, use the accelerator pedal adjustment screw to regulate the travel.

**REMOVING-REFITTING**

- Removing-refitting power unit 1
- Separating the gearbox-differential assembly 10

**REPLACING THE AUXILIARY DRIVE BELT**

- Removing-refitting the auxiliary drive belts 12
- Checking valve gear timing 15

**REPLACING THE TIMING BELT**

- Removing-refitting timing drive belt 17

**REMOVING-REFITTING CYLINDER HEAD**

- Removing-refitting cylinder head 23

**REMOVING-REFITTING EXHAUST MANIFOLD**

- Removing-refitting exhaust manifold 27

**REMOVING-REFITTING INLET MANIFOLD**

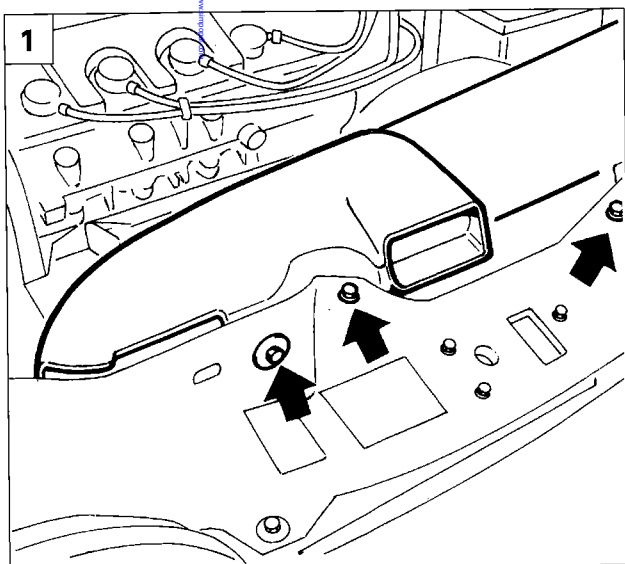
- Removing-refitting inlet manifold 28

**REPLACING WATER PUMP**

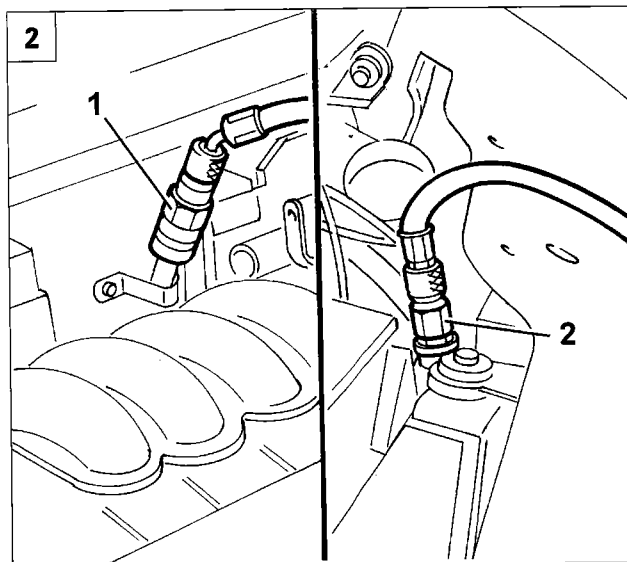
- Removing-refitting water pump 30

**REMOVING-REFITTING RADIATOR**

- Removing-refitting radiator 30
- Procedure for filling engine cooling circuit for versions with heater 32
- Procedure for filling engine cooling circuit for versions with air conditioning 34



P4A01HX01



P4A01HX02

### REMOVING-REFITTING POWER UNIT



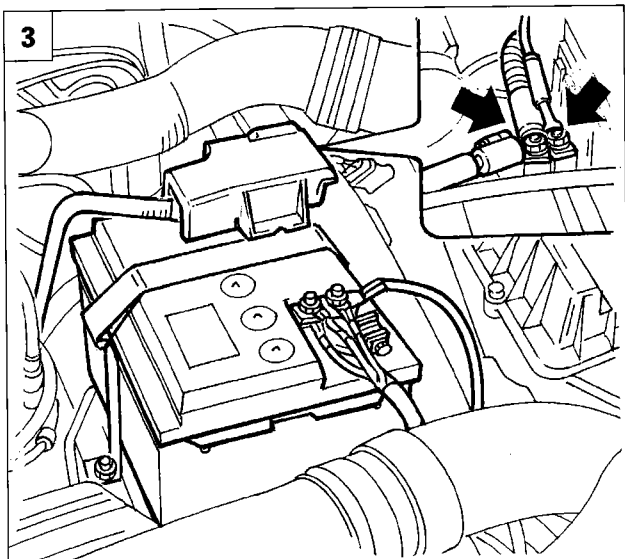
Position the vehicle on a lift, remove the front wheels then proceed as described below:



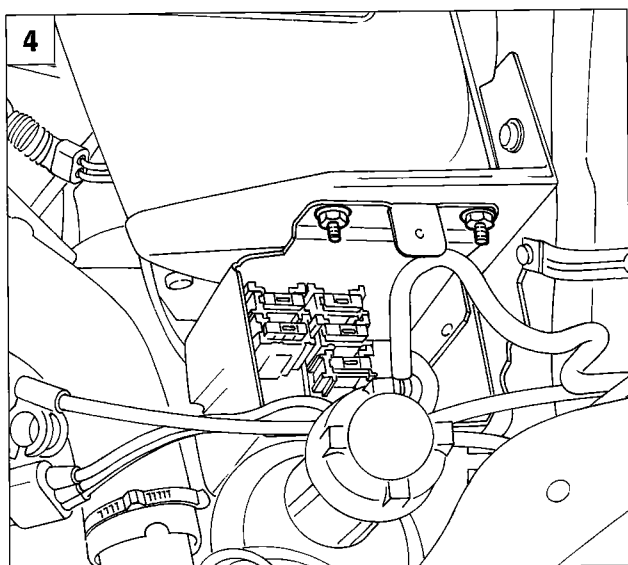
1. Undo the three fixing bolts and remove the air intake disconnecting first from the air filter.
2. Drain the air conditioning system using the special equipment, connecting the pipe marked with the light blue connector (1) to the low pressure circuit needle valve and the pipe marked with the red connector (2) to the high pressure circuit needle valve.



*Protective gloves and goggles should be worn whilst draining the system as protection against contact with R134A. To facilitate the draining of the refrigerant from the vehicle air conditioning system, the system should be left running first for 10 - 15 minutes.*



P4A01HX03

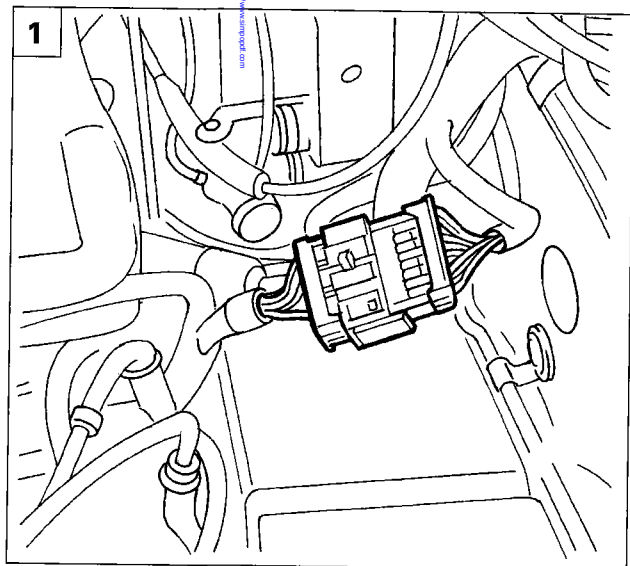


P4A001B03

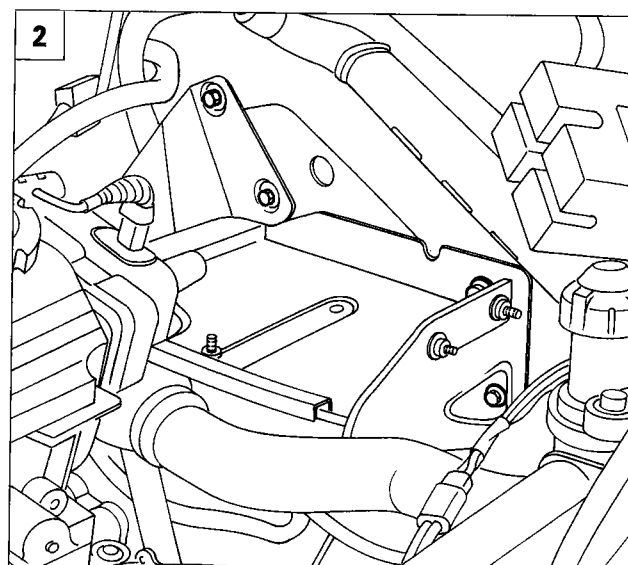
3. Disconnect the negative battery lead, remove the protective cover for the positive pole, disconnect the terminal and separate the starter motor supply cables from the terminal; undo the nut securing the battery to the drip tray, then remove the latter from the engine compartment.
4. Undo the bolt securing the relay casing cover and remove it, then undo the nuts fixing the casing to the battery drip tray and position the casing to the side.



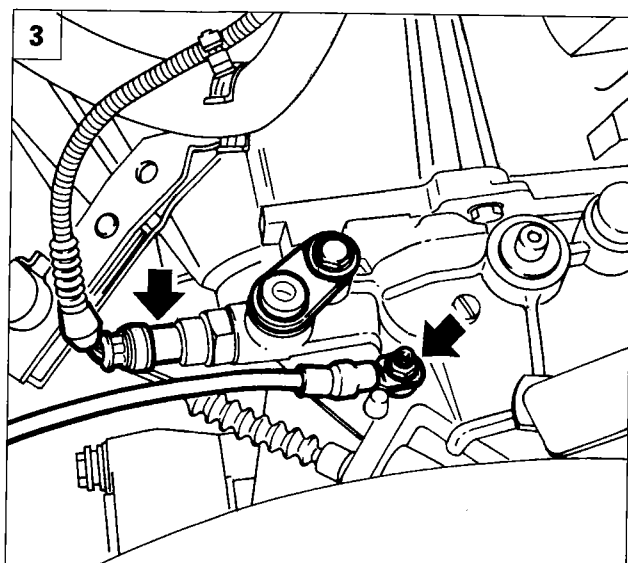
### 10.



P4A02HX01



P4A001B04



P4A02HX02



1. Disconnect the injection cable coupling shown in the diagram.

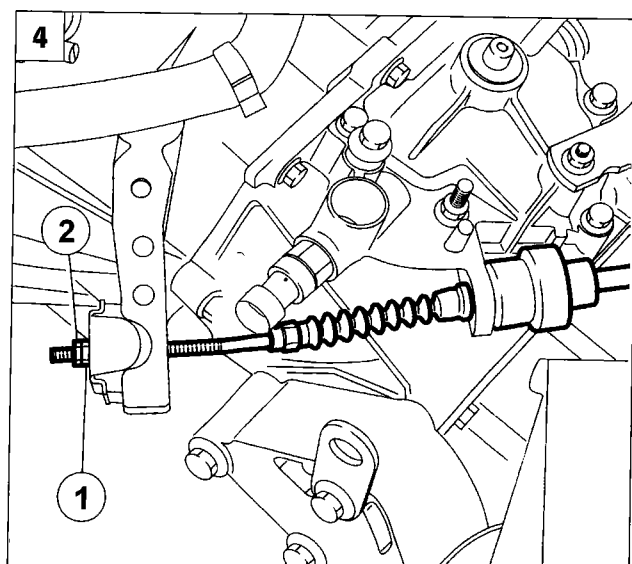


2. Remove the battery drip tray undo the bolts fixing it to the bodyshell.

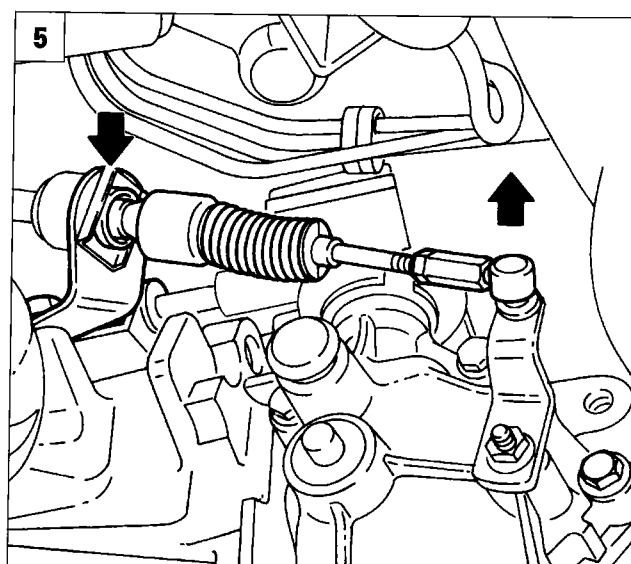
3. Disconnect the connector for the reversing lights switch and the earth cable.

4. Acting on the nut (1) and the lock nut (2), disconnect the clutch cable from the control lever.

5. Disconnect the end of the gear engagement cable, lift up the retaining fork shown in the diagram, then remove the cable from the mounting bracket.

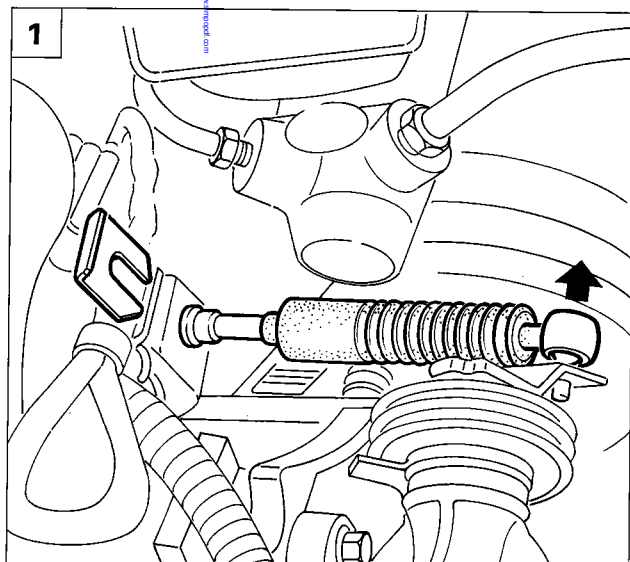


P4A02HX03

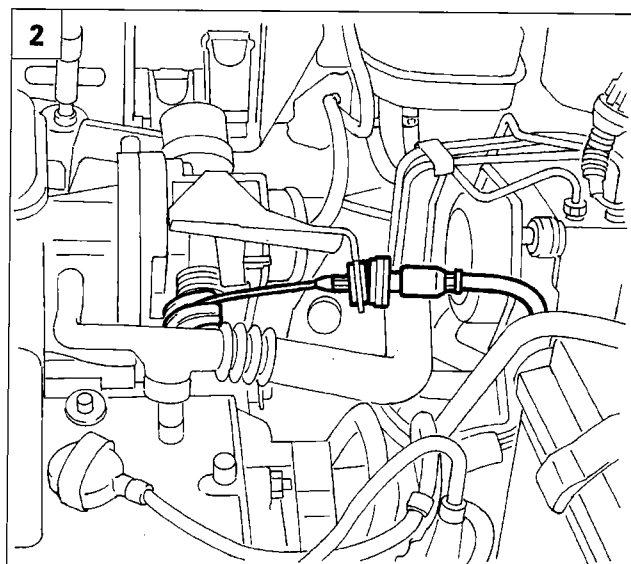


P4A02HX04

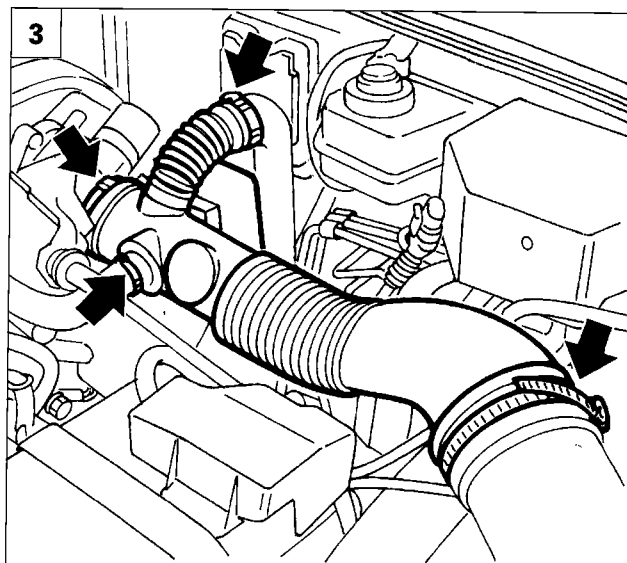




P4A002B02



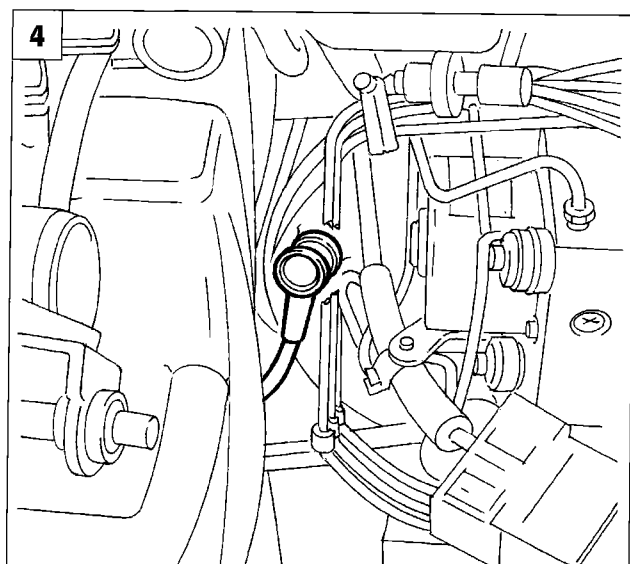
P4A18HX02



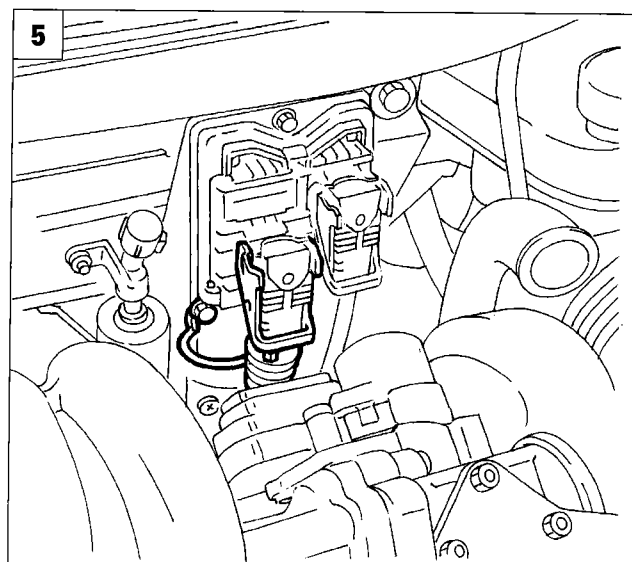
P4A03HX01



1. Disconnect the end of the gear selector cable, lift up the retaining fork shown in the diagram, then position the assembly to the side in the engine compartment.
2. Disconnect the accelerator cable.
3. Disconnect the bands illustrated in the diagram, then remove the air inlet hose.
4. Disconnect the vacuum pipe from the brake servo.
5. Disconnect the connector shown in the diagram from the injection/ignition control unit and remove the earth lead from the control unit support.

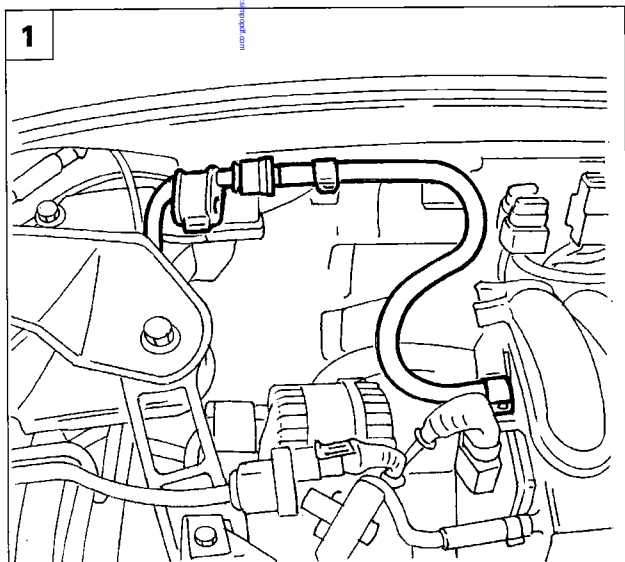


P4A03HX02

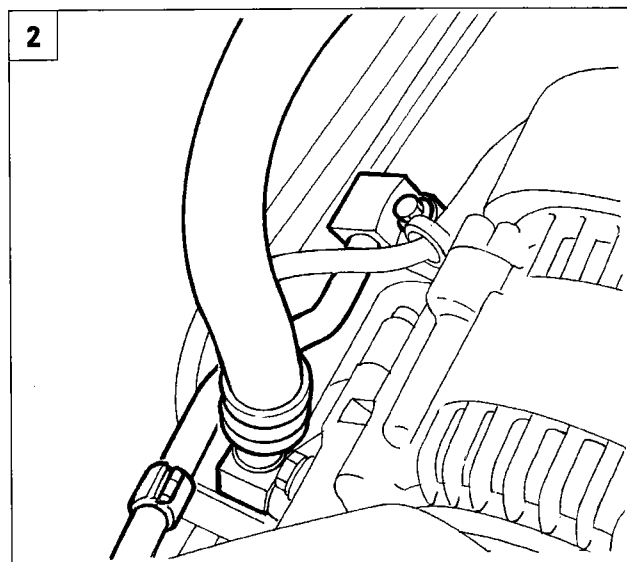


P4A03HX03

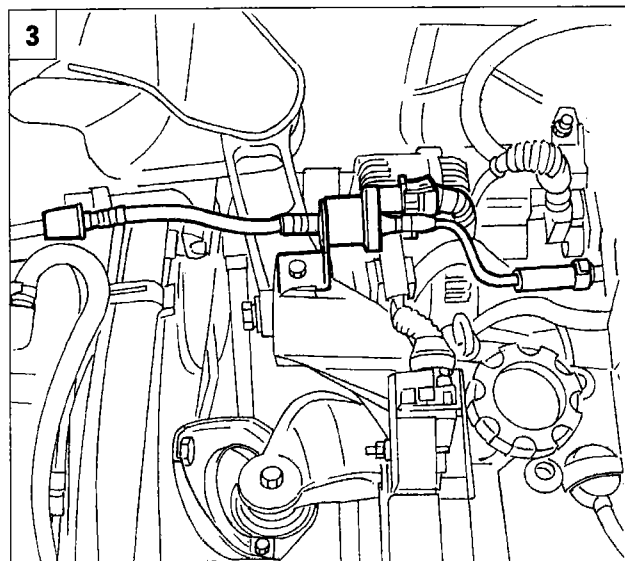
### 10.



P4A04HX01



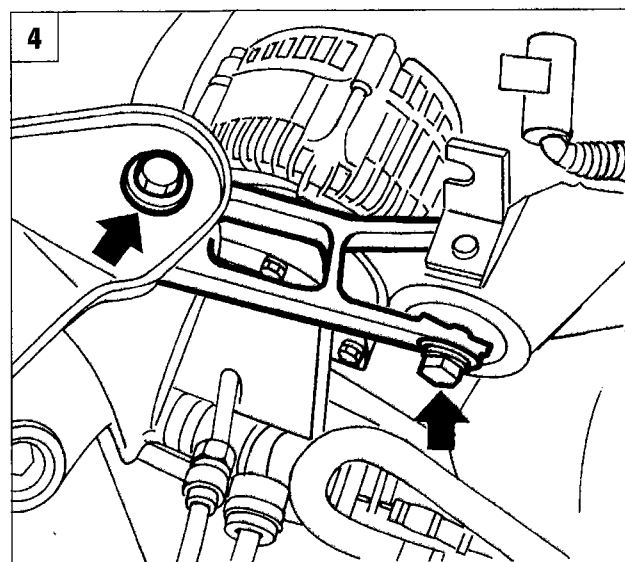
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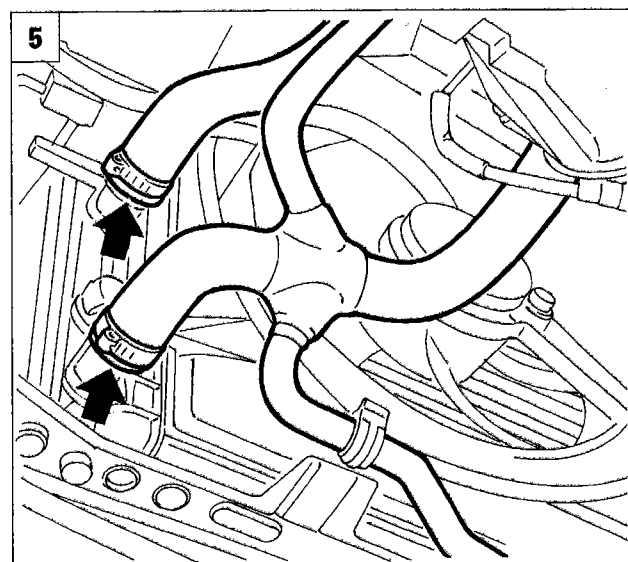
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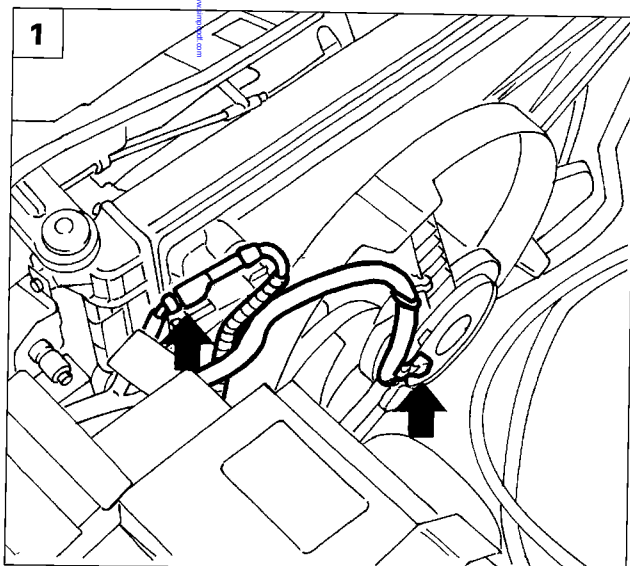
1. Disconnect the fuel supply pipe, working on the rapid attachment.
2. Disconnect the air conditioning compressor supply and inlet pipes.
3. Disconnect the fuel vapour recovery pipe acting on the rapid attachment, remove the canister solenoid valve opening electrical connection, then remove the entire pipe from the mounting bracket disconnecting the band fixing it to the inlet manifold.
4. Undo the bolts fixing the reaction rod, then remove it.
5. Drain the coolant, disconnecting the pipes shown in the diagram.



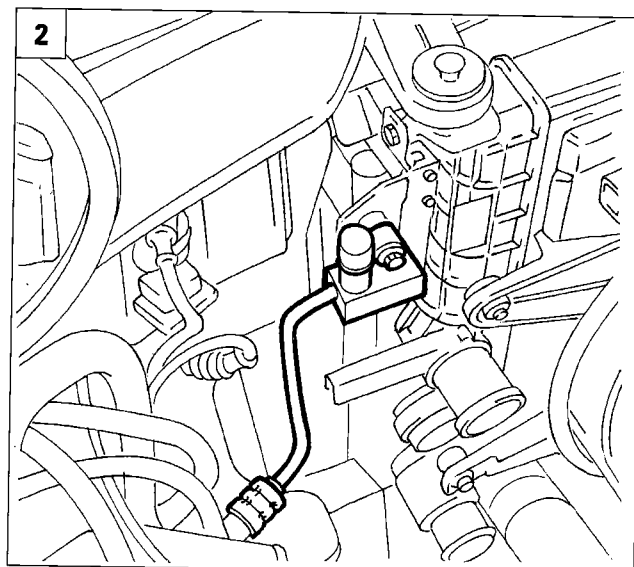
P4A04HX04



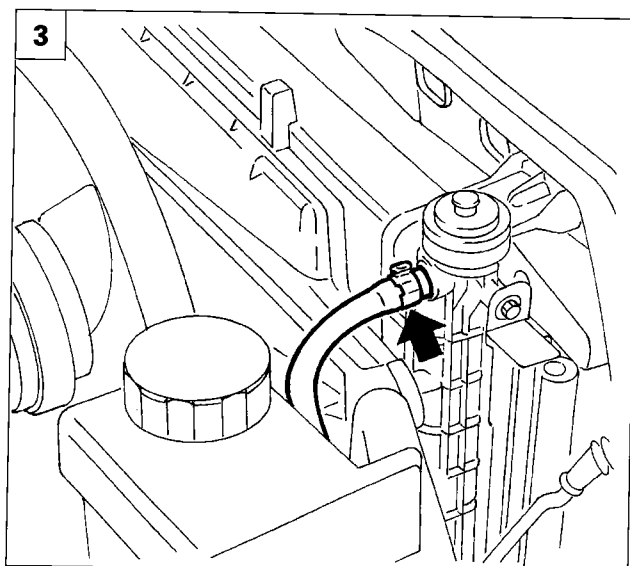
P4A30HX03



P4A31HX01



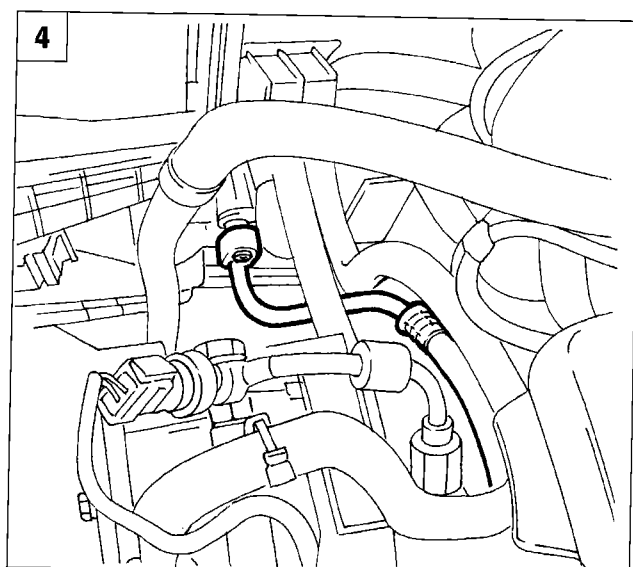
P4A05HX01



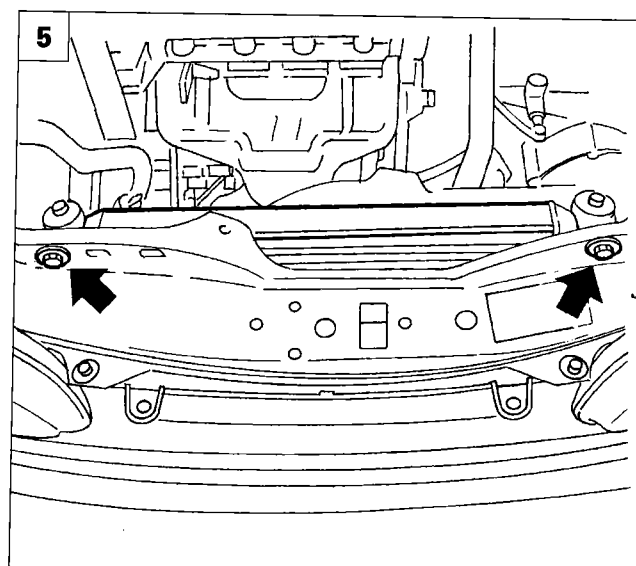
P4A31HX03



1. Disconnect the engine cooling fan supply electrical connections.
2. Disconnect the high pressure air conditioning circuit needle valve undoing the bolt fixing it to the condenser.
3. Open the band and disconnect the pipe between the radiator and the tank.
4. Disconnect the air conditioning circuit condenser rigid inlet pipe.
5. Remove the radiator complete with electric fan, undoing the two bolts fixing it to the bodyshell.

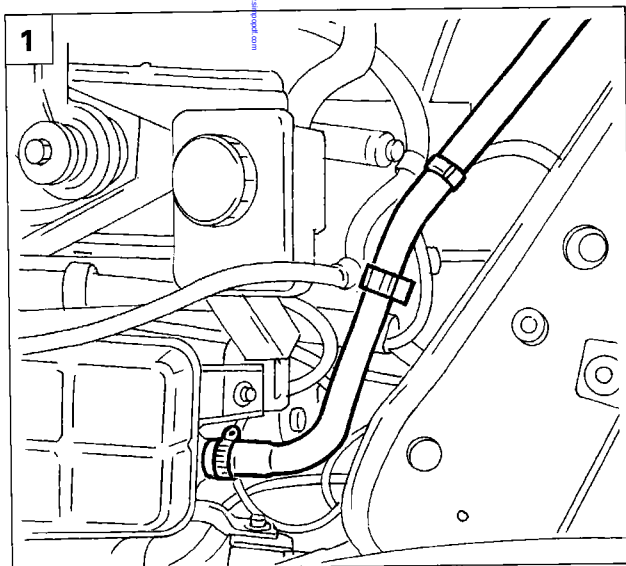


P4A05HX02

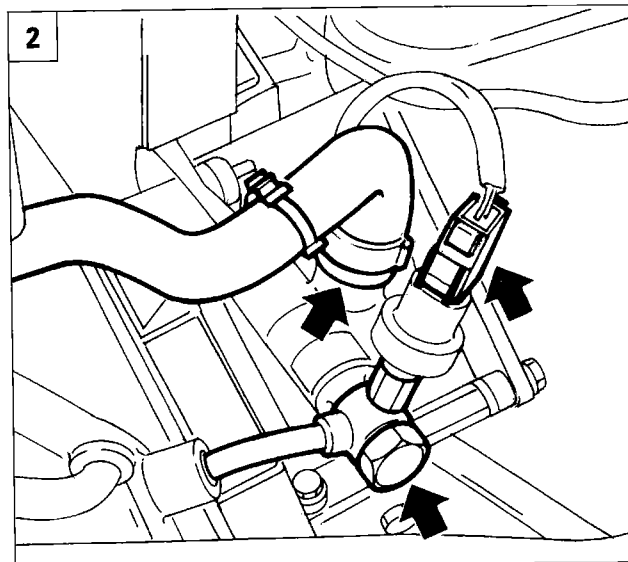


P4A05HX03

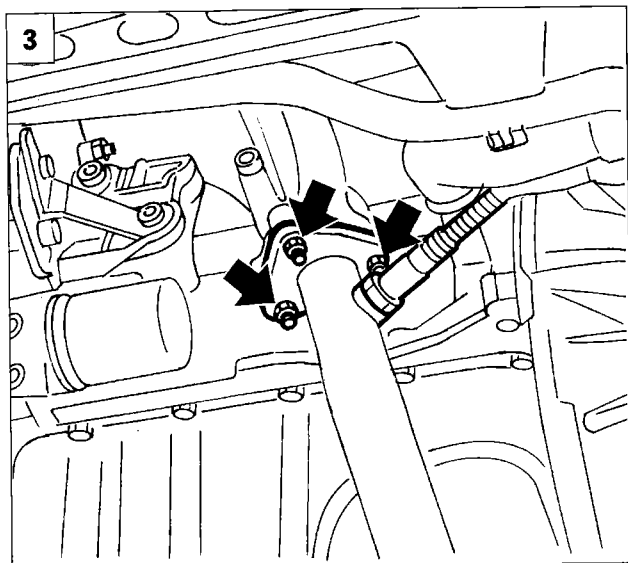
### 10.



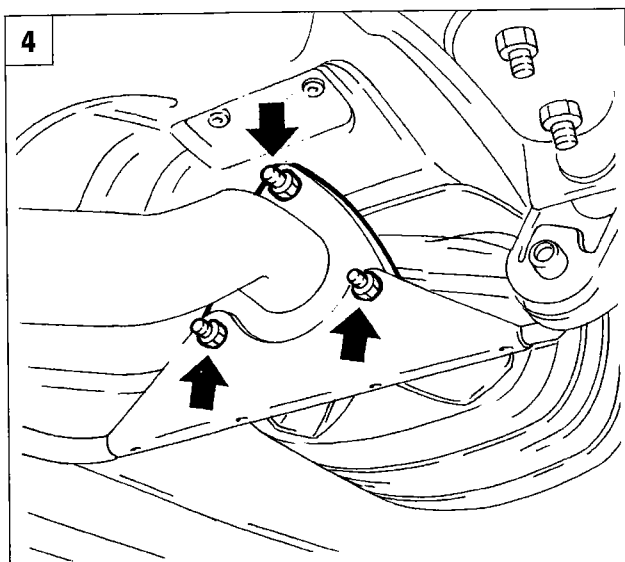
P4A06HX01



P4A06HX02



P4A06HX03



P4A06HX04



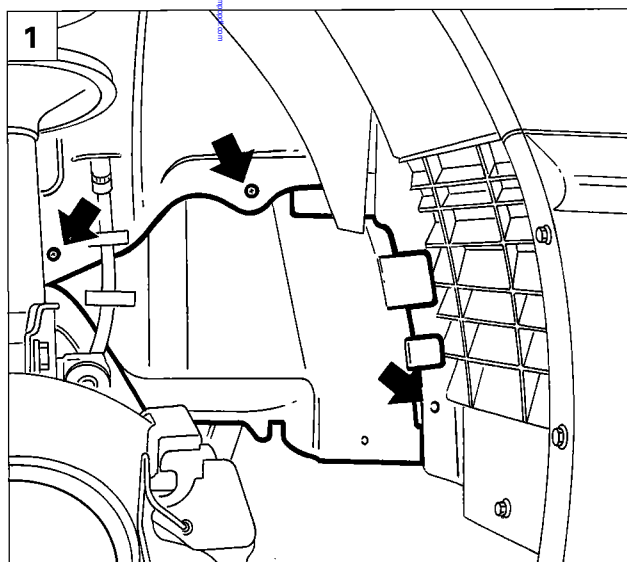
1. Disconnect the coolant pipe from the expansion tank, remove it from the retaining springs and place it at the side.

- Draw off the power assisted steering fluid from the reservoir.

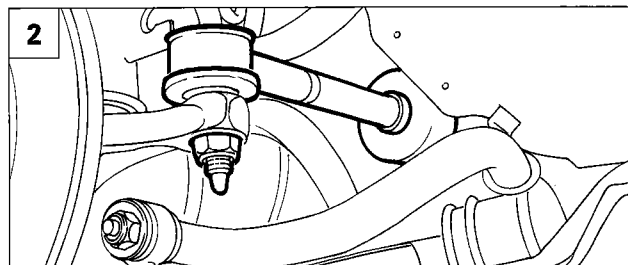
2. Disconnect the electrical connection for the pressure sensor on the power assisted steering pump, undo the union for the rigid supply pipe, open the band for the flexible inlet pipe, then position the pipes at the side.

3. Disconnect the Lambda sensor connector and undo the nuts fixing the first section of the exhaust pipe to the manifold.

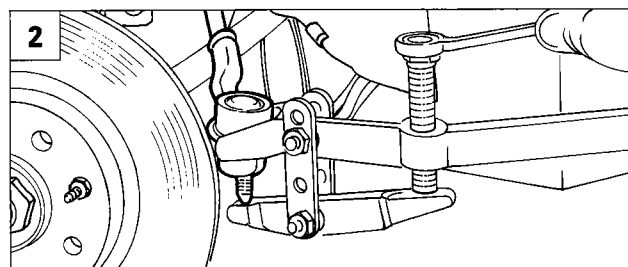
4. Undo the nuts fixing the first section of the exhaust pipe to the catalytic converter, then remove the pipe.



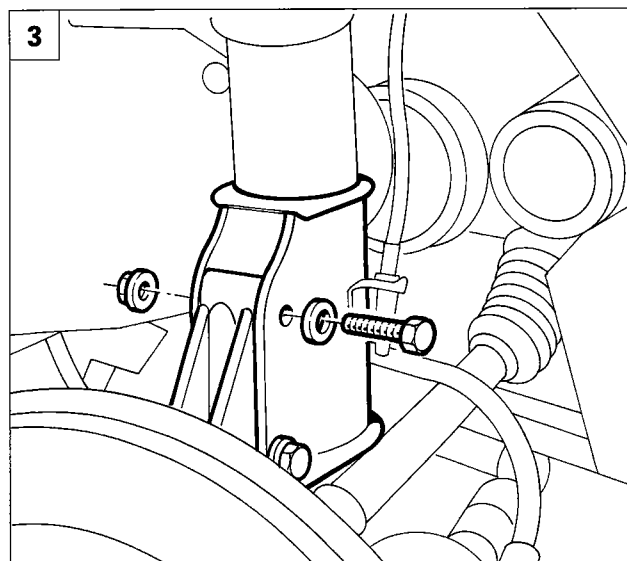
P4A07BX04



P4A002B04



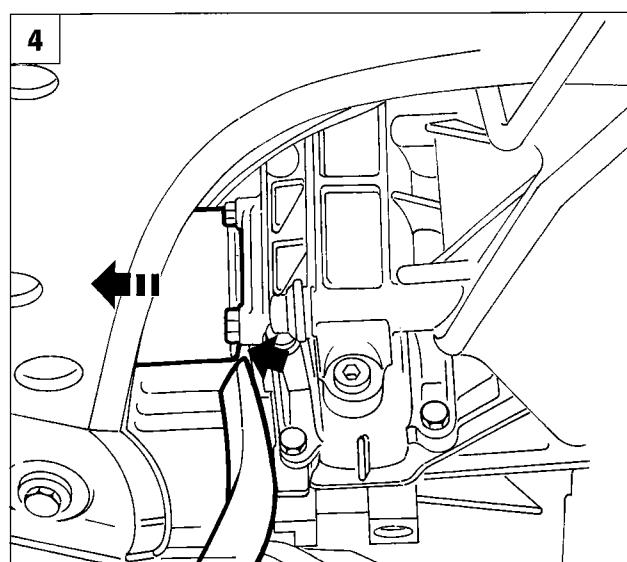
P4A002B05



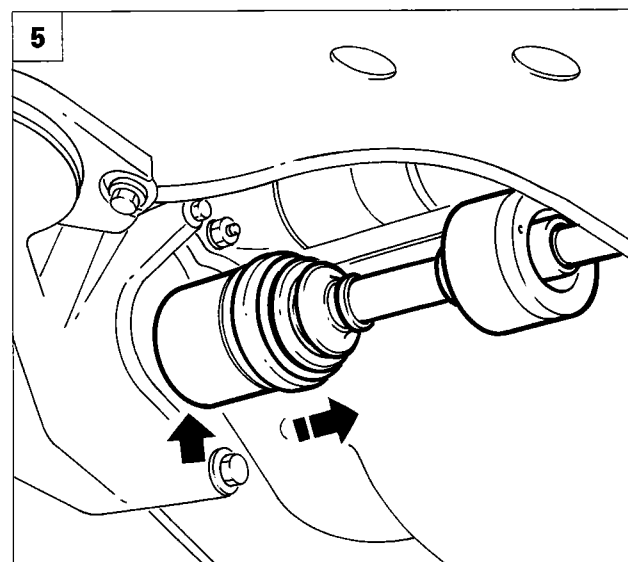
P4A003B05



1. Remove the plastic liner from the right wheel arch, acting on the fixing bolts and button.
2. Remove the nut fixing the end of the steering rod to the steering knuckle (gear-box side), then extract the track rod end using tool 1847038000.
3. Remove the bolts fixing the shock absorber to the steering knuckle (gearbox side), then rotate the actual steering knuckle forwards, releasing the brake pipe from the housing in the shock absorber.
4. Disconnect the gearbox side drive shaft from the differential using leverage at the engagement point; place it at the side and secure it.
5. Disconnect the timing side drive shaft using leverage at the engagement point; place it at the side and secure it.



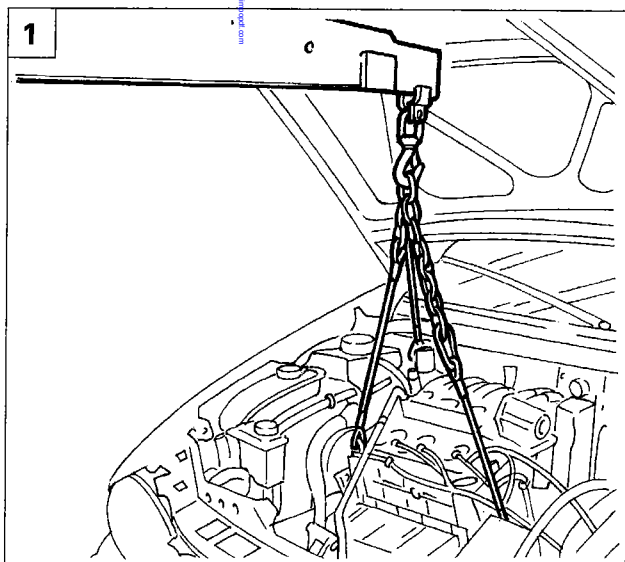
P4A004B01



P4A07AX02



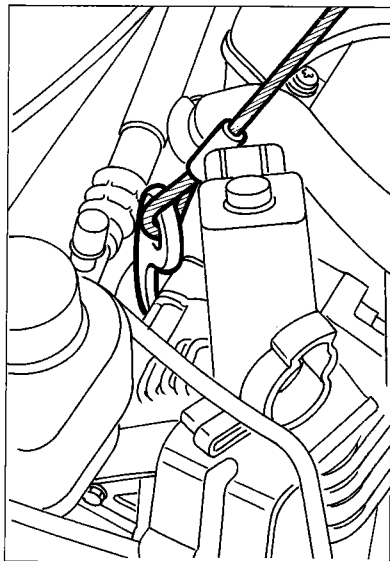
### 10.



P4A08HX01

1. Position the universal hook 1860592000, fitted to a hoist, in the special power unit mounting brackets. Working on the hoist, tension the power unit supporting cables.

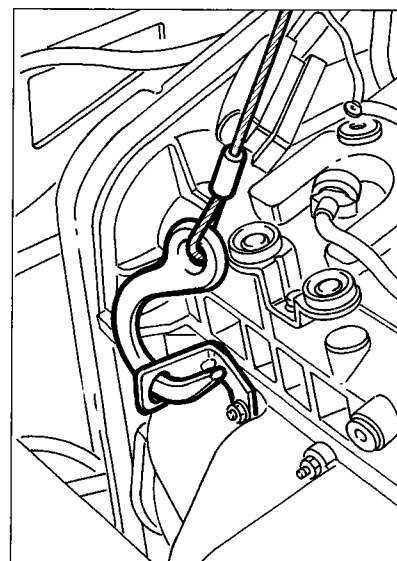
**NOTE** The diagrams below illustrate the positioning of the hooks in the power unit mounting brackets.



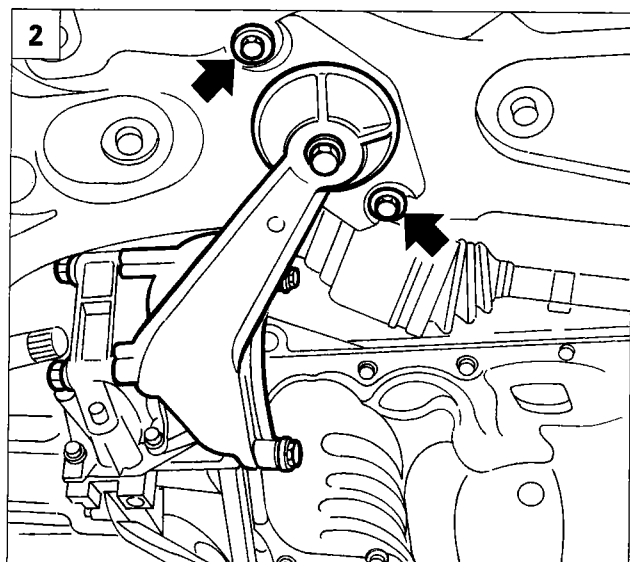
P4A08HX02



P4A08HX03



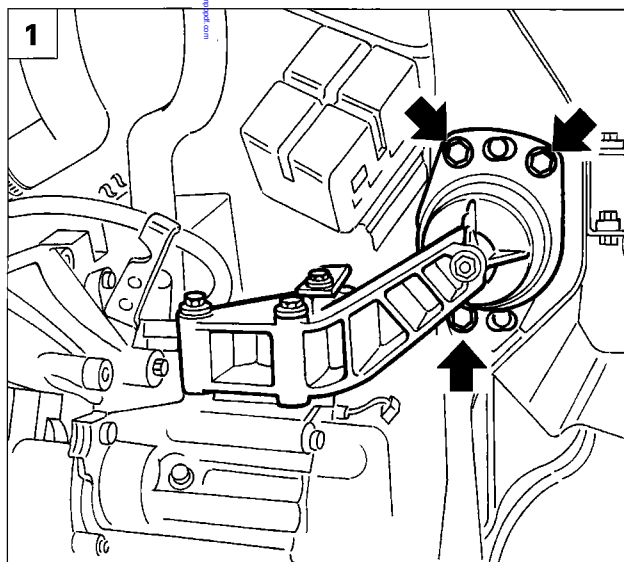
P4A08HX04



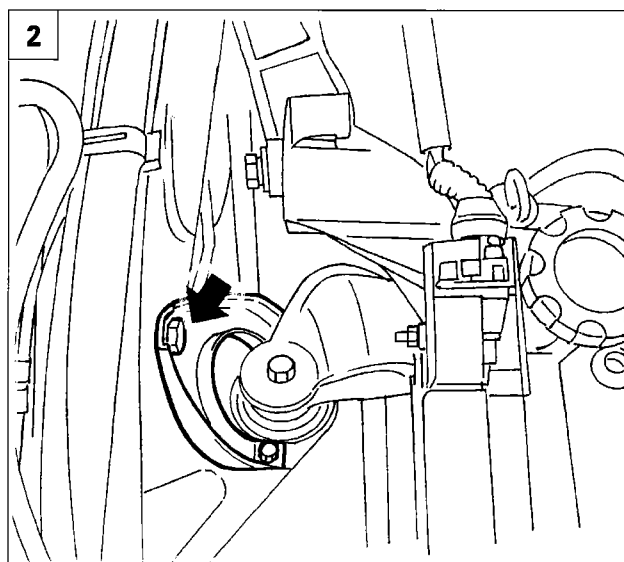
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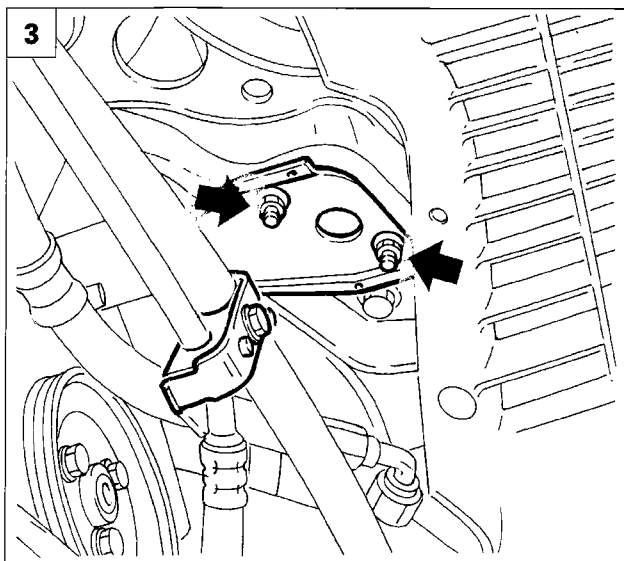
2. Undo the bolts fixing the power unit centre support to the bodyshell.



P4A09HX01



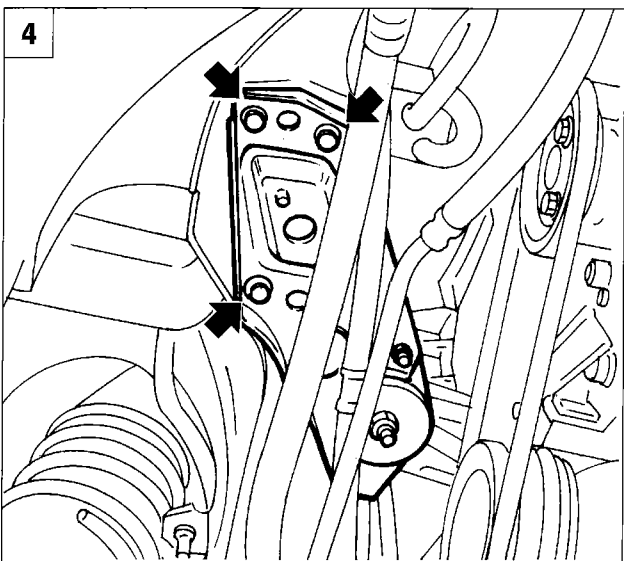
P4A09HX02



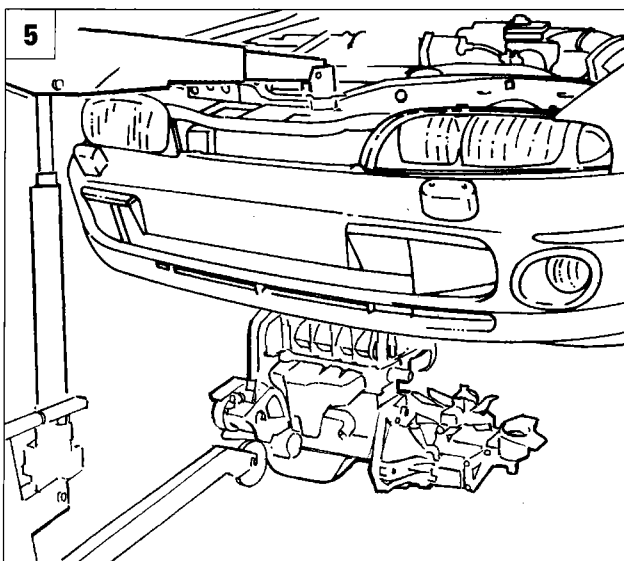
P4A09HX03



1. Undo the bolts fixing the power unit mounting, gearbox side.
2. Undo the bolt fixing the timing side power unit mounting bracket to the bodyshell.
3. Undo the fixing nuts and place the bracket illustrated at the side.
4. Undo the bolts fixing the timing side power unit mounting bracket to the bodyshell.
5. Extract the power unit from the underneath of the engine compartment, suitably manoeuvring the hoist and the lift. With the help of a second operator, rest the power unit on a support, positioning it securely.



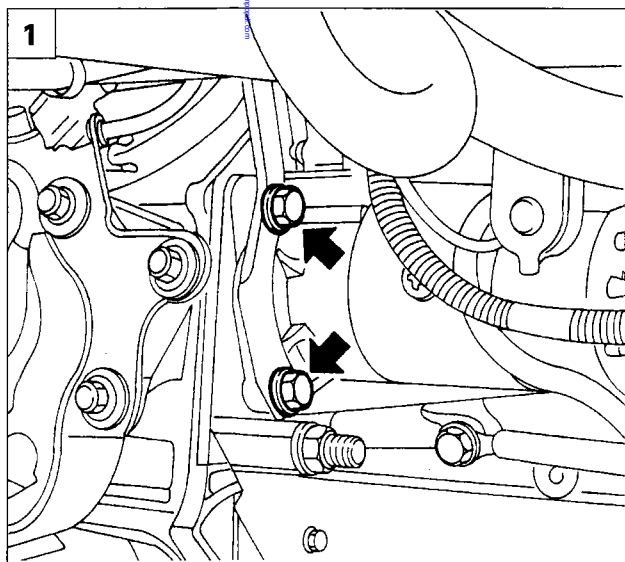
P4A09HX04



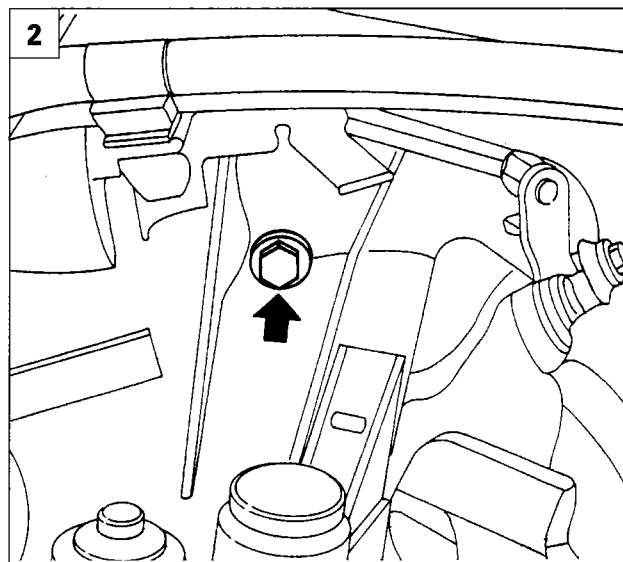
P4A09HX05



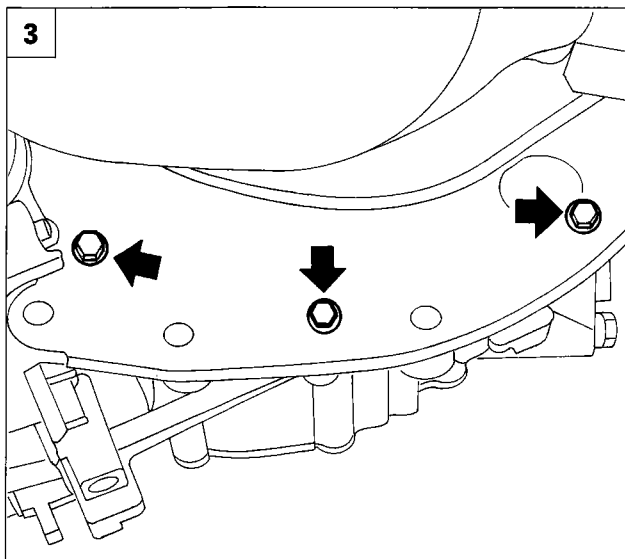
### 10.



P4A10HX01



P4A10HX02



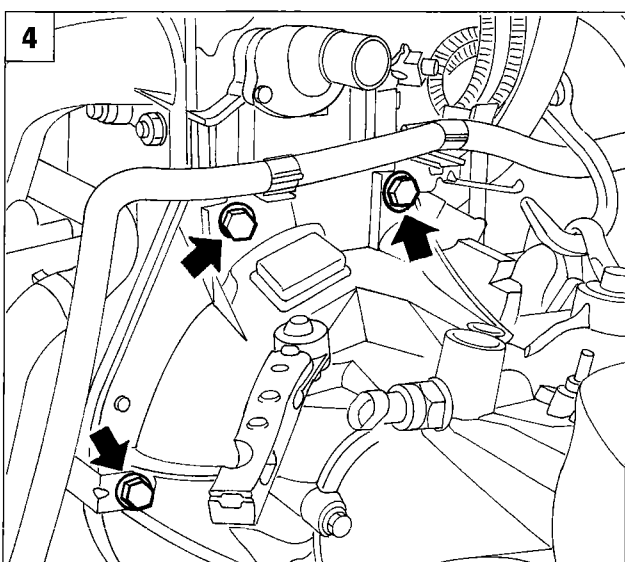
P4A10HX03



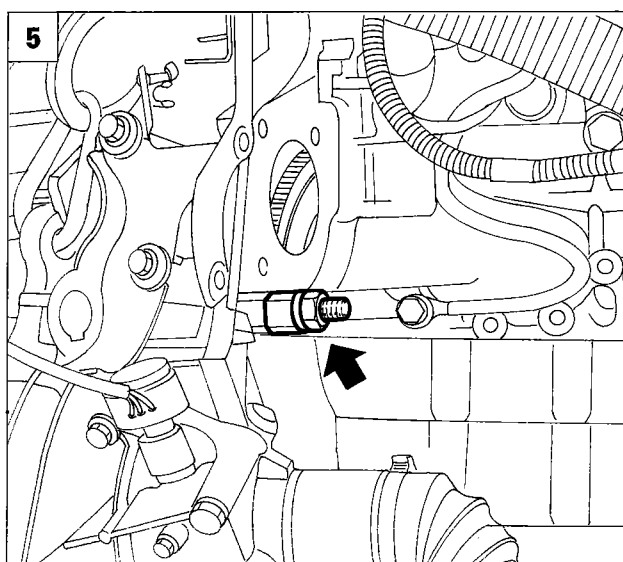
### SEPARATING THE GEARBOX-DIFFERENTIAL ASSEMBLY



1. Disconnect the electrical connections and undo the bolts fixing the starter motor to the gearbox.
2. Undo the bolt shown in the diagram, then remove the starter motor.
3. Undo the bolts fixing the engine flywheel protection.
4. Undo the bolts fixing the gearbox-differential assembly to the engine.
5. Undo the nut between the gearbox and the engine; then separate the gearbox-differential assembly from the engine.



P4A10HX04



P4A10HX05

**NOTE** *To refit the gearbox-differential assembly to the engine, suitably reverse the order of the operations described for the removal.  
In order to refit the power unit, simply reverse the order of the operations described for the removal.*

- *Prepare the engine compartment for the fitting of the power unit, taking care to connect all the electrical cables, pipes, etc. so that there are no problems when fitting;*
- *take care when fitting the power unit to avoid damaging the individual components;*
- *when refitting the engine coolant pipes, the reference on the flexible (rubber) pipe has to coincide with the projection on the rigid coupling hose. To refill the engine cooling circuit, refer to the instructions in the "Removing-refitting radiator" chapter.*

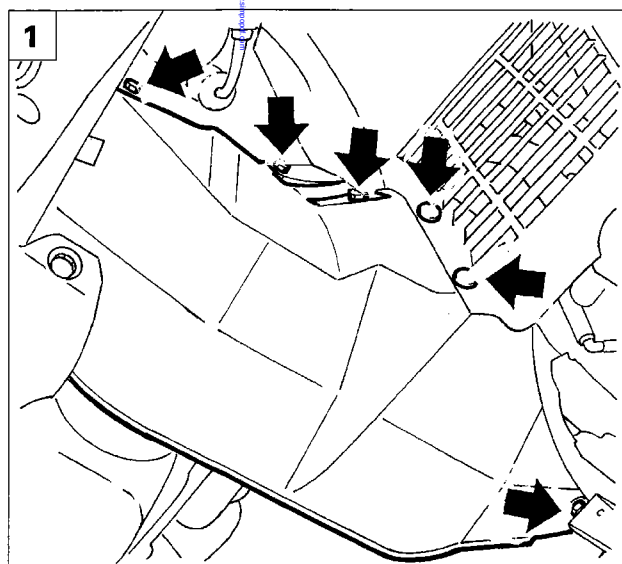


*Once the power unit has been positioned, check that the bolts fixing the power unit mounting to the bodyshell are correctly tightened.*



*Clutch pedal height.*

10.



P4A12HX01



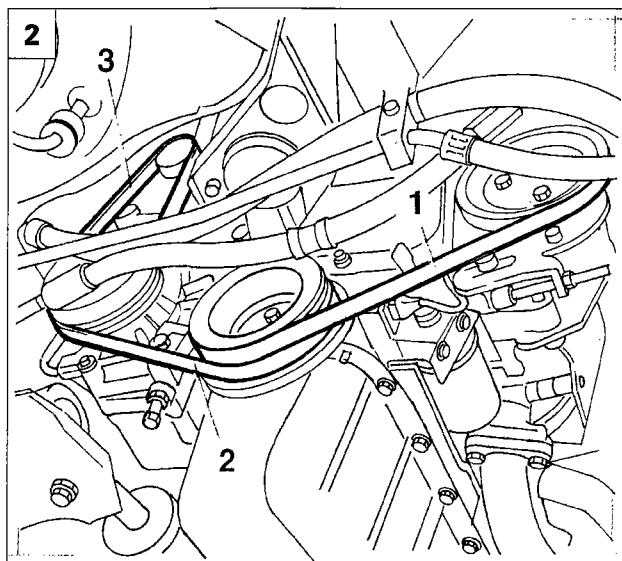
### REMOVING-REFITTING AUXILIARY DRIVE BELTS

Position the vehicle on a lift, disconnect the negative battery lead, remove the right front wheel, then proceed as described below:

1. Remove the shield for the auxiliary shaft drive belts.



*Check the condition and the tension of the auxiliary shaft drive belts and, in particular, that there are no cracks, cuts, surface wear of the material (which would look shiny and smooth), or dry or hard sections with a consequent loss of grip. If one of the defects mentioned above is found, the belts in question must be replaced.*



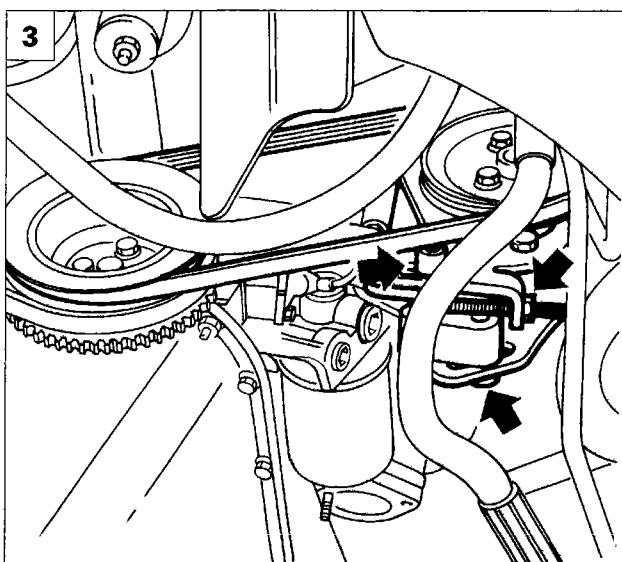
P4A12HX02

2. View of the auxiliary shaft drive belts fitted on vehicle:

1. Power assisted steering pump drive belt.
2. Air conditioning compressor drive belt.
3. Alternator drive belt.



*Avoid the belts coming into contact with oil or solvents which could adversely affect the elasticity of the rubber resulting in a loss of grip.*

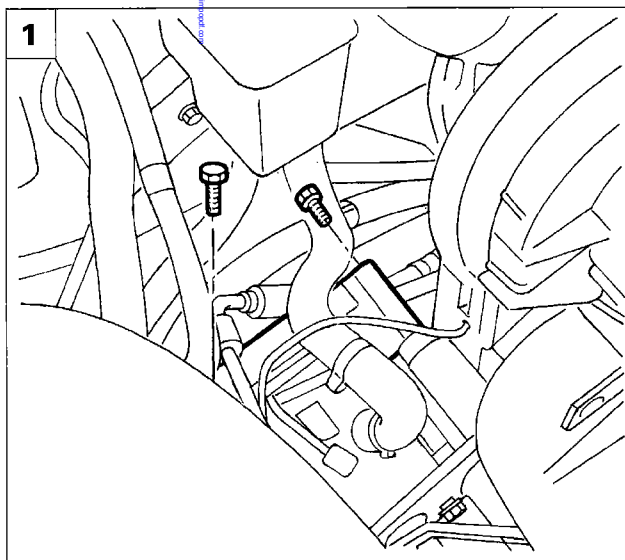


P4A12HX03

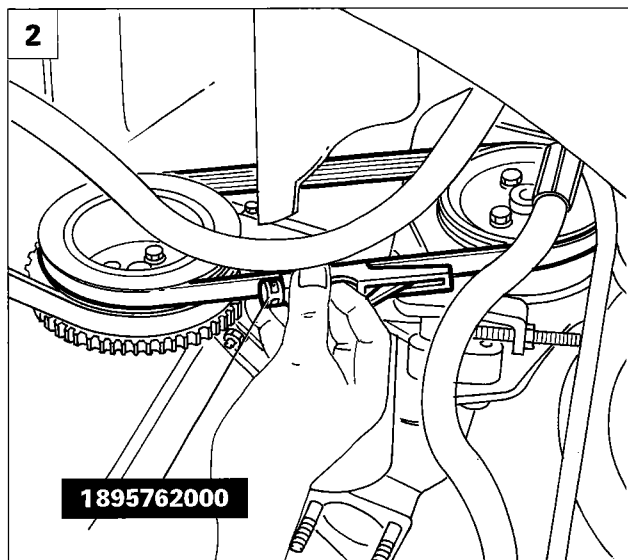


### Power assisted steering pump drive belt

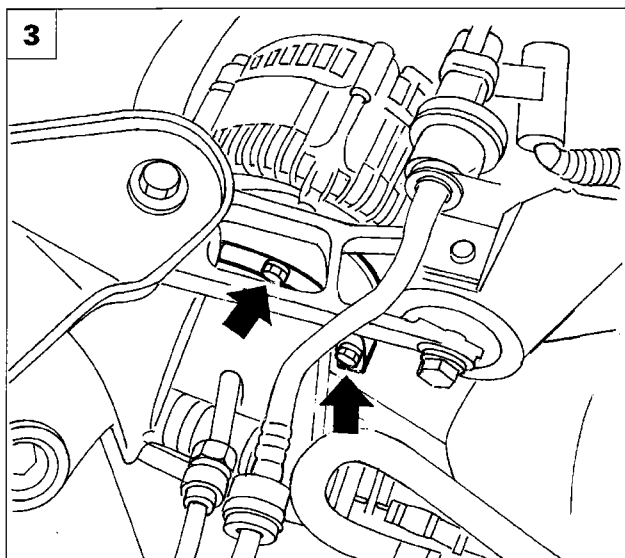
3. Loosen the tension of the power assisted steering pump drive belt acting on the bolts shown in the diagram.



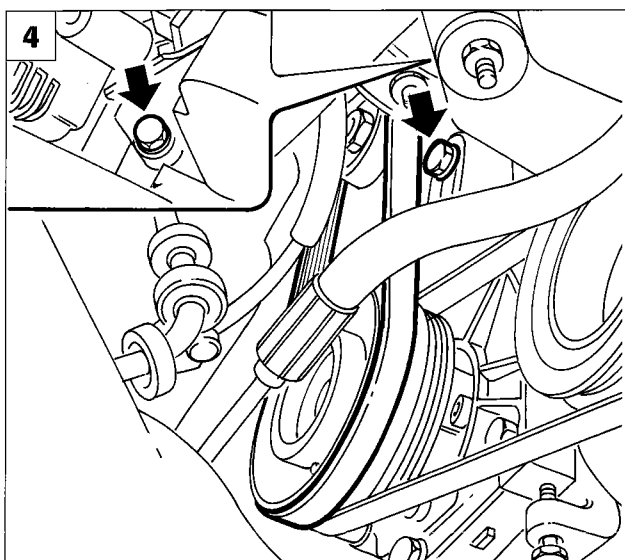
P4A13HX01



P4A13HX02



P4A13HX03



P4A13HX04

1. Remove the shield for the power steering pump pulley, then remove the drive belt.

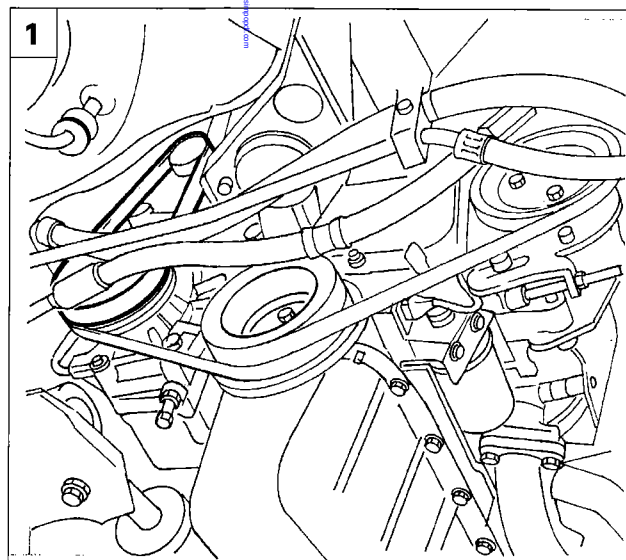
#### Refitting

2. Tension the power assisted steering drive belt acting on the bolts securing the pump mounting bracket. Using tool 1895762000, check that the tension of the new belt is between 36 and 45 daN. If the same belt is refitted, the tension should be between 23 and 30 daN.

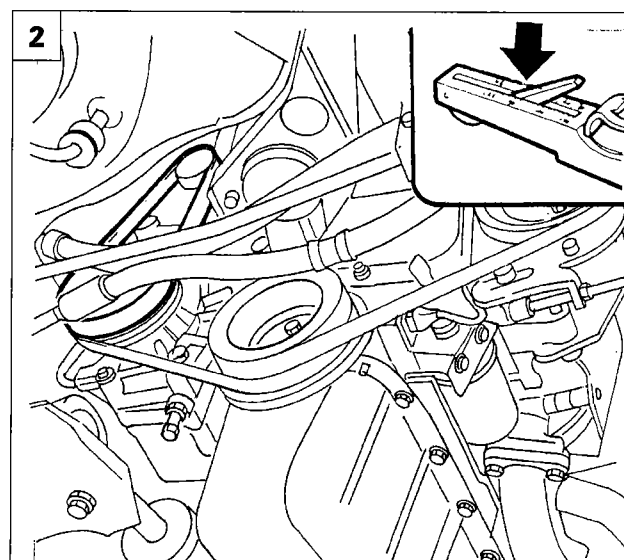
#### Alternator drive belt

3. After having removed the shield for the auxiliary drive belts, remove the protective cover for the alternator pulley.
4. Loosen the tension of the alternator drive belt acting on the bolts shown in the diagram and the rear bolt fixing it to the alternator bracket.

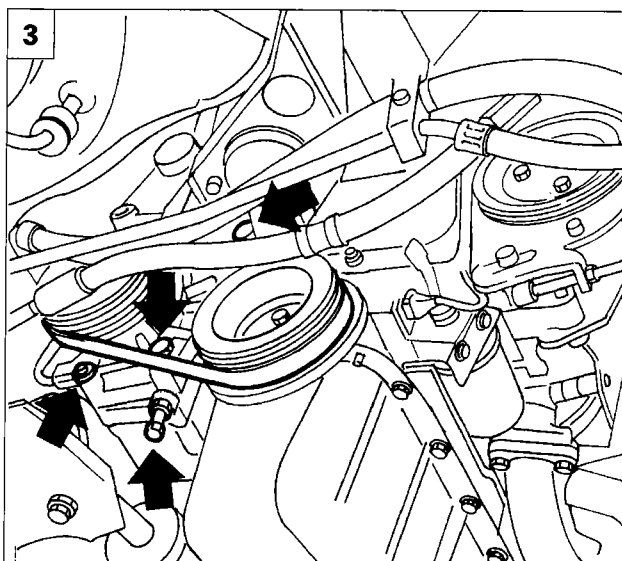
### 10.



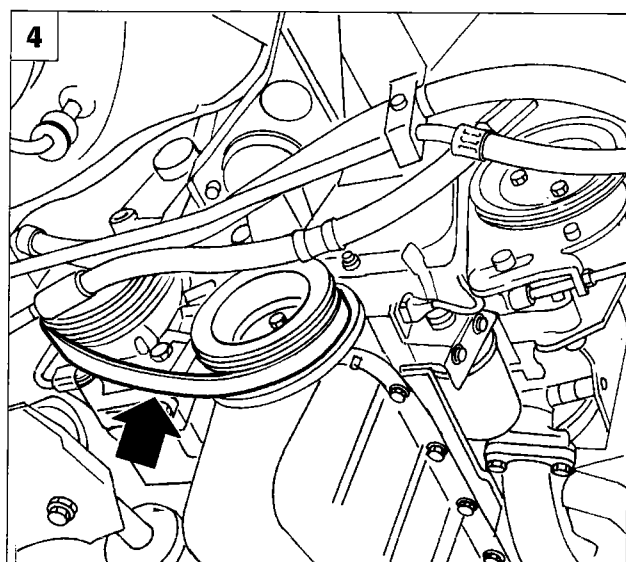
P4A14HX01



P4A14HX02



P4A14HX03



P4A14HX04



1. Remove the alternator drive belt from the drive pulleys.



#### Refitting

2. Position the alternator drive belt and tension it acting on the alternator fixing bolts. Using tool 1895762000, check that the tension of the new belt is between 48 and 60 daN; if the same belt is refitted, check that the tension is between 30 and 41 daN. Then refit the components removed previously.

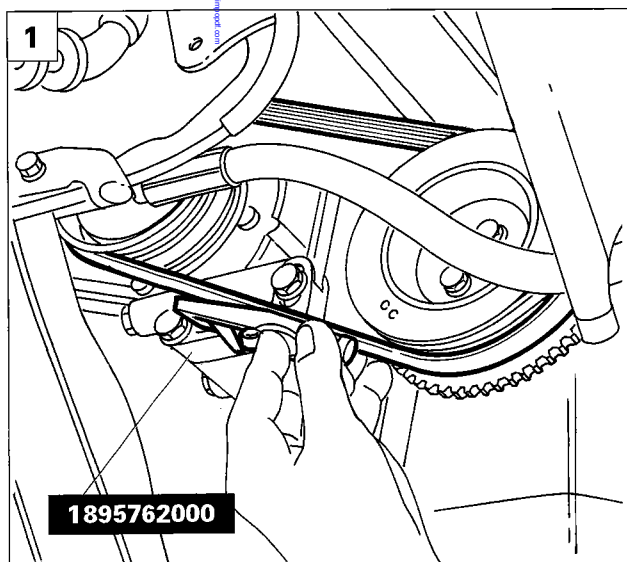


#### Air conditioning compressor drive belt

After having removed the shield for the auxiliary drive belts, remove the power assisted steering and alternator drive belts as described previously, then proceed as follows:

3. Loosen the tension of the air conditioning compressor drive belt, acting on the bolts shown in the diagram.
4. Remove the compressor drive belt from the pulleys.

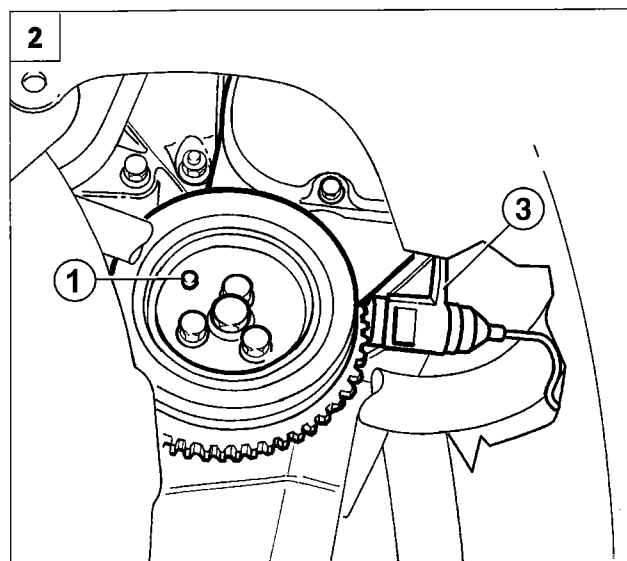




P4A15HX01

### Refitting

1. Position the compressor drive belt on the drive pulleys and tension it acting on the bolts fixing the compressor mounting bracket. Using tool 1895762000, check that the tension of the new belt is between 48 and 60 daN; if the same belt is refitted, the tension should be between 30 and 41 daN. Then refit the components removed previously and the alternator and power assisted steering drive belts.

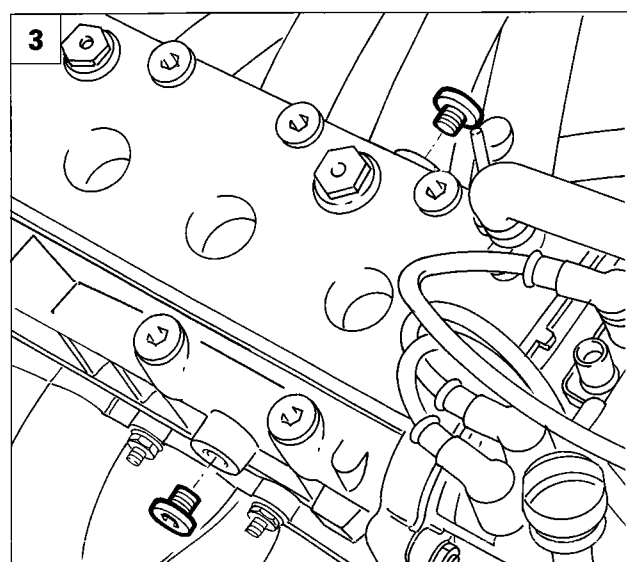


P4A15HX02

### CHECKING VALVE GEAR TIMING



*Before checking the valve gear timing, it is necessary to remove: the auxiliary drive belts, following the instructions given previously, the upper section of the inlet manifold, complete with fuel manifold and the timing belt shield, following the instructions given in the "Removing - refitting timing belt" paragraph which follows.*



P4A15HX03

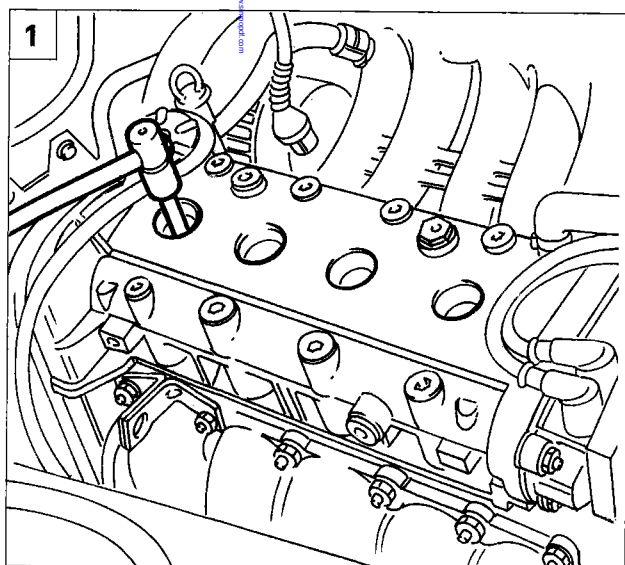
2. Rotate the auxiliary shaft drive pulley in its normal direction of rotation until the reference (1) is on the opposite side to the rpm and TDC sensor (3). This operation is carried out to bring the pistons approximately in line with one another.
3. Remove the sealing plugs illustrated in the diagram from the camshaft housing.

# Engine

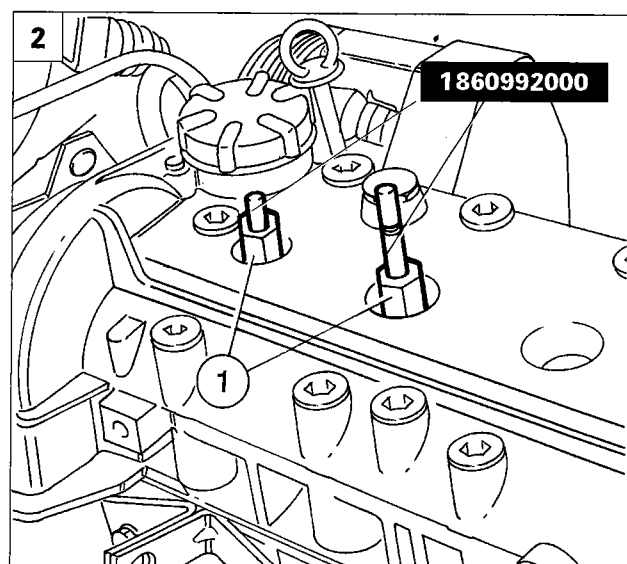
## Replacing auxilliary shaft belt

### 10.

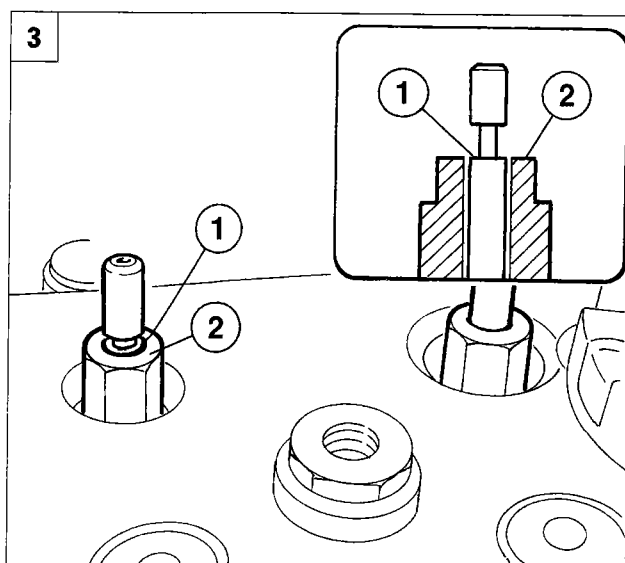
**Bravo-Brava**  16v  
98 range



P4A16HX01



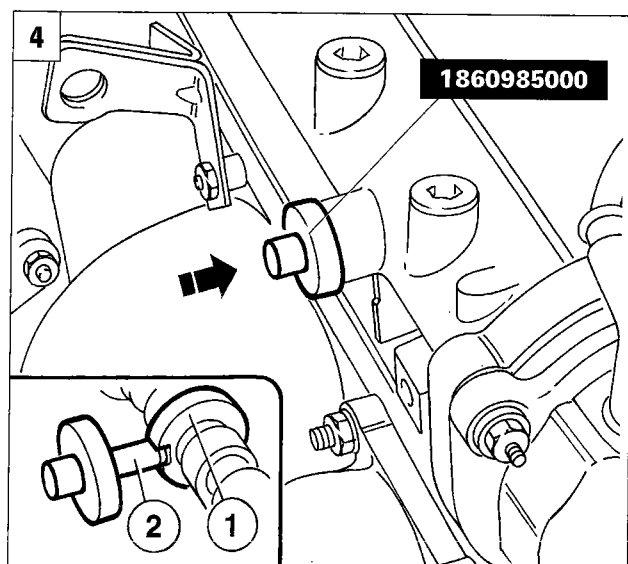
P4A16HX02



P4A16HX03



1. Disconnect the H.T. leads from the spark plugs and, using a USAG 279 MG spanner or a similar tool, remove the spark plugs.
2. Position tools 1860992000 in the housings for the spark plugs for cylinders 1 and 2, tightening the tool components (1) by hand to a maximum torque of 0.5 daNm.
3. The timing is checked with the four pistons in line, therefore the crankshaft must be rotated, using small movements, in its normal direction of rotation, until the surface (1) on the tool moving element is in line with the reference (2) on the component fixed in the spark plug housing.

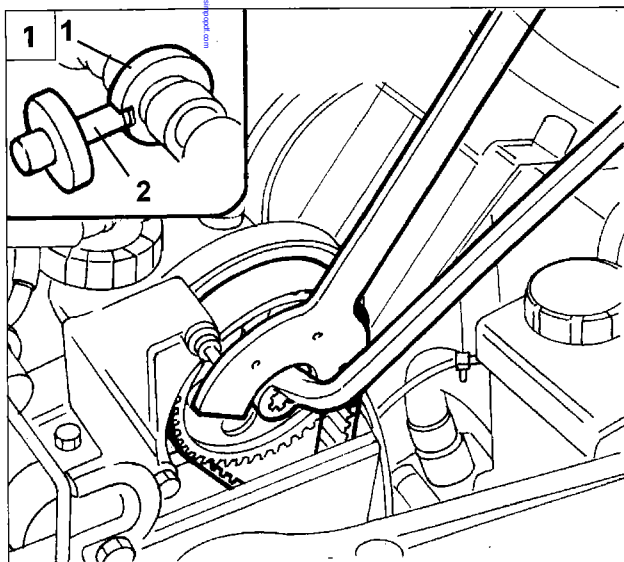


P4A16HX04

When both tools positioned in the spark plug housings reach this condition, the pistons will be in line with one another with the 1st piston in the inlet stroke.

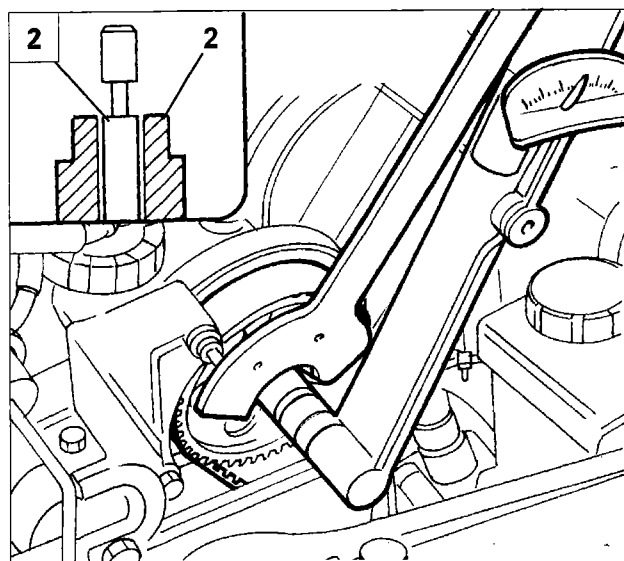
4. Visually inspect that the splining (1) on the camshafts is near the seats; if not, rotate the crankshaft through 360°, restore the precise alignment of the pistons, using tools 1860992000, then position tools 1860985000 in the plug housings; insert the pin (2) for the tool in the splining (1) on the camshafts. The engine is timed under these circumstances.





P4A17HX01

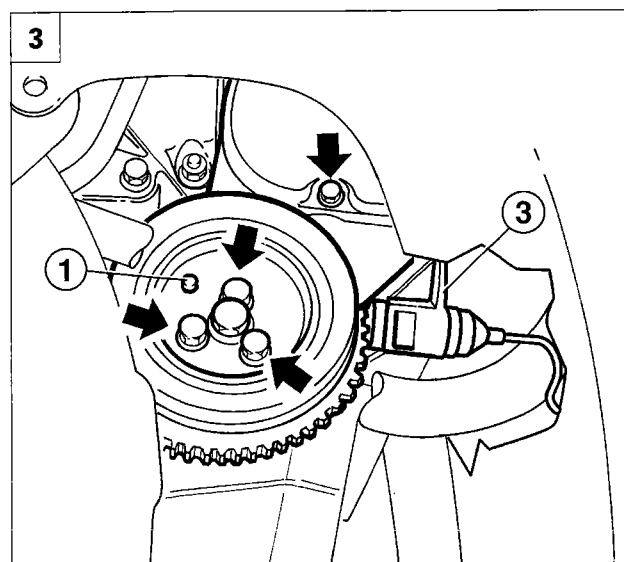
1. If the tools 1860985000 do not engage in the housings in the camshafts, the engine is not correctly timed; therefore the crankshaft should be rotated, using small movements, until the tools (2) are perfectly matched with the shaft splining (1), then, using spanner 1860831000, loosen the bolt fixing the camshaft pulley.



P4A17HX02



2. Rotate the crankshaft once again until the tools 1860992000 indicate that the pistons are aligned, i.e. with the surface (1) perfectly in line with the surface (2). In this configuration, the engine is correctly timed. Tighten the camshaft pulley to the recommended torque and then refit the components previously removed.



P4A17HX03

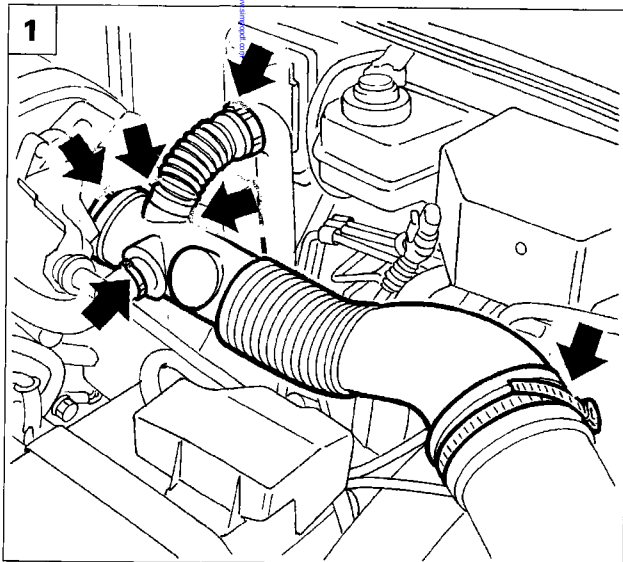
### REMOVING - REFITTING TIMING BELT



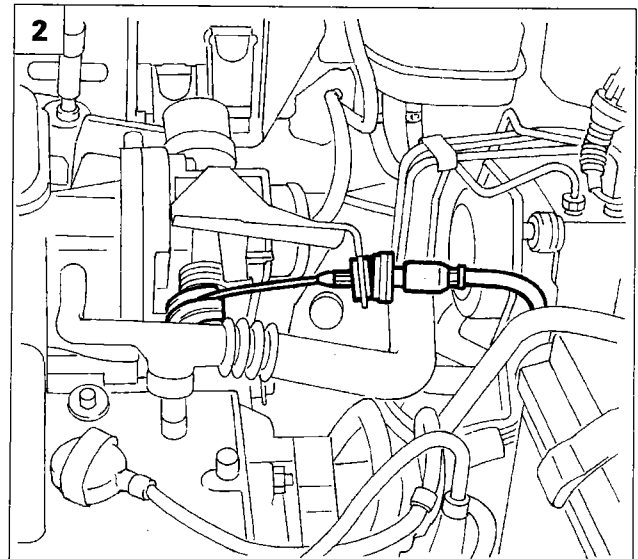
*Remove the auxiliary drive belts following the instructions given in the appropriate paragraphs.*

3. Rotate the auxiliary shaft drive pulley in its normal direction of rotation until the reference (1) is opposite the rpm and TDC sensor (3), then undo the fixing bolts and remove it. Also undo the bolts fixing the timing belt lower shield.

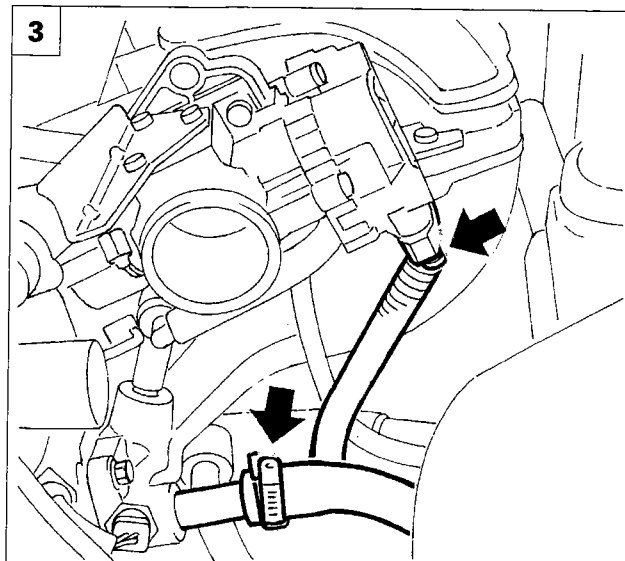
### 10.



P4A18HX01



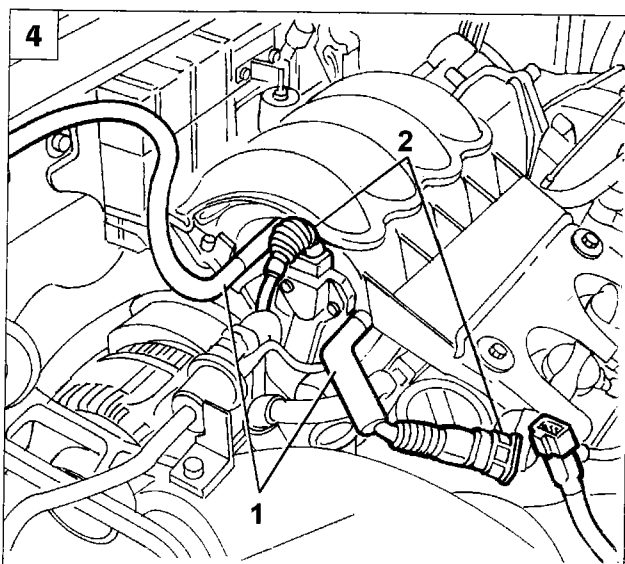
P4A18HX02



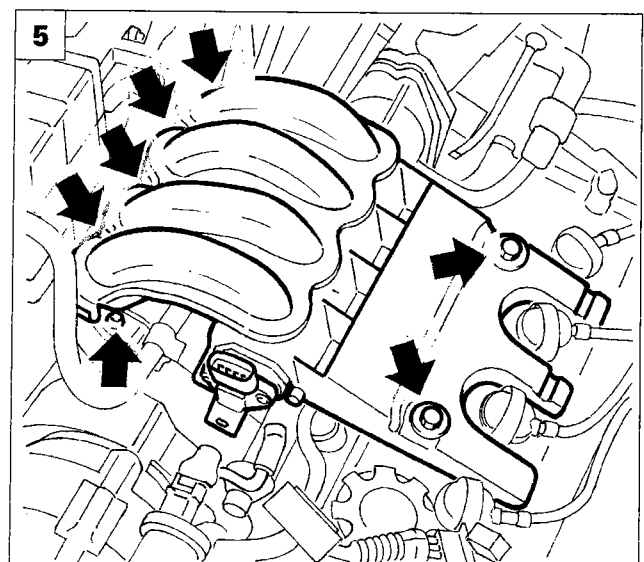
P4A18HX03



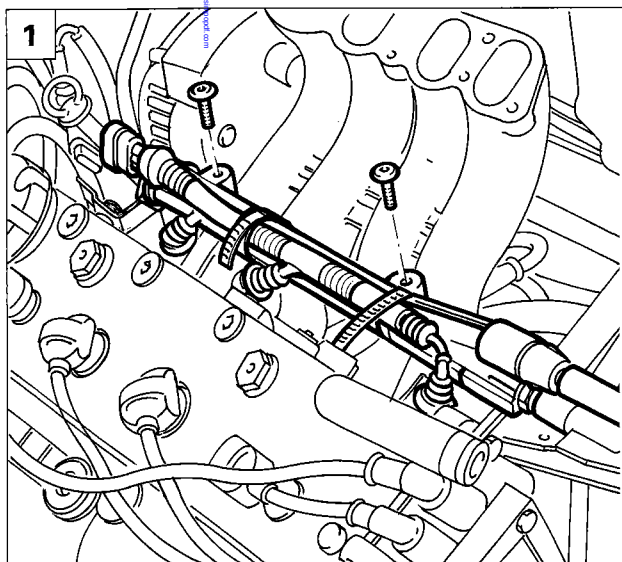
1. Disconnect the bands illustrated and undo the bolts fixing the resonator, then disconnect the oil vapour pipe band and remove the resonator complete with hose.
2. Disconnect the accelerator cable.
3. Disconnect the connection shown and the brake servo vacuum pipe from the butterfly casing.
4. Disconnect the pipes (1) and the connections (2) from the upper part of the inlet manifold.
5. Remove the bolts fixing the top section of the inlet manifold using a USAG TX 27 spanner or similar tool and remove the manifold from the vehicle complete with butterfly casing.



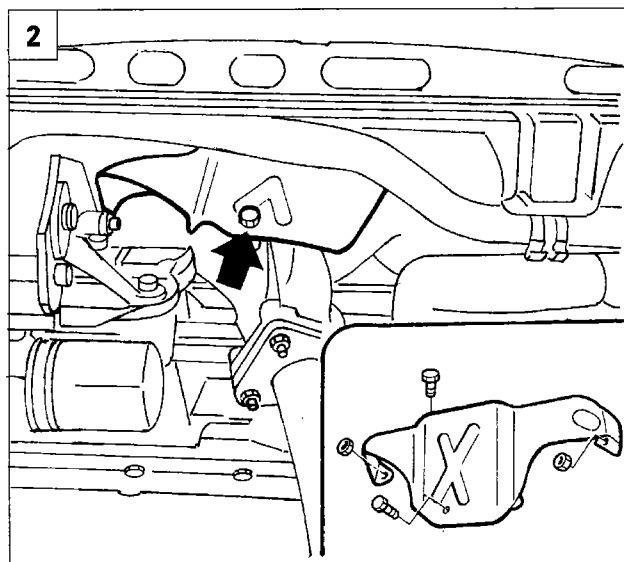
P4A18HX04



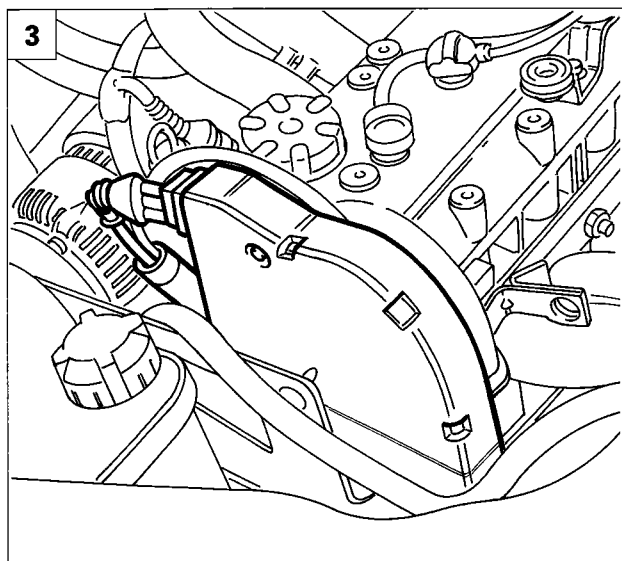
P4A18HX05



P4A19HX01



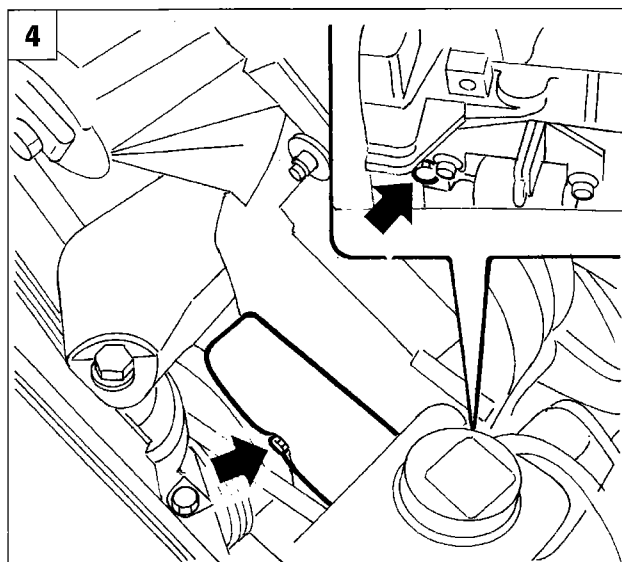
P4A19HX02



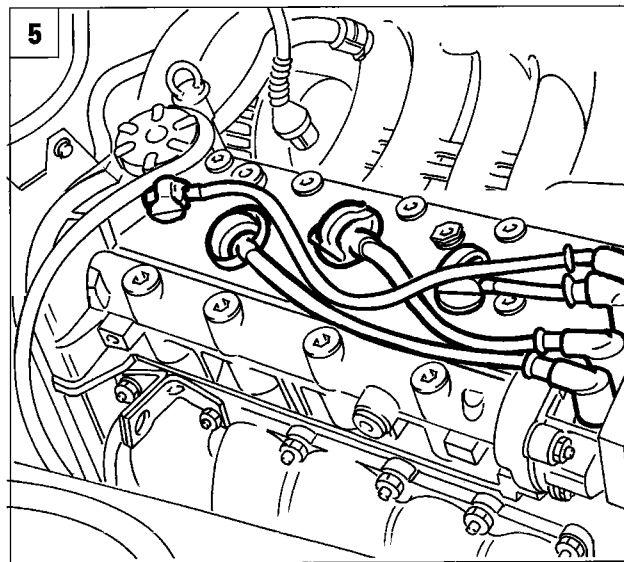
P4A19HX03



1. Undo the bolts fixing the fuel manifold, remove it complete with injectors and position it at the side, away from the work area.
2. Remove the heat shield undoing the fixing nuts and bolts.
3. Undo the bolts fixing the timing belt upper shield; disconnect the connector for the Rpm and T.D.C. sensor, then remove the upper shield.
4. Undo the fixing bolts and remove the lower shield for the timing drive belt.
5. Disconnect the H.T. leads from the spark plugs.

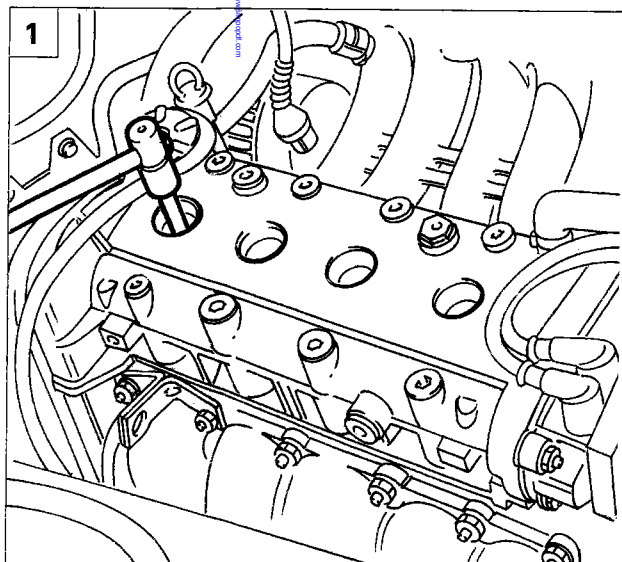


P4A19HX04

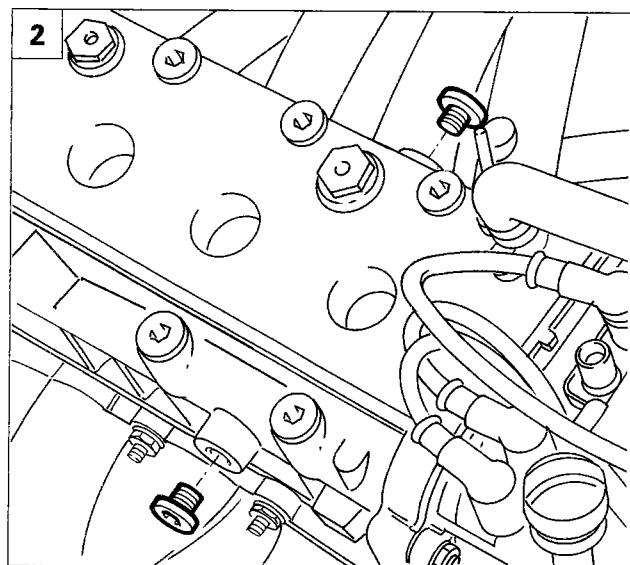


P4A19HX05

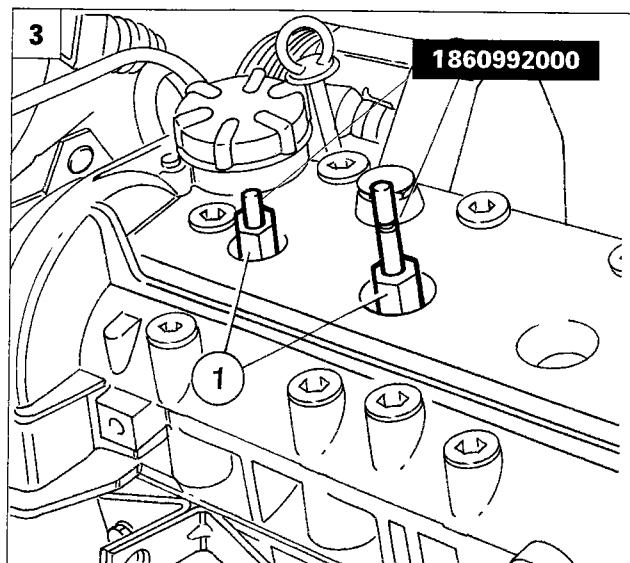
### 10.



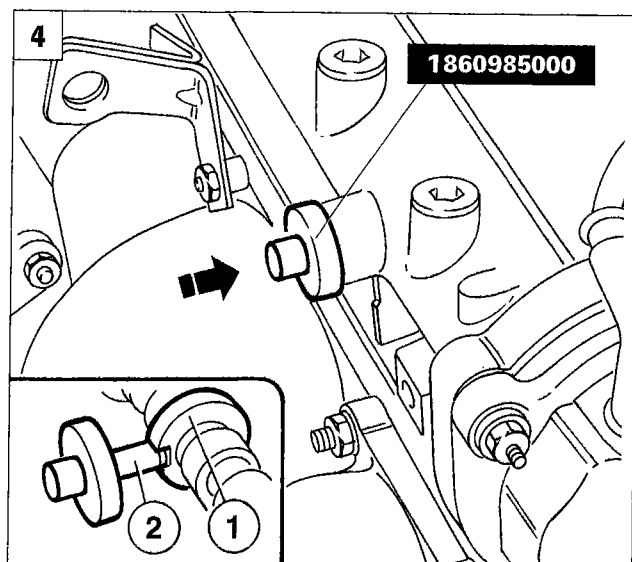
P4A16HX01



P4A15HX03



P4A16HX02



P4A16HX04



1. Remove the spark plugs using a USAG 279 MG spanner or a similar one.

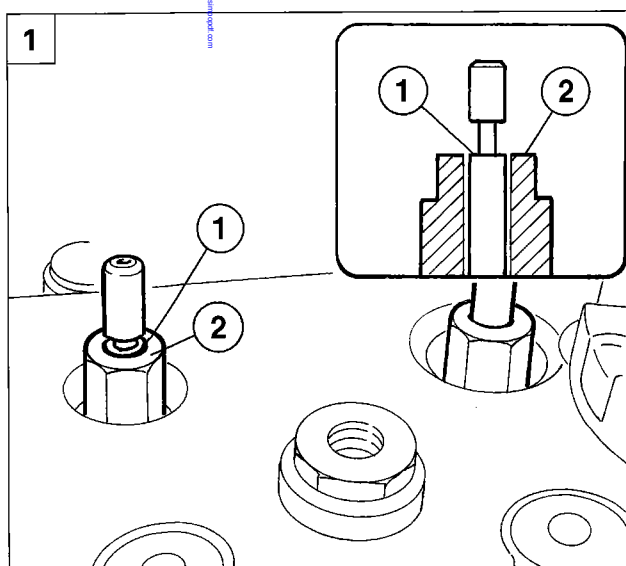
2. Remove the two sealing plugs illustrated in the diagram from the camshaft housing.

3. Position tools 1860992000 in the housings for the spark plugs for cylinders no. 1 and 2, tightening the tool elements (1), by hand, to a maximum torque of 0.5 daNm.

4. Visually inspect that the splining (1) on the camshafts is near the plug housings, if not, rotate the crankshaft through 360°, restore the precise alignment of the pistons, using tools 1860992000, then position tools 1860985000 in the housings of the actual plugs; insert the pin (2) in the splining (1) in the camshafts. The engine is correctly timed under these circumstances.



*Tools 1860985000 can be used as reaction tools to loosen the bolts fixing the rear gears for the camshafts (if they require intervention)*

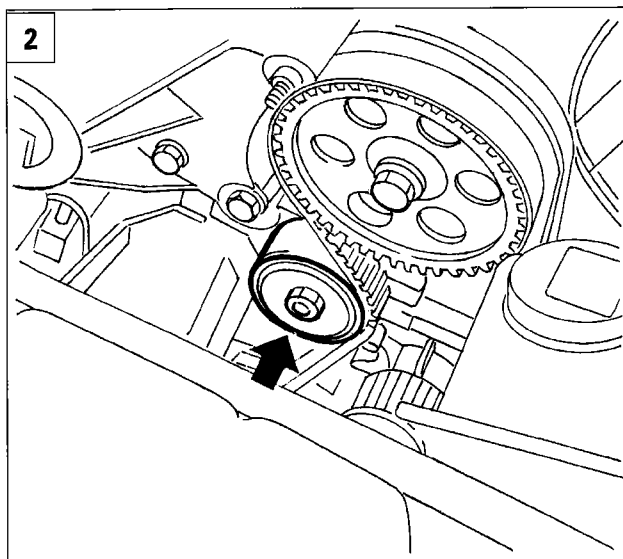


P4A16HX03

1. The timing is checked with the four pistons in line, therefore the crankshaft must be rotated until the reference (1) on the moving element of the tool is in line with the reference (2) on the fixed element in the spark plug housing.

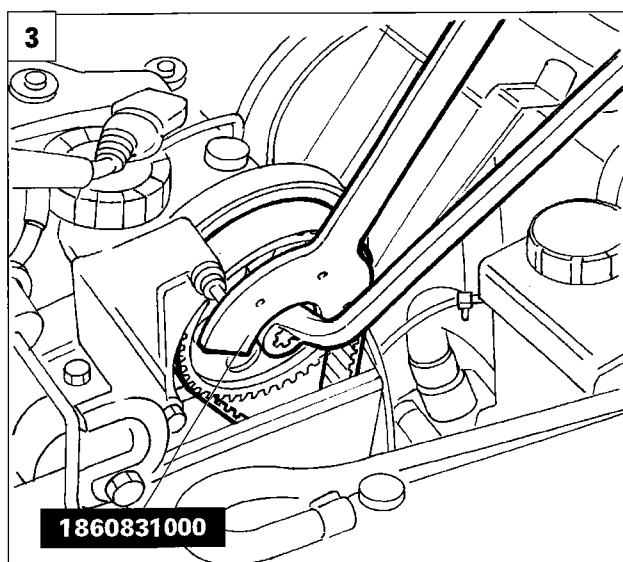
When both tools positioned in the spark plug housings are in this condition, the engine pistons will be in line with one another and the 1st piston will be in the inlet stroke.

**NOTE** The alignment of the pistons is also achieved 180° from the correct position. Once the pistons are in line, check that the pin on the crankshaft gear is approximately opposite the rpm and TDC sensor.



P4A21HX02

2. Loosen the nut fixing the timing drive belt tensioning device, then remove the actual belt.



P4A21HX03

### Fitting and tensioning timing drive belt

3. The camshaft drive pulley is slotted; to facilitate the correct matching of the pulley teeth and the timing belt, loosen the bolt fixing the actual pulley using tool 1860831000.

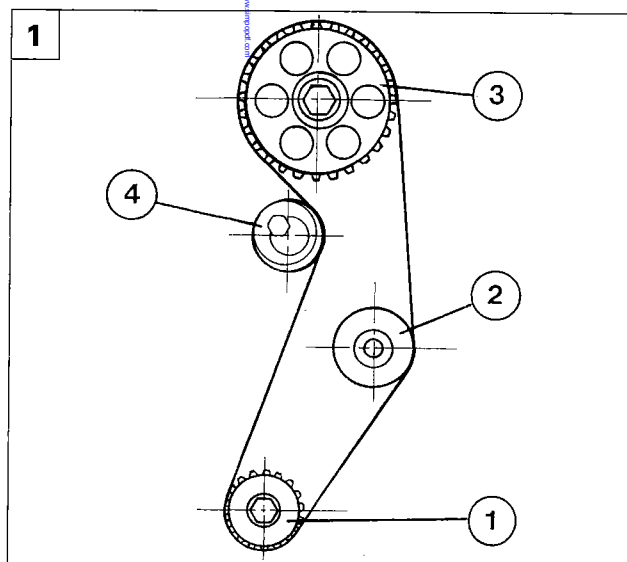


# Engine

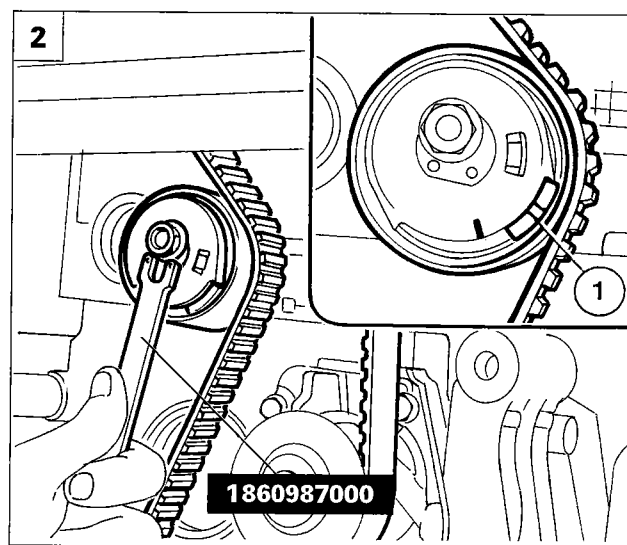
## Replacing timing belt

### 10.

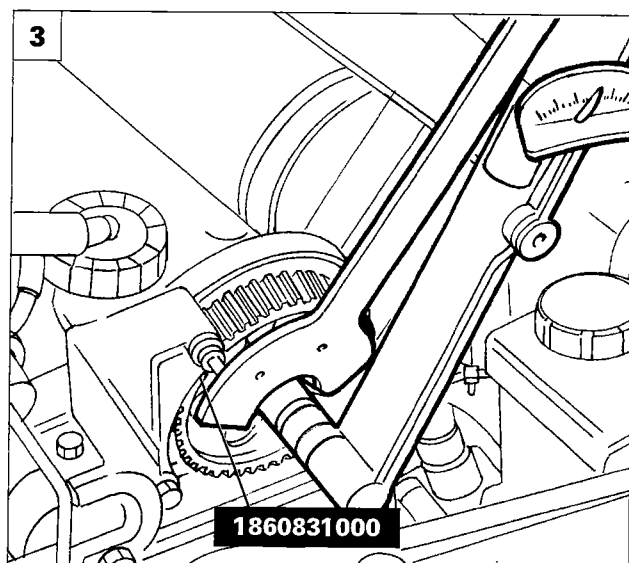
**Bravo-Brava** 1242 16v  
98 range



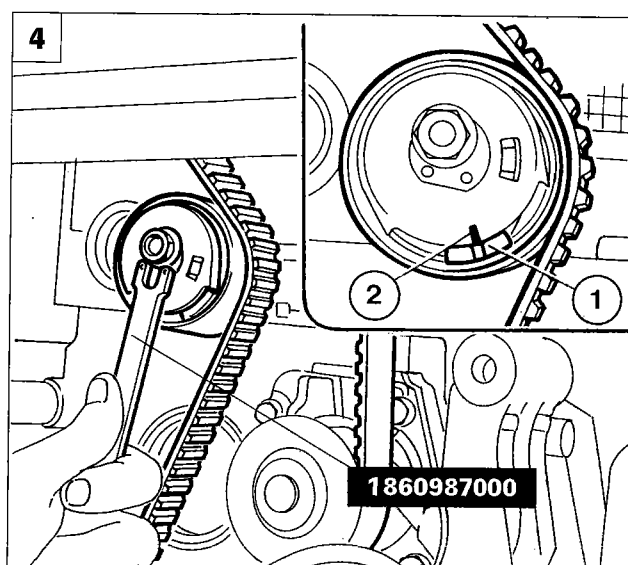
P4A22HX01



P4A22HX02



P4A22HX03

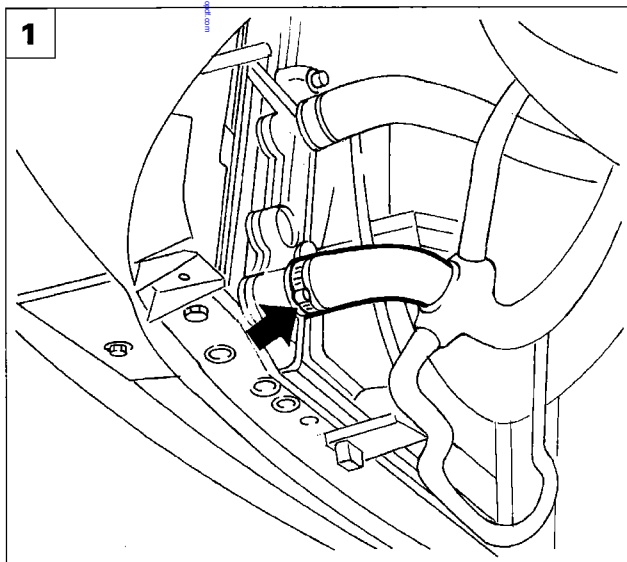


P4A22HX04

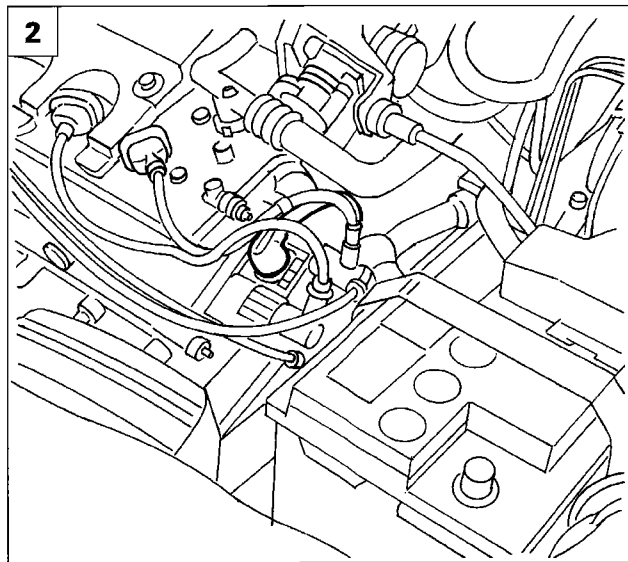
1. Before refitting the timing belt, make sure that the camshafts are timed and secured using tools 1860985000 and that the pistons are aligned, check in the position of the pins for tools 1860992000 as described previously. Then fit the timing drive belt following the order given below:
  1. Crankshaft drive gear
  2. Water pump gear
  3. Timing pulley
  4. Belt tensioner pulley
2. Position tool 1860987000 and, working on it, place the automatic tensioner in the maximum tension position, i.e. with the moving reference (1) as illustrated in the diagram, then lock the nut fixing the tensioner to the support.
3. Using spanner 1860831000, tighten the timing pulley on the inlet side to the recommended torque. Remove the tools positioned previously for timing and locking the camshafts and rotate the crankshaft, in its normal direction of rotation, through two revolutions.
4. Loosen the nut fixing the tensioner and ensure that the moving reference (1) on the tensioner coincides with the fixed reference (2), then tighten the nut fixing the tensioner to the recommended torque. Rotate the crankshaft, in its normal direction of rotation, through a further two revolutions, then reposition the tools for timing the engine illustrated previously and check that the engine is correctly timed.



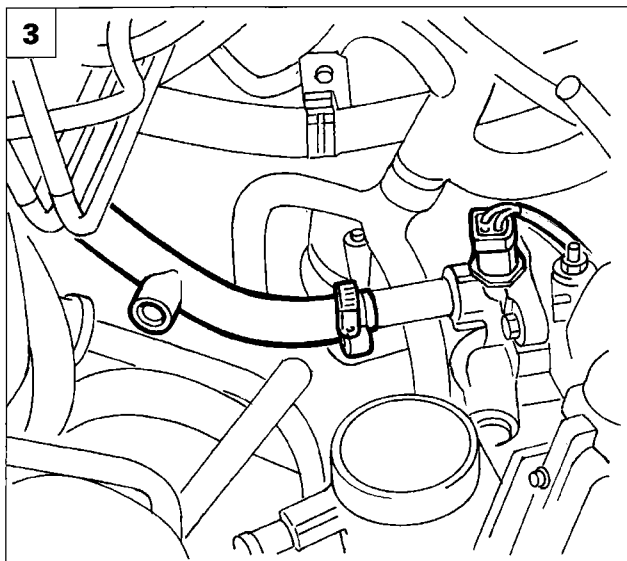
*Fit the remaining components, suitably reversing the order of the operations carried out for the removal.*



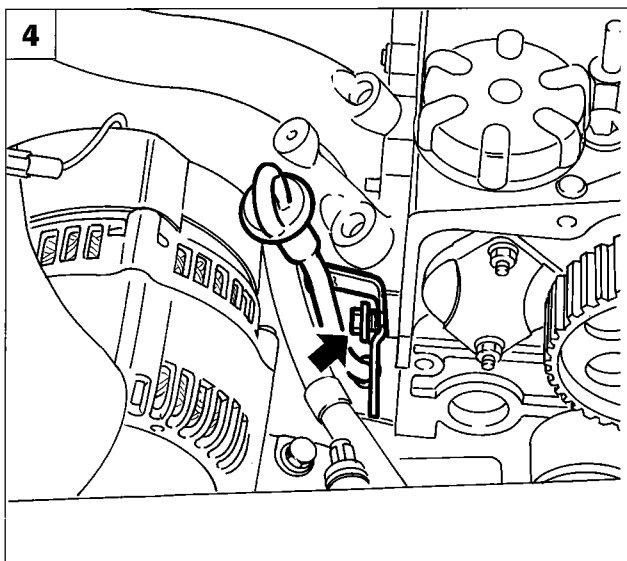
P4A23HX01



P4A23HX02



P4A23HX03



P4A23HX04



### REMOVING-REFITTING CYLINDER HEAD

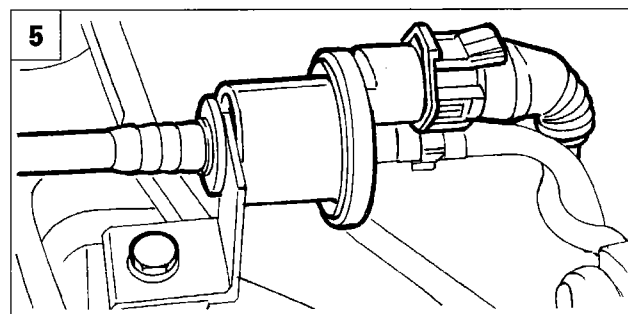
Position the vehicle on a lift, disconnect the negative battery lead, then proceed as described below:

1. Drain the coolant disconnecting the hose shown in the diagram from the lower part of the vehicle



*Remove the timing drive belt following the instructions in the previous paragraph.*

2. Disconnect the connections (1), then remove the ignition coils acting on the fixing nuts and the engine cooling system pipe underneath.
3. Disconnect the heater outlet pipe and the water temperature sensor connection (1).
4. Undo the bolt fixing the oil dipstick mounting bracket to the cylinder head.
5. Disconnect the fuel vapour solenoid valve connection and undo the mounting bracket fixing bolt.



P4A23HX05

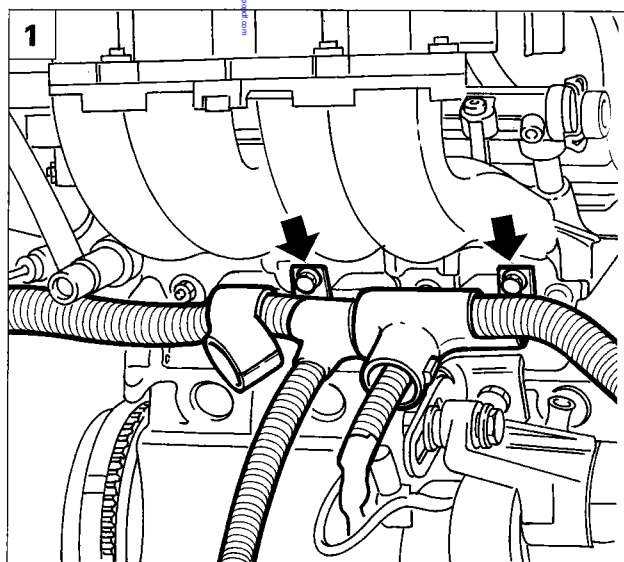


# Engine

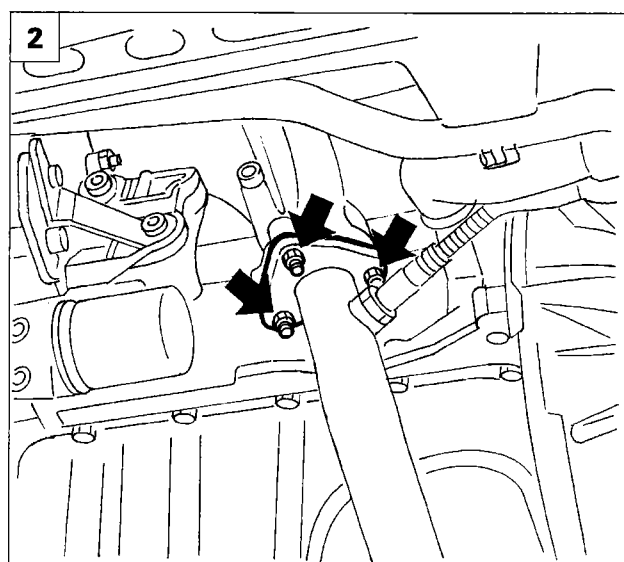
## Removing - Refitting cylinder head

### 10.

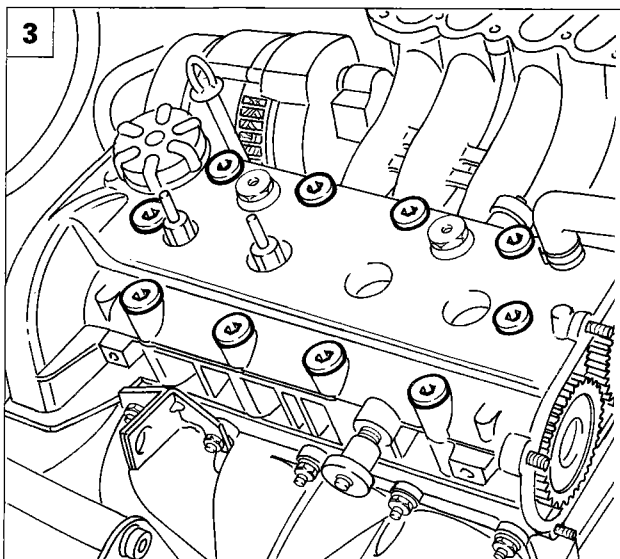
**Bravo-Brava**  16v  
98 range



P4A24HX01



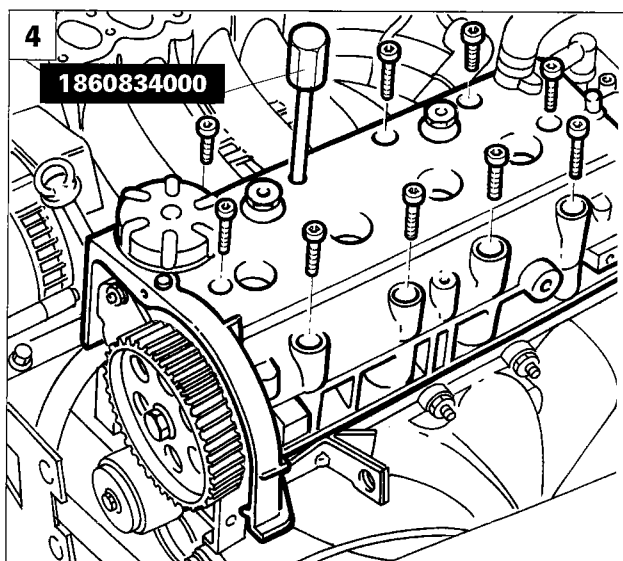
P4A24HX02



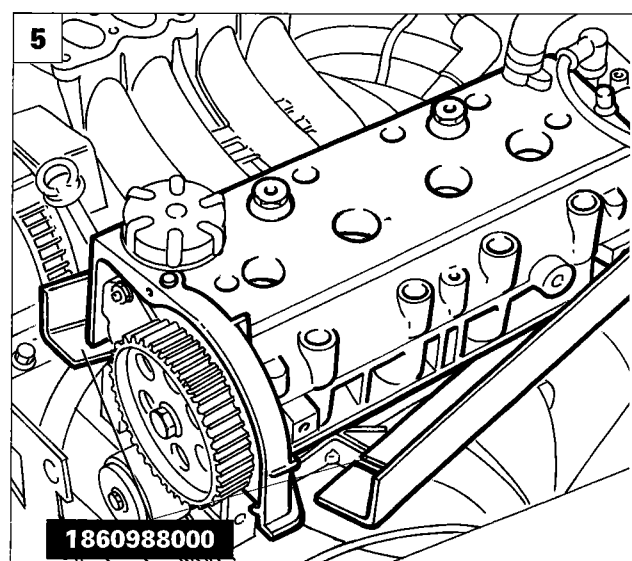
P4A24HX03



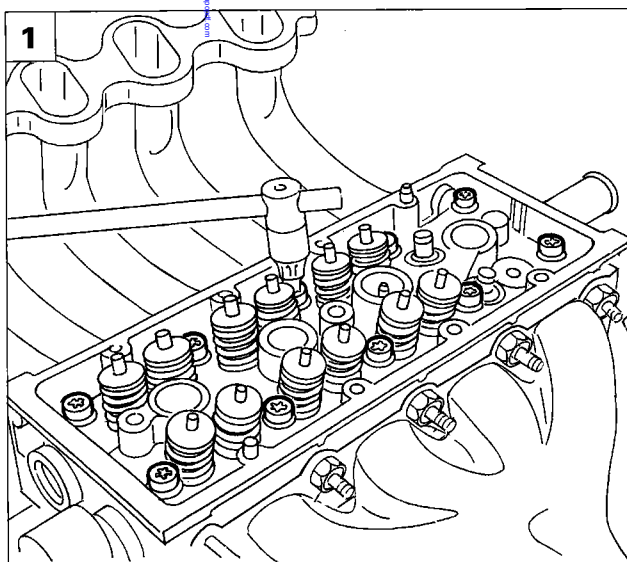
1. Release the injection cables from the lower part of the inlet manifold, undo the bolts fixing the mounting brackets.
2. Undo the nuts fixing the first section of the exhaust pipe to the manifold.
3. Undo the protective plugs for the bolts fixing the camshaft housing to the cylinder head. Also remove the element (1).
4. Using spanner 1860834000, undo the bolts fixing the camshaft housing to the cylinder head.
5. Lift the head, as much as necessary, and position the pair of tools 1860988000 for retaining the tappets, then remove the camshaft housing from the cylinder head, tools 1860992000 and the camshaft housing gasket.



P4A24HX04



P4A24HX05



P4A25HX01

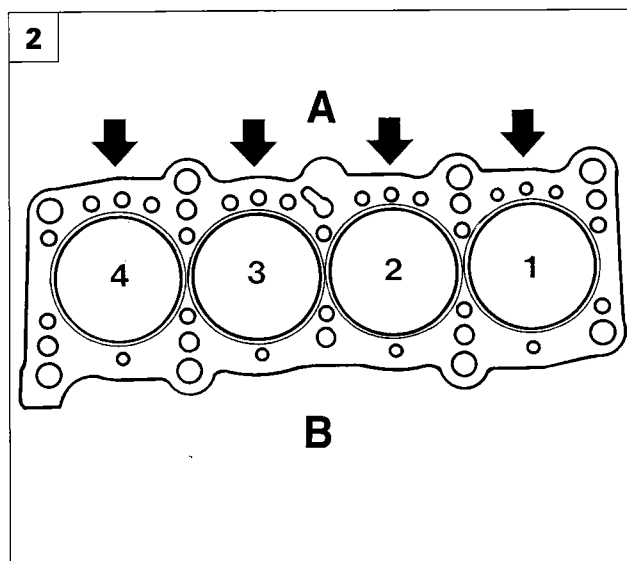
1. Using spanner USAG dia. 10 233 1/2 S or a similar tool, undo the bolts fixing the cylinder head to the cylinder block/crankcase; then remove the cylinder head and the gasket underneath.

#### Fitting cylinder head

2. Fit the gasket on the cylinder block with the word "ALTO" facing the operator, taking care not to get the gasket or the cylinder block plane dirty or covered in lubricant. The openings shown by the arrows have increasing diameters from the 1st to the 4th cylinder so that the engine coolant is distributed evenly throughout the cylinder block/crankcase.

A = exhaust side

B = inlet side



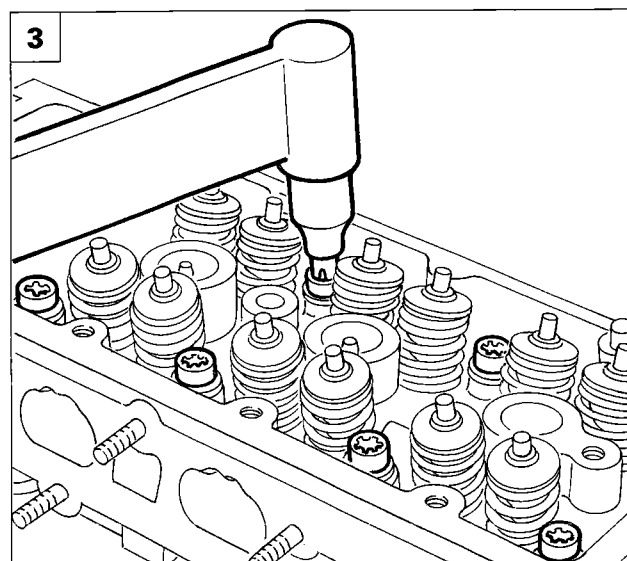
P4A25HX02



*ASTADUR type cylinder head gaskets are used. These gaskets, on account of the special material from which they are made, undergo a polymerization process during the operation of the engine, so that they harden considerably during usage.*

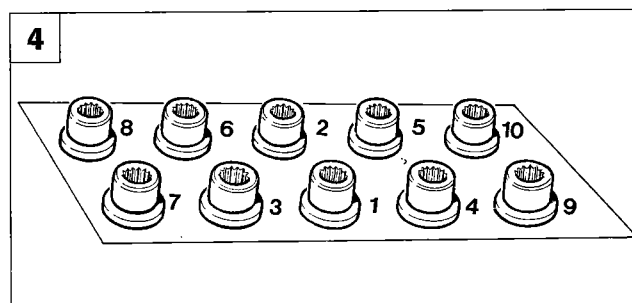
*In order for the polymerization of the cylinder head gaskets to take place it is necessary to:*

- keep the gasket in its sealed nylon container;
- to only take it out of its container shortly before fitting;
- not to lubricate or get oil on the gasket, taking care that the surfaces of the cylinder head and crankcase are clean.



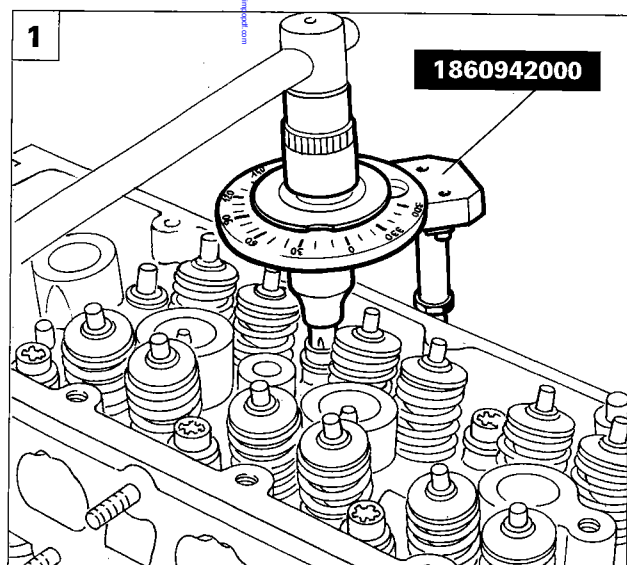
P4A25HX03

- 3-4. Position the cylinder head and tighten the bolts to a torque of 2 daNm following the tightening order illustrated in the diagram.

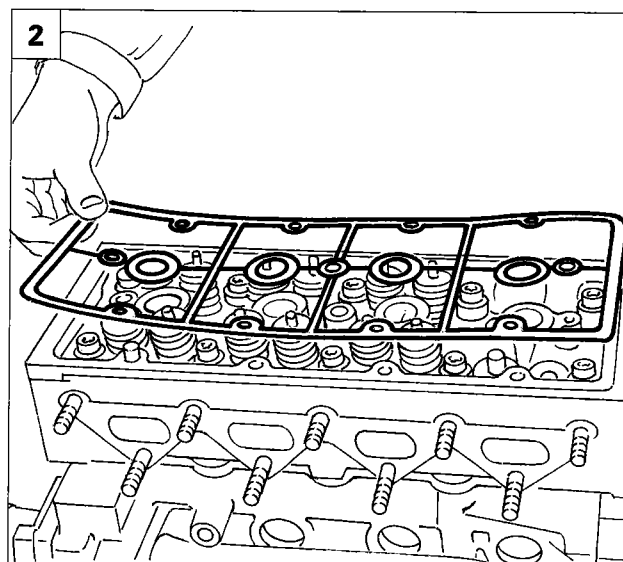


P4A25HX04

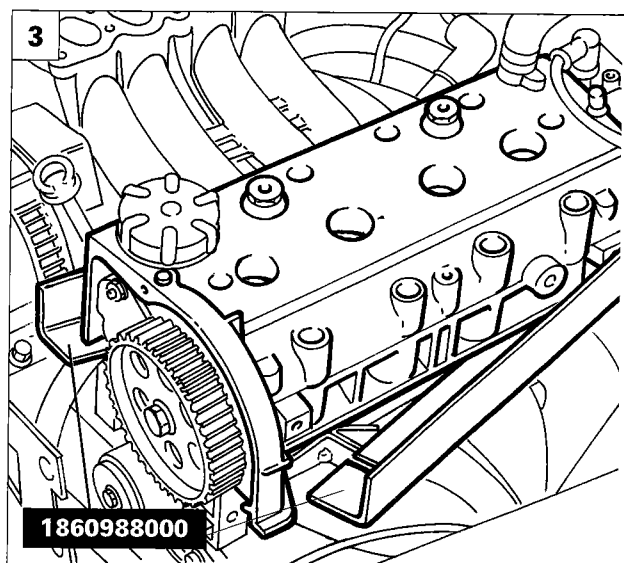
10.



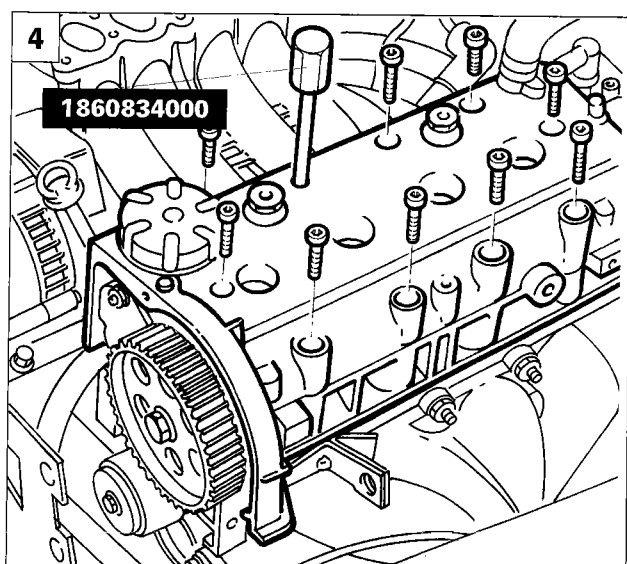
P4A26HX01



P4A26HX02



P4A24HX05



P4A24HX04

1. Tightening the bolts fixing the cylinder head to the cylinder block/crankcase:

1st STAGE: Tighten the bolts to a torque of 3 daNm, following the order illustrated previously.

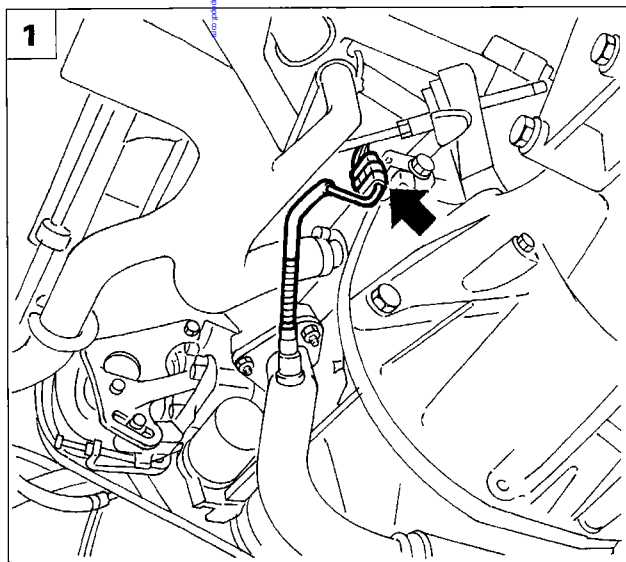
2nd STAGE: Tighten the bolts through 90° using tool 1860942000.

3rd STAGE: Further tighten all the bolts through 90°.

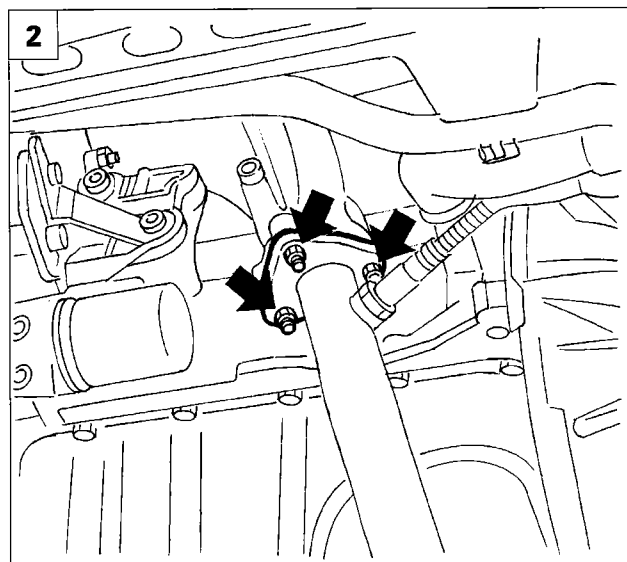
2. Position the gasket for the camshaft housing on the cylinder head support surface.
3. Position the camshaft housing in cylinder head, then remove the tappet retaining tools 1860988000.
4. Using spanner 1860834000, tighten the bolts fixing the camshaft housing to the cylinder head to the recommended torque; then position the protective plugs for the actual bolts.



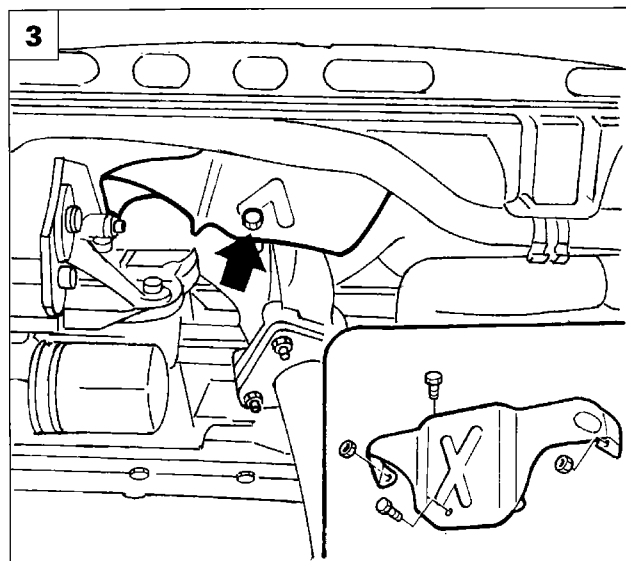
*Proceed with refitting the remaining components, reversing the order described for the removal. To refit the timing belt, refer to the previous paragraph.*



P4A27HX01



P4A24HX02



P4A19HX02



**REMOVING-REFITTING EXHAUST MAN-IFOLD**

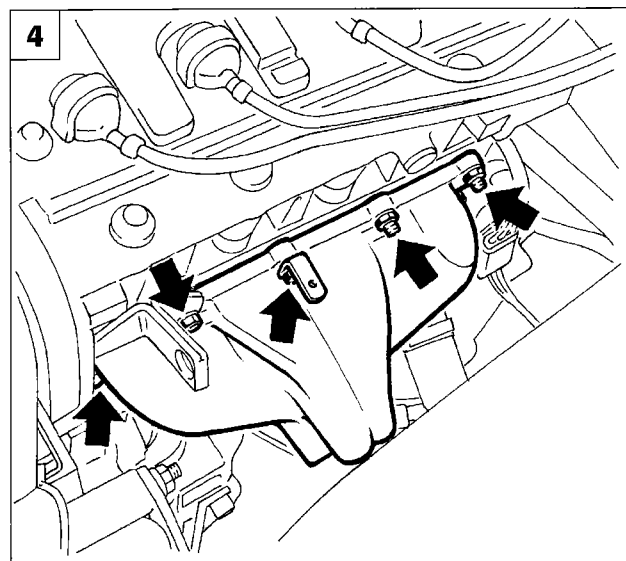


1. Disconnect the Lambda sensor connector.

2. Undo the nuts fixing the first section of the exhaust pipe to the manifold.

3. Undo the heat shield fixings and remove it.

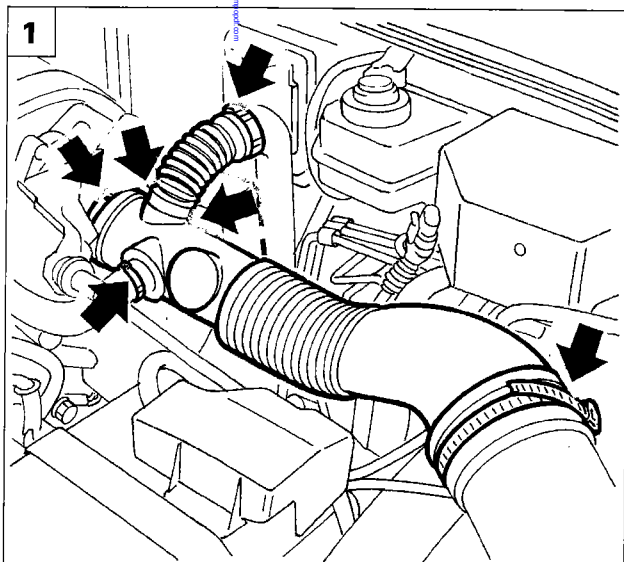
4. Undo the nuts fixing the exhaust manifold and remove it complete with the gasket underneath.



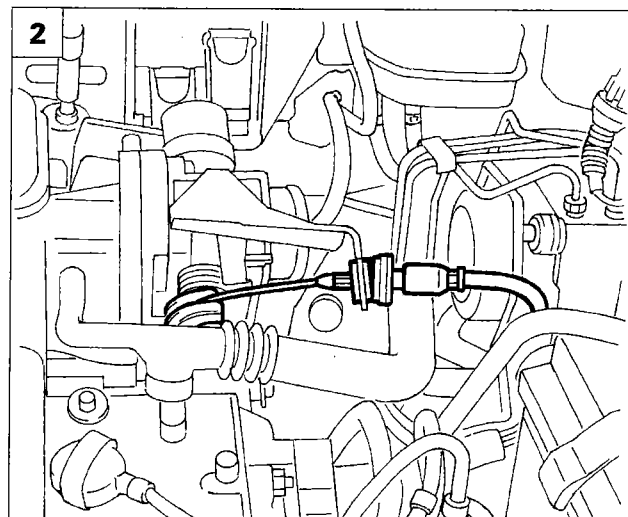
P4A27HX02



### 10.



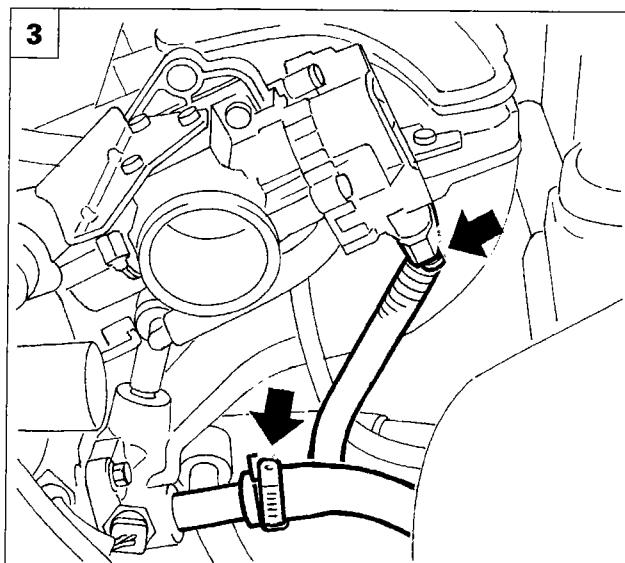
P4A18HX01



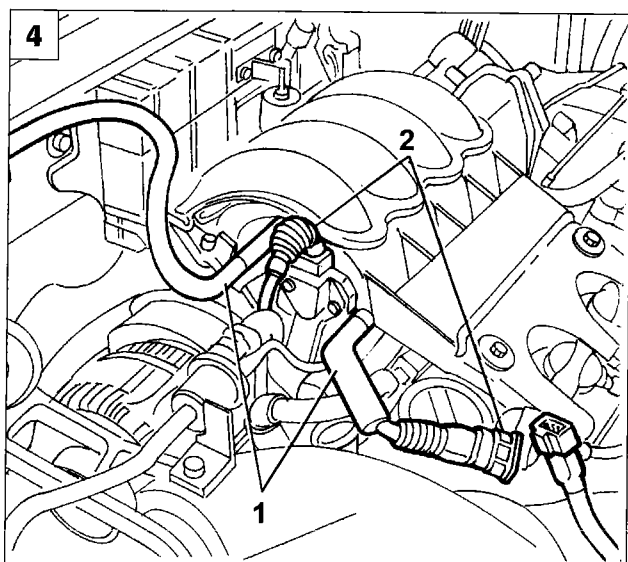
P4A18HX02

### REMOVING-REFITTING INLET MANIFOLD

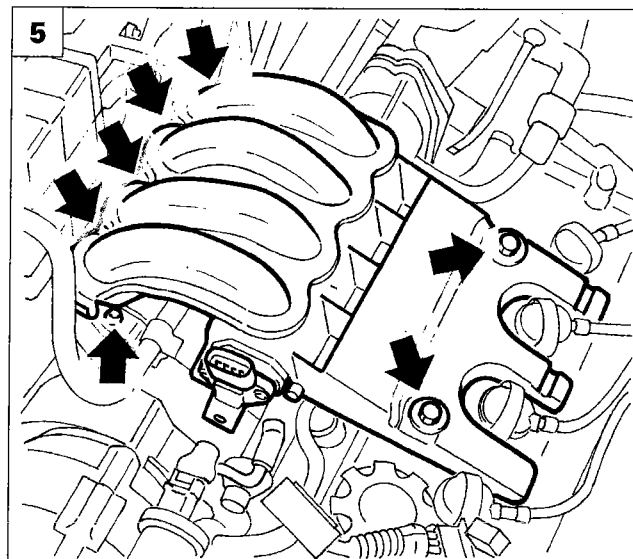
1. Remove the resonator complete with air inlet hose disconnecting the bands shown and undoing the fixing bolts. Also disconnect the oil vapour recovery pipe from the lower part of the resonator.
2. Disconnect the accelerator cable
3. Disconnect the connections shown and the brake servo vacuum pipe from the butterfly casing.
4. Disconnect the pipes (1) and the connections (2) from the top part of the inlet manifold.
5. Remove the fixing bolts for the top part of the inlet manifold using a USAG TX 27 spanner or similar tool, disconnect the oil vapour recovery pipe (1) and remove the manifold from the vehicle complete with butterfly casing.



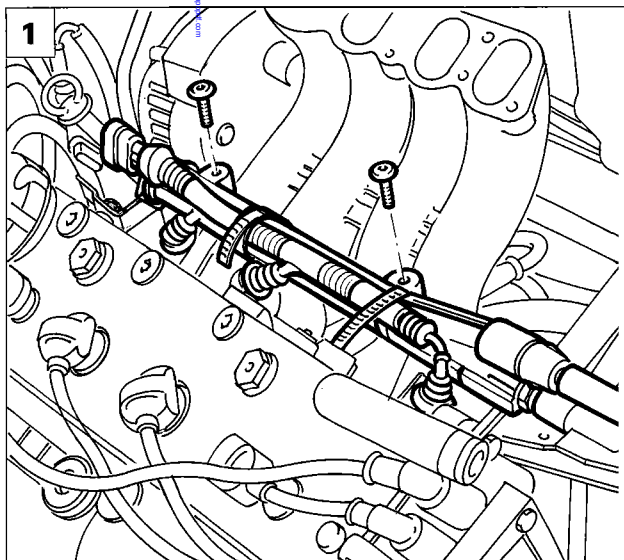
P4A18HX03



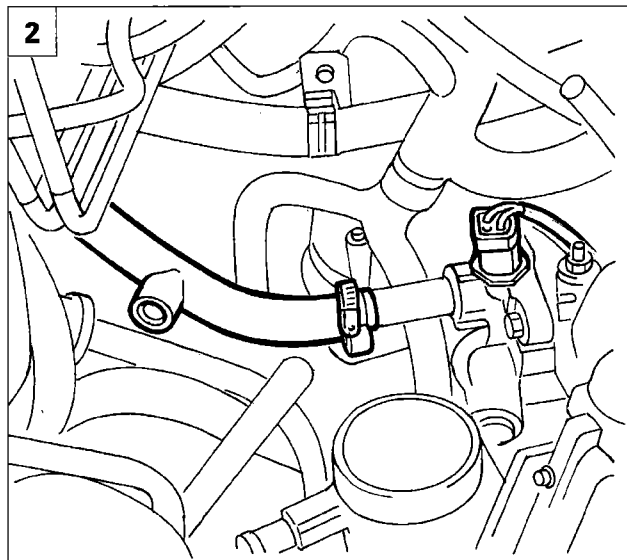
P4A18HX04



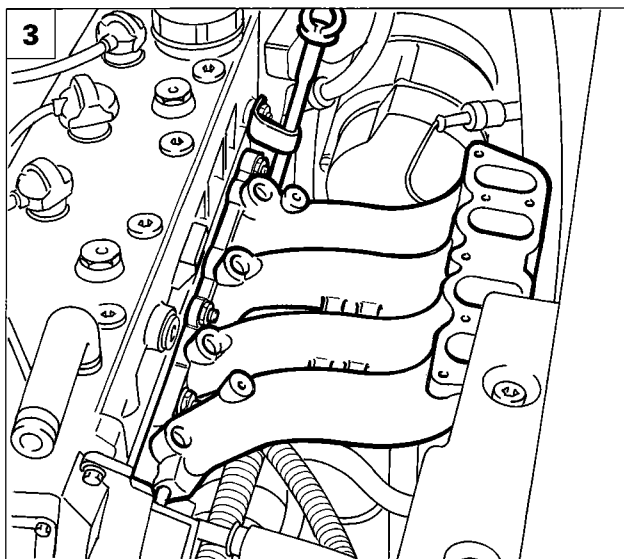
P4A18HX05



P4A19HX01



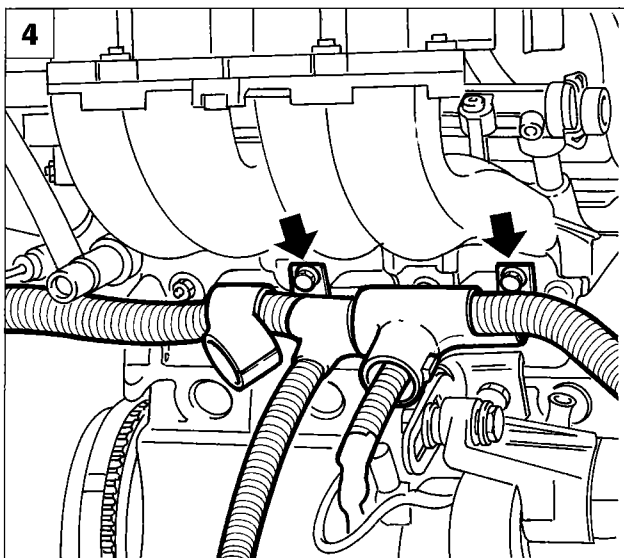
P4A23HX03



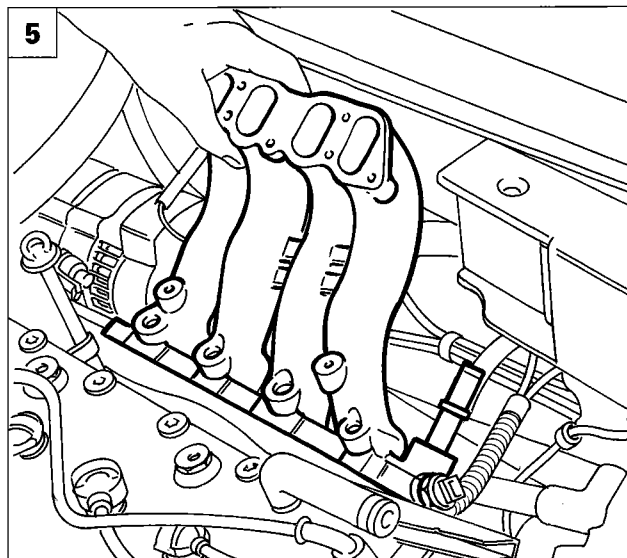
P4A29HX03



1. Undo the bolts fixing the fuel manifold, remove it complete with injectors and position it at the side of the work area.
2. Disconnect the heater outlet pipe and the connection (1).
3. Undo the nuts fixing the inlet manifold and release the engine oil dipstick from the mounting bracket.
4. Gently extract the inlet manifold and release the injection cables from the rear part, acting on the bolts fixing the mounting brackets.
5. Then extract the lower part of the inlet manifold.



P4A24HX01



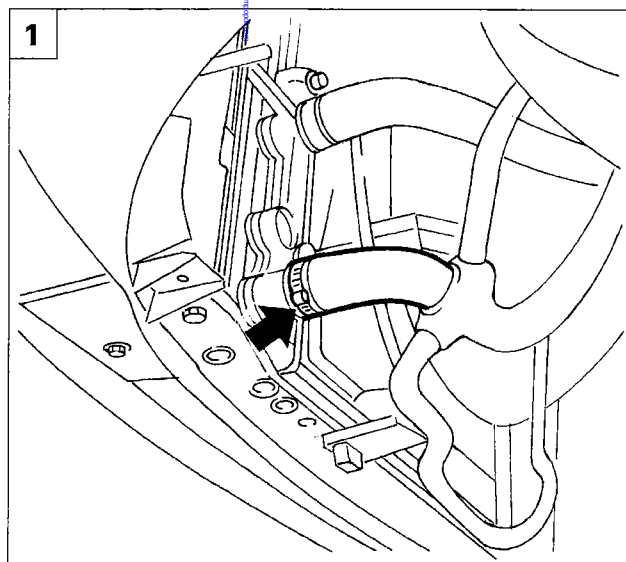
P4A29HX05

# Engine

## Removing - Refitting water pump

### 10.

**Bravo-Brava**  16v  
98 range



P4A23HX01

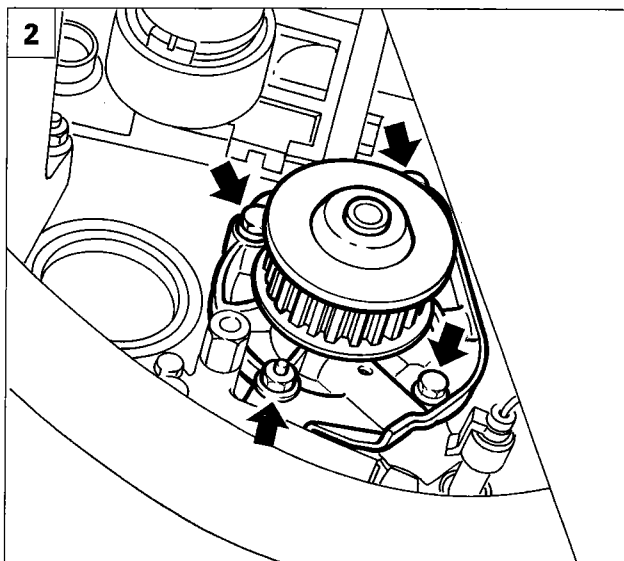


#### REMOVING-REFITTING WATER PUMP

1. Position the vehicle on a lift, disconnect the negative battery lead, then drain the coolant disconnecting the hose shown from the lower part of the radiator.



*Remove the timing drive belt as described in the previous paragraphs.*

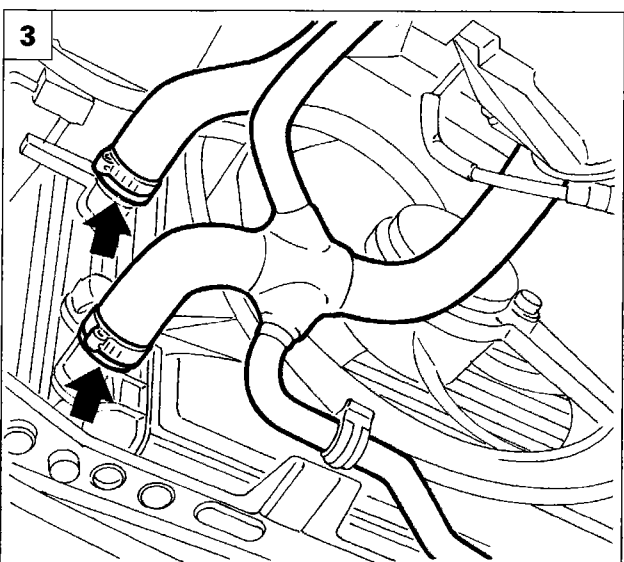


P4A30HX02

2. Remove the water pump acting on the fixings shown in the diagram.



*Refit the components removed previously and tension the timing belt as described in the previous paragraphs.*



P4A30HX03

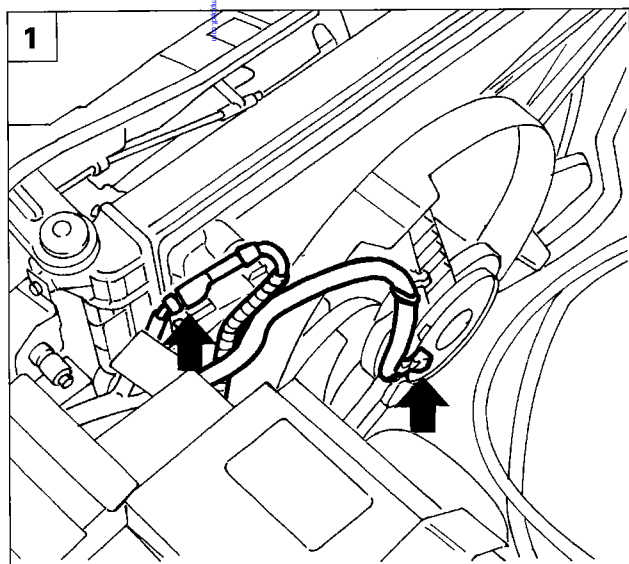


#### REMOVING-REFITTING RADIATOR

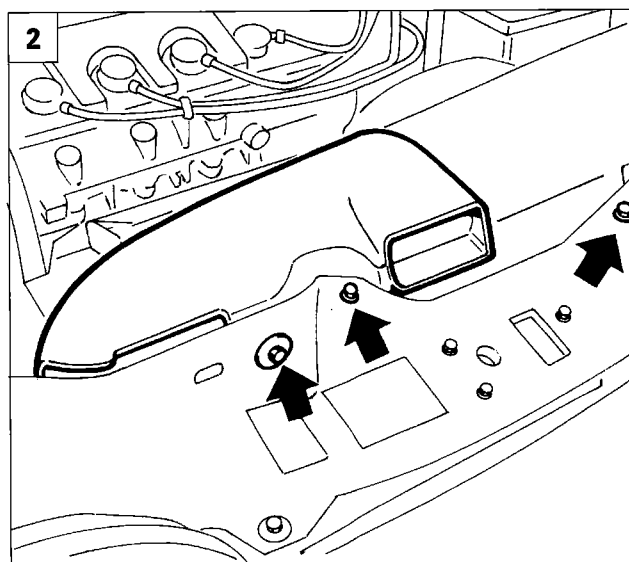
Position the vehicle on a lift, disconnect the negative battery lead, then proceed as described below:

3. Drain the coolant, disconnecting the pipes shown in the diagram.

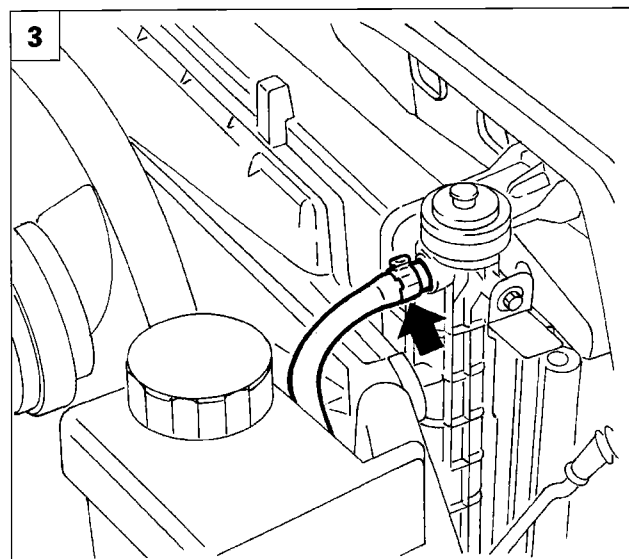




P4A31HX01



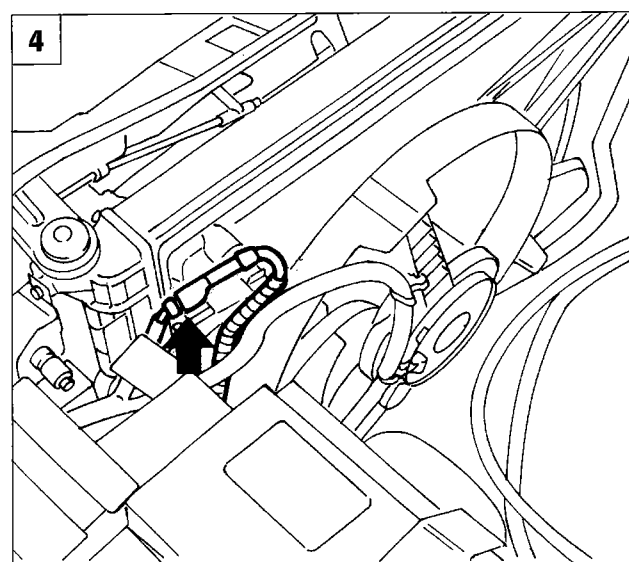
P4A31HX02



P4A31HX03



1. Disconnect the fan supply connections.
2. Undo the three bolts and remove the air intake disconnecting it from the air filter hose.
3. Open the band and disconnect the pipe between the radiator and the tank.
4. Remove the engine cooling fan, undoing the fixing bolts, then undo the bolts fixing the radiator to the condenser and to the bodyshell and extract the radiator upwards.



P4A31HX04

# 10.

## PROCEDURE FOR REFILLING THE ENGINE COOLING SYSTEM (version with heater)

System total capacity: 4.67 litres

### Instructions for draining the circuit

If necessary, the system should be drained as follows:

1. Remove the expansion tank cap (3) and open the bleed valve (5) on the radiator, the bleed valve (6) on the heater inlet hose and the bleed valve (7) on the heater outlet hose.
2. Disconnect the coolant return pipe from the radiator (12) and recover the engine coolant which comes out in a special container. When the operation is completed, restore the pipe connection (12) with the radiator, using a new band.

### Instructions for refilling the circuit

1. Check that the bleed valve (5) on the radiator, the bleed valve (6) on the heater inlet hose and the bleed valve (7) on the heater outlet hose are open.
2. Fill the system slowly introducing coolant (a mixture of 50% water and paraflu), until coolant comes out of the bleed valve (5) on the radiator, then close it.  
Continue filling until coolant comes out of the bleed valve (6) on the heater inlet hose (at this point coolant will not come out of the bleed valve (7) on the heater outlet hose and the level in the expansion tank should exceed the MAX mark). Then close the bleed valves (6) and (7) and the plug on the expansion tank (3).
3. Working from inside the vehicle, set the heating at maximum, turning the air temperature adjustment knob to the maximum (red) setting and the fan speed adjustment knob to the maximum ventilation position.
4. Start up the engine and keep it idling for about 2-3 minutes. Partly open (2 - 3 threads) the bleed screw (7) on the heater outlet hose in order to bleed the heater completely, slowly increase the engine speed until coolant comes out of this bleed screw, then close it.
5. Then carry out gradual, periodic accelerations (about every 30 seconds) to 3/4 of the maximum power. During this operation, check the engine coolant temperature gauge and check that hot air is coming out of the air vents; if this is not the case, loosen the bleed screw (7) and repeat the procedure described in point 4.

This operation should be carried out until the engine cooling fan comes on for the first time.

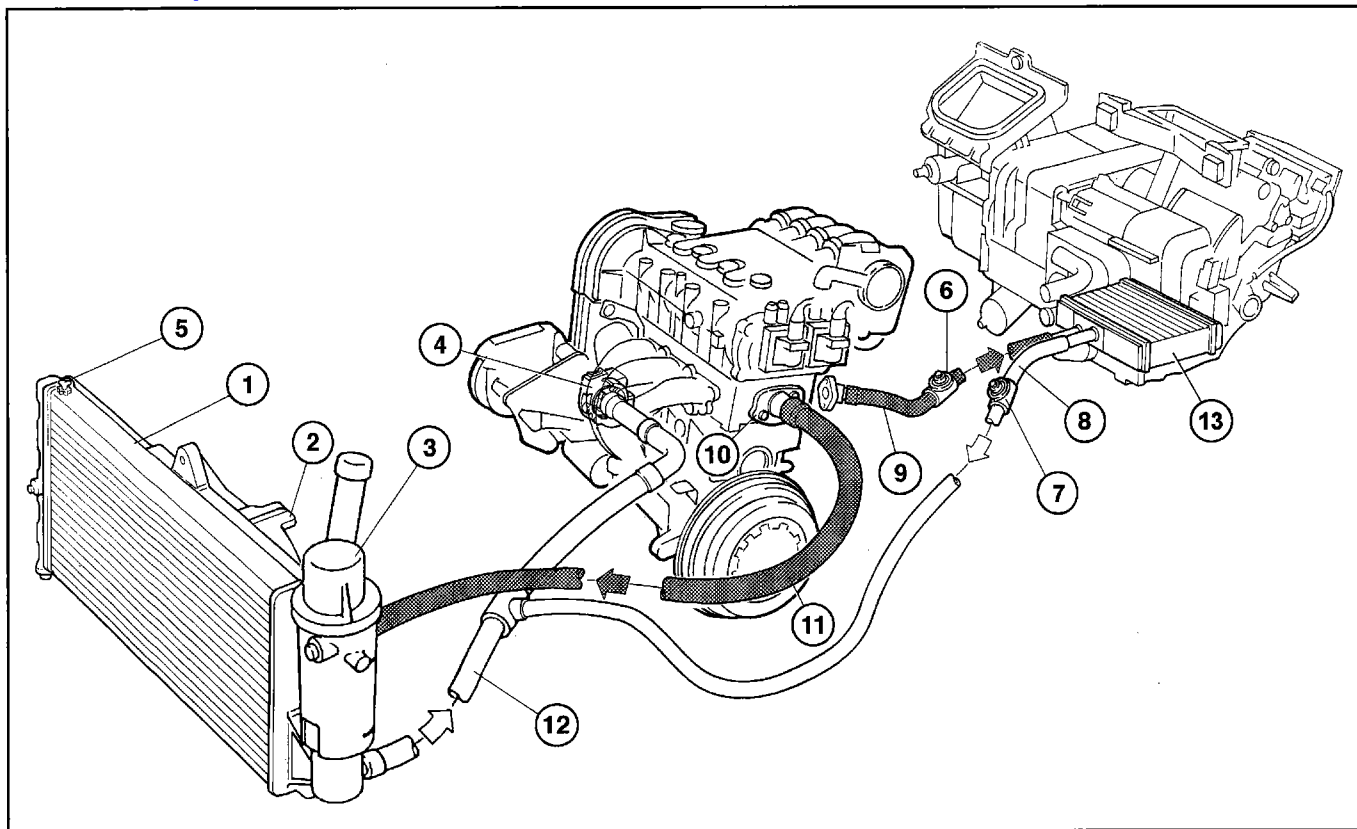
Let the engine idle again, undo the bleed screw (5) on the radiator carefully, on account of the high temperature of the coolant, to allow the escape of any residual air.

Slowly increase the engine speed until coolant comes out of the bleed screw (5); retighten the bleed screw (5) and let the engine idle once again. Keep the engine idling for at least 5 minutes. Switch off the engine and wait until it cools down. The coolant level, when cold, should settle down to between the two MIN and MAX reference marks on the expansion tank.

When the operation is completed, check that the quantity of fluid introduced is at least the same as or more than that recovered when draining the system.

**NOTE** *If the coolant should boil during the operations described in point 5, the procedure should be halted and repeated starting from the operation described in point 4.*

Engine cooling system components (version with heater)



4A33HX01

1. Engine cooling radiator
2. Engine cooling fan
3. Coolant expansion tank
4. Engine cooling system pump
5. Bleed cock on radiator
6. Bleed plug on heater inlet pipe
7. Bleed plug on heater outlet pipe
8. Coolant return pipe from car interior heater radiator to engine cooling radiator
9. Coolant supply pipe to car interior heater radiator
10. Coolant by-pass thermostat
11. Coolant supply pipe from thermostat to engine cooling radiator
12. Coolant return pipe from radiator to pump
13. Car interior heater radiator

### 10.

#### PROCEDURE FOR REFILLING ENGINE COOLING SYSTEM (version with air conditioning)

Total capacity of system: 4.45 litres

##### Method for draining the circuit

The system can, if necessary, be drained as follows:

1. Remove the cap from the expansion tank (3) and open the bleed screw (5) on the heater inlet hose and the bleed screw (6) on the heater outlet hose.
2. Disconnect the coolant return pipe (11) from the radiator and recover the engine coolant which comes out in a suitable container. When this operation is completed, restore the connection for the pipe (11) with the radiator, using a new band.

##### Method for refilling the circuit

1. Check that the bleed screw (5) on the heater inlet hose and the bleed screw (6) on the heater outlet hose are open.
2. Refill the system by slowly introducing coolant (a mixture of 50% water and paraflu) until coolant comes out of the bleed screw (5) on the heater inlet hose and the bleed screw (6) on the coolant outlet hose. Then close bleed fittings (5) and (6).

Complete the refilling until the MAX reference on the expansion tank (3) is reached. Then refit the cap on the tank (3).

3. Working from inside the vehicle, set the maximum heating condition, turning the air temperature adjustment knob to the maximum temperature position (red sector) and the fan speed adjustment knob to the maximum ventilation position and switch the air conditioning OFF.
4. Start up the engine and let it idle for about 2-3 minutes. Partly (2-3 threads) open the bleed screw (6) on the heater return hose in order to completely bleed the heater, slowly increase the engine speed until coolant comes out of the above mentioned bleed screw, then close it again.
5. Then carry out gradual, periodic accelerations (about every 30 seconds) until 3/4 of the maximum power speed is reached, at the same time introducing engine coolant into the expansion tank, but not beyond the MAX level. During this operation, check the engine coolant temperature gauge and make sure that hot air is coming out of the vents; if this is not the case, repeat the operations described in point 4.

This operation should be carried out until the engine cooling fan comes on for the first time.

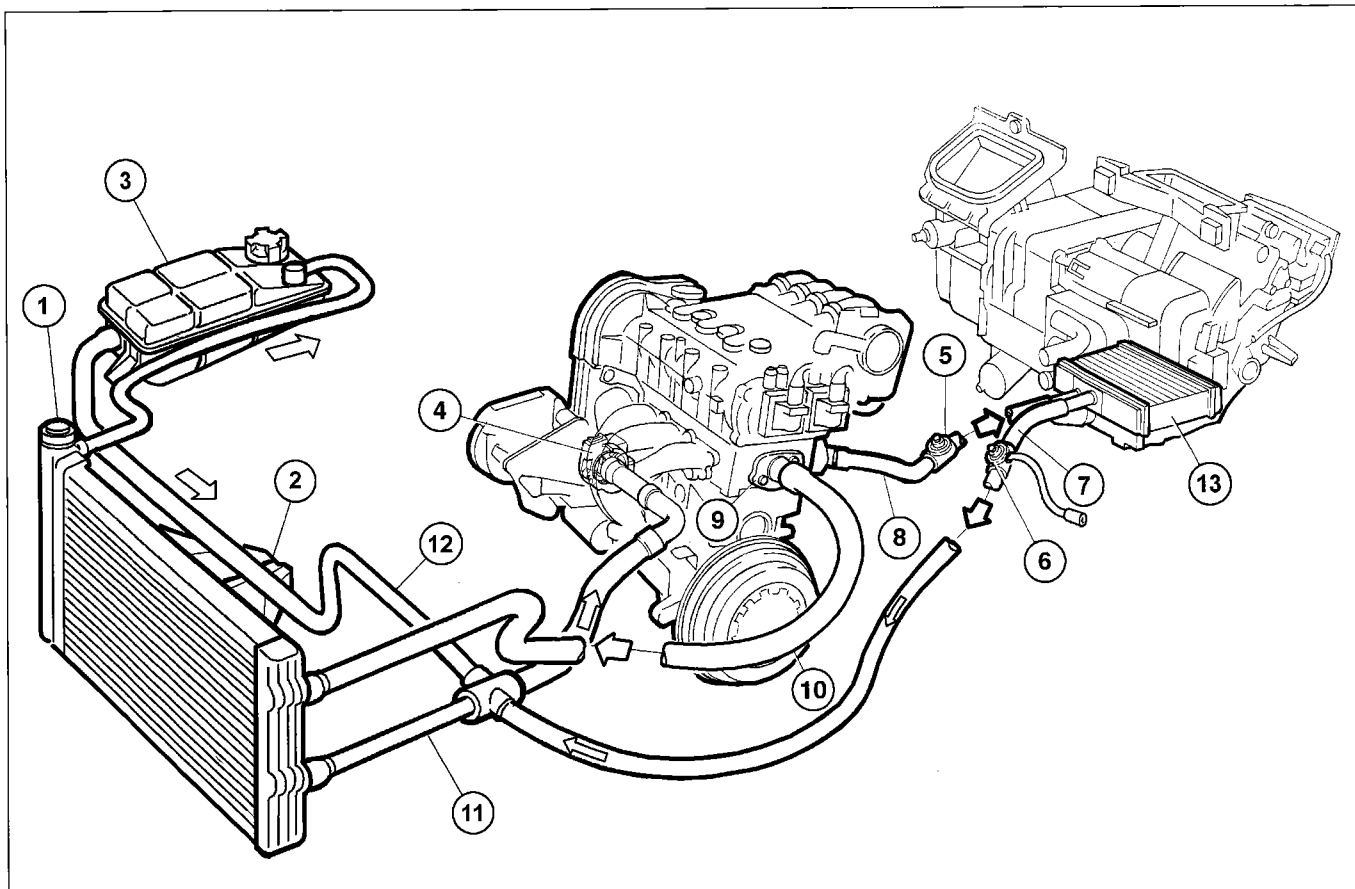
Let the engine idle for at least 5 minutes, then switch it off.

If necessary, top up until the level is between the MIN and MAX marks on the expansion tank. This operation should be carried out after having left the engine too cool down so that the temperature of the coolant is not above 25°C.

When the operation is completed, check that the quantity of fluid introduced is at least equal to that recovered when the system was drained.

**NOTE** *If, during the operations described in point 5, the coolant should boil, the procedure should be interrupted and repeated starting from the operation described in point 4.*

**Engine cooling system components (version with air conditioning)**



P4A35HX01

1. Engine cooling radiator
2. Engine cooling fan
3. Expansion tank
4. Water pump
5. Bleed plug on heater inlet hose
6. Bleed plug on heater outlet hose
7. Coolant return pipe from car interior heater radiator to cooling radiator
8. Coolant supply pipe to car interior heater radiator
9. Coolant by-pass thermostat
10. Coolant supply pipe from thermostat to engine cooling radiator
11. Coolant return pipe from radiator to pump
12. Connecting pipes from radiator to expansion tank
13. Car interior heater radiator



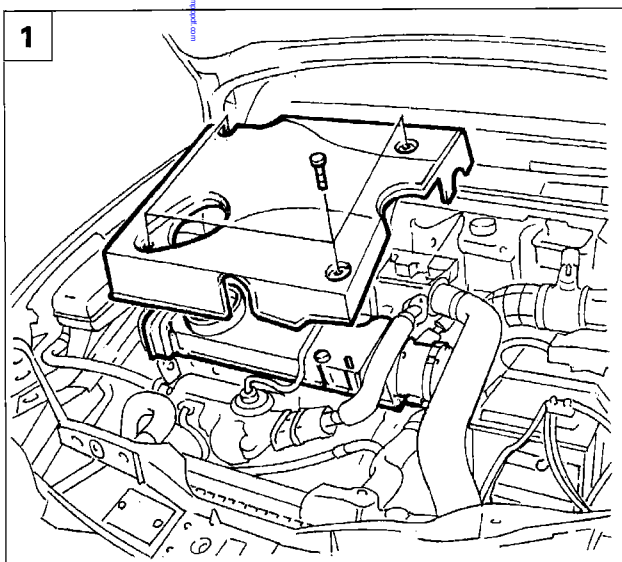
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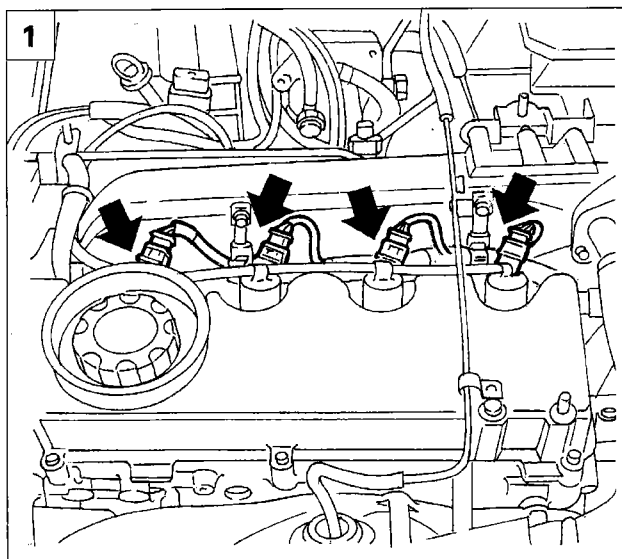
## REMOVING - REFITTING INJECTORS

Disable the alarm (if fitted) via the switch under the junction unit cover and disconnect the negative battery lead.

1. Undo the bolts and remove the upper engine protective cover.



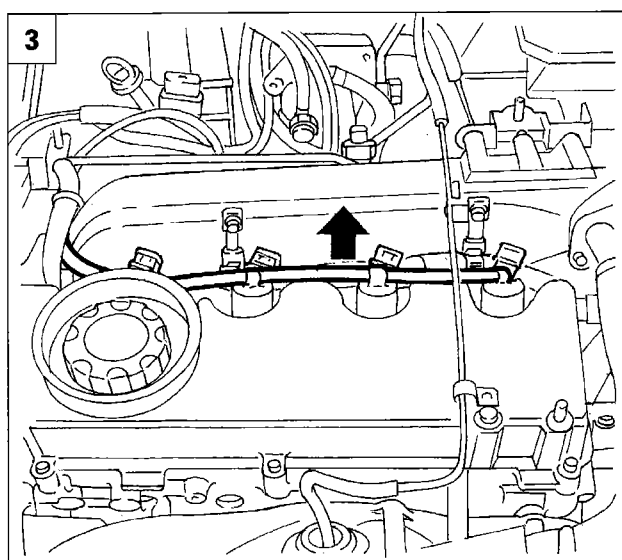
P4A27KJ01



P4A27KJ02



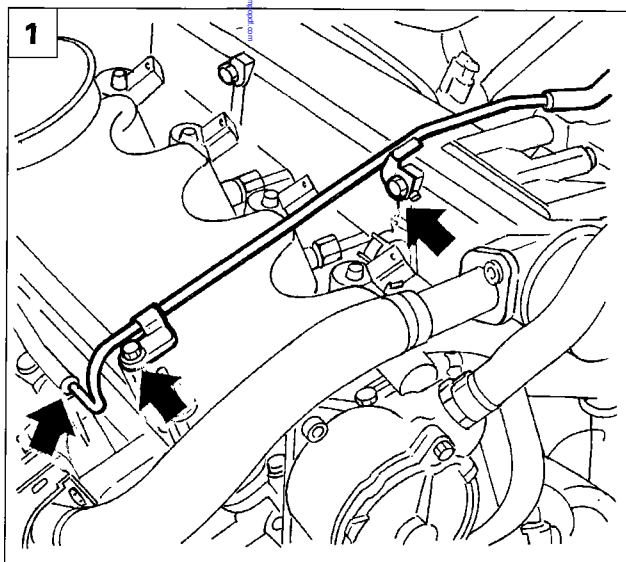
2. Disconnect the electrical connections from the injectors



P4A27KJ03

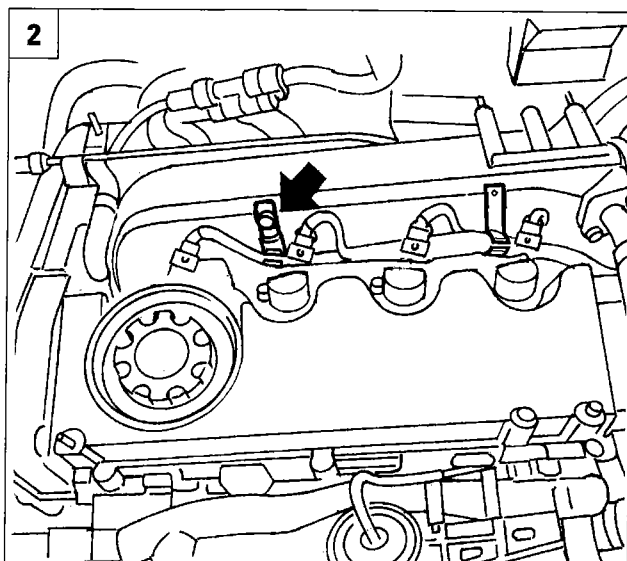
3. Disconnect the fuel return pipe from the injectors.

### 10.



P4A28KJ02

1. Remove the rigid pipe between the E.G.R. valve and the solenoid valve acting on the fixing nuts and releasing the ends of the connector pipes.

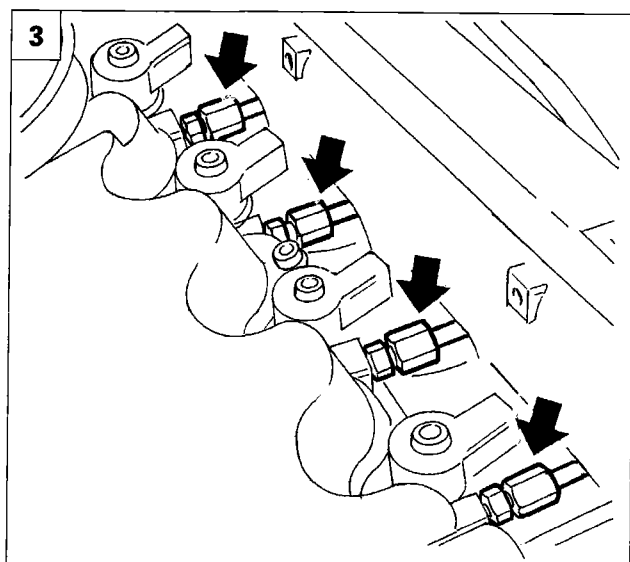


P4A28KJ03

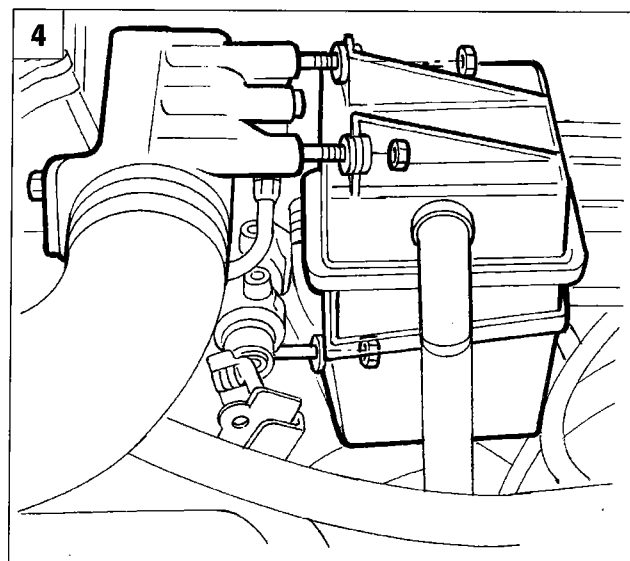
2. Remove the two injector cable loom retaining springs undoing the fixing nut shown in the diagram and place the wiring at the side.

3. Loosen the injector side connectors for the pipes between the injectors and the distribution manifold.

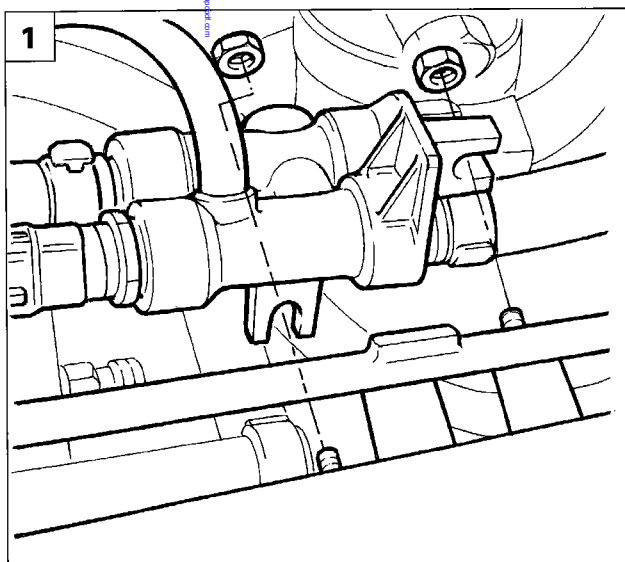
4. Move the oil vapour separator aside, undoing the three fixing nuts.



P4A28KJ04

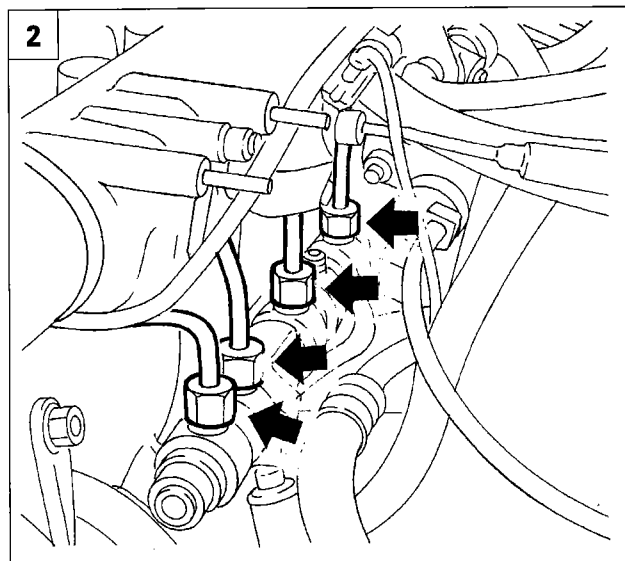


P4A28KJ05



P4A29KJ01

1. Remove the return manifold loosening the two fixing nuts.

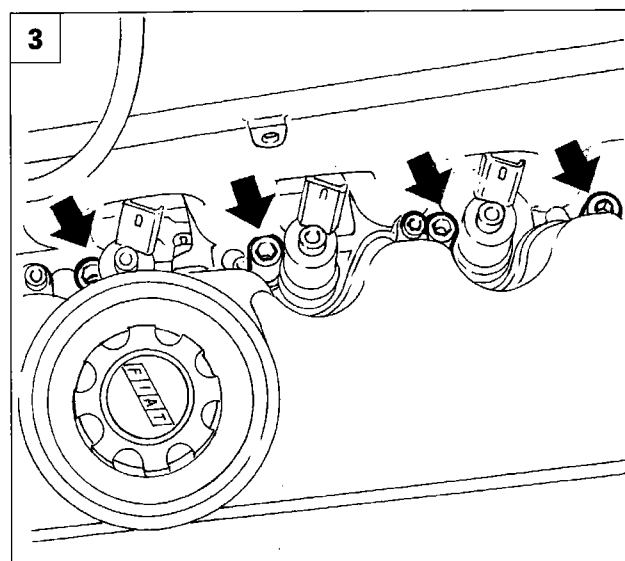


P4A29KJ02



**2 daNm**

2. Undo the manifold side connectors for the pipes from the distribution manifold to the injectors and remove them.

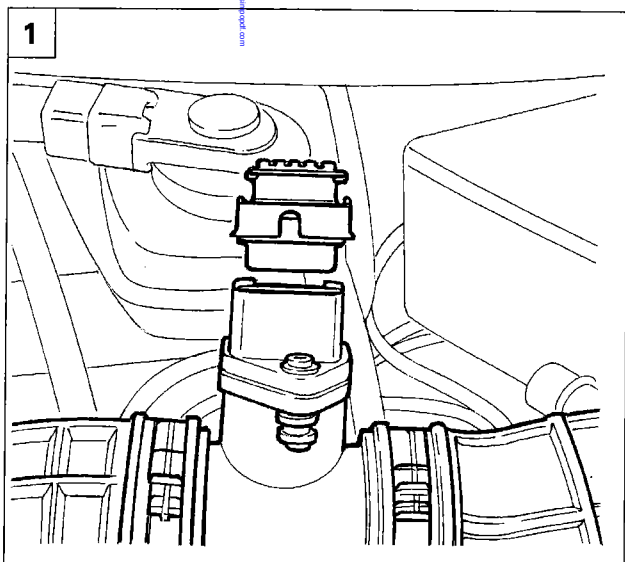


P4A29KJ03

3. Undo the fixing nuts and remove firstly the bracket and then the injectors.

**NOTE** When refitting, reverse the order of the operations described above, tightening the connectors between the return manifold and the injectors to the recommended torque of 20 daNm

## 10.

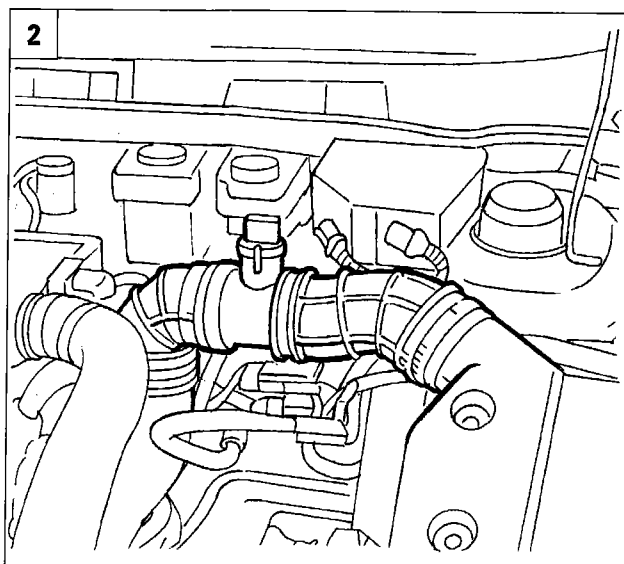


P4A30KJ03

### REMOVING-REFITTING DISTRIBUTION MANIFOLD

- Disable the alarm (if fitted) via the switch under the junction unit cover.
- Disconnect the terminals and remove the battery.

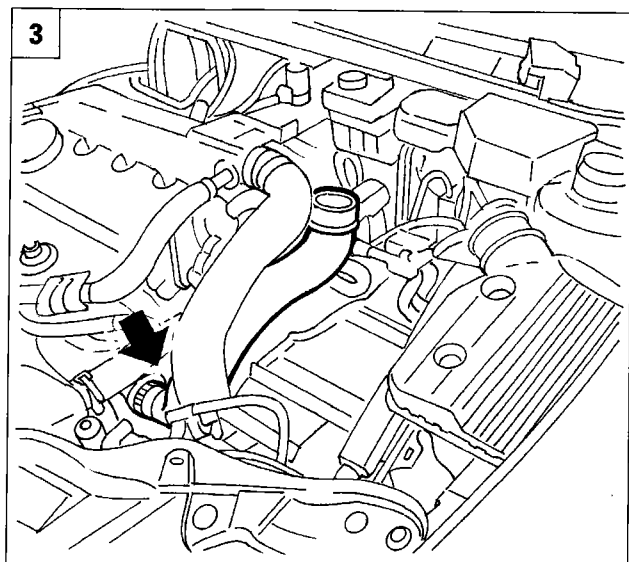
1. Disconnect the electrical connection for the flow meter.



P4A30KJ04

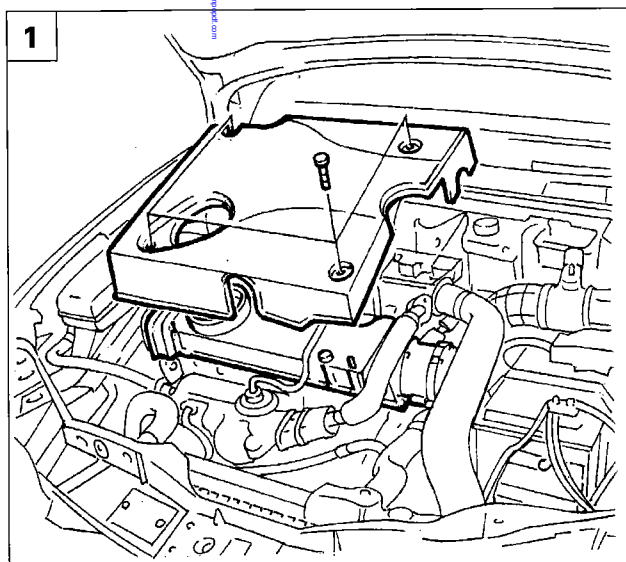


2. Loosen the bands and remove the first section of the pipe between the air filter casing and the turbocharger.



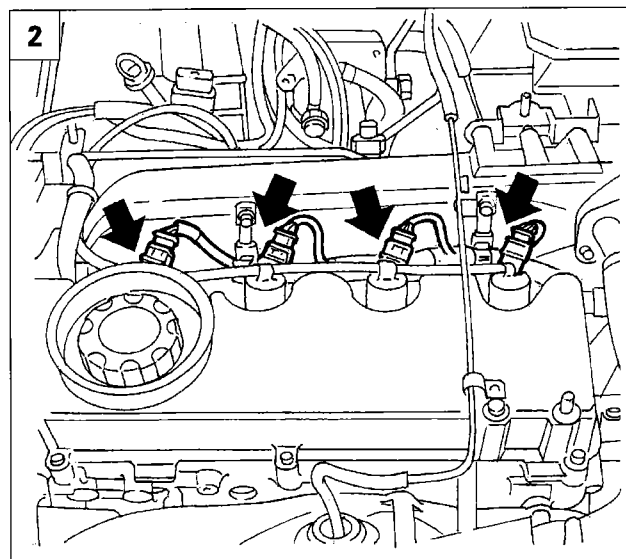
P4A30KJ05

3. Loosen the bands and remove the second section of the pipe between the air filter casing and the turbocharger.



P4A27KJ01

1. Undo the bolts and remove the upper engine protective cover.



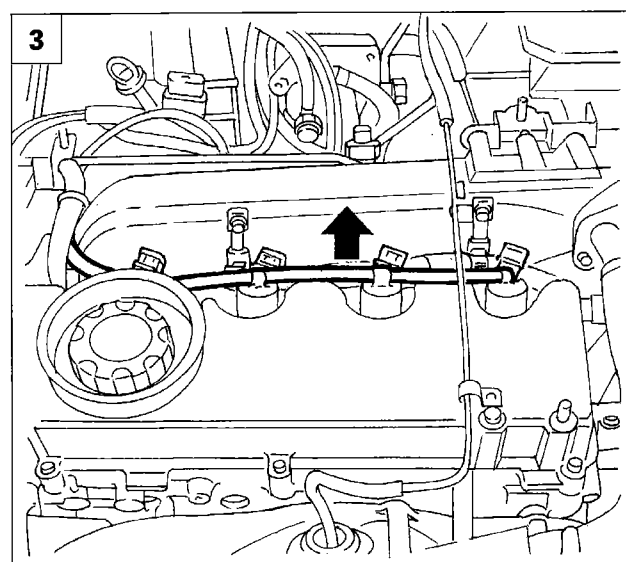
P4A27KJ02



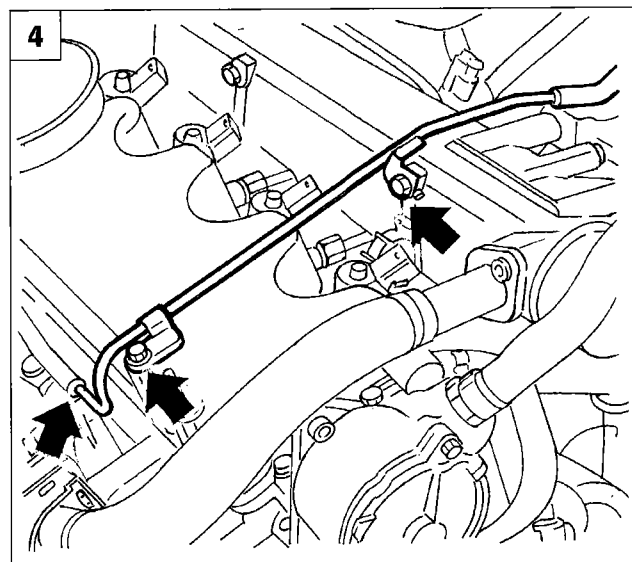
2. Disconnect the electrical connections from the injectors.

3. Disconnect the fuel return pipe from the injectors.

4. Remove the rigid pipe between the E.G.R. valve and the solenoid valve acting on the fixing nuts and releasing the ends from the connector pipes.

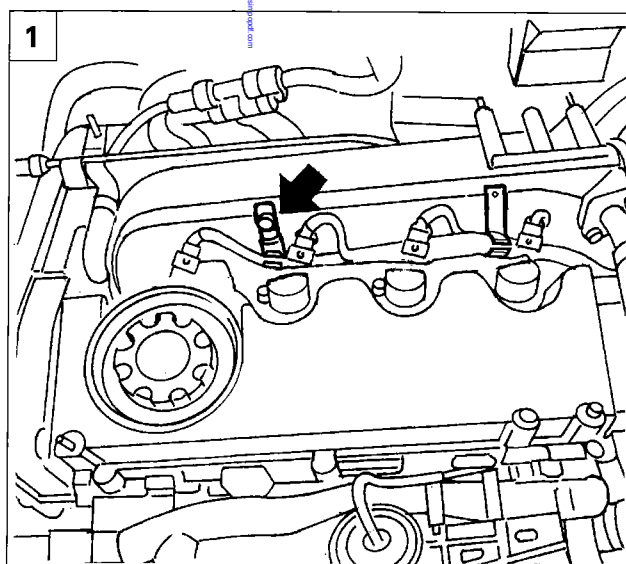


P4A27KJ03

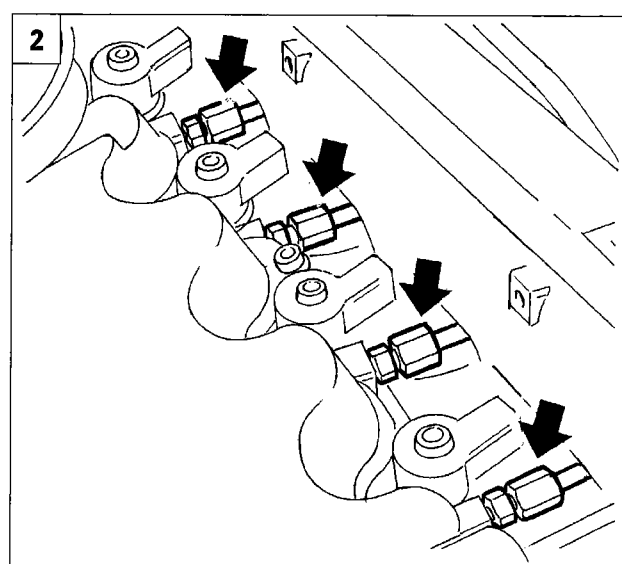


P4A28KJ02

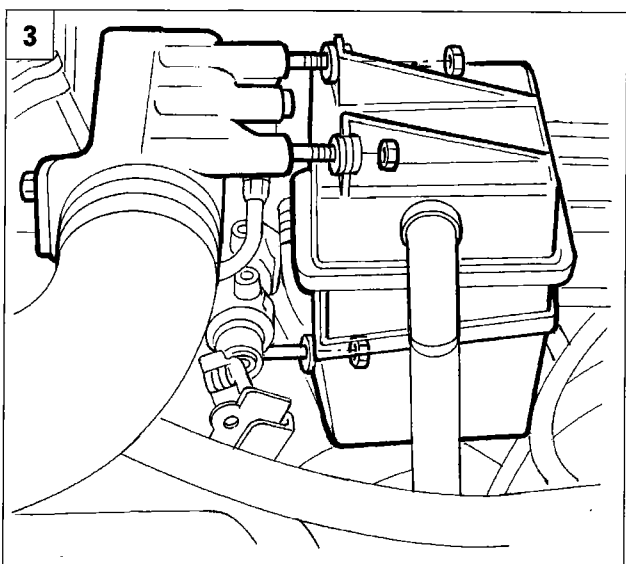
### 10.



P4A28KJ03



P4A28KJ04



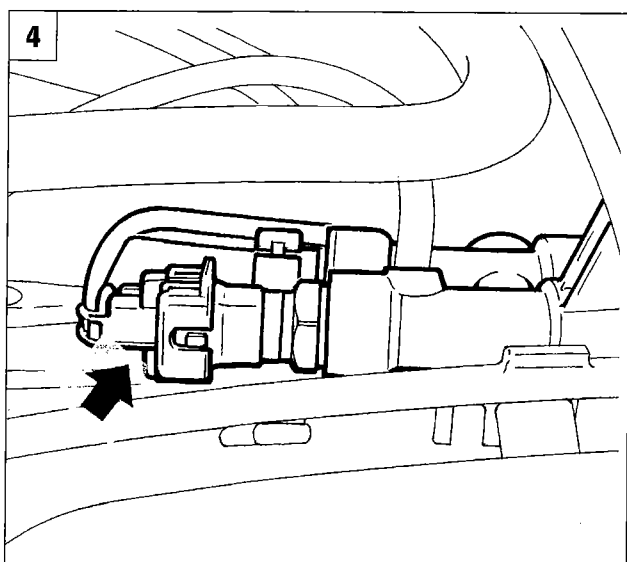
P4A28KJ05



1. Remove the two injector cable loom retaining springs undoing the remaining fixing nut shown in the diagram and then move the wiring aside.

2. Loosen the connectors for the pipes between the injectors and the distributor manifold, injector side.

3. Remove the oil vapour separator undoing the fixing nuts shown in the diagram.

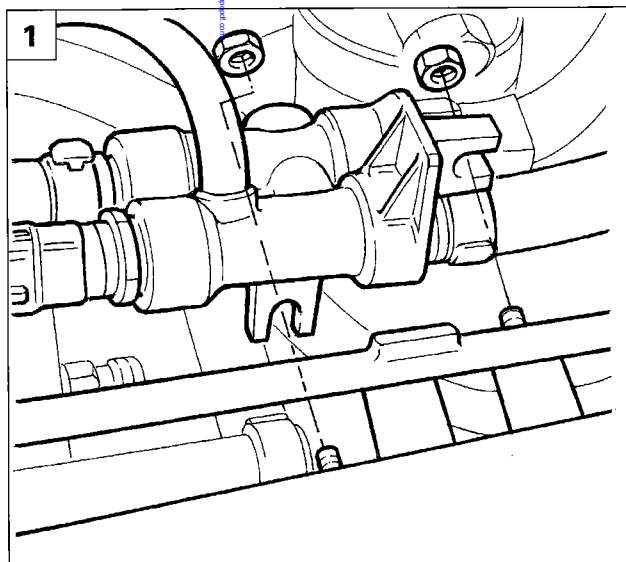


P4A32KJ04

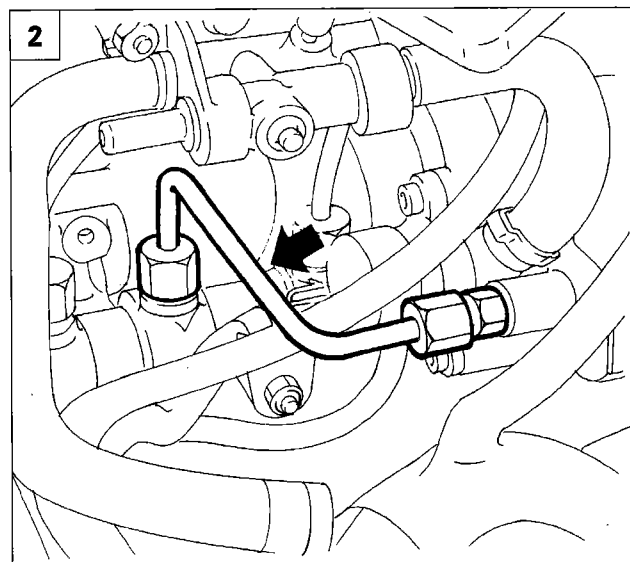
4. Disconnect the electrical connection from the fuel temperature sensor.



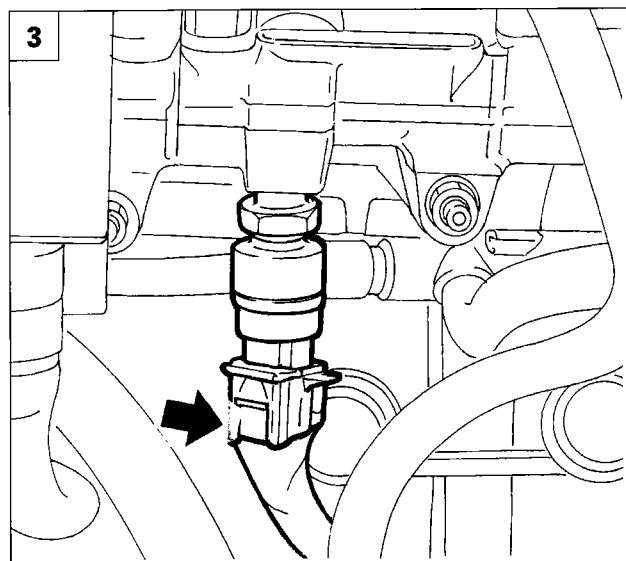
# 10.



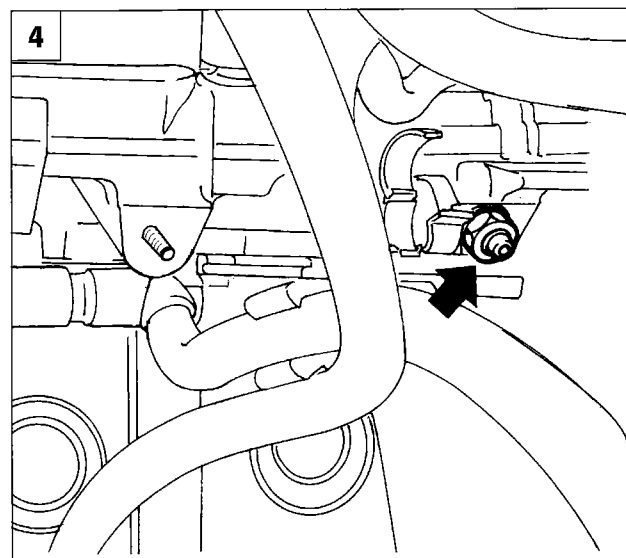
P4A29KJ01



P4A33KJ02



P4A33KJ03



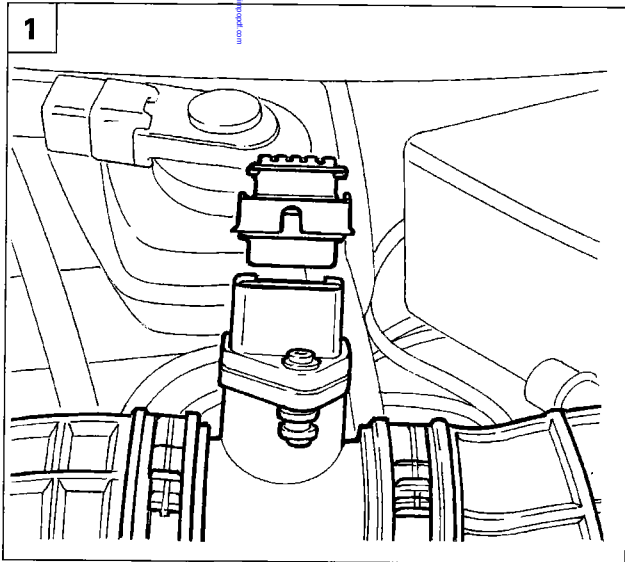
P4A33KJ04

1. Remove the return manifold loosening the two fixing nuts.
2. Remove the fuel supply pipe from the pressure pump to the distribution manifold.
3. Disconnect the electrical connection from the fuel pressure sensor.
4. Undo the remaining nut fixing the distribution manifold and remove it.

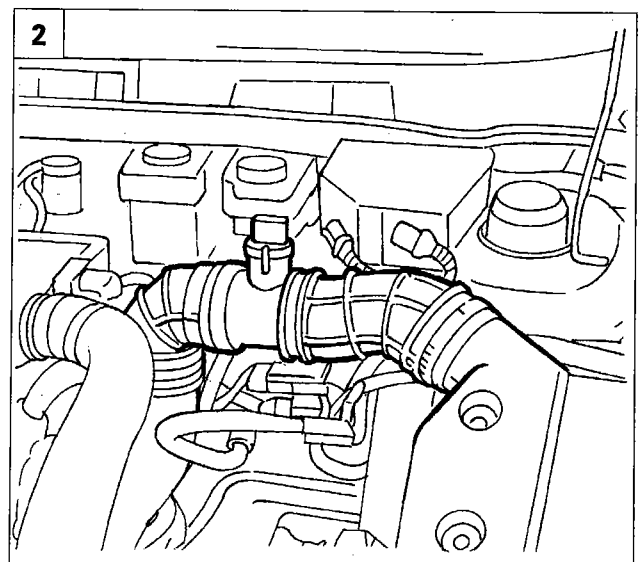
**NOTE** To refit, carry out the operations reversing the order described, tightening the connectors for the pipes between the return manifold and the injectors and the fuel supply pipe from the pressure pump to the recommended torque of 20 daNm



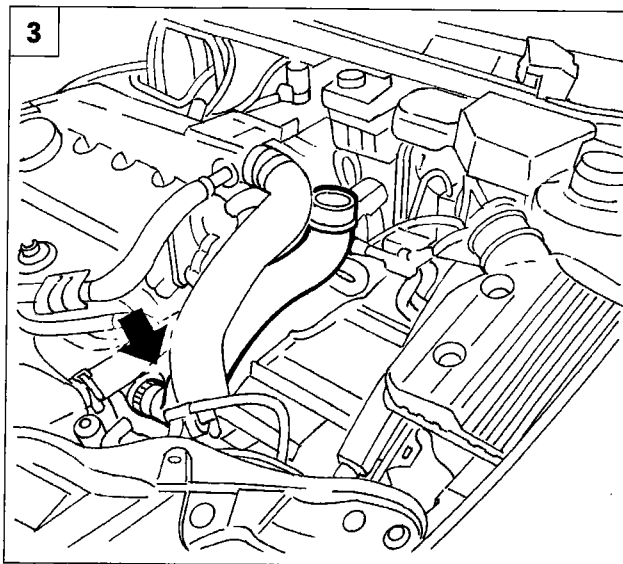
### 10.



P4A30KJ03



P4A30KJ04



P4A30KJ05



#### REMOVING - REFITTING HEATER PLUGS

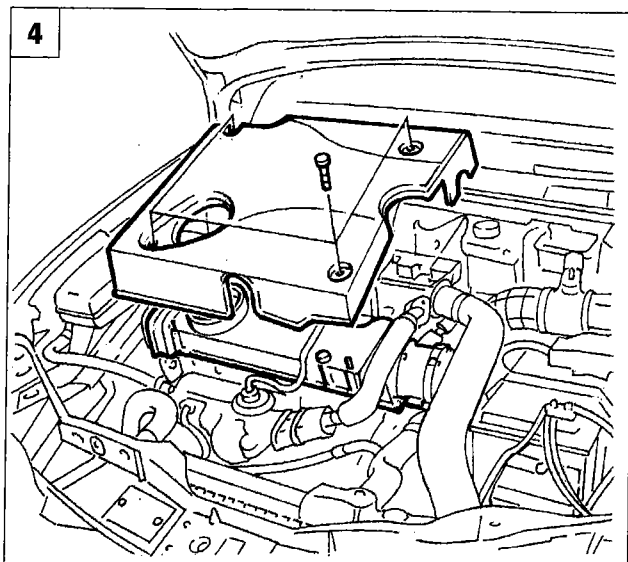
- Disable the alarm (if fitted) via the switch under the junction unit cover.
- Disconnect the terminals and remove the battery.

1. Disconnect the electrical connection for the flow meter.

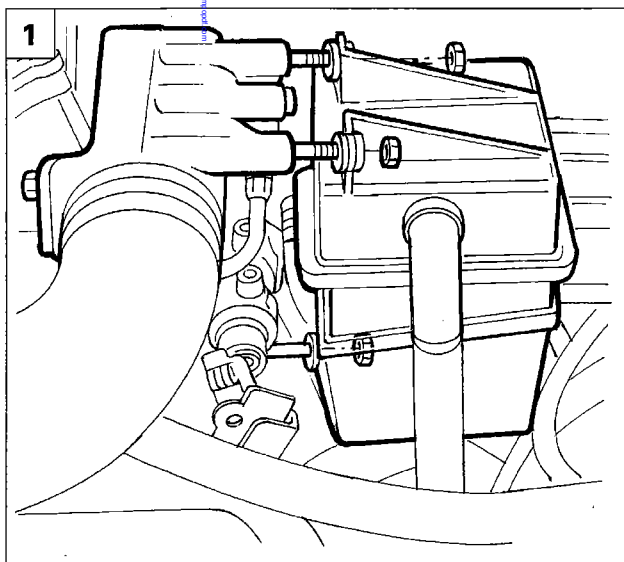
2. Loosen the bands and remove the first section of the pipe between the air filter casing and the turbocharger.

3. Remove the second section of the pipe between the air filter casing and the turbocharger.

4. Undo the fixing bolts and remove the upper engine protective cover.

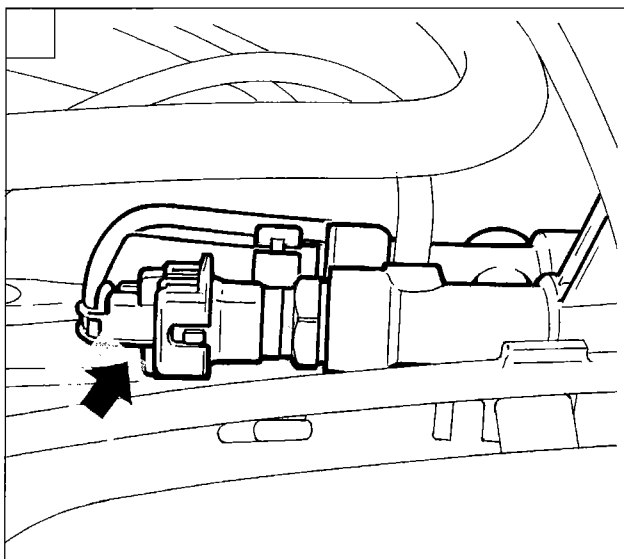


P4A27KJ01



P4A28KJ05

1. Remove the oil vapour separator undoing the three fixing nuts shown in the diagram.

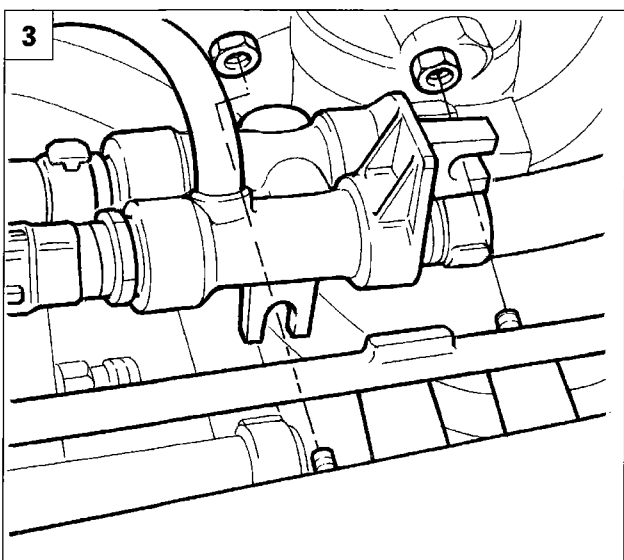


P4A32KJ04



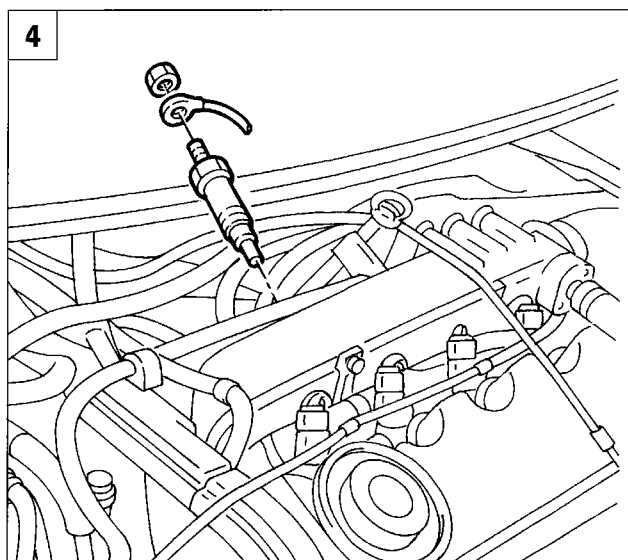
2. Disconnect the electrical connection from the fuel temperature sensor.

3. Remove the return manifold loosening the two fixing nuts.



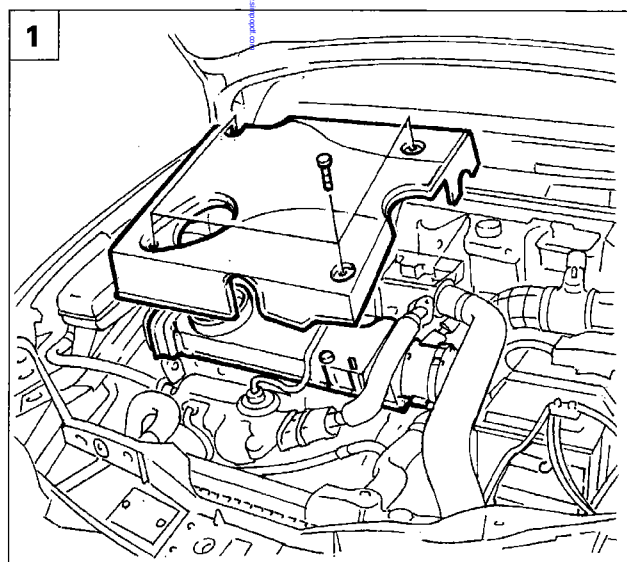
P4A29KJ01

4. Disconnect the electrical connection undoing the fixing nut and remove the heater plugs using a suitable spanner.

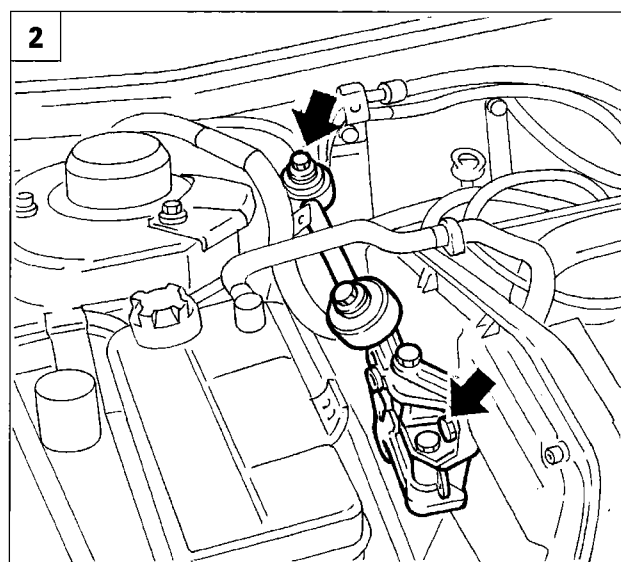


P4A35KJ05

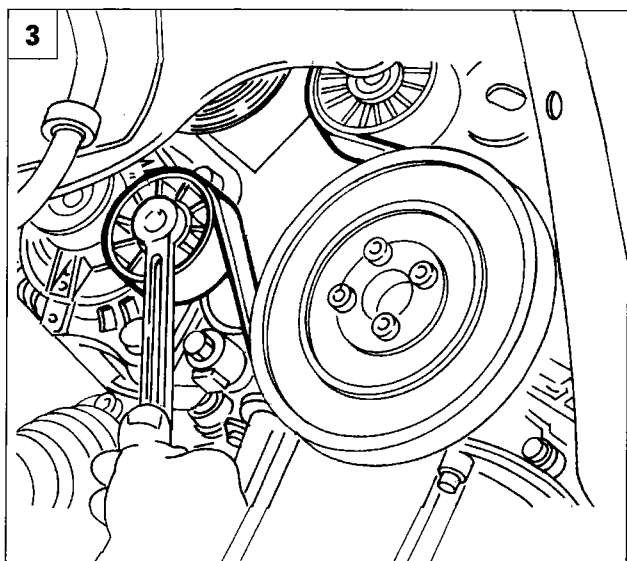
## 10.



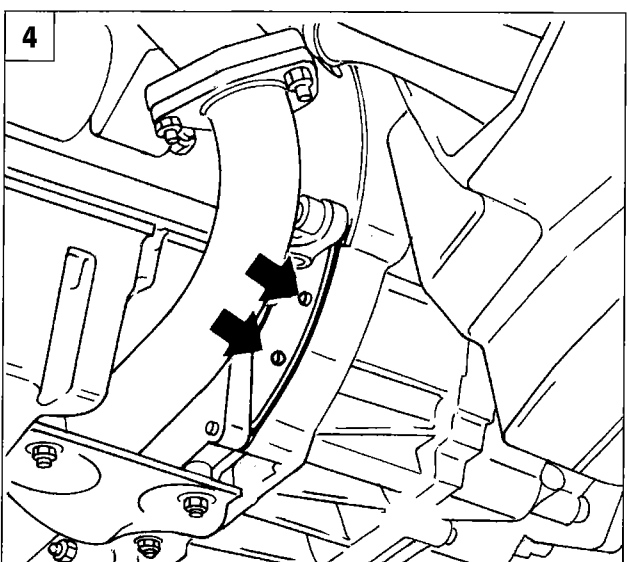
P4A27KJ01



P4A36KJ02



P4A36KJ03



P4A36KJ04



### REMOVING - REFITTING PRESSURE PUMP



Position the vehicle on a lift.

- Disable the alarm (if fitted) via the switch under the junction unit cover and disconnect the negative battery lead.

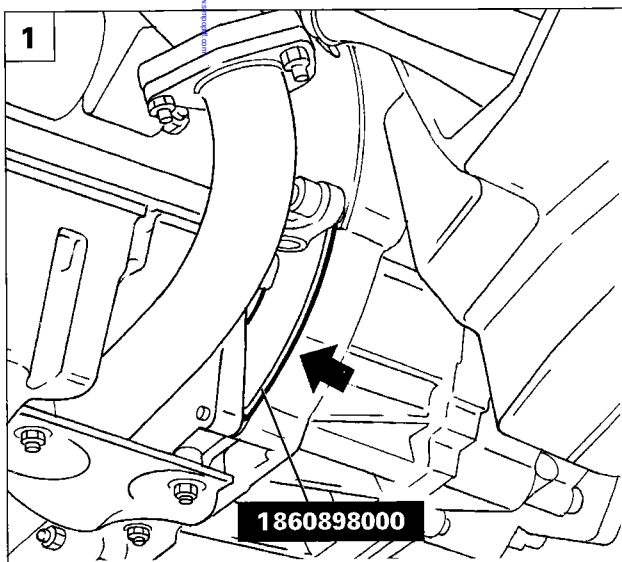
1. Remove the upper engine protective cover.

2. Remove the bracket assembly on the engine and reaction rod undoing the bolts shown in the diagram.

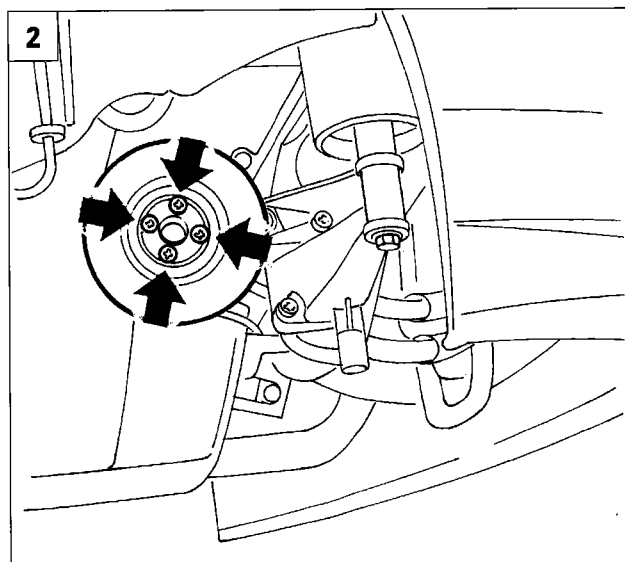
- Remove the right front wheel and the wheel arch liner.

3. Act on the moving tensioner to loosen the tension for the auxiliary drive belt and remove the belt.

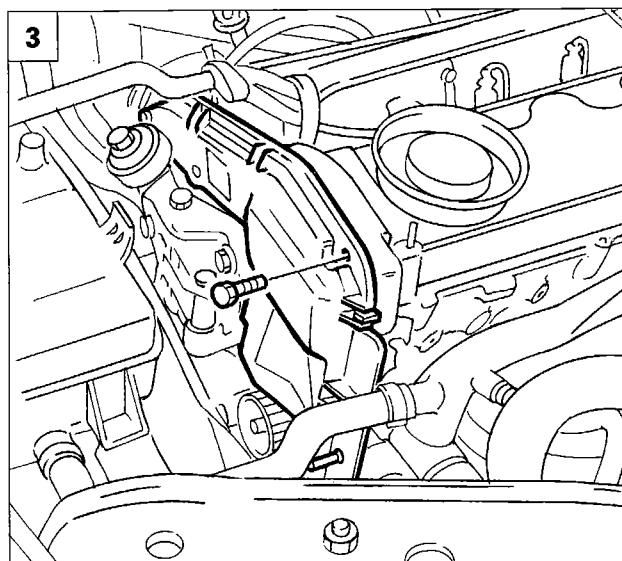
4. Undo the bolts shown in the diagram and remove the flywheel protection.



P4A37KJ01



P4A37KJ02

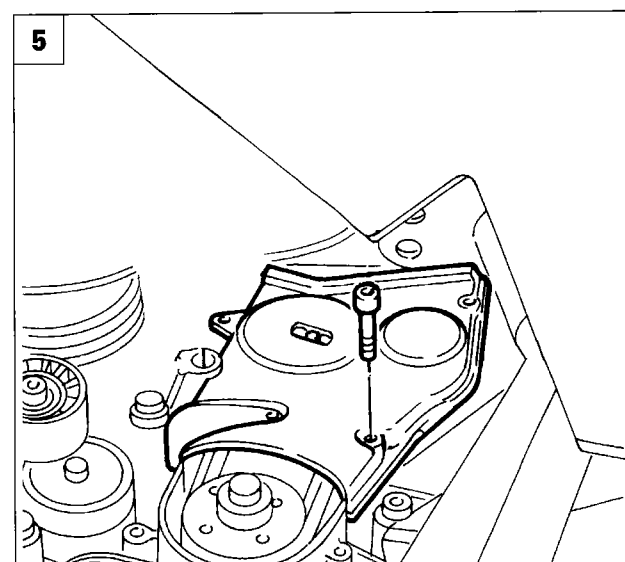
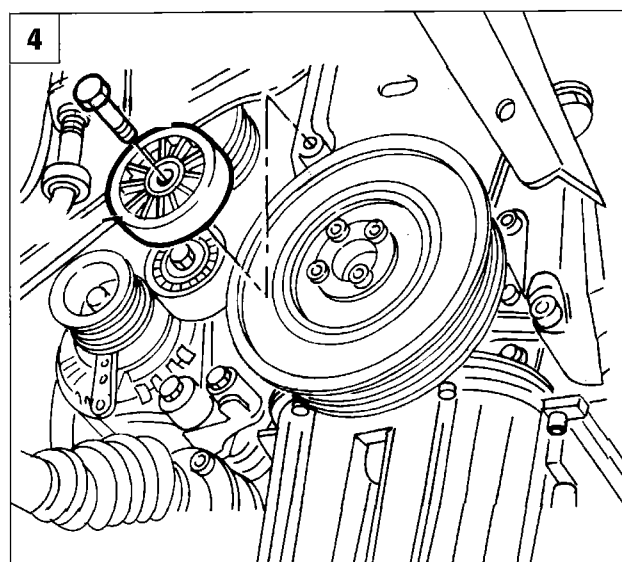


P4A37KJ03



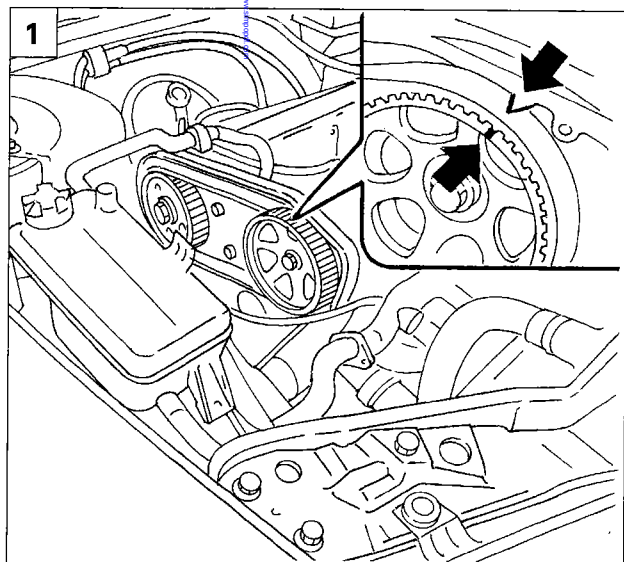
P4A37KJ04

1. Fit the flywheel lock 1860898000.
2. Undo the bolts and remove the damper flywheel
  - Remove the flywheel lock and lower the lift.
3. Remove the upper timing belt shield undoing the fixing nuts.
  - Raise the lift.
4. Undo the fixing bolt and remove the single belt fixed tensioner.
5. Undo the fixing bolts and remove the lower timing drive belt shield.

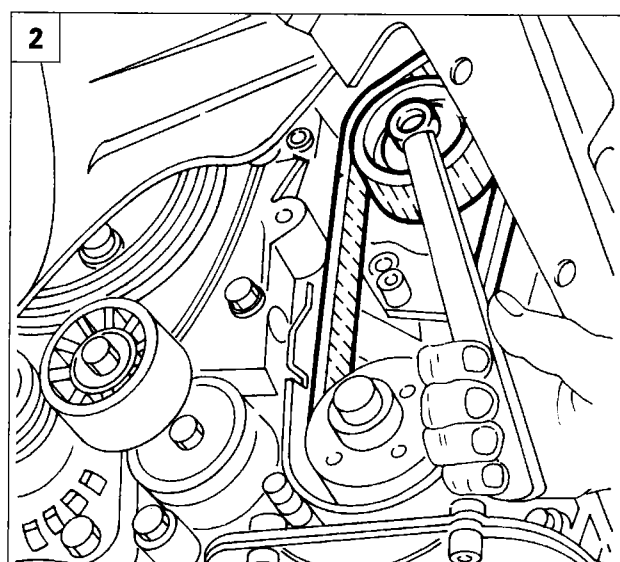


P4A37KJ05

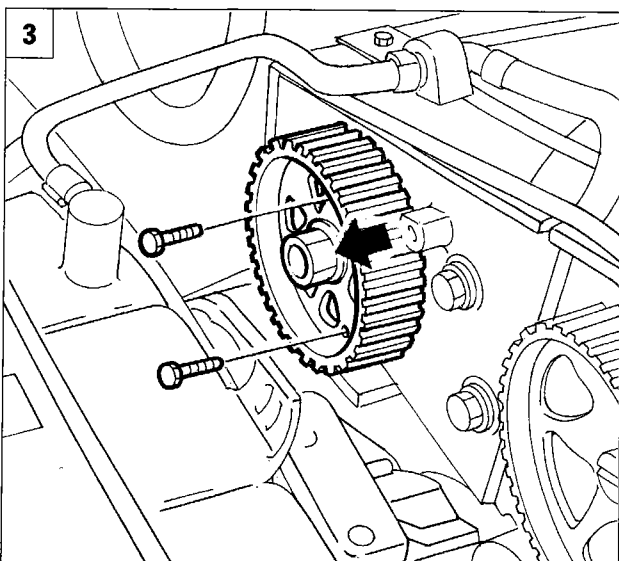
### 10.



P4A38KJ01



P4A38KJ02



P4A38KJ03

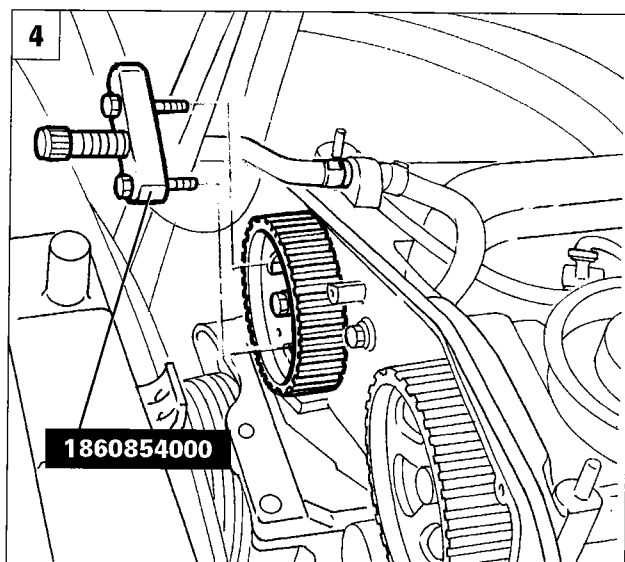


1. Rotate the crankshaft in its normal direction of rotation and position the reference on the toothed pulley in line with the reference for timing cylinder no. 1 at T.D.C.

2. Loosen the nut for the timing drive belt moving tensioner and remove the timing drive belt.

Lower the lift.

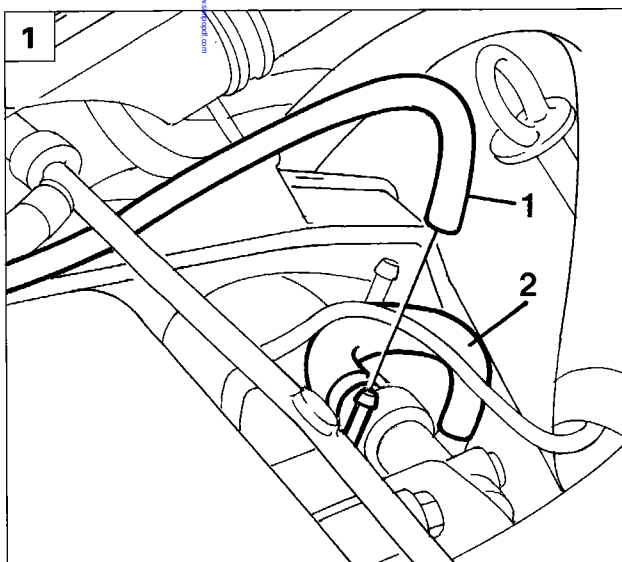
3. Tighten the two bolts in the special housings to lock the pressure pump drive pulley and undo the fixing nut.



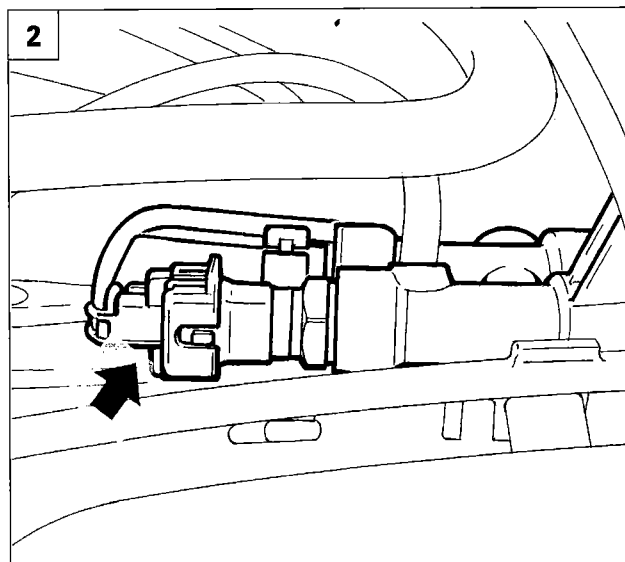
P4A38KJ04

4. Using tool 1860854000, shown in the diagram, remove the pulley.

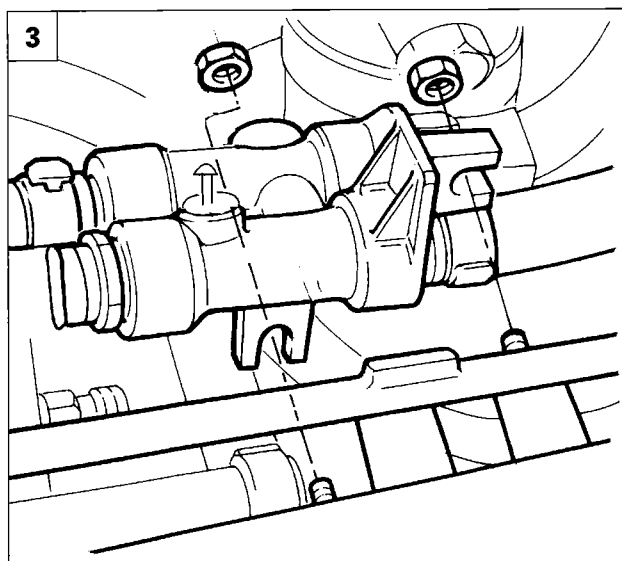




P4A39KJ01



P4A32KJ04



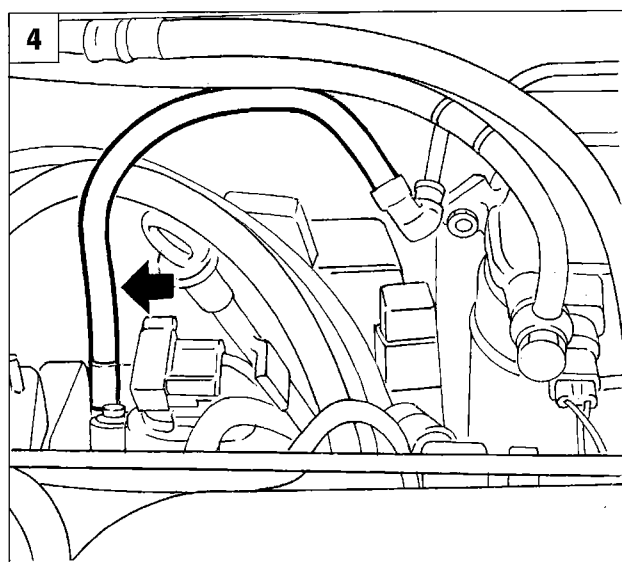
P4A39KJ03



1. Disconnect the fuel return pipe from the injectors (1) from the return manifold and the fuel return pipe from the pressure pump (2).

2. Disconnect the electrical connection from the fuel temperature sensor.

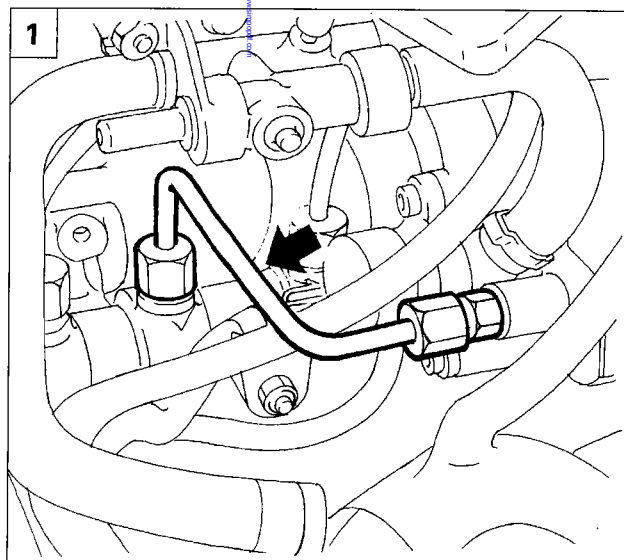
3. Acting on the fixing nuts, move the return manifold aside.



P4A39KJ04

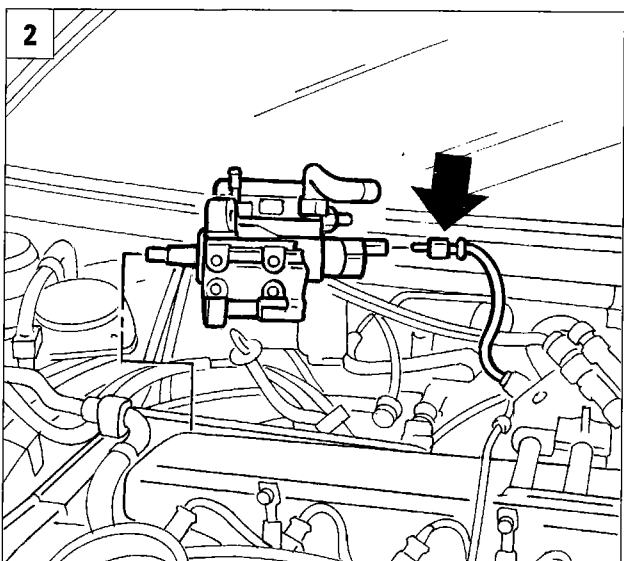
4. Loosen the fixing band and disconnect the fuel inlet pipe.

**10.**



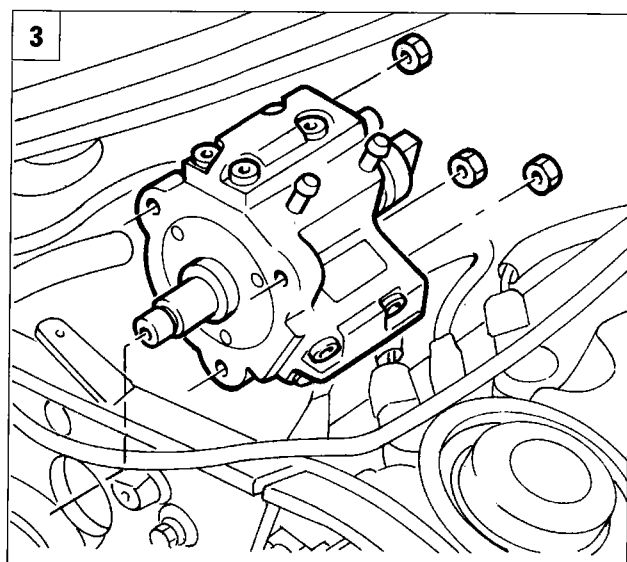
P4A33KJ02

1. Remove the fuel supply pipe from the pressure pump to the distribution manifold.



P4A40KJ02

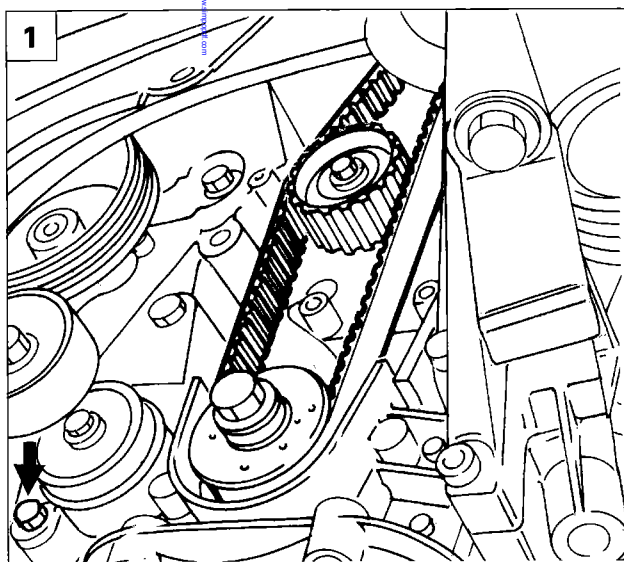
2. Disconnect the electrical connection from the pressure regulator at the pressure pump.



P4A40KJ03

3. Undo the fixing nuts and remove the pressure pump.





P4A41KJ01

### Refitting

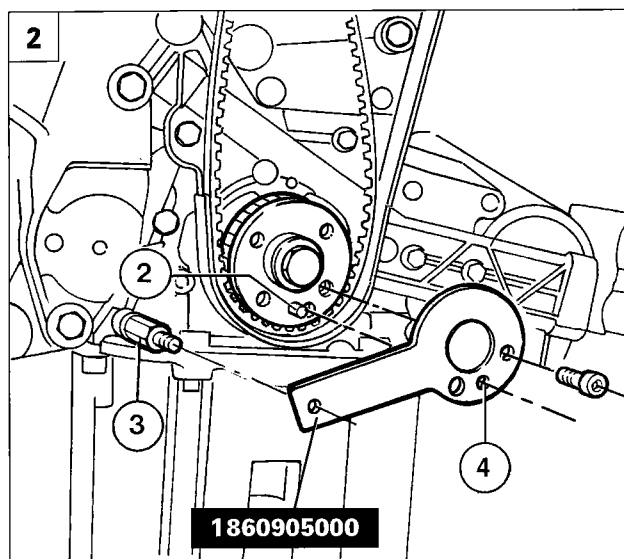
Reverse the order of the operations described for the removal until the refitting of the pressure pump pulley. Then proceed with refitting and tensioning the timing belt and the auxiliary drive belt.



*Check that the timing belt and the auxiliary drive belt are not cracked or worn so that they do not adversely affect the operation.*



*Tighten the connectors for the fuel supply pipe from the pressure pump to the distribution manifold to a torque of 20 daNm*



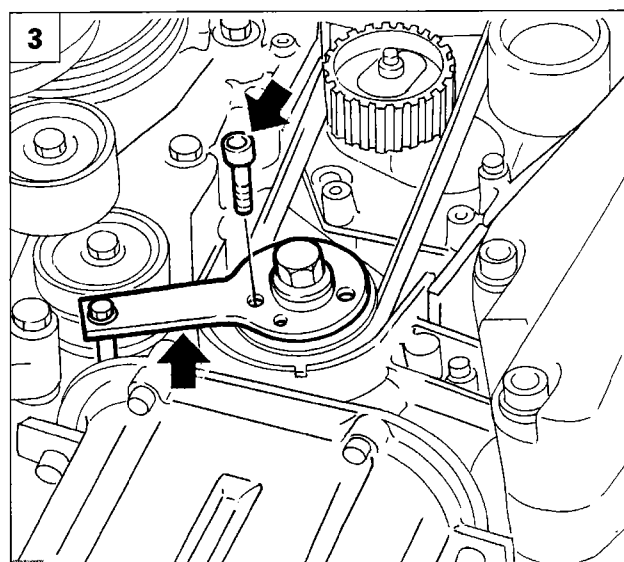
P4A41KJ02

### Refitting and tensioning timing belt

1. Temporarily fit the timing belt on the crankshaft gear and remove the oil pump bolt shown.

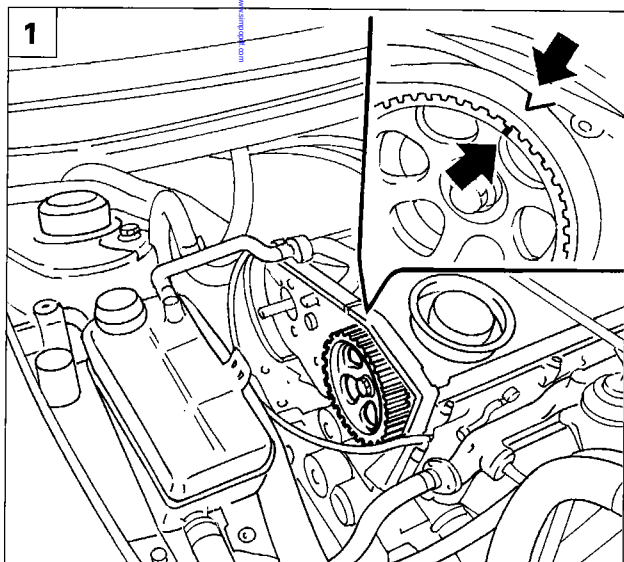
2. Position tool 1860905000 on the crankshaft drive gear and on the pin (3); rotate the crankshaft, with small movements, until the centering dowel (2) is matched with the opening (4) in the tool. In this position cylinder no. 1 is exactly aligned at T.D.C.

3. Fix the tool to the crankshaft drive gear using the bolt shown.



P4A41KJ03

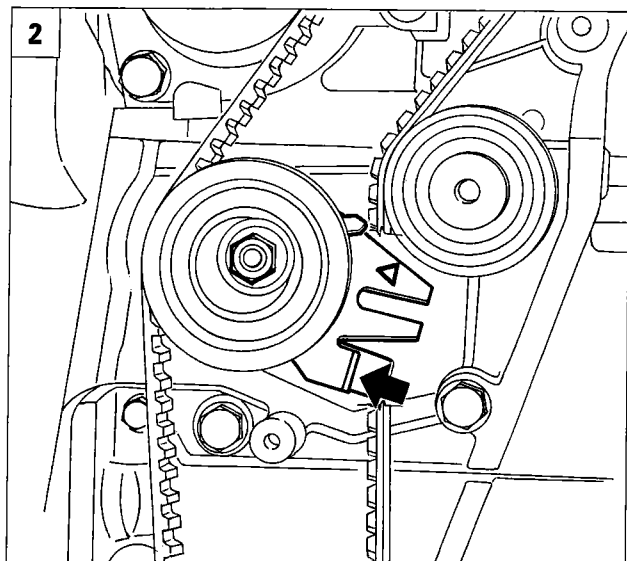
# 10.



P4A42KJ01

Lower the lift.

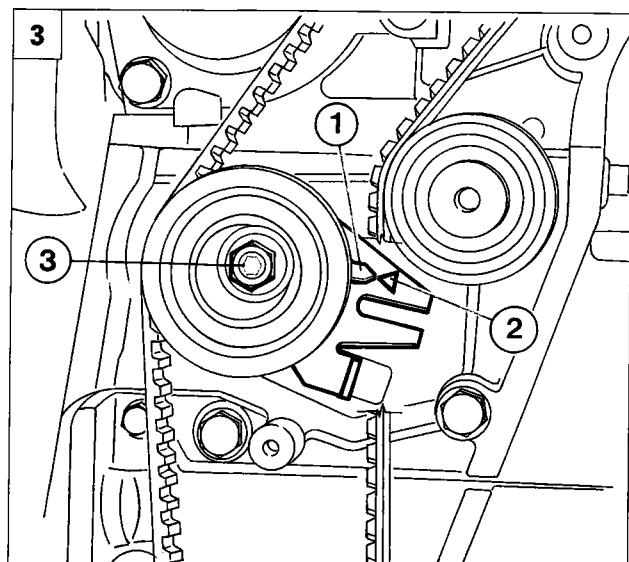
1. Rotate the driven toothed pulley until the timing references coincide.



P4A42KJ02

Raise the lift and complete the fitting of the timing belt, checking the timing.

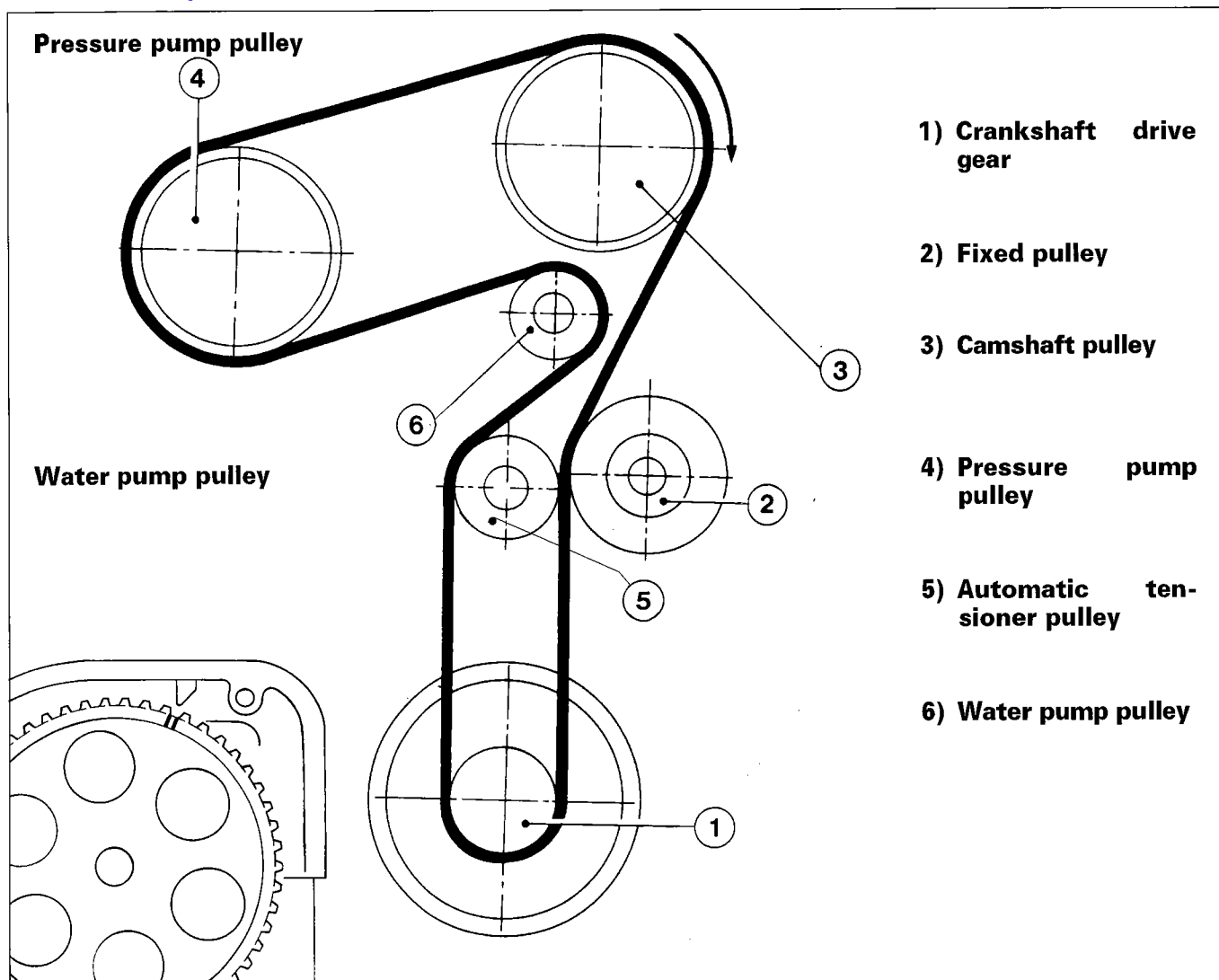
2. Using a screwdriver, apply force to the automatic tensioner so that the tensioner is in the maximum tension position, then tighten the nuts fixing the tensioner to the support. Remove the tool 1860905000 and rotate the engine through two revolutions in its normal direction of rotation.



P4A42KJ03

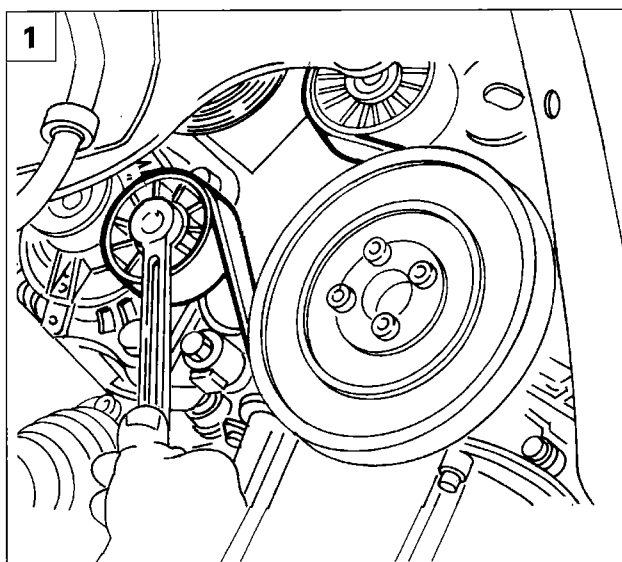
3. Loosen the nut fixing the tensioner (3) and, using a screwdriver for leverage in order not to completely loosen the tensioner, make sure that the moving reference (1) on the tensioner coincides with the fixed reference (2), then tighten the tensioner (3) fixing nut to the recommended torque.

**Timing belt fitting order**



P4A43KJ01

P4A43KJ02



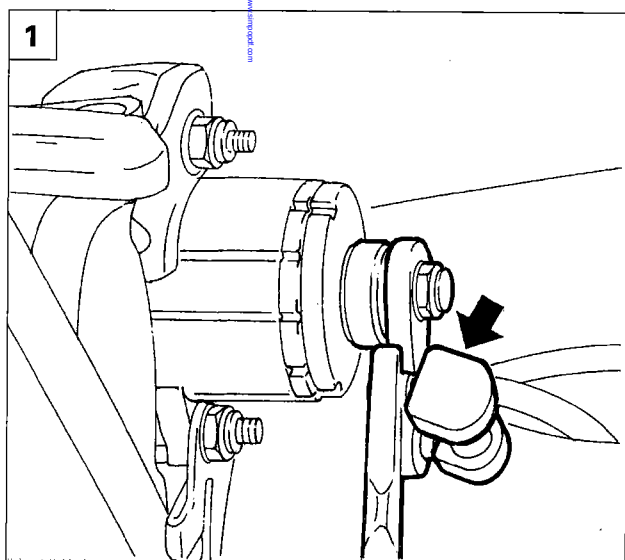
P4A36KJ03

**Refitting and tensioning the auxiliary shaft belt**

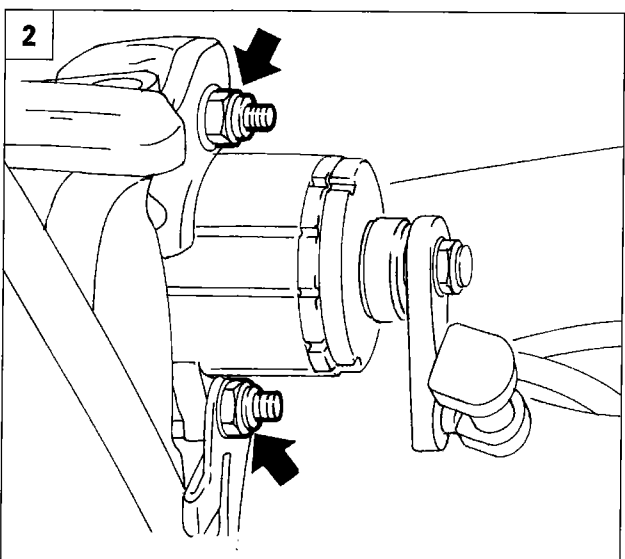
1. Acting on the belt tensioning device, fit the single drive belt.

The tensioning device is automatic and, thanks to a pre-loaded spring, the correct belt tension is set.

### 10.



4A44KJ02



P4A44KJ03



### REMOVING - REFITTING ACCELERATOR PEDAL POTENTIOMETER

- Disable the alarm (if fitted) via the switch under the cover for the junction unit and disconnect the negative battery lead.

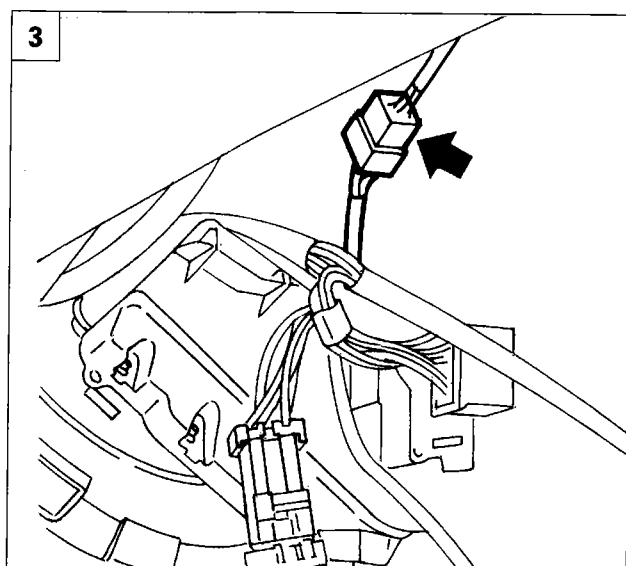
- Remove the shield under the pedals.

1. Remove the idler rod for the potentiometer from the accelerator pedal.

2. Undo the nuts fixing the potentiometer to the steering column bracket and remove the potentiometer moving the wiring as close as possible to the plastic casing retaining it, taking care not to damage the nearby cables.

3. From the passenger side, remove the shield under the dashboard and the oddments pocket and disconnect the electrical connector for the potentiometer moving the wiring as close as possible to the plastic casing retaining it, taking care not to damage the nearby cables.

**NOTE** To refit, position the new potentiometer and prepare the new bridge, fastening it under the tunnel so that the movement of the climate control unit is not impeded and it does not produce noise/vibrations whilst the vehicle is moving.



P4A44KJ04

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Airbag

Connector Block

Radio

Wiring Diagrams 98

Wiring Diagrams 99

Electrical Equipment 2000

**AIR BAG NEW FEATURES**

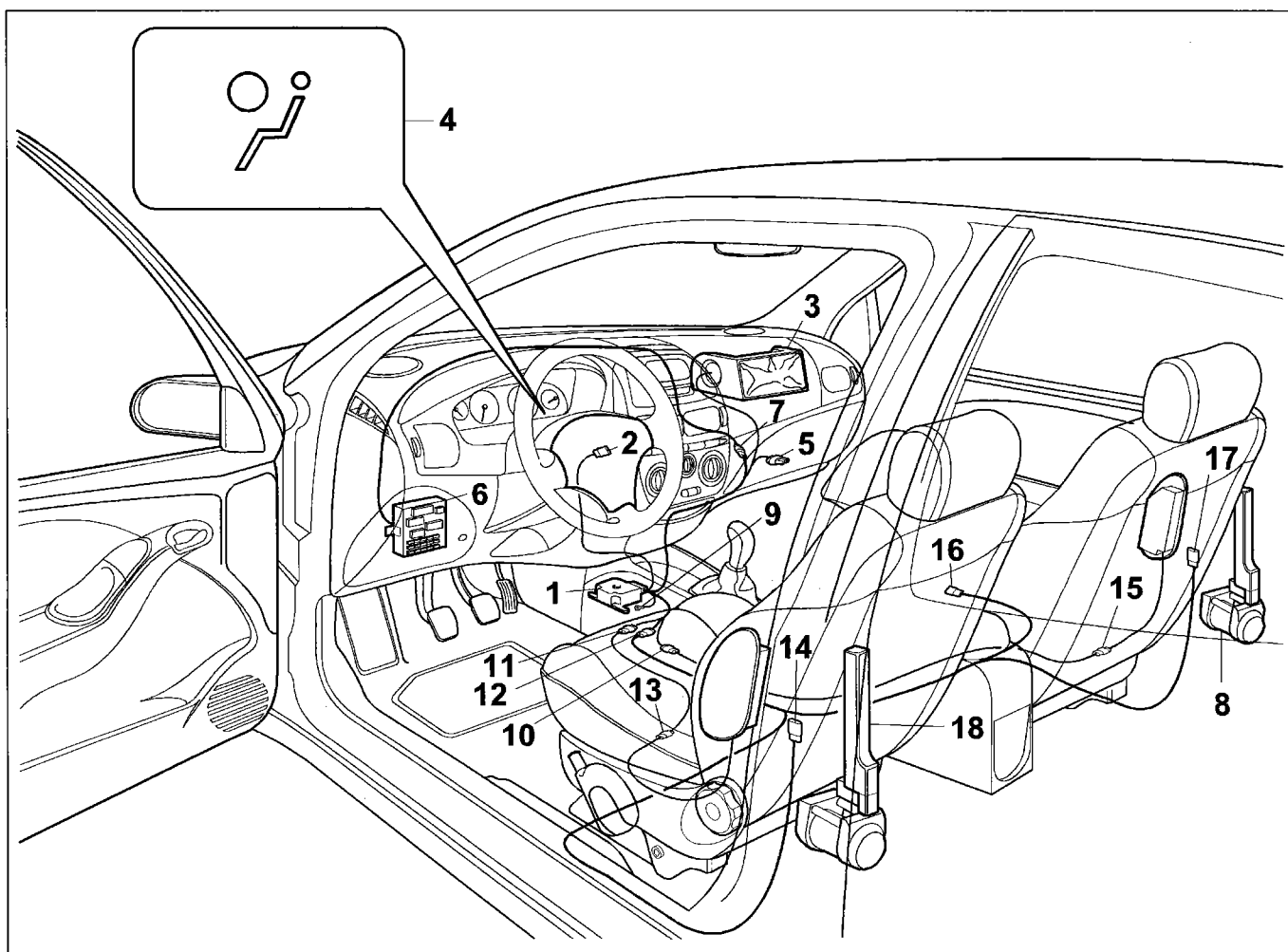
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**INTRODUCTION**

The 1998 Fiat Bravo-Brava range is fitted with a new Air Bag system. This differs from the current system in the addition of a passenger presence sensor PPD on the front seat. This allows the passenger side air bag and pretensioner to go off only if the seat is occupied.

The standard system may also optionally be fitted with a side impact prevention system known as a side bag.

**Location of air bag and side bag system components on the car.**



4A01JL01

- |                                                                |                                                             |
|----------------------------------------------------------------|-------------------------------------------------------------|
| 1. Air bag control unit                                        | 11. Euro Bag - Side Bag control unit junction - Driver side |
| 2. Passenger side Euro Bag clock spring contact                | 12. Euro Bag - PPD sensor control unit junction             |
| 3. Driver's Euro Bag module                                    | 13. Driver's Side Bag module                                |
| 4. Euro Bag system failure warning light                       | 14. Driver's satellite sensor (side impact recognition)     |
| 5. Tester connection                                           | 15. Passenger side bag module                               |
| 6. Junction unit                                               | 16. Passenger presence sensor (PPD)                         |
| 7. Euro Bag control unit supply junction                       | 17. Passenger satellite sensor (side impact recognition)    |
| 8. Passenger side mechanical pretensioner                      | 18. Driver side mechanical pretensioner                     |
| 9. Earth for Euro Bag                                          |                                                             |
| 10. Euro Bag - Side Bag control unit junction - Passenger side |                                                             |

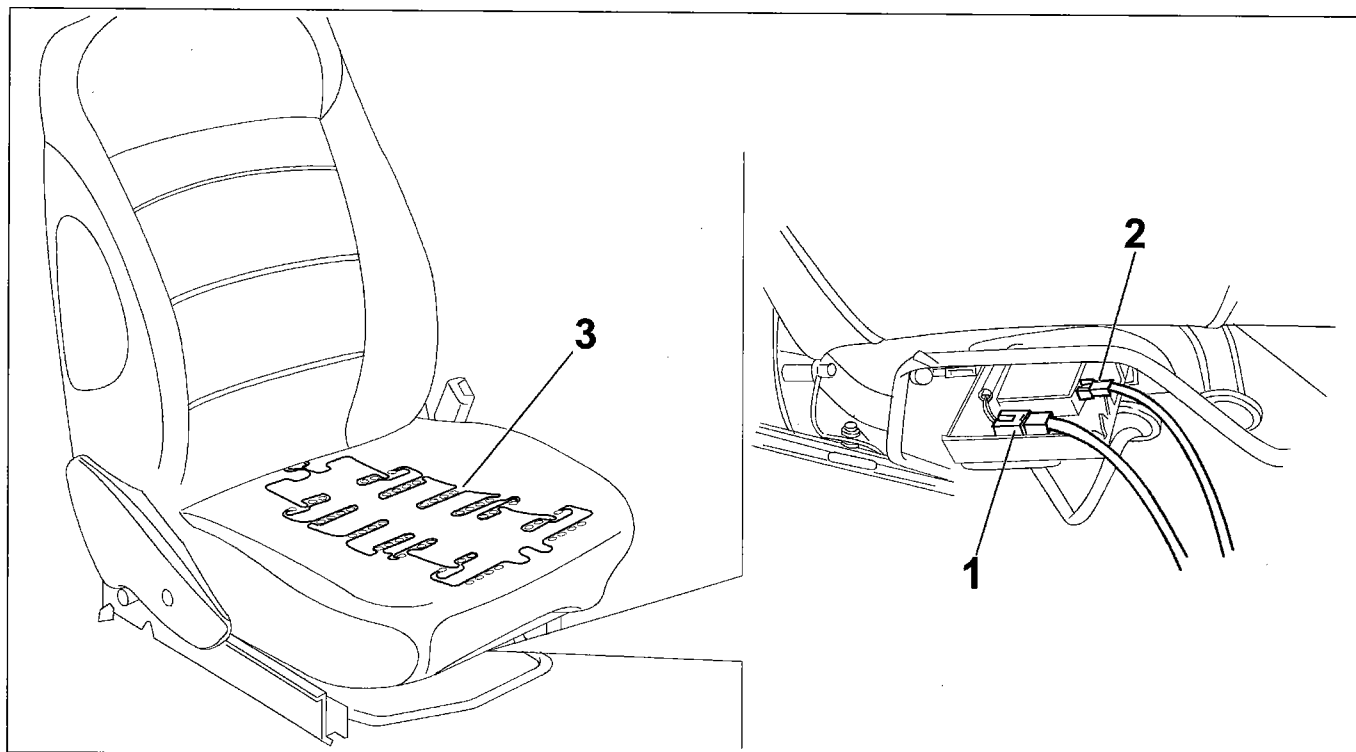


# 55.

## PASSENGER PRESENCE SENSOR PPD

The 1998 range air bag system now comes with a passenger presence sensor that prevents the front passenger air bag and passenger side bag (where fitted) going off if a passenger is not present.

### Passenger side seat with passenger presence sensor (PPD)



4A02JL01

1. Side bag control connector
2. Passenger presence sensor connector
3. Passenger presence sensor PPD

The Passenger Presence Sensor identifies the presence of a weight on the seat cushion and transmits this information to the electronic control unit that manages the air bag system. The ECU, which also controls the pretensioner, is connected electrically to the system via a cable (with a yellow sheath). The cable connector is located in the lower part of the seat anchored to the bottom on the right side.

If no passenger is present, the control unit disables the front and side bags (where fitted) on the passenger side.

This solution allows a significant reduction in repair costs in the case of accidents where it is not necessary to activate the restraint and protection systems on the passenger side because no occupant is present.

**55.**

The sensor consists of a fine, flexible plastic plate that is adhesive on the side in contact with the seat padding and contains an electrical circuit that controls its operation. The plate covers the entire seat cushion area except the two sides. It fits between the padding and trim without altering the functional, aesthetic and ergonomic properties of the seat.

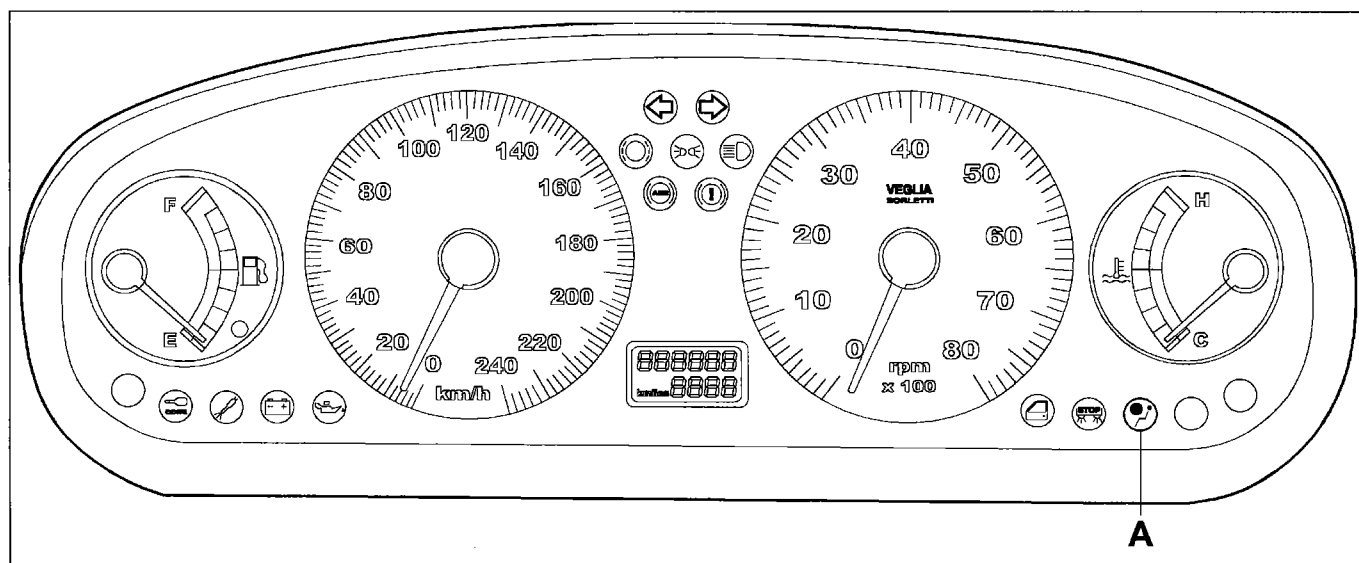
A passenger's presence on the seat is therefore detected even if the passenger sits incorrectly and regardless of whether the seat belt is worn or not.

The sensor is also designed to be compatible with a seat heater (available as an option). If a heater is present, the sensor is located underneath it.

The system is adjusted to detect a weight of at least 12 kg under all service conditions (from -35 to +70°C). For lower weights, the response depends on service conditions (temperature, shape and position of the weight, trim type, presence or absence of a heater).

The passenger presence sensor and its branch of wiring are monitored continually during car use. The diagnostic function checks for short-circuits or open circuits.

In the case of sensor malfunction, sensor readings are ignored and the system behaves in the same way as a conventional system, maintaining the passenger front and side bags active. The red failure warning light stays on.

**Instrument panel**

4A03JL01

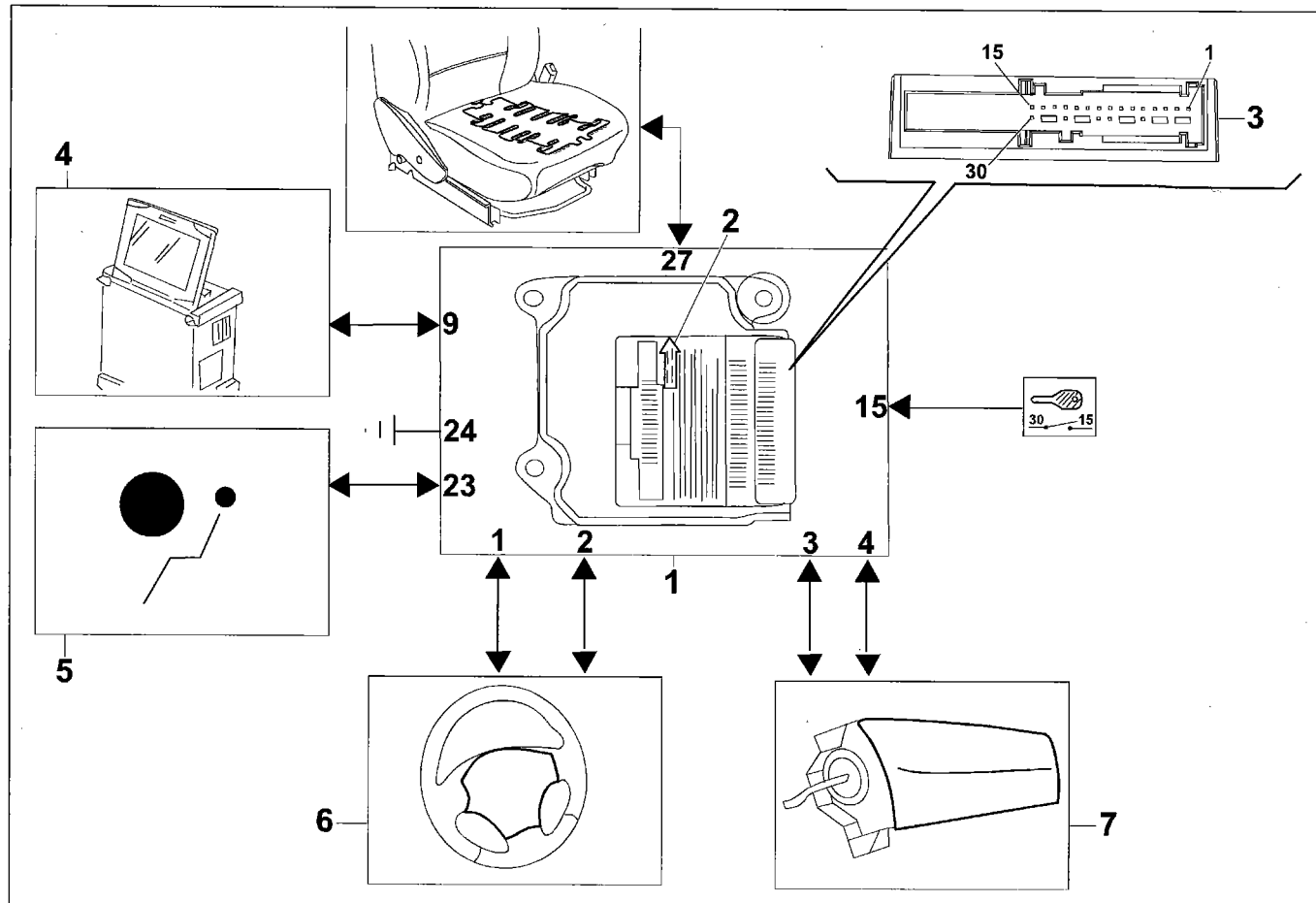
A. Air bag system failure warning light

**ELECTRONIC CONTROL UNIT FOR AIR BAG SYSTEM AND PASSENGER PRESENCE SENSOR (PPD)**

The air bag system fitted to the 1999 Fiat Bravo-Brava range comes with a new electronic control that differs from the previous system in the addition of a connection to the passenger presence sensor and the integration of control functions.

# 55.

Diagram showing connections between control unit and components



4A04JL01

- |                                                      |                                              |
|------------------------------------------------------|----------------------------------------------|
| 1. Electronic control unit                           | 5. Air bag system failure warning light bulb |
| 2. Arrow showing control unit installation direction | 6. Driver air bag module                     |
| 3. 30 pin connection (see PIN OUT)                   | 7. Passenger air bag module                  |
| 4. Tester                                            | 8. Passenger presence sensor (PPD)           |

### Control unit pin out

- |                                          |                                          |
|------------------------------------------|------------------------------------------|
| 1. Driver air bag                        | 17. Short circuit                        |
| 2. Driver air bag                        | 18. Short circuit                        |
| 3. Passenger air bag                     | 19. Short circuit                        |
| 4. Passenger air bag                     | 20. Not connected                        |
| 5. Available                             | 21. Short circuit                        |
| 6. Not connected                         | 22. Short circuit                        |
| 7. Not connected                         | 23. Air bag system failure warning light |
| 8. Available                             | 24. Earth                                |
| 9. Serial line (K) for testers           | 25. Short circuit                        |
| 10. Not connected                        | 26. Short circuit                        |
| 11. Not connected                        | 27. Passenger presence sensor            |
| 12. Available                            | 28. Short circuit                        |
| 13. Not connected                        | 29. Short circuit                        |
| 14. Not connected                        | 30. Electrical wiring recognition input  |
| 15. Ignition-operated power supply (+15) |                                          |
| 16. Short circuit                        |                                          |

**SYSTEM WITH SIDE BAG**

The side impact protection system, or side bag, fitted as an option on the car, extends the system already present on the car and offers maximum protection to front seat passengers by protecting critical body areas, i.e. ribs, abdomen and pelvis.

The side bag system is controlled integrally with the two front air bags by a control unit that reads and processes deceleration and impact data from two satellite sensors located in the car's side pillars.

The system consists of:

- 50 pin control unit;
- side bag modules within the front seat squabs, on the side facing the outside of the car;
- side satellite deceleration sensors.

**CONTROL UNIT FOR AIR BAG, SIDE BAG AND PASSENGER PRESENCE SENSOR (PPD) SYSTEM**

The control unit for the system with side bag differs from the unit used with the system made up of driver air bag, passenger air bag, pretensioners and passenger presence sensor because it is able to process data sent by satellite side sensors and features a different pin out: the control unit is connected to the system via a 50-pin connection.

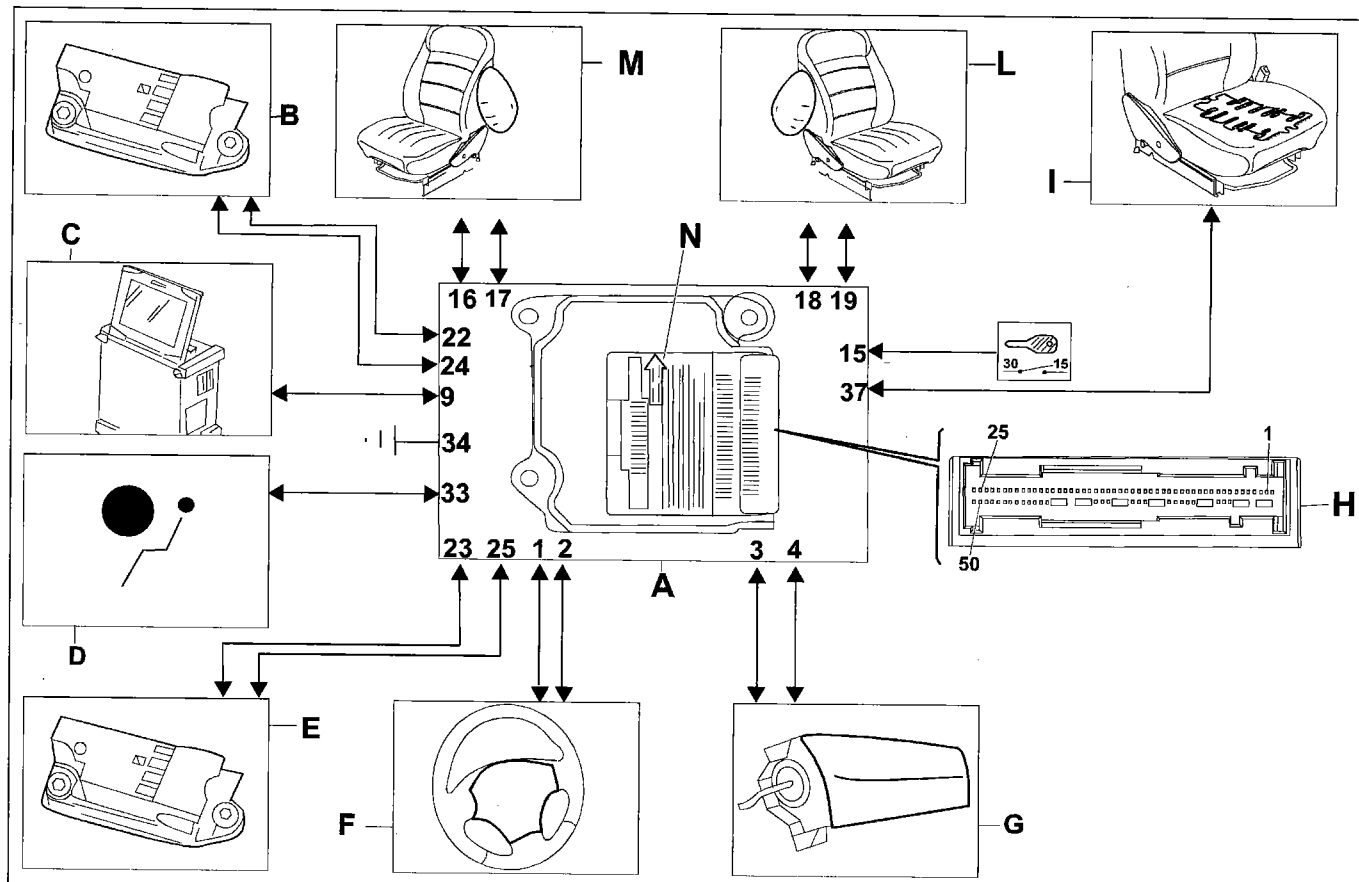
The control unit is calibrated in accordance with specific activation thresholds that ensure the unit operates only in the case of impacts where the occupant requires additional protection. It is able to differentiate between these impacts and other events where operation is not necessary (low-energy side impact, blows against the side not caused by other vehicles, etc.).

The control unit is programmed to deactivate the front air bag, the side bag module on the passenger side and the associated pretensioner if the presence sensor detects the continual absence of a passenger for at least 30 seconds, and to reactivate them immediately as soon as a passenger presence is detected.

In the case of an air bag system with side bag, the wiring branch is monitored continuously by the control unit while the car is in use. If an anomaly is detected, the red failure warning light is activated and the system operates in conventional manner to keep the driver and passenger side air bags operational at all times.

# 55.

Diagram showing connections between control unit and components



4A06JL01

## Control unit pin out

- |                                            |                                          |
|--------------------------------------------|------------------------------------------|
| 1. Driver air bag                          | 26. Short circuit                        |
| 2. Driver air bag                          | 27. Short circuit                        |
| 3. Passenger air bag                       | 28. Short circuit                        |
| 4. Passenger air bag                       | 29. Short circuit                        |
| 5. Available                               | 30. Not connected                        |
| 6. Not connected                           | 31. Short circuit                        |
| 7. Not connected                           | 32. Short circuit                        |
| 8. Available                               | 33. Air bag system failure warning light |
| 9. Serial interface (K) for tester         | 34. Earth                                |
| 10. Not connected                          | 35. Short circuit                        |
| 11. Not connected                          | 36. Short circuit                        |
| 12. Available                              | 37. Passenger presence sensor            |
| 13. Not connected                          | 38. Short circuit                        |
| 14. Not connected                          | 39. Short circuit                        |
| 15. (+15) ignition-operated power supply   | 40. Electrical wiring recognition input  |
| 16. Driver side bag                        | 41. Short circuit                        |
| 17. Driver side bag                        | 42. Short circuit                        |
| 18. Passenger side bag                     | 43. Short circuit                        |
| 19. Passenger side bag                     | 44. Short circuit                        |
| 20. Available                              | 45. Not connected                        |
| 21. Not connected                          | 46. Not connected                        |
| 22. Driver side bag sensor power supply    | 47. Not connected                        |
| 23. Passenger side bag sensor power supply | 48. Not connected                        |
| 24. Driver's side bag sensor earth         | 49. Not connected                        |
| 25. Passenger side bag sensor earth        | 50. Not connected                        |

- A. Electronic control unit
- B. Driver's side satellite sensor
- C. Tester
- D. Air bag system failure warning light bulb
- E. Passenger side satellite sensor
- F. Driver air bag module
- G. Passenger air bag module

- H. 50-pin connector (see pin out)
- I. Passenger presence sensor
- L. Passenger side bag module
- M. Driver's side bag module
- N. Arrows indicating control unit installation direction

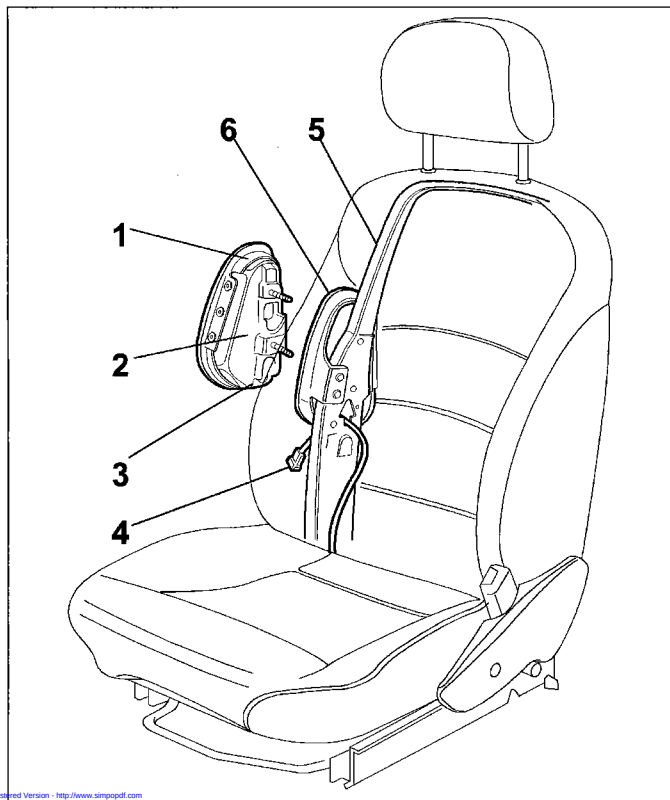
### **SIDE BAG MODULES**

The side bag modules fitted to the Fiat Bravo-Brava are fitted by a bracket to the inside of the squab on the side facing the outside of the structure. This solution is an improvement on the door-mounted version because the bag is always in optimal position in relation to the occupant regardless of seat position or occupant size.

The side bag modules consist mainly of:

- a bag measuring about 12 litres in volume and made out of permeable cloth that is able to protect the outer area of the chest and abdomen;
- a metal case containing a pyrotechnic charge that, when activated by an electric signal, causes gas to emerge and inflate the bag.
- an extremely light, plastic containment cover for the bag that maintains squab size and appearance while ensuring the bag emerges easily;
- bracket securing the module to the seat structure.

#### **Side bag module**



- 1. Plastic cover
- 2. Metal case
- 3. Side bag module connector
- 4. Electrical activation lead
- 5. Squab structure
- 6. Side bag module compartment

4A07JL01

Side bag modules are fitted in the squab trim and do not significantly alter original seat style and size. A plastic cover in the seat trim over the module opens to allow the bag to inflate.

# 55.

## GENERAL WARNINGS



*IT IS ABSOLUTELY FORBIDDEN to use any type of seat cover that is not specifically designed for this type of seat. When replacing, take the greatest care to install in the correct position: the wording **SIDE BAG** must be on the same side of the squab as the side bag module.*



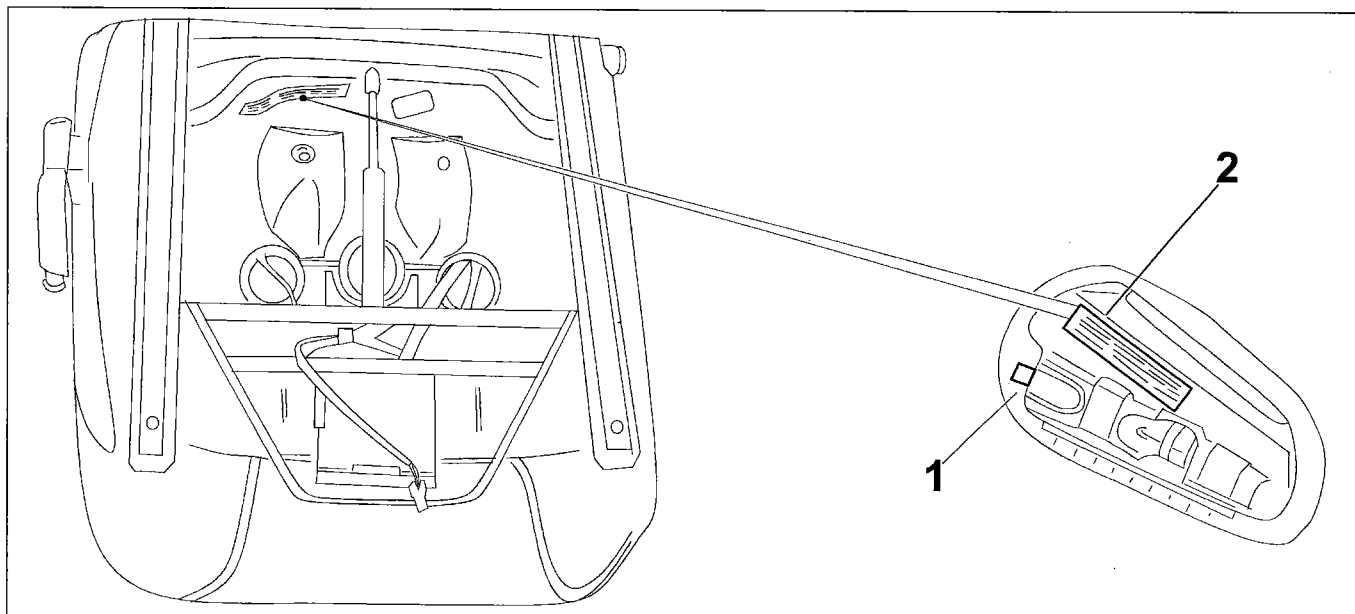
*Before disconnecting the seat connections to the air bag system (leads with yellow sheath), disconnect both battery terminals, take them out carefully and **WAIT AT LEAST 10 MINUTES**. Whenever working on the air bag system, it is **OBLIGATORY** to check system function using special test equipment at the end of the procedure.*



*It is **STRICTLY NECESSARY** to observe the contents of Identification and warning plates on the side bag module whenever the module is handled.*

*When replacing the module, take off the removable label (1) on the cover of the new module and apply it to the front part of the seat structure at more or less the point indicated in the following figure so that it is legible with the seat fitted. Also record the serial number in the special log so the unit can be traced.*

*If the seat structure is to be replaced and the side bag module transferred, the above label must be transferred from the old to the new structure.*



4A08JL01

1. New side bag module
2. Removable self-adhesive plate

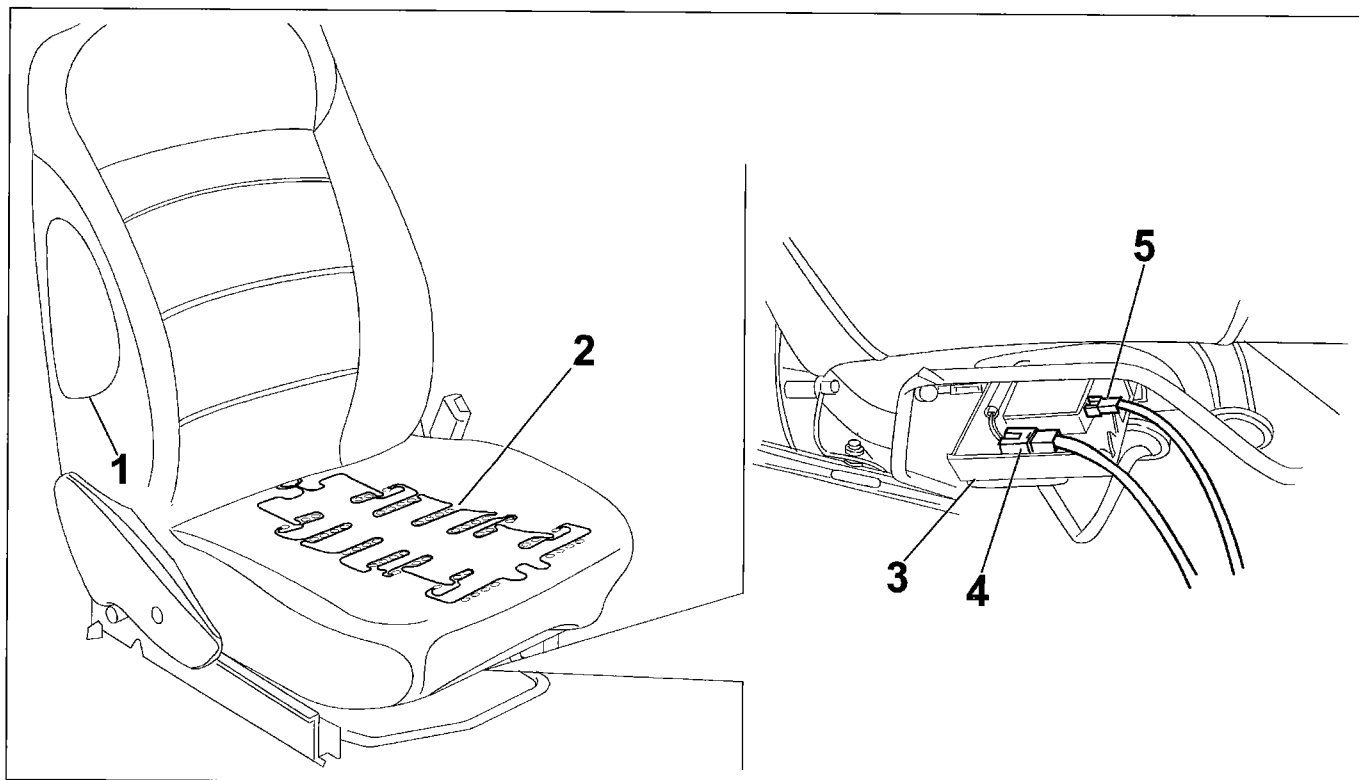


The points for connecting the Side Bag module to the Air Bag system and the passenger presence sensor (cables with yellow outer casing) are located at the bottom of the seat in the front section inside a protective casing.

The connection for the Side Bag module and the passenger presence sensor are secured in the casing fixed under the passenger seat.

If checks have to be carried out on the system or the seat has to be removed, in order to gain access to the connections located inside the casing, the cover must be opened by removing the casing safety cap acting on the retaining springs.

#### **Seat with Side Bag and passenger presence sensor (PPD)**



P3U33GB01

1. Side Bag module
2. Passenger presence sensor (PPD)
3. Connections protective casing
4. Side Bag module connection
5. Passenger presence sensor (PPD) connection

#### **"SATELLITE" DECELERATION SENSORS**

The "satellite" deceleration sensors are fitted on the vehicle centre pillars and contain an accelerometer capable of detecting acceleration which occurs during a side impact.

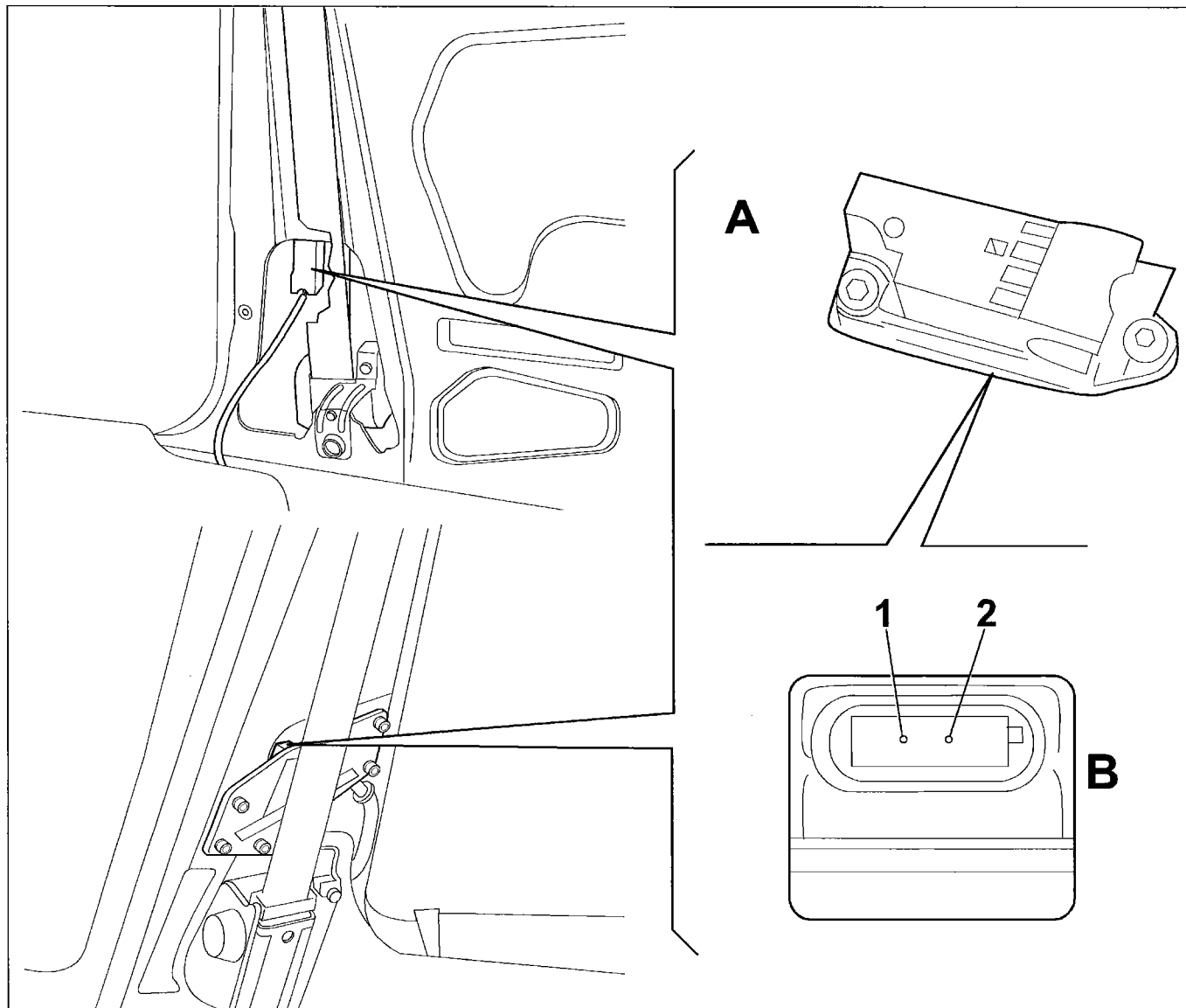
If the impact exceeds a certain degree of severity, the information is transferred by the sensor concerned to the Air Bag system main control unit which compares the information with that received from a second accelerometer which it contains guaranteeing a safety function (safing).

If the acceleration information detected by the "satellite" sensor and the control unit concurs, the main control unit activates the Side Bag module for the side affected by the impact.

If the impact is on the passenger side, the main control unit compares the signal coming from the "satellite" sensor with the one coming from the passenger presence sensor to either activate or not activate the Side Bag module.

### 55.

#### Location of deceleration "satellite" sensors



P4A10JL01

A. Deceleration "satellite" sensor

B. Pin out

1. Side Bag sensor supply
2. Side Bag sensor earth

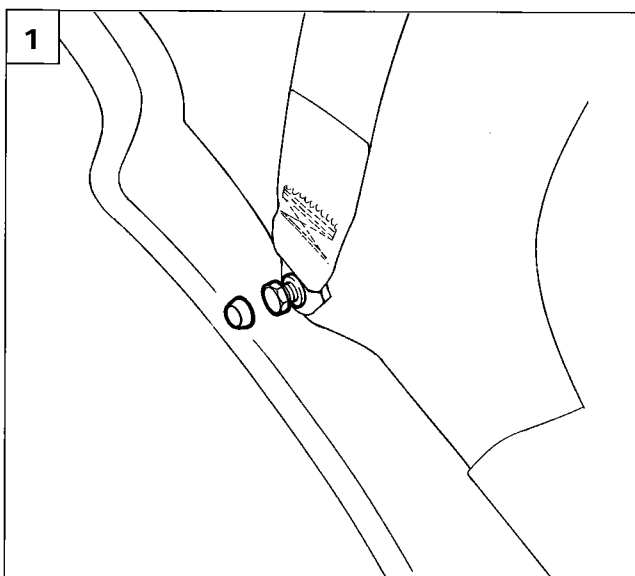
#### SAFETY INSTRUCTIONS TO BE FOLLOWED FOR OPERATIONS ON VEHICLES EQUIPPED WITH AIR BAG-SIDE BAG SYSTEM



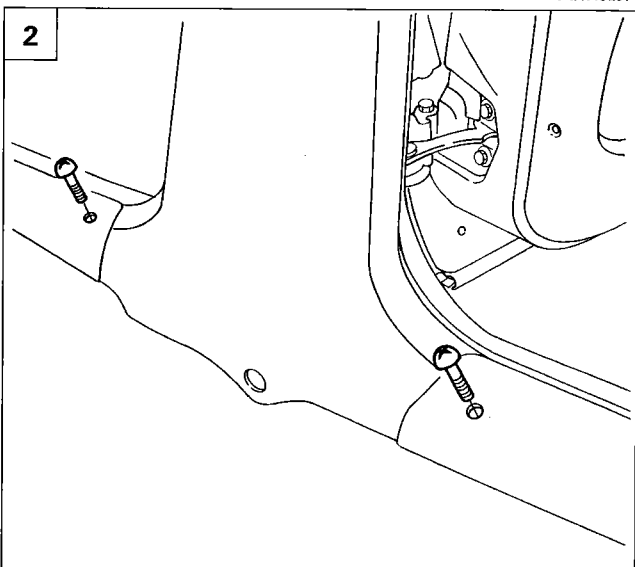
*The following rules MUST, UNDER ALL CIRCUMSTANCES, BE FOLLOWED during any operations involving vehicles equipped with Air Bag/Side Bag systems.*

The system components MUST ONLY be fitted and removed by skilled and authorized technical staff, bearing in mind that the components are devices which must be handled with care.

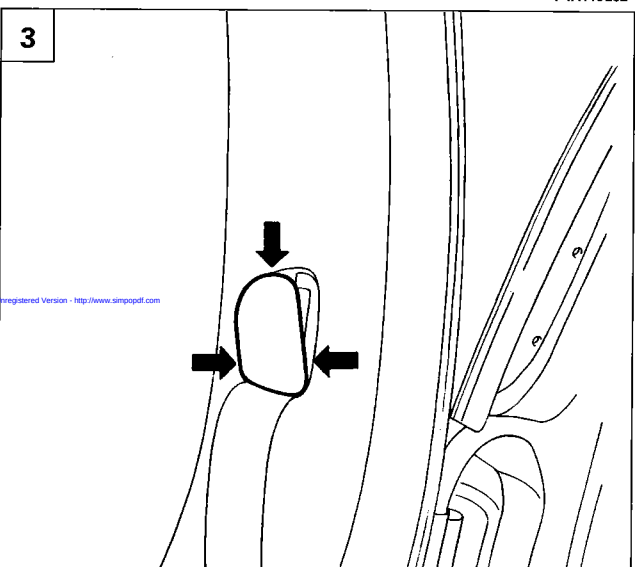
The transportation and storage of these components is governed by the handling procedures described in Section 55 - Electrical Equipment - "FIAT Bravo-Brava" Service Manual (2nd volume).



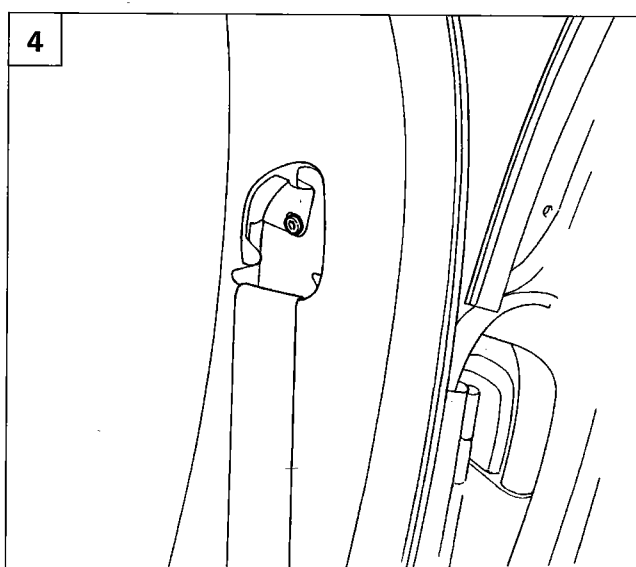
P4A11JL01



P4A11JL02



P4A11JL03



P4A11JL04



REMOVING-REFITTING  
"SATELLITE" SENSOR

DECELERATION

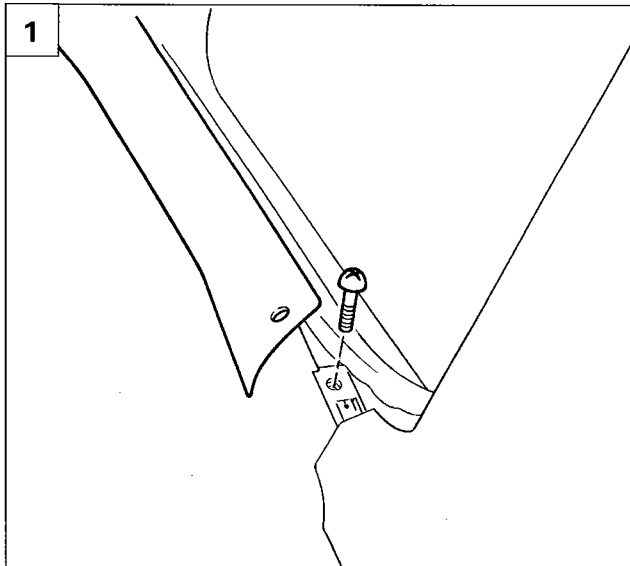
**NOTE** The procedure described below is for the Fiat Brava; proceed in the same way for the Fiat Bravo.



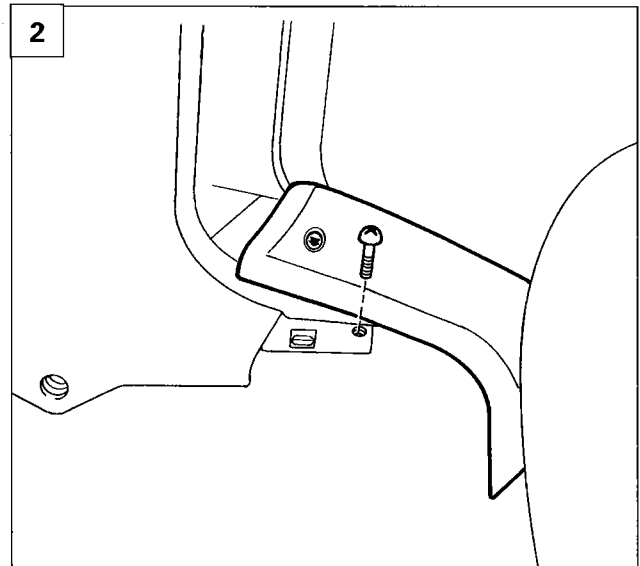
Place the ignition key in the OFF position and remove it; then disconnect the battery.

1. Remove the cover and undo the bolt fixing the front seat belt.
2. Undo the bolts fixing the running boards shown in the diagram.
3. Act on the retaining tabs and remove the pillar cover trim.
4. Undo the bolt fixing the pillar cover.

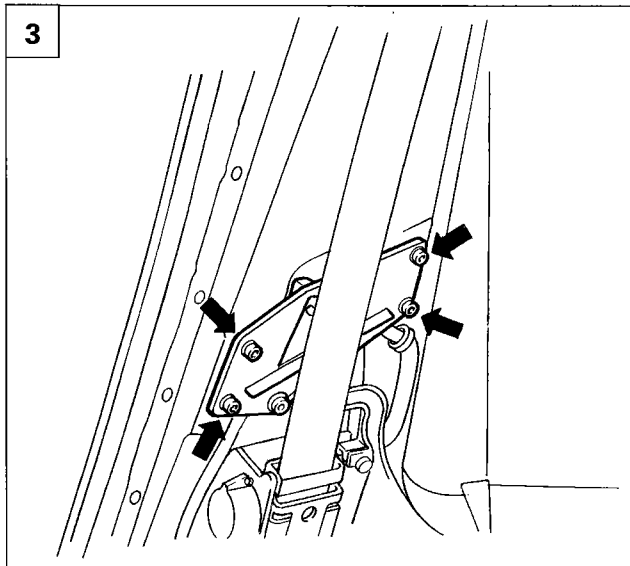
### 55.



P4A12JL01



P4A12JL02

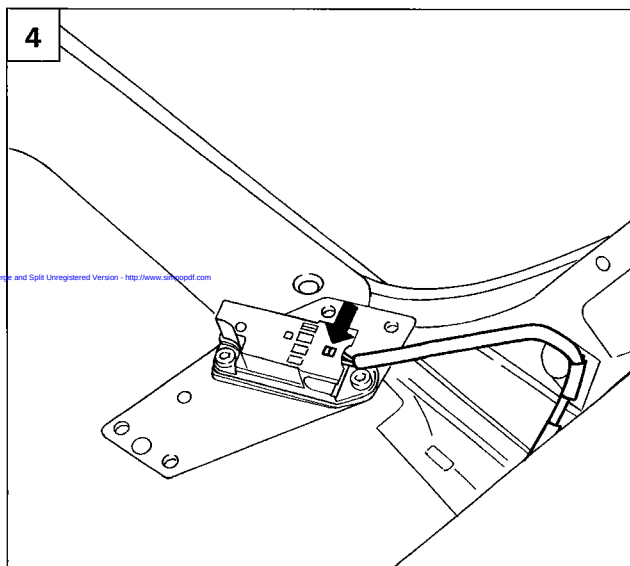


P4A12JL03

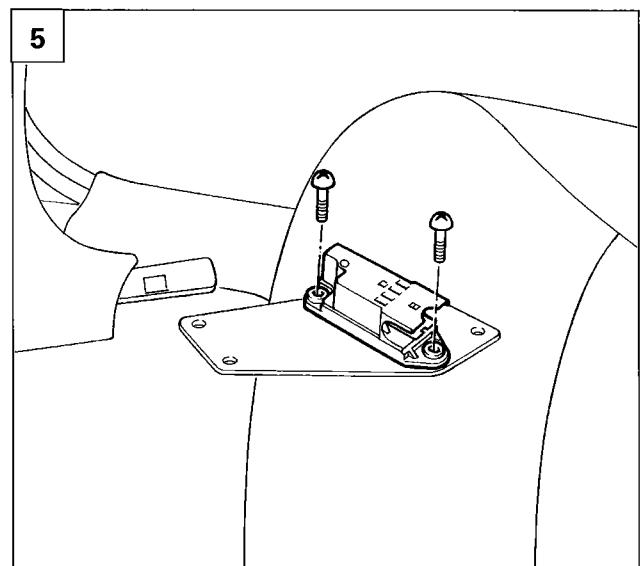


1. Lift up the rear running board, then undo the bolt underneath fixing the pillar cover.
2. Lift up the front running board, then undo the bolt underneath fixing the pillar cover.
3. Lift up the pillar cover, then undo the bolts fixing the Side Bag deceleration "satellite" sensor mounting bracket.
4. Disconnect the electrical connection shown in the diagram.
5. Undo the bolts shown in the diagram, then remove the deceleration "satellite" sensor from the bracket.

**NOTE** *To refit, suitably reverse the order of the operations carried out for the removal.*



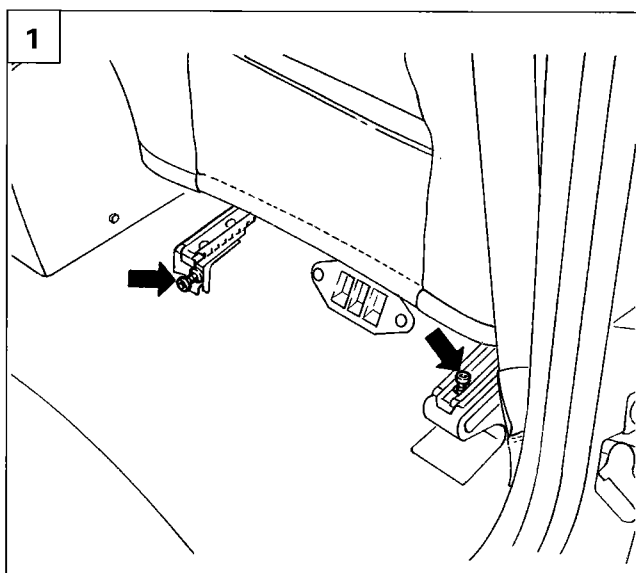
P4A12JL04



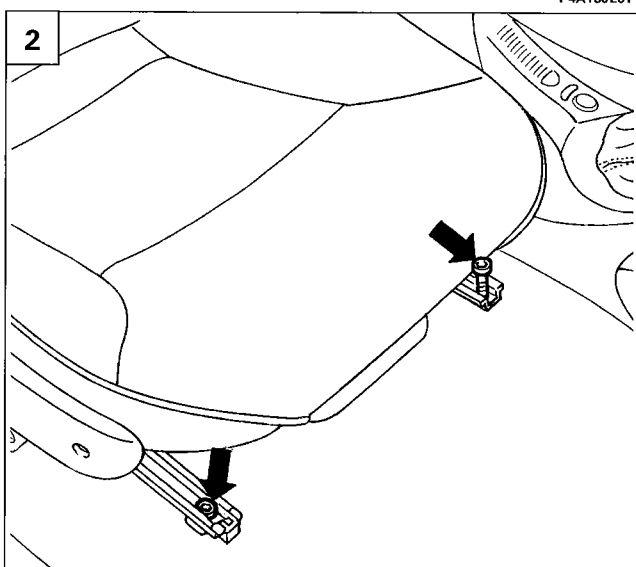
P4A12JL05

### 55.

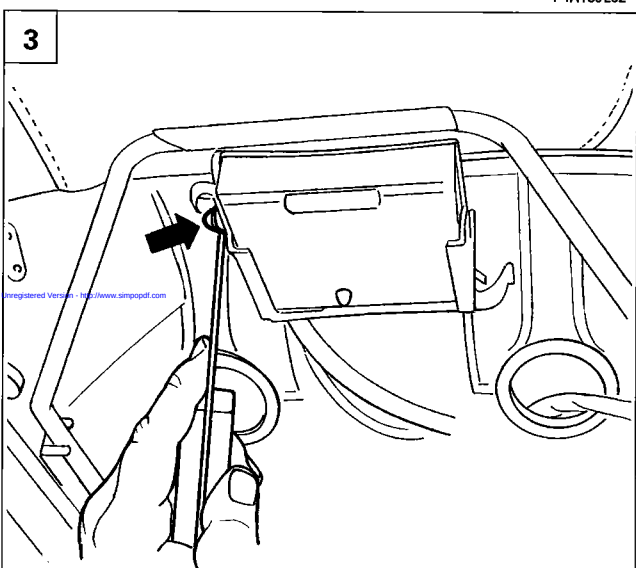
#### REMOVING-REFITTING FRONT SEAT WITH PASSENGER PRESENCE SENSOR AND SIDE BAG



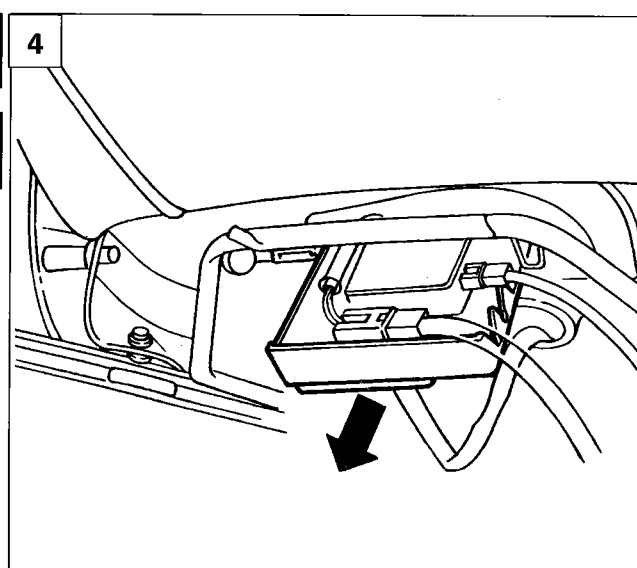
P4A13JL01



P4A13JL02



P4AJL1303



P4A13JL04

#### Removing

1. Move the seat forwards, into the end of travel position, and undo the bolts fixing the guides to the floor.
2. Move the seat backwards, into the end of travel position, and undo the bolts fixing the guides to the floor.

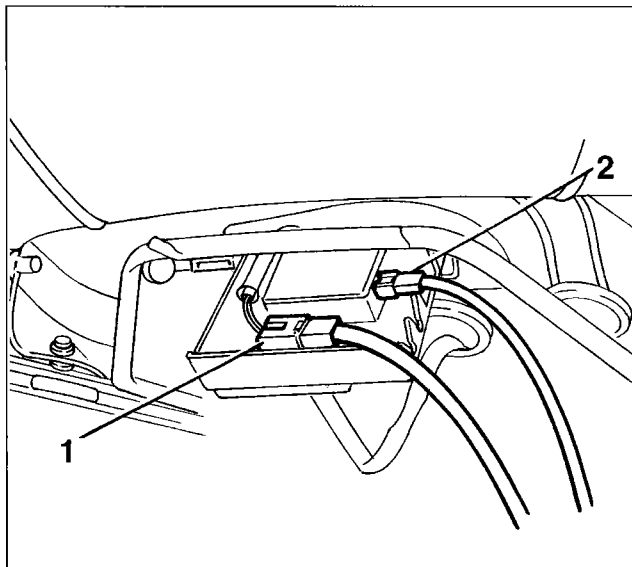


*Before proceeding with the removal of the seat:*

- disconnect the battery terminals;
- wait at least 10 minutes before disconnecting the connections for the passenger presence sensor, then proceed as described below.

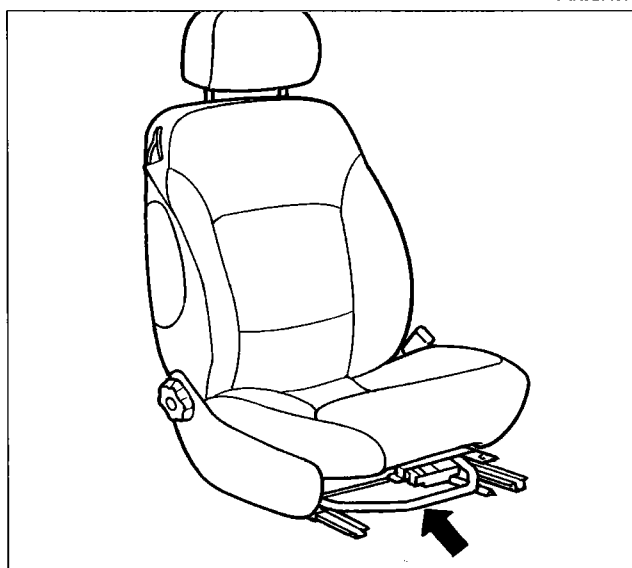
3. Fold the seat backwards to gain access to the connections, then disconnect the connector for the lumbar adjuster, heater pad and seat belt, if fitted, and remove the connector box safety cap.
4. Extract the connector box flap.

### 55.



**NOTE** *There are two connections on the passenger side (Side Bag and passenger presence sensor) whilst there is only one connection for the Side Bag on the driver's seat.*

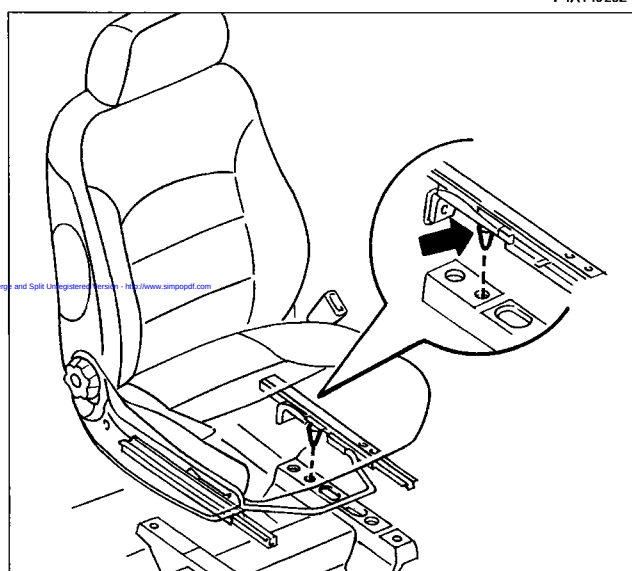
- Disconnect the connector (1) for the Side Bag and the connector (2) for the Passenger Presence;



- remove the seat from the vehicle.



*Do not extract the seat from its housing, using the seat drive lever shown by the arrow in the diagram, in order not to alter the alignment of the guides.*

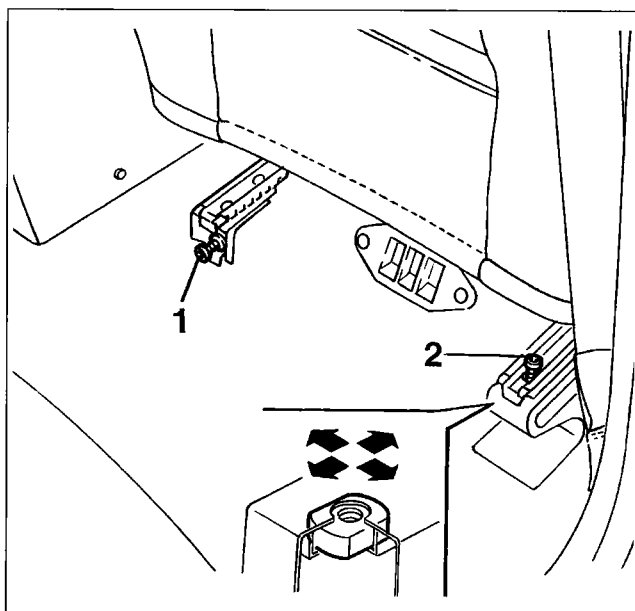


### Refitting

- Position the seat in the vehicle;
- connect the electrical connectors coming from the vehicle floor;
- make sure that the centering pin on the seat guide is in the correct position;



*Check that the carpet does not interfere in the seat guide support areas.*

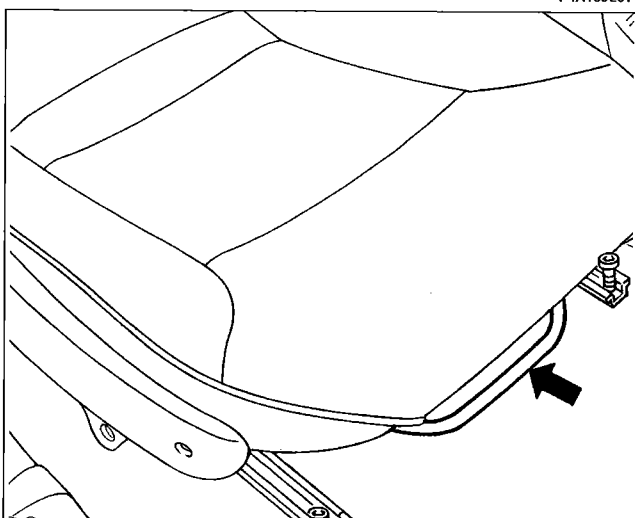


- fit and tighten the rear fixing bolts, starting from the inside (1) and continuing towards the outside (2), to a torque of 2.4 daNm;



*The seat should be fixed to the floor without the guides being distorted; if necessary act on the nuts, shown in the inset, making sure that they are free.*

**NOTE** During this stage, do not lift the seat to fit the fixing bolts.

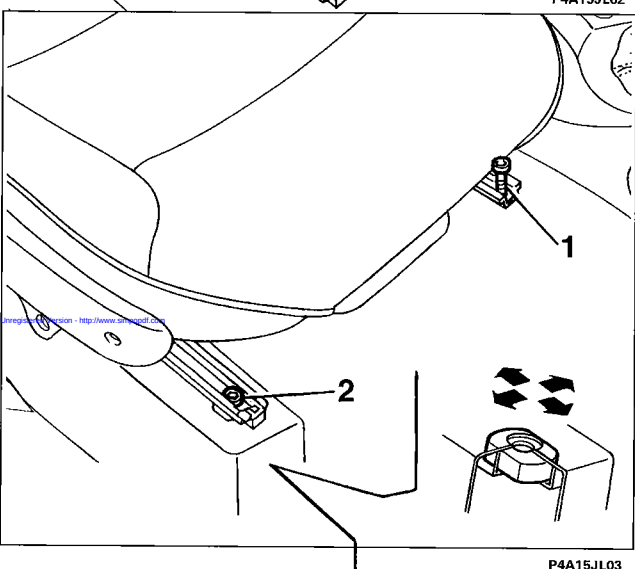


- place the seat in the "FULLY RETRACTED" position using the guide control lever;



*Make sure that the guide control lever is correctly attached.*

**NOTE** For the BRAVO avoid lowering the backrest to slide the seat in order not to loosen the guides which would result in them not being aligned.



- fit and tighten the front fixing bolts, starting from the inside (1) and working towards the outside (2), to a torque of 2.4 daNm.



*The seat should be fixed to the floor without the guides being distorted; if necessary act on the nuts, shown in the inset, making sure that they are free.*

**NOTE** Each time operations are carried out on the Air Bag system the operation of the system **MUST, UNDER ALL CIRCUMSTANCES**, be checked using the diagnostic equipment.

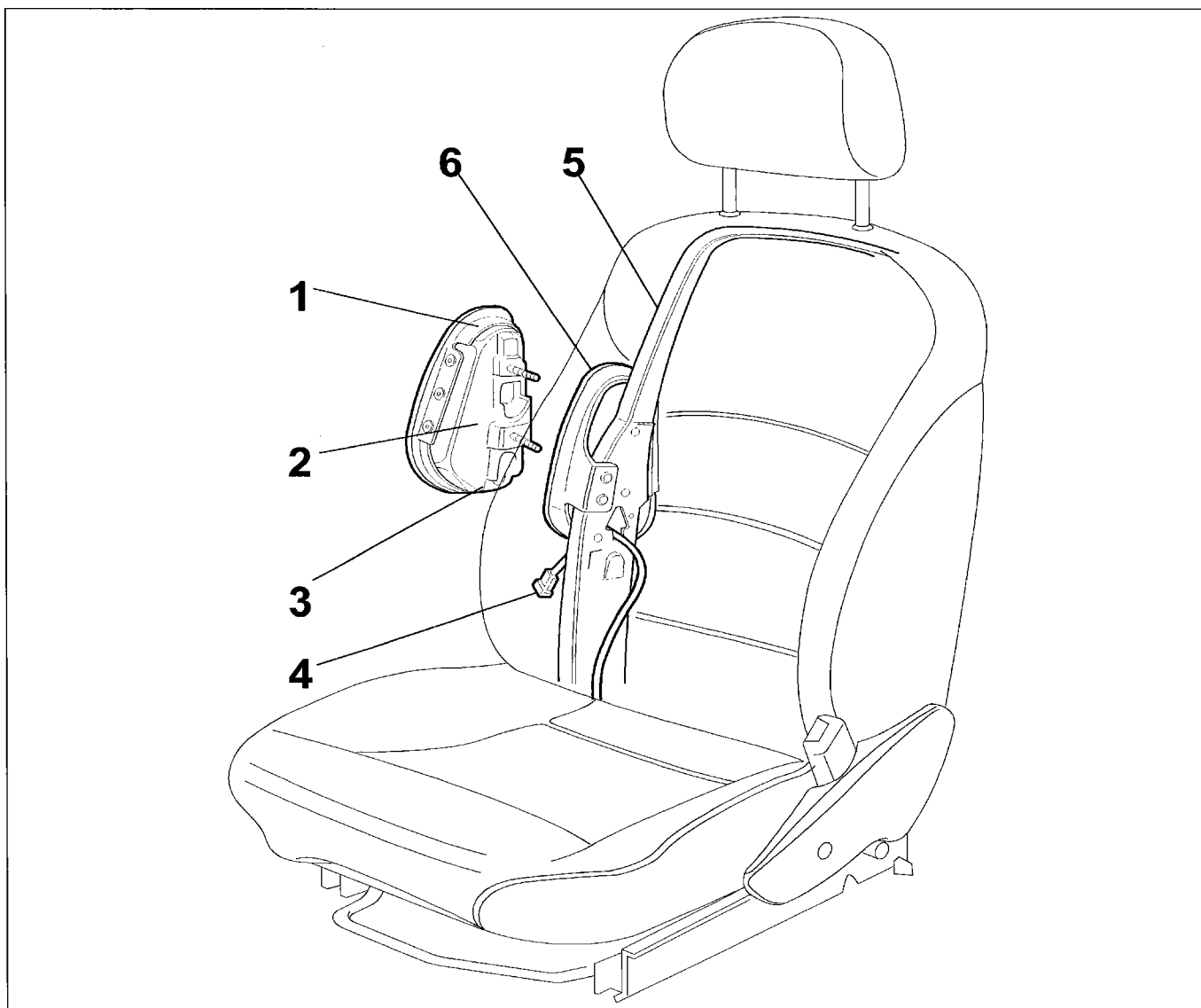


### 55.

#### DIAGRAMMATIC VIEW OF SIDE BAG MODULE

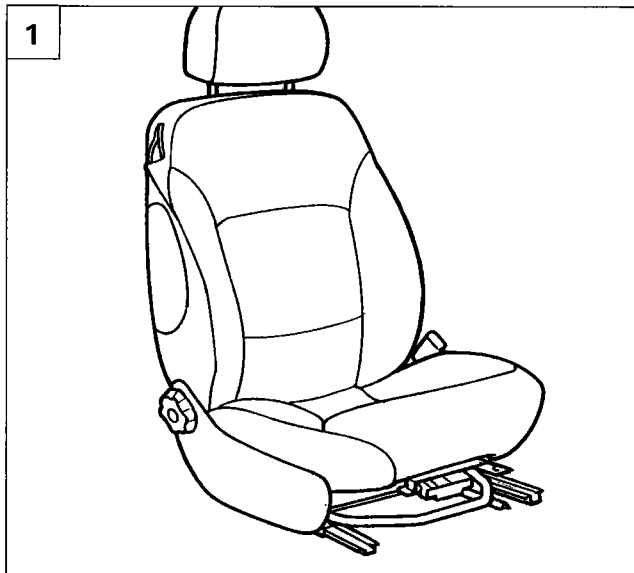
##### Dismantling Side Bag

The Side Bag modules are fitted under the backrest cover and do not significantly alter the style or dimensions of the seat.

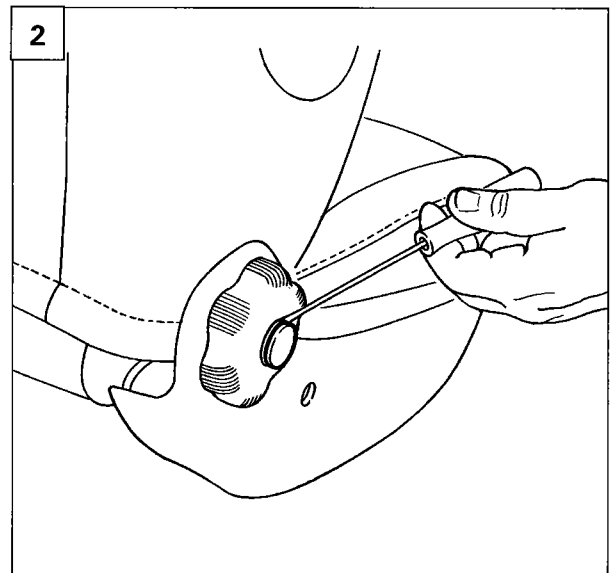


P4A16JL01

1. Plastic cover
2. Metal casing
3. Side Bag module connector
4. Electrical activation cable
5. Backrest structure
6. Side Bag module housing



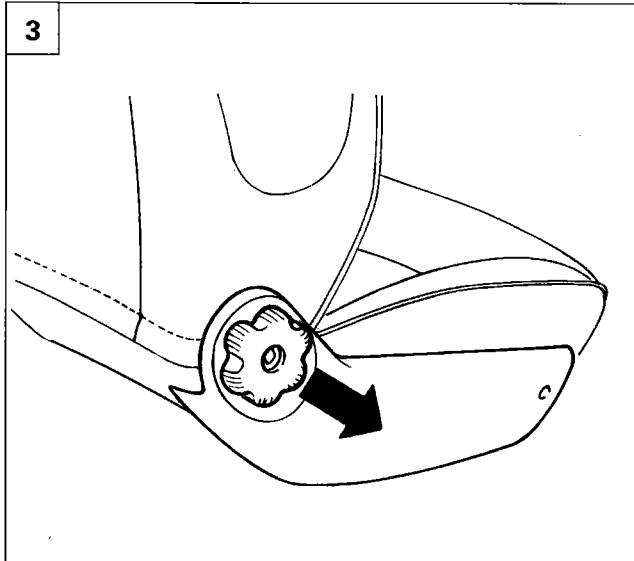
P4A17JL01



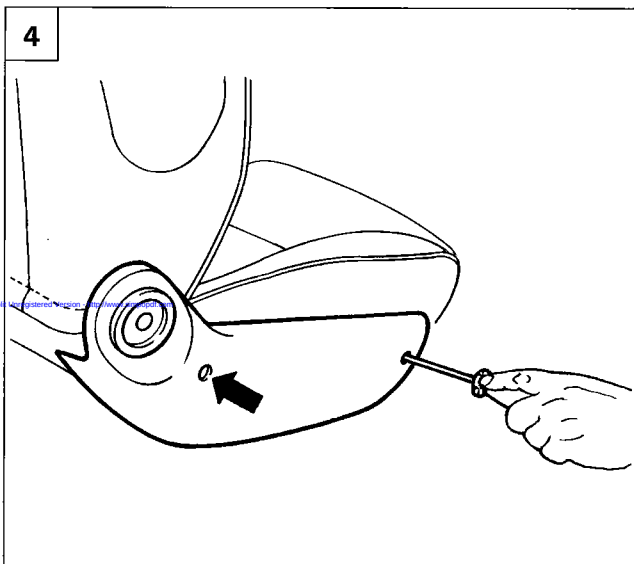
P4A17JL02

### REMOVING-REFITTING SIDE BAG MODULE

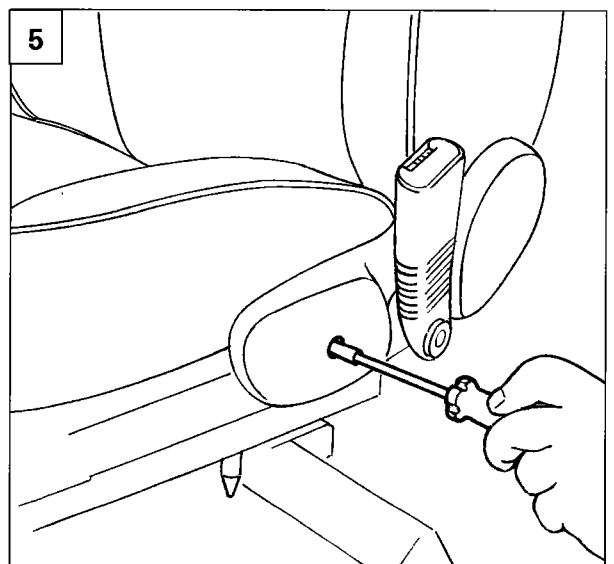
1. Remove the front seat as described in the paragraph "FRONT SEAT WITH PASSENGER PRESENCE SENSOR AND SIDE BAG".
2. Remove the cap fixing the seat angle adjustment knob.
3. Extract the seat angle adjustment knob.
4. Undo the fixing bolts shown in the diagram and remove the outer seat cover.
5. Undo the bolt fixing the inner seat cover.



P4A17JL03

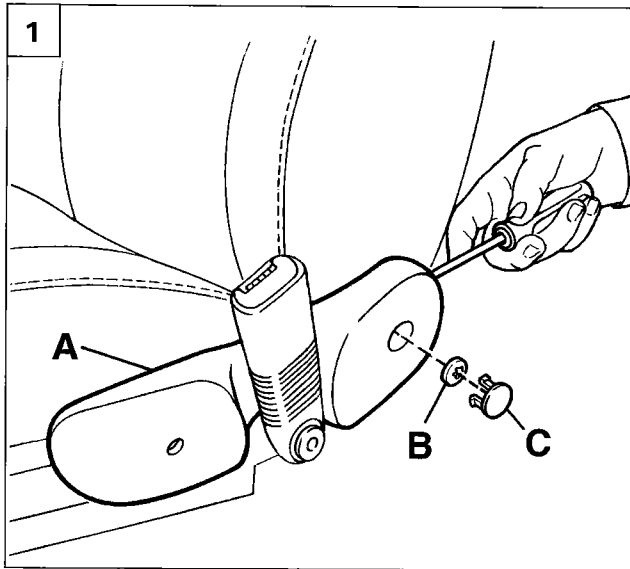


P4A17JL04

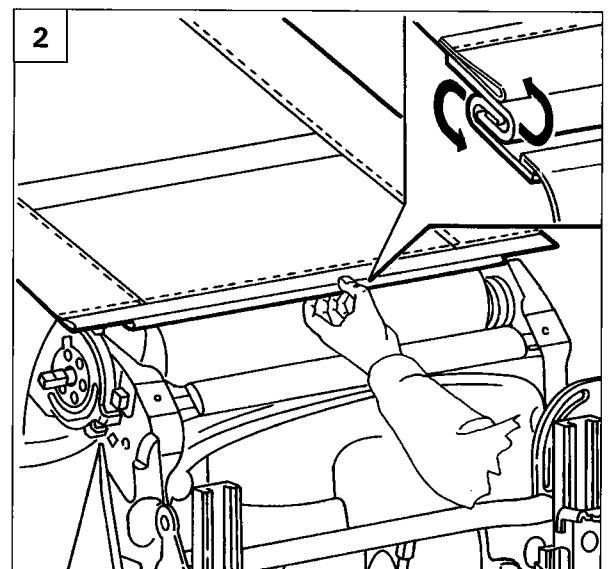


P4A17JL05

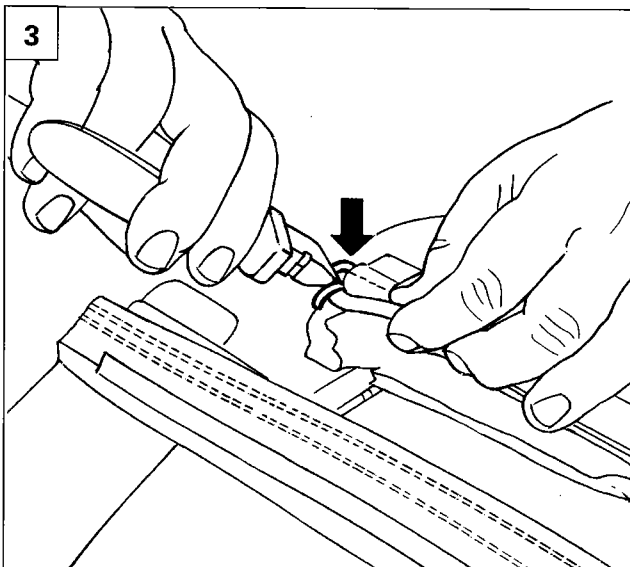
### 55.



P4A18JL01

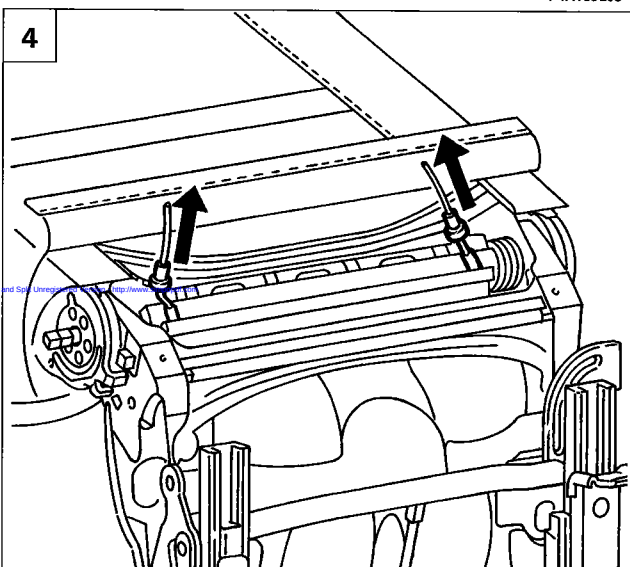


P4A022M08

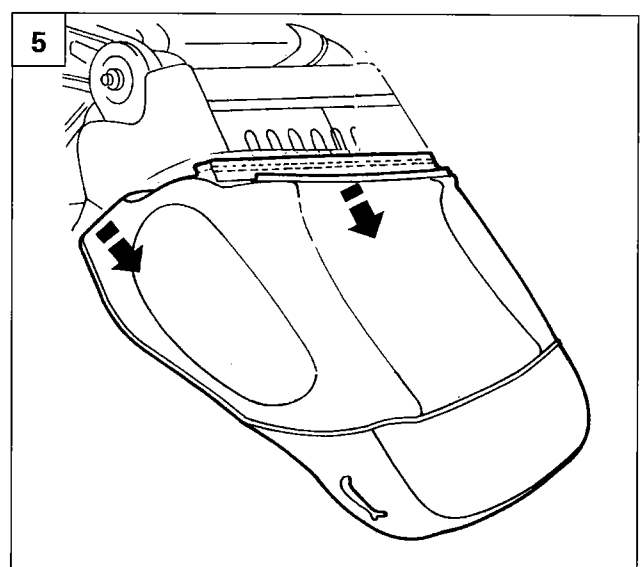


P4A18JL03

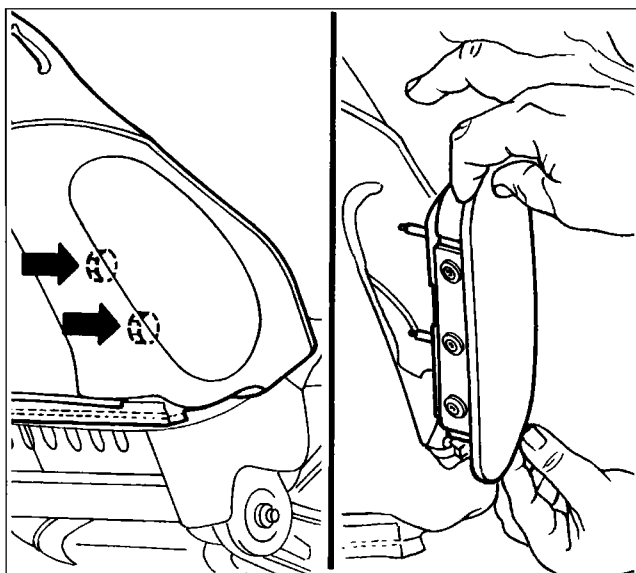
1. Extract cover A manoeuvring it to release washer B, taking care to avoid breakages. Push cap C from the inside after removing the trim. Recover washer B.
2. Release the plastic profile for the backrest from the attachment system.
3. Remove the hooks (two per side) fixing the upholstery using clippers."
4. Disconnect the tensioning rods.
5. Partly remove the upholstery to gain access to the Side Bag module fixing nuts.



P4A022M09



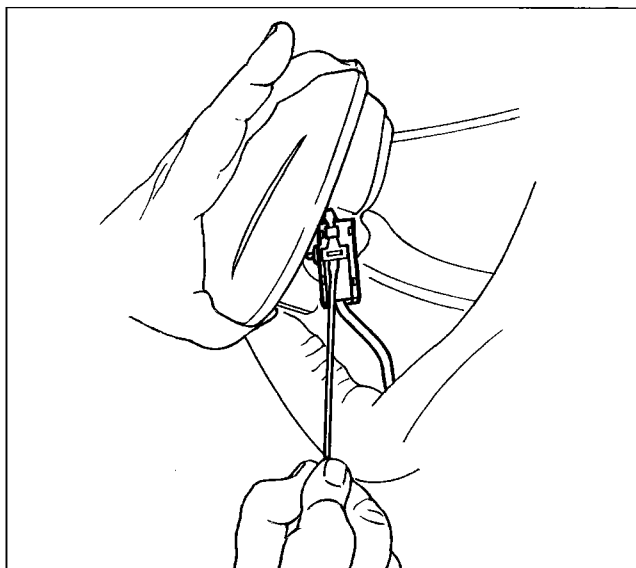
P4A18JL06



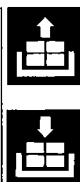
P4A19JL01



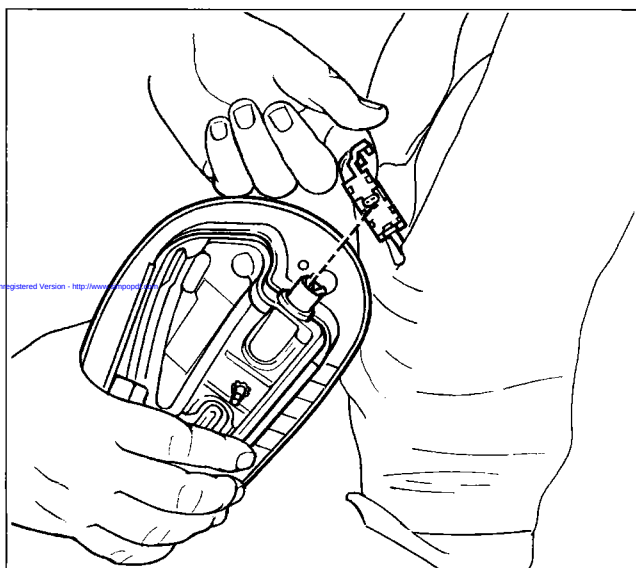
- Undo the nuts (M6) fixing the Side Bag module to the seat frame using a 10 mm spanner;



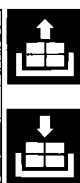
P4A19JL02



- extract the Side Bag module from its housing, disconnect the safety connection;



P4A19JL03



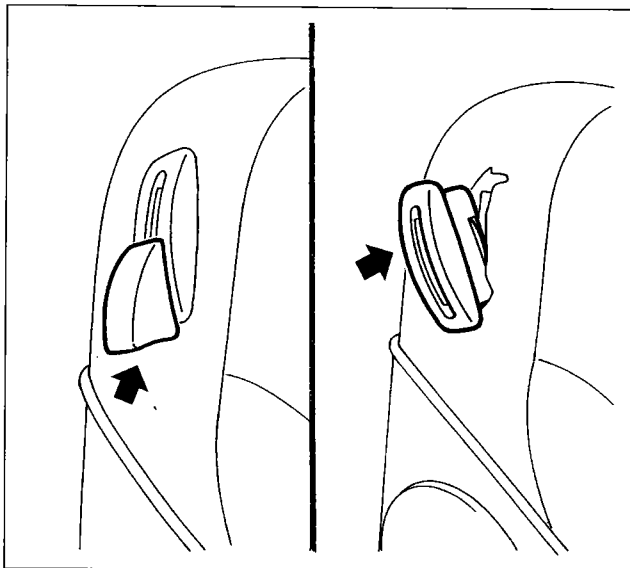
- remove the Side Bag module from the supply cable.



Carefully follow the instructions in the "General Warnings" chapter when handling Side Bag modules.

**NOTE** When refitting, suitably reverse the order of the operations carried out for the removal, making sure that the Side Bag module safety connector is always re-connected; if this is not the case, the fault will be shown by the warning light in the instrument panel.

55.



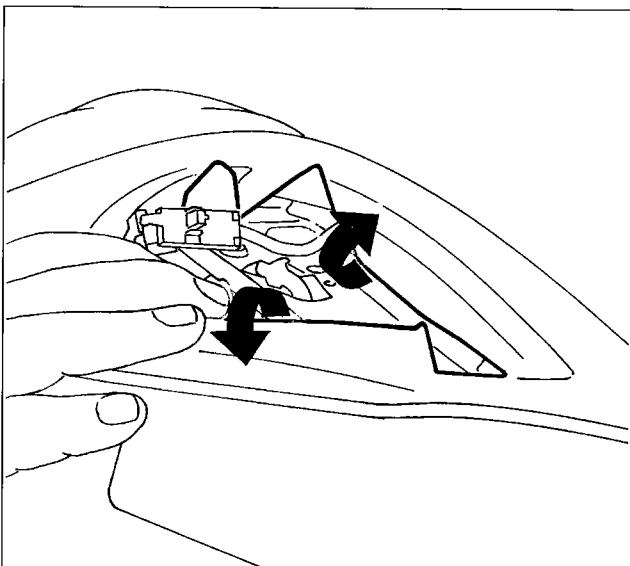
P4A20JL01

### DISMANTLING-REASSEMBLING FRONT SEAT

#### Removing-refitting front seat backrest cover

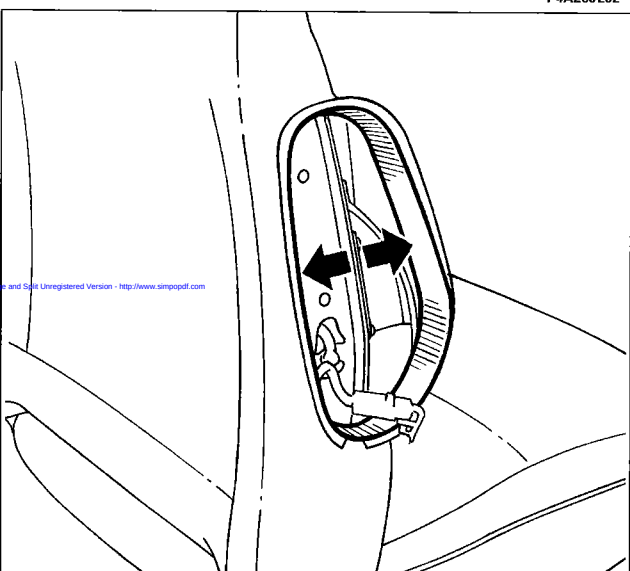
Remove the Side Bag module as described in the "SIDE BAG MODULE" paragraph

- extract the backrest folding lever and remove the trim, acting on the retaining tabs (Bravo only);



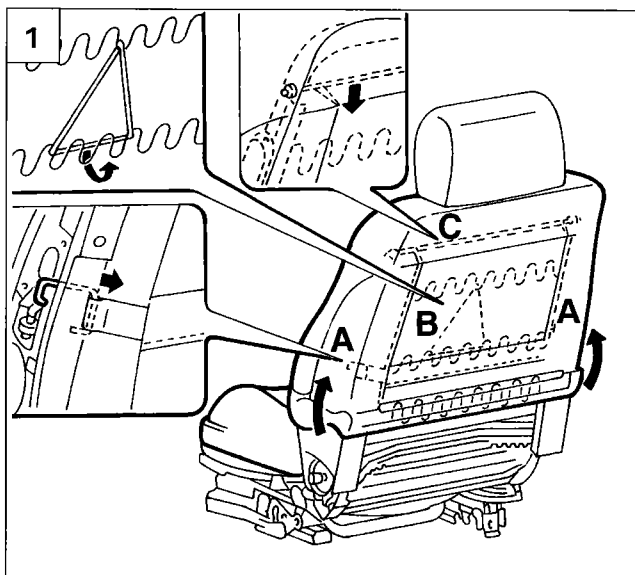
P4A20JL02

- remove the cover along the perimeter of the Side Bag housing from the velcro;

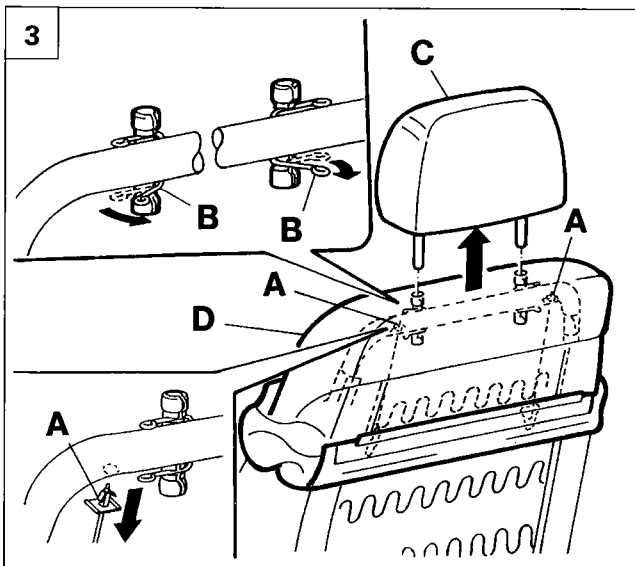


P4A20JL03

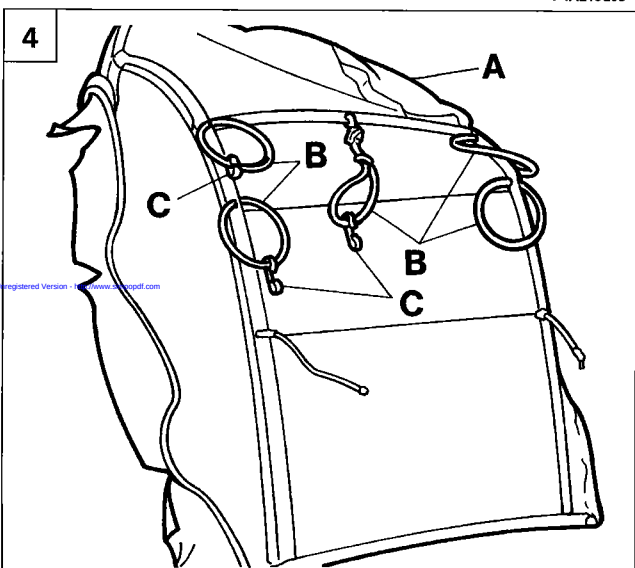
- Stick the seat backrest cover to the velcro, around the perimeter of the Side Bag housing, as illustrated in the diagram (during refitting only).



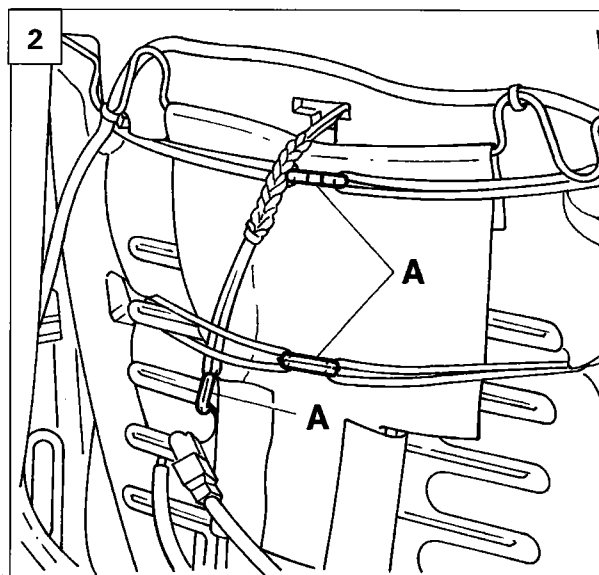
P4A21JL01



P4A21JL03



P4A21JL04



P4A21JL02

1. Remove the cover, then remove the fixing hooks A: release the circlip B and then the upper retaining rod C; (operation valid for the passenger seat).
2. Release the attachments (A) for the tensioning circlips (operation valid for the driver's seat).
3. Release the two rods A from the pipe as illustrated in the inset, rotate the spring B, extract the head restraint C and then remove the cover D.

#### 4. View of inner cover

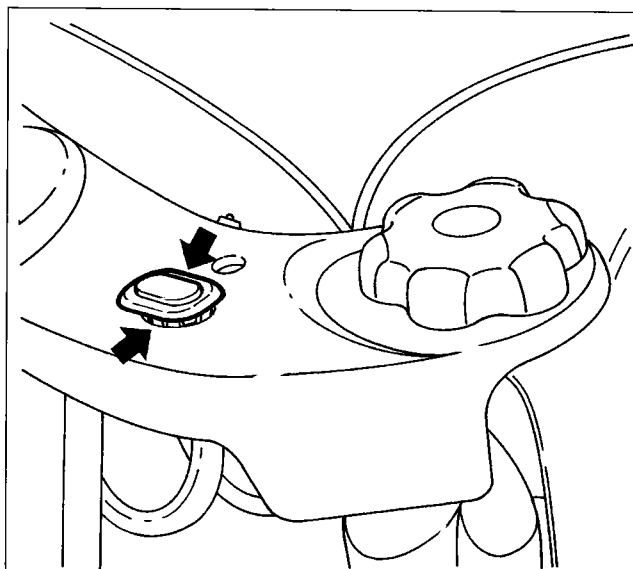
- A. Cover
- B. Circlips
- C. C. Attachments

**NOTE** To refit, suitably reverse the order of the operations carried out for the removal. Fix the backrest cover hooks using tool 1878077000, taking care to ensure that the rods are correctly positioned.

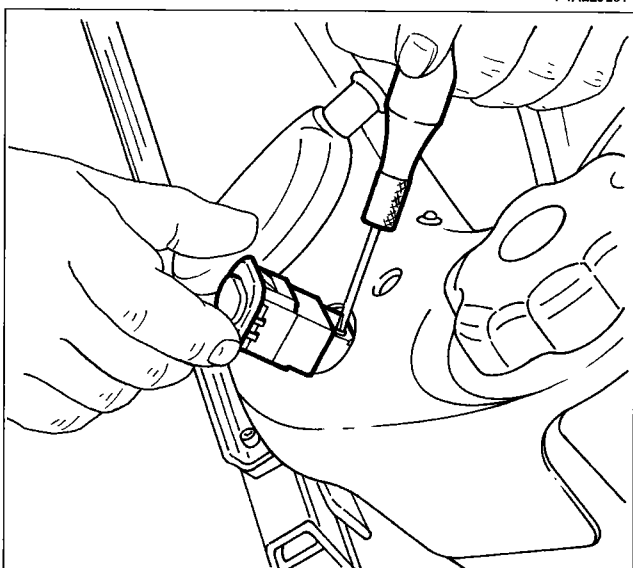


Use new hooks.

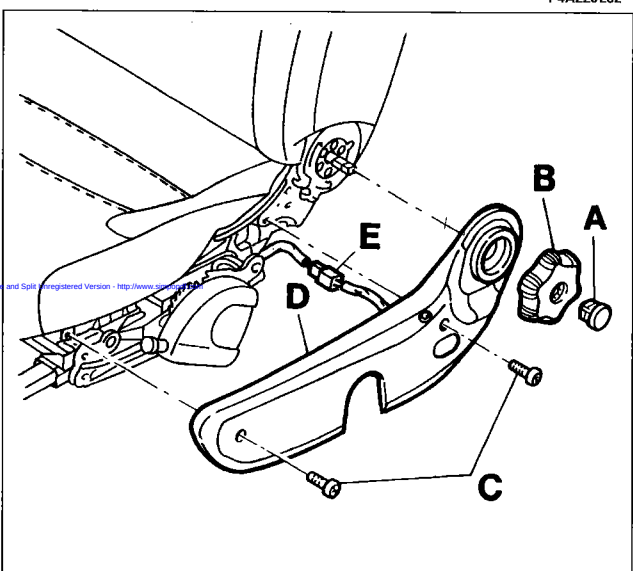
55.



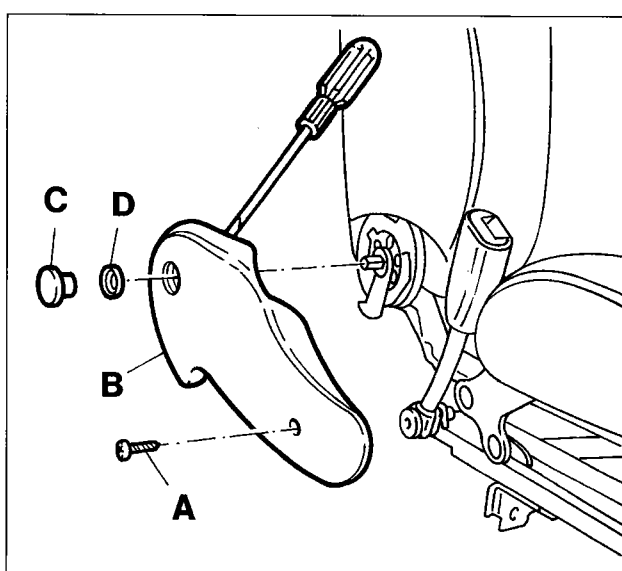
P4A22JL01



P4A22JL02



P4A22JL03



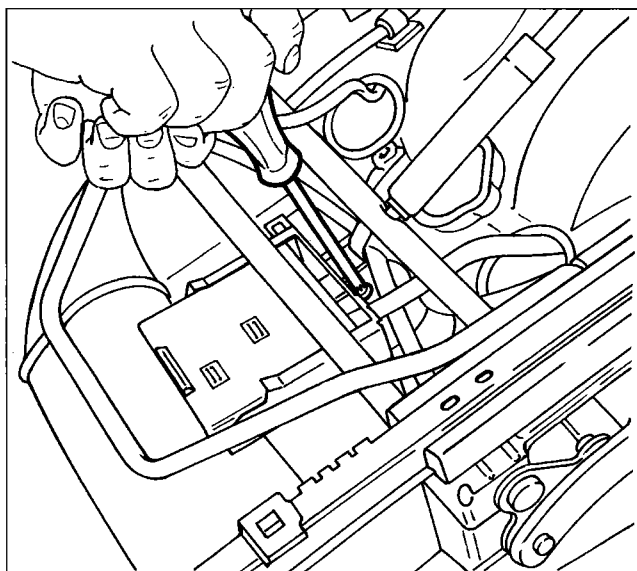
P4A22JL04

### Removing-refitting front seat cushion cover

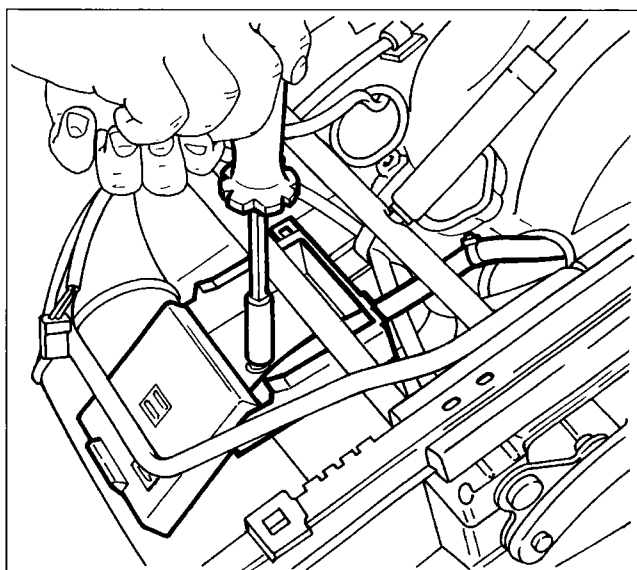
Remove the front seat as described in the paragraph "REMOVING-REFITTING FRONT SEAT WITH PASSENGER PRESENCE SENSOR AND SIDE BAG".

1. Act on the retaining tabs, remove the lumbar adjustment control switch, if fitted.
2. Disconnect the connector and remove the lumbar adjustment control switch.
3. Remove the cap A and the backrest adjustment knob B. Undo the bolts C fixing the outer trim D, then remove it, after having disconnect the connection E for the heater pad LED E (if fitted).
4. Undo the bolt A fixing the trim B to release the washer D, taking care to avoid breakages. Push the cap C from the inside, after extracting the trim, recovering the washer D.

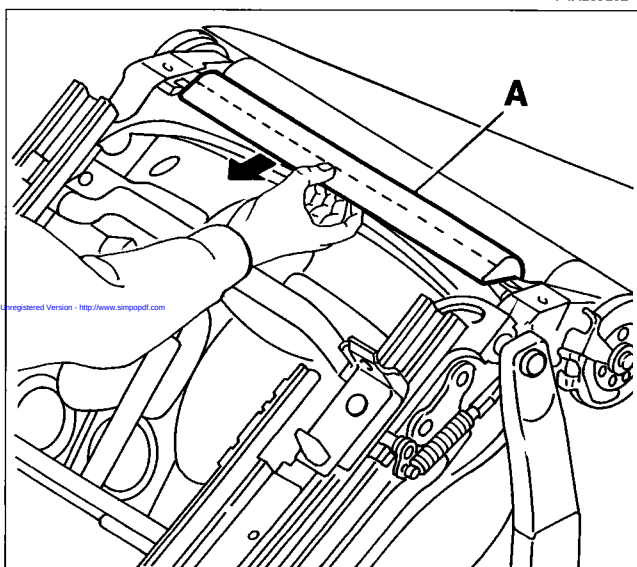




P4A23JL01



P4A23JL02

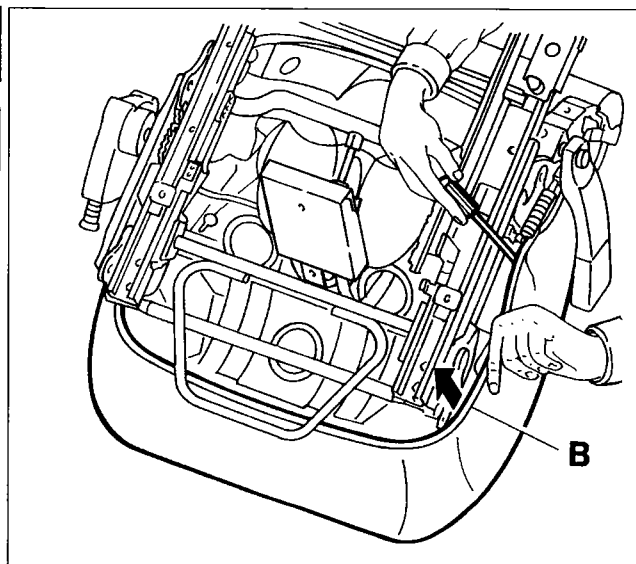


P4A021M08

1. Undo the bolt fixing the connector box.
2. Extract the box flap, undo the bolt underneath and place the connector box to the side.
3. Release the plastic profile (A) at the rear, working as illustrated in the diagram.
4. Proceed to extract the plastic profile B, starting from the rear side section, releasing it with the help of a screwdriver, then remove the cushion.



*Remove the cushion, complete with cover, from its housing, taking care over the electrical wiring and, in particular, the passenger presence sensor and heater pad.*



P4A23JL04

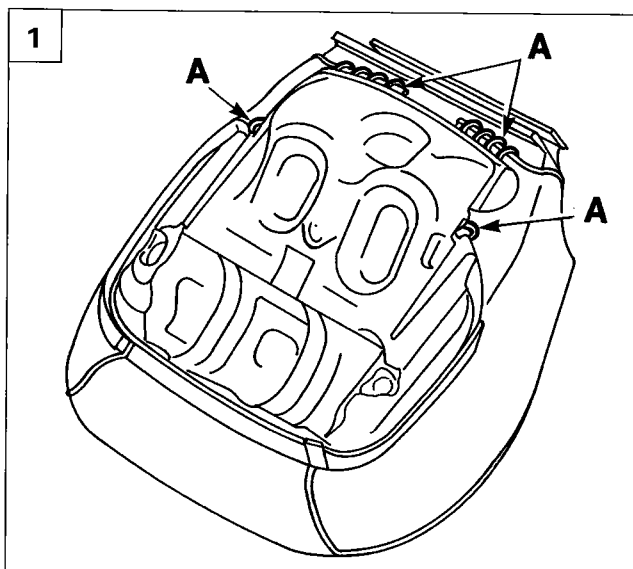
# Electrical equipment

## Air Bag – New features

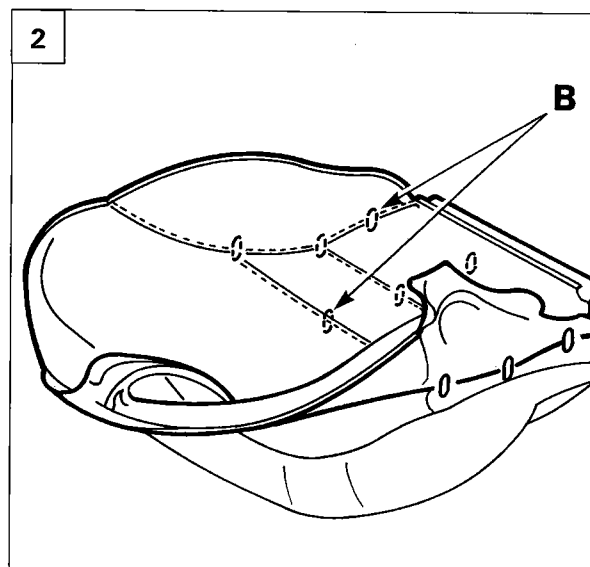
**Bravo-Brava**

98 range

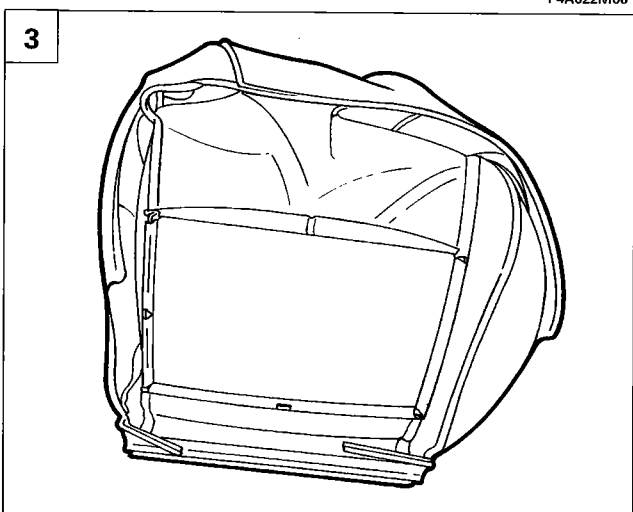
**55.**



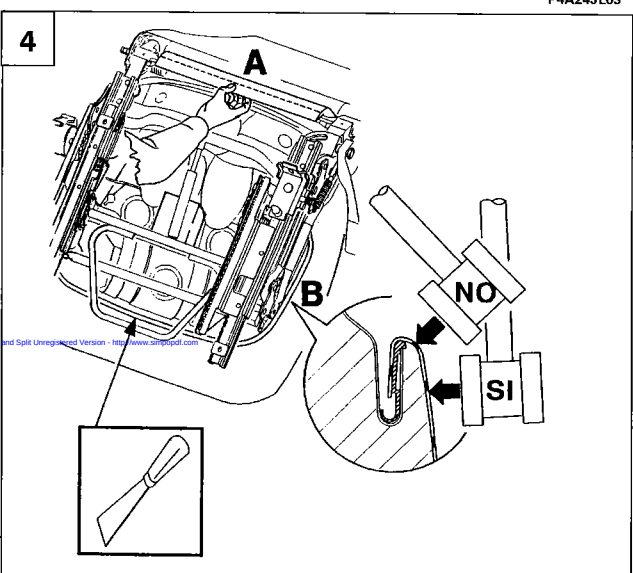
P4A022M06



P4A022M07



P4A24JL03



P4A24JL04

1. Proceed with dismantling the hooks A fixing the cover to the upholstery using the clip-pers;
2. turn the cover over and dismantle the fixing hooks B by the edges of the seat;



*Remove any remaining hooks connected to the upholstery to prevent damage to the new cover.*

3. remove the seat cushion cover from its housing.

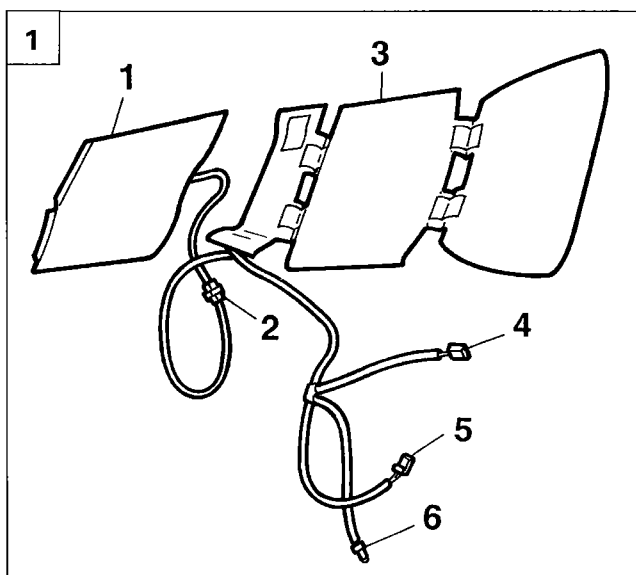
**NOTE** To refit, simply reverse the order of the operations carried out for the removal. Fix the cushion cover hooks using tool 1878077000.

### Refitting

4. Refit the cushion module to the seat frame; attach plastic profile (A) and attach plastic profile (B) using a spatula, starting from the centre front area. Strike the rain gutter using a rubber hammer (the diagram shows how to use a rubber hammer correctly)



*Using other tools could damage the cover.*



P4A25JL01



### SEAT HEATER PAD

#### Key

1. Backrest heater pad
2. Backrest/cushion heater pad connector
3. Cushion heater pad
4. Heater pad switch connector
5. Supply connector
6. Seat heater pad on warning light connector

#### Removing-refitting backrest heater pad

Remove the front seat backrest cover as described in the paragraph "Removing-refitting front seat backrest cover" with the exception of the head restraint, freeing only the part which covers the heater pad.

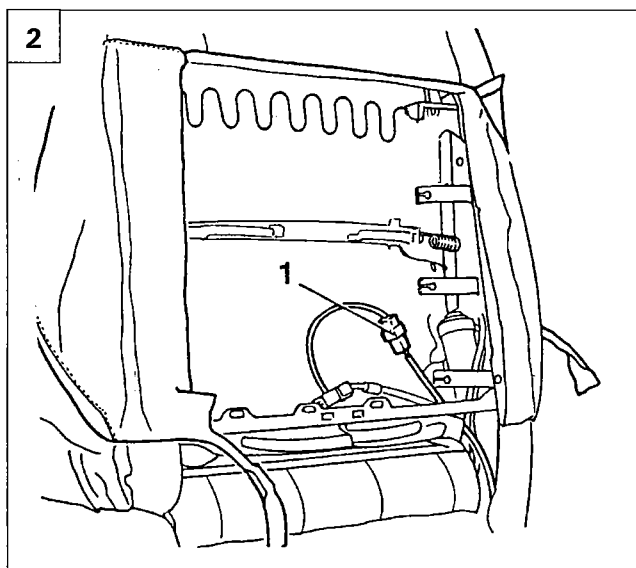
**NOTE** Remove the backrest lowering lever and frame (Fiat Bravo only)

2. Disconnect the electrical supply connection (1) and remove the cable passing it in front of the backrest upholstery.
3. Remove the heater pad from the seat backrest upholstery.

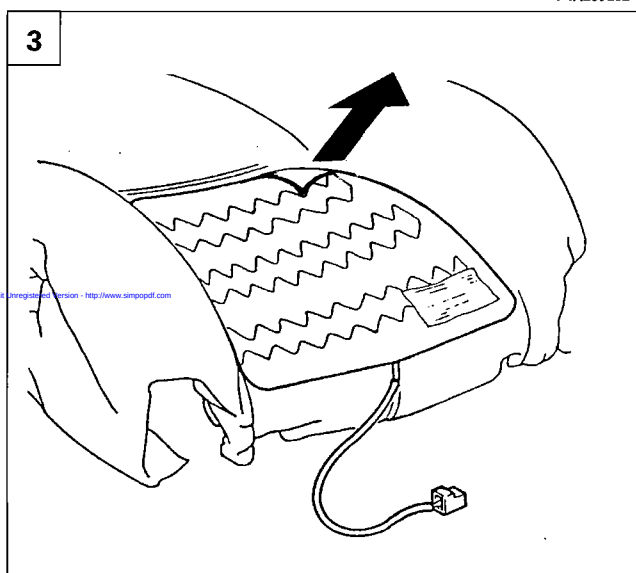
#### Refitting

4. To refit, position the heater pad on the backrest, as illustrated in the diagram, pass the cable behind the upholstery through the slit shown at the base of the backrest, re-connect the electrical connection and refit the backrest cover as described.

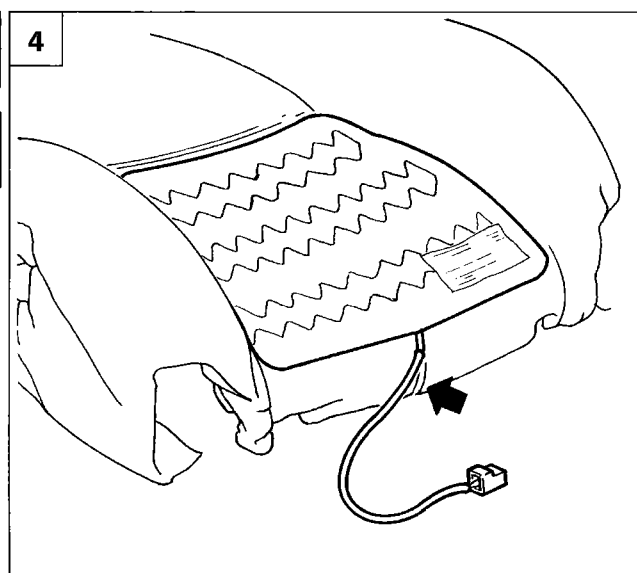
Refit the front seat backrest cover as described in the paragraph "Removing-refitting front seat backrest cover".



P4A25JL02

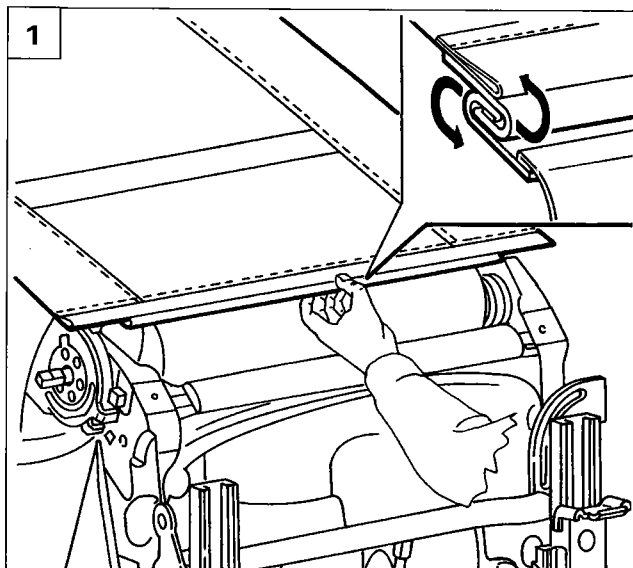


P4A25JL03

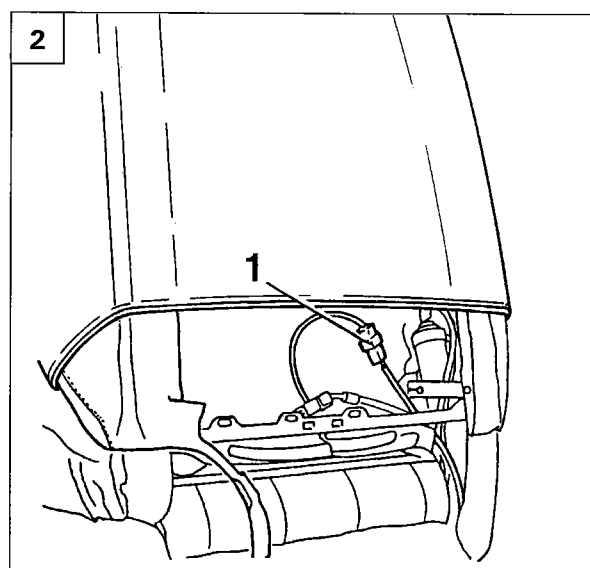


P3U92NL05

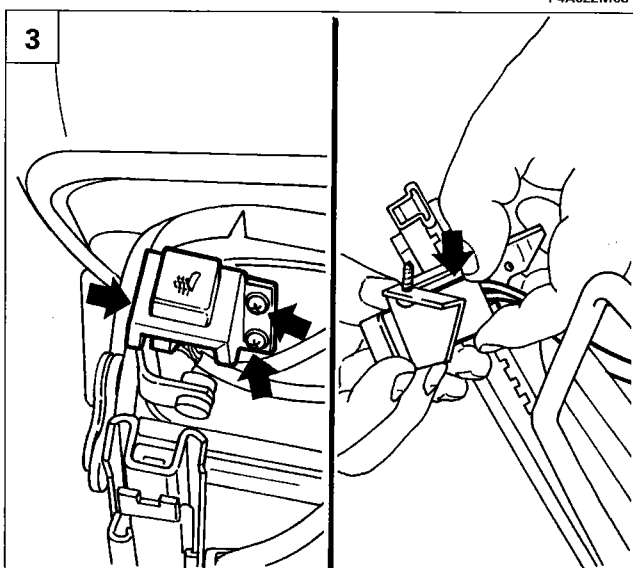
### 55.



P4A022M08



P4A26JL05



P4A26JL03

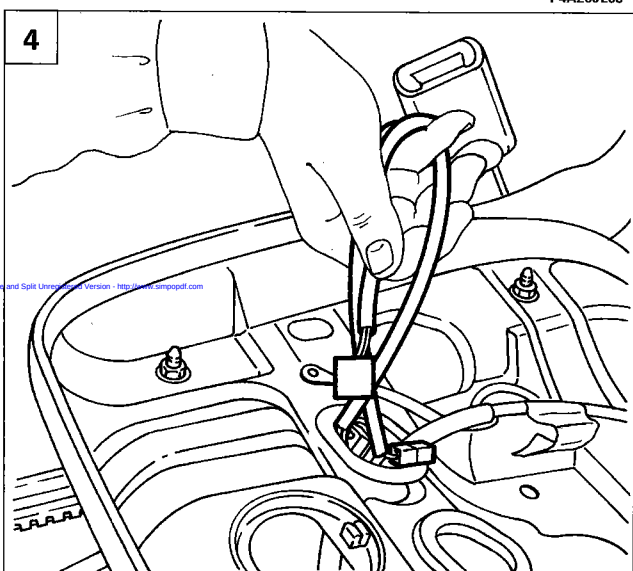
#### Removing-refitting cushion heater pad

1. Release the backrest plastic profile from the attachment system.
2. Partly remove the seat backrest cover to disconnect the electrical supply connection (1) and remove the wiring.

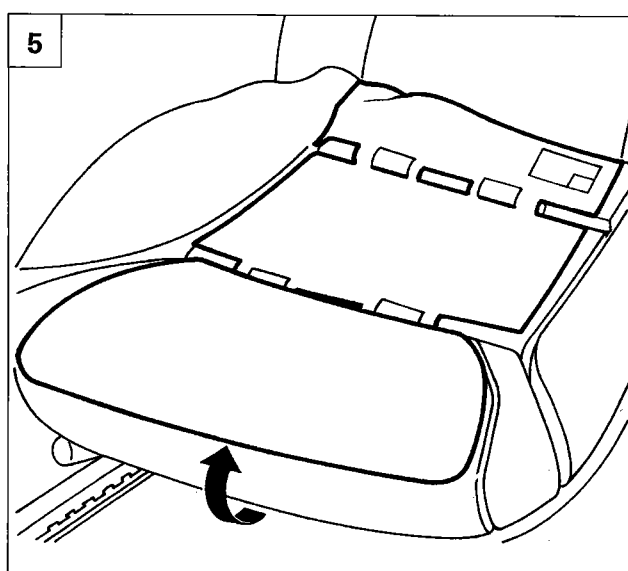
Remove the cushion cover as described in the paragraph "Removing-refitting front seat cushion cover".

3. Undo the bolts fixing the heater pad switch and disconnect the heater pad electrical supply connection.
4. Lift up the seat cushion upholstery and release the electrical wiring from the retaining springs.
5. Remove the heater pad without damaging the PPD sensor.

**NOTE** To refit, simply reverse the order of the operations carried out for the removal.

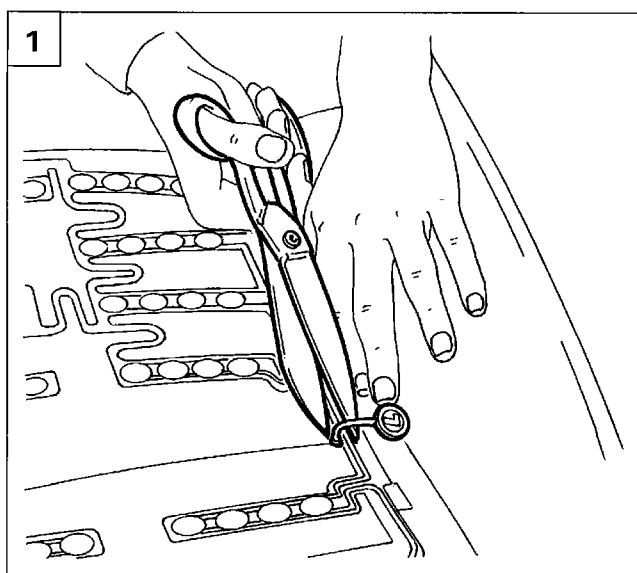


P4A26JL04



P4A26JL05

#### REMOVING-REFITTING PASSENGER PRESENCE SENSOR (PPD)



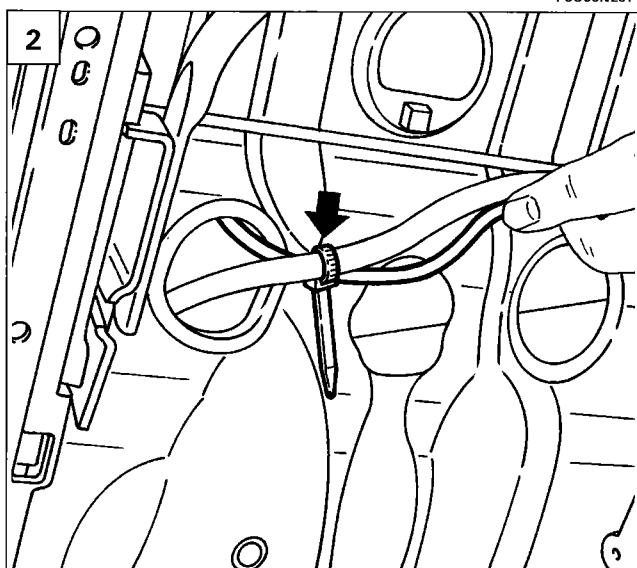
#### Removing-refitting

Remove the front seat cushion cover as described in the paragraph "Removing-refitting front seat cushion cover" and the cushion heater pad (if fitted).

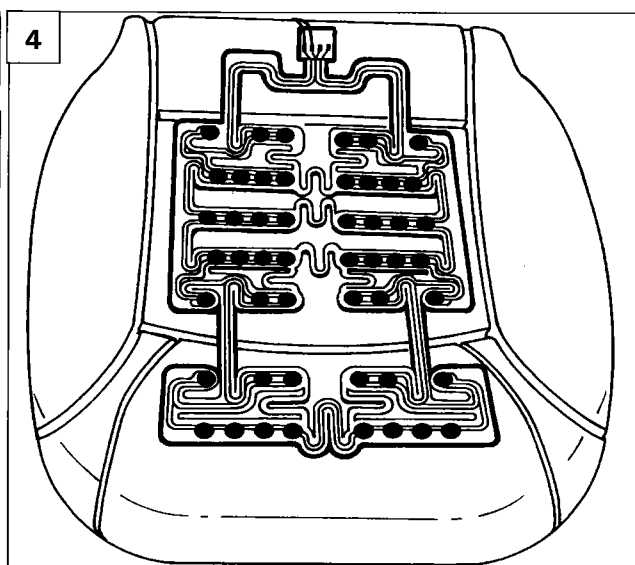
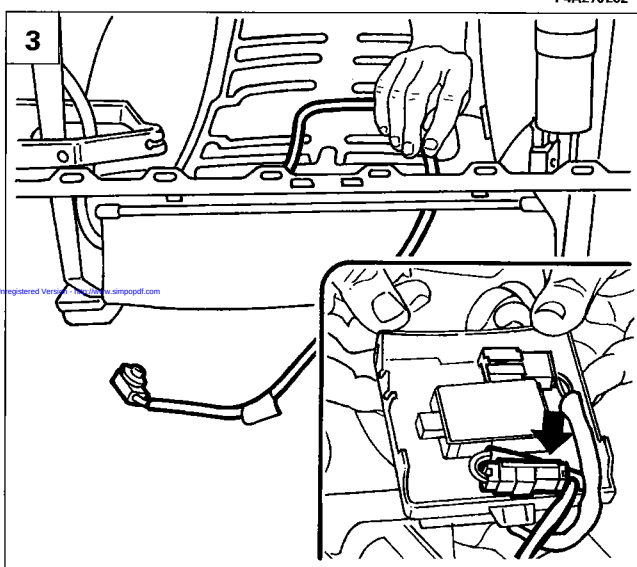
1. Cut the sealant, taking great care not to damage the sensor.



*The sealant is designed to ensure the correct operation of the PPD sensor. The moment the sealant is removed, for any reason, the manufacturer's guarantee is no longer valid. When re-fitting, renew the guarantee sealant with genuine Fiat sealant.*



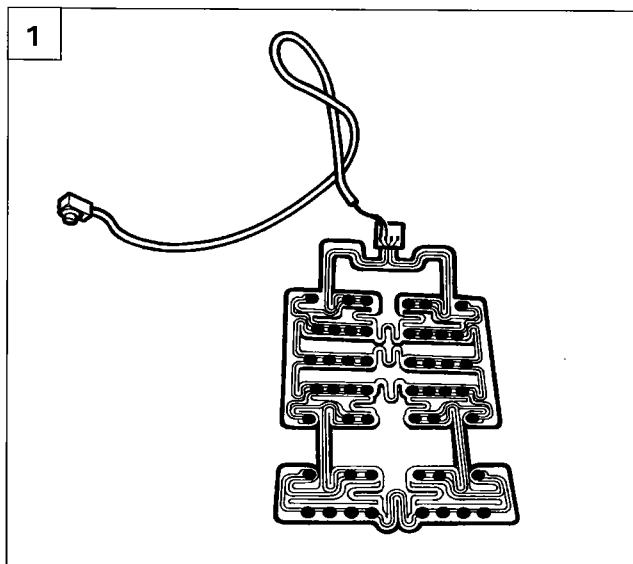
2. Release the passenger presence sensor supply wiring from the retaining band.
3. Remove the PPD sensor from the cushion upholstery working carefully to avoid damaging it.
4. Disconnect the connector in the connector box (shown in the inset), then remove the passenger presence sensor supply wiring from the bottom of the seat.



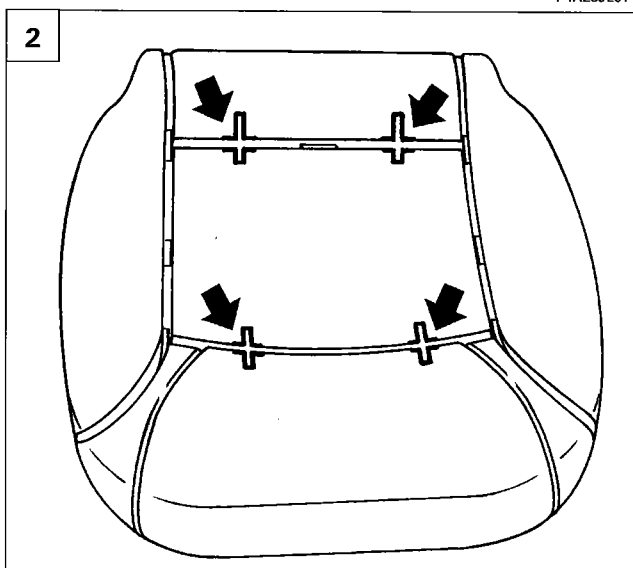
P4A27JL03

P4A27JL04

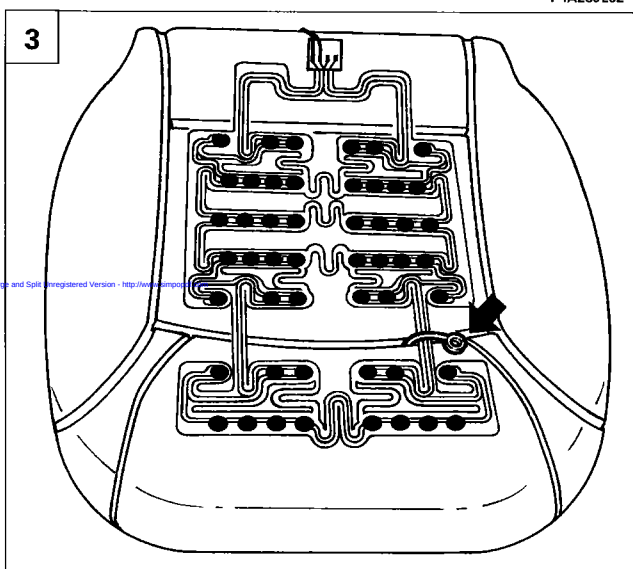
### 55.



P4A28JL01



P4A28JL02



P4A28JL03

### Refitting

- To refit, position the PPD sensor with the adhesive section facing the upholstery;

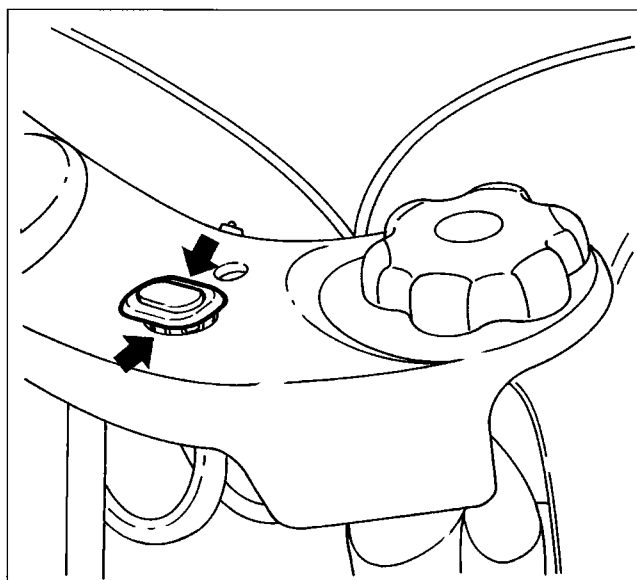
- Fit the PPD sensor in the special notches in the cushion upholstery shown in the diagram;

- reposition the electrical wiring for the PPD sensor and restore the guarantee seal.



*Each time operations are carried out on the Air Bag system, at the end of the procedure, its operation **MUST, UNDER ALL CIRCUMSTANCES,** be checked using the appropriate diagnostic equipment.*

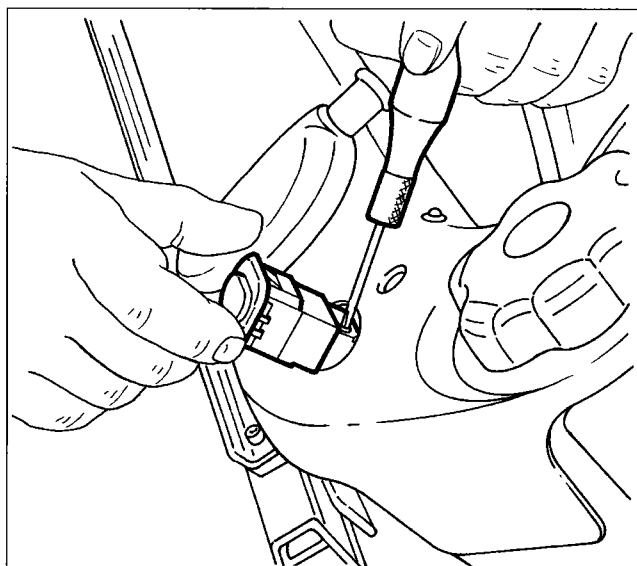




P4A22JL01



### REMOVING-REFITTING SIDE BAG SUPPLY CABLE

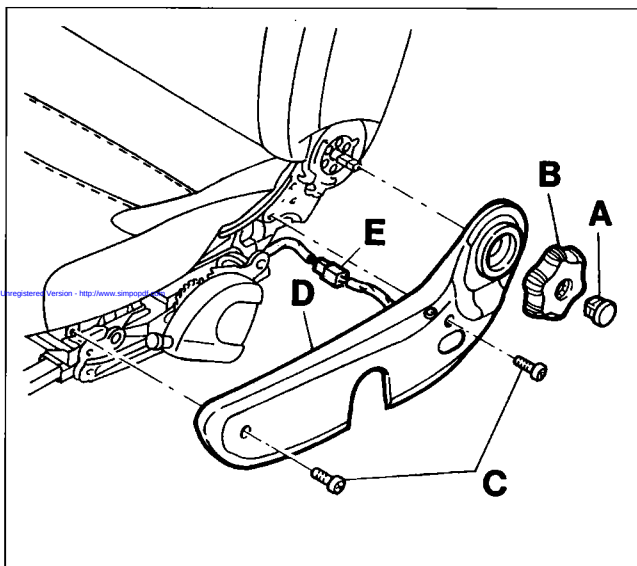


P4A22JL02

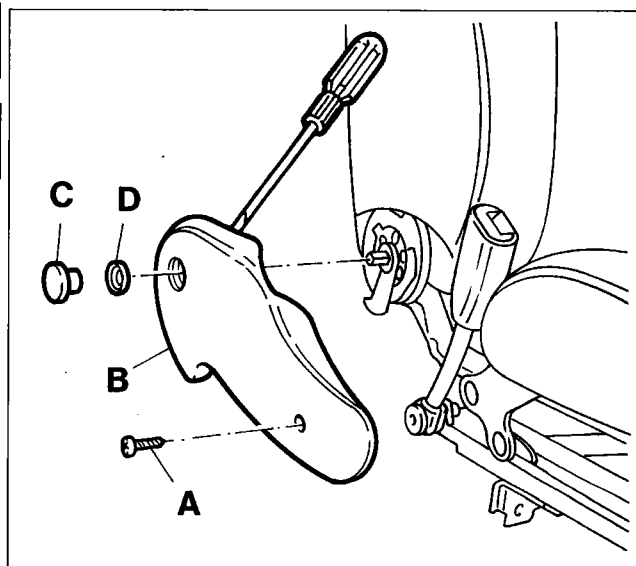


Remove the Side Bag module as described in the paragraph "REMOVING-REFITTING SIDE BAG MODULE" on the previous pages.

1. Act on the retaining tabs to remove the lumbar adjustment switch, if fitted.
2. Disconnect the connector and remove the lumbar adjustment control switch.
3. Remove the cap A and the backrest adjustment knob B. Undo the bolts C fixing the outer trim D, then remove it, after having disconnect the connection E for the heater pad LED (if fitted).
4. Undo the bolt A fixing the trim B to release the washer D, taking care to avoid breakages. Push the cap C from the inside after extracting the trim. Recover the washer D.



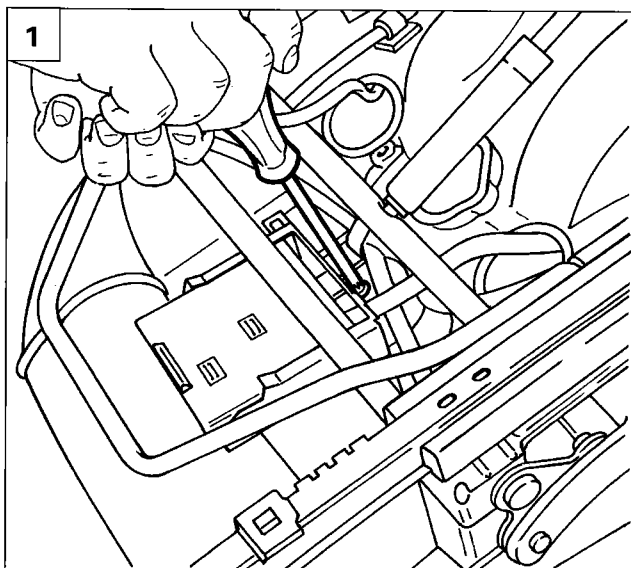
P4A22JL03



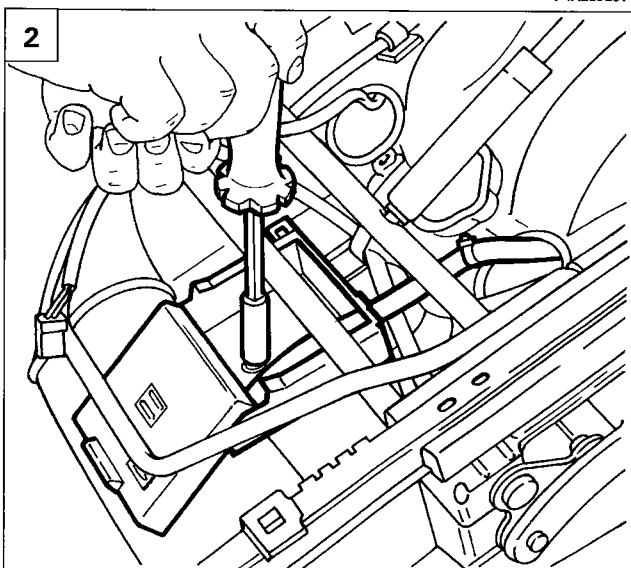
P4A22JL04



### 55.



P4A23JL01



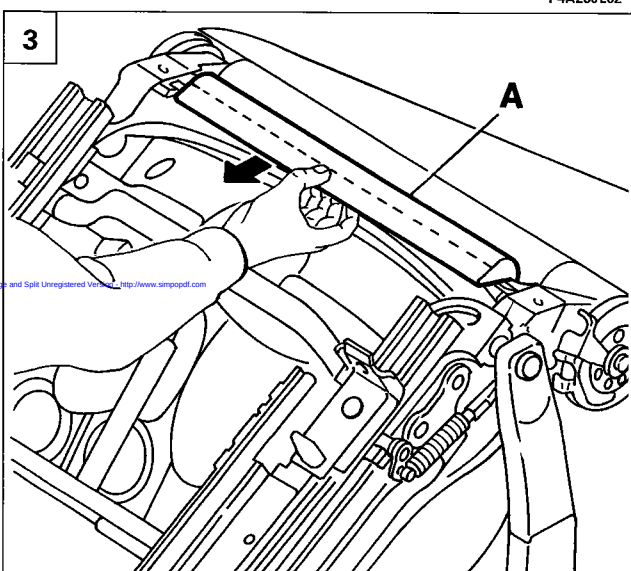
P4A23JL02



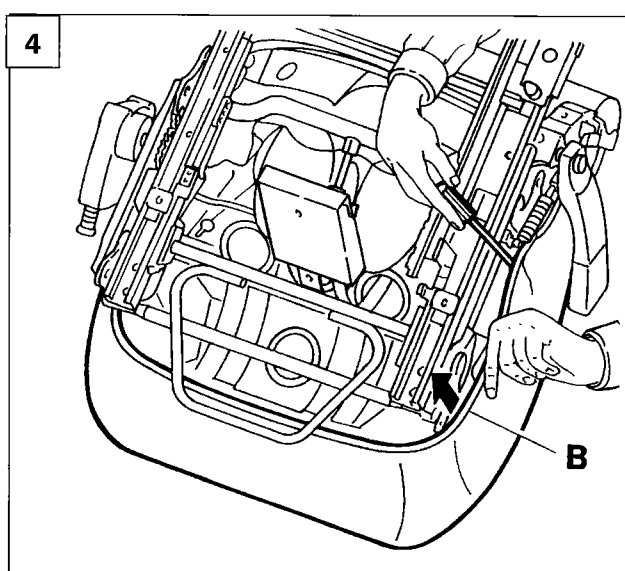
1. Undo the bolt fixing the connector box.
2. Extract the connector box flap, undo the bolt underneath and place the connector box to the side.
3. Release the plastic profile (A) at the rear, following the illustration.
4. Proceed with removing the plastic profile (B), starting from the rear side section, releasing it with the help of a screwdriver, then remove the cushion.



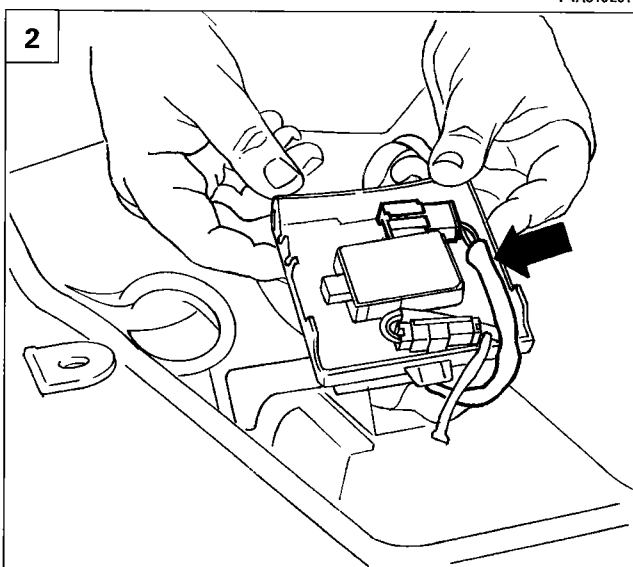
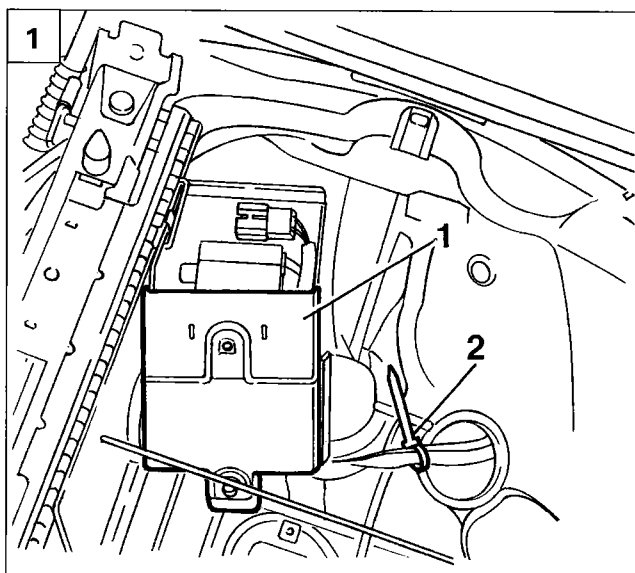
*Remove the cushion, complete with cover, from its housing, taking care over the electric wires, in particular the passenger presence sensor and the heater pad.*



P4A21M08

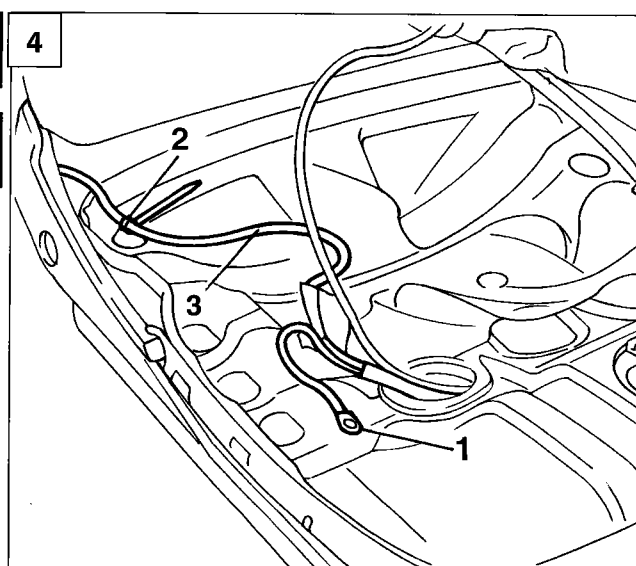
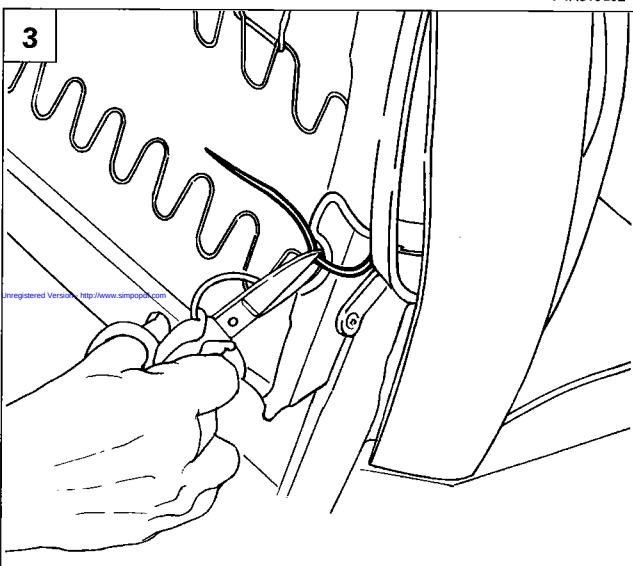


P4A23JL04

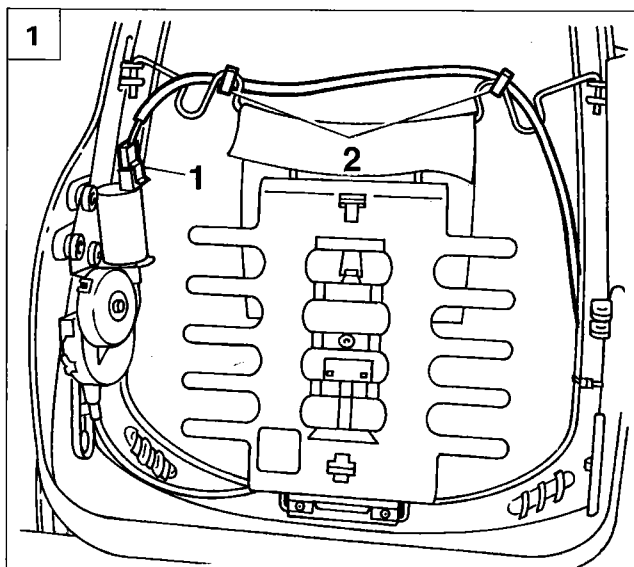


1. Remove the connector box flap (1) and release the supply cables opening the retaining band (2) fixed to the bottom of the seat.
2. Remove the Side Bag supply cable from the connector box, shown in the diagram.
3. Remove the rivet (1) fixing the earth lead, widen the retaining band (2) and remove the Side Bag supply cable (3) from the seat.
4. Cut the band fixing the supply cable to the seat backrest frame.

**NOTE** To refit, simply reverse the order of the operations carried out for the removal.



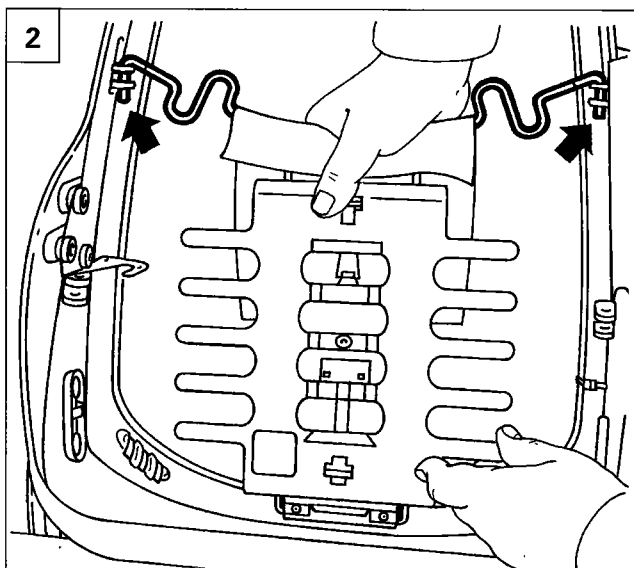
### 55.



P4A32JL01



### REMOVING-REFITTING LUMBAR ADJUSTMENT DEVICE



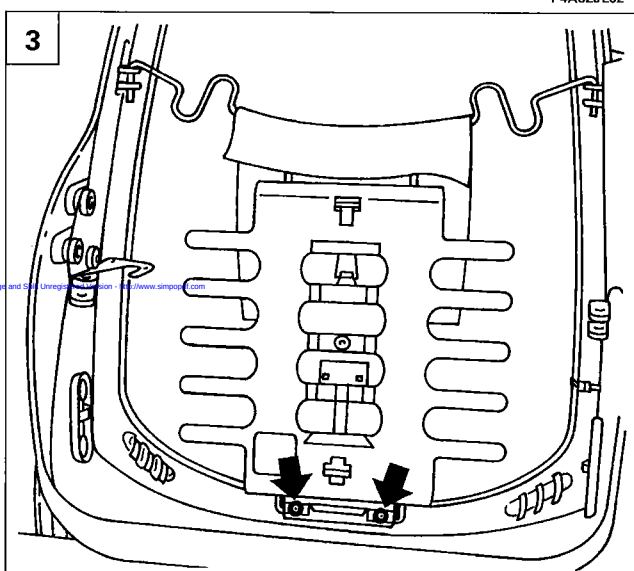
P4A32JL02



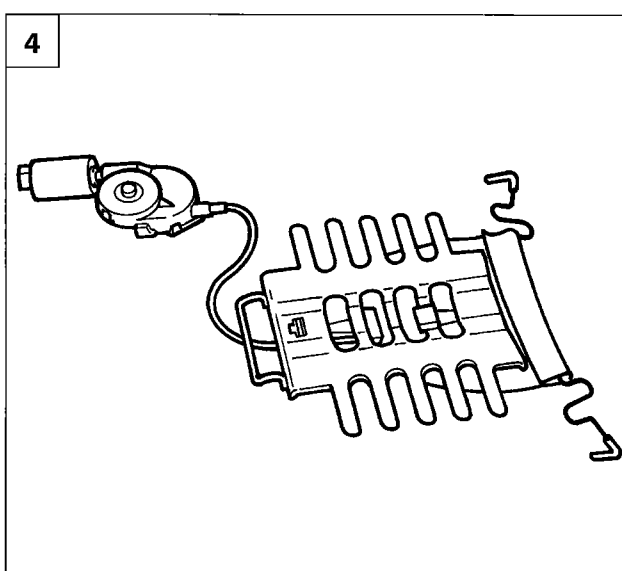
Lift up the front seat backrest cover as described in the paragraph "Removing-refitting front seat backrest cover".

1. Disconnect the electrical connection (1) for the lumbar adjustment motor, then remove the bands (2) retaining the supply cable.
2. Release the hooks fixing the lumbar adjustment device to the backrest frame.
3. Undo the bolts fixing the lumbar adjustment device shown in the diagram.
4. Remove the lumbar adjustment device from the seat backrest.

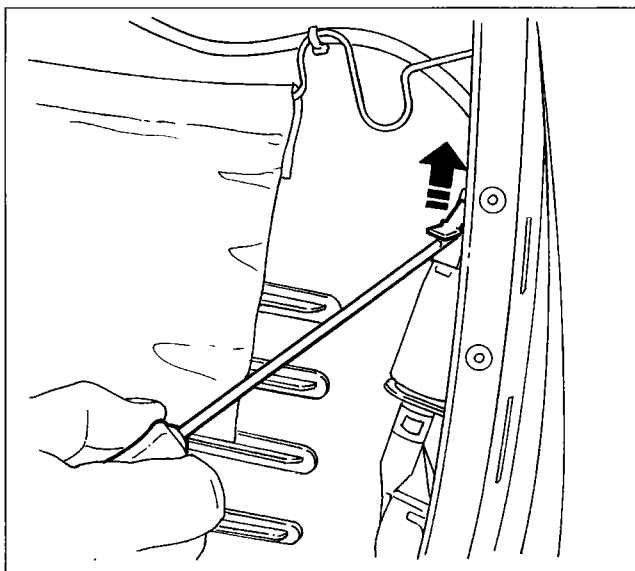
**NOTE** To refit, simply reverse the order of the operations carried out for the removal.



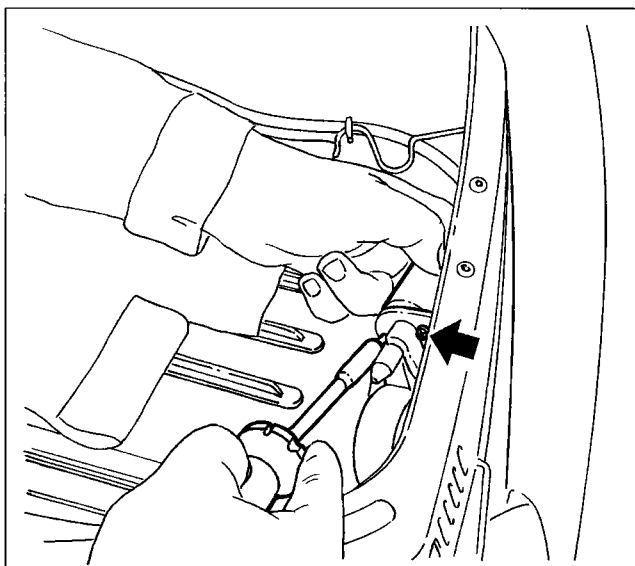
P4A32JL03



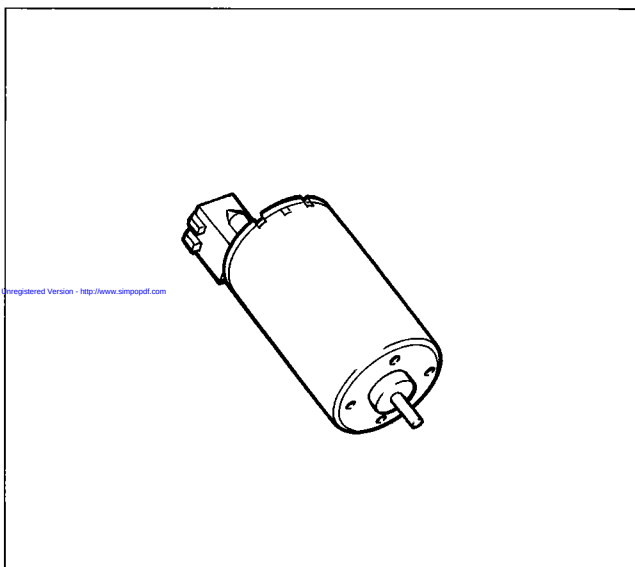
P4A32JL04



P4A33JL01



P4A33JL02



P4A33JL03



### Removing-refitting lumbar adjustment device motor

Remove the front seat backrest cover as described in the paragraph "Removing-refitting front seat backrest cover" with the exception of the head restraint.

- Disconnect the electrical supply connection for the lumbar adjustment motor.



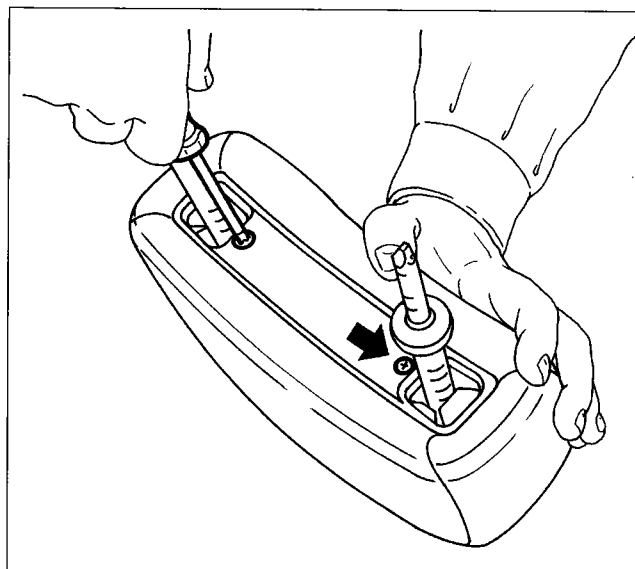
- undo the bolts fixing the motor shown in the diagram;



- remove the lumbar adjustment motor from its housing.

**NOTE** To refit, simply reverse the order of the operations carried out for the removal.

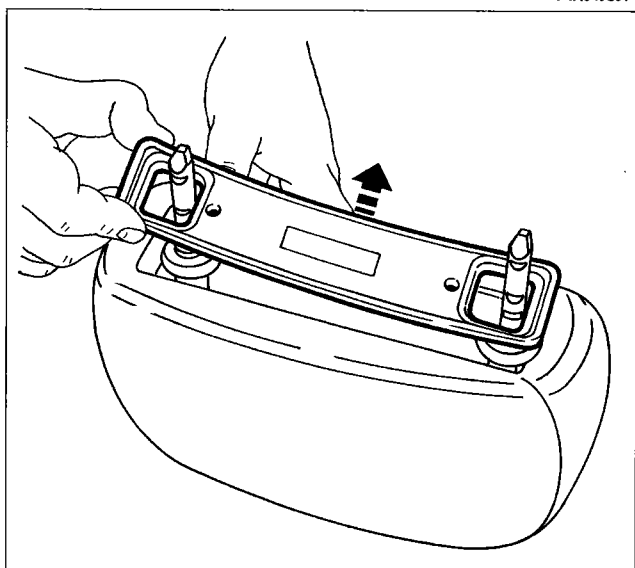
### 55.



P4A34JL01



### DISMANTLING HEAD RESTRAINT

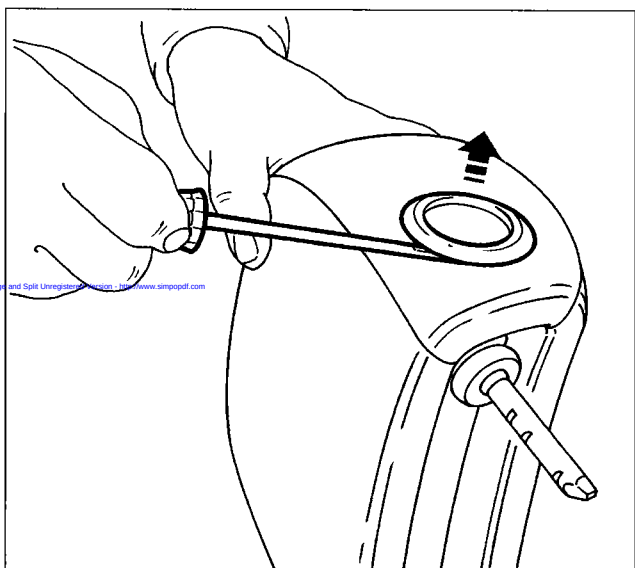


P4A34JL02

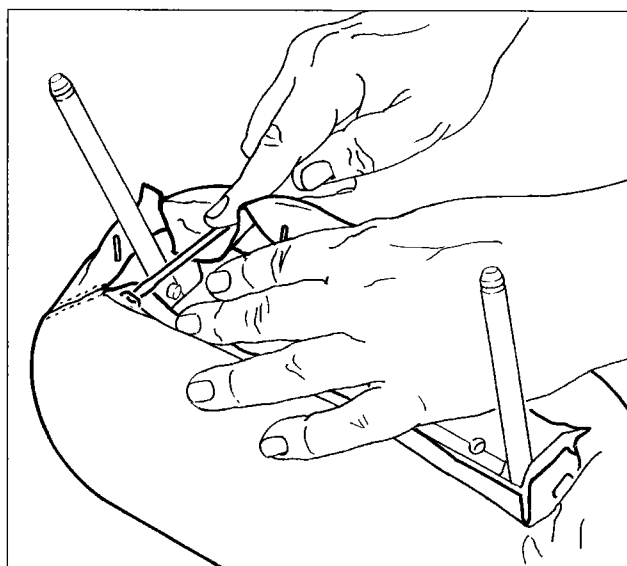


Remove the head restraint as described in the paragraph "Removing-refitting front seat back-rest cover".

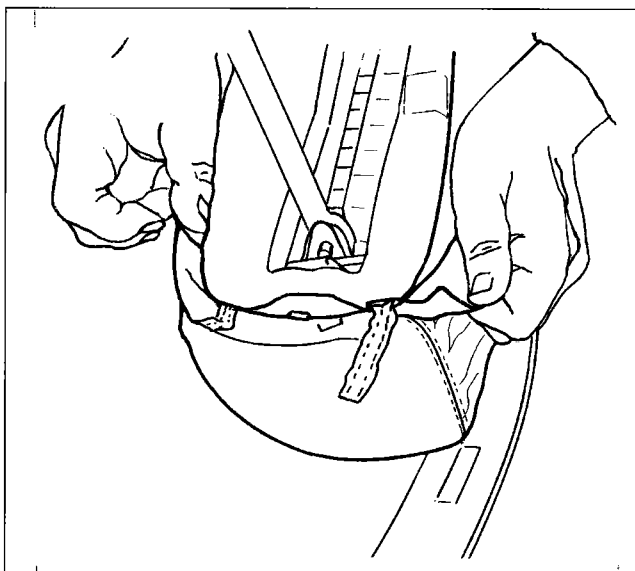
1. Undo the bolts fixing the cover retaining trim.
2. Lift up the trim and remove it from the head restraint.
3. Remove the head restraint height adjustment control button and surround.
4. Lift up and remove the securing clips from the head restraint cover.



P4A34JL03



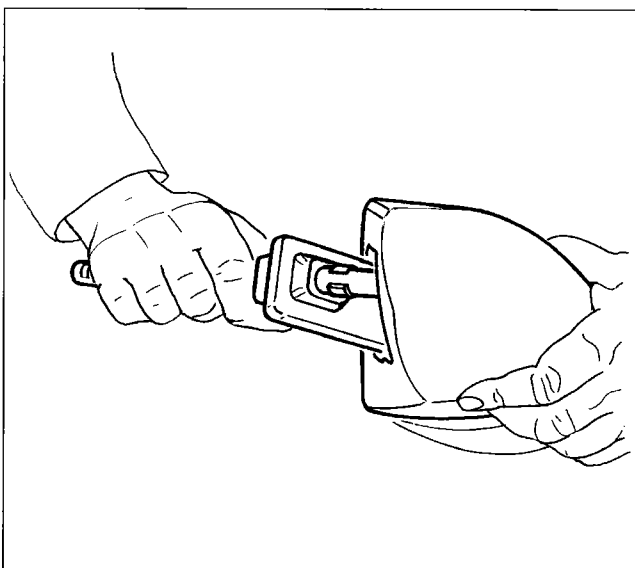
P3U84NL07



P3U84NL08



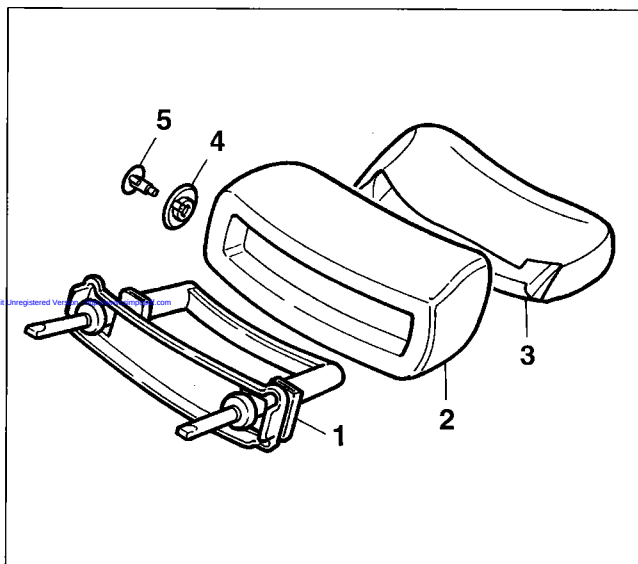
- Remove the cover from the head restraint upholstery;



P3U85NL05



- separate the upholstery from the head restraint structure;

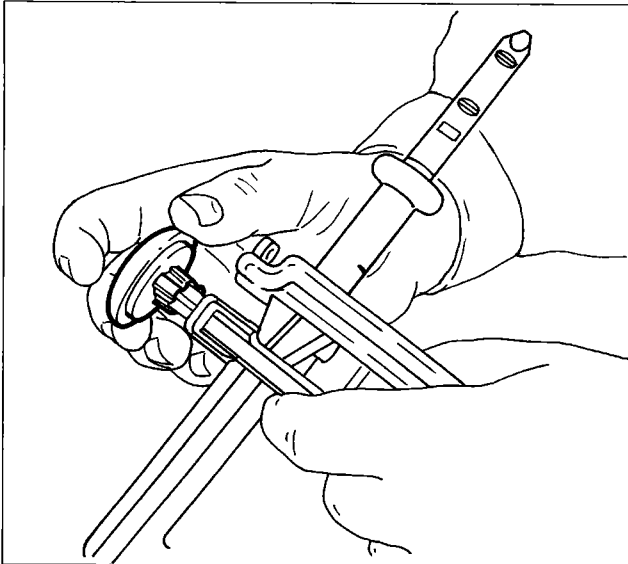


P4A35JL03



- structure (1), upholstery (2), " cover (3), surround (4), button (5);

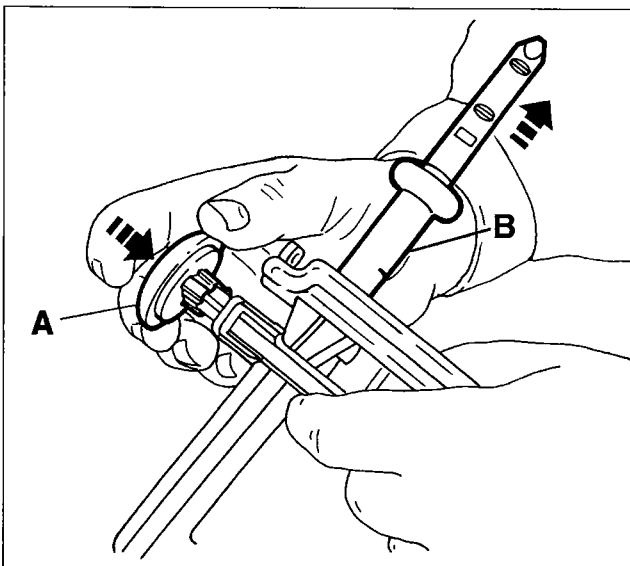
### 55.



P4A36JL01



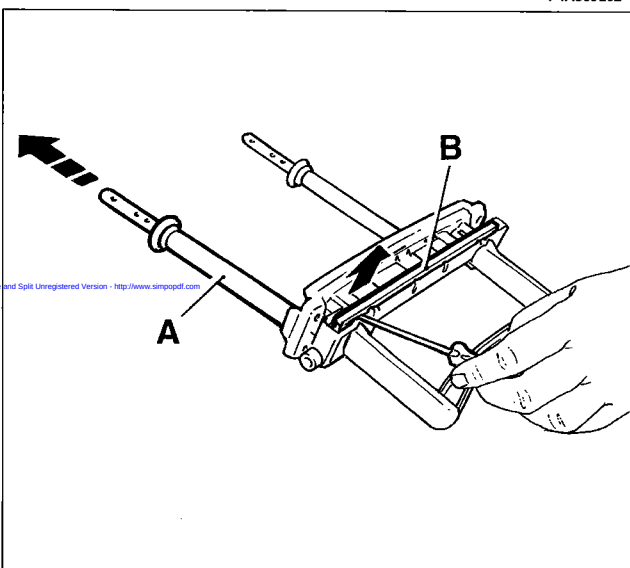
- place the head restraint height adjustment control button in position;



P4A36JL02



- press the button (A) and place the head restraint rod (B) in the end of travel position;
- remove the button fitted previously;



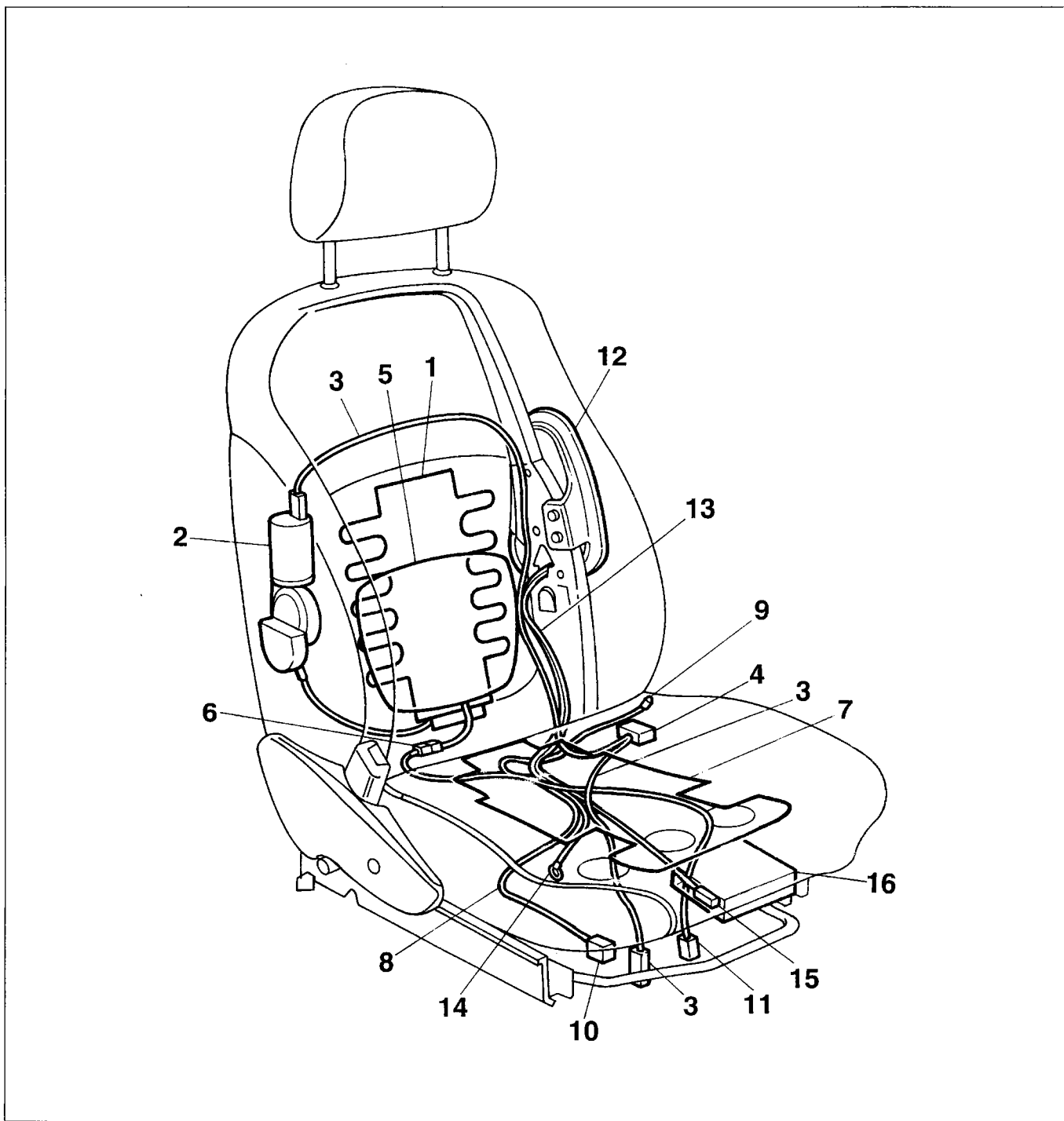
P4A36JL03



- work carefully on the insert (A) to prevent the retaining springs from coming out, then extract the head restraint rod (B).

**NOTE** To refit, reverse the order of the operations carried out for the removal.



**LOCATION OF DRIVER'S SEAT COMPONENTS**

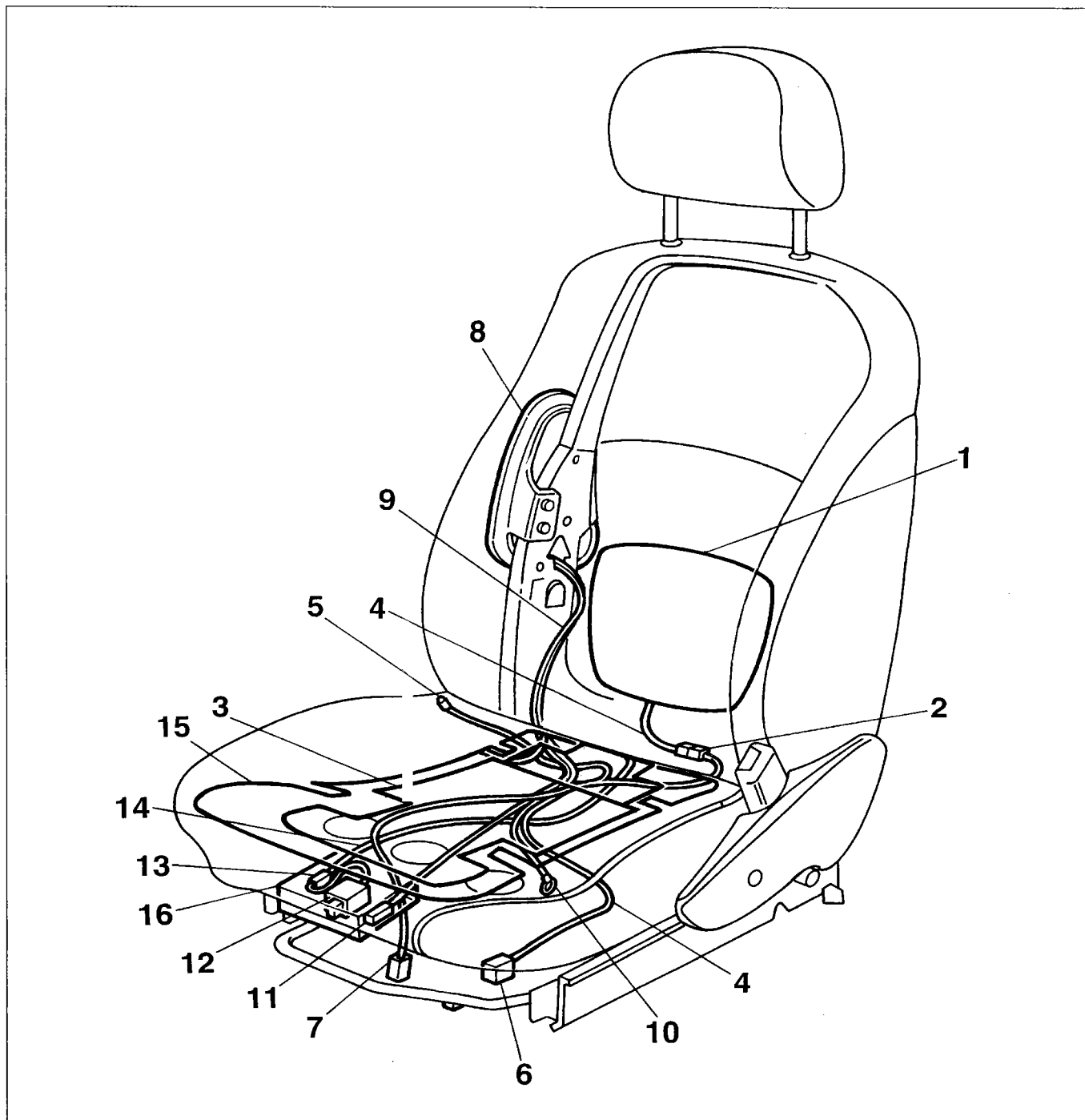
1. Lumbar adjustment device
2. Lumbar adjustment motor
3. Lumbar supply cable
4. Lumbar adjustment switch
5. Backrest heater pad
6. Backrest and cushion heater pad connector
7. Cushion heater pad
8. Heater pad supply cable
9. Heater pad warning light

10. Heater pad switch
11. Heater pad supply
12. Side Bag
13. Side Bag supply cable
14. Side Bag earth
15. Side Bag supply
16. Connector box

P4A37JL01

# 55.

## LOCATION OF PASSENGER SEAT COMPONENTS



P4A38JL01

- |                                              |                                                                           |
|----------------------------------------------|---------------------------------------------------------------------------|
| 1. Backrest heater pad                       | 10. Side Bag earth                                                        |
| 2. Backrest and cushion heater pad connector | 11. Side Bag supply                                                       |
| 3. Cushion heater pad                        | 12. Passenger presence sensor PPD interface control unit                  |
| 4. Heater pad supply cable                   | 13. Passenger presence sensor (PPD) with interface control unit connector |
| 5. Heater pad warning light                  | 14. Passenger presence sensor (PPD) supply cable                          |
| 6. Heater pad switch                         | 15. Passenger presence sensor                                             |
| 7. Heater pad supply                         | 16. Connector box                                                         |
| 8. Side Bag                                  |                                                                           |
| 9. Side Bag supply cable                     |                                                                           |

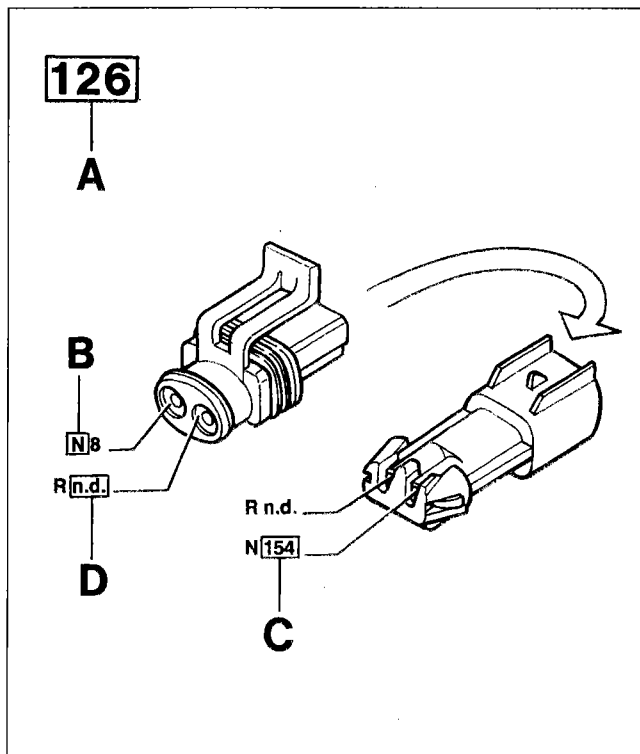
page

**CONNECTOR BLOCKS**

|                                                       |     |
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| - Interpretation of the codes at the connector blocks | 172 |
| - Cable colour code                                   | 172 |
| - Connector blocks                                    | 173 |

## INTRODUCTION

### Interpretation of the codes at the connector blocks



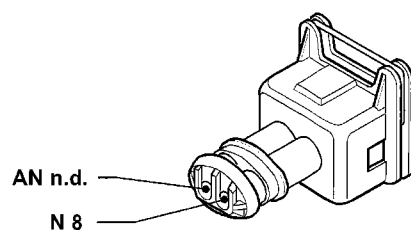
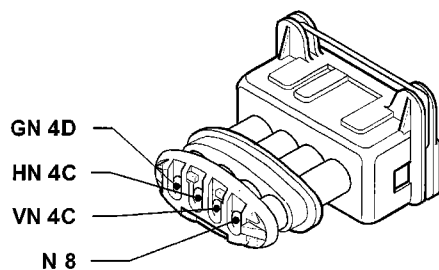
P4A202N01

- A** Identification N° of the connector block with reference to the wiring diagrams
- B** Cable colour identification code (see table at the foot of the page)
- C** Identification N° of destination block of cable marked with the relevant code
- D** The code n.d. identifies ultrasound welding taped in the cable loom

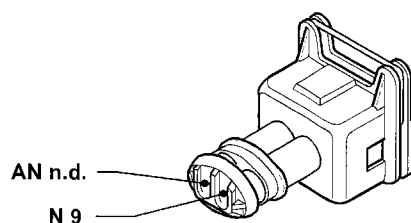
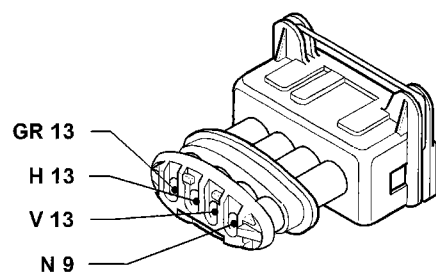
### Cable colour code

|           |                   |           |                   |           |              |
|-----------|-------------------|-----------|-------------------|-----------|--------------|
| <b>A</b>  | Light blue        | <b>BG</b> | White-Yellow      | <b>LB</b> | Blue-White   |
| <b>B</b>  | White             | <b>BL</b> | White-Blue        | <b>LG</b> | Blue-Yellow  |
| <b>C</b>  | Orange            | <b>BN</b> | White-Black       | <b>LN</b> | Blue-Black   |
| <b>G</b>  | Yellow            | <b>BR</b> | White-Red         | <b>LR</b> | Blue-Red     |
| <b>H</b>  | Grey              | <b>BV</b> | White-Green       | <b>LV</b> | Blue-Green   |
| <b>L</b>  | Blue              | <b>BZ</b> | White-Violet      | <b>MB</b> | Brown-White  |
| <b>M</b>  | Brown             | <b>CA</b> | Orange-Light blue | <b>MN</b> | Brown-Black  |
| <b>N</b>  | Black             | <b>CB</b> | Orange-White      | <b>NZ</b> | Black-Violet |
| <b>R</b>  | Red               | <b>CN</b> | Orange-Black      | <b>RB</b> | Red-White    |
| <b>S</b>  | Pink              | <b>GN</b> | Yellow-Black      | <b>RG</b> | Red-Yellow   |
| <b>V</b>  | Green             | <b>GL</b> | Yellow-Blue       | <b>RN</b> | Red-Black    |
| <b>Z</b>  | Violet            | <b>GR</b> | Yellow-Red        | <b>RV</b> | Red-Green    |
| <b>AB</b> | Light blue-White  | <b>GV</b> | Yellow-Green      | <b>SN</b> | Pink-Black   |
| <b>AG</b> | Light blue-Yellow | <b>HG</b> | Grey-Yellow       | <b>VB</b> | Green-White  |
| <b>AN</b> | Light blue-Black  | <b>HN</b> | Grey-Black        | <b>VN</b> | Green-Black  |
| <b>AR</b> | Light blue-Red    | <b>HR</b> | Grey-Red          | <b>VR</b> | Green-Red    |
| <b>AV</b> | Light blue-Green  | <b>HV</b> | Grey-Green        | <b>ZB</b> | Violet-White |

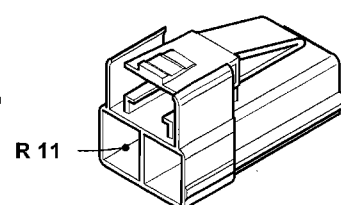
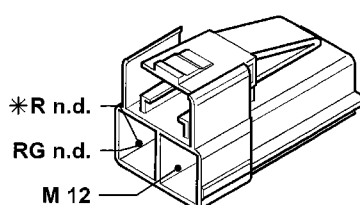
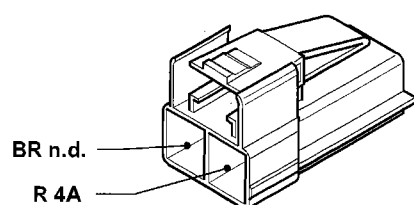
**1** Left front light cluster



**2** Right front light cluster

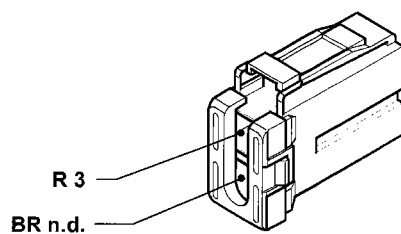


**3** Power fuse box

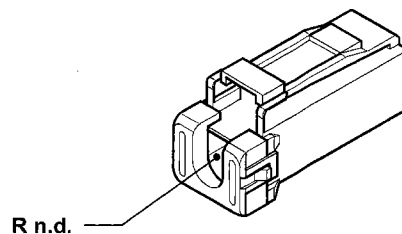


\* Variant for the JTD version

**4A** Junction unit



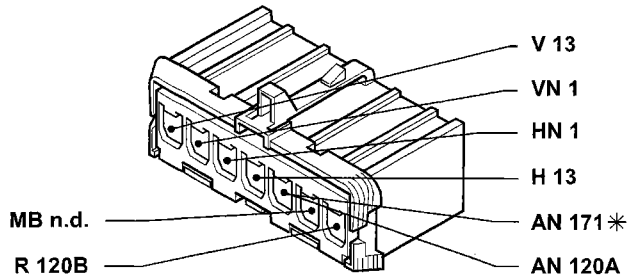
**4B** Junction unit



P4A319I01

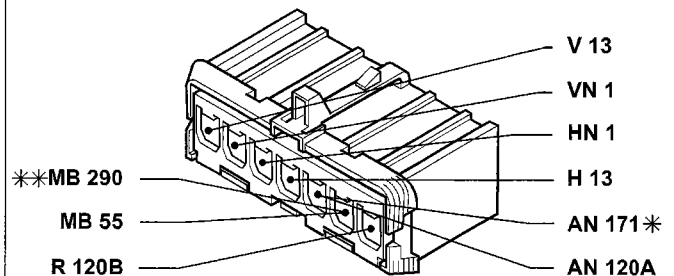
# 55.

### 4C Junction unit



\* Only valid for versions with heaters

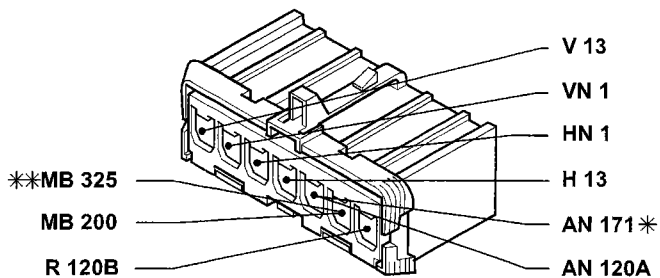
### 4C Junction unit



\* Only valid for versions with heaters

\*\* Variant for the 1998 version

### 4C Junction unit

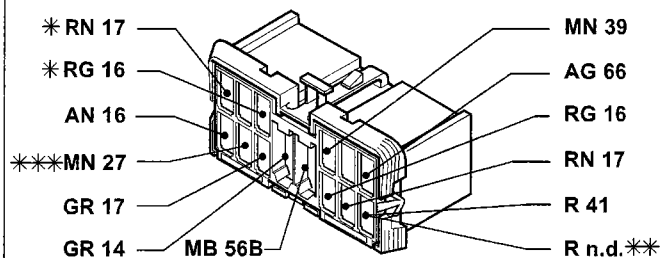


\* Only valid for versions with heaters

\*\* Variant for the JTD version

Only for the 1910 JTD version

### 4E Junction unit

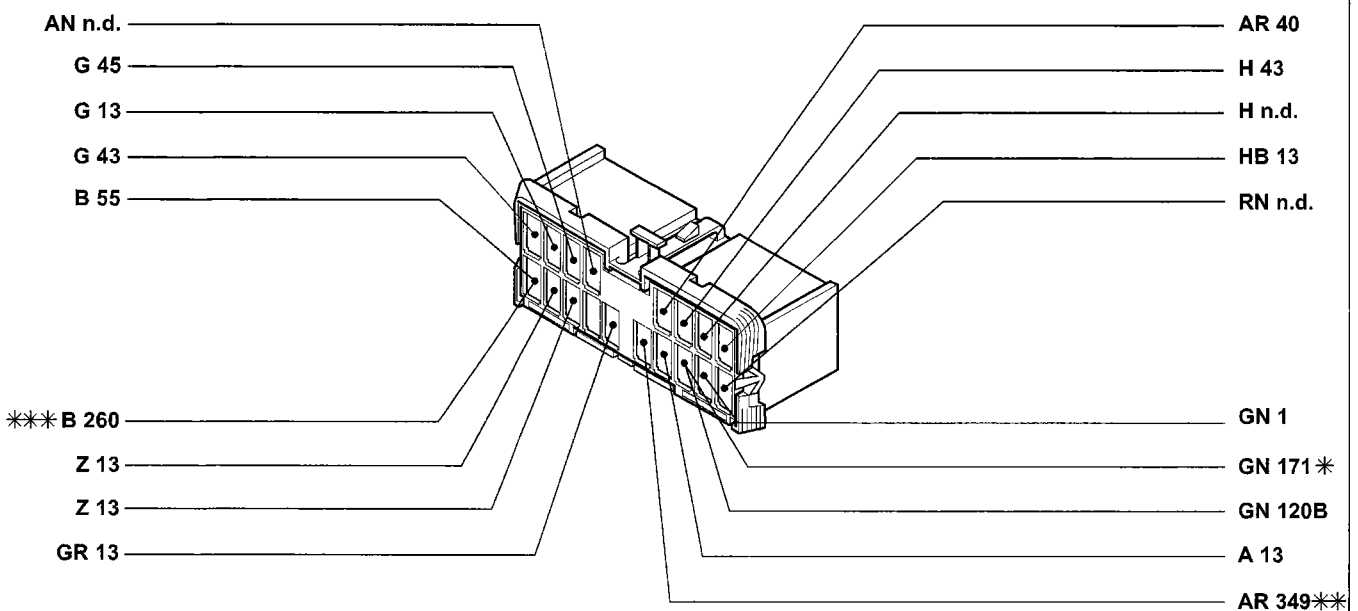


\* Non existent for the SX - GT trim levels

\*\* Variant for the version with automatic transmission

\*\*\* Only for the BRAVA

### 4D Junction unit



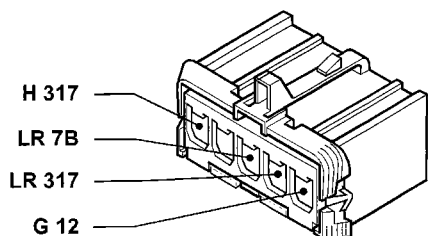
\* Only valid for versions with heaters

\*\* Exists only for the JTD version

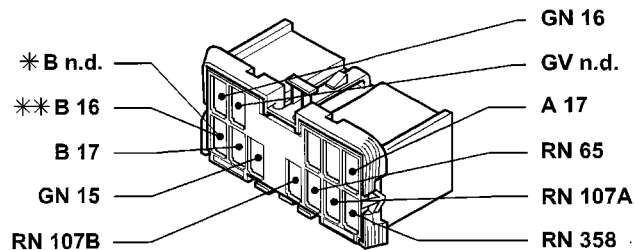
\*\*\* Variant for the version with automatic transmission

P4A320I01

### 4F Junction unit



### 4G Junction unit

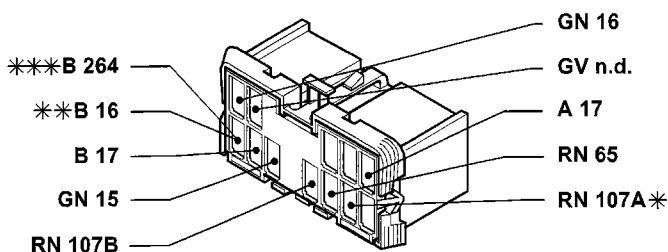


\* Variant for the version with automatic transmission

\*\* Only for Brava

Exists only for the ELX trim level

### 4G Junction unit



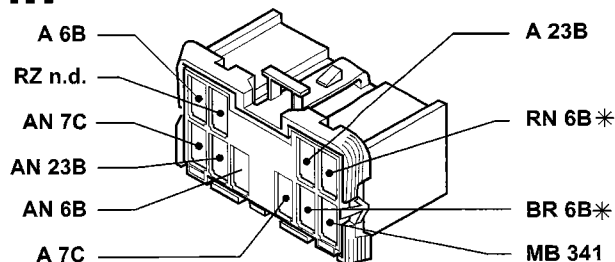
\* Only valid for versions with alarms

\*\* Only for Brava

\*\*\* Variant for the version with automatic transmission

Exists only for the SX trim level

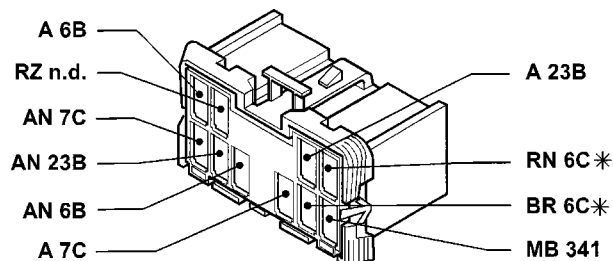
### 4H Junction unit



\* Non existent for the SX trim level

Exists in all versions

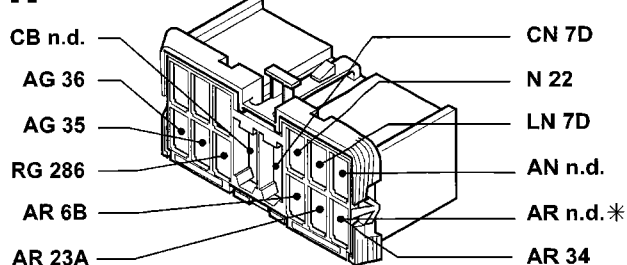
### 4H Junction unit



\* Variant for the ELX trim level

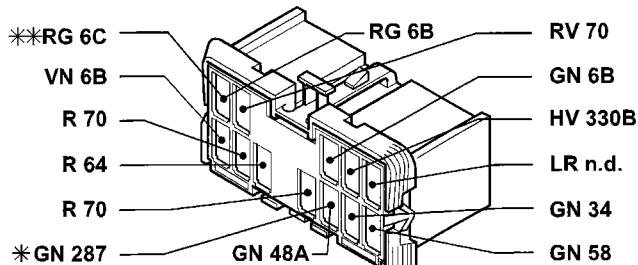
Exists only for the version with automatic transmission

### 4I Junction unit



\* Variant for the ELX trim level with automatic transmission

### 4J Junction unit

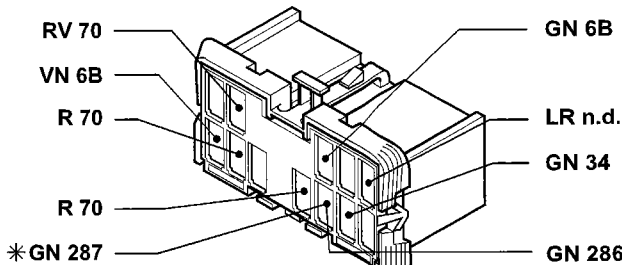


\* Variant for versions with radio phones

\*\* Variant for versions with automatic transmission

Exists only for the ELX trim level

### 4J Junction unit



\* Variant for versions with radio phones

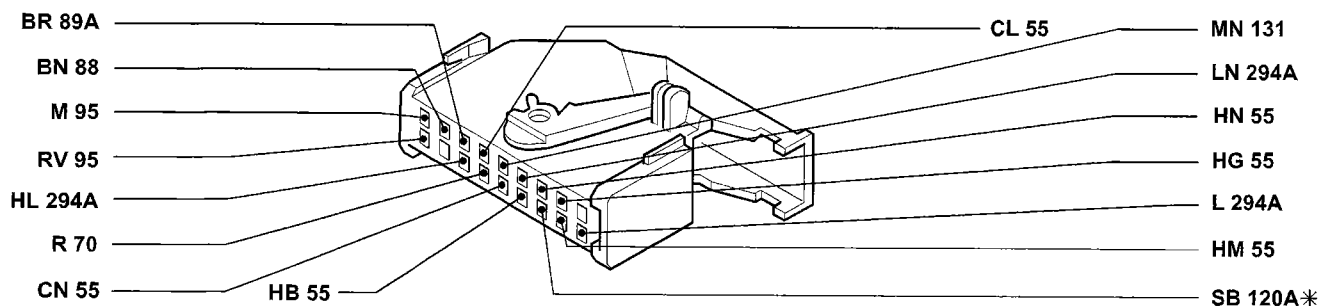
Exists only for the SX trim level

P4A321101



### 55.

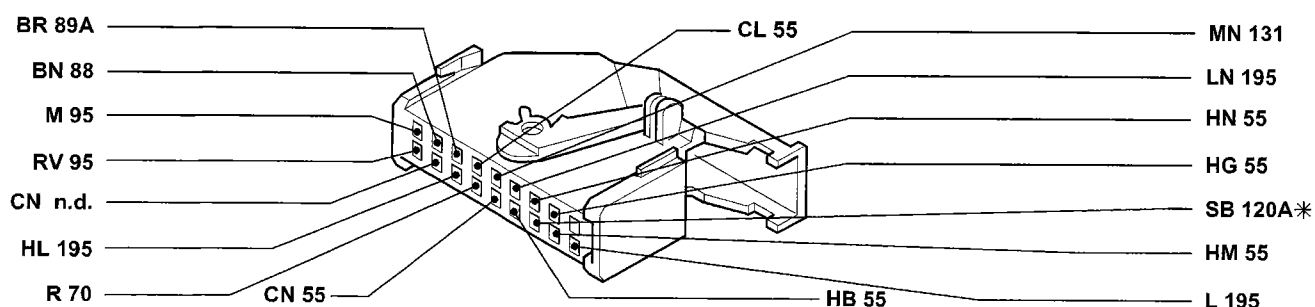
#### 6A Instrument panel



Only for the 1242 version

\* Only valid for versions with air conditioning

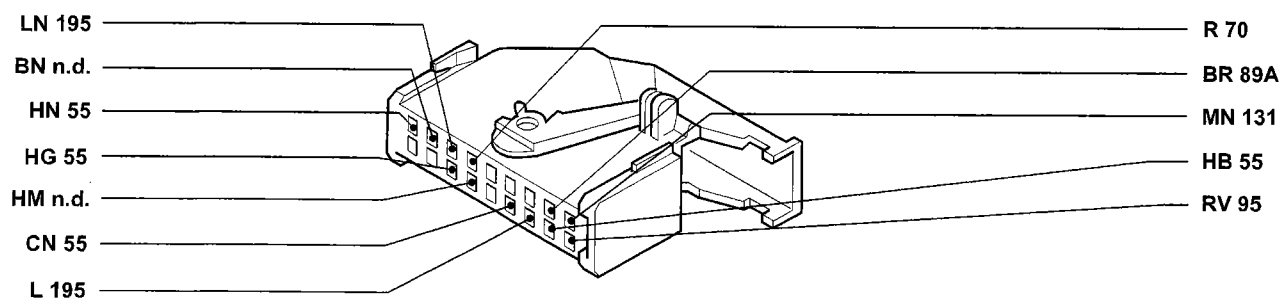
#### 6A Instrument panel



Only for the 1581 version

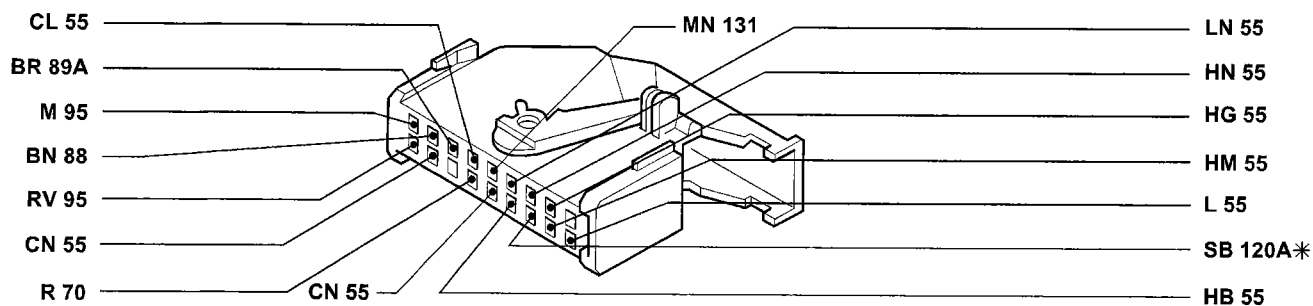
\* Only valid for versions with air conditioning

#### 6A Instrument panel



Only valid for 1581 versions with automatic transmission

#### 6A Instrument panel

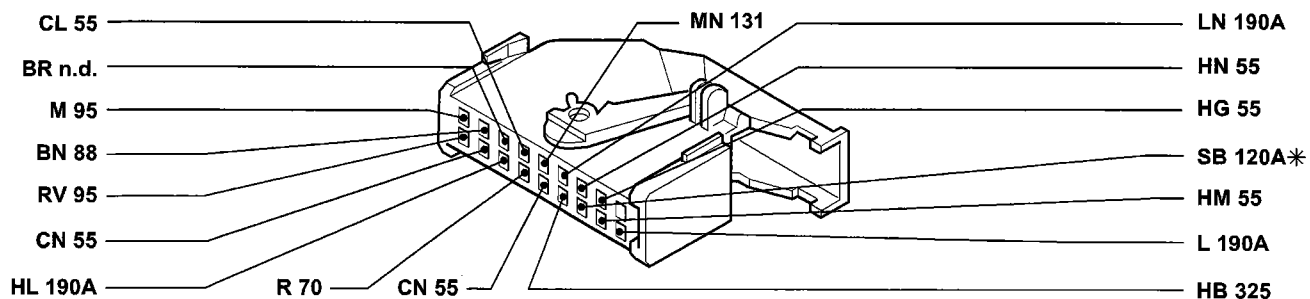


Only for the 1747 version

\* Only valid for versions with air conditioning

P4A322101

**6A** Instrument panel

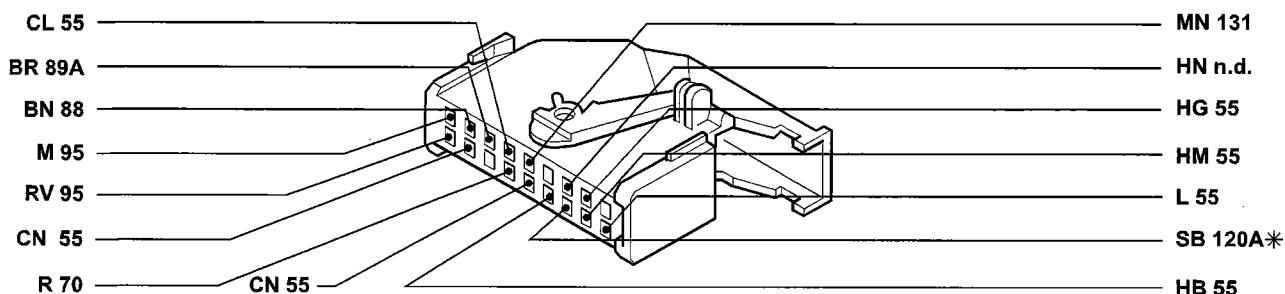


Only for 1998 version

\* Applies only to versions with air conditioner

P4A323101

**6A** Instrument panel

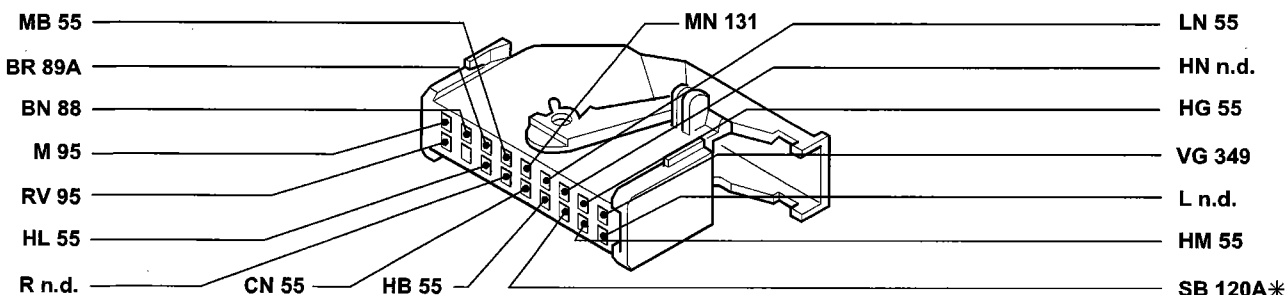


Only for 1910TD version

\* Applies only to versions with air conditioner

P4A323102

**6A** Instrument panel

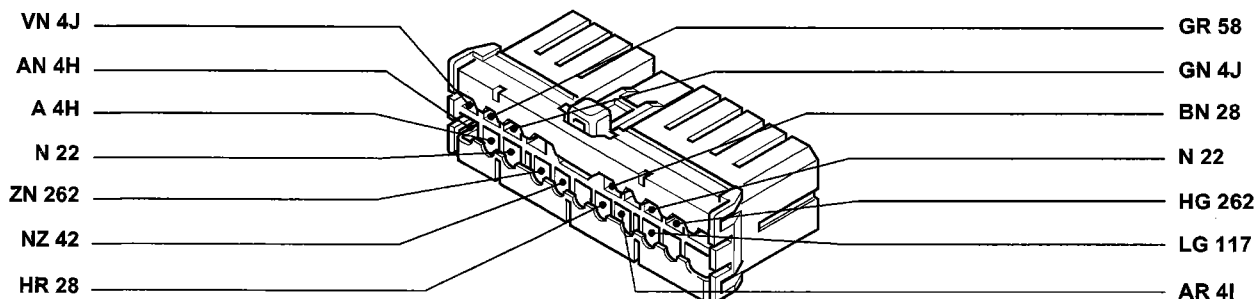


Only for JTD version

\* Applies only to versions with air conditioner

P4A323103

**6B** Instrument panel

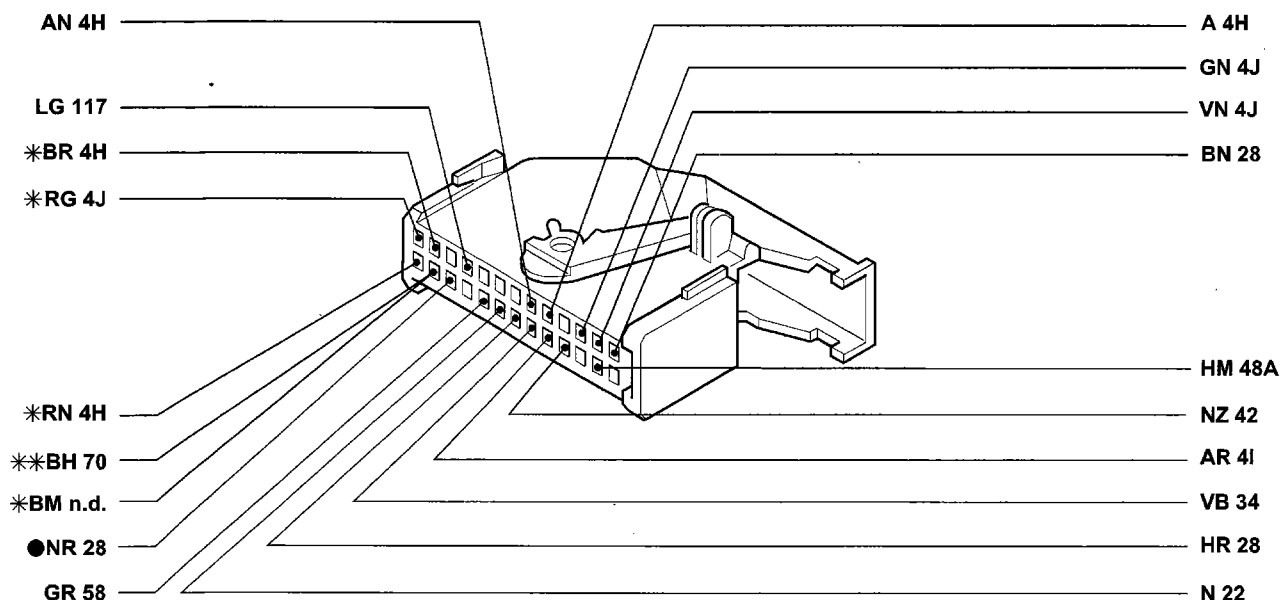


Only in versions with automatic transmission

P4A323104

### 55.

#### 6B Instrument panel



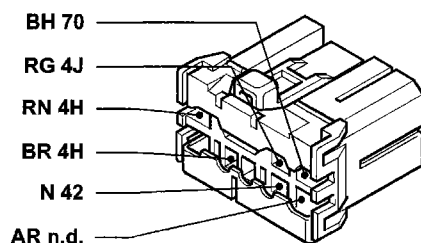
\* Not present for outfits SX - GT

\*\* Variant for versions with alarm

● Applies only for HGT outfit

P4A324I01

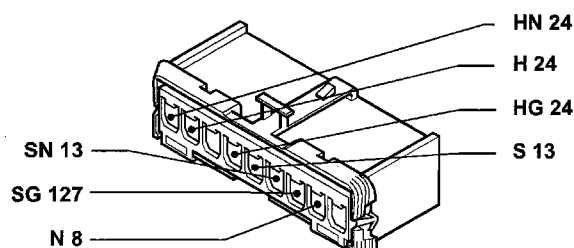
#### 6C Instrument panel



Applies only to ELX outfit with automatic transmission

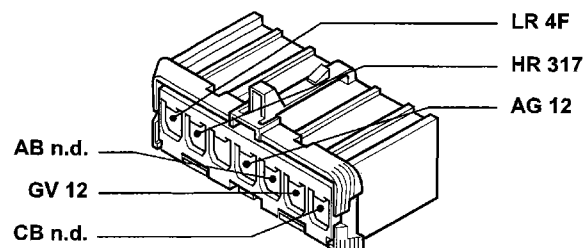
P4A324I02

#### 7A Steering column switch unit



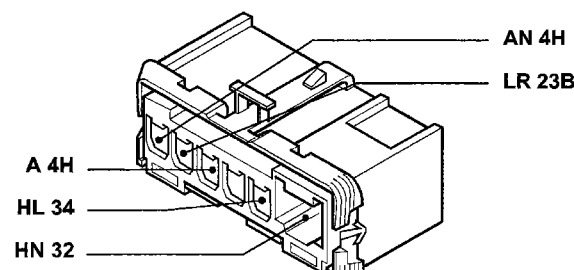
P4A324I03

#### 7B Steering column switch unit



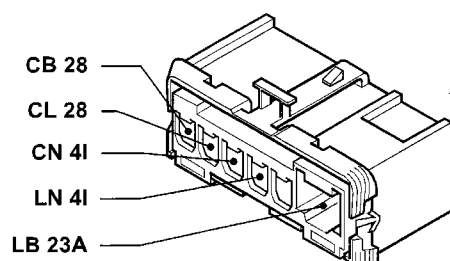
P4A324I04

#### 7C Steering column switch unit

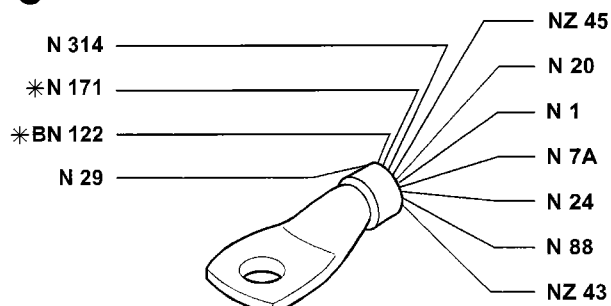


P4A324I05

**7D** Steering column switch unit

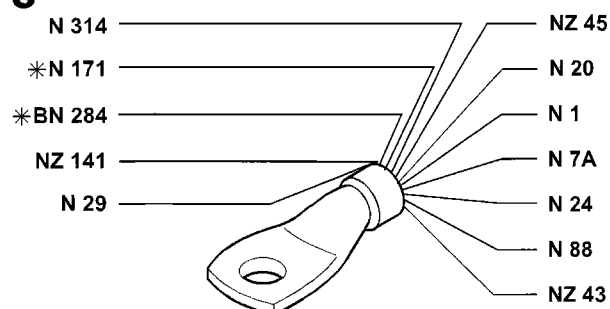


**8** Left front earth



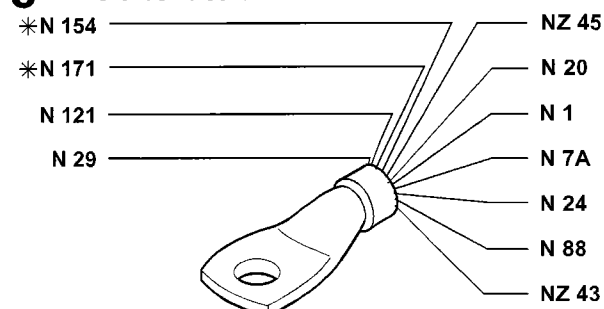
Only for the 1242 version  
\* Only valid for versions with heaters

**8** Left front earth



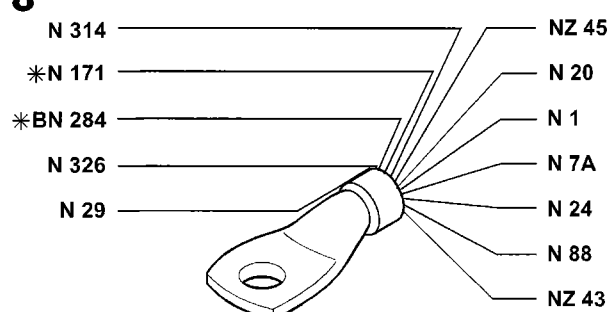
Only for the 1581 version  
\* Only valid for versions with heaters

**8** Left front earth



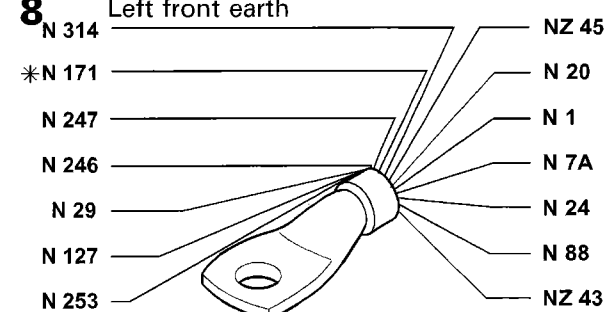
Only for the 1747 version  
\* Only valid for versions with heaters

**8** Left front earth



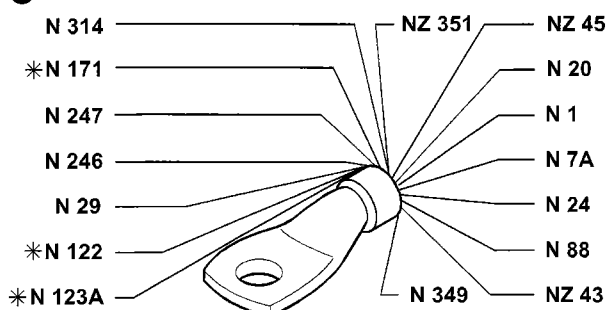
Only for the 1998 version  
\* Only valid for versions with heaters

**8** Left front earth



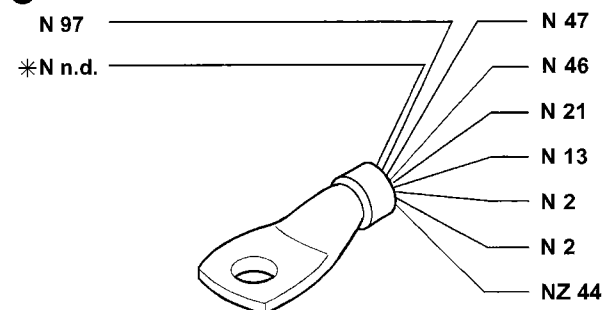
Only for the 1910 TD version  
\* Only valid for versions with heaters

**8** Left front earth



\* Only valid for versions with heaters  
Only exists on the JTD version

**8** Left front earth

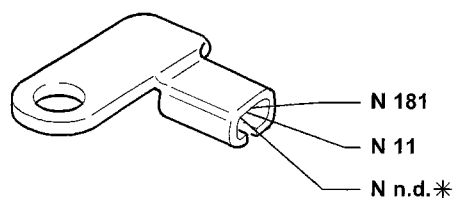


\* Only valid for the 1910 TD version

P4A325I01

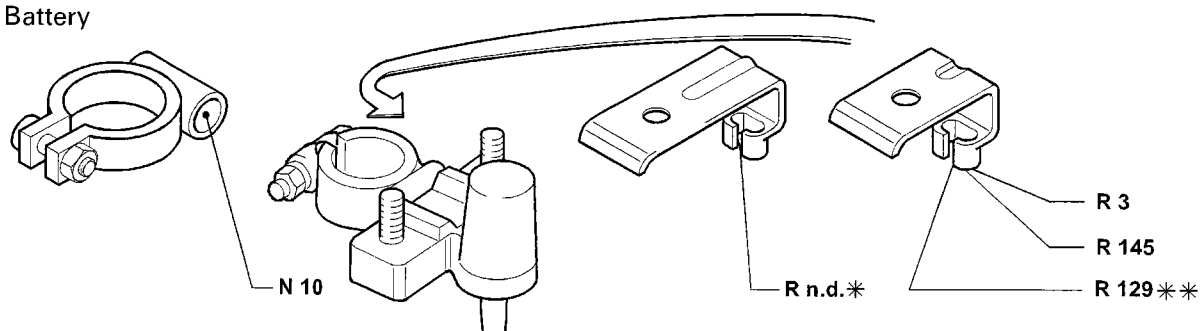
# 55.

### 10 Earth for battery on bodyshell



\* Only valid for versions with heaters

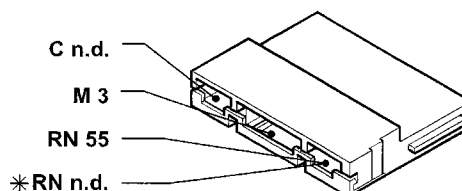
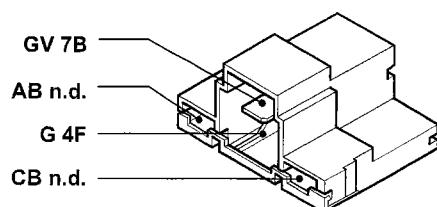
### 11 Battery



\* Variant for 1910 TD and JTD versionsD

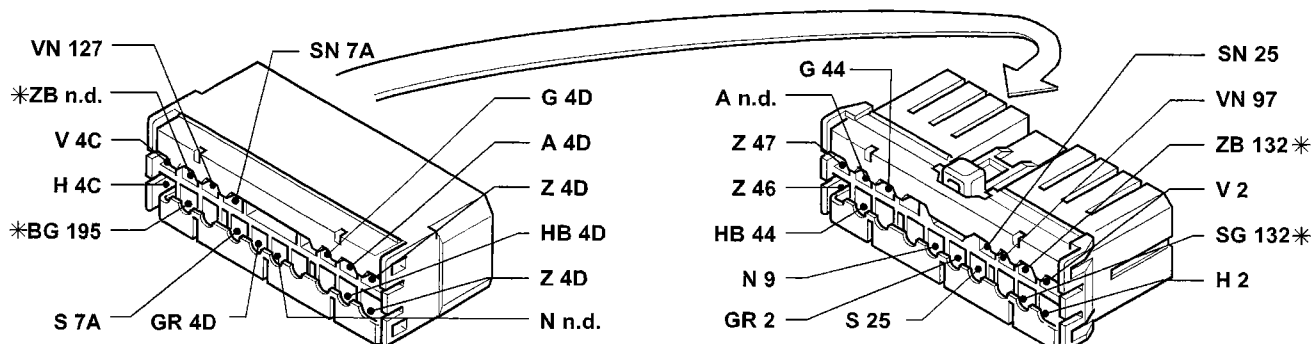
\*\* Non existent for 1910 TD and JTD versions

### 12 Ignition switch



\* Variant for the 1547 version with automatic transmission

### 13 Connection between left/right front cables

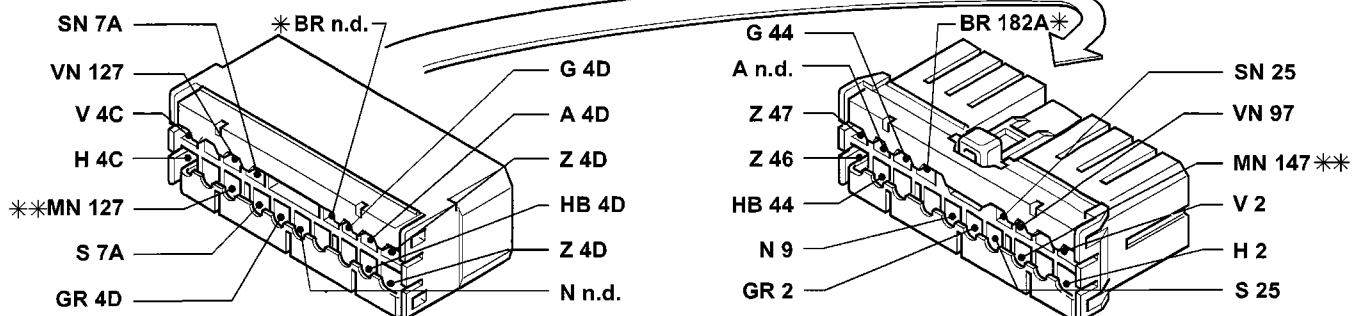


\* Variant for the 1581 version

Only for the 1242 and 1581 versions

P4A326I01

### 13 Front right/left cables connection

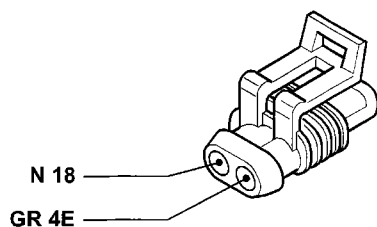


\* Only valid for the 1998 version

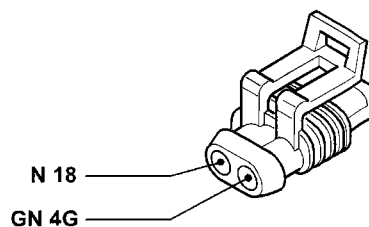
\*\* Only valid for the JTD version

Exists on all versions

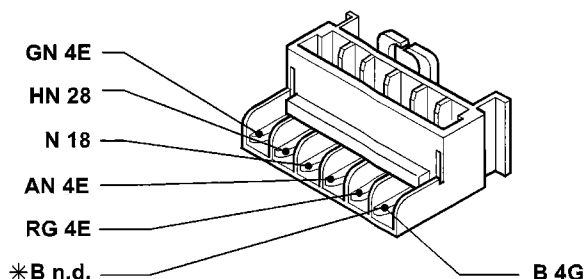
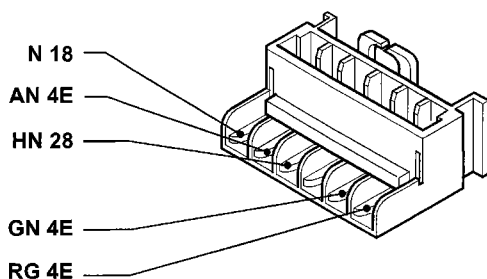
### 14 Left no. plate light



### 15 Right no. plate light

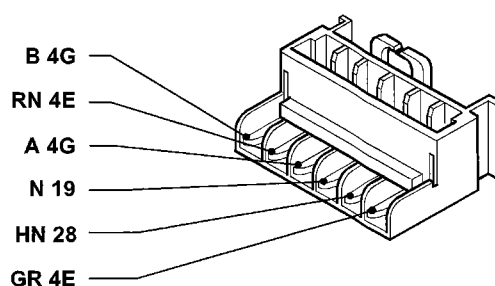
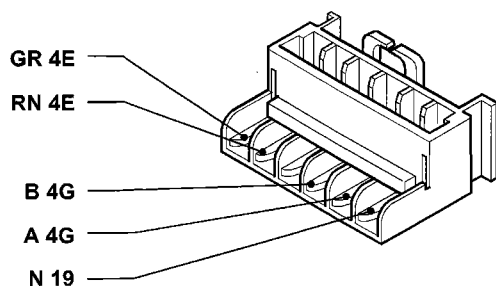


### 16 Left rear light cluster



\* Variant for the version with automatic transmission

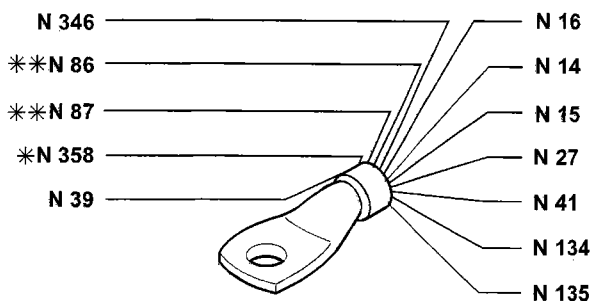
### 17 Right rear light cluster



P4A327I01

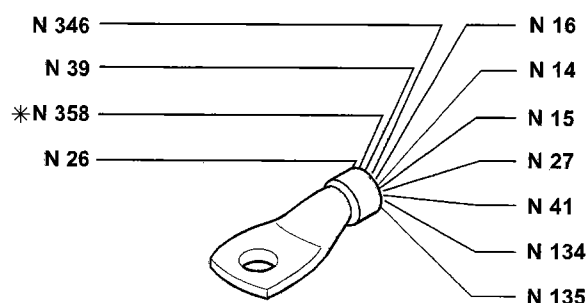
# 55.

### 18 Left rear earth



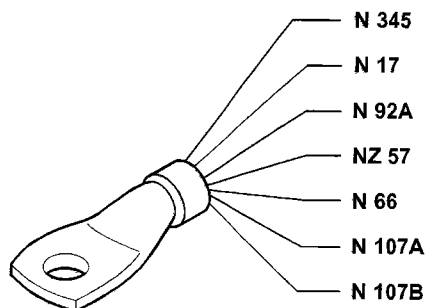
\* Variant for the ELX trim level  
 \*\* Only exists for the SX trim level with alarm  
 Only for the Brava

### 18 Left rear earth

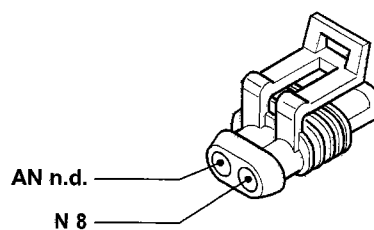


\* Variant for the ELX trim level  
 Only for the Brava

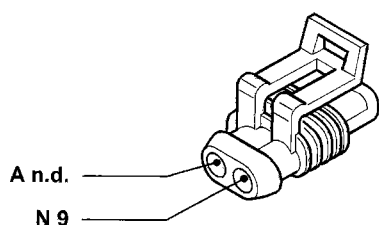
### 19 Right rear earth



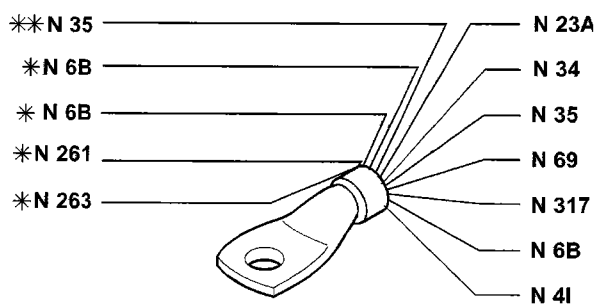
### 20 Left front side direction indicator



### 21 Right front side direction indicator

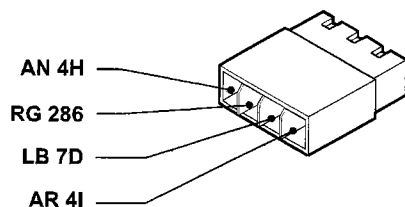


### 22 Left dashboard earth

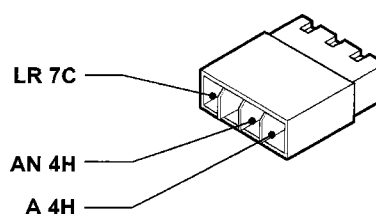


\* Variant for the version with automatic transmission  
 \*\* Only exists for the ELX trim level

### 23A Hazard warning lights warning light



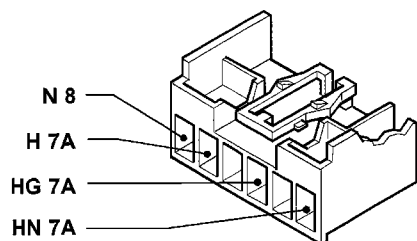
### 23B Hazard warning lights control switch



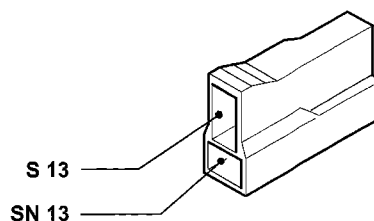
P4A328I01



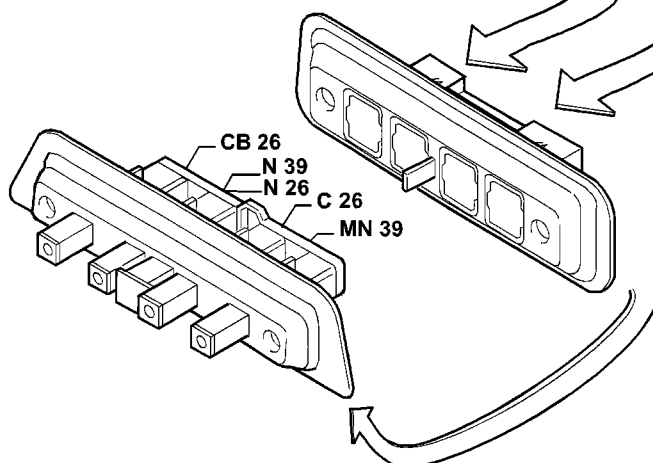
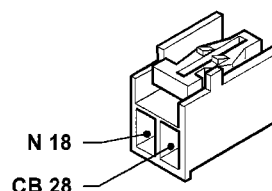
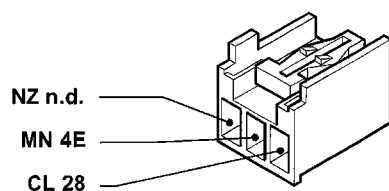
**24** Windscreen wiper motor



**25** Elec. windscreen/rearscreen washer pump



**27** Contact board for rear connections with luggage compartment light switch incorporated

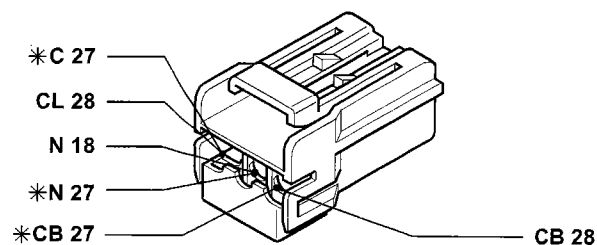


Only for the Brava

P4A329I01

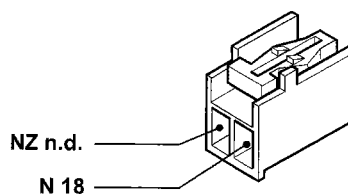
### 55.

#### 26 Rearscreen wiper motor



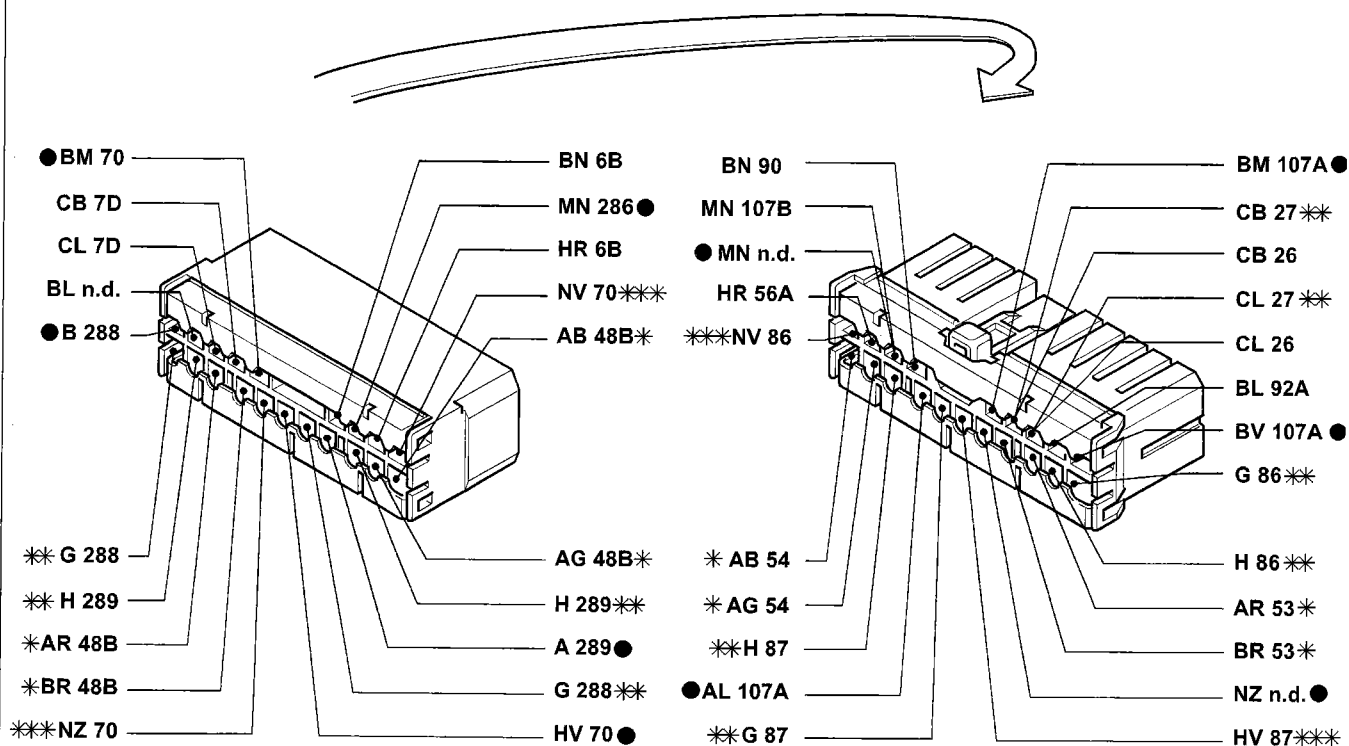
\* Variant for the Brava

#### 27A Button for luggage compartment light, switching on alarm and signalling boot lid open



Only for the Bravo

#### 28 Connection for longitudinal dashboard cables (only on the SX trim level)



\* Only valid for versions with top of the range radio

\*\* Only for the Brava

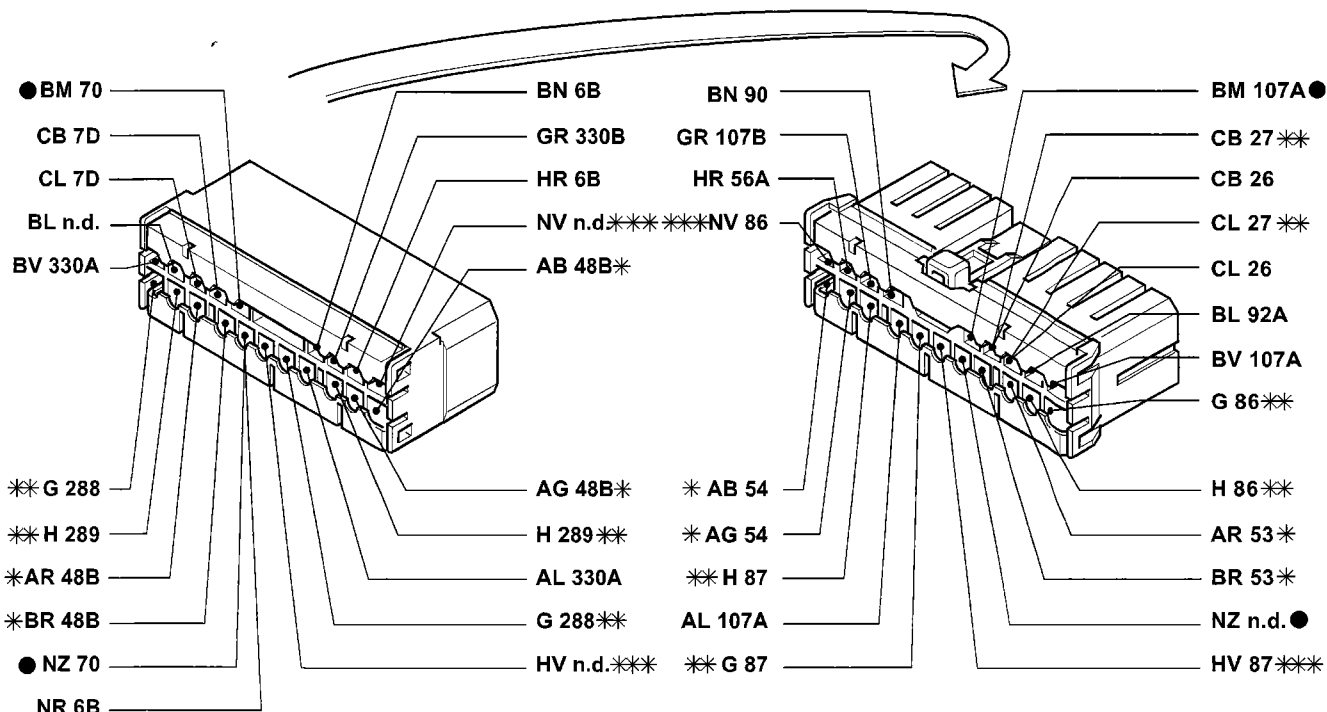
\*\*\* Only valid for the Brava version with alarm

● Exists only for versions with alarm

P4A330I01

**28**

Connection for longitudinal dashboard cables (only for the ELX trim level)



\* Only valid on versions with top of the range radio

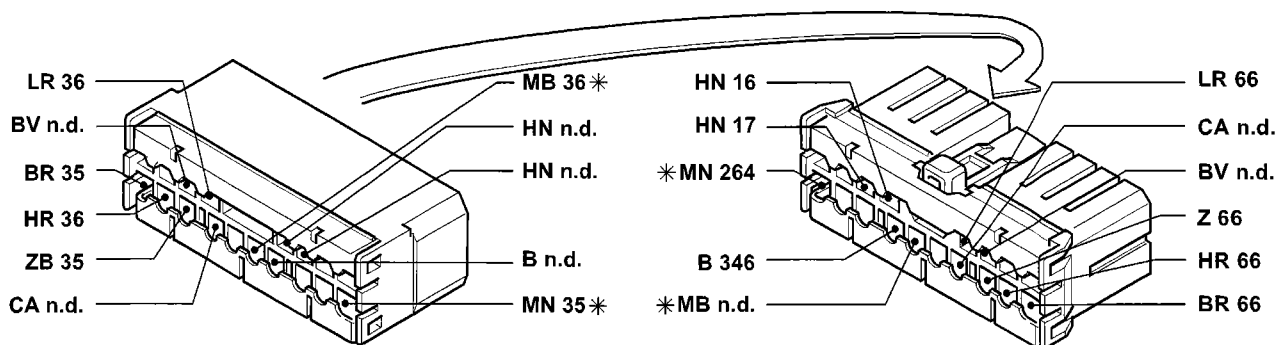
\*\* Only valid for the Brava

\*\*\* Only valid for the Brava version with alarm

● Only exists on the version with alarm

**28A**

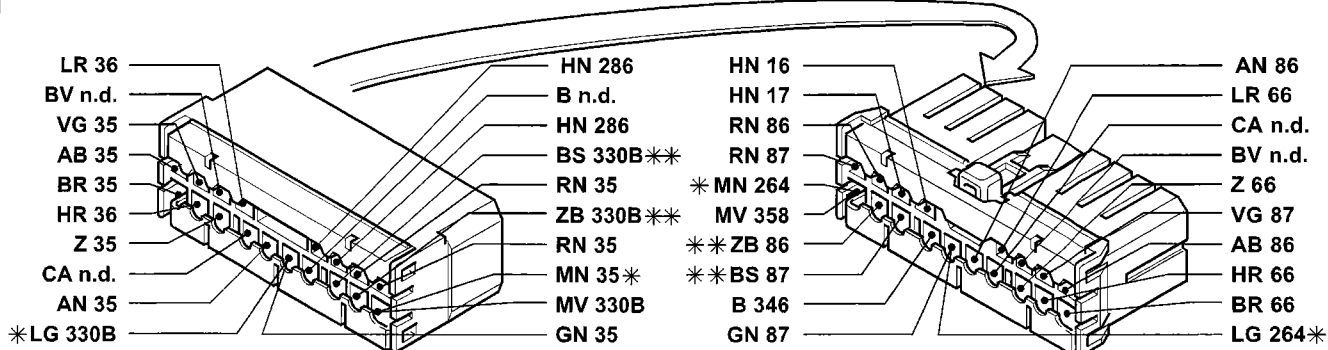
Connection for longitudinal dashboard cables (only for the SX trim level)



\* Only valid for versions with automatic transmission

**28A**

Connection for longitudinal dashboard cables (only for the ELX trim level)

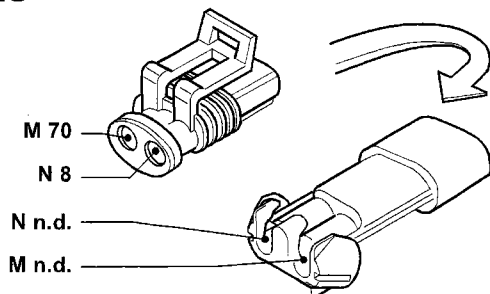


\* Only valid for the version with automatic transmission\*\* Only valid for the Brava

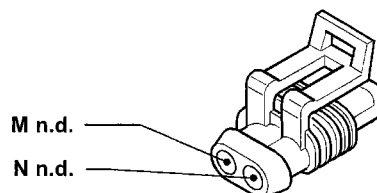
P4A331101

### 55.

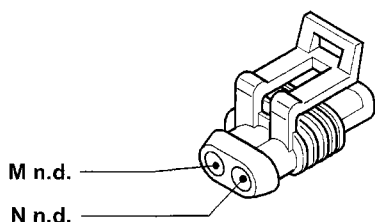
#### 29 Connection between front/fog light cables



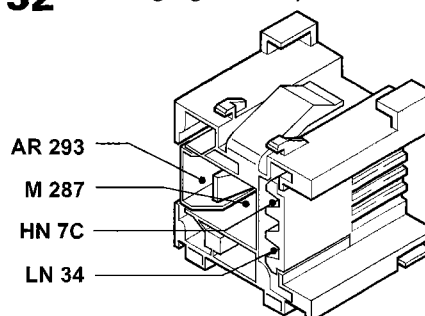
#### 30 Left fog lamp



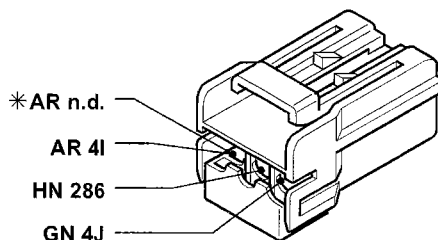
#### 31 Right fog lamp



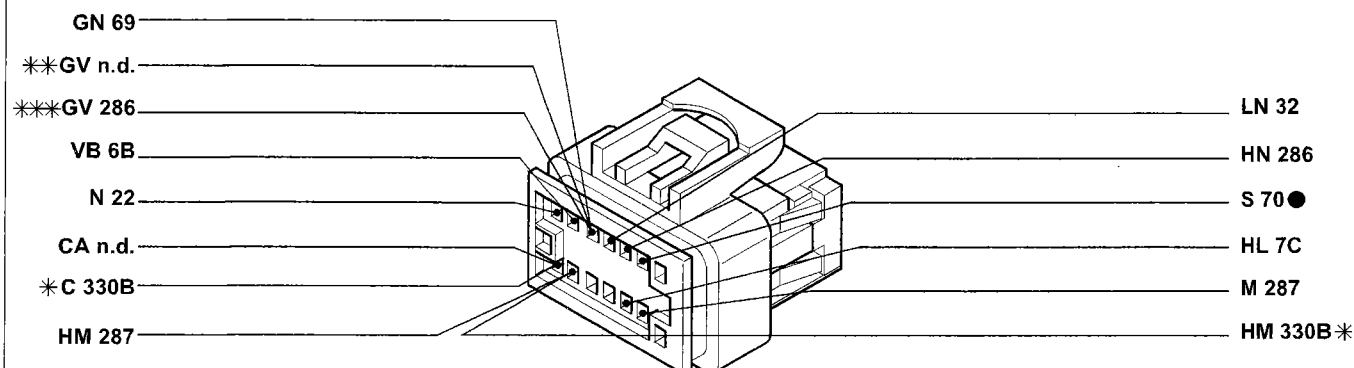
#### 32 Fog lights relay



#### 34 Switch control unit



\* Variant for the ELX trim level with automatic transmission



\* Variant for the ELX trim level

\*\* Variant for the version with automatic transmission

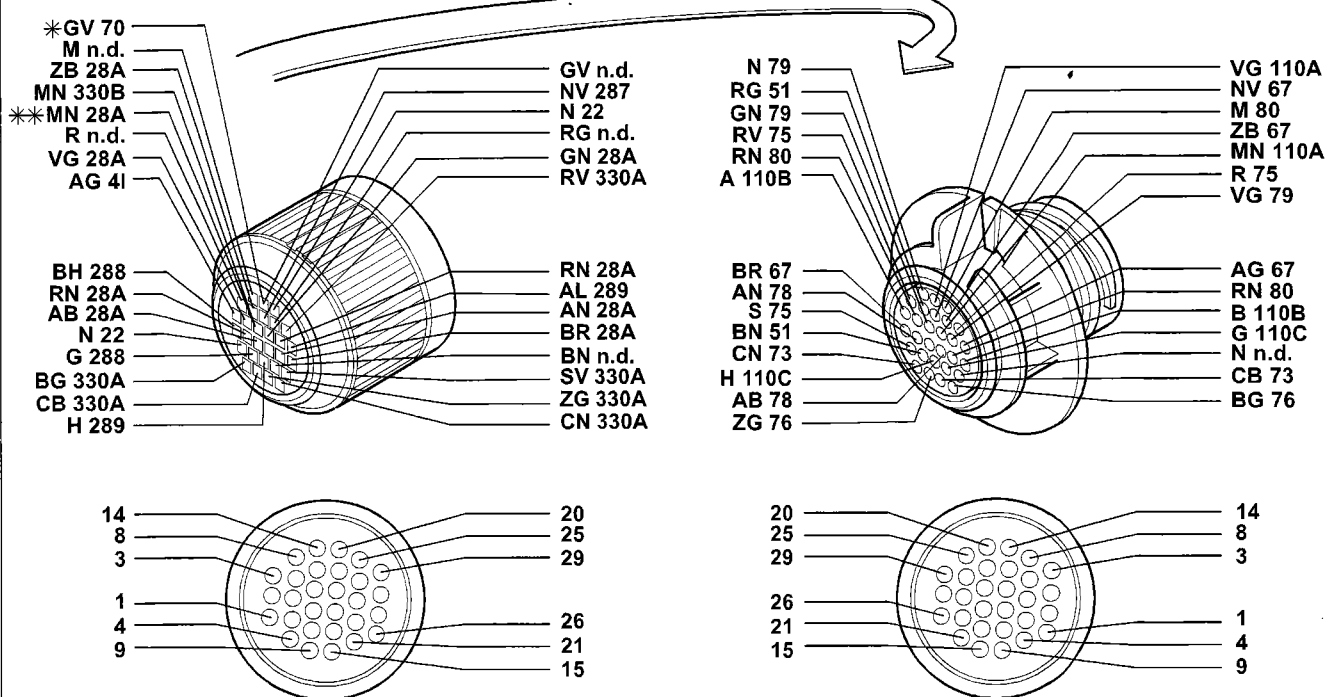
\*\*\* Variant for the SX trim level with automatic transmission

● Only valid for the version with alarm

P4A332101

### 35

Dashboard/left front door cables connection (only for the ELX)

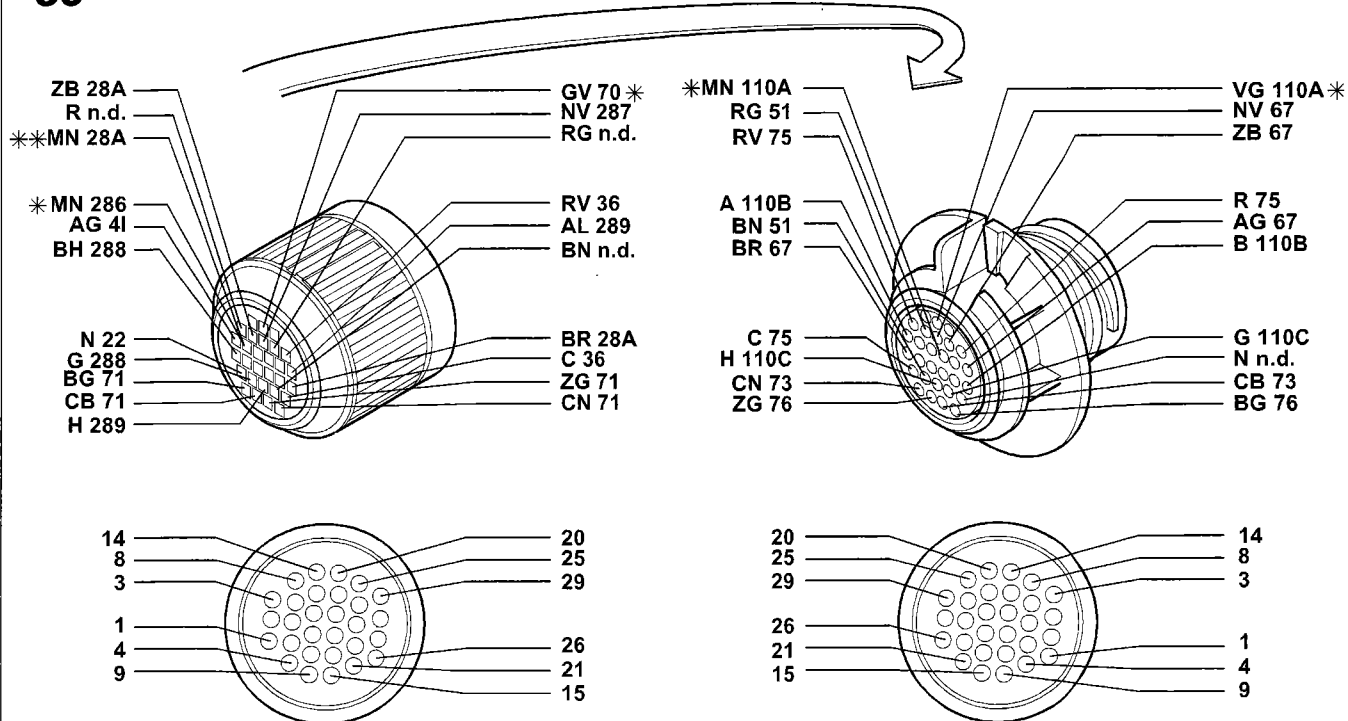


\* Only valid for version with alarm

\*\* Only valid for the version with automatic transmission

### 35

Dashboard/left front door cables connection



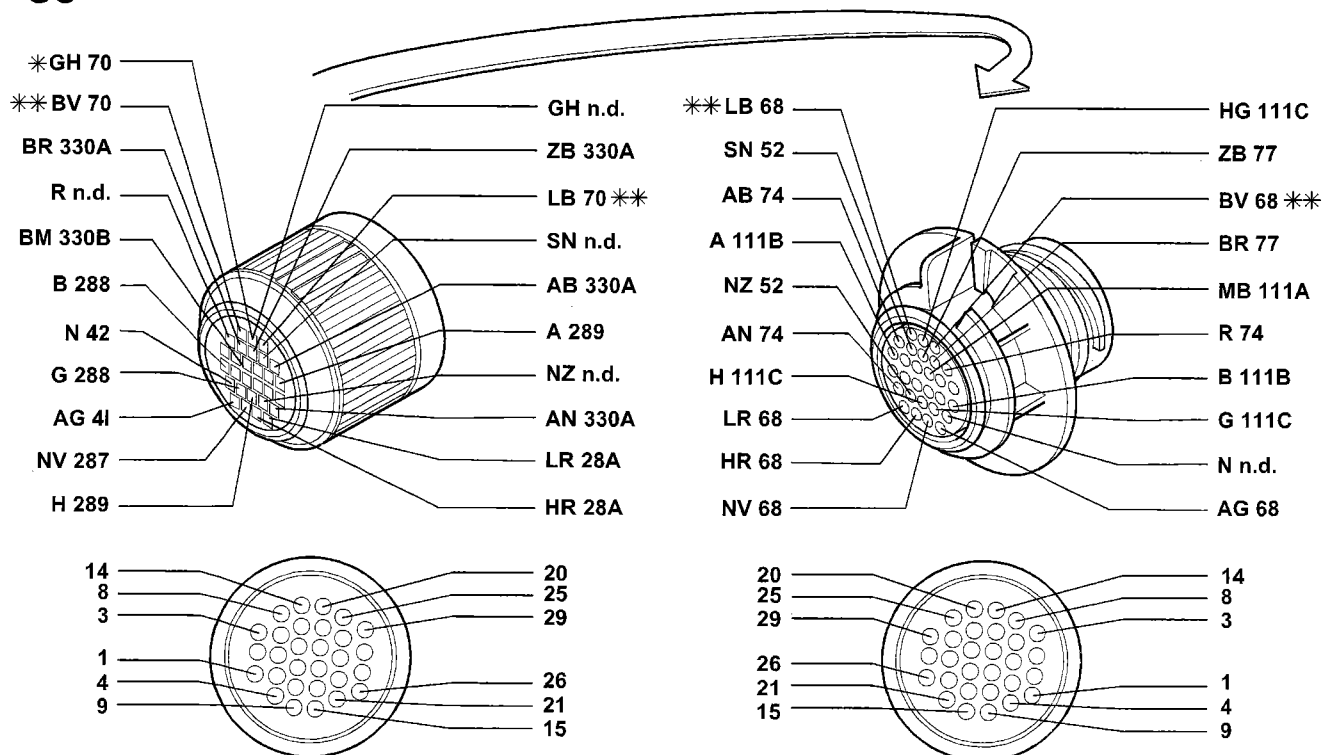
\* Only valid for version with alarm

\*\* Only valid for the version with automatic transmission

P4A333101

**55.**

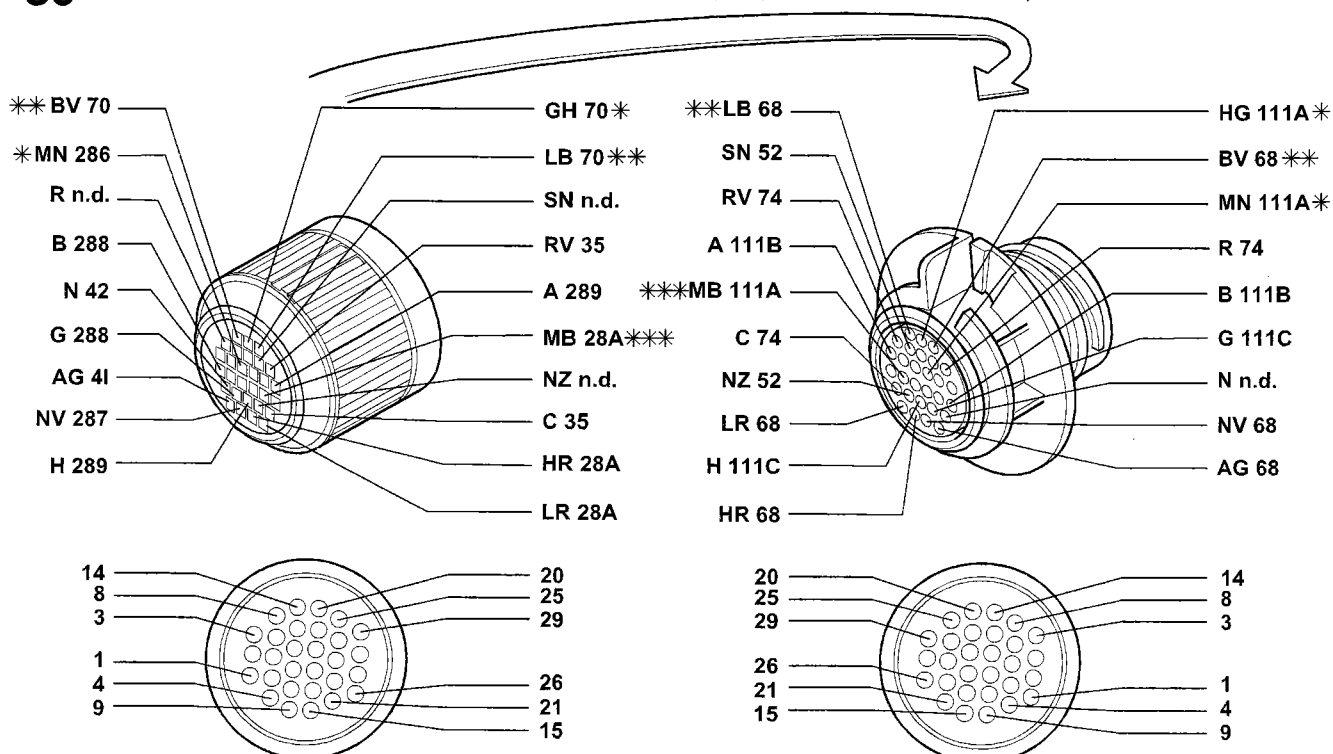
### 36 Dashboard/right front door cables connection (only for the ELX trim level)



\* Only valid for versions with alarm

\*\* Only valid for the version with air conditioning

### 36 Dashboard/right front door cables connection (only for the SX trim level)



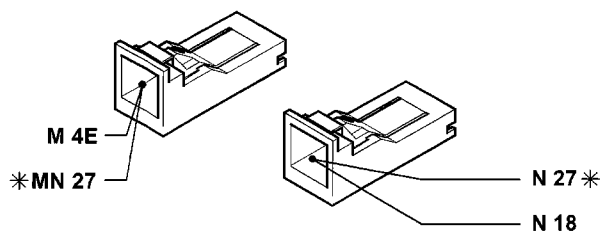
\* Only valid for version with alarm

\*\* Only valid for the version with air conditioning

\*\*\* Only valid for the version with automatic transmission

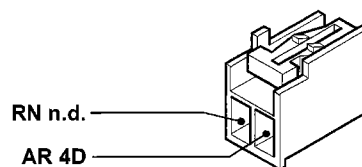
P4A334I01

**39** Heated rear windscreen

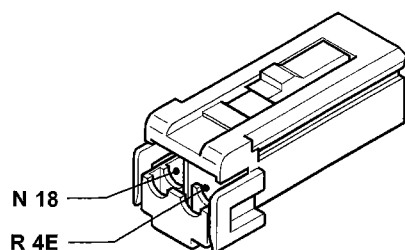


\* Only exists on the Brava

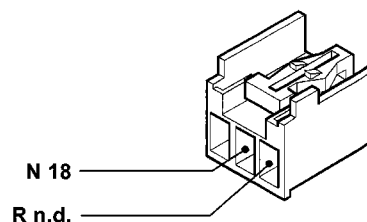
**40** Brake lights control switch



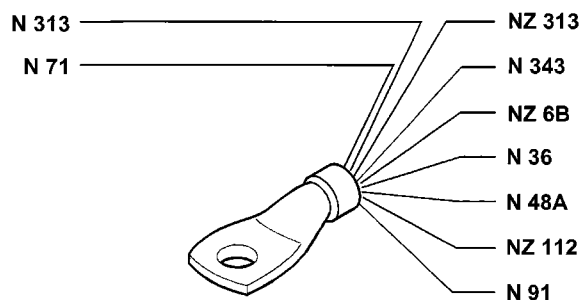
**41** Additional brake light



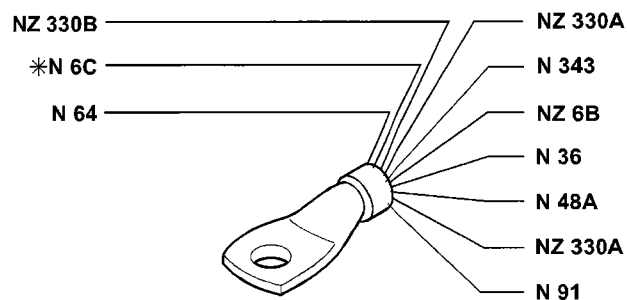
**41** Additional brake light



**42** Right dashboard earth (only for the SX trim level)

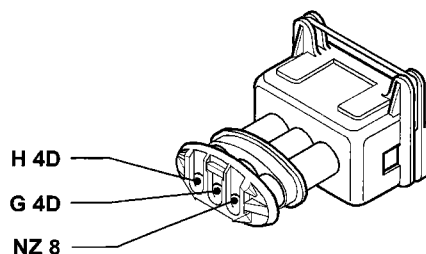


**42** Right dashboard earth

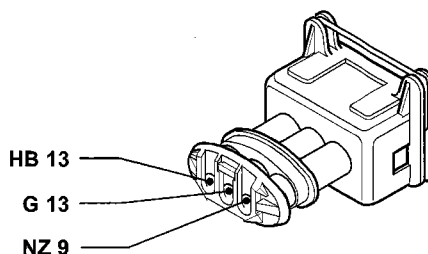


\* Only valid for versions with automatic transmission

**43** Left headlamp alignment correction motor



**44** Right headlamp alignment correction motor

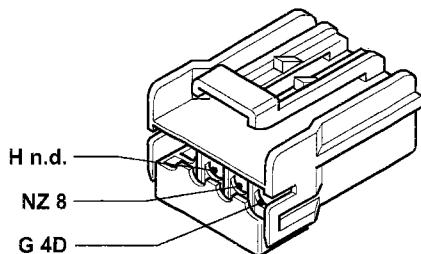


P4A335I01

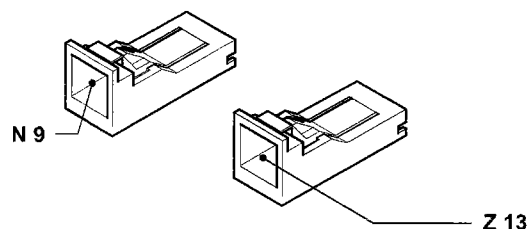


# 55.

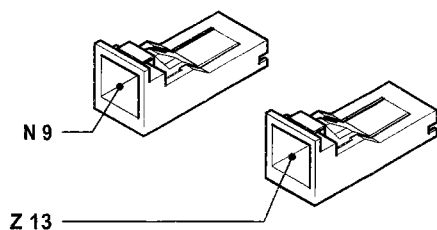
### 45 Headlamp alignment control unit



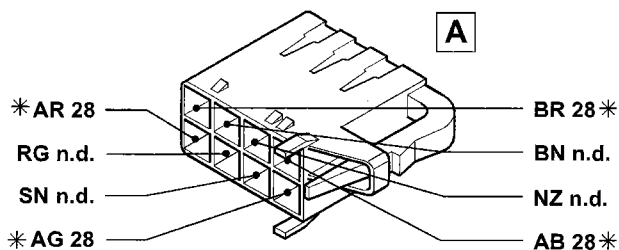
### 46 Left electric horn



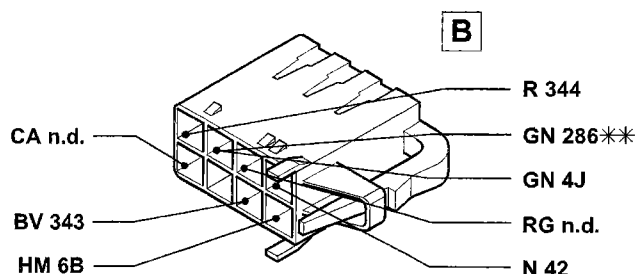
### 47 Right electric horn



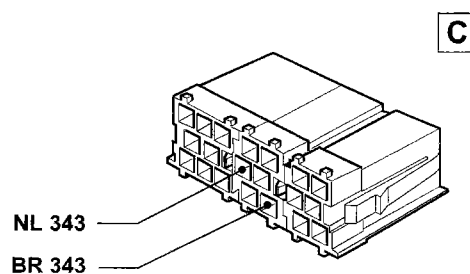
### 48 Radio receiver with clock



\* Only valid for version with top of the range radio

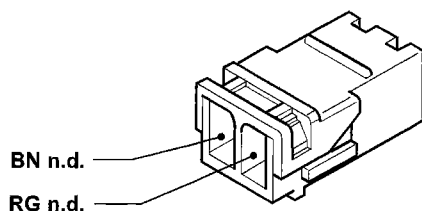


\*\* Only valid for version with radio phone

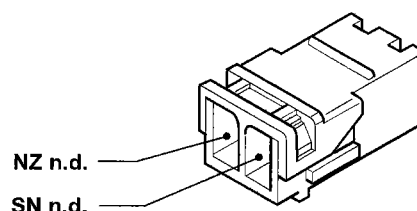


Exists only for version with top of the range radio

### 49 Left front speaker (tweeter)

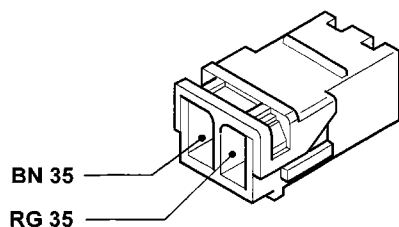


### 50 Right front speaker (tweeter)

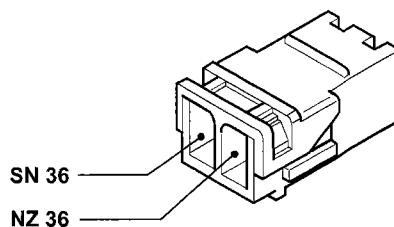


P4A336I01

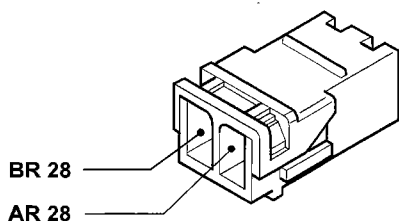
**51** Speaker in left front door



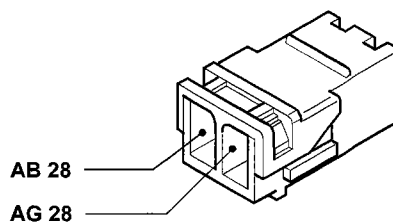
**52** Speaker in right front door



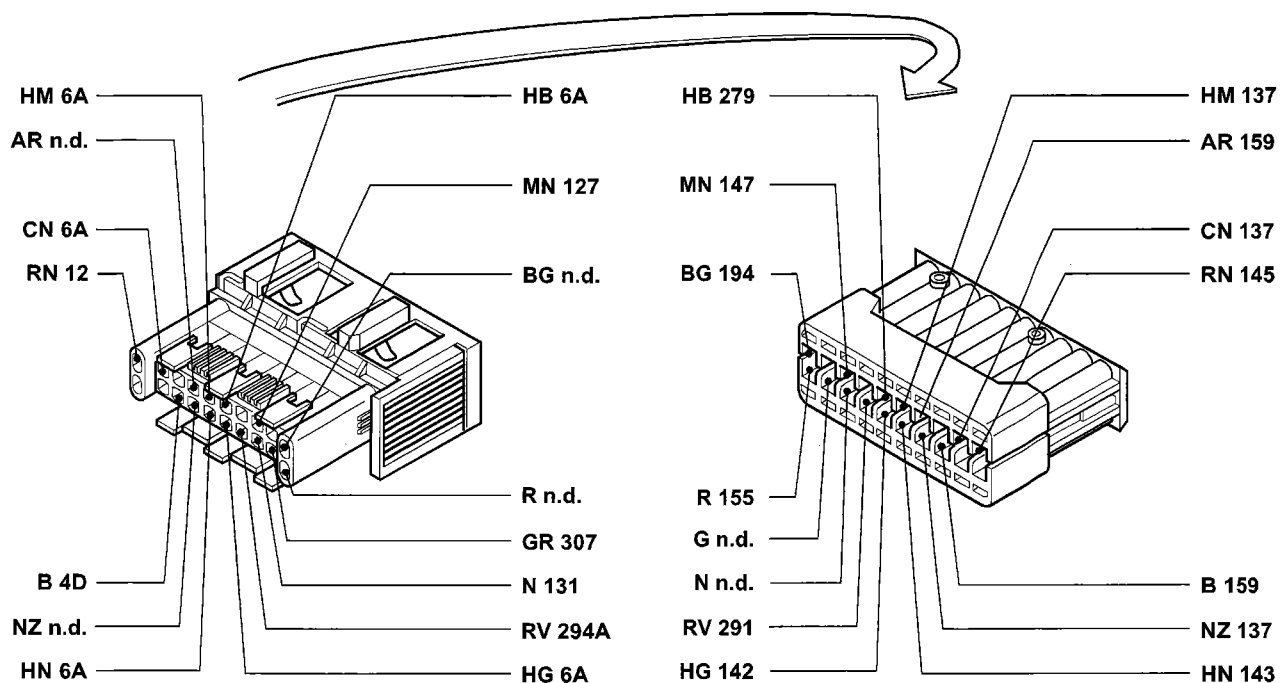
**53** Left rear speaker



**54** Right rear speaker



**55** Connection between front cables/engine pre-wiring (1242)

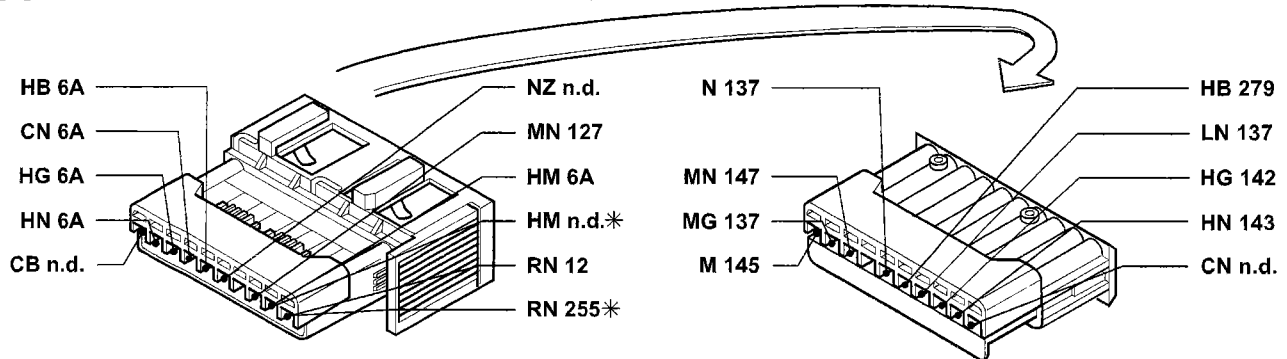


P4A337I01

**55.**

**55**

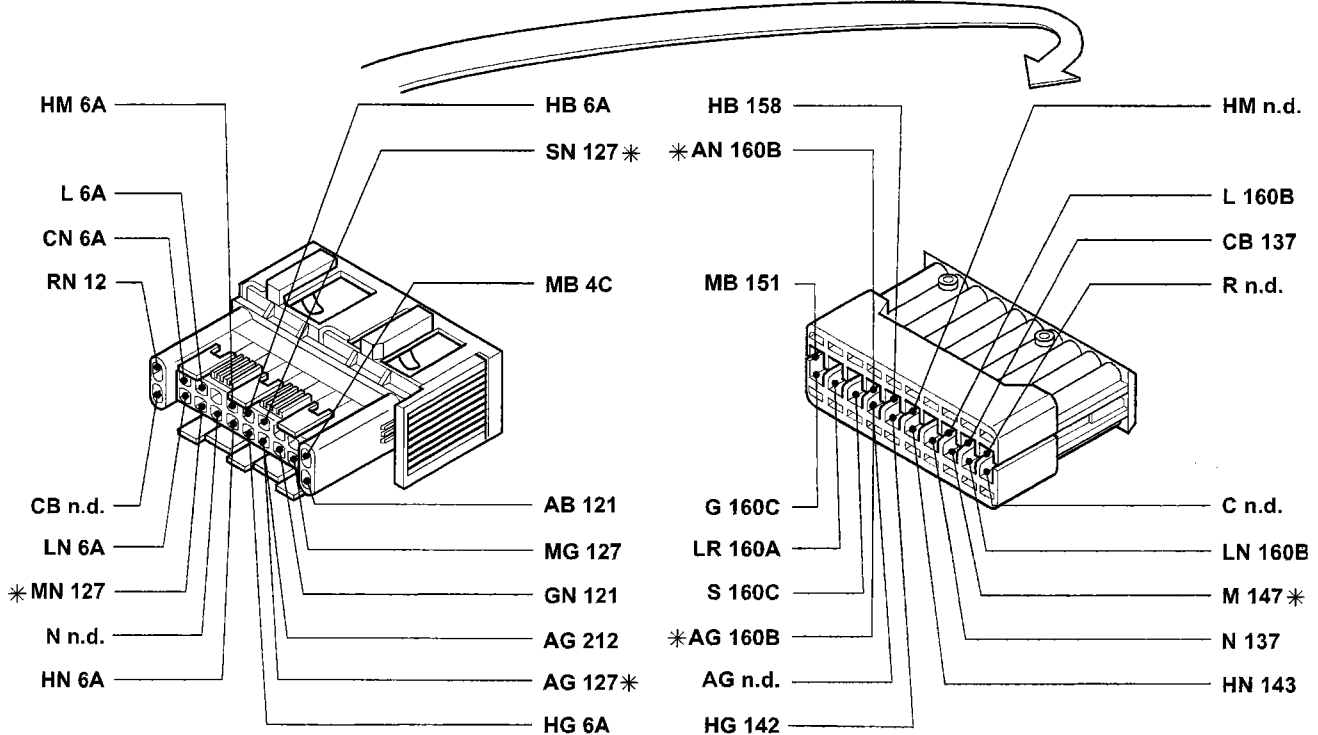
Connection between front/engine pre-wiring cables (1581)



\* Only valid for version with automatic transmission

**55**

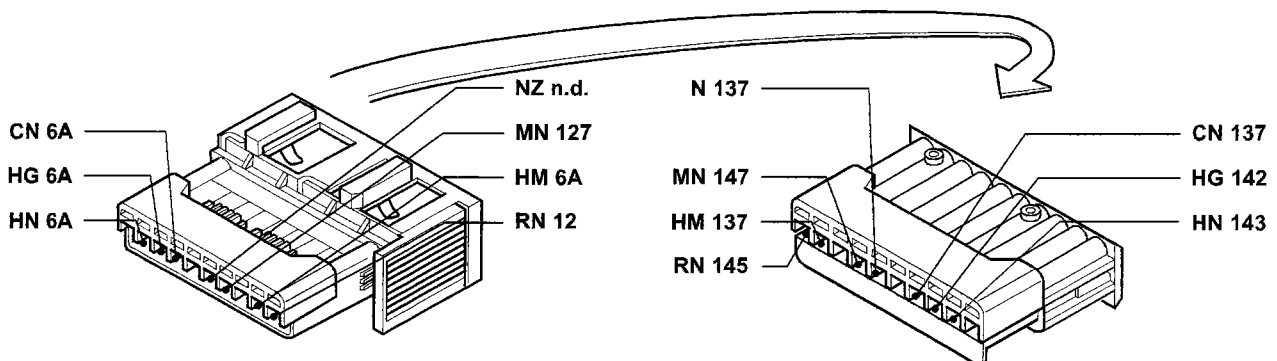
Connection between front/engine pre-wiring cables (1747)



\* Only valid for version without air conditioning

**55**

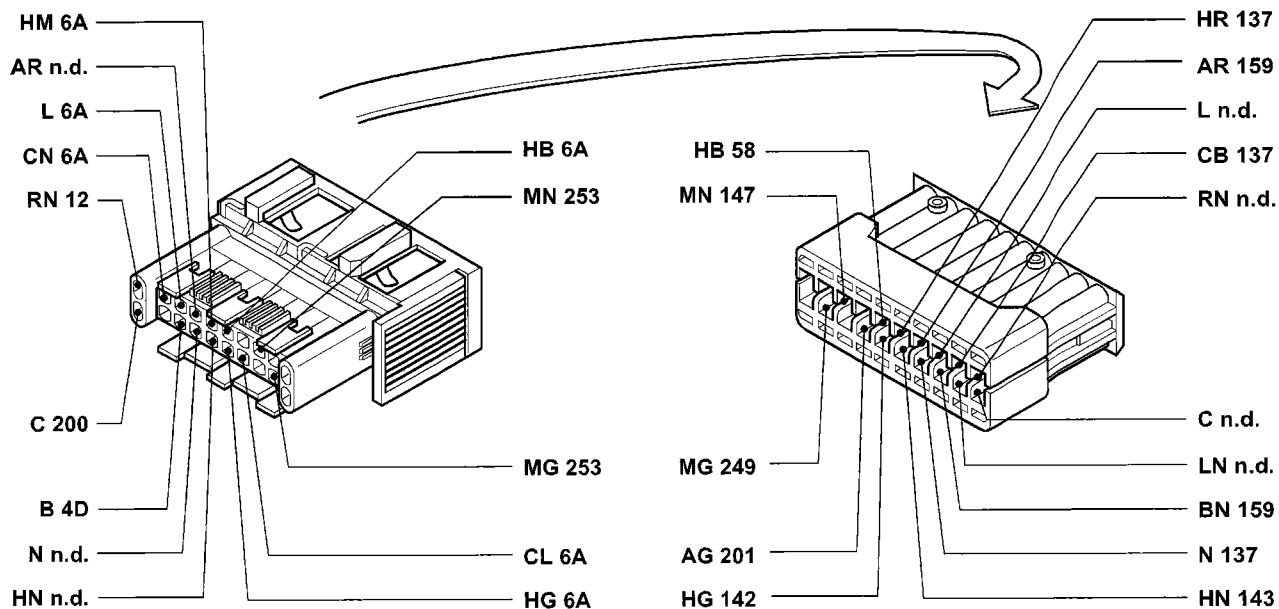
Connection between front/engine pre-wiring cables (1998)



P4A338I01

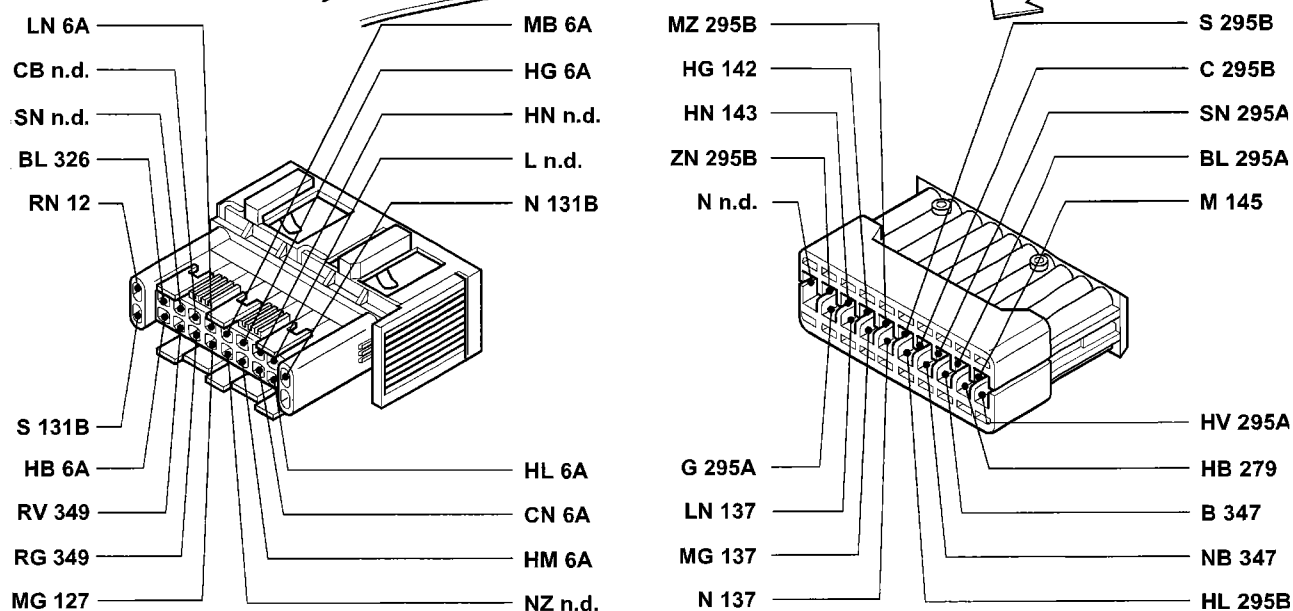
**55**

Connection between front/engine pre-wiring cables (1910 TD)



**55**

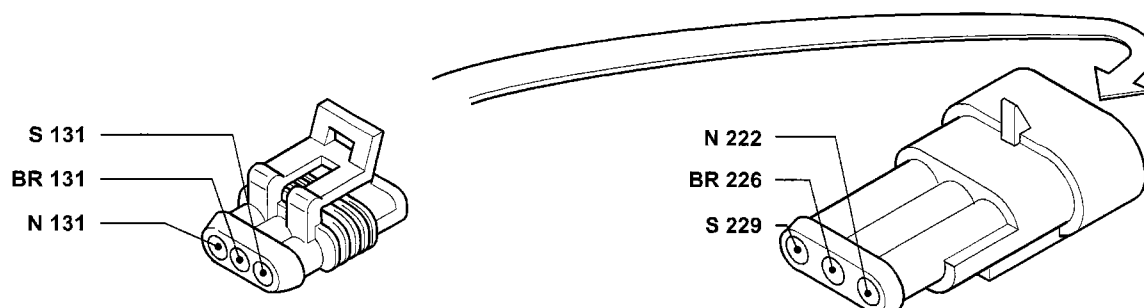
Connection between front/engine pre-wiring cables (1910 JTD)



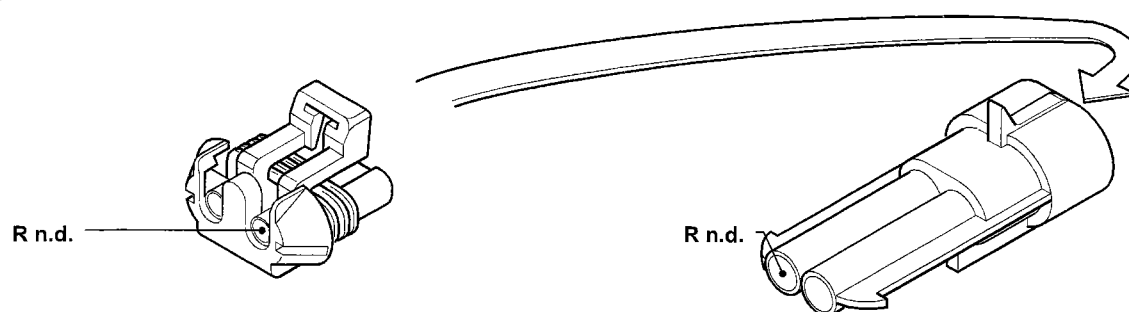
P4A339I01

### 55.

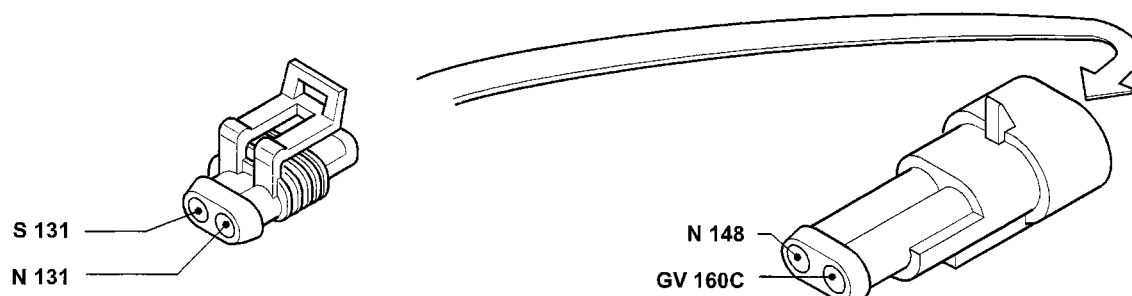
#### 55A Connection between front/engine pre-wiring cables (1910 TD)



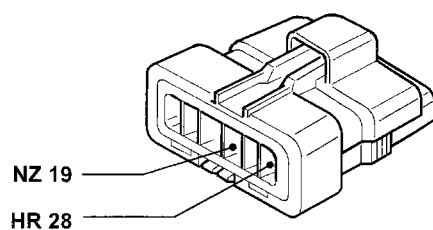
#### 55B Connection between front/engine pre-wiring cables (1747)



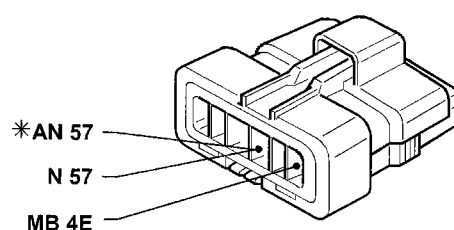
#### 55C Connection between front/engine pre-wiring cables (1747)



#### 56A Fuel level sensor



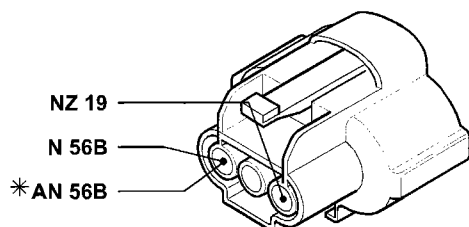
#### 56B Electric fuel pump



\* Variant for 1998 and JTD versions

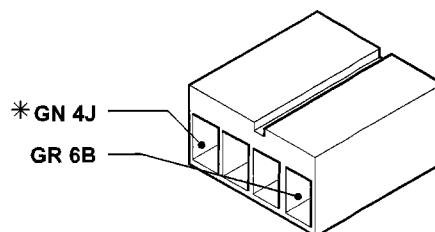
P4A340I01

**57** Inertia switch

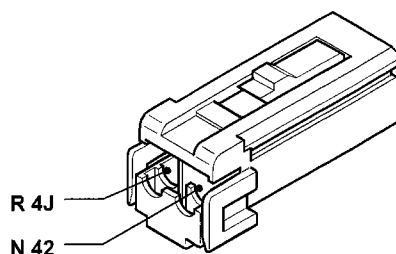


\* Variant on 1998 and JTD versions

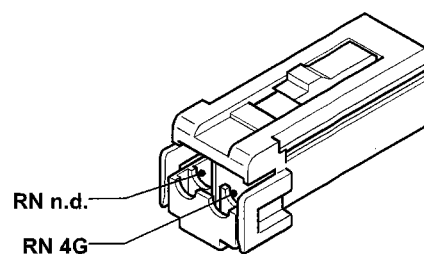
**58** Light dimmer



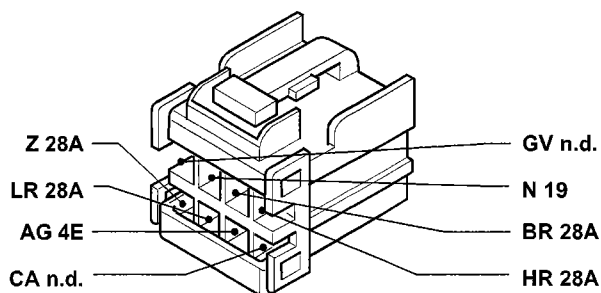
**64** Glove compartment light bulb with switch incorporated



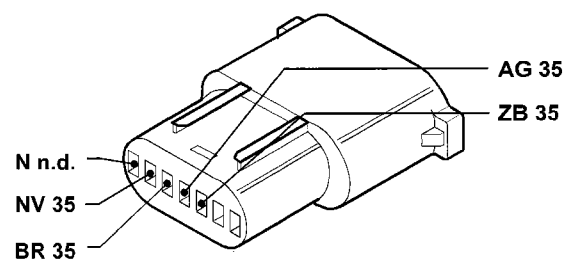
**65** Luggage compartment light/anti-theft device on



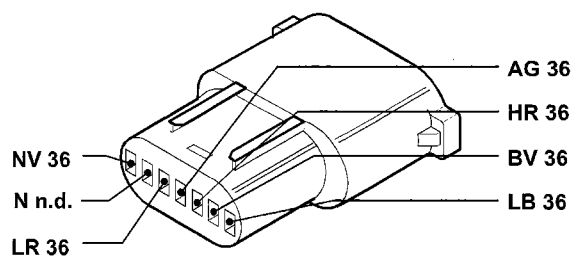
**66** Electrically adjusted external rear view mirrors control panel



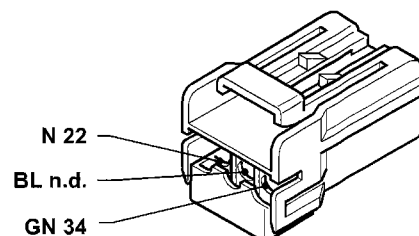
**67** Left electrically adjusted external rear view mirror



**68** Right electrically adjusted external rear view mirror

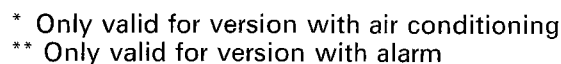


**69** Cigar lighter

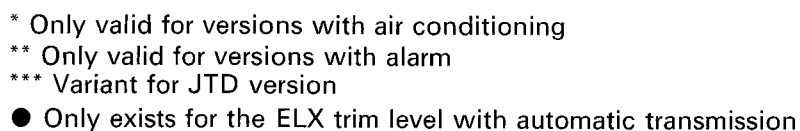


P4A341101

## 70

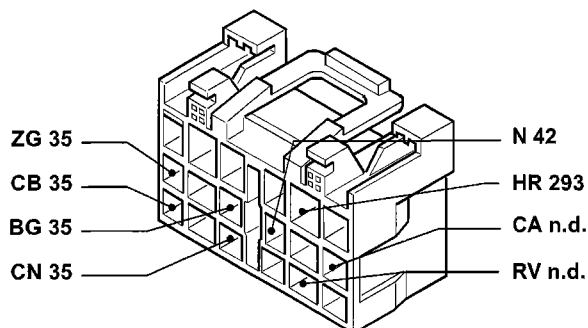


## 70



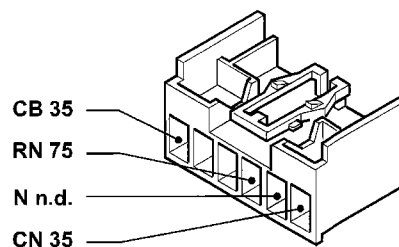


**71** Electric front windows control unit

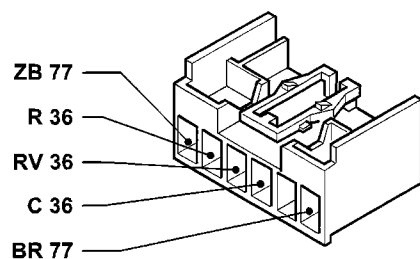


Only exists on the SX trim level

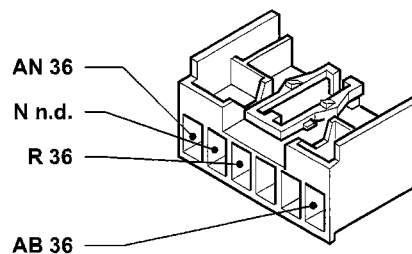
**73** Left front electric window control panel



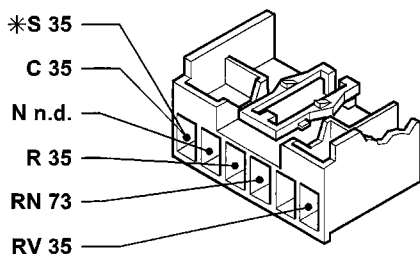
**74** Right electric front window control panel



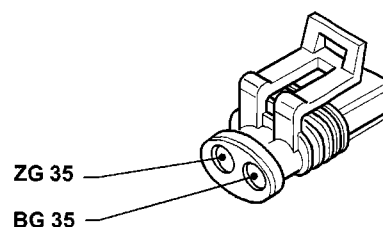
**74** Right electric front window control panel



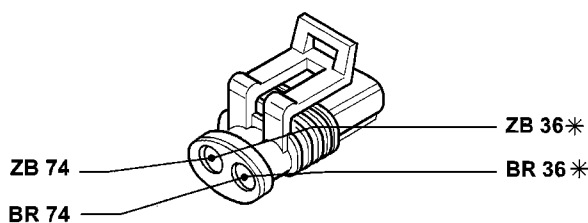
**75** Right front electric window control panel on left front door



**76** Left front electric window motor

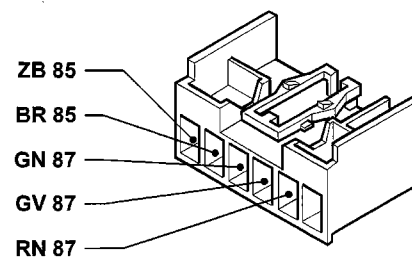


**77** Right front electric window motor



\* Variant for the ELX trim level

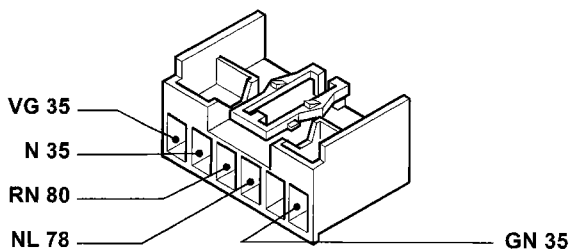
**78** Left rear electric window control panel on left rear door



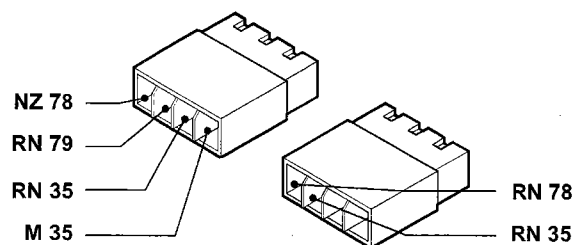
P4A343101

### 55.

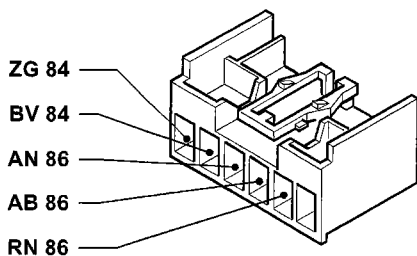
#### 79 Right rear electric window control panel on right rear door



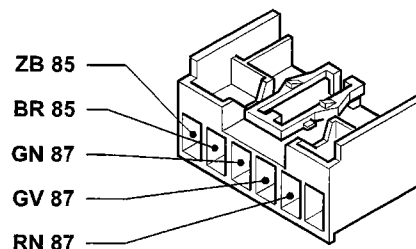
#### 80 Electric rear windows inhibitor switch



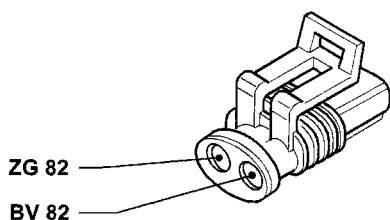
#### 82 Left rear electric window control panel on left rear door



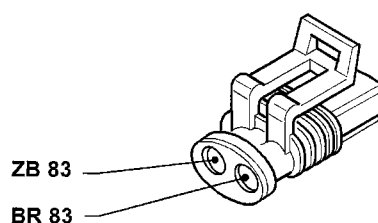
#### 83 Right rear electric window control panel on right rear door



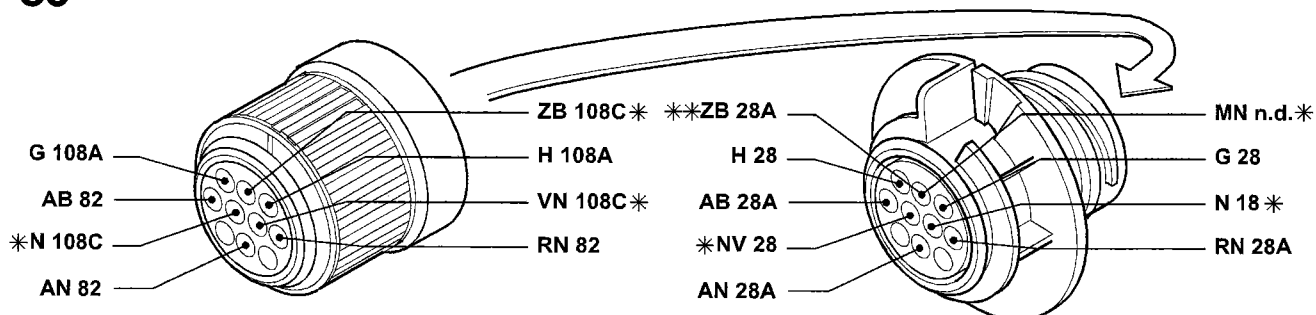
#### 84 Left rear electric window motor



#### 85 Right rear electric window motor



#### 86 Longitudinal/left rear door cables connection

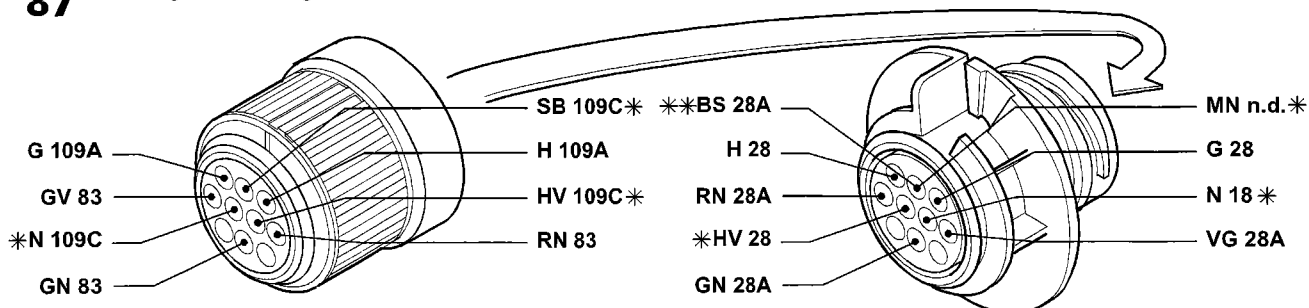


\* Only valid for version with alarm

\*\* Only valid for the ELX trim level

P4A344I01

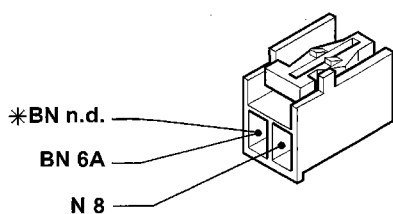
### 87 Longitudinal/right rear door cables connection



\* Only valid for version with alarm

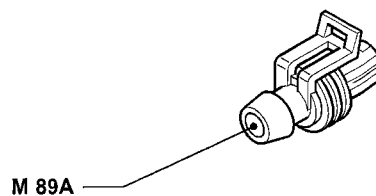
\*\* Only valid for the ELX trim level

### 88 Insufficient brake fluid level sensor

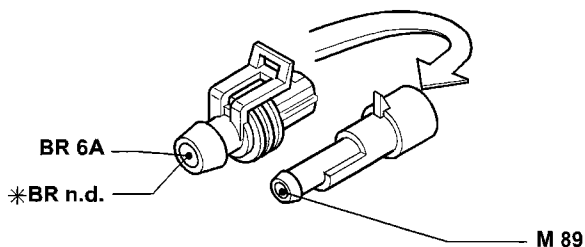


\* Only valid for version with automatic transmission

### 89 Left brake pad wear sensor

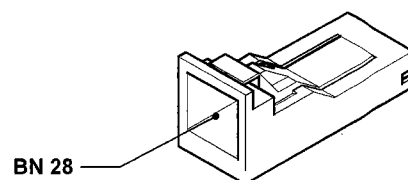


### 89A Left brake pad wear sensor cables connection

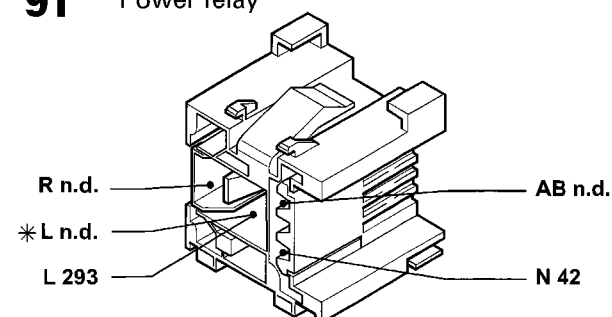


\* Only valid for the HGT trim level

### 90 Switch signalling handbrake applied

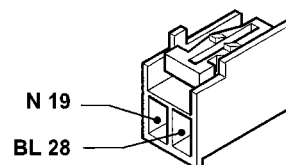


### 91 Power relay



\* Only valid for the ELX trim level

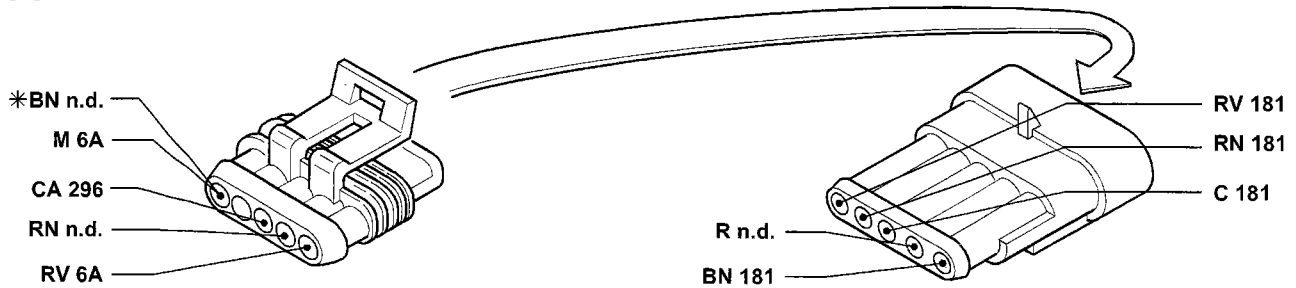
### 92A Electric sun roof cables connection



P4A345I01

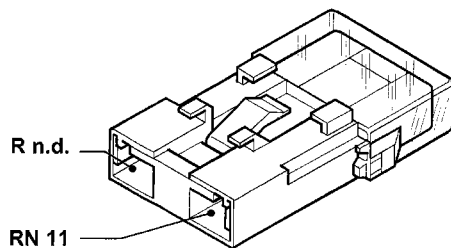
**55.**

## 95 Front/anti-lock brakes cables connection (A.B.S.)

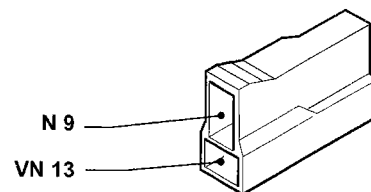


\* Only valid for version with automatic transmission

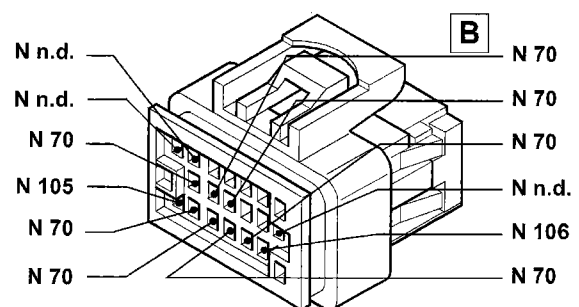
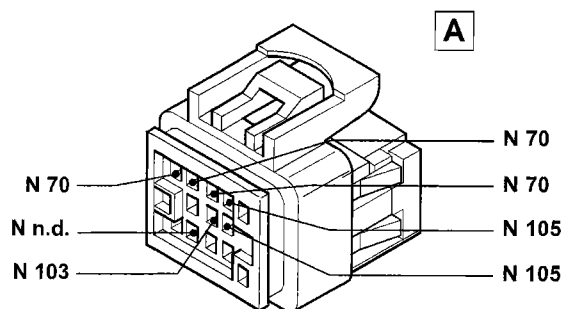
**96** 60A protective power fuse for electrical equipment



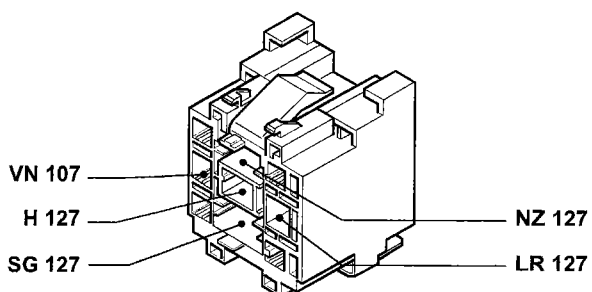
**97** Electric headlamp washer pump



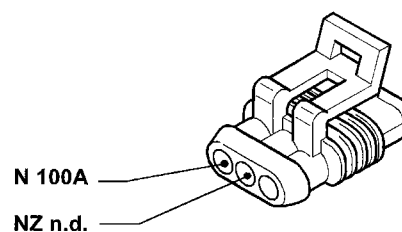
**100** Alarm device electronic control unit



**98** Headlamp washer intermittent device

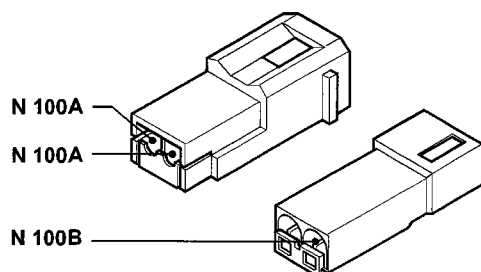


**103** Diagnostic socket for alarm



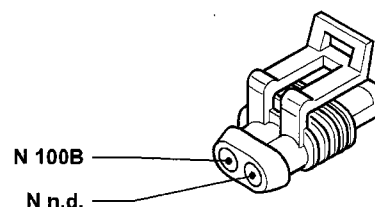
P4A346101

**105** Alarm deactivation switch



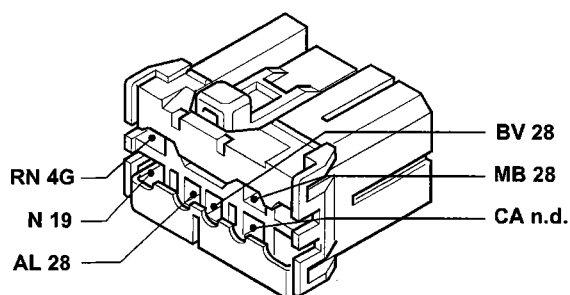
P4A347101

**106** Alarm activation switch



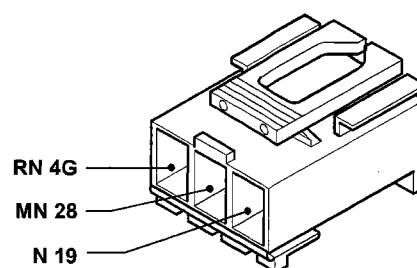
P4A347102

**107A** Door remote control receiver



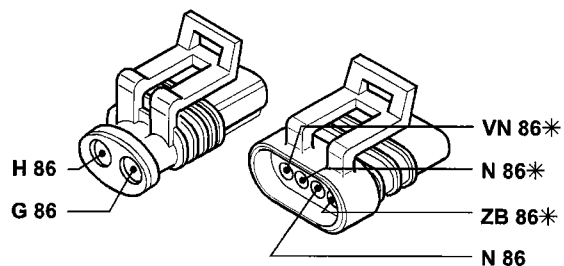
P4A347103

**107B** Car interior courtesy light



P4A347104

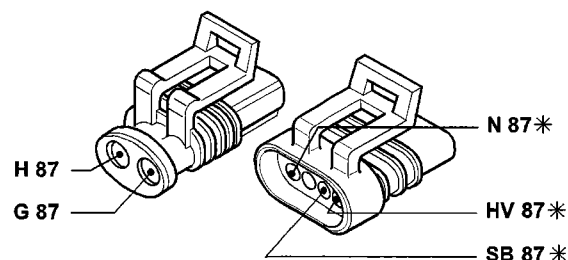
**108** Left rear central locking/alarm on switch



\*Applies only for version with alarm

P4A347105

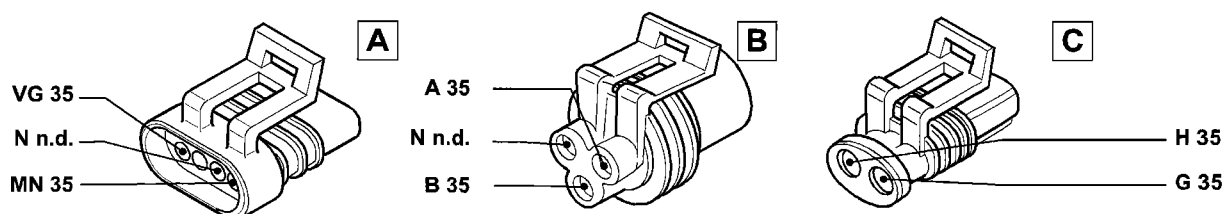
**109** Right rear central locking/alarm on switch



\*Applies only for version with alarm

P4A347106

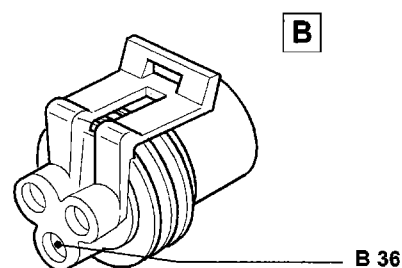
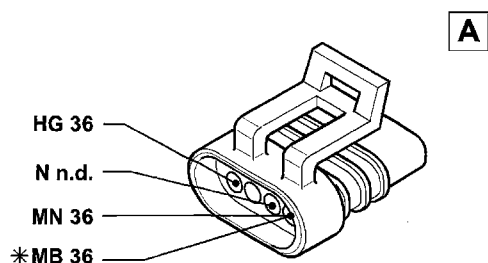
**110** Left front central locking/alarm on switch



P4A347107

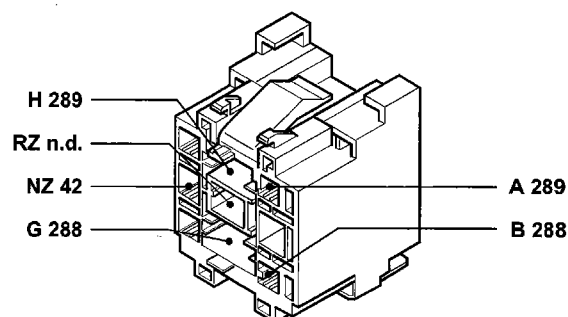
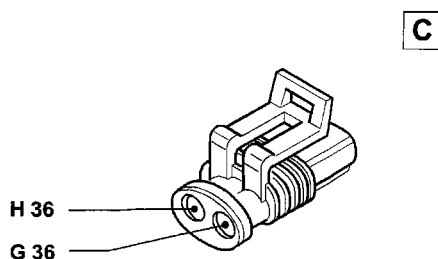
### 55.

#### 111 Right front central locking/alarm on switch



\*Applies only for ELX outfit with automatic transmission

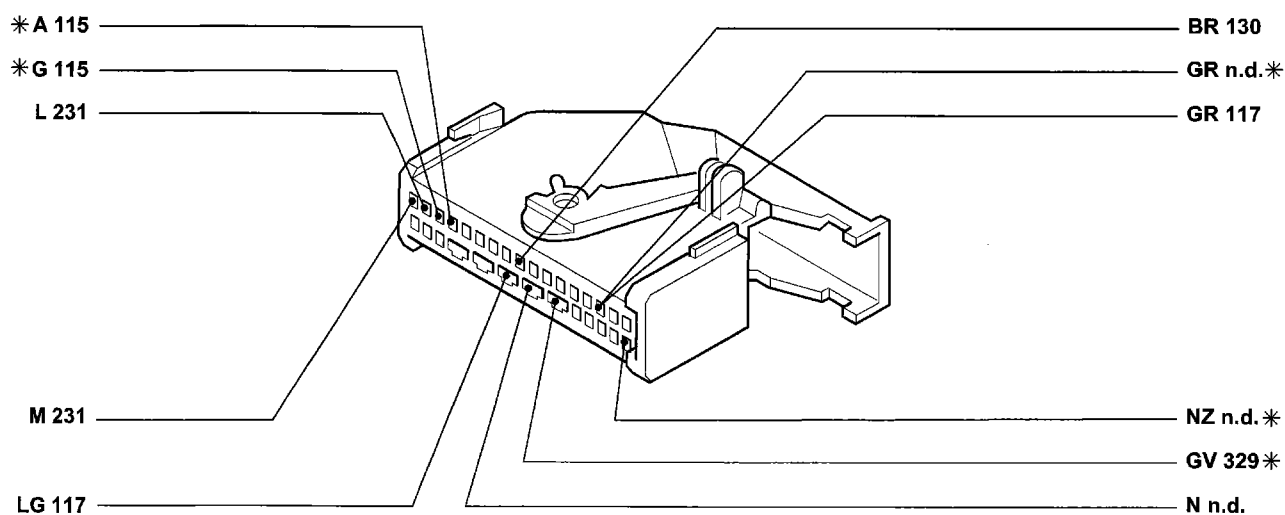
#### 112 Door lock system electronic control unit



P4A348I01

P4A348I02

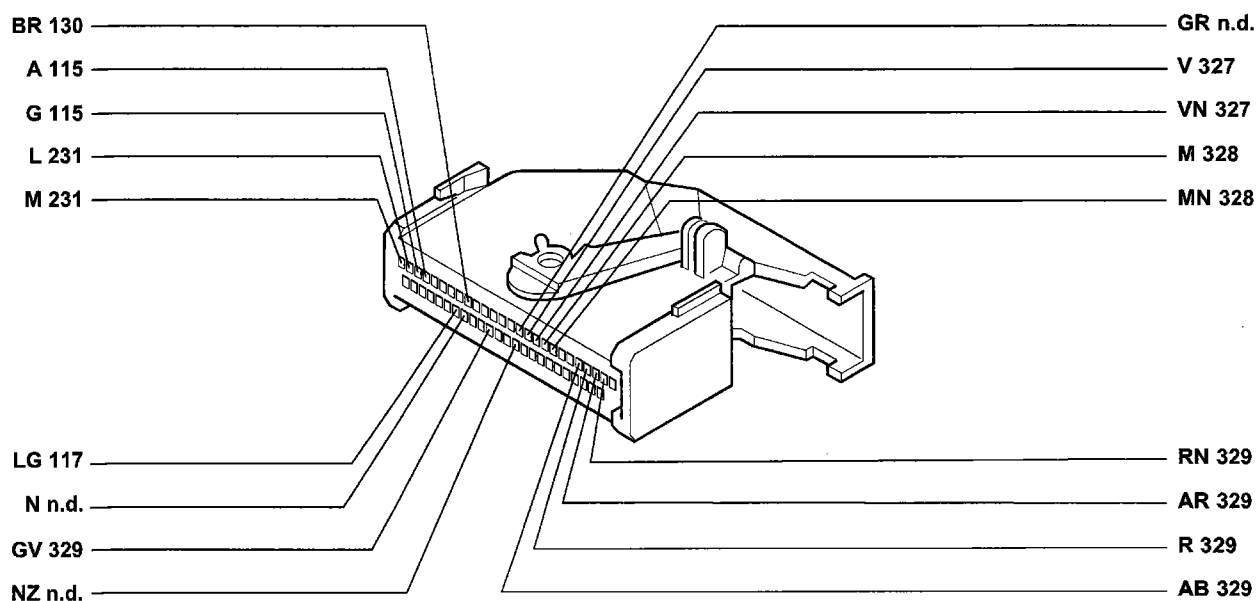
#### 114 EURO-BAG electronic control unit



\*Applies only for version with driver and passenger side EURO-BAG

P4A348I03

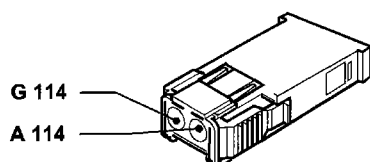
### 114 EURO-BAG electronic control unit



Only in version with SIDE-BAG

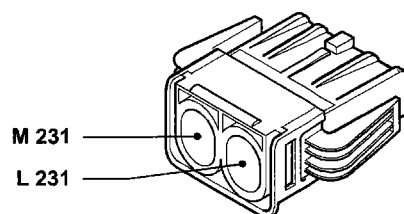
P4A349I01

### 115 Passenger EURO BAG



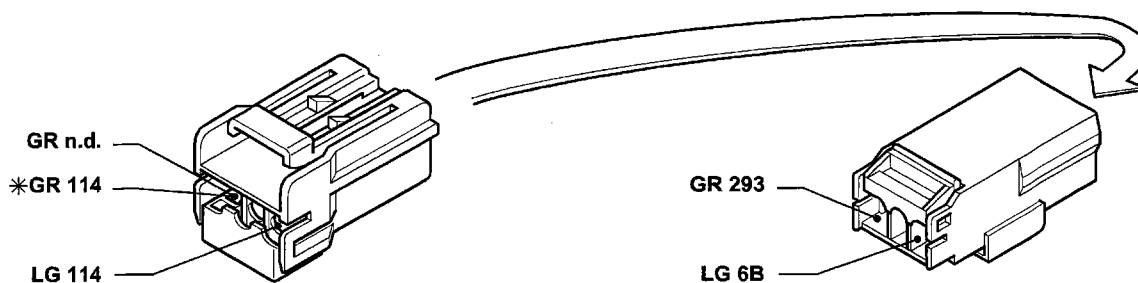
P4A349I02

### 116 Driver's EURO BAG



P4A349I03

### 117 EURO-BAG/facia cable connection



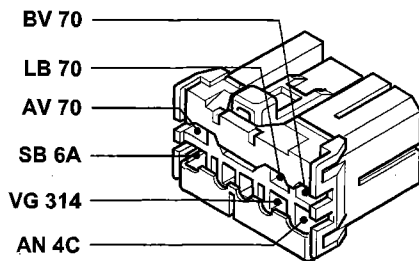
\*Variant for version with driver's side EURO-BAG

P4A349I04

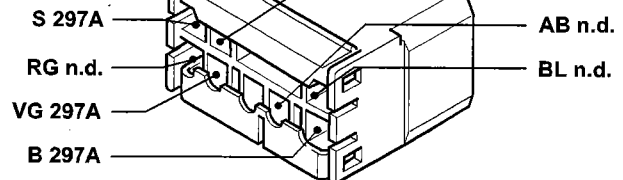


# 55.

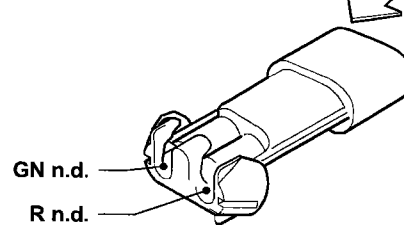
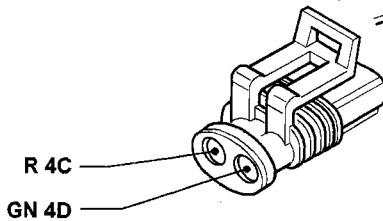
### 120 Connection for air conditioning unit cables



**A**

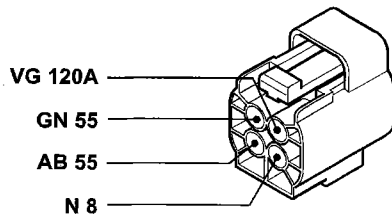


**B**



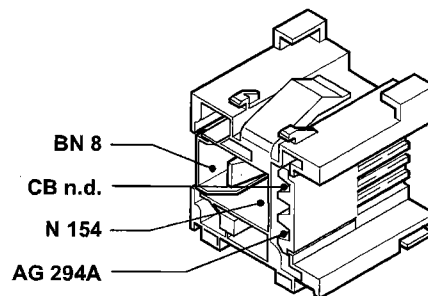
P4A350I01

### 121 Three stage pressure switch



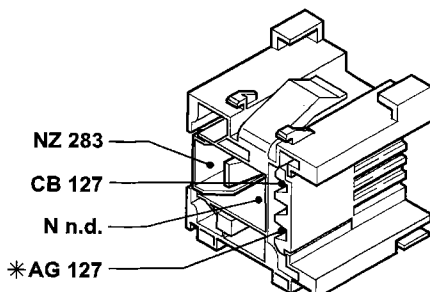
P4A350I02

### 122 Engine cooling fan low speed relay feed (1242 without air conditioner)



P4A350I03

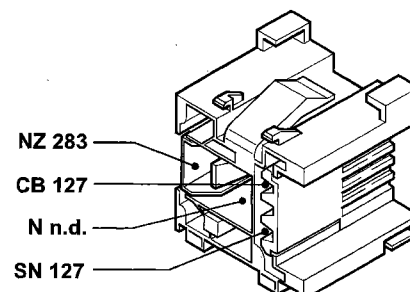
### 122 Engine cooling fan low speed relay feed (1242 and 1581 with air conditioner)



\* Not in version with automatic transmission

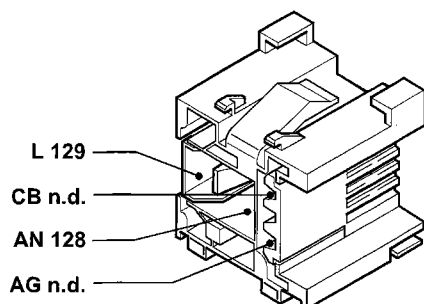
P4A350I04

### 122 Engine cooling fan low speed relay feed (1747 and 1998 with air conditioner)

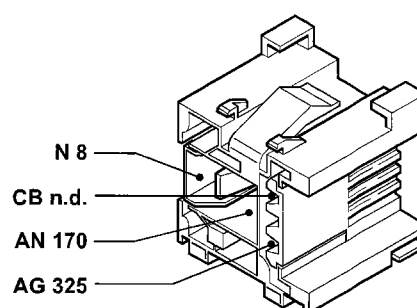


P4A350I05

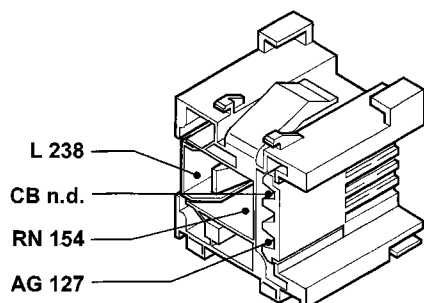
### 122 Engine cooling fan low speed relay feed (1910 TD)



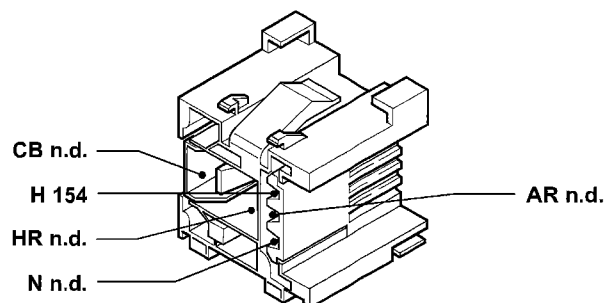
### 122 Engine cooling fan low speed relay feed (1910 JTD without air conditioning)



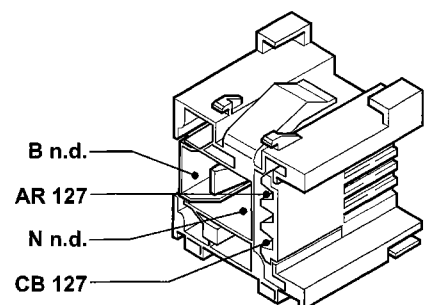
### 122 Engine cooling fan low speed relay feed (1910 JTD with air conditioning)



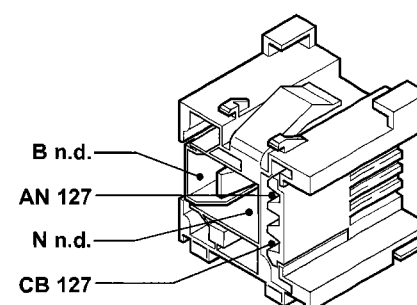
### 123 Engine cooling fan high speed timer (1910 JTD with air conditioning)



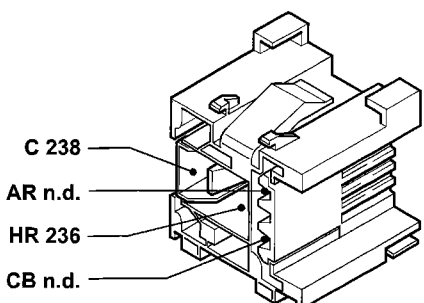
### 123A Engine cooling fan high speed relay feed (1242 and 1581 with air conditioning)



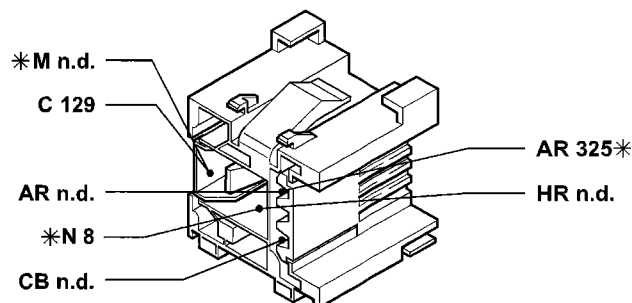
### 123A Engine cooling fan high speed relay feed (1747 and 1998 with air conditioning)



### 123A Engine cooling fan high speed relay feed (1910 TD)



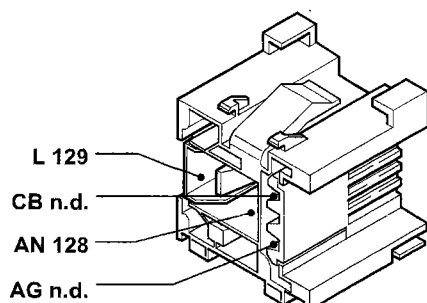
### 123A Engine cooling fan high speed relay feed (1910 JTD)



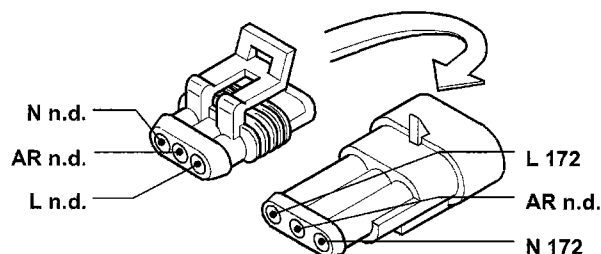
\* Variant on versions without air conditioning

# 55.

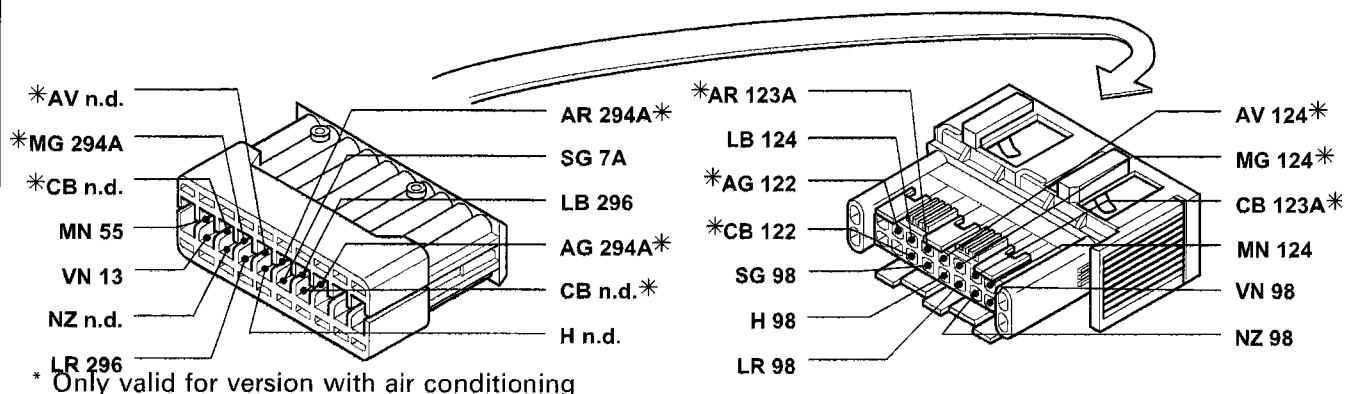
### 124 Air conditioning compressor relay (1910 TD)



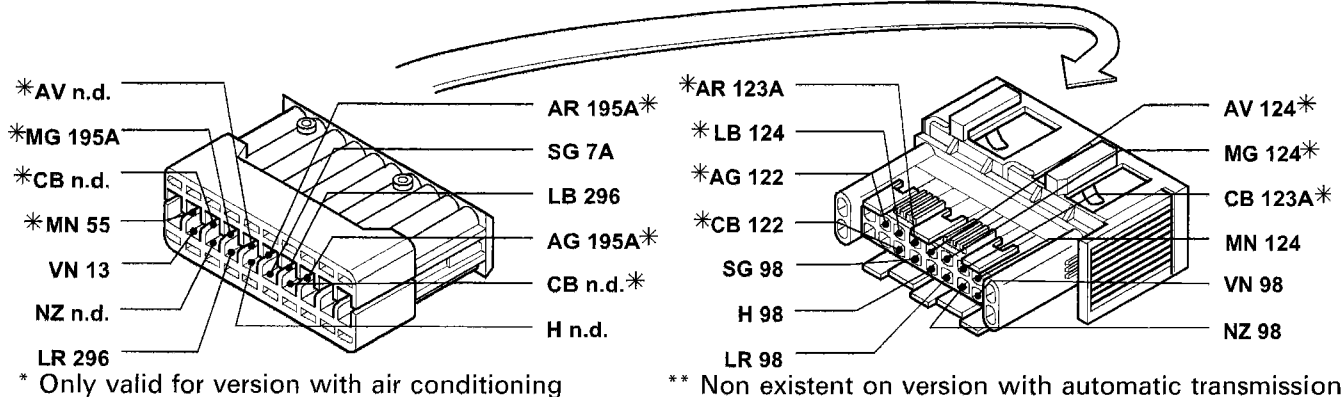
### 126 Front/air conditioning cables connection (1910 TD)



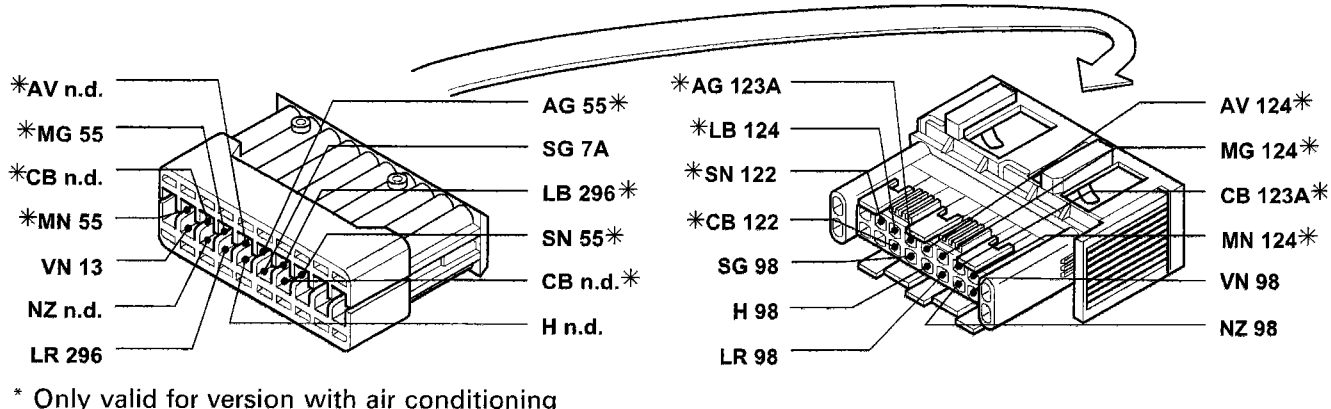
### 127 Connection between left front cable/cable on relay holder bracket (1242)



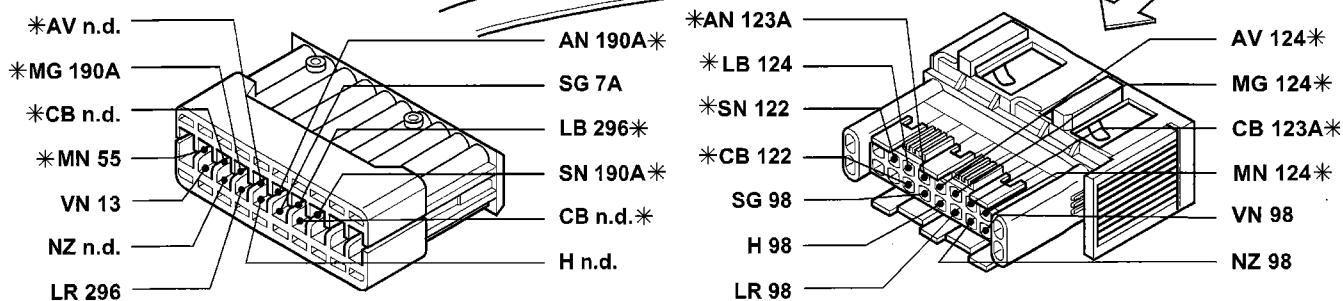
### 127 Connection between left front cable/cable on relay holder bracket (1581)



### 127 Connection between left front cable/cable on relay holder bracket (1747)

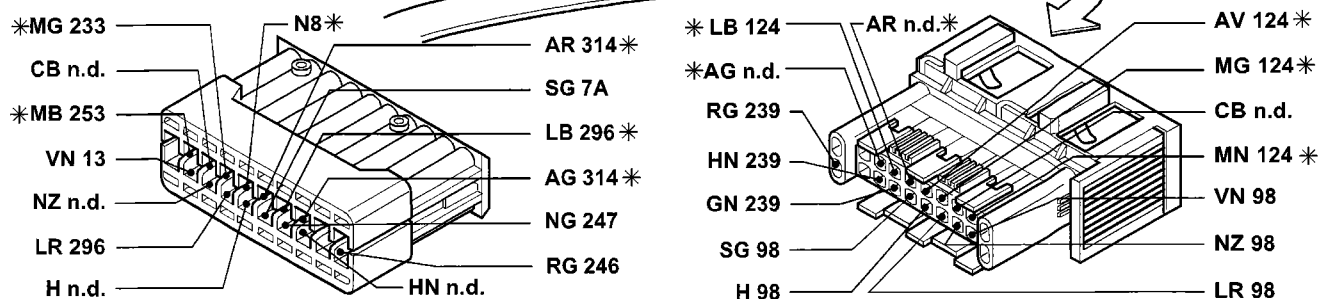


### 127 Connection between left front cable/cable on relay holder bracket (1998)



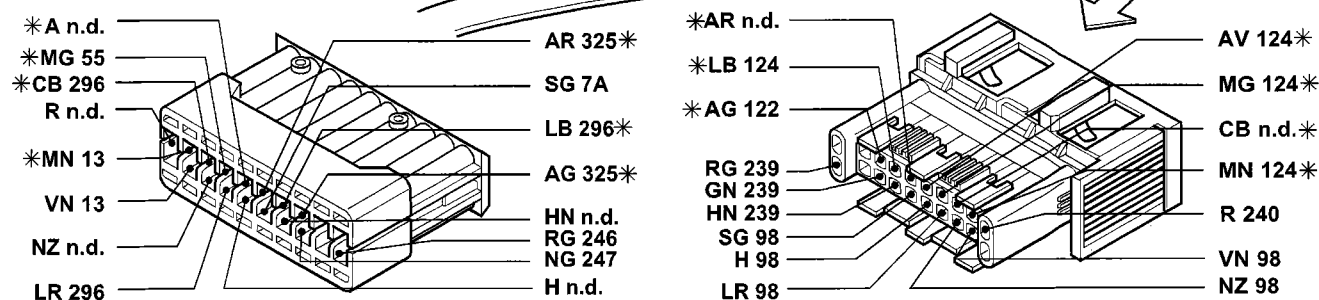
\* Only valid for version with air conditioning

### 127 Connection between left front cable/cable on relay holder bracket (1910 TD)



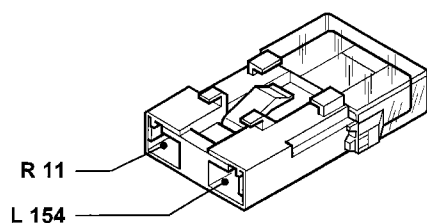
\* Only valid for version with air conditioning

### 127 Connection between left front cable/cable on relay holder bracket (1910 JTD)

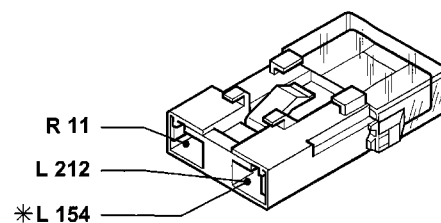


\* Only valid for version with air conditioning

### 129 Power fuse protecting engine cooling fan (1242, 1581, 1998)



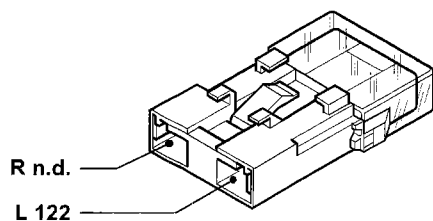
### 129 Power fuse protecting engine cooling fan (1747)



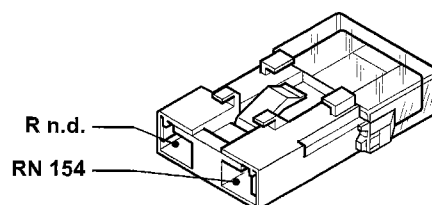
\* Variant on version with air conditioning

**55.**

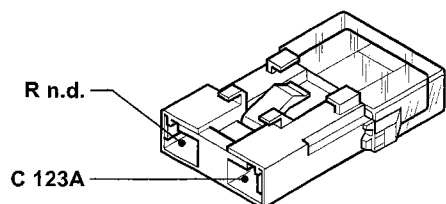
**129** Power fuse protecting engine cooling fan (1910 TD)



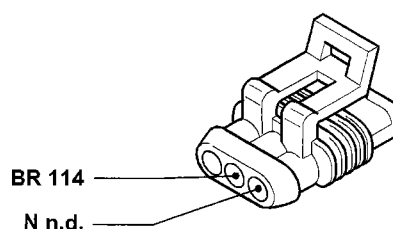
**129** Power fuse protecting engine cooling fan (1910 JTD without air conditioning)



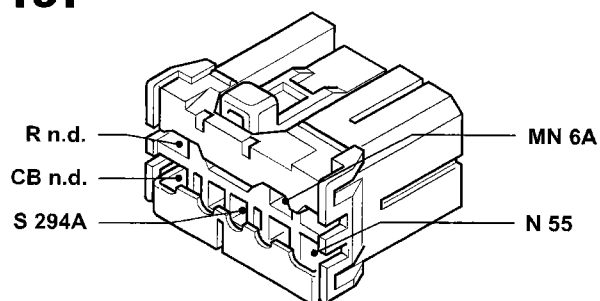
**129** Power fuse protecting engine cooling fan (1910 JTD with air conditioning)



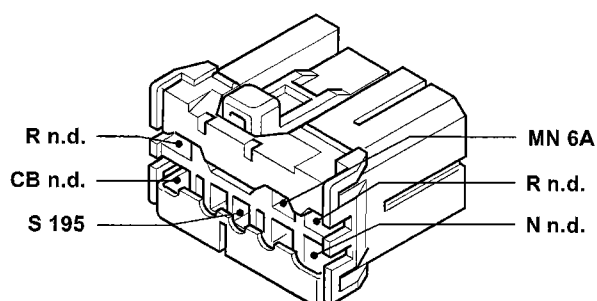
**130** Diagnostic socket for EURO-BAG



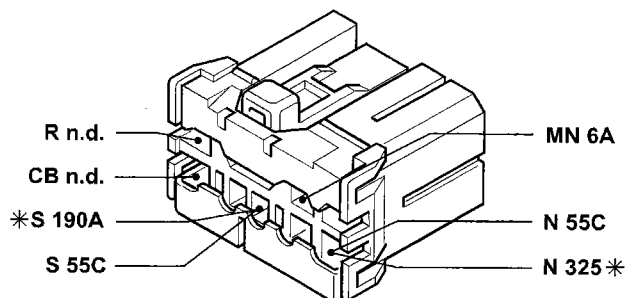
**131** Fiat-CODE electronic control unit



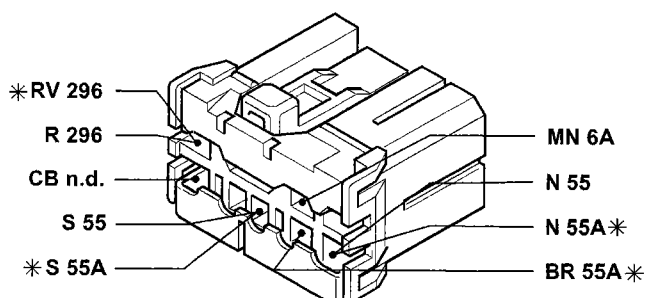
Only exists on the 1242 version



Only exists on the 1581 version



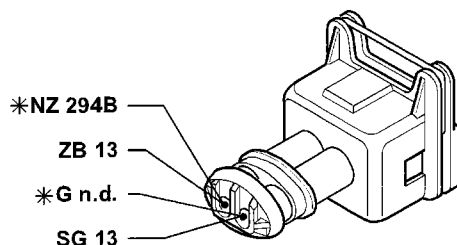
\* Variant on the 1998 version  
Only exists on the 1747 and 1998 versions



\* Variant for the 1910 JTD version  
Only exists on the 1910 TD and 1910 JTD versions

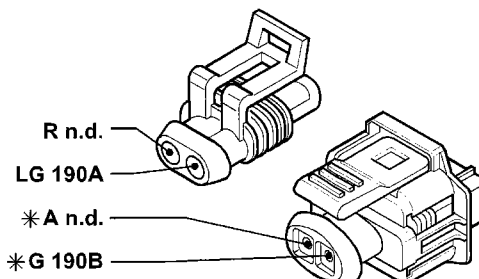
P4A354101

**132** Petrol vapour cut out solenoid valve (canister) (1242 and 1581)



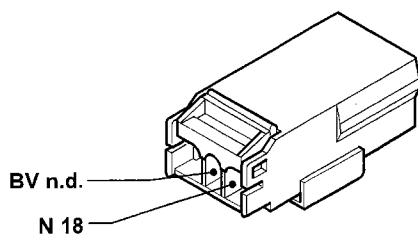
\* Only valid on the 1242 version

**132** Petrol vapour cut out solenoid valve (canister) (1747 and 1998)

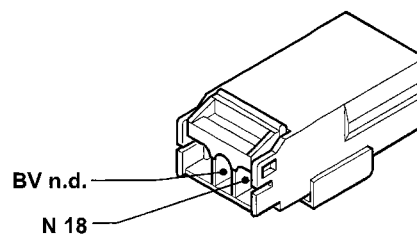


\* Only valid on the 1998 version

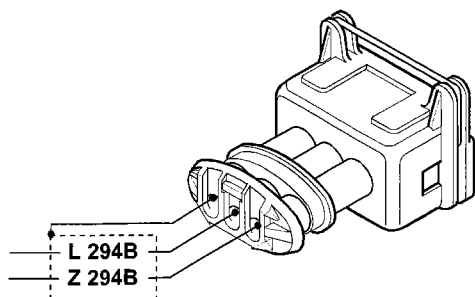
**134** Rear/heated driver's seat cables connection



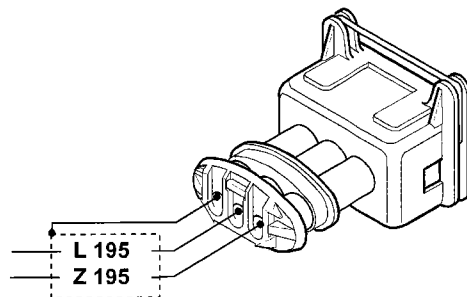
**135** Rear/heated passenger seat cables connection



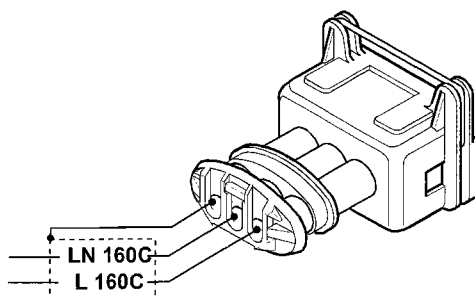
**136** Detonation sensor (1242)



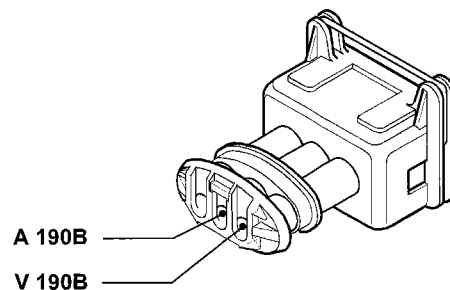
**136** Detonation sensor (1581)



**136** Detonation sensor (1747)



**136** Detonation sensor (1998)

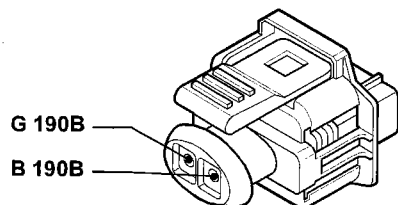


P4A355I01

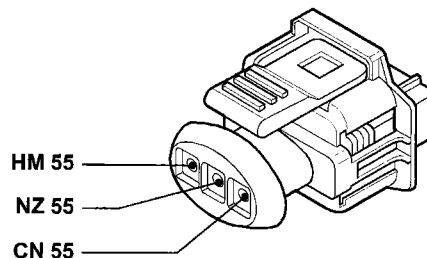


### 55.

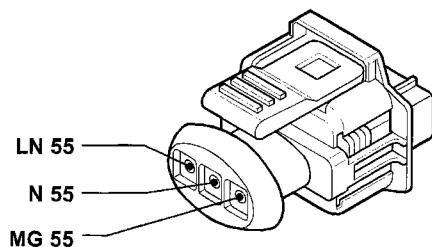
**136A** Detonation sensor (1998)



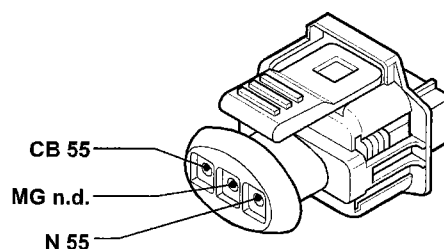
**137** Vehicle speed sensor (1242)



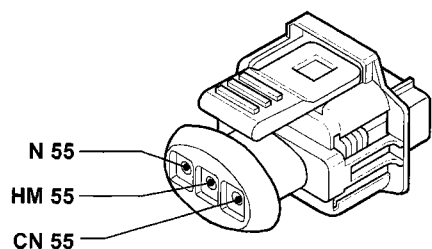
**137** Vehicle speed sensor (1581)



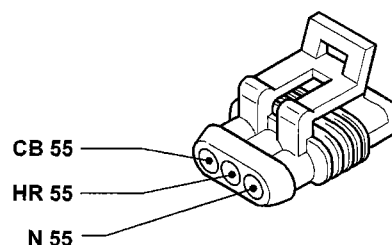
**137** Vehicle speed sensor (1747)



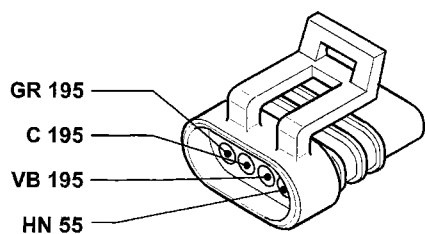
**137** Vehicle speed sensor (1998)



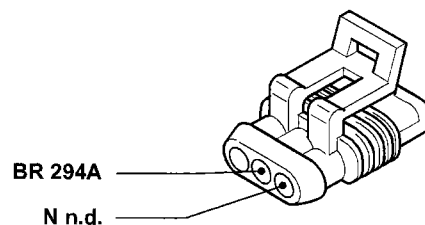
**137** Vehicle speed sensor (1910 TD)



**138** Idle adjustment actuator motor (1581)



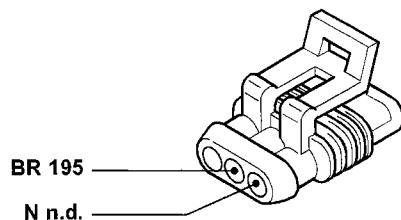
**139** Diagnostic socket for injection system (1242)



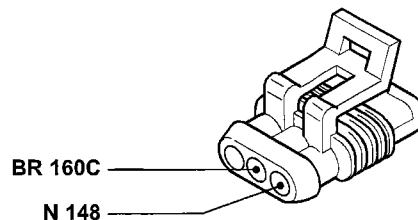
P4A356I01



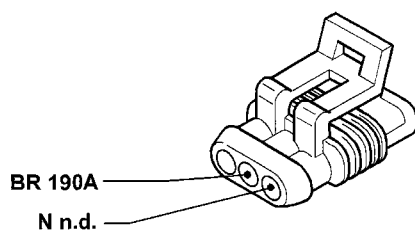
### 139 Diagnostic socket for injection system (1581)



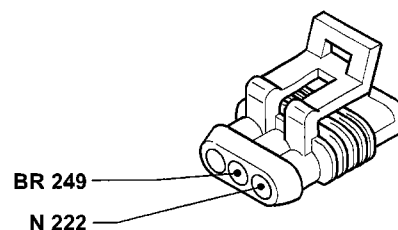
### 139 Diagnostic socket for injection system (1747)



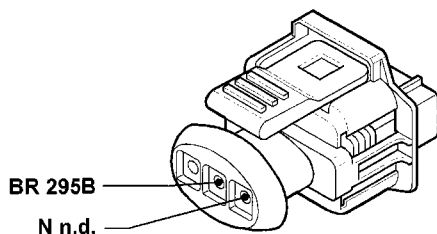
### 139 Diagnostic socket for injection system (1998)



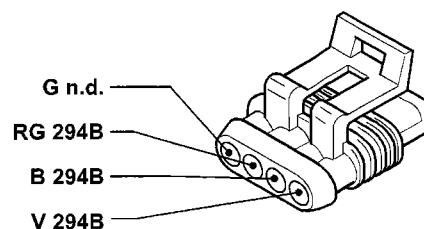
### 139 Diagnostic socket for injection system (1910 TD)



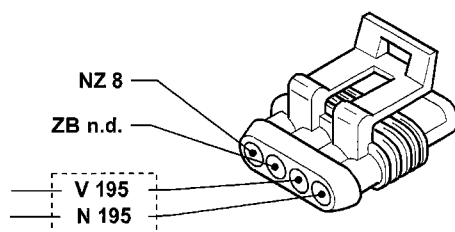
### 139 Diagnostic socket for injection system (1910 JTD)



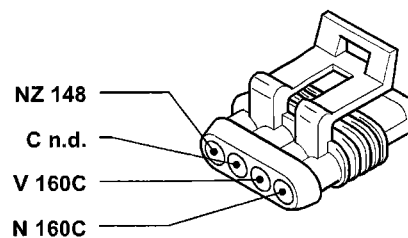
### 141 Heated Lambda sensor (1242)



### 141 Heated Lambda sensor (1581)

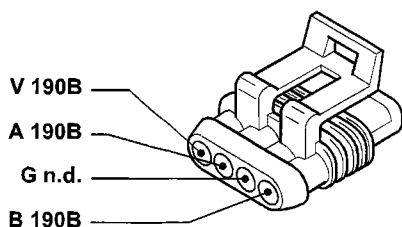


### 141 Heated Lambda sensor (1747)

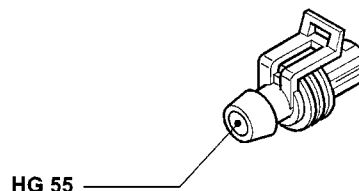


### 55.

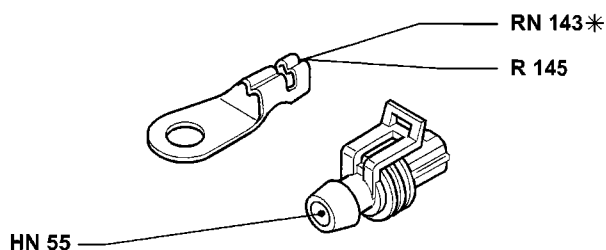
#### 141 Heated Lambda sensor (1998)



#### 142 Switch signalling insufficient engine oil pressure

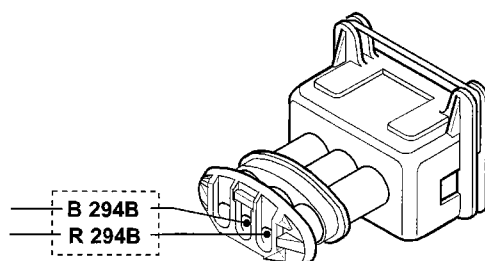


#### 143 Alternator

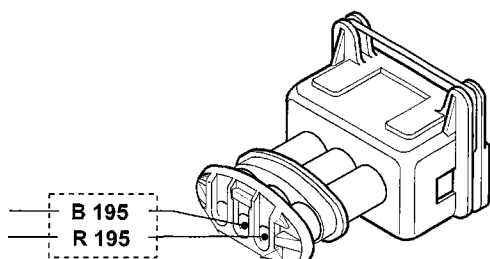


\* Only valid for the 1242 version

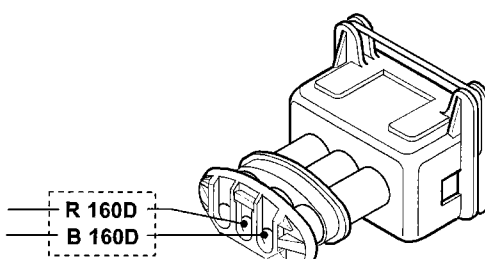
#### 144 Rpm and T.D.C. sensor (1242)



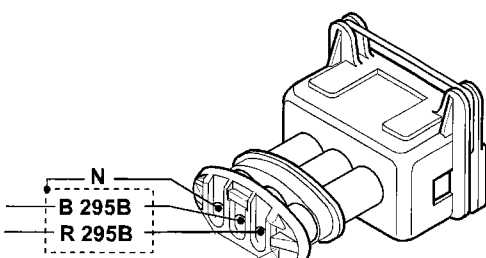
#### 144 Rpm and T.D.C. sensor (1581)



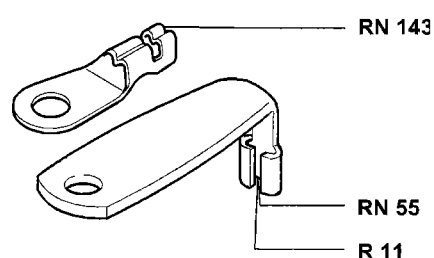
#### 144 Rpm and T.D.C. sensor (1747)



#### 144 Rpm and T.D.C. sensor (1910 JTD)

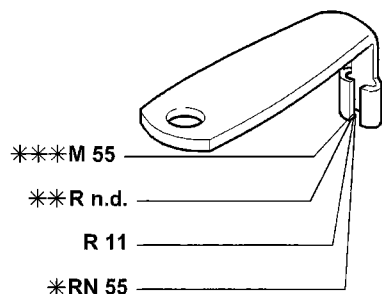


#### 145 Starter motor (1242)

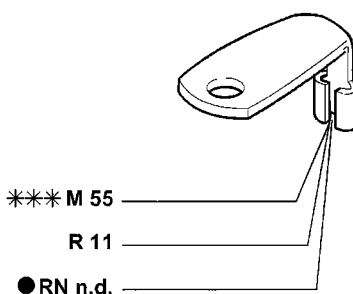


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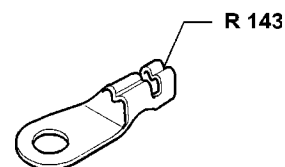
### 145 Starter motor



Petrol versions



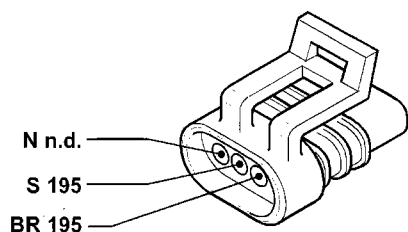
Diesel versions



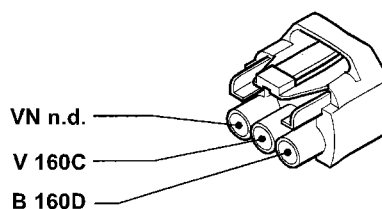
\* Only valid for the 1998 version and automatic transmission  
\*\* Only valid for the 1747 version

\*\*\* Only valid for 1581 and JTD versions  
● Only exists on the 1910 TD version

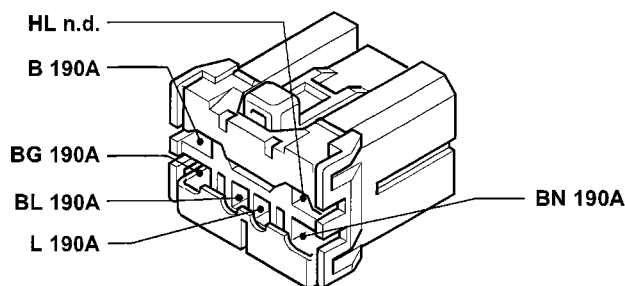
### 146 Potentiometer on butterfly valve (1581)



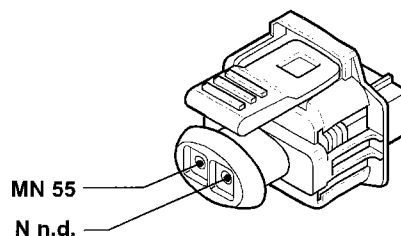
### 146 Potentiometer on butterfly valve (1747)



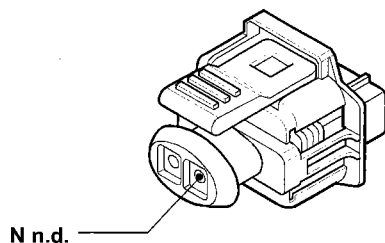
### 146 Potentiometer on butterfly valve (1998)



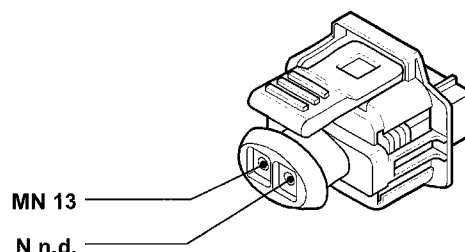
### 147 Compressor for air conditioning



Only exists on the 1242, 1581, 1910TD and 1998 versions



Only exists on the 1747 version

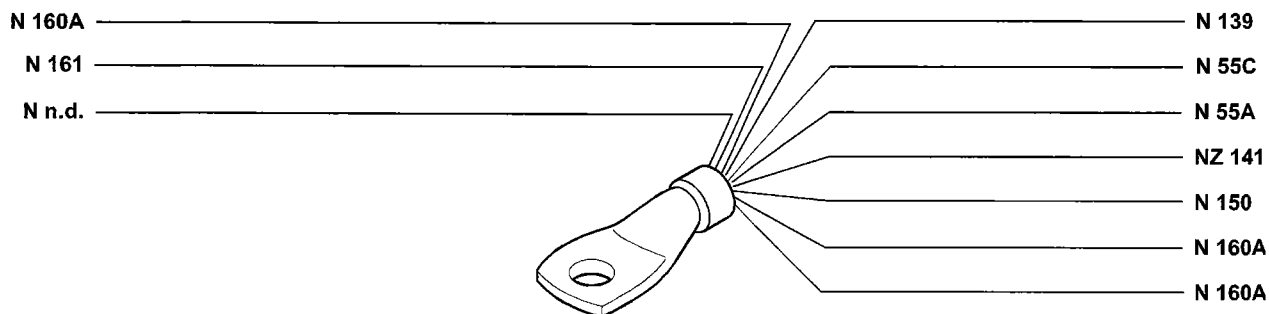


Only exists on the JTD version

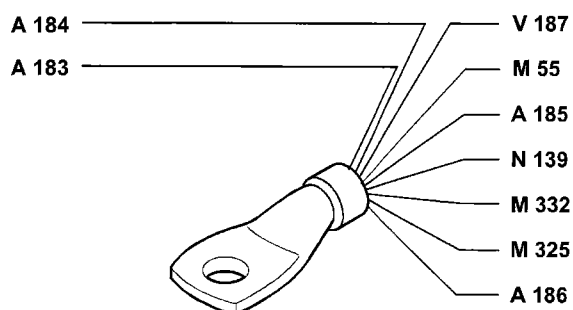
P4A359I01

# 55.

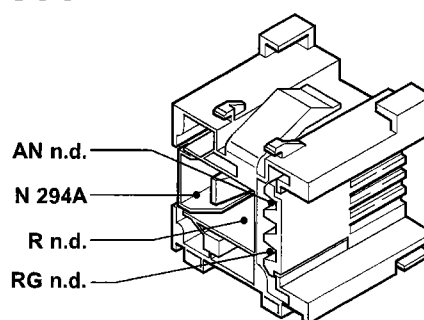
### 148 Earth for electronic injection (1747)



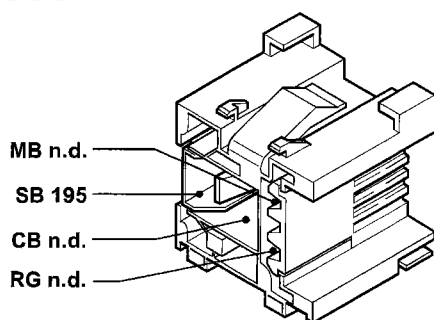
### 148 Earth for electronic injection (1998)



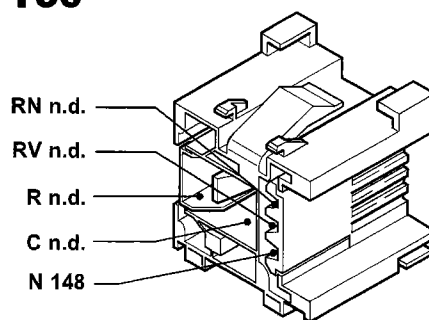
### 150 Injection system relay feed (1242)



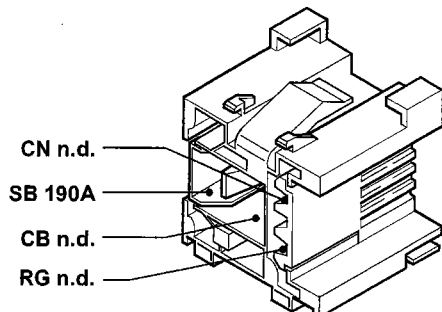
### 150 Injection system relay feed (1581)



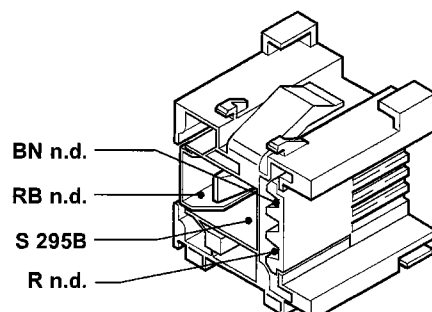
### 150 Injection system relay feed (1747)



### 150 Injection system relay feed (1998)

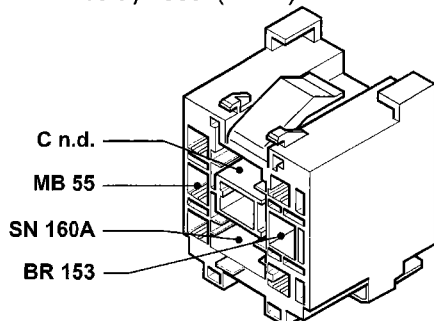


### 150 Injection system relay feed (1910 JTD)

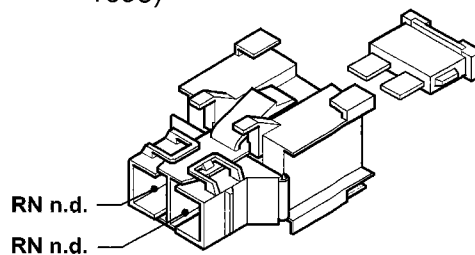


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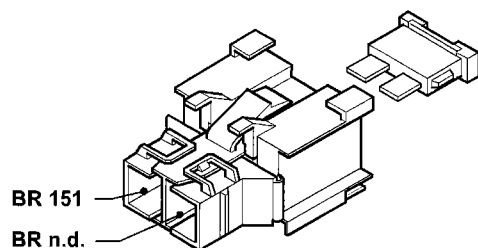
**151** Lambda sensor, electric fuel pump, injector relay feed (1747)



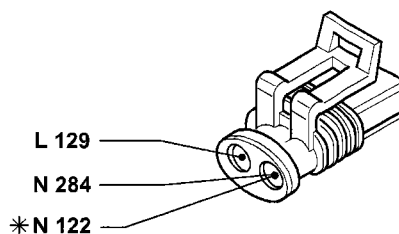
**152** 10A protective fuse for injection system (25A for 1581, 30A for 1747, 7.5A for 1998)



**153** 10A protective fuse for electric fuel pump, Lambda sensor (15A for 1747)

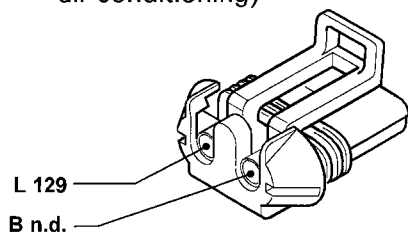


**154** Engine cooling fan (1242 and 1581 without air conditioning)

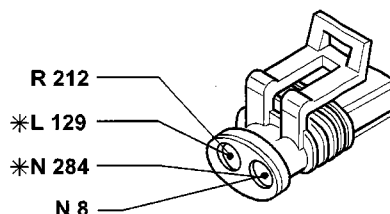


\* Only valid for the 1242 version

**154** Engine cooling fan (1242 and 1581 with air conditioning)

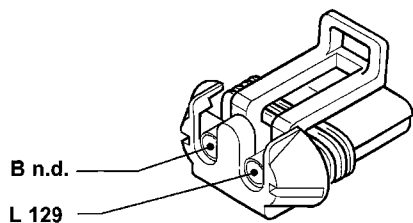


**154** Engine cooling fan (1747 and 1998 without air conditioning)

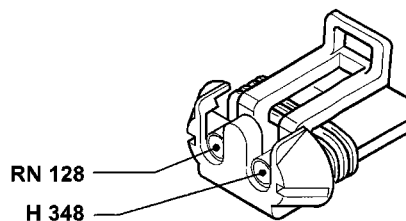


\* Only valid for the 1998 version

**154** Engine cooling fan (1747 and 1998 with air conditioning)



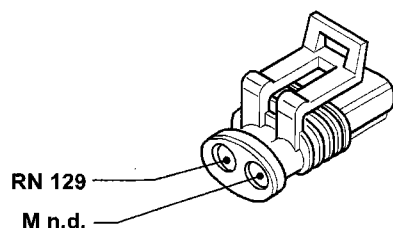
**154** Engine cooling fan (1910 TD)



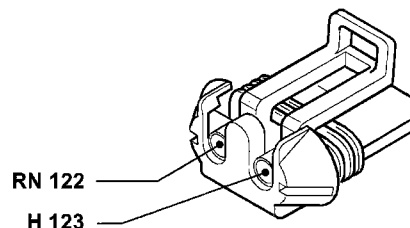
P4A361101

### 55.

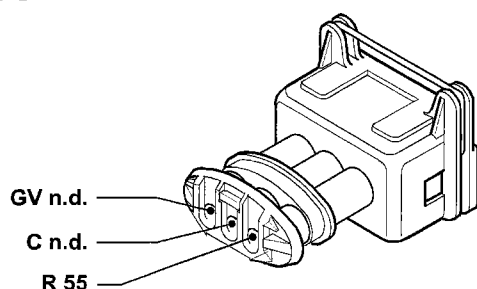
**154** Engine cooling fan (1910 JTD without air conditioning)



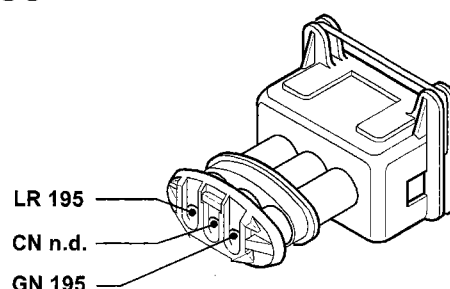
**154** Engine cooling fan (1910 JTD with air conditioning)



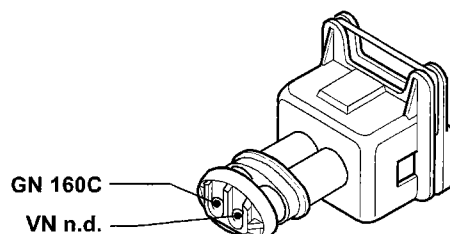
**155** Ignition coils (1242)



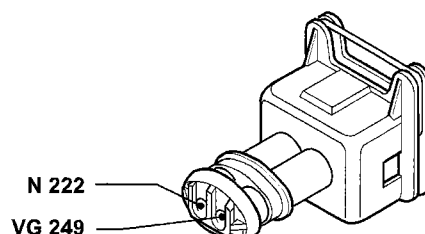
**155** Ignition coils (1581)



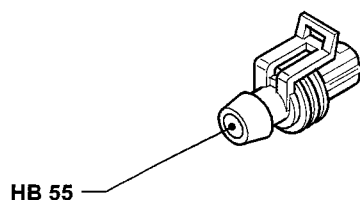
**157** Water temperature sensor for injection system (1747)



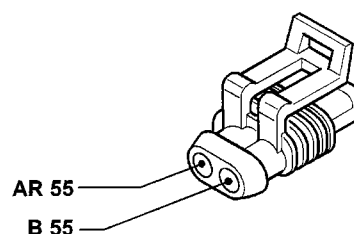
**157** Water temperature sensor for injection system (1910 TD)



**158** Water temperature sensor for instrument (1747 and 1910 TD)

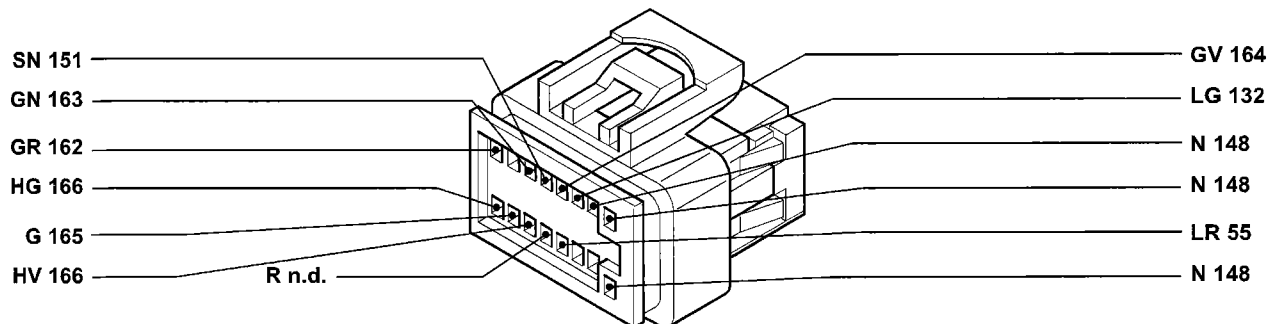


**159** Reversing lights control switch (1242)

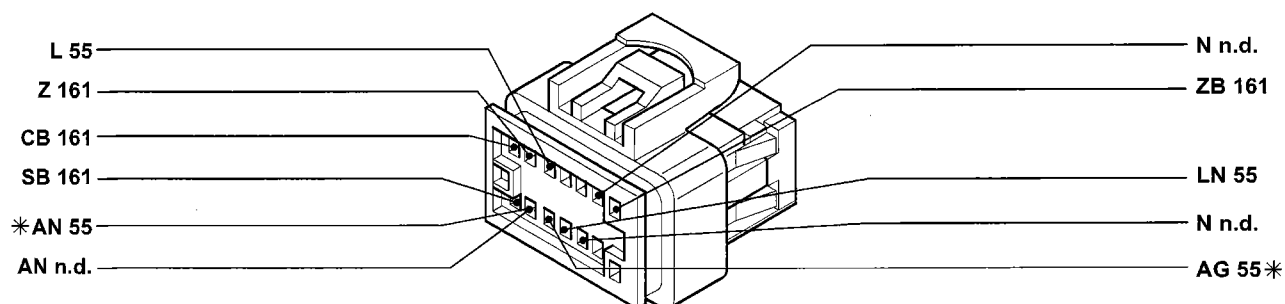


P4A362I01

**160A** Injection/ignition electronic control unit (1747)

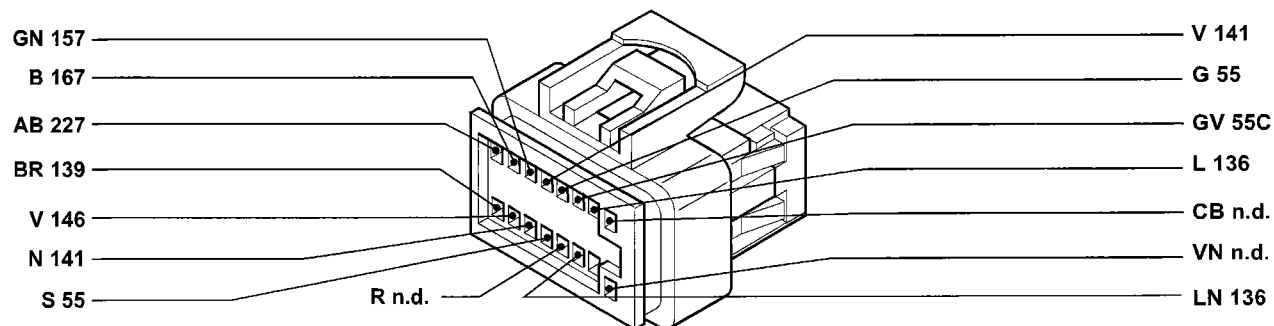


**160B** Injection/ignition electronic control unit (1747)

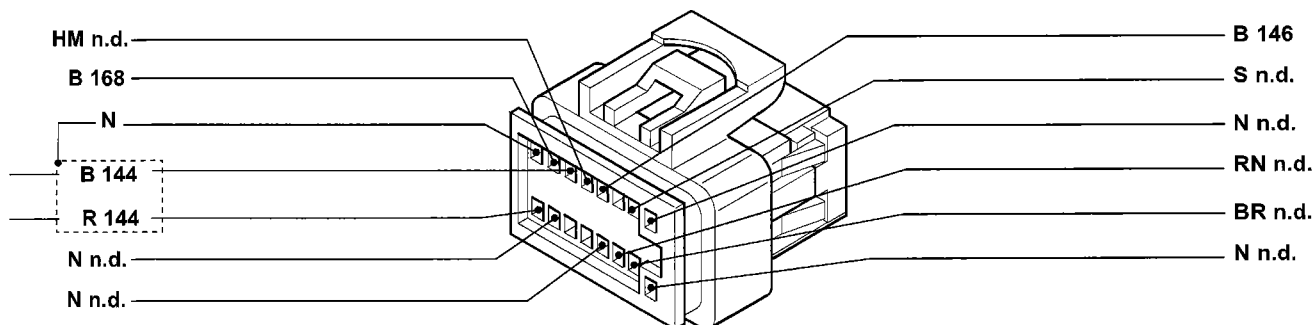


\* Only valid for version with air conditioning

**160C** Injection/ignition electronic control unit (1747)



**160D** Injection/ignition electronic control unit (1747)

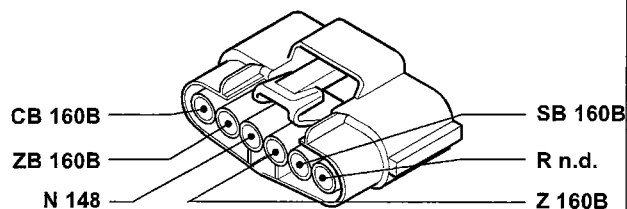


P4A363101

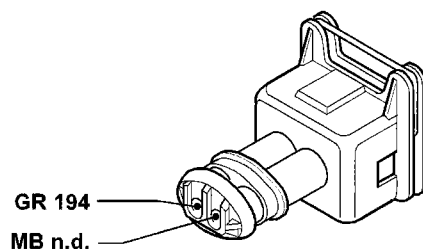


### 55.

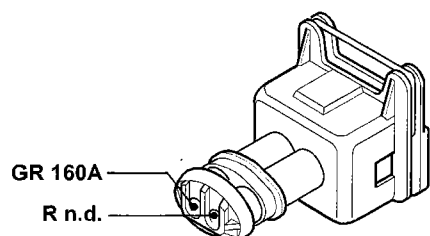
#### 161 Ignition power module (1747)



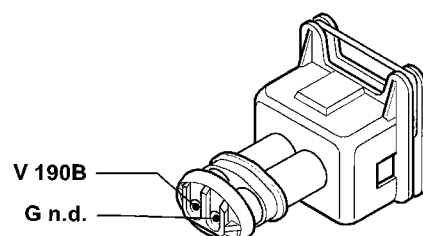
#### 162 Injector (1°) (1581)



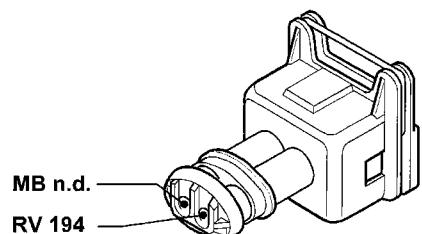
#### 162 Injector (1°) (1747)



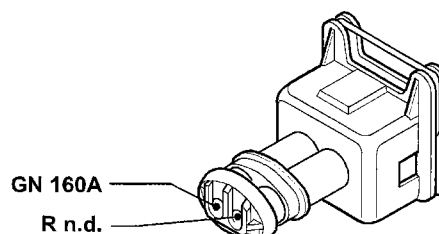
#### 162 Injector (1°) (1998)



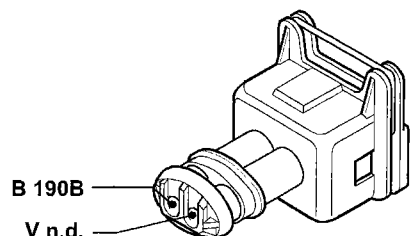
#### 163 Injector (2°) (1242-1581)



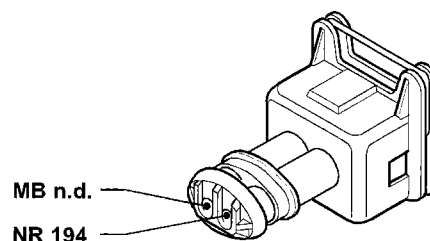
#### 163 Injector (2°) (1747)



#### 163 Injector (2°) (1998)

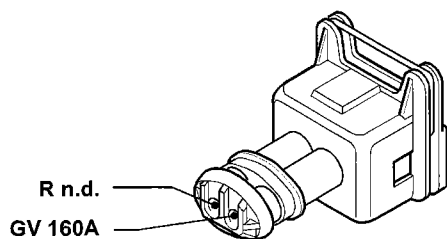


#### 164 Injector (3°) (1242-1581)

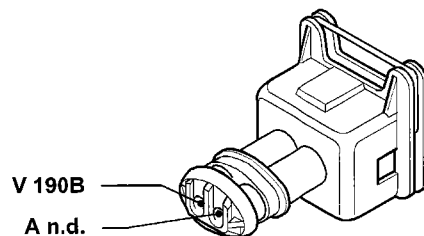


P4A364I01

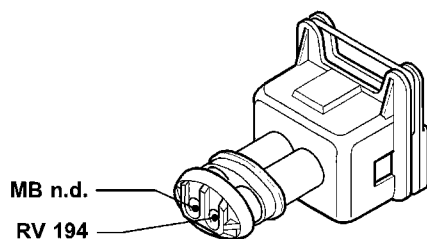
**164** Injector (3°) (1747)



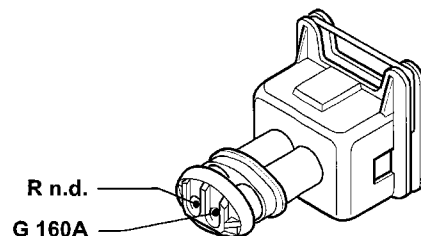
**164** Injector (3°) (1998)



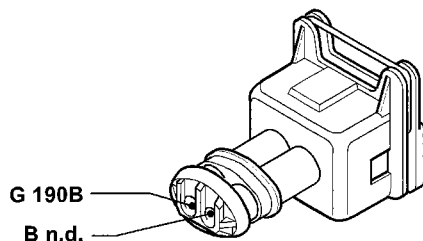
**165** Injector (4°) (1242-1581)



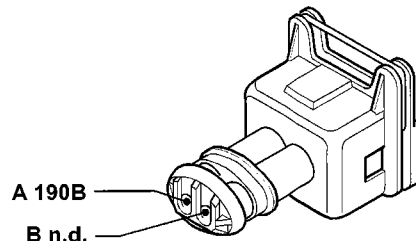
**165** Injector (4°) (1747)



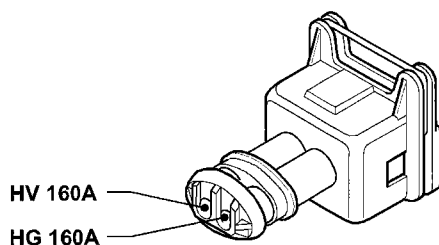
**165** Injector (4°) (1998)



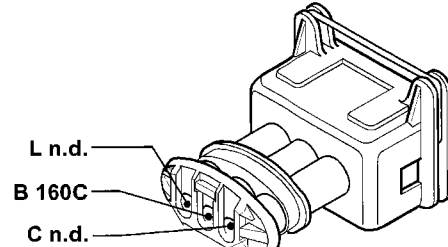
**165A** Injector (5°) (1998)



**166** Idle adjustment actuator (1747)



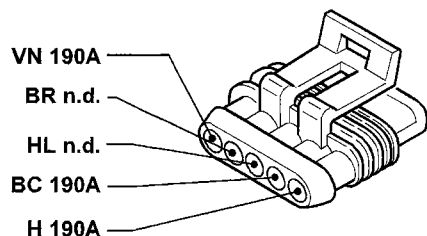
**167** Air flow meter (1747)



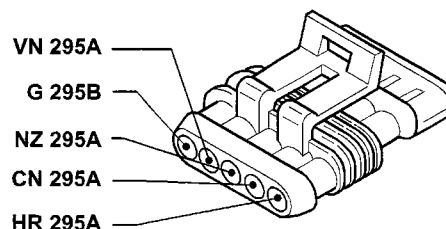
P4A365101

# 55.

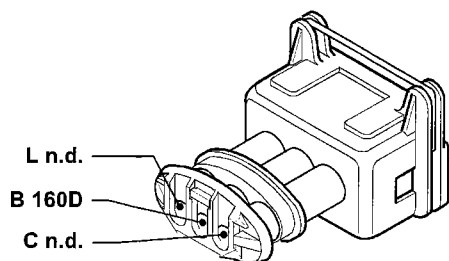
### 167 Air flow meter (1998)



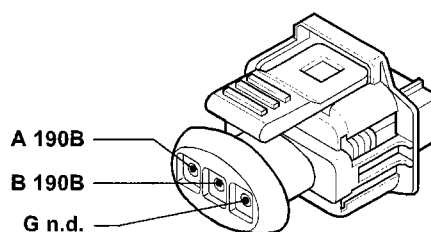
### 167 Air flow meter (1910 JTD)



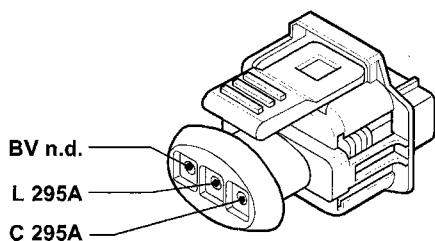
### 168 Timing sensor (1747)



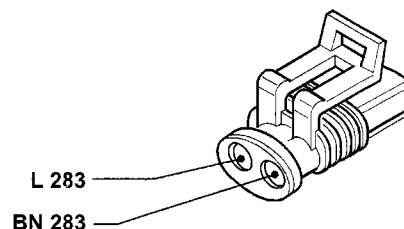
### 168 Timing sensor (1998)



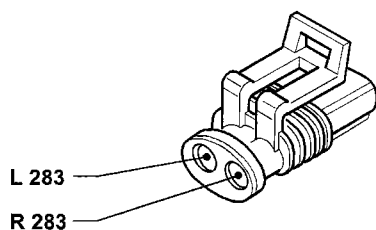
### 168 Timing sensor (1910 JTD)



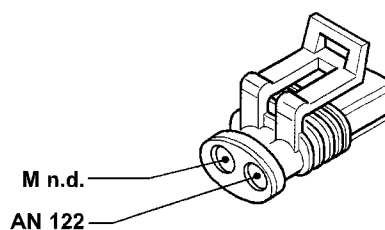
### 170 Engine cooling fan limiting resistance (1242 and 1581 with air conditioning)



### 170 Engine cooling fan limiting resistance (1747 and 1998 with air conditioning)

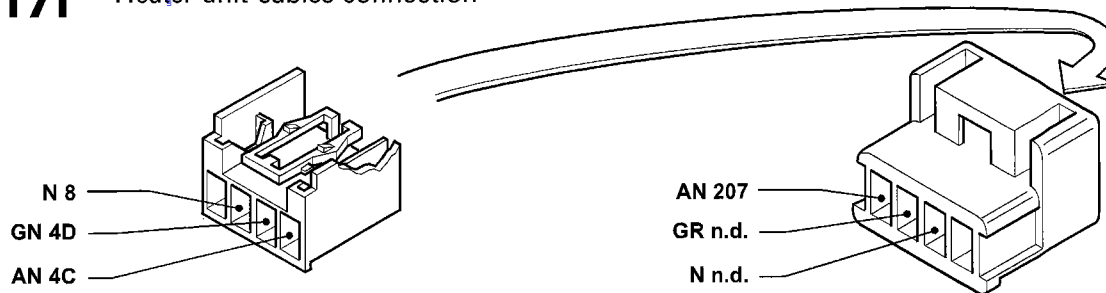


### 170 Engine cooling fan limiting resistance (1910 JTD with air conditioning)

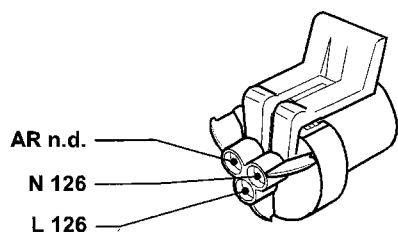


P4A366I01

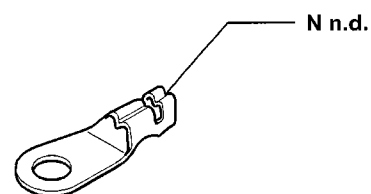
### 171 Heater unit cables connection



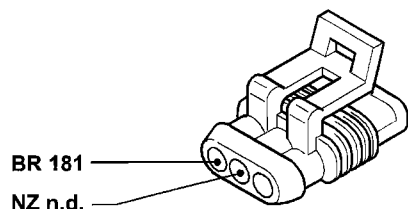
### 172 Two level thermal switch (1910 TD)



### 174 Power earth for anti-lock brakes (A.B.S.)

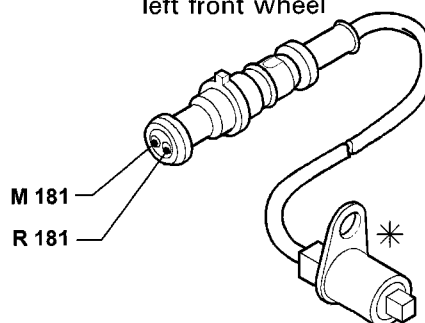


### 176 Diagnostic socket for anti-lock braking system (A.B.S.)



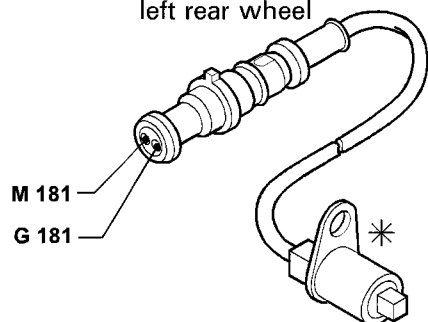
### 177(\*) Sensor on left front wheel (A.B.S.)

#### 177A Connection for A.B.S. sensor cable on left front wheel



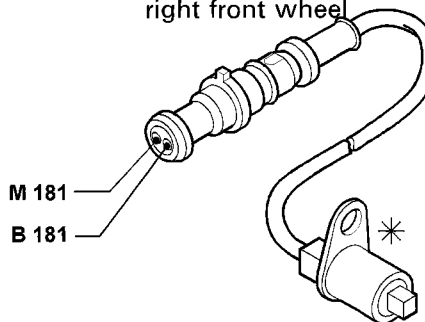
### 178(\*) Sensor on left rear wheel (A.B.S.)

#### 178A Connection for A.B.S. sensor cable on left rear wheel



### 179(\*) Sensor on right front wheel (A.B.S.)

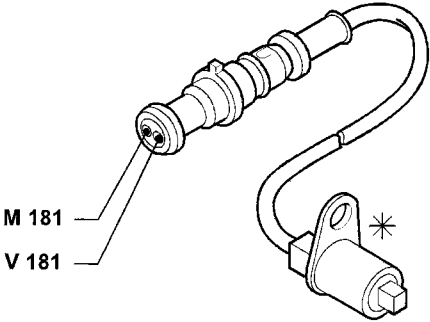
#### 179A Connection for A.B.S. sensor cable on right front wheel



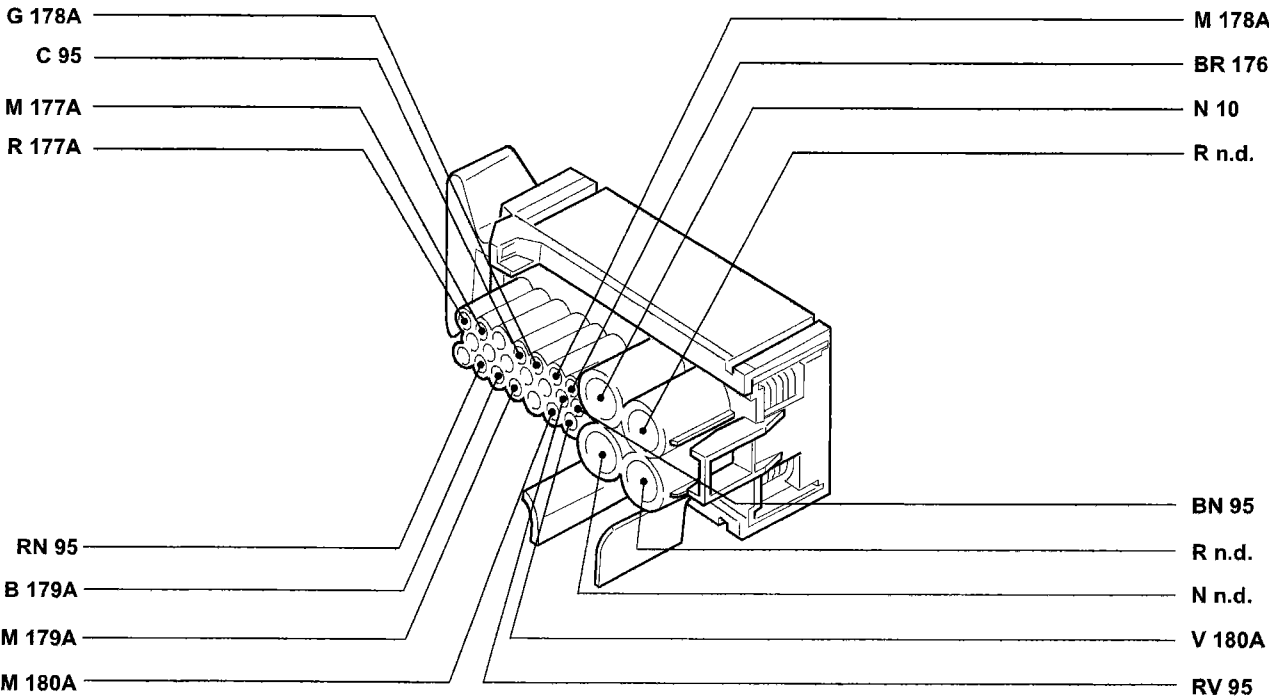
P4A367I01

**180(\*)** Sensor on right rear wheel (A.B.S.)

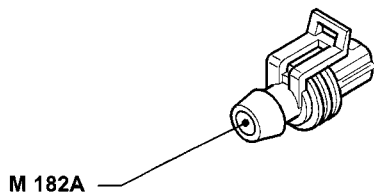
**180A** Connection for A.B.S. sensor cable on right rear wheel



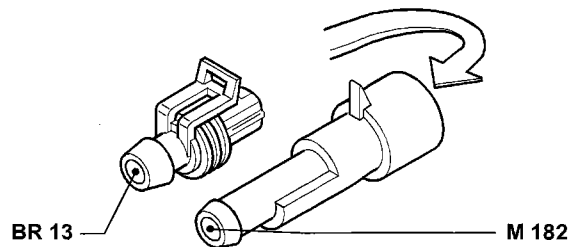
**181** Electro-hydraulic control unit for anti-lock brakes (A.B.S.)



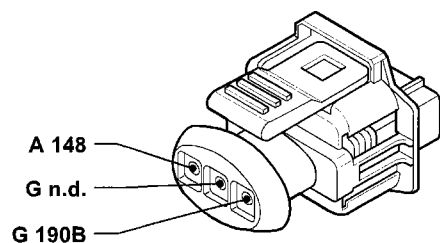
### 182 Right brake pad wear sensor (1998)



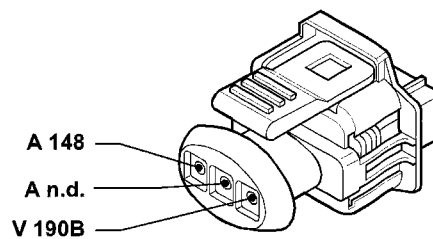
### 182A Right brake pad wear sensor cables connection (1998)



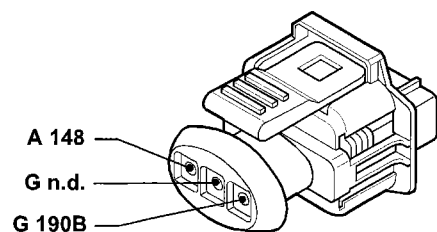
### 183 Ignition coil (1°) (1998)



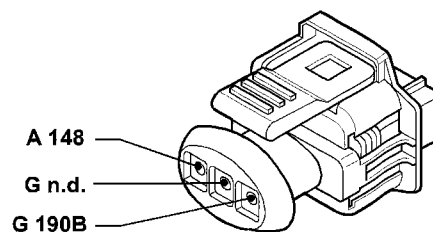
### 184 Ignition coil (2°) (1998)



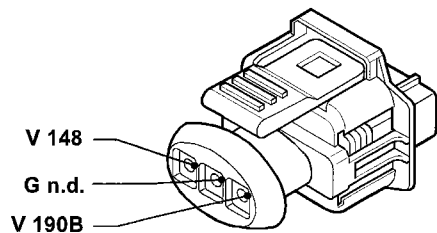
### 185 Ignition coil (3°) (1998)



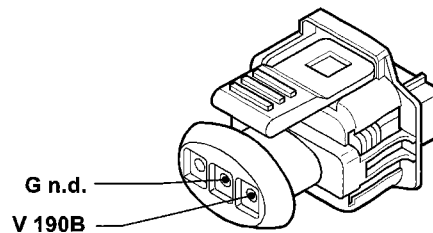
### 186 Ignition coil (4°) (1998)



### 187 Ignition coil (5°) (1998)

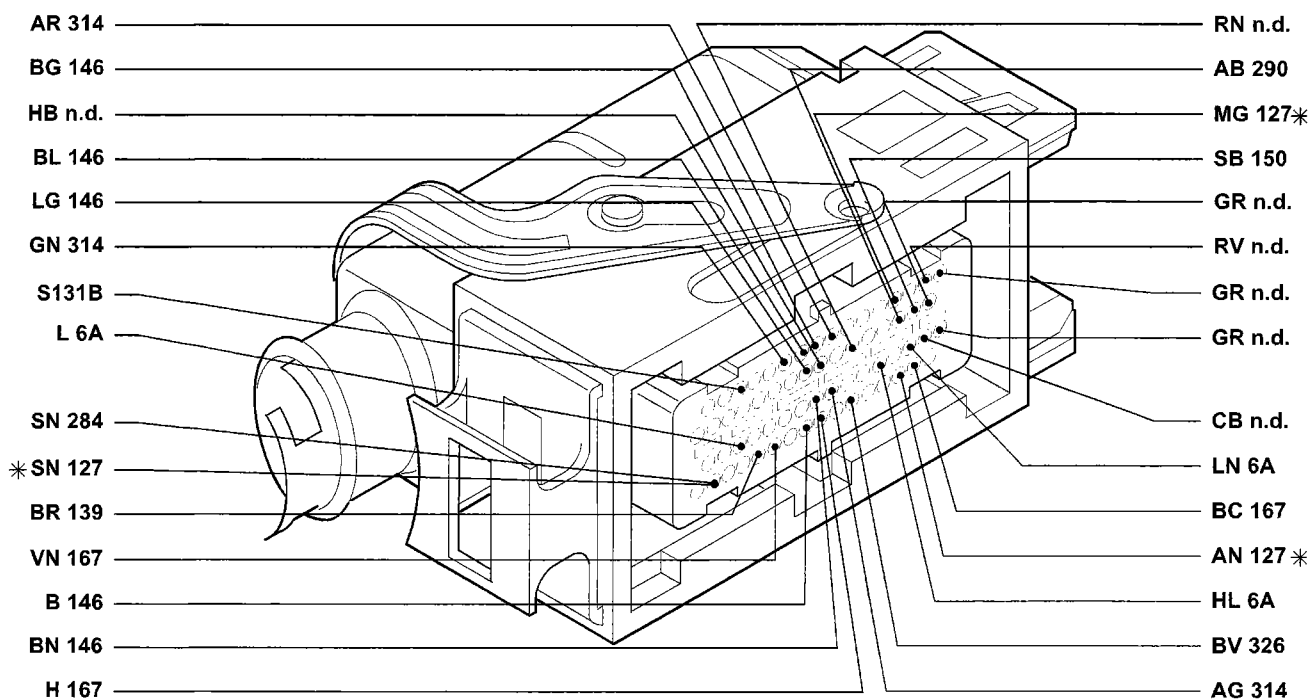


### 189 Phase transformer (1998)



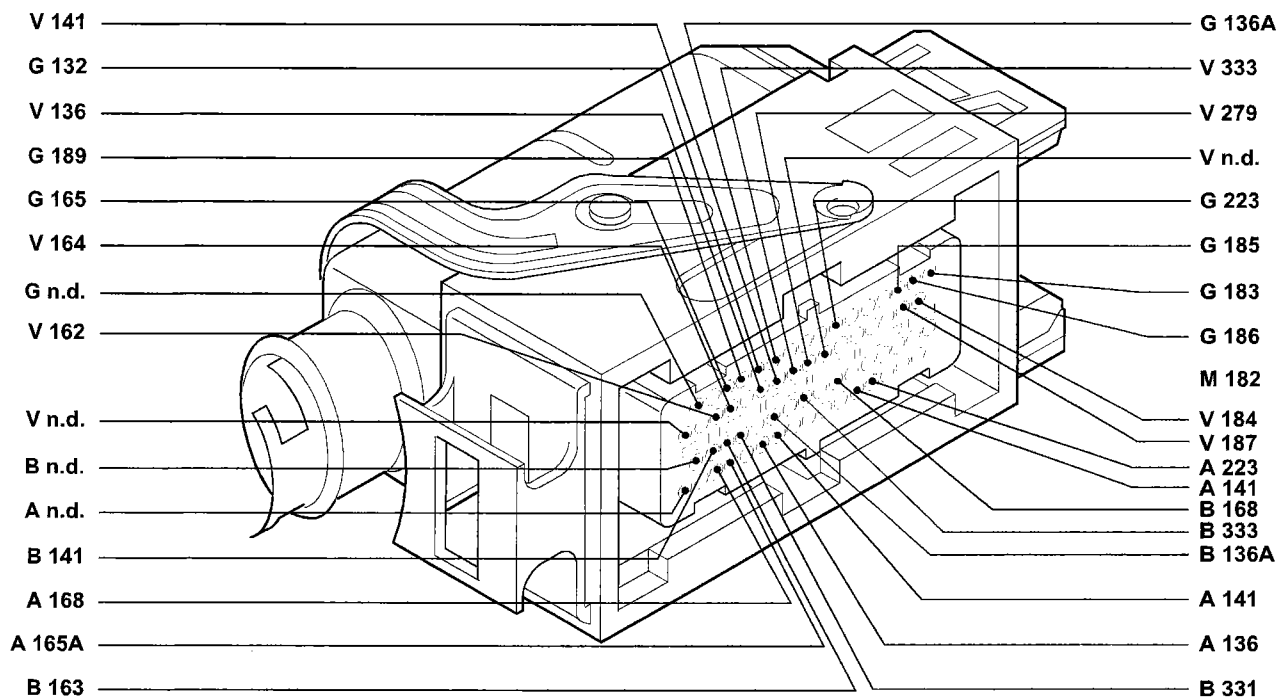
# 55.

### 190A Injection/ignition electronic control unit (1998)



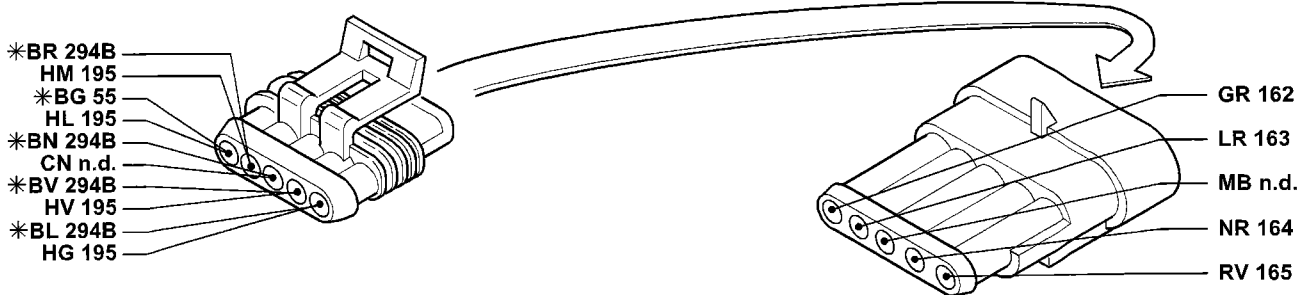
\* Variant for version with air conditioning

### 190B Injection/ignition electronic control unit (1998)



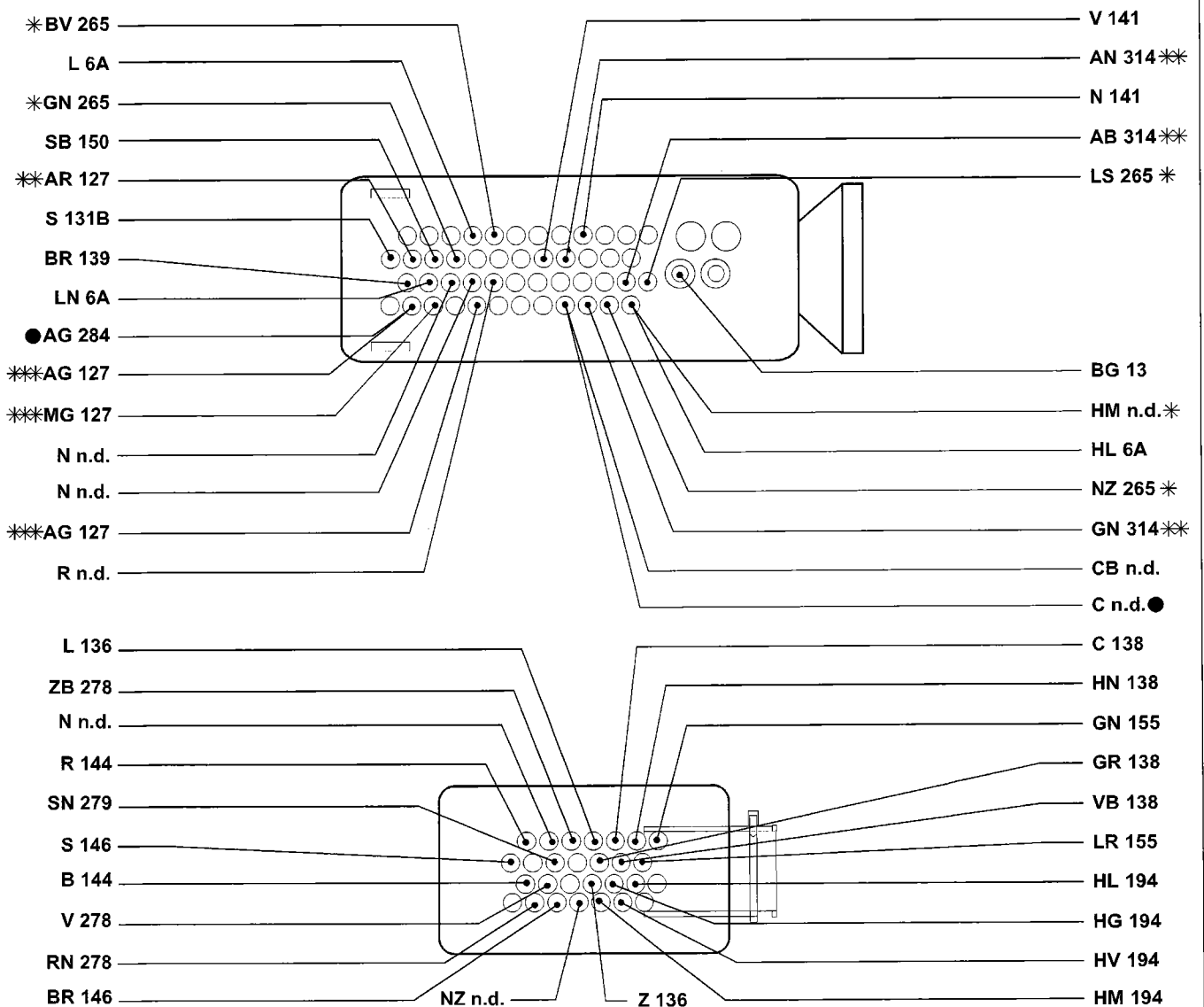


### 194 Injection cables/injector band connection (1242-1581)



\* Variant for the 1242 version

### 195 Injection/ignition electronic control unit (1581)



\* Only valid for version with automatic transmission

\*\* Only valid for version with air conditioning

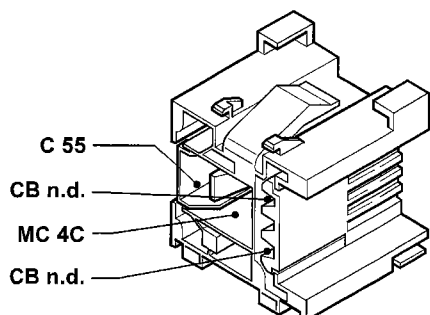
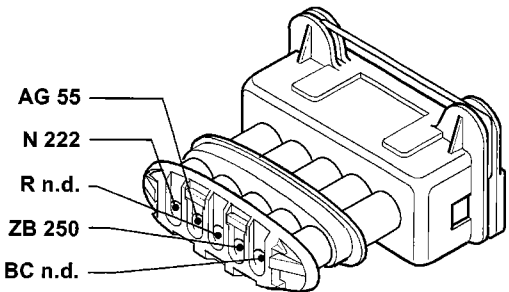
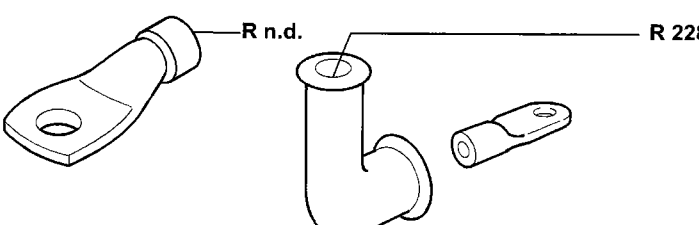
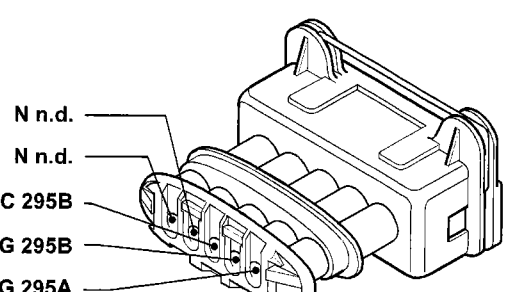
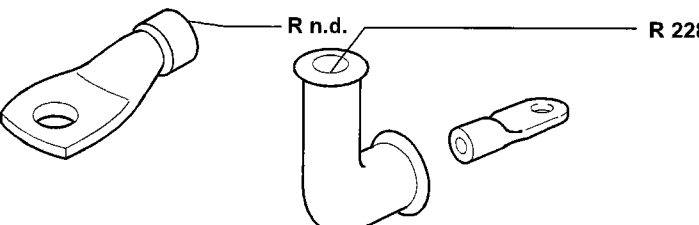
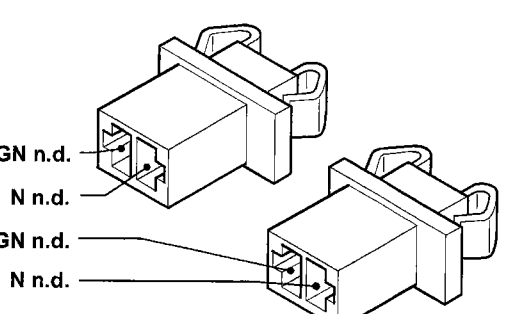
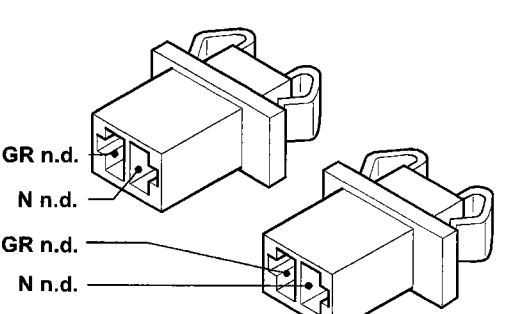
\*\*\* Non existent for versions with automatic transmission

● Only exists on version without air conditioning

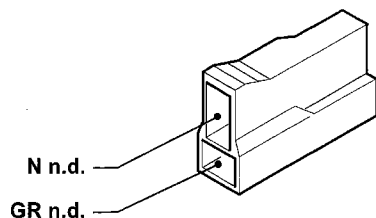
P4A371101

4A3711

### 55.

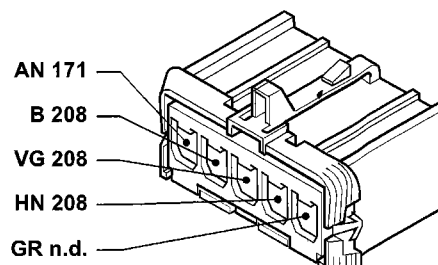
|                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>200</b> Inertia switch relay feed (1910 TD)</p>  <p>C 55<br/>CB n.d.<br/>MC 4C<br/>CB n.d.</p>                                                      |                                                                                                                                                                                                                                                |
| <p><b>201</b> Heater plugs control unit (1910 TD)</p>  <p>AG 55<br/>N 222<br/>R n.d.<br/>ZB 250<br/>BC n.d.</p>                                          |  <p>R n.d.<br/>R 228</p>                                                                                                                                    |
| <p><b>201</b> Heater plugs control unit (1910 JTD)</p>  <p>N n.d.<br/>N n.d.<br/>C 295B<br/>MG 295B<br/>G 295A</p>                                      |  <p>R n.d.<br/>R 228</p>                                                                                                                                   |
| <p><b>202</b> Heater/air conditioning lights</p>  <p>GN n.d.<br/>N n.d.<br/>GN n.d.<br/>N n.d.</p> <p>Only exists on versions with air conditioning</p> | <p><b>202</b> Heater/air conditioning lights</p>  <p>GR n.d.<br/>N n.d.<br/>GR n.d.<br/>N n.d.</p> <p>Only exists on versions without air conditioning</p> |

**206** Heater/air conditioning fan



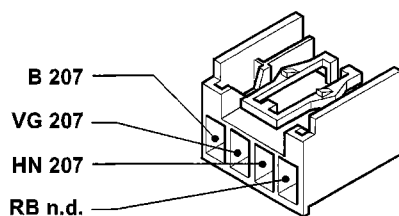
Only exists on the version without air conditioning

**207** Heating/air conditioning system speed control switch



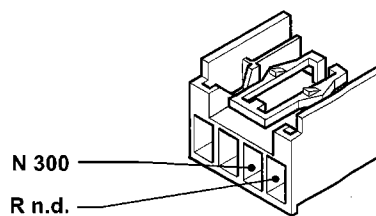
Only exists on the version without air conditioning

**208** Heating/air conditioning system limiter resistance



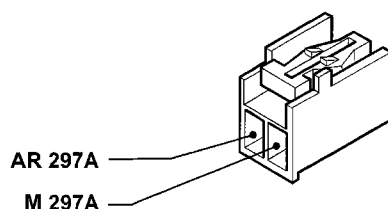
Only exists on the version without air conditioning

**208** Heating/air conditioning system limiter resistance



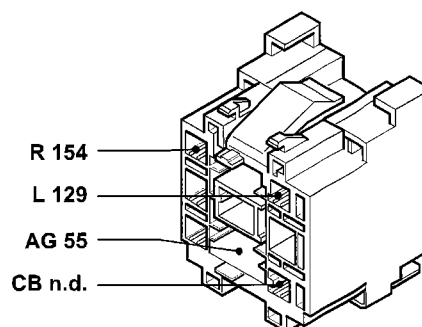
Only exists on the version with air conditioning

**209** Outside/recirculation air flap control actuator



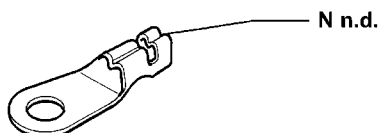
Only exists on the version with air conditioning

**212** Engine cooling fan relay feed

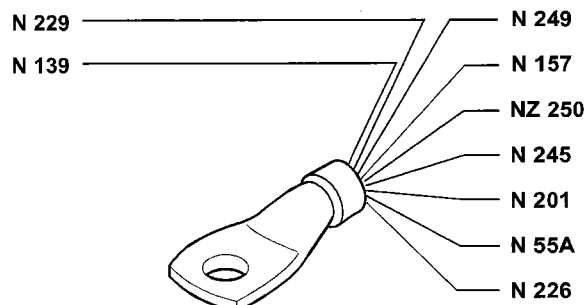


Only exists on the 1747 version without air conditioning

**213** Earth for EURO-BAG

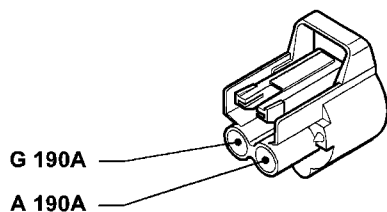


**222** Earth for fuel system (1910 TD)

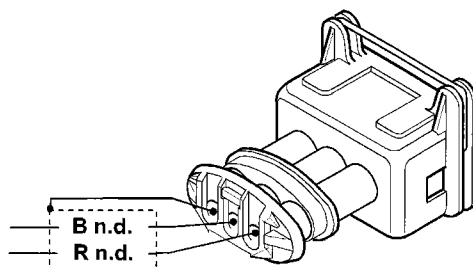


**55.**

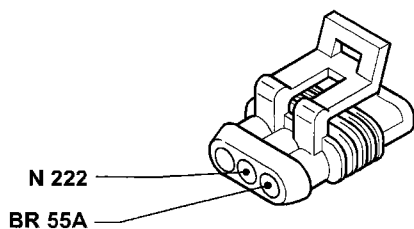
**223** Rpm sensor (1998)



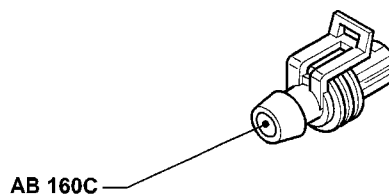
**223** Rpm sensor (1910 TD)



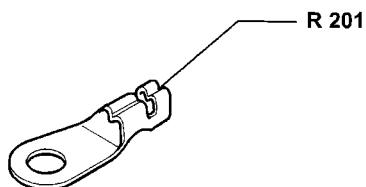
**226** Diagnostic socket for Fiat code system (1910 TD)



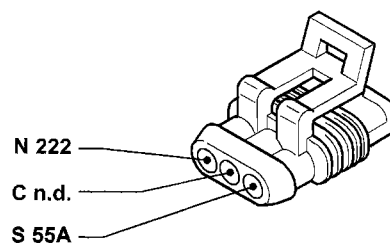
**227** Diagnostic socket for injection system (1747)



**228** eater plugs (1910 TD-1910 JTD)



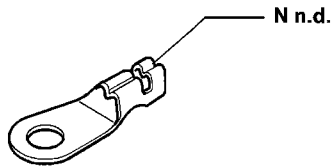
**229** Engine cut out electro-stop (1910 TD-1910 JTD)



**231** Clock spring connection

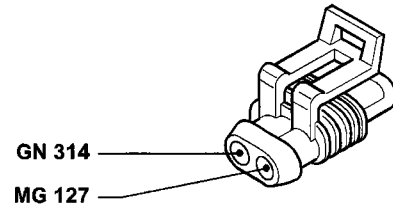


### 232 Compressor earth (1910JTD)



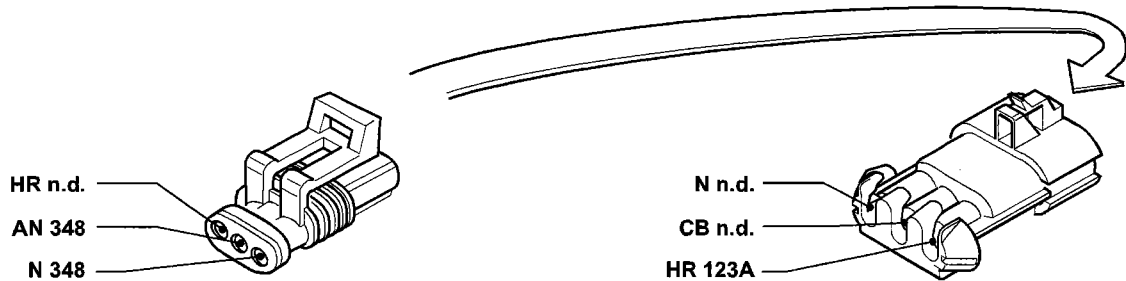
P4A375I01

### 233 Thermal relay on engine coolant pump (1910 TD)



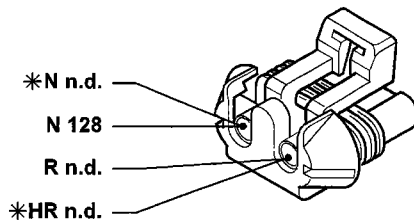
P4A375I02

### 236 Connection between front leads/air conditioner (1910 TD)



P4A375I03

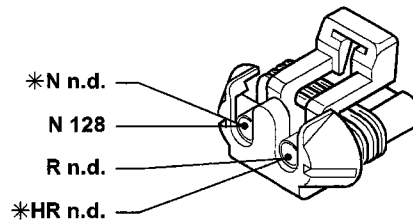
### 237 Supplementary engine cooling fan (1910 TD-1910 JTD)



\* Variant for JTD version with air conditioner

P4A375I04

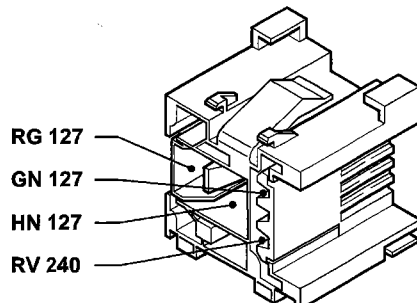
### 238 40A fuse protecting engine cooling fan (1910 TD-1910 JTD)



\* Only applies to JTD version with air conditioner

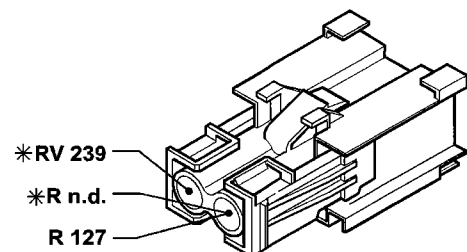
P4A375I05

### 239 Heated diesel filter relay



P4A375I06

### 240 15A fuse protecting heated diesel filter relay

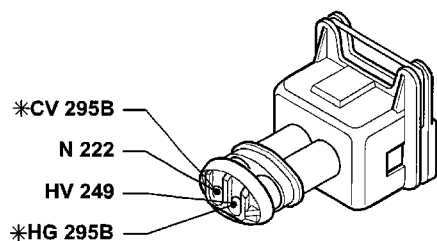


\* Variant for JTD version

P4A375I07

### 55.

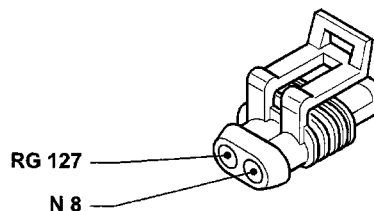
#### 245 E.G.R. solenoid (1910 TD-1910 JTD)



\* Variant only in JTD version

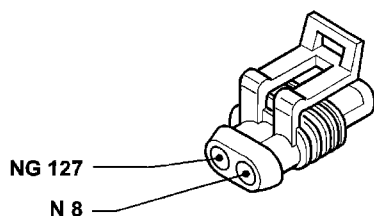
P4A376I01

#### 246 Heated fuel filter (1747-1910 JTD)



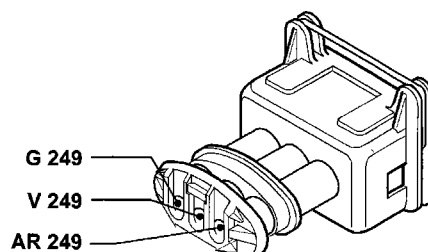
P4A376I02

#### 247 Heated fuel filter thermal contact (1747-1910 JTD)



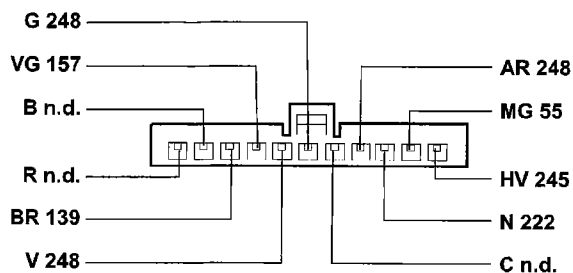
P4A376I03

#### 248 Potentiometer on fuel pump (1910 TD)



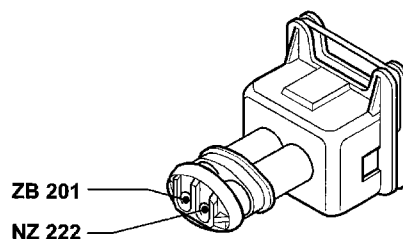
P4A376I04

#### 249 E.G.R. electronic control unit (1910 TD)



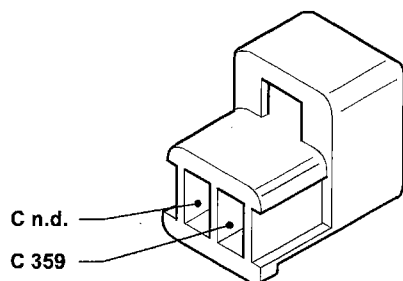
P4A376I05

#### 250 Preheating control unit coolant temperature sensor (1910 TD)



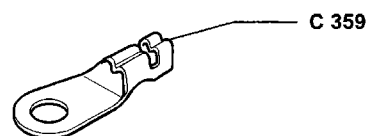
P4A376I06

#### 251 Thermal switch for KSB (1910 TD)



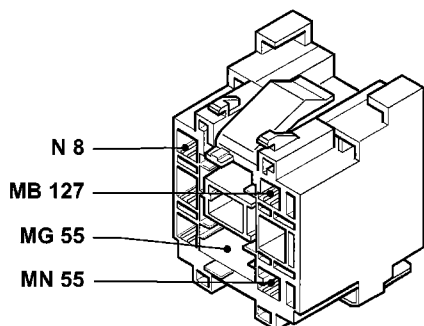
P4A376I07

#### 252 Earth for KSB device (1910 TD)

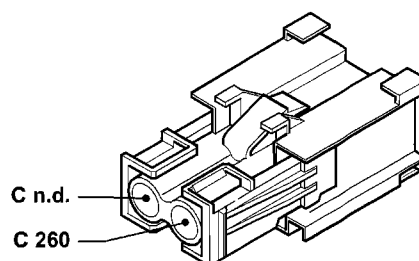


P4A376I08

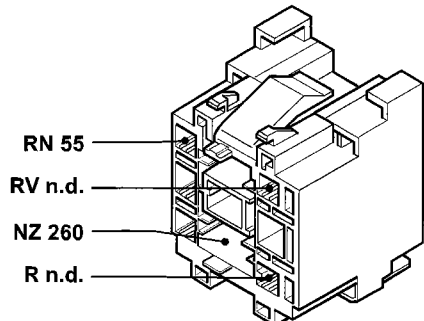
### 253 Relay for disengaging compressor (1910 TD)



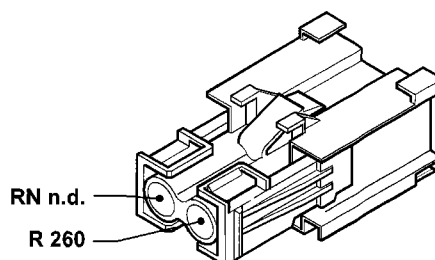
### 254 10A fuse protecting automatic transmission (1581)



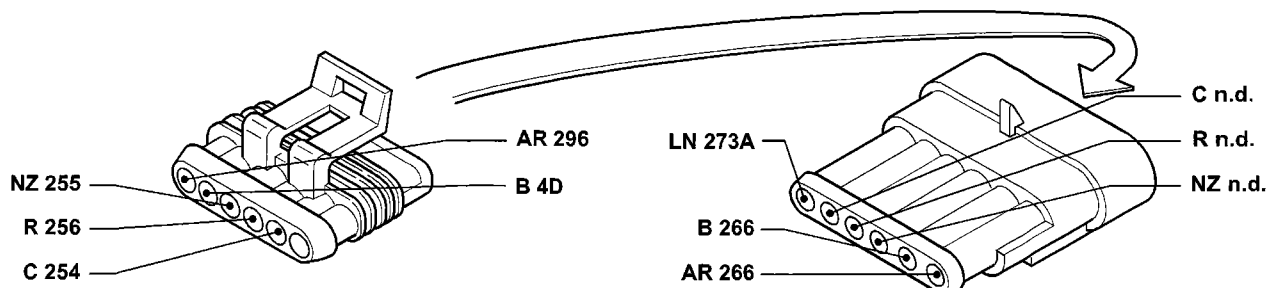
### 255 Starter go ahead relay for automatic transmission (1581)



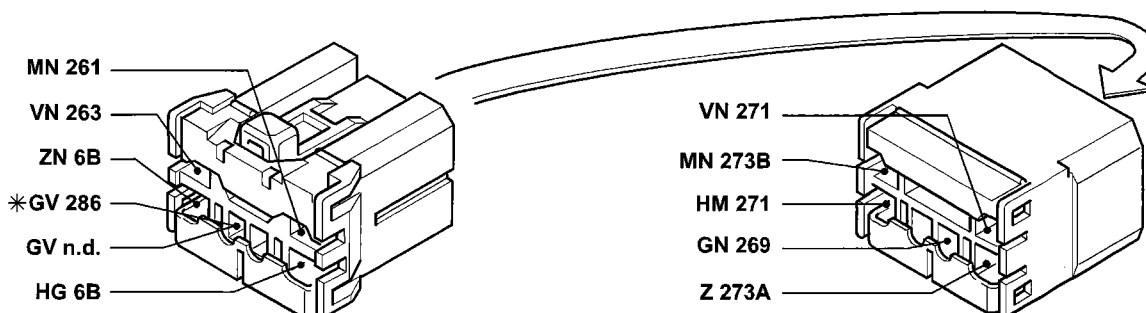
### 256 5A fuse protecting automatic transmission (1581)



### 260 Connection between front/automatic transmission cables (1581)



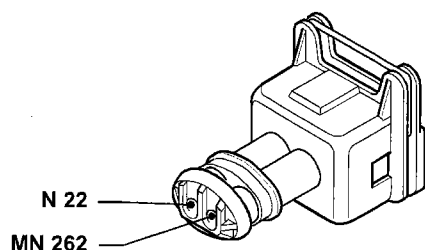
### 262 Connection between dashboard/automatic transmission cables (1581)



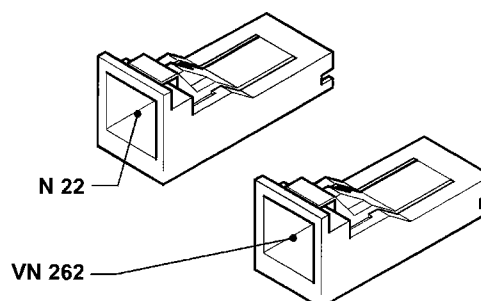


# 55.

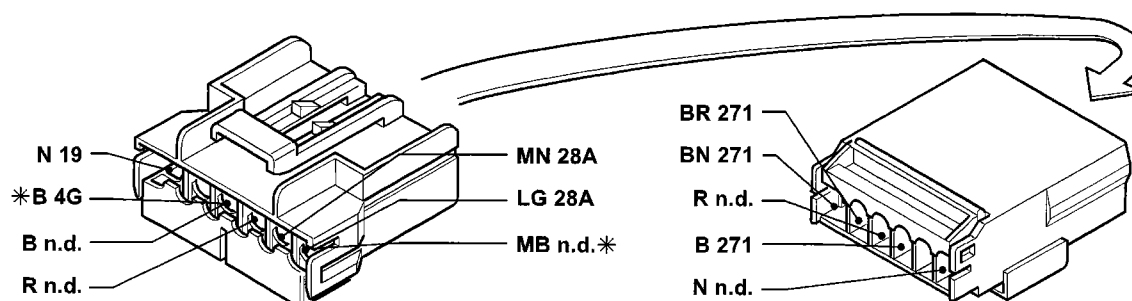
### 261 Kick-Down switch (1581 auto. trans.)



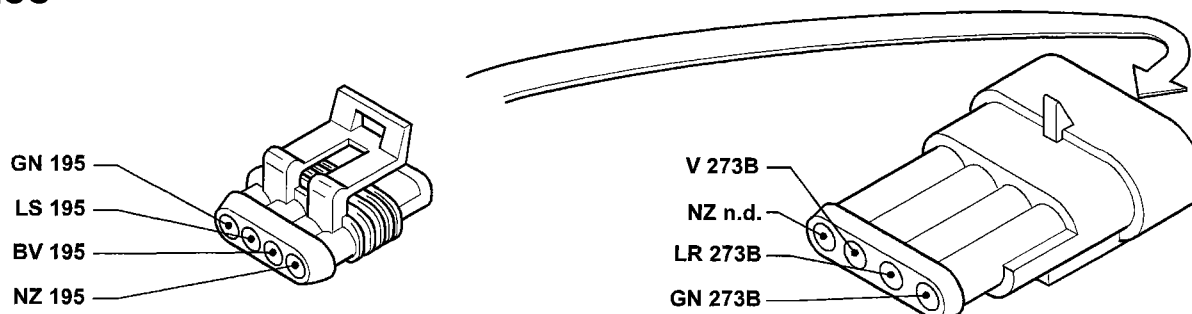
### 263 Solenoid valve on ignition switch (1581 auto. trans.)



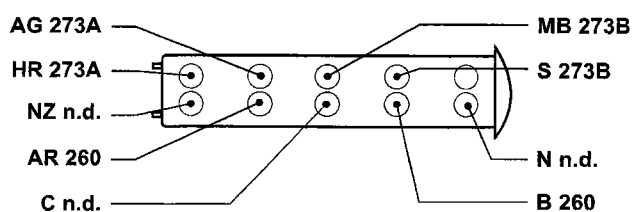
### 264 Connection between rear/automatic transmission cables (1581)



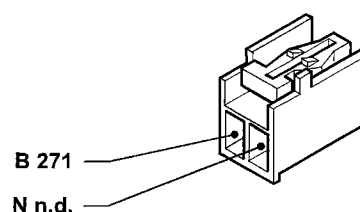
### 265 Connection between automatic transmission/injection cables (1581)



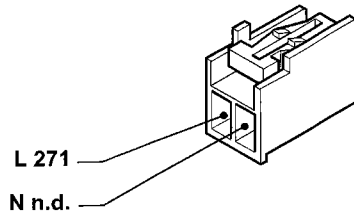
### 266 Multi-purpose switch on automatic transmission (1581)



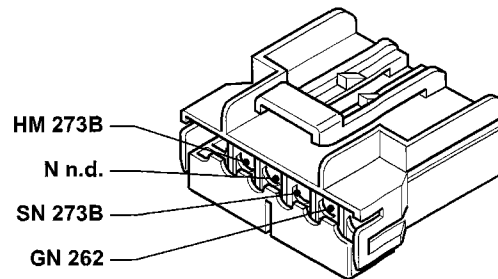
### 267 Additional parking switch (1581)



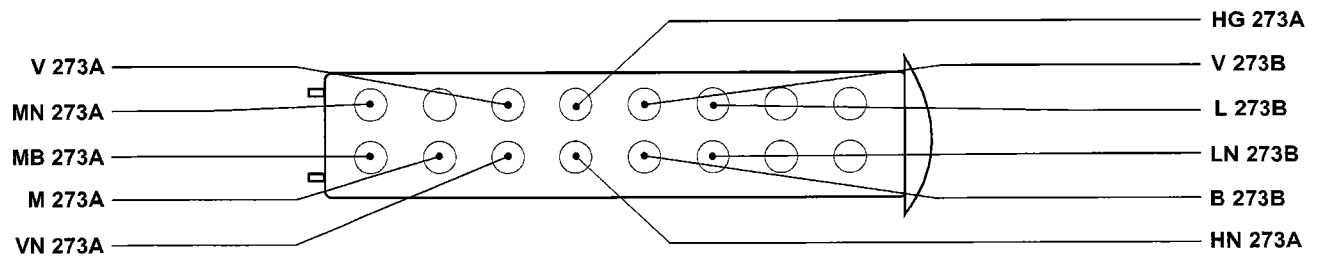
### 268 Shift-Lock solenoid valve (1581 automatic transmission)



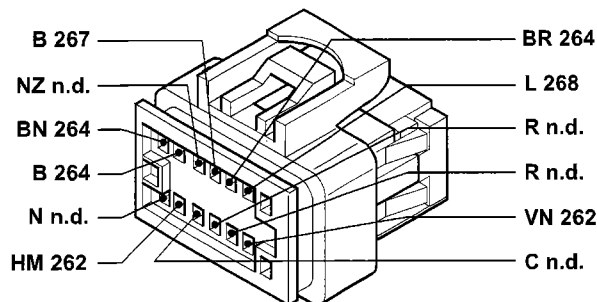
### 269 Normal / Sport / Ice selector switch (1581 automatic transmission)



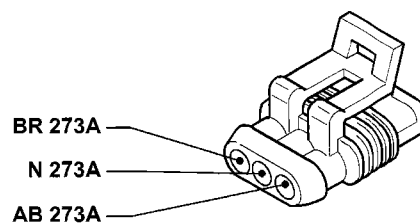
### 270 Connection for cables on gearbox (1581)



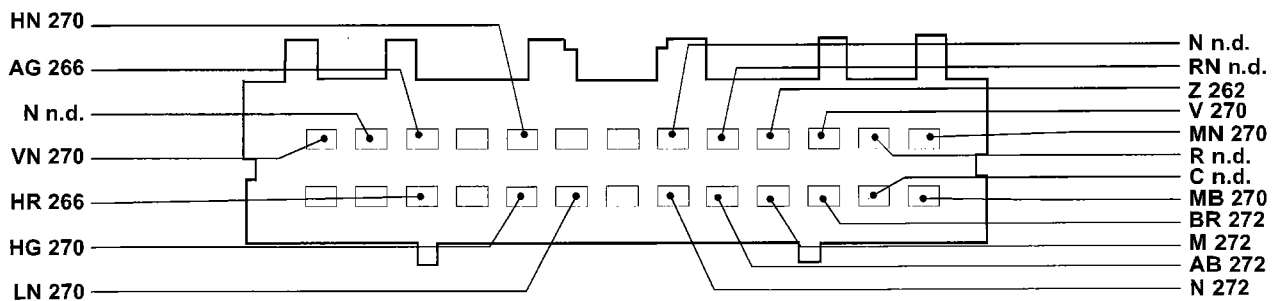
### 271 Electronic safety control unit for automatic transmission (1581)



### 272 Diagnostic socket for automatic transmission control unit (1581)

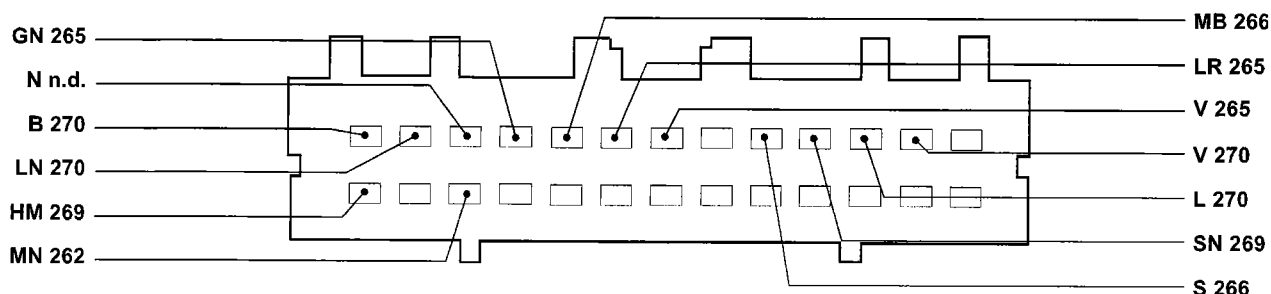


### 273A Automatic transmission electronic control unit (1581)

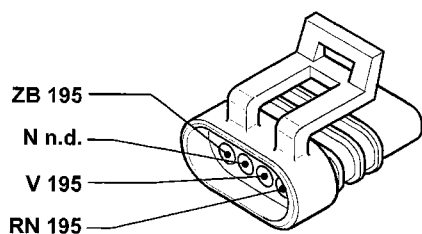


**55.**

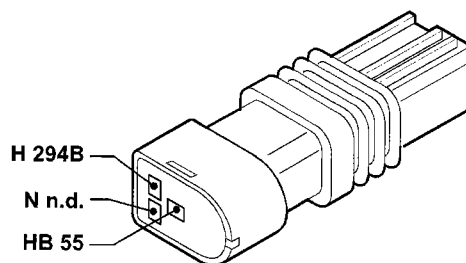
### 273B Automatic transmission electronic control unit (1581)



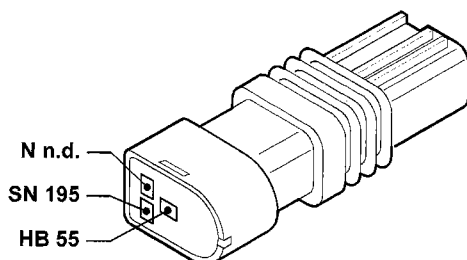
### 278 Integrated air temperature/pressure sender unit (1581)



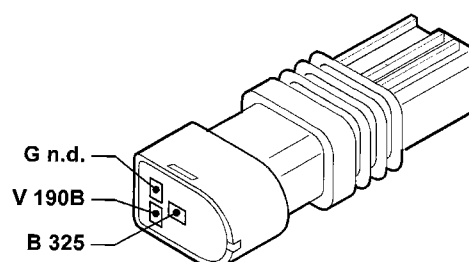
### 279 Twin engine coolant temperature sender unit (1242)



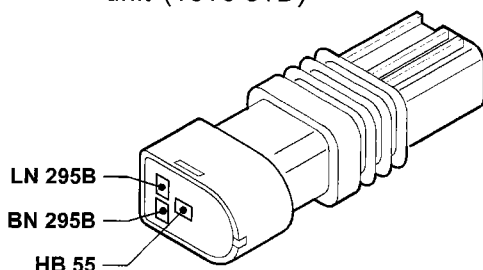
### 279 Twin engine coolant temperature sender unit (1581)



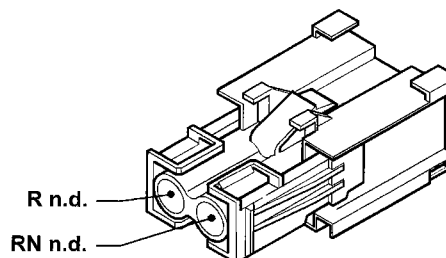
### 279 Twin engine coolant temperature sender unit (1998)



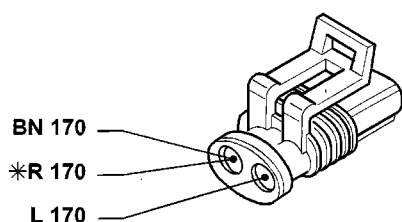
### 279 Twin engine coolant temperature sender unit (1910 JTD)



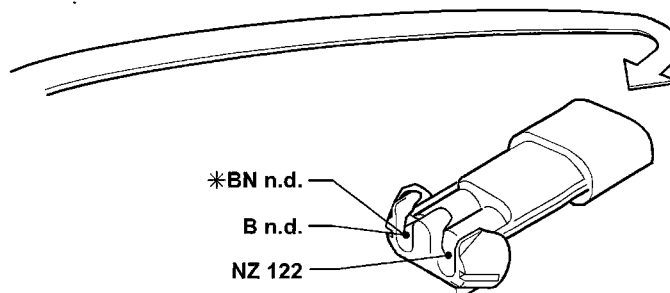
### 282 7.5A fuse protecting Fiat-CODE/electronic injection (60 for UNIJET)



**283** Connection between front cable/resistor (petrol versions)

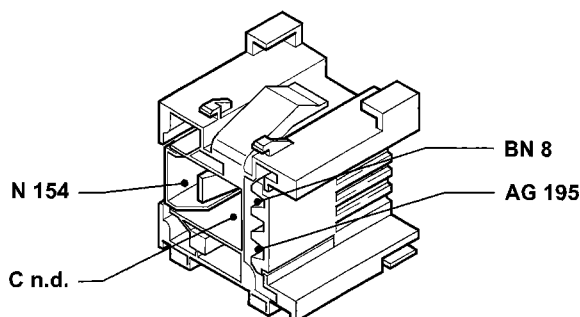


\* Variant for 1747 version



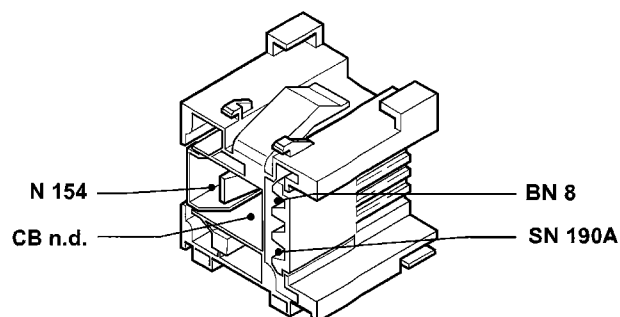
\* Variant for 1581 version

**284** Engine cooling fan relay feed

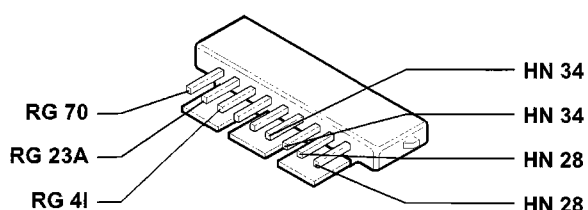


Only exists on the 1581 version without air conditioning

**284** Engine cooling fan relay feed

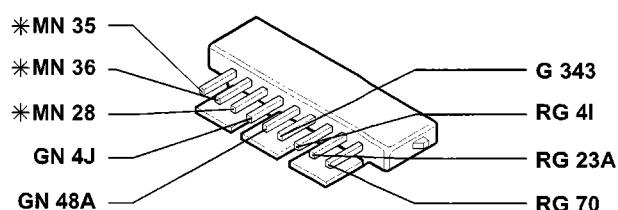


**286** Short circuit connection



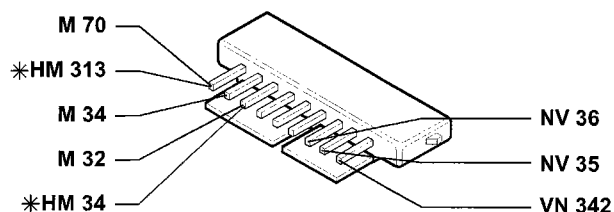
Only exists on version with preparation for radio phone

**286** Short circuit connection



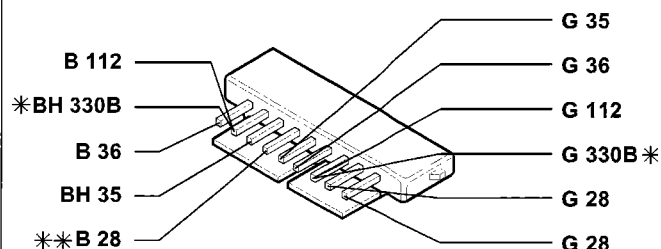
Only exists on version with preparation for radio phone and telepass

**287** Short circuit connection



\* Variant for version without A.B.I.

**288** Short circuit connection

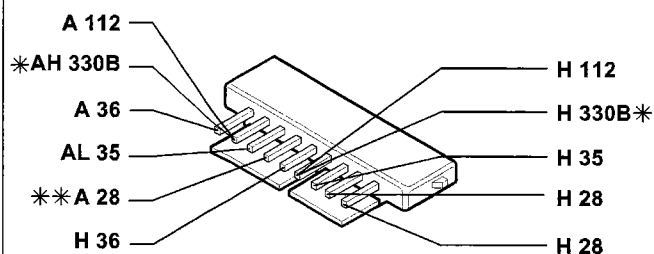


\* Variant for version with A.B.I.

\*\* Only valid for SX trim level with alarm

**55.**

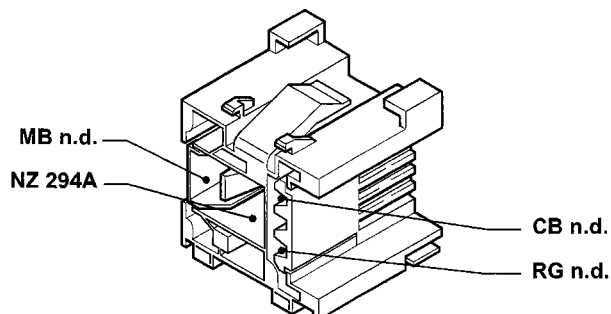
### 289 Short circuit connection



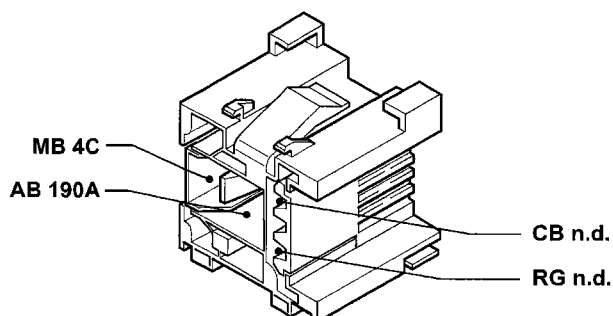
\* Variant for version with A.B.I.

\*\* Only valid for SX trim level with alarm

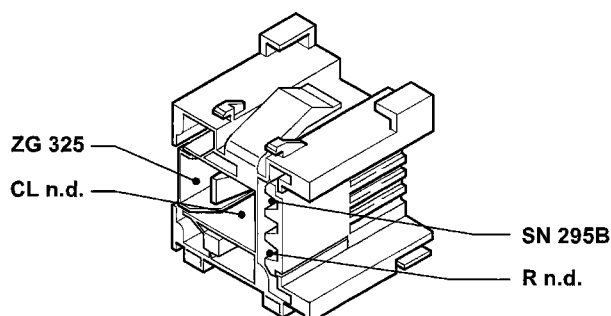
### 290 Electric fuel pump relay feed (1242)



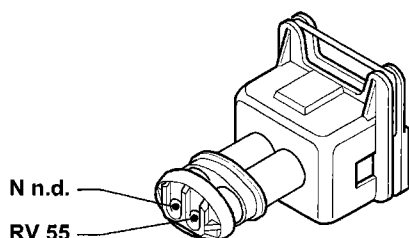
### 290 Electric fuel pump relay feed (1998)



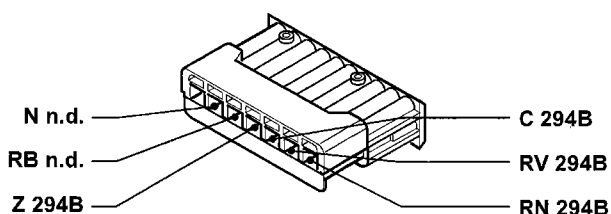
### 290 Electric fuel pump relay feed (1910 JTD)



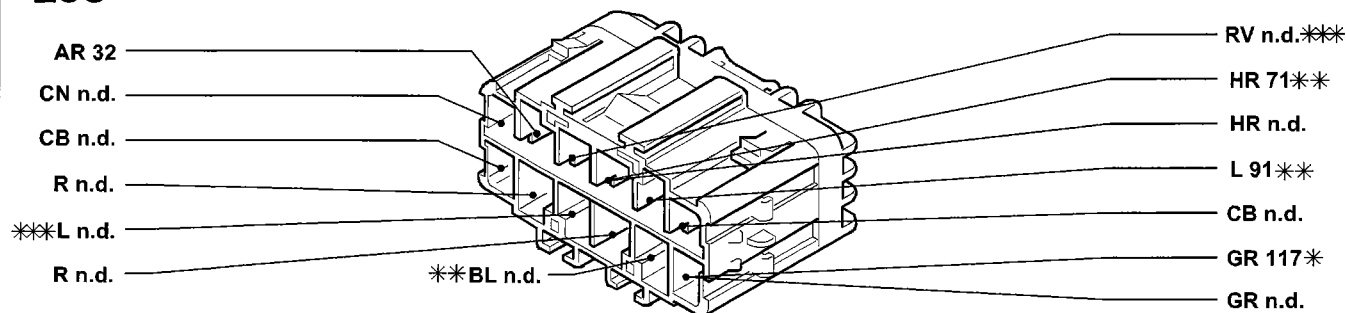
### 291 Sensor for power assisted steering pump (1242)



### 292 Modular actuator (1242)



### 293 Fuse carrier base on dashboard cable

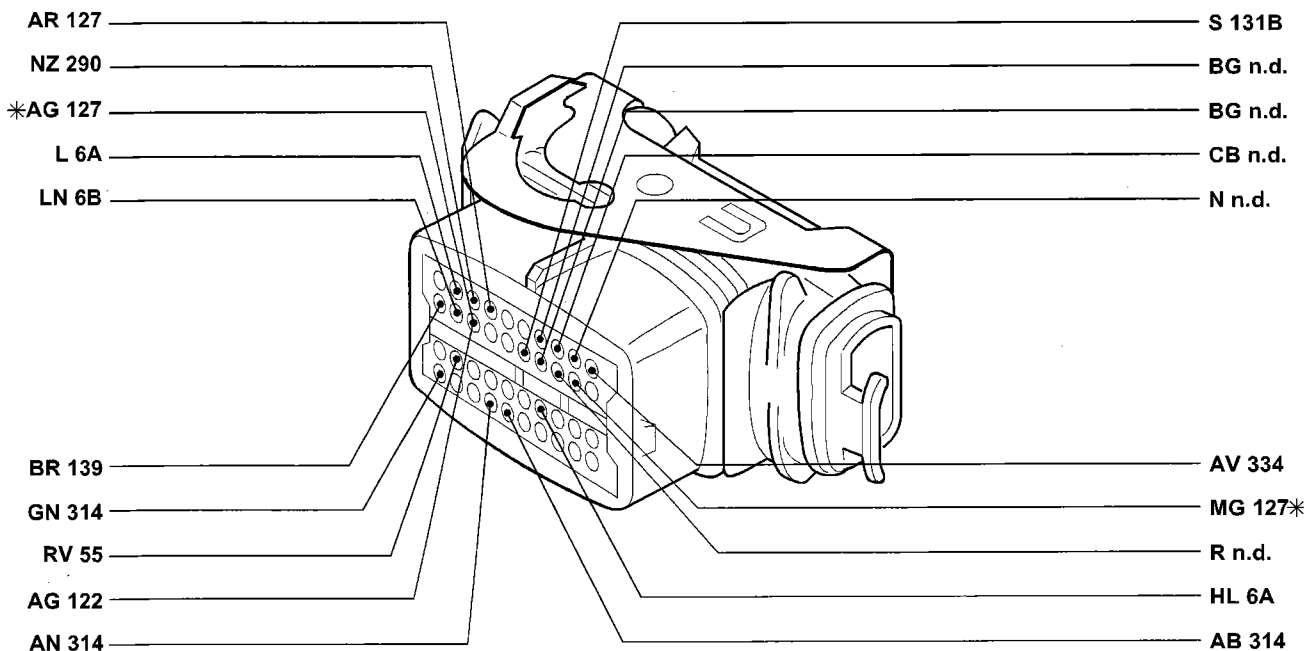


\* Variant for version with EURO-BAG and SIDE-BAG

\*\* Only valid for SX trim level

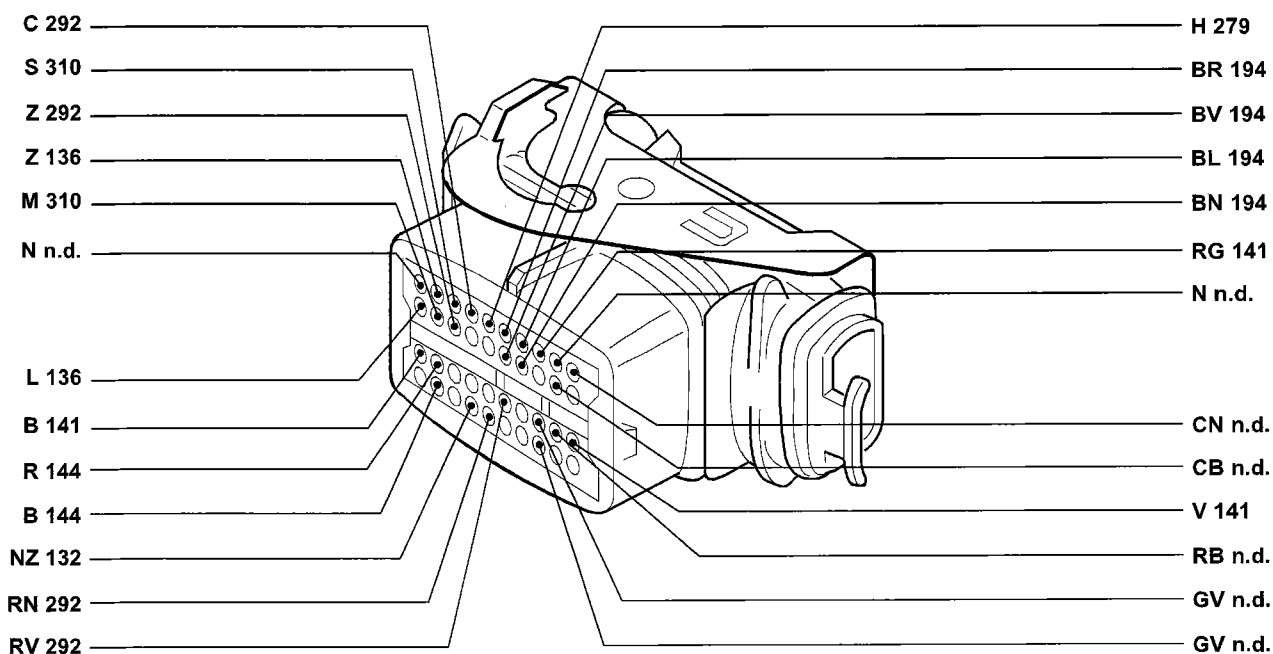
\*\*\* Only valid for ELX trim level

**294A** Injection/ignition electronic control unit (1242)



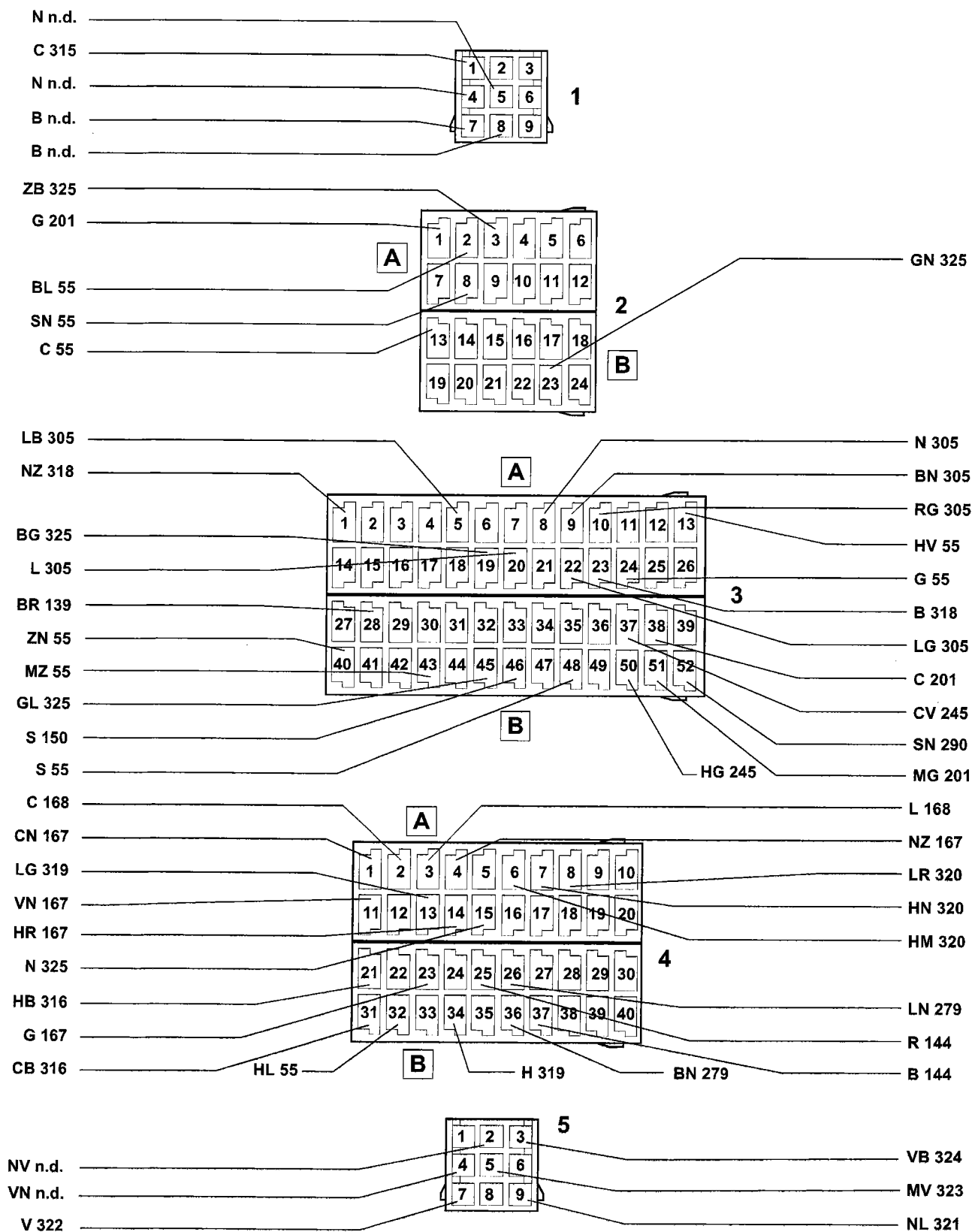
\* Only valid for version with air conditioning

**294B** Injection/ignition electronic control unit (1242)



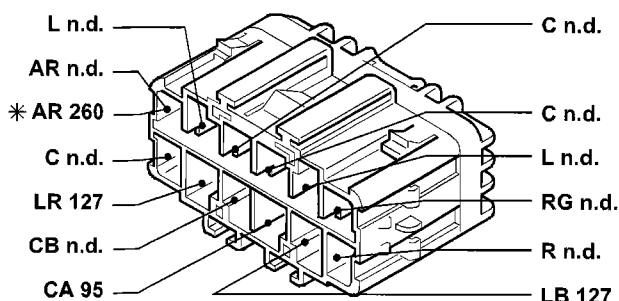
# 55.

### 295 Injection/ignition electronic control unit (1910 JTD)



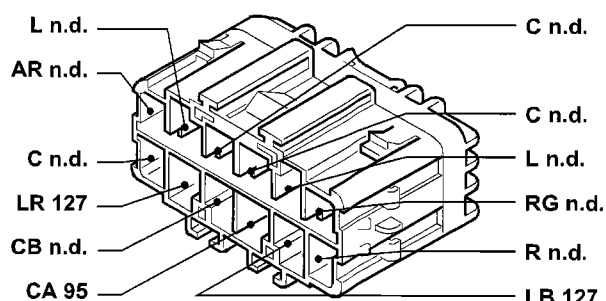


### 296 Fuse carrier base on front cable (1242-1581)

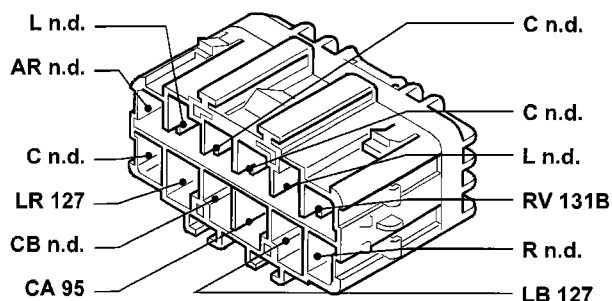


\* Variant on version with automatic transmission

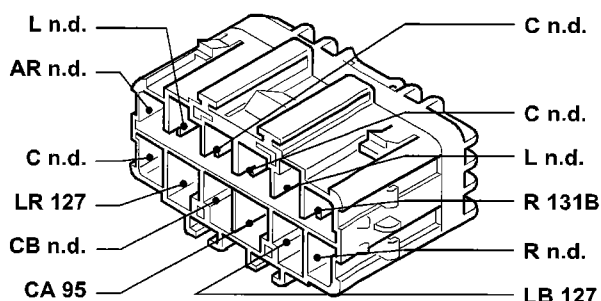
### 296 Fuse carrier base on front cable (1747-1998)



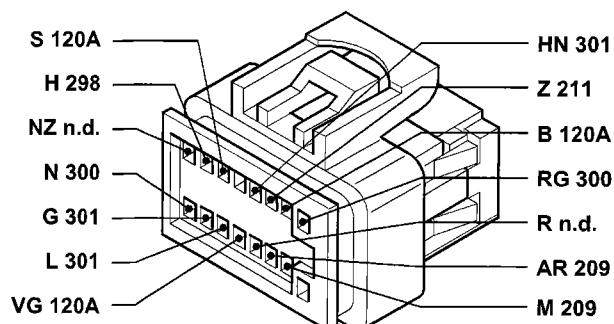
### 296 Fuse carrier base on front cable (1910 TD)



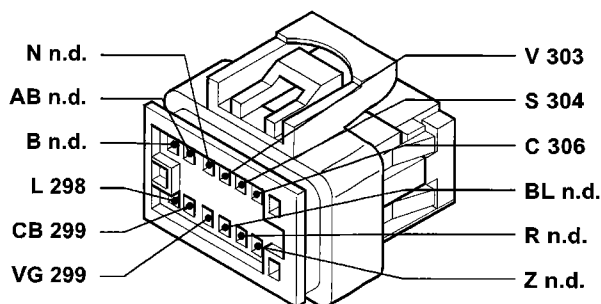
### 296 Fuse carrier base on front cable (1910 JTD)



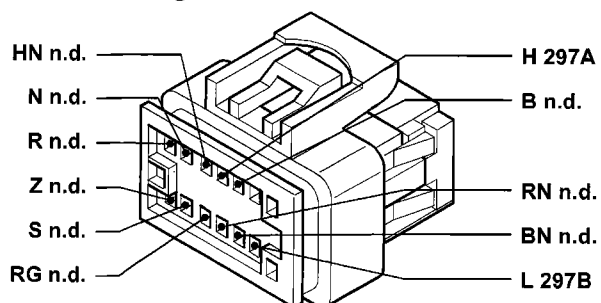
### 297A Air conditioning control unit



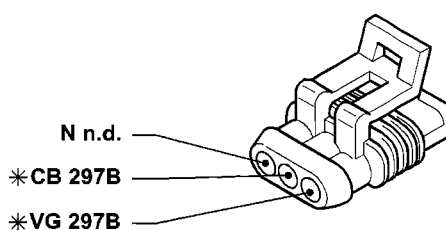
### 297B Air conditioning control unit



### 298 Recirculation control for heater/air conditioning



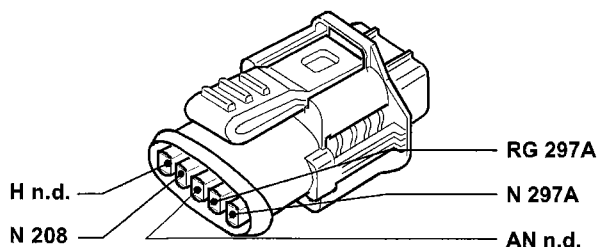
### 299 Diagnostic socket for heater/air conditioning



\* Only valid on version with air conditioning

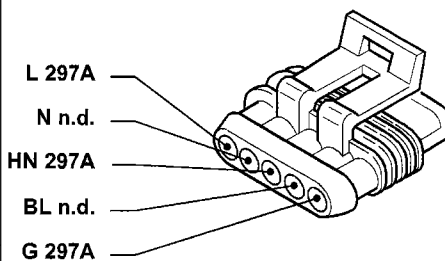
# 55.

### 300 Car interior fan electronic transformer



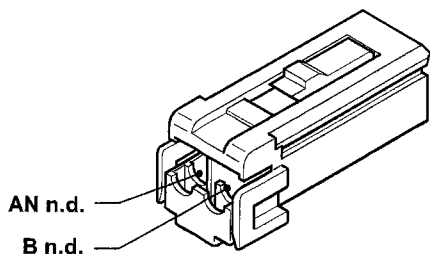
Only exists on version with air conditioning

### 301 Car interior mixture control actuator

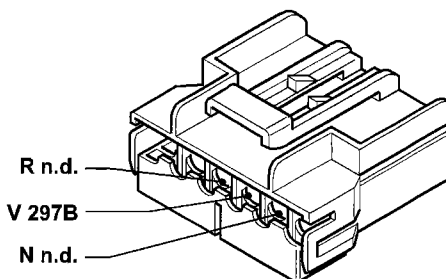


Only exists on version with air conditioning

### 302 Maximum demisting control switch

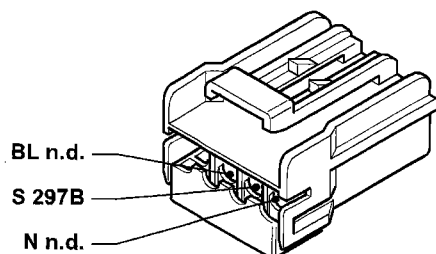


### 303 Internal ventilation potentiometer



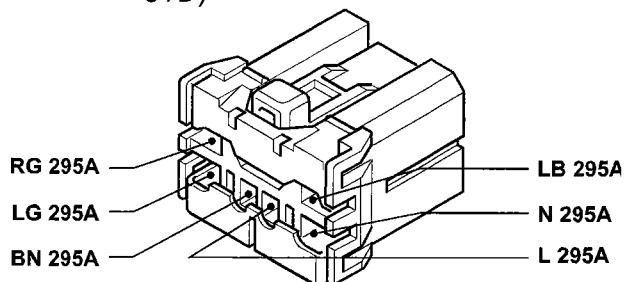
Only exists on version with air conditioning

### 304 Potentiometer for car interior temperature

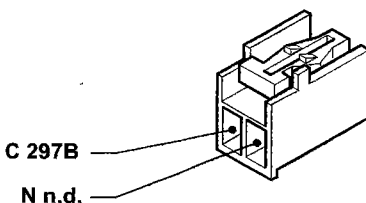


Only exists on version with air conditioning

### 305 Potentiometer on accelerator pedal (1910 JTD)

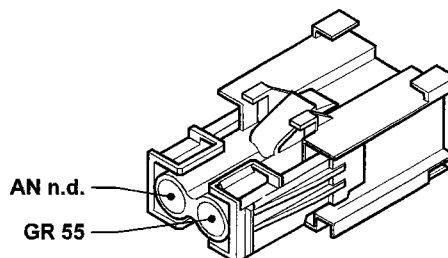


### 306 Treated air sensor

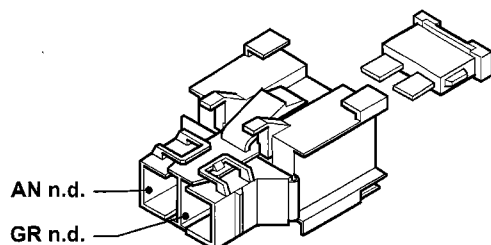


Only exists on version with air conditioning

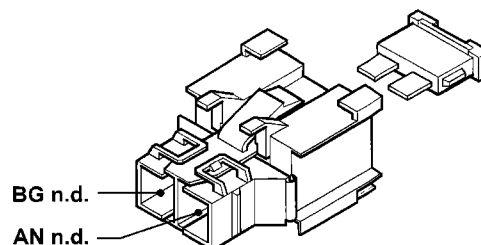
### 307 15A fuse protecting injection system (1242)



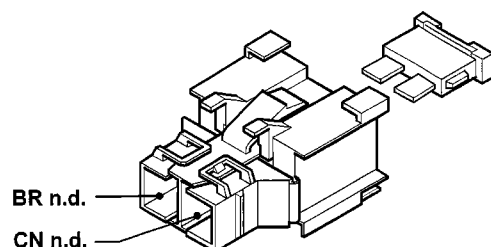
**307** 15A fuse protecting injection system (1998)



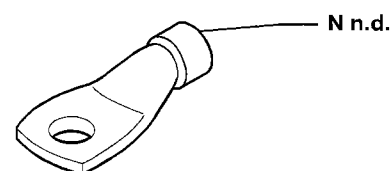
**308** 15A fuse protecting canister solenoid valve (1242)



**308** 15A fuse protecting canister solenoid valve (1998)

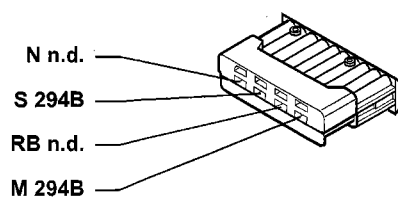


**309** Earth for air conditioning unit

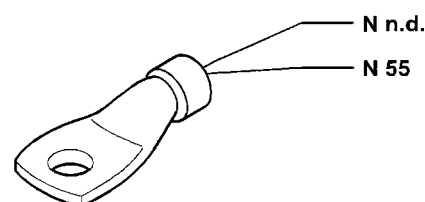


Only exists on version with A.B.I.

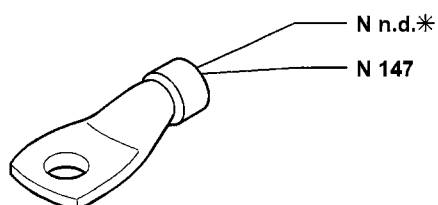
**310** Absolute pressure and air temperature sensor (1242)



**311** Earth for electronic injection control unit (1242)

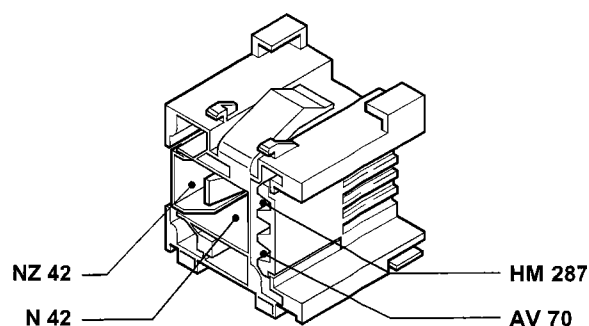


**312** Power earth for electronic injection control unit (1910 JTD)



\* Variant for 1242 version

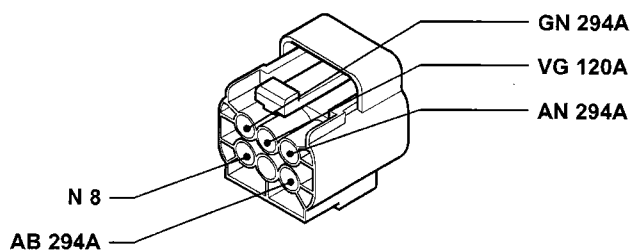
**313** Relay for reversing air conditioning signal



Only exists on version without A.B.I.

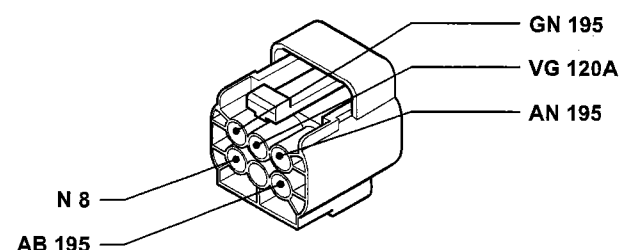
# 55.

### 314 Four stage pressure switch



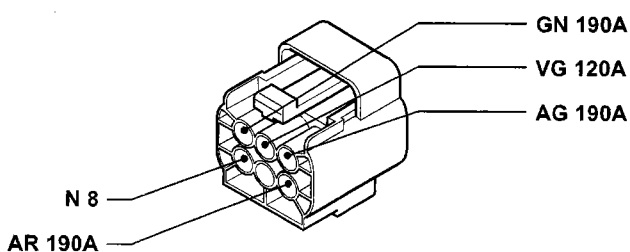
Only exists on 1242 version with air conditioning

### 314 Fuel pressure regulator for injection system (1910 JTD)



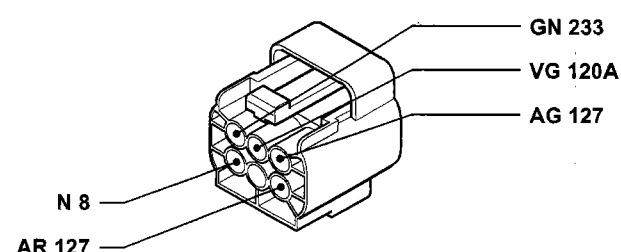
Only exists on 1581 version with air conditioning

### 314 Four stage pressure switch



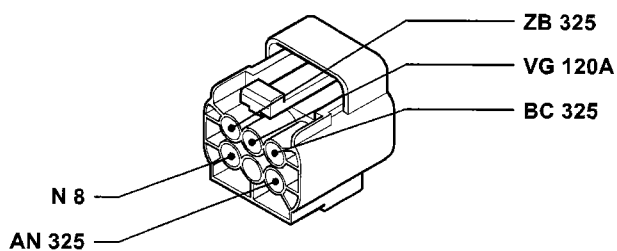
Only exists on 1998 version with air conditioning

### 314 Four stage pressure switch



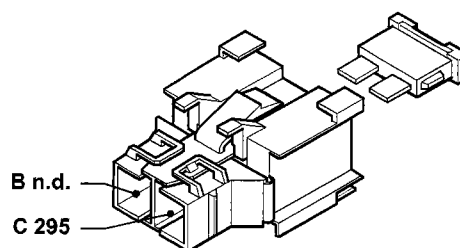
Only exists on 1910TD version with air conditioning

### 314 Four stage pressure switch

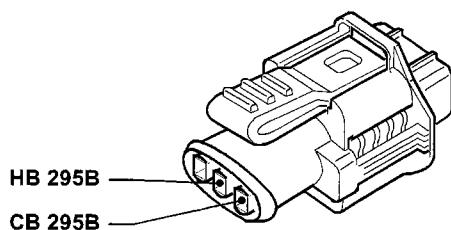


Only exists on JTD version with air conditioning

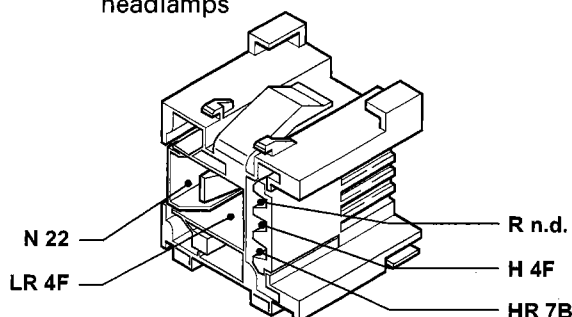
### 315 7.5A fuse protecting electronic injection control unit (1910 JTD)



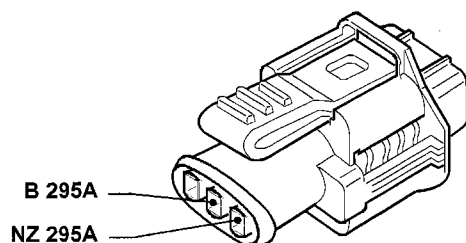
### 316 Fuel pressure regulator for injection system 1910 JTD



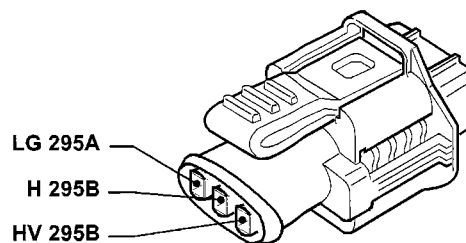
### 317 Remote control switch for main beam headlamps



**318** Fuel temperature sensor (1910 JTD)

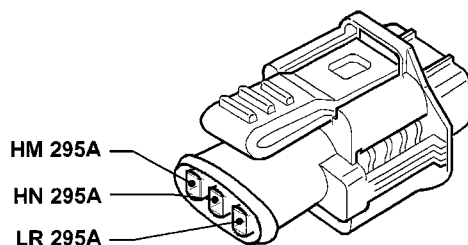


**319** Fuel pressure sensor

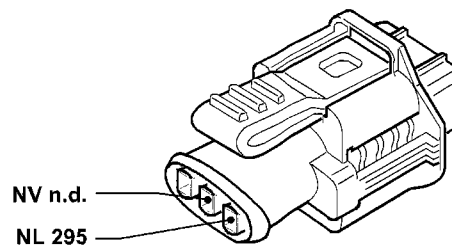


Only exists on the JTD version

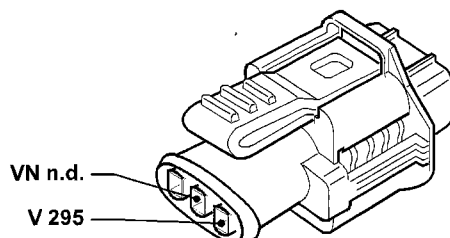
**320** Turbo pressure regulator (1910 JTD)



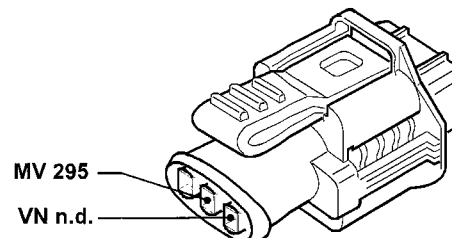
**321** Injector 1° for injection (1910 JTD)



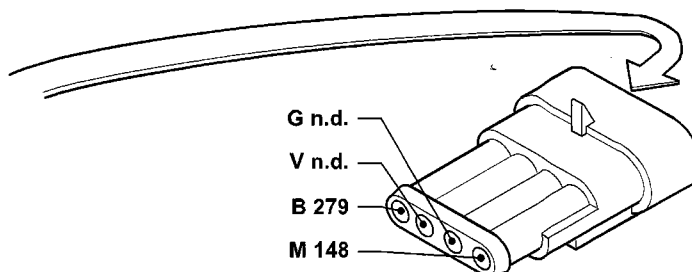
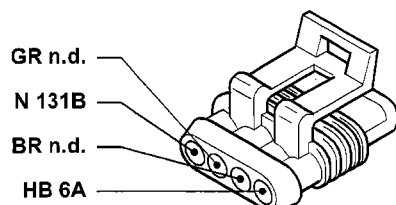
**322** Injector 2° for injection (1910 JTD)



**323** Injector 3° for injection (1910 JTD)

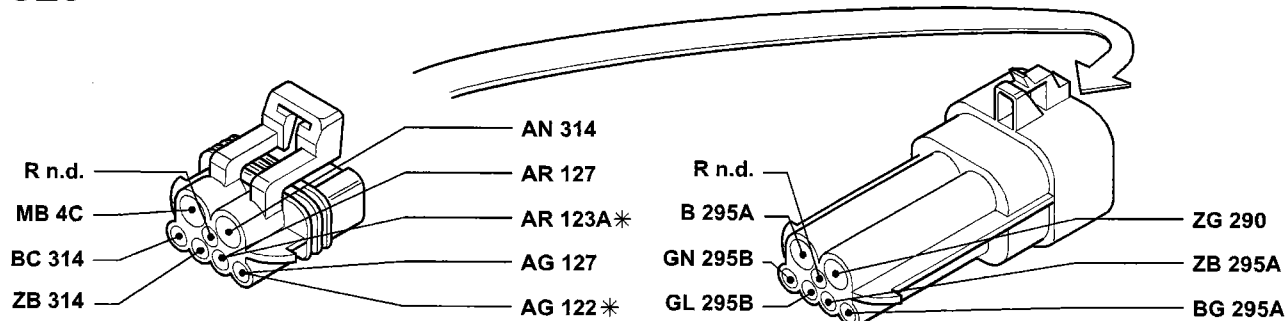


**325** Connection between injection/left front cables (1998)



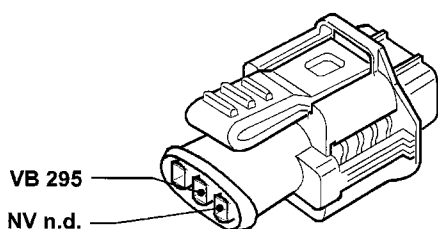
**55.**

### 325 Connection between injection/left front cables (1910 JTD)

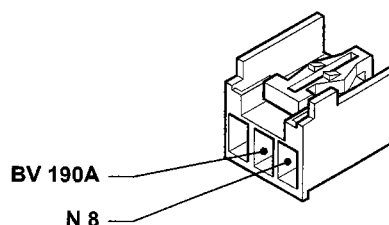


\* Variant on version without air conditioning

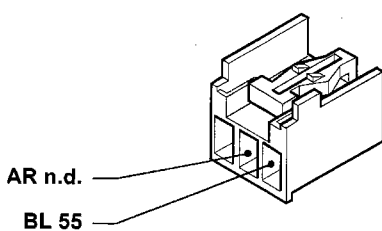
### 324 Injector 4° for injection (1910 JTD)



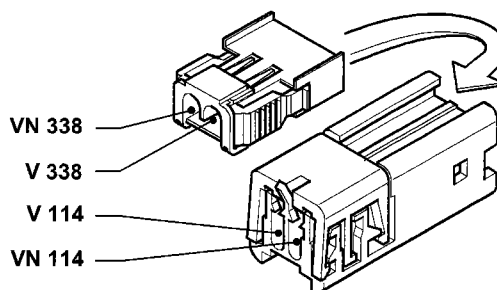
### 326 Switch on clutch (1998)



### 326 Switch on clutch (1910 JTD)

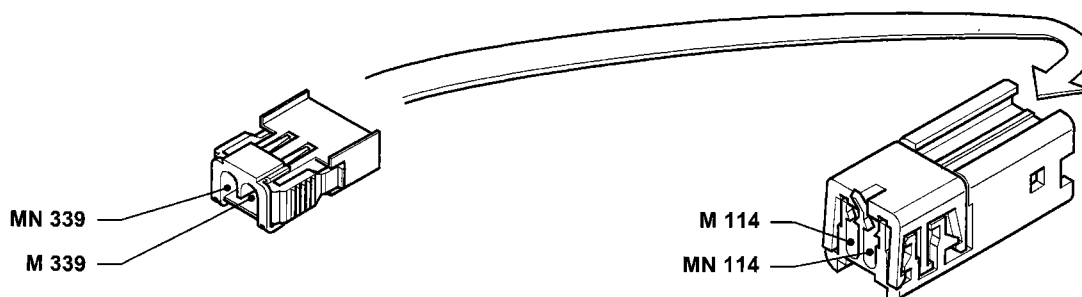


### 327 Connection with bridge on floor for left EURO-BAG



Only exists on version with SIDE-BAG

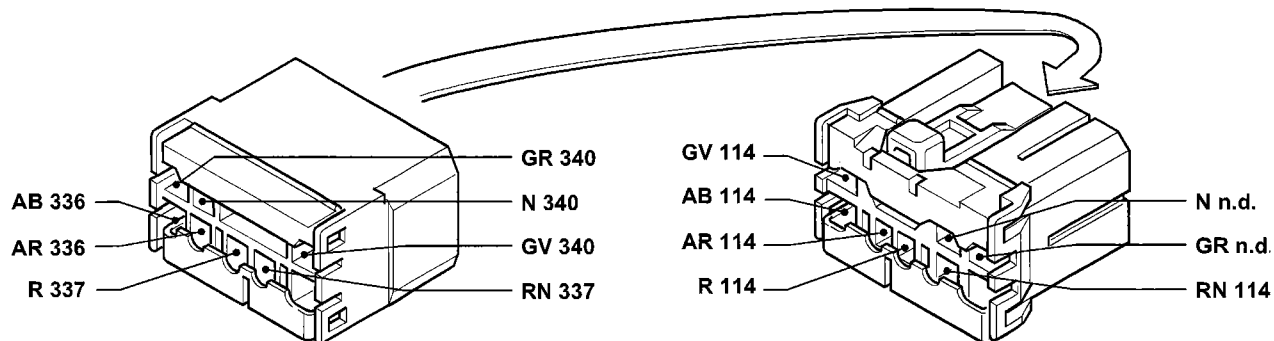
### 328 Connection with bridge on floor for right EURO-BAG



Only exists on version with SIDE-BAG

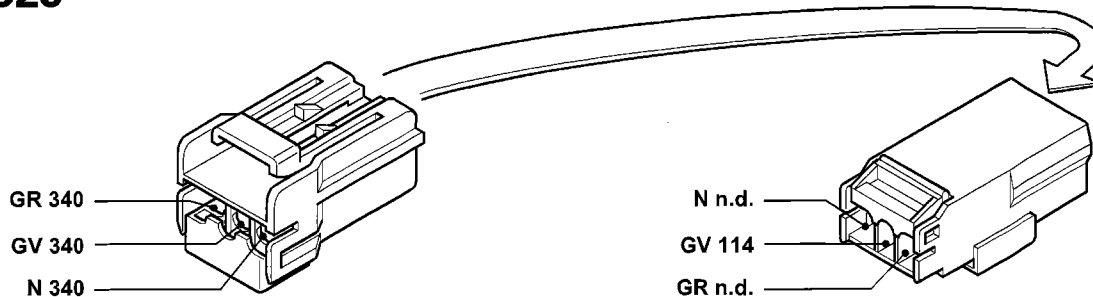
P4A390I01

**329** Connection with bridge on floor



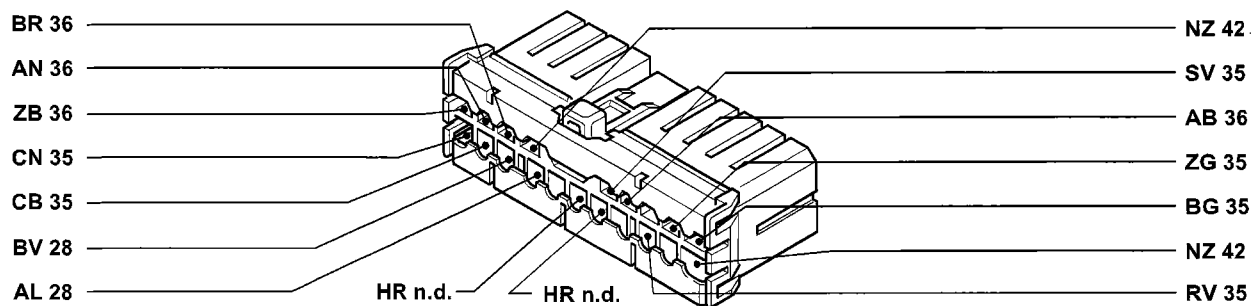
Only exists on version with EURO-BAG and SIDE-BAG

**329** Connection with bridge on floor

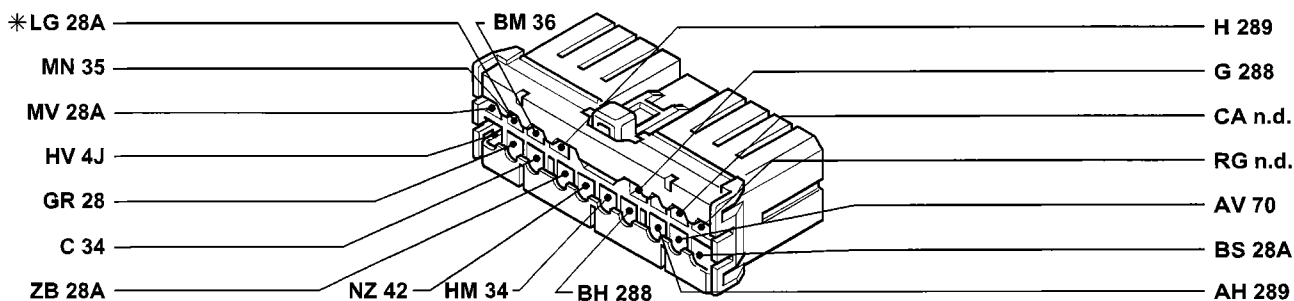


Only exists on version with driver's and passenger EURO-BAG

**330A** A.B.I. control unit



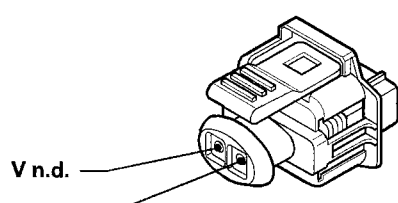
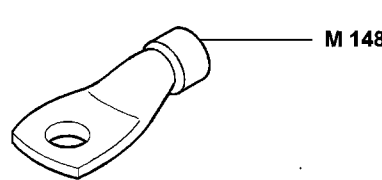
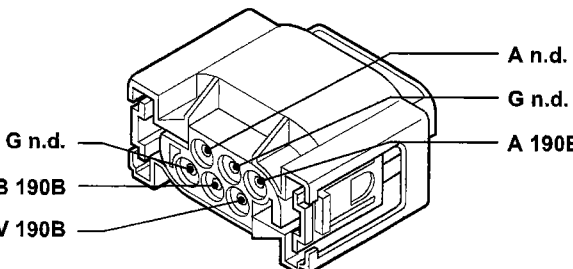
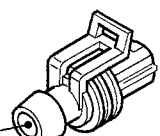
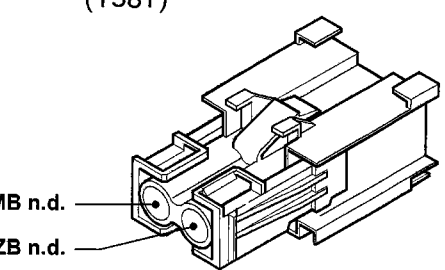
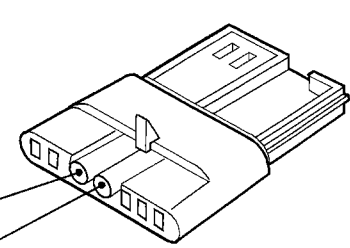
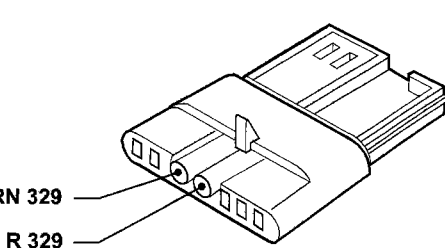
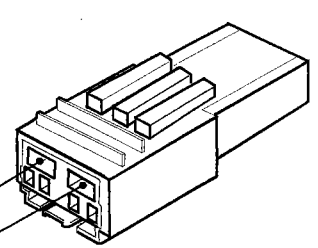
**330B** A.B.I. control unit



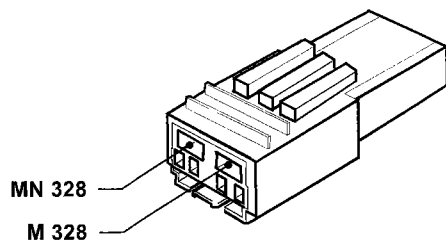
\* Variant for version with automatic transmission



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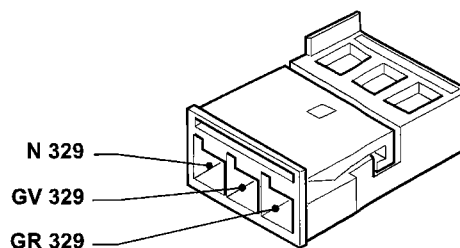
|                                                                                                                                                                                                                                             |                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>331</b> Phase transformer injector (1998)</p>  <p>V n.d.<br/>B 190B</p>                                                                              | <p><b>332</b> Earth on electronic control unit (1998)</p>  <p>M 148</p>                                               |
| <p><b>333</b> Motorized butterfly casing</p>  <p>G n.d.<br/>B 190B<br/>V 190B<br/>A n.d.<br/>G n.d.<br/>A 190B</p> <p>Only exists on the 1998 version</p> | <p><b>334</b> Connection for diagnostic cable (1242)</p>  <p>AV 294A</p>                                              |
| <p><b>335</b> 15A fuse protecting Lambda sensor (1581)</p>  <p>MB n.d.<br/>ZB n.d.</p>                                                                   | <p><b>336</b> Driver's sensor for EURO-BAG</p>  <p>AR 329<br/>AB 329</p> <p>Only exists on version with SIDE-BAG</p> |
| <p><b>337</b> Passenger side sensor for EURO-BAG</p>  <p>RN 329<br/>R 329</p> <p>Only exists on version with SIDE-BAG</p>                                | <p><b>338</b> Driver's SIDE BAG</p>  <p>V 327<br/>VN 327</p> <p>Only exists on version with EURO-BAG</p>             |

### 339 Passenger SIDE BAG



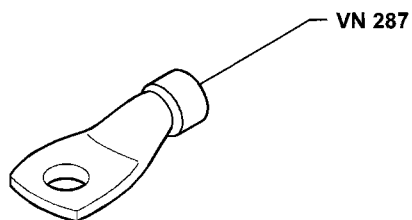
Only exists on version with EURO-BAG

### 340 Passenger presence sensor

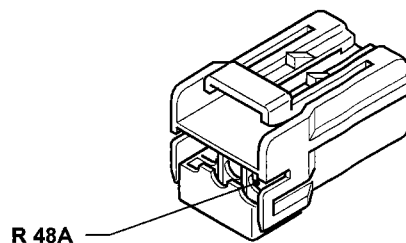


Only exists on version with EURO-BAG and SIDE-BAG

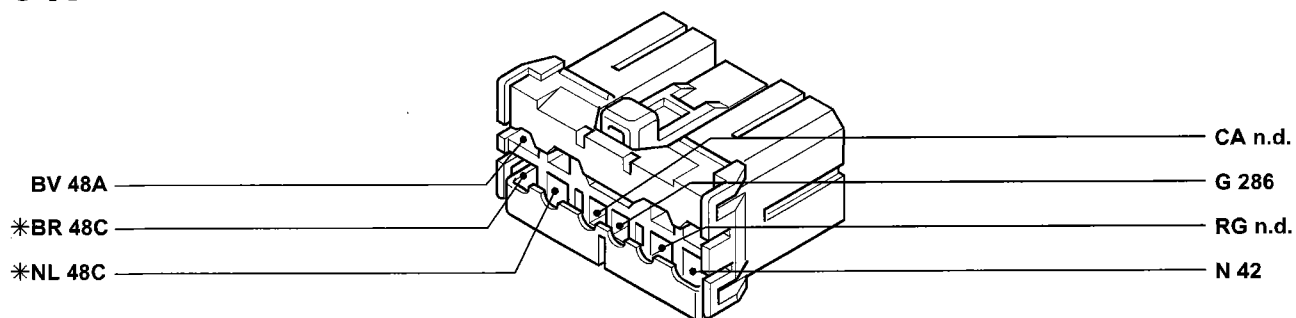
### 342 Power earth for electronic injection



### 344 Connection for cable for preparation for electric aerial

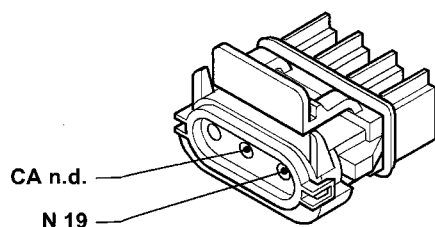


### 343 Connection for preparation for radio phone

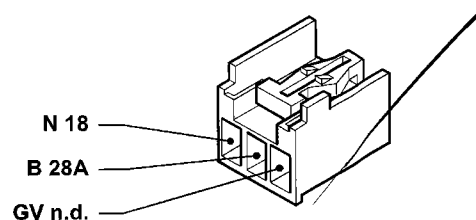


\*Non existent on version with bottom of the range radio

### 345 Connection for preparation for telepass

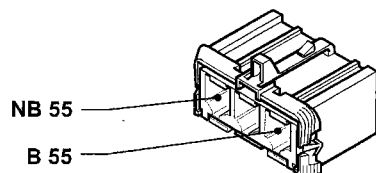


### 346 Current socket

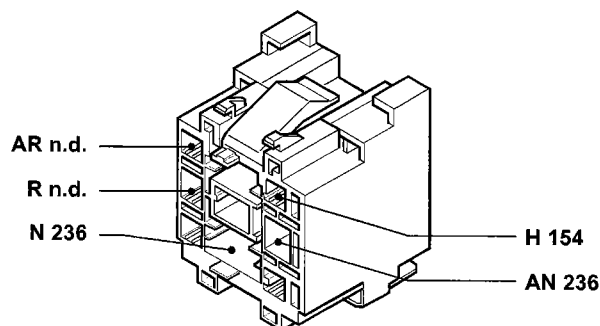


**55.**

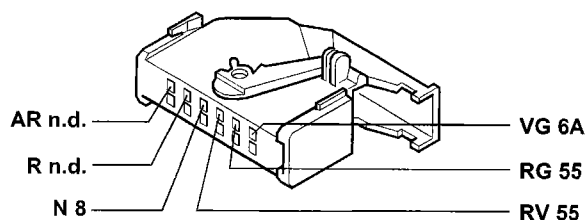
**347** Engine oil level sensor (1910 JTD)



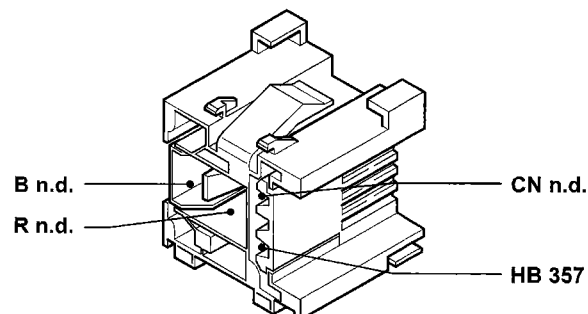
**348** Remote control switch for engine cooling fan (1910 JTD)



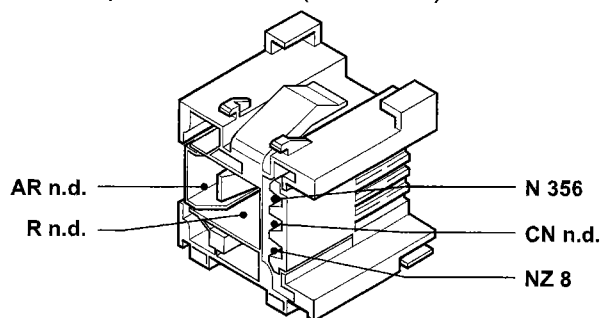
**349** Engine oil level control unit (1910 JTD)



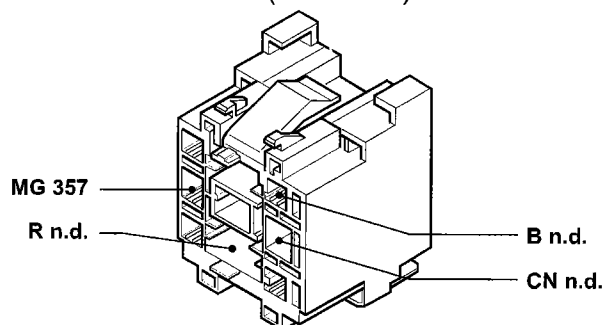
**350** 30A relay for heating passenger compartment water (1910 JTD)



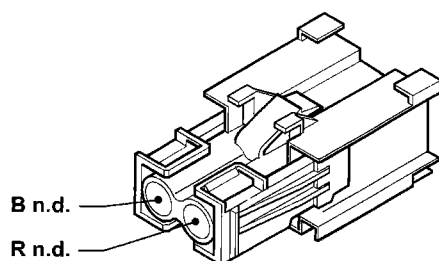
**351** Safety relay for heating passenger compartment water (1910 JTD)



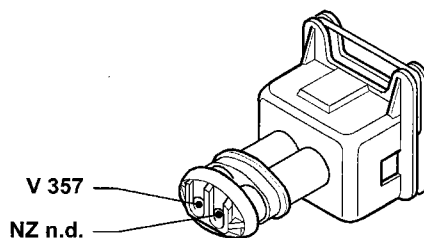
**352** 50A relay for heating passenger compartment water (1910 JTD)



**353** 70A fuse protecting passenger compartment water heater plugs (1910 JTD)

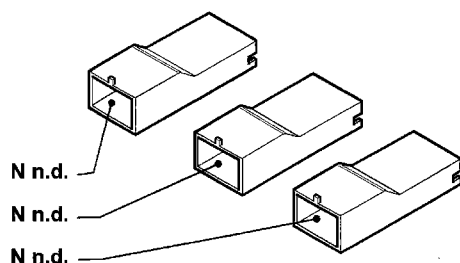


**354** N.T.C. sensor on heating supply pipe (1910 JTD)



**355**

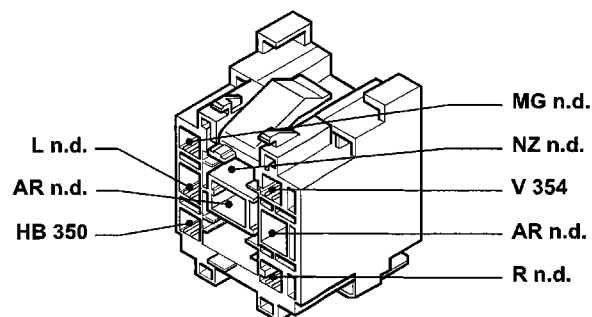
Passenger compartment coolant heating plugs (1910JTD)



P4A395101

**357**

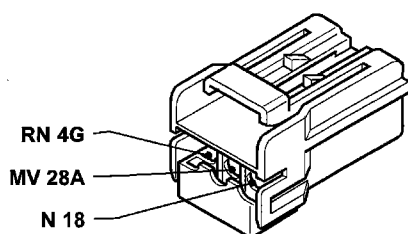
Passenger compartment interior heater plugs control unit (1910 JTD)



P4A395102

**258**

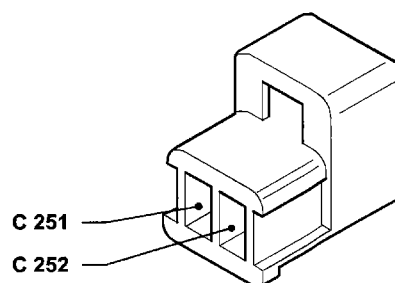
Rear courtesy light



P4A395103

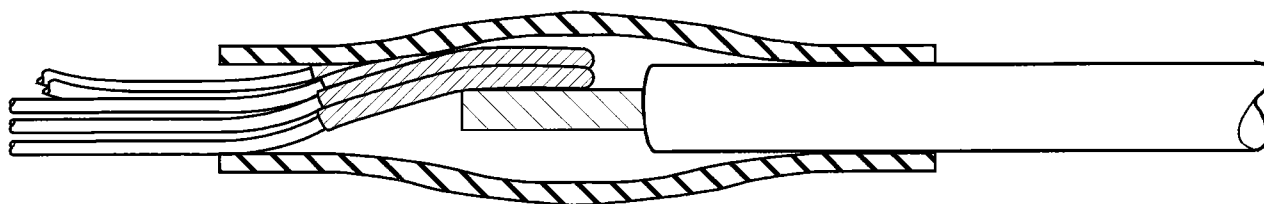
**359**

K.S.B. device (1910 TD)



P4A395104

**N.D.** Ultrasound welding taped in cable loom



P4A395107



**RADIO SYSTEM**

|                                |    |
|--------------------------------|----|
| - General description          | 1  |
| - Warnings                     | 5  |
| - Description of controls      | 6  |
| - Operation                    | 15 |
| - EXPERT control level         | 22 |
| - Coding                       | 26 |
| - Compact Disc Player          | 28 |
| - Cassette Player              | 29 |
| - Multiple Compact Disc player | 31 |
| - Advice and precautions       | 33 |

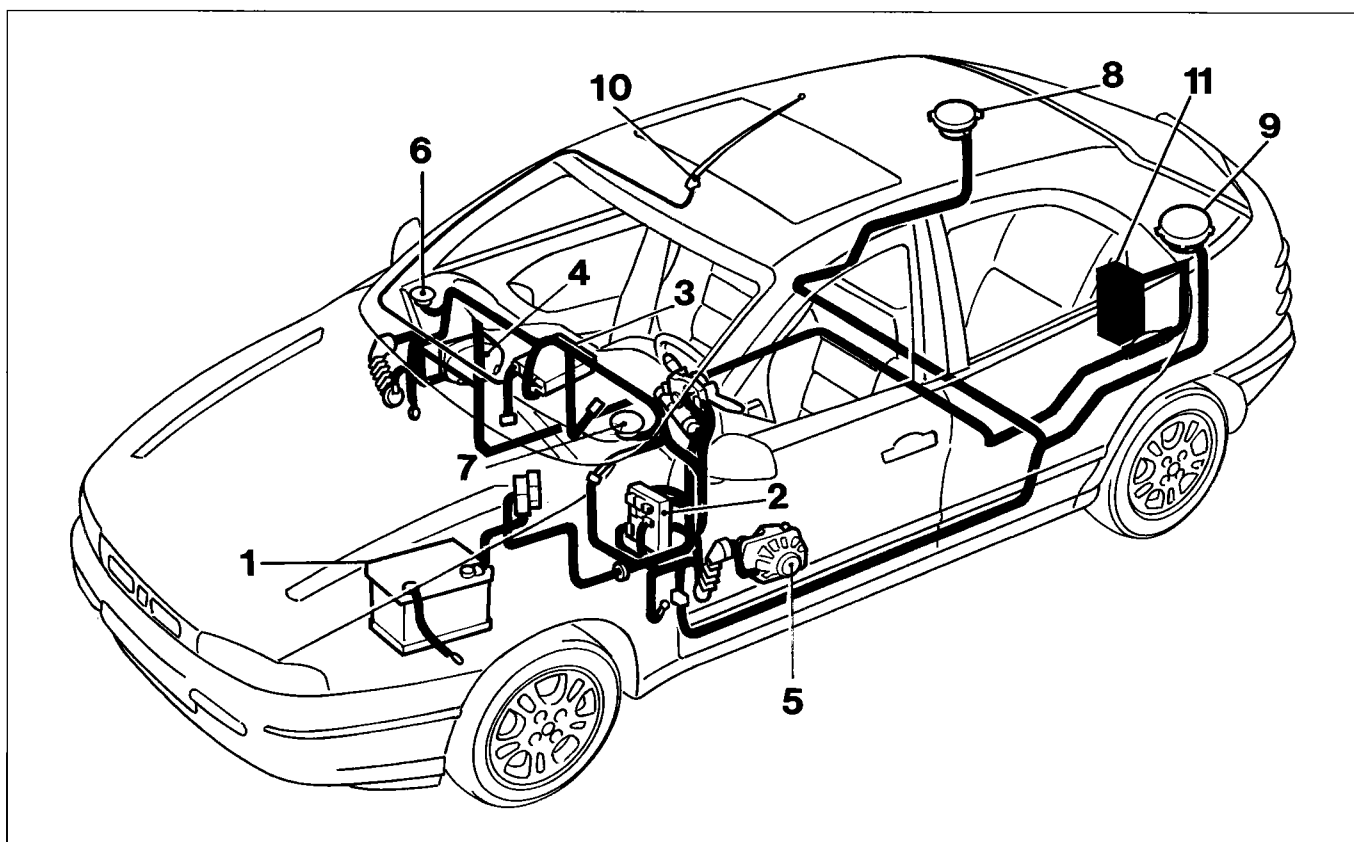
**GENERAL DESCRIPTION**

The car radio reception and playing system has been developed with the acoustic properties of the passenger compartment in mind to offer outstanding sound reproduction at all times.

The system is installed on the car directly during production, without subsequent interventions. All wires are integral with the car wiring.

The system includes:

- radio
- front speakers (with separate tweeters)
- rear speakers
- radio supply leads
- radio and speaker connection leads
- radio controls on steering wheel
- coaxial aerial connection lead
- stylus aerial on roof
- connection lead for CD changer, located in boot.

**LOCATION OF SYSTEM COMPONENTS**

4A054L06

**Component key**

- |                       |                      |
|-----------------------|----------------------|
| 1 Battery             | 8 Right rear speaker |
| 2 Junction unit       | 9 Left rear speaker  |
| 3 Radio               | 10 Aerial            |
| 4 Right front speaker | 11 CD player/changer |
| 5 Left front speaker  |                      |
| 6 Right front tweeter |                      |
| 7 Left front tweeter  |                      |



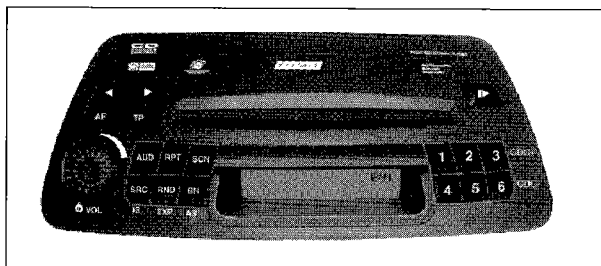
## 55.

### CAR RADIO

The radio is customised to fit in with the instrument facia styling. It is fixed because it cannot be adapted to any other car.

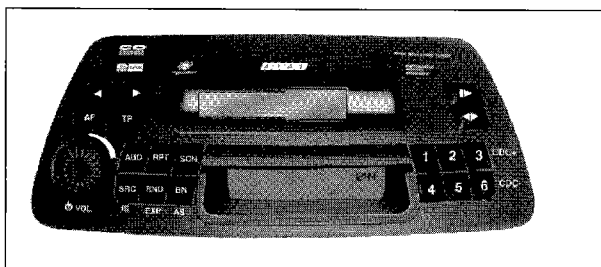
It comes in three versions:

**RADIO H4 :** *with CD player, theft protection, predisposition for handsfree mobile phone use, connection lead for CD changer, possibility of steering wheel controls.*



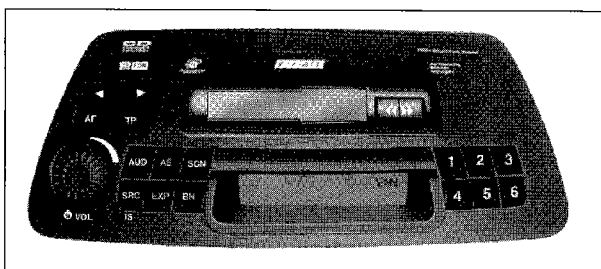
4A002ML01

**RADIO H3 :** *with cassette player, theft protection, predisposition for handsfree mobile phone use, connection lead for CD changer, possibility of steering wheel controls.*



4A002ML02

**RADIO M2 :** *with cassette player, predisposition for handsfree mobile phone use*



4A002ML03

### AERIAL

The car is fitted with an aerial on the roof.

### Electrically-controlled aerial

The car radio is fitted with the wiring for controlling an automatic electric aerial (that rises when the car radio is switched on and lowers when the radio is switched off).

### SPEAKERS

The special sound system comprises:

- 2 elliptical mid-woofer speakers 130 x 180 mm with a power output of 30W max each;
- 2 diffusori fluid iron tweeter dome speakers with a max power output of 40W max;
- 2 full-range Ø 130 mm speakers with a power output of 30W max each (*only for H4 and H3*)

### TECHNICAL DATA

#### Radio power (*H4 and H3 versions*)

- 4 x 15W (with standard sound system made up of mid-woofer + tweeter and full range speakers).

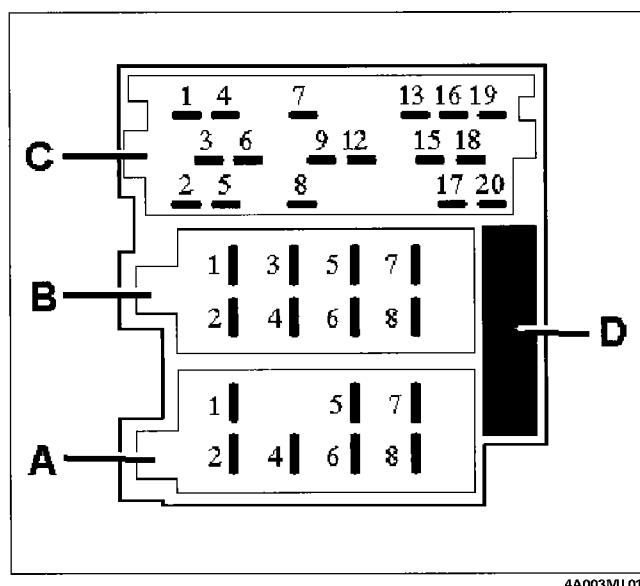
#### Radio power (*version M2*)

- 2 x 15W (with standard sound system made up of mid-woofer + tweeter speakers).
- 4 x 5W (with optional 4-channel speaker system that can be installed by After Market).

**WARNING**      *The standard system is 2 x 15W. If a 2 x 15W system is fitted, an adaptor is fitted between radio and wiring.*

### Fuse

The radio is fitted with a 10A fuse (D). (*5A for the M2 version*)



### CONNECTIONS

#### Connector A

- A1 SCV signal (+) for adjusting volume according to speed
- A2 Phone Mute signal for mobile phone
- A4 +12V ignition-operated voltage supply
- A5 aerial supply output +12V (max. 0.5A)
- A6 +12V display lighting output voltage
- A7 +12V direct supply voltage
- A8 Earth

#### Connector B

- B1 rear speaker (right +)
- B2 rear speaker (right -)
- B3 front speaker (right +)
- B4 front speaker (right -)
- B5 front speaker (left +)
- B6 front speaker (left -)
- B7 rear speaker (left +)
- B8 rear speaker (left -)

### 55.

#### Supplementary connections

##### Connector C

**Line output:** possibility of connection for power amplifier (Booster) or active speaker

- C1 Rear speaker (left +)
- C2 Rear speaker (right +)
- C3 Earth (-)
- C4 Front speaker (left +)
- C5 Front speaker (right +)
- C6 Switch signal for power amplifier: on/off (max. 0.3A).

##### Phone input

Possibility of mobile phone handsfree connection

- C7 NF phone
- C12 NF phone earth

##### Remote control from steering wheel (*H4 and H3 versions*)

- C8 Earth
- C9 Remote control

##### Cd changer connection (*H4 and H3 versions*)

- C13 CD bus control line
- C15 CD bus earth
- C16 +12V supply voltage for cd changer
- C17 Switching voltage for cd changer
- C18 NF CD earth
- C19 left NF CD
- C20 right NF CD

**WARNINGS****Anti-theft protection**

The radio comes with a theft protection system comprising of a secret 4 digit code.

The protection system makes the radio inoperable if it is removed from the fascia as a result of a theft. See the following pages to activate the antitheft device

**CODE card**

The radio identity document shows the model, serial number and secret code.

The serial number is the same as the number stamped on the set frame

If the set is lost, the CODE card facilitates search investigations and speeds up claim settlement by insurers due to the ownership document.



**ATTENTION:** *If the antitheft protection is active and the radio is disconnected from the car battery, the radio is still protected electronically. It may only be operated again by entering a special code.*

**Display**

If the set is disconnected from the voltage supply, the display figures flash when it is reconnected. The flashing figures are a reminder that the clock must be reset as described below.

**Extended function field (EXP key)**

The EXPERT control level allows the user to use a range of functions beginning with the base control yet without losing an overall view.

**Operation with mobile phone (PHONE)**

The radio is designed for connection to a mobile phone handsfree system (using the PHONE IN input).

The radio sound is deactivated while the mobile phone is in operation.

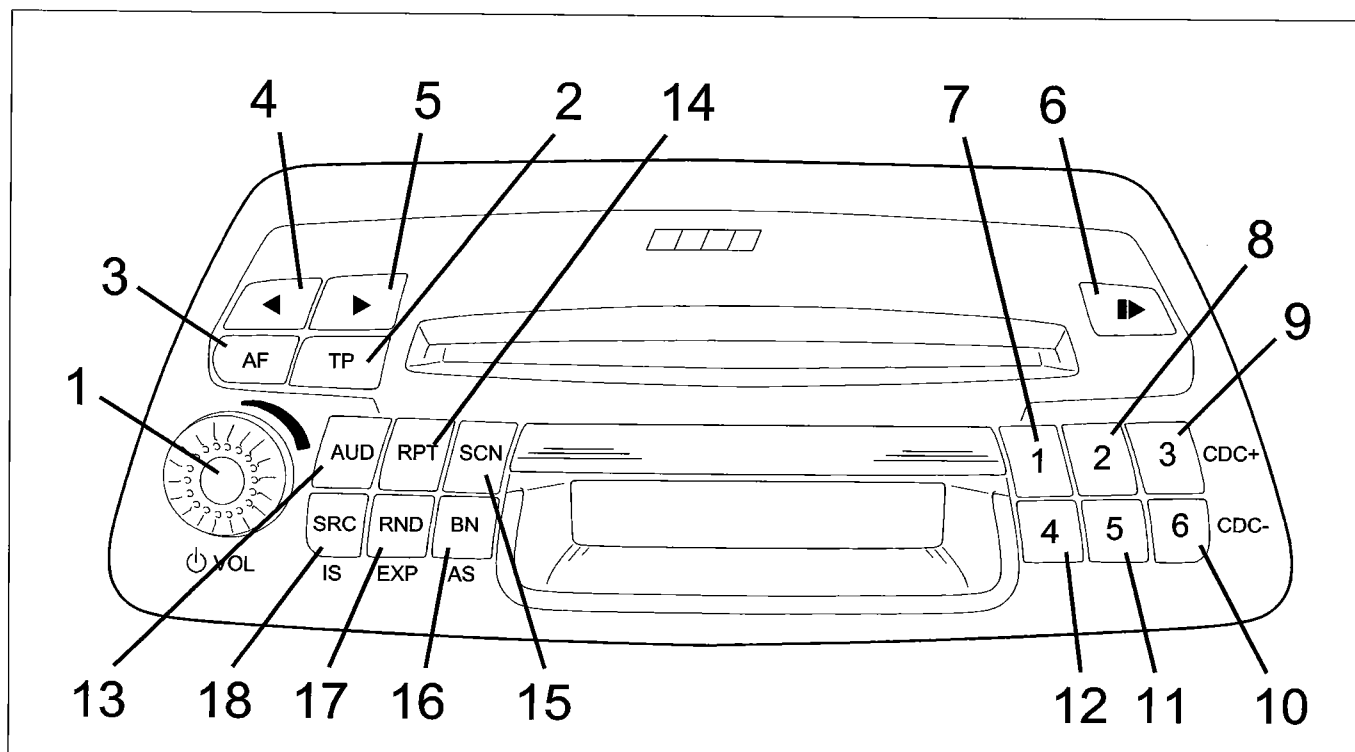
PHONE appears on the display.

## 55.

### CONTROL DESCRIPTION

#### RADIO H4

This comes with a CD player, antitheft protection, predisposition for mobile phone handsfree operation, connection lead for CD changer, possibility of steering wheel controls.



4A006ML01

The tables on the following pages details key functions according to operating mode (RADIO, CD, CD CHANGER, PHONE).

| Key | Function                                | Status<br>EXPERT | RADIO mode                                                                 |                                                                          | CD mode                                                               |                               | CD-CHANGER mode                                                       |                               | PHONE<br>mode                                                         |
|-----|-----------------------------------------|------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------|
|     |                                         |                  | short press                                                                | press > 2 secs                                                           | short press                                                           | press > 2 secs                | short press                                                           | press > 2 secs                |                                                                       |
| 1   | Radio on/off<br>VOL/AUD ad-<br>justment | -                | On/<br>off: press VOL/AUD ad-<br>justment: Turn left: down, Turn right: up |                                                                          | On/<br>off: press VOL/AUD adjustment: Turn left: down, Turn right: up |                               | On/<br>off: press VOL/AUD adjustment: Turn left: down, Turn right: up |                               | On/<br>off: press VOL/AUD adjustment: Turn left: down, Turn right: up |
| 2   | TP<br>Traffic<br>programme              | -                | TP ON/OFF                                                                  | PTY                                                                      | TP ON/OFF                                                             | -                             | TP ON/OFF                                                             | -                             | -                                                                     |
| 3   | AF:<br>Alternate<br>frequency           | -                | AF ON/OFF                                                                  | RDF ON/OFF                                                               | -                                                                     | -                             | -                                                                     | -                             |                                                                       |
| 4   | Previous<br>(left)                      | IS=OFF           | FM: Search -<br>AM: Search -<br>PTY: Select next<br>programme              | FM:MAN -<br>AM:MAN -<br>PTY: Automatic<br>search (within pro-<br>gramme) | Track -N                                                              | Fast rewind<br>(continuous)   | Track -N                                                              | Fast rewind<br>(continuous)   | -                                                                     |
|     |                                         | IS=ON            | FM: Store next IS<br>AM: Search -<br>PTY: Select next<br>programme         | FM:MAN -<br>AM:MAN -<br>PTY: Automatic<br>search (within pro-<br>gramme) | Track -N                                                              | Fast rewind<br>(continuous)   | Track -N                                                              | Fast rewind<br>(continuous)   | -                                                                     |
| 5   | Previous<br>(destra)                    | IS=OFF           | FM: search +<br>AM: search +<br>PTY: Select next<br>programme              | FM:MAN +<br>AM:MAN +<br>PTY: Automatic<br>search (within pro-<br>gramme) | Track +N                                                              | fast forward (contin-<br>ous) | Track +N                                                              | fast forward (contin-<br>ous) |                                                                       |
|     |                                         | IS=ON            | FM: Store next IS<br>AM: search +<br>PTY: Select next<br>programme         | FM:MAN +<br>AM:MAN +<br>PTY: Automatic<br>search (within pro-<br>gramme) | Track +N                                                              | fast forward (contin-<br>ous) | Track +N                                                              | fast forward (contin-<br>ous) |                                                                       |
| 6   | Eject                                   | -                | Eject (CD)                                                                 | -                                                                        | Eject (CD)                                                            | -                             | Eject (CD)                                                            | -                             | Eject (CD)                                                            |
| 7   | Preset<br>station 1                     | -                | FM/AM: recall<br>preset station 1                                          | FM/AM: store prese-<br>lected station 1 PTY;<br>store programme          | -                                                                     | -                             | -                                                                     | -                             | -                                                                     |
| 8   | Preset<br>station 2                     | -                | FM/AM: recall<br>preset station 1                                          | FM/AM: store prese-<br>lected station 2 PTY;<br>store programme          | -                                                                     | -                             | -                                                                     | -                             | -                                                                     |

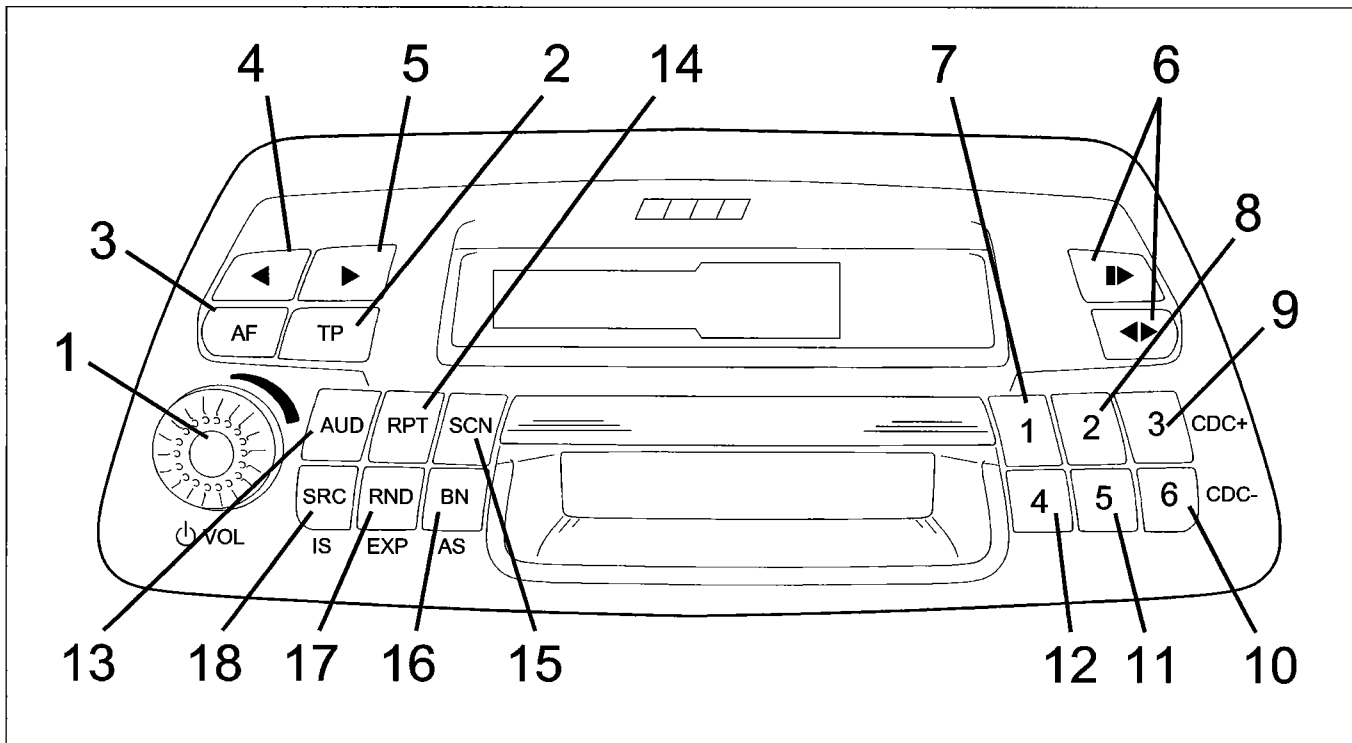
# 55.

|     |                           |        |                                                             |                                                                        |                                                             |                                                          |                                                             |                                                          |                                                             |
|-----|---------------------------|--------|-------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------|
| 9   | Preset station 3          | -      | FM/AM: recall preset station 3                              | FM/AM: store preselected station 3 PTY: store programme                | -                                                           | -                                                        | CDC +                                                       | -                                                        | -                                                           |
| 10  | Preset station 6          | -      | FM/AM: recall preset station 6                              | FM/AM: store preselected station 6 PTY: store programme                | -                                                           | -                                                        | CDC -                                                       | -                                                        | -                                                           |
| 11  | Preset station 5          | -      | FM/AM: recall preset station 5                              | FM/AM: store preselected station 5 PTY: store programme                | -                                                           | -                                                        | -                                                           | -                                                        | -                                                           |
| 12  | Preset station 4          | -      | FM/AM: recall preset station 4                              | FM/AM: store preselected station 4 PTY: store programme                | -                                                           | -                                                        | -                                                           | -                                                        | -                                                           |
| 13  | AUD: Audio settings       | -      | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | RESET return to original B/T/B/F/- AUD settings (CENTER)               | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | RESET return to original B/T/B/F/- AUD settings (CENTER) | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | RESET return to original B/T/B/F/- AUD settings (CENTER) | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) |
| 14  | RPT: Random               | -      | -                                                           | -                                                                      | On/off repeat track                                         | -                                                        | On/off repeat track                                         | On/off repeat CD                                         | -                                                           |
| 15  | SCN: Automatic store      | IS=OFF | Automatic scan of all preset stations on band in use        | Automatic store of all stations tunable on band in use (Search)        | Automatic selection of CD tracks                            | -                                                        | Automatic selection of CD tracks                            | -                                                        | -                                                           |
|     |                           | IS=ON  | Automatic scan of all preset stations on band in use        | Automatic scan of all stations on intelligent search system IS (Store) | Automatic scan of CD tracks                                 | -                                                        | Automatic scan of CD tracks                                 | -                                                        | -                                                           |
| 16  | BN: Select frequency band | -      | FM1, FM2, FM3, MW, LW                                       | Automatically store preset station groups                              | -                                                           | -                                                        | -                                                           | -                                                        | -                                                           |
| 17S | RND: Random repeat        | -      | -                                                           | EXPERT on/off                                                          | Random tracks                                               | EXPERT on/off                                            | Random tracks (on selected CD)                              | EXPERT on/off                                            | -                                                           |
| 18  | SRC: Select source        | IS=OFF | CD, RADIO, CDC (if connected)                               | -                                                                      | CD, RADIO, CDC (if connected)                               | -                                                        | CD, RADIO, CDC                                              | -                                                        | -                                                           |
|     |                           | IS=ON  | CD, RADIO, CDC (if connected)                               | Update intelligent search and store IS                                 | CD, RADIO, CDC (if connected)                               | -                                                        | CD, RADIO, CDC                                              | -                                                        | -                                                           |



### RADIO H3

This comes with a cassette player, antitheft protection, predisposition for mobile phone handsfree operation, connection lead for CD changer, possibility of steering wheel controls.



4A007ML01

The tables on the following pages details key functions according to operating mode (RADIO, CASSETTE, CD CHANGER, PHONE).

# 55.

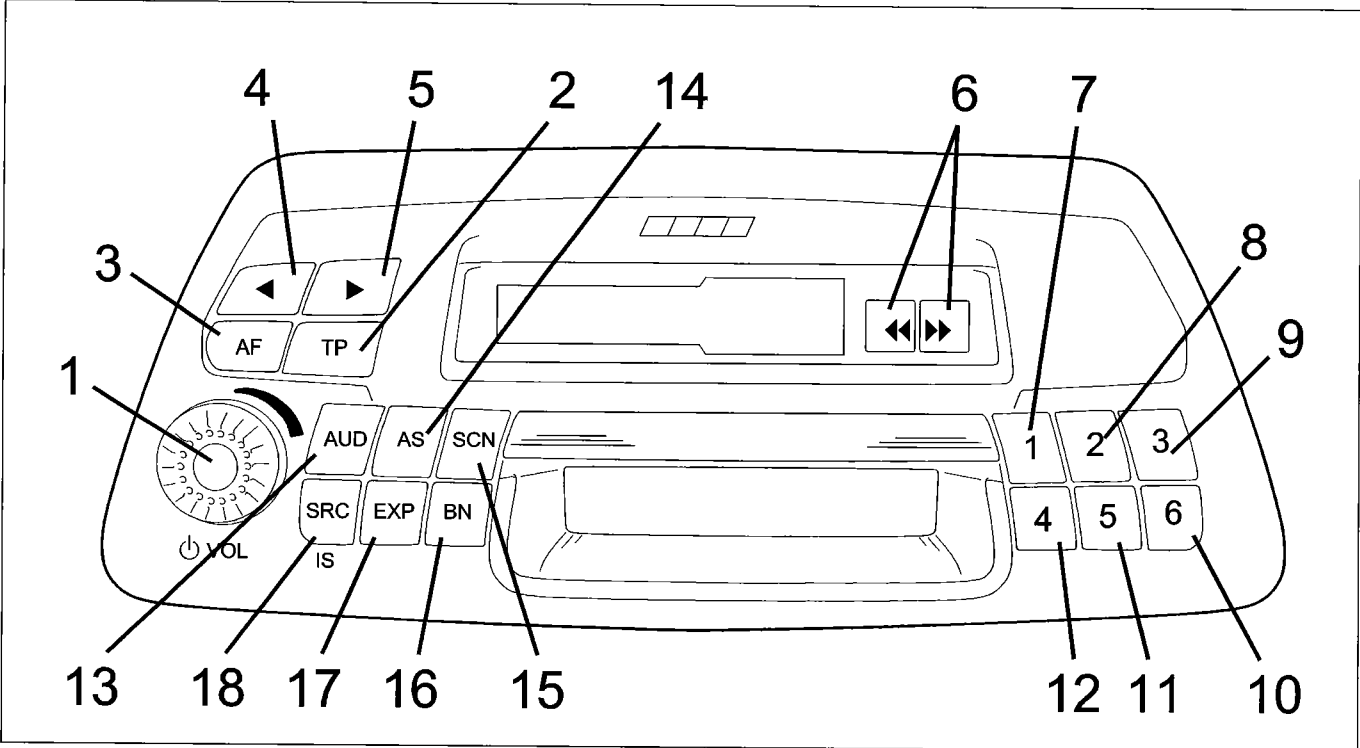
| Key | Function                           | Status<br>EXPERT | RADIO mode                                                                 |                                                                          | CASSETTE mode                                                               |                | CD-CHANGER mode                                                             |                                                                             | PHONE<br>mode |
|-----|------------------------------------|------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------|
|     |                                    |                  | short press                                                                | press > 2 secs                                                           | short press                                                                 | press > 2 secs | short press                                                                 | press > 2 secs                                                              |               |
| 1   | Radio on/off<br>VOL/AUD adjustment | -                | On/off: press<br>VOL/AUD adjustment:<br>Turn left: down, Turn right:<br>up | -                                                                        | On/<br>off: press VOL/AUD<br>adjustment: Turn left:<br>down, Turn right: up | -              | On/<br>off: press VOL/AUD<br>adjustment: Turn left:<br>down, Turn right: up | On/<br>off: press VOL/AUD<br>adjustment: Turn left:<br>down, Turn right: up | short press   |
| 2   | TP<br>Traffic<br>programme         | -                | TP ON/OFF                                                                  | PTY                                                                      | TP ON/OFF                                                                   | -              | TP ON/OFF                                                                   | -                                                                           | -             |
| 3   | AF:<br>Alternate<br>frequency      | -                | AF ON/OFF                                                                  | RDF ON/OFF                                                               | -                                                                           | -              | -                                                                           | -                                                                           | -             |
| 4   | Previous<br>(left)                 | IS=OFF           | FM: Search -<br>AM: Search -<br>PTY: Select next<br>programme              | FM:MAN -<br>AM:MAN -<br>PTY: Automatic<br>search (within pro-<br>gramme) |                                                                             |                |                                                                             |                                                                             | -             |
|     |                                    | IS=ON            | FM: Store next IS<br>AM: Search -<br>PTY: Select next<br>programme         | FM:MAN -<br>AM:MAN -<br>PTY: Automatic<br>search (within pro-<br>gramme) |                                                                             |                |                                                                             |                                                                             | -             |
|     |                                    | MSS=OFF          |                                                                            |                                                                          | Fast return (to begin-<br>ning of tape)                                     |                | Track - N                                                                   | Fast rewind<br>(continuous)                                                 |               |
|     |                                    | MSS=ON           |                                                                            |                                                                          | Track -N max. 9)                                                            |                | Track - N                                                                   | Fast rewind<br>(continuous)                                                 | -             |
| 5   | programme<br>(destra)              | IS=OFF           | FM: search +<br>AM: search +<br>PTY: Select next<br>programme              | FM:MAN +<br>AM:MAN +<br>PTY: Automatic<br>search (within pro-<br>gramme) |                                                                             |                |                                                                             |                                                                             |               |
|     |                                    | IS=ON            | FM: Store next IS<br>AM: search +<br>PTY: Select next<br>programme         | FM:MAN +<br>AM:MAN +<br>PTY: Automatic<br>search (within pro-<br>gramme) |                                                                             |                |                                                                             |                                                                             |               |
|     |                                    | MSS=OFF          |                                                                            |                                                                          | fast forward (to end of<br>tape)                                            |                | Track + N                                                                   | fast forward (contin-<br>ous)                                               |               |
|     |                                    | MSS=ON           |                                                                            |                                                                          | Track +N max.9)                                                             |                | Track + N                                                                   | fast forward (contin-<br>ous)                                               | -             |
| 6   | Eject                              |                  | Eject Tape                                                                 |                                                                          | Eject Tape                                                                  |                | Eject Tape                                                                  |                                                                             | Eject Tape    |
|     | Reverse                            | -                |                                                                            | -                                                                        | Reverse/Normal                                                              | -              | -                                                                           | -                                                                           | )             |

|     |                           |        |                                                             |                                                                        |                                                          |                                                             |                                                          |                                                             |                                                             |
|-----|---------------------------|--------|-------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| 7   | Preset station 1          | -      | FM/AM: recall preset station 1                              | FM/AM: store preselected station 1 PTY: store programme                | -                                                        | -                                                           | -                                                        | -                                                           | -                                                           |
| 8   | Preset station 2          | -      | FM/AM: recall preset station 1                              | FM/AM: store preselected station 2 PTY: store programme                | -                                                        | -                                                           | -                                                        | -                                                           | -                                                           |
| 9   | Preset station 3          | -      | FM/AM: recall preset station 3                              | FM/AM: store preselected station 3 PTY: store programme                | -                                                        | -                                                           | CDC+                                                     | -                                                           | -                                                           |
| 10  | Preset station 6          | -      | FM/AM: recall preset station 6                              | FM/AM: store preselected station 6 PTY: store programme                | -                                                        | -                                                           | CDC+                                                     | -                                                           | -                                                           |
| 11  | Preset station 5          | -      | FM/AM: recall preset station 5                              | FM/AM: store preselected station 5 PTY: store programme                | -                                                        | -                                                           | -                                                        | -                                                           | -                                                           |
| 12  | Preset station 4          | -      | FM/AM: recall preset station 4                              | FM/AM: store preselected station 4 PTY: store programme                | -                                                        | -                                                           | -                                                        | -                                                           | -                                                           |
| 13  | AUD: Audio settings       | -      | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | RESET return to original B/T/B/F/- AUD settings (CENTER)               | RESET return to original B/T/B/F/- AUD settings (CENTER) | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | RESET return to original B/T/B/F/- AUD settings (CENTER) | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) |
| 14  | RPT: Random               | -      | -                                                           | -                                                                      | On/off repeat track                                      | On/off repeat track                                         | On/off repeat CD                                         | -                                                           | -                                                           |
| 15  | SCN: Automatic store      | IS=OFF | Automatic scan of all preset stations on band in use        | Automatic store of all stations tunable on band in use (Search)        | -                                                        | Automatic scan of CD tracks                                 | -                                                        | -                                                           | -                                                           |
|     |                           | IS=ON  | Automatic scan of all preset stations on band in use        | Automatic scan of all stations on intelligent search system IS (Store) | -                                                        | Automatic scan of CD tracks                                 | -                                                        | -                                                           | -                                                           |
| 16  | BN: Select frequency band | -      | FM1, FM2, FM3, MW, LW                                       | Automatically store preset station groups                              | -                                                        | -                                                           | -                                                        | -                                                           | -                                                           |
| 17S | RND: Random repeat        | -      | -                                                           | EXPERT on/off                                                          | EXPERT on/off                                            | Random tracks (on selected CD)                              | EXPERT on/off                                            | -                                                           | -                                                           |
| 18  | SRC: Select source        | IS=OFF | CD, RADIO, CDC (if connected)                               | -                                                                      | CD, RADIO, CDC (if connected)                            | CD, RADIO, CDC                                              | -                                                        | -                                                           | -                                                           |
|     |                           | IS=ON  | CD, RADIO, CDC (if connected)                               | Update intelligent search and store IS                                 | CD, RADIO, CDC (if connected)                            | CD, RADIO, CDC                                              | -                                                        | -                                                           | -                                                           |

55.

RADIO M2

This comes with a cassette player and predisposition for mobile phone handsfree operation



4A008ML01

The tables on the following pages details key functions according to operating mode (RADIO, CASSETTE, PHONE).

| Key | Function                                       | Status<br>EXPERT | RADIO mode                                                                 |                                                                     | CASSETTE mode                                                              |                | PHONE<br>mode                                                           |
|-----|------------------------------------------------|------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------|
|     |                                                |                  | short press                                                                | press > 2 secs                                                      | short press                                                                | press > 2 secs |                                                                         |
| 1   | radio<br>VOL/AUD adjustment<br>on/off          | -                | On/off:<br>press VOL/AUD adjustment:<br>Turn left: down,<br>Turn right: up | -                                                                   | On/off: press VOL/AUD adjustment:<br>Turn left: down,<br>Turn right: up    | -              | On/off: press VOL/AUD adjustment:<br>Turn left: down,<br>Turn right: up |
| 2   | TP/Traffic<br>programme                        | -                | TP ON/OFF                                                                  | PTY ON                                                              | TP ON/OFF                                                                  | -              | -                                                                       |
| 3   | AF: Alternate<br>frequency                     | -                | AF ON/OFF                                                                  | RDF ON/OFF                                                          | -                                                                          | -              | -                                                                       |
| 4   | Previous<br>(left)                             | IS=OFF           | FM: Search -<br>AM: Search -<br>PTY: Select next<br>programme              | FM:MAN -<br>AM:MAN -<br>PTY: Automatic<br>search (within programme) | -                                                                          | -              | -                                                                       |
|     |                                                | IS=ON            | FM: Store next IS<br>AM: Search -<br>PTY: Select next<br>programme         | FM:MAN -<br>AM:MAN -<br>PTY: Automatic<br>search (within programme) | -                                                                          | -              | -                                                                       |
| 5   | programme<br>(destra)                          | IS=OFF           | FM: search +<br>AM: search +<br>PTY: Select next<br>programme              | FM:MAN +<br>AM:MAN +<br>PTY: Automatic<br>search (within programme) | -                                                                          | -              | -                                                                       |
|     |                                                | IS=ON            | FM: Store next IS<br>AM: search +<br>PTY: Select next<br>programme         | FM:MAN +<br>AM:MAN +<br>PTY: Automatic<br>search (within programme) | -                                                                          | -              | -                                                                       |
| 6   | Fast rewind                                    |                  |                                                                            |                                                                     | Fast rewind                                                                |                |                                                                         |
|     | Fast forward                                   |                  |                                                                            |                                                                     | Fast forward                                                               |                |                                                                         |
|     | Reverse or Eject<br>(IF PRESSED TO-<br>GETHER) | -                |                                                                            | -                                                                   | Reverse/Normal (IF PRESSED<br>HALF WAY) Eject Tape (IF<br>FULLY DEPRESSED) | -              |                                                                         |
| 7   | Preset station1                                | -                | FM/AM/PTY: recall preset sta-<br>tion1                                     | FM/AM: store preset<br>station 1 PTY:<br>store programme            | -                                                                          | -              | -                                                                       |
| 8   | Preset station2                                | -                | FM/AM/PTY: recall preset sta-<br>tion2                                     | FM/AM: store preset<br>station 2 PTY:<br>store programme            | -                                                                          | -              | -                                                                       |
| 9   | Preset station3                                | -                | FM/AM/PTY: recall preset sta-<br>tion3                                     | FM/AM: store preset<br>station 3 PTY:<br>store programme            | -                                                                          | -              | -                                                                       |

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|     |                           |        |                                                             |                                                                         |                                                             |                                                             |
|-----|---------------------------|--------|-------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| 10  | Preset station 6          | -      | FM/AM: recall preset station 6                              | FM/AM: store preset station 6 PTY: store programme                      | -                                                           | -                                                           |
| 11  | Preset station 5          | -      | FM/AM: recall preset station 5                              | FM/AM: store preset station 6 PTY: store programme                      | -                                                           | -                                                           |
| 12  | Preset station 4          | -      | FM/AM: recall preset station 4                              | FM/AM: store preset station 4 PTY: store programme                      | -                                                           | -                                                           |
| 13  | AUD: audio settings       | -      | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | RESET return to original B/T/B/F/-AUD settings (CENTER)                 | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) | Bass (B), Treble (T), Balance (B), Fader (F), Loudness (LD) |
| 14  | AS: Automatic store       | -      | Automatic store in preset station group                     | -                                                                       | -                                                           | -                                                           |
| 15  | SCN: Automatic scan       | IS=OFF | Automatic store of all preset stations on band in use       | Automatic store of all stations tunable on band in use (Search)         | -                                                           | -                                                           |
|     |                           | IS=ON  | Automatic store of all preset stations on band in use       | Automatic store of all stations in intelligent search system IS (Store) | -                                                           | -                                                           |
| 16  | BN: Select frequency band | -      | FM1, FM2, FM3, MW, LW                                       | -                                                                       | -                                                           | -                                                           |
| 17S | EXP: Expert               | -      | -                                                           | EXPERT on/off                                                           | EXPERT on/off                                               | -                                                           |
| 18  | SRC: Select source        | IS=OFF | TAPE, RADIO                                                 | -                                                                       | TAPE, RADIO                                                 | -                                                           |
|     |                           | IS=ON  | TAPE, RADIO                                                 | Update intelligent search and storage IS                                | TAPE, RADIO                                                 | -                                                           |

**OPERATION****ON/OFF**

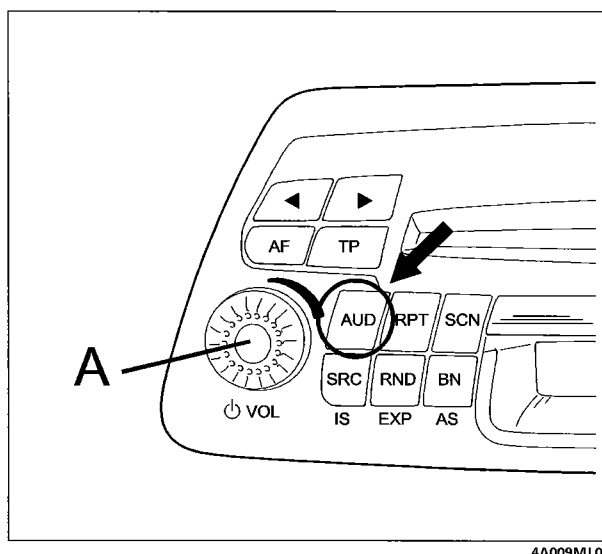
The set can be turned on and off in two ways.

1. Press knob A (VOL).
2. Turn on/off by means of car ignition switch. This function may be set in the EXPERT control level. Manual activation and deactivation are possible at all times in this case.

**NOTE:** *if the EXPERT "IGN" function is not active, the radio goes off automatically 20 minutes after the engine is turned off.*

**ADJUSTING VOLUME AND SOUND****Volume**

Adjust to required volume by means of knob A (VOL).  
the display shows: «VOL 00» □ «VOL 31».



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**Adjusting sound**

For each of the settings BASS, TREBLE, FADER, BALANCE, LOUDNESS:

1. Select functions by pressing the AUD key once or more.
2. Select the required sound setting by means of key A or select the basic setting: press the AUD key for longer than 2 seconds until the display shows «CENTER» Or «- -».
3. Finish adjustment: press the AUD key several times until the display shows «VOL ...».

**NOTE:** *the radio comes with a sound reproduction condition memory specific to each source type. This makes it possible to set different sound geometries (FADER, BALANCE) and frequency responses (BASS, TREBLE, LOUDNESS) for radio, cassette and phone sources (Automatic Sound Memory function)..After about 5 seconds, the control level with the current settings is automatically abandoned.*



### 55.

#### Example 1: bass setting.

Repeatedly press the **AUD** key until the display shows: «BASS 00».

Use the **A** key to adjust the bass tones.

To restore all sound settings to neutral (all set to zero), keep the AUD key depressed for longer than 2 seconds until the display shows "00"

**NOTE:** *this reset function only applies to the source in current use; the existing settings remain valid for the others. The LOUDNESS FUNCTION IS NOT INCLUDED IN THIS RESET FUNCTION MUST ALWAYS BE DEACTIVATED MANUALLY.*

#### Example 2: LOUDNESS setting

Repeatedly press the **AUD** until the display shows»LOUD«.

To activate(LOUD ON), turn the volume key anticlockwise; to deactivate (LOUD OFF) turn it clockwise. When the Loudness function is active, the display shows the symbol «LD».

#### Volume distribution FAD (FADER)

The FADER is used to distribute volume between the front speaker group «F» (Front) and rear group «R» (Rear). Use knob **A**. to adjust the function.

The display shows «FAD F -- -- R».

**Only for version M2:** *the function must be activated (see EXPERT settings) in the case of changes to the speaker system (4 x 5W speakers).*

*With the standard system (2 x 15W speakers) the function is not usable*

#### Volume ratio BAL (balance)

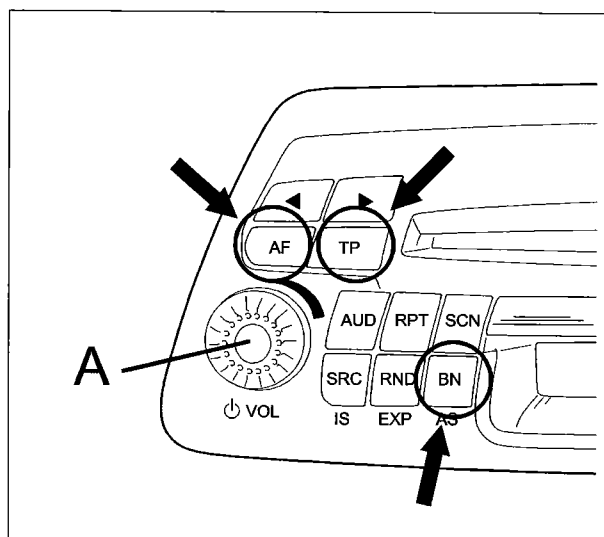
Balance is the volume ratio between the left and right hand speakers Use knob **A**. to adjust the function

The display shows«BAL L -- -- R».

#### Manual switching to MONO

See EXPERT settings This function is recommended when the radio is tuned to a station with a lot of interference, to reduce the background noise.

#### RADIO (Tuner)



**Range selection**

FM range: press the **BN** key repeatedly until the display shows the required range «FM 1», «FM 2» or «FM 3».

AM Range: press the **BN** key repeatedly until the display shows «MW» (medium wave) or «LW» (long wave).

**Last station memory**

Once the selection has been made, the last programme tuned on this range can be played (Last Station Memory) While in Last Station Memory mode, the set stores the settings present before it is turned off: selected station, CD or TAPE, and plays them when the set is turned on again.

**Stereo reception - FM**

When a stereo station is received, the display shows the corresponding symbol.

**Traffic information reception (TP)**

TP (Traffic Program): RDS station able to transmit traffic broadcasts.

TP function activation

Give the **TP** key a short press. This enables the traffic broadcast reception function: the display shows the message "TP"

When traffic information is received with the TP function active and another sound source is playing (e.g. CD or tape), the source is interrupted to listen to the radio information and the display shows the message "TA INFO" for 10 seconds.

At the end of the traffic information, the source is automatically switched to the source selected originally.

**NOTE:** *if the station tuned in is not an RDS station able to broadcast traffic information, a search is automatically started for an RDS station when the TP function is selected.*

**Interrupting traffic information**

Give the **TP** key a short press. The function still remains active to receive future traffic information.

**RDS-EON**

Because the radio offers the EON service, another station belonging to the same network may tune in while listening to a radio station to provide traffic information (only with TP function enabled); it will return to the original station automatically at the end of the news.

**NOTE:** *traffic information is provided at minimum volume.* This volume may be adjusted by means of the EXPERT control menu.

*If only traffic information is to be played, activate the function by means of the TP key and set the volume to zero using knob A*

**Alternative frequency (AF)**

During reception of an RDS programme that is broadcast by several stations at different frequencies, the radio will automatically switch to the frequency with the best local reception.

**NOTE:** *in a very poor reception area, the user may become aware of attempts to switch between sound frequencies due to frequent pauses.* In this case, it is advisable to deactivate the AF function temporarily.

### 55.

#### Deactivating AF function

**NOTE:** *this function can be deactivated only when receiving stations with alternative frequencies. To deactivate the AF, simply give the **AF** key a short press. When a short message »AF OFF« will appear on the display. Do the same to reactivate.*

**NOTE:** *the AF OFF reception condition should be considered a local, temporary solution because it involves manual compensation of a broadcasting service.*

For this reason, tuning will automatically be switched to AF ON upon each manual or automatic tuning control or selection of another stored station.

The AF OFF condition can be stored, together with the station, when it is activated before storage.

If an attempt is made to deactivate AF for a station that is not broadcasting using an RDS protocol, the message "NO AF" will appear on the display.

#### RDS OFF

With some stations (e.g. MF103.3-ISORADIO in Italy), it is advisable to store the station in RDS OFF mode to receive optimum reception.

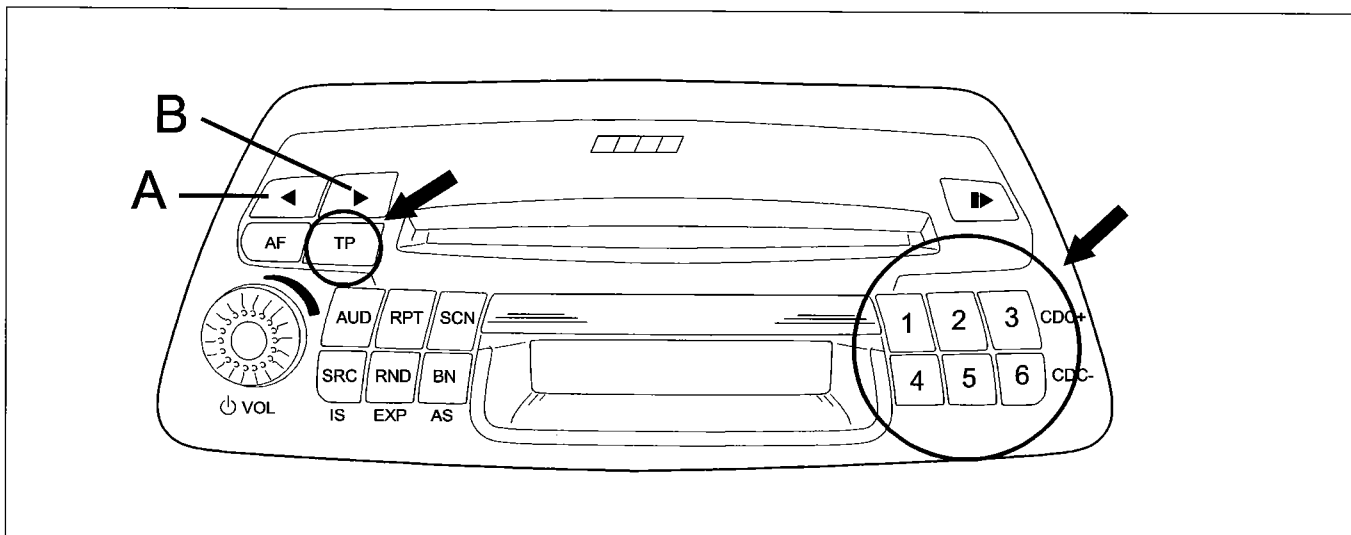
To activate RDS OFF mode, simply press the **AF** key for more than 2 seconds.

RDS OFF mode, as with AF OFF mode, is absolutely temporary. The RDS OFF condition can be stored, together with the station, whenever it is activated before storage.

#### Storing RDS stations/programmes

Press the **selection key for stations 1 to 6** for more than 2 seconds until the station can be heard again.

**NOTE:** *the AF ON/OFF and RDS ON/OFF modes are stored together with the station.*



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**TUNING****Tuning RDS stations/programmes with automatic search for stations**

1. Use key **BN** to select the range:: FM1, FM2, FM3, MW or LW.  
The automatic search within FM ranges operates with two degrees of sensitivity. During the first search through the reception range, the search is carried out for stations with high field intensity (local stations). The second search seeks stations with low field intensity (distant reception). The message "DX" appears on the display during the search.  
The DX function may be deactivated (see chapter on EXPERT control level)
2. An automatic search in the required direction may be started by giving a short press to one of the keys **A** or **B**. The display shows the relevant frequency: when a station with an identification code is found, this is shown on the display. Otherwise the frequency indication remains.  
If the RDS station/programme tunes within the selected range, it is stored on a selection key for stations **1 to 6**. The relevant number appears on the display, e.g. "3" for memory position 3.
3. If the tuned station is to be stored on a selection key, proceed as described in the paragraph on station selection keys.

**Recalling stored RDS station/programme**

Use the **BN** key to select the range: FM1, FM2, FM3, MW or LW.

Give a short press to the selection key for stations 1 to 6.

Even if the radio power supply is disconnected, the memory contents of the station selection keys are maintained.

**Manual frequency tuning**

1. Use key **BN** to select the range:: FM1, FM2, FM3, MW or LW.
2. Press one of the keys **A** or **B** for 2 seconds until "MAN" appears on the display and the frequency tuning is not visible. Continual switching takes place during fast forward when one of the keys is held down.
3. Use keys **A** or **B** to tune in the required direction: the frequency will be increased or reduced by 50 Hz while in FM or 1 kHz in AM.
4. If the tuned station is to be stored on one of the station selection keys, proceed as described in the paragraph on "Station selection keys".
5. Conclusion of manual frequency tuning: give a short press to one of the station selection keys from 1 to 6.

**NOTE:** *If no key is pressed for 60 seconds, manual frequency tuning is automatically concluded.*

**Automatic station storage: AUTOSTORE**

Automatically store the most powerful stations in the selected local reception range on station keys **1 to 6**.  
Range selection: FM I, FM 2, FM 3, MW or LW.

Press the **BN** key for more than 2 seconds until the message "AS" appears on the display and the frequency indication changes.

The station with the best reception can be heard at the end of the search.

## 55.

### Tuning RDS programmes (IS LEARN) function (see EXP)

The IS LEARN function (which can be run only after activating the EXPERT function) can be used to store up to 30 programmes in the IS memory (virtual memory area that does not correspond to storage keys).

Stored programmes can be called up one by one as described in the EXP section.

The IS memory is useful when the station selection keys are restored or when the tuning stops on a new reception field and you do not wish to delete stored stations from preset keys.

### Starting the automatic IS LEARN function

Use the **BN** key to select the range «FM 1», «FM 2» or «FM 3».

Press the **SRC** key for longer than 2 seconds. «IS ...» will appear on the display. the receiver starts the search.

If an attempt is made to start the IS LEARN search without the IS mode being active (see EXPERT), the display will show the message "EXPERT".

**NOTE:** *Always wait for the end of the automatic intelligent search (IS).*

If no reception is possible, the automatic intelligent research may stay on, e.g. in an underground garage or if the aerial is defective. In this case, the automatic search can be interrupted by pressing one of the station selection keys from 1 to 6.

The automatic intelligent search IS ensures up to 30 stations can be stored with optimum reception.

During automatic intelligent search IS, RDS programmes are stored first ordered by programme code, followed by FM stations.

### Calling up the contents of the IS memory

Stations can be called up from the memory in the required direction by giving a short press to one of the keys **A** or **B**. «IS-SCAN» appears on the display during station selection.

### Programme types (PTY)

Many radio programmes offer the programme type service (PTY) in the FM range (FM1, FM 2, FM3) The message «NEWS» is displayed during a news programme, for example.

The PTY function activates a search filter that allows the radio to tune only to stations that broadcast programmes with a preset PTY code.

### Programme types

The types of programme offered by a radio station vary according to the type of programme transmitted.

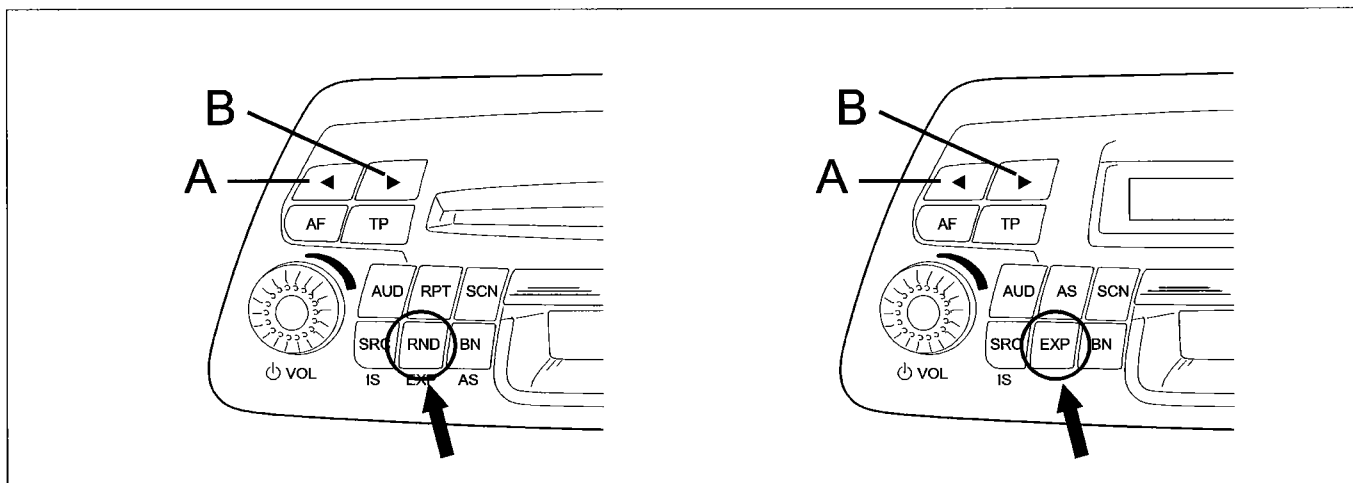
|          |                                  |
|----------|----------------------------------|
| NEWS     | News and topical matters         |
| AFFAIRS  | Politics and events              |
| INFO     | Special information programmes   |
| SPORT    | Sports broadcasts                |
| EDUCATE  | Education and training           |
| DRAMA    | Radio plays and readings         |
| CULTURE  | Culture, church and religion     |
| SCIENCE  | Science                          |
| VARIED   | Various                          |
| POP      | Pop music (hits and chart music) |
| ROCK M   | Rock music                       |
| EASY M   | Easy listening                   |
| LIGHT M  | Light classical music            |
| CLASSICS | Classical music                  |
| OTHER M  | Unclassified music programmes    |

|          |                                        |
|----------|----------------------------------------|
| WEATHER  | Weather forecasts                      |
| FINANCE  | Financial news                         |
| CHILDREN | Children's programmes                  |
| SOCIAL A | Social information                     |
| RELIGION | Religious and philosophical broadcasts |
| PHONE IN | Listeners' phone-ins (*)               |
| TRAVEL   | Tourist information                    |
| LEISURE  | Leisure, hobbies and pastimes          |
| JAZZ     | Jazz music                             |
| COUNTRY  | Country music                          |
| NATIONAL | National broadcasts                    |
| OLDIES   | Golden Oldies                          |
| FOLK M   | Folk music                             |
| DOCU     | Special documentaries                  |
| NO PTY   | No identification code                 |

(\*) differs from phone-in function, activated only with the handsfree connection for mobile phone

### Automatic PTY search

When selecting a programme type, an automatic search may be activated in two ways.



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1. Six programme types are allocated to the 6 programme keys (**station selection keys**). The preset allocation may be altered as required.
2. A programme type may be selected from the stored list and an automatic search may then be started.

The procedure is described below:

#### 1. Reactivate PTY function

Press the TP for longer than 2 seconds until the message «PTY ON» appears on the display. Then the last type of programme selected will appear on the display (e.g. «POP»).

#### 2. setting programme type

Give a short press to a key from 1 to 6. An automatic PTY search is started for the next station offering the selected programme type and the programme type is briefly displayed (e.g. "POP"), followed by the station code and the message "PTY".

Alternatively, press one of the keys **A** or **B** repeatedly until the required programme type appears on the display.

Press one of the keys **A** or **B** for more than 2 seconds until the automatic PTY search starts. La ricerca automatica PTY si arresta automaticamente sull'emittente successiva che offre il tipo di programma pre-selezionato, e mostra il tipo di programma (es. «POP») e la scritta «PTY».

**NOTE:** *If no station offers the selected programme type, the last station tuned is played and the PTY function is abandoned.*

#### 3. deactivating the PTY function

This occurs automatically after about 10 seconds.

### Storing PTY programme keys: station selection keys

The standard setting is defined in the table:

|      | 2     | 3   | 4      | 5        | 6       |
|------|-------|-----|--------|----------|---------|
| NEWS | SPORT | POP | ROCK M | CLASSICS | EDUCATE |

Each station selection key may be occupied by any programme type as required:

#### 1. Activating the PTY function:

Press the TP key for longer than 2 seconds until the display shows »PTY ON« and select the set programme type (e.g. «NEWS»).

#### 2. Press one of the keys **A** or **B** repeatedly until the required programme type appears on the display.

#### 3. Press one of the station selection keys for longer than 2 seconds.

## 55.

### Scanning stored stations (SCAN)

The SCAN function allows automatic scanning of stored stations.

With IS LEARN OFF (EXP):

- short press: scan of all preset stations (**keys 1-6**) for all FM bands, or the 6 MW stations, or the 6 LW stations
- press for more than 2 seconds: scan of all stations receivable on the FM band.

With IS LEARN ON (EXP):

- short press: scan of all preset stations (**keys 1-6**) for all FM bands
- press for longer than 2 seconds: scan IS LEARN

### EXPERT CONTROL LEVEL

To make daily radio control as easy as possible, the supplementary control level (EXPERT) contains several settings that may be required once only or only occasionally.

### LIST OF POSSIBLE EXPERT SETTINGS

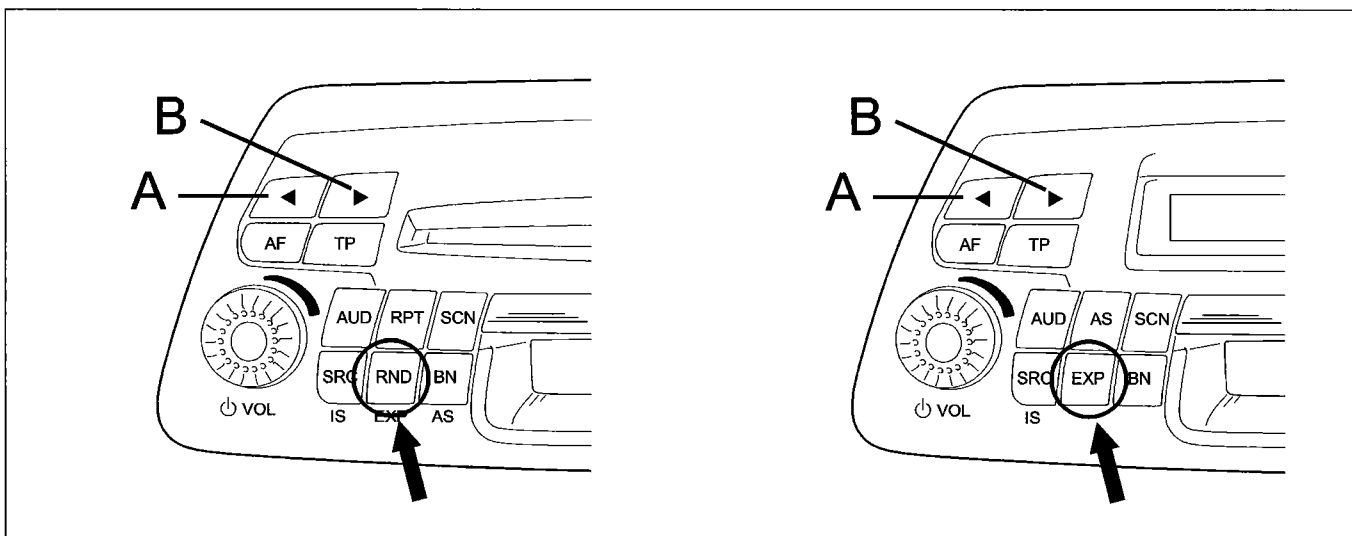
|    |                                                                                                   |
|----|---------------------------------------------------------------------------------------------------|
| 1  | Hour setting (TM)                                                                                 |
| 2  | Activation/deactivation of time synchronisation with time sent by some RDS stations (SYNC)        |
| 3  | Setting of maximum volume upon start-up (ON VOL)                                                  |
| 4  | Setting of minimum volume for traffic information (TA VOL)                                        |
| 5  | Activation deactivation by means of car ignition switch (IGN)                                     |
| 6  | IS LEARN activation/deactivation (IS)                                                             |
| 7  | LRN activation/deactivation (LRN)                                                                 |
| 8  | Automatic program change (REG) activation/deactivation                                            |
| 9  | Delayed booster activation (BDLY)                                                                 |
| 10 | Suppression of sound in case of incoming/outgoing phone call with handsfree set connected (PHONE) |
| 11 | Setting phone input sensitivity (PHONE)                                                           |
| 12 | Activation of security code (CODE)                                                                |
| 13 | Control of volume according to speed (SC VOL)                                                     |
| 14 | Sound confirmation of functions (BEEP)                                                            |
| 15 | Choice of MONO/STEREO radio broadcasting (MONO)                                                   |
| 16 | LOC activation/deactivation (LOC)                                                                 |



## ALTERING EXPERT SETTINGS

### Turning on EXPERT

Depress the **EXP** key for 2 seconds until «EXPERT» appears on the display.



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### Choosing options

Select the settings to be checked or altered using keys **A** or **B**.

**Example:** Setting maximum volume upon start-up. (N.3): use keys **A** or **B** to select the required option (e.g. ONVOL 13), the display shows «ONVOL 13». The selected station is played at the set speed.

### Altering the setting

Turn the volume knob to set the required volume, the display shows "ONVOL 20", for example. Turn the knob clockwise: increase the value; turn the knob anticlockwise: reduce the value.

### Concluding the setting

Set the next function using keys **A** or **B**

Alternatively, press the **EXP** for 2 seconds until "EXIT" appears on the display. EXPERT mode is closed (except for the code and clock).

## POSSIBLE SETTINGS

### 1 - set time

«TM 2:13» appears, for example.

Turn the volume knob to set hours and minutes:

- turn fast to adjust hours
- turn slow to adjust minutes

Give a short press to the **EXP** key to start the clock.

### 2 - activate/deactivate synchronisation of the clock with the time sent by some RDS stations

- turn volume knob clockwise: «SYNC ON»: the built-in clock goes forward (synchronisation) toward RDS information.
- turn the knob anticlockwise: »SYNC OFF«.

Synchronisation may be deactivated in places where no RDS TIMER signal is received.

**NOTE:** The signal sent by the stations may often be incorrect.

### 55.

#### 3 - setting maximum volume upon start-up

«ONVOL 20» appears for example, where 20 is the setting in a range that extends up to 31

- turn volume knob clockwise: VOL +
- turn volume knob anticlockwise: VOL -

Volume is limited only when volume is higher than the set value when the radio is turned off.

#### 4 - setting minimum volume for traffic information

«TA VOL 16» appears for example (limit values from 4 to 31)

- turn volume knob clockwise = VOL +
- turn volume knob anticlockwise = VOL -

During adjustment, the volume is as selected for traffic news.

#### 5 - automatic deactivation by means of car ignition switch

- turn volume knob clockwise: «IGN ON» appears : in this way, the radio can be turned on/off using the car ignition switch.
- turn volume knob anticlockwise: "IGN OFF": activation/deactivation takes place only via the VOL knob.

#### 6 - IS LEARN activation/deactivation

- turn volume knob clockwise: «IS ON» appears
- turn volume knob anticlockwise: «ISN OFF».

#### 7 - LRN activation/deactivation

With «LRN OFF» (standard mode) the radio remains on the selected station until the incoming signal is practically illegible.

In «LRN ON» mode, the radio turns to another station as soon as the incoming signal quality falls.

When in an area where the reception of RDS programmes with traffic news is uncertain, the station search may be blocked in the radio function.

- turn volume knob clockwise: «LRN ON» appears: automatic search of traffic news broadcasts is activated automatically,
- turn volume knob anticlockwise: «LRN OFF»: automatic search of traffic news broadcasts is not activated.

#### 8 - activation/deactivation of automatic regional programme change

When the same RDS programme is transmitted from various regional stations, the radio may switch between stations due to the reception field.

- turn volume knob clockwise: "REG ON" appears: regional programme may be changed automatically in this mode.
- turn volume knob anticlockwise: «REG OFF»: regional programme cannot be changed automatically.

#### 9 - delayed activation/deactivation for connected booster (BDLY)

**NOTE:** remember that the Booster switch signal is connected to pin C6 of the radio.

This mode eliminates the abrupt on/off manoeuvre:

- turn volume knob clockwise: »BDLY ON» appears
- turn volume knob anticlockwise: «BDLY OFF»: is disabled.

**10 - suppression of sound in case of incoming/outgoing phone call**

- turn volume knob clockwise: «PHONE OFF» no use of phone connection
- turn volume knob clockwise: «PHONE ON»: the radio sound is automatically deactivated in the case of a phone call

The «PHONE ON» function required the mobile phone mount base to be connected.

The «PHONE IN» function allows a conversation via the car speakers in the case of a phone call.

The «PHONE IN» function requires the mobile phone to be connected in handsfree mode

If the radio is off, a phone call (IN or OUT) is still possible. In this case the radio

- comes on automatically;
- allows listening under sound conditions identical to the last phone call (BASS, TREBLE, FADER, BALANCE);
- goes off automatically at the end of the phone call

**11 - setting mobile phone input sensitivity**

Allows adaptation to the signal broadcast level for the type of handsfree system installed.

- turn volume knob anticlockwise: «PHONE 00» : low input sensitivity
- turn volume knob clockwise: «PHONE 03»: high input sensitivity

**12 - security code activation**

The code is not activated if «CODE» appears on the display.

If «SAFE» appears on the display, the code is activated.

**NOTE:** See next section for more detailed instructions.

**13 - Controlling volume according to vehicle speed (SCV)**

Standard value: «SCVOL 19»

Function off: «SCVOL - -«

Function at maximum efficiency: «SCVOL 34»

**Setting:**

1. Vehicle still, engine on: set required volume using the relevant knob.  
Depress the EXP key for more than 2 seconds until «EXPERT» appears on the display.
2. Use keys A or B to select the «SCVOL» setting.
3. Set the required value using the volume knob:
  - turn volume knob clockwise: VOL +
  - turn volume knob anticlockwise: VOL -

**14 - audible function confirmation (BEEP)**

The BEEP function is active in the system

This function gives an audible confirmation (BEEP) of the functions. Function activation requires continuous pressing of the key for a time greater than or equal to 2 seconds.

**15 - select MONO/STEREO radio reproduction**

- turn volume knob clockwise: «MONO ON».
- turn volume knob anticlockwise: «MONO OFF».

**16 - activate/deactivate LOC**

The automatic search in the FM range may be used at two sensitivity levels. When in search of stations, the set may be tuned with high field intensity (local stations) or low field intensity (distant reception).

- turn volume knob clockwise: «LOC ON».
- turn volume knob anticlockwise: «LOC OFF».

# 55.

## CODING

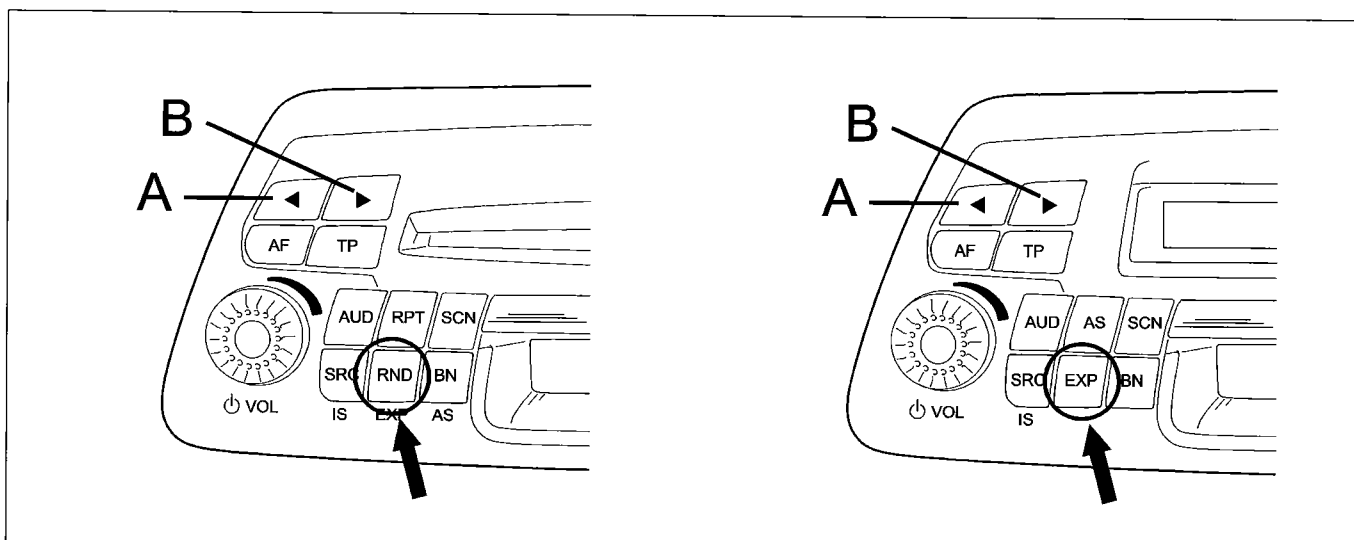
When coding is activated, the radio is protected electronically as soon as the radio is disconnected from the car power supply. It can be made to work again only by entering the code. The radio code is on the CODE CARD



4A020ML01



**ATTENTION:** coding is not activated initially by the Manufacturer



4A017ML01

## ACTIVATING THE CODE

1. Select the EXPERT code level and press keys **A** or **B**, until «CODE» appears on the display.
2. Enter the first figure of the code by turning the volume knob and confirm by pressing the **RND/EXP** key.

Example: **1 7 0 3**

- turn the volume knob to display the figure«1---«  
press the **RND/EXP** key briefly to confirm
- turn the volume knob to display the figure«17«  
press the **RND/EXP** key briefly to confirm
- turn the volume knob to display the figure«170-«  
press the **RND/EXP** key briefly to confirm
- turn the volume knob to display the figure«1703»»  
press the **RND/EXP** key briefly to confirm

3. To confirm the code: press the EXP key, «SAFE» appears on the display : **the code is activated.**
4. To deactivate EXPERT mode: press the EXP key until «EXIT» appears on the display.

**Checking code activation**

Select the EXPERT control level and press keys **A** or **B** until «SAFE» or «CODE» appears on the display:

If «SAFE» appears: the code is activated

If «CODE» appears: the code is not activated

**DEACTIVATING THE CODE**

1. Activate EXPERT mode: «SAFE» appears on the display.
2. Set the code, as described previously.
3. To confirm the code: briefly press the **EXP** key until «CODE» appears on the display: the coding is no longer active.

**NOTE:** *If an incorrect code is entered, the message «SAFE» remains on the display and the procedure must be repeated in full. Respect the **waiting times** between one attempt and the next, as indicated below.*

**RESTORING TO OPERATION**

If the radio is disconnected from the car power supply (e.g. when servicing), it is protected electronically with the code active.

1. Turn on the radio: the message «SAFE» appears on the display, «1 - - -» appears after more than 3 seconds. The «1» marks the number of input attempts.
2. Set the code, as described in CODE ACTIVATION.
3. Confirm the code by pressing the EXP key briefly. The message "SAFE" appears on the display. The radio switches on after about 3 seconds.

**NOTE:** *If an incorrect code is entered, the message «SAFE» remains on the display, the radio does not come on and the procedure must be repeated completely. Respect the **waiting times** between one attempt and the next, as indicated below.*

**WARNING: waiting times**

To make it impossible to restore the radio to operation and deactivate the code by repeated, successive attempts, specific waiting times must be left between attempts.

The radio must not be switched on during the standby time.

It must still be connected to the power supply

As long as the message "SAFE" is on the display, the waiting time is not over.

The waiting time is up when the number of the next attempt can be seen on the display (e.g. "2- - -").

The following table shows the waiting times between attempts:

| Unsuccessful attempts<br>(number shown on display) | Approximate waiting time |
|----------------------------------------------------|--------------------------|
| 1                                                  | 21 seconds               |
| 2                                                  | 1.5 seconds              |
| 3                                                  | 5.5 seconds              |
| 4                                                  | 22 seconds               |
| 5                                                  | 1.5 seconds              |
| 6                                                  | 6 seconds                |
| 7                                                  | 24 seconds               |

### 55.

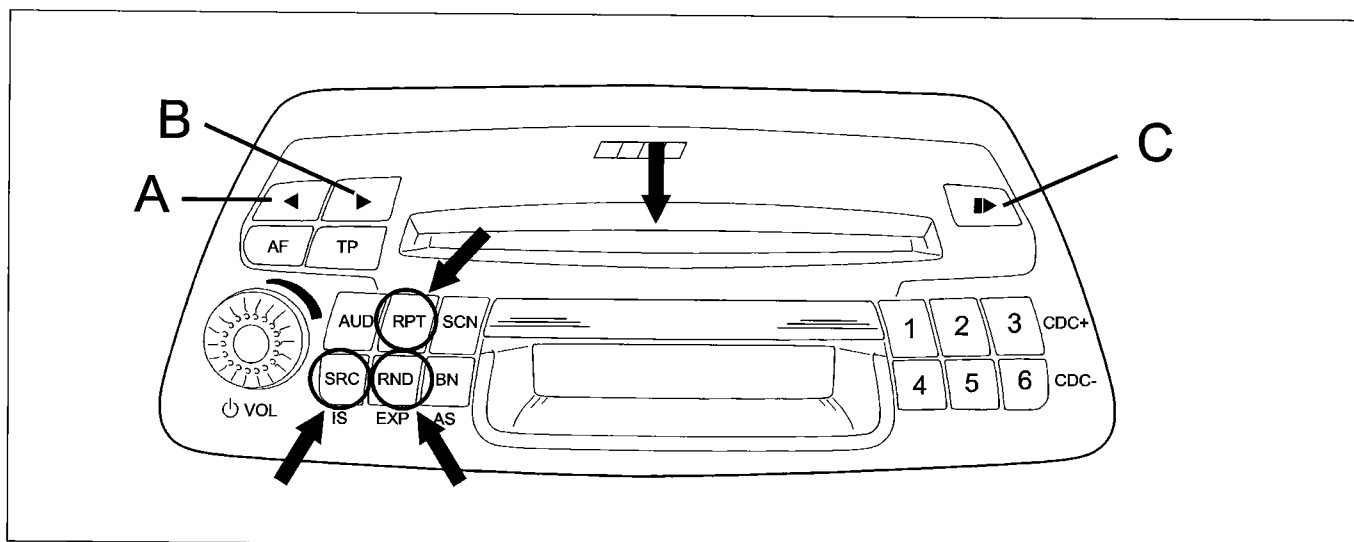
#### COMPACT DISC PLAYER – only for H4 version

##### Activating CD operation

Place a CD in the slot and press slightly, the player will draw in the CD automatically.

If a CD is already present in the slot, press the SRC key until the message «DISC» appears on the display; the CD begins to play automatically.

SRC = Source; the sources are: RADIO, DISC, CDC (CD Changer)



4A022ML01

##### Choosing a track

Keep tapping key A to choose a track in increasing order; similarly, keep tapping key B to choose a track in decreasing order.

##### Fast forward to a track

Hold keys A or B down continuously to fast forward or return to the track being played.

##### Repeating a track

Press the RPT key to repeat the track being played currently; the wording «RPT ON» appears on the display for a few seconds.

The current track will be repeated until the function is deactivated by pressing the RPT key again; the wording «RPT OFF» appears on the display for a few seconds.

##### RANDOM track selection

Tracks to be played are selected automatically after pressing the RND key; the message «RND ON» appears on the display for a few seconds.

The function is interrupted by pressing RND again; the message «RND OFF» appears on the display for a few seconds.

##### Automatic track scan

Press the SCN key to play all tracks on the CD for about 10 seconds each. The message «SCN ON» appears on the display for a few seconds.

The function is suspended by pressing SCN again; the message «SCNOFF» appears on the display for a few seconds.

##### Concluding operation and removing the CD

Simply press the C EJECT key to remove the CD from the player.

The wording «EJECT» appears for a few seconds on the display.

Alternatively press the SRC key, the source changes from DISC to CDC (if CD Changer present) or RADIO. Source selection is sequential: RADIO, DISC, CDC.

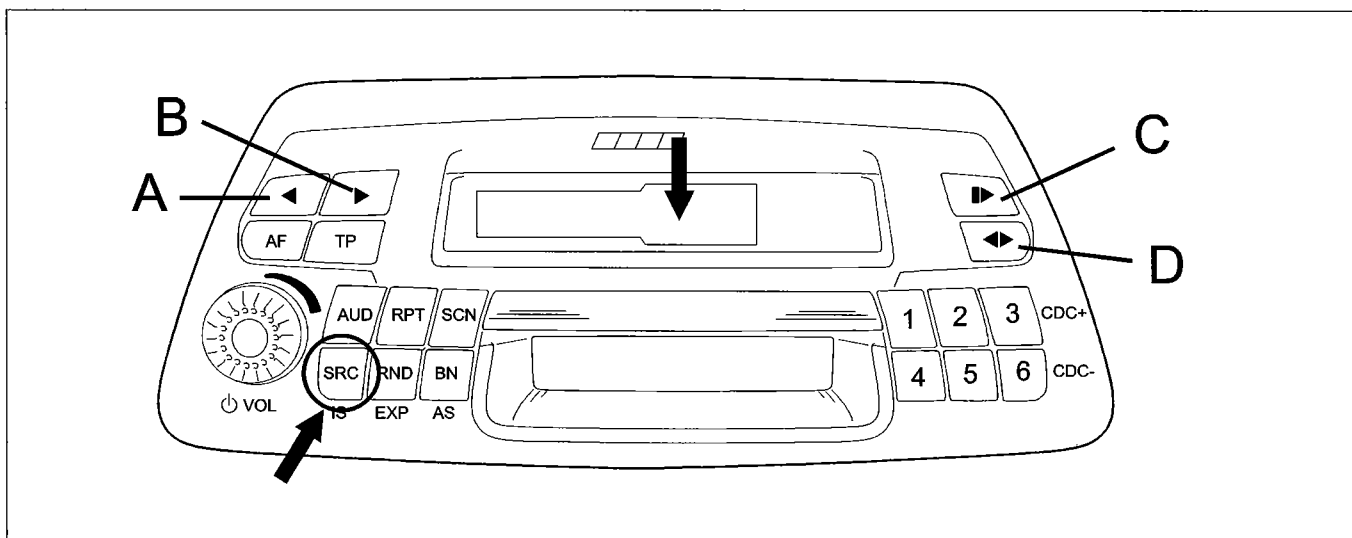
**NOTE:** Status of RPT, RND, SCN functions are not stored when the radio set is turned off.

**TAPE PLAYER - version H3**
**Activating tape operation**

Place a tape in the slot. «TAPE A» or «TAPE B» appears on the display.

If the slot already contains a tape, press the SRC repeatedly until «TAPE» appears on the display.

SRC = Source; the sources are: RADIO, TAPE, CDC.



4A023ML01

**Changing the tape side**

Press the **D** REVERSE key briefly.

When the end of the tape is reached the side changes automatically.

The meanings of the symbols on the display are as follows:

"TAPE A" : top side of tape

"TAPE B" : bottom side of tape.

**MSS function**

MSS = Music-Search-System

This function can be used to forward/rewind to the beginning of the track to obtain the "skip track" or "repeat track" function.

Pauses of at least 3 seconds are left between tracks for the MSS function (without an announcement text). Musical pieces with very low passages (e.g. classical music) are not suitable because these are treated as pauses.

**Activating MSS**

The MSS function can be turned on or off from the EXPERT menu; the standard condition is MSS ON

In this configuration, press key **B** to make the radio skip a number of tracks corresponding to the number of presses on the key; «+ --» appears on the display.

Example: 3 short presses on the key: skip three tracks;; «+3» appears on the display.

When keys **A** or **B** are pressed for longer than 2 seconds, the CD player is made to forward/rewind fully to the end of the tape.

If the MSS function is deactivated ( from EXPERT) a short press on key **A** or **B** allows fast forward or fast rewind of the tape.



### 55.

#### Finish MSS before time

Press key **A** or **B** until «0» appears on the display. The player stops in its current forward/rewind position and starts to play the track from that point.

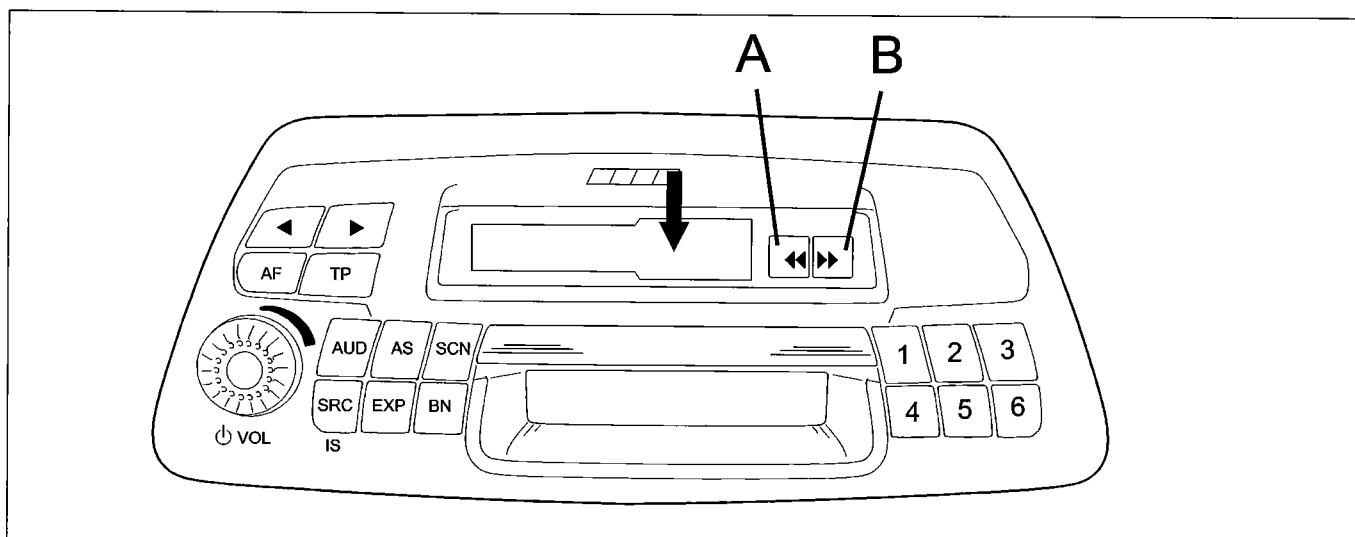
#### Concluding tape operation

Press the **C** EJECT key: the tape is ejected. «EJECT» appears briefly on the display

Alternatively press the key **SRC**, the source changes from TAPE to MCD (if CD CHANGER is present) or RADIO. source selection is sequential: RADIO, TAPE, MCD.

**NOTE:** *The source is switched immediately if the fast rewind or fast forward function is active but the tape player completes its current function.*

#### TAPE PLAYER - version M2



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#### Changing the tape side

Press keys **A** and **B** half way down.

When the end of the tape is reached the side changes automatically.

The meanings of the symbols on the display are as follows:

"TAPE A" : top side of tape

"TAPE B" : bottom side of tape.

#### Fast forward/rewind

Fully depress keys **A** and **B**

#### Suspending operation

To suspend operation, briefly press the key opposite to the active key.

The tape begins to play automatically

#### Concluding tape operation

Fully depress the fast forward and rewind keys simultaneously. The tape will be ejected.

### MULTIPLE COMPACT DISC PLAYER (CD changer)

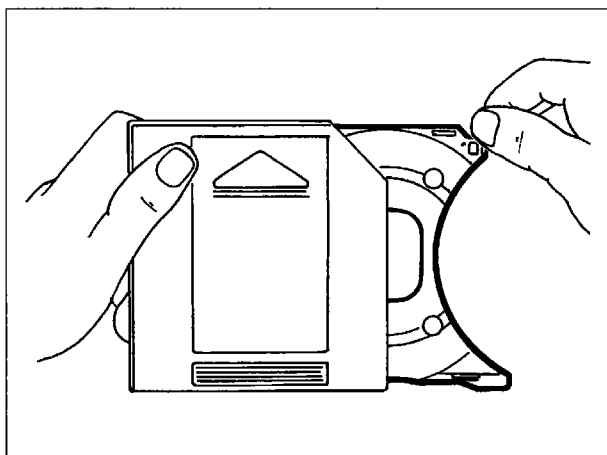
The radio set (*in H4 and H3 versions*) is designed to work with compatible compact disc players available from the Fiat Accessory range.

The Fiat Accessory range player comes with a loader that can hold up to 6 CDs.

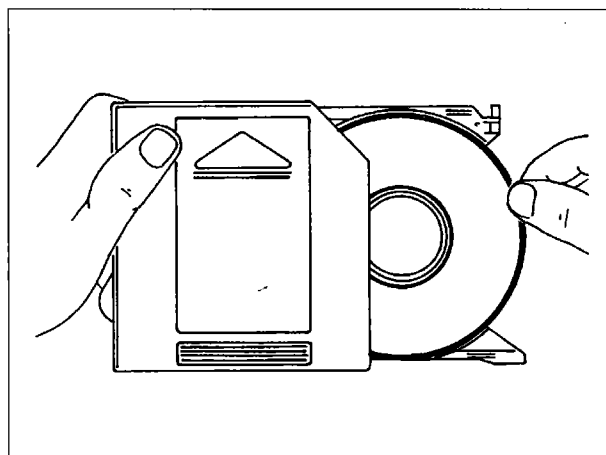
#### Filling the loader

The holder contains 6 holders that can each contain one compact disc.

Take a holder from the loader for each CD to be played and insert the CD



4A025ML01



4A025ML02

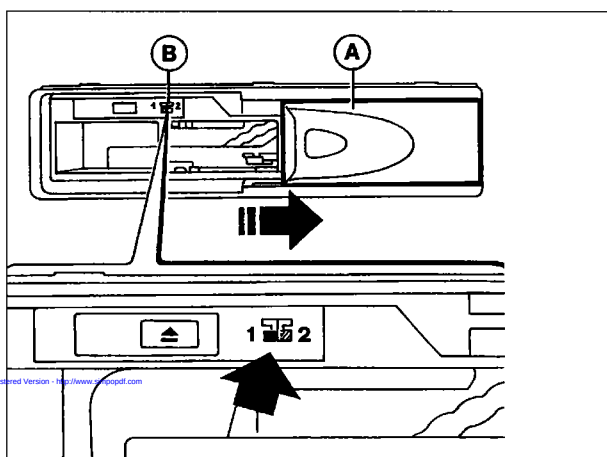
Ensure the CD label is facing the correct way, i.e. toward the holder. Otherwise the player will not work

**NOTE** *The CD player is not designed for playing 8 cm CDs, which require adaptors available from Hi-Fi stores.*

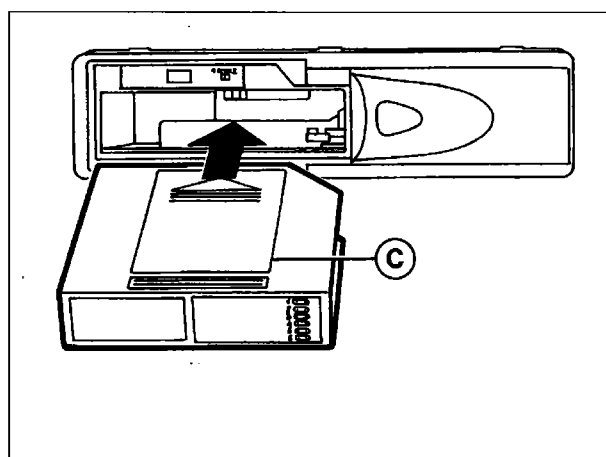
#### Inserting the loader into the CD player.

Proceed as follows:

- move sliding flap **A** fully to the right until it locks
- check that switch **B** is in position "1"



4A025ML03



4A025ML04

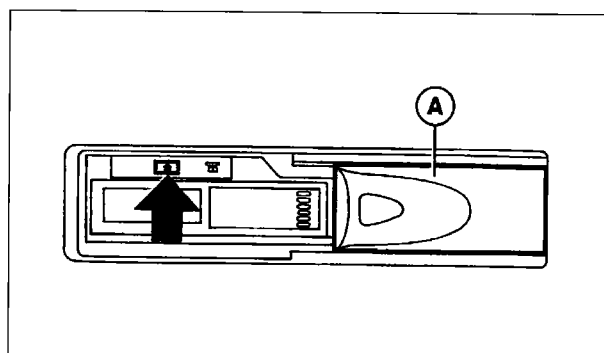
- insert loader **C**- into the CD player with the labelled side (see arrow) facing up.
- close sliding flap **A** after inserting the loader in order to prevent foreign bodies or dust entering the CD player.

### 55.

#### Removing the loader from the CD player.

Proceed as follows:

- slide flap **A**- to the right until it is no longer locked
- press the eject button on the CD player, .



4A026ML01

#### Removing the CDs from the loader

Remove the CDs in order after removing the holders from the loader.

### CD PLAYER OPERATION

#### Selecting CD changer programme source

Press the SRC briefly and repeatedly until the message «MCD» appears on the display.

#### Choosing a CD

Keep tapping station selection key 3 or 6 until the number of the required CD appears on the display.

3: previous CD

6: next CD

#### Selecting or repeating a track

Keep tapping the «RIGHT» or «LEFT» keys until the required track number appears on the display.

«RIGHT»: next track

«LEFT»: the track currently playing or the previous track is repeated.

#### Play a track on the selected CD for 10 seconds (SCAN)

Press the SCAN key briefly.

«SCAN ON» appears briefly on the display.

To stop this function briefly press SCAN key.

«SCAN OFF» appears briefly on the display.

#### Fast forward and return (TRACK FAST)

To listen to the track at reduced volume during track fast:

Forward: press "RIGHT" and hold down.

Return: press "LEFT" and hold down.

#### Repeat track (TRACK REPEAT)

To repeat the current track continually: press the RPT key, "TRK ON" appears on the display.

A different track may be selected.

Press RPT key again to suspend the function: «TRK OFF» appears on the display.

**Repetition of a CD (REPEAT)**

To repeat the current CD continuously: press the RPT key for longer than 2 seconds: "RPT CD" appears on the display.

A different CD may be selected. To suspend the function, press the RPT key again for longer than 2 seconds: «RPT MAG» appears on the display.

**Selecting tracks in a random sequence (TRACK RANDOM)**

To start the random track search:

press the RND key: "RND ON" appears on the display. The selected CD tracks are played in a random sequence.

Press the RND key again to end the random track search: "RND OFF" appears on the display.

**NOTE:** *The TRACK RANDOM function cannot be combined with the TRACK REPEAT and CD REPEAT functions.*

**Concluding CD operation****Press the EJECT key**

Alternatively, press the SRC to listen to the radio again

**ADVICE AND PRECAUTIONS****RECEPTION CONDITIONS**

The reception conditions will vary greatly while driving.

Reception can be affected by mountains, buildings or bridges especially when far away from the transmitter of the station you are listening to.

**NOTE:** *When listening to traffic information (TA), the volume may rise considerably compared to normal levels.*

**MAINTENANCE**

The radio is built for long-term use without any special maintenance requirements.

If necessary, clean the panel with a soft, antistatic cloth. Cleaning and polishing products could damage the surface.

**TAPES**

For optimum playing conditions:

- do not use poor quality tapes, with deformations or peeling labels;
- do not leave the tape inside the radio when not in use;
- do not introduce any objects into the cassette slot;
- do not expose the tapes to sunlight, excessive temperature or high moisture levels;
- replace the tapes in their cases after use;
- dirt on the playing heads caused by tapes could eventually lead to a reduction in high tones during playing. It is therefore advisable to clean the playing heads at intervals using a special non-abrasive head cleaning tape;
- it is preferable to C60 tapes or in the worst case C90 tapes to ensure optimum playing quality at all times. The very fine tape contained in very long cassettes could also break very easily;
- avoid inserting cassettes with loose tapes, particularly if C90, because the tape could emerge and block the mechanism. If the radio detects a loose tape or similar problems, the cassette is in any case automatically ejected;
- do not lubricate the tape mechanism;
- do not touch the playing heads with magnetic or hard items.

### 55.

#### COMPACT DISC

When using the Compact Disc player, remember that dirt or marks on the CD could cause the track to jump or lead to poor sound quality.

The same thing happens if CDs are inadvertently bent.

For optimum playing conditions:

- carefully clean each CD to remove fingerprints and dust using a soft cloth;
- hold the CDs at the edges and clean from the middle outward;
- never use chemical products to clean (e.g. sprays, antistatic products or thinners) because they could damage the CD surfaces;
- replace the CDs in their containers after use to avoid creating marks or scratches that could cause the tracks to jump;
- do not expose the CDs to direct sunlight, high temperatures or moisture for long periods. Avoid bending;
- do not stick labels onto or write on the recorded surfaces of CDs;
- to remove a CD from its case, press in the centre and lift the disc out by holding carefully around the edges;
- always hold CDs by the edges. Never touch the surface;
- new CDs may be rough around the edges. When these discs are used, the radio may not play correctly.
- do not use CDs that are scratched, cracked or deformed etc. The use of such discs could lead to malfunction or damage.

page

|                   |     |
|-------------------|-----|
| - Wiring diagrams | 1   |
| - Key             | 169 |

Electrical equipment  
Wiring diagrams  
55.

| DESCRIPTION                                                                                                                                                                                       | Bravo       |             |              |             |             |             |             | Brava       |             |              |             |             |             |             |             |             |             |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                                                                                                                                                                                   | SX          |             |              | GT          |             |             | HGT         | SX          |             |              | ELX         |             |             |             | HSX         |             |             |             |
|                                                                                                                                                                                                   | 1242<br>16V | 1581<br>16V | 1910<br>75CV | 1581<br>16V | 1747<br>16V | 1910<br>JTD | 1998<br>20V | 1242<br>16V | 1581<br>16V | 1910<br>75CV | 1242<br>16V | 1581<br>16V | 1747<br>16V | 1910<br>JTD | 1242<br>16V | 1581<br>16V | 1747<br>16V | 1910<br>JTD |
| Side lights and warning light - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights                                                              | 5           | 5           | 5            | 5           | 5           | 5           | 5           | 5           | 5           | 5            | 5           | 5           | 5           | 5           | 5           | 5           | 5           | 5           |
| Fog lights and warning light - Rear fog lamps and warning light                                                                                                                                   | 7           | 7           | 7            | 7           | 7           | 7           | 7           | 7           | 7           | 7            | 7           | 7           | 7           | 7           | 7           | 7           | 7           | 7           |
| Fiat-CODE and failure warning light                                                                                                                                                               | 9           | 11          | 17           | 11          | 13          | 19          | 15          | 9           | 11          | 17           | 9           | 11          | 13          | 19          | 9           | 11          | 13          | 19          |
| Driver's EURO-BAG and failure warning light                                                                                                                                                       | 21          | 21          | 21           | 21          | 21          | 21          | 21          | 21          | 21          | 21           | 21          | 21          | 21          | 21          | 21          | 21          | 21          | 21          |
| Twin EURO-BAGS (driver and passenger) and failure warning light                                                                                                                                   | 23          | 23          | 23           | 23          | 23          | 23          | 23          | 23          | 23          | 23           | 23          | 23          | 23          | 23          | 23          | 23          | 23          | 23          |
| Twin EURO-BAGS (driver and passenger), SIDE-BAG and failure warning light                                                                                                                         | 25          | 25          | 25           | 25          | 25          | 25          | 25          | 25          | 25          | 25           | 25          | 25          | 25          | 25          | 25          | 25          | 25          | 25          |
| Anti-lock brakes and failure warning light (A.B.S.)                                                                                                                                               | 27          | 27          | 27           | 27          | 27          | 27          | 27          | 27          | 27          | 27           | 27          | 27          | 27          | 27          | 27          | 27          | 27          | 27          |
| Electrically adjustable, heated external rear view mirrors                                                                                                                                        | 29          | 29          | 29           | 29          | 29          | 29          | 29          | 29          | 29          | 29           | 29          | 29          | 29          | 29          | 29          | 29          | 29          | 29          |
| Headlamp alignment correction device                                                                                                                                                              | 31          | 31          | 31           | 31          | 31          | 31          | 31          | 31          | 31          | 31           | 31          | 31          | 31          | 31          | 31          | 31          | 31          | 31          |
| Electric sun roof                                                                                                                                                                                 | 33          | 33          | 33           | 33          | 33          | 33          | 33          | 33          | 33          | 33           | 33          | 33          | 33          | 33          | 33          | 33          | 33          | 33          |
| Heated front seats                                                                                                                                                                                | 35          | 35          | 35           | 35          | 35          | 35          | 35          | 35          | 35          | 35           | 35          | 35          | 35          | 35          | 35          | 35          | 35          | 35          |
| Preparation for radio phone - Preparation for Telepass                                                                                                                                            | 37          | 37          | 37           | 37          | 37          | 37          | 37          | 37          | 37          | 37           | 37          | 37          | 37          | 37          | 37          | 37          | 37          | 37          |
| Preparation for bottom of the range radio - Cigar lighter                                                                                                                                         | 39          | 39          | 39           | 39          | 39          | 39          | 39          | 39          | 39          | 39           | 39          | 39          | 39          | 39          | 39          | 39          | 39          | 39          |
| Preparation for top of the range radio - Cigar lighter                                                                                                                                            | 41          | 41          | 41           | 41          | 41          | 41          | 41          | 41          | 41          | 41           | 41          | 41          | 41          | 41          | 41          | 41          | 41          | 41          |
| Electric front windows                                                                                                                                                                            | 43          | 43          | 43           | 43          | 43          | 43          | 45          | 43          | 43          | 43           | 45          | 45          | 45          | 45          | 45          | 45          | 45          | 45          |
| Electric rear windows                                                                                                                                                                             |             |             |              |             |             |             |             |             |             |              | 47          | 47          | 47          | 47          | 47          | 47          | 47          | 47          |
| Automatic heater JTD                                                                                                                                                                              |             |             |              |             |             | 49          |             |             |             |              |             |             |             | 49          |             |             |             | 49          |
| Version without alarm<br>Central locking                                                                                                                                                          | 51          | 51          | 51           | 51          | 51          | 51          | 97          | 51          | 51          | 51           | 97          | 97          | 97          | 97          | 97          | 97          | 97          | 97          |
| Version: with automatic air conditioning<br>Engine cooling - Water temperature gauge                                                                                                              | 53          | 55          | 61           | 55          | 57          | 63          | 59          | 53          | 55          | 61           | 53          | 55          | 57          | 63          | 53          | 55          | 57          | 63          |
| Diagnostic socket connections                                                                                                                                                                     | 65          | 65          | 67           | 65          | 67          | 71          | 67          | 65          | 65          | 67           | 65          | 65          | 67          | 71          | 65          | 65          | 67          | 71          |
| Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure warning light - Rev counter - Speedometer | 73          | 75          |              | 75          | 79          |             | 81          | 73          | 75          |              | 73          | 75          | 79          |             | 73          | 75          | 79          |             |



55.

| DESCRIPTION                                                                                                                                                                                                                                                                                 | Bravo       |             |              |             |             |             |             | Brava       |             |              |             |             |             |             |             |             |             |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                                                                                                                                                                                                                                                                             | SX          |             |              | GT          |             |             | HGT         | SX          |             |              | ELX         |             |             |             | HSX         |             |             |             |
|                                                                                                                                                                                                                                                                                             | 1242<br>16V | 1581<br>16V | 1910<br>75CV | 1581<br>16V | 1747<br>16V | 1910<br>JTD | 1998<br>20V | 1242<br>16V | 1581<br>16V | 1910<br>75CV | 1242<br>16V | 1581<br>16V | 1747<br>16V | 1910<br>JTD | 1242<br>16V | 1581<br>16V | 1747<br>16V | 1910<br>JTD |
| Version with automatic transmission<br>Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Signalling of injection system failure - Rev counter - Speedometer                                                    |             | 77          |              | 77          |             |             |             |             | 77          |              |             | 77          |             |             |             | 77          |             |             |
| Starting - Recharging and warning light - Insufficient engine oil pressure warning light - Heater plugs warning light                                                                                                                                                                       |             |             | 83           |             |             | 85          |             |             |             | 83           |             |             |             | 85          |             |             |             | 85          |
| Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights                                                                                                                                                                          | 87          | 87          | 87           | 87          | 87          | 87          | 89          | 87          | 87          | 87           | 89          | 89          | 89          | 89          | 89          | 89          | 89          | 89          |
| Version without A.B.I.<br>Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer                                                                                                                                         | 91          | 91          | 91           |             |             |             |             | 91          | 91          | 91           |             |             |             |             |             |             |             |             |
| Version with A.B.I.<br>Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer                                                                                                                                            |             |             |              | 93          | 93          | 93          | 93          |             |             |              | 93          | 93          | 93          | 93          | 93          | 93          | 93          | 93          |
| Version with alarm<br>Central locking                                                                                                                                                                                                                                                       | 95          | 95          | 95           | 95          | 95          | 95          | 99          | 95          | 95          | 95           | 99          | 99          | 99          | 99          | 99          | 99          | 99          | 99          |
| Vehicle interior lights - Ideogram lights                                                                                                                                                                                                                                                   | 101         | 101         | 101          | 101         | 101         | 101         | 103         | 101         | 101         | 101          | 103         | 103         | 103         | 103         | 103         | 103         | 103         | 103         |
| Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Water temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light | 105         | 105         | 105          | 105         | 105         | 111         | 109         | 105         | 105         | 105          | 107         | 107         | 107         | 111         | 107         | 107         | 107         | 111         |
| Version without automatic air conditioning<br>Engine cooling - Water temperature gauge - Car interior ventilation                                                                                                                                                                           | 113         | 115         | 121          | 115         | 117         | 123         | 119         | 113         | 115         | 121          | 113         | 115         | 117         | 123         | 113         | 115         | 117         | 123         |
| Automatic air conditioning without A.B.I.                                                                                                                                                                                                                                                   | 125         | 127         | 129          |             |             |             |             | 125         | 127         | 129          |             |             |             |             |             |             |             |             |
| Automatic air conditioning with A.B.I.                                                                                                                                                                                                                                                      |             |             |              | 133         | 135         | 139         | 137         |             |             |              |             | 133         | 135         | 139         | 131         | 133         | 135         | 139         |
| Alarm device - Alarm on warning light                                                                                                                                                                                                                                                       | 141         | 141         | 141          | 141         | 141         | 141         | 143         | 141         | 141         | 141          | 143         | 143         | 143         | 143         | 143         | 143         | 143         | 143         |
| A.B.I. control unit connection                                                                                                                                                                                                                                                              |             |             |              | 145         | 145         | 145         | 145         |             |             |              |             | 145         | 145         | 145         | 145         | 145         | 145         | 145         |
| Automatic transmission - Failure warning light                                                                                                                                                                                                                                              |             | 147         |              | 147         |             |             |             |             | 147         |              |             | 147         |             |             |             | 147         |             |             |
| Instrument panel connections                                                                                                                                                                                                                                                                | 149         | 149         | 149          | 149         | 149         | 149         | 153         | 149         | 149         | 149          | 151         | 151         | 151         | 151         | 151         | 151         | 151         | 151         |
| Version with automatic transmission<br>Instrument panel connections                                                                                                                                                                                                                         |             | 155         |              | 155         |             |             |             |             | 155         |              |             | 157         |             |             |             | 157         |             |             |
| Junction unit                                                                                                                                                                                                                                                                               | 159         | 159         | 159          | 159         | 159         | 159         | 159         | 159         | 159         | 159          | 159         | 159         | 159         | 159         | 159         | 159         | 159         | 159         |
| Diagrammatic view of location of cable looms and components                                                                                                                                                                                                                                 | 161         | 162         | 165          | 162         | 163         | 166         | 164         | 161         | 162         | 165          | 161         | 162         | 163         | 166         | 161         | 162         | 163         | 166         |
| Diagrammatic view of location of cable looms and components                                                                                                                                                                                                                                 |             |             |              | 167         | 167         | 167         | 167         | 168         | 168         | 168          |             |             |             |             |             |             |             |             |

**Electrical symbols**

|                                                                                     |                                                      |                                                                                     |                                   |                                                                                       |                                                        |
|-------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------|
|    | Positions                                            |    | Choke                             |    | Switch discharge                                       |
|    | Main beam headlamps                                  |    | Water in fuel filter              |    | Dipped headlamps                                       |
|    | Heated seat                                          |    | Heater plugs                      |    | Signalling of direction indicators for central locking |
|    | Seat belts                                           |    | Turbocharging pressure            |    | Electric horns                                         |
|    | Heated rear wind-screen                              |    | Rear fog lamp                     |    | Left direction indicator                               |
|  | Handbrake applied and insufficient brake fluid level |  | Fog light                         |  | Right direction indicator                              |
|  | A.B.S.                                               |  | Brake pad wear                    |  | Engine cooling                                         |
|  | Hazard warning lights                                |  | Turbocharging pressure            |  | Windscreen wiper                                       |
|  | Direction indicators                                 |  | Automatic gearbox oil temperature |  | Electrically operated sun roof                         |
|  | Handbrake and insufficient brake fluid level         |  | Speed limits                      |  | Catalytic silencer temperature                         |
|  | Recharging                                           |  | Fuel level                        |  | Resistance                                             |
|  | Engine oil pressure                                  |  | Engine coolant temperature        |  | Diode                                                  |

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#### Electrical symbols

|                                                                                     |                                 |                                                                                     |                                              |                                                                                       |                                   |
|-------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------|
|    | Warning light                   |    | Trip computer                                |    | Differential lock                 |
|    | Bulb                            |    | Electronic injection                         |    | Automatic gearbox oil temperature |
|    | Fuse                            |    | Engine oil level                             |    | Temperature                       |
|    | Switch open                     |    | Brake fluid level (Japanese version)         |    | Anti-theft device                 |
|    | Selector switch                 |    | Doors open                                   |    | Electric windows                  |
|  | Button open                     |  | Central locking                              |  | Earth                             |
|  | Switch operated by coil (Relay) |  | Controlled damping suspension Sport Function |  | Number plate lights               |
|  | Motor                           |  | Transistor                                   |  | Impulse generator (Timer)         |
|  | Rearscreen wiper                |  | Air-Bag                                      |  | Analogue clock                    |
|  | Headlamp washer                 |  | A.B.S. (Japanese Version)                    |  | Digital clock                     |
|  | Windscreen wash/wipe            |  | Brake lights failure                         |  | Speedometer                       |
|  | Rearscreen wash/wipe            |  | Windscreen wiper                             |  | Rev counter                       |

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**Electrical symbols**



Digital speedometer



Digital rev counter



Digital fuel level gauge



Analogue fuel level gauge



Analogue engine temperature gauge



Econometer



Digital engine temperature gauge



Engine oil temperature



Engine oil pressure gauge

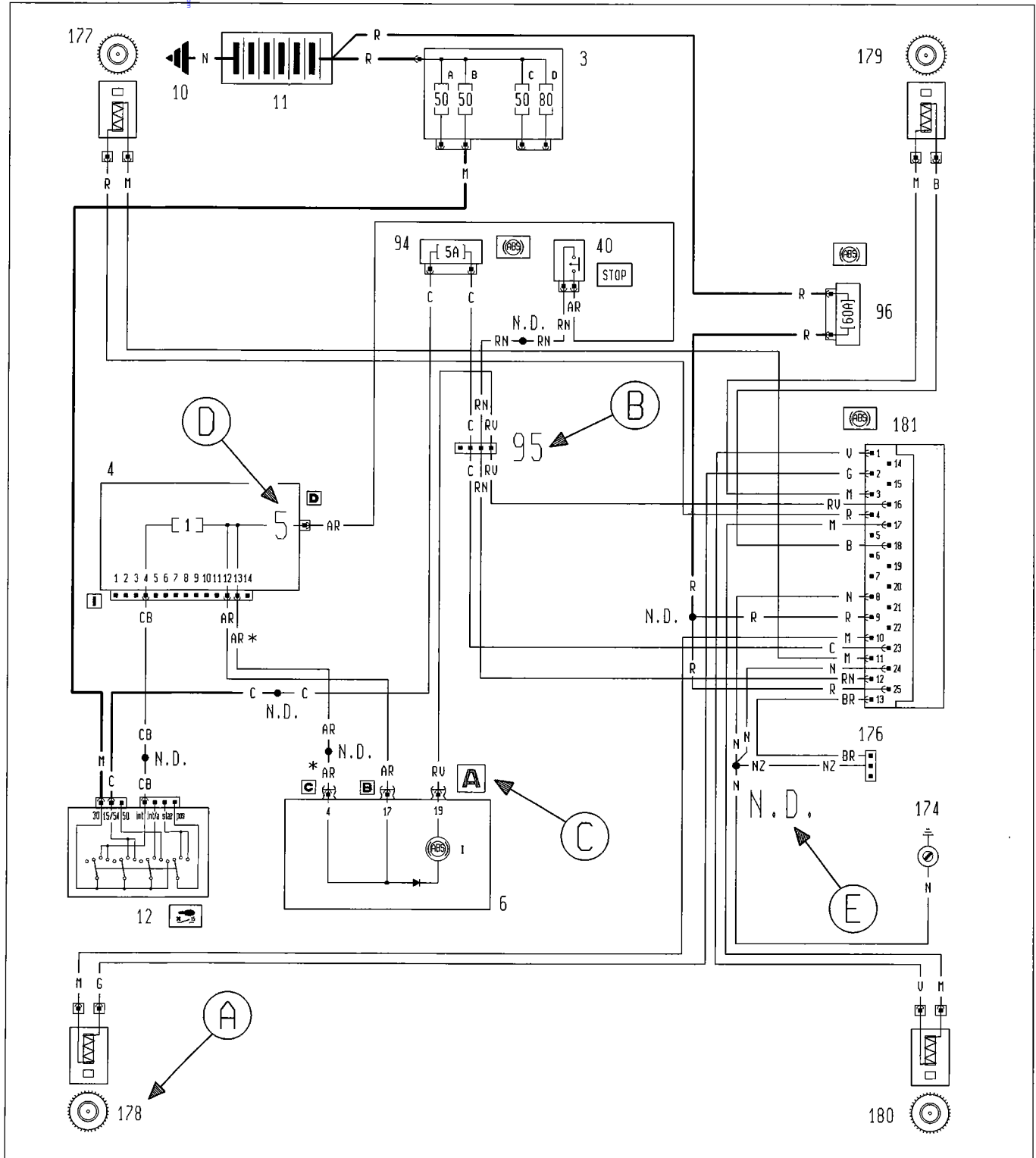


Voltmeter

P4A003I01

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## Explanation of how to read wiring diagrams

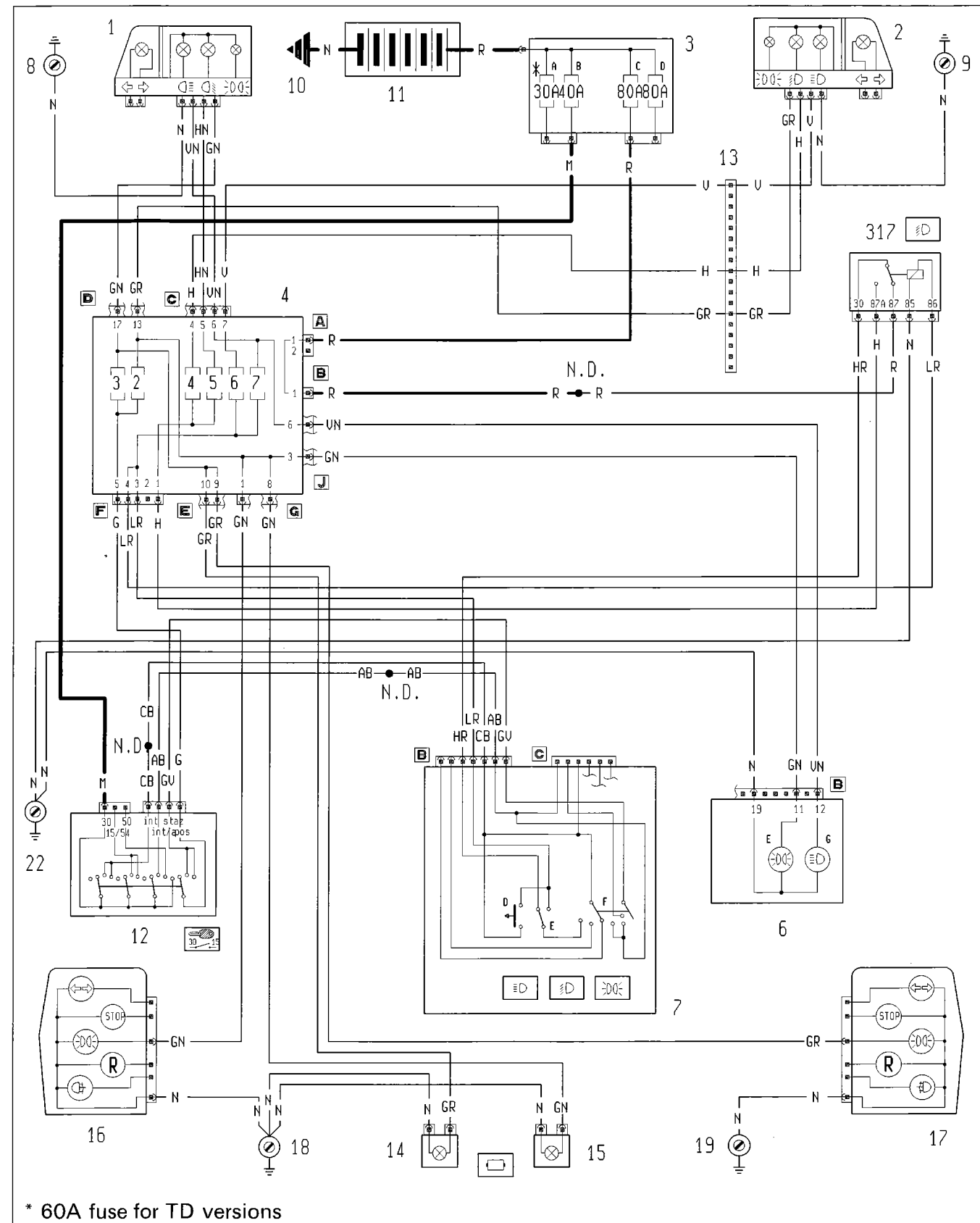


P4A004I01

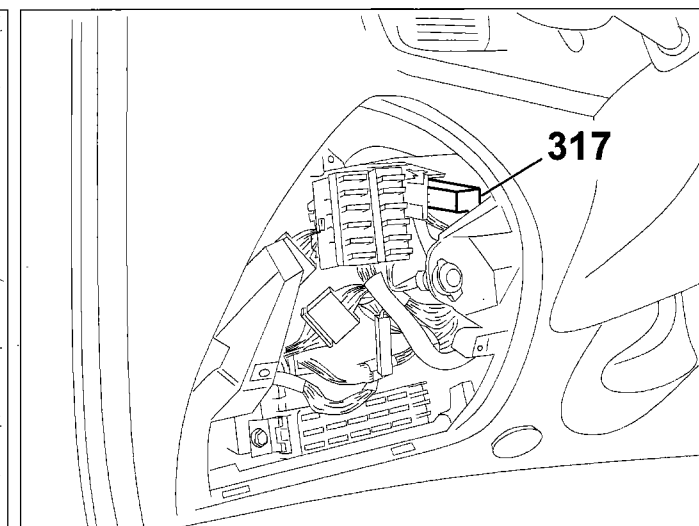
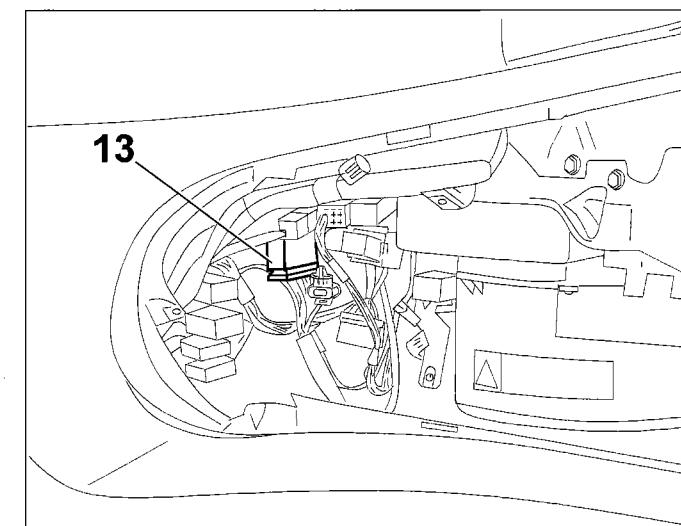
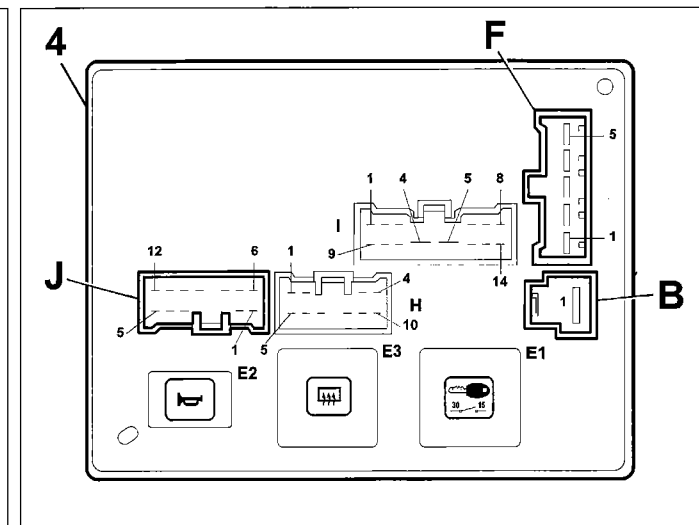
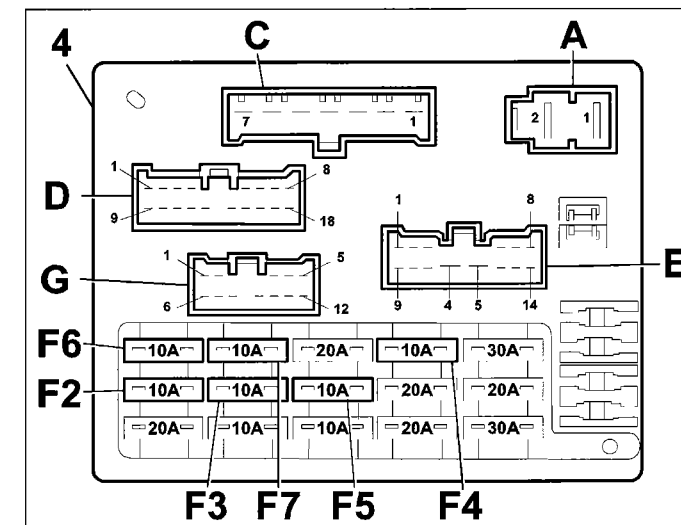
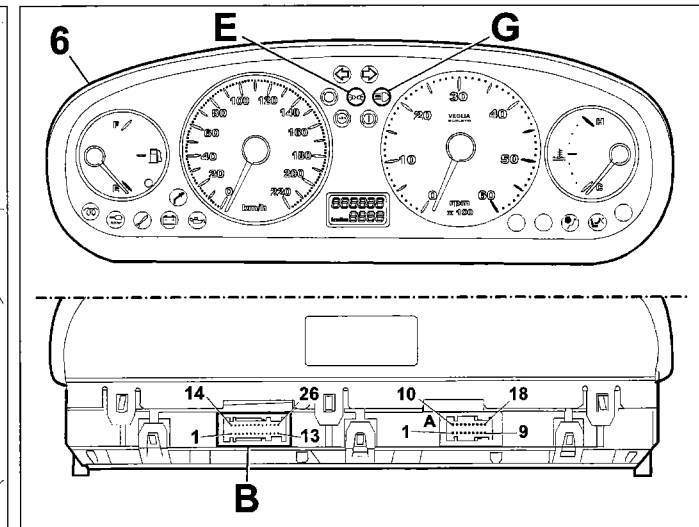
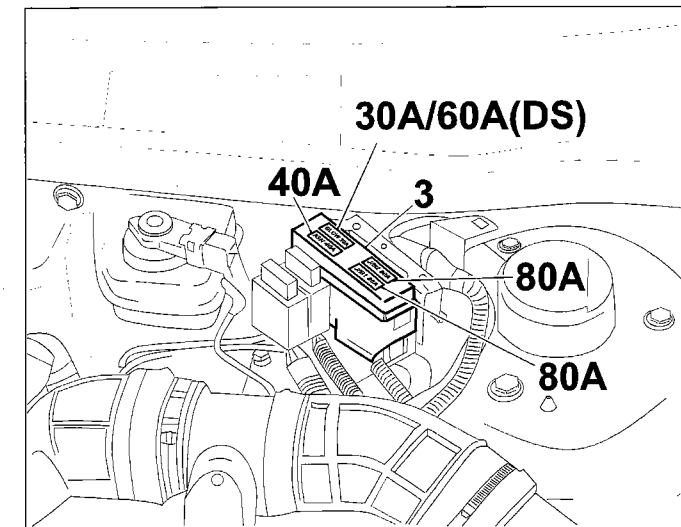
### Reference key

- A Component number
- B Connection number
- C Identification of connector at component
- D Connecting pin number
- E Ultrasound welding taped in cable loom

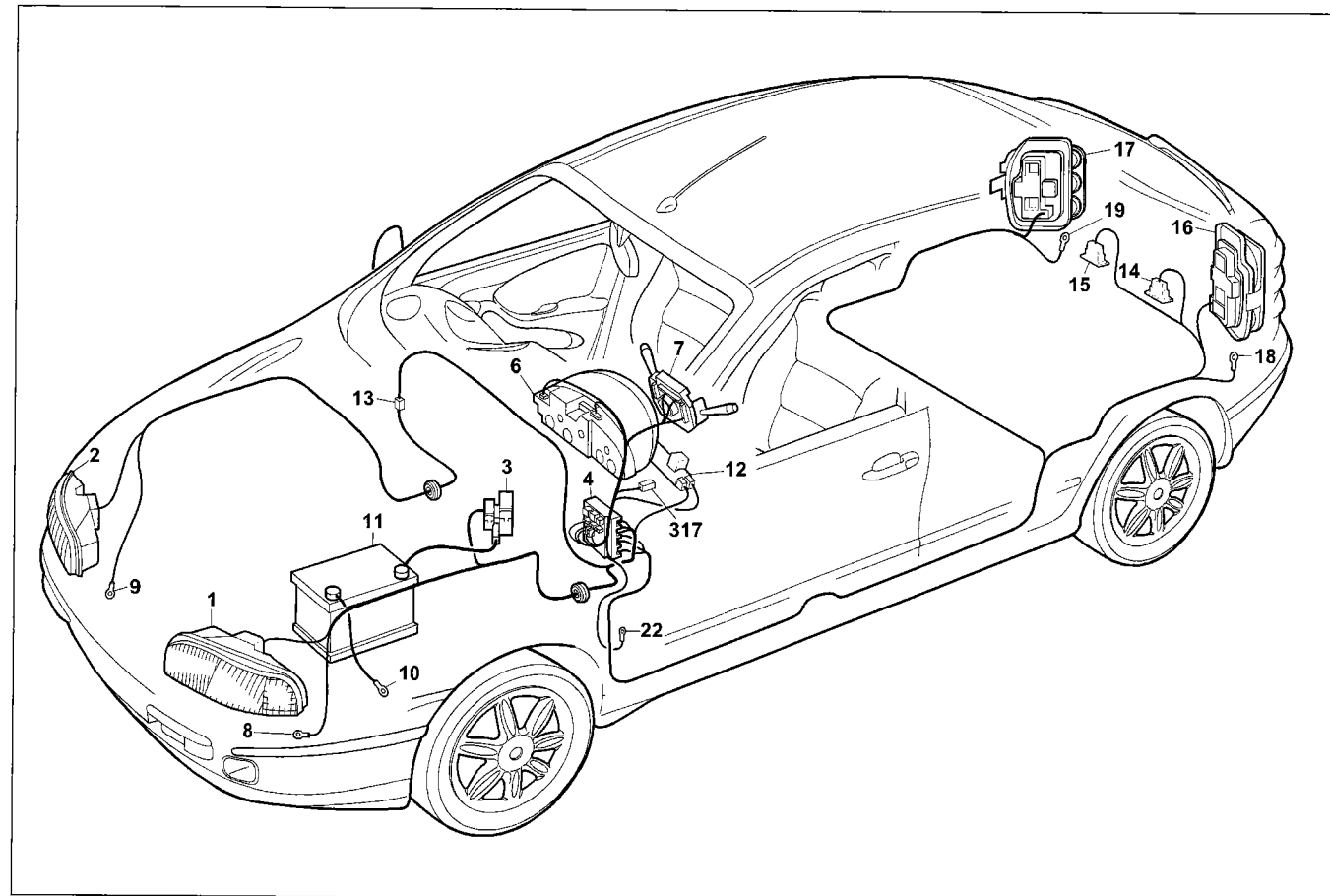
Side lights and warning light - Dipped beam headlamps - Main beam headlamps and warning light -  
Parking lights - Number plate lights - (See key at end of wiring diagrams)



**Location of components**



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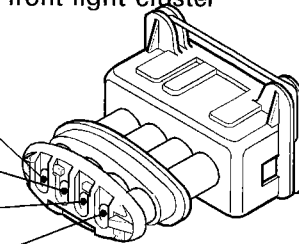
**Side lights and warning light - Dipped beam headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights**

### Components key

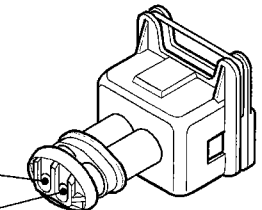
- |                                                                  |                                               |
|------------------------------------------------------------------|-----------------------------------------------|
| 1 Left front light cluster                                       | 13 Front right/left cables connection         |
| 2 Right front light cluster                                      | 14 Left no. plate light                       |
| 3 Power fuse box:                                                | 15 Right no. plate light                      |
| A 30A protective fuse for injection system (60A for TD versions) | 16 Left rear light cluster                    |
| B 40A protective fuse for ignition system                        | 17 Right rear light cluster                   |
| C 80A fuse protecting additional options                         | 18 Left rear earth                            |
| D 80A protective fuse for junction unit                          | 19 Right rear earth                           |
| 4 Junction unit                                                  | 22 Left dashboard earth                       |
| 6 Instrument panel:                                              | 317 Main beam headlamps remote control switch |
| E Side lights warning light                                      | N.D. Ultrasound welding taped in cable loom   |
| G Main beam headlamps warning light                              |                                               |
| 7 Steering column switch unit:                                   |                                               |
| D Flasher control                                                |                                               |
| E Switch for dipped/main beam headlamps                          |                                               |
| F Switch for side lights                                         |                                               |
| 8 Left front earth                                               |                                               |
| 9 Right front earth                                              |                                               |
| 10 Earth for battery on bodyside                                 |                                               |
| 11 Battery                                                       |                                               |
| 12 Ignition switch                                               |                                               |

### 1 Left front light cluster

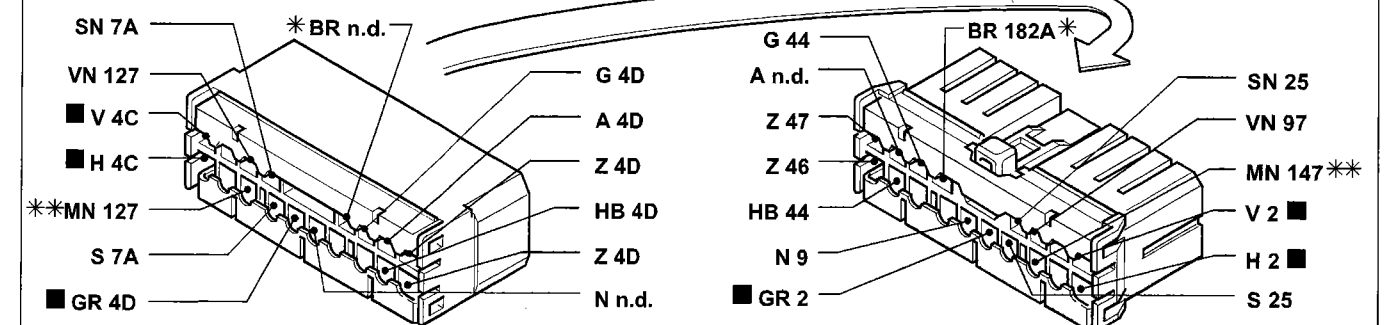
- GN 4D
- HN 4C
- VN 4C
- N 8



- AN n.d.
- N 8



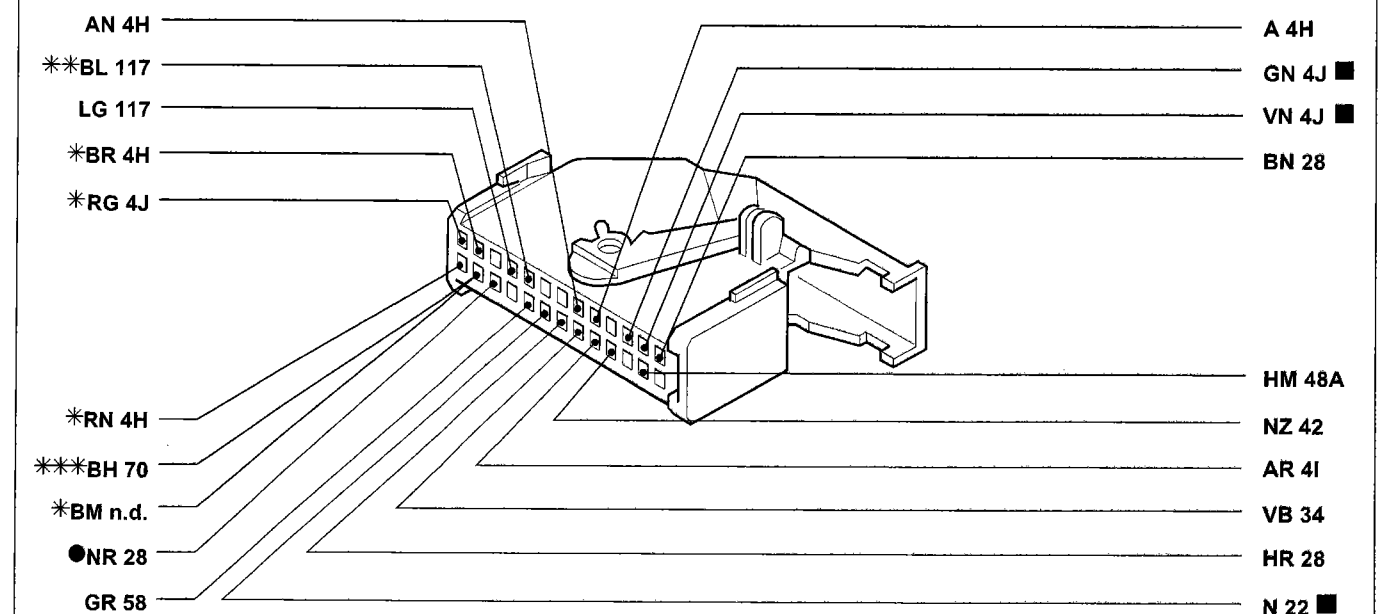
### 13 Front right/left cables connection



\* Variant connection for 1998 20v versions

\*\* Variant connection for 1910 JTD versions

### 6B Instrument panel



\* Non existent for trim levels SX - GT

\*\* Variant connection for versions with passenger AIR BAG

\*\*\* Variant connection for trim levels SX - GT with alarm

● Variant connection for trim level HGT

The cables in the wiring diagram are marked

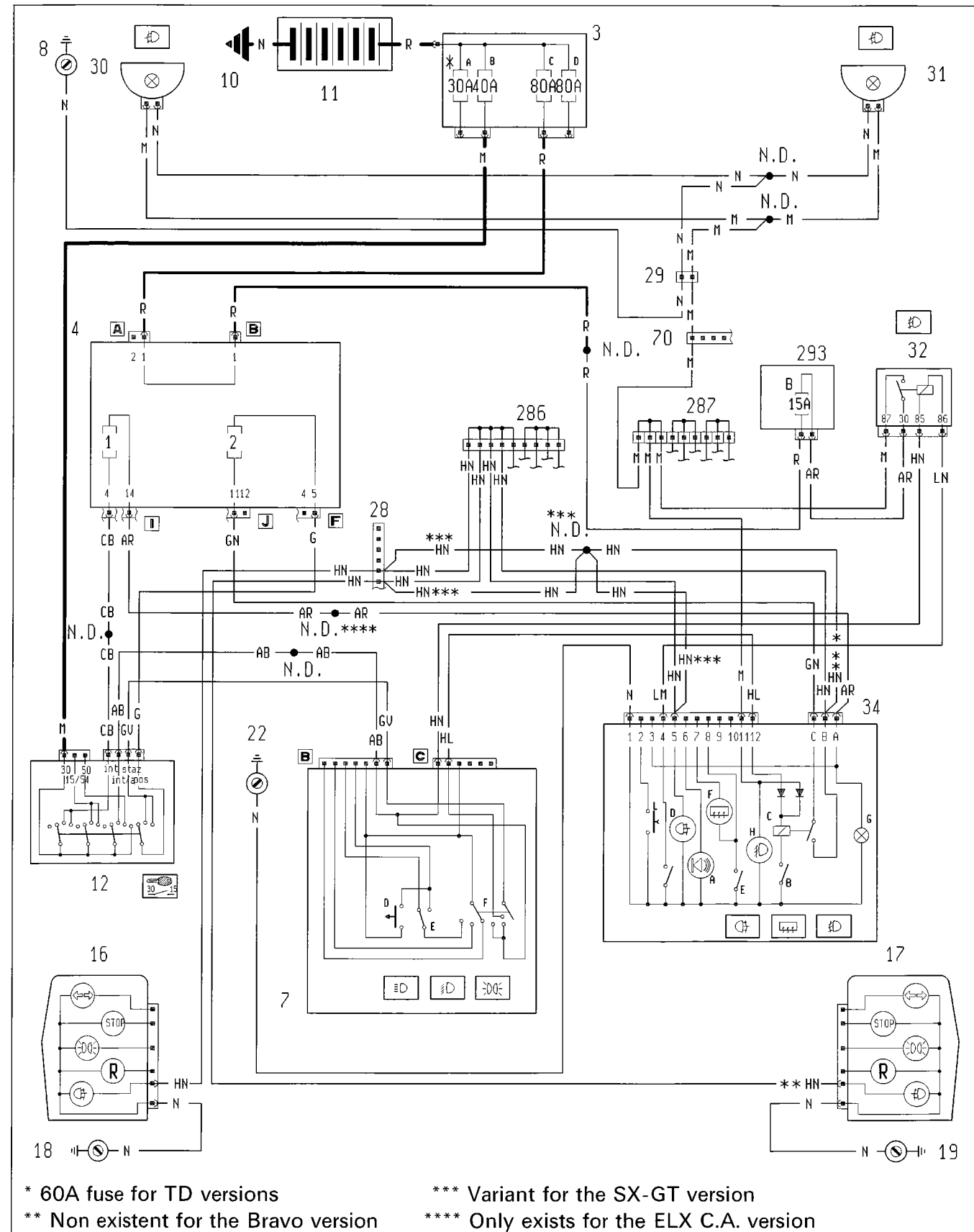
P4A008101

4A0071

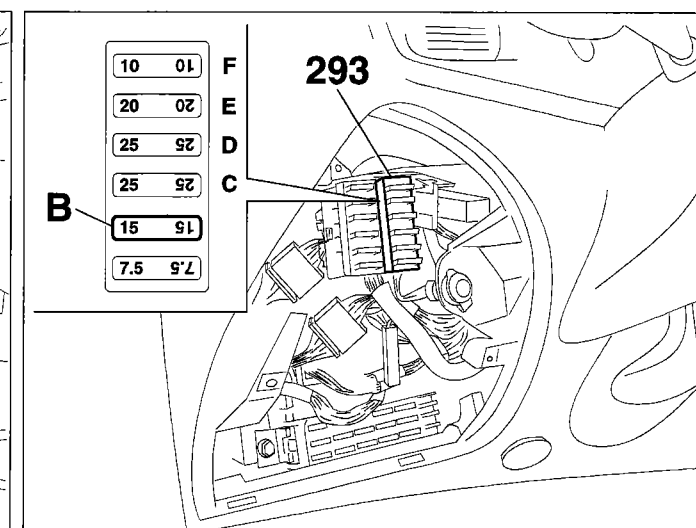
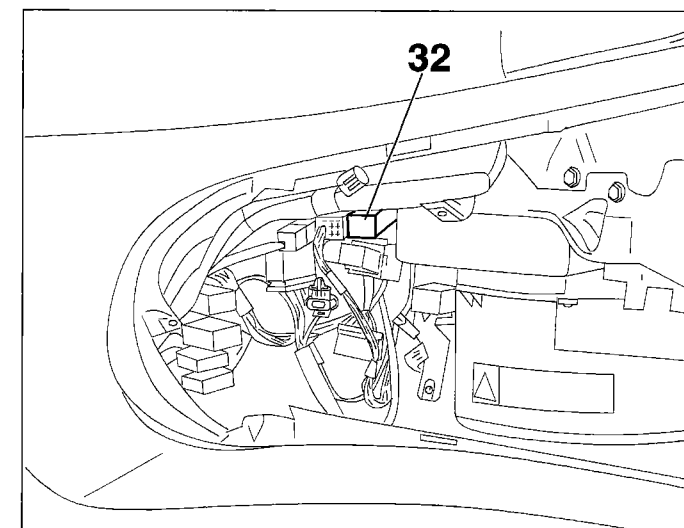
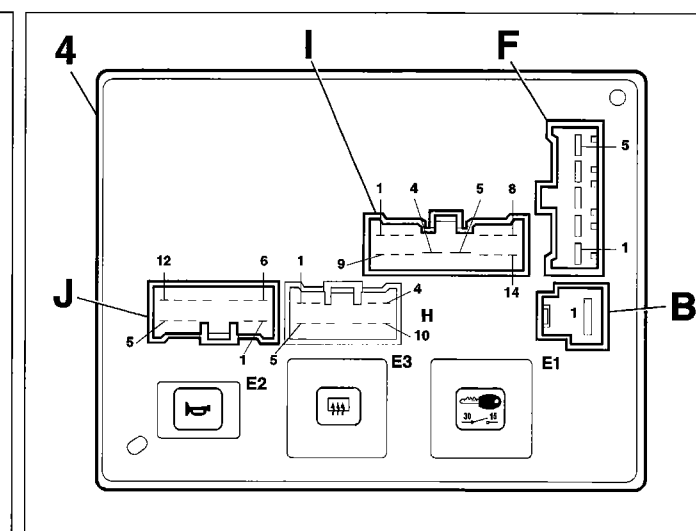
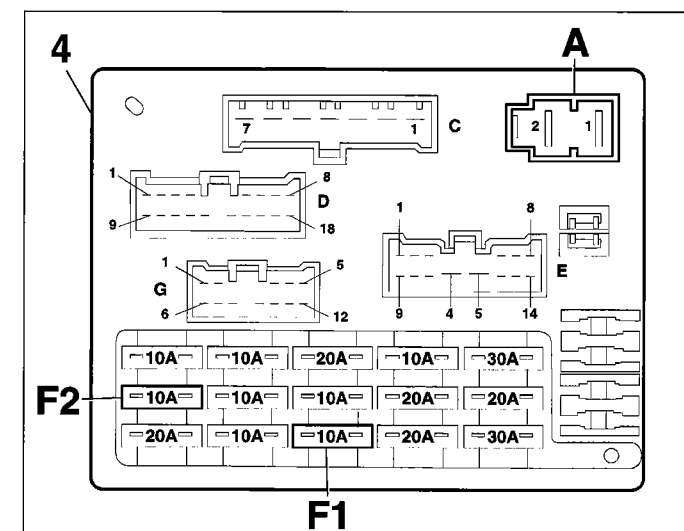
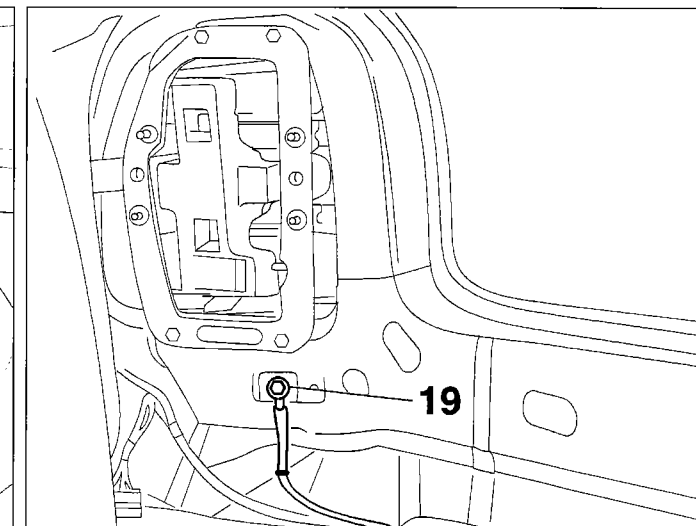
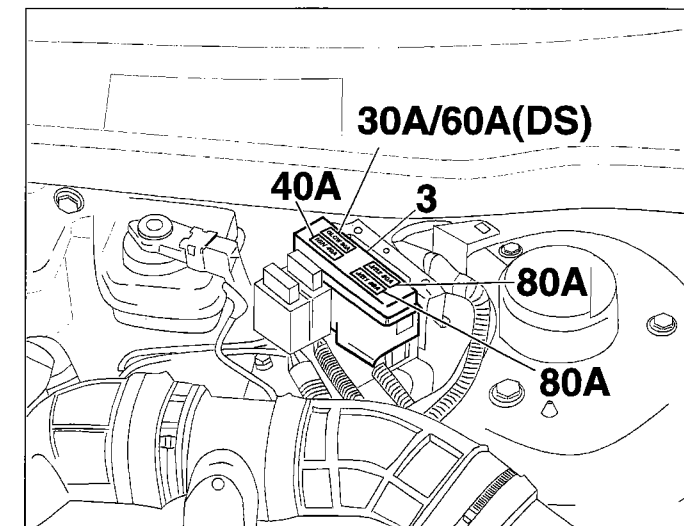
4A0081

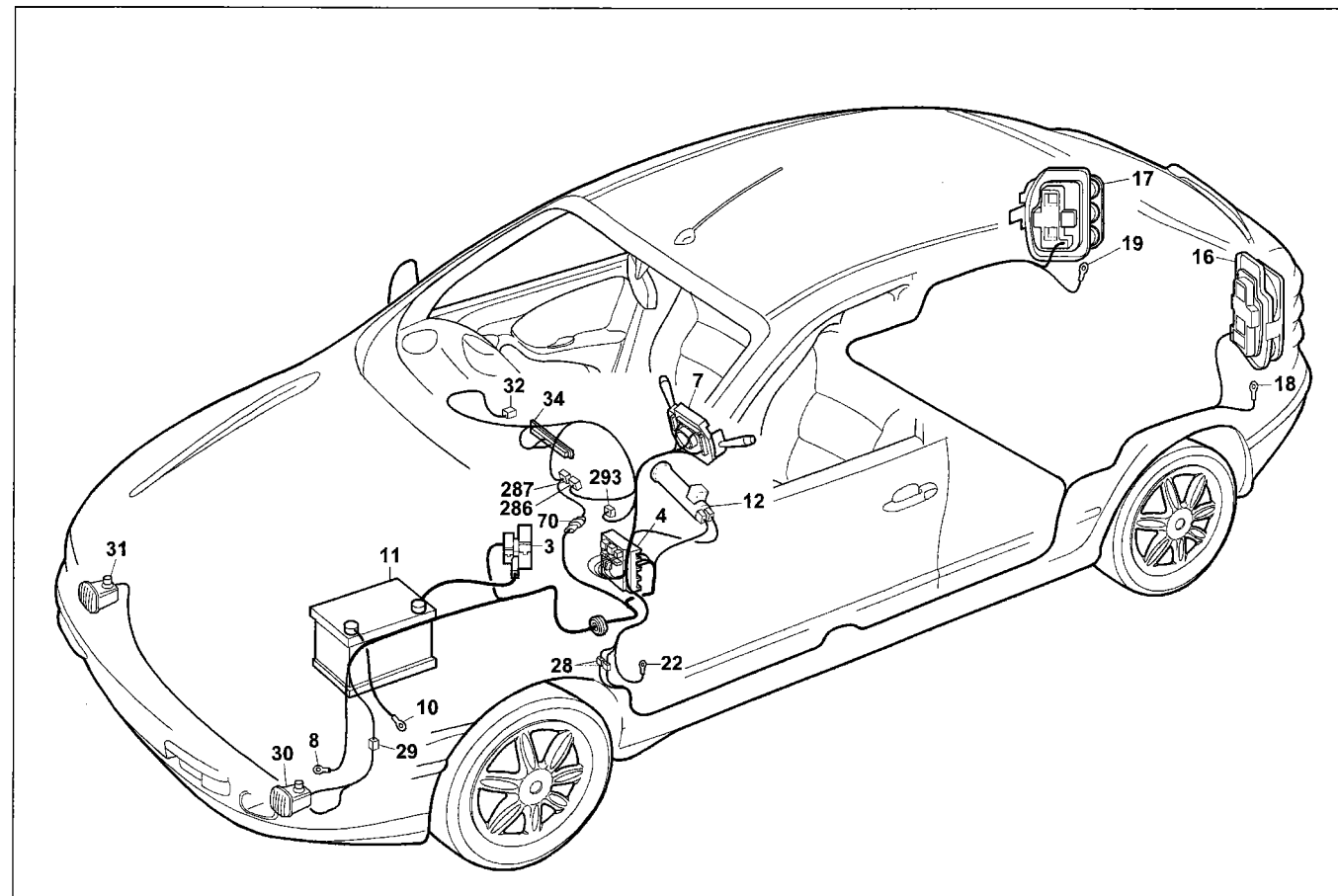


**Fog lights and warning light - Rear fog lamps and warning light - (See key at end of wiring diagrams)**



### Location of components





P4A011I01

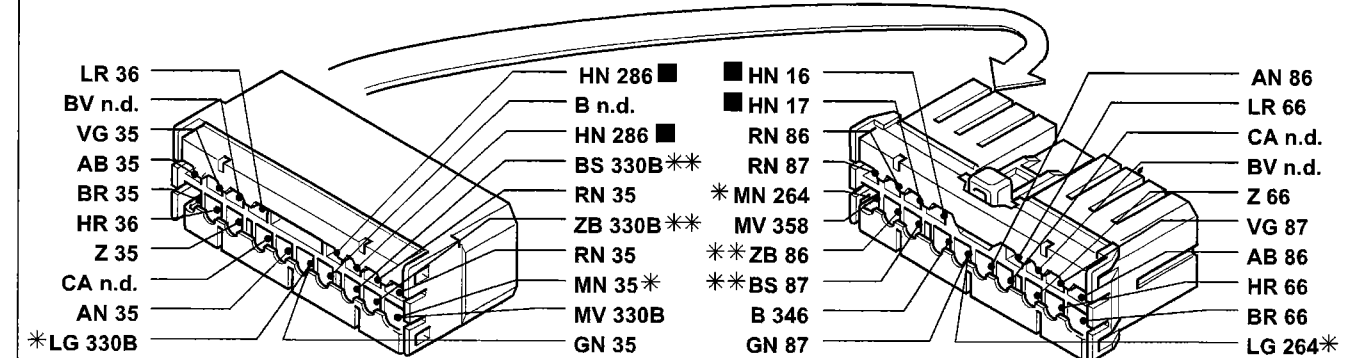
### Fog lights and warning light - Rear fog lamps and warning light

### Components key

- |                                                                  |                                              |
|------------------------------------------------------------------|----------------------------------------------|
| 3 Power fuse box:                                                | 29 Connection between front/fog light cables |
| A 30A protective fuse for injection system (60A for TD versions) | 30 Left fog lamp                             |
| B 40A protective fuse for ignition system                        | 31 Right fog lamp                            |
| C 80A fuse protecting additional options                         | 32 Fog lights relay                          |
| D 80A protective fuse for junction unit                          | 34 Switch control unit:                      |
| 4 Junction unit                                                  | A Anti-theft warning light on                |
| 7 Steering column switch unit:                                   | B Rear fog lamps switch                      |
| D Flasher control                                                | C Rear fog lamps relay feed                  |
| E Remote control switch for dipped/main beam headlamps           | D Rear fog lamps warning light               |
| F Switch for side lights                                         | E Heated rear windscreen control switch      |
| 8 Left front earth                                               | F Heated rear windscreen warning light       |
| 10 Earth for battery on bodyshell                                | G Ideogram light for switch control panel    |
| 11 Battery                                                       | H Fog lights warning light                   |
| 12 Ignition switch                                               | L Outside temperature control switch         |
| 16 Left rear light cluster                                       | 70 Dashboard/front cables connection         |
| 17 Right rear light cluster                                      | 286 Short circuit connection                 |
| 18 Left rear earth                                               | 287 Short circuit connection                 |
| 19 Right rear earth                                              | 293 Fuse carrier base on dashboard cable     |
| 22 Left dashboard earth                                          | B 15A fuse protecting fog lamps relay        |
| 28 Dashboard/longitudinal cables connection                      |                                              |
- N.D. Ultrasound welding taped in cable loom

N.D. Ultrasound welding taped in cable loom

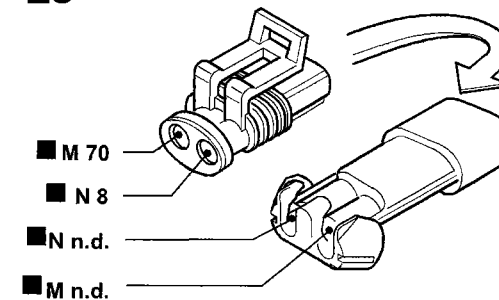
## 28A Dashboard/longitudinal cables connection Only: ELX - HSX - HGT



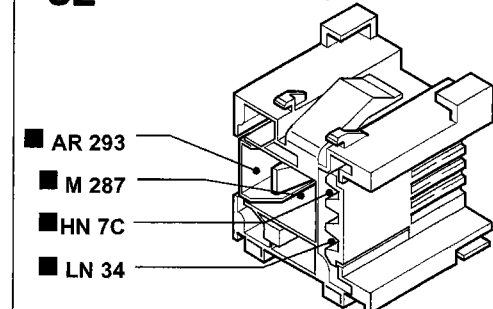
\* Variant connection for version with automatic transmission

**\*\* Variant connection for Brava versions**

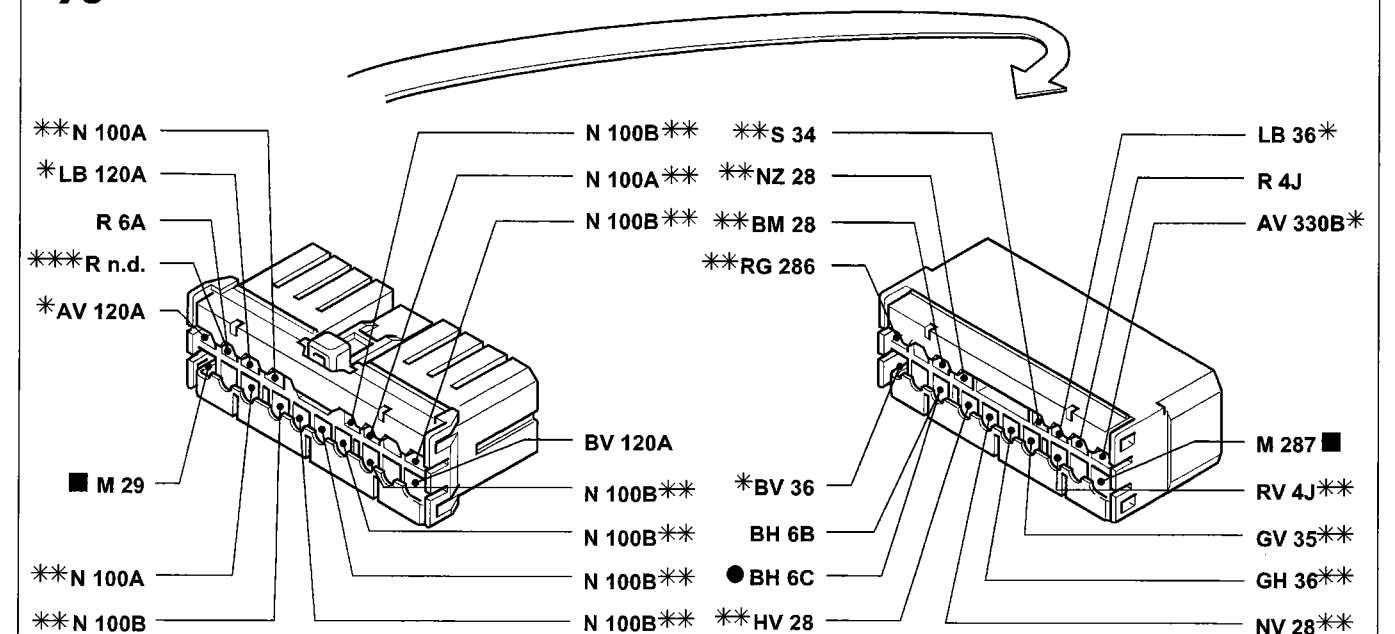
## 29 Connection between front/fog light cables



### 32 Fog lights relay



## 70 Dashboard/front cables connection Only: ELX - HSX - HGT



\* Variant connection for versions with air conditioning

**\*\* Variant connection for versions with alarm**

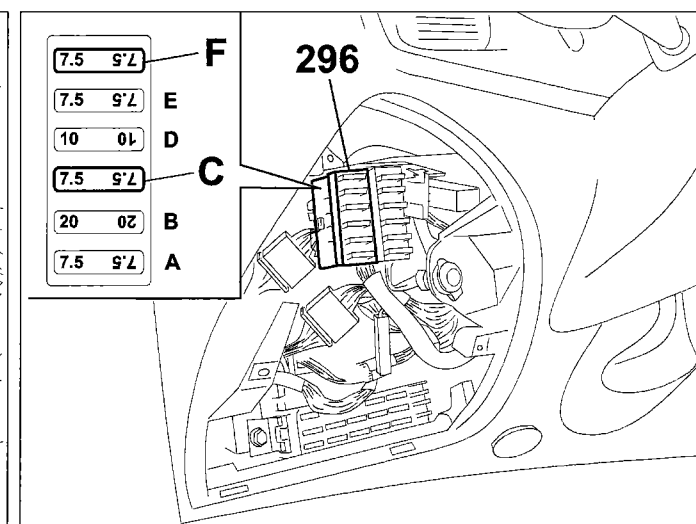
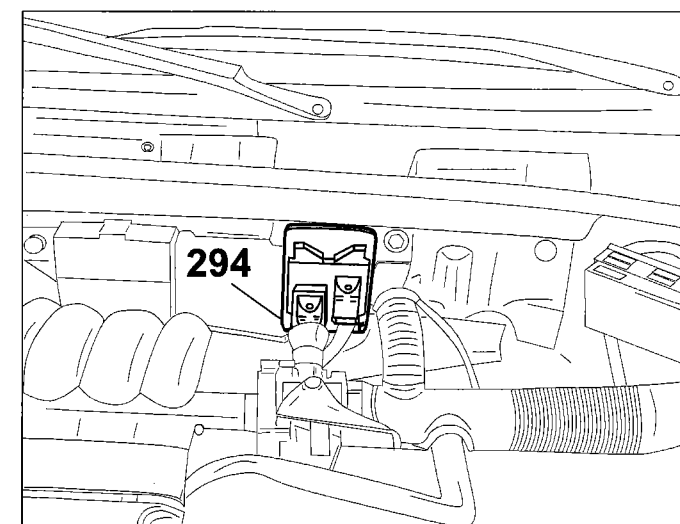
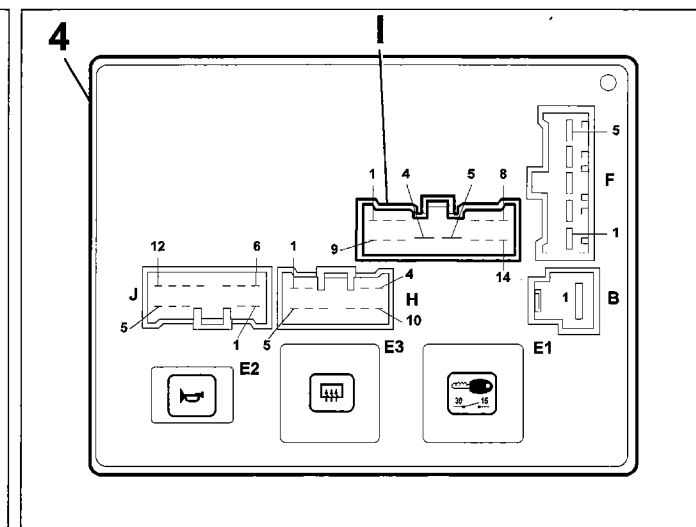
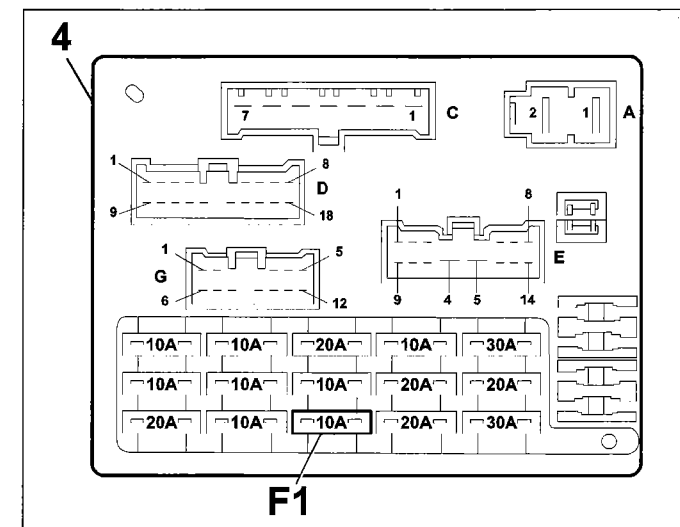
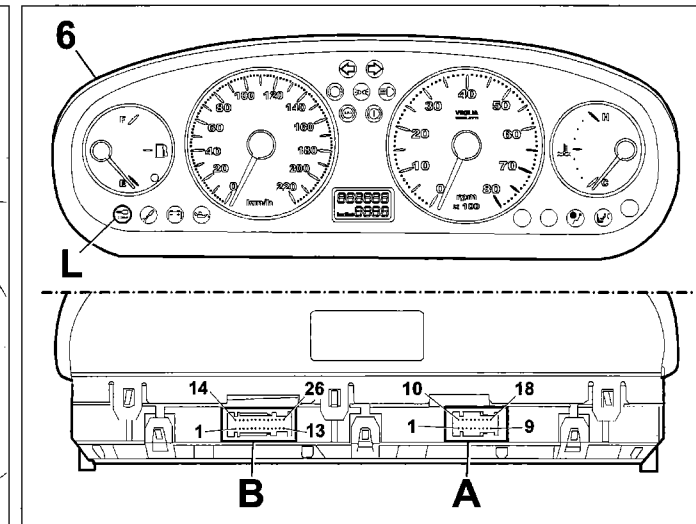
\*\*\* Variant connection for 1910 JTD versions

- Variant connection for ELX trim level with automatic transmission

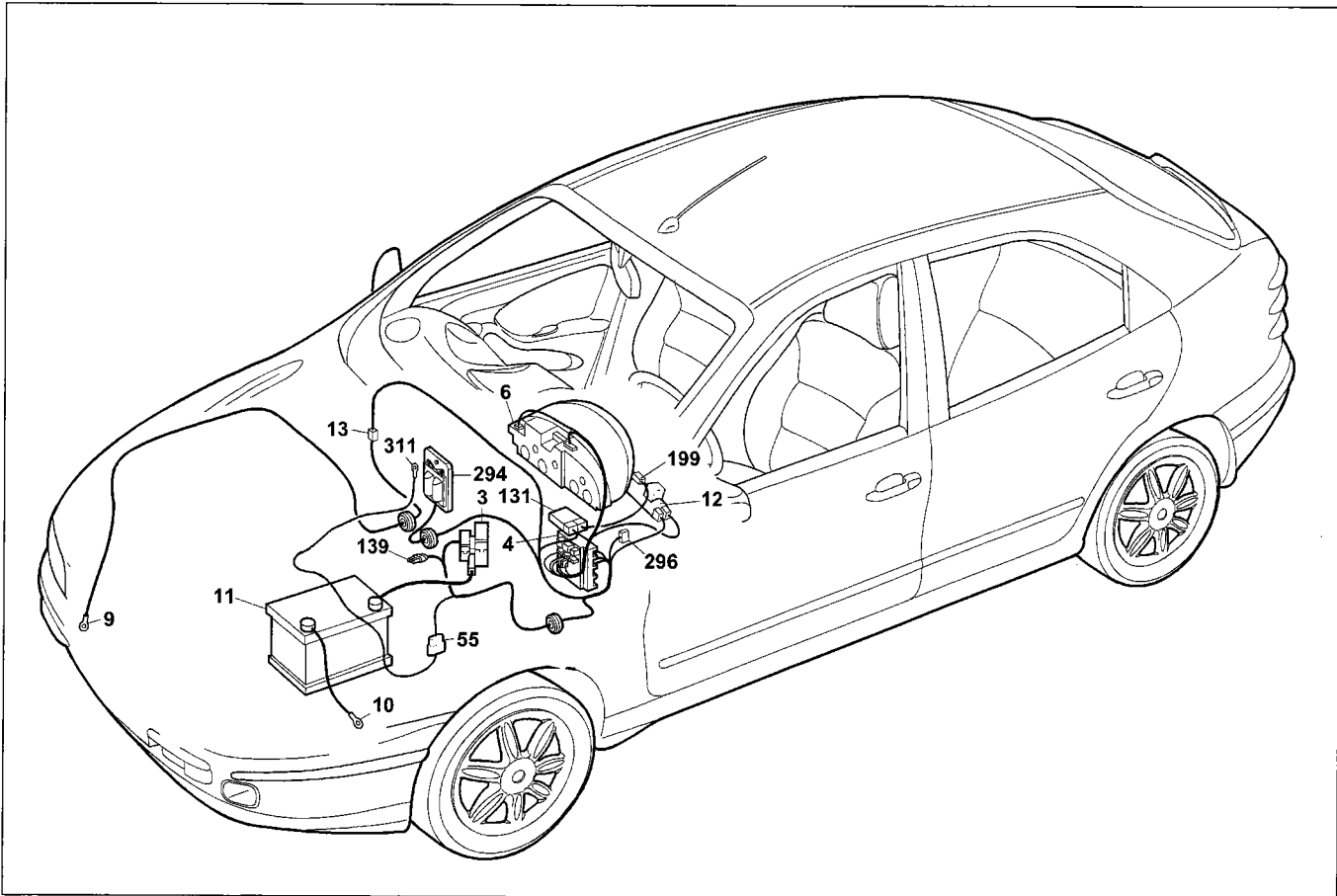
The cables in the wiring diagram are marked

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P4A015101

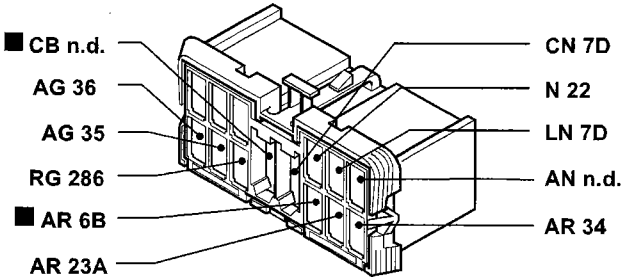
Fiat-CODE and failure warning light

Components key

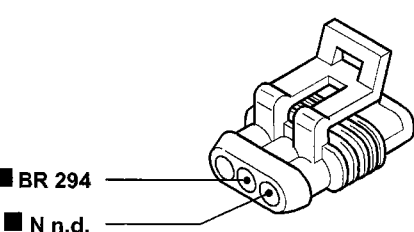
- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
L Fiat CODE device failure warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Connection between front right/left cables
- 55 Connection between front/engine pre-wiring cables
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 148 Earth for electronic injection
- 199 Aerial for Fiat-CODE
- 294 Injection/ignition electronic control unit 1242
- 296 Fuse carrier base on front cable:  
C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection  
F 7.5A fuse protecting electronic injection system/ Fiat-Code

311 Earth for electronic injection control unit  
N.D. Ultrasound welding taped in cable loom

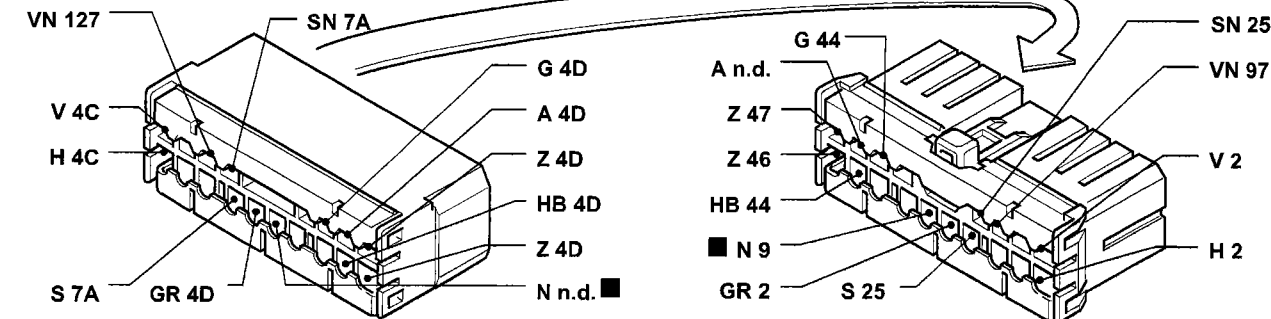
41 Junction unit



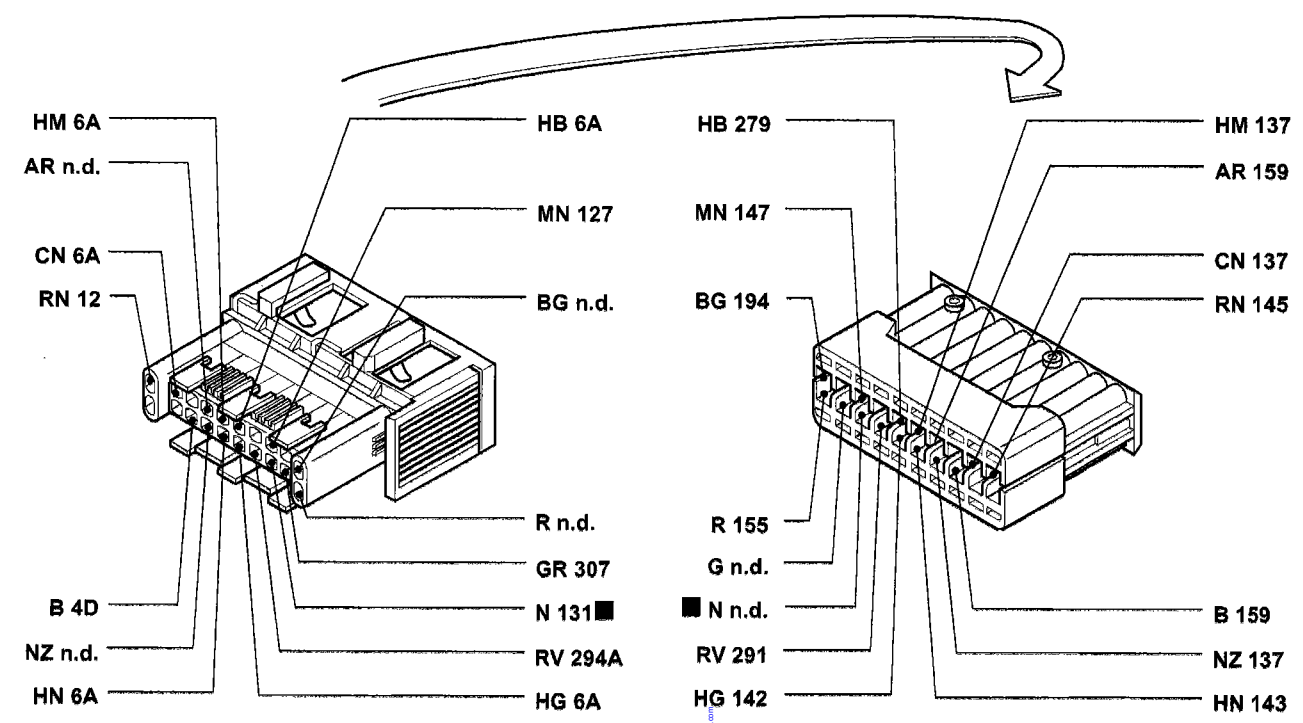
139 Diagnostic socket for injection system



13 Front right/left cables connection



55 Connection between front/engine pre-wiring cables

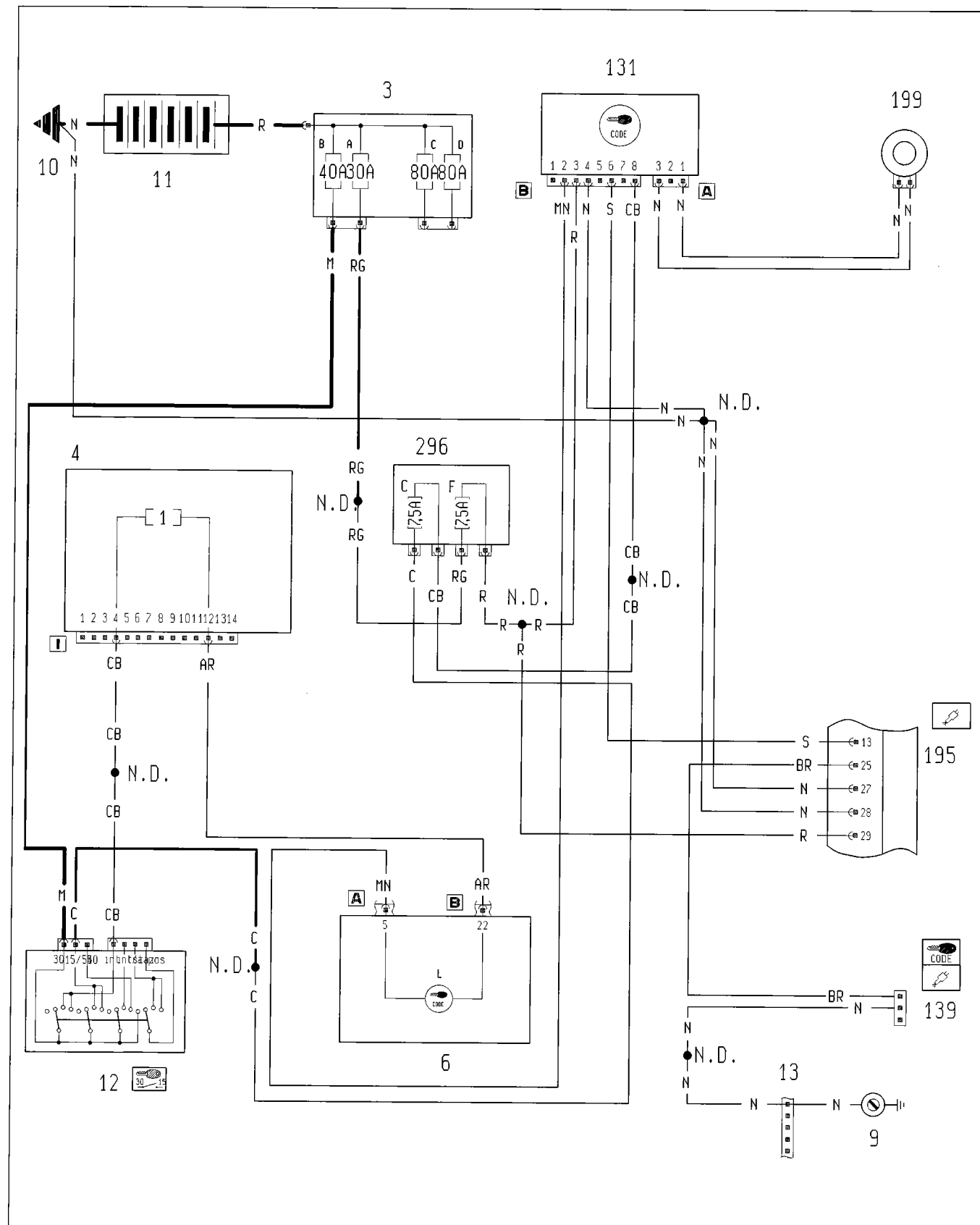


The cables in the wiring diagram are marked

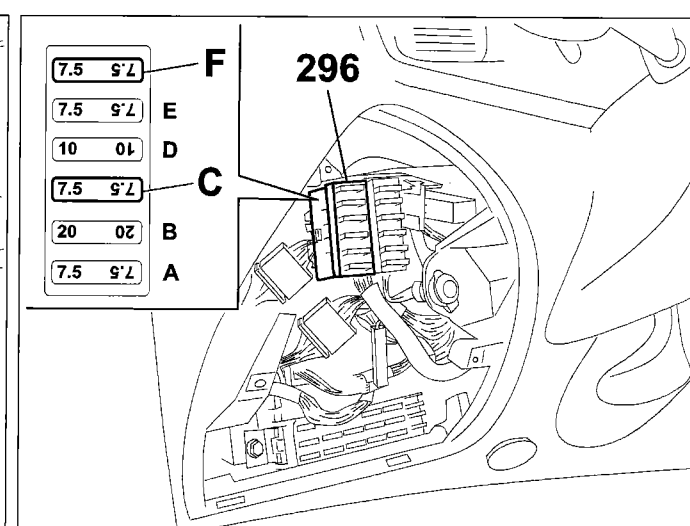
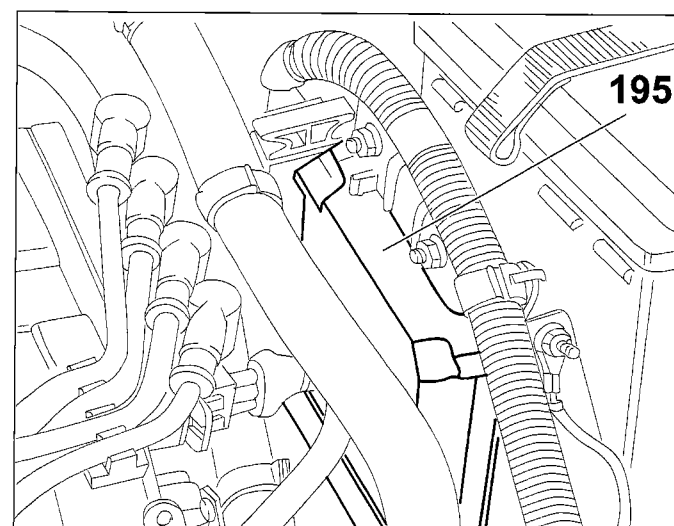
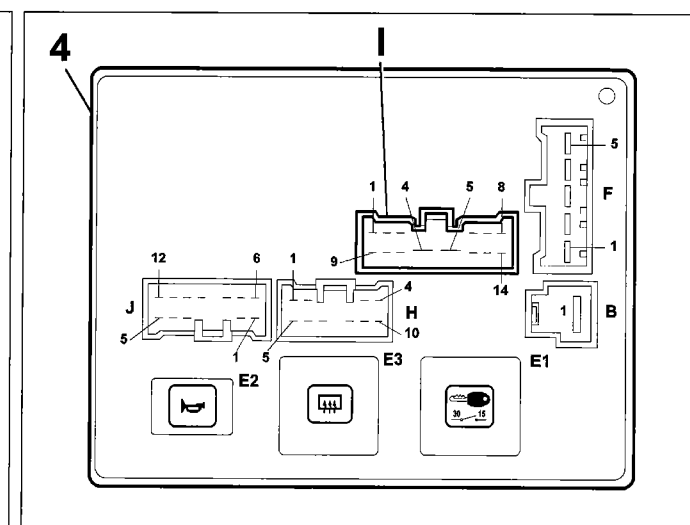
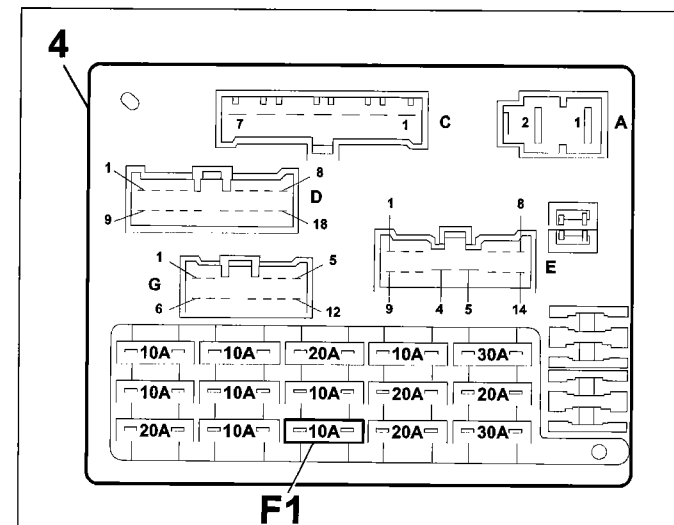
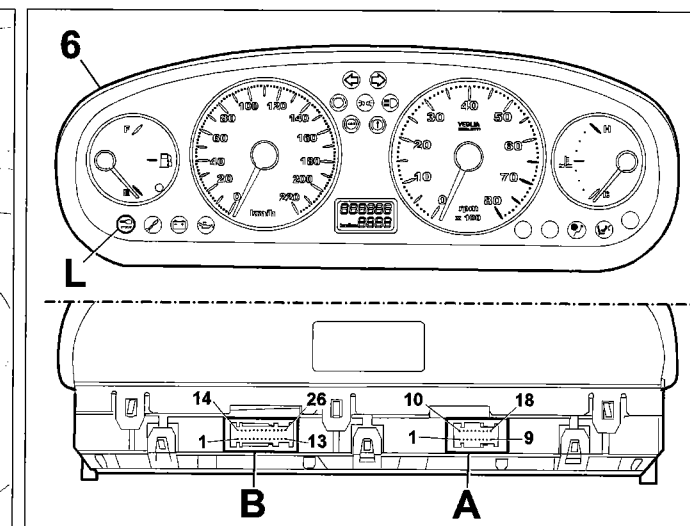
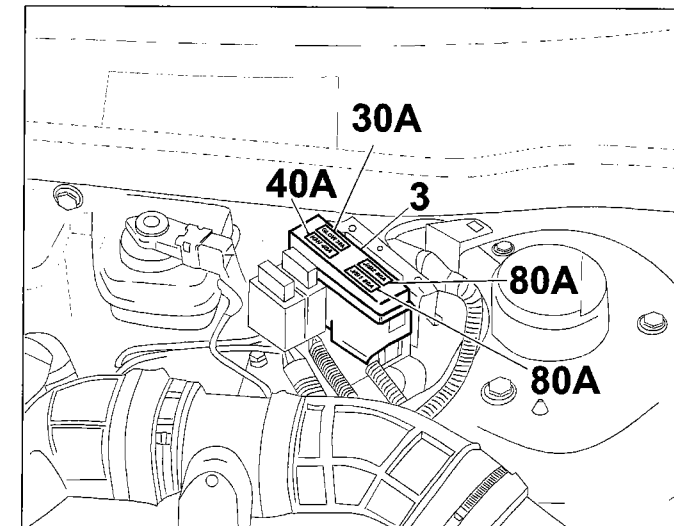
P4A016101



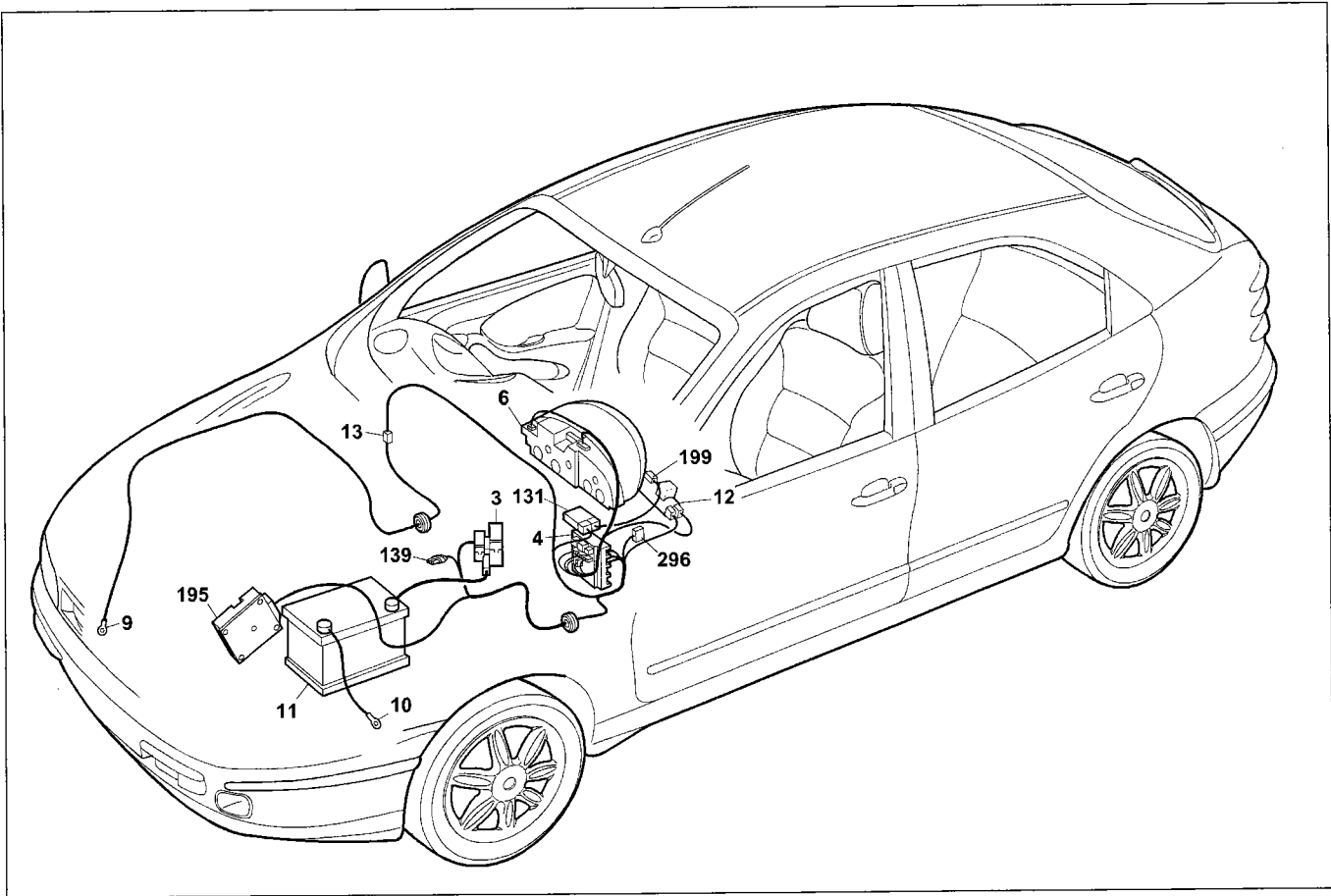
### Fiat-CODE and failure warning light - (See key at end of wiring diagrams)



### Location of components



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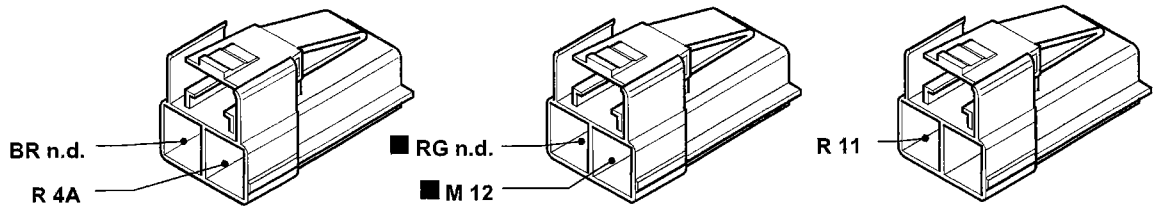
P4A019I01

Fiat-CODE and failure warning light

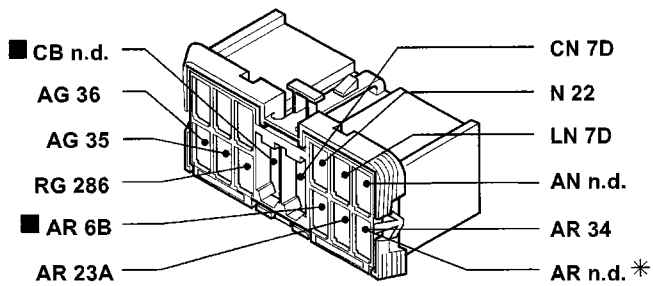
Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
L Fiat CODE device failure warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 148 Earth for electronic injection
- 195 Injection/ignition electronic control unit (1581)
- 199 Aerial for Fiat-CODE
- 296 Fuse carrier base on front cable  
C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection  
F 7.5A fuse protecting electronic injection system/ Fiat-CODE
- N.D. Ultrasound welding taped in cable loom

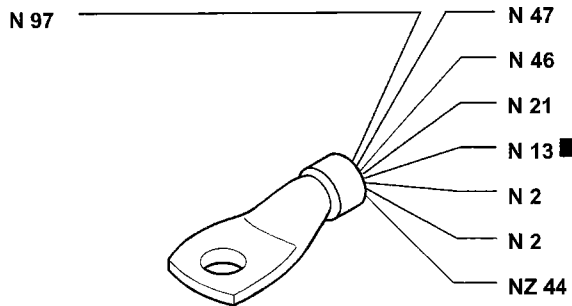
3 Power fuse box



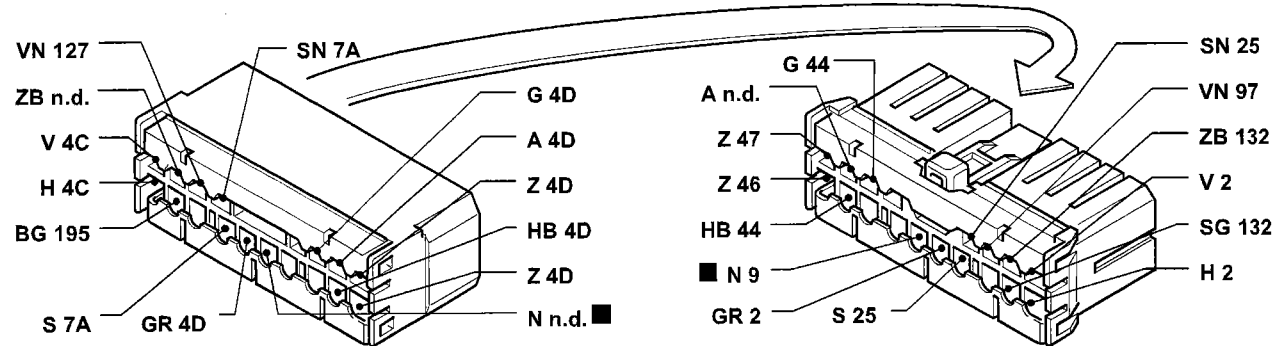
41 Junction unit



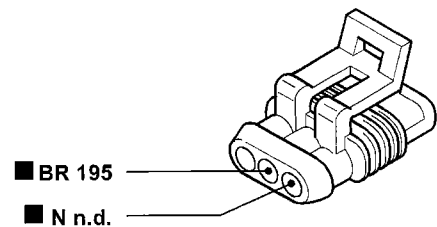
9 Right front earth



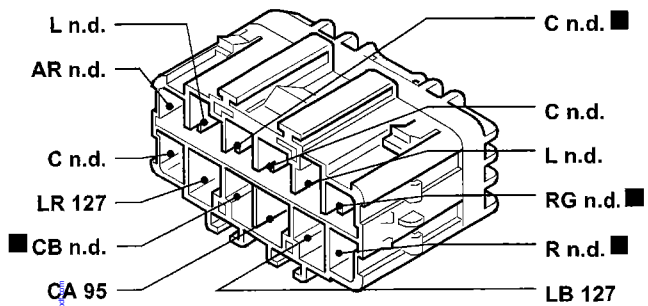
13 Front right/left cables connection



139 Injection system diagnostic socket



296 Fuse carrier base on front cable



P4A020I01

The cables in the wiring diagram are marked

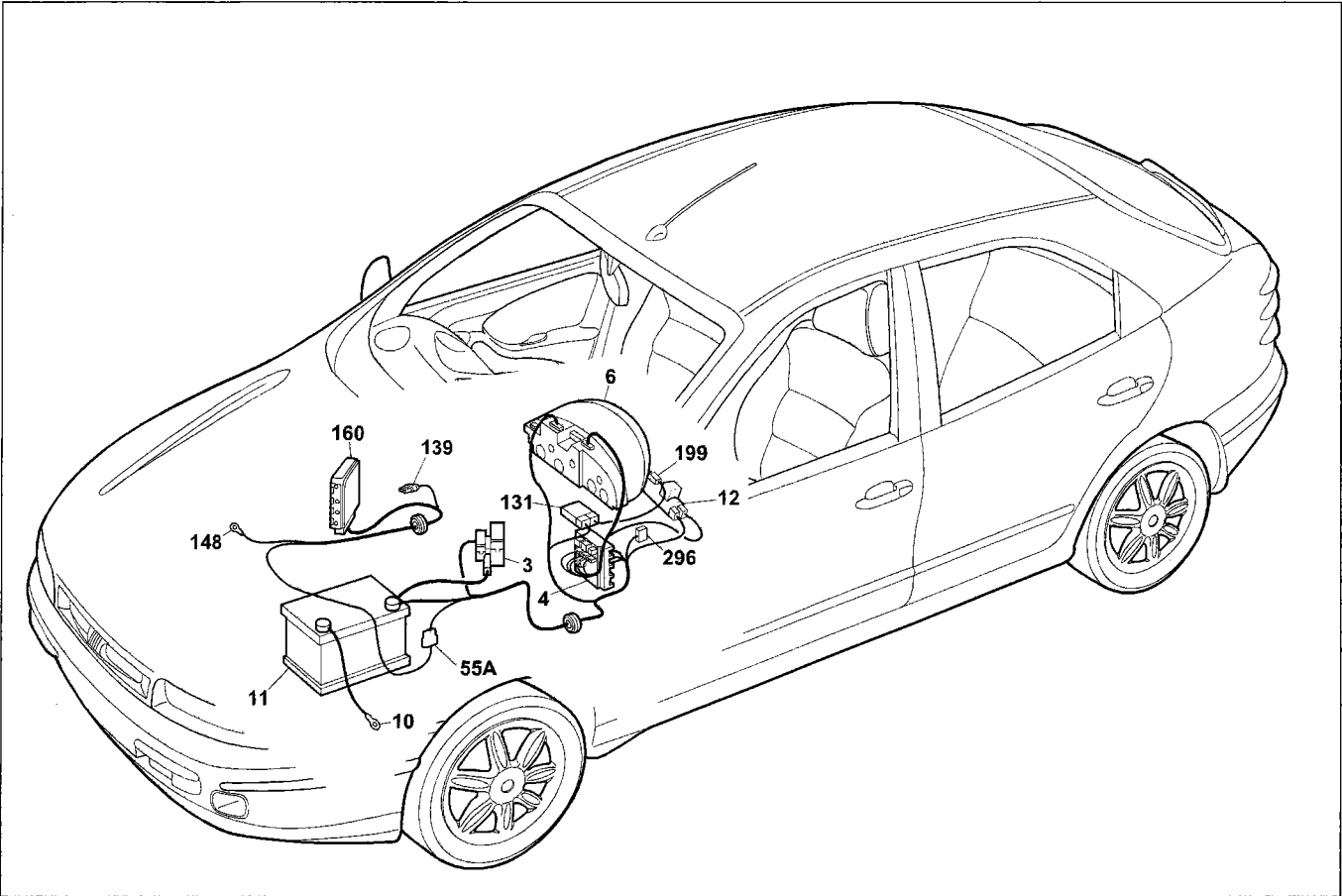
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4A019I





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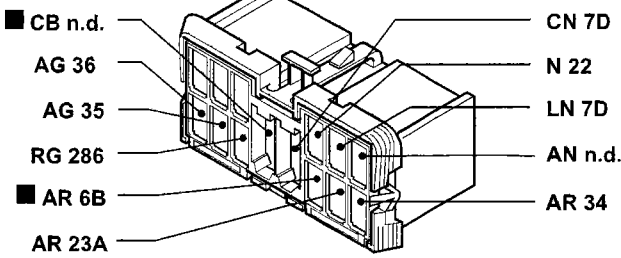
P4A023101

Fiat-CODE and failure warning light

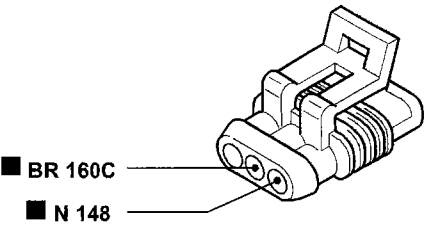
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - L Fiat CODE device failure warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 55B Connection between front/engine pre-wiring cables
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 148 Earth for electronic injection
- 160 Injection/ignition electronic control unit (1747)
- 199 Aerial for Fiat-CODE
- 296 Fuse carrier base on front cable
  - C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection
  - F 7.5A fuse protecting electronic injection system/ Fiat-CODE
- N.D. Ultrasound welding taped in cable loom

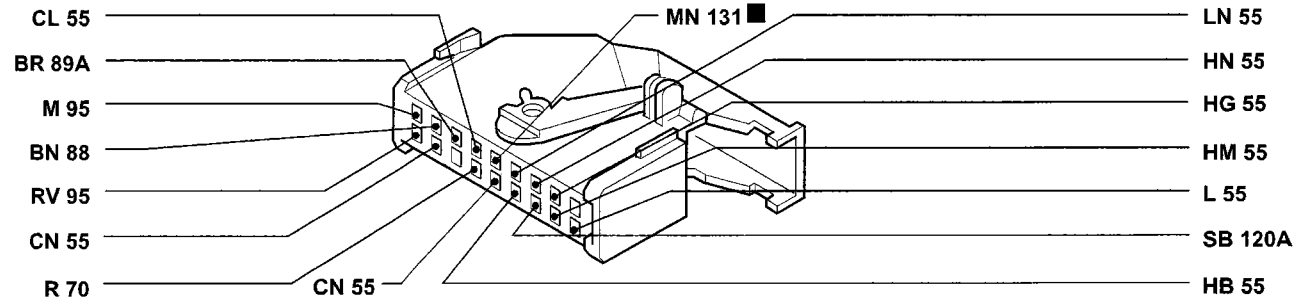
4I Junction unit



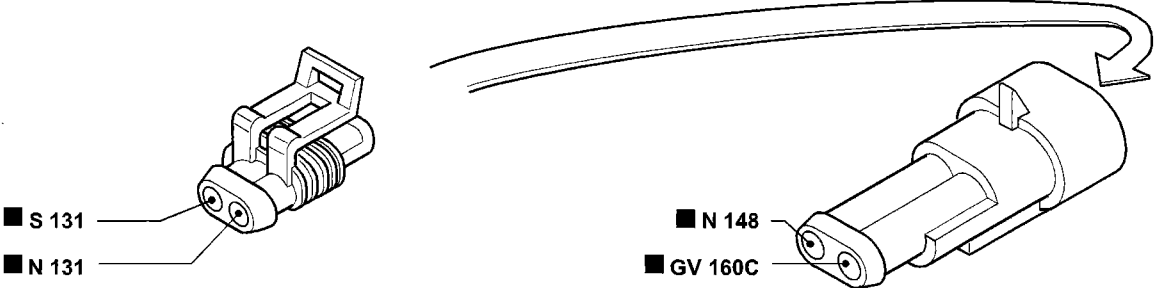
139 Diagnostic socket for injection system



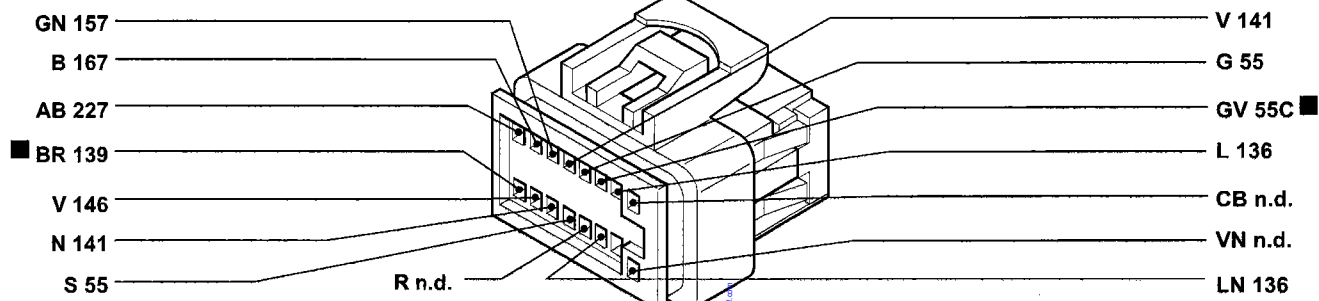
6A Instrument panel



55C Connection between front cable/engine pre-wiring



160C Injection/ignition electronic control unit

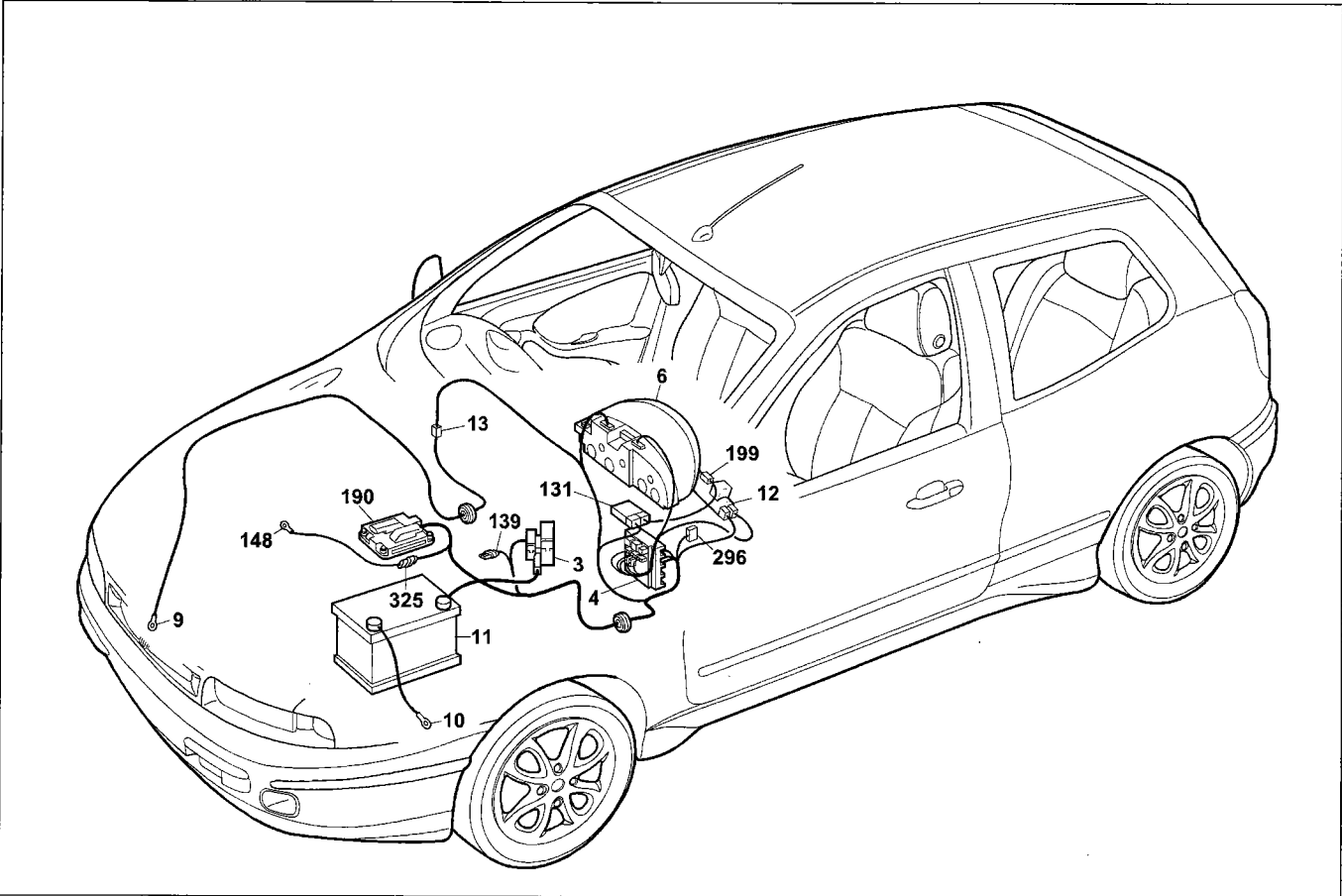


The cables in the wiring diagram are marked

P4A024101



55.



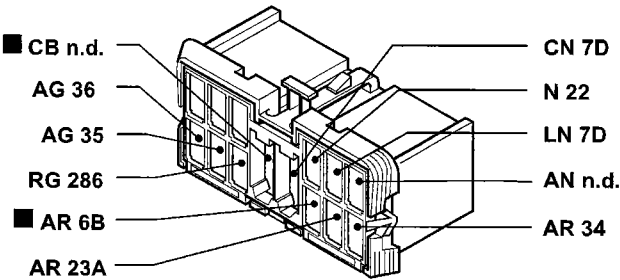
P4A027I01

Fiat-CODE and failure warning light

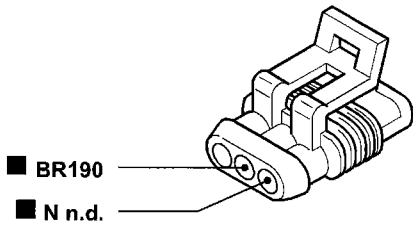
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - L Fiat CODE device failure warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 148 Earth for electronic injection
- 190 Injection/ignition electronic control unit (1998)
- 199 Aerial for Fiat-CODE
- 296 Fuse carrier base on front cable
  - C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection
  - F 7.5A fuse protecting electronic injection system/ Fiat-CODE
- 325 Connection between injection/front left cables
- N.D. Ultrasound welding taped in cable loom

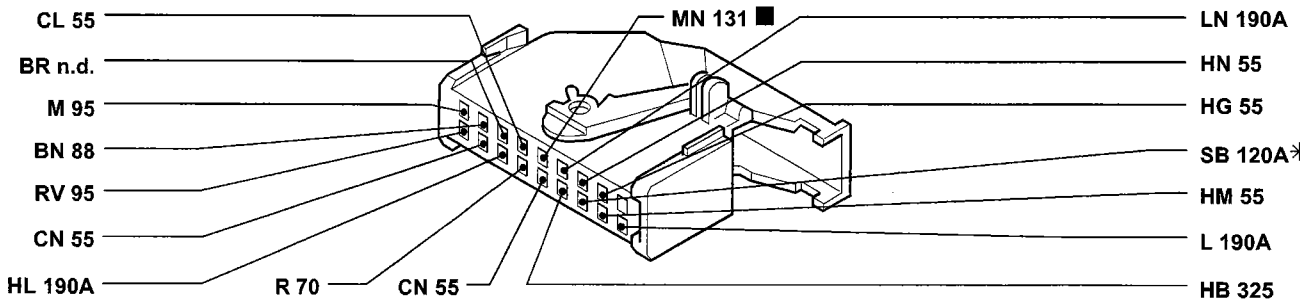
41 Junction unit



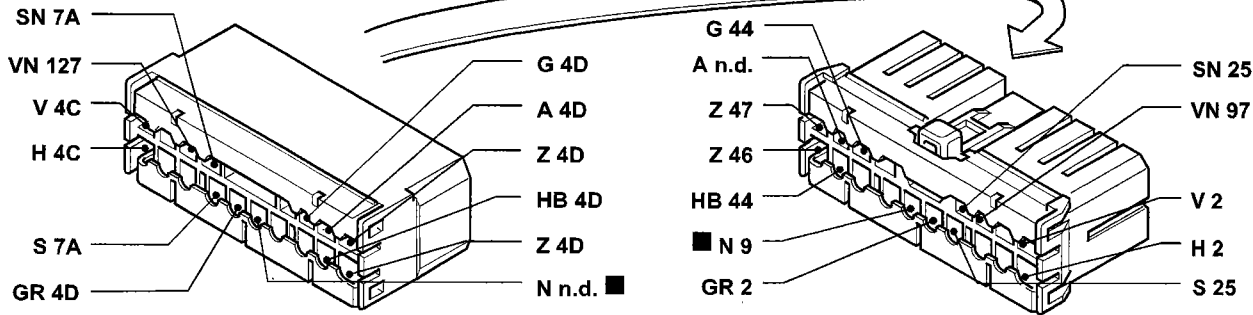
139 Diagnostic socket for injection system



6A Instrument panel

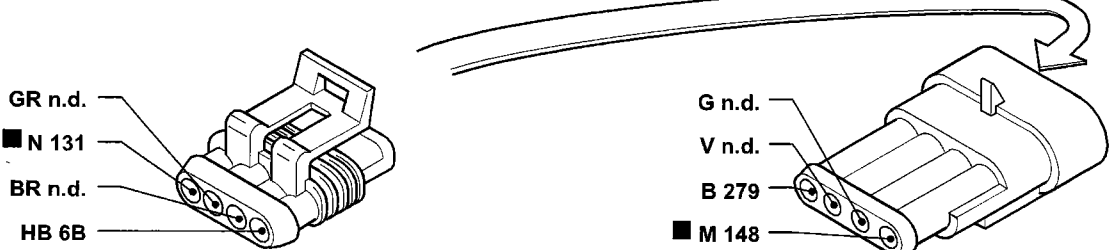


13 Front right/left cables connection



\* Variant connection for versions with air conditioning

325 Connection between injection/front left cables



The cables in the wiring diagram are marked

P4A028I01

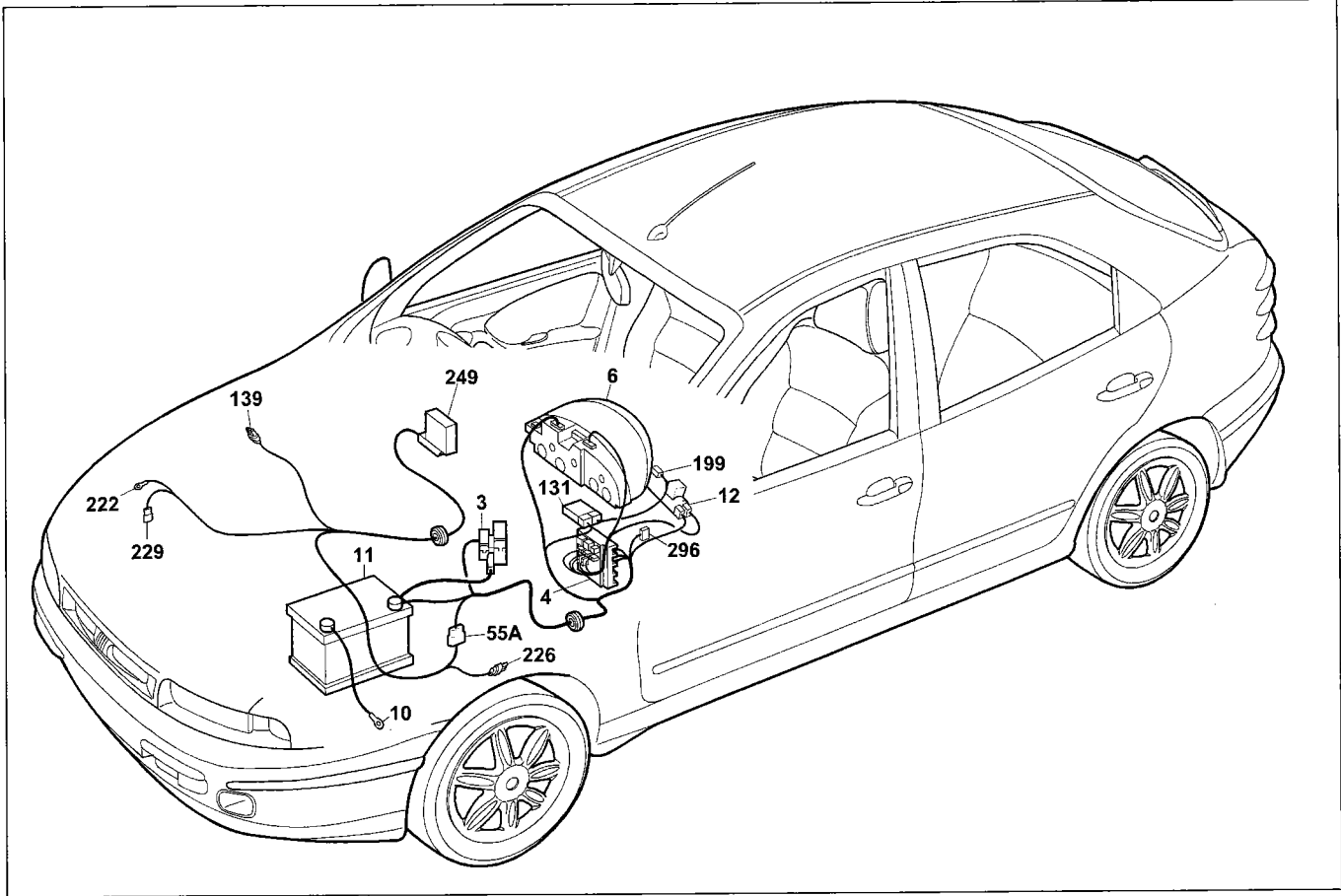
Simpo PDF Merge and Split Unregistered Version - <http://www.simpopdf.com>



The diagram shows the rear window assembly with the 296 pin connector labeled '296' and the location of the 7.5 9/2, 7.5 9/2, 10 01, 7.5 9/2, 20 02, and 7.5 9/2 connectors labeled 'F', 'E', 'D', 'C', 'B', and 'A' respectively.



55.



P4A031101

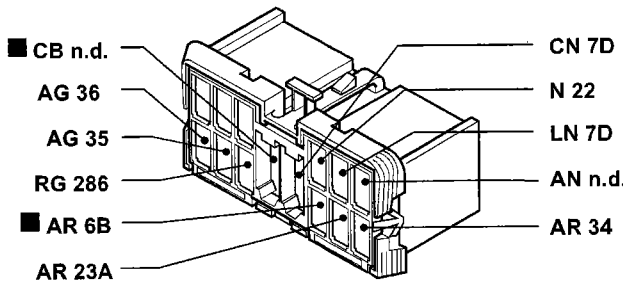
Fiat-CODE and failure warning light

Components key

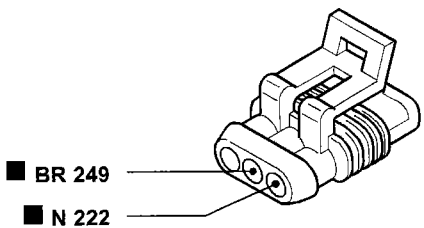
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - L Fiat CODE device failure warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 19 Right rear earth
- 55A Connection between front/engine pre-wiring cables
- 131 Fiat CODE electronic control unit
- 139 Diagnostic socket for injection system
- 199 Aerial for Fiat CODE
- 222 Earth for fuel system
- 226 Diagnostic socket for Fiat code system
- 229 Engine cut out electro-stop

- 249 E.G.R. electronic control unit
- 296 Fuse carrier base on front cable
  - C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection
  - F 7.5A fuse protecting electronic injection system/ Fiat-CODE
- N.D. Ultrasound welding taped in cable loom

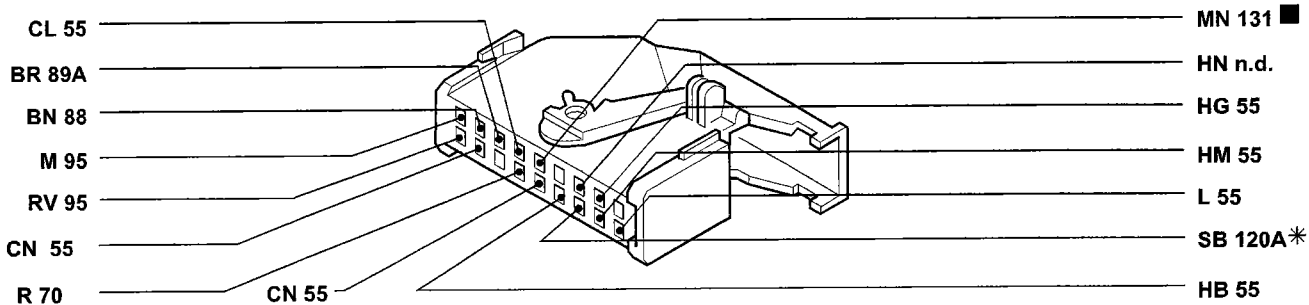
41 Junction unit



139 Diagnostic socket for injection system



6A Instrument panel

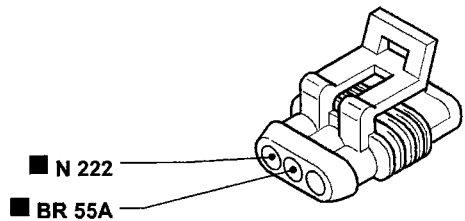


\* Variant connection for versions with air conditioning

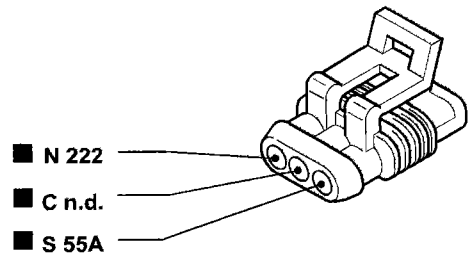
55A Connection between front cable/engine pre-wiring



226 Diagnostic socket for Fiat code system



229 Engine cut out electro-stop



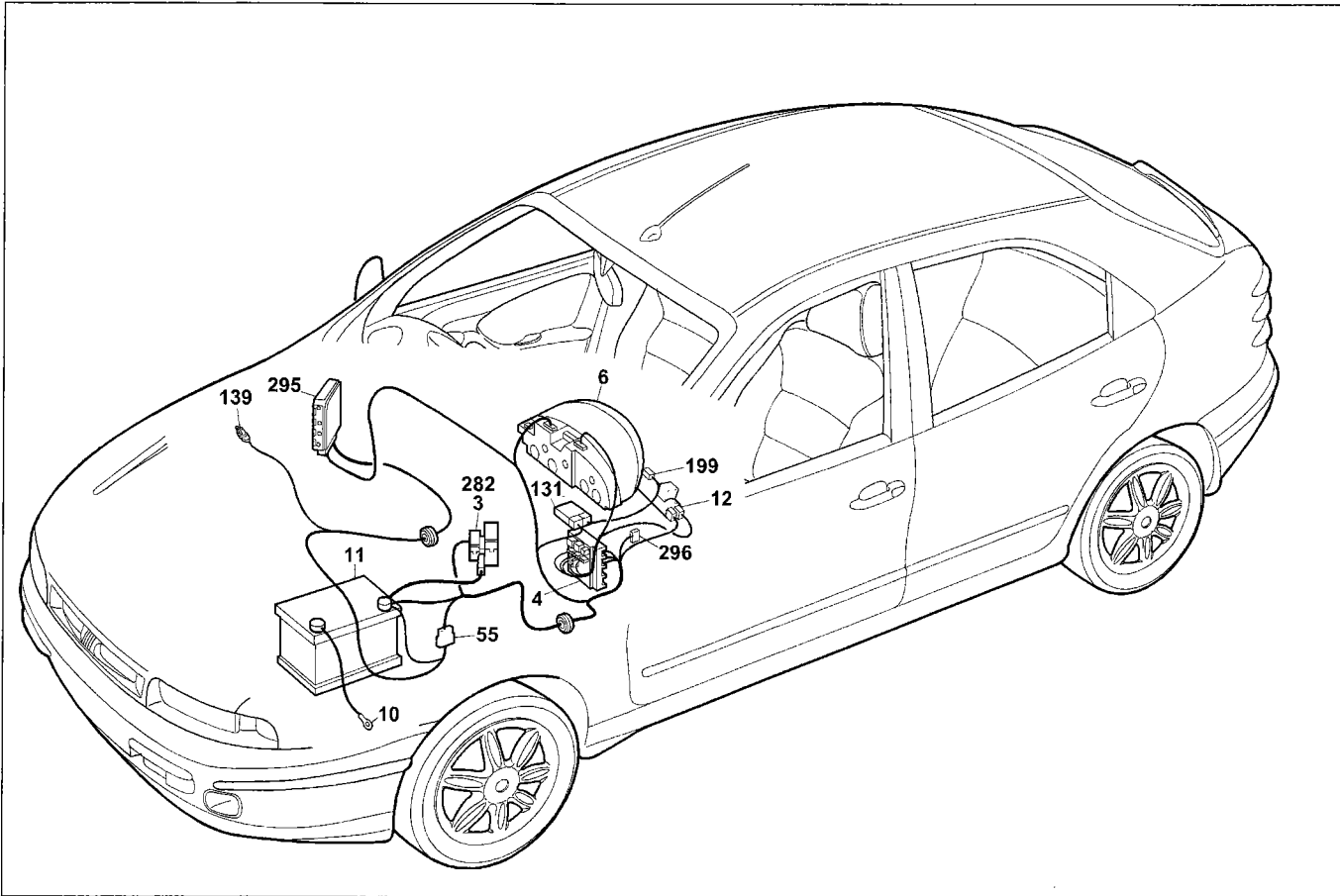
The cables in the wiring diagram are marked

P4A032101

Diagram illustrating the rear window assembly. The diagram shows the internal wiring and components of the rear window. A label '296' points to a specific connector. A legend on the left lists components A through F:

- F: 7.5 9.2
- E: 7.5 9.2
- D: 10 01
- C: 7.5 9.2
- B: 20 02
- A: 7.5 9.2

55.



P4A035101

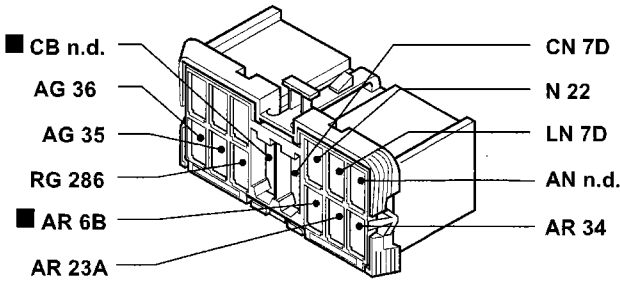
Fiat-CODE and failure warning light

Components key

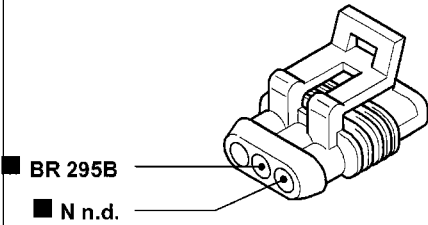
- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
L Fiat CODE device failure warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 55 Connection between front/engine pre-wiring cables
- 131 Fiat CODE electronic control unit
- 139 Diagnostic socket for injection system
- 199 Aerial for Fiat- CODE

- 282 7.5A fuse protecting Fiat-CODE/electronic injection (60 for UNIJET)
- 295 Injection/ignition electronic control unit 1910 TD UNIJET
- 296 Fuse carrier base on front cable
- C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection
- F 7.5A fuse protecting electronic injection system/ Fiat- CODE
- N.D. Ultrasound welding taped in cable loom

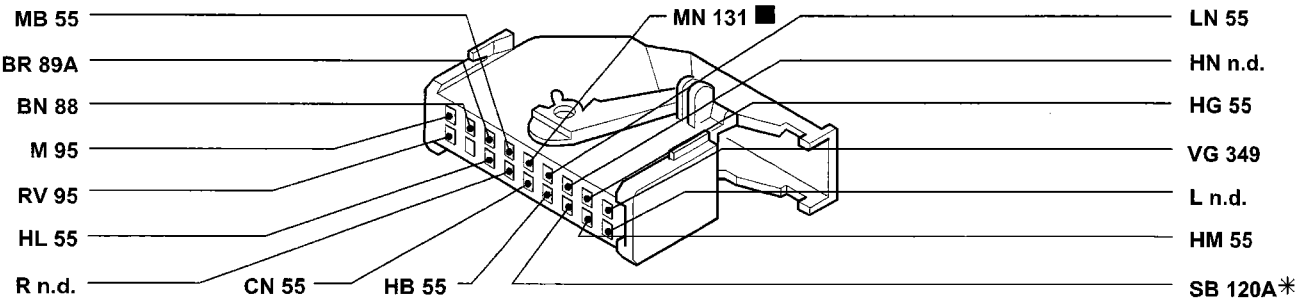
41 Junction unit



139 Diagnostic socket for injection system

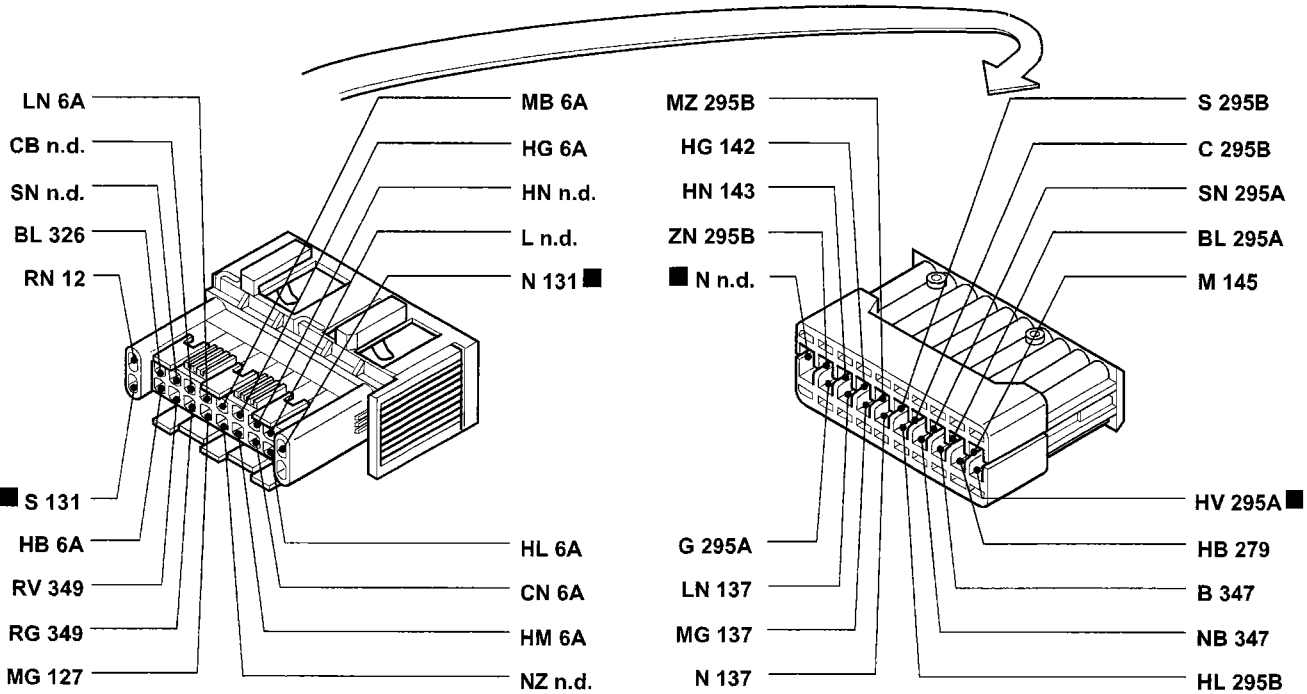


6A Instrument panel



\* Variant connection for versions with air conditioning

55 Connection for front cable/engine pre-wiring

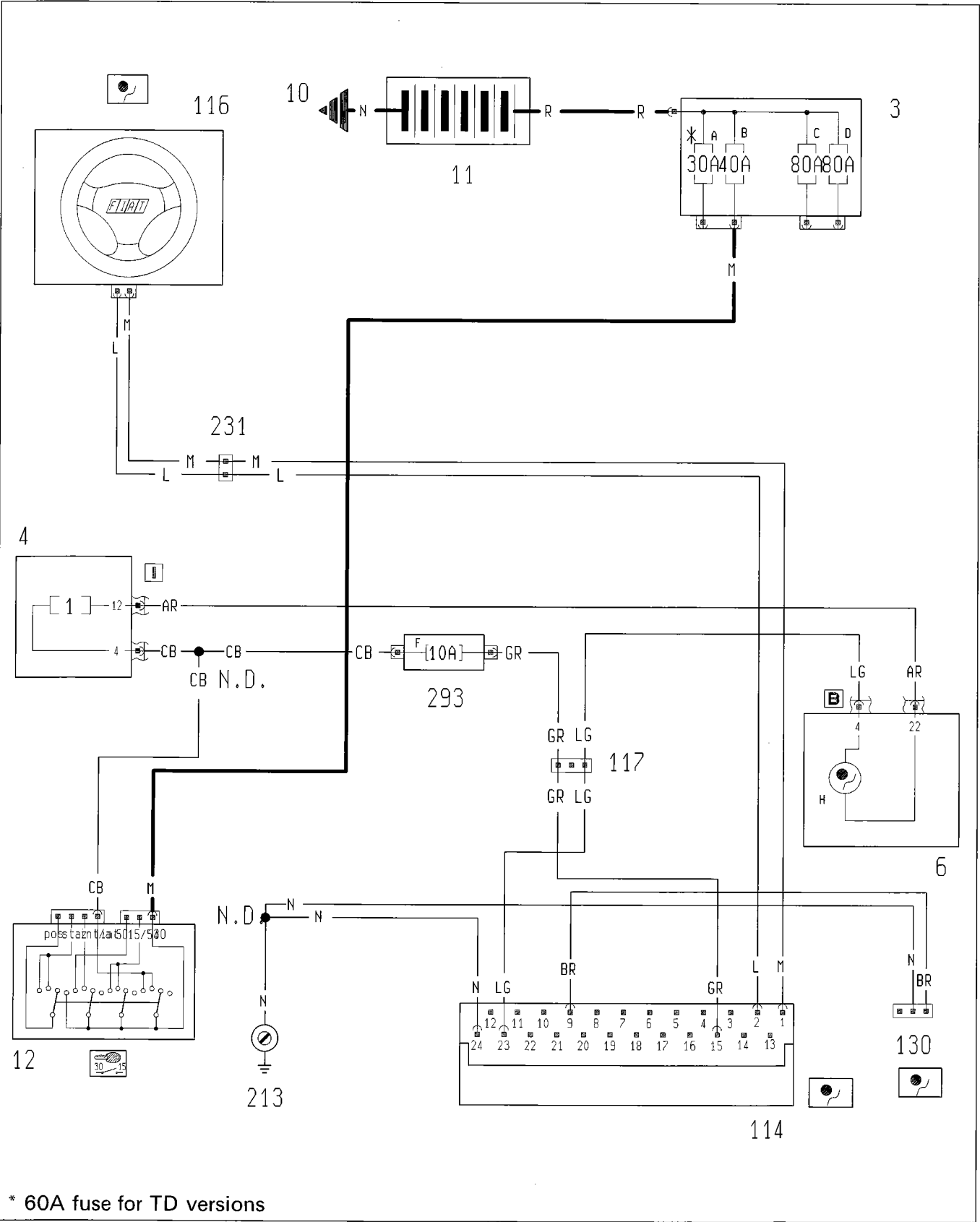


The cables in the wiring diagram are marked

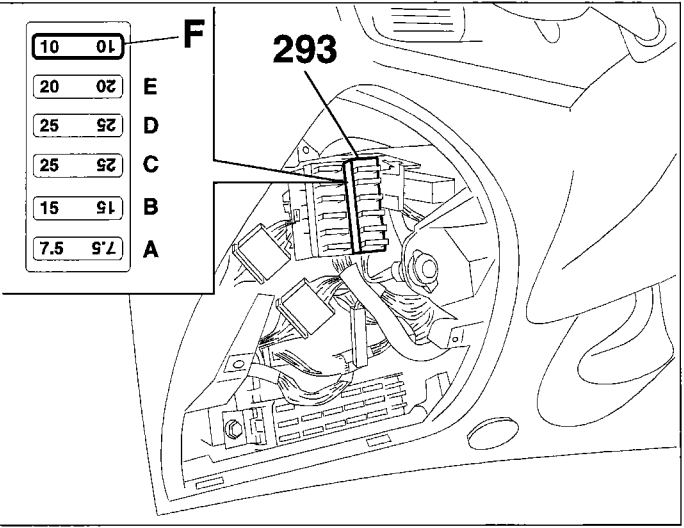
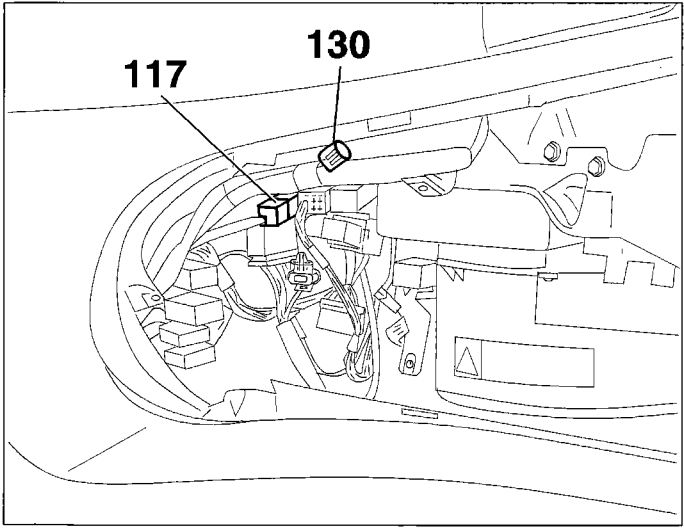
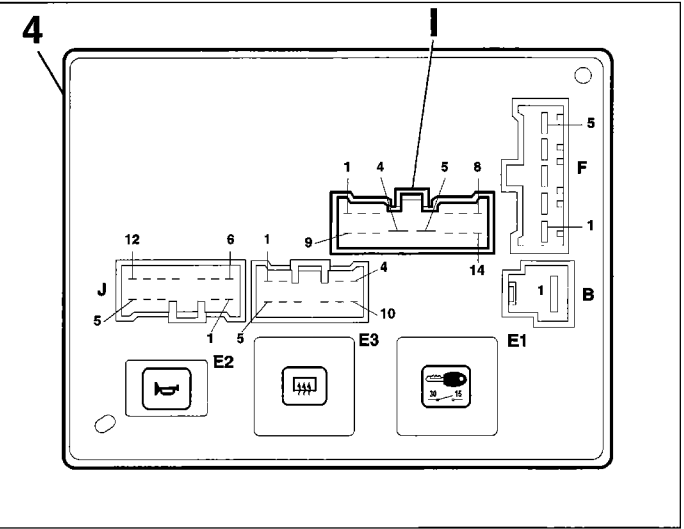
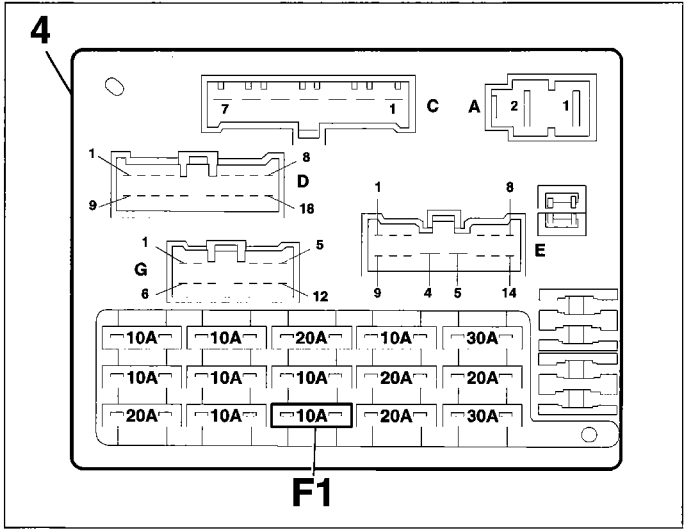
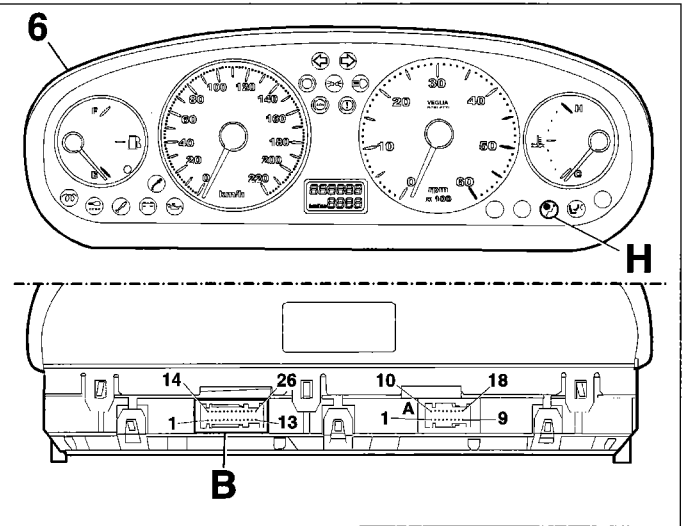
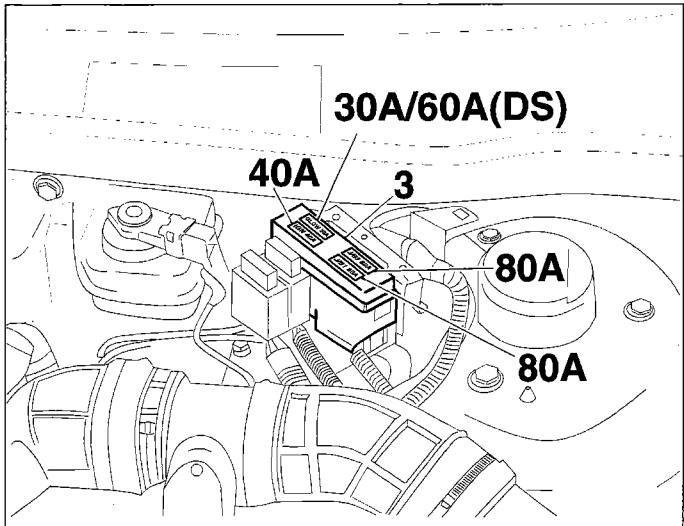
P4A036101



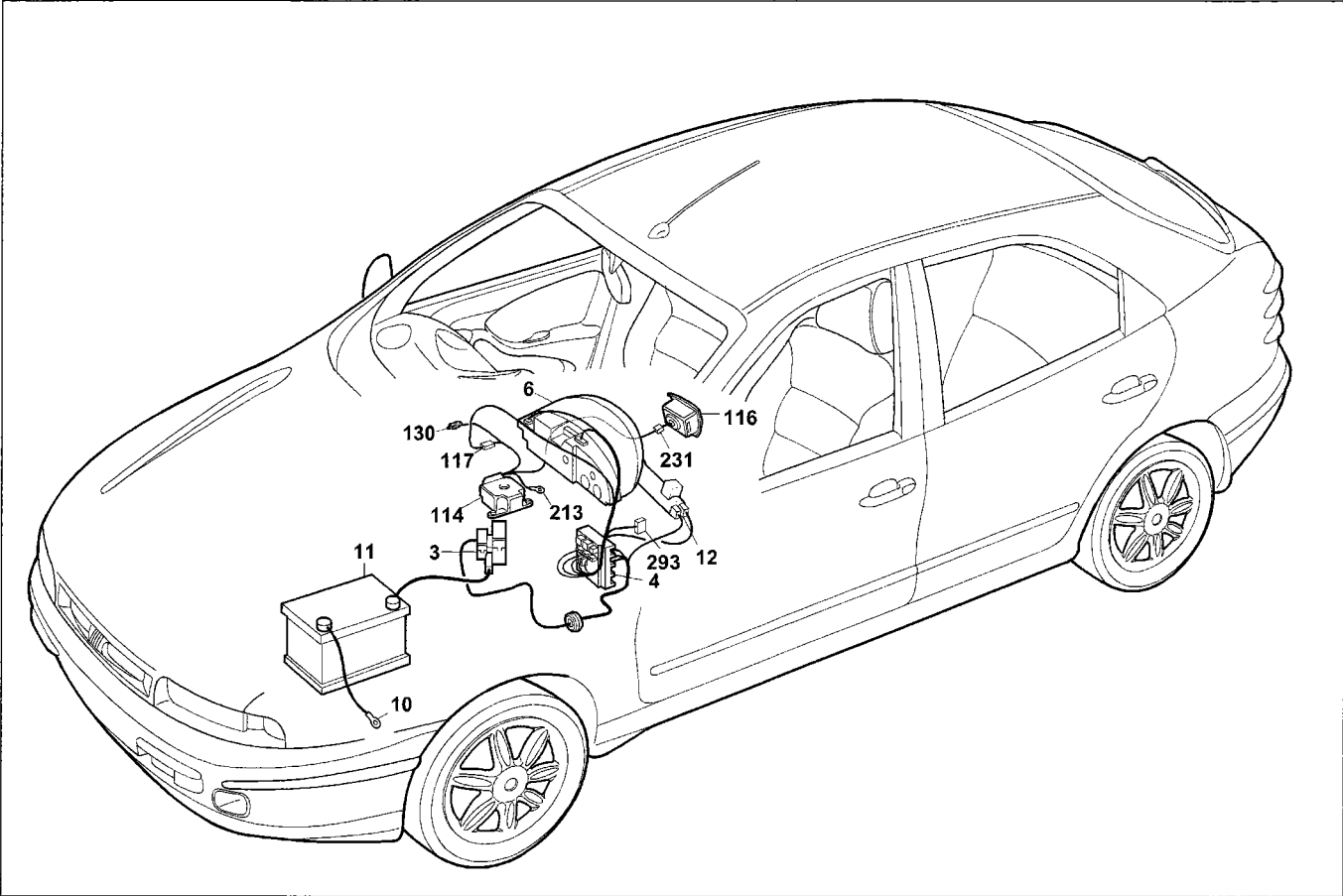
Driver's EURO-BAG and failure warning light - (See key at end of wiring diagrams)



Location of components



55.



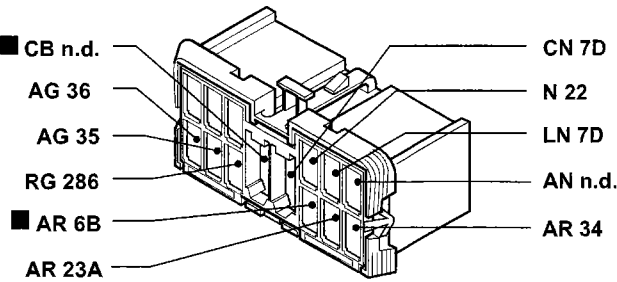
P4A039I01

Driver's EURO-BAG and failure warning light

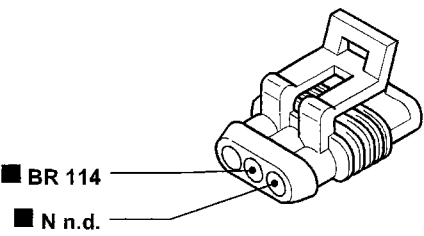
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - H EURO-BAG system failure warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 114 EURO-BAG electronic control unit
- 116 Driver's EURO-BAG
- 117 Connection between EURO-BAG/dashboard cables
- 130 Diagnostic socket for EURO-BAG
- 213 Earth for EURO-BAG
- 231 Clock spring connection
- 293 Fuse carrier base on dashboard cable
  - F 10A fuse protecting EURO-BAG
- N.D. Ultrasound welding taped in cable loom

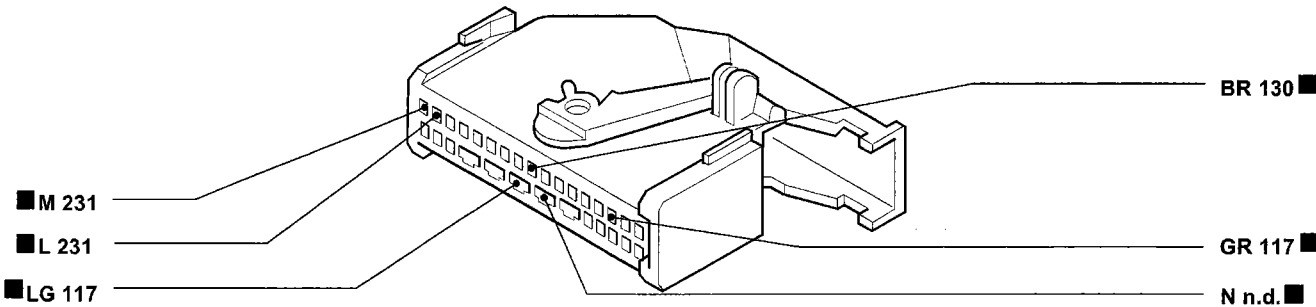
41 Junction unit



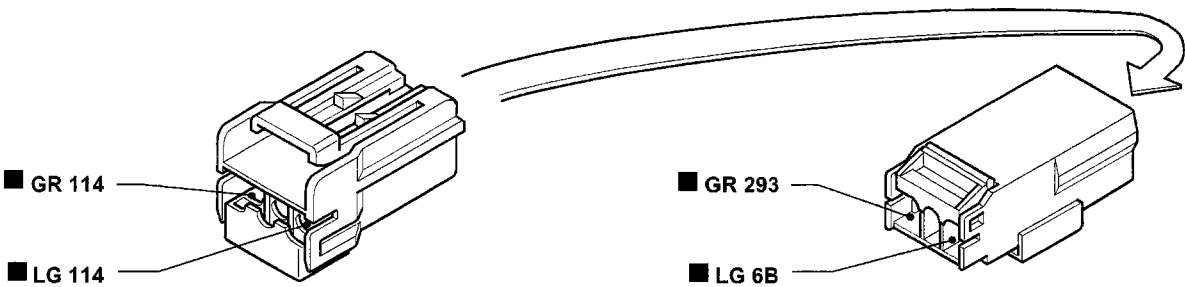
130 Diagnostic socket for EURO-BAG



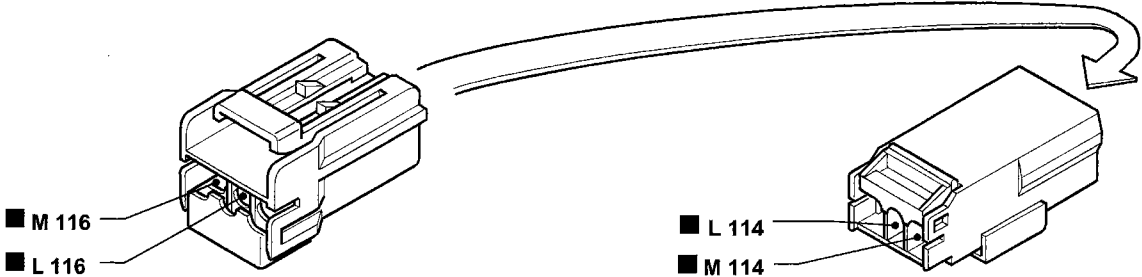
114 EURO-BAG electronic control unit



117 Connection between EURO-BAG/dashboard cables



231 Clock spring connection

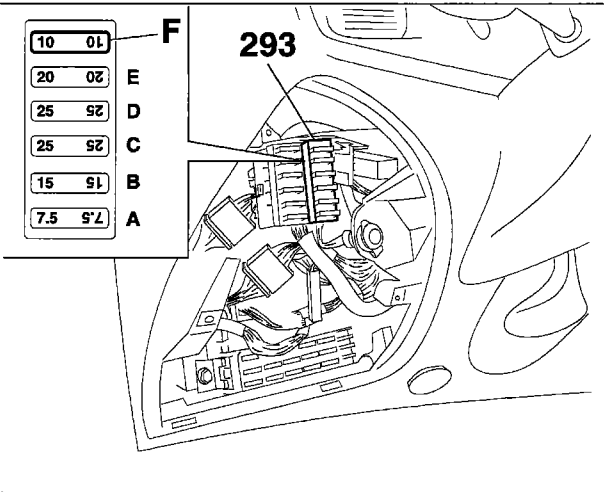
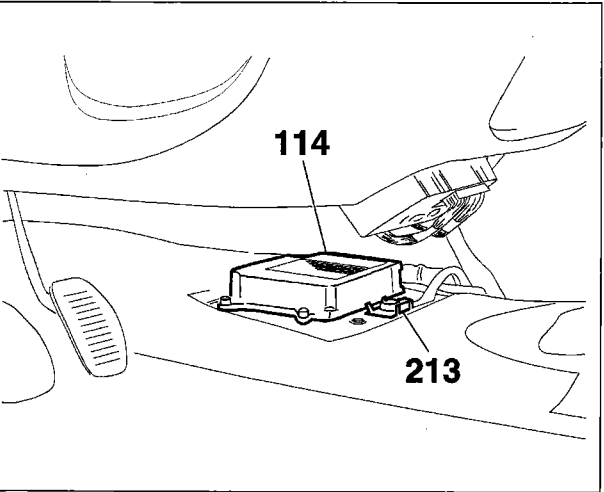
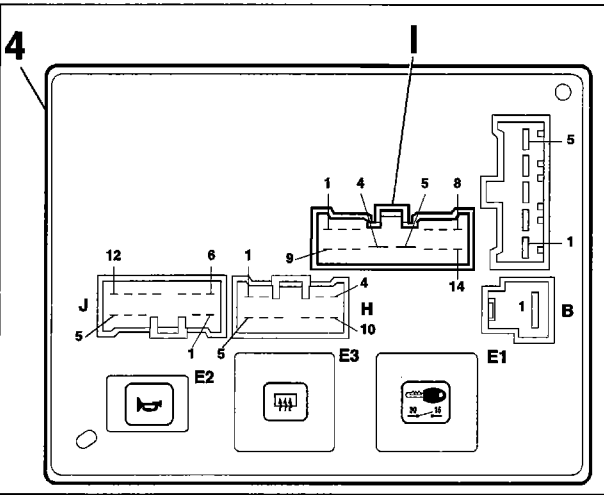
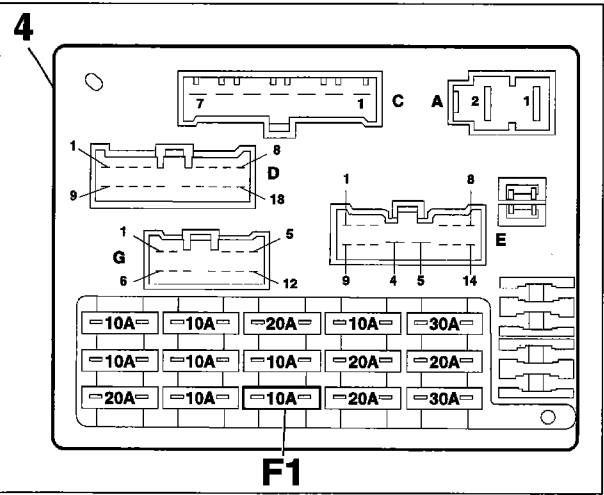
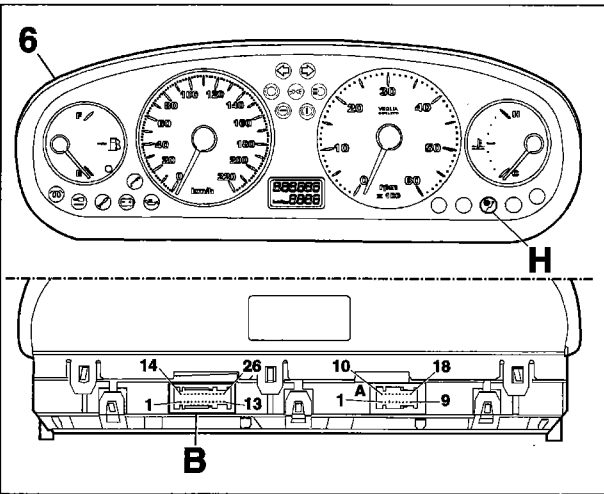
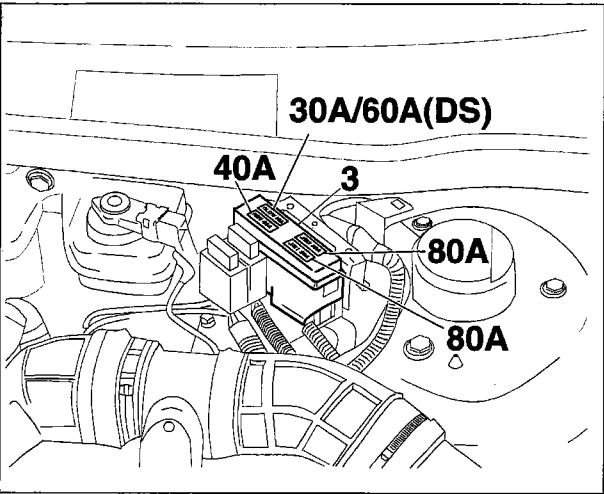
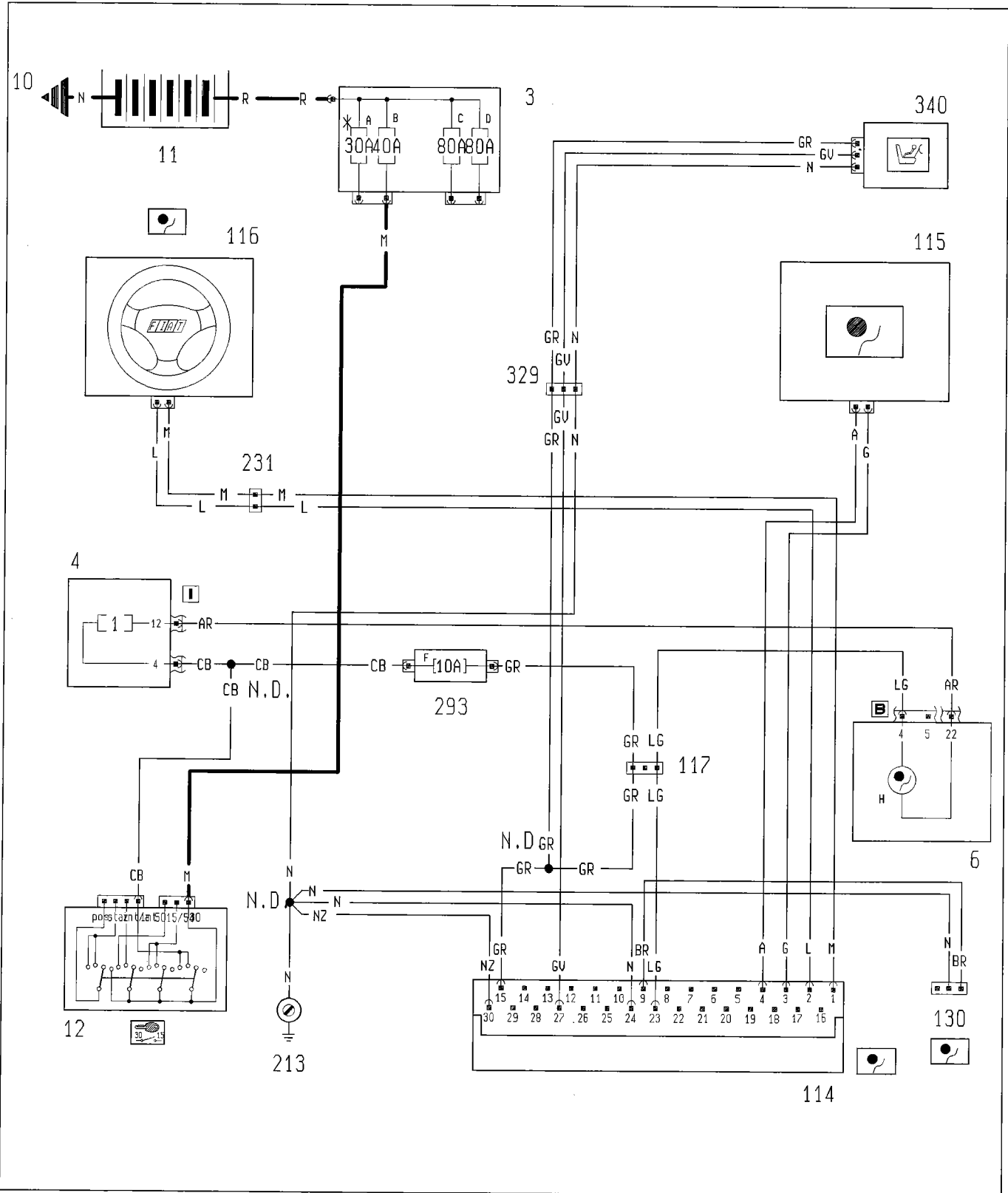


The cables in the wiring diagram are marked

P4A040I01

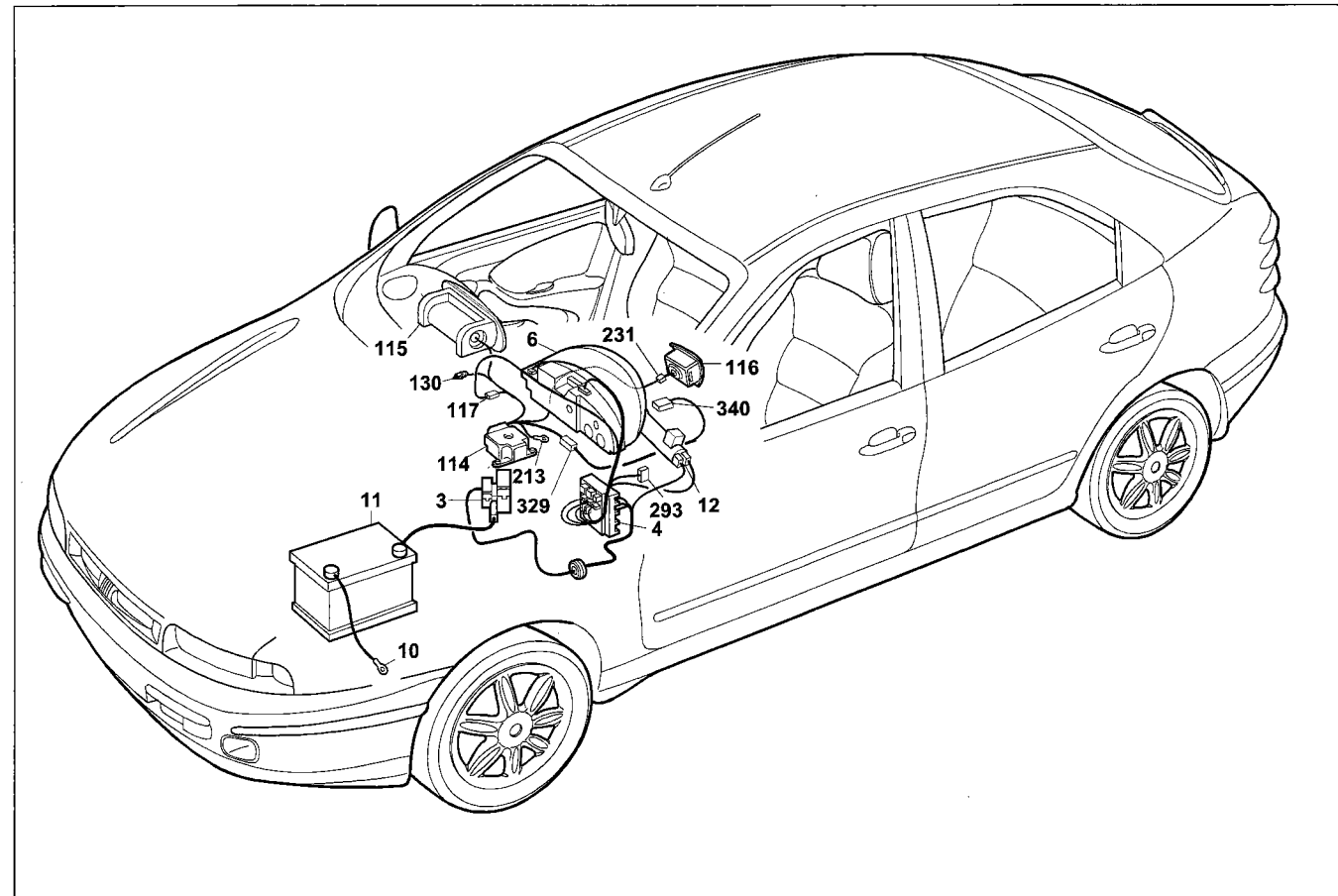
Driver's side, passenger side EURO-BAG and failure warning light - (See key at end of wiring diagrams)

Component location



\* 60A fuse for TD versions

### 55.



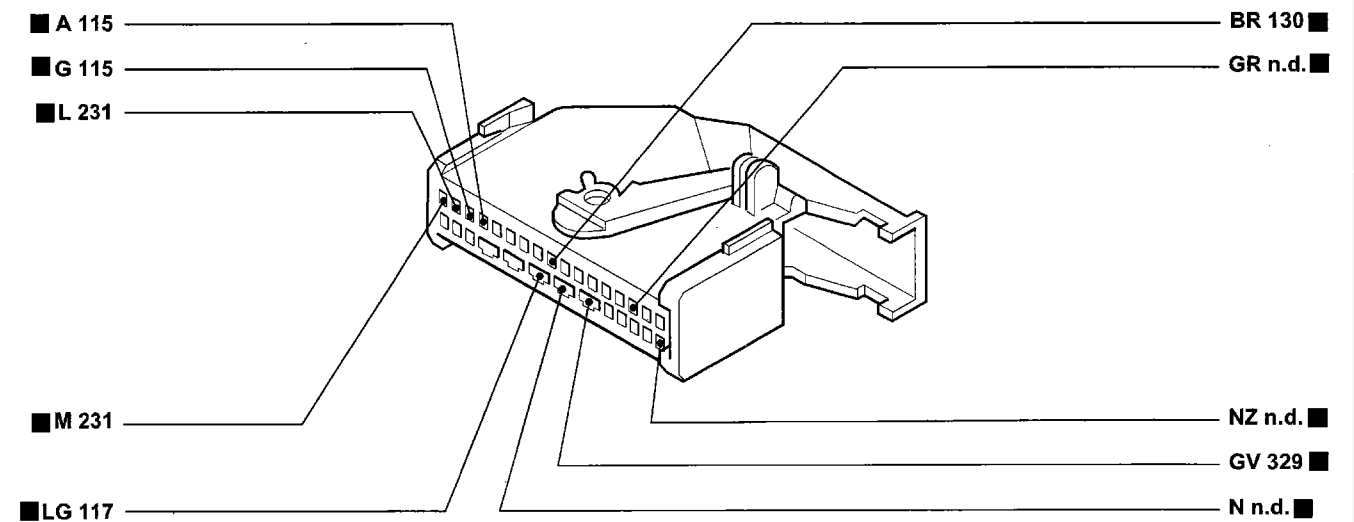
4A043I01

#### Driver's side, passenger side EURO-BAG and failure warning light

#### Key to components

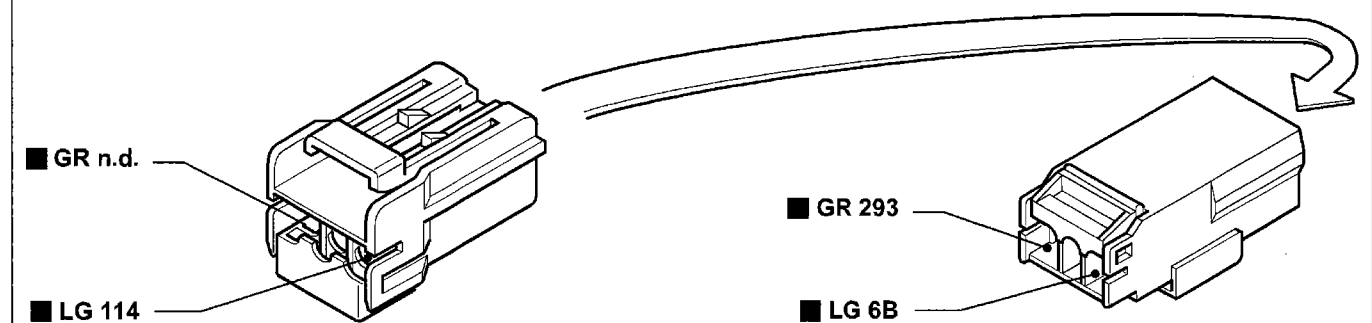
- |                                                               |                                             |
|---------------------------------------------------------------|---------------------------------------------|
| 3 Power fusebox:                                              | 231 Clock spring connector                  |
| A 30A fuse protecting injection system (60A for TD versions0) | 293 Fuse holder base on facia lead          |
| B 40A fuse protecting ignition system                         | F 10A fuse protecting EURO BAG              |
| C 80A fuse protecting additional options                      | 329 Connection with braid on floorpan       |
| D 80A fuse protecting junction unit                           | 340 Passenger presence sensor               |
| 4 Junction unit:                                              | N.D. Ultrasound welding taped in cable loom |
| 6 Instrument panel                                            |                                             |
| H EURO-BAG system failure warning light                       |                                             |
| 10 Earth for battery on body                                  |                                             |
| 11 Battery                                                    |                                             |
| 12 Ignition switch                                            |                                             |
| 114 EURO-BAG electronic control unit                          |                                             |
| 115 Passenger side EURO-BAG                                   |                                             |
| 116 Driver's EURO BAG                                         |                                             |
| 117 EURO-BAG/facia lead connections                           |                                             |
| 130 Tester connection for EURO-BAG                            |                                             |
| 213 Earth for EURO-BAG                                        |                                             |

#### 114 EURO-BAG electronic control unit



4A044I01

#### 117 EURO-BAG/facia wiring connection



4A044I02

#### 231 Clock spring connector



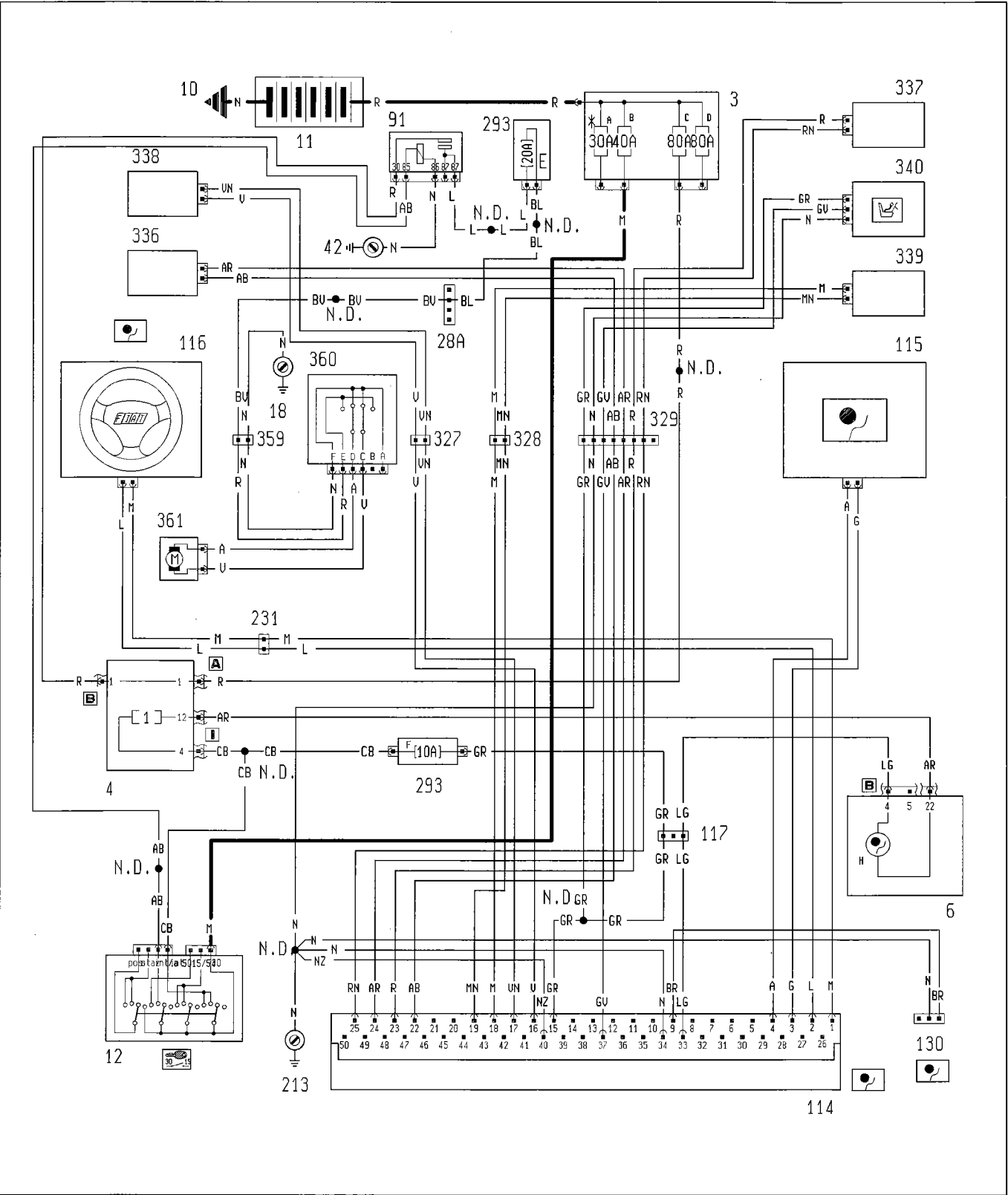
4A044I03

The wires marked in the wiring diagram are marked by the square

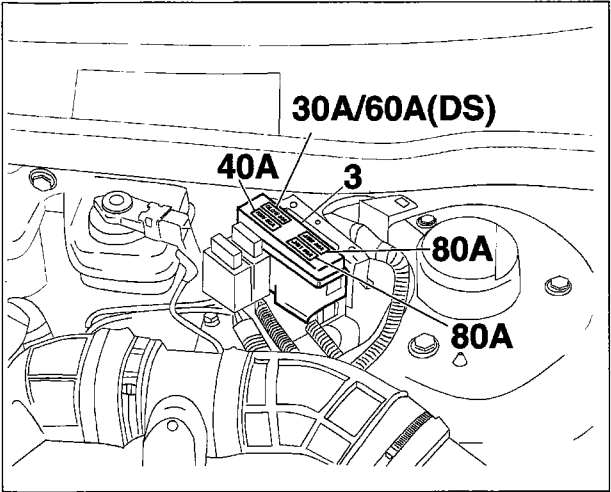


Driver's, passenger side EURO BAG SIDE BAG and failure warning light - Lumbar adjustment - (See key at end of wiring diagrams)

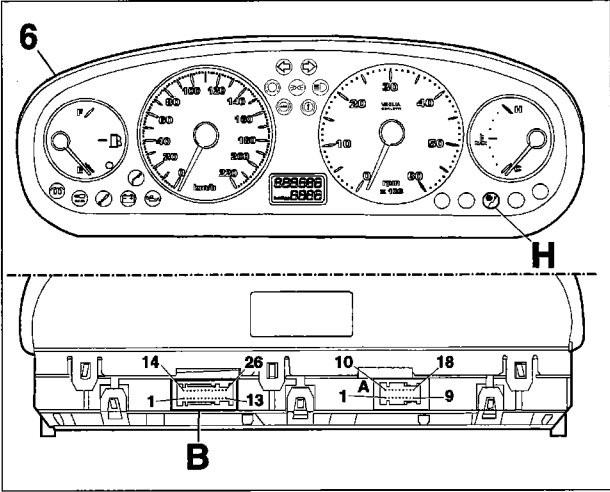
Component location



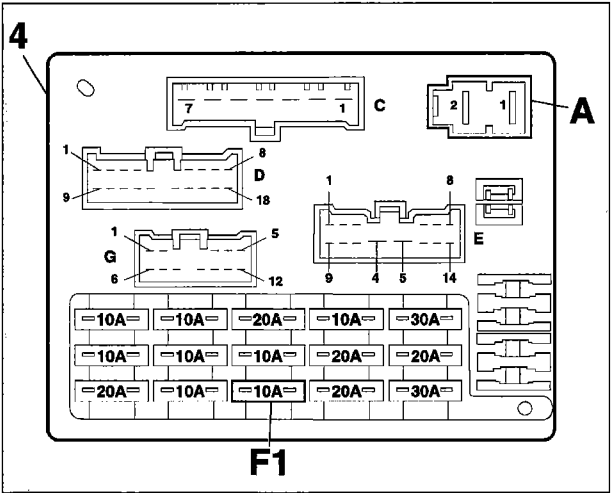
4A045101



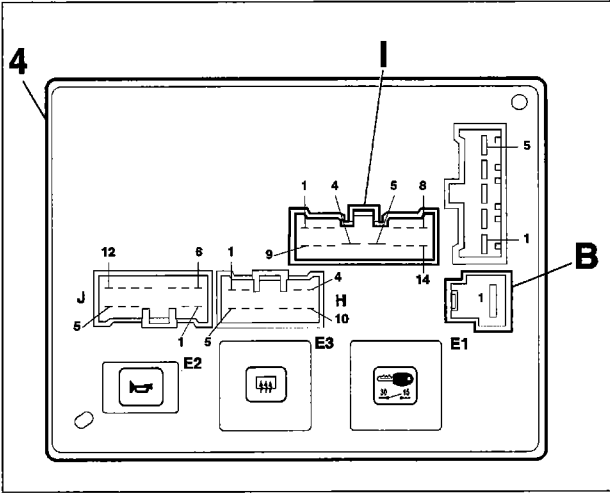
4A046101



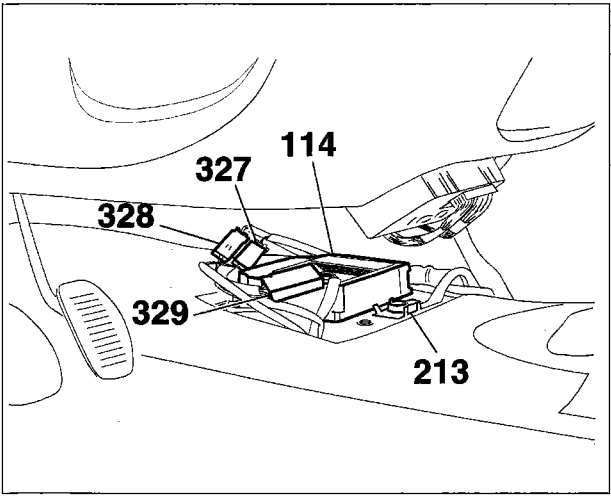
4A046102



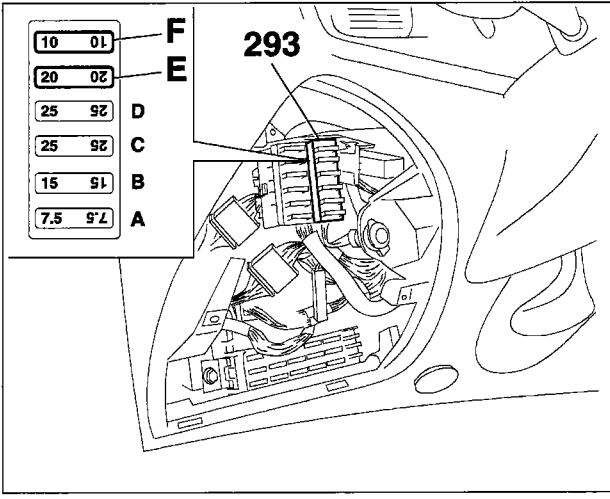
4A046103



4A046104



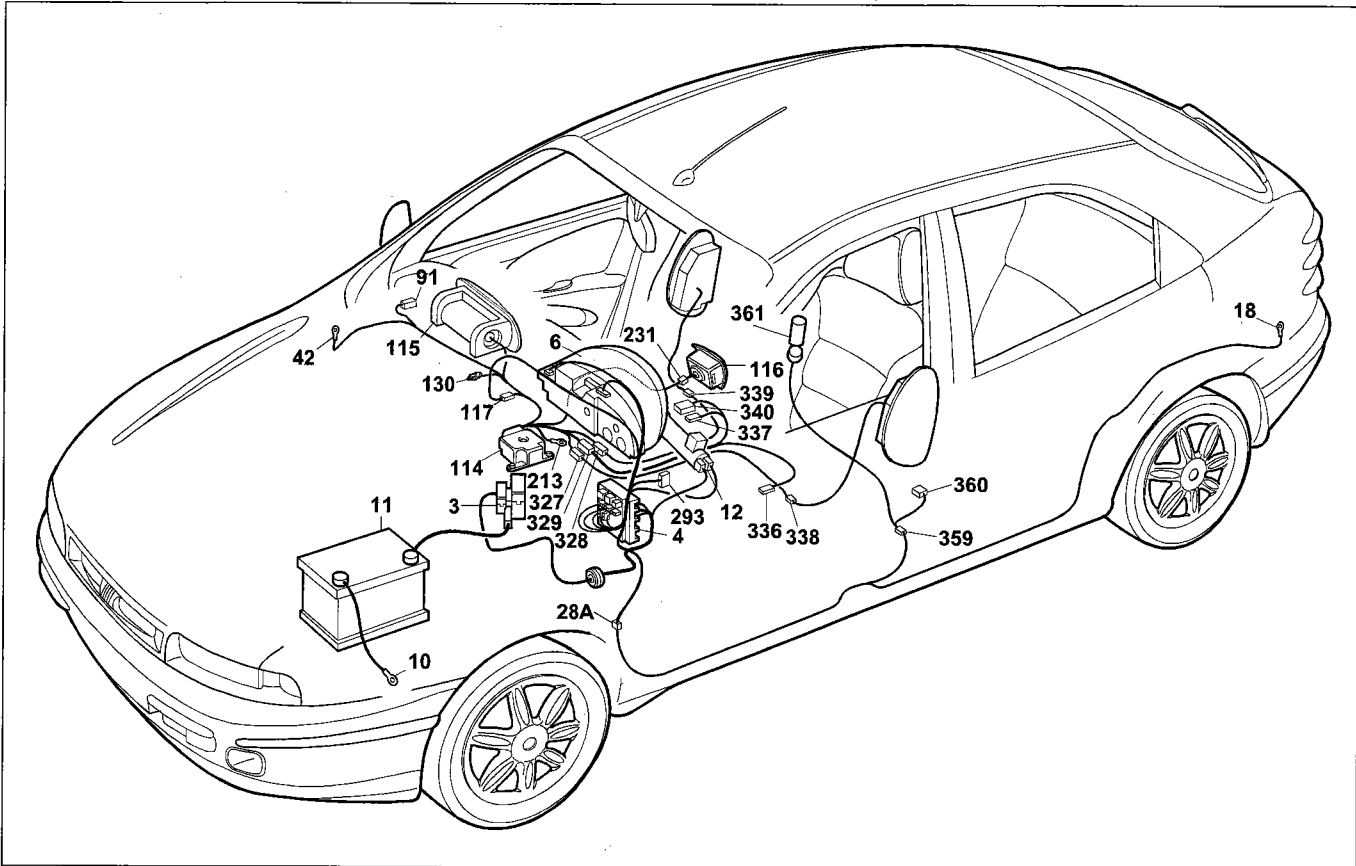
4A046105



4A046106

\* 60A fuse for TD versions

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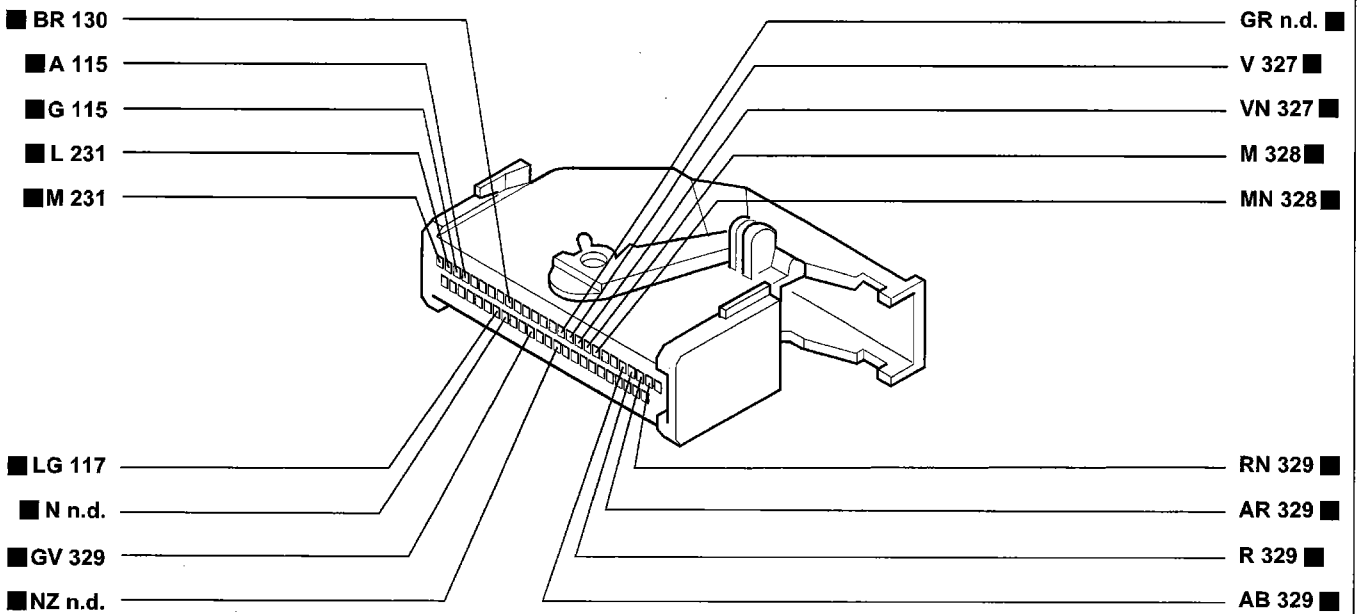


Driver's, passenger side EURO BAG, passenger SIDE BAG and failure warning light - Lumbar adjustment

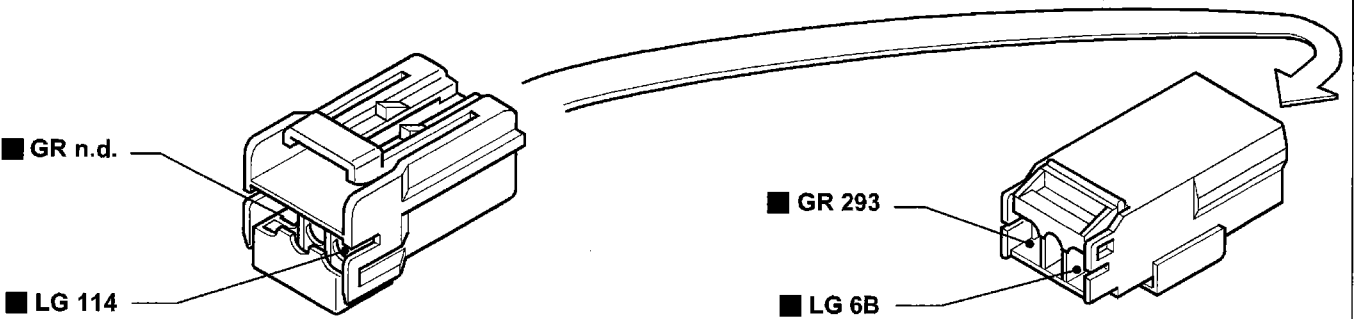
Key to components

- |                                                                                                                                                                                                                 |                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 3 power fusebox:<br>A 30A fuse protecting injection system<br>(60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting additional options<br>D 80A fuse protecting junction unit | 293 Fuse holder base on dashboard cable<br>F10A fuse protecting EURO BAG                            |
| 4 Junction unit                                                                                                                                                                                                 | 327 Connection with braid on floor for left EURO BAG                                                |
| 6 Instrument panel:<br>H EURO-BAG system failure warning light                                                                                                                                                  | 328 Connection with braid on floor for right EURO BAG                                               |
| 9.1 Power relay                                                                                                                                                                                                 | 329 Connection with braid on floor                                                                  |
| 10 Battery earth on body                                                                                                                                                                                        | 336 Driver's sensor for EURO BAG                                                                    |
| 11 Battery                                                                                                                                                                                                      | 337 Passenger side sensor for EURO BAG                                                              |
| 12 Ignition switch                                                                                                                                                                                              | 338 Driver's SIDE BAG                                                                               |
| 18 Left rear earth                                                                                                                                                                                              | 339 Passenger SIDE BAG                                                                              |
| 42 Right facia earth                                                                                                                                                                                            | 340 Passenger presence sensor                                                                       |
| 28A Connection between dashboard/longitudinal cables                                                                                                                                                            | 359 Connection between longitudinal cables and cables for lumbar adjustment device on driver's seat |
| 114 EURO-BAG electronic control unit                                                                                                                                                                            | 360 Lumbar adjustment device control switch on driver's seat                                        |
| 115 Passenger EURO BAG                                                                                                                                                                                          | 361 Lumbar adjustment motor                                                                         |
| 116 Driver's EURO BAG                                                                                                                                                                                           | N.D. Ultrasound welding taped in cable loom                                                         |
| 117 EURO-BAG/facia connection                                                                                                                                                                                   |                                                                                                     |
| 130 Tester connection for EURO-BAG                                                                                                                                                                              |                                                                                                     |
| 213 Earth for EURO-BAG                                                                                                                                                                                          |                                                                                                     |
| 231 Clock spring connector                                                                                                                                                                                      |                                                                                                     |

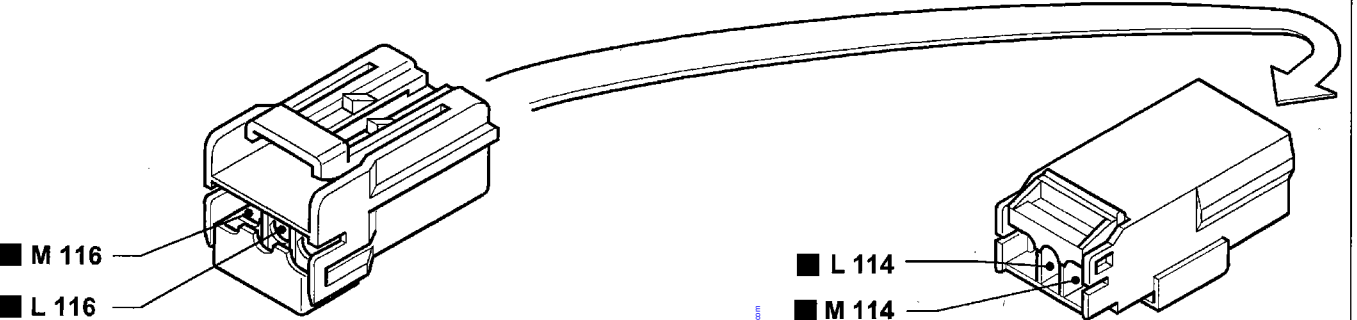
114 EURO-BAG electronic control unit



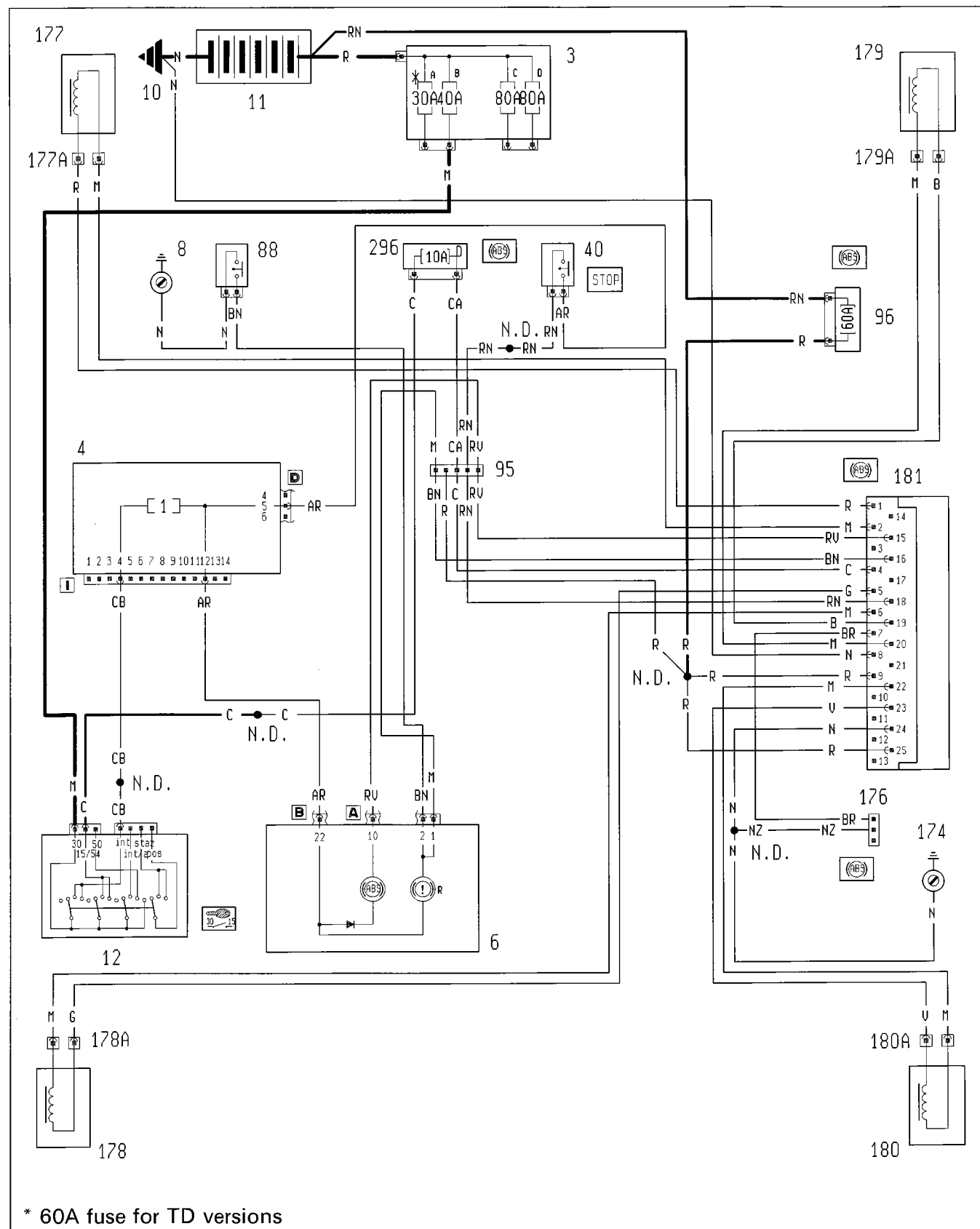
117 EURO-BAG/facia wiring connection



231 Clock spring connector



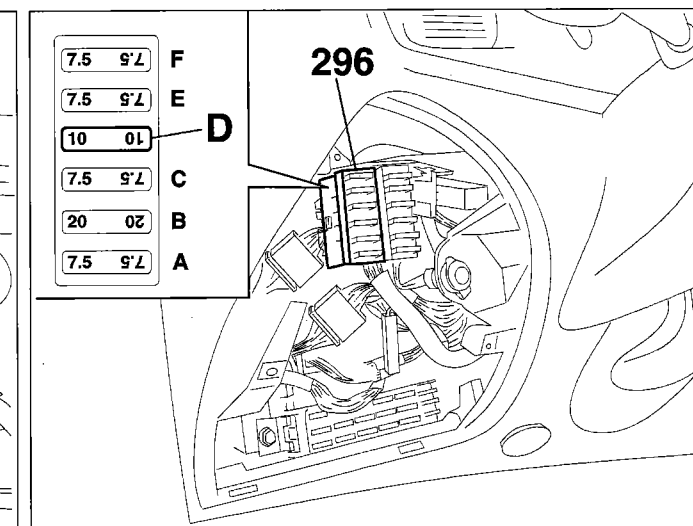
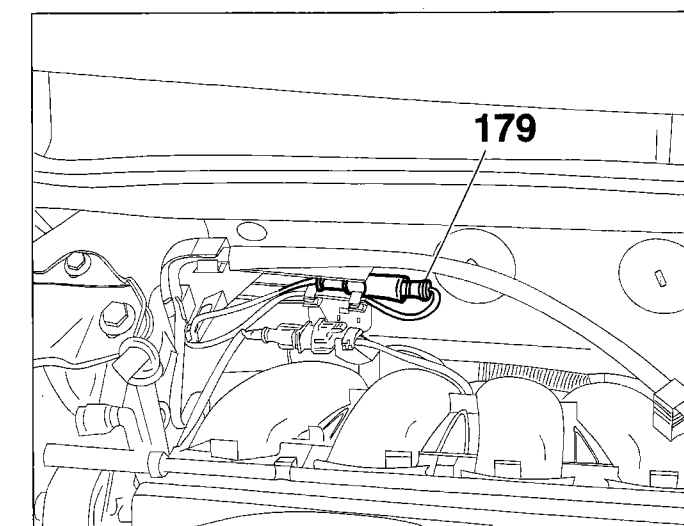
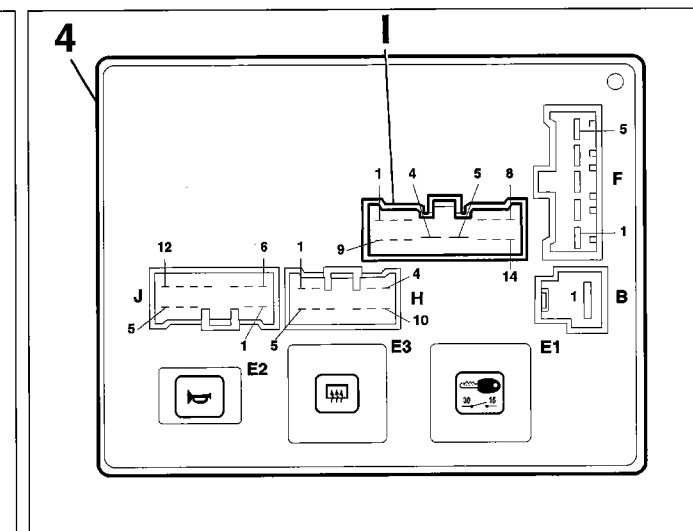
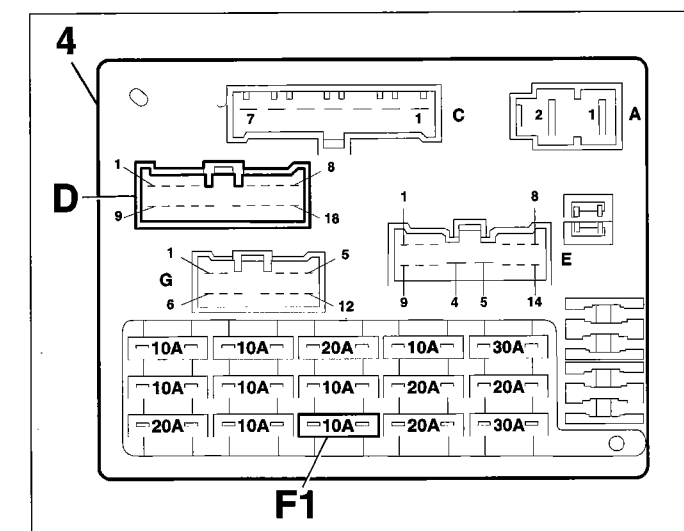
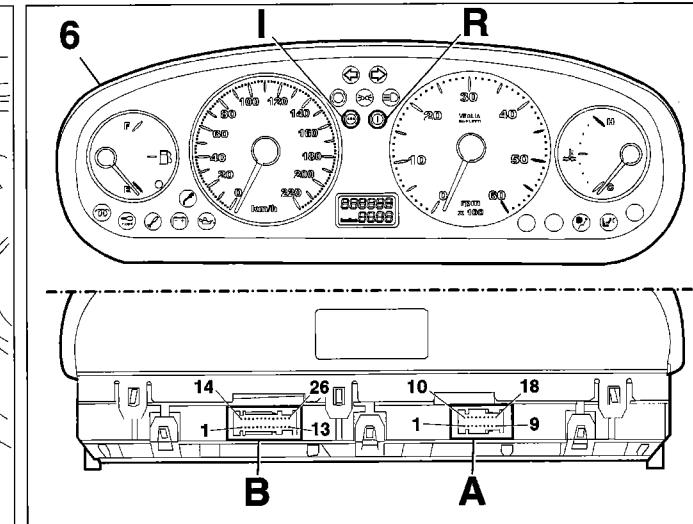
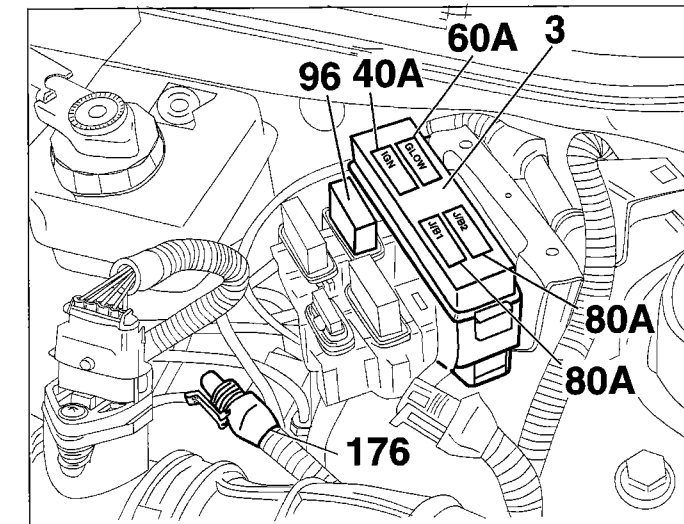
**Anti-lock brakes (A.B.S.) and failure warning light - (See key at end of wiring diagrams)**



\* 60A fuse for TD versions

P4A049I01

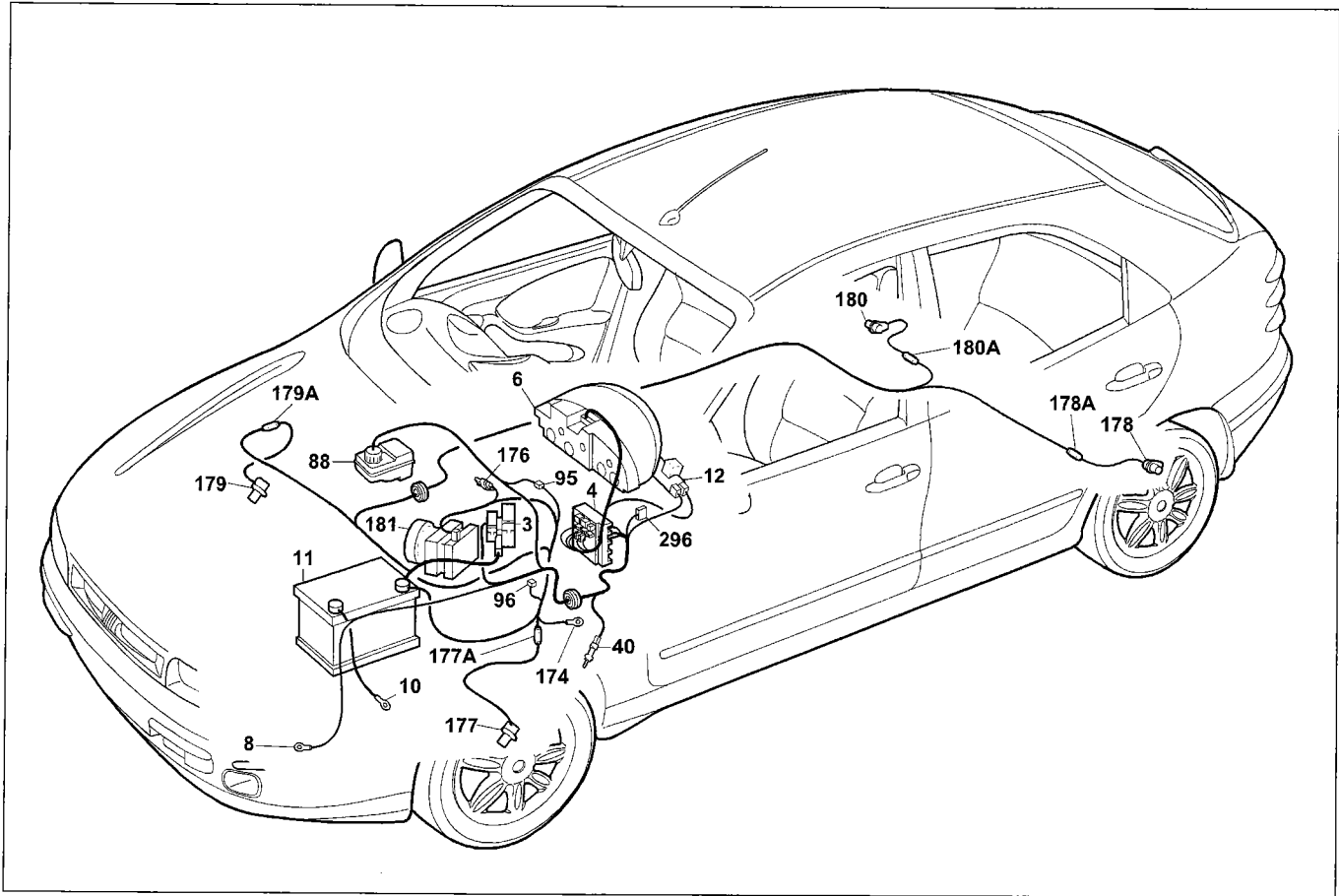
### Location of components



P4A050I01



55.

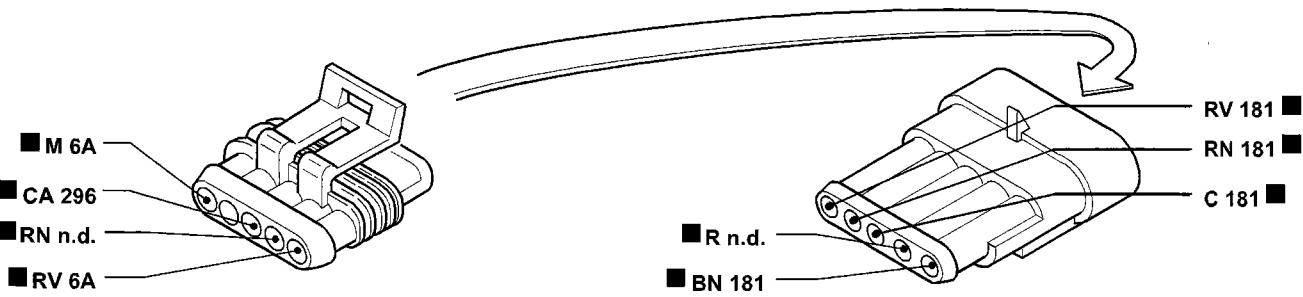


Anti-lock brakes and failure warning light (A.B.S.)

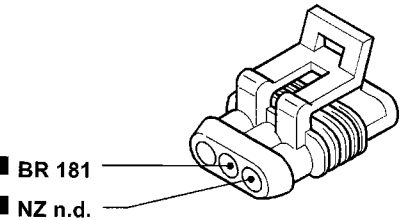
Components key

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>3 Power fuse box:<br/>A 30A protective fuse for injection system (60A for TD versions)<br/>B 40A protective fuse for ignition system<br/>C 80A fuse protecting additional options<br/>D 80A protective fuse for junction unit</p> <p>4 Junction unit</p> <p>6 Instrument panel:<br/>R Handbrake/insufficient brake fluid level warning light</p> <p>8 Left front earth</p> <p>10 Earth for battery on bodysell</p> <p>11 Battery</p> <p>12 Ignition switch</p> <p>40 Vehicle brake lights switch</p> <p>88 Insufficient brake fluid level sensor</p> <p>95 Connection between front/anti-lock brake cables (A.B.S.)</p> <p>96 60A protective power fuse for electrical equipment</p> <p>174 Power earth for anti-lock brakes (A.B.S.)</p> <p>176 Diagnostic socket for anti-lock braking system (A.B.S.)</p> <p>177 Sensor on left front wheel for anti-lock brakes (A.B.S.)</p> <p>177A Connection for cable on left front wheel sensor</p> | <p>178 Sensor on left rear wheel for anti-lock brakes (A.B.S.)</p> <p>178A Connection for cable on left rear wheel sensor</p> <p>179 Sensor on right front wheel for anti-lock brakes (A.B.S.)</p> <p>179A Connection for cable on right front wheel sensor</p> <p>180 Sensor on right rear wheel for anti-lock brakes (A.B.S.)</p> <p>180A Connection for cable on right rear wheel sensor</p> <p>181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)</p> <p>296 Fuse carrier base on front cable<br/>D 10A fuse protecting A.B.S.<br/>N.D. Ultrasound welding taped in cable loom</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

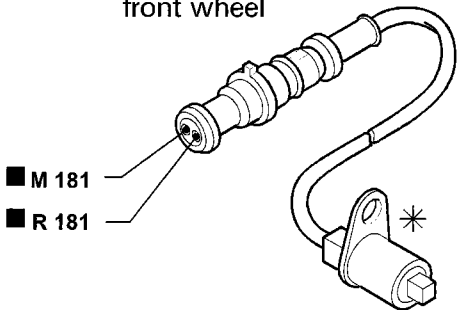
95 Front/anti-lock brakes cables connection (A.B.S.)



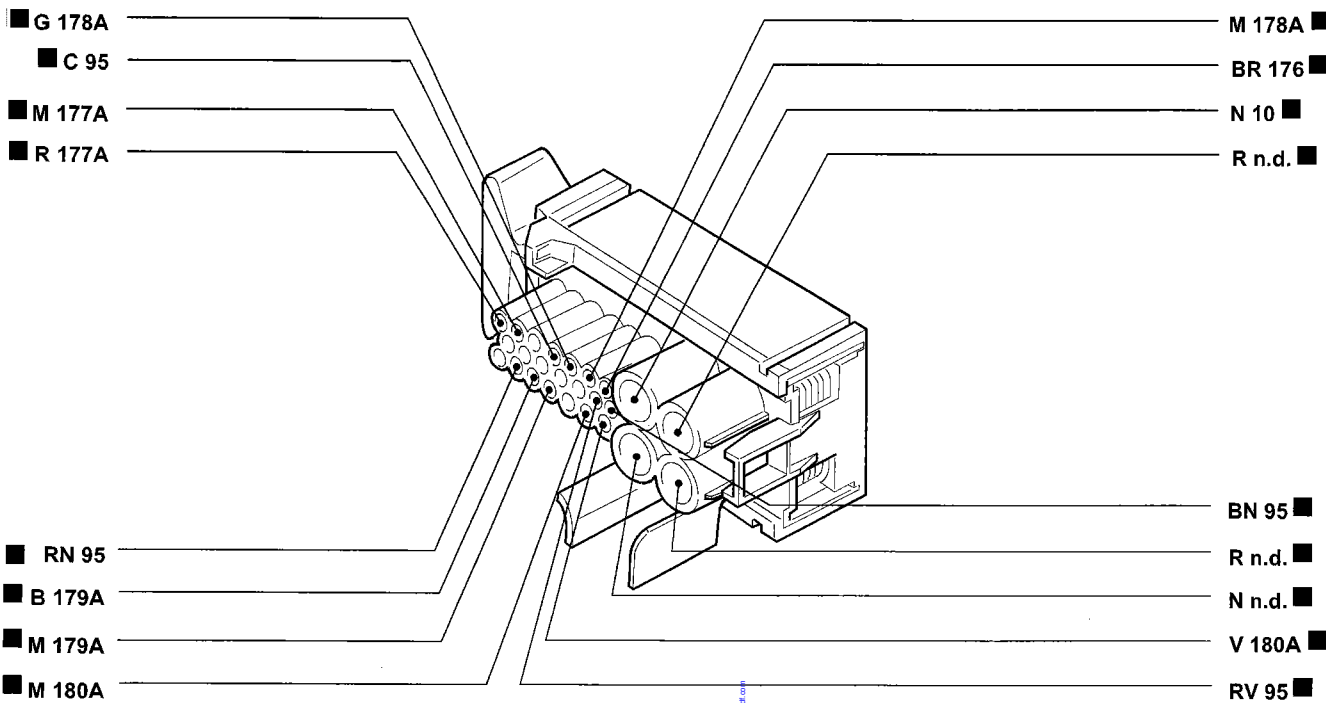
176 Diagnostic socket for A.B.S.



177(\*) Sensor on left front wheel (A.B.S.)  
177A Connection for A.B.S. sensor cable on left front wheel

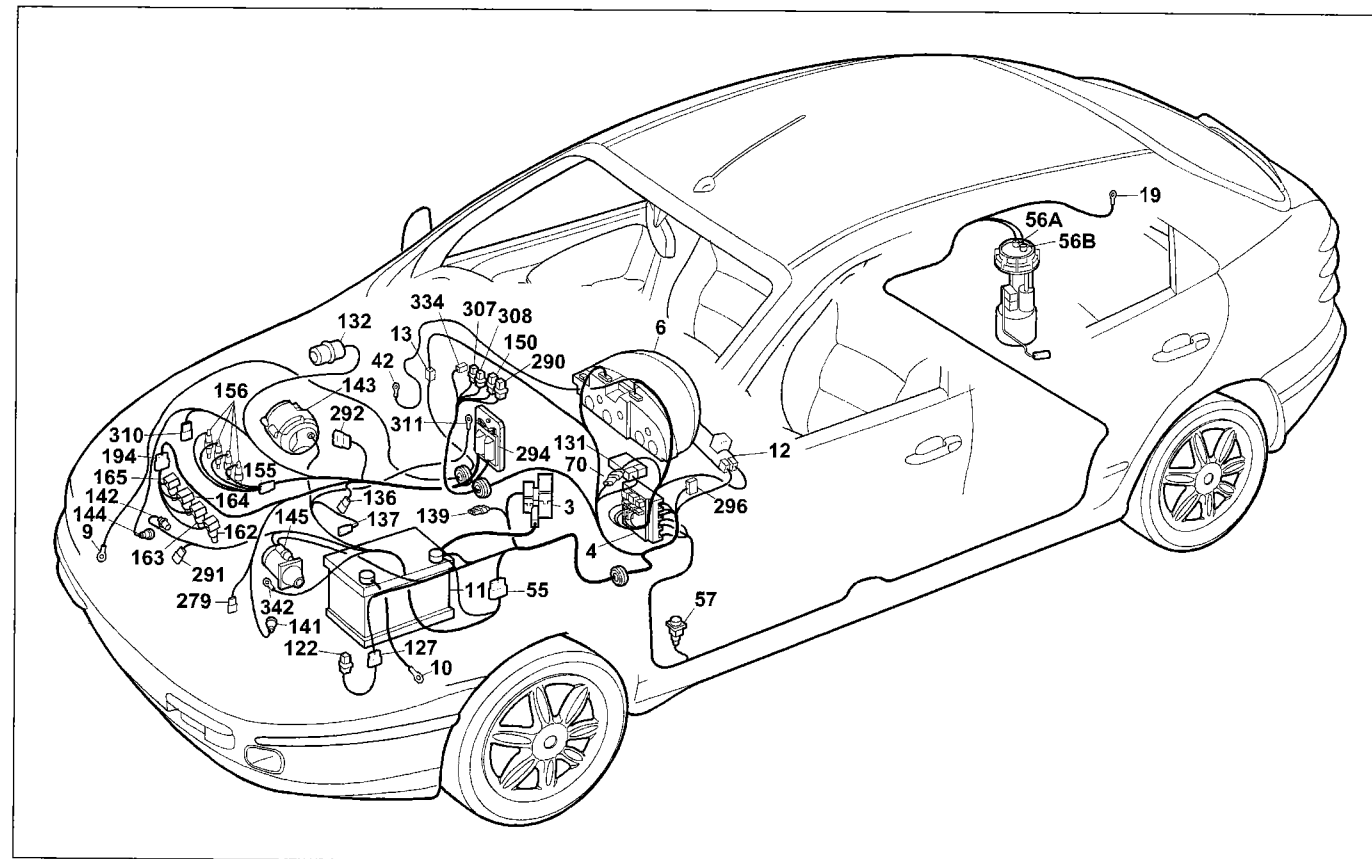


181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)



The cables in the wiring diagram are marked

### 55.



P4A143101

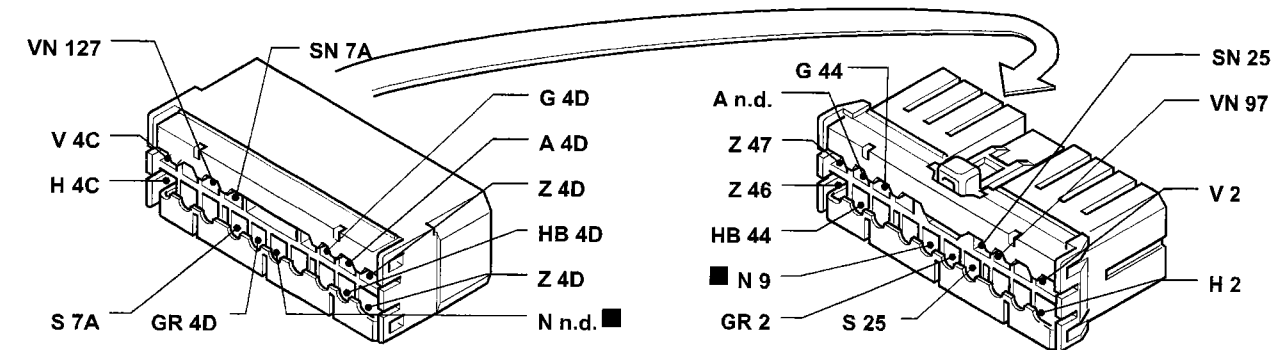
**Starting - BOSCH M1.5.5 Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and injection system failure warning light - Rev counter - Speedometer**

#### Components key

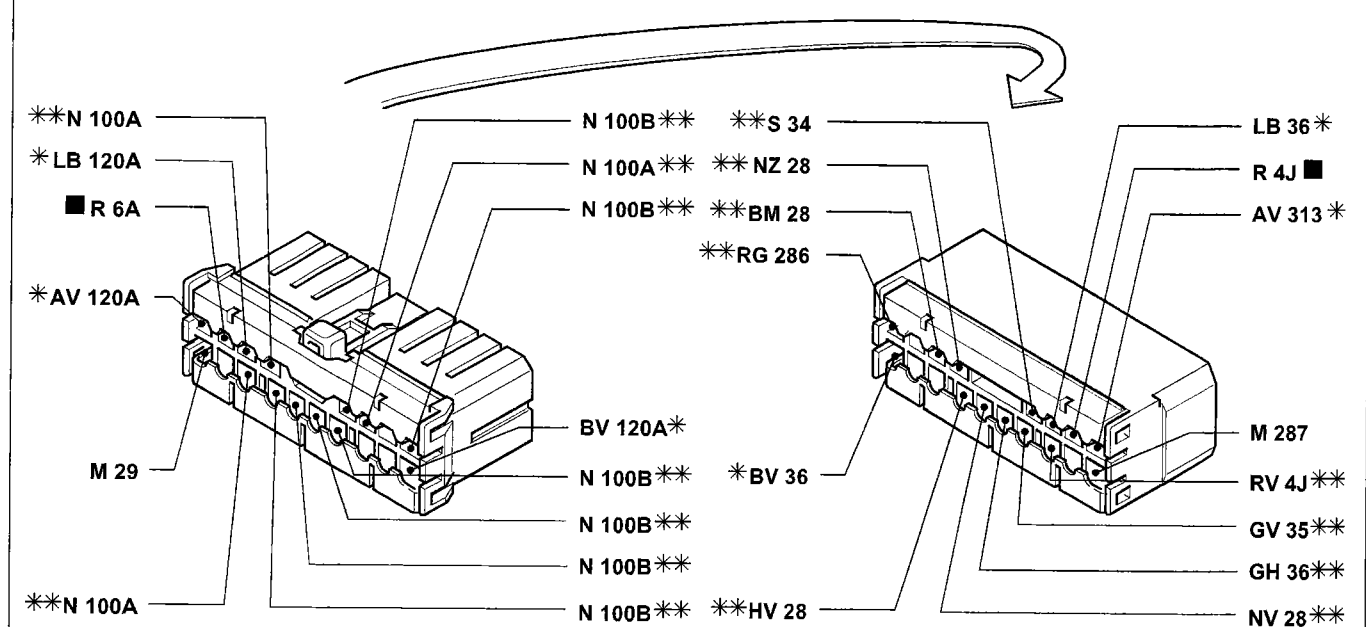
- |                                                                  |                                                                      |
|------------------------------------------------------------------|----------------------------------------------------------------------|
| 3 Power fuse box                                                 | 139 Diagnostic socket for injection system                           |
| A 30A protective fuse for injection system (60A for TD versions) | 141 Heated Lambda sensor                                             |
| B 40A protective fuse for ignition system                        | 142 Switch signalling insufficient engine oil pressure               |
| C 80A fuse protecting additional options                         | 143 Alternator                                                       |
| D 80A protective fuse for junction unit                          | 144 Rpm and T.D.C. sensor                                            |
| 4 Junction unit                                                  | 145 Starter motor                                                    |
| 6 Instrument panel:                                              | 150 Injection system relay feed                                      |
| A Battery recharging warning light                               | 155 Ignition coils                                                   |
| B Insufficient engine oil pressure warning light                 | 156 Spark plugs                                                      |
| M Injection system failure warning light petrol/ds               | 162 Injector (1*)                                                    |
| V Speedometer control module                                     | 163 Injector (2*)                                                    |
| 9 Right front earth                                              | 164 Injector (3*)                                                    |
| 10 Right front earth                                             | 165 Injector (4*)                                                    |
| 11 Battery                                                       | 194 Injection cables/injector band connection                        |
| 12 Ignition switch                                               | 279 Twin engine coolant temperature sender unit                      |
| 13 Front right/left cables connection                            | 290 Electric fuel pump relay feed                                    |
| 19 Right rear earth                                              | 291 Sensor for power assisted steering pump                          |
| 42 Right dashboard earth                                         | 292 Modular actuator                                                 |
| 55 Connection between front/engine pre-wiring cables             | 294 Injection/ignition electronic control unit 1242                  |
| 56 Fuel level gauge                                              | 296 Fuse carrier base on front cable                                 |
| A Fuel level sensor                                              | C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection |
| B Electric fuel pump                                             | F 7.5A fuse protecting electronic injection system/ Fiat- CODE       |
| 57 Inertia switch                                                | 307 15A fuse protecting injection system                             |
| 70 Dashboard/front cables connection                             | 308 15A fuse protecting canister solenoid valve                      |
| 122 Engine cooling fan low speed relay feed                      | 310 Absolute pressure and air temperature sensor                     |
| 127 Front left cables/cable on relay holder bracket connection   | 311 Earth for electronic injection control unit                      |
| 131 Fiat-CODE electronic control unit                            | 334 Diagnostic connecting cable for 1242                             |
| 132 Petrol vapour cut out solenoid valve (canister)              | 342 Power earth for electronic injection                             |
| 136 Detonation sensor                                            |                                                                      |
| 137 Vehicle speed sensor                                         |                                                                      |

N.D. Ultrasound welding taped in cable loom

#### 13 Front right/left cables connection



#### 70 Dashboard/front cables connection Trim level: SX - GT



\* Variant connection for versions with air conditioning

\*\* Variant connection for versions with alarm

#### 194 Injection cables/injector band connection

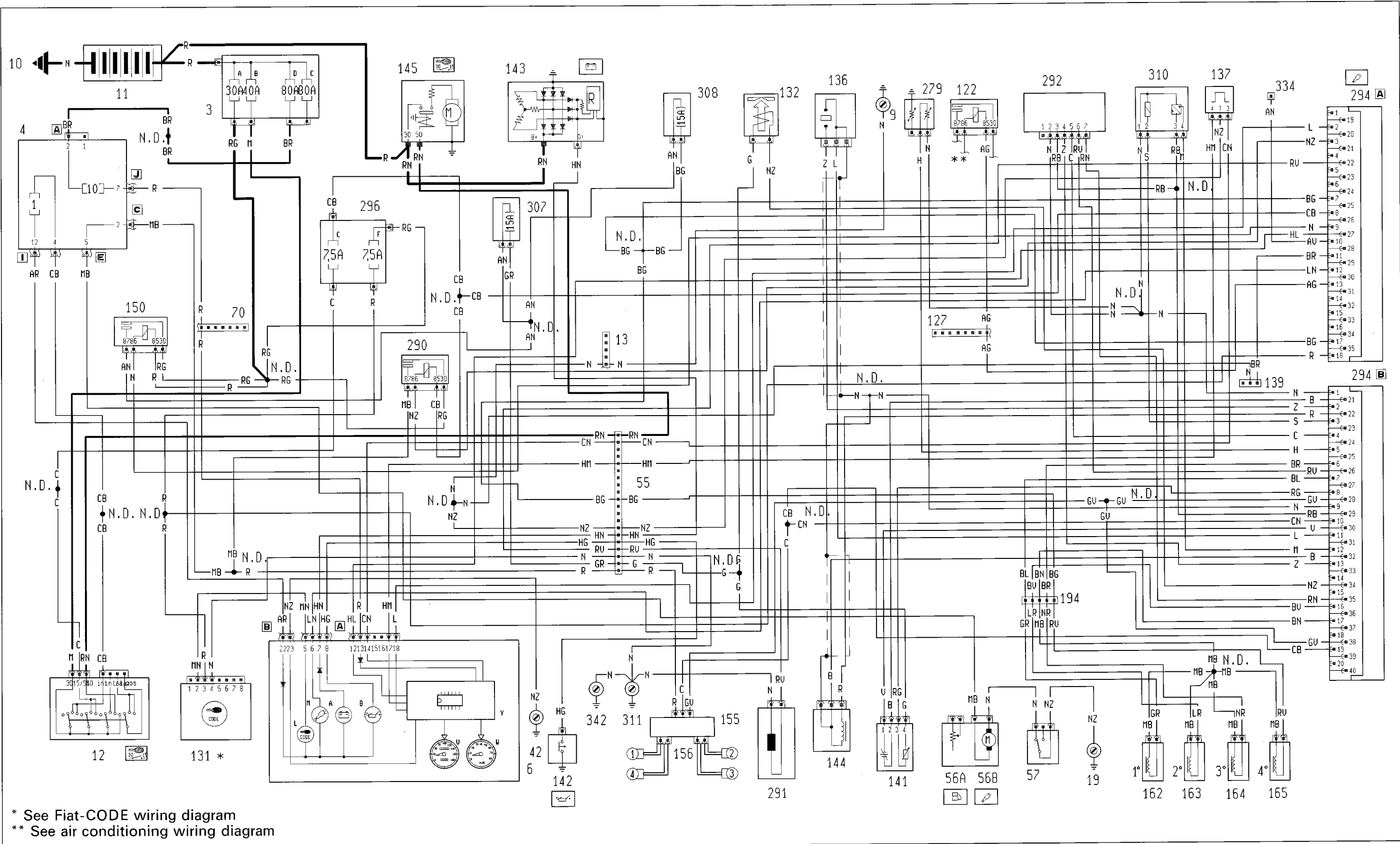


The cables in the wiring diagram are marked

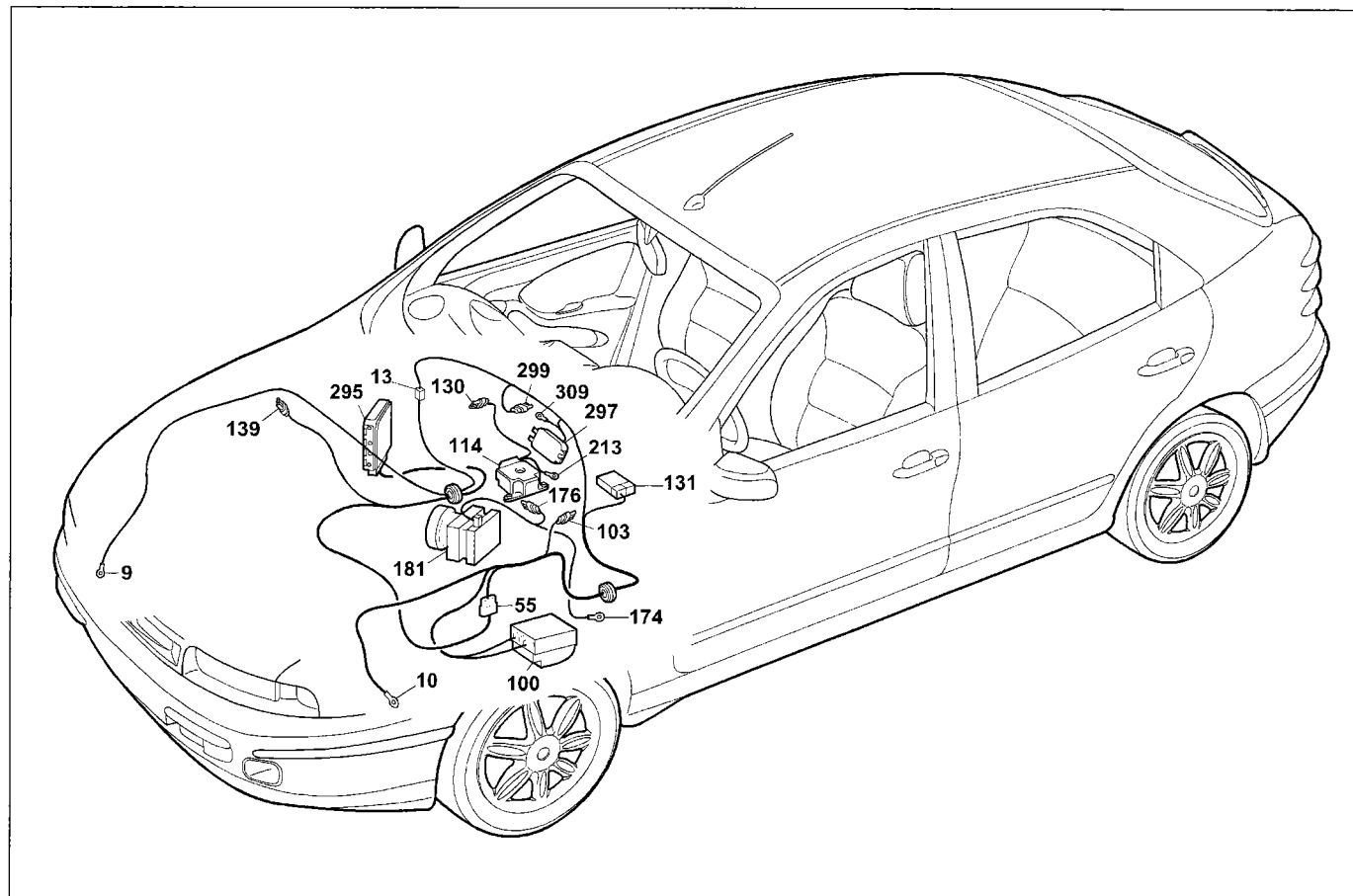
P4A144101

Electrical equipment  
Wiring diagrams  
55.

Starting - BOSCH M1.5.5 Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and warning light - Rev counter - Speedometer - (See key at end of wiring diagrams)



### 55.



P4A139I01

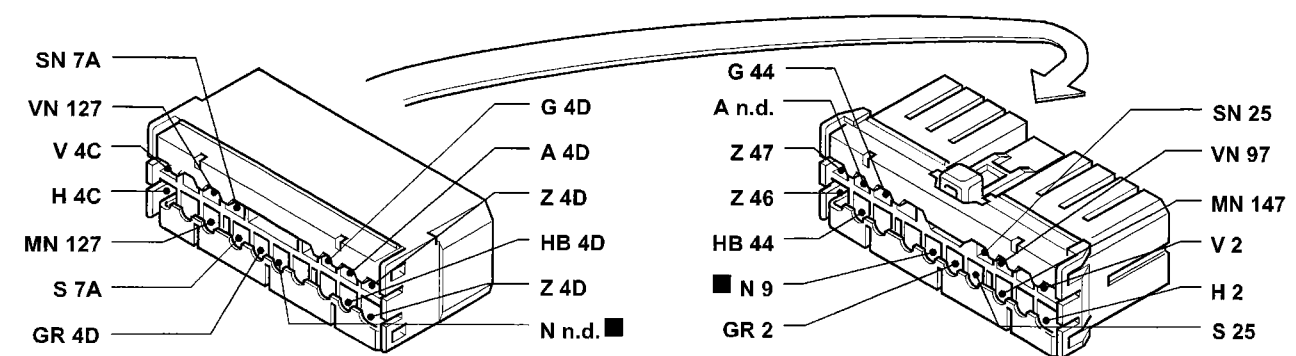
#### Diagnostic socket connections

#### Components key

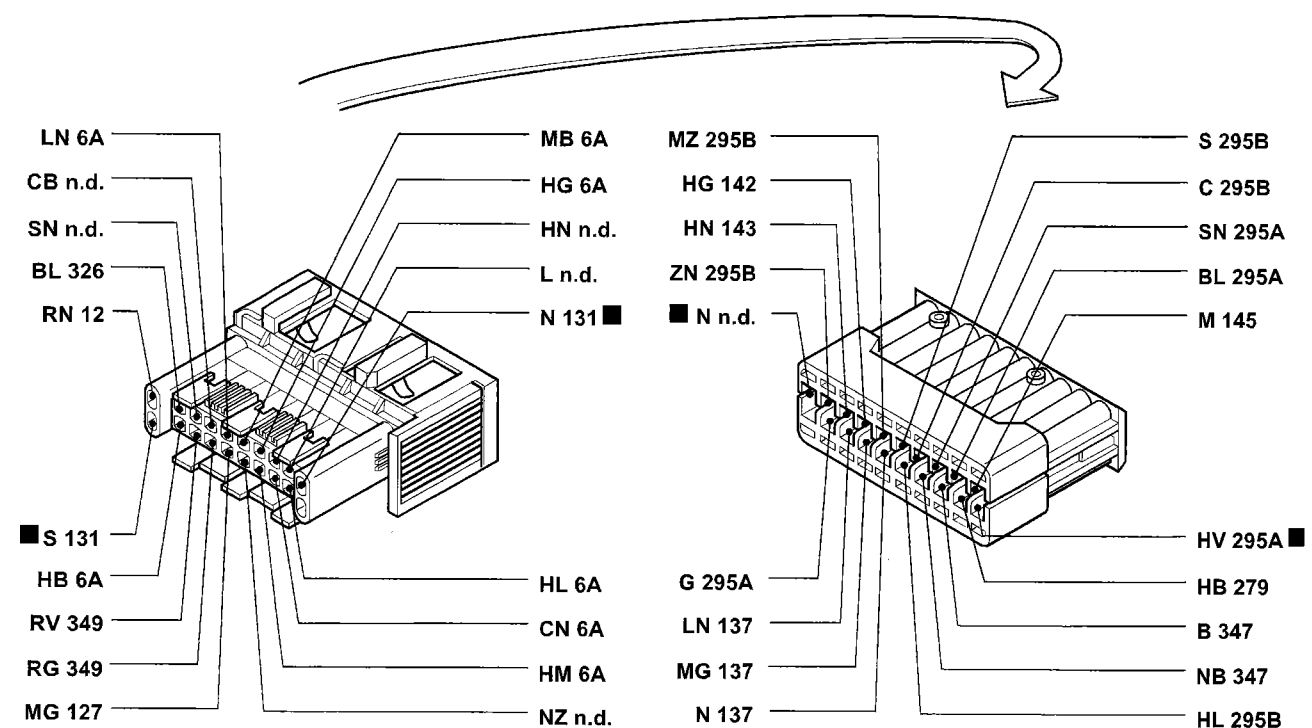
- 9 Right front earth
- 10 Earth for battery on bodyshell
- 13 Front right/left cables connection
- 55 Connection between front/engine pre-wiring cables
- 100 Alarm device electronic control unit
- 103 Diagnostic socket for alarm
- 114 EURO-BAG electronic control unit
- 130 Diagnostic socket for EURO-BAG
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 174 Power earth for anti-lock brakes (A.B.S.)
- 176 Diagnostic socket for anti-lock braking system (A.B.S.)
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 213 Earth for EURO-BAG
- 295 Climate control electronic control unit
- 297 Climate control unit
- 299 Diagnostic socket for heater/climate control
- 309 Earth for climate control unit

N.D. Ultrasound welding taped in cable loom

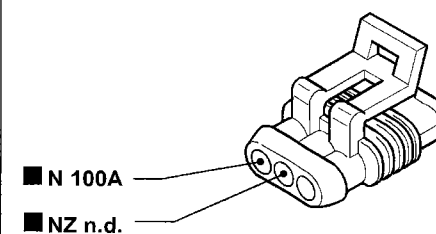
#### 13 Front right/left cables connection



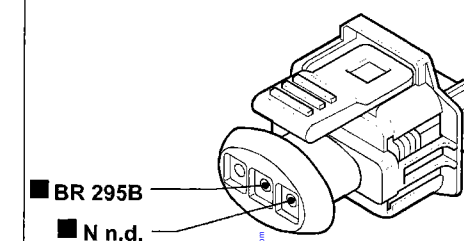
#### 55 Connection between front/engine pre-wiring cables



#### 103 Diagnostic socket for alarm



#### 139 Diagnostic socket for injection system

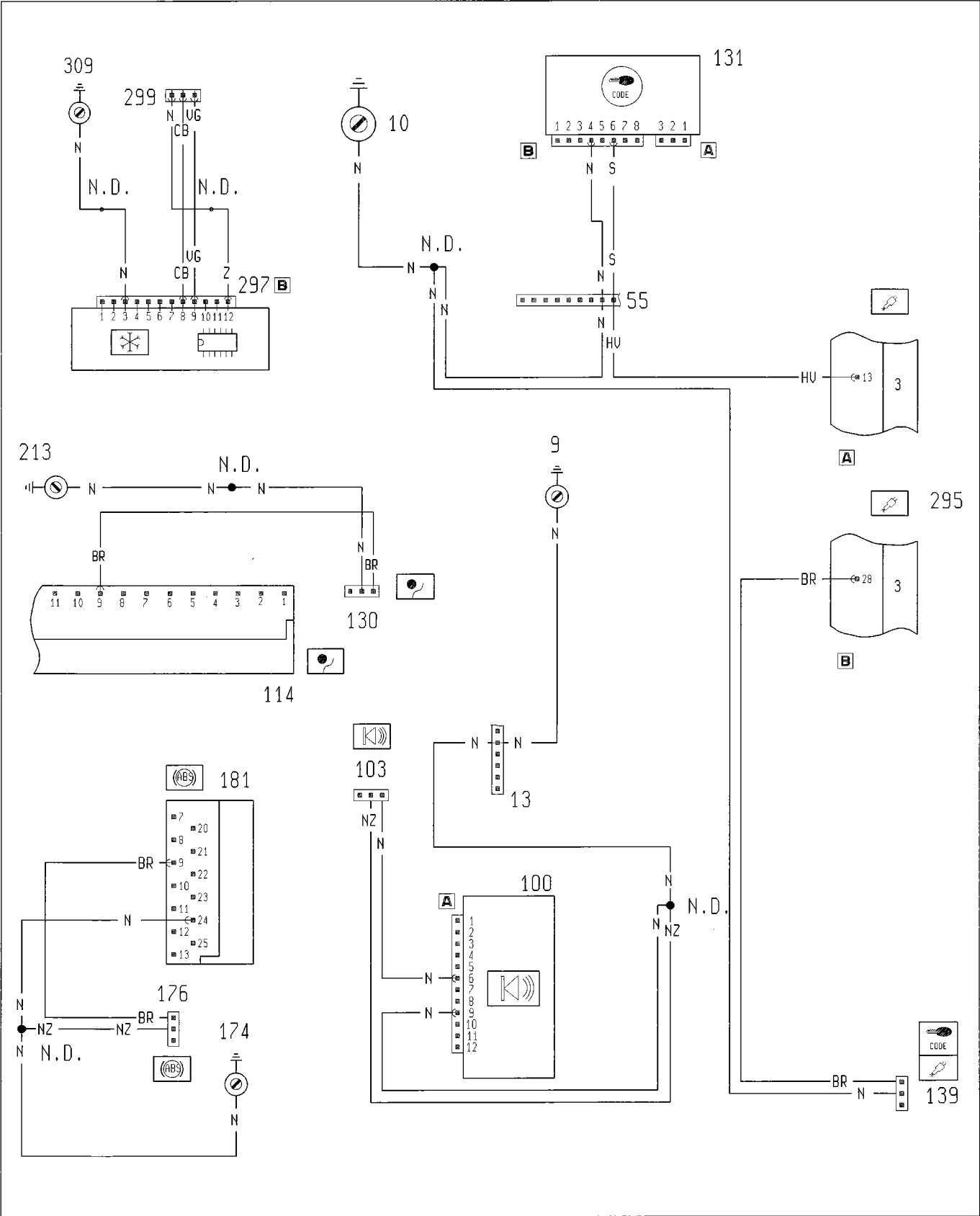


The cables in the wiring diagram are marked

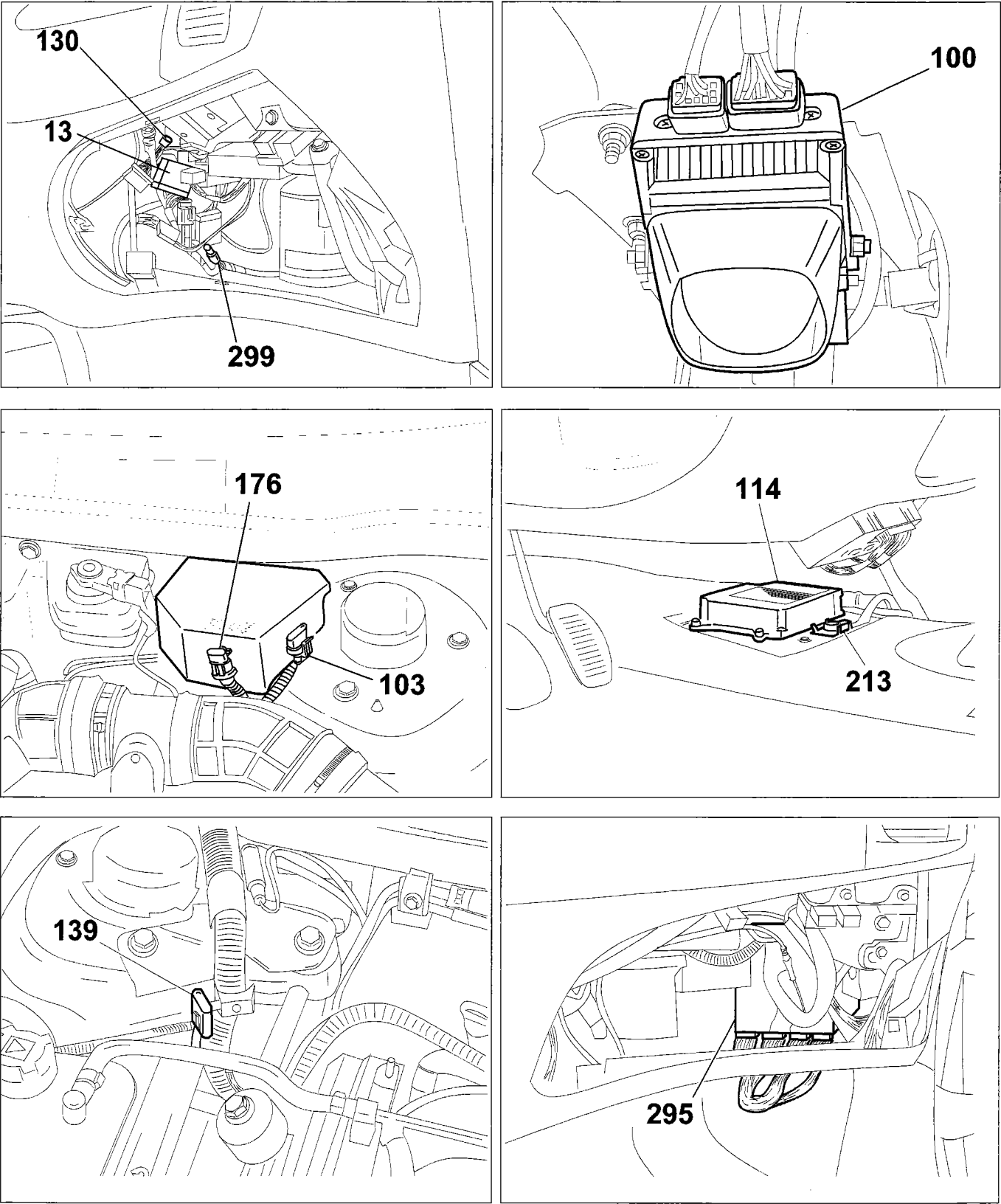
P4A140I01



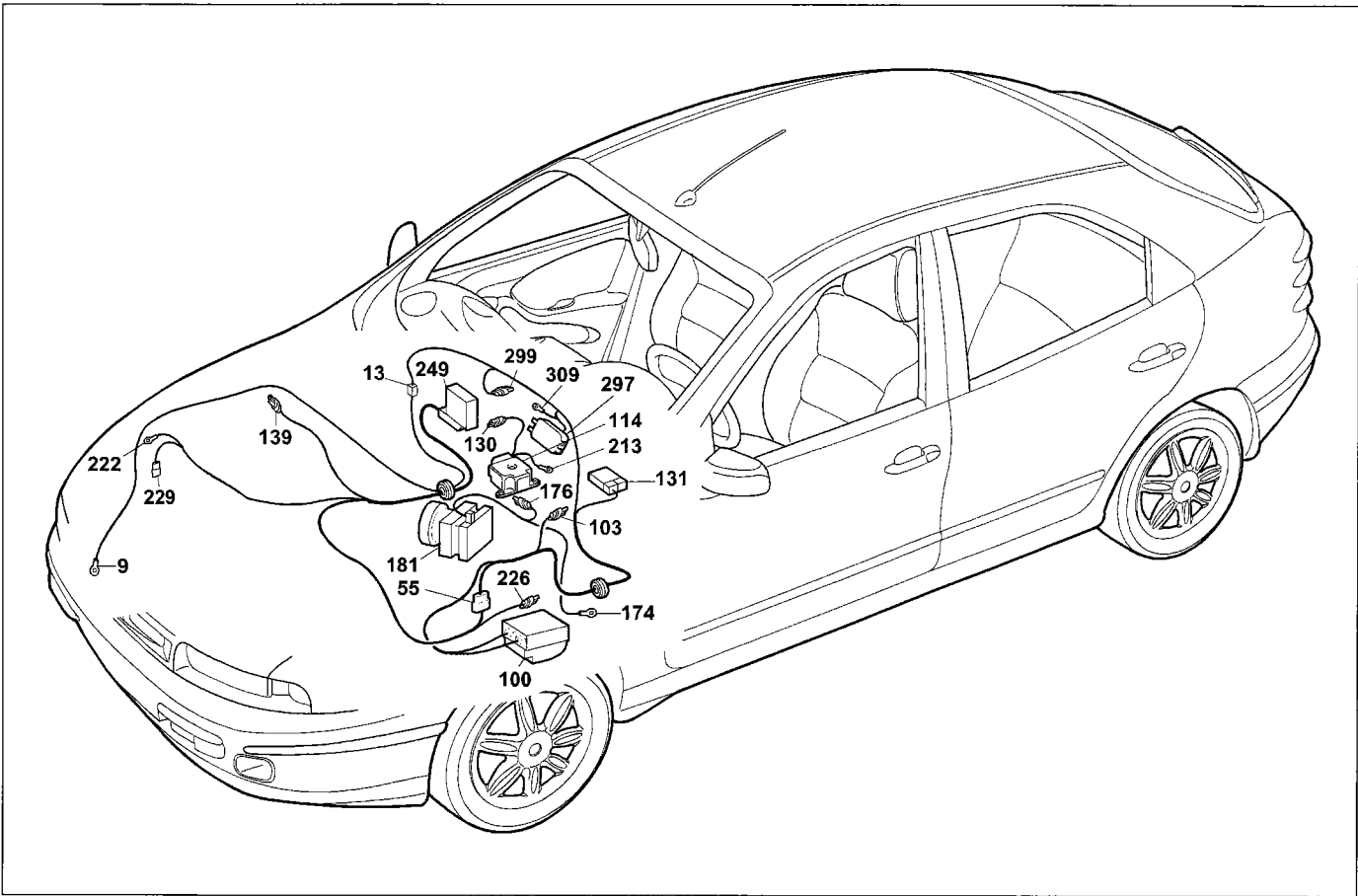
Diagnostic sockets connection - (See key at end of wiring diagrams)



Location of components



55.



P4A135I01

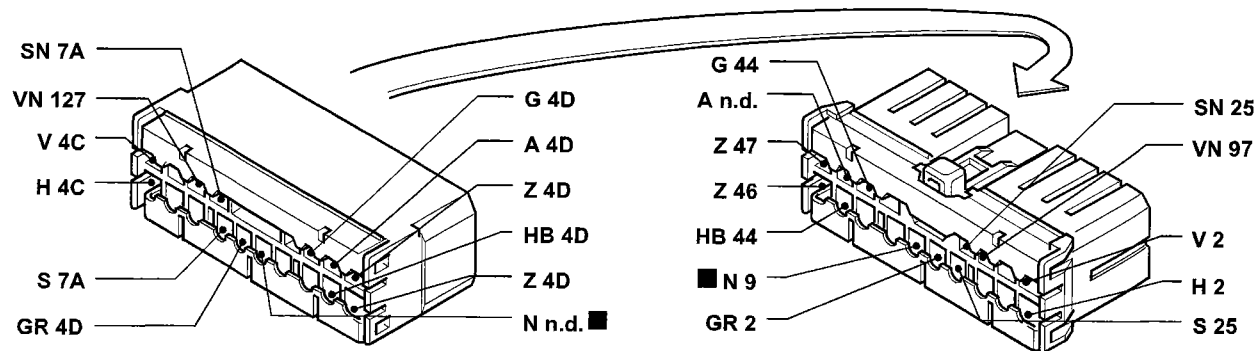
Diagnostic socket connections

Components key

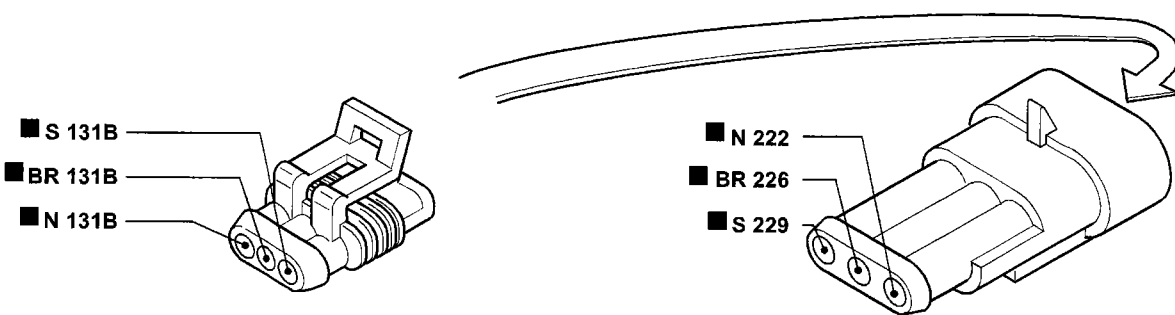
- 9 Right front earth
- 13 Front right/left cables connection
- 55A Connection between front/engine pre-wiring cables
- 100 Alarm device electronic control unit
- 103 Diagnostic socket for alarm
- 114 EURO-BAG electronic control unit
- 130 Diagnostic socket for EURO-BAG
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 174 Power earth for anti-lock brakes (A.B.S.)
- 176 Diagnostic socket for anti-lock braking system (A.B.S.)
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 213 Earth for EURO-BAG
- 222 Earth for fuel system
- 226 Diagnostic socket for Fiat code system (1910 TD)
- 229 Engine cut out electro-stop
- 249 E.G.R. electronic control unit
- 297 Air conditioning control unit
- 299 Diagnostic socket for heater/air conditioning
- 309 Earth for air conditioning unit

N.D. Ultrasound welding taped in cable loom

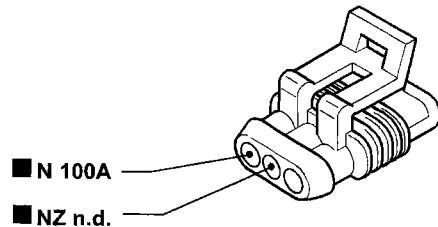
13 Front right/left cables connection



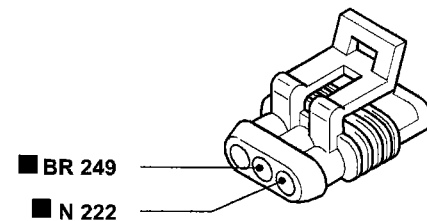
55A Connection between front/engine pre-wiring cables



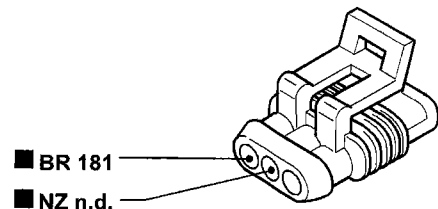
103 Diagnostic socket for alarm



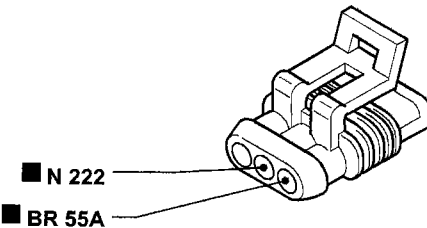
139 Injection system diagnostic socket



176 Diagnostic socket for A.B.S.



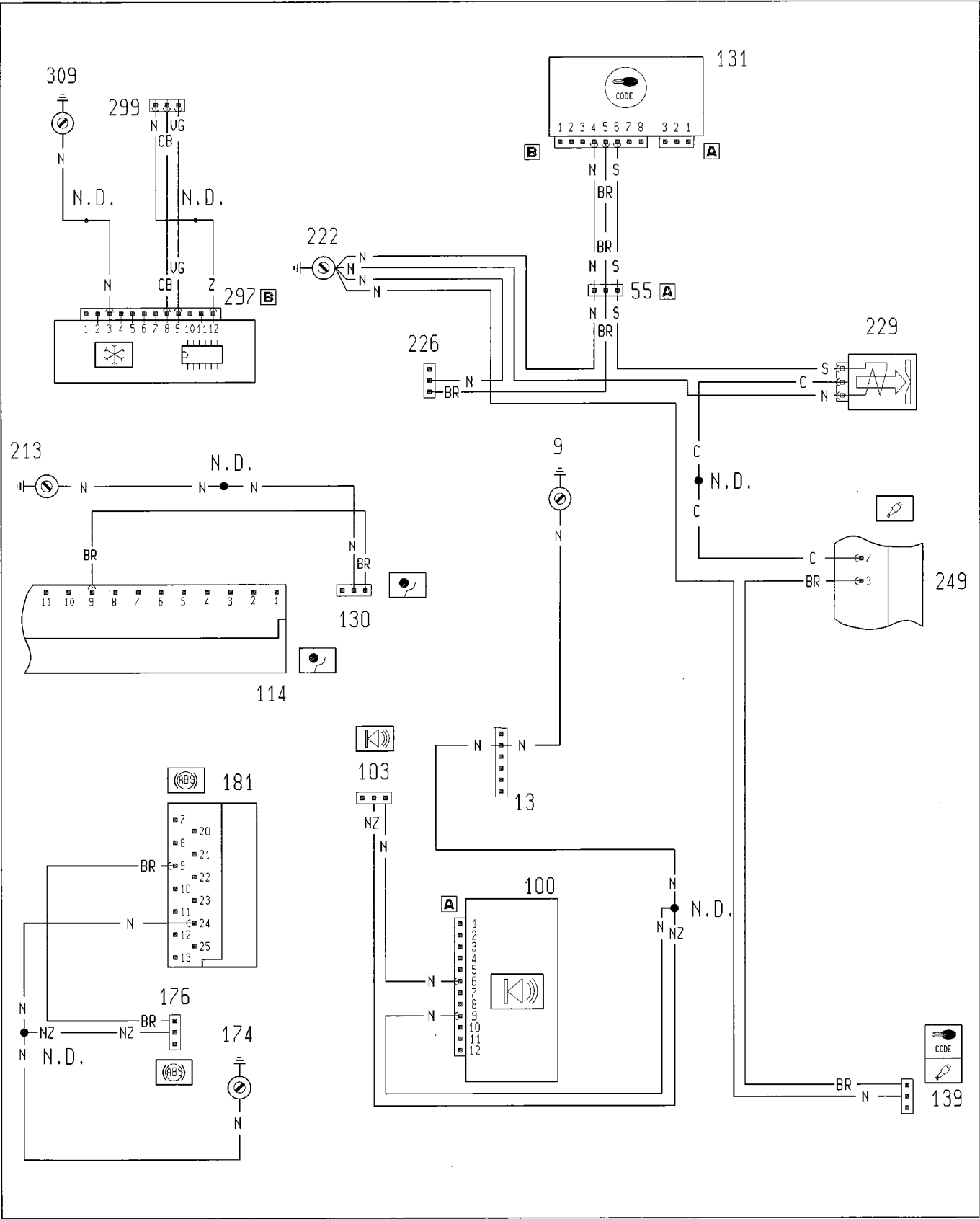
226 Fiat CODE diagnostic socket (1910 TD)



The cables in the wiring diagram are marked

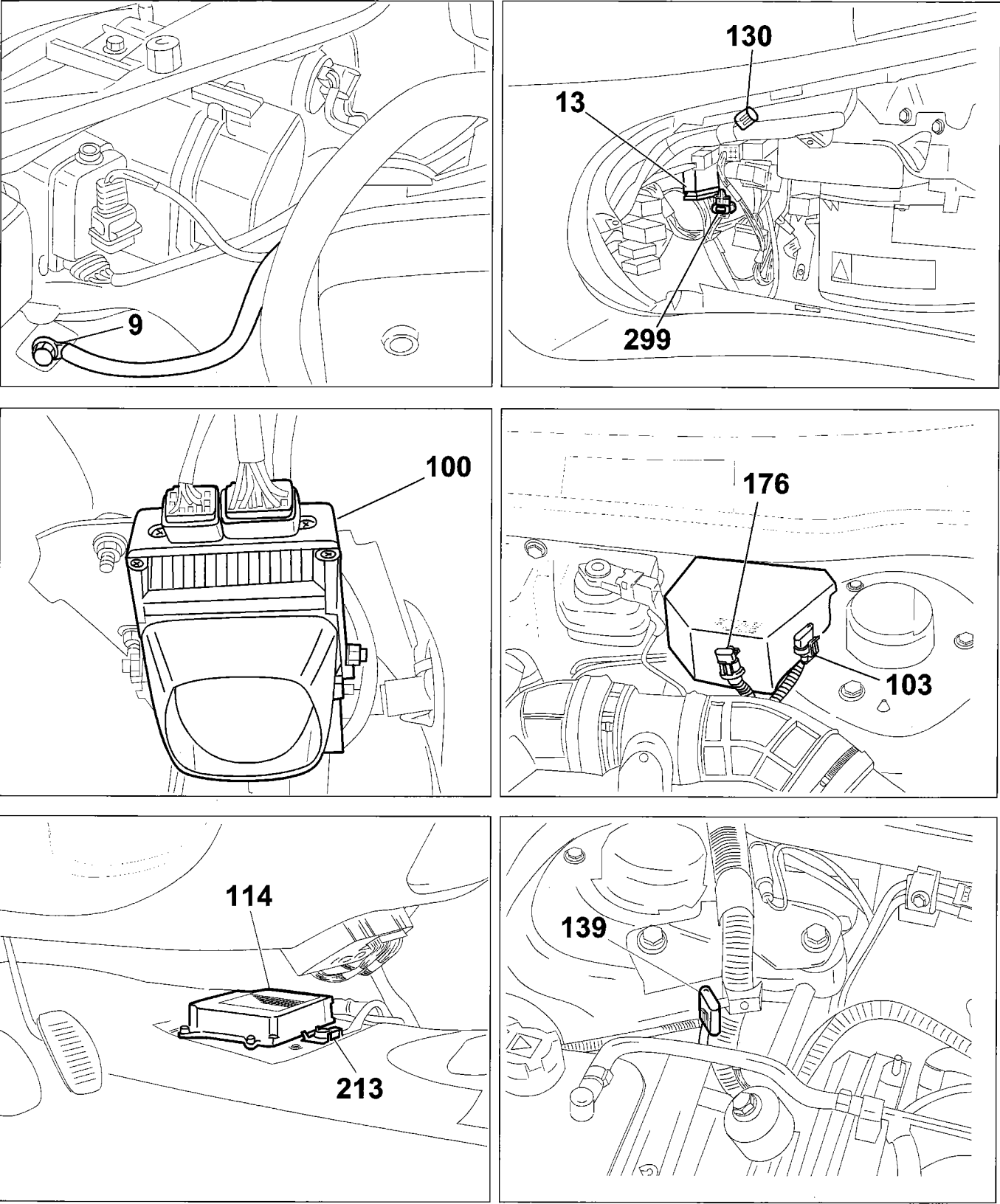
P4A136I01

Diagnostic socket connections - (See key at end of wiring diagrams)



P4A133I01

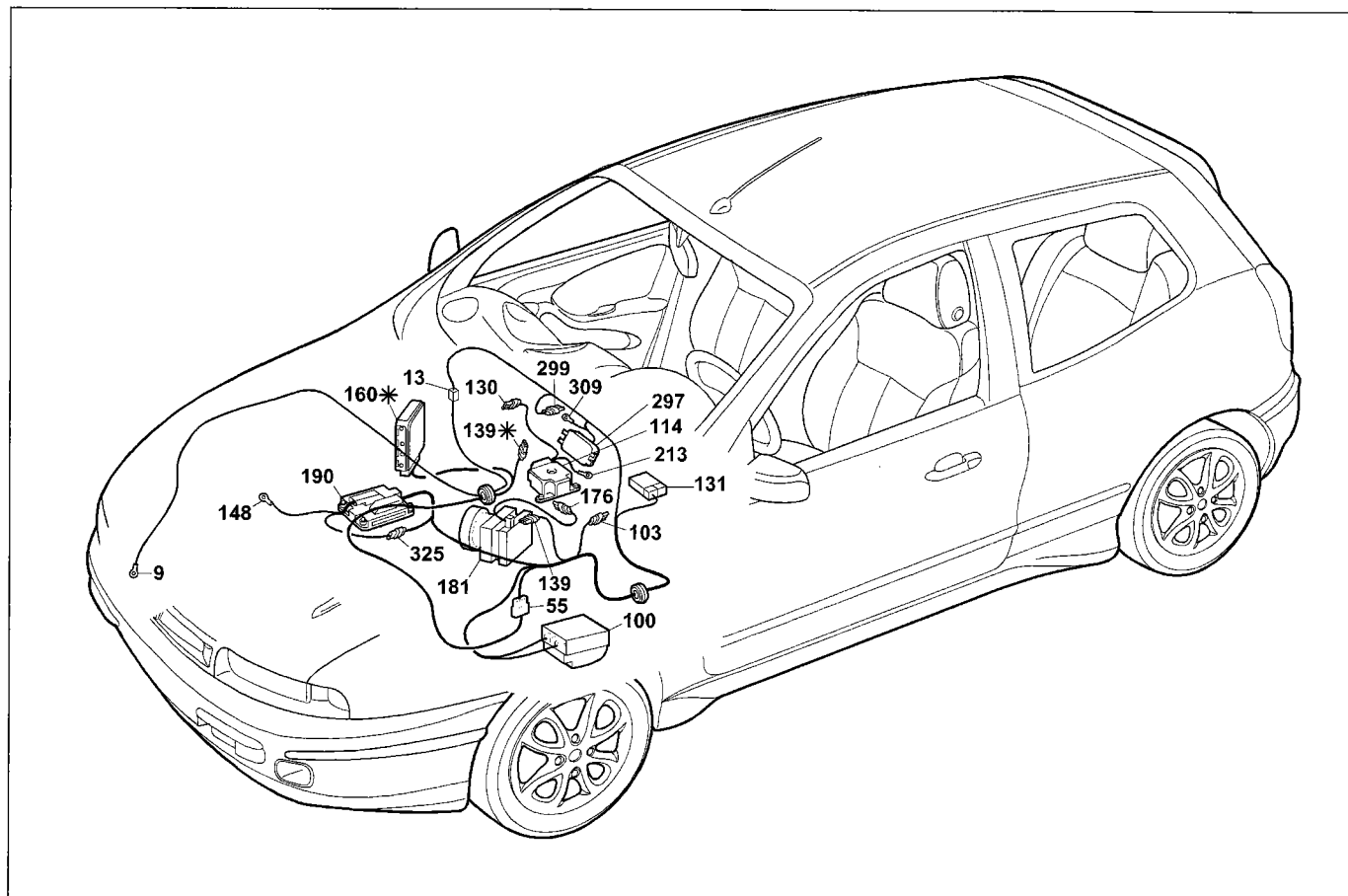
Location of components



4A134I

P4A134I01





P4A131I01

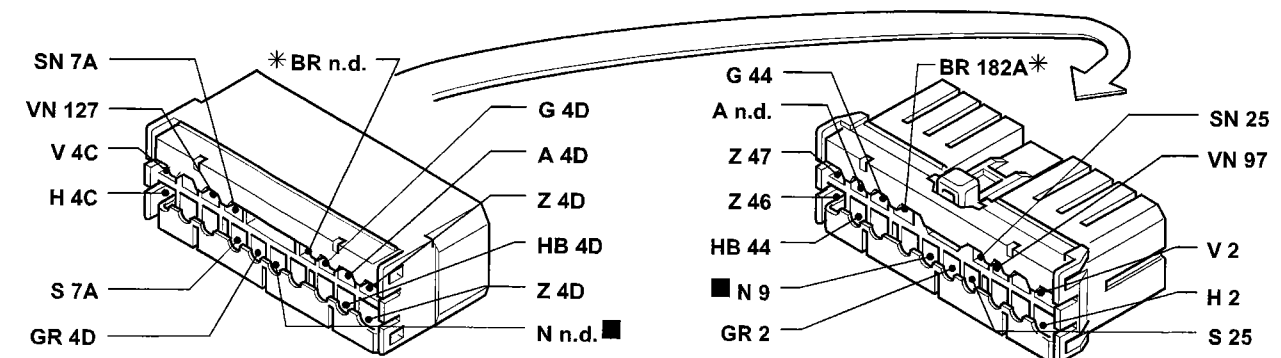
### Diagnostic socket connections

### Components key

- 9 Right front earth
- 13 Front right/left cables connection
- 55C Connection between front/engine pre-wiring cables
- 100 Alarm device electronic control unit
- 103 Diagnostic socket for alarm
- 114 EURO-BAG electronic control unit
- 130 Diagnostic socket for EURO-BAG
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 148 Earth for electronic injection
- 160 Injection/ignition electronic control unit (1747)
- 174 Power earth for anti-lock brakes (A.B.S.)
- 176 Diagnostic socket for anti-lock braking system (A.B.S.)
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 190 Injection/ignition electronic control unit (1998)
- 213 Earth for EURO-BAG
- 297 Air conditioning control unit
- 299 Diagnostic socket for heater/air conditioning
- 309 Earth for air conditioning unit
- 325 Connection between injection/left front cables

N.D. Ultrasound welding taped in cable loom

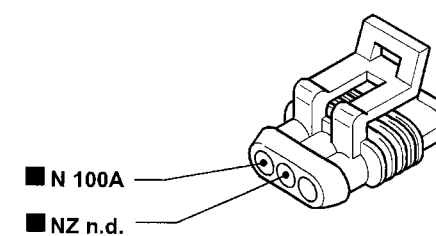
### 13 Front right/left cables connection



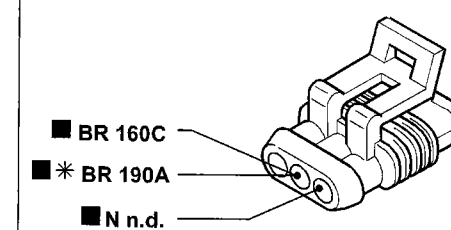
### 55C Connection between front/engine pre-wiring cables



### 103 Diagnostic socket for alarm

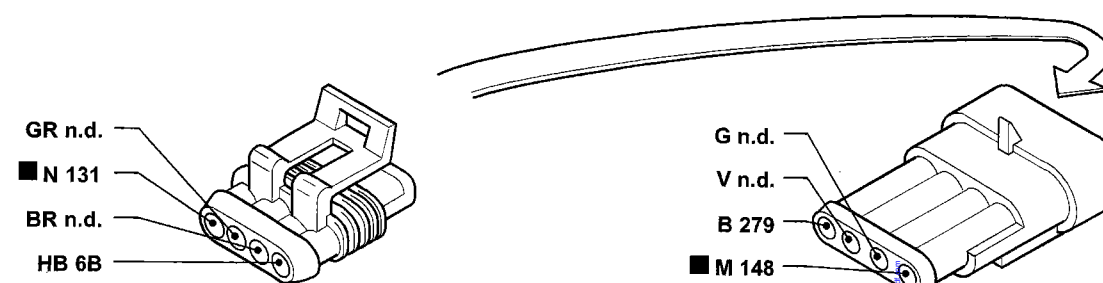


**139** Diagnostic socket for injection system



\* Variant connection for 1998 20v versions

### 325 Connection between injection/left front cables

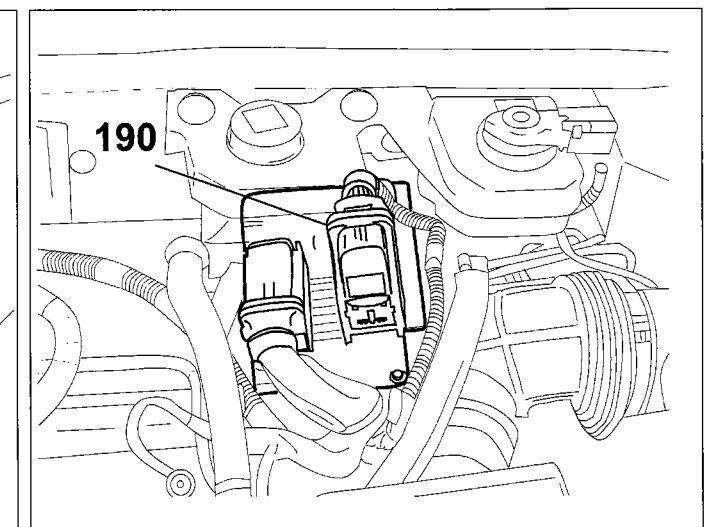
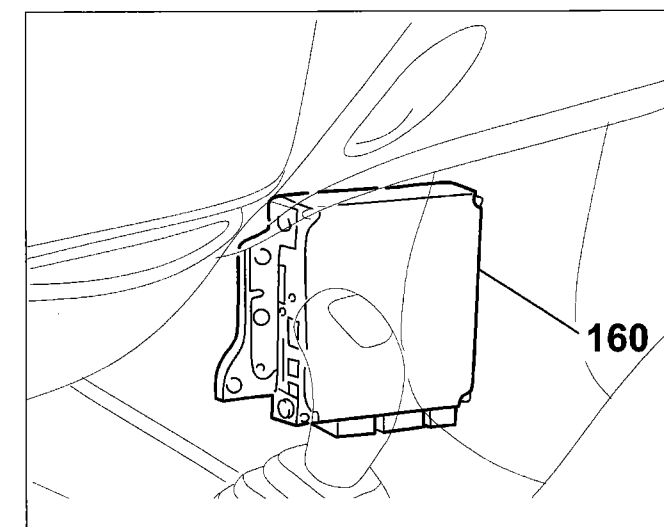
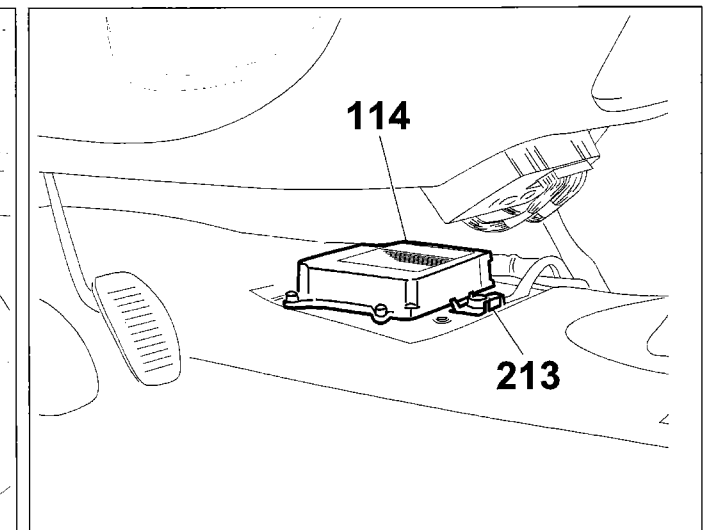
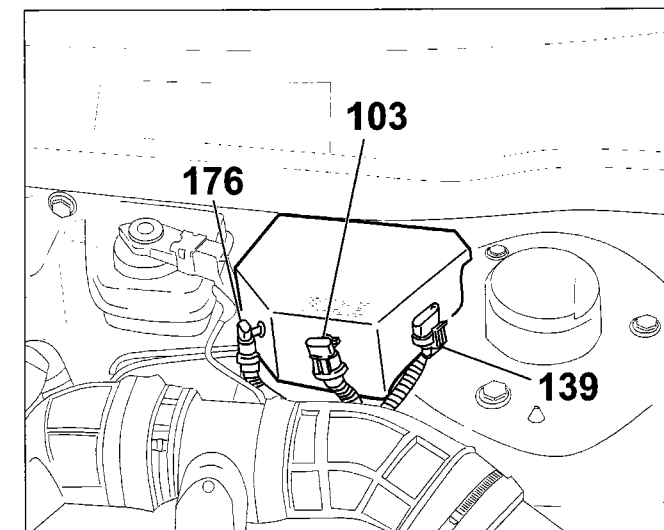
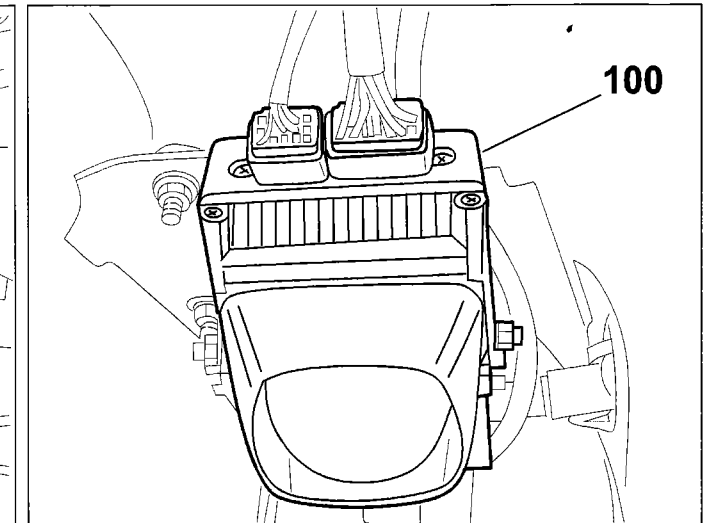
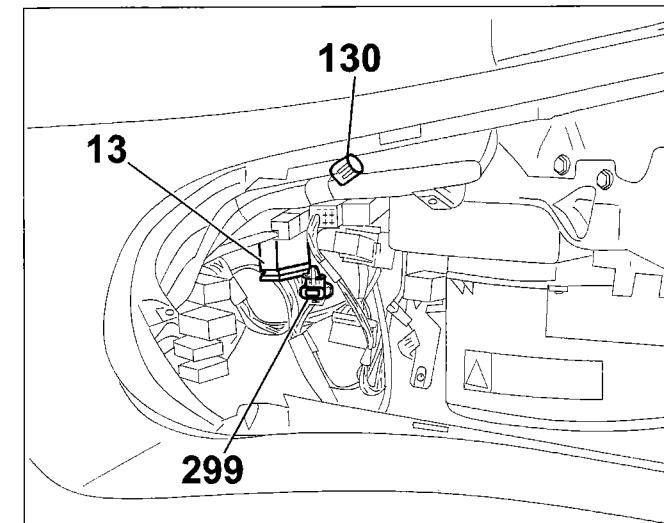
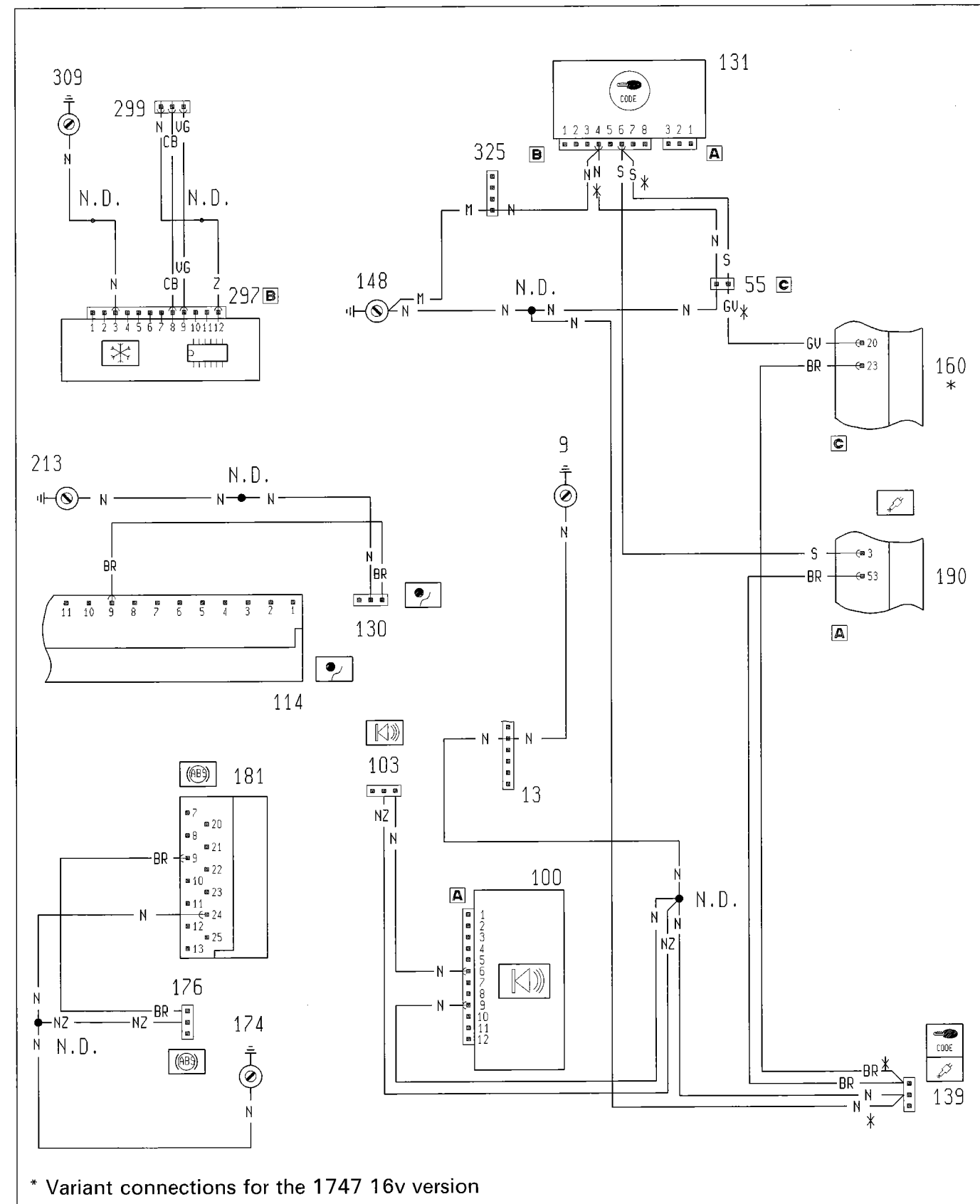


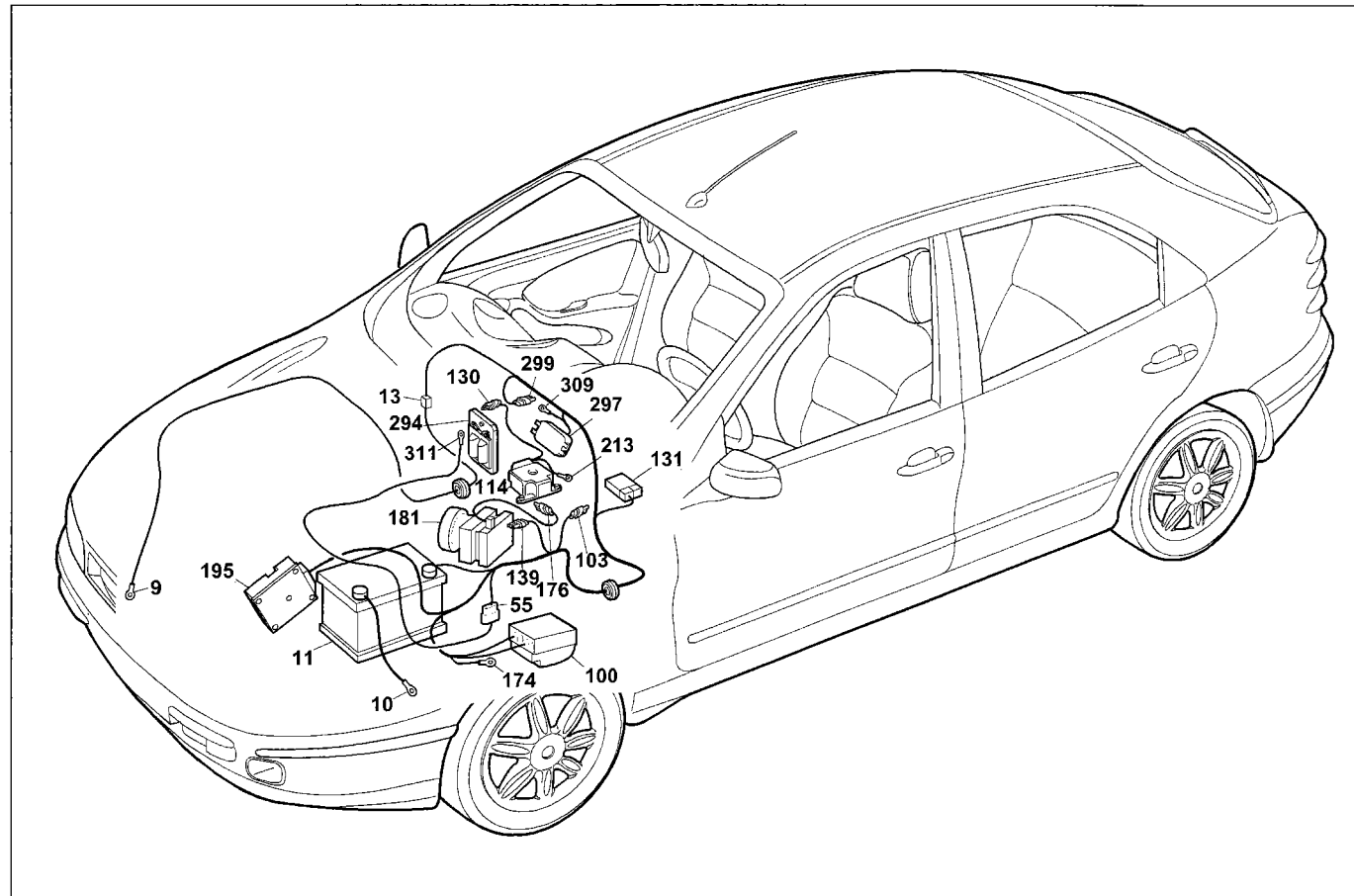
The cables in the wiring diagram are marked

P4A132I01

**Diagnostic socket connections - (See key at end of wiring diagrams)**

### Location of components





P4A127I01

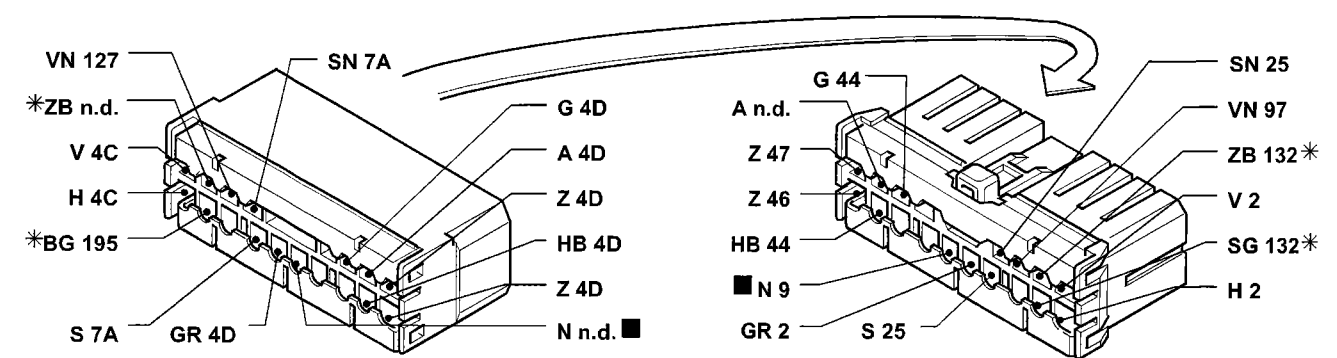
## Diagnostic socket connections

### Components key

- 9 Right front earth
- 13 Front right/left cables connection
- 55 Connection between front/engine pre-wiring cables
- 100 Alarm device electronic control unit
- 103 Diagnostic socket for alarm
- 114 EURO-BAG electronic control unit
- 130 Diagnostic socket for EURO-BAG
- 131 Fiat-CODE electronic control unit
- 139 Diagnostic socket for injection system
- 174 Power earth for anti-lock brakes (A.B.S.)
- 176 Diagnostic socket for anti-lock braking system (A.B.S.)
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 195 Injection/ignition electronic control unit (1581)
- 213 Earth for EURO-BAG
- 294 Injection/ignition electronic control unit 1242
- 297 Air conditioning control unit
- 299 Diagnostic socket for heater/air conditioning
- 309 Earth for air conditioning unit
- 311 Earth for electronic injection control unit

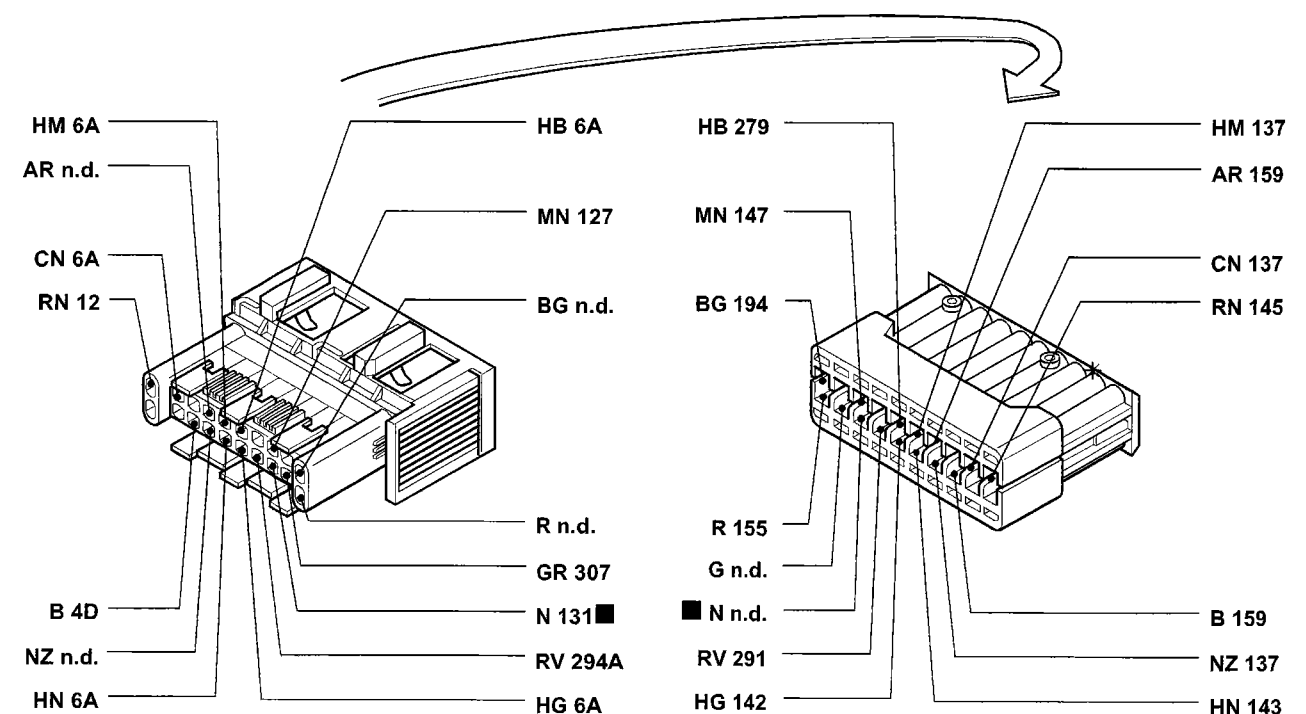
N.D. Ultrasound welding taped in cable loom

### 13 Front right/left cables connection

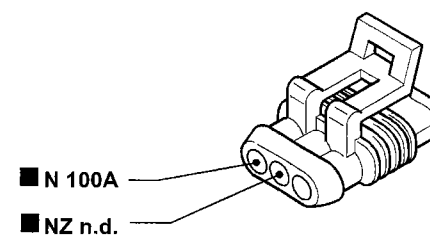


\* Variant connection for 1581 16v versions

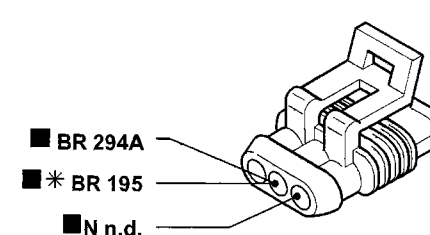
## 55 Connection between front/engine pre-wiring cables



### 103 Diagnostic socket for alarm



### 139 Diagnostic socket for injection system



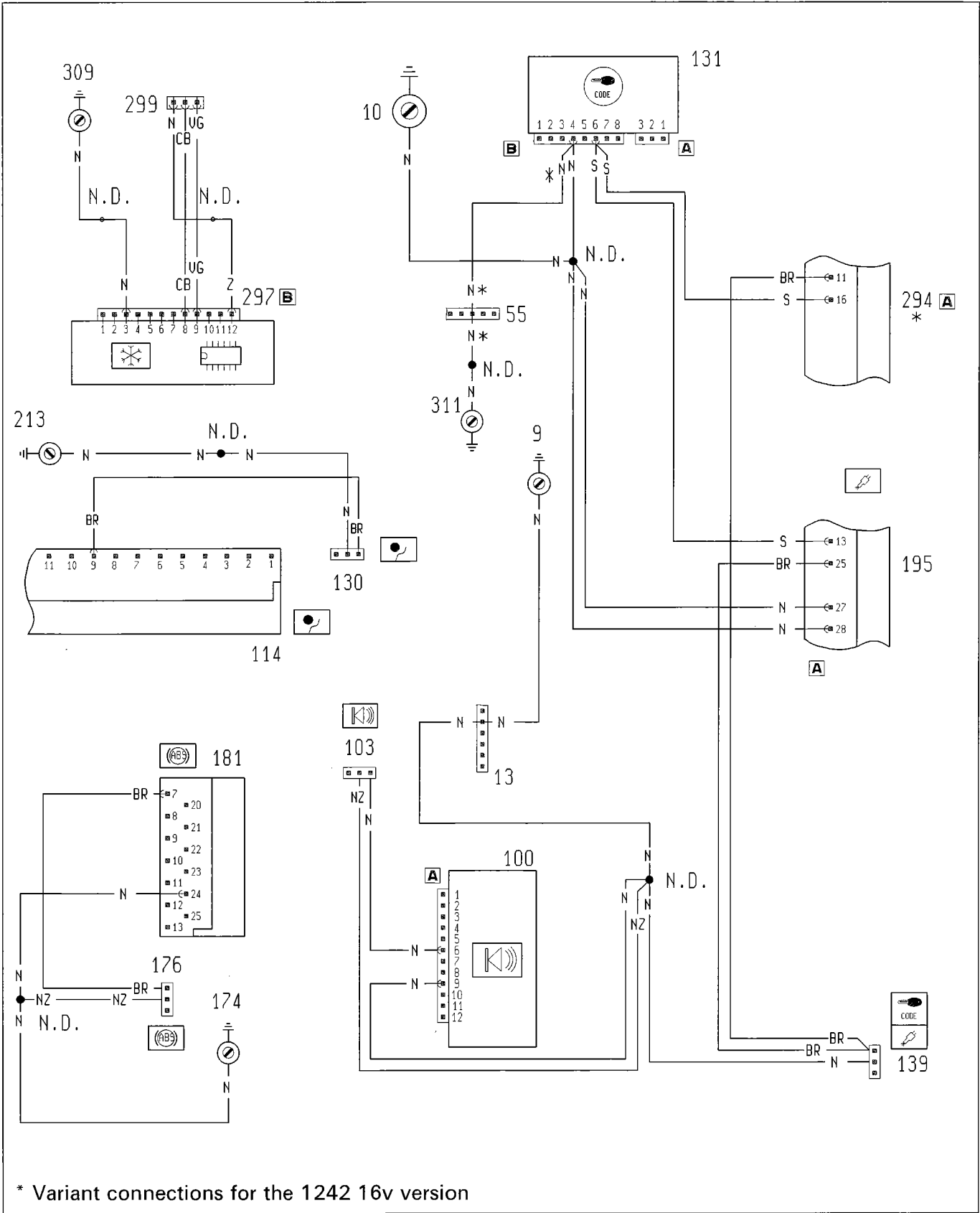
\* Variant connection for 1581 16v versions

P4A128I01

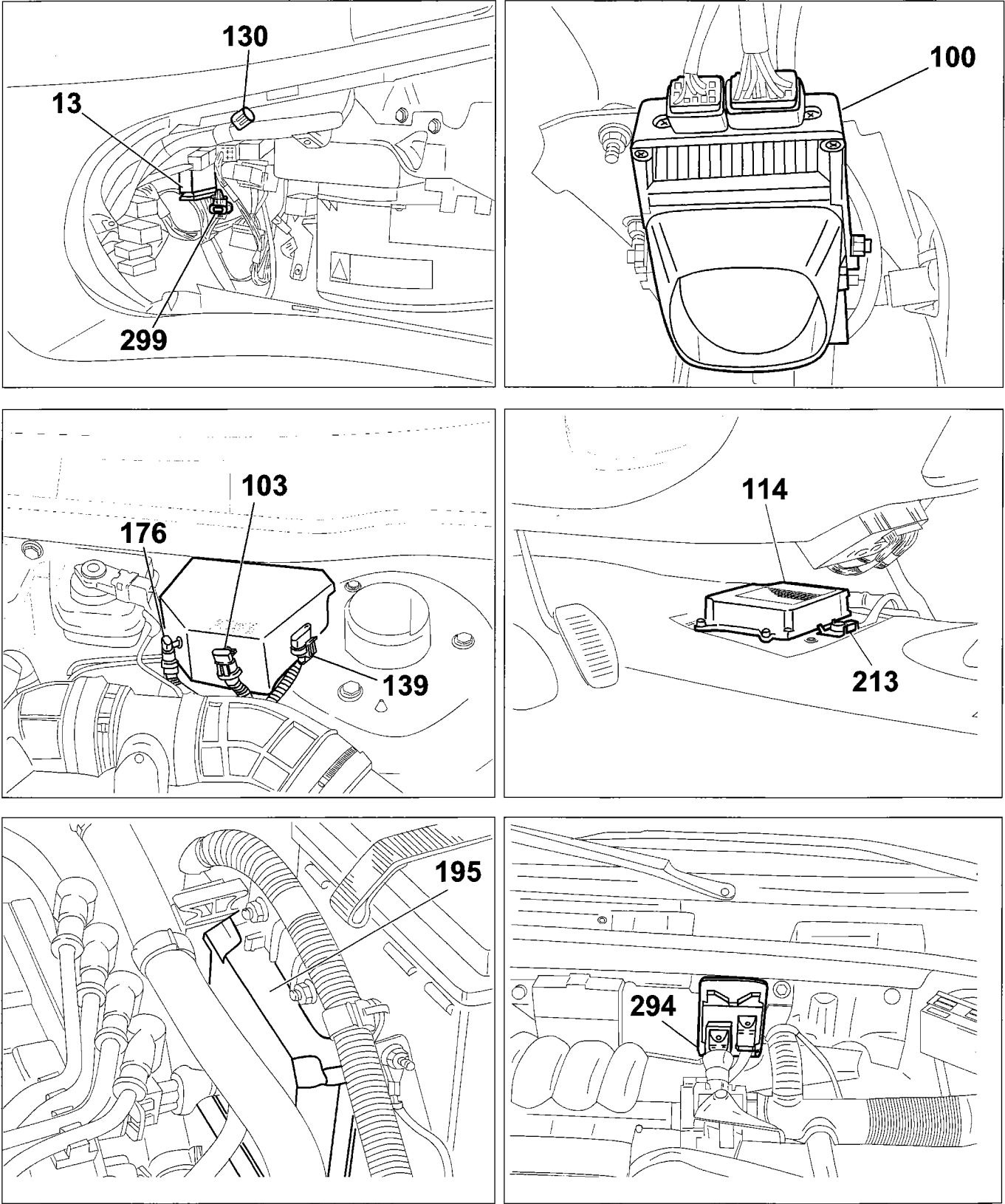
The cables in the wiring diagram are marked

Electrical equipment  
Wiring diagrams  
**55.**

Diagnostic socket connections - (See key at end of wiring diagrams)

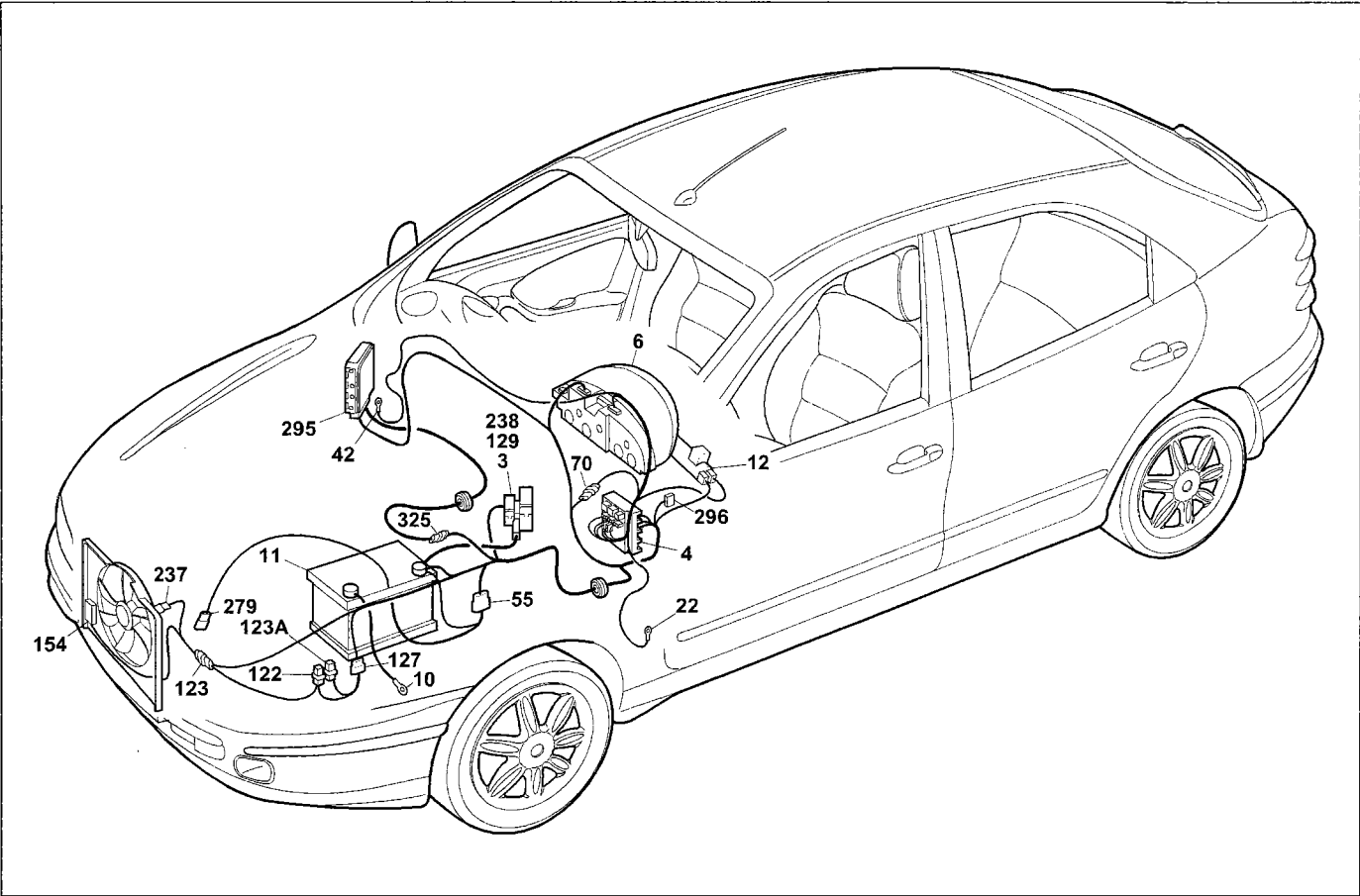


Location of components





55.



P4A123101

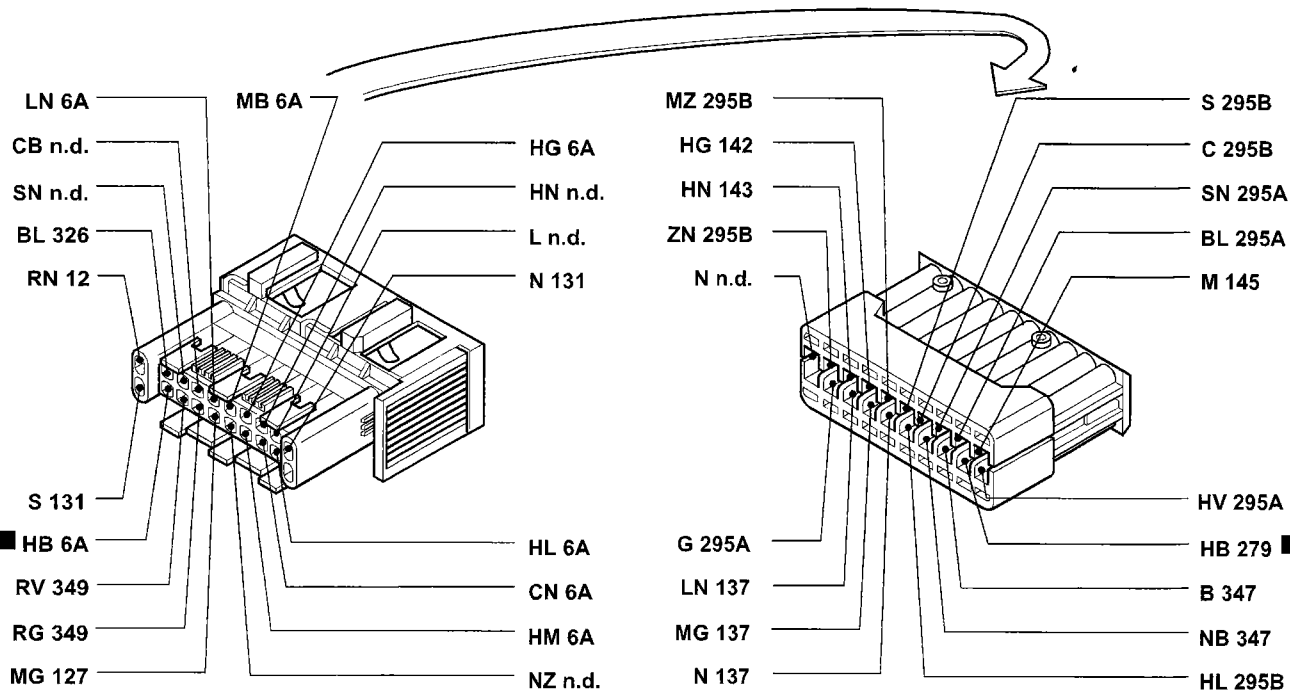
Version with automatic air conditioning  
Engine cooling - Water temperature gauge

Components key

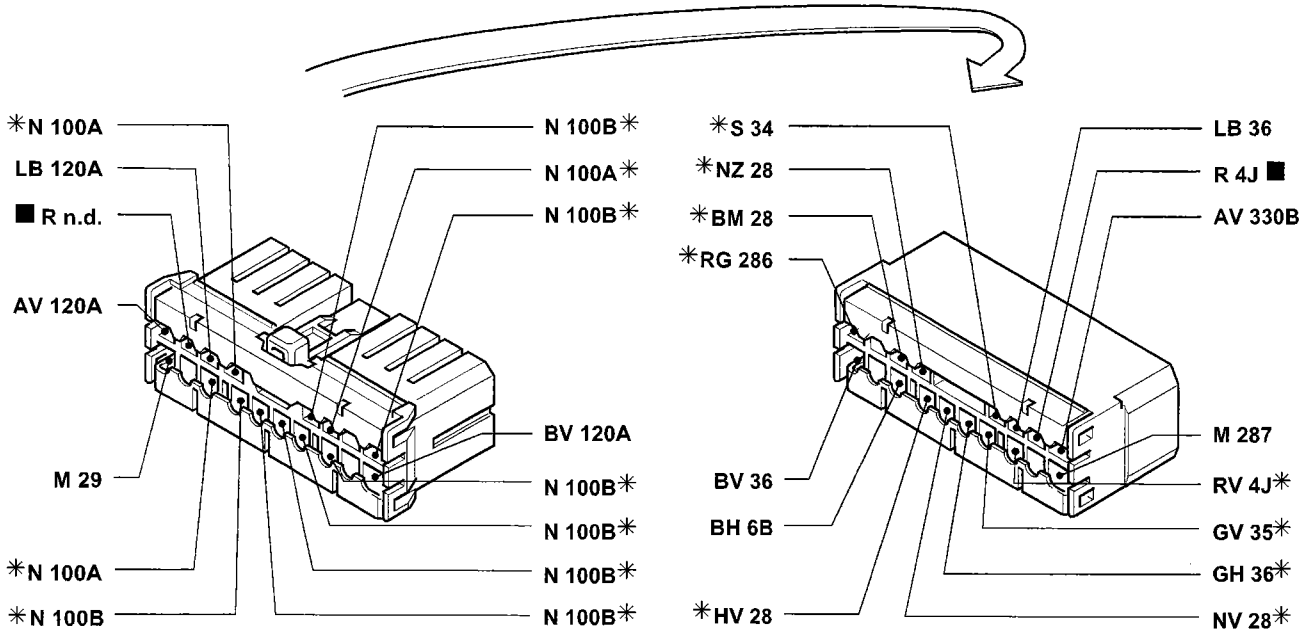
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit:
  - E1 Ignition discharge relay
- 6 Instrument panel:
  - X Water temperature gauge
  - Y Electronic module
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 42 Right dashboard earth
- 55 Connection between front/engine pre-wiring cables
- 70 Connection for front dashboard cables
- 122 Engine cooling fan low speed relay feed
- 123 Engine cooling fan high speed timer
- 123A Engine cooling fan high speed relay feed
- 127 Connection between left front cable/cable on relay holder bracket
- 129 40A power fuse protecting engine cooling fan
- 154 Engine cooling fan
- 237 Additional engine cooling fan
- 238 40A fuse protecting engine cooling fan
- 279 Twin engine coolant temperature sender unit
- 295 Injection/ignition electronic control unit 1910 TD UNIJET
- 296 Fuse carrier base on front cable
  - C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection
- 325 Connection between injection/left front cables

N.D. Ultrasound welding taped in cable loom

55 Connection between front/engine pre-wiring cables



70 Dashboard/front cables connection. Trim level: SX - GT



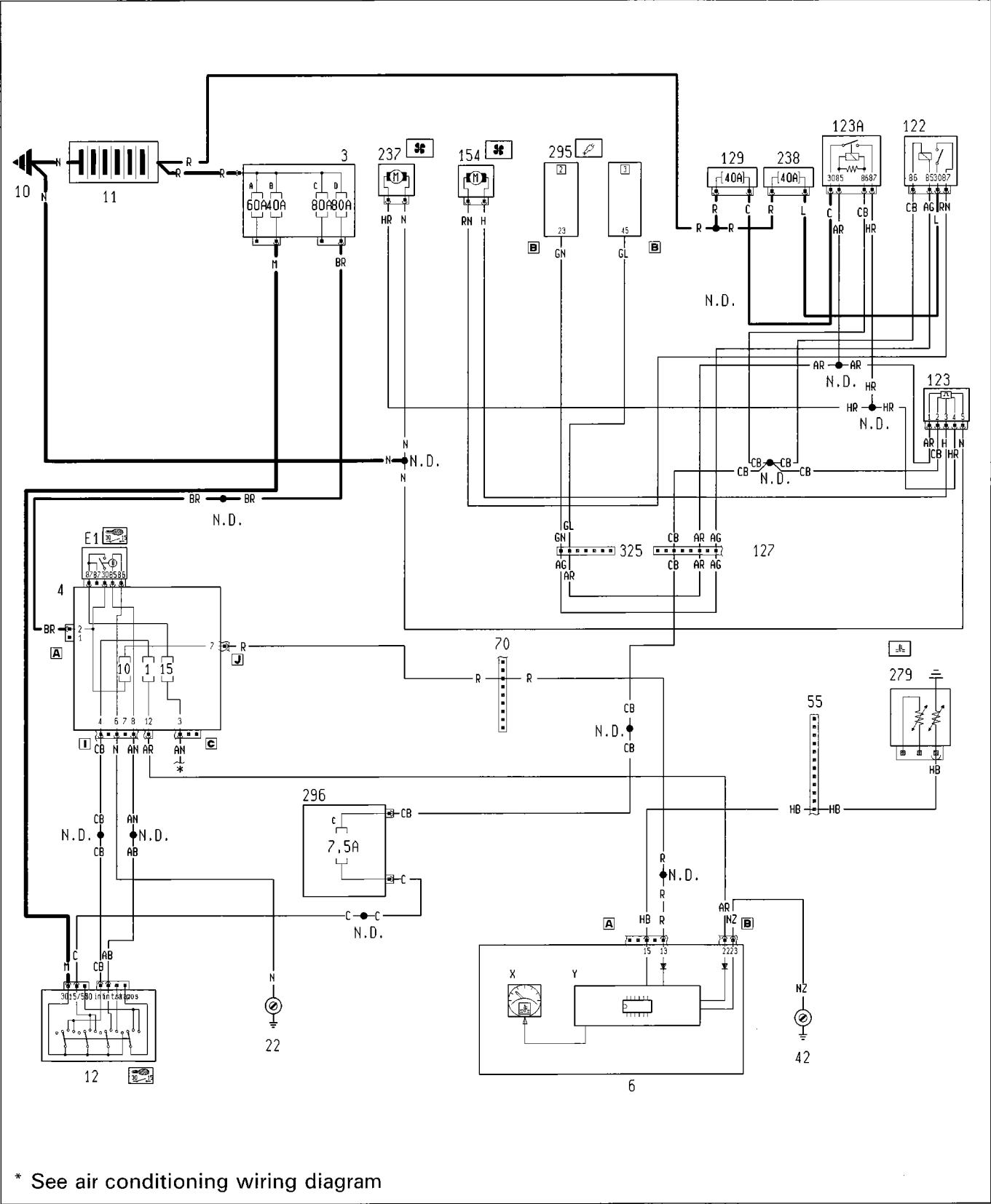
\* Variant connection for versions with alarm

The cables in the wiring diagram are marked

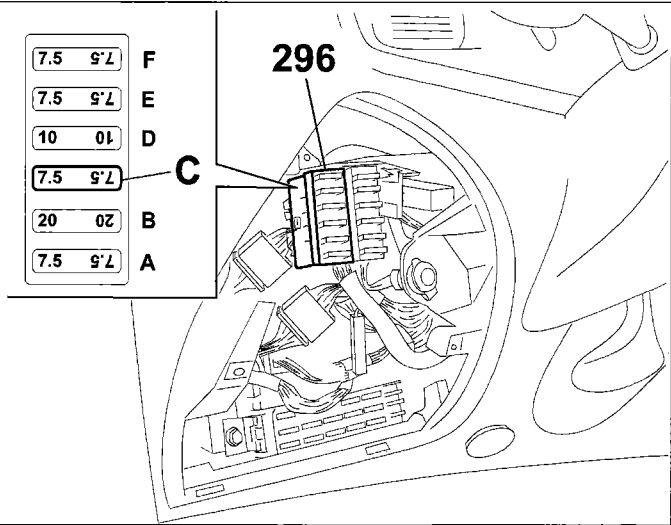
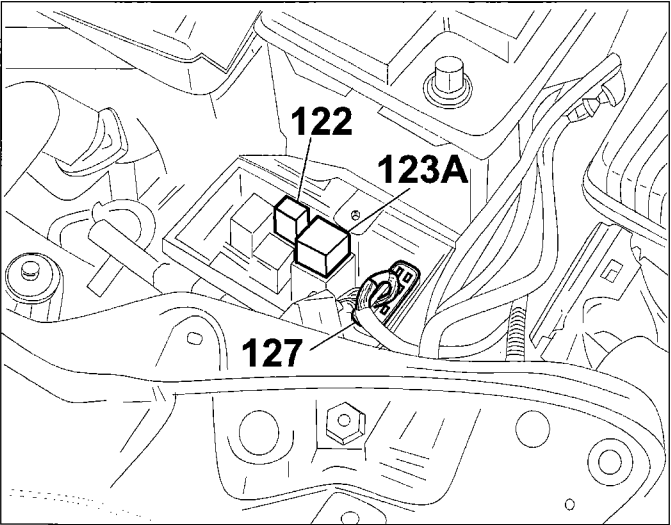
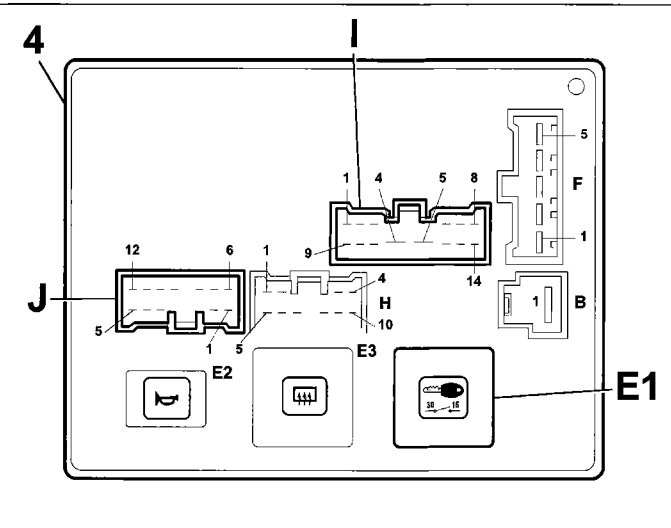
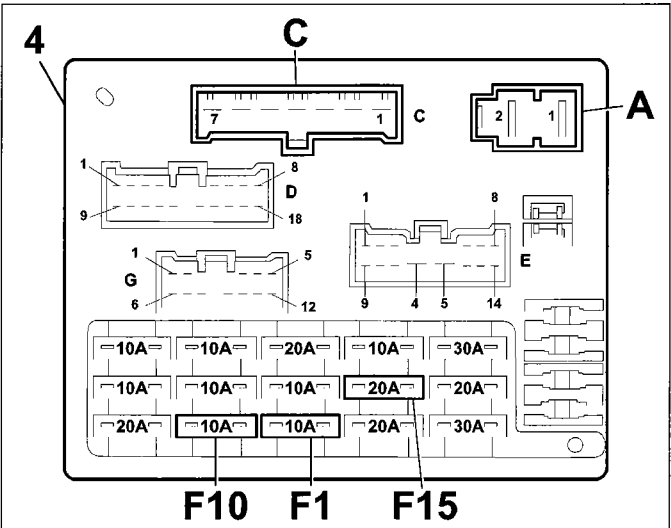
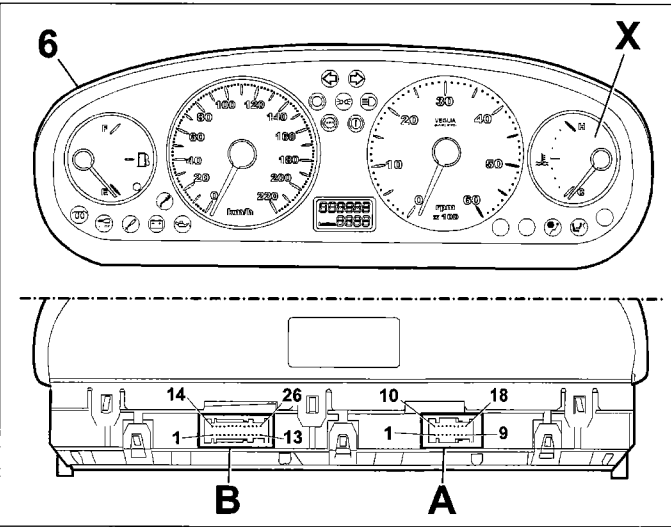
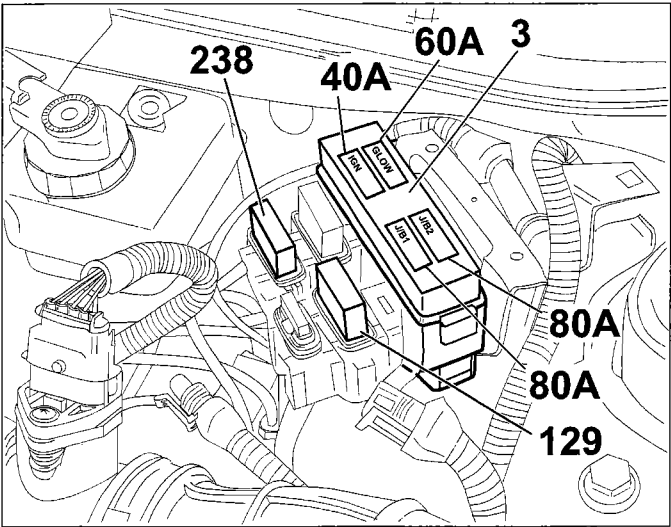
P4A124101

Electrical equipment  
Wiring diagrams  
55.

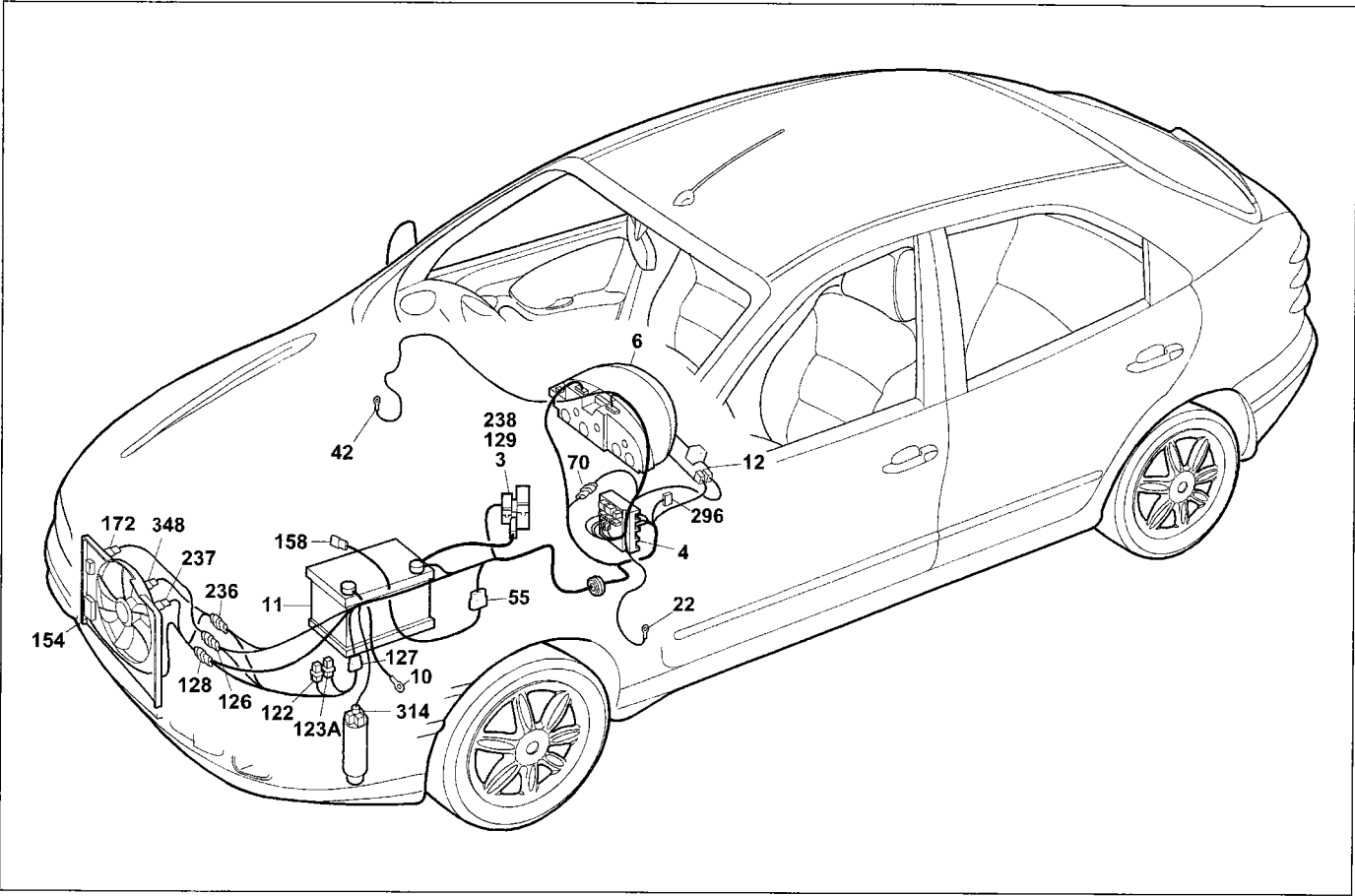
Version with automatic air conditioning  
Engine cooling - Water temperature gauge - (See key at end of wiring diagrams)



Location of components



55.



Version with automatic air conditioning  
Engine cooling - Water temperature gauge

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

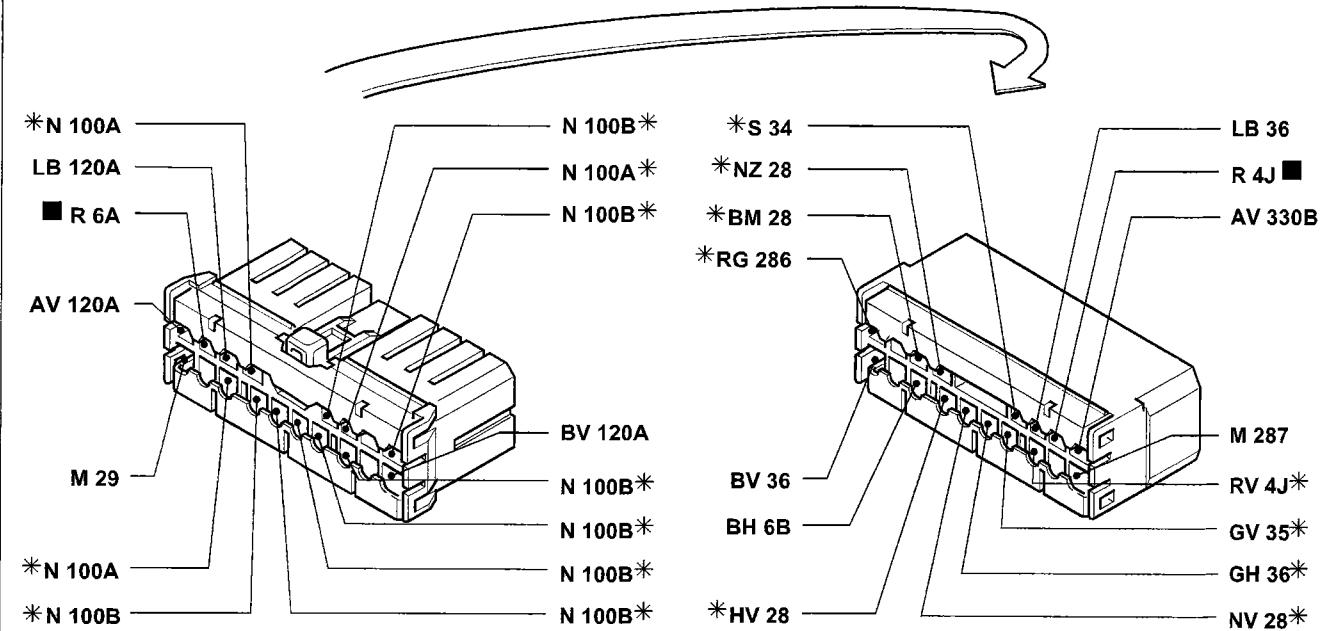
4 Junction unit:  
E1 Ignition discharge relay

6 Instrument panel:  
X Water temperature gauge  
Y Electronic module

10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
22 Left dashboard earth  
42 Right dashboard earth  
55 Connection between front/engine pre-wiring cables  
58 Dimmer control  
70 Dashboard/front cables connection  
122 Engine cooling fan low speed relay feed  
123A Engine cooling fan high speed relay feed  
126 Front/air conditioning cables connection  
127 Front left cables/cable on relay holder bracket connection
- 128 Front/air conditioning cables connection  
129 50A protective power fuse for engine cooling fan  
154 Engine cooling fan  
172 Two level thermal switch  
236 Connection for front air conditioning cables  
237 Additional engine cooling fan  
238 40A fuse protecting engine cooling fan  
296 Fuse carrier base on front cable  
C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection  
314 Four stage pressure switch  
348 Remote control switch for engine cooling fan

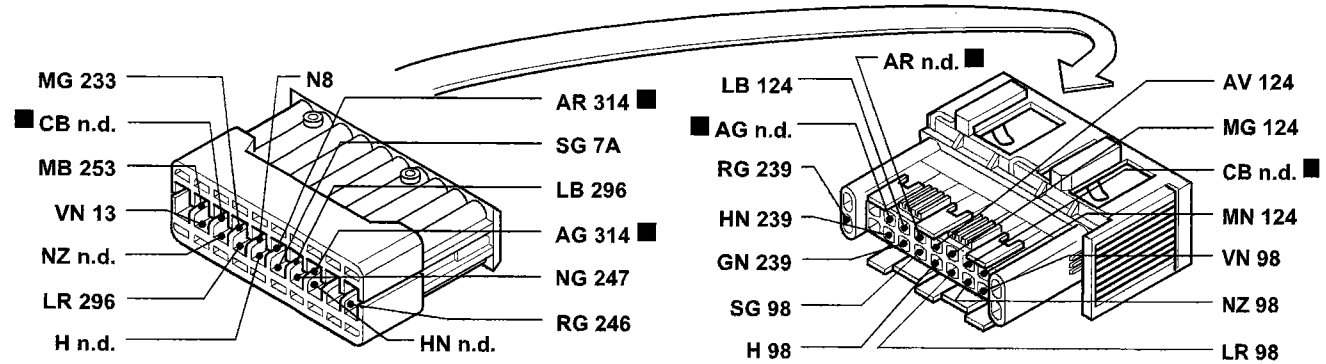
N.D. Ultrasound welding taped in cable loom

70 Dashboard/front cables connection. Trim level: SX - GT

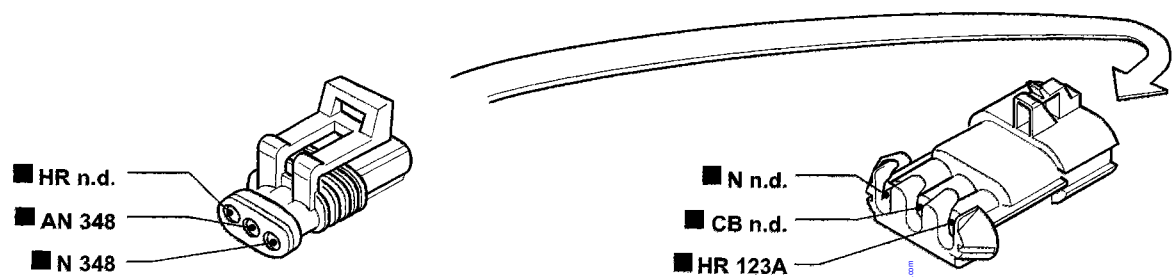


\* Variant connection for versions with alarm

127 Connection between left front cable/cable on relay holder bracket



236 Front/air conditioning cables connection



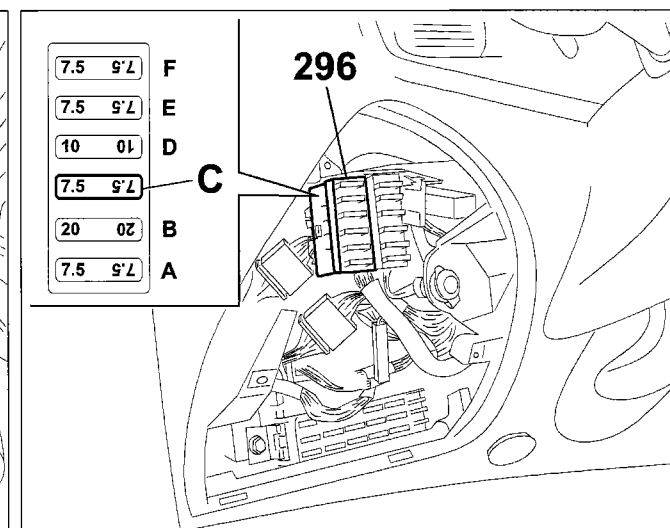
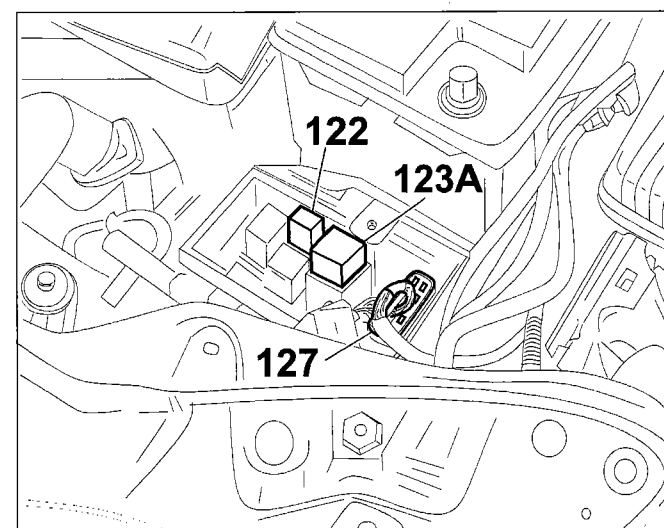
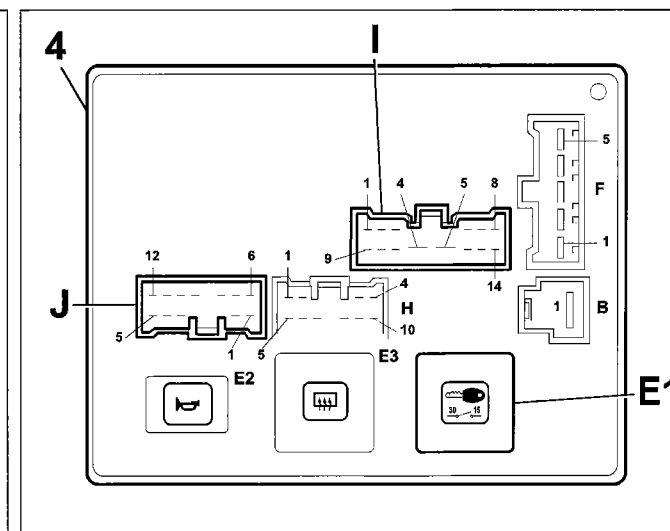
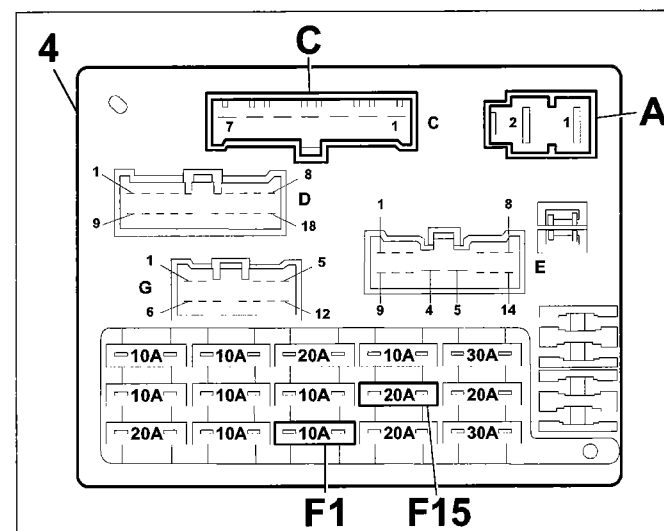
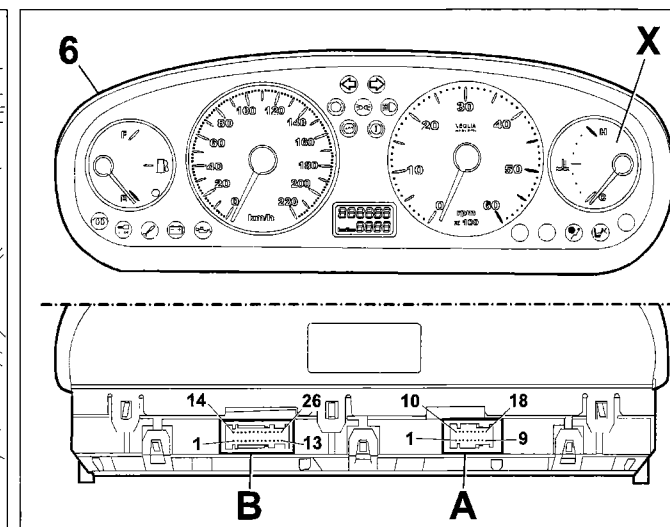
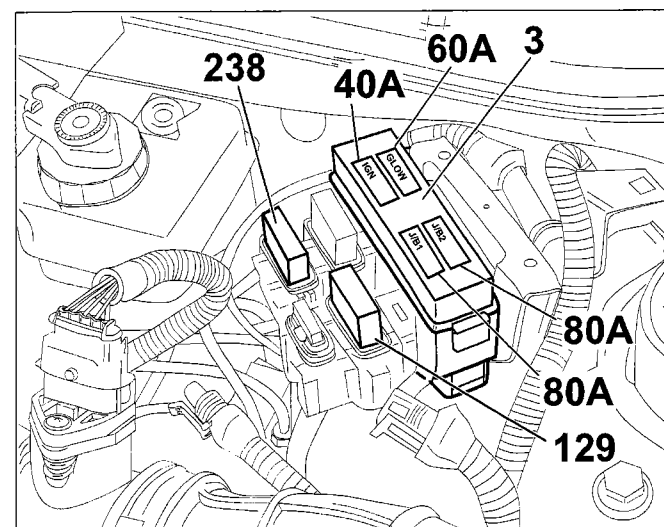
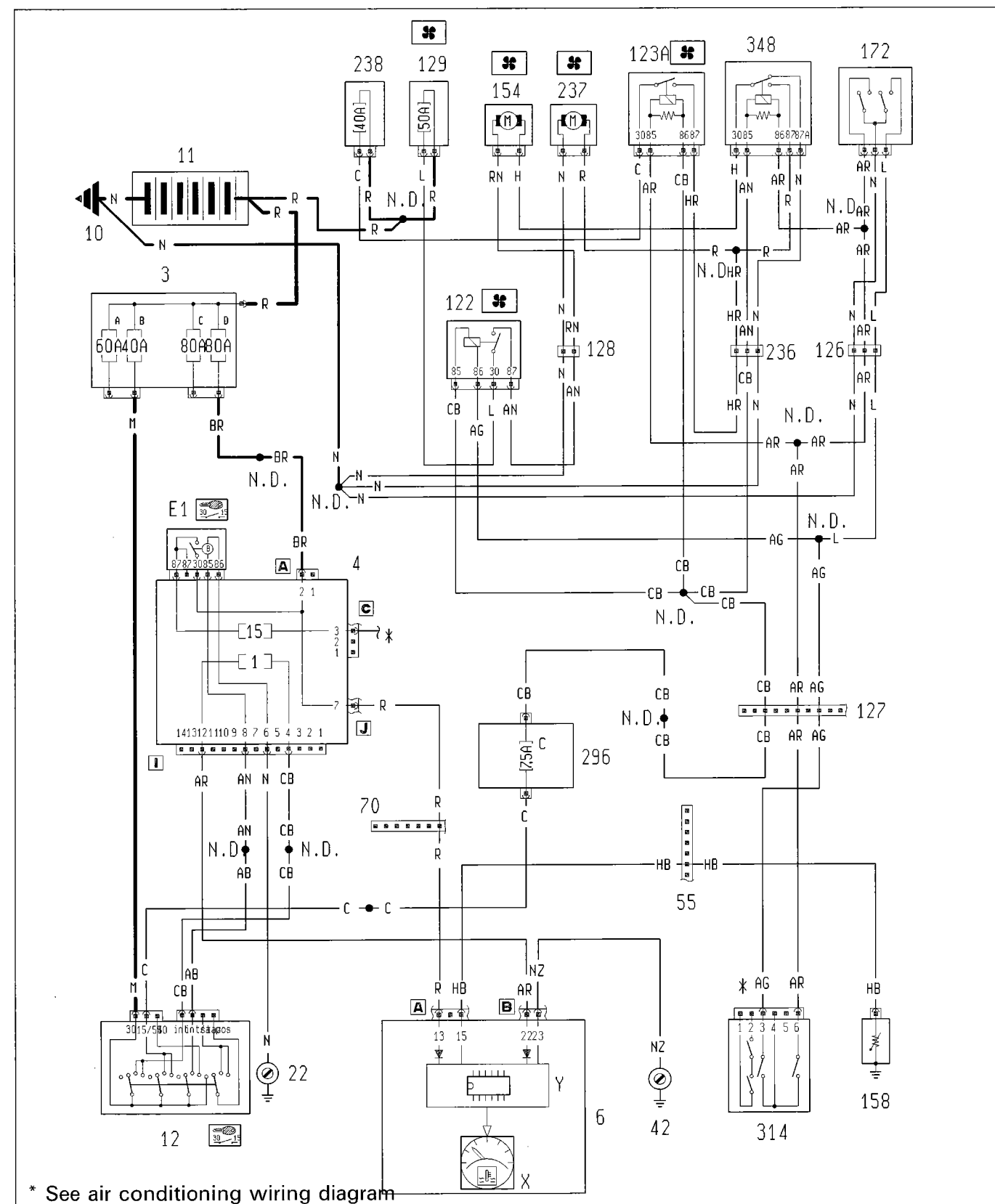
The cables in the wiring diagram are marked



### Version with automatic air conditioning

**Engine cooling - Water temperature gauge - (See key at end of wiring diagrams)**

### Location of components



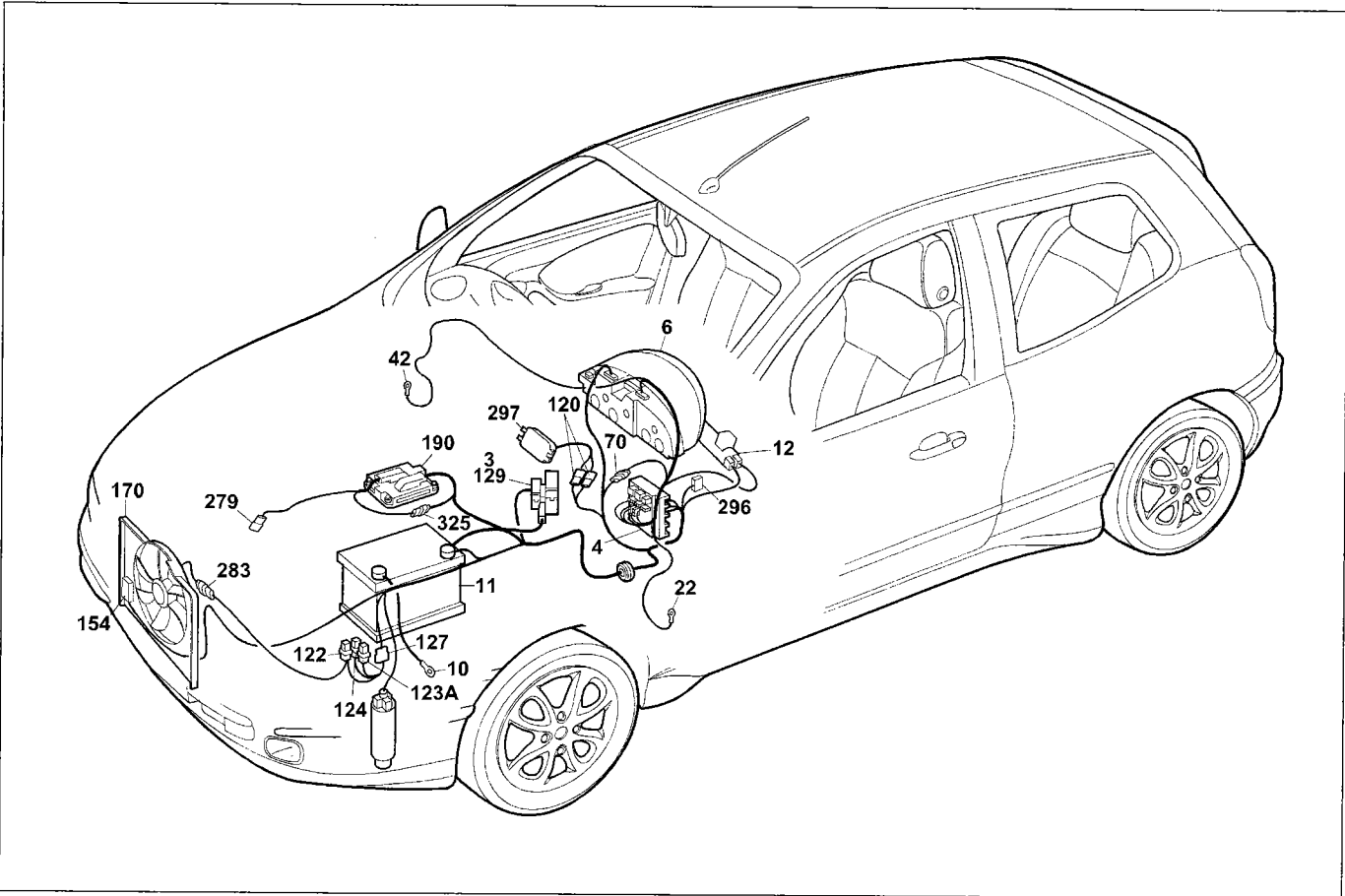
4A117I

P4A117I01

4A118I

P4A118|01

55.



Version with automatic air conditioning  
Engine cooling - Water temperature gauge

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

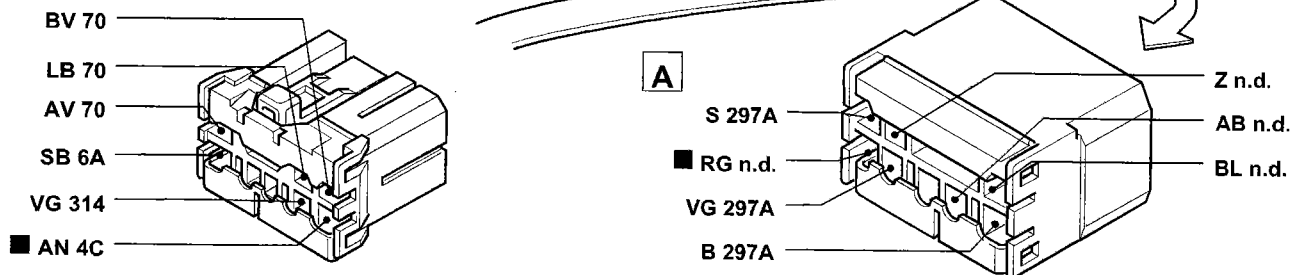
4 Junction unit:  
E1 Ignition discharge relay

6 Instrument panel:  
X Water temperature gauge  
Y Electronic module

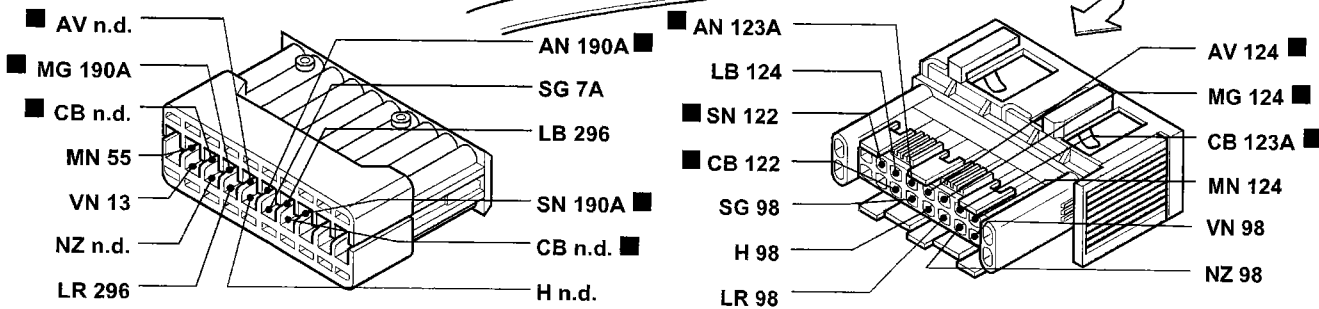
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
22 Left dashboard earth  
42 Right dashboard earth  
70 Dashboard/front cables connection  
120 Air conditioning unit  
122 Engine cooling fan low speed relay feed  
123A Engine cooling fan high speed relay feed  
127 Front left cables/cable on relay holder bracket connection  
129 50A protective power fuse for engine cooling fan
- 154 Engine cooling fan  
170 Engine cooling fan limiting resistance  
190 Injection/ignition electronic control unit (1998)  
279 Twin engine coolant temperature sender unit  
283 Connection between front cable/resistor  
296 Fuse carrier base on front cable  
A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm  
C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection

297 Air conditioning control unit  
325 Connection on injection cable/left front
- N.D. Ultrasound welding taped in cable loom

120 Air conditioning unit cables connection



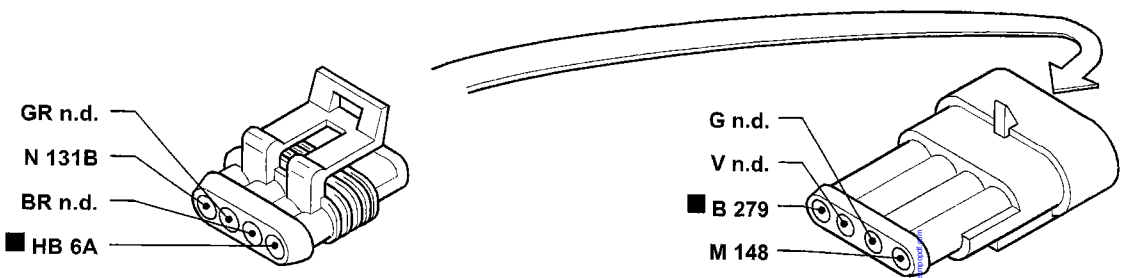
127 Connection between left front cable/cable on relay holder bracket



283 Connection between front cable/resistor



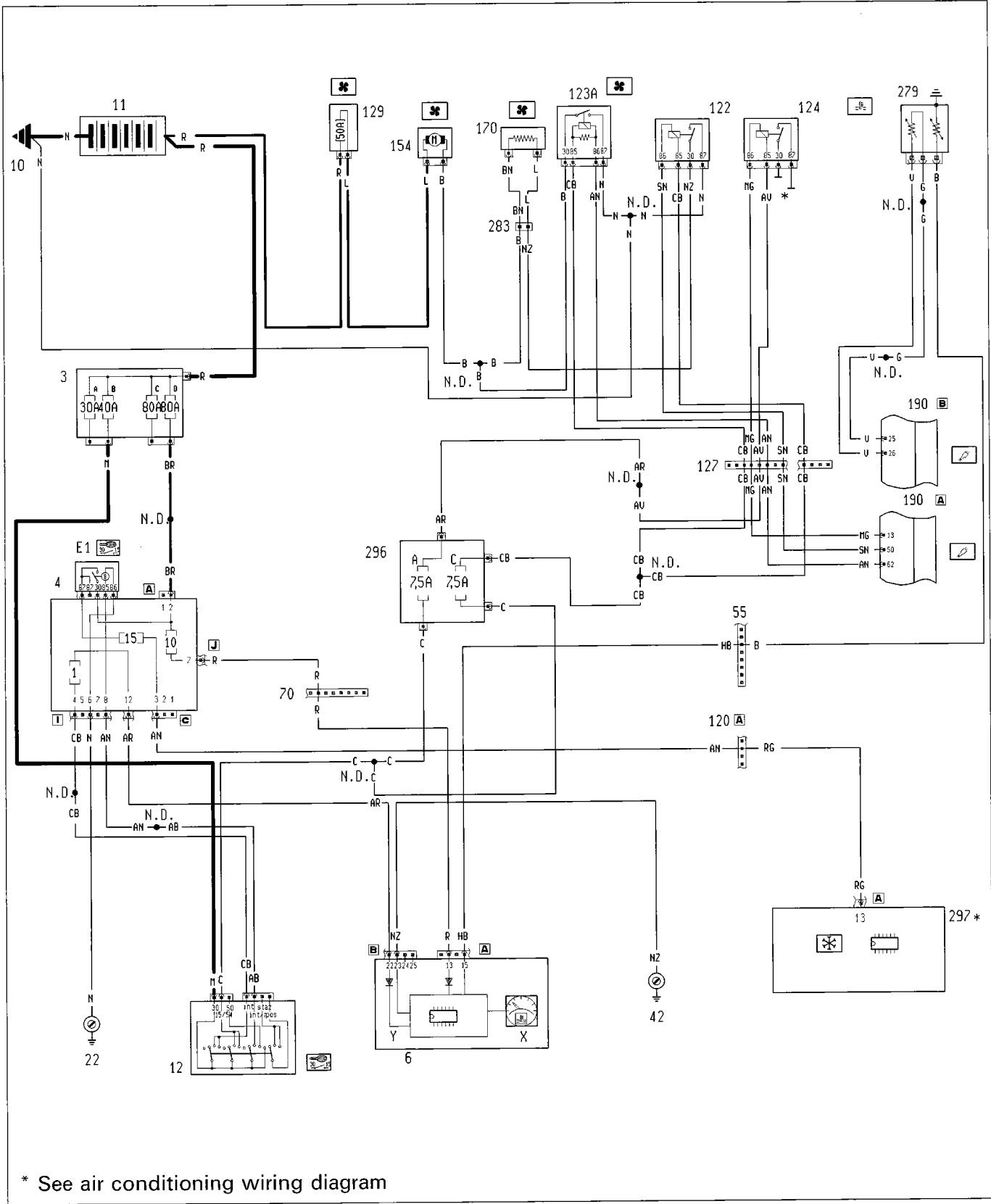
325 Connection between injection/left front cables



The cables in the wiring diagram are marked

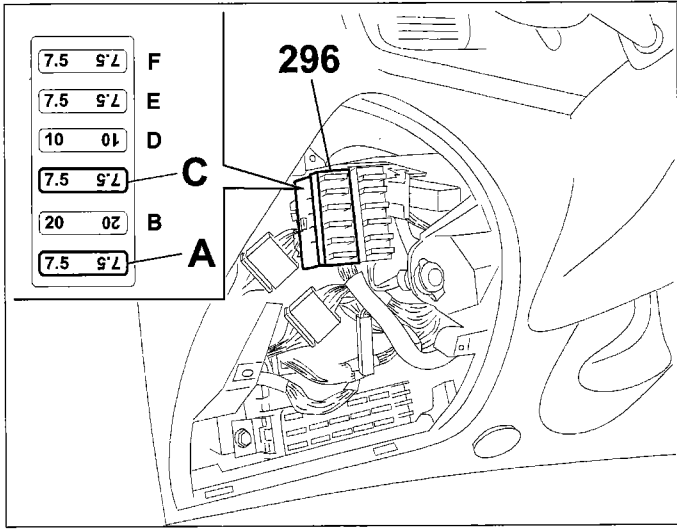
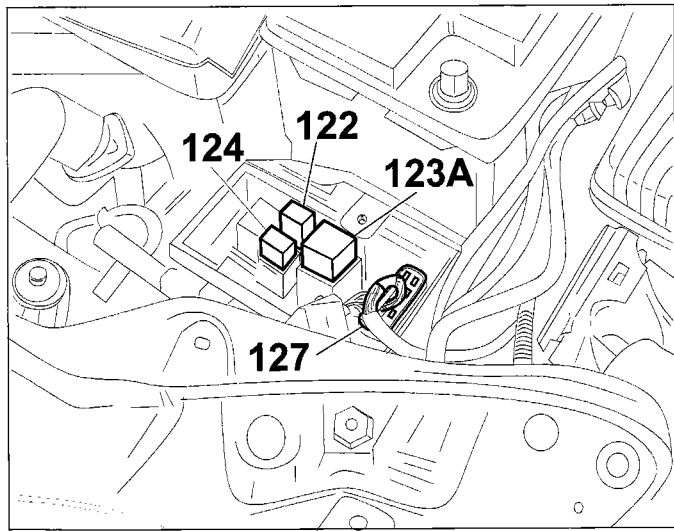
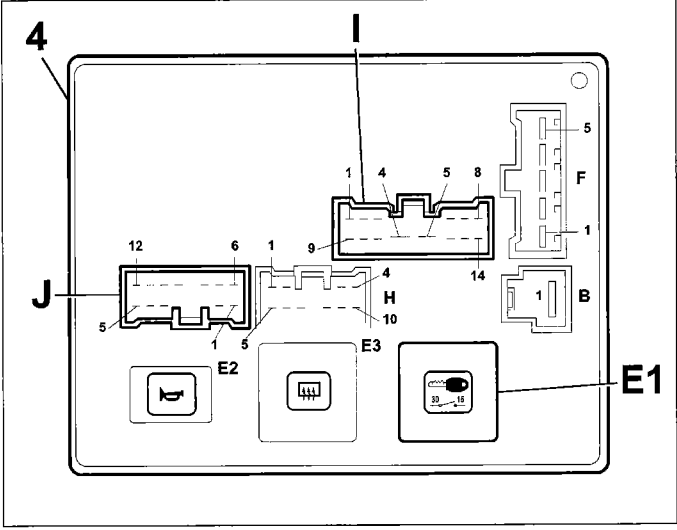
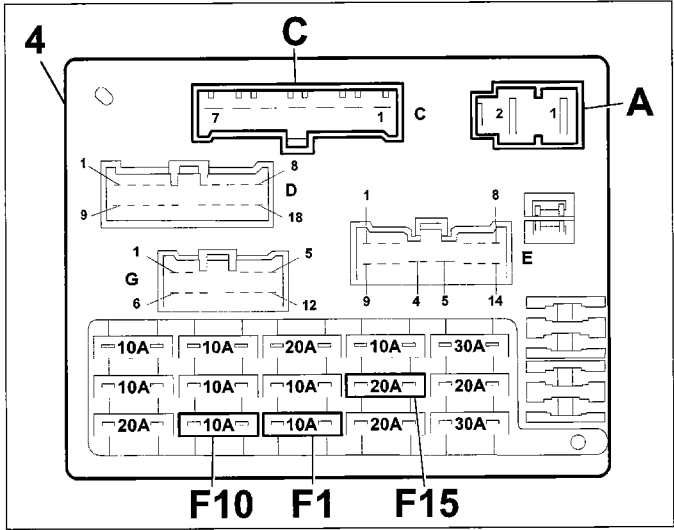
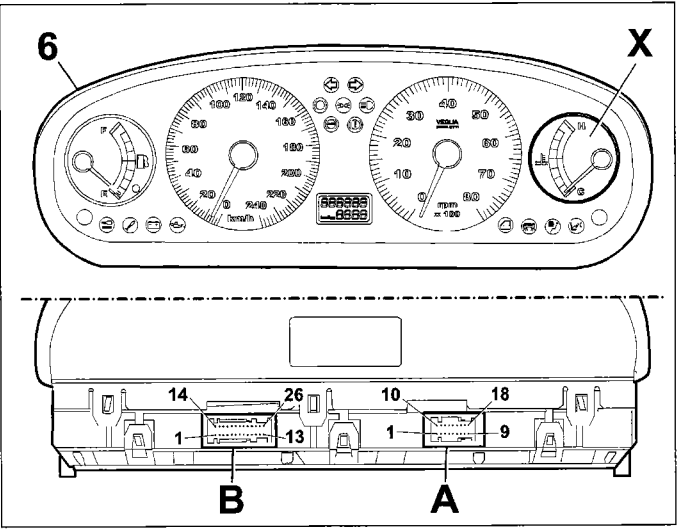
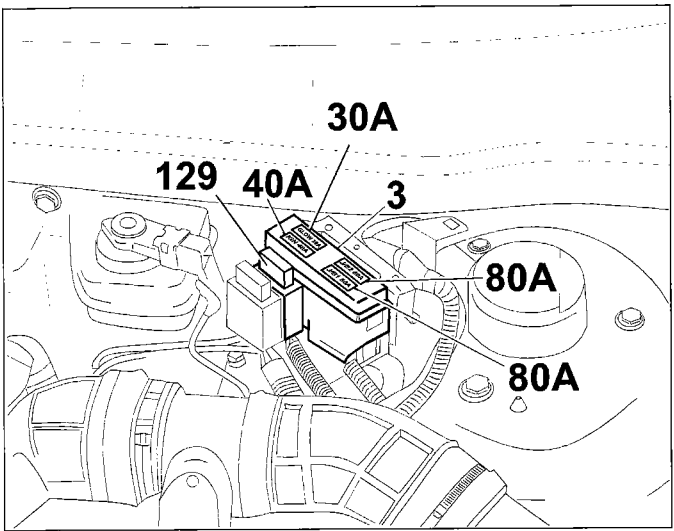
Electrical equipment  
Wiring diagrams  
55.

Version with automatic air conditioning  
Engine cooling - Water temperature gauge - (See key at end of wiring diagrams)



P4A113101

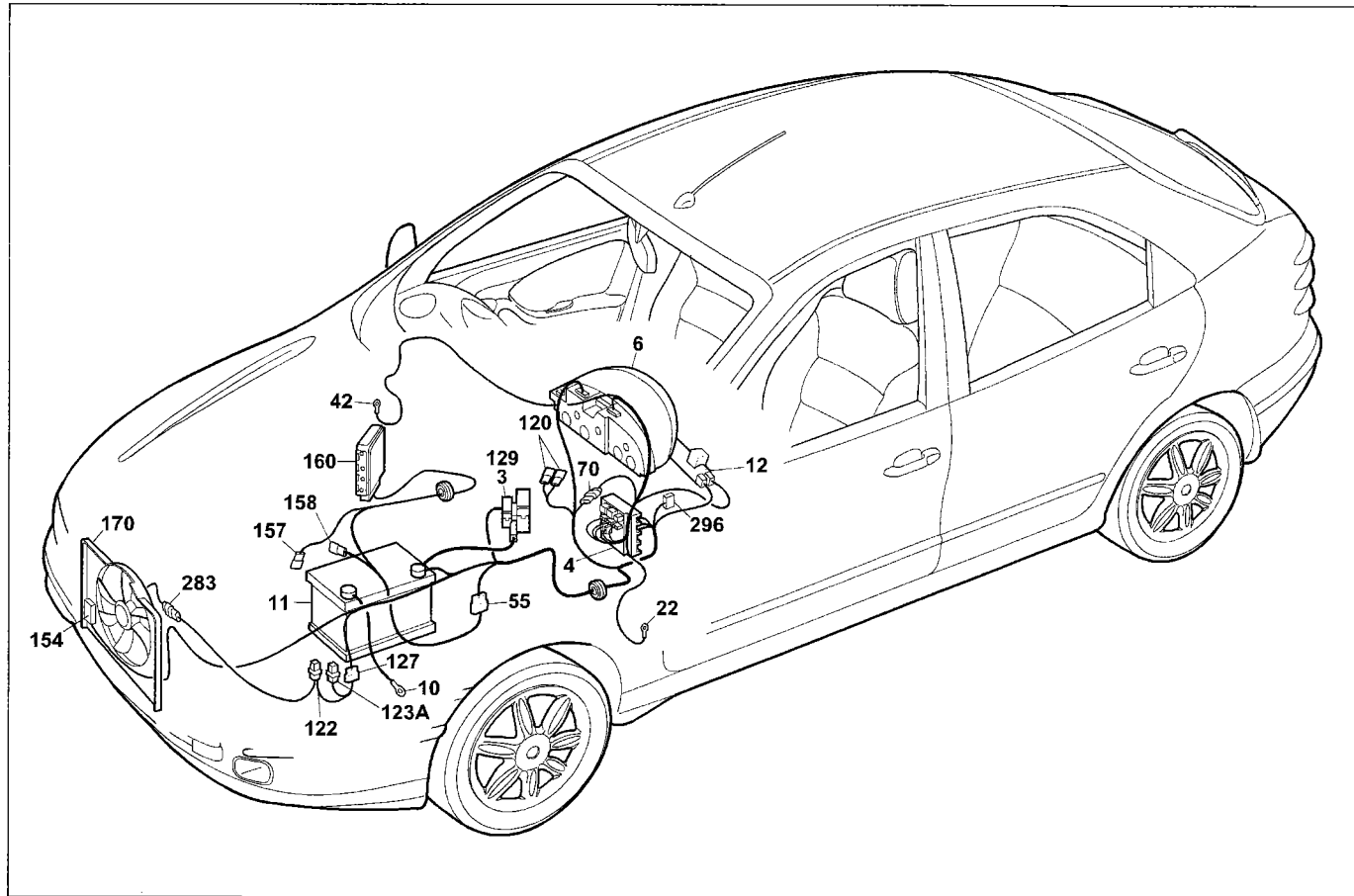
Location of components



P4A114101



### 55.



P4A111I01

**Version with automatic air conditioning**

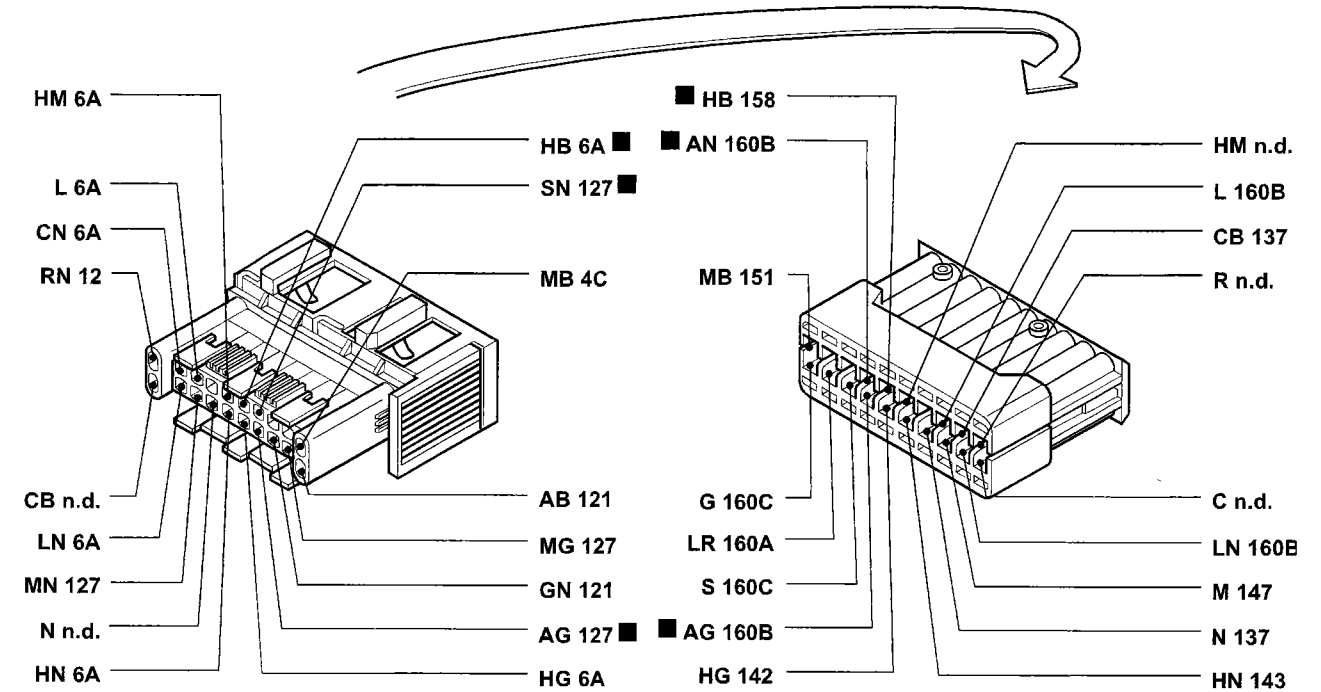
**Engine cooling - Water temperature gauge**

#### Components key

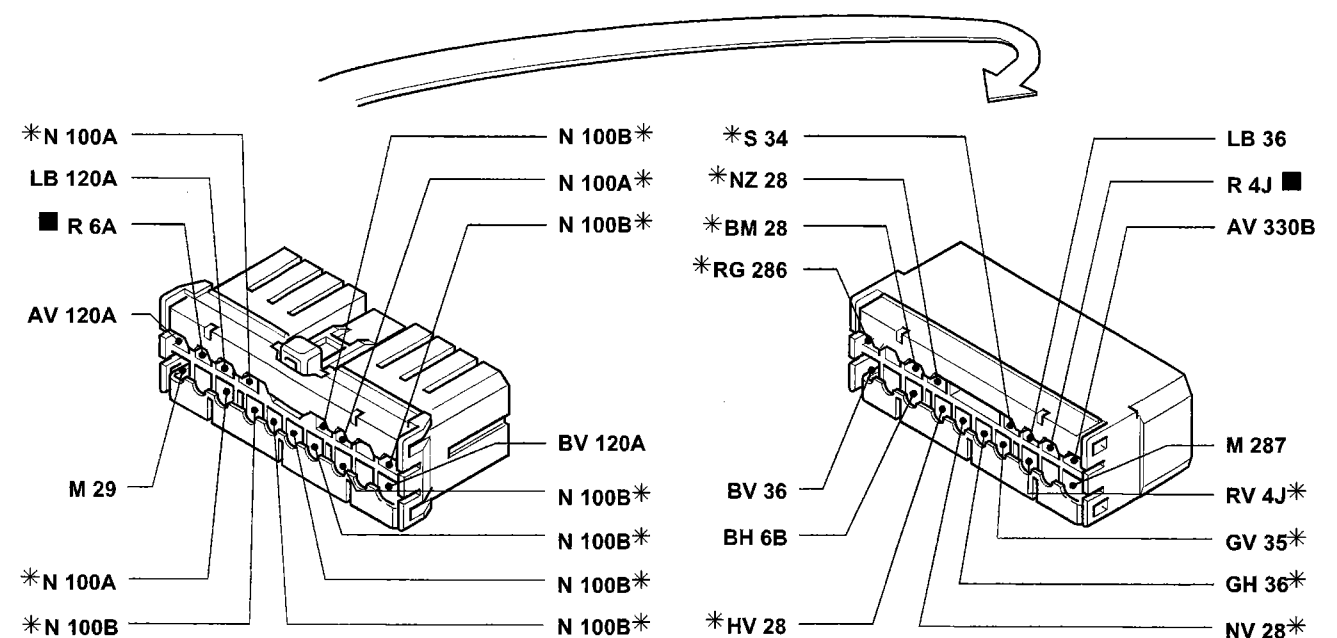
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit:
  - E1 Ignition discharge relay
- 6 Instrument panel:
  - X Water temperature gauge
  - Y Electronic module
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 42 Right dashboard earth
- 55 Connection for engine pre-wiring front cables
- 70 Dashboard/front cables connection
- 120A Air conditioning unit cables connection
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed
- 127 Connection between left front cable/cable on relay holder bracket
- 129 50A protective power fuse for engine cooling fan
- 154 Engine cooling fan
- 157 Coolant temperature sensor for injection system
- 158 Coolant temperature sensor for instrument
- 160 Injection/ignition electronic control unit (1747)
- 170 Engine cooling fan limiting resistance
- 283 Connection between front cable/resistor
- 296 Fuse carrier base on front cable
- C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection

N.D. Ultrasound welding taped in cable loom

### 55 Connection between front/engine pre-wiring cables



### 70 Dashboard/front cables connection. Trim level: SX - GT



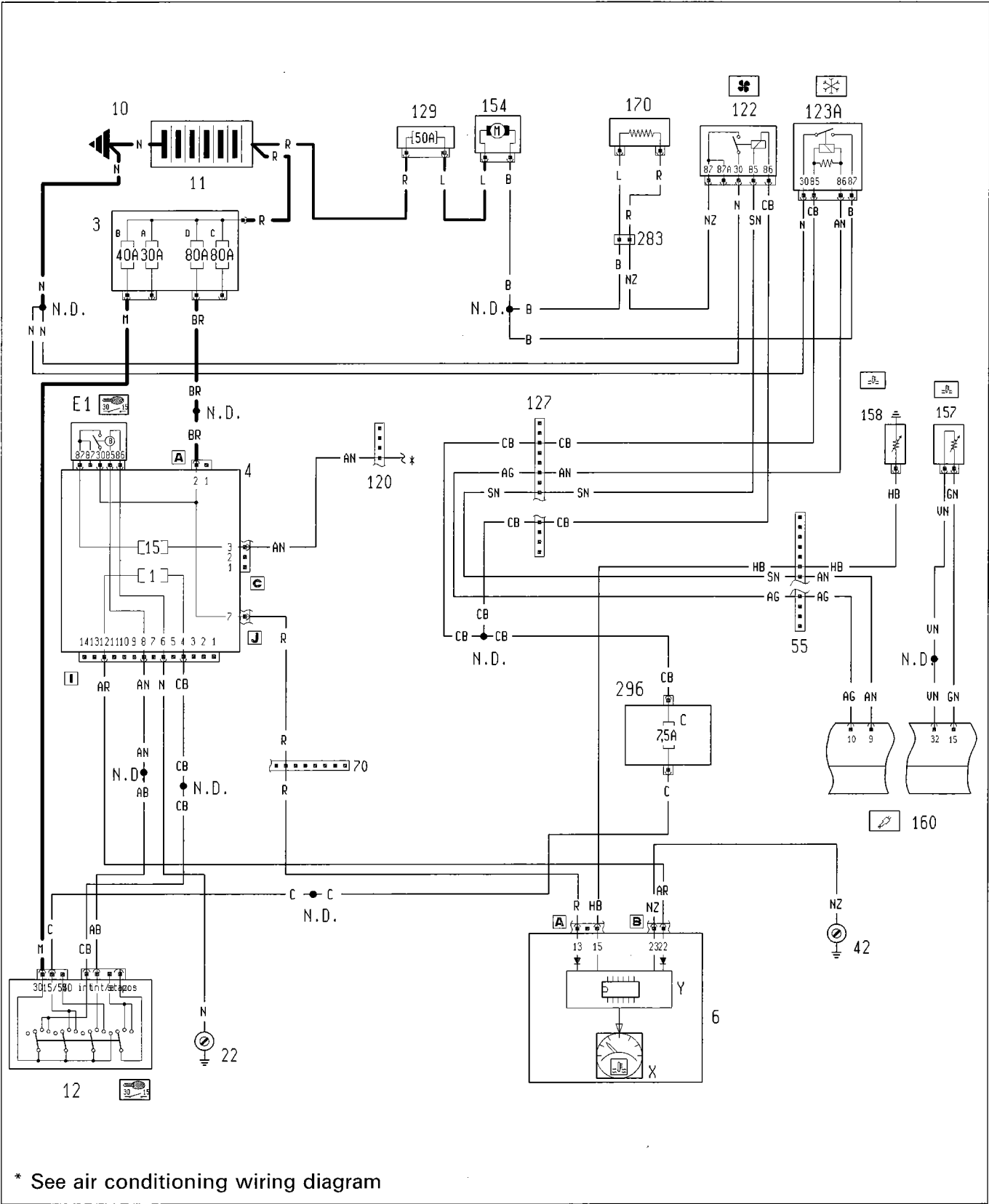
\* Variant connection for versions with alarm

The cables in the wiring diagram are marked

P4A112I01

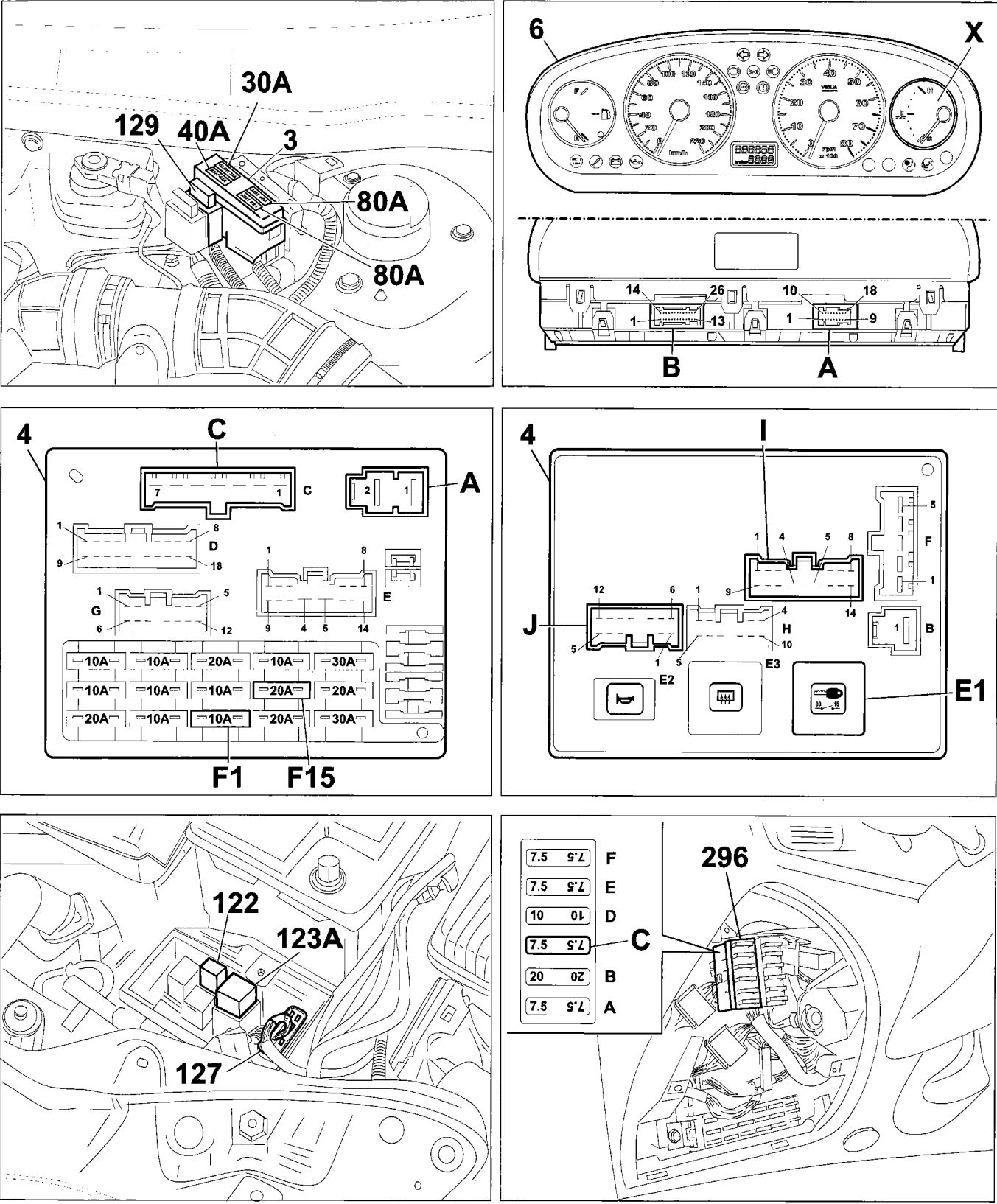
Electrical equipment  
Wiring diagrams  
55.

Version with automatic air conditioning  
Engine cooling - Water temperature gauge - (See key at end of wiring diagrams)



P4A109I01

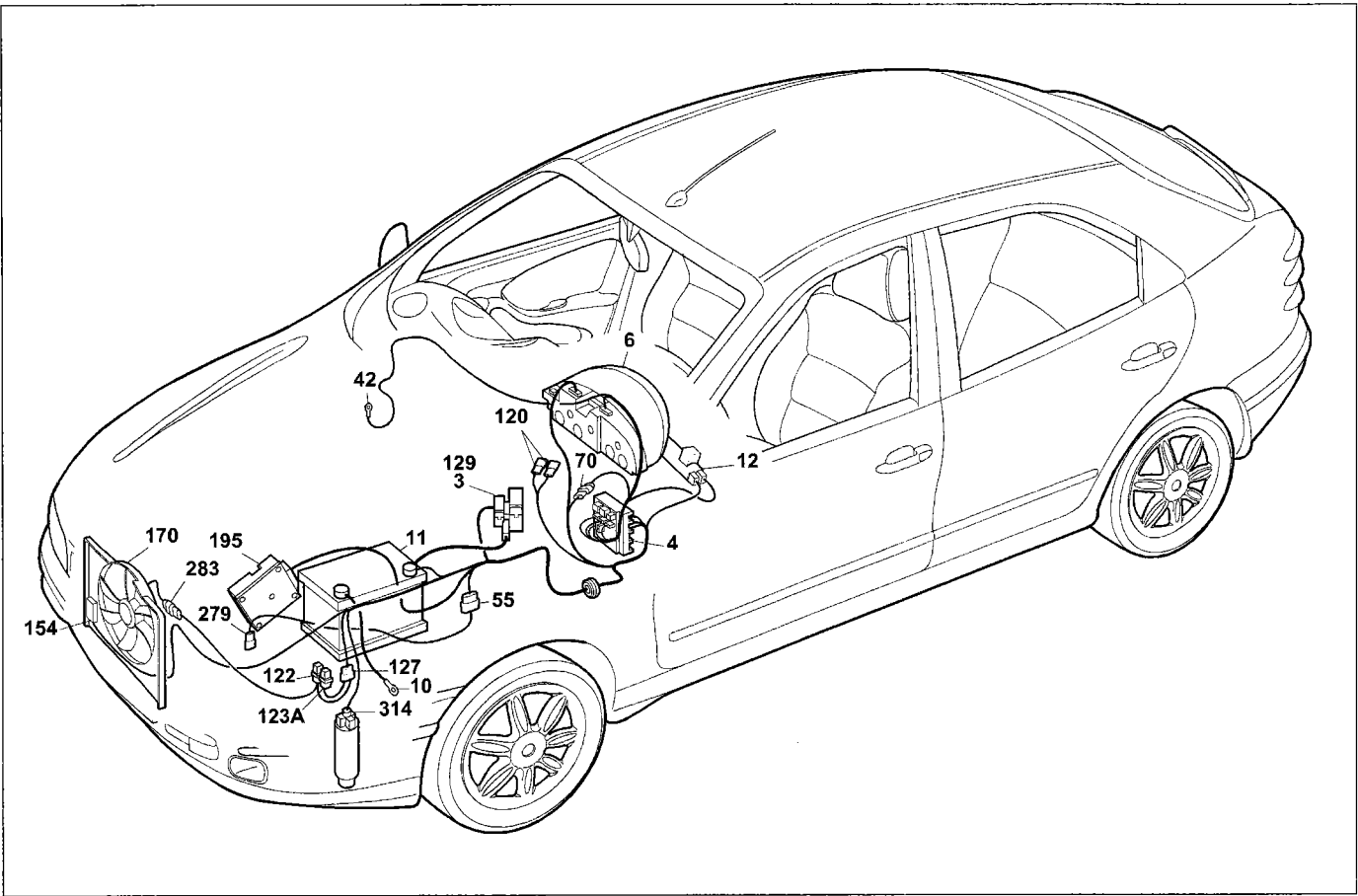
Location of components



P4A110I01

4A109I

55.



P4A107101

Version with automatic air conditioning

Engine cooling - Water temperature gauge

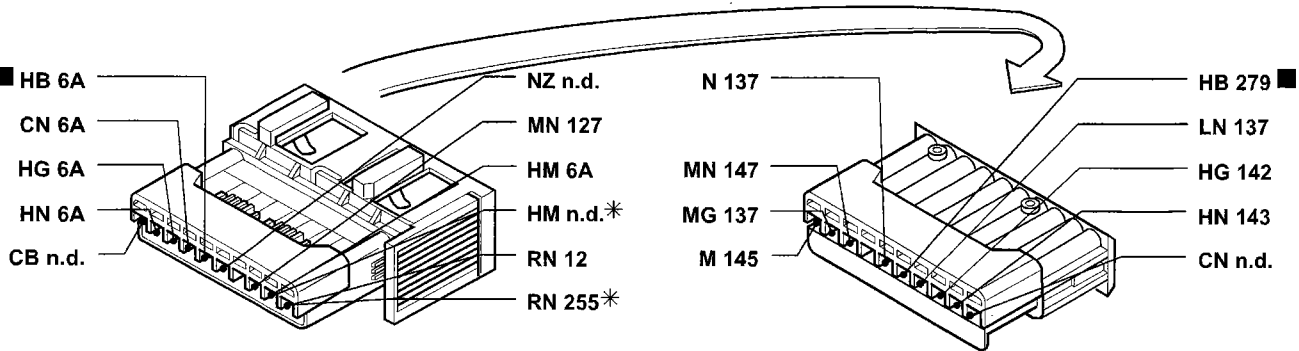
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit:
  - E1 Ignition discharge relay
- 6 Instrument panel:
  - X Water temperature gauge
  - Y Electronic module
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 42 Right dashboard earth
- 55 Connection between front cables/engine pre-wiring
- 70 Dashboard/front cables connection
- 120A Air conditioning unit cables connection
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed
- 127 Connection between front left cables/cable on relay holder bracket

- 129 40A power fuse protecting engine cooling fan
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistance
- 195 Injection/ignition electronic control unit (1581)
- 279 Twin engine coolant temperature sender unit
- 283 Connection between front cable/resistor
- 296 Fuse carrier base on front cable
  - C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection
- 314 Four stage pressure switch

N.D. Ultrasound welding taped in cable loom

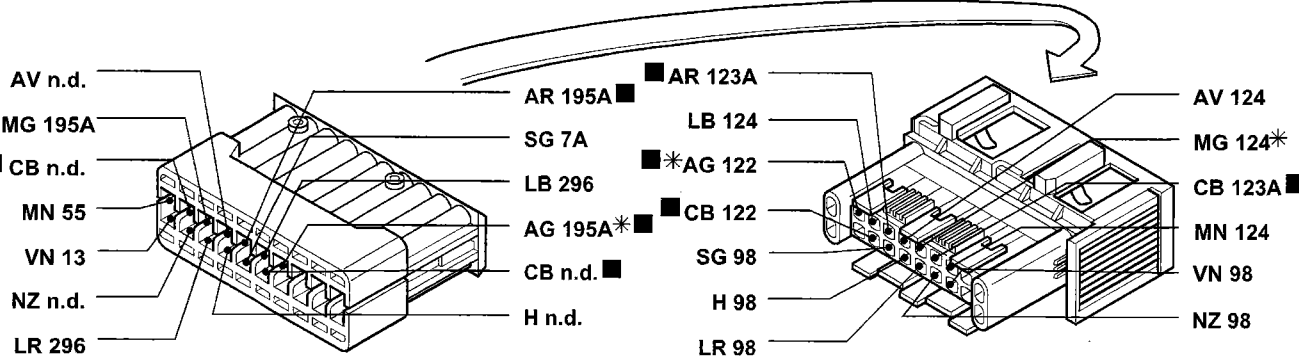
55 Connection between front/engine pre-wiring cables



120 Air conditioning unit cables connection

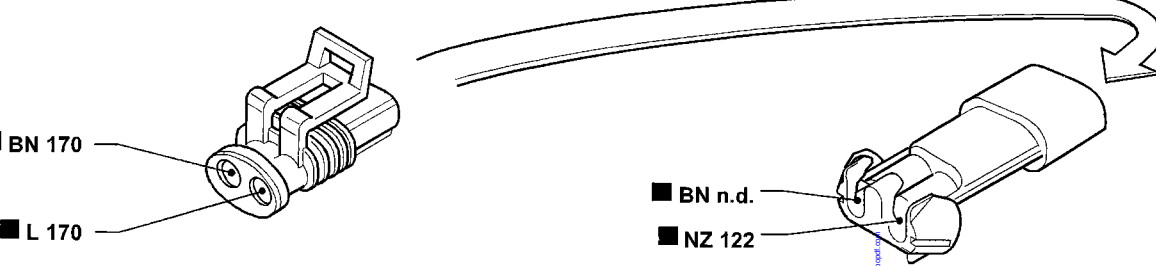


127 Connection between left front cable/cable on relay holder bracket



\* Not present on versions with automatic transmission

283 Connection between front cable/resistor

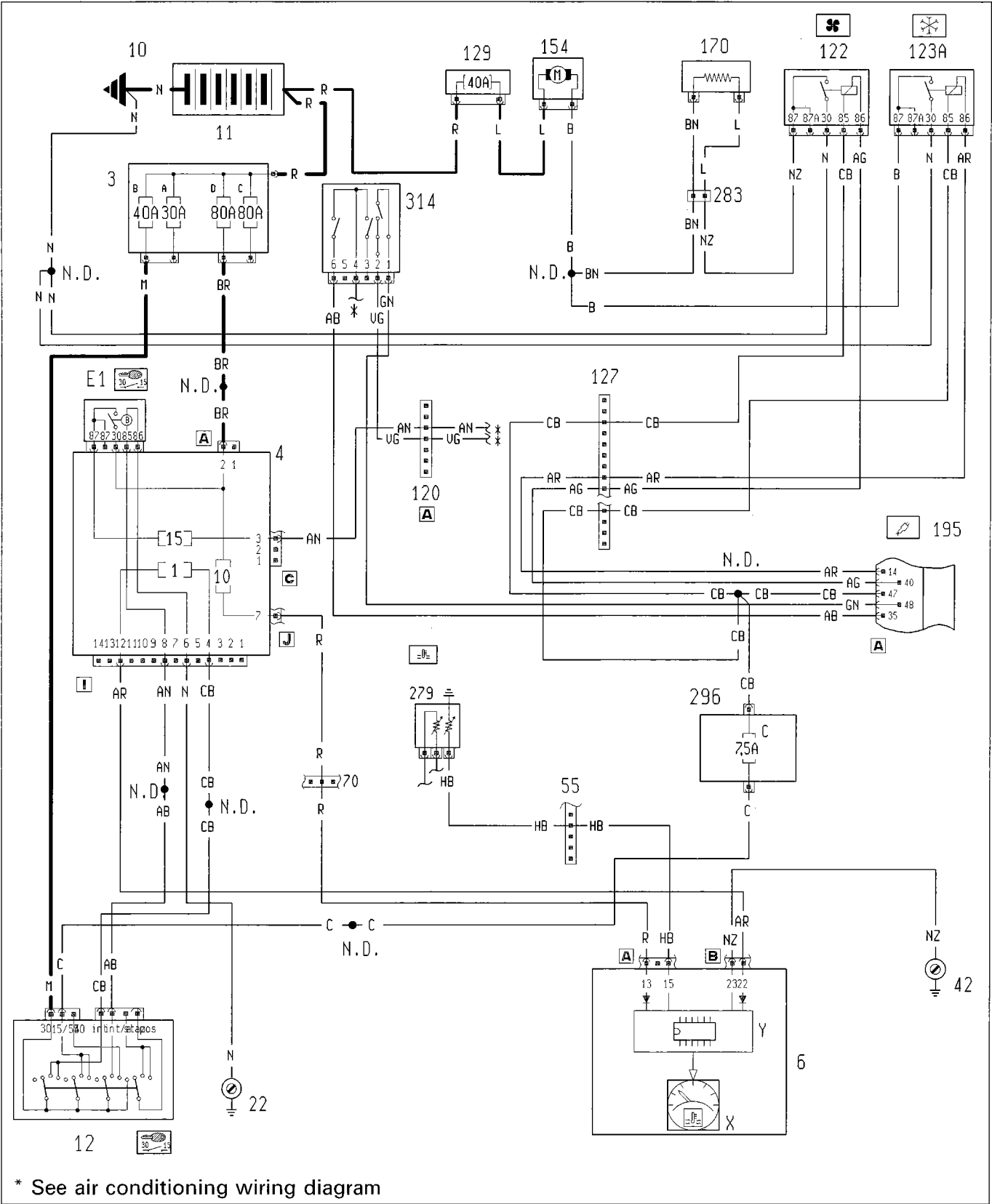


The cables in the wiring diagram are marked

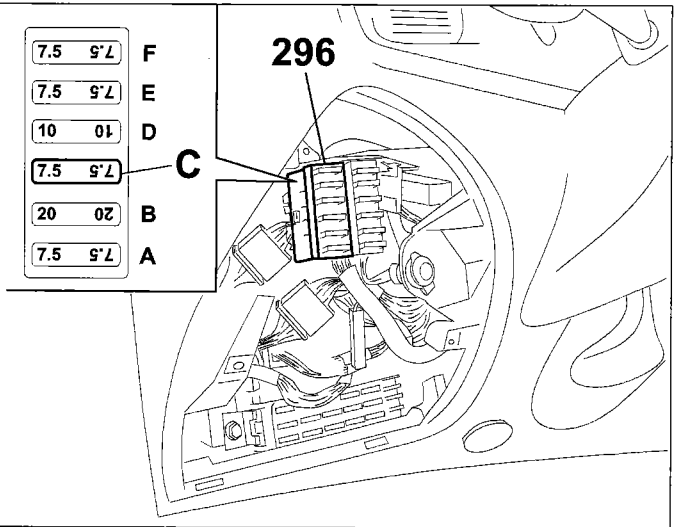
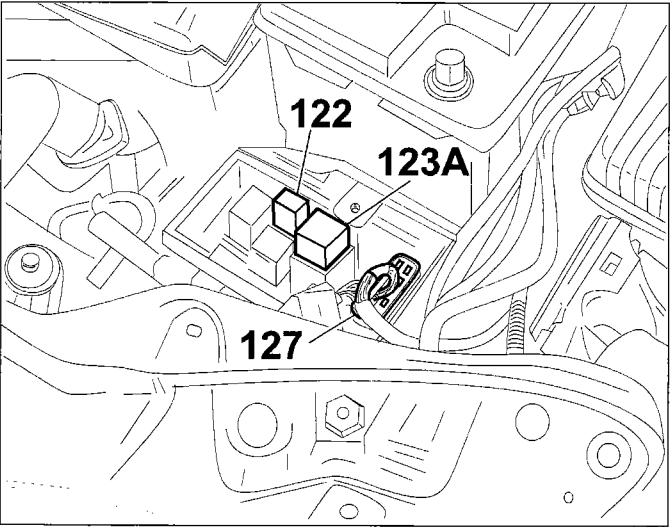
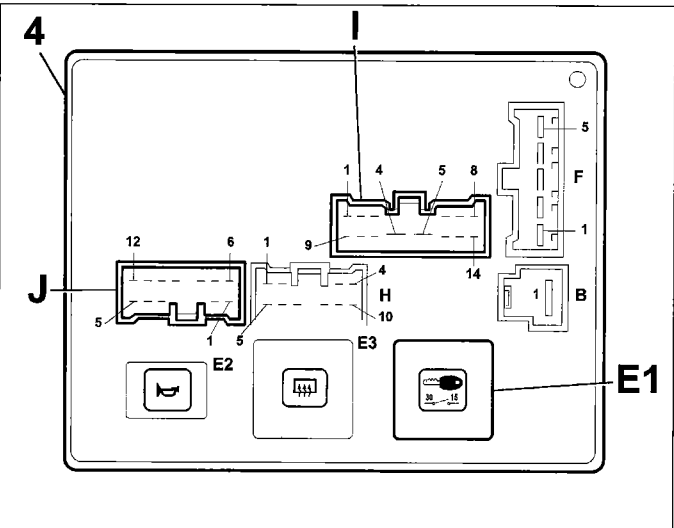
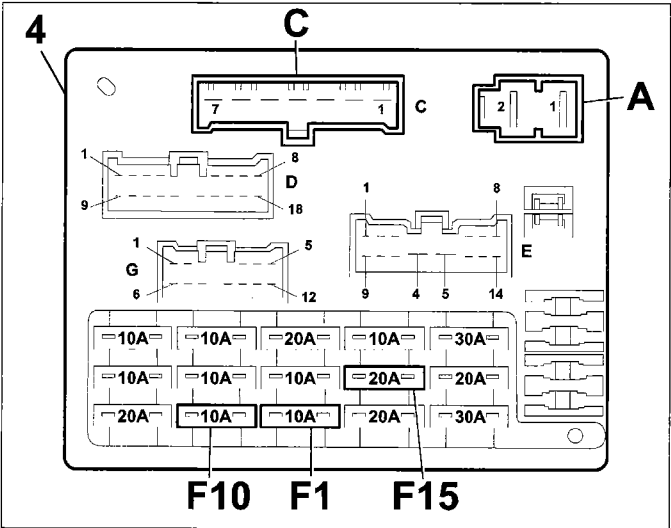
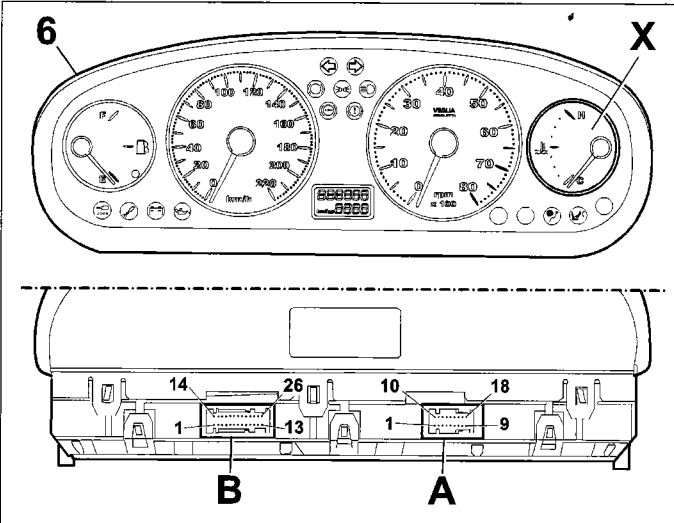
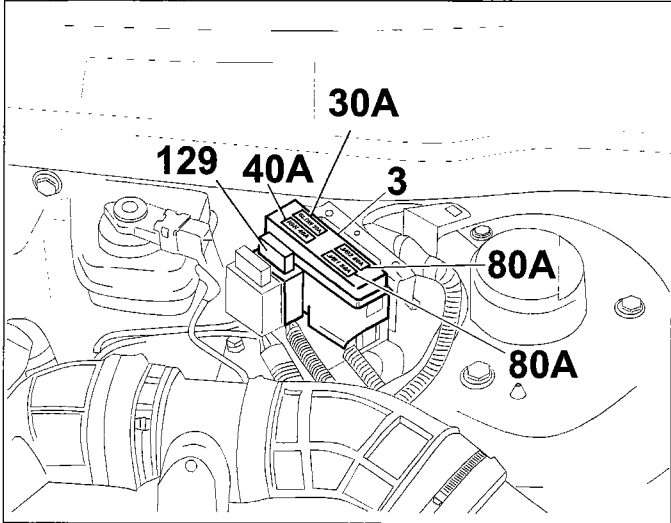
P4A108101



Version with automatic air conditioning  
Engine cooling - Water temperature gauge - (See key at end of wiring diagrams)

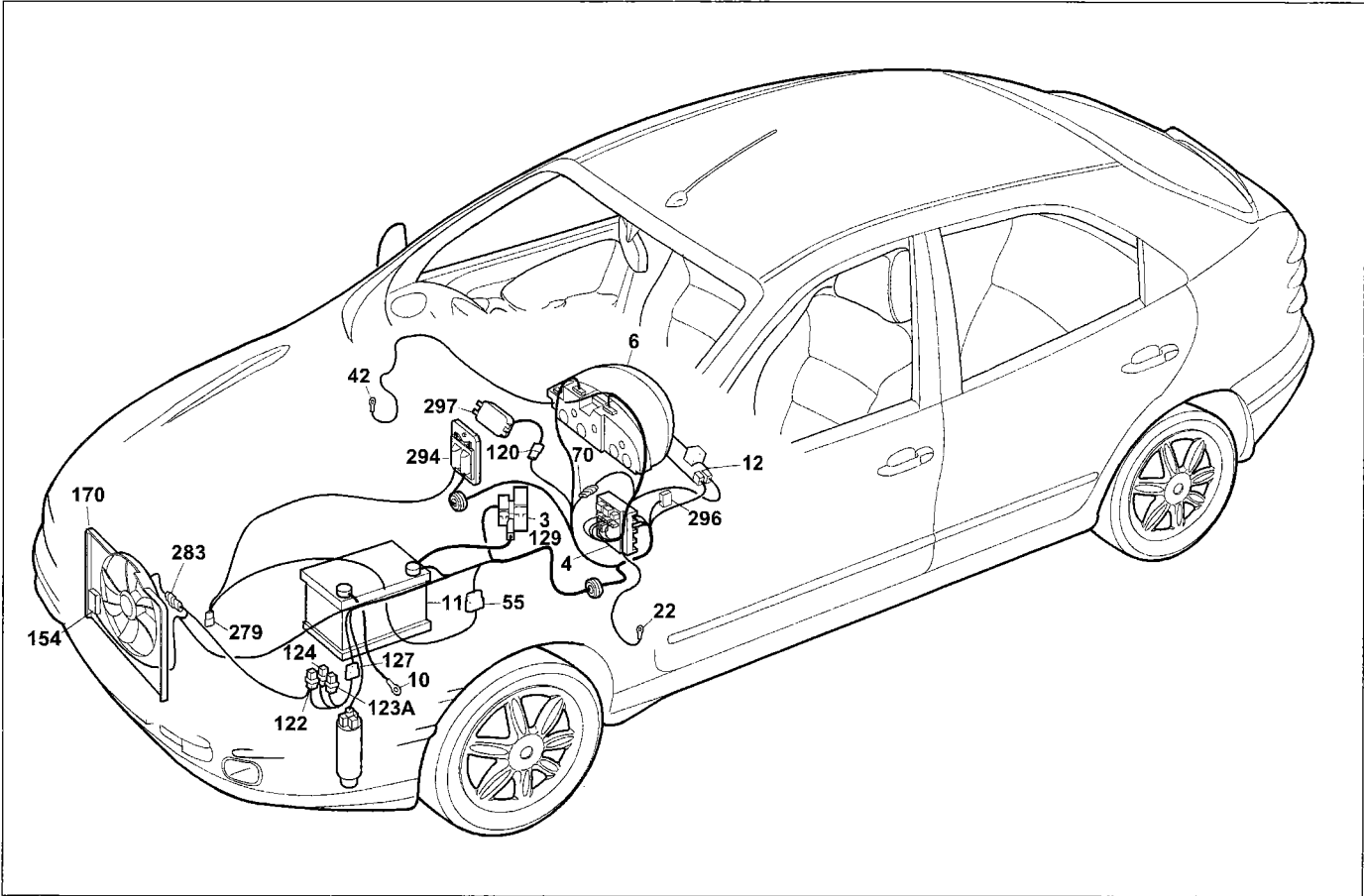


Location of components





55.



Version with automatic air conditioning  
Engine cooling - Water temperature gauge  
Components key

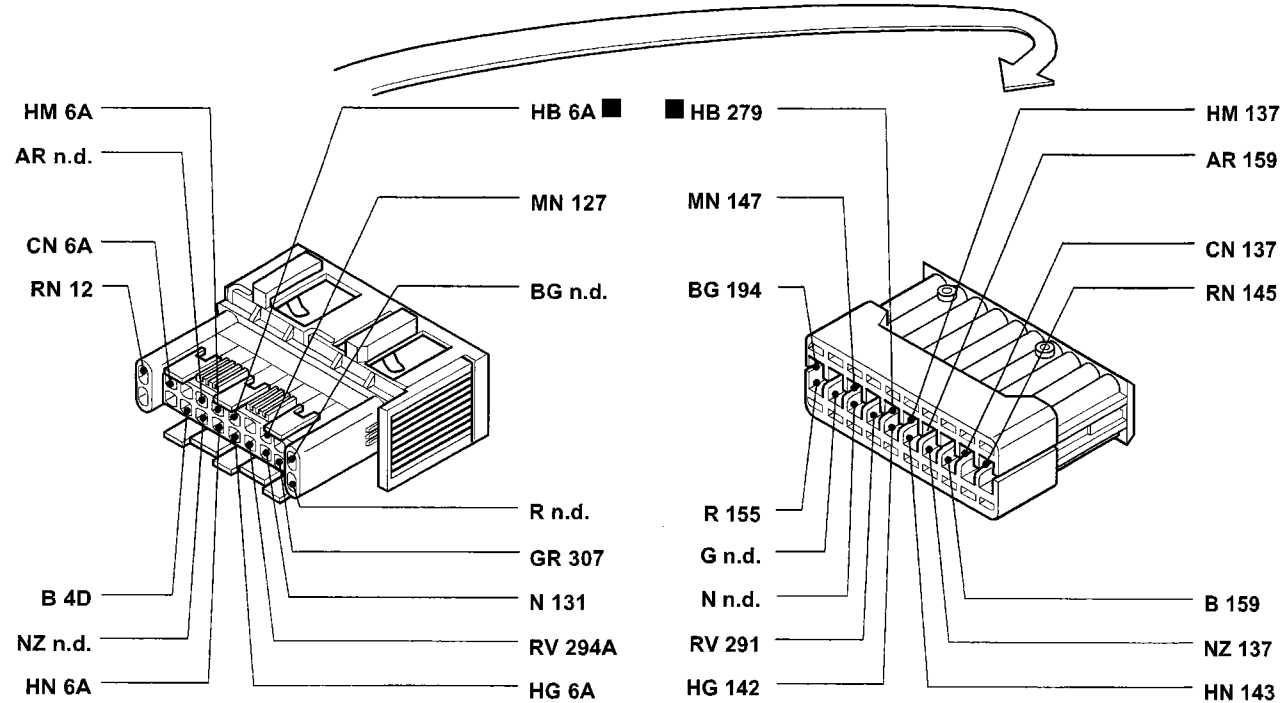
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
  - E1 Ignition discharge relay
- 6 Instrument panel
- X Water temperature gauge
- Y Electrical module
  - 10 Earth for battery on bodysell
  - 11 Battery
  - 12 Ignition switch
  - 22 Left dashboard earth
  - 42 Right dashboard earth
  - 70 Dashboard/front cables connection
- 120A Air conditioning unit cables connection
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed
- 124 Air conditioning compressor relay
- 127 Connection between front left cable/cable on relay holder bracket

- 129 40A power fuse protecting engine cooling fan
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistance
- 279 Twin engine coolant temperature sender unit
- 283 Connection between front cable/resistor
- 294 Injection/ignition electronic control unit 1242
- 297 Climate control unit
- 296 Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/ electronic injection; C.A. system; Alarm
  - C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection

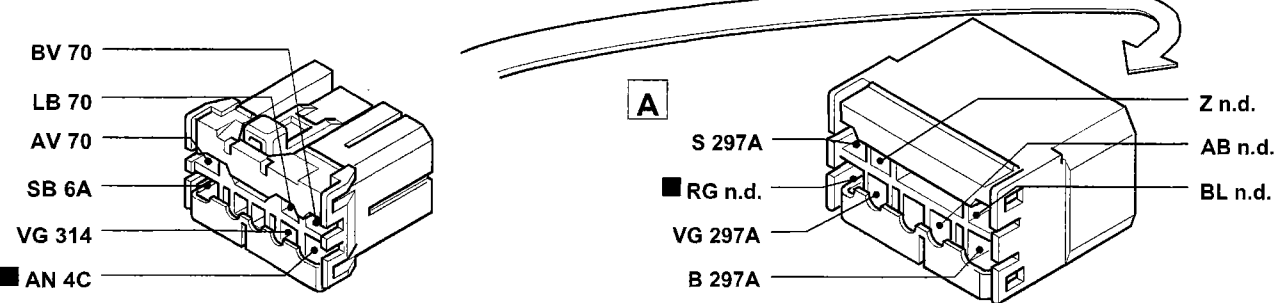
N.D. Ultrasound welding taped in cable loom

P4A103101

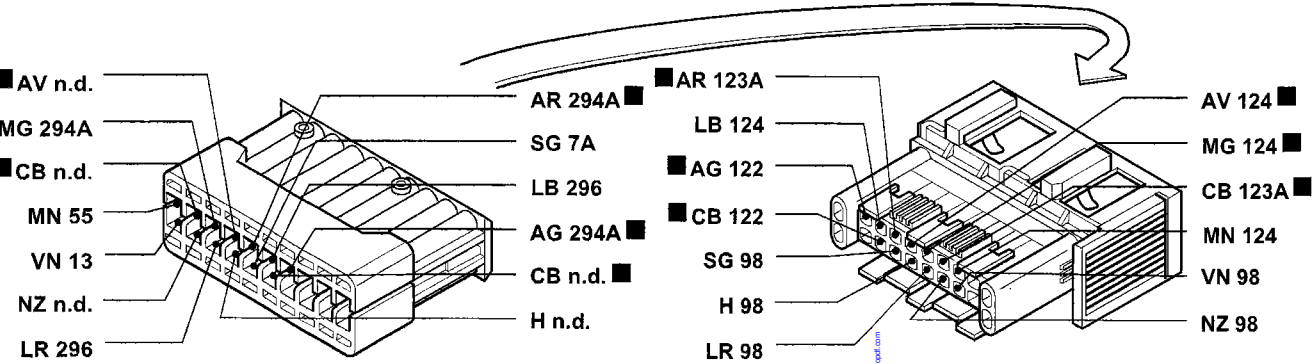
55 Connection between front/engine pre-wiring cables



120 Air conditioning unit cables connection



127 Connection between front left cable/cable on relay holder bracket



The cables in the wiring diagram are marked

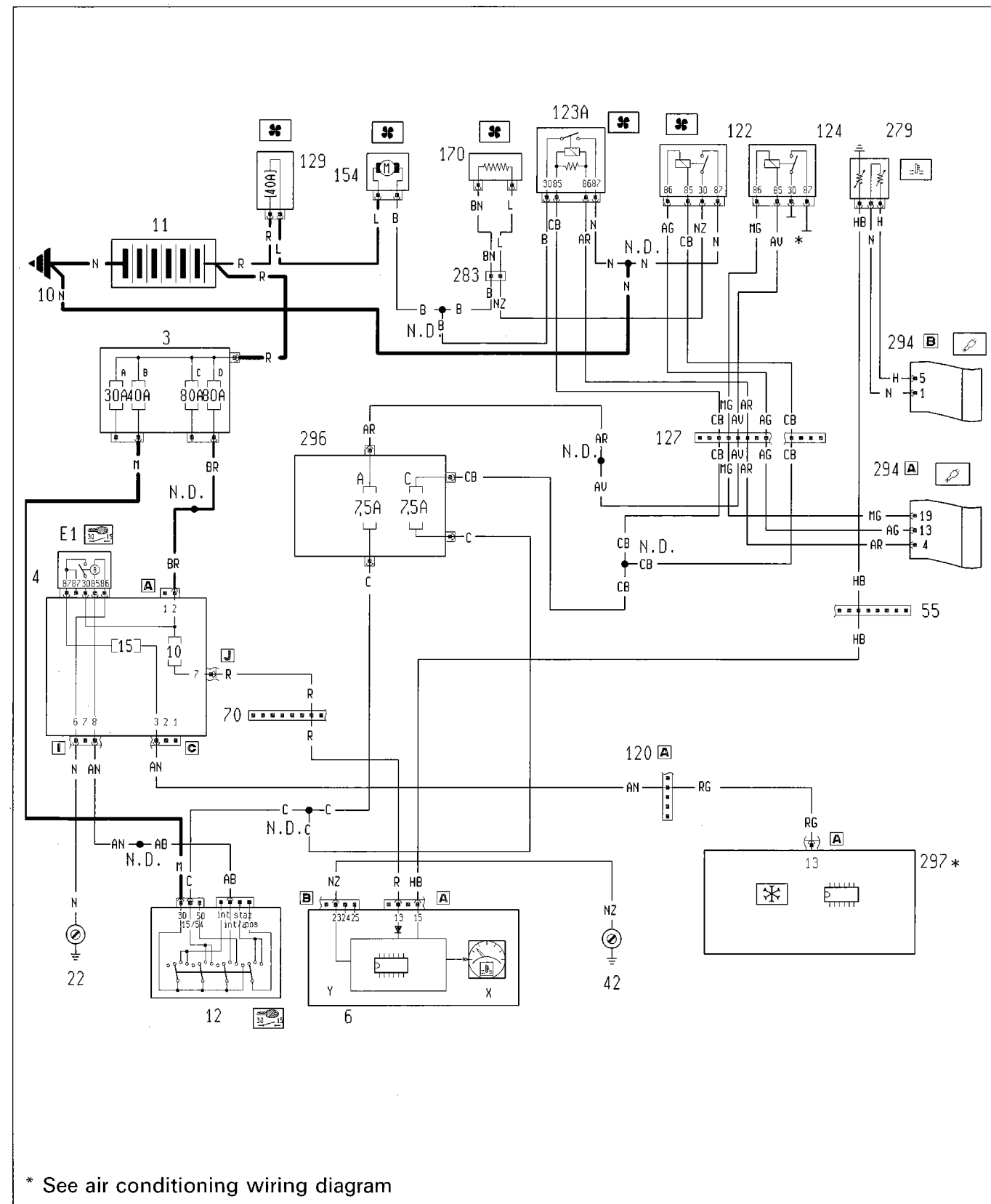
P4A104101

# Electrical equipment

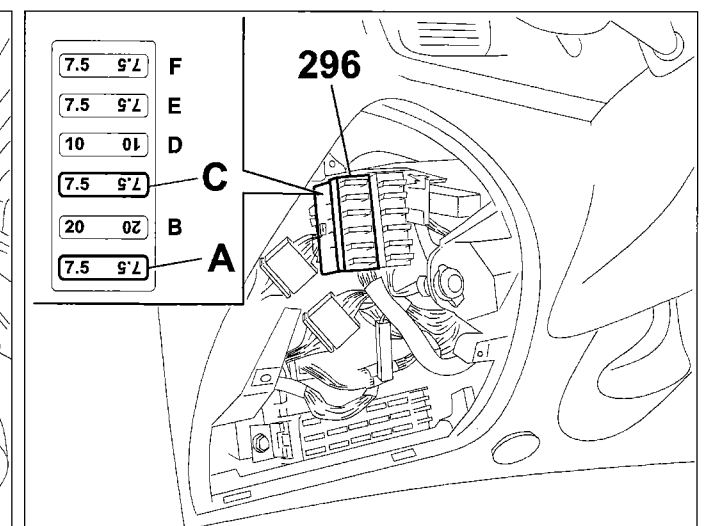
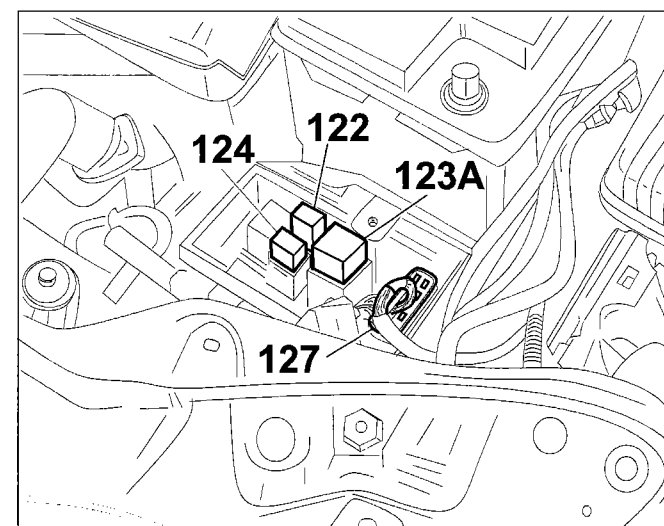
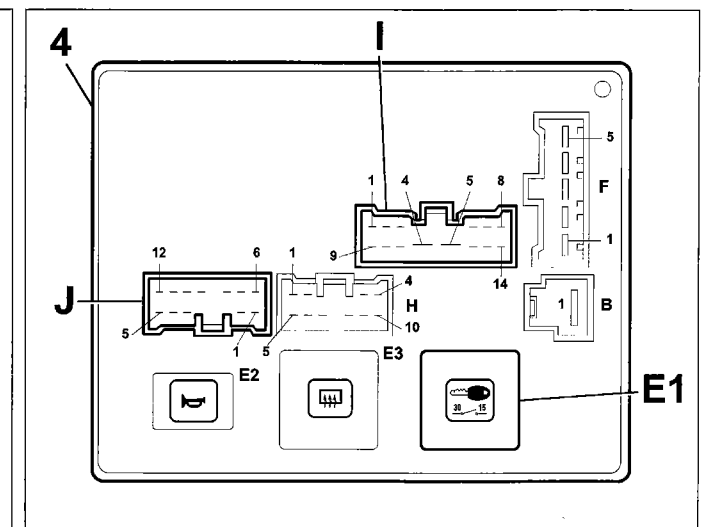
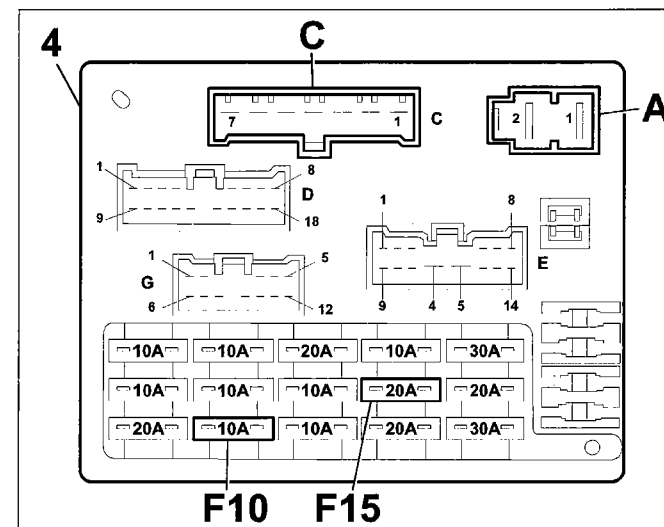
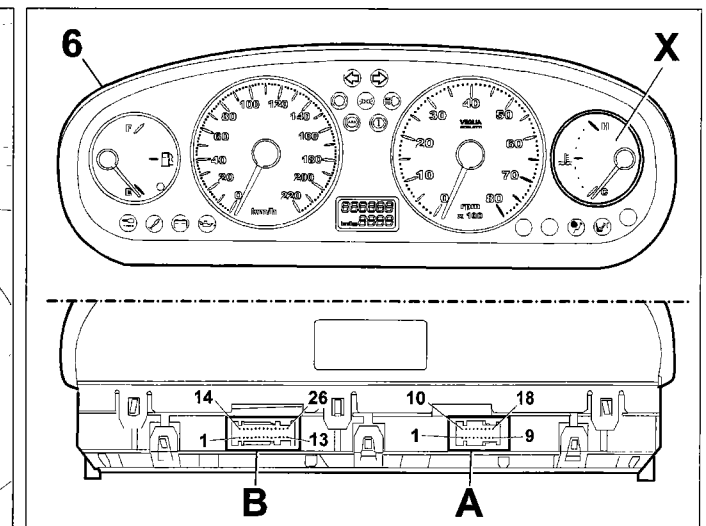
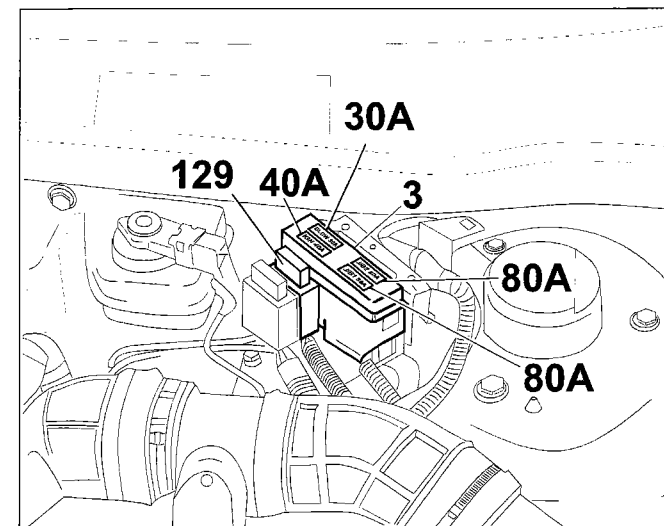
## Wiring diagrams

### 55.

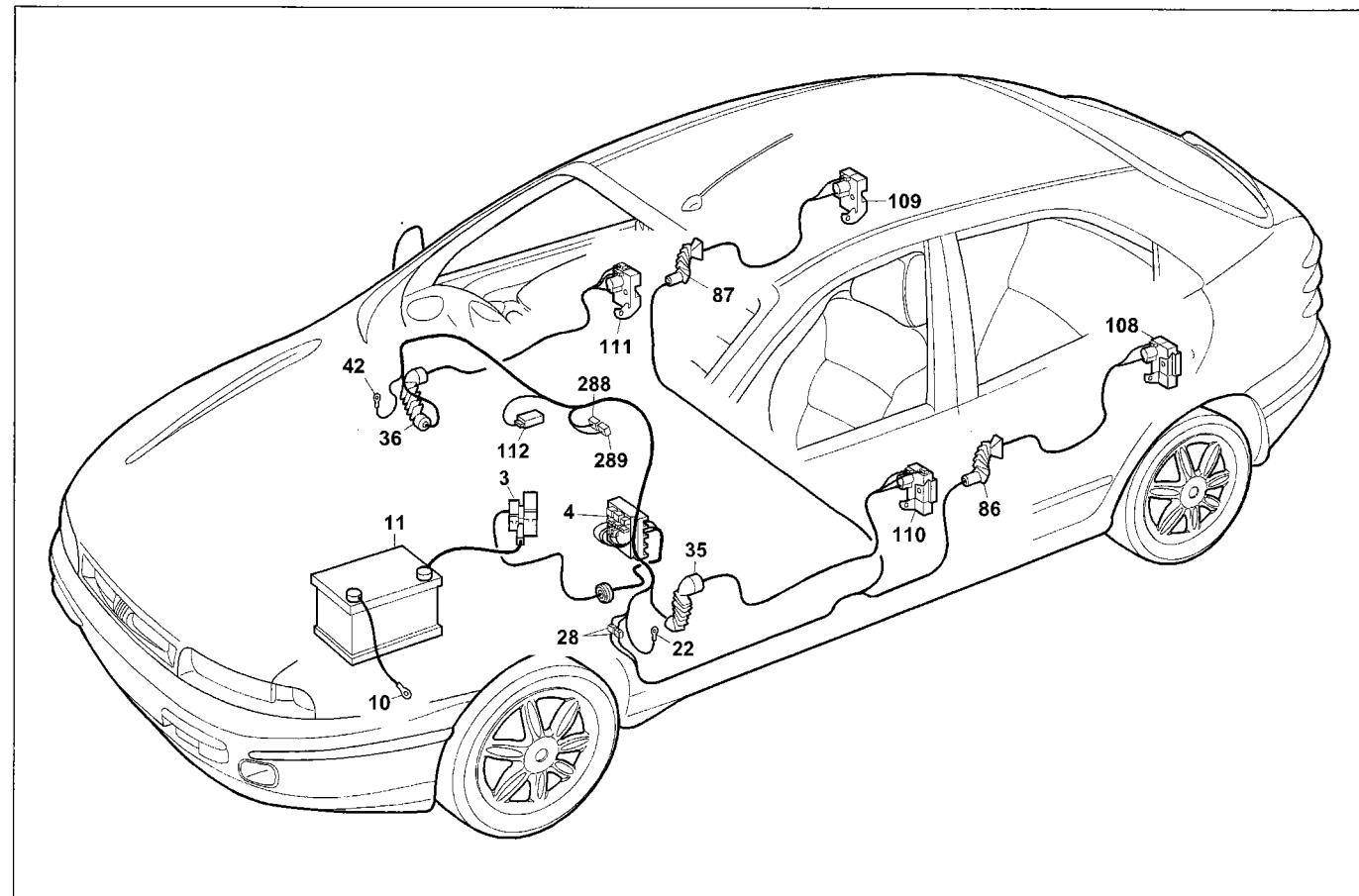
Version with automatic air conditioning  
Engine cooling - Water temperature gauge - (See key at end of wiring diagrams)



#### Location of components



### 55.



**Version without alarm: SX - GT**

**Central locking**

**Components key**

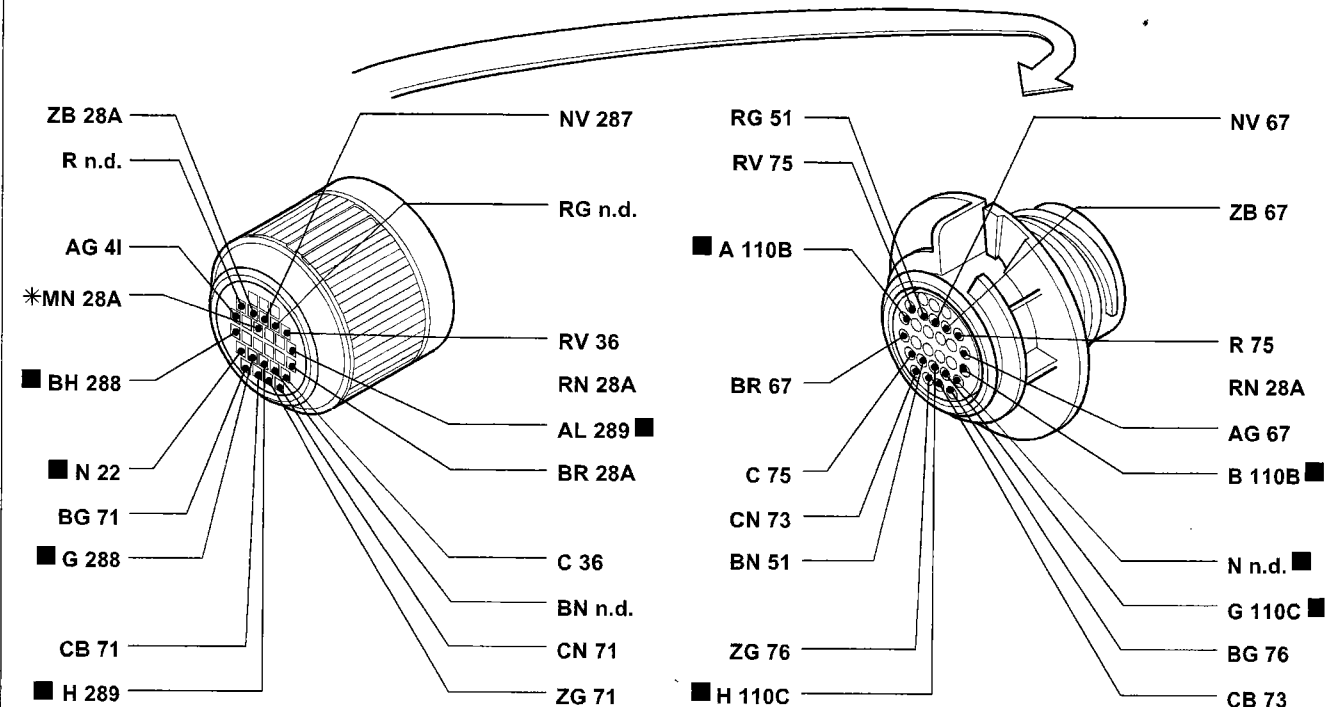
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 10 Earth for battery on bodyshell
- 11 Battery
- 22 Left dashboard earth
- 28 Dashboard/longitudinal cables connection
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 86 Longitudinal/left rear door cables connection
- 87 Longitudinal/right rear door cables connection
- 108 Left rear central locking/alarm switch
- 109 Right rear central locking/switch for engaging alarm
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/switch for engaging alarm
- 112 Central door locking control unit

- 288 Short circuit connection
- 289 Short circuit connection

N.D. Ultrasound welding taped in cable loom

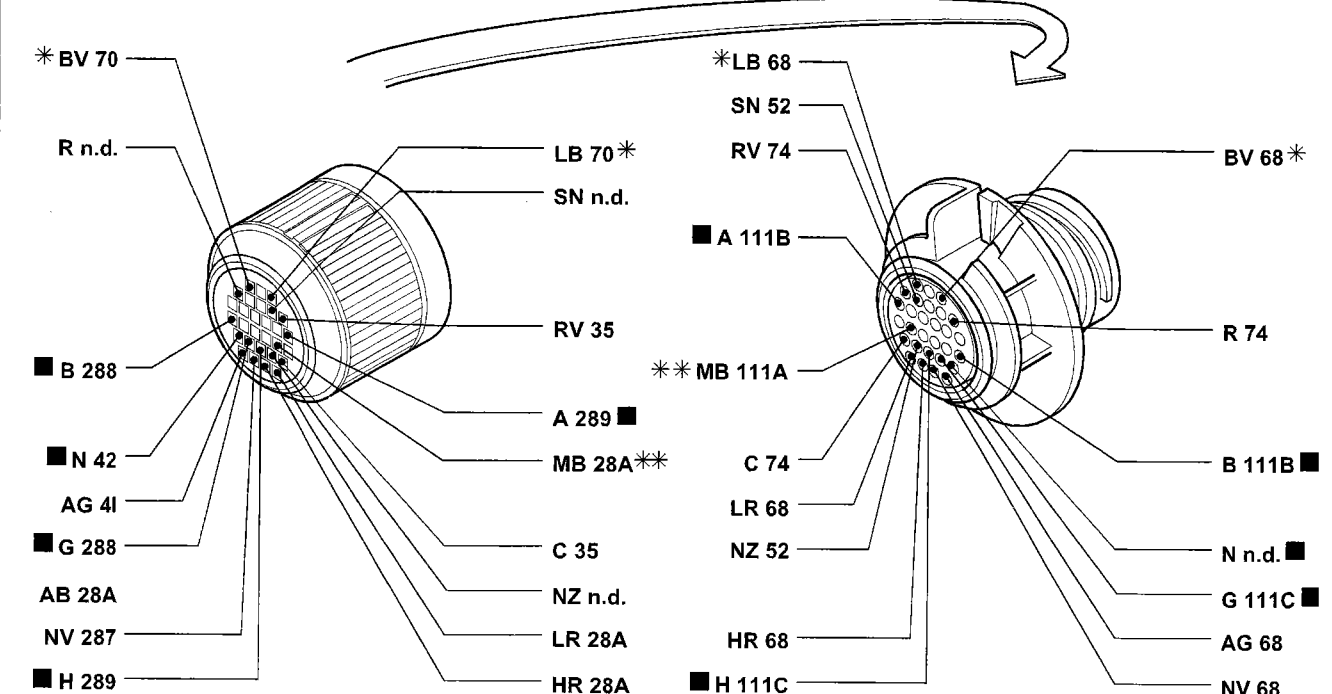
P4A099I01

### 35 Dashboard/left front door cables connection. Trim level: SX - GT



\* Variant connection for version with automatic transmission

### 36 Dashboard/right front door cables connection. Trim level: SX - GT



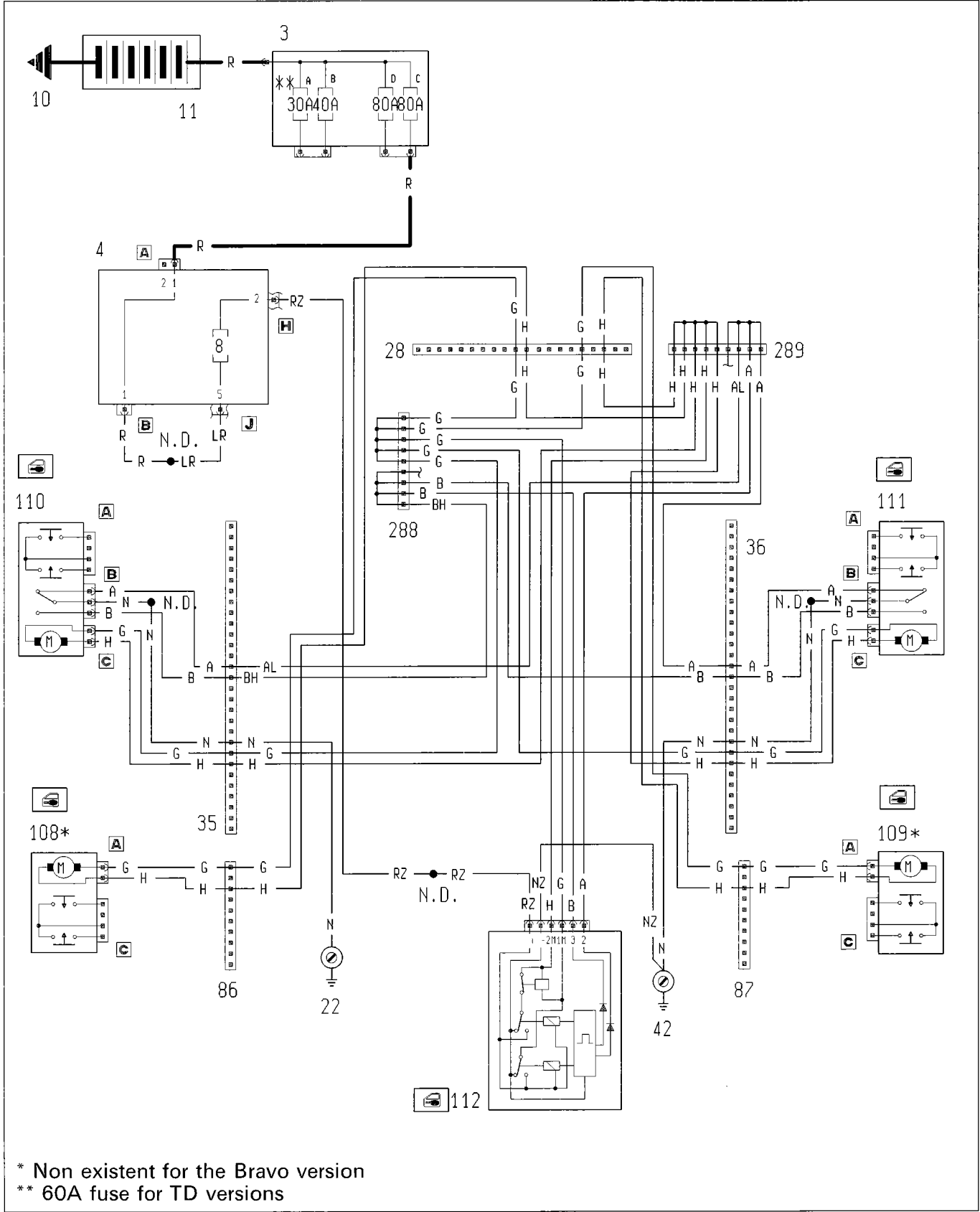
\* Variant connection for versions with air conditioning

\*\* Variant connection for version with automatic transmission

The cables in the wiring diagram are marked

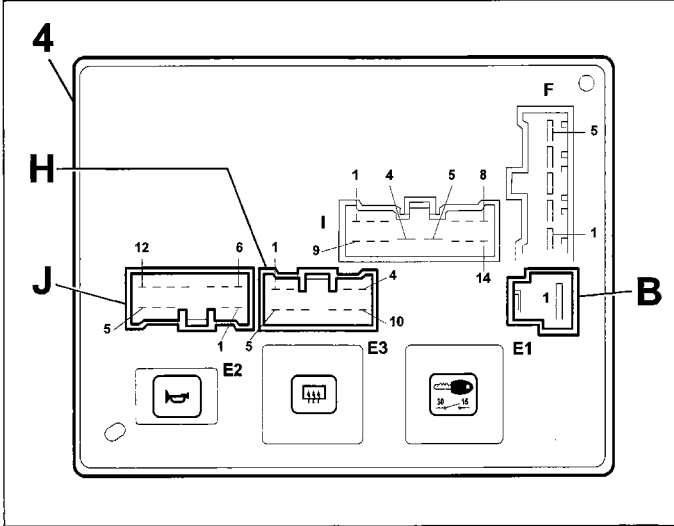
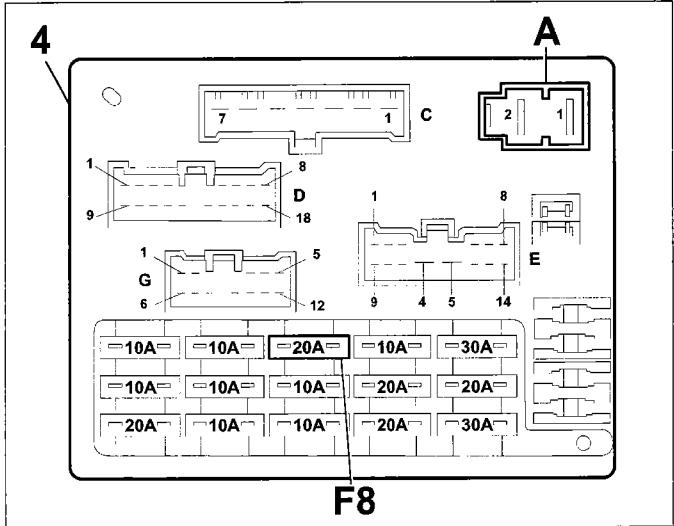
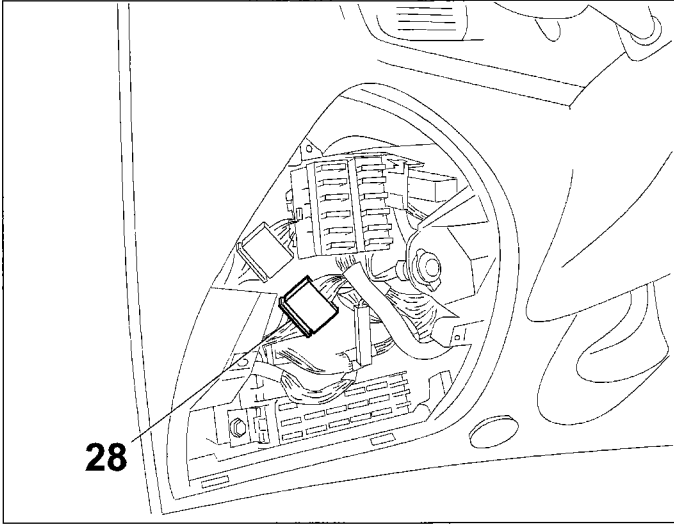
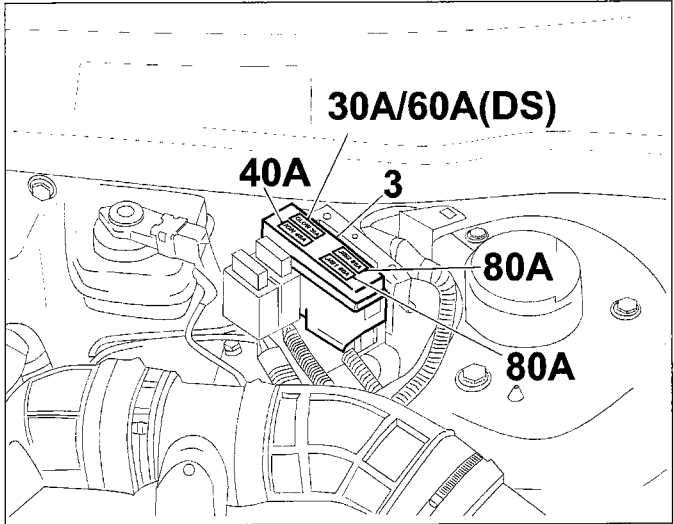
P4A100I01

Version without alarm: SX - GT  
Central locking - (See key at end of wiring diagrams)



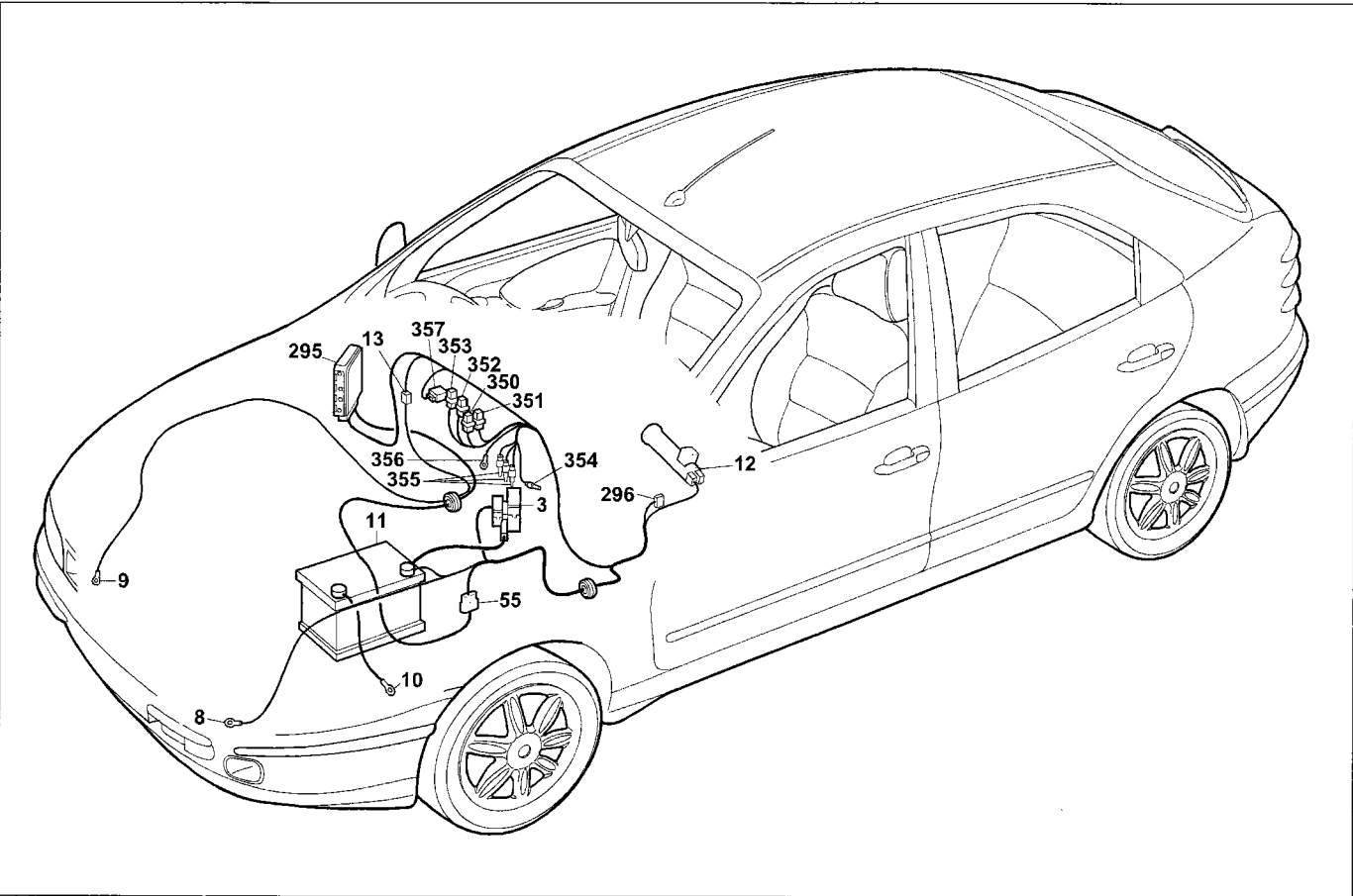
P4A097I01

**Location of components**





55.



P4A095101

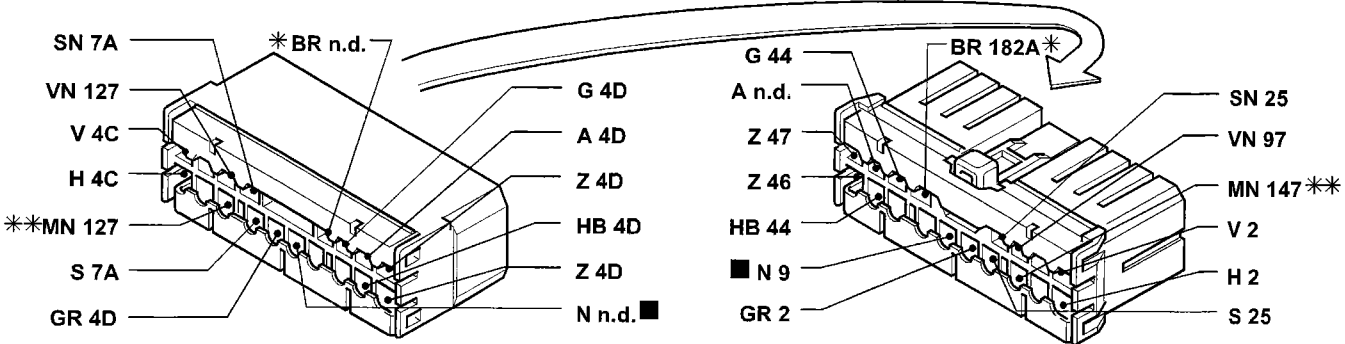
Automatic heater

Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 8 Left front earth
- 9 Right front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 40 Brake lights control switch
- 55 Connection between front/engine pre-wiring cables
- 295 Injection/ignition electronic control unit 1910 TD UNIJET
- 296 Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/ electronic injection; C.A. system; Alarm
- 350 Passenger compartment water heating 30A relay
- 351 Passenger compartment water heating safety relay
- 352 Passenger compartment water heating 50A relay
- 353 70A fuse protecting passenger compartment water heating heater plugs
- 354 N.T.C. sensor on heating supply pipe
- 355 Passenger compartment water heater plugs

- 356 Heater plugs relay earth
- 357 Passenger compartment heater plugs control unit
- N.D. Ultrasound welding taped in cable loom

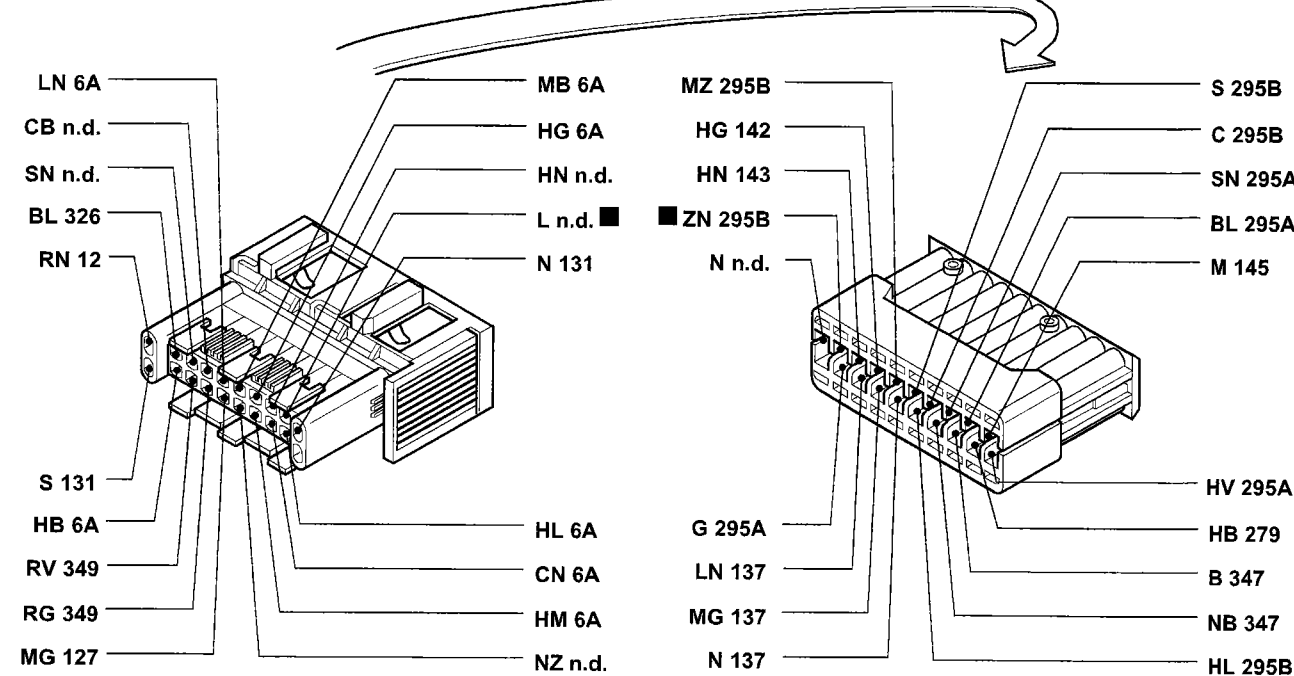
13 Front right/left cables connection



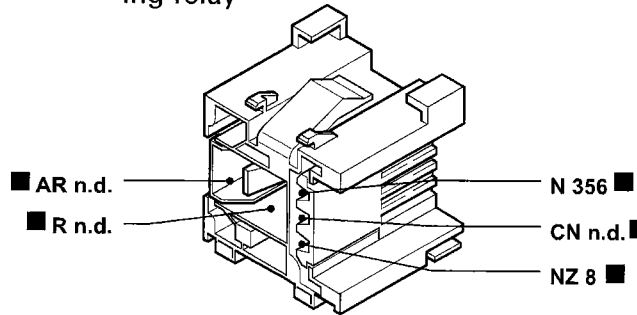
\* Variant connection for 1998 20v versions

\*\* Variant connection for 1910 JTD versions

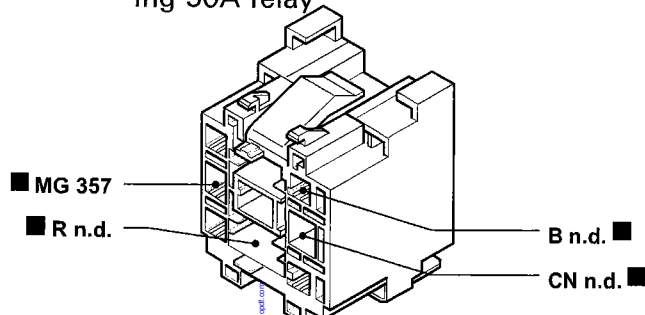
55 Connection between front/engine pre-wiring cables



351 Passenger compartment water heating relay



352 Passenger compartment water heating 50A relay



The cables in the wiring diagram are marked

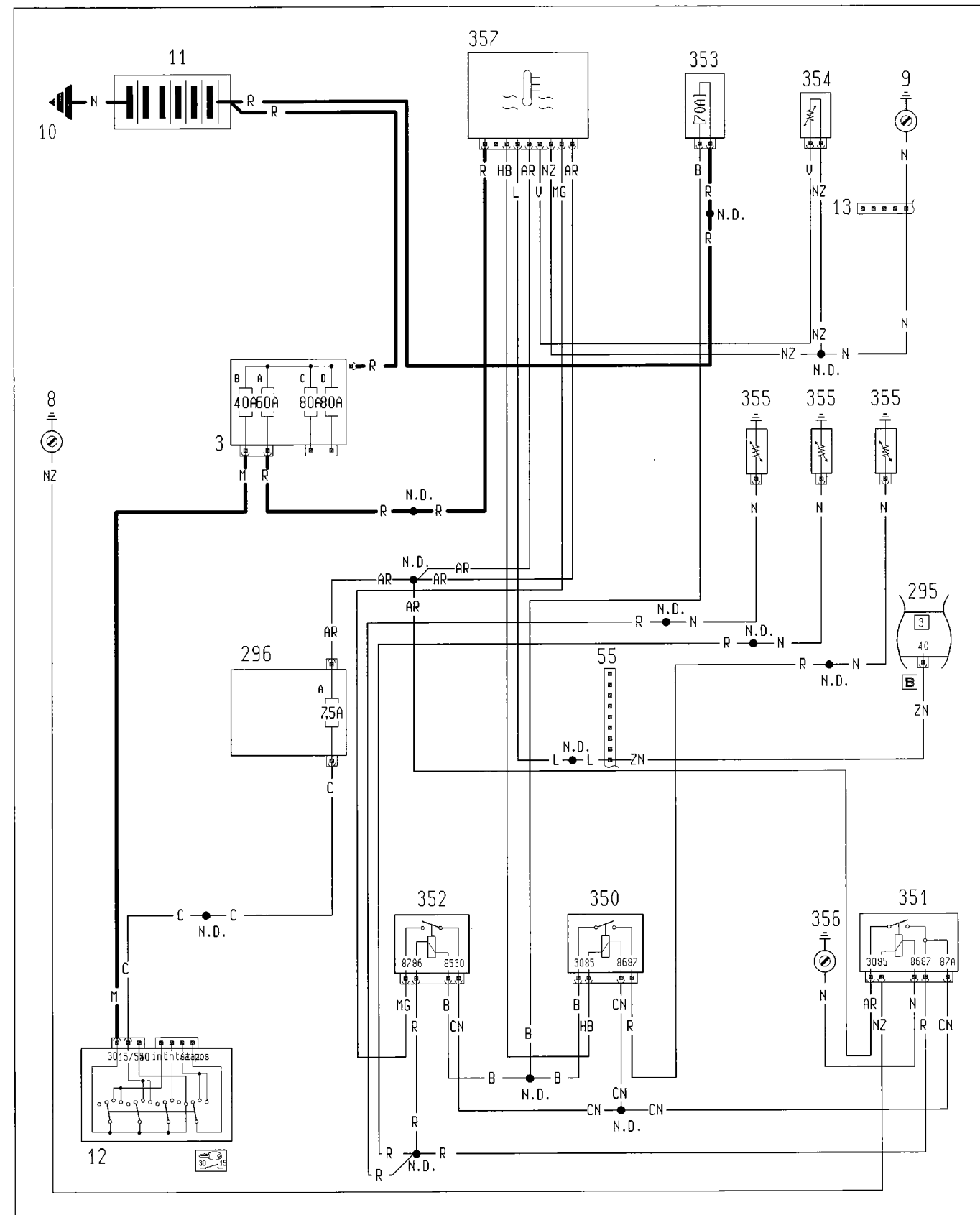
P4A096101

# Electrical equipment

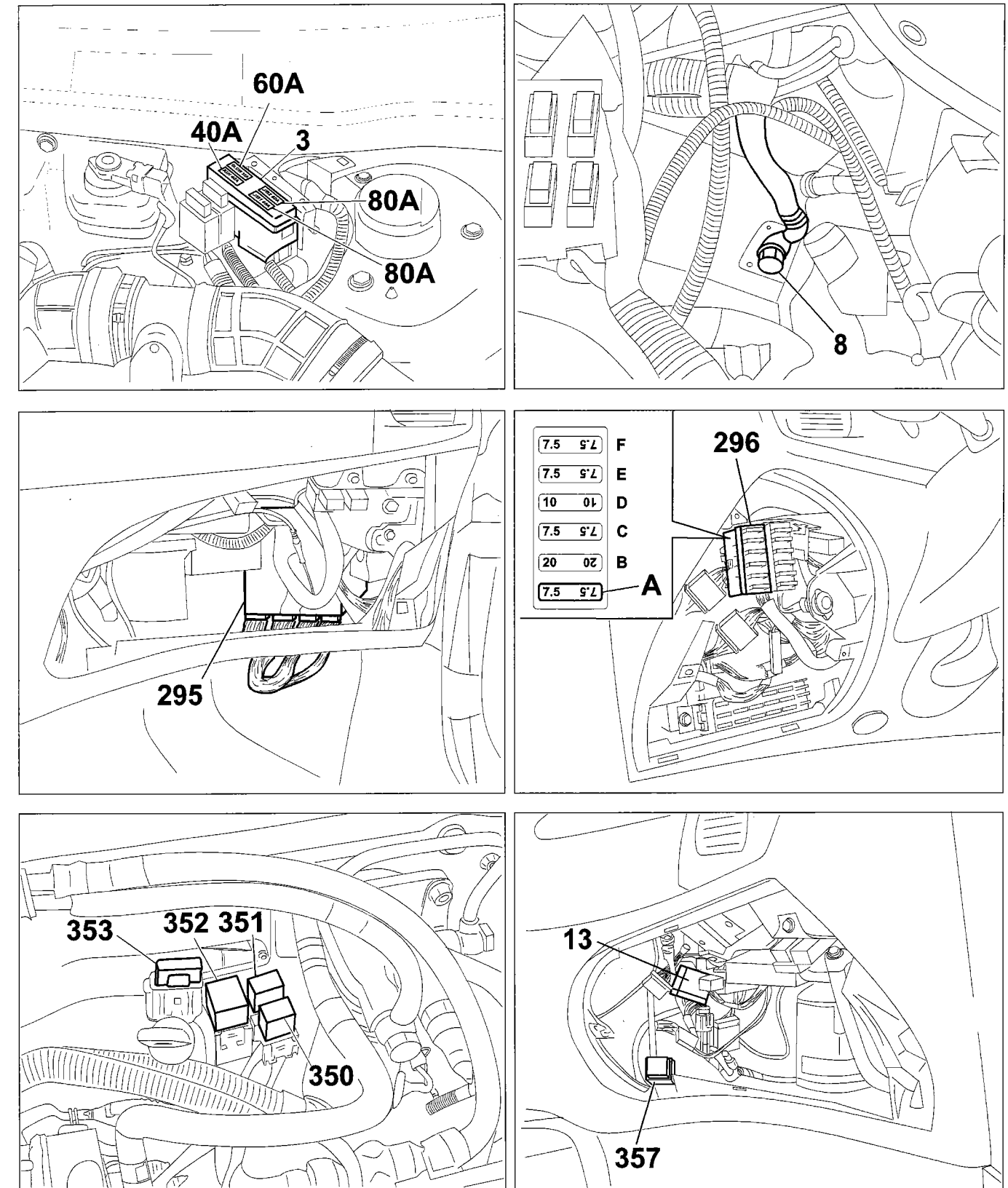
## Wiring diagrams

### 55.

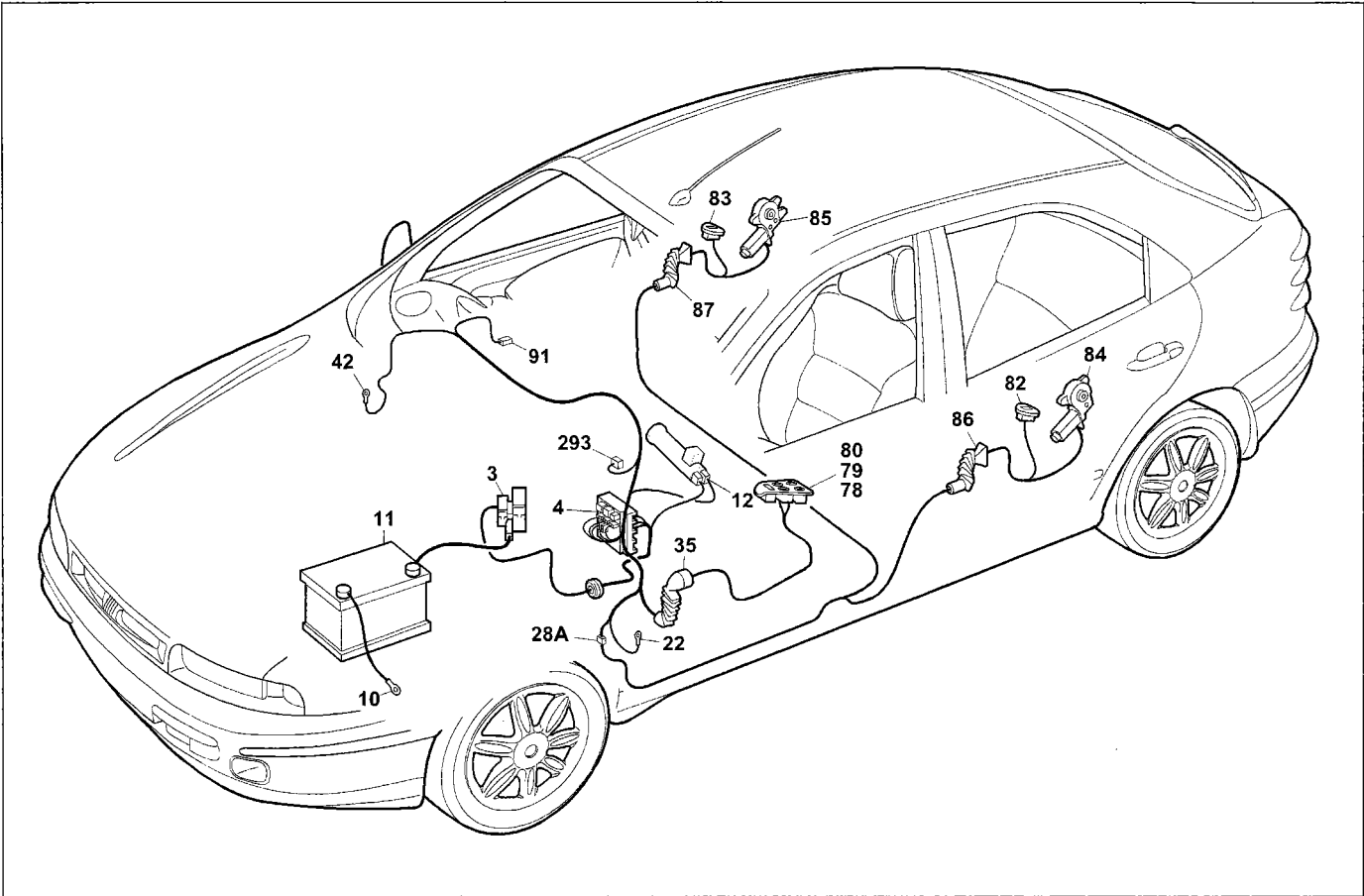
Automatic heater - (See key at end of wiring diagrams)



#### Location of components



55.



P4A091101

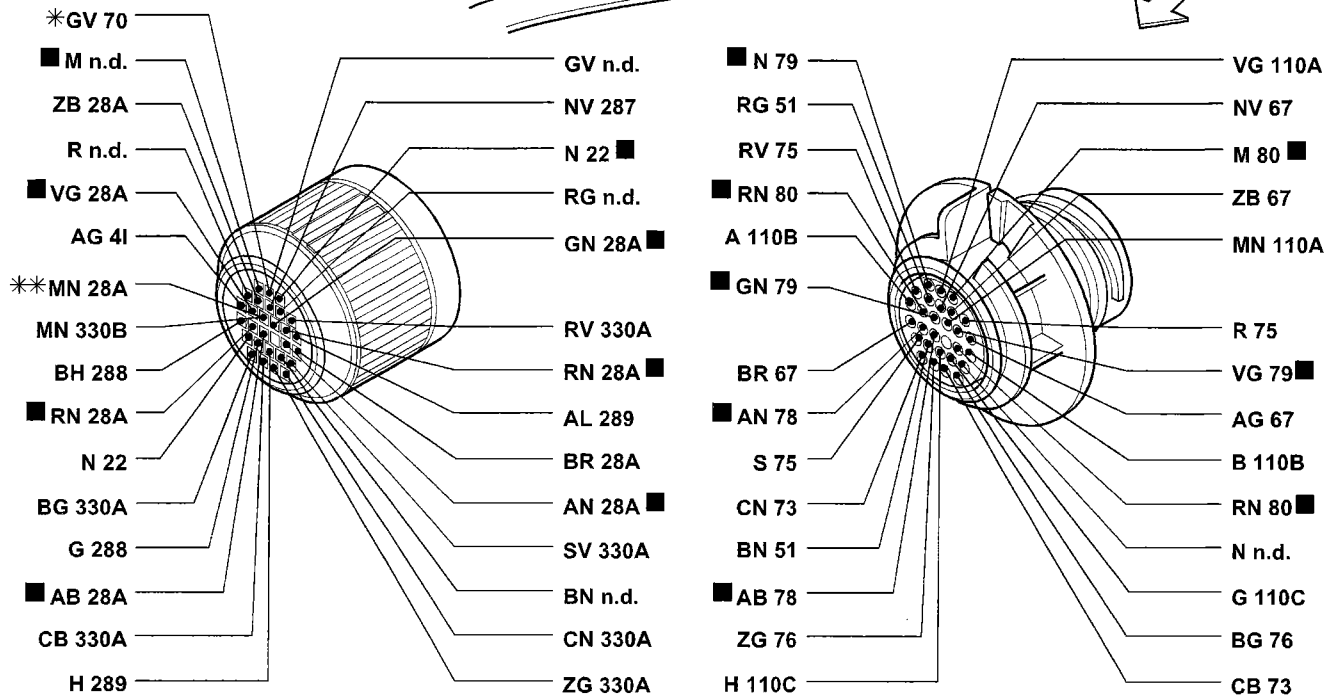
Trim level: ELX - HSX - HGT  
Electric rear windows

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit  
E1 Ignition discharge relay
- 10 Earth for battery on bodysell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 28A Dashboard/longitudinal cables connection
- 35 Dashboard/left front door cables connection
- 42 Right dashboard earth
- 78 Left rear electric window control panel in left front door
- 79 Right rear electric window control panel in left front door
- 80 Electric rear windows inhibitor switch
- 82 Left rear electric window control panel on left rear door
- 83 Right rear electric window control panel on right rear door

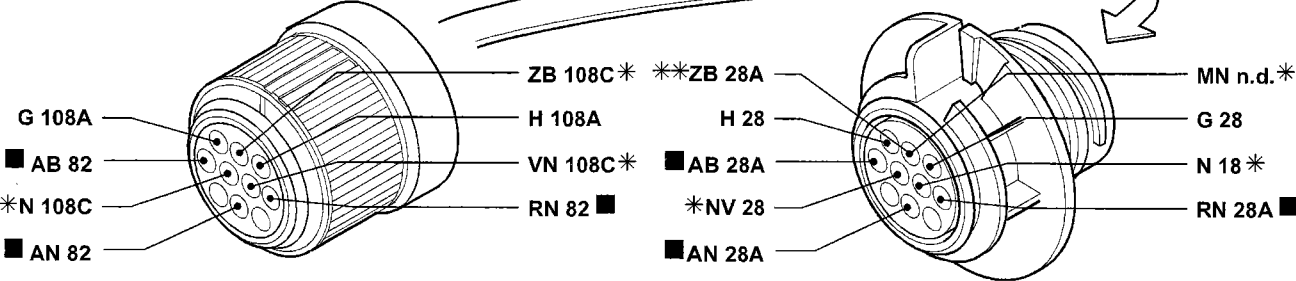
- 84 Left rear electric window motor
- 85 Right rear electric window motor
- 86 Longitudinal/left rear door cables connection
- 87 Longitudinal/right rear door cables connection
- 91 Power relay
- 293 Fuse carrier base on dashboard cable  
C 25A fuse protecting electric rear windows (non existent for SX versions)
- N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection. Trim level: ELX - HSX - HGT



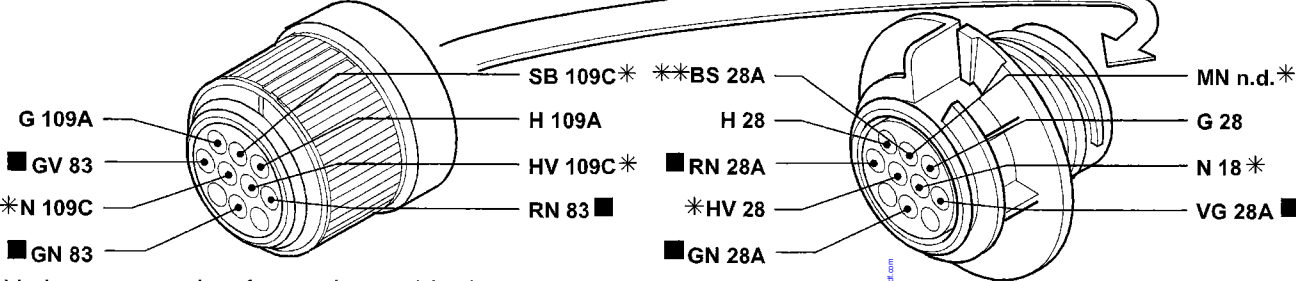
\* Variant connection for versions with alarm  
\*\* Variant connection for version with automatic transmission

86 Longitudinal/left rear door cables connection



\* Variant connection for versions with alarm  
\*\* Variant connection for ELX trim levels

87 Longitudinal/right rear door cables connection



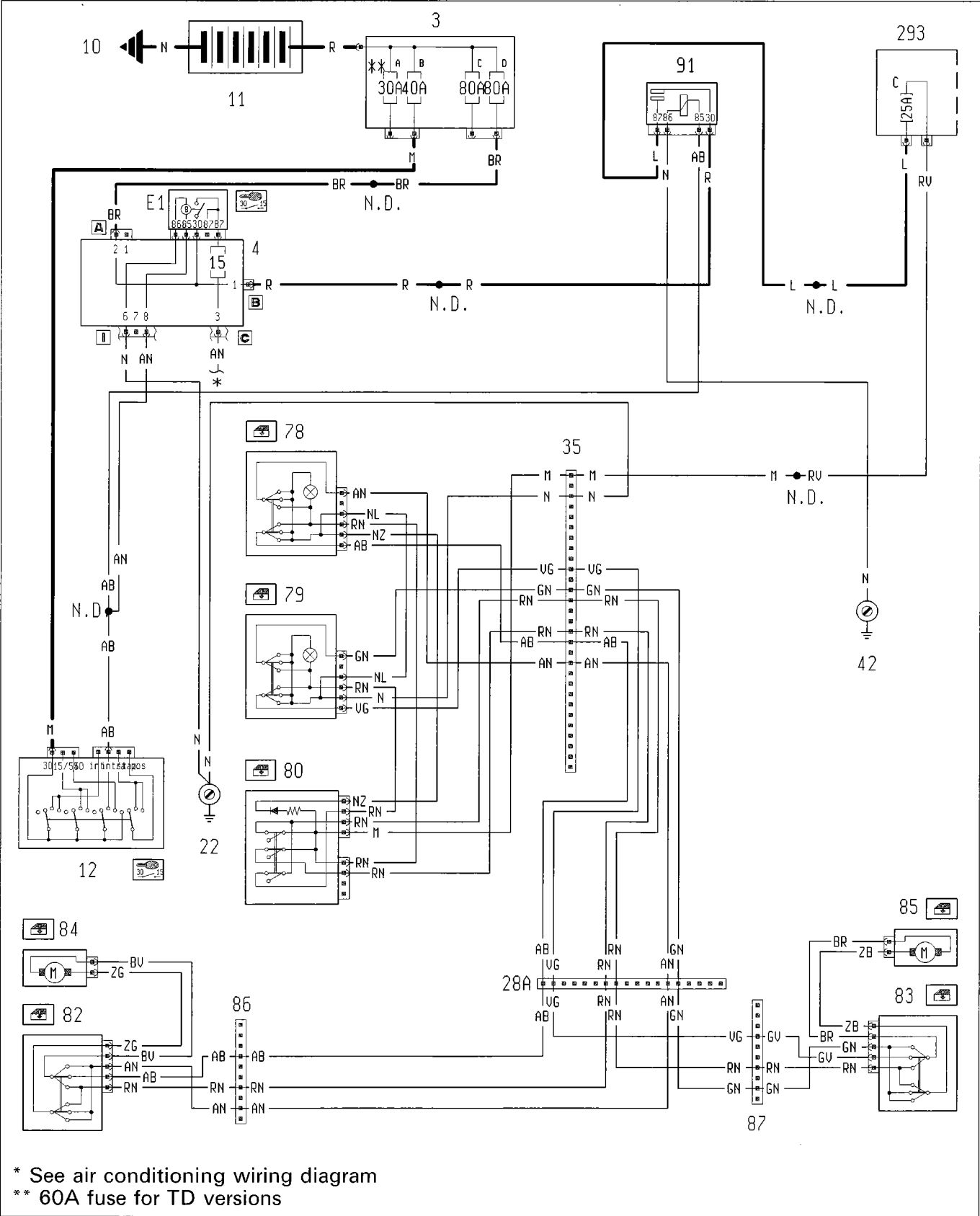
\* Variant connection for versions with alarm  
\*\* Variant connection for ELX trim levels

The cables in the wiring diagram are marked

P4A092101

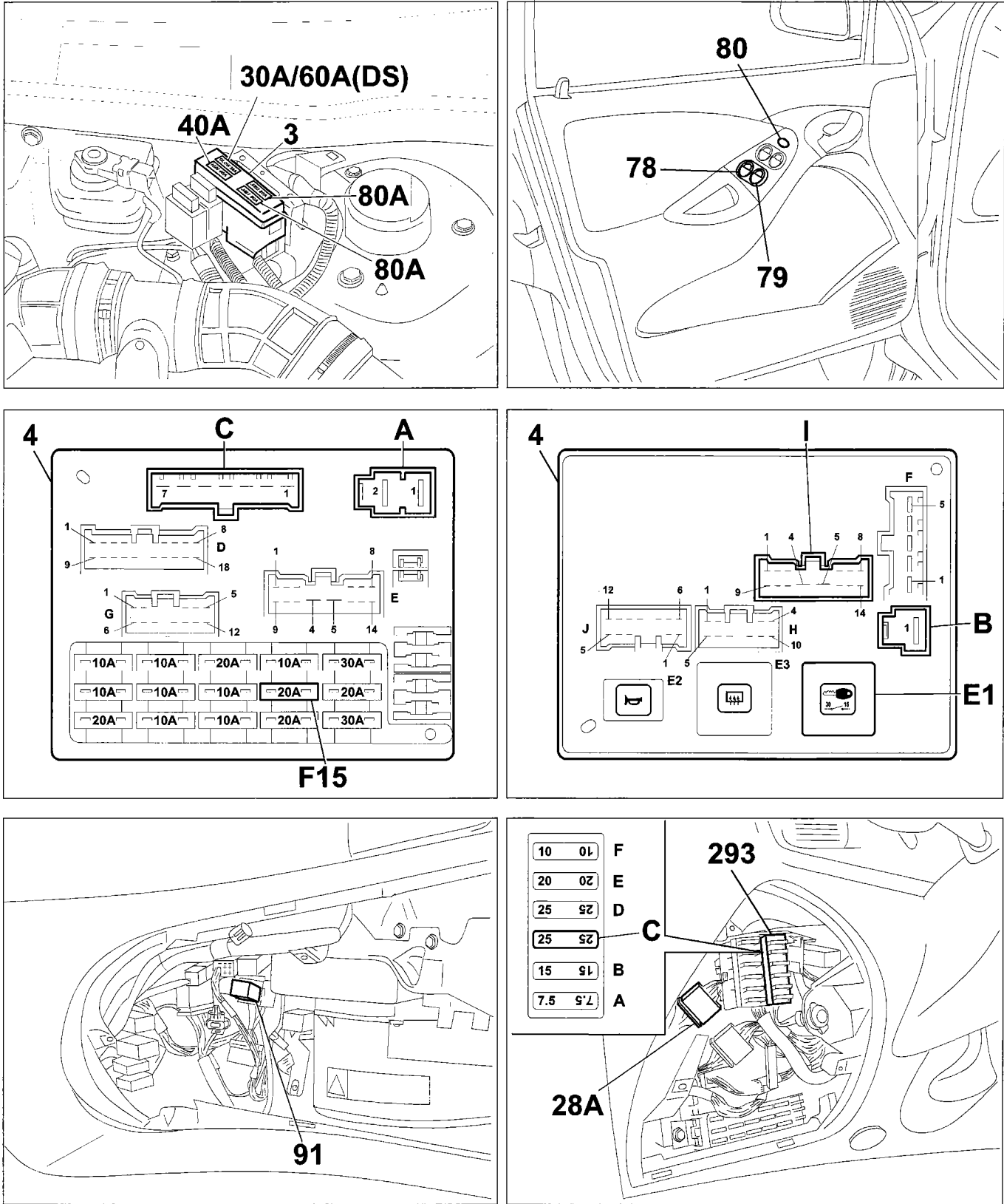


Trim level: ELX - HSX - HGT  
Electric rear windows - (See key at end of wiring diagrams)



P4A089101

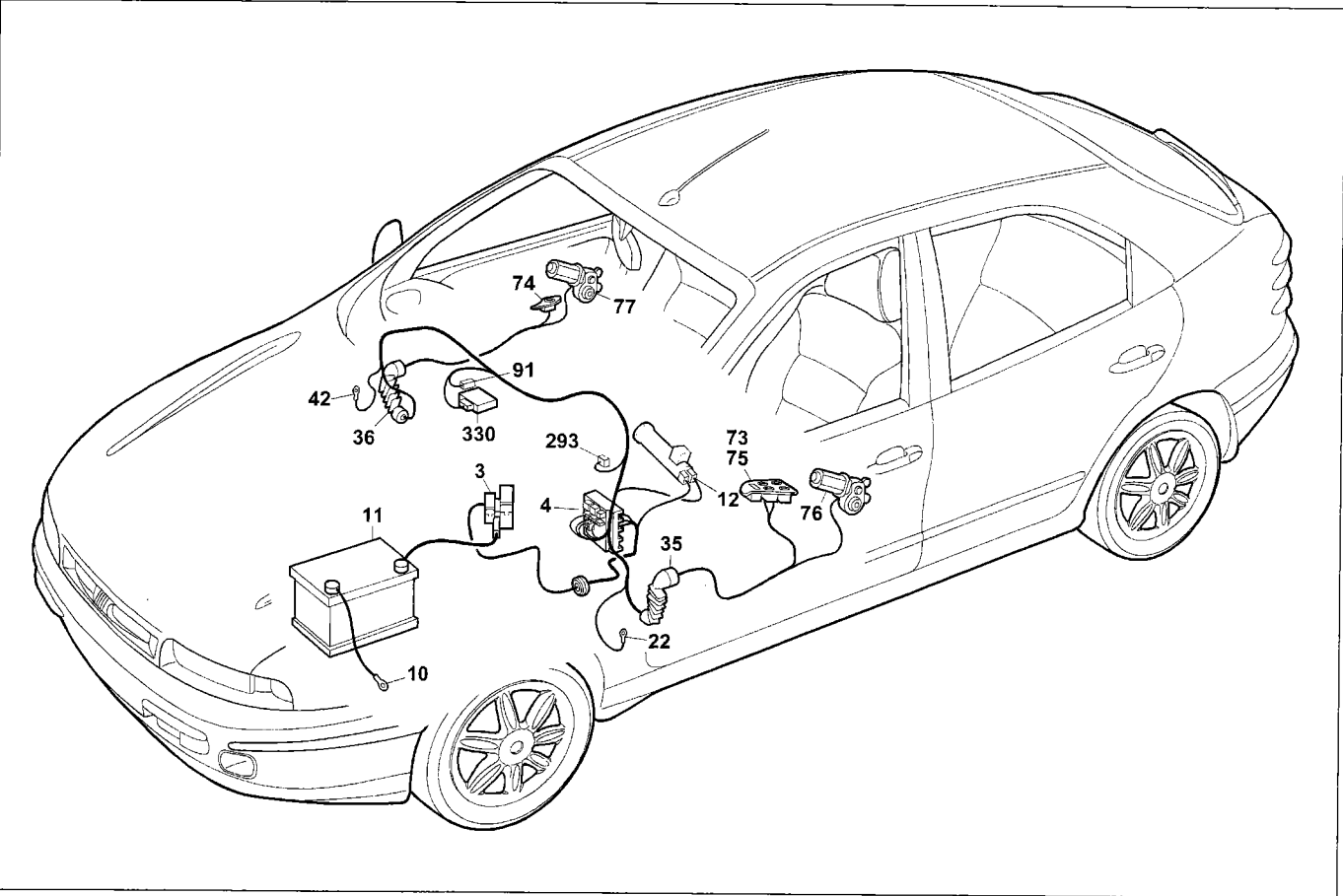
Location of components



4A0901

P4A090101

55.



P4A087101

Trim level: ELX - HSX - HGT  
Electric front windows

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

4 Junction unit

10 Earth for battery on bodyshell

11 Battery

12 Ignition switch

22 Left dashboard earth

35 Dashboard/left front door cables connection

36 Dashboard/right front door cables connection

42 Right dashboard earth

73 Left front electric window control panel

74 Right electric front window control panel

75 Right electric front window control panel in left front door

76 Left front electric window motor

77 Right front electric window motor
- 91 Power relay

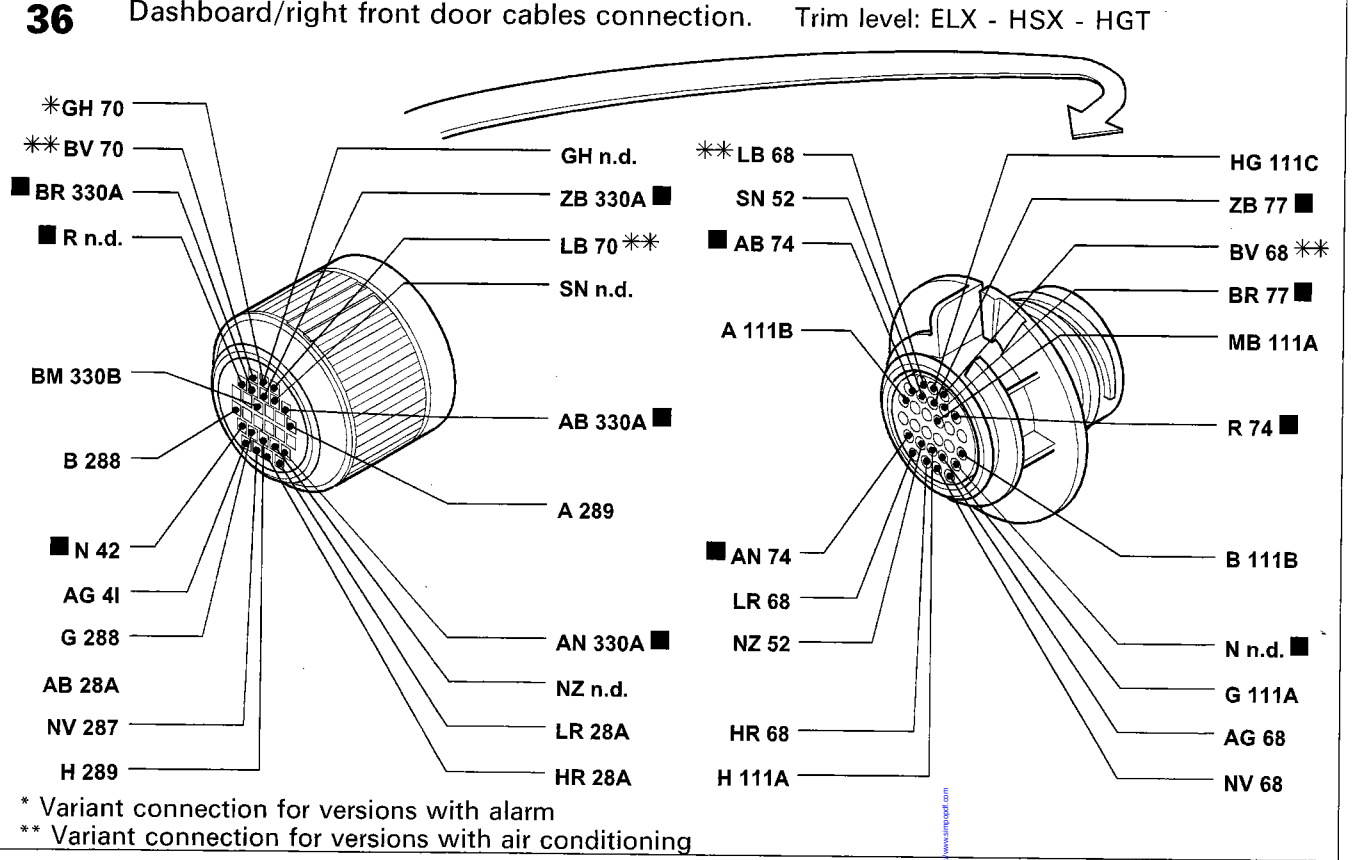
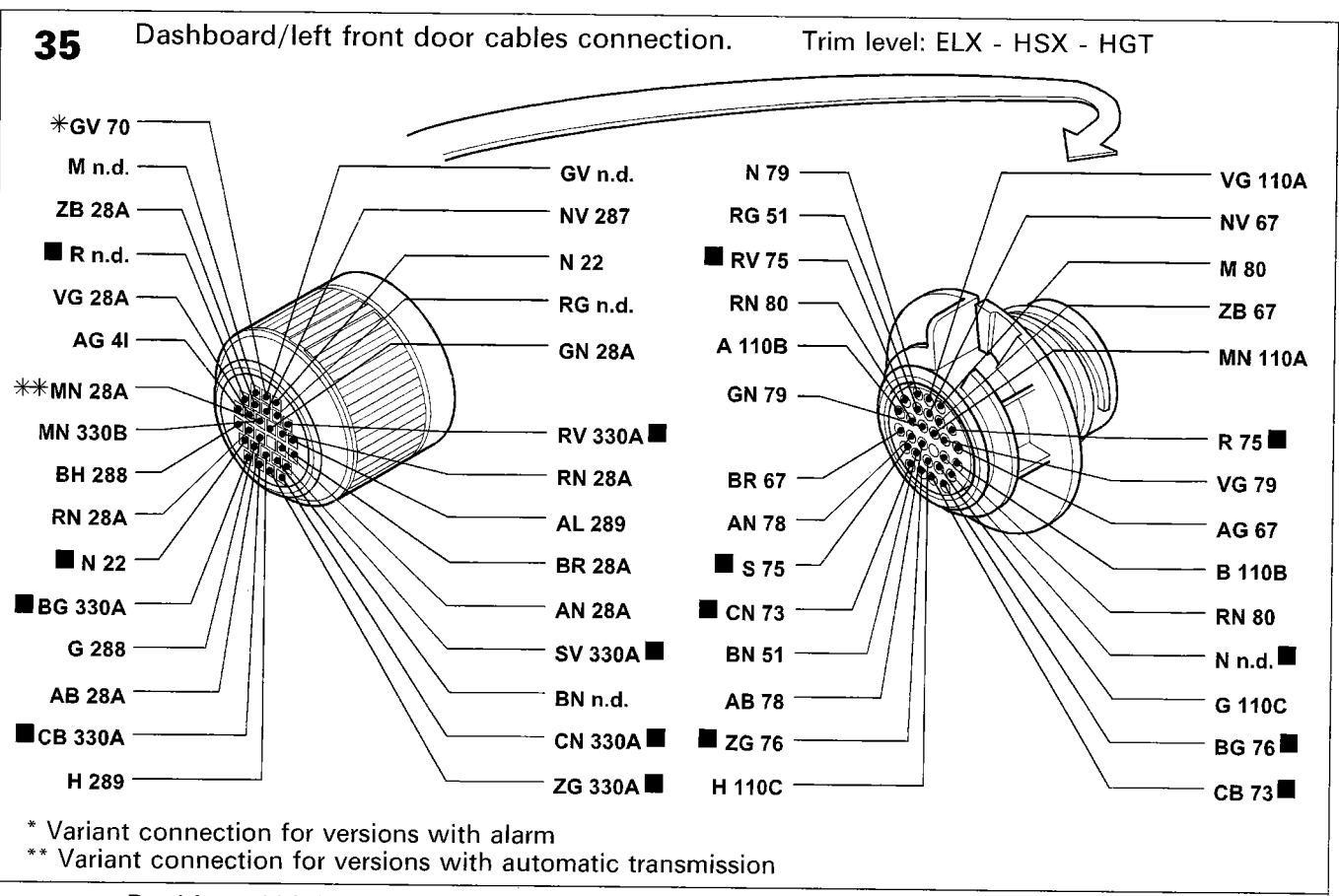
293 Fuse carrier base on dashboard cable

C 25A fuse protecting Electric rear windows (non existent for the SX versions)

D 25A fuse protecting A.B.I. control unit; Central locking control unit

330 A.B.I. control unit

N.D. Ultrasound welding taped in cable loom

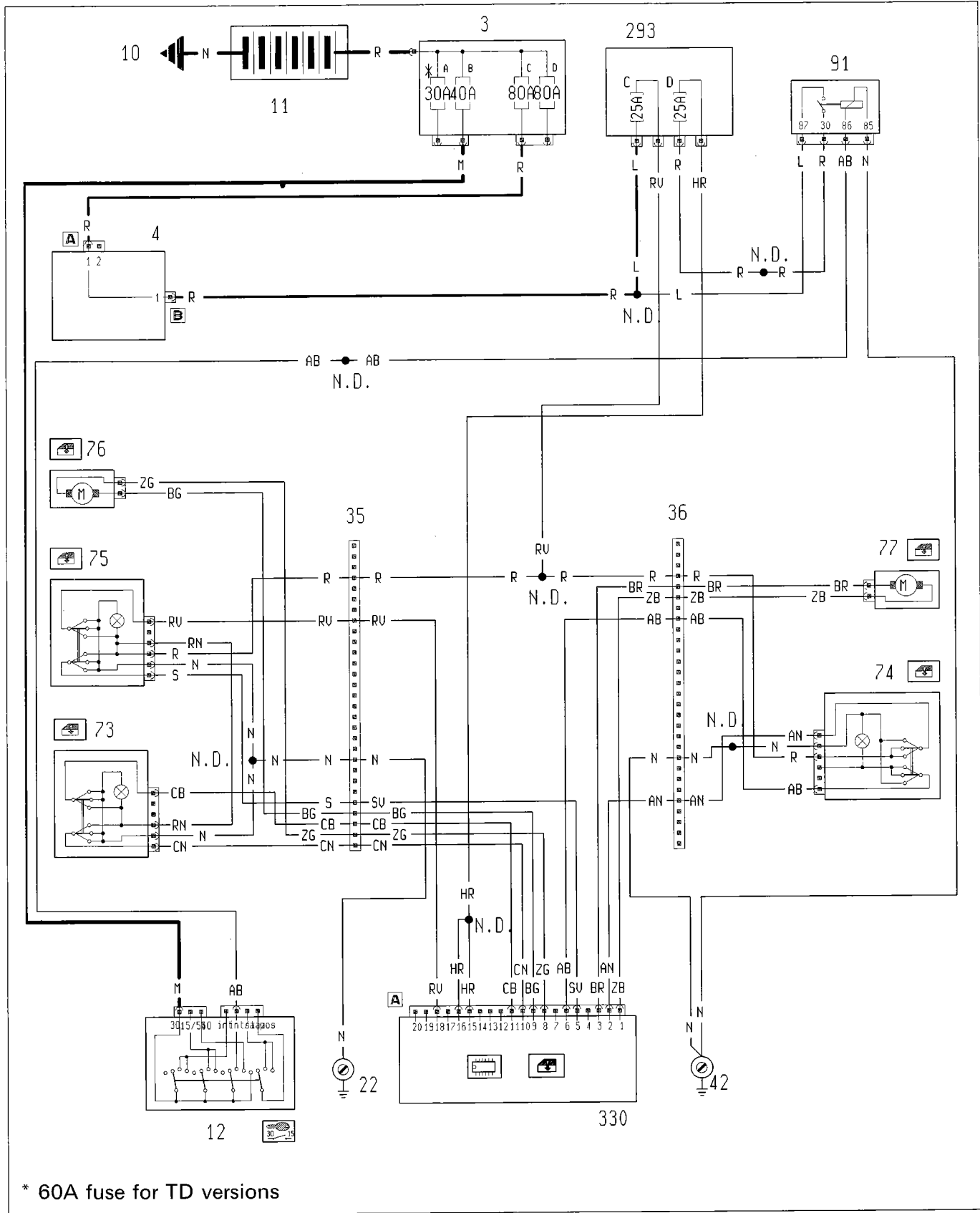


P4A088101

The cables in the wiring diagram are marked

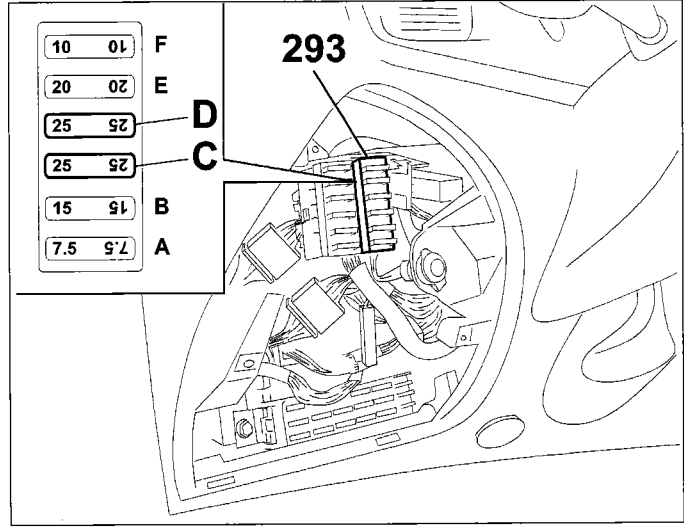
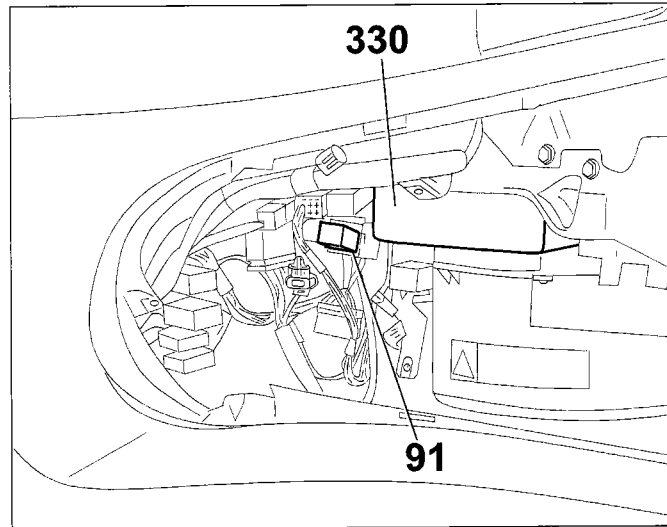
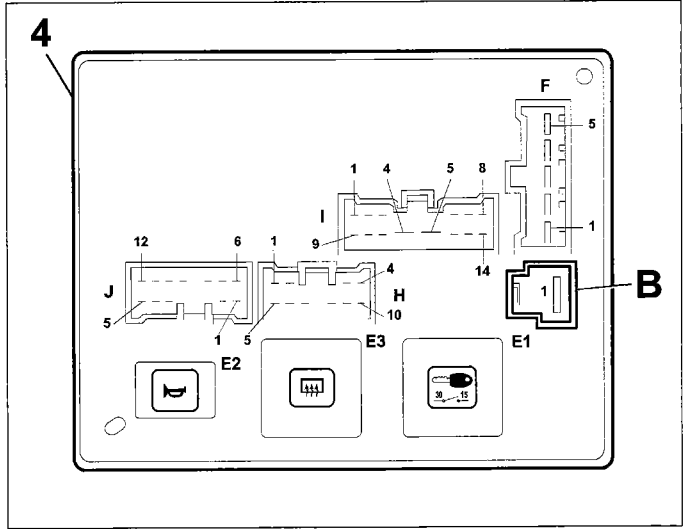
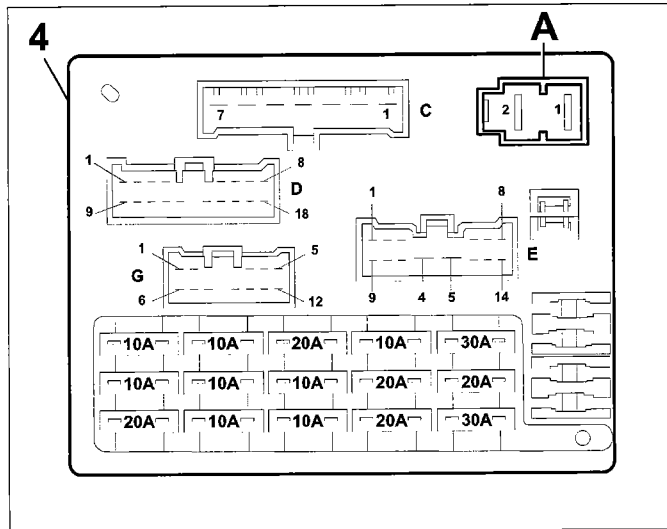
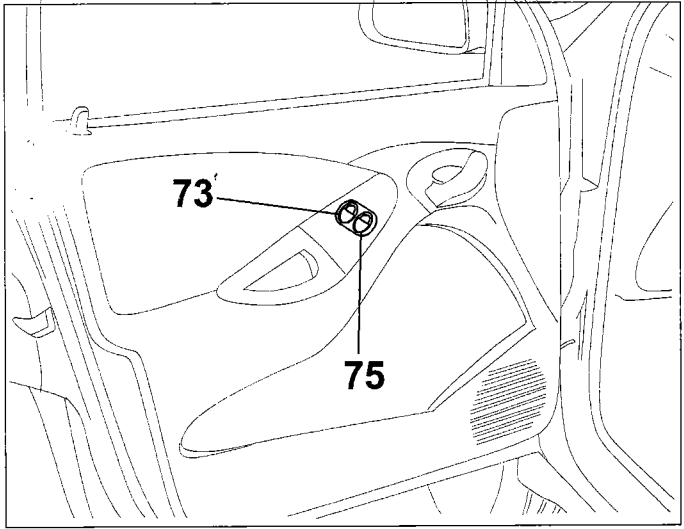
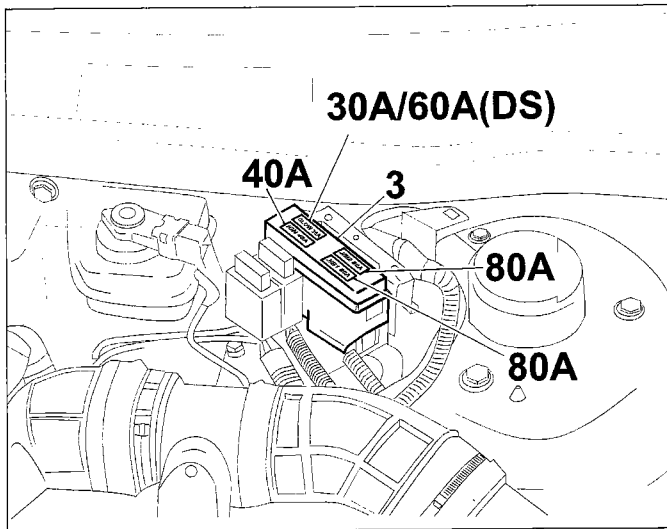
4A0881

Trim level: ELX - HSX - HGT  
Electric front windows - (See key at end of wiring diagrams)



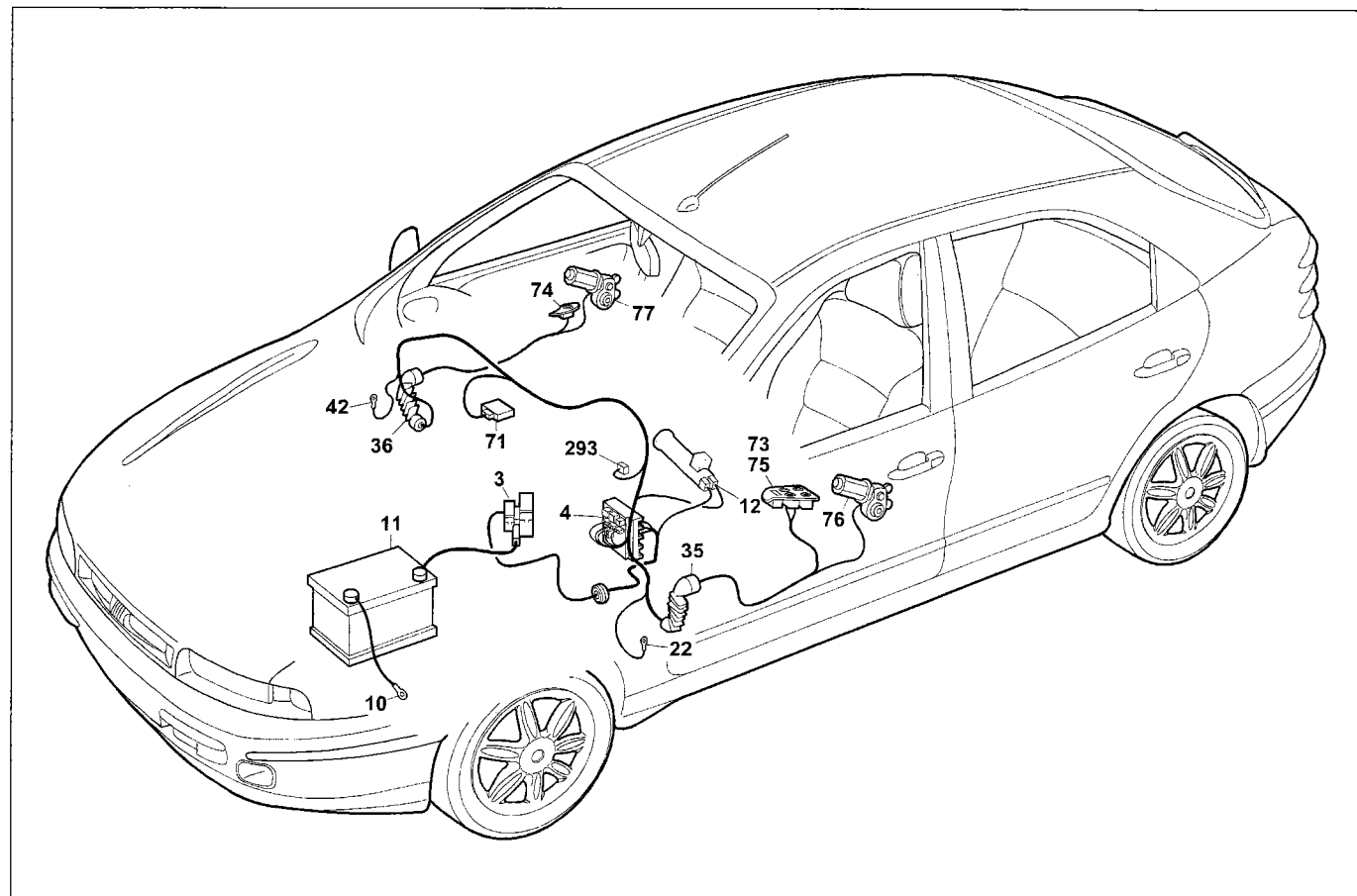
P4A085101

Location of components



P4A086101

### 55.



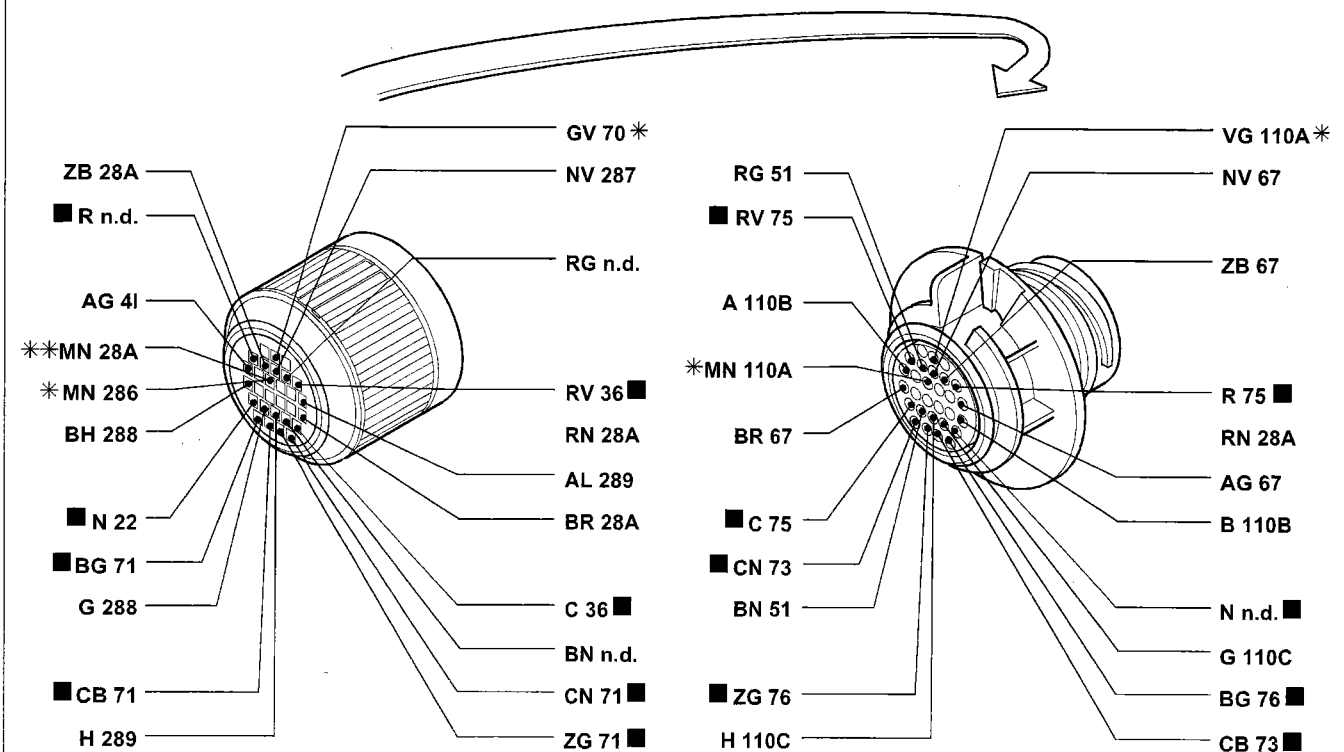
P4A083101

**Trim level: SX - GT**  
**Electric front windows**

#### Components key

- 3 Power fuse box:  
 A 30A protective fuse for injection system (60A for TD versions)  
 B 40A protective fuse for ignition system  
 C 80A fuse protecting additional options  
 D 80A protective fuse for junction unit
- 4 Junction unit  
 E1 Ignition discharge relay
- 10 Earth for battery on bodyshell  
 11 Battery  
 12 Ignition switch  
 22 Left dashboard earth  
 35 Dashboard/left front door cables connection  
 36 Dashboard/right front door cables connection  
 42 Right dashboard earth  
 71 Electric front windows control unit  
 73 Left front electric window control panel  
 74 Right electric front window control panel  
 75 Right electric front window control panel in left front door  
 76 Left front electric window motor  
 77 Right front electric window motor
- 293 Fuse carrier base on dashboard cable  
 A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors  
 D 25A fuse protecting A.B.I. control unit; Central locking control unit  
 N.D. Ultrasound welding taped in cable loom

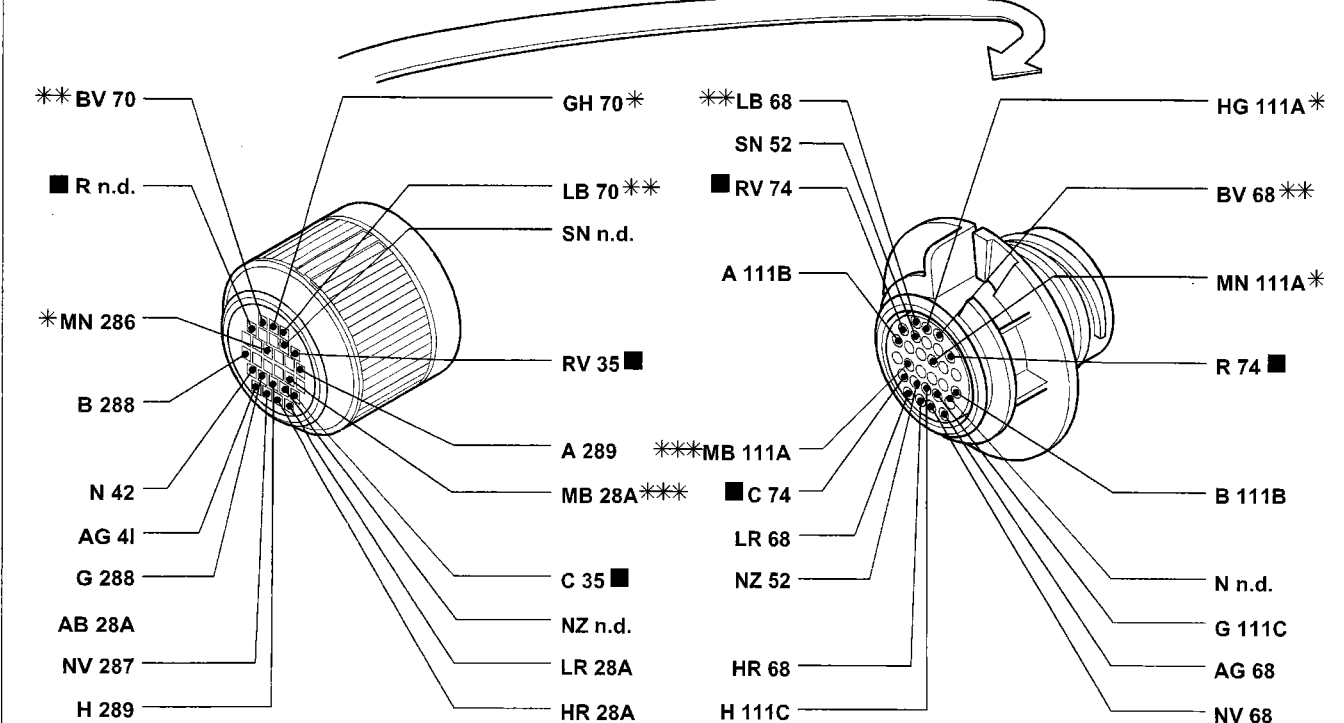
#### 35 Dashboard/left front door cables connection. Trim level: SX - GT



\* Variant connection for versions with alarm

\*\* Variant connection for version with automatic transmission

#### 36 Dashboard/right front door cables connection. Trim level: SX - GT



\* Variant connection for versions with alarm

\*\* Variant connection for versions with air conditioning

\*\*\* Variant connection for version with automatic transmission

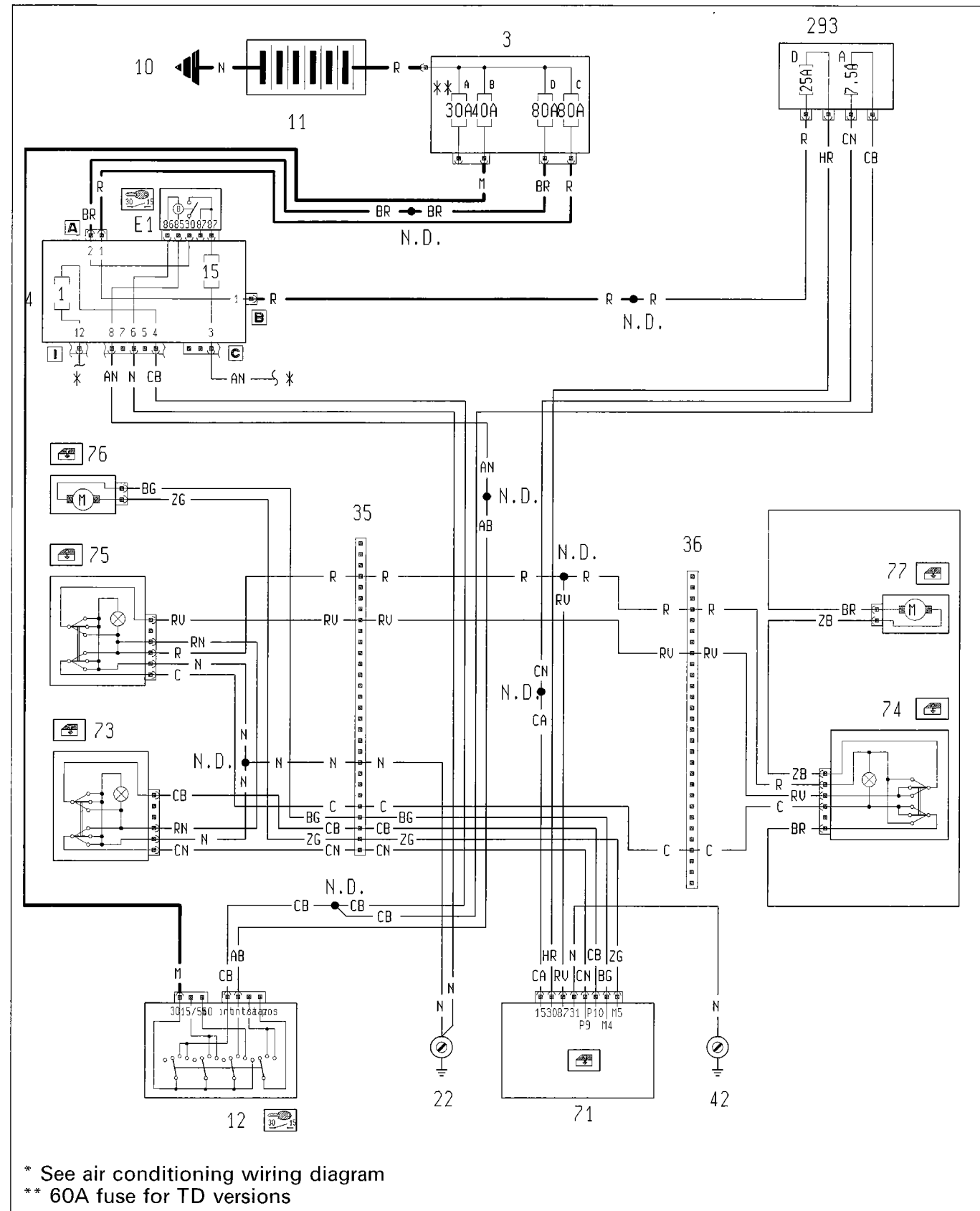
The cables in the wiring diagram are marked

P4A084101



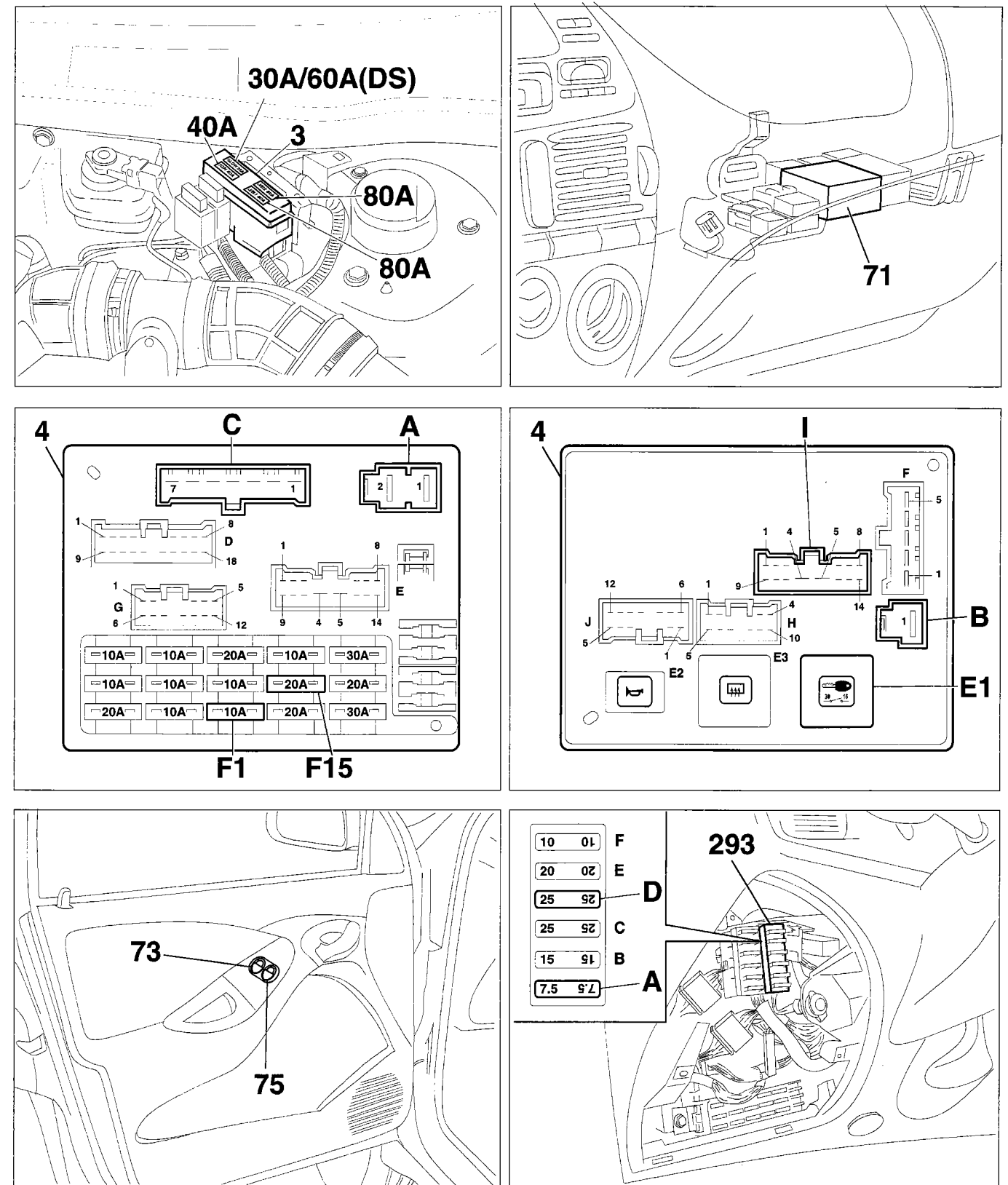
**Trim level: SX - GT**

**Electric front windows - (See key at end of wiring diagrams)**

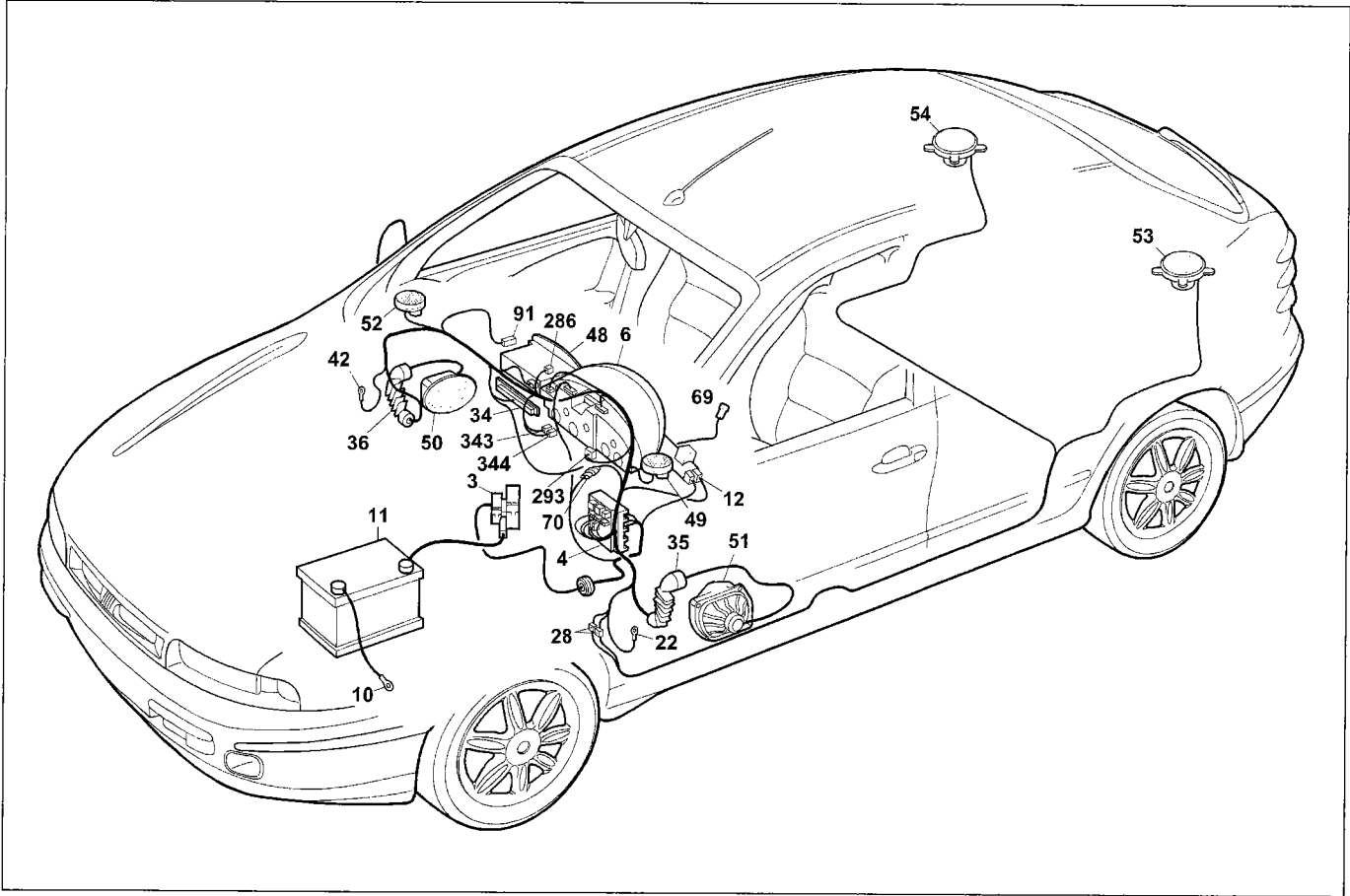


P4A081101

### Location of components



55.



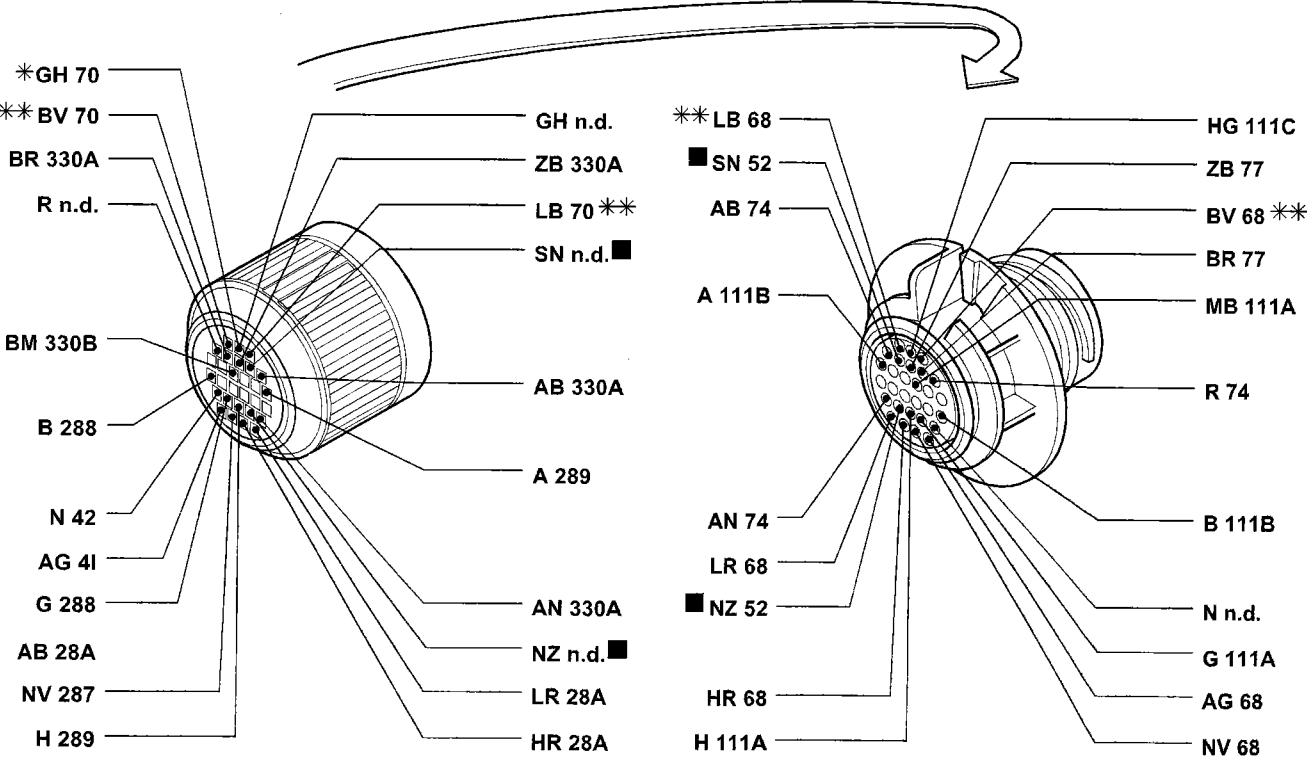
P4A079101

Preparation for top of the range radio - Cigar lighter

Components key

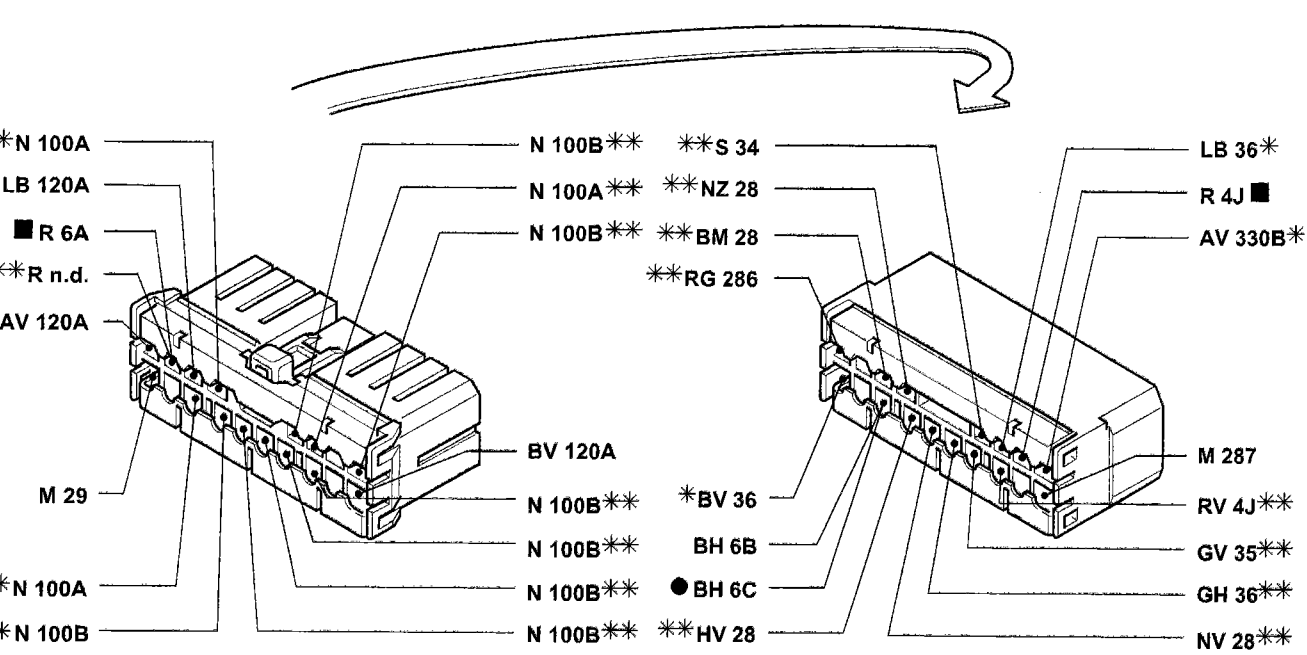
- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit:  
E1 Ignition discharge relay
- 6 Instrument panel:  
Y Electronic module
- 10 Earth for battery on bodyside
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 28 Dashboard/longitudinal cables connection
- 34 Switch control unit  
A Anti-theft warning light on  
B Rear fog lamps switch  
C Rear fog lamp relay feed
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 48 Radio receiver with clock
- 49 Left front speaker (tweeter)
- 50 Right front speaker (tweeter)
- 51 Speaker in left front door
- 52 Speaker in right front door
- 53 Left rear speaker
- 54 Right rear speaker
- 69 Cigar lighter
- 91 Power relay
- 286 Short circuit connection
- 293 Fuse carrier base on dashboard cable  
A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors  
E 20A protective fuse for current socket; Cigar lighter; Electric seats; Electric roof
- 343 Connection for preparation for radio phone
- 344 Electric aerial preparation cable connection
- N.D. Ultrasound welding taped in cable loom

36 Dashboard/right front door cables connection Trim level: ELX - HSX - HGT



\* Variant connection for versions with alarm  
\*\* Variant connection for versions with air conditioning

70 Dashboard/front cables connection. Trim level: ELX - HSX - HGT

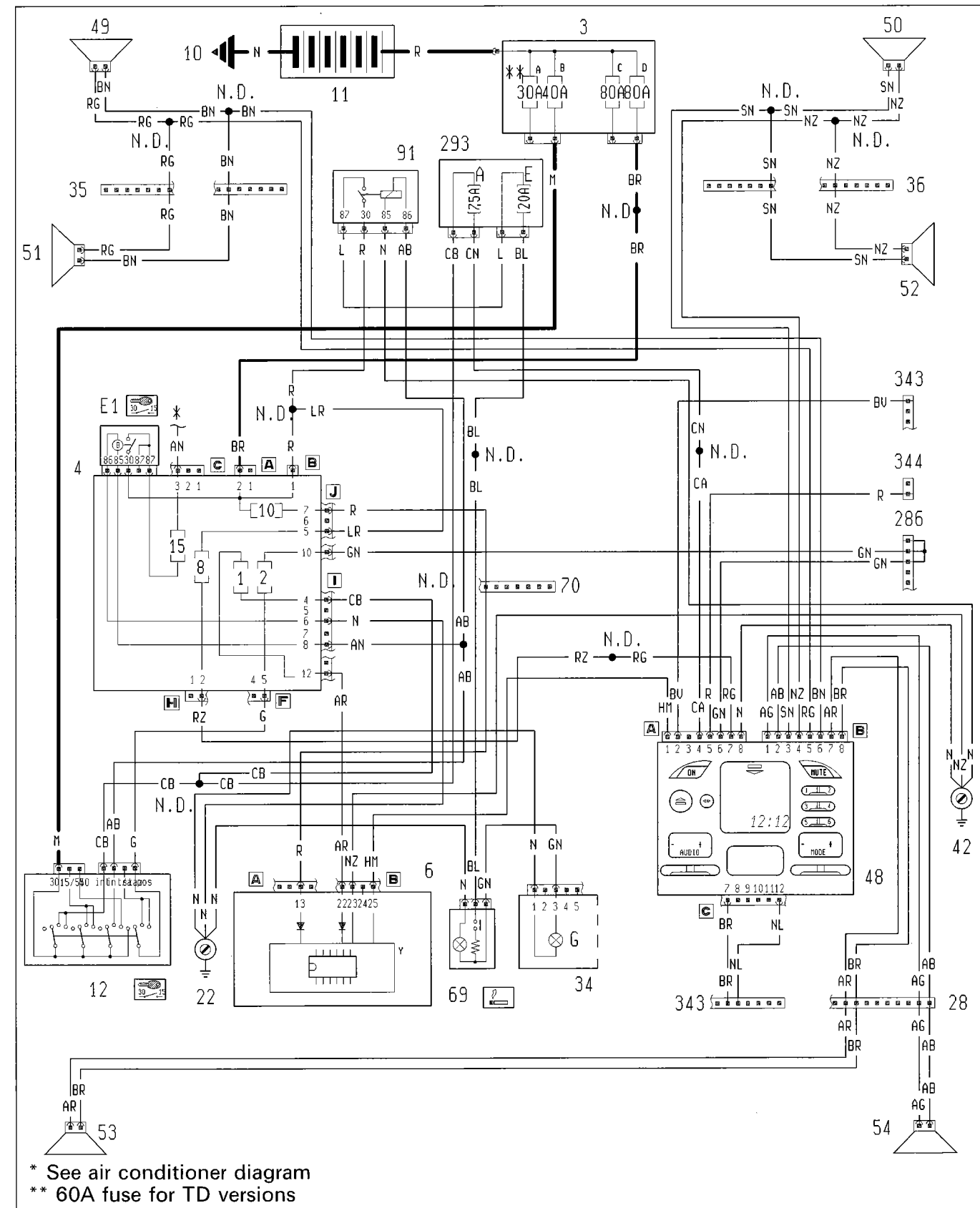


\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm  
\*\*\* Variant connection for 1910 JTD versions  
● Variant connection for ELX trim level with automatic transmission

The cables in the wiring diagram are marked

P4A080101

**Preparation for top of the range radio - Cigar lighter - (See key at end of wiring diagrams)**



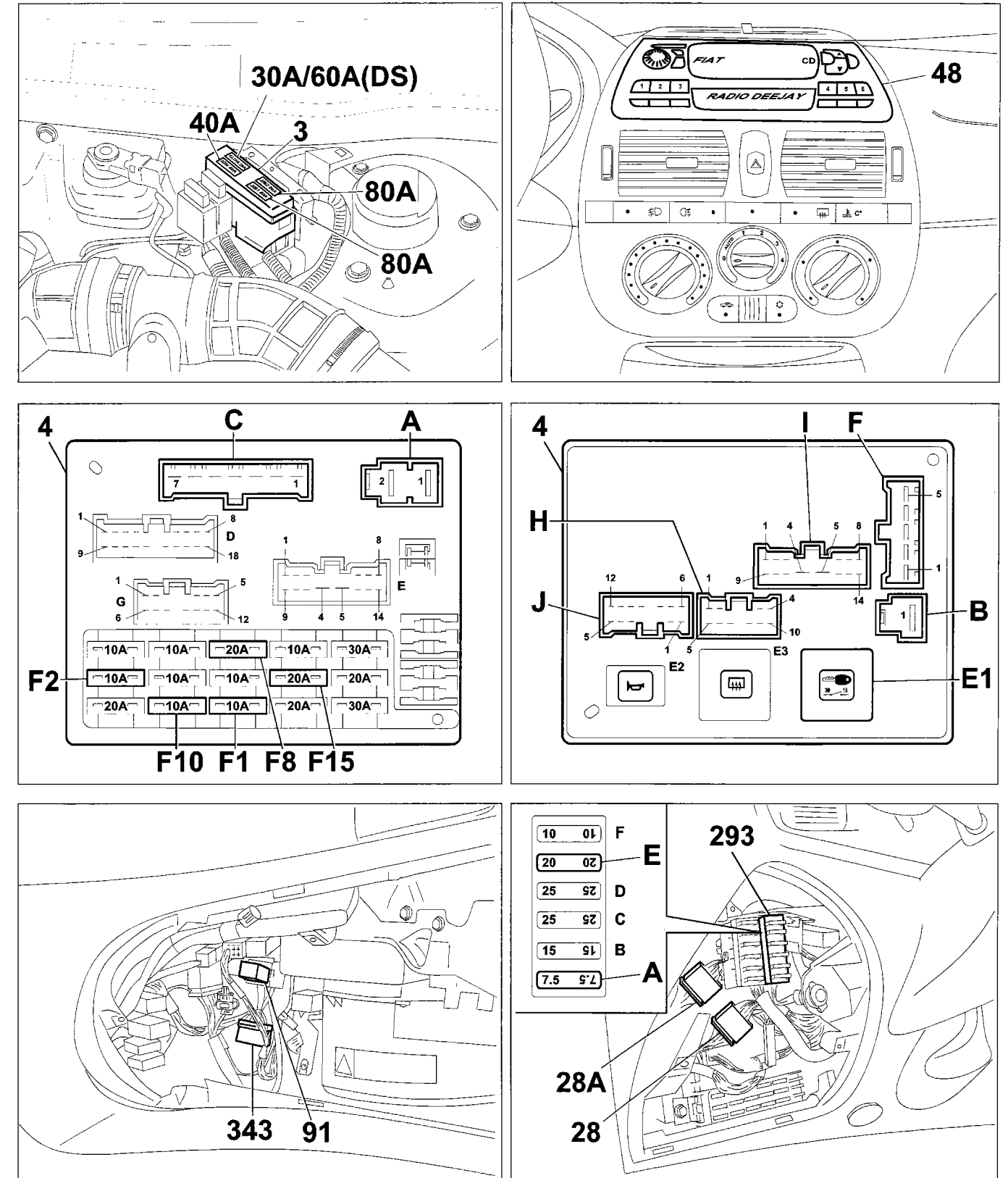
4A077I

Copyright by Fiat Auto

P4A077I01

41

### Location of components

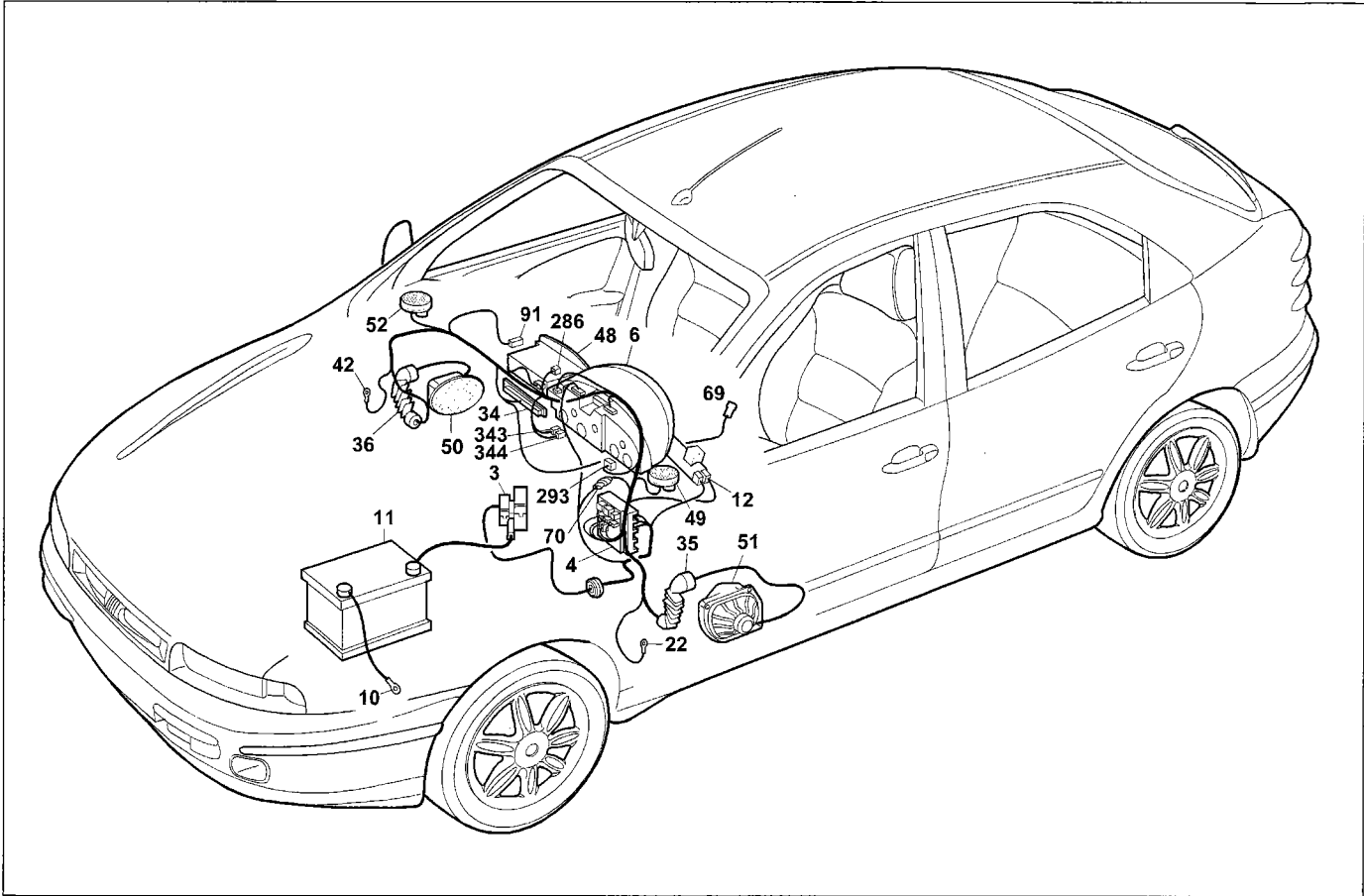


4A078I

P4A078I01



55.



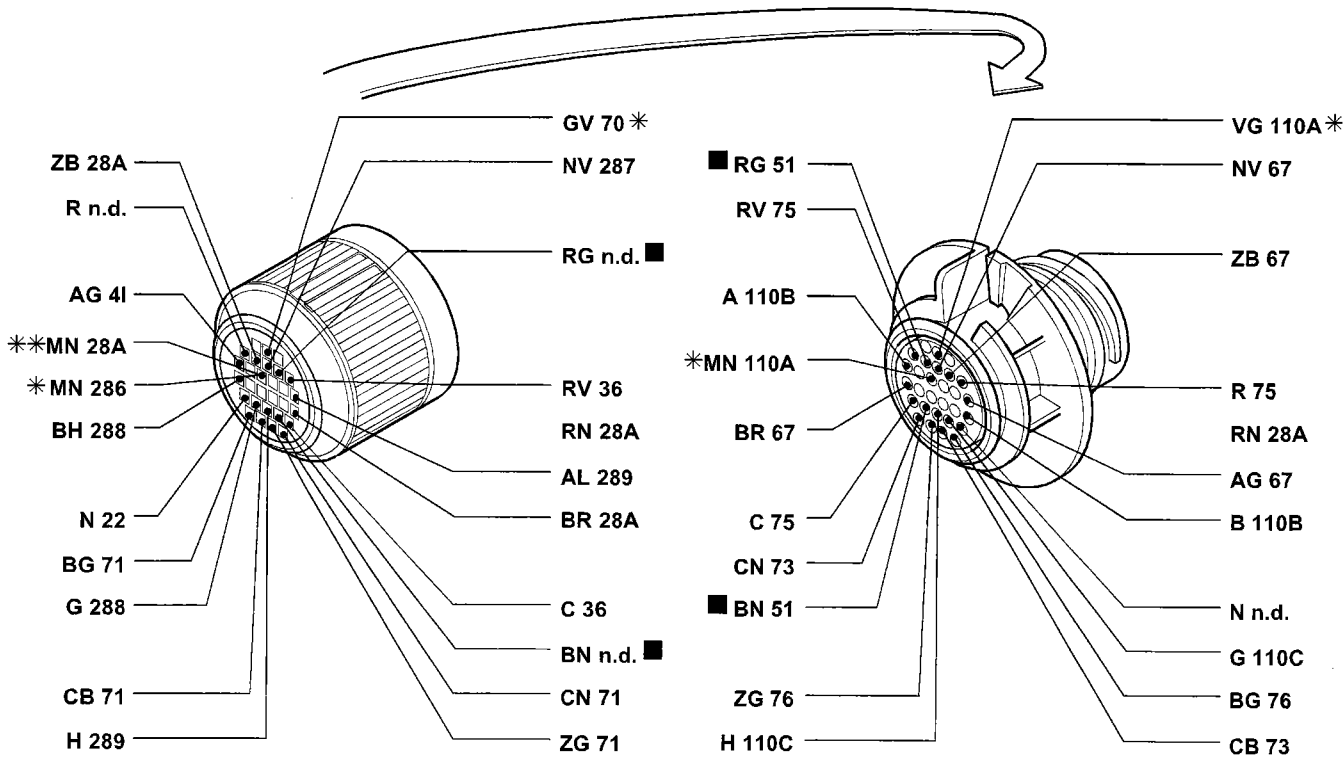
P4A075101

Preparation for bottom of the range radio - Cigar lighter

Components key

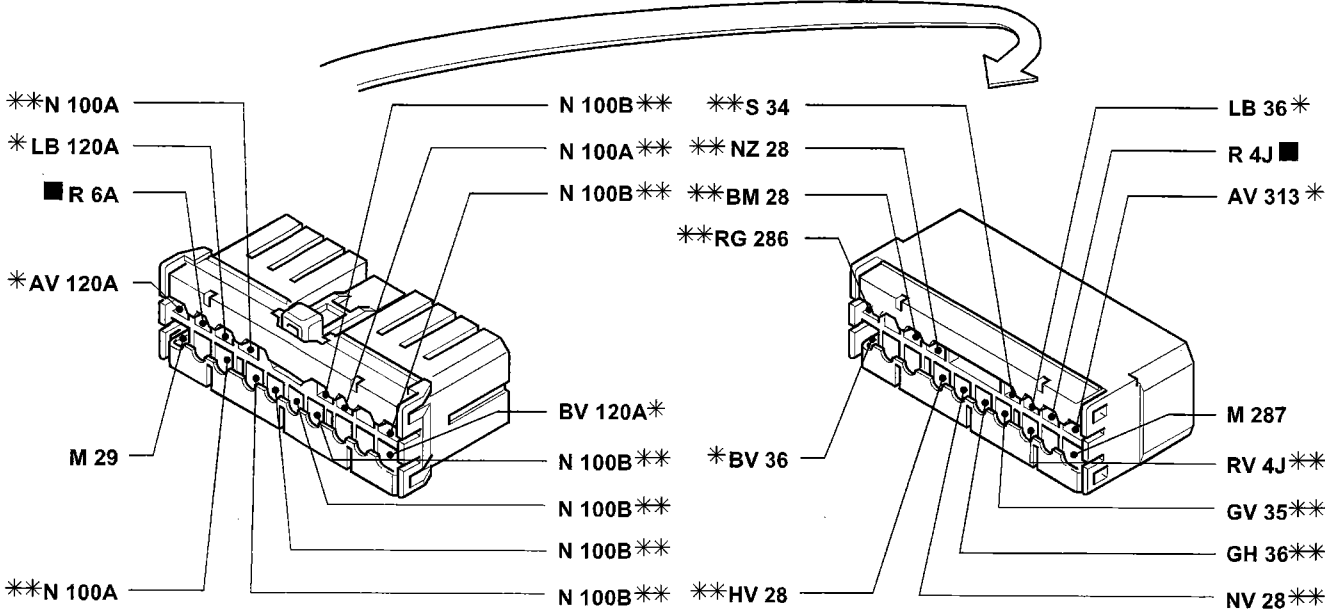
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit:
  - E1 Ignition discharge relay
- 6 Instrument panel
  - Y Electronic module
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 34 Switch control unit:
  - A Anti-theft warning light on
  - B Rear fog lamps switch
  - C Rear fog lamp relay feed
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 48 Radio receiver with clock
- 49 Left front speaker (tweeter)
- 50 Right front speaker (tweeter)
- 51 Speaker in left front door
- 52 Speaker in right front door
- 69 Cigar lighter
- 70 Dashboard/front cables connection
- 91 Power relay
- 286 Short circuit connection
- 293 Fuse carrier base on dashboard cable
  - A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors
  - E 20A protective fuse for current socket; Cigar lighter; Electric seats; Electric roof
- 343 Connection for preparation for radio phone
- 344 Electric aerial preparation cable connection
- N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection. Trim level: SX - GT



\* Variant connection for versions with alarm  
\*\* Variant connection for version with automatic transmission

70 Dashboard/front cables connection. Trim level: SX - GT

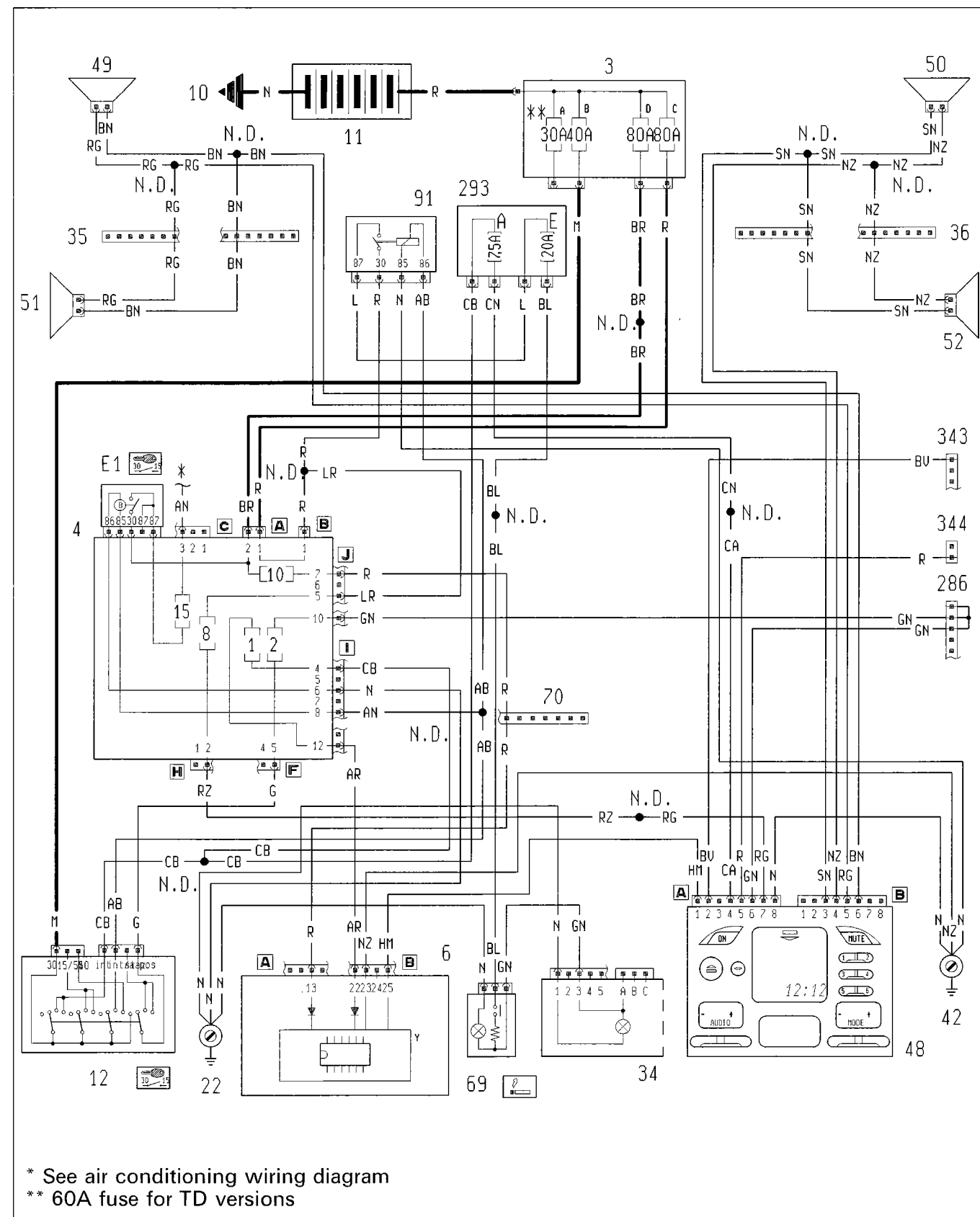


\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

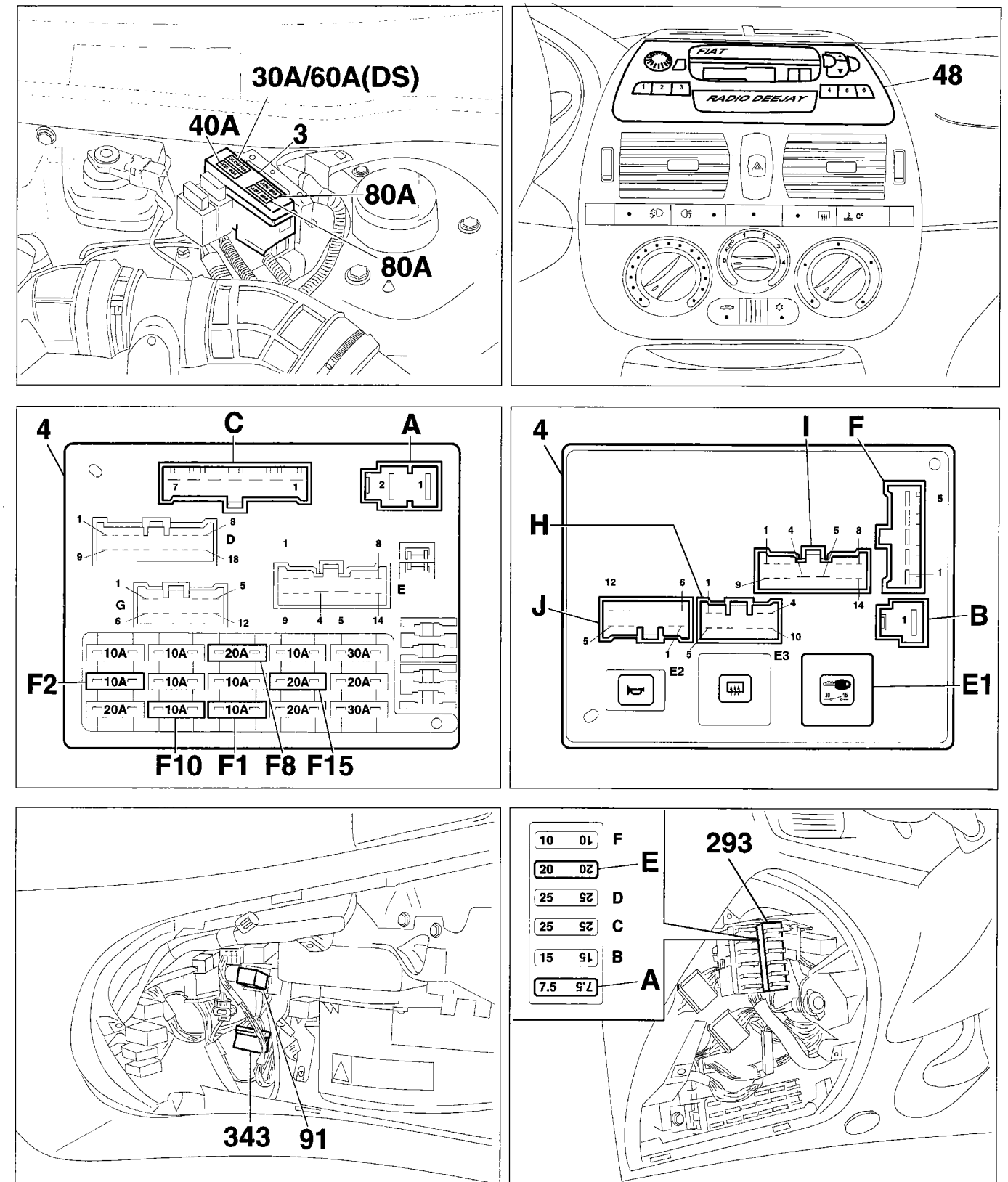
The cables in the wiring diagram are marked

P4A076101

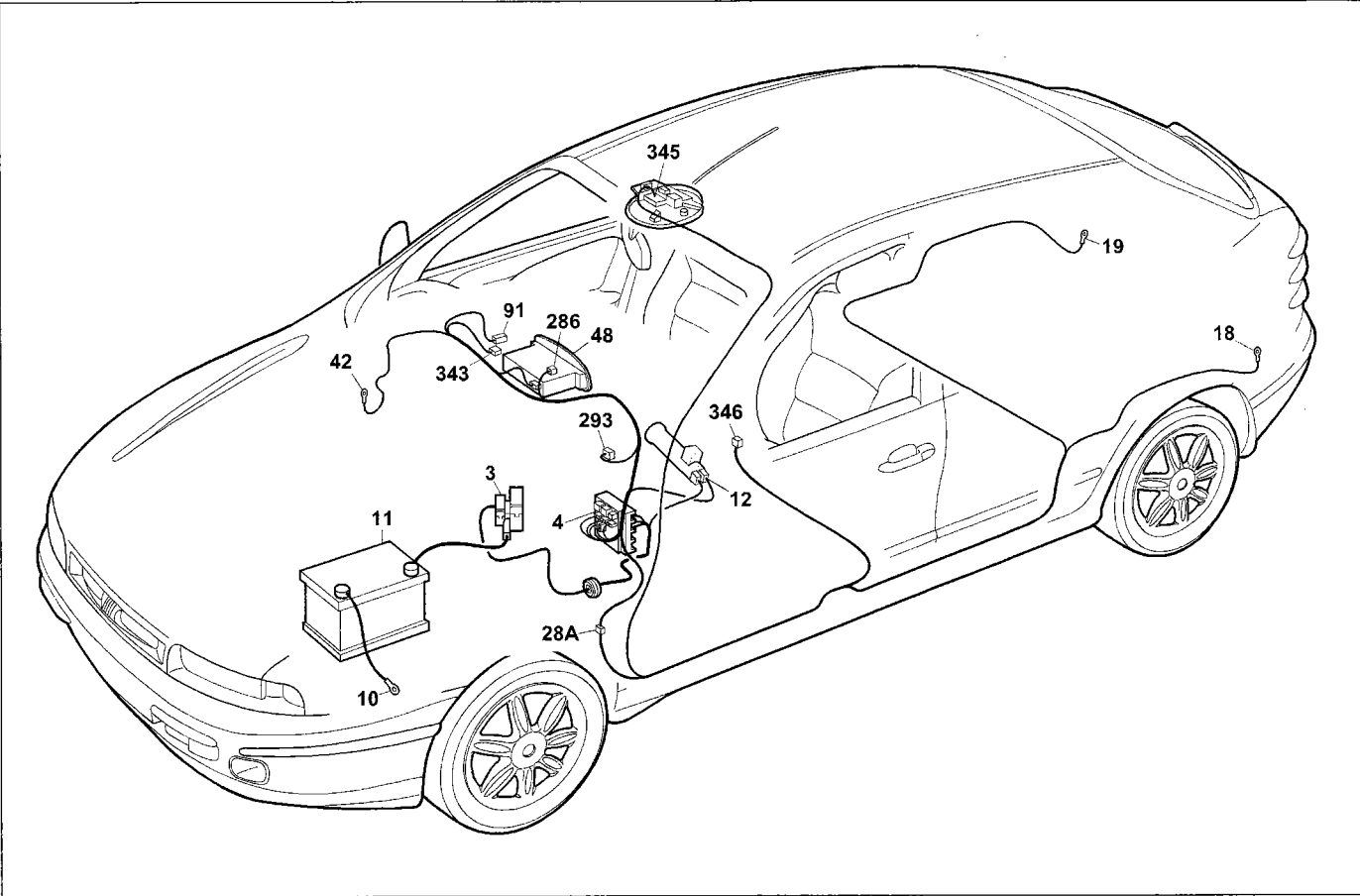
**Preparation for bottom of the range radio Cigar lighter - (See key at end of wiring diagrams)**



### Location of components



55.

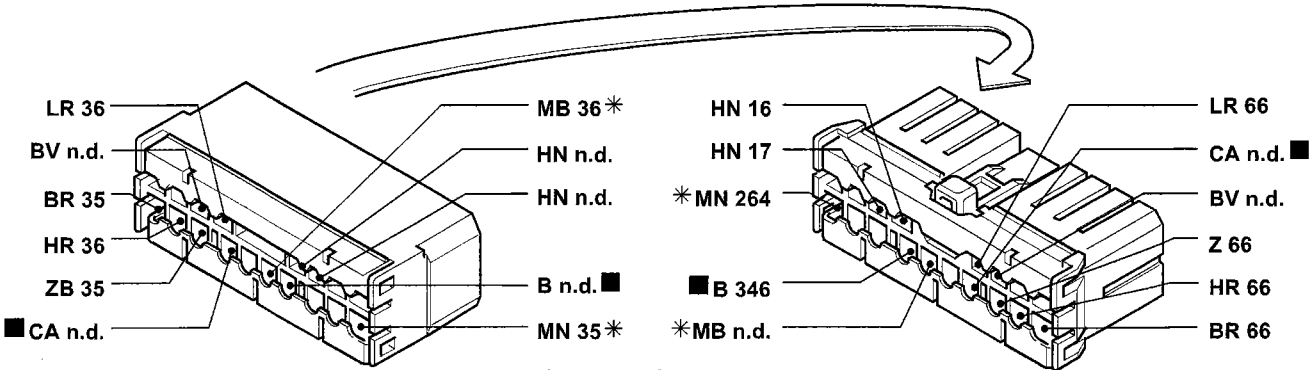


Preparation for radio phone- Preparation for Telepass

Components key

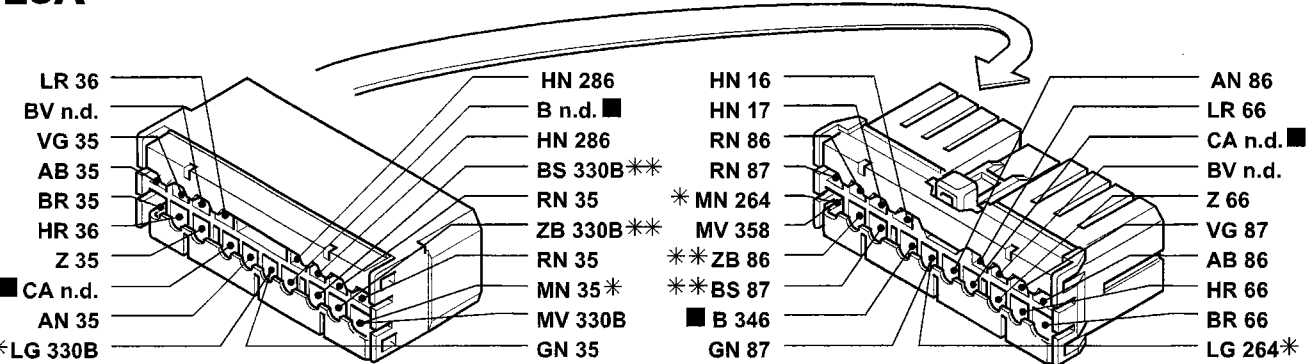
- |                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fuse box:<br>A 30A protective fuse for injection system (60A for TD versions)<br>B 40A protective fuse for ignition system<br>C 80A fuse protecting additional options<br>D 80A protective fuse for junction unit | 91 Power relay<br>286 Short circuit connection<br>293 Fuse carrier base on dashboard cable<br>A 7.5A fuse protecting switch panel light Radio phone; Radio; Electric mirrors<br>E 20A protective fuse for current socket; Cigar lighter; Electric seats; Electric roof |
| 4 Junction unit<br>10 Earth for battery on bodyshell<br>11 Battery<br>12 Ignition switch<br>18 Left rear earth<br>19 Right rear earth                                                                                     | 343 Connection for preparation for radio phone<br>345 Connection for preparation for telepass<br>346 Current socket<br>N.D. Ultrasound welding taped in cable loom                                                                                                     |
- 28A Dashboard/longitudinal cables connection  
42 Right dashboard earth  
48 Radio receiver with clock

28A Dashboard/longitudinal cables connection.



\* Variant connection for version with automatic transmission

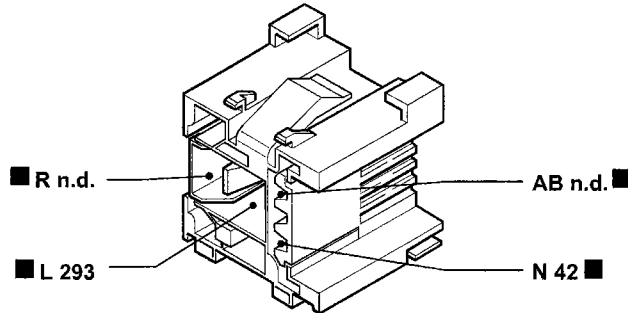
28A Dashboard/longitudinal cables connection.



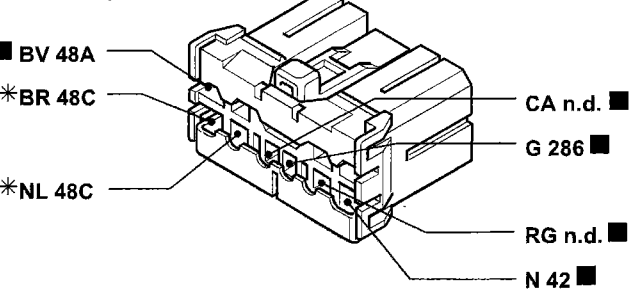
\* Variant connection for version with automatic transmission

\*\* Variant connection for Brava versions

91 Power relay

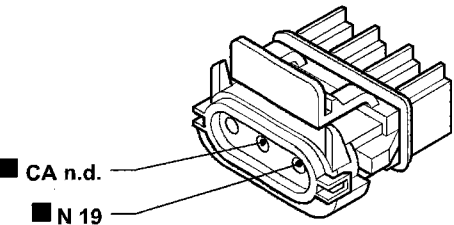


343 Connection for preparation for radio phone

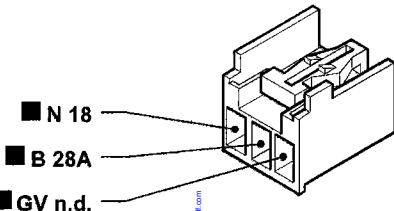


\* Non existent for versions with bottom of the range radio

345 Connection for preparation for telepass



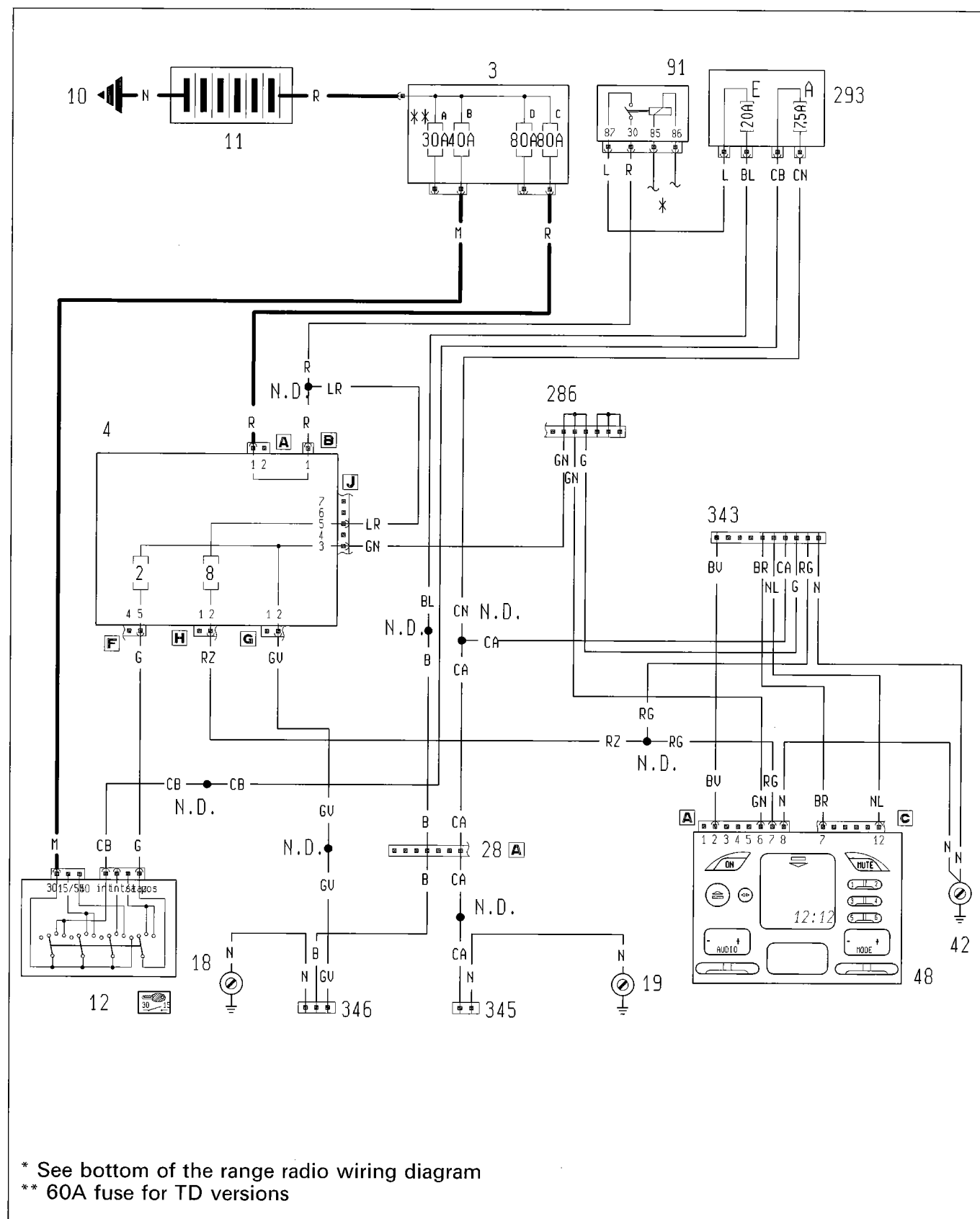
346 Current socket



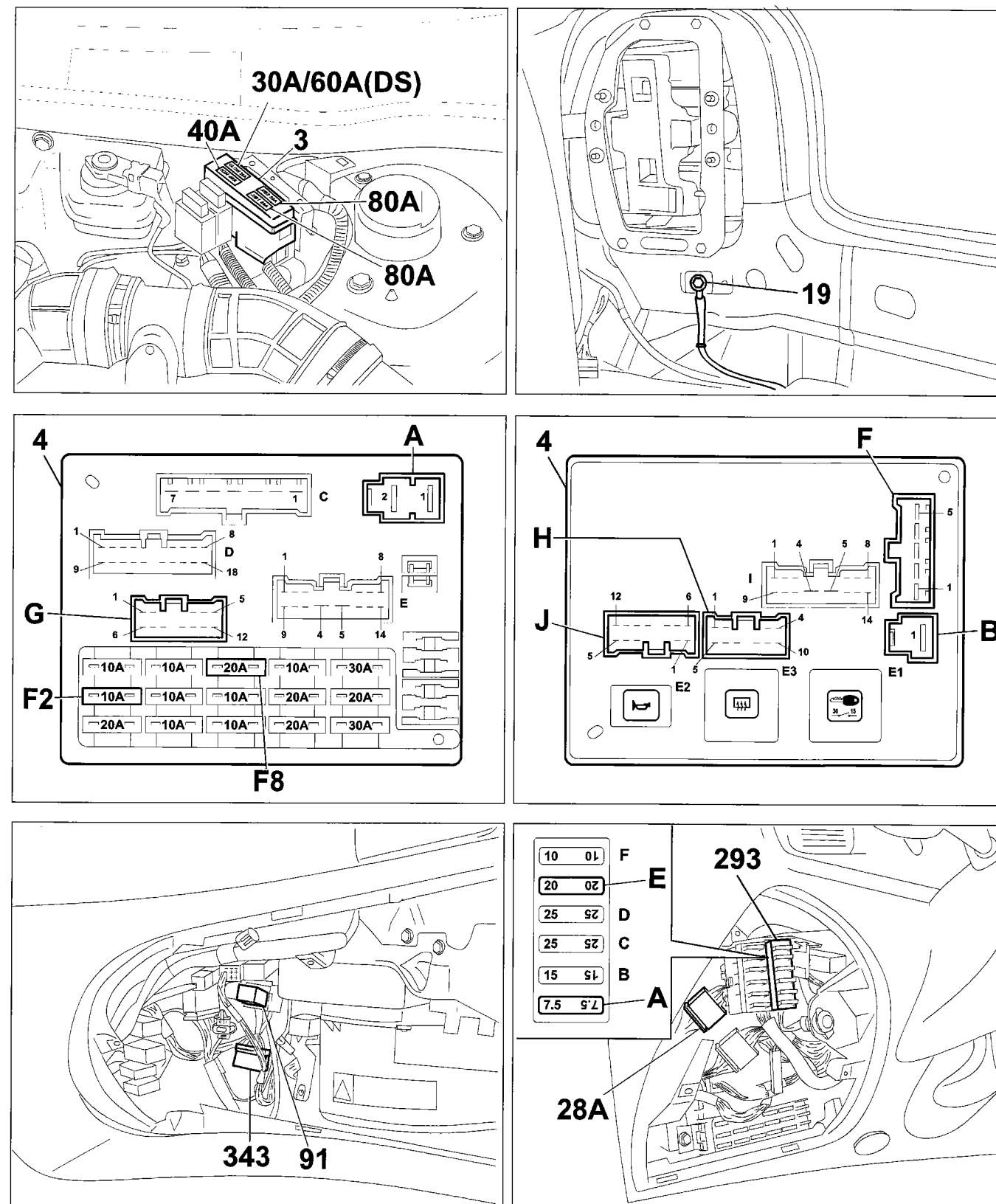
The cables in the wiring diagram are marked

P4A072101

Preparation for radio phone - Preparation for telepass - (See key at end of wiring diagrams)

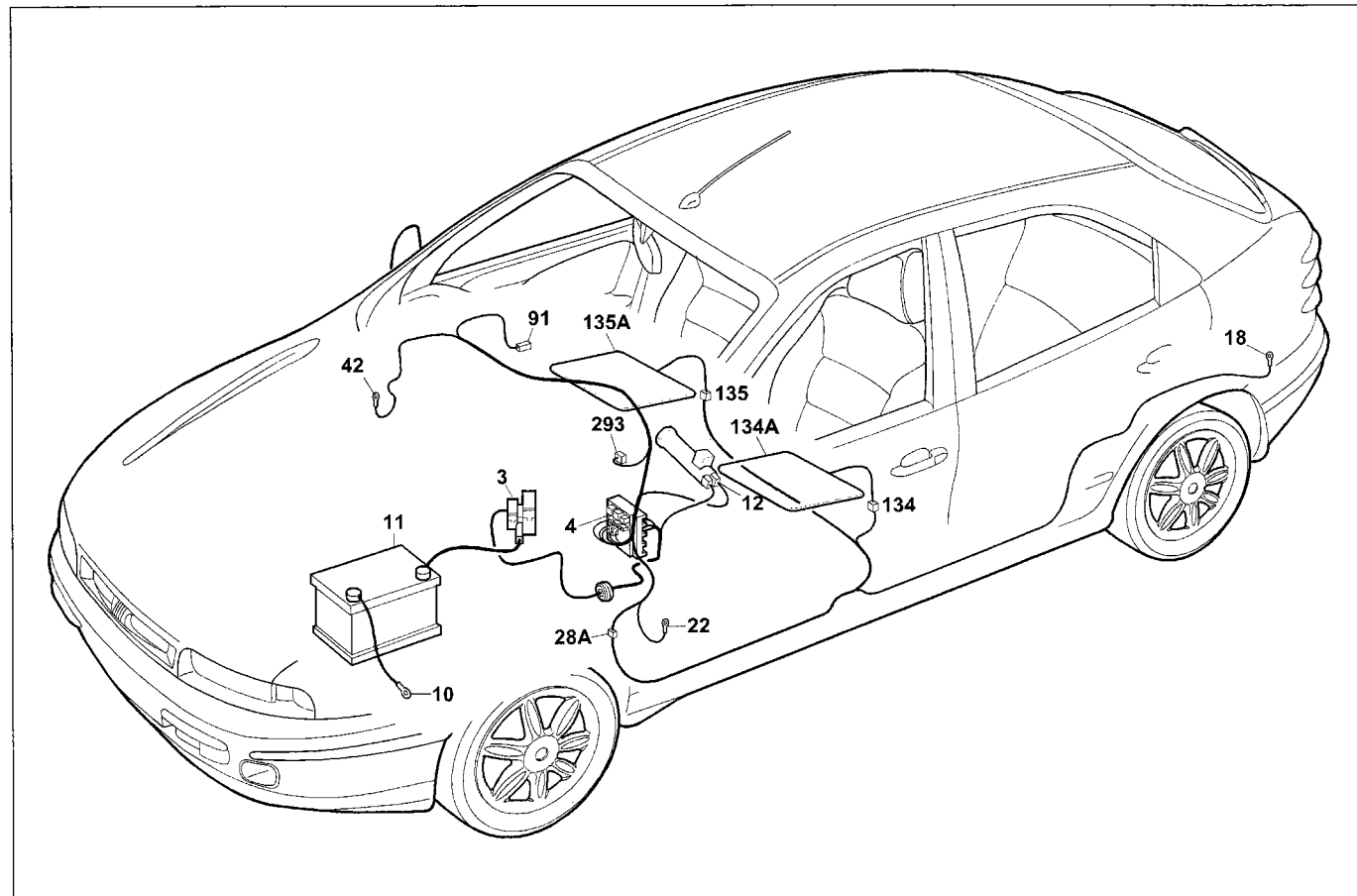


Location of components





### 55.



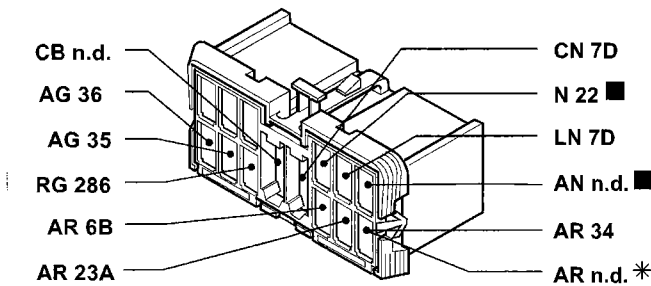
P4A067101

### Heated front seats

### Components key

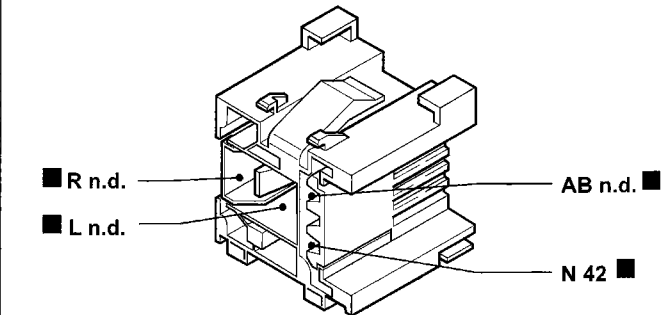
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
  - E1 Ignition discharge relay
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 18 Left rear earth
- 22 Left dashboard earth
- 28A Dashboard/longitudinal cables connection
- 42 Right dashboard earth
- 91 Power relay
- 134 Rear/heated driver's seat cables connection
- 134A Heated driver's seat heater pad
- 135 Connection between rear/heated passenger seat cables
- 135A Heated passenger seat heater pad
- 293 Fuse carrier base on dashboard cable
  - E 20A protective fuse for current socket; Cigar lighter; Electric seats; Electric roof
- N.D. Ultrasound welding taped in cable loom

### 41 Additional brake light

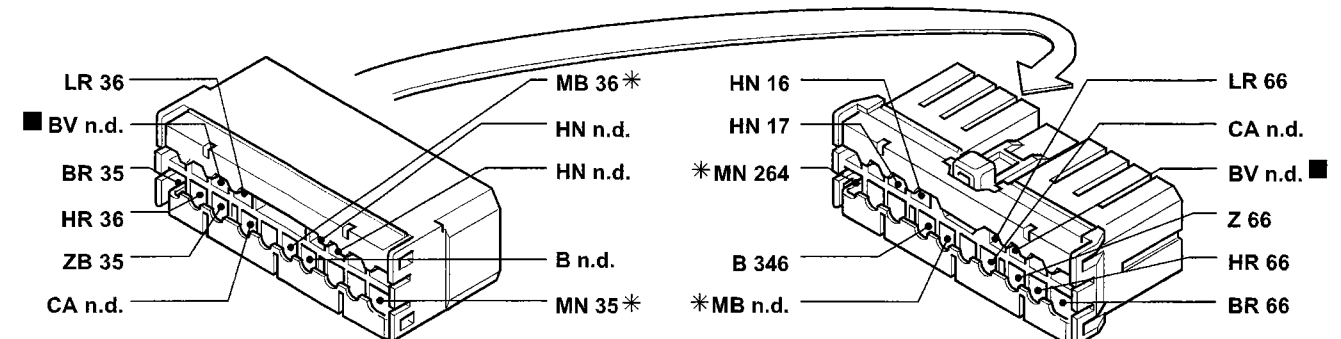


\* Variant connection for ELX trim levels with automatic transmission

### 91 Power relay

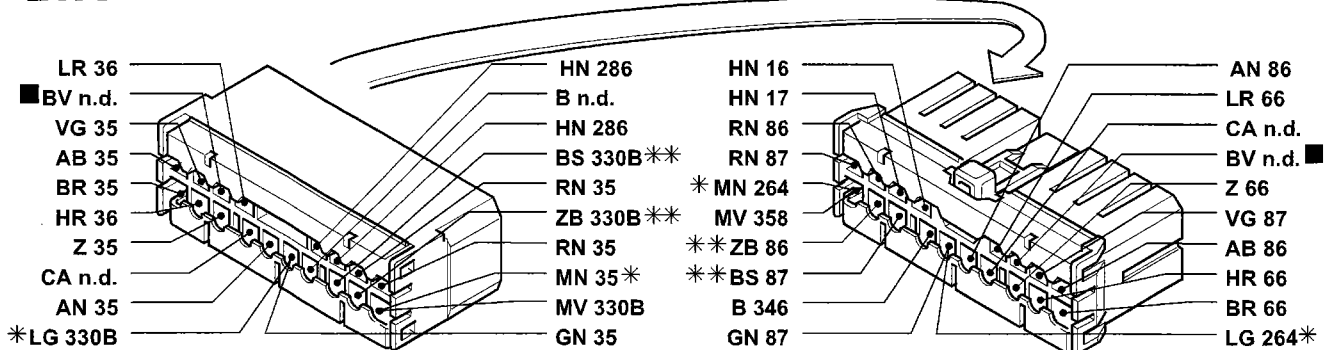


### 28A Dashboard/longitudinal cables connection. Trim level: SX - GT



\* Variant connection for version with automatic transmission

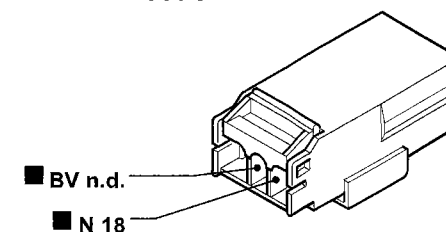
### 28A Dashboard/longitudinal cables connection. Trim level: ELX - HSX - HGT



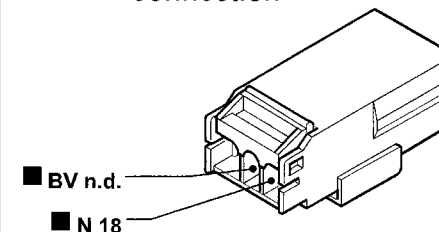
\* Variant connection for version with automatic transmission

\*\* Variant connection for Brava versions

### 134 Rear/heated driver's seat cables connection



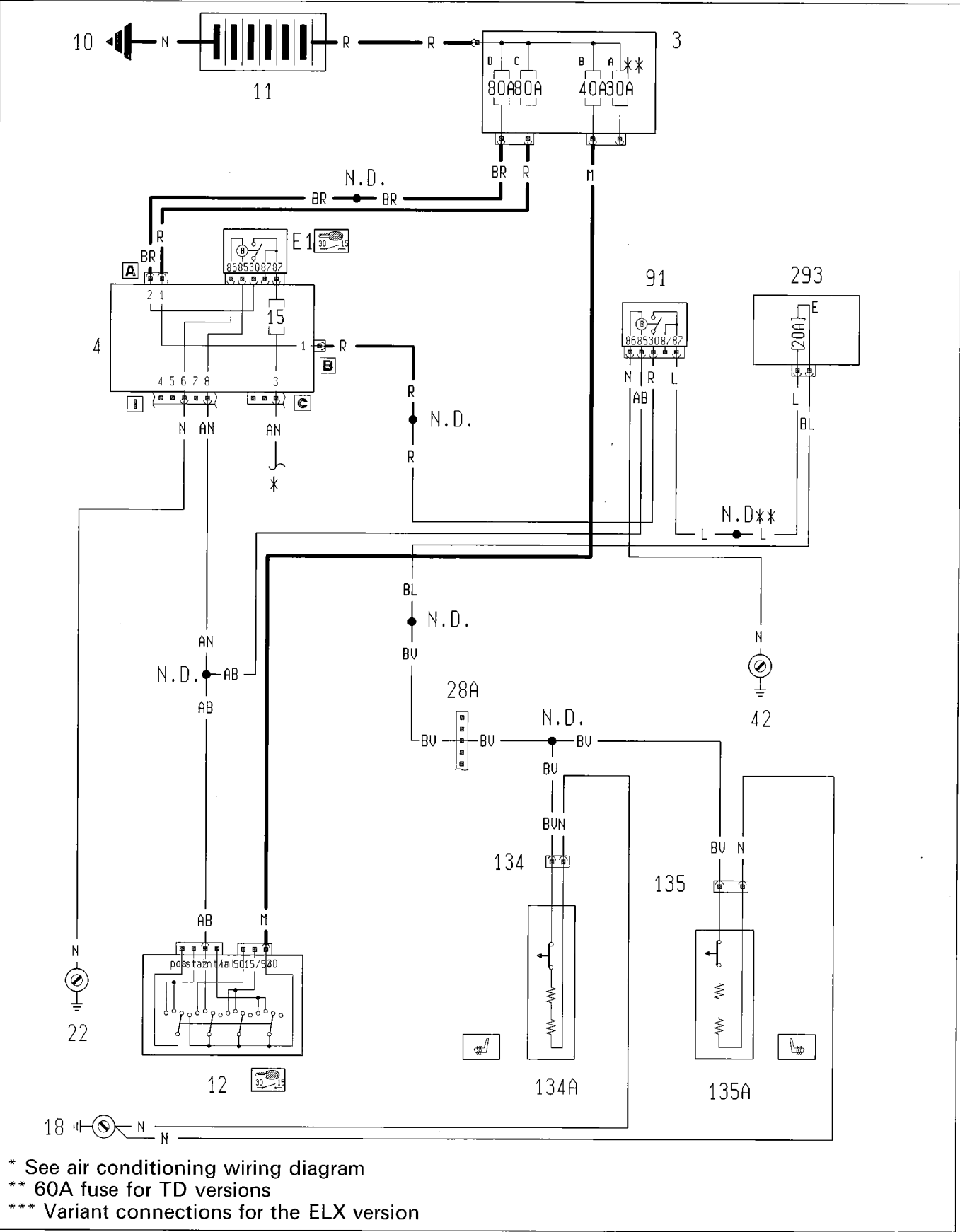
### 135 Rear/heated passenger seat cables connection



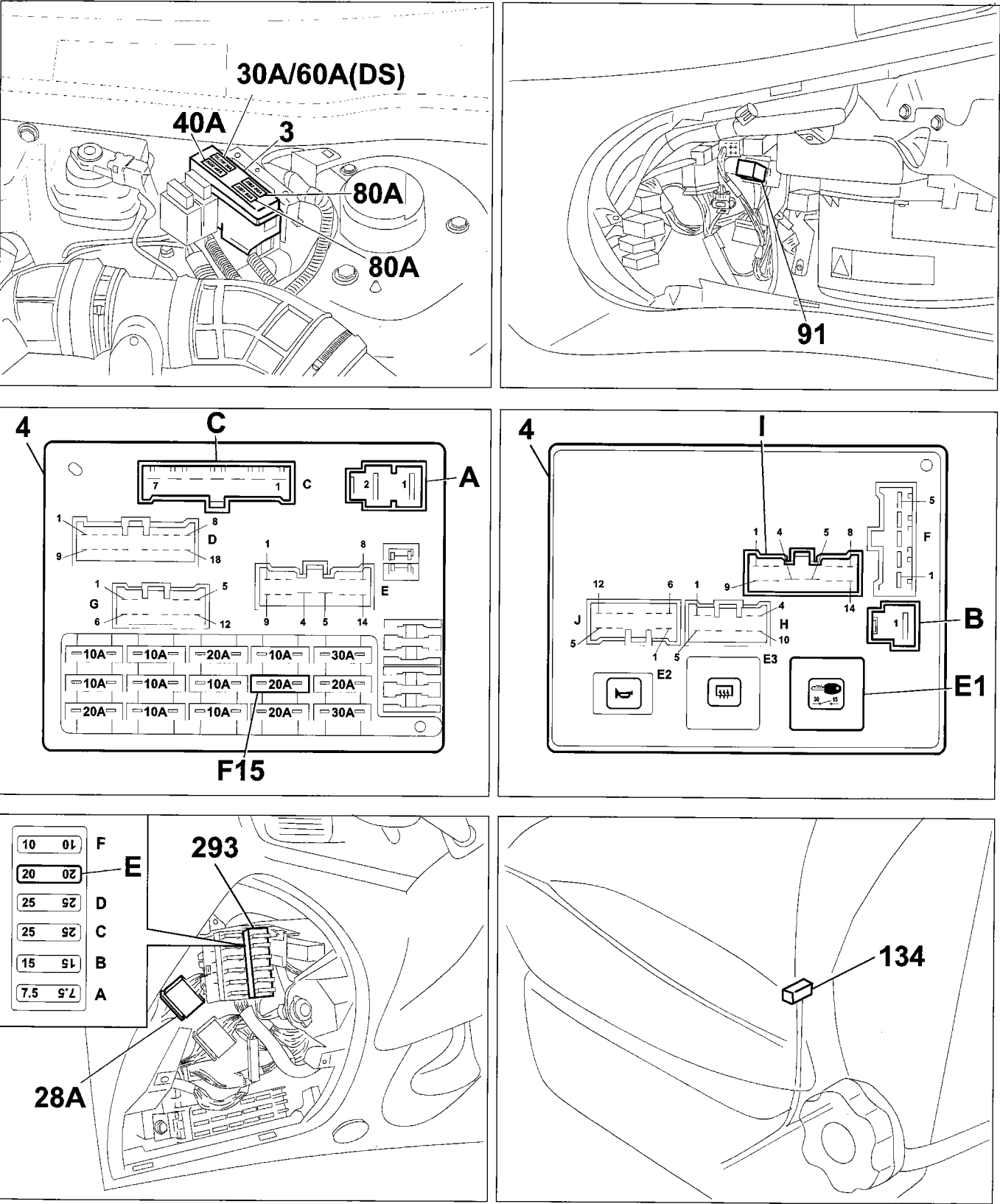
The cables in the wiring diagram are marked

P4A068101

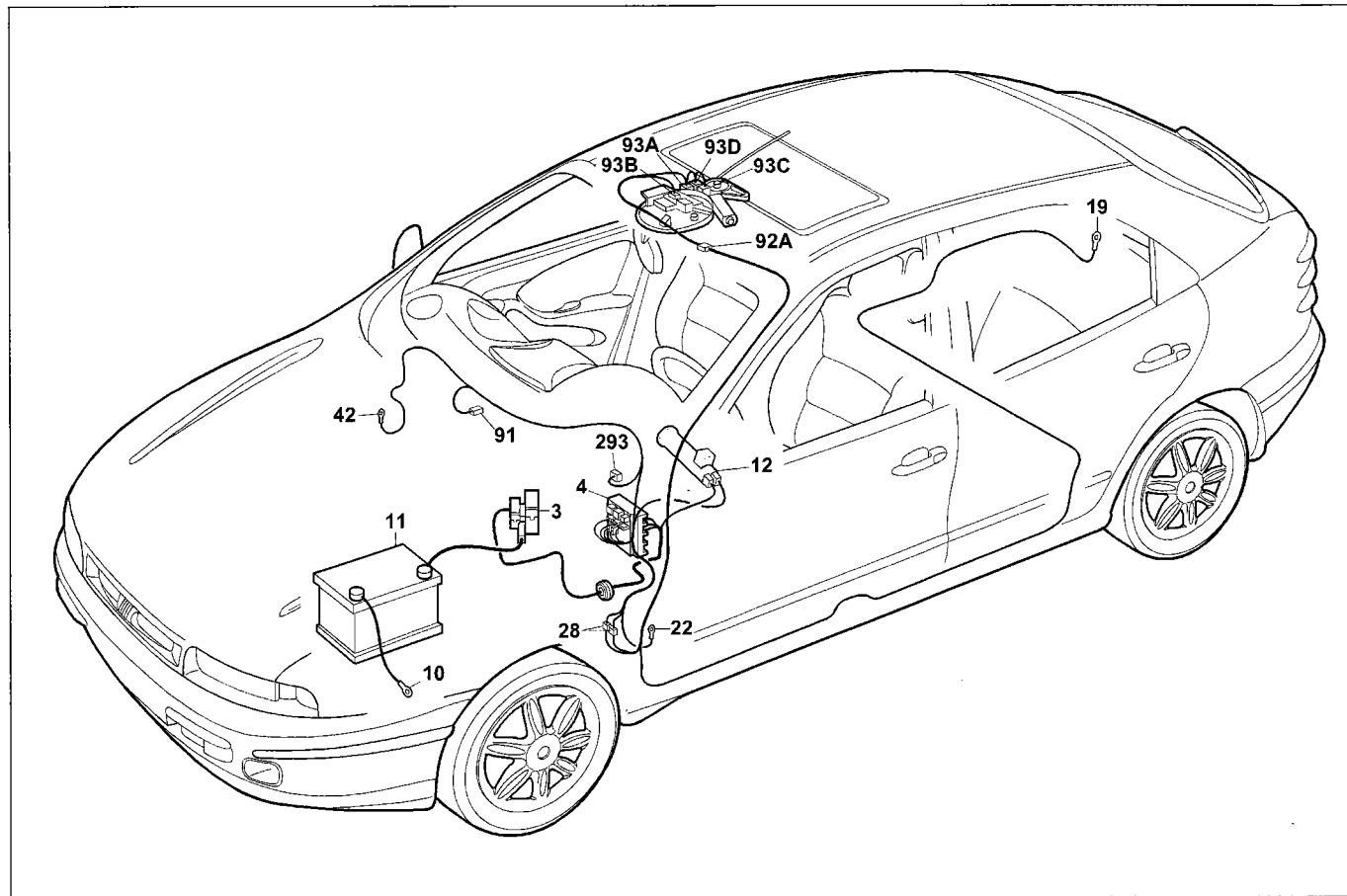
Heated front seats - (See key at end of wiring diagrams)



Location of components



# 55.



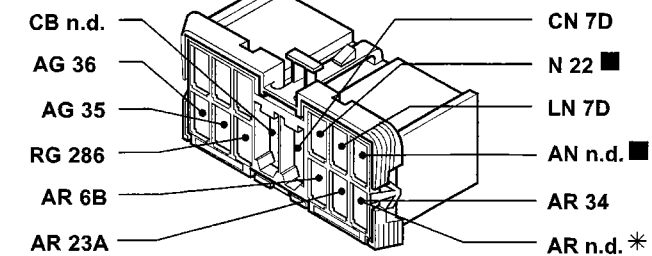
P4A063101

### Electric sun roof

### Components key

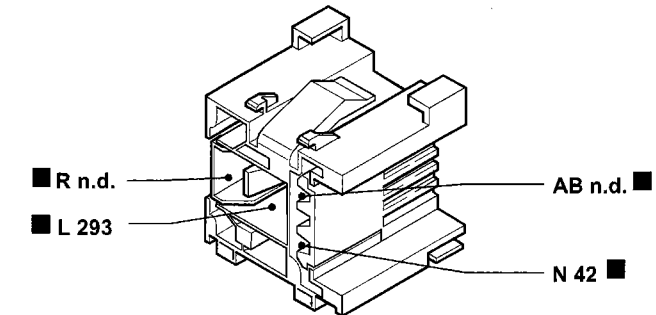
- 3 Power fuse box:  
 A 30A protective fuse for injection system (60A for TD versions)  
 B 40A protective fuse for ignition system  
 C 80A fuse protecting additional options  
 D 80A protective fuse for junction unit
- 4 Junction unit  
 E1 Ignition discharge relay
- 10 Earth for battery on bodysheet
- 11 Battery
- 12 Ignition switch
- 19 Right rear earth
- 22 Left dashboard earth
- 28 Dashboard/longitudinal cables connection
- 42 Right dashboard earth
- 91 Power relay
- 92A Electric sun roof cables connection
- 93A Electrically operated sun roof control unit
- 93B Electrically operated sun roof control button
- 93C Electrically operated sun roof motor
- 93D Electrically operated sun roof end of travel switch
- 293 Fuse carrier base on dashboard cable  
 E 20A protective fuse for current socket; Cigar lighter; Electric seats; Electric roof
- N.D. Ultrasound welding taped in cable looms

### 41 Junction unit

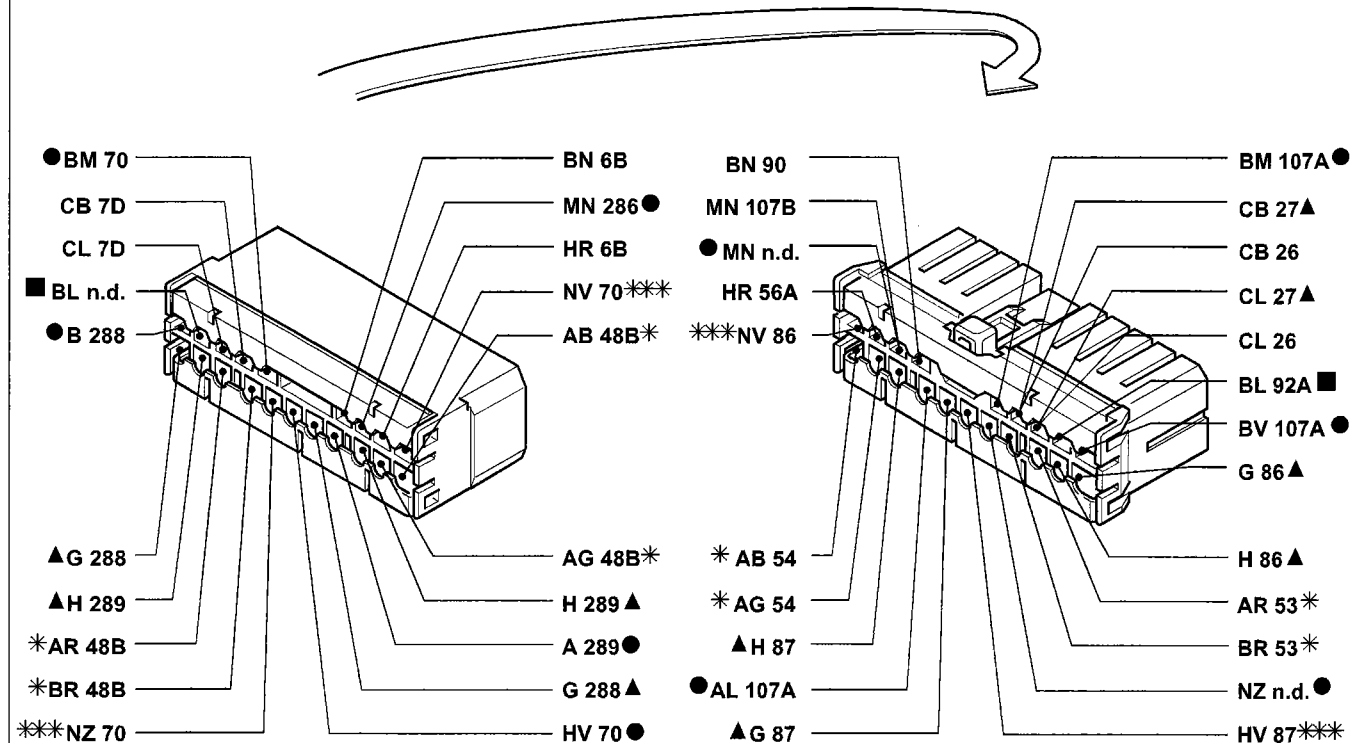


\* Variant connection for ELX trim levels with automatic transmission

### 91 Power relay

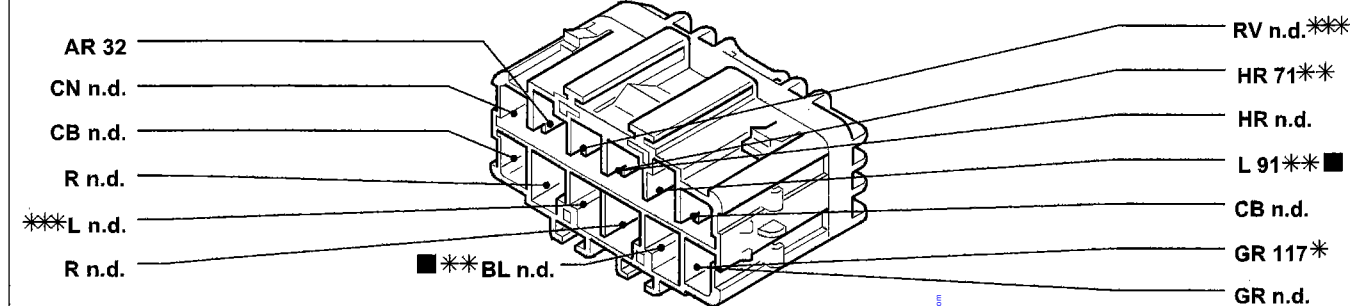


### 28 Dashboard/longitudinal cables connection



\* Variant connection for versions with top of the range radio  
 \*\*\* Variant connection for Bravo versions with alarm  
 ● Variant connection for versions with air conditioning  
 ▲ Variant connection for Brava versions

### 293 Fuse carrier base on dashboard cable



\* Variant connection for versions with passenger AIR-BAG and SIDE-BAG  
 \*\* Variant connection for trim level SX - GT  
 \*\*\* Variant connection for trim level ELX - HSX - HGT

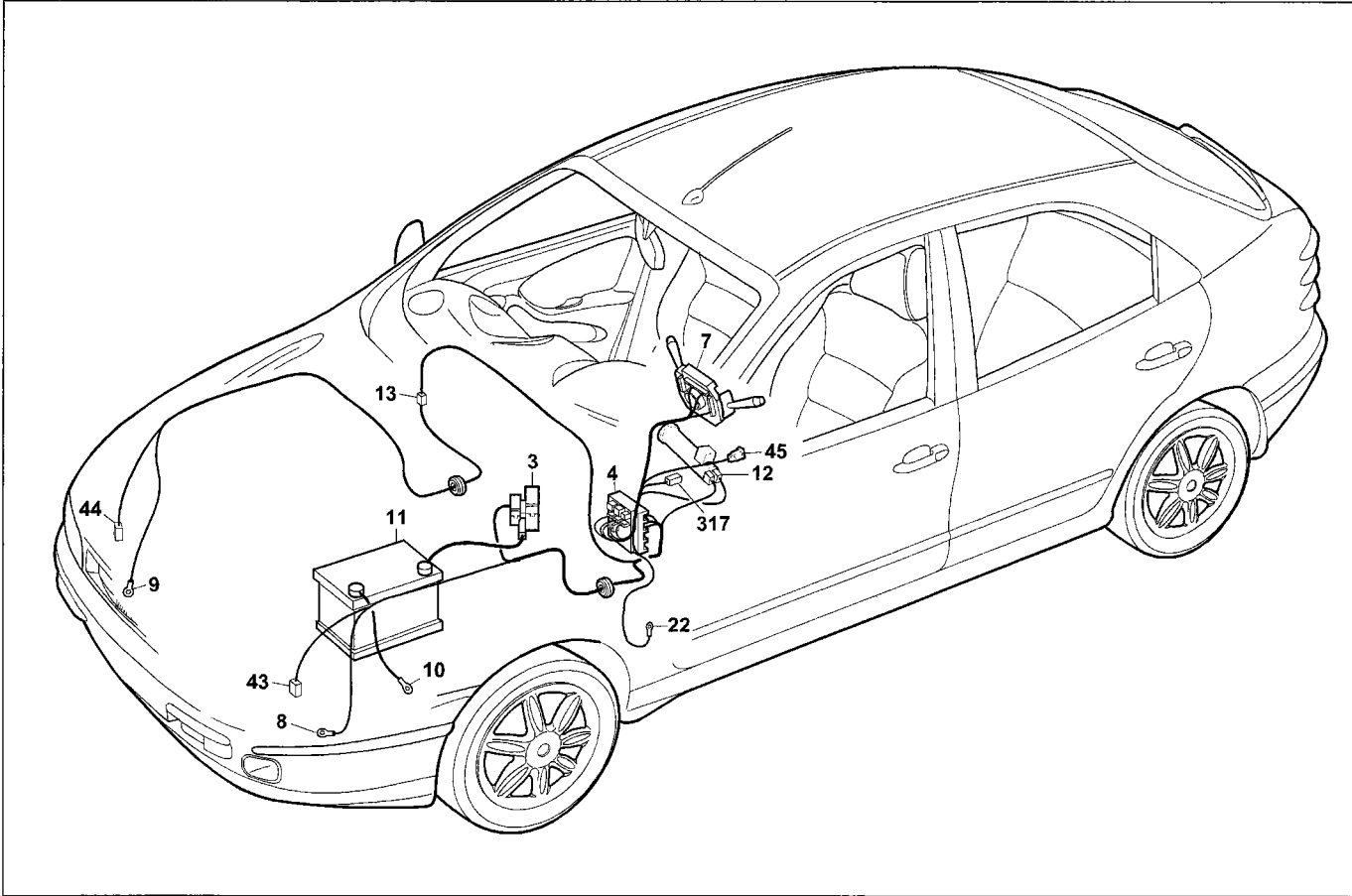
The cables in the wiring diagram are marked

P4A064101





55.

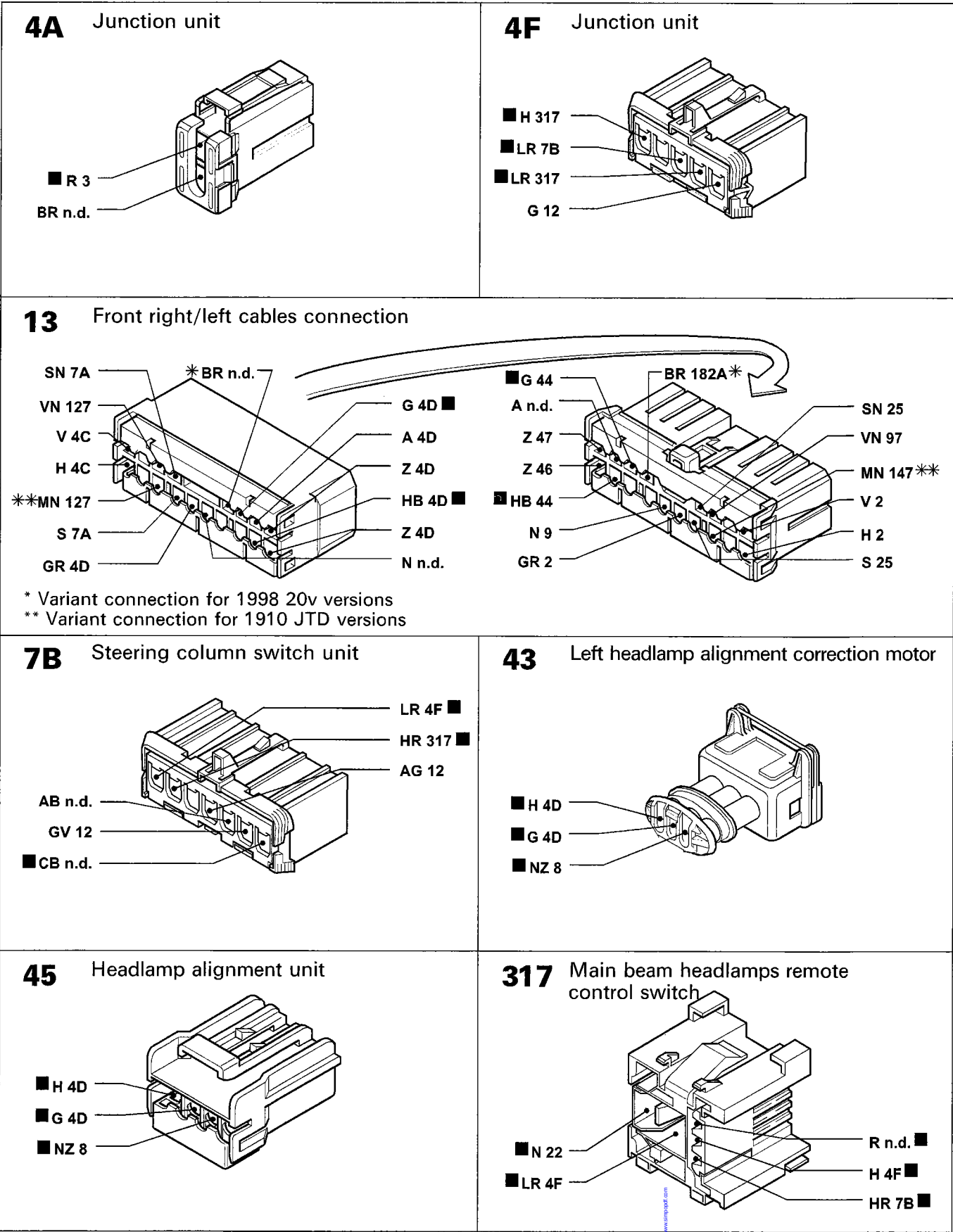


P4A059101

Headlamp alignment correction device

Components key

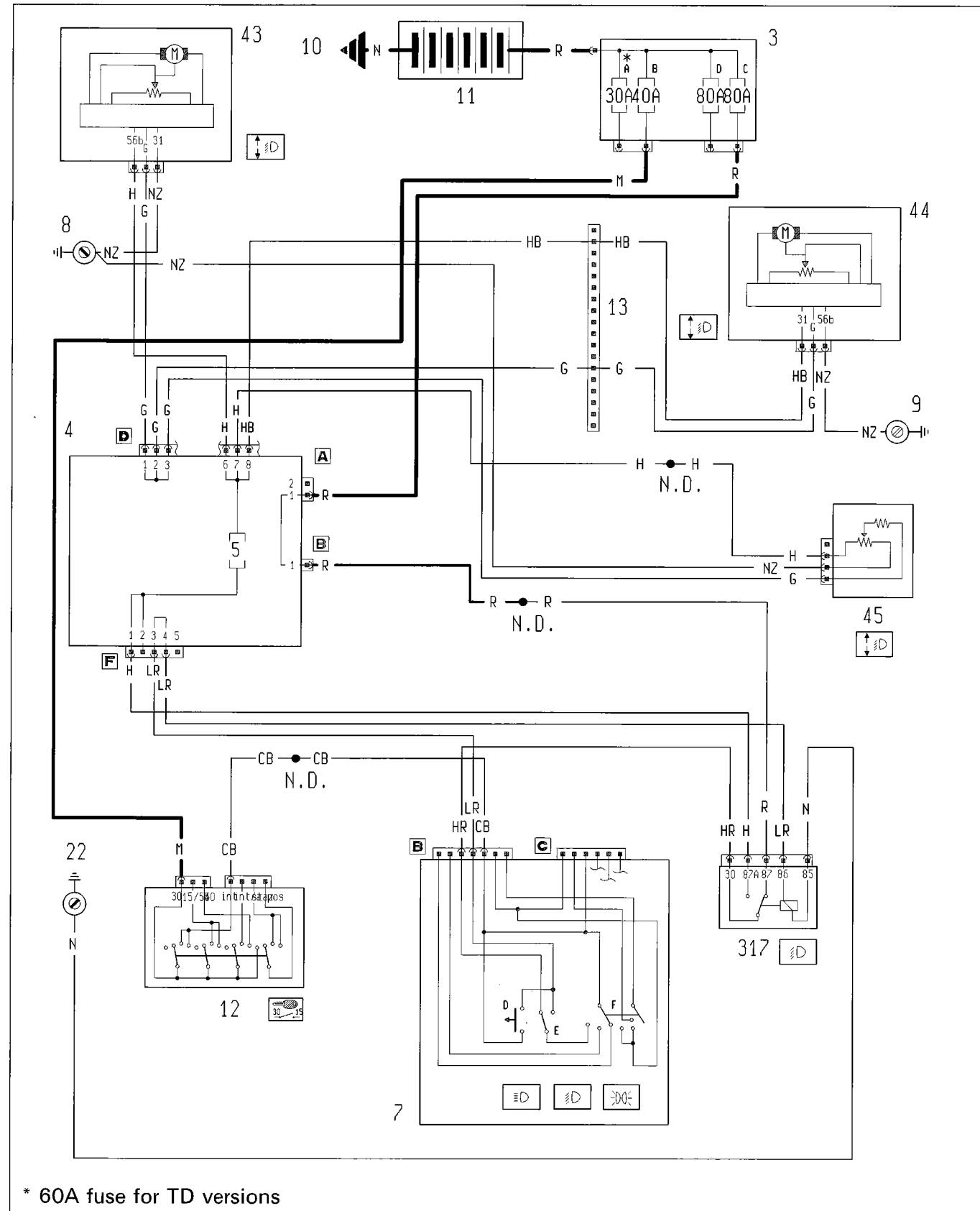
- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 7 Steering column switch unit:  
D Flasher control  
E Switch for dipped/main beam headlamps  
F Switch for side lights
- 8 Left front earth  
9 Right front earth  
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
13 Front right/left cables connection  
22 Left dashboard earth
- 43 Left headlamp alignment correction motor  
44 Right headlamp alignment correction motor  
45 Headlamp alignment control unit  
317 Remote control switch for main beam headlamps  
N.D. Ultrasound welding taped in cable loom



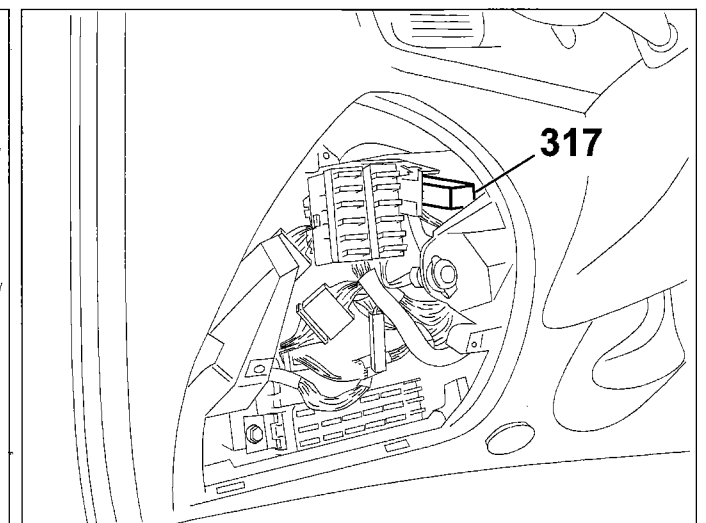
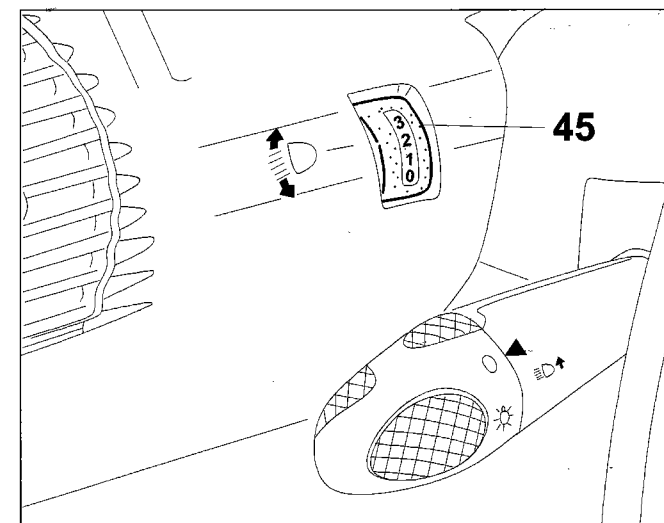
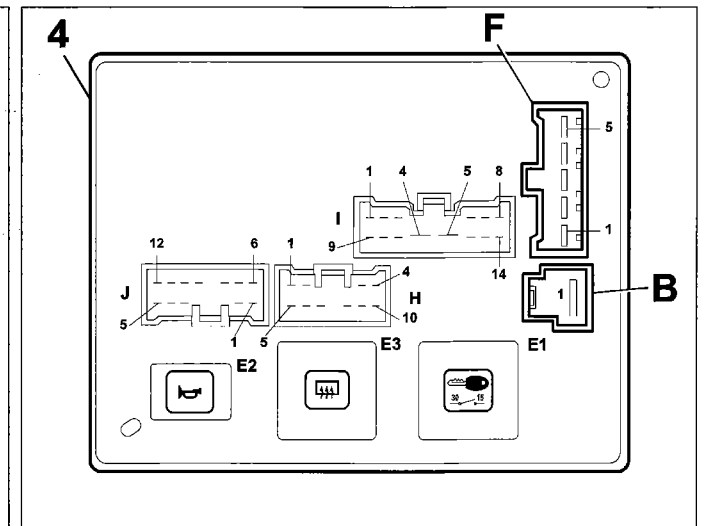
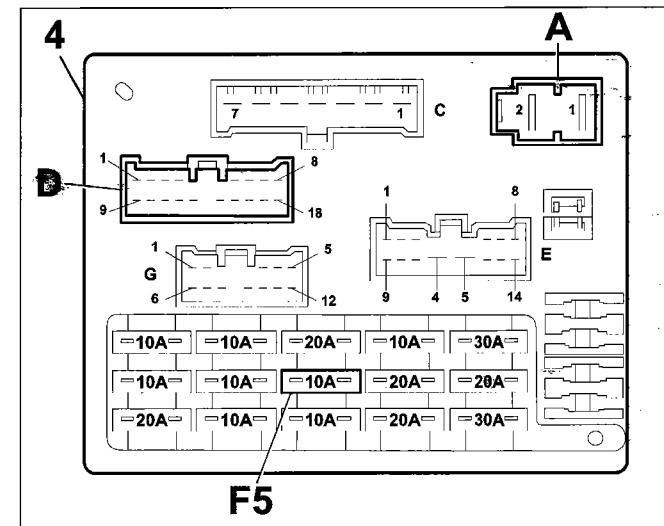
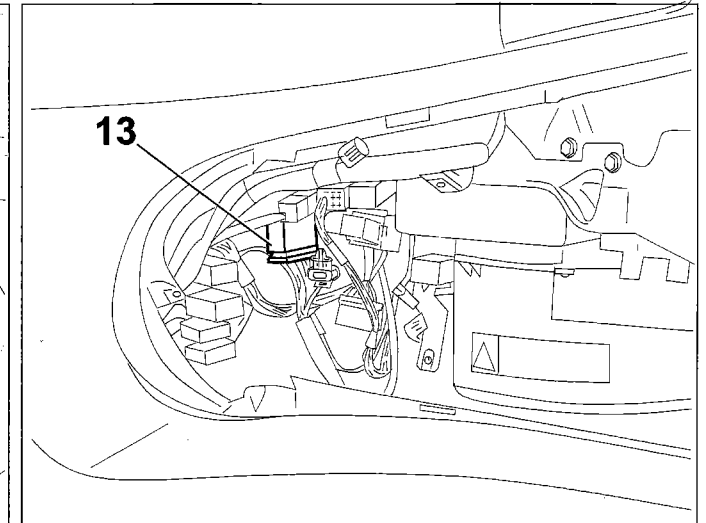
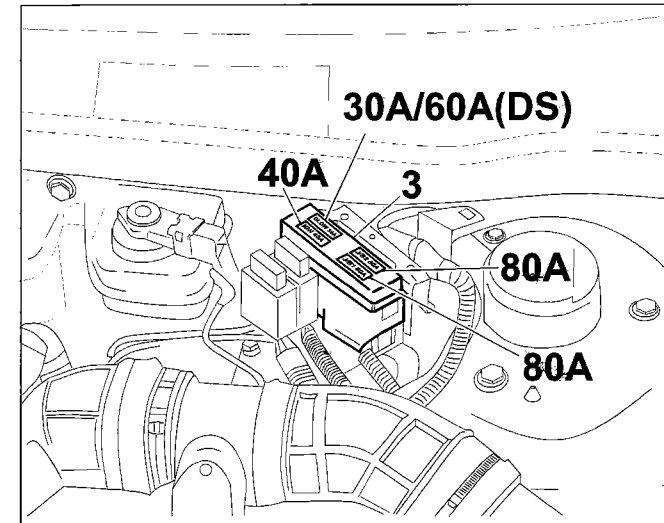
The cables in the wiring diagram are marked

P4A060101

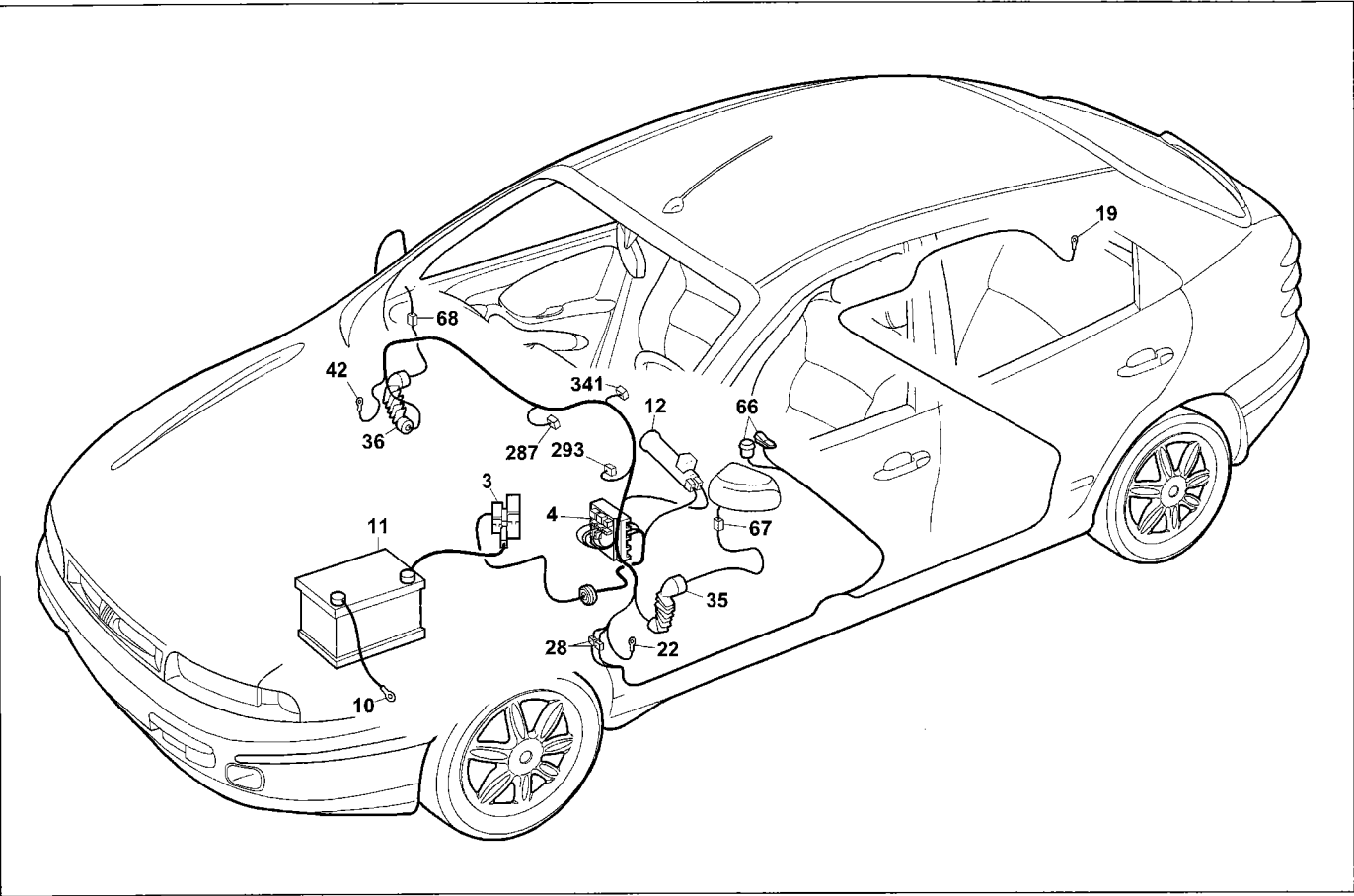
Headlamp alignment correction device - (See key at end of wiring diagrams)



Location of components



55.



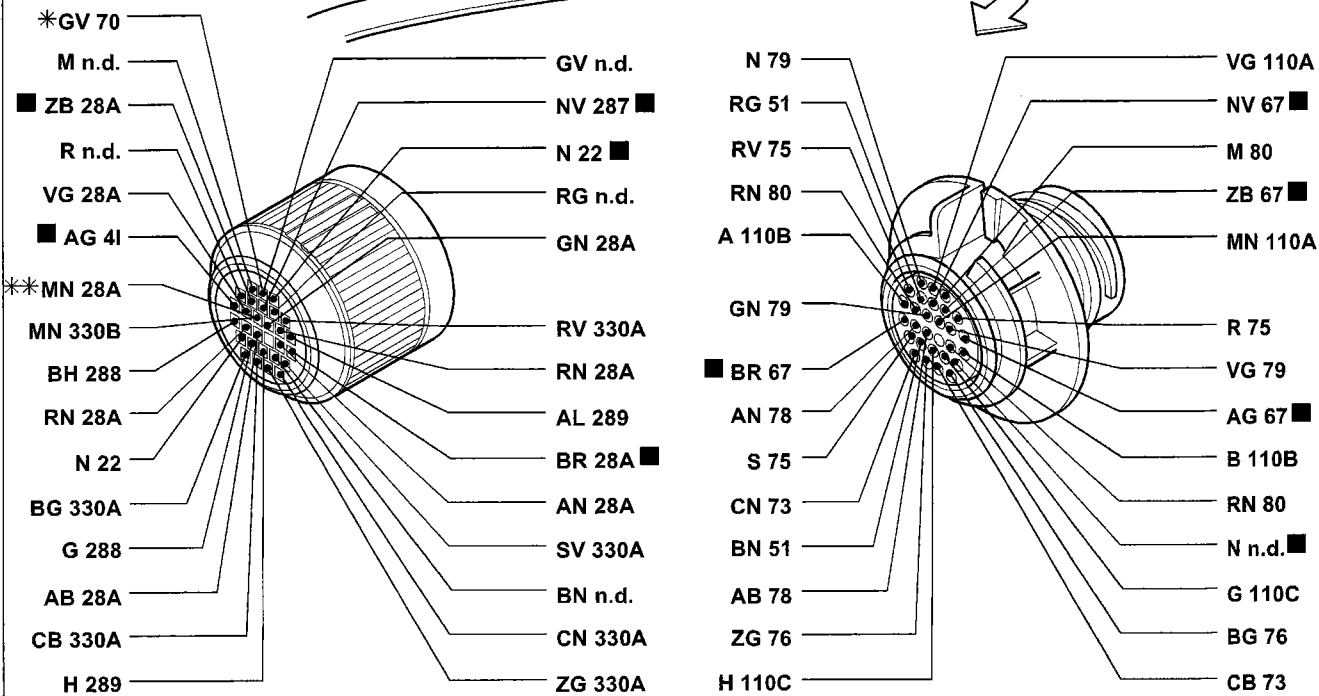
P4A055I01

Electrically adjustable, heated external rear view mirrors

Components key

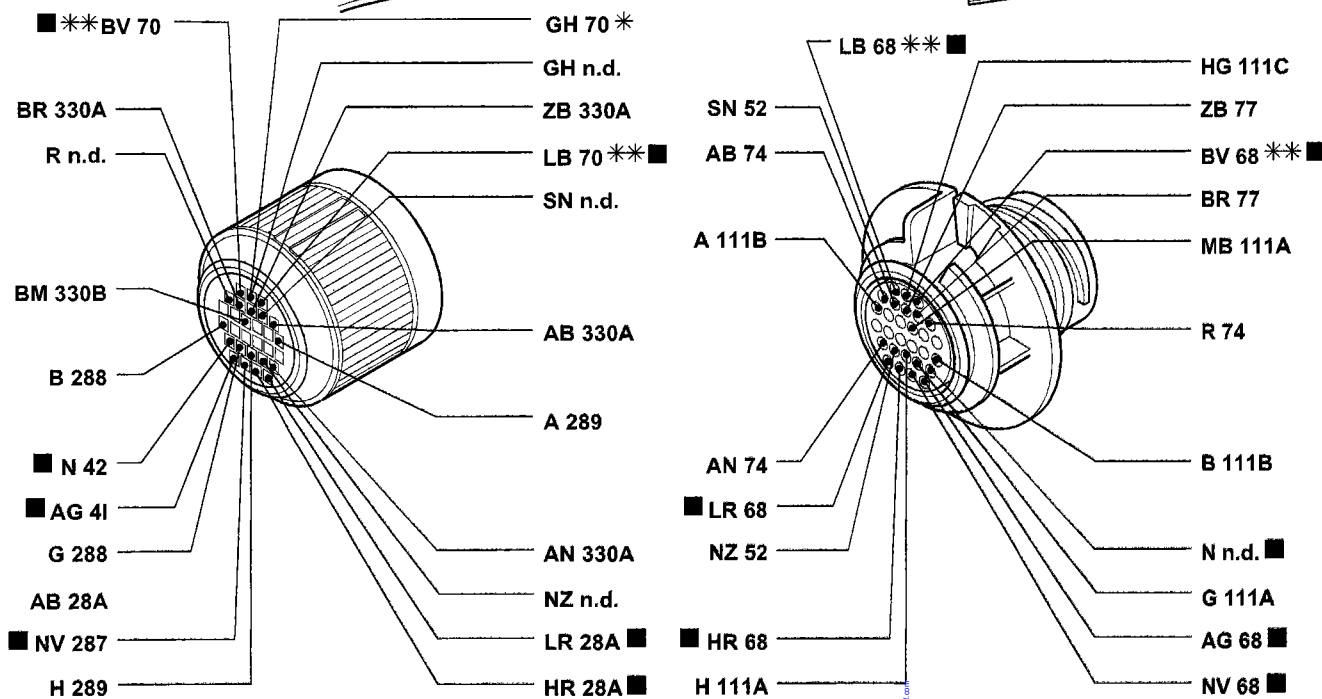
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit:
  - E3 Heated rear windscreen relay feed
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 19 Right rear earth
- 22 Left dashboard earth
- 28A Dashboard/longitudinal cables connection
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 66 External electrically adjusted rear view mirror control panel
- 67 Left electrically adjusted external rear view mirror
- 68 Right electrically adjusted external rear view mirror
- 287 Short circuit connection
- 293 Fuse carrier base on dashboard cable
  - A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors
- 341 Multi-purpose switch for electric mirrors
- 342 Power earth for electronic injection
- N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection



\* Variant connection for versions with alarm  
\*\* Variant connection for version with automatic transmission

36 Connection between dashboard/right side door cables



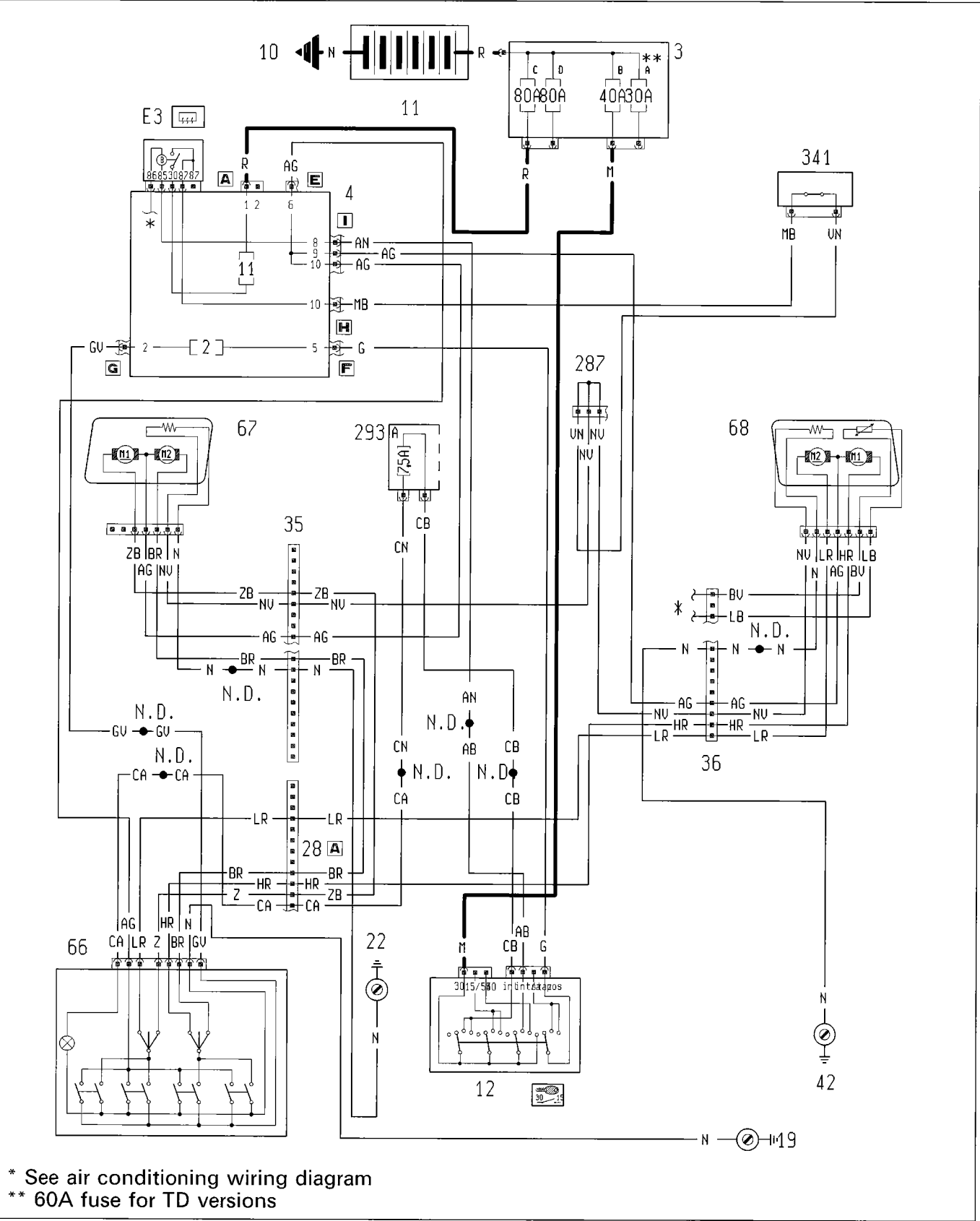
\* Variant connection for versions with alarm  
\*\* Variant connection for versions with air conditioning

The cables in the wiring diagram are marked

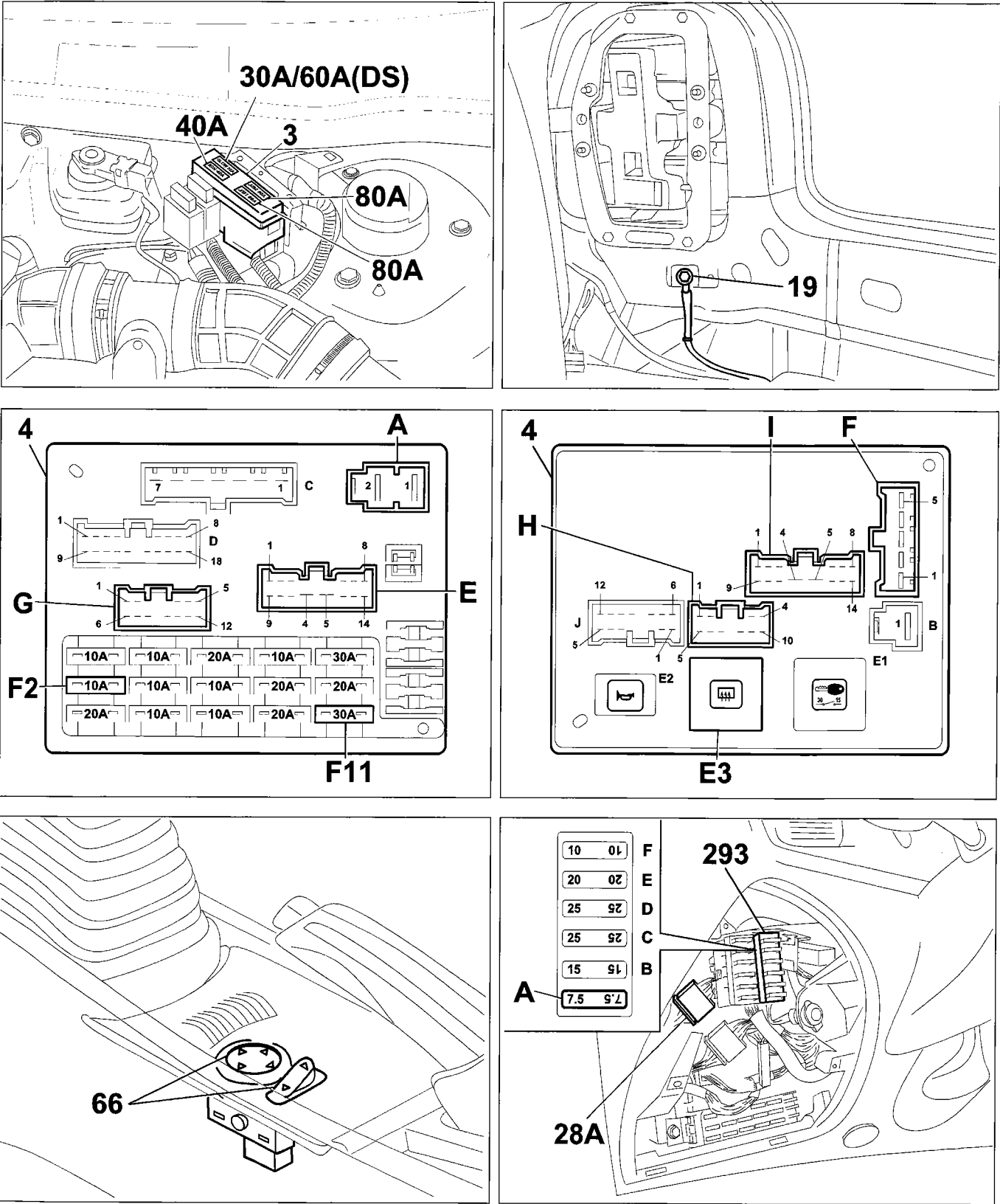
P4A056I01



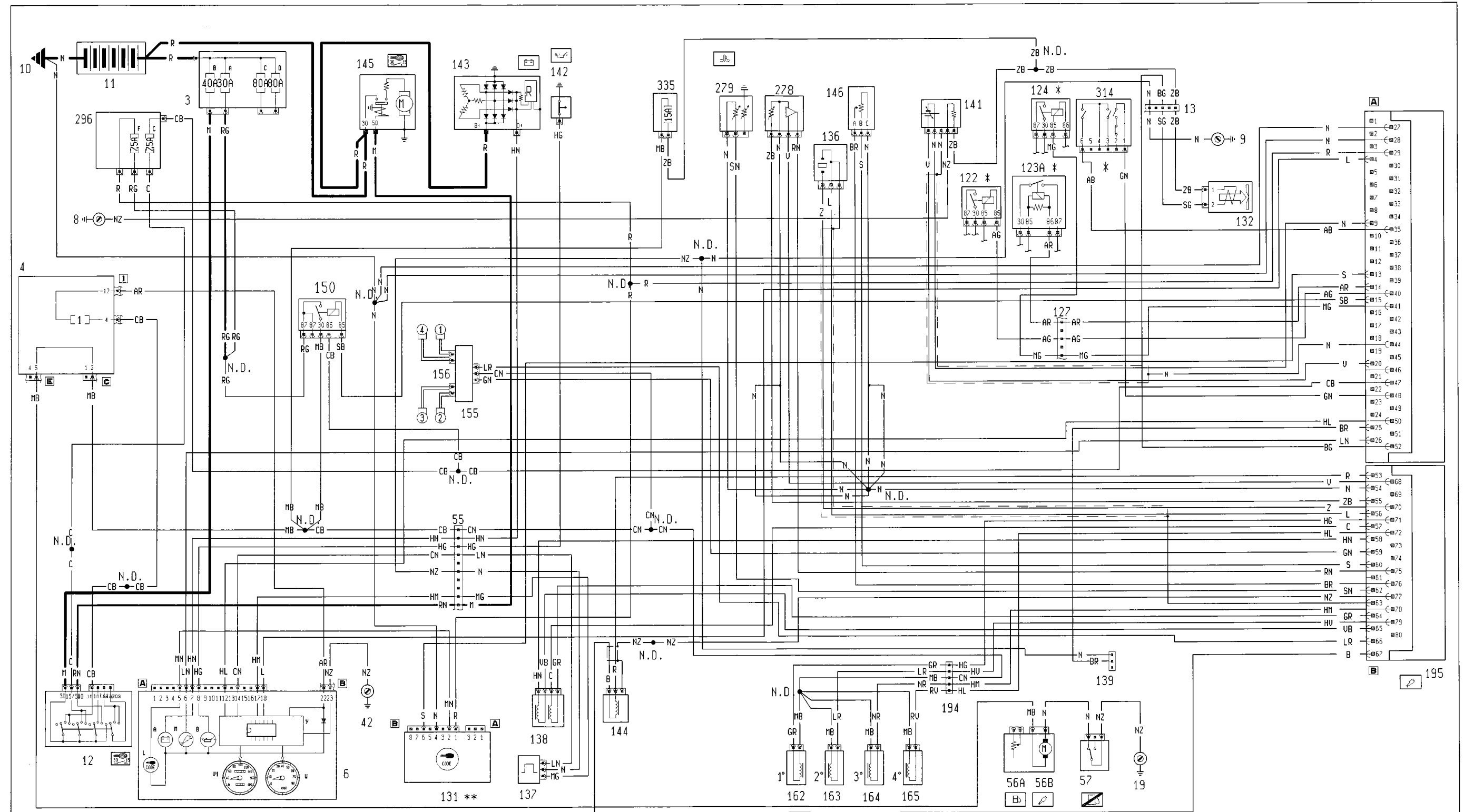
Electrically adjustable, heated external rear view mirrors - (See key at end of wiring diagrams)



Location of components

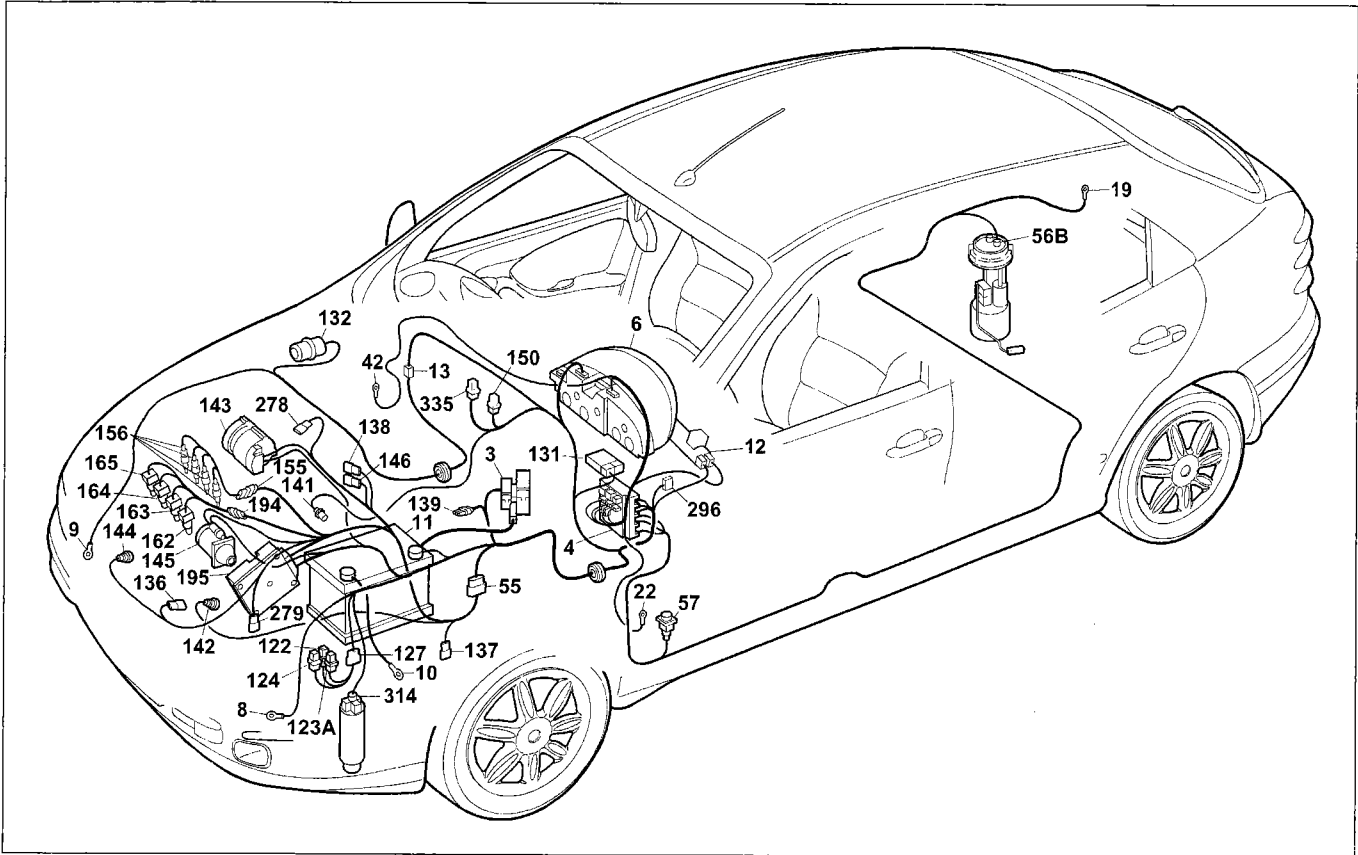


**Starting - IAW 49F Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and warning light - Rev counter - Speedometer - (See key at end of wiring diagrams)**



\* See air conditioning wiring diagram  
\*\* See Fiat-CODE wiring diagram

55.



P4A147101

Starting - IAW 49F Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and injection system failure warning light - Rev counter - Speedometer

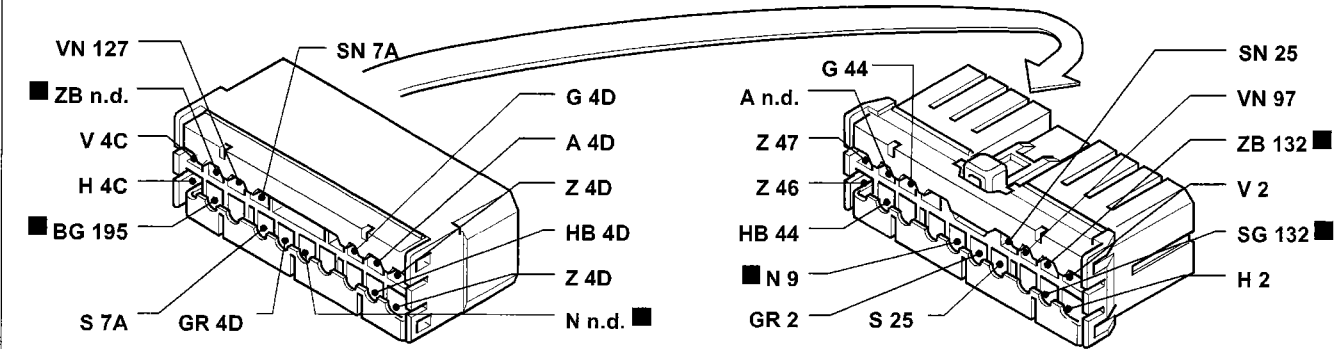
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - A Battery recharging warning light
  - B Insufficient engine oil pressure warning light
  - M Injection system failure warning light Petrol/DS
  - W Rev counter
  - Y Electronic module
- Y1 Speed control module
- 8 Left front earth
- 9 Right front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 19 Right rear earth
- 42 Right dashboard earth
- 55 Connection between front/engine pre-wiring cables
- 56 Fuel level gauge
  - A Fuel level sensor
  - B Electric fuel pump
- 57 Inertia switch
- 121 Three stage pressure switch
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed

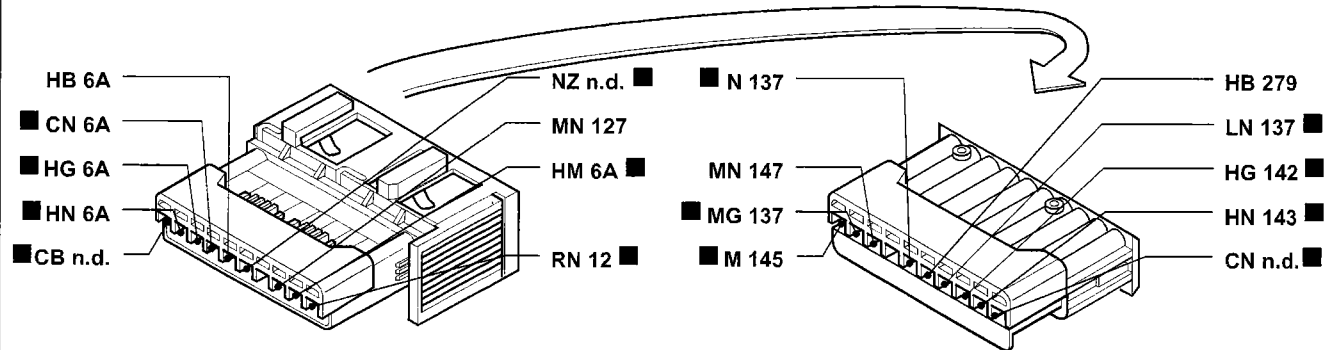
- 124 Engine cooling fan high speed relay feed
- 127 Connection between left front cable/cable on relay holder bracket
- 131 Fiat-CODE electronic control unit
- 132 Petrol vapour cut out solenoid valve (canister)
- 136 Detonation sensor
- 137 Vehicle speed sensor
- 138 Idle adjustment actuator motor
- 139 Diagnostic socket for injection system
- 141 Heated Lambda sensor
- 142 Switch signalling insufficient engine oil pressure
- 143 Alternator
- 144 Rpm and T.D.C. sensor
- 145 Starter motor
- 146 Potentiometer on butterfly valve
- 150 Injection system relay feed
- 155 Ignition coils
- 156 Spark plugs
- 162 Injector (1)
- 163 Injector (2)
- 164 Injector (3)
- 165 Injector (4)
- 194 Injection cables/injector band connection
- 195 Injection/ignition electronic control unit (1581)
- 278 Integrated air temperature/pressure sender unit
- 279 Twin engine coolant temperature sender unit
- 296 Fuse carrier base on front cable
  - C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection
  - F 7.5A fuse protecting electronic injection system/ Fiat - CODE
- 335 15A fuse protecting Lambda sensor

N.D. Ultrasound welding taped in cable loom

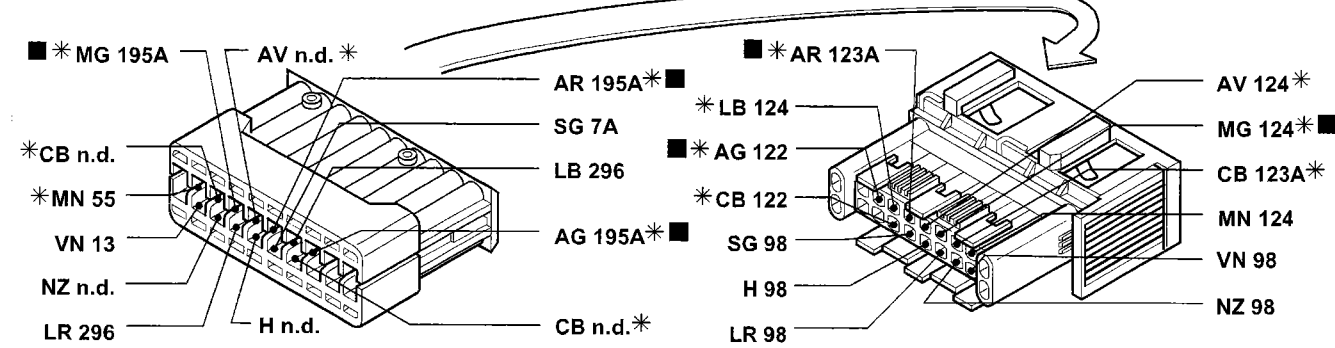
13 Front right/left cables connection



55 Connection between front/engine pre-wiring cables

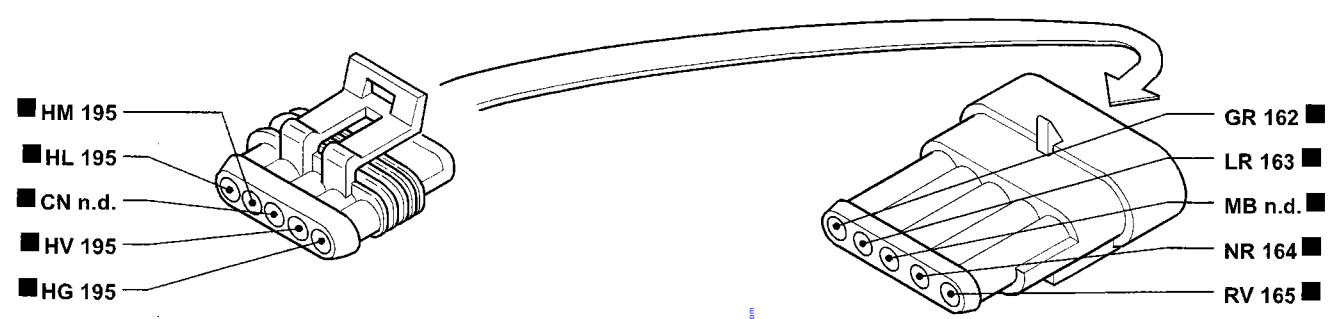


127 Connection between left front cable/cable on relay holder bracket



\* Variant connection for versions with air conditioning

194 Injection cables/injector band connection



P4A148101

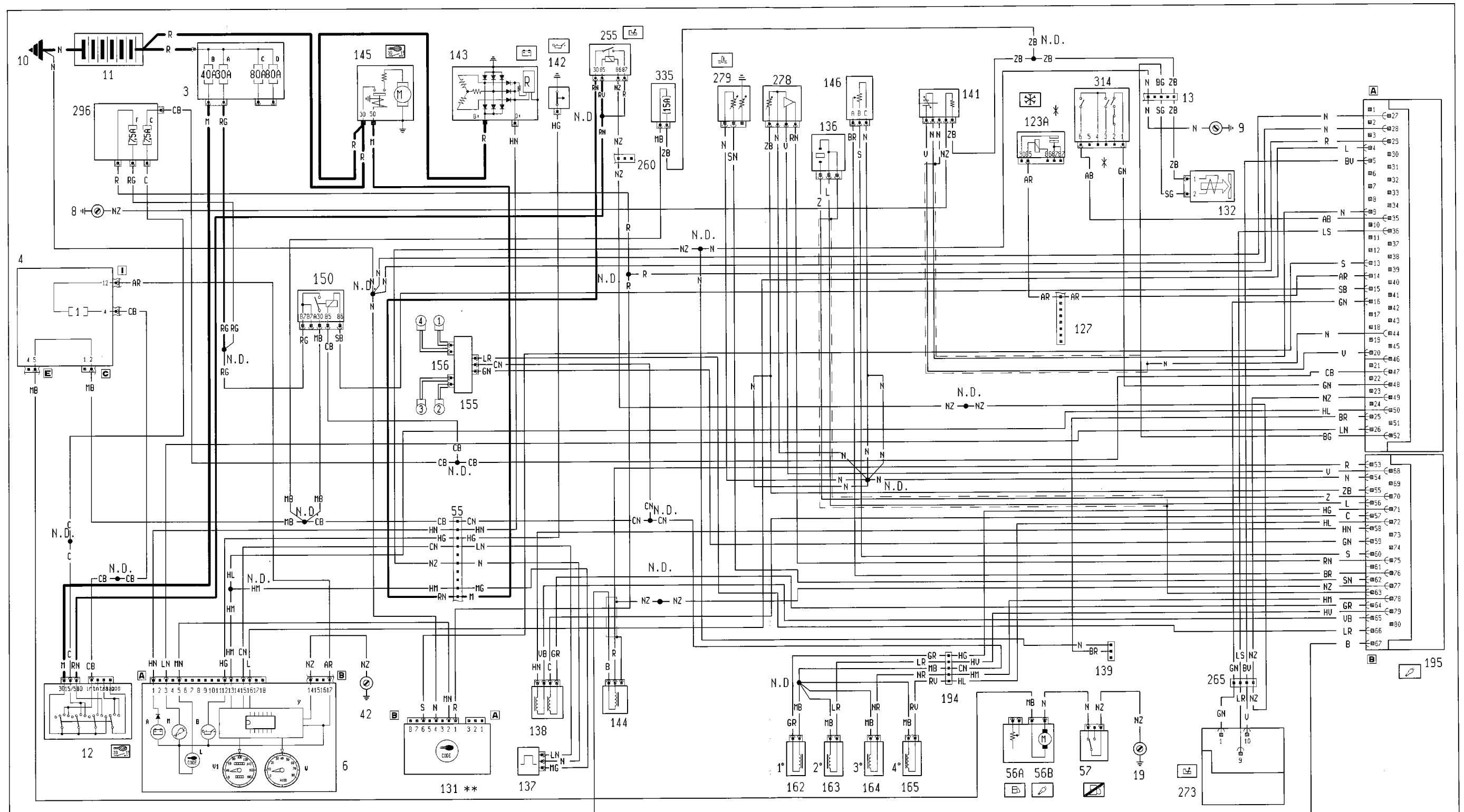
The cables in the wiring diagram are marked

4A1481

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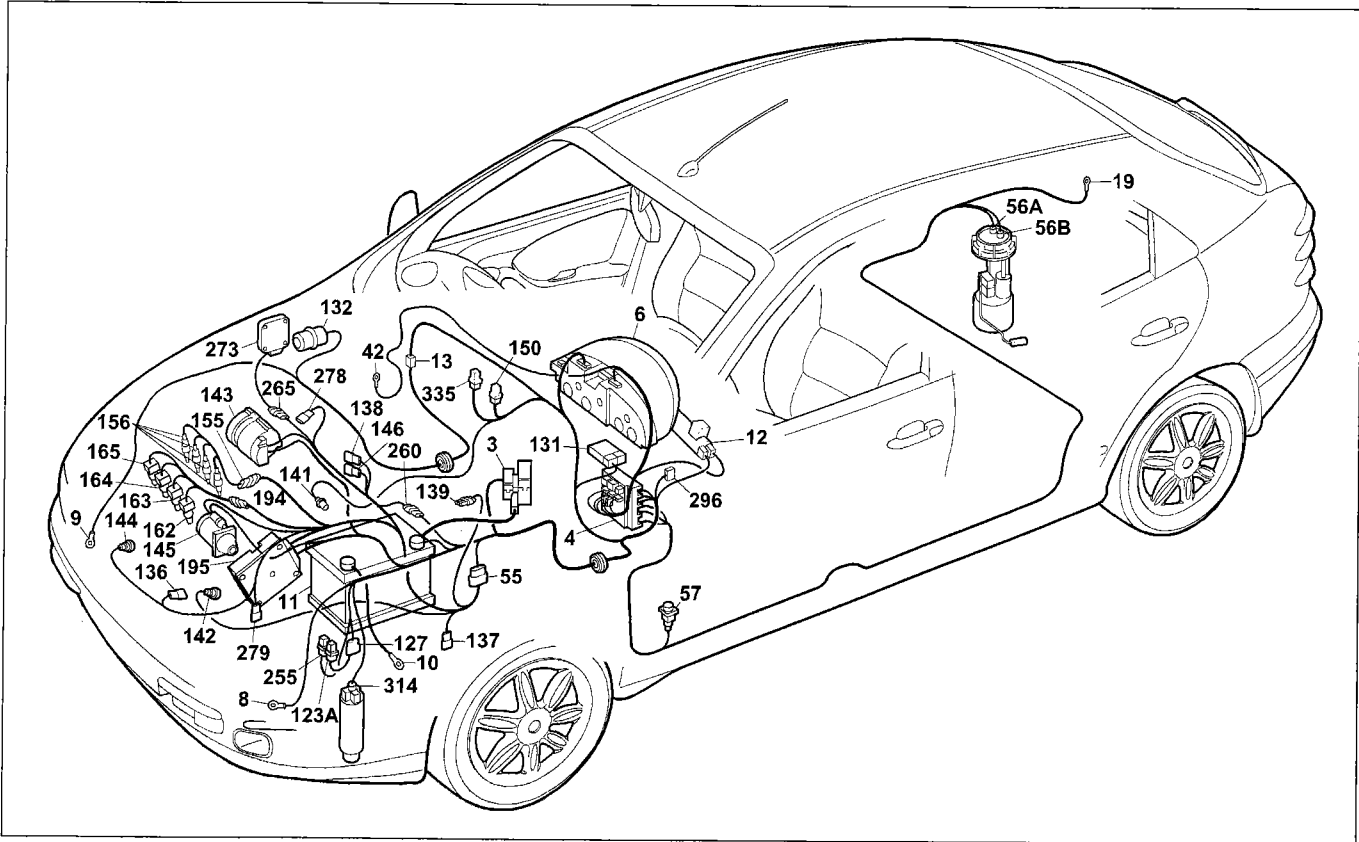


**Version with automatic transmission**  
**Starting - Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and warning light - Rev counter - Speedometer - (See key at end of wiring diagrams)**



\* See air conditioning wiring diagram  
\*\* See Fiat-CODE wiring diagram

55.



Version with automatic transmission

Starting - Electronic injection and ignition - Recharging and warning light - Warning light signalling system failure - Insufficient engine oil pressure warning light - Fiat-CODE and injection system failure warning light - Rev counter - Speedometer

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

4 Junction unit

6 Instrument panel:  
A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
M Injection system failure warning light Petrol/DS  
W Rev counter  
Y Electronic module  
V1 Speedometer

8 Left front earth

9 Right front earth

10 Earth for battery on bodyside

11 Battery

12 Ignition switch

13 Front right/left cables connection

19 Right rear earth

42 Right dashboard earth

55 Connection between front/engine pre-wiring cables

56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump

57 Inertia switch

123A Engine cooling fan high speed relay feed

127 Connection between left front cables/cable on relay holder bracket

131 Fiat-CODE electronic control unit

132 Petrol vapour cut out solenoid valve (canister)

136 Detonation sensor
- 137 Vehicle speed sensor

138 Idle adjustment actuator motor

139 Diagnostic socket for injection system

141 Heated Lambda sensor

142 Switch signalling insufficient engine oil pressure

143 Alternator

144 Rpm and T.D.C. sensor

145 Starter motor

146 Potentiometer on butterfly valve

150 Injection system relay feed

155 Ignition coils

156 Spark plugs

162 Injector (1 )

163 Injector (2 )

164 Injector (3 )

165 Injector (4 )

194 Injection cables/injector band connection

195 Injection/ignition electronic control unit (1581)

255 Starting go ahead relay for automatic transmission

260 Connection between front/automatic transmission cables

265 Connection between automatic transmission/injection cables

273 Automatic transmission electronic control unit

278 Integrated air temperature/pressure sender unit

279 Twin engine coolant temperature sender unit

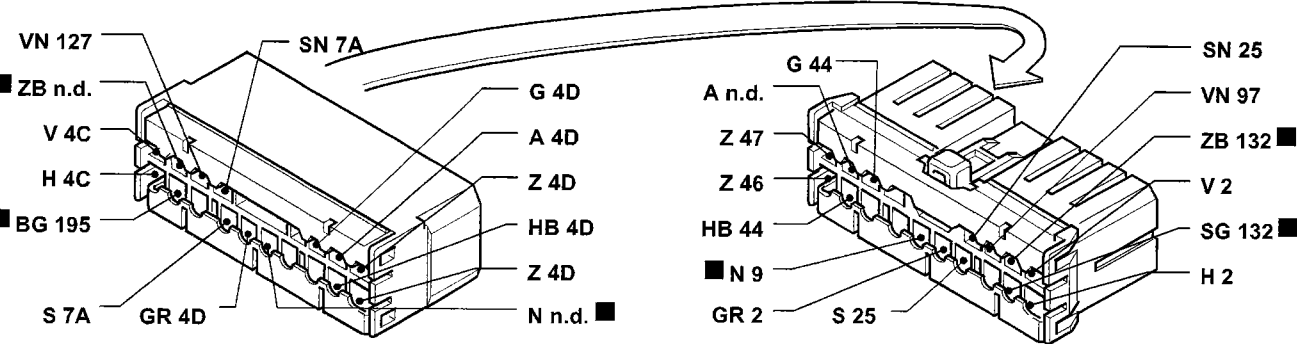
296 Fuse carrier base on front cable  
C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection  
F 7.5A fuse protecting electronic injection system/ Fiat-CODE

314 Four stage pressure switch

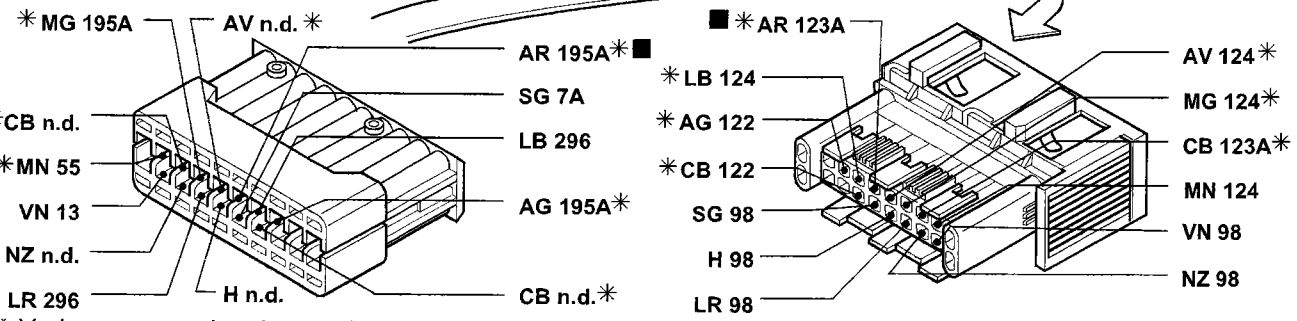
335 15A fuse protecting Lambda sensor

N.D. Ultrasound welding taped in cable loom

13 Front right/left cables connection

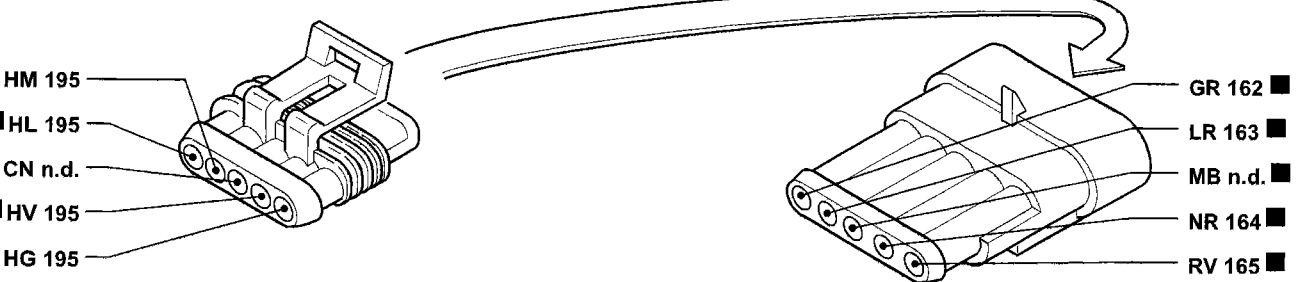


127 Connection between left front cable/cable on relay holder bracket

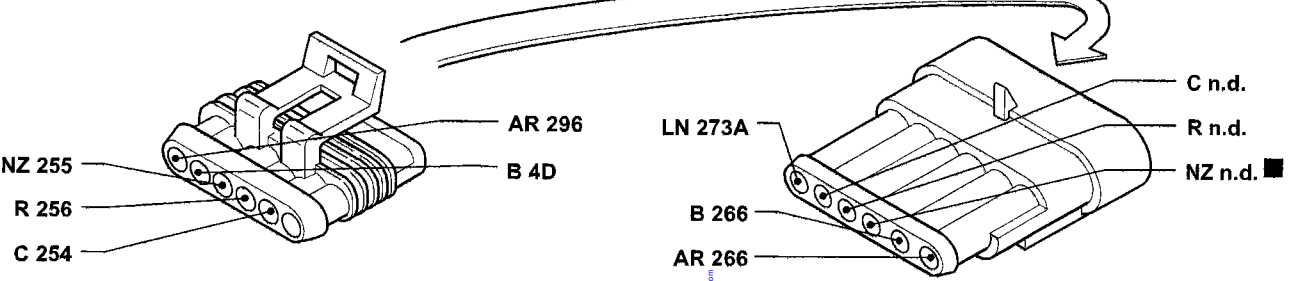


\* Variant connection for versions with air conditioning

194 Injection cables/injector band connection



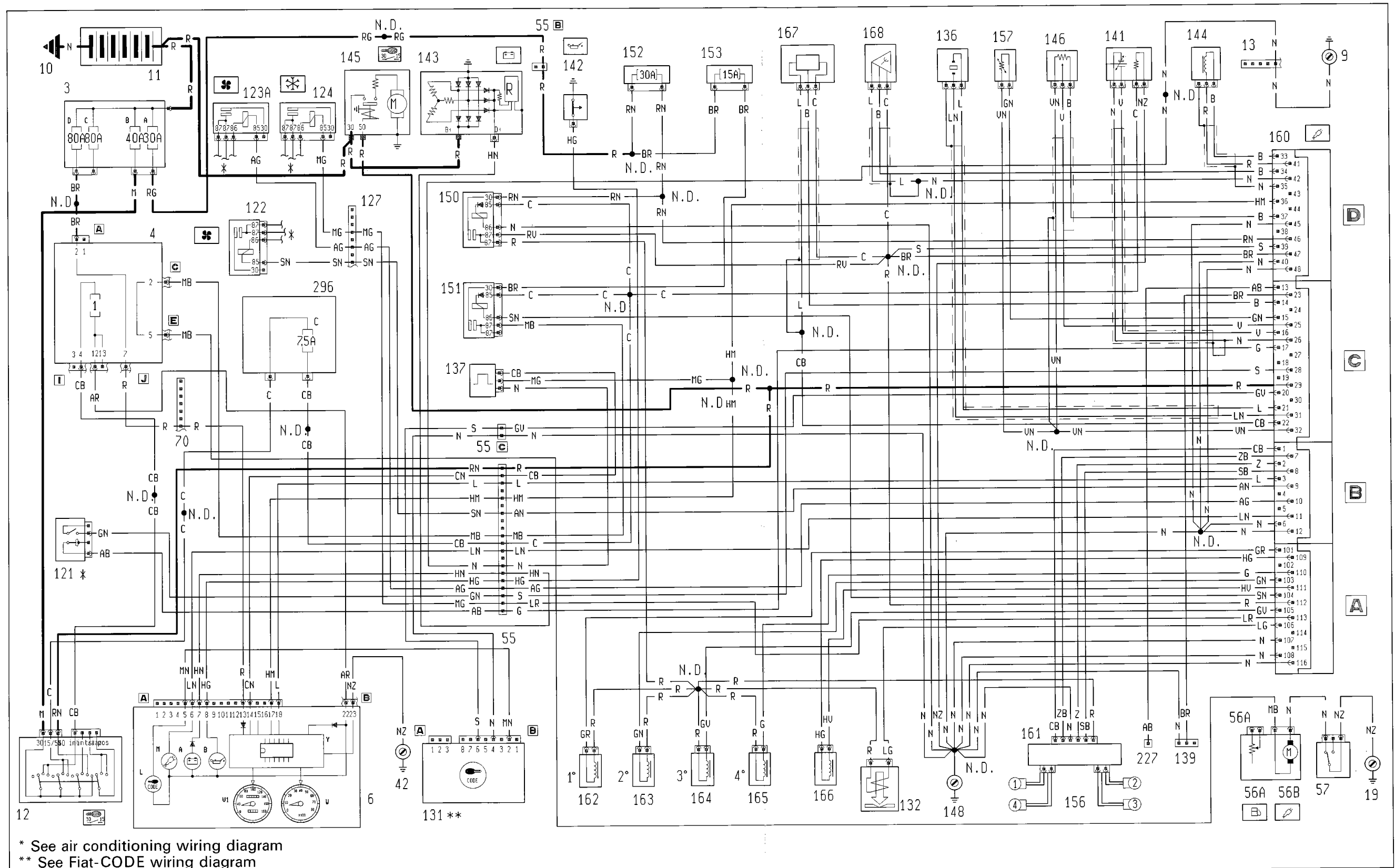
260 Connection between front/automatic transmission cables



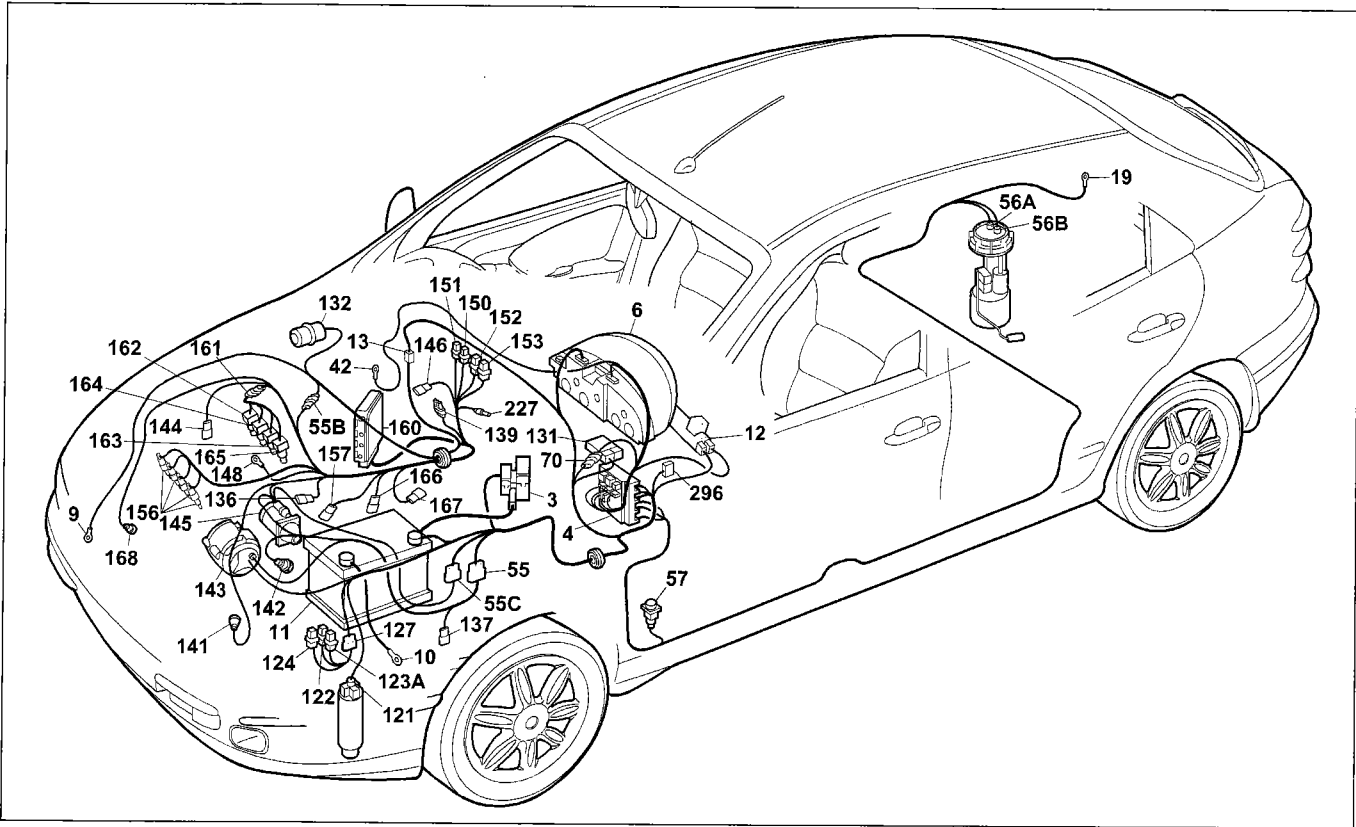
The cables in the wiring diagram are marked

P4A152101

**Starting - Hitachi MFI-003 Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and warning light - Rev counter - Speedometer - (See key at end of wiring diagrams)**



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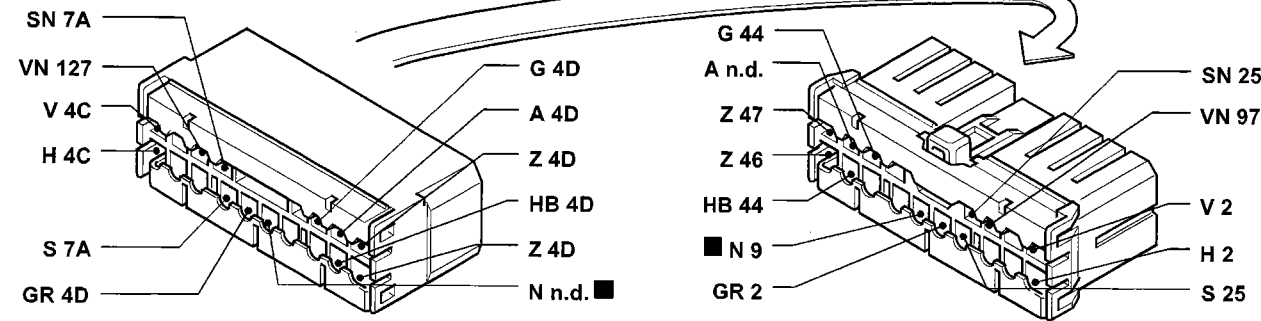
Starting - Hitachi MFI-003 Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and injection system failure warning light - Rev counter - Speedometer

Components key

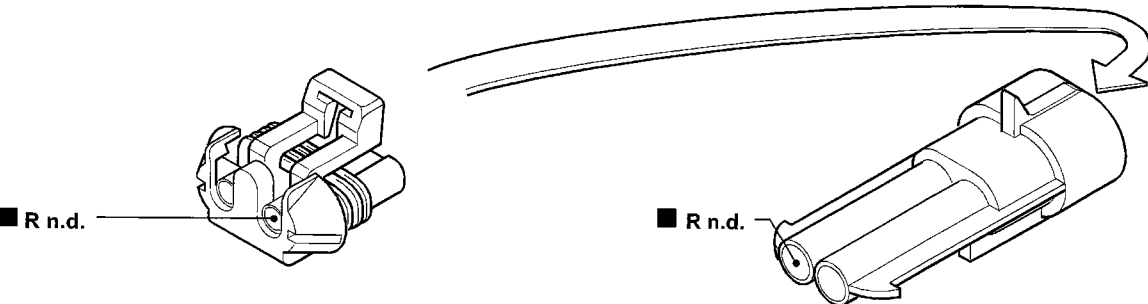
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - A Battery recharging warning light
  - B Insufficient engine oil pressure warning light
  - M Injection system failure warning light Petrol/DS
  - V1 Speedometer
  - W Rev counter
  - Y Electronic module
- 9 Right front earth
- 10 Earth for battery on bodysell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 19 Right rear earth
- 42 Right dashboard earth
- 55 Connection between front/engine pre-wiring cables
- 55A Connection between front/engine pre-wiring cables
- 55B Connection between front/engine pre-wiring cables
- 56 Fuel level gauge
  - A Fuel level sensor
  - B Electric fuel pump
- 57 Inertia switch
- 70 Dashboard/front cables connection
- 121 Three stage pressure switch
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed
- 124 Air conditioning compressor relay
- 127 Connection between left front cable/cable on relay holder bracket
- 131 Fiat-CODE electronic control unit
- 132 Petrol vapour cut out solenoid valve (canister)
- 136 Detonation sensor
- 137 Vehicle speed sensor
- 139 Diagnostic socket for injection system
- 141 Heated Lambda sensor
- 142 Switch signalling insufficient engine oil pressure
- 143 Alternator
- 144 Rpm and T.D.C. sensor
- 145 Starter motor
- 146 Potentiometer on butterfly valve
- 148 Earth for electronic injection
- 150 Injection system relay feed
- 151 Relay feed for Lambda sensor, electric fuel pump, injector
- 152 10A protective fuse for injection system (25A for 1581; 30A for 1747. 7.5A for 1998)
- 153 10A protective fuse for electric fuel pump, Lambda sensor (15A for 1747)
- 156 Spark plugs
- 157 Coolant temperature sensor for injection system
- 160 Injection/ignition electronic control unit (1747)
- 161 Ignition power module
- 162 Injector (1)
- 163 Injector (2)
- 164 Injector (3)
- 165 Injector (4)
- 166 Idle adjustment actuator
- 167 Air flow meter
- 168 Timing sensor
- 227 Diagnostic socket for injection system (1747)
- 296 Fuse carrier base on front cable
  - C 7.5A fuse protecting Fiat-CODE cooling system/ electronic injection

N.D. Ultrasound welding taped in cable loom

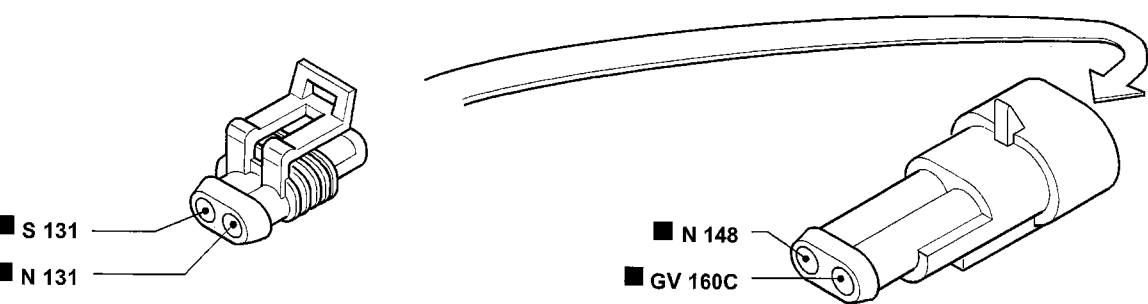
13 Front right/left cables connection



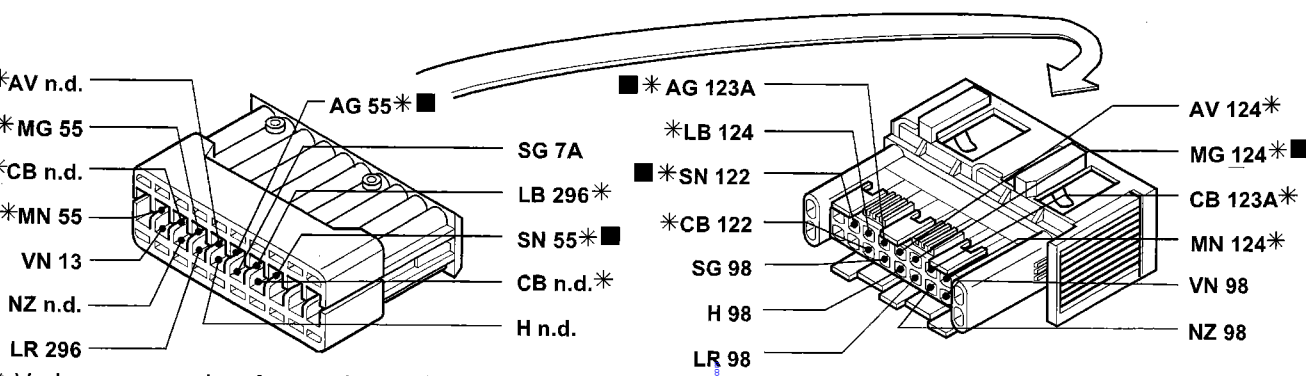
55B Connection between front/engine pre-wiring cables



55C Connection between front/engine pre-wiring cables



127 Connection between left front cable/cable on relay holder bracket

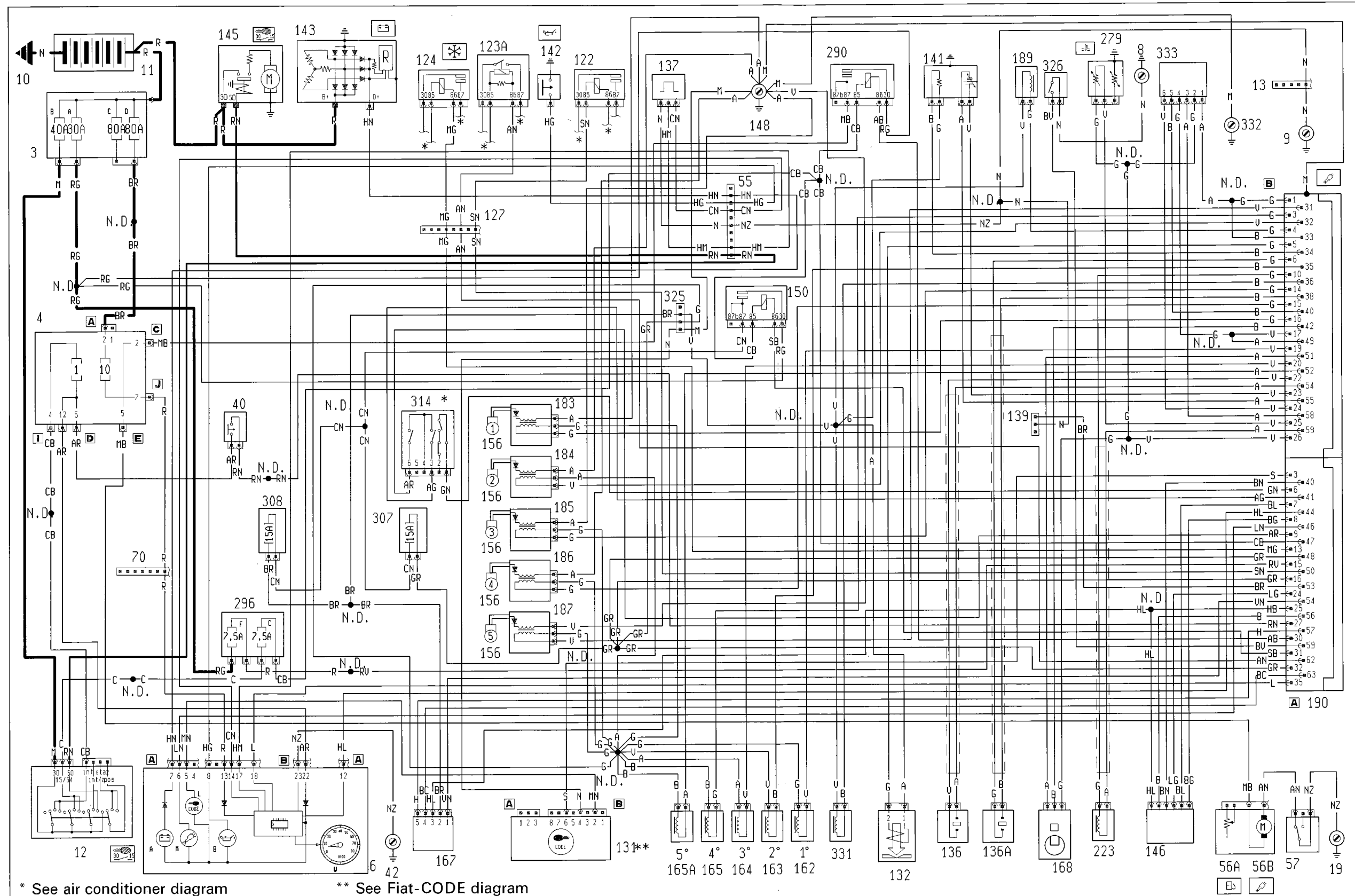


\* Variant connection for versions with air conditioning

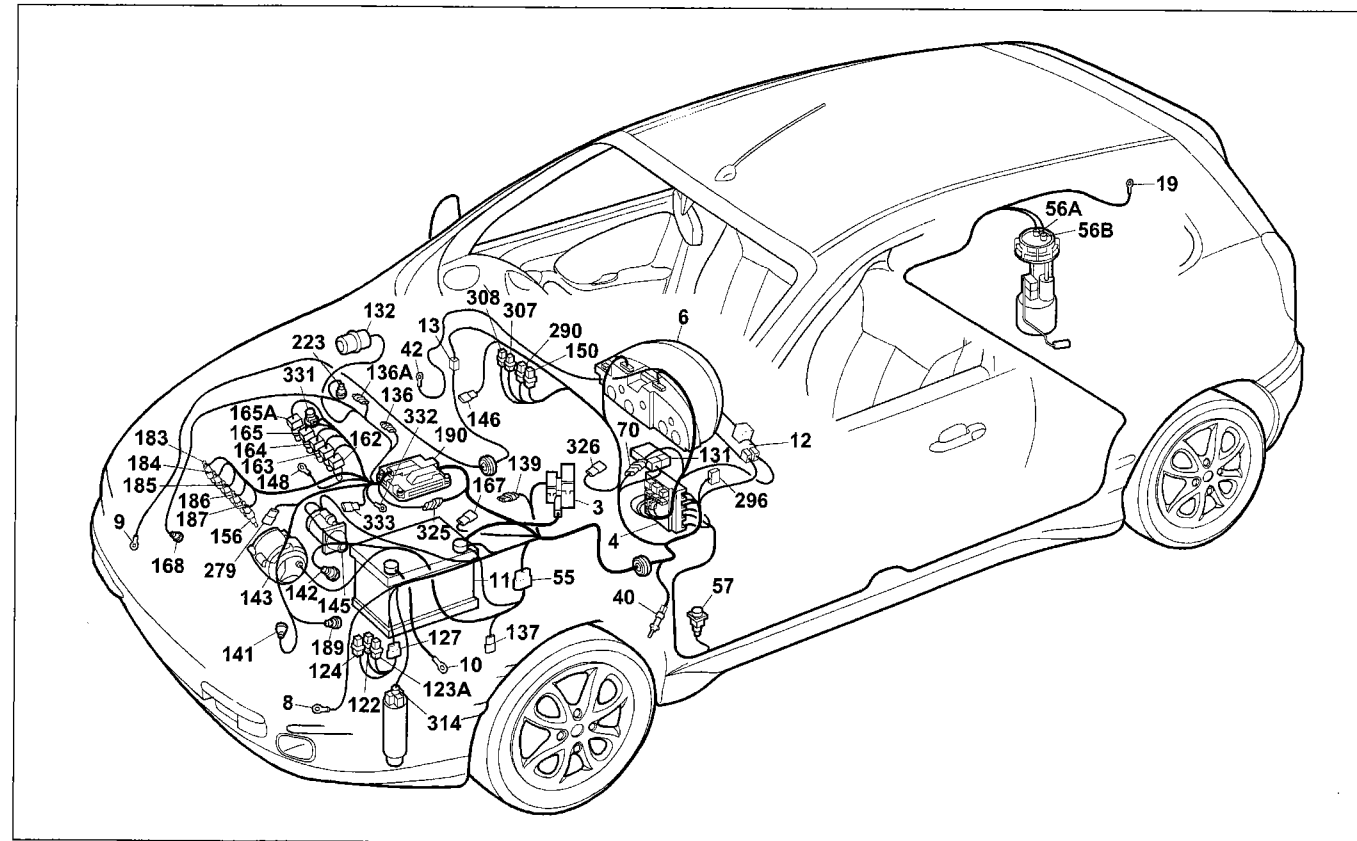
The cables in the wiring diagram are marked



**Starting - Bosch Motronic ME 3.1 Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and warning light - Rev counter - (See key at end of wiring diagrams)**



### 55.



P4A159I01

**Starting - Bosch Motronic ME 3.1 Electronic injection and ignition - Recharging and warning light - Warning light signalling injection system failure - Insufficient engine oil pressure warning light - Fiat-CODE and warning light - Rev counter**

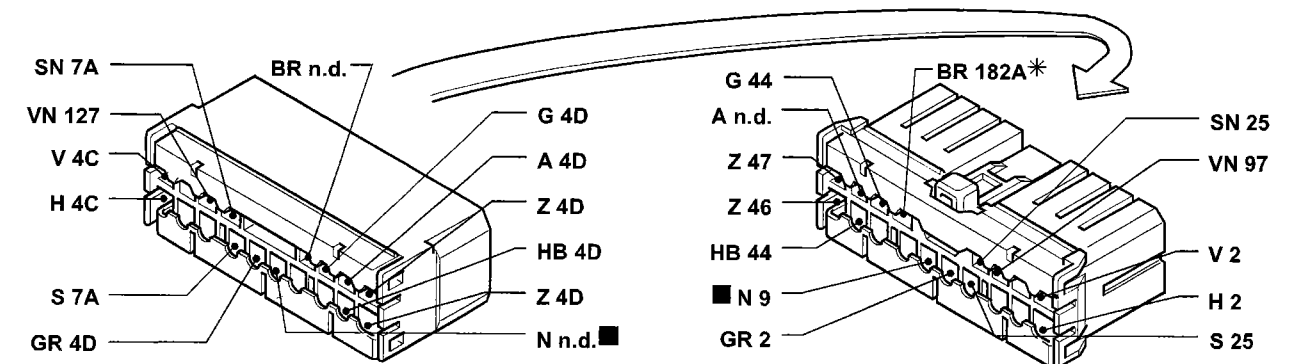
#### Components key

- |                                                                  |                                                                       |
|------------------------------------------------------------------|-----------------------------------------------------------------------|
| 3 Power fuse box:                                                | 141 Heated Lambda sensor                                              |
| A 30A protective fuse for injection system (60A for TD versions) | 142 Switch signalling insufficient engine oil pressure                |
| B 40A protective fuse for ignition system                        | 143 Alternator                                                        |
| C 80A fuse protecting additional options                         | 145 Starter motor                                                     |
| D 80A protective fuse for junction unit                          | 146 Potentiometer on butterfly valve                                  |
| 4 Junction unit                                                  | 148 Earth for electronic injection                                    |
| 6 Instrument panel:                                              | 150 Injection system relay feed                                       |
| A Battery recharging warning light                               | 156 Spark plugs                                                       |
| B Insufficient engine oil pressure warning light                 | 162 Injector (1)                                                      |
| M Injection system failure warning light Petrol/DS               | 163 Injector (2)                                                      |
| W Rev counter                                                    | 164 Injector (3)                                                      |
| 8 Left front earth                                               | 165 Injector (4)                                                      |
| 9 Right front earth                                              | 165A Injector (5)                                                     |
| 10 Earth for battery on bodysell                                 | 167 Air flow meter                                                    |
| 11 Battery                                                       | 168 Timing sensor                                                     |
| 12 Ignition switch                                               | 183 Ignition coil (1)                                                 |
| 13 Front right/left cables connection                            | 184 Ignition coil (2)                                                 |
| 19 Right rear earth                                              | 185 Ignition coil (3)                                                 |
| 40 Brake lights control switch                                   | 186 Ignition coil (4)                                                 |
| 42 Right dashboard earth                                         | 187 Ignition coil (5)                                                 |
| 55 Connection between front/engine pre-wiring cables             | 189 Phase transformer                                                 |
| 56 Fuel level gauge                                              | 190 Injection/ignition electronic control unit (1998)                 |
| A Fuel level sensor                                              | 223 Rpm sensor                                                        |
| B Electric fuel pump                                             | 279 Twin engine coolant temperature sender unit                       |
| 57 Inertia switch                                                | 290 Electric fuel pump relay feed                                     |
| 70 Dashboard/front cables connection                             | 296 Fuse carrier base on front cable                                  |
| 122 Engine cooling fan low speed relay feed                      | C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection |
| 123A Engine cooling fan high speed relay feed                    | F 7.5A fuse protecting electronic injection system/Fiat -CODE         |
| 124 Air conditioning compressor relay                            | 307 15A fuse protecting injection system                              |
| 127 Front left cables/cable on relay holder bracket connection   | 308 15A fuse protecting canister solenoid valve                       |
| 131 Fiat CODE electronic control unit                            | 314 Four stage pressure switch                                        |
| 132 Petrol vapour cut out solenoid valve (canister)              | 325 Connection between injection/left front cables                    |
| 136 Detonation sensor                                            | 326 Switch on clutch                                                  |
| 136A Detonation sensor                                           | 331 Phase transformer injector                                        |
| 137 Vehicle speed sensor                                         | 332 Earth on electronic control unit                                  |
| 139 Diagnostic socket for injection system                       | 333 Motorized butterfly casing                                        |

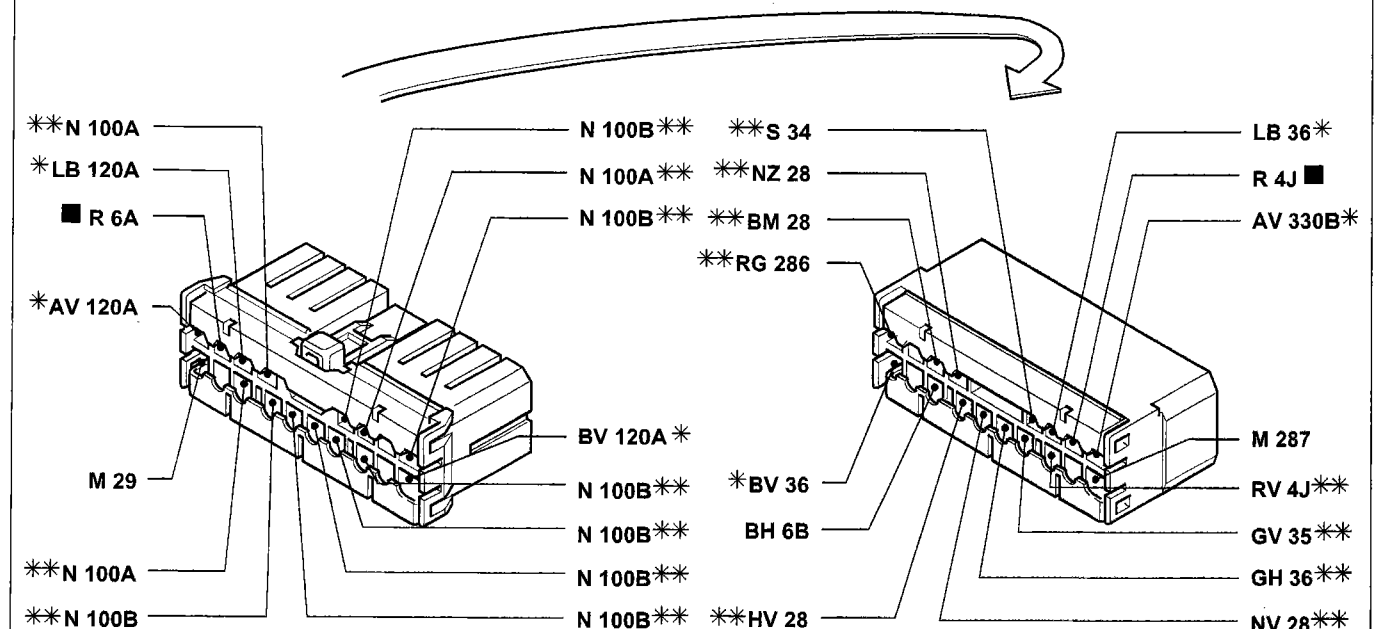
N.D. Ultrasound welding taped in cable loom

4A159I

#### 13 Front right/left cables connection



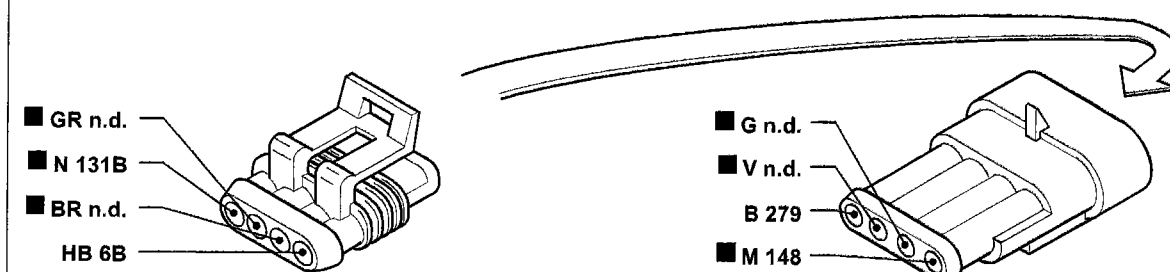
#### 70 Dashboard/front cables connection Trim level: SX - GT



\* Variant connection for versions with air conditioning

\*\* Variant connection for versions with alarm

#### 325 Connection between injection/left front cables

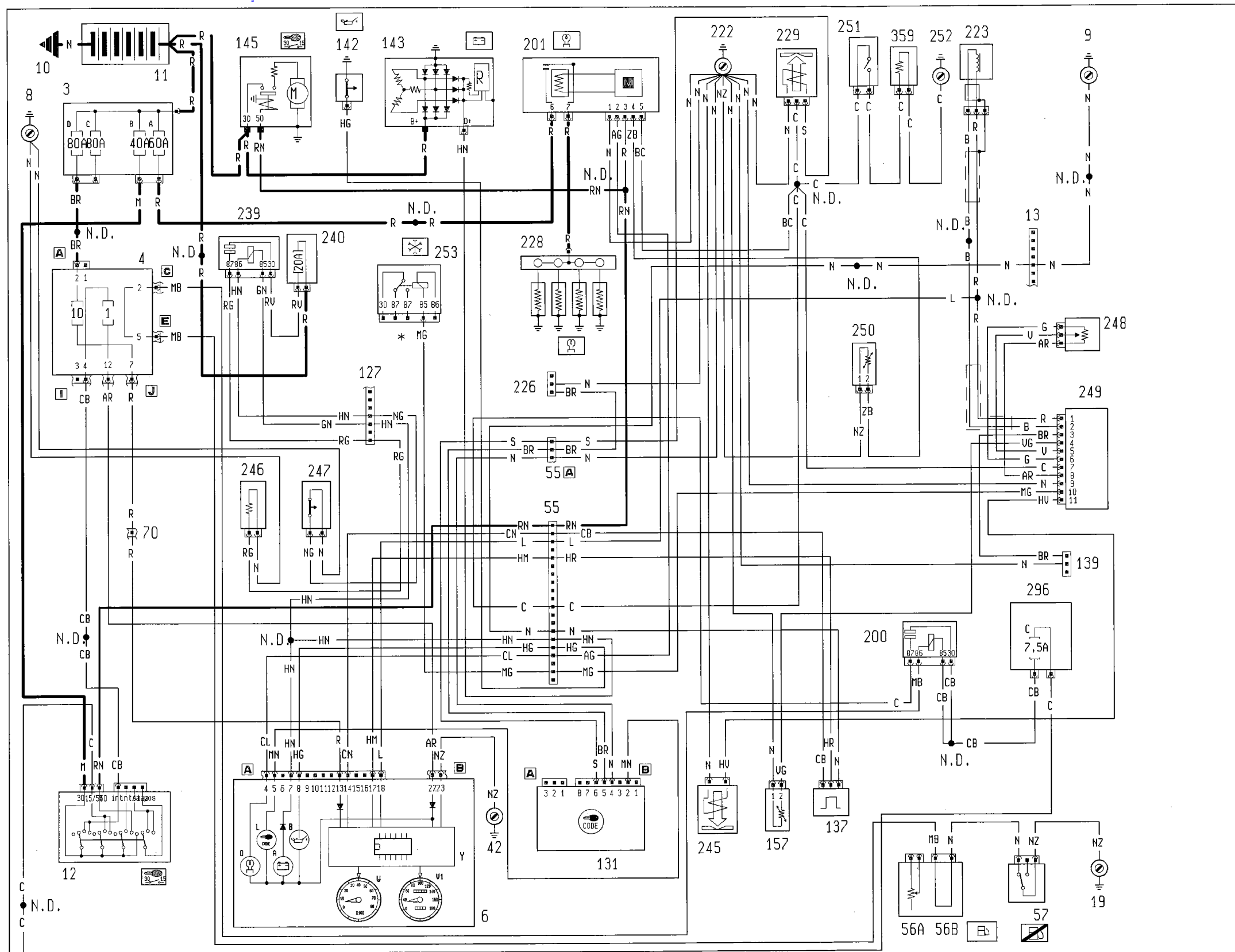


The cables in the wiring diagram are marked

P4A160I01

4A160I

Starting - Recharging and warning light - Low engine oil pressure warning light - Glow plug preheating warning light  
- Fiat-CODE and warning light - Rev counter - Speedometer - (See key at end of diagrams)

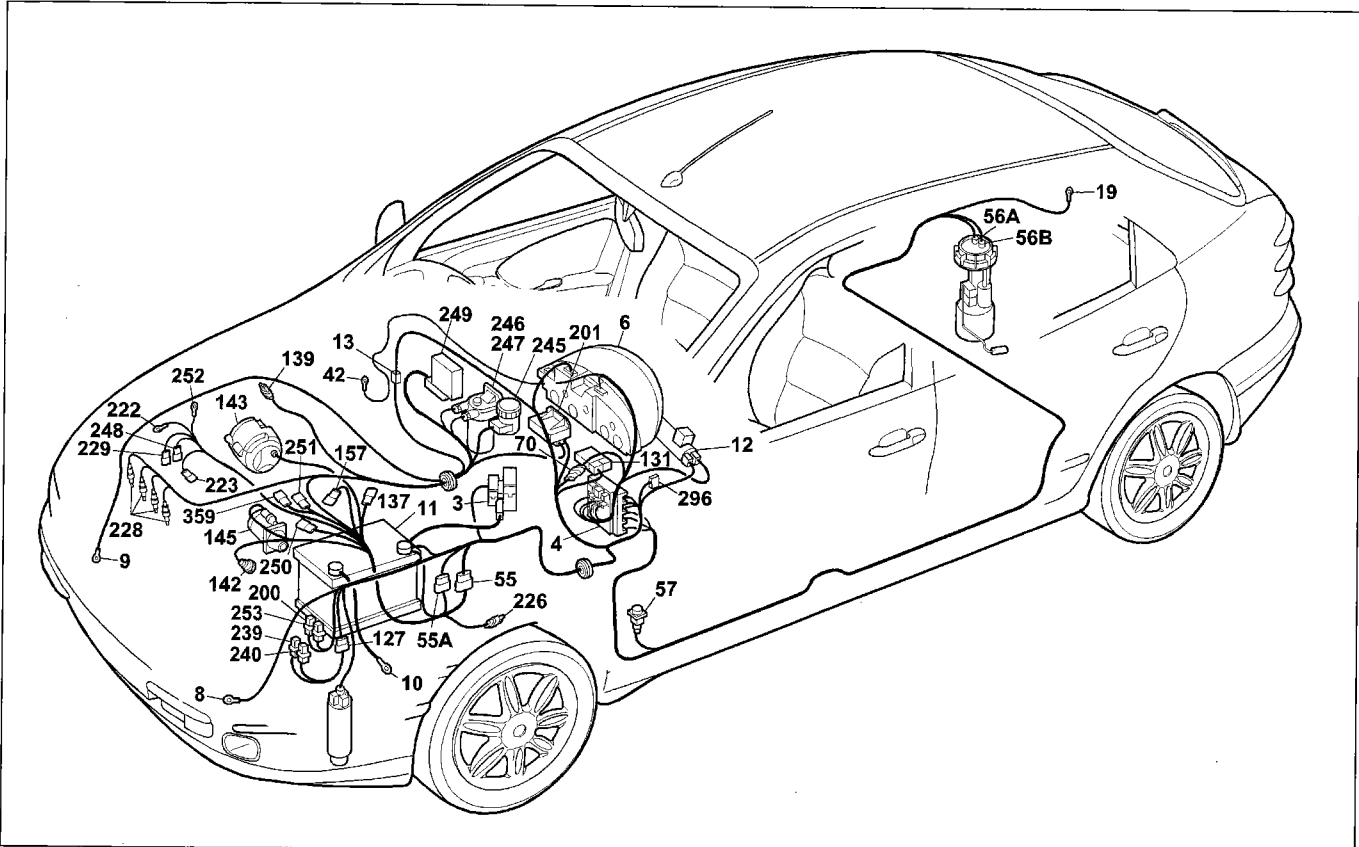


\* See air conditioning wiring diagram

4A161101



55.

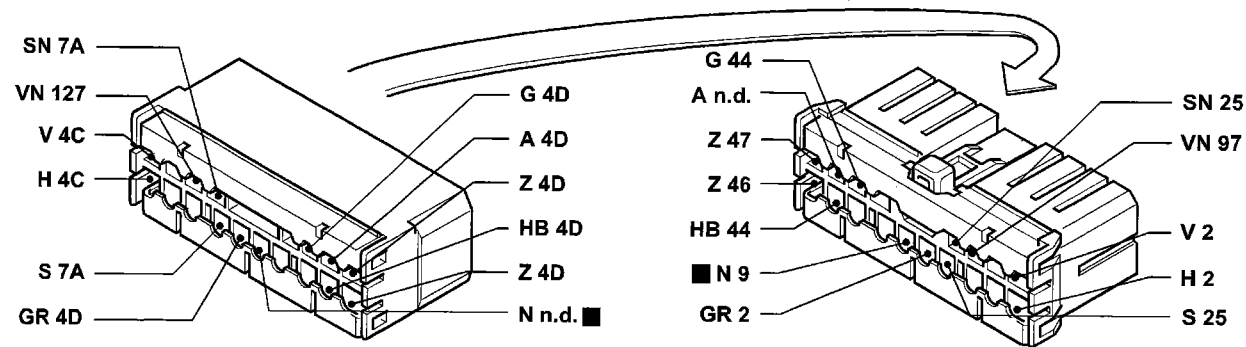


Starting - Recharging and warning light - Low engine oil pressure warning light - Glow plug preheating warning light - Fiat-CODE and warning light - Rev counter - Speedometer

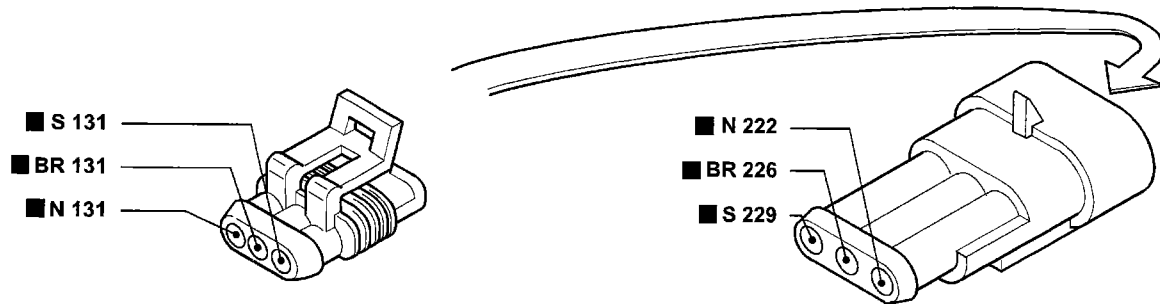
Key to components

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system (60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting additional options<br>D 80A fuse protecting junction unit                                                                                                                                                                                                                                                                                                   | 157 Coolant temperature sensor for injection system<br>200 Inertia switch control relay<br>201 Glow plug preheating control unit<br>222 Earth for fuel system<br>223 Rpm sensors<br>226 Tester connection for Fiat-CODE<br>228 Glow plugs<br>229 Electric engine stop device<br>239 Heated diesel filter relay<br>240 15A fuse protecting heated diesel filter relay<br>245 E.G.R. solenoid valve<br>246 Heated fuel filter device<br>247 Heated fuel filter thermal contact<br>248 Potentiometer on fuel pump<br>249 EGR electronic control unit<br>250 Coolant temperature sensor for preheating control unit<br>251 Thermal switch for K.S.B.<br>252 Earth for K.S.B.<br>253 Compressor deactivation relay<br>359 K.S.B. |
| 4 Junction unit<br>6 Instrument panel:<br>A Battery recharging warning light<br>B Low engine oil pressure warning light<br>L Fiat-CODE failure warning light<br>O Glow plug warning light<br>V1 Speedometer<br>Y Electronic module<br>W Rev counter                                                                                                                                                                                                                                                            | N.D. Ultrasound welding taped in cable loom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 8 Left front earth<br>9 Right front earth<br>10 Earth for battery on body<br>11 Battery<br>12 Ignition switch<br>13 Connection between right/left front cables<br>19 Right rear earth<br>42 Right facia earth<br>55 Connection between front cables/engine pre-wiring<br>55C Connection between front cables/pre-wiring#<br>56A Fuel gauge unit<br>56B Fuel pump<br>57 Inertia switch<br>70 Connection between dashborad/front cables<br>127 Connection between front left cable/cable on relay holder bracket |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 131 Fiat-CODE electronic control unit<br>137 Vehicle speed sensor<br>139 Tester socket for injection system<br>142 Switch signalling insufficient engine oil pressure<br>143 Alternator<br>145 Starter motor                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

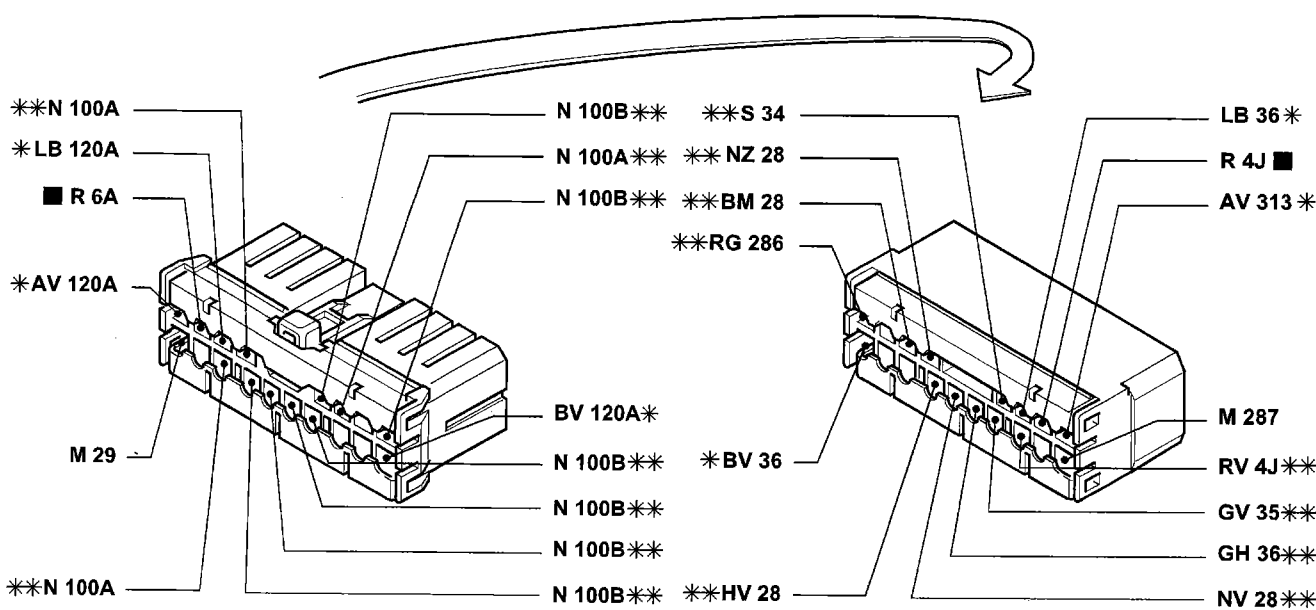
13 Connection between right/left front cables



55A Connection between front cables/engine pre-wiring



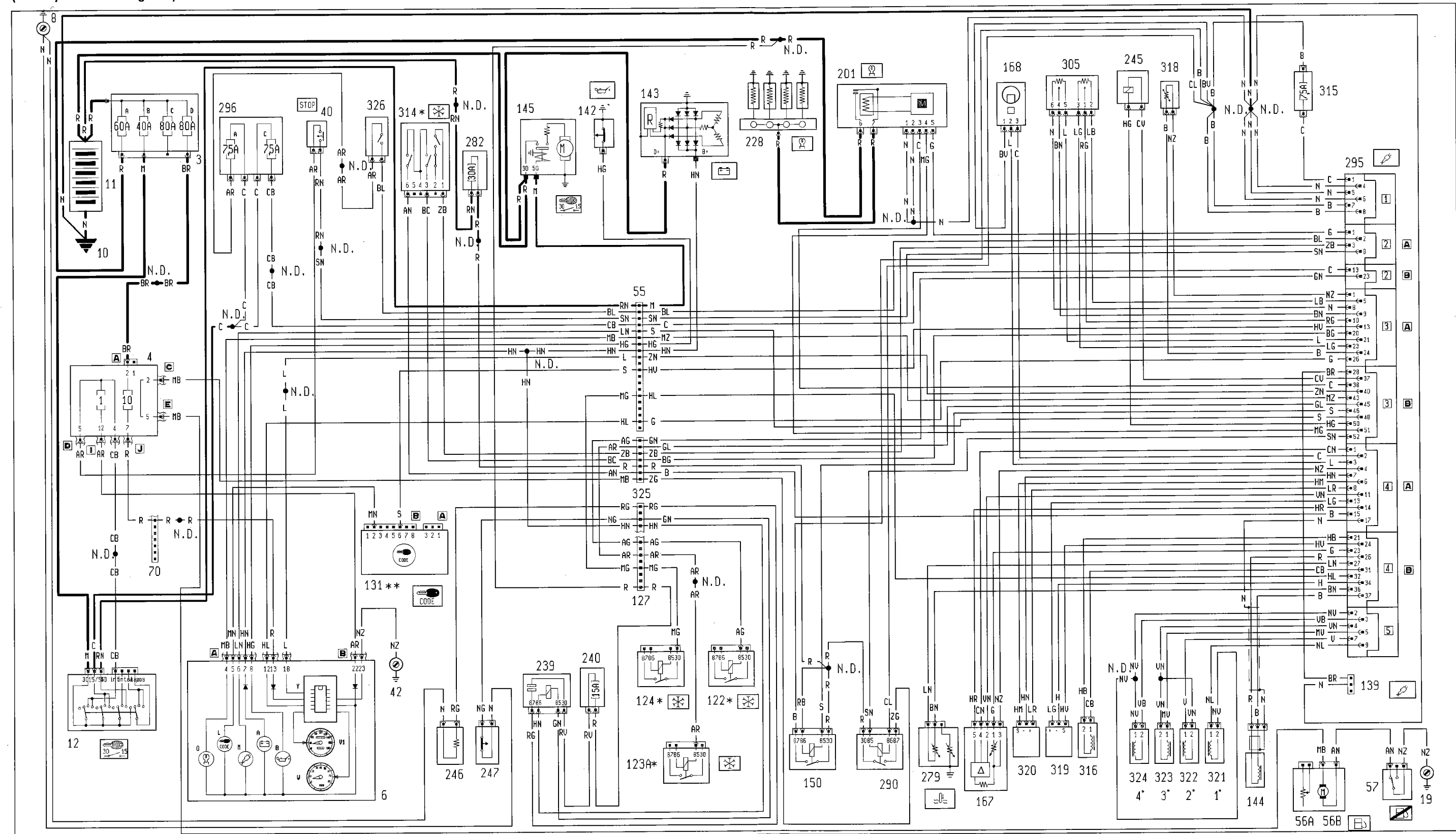
70 Connection between dashborad/front cables Outfit: SX - GT



\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

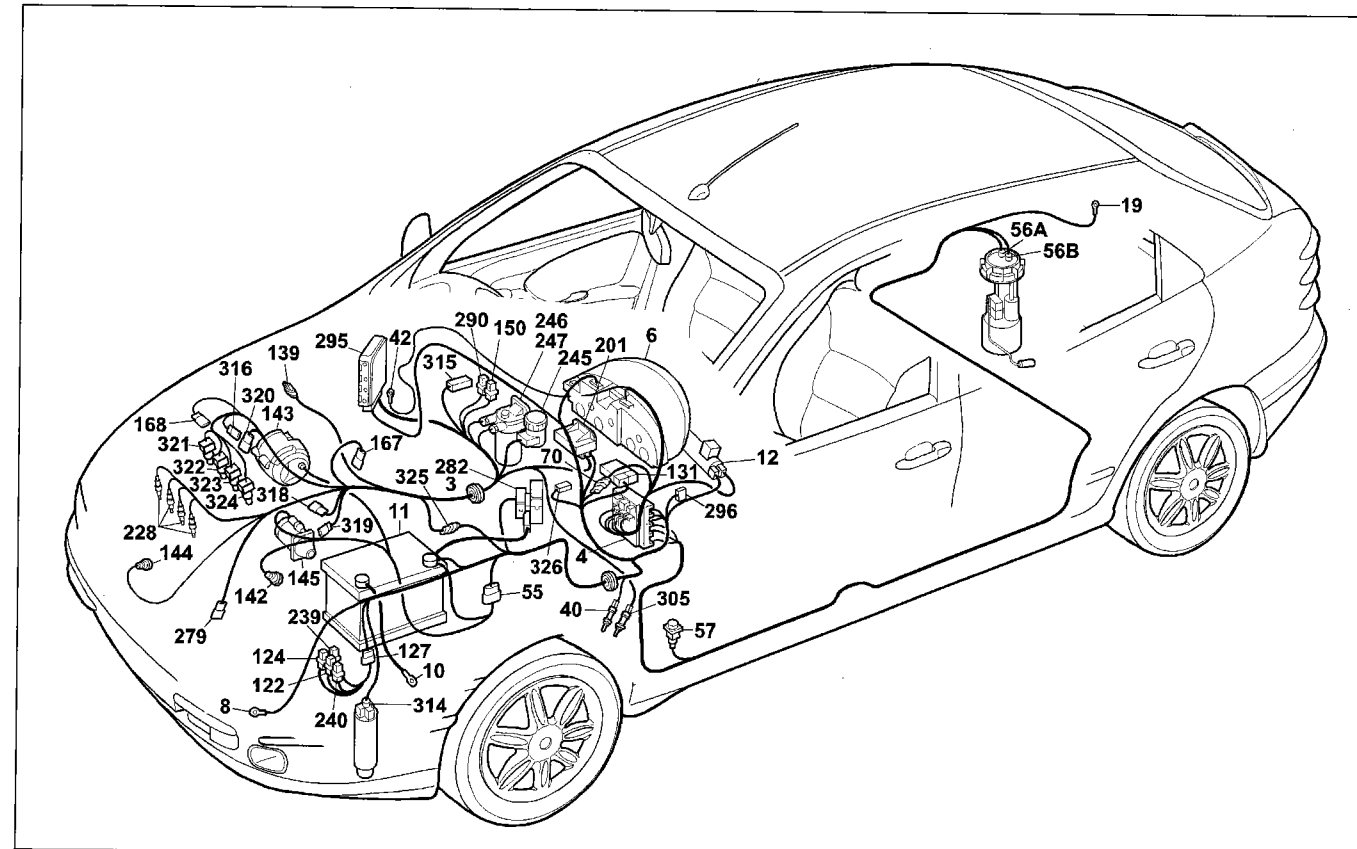
Wires marked in the wiring diagram are marked with a box

Starting - Bosch EDC 15C-5.7 unijet electronic injection - Recharging and warning light - Low engine oil pressure warning light - Glow plug preheating warning light - Fiat-CODE and warning light - Rev counter - Speedometer -  
(See key at end of diagrams)



- \* See air conditioning wiring diagram
- \*\* See Fiat CODE wiring diagram

### 55.

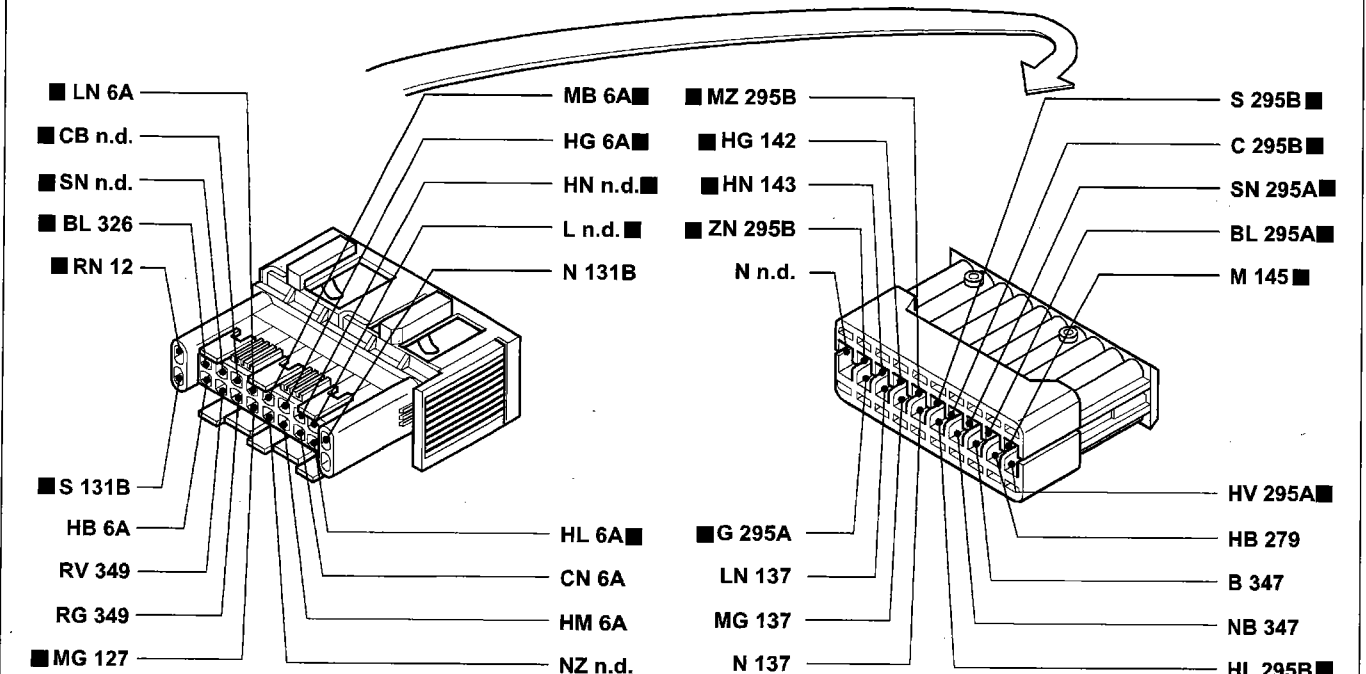


Starting - Bosch EDC 15C-5.7 unijet electronic injection - Recharging and warning light - Low engine oil pressure warning light - Glow plug preheating warning light - Fiat-CODE and warning light - Rev counter - Speedometer

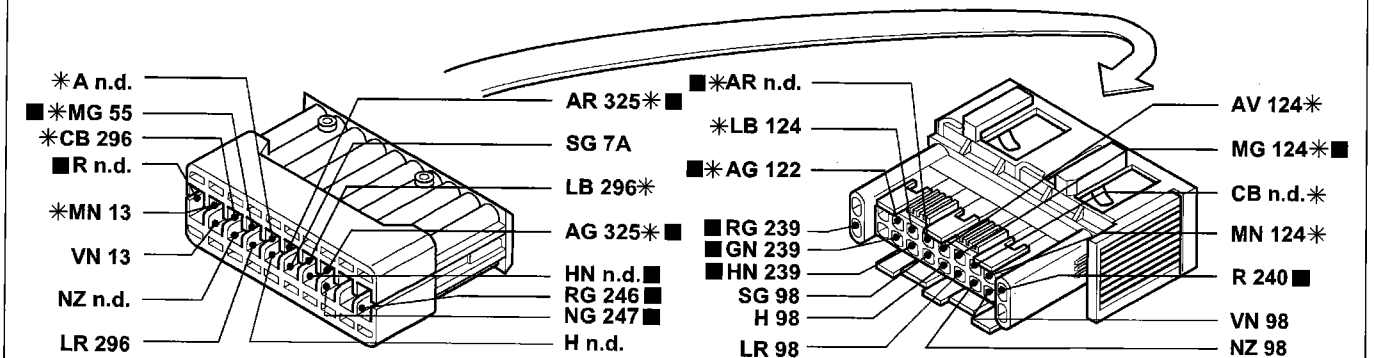
#### Key to components

- |                                                                       |                                                                                    |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 3 Power fusebox                                                       | 145 Starter motor                                                                  |
| A 30A fuse protecting injection system (60A for TD versions)          | 150 Injection system relay feed                                                    |
| B 40A fuse protecting ignition system                                 | 167 Air flow meter (debimetro)                                                     |
| C 80A fuse protecting additional options                              | 168 Timing sensor                                                                  |
| D 80A fuse protecting junction unit                                   | 201 Glow plug preheating control unit                                              |
| 4 Junction unit                                                       | 228 Glow plugs                                                                     |
| 6 Instrument panel:                                                   | 239 Heated diesel filter relay                                                     |
| A Battery recharging warning light                                    | 240 15A fuse protecting heated diesel filter relay                                 |
| B Low engine oil pressure warning light                               | 245 E.G.R. solenoid valve                                                          |
| L Fiat-CODE failure warning light                                     | 246 Heated fuel filter device                                                      |
| M Injection system failure warning light                              | 247 Heated fuel filter thermal contact                                             |
| O Glow plug warning light                                             | 279 Engine coolant temperature twin sender unit                                    |
| V1 Speedometer                                                        | 282 7.5A fuse protecting Fiat-CODE/electronic injection (60 for UNIJET)            |
| Y Electronic module                                                   | 290 Fuel pump control relay                                                        |
| W Rev counter                                                         | 295 Injection/ignition electronic control unit 1910 TD UNIJET                      |
| 8 Left front earth                                                    | 296 Fuse holder base on front cable                                                |
| 10 Earth for battery only body                                        | A7.5A fuse protecting switch panel light; Radio telephone; Radio; Electric mirrors |
| 11 Battery                                                            | C7.5A fuse protecting Fiat-CODE cooling system electronic injection                |
| 12 Ignition switch                                                    | 305 Potentiometer on accelerator pedal                                             |
| 19 Left facia earth                                                   | 314 Four stage pressure switch                                                     |
| 40 Brake lights control switch                                        | 315 7.5A fuse protecting electronic injection control unit 1910 TD UNIJET          |
| 42 Right facia earth                                                  | 316 Fuel pressure regulator for injection system 1910 TD UNIJET                    |
| 55 Connection between front cables/engine pre-wiring                  | 318 Fuel temperature sensor                                                        |
| 55A Connection between front cables/engine pre-wiring                 | 319 Fuel pressure sensor                                                           |
| 56B Fuel gauge unit                                                   | 320 Turbo pressure regulator                                                       |
| 57 Inertia switch                                                     | 321 1st injector for 1910 TD UNIJET injection system                               |
| 70 Connection between dashbord/front cables                           | 322 2nd injector for 1910 TD UNIJET injection system                               |
| 122 Engine cooling fan low speed relay feed                           | 323 3rd injector for 1910 TD UNIJET injection system                               |
| 123A Engine cooling fan high speed relay feed                         | 324 4th injector for 1910 TD UNIJET injection system                               |
| 124 Air conditioning compressor control relay                         | 325 Connection between injection/left front cables                                 |
| 127 Connection between front left cable/cable on relay holder bracket | 326 Switch on clutches                                                             |
| 131 Fiat-CODE electronic control unit                                 | N.D. Ultrasound welding taped in cable loom                                        |
| 139 Tester socket for injection system                                |                                                                                    |
| 142 Switch signalling insufficient engine oil pressure                |                                                                                    |
| 143 Alternator                                                        |                                                                                    |
| 144 Rpm and TDC sensor                                                |                                                                                    |

#### 55 Connection between front cables/engine pre-wiring

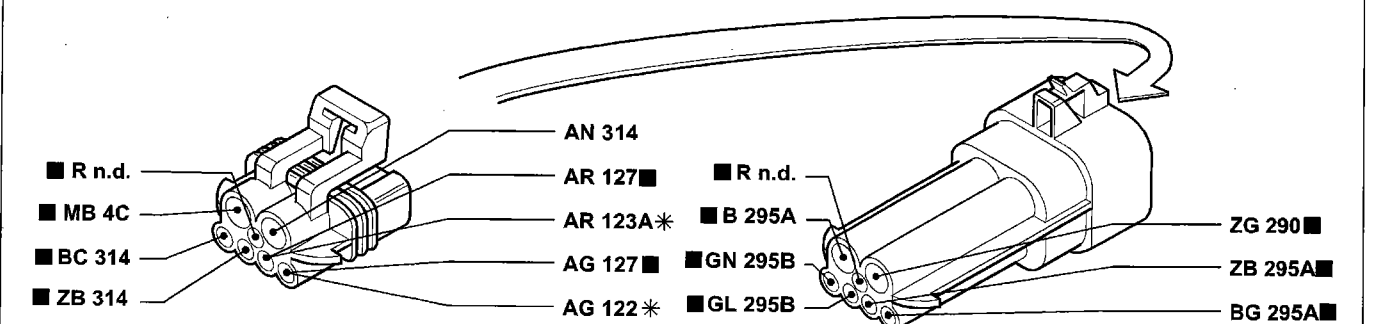


#### 127 Connection between front left cable/cable on relay holder bracket



\* Connection variant for versions with air conditioner

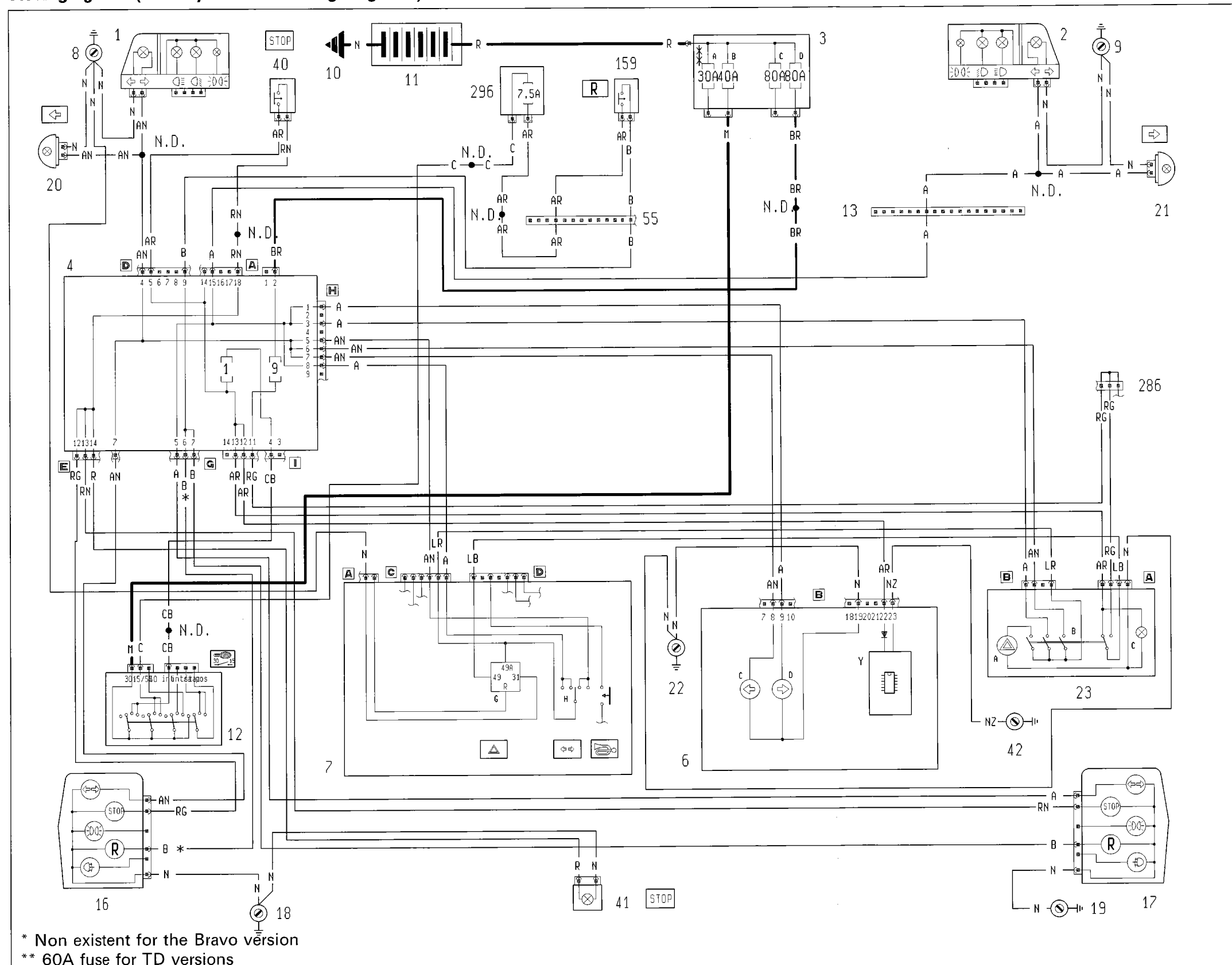
#### 70 Connection between injection/left front cables



\* Connection variant for versions without air conditioner

Trim level: **SX - GT**

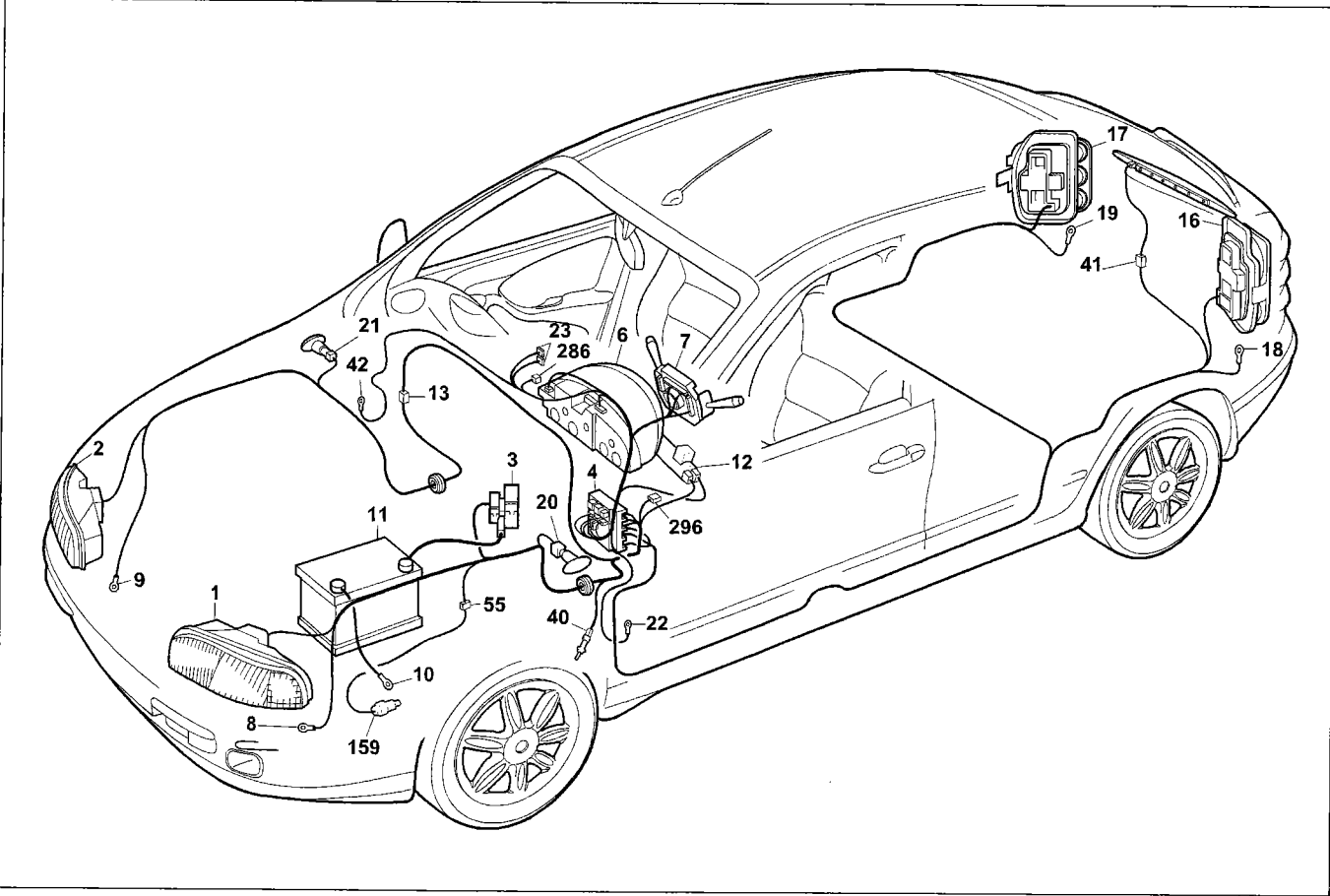
**Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights - (See key at end of wiring diagrams)**



P4A169101



55.



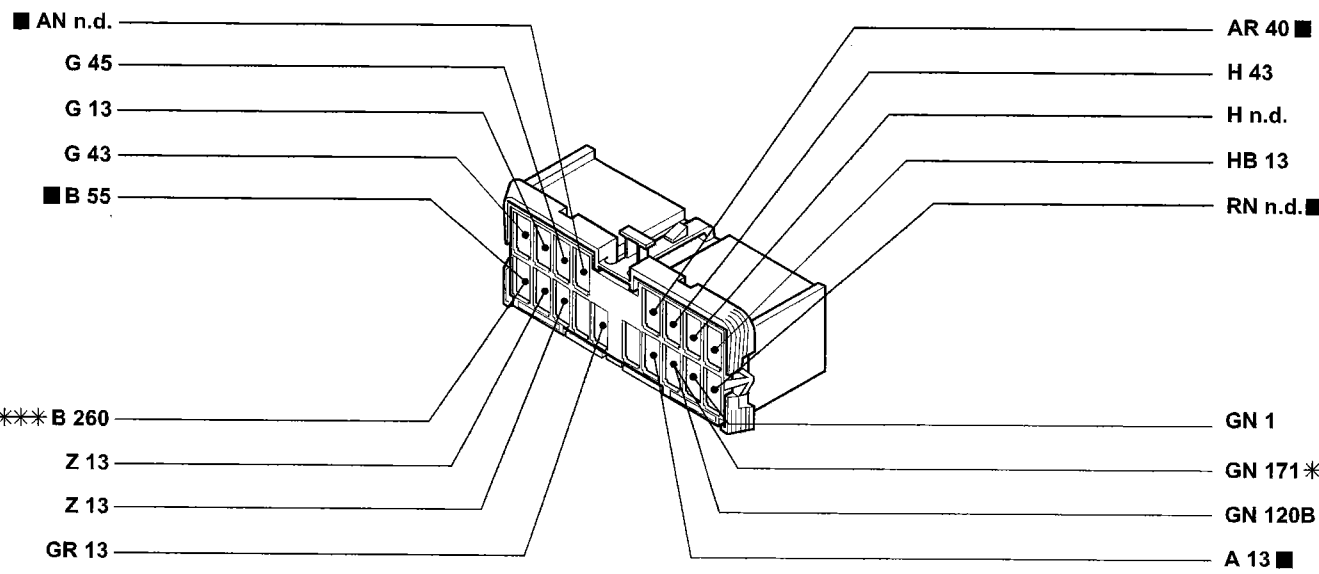
Trim level: SX - GT

Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights

Components key

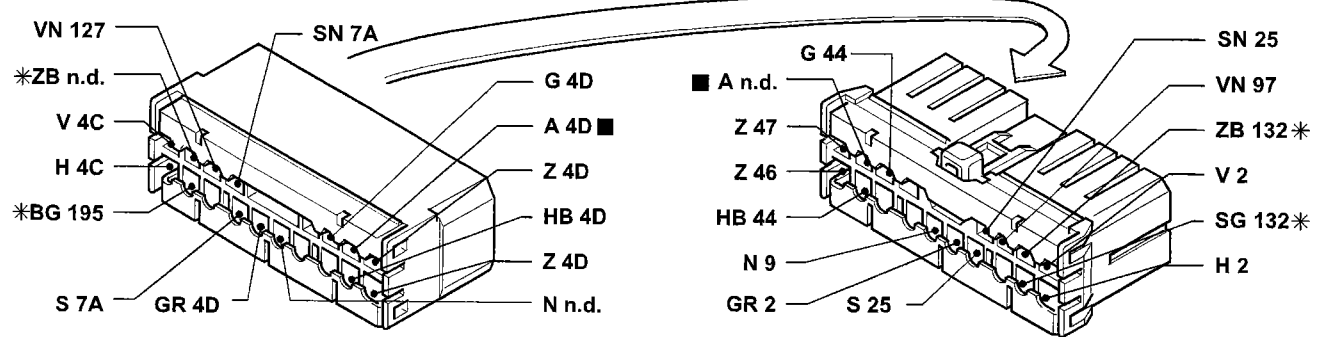
- 1 Left front light cluster
- 2 Right front light cluster
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - C Left direction indicator warning light
  - D Right direction indicator warning light
  - Y Electronic module
- 7 Steering column switch unit:
  - H Switch for direction indicators
  - G Direction indicators/hazard warning lights switch
- 8 Left front earth
- 9 Right front earth
- 10 Earth for battery on bodysell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 16 Left rear light cluster
- 17 Right rear light cluster
- 18 Left rear earth
- 19 Right rear earth
- 20 Left front side direction indicator
- 21 Right front side direction indicator
- 22 Left dashboard earth
- 23 Hazard warning lights switch unit
  - A Hazard warning lights warning light
  - B Hazard warning lights switch
  - C Hazard warning lights ideogram light
- 40 Brake lights control switch
- 41 Additional brake light
- 42 Right dashboard earth
- 55 Connection between front/engine pre-wiring cables
- 159 Reversing lights control switch
- 286 Short circuit connection
- 296 Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm
- N.D. Ultrasound welding taped in cable loom

4D Junction unit



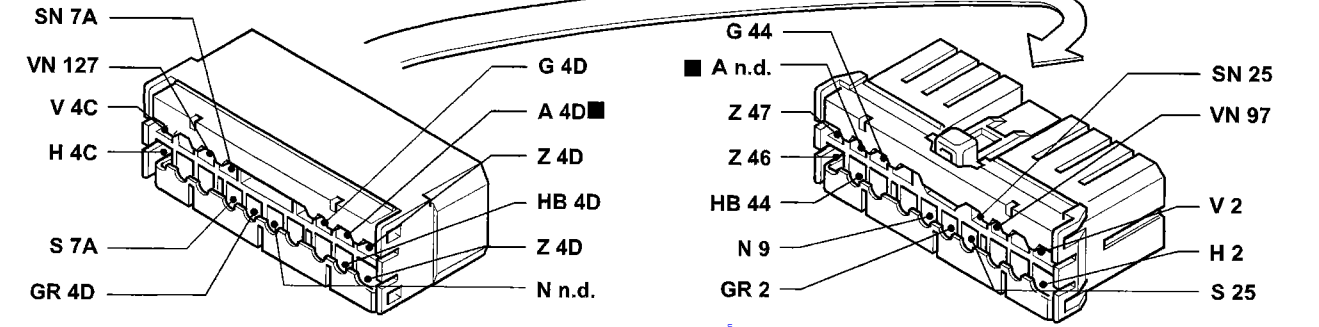
\* Variant connection for versions without air conditioning  
\*\* Variant connection for version with automatic transmission

13 Front right/left cables connection. Versions: 1242 16v - 1581 16v



\* Variant connection for 1581 16v version

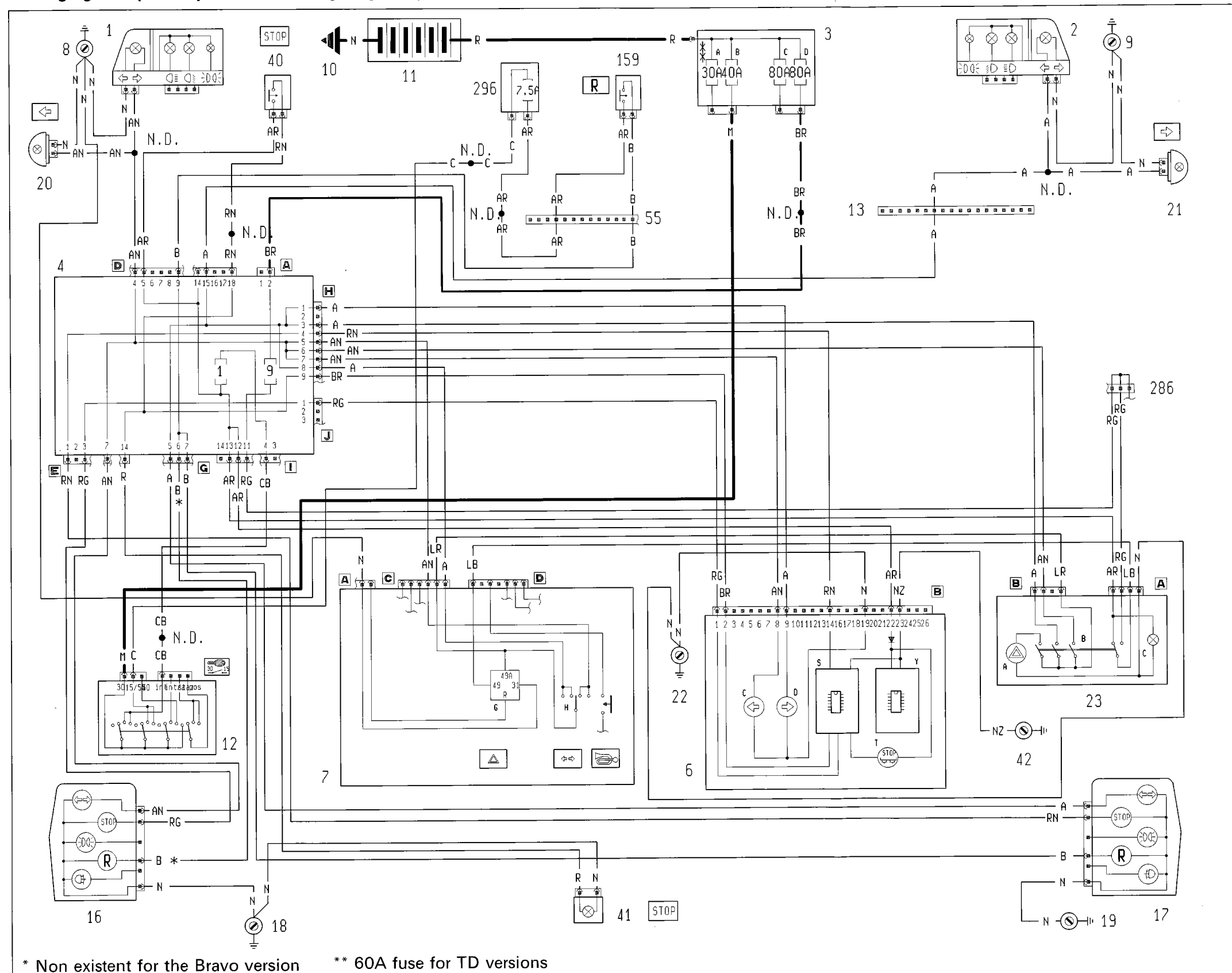
13 Front right/left cables connection



The cables in the wiring diagram are marked

Trim level: ELX - HSX - HGT

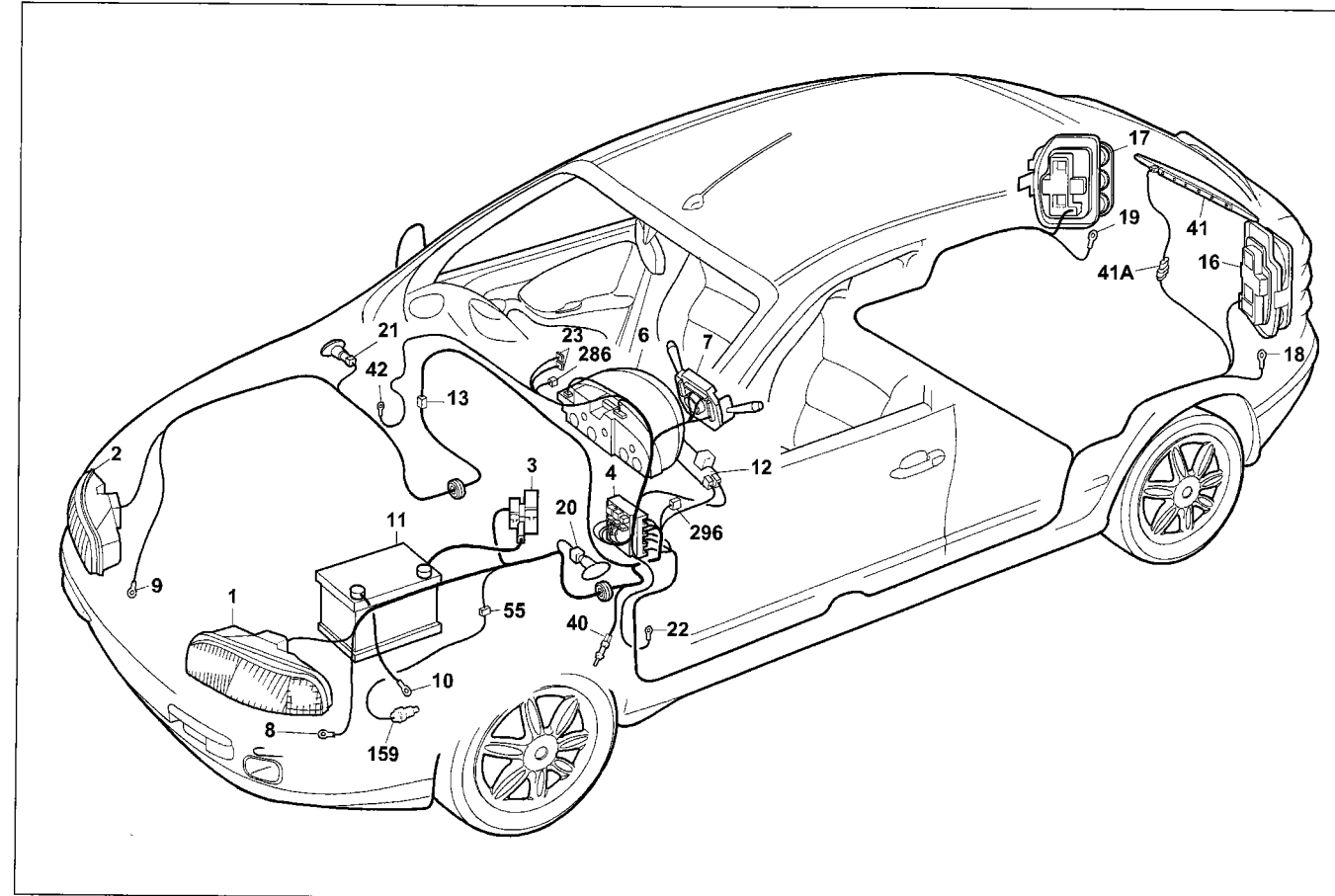
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights - (See key at end of wiring diagrams)



\* Non existent for the Bravo version \*\* 60A fuse for TD versions



### 55.



Trim level: **HSX - ELX - HGT**

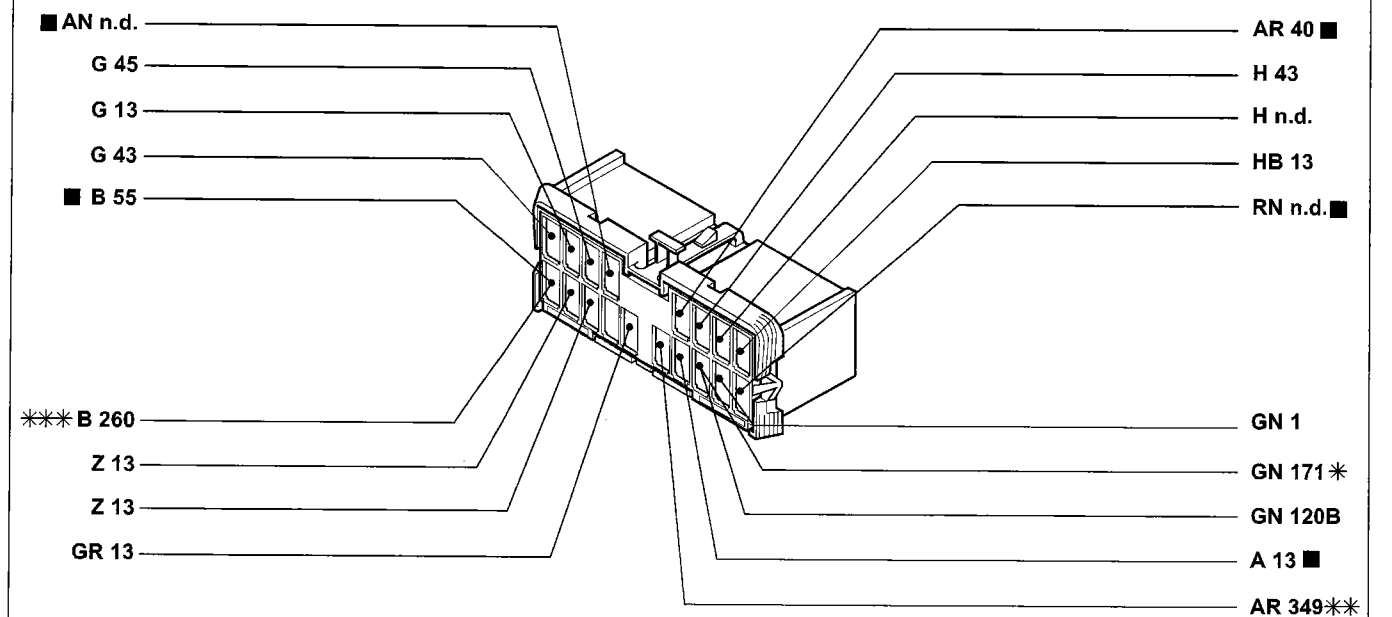
**Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights**

#### Components key

- |                                                                  |                                                                                                                    |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1 Left front light cluster                                       | 16 Left rear light cluster                                                                                         |
| 2 Right front light cluster                                      | 17 Right rear light cluster                                                                                        |
| 3 Power fuse box:                                                | 18 Left rear earth                                                                                                 |
| A 30A protective fuse for injection system (60A for TD versions) | 19 Right rear earth                                                                                                |
| B 40A protective fuse for ignition system                        | 20 Left front side direction indicator                                                                             |
| C 80A fuse protecting additional options                         | 21 Right front side direction indicator                                                                            |
| D 80A protective fuse for junction unit                          | 22 Left dashboard earth                                                                                            |
| 4 Junction unit                                                  | 23 Hazard warning lights switch unit                                                                               |
| 6 Instrument panel:                                              | A Hazard warning lights warning light                                                                              |
| C Left direction indicator warning light                         | B Hazard warning lights switch                                                                                     |
| D Right direction indicator warning light                        | C Hazard warning lights ideogram light                                                                             |
| S Electronic module for signalling brake lights failure          |                                                                                                                    |
| T Warning light signalling brake lights failure                  |                                                                                                                    |
| Y Electronic module                                              |                                                                                                                    |
| 8 Left front earth                                               | 40 Brake lights control switch                                                                                     |
| 7 Steering column switch unit                                    | 41 Additional brake light                                                                                          |
| H Switch for direction indicators                                | 42 Right dashboard earth                                                                                           |
| G Direction indicators/hazard warning lights switch              | 55 Connection between front/engine pre-wiring cables                                                               |
| 8 Left front earth                                               | 159 Reversing lights control switch                                                                                |
| 9 Right front earth                                              | 286 Short circuit connection                                                                                       |
| 10 Earth for battery on bodyshell                                | 296 Fuse carrier base on front cable                                                                               |
| 11 Battery                                                       | A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm                                     |
| 12 Ignition switch                                               | Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights |
| 13 Front right/left cables connection                            |                                                                                                                    |

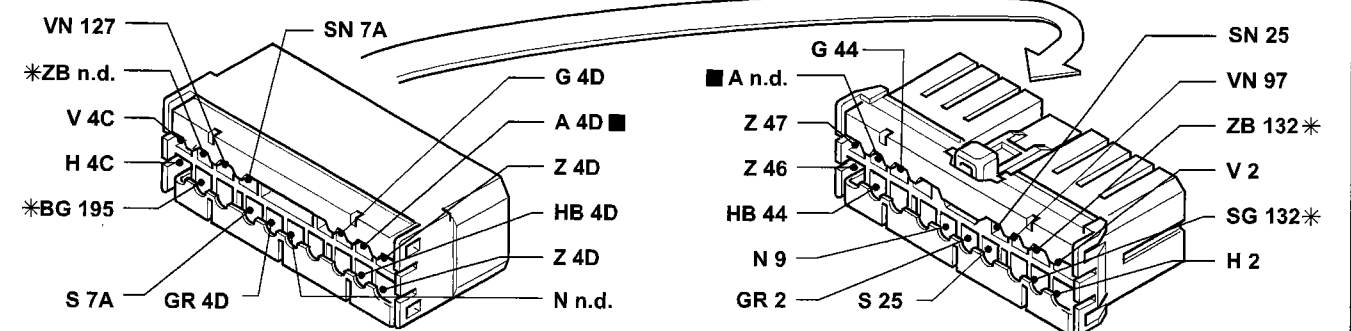
N.D. Ultrasound welding taped in cable loom

#### 4D Junction unit



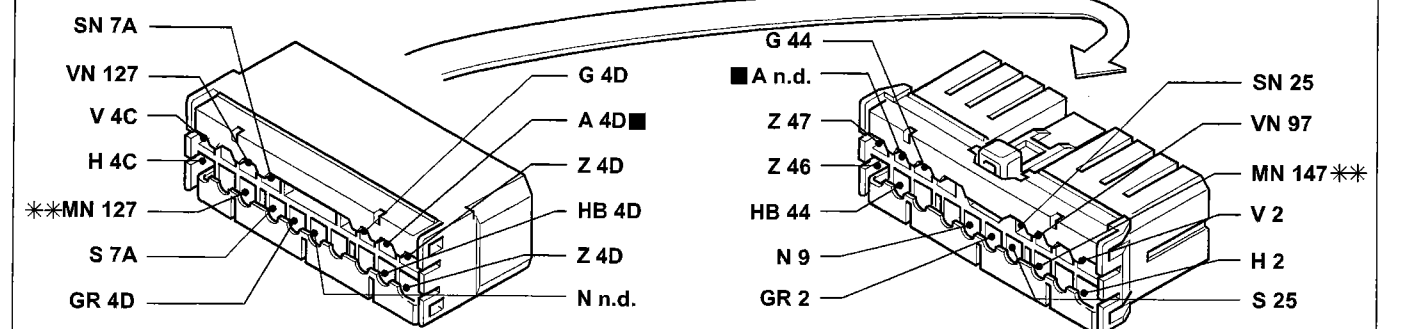
- \* Variant connection for versions without air conditioning
- \*\* Variant connection for JTD versions
- \*\*\* Variant connection for version with automatic transmission

#### 13 Front right/left cables connection. Versions: 1242 16v - 1581 16v



\* Variant connection for 1581 16v versions

#### 13 Front right/left cables connection

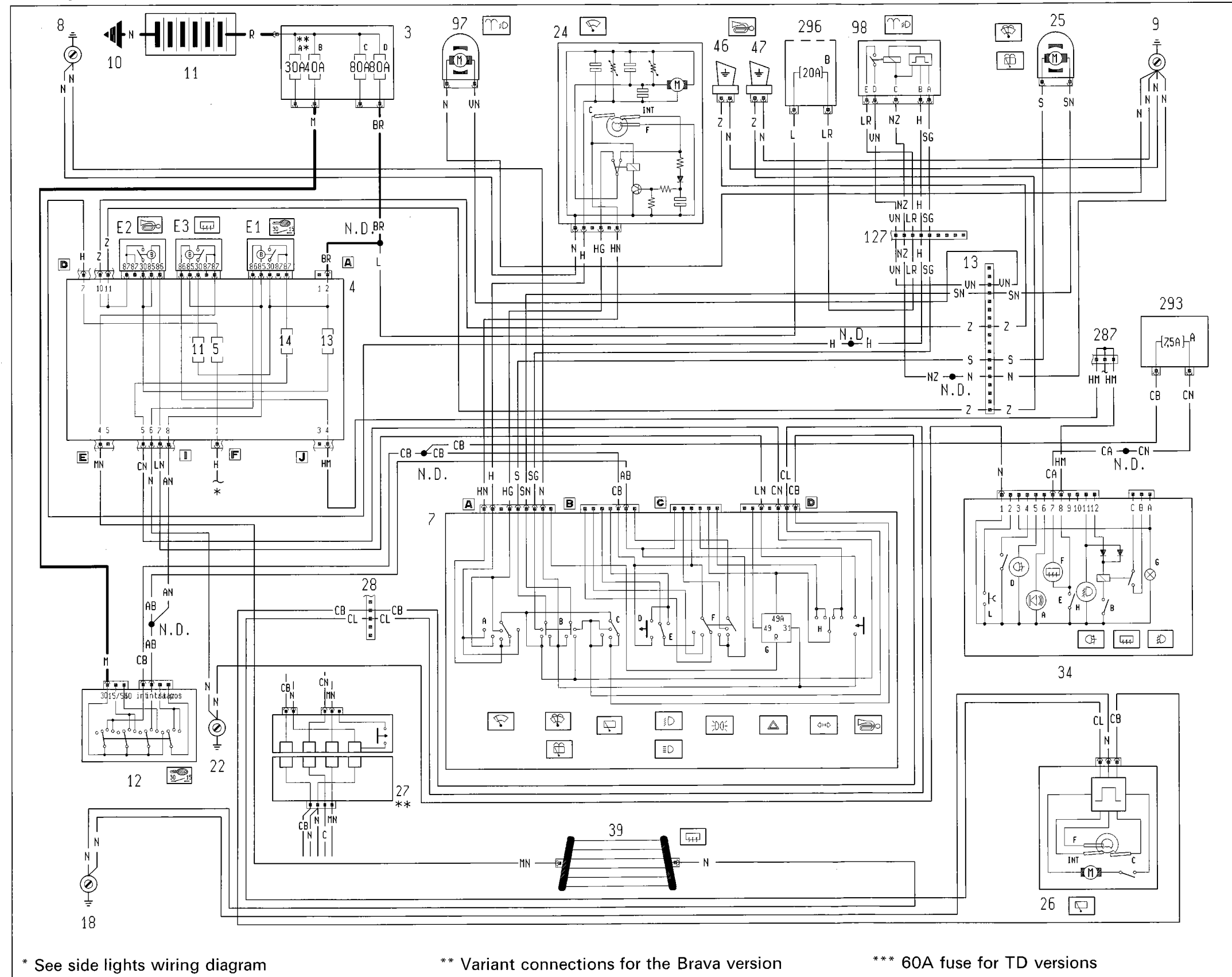


\* Variant connection for JTD versions

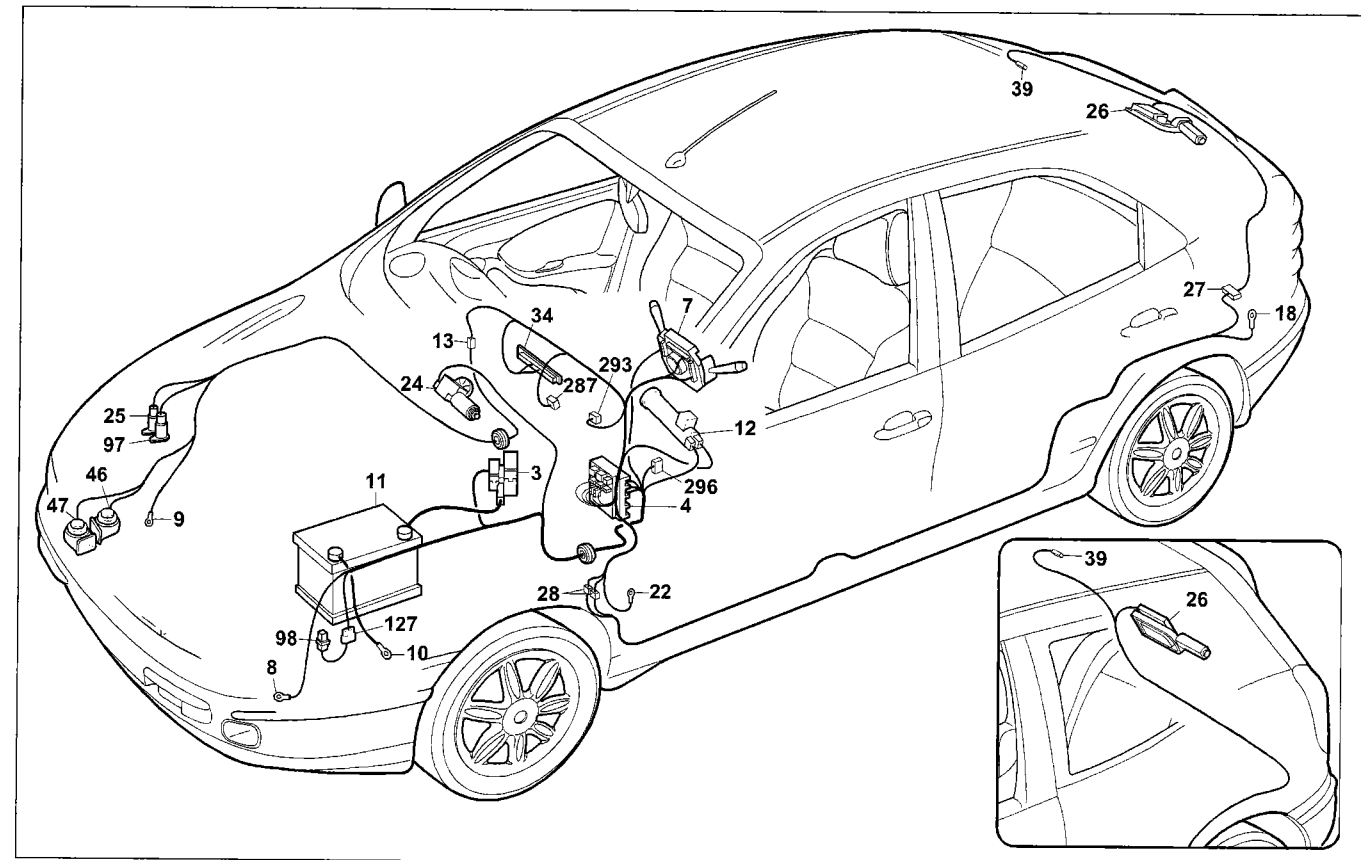
The cables in the wiring diagram are marked

### Version without A.B.I.

**Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer - (See key at end of wiring diagrams)**



**55.**



P4A179101

### Version without A.B.I.

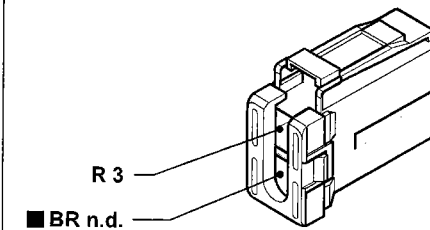
**Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer**

#### Components key

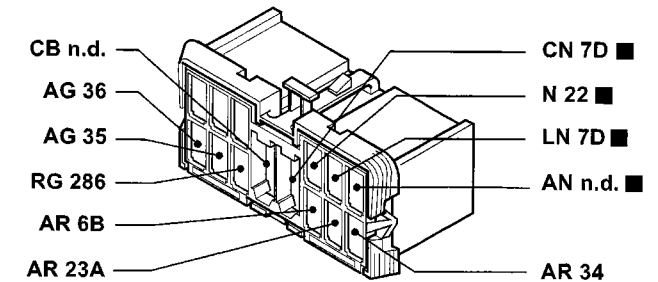
- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit:  
E1 Ignition discharge relay  
E2 Horn relay feed  
E3 Heated rear windscreen relay feed
- 7 Steering column switch unit:  
A Windscreen wiper speed control switch  
B Windscreen washer/headlamp washer/rearscreen washer control switch  
C Rearscreen wiper control switch  
D Flasher control  
E Switch for dipped/main beam headlamps  
F Switch for side lights  
G Direction indicators/hazard warning lights intermittent device  
H Switch for direction indicators  
I Horn control
- 8 Left front earth  
9 Right front earth  
10 Earth for battery on bodyshe'll  
11 Battery  
12 Ignition switch  
13 Front right/left cables connection  
18 Left rear earth  
22 Left dashboard earth  
24 Windscreen wiper motor
- 25 Windscreen/rearscreen electric washer pump  
26 Rearscreen wiper motor  
27 Contact board for rear connections with luggage compartment light switch incorporated  
28 Dash./longitudinal cables connection  
34 Switch unit:  
A Alarm on warning light  
B Rear fog lamps switch  
D Rear fog lamps warning light  
E Heated rear windscreen switch  
F Heated rear windscreen warning light  
G Switch control unit ideogram light  
H Fog lights warning light  
I Fog lights switch  
L Outside temperature control switch
- 39 Heated rear windscreen  
46 Left electric horn  
47 Right electric horn  
97 Electric headlamp washer pump  
98 Headlamp washer intermittent device  
127 Connection between left front cable/cable on relay holder bracket  
287 Short circuit connection  
293 Fuse carrier base on dashboard cable  
A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors  
296 Fuse carrier base on front cable  
B 20A protective fuse windscreen wiper with A.B.I. or without A.B.I.

N.D. Ultrasound welding taped in cable loom

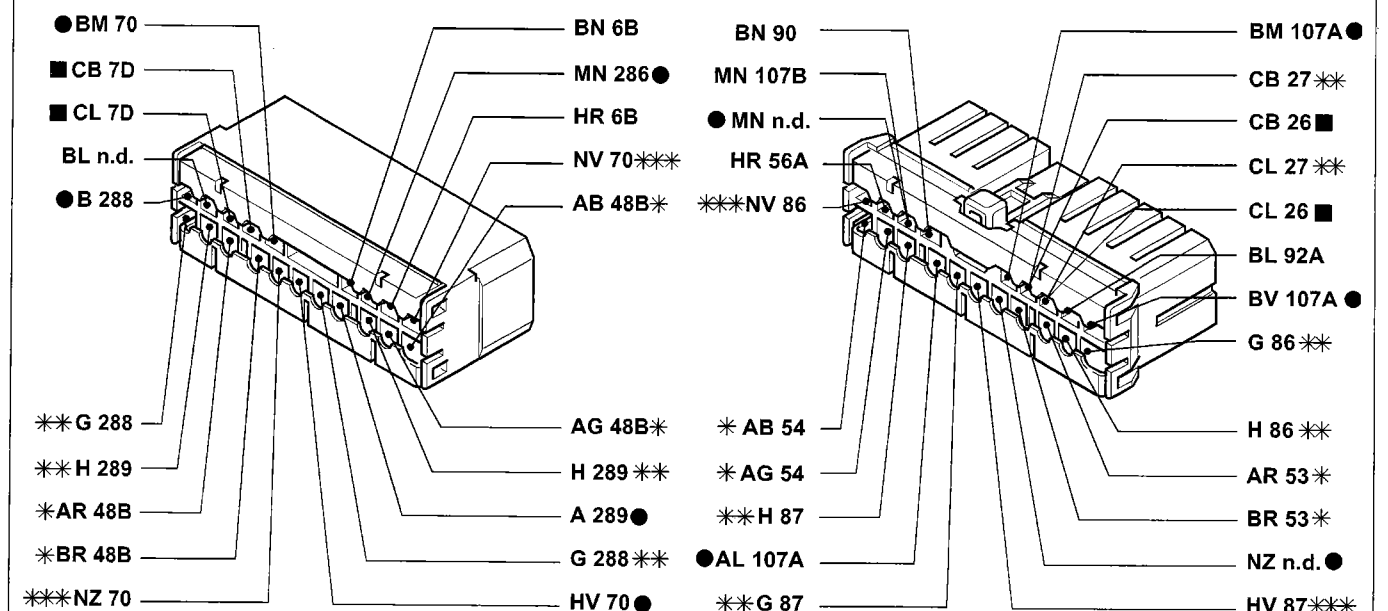
#### 4A Junction unit



#### 4I Junction unit



#### 28 Dashboard/longitudinal cables connection. Versions without A.B.I. control unit.



- Variant connection for versions with alarm
- \* Variant connection for versions with top of the range radio
- \*\* Variant connection for Brava versions
- \*\*\* Variant connection for Brava versions with alarm

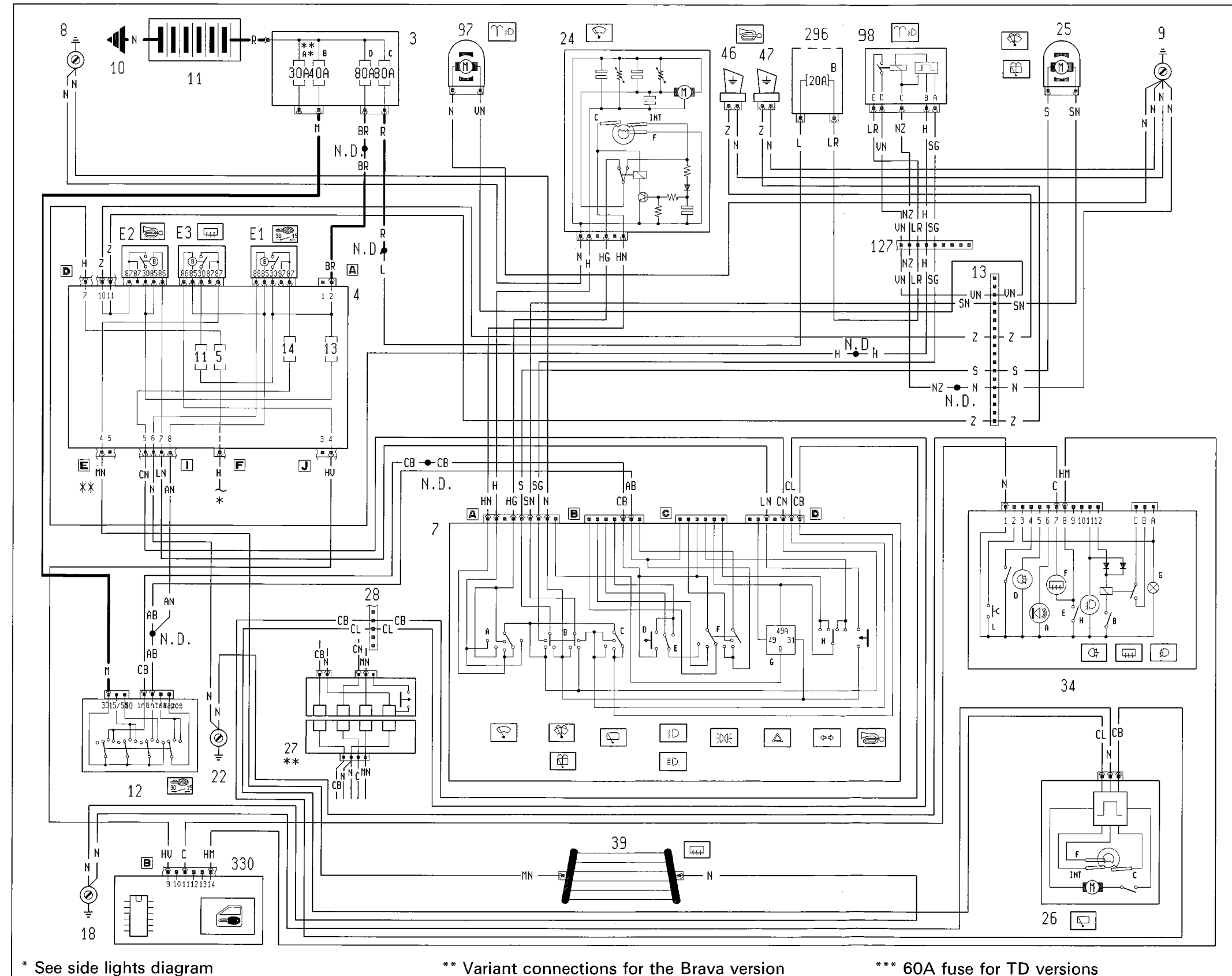
The cables in the wiring diagram are marked

P4A180101

4A1801

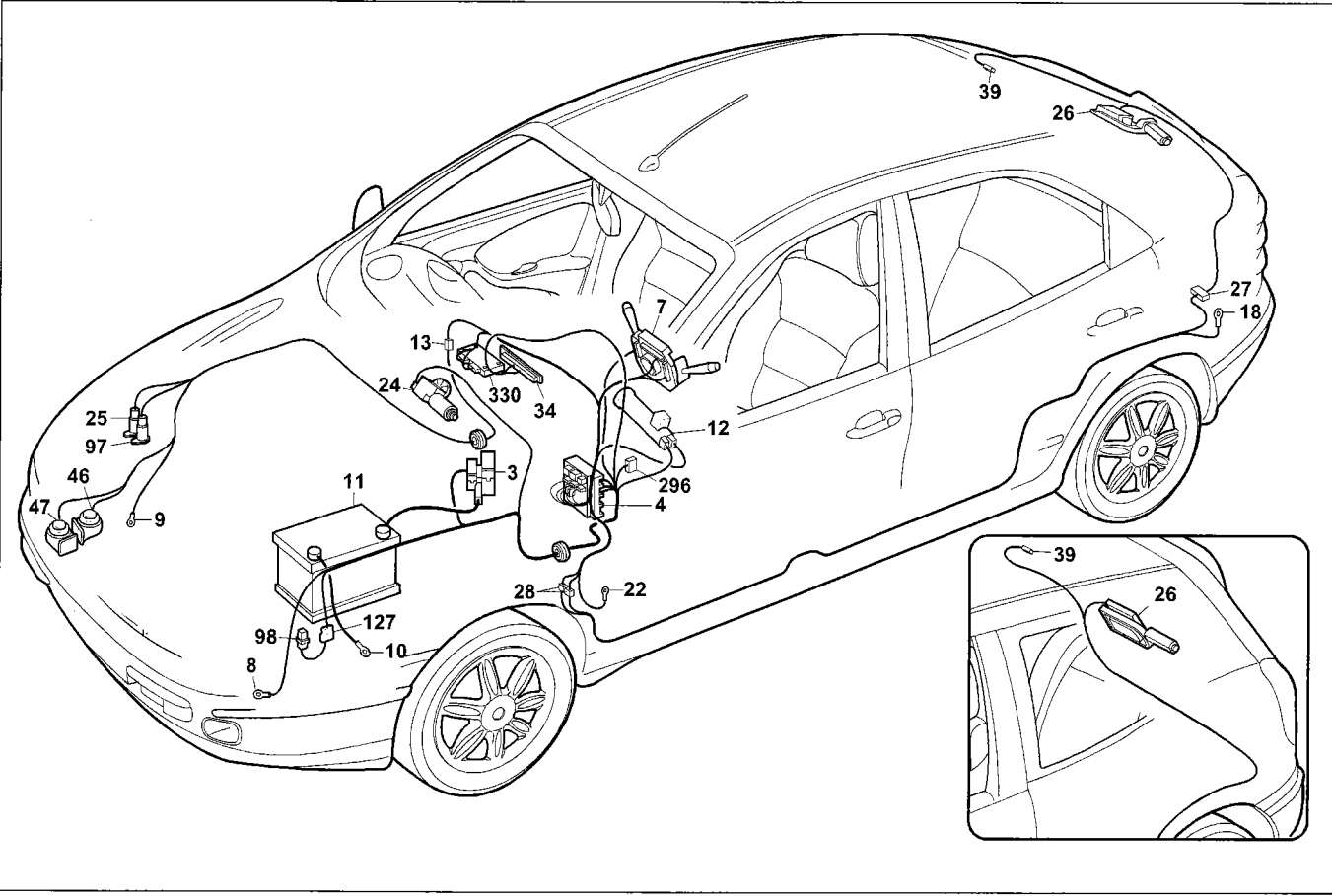
### Version with A.B.I.

**Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer - (See key at end of wiring diagrams)**





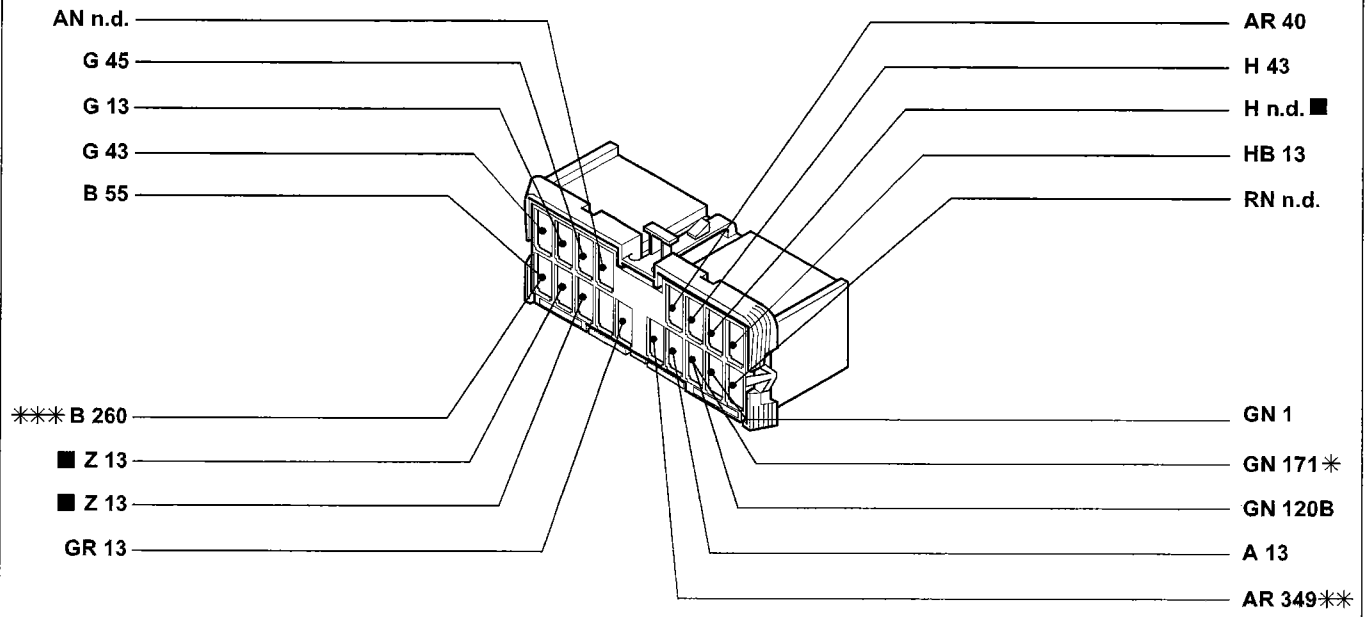
55.



**Version with A.B.I.**  
**Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer**

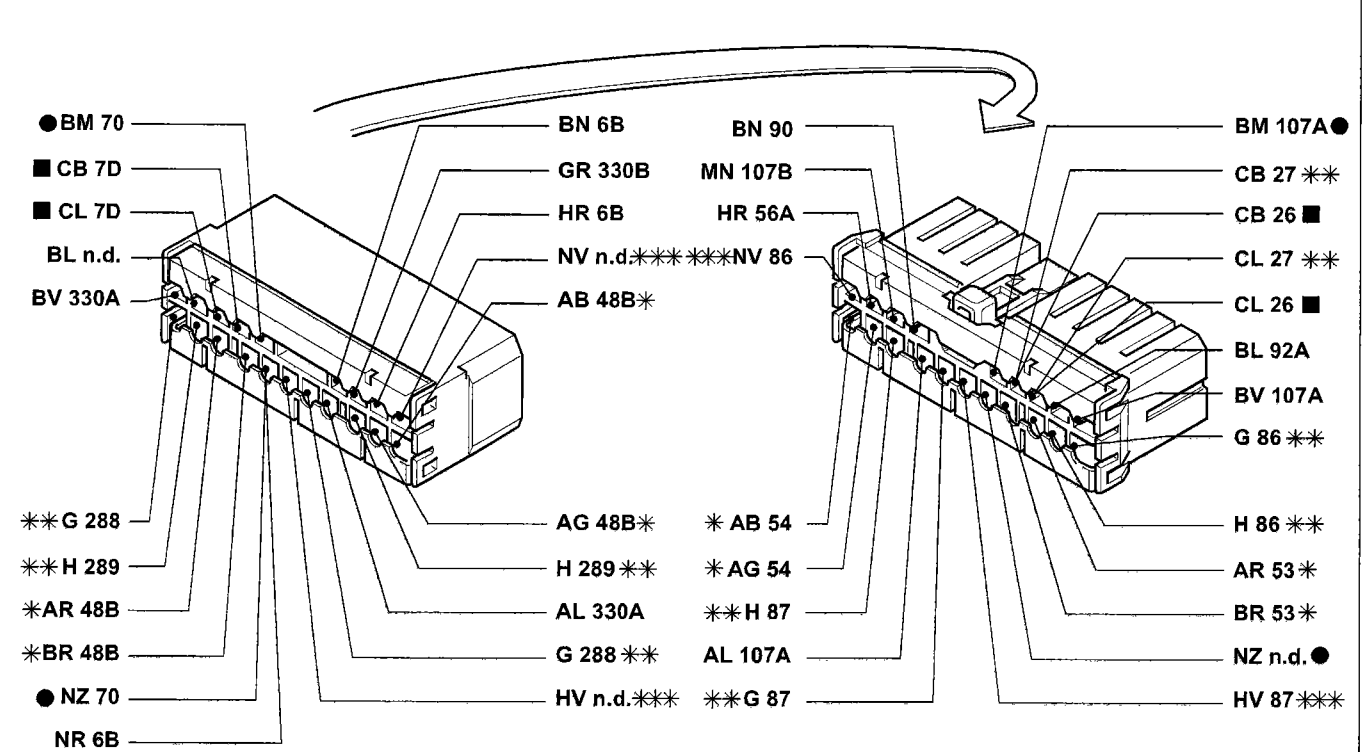
- Components key**
- 3 Power fuse box:
    - A 30A protective fuse for injection system (60A for TD versions)
    - B 40A protective fuse for ignition system
    - C 80A fuse protecting additional options
    - D 80A protective fuse for junction unit
  - 4 Junction unit:
    - E1 Ignition discharge relay
    - E2 Horn relay feed
    - E3 Heated rear windscreen relay feed
  - 7 Steering column switch unit:
    - A Windscreen wiper speed control switch
    - B Windscreen/headlamp/rearscreen washer control switch
    - C Rearscreen wiper control switch
    - D Flasher control
    - E Switch for dipped/main beam headlamps
    - F Switch for side lights
    - G Direction indicators/hazard w/lights intermittent device
    - H Switch for direction indicators
    - I Horn control
  - 8 Left front earth
  - 9 Right front earth
  - 10 Earth for battery on bodyshell
  - 11 Battery
  - 12 Ignition switch
  - 13 Front right/left cables connection
  - 18 Left rear earth
  - 22 Left dashboard earth
  - 24 Windscreen wiper motor
  - 25 Electric windscreen/rearscreen washer pump
  - 26 Rearscreen wiper motor
  - 27 Contact board for rear connections with luggage compartment light switch incorporated
  - 28 Dashboard/longitudinal cables connection
  - 34 Switch unit:
    - A Alarm on warning light
    - B Rear fog lamps switch
    - C Rear fog lamps relay feed
    - D Rear fog lamps warning light
    - E Heated rear windscreen switch
    - F Heated rear windscreen warning light
    - G Ideogram light from switch unit
    - H Fog lights warning light
    - I Fog lights switch
    - L Outside temperature control switch
  - 39 Heated rear windscreen
  - 46 Left electric horn
  - 47 Right electric horn
  - 97 Electric headlamp washer pump
  - 98 Headlamp washer intermittent device
  - 127 Connection between left front cable/cable on relay holder bracket
  - 296 Fuse carrier base on front cable
    - B 20A protective fuse for windscreen wiper with A.B.I. or without A.B.I.
  - 330 A.B.I. control unit
  - N.D. Ultrasound welding taped in cable loom

**4D** Junction unit



\* Variant connection for versions without air conditioning  
\*\* Variant connection for JTD versions  
\*\*\* Variant connection for version with automatic transmission

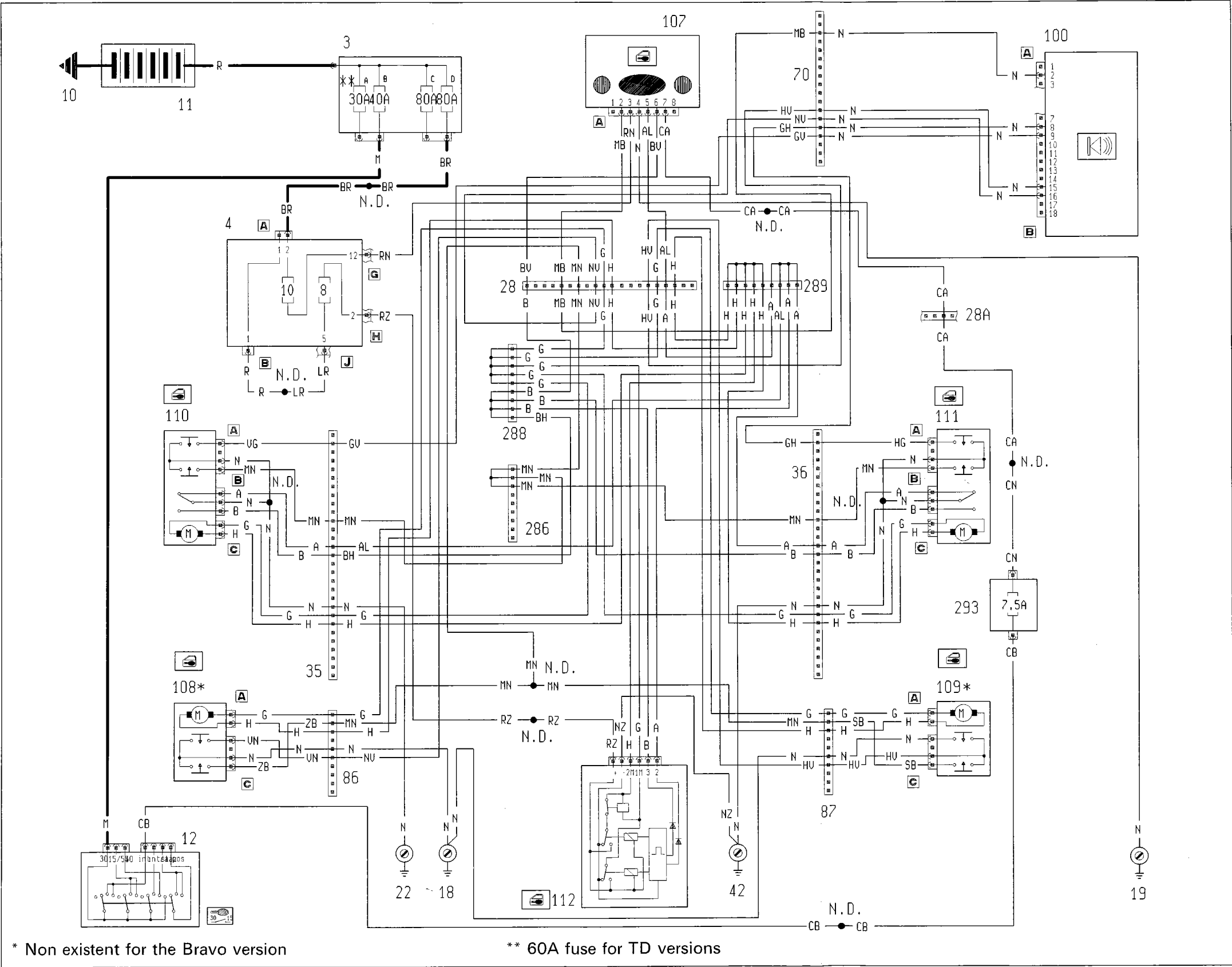
**28** Connection between dashboard/longitudinal cables. Versions with A.B.I. control unit



● Variant connection for versions with alarm  
\* Variant connection for versions with top of the range radio  
\*\* Variant connection for Brava versions  
\*\*\* Variant connection for Brava versions with alarm

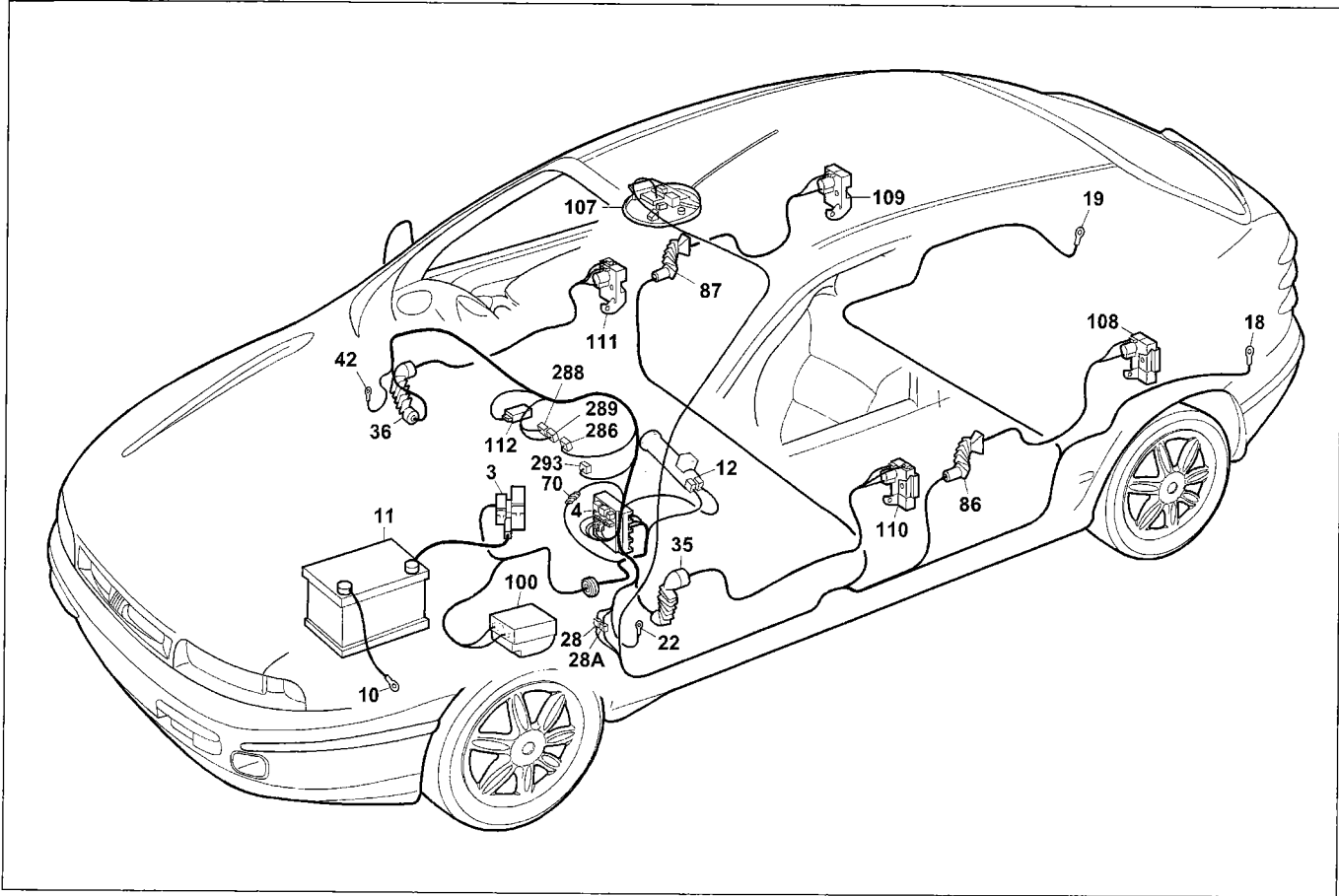
The cables in the wiring diagram are marked

Version with alarm: SX - GT  
Central locking - (See key at end of wiring diagrams)





55.



Version with alarm: SX - GT

Central locking

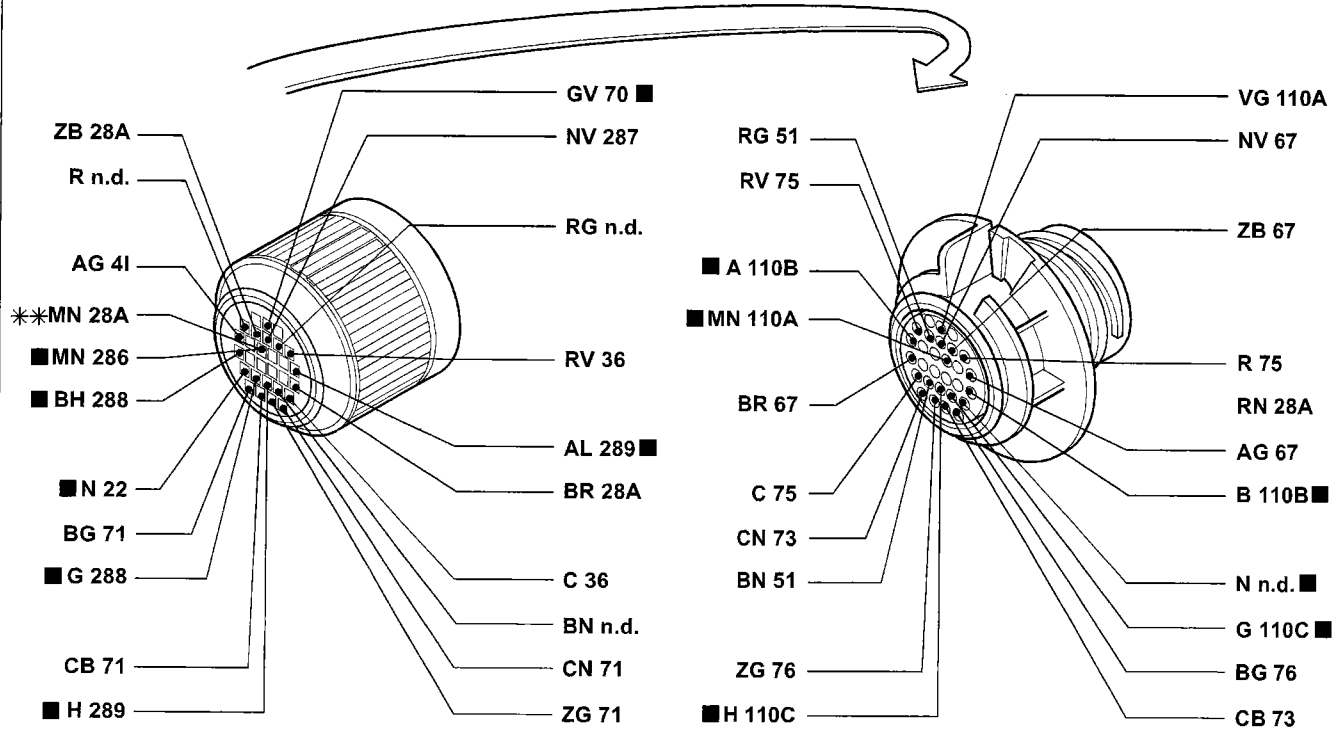
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 10 Earth for battery on bodysell
- 11 Battery
- 12 Ignition switch
- 18 Left rear earth
- 19 Right rear earth
- 22 Left dashboard earth
- 28 Dashboard/longitudinal cables connection
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 70 Dashboard/front cables connection
- 86 Longitudinal/left rear door cables connection
- 87 Longitudinal/right rear door cables connection
- 100 Alarm device electronic control unit
- 107A Central locking remote control receiver

- 108 Left rear central locking/alarm switch
- 109 Right rear central locking/alarm on switch
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/alarm on switch
- 112 Central door locking control unit
- 286 Short circuit connection
- 288 Short circuit connection
- 289 Short circuit connection
- 293 Fuse carrier base on dashboard cable
  - A 7.5A fuse protecting switch panel light Radio phone; Radio; Electric mirrors

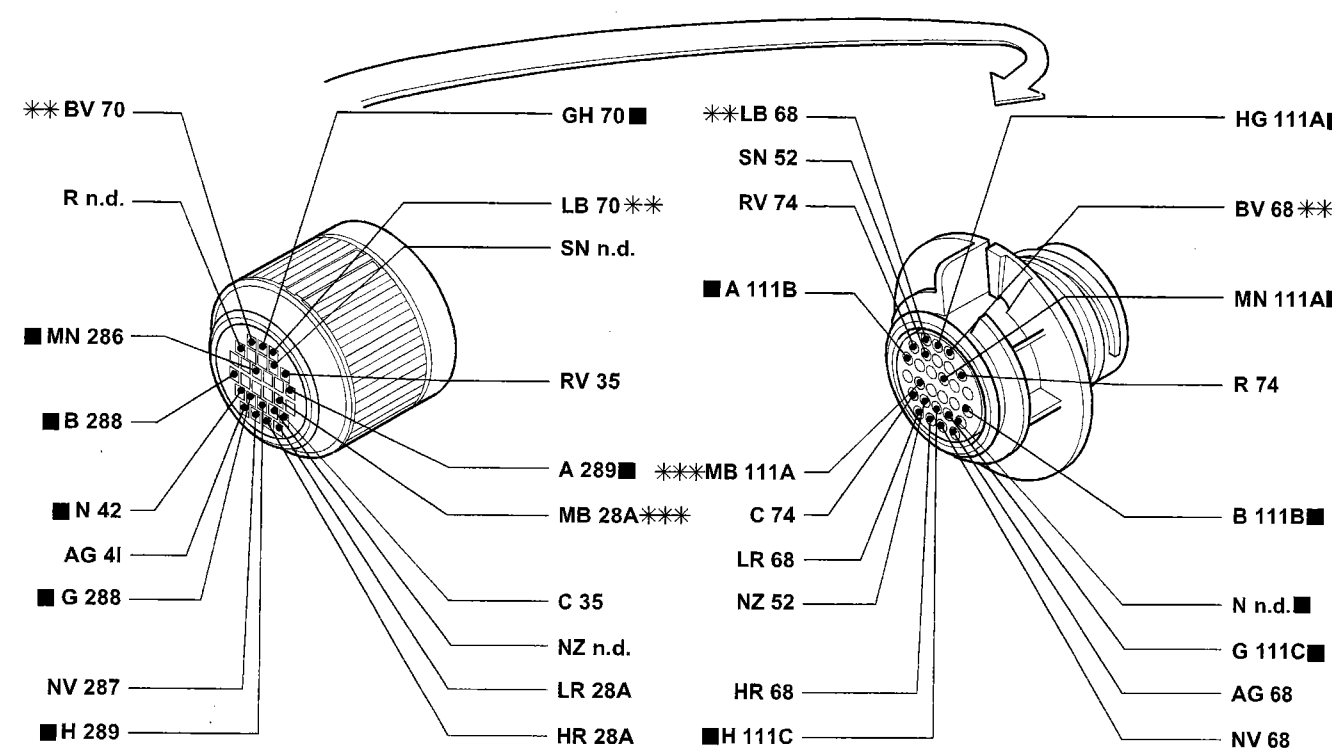
N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection



\*\* Variant connection for version with automatic transmission

36 Connection for dashboard cables/right side door



\*\* Variant connection for versions with air conditioning

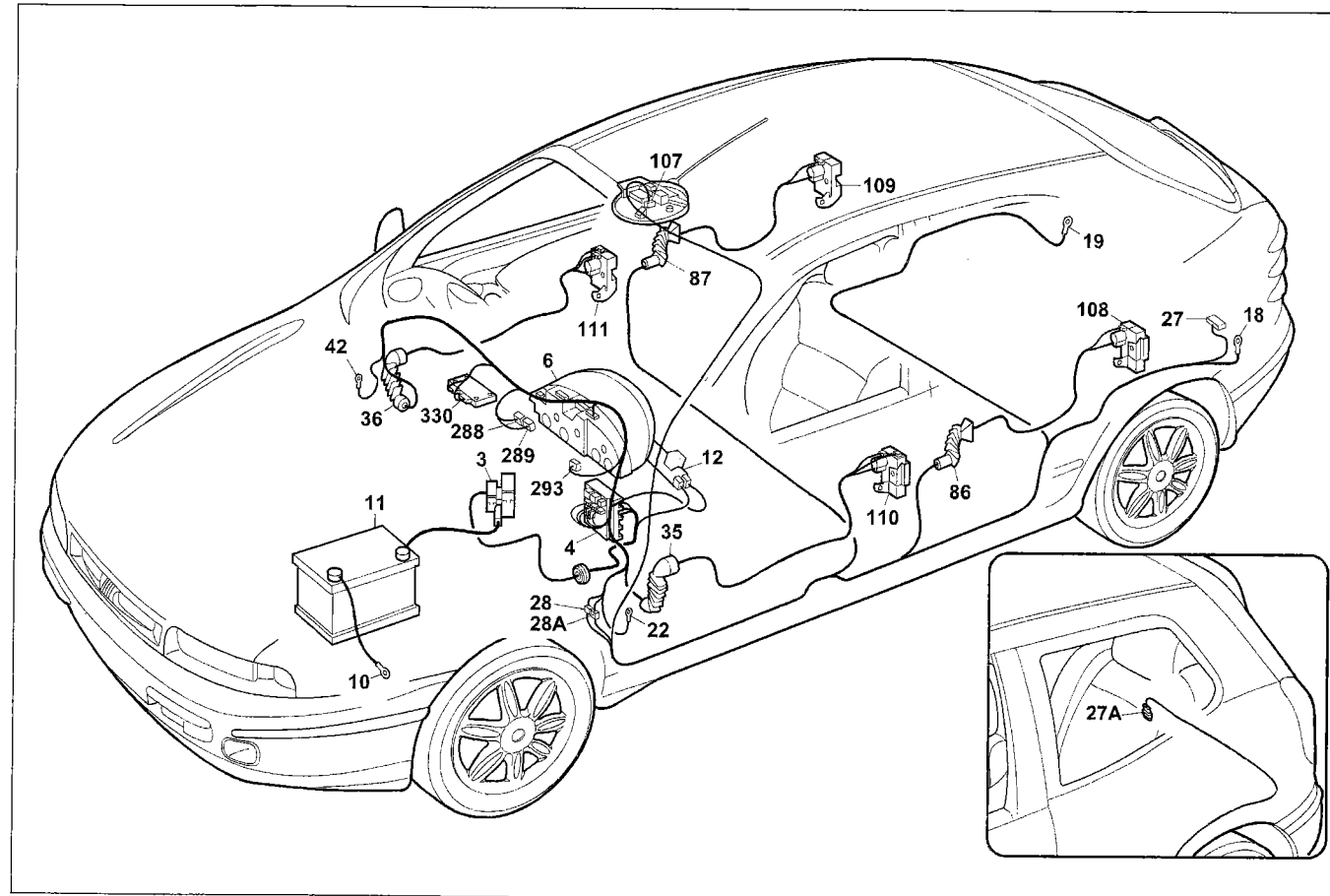
\*\*\* Variant connection for version with automatic transmission

The cables in the wiring diagram are marked

\* Non existent for the Bravo version

\*\* 60A fuse for TD versions

\*\*\* Variant connections for the Bravo version



**Version without alarm: ELX - HSX - HGT**

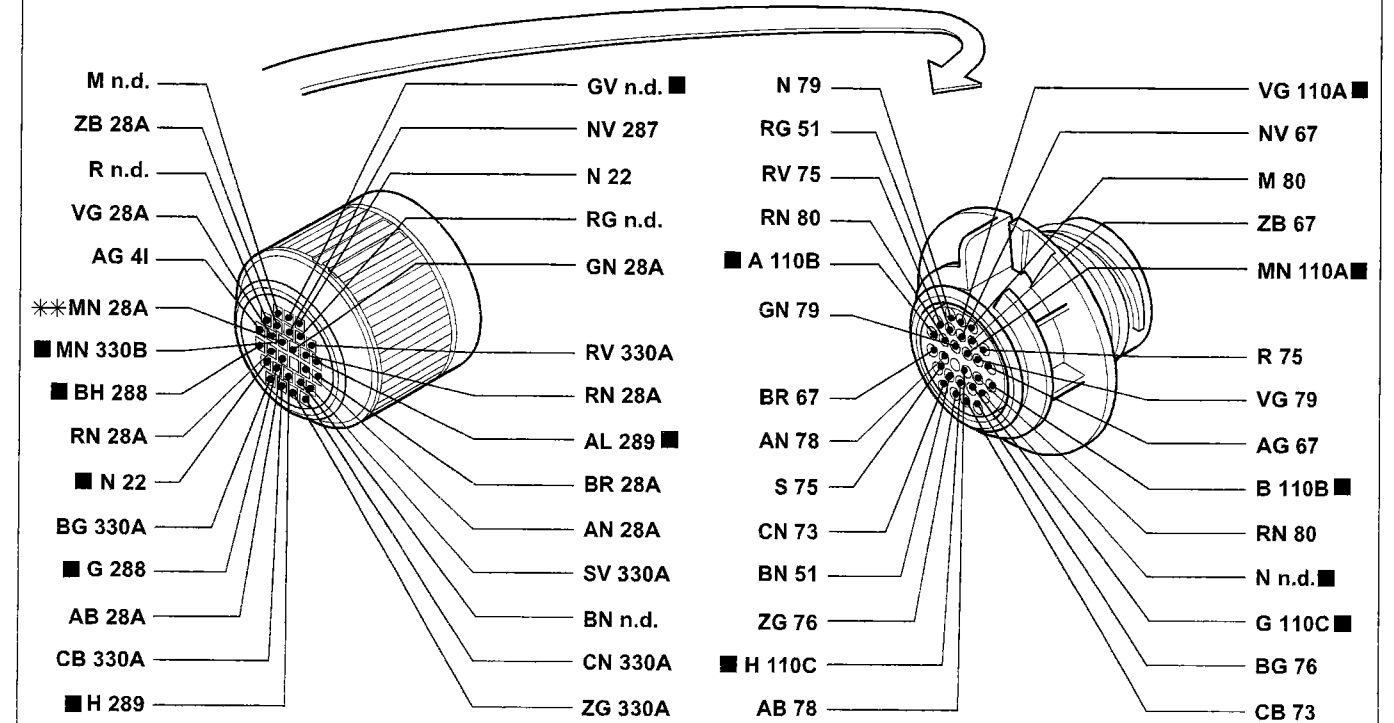
### Central door locking and car doors not shut warning system

### Components key

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>3 Power fuse box:</li> <li>A 30A protective fuse for injection system (60A for TD versions)</li> <li>B 40A protective fuse for ignition system</li> <li>C 80A fuse protecting additional options</li> <li>D 80A protective fuse for junction unit</li> <li>4 Junction unit</li> <li>6 Instrument panel:</li> <li>U Doors ajar warning light</li> <li>10 Earth for battery on bodyshell</li> <li>11 Battery</li> <li>12 Ignition switch</li> <li>18 Left rear earth</li> <li>19 Right rear earth</li> <li>22 Left dashboard earth</li> <li>27 Contact board for rear connections with luggage compartment light switch</li> <li>27A Button for luggage compartment light, switching on alarm and signalling boot lid open</li> <li>28 Dashboard/longitudinal cables connection</li> <li>28A Dashboard/longitudinal cables connection</li> <li>35 Dashboard/left front door cables connection</li> <li>36 Dashboard/right front door cables connection</li> <li>42 Right dashboard earth</li> <li>86 Longitudinal/left rear door cables connection</li> <li>87 Longitudinal/right rear door cables connection</li> <li>107A Central locking remote control receiver</li> </ul> | <ul style="list-style-type: none"> <li>108 Left rear central locking/alarm switch</li> <li>109 Right rear central locking/alarm on switch</li> <li>110 Left front central locking/alarm on switch</li> <li>111 Right front central locking/alarm on switch</li> <li>288 Short circuit connection</li> <li>289 Short circuit connection</li> <li>293 Fuse carrier base on dashboard cable</li> <li>A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors</li> <li>D 25A fuse protecting A.B.I. control unit; Central locking control unit</li> <li>330 A.B.I. control unit</li> <br/> <li>N.D. Ultrasound welding taped in cable loom</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

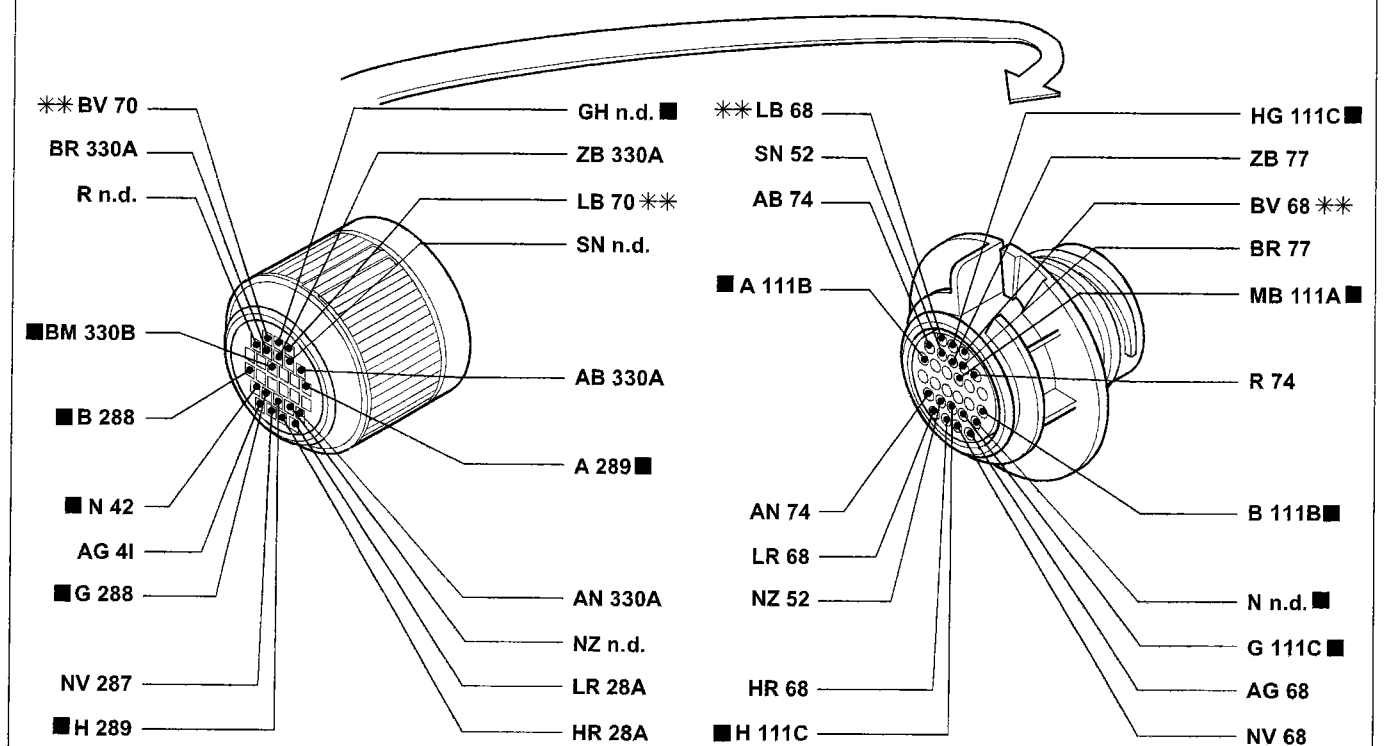
N.D. Ultrasound welding taped in cable loom

### 35 Dashboard/left front door cables connection



\*\* Variant connection for version with automatic transmission

### 36 Connection for dashboard cables/right side door



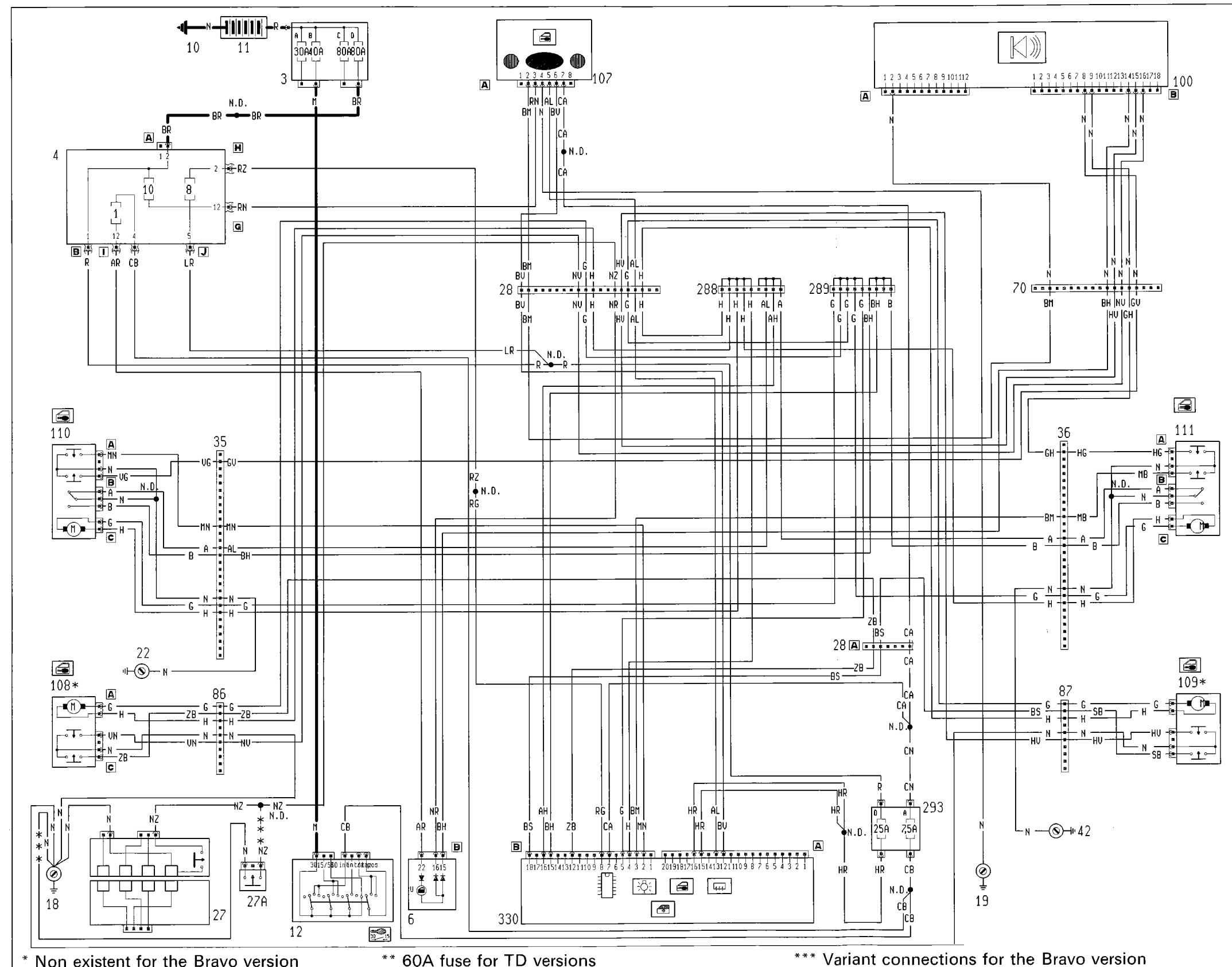
\*\* Variant connection for versions with air conditioning

The cables in the wiring diagram are marked

94A192101

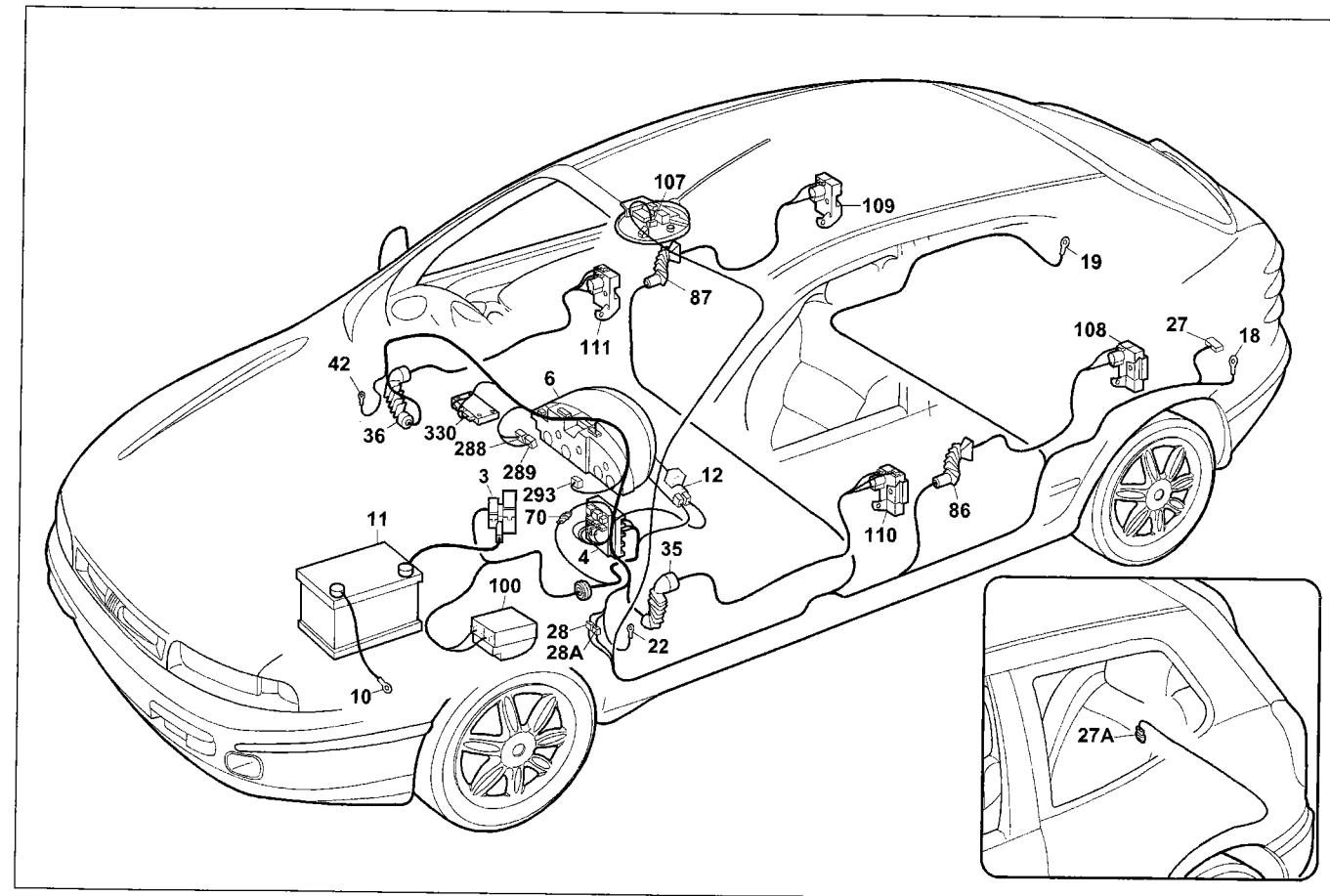
Version with alarm: ELX - HSX HGT

Central door locking and car doors not shut warning system - (See key at end of wiring diagrams)





**55.**



**Version with alarm: ELX - HSX - HGT**

**Central locking and signalling doors open**

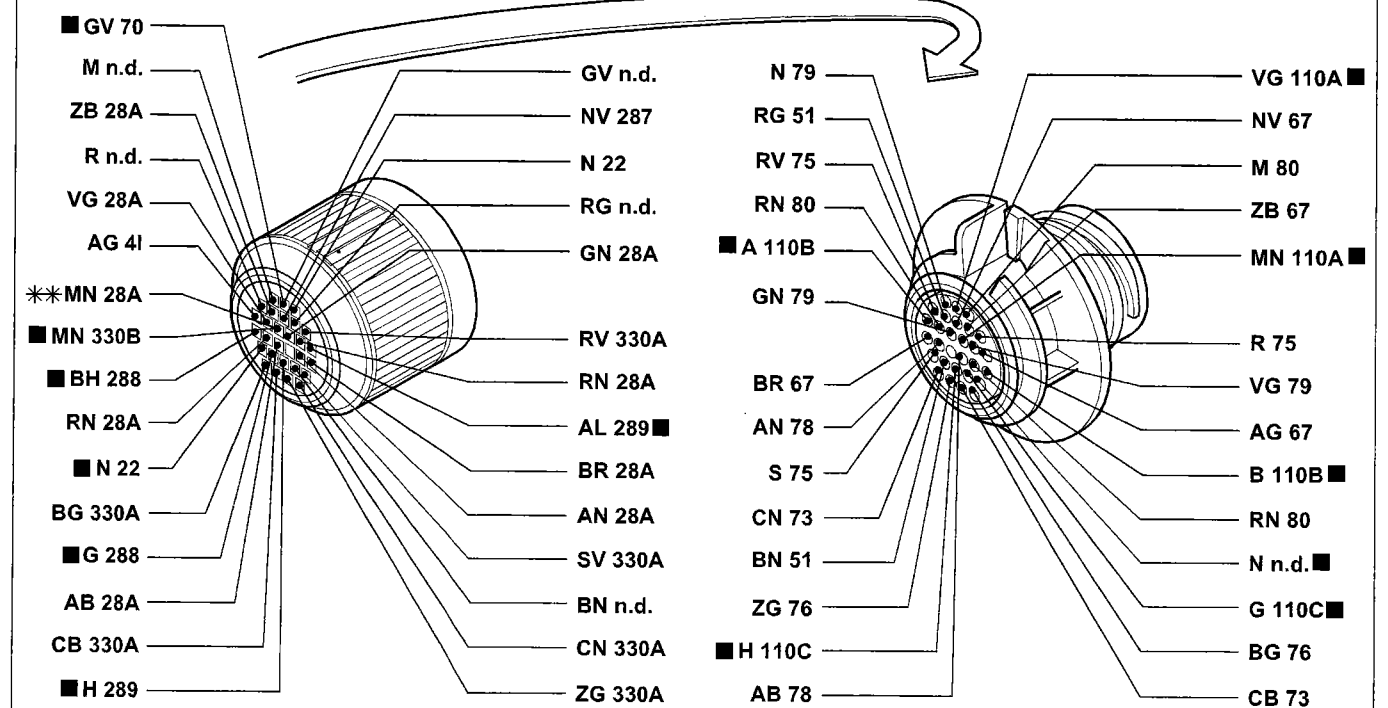
**Components key**

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
U Doors ajar warning light
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 18 Left rear earth
- 19 Right rear earth
- 22 Left dashboard earth
- 27 Contact board for rear connections with luggage compartment light switch
- 27A Button for luggage compartment light, switching on alarm and signalling boot lid open
- 28 Dashboard/longitudinal cables connection
- 28A Connection for longitudinal dashboard cables
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 70 Dashboard/front cables connection
- 86 Longitudinal/left rear door cables connection
- 87 Longitudinal/right rear door cables connection
- 100 Alarm device electronic control unit
- 107A Central locking remote control receiver
- 108 Left rear central locking/alarm switch
- 109 Right rear central locking/alarm on switch
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/alarm on switch
- 288 Short circuit connection
- 289 Short circuit connection
- 293 Fuse carrier base on dashboard cable  
A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors  
D 25A fuse protecting A.B.I. control unit; Central locking control unit
- 330 A.B.I. control unit
- N.D. Ultrasound welding taped in cable loom

P4A195I01

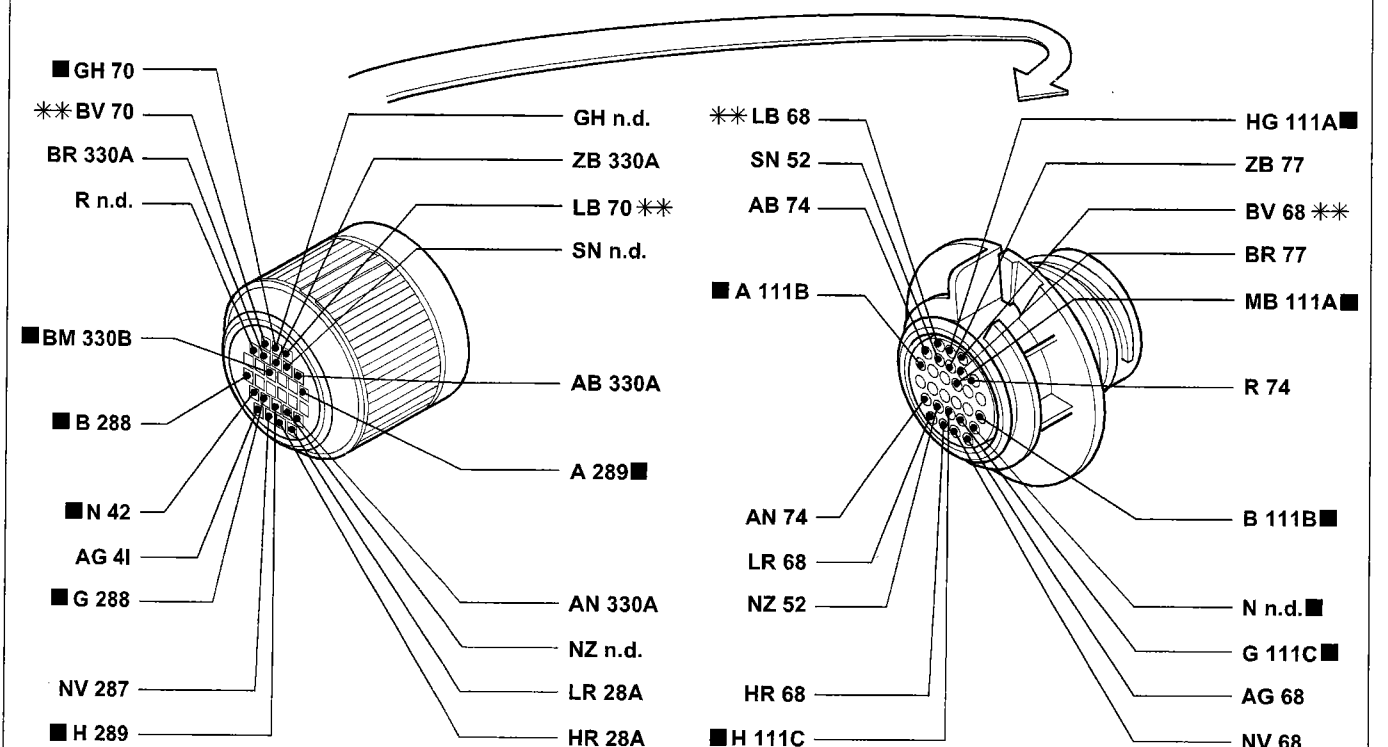
4A195I

### 35 Dashboard/left front door cables connection



\*\* Variant connection for version with automatic transmission

### 36 Connection for dashboard cables/right side door



\*\* Variant connection for version with automatic transmission

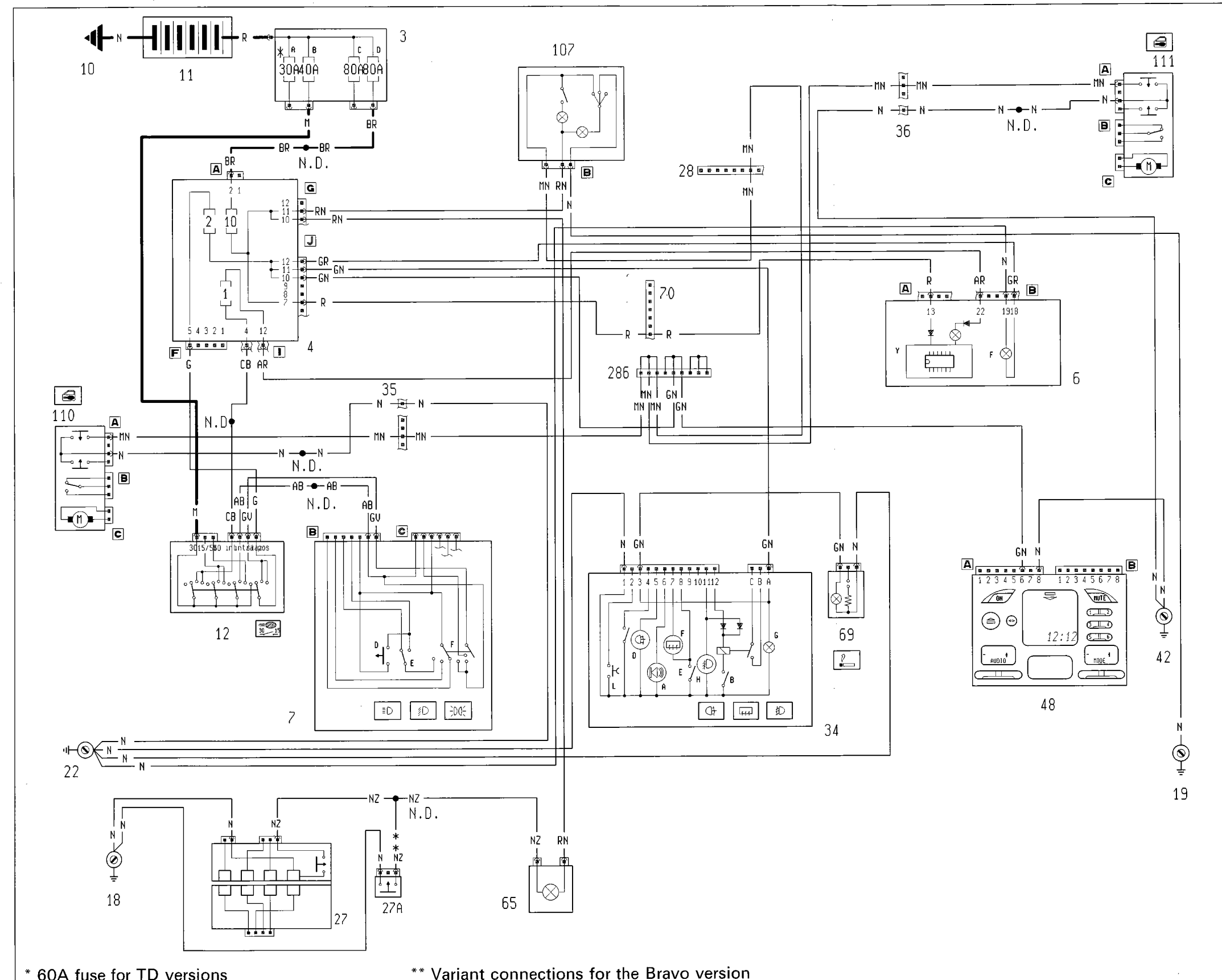
The cables in the wiring diagram are marked

P4A196I01

4A196I

Trim level: SX - GT

Vehicle interior lights - Ideogram lights - (See key at end of wiring diagrams)

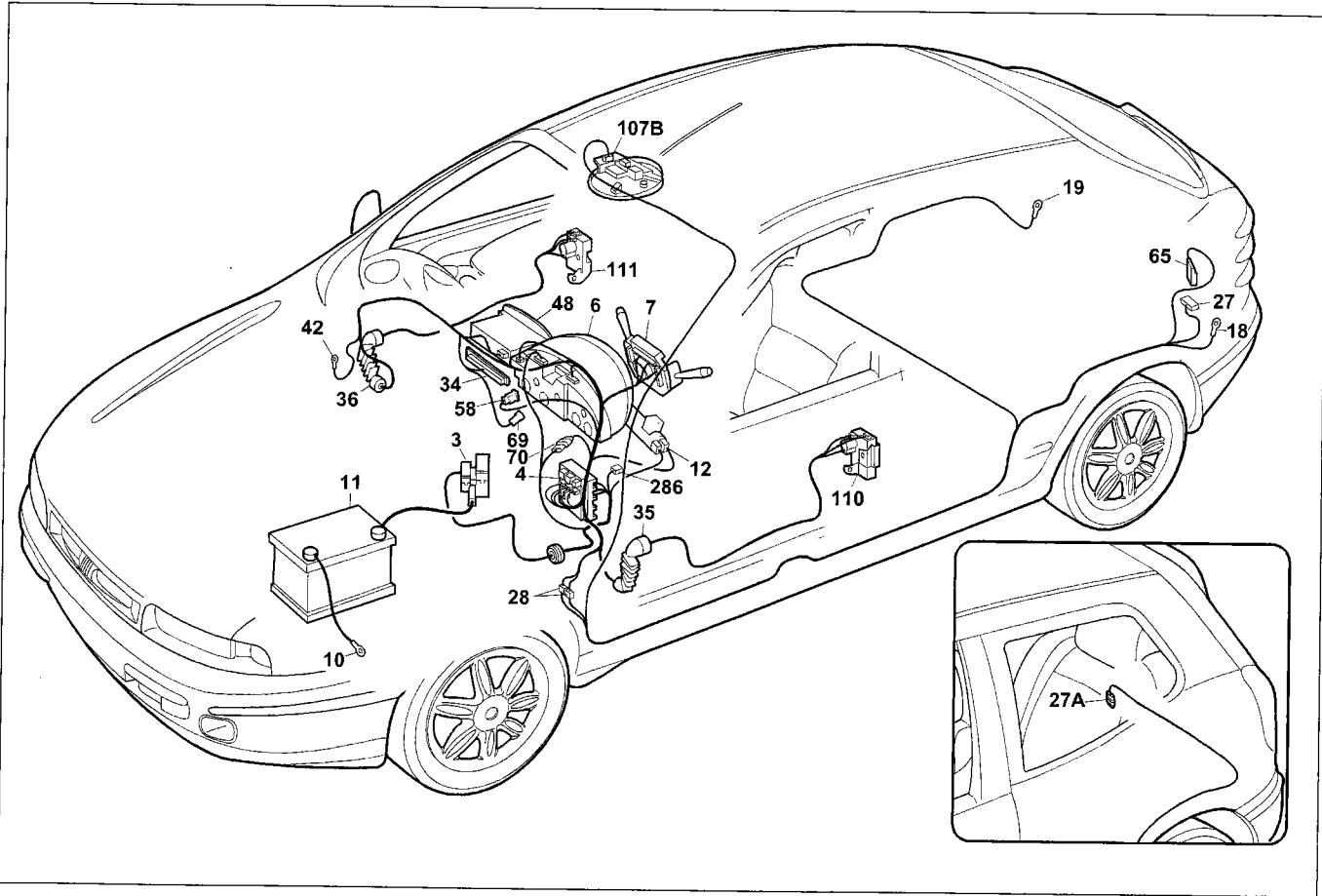


\* 60A fuse for TD versions

\*\* Variant connections for the Bravo version



55.



Trim level: SX - GT

Vehicle interior lights - Ideogram lights

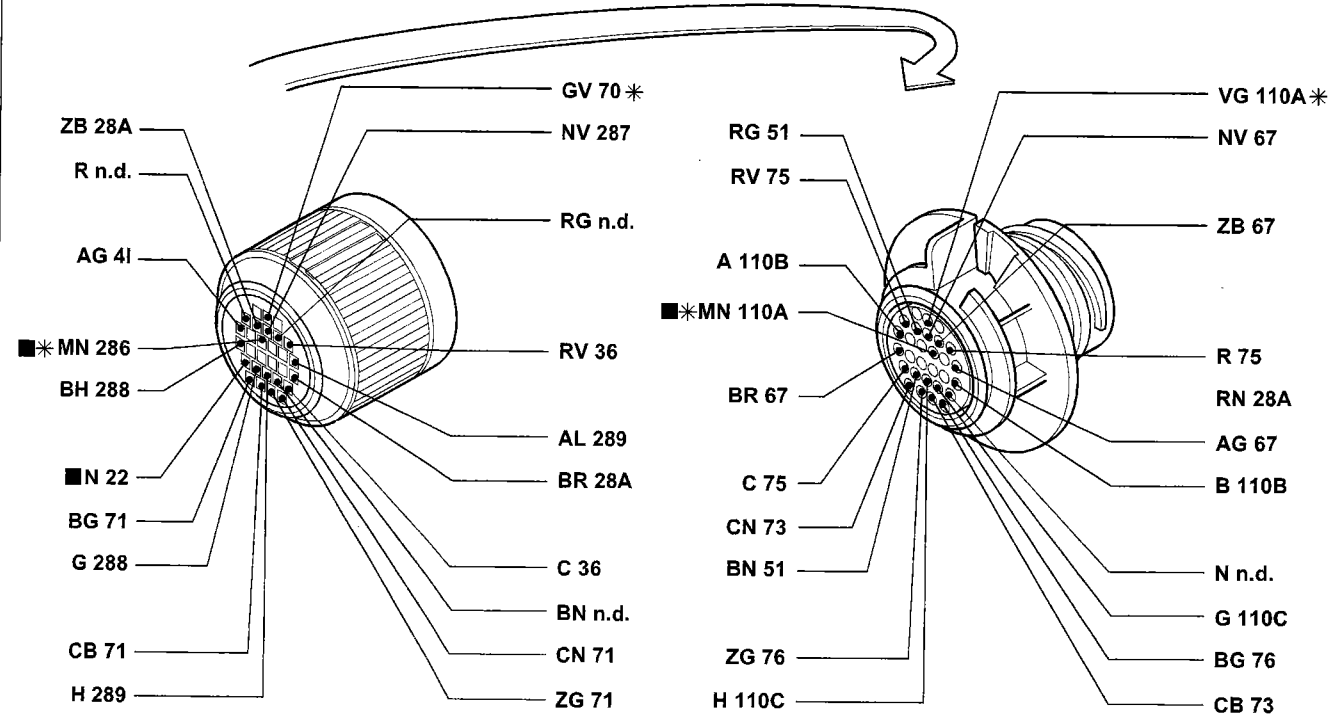
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - F Instrument panel ideogram lights
  - Y Electronic module
- 7 Steering column switch unit:
  - D Flasher control
  - E Switch for dipped/main beam headlamps
  - F Switch for side lights
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 18 Left rear earth
- 27 Contact board for rear connections with luggage compartment light switch incorporated
- 27A Button for luggage compartment light, switching on alarm and signalling boot lid open
- 28 Connection between dashboard/longitudinal cables
- 34 Switch control panel:
  - A Anti-theft warning light on
  - B Rear fog lamps switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen switch

- F Heated rear windscreen warning light
- G Ideogram light for switch control panel
- H Fog lights warning light
- I Fog lights switch
- L Outside temperature control switch
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 48 Radio receiver with clock
- 58 Light dimmer
- 65 Luggage compartment light bulb/anti-theft device on
- 69 Cigar lighter
- 70 Dashboard/front cables connection
- 107B Courtesy lights
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/alarm on switch
- 286 Short circuit connection

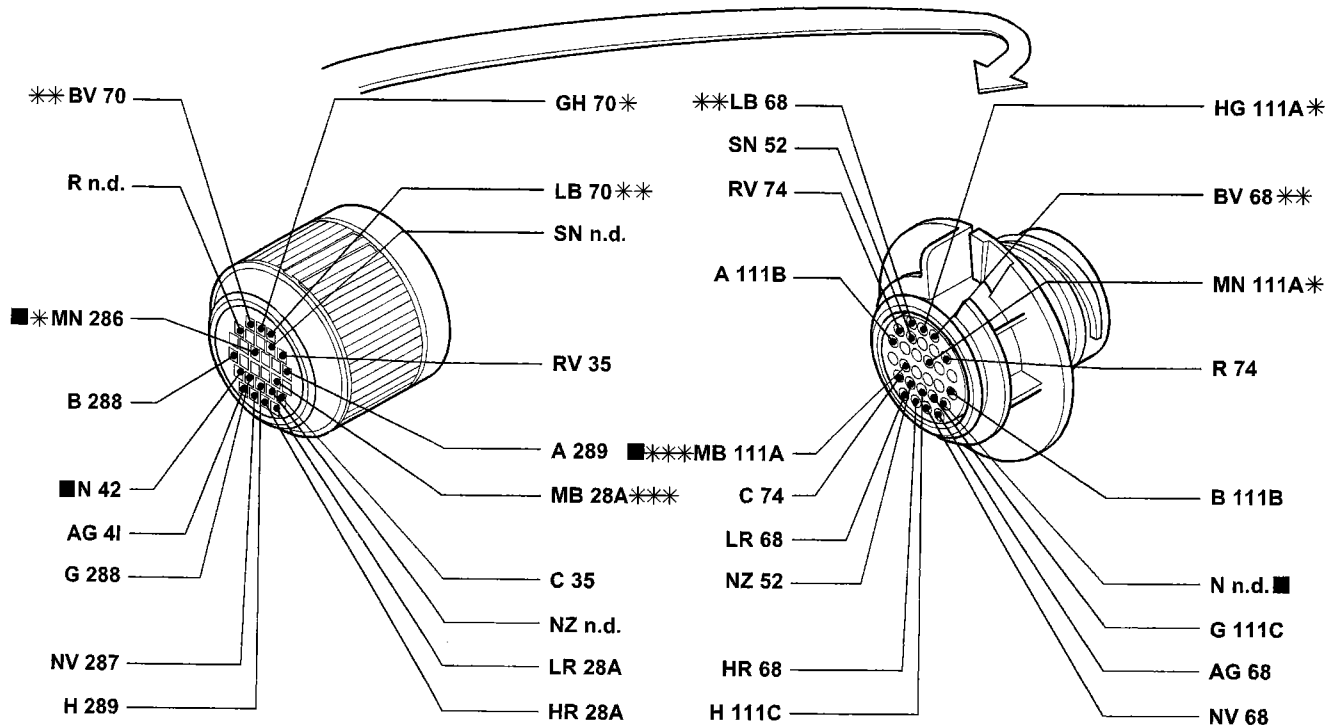
N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection



\* Variant connection for versions with alarm

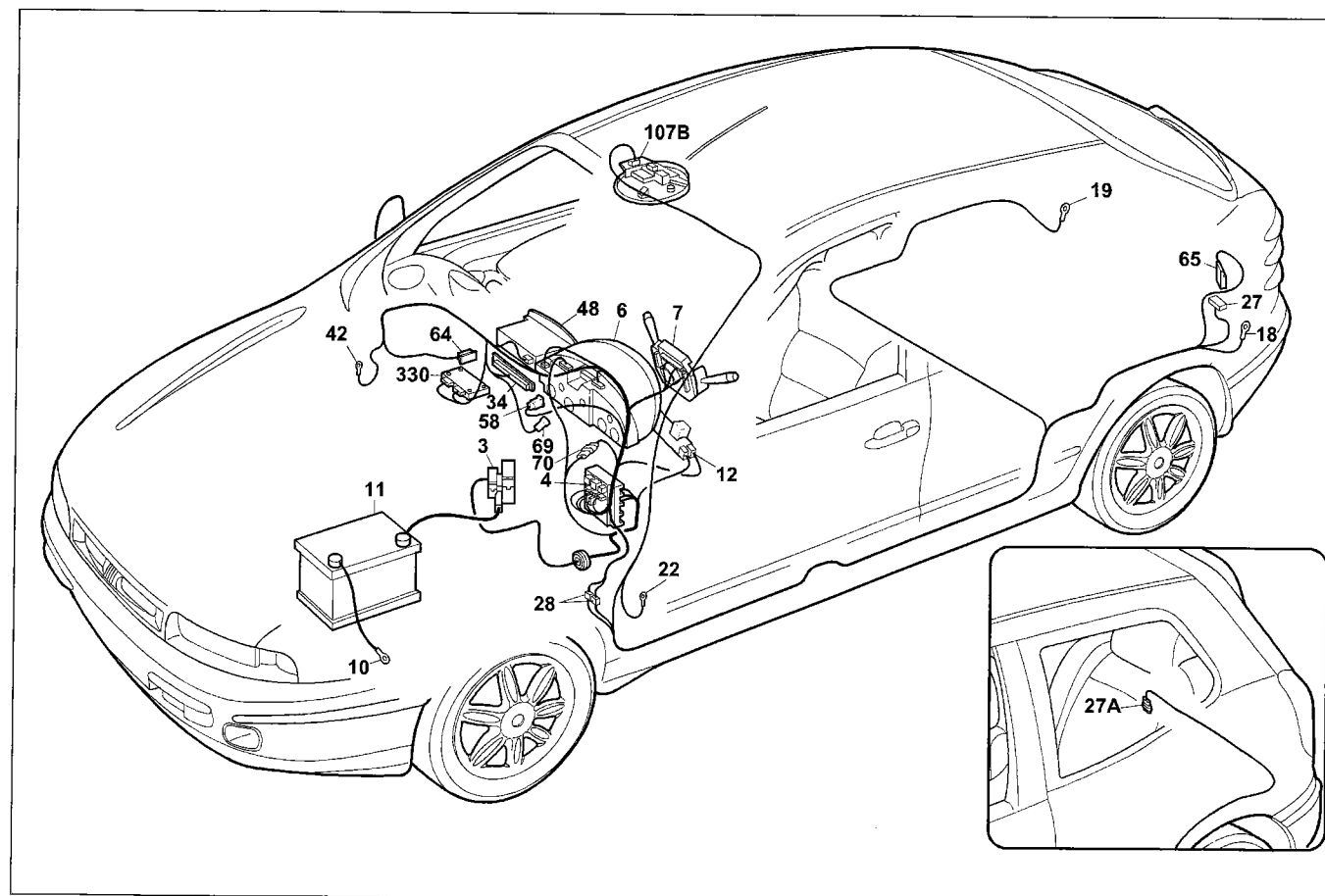
36 Connection for dashboard cables/right side door



- \* Variant connection for versions with alarm
- \*\* Variant connection for versions with air conditioning
- \*\*\* Variant connection for version with automatic transmission

The cables in the wiring diagram are marked





**Trim level: ELX - HSX - HGT**

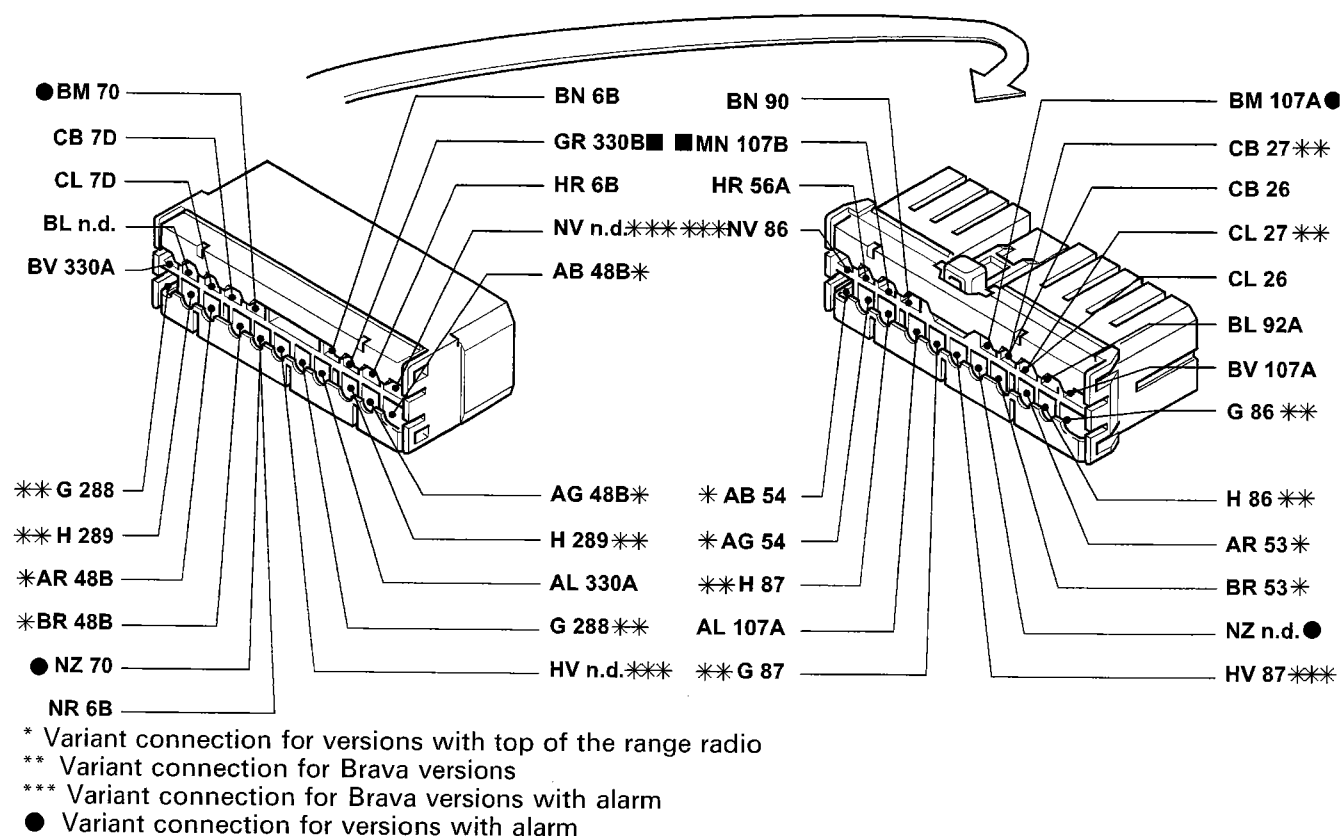
### Vehicle interior lights - Ideogram lights

### Components key

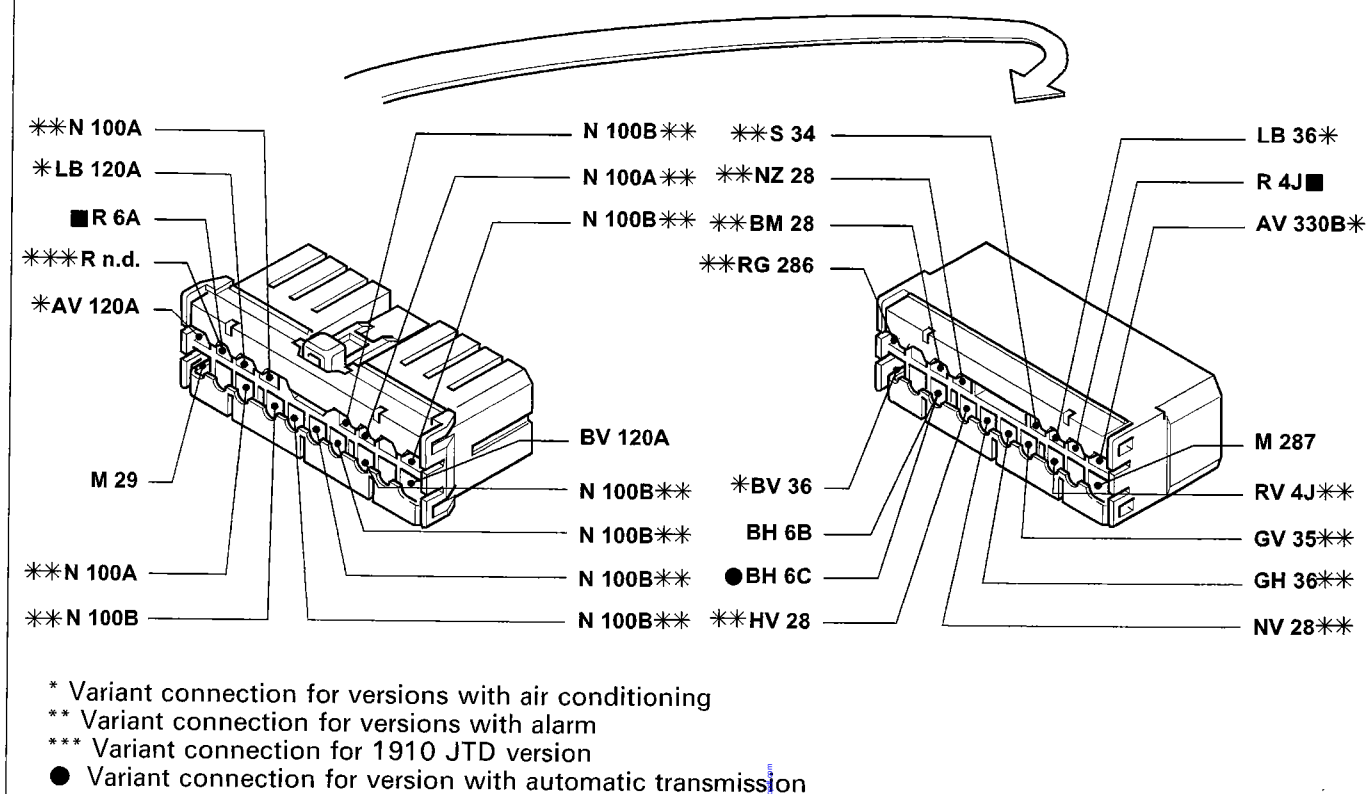
- |     |                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                       |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3   | Power fuse box:<br>A 30A protective fuse for injection system (60A for TD versions)<br>B 40A protective fuse for ignition system<br>C 80A fuse protecting additional options<br>D 80A protective fuse for junction unit | 34   | Switch control panel:<br>A Anti-theft warning light on<br>B Rear fog lamps switch<br>D Rear fog lamps warning light<br>E Heated rear windscreen switch<br>F Heated rear windscreen warning light<br>G Switch control unit ideogram light<br>H Fog lights warning light<br>I Fog lights switch<br>L Outside temperature control switch |
| 4   | Junction unit                                                                                                                                                                                                           | 42   | Right dashboard earth                                                                                                                                                                                                                                                                                                                 |
| 6   | Instrument panel:<br>F Instrument panel ideogram lights<br>Y Electronic module                                                                                                                                          | 48   | Radio receiver with clock                                                                                                                                                                                                                                                                                                             |
| 7   | Steering column switch unit:<br>D Flasher control<br>E Switch for dipped/main beam headlamps<br>F Switch for side lights                                                                                                | 58   | Light dimmer                                                                                                                                                                                                                                                                                                                          |
| 10  | Earth for battery on bodyshell                                                                                                                                                                                          | 64   | Glove compartment light bulb with switch incorporated                                                                                                                                                                                                                                                                                 |
| 11  | Battery                                                                                                                                                                                                                 | 65   | Luggage compartment light bulb/anti-theft device on                                                                                                                                                                                                                                                                                   |
| 12  | Ignition switch                                                                                                                                                                                                         | 69   | Cigar lighter                                                                                                                                                                                                                                                                                                                         |
| 18  | Left rear earth                                                                                                                                                                                                         | 70   | Dashboard/longitudinal cables connection                                                                                                                                                                                                                                                                                              |
| 19  | Right rear earth                                                                                                                                                                                                        | 107B | Courtesy lights                                                                                                                                                                                                                                                                                                                       |
| 22  | Left dashboard earth                                                                                                                                                                                                    | 330  | A.B.I. control unit                                                                                                                                                                                                                                                                                                                   |
| 27  | Contact board for rear connections with luggage compartment light incorporated                                                                                                                                          | 358  | Rear courtesy light                                                                                                                                                                                                                                                                                                                   |
| 27A | Button for luggage compartment light, switching on alarm and signalling boot lid open                                                                                                                                   |      | N.D. Ultrasound welding taped in cable loom                                                                                                                                                                                                                                                                                           |
| 28  | Dashboard/longitudinal cables connection                                                                                                                                                                                |      |                                                                                                                                                                                                                                                                                                                                       |
| 28A | Dashboard/longitudinal cables connection                                                                                                                                                                                |      |                                                                                                                                                                                                                                                                                                                                       |

N.D. Ultrasound welding taped in cable loom

## 28 Connection between dashboard/longitudinal cables



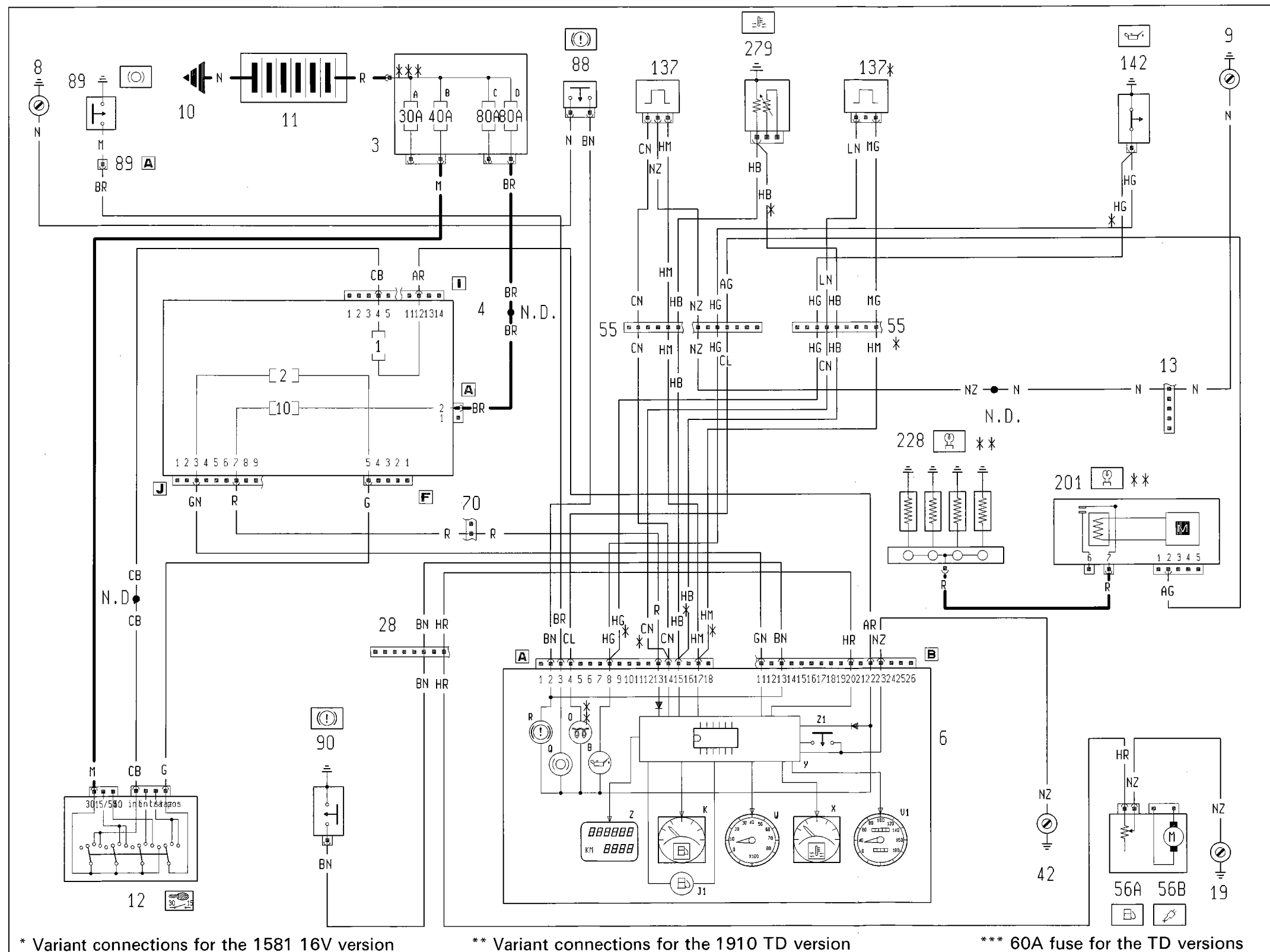
## 70 Dashboard/front cables connection



The cables in the wiring diagram are marked

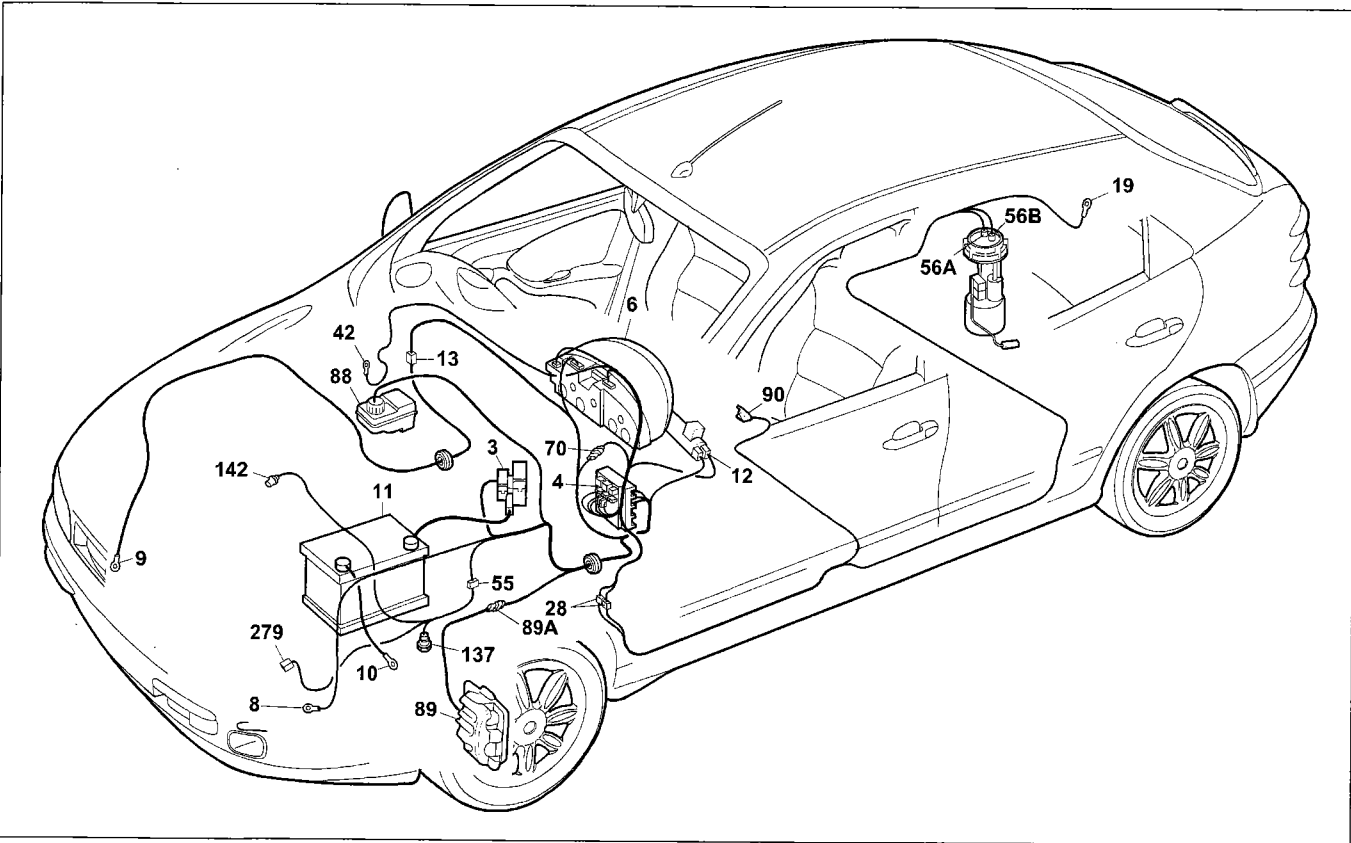
Trim level: SX - GT

**Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Water temperature gauge- Insufficient engine oil pressure warning light - Front brake pad wear warning light - (See key at end of wiring diagrams)**





55.



Trim level: SX - GT

Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Water temperature gauge- Insufficient engine oil pressure warning light - Front brake pad wear warning light

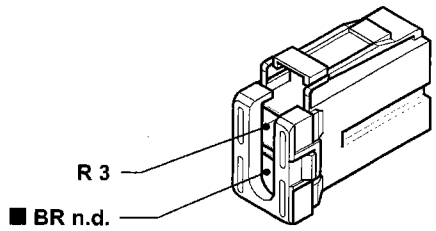
Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
B Insufficient engine oil pressure warning light  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
O Heater plugs warning light  
Q Front brake pad wear warning light  
R Handbrake/insufficient brake fluid level warning light  
V1 Speedometer  
X Engine coolant temperature gauge  
W Rev counter  
Y Electronic module
- Z Milometer/trip meter  
Z1 Trip meter zeroing button
- 8 Left front earth  
9 Right front earth  
10 Earth for battery on bodysell  
11 Battery  
12 Ignition switch

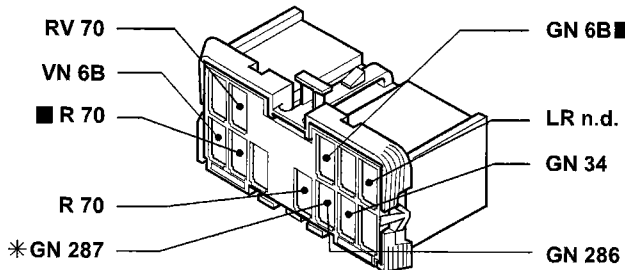
- 13 Front right/left cables connection  
19 Right rear earth  
28 Dashboard/longitudinal cables connection  
42 Right dashboard earth  
55 Connection between front/engine pre-wiring cables  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump  
70 Dashboard/front cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Switch signalling handbrake applied  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
201 Heater plugs control unit  
228 Heater plugs  
279 Twin engine coolant temperature sender unit

N.D. Ultrasound welding taped in cable loom

4A Junction unit

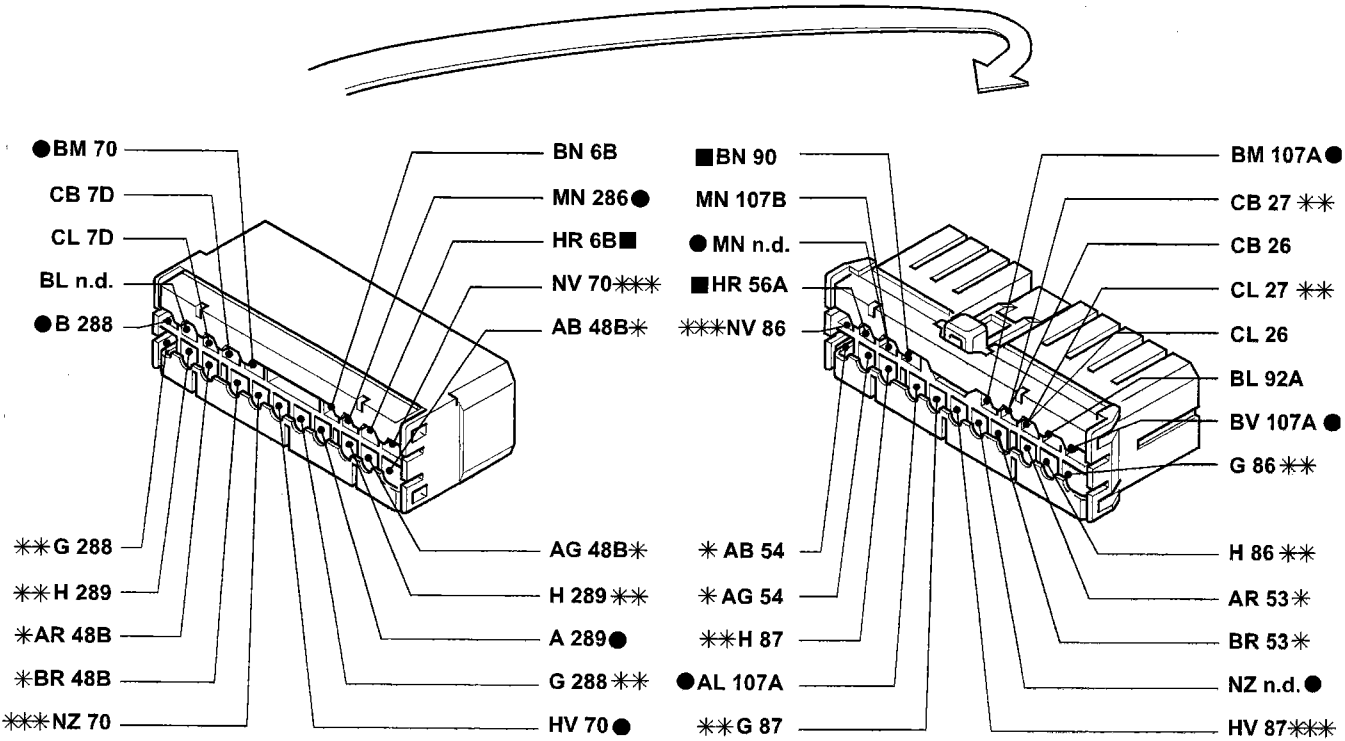


4J Junction unit



\* Variant connection for versions with radio phone

28 Dashboard/longitudinal cables connection. Versions without A.B.I. control unit.



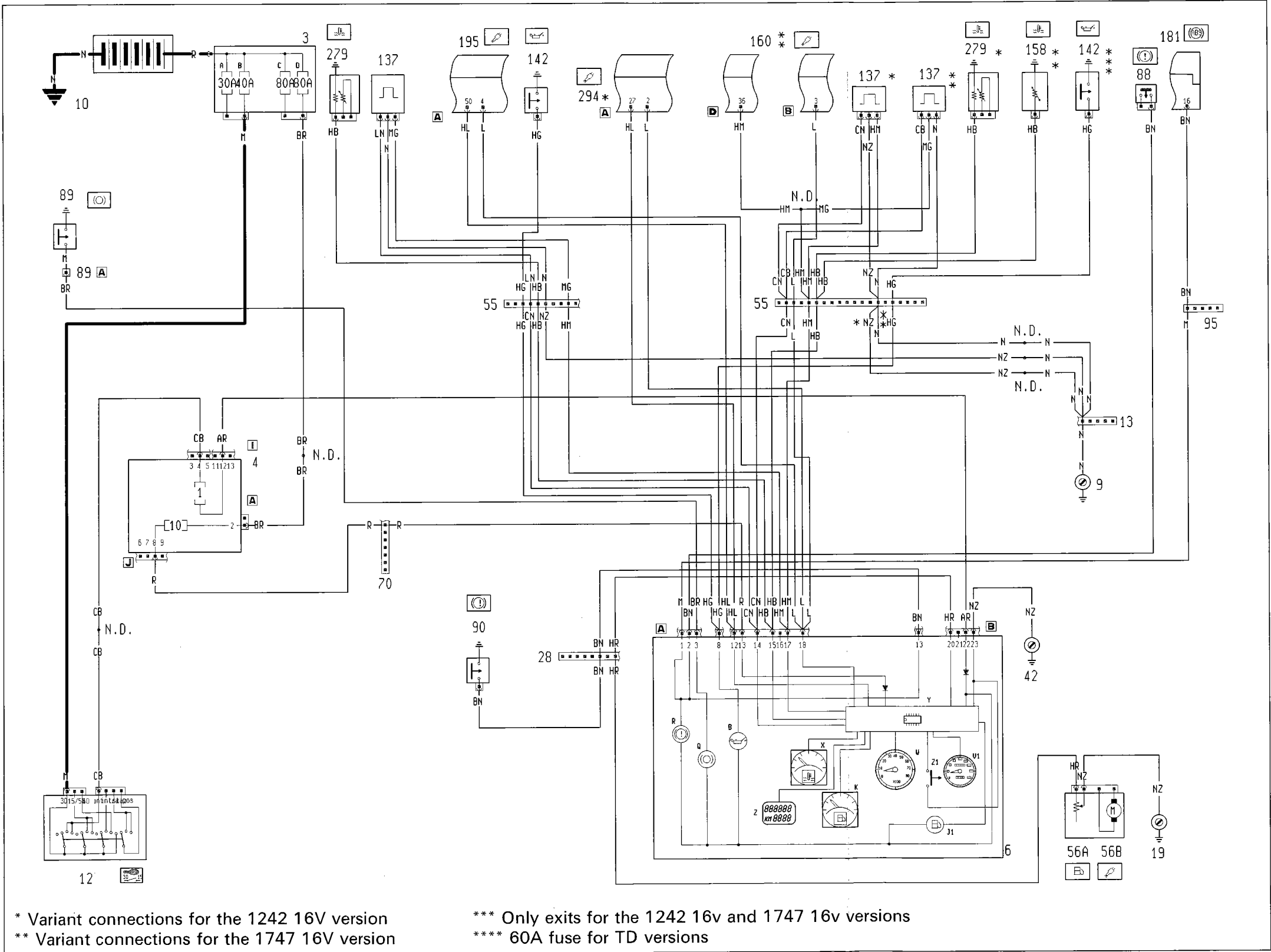
- Variant connection for versions with alarm  
\* Variant connection for versions with top of the range radio  
\*\* Variant connection for Brava versions  
\*\*\* Variant connection for Brava versions with alarm

The cables in the wiring diagram are marked

P4A208I01

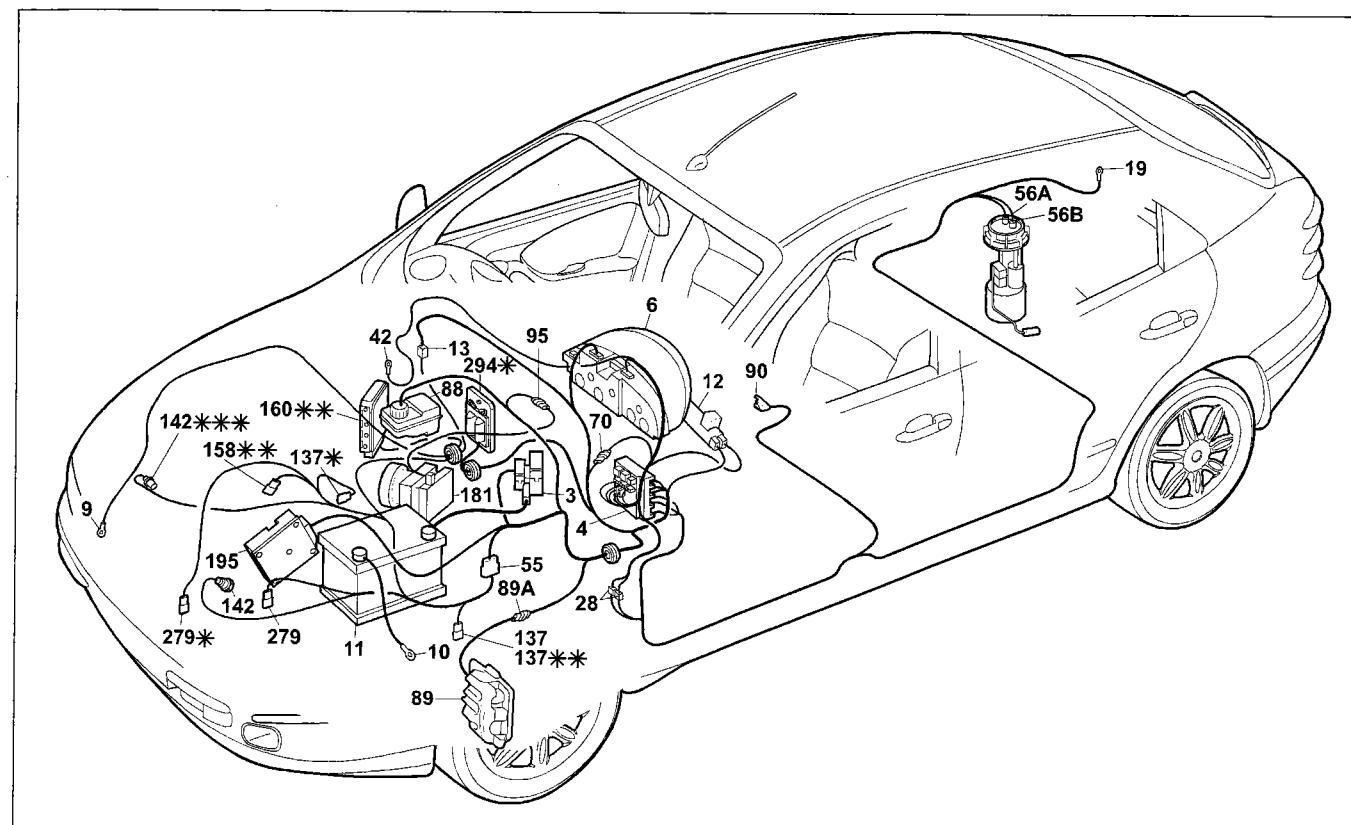
Electrical equipment  
Wiring diagrams  
55.

Trim level: ELX - HSX  
Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Water temperature gauge- Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter - (See key at end of wiring diagrams)





**55.**



P4A211101

**Trim level: ELX - HSX**

**Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Water temperature gauge- Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter**

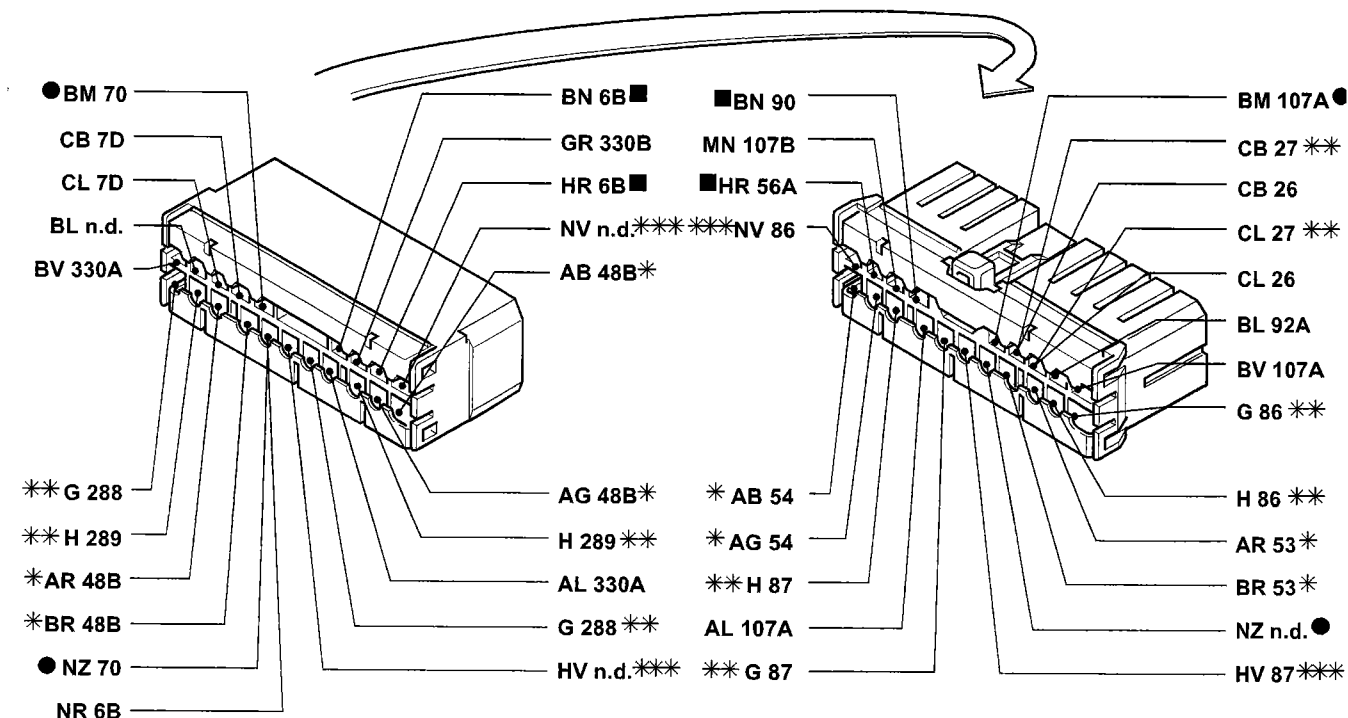
### Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:
  - B Insufficient engine oil pressure warning light
  - J1 Warning light signalling fuel reserve
  - K Fuel level gauge
  - Q Front brake pad wear warning light
  - R Handbrake/insufficient brake fluid level warning light
  - V1 Speedometer
  - W Rev counter
  - X Engine coolant temperature gauge
  - Y Electronic module
  - Z Milometer/trip meter
  - Z1 Trip meter zeroing button
- 9 Right front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 19 Right rear earth
- 28 Dashboard/longitudinal cables connection
- 42 Right dashboard earth

- 55 Connection between front/engine pre-wiring cables
- 56 Fuel level gauge
  - A Fuel level sensor
  - B Electric fuel pump
- 70 Dashboard/front cables connection
- 88 Insufficient brake fluid level sensor
- 89 Left brake pad wear sensor
- 89A Left brake pad wear sensor cables connection
- 90 Switch signalling handbrake applied
- 95 Front/anti-lock brakes cables connection A.B.S.
- 137 Vehicle speed sensor
- 142 Switch signalling insufficient engine oil pressure
- 158 Coolant temperature sensor for instrument
- 160 Injection/ignition electronic control unit (1747)
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 195 Injection/ignition electronic control unit (1581)
- 279 Twin engine coolant temperature sender unit
- 294 Injection/ignition electronic control unit 1242

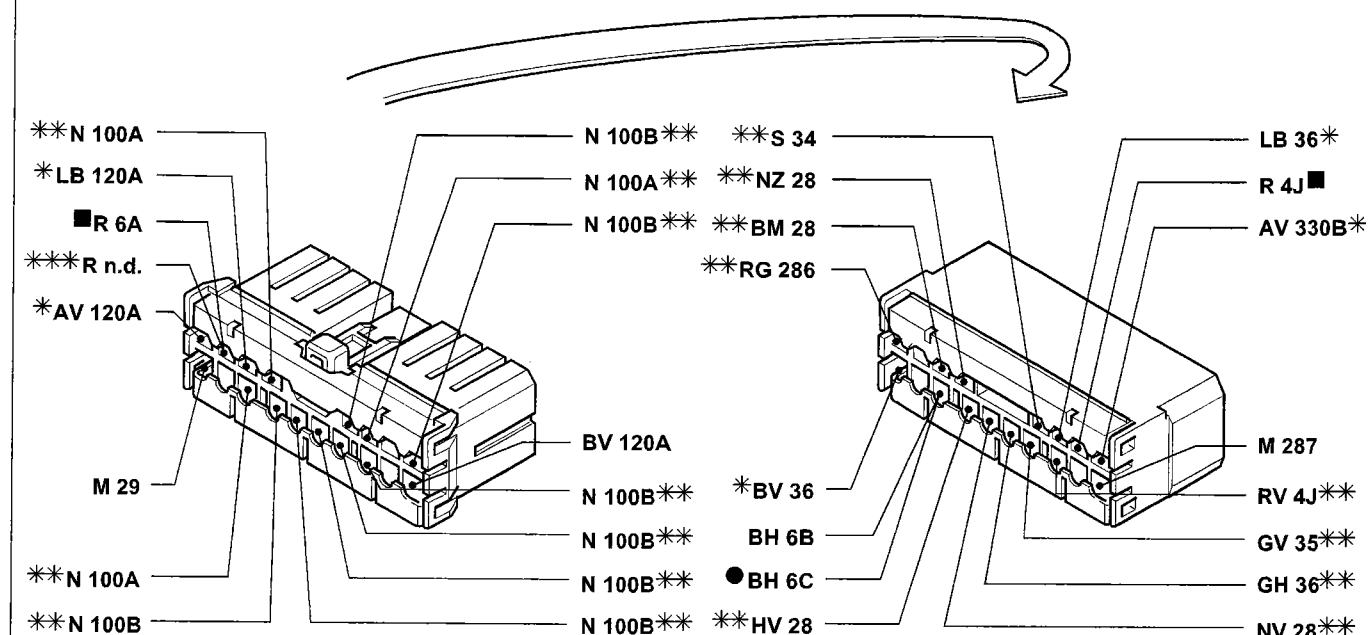
N.D. Ultrasound welding taped in cable loom

### 28 Connection between dashboard/longitudinal cables.



- \* Variant connection for versions with top of the range radio
- \*\* Variant connection for Brava versions
- \*\*\* Variant connection for Brava versions with alarm
- Variant connection for versions with alarm

### 70 Dashboard/front cables connection



- \* Variant connection for versions with air conditioning
- \*\* Variant connection for versions with alarm
- \*\*\* Variant connection for 1910 JTD versions
- Variant connection for version with automatic transmission

The cables in the wiring diagram are marked

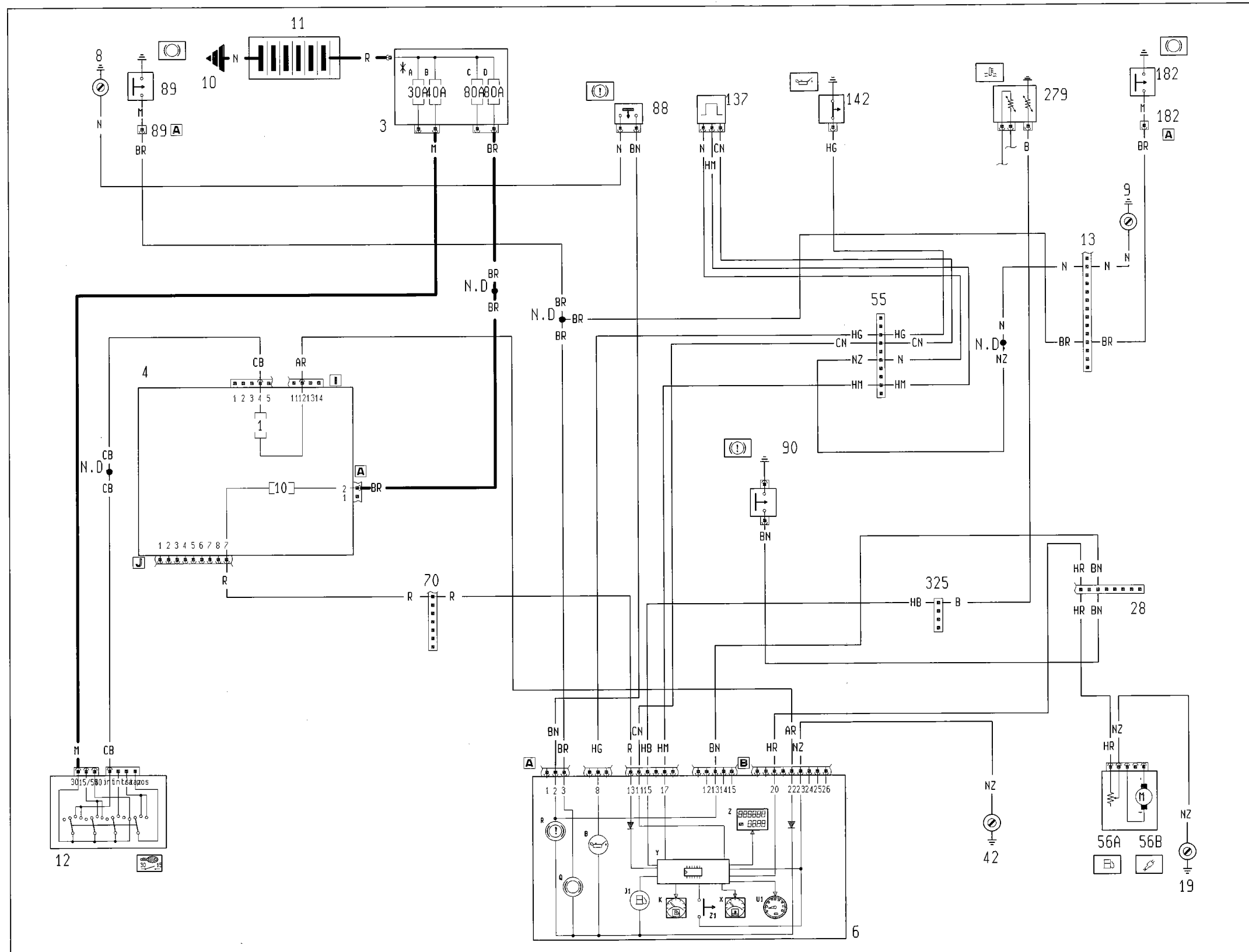
P4A212101

4A2111

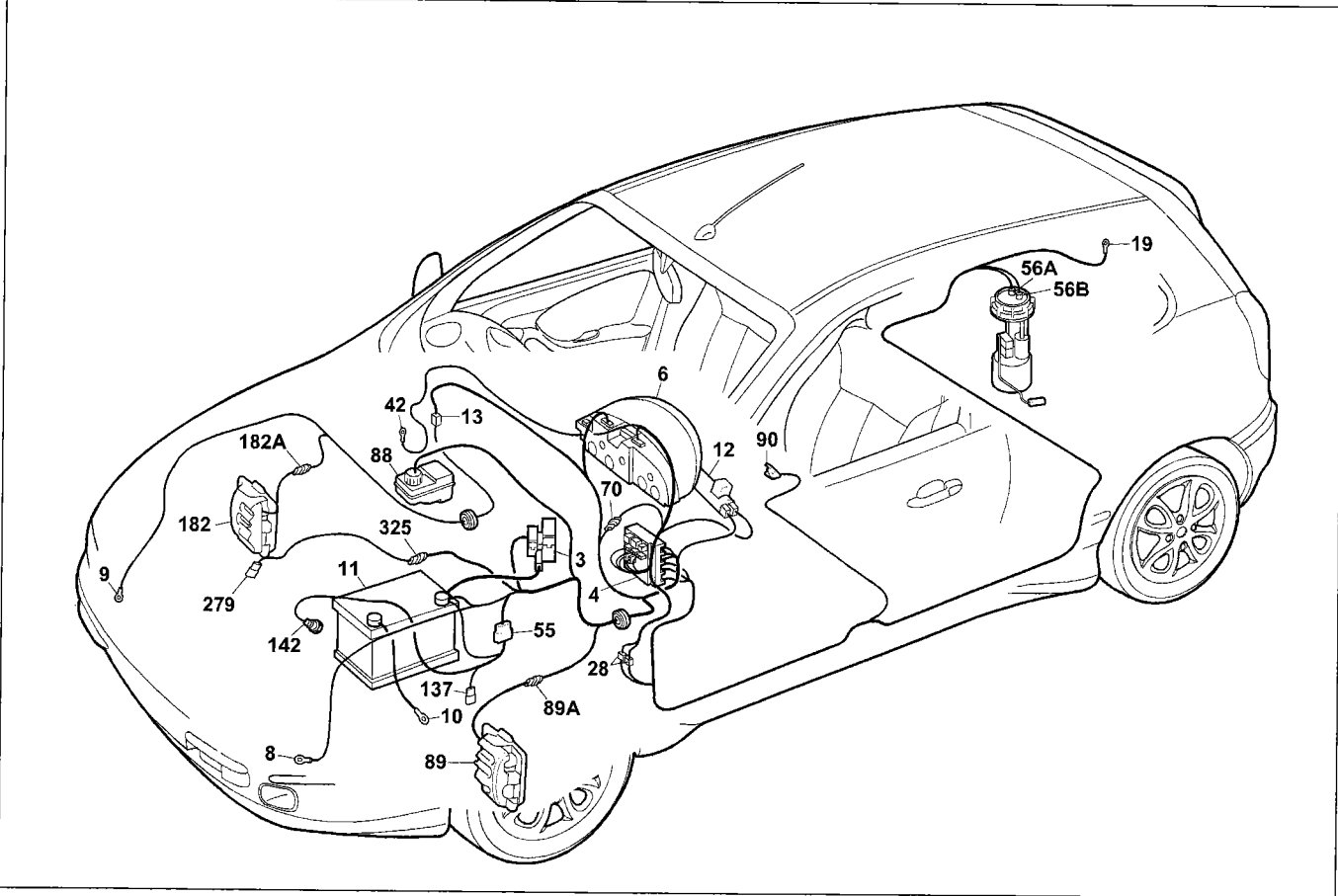
4A2121

Trim level: HGT

Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Water temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter - (See key at end of wiring diagrams)



55.



Trim level: HGT

Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Water temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
B Insufficient engine oil pressure warning light  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
Q Front brake pad wear warning light  
R Handbrake/insufficient brake fluid level warning light

- V1 Speedometer  
X Engine coolant temperature gauge  
Y Electronic module  
Z Milometer/trip meter display  
Z1 Trip meter zeroing button

- 8 Left front earth  
9 Right front earth  
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
13 Front right/left cables connection

- 19 Right rear earth  
28 Dashboard/longitudinal cables connection  
42 Right dashboard earth  
55 Connection between front/engine pre-wiring cables  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump  
70 Dashboard/front cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection

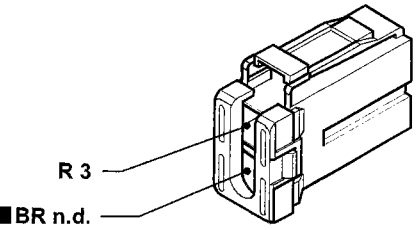
- 90 Switch signalling handbrake applied  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure

- 182 Right brake pad wear sensor  
182A Right brake pad wear sensor cables connection

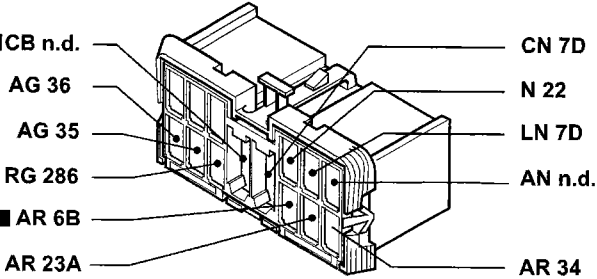
- 279 Twin engine coolant temperature sender unit

- 325 Connection between injection/left front cables  
N.D. Ultrasound welding taped in cable loom

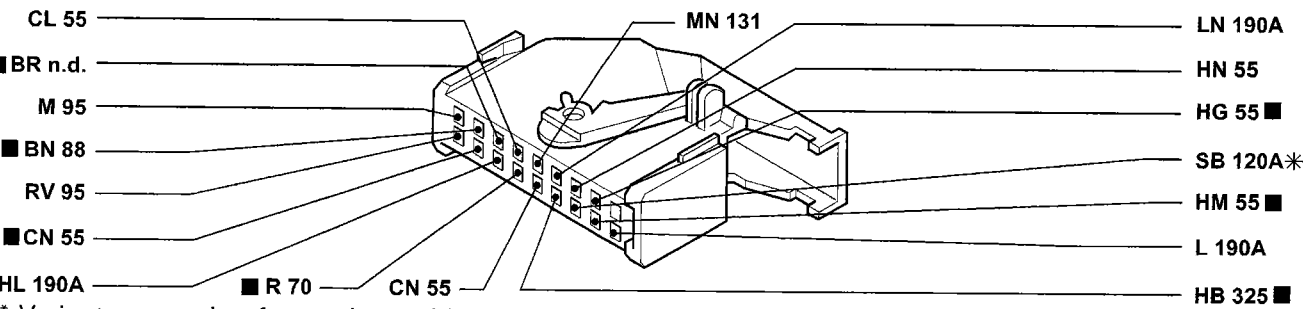
4A Junction unit



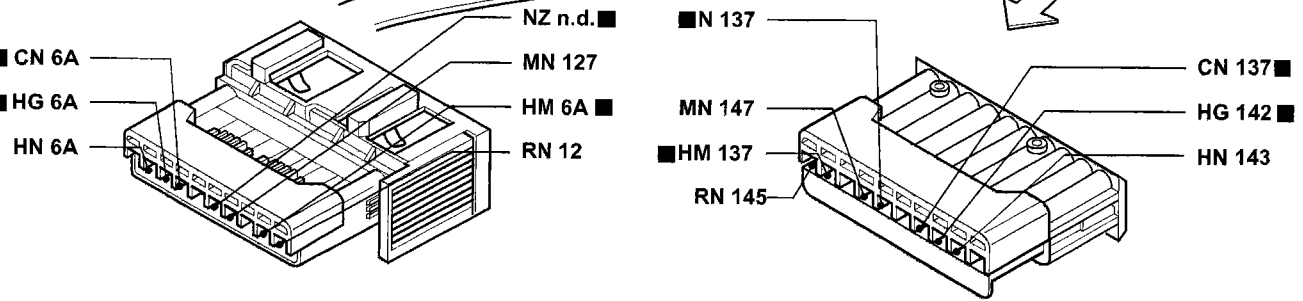
4I Junction unit



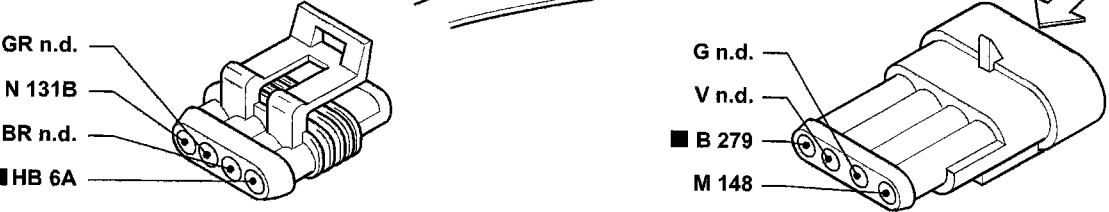
6A Instrument panel.



55 Connection between front/engine pre-wiring cables.



325 Connection between injection/left front cables.



The cables in the wiring diagram are marked

P4A216I01

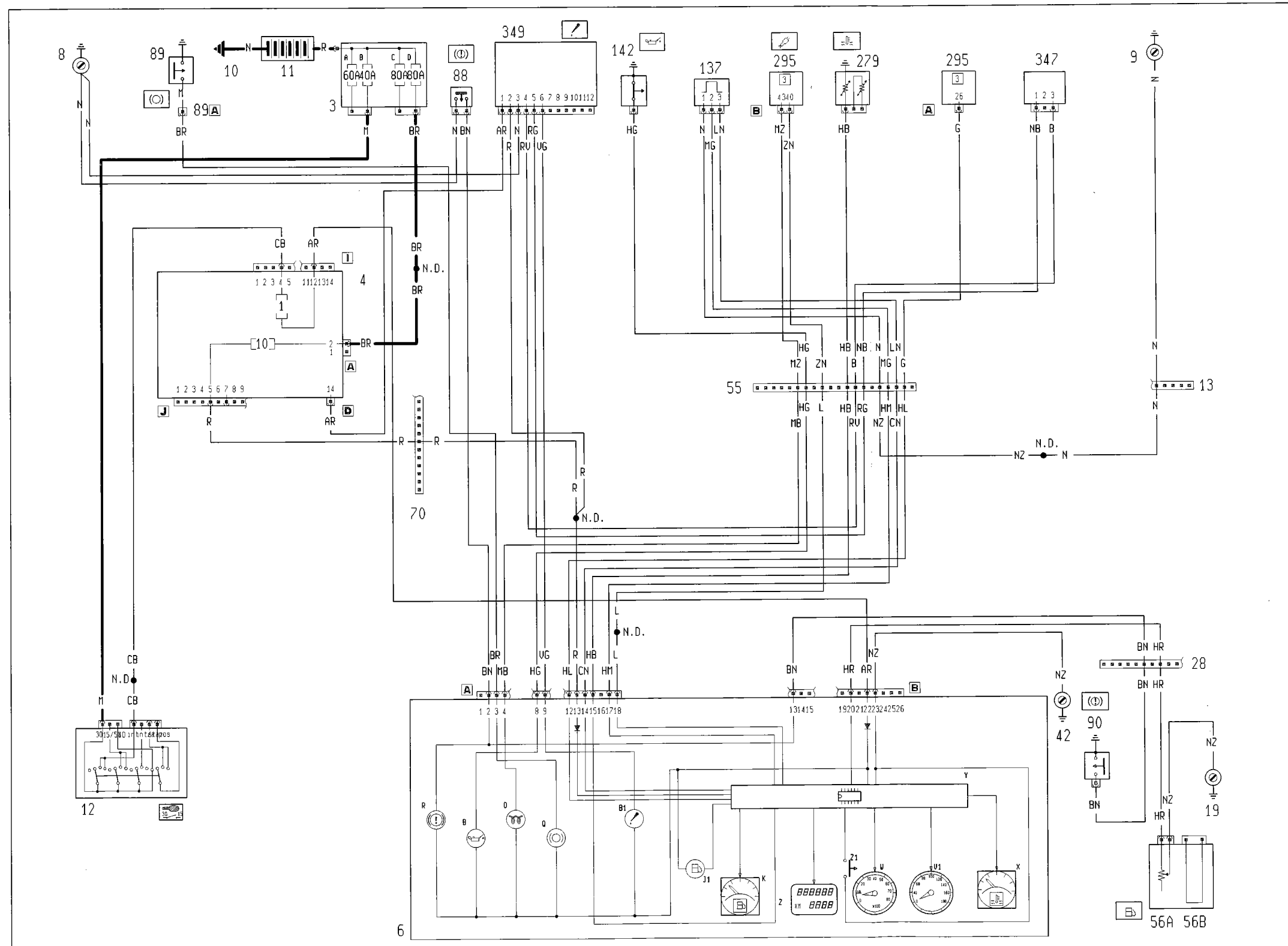
# Electrical equipment

## Wiring diagrams

### 55.

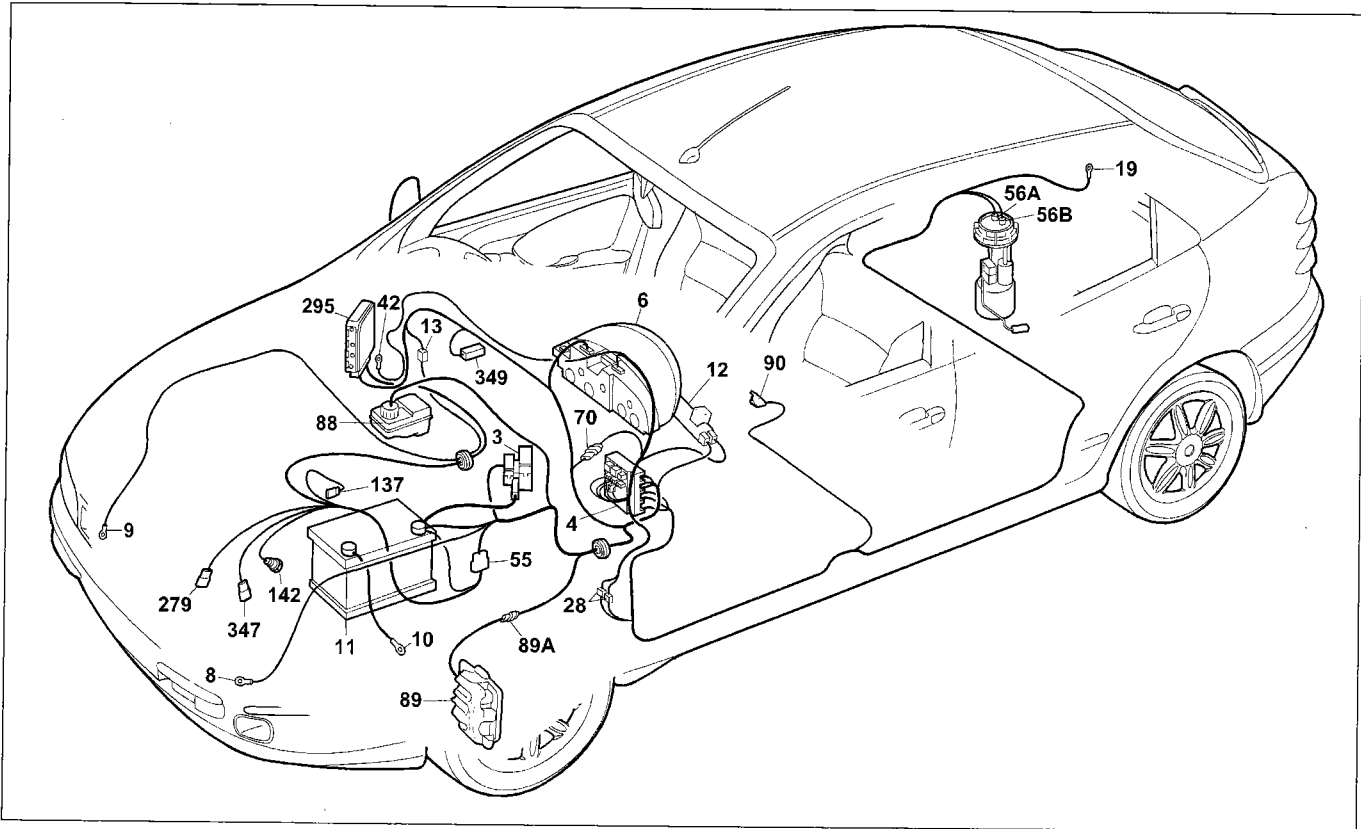
Version: 1910 JTD

Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Water temperature gauge - Insufficient engine oil pressure warning light - Insufficient engine oil level warning light - Heater plugs warning light - Front brake pad wear warning light - Rev counter - (See key at end of wiring diagrams)





55.



P4A219I01

Fuel level gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Water temperature gauge- Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system  
(60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

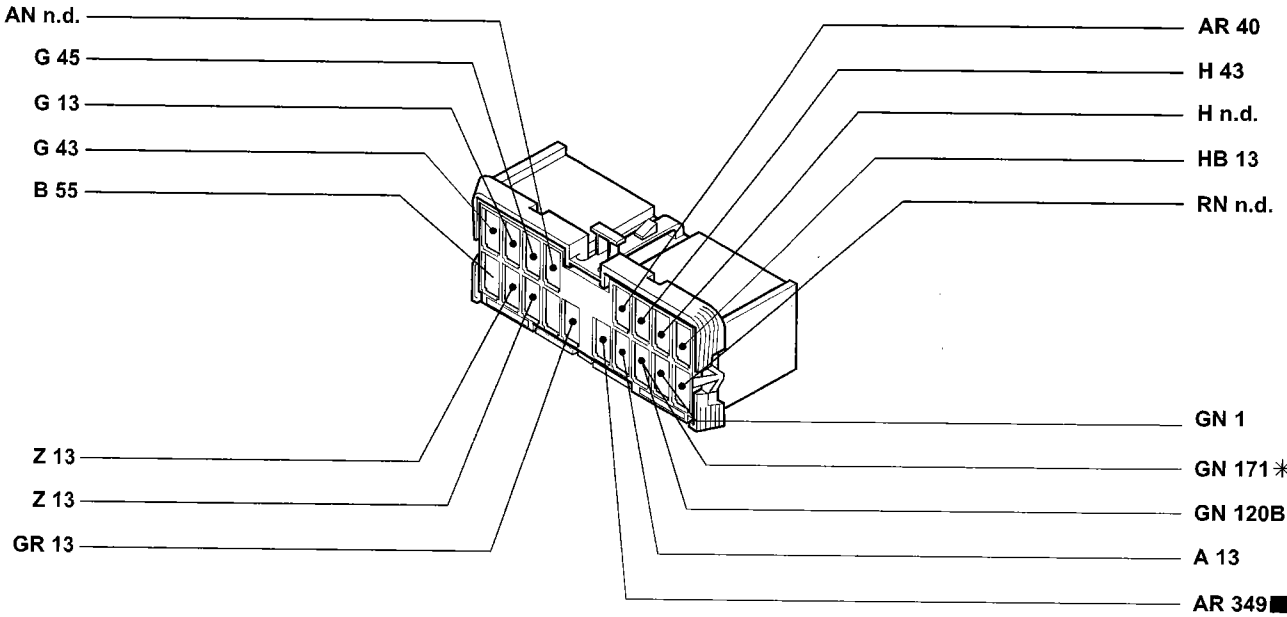
4 Junction unit

6 Instrument panel:  
B Insufficient engine oil pressure warning light  
B1 Insufficient engine oil level warning light  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
O Heater plugs warning light  
Q Front brake pad wear warning light  
R Handbrake/insufficient brake fluid level warning light  
V1 Speedometer  
W Rev counter  
X Engine coolant temperature gauge  
Y Electronic module  
Z Milometer/trip meter display  
Z1 Trip meter zeroing button

8 Left front earth  
9 Right front earth  
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
13 Front right/left cables connection
- 19 Right rear earth  
28 Dashboard/longitudinal cables connection  
42 Right dashboard earth  
55 Connection between front/engine pre-wiring cables  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump  
70 Dashboard/front cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Switch signalling handbrake applied  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
279 Twin engine coolant temperature sender unit  
295 Injection/ignition electronic control unit 1242  
347 Engine oil level sensor  
349 Engine oil level control unit

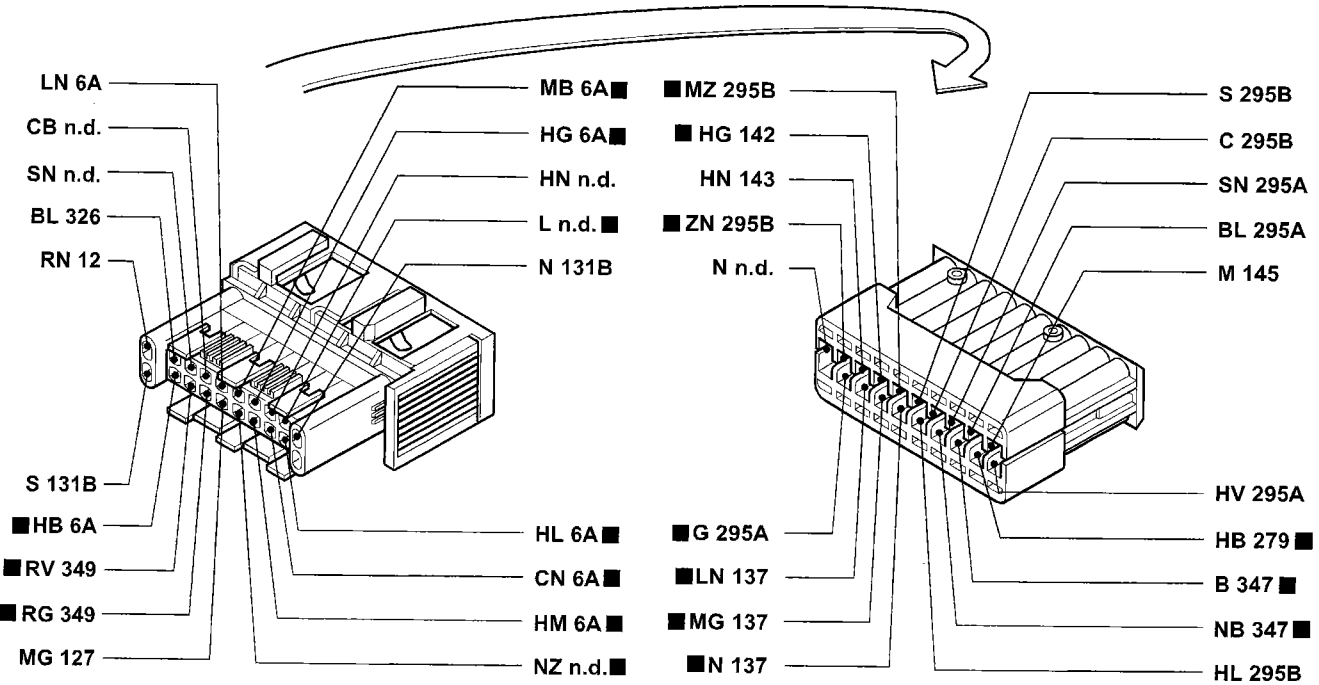
N.D. Ultrasound welding taped in cable loom

4D Junction unit



\* Variant connection for versions with air conditioning

55 Connection between front/engine pre-wiring cables.

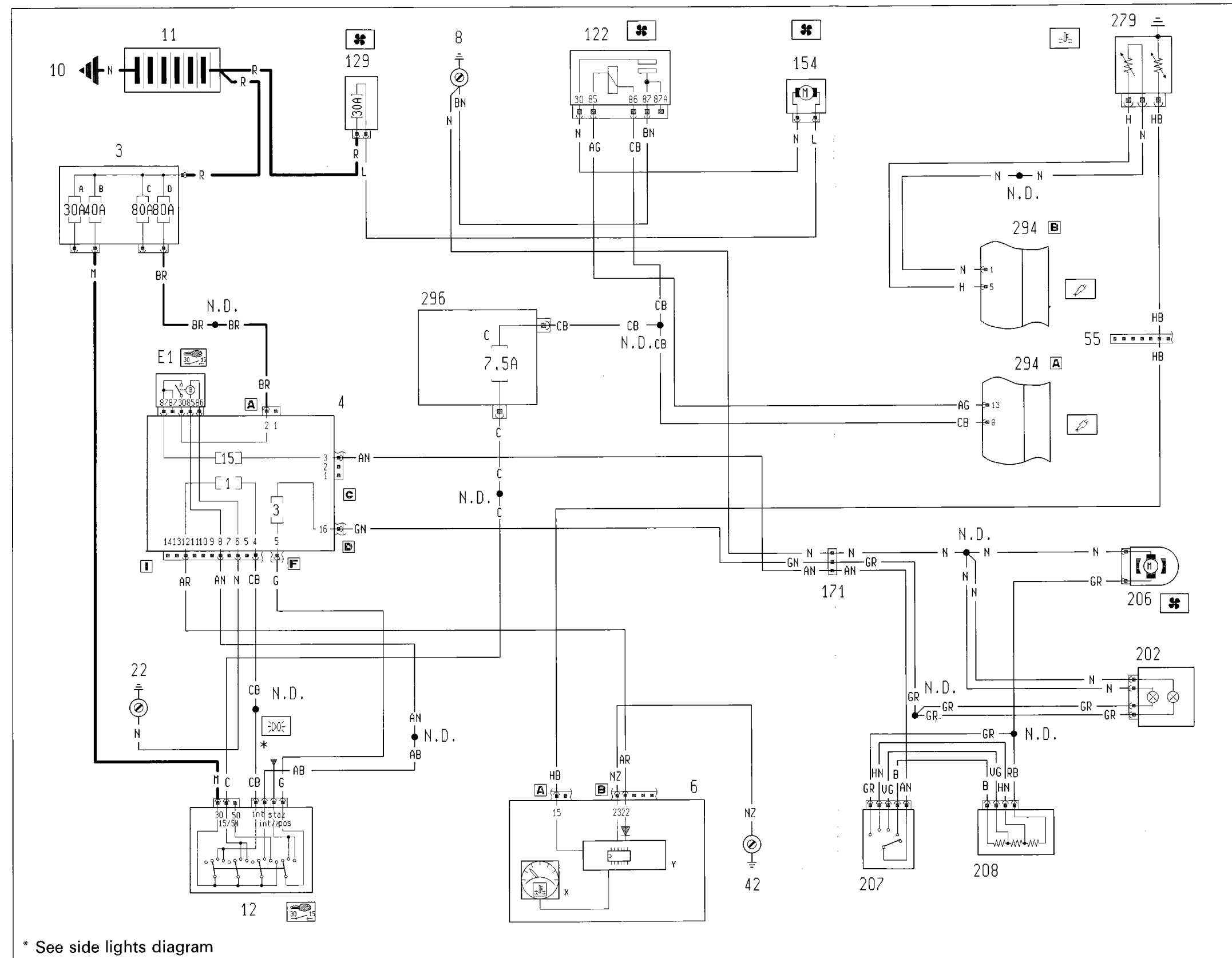


The cables in the wiring diagram are marked

P4A220I01

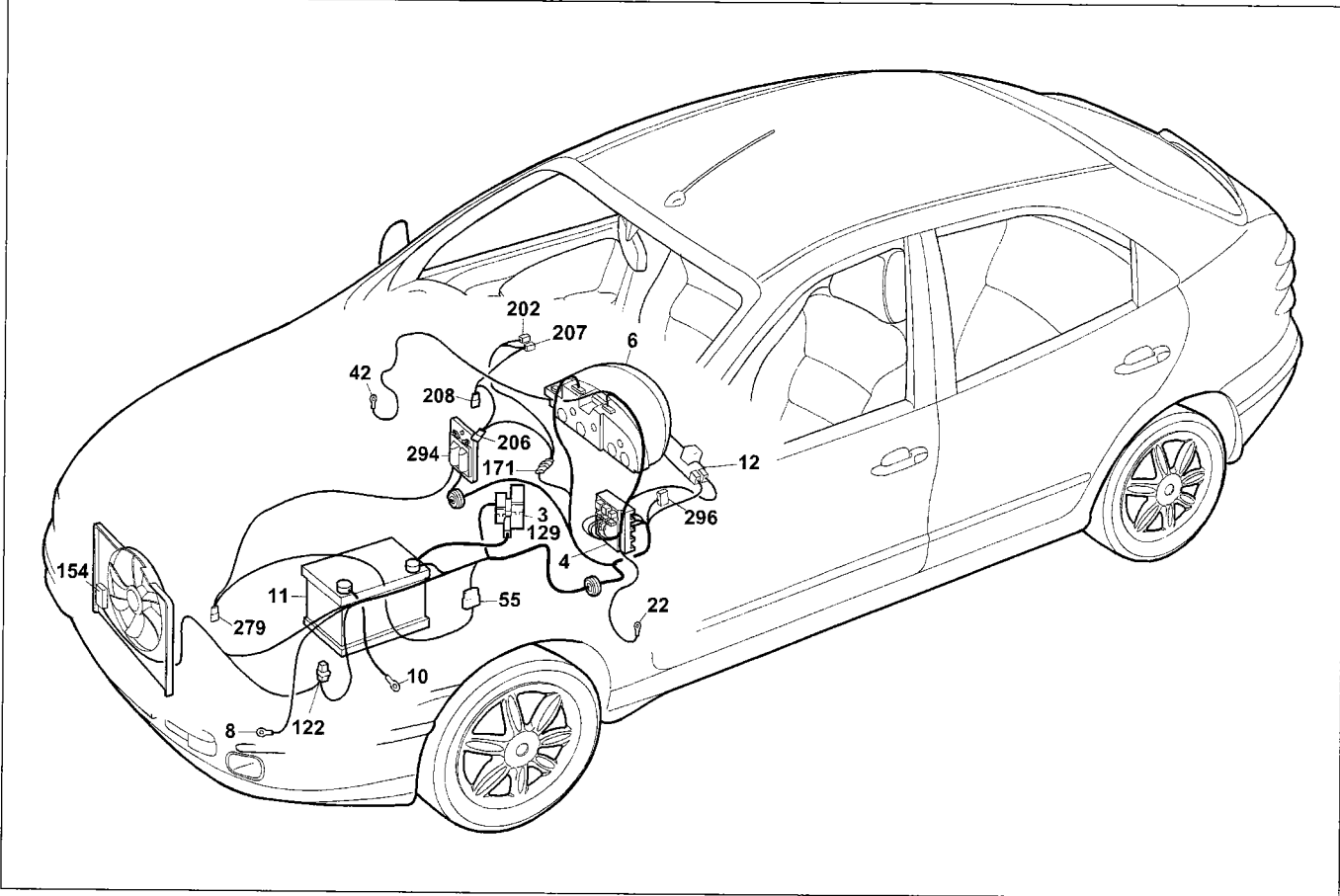
### Version without automatic air conditioning

**Engine cooling - Water temperature gauge - Car interior ventilation - (See key at end of wiring diagrams)**





55.



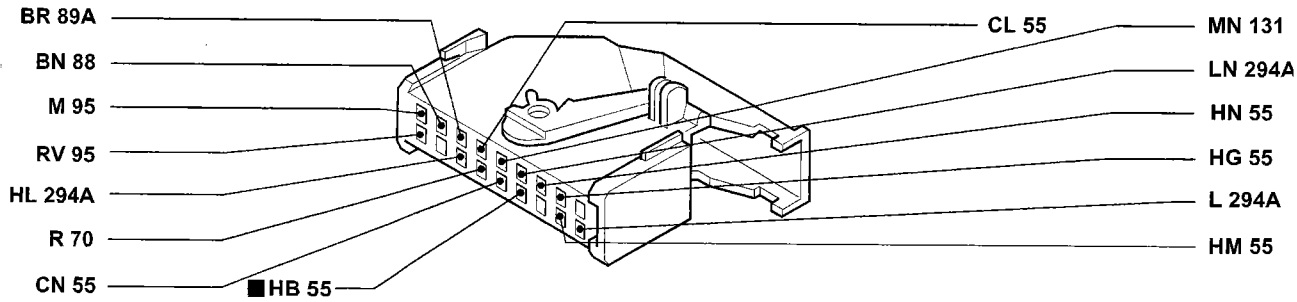
Version : without automatic air conditioning  
Engine cooling - Water temperature gauge - Car interior ventilation

Components key

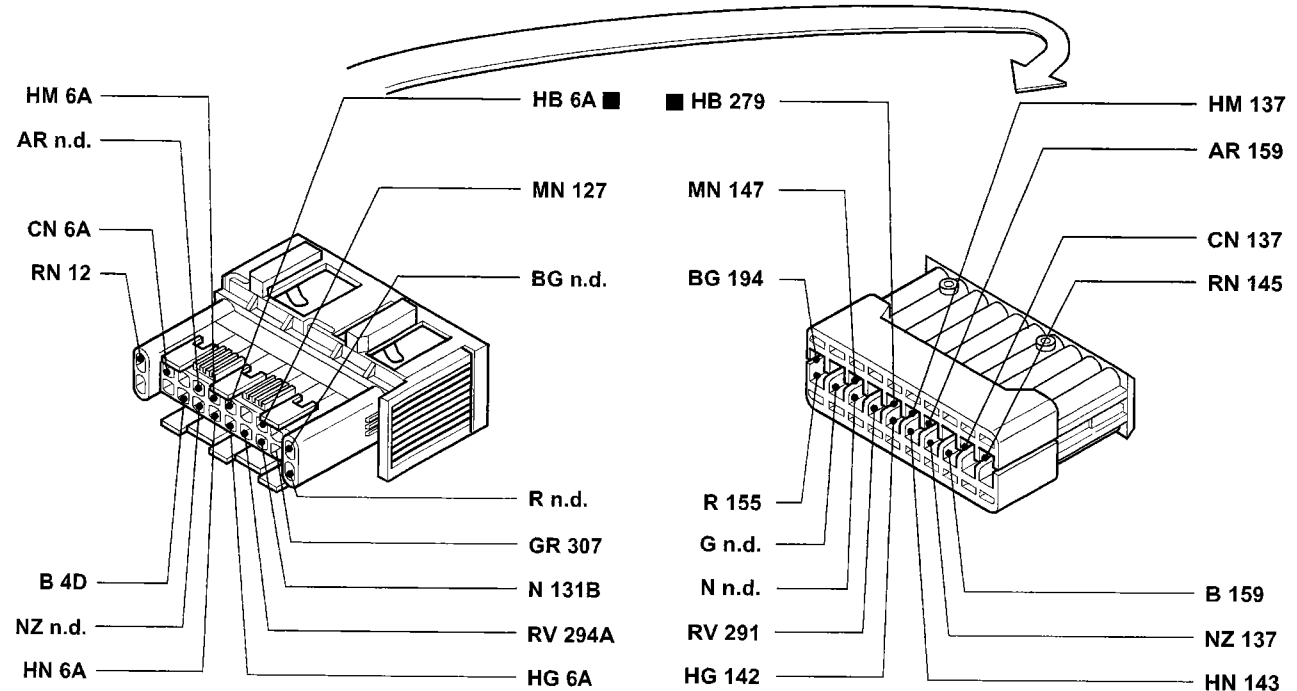
- 3 Power fuse box:
    - A 30A protective fuse for injection system (60A for TD versions)
    - B 40A protective fuse for ignition system
    - C 80A fuse protecting additional options
    - D 80A protective fuse for junction unit
  - 4 Junction unit
    - E1 Ignition discharge relay
  - 6 Instrument panel:
    - X Engine coolant temperature gauge
    - Y Electronic module
  - 7 Steering column switch unit
  - 8 Left front earth
  - 10 Earth for battery on bodyshell
  - 11 Battery
  - 12 Ignition switch
  - 22 Left dashboard earth
  - 42 Right dashboard earth
  - 55 Connection between front/engine pre-wiring cables
  - 122 Engine cooling fan low speed relay feed
  - 129 30A power fuse protecting engine cooling fan
- 154 Engine cooling fan  
171 Heater unit  
202 Heater unit/air conditioning light bulbs  
206 Heater/air conditioning fan  
207 Heating/air conditioning system speed control switch  
208 Limiting resistance for heating/air conditioning system  
279 Twin engine coolant temperature sender unit  
294 Injection/ignition electronic control unit 1242  
296 Fuse carrier base on front cable  
C 7.5A fuse protecting Fiat-CODE cooling system /electronic injection

N.D. Ultrasound welding taped in cable loom

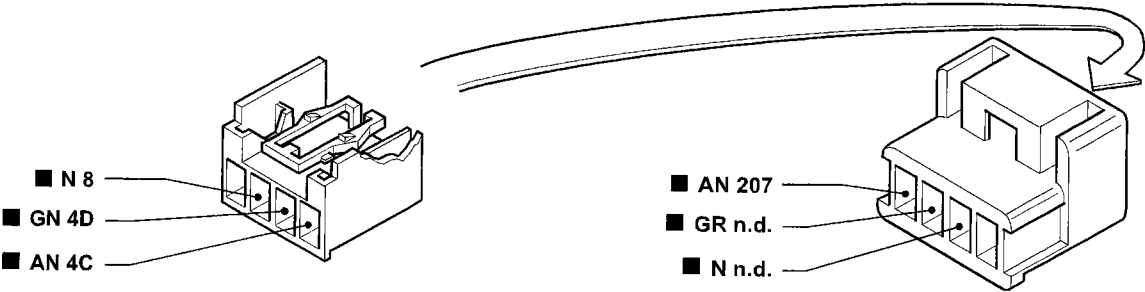
6A Instrument panel.



55 Connection between front/engine pre-wiring cables.



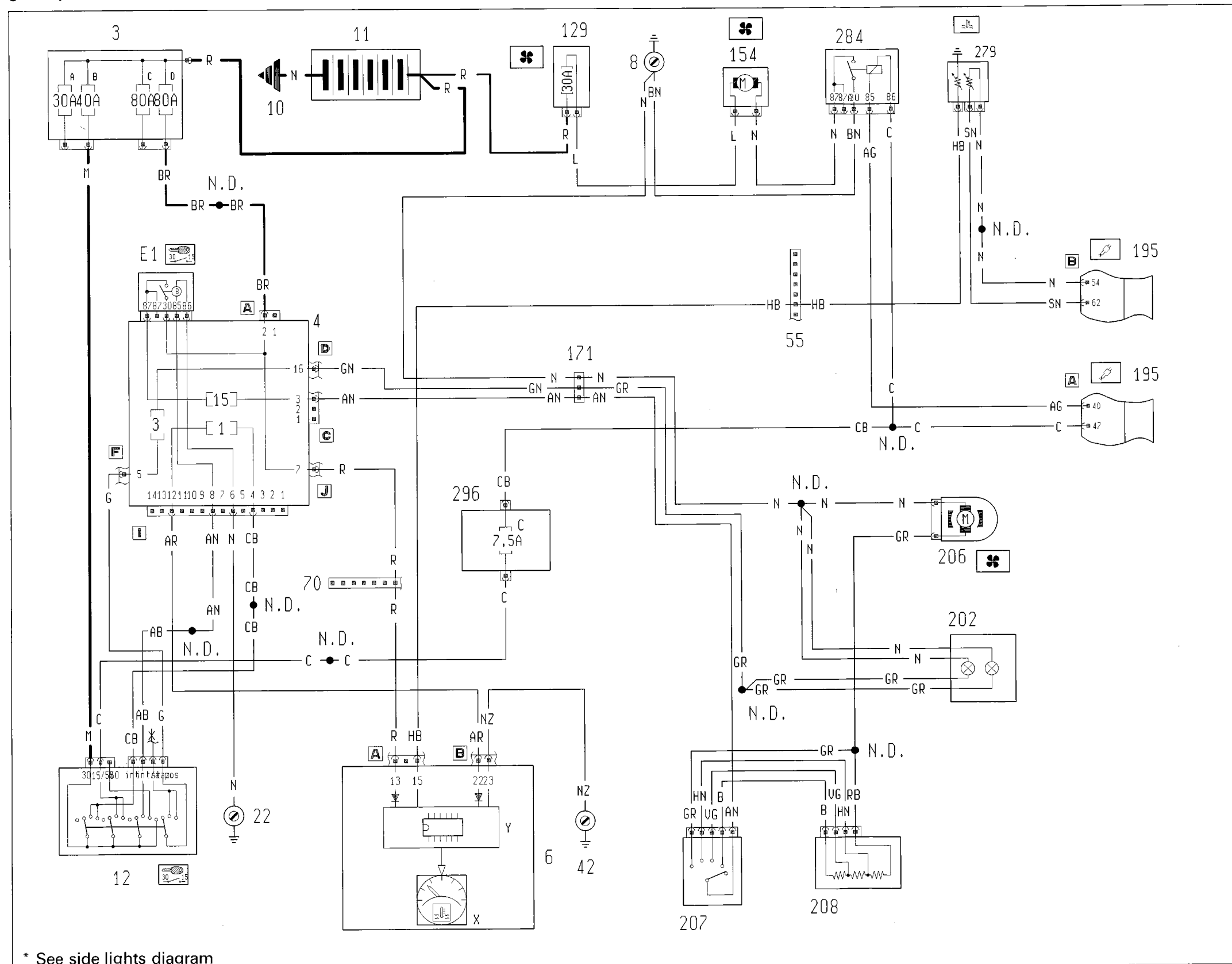
171 Heater unit cables connection



The cables in the wiring diagram are marked

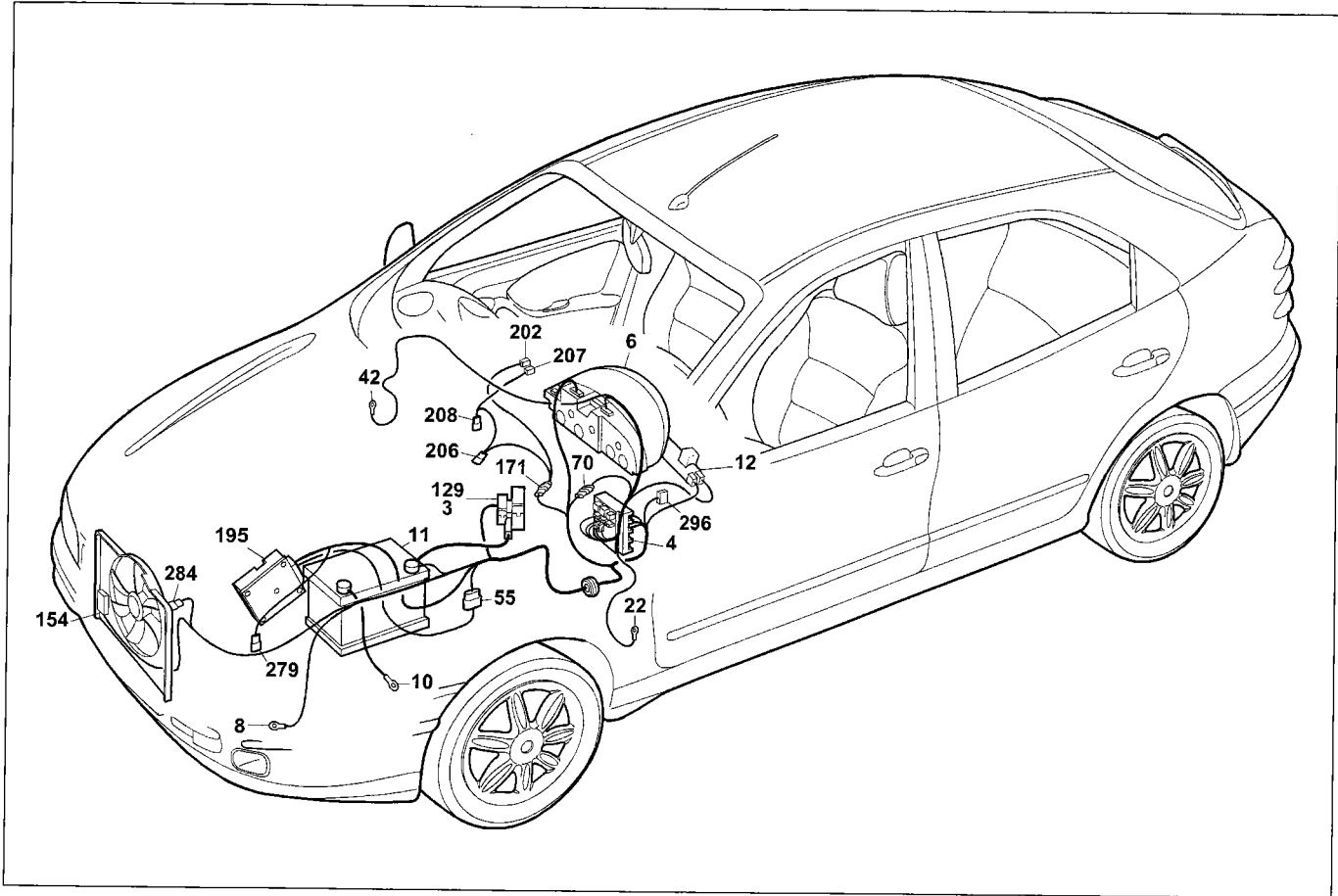
P4A224I01

**Version without automatic air conditioning**  
**Engine cooling - Water temperature gauge - Car interior ventilation - (See key at end of wiring diagrams)**



P4A225101

55.



Version: without automatic air conditioning  
Engine cooling - Water temperature gauge - Car interior ventilation

Components key

- 3 Power fuse box:

  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit

4 Junction unit

  - E1 Ignition discharge relay

6 Instrument panel:

  - X Engine coolant temperature gauge
  - Y Electronic module

8 Left front earth

10 Earth for battery on bodyshell

11 Battery

12 Ignition switch

22 Left dashboard earth

42 Right dashboard earth

55 Connection between front/engine pre-wiring cables

70 Dashboard/front cables connection

129 30A power fuse protecting engine cooling fan
- 154 Engine cooling fan

171 Heater unit cables connection

195 Injection/ignition electronic control unit (1581)

202 Heater unit/air conditioning light bulbs

206 Heater/air conditioning fan

207 Heating/air conditioning system speed control switch

208 Limiting resistance for heating/air conditioning system

279 Twin engine coolant temperature sender unit

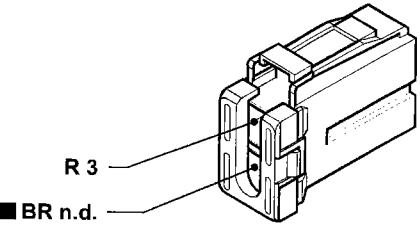
284 Engine cooling fan relay feed

296 Fuse carrier base on front cable

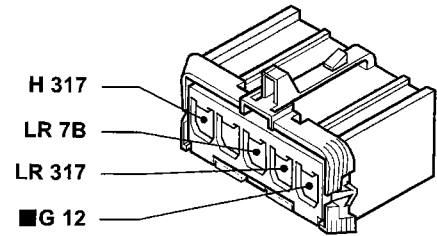
C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection

N.D. Ultrasound welding taped in cable loom

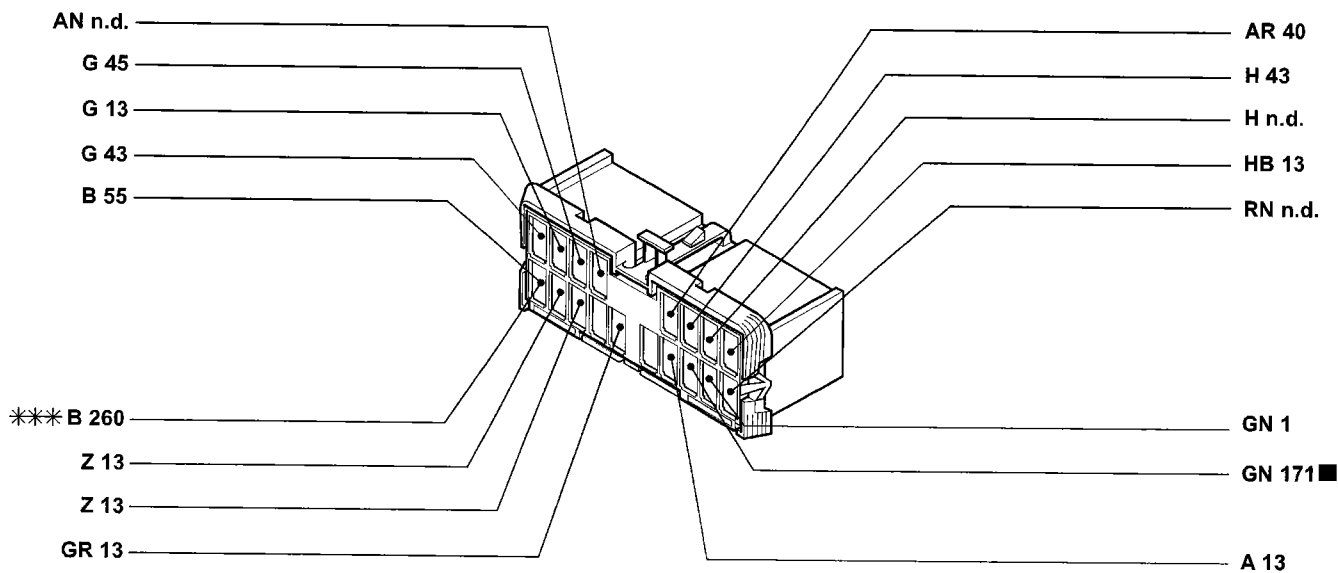
4A Junction unit



4F Junction unit

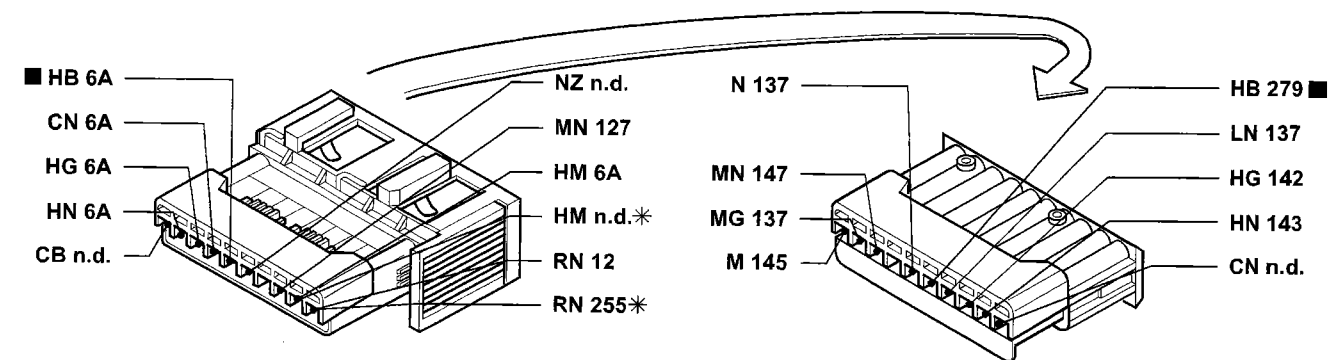


4D Junction unit



\*\*\* Variant connection for version with automatic transmission

55 Connection between front/engine pre-wiring cables.

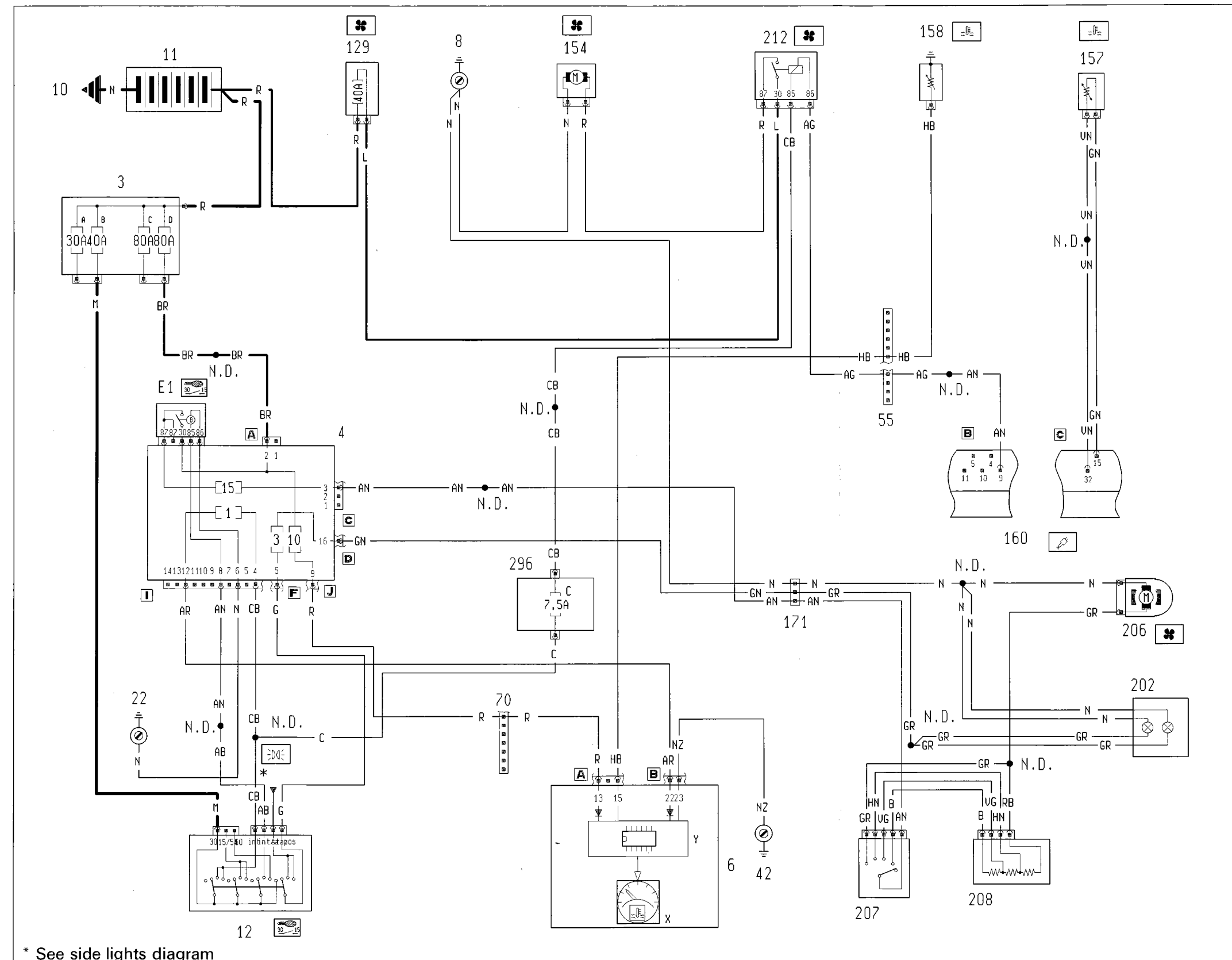


\* Variant connection for version with automatic transmission

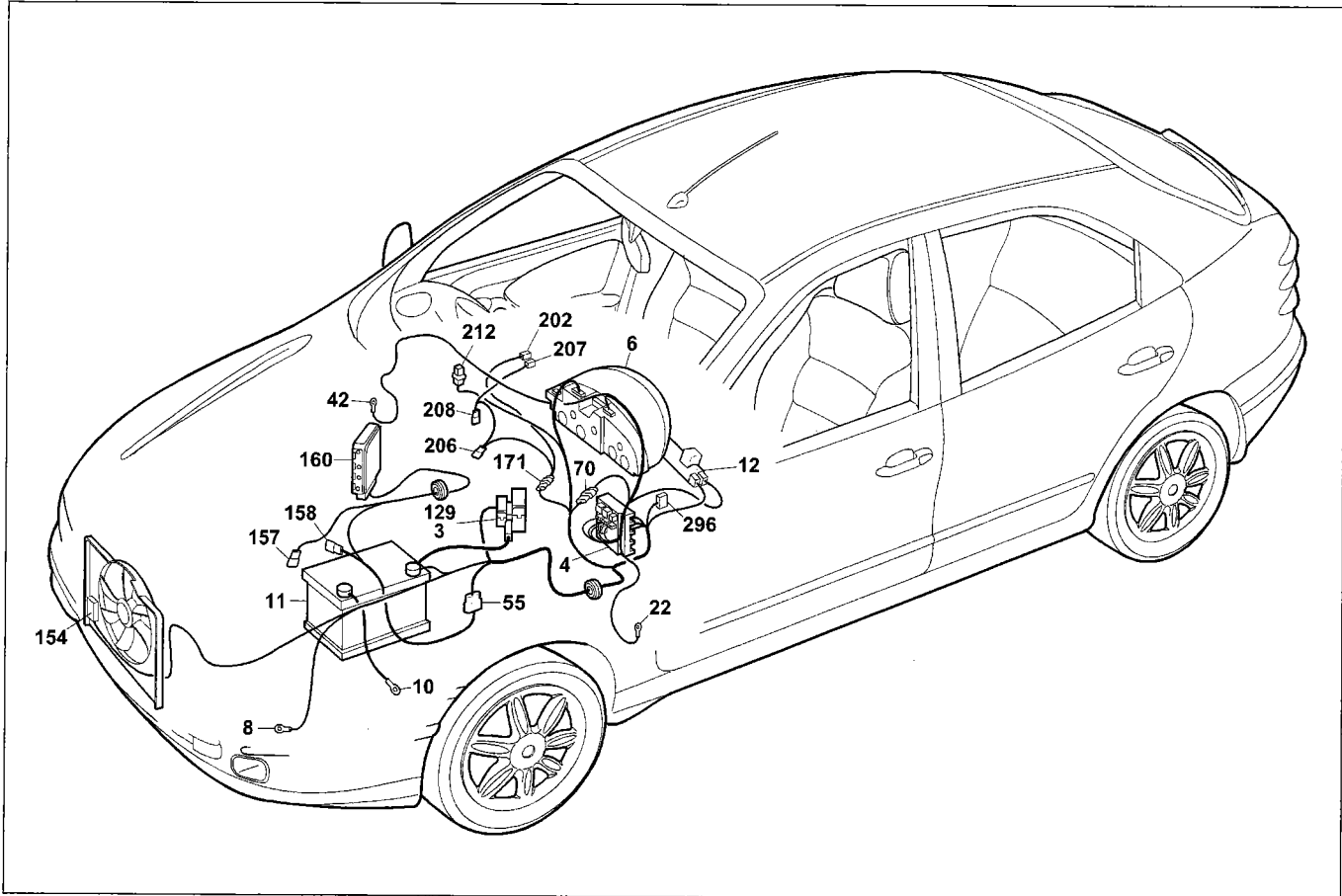
The cables in the wiring diagram are marked

### Version without automatic air conditioning

**Engine cooling - Water temperature gauge - Car interior ventilation - (See key at end of wiring diagrams)**



55.



Version without automatic air conditioning  
Engine cooling - Water temperature gauge - Car interior ventilation

Components key

- 3 Power fuse box:

  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit

4 Junction unit

  - E1 Ignition discharge relay

6 Instrument panel:

  - X Engine coolant temperature gauge
  - Y Electronic module

8 Left front earth

10 Earth for battery on bodysell

11 Battery

12 Ignition switch

22 Left dashboard earth

42 Right dashboard earth

55 Connection between front/engine pre-wiring cables

70 Dashboard/front cables connection

129 40A power fuse protecting engine cooling fan
- 154 Engine cooling fan

157 Coolant temperature sensor

158 Instrument coolant temperature sensor

160 Injection/ignition electronic control unit (1747)

171 Heater unit cables connection

202 Heater unit/air conditioning light bulbs

206 Heater/air conditioning fan

207 Heating/air conditioning system speed control switch

208 Limiting resistance for heating/air conditioning system

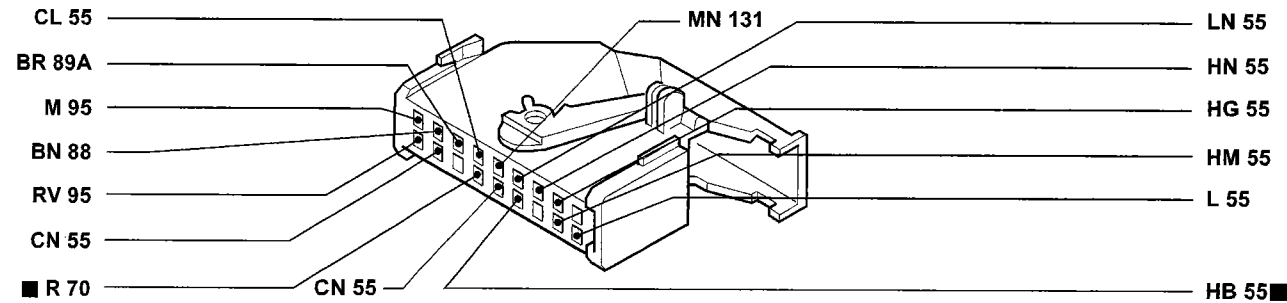
212 Engine cooling fan relay feed

296 Fuse carrier base on front cable

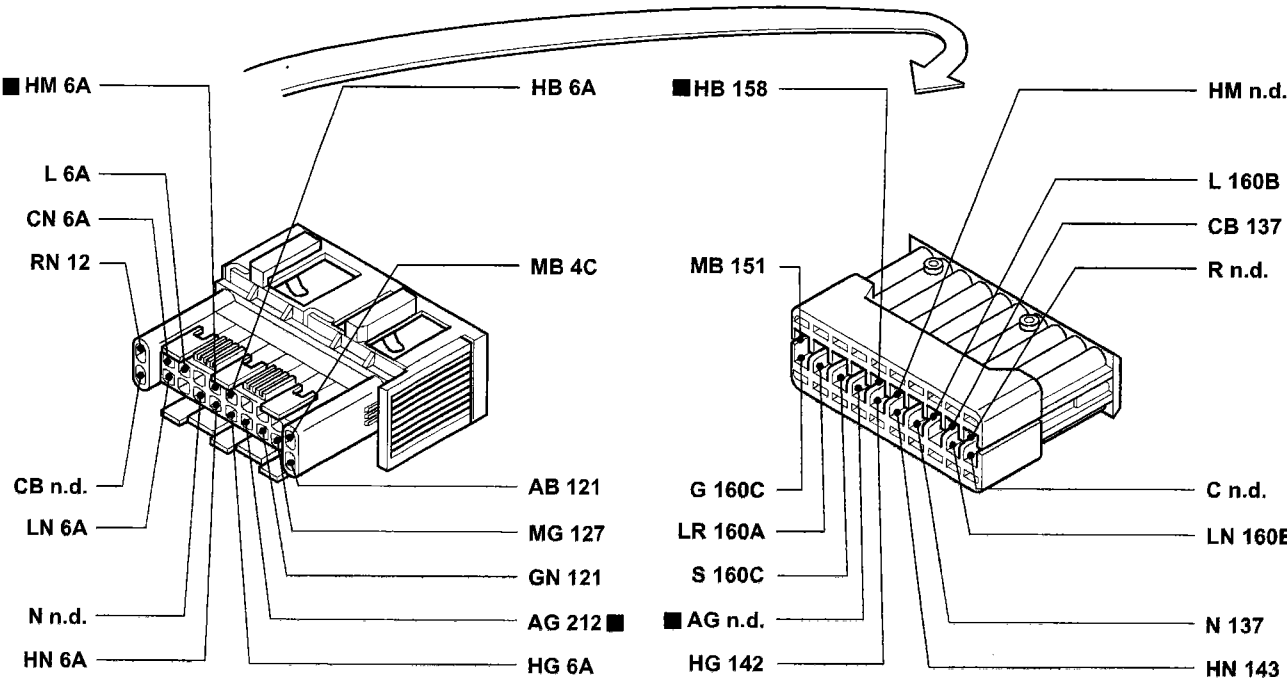
C 7.5A fuse protecting Fiat - CODE cooling system/electronic injection

N.D. Ultrasound welding taped in cable loom

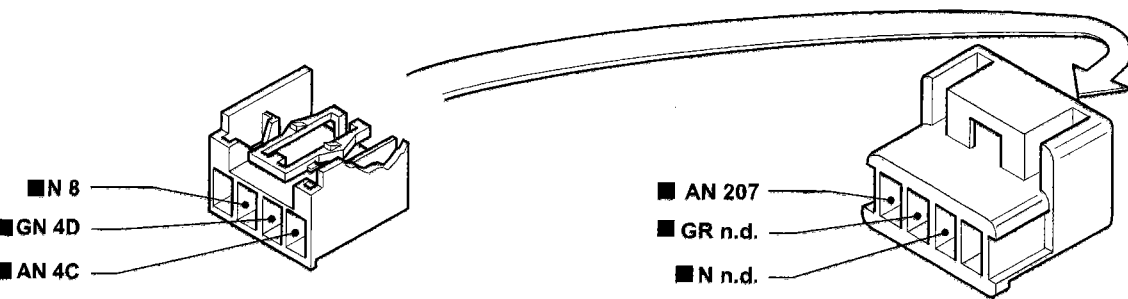
6A Instrument panel.



55 Connection between front/engine pre-wiring cables.



171 Heater unit cables connection

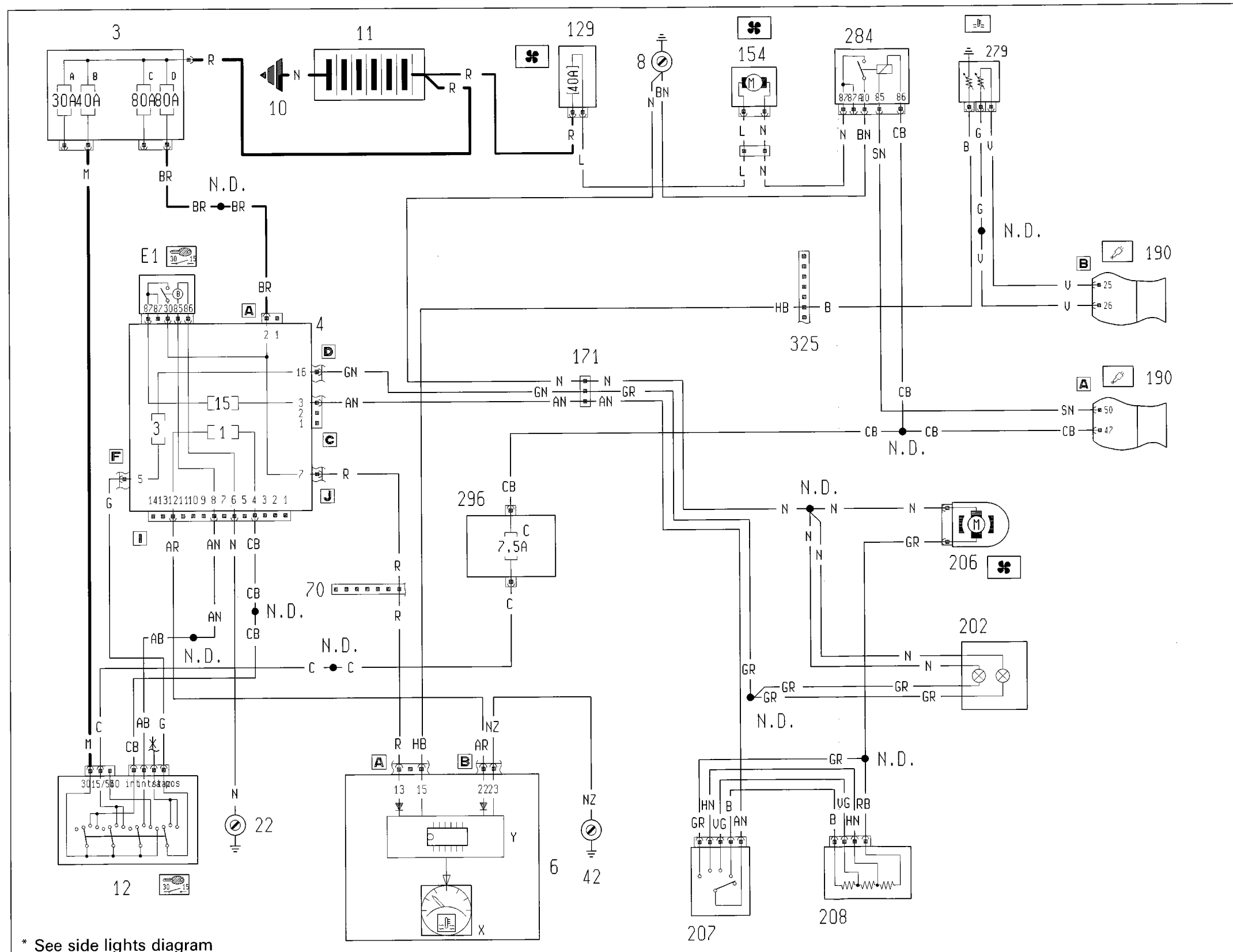


The cables in the wiring diagram are marked

P4A232101

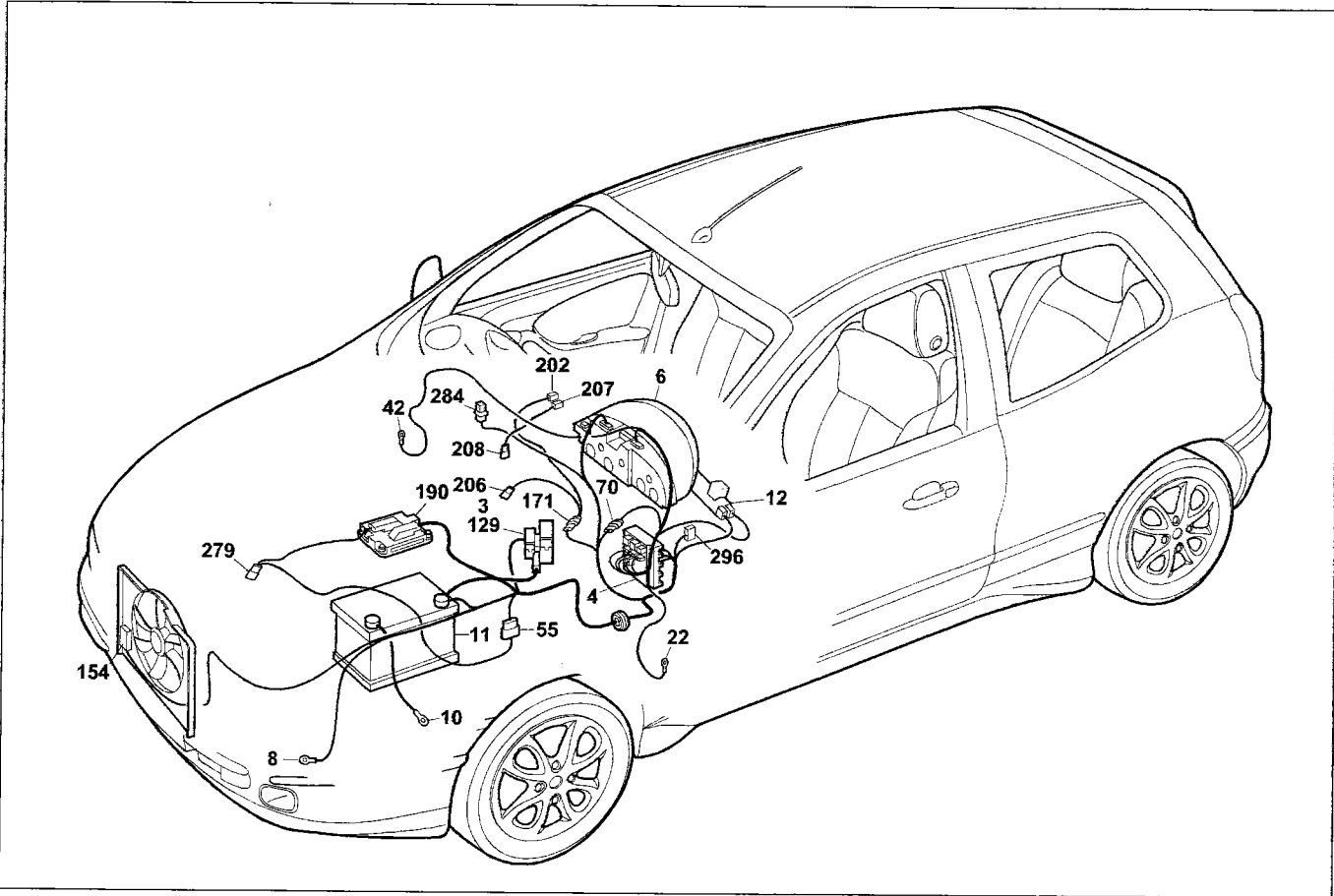


**Version without automatic air conditioning**  
**Engine cooling - Water temperature gauge - Car interior ventilation - (See key at end of wiring diagrams)**





55.



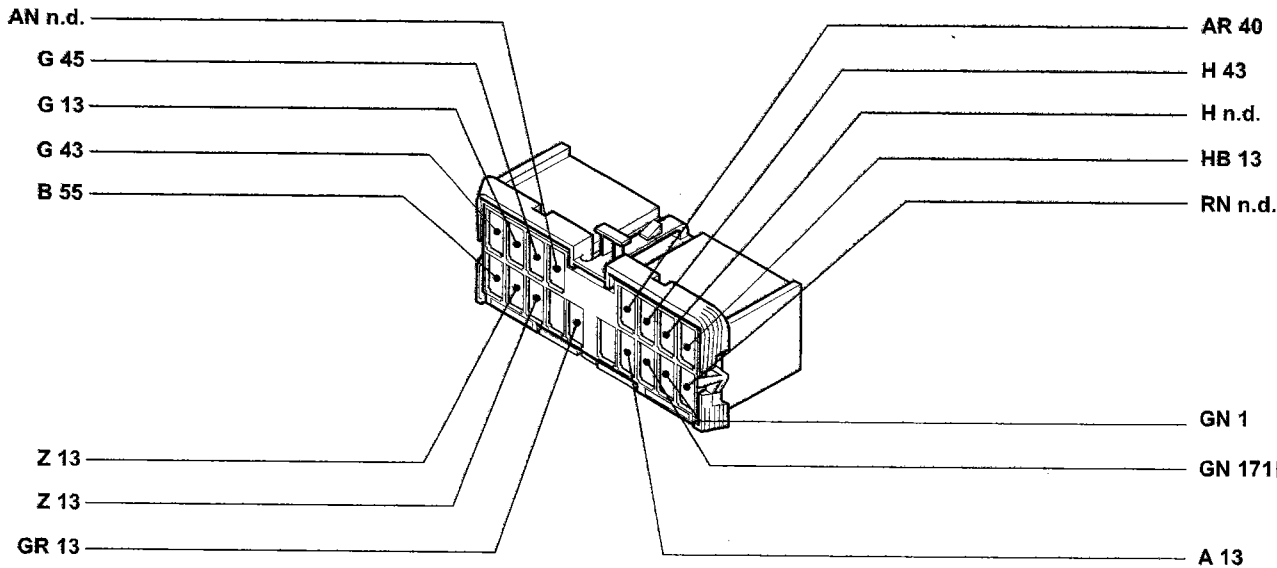
Version without automatic air conditioning  
Engine cooling - Water temperature gauge - Car interior ventilation

Components key

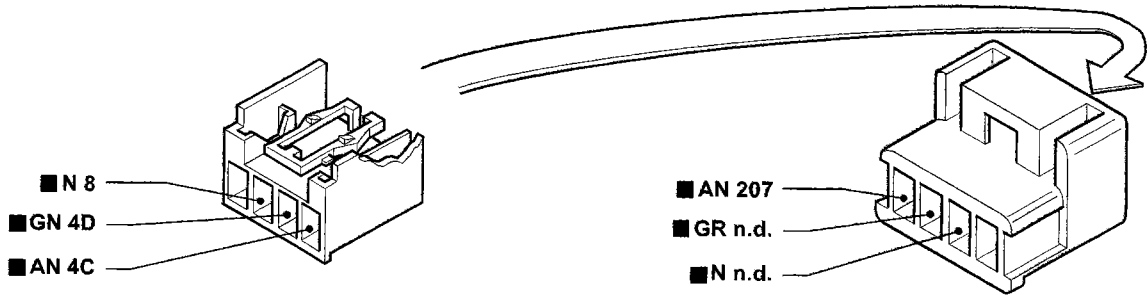
- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit  
E1 Ignition discharge relay
- 6 Instrument panel:  
X Engine coolant temperature gauge  
Y Electronic module
- 8 Left front earth  
10 Earth for battery on bodysell  
11 Battery  
12 Ignition switch  
22 Left dashboard earth  
42 Right dashboard earth  
55 Connection between front/engine pre-wiring cables  
70 Dashboard/front cables connection  
129 40A power fuse protecting engine cooling fan
- 154 Engine cooling fan  
171 Connection for heater unit cables  
190 Injection/ignition electronic control unit (1998)  
202 Heater unit/air conditioning light bulbs  
206 Heater/air conditioning fan  
207 Heating/air conditioning system speed control switch  
208 Limiting resistance for heating/air conditioning system  
279 Twin engine coolant temperature sender unit  
284 Engine cooling fan relay feed  
296 Fuse carrier base on front cable  
C 7.5A fuse protecting Fiat - CODE cooling system/electronic injection

N.D. Ultrasound welding taped in cable loom

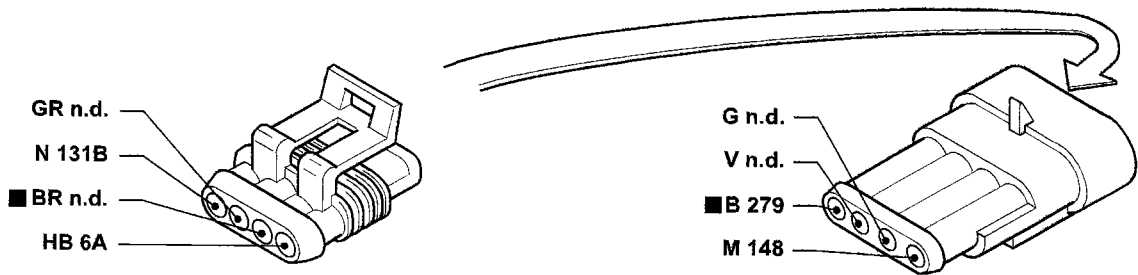
4D Junction unit



171 Heater unit cables connection



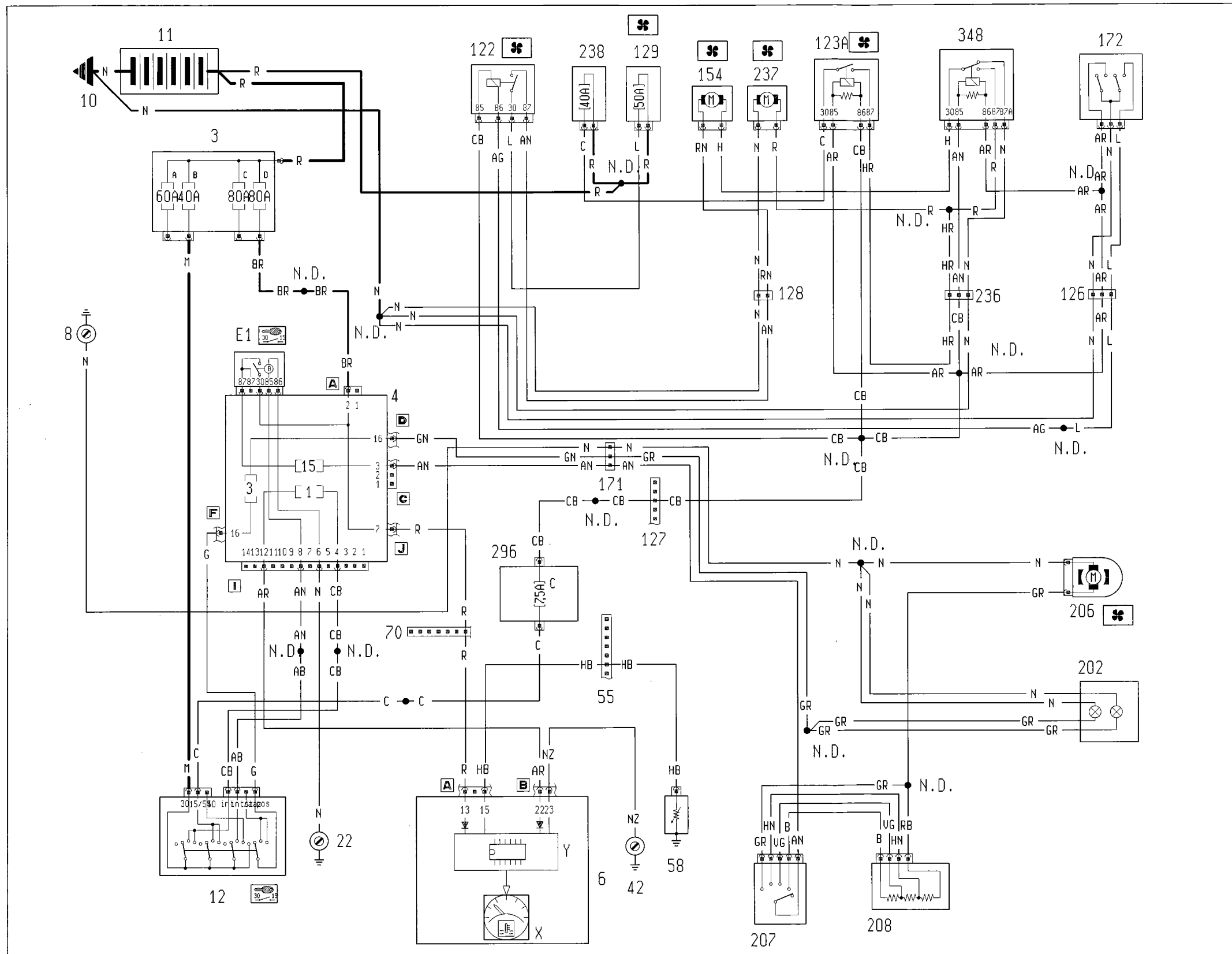
325 Connection between injection/left front cables



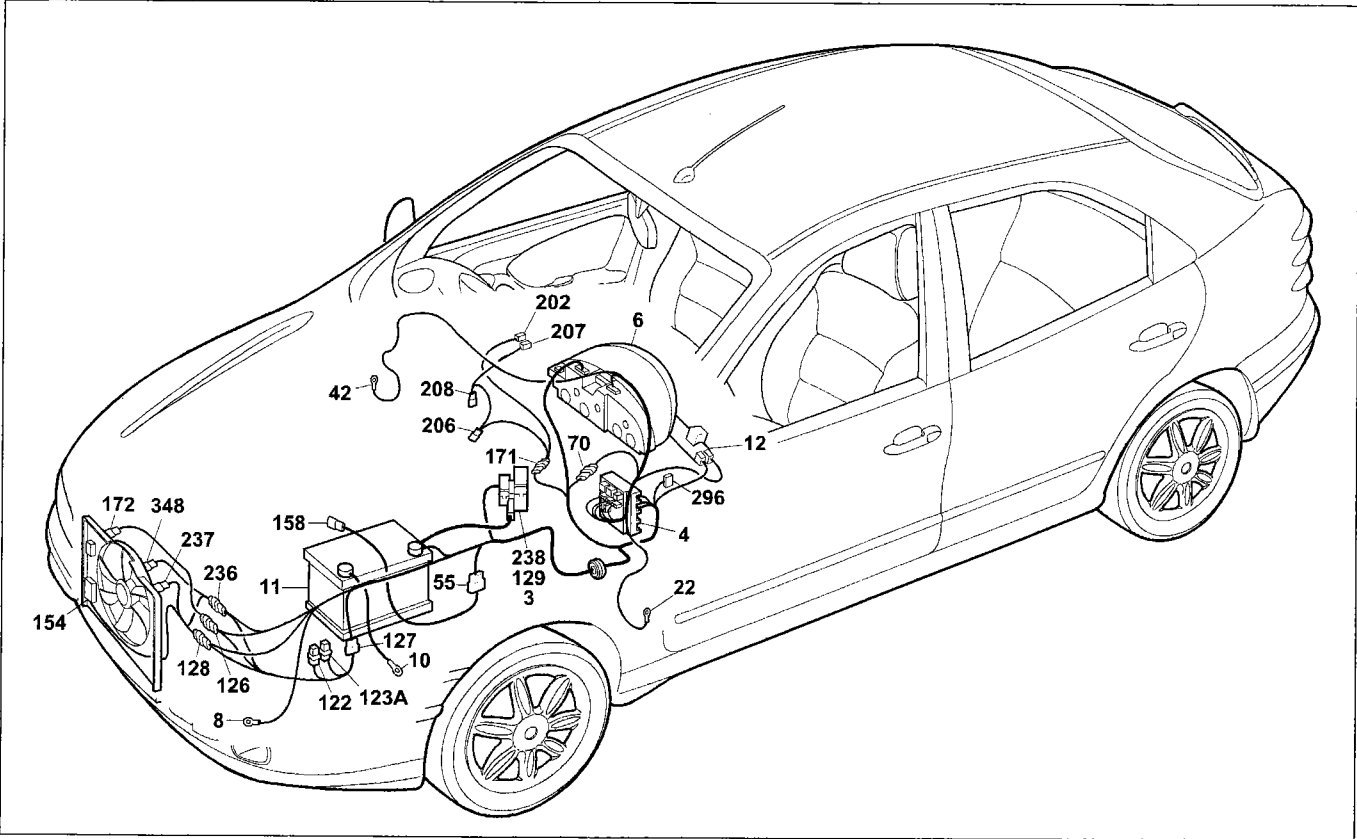
The cables in the wiring diagram are marked

Version without automatic air conditioning

Engine cooling - Water temperature gauge - Car interior ventilation - (See key at end of wiring diagrams)



55.



Version without automatic air conditioning  
Engine cooling - Water temperature gauge - Car interior ventilation

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

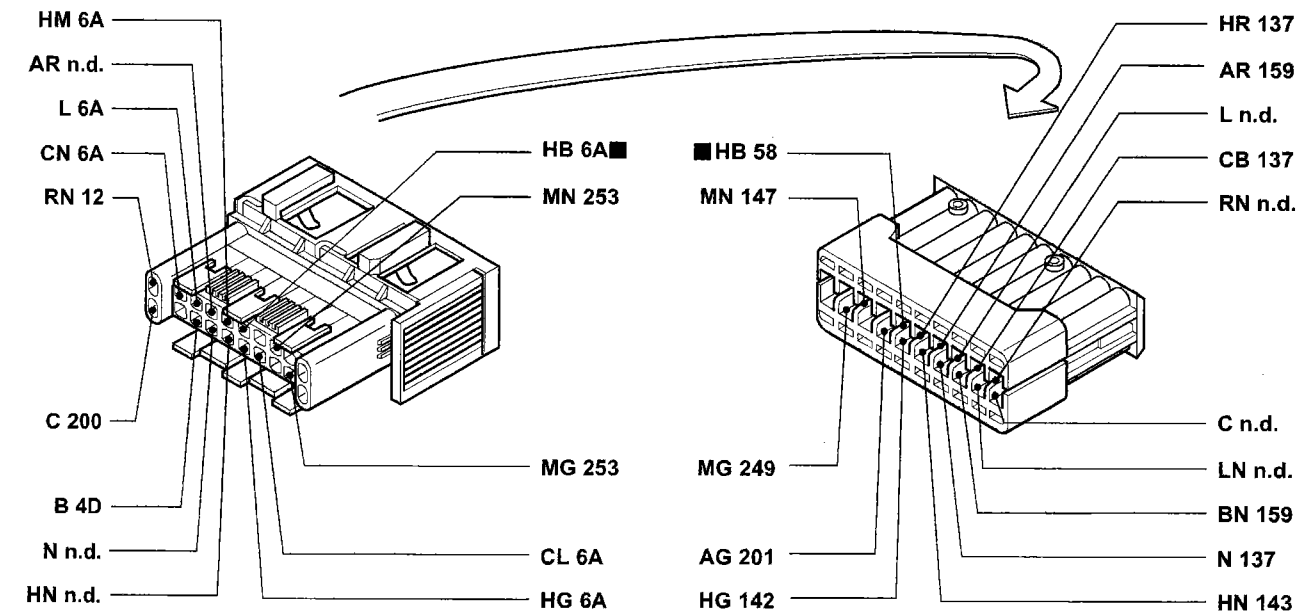
4 Junction unit  
E1 Ignition discharge relay

6 Instrument panel:  
X Engine coolant temperature gauge  
Y Electronic module

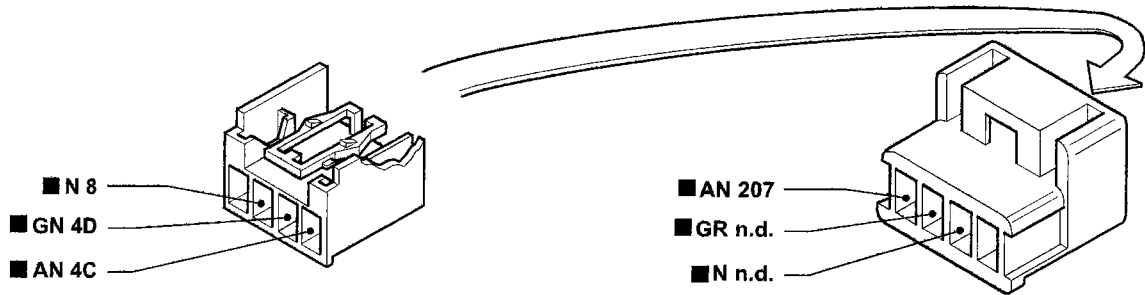
8 Left front earth  
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
22 Left dashboard earth  
42 Right dashboard earth  
55 Connection between front/engine pre-wiring cables  
58 Light dimmer  
70 Dashboard/front cables connection  
122 Engine cooling fan low speed relay feed  
123A Engine cooling fan high speed relay  
126 Front/air conditioning cables connection  
127 Connection between left front cable/cable on relay holder bracket  
128 Front/air conditioning cables connection  
129 50A protective power fuse for engine cooling fan
- 154 Engine cooling fan  
171 Heater unit  
172 Two level thermal switch  
202 Heater unit/air conditioning light bulbs  
206 Heater/air conditioning fan  
207 Heating/air conditioning system speed control switch  
208 Limiting resistance for heating/air conditioning system  
236 Front/air conditioning cables connection  
237 Additional engine cooling fan  
238 40A fuse protecting engine cooling fan  
296 Fuse carrier base on front cable  
C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection  
348 Remote control switch for engine cooling solenoid valve

N.D. Ultrasound welding taped in cable loom

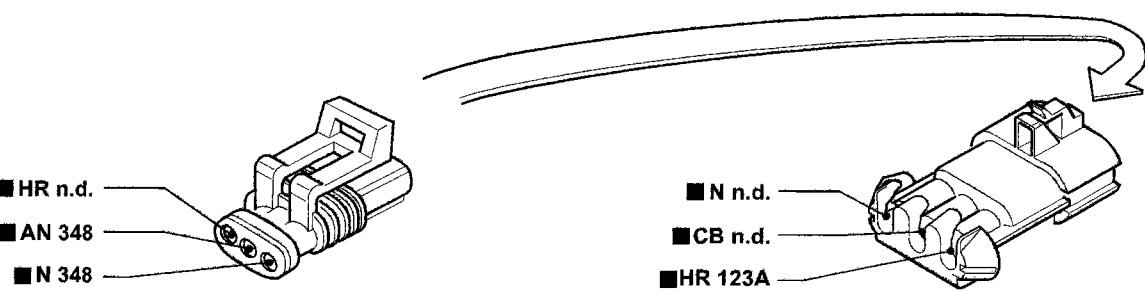
55 Connection between front/engine pre-wiring cables.



171 Heater unit cables connection

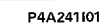


236 Front/air conditioning cables connection.

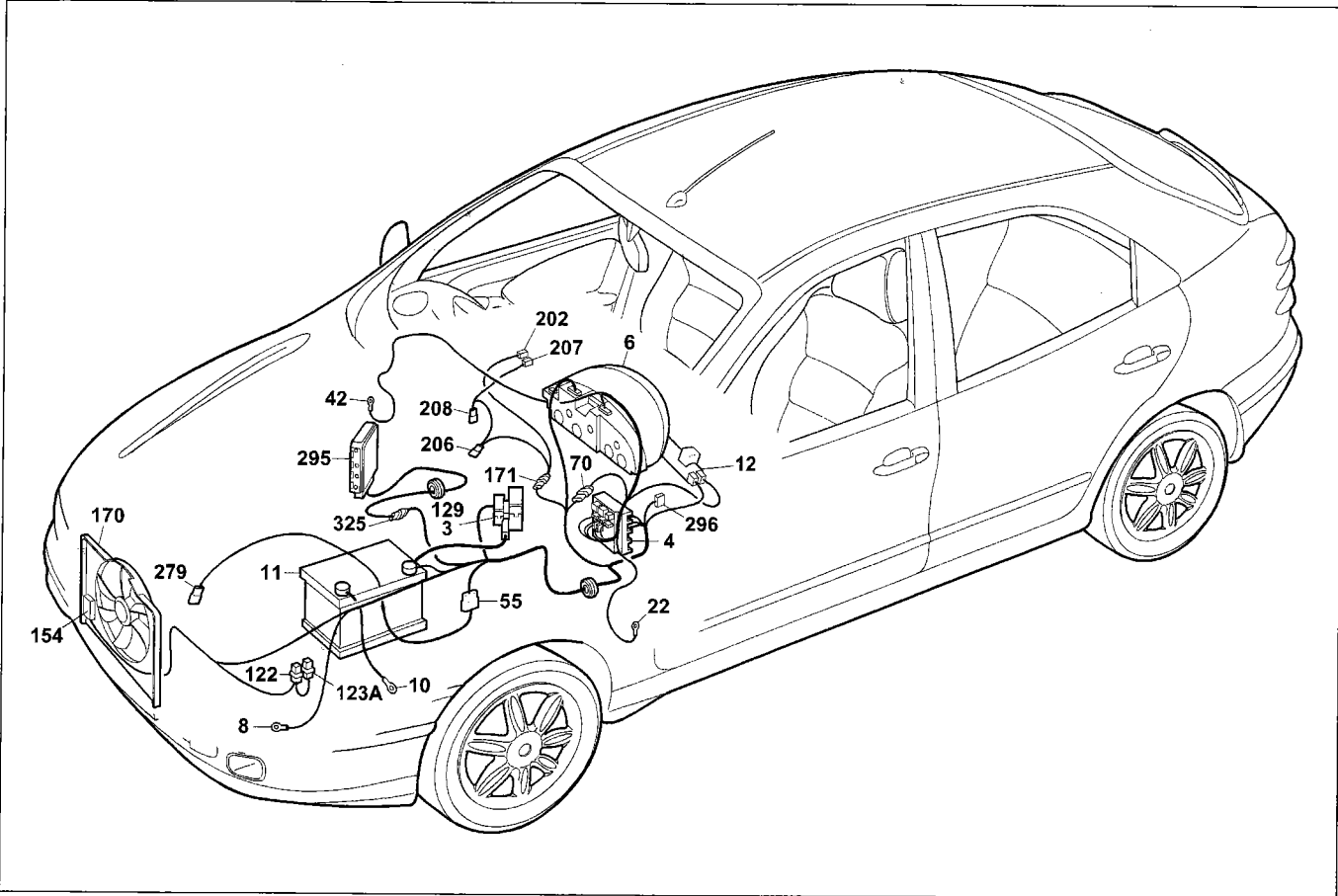


The cables in the wiring diagram are marked

**Engine cooling - Water temperature gauge - Car interior ventilation - (See key at end of wiring diagrams)**



55.



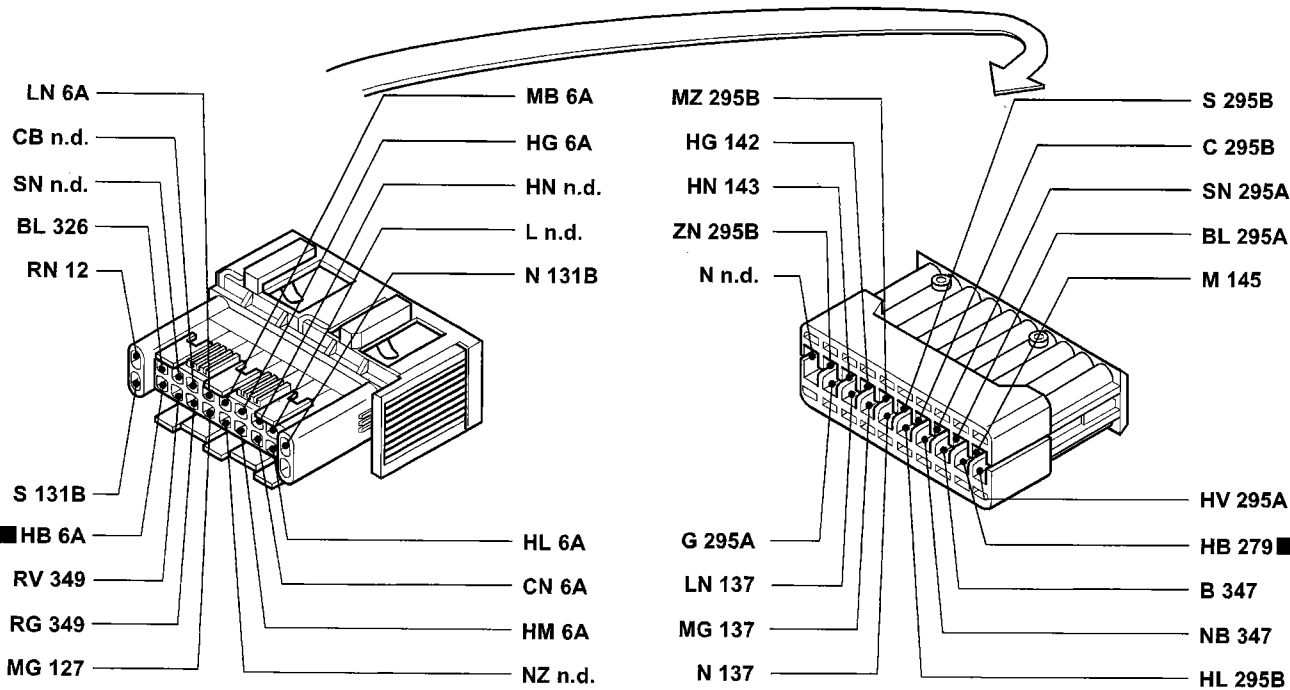
Version without automatic air conditioning  
Engine cooling - Water temperature gauge - Car interior ventilation

Components key

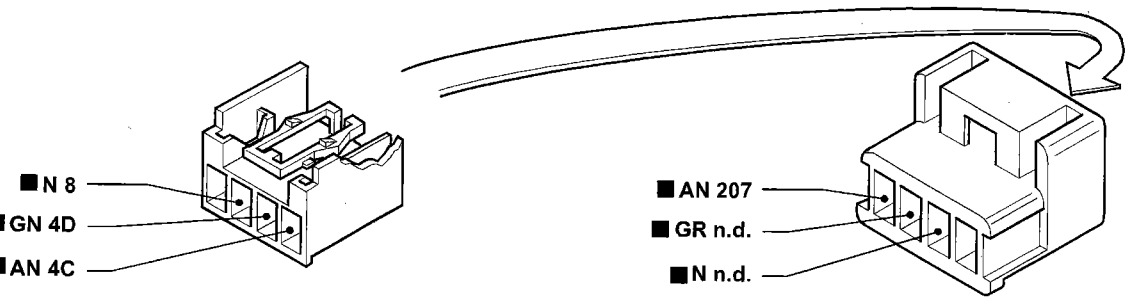
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
  - E1 Ignition discharge relay
- 6 Instrument panel:
  - X Engine coolant temperature gauge
  - Y Electronic module
- 8 Left front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 42 Right dashboard earth
- 55 Connection between front cables/engine pre-wiring
- 55A Connection between engine pre-wiring front cables
- 70 Dashboard/front cables connection
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed
- 129 50A protective power fuse for engine cooling fan
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistance
- 171 Heater unit
- 202 Heater/air conditioning light bulbs
- 206 Heater/air conditioning fan
- 207 Heater/air conditioning system speed control switch
- 208 Heater/air conditioning system limiter resistance
- 279 Twin engine coolant temperature sender unit
- 293 Fuse carrier base on dashboard cable
  - C 7.5A fuse protecting cooling system/electronic injection Fiat-CODE
- 295 Electronic control unit for 1910 TD UNIJET ignition/injection

N.D. Ultrasound welding taped in cable loom

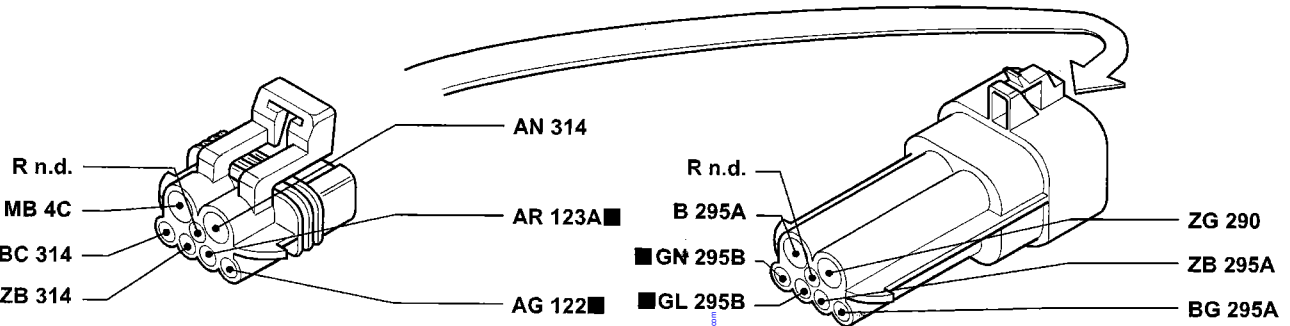
55 Connection between front/engine pre-wiring cables.



171 Heater unit cables connection



325 Connection between injection/left front cables.

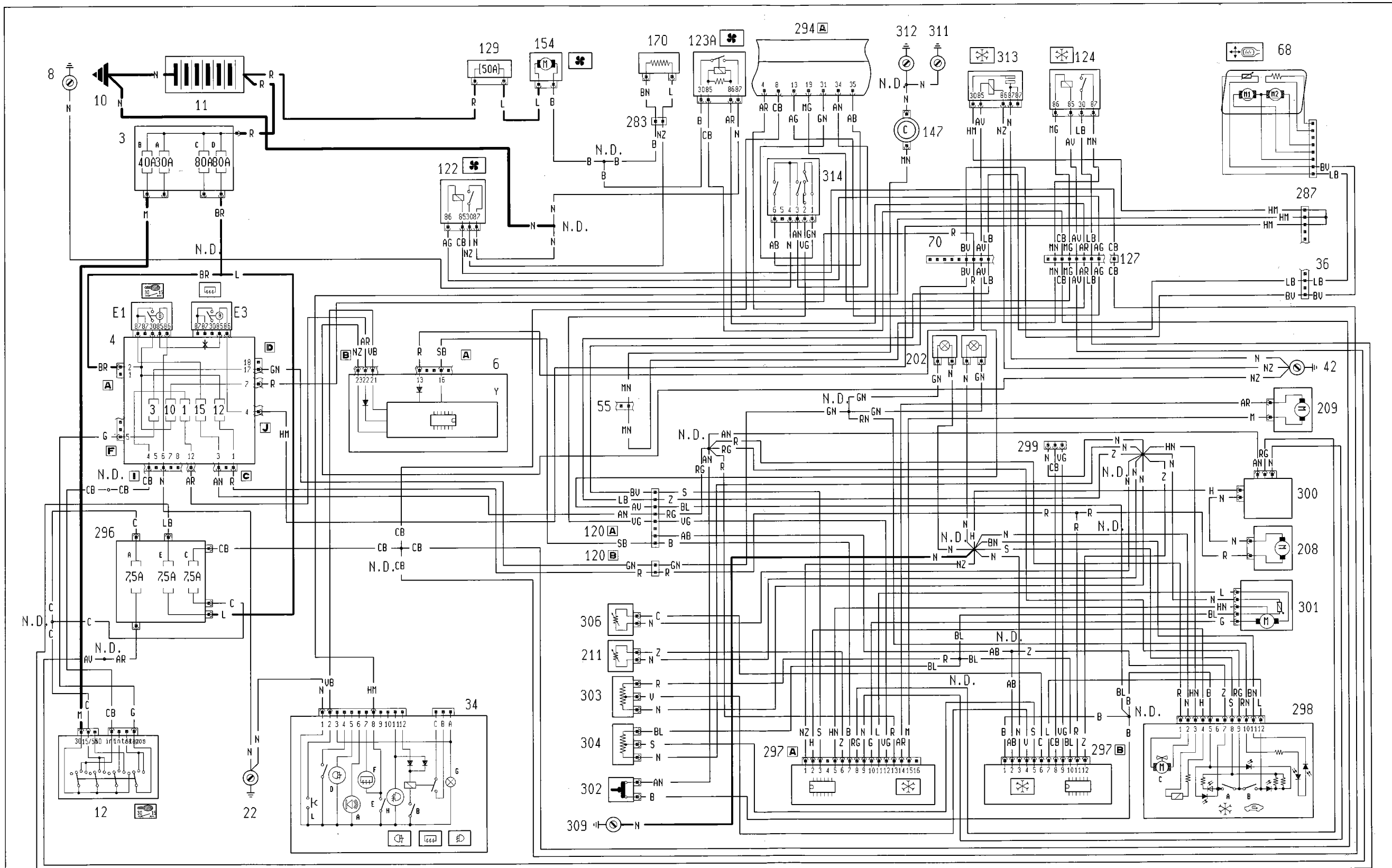


The cables in the wiring diagram are marked



### Version without A.B.I.

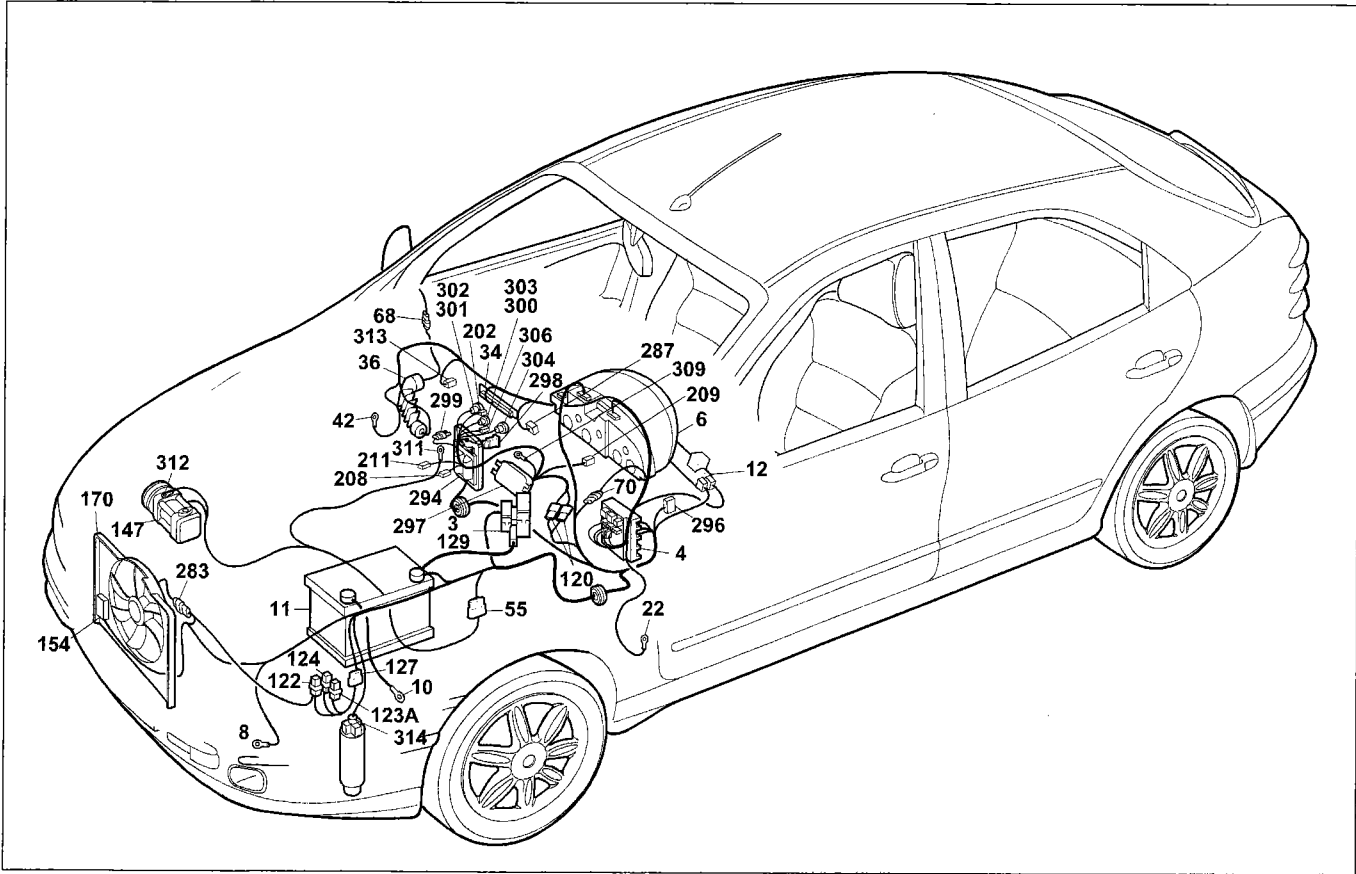
**Automatic air conditioning - (See key at end of wiring diagrams)**



\* See heated rear windscreen diagram



55.



Version without A.B.I.

Automatic air conditioning

Components key

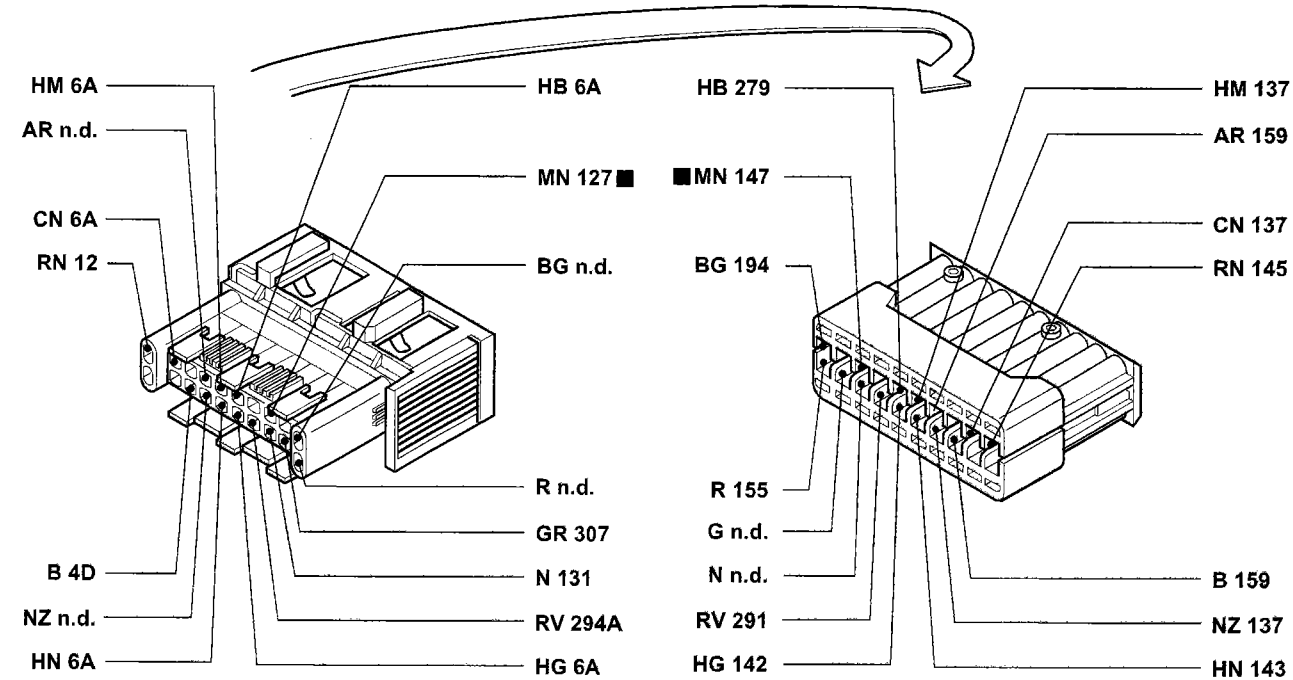
- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit:
  - E1 Ignition discharge relay
  - E3 Heated rear windscreen relay feed
- 6 Instrument panel:
  - Y Electronic module
- 7 Steering column switch unit
- 8 Left front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 34 Switch control unit
  - A Anti-theft warning light on
  - B Rear fog lamps switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen control switch
  - F Heated rear windscreen warning light
  - G Switch control unit ideogram light
  - H Fog lamps warning light
  - L Outside temperature control switch
- 36 Dashboard/left front door cables connection
- 42 Right dashboard earth
- 55 Connection between front/engine pre-wiring cables
- 68 Right electrically adjusted external rear view mirror
- 70 Dashboard/front cables connection
- 120A Air conditioning unit cables connection
- 120B Air conditioning unit cables connection
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed

- 124 Air conditioning compressor relay
- 127 Front left cables/cable on relay holder bracket connection
- 129 50A power fuse protecting engine cooling fan
- 147 Compressor for air conditioning
- 154 Engine cooling fan
- 170 Engine cooling fan limiter resistance
- 202 Heater/air conditioning light bulbs
- 208 Limiter resistance for heater/air conditioning
- 209 Outside/recirculation air flap control actuator
- 211 Electronic thermostat (N.T.C.)
- 283 Connection between front/resistance cables
- 287 Short circuit connection
- 294 Injection/ignition electronic control unit 1242
- 296 Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/ electronic injection; C.A. system; Alarm
  - C 7.5A fuse protecting Fiat-CODE cooling system/electronic Injection
  - E 7.5A fuse protecting climate control system
- 297 Air conditioning control unit
- 298 Heater/air conditioning recirculation control
- 299 Diagnostic socket for heater/air conditioning
- 300 Car interior fan electronic transformer
- 301 Car interior mixture control actuator
- 302 Maximum demisting control switch
- 303 Interior ventilation potentiometer
- 304 Potentiometer for car interior temperature
- 306 Treated air sensor
- 309 Earth for air conditioning unit
- 311 Earth for electronic injection control unit
- 312 Power earth for electronic injection control unit
- 313 Relay for inverting signal for air conditioning
- 314 Four stage pressure switch

N.D. Ultrasound welding taped in cable loom

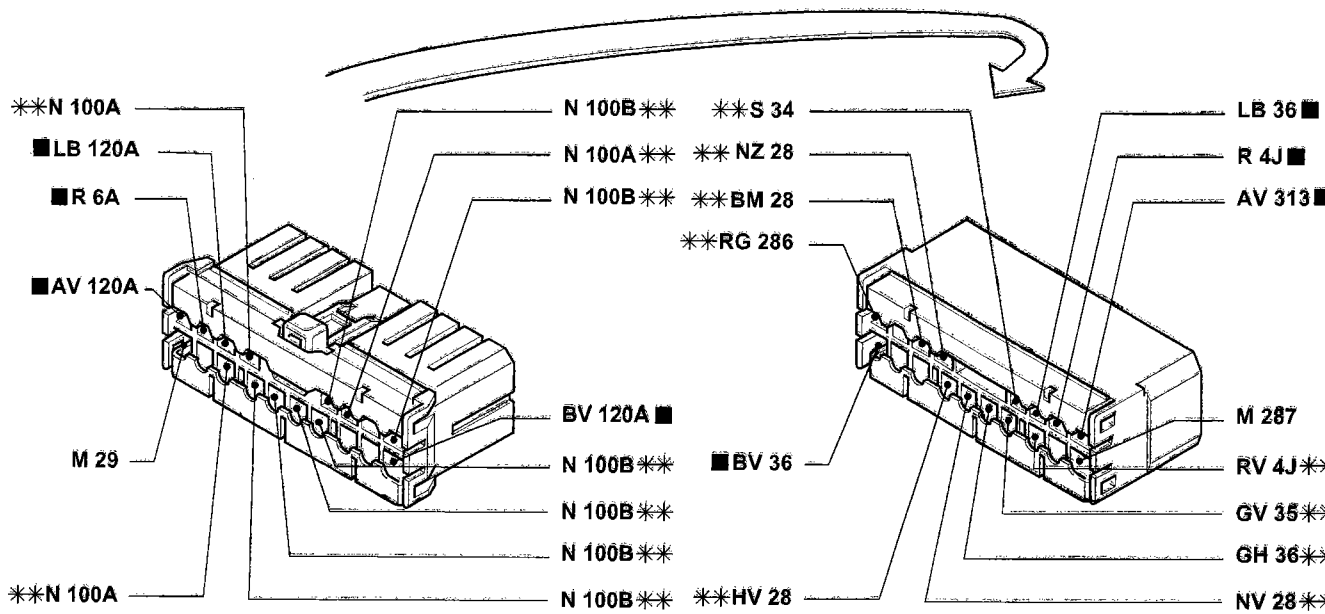
55

Connection between front/engine pre-wiring cables.



70

Dashboard/front cables connection.



\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

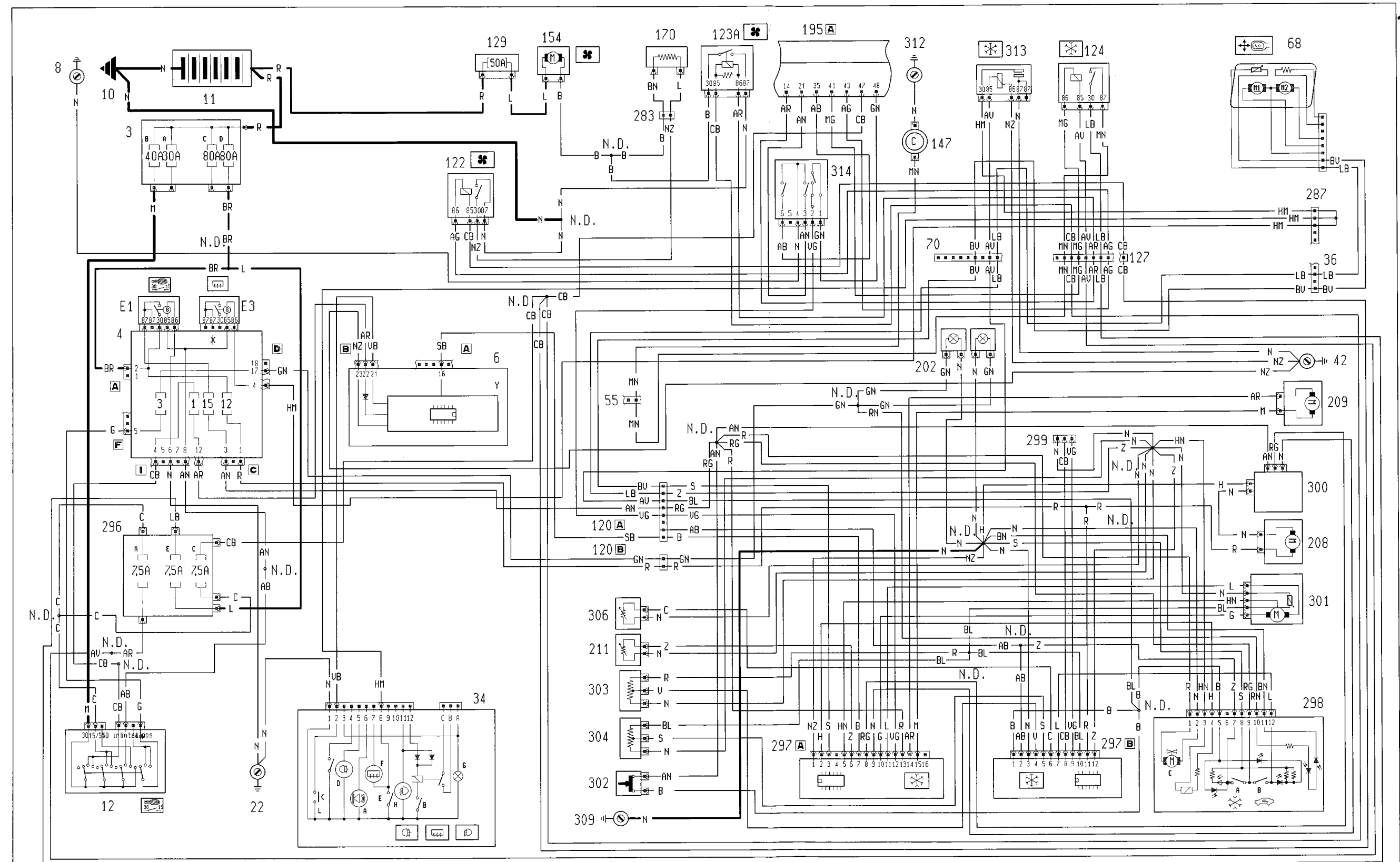
The cables in the wiring diagram are marked

# Electrical equipment

## Wiring diagrams

### 55.

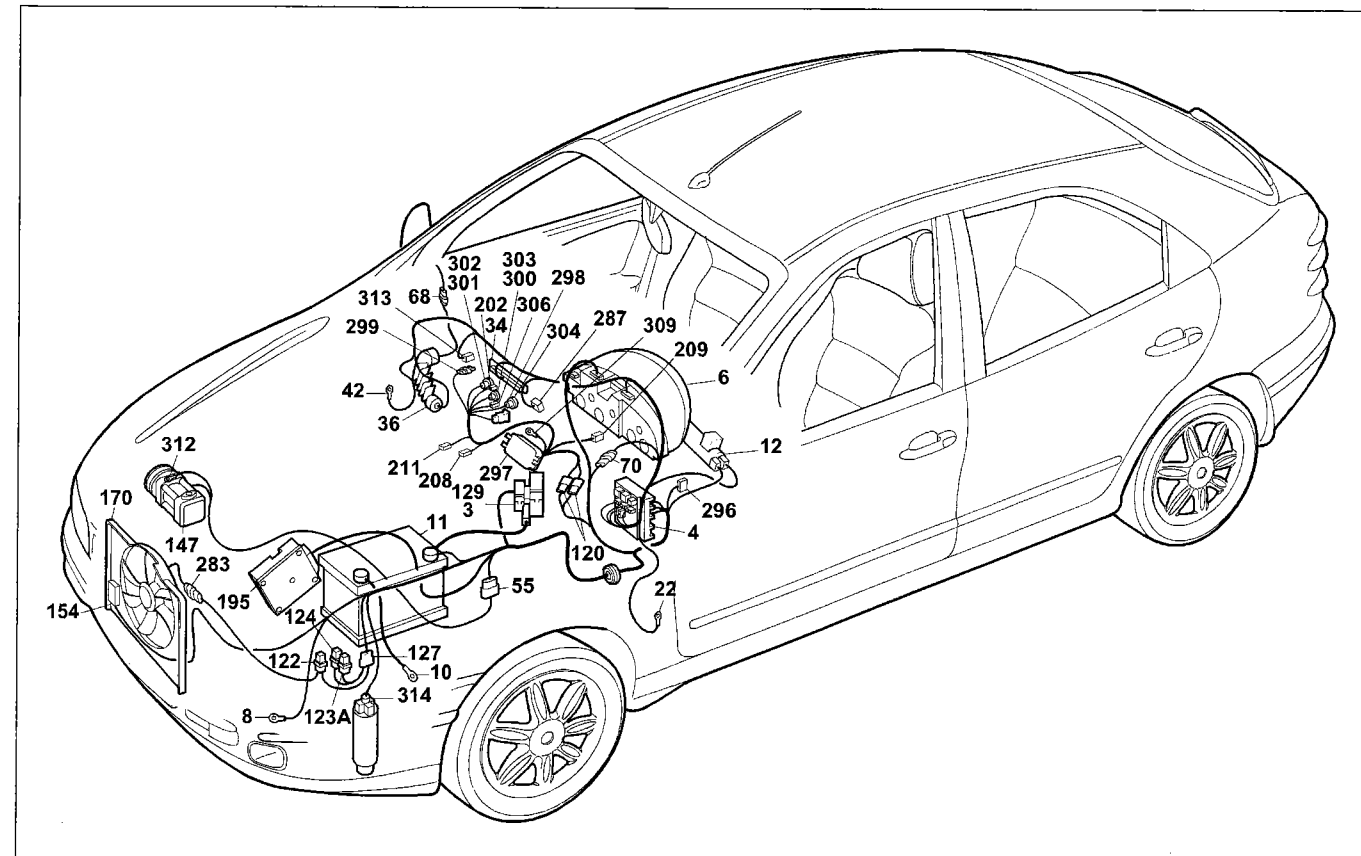
Version without A.B.I.  
Automatic air conditioning - (See key at end of wiring diagrams)



\* See heated rear windscreen diagram

P4A249101

### 55.



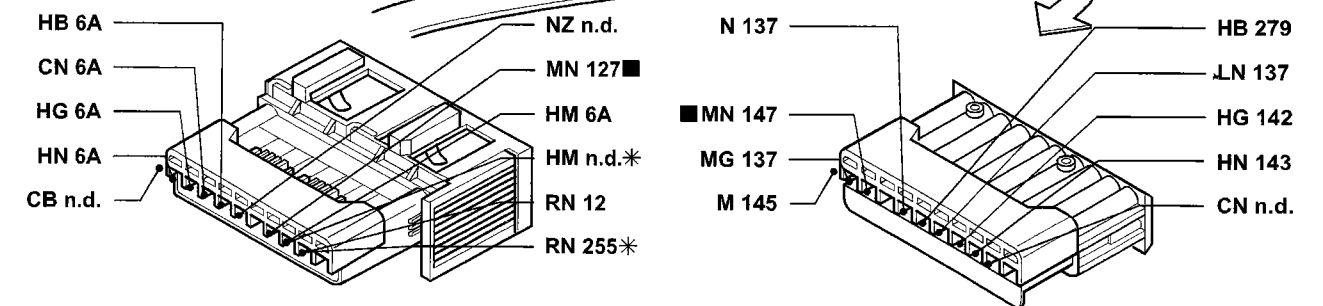
#### Version without A.B.I. Automatic air conditioning Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit:
  - E1 Ignition discharge relay
- 6 Instrument panel
  - Y Electric module
- 7 Steering column switch unit
- 8 Left front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 34 Switch control unit
  - A Anti-theft warning light on
  - B Rear fog lamps switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen switch
  - F Heated rear windscreen warning light
  - G Switch control unit ideogram light
  - H Fog lights warning light
  - I Outside temperature control switch
  - L Outside temperature control switch
- 36 Dashboard/left front door cables connection
- 42 Right dashboard earth
- 55 Connection between front/engine pre-wiring cables
- 68 Right electrically adjusted external rear view mirror
- 70 Dashboard/front cables connection
- 120 Air conditioning unit cables connection
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed
- 124 Air conditioning compressor relay
- 127 Connection between left front cable/cable on relay holder bracket

- 129 50A power fuse protecting engine cooling fan
- 147 Compressor for air conditioning
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistance
- 195 Injection/ignition electronic control unit (1581)
- 202 Heater/air conditioning light bulbs
  - A Air conditioning on switch
  - B Air conditioning recirculation switch
- 208 Limiter resistance for heater/air conditioning
- 209 Outside/recirculation air flap control actuator
- 211 Electronic thermostat (N.T.C.)
- 283 Connection between front cable/resistance
- 287 Short circuit connection
- 296 Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm
  - C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection
  - E 7.5A fuse protecting electronic injection system/ Fiat-CODE
- 297 Control unit for heater/air conditioning
- 299 Diagnostic socket for heater/air conditioning
- 298 Recirculation for heater/air conditioning
  - A Recirculation control switch
  - B Recirculation control switch
  - C Ventilation sensor
- 300 Vehicle interior fan electronic transformer
- 301 Car interior mixture control actuator
- 302 Maximum demisting control switch
- 303 Internal ventilation potentiometer
- 304 Potentiometer for car interior temperature
- 306 Treated air sensor
- 309 Earth for air conditioning unit
- 312 Power earth for electronic injection control unit
- 313 Relay for inverting signal for air conditioning
- 314 Four stage pressure switch

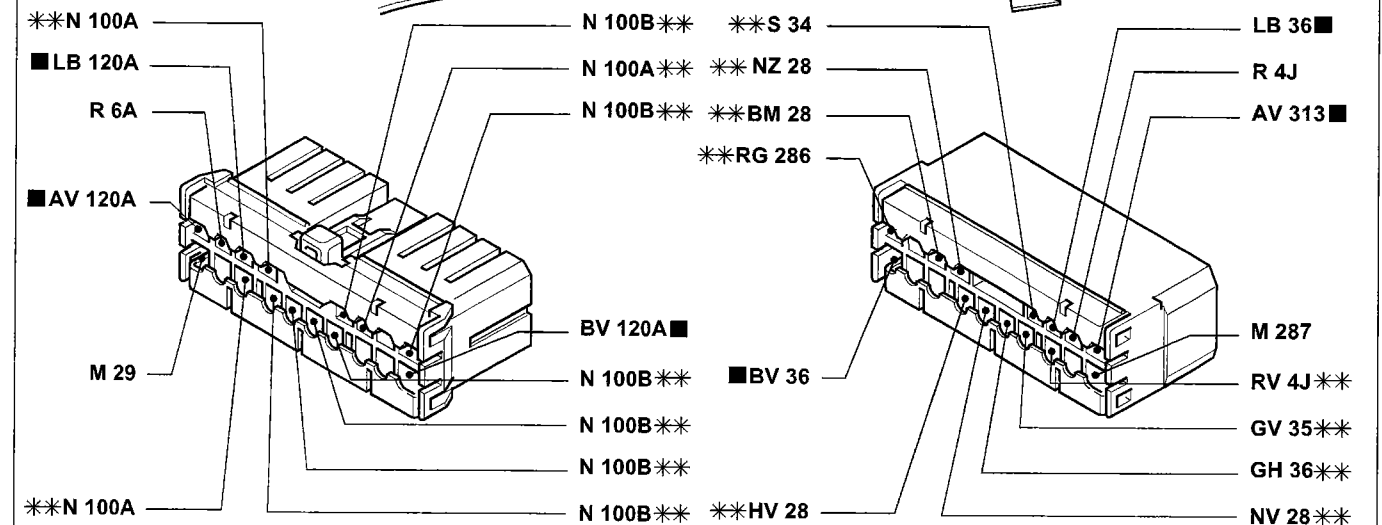
N.D. Ultrasound welding taped in cable loom

#### 55 Connection between front/engine pre-wiring cables.



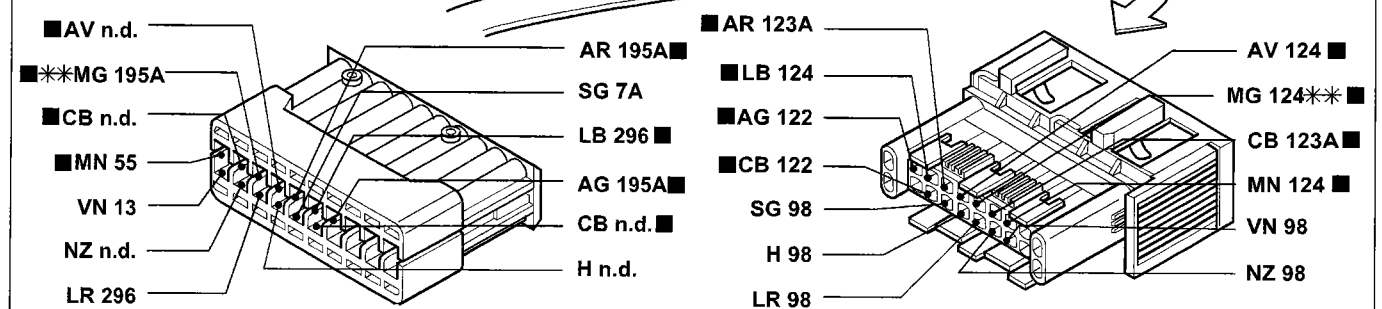
\* Variant connection for version with automatic transmission

#### 70 Dashboard/front cables connection.



\*\* Variant connection for versions with alarm

#### 127 Connection between left front cable/cable on relay holder bracket.



\*\* Variant connection for version with automatic transmission

The cables in the wiring diagram are marked

P4A252101

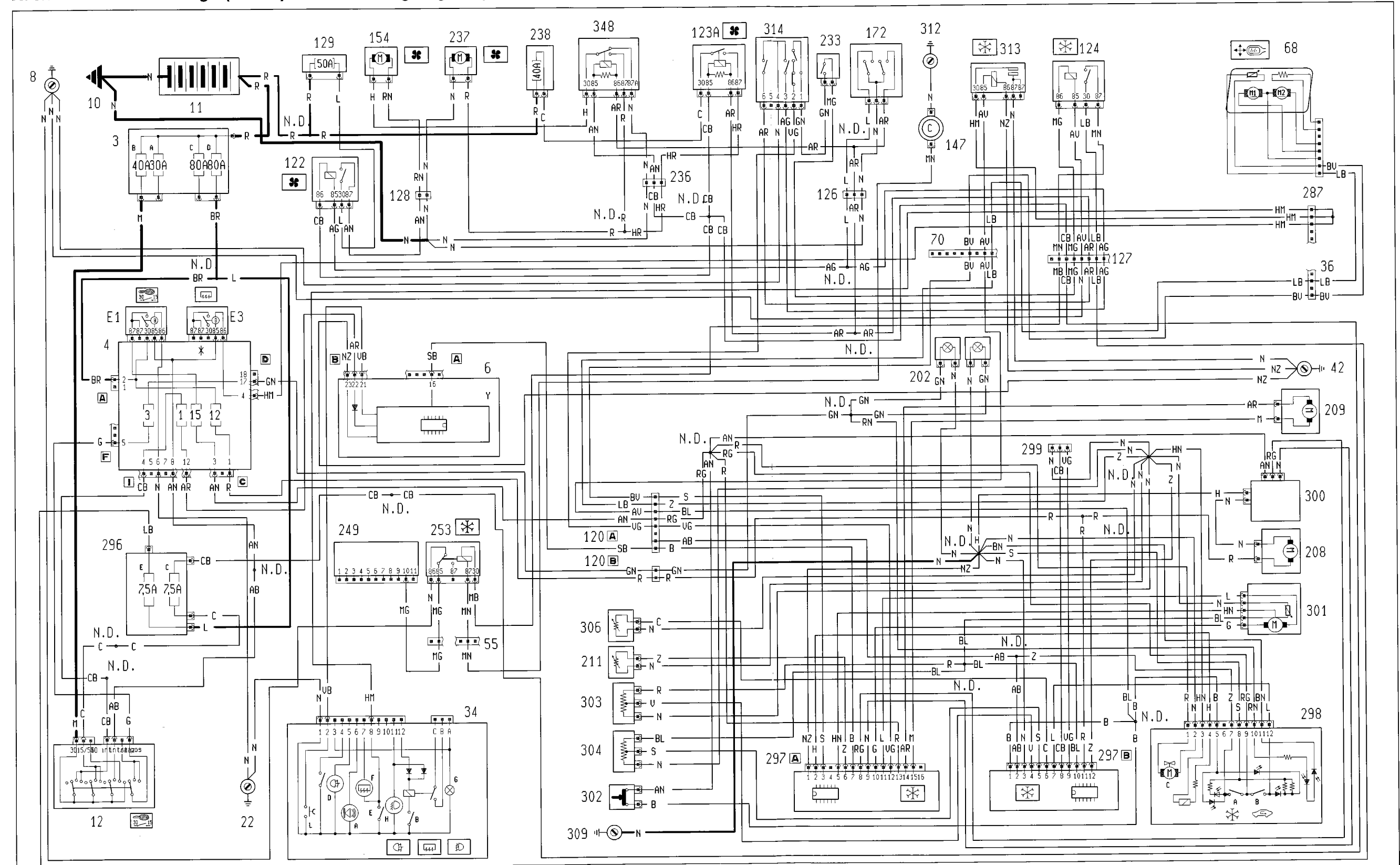


# Electrical equipment

## Wiring diagrams

### 55.

Version without A.B.I.  
Automatic air conditioning - (See key at end of wiring diagrams)



\* See heated rear windscreen diagram

P4A253101

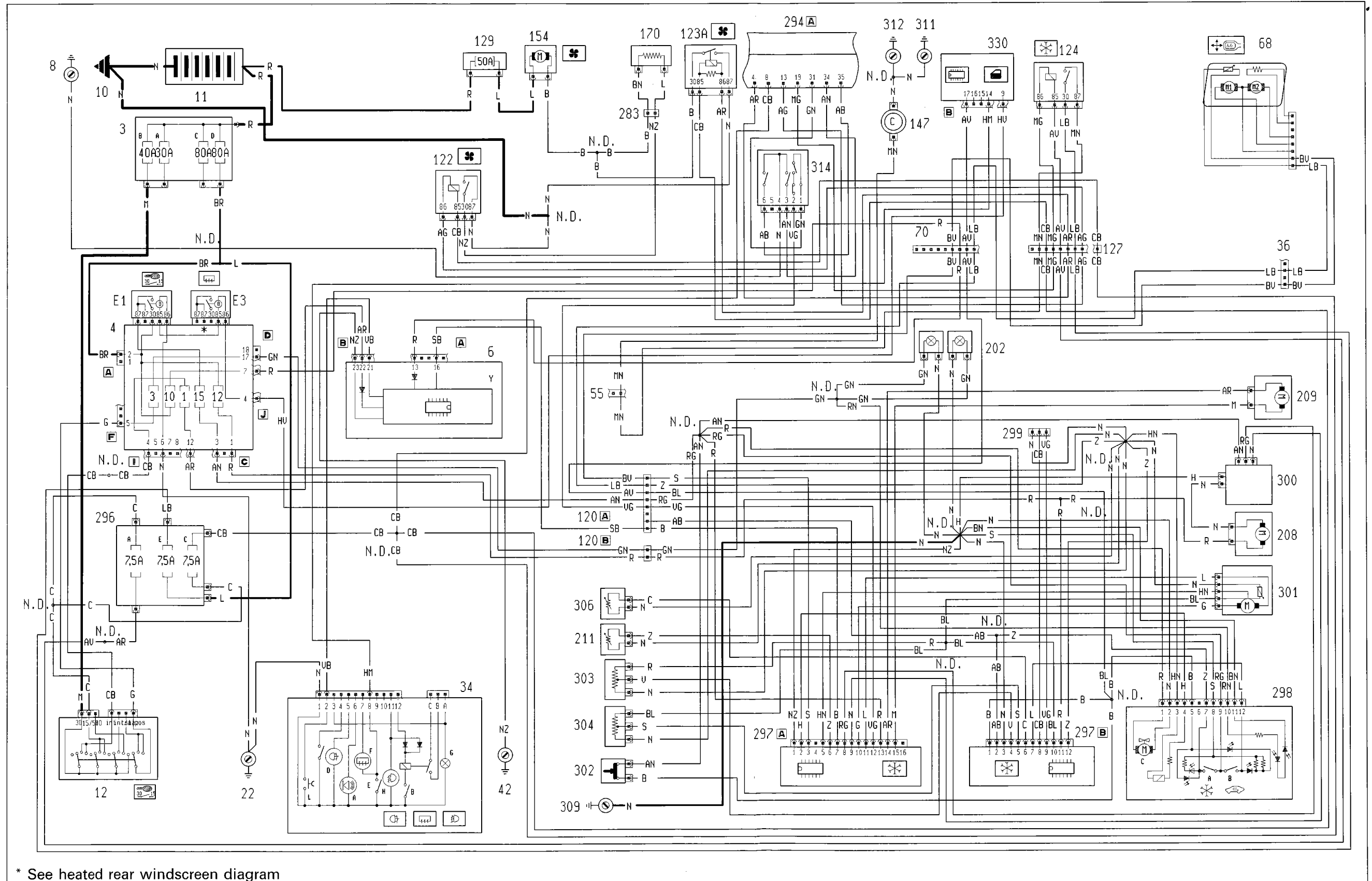
**55** Connection between front/engine pre-wiring cables.

# Electrical equipment

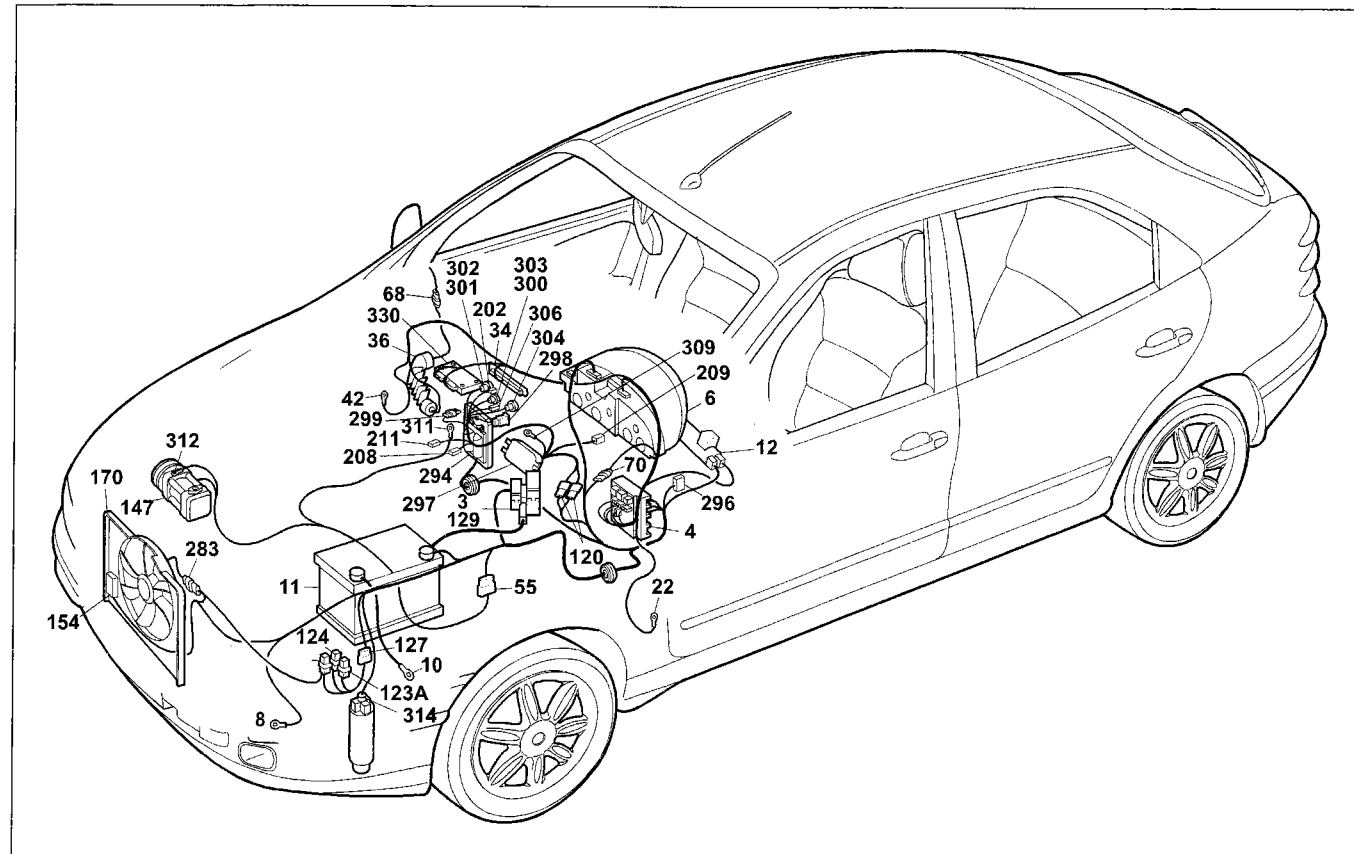
## Wiring diagrams

### 55.

Version with A.B.I.  
Automatic air conditioning - (See key at end of wiring diagrams)







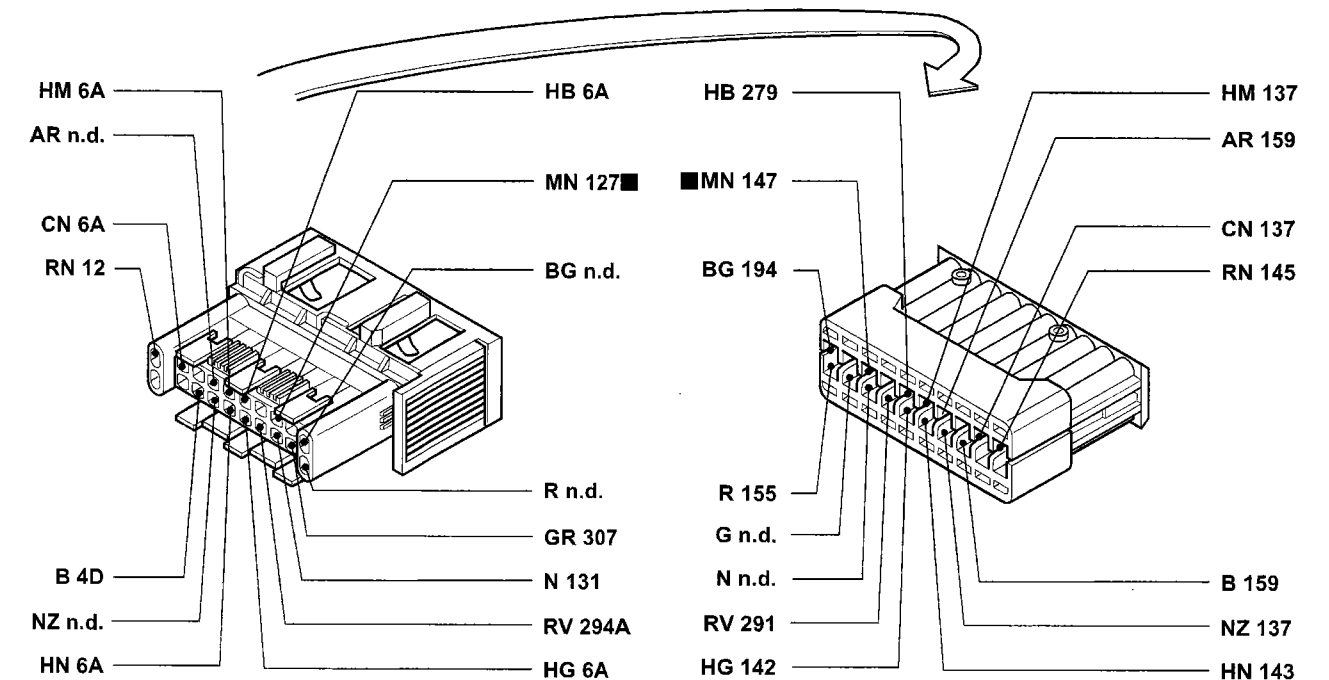
**Version with A.B.I.  
Automatic air conditioning**

### Components key

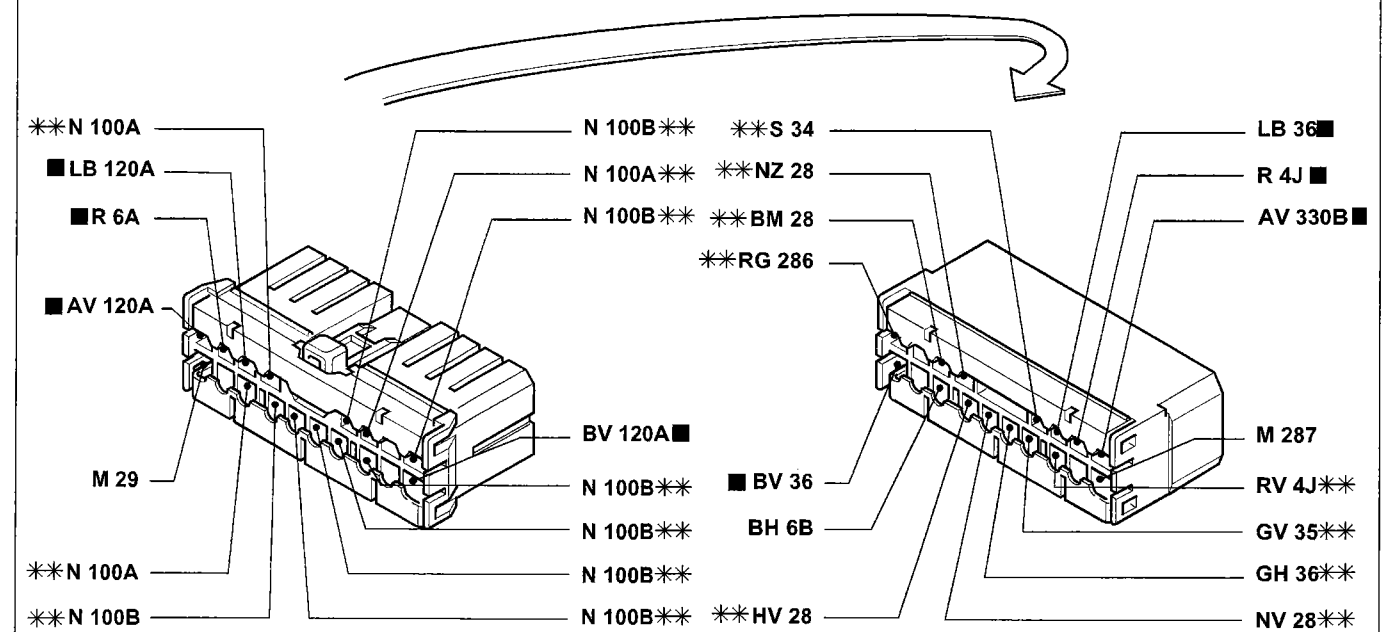
- |      |                                                                |     |                                                                              |
|------|----------------------------------------------------------------|-----|------------------------------------------------------------------------------|
| 3    | Power fuse box:                                                | 147 | Compressor for air conditioning                                              |
| A    | 30A protective fuse for injection system (60A for TD versions) | 154 | Engine cooling fan                                                           |
| B    | 40A protective fuse for ignition system                        | 170 | Limiter resistance for engine cooling fan                                    |
| C    | 80A fuse protecting additional options                         | 202 | Heater/air conditioning light bulbs                                          |
| D    | 80A protective fuse for junction unit                          | A   | Air conditioning on switch                                                   |
| 4    | Junction unit:                                                 | B   | Air conditioning recirculation switch                                        |
| E1   | Ignition discharge relay                                       | 208 | Limiter resistance for heater/air conditioning                               |
| E3   | Heated rear windscreen relay feed                              | 209 | Outside/recirculation air flap control actuator                              |
| 6    | Instrument panel:                                              | 211 | Electronic thermostat (N.T.C.)                                               |
| Y    | Electronic module                                              | 283 | Front cable/resistance connection                                            |
| 8    | Left front earth                                               | 294 | Injection/ignition electronic control unit 1242                              |
| 10   | Earth for battery on bodyshe'll                                | 296 | Fuse carrier base on front cable                                             |
| 11   | Battery                                                        | A   | 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm |
| 12   | Ignition switch                                                | C   | 7.5A fuse protecting Fiat - CODE cooling system/electronic injection         |
| 22   | Left dashboard earth                                           | E   | 7.5A fuse protecting climate control system                                  |
| 34   | Switch unit:                                                   | 297 | Air conditioning control unit                                                |
| A    | Anti-theft warning light on                                    | 298 | Recirculation control for heater/air conditioning                            |
| B    | Rear fog lamps switch                                          | A   | Air conditioning on switch                                                   |
| D    | Rear fog lamps warning light                                   | B   | Recirculation control switch                                                 |
| E    | Heated rear windscreen switch                                  | C   | Ventilation sensor                                                           |
| F    | Heated rear windscreen warning light                           | 299 | Diagnostic socket for heater/air conditioning                                |
| G    | Switch control unit ideogram light                             | 300 | Car interior fan electronic transformer                                      |
| H    | Fog lights warning light                                       | 301 | Car interior mixture control actuator                                        |
| I    | Fog lights switch                                              | 302 | Maximum demisting control switch                                             |
| L    | Outside temperature control switch                             | 303 | Internal ventilation potentiometer                                           |
| 36   | Dashboard/right front door cables connection                   | 304 | Potentiometer for car interior temperature                                   |
| 42   | Right dashboard earth                                          | 306 | Treated air sensor                                                           |
| 55   | Connection between front/engine pre-wiring cables              | 309 | Earth for air conditioning unit                                              |
| 68   | Right electrically adjusted external rear view mirror          | 311 | Earth for electronic injection control unit                                  |
| 70   | Dashboard/front cables connection                              | 312 | Power earth for electronic injection control unit                            |
| 120A | Air conditioning unit cables connection                        | 314 | Four stage pressure switch                                                   |
| 120B | Air conditioning unit cables connection                        |     |                                                                              |
| 122  | Engine cooling fan low speed relay feed                        |     |                                                                              |
| 123A | Engine cooling fan high speed relay feed                       |     |                                                                              |

N.D. Ultrasound welding taped in cable loom

**55** Connection between front/engine pre-wiring cables.



## 70 Dashboard/front cables connection.



\*\* Variant connection for versions with alarm

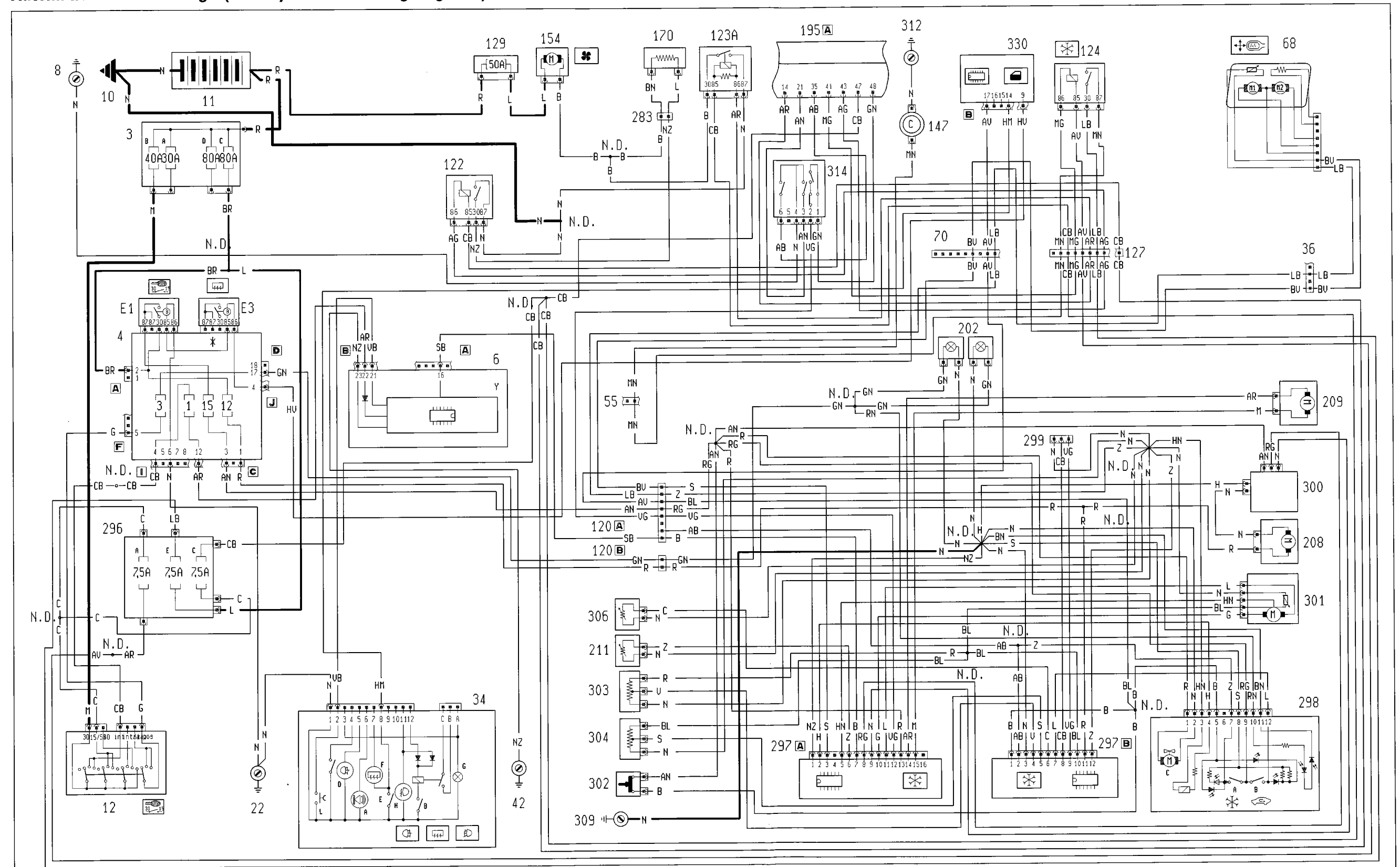
The cables in the wiring diagram are marked

# Electrical equipment

## Wiring diagrams

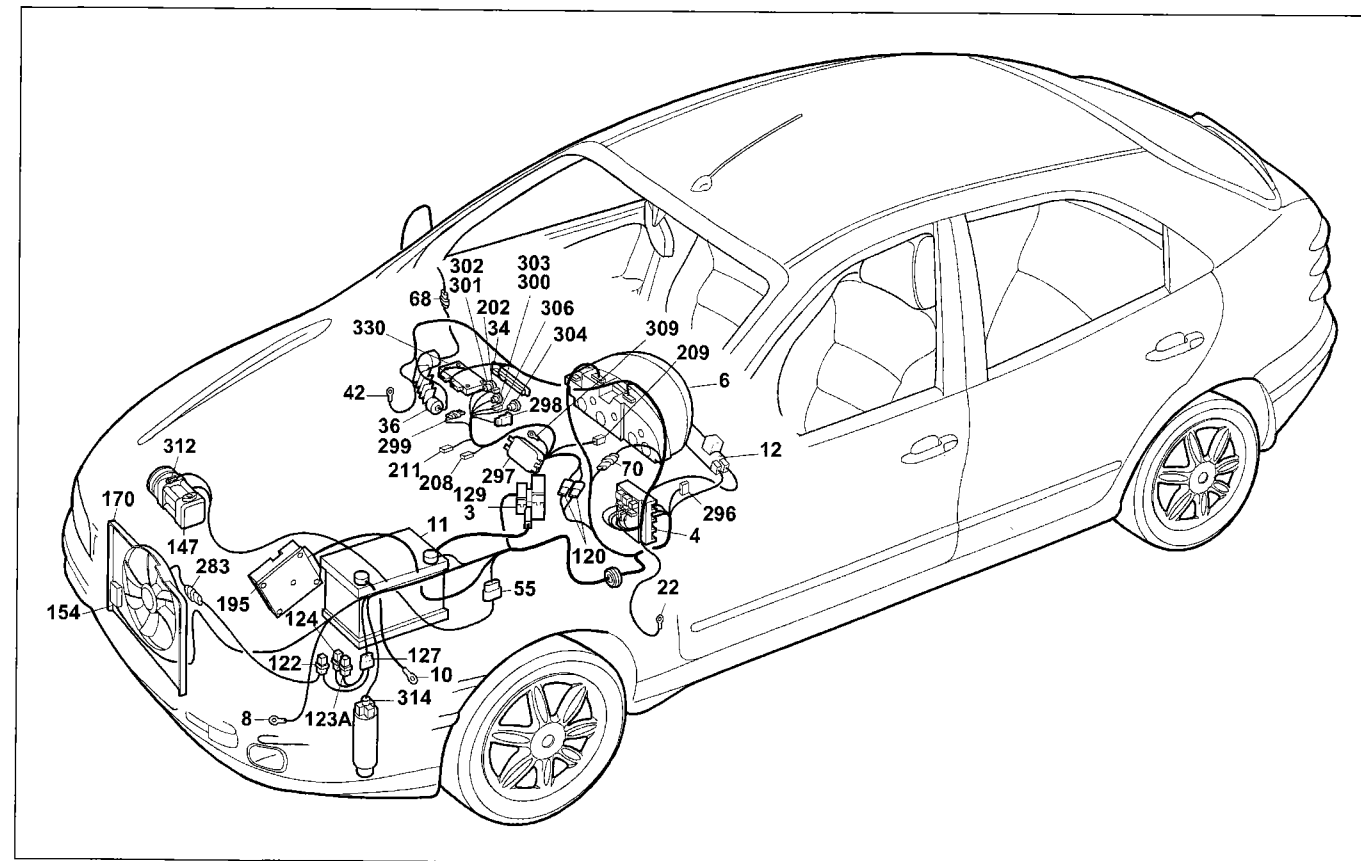
### 55.

Version with A.B.I.  
Automatic air conditioning - (See key at end of wiring diagrams)



\* See heated rear windscreen diagram

P4A261101



P4A263I01

**Version with A.B.I.**

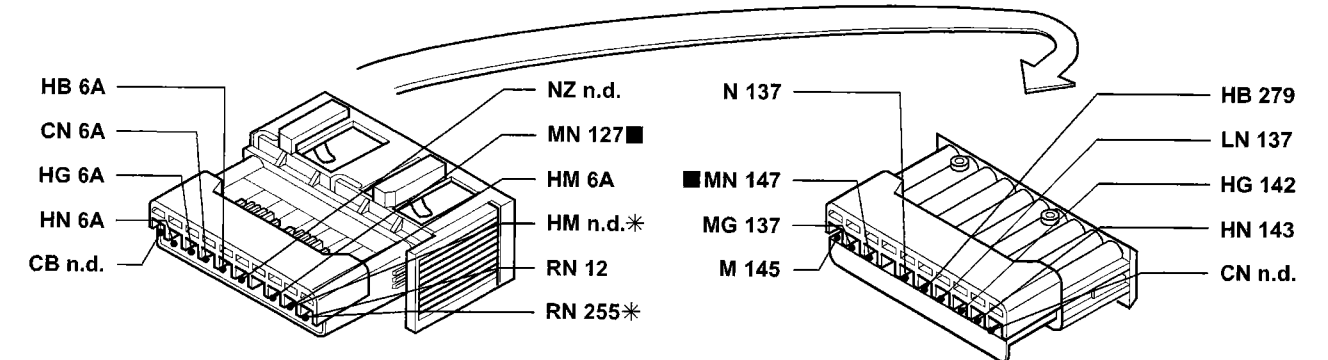
### Automatic air conditioning

### Components key

- |      |                                                                |     |                                                                              |
|------|----------------------------------------------------------------|-----|------------------------------------------------------------------------------|
| 3    | Power fuse box:                                                | 14  | Engine cooling fan                                                           |
| A    | 30A protective fuse for injection system (60A for TD versions) | 170 | Engine cooling fan limiting resistance                                       |
| B    | 40A protective fuse for ignition system                        | 195 | Injection/ignition electronic control unit (1581)                            |
| C    | 80A fuse protecting additional options                         | 202 | Heater/air conditioning light bulbs                                          |
| D    | 80A protective fuse for junction unit                          | 208 | Limiter resistance for heater/air conditioning                               |
| 4    | Junction unit:                                                 | 209 | Outside/recirculation air flap control actuator                              |
| E1   | Ignition discharge relay                                       | 211 | Electronic thermostat (N.T.C.)                                               |
| E3   | Heated rear windscreen relay feed                              | 232 | Earth for compressor                                                         |
| 6    | Instrument panel:                                              | 283 | Connection between front cable/resistance                                    |
| Y    | Electronic module                                              | 296 | Fuse carrier base on front cable                                             |
| 8    | Left front earth                                               | A   | 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm |
| 10   | Earth for battery on bodyshell                                 | C   | 7.5A fuse protecting Fiat - CODE cooling system/electronic injection         |
| 11   | Battery                                                        | E   | 7.5A fuse protecting climate control system                                  |
| 12   | Ignition switch                                                | 297 | Air conditioning control unit                                                |
| 22   | Left dashboard earth                                           | 298 | Recirculation control for heater/air conditioning                            |
| 34   | Switch unit:                                                   | A   | Air conditioning on switch                                                   |
| A    | Anti-theft warning light on                                    | B   | Recirculation control switch                                                 |
| B    | Rear fog lamps switch                                          | C   | Ventilation sensor                                                           |
| D    | Rear fog lamps warning light                                   | 299 | Diagnostic socket for heater/air conditioning                                |
| E    | Heated rear windscreen switch                                  | 300 | Car interior fan electronic transformer                                      |
| F    | Heated rear windscreen warning light                           | 301 | Car interior mixture control actuator                                        |
| G    | Switch unit ideogram light                                     | 302 | Maximum demisting control switch                                             |
| H    | Fog lights warning light                                       | 303 | Internal ventilation potentiometer                                           |
| I    | Fog lights switch                                              | 304 | Potentiometer for car interior temperature                                   |
| L    | Outside temperature control switch                             | 306 | Treated air sensor                                                           |
| 36   | Dashboard/right front door cables connection                   | 309 | Earth for air conditioning unit                                              |
| 55   | Connection between front/engine pre-wiring cables              | 312 | Power earth for electronic injection control unit                            |
| 68   | Right electrically adjusted external rear view mirror          | 314 | Four stage pressure switch                                                   |
| 70   | Dashboard/front cables connection                              | 330 | A.B.I. control unit                                                          |
| 120A | Air conditioning unit cables connection                        |     |                                                                              |
| 120B | Air conditioning unit cables connection                        |     |                                                                              |
| 122  | Engine cooling fan low speed relay feed                        |     |                                                                              |
| 123A | Engine cooling fan high speed relay feed                       |     |                                                                              |

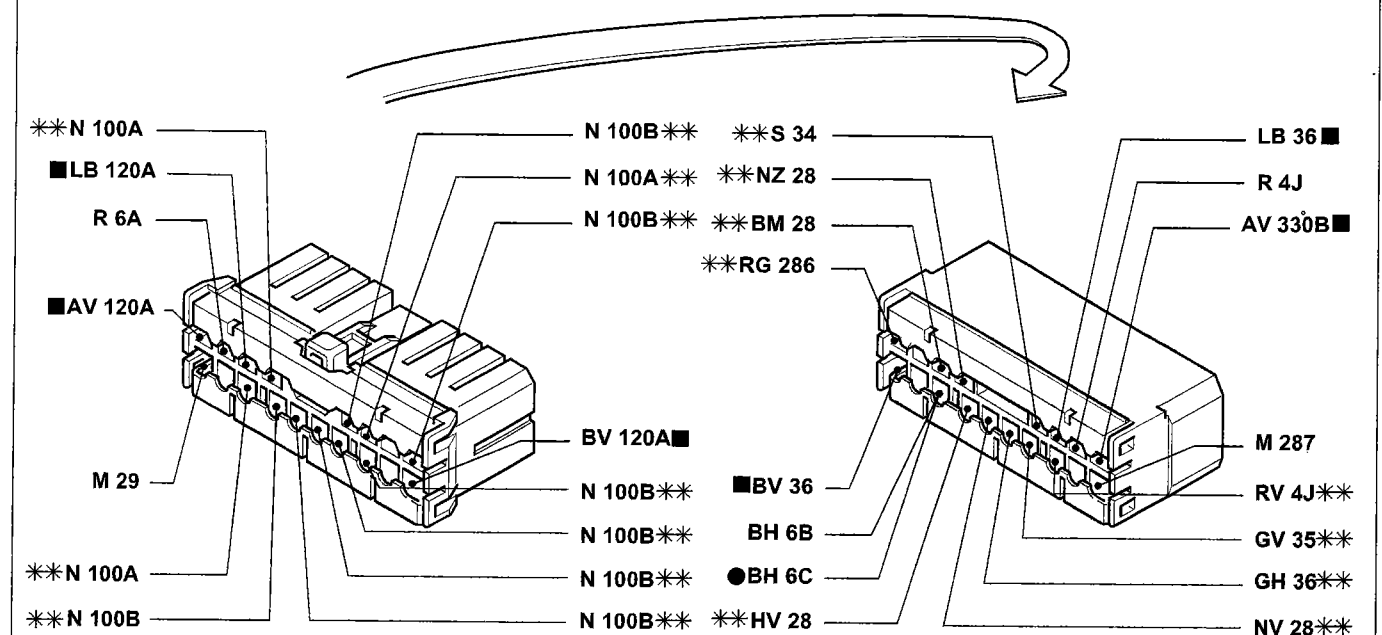
N.D. Welding taped in cable loom

**55** Connection between front/engine pre-wiring cables.



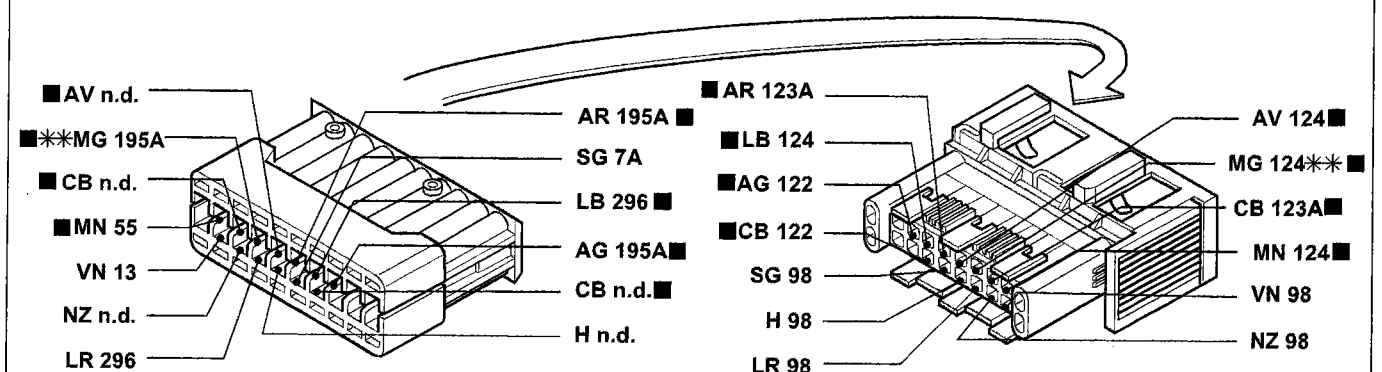
\* Variant connection for version with automatic transmission

## 70 Dashboard/front cables connection.



\*\* Variant connection for versions with alarm

**127** Connection between left front cable/cable on relay holder bracket.



**\*\* Variant connection for version with automatic transmission**

The cables in the wiring diagram are marked

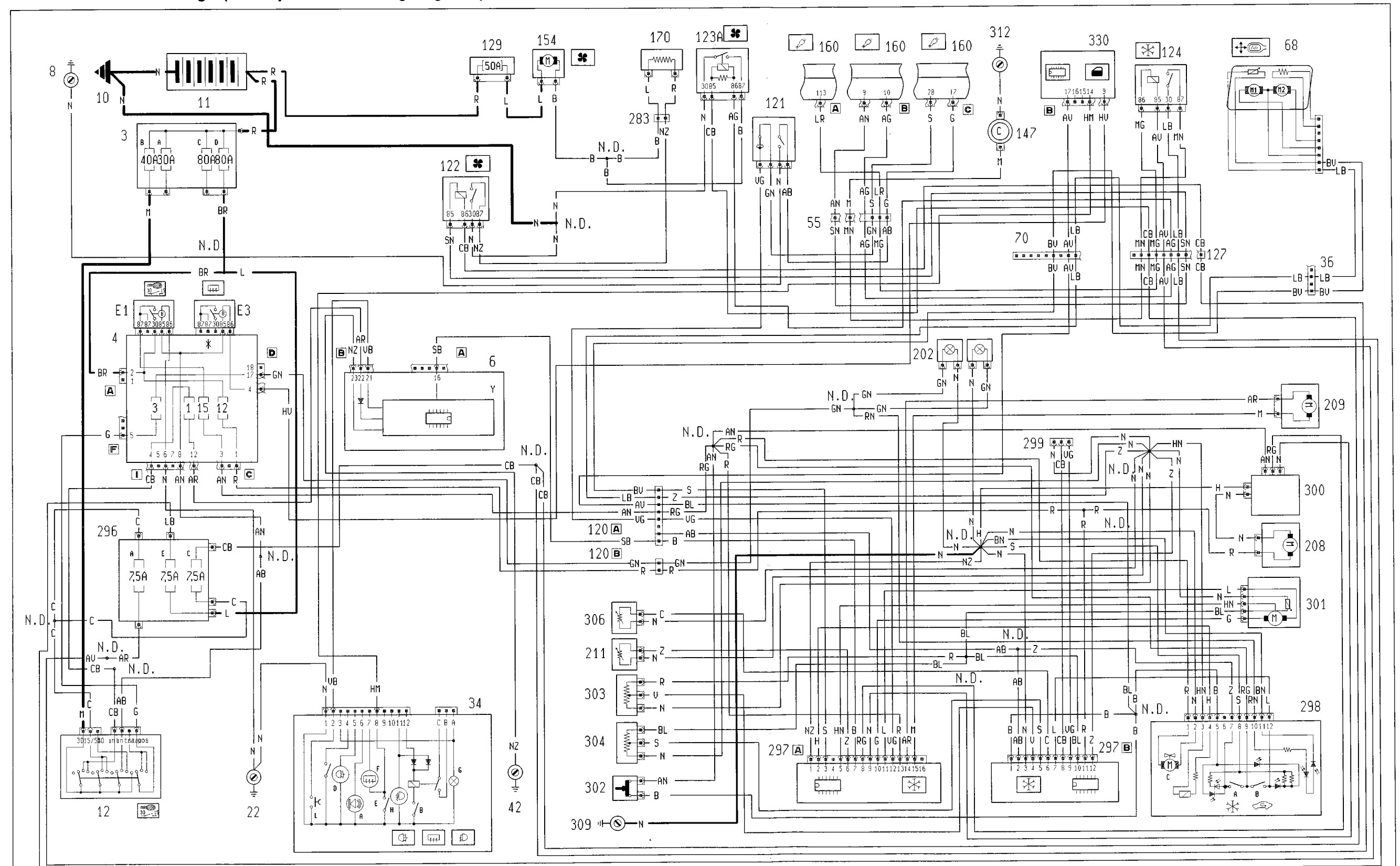
P4A264I01

# Electrical equipment

## Wiring diagrams

### 55.

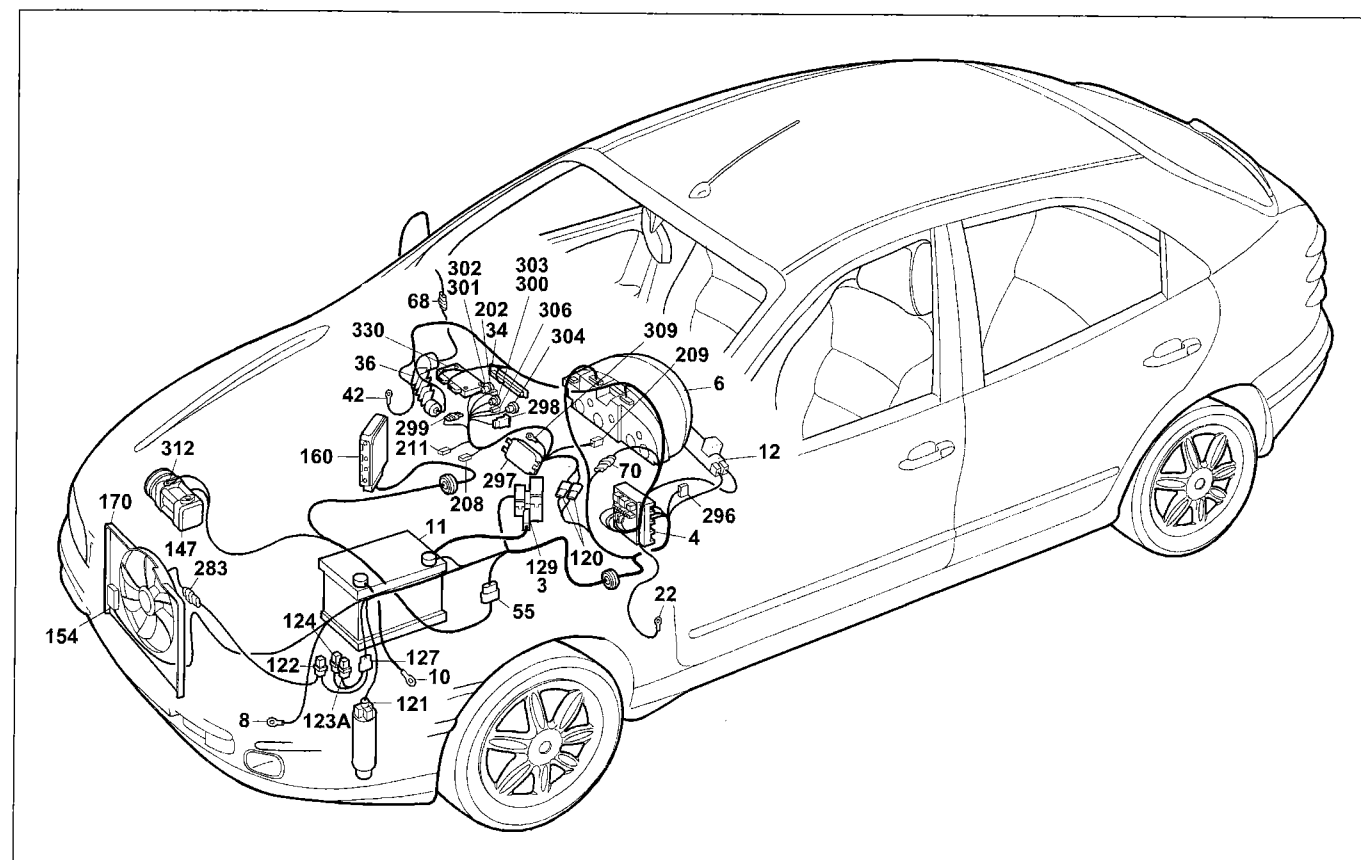
Version with A.B.I.  
Automatic air conditioning - (See key at end of wiring diagrams)



\* See heated rear windscreen diagram

P4A265101





P4A267I03

**Version with A.B.I.**

### Automatic air conditioning

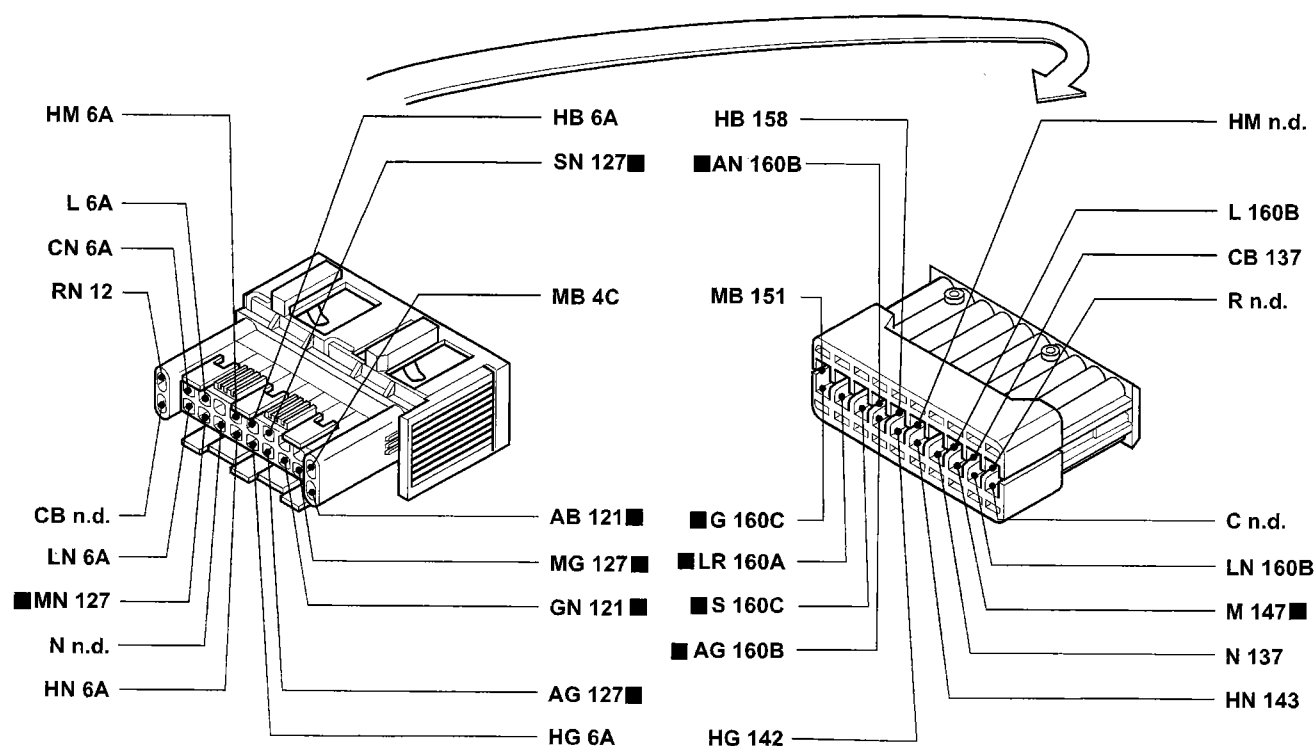
### Components key

- |                                                                  |                                                                  |
|------------------------------------------------------------------|------------------------------------------------------------------|
| 3 Power fuse box:                                                | 147 Compressor for air conditioning                              |
| A 30A protective fuse for injection system (60A for TD versions) | 154 Engine cooling fan                                           |
| B 40A protective fuse for ignition system                        | 160 Injection/ignition electronic control unit (1747)            |
| C 80A fuse protecting additional options                         | 170 Limiter resistance for engine cooling fan                    |
| D 80A protective fuse for junction unit                          | 202 Heater/air conditioning light bulbs                          |
| 4 Junction unit:                                                 | 208 Limiter resistance for heater/air conditioning               |
| E1 Ignition discharge relay                                      | 209 Outside/recirculation air flap control actuator              |
| 6 Instrument panel:                                              | 211 Electronic thermostat (N.T.C.)                               |
| Y Electronic module                                              | 283 Connection between front cable/resistance                    |
| 7 Steering column switch unit                                    | 296 Fuse carrier base on front cable                             |
| 8 Left front earth                                               | A 7.5A fuse protecting cooling system/electronic injection; C.A. |
| 10 Earth for battery on bodyshe'll                               | system; Alarm                                                    |
| 11 Battery                                                       | C 7.5A fuse protecting Fiat - CODE cooling system/electronic in- |
| 12 Ignition switch                                               | jection                                                          |
| 22 Left dashboard earth                                          | E 7.5A fuse protecting climate control system                    |
| 34 Switch unit:                                                  | 297 Air conditioning control unit                                |
| A Anti-theft warning light on                                    | 298 Recirculation control for heater/air conditioning            |
| B Rear fog lamps switch                                          | A Air conditioning on switch                                     |
| D Rear fog lamps warning light                                   | B Recirculation control switch                                   |
| E Heated rear windscreen switch                                  | C Ventilation sensor                                             |
| F Heated rear windscreen warning light                           | 299 Diagnostic socket for heater/air conditioning                |
| G Switch control unit ideogram light                             | 300 Car interior fan electronic transformer                      |
| H Fog lights warning light                                       | 301 Car interior mixture control actuator                        |
| I Fog lights switch                                              | 302 Maximum demisting control switch                             |
| L Outside temperature control switch                             | 303 Internal ventilation potentiometer                           |
| 36 Dashboard/right front door cables connection                  | 304 Potentiometer for car interior temperature                   |
| 42 Right dashboard earth                                         | 306 Treated air sensor                                           |
| 55 Connection between front/engine pre-wiring cables             | 309 Earth for air conditioning unit                              |
| 68 Right electrically adjusted external rear view mirror         | 312 Power earth for electronic injection control unit            |
| 70 Dashboard/front cables connection                             | 330 A.B.I. control unit                                          |
| 120A Air conditioning unit cables connection                     |                                                                  |
| 120B Air conditioning unit cables connection                     |                                                                  |
| 121 Three stage pressure switch                                  |                                                                  |
| 122 Engine cooling fan low speed relay feed                      | N.D. Ultrasound welding taped in cable loom                      |

N.D. Ultrasound welding taped in cable loom

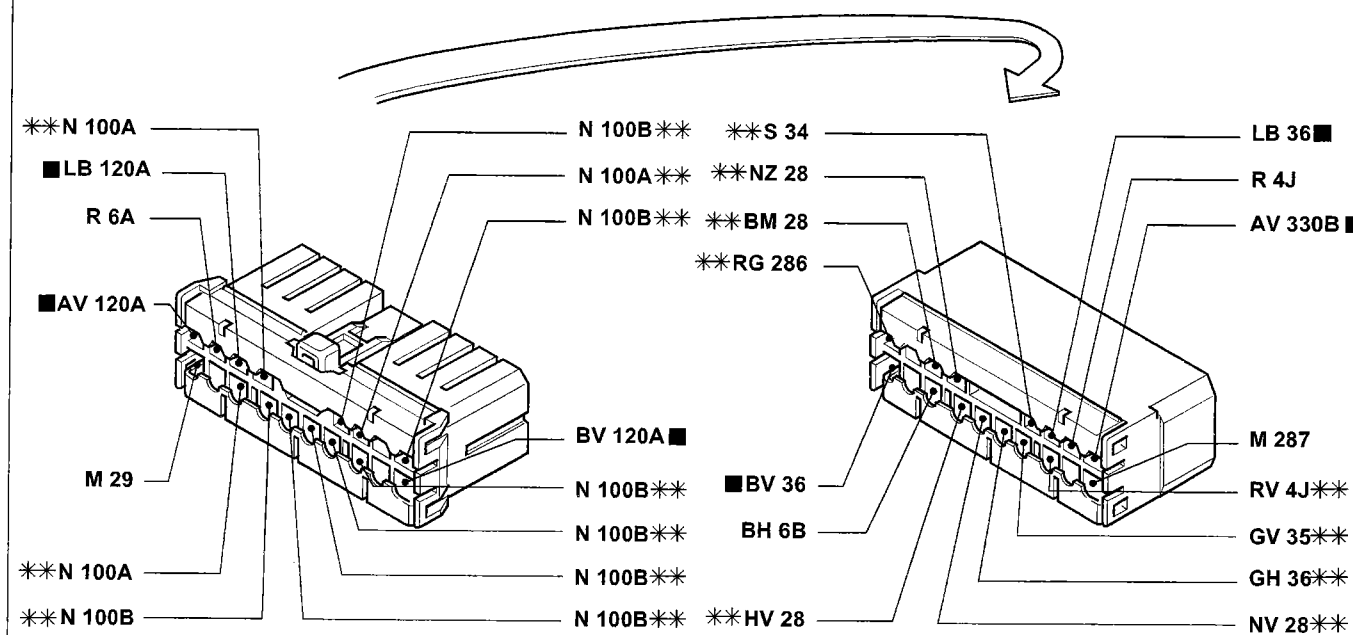
## 55

Connection between front/engine pre-wiring cables.



## 70

Dashboard/front cables connection.

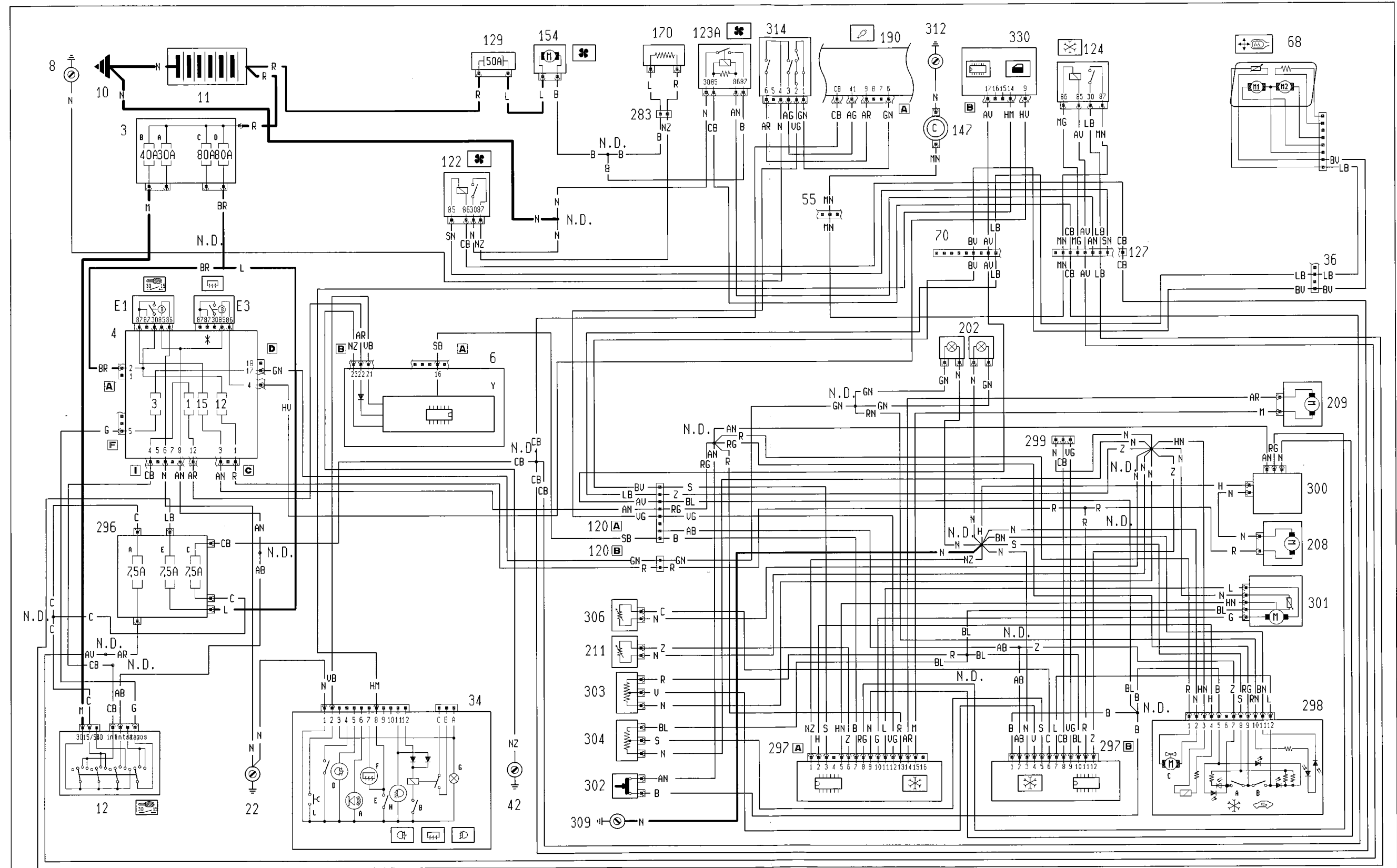


\*\* Variant connection for versions with alarm

P4A268I01

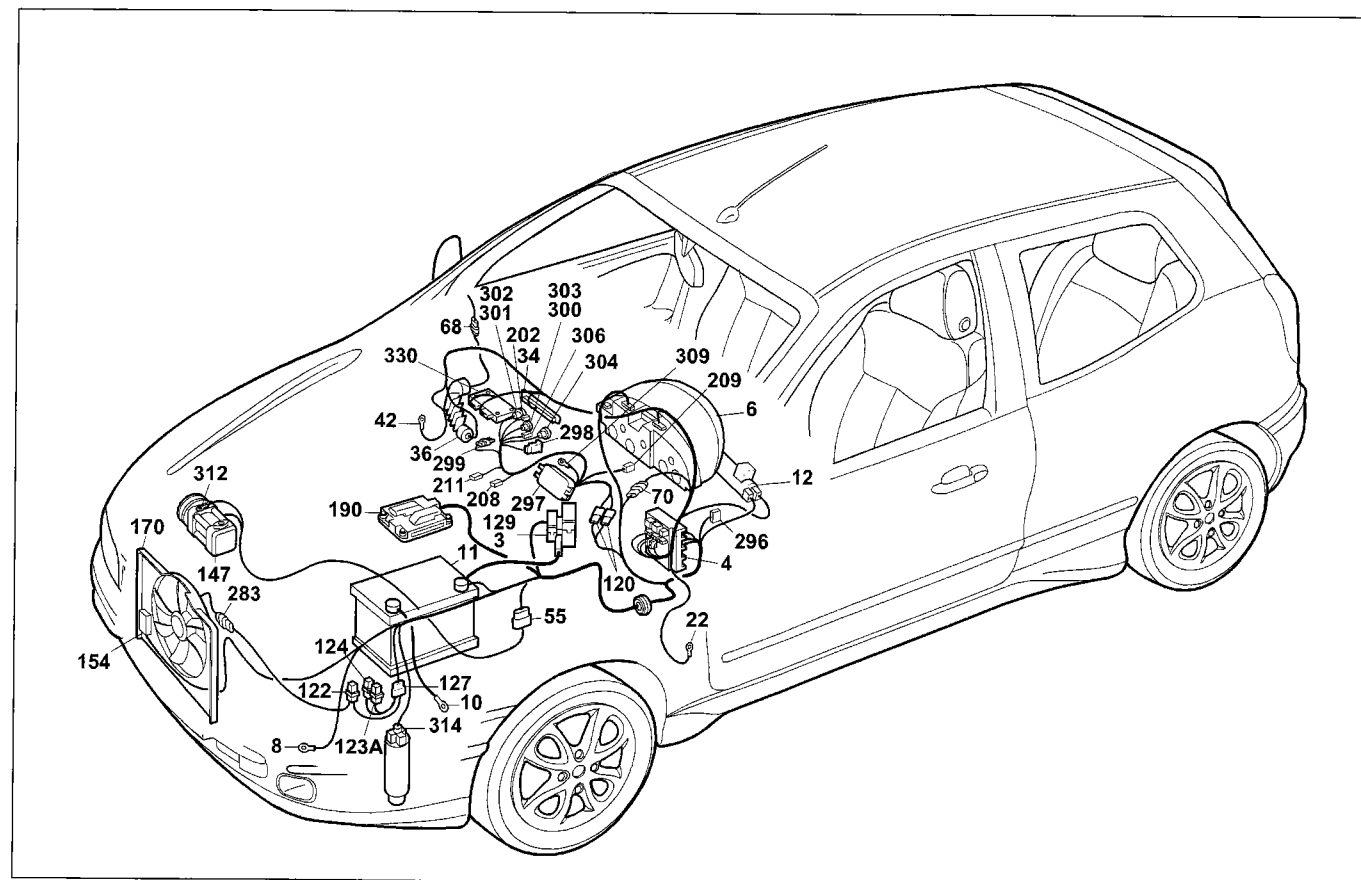
**Version with A.B.I.**

**Automatic air conditioning - (See key at end of wiring diagrams)**



\* See heated rear windscreen diagram





P4A271103

**Version with A.B.I.**

### Automatic air conditioning

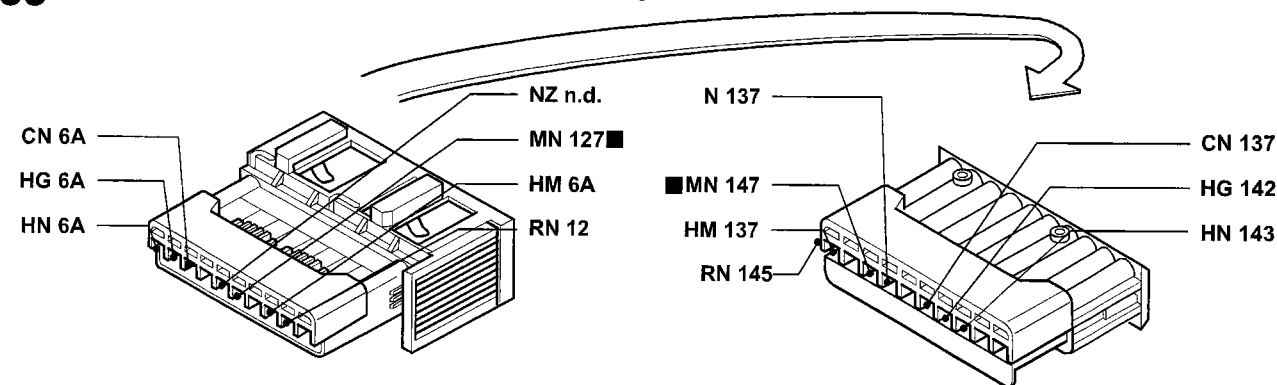
### Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 6 Instrument panel:
  - Y Electronic module
- 4 Junction unit:
  - E1 Ignition discharge relay
- 7 Steering column switch unit
- 8 Left front earth
- 10 Earth for battery on bodyshe'll
- 11 Battery
- 12 Ignition switch
- 22 Left dashboard earth
- 34 Switch control unit:
  - A Anti-theft warning light on
  - B Rear fog lamps switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen switch
  - F Heated rear windscreen warning light
  - G Switch control unit ideogram light
  - H Fog lights warning light
  - I Fog lights switch
  - L Outside temperature control switch
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 68 Right electrically adjusted external rear view mirror
- 55 Connection between front/engine pre-wiring cables
- 68 Right electrically adjusted external rear view mirror
- 70 Dashboard/front cables connection
- 120A Air conditioning unit cables connection
- 120B Air conditioning unit cables connection
- 122 Engine cooling fan low speed relay feed

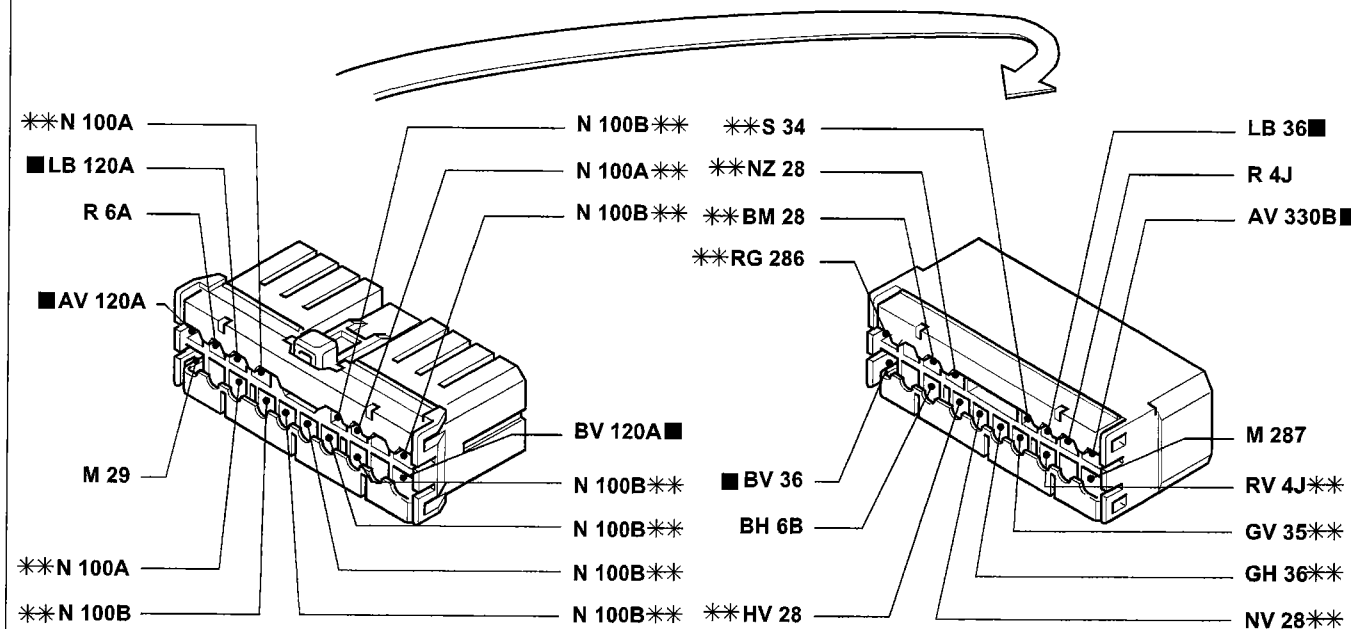
- 123A Engine cooling fan high speed relay feed
- 127 Front left cables/cable on relay holder bracket connection
- 129 50A power fuse protecting engine cooling fan
- 147 Compressor for air conditioning
- 154 Engine cooling fan
- 170 Engine cooling fan limiting resistance
- 190 Injection/ignition electronic control unit (1998)
- 202 Heater/air conditioning light bulbs
- 208 Limiter resistance for heater/air conditioning
- 209 Outside/recirculation air flap control actuator
- 211 Electronic thermostat (N.T.C.)
- 283 Connection between front cable/resistance
- 296 Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm
  - C 7.5A fuse protecting Fiat - CODE cooling system/electronic injection
  - E 7.5A fuse protecting climate control system
- 297 Air conditioning control unit
- 298 Recirculation control for heater/air conditioning
  - A Air conditioning on switch
  - B Recirculation control switch
  - C Ventilation sensor
- 299 Diagnostic socket for heater/air conditioning
- 300 Car interior fan electronic transformer
- 301 Car interior mixture control actuator
- 302 Maximum demisting control switch
- 303 Internal ventilation potentiometer
- 304 Potentiometer for car interior temperature
- 306 Treated air sensor
- 309 Earth for air conditioning unit
- 312 Power earth for electronic injection control unit
- 314 Four stage pressure switch
- 330 A.B.I. control unit

N,D, Ultrasound welding taped in cable loom

**55** Connection between front/engine pre-wiring cables.

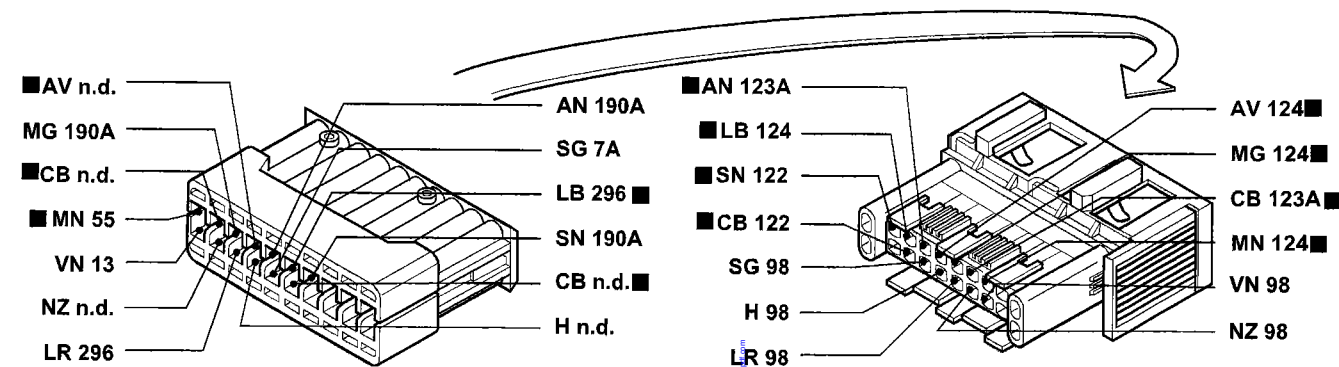


## 70 Dashboard/front cables connection.



**\*\* Variant connection for versions with alarm**

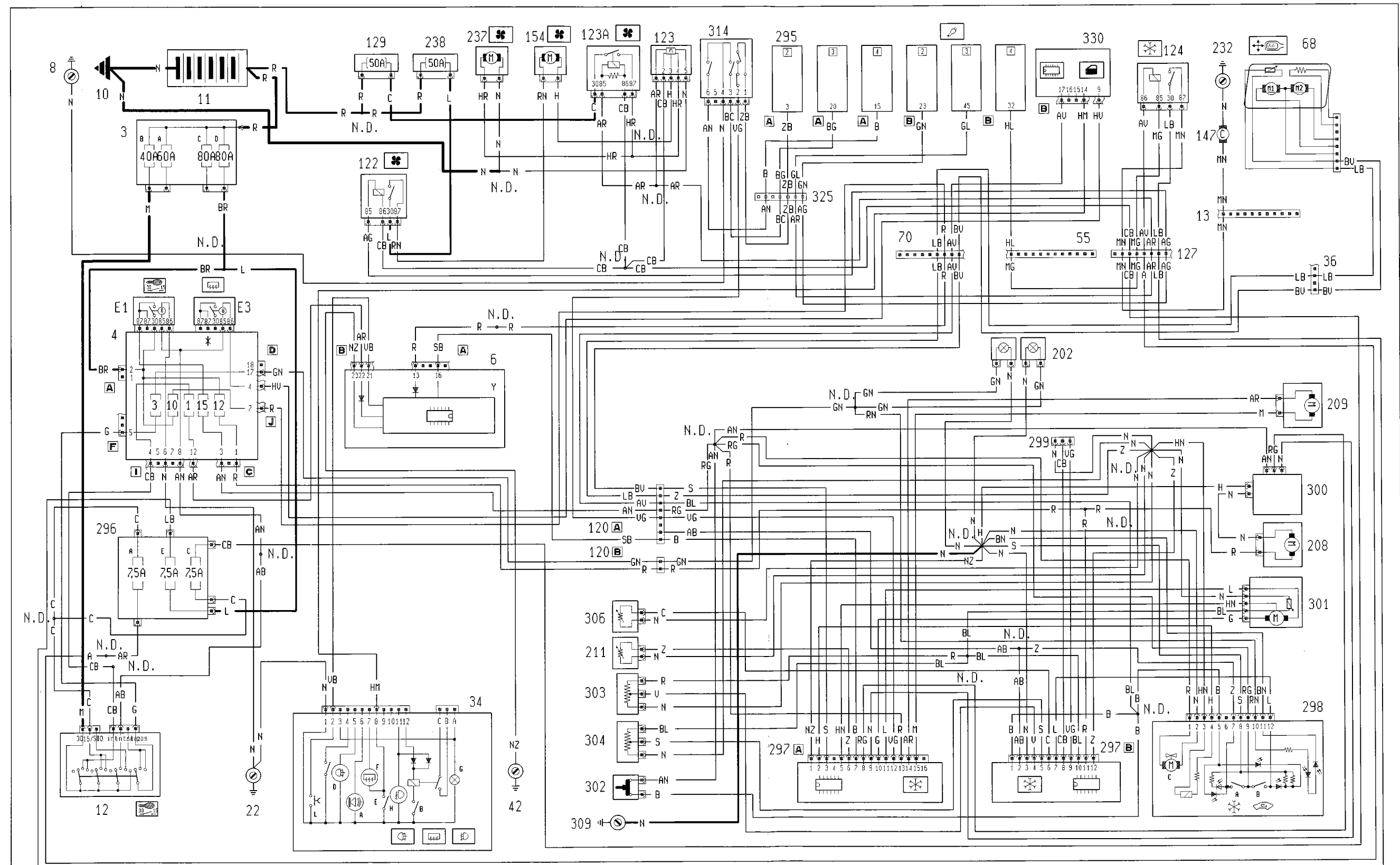
**127** Connection between left front cable/cable on relay holder bracket.



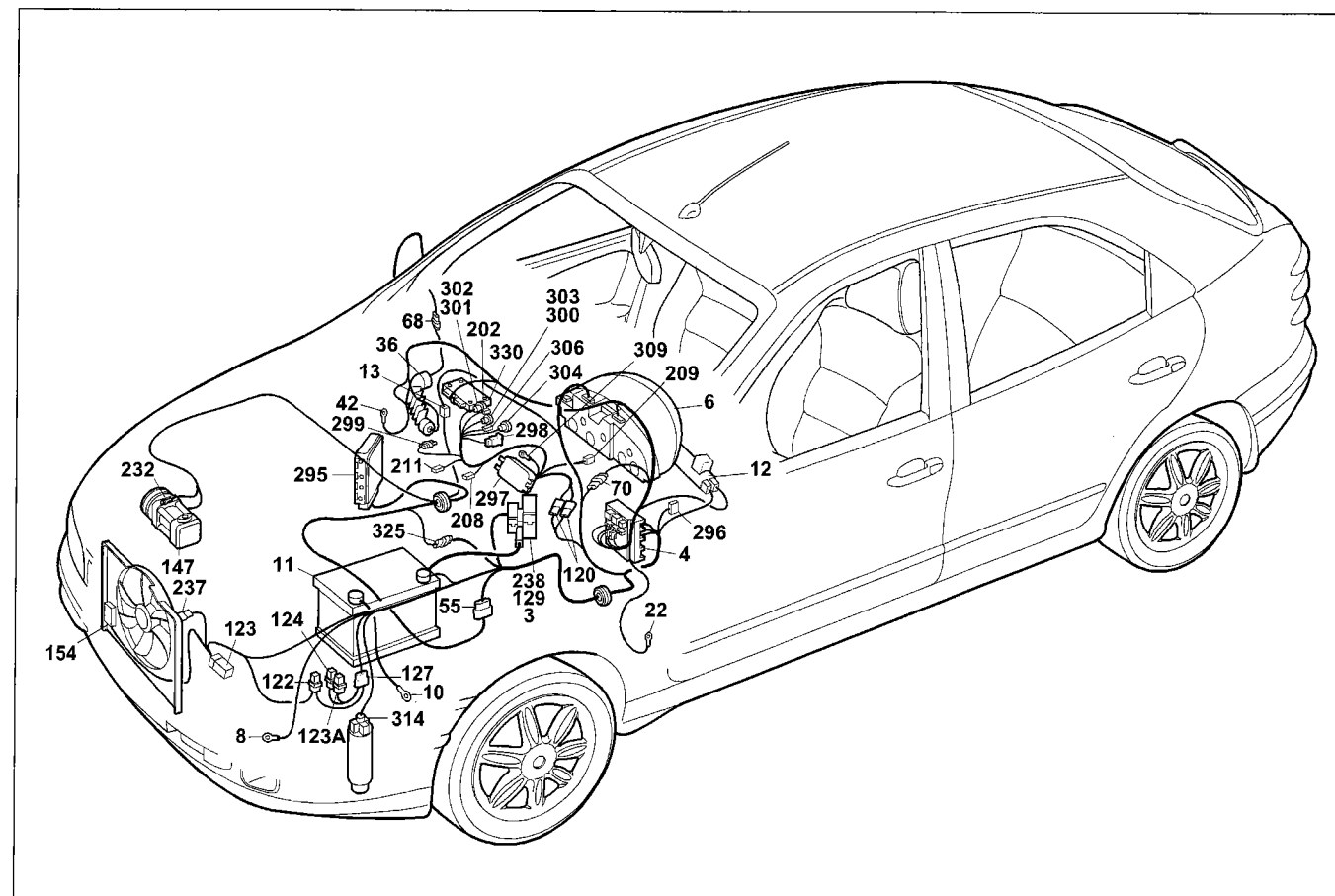
P4A272I01

The cables in the wiring diagram are marked

Version with A.B.I.  
Automatic air conditioning - (See key at end of wiring diagrams)



\* See heated rear windscreen diagram



P4A275I01

**Version with A.B.I.**

### Automatic air conditioning

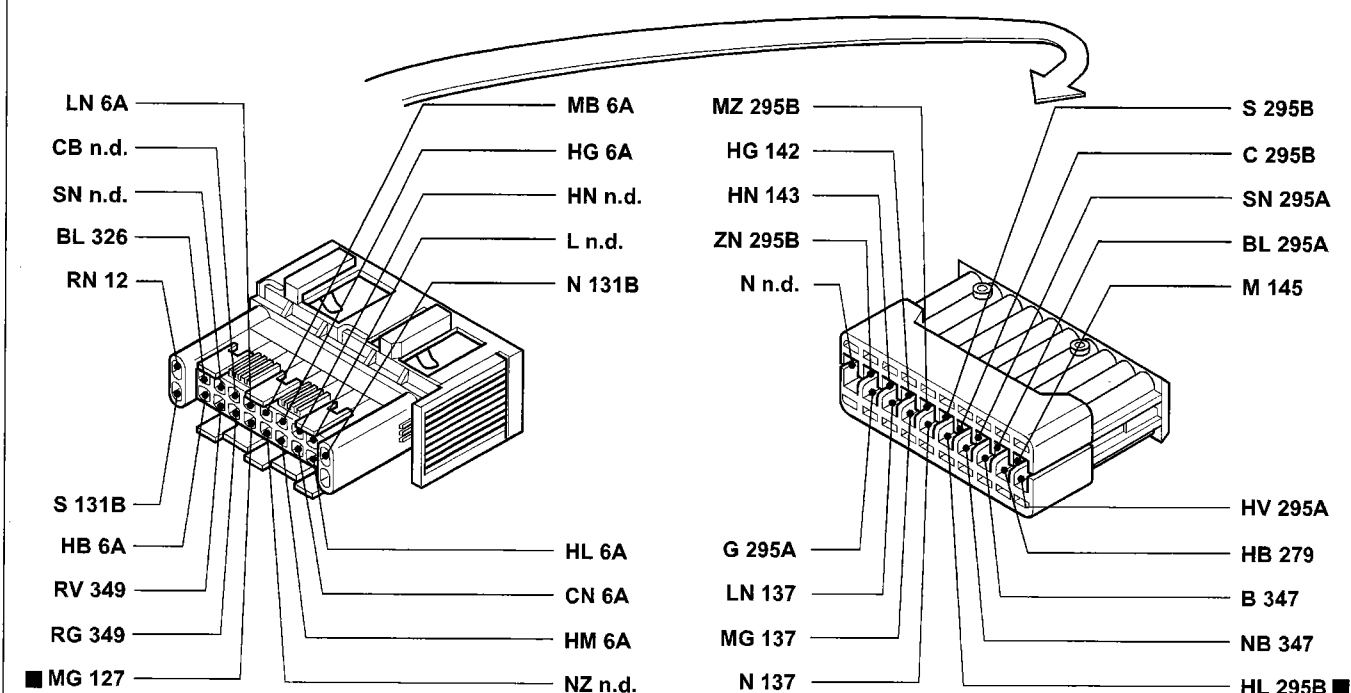
### Components key

- |      |                                                                |     |                                                                               |
|------|----------------------------------------------------------------|-----|-------------------------------------------------------------------------------|
| 3    | Power fuse box:                                                | 104 | Engine cooling fan                                                            |
| A    | 30A protective fuse for injection system (60A for TD versions) | 202 | Heater/air conditioning light bulbs                                           |
| B    | 40A protective fuse for ignition system                        | 208 | Limiter resistance for heater/air conditioning                                |
| C    | 80A fuse protecting additional options                         | 209 | Outside/recirculation air flap control actuator                               |
| D    | 80A protective fuse for junction unit                          | 211 | Electronic thermostat (N.T.C.)                                                |
| 4    | Junction unit:                                                 | 232 | Earth for compressor                                                          |
| E1   | Ignition discharge relay                                       | 233 | Thermostatic switch on water pump                                             |
| 8    | Left front earth                                               | 237 | Additional engine cooling fan                                                 |
| 6    | Instrument panel:                                              | 238 | 40A fuse protecting engine cooling fan                                        |
| Y    | Electronic module                                              | 295 | Injection/ignition electronic control unit 1910 TD UNIJET                     |
| 10   | Earth for battery on bodysell                                  | 296 | Fuse carrier base on front cable                                              |
| 11   | Battery                                                        | A   | 7.5A fuse protecting cooling system/ electronic injection; C.A. system; Alarm |
| 12   | Ignition switch                                                | C   | 7.5A fuse protecting Fiat - CODE cooling system/electronic injection          |
| 13   | Front right/left cables connection                             | E   | 7.5A fuse protecting climate control system                                   |
| 22   | Left dashboard earth                                           | 297 | Air conditioning control unit                                                 |
| 36   | Dashboard/right front door cables connection                   | 298 | Recirculation control for heater/air conditioning                             |
| 42   | Right dashboard earth                                          | A   | Air conditioning on switch                                                    |
| 55   | Connection between front/engine pre-wiring cables              | B   | Recirculation control switch                                                  |
| 68   | Right electrically adjusted external rear view mirror          | C   | Ventilation sensor                                                            |
| 70   | Dashboard/front cables connection                              | 299 | Diagnostic socket for heater/air conditioning                                 |
| 120  | Air conditioning unit cables connection                        | 300 | Car interior fan electronic transformer                                       |
| 120B | Air conditioning unit cables connection                        | 301 | Car interior mixture control actuator                                         |
| 122  | Engine cooling fan low speed relay feed                        | 303 | Internal ventilation potentiometer                                            |
| 123  | Engine cooling fan high speed timer                            | 304 | Potentiometer for car interior temperature                                    |
| 123A | Engine cooling fan high speed relay feed                       | 306 | Treated air sensor                                                            |
| 124  | Air conditioning compressor relay                              | 309 | Earth for air conditioning unit                                               |
| 127  | Front left cables/cable on relay holder bracket connection     | 314 | Four stage pressure switch                                                    |
| 129  | Power fuse protecting engine cooling fan                       | 325 | Connection between injection/left front cables                                |
| 147  | Compressor for air conditioning                                | 330 | A.B.I. control unit                                                           |

N.D. Ultrasound welding taped in cable loom

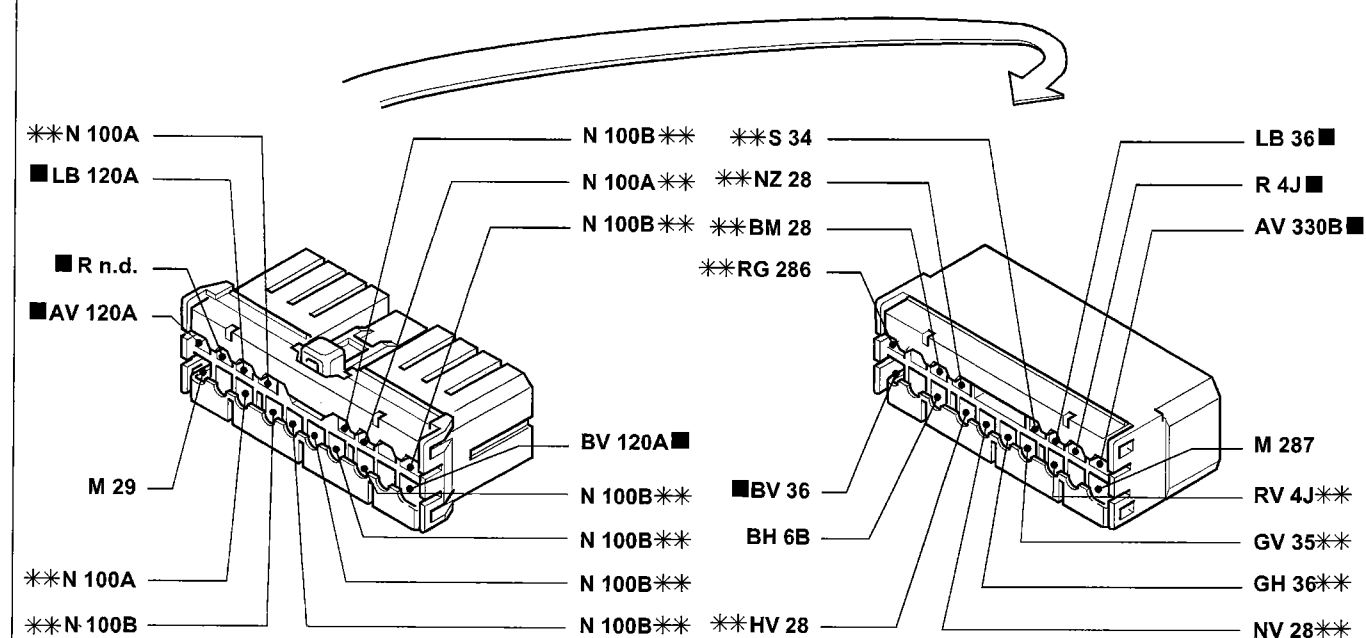
## 55

Connection between front/engine pre-wiring cables.



## 70

### Dashboard/front cables connection.



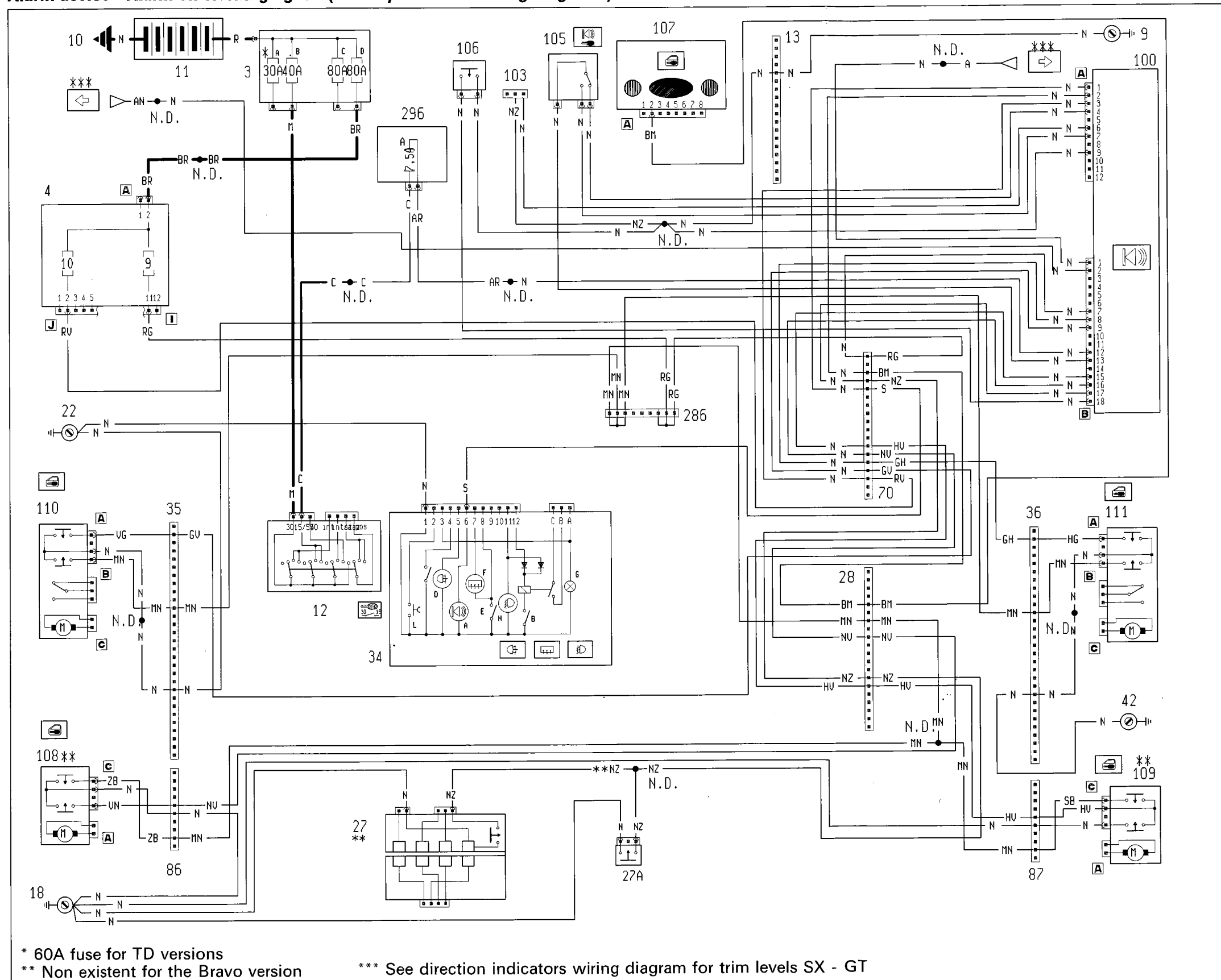
\*\* Variant connection for versions with alarm

The cables in the wiring diagram are marked

P4A276I01

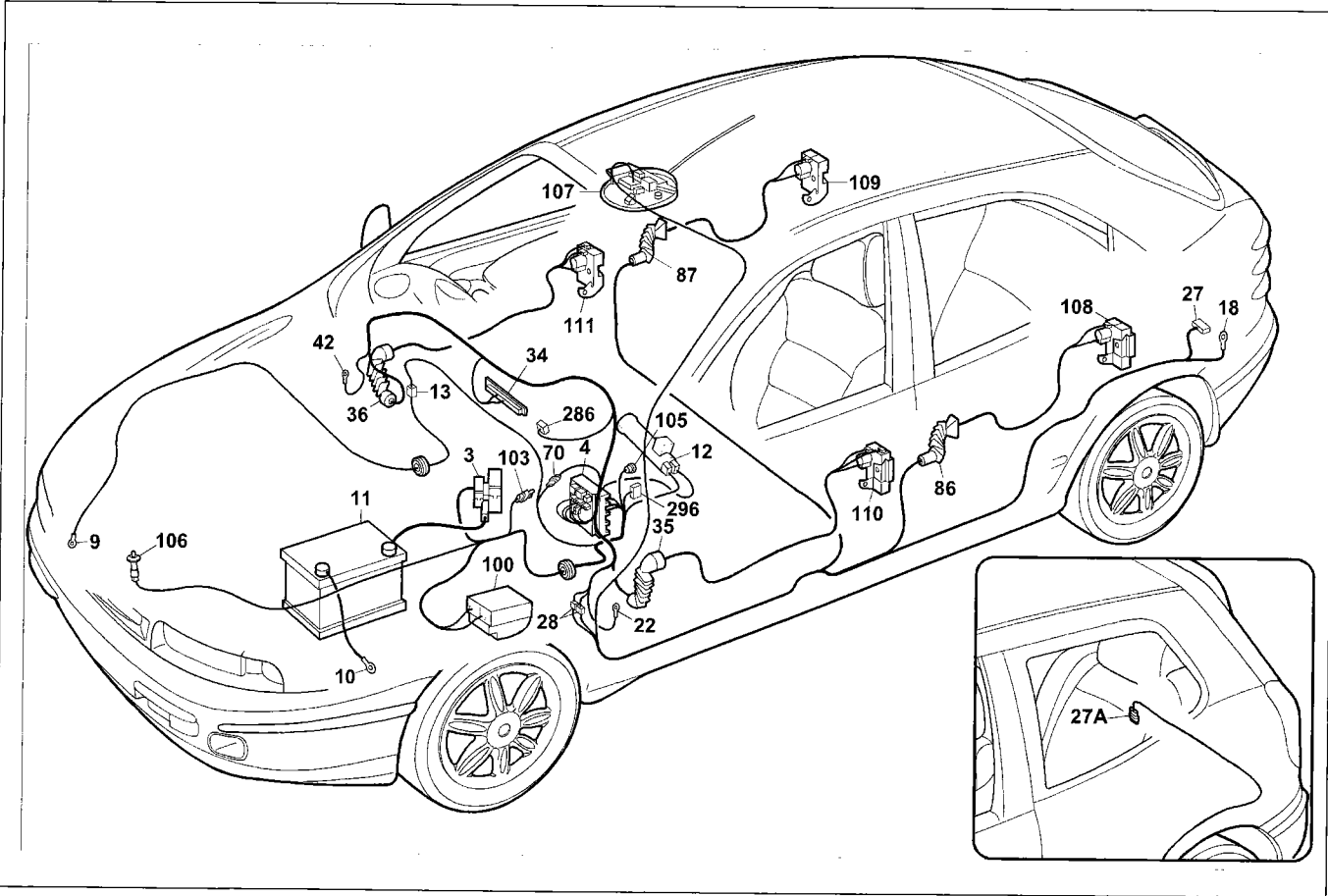
Trim level: SX - GT

Alarm device - Alarm on warning light - (See key at end of wiring diagrams)





55.



SX - GT Trim level

Alarm device - Alarm on warning light

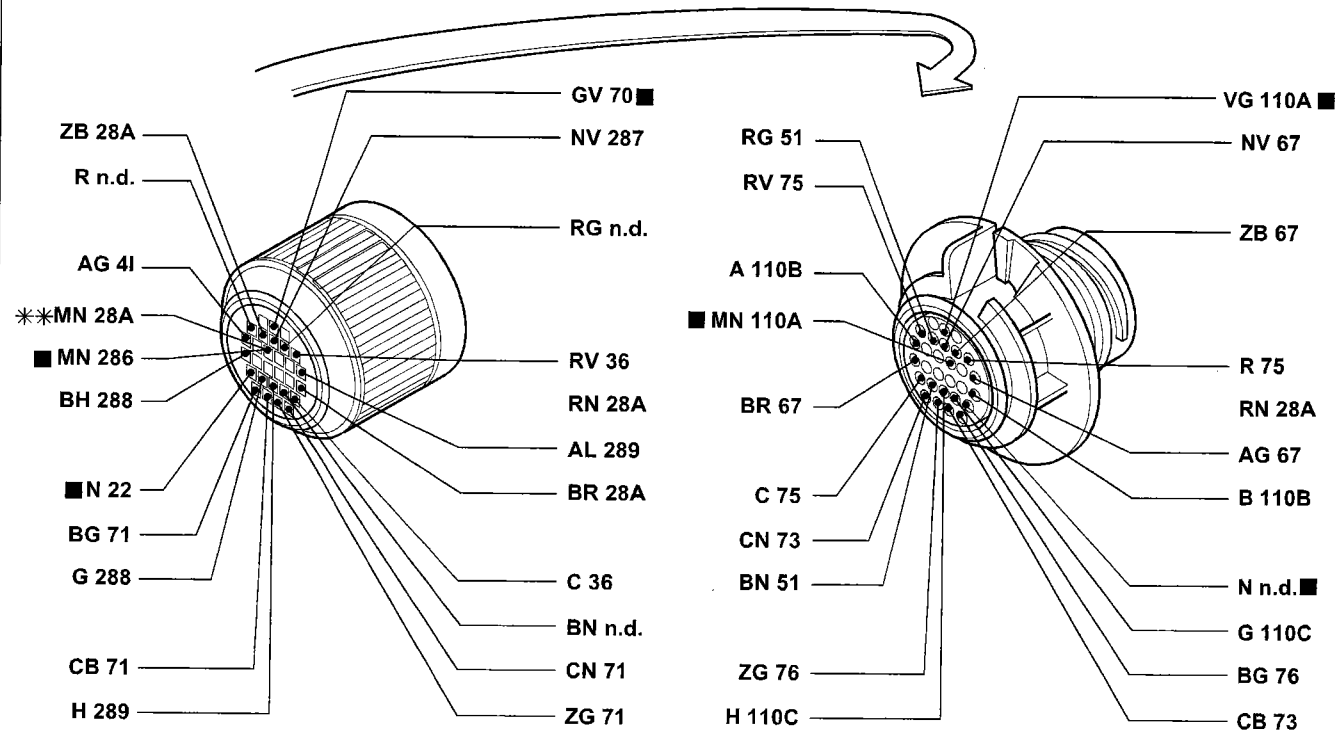
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
- 9 Right front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Front right/left cables connection
- 18 Left rear earth
- 22 Left dashboard earth
- 27 Contact board for rear connections with luggage compartment light incorporated
- 27A Push button for luggage compartment light, engaging alarm and signalling tailgate open
- 28 Dashboard/longitudinal cables connection
- 34 Switch control unit:
  - A Alarm on warning light
  - B Rear fog lamps switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen switch
  - F Heated rear windscreen warning light
  - G Switch control unit ideogram light
  - H Fog lights warning light
  - I Fog lights switch
  - L Outside temperature control switch

- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 70 Dashboard/front cables connection
- 86 Longitudinal/left rear door cables connection
- 87 Longitudinal/right rear door cables connection
- 100 Alarm device electronic control unit
- 103 Diagnostic socket for alarm
- 105 Alarm device off switch
- 106 Alarm on switch
- 107A Central locking remote control receiver
- 108 Left rear central locking/alarm switch
- 109 Right rear central locking/alarm on switch
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/alarm on switch
- 286 Short circuit connection
- 296 Fuse carrier base on front cable
  - A 7.5A fuse protecting cooling system/ electronic injection; C.A. system; Alarm

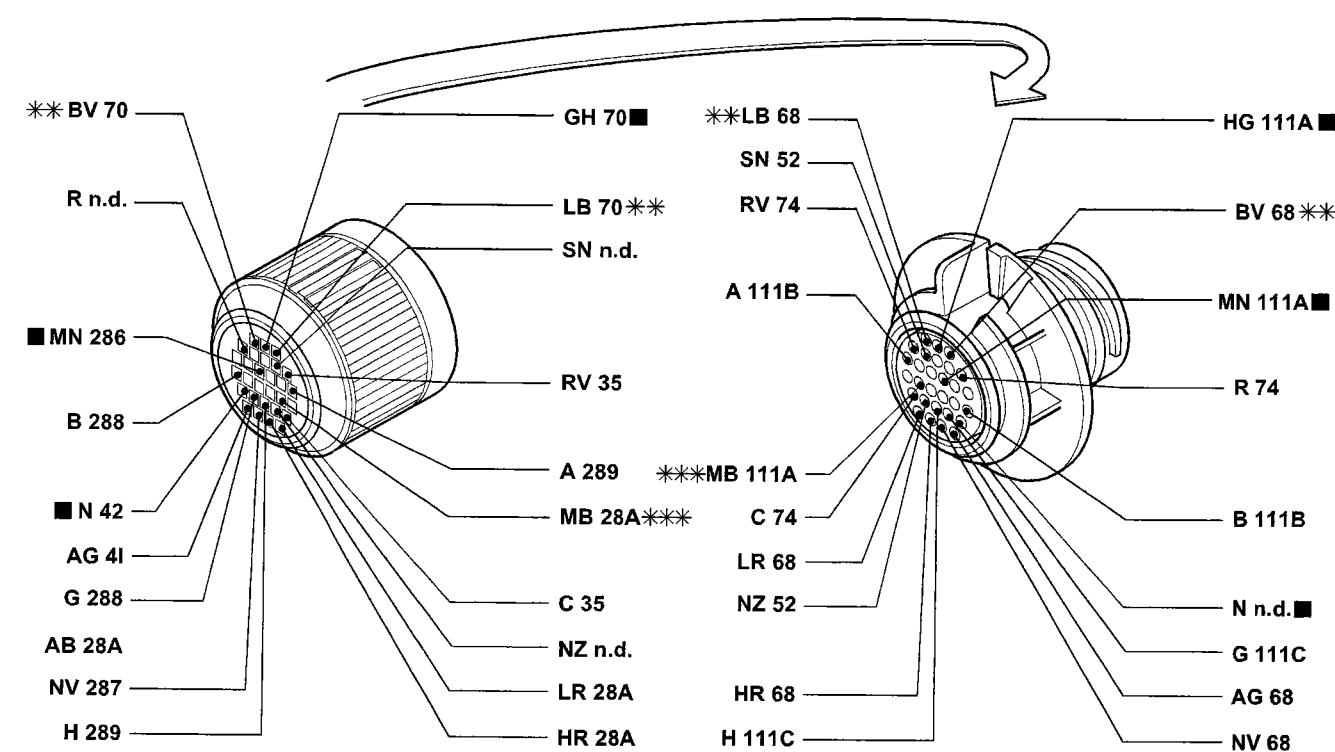
N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection.



\*\* Variant connection for version with automatic transmission

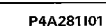
36 Dashboard/right front door cables connection.



\*\* Variant connection for version with automatic transmission

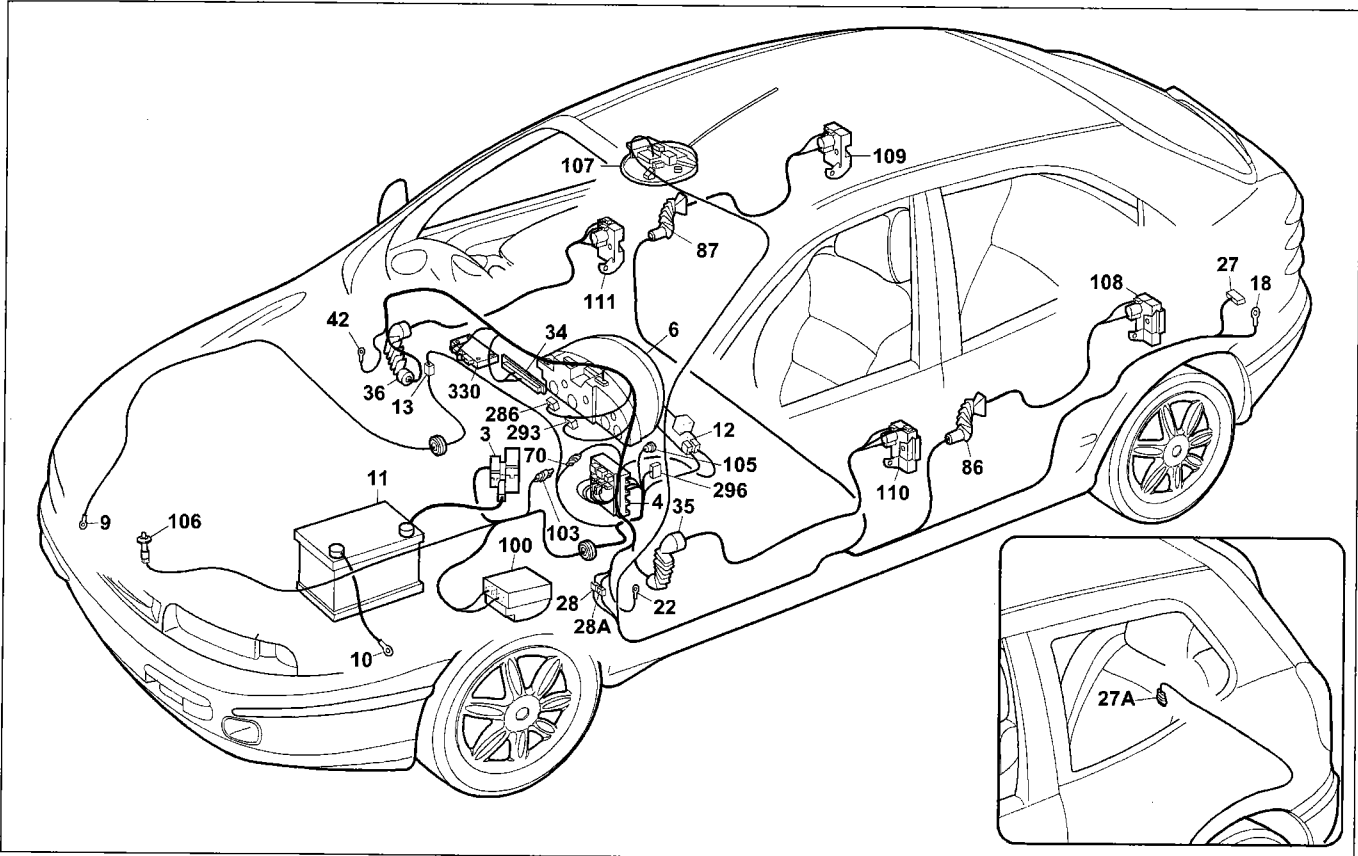
The cables in the wiring diagram are marked

**Alarm device - Alarm on warning light - (See key at end of wiring diagrams)**





55.



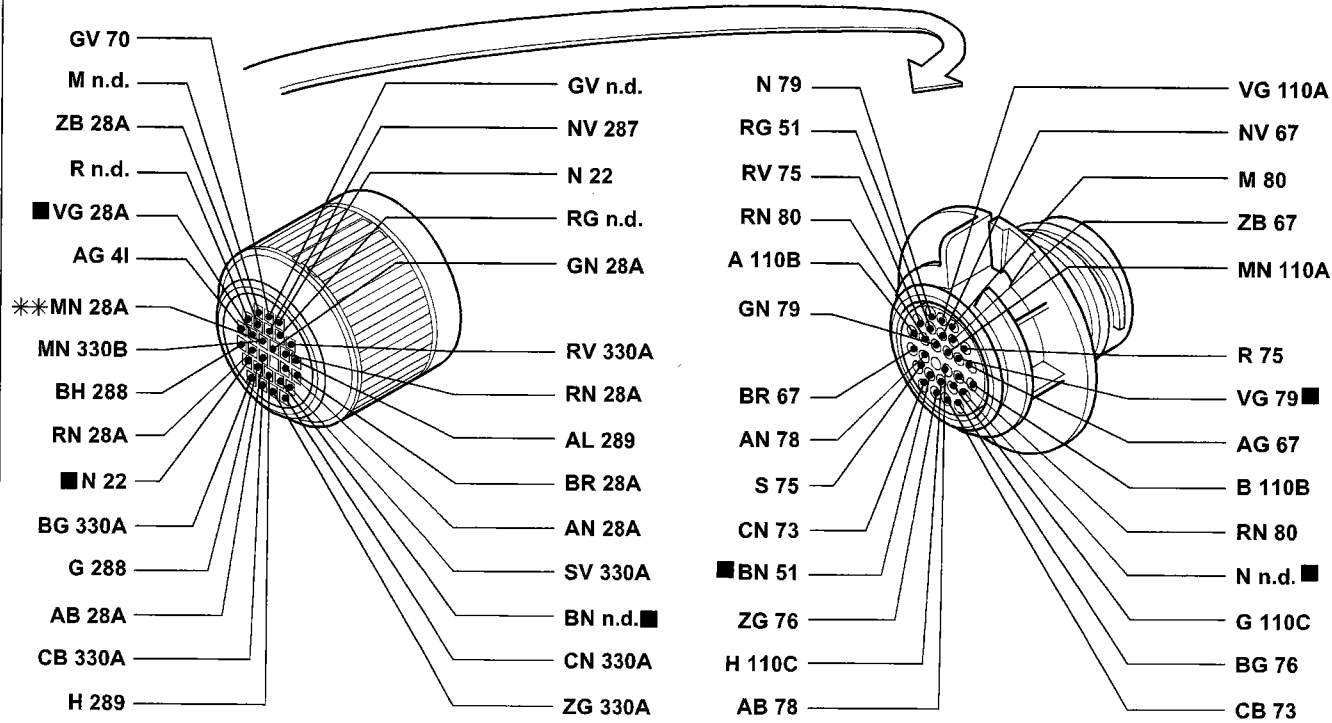
Trim level: ELX - HSX - HGT  
Alarm device - Alarm on warning light  
Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit  
4 Junction unit  
6 Instrument panel:  
U Doors ajar warning light  
9 Right front earth  
10 Earth for battery on bodysell  
11 Battery  
12 Ignition switch  
13 Front right/left cables connection  
18 Left rear earth  
22 Left dashboard earth  
27 Contact board for rear connections with luggage compartment light switch incorporated  
27A Button for luggage compartment light, switching on alarm and signalling boot lid open  
28 Dashboard/longitudinal cables connection  
34 Switch control panel:  
A Alarm on warning light  
B Rear fog lamps switch  
D Rear fog lamps warning light  
E Heated rear windscreen switch  
F Heated rear windscreen warning light  
G Switch control unit ideogram light  
H Fog lights warning light  
I Fog lights switch  
L Outside temperature control switch

- 35 Dashboard/left front door cables connection  
36 Dashboard/right front door cables connection  
42 Right dashboard earth  
70 Dashboard/front cables connection  
86 Longitudinal/left rear door cables connection  
87 Longitudinal/right rear door cables connection  
100 Alarm device electronic control unit  
103 Diagnostic socket for alarm  
105 Alarm device off switch  
106 Alarm on switch  
107A Central locking remote control receiver  
108 Left rear central locking/alarm switch  
109 Right rear central locking/alarm on switch  
110 Left front central locking/alarm on switch  
111 Right front central locking/alarm on switch  
286 Short circuit connection  
293 Fuse carrier base on dashboard cable  
A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors  
D 25A fuse protecting ABI control unit; Central locking control unit  
296 Fuse carrier base on front cable  
A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm  
330 A.B.I. control unit

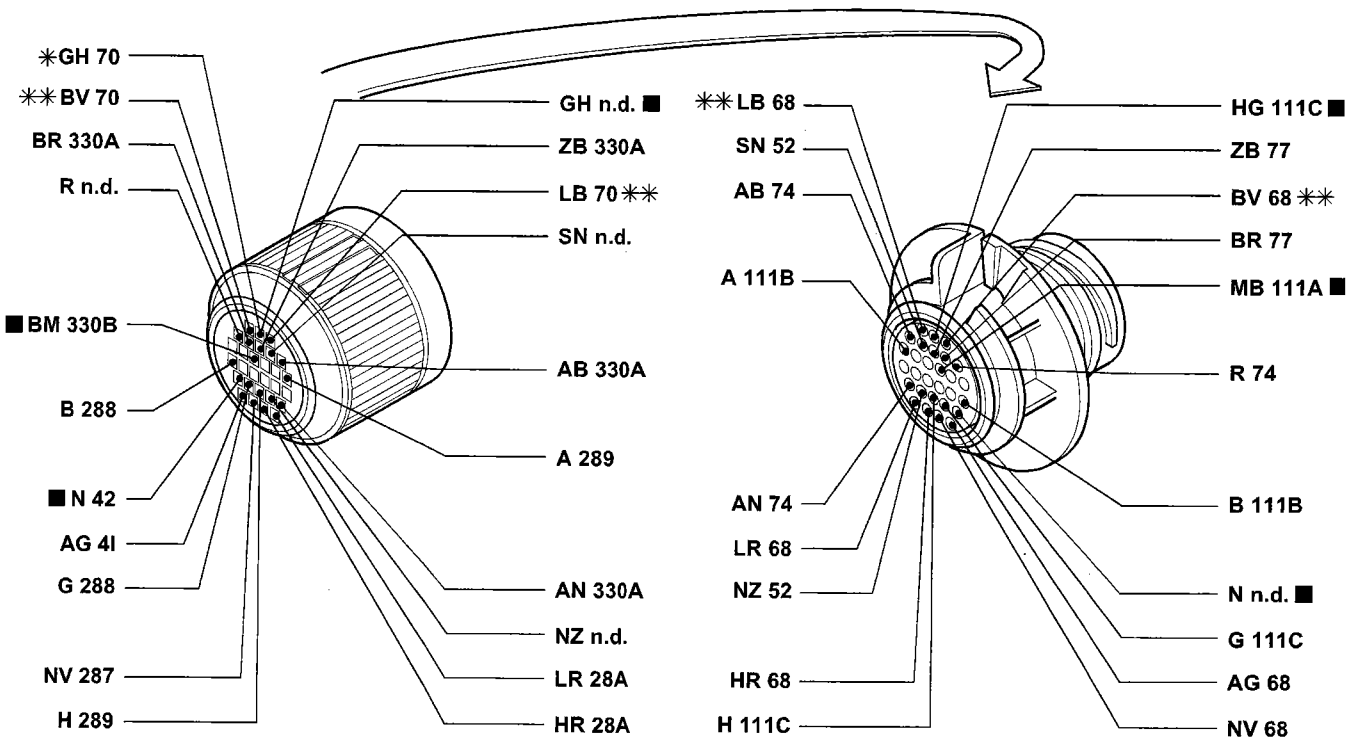
N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection.



\*\* Variant connection for version with automatic transmission

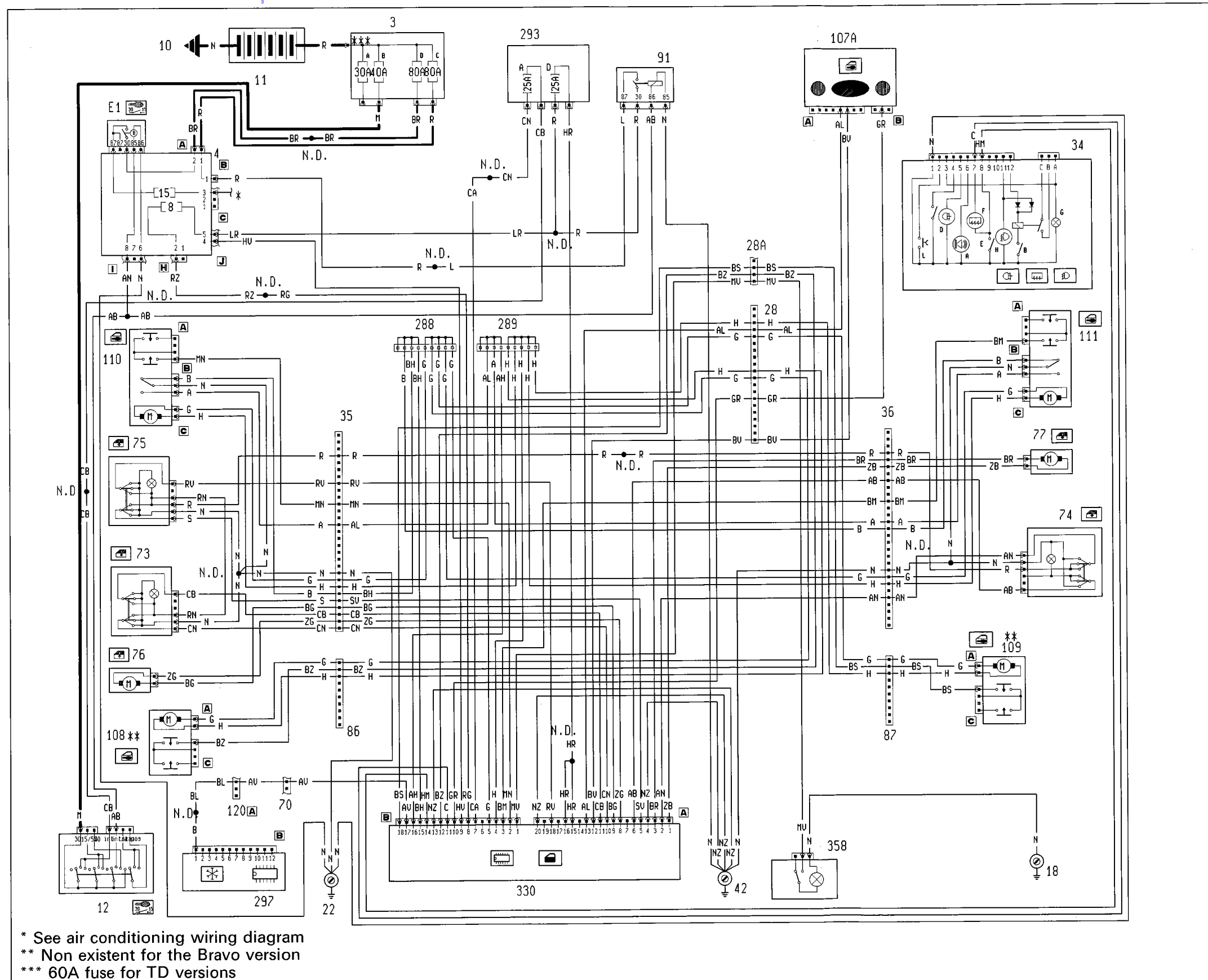
36 Dashboard/right front door cables connection.



\*\* Variant connection for version with automatic transmission

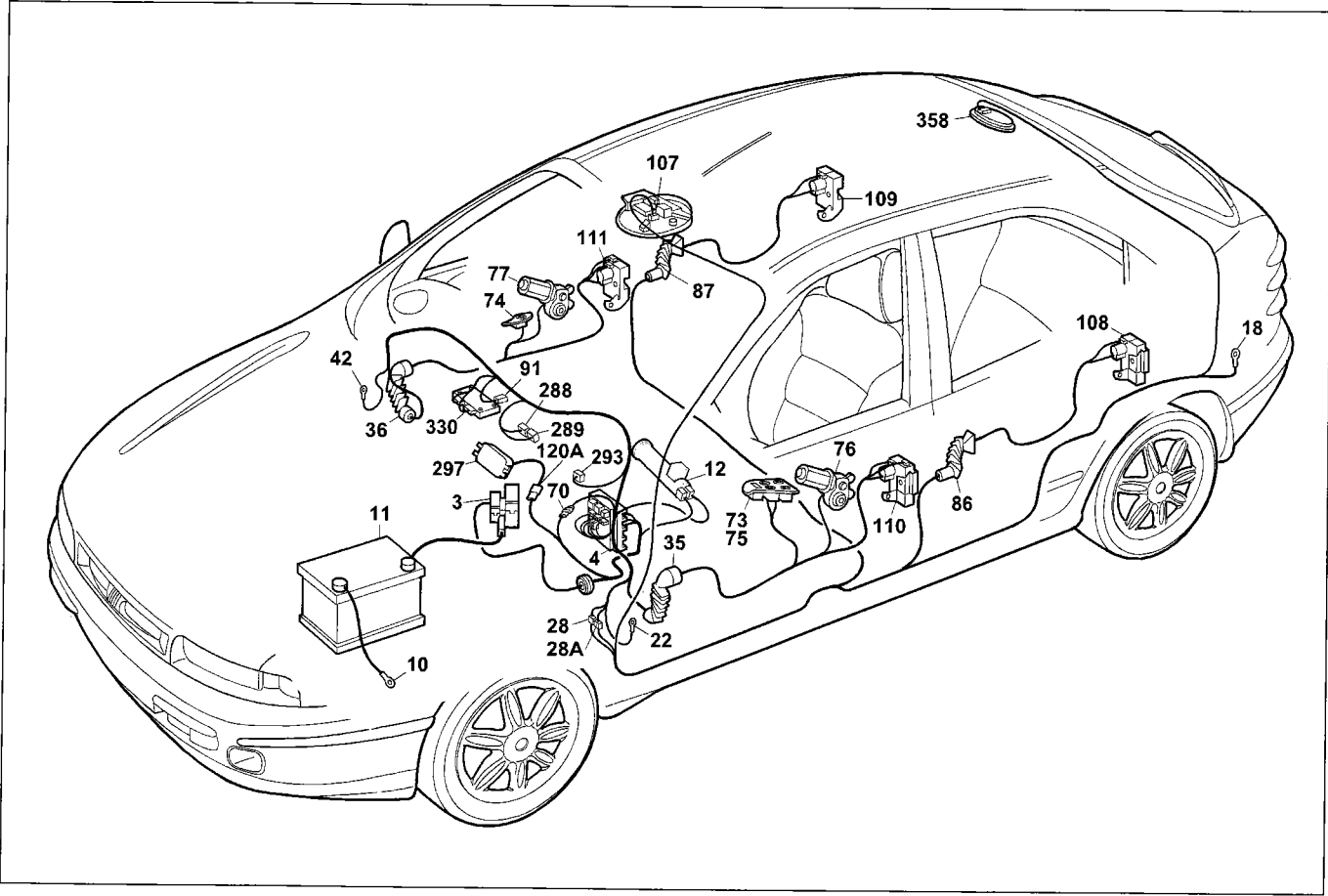
The cables in the wiring diagram are marked

**A.B.I. control unit connection (See key at end of wiring diagrams)**



P4A285101

55.



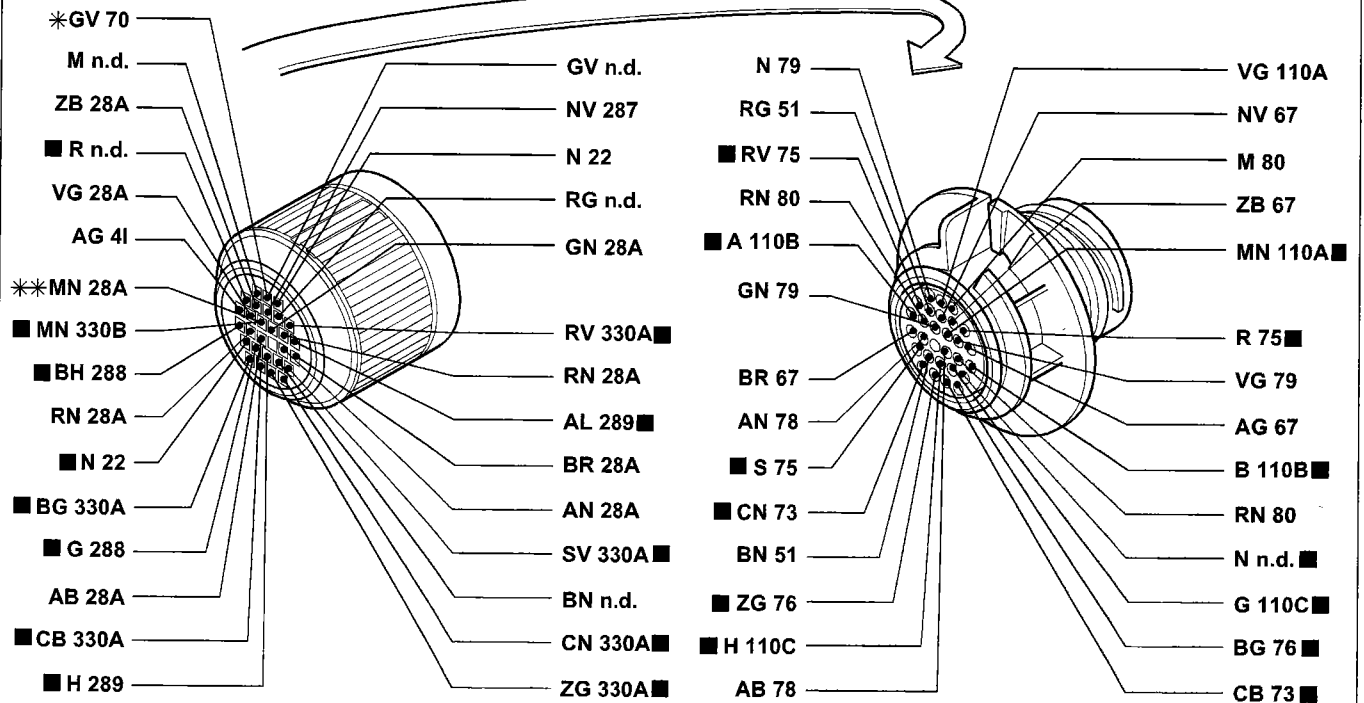
A.B.I. control unit connection  
Components key

- 3 Power fuse box:
  - A 30A protective fuse for injection system (60A for TD versions)
  - B 40A protective fuse for ignition system
  - C 80A fuse protecting additional options
  - D 80A protective fuse for junction unit
- 4 Junction unit
  - E1 Ignition discharge relay
- 10 Earth for battery on bodysheet
- 11 Battery
- 12 Ignition switch
- 18 Left rear earth
- 22 Left dashboard earth
- 28 Dashboard/longitudinal cables connection
- 28A Dashboard/longitudinal cables connection
- 34 Switch control panel:
  - A Alarm on warning light
  - B Rear fog lamps switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen switch
  - F Heated rear windscreen warning light
  - G Switch control unit ideogram light
  - H Fog lights warning light
  - I Fog lights switch
  - L Outside temperature control switch
- 35 Dashboard/left front door cables connection
- 36 Dashboard/right front door cables connection
- 42 Right dashboard earth
- 70 Dashboard/front cables connection
- 73 Left front electric window control panel

- 75 Right front electric window control panel on left front door
- 76 Left front electric window motor
- 77 Right front electric window motor
- 86 Longitudinal/left rear door cables connection
- 87 Longitudinal/right rear door cables connection
- 91 Power relay
- 107A Central locking remote control receiver
- 108 Left rear central locking/alarm switch
- 109 Right rear central locking/alarm on switch
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/alarm on switch
- 120A Air conditioning unit cables connection
- 288 Short circuit connection
- 289 Short circuit connection
- 293 Fuse carrier base on dashboard cable
  - A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors
  - D 25A fuse protecting ABI control unit; Central locking control unit
- 297 Air conditioning control unit
- 330 A.B.I. control unit
- 358 Rear courtesy light

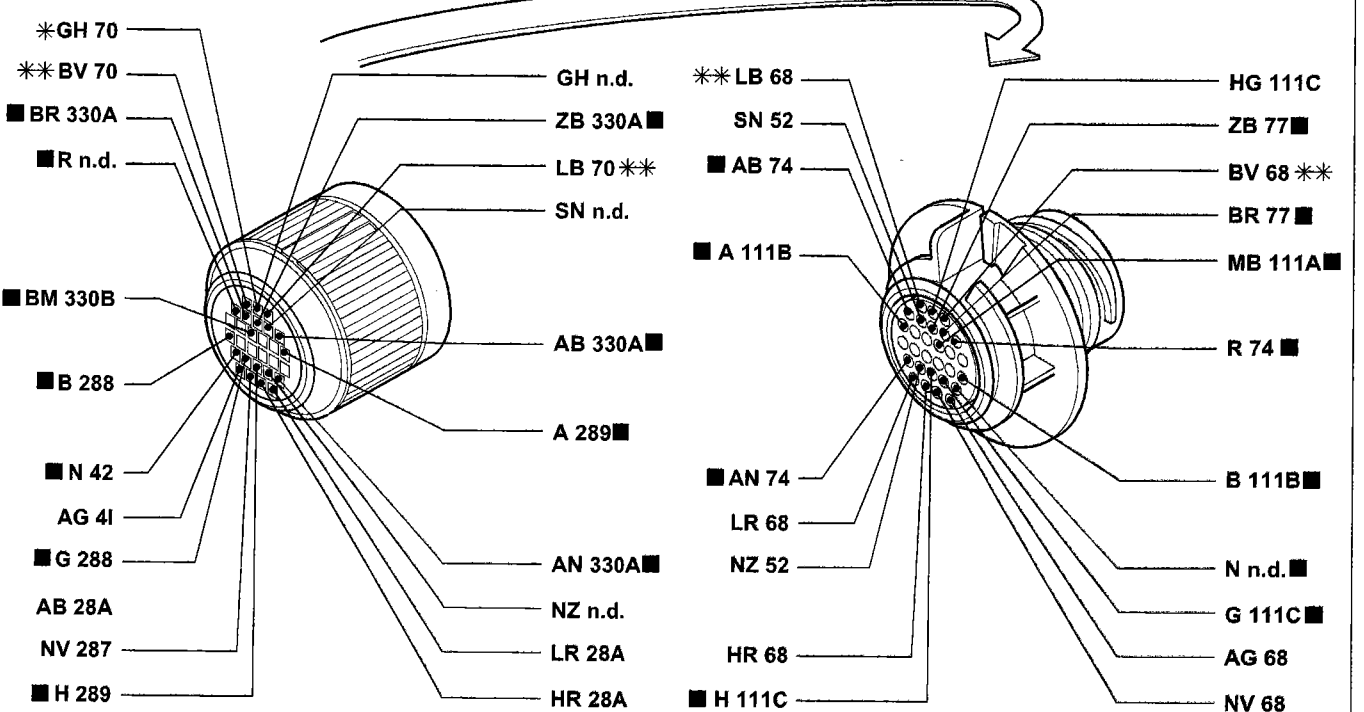
N.D. Ultrasound welding taped in cable loom

35 Dashboard/left front door cables connection.



\* Variant connection for versions with alarm  
\*\* Variant connection for version with automatic transmission

36 Dashboard/right front door cables connection.



\* Variant connection for versions with alarm  
\*\* Variant connection for versions with air conditioning

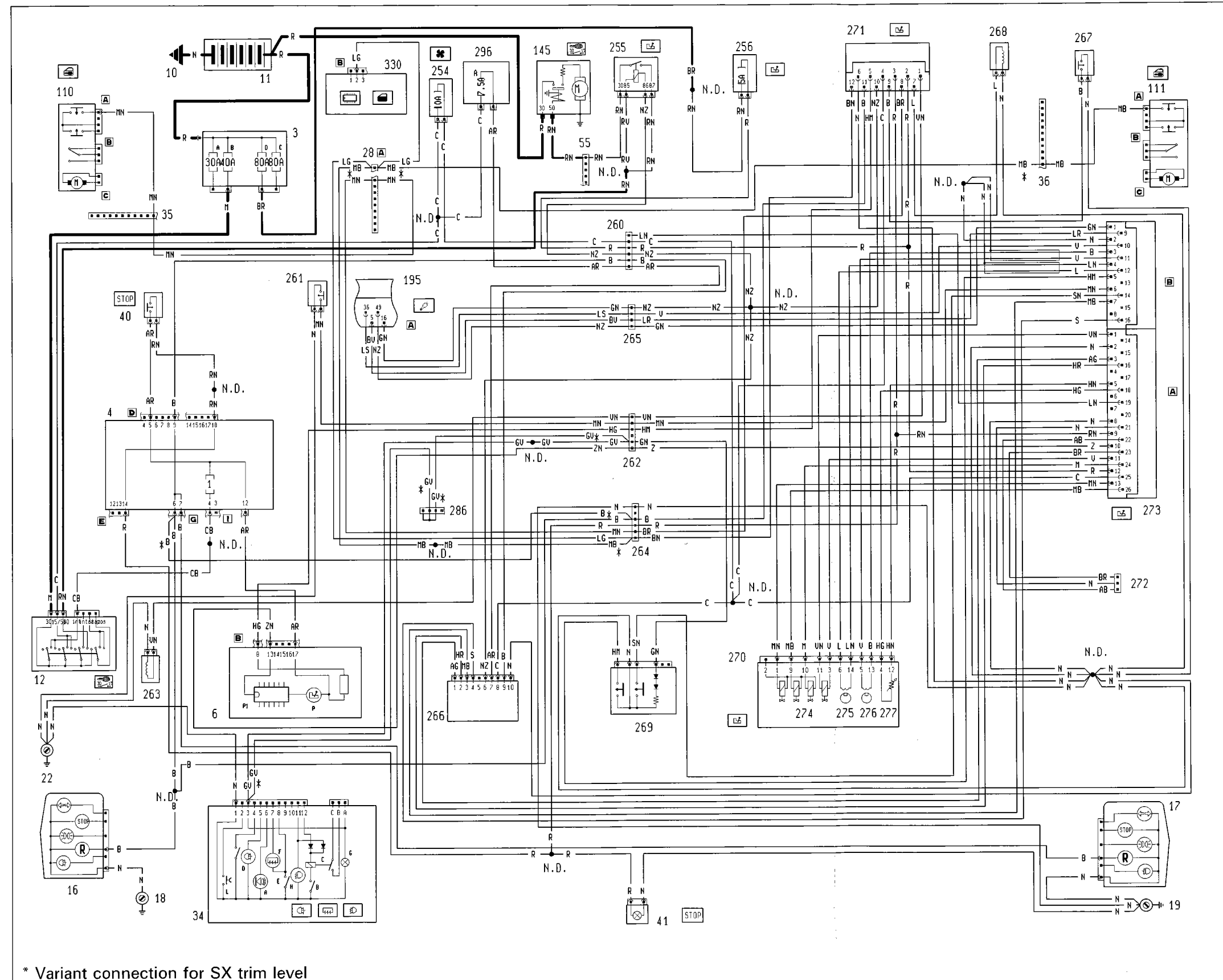
The cables in the wiring diagram are marked

# Electrical equipment

## Wiring diagrams

### 55.

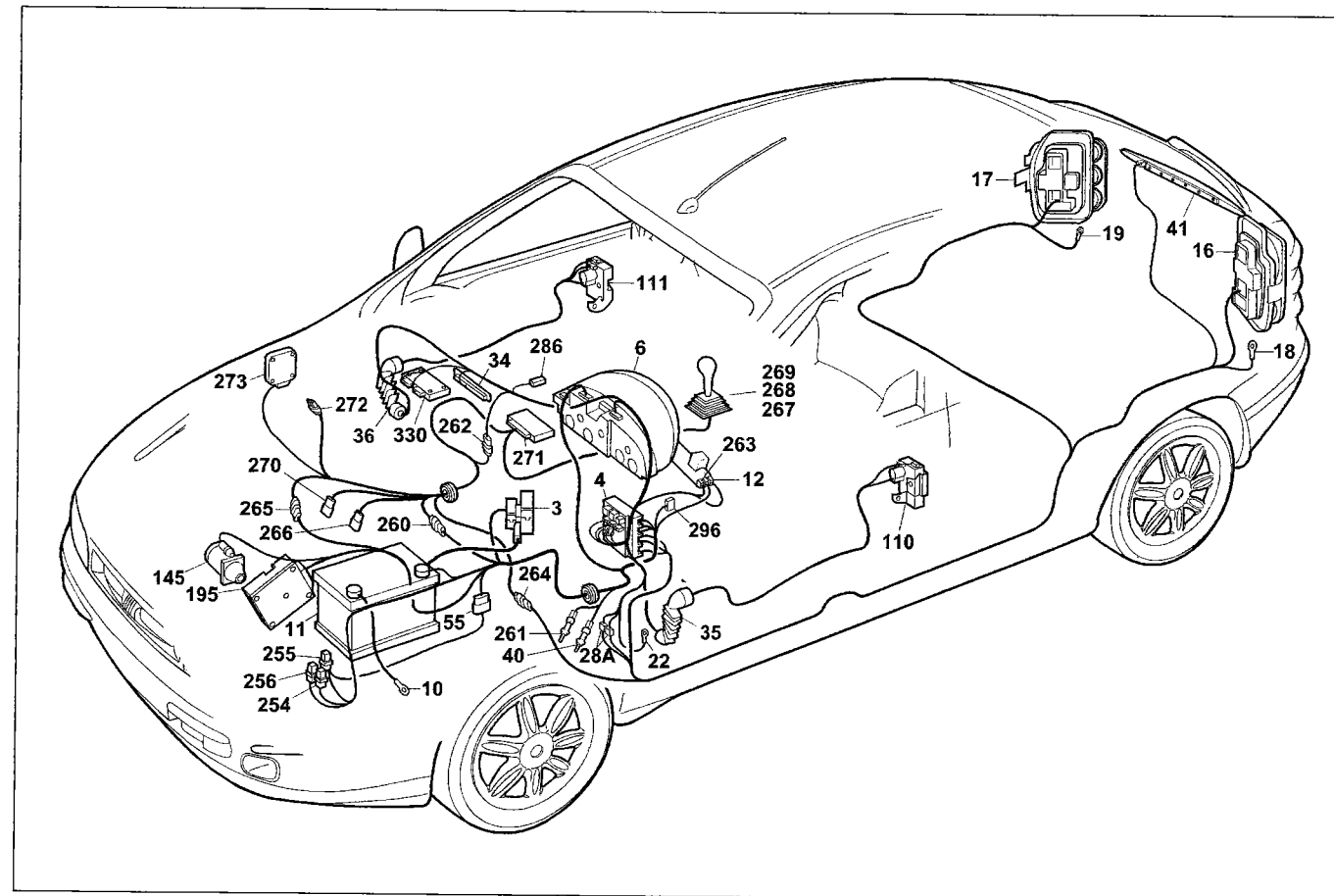
Automatic transmission - (See key at end of wiring diagrams)



P4A289101



### 55.

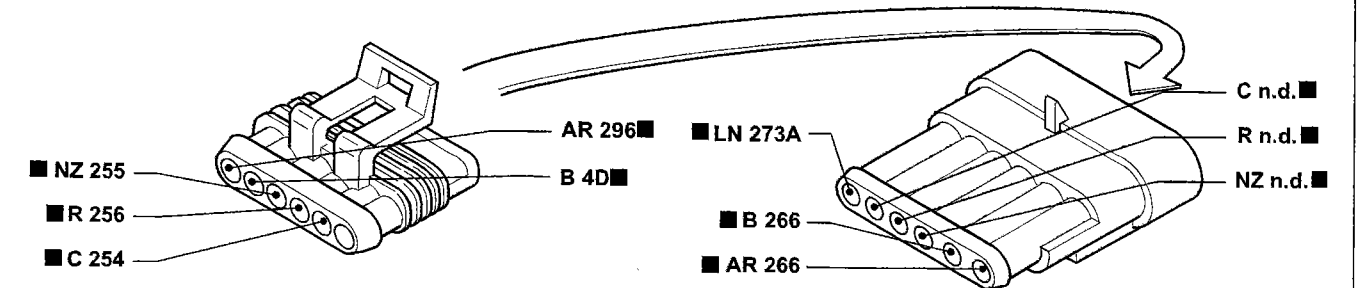


P4A291101

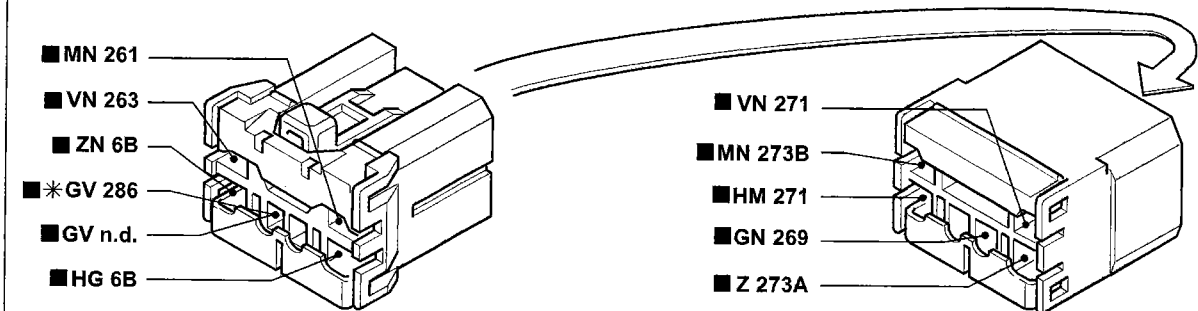
#### Automatic transmission Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)
- B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit:  
6 Instrument panel:  
P Automatic transmission failure warning light  
P1 Automatic transmission circuit control module
- 10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
16 Left rear light cluster  
17 Right rear light cluster  
18 Left rear earth  
19 Right rear earth  
22 Left dashboard earth  
28A Dashboard/longitudinal cables connection  
34 Switch control panel:  
A Alarm on warning light  
B Rear fog lamps switch  
D Rear fog lamps warning light  
E Heated rear windscreen switch  
F Heated rear windscreen warning light  
G Switch control unit ideogram light  
H Fog lights warning light  
I Fog lights switch  
L Outside temperature control switch  
35 Dashboard/left front door cables connection  
36 Dashboard/right front door cables connection  
40 Brake lights control switch
- 41 Additional brake light  
41A Additional rear brake light cables connection  
55 Connection between front/engine pre-wiring cables  
110 Left front central locking/alarm on switch  
111 Right front central locking/alarm on switch  
145 Starter motor  
195 Injection/ignition electronic control unit (1581)  
254 10A fuse protecting automatic transmission  
255 Automatic transmission starting go ahead relay  
256 5A fuse protecting automatic transmission  
260 Connection between front/automatic transmission cables  
261 Kick-Down switch  
262 Connection between dashboard/automatic transmission cables  
263 Solenoid valve on ignition switch  
264 Connection between rear/automatic transmission cables  
265 Connection between automatic transmission/injection cables  
266 Multi-purpose switch on automatic transmission  
267 Additional parking switch  
268 Shift-Lock solenoid valve  
269 Normal / Sport / Ice selector switch  
270 Connection for cables on gearbox  
271 Electronic safety control unit for automatic transmission  
272 Diagnostic socket for automatic transmission control unit  
273 Automatic transmission electronic control unit  
274 Modulating solenoid valves  
275 Vehicle speed electro-magnetic sensor  
276 Gearbox input revs electro-magnetic sensor  
277 Automatic transmission oil temperature sensor  
286 Short circuit connection  
296 Fuse carrier base on front cable  
A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm  
330 A.B.I. control unit  
N.D. Ultrasound welding taped in cable loom

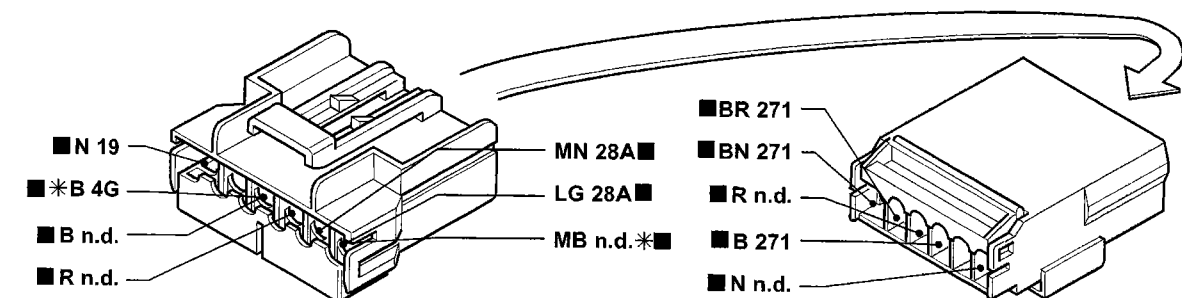
#### 260 Connection between front/automatic transmission cables.



#### 262 Connection between dashboard/automatic transmission cables.



#### 264 Connection between rear/automatic transmission cables.



#### 265 Connection between automatic transmission/injection cables.



The cables in the wiring diagram are marked

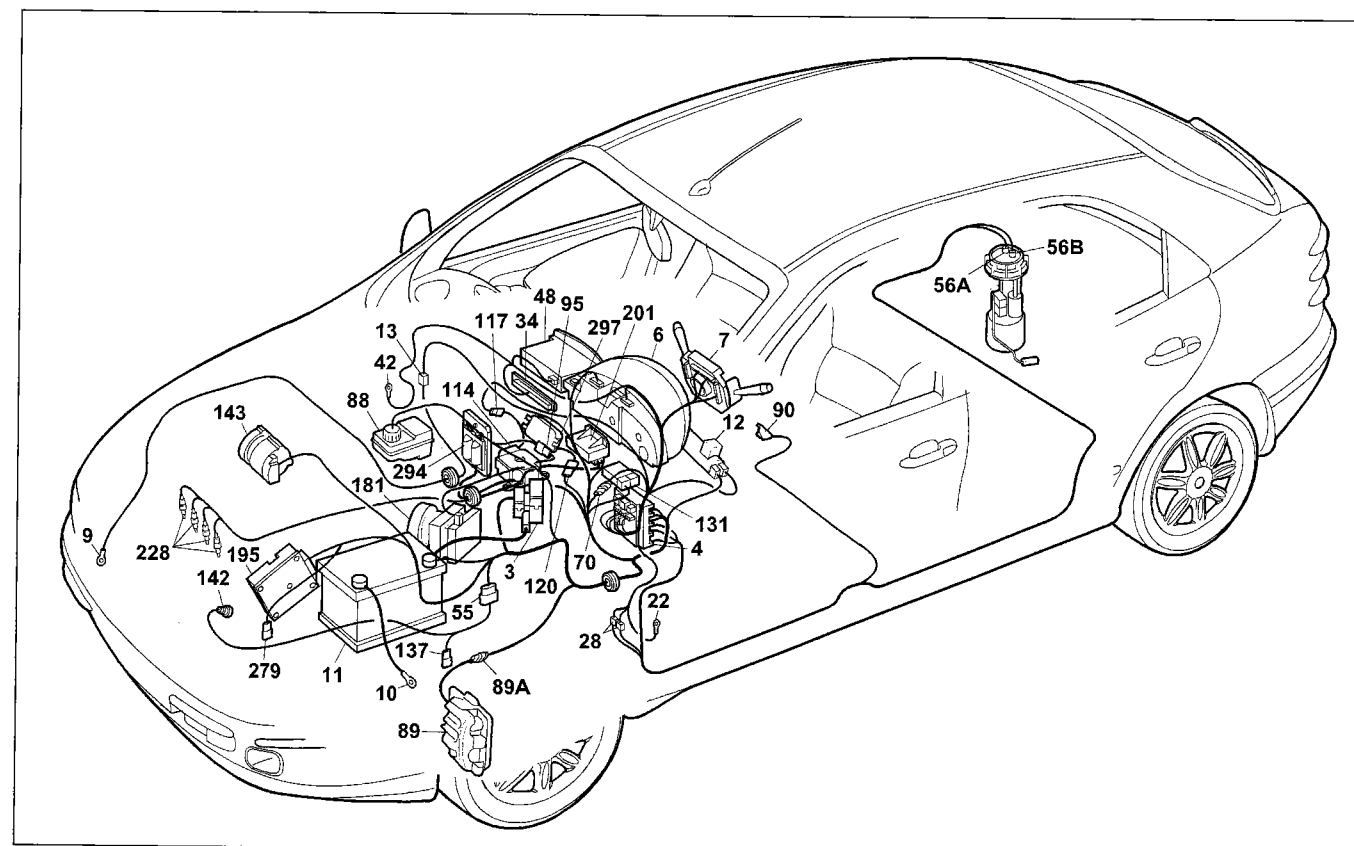
4A2921

P4A292101

\* Variant connections for the 1581 16v version  
\*\* Variant connections for the 1910 TD version  
\*\*\* 60A fuse for TD versions



**55.**



Trim level: **SX - GT**

### Instrument panel connections

#### Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

#### 4 Junction unit

#### 6 Instrument panel:

- A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel ideogram lights  
G Main beam headlamps warning light  
H EURO-BAG system failure warning light  
H1 Passenger EURO-BAG off warning light

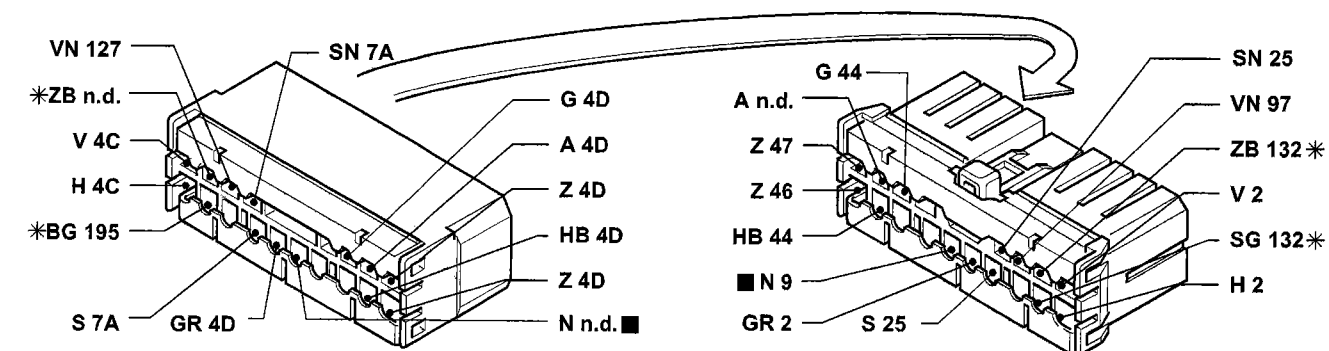
- I Anti-lock braking system failure warning light  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
L Fiat CODE device failure warning light  
M Injection system failure warning light Petrol/DS  
O Heater plugs warning light  
Q Front brake pad wear warning light  
R Handbrake/insufficient brake fluid level warning light  
V1 Speedometer  
W Rev counter  
X Engine coolant temperature gauge  
Y Electronic module  
Z Milometer/trip meter  
Z1 Trip meter zeroing button  
Z2 Milometer/trip meter light

#### 7 Steering column switch unit:

- D Flasher control  
E Switch for dipped/main beam headlamps  
F Switch for side lights  
H Switch for direction indicators  
9 Right front earth  
10 Earth for battery on bodyshell

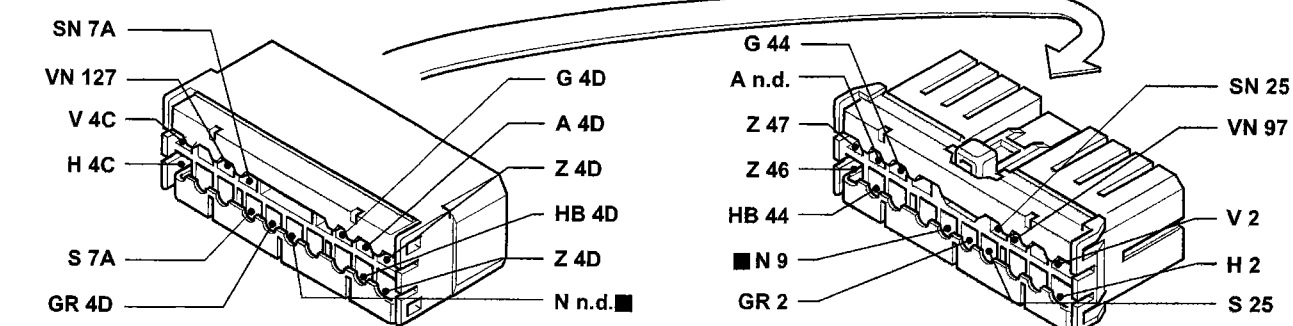
- 11 Battery  
12 Ignition switch  
13 Front right/left cables connection  
22 Left dashboard earth  
28 Dashboard/longitudinal cables connection  
34 Switch control panel:  
A Anti-theft warning light on  
B Rear fog lamps switch  
C Rear fog lamps relay feed  
D Rear fog lamps warning light  
E Heated rear windscreen switch  
F Heated rear windscreen warning light  
G Switch control unit ideogram light  
H Fog lights warning light  
I Fog lights switch  
L Outside temperature control switch  
42 Right dashboard earth  
48 Radio receiver with clock  
55 Connection between front/engine pre-wiring cables  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump  
70 Dashboard/front cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Switch signalling handbrake applied  
95 Front/anti-lock brakes cables connection (A.B.S.)  
114 EURO-BAG electronic control unit  
117 Connection between EURO-BAG/dashboard cables  
120A Air conditioning unit cables connection  
131 Fiat CODE electronic control unit  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
143 Alternator  
181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)  
201 Heater plugs control unit  
228 Heater plugs  
279 Twin engine coolant temperature sender unit  
294 Injection/ignition electronic control unit 1242  
297 Air conditioning control unit  
N.D. Ultrasound welding taped in cable loom

### 13 Front right/left cables connection. Versions: 1242 16v - 1581 16v

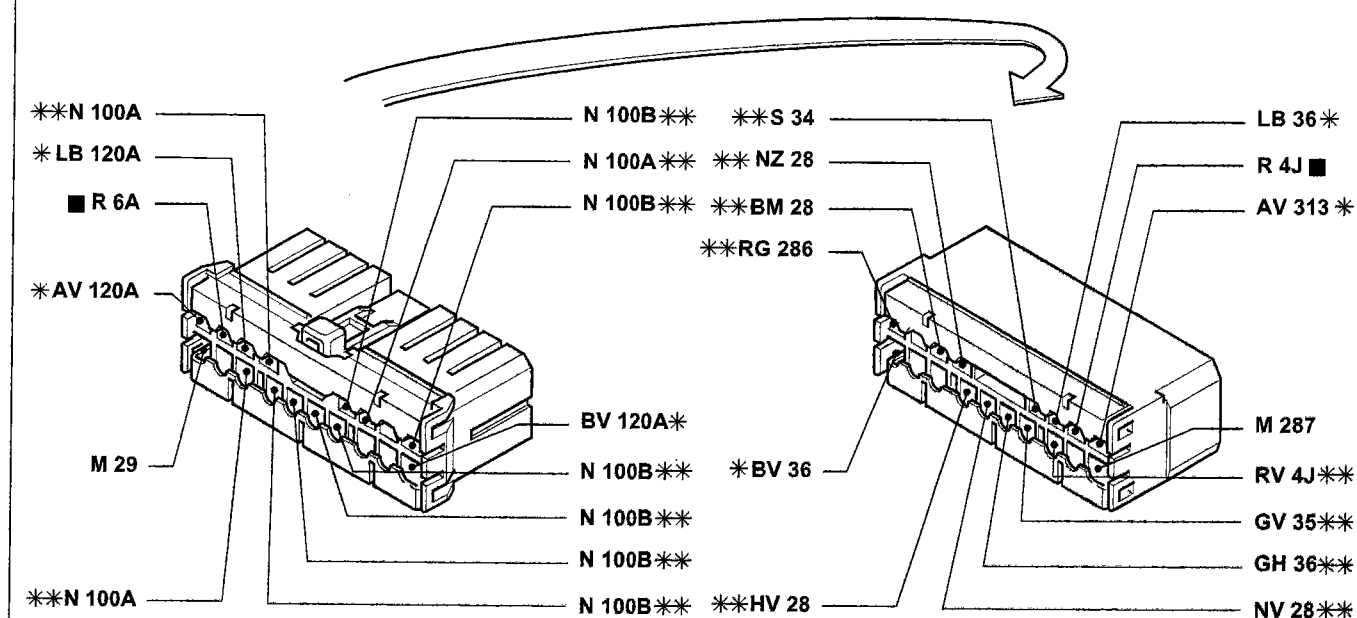


\* Variant connection for 1581 16v versions

### 13 Front right/left cables connection



### 70 Dashboard/front cables connection.



\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

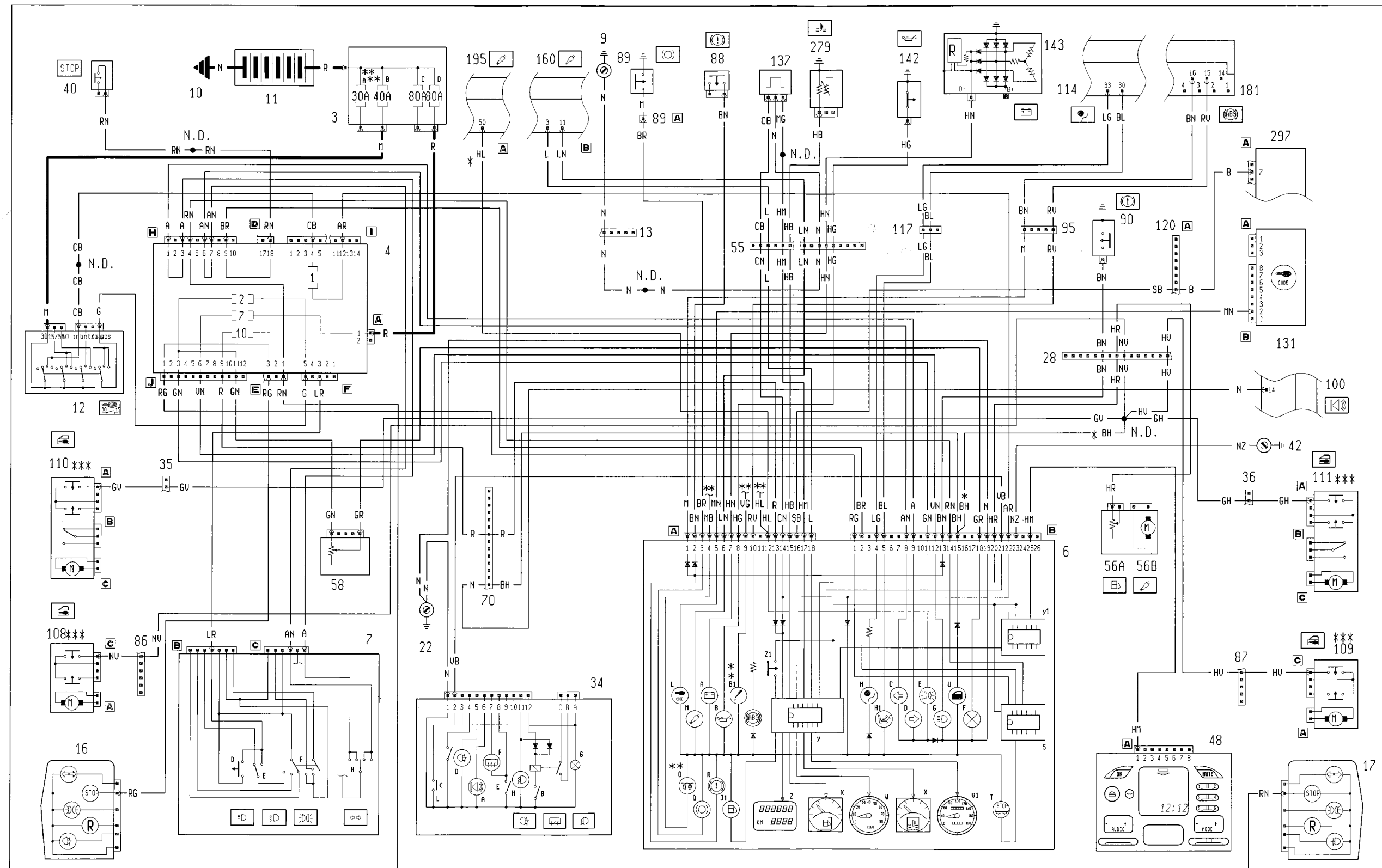
The cables in the wiring diagram are marked

P4A298101

4A2951

4A2961

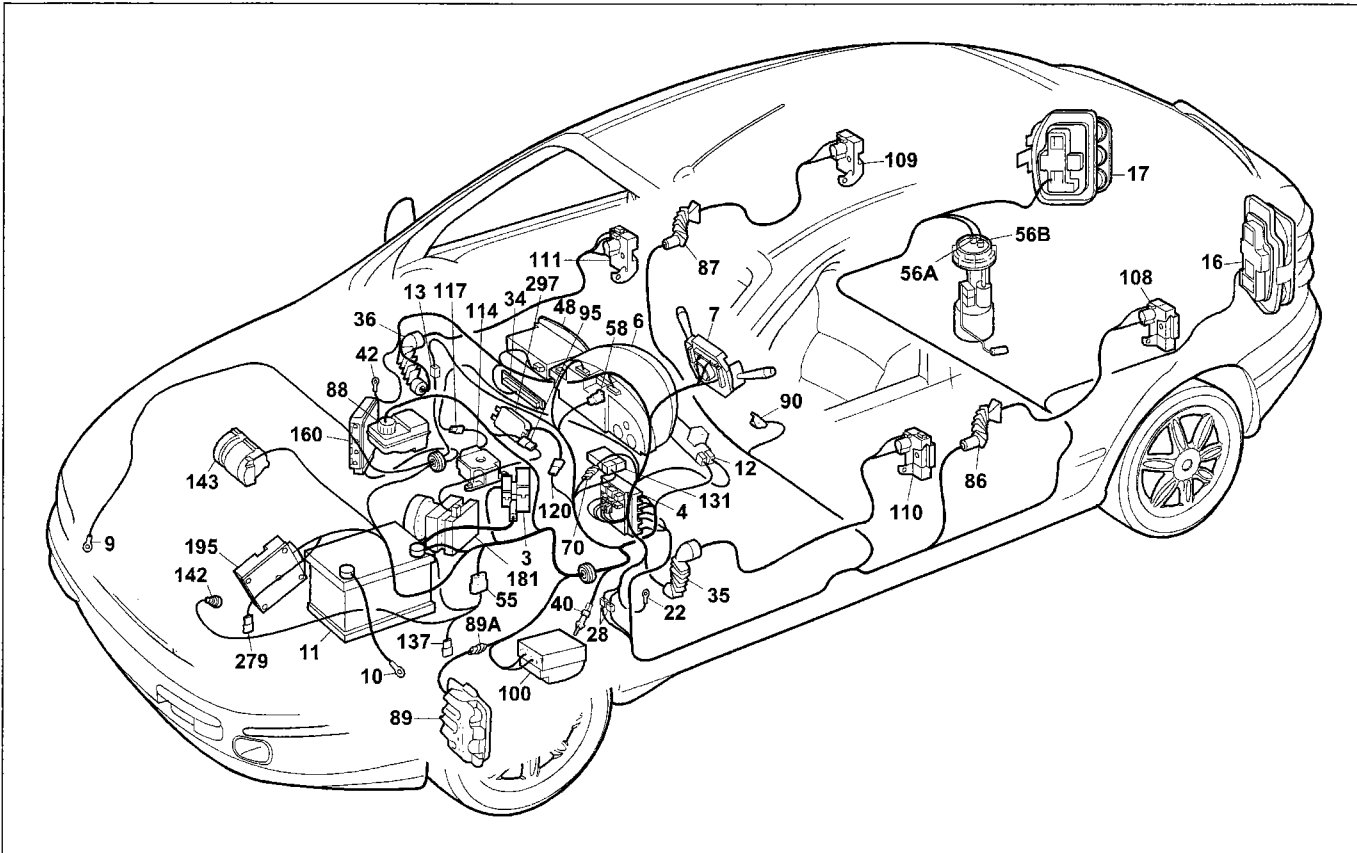
Trim level: ELX - HSX  
Instrument panel connections - (See key at end of wiring diagrams)



\* Variant connection for the 1581 16v version  
\*\* Exists only for the 1910 JTD version

\*\*\* Variant connection for versions without alarms  
\*\*\*\* 60A fuse for TD versions

55.



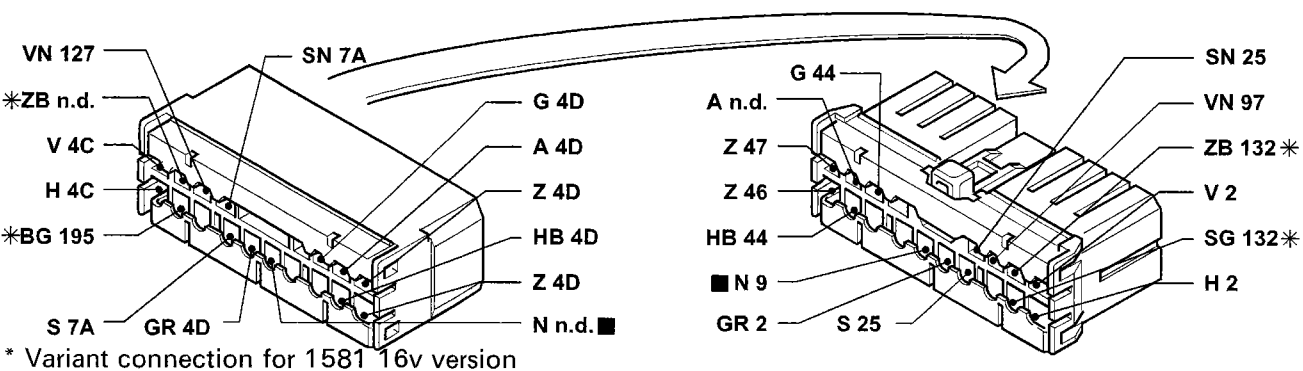
P4A299I01

Trim level: ELX - HSX  
Instrument panel connections  
Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel ideogram lights  
G Main beam headlamps warning light  
H EURO-BAG system failure warning  
H1 Passenger EURO-BAG failure warning light  
I Anti-lock braking system failure warning light  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
L Fiat CODE device failure warning light  
M Injection system failure warning light Petrol/DS  
N Maximum turbocharging pressure warning light  
O Heater plugs warning light  
Q Front brake pad wear warning light  
R Handbrake/insufficient brake fluid level warning light  
S Brake lights failure signal electronic module  
T Warning light signalling brake lights failure  
U Doors ajar warning light  
V1 Speedometer  
W Rev counter  
X Water temperature gauge  
Y Electronic module  
Y1 Speed control module  
Z Milometer/trip meter  
Z1 Trip meter zeroing button
- 7 Steering column switch unit:  
D Flasher control  
E Switch for dipped/main beam headlamps  
F Switch for side lights  
H Switch for direction indicators
- 9 Right front earth  
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
13 Front right/left cables connection

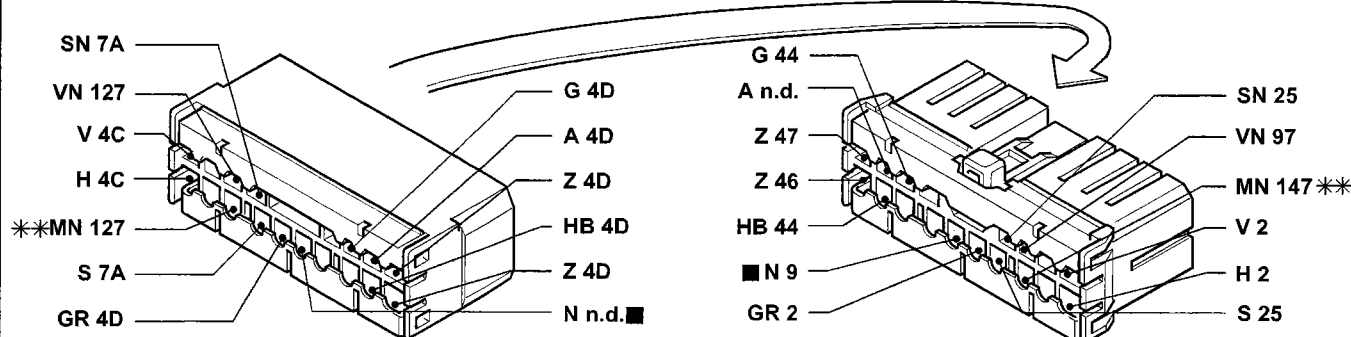
- 16 Left rear light cluster  
17 Right rear light cluster  
22 Left dashboard earth  
28 Dashboard/longitudinal cables connection  
34 Switch control panel:  
A Anti-theft warning light on  
B Rear fog lamps switch  
D Rear fog lamps warning light  
E Heated rear windscreen switch  
F Heated rear windscreen warning light  
G Switch control unit ideogram light  
H Fog lights warning light  
I Fog lights switch  
L Outside temperature control switch
- 35 Dashboard/left front door cables connection  
36 Dashboard/right front door cables connection  
40 Vehicle brake lights switch  
42 Right dashboard earth  
48 Radio receiver with clock  
55 Connection between front/engine pre-wiring cables  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump
- 58 Light dimmer  
70 Dashboard/front cables connection  
86 Longitudinal/left rear door cables connection  
87 Longitudinal/right rear door cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Switch signalling handbrake applied  
95 Front/anti-lock brakes cables connection (A.B.S.)  
100 Alarm device electronic control unit  
108 Left rear central locking/alarm switch  
109 Right rear central locking/alarm on switch  
110 Left front central locking/alarm on switch  
111 Right front central locking/alarm on switch  
114 EURO-BAG electronic control unit  
117 Connection between EURO-BAG/dashboard cables  
120A Air conditioning unit cables connection  
131 Fiat CODE electronic control unit  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
143 Alternator  
160 Injection/ignition electronic control unit (1747)  
181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)  
195 Injection/ignition electronic control unit (1581)  
279 Twin engine coolant temperature sender unit  
297 Air conditioning control unit  
N.D. Ultrasound welding taped in cable loom

13 Front right/left cables connection. Versions: 1242 16v - 1581 16v



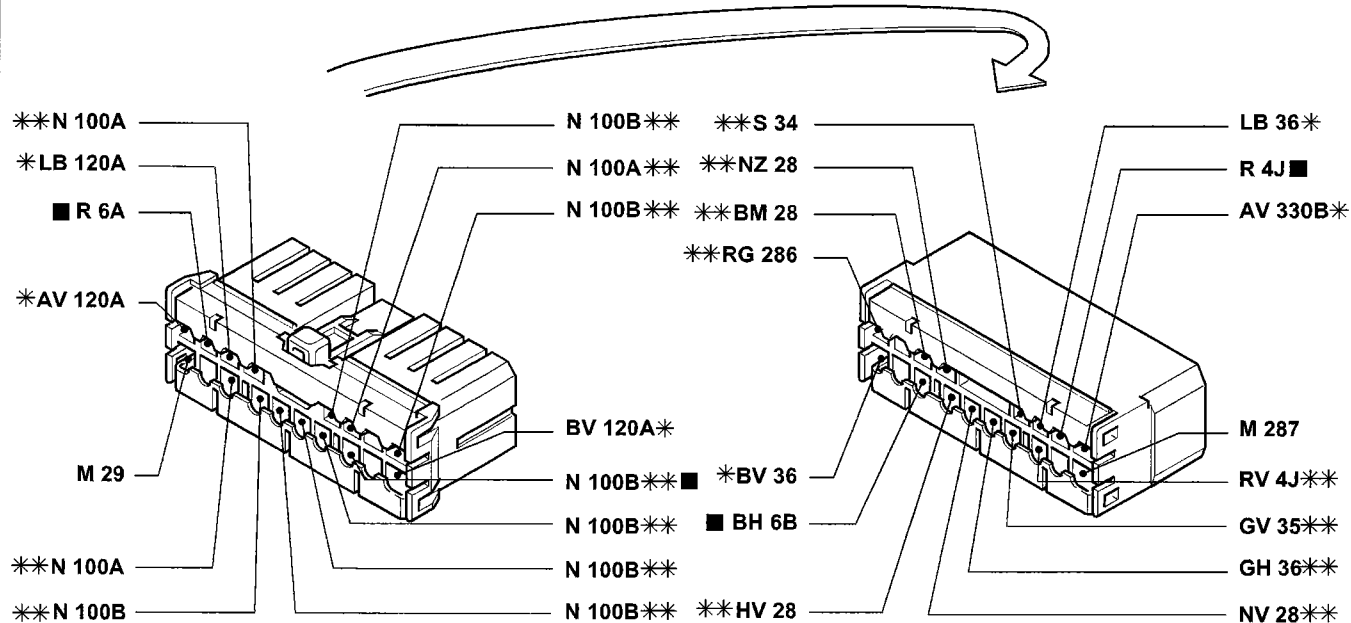
\* Variant connection for 1581 16v version

13 Front right/left cables connection



\*\* Variant connection for 1910 JTD version

70 Dashboard/front cables connection.



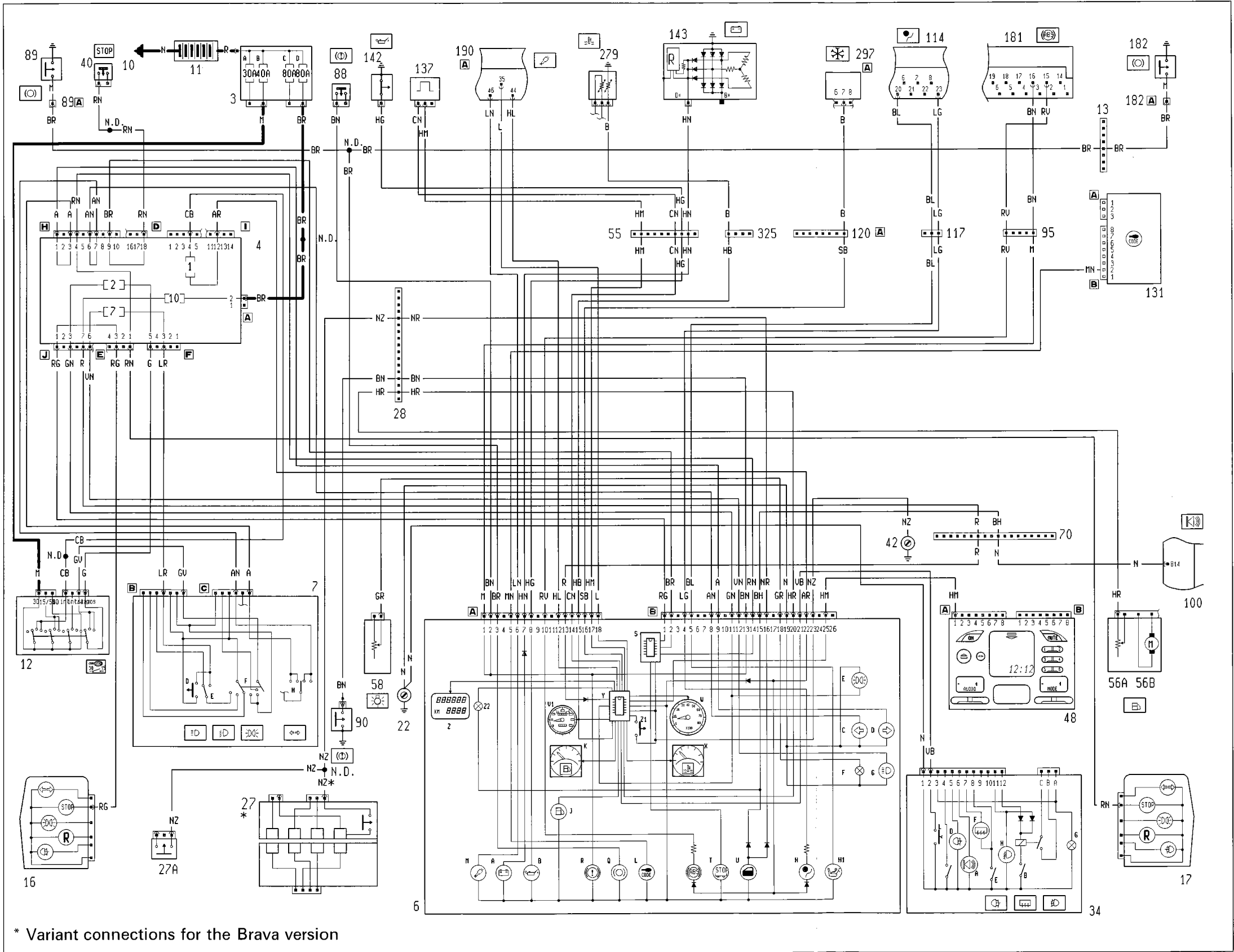
\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

The cables in the wiring diagram are marked

P4A300I01

Trim level: HGT

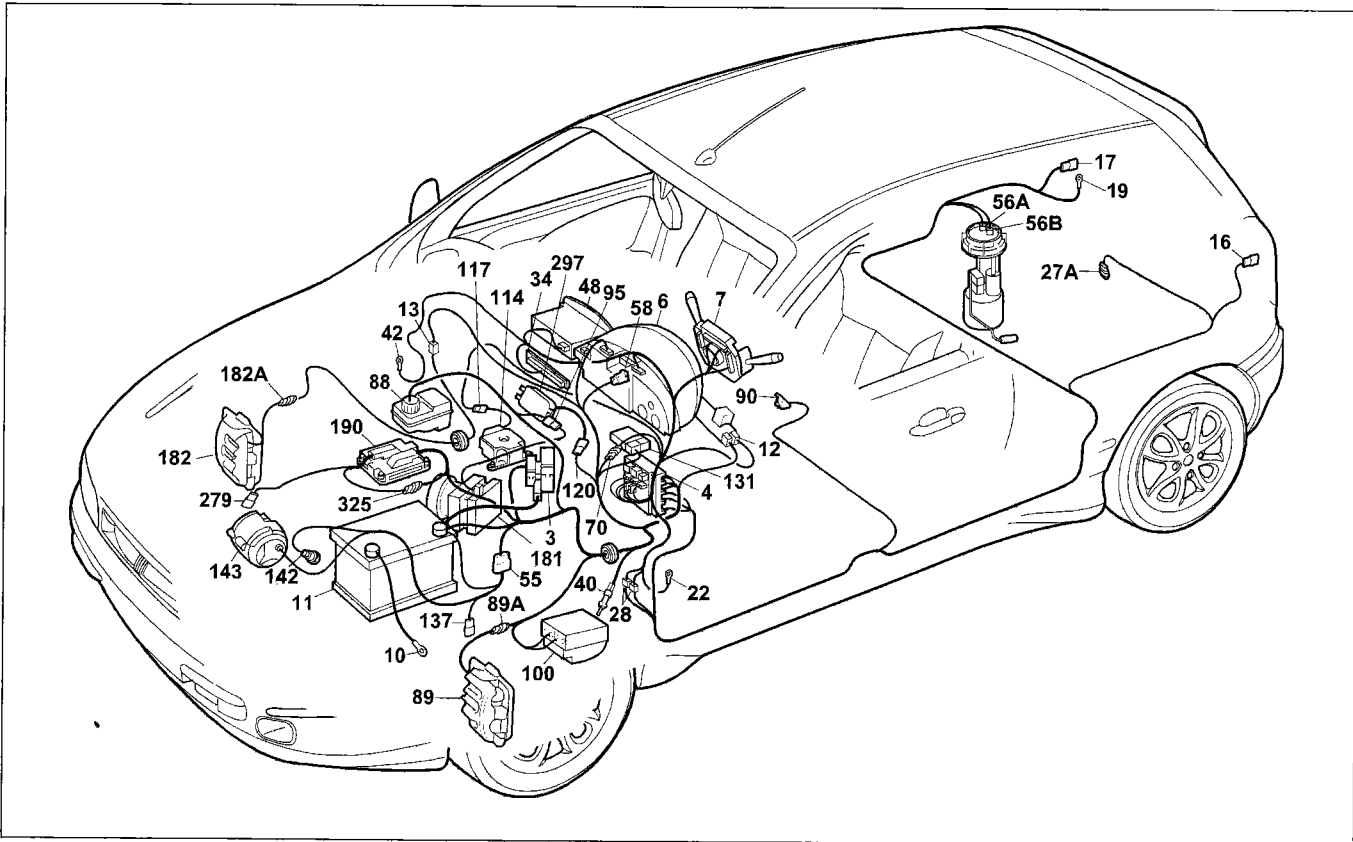
Instrument panel connections - (See key at end of wiring diagrams)



P4A301101



55.

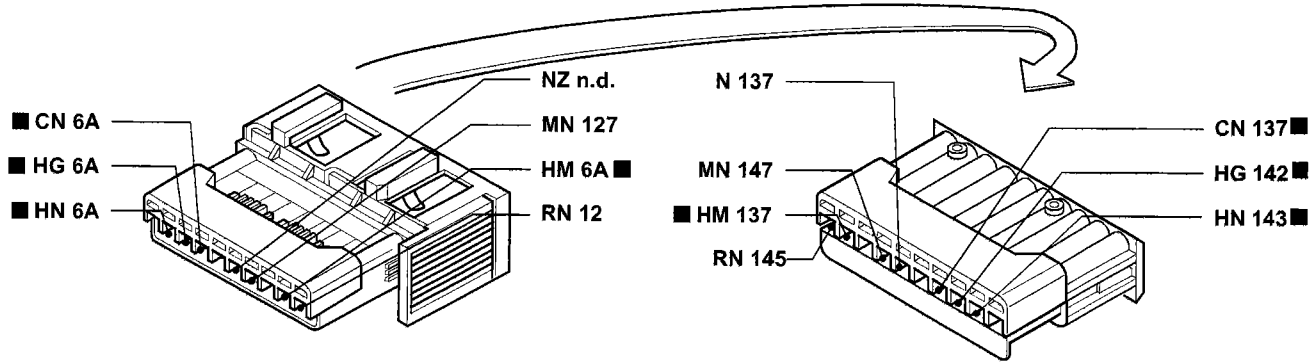


Trim level: HGT  
Instrument panel connections  
Components key

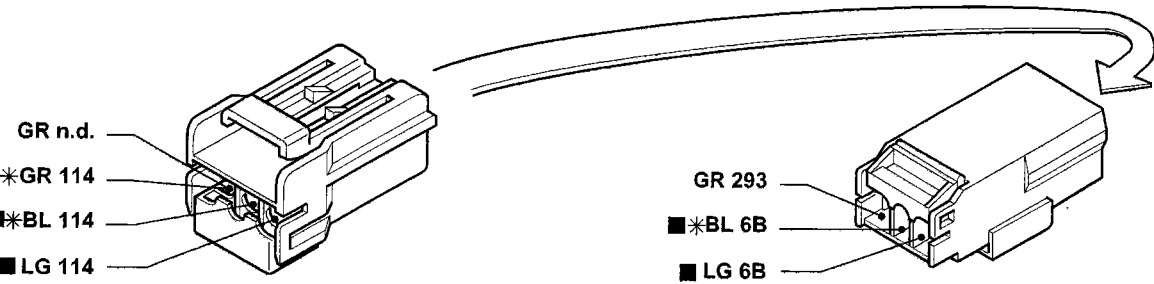
- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel ideogram lights  
G Main beam headlamps warning light  
H EURO-BAG system failure warning light  
H1 Passenger EURO-BAG failure warning light  
I Anti-lock braking system failure warning light  
J Fuel reserve circuit control module  
K Fuel level gauge  
L Fiat CODE device failure warning light  
M Injection system failure warning light petrol/DS  
O Front brake pad wear warning light  
R Handbrake/insufficient brake fluid level warning light  
S Brake lights failure signalling electronic module  
T Warning light signalling brake lights failure  
U Doors ajar warning light  
V1 Speedometer  
W Rev counter  
X Engine coolant temperature gauge  
Y Electronic module  
Z Milometer/trip meter  
Z1 Trip meter zeroing button
- 7 Steering column switch unit:  
D Flasher control  
E Switch for dipped/main beam headlamps  
F Switch for side lights  
H Switch for direction indicators
- 10 Earth for battery on bodysell  
11 Battery  
12 Ignition switch

- 13 Front right/left cables connection  
16 Left rear light cluster  
17 Right rear light cluster  
22 Left dashboard earth  
27A Button for luggage compartment light, switching on alarm and signalling boot lid open
- 28 Dashboard/longitudinal cables connection  
34 Switch control panel:  
A Anti-theft warning light on  
B Rear fog lamps switch  
C Rear fog lamps relay feed  
D Rear fog lamps warning light  
E Heated rear windscreen switch  
F Heated rear windscreen warning light  
G Switch control unit ideogram light  
H Fog lights warning light  
I Fog lights switch  
L Outside temperature control switch
- 40 Vehicle brake lights switch  
42 Right dashboard earth  
48 Radio receiver with clock  
55 Connection between front cables/engine pre-wiring  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump
- 58 Light dimmer  
70 Dashboard/front cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Switch signalling handbrake applied  
95 Front/anti-lock brakes cables connection (A.B.S.)  
100 Anti-theft device electronic control unit  
114 EURO-BAG electronic control unit  
117 Connection between EURO-BAG/dashboard cables  
120A Air conditioning unit cables connection  
131 Fiat-CODE electronic control unit  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
143 Alternator  
181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)  
182 Right brake pad wear sensor  
182A Right brake pad wear sensor cables connection  
190 Injection/ignition electronic control unit (1998)  
279 Twin engine coolant temperature sender unit  
297 Air conditioning control unit  
325 Connection between injection/left front cables  
N.D. Ultrasound welding taped in cable loom

55 Connection between front/engine pre-wiring cables.

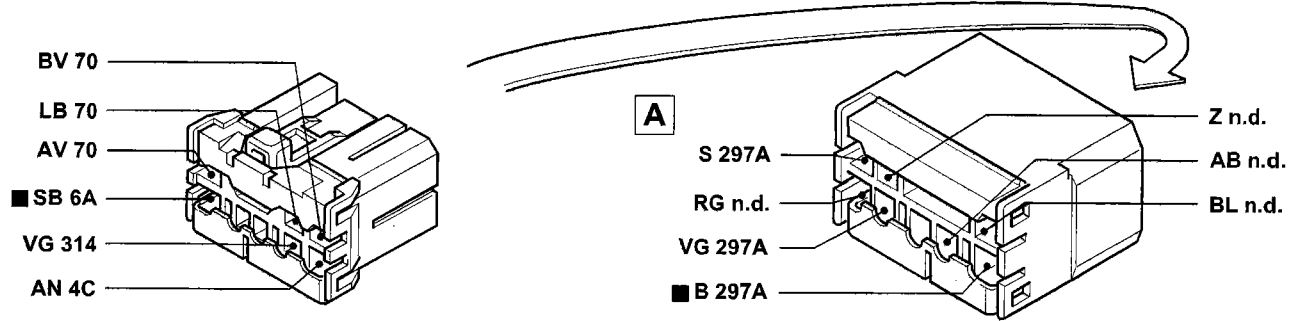


177 Connection between EURO-BAG/dashboard cables

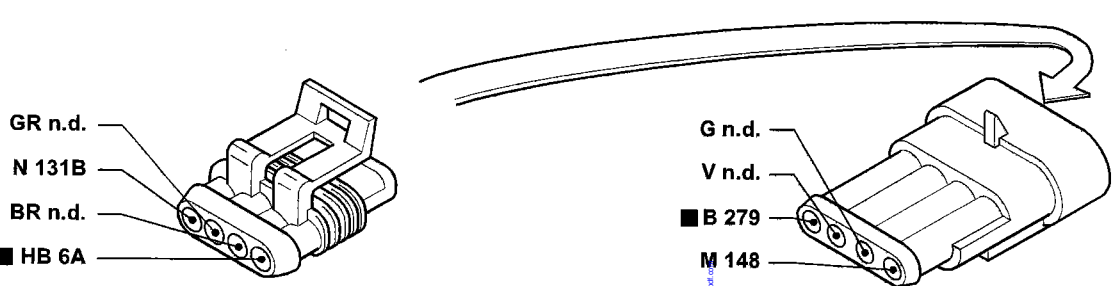


\* Variant connection for versions with passenger EURO-BAG and SIDE BAG  
\*\* Variant connection for versions with driver's EURO-BAG

120 Air conditioning unit cables connection



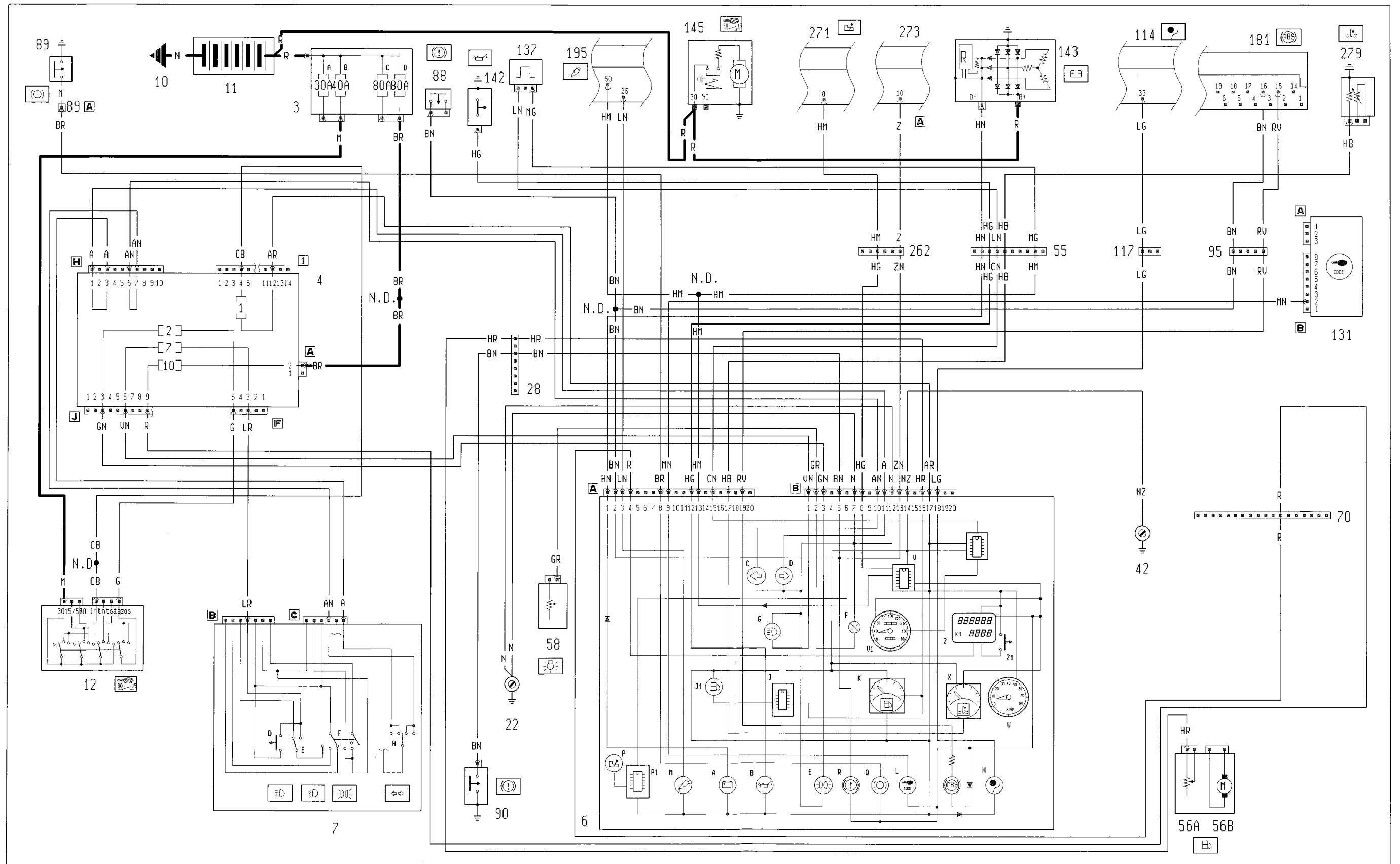
325 Connection between injection/left front cables.



The cables in the wiring diagram are marked

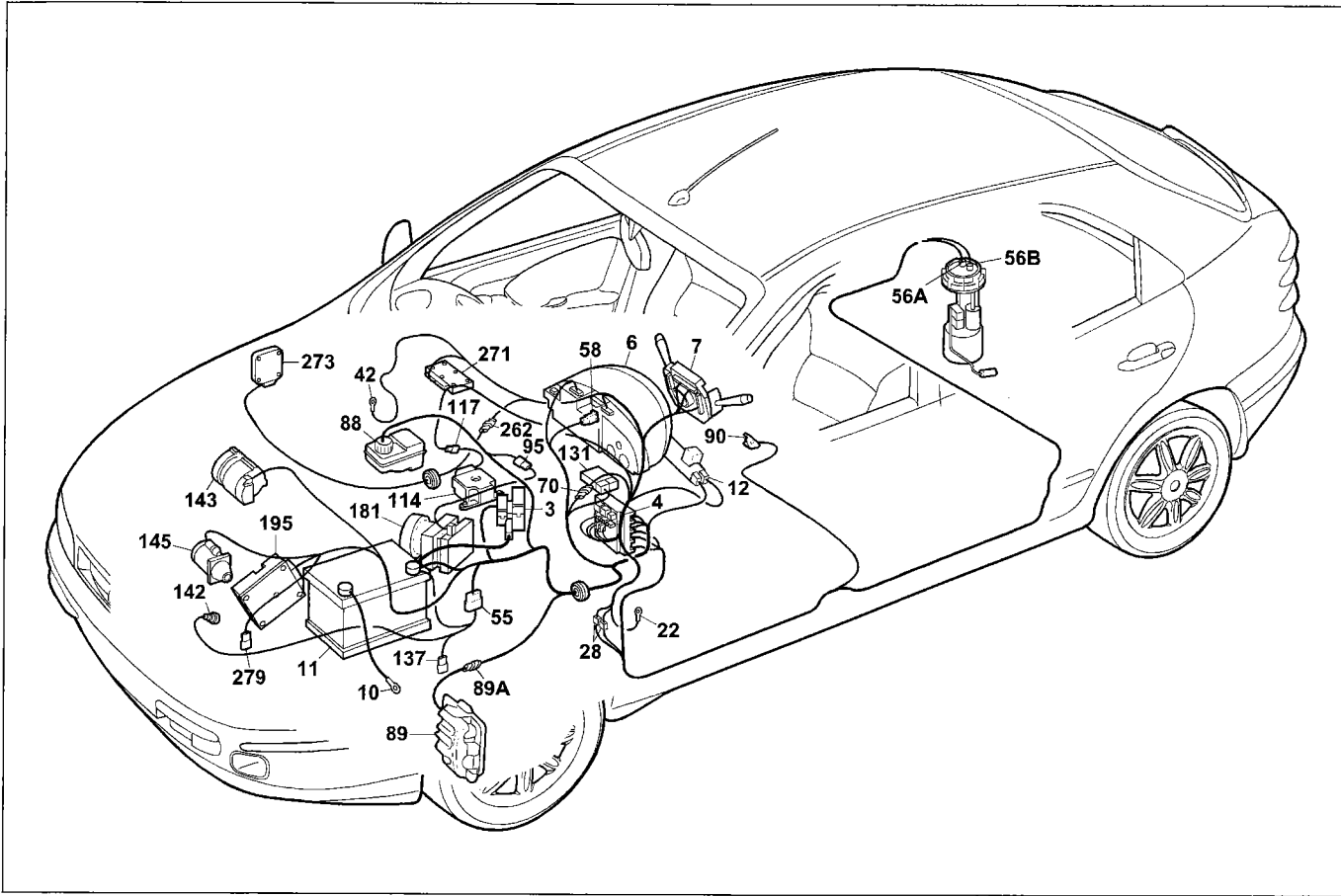
**Trim level: SX - GT with automatic transmission**

**Instrument panel connections - (See key at end of wiring diagrams)**





55.



Trim level: SX - GT with automatic transmission

P4A307101

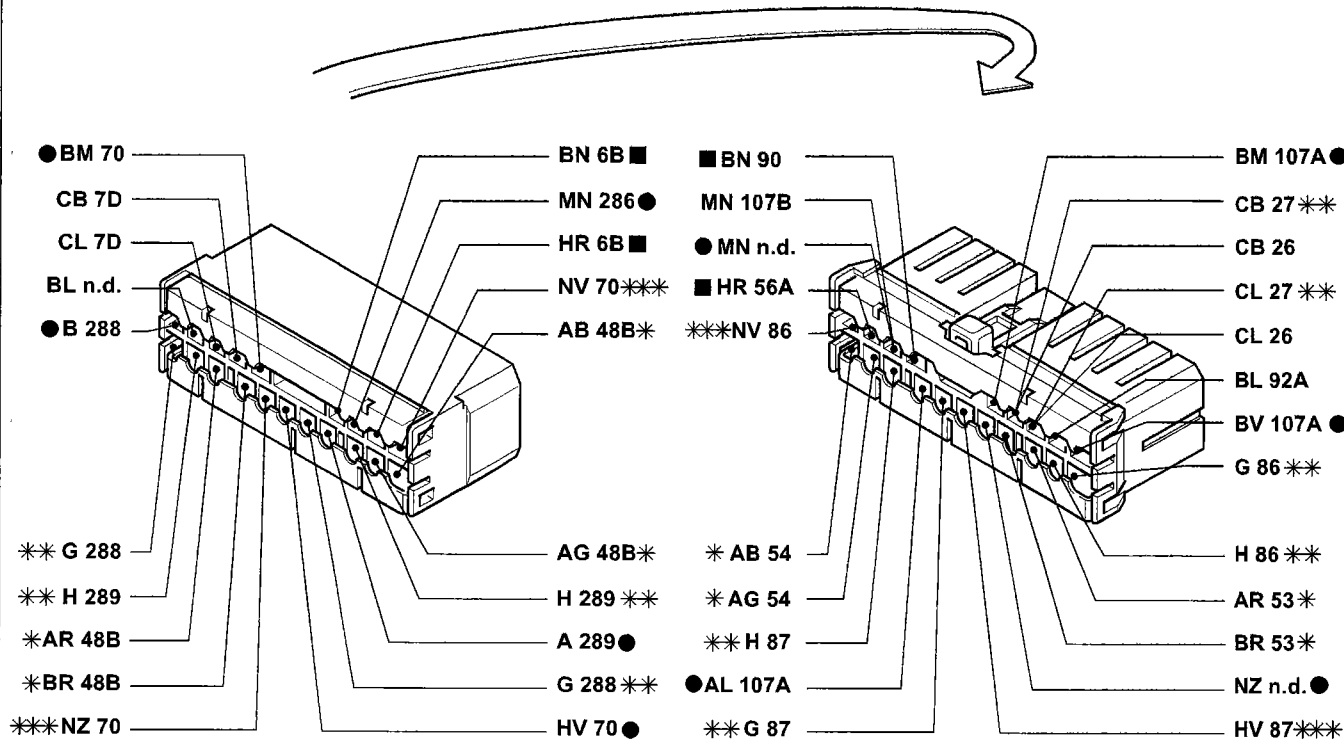
Instrument panel connections

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit
- 4 Junction unit
- 6 Instrument panel:  
A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel ideogram lights  
G Main beam headlamps warning light  
H EURO-BAG system failure warning light  
I Anti-lock braking system failure warning light  
J Fuel reserve circuit control module  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
L Fiat CODE device failure warning light  
M Injection system failure warning light Petrol/DS  
Q Front brake pad wear warning light  
R Handbrake/insufficient brake fluid level warning light  
S Brake lights failure signalling electronic module  
T Warning light signalling brake lights failure  
U Doors ajar warning light  
V Speedometer control module  
V1 Speedometer  
X Engine coolant temperature gauge  
Z Milometer/trip meter  
Z1 Trip meter zeroing button
- 7 Steering column switch unit:  
D Flasher control  
E Switch for dipped/main beam headlamps

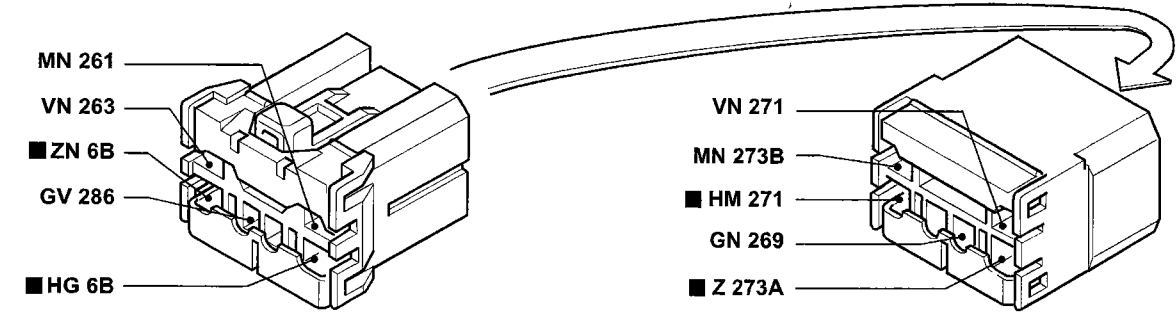
- F Switch for side lights  
H Switch for direction indicators
- 10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
16 Left rear light cluster  
17 Right rear light cluster  
22 Left dashboard earth  
28 Dashboard/longitudinal cables connection  
40 Vehicle brake lights switch  
42 Right dashboard earth  
55 Connection between front/engine pre-wiring cables  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump
- 58 Light dimmer  
70 Dashboard/front cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Switch signalling handbrake applied  
95 Front/anti-lock brakes cables connection (A.B.S.)  
100 Alarm device electronic control unit  
114 EURO-BAG electronic control unit  
117 Connection between EURO-BAG/dashboard cables  
131 Fiat CODE electronic control unit  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
143 Alternator  
145 Starter motor  
181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)  
195 Injection/ignition electronic control unit (1581)  
262 Connection between dashboard/automatic transmission cables  
271 Electronic safety control unit for automatic transmission  
273 Automatic transmission electronic control unit  
279 Twin engine coolant temperature sender unit  
N.D. Ultrasound welding taped in cable looms

28 Dashboard/longitudinal cables connection.



- Variant connection for versions with alarm
- \* Variant connection for versions with top of the range radio
- \*\* Variant connection for Brava versions
- \*\*\* Variant connection for Brava versions with alarm

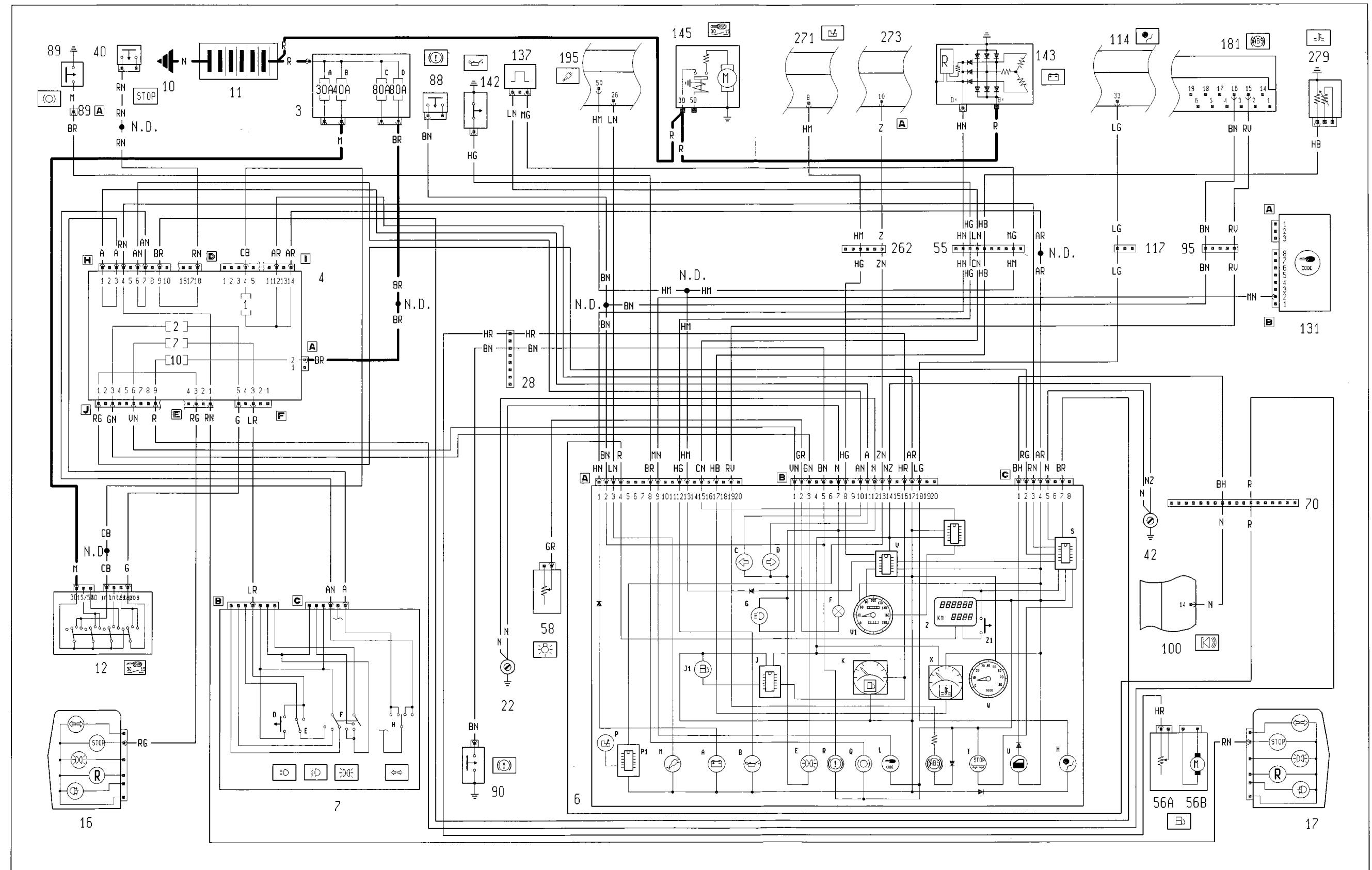
262 Connection between dashboard/automatic transmission cables



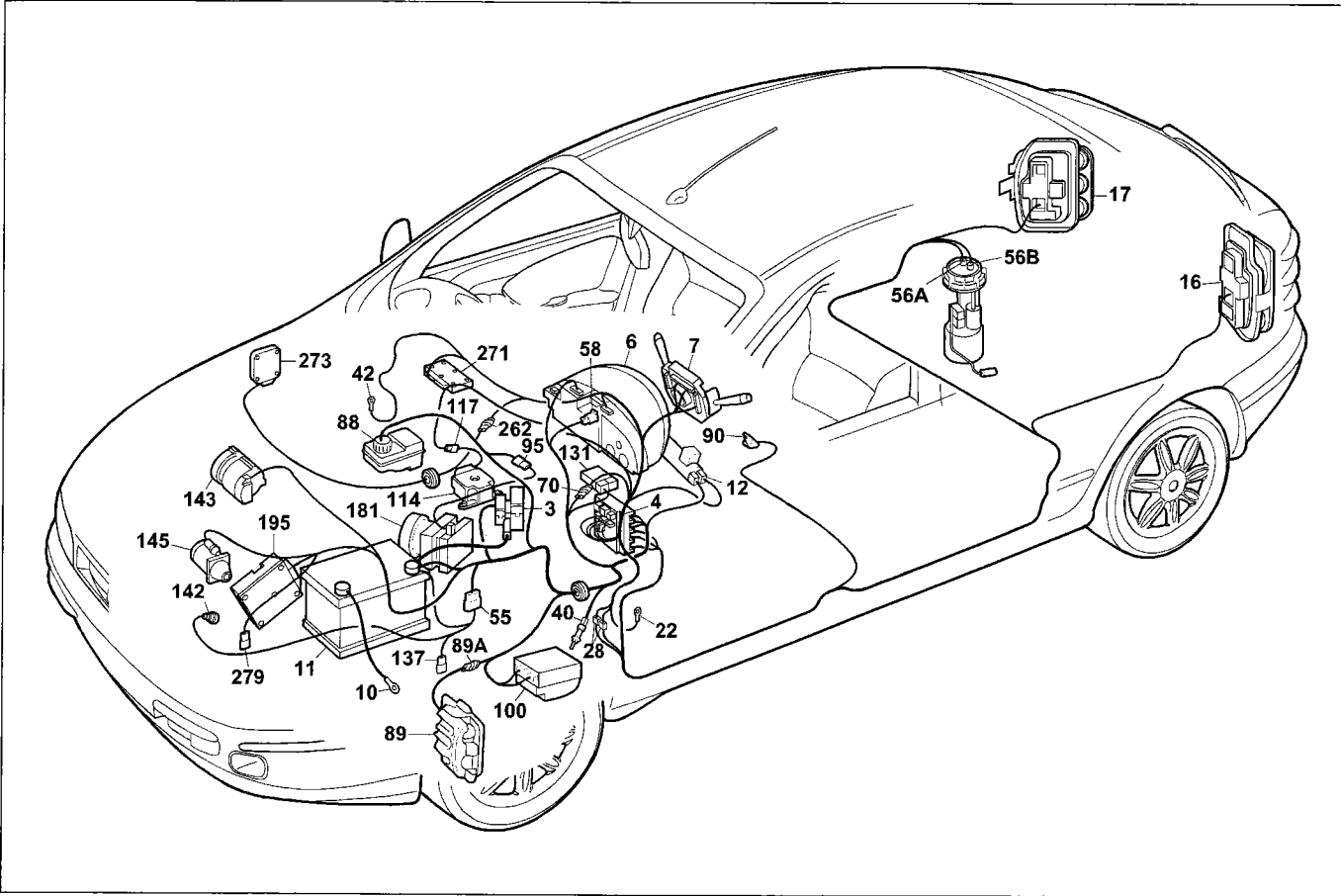
The cables in the wiring diagram are marked

P4A308101

Trim level: ELX - HSX with automatic transmission  
Instrument panel connections - (See key at end of wiring diagrams)



55.



Trim level: ELX - HSX with automatic transmission

Instrument panel connections

Components key

- 3 Power fuse box:  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit

4 Junction unit

6 Instrument panel:

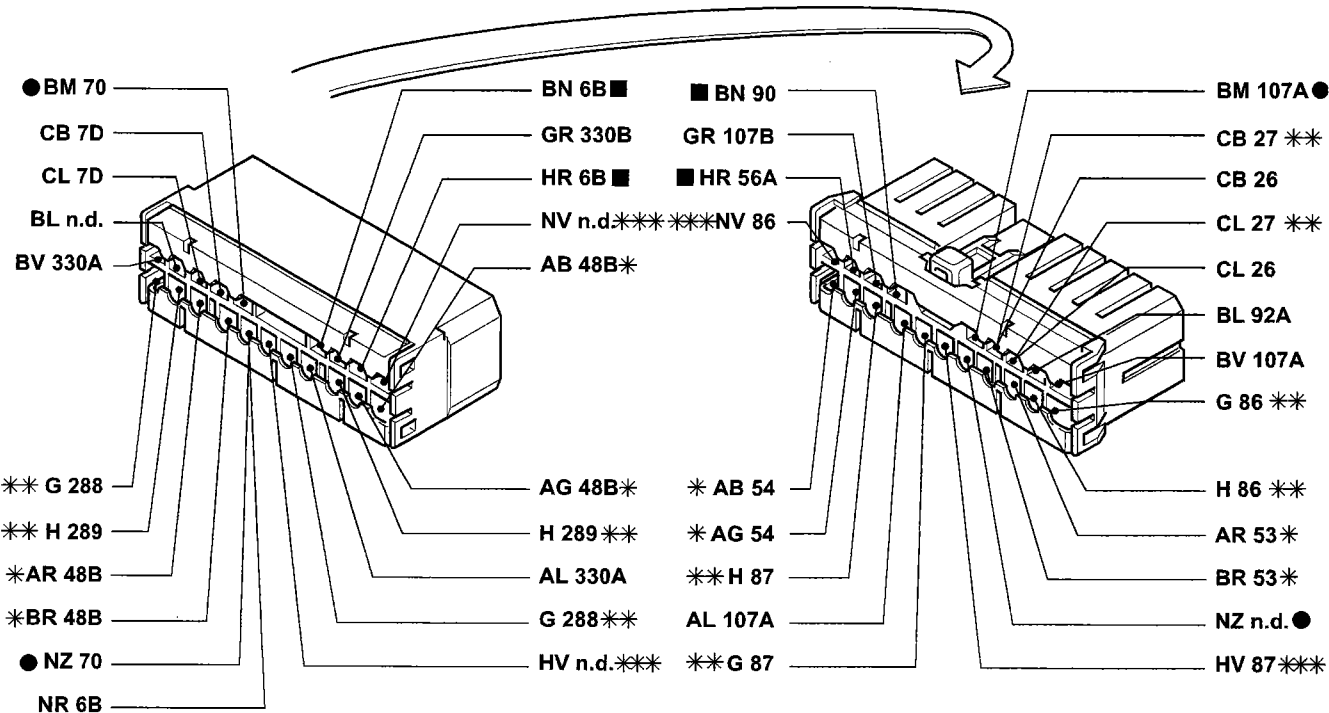
- A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel ideogram lights  
G Main beam headlamps warning light  
H EURO-BAG system failure warning light  
I Anti-lock braking system failure warning light  
J Fuel reserve circuit control module  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
L Fiat CODE device failure warning light  
M Injection system failure warning light Petrol/DS  
Q Front brake pad wear warning light  
R Handbrake applied/insufficient brake fluid level warning light  
V Speedometer control module  
V1 Speedometer  
W Rev counter  
X Water temperature gauge  
Z Milometer/trip meter  
Z1 Trip meter zeroing button

7 Steering column switch unit:

- D Flasher control  
E Switch for dipped/main beam headlamps

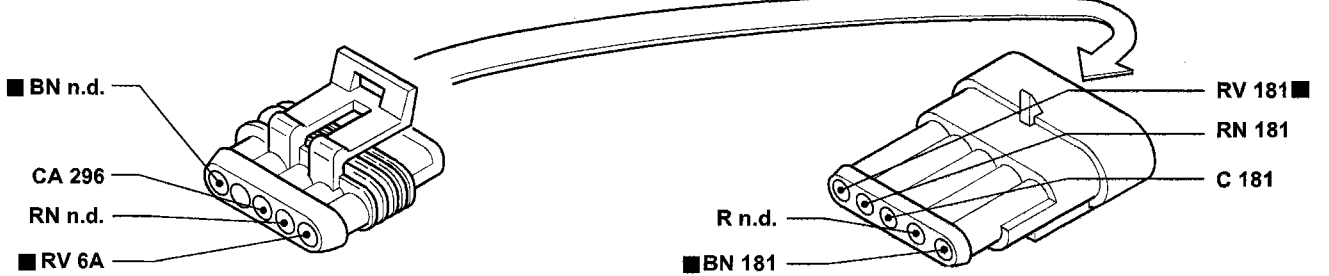
- F Switch for side lights  
H Switch for direction indicators  
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
22 Left dashboard earth  
28 Dashboard/longitudinal cables connection  
42 Right dashboard earth  
55 Connection between front cables/engine pre-wiring  
56 Fuel level gauge  
A Fuel level sensor  
B Electric fuel pump  
58 Light dimmer  
70 Dashboard/front cables connection  
88 Insufficient brake fluid level sensor  
89 Left brake pad wear sensor  
89A Left brake pad wear sensor cables connection  
90 Switch signalling handbrake applied  
95 Front/anti-lock brakes cables connection (A.B.S.)  
114 EURO-BAG electronic control unit  
117 Connection between EURO-BAG/dashboard cables  
131 Fiat-CODE electronic control unit  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
143 Alternator  
145 Starter motor  
181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)  
195 Injection/ignition electronic control unit (1581)  
262 Connection between dashboard/automatic transmission cables  
271 Electronic safety control unit for automatic transmission  
273 Automatic transmission electronic control unit  
279 Twin engine coolant temperature sender unit  
N.D. Ultrasound welding taped in cable loom

28 Dashboard/longitudinal cables connection.

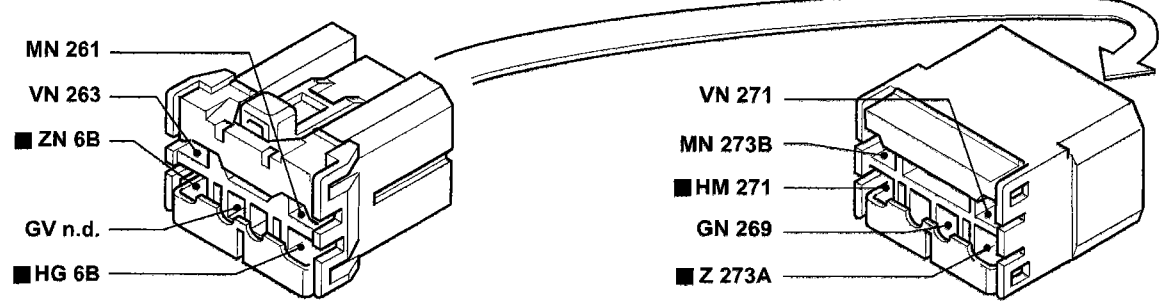


- \* Variant connection for versions with top of the range radio  
\*\* Variant connection for Brava versions  
\*\*\* Variant connection for Brava versions with alarm  
● Variant connection for versions with alarm

95 Front/anti-lock brakes cables connection (A.B.S.)

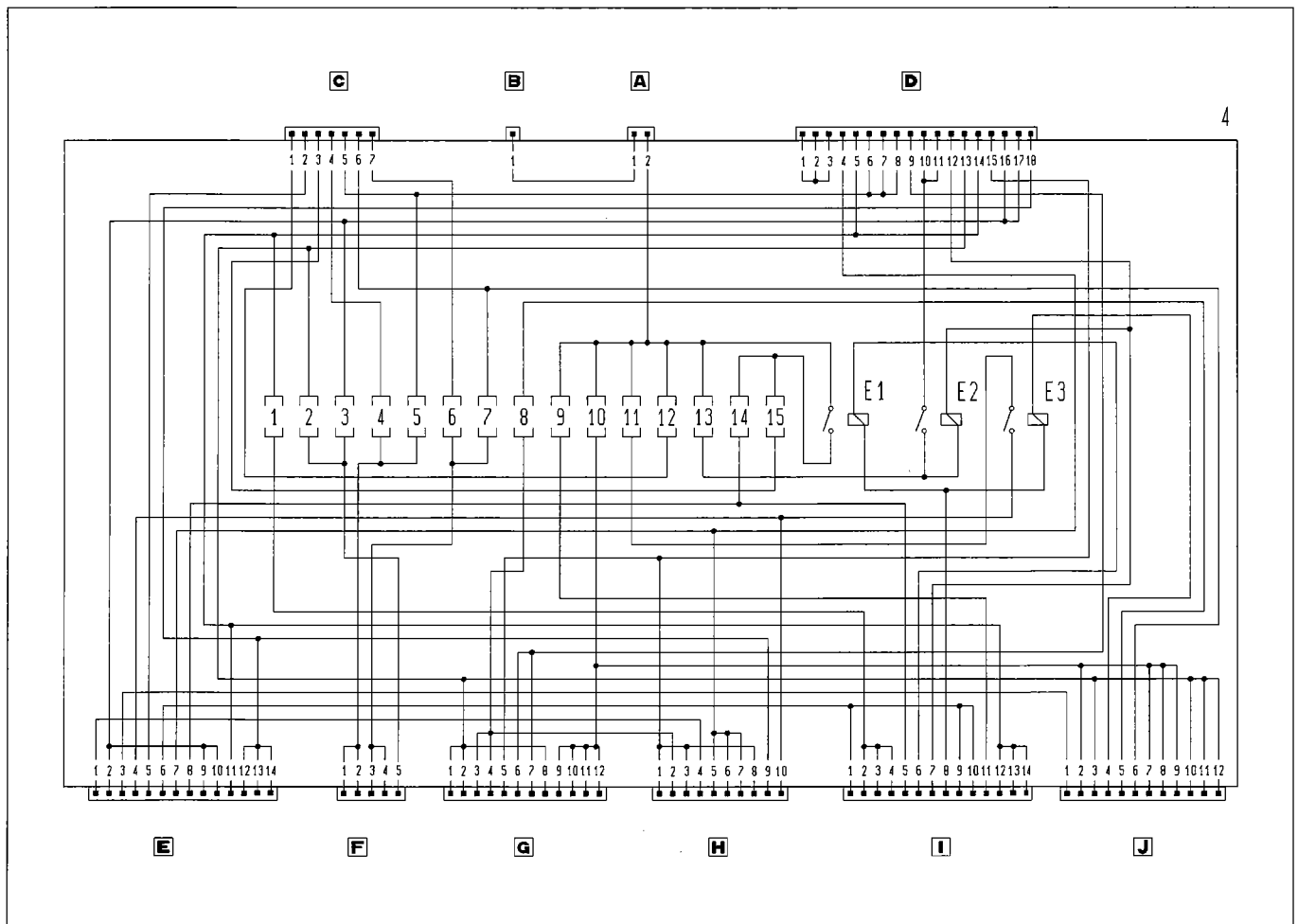


262 Connection between dashboard/automatic transmission cables



The cables in the wiring diagram are marked

**Junction unit - (See key at end of wiring diagrams)**



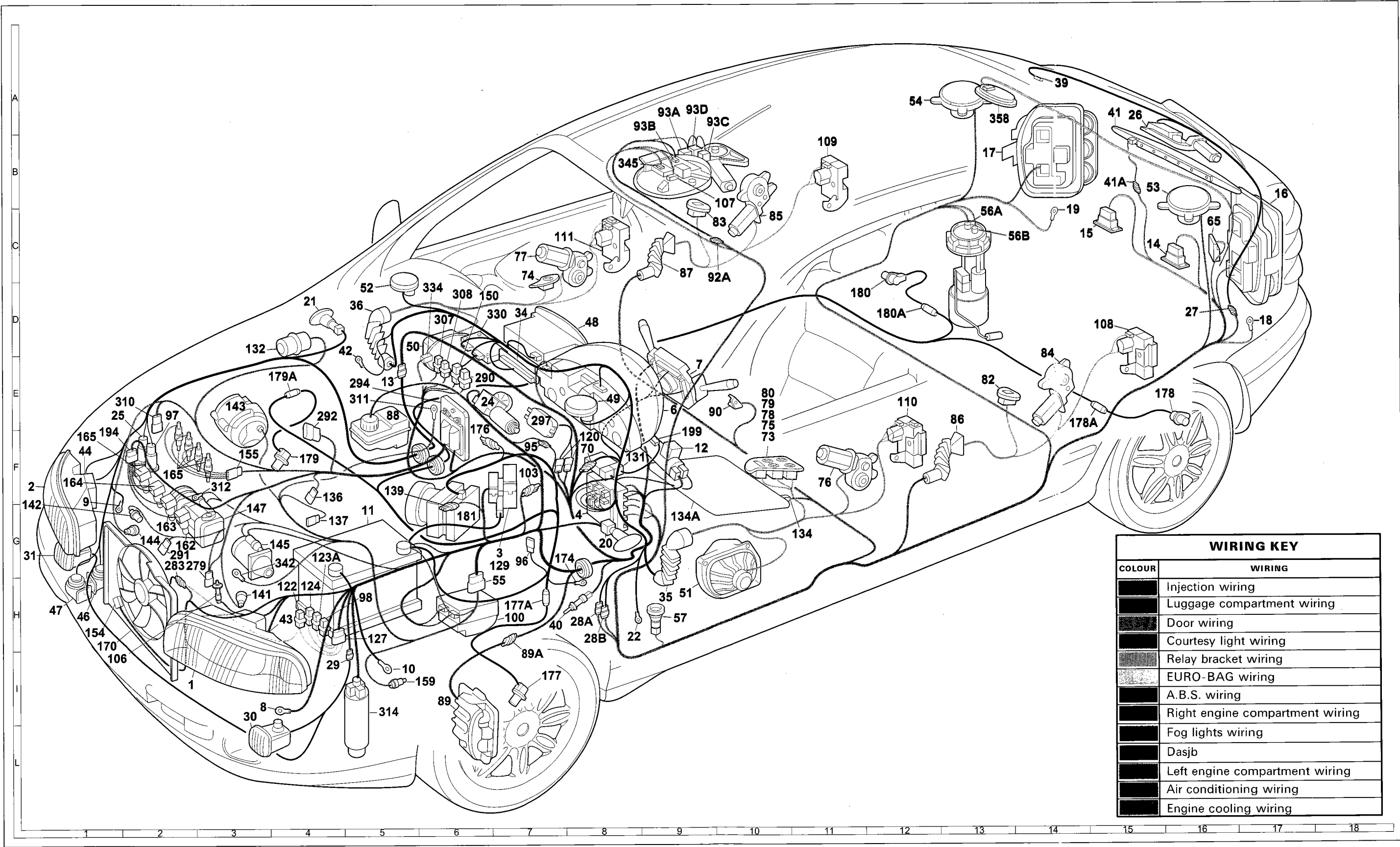
P4A313I01

- E1** Ignition discharge relay
- E2** Horn relay feed
- E3** Heated rear windscreen relay feed



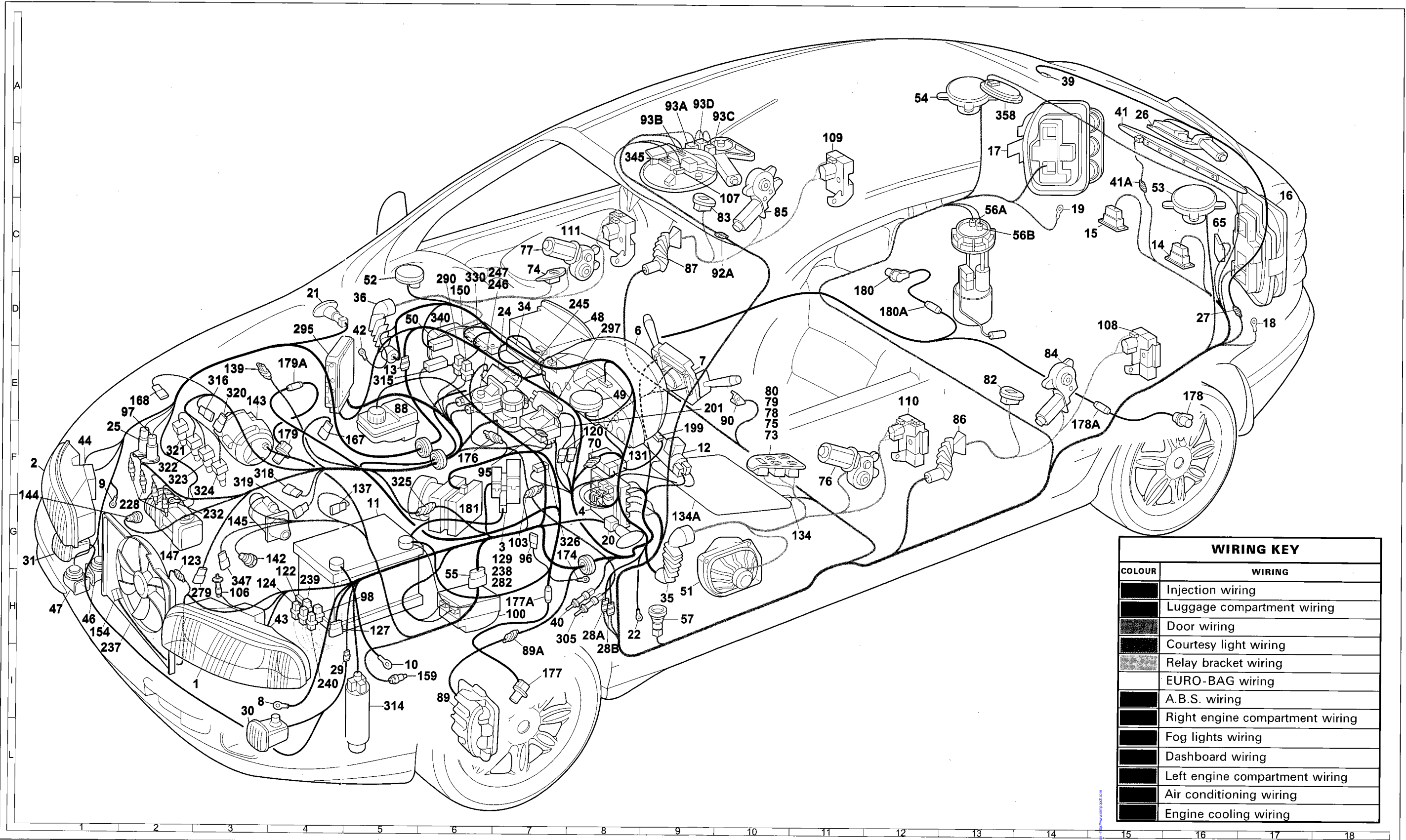
Electrical equipment  
Diagrammatic views  
55.

Diagrammatic view of location of cable looms and components (See key at end of wiring diagrams with the co-ordinates referring to the components)



55.

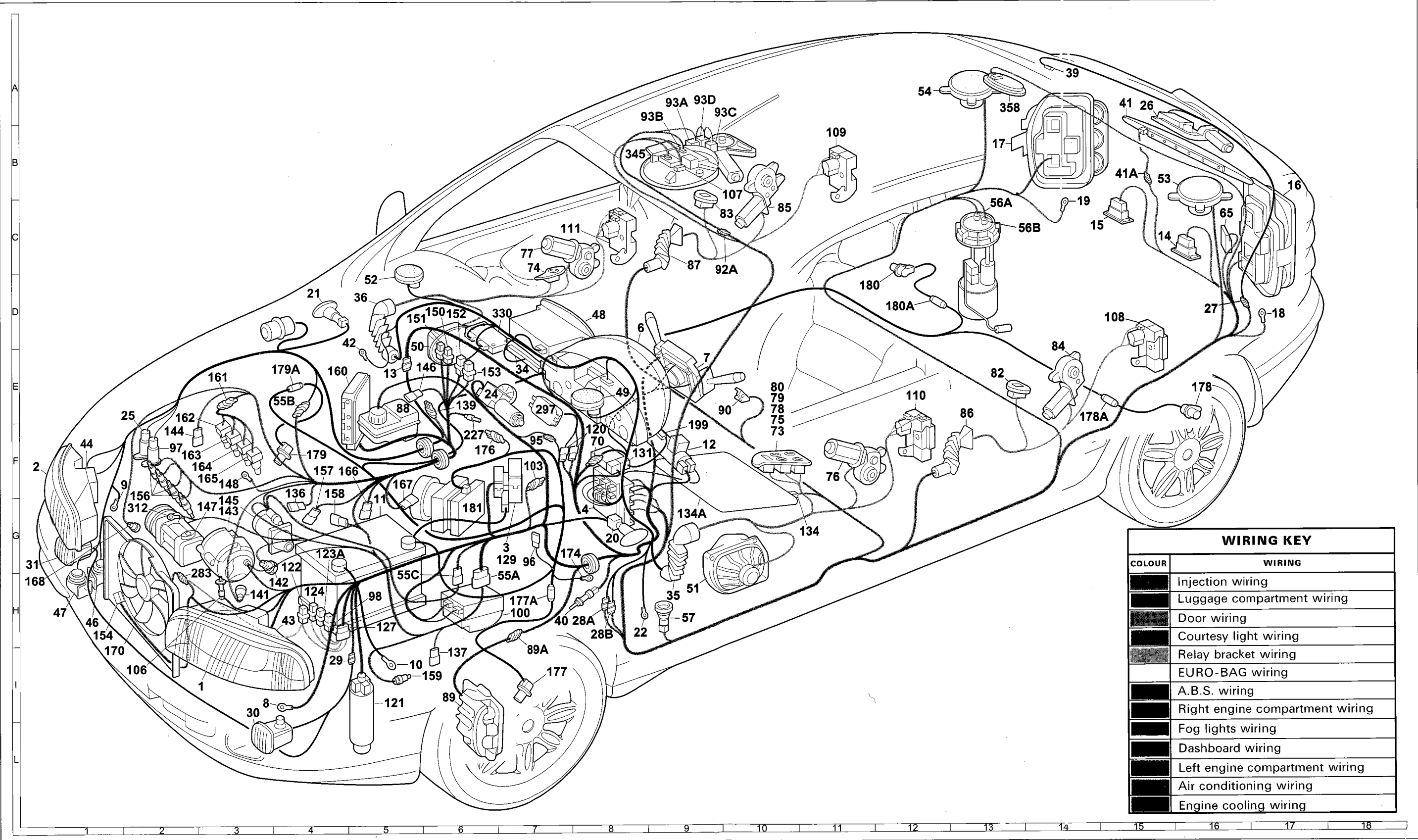
Diagrammatic view of location of cable looms and components (See key at end of wiring diagrams with the co-ordinates referring to the components)





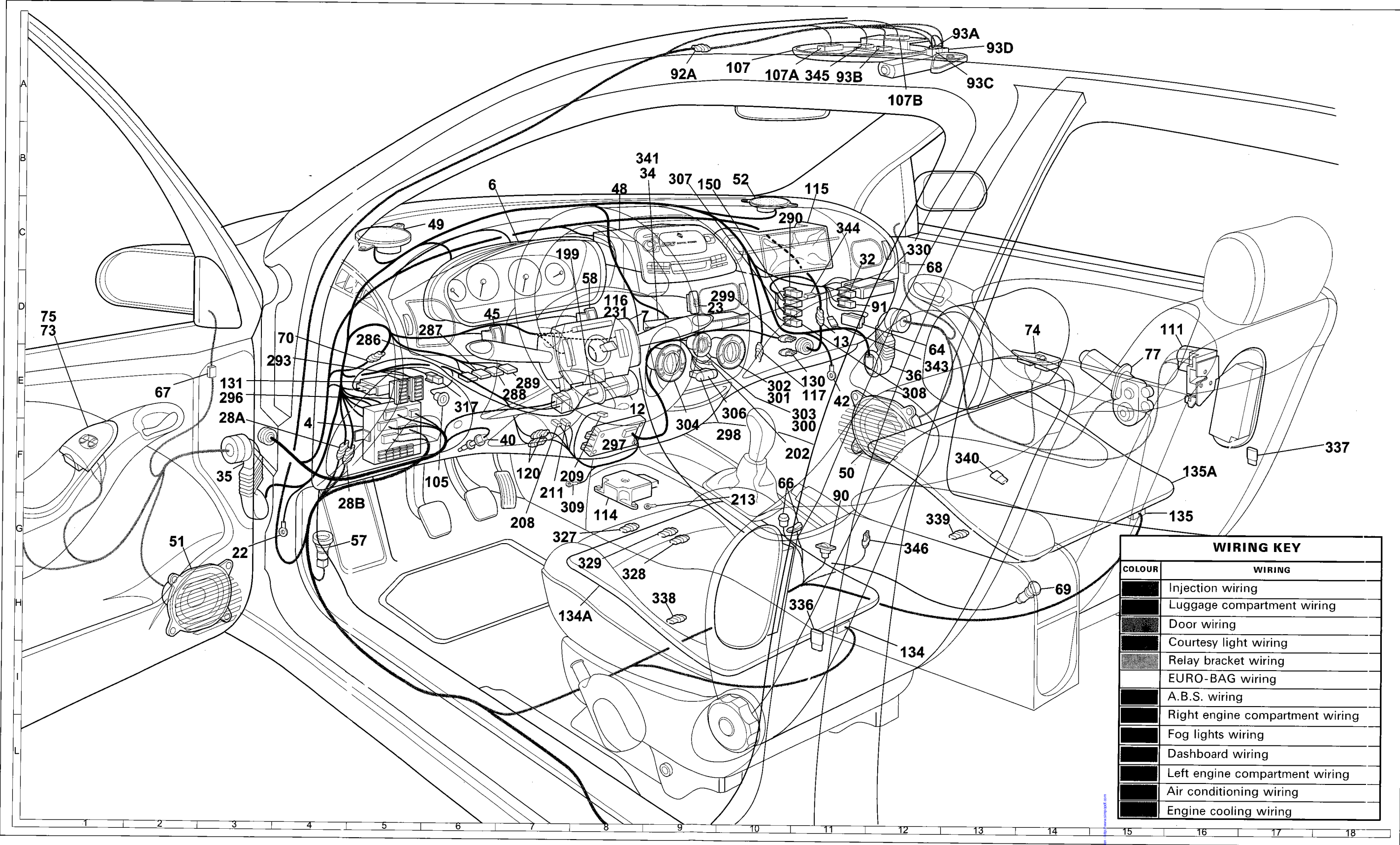
Electrical equipment  
Diagrammatic views  
55.

Diagrammatic view of location of cable looms and components (See key at end of wiring diagrams with the co-ordinates referring to the components)



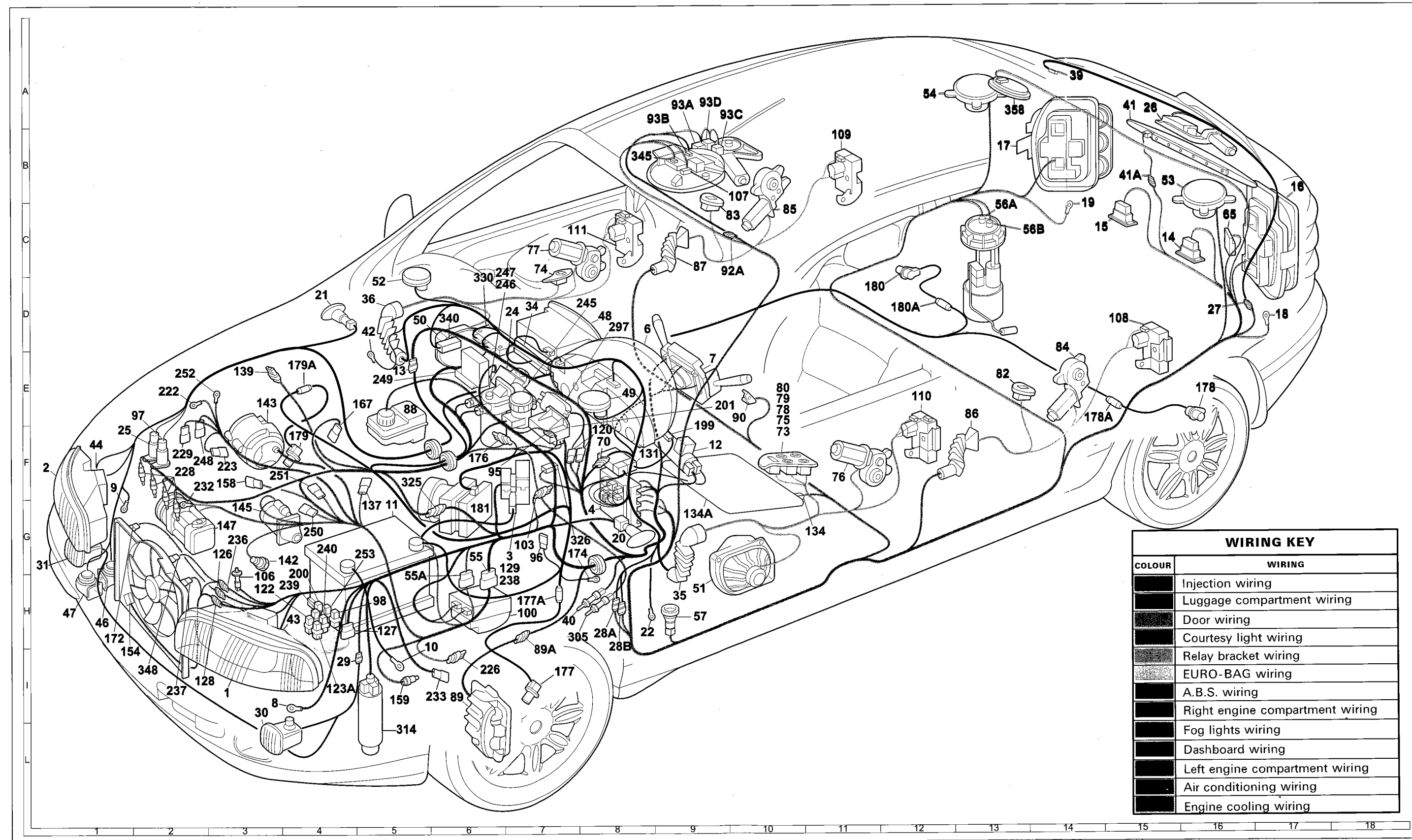
55.

Diagrammatic view of location of cable looms and components with A.B.I. (See key at end of wiring diagrams with the co-ordinates referring to the components)



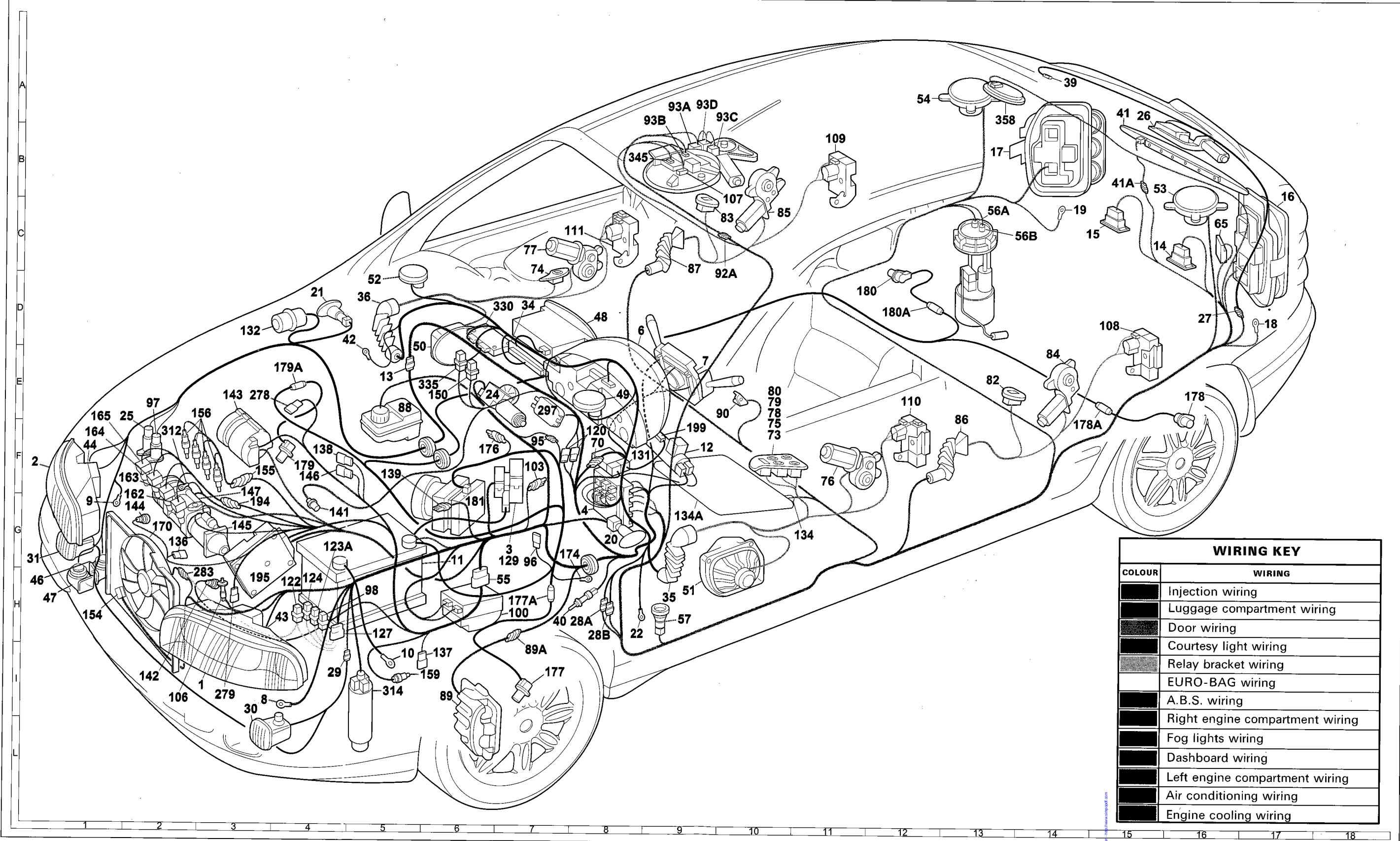


Diagrammatic view of location of cable looms and components (See key at end of wiring diagrams with the co-ordinates referring to the components)



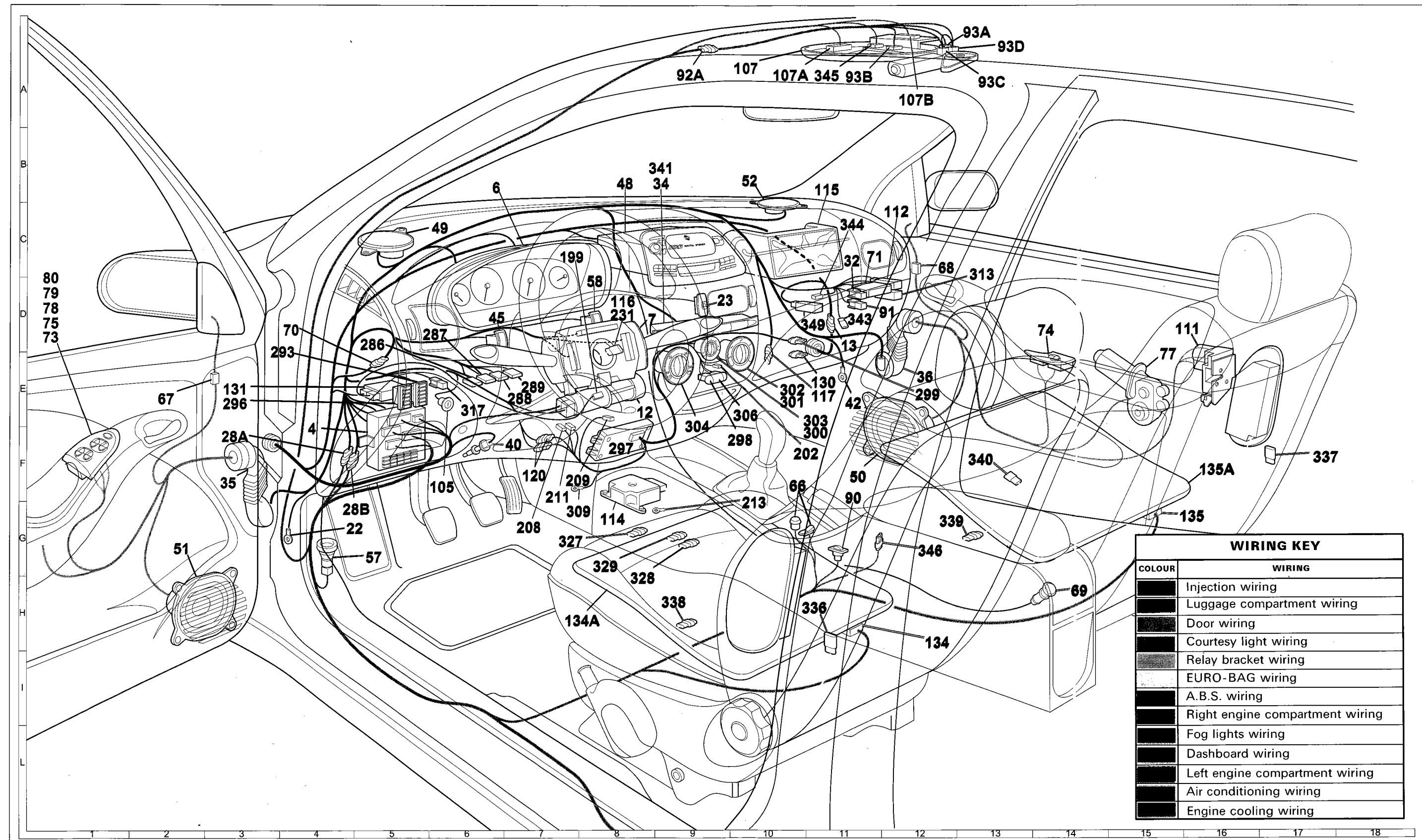
55.

Diagrammatic view of location of cable looms and components (See key at end of wiring diagrams with the co-ordinates referring to the components)



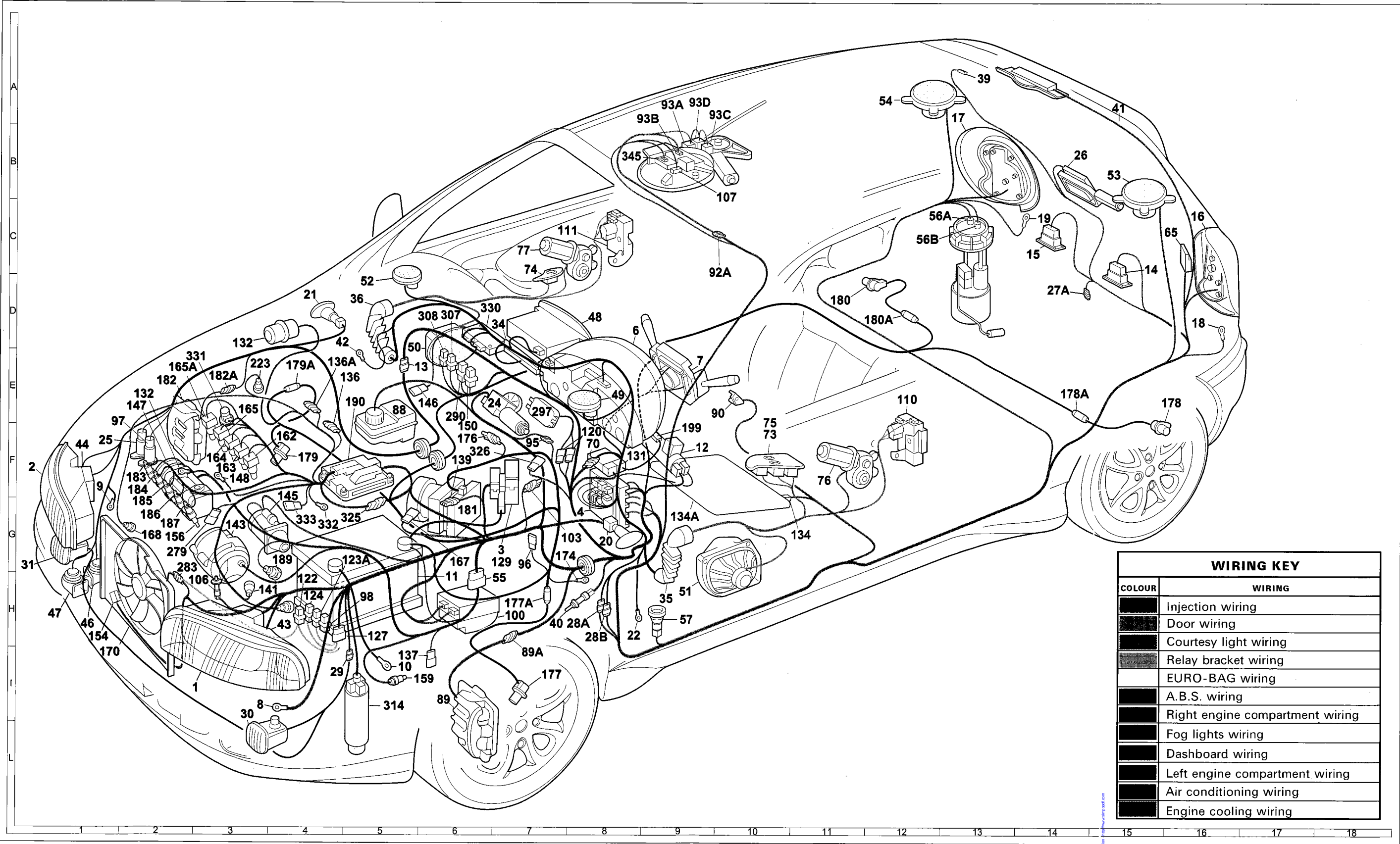


Diagrammatic view of location of cable looms and components without A.B.I. (See key at end of wiring diagrams with the co-ordinates referring to the components)



55.

Diagrammatic view of location of cable looms and components (See key at end of wiring diagrams with the co-ordinates referring to the components)





# Electrical equipment

## Bravo-Brava

### 98 range

#### 55.

#### Components key

- 1 Left front light cluster (I3\*)  
2 Right front light cluster (F1\*)  
3 Power fuse box (G7\*)  
A 30A protective fuse for injection system (60A for TD versions)  
B 40A protective fuse for ignition system  
C 80A fuse protecting additional options  
D 80A protective fuse for junction unit  
4 Junction unit: (G8\*) (E4\*\*)   
E1 Ignition discharge relay  
E2 Horn relay feed  
E3 Heated rear windscreen relay feed  
6 Instrument panel: (D8\*) (B6\*\*)   
A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
B1 Insufficient engine oil level warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel ideogram lights  
G Main beam headlamps warning light  
H EURO-BAG system failure warning light  
H1 Passenger EURO-BAG switched off warning light  
I Anti-lock braking system failure warning light  
J Fuel reserve circuit control module  
J1 Warning light signalling fuel reserve  
K Fuel level gauge  
L Fiat-CODE failure warning light  
M Injection system failure warning light  
N Maximum turbocharging pressure warning light  
O Heater plugs warning light  
P Automatic transmission failure warning light  
P1 Automatic transmission circuit control module  
Q Front brake pad wear warning light  
R Handbrake applied/insufficient brake fluid level warning light
- S Brake light failure signalling device electronic control module  
T Warning light signalling brake lights failure  
U Doors ajar warning light  
V Speedometer control module  
V1 Speedometer  
W Rev counter  
X Water temperature gauge  
Y Electronic module  
Y1 Speed control module  
Z Milometer/trip meter  
Z1 Trip meter zeroing button  
Z2 Milometer/trip meter light  
7 Steering column switch unit: (E9\*) (D8\*\*)   
A Windscreen wiper speed control switch  
B Windscreen washer/headlamp washer/rearscreen washer control switch  
C Rearscreen wiper control switch  
D Flasher control  
E Dipped beam headlamps/main beam headlamps control switch  
F Switch for side lights  
G Direction indicators/hazard w/lights switch  
H Switch for direction indicators  
I Horn control
- 8 Left front earth (H4\*)  
9 Right front earth (F2\*)  
10 Earth for battery on bodysheIl (I5\*)  
11 Battery (F5\*)  
12 Ignition switch (F9\*) (E8\*\*)   
13 Front right/left cables connection (E5\*) (D11\*\*)   
14 Left no. plate light (C15\*)  
15 Right no. plate light (C14\*)  
16 Left rear light cluster (B17\*)  
17 Right rear light cluster (B13\*)  
18 Left rear earth (D17\*)  
19 Right rear earth (C14\*)  
20 Left front side direction indicator (G8\*)  
21 Right front side direction indicator (D4\*)  
22 Left dashboard earth (H8\*) (G3\*\*)   
23 Hazard warning lights control switch (D9\*)   
A Hazard warning lights warning light  
B Hazard warning lights switch  
C Hazard warning lights ideogram light
- 24 Windscreen wiper motor (E6\*)  
25 Electric wind/rearscreen washer pump (E2\*)  
26 Rearscreen wiper motor (A15\*)

- 27 Contact board for rear connections with luggage compartment light switch incorporated (D16\*)  
27A Button for luggage compartment light, switching on alarm and signalling boot lid open  
28 Dashboard/longitudinal cables connection (H8\*) (G4\*\*)   
28A Dashboard/longitudinal cables connection (H8\*) (E3\*\*)   
29 Connection between front/fog light cables (H4\*)  
30 Left fog lamp (I3\*)  
31 Right fog lamp (G1\*)  
32 Fog lights relay (C11\*\*)   
33 20A protective fuse for fog lights (C9\*)  
34 Switch control panel: (E7\*) (B8\*\*)   
A Anti-theft warning light on  
B Rear fog lamps switch  
C Rear fog lamps relay feed  
D Rear fog lamps warning light  
E Heated rear windscreen switch  
F Heated rear windscreen warning light  
G Switch control unit ideogram light  
H Fog lights warning light  
I Fog lights switch  
L Outside temperature control switch  
35 Dashboard/left front door cables connection (H9\*) (F3\*\*)   
36 Dashboard/right front door cables connection (D5\*) (D12\*\*)   
37 Left external rear view mirror heating resistance  
38 Right external rear view mirror heating resistance  
39 Heated rear windscreen (A14\*)  
40 Vehicle brake lights switch (H7\*) (F7\*\*)   
41 Additional brake light (A15\*)  
41A Additional rear brake light cables connection (B15\*)  
42 Right dashboard earth (D5\*) (E11\*\*)   
43 Left headlamp alignment correction motor (H4\*)  
44 Right h/lamp align. correction motor (F1\*)  
45 Headlamp alignment control unit (D6\*\*)   
46 Left electric horn (H1\*)  
47 Right electric horn (H1\*)  
48 Radio receiver with clock (D8\*) (B8\*\*)   
49 Left front speaker (tweeter) (E8\*) (C6\*\*)   
50 Right front speaker (tweeter) (D5\*) (F11\*\*)

- 51 Speaker in left front door (H9\*) (G2\*\*)   
52 Speaker in right front door (D5\*) (B10\*\*)   
53 Left rear speaker (B15\*)  
54 Right rear speaker (A12\*)  
55 Connection between front cables/engine pre-wiring (H6\*)  
55A Connection between front/engine pre-wiring cables (H7\*)  
55B Connection between front/engine pre-wiring cables (E4\*)  
55C Connection between front/engine pre-wiring cables (H5\*)  
56 Fuel level gauge  
A Fuel level sensor (C13\*)  
B Electric fuel pump (C13\*)  
57 Inertia switch (H9\*) (G5\*\*)   
58 Light dimmer (C7\*\*)   
64 Glove compartment light bulb with switch incorporated (D12\*\*)   
65 Luggage compartment light bulb/anti-theft device on (C16\*)  
66 Electrically adjusted external rear view mirrors control panel (F10\*\*)   
67 Left external electrically adjustable rear view mirror (E2\*\*)   
68 Right external electrically adjustable rear view mirror (C12\*\*)   
69 Cigar lighter (H14\*\*)   
70 Dashboard/front cables connection (F8\*) (D4\*\*)   
71 Electric front windows control unit (C11\*\*)   
72 30A fuse protecting electric front windows  
73 Left front electric window control panel (F10\*) (D1\*\*)   
74 Right front electric window control panel (C7\*) (D14\*\*)   
75 Right front electric window control panel on left front door (F10\*) (D1\*\*)   
76 Left front electric window motor (F11\*)  
77 Right front electric window motor (C7\*) (D15\*\*)   
78 Left rear electric window control panel on left rear door (E10\*) (D1\*\*)   
79 Right rear electric window control panel on right rear door (E10\*) (D1\*\*)   
80 Electric rear windows inhibitor switch (E10\*) (D1\*\*)   
81 30A fuse protecting electric rear windows

- 82 Left rear electric window control panel on left rear door (E13\*)  
83 Right rear electric window control panel on right rear door (C9\*)  
84 Left rear electric window motor (D14\*)  
85 Right rear electric window motor (C10\*)  
86 Longitudinal/left rear door cables connection (E13\*)  
87 Longitudinal/right rear door cables connection (C9\*)  
88 Insufficient brake fluid level sensor (E5\*)  
89 Left brake pad wear sensor (I6\*)  
89A Connection for left brake pad wear sensor cables (I7\*)  
90 Switch signalling handbrake applied (E10\*) (F11\*\*)   
91 Power relay (D12\*\*)   
92 20A protective fuse for electric sun roof  
92A Electric sun roof cables connection (C10\*) (A9\*\*)   
93A Electrically operated sun roof control unit (A9\*) (A13\*\*)   
93B Electrically operated sun roof control button (A9\*) (A11\*\*)   
93C Electrically operated sun roof motor (A9\*) (B13\*\*)   
93D Electrically operated sun roof end of travel switch (A9\*) (A13\*\*)   
95 Front/anti-lock brakes cables connection (A.B.S.) (F7\*)  
96 60A power fuse protecting electrical equipment (G7\*)  
97 Electric headlamp washer pump (F2\*)  
98 Intermit. device for h/lamp washer (H5\*)  
98 Headlamp washer intermittent device  
100 Alarm electronic control unit (H7\*)  
103 Diagnostic socket for alarm (F7\*)  
105 Alarm device off switch (F6\*\*)   
106 Alarm on switch (H2\*)  
107A Central locking remote control receiver (B10\*) (A10\*\*)   
107B Courtesy lights (B10\*) (A12\*\*)   
108 Left rear central locking/alarm on switch (D15\*)  
109 Right rear central locking/alarm on switch (B11\*)  
110 Left front central locking/alarm on switch (E12\*)  
111 Right front central locking/alarm on switch (C7\*) (D16\*\*)

- 112 Central locking system control unit (C12\*\*)   
114 EURO-BAG electronic control unit (G8\*\*)   
115 Passenger EURO-BAG (B11\*\*)   
116 Driver's EURO-BAG (D8\*\*)   
117 Connection between EURO-BAG/dashboard cables (E11\*\*)   
120A Connection for air conditioning cables (F8\*) (F7\*\*)   
120B Connection for air conditioning cables (F8\*) (F7\*\*)   
121 Three stage pressure switch (I5\*)  
122 Engine cooling fan low speed relay feed (G4\*)  
123 Engine cooling fan high speed timer (G3\*)  
123A Engine cooling fan high speed relay feed (H5\*)  
124 Air conditioning compressor relay feed (H4\*)  
126 Connection between front/air conditioning cables (G3\*)  
127 Connection between left front cable/cable on relay holder bracket (H5\*)  
128 Connection between front/air conditioning cables (I2\*)  
129 Power fuse protecting engine cooling fan (G7\*)  
130 Diagnostic socket for EURO-BAG (E11\*\*)   
131 Fiat CODE electronic control unit (F8\*) (E3\*\*)   
132 Petrol vapour cut out solenoid valve (canister) (E2\*)  
134 Connection between rear/driver's heated seat cables (G11\*) (H12\*\*)   
134A Heated driver's seat heater pad (G9\*) (H8\*\*)   
135 Connection between rear/passenger heated seat cables (G15\*\*)   
135A Passenger heated seat heater pad (F16\*\*)   
136 Detonation sensor (F3\*)  
136A Detonation sensor (E5\*)  
137 Vehicle speed sensor (G5\*)  
138 Idle adjustment actuator motor (F4\*)  
139 Diagnostic socket for injection system (E3\* for TD) (F6\* for petrol)  
141 Heated Lambda sensor (H3\*)  
142 Switch signalling insufficient engine oil pressure (G4\*TD) (F1\*1242) (I2\*1581) (H4\*1747)

- 143 Alternator (E3\*)  
144 Rpm and T.D.C. sensor (F2\*)  
145 Starter motor (G3\*)  
146 Potentiometer on butterfly valve (E6\*)  
147 Compressor for air conditioning (F3\*)  
147A Compressor for air conditioning  
148 Earth for electronic injection (F3\*)  
150 Injection system relay feed (D6\*) (C11\*\*)   
151 Lambda sensor, electric fuel pump, injector relay feed (D5\*)  
152 10A fuse protecting injection system (25A for 1581, 30A for 1747, 7.5A for 1998 ) (D6\*)  
153 10A protective fuse for electric fuel pump, Lambda sensor (15A for 1747) (E6\*)  
154 Engine cooling fan (H1\*)  
155 Ignition coils (F3\*)  
156 Spark plugs (F2\*)  
157 Water temperature sensor for injection system (F4\*)  
158 Water temperature sensor for instrument (F4\*)  
159 Reversing lights control switch (I6\*)  
160 Injection/ignition electronic control unit (1747) (E4\*)  
161 Ignition power module (E3\*)  
162 Injector (1\*) (E2\*)  
163 Injector (2\*) (F2\*)  
164 Injector (3\*) (F2\*)  
165 Injector (4\*) (F3\*)  
165A Injector (5\*) (F2\*)  
166 Idle adjustment actuator (F5\*)  
167 Air flow meter (F5\*)  
168 Timing sensor (H1\*)  
170 Engine cooling fan limiting resistance (I1\*)  
171 Heater unit cables connection  
172 Two level thermal switch (H1\*)  
172 Power earth for anti-lock brakes (A.B.S.) (I5\*)  
176 Diagnostic socket for anti-lock brakes (A.B.S.) (F6\*)  
177 Sensor on left front wheel for anti-lock brakes (A.B.S.) (I7\*)  
177A Connection for cable with anti-lock brakes (A.B.S.) left front wheel sensor (H7\*)  
178 Sensor on left rear wheel for anti-lock brakes (A.B.S.) (E16\*)  
178A Connection for cable with anti-lock brakes (A.B.S.) left rear wheel sensor (E15\*)

- 179 Sensor on right front wheel for anti-lock brakes (A.B.S.) (F4\*)  
179A Connection for cable with anti-lock brakes (A.B.S.) right front wheel sensor (E4\*)  
180 Sensor on right rear wheel for anti-lock brakes (A.B.S.) (D12\*)  
180A Connection for cable with anti-lock brakes (A.B.S.) right rear wheel sensor (D12\*)  
181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.) (G6\*)  
182 Right brake pad wear sensor (E2\*)  
182A Right brake pad wear sensor cables connection (E3\*)  
183 Ignition coil (1\*) (F2\*)  
184 Ignition coil (2\*) (F2\*)  
185 Ignition coil (3\*) (F2\*)  
186 Ignition coil (4\*) (G2\*)  
187 Ignition coil (5\*) (G2\*)  
189 Phase transformer (G4\*)  
190 Injection/ignition electronic control unit (1998) (E5\*)  
194 Connection between injection cables/injector bridge (F2\*)  
195 Injection/ignition electronic control unit (1581) (H3\*)  
198 5A fuse protecting injection/ignition electronic control unit  
199 Aerial for Fiat-CODE (F9\*) (C7\*\*)   
201 Heater plugs control unit (E9\*)  
202 Heater/air conditioning lights (E10\*\*)   
207 Heater/air conditioning system speed control switch  
208 Limiting resistor for heating/air conditioning system (G7\*\*)   
209 Outside/recirculation air flap control actuator (F7\*\*)   
211 Electronic thermostat ( N.T.C. ) (F7\*\*)   
213 Earth for EURO-BAG (F10\*\*)   
222 Earth for fuel system (E2\*)  
223 Rpm sensor (F3\*)  
226 Diagnostic socket for Fiat code system (1910 TD) (I6\*)  
227 Diagnostic socket for injection system (1747) (F6\*)  
228 Heater plugs (G2\*)  
229 Engine cut out electro-stop (F2\*)  
231 Clock spring connection (D8\*\*)   
232 Earth for compressor (G3\*)  
233 Thermostatic relay on water pump (I6\*)

- 279 Twin engine coolant temperature sender unit (H2\*)  
282 7.5A fuse protecting Fiat-CODE/ electronic injection (30 for JTD) (F7\*\*)   
283 Front cable connection/resistor (H3\*)  
286 Short circuit connection (D5\*\*)   
287 Short circuit connection (D6\*\*)   
288 Short circuit connection (E7\*\*)   
289 Short circuit connection (E7\*\*)   
290 Electric fuel pump relay feed (D6\*) (C10\*\*)   
291 Sensor for power assisted steering pump  
292 Modular actuator (E4\*)  
293 Fuse carrier base on dashboard cable (E4\*\*)   
A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors  
B 15A fuse protecting fog lights relay  
C 25A fuse protecting Electric rear windows (non existent for the SX versions)  
D 25A fuse protecting A.B.I. control unit; Central locking control unit  
E 20A protective fuse current socket; Cigar lighter; Electric seats ; Electric roof  
F 10A fuse protecting EURO- BAG  
294 Injection/ignition electronic control unit 1242 (E5\*)  
295 Injection/ignition electronic control unit 1910 JTD (D4\*)  
296 Fuse carrier base on front cable (E3\*\*)   
A 7.5A fuse protecting cooling system/- electronic injection; C.A. system; Alarm  
B 20A protective fuse Windscreen wiper with A.B.I. or without A.B.I.  
C 7.5A fuse protecting Fiat-CODE cooling system/electronic injection  
D 10A fuse protecting A.B.S.  
E 7.5A fuse protecting climate control system  
F 7.5A fuse protecting electronic injection system/Fiat-CODE  
297 Air conditioning control unit (E7\*) (E8\*\*)   
298 Recirculation control for heater/air conditioning (F10\*\*)   
A Air conditioning on switch  
B Recirculation control switch  
C Ventilation sensor  
299 Diagnostic socket for heater/air conditioning (D10\*\*)

- 300 Car interior fan electronic transformer (E11\*\*)   
301 Car interior mixture control actuator (E10\*\*)   
302 Maximum demisting control switch (E10\*\*)   
303 Internal ventilation potentiometer (E11\*)  
304 Potentiometer for car interior temperature (E10\*)  
305 Potentiometer on accelerator pedal (H7\*)  
306 Treated air sensor (F10\*\*)   
307 15A fuse protecting injection system (D6\*) (C12\*\*)   
308 15A fuse protecting canister solenoid valve (D6\*) (E12\*\*)   
309 Earth for air conditioning unit (G8\*\*)   
310 Absolute pressure and air temperature sensor (E2\*)  
311 Earth for electronic injection control unit (E5\*)  
312 Power earth for electronic injection control unit (G2\*)  
313 Relay for reversing signal for air conditioning (D12\*\*)   
314 Four stage pressure switch (I5\*)  
315 7.5A fuse protecting electronic injection control unit 1910 JTD (E5\*)  
316 Fuel pressure regulator for injection system 1910 JTD (E3\*)  
317 Main beam headlamps remote control switch (E6\*\*)   
318 Fuel temperature sensor (F3\*)  
319 Fuel pressure sensor (F3\*)  
320 Turbo pressure regulator (E3\*)  
321 Injector 1\* for injection 1910 JTD (F2\*)  
322 Injector 2\* for injection 1910 JTD (F2\*)  
323 Injector 3\* for injection 1910 JTD (F2\*)  
324 Injector 4\* for injection 1910 JTD (F3\*)  
325 Connection between injection/left front cables (F5\*)  
326 Switch on clutch (G8\*)  
327 Connection with bridge on floor left EURO-BAG (G7\*\*)   
328 Connection with bridge on floor right EURO-BAG (G8\*\*)   
329 Connection with bridge on floor (G8\*\*)   
330 A.B.I. control unit (D7\*) (C12\*\*)   
331 Phase transformer injector (E3\*)  
332 Earth on electronic control unit (G4\*)  
333 Motorized butterfly casing (G4\*)  
334 Diagnostic cable connection for 1242 (D6\*)  
335 15A fuse protecting Lambda sensor (E5\*)

- 336 Driver's sensor for EURO-BAG (H11\*\*)   
337 Passenger sensor for EURO-BAG (F16\*\*)   
338 Driver's SIDE BAG (H9\*\*)   
339 Passenger SIDE BAG (G12\*\*)   
340 Passenger presence sensor (D6\*) (F13\*\*)   
341 Multi-purpose switch for electric mirrors (B8\*\*)   
342 Power earth for electronic injection (G4\*)  
343 Connection for preparation for radio phone (E12\*\*)   
344 Connection for cable for preparation for electric aerial (E12\*\*)   
345 Connection for preparation for telepass (B8\*) (A11\*\*)   
346 Current socket (G12\*\*)   
347 Engine oil level sensor (G3\*)  
348 Remote control switch for engine cooling fan (I2\*)  
349 Engine oil level control unit (D11\*)  
350 30A relay for heating engine coolant  
351 Safety relay for heating engine coolant  
352 50A relay for heating engine coolant  
353 70A fuse protecting engine coolant heater plugs  
354 N.T.C. sensor on heating supply pipe  
355 Engine coolant heater plugs  
356 Heater plugs relay feed earth  
357 Engine coolant heater plugs control unit  
358 Rear courtesy light (A13\*)

N.D. Ultrasound welding taped in cable loom

#### Cable colour code

|           |                  |           |                   |
|-----------|------------------|-----------|-------------------|
| <b>A</b>  | Light blue       | <b>AG</b> | Light blue-Yellow |
| <b>B</b>  | White            | <b>AN</b> | Light blue-Black  |
| <b>C</b>  | Orange           | <b>AR</b> | Light blue-Red    |
| <b>G</b>  | Yellow           | <b>AV</b> | Light blue-Violet |
| <b>H</b>  | Grey             | <b>BG</b> | White-Yellow      |
| <b>L</b>  | Blue             | <b>BL</b> | White-Blue        |
| <b>M</b>  | Brown            | <b>BN</b> | White-Black       |
| <b>N</b>  | Black            | <b>BR</b> | White-Red         |
| <b>R</b>  | Red              | <b>BV</b> | White-Green       |
| <b>S</b>  | Pink             | <b>BZ</b> | White-Violet      |
| <b>V</b>  | Green            | <b>CA</b> | Orange-Light blue |
| <b>Z</b>  | Violet           | <b>CB</b> | Orange-White      |
| <b>AB</b> | Light blue-White | <b>CN</b> | Orange-Black      |
| <b>GN</b> | Yellow-Black     | <b>MB</b> | Brown-White       |
| <b>GL</b> | Yellow-Blue      | <b>MN</b> | Brown-Black       |
| <b>GR</b> | Yellow-Red       | <b>NZ</b> | Black-Violet      |
| <b>GV</b> | Yellow-Green     | <b>RB</b> | Red-White         |
| <b>HG</b> | Grey-Yellow      | <b>RG</b> | Red-Yellow        |
| <b>HN</b> | Grey-Black       | <b>RN</b> | Red-Black         |
| <b>HR</b> | Grey-Red         | <b>RV</b> | Red-Green         |
| <b>HV</b> | Grey-Green       | <b>SN</b> | Pink-Black        |
| <b>LB</b> | Blue-White       | <b>VB</b> | Green-White       |
| <b>LG</b> | Blue-Yellow      | <b>VN</b> | Green-Black       |
| <b>LN</b> | Blue-Black       | <b>VR</b> | Green-Red         |
| <b>LR</b> | Blue-Red         | <b>ZB</b> | Violet-White      |
| <b>LV</b> | Blue-Green       |           |                   |

\* Co-ordinates of components in the complete diagrammatic views complete from page 161 to page 166 (see engines concerned)  
\*\* Co-ordinates of components in the diagrammatic views of the dashboard from page 167 to page 168



**55.**

page

|                   |    |
|-------------------|----|
| - Wiring diagrams | 1  |
| - Key             | 41 |

| DESCRIPTION                                                                                                                                                                                                                                                                                                   | Bravo- Brava  16V |           |           |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|
|                                                                                                                                                                                                                                                                                                               | SX                                                                                                   | GT        | ELX       | HSX       |
| Fiat- CODE device and warning light                                                                                                                                                                                                                                                                           | <b>5</b>                                                                                             | <b>5</b>  | <b>5</b>  | <b>5</b>  |
| Version: with automatic air conditioning<br>Engine cooling - Engine coolant temperature gauge                                                                                                                                                                                                                 | <b>7</b>                                                                                             | <b>7</b>  | <b>7</b>  | <b>7</b>  |
| Diagnostic socket connections                                                                                                                                                                                                                                                                                 | <b>9</b>                                                                                             | <b>9</b>  | <b>9</b>  | <b>9</b>  |
| Version without automatic air conditioning<br>Engine cooling - Engine coolant temperature gauge - Car interior fan                                                                                                                                                                                            | <b>11</b>                                                                                            | <b>11</b> | <b>11</b> | <b>11</b> |
| Automatic air conditioning with A.B.I.                                                                                                                                                                                                                                                                        |                                                                                                      | <b>13</b> | <b>13</b> | <b>13</b> |
| Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning logiht - Injection system failure - Rev counter - Speedometer                                                                                                                          | <b>15</b>                                                                                            | <b>15</b> | <b>15</b> | <b>15</b> |
| Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning logiht - Rev counter | <b>17</b>                                                                                            | <b>17</b> | <b>18</b> | <b>18</b> |
| Instrument panel connections                                                                                                                                                                                                                                                                                  | <b>21</b>                                                                                            | <b>21</b> | <b>23</b> | <b>23</b> |
| Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights                                                                                                                                                                                            | <b>25</b>                                                                                            | <b>25</b> | <b>27</b> | <b>27</b> |
| Version without A.B.I.<br>Windscreen wash/wipe - Rearscreen wash/wipe - Horns - Heated rear windscreen and warning light - Headlamp washer                                                                                                                                                                    | <b>29</b>                                                                                            | <b>29</b> | <b>29</b> | <b>29</b> |
| Version with A.B.I.<br>Windscreen wash/wipe - Rearscreen wash/wipe - Horns - Heated rear windscreen and warning light - Headlamp washer                                                                                                                                                                       |                                                                                                      | <b>31</b> | <b>31</b> | <b>31</b> |



### Electrical symbols

|                                                                                     |                                                      |                                                                                     |                                          |                                                                                       |                                             |
|-------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------|
|    | Position                                             |    | Choke                                    |    | Switch discharge                            |
|    | Main beam headlamps                                  |    | Water in fuel filter                     |    | Dipped headlamps                            |
|    | Heated seat                                          |    | Heater plugs                             |    | Central locking direction indicators signal |
|    | Seat belts                                           |    | Turbocharging pressure                   |    | Electric horns                              |
|    | Heated rear windscreen                               |    | Rear fog lamp                            |    | Left direction indicator                    |
|  | Handbrake applied and insufficient brake fluid       |  | Fog light                                |  | Right direction indicator                   |
|  | A.B.S.                                               |  | Brake pad wear                           |  | Engine cooling                              |
|  | Hazard warning                                       |  | Turbocharger pressure                    |  | Windscreen wiper                            |
|  | Direction indicator                                  |  | Automatic transmission fluid temperature |  | Electronically operated sun roof            |
|  | Handbrake applied and insufficient brake fluid level |  | Speed limit                              |  | Catalytic silencer temperature              |
|  | Recharging                                           |  | Fuel gauge                               |  | Resistance                                  |
|  | Engine oil pressure                                  |  | Engine coolant temperature               |  | Diode                                       |

### 55.

#### Electrical symbols

|                                                                                     |                                   |                                                                                     |                                              |                                                                                       |                                          |
|-------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------|
|    | Warning light                     |    | Trip computer control                        |    | Differential lock                        |
|    | Bulb                              |    | Electronic injection                         |    | Automatic transmission fluid temperature |
|    | Fuse                              |    | Engine oil level                             |    | Temperature                              |
|    | Switch open                       |    | Brake fluid level (Japanese Version)         |    | Anti-theft                               |
|   | Selector switch                   |   | Doors open                                   |   | Electric windows                         |
|  | Switch controlled by coil (relay) |  | Central locking                              |  | Earth                                    |
|  | Engine                            |  | Controlled damping suspension Sport Function |  | No. plate lights                         |
|  | Rearscreen wiper                  |  | Transistor                                   |  | Impulse generator (timer)                |
|  | Headlamp washer                   |  | Air-bag                                      |  | Analogue clock                           |
|  | Windscreen wash/wipe              |  | A.B.S. (Japanese Version)                    |  | Digital clock                            |
|  | Rearscreen wash/wipe              |  | Brake failure                                |  | Speedometer                              |
|  | Engine oil pressure               |  | Windscreen wiper                             |  | Rev counter                              |



**Electrical symbols**

Digital speedometer



Digital rev counter



Digital fuel gauge



Analogue fuel gauge

Analogue engine  
coolant temperature  
gauge

Econometer

Digital engine coolant  
temperature gauge

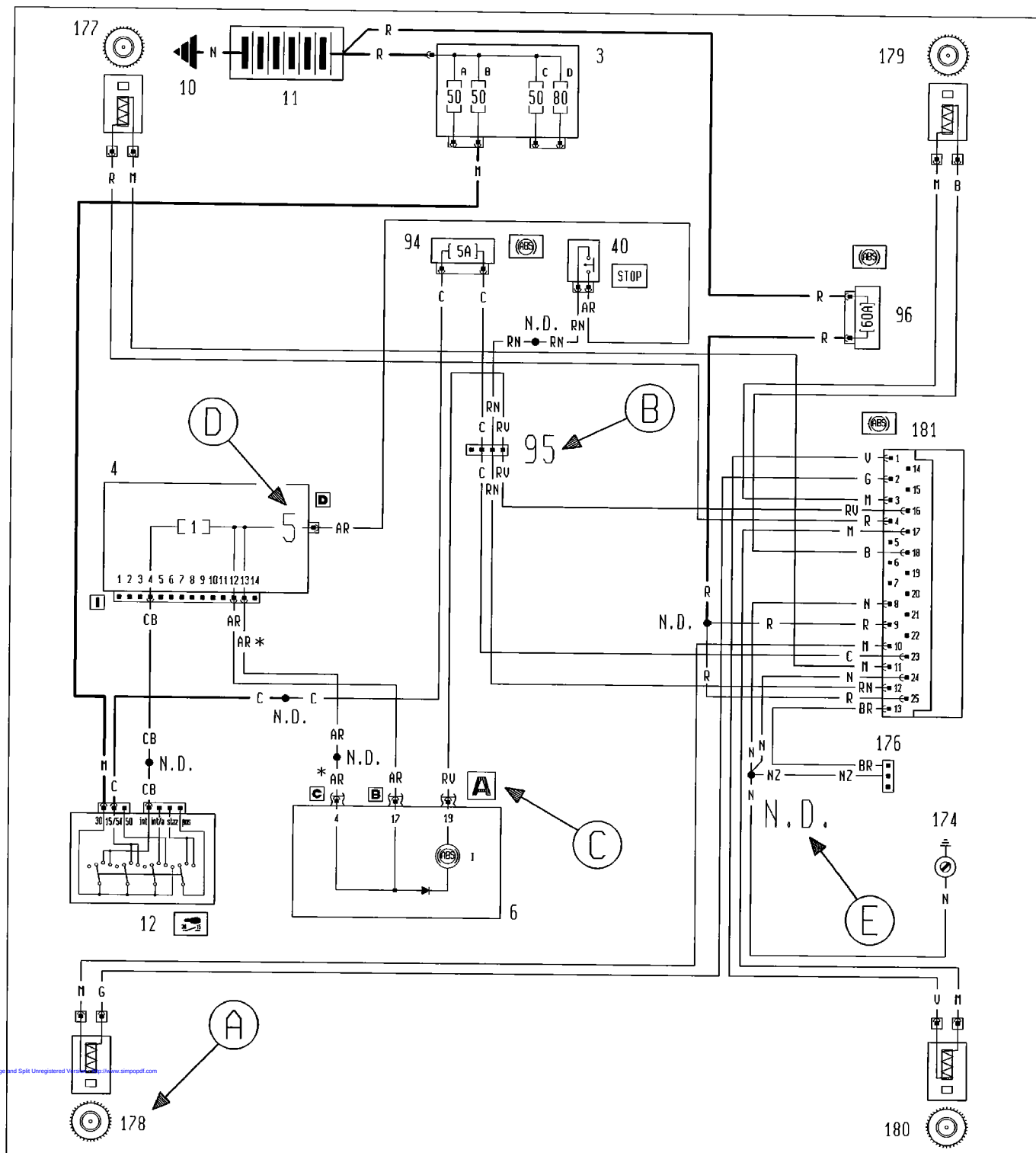
Engine oil temperature

Engine oil pressure  
gauge

Voltmeter

### 55.

Explanation for reading wiring diagram



4A004N01

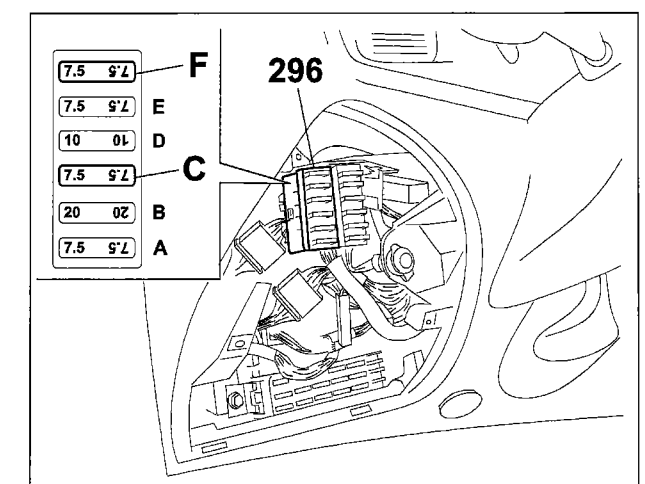
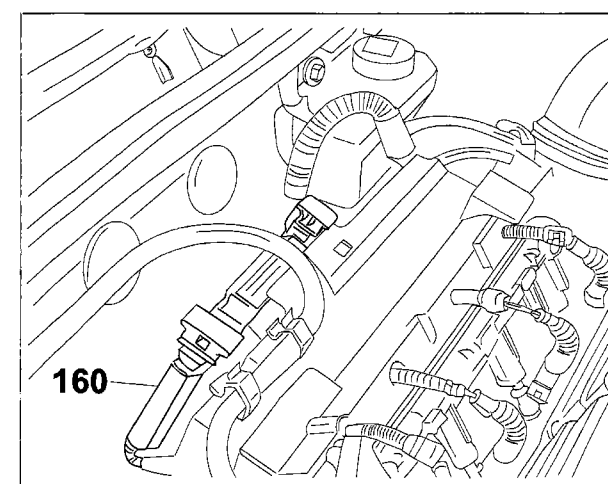
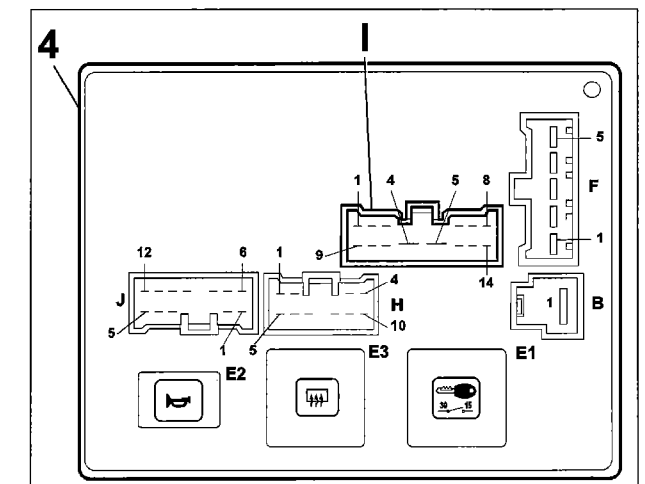
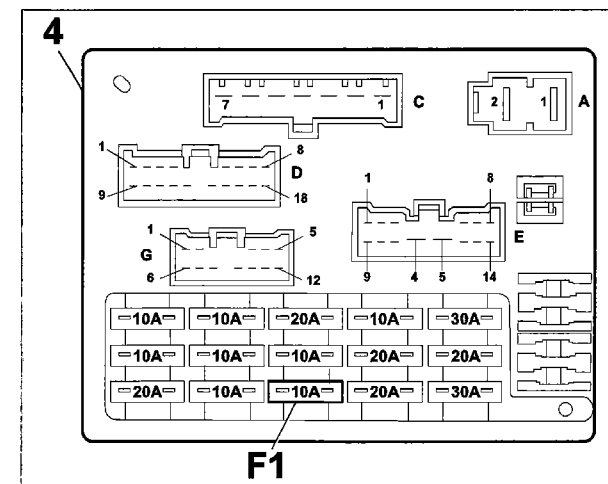
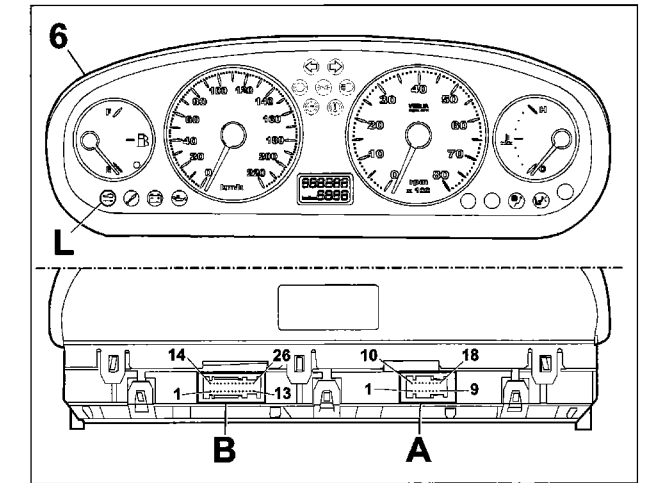
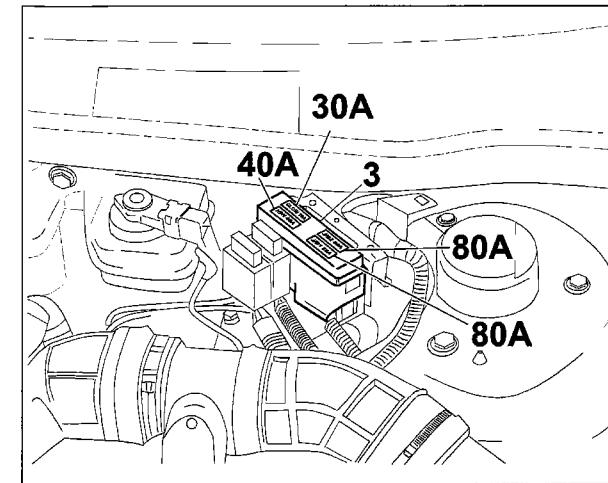
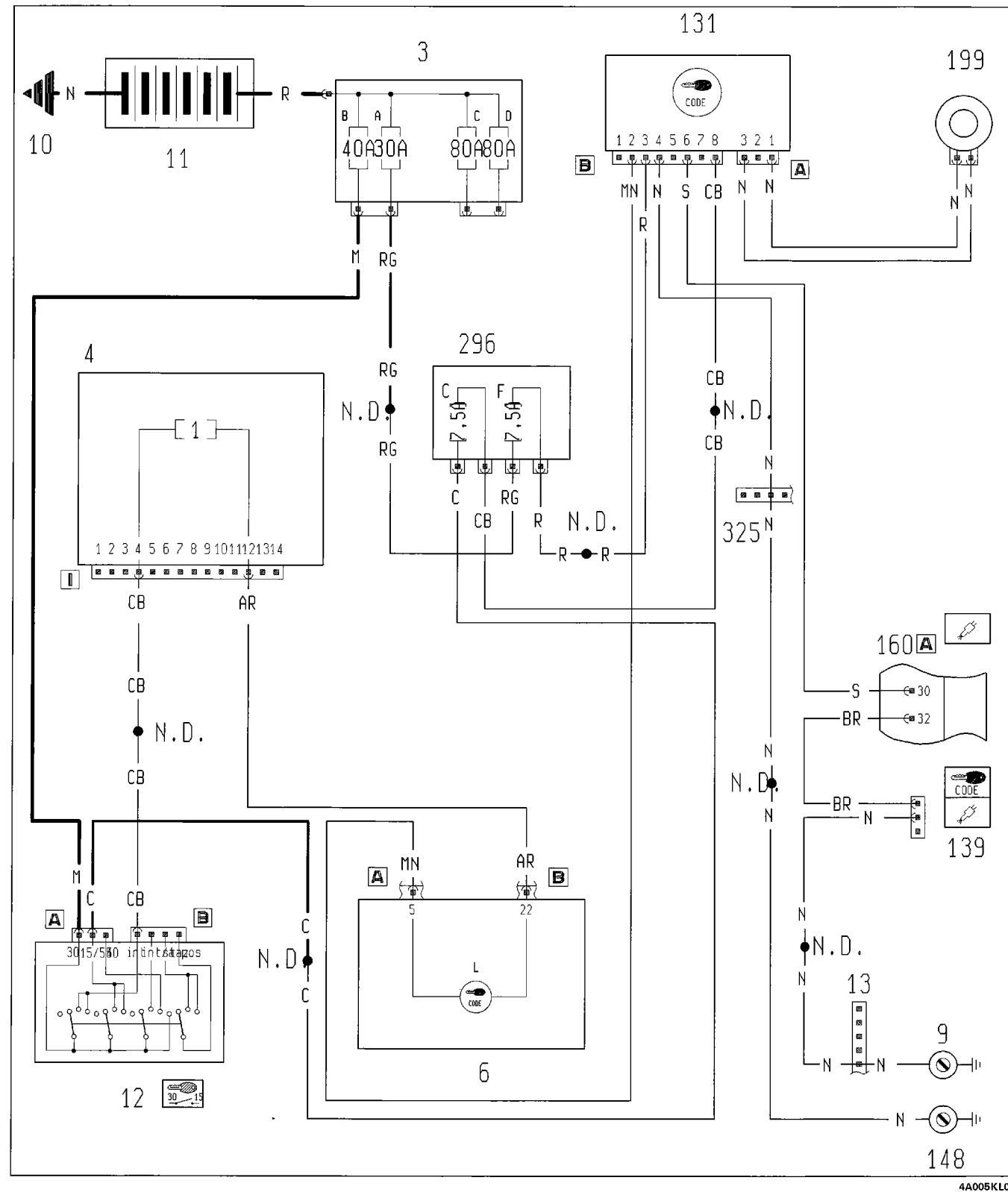
### Reference key

- A Component no.
- B Connector no.
- C Connector identification at component

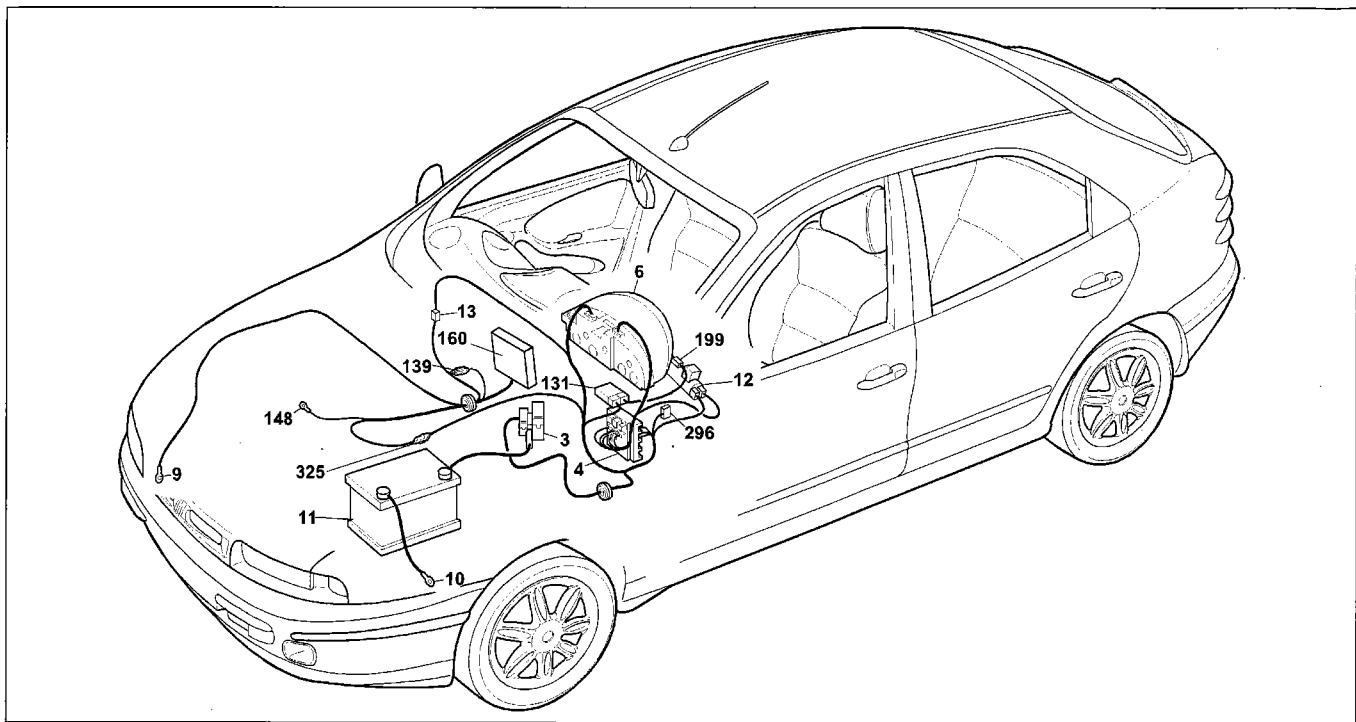
- D Connecting pin no.
- E Ultrasound welding

Fiat-CODE device and warning light (See key at end of wiring diagrams)

Component location



55.

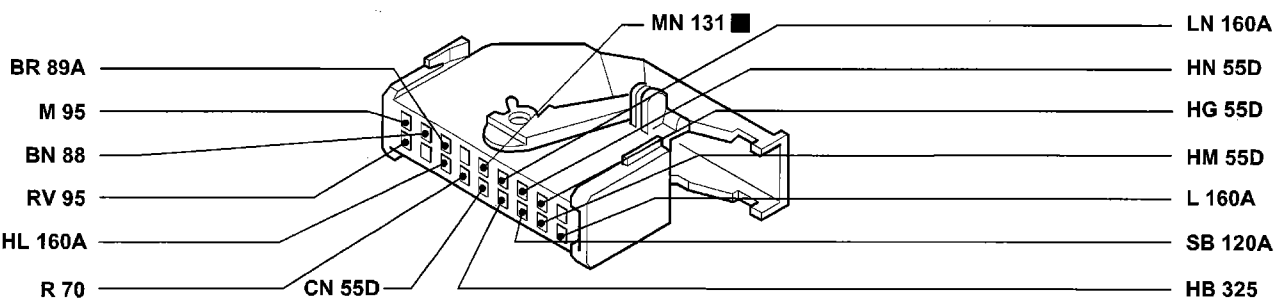


Fiat-CODE device and warning light

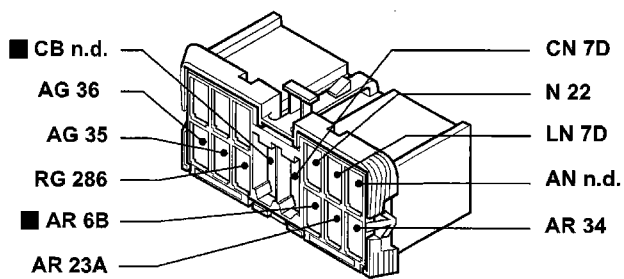
Key to components

- |                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fuse box:<br>A 30A fuse protecting injection system<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting additional extras<br>D 80A fuse protecting junction unit                                       | 131 Fiat-CODE electronic control unit<br>139 Diagnostic socket for injection system<br>148 Earth for electronic injection<br>160 Injection/ignition electronic control unit (1747)<br>199 Aerial for Fiat-CODE<br>296 Fuse holder base on front cable<br>C 7.5A fuse protecting electronic injection/cooling system Fiat-CODE<br>F 7.5A fuse protecting electronic injection system/Fiat-CODE<br>325 Connection between injection/left front cables |
| 4 Junction unit<br>6 Instrument panel:<br>L Fiat-CODE failure warning light<br>9 Right front earth<br>10 Earth for battery on bodyshell<br>11 Battery<br>12 Ignition switch<br>13 Connection between right/left front cables | N.D Ultrasound welding taped in cable loom                                                                                                                                                                                                                                                                                                                                                                                                          |

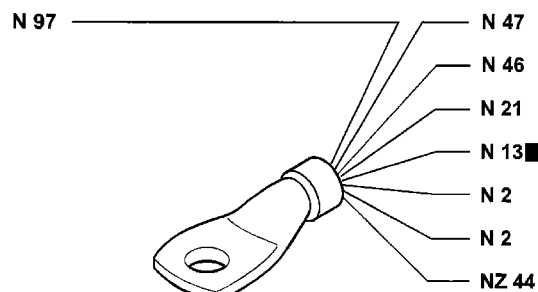
6A Instrument panel



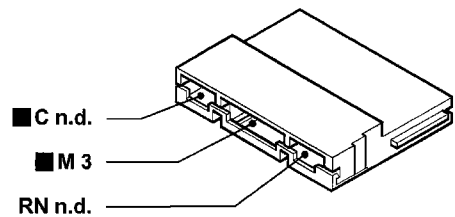
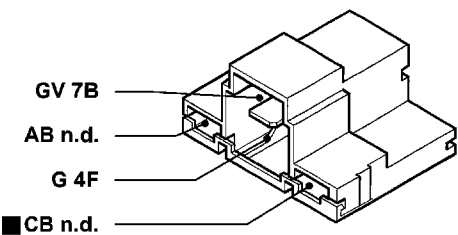
4I Junction unit



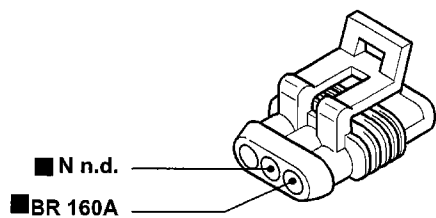
9 Right front earth



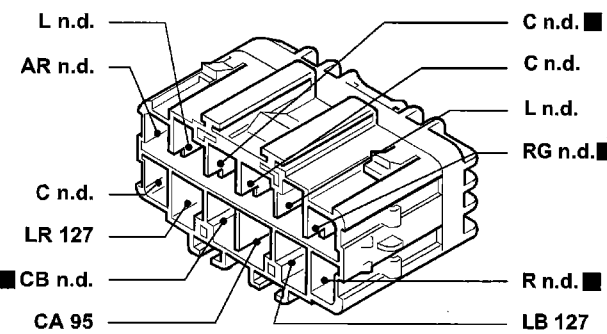
12 Ignition switch



139 Diagnostic socket for injection system



296 Fuse holder base on front cable

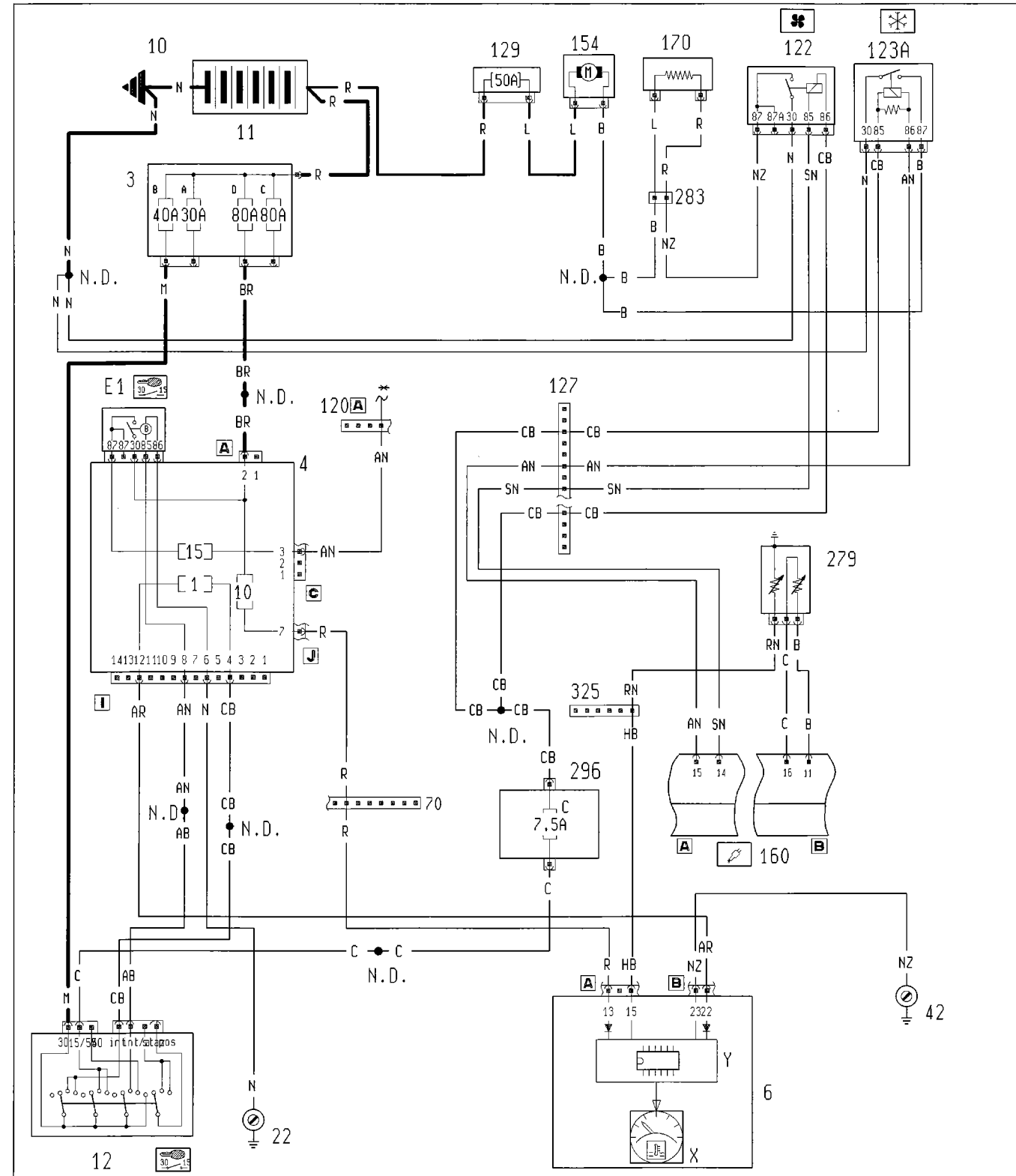


Leads involved in the wiring diagram are marked by a square

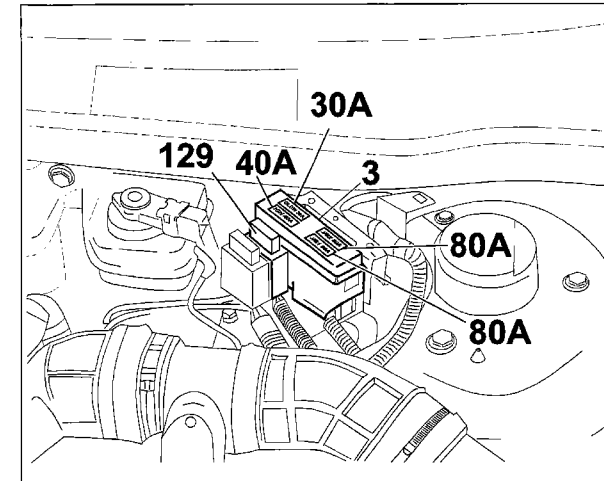
Version: with automatic air conditioning

Engine cooling - Engine coolant temperature gauge - (See key at end of wiring diagrams)

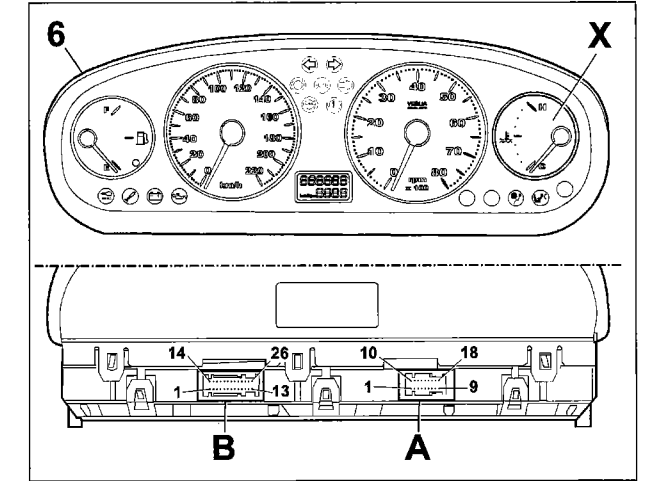
Component location



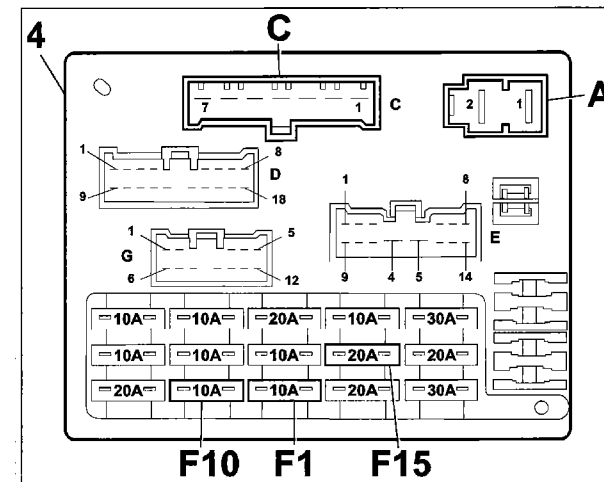
4A009KL01



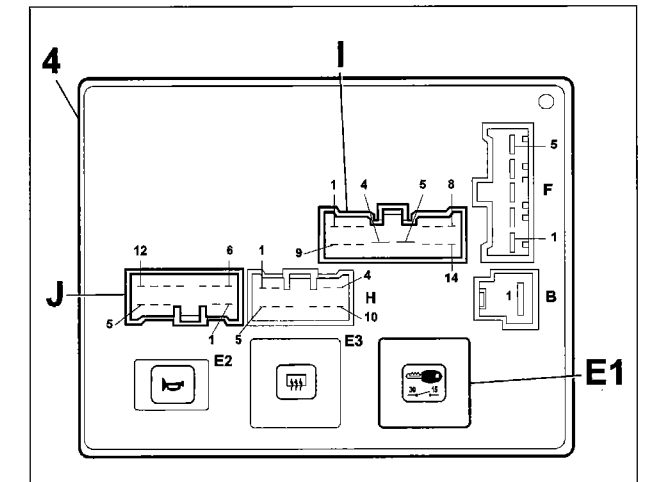
4A010KL01



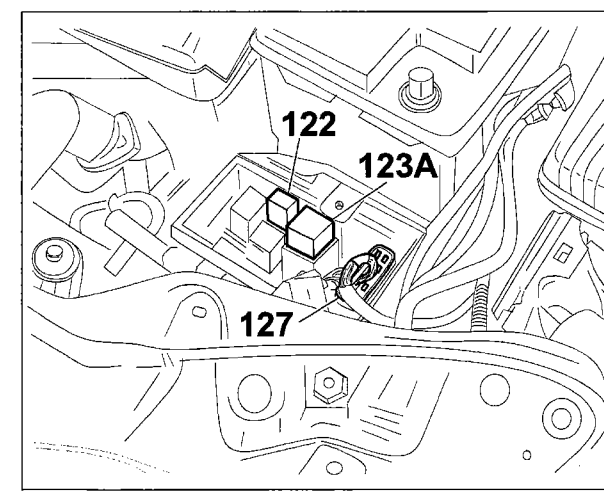
4A010KL02



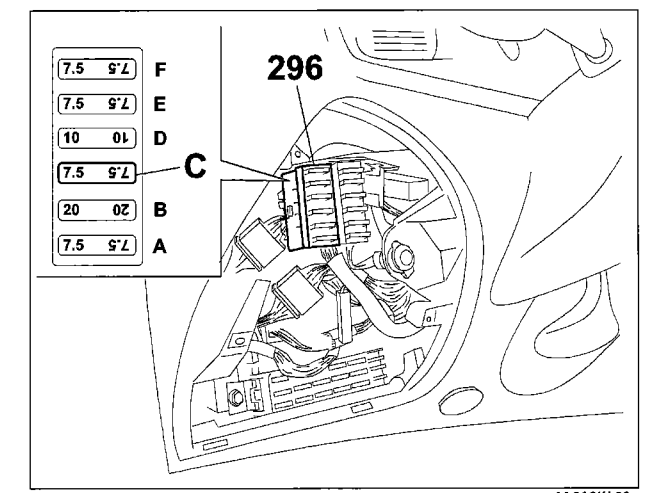
4A010KL03



4A010KL04



4A010KL05

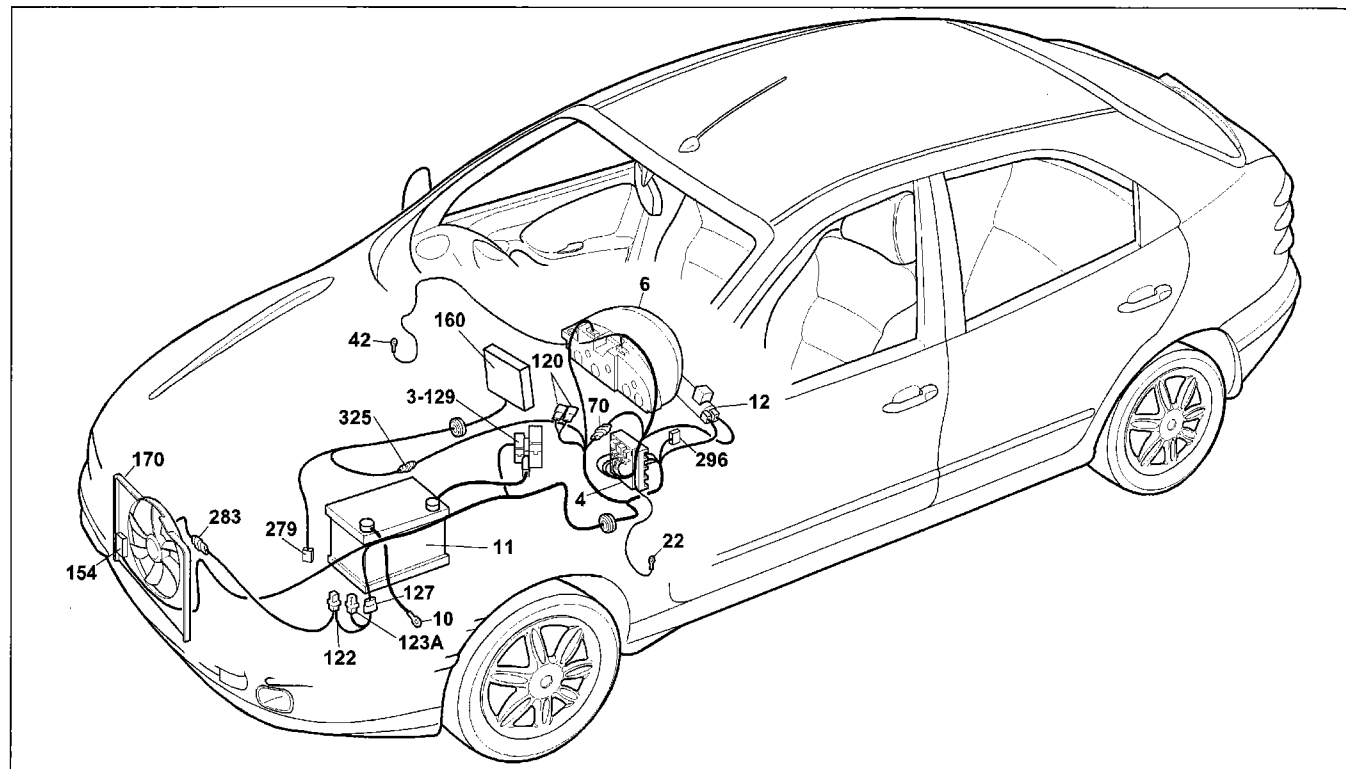


4A010KL06

\* See air conditioning wiring diagram



**55.**

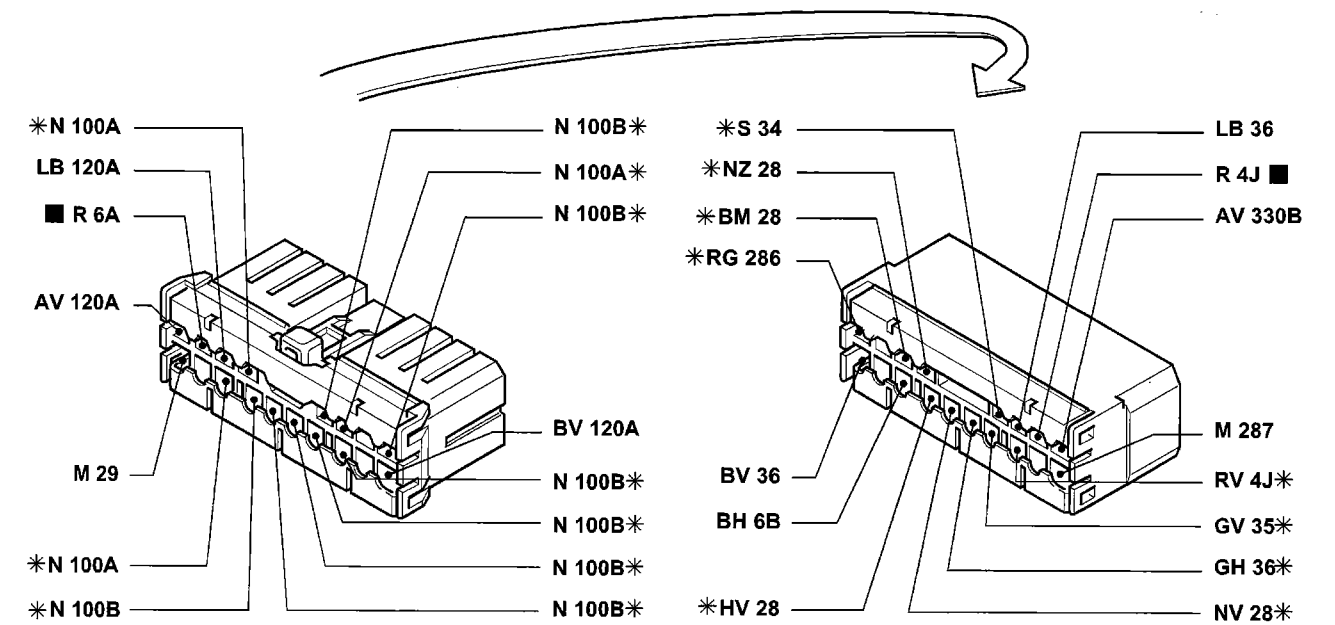


**Version with automatic air conditioning**  
**Engine cooling - Engine coolant temperature gauge**

### Key to components

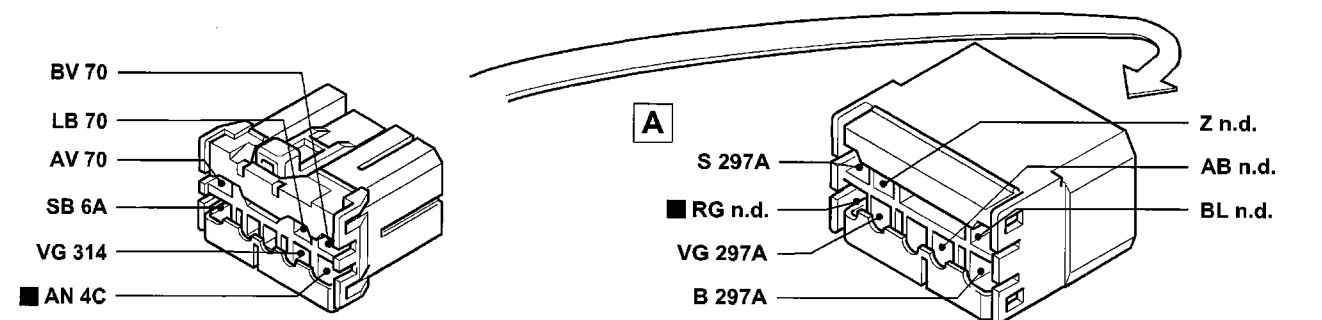
- |                                                  |                                                                    |
|--------------------------------------------------|--------------------------------------------------------------------|
| 3 Power fuse box:                                | 123A Engine cooling fan high speed relay feed                      |
| 30A fuse protecting injection system             | 127 Connection between front/left cables on relay holder bracket   |
| 40A fuse protecting ignition system              | 129 50A power fuse protecting engine cooling fan                   |
| 80A fuse protecting additional extras            | 154 Engine cooling fan                                             |
| 80A fuse protecting junction unit                | 160 Injection/ignition electronic control unit (1747)              |
| 4 Junction unit                                  | 170 Engine cooling fan limit resistor                              |
| E1 Switch discharge relay                        | 279 Engine coolant temperature twin sender unit                    |
| 6 Instrument panel:                              | 283 Connection between front/resistor cables                       |
| Engine coolant temperature gauge                 | 296 Fuse holder base on electronic injection front cable           |
| 10 Earth for battery on bodyshell                | 7.5A fuse protecting electronic injection/cooling system Fiat-CODE |
| 11 Battery                                       | 325 Connection between injection/front left cables                 |
| 12 Ignition switch                               | N.D. Ultrasound welding taped in cable loom                        |
| 22 Left dashboard earth                          |                                                                    |
| 42 Right dashboard earth                         |                                                                    |
| 70 Connection between dashboard/front cables     |                                                                    |
| 120A Connection for air conditioning unit cables |                                                                    |
| 122 Engine cooling fan low speed relay feed      |                                                                    |

## 70 Connection between dashboard/front cables



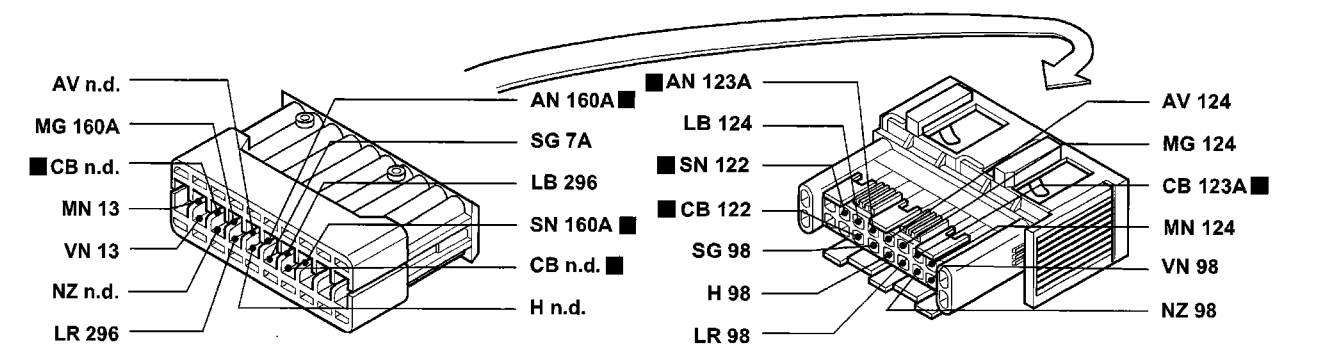
\* Variant connection for versions with alarm

## 120 Connection for air conditioning unit cables



A012KL02

**127** Connection between front left cable/cable on relay holder bracket



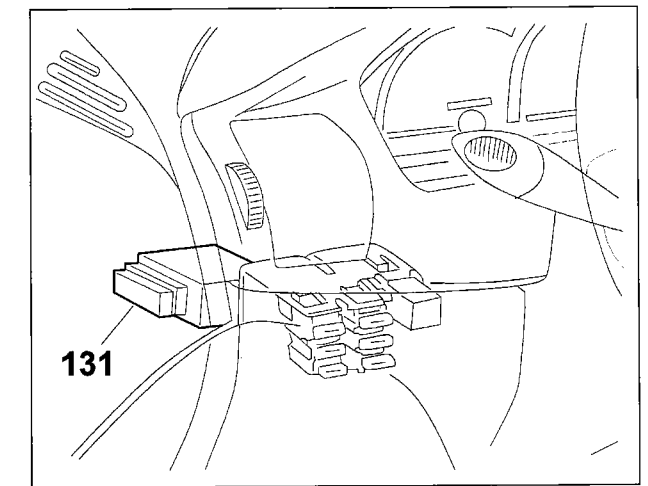
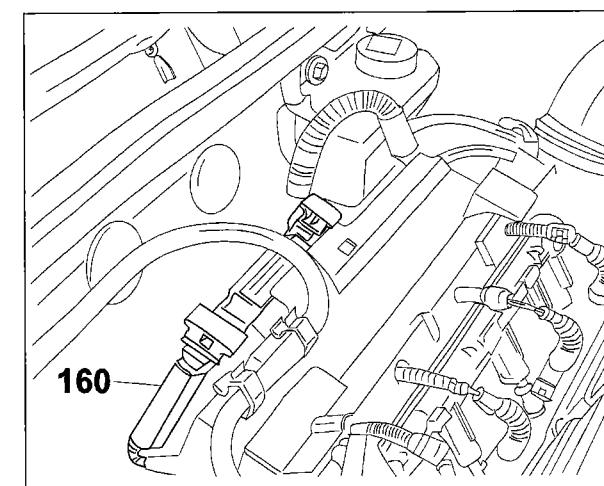
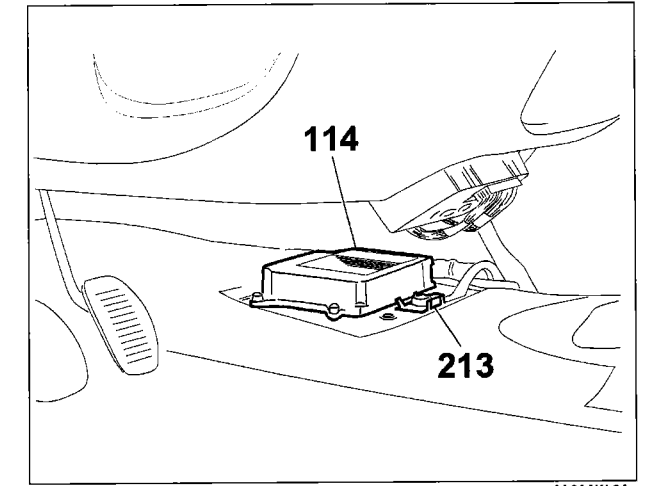
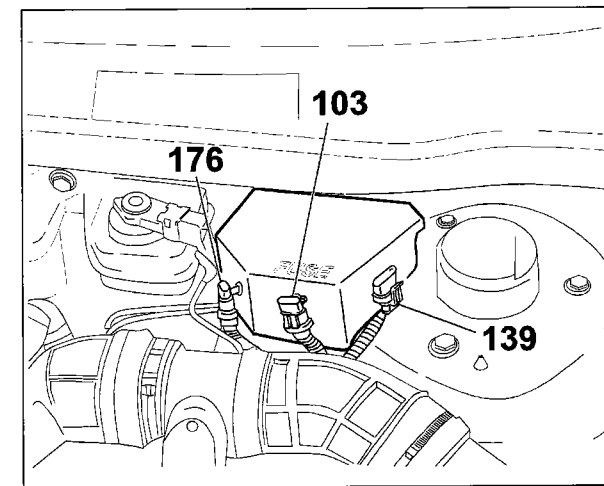
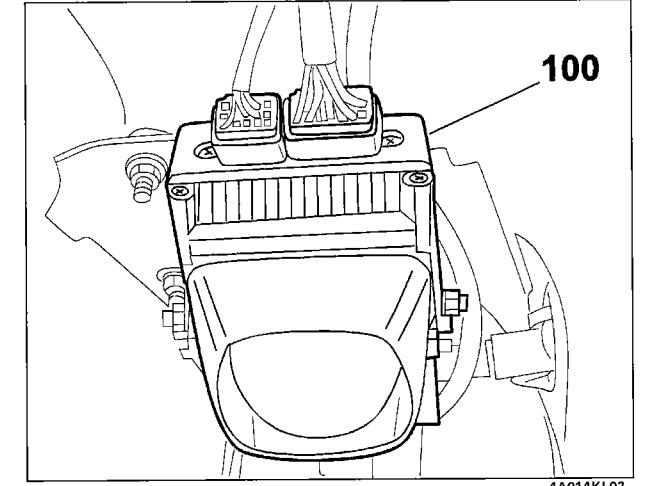
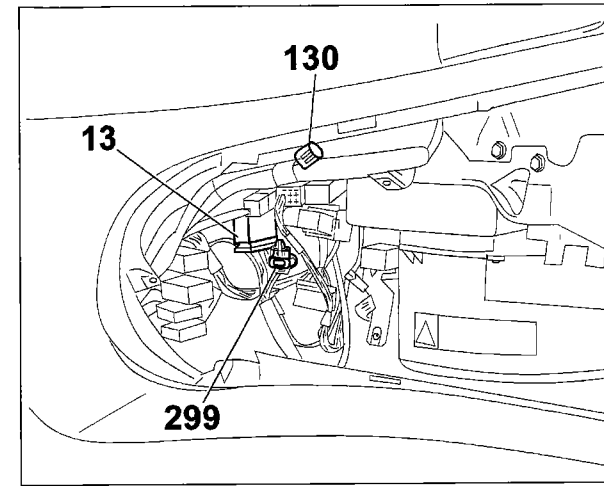
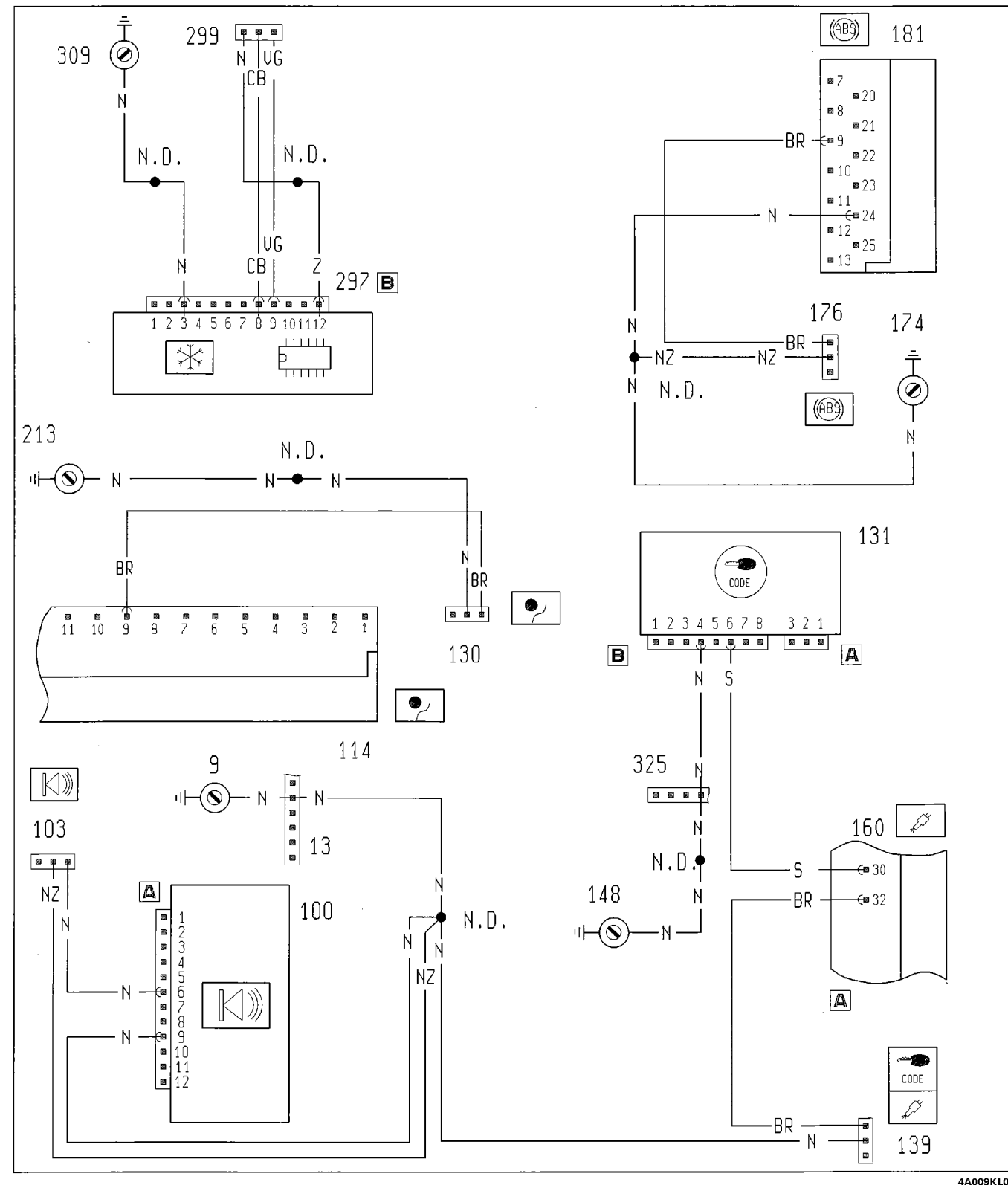
012KL03

Leads involved in the wiring diagram are marked by a square

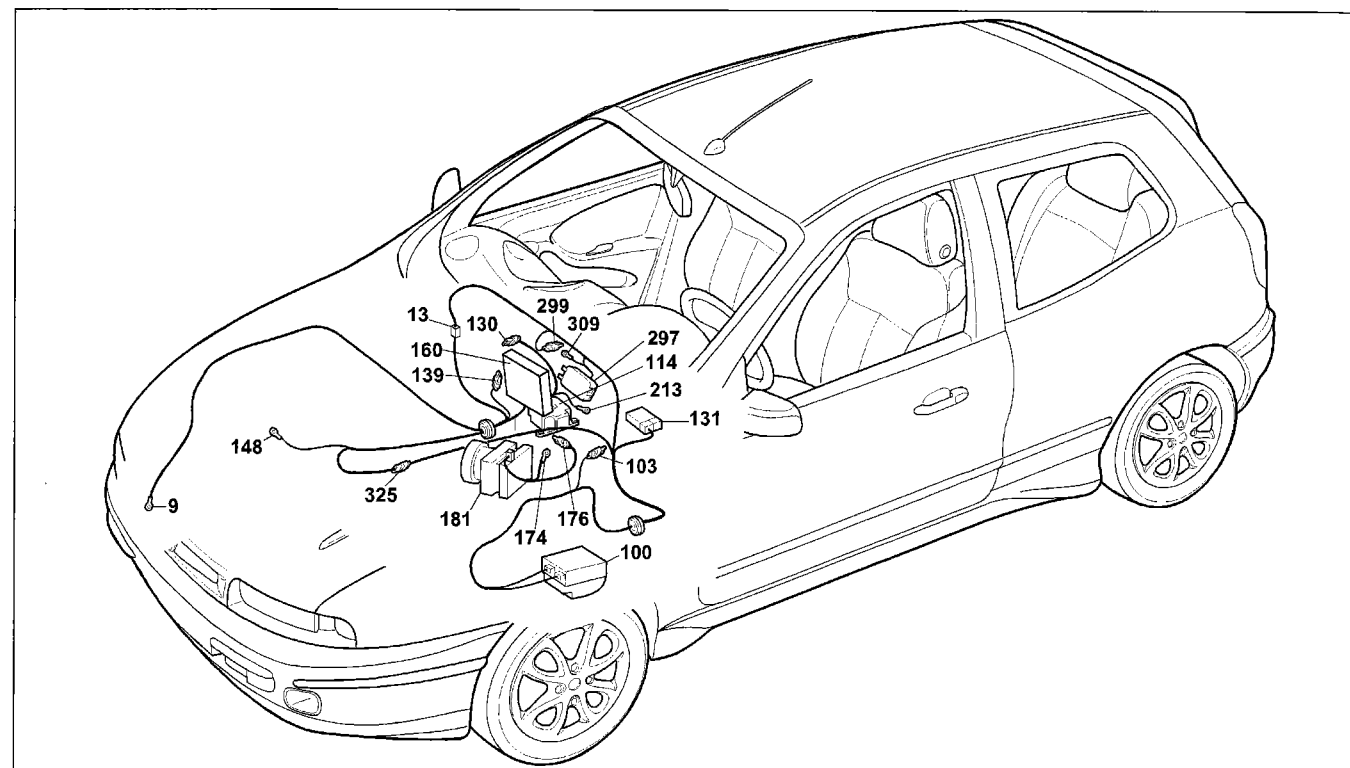


Diagnostic socket connections - (See key at end of wiring diagrams)

Component location



### 55.

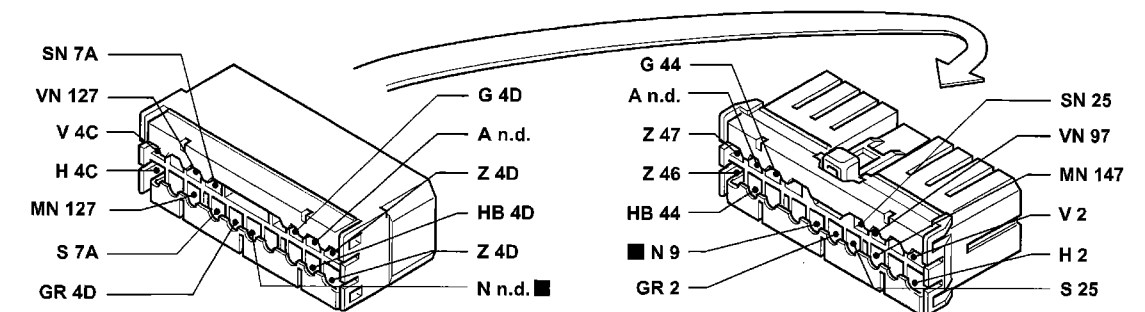


Diagnostic socket connections

#### Key to components

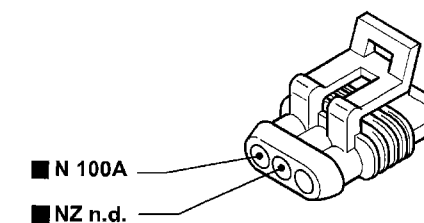
- |                                                       |                                                                  |
|-------------------------------------------------------|------------------------------------------------------------------|
| 9 Right front earth                                   | 176 Diagnostic socket for anti-lock brakes (A.B.S.)              |
| 13 Connection between right/left front cables         | 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.) |
| 100 Alarm electronic control unit                     | 213 Earth for EURO-BAG                                           |
| 103 Diagnostic socket for alarm                       | 297 Air conditioning control unit                                |
| 114 Alarm electronic control unit                     | 299 Diagnostic socket for heater/air conditioning                |
| 130 EURO-BAG diagnostic socket                        | 309 Earth for air conditioning unit                              |
| 131 Fiat-CODE electronic control unit                 | 325 Connection between injection/left front cables               |
| 139 Presa diagnostica per impianto iniezione          | N.D. Ultrasound welding taped in cable loom                      |
| 148 Earth for electronic injection                    |                                                                  |
| 160 Injection/ignition electronic control unit (1747) |                                                                  |
| 174 Power earth for anti-lock brakes (A.B.S.)         |                                                                  |

#### 13 Connection between right/left front cables



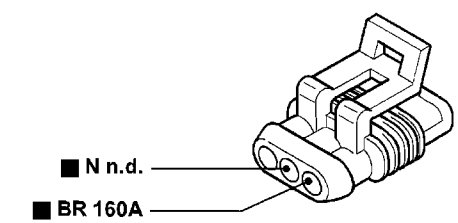
4A016KL01

#### 103 Diagnostic socket for alarm



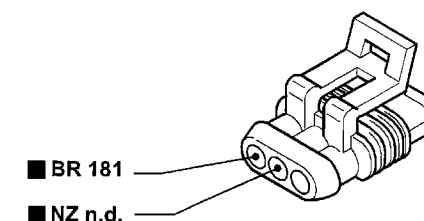
4A016KL02

#### 139 Diagnostic socket for injection system



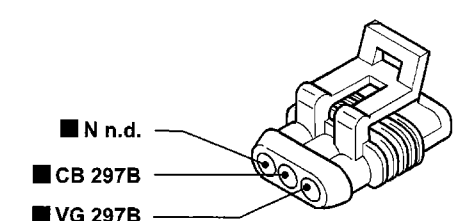
4A016KL03

#### 176 Diagnostic socket for anti-lock brakes (A.B.S.)



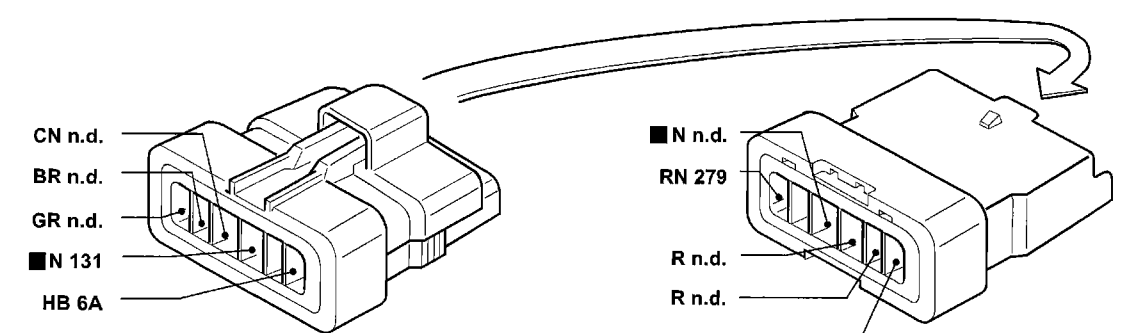
4A016KL04

#### 299 Diagnostic socket for heater/air conditioning



4A016KL05

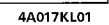
#### 325 Connection between injection/left front cables



4A016KL06

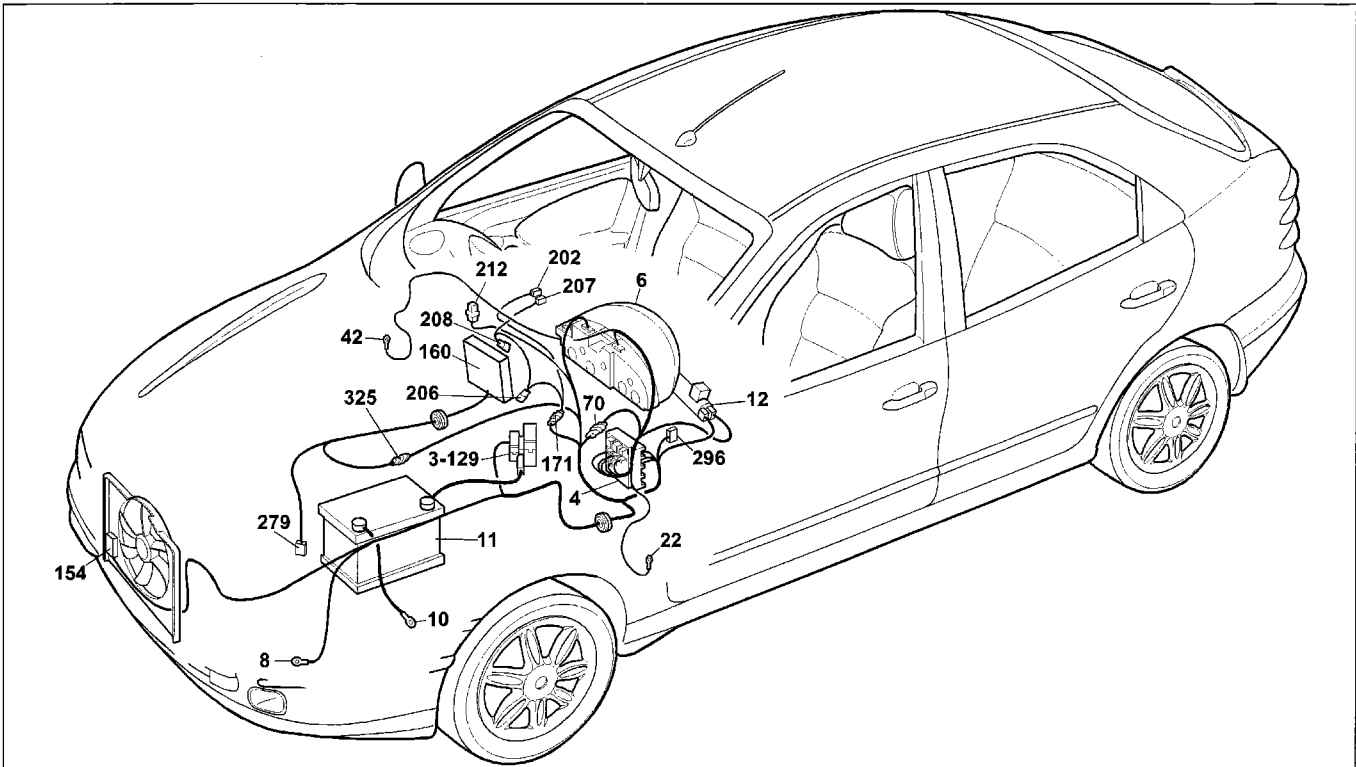
Leads involved in the wiring diagram are marked by a square

**Engine cooling - Engine coolant temperature gauge - Car interior ventilation - (See key at end of wiring diagrams)**



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55.



Version without automatic air conditioning  
Engine cooling - Engine coolant temperature gauge - Car interior ventilation

Key to components

- 3 Power fuse box:  
30A fuse protecting injection system  
40A fuse protecting ignition system  
80A fuse protecting additional extras  
80A fuse protecting junction unit

4 Junction unit  
E1 Switch discharge relay

6 Instrument panel:  
X Engine coolant temperature gauge  
Y Electronic module

8 Left front earth

10 Earth for battery on bodysell

11 Battery

12 Ignition switch

22 Left dashboard earth

42 Right dashboard earth

70 Connection between dashborad/front cables

129 40A power fuse protecting engine cooling fan
- 154 Engine cooling fan

160 Injection/ignition electronic control unit (1747)

171 Connection for heater unit cables

202 Bulbs for heater unit/air conditioning

206 Heater/air conditioning fan

207 Heater/air conditioning system speed control switch

208 Heater/air conditioning system limit resistor Engine cooling fan relay feed

212 Engine cooling fan relay feed

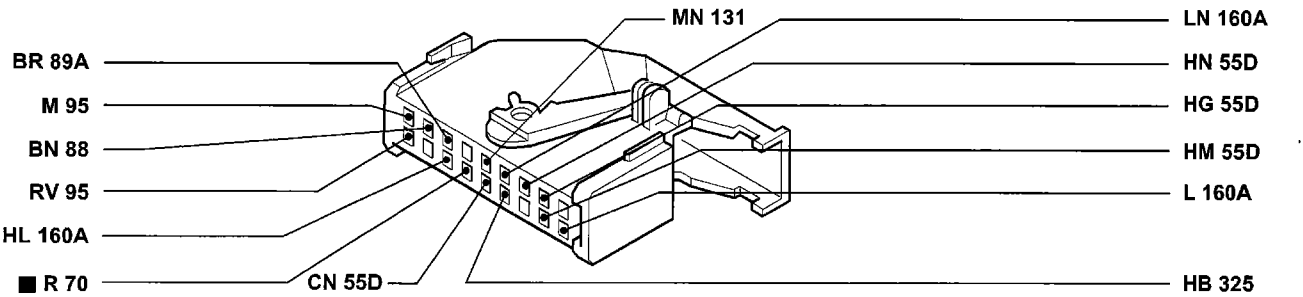
279 Engine coolant temperature twin sender unit

296 Fuse holder base on front cable  
C 7.5A fuse protecting electronic injection/cooling system Fiat-CODE

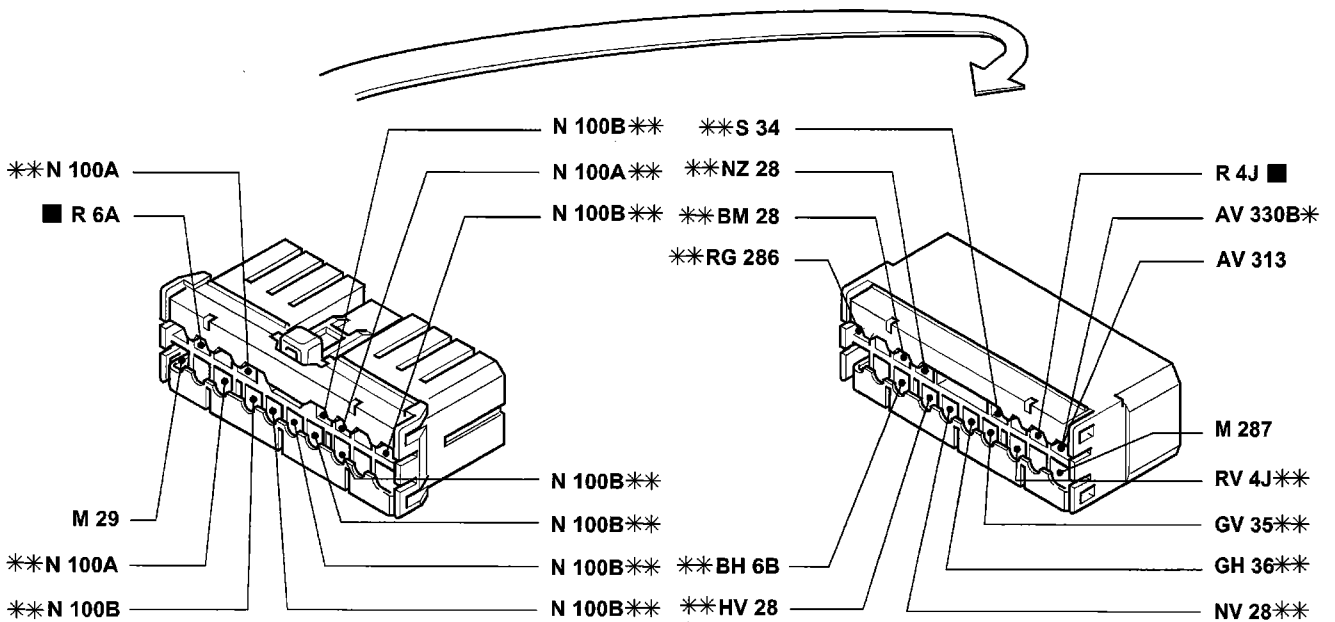
325 Connection between injection/left front cables

N.D. Ultrasound welding taped into wiring

6A Instrument panel

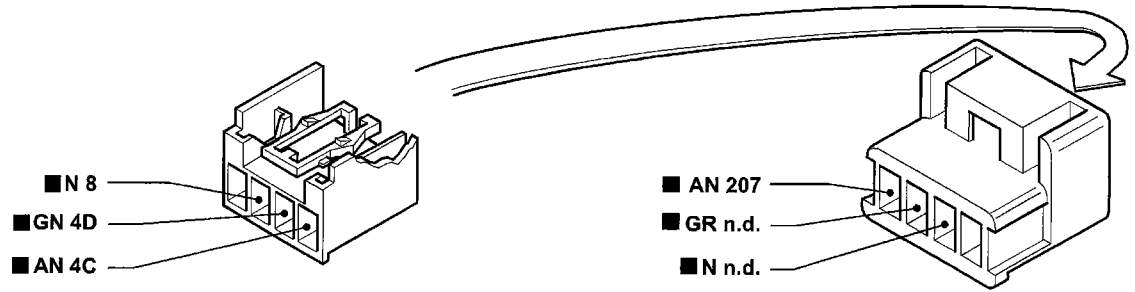


70 Connection between dashboard/front cables



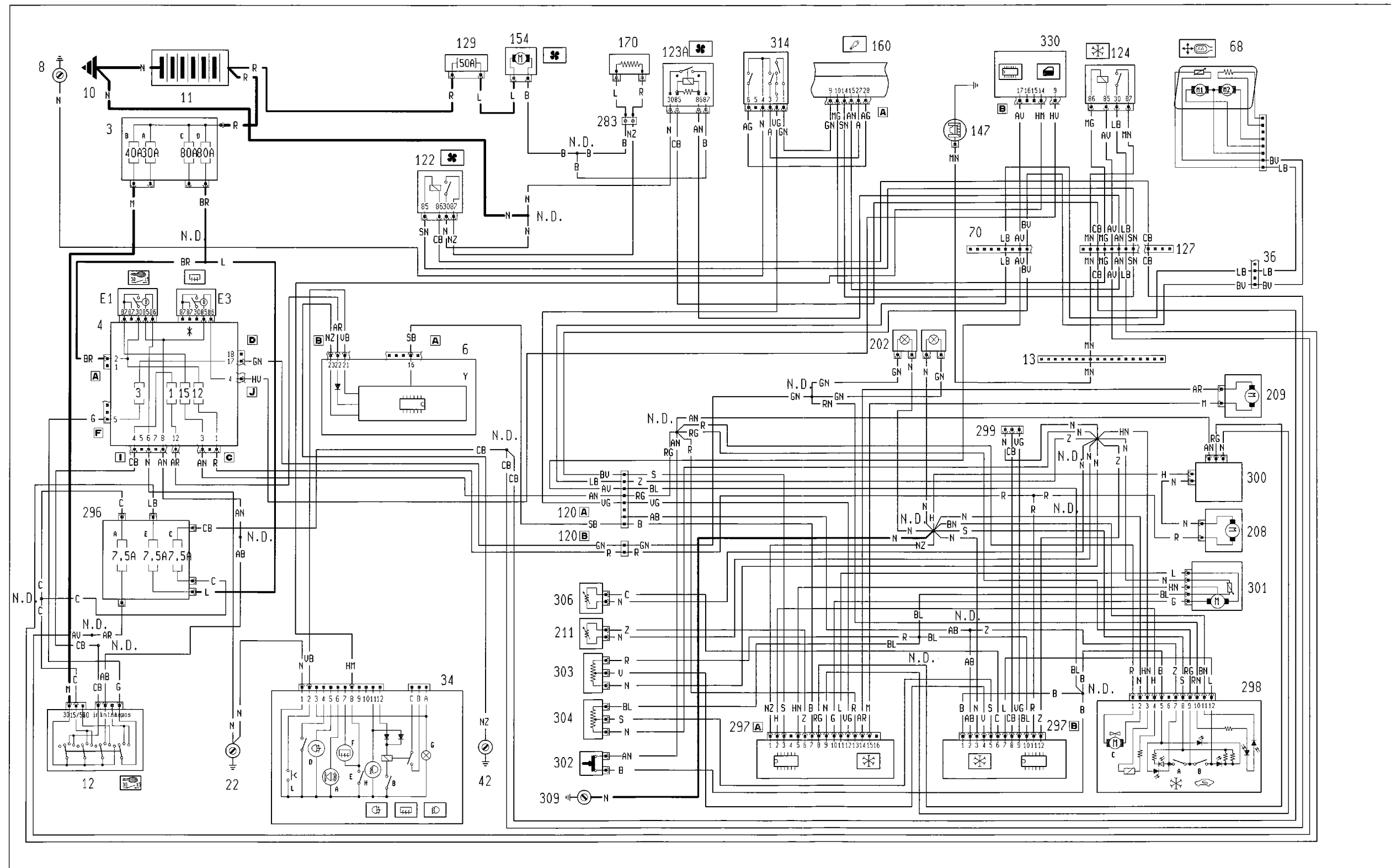
\* Variant connection for ELX trim level  
\*\* Variant connection for versions with alarm

171 Connection for heater unit cables



Leads involved in the wiring diagram are marked by a square

Automatic air conditioning with A.B.I. - (See key at end of wiring diagrams)

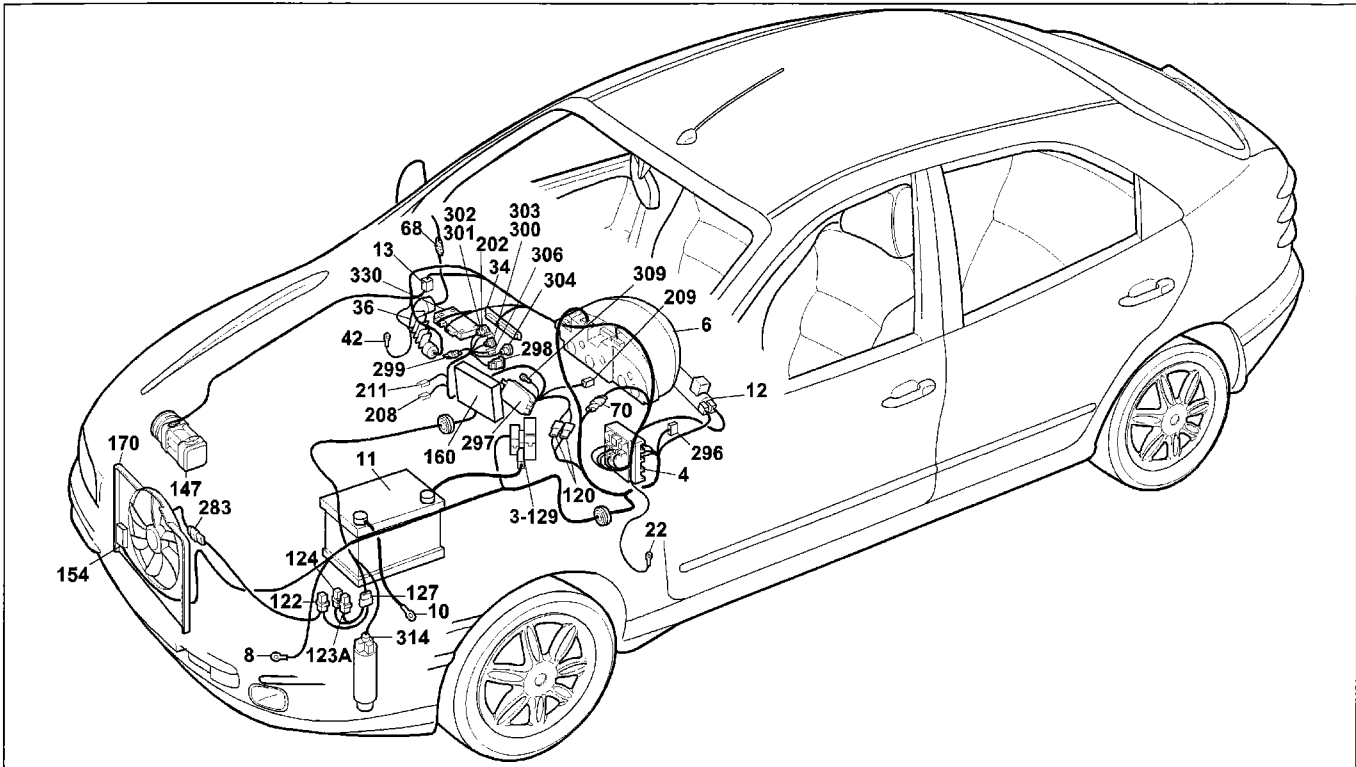


4A021 KL01

\* See heated rear windscreen wiring diagram



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4A023KL01

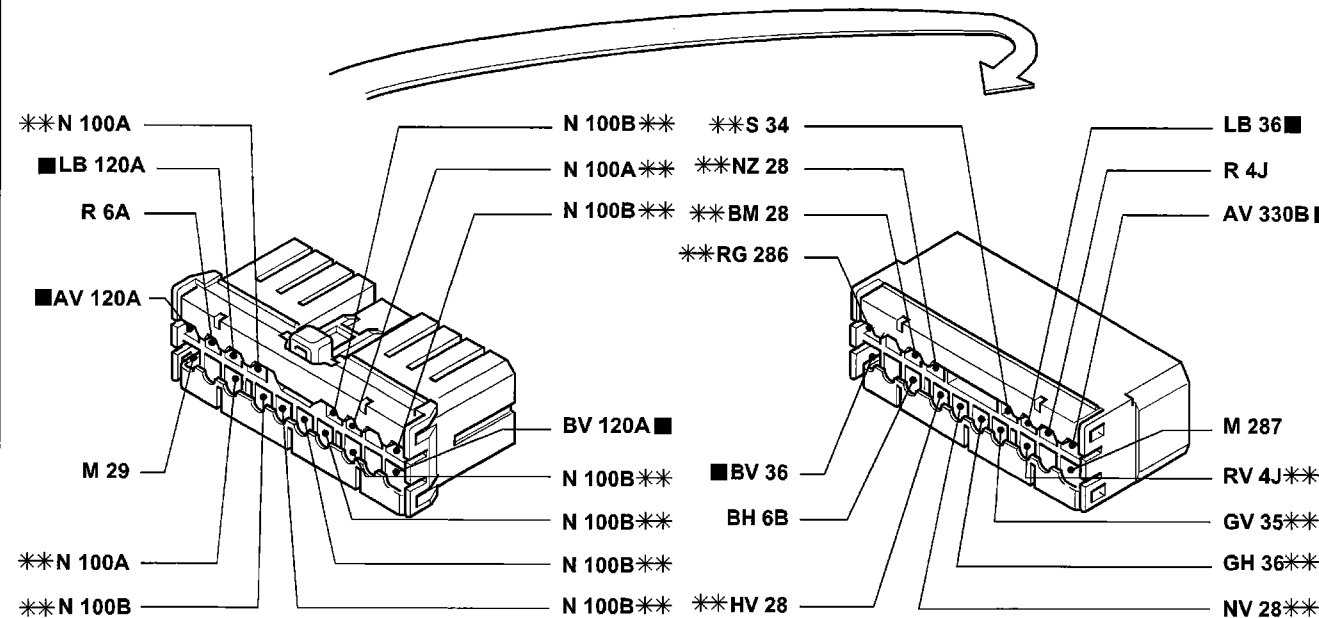
Version with A.B.I.  
Automatic air conditioning

Key to components

- 3 Power fuse box:
  - A 30A fuse protecting injection system
  - B 40A fuse protecting ignition system
  - C 80A fuse protecting additional extras
  - D 80A fuse protecting junction unit
- 4 Junction unit:
  - E1 Switch discharge relay
  - E3 Switch discharge relay
- 6 Instrument panel
  - Y Electronic module
- 8 Left front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Connection between right/left front cables
- 22 Left dashboard earth
- 34 Switch control panel:
  - A Anti-theft device on warning light
  - B Rear fog lamps switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen control switch
  - F Heated rear windscreen warning light
  - I Switch control panel ideograme light
  - H Fog lights warning light
  - I Fog lights control switch
  - L Outside temperature control switch
- 36 Connection between dashboard/right front door cables
- 42 Right dashboard earth
- 68 Right electrically adjustable exterior rear view mirror
- 70 Connection between dashboard/front cables
- 120A Connection for air conditioning unit cables
- 120B Connection for air conditioning unit cables
- 122 Engine cooling fan low speed relay feed
- 23A Engine cooling fan high speed relay feed
- 124 Air conditioning compressor relay feed
- 127 Connection between left front cable/cable on relay holder bracket
- 129 50A power fuse protecting engine cooling fan
- 147 Compressor for air conditioning
- 154 Engine cooling fan
- 160 Injection/ignition electronic control unit (1747)
- 170 Engine cooling fan limit resistor
- 202 Heater/air conditioning bulbs
- 208 Heater/air conditioning system limit resistor
- 209 Outside/recirculation air flap control actuator
- 211 Electronic thermostat (N.T.C.)
- 283 Connection between front/resistor cables
- 296 Fuse holder base on front cable
  - A 7.5A fuse protecting electronic injection/cooling system; A.C. system, Alarm
  - C 7.5A fuse protecting electronic injection/cooling system Fiat-CODE
  - E 7.5A fuse protecting climate control system
- 297 Air conditioning control unit
- 298 Recirculation control for heater/air conditioning
  - A Air conditioning control switch
  - B Recirculation control switch
  - C Fan sensor
- 299 Diagnostic socket for heater/air conditioning
- 300 Heater fan electronic transformer
- 301 Vehicle interior mixture control actuator
- 302 Maximum demisting control switch
- 303 Interior ventilation potentiometer
- 304 Vehicle interior temperature potentiometer
- 306 Treated air sensor
- 309 Earth for air conditioning unit
- 314 4 stage pressure switch
- 330 A.B.I. control unit

N.D. Ultrasound welding taped in cable loom

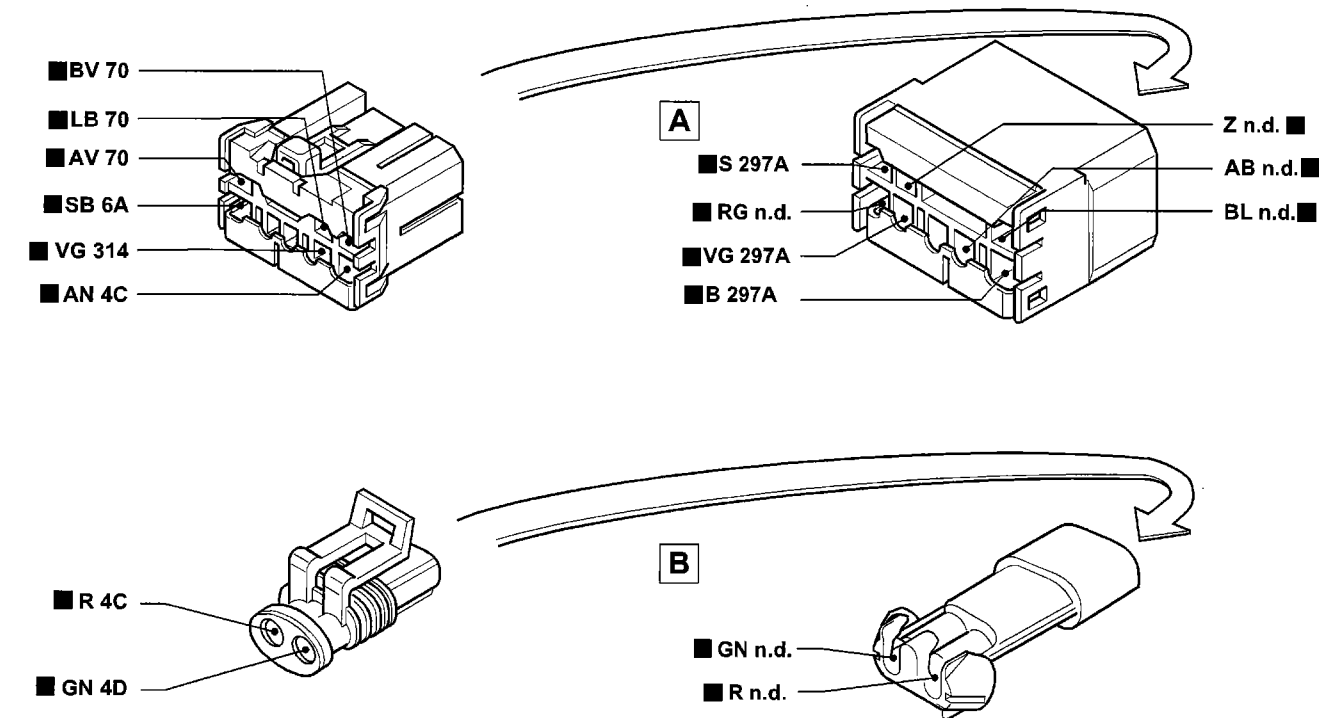
70 Connection between dashboard/front cables



\*\* Variant connections for versions with alarm

4A024KL01

120 Connection for air conditioning unit cables

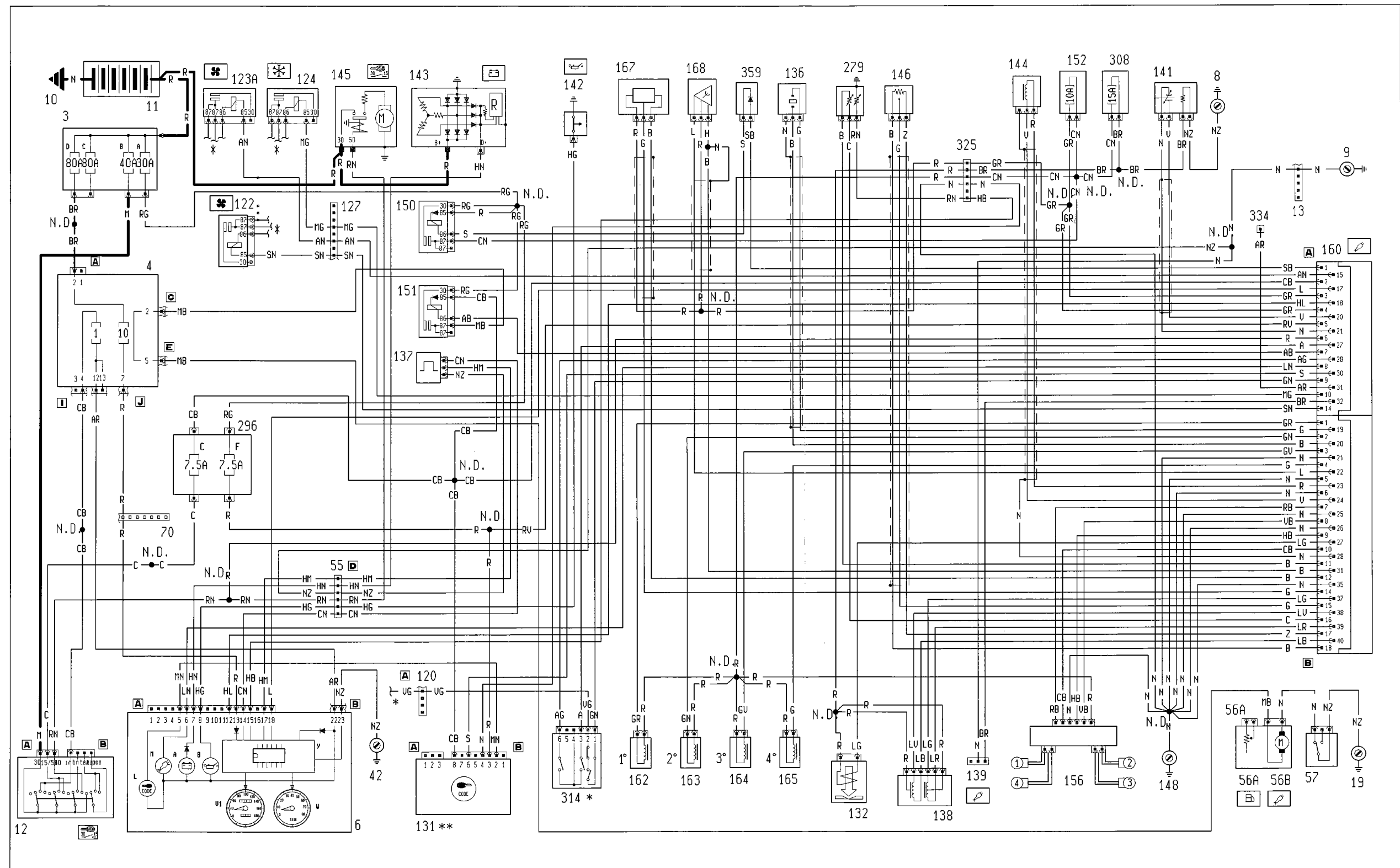


4A024KL02

Leads involved in the wiring diagram are marked by a square



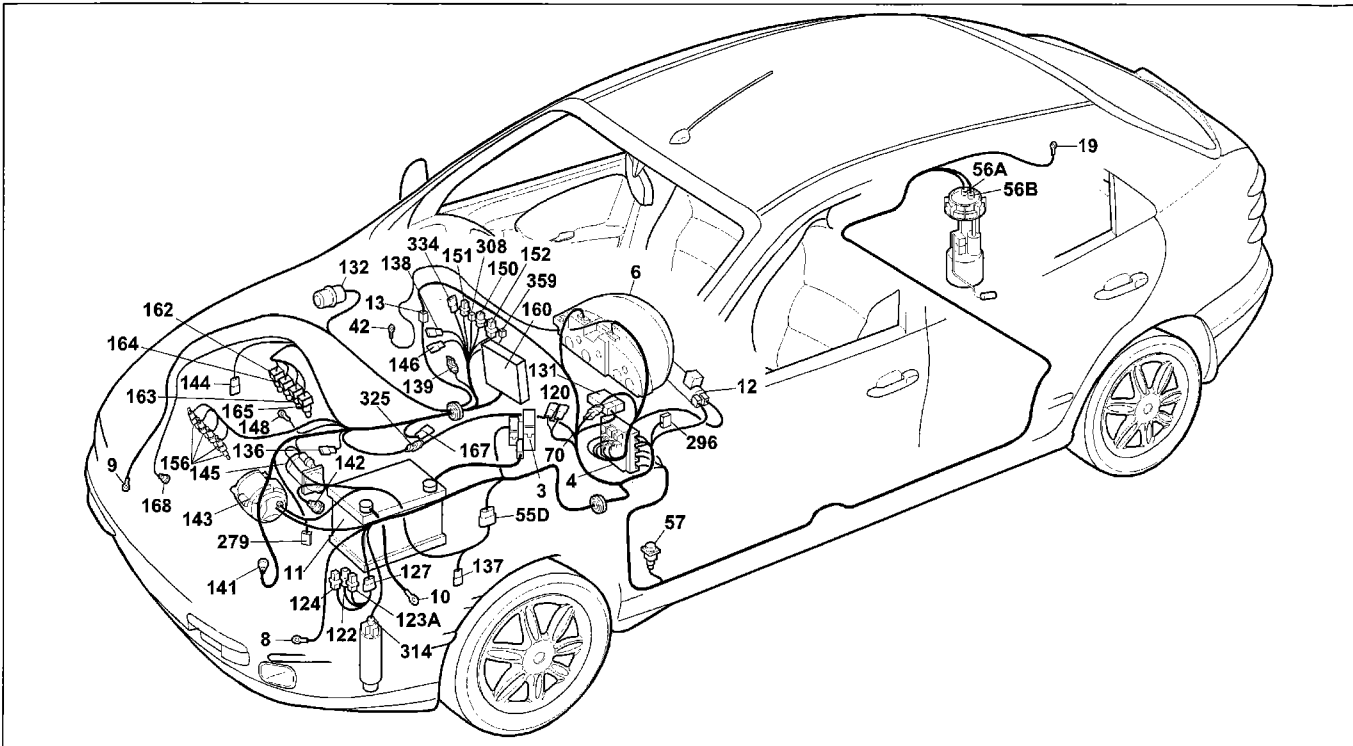
Starting - Electronic ignition and injection - Recharging and warning light - Low engine oil pressure warning light - Injection system failure warning light - Rev counter - Speedometer - (See key at end of wiring diagrams)



\* See air conditioning wiring diagram \*\* See Fiat-CODE wiring diagram

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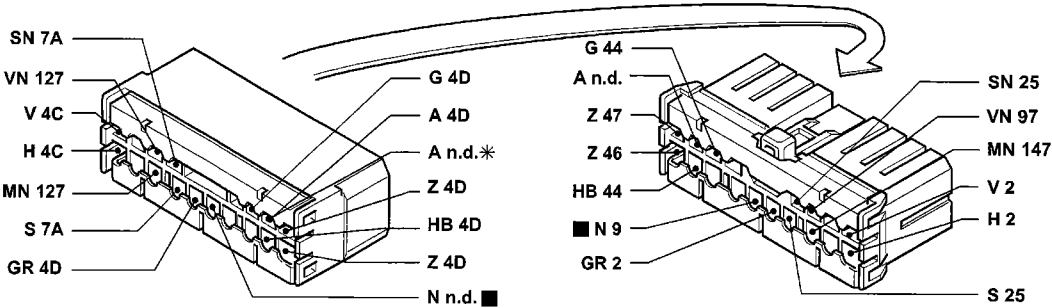


Starting - Electronic ignition and injection - Recharging and warning light - Low engine oil pressure warning light - Injection system failure warning light - Rev counter - Speedometer

Key to components

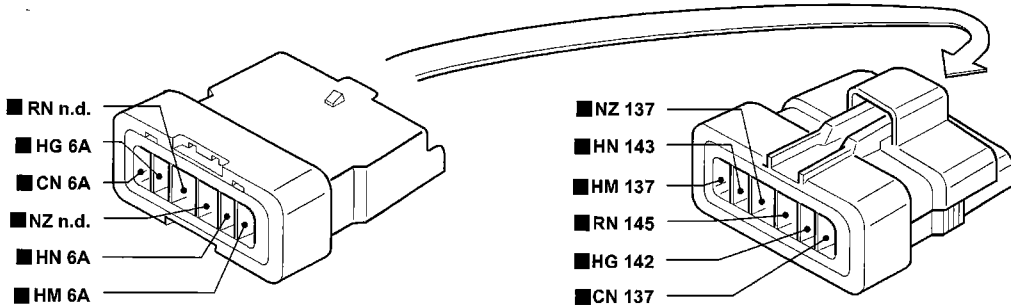
- |                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fuse box:<br>A 30A fuse protecting injection system<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting additional extras<br>D 80A fuse protecting junction unit                                                                                                                                                                            | 136 Knock sensor<br>137 Vehicle speed sensor<br>138 Idle adjustment actuator<br>139 Presa diagnostica per impianto iniezione<br>141 Hot lambda probe<br>142 Switch signalling insufficient engine oil pressure<br>143 Alternator<br>144 RPM and TDC sensor<br>145 Starter motor<br>146 Potentiometer on butterfly valve<br>148 Earth for electronic injection<br>150 Injection system relay feed<br>151 Relay feed for Lambda sensor, electric fuel pump, injectors               |
| 4 Junction unit:<br>6 Instrument panel<br>A Battery recharging warning light<br>B Low engine oil pressure warning light<br>L Fiat-CODE failure warning light<br>M Injection system failure warning light<br>V1 Speedometer<br>W Rev counter<br>Y Electronic module                                                                                                | 152 10A fuse protecting injection system<br>156 Spark plugs<br>160 Injection/ignition electronic control unit (1747)<br>162 Injector (1)<br>163 Injector (2)<br>164 Injector (3)<br>165 Injector (4)<br>167 Air flow meter<br>168 Timing sensor<br>279 Engine coolant temperature twin sender unit<br>296 Fuse holder base on front cable<br>C 7.5A fuse protecting electronic injection/cooling system Fiat-CODE<br>F 7.5A fuse protecting electronic injection system/Fiat-CODE |
| 8 Left front earth<br>9 Right front earth<br>10 Earth for battery on bodyshell<br>11 Battery<br>12 Ignition switch<br>13 Connection between right/left front cables<br>19 Right rear earth<br>42 Right dashboard earth<br>55 D Coupling between left front cable and services pre-wiring<br>56 Fuel gauge assembly<br>A Fuel level sensor<br>B Electric fuel pump | 308 15A fuse protecting canister solenoid valve<br>314 4 stage pressure switch<br>325 Connection between injection/left front cables<br>334 Connection for diagnostic cable (1747)<br>359 Signal inversion relay diode (1747)                                                                                                                                                                                                                                                     |
- N.D. Ultrasound welding taped in cable loom

13 Connection between right/left front cables

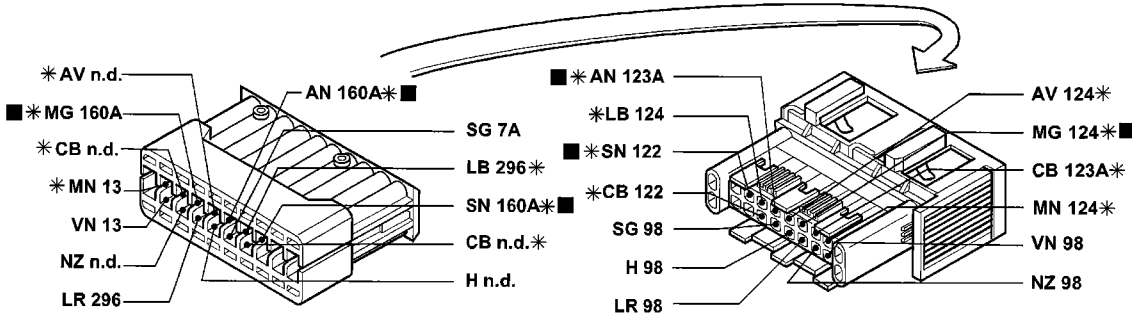


\* Variant connection for versions with alarm

55D Connection between front cables/pre-wiring

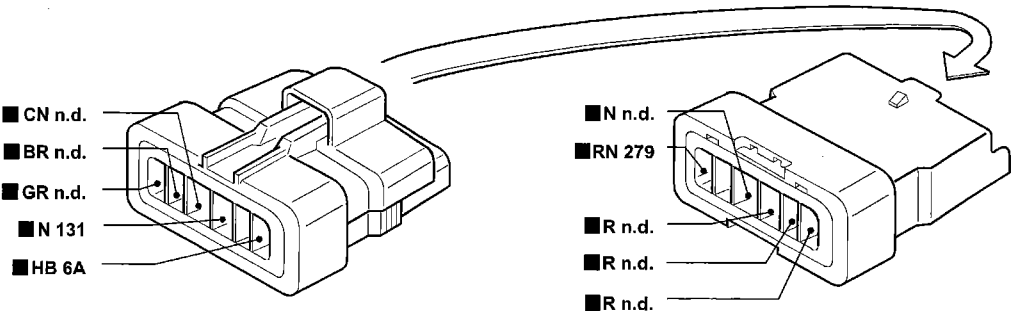


127 Connection between left front cable/cable on relay holder bracket



\* Variant connection for versions with alarm

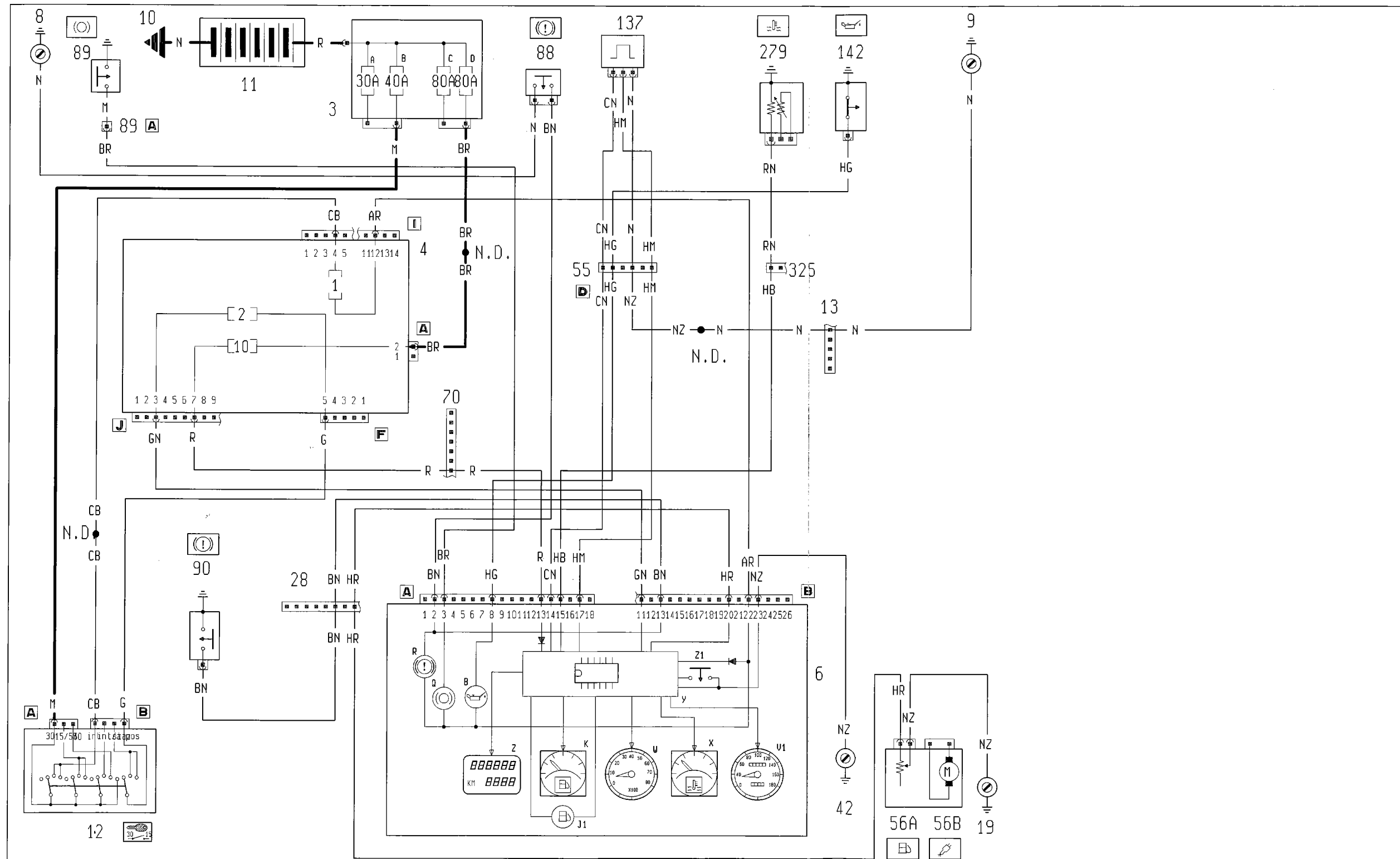
325 Connection between front/injection cables



Leads involved in the wiring diagram are marked by a square

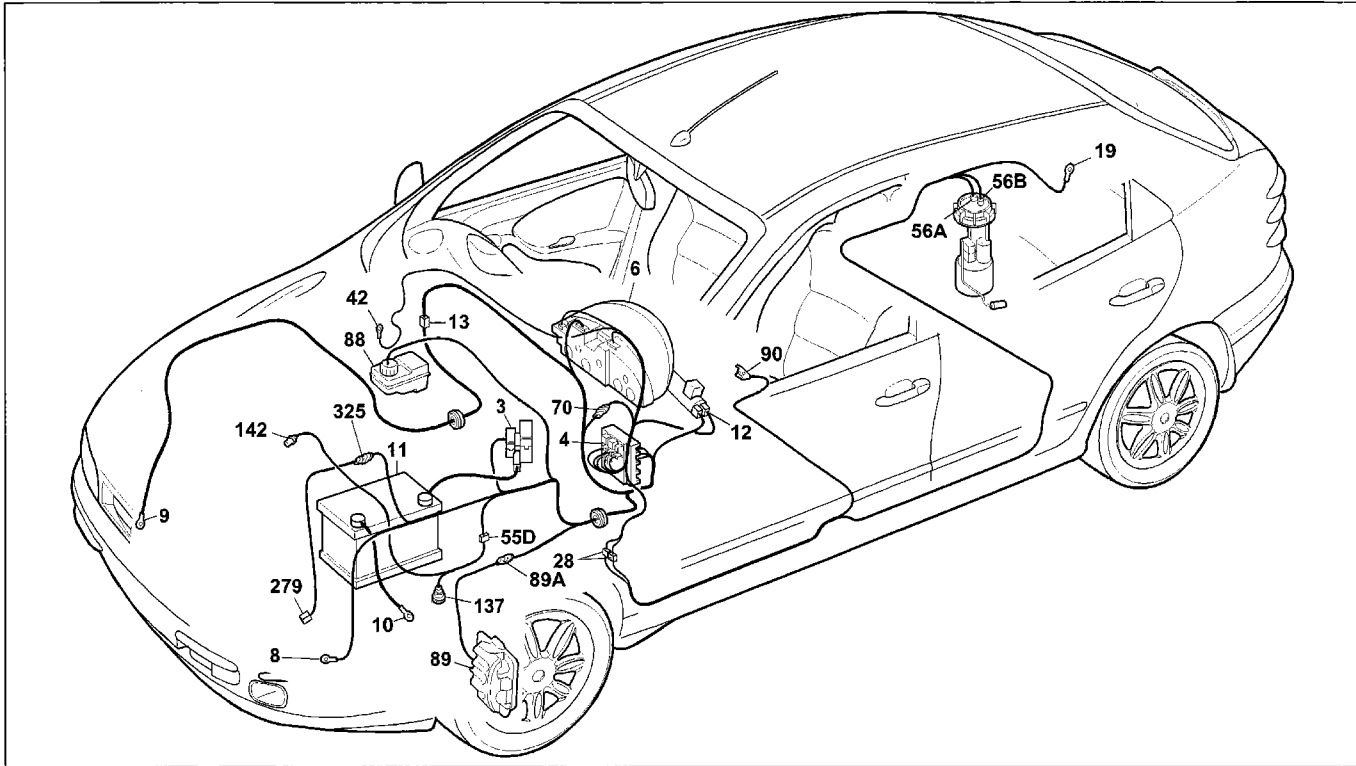
Trim level: SX □ GT

Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter (See key at end of wiring diagrams)



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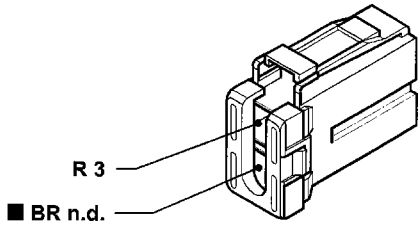


Trim level: SX - GT  
Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter

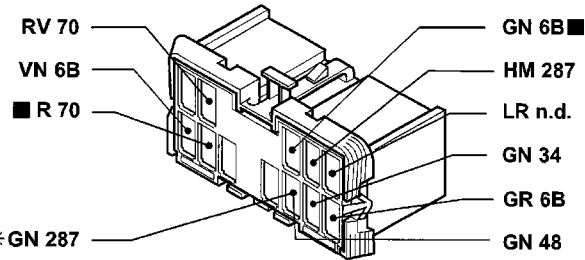
Key to components

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fuse box:<br>A 30A fuse protecting injection system<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting additional extras<br>D 80A fuse protecting junction unit                                                                                                                                                                                                                                                                        | 10 Earth for battery on bodyshell<br>11 Battery<br>12 Ignition switch<br>13 Connection between right/left front cables<br>19 Right rear earth<br>28 Connection between dashboard/longitudinal cables<br>42 Right dashboard earth<br>55 D Connection between left front cable/services pre-wiring<br>56 Fuel gauge assembly<br>A Fuel level sensor<br>B Electric fuel pump<br>70 Connection between dashboard/front cables<br>88 Insufficient brake fluid level sensor<br>89 Left front brake pad wear sensor<br>89A Connection for left brake pad wear sensor cables<br>90 Switch signalling handbrake applied<br>137 Vehicle speed sensor<br>142 Switch signalling insufficient engine oil pressure<br>279 Engine coolant temperature twin sender unit<br>325 Connection between injection/left front cables<br>N.D. Ultrasound welding taped in cable loom |
| 4 Junction unit<br>6 Instrument panel:<br>B Low engine oil pressure warning light<br>J1 Fuel reserve warning light<br>K Fuel gauge<br>Q Front brake pad wear warning light<br>R Handbrake applied/insufficient brake fluid level warning light<br>V1 Speedometer<br>X Engine coolant temperature gauge<br>W Rev counter<br>Y Electronic module<br>8 Z Milometer/trip meter display<br>9 Z1 Trip meter zeroing button<br>Left front earth<br>Right front earth |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

4A Junction unit

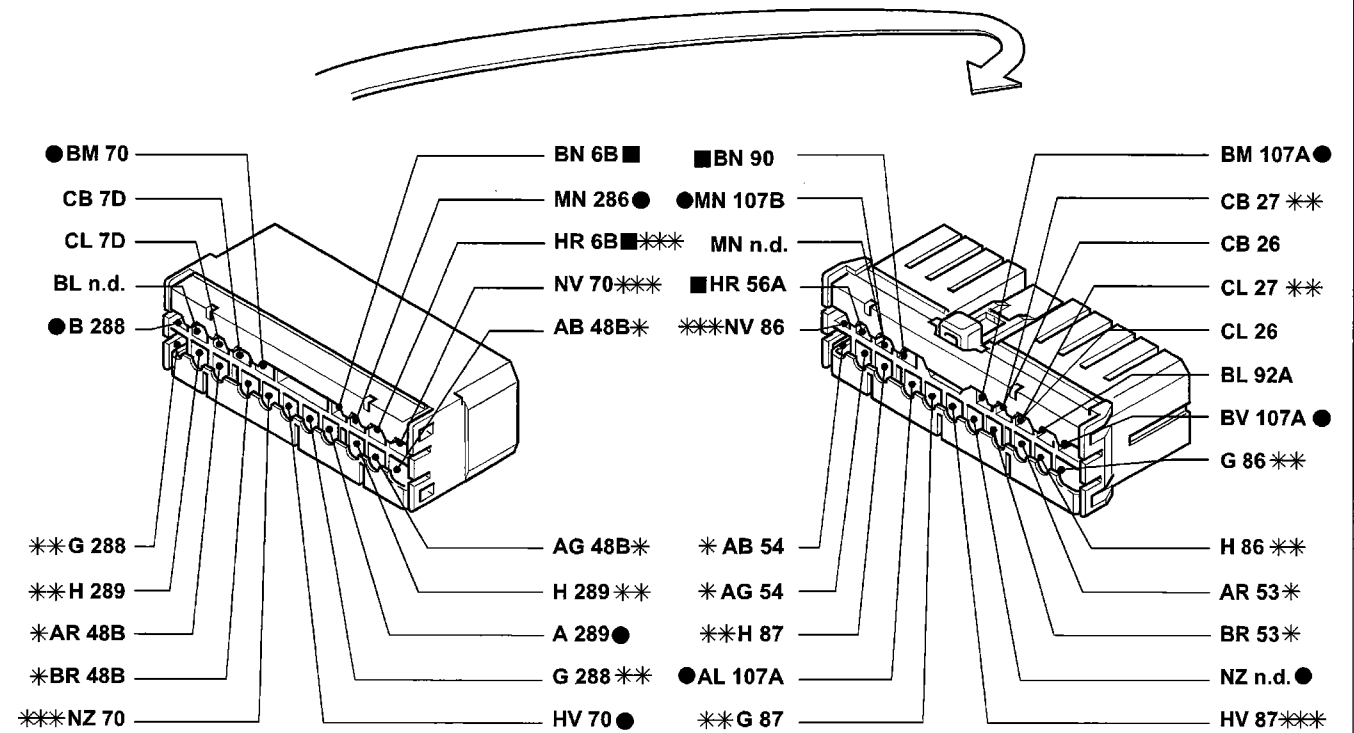


4J Junction unit



\* Variant connection for versions with radio phone

28 Connection between dashboard/longitudinal cables Versions without A.B.I. control unit

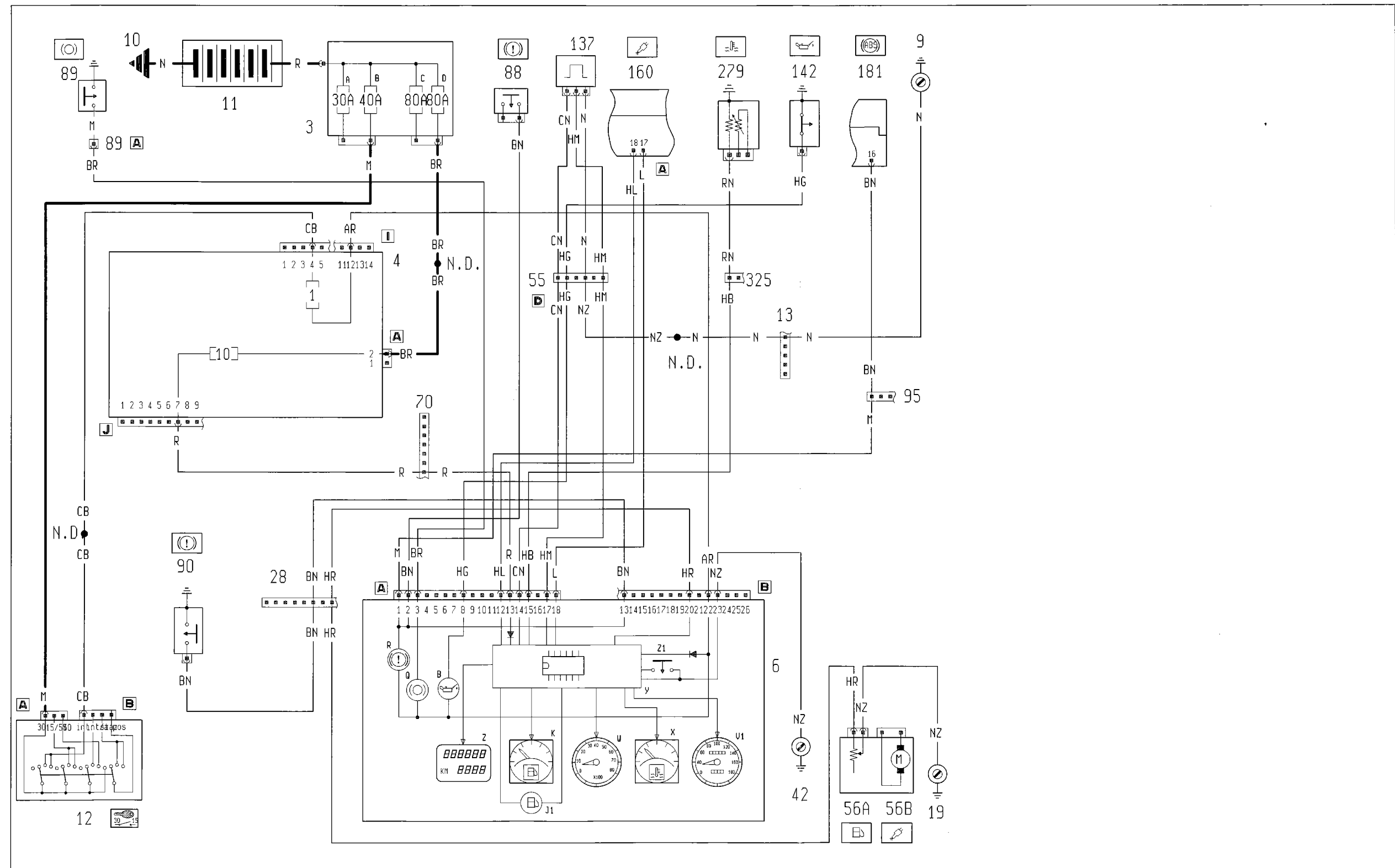


- Variant connections for versions with alarm
- \* Variant connection for versions with top of the range radio
- \*\* Variant connection for Brava versions
- \*\*\* Variant connection for Brava versions with alarm

Leads involved in the wiring diagram are marked by a square

Trim level: ELX □ HSX

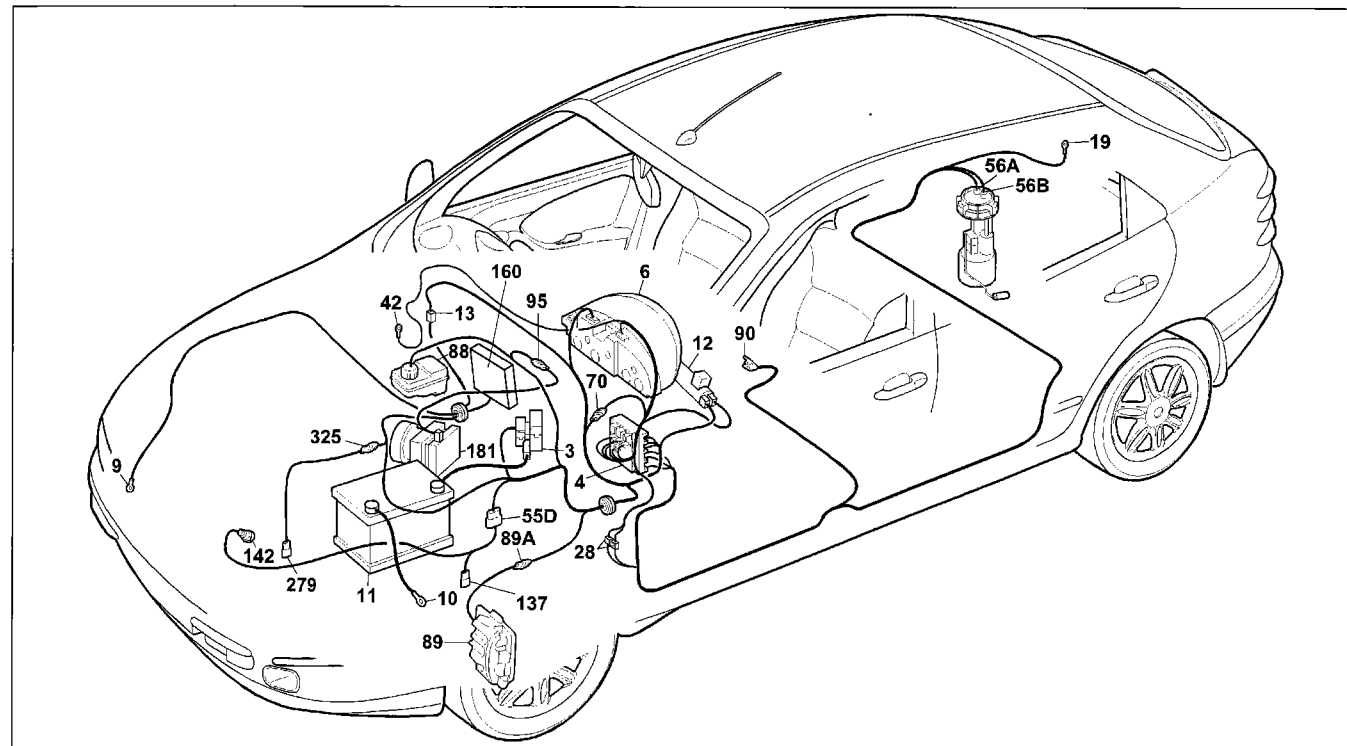
Fuel gauge and reserve warning light - Handbrake applied and insufficient brake fluid warning light - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter - (See key at end of wiring diagrams)



4A033KL01



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4A035KL0

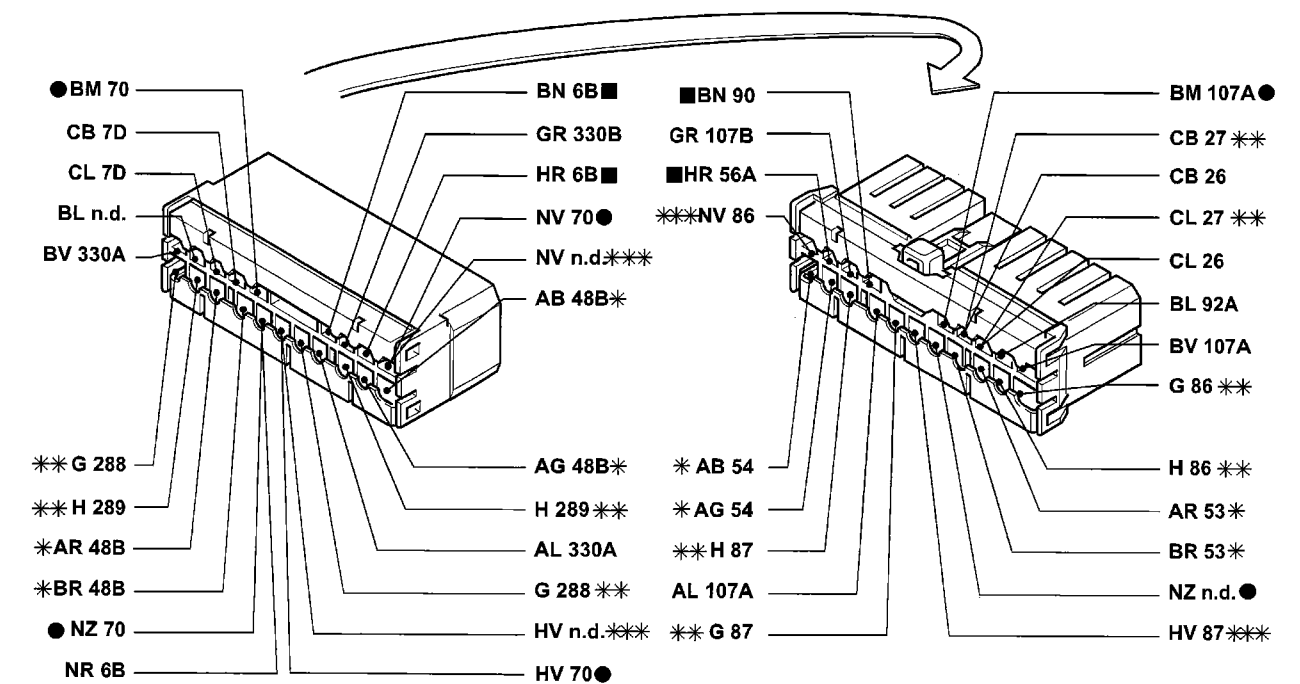
**Trim level: ELX - HSX**

Fuel gauge and reserve warning light - Handbrake applied and insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter

### Key to components

- |                                                                  |                                                                  |
|------------------------------------------------------------------|------------------------------------------------------------------|
| 3 Power fuse box:                                                | 19 Right rear earth                                              |
| A 30A fuse protecting injection system                           | 28 Connection between dashboard/longitudinal cables              |
| B 40A fuse protecting ignition system                            | 42 Right dashboard earth                                         |
| C 80A fuse protecting additional extras                          | 55 D Connection between left front cable/services pre-wiring     |
| D 80A fuse protecting junction unit                              | 56 Fuel gauge unit                                               |
| 4 Junction unit                                                  | A Fuel level sensor                                              |
| 6 Instrument panel:                                              | B Electric fuel pump                                             |
| B Low engine oil pressure warning light                          | 70 Connection between dashboard/front cables                     |
| J1 Fuel reserve warning light                                    | 88 Insufficient brake fluid level sensor                         |
| K Fuel gauge                                                     | 89 Left front brake pad wear sensor                              |
| Q Front brake pad wear warning light                             | 89A Connection for left brake pad wear sensor cables             |
| R Handbrake applied/insufficient brake fluid level warning light | 90 Switch signalling handbrake applied                           |
| V1 Speedometer                                                   | 95 Connection between front cables/anti-lock brakes A.B.S.       |
| W Rev counter                                                    | 137 Vehicle speed sensor                                         |
| X Engine coolant temperature gauge                               | 142 Switch signalling insufficient engine oil pressure           |
| Y Electronic module                                              | 160 Injection/ignition electronic control unit (1747)            |
| Z Milometer/trip meter display                                   | 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.) |
| Z1 Trip meter zeroing button                                     | 279 Engine coolant temperature twin sender unit                  |
| 9 Right front earth                                              | 325 Connection between injection/left front cables               |
| 10 Earth for battery on bodyshell                                |                                                                  |
| 11 Battery                                                       |                                                                  |
| 12 Ignition switch                                               |                                                                  |
| 13 Connection between right/left front cables                    | N.D Ultrasound welding taped in cable loom                       |

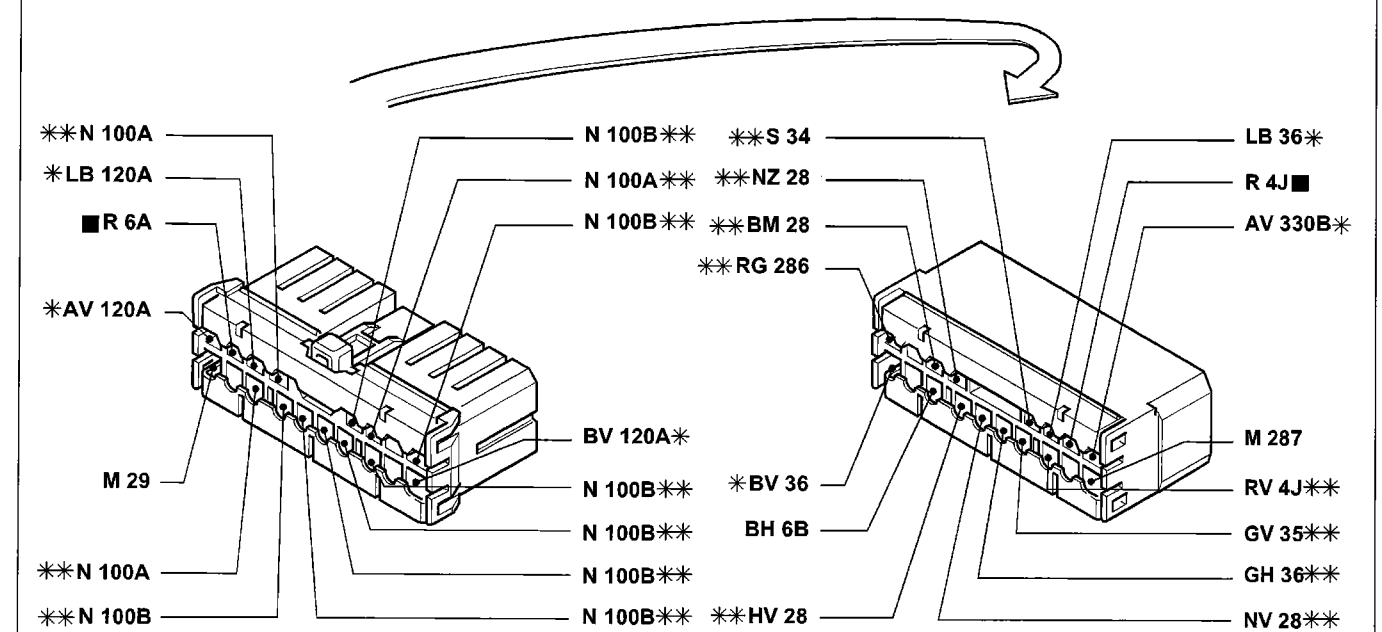
## 28 Connection between dashboard/longitudinal cables



- Variant connection for versions with alarm
- \* Variant connection for versions with top of the range radio
- \*\* Variant connection for Brava versions
- \*\*\* Variant connection for Brava versions with alarm

A036KL01

## 70 Connection between dashboard/front cables



- \* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

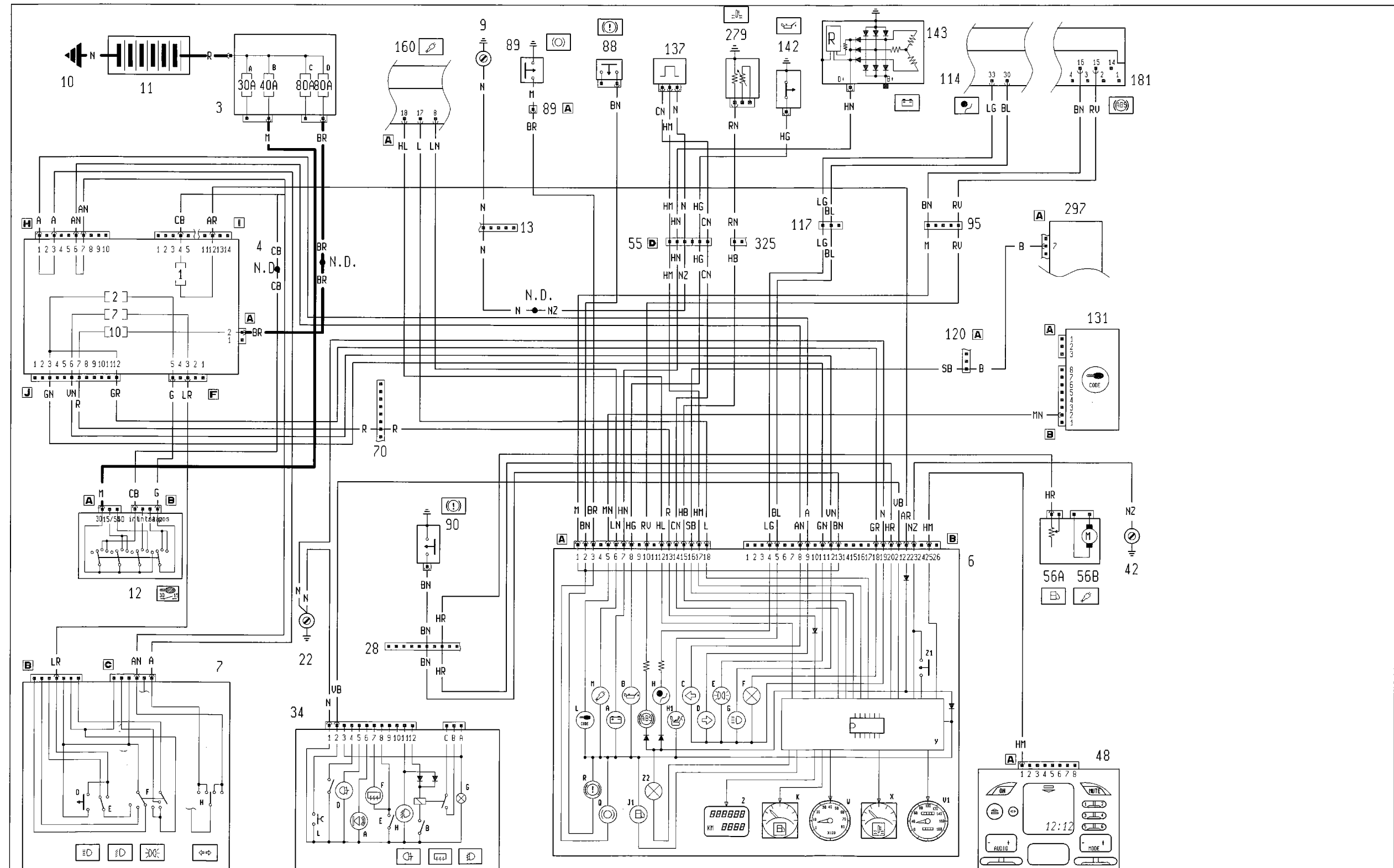
A036KL02

Leads involved in the wiring diagram are marked by a square



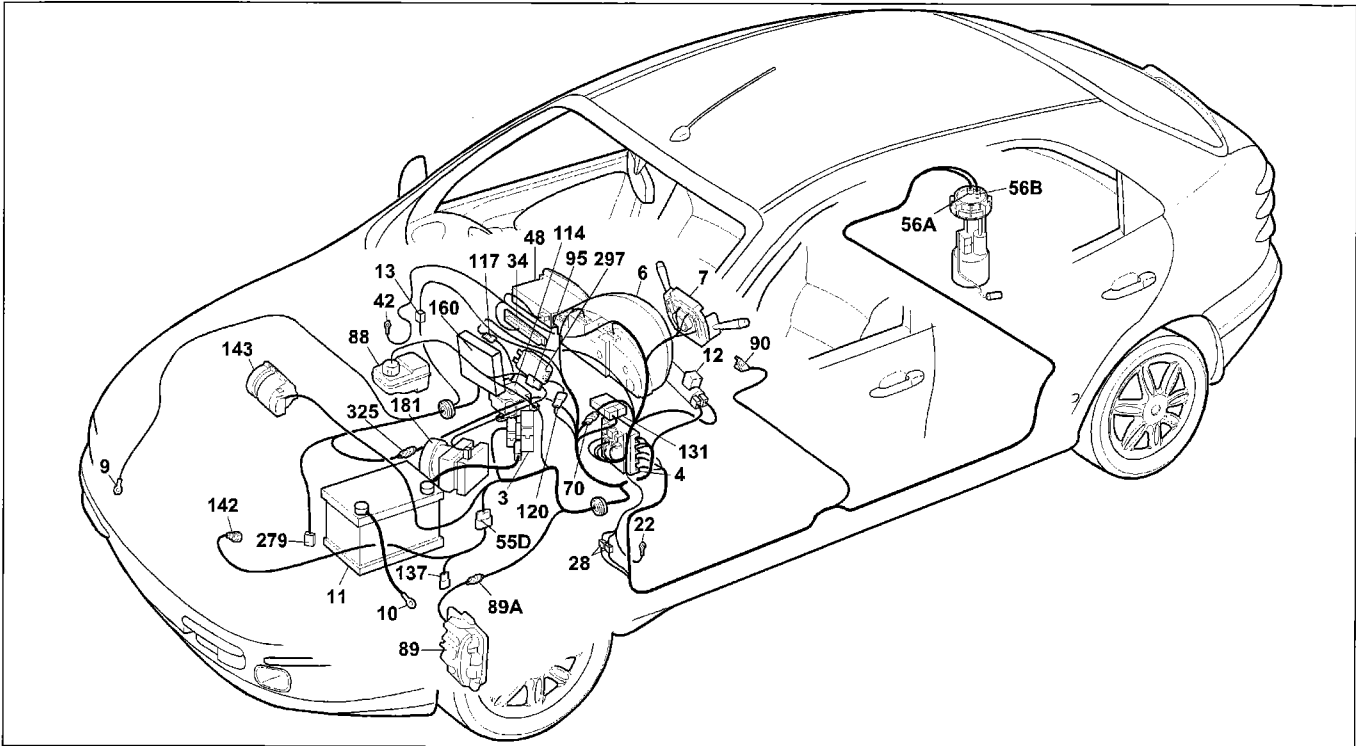
**Trim level: SX - GT**

**Instrument panel connections - (See key at end of wiring diagrams)**



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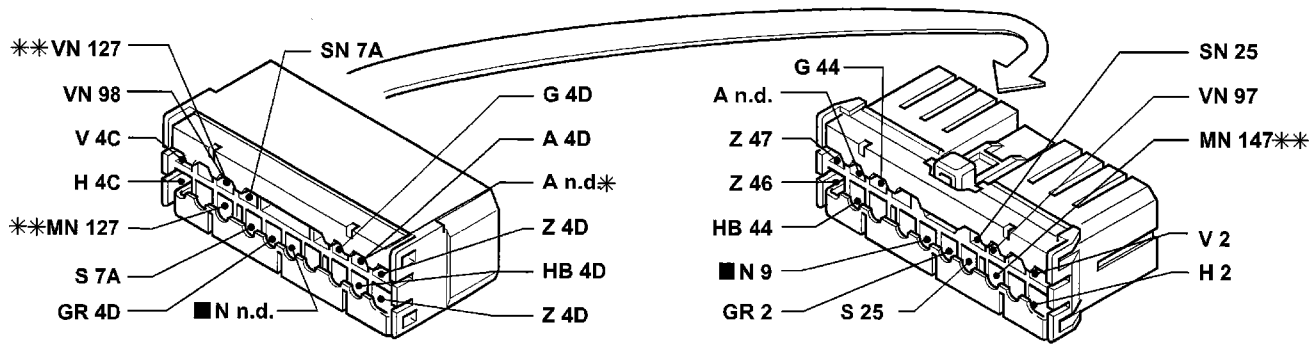
Trim level: SX - GT  
Instrument panel connections

Key to components

- 3 Power fuse box:  
A 30A fuse protecting injection system  
B 40A fuse protecting ignition system  
C 80A fuses protecting additional extras  
D 80A fuse protecting junction unit
- 4 Junction unit:
- 6 Instrument panel:  
A Battery recharging warning light  
B Insufficient engine oil pressure warning light  
C Left direction indicator warning light  
D Right direction indicator warning light  
E Side lights warning light  
F Instrument panel ideogram light  
G Main beam headlamps warning light  
H EURO-BAG system failure warning light  
H1 Passenger EURO-BAG disabled warning light  
I Anti-lock brakes failure warning light  
J1 Fuel reserve warning light  
K Fuel gauge  
L Fiat-CODE failure warning light  
M Petrol/DS injection system failure warning light  
Q Front brake pad wear warning light  
R Handbrake applied/insufficient brake fluid level warning light  
V1 Speedometer  
W Rev counter  
X Engine coolant temperature gauge  
Y Electronic module  
Z Milometer/trip meter display  
Z1 Trip meter zeroing button  
Z2 Trip meter light
- 7 Steering column switch unit:  
D Flasher button  
E Dipped/main beam headlamps control switch  
F Side lights control switch  
H Direction indicators control switch
- 9 Right front earth  
10 Earth for battery on bodysell  
11 Battery  
12 Ignition switch  
13 Connection between right/left front cables  
22 Right dashboard earth

- 28 Connection between dashboard/longitudinal cables  
34 Switch control panel:  
A Anti-theft device on warning light  
B Rear fog lamps control switch  
C Rear fog lamps relay feed  
D Rear fog lamps warning light  
E Heated rear windscreen control switch  
F Heated rear windscreen warning light  
G Switch control panel ideogram light  
H Fog lights warning light  
I Fog lights control switch  
L Outside temperature control switch
- 42 Right dashboard earth  
48 Radio receiver with clock  
55 D Connection between front/services cables  
56 Fuel gauge assembly:  
A Fuel level sensor  
B Electric fuel pump
- 70 Connection between dashboard/front cables
- 88 Insufficient brake fluid level sensor  
89 Left front brake pad wear  
89A Connection for left brake pad wear sensor cables  
90 Switch signalling handbrake applied  
95 Connection between front cables/anti-lock brakes (A.B.S.)
- 114 EURO-BAG electronic control unit  
117 Connection between EURO-BAG/dashboard cables  
120A Connection for air conditioning unit cables  
131 Fiat-CODE electronic control unit  
137 Vehicle speed sensor  
142 Switch signalling insufficient engine oil pressure  
143 Alternator  
160 Injection/ignition electronic control unit  
181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 279 Engine coolant temperature twin sender unit  
297 Air conditioning control unit  
325 Connection between front/injection cables  
N.D. Ultrasound welding taped in cable loom

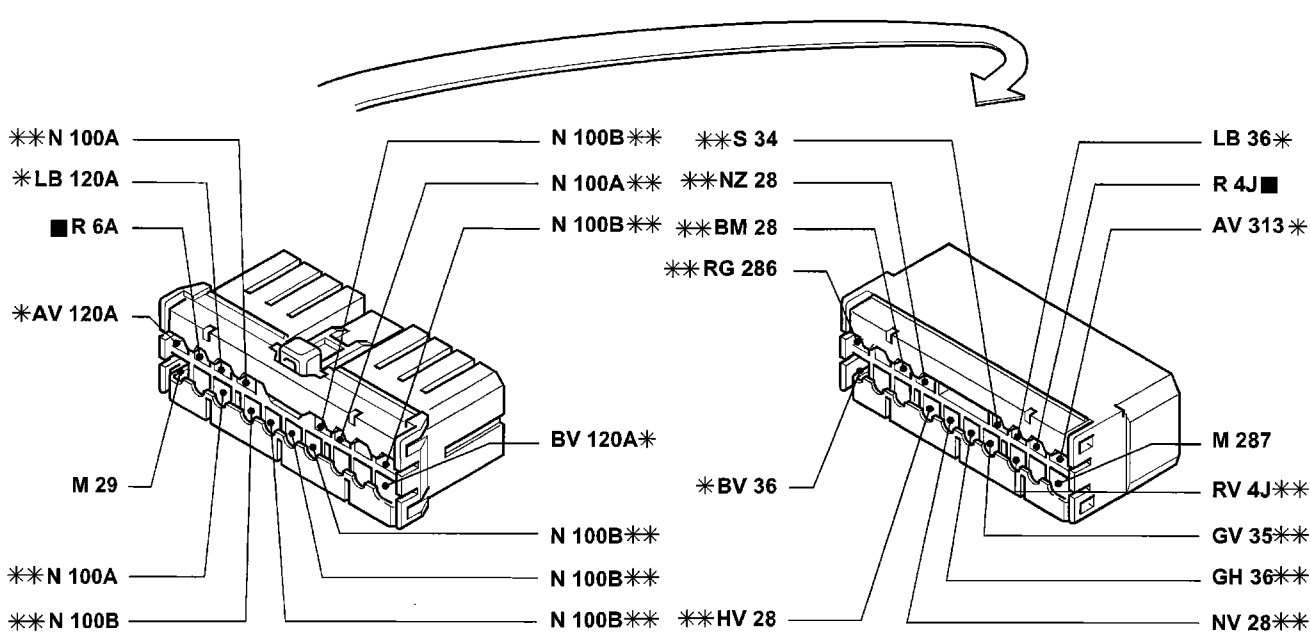
13 Connection between right/left front cables



\* Variant connection for versions with alarm  
\*\* Variant connection for versions with air conditioning

4A040KL01

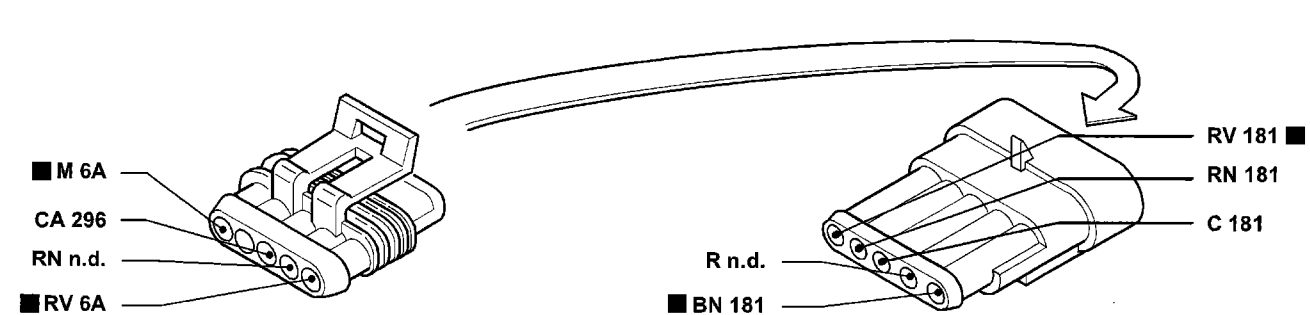
70 Connection between dashboard/front cables



\* Variant connections for versions with air conditioning  
\*\* Variant connection for versions with alarm

4A040KL02

95 Connection between left front/antiskid (A.B.S.) cables

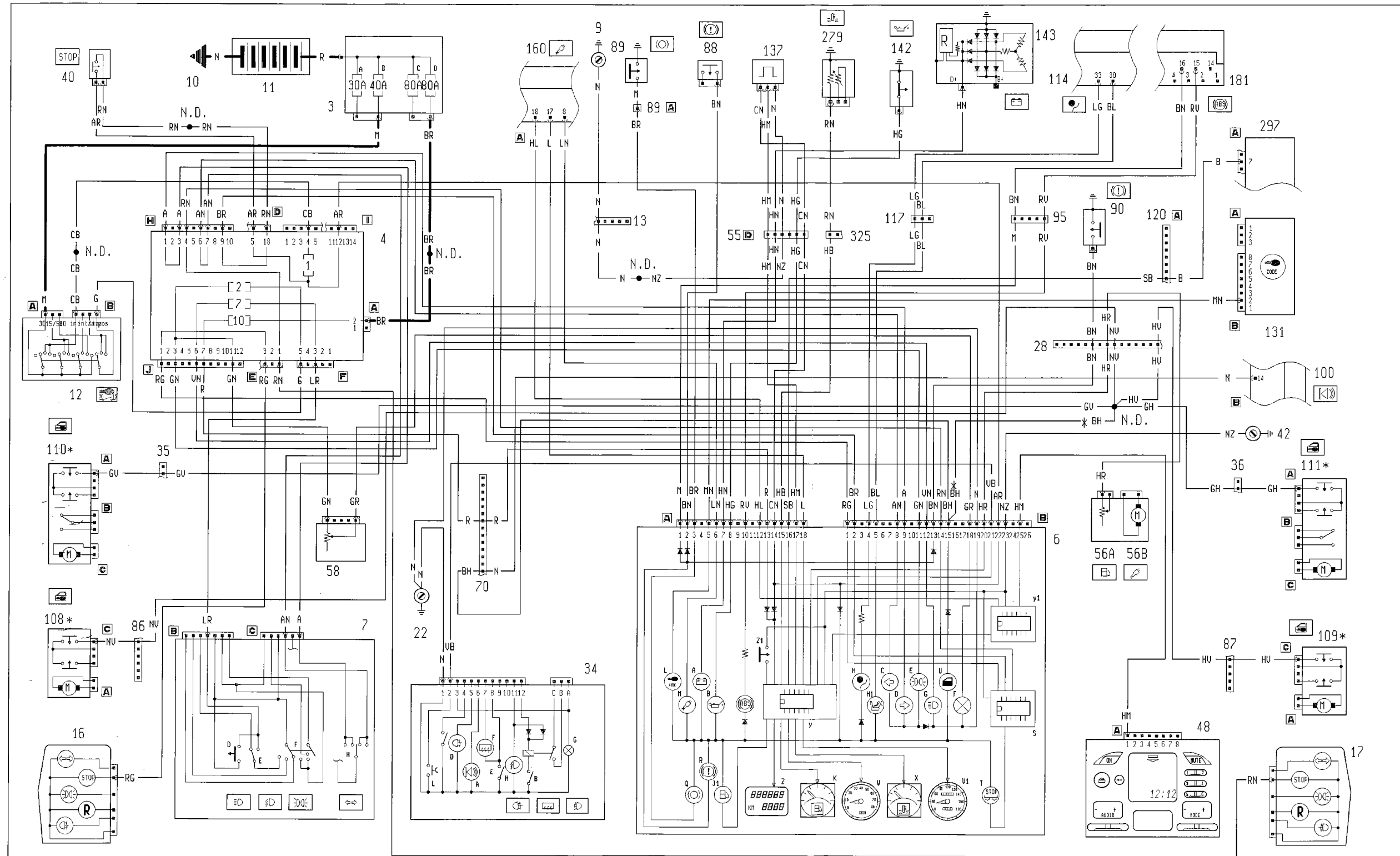


4A040KL03

Leads involved in the wiring diagram are marked by a square

**Trim level: ELX - HSX**

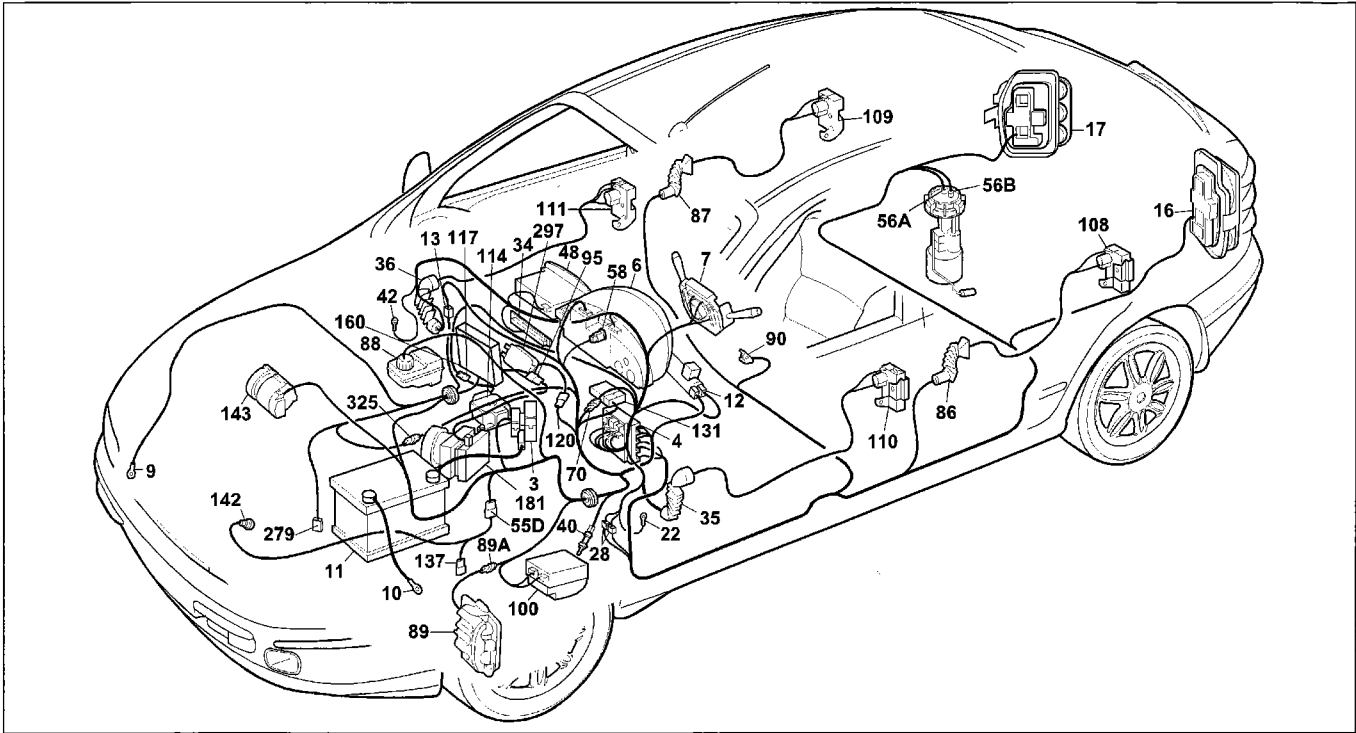
**Instrument panel connections - (See key at end of wiring diagrams)**



4A041KL01

\* Variant connection for versions without alarm

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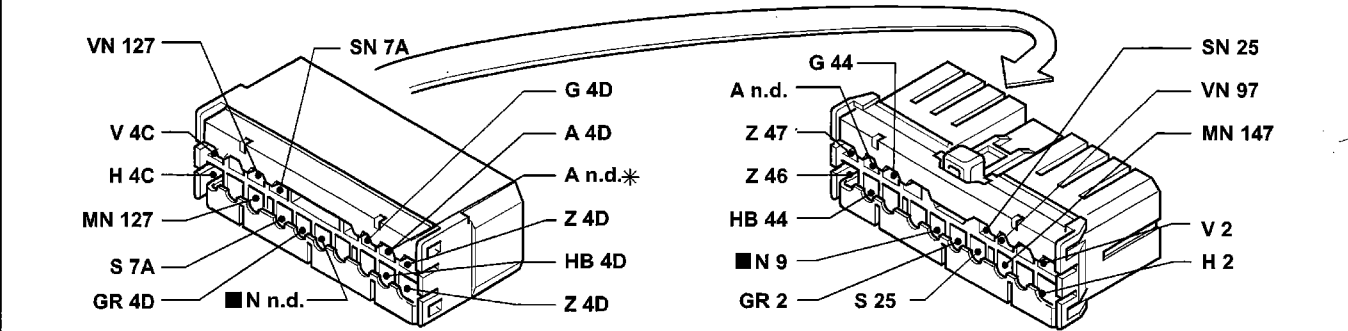


- Trim level: ELX - HSX  
Instrument panel connections  
Key to components
- 3 Power fuse box:
    - A 30A fuse protecting injection system
    - B 40A fuse protecting ignition system
    - C 80A fuse protecting additional extras
    - D 80A fuse protecting junction unit
  - 4 Junction unit:
  - 6 Instrument panel:
    - A Battery recharging warning light
    - B Insufficient engine oil pressure warning light
    - C Left direction indicator warning light
    - D Right direction indicator warning light
    - E Side lights warning light
    - F Instrument panel ideograms light
    - G Main beam headlamps warning light
    - H EURO-BAG system failure warning light
    - H1 Passenger EURO-BAG disabled warning light
    - I Anti-lock brakes failure warning light
    - J1 Fuel reserve warning light
    - K Fuel gauge
    - L Fiat-CODE failure warning light
    - M Petrol/DS injection system failure warning light
    - Q Front brake pad wear warning light
    - R Handbrake applied/insufficient brake fluid level warning light
    - S Brake lights failure electronic module
    - T Brake lights failure warning light
    - U Doors open warning light
    - V1 Speedometer
    - W Rev counter
    - X Engine coolant temperature gauge
    - Y Electronic module
    - Y1 Speed control module
    - Z Milometer/trip meter display
    - Z1 Trip meter zeroing button
  - 7 Steering column switch unit:
    - D Flasher button
    - E Dipped/main beam headlamps control switch
    - F Side lights control switch
    - H Direction indicators control switch
  - 9 Right front earth
  - 10 Earth for battery on bodyshell
  - 11 Battery
  - 12 Ignition switch
  - 13 Connection between right/left front cables
  - 16 Left rear light cluster
  - 17 Right rear light cluster
  - 22 Left dashboard earth

- 28 Connection between dashboard/longitudinal cables
- 34 Switch control panel:
  - A Anti-theft device on warning light
  - B Rear fog lamps control switch
  - C Rear fog lamps warning light
  - E Heated rear windscreen control switch
  - F Heated rear windscreen warning light
  - G Switch control panel ideogram light
  - H Fog lights warning light
  - I Fog lights control switch
  - L Outside temperature control switch
- 35 Connection between dashboard/left front door cables
- 36 Connection between dashboard/right front door cables
- 40 Brake lights control switch
- 42 Right dashboard earth
- 48 Radio receiver with clock
- 55 D Connection between front/services cables
- 56 Fuel gauge assembly:
  - A Fuel level sensor
  - B Electric fuel pump
- 58 Light dimmer
- 70 Connection between dashboard/front cables
- 86 Connection between longitudinal/left rear door cables
- 87 Connection between longitudinal/right rear door cables
- 88 Insufficient brake fluid level sensor
- 89 Left brake pad wear sensor
- 89A Left brake pad wear sensor cables
- 90 Switch signalling handbrake applied
- 95 Connection between front cables/anti-lock brakes (A.B.S.)
- 100 Alarm electronic control unit
- 108 Left rear central locking/alarm on switch
- 109 Right rear central locking/alarm on switch
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/alarm on switch
- 114 EURO-BAG electronic control unit
- 117 EURO-BAG/dashboard cables connection
- 120A Connection for air conditioning unit cables
- 131 Fiat-CODE electronic control unit
- 137 Vehicle speed sensor
- 142 Switch signalling insufficient engine oil pressure
- 143 Alternator
- 160 Injection/ignition electronic control unit
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 279 Engine coolant temperature twin sender unit
- 297 Air conditioning control unit
- 325 Connection between front/injection cables

N.D. Ultrasound welding taped in cable loom

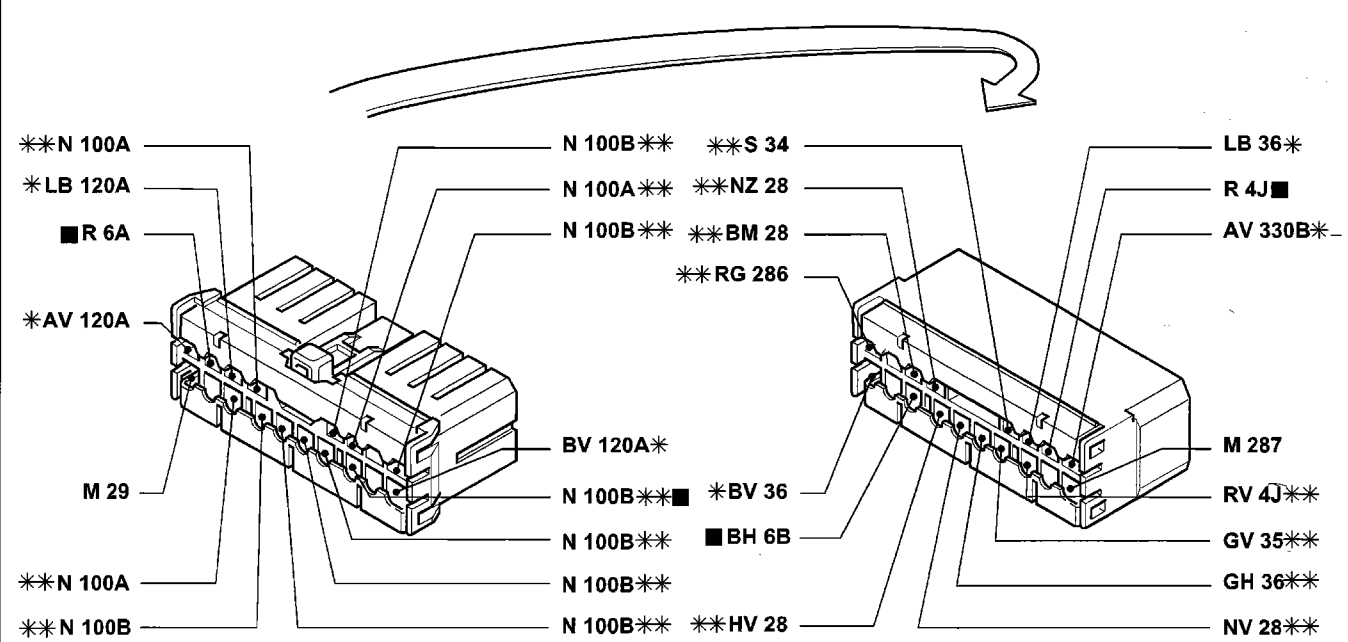
13 Connection between right/left front cables



\* Variant connection for versions with alarm

4A044KL01

70 Connection between dashboard/front cables

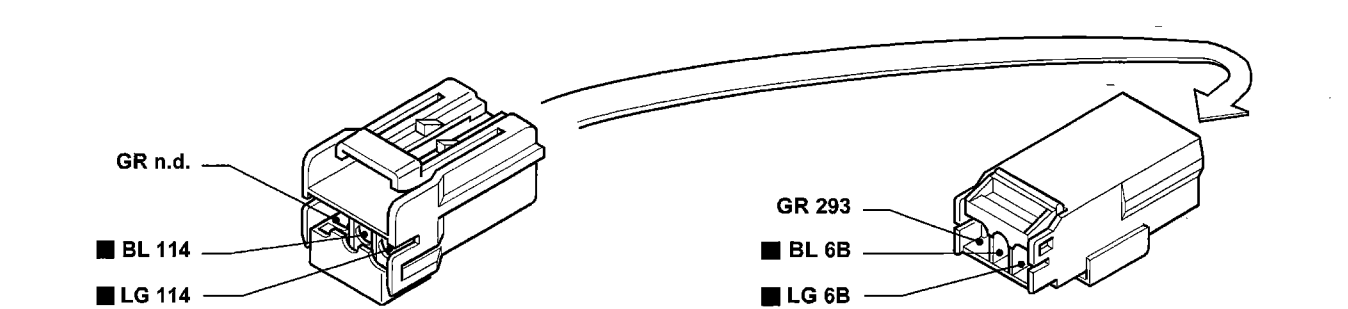


\* Variant connection for versions with air conditioning

\*\* Variant connection for versions with alarm

4A044KL02

117 Connection between EURO-BAG/dashboard cables



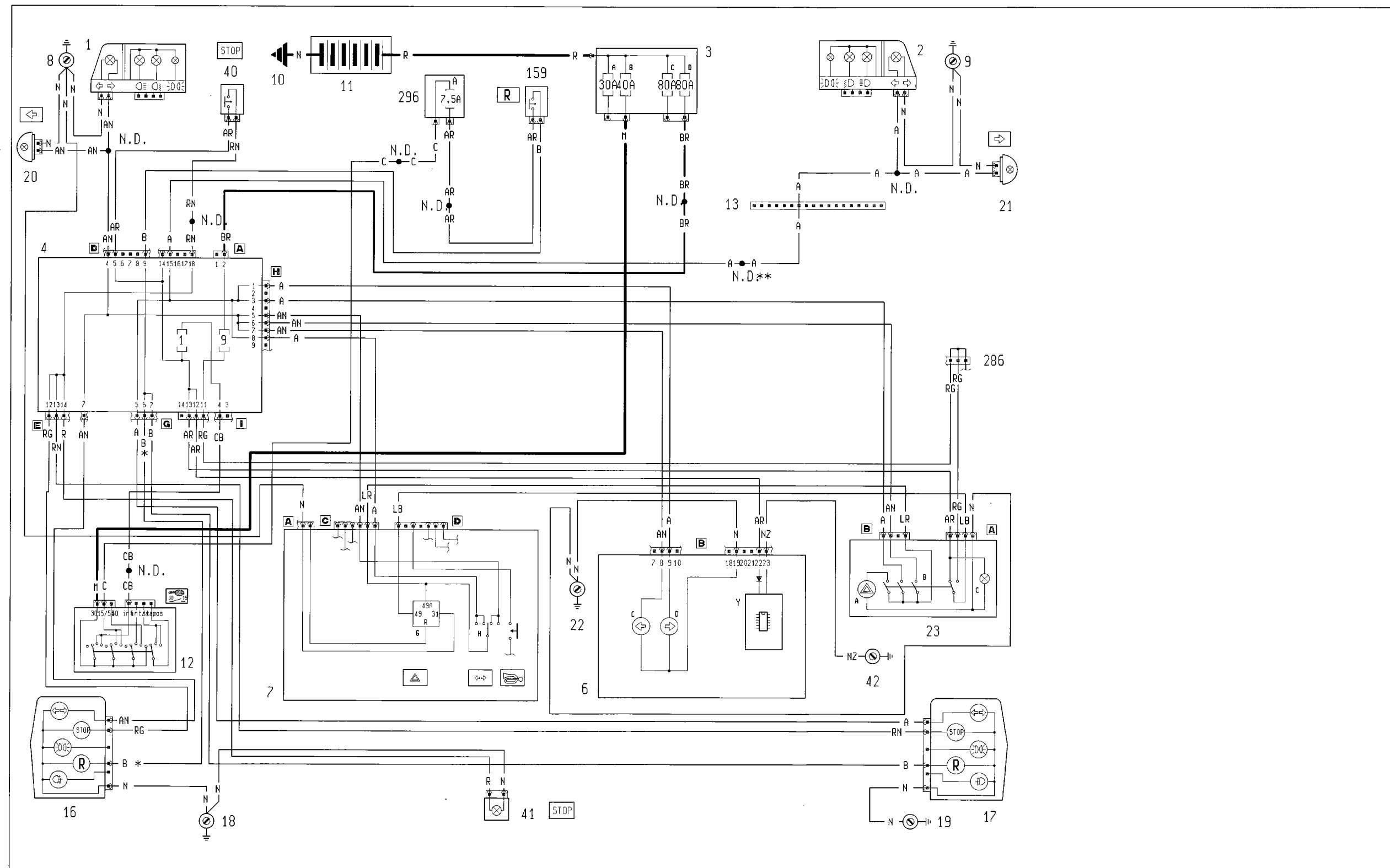
4A044KL03

Leads involved in the wiring diagram are marked by a square



Trim level: SX □ GT

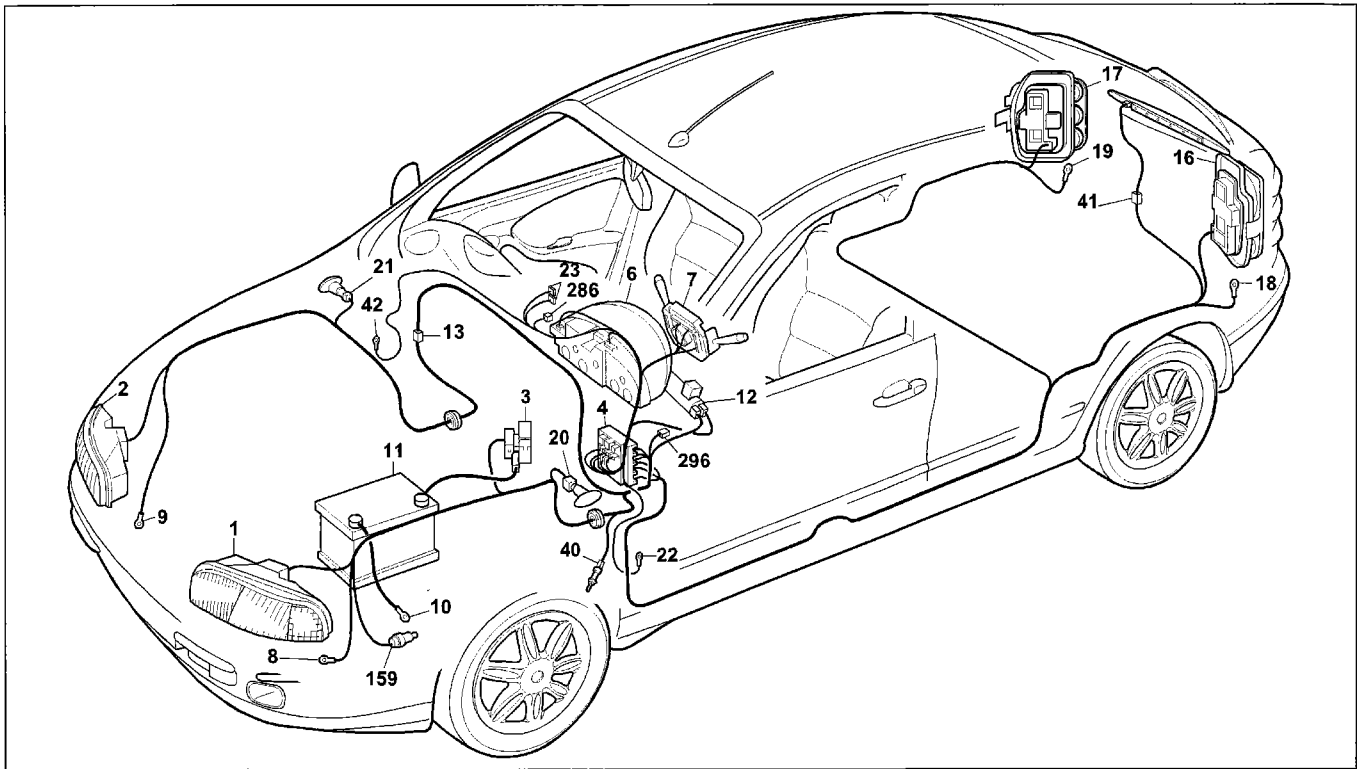
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights - (See key at end of wiring diagrams)



\* Non existent for the BRAVO version \*\* Variant connection for the version with alarm

4A045KL01

55.

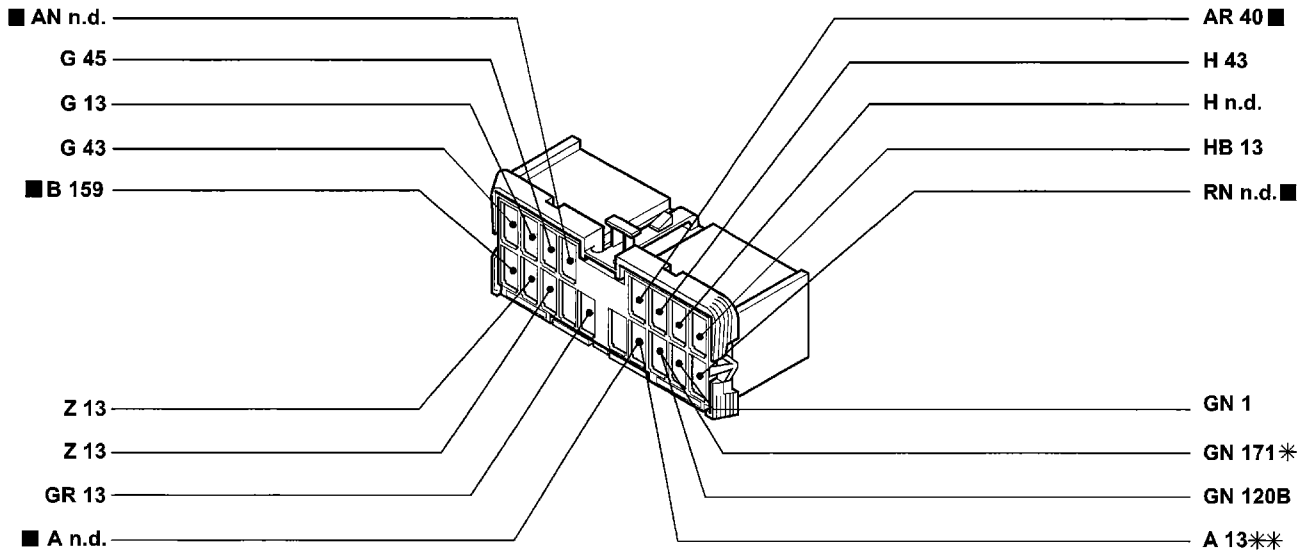


Trim level: SX □ GT  
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing light

Key to components

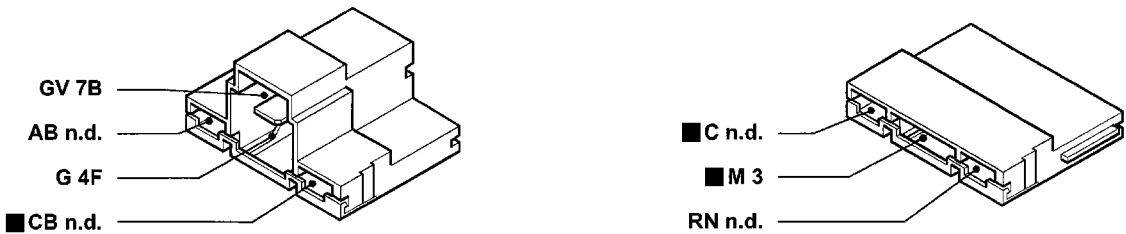
- |                                                                                                                                                                                        |                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Left front light cluster                                                                                                                                                             | 16 Left rear light cluster                                                                                                                                        |
| 2 Right front light cluster                                                                                                                                                            | 17 Right rear light cluster                                                                                                                                       |
| 3 Power fuse box:<br>A 30A fuse protecting injection system<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting additional extras<br>D 80A fuse protecting junction unit | 18 Left rear earth                                                                                                                                                |
| 4 Junction unit                                                                                                                                                                        | 19 Right rear earth                                                                                                                                               |
| 6 Instrument panel:<br>C Left direction indicator warning light<br>D Right direction indicator warning light<br>Y Electronic module                                                    | 20 Left front direction indicator                                                                                                                                 |
| 7 Steering column switch unit<br>H Hazard warning lights control switch<br>G Direction indicators/hazard warning lights switch                                                         | 21 Right front direction indicator                                                                                                                                |
| 8 Left front earth                                                                                                                                                                     | 22 Left dashboard earth                                                                                                                                           |
| 9 Right front earth                                                                                                                                                                    | 23 Hazard warning lights switch unit<br>A Hazard warning lights warning light<br>B Hazard warning lights control switch<br>C Hazard warning lights ideogram light |
| 10 Earth for battery on bodyshell                                                                                                                                                      | 40 Brake lights control switch                                                                                                                                    |
| 11 Battery                                                                                                                                                                             | 41 Additional brake light                                                                                                                                         |
| 12 Ignition switch                                                                                                                                                                     | 42 Right dashboard earth                                                                                                                                          |
| 13 Connection between right/left front cables                                                                                                                                          | 159 Reversing lights control switch                                                                                                                               |
|                                                                                                                                                                                        | 286 Short circuit connection                                                                                                                                      |
|                                                                                                                                                                                        | 296 Fuse holder base on front cable<br>A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm                                             |
- N.D. Ultrasound welding taped in cable loom

4D Junction unit

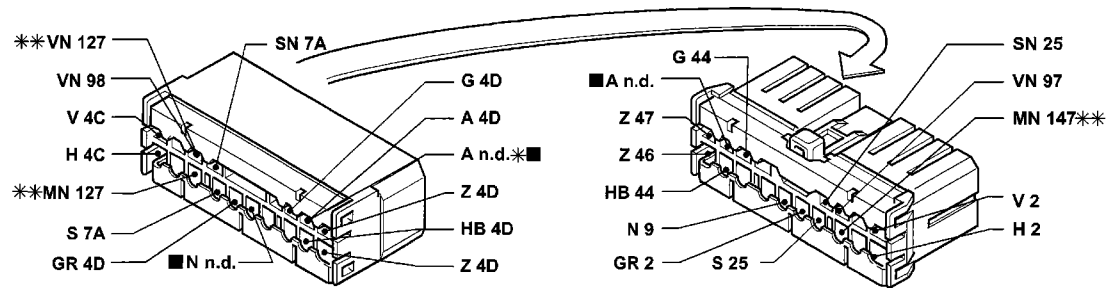


\* Variant connection for versions without air conditioning  
\*\* Variant connection for versions without alarm

12 Ignition switch



13 Connection between right/left front cables



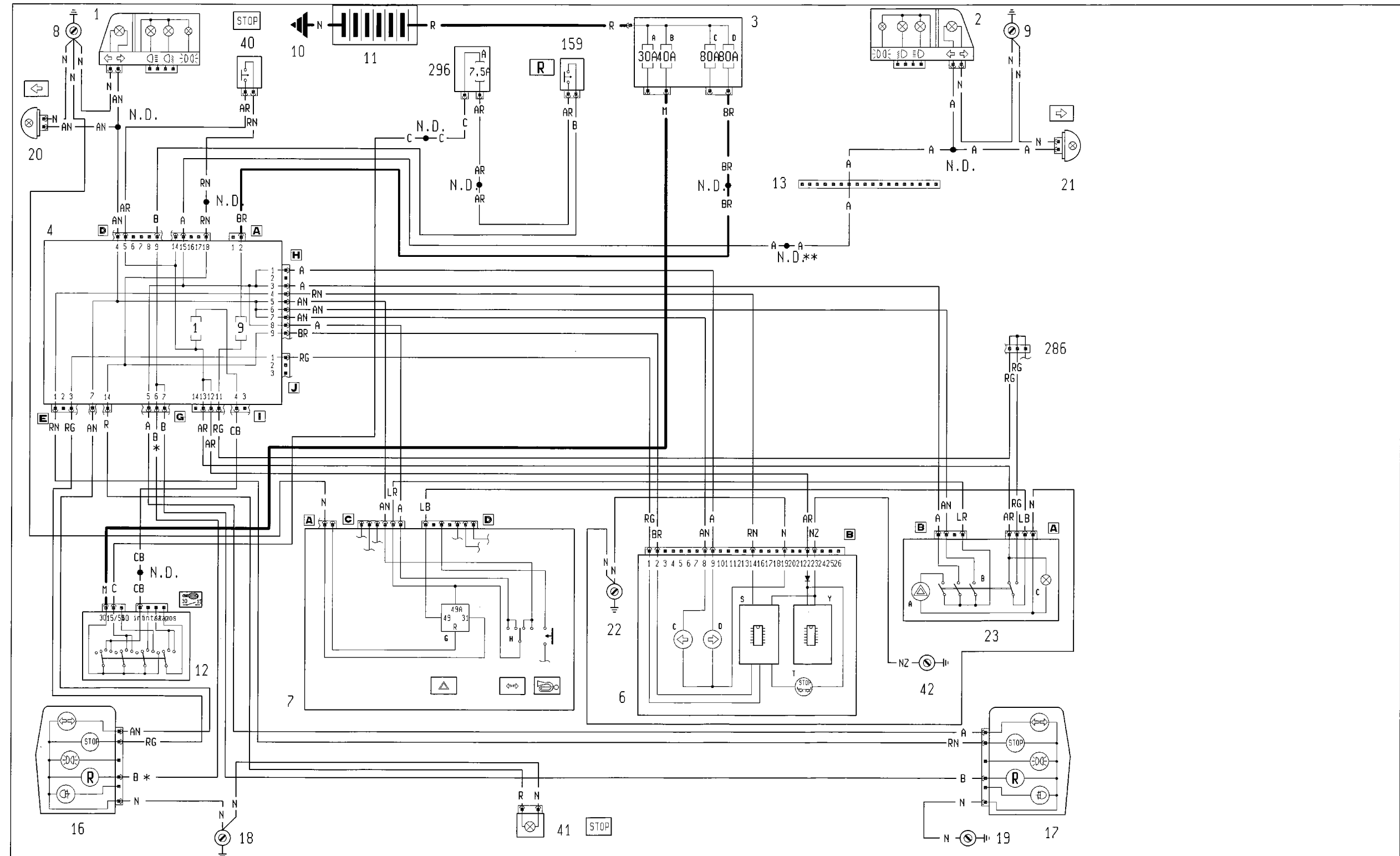
\* Variant connection for versions with alarm  
\*\* Variant connection for versions with air conditioning

Leads involved in the wiring diagram are marked by a square



Trim level: ELX - HSX

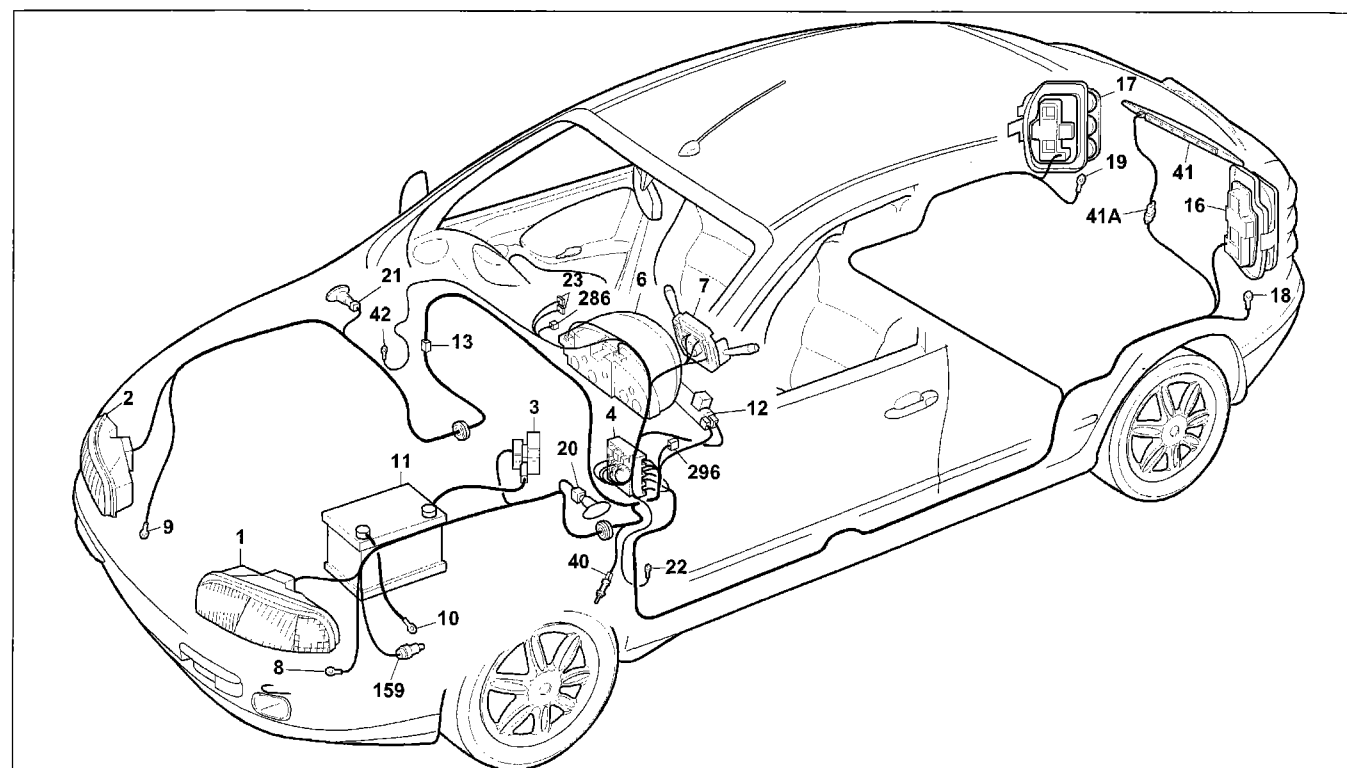
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights - (See key at end of wiring diagrams)



\* Non existent for BRAVO version \*\* Variant connection for version with alarm

4A049KL01

### 55.



4A051KL01

Trim level: ELX - HSX

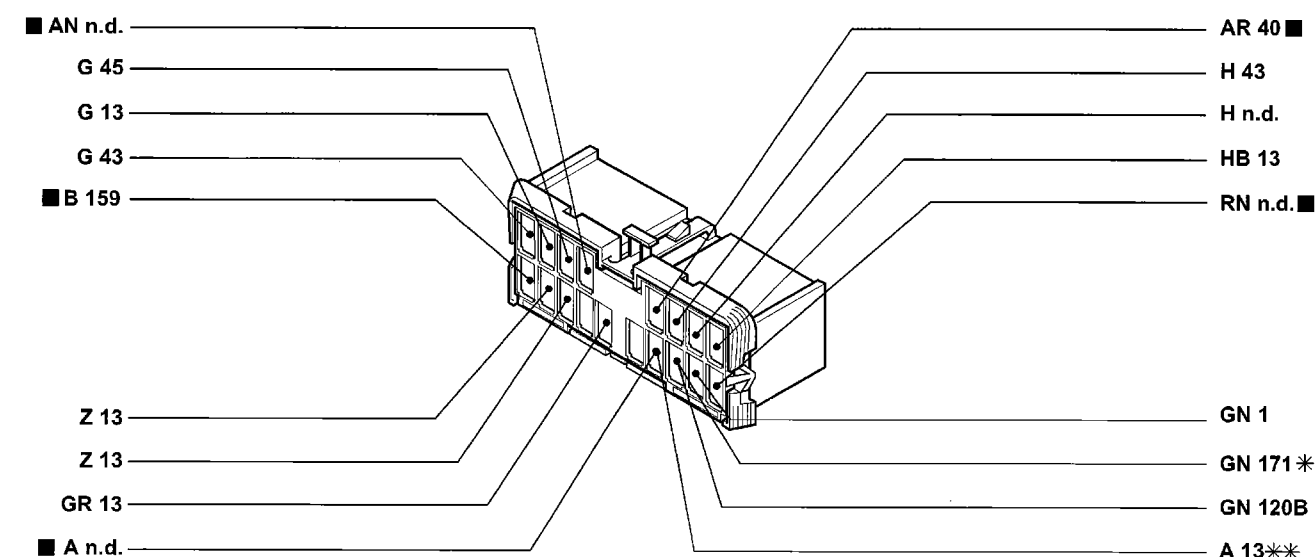
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing light

#### Key to components

- |                                                     |                                                                                    |
|-----------------------------------------------------|------------------------------------------------------------------------------------|
| 1 Left front light cluster                          | 12 Ignition switch                                                                 |
| 2 Right front light cluster                         | 13 Connection between right/left front cables                                      |
| 3 Power fuse box:                                   | 16 Left rear light cluster                                                         |
| A 30A fuse protecting injection system              | 17 Right rear light cluster                                                        |
| B 40A fuse protecting ignition system               | 18 Left rear earth                                                                 |
| C 80A fuse protecting additional extras             | 19 Right rear earth                                                                |
| D 80A fuse protecting junction unit                 | 20 Left front side direction indicator                                             |
| 4 Junction unit                                     | 21 Right front side direction indicator                                            |
| 6 Instrument panel:                                 | 22 Left dashboard earth                                                            |
| C Left direction indicator warning light            | 23 Hazard warning lights switch unit                                               |
| D Right direction indicator warning light           | A Hazard warning lights warning light                                              |
| S Brake lights failure electronic module            | B Hazard warning lights control switch                                             |
| T Brake lights failure warning light                | C Hazard warning lights ideogram light                                             |
| Y Electronic module                                 | Brake lights control switch                                                        |
| 7 Steering column switch unit                       | 40 Additional brake light                                                          |
| H Hazard warning lights control switch              | 41 Right dashboard earth                                                           |
| G Direction indicators/hazard warning lights switch | 42 Reversing lights control switch                                                 |
| 8 Left front earth                                  | 159 Short circuit connection                                                       |
| 9 Right front earth                                 | 286 Fuse holder base on front cable                                                |
| 10 Earth for battery on bodysell                    | 296 A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm |
| 11 Battery                                          |                                                                                    |

N.D. Ultrasound welding taped in cable loom

#### 4D Junction unit

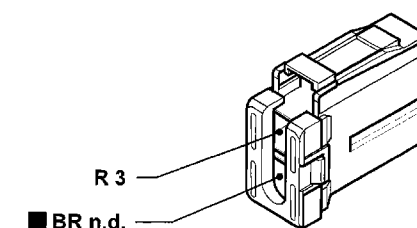


\* Variant connection for versions without air conditioning

\*\* Variant connection for versions without alarm

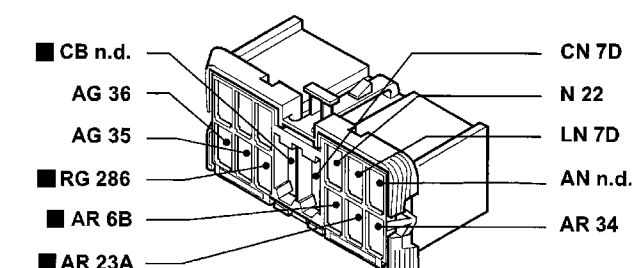
4A052KL01

#### 4A Junction unit



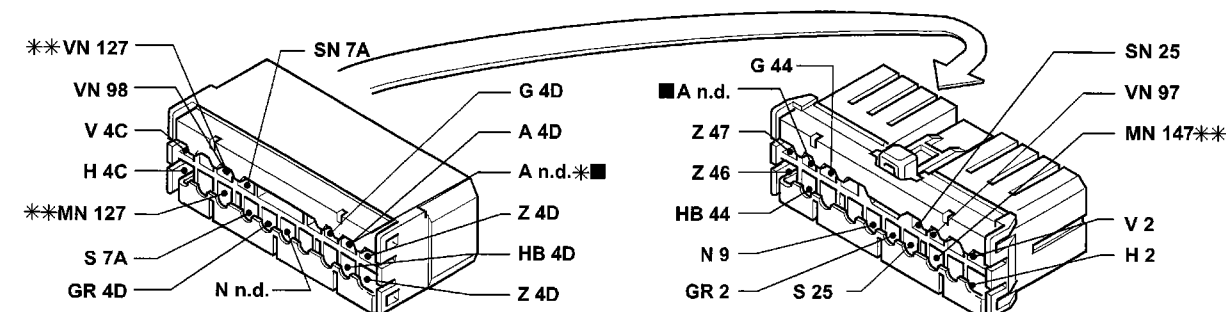
4A052KL02

#### 4I Junction unit



4A052KL03

#### 13 Connection between right/left front cables



\* Variant connection for versions with alarm

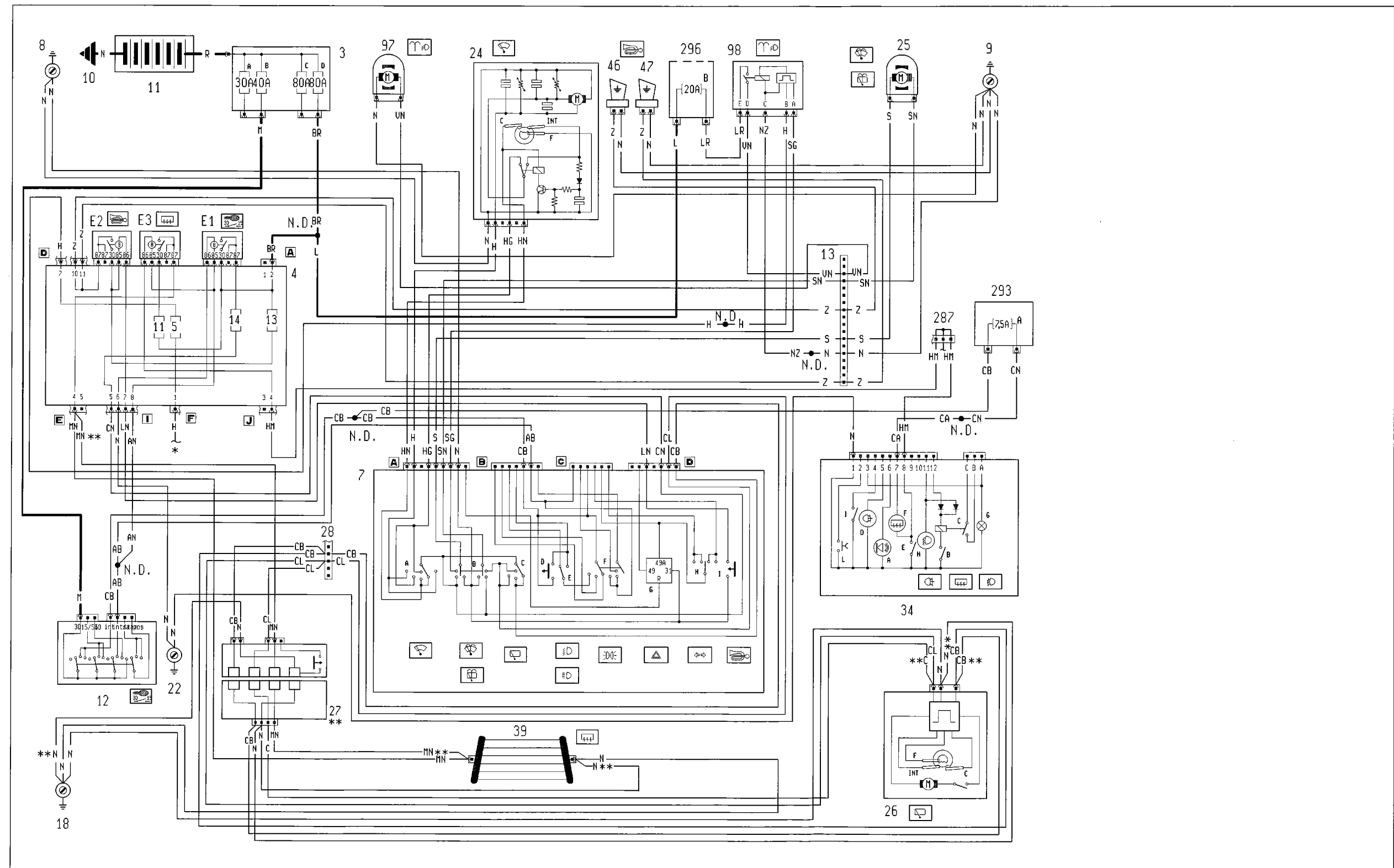
\*\* Variant connection for versions with air conditioning

4A052KL04

Leads involved in the wiring diagram are marked by a square

Version with A.B.I.

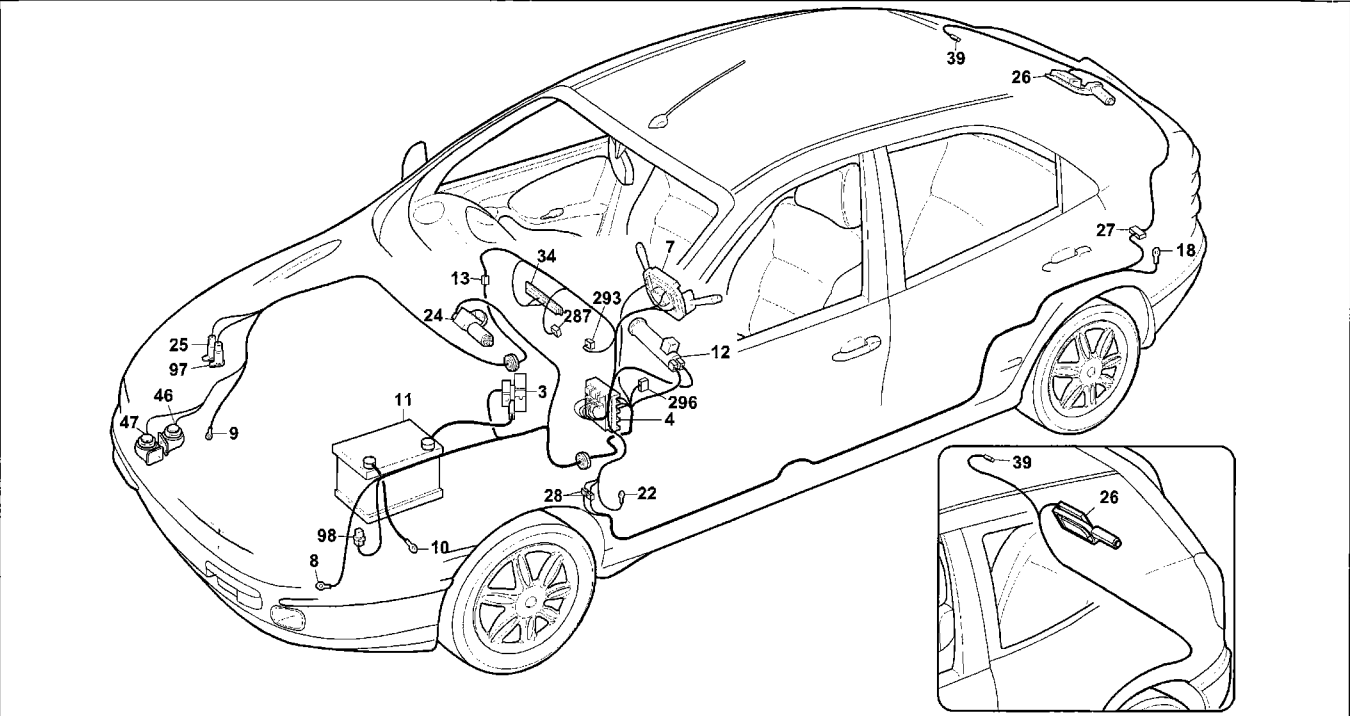
Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer - (See key at end of wiring diagrams)



\* See side lights wiring diagram \*\* Variant connection for the BRAVA version

4A053 KL01

55.

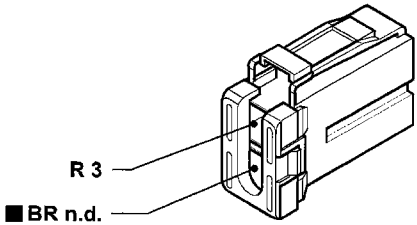


Version without A.B.I.  
Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer

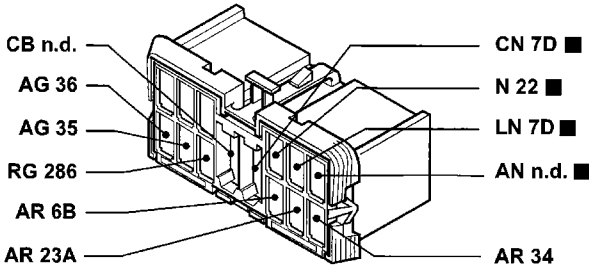
Key to components

- 3 Power fuse box:
  - A 30A fuse protecting injection system
  - B 40A fuse protecting ignition system
  - C 80A fuse protecting additional extras
  - D 80A fuse protecting junction unit
- 4 Junction unit
  - E1 Switch discharge relay
  - E2 Electric horn relay feed
  - E3 Heated rear windscreen relay feed
- 7 Steering column switch unit:
  - A Windscreen wiper speed control switch
  - B Windscreen washer/headlamp washer/rearscreen washer control switch
  - C Rearscreen wiper control switch
  - D Headlamp flasher button
  - E Dipped/main beam headlamps control switch
  - F Side lights control switch
  - G Direction indicators/hazard warning lights intermittent device
  - H Direction indicators control switch
  - I Electric horn control button
- 8 Left front earth
- 9 Right front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Connection between right/left front cables
- 18 Left rear earth
- 22 Left dashboard earth
- 24 Windscreen wiper motor
- 25 Electric windscreen/rearscreen washer pump
- 26 Rearscreen wiper motor
- 27 Contact board between bodyshell and tail-gate (Brava)
- 28 Connection between dashboard/longitudinal cables
- 34 Switch control panel:
  - A Alarm on warning light
  - B Rear fog lamps control switch
  - D Rear fog lamps warning light
  - E Heated rear windscreen control switch
  - F Heated rear windscreen warning light
  - G Switch control panel ideogram light
  - H Fog lights warning light
  - I Fog lights control switch
  - L Outside temperature control switch
- 39 Heated rear windscreen
- 46 Left horn
- 47 Right horn
- 97 Electric headlamp washer pump
- 98 Headlamp washer intermittent device
- 287 Short circuit connection
- 293 Fuse holder base on dashboard cable
  - A 7.5A fuse protecting switch panel light; Radio telephone; Radio; Electric mirrors
- 296 Fuse holder base on front cable
  - B 20A fuse protecting windscreen wiper with A.B.I. or without A.B.I.
- N.D. Ultrasound welding taped in cable loom

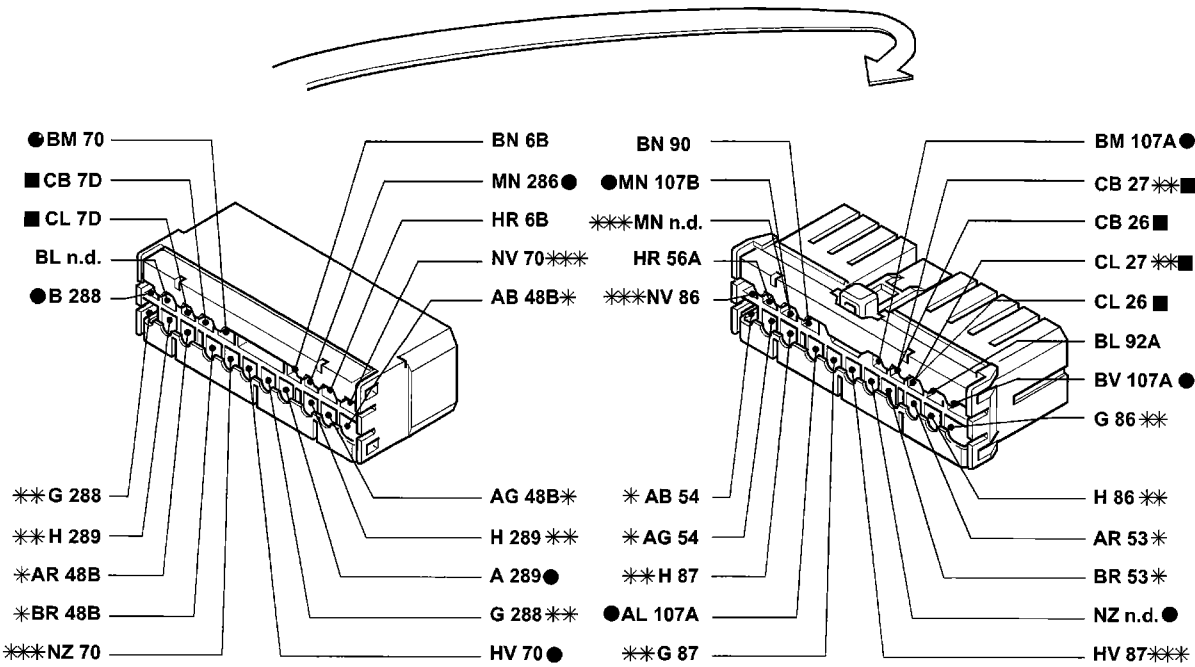
4A Junction unit



4I Junction unit



28 Connection between dashboard/longitudinal cables Versions without A.B.I. control unit

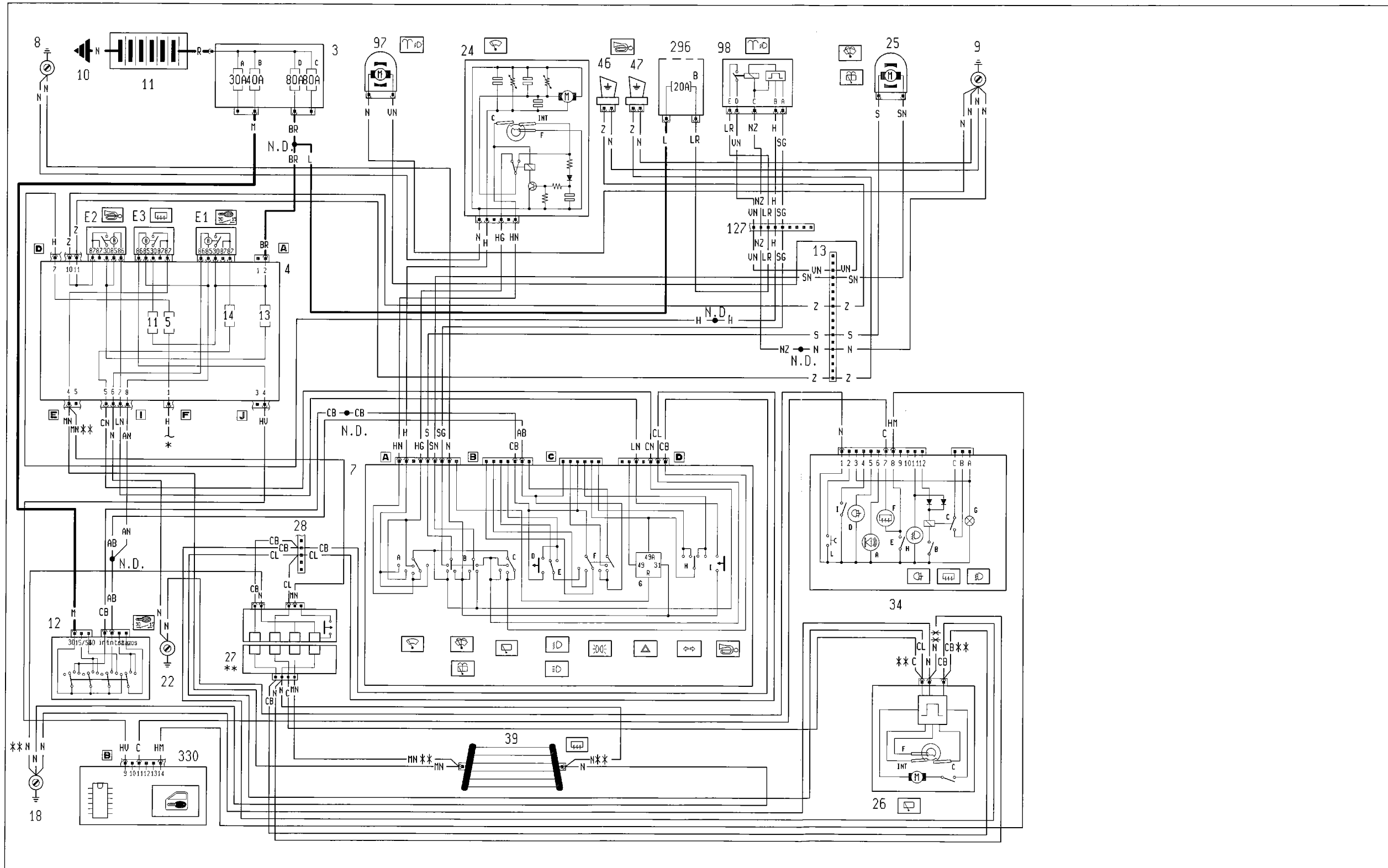


• Variant connection for versions with alarm  
\* Variant connection for versions with top of the range radio  
\*\* Variant connection for Brava versions  
\*\*\* Variant connection for Brava versions with alarm

Leads involved in the wiring diagram are marked by a square

**Version with A.B.I.**

**Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer (See key at end of wiring diagrams)**

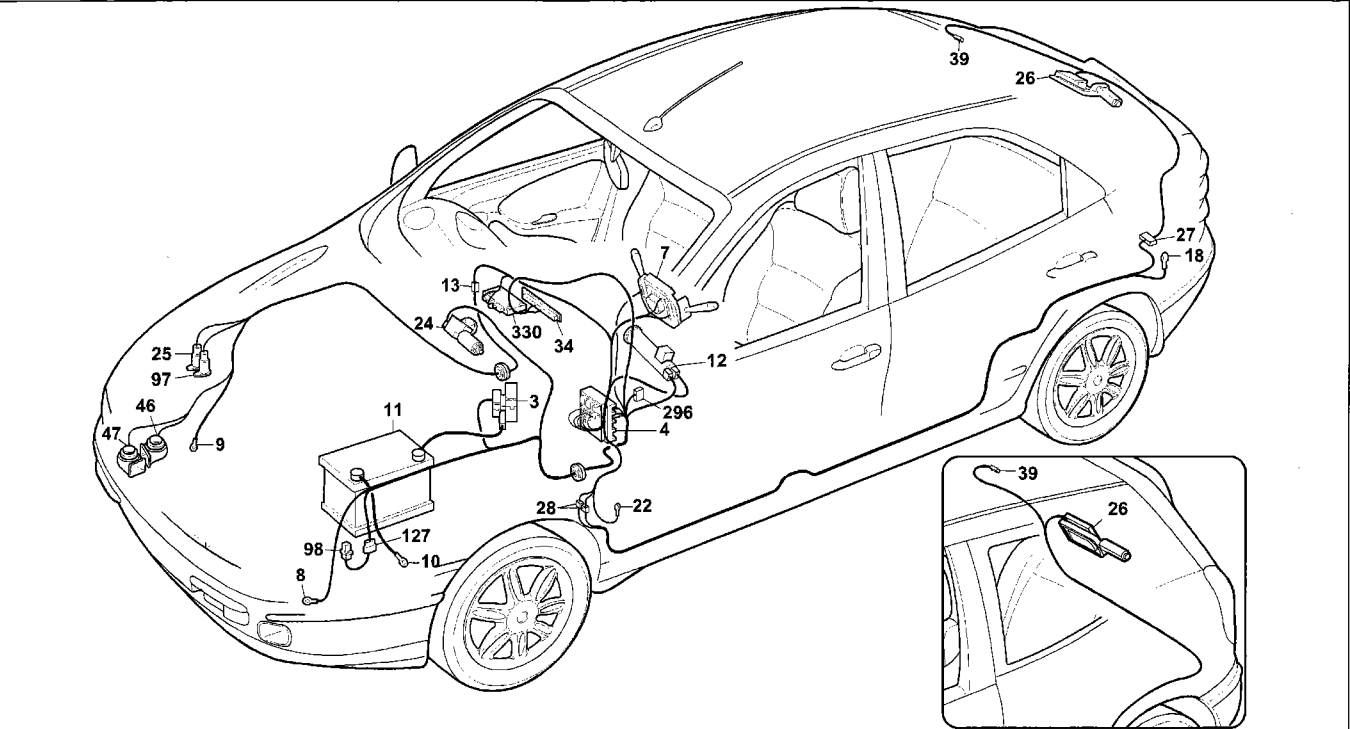


\* See side lights wiring diagram    \*\* Variant connection for the BRAVA version

4A057KL01



55.



Version with A.B.I.  
Windscreen wash/wipe - Rearscreen wash/wipe - Electric horns - Heated rear windscreen and warning light - Headlamp washer

Key to components

- 3 Power fuse box:  
A 30A fuse protecting injection system  
B 40A fuse protecting ignition system  
C 80A fuse protecting additional extras  
D 80A fuse protecting junction unit

4 Junction unit  
E1 Switch discharge relay  
E2 Horn relay feed  
E3 Heated rear windscreen relay feed

7 Steering column switch unit:  
A Windscreen wiper speed control switch  
B Windscreen/headlamp/rearscreen washer control switch  
C Rearscreen wiper control switch  
D Headlamp flasher button  
E Dipped/main beam headlamp control switch  
F Side lights control switch  
G Direction indicators/hazard warning lights intermittent device  
H Direction indicators control switch  
I Horn control button

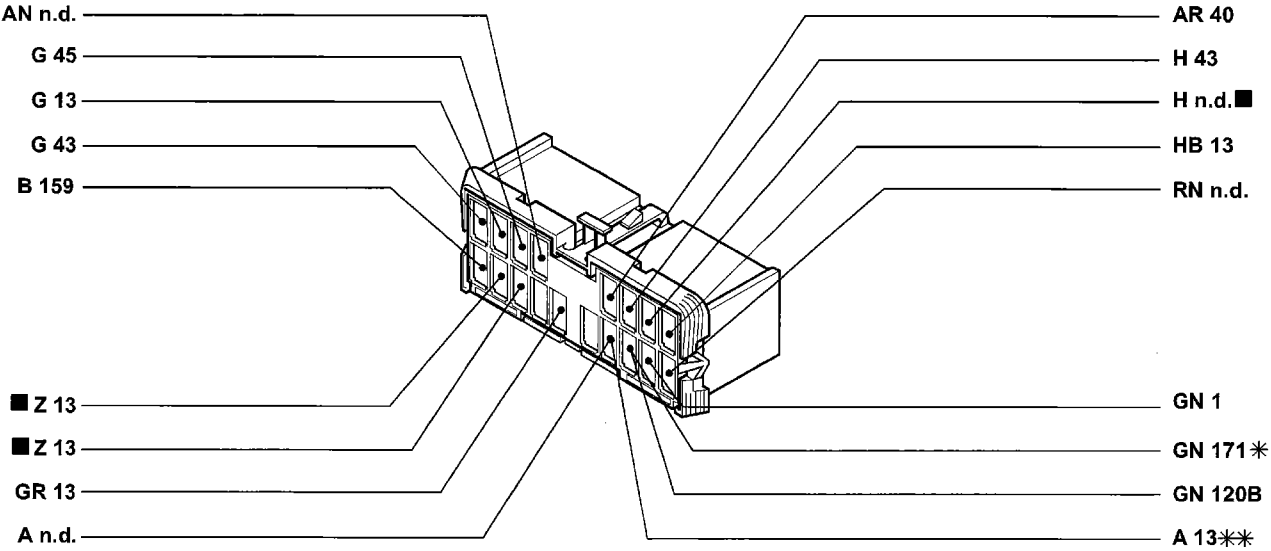
8 Left front earth  
9 Right front earth  
10 Earth for battery on bodyshell  
11 Battery  
12 Ignition switch  
13 Connection between right/left front cables  
18 Left rear earth
- 22 Left dashboard earth  
24 Windscreen wiper motor  
25 Electric windscreen/rearscreen washer pump  
26 Windscreen wiper motor  
27 Contact board between bodyshell and tailgate (Brava)

28 Connection between dashboard/longitudinal cables

34 Switch control panel:  
A Alarm on warning light  
B Rear fog lamps control switch  
C Rear fog lamps relay feed  
D Rear fog lamps warning light  
E Heated rear windscreen control switch  
F Heated rear windscreen warning light  
G Switch control panel ideogram light  
H Fog lights warning light  
I Fog lights control switch  
L Outside temperature control switch

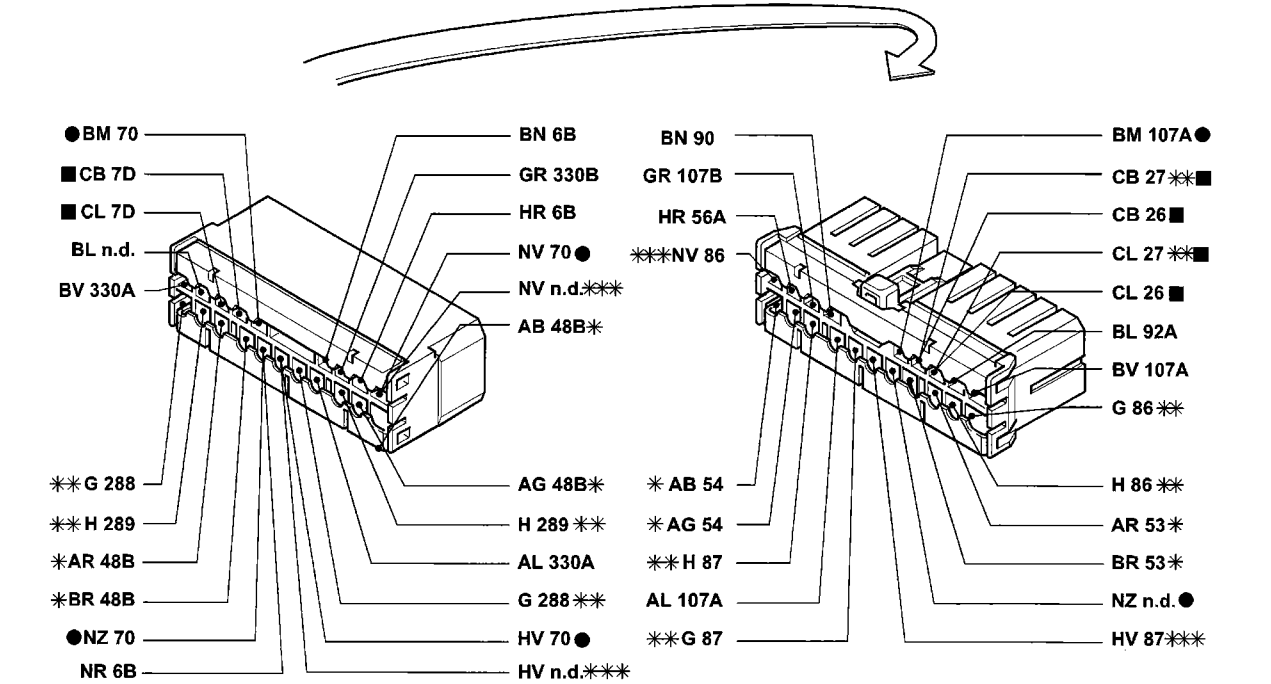
39 Heated rear windscreen  
46 Left horn  
47 Right horn  
97 Electric headlamp washer pump  
98 Headlamp washer intermittent device  
127 Connection between left front cable/cable on relay holder bracket  
296 Fuse holder base on front cable  
B 20A fuse protecting windscreen wiper with A.B.I. or without A.B.I.  
330 A.B.I. control unit  
N.D. Ultrasound welding taped in cable loom

4D Junction uni



\* Variant connection for versions without air conditioning  
\*\* Variant connection for versions without alarm

28 Connection between dashboard/longitudinal cables Versions with A.B.I. control unit



• Variant connection for versions with alarm  
\* Variant connection for versions with top of the range radio  
\*\* Variant connection for Brava versions  
\*\*\* Variant connection for Brava versions with alarm

Leads involved in the wiring diagram are marked by a square

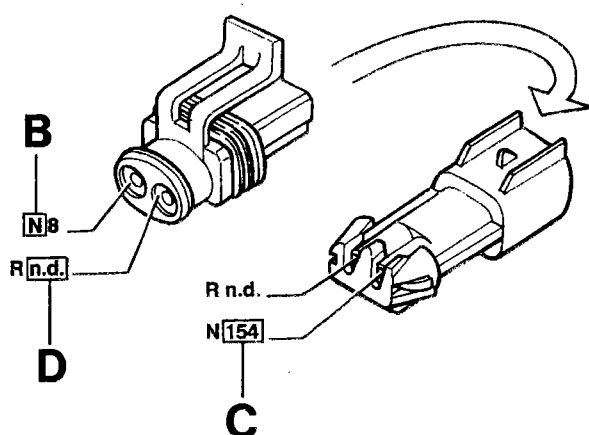


### INTRODUCTION

#### Meaning of codes on connector blocks

**126**

**A**



**A** Connector block identification number used in wiring diagrams

**B** Wiring colour identification code (see table at bottom of page)

**C** Identification N° of connector block for cable marked with appropriate code

The letters n.d. identify ultrasound welding  
**D** taped in the cable loom

4A202N01

#### Cable colour codes

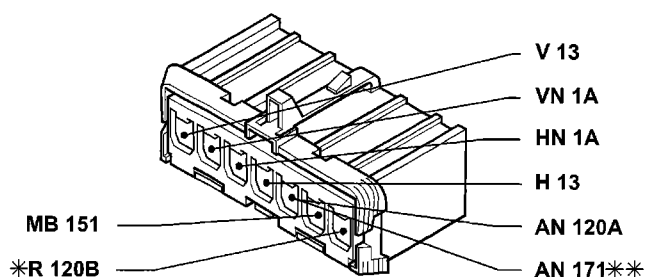
**A** Light blue  
**B** White  
**C** Orange  
**G** Yellow  
**H** Grey  
**L** Dark blue  
**M** Brown  
**N** Black  
**R** Red  
**S** Pink  
**V** Green  
**Z** Purple  
**AB** Light blue-White  
**AG** Light blue-Yellow  
**AN** Light blue-Black  
**AR** Light blue-Red  
**AV** Light blue-Green

**BG** White-Yellow  
**BL** White-Dark blue  
**BN** White-Black  
**BR** White-Red  
**BV** White-Green  
**BZ** White-Purple  
**CA** Orange-Light blue  
**CB** Orange-White  
**CN** Orange-Black  
**GN** Yellow-Black  
**GL** Yellow-Dark blue  
**GR** Yellow-Red  
**GV** Yellow-Green  
**HG** Grey-Yellow  
**HN** Grey-Black  
**HR** Grey-Red  
**HV** Grey-Green

**LB** Dark blue-White  
**LG** Dark blue-Yellow  
**LN** Dark blue-Black  
**LR** Dark blue-Red  
**LV** Dark blue-Green  
**MB** Brown-White  
**MN** Brown-Black  
**NZ** Black-Purple  
**RB** Red-White  
**RG** Red-Yellow  
**RN** Red-Black  
**RV** Red-Green  
**SN** Pink-Black  
**VB** Green-White  
**VN** Green-Black  
**VR** Green-Red  
**ZB** Purple-White

### 55.

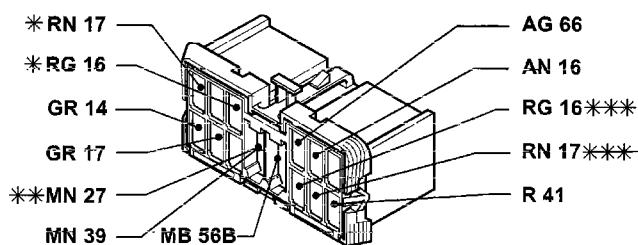
#### 4C Junction unit



- \* Non existent for versions without air conditioning
- \*\* Variant connections for versions without air conditioning

4A062KL01

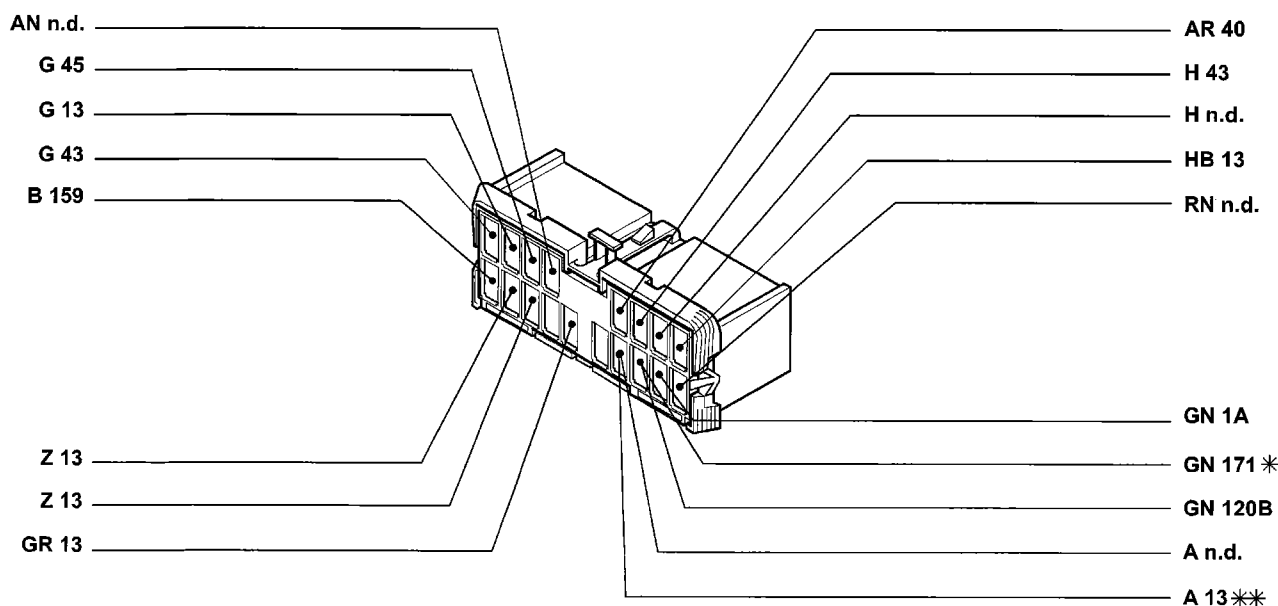
#### 4E Junction unit



- \* Only valid for ELX trim level
- \*\* Variant connection for the BRAVA
- \*\*\* Only valid for SX - GT trim level

4A062KL02

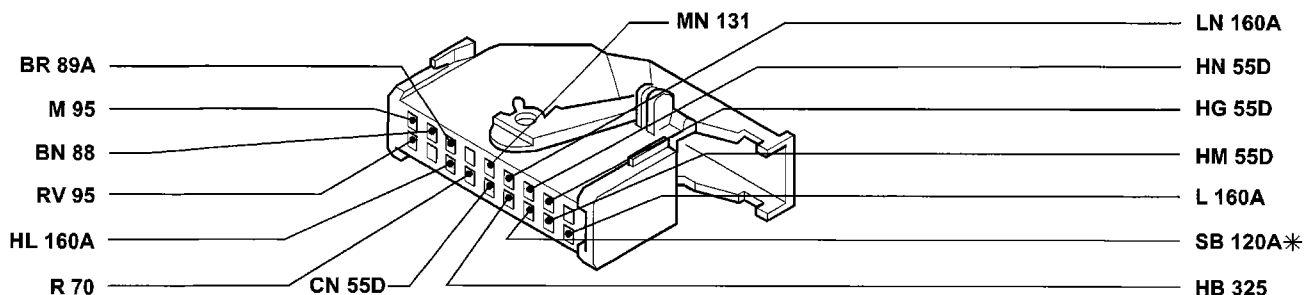
#### 4D Junction unit



- \* Variant connection for versions without air conditioning
- \*\* Variant connection for versions without alarm

4A062KL03

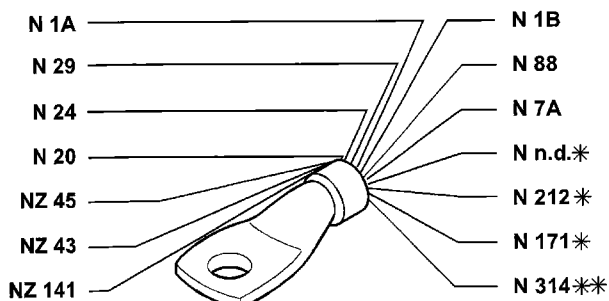
#### 6A Instrument panel



- \* Non existent for versions without air conditioning

4A062KL04

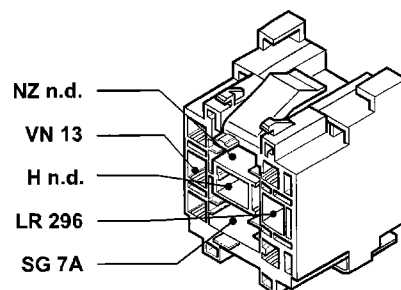
### 8 Left front earth



\* Only for version with heater  
 \*\* Only for version with air conditioning

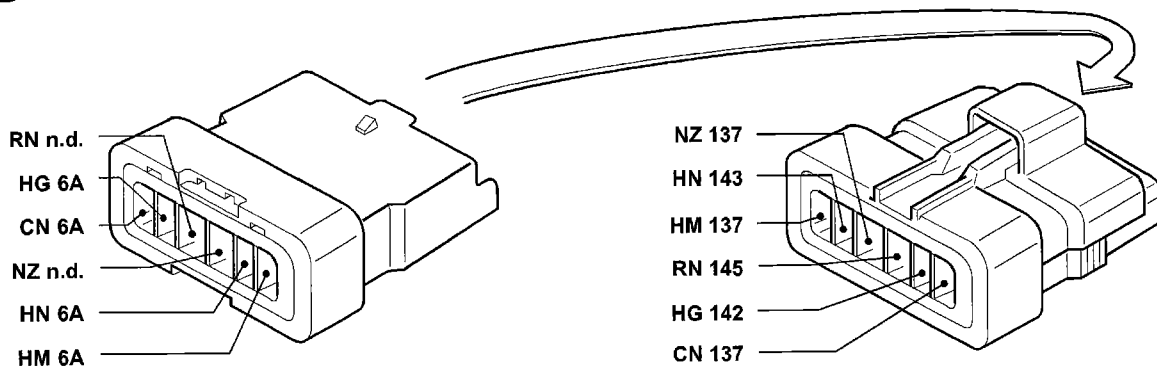
4A063KL01

### 98 Intermittent device for headlamp washer (without climate control)



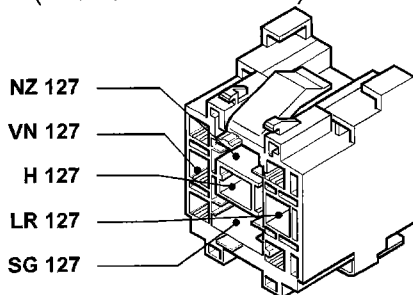
4A063KL02

### 55D Connection between front cables/engine pre-wiring



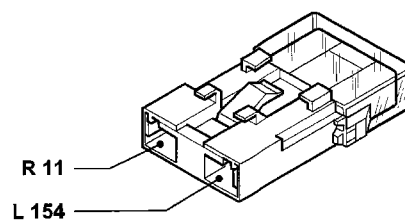
4A063KL03

### 98 Intermittent device for headlamp washer (with climate control)



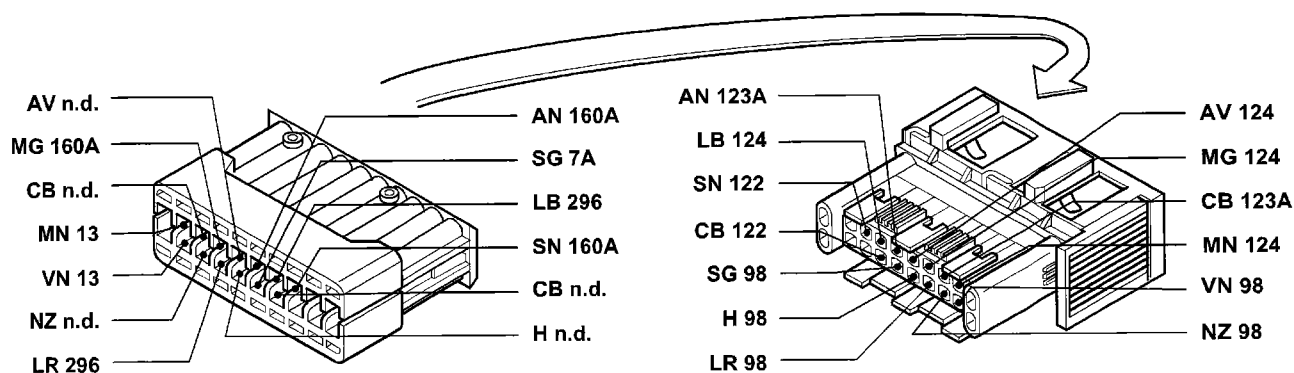
4A063KL04

### 129 Power fuse protecting engine cooling fan



4A063KL05

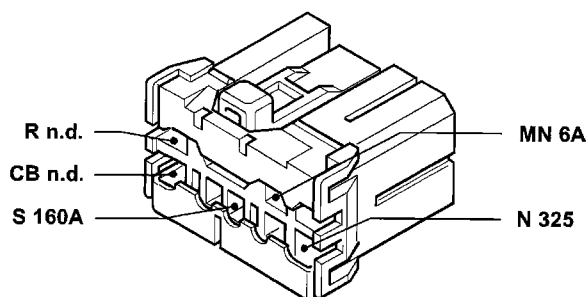
### 127 Connection between front left cable/cable on relay holder bracket



4A063KL06

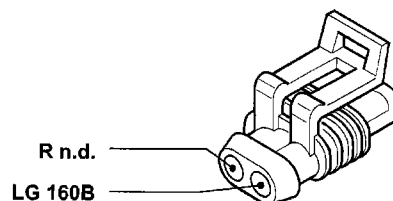
### 55.

#### 131 Fiat-CODE electronic control unit



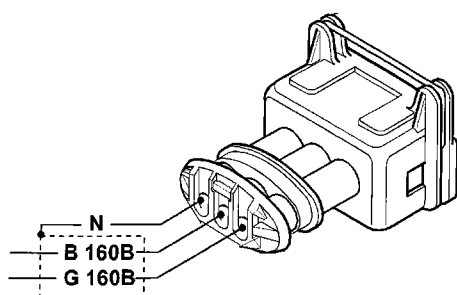
4A064KL01

#### 132 Petrol vapour cut out solenoid valve (canister)



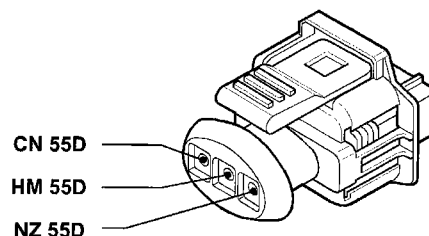
4A064KL02

#### 136 Knock sensor



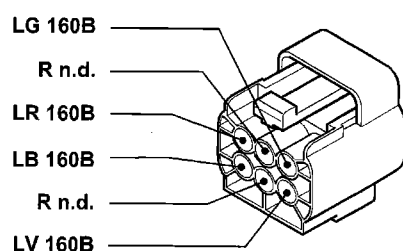
4A064KL03

#### 137 Vehicle speed sensor



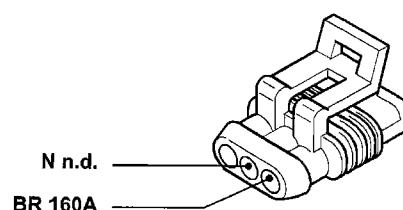
4A064KL04

#### 138 Idle adjustment actuator



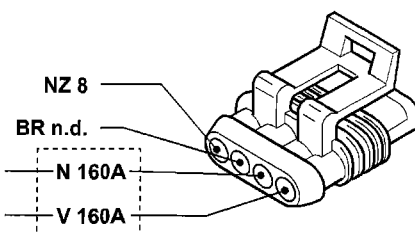
4A064KL05

#### 139 Diagnostic socket for injection system



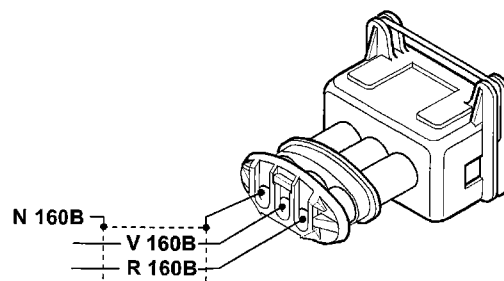
4A064KL06

#### 141 Hot lambda probe



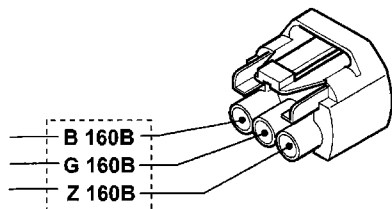
4A064KL07

#### 144 RPM and TDC sensor



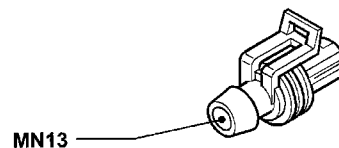
4A064KL08

### 146 Throttle valve potentiometer



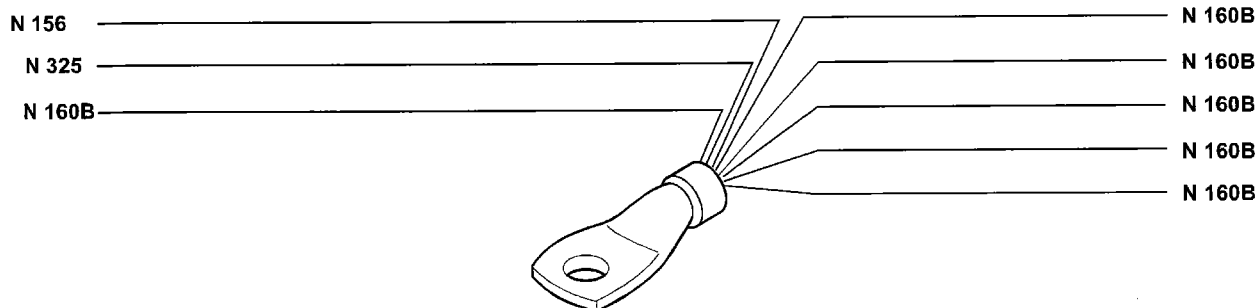
4A065KL01

### 147 Compressor for air conditioning



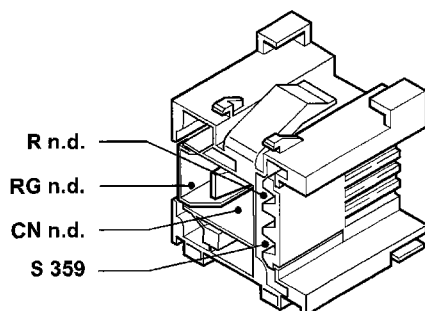
4A065KL02

### 148 Earth for electronic injection



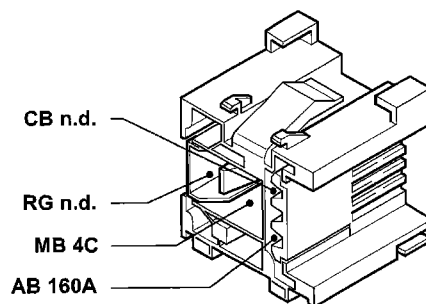
4A065KL03

### 150 Injection system relay feed



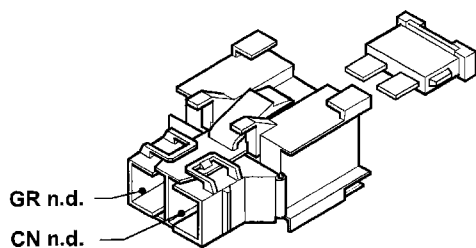
4A065KL04

### 151 Relay feed for Lambda sensor, electric fuel pump, injector



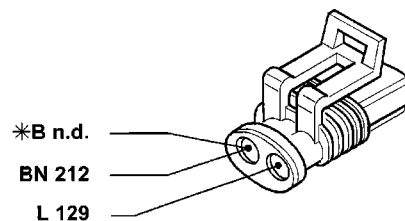
4A065KL05

### 152 10A fuse protecting injection system



4A065KL06

### 154 Engine cooling fan

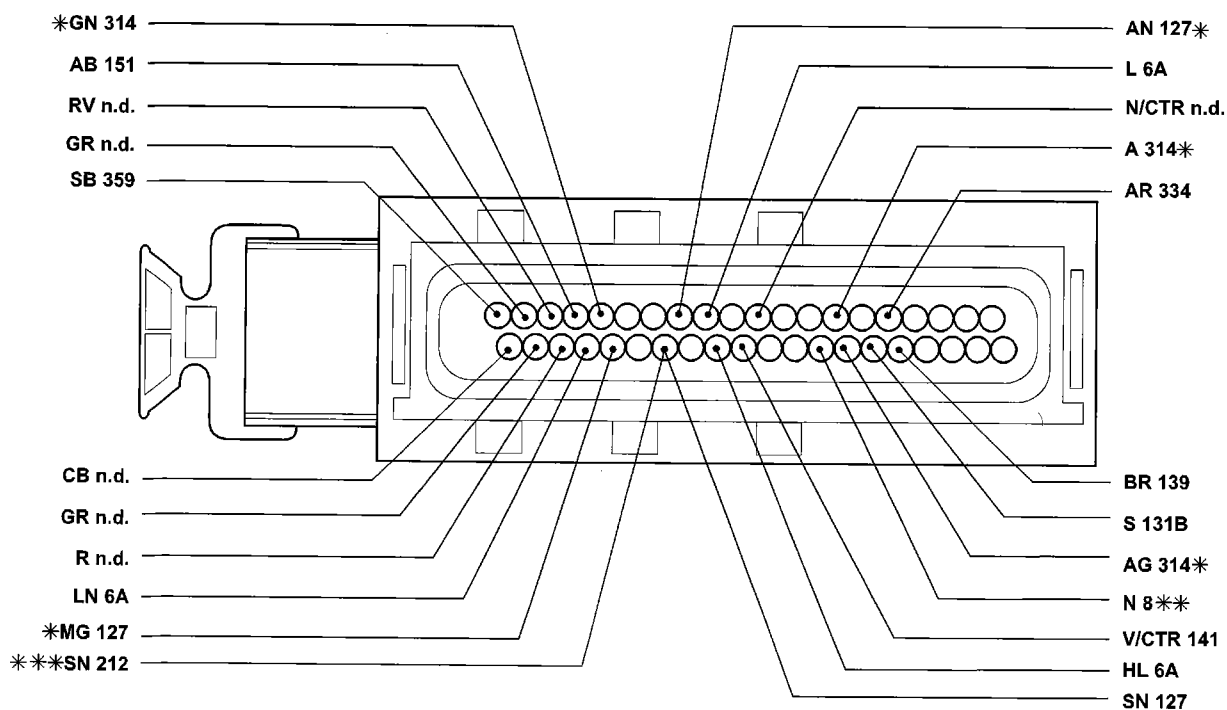


\* Variant connection with climate control

4A065KL07

# 55.

### 160A Injection/ignition electronic control unit (1747)



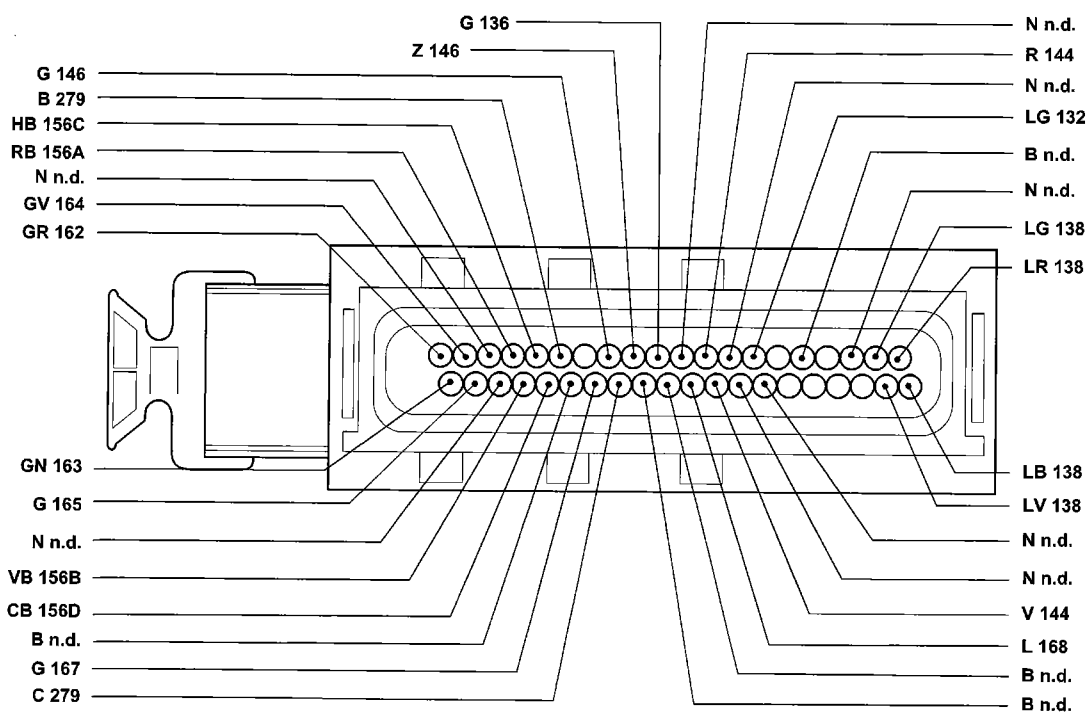
\* Non existent for versions without air conditioning

\*\* Non existent for versions with air conditioning

\*\*\* Variant connection for versions without air conditioning

4A066KL01

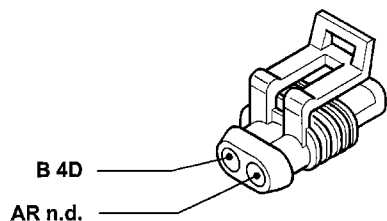
### 160B Injection/ignition electronic control unit (1747)



4A066KL02

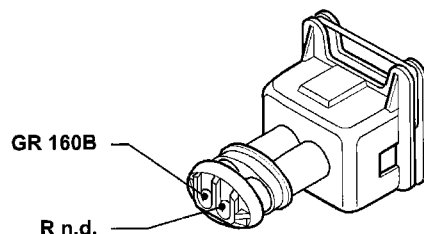


### 159 Reversing lights control switch



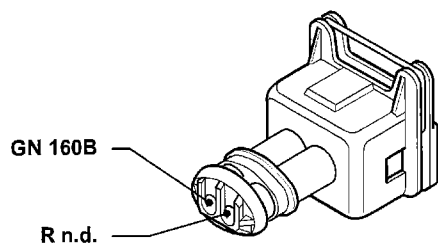
4A067KL01

### 162 Injector (1)



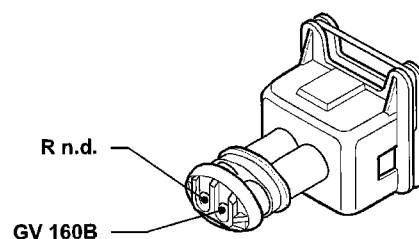
4A067KL02

### 163 Injector (2)



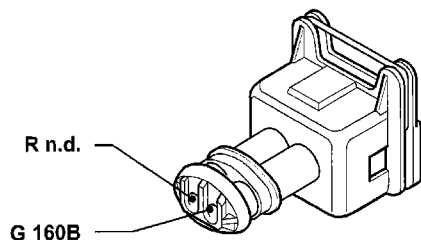
4A067KL03

### 164 Injector (3)



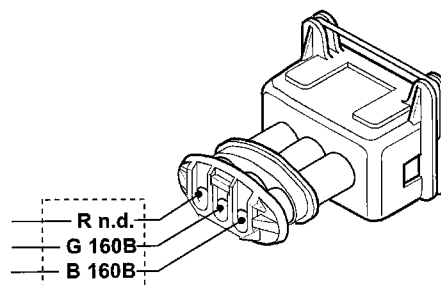
4A067KL04

### 165 Injector (4)



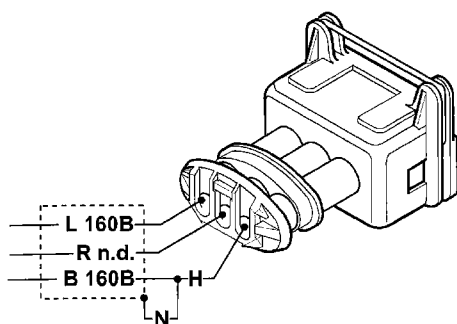
4A067KL05

### 167 Air flow meter



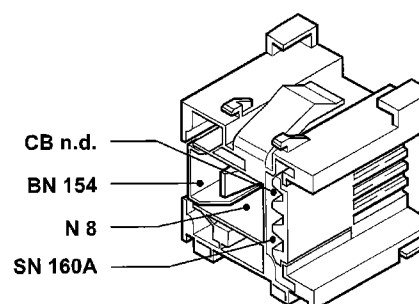
4A067KL06

### 168 Timing sensor



4A067KL07

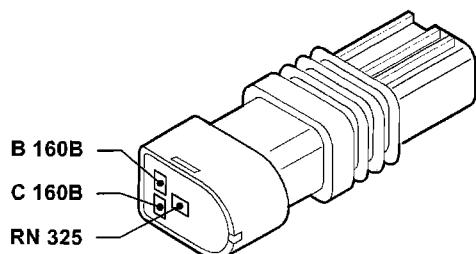
### 212 Relay for radiator fan



4A067KL08

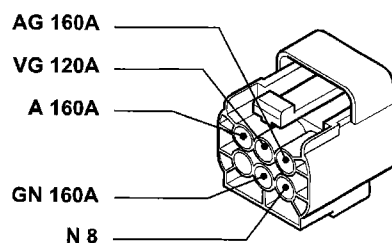
### 55.

#### 279 Engine coolant temperature twin sender unit



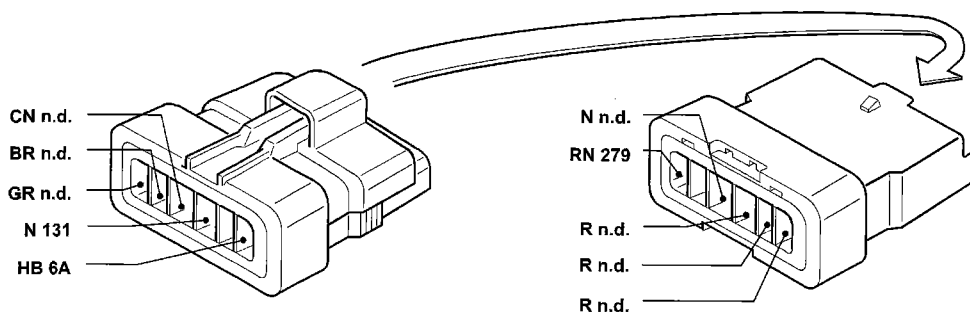
4A068KL01

#### 314 Four stage pressure switch



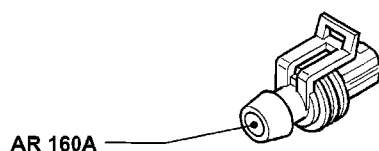
4A068KL02

#### 325 Connection between injection/left front cables



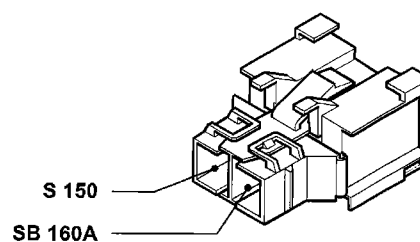
4A068KL03

#### 334 Diagnostic cable connection for 1747



4A068KL04

#### 359 Signal inversion relay diode (1747)



4A068KL05

Key to components

- 1 Left front light cluster
- 2 Right front light cluster
- 3 Power fuse box:
  - A 30A fuse protecting injection system
  - B 40A fuse protecting ignition system
  - C 80A fuse protecting additional extras
  - D 80A fuse protecting junction unit
- 4 Junction unit
  - E1 Switch discharge relay
  - E2 Horn relay feed
  - E3 Heated rear windscreen relay feed
- 6 Instrument panel
  - A Battery recharging warning light
  - B Insufficient engine oil pressure warning light
  - C Left direction indicator warning light
  - D Right direction indicator warning light
  - E Side lights warning light
  - F Instrument panel ideogram light
  - G Main beam headlamps warning light
  - H Passenger EURO-BAG disabled warning light
  - I Anti-lock brakes failure warning light
- J1 Fuel reserve warning light
- K Fuel gauge
- L Fiat-CODE failure warning light
- M Petrol/DS injection system failure warning light
- Q Front brake pad wear warning light
- R Handbrake applied/insufficient brake fluid level warning light
- S Brake lights failure electronic module
- T Brake lights failure warning light
- U Doors open warning ilght
- V1 Speedometer
- W Rev counter
- X Engine coolant temperature gauge
- Y Electronic module
- Z Milometer/trip meter display
- Z1 Trip meter zeroing button
- 7 Steering column switch unit
  - A Windscreen wiper speed control switch
  - B Windscreen/headlamp/rearscreen washer control switch

- C Rearscreen wiper control switch
- D Headlamp flasher button
- E Dipped/main beam headlamps control switch
- F Side lights control switch
- G Direction indicators/hazard warning lights switch
- H Direction indicators control switch
- I Horn control button
- 8 Left front earth
- 9 Right front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 17 Left rear light cluster
- 18 Left rear earth
- 19 Right rear earth
- 20 Left front side direction indicator
- 21 Right front side direction indicator
- 22 Left dashboard earth
- 23 Hazard warning lights switch unit
  - A Hazard warning lights warning light
  - B Hazard warning lights control switch
  - C Hazard warning lights ideogram light
- 24 Windscreen wiper motor
- 25 Electric windscreen/rearscreen washer pump
- 26 Rearscreen wiper motor
- 27 Contact board for rear connections with luggage compartment light switch incorporated
- 28 Connection between dashboard/longitudinal cables
- 34 Switch control panel:
  - A Rear fog lamps control switch
  - B Rear fog lamps control switch
  - C Rear fog lamps relay feed
  - D Rear fog lamps warning light
  - E Heated rear windscreen control switch
  - F Heated rear windscreen warning light
  - G Switch panel ideogram light
  - H Fog lights warning light
  - I Fog lights control switch
  - L Outside temperature control switch
- 35 Connection between dashboard/left front door cables
- 36 Connection between dashboard/right front door cables
- 39 Heated rear windscreen
- 40 Brake lights control switch

- 41 Additional brake light
- 42 Right dashboard earth
- 46 Left horn
- 47 Right horn
- 48 Radio receiver with clock
- 55D Connection between front left cables/services pre-wiring
- 56 Fuel gauge assembly
  - A Fuel level sensor
  - B Fuel pump
- 57 Inertia switch
- 58 Light dimmer
- 68 Right electrically adjustable external rear view mirror
- Connection between dashboard/front
- 70 cables
- 86 Connection between longitudinal/left rear door cables
- 87 Connection between longitudinal/right rear door cables
- 88 Insufficient brake fluid level sensor
- 89 Left brake pad wear sensor
- 89A Connection for left brake pad wear sensor cables
- 90 Switch signalling handbrake applied
- 95 Connection between front cable/anti-lock brakes (A.B.S.)
- 97 Electric headlamp washer pump
- 98 Intermittent device for headlamp washer
- 100 Alarm electronic control unit
- 103 Diagnostic socket for alarm
- 108 Left rear central locking/alarm on switch
- 109 Right rear central locking/alarm on switch
- 110 Left front central locking/alarm on switch
- 111 Right front central locking/alarm on switch
- 114 EURO-BAG electronic control unit
- 117 EURO-BAG/dashboard cables connection
- 120 Connection for air conditioning unit cables
- 122 Engine cooling fan low speed relay feed
- 123A Engine cooling fan high speed relay feed
- 124 Air conditioning compressor relay feed
- 127 Connection between left front cable/cable on relay holder bracket
- 129 Power fuse (50A) protecting engine cooling fan
- 130 Diagnostic socket for EURO-BAG
- 131 Fiat-CODE electronic control unit

- 132 Petrol vapour cut out solenoid valve (canister)
- 137 Vehicle speed sensor
- 138 Idle adjustment actuator
- 139 Diagnostic socket for injection system
- 141 Hot lambda probe
- 142 Switch signalling insufficient engine oil pressure
- 143 Alternator
- 144 RPM and TDC sensor
- 145 Starter motor
- 146 Throttle valve potentiometer
- 147 Compressor for air conditioning
- 148 Earth for electronic injection
- 150 Injection system relay feed
- 151 Relay feed for Lambda sensor, electric fuel pump, injector
- 152 10A fuse protecting injection system
- 154 Engine cooling fan
- 156 Spark pulgs
- 159 Reversing lights control switch
- 160 Ignition electronic control unit
- 162 Injector (1)
- 163 Injector (2)
- 164 Injector (3)
- 165 Injector (4)
- 167 Air flow meter
- 168 Timing sensor
- 170 Engine cooling fan limit resistor
- 171 Heater unit cables connection
- 174 Power earth for anti-lock brakes
- 176 Diagnostic socket for anti-lock brakes
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 199 Aerial for Fiat-CODE
- 202 Heater/air conditioning bulbs
- 207 Heater/air conditioning system speed control switch
- 208 Heater/air conditioning system limit resistor
- 209 Outside/recirculation air flap control actuator (N.T.C.)
- 211 Electronic thermostat
- 213 Earth for EURO-BAG
- 279 Engine coolant temperature twin sender unit
- 283 Connection between front cable/resistor
- 286 Short circuit connection
- 287 Short circuit connection
- 293 Fuse holder base on dashboard cable
  - A 7.5A fuse protecting switch panel light; Radio telephone; Radio; Electric mirrors

- 296 Fuse holder base on front cable

- A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm
- B 20A fuse protecting windscreen wiper with A.B.I. or without A.B.I.
- C 7.5A fuse protecting electronic injection/cooling system Fiat-CODE
- F 7.5A fuse protecting electronic injection system/Fiat-CODE
- 297 Air conditioning control unit
- 298 Heater/air conditioning recirculation control
  - A Air conditioning control switch
  - B Recirculation control switch
  - C Fan sensor
- 299 Diagnostic socket for heater/air conditioning
- 300 Car interior fan electronic transformer
- 301 Car interior mixture control actuator
- 302 Maximum demisting control switch
- 303 Interior fan potentiometer
- 304 Car interior temperature potentiometer
- 306 Treated air sensor
- 308 15A fuse protecting canister solenoid valve
- 314 Four stage pressure switch
- 325 Connection between injection/left front cables
- 330 A.B.I. control unit
- 334 Diagnostic cable connection (1747)
- 359 Signal inversion relay diode (1747)

Cable colour code

- A Light blue
- B White
- G Yellow
- H Grey
- L Dark blue
- M Brown
- N Black
- R Red
- S Pink
- Z Purple
- AB Light blue-White
- AG Light blue-Yellow
- AN Light blue-Black
- GN Yellow-Black
- GL Yellow-Dark blue
- GR Yellow-Red
- GV Yellow-Green
- HG Grey-Yellow
- HN Grey-Yellow
- HR Grey-Black
- HV Grey-Red
- LB Grey-Green
- LG Dark blue-White
- LN Dark blue-Yellow
- LR Dark blue-Black
- AG Light blue-Yellow
- AN Light blue-Black
- AR Light blue-Red
- AV Light blue-Purple
- BG White-Yellow
- BL White-Dark blue
- BN White-Black
- BR White-Red
- BV White-Green
- BZ White-Purple
- CA Orange-Light blue
- CB Orange-White
- CN Orange-Black
- LV Dark blue-Green
- MB Brown-White
- MN Brown-Black
- NZ Black-Purple
- RB Red-White
- RG Red-Yellow
- RN Red-Black
- RV Red-Green
- SN Pink-Black
- VB Green-White
- VN Green-Black
- VR Green-Red
- ZB Purple-White

|                      |    |
|----------------------|----|
| - Electrical symbols | I  |
| - Wiring diagrams    | 5  |
| - Key                | 81 |

### Electrical symbols

|                                                                                     |                                                      |                                                                                     |                                          |                                                                                       |                                             |
|-------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------|
|    | Position                                             |    | Choke                                    |    | Switch discharge                            |
|    | Main beam headlamps                                  |    | Water in fuel filter                     |    | Dipped headlamps                            |
|    | Heated seat                                          |    | Heater plugs                             |    | Central locking direction indicators signal |
|    | Seat belts                                           |    | Turbocharger pressure                    |    | Electric horns                              |
|    | Heated rear windscreen                               |    | Rear fog lamp                            |    | Left direction indicator                    |
|  | Handbrake applied and insufficient brake fluid       |  | Fog light                                |  | Right direction indicator                   |
|  | A.B.S.                                               |  | Brake pad wear                           |  | Engine cooling                              |
|  | Hazard warning                                       |  | Turbocharger pressure                    |  | Windscreen wiper                            |
|  | Direction indicator                                  |  | Automatic transmission fluid temperature |  | Electronically operated sun roof            |
|  | Handbrake applied and insufficient brake fluid level |  | Speed limit                              |  | Catalytic silencer temperature              |
|  | Recharging                                           |  | Fuel level                               |  | Resistance                                  |
|  | Engine oil pressure                                  |  | Engine coolant temperature               |  | Diode                                       |

# Electrical equipment

## Electrical symbols

**Bravo- Brava**

2000 update

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### Electrical symbols

|                                                                                    |                                   |                                                                                     |                                              |                                                                                       |                                          |
|------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------|
|    | Waring light                      |    | Trip computer control                        |    | Differential lock                        |
|    | Bulb                              |    | Electronic injection                         |    | Automatic transmission fluid temperature |
|    | Fuse                              |    | Engine oil level                             |    | Temperature                              |
|    | Switch open                       |    | Brake fluid level<br>(Japanese Version)      |    | Anti-theft                               |
|   | Selector switch                   |   | Doors open                                   |   | Electrically operated windows            |
|  | Switch controlled by coil (relay) |  | Central locking                              |  | Permissible                              |
|  | Engine                            |  | Controlled damping suspension Sport Function |  | No. plate lights                         |
|  | Rearscreen wiper                  |  | Transistor                                   |  | Impulse generator (timer)                |
|  | Headlamp washer                   |  | Air-bag                                      |  | Analogue clock                           |
|  | Windscreen wash/wipe              |  | A.B.S. (Japanese Version)                    |  | Digital clock                            |
|  | Rearscreen wash/wipe              |  | Brake failure                                |  | Speedometer                              |
|  | Engine oil pressure               |  | Windscreen wiper                             |  | Rev counter                              |



**Electrical symbols**

Digital speedometer



Digital rev counter



Digital fuel gauge



Analogue fuel gauge

Analogue engine  
coolant temperature  
gauge

Econometer

Digital engine coolant  
temperature gauge

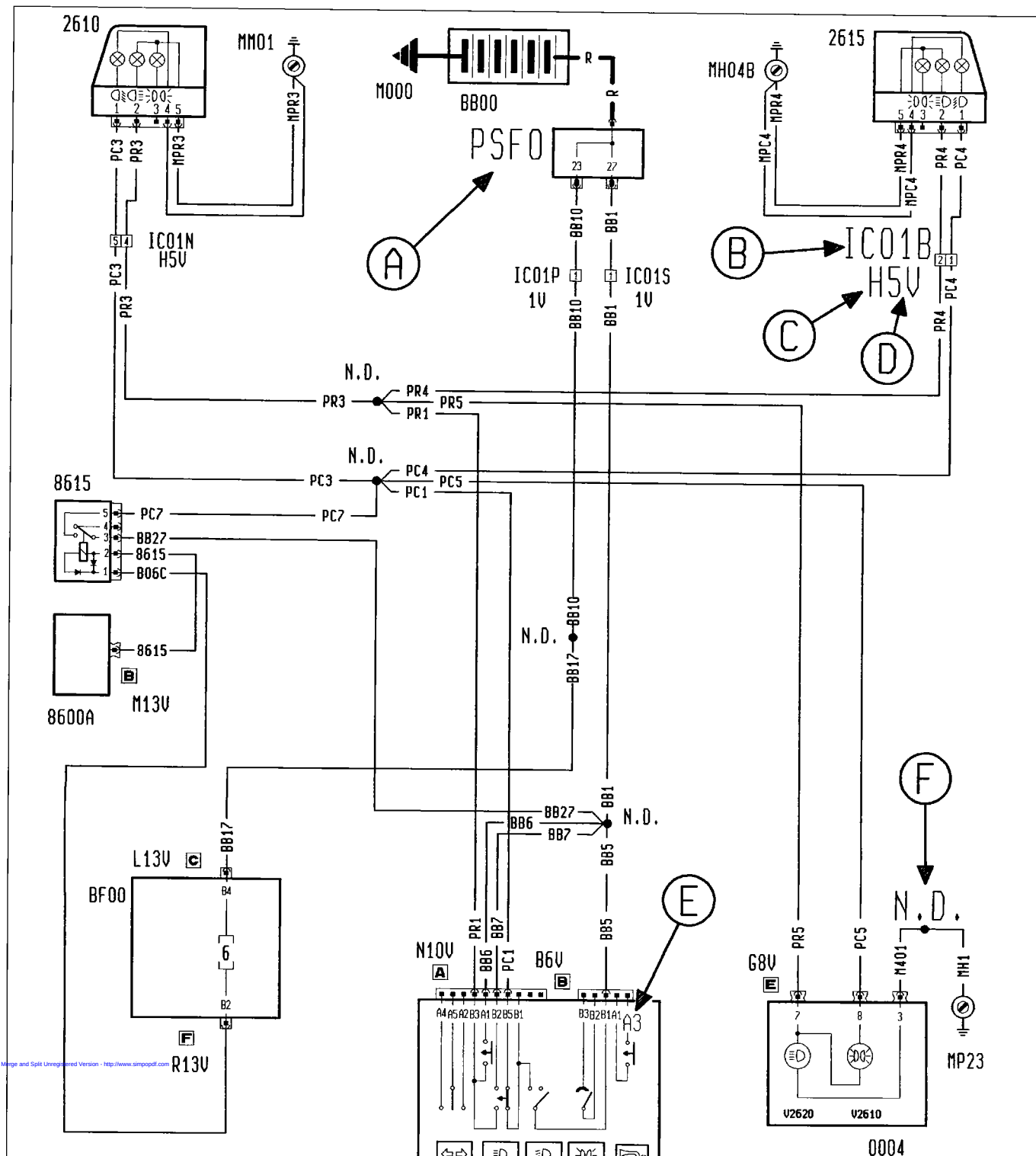
Engine oil temperature

Engine oil pressure  
gauge

Voltmeter

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### Explanation for reading wiring diagram



4A004N01

### Reference key

- A Component code  
B Connection code  
C Colour code  
D Connection no. of ways

- E Connection number of ways  
F Ultrasound welding taped in cable loom

| DESCRIPTION                                                                                                                                                                                                                                                  | BRAVO                                                                                   |                                                                                         |                                                                                         |                                                                                         |                                                                                         | BRAVA                                                                                   |                                                                                         |                                                                                         |                                                                                         |                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                              | SX                                                                                      |                                                                                         |                                                                                         | GT                                                                                      |                                                                                         | SX                                                                                      |                                                                                         |                                                                                         | ELX                                                                                     |                                                                                         |
|                                                                                                                                                                                                                                                              |  16v |  16v |  JTD |  16v |  JTD |  16v |  16v |  JTD |  16v |  JTD |
| Side lights and warning light - Dipped headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights                                                                                                                              | 5                                                                                       | 5                                                                                       | 5                                                                                       | 5                                                                                       | 5                                                                                       | 5                                                                                       | 5                                                                                       | 5                                                                                       | 5                                                                                       | 5                                                                                       |
| Fog lights and warning light - Rear fog lamp and warning light                                                                                                                                                                                               | 7                                                                                       | 7                                                                                       | 7                                                                                       | 7                                                                                       | 7                                                                                       | 7                                                                                       | 7                                                                                       | 7                                                                                       | 7                                                                                       | 7                                                                                       |
| Fiat-CODE and failure warning light                                                                                                                                                                                                                          | 9                                                                                       | 11                                                                                      | 13                                                                                      | 11                                                                                      | 13                                                                                      | 9                                                                                       | 11                                                                                      | 13                                                                                      | 11                                                                                      | 13                                                                                      |
| Driver's side EURO-BAG and failure warning light                                                                                                                                                                                                             | 15                                                                                      | 15                                                                                      | 15                                                                                      | 15                                                                                      | 15                                                                                      | 15                                                                                      | 15                                                                                      | 15                                                                                      | 15                                                                                      | 15                                                                                      |
| Driver's side, passenger side EURO-BAG and failure warning light                                                                                                                                                                                             | 17                                                                                      | 17                                                                                      | 17                                                                                      | 17                                                                                      | 17                                                                                      | 17                                                                                      | 17                                                                                      | 17                                                                                      | 17                                                                                      | 17                                                                                      |
| Driver's, passenger side EURO BAG, passenger SIDE BAG and failure warning light - Lumbar adjustment                                                                                                                                                          | 19                                                                                      | 19                                                                                      | 19                                                                                      | 19                                                                                      | 19                                                                                      | 19                                                                                      | 19                                                                                      | 19                                                                                      | 19                                                                                      | 19                                                                                      |
| Anti-lock braking system and failure warning light (ABS)                                                                                                                                                                                                     | 21                                                                                      | 21                                                                                      | 21                                                                                      | 21                                                                                      | 21                                                                                      | 21                                                                                      | 21                                                                                      | 21                                                                                      | 21                                                                                      | 21                                                                                      |
| Headlamp alignment corrector                                                                                                                                                                                                                                 | 23                                                                                      | 23                                                                                      | 23                                                                                      | 23                                                                                      | 23                                                                                      | 23                                                                                      | 23                                                                                      | 23                                                                                      | 23                                                                                      | 23                                                                                      |
| Electric sun-roof                                                                                                                                                                                                                                            | 25                                                                                      | 25                                                                                      | 25                                                                                      | 25                                                                                      | 25                                                                                      | 25                                                                                      | 25                                                                                      | 25                                                                                      | 25                                                                                      | 25                                                                                      |
| Additional heater                                                                                                                                                                                                                                            |                                                                                         |                                                                                         | 27                                                                                      |                                                                                         | 27                                                                                      |                                                                                         |                                                                                         | 27                                                                                      |                                                                                         | 27                                                                                      |
| Diagnostic sockect connections                                                                                                                                                                                                                               | 29                                                                                      | 29                                                                                      | 29                                                                                      | 29                                                                                      | 29                                                                                      | 29                                                                                      | 29                                                                                      | 29                                                                                      | 29                                                                                      | 29                                                                                      |
| Starting - Injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE failure warning light                | 31                                                                                      | 33                                                                                      |                                                                                         | 33                                                                                      |                                                                                         | 31                                                                                      | 33                                                                                      |                                                                                         | 33                                                                                      |                                                                                         |
| Starting - Electronically operated diesel pump - Recharging and warning light - Insufficient engine oil pressure warning light - Heater plugs warning light - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE failure warning light |                                                                                         |                                                                                         | 35                                                                                      |                                                                                         | 35                                                                                      |                                                                                         |                                                                                         | 35                                                                                      |                                                                                         | 35                                                                                      |

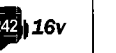
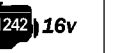
**NOTE** The numbers in the table correspond to the page numbers in the electrical equipment manual

## Electrical equipment

### Wiring diagrams

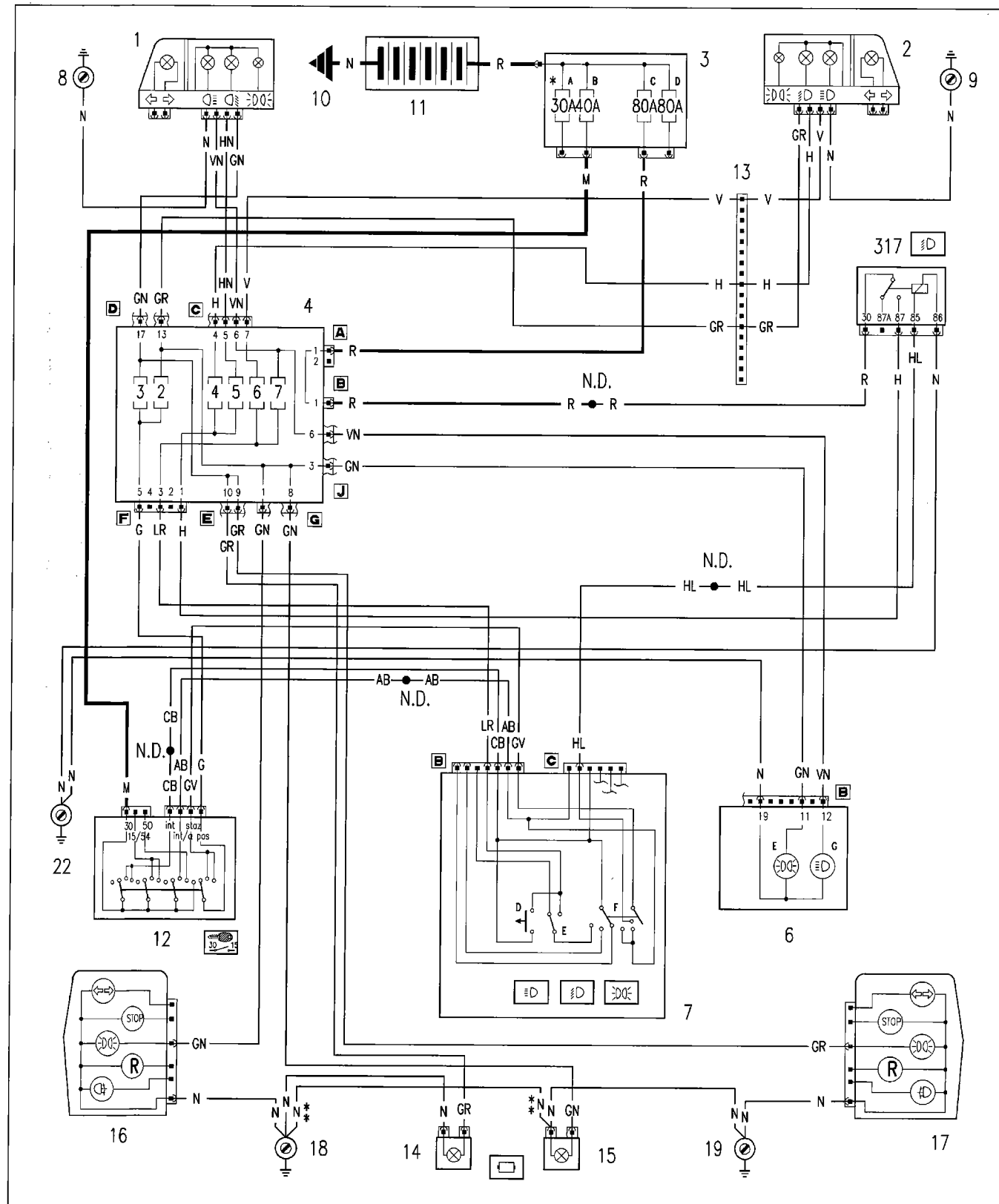
**Bravo- Brava**  
2000 update

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| DESCRIPTION                                                                                                                                                                                                                                                                                                                                                      | BRAVO                                                                                        |                                                                                              |                                                                                              |                                                                                              |                                                                                              | BRAVA                                                                                        |                                                                                              |                                                                                              |                                                                                              |                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                  | SX                                                                                           |                                                                                              |                                                                                              | GT                                                                                           |                                                                                              | SX                                                                                           |                                                                                              |                                                                                              | ELX                                                                                          |                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                  |  1242 16v |  1581 16v |  1910 JTD |  1581 16v |  1910 JTD |  1242 16v |  1581 16v |  1910 JTD |  1581 16v |  1910 JTD |
| Version without automatic air conditioning:<br>Engine cooling with one fan - Engine coolant temperature gauge - Vehicle interior ventilation - Heater/air conditioning unit light                                                                                                                                                                                | 37                                                                                           | 39                                                                                           | 41                                                                                           | 39                                                                                           | 41                                                                                           | 37                                                                                           | 39                                                                                           | 41                                                                                           | 39                                                                                           | 41                                                                                           |
| Version with automatic air conditioning:<br>Engine cooling with one fan - Engine coolant temperature gauge                                                                                                                                                                                                                                                       | 43                                                                                           | 45                                                                                           |                                                                                              | 45                                                                                           |                                                                                              | 43                                                                                           | 45                                                                                           |                                                                                              | 45                                                                                           |                                                                                              |
| Version with automatic air conditioning:<br>Engine cooling with two fans - Engine coolant temperature gauge - Water in fuel filter sensor                                                                                                                                                                                                                        |                                                                                              |                                                                                              | 47                                                                                           |                                                                                              | 47                                                                                           |                                                                                              |                                                                                              | 47                                                                                           |                                                                                              | 47                                                                                           |
| Trim level: SX □ GT:<br>Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing light                                                                                                                                                                                                                        | 49                                                                                           | 49                                                                                           | 49                                                                                           | 49                                                                                           | 49                                                                                           | 49                                                                                           | 49                                                                                           | 49                                                                                           | 51                                                                                           | 51                                                                                           |
| Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter                                                     | 53                                                                                           | 53                                                                                           |                                                                                              | 53                                                                                           |                                                                                              | 53                                                                                           | 53                                                                                           |                                                                                              | 53                                                                                           |                                                                                              |
| Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter - Milometer/trip meter display and zeroing button/engine oil level gauge - Heater plugs warning light |                                                                                              |                                                                                              | 55                                                                                           |                                                                                              | 55                                                                                           |                                                                                              |                                                                                              | 55                                                                                           |                                                                                              | 55                                                                                           |
| Version without ABI:<br>Automatic air conditioning                                                                                                                                                                                                                                                                                                               | 57                                                                                           | 59                                                                                           | 61                                                                                           |                                                                                              | 57                                                                                           | 59                                                                                           | 61                                                                                           |                                                                                              |                                                                                              |                                                                                              |
| Version with ABI:<br>Automatic air conditioning                                                                                                                                                                                                                                                                                                                  |                                                                                              |                                                                                              |                                                                                              | 63                                                                                           | 65                                                                                           |                                                                                              |                                                                                              |                                                                                              | 63                                                                                           | 65                                                                                           |
| Alarm - Alarm on warning light                                                                                                                                                                                                                                                                                                                                   | 67                                                                                           | 67                                                                                           | 67                                                                                           | 69                                                                                           | 69                                                                                           | 67                                                                                           | 67                                                                                           | 67                                                                                           | 69                                                                                           | 69                                                                                           |
| ABI control unit connections                                                                                                                                                                                                                                                                                                                                     |                                                                                              |                                                                                              |                                                                                              | 71                                                                                           | 71                                                                                           |                                                                                              |                                                                                              |                                                                                              | 71                                                                                           | 71                                                                                           |
| Instrument panel connections                                                                                                                                                                                                                                                                                                                                     | 73                                                                                           | 73                                                                                           | 75                                                                                           | 73                                                                                           | 75                                                                                           | 73                                                                                           | 73                                                                                           | 75                                                                                           | 77                                                                                           | 79                                                                                           |
| Comprehensive perspective view showing location of cable loom and components                                                                                                                                                                                                                                                                                     | 111                                                                                          | 112                                                                                          | 113                                                                                          | 112                                                                                          | 113                                                                                          | 111                                                                                          | 112                                                                                          | 113                                                                                          | 112                                                                                          | 113                                                                                          |
| Perspective view of dashboard showing location of cable loom and components                                                                                                                                                                                                                                                                                      | 114                                                                                          | 114                                                                                          | 114                                                                                          | 115                                                                                          | 115                                                                                          | 114                                                                                          | 114                                                                                          | 114                                                                                          | 115                                                                                          | 115                                                                                          |

**NOTE** *The numbers in the table correspond to the page numbers in the electrical equipment manual*

Side lights and warning light - Dipped headlamps - Main beam headlamps and warning light - Parking lights - Number plate lights

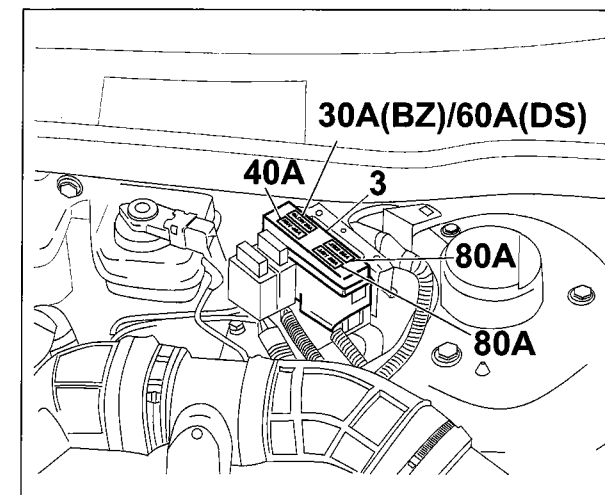


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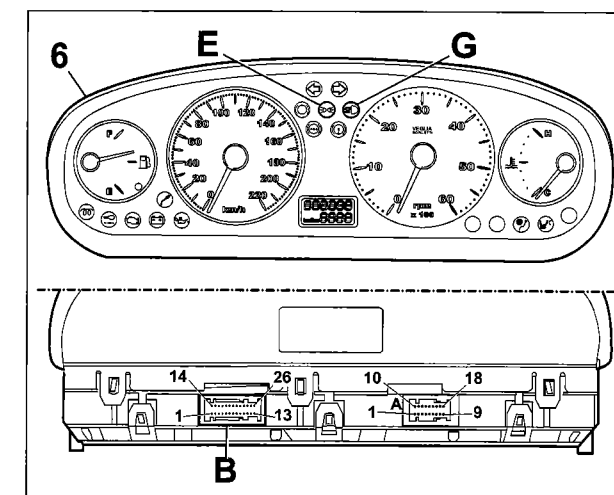
\* 60A fuse for JTD versions

\*\* Variant connection for Brava version

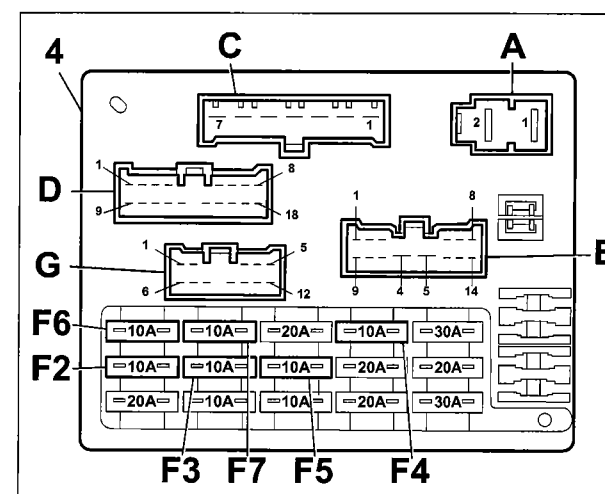
Component location



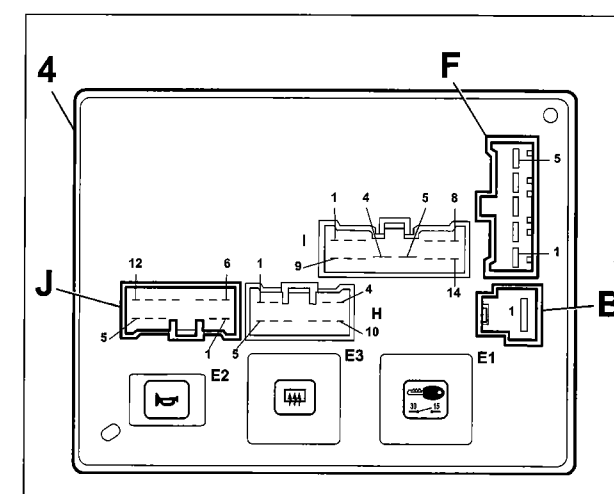
4A005NL02



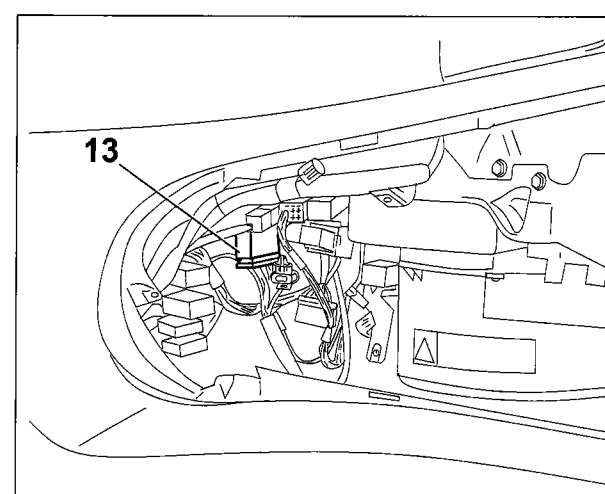
4A005NL03



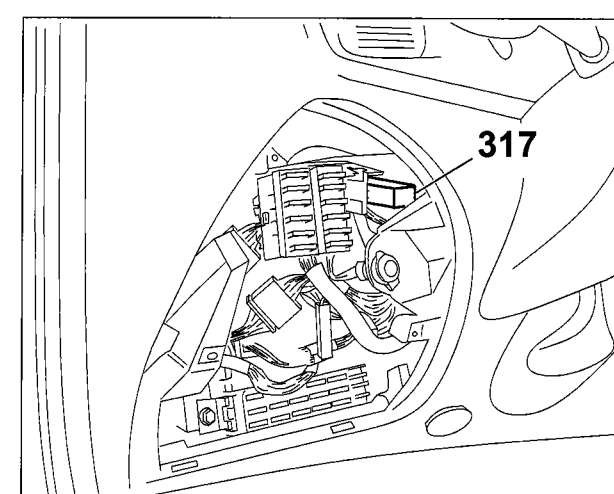
4A005NL04



4A005NL05

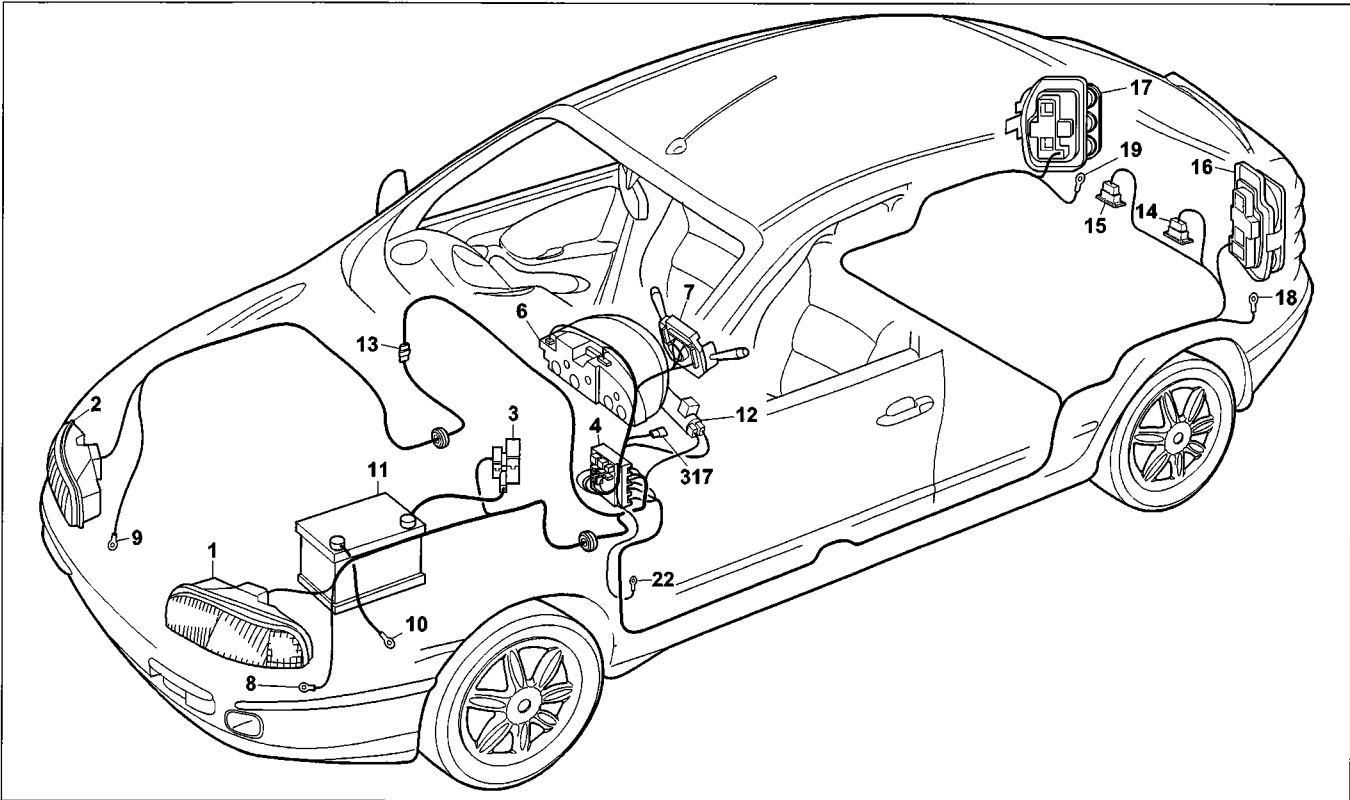


4A005NL06



4A005NL07

55.



Side lights and warning light - Dipped headlamps - Main beam headlamps and warning light - Parking lights - Num-ber plate lights

Component key

- 1 Left front light cluster

2 Right front light cluster

3 Power fusebox

A 30A fuse protecting injection system (60A for TD versions)

B 40A fuse protecting ignition system

C 80A fuse protecting optional equipment

D 80A fuse protecting junction unit

4 Junction unit

6 Instrument panel:

E Side lights warning light

G Main beam headlamps warning light

7 Stalk unit

D Headlamp flasher button

E Dipped/main beam headlamps control switch

F Side lights control switch

8 Left front earth

9 Right front earth

10 Earth for battery on bodyshell

11 Battery

12 Ignition switch
- 13 Connection between right/left front cables

14 Left no. plate light

15 Right no. plate light

16 Left tail light cluster

17 Right tail light cluster

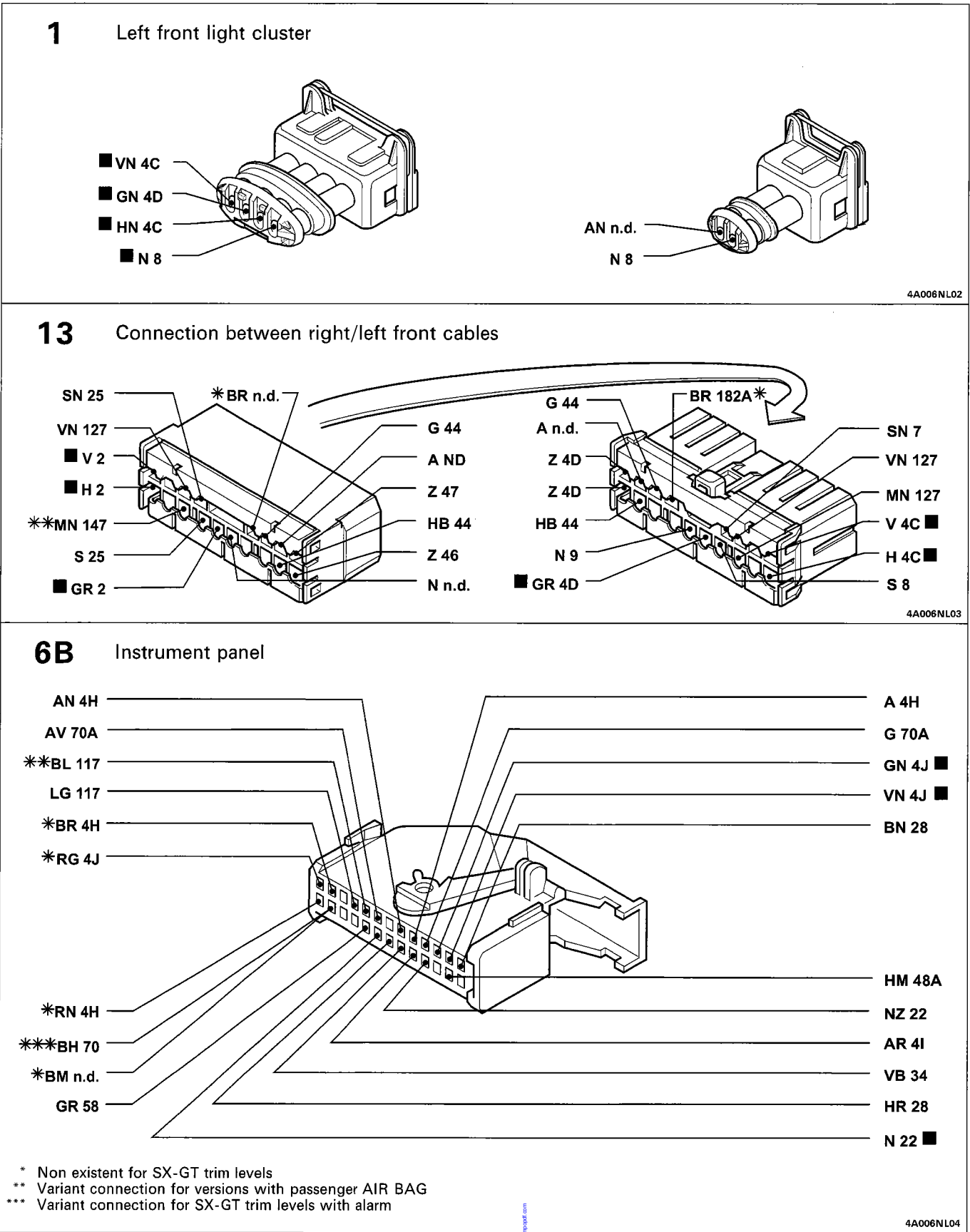
18 Left rear earth

19 Right rear earth

22 Left facia earth

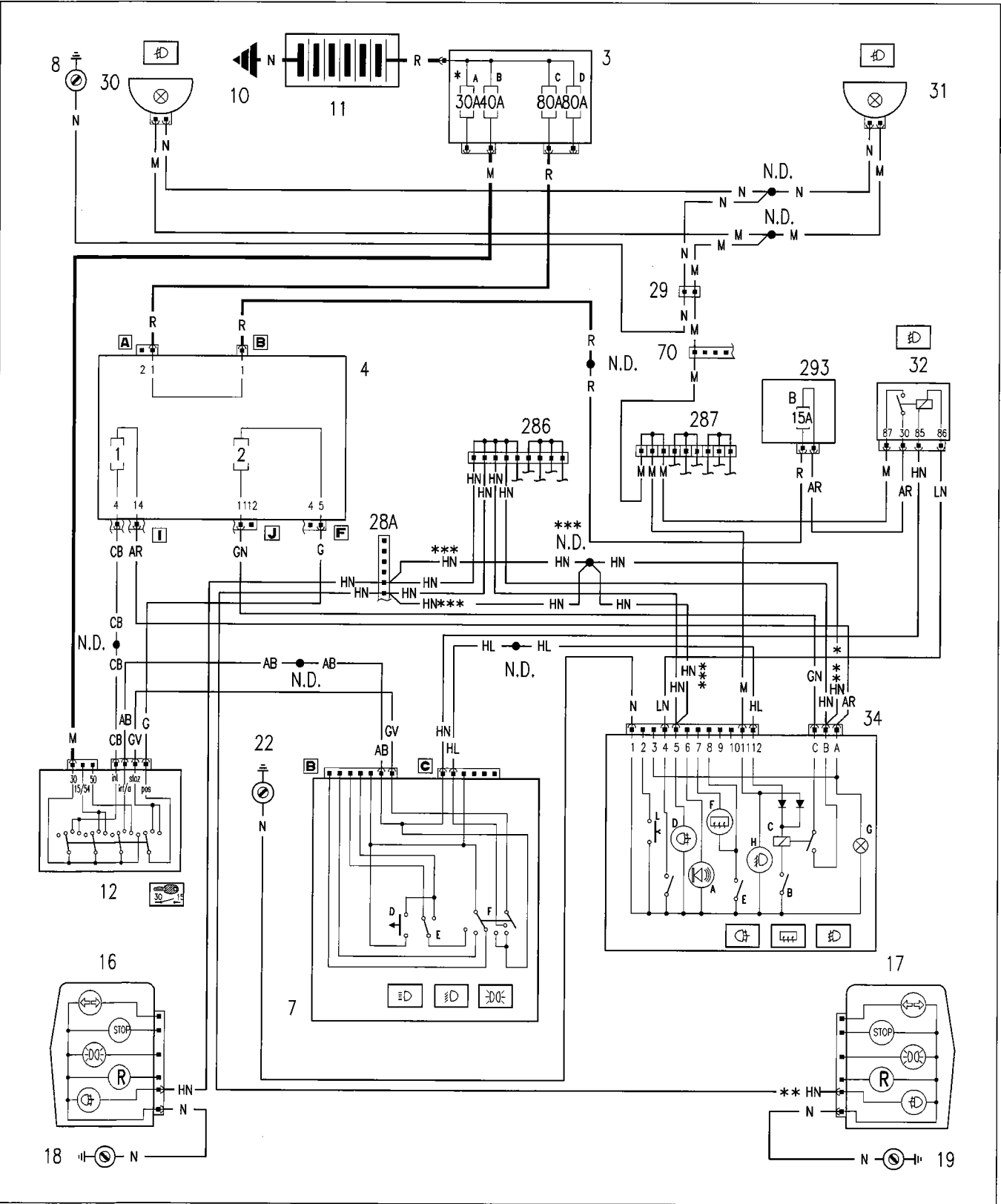
317 Main beam headlamp maintenance remote control switch

N.D. Ultrasound welding taped in cable loom





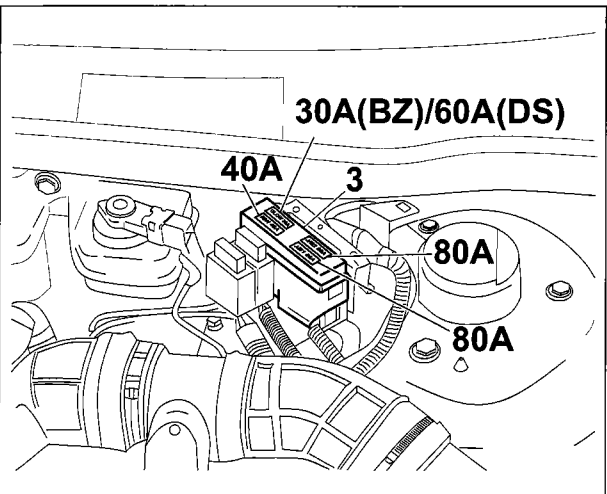
Fog lights and warning light - Rear fog lamps and warning light



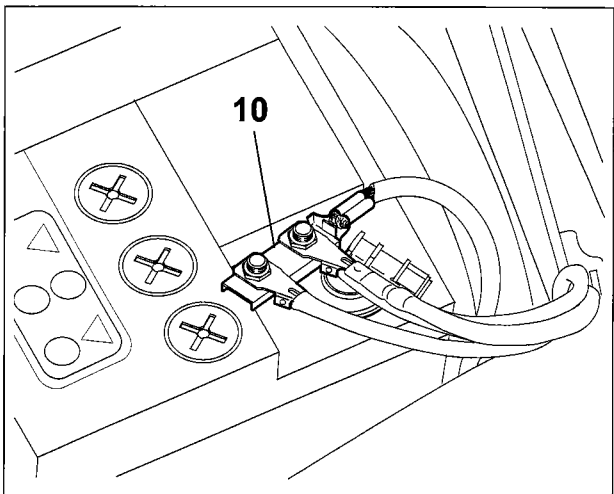
\* 60A fuse for JTD versions  
\*\*\* Variant connection for the SX-GT version

\*\* Non existent for Bravo version

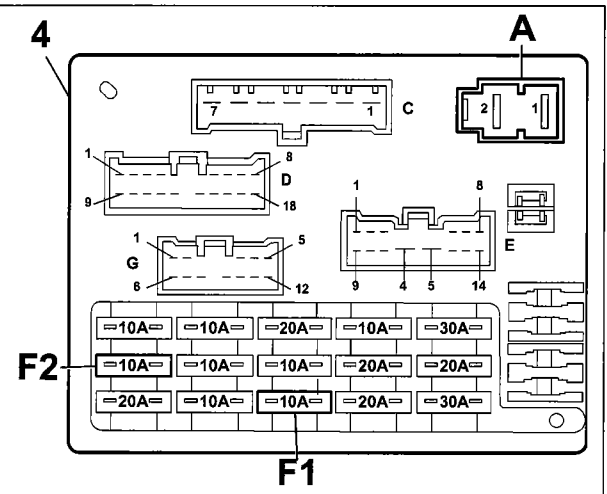
Component location



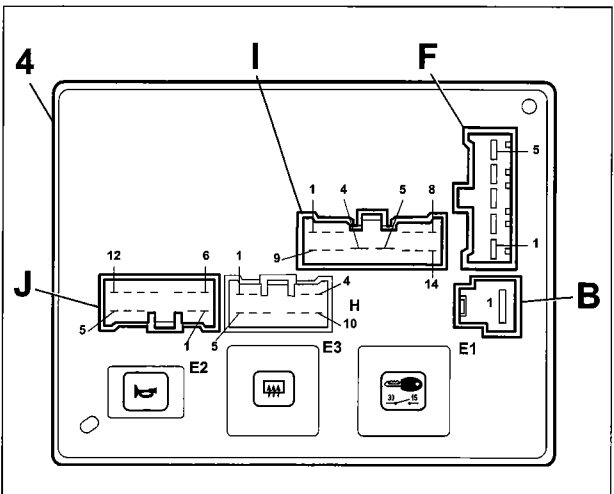
4A005NL02



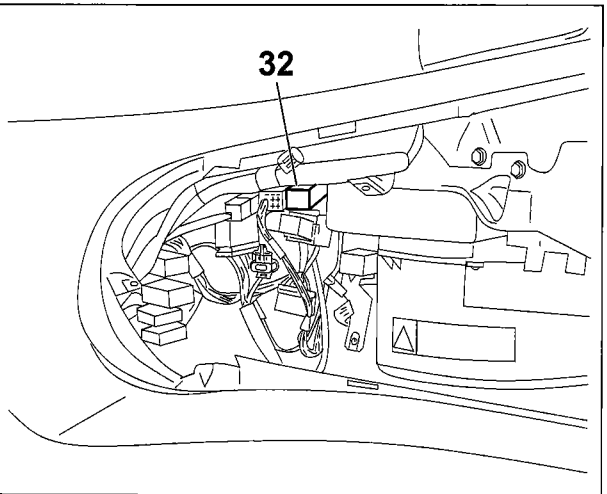
4A007NL03



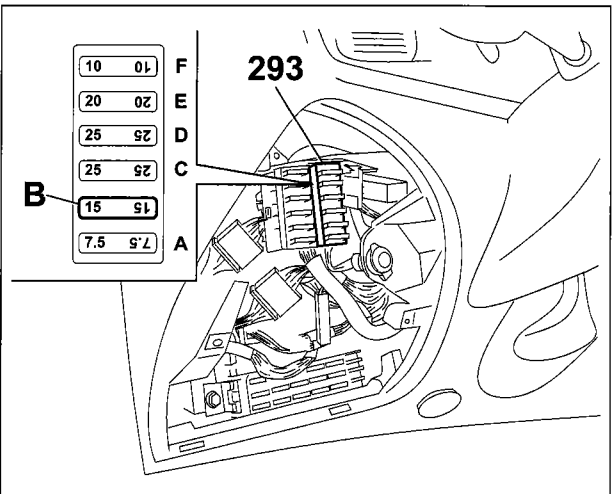
4A007NL04



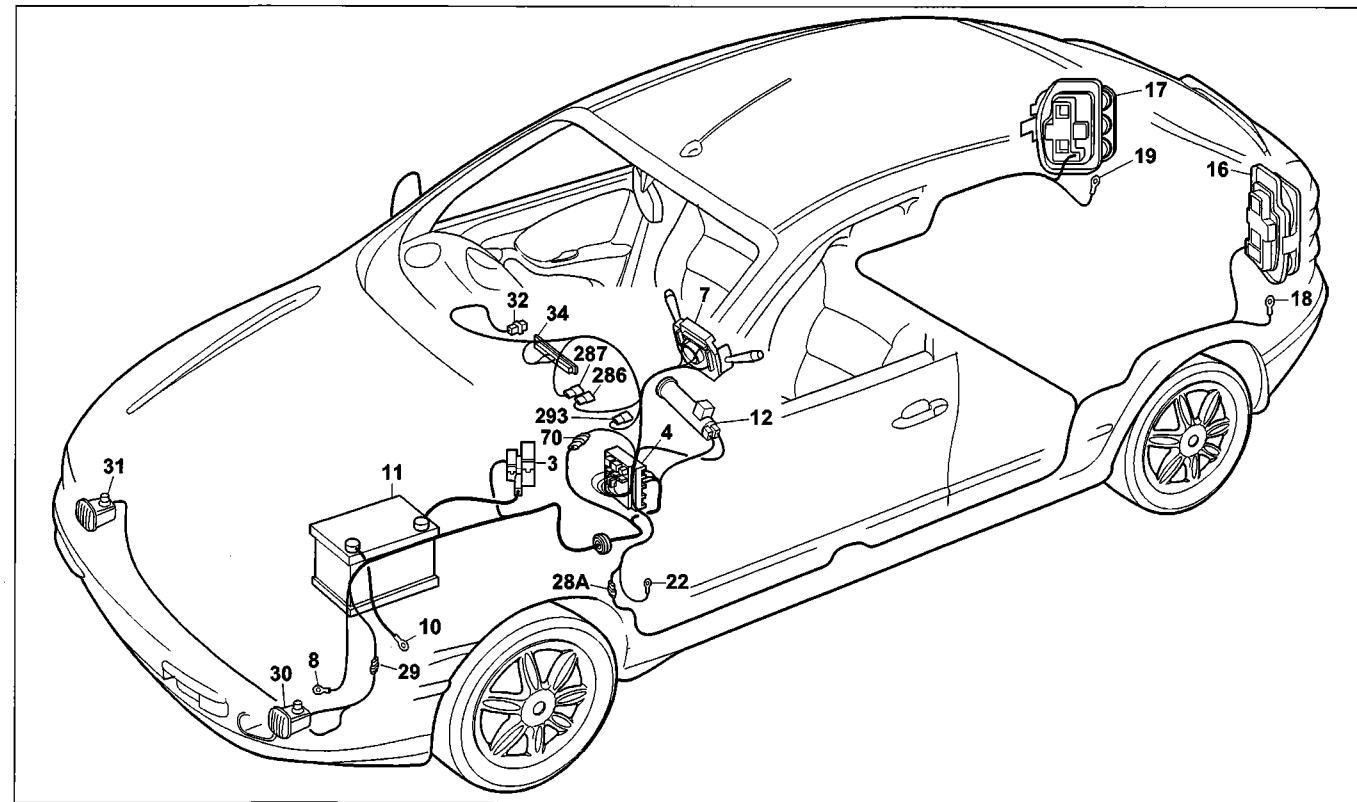
4A007NL05



4A007NL06



4A007NL07

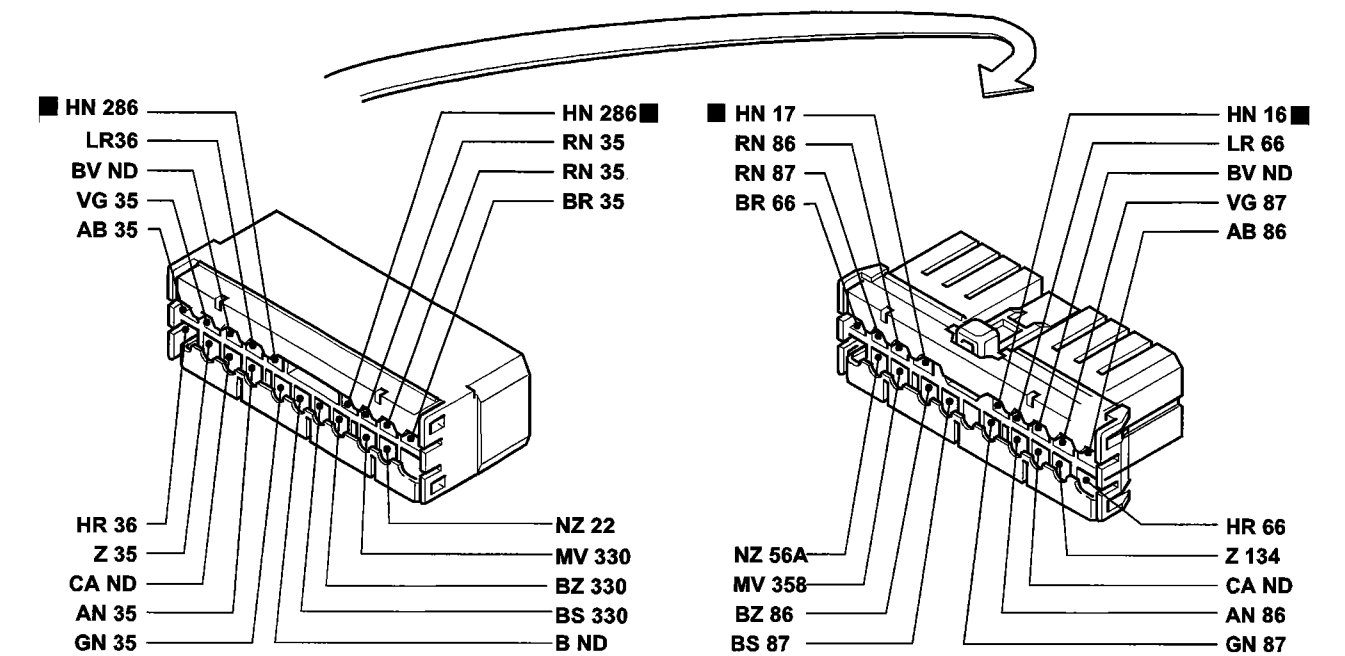


**Fog lights and warning light - Rear fog lamps and warning light**

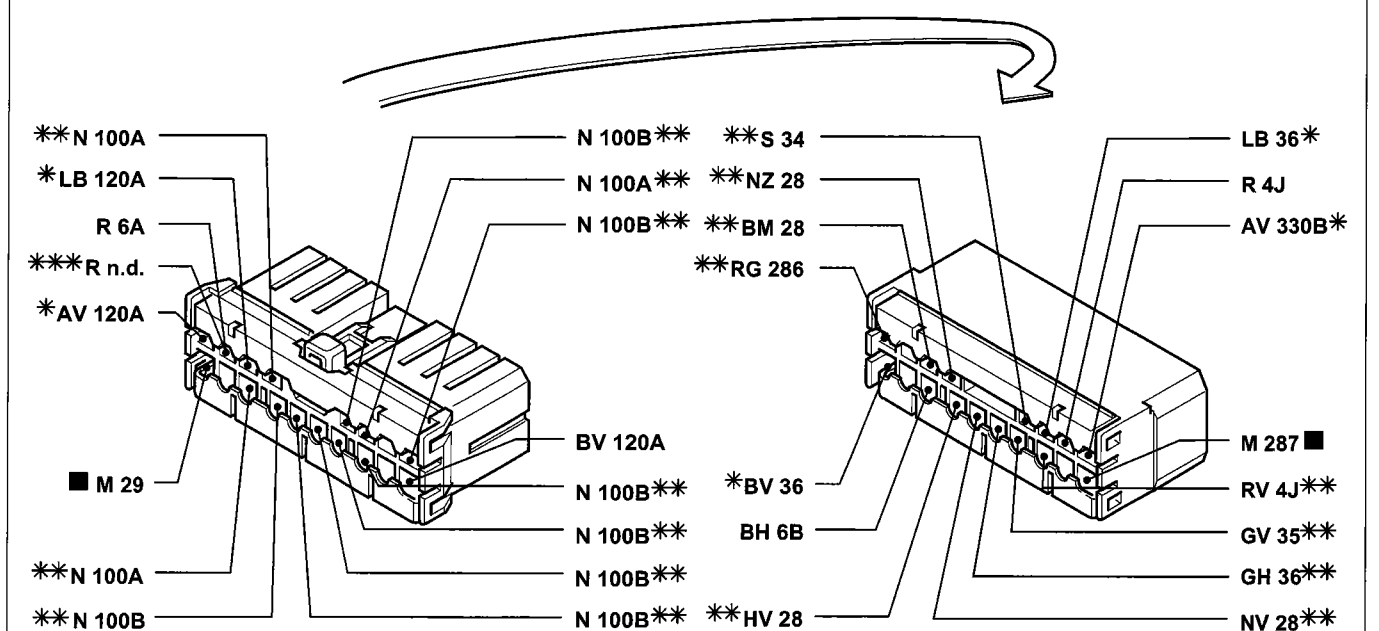
### Component key

- 3 Power fusebox:
  - A 30A fuse protecting injection system (60A for TD versions)
  - B 40A fuse protecting ignition system
  - C 80A fuse protecting optional equipment
  - D 80A fuse protecting junction unit
- 4 Junction unit
- 7 Stalk unit
  - D Headlamp flasher button
  - E Dipped/main beam headlamps control switch
  - F Side lights control switch
- 8 Left front earth
- 10 Earth for battery on bodyshell
- 11 Battery
- 12 Ignition switch
- 16 Left tail light cluster
- 17 Right tail light cluster
- 18 Left rear earth
- 19 Right rear earth
- 22 Left facia earth
- 28A Connection between dashboard/longitudinal cables
- 29 Connection between front/fog light cables
- 30 Left fog light
- 31 Right fog light
- 32 Fog light relay feed
- 34 Switch control unit:
  - A Anti-theft device on warning light
  - B Rear fog lamps control switch
  - C Rear fog lamps relay feed
  - D Rear fog lamps warning light
  - E Heated rear windscreen control switch
  - F Heated rear windscreen warning light
  - G Switch control panel ideogram light
  - H Fog lights warning light
  - L Outside temperature control switch
- 70 Connection between facia/front leads
- 286 Short circuit connection
- 287 Short circuit connection
- 293 Fuse holder base on dashboard cable
  - B 15A fuse protecting fog lights maintenance relay
- N.D. Ultrasound welding taped in cable loom

## 28A Connection between dashboard/longitudinal cables (ELX trim level only)



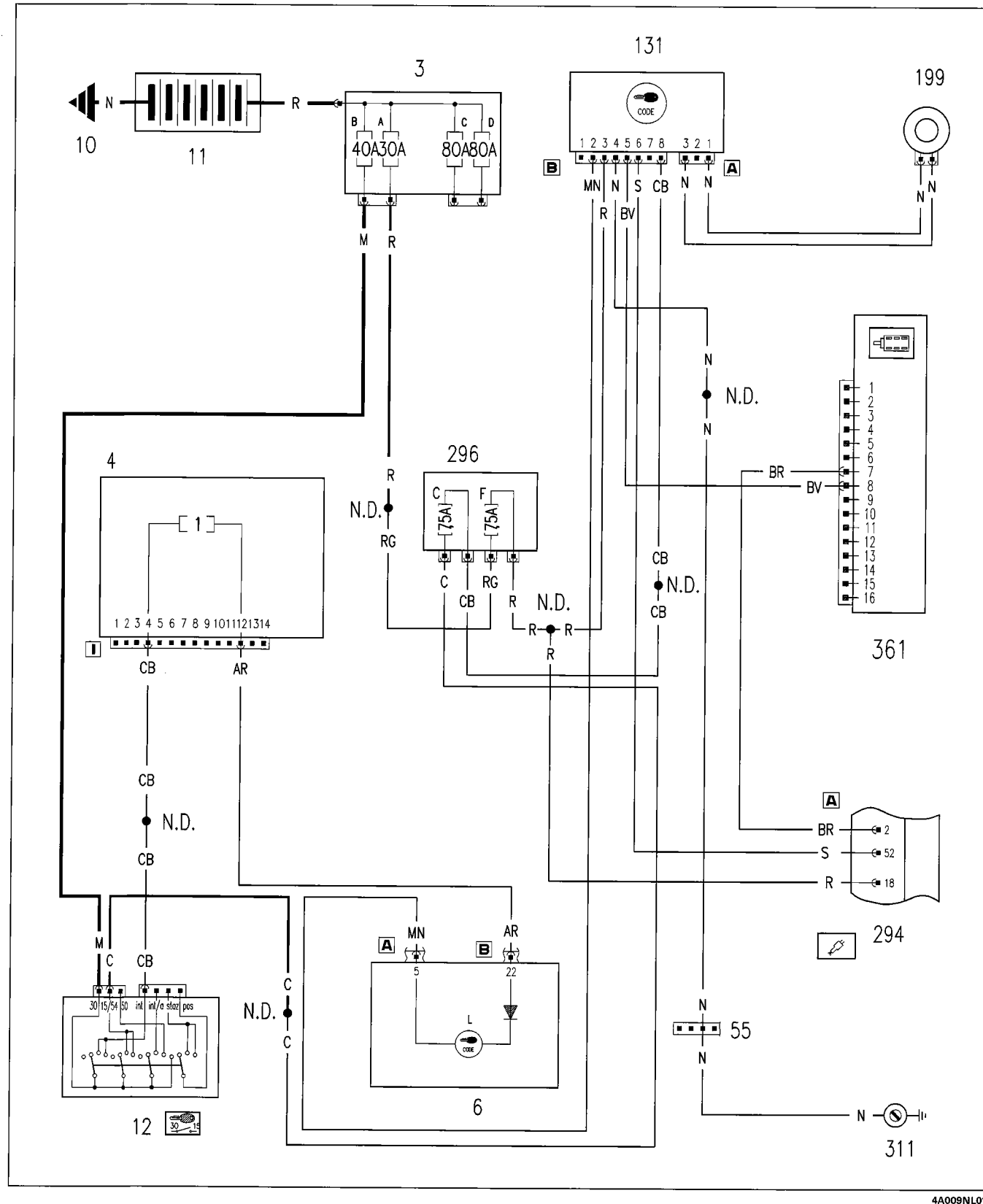
## 70 Connection between dashborad/front cables



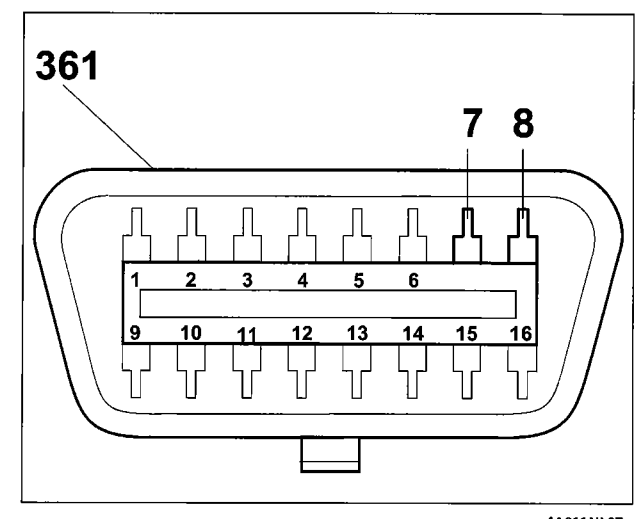
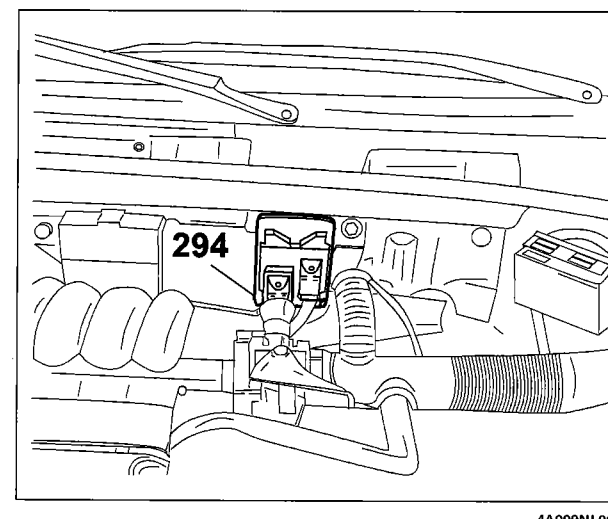
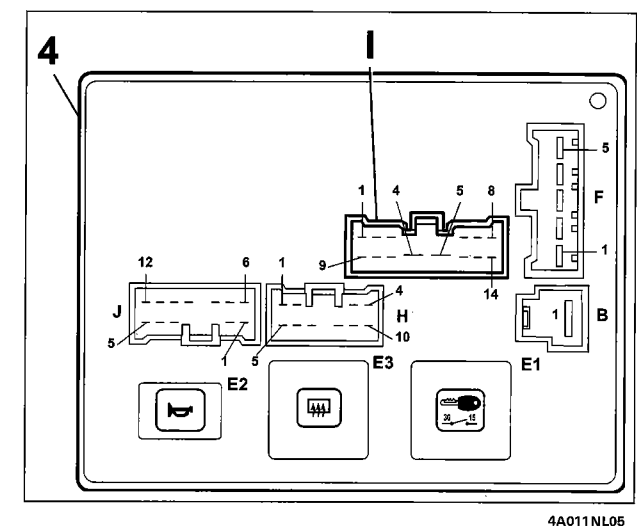
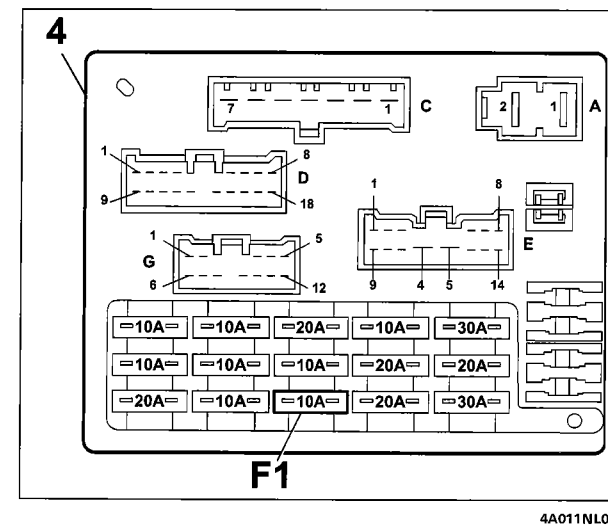
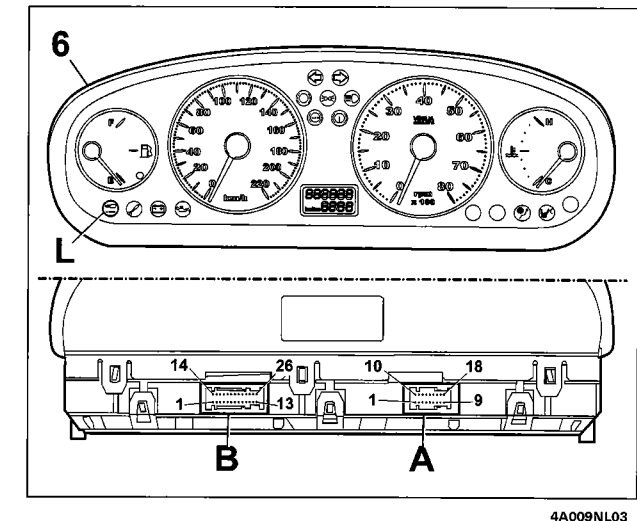
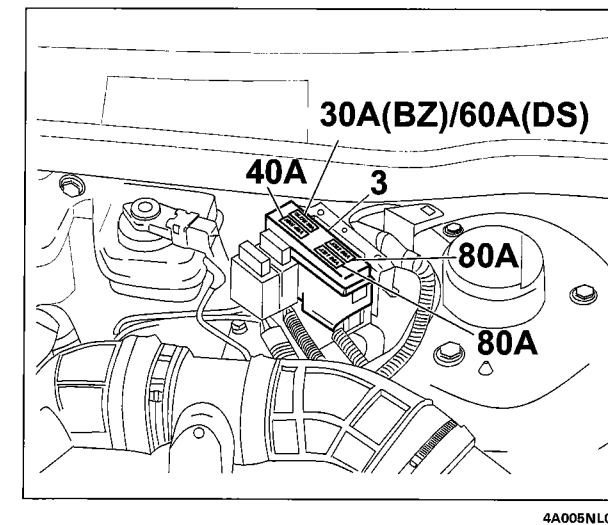
\* Variant connection for versions with air conditioning  
 \*\* Variant connection for versions with alarm  
 \*\*\* Variant connection for 1910 JTD versions

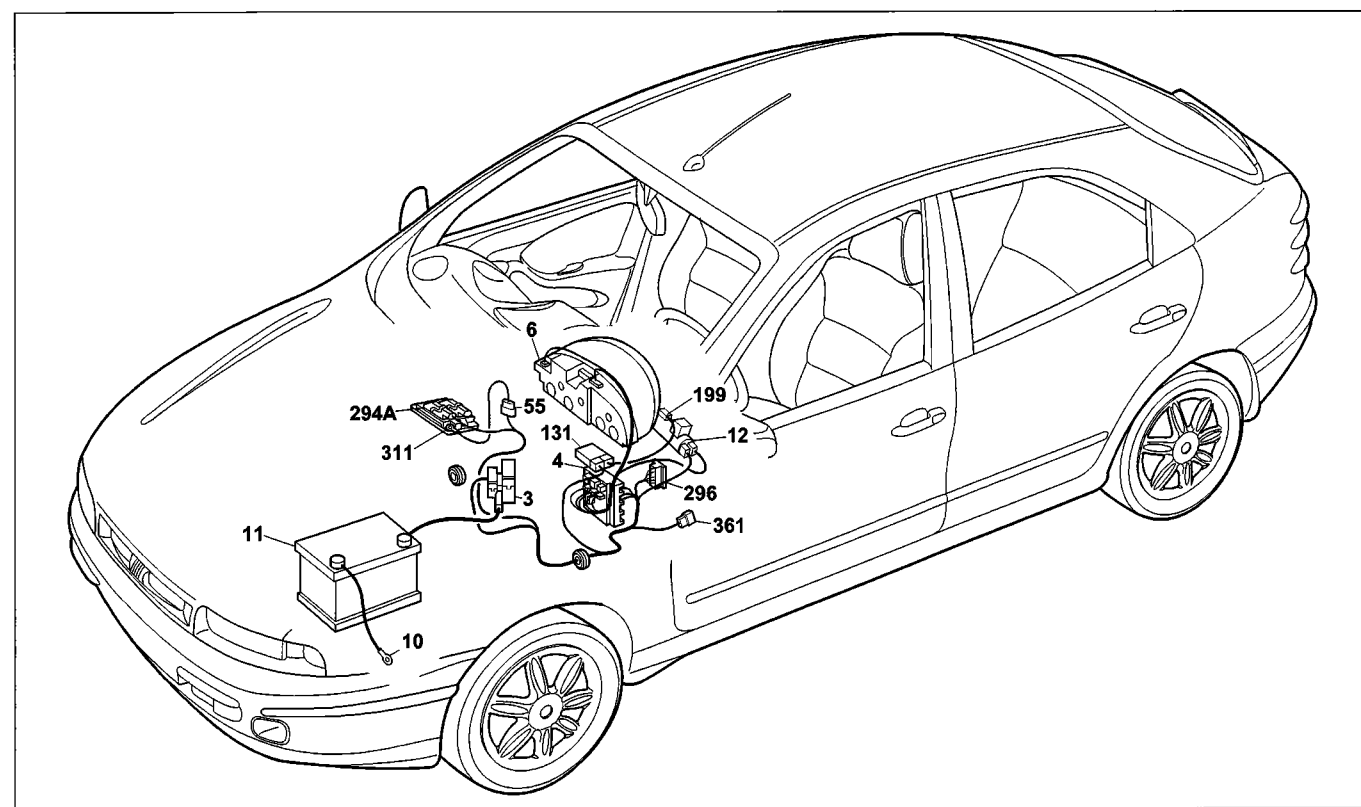
The cables concerned are marked in the wiring diagram with a square

**Fiat-CODE and failure warning light**



**Component location**





4A010NL01

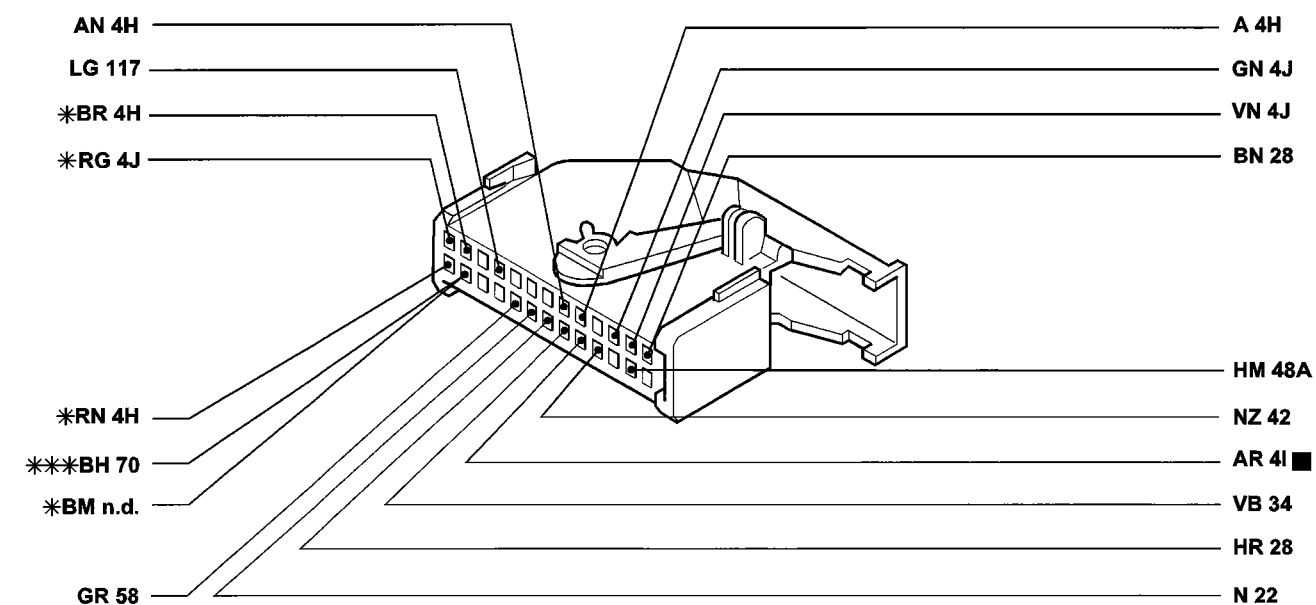
### Fiat-CODE and failure warning light

#### Component key

- |                                                              |                                                                      |
|--------------------------------------------------------------|----------------------------------------------------------------------|
| 3 Power fusebox:                                             | 296 Fuse holder base on front cable:                                 |
| A 30A fuse protecting injection system (60A for TD versions) | C 7.5A fuse protecting Fiat CODE cooling system/electronic injection |
| B 40A fuse protecting ignition system                        | F 7.5A fuse protecting Fiat CODE electronic injection system         |
| C 80A fuse protecting optional equipment                     | 311 1242 16V engine pre-wiring earth                                 |
| D 80A fuse protecting junction unit                          | 361 Diagnostic socket                                                |
| 4 Junction unit                                              | N.D. Ultrasound welding taped in cable loom                          |
| 6 Instrument panel                                           |                                                                      |
| L Fiat-CODE failure warning light                            |                                                                      |
| 10 Battery earth on bodyshell                                |                                                                      |
| 11 Battery                                                   |                                                                      |
| 12 Ignition switch                                           |                                                                      |
| 55 Connection between front cables/engine pre-wiring         |                                                                      |
| 131 Fiat CODE electronic control unit                        |                                                                      |
| 199 Aerial for Fiat CODE                                     |                                                                      |
| 294 Injection/ignition electronic control unit 1242          |                                                                      |

## 55.

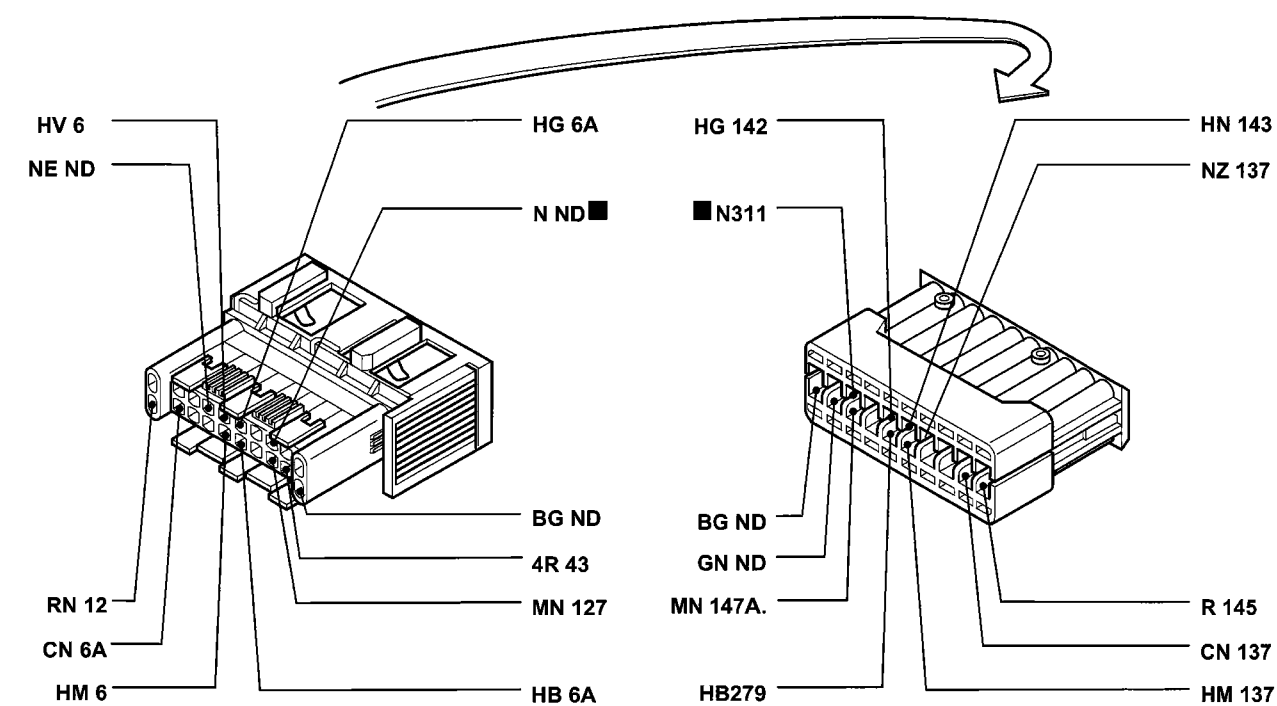
### 6B Instrument panel



- \* Non existent for SX-GT trim levels
- \*\* Variant connection for versions with passenger AIR BAG
- \*\*\* Variant connection for SX-GT trim levels with alarm

4A010NL02

### 55 Connection between front cables/engine pre-wiring



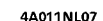
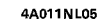
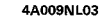
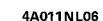
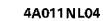
4A010NL03

The cables concerned are marked in the wiring diagram with a square

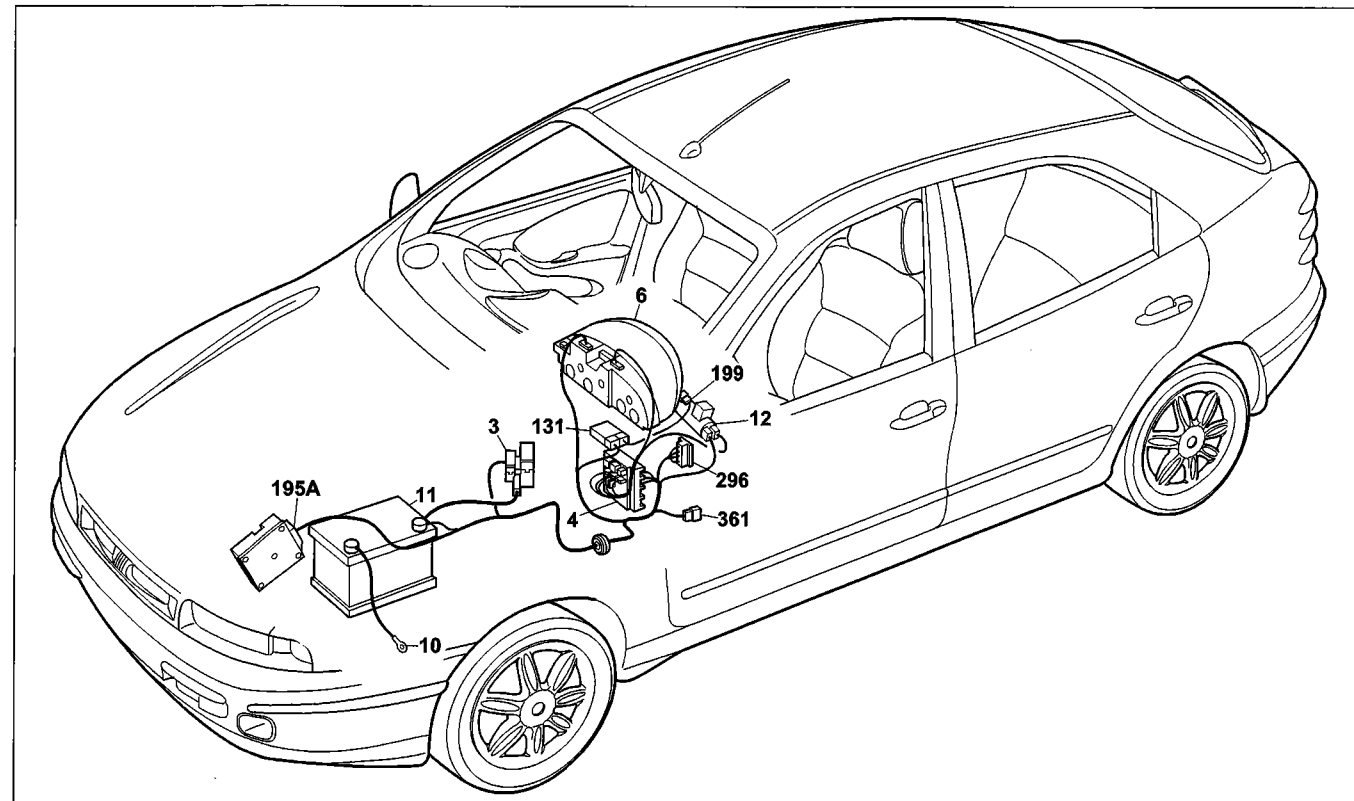


Simpo PDF Merge and Split Unregistered Version - <http://www.simpopdf.com>

## 4A005NL02



### 55.



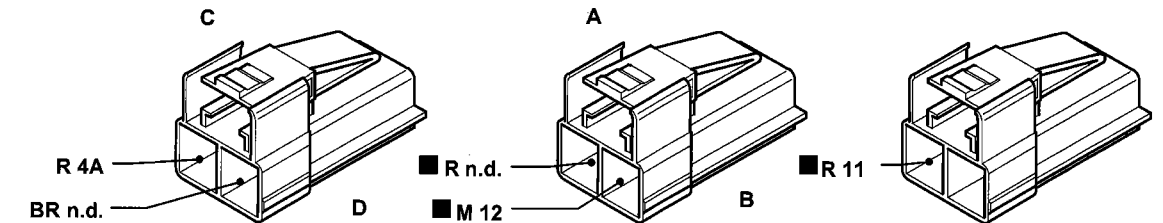
4A012NL01

#### Fiat-CODE and failure warning light

#### Component key

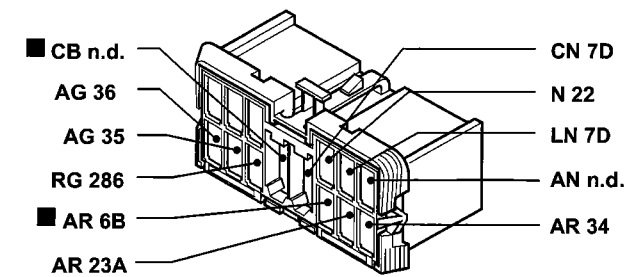
- |                                                              |                                                                      |
|--------------------------------------------------------------|----------------------------------------------------------------------|
| 3 Power fusebox:                                             | 296 Fuse holder base on front cable:                                 |
| A 30A fuse protecting injection system (60A for TD versions) | C 7.5A fuse protecting Fiat CODE cooling system/electronic injection |
| B 40A fuse protecting ignition system                        | F 7.5A fuse protecting Fiat CODE electronic injection system         |
| C 80A fuse protecting optional equipment                     | 361 Diagnostic socket                                                |
| D 80A fuse protecting junction unit                          | N.D. Ultrasound welding taped in cable loom                          |
| 4 Junction unit                                              |                                                                      |
| 6 Instrument panel:                                          |                                                                      |
| L Fiat-CODE failure warning light                            |                                                                      |
| 10 Battery earth on bodyshell                                |                                                                      |
| 11 Battery                                                   |                                                                      |
| 12 Ignition switch                                           |                                                                      |
| 131 Fiat CODE electronic control unit                        |                                                                      |
| 195 Injection/ignition electronic control unit (1581)        |                                                                      |
| 199 Fiat CODE aerial                                         |                                                                      |

#### 3 Power fusebox



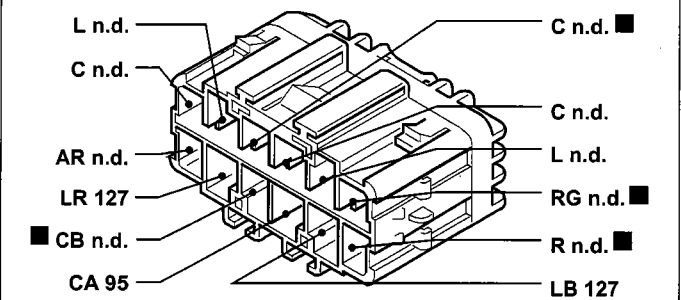
4A012NL02

#### 4I Junction unit



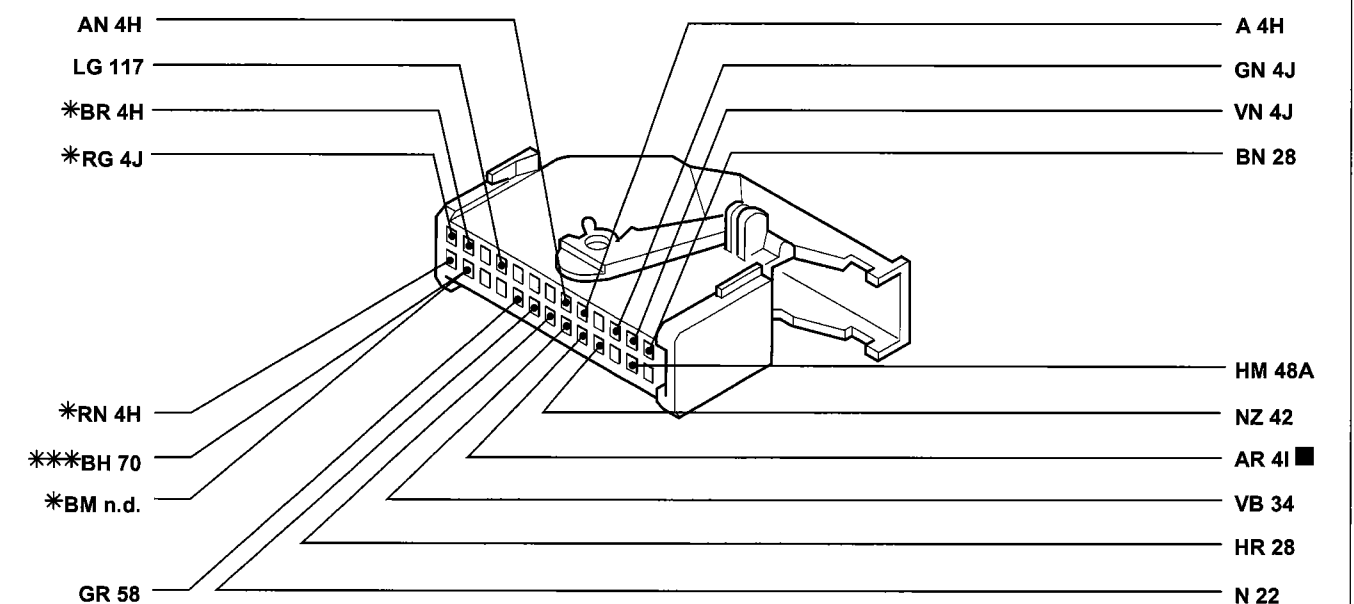
4A012NL03

#### 296 Fuse holder base on front cable



4A012NL04

#### 6B Instrument panel



4A012NL05

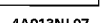
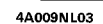
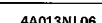
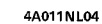
The cables concerned are marked in the wiring diagram with a square



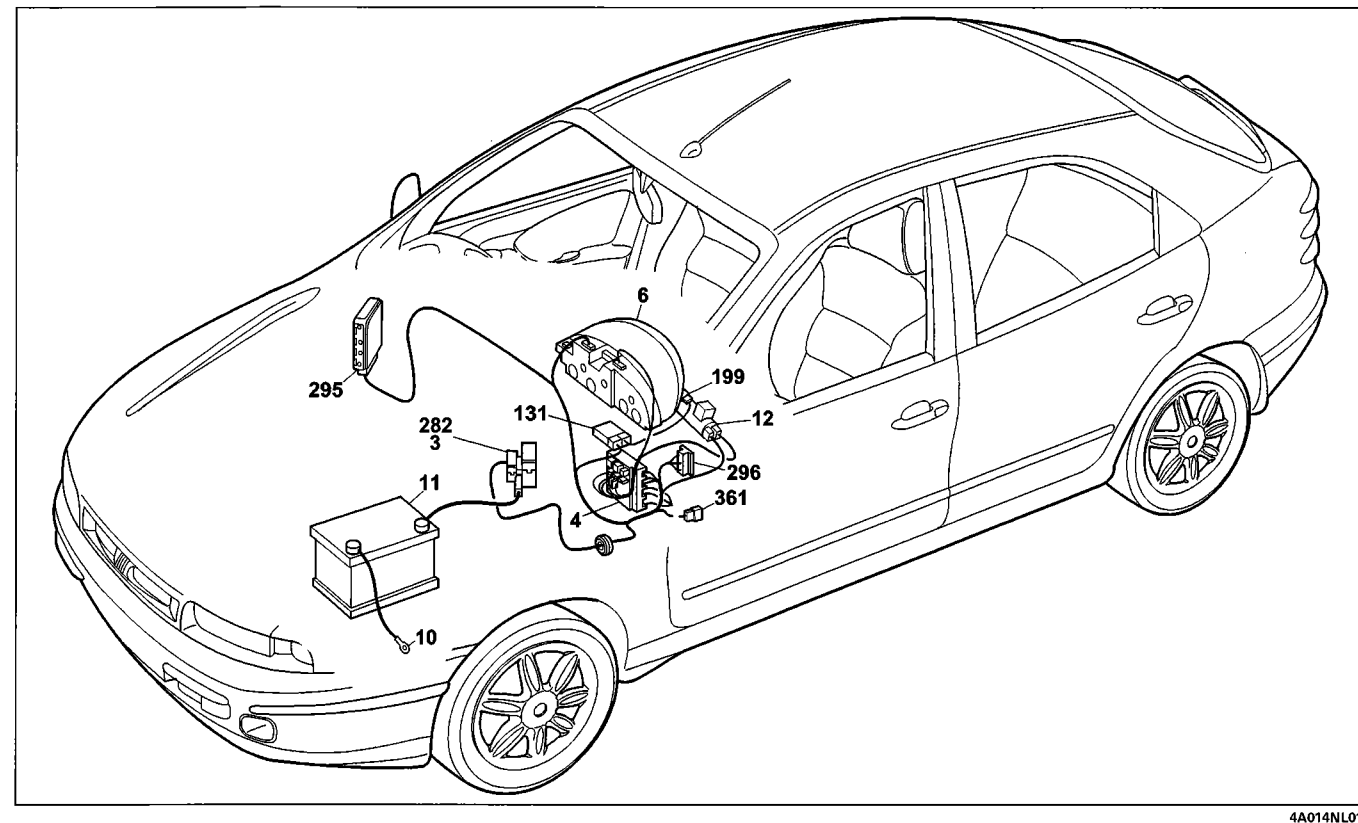
1



## 4A013NL02



### 55.



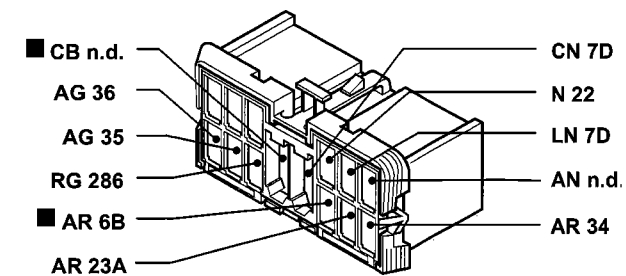
4A014NL01

#### Fiat-CODE and failure warning light

#### Component key

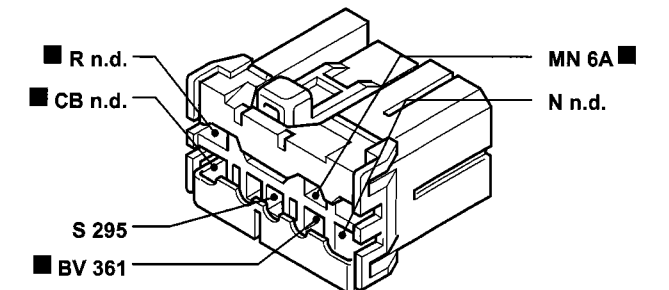
- |                                                                        |                                                                      |
|------------------------------------------------------------------------|----------------------------------------------------------------------|
| 3 Power fusebox:                                                       | 296 Fuse holder base on front cable:                                 |
| A 30A fuse protecting injection system (60A for TD versions)           | C 7.5A fuse protecting Fiat CODE cooling system/electronic injection |
| B 40A fuse protecting ignition system                                  | F 7.5A fuse protecting Fiat CODE electronic injection system         |
| C 80A fuse protecting optional equipment                               | 361 Diagnostic socket                                                |
| D 80A fuse protecting junction unit                                    | N.D. Ultrasound welding taped in cable loom                          |
| 4 Junction box                                                         |                                                                      |
| 6 Instrument panel:                                                    |                                                                      |
| L Fiat-CODE failure warning light                                      |                                                                      |
| 10 Battery earth on bodyshell                                          |                                                                      |
| 11 Battery                                                             |                                                                      |
| 12 Ignition switch                                                     |                                                                      |
| 131 Fiat CODE electronic control unit                                  |                                                                      |
| 199 Aerial for Fiat CODE                                               |                                                                      |
| 282 30A fuse protecting Fiat CODE/electronic injection (60 for UNIJET) |                                                                      |
| 295 Electronic injection/ignition electronic control unit 1910 UNIJET  |                                                                      |

#### 4I Junction unit



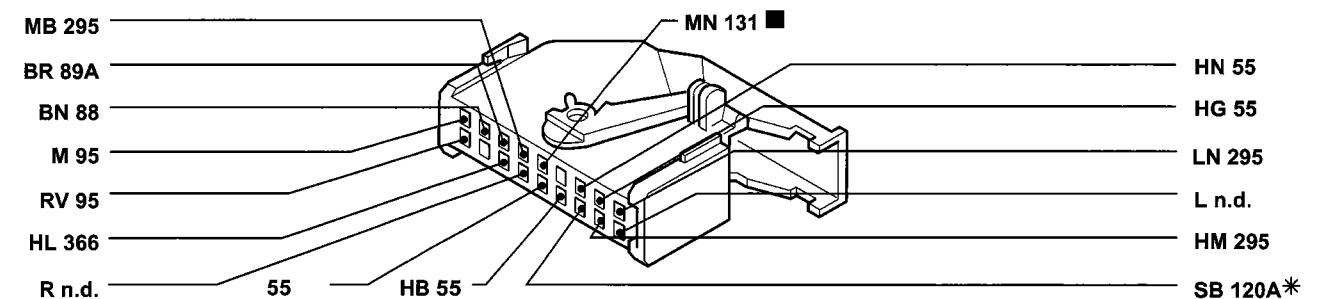
4A014NL02

#### 131B Fiat CODE electronic control unit connection



4A014NL03

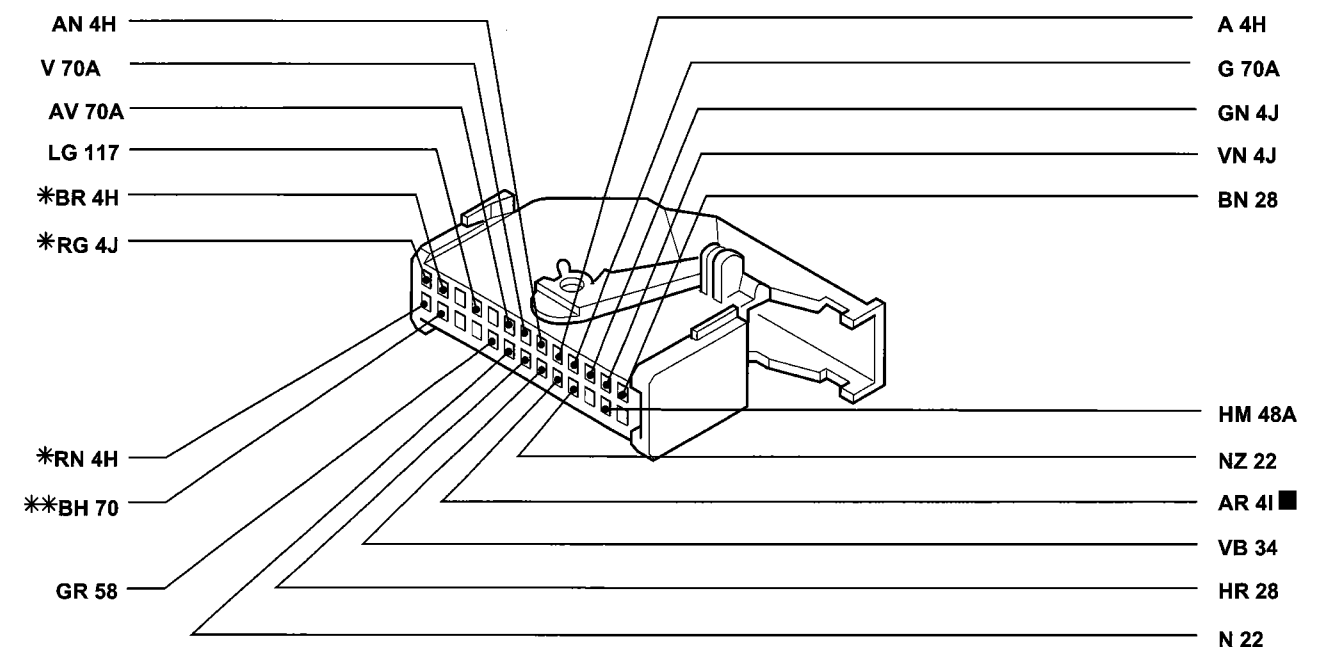
#### 6A Instrument panel



\* Variant connection for versions with air conditioning

4A014NL04

#### 6B Instrument panel

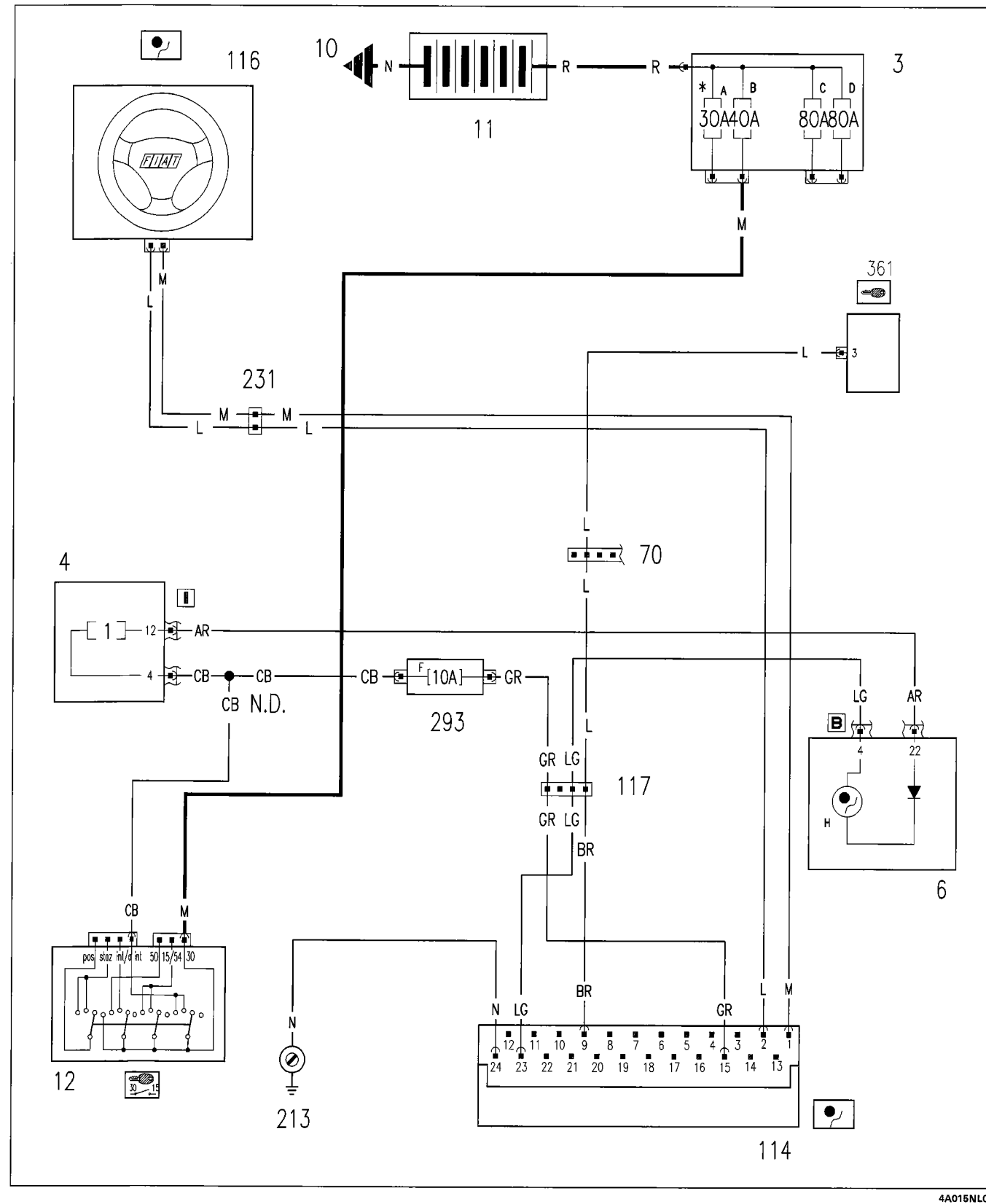


\* Non existent for SX-GT trim levels  
\*\* Variant for versions with alarm

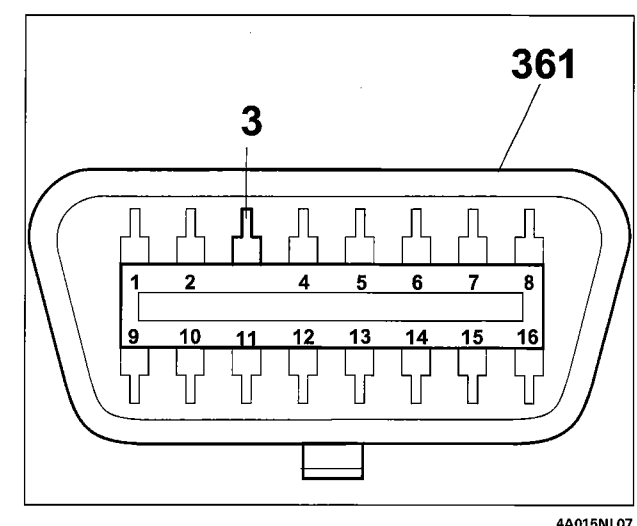
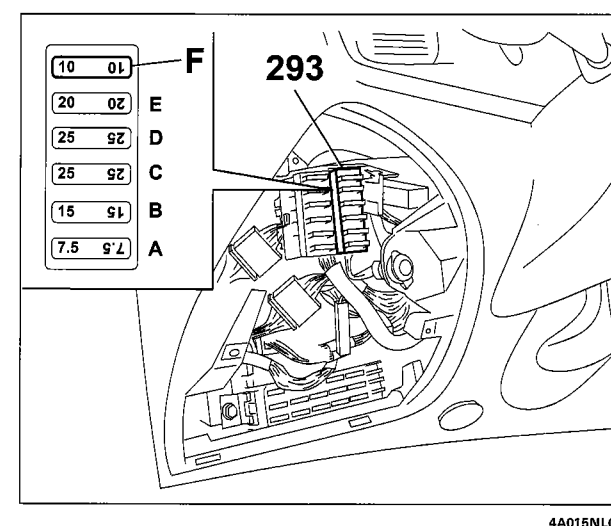
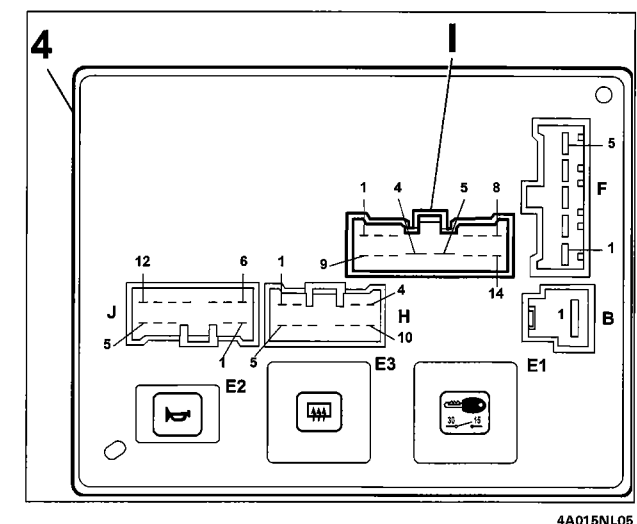
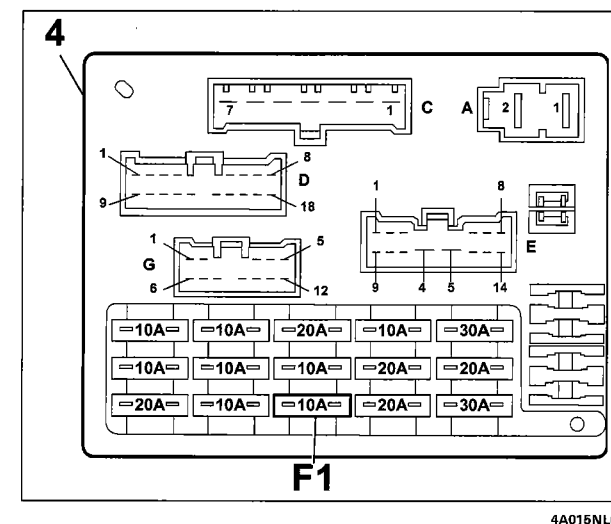
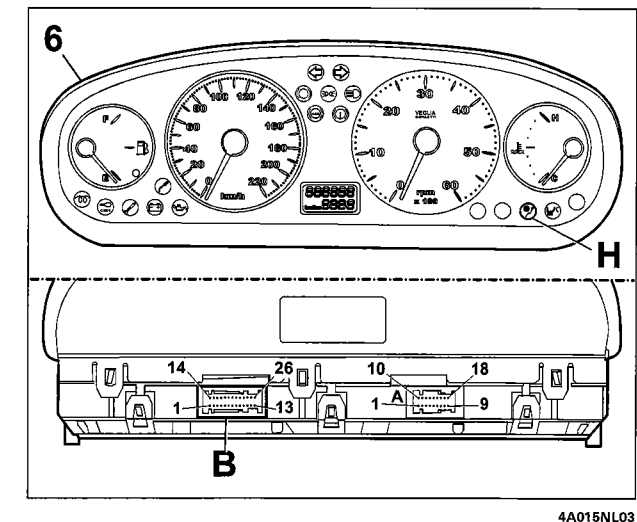
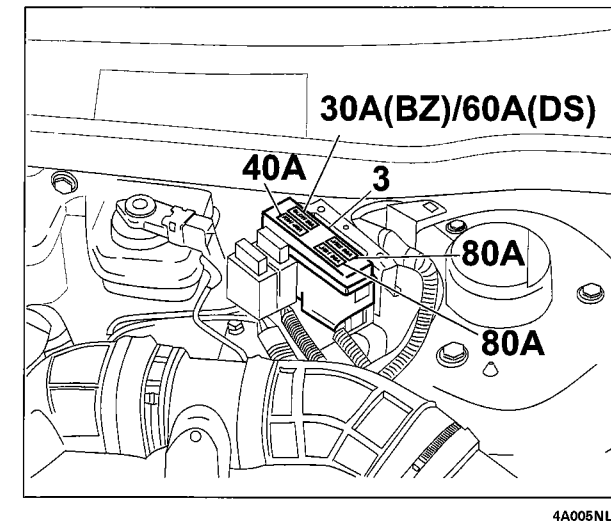
4A014NL05

The cables concerned are marked in the wiring diagram with a square

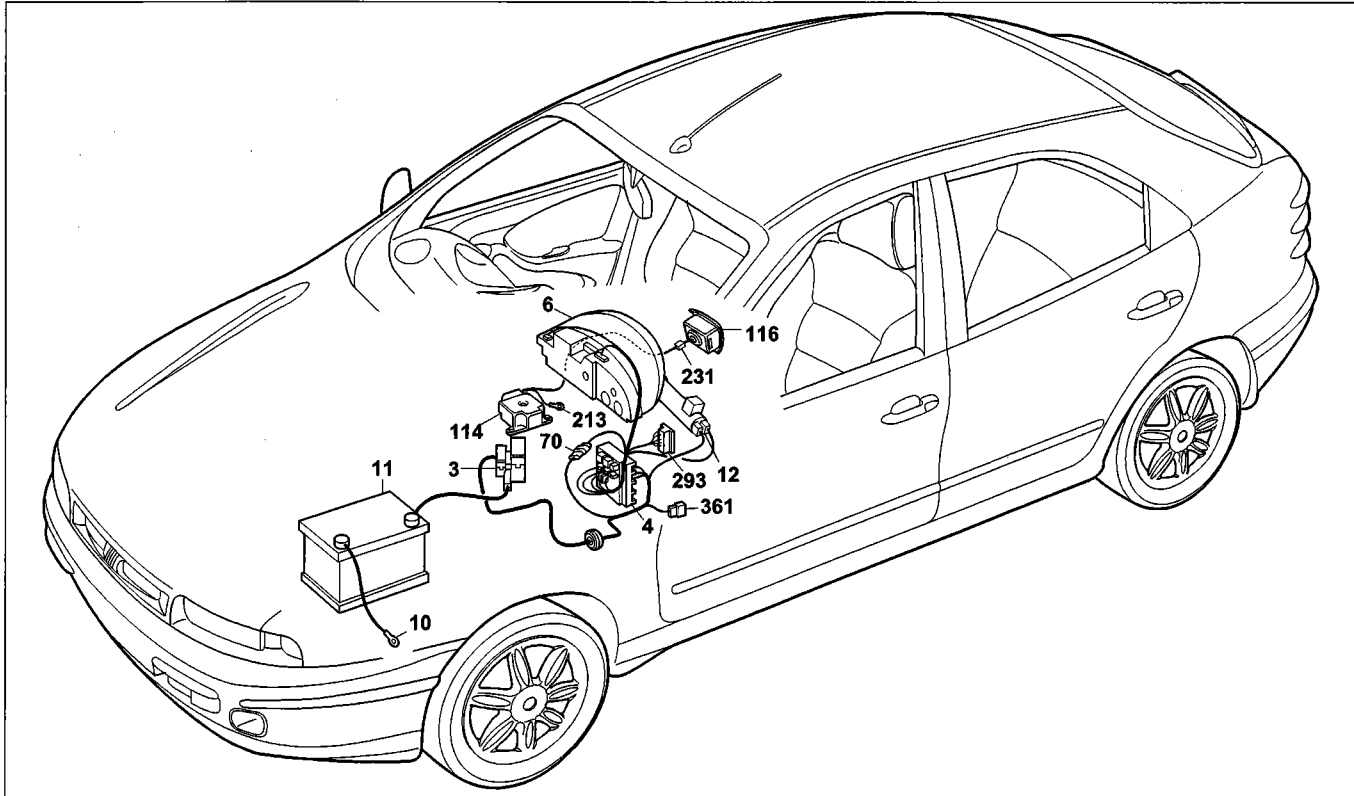
Driver's EURO BAG and failure warning light



Component location



55.



Driver's EURO BAG and failure warning light

Component key

- 3 Power fusebox:  
A 30A fuse protecting injection system  
(60A for TD versions)  
B 40A fuse protecting ignition system  
C 80A fuse protecting optional equipment  
D 80A fuse protecting junction unit

4 Junction unit

6 Instrument panel:  
H EURO-BAG system failure warning light

10 Battery earth on bodyshell

11 Battery

12 Ignition switch

70 Front dashboard connection

114 EURO BAG electronic control unit

116 Driver's EURO BAG

117 Connection between EURO BAG/dashboard  
cables

213 Earth for EURO BAG

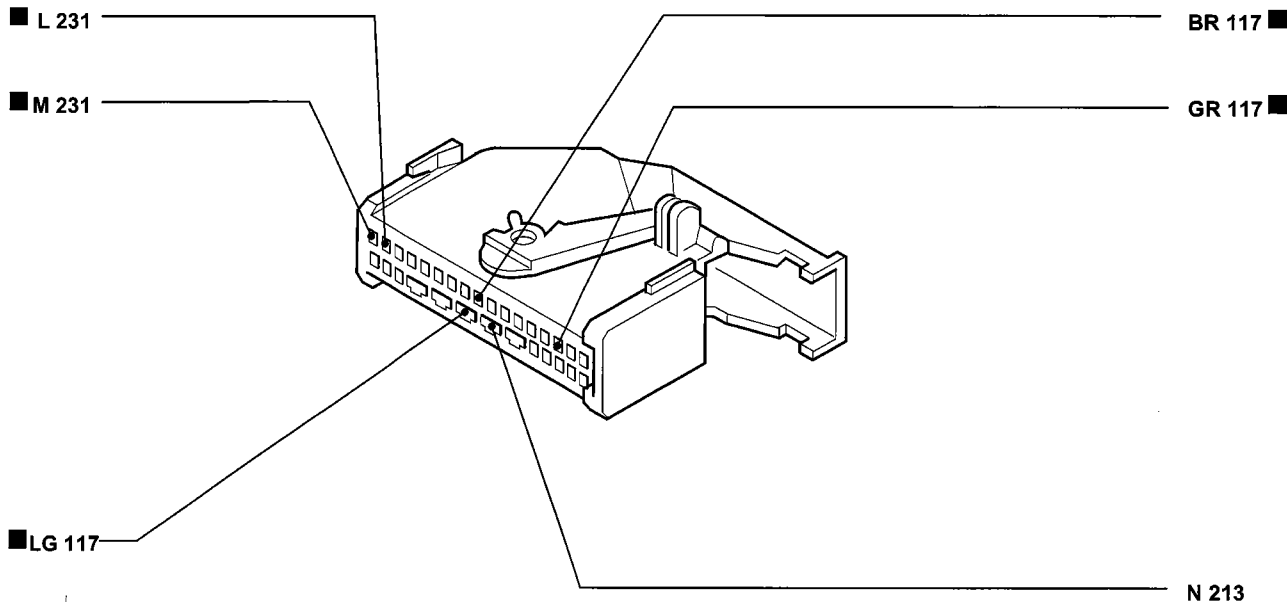
231 Clock spring connection

293 Fuse holder base on dashboard cable  
F 10A fuse protecting EURO BAG

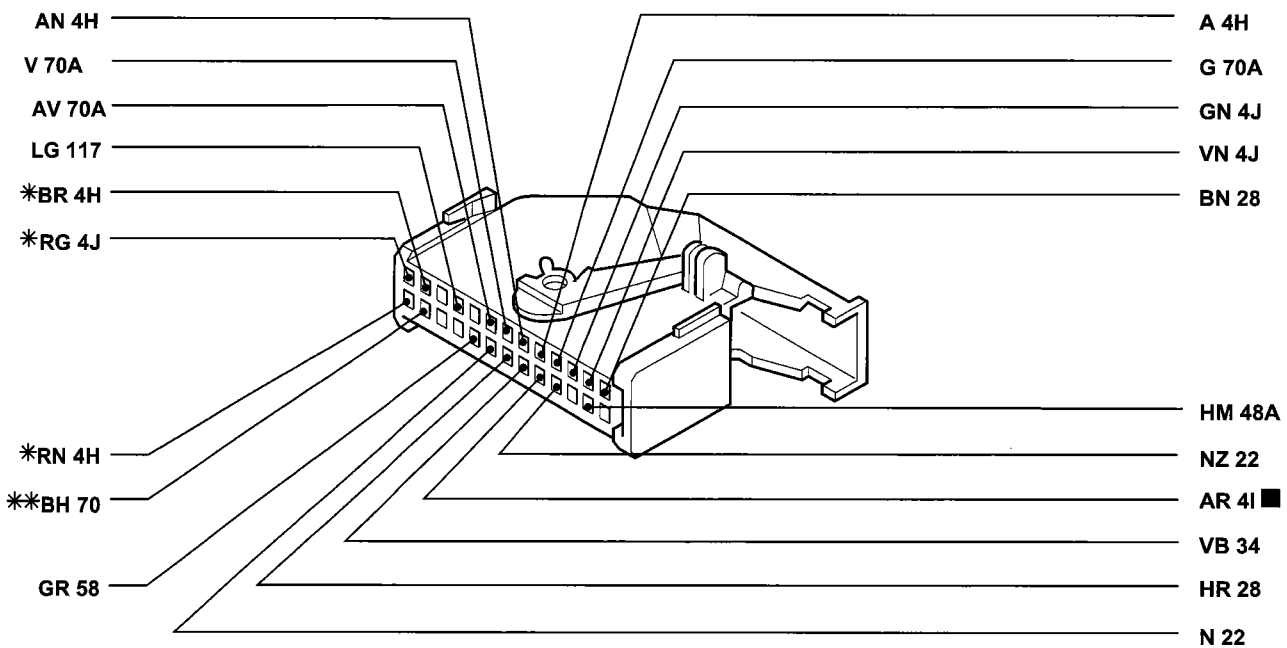
361 Diagnostic socket

N.D. Ultrasound welding taped in cable loom

114 EURO-BAG electronic control unit



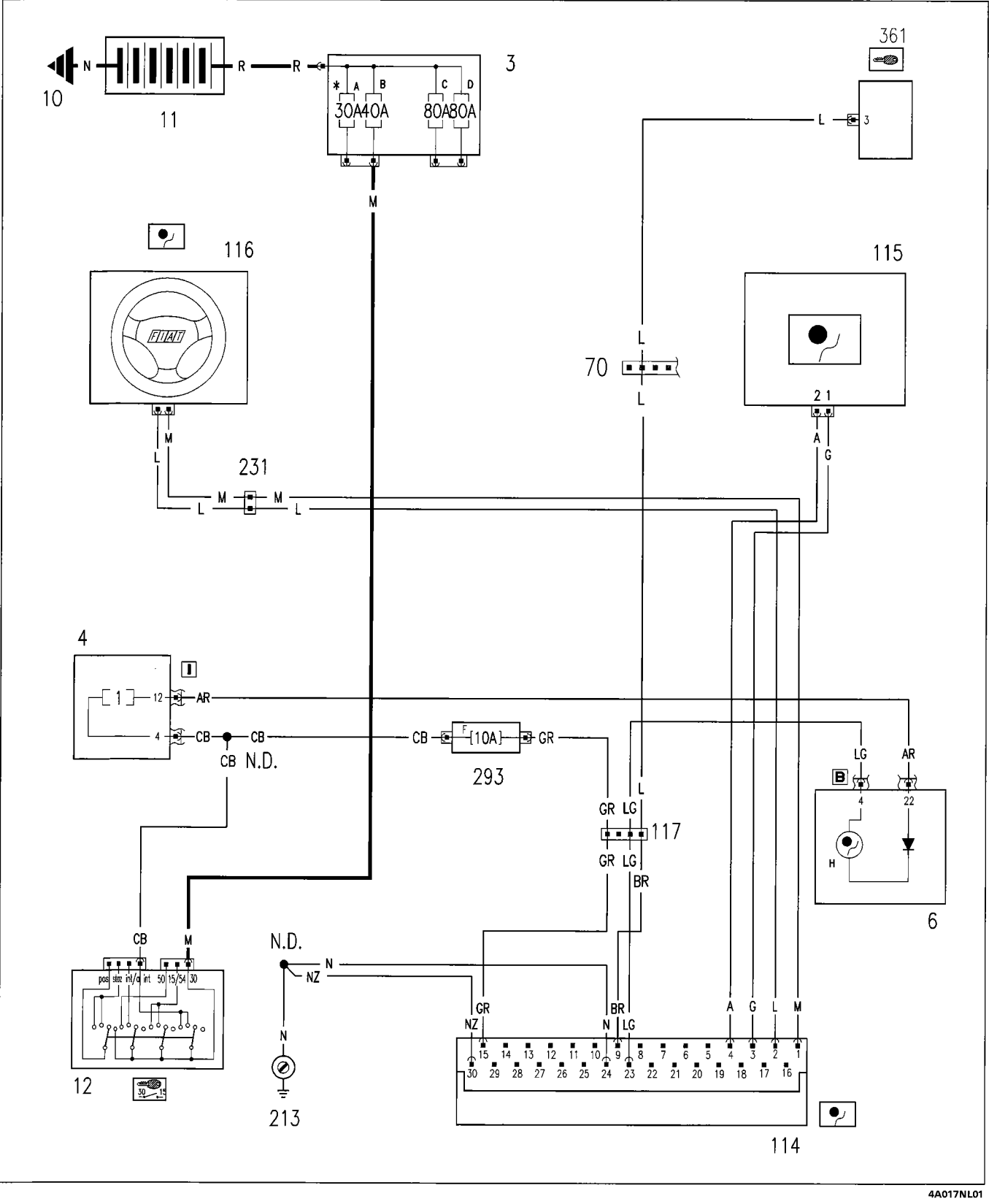
6B Instrument panel



\* Non existent for SX-GT trim levels  
\*\* Variant for versions with alarm]

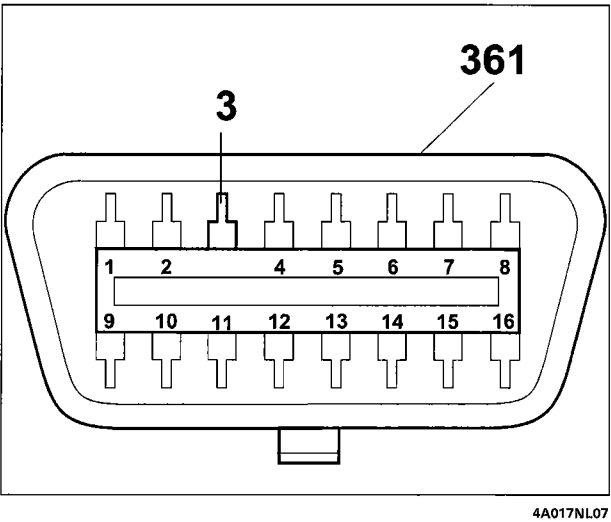
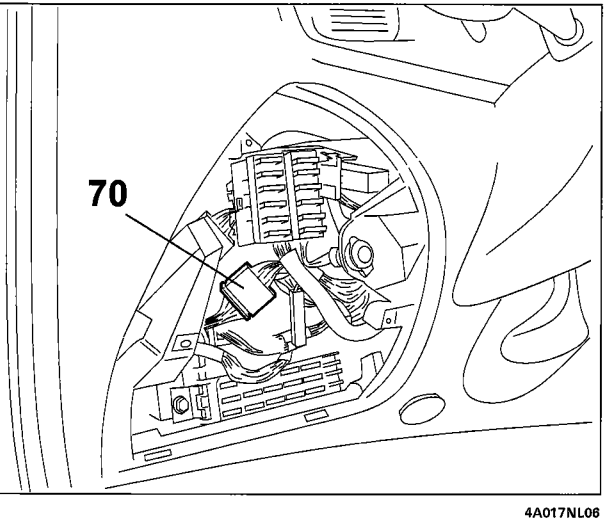
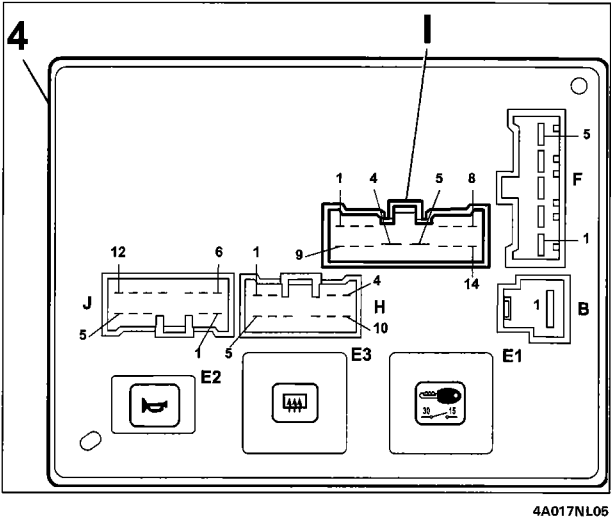
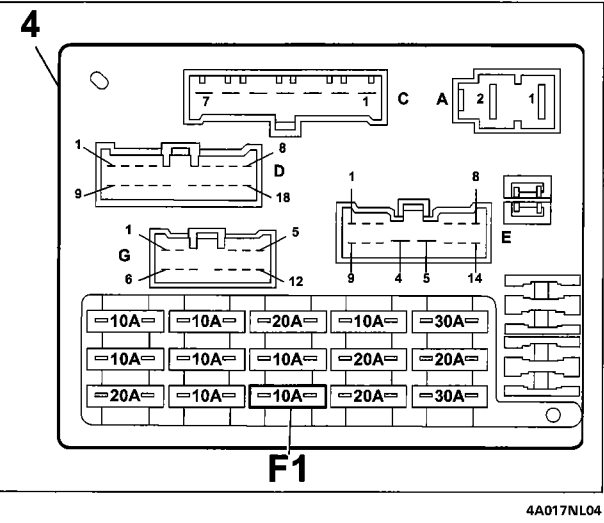
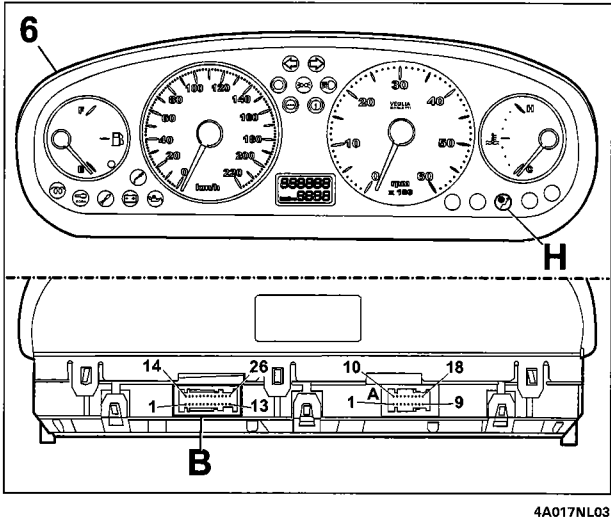
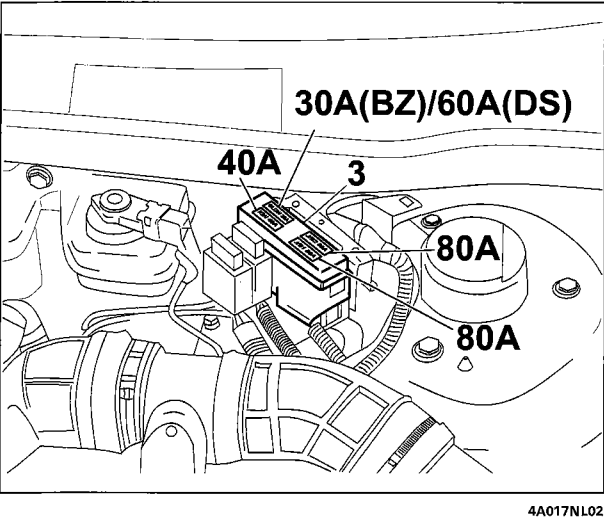
The cables concerned are marked in the wiring diagram with a square

Dual EURO BAGS (driver and passenger) and failure warning light



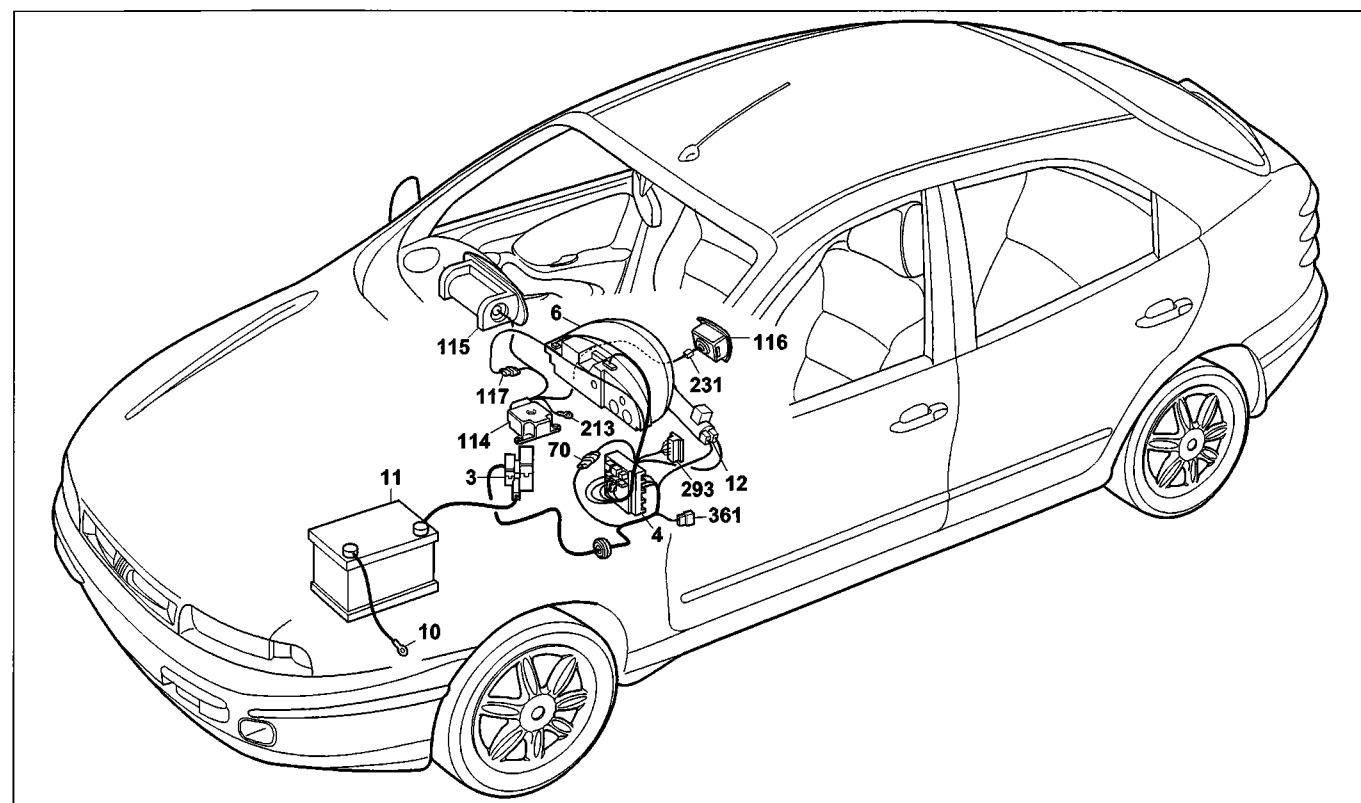
\* 60A protective fuse for JTD versions

Component location





## 55.



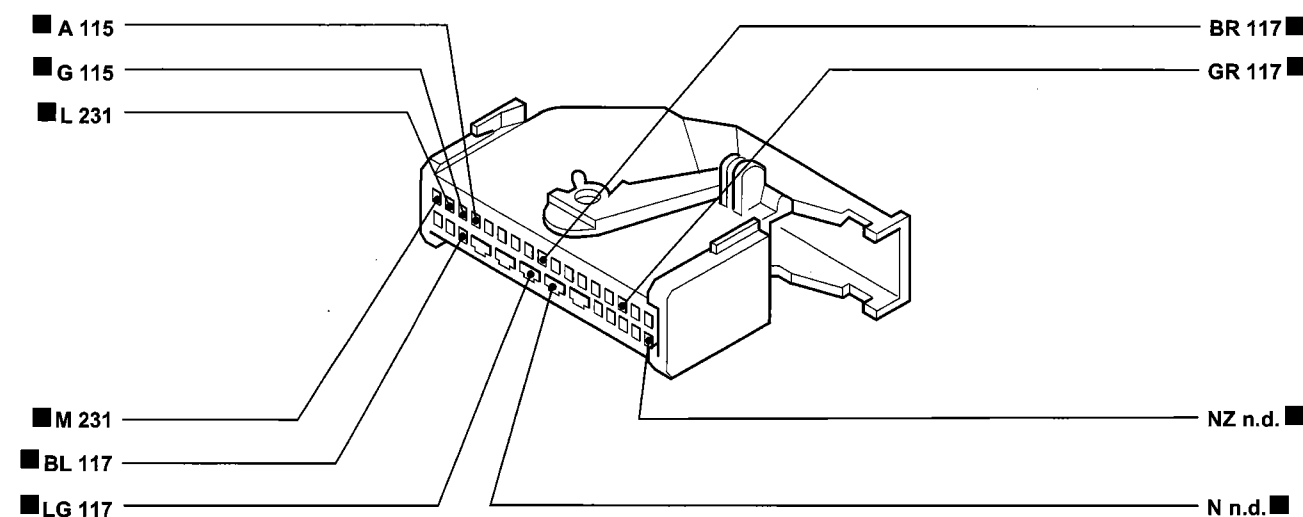
4A018NL01

### Dual EURO BAGS (driver and passenger) and failure warning light

#### Component key

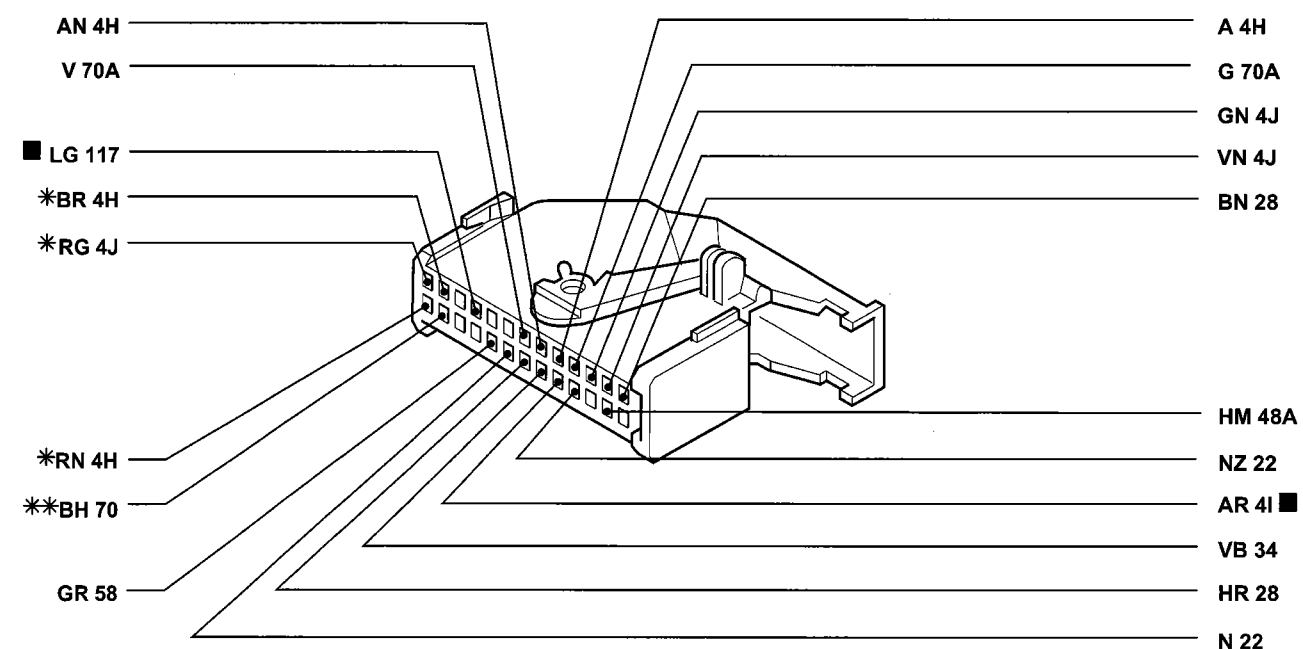
- |                                                              |                                             |
|--------------------------------------------------------------|---------------------------------------------|
| 3 Power fusebox:                                             | 361 Diagnostic socket                       |
| A 30A fuse protecting injection system (60A for TD versions) | N.D. Ultrasound welding taped in cable loom |
| B 40A fuse protecting ignition system                        |                                             |
| C 80A fuse protecting optional equipment                     |                                             |
| D 80A fuse protecting junction unit                          |                                             |
| 4 Junction unit                                              |                                             |
| 6 Instrument panel:                                          |                                             |
| H EURO-BAG system failure warning light                      |                                             |
| 10 Battery earth on bodyshell                                |                                             |
| 11 Battery                                                   |                                             |
| 12 Ignition switch                                           |                                             |
| 70 Front dashboard connection                                |                                             |
| 114 EURO BAG electronic control unit                         |                                             |
| 115 Passenger EURO BAG                                       |                                             |
| 116 Driver's EURO BAG                                        |                                             |
| 117 Connection between EURO BAG/dashboard cables             |                                             |
| 213 Earth for EURO BAG                                       |                                             |
| 231 Clock spring connection                                  |                                             |
| 293 Fuse holder base on dashboard cable                      |                                             |
| F 10A fuse protecting EURO BAG                               |                                             |

### 114 EURO-BAG electronic control unit



4A018NL02

### 6B Instrument panel



\* Non existent for SX-GT trim levels  
\*\* Variant for versions with alarm

4A018NL03

The cables concerned are marked in the wiring diagram with a square

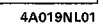


# Bravo-Brava

## 2000 update

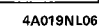
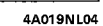
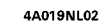
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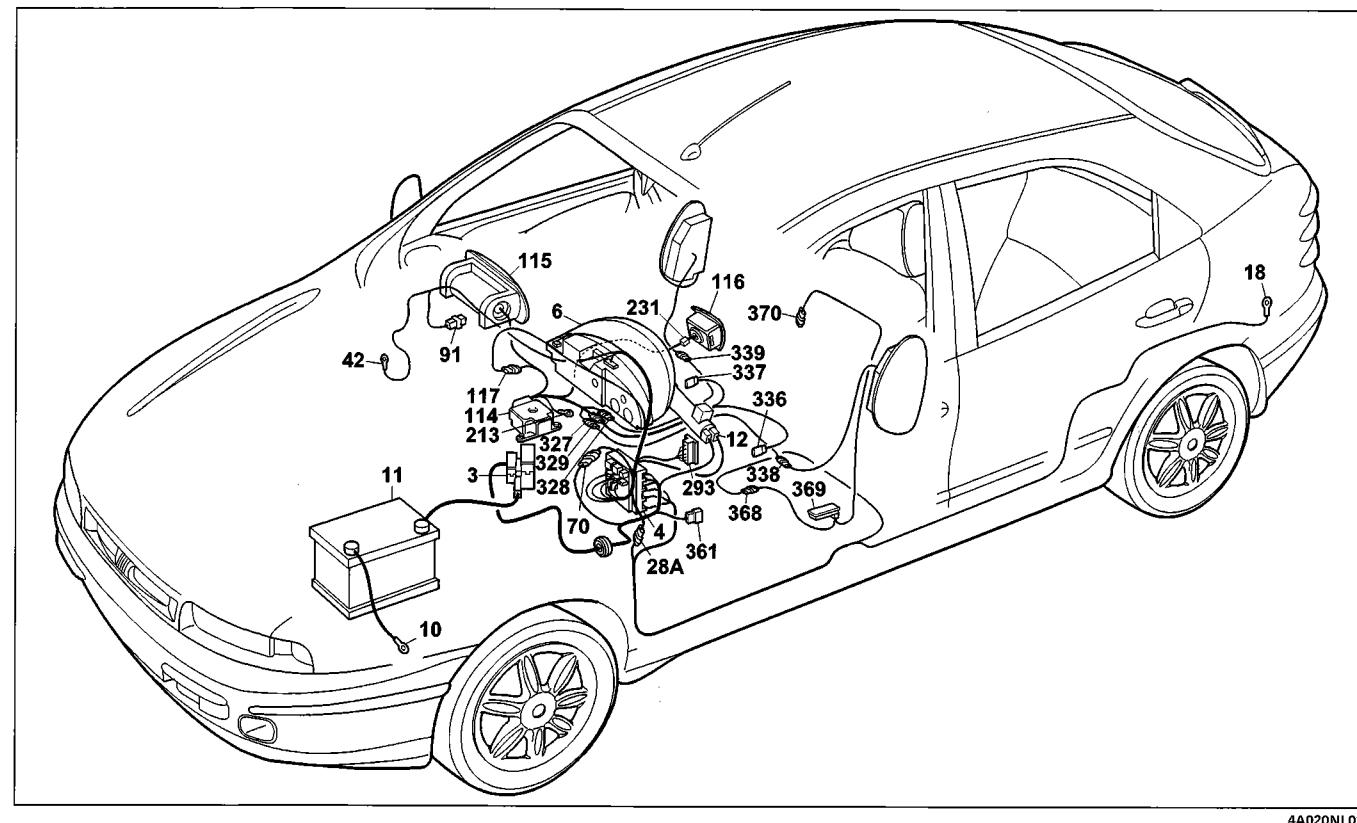
Driver's - passenger side EUBS BAS



\*\* Only valid for ELX trim level

## 3. parent location





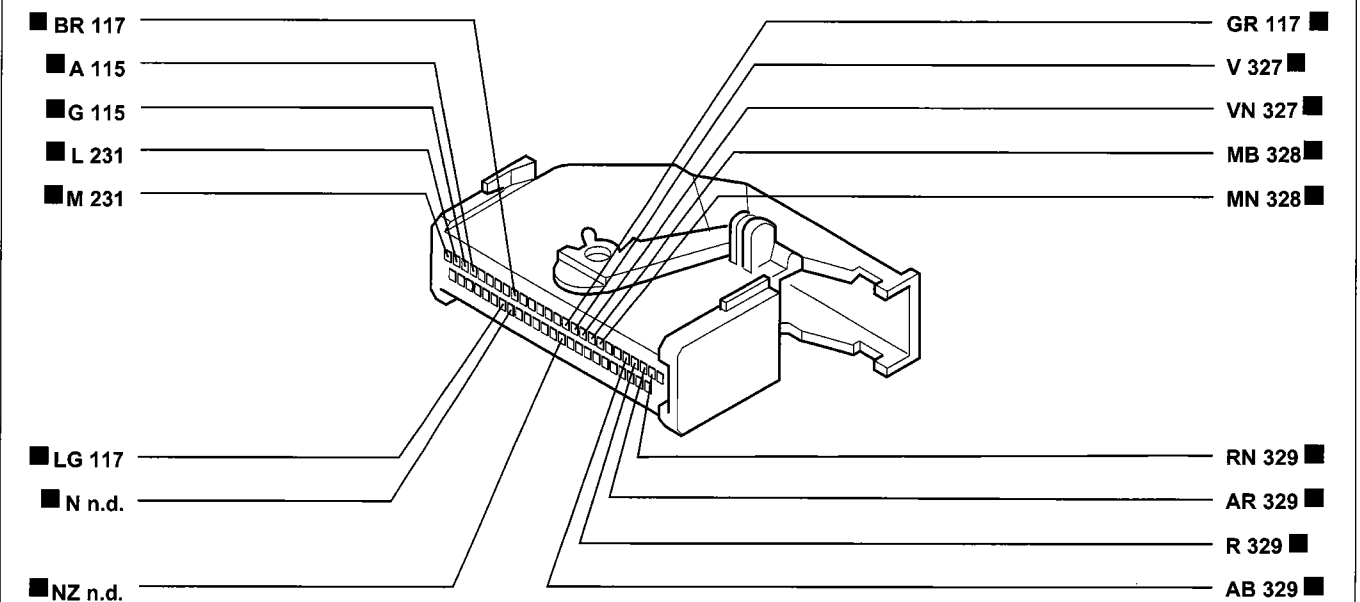
Driver's, passenger side EURO BAG, passenger SIDE BAG and failure warning light - Lumbar adjustment

### Component key

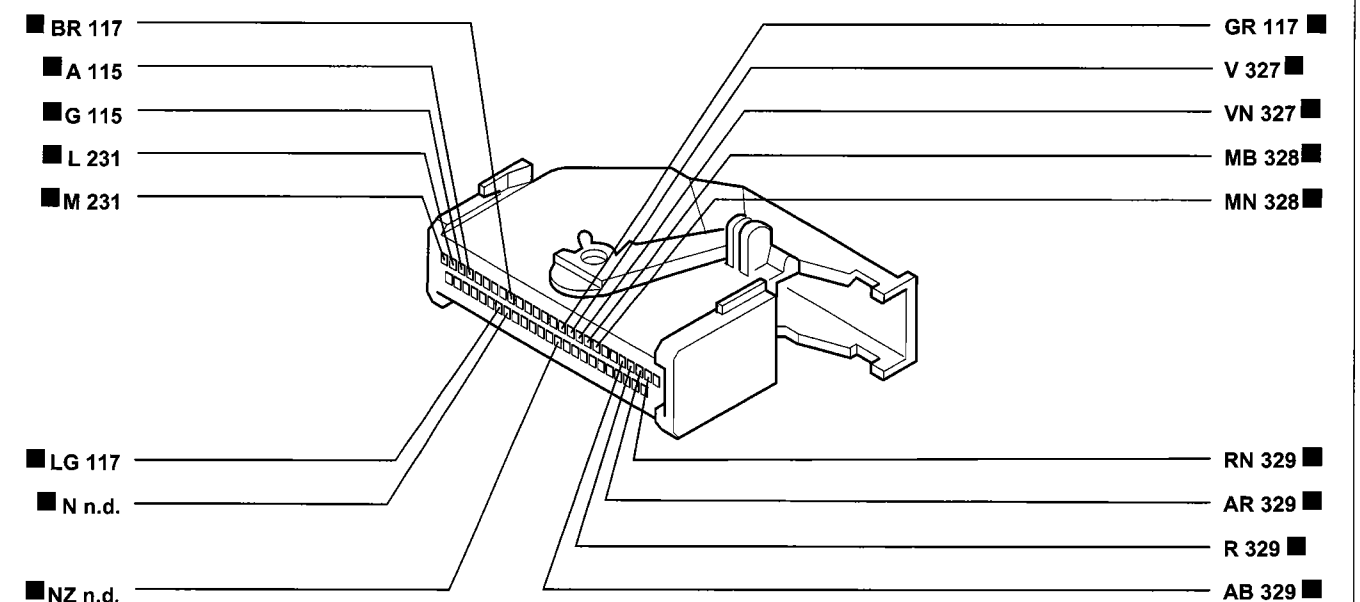
- |                                                              |                                                          |
|--------------------------------------------------------------|----------------------------------------------------------|
| 3 Power fusebox:                                             | 213 Earth for EURO BAG                                   |
| A 30A fuse protecting injection system (60A for TD versions) | 231 Clock spring connection                              |
| B 40A fuse protecting ignition system                        | 293 Fuse holder base on dashboard cable                  |
| C 80A fuse protecting optional equipment                     | E 20A fuse protecting EURO BAG                           |
| D 80A fuse protecting junction unit                          | F 10A fuse protecting EURO BAG                           |
| 4 Junction unit                                              | 327 Connection with bridge on floor for left EURO BAG    |
| 6 Instrument panel:                                          | 328 Connection with bridge on floor for right EURO BAG   |
| H EURO-BAG system failure warning light                      | 329 Connection with bridge on floor                      |
| 10 Battery earth on bodyshell                                | 336 Driver's side sensor for EURO BAG                    |
| 11 Battery                                                   | 337 Passenger side sensor for EURO BAG                   |
| 12 Ignition switch                                           | 338 Driver's SIDE BAG                                    |
| 18 Left rear earth                                           | 399 Passenger SIDE BAG                                   |
| 42 Right dashborad earth                                     | 361 Diagnostic socket                                    |
| 28A Connection between dashboard/longitudinal cables         | 366 Lumbar adjustment motor                              |
| 70 Front dashboard connection                                | 368 Connection between rear and lumbar adjustment cables |
| 91 Power relay                                               | 369 Lumbar adjuster                                      |
| 114 EURO BAG electronic control unit                         | N.D. Ultrasound welding taped in cable loom              |
| 115 Passenger EURO BAG                                       |                                                          |
| 116 Driver's EURO BAG                                        |                                                          |
| 117 Connection between EURO BAG/dashboard cables             |                                                          |

## 55.

### 114 EURO-BAG electronic control unit



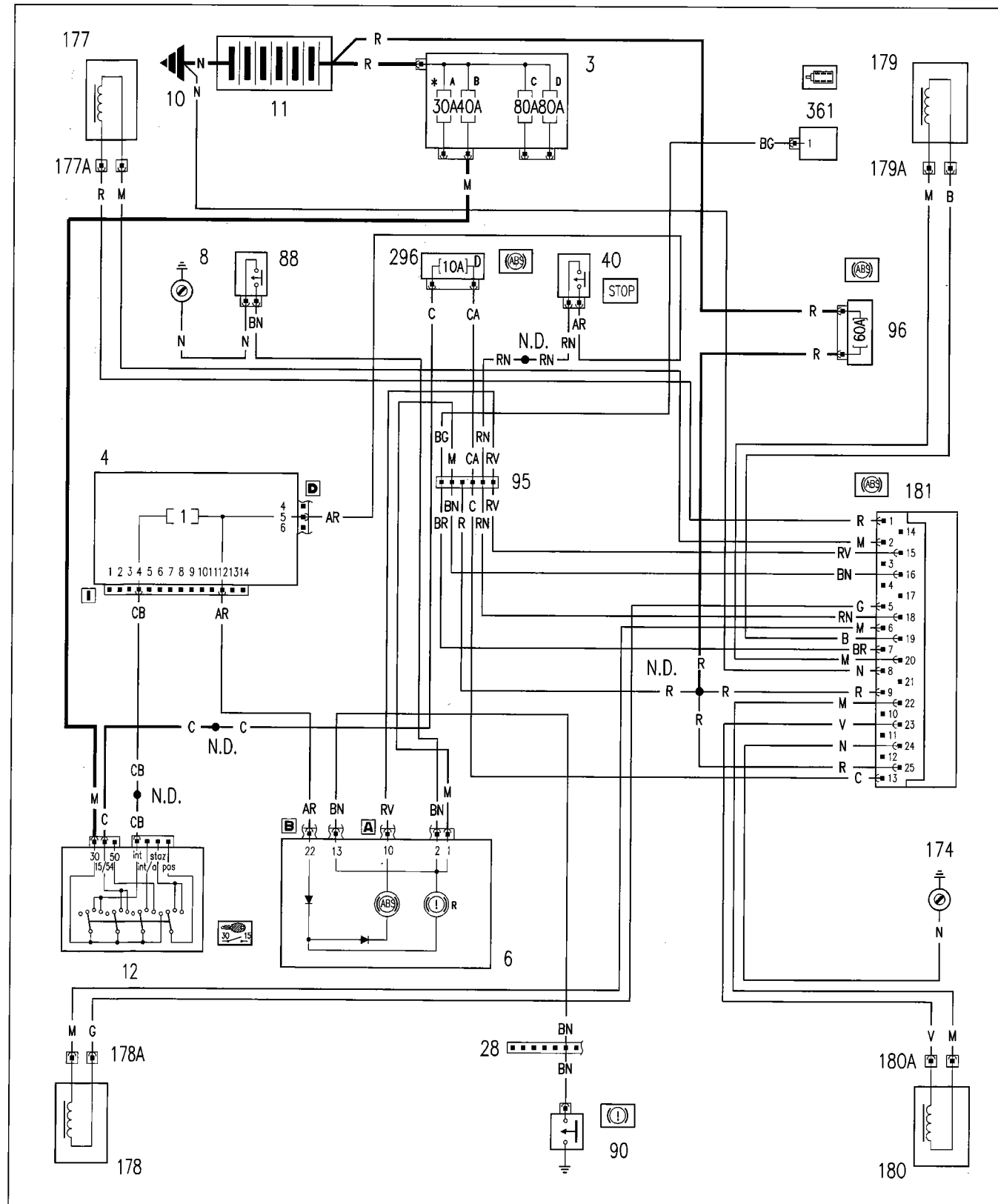
### 6B Instrument panel



\* Non existent for SX-GT trim levels  
\*\* Variant for versions with alarm

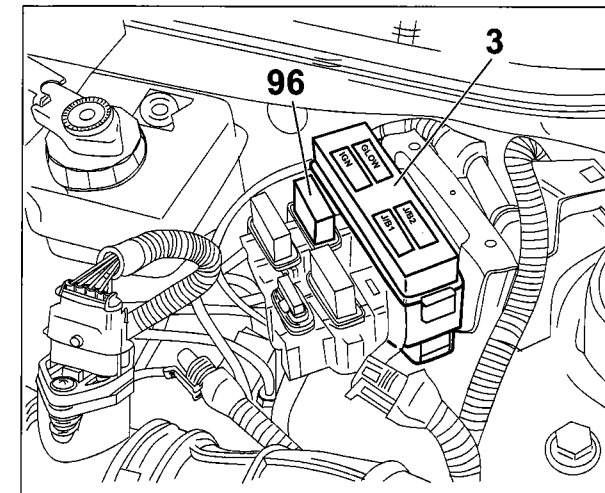
The cables concerned are marked in the wiring diagram with a square

**Anti-lock braking system and failure warning light (ABS)**

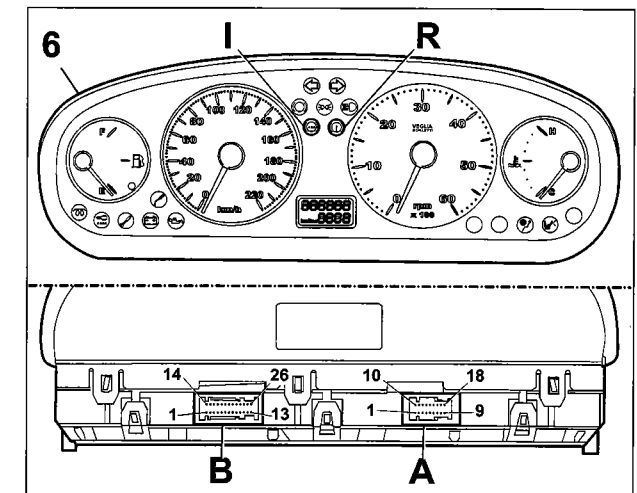


4A021NL01

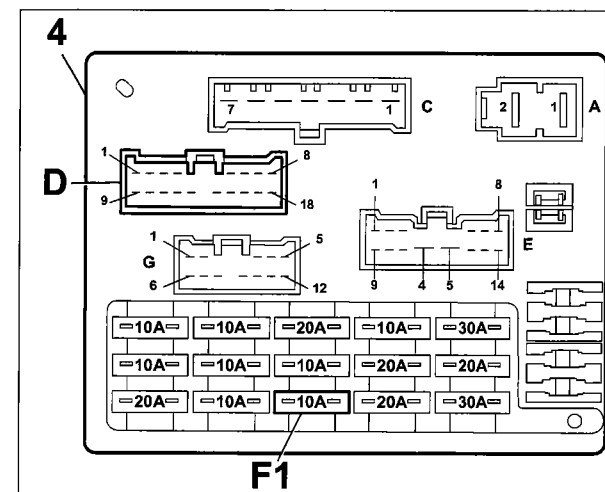
**Component location**



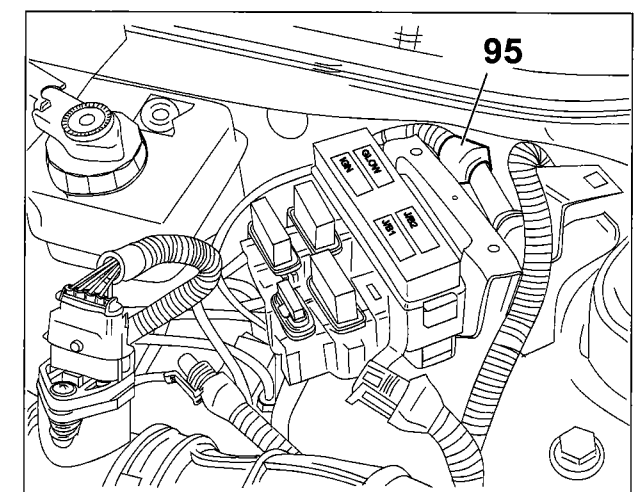
4A021NL02



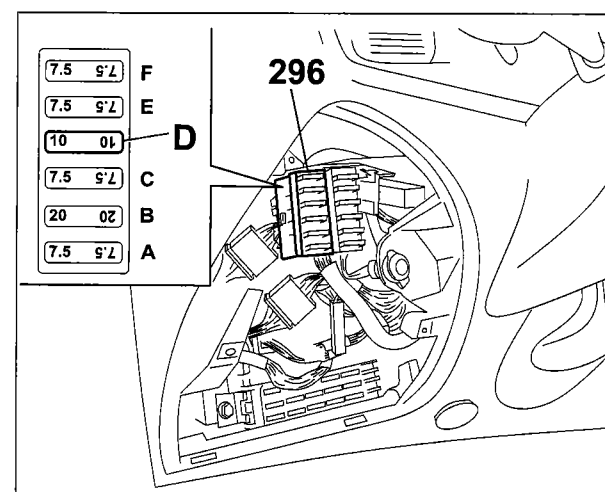
4A021NL03



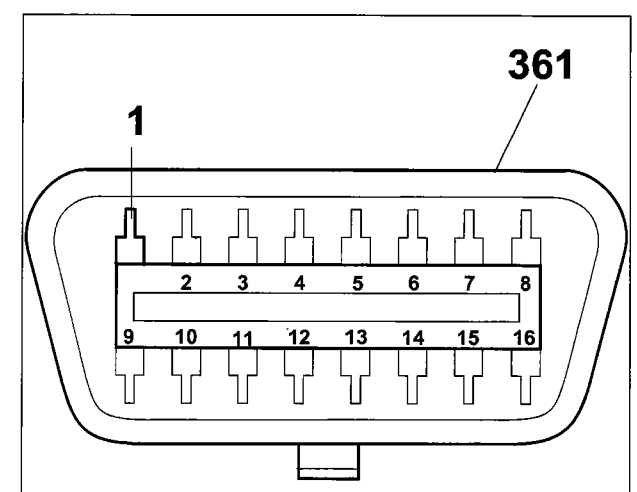
4A021NL04



4A021NL05



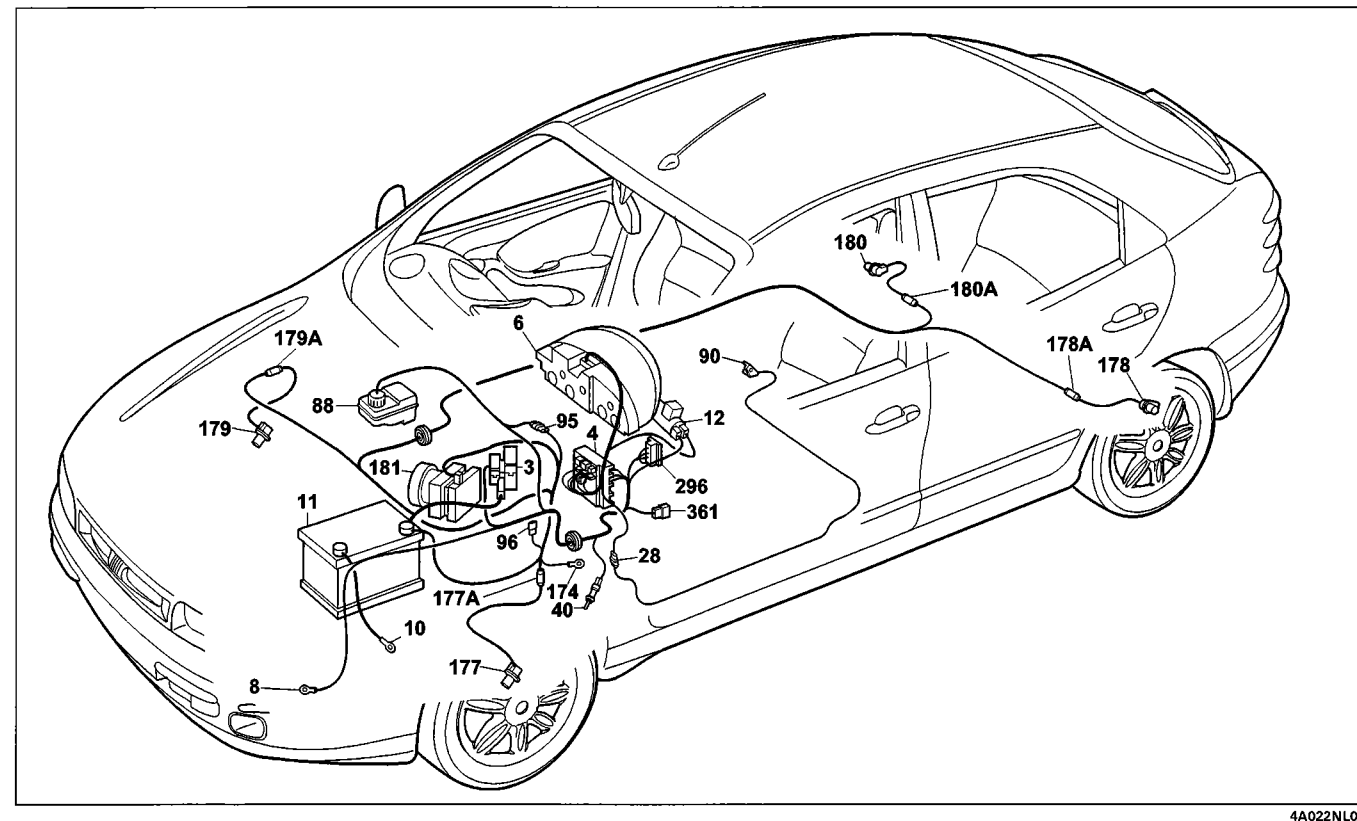
4A021NL06



4A021NL07

\* 60A fuse for JTD versions

### 55.

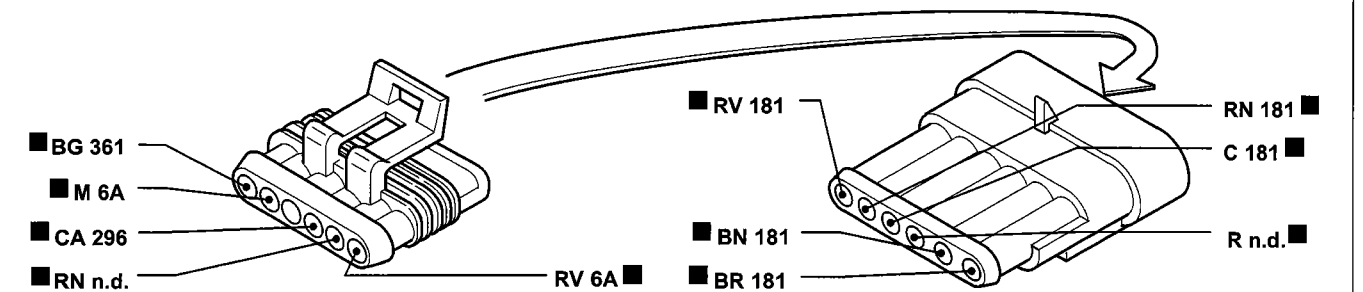


Anti-lock braking system and failure warning light (ABS)

#### Component key

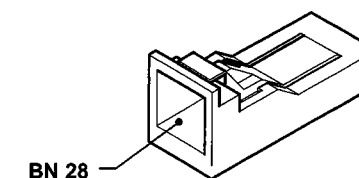
- |                                                                   |                                                                                  |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 3 Power fusebox:                                                  | 177 Sensor on left front wheel for anti-lock brakes (ABS)                        |
| A 30A fuse protecting injection system (60A for TD versions)      | 177A Connection between cable/left front wheel sensor for anti-lock brakes (ABS) |
| B 40A fuse protecting ignition system                             | 178 Sensor on left rear wheel for anti-lock brakes (ABS)                         |
| C 80A fuse protecting optional equipment                          | 178A Connection for cable on left rear wheel sensor                              |
| D 80A fuse protecting junction unit                               | 179 Sensor on right front wheel for anti-lock brakes (ABS)                       |
| 4 Junction unit                                                   | 179A Connection for cable on right front wheel sensor                            |
| 6 Instrument panel:                                               | 180 Sensor on right rear wheel for anti-lock brakes (ABS)                        |
| R Handbrake applied/insufficient brake fluid level warning light  | 180A Connection for cable on right rear wheel sensor                             |
| 10 Battery earth on bodyshell                                     | 181 Electro-hydraulic control unit for anti-lock brakes (ABS)                    |
| 11 Battery                                                        | 296 Fuse holder base on front cable                                              |
| 12 Ignition switch                                                | 361 Diagnostic socket                                                            |
| 28 Dashboard/longitudinal connection                              | N.D. Ultrasound welding taped in cable loom                                      |
| 40 Brake light control switch                                     |                                                                                  |
| 88 Insufficient brake fluid level sensor                          |                                                                                  |
| 90 Switch indicating handbrake applied                            |                                                                                  |
| 95 Connection between front/anti-lock braking system (ABS) cables |                                                                                  |
| 96 60A fuse protecting electrical equipment                       |                                                                                  |
| 174 Power earth for anti-lock brakes (ABS)                        |                                                                                  |

#### 95 Connection between front cables/anti-lock brakes (A.B.S.)



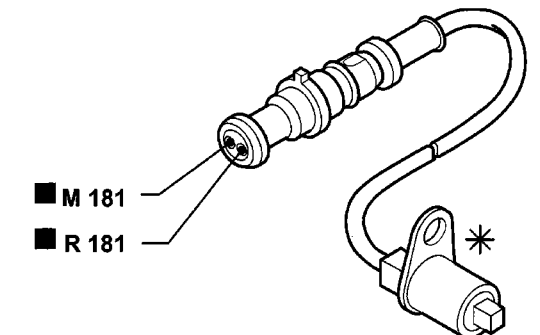
4A022NL02

#### 90 Switch signalling handbrake applied



#### 177 (\*) Sensor on left front wheel for anti-lock brakes (ABS)

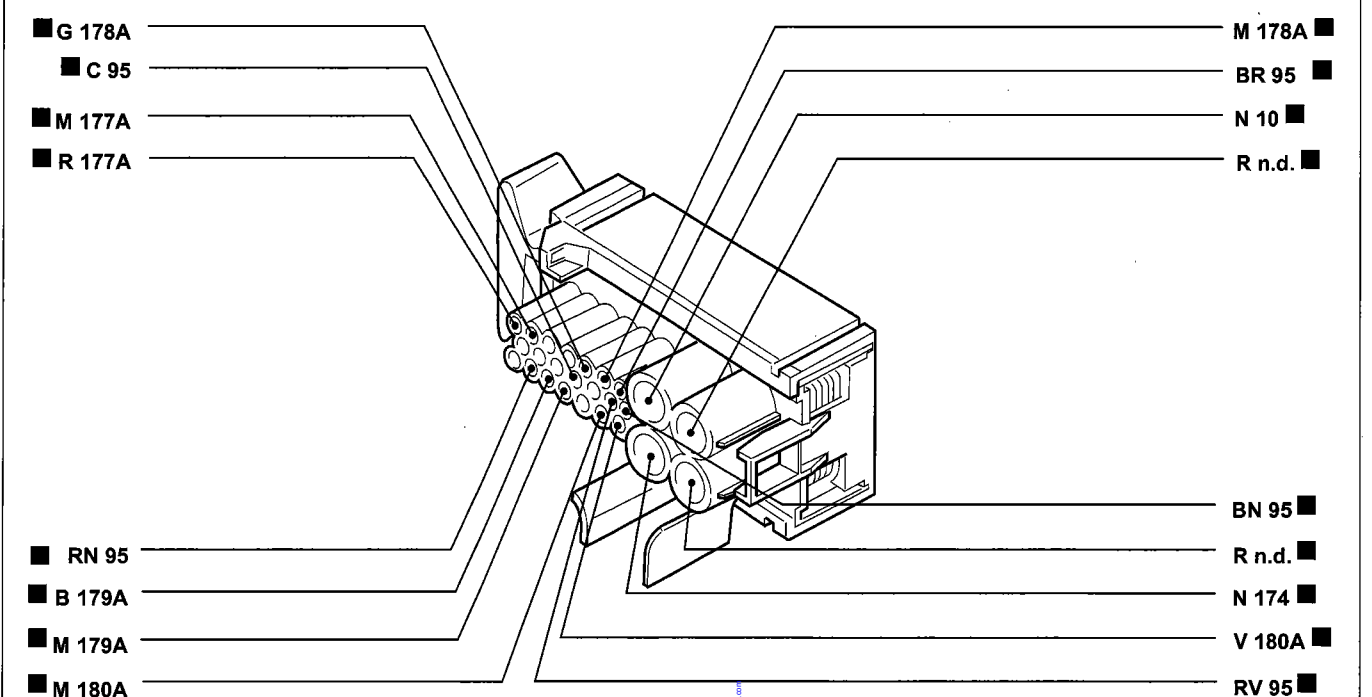
#### 177A Connection for ABS sensor cable on left front wheel



4A022NL03

4A022NL04

#### 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)

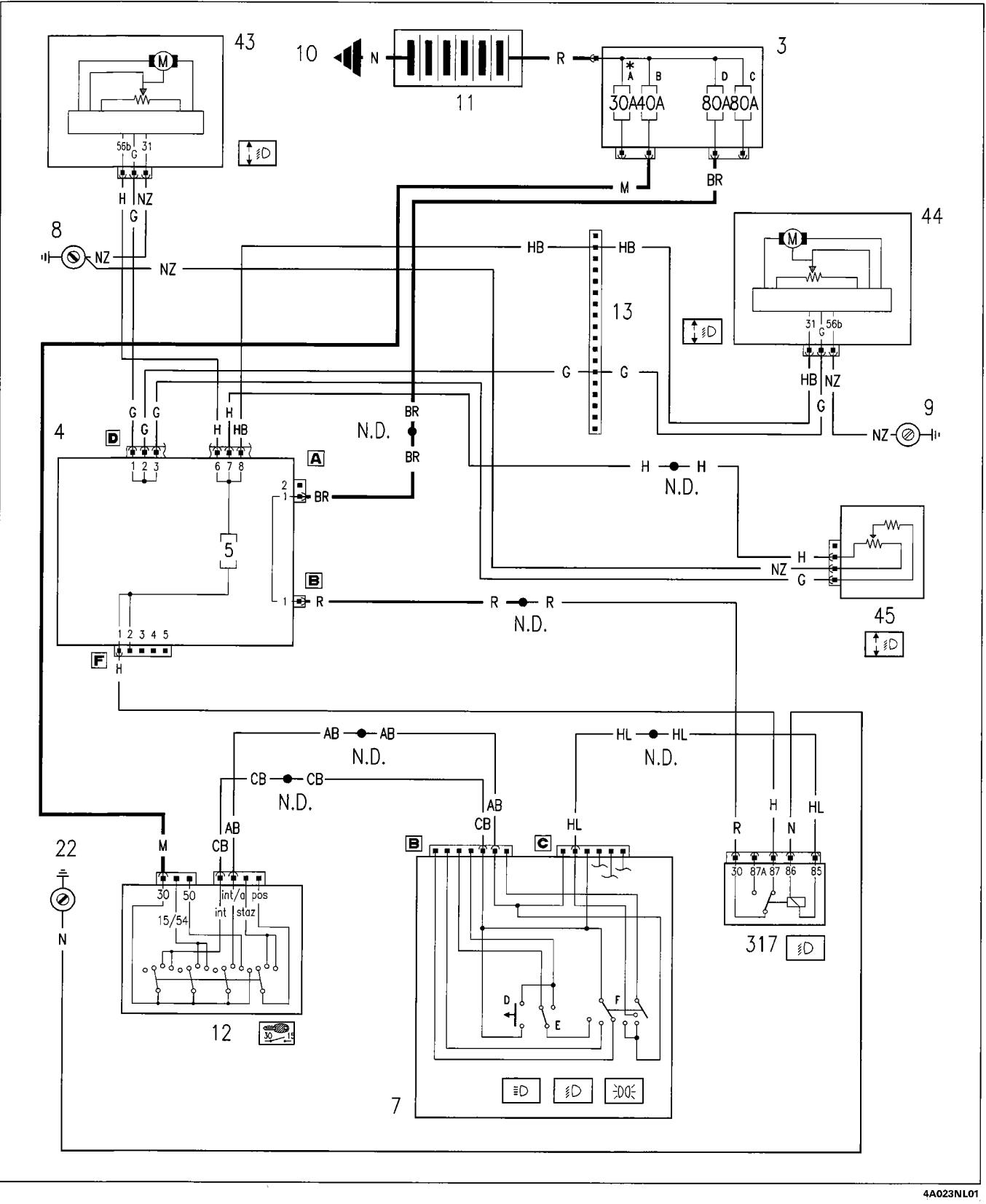


4A022NL05

The cables concerned are marked in the wiring diagram with a square

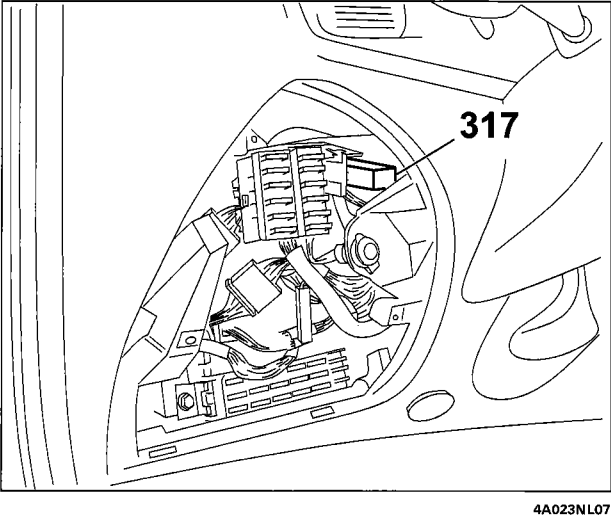
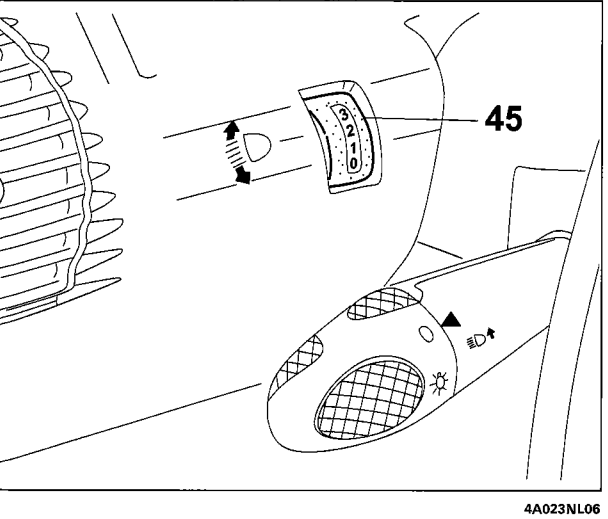
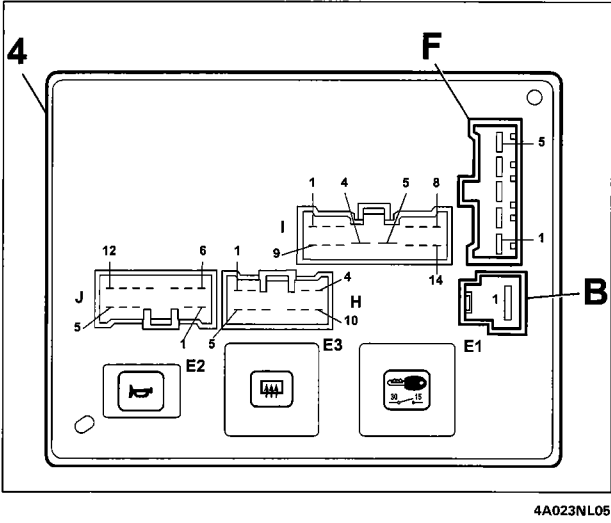
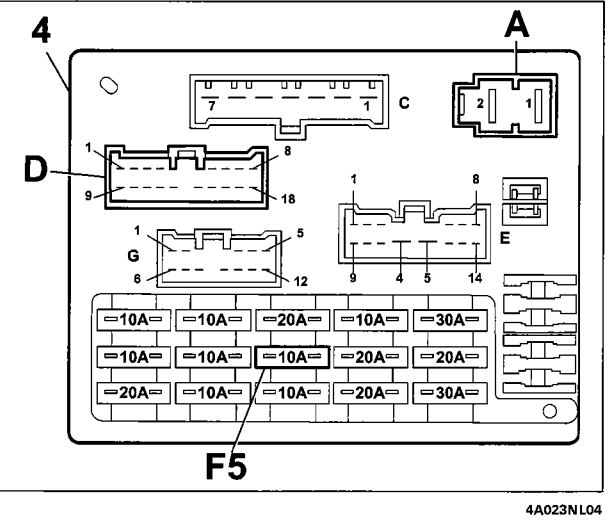
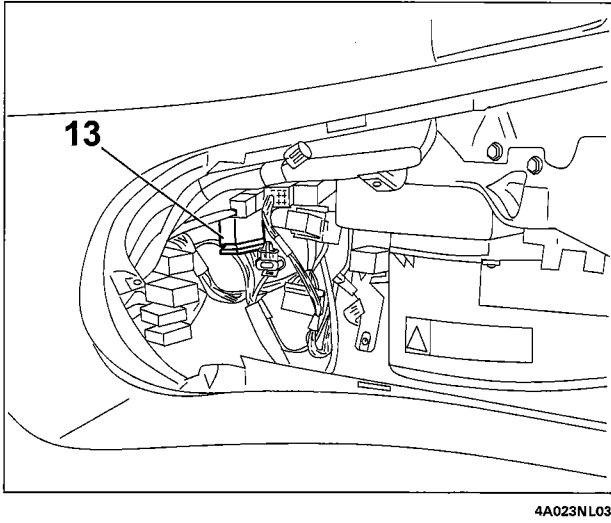
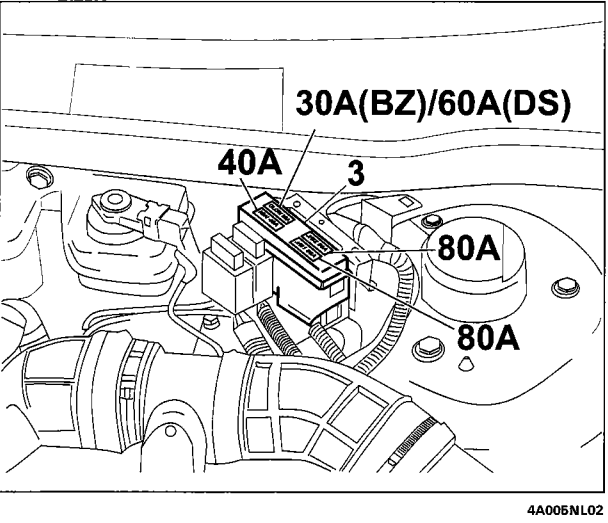


Headlamp alignment corrector

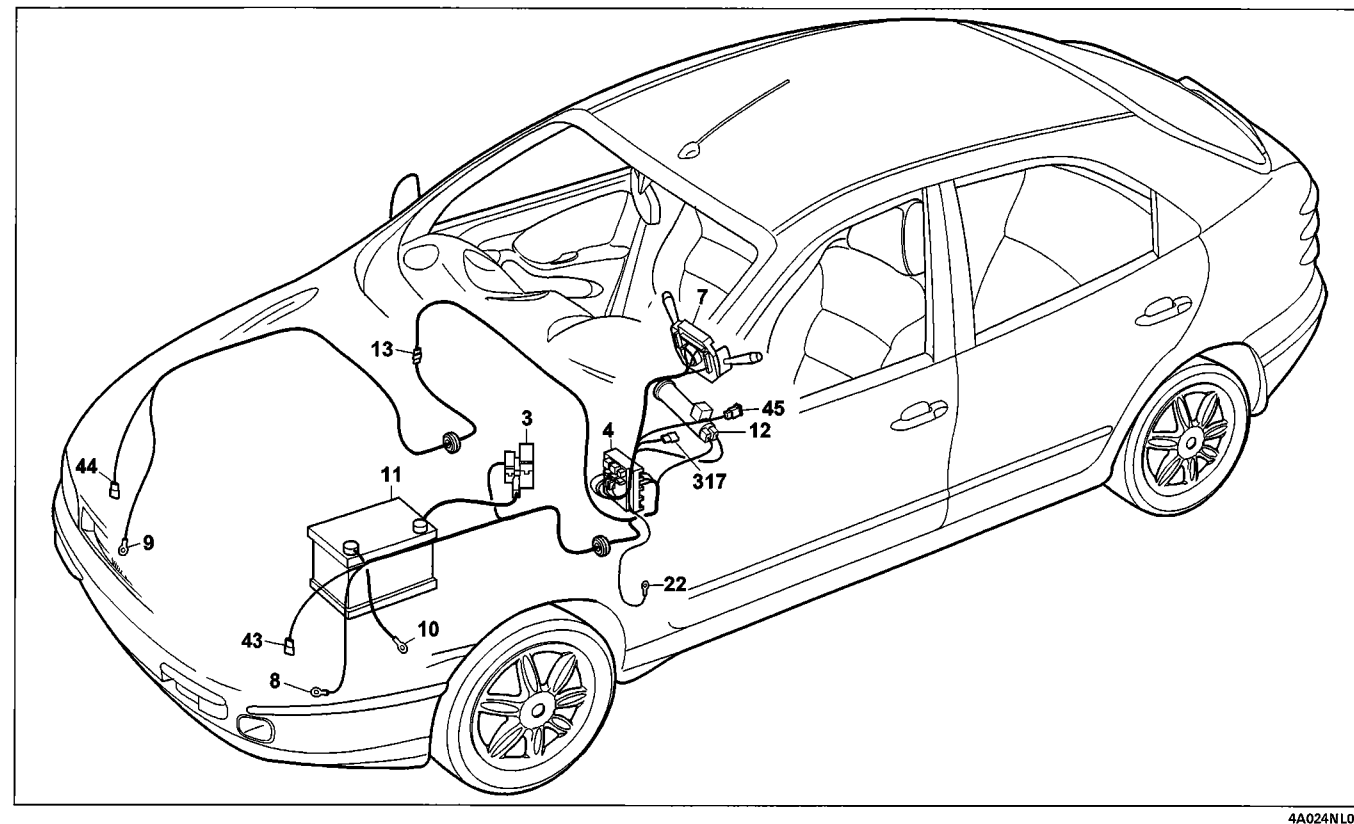


\* 60A fuse for JTD versions

Component location



**55.**

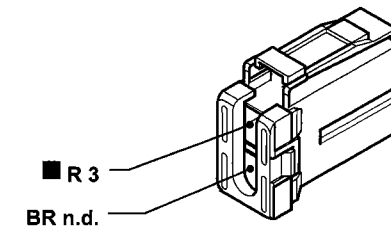


**Headlamp alignment corrector**

**Component key**

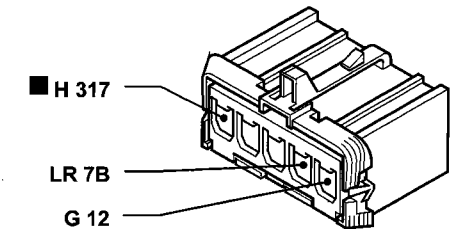
- |                                                              |                                                          |
|--------------------------------------------------------------|----------------------------------------------------------|
| 3 Power fusebox:                                             | 43 Left headlamp alignment correction motor              |
| A 30A fuse protecting injection system (60A for TD versions) | 44 Right headlamp alignment correction motor             |
| B 40A fuse protecting ignition system                        | 45 Headlamp alignment control unit                       |
| C 80A fuse protecting optional equipment                     | 317 Main beam headlamp maintenance remote control switch |
| D 80A fuse protecting junction unit                          | N.D. Ultrasound welding taped in cable loom              |
| 4 Junction unit                                              |                                                          |
| 7 Stalk unit:                                                |                                                          |
| D Headlamp flasher button                                    |                                                          |
| E Dipped/main beam headlamp control switch                   |                                                          |
| F Side lights control switch                                 |                                                          |
| 8 Left front earth                                           |                                                          |
| 9 Right front earth                                          |                                                          |
| 10 Battery earth on bodyshell                                |                                                          |
| 11 Battery                                                   |                                                          |
| 12 Ignition switch                                           |                                                          |
| 13 Connection between right/left front cables                |                                                          |
| 22 Left facia earth                                          |                                                          |

**4A** Junction unit



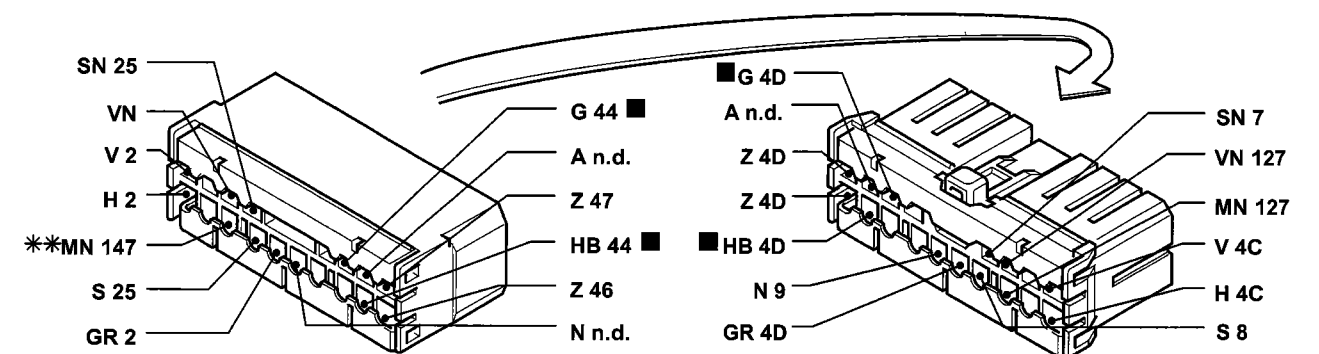
4A024NL02

**4F** Junction unit



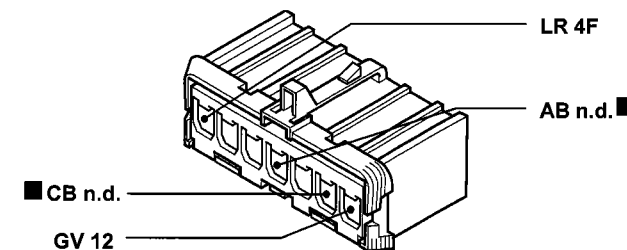
4A024NL03

**13** Connection between right/left front cables



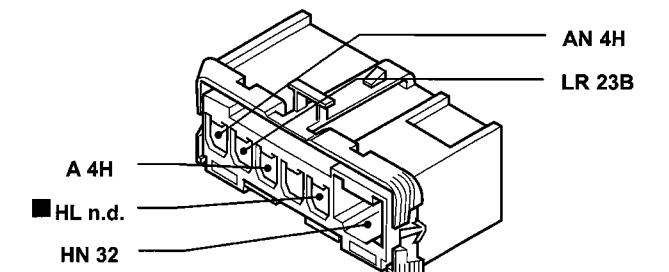
4A024NL04

**7B** Steering column switch unit



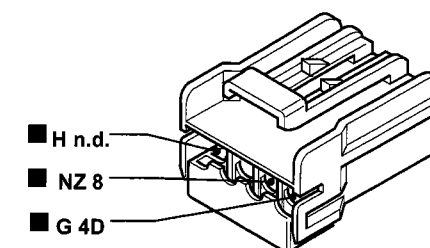
4A024NL05

**7C** Steering column switch unit



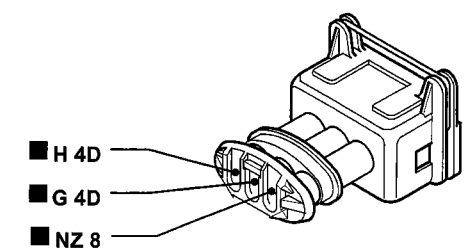
4A024NL06

**45** Headlamp alignment control unit



4A024NL07

**43** Left headlamp alignment corrector

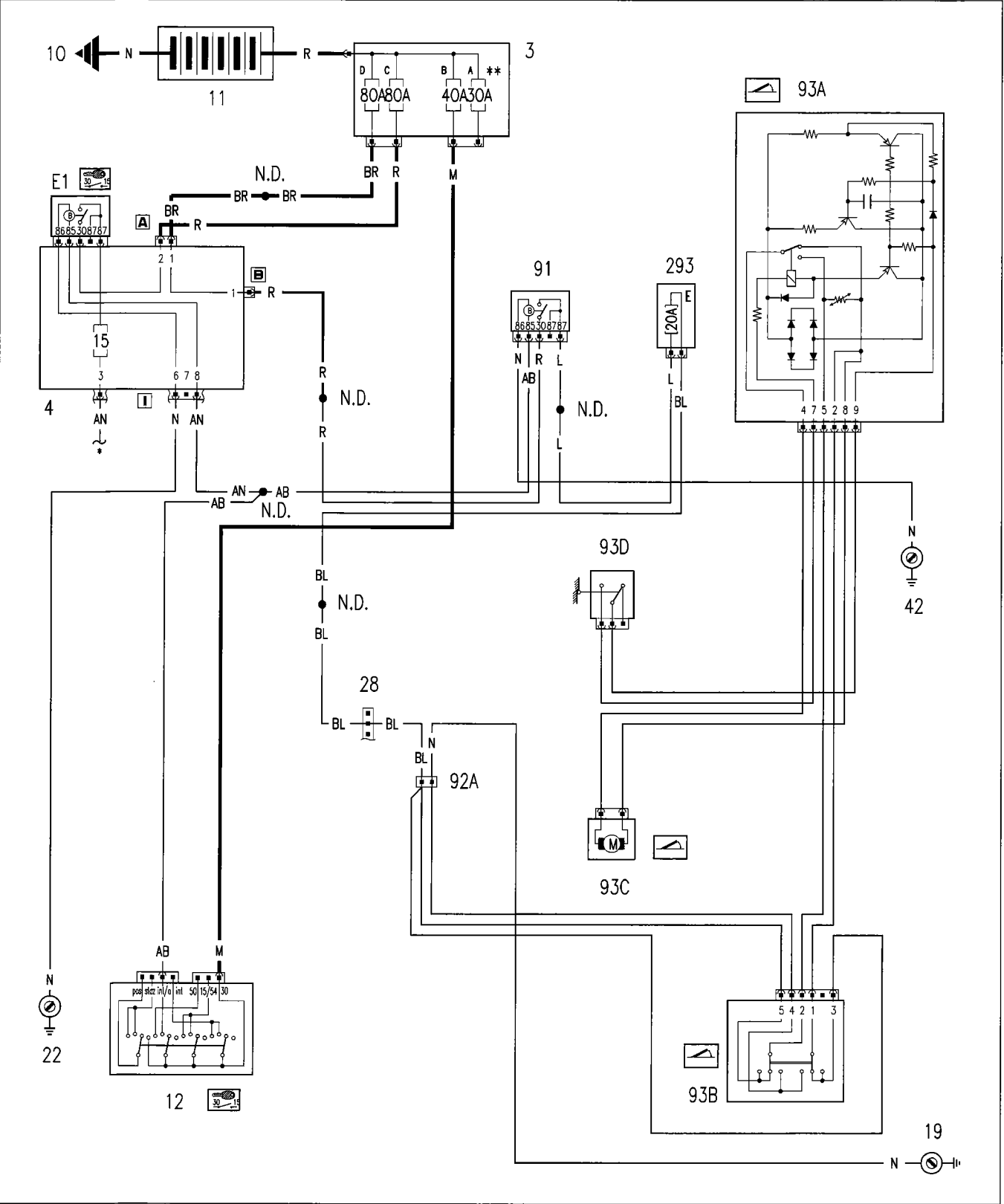


4A024NL08

The cables concerned are marked in the wiring diagram with a square



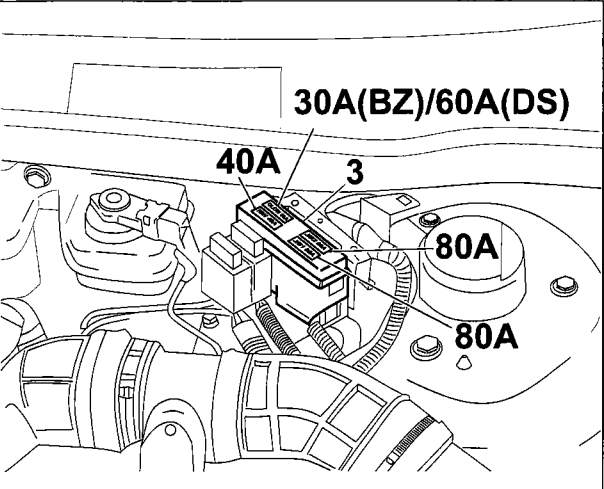
Electric sun-roof



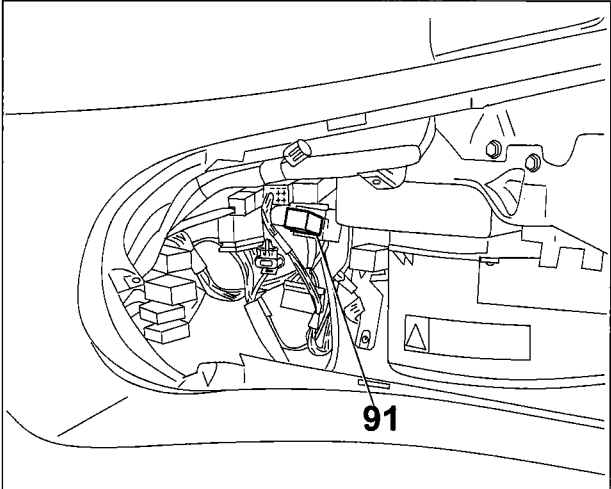
\* See air conditioning wiring diagram

\*\* 60A fuse for JTD versions

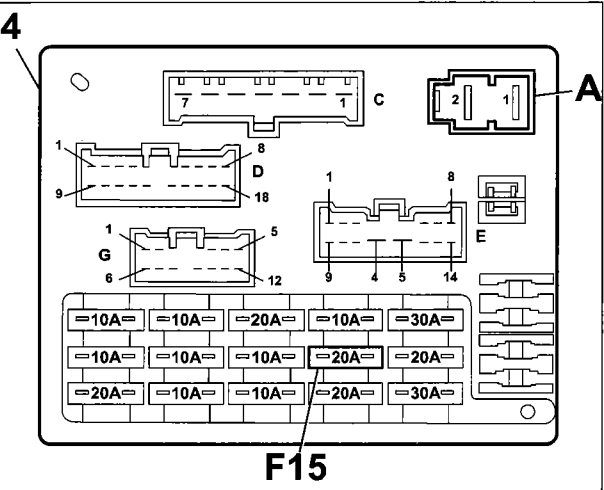
Component location



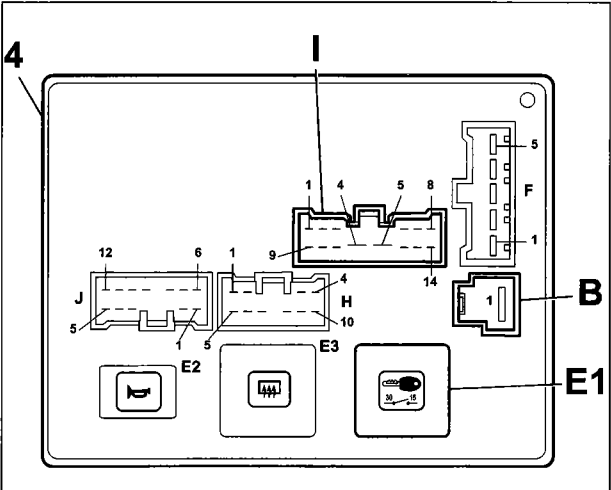
4A005NL02



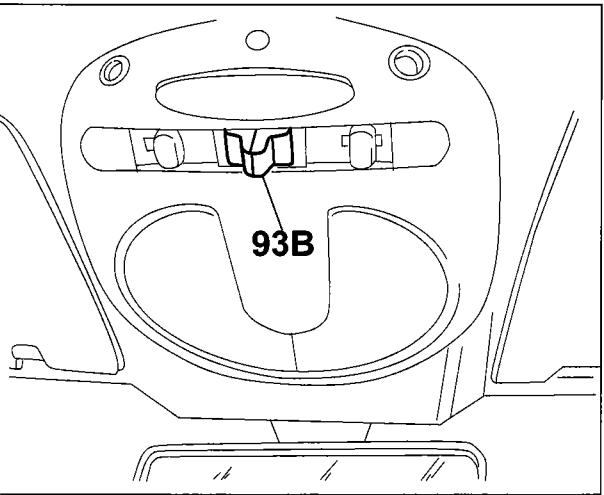
4A025NL03



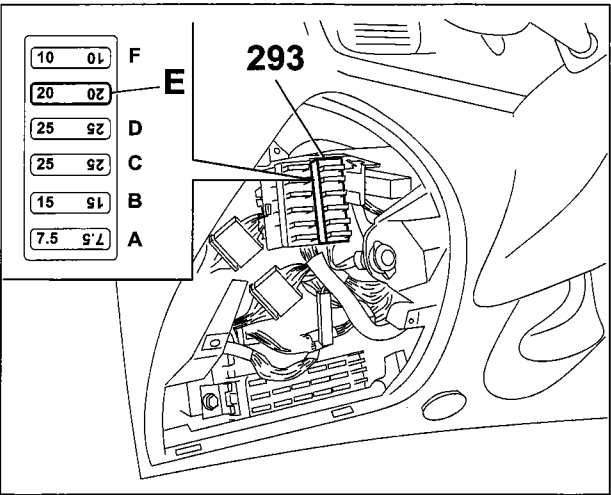
4A025NL04



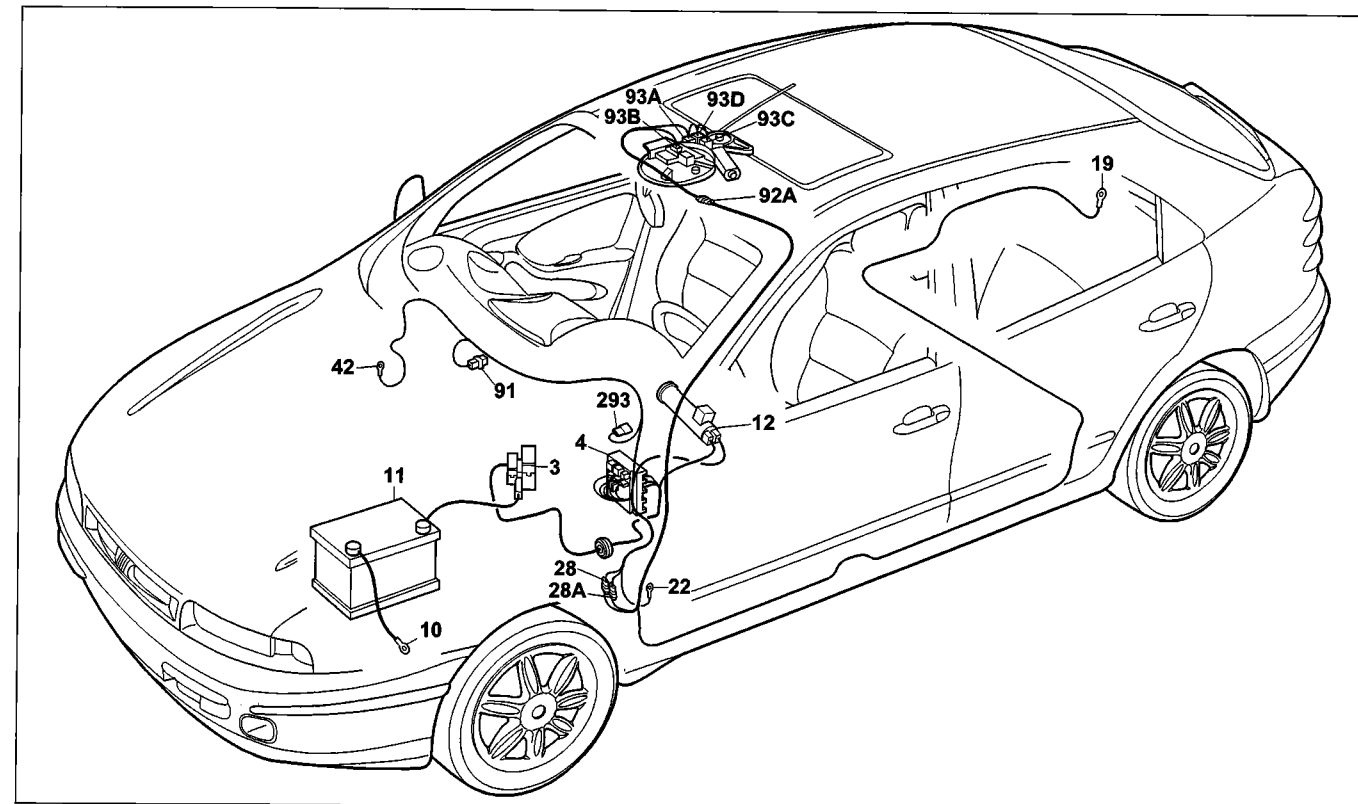
4A025NL05



4A025NL06



4A025NL07



4A026NL01

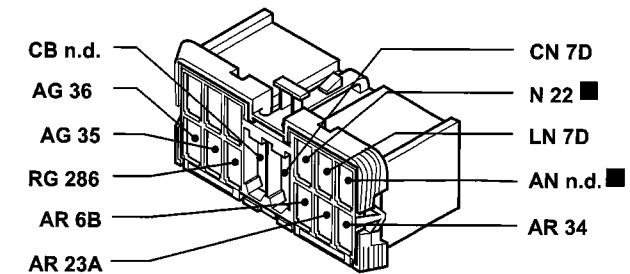
### Electric sun-roof

#### Component key

- 3 Power fusebox:
  - A 30A fuse protecting injection system (60A for TD versions)
  - B 40A fuse protecting ignition system
  - C 80A fuse protecting optional equipment
  - D 80A fuse protecting junction unit
- 4 Junction unit
  - E1 Switch discharge relay
- 10 Battery earth on bodyshell
- 11 Battery
- 12 Ignition switch
- 19 Right rear earth
- 22 Left facia earth
- 28 Connection between facia/longitudinal cables
- 42 Right dashboard earth
- 91 Power relay
- 92A Connection between cables and electric sun roof
- 93A Electric sun roof control unit
- 93B Electric sun roof control button
- 93C Electric sun roof motor
- 93D Electric sun roof end of travel switch
- 293 Fuse holder base on dashboard cable
  - E 20A fuse protecting current socket; Cigar lighter; Electric seats; Electric sun-roof
- N.D. Ultrasound welding taped in cable loom

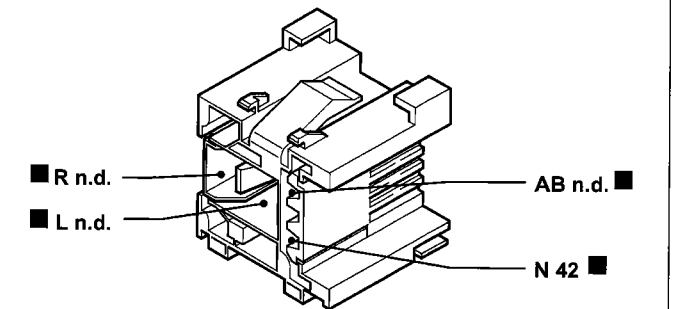
## 55.

### 41 Junction unit



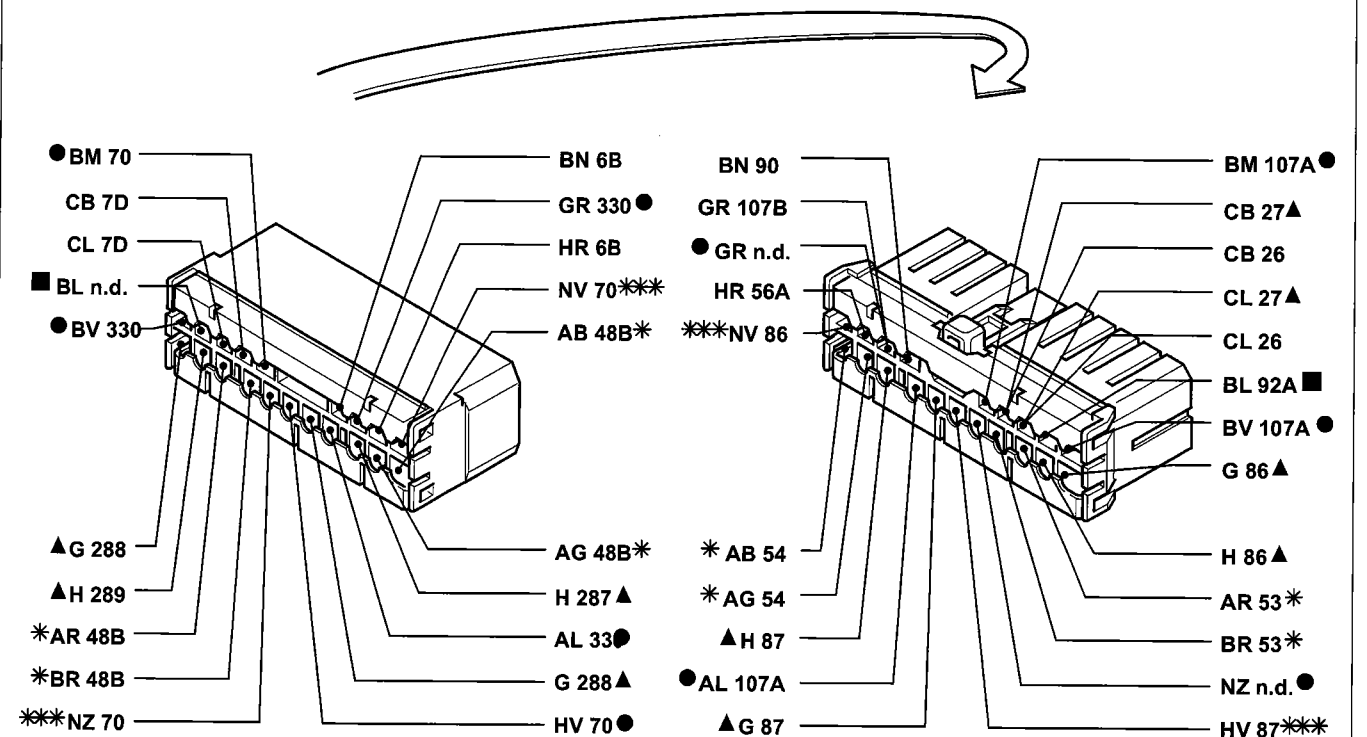
4A026NL02

### 91 Power relay



4A026NL03

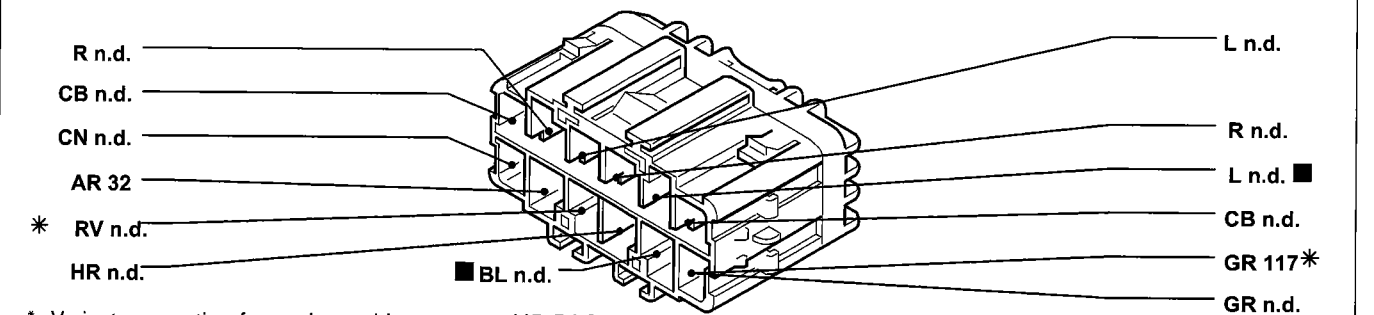
### 28 Connection between dashboard/longitudinal cables



- \* Variant connection for versions with top of the range radio
- \*\* Variant connection for Brava versions with alarm
- Variant connection for versions with air conditioning
- ▲ Variant connection for Brava versions

4A026NL04

### 293 Fuse holder base on dashboard cable

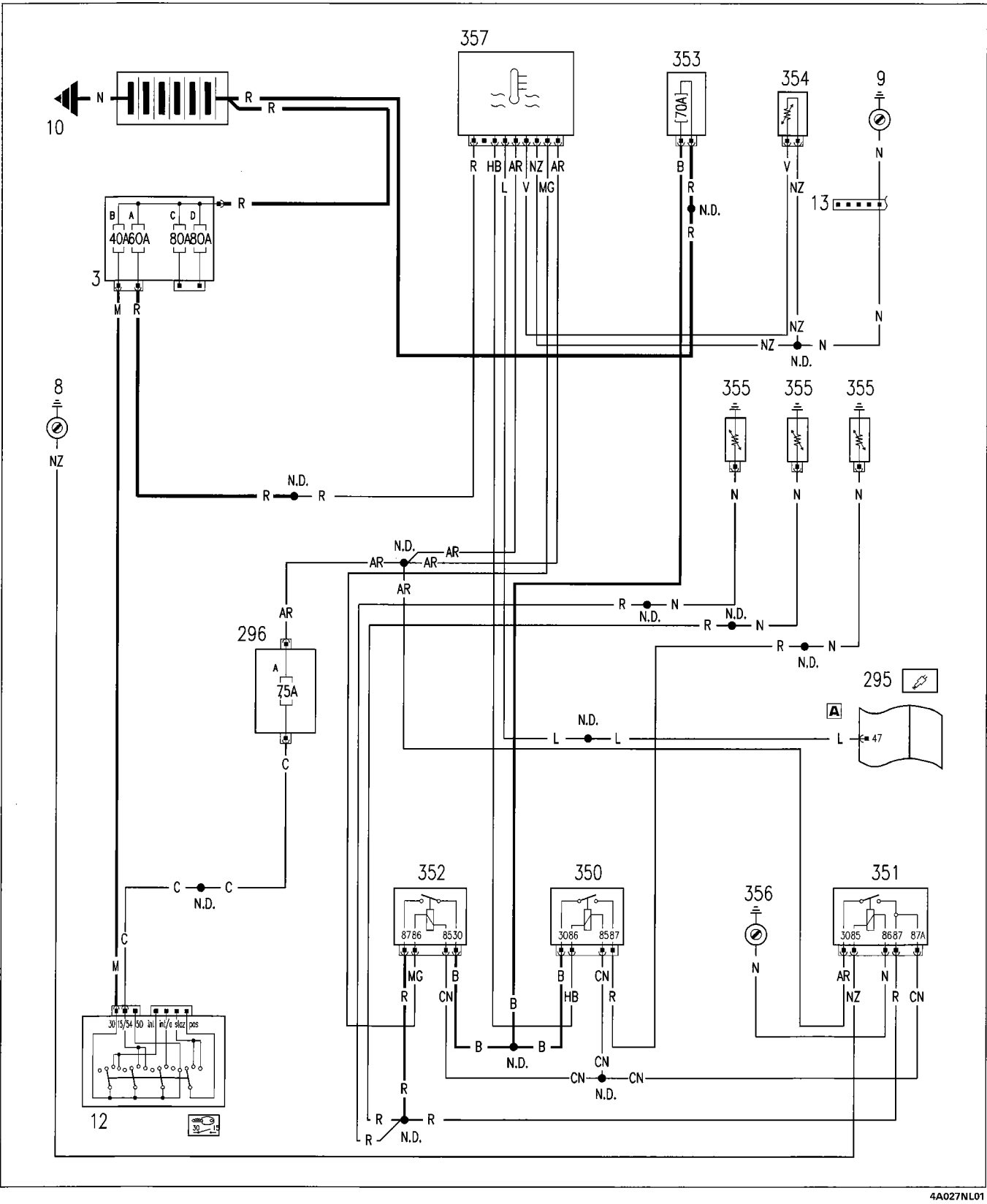


- \* Variant connection for versions with passenger AIR BAG and SIDE BAG
- \*\* Variant connection for SX-GT trim level
- \*\*\* Variant connection for ELX trim level

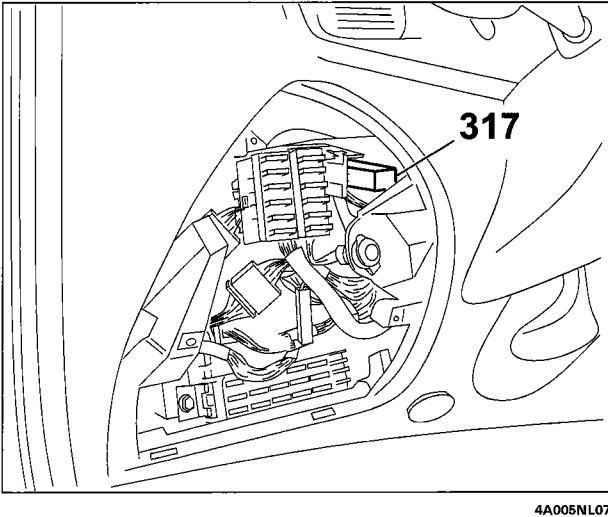
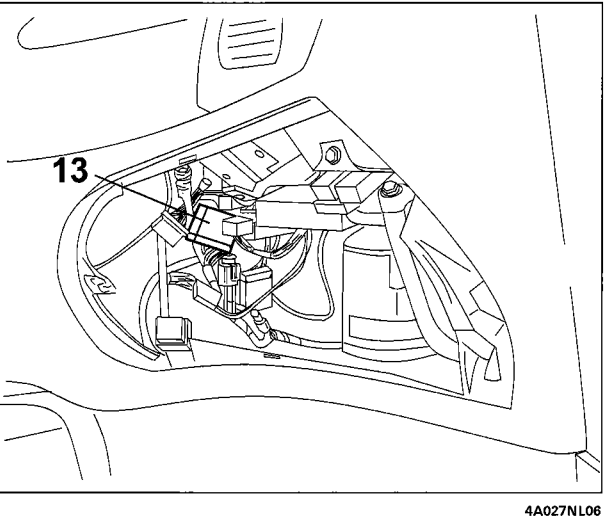
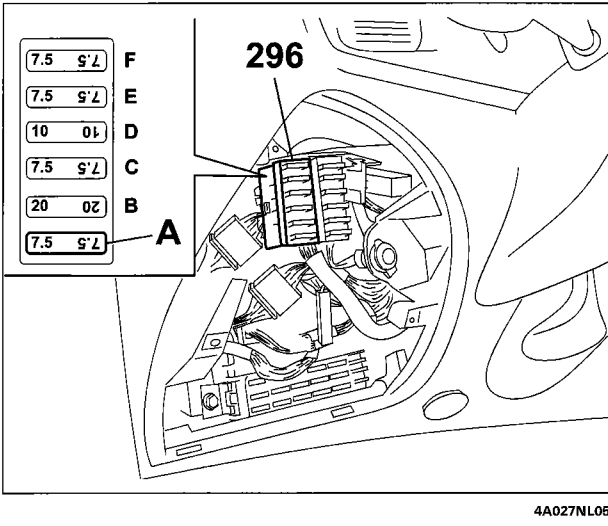
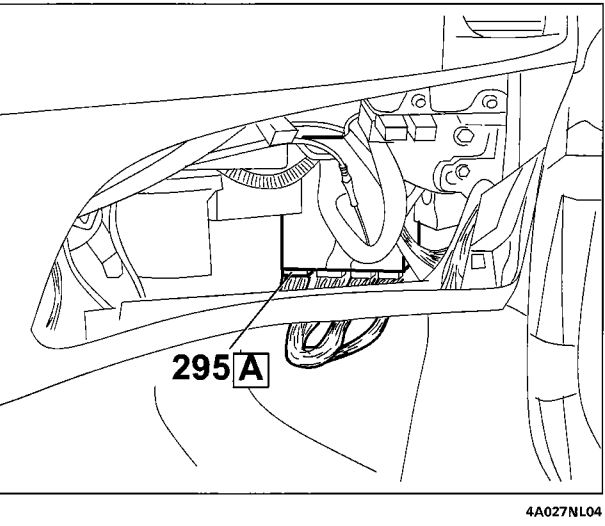
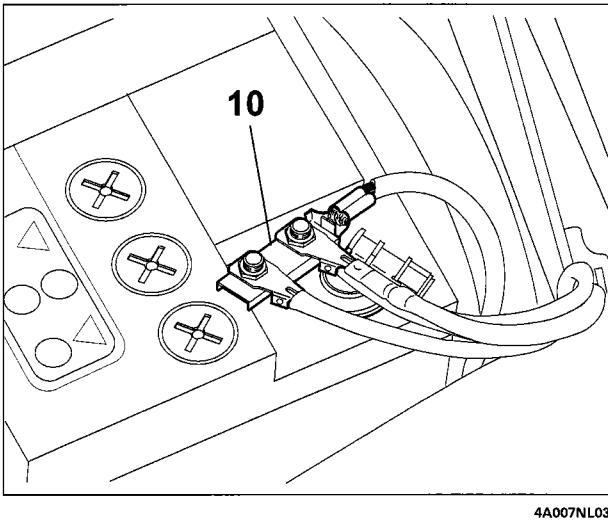
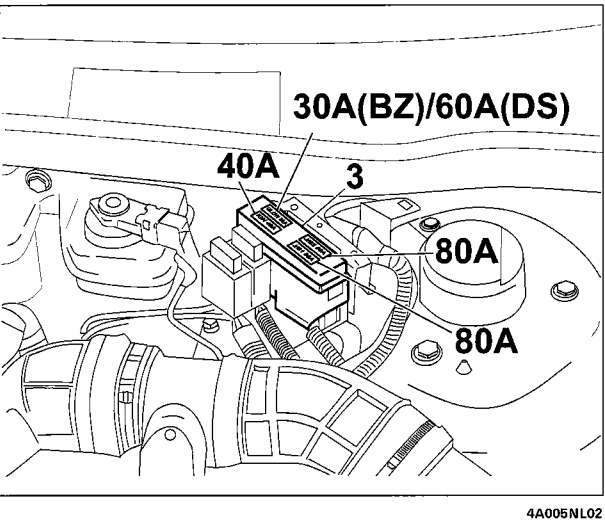
4A026NL05

The cables concerned are marked in the wiring diagram with a square

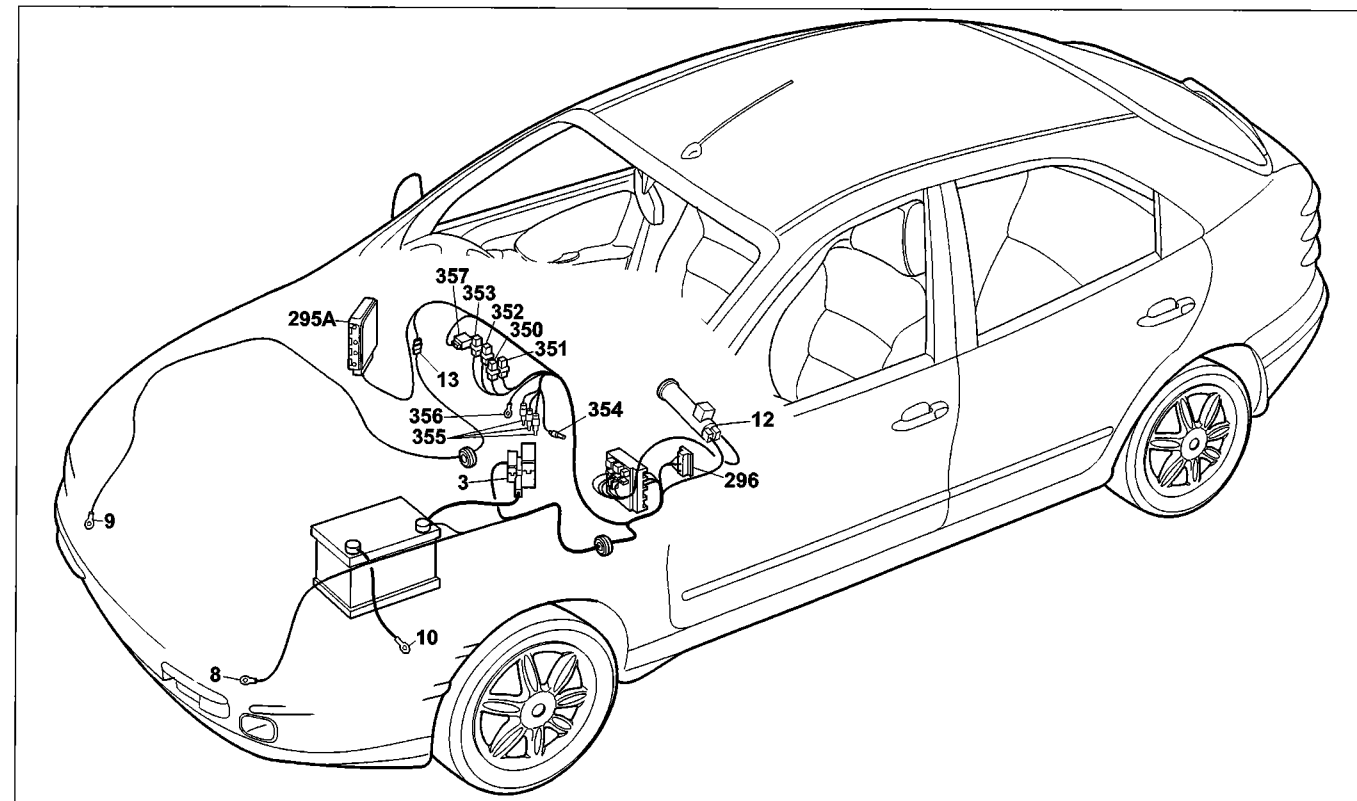
Additional heater



Component location



### 55.



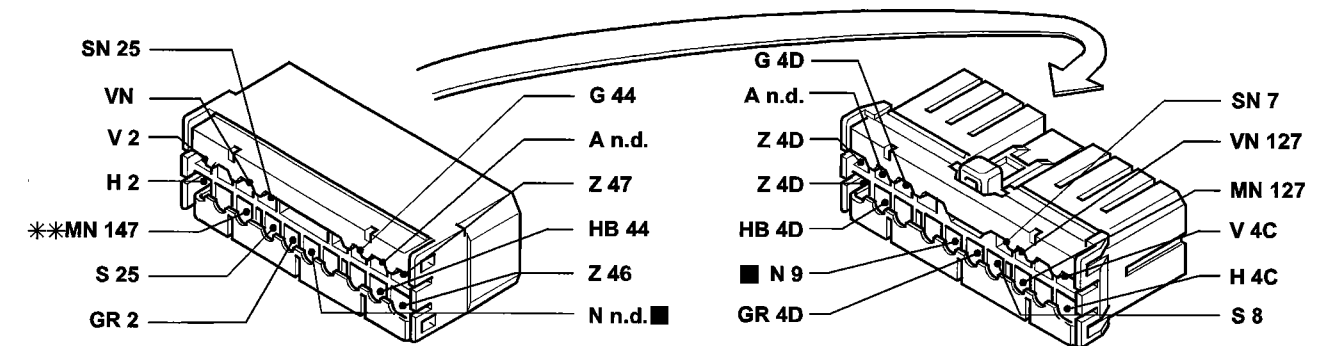
4A028NL01

#### Automatic heater

#### Component key

- |                                                                     |                                                                     |
|---------------------------------------------------------------------|---------------------------------------------------------------------|
| 3 Power fusebox:                                                    | 352 Passenger compartment interior heater 50A relay                 |
| A 30A fuse protecting injection system (60A for TD versions)        | 353 70A fuse protecting passenger compartment interior heater plugs |
| B 40A fuse protecting ignition system                               | 354 N.T.C. sensor on heater supply pipe                             |
| C 80A fuse protecting optional equipment                            | 355 Passenger compartment interior heater plugs                     |
| D 80A fuse protecting junction unit                                 | 356 Heater plugs relay earth                                        |
| 4 Junction unit                                                     | 357 Passenger compartment interior heater plugs control unit        |
| E1 Switch discharge relay                                           |                                                                     |
| 8 Left front earth                                                  | N.D. Ultrasound welding taped in cable loom                         |
| 9 Right front earth                                                 |                                                                     |
| 10 Battery earth on bodyshell                                       |                                                                     |
| 11 Battery                                                          |                                                                     |
| 12 Ignition switch                                                  |                                                                     |
| 13 Connection between right/left front cables                       |                                                                     |
| 295 Injection/ignition electronic control unit 1910 TD UNIJET       |                                                                     |
| 296 Fuse holder base on front cable                                 |                                                                     |
| A 7.5A fuse protecting cooling system/injection; A.C. system; Alarm |                                                                     |
| 350 Passenger compartment interior heater 30A relay                 |                                                                     |
| 351 Passenger compartment interior heater safety relay              |                                                                     |

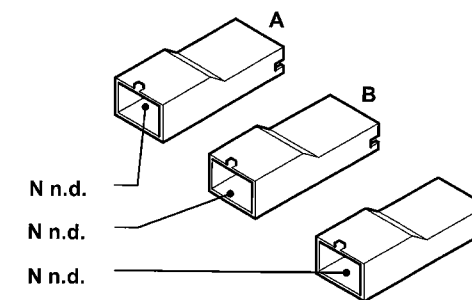
#### 13 Connections between right/left front cables



\*\* Variant connection for 1910 JTD versions

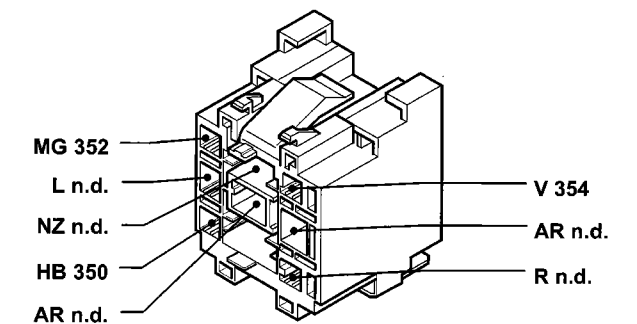
4A028NI02

#### 355 Passenger compartment interior heater plugs (1910 JTD)



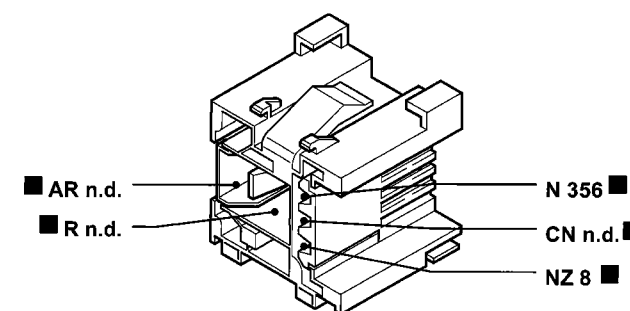
4A028NI03

#### 357 Passenger compartment interior heater plugs control unit (1910 JTD)



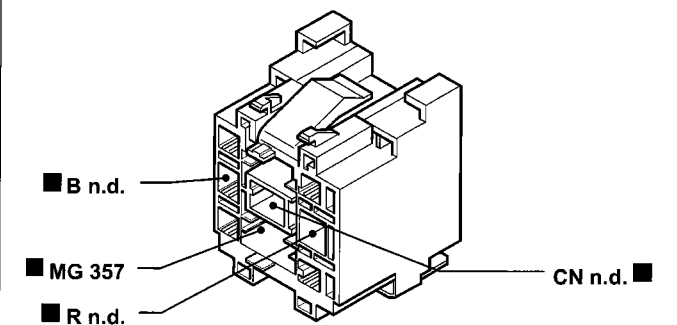
4A028NI04

#### 351 Passenger compartment water heater relay



4A028NI05

#### 352 Passenger compartment water heater 50A relay

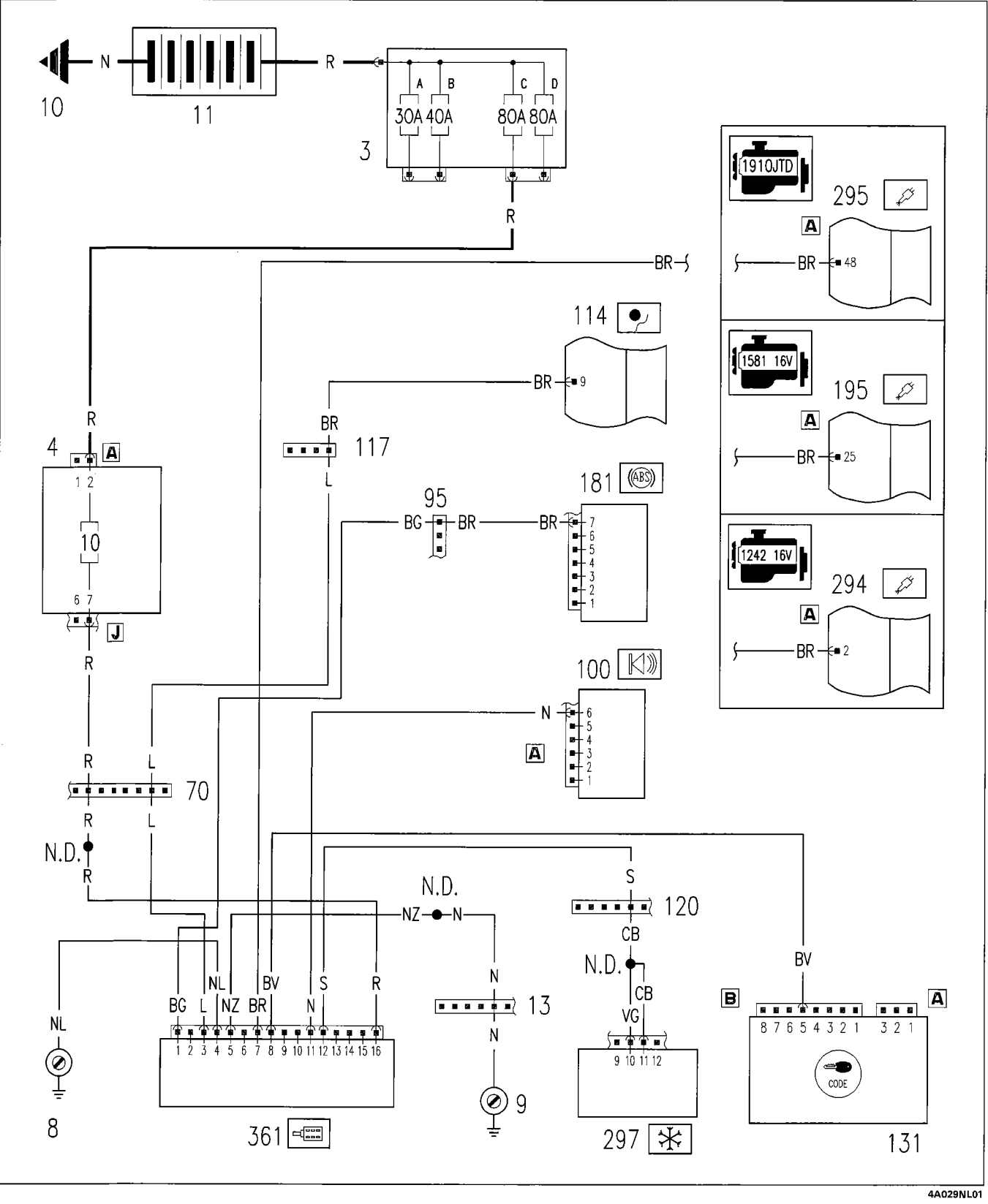


4A028NI06

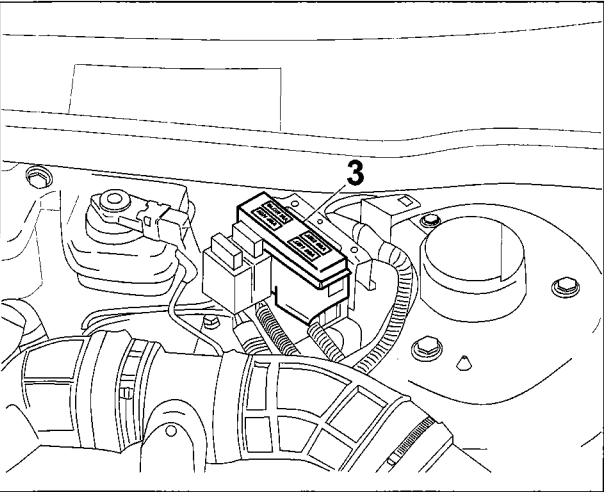
The cables concerned are marked in the wiring diagram with a square



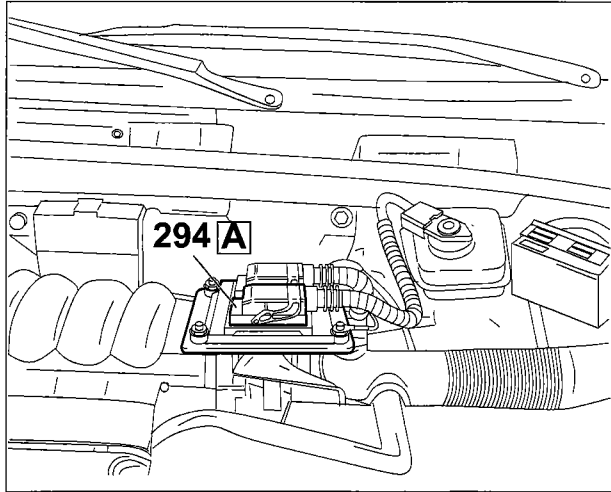
Diagnostic socket connections



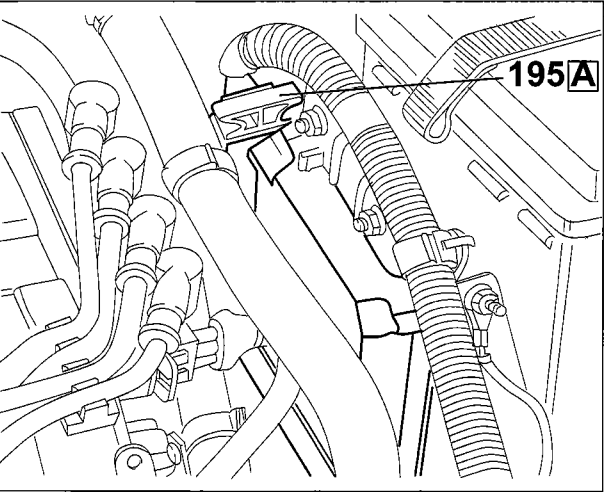
Component location



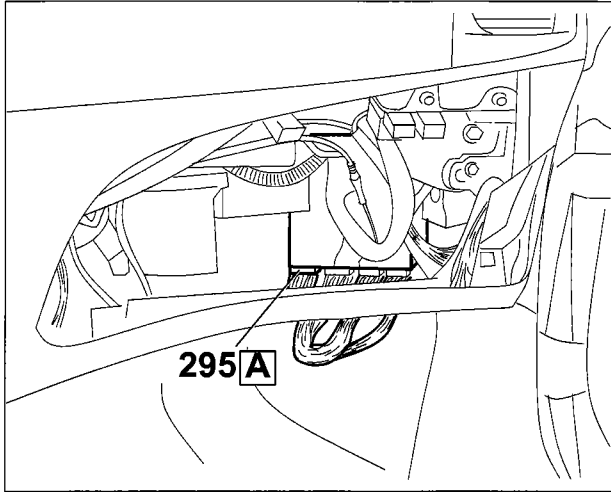
4A029NL02



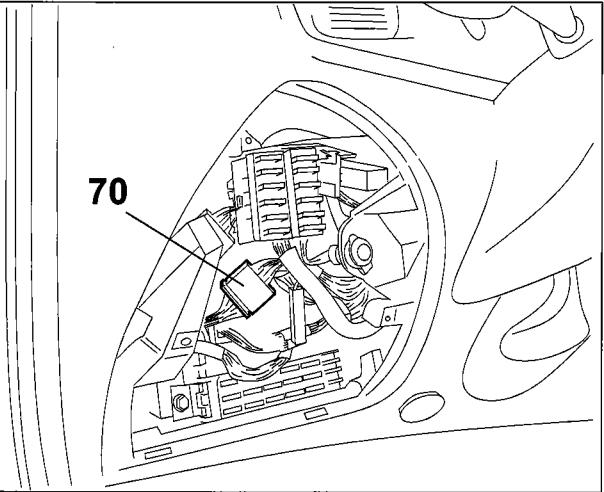
4A029NL03



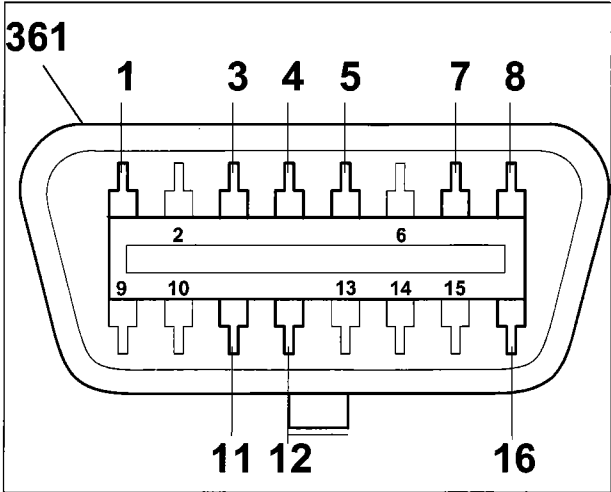
4A029NL04



4A029NL05

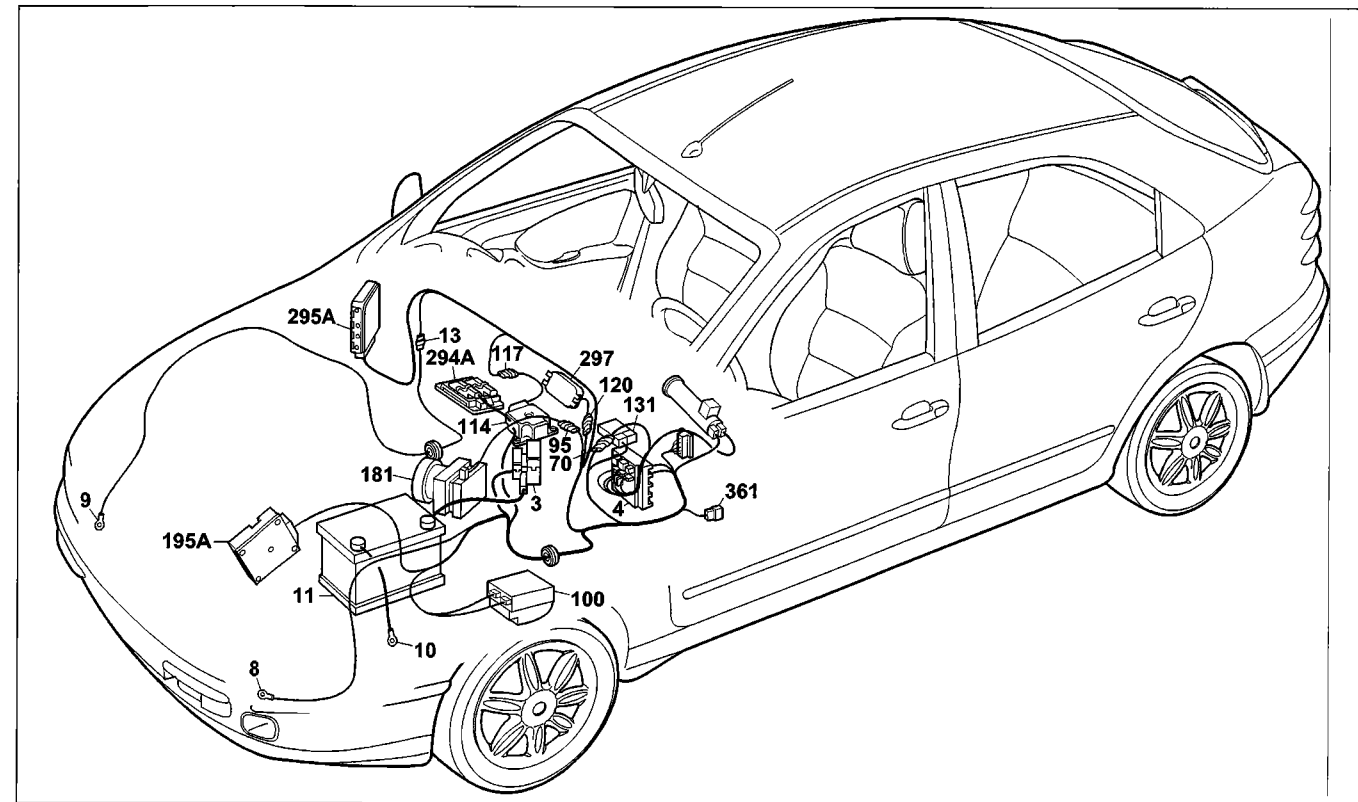


4A029NL06



4A029NL07

### 55.



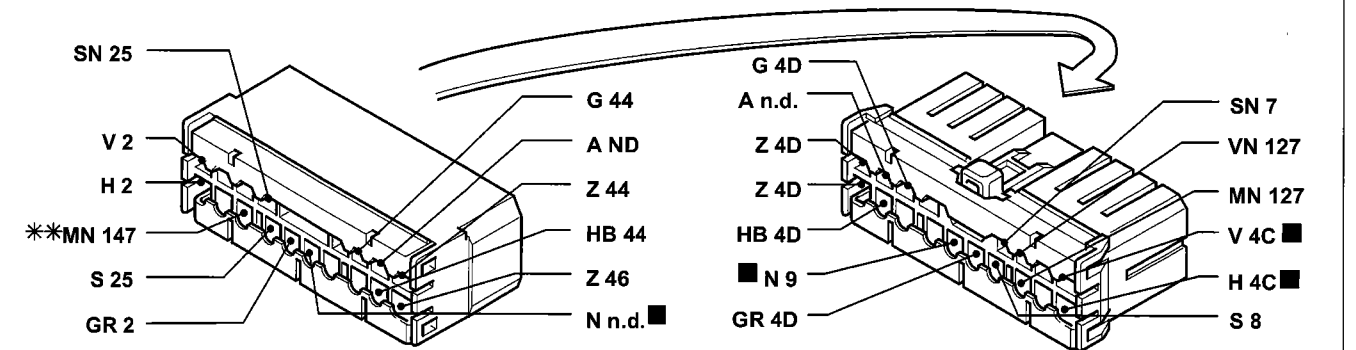
4A030NL01

#### Diagnostic socket connections

#### Component key

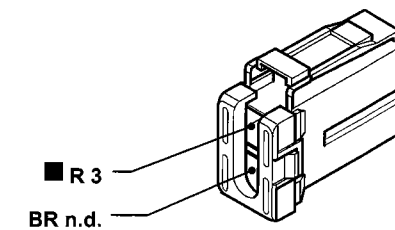
- |                                                                  |                                                               |
|------------------------------------------------------------------|---------------------------------------------------------------|
| 3 Power fusebox:                                                 | 195 Injection/ignition electronic control unit (1581)         |
| A 30A fuse protecting injection system (60A for TD versions)     | 294 Injection/ignition electronic control unit (1242)         |
| B 40A fuse protecting ignition system                            | 295 Injection/ignition electronic control unit 1910 TD UNIJET |
| C 80A fuse protecting optional equipment                         | 297 Air conditioning control unit                             |
| D 80A fuse protecting junction unit                              | 361 Diagnostic socket                                         |
| 4 Junction unit                                                  |                                                               |
| 8 Left front earth                                               | N.D. Ultrasound welding taped in cable loom                   |
| 9 Right front earth                                              |                                                               |
| 10 Battery earth on bodyshell                                    |                                                               |
| 11 Battery                                                       |                                                               |
| 13 Connection between right/left front cables                    |                                                               |
| 70 Connection between facia/front leads                          |                                                               |
| 95 Connection between front cables/anti-lock brakes (A.B.S.)     |                                                               |
| 100 Anti-theft electronic control unit                           |                                                               |
| 114 EURO BAG electronic control unit                             |                                                               |
| 117 Connection between EURO BAG/dashboard cables                 |                                                               |
| 131 Fiat CODE electronic control unit                            |                                                               |
| 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.) |                                                               |

#### 13 Connection between right/left front cables



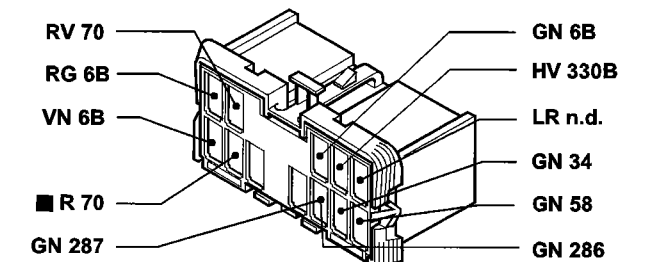
4A030NL02

#### 4A Junction unit



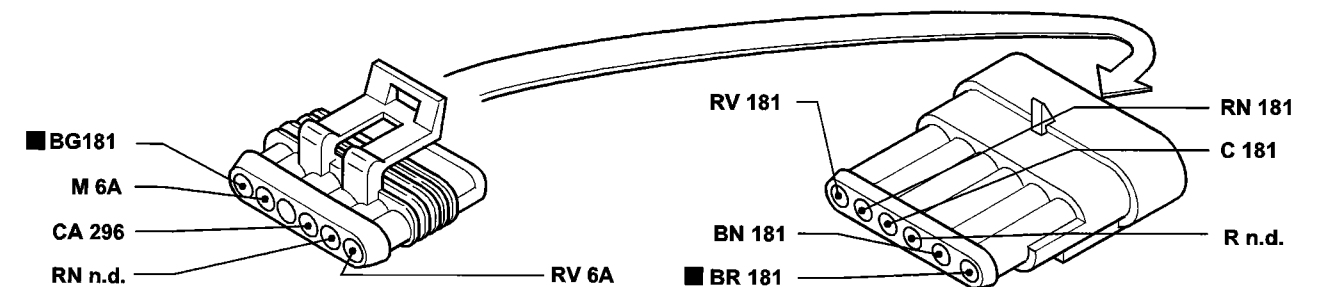
4A030NL03

#### 4J Junction unit



4A030NL04

#### 95 Cable connection

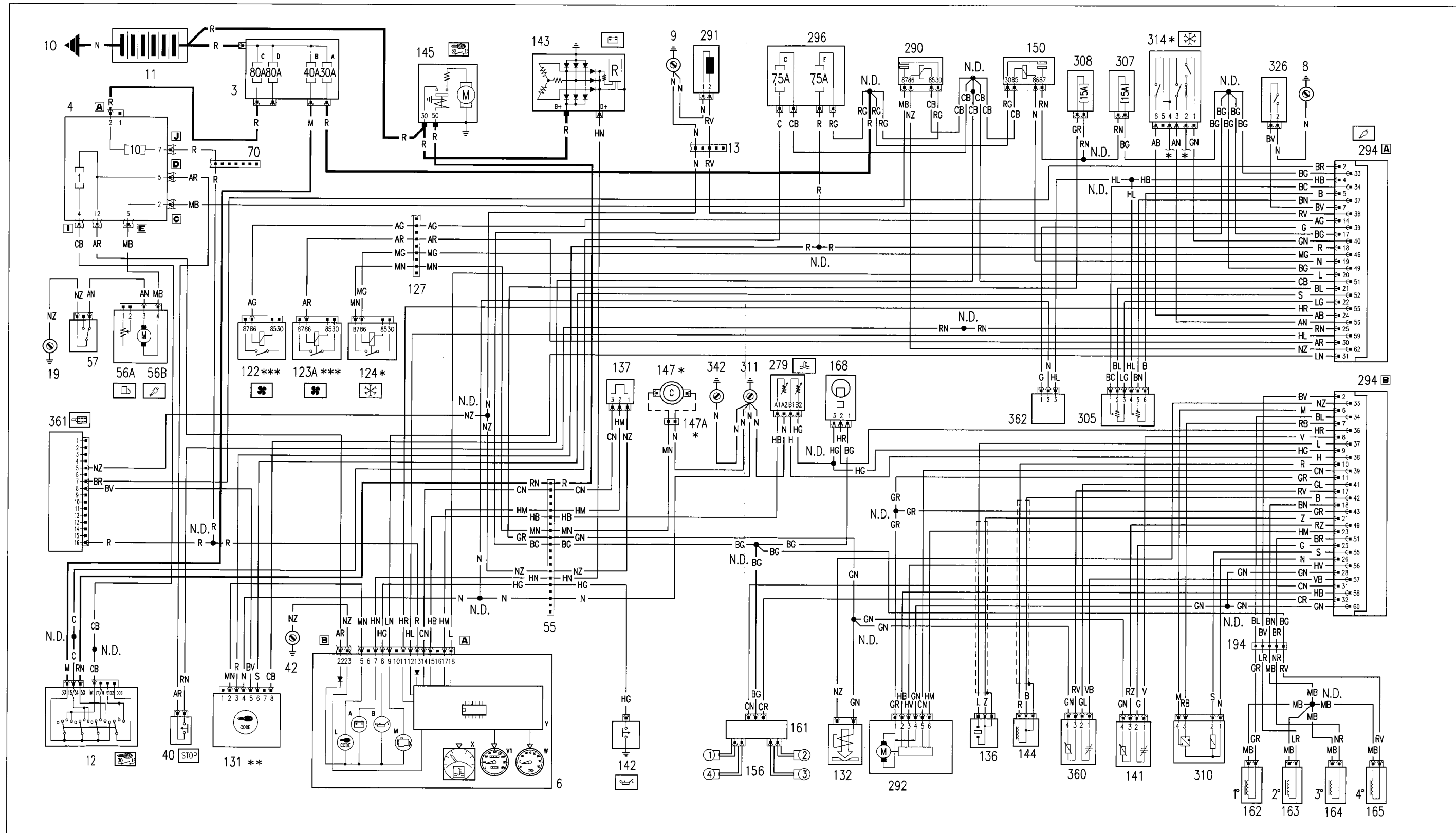


4A030NL05

The cables concerned are marked in the wiring diagram with a square



Starting - Injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE warning light

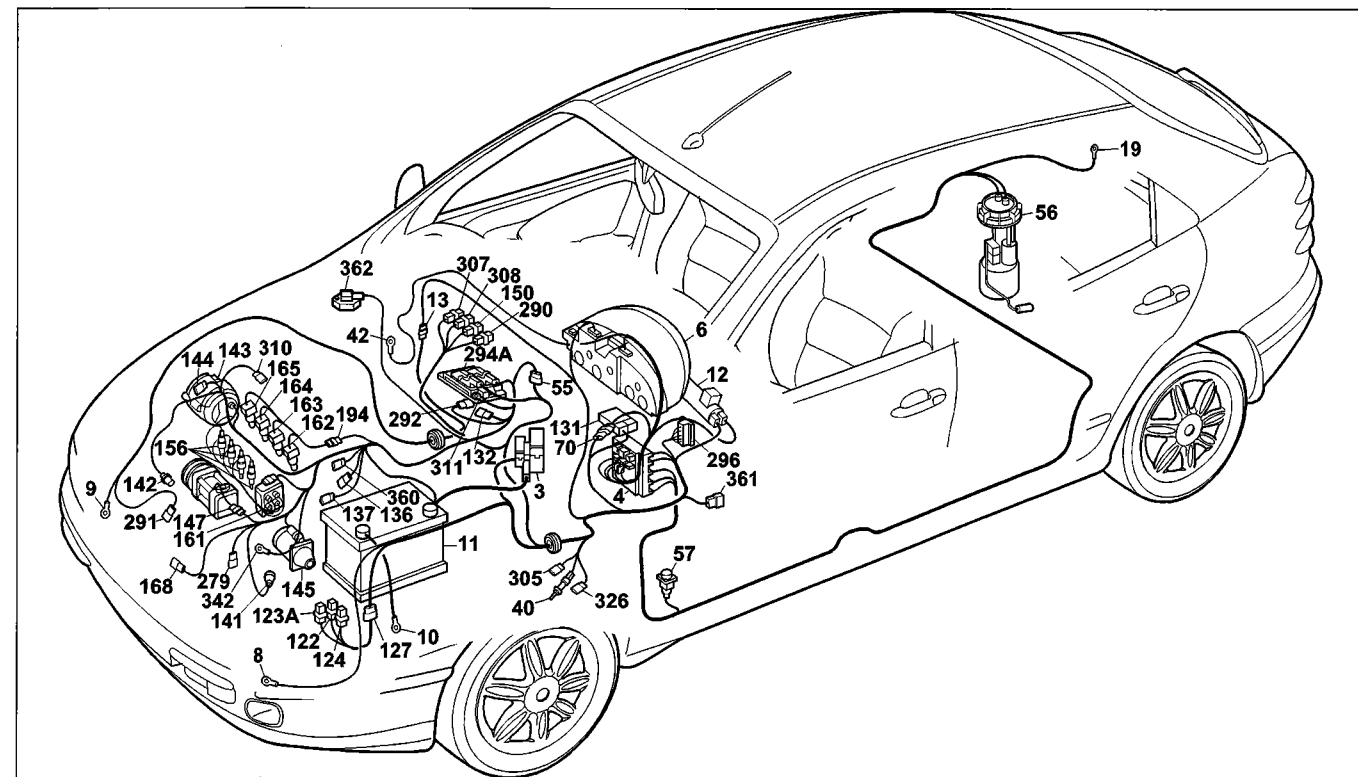


\* See air conditioning wiring diagram

\*\* See Fiat CODE wiring diagram

\*\*\* See engine cooling wiring diagram

### 55.

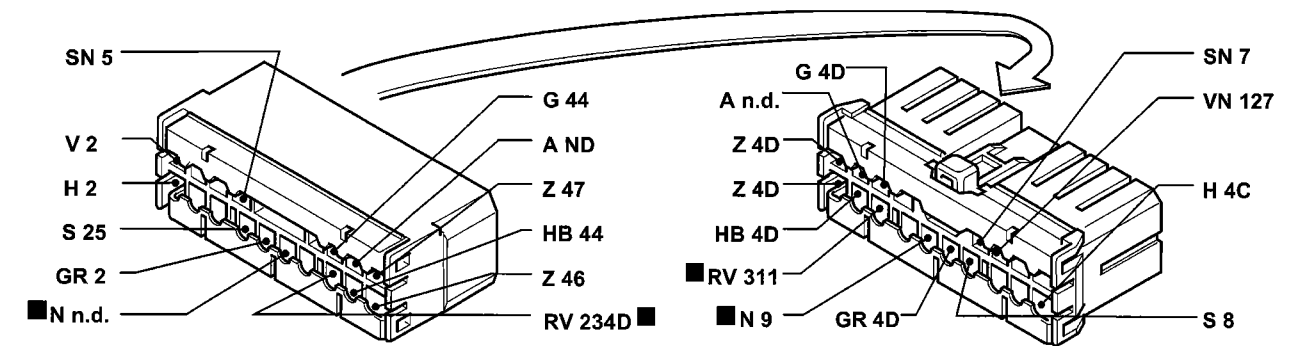


Starting - Injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE failure warning light

#### Component key

- |                                                                       |                                                         |
|-----------------------------------------------------------------------|---------------------------------------------------------|
| 3 Power fusebox:                                                      | 131 Fiat-CODE electronic control unit                   |
| A 30A fuse protecting injection system (60A for TD versions)          | 132 Petrol vapour cut out solenoid valve (canister)     |
| B 40A fuse protecting ignition system                                 | 136 Detonation sensor                                   |
| C 80A fuse protecting optional equipment                              | 137 Vehicle speed sensor                                |
| D 80A fuse protecting junction unit                                   | 141 Heated Lambda sensor                                |
| 4 Junction box                                                        | 142 Switch indicating insufficient engine oil pressure  |
| 6 Instrument panel                                                    | 143 Alternator                                          |
| A Battery recharging warning light                                    | 144 Rpm and T.D.C. sensor                               |
| B Low engine oil pressure warning light                               | 145 Starter motor                                       |
| L Fiat-CODE failure warning light                                     | 147 Compressor for air conditioning                     |
| M Injection system failure warning light petrol/diesel                | 147A Coupling for air conditioning compressor           |
| X Engine coolant temperature gauge                                    | 150 Injection system relay feed                         |
| Y Electronic module                                                   | 156 Spark plugs                                         |
| V1 Speedometer                                                        | 161 Ignition power module                               |
| W Rev counter                                                         | 162 Injector (1°)                                       |
| 8 Left front earth                                                    | 163 Injector (2°)                                       |
| 9 Right front earth                                                   | 164 Injector (3°)                                       |
| 10 Battery earth on bodyshell                                         | 165 Injector (4°)                                       |
| 11 Battery                                                            | 168 Timing sensor                                       |
| 12 Ignition switch                                                    | 194 Connection between injection cables/injector bridge |
| 13 Connection between right/left front cables                         | 279 Engine coolant temperature twin sender unit         |
| 19 Right rear earth                                                   | 290 Electric fuel pump relay feed                       |
| 40 Brake light control switch                                         | 291 Sensor for power assisted steering pump             |
| 42 Right dashboard earth                                              | 292 Modular actuator                                    |
| 55 Connection between front cables/fuel gauge                         | 294 Injection/ignition control unit 1242 16V            |
| 56 Fuel level gauge control unit                                      | 296 Fuse holder base on front cable (C and F)           |
| A Fuel level sensor                                                   | 305 Potentiometer on accelerator pedal                  |
| B Electric fuel pump                                                  | 307 ISA fuse protecting injection system                |
| 57 Inertia switch                                                     | 308 ISA fuse protecting canister valves                 |
| 70 Connection between facia/front leads                               | 310 Absolute pressure and temperature sensor            |
| 122 Engine cooling fan low speed relay feed                           | 311 Engine pre-wiring earth                             |
| 123A Engine cooling fan high speed relay feed                         | 314 4 stage pressure switch                             |
| 124 Air conditioning compressor relay feed                            | 326 Switch on clutch                                    |
| 127 Connection between front left cable/cable on relay holder bracket | 342 Power earth for electronic injection                |
|                                                                       | 360 Rear Lambda sensor                                  |
|                                                                       | 361 Diagnostic socket                                   |
|                                                                       | 362 Accelerometer                                       |
|                                                                       | N.D. Ultrasound welding taped in cable loom             |

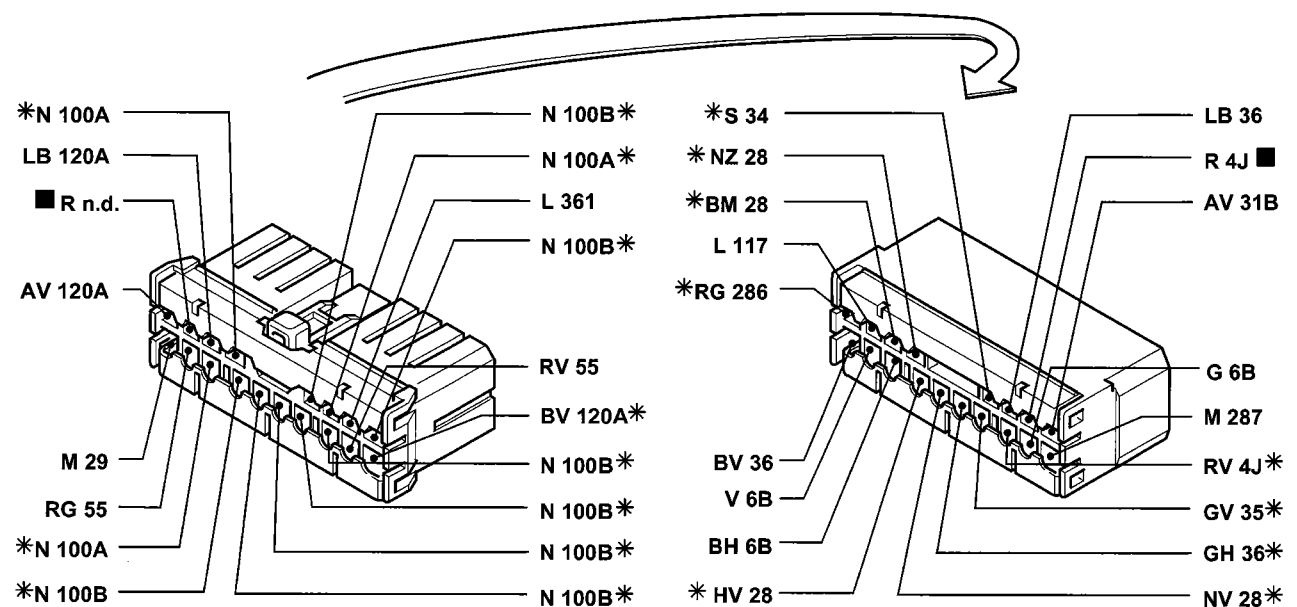
#### 13 Connection between right/left front cables



\*\* Variant connection for 1910 JTD versions

4A032NL02

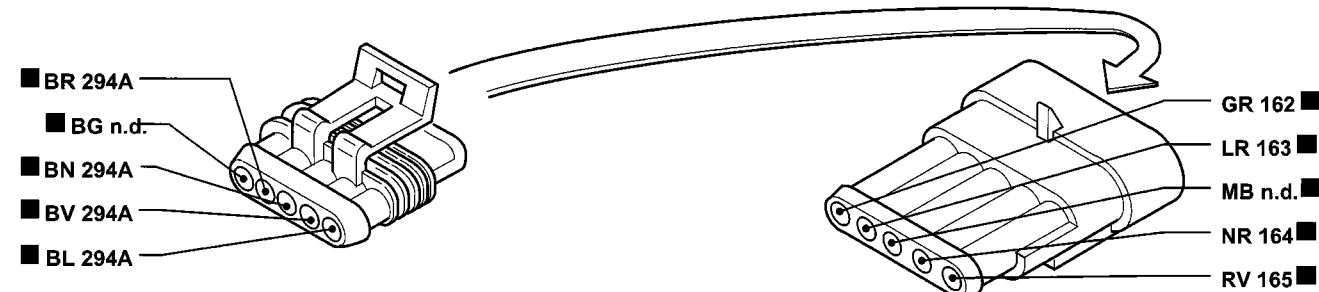
#### 70 Connection between dashboard/front cables Trim level: SX-GT



\* Variant connection for versions with alarm

4A032NL03

#### 194 Connection for heater unit cables

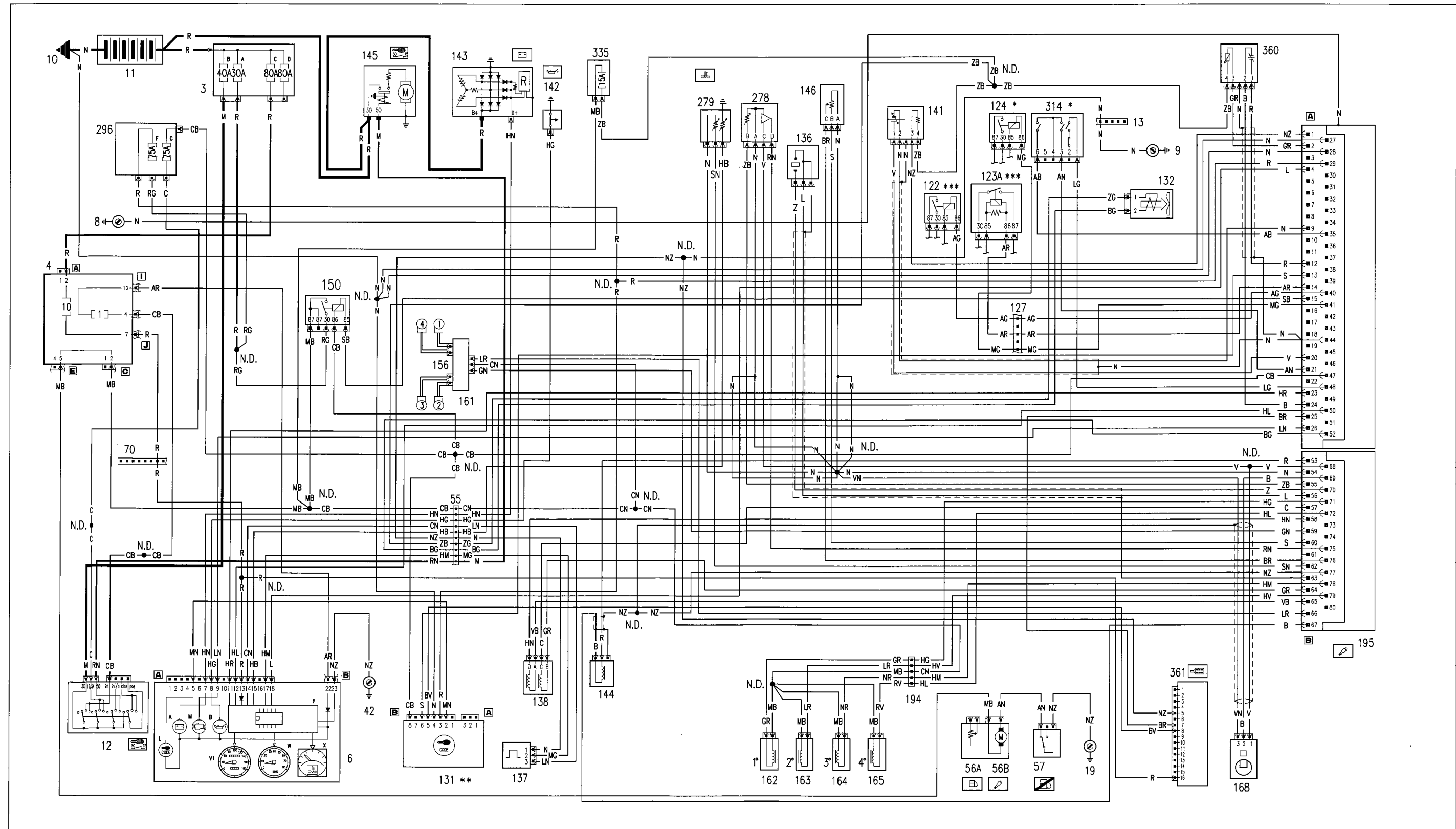


4A032NL04

The cables concerned are marked in the wiring diagram with a square

**55.**

**Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE failure warning light**

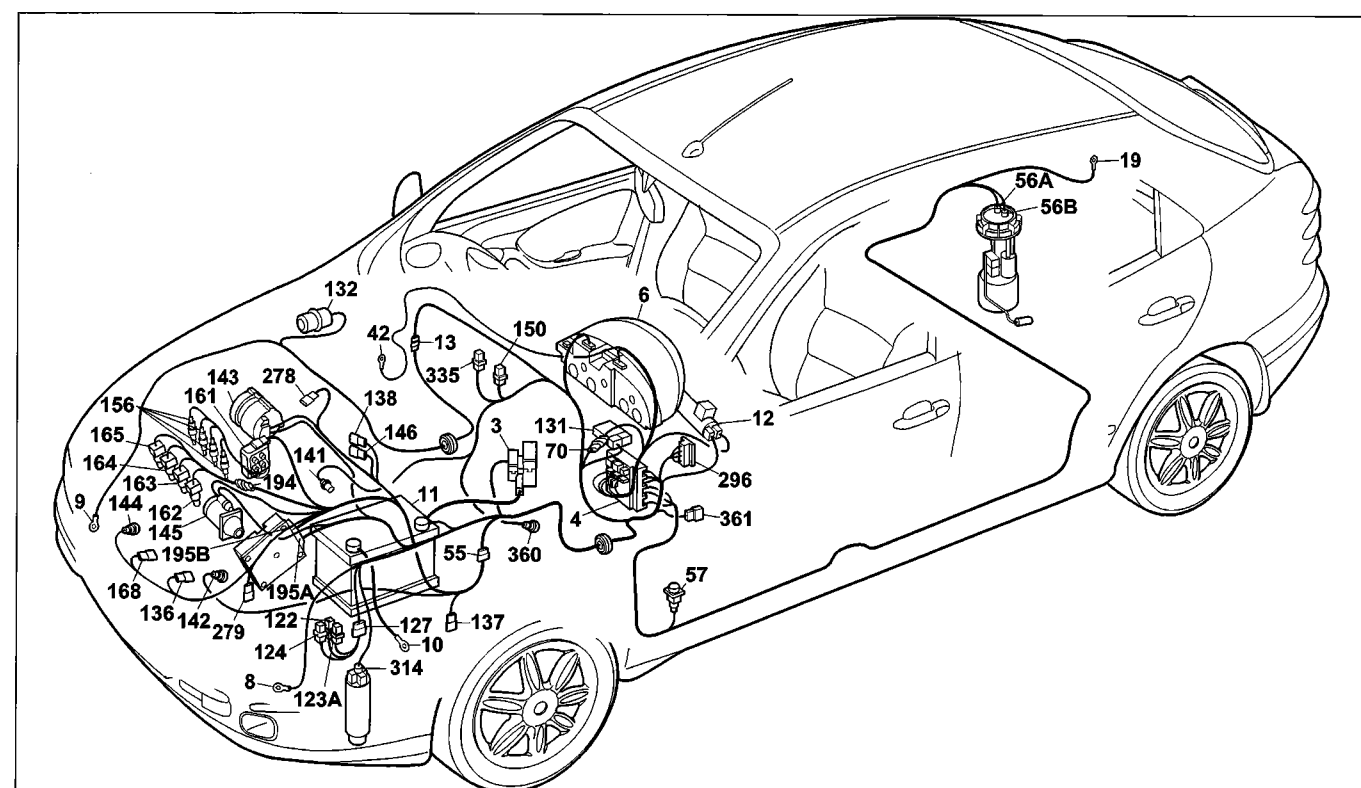


\* See air conditioning wiring diagram

\*\* See Fiat CODE wiring diagram

\*\*\* See engine cooling wiring diagram





4A034NL01

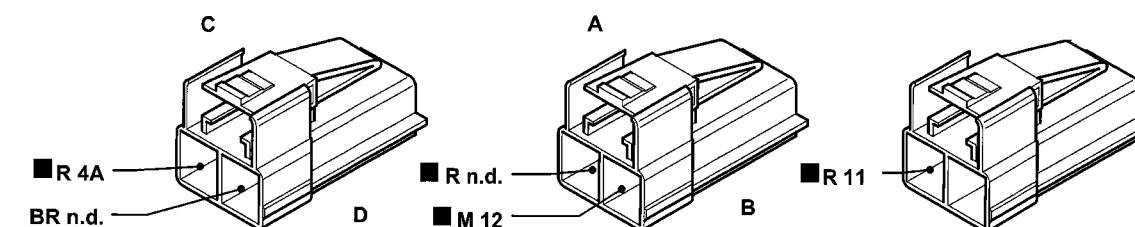
Starting - Ignition and IAW 49F injection - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE failure warning light

### Component key

- |                                                                       |                                                                      |
|-----------------------------------------------------------------------|----------------------------------------------------------------------|
| 3 Power fusebox:                                                      | 131 Fiat-CODE electronic control unit                                |
| A 30A fuse protecting injection system (60A for TD versions)          | 132 Petrol vapour cut out solenoid valve (canister)                  |
| B 40A fuse protecting ignition system                                 | 136 Detonation sensor                                                |
| C 80A fuse protecting optional equipment                              | 137 Vehicle speed sensor                                             |
| D 80A fuse protecting junction unit                                   | 138 Idle adjustment actuator                                         |
| 4 Junction unit                                                       | 141 Heated Lambda sensor                                             |
| 6 Instrument panel                                                    | 142 Switch indicating insufficient engine oil pressure               |
| A Battery recharging warning light                                    | 143 Alternator                                                       |
| B Low engine oil pressure warning light                               | 144 Rpm and T.D.C. sensor                                            |
| L Fiat-CODE failure warning light                                     | 145 Starter motor                                                    |
| N Injection system failure warning light                              | 146 Potentiometer on throttle valve                                  |
| Y Electronic module                                                   | 150 Injection system relay feed                                      |
| V1 Speedometer                                                        | 156 Spark plugs                                                      |
| W Rev counter                                                         | 161 Ignition power module                                            |
| 8 Left front earth                                                    | 162 Injector (1°)                                                    |
| 9 Right front earth                                                   | 163 Injector (2°)                                                    |
| 10 Battery earth on bodyshell                                         | 164 Injector (3°)                                                    |
| 11 Battery                                                            | 165 Injector (4°)                                                    |
| 12 Ignition switch                                                    | 168 Timing sensor                                                    |
| 13 Connection between right/left front cables                         | 194 Connection between injection cables/injector bridge              |
| 19 Right rear earth                                                   | 195 Injection/ignition electronic control unit (1581)                |
| 42 Right dashboard earth                                              | 278 Integrated air temperature/pressure sender unit                  |
| 55 Connection between front cables/fuel gauge                         | 279 Engine coolant temperature twin sender unit                      |
| 56 Fuel level gauge control unit                                      | 296 Fuse holder base on front cable (C and F)                        |
| A Fuel level sensor                                                   | C 7.5A fuse protecting Fiat CODE cooling system/electronic injection |
| B Electric fuel pump                                                  | F 7.5A fuse protecting injection system/Fiat CODE                    |
| 57 Inertia switch                                                     | 314 4 stage pressure switch                                          |
| 70 Connection between facia/front leads                               | 360 Rear Lambda sensor                                               |
| 122 Engine cooling fan low speed relay feed                           | 361 Diagnostic socket                                                |
| 123A Engine cooling fan high speed relay feed                         |                                                                      |
| 124 Air conditioning compressor relay feed                            |                                                                      |
| 127 Connection between front left cable/cable on relay holder bracket |                                                                      |
- N.D. Ultrasound welding taped in cable loom

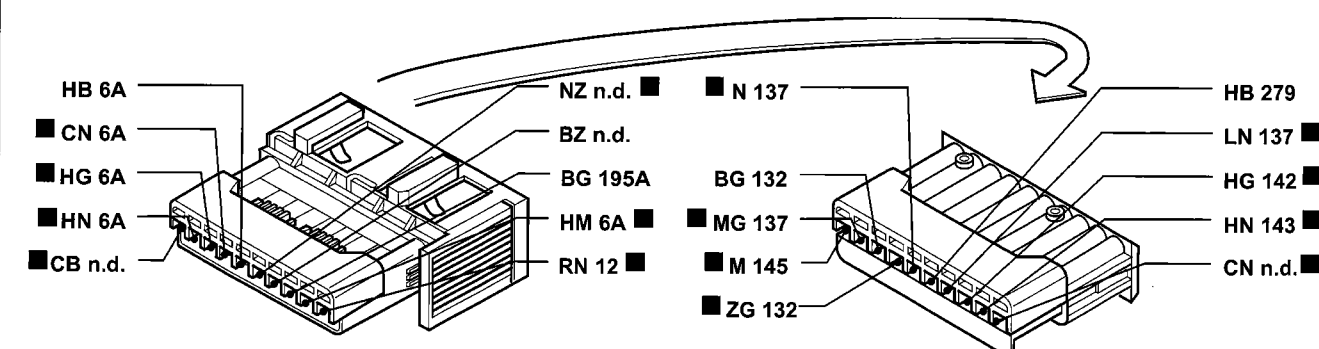
## 55.

### 3 Power fusebox



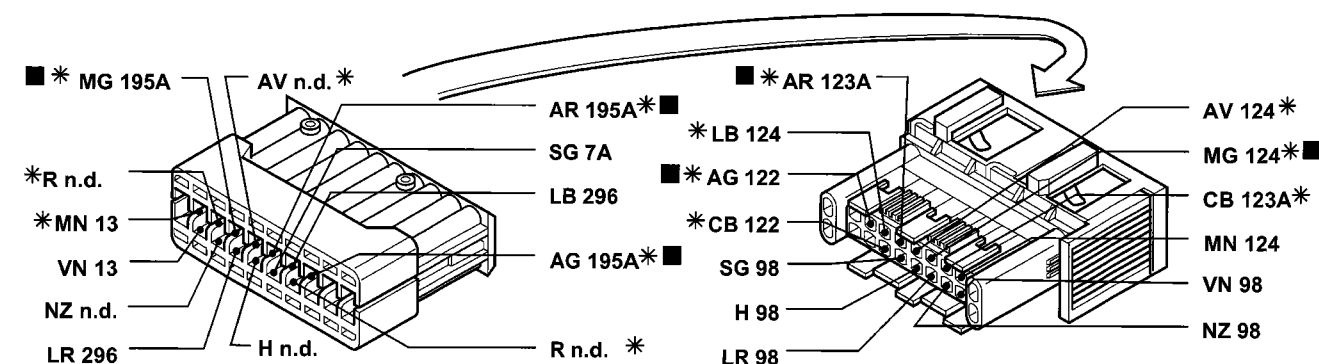
4A034NL02

### 55 Connection between front cables/fuel level gauge



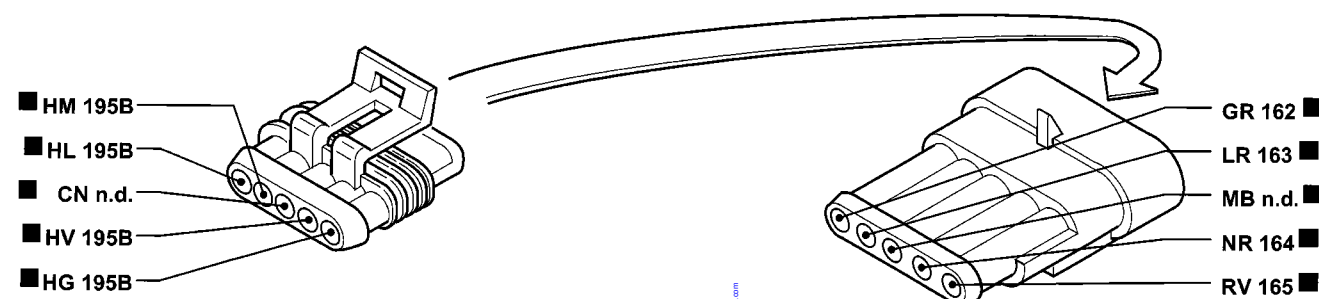
4A034NL03

### 127 Connection between front left cables/cable on relay holder bracket



4A034NL04

### 194 Connection between injection cables/injector bridge

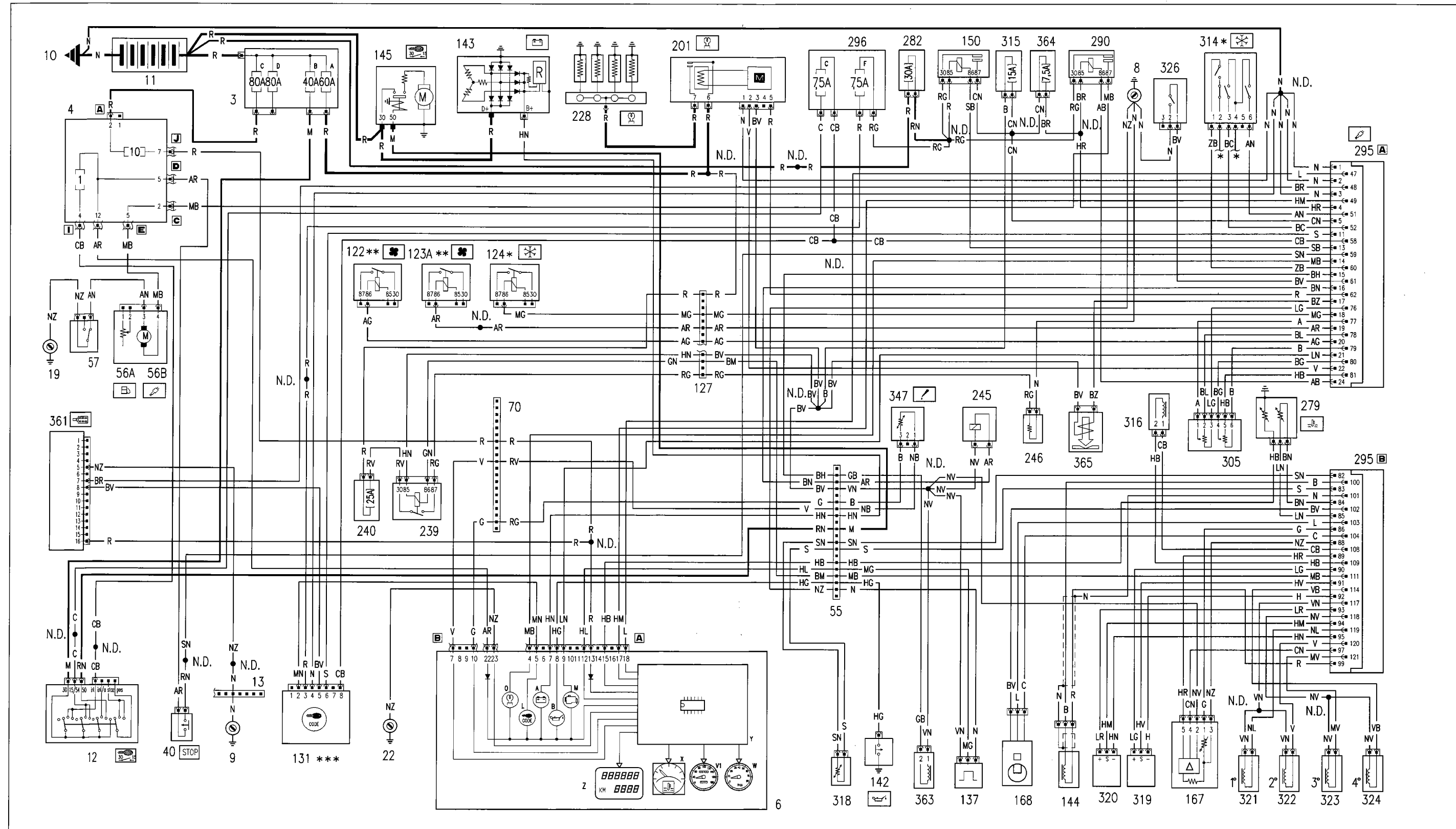


4A034NL05

The cables concerned are marked in the wiring diagram with a square

**55.**

Starting - Electronically operated diesel pump - Recharging and warning light - Insufficient engine oil pressure warning light - Heater plugs warning light - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE failure warning light



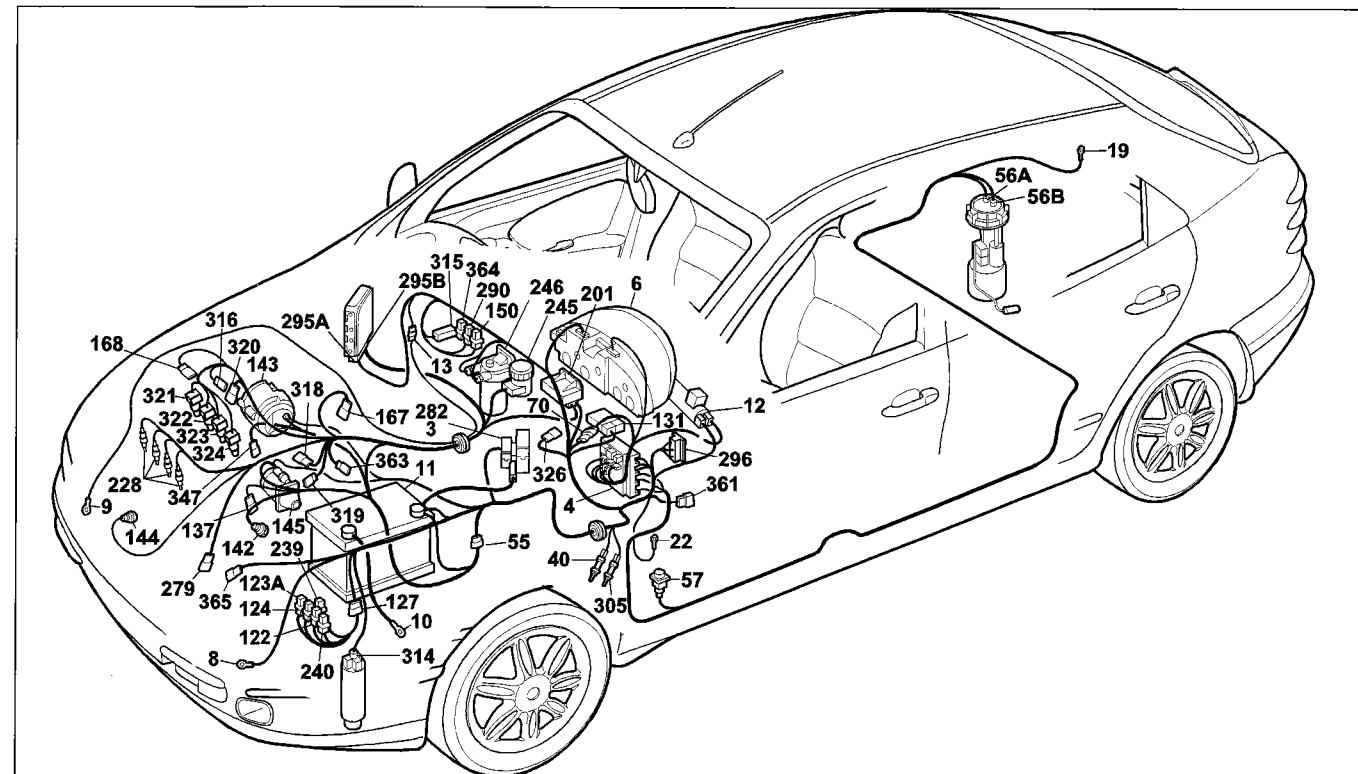
\* See air conditioning wiring diagram

\*\* See engine cooling wiring diagram

\*\*\* See Fiat CODE wiring diagram

4A035NL01

### 55.



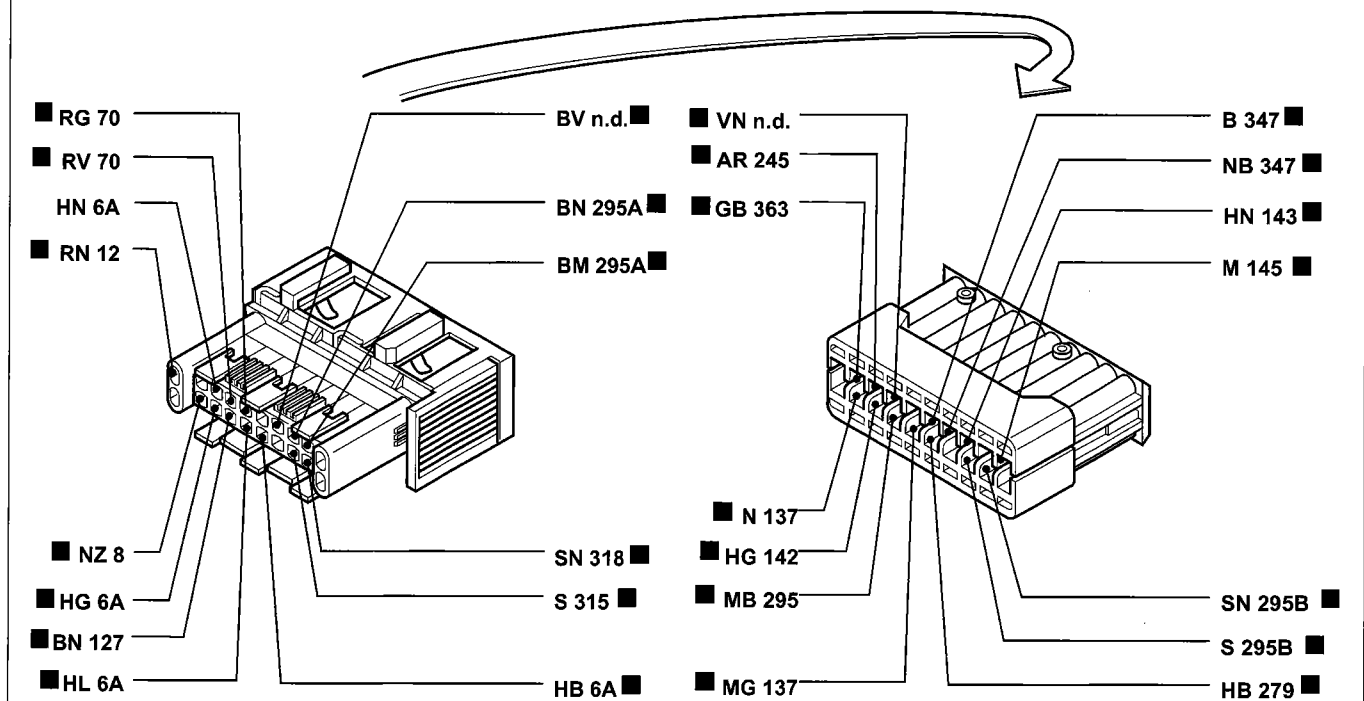
Starting - Electronically operated diesel pump - Recharging and warning light - Insufficient engine oil pressure warning light - Heater plugs warning light - Rev counter - Speedometer - Engine coolant temperature gauge - Fiat CODE failure warning light

#### Component key

- |                                                                       |                                                                      |
|-----------------------------------------------------------------------|----------------------------------------------------------------------|
| 3 Power fusebox:                                                      | 142 Switch indicating insufficient engine oil pressure               |
| A 30A fuse protecting injection system (60A for TD versions)          | 142 Alternator                                                       |
| B 40A fuse protecting ignition system                                 | 144 Rpm and T.D.C. sensor                                            |
| C 80A fuse protecting optional equipment                              | 145 Starter motor                                                    |
| D 80A fuse protecting junction unit                                   | 150 Injection system relay feed                                      |
| 4 Junction unit                                                       | 167 Flow meter                                                       |
| 6 Instrument panel                                                    | 168 Timing sensor                                                    |
| A Battery recharging warning light                                    | 201 Heater plugs control unit                                        |
| B Low engine oil pressure warning light                               | 228 Heater plugs                                                     |
| L Fiat-CODE failure warning light                                     | 239 Heated diesel filter relay                                       |
| M Injection system failure warning light petrol/diesel                | 240 15A fuse protecting heated diesel filter relay                   |
| O Heater plugs warning light                                          | 245 E.G.R. solenoid valve                                            |
| X Engine coolant temperature gauge                                    | 246 Heated fuel filter                                               |
| X1 Water in fuel filter sensor                                        | 279 Engine coolant temperature twin sender unit                      |
| Y Electronic module                                                   | 282 30A fuse protecting Fiat CODE and electronic injection           |
| V1 Speedometer                                                        | 290 Electric fuel pump relay feed                                    |
| W Rev counter                                                         | 295 Injection/ignition electronic control unit 1910 JTD              |
| 8 Left front earth                                                    | 296 Fuse holder base on front cable                                  |
| 9 Right front earth                                                   | C 7.5A fuse protecting electronic injection/cooling system Fiat-CODE |
| 10 Battery earth on bodyshe'll                                        | F 7.5A fuse protecting electronic injection system/Fiat-CODE         |
| 11 Battery                                                            | 305 Potentiometer on accelerator pedal                               |
| 12 Ignition switch                                                    | 314 4 stage pressure switch                                          |
| 13 Connection between right/left front cables                         | 315 15A fuse protecting electronic control unit 1910 JTD             |
| 19 Right rear earth                                                   | 316 Fuel pressure regulator for 1910 JTD                             |
| 22 Left facia earth                                                   | 318 Fuel temperature sensor                                          |
| 40 Brake light control switch                                         | 319 Fuel pressure sensor                                             |
| 55 Connection between front cables/fuel level gauge                   | 320 Turbo pressure regulator                                         |
| 56 Fuel level gauge control unit                                      | 321 Injector 1 for 1910 JTD                                          |
| A Fuel level sensor                                                   | 322 Injector 2 for 1910 JTD                                          |
| B Electric fuel pump                                                  | 232 Injector 3 for 1910 JTD                                          |
| 57 Inertia switch                                                     | 324 Injector 4 for 1910 JTD                                          |
| 70 Connection between facia/front leads                               | 326 Switch on clutch                                                 |
| 122 Engine cooling fan low speed relay feed                           | 347 Engine oil level sensor                                          |
| 123A Engine cooling fan high speed relay feed                         | 361 Diagnostic socket                                                |
| 124 Air conditioning compressor relay feed                            | 363 Throttle valve                                                   |
| 127 Connection between front left cable/cable on relay holder bracket | 365 Waste gate valve                                                 |
| 131 Fiat-CODE electronic control unit                                 | N.D. Ultrasound welding taped in cable loom                          |
| 137 Vehicle speed sensor                                              |                                                                      |

### 55

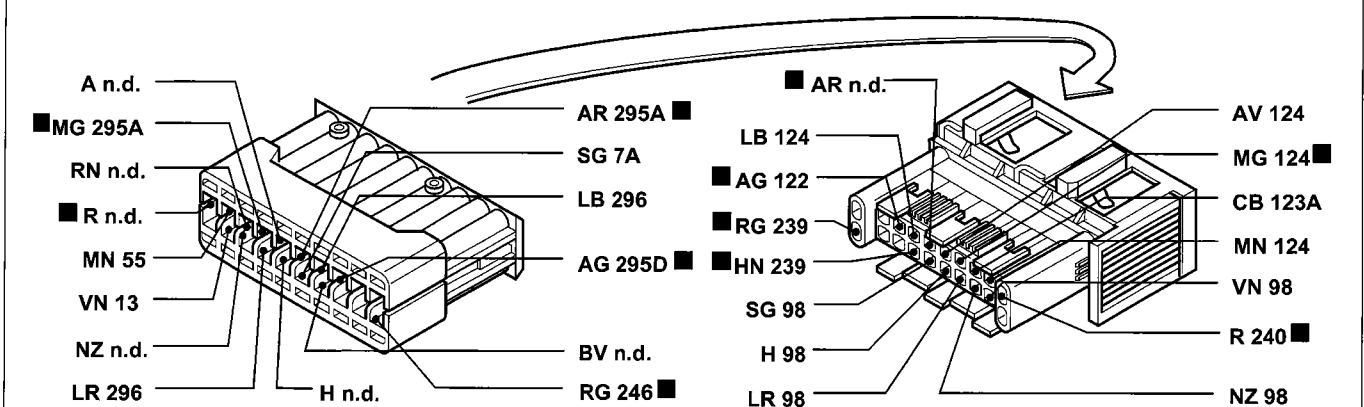
Connection between front cables/engine pre-wiring



\* Variant connection for versions with air conditioning

### 127

Connection between front left cables/cable on relay holder bracket

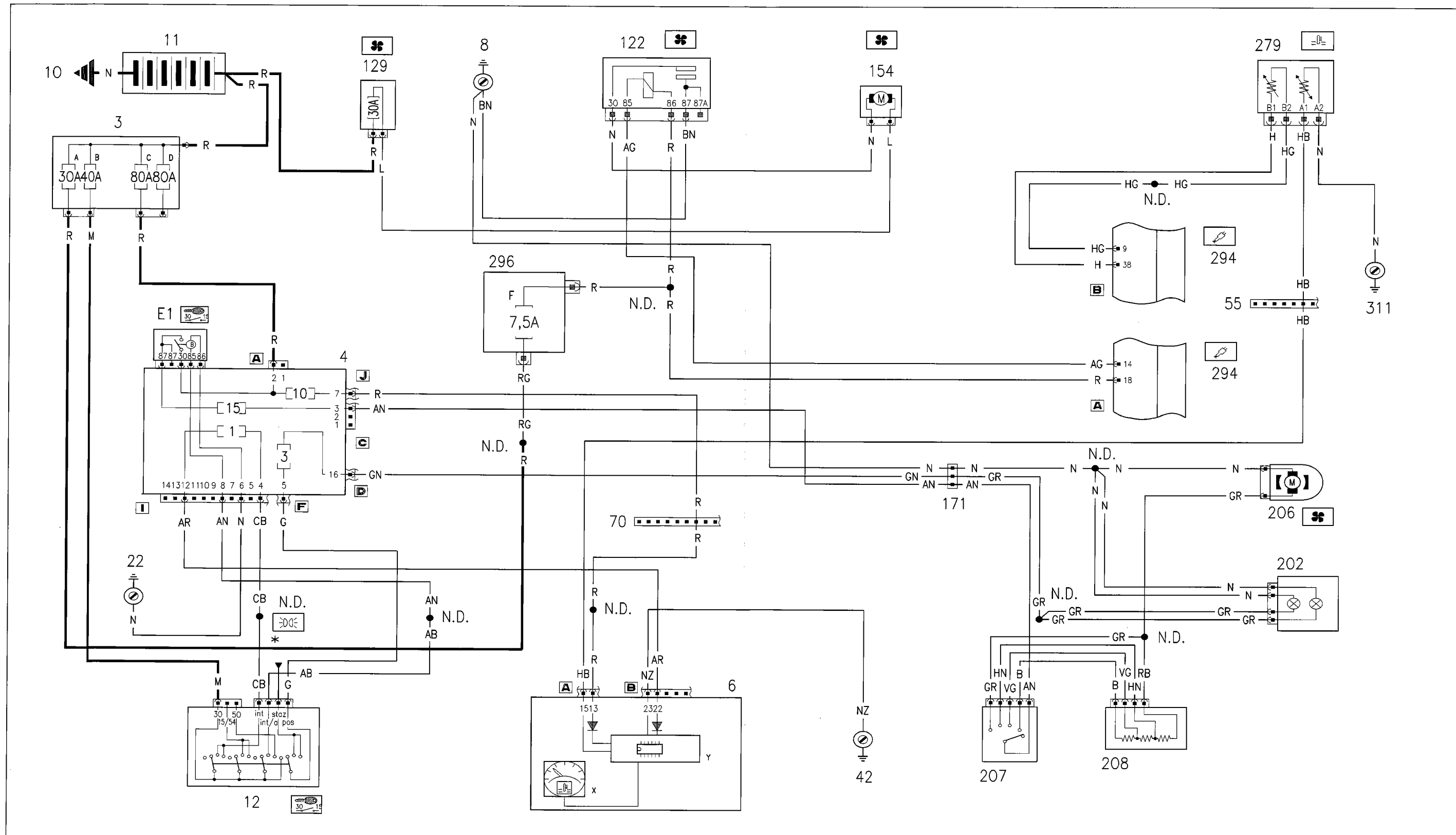


The cables concerned are marked in the wiring diagram with a square



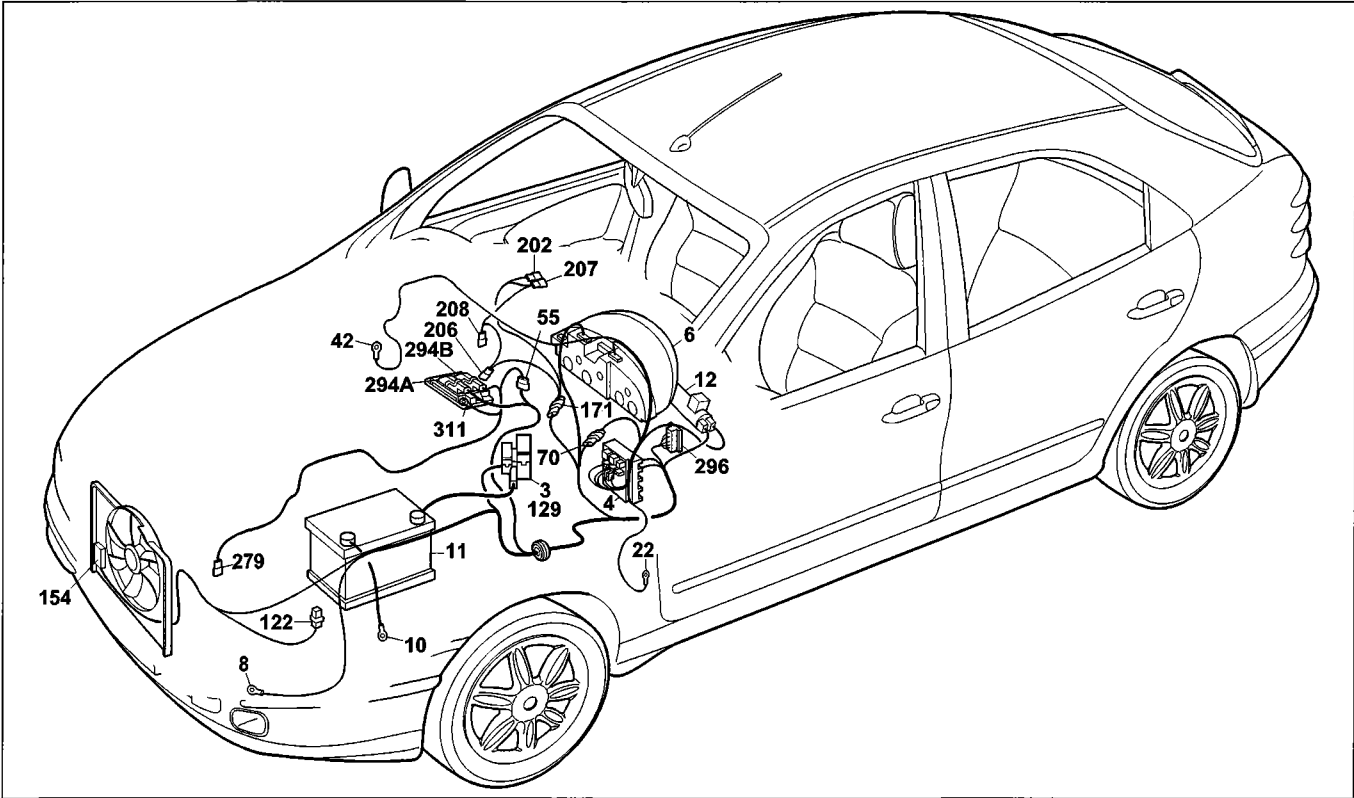
Version without automatic air conditioning:

Engine cooling with one fan - Engine coolant temperature gauge - Vehicle interior ventilation - Heater/air conditioning lighting



\* See side lights wiring diagram

4A037NL01



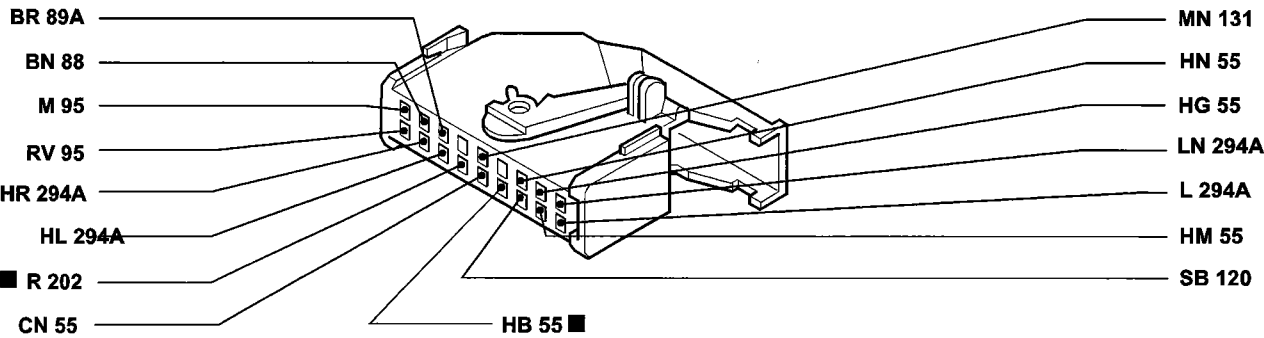
Version without automatic air conditioning:  
Engine cooling with one fan - Engine coolant temperature gauge - Vehicle interior ventilation - Heater/air conditioning lighting

Component key

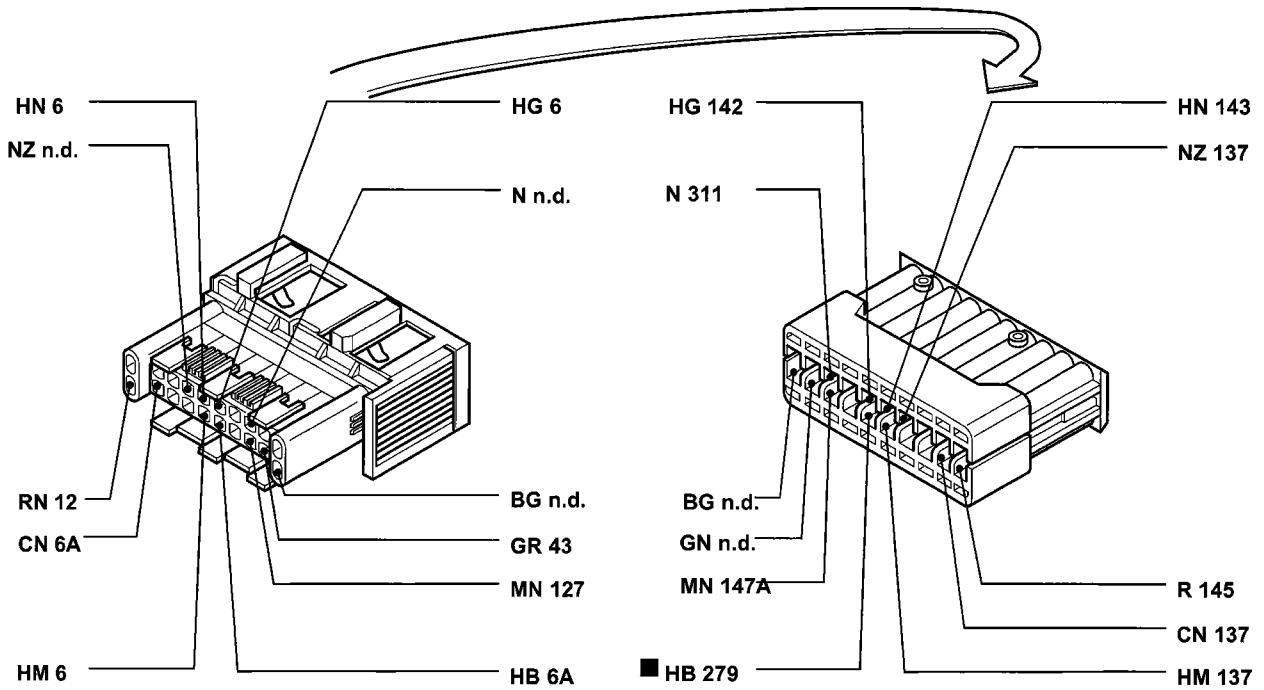
- |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system<br>(60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting additional extras<br>D 80A fuse protecting junction unit                                                                                                                                                                     | 122 Engine cooling fan low speed relay feed<br>129 30A power fuse protecting engine cooling fan<br>154 Engine cooling fan<br>171 Heater unit<br>202 Heater/air conditioning bulbs<br>206 Heater/air conditioning fan<br>207 Heater/air conditioning system speed control switch<br>208 Heater/air conditioning system limit resistor<br>279 Engine coolant temperature twin sender unit<br>294 Injection/ignition electronic control unit (1242)<br>296 Fuse holder base on front cable<br>F 7.5A fuse protecting electronic injection system/Fiat-CODE<br>311 Engine pre-wiring earth 1242 16V |
| 4 Junction unit<br>E1 Switch discharge relay<br>6 Instrument panel:<br>X Engine coolant temperature gauge<br>Y Electronic module<br>8 Left front earth<br>10 Battery earth on bodyshell<br>11 Battery<br>12 Ignition switch<br>22 Left fascia earth<br>42 Right dashboard earth<br>55 Connection between front cables/fuel level gauge<br>70 Connection between fascia/front leads | N.D. Ultrasound welding taped in cable loom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

55.

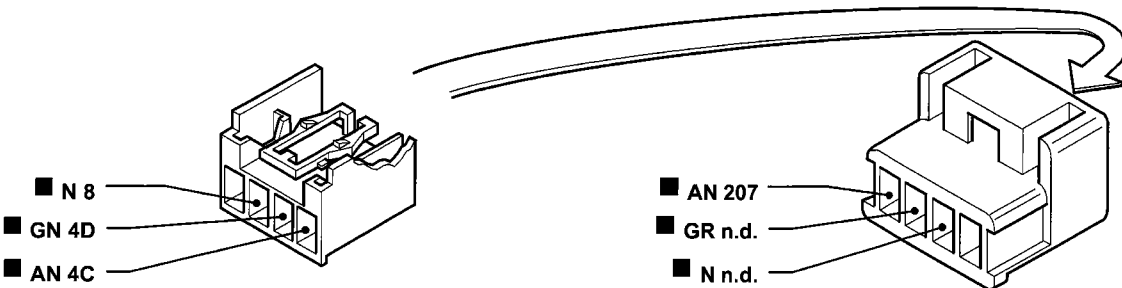
6A Instrument panel



55 Connection between right front cables/engine pre-wiring



171 Connection for heater unit cables

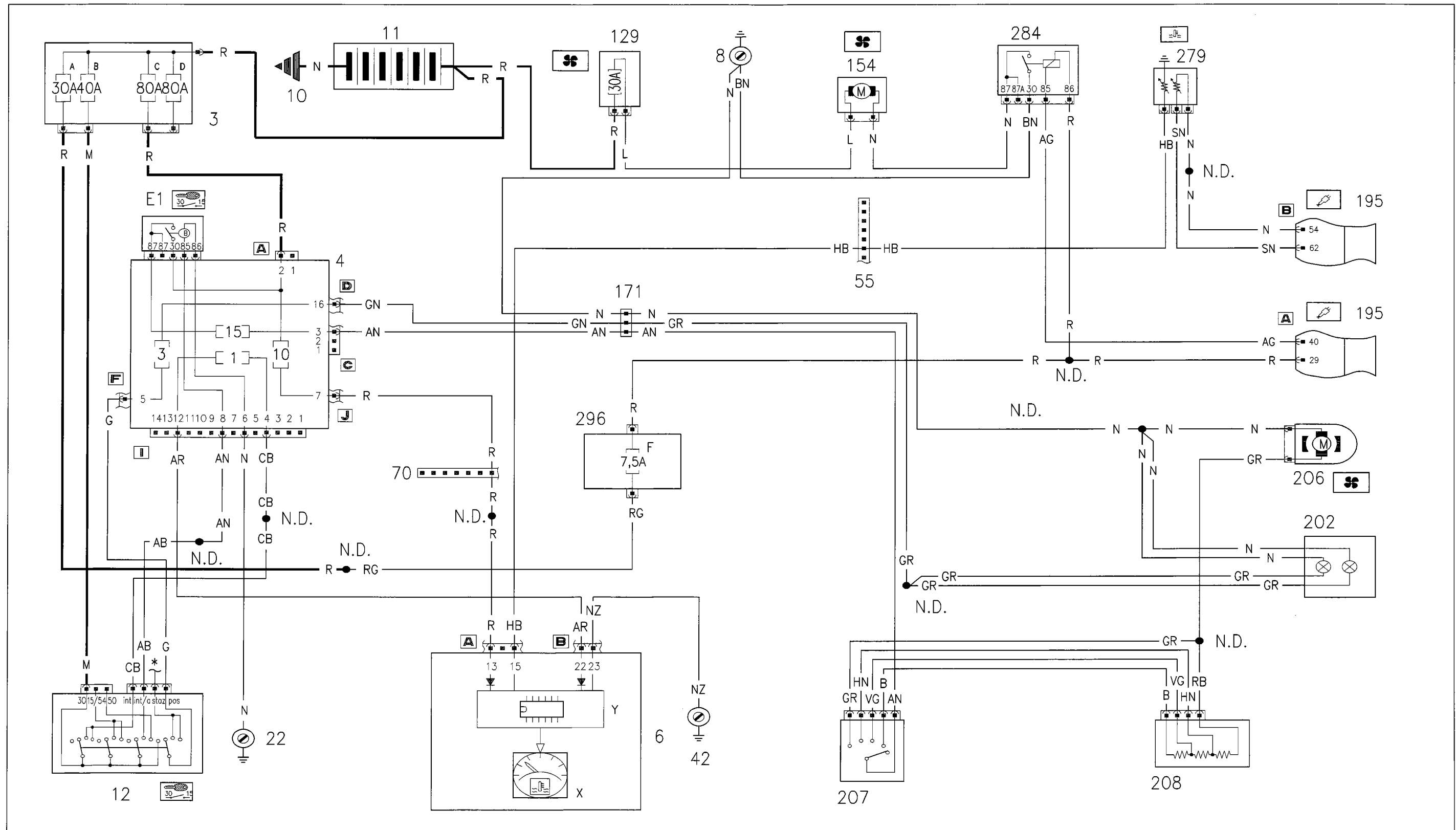


The cables concerned are marked in the wiring diagram with a square

**55.**

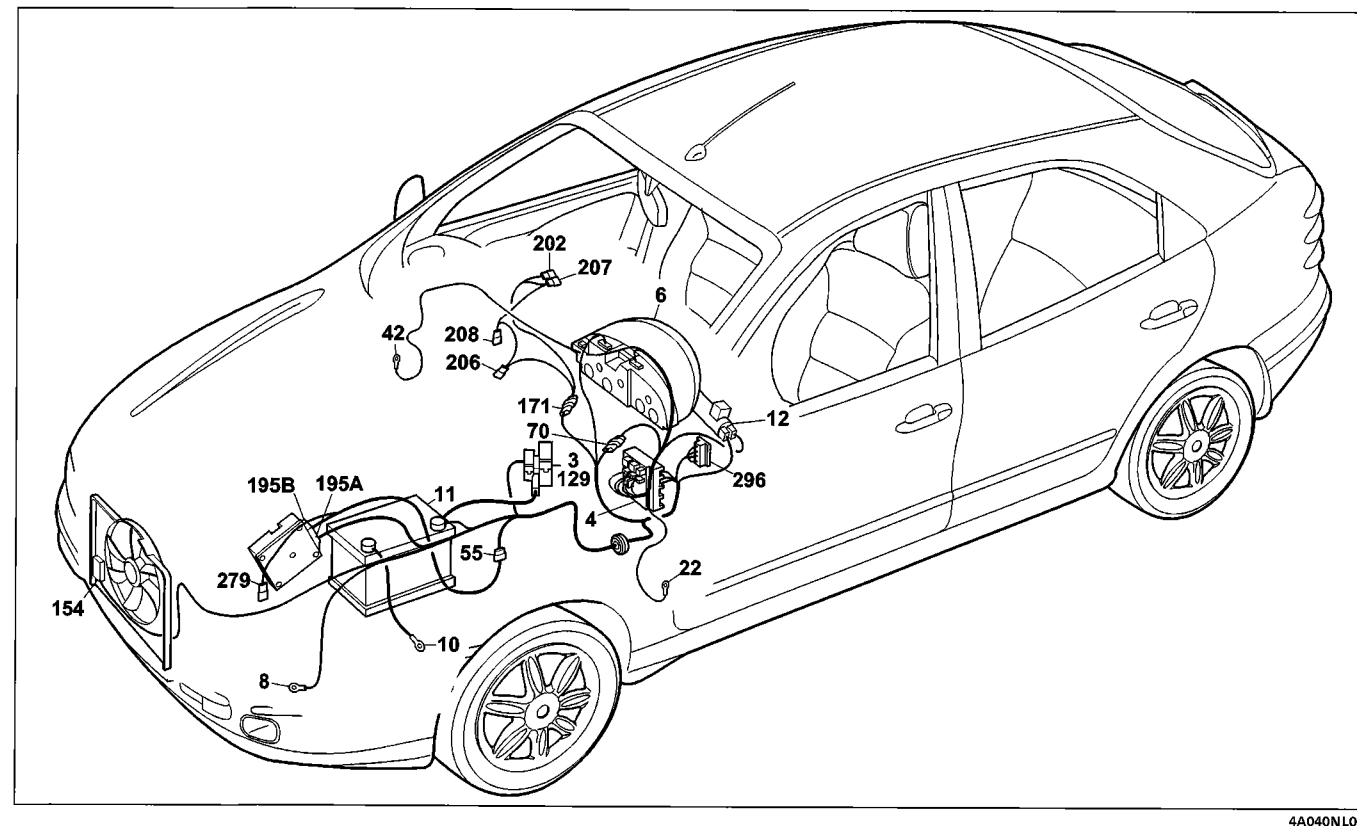
**Version without automatic air conditioning:**

Engine cooling with one fan - Engine coolant temperature gauge - Vehicle interior ventilation - Heater/air conditioning lighting



\* See side lights wiring diagram

### 55.

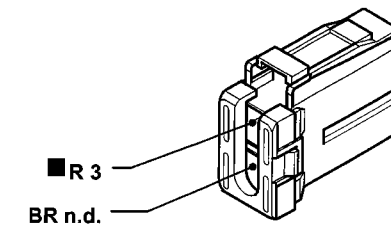


Version without automatic air conditioning:  
Engine cooling with one fan - Engine coolant temperature gauge - Vehicle interior ventilation - Heater/air conditioning lighting

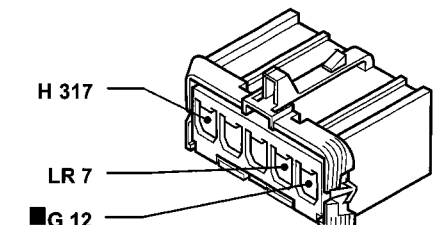
#### Component key

- |                                                              |                                                              |
|--------------------------------------------------------------|--------------------------------------------------------------|
| 3 Power fusebox:                                             | 129 30A power fuse protecting engine cooling fan             |
| A 30A fuse protecting injection system (60A for TD versions) | 154 Engine cooling fan                                       |
| B 40A fuse protecting ignition system                        | 171 Connection for heater unit cables                        |
| C 80A fuse protecting optional equipment                     | 195 Injection/ignition electronic control unit (1581)        |
| D 80A fuse protecting junction unit                          | 202 Heater/air conditioning bulbs                            |
| 4 Junction unit                                              | 206 Heater/air conditioning fan                              |
| E1 Switch discharge relay                                    | 207 Heater/air conditioning system speed control switch      |
| 6 Instrument panel:                                          | 208 Heater/air conditioning system limit resistor            |
| X Engine coolant temperature gauge                           | 279 Engine coolant temperature twin sender unit              |
| Y Electronic module                                          | 284 Cooling fan relay feed                                   |
| 8 Left front earth                                           | 296 Fuse holder base on front cable                          |
| 10 Battery earth on bodyshell                                | F 7.5A fuse protecting electronic injection system/Fiat-CODE |
| 11 Battery                                                   | N.D. Ultrasound welding taped in cable loom                  |
| 12 Ignition switch                                           |                                                              |
| 22 Left facia earth                                          |                                                              |
| 42 Right dashboard earth                                     |                                                              |
| 55 Connection between front cables/fuel level gauge          |                                                              |
| 70 Connection between facia/front leads                      |                                                              |

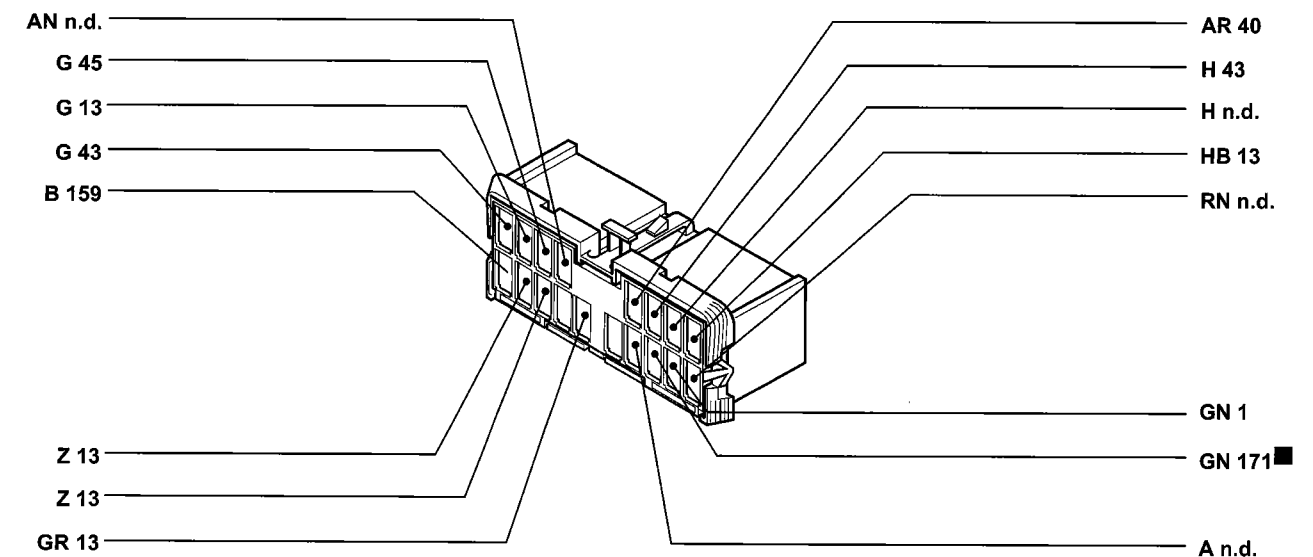
#### 4A Junction unit



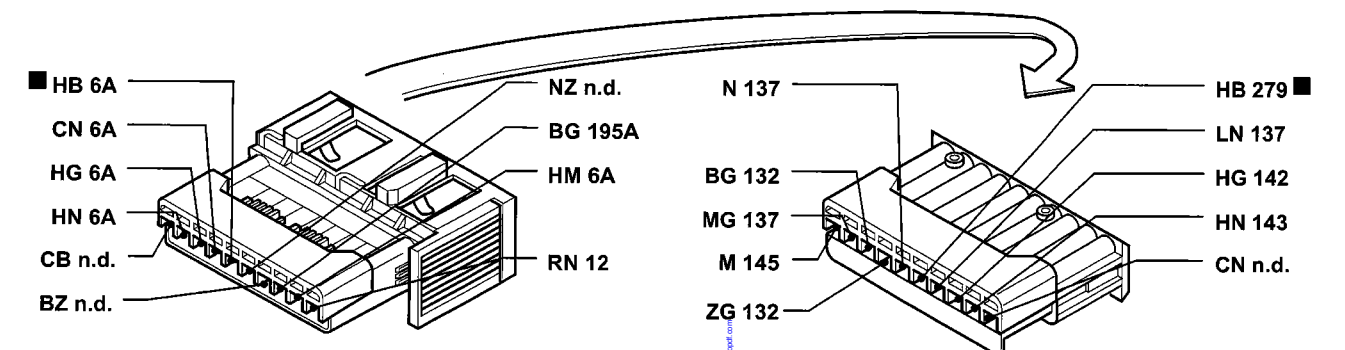
#### 4F Junction unit



#### 4D Junction unit

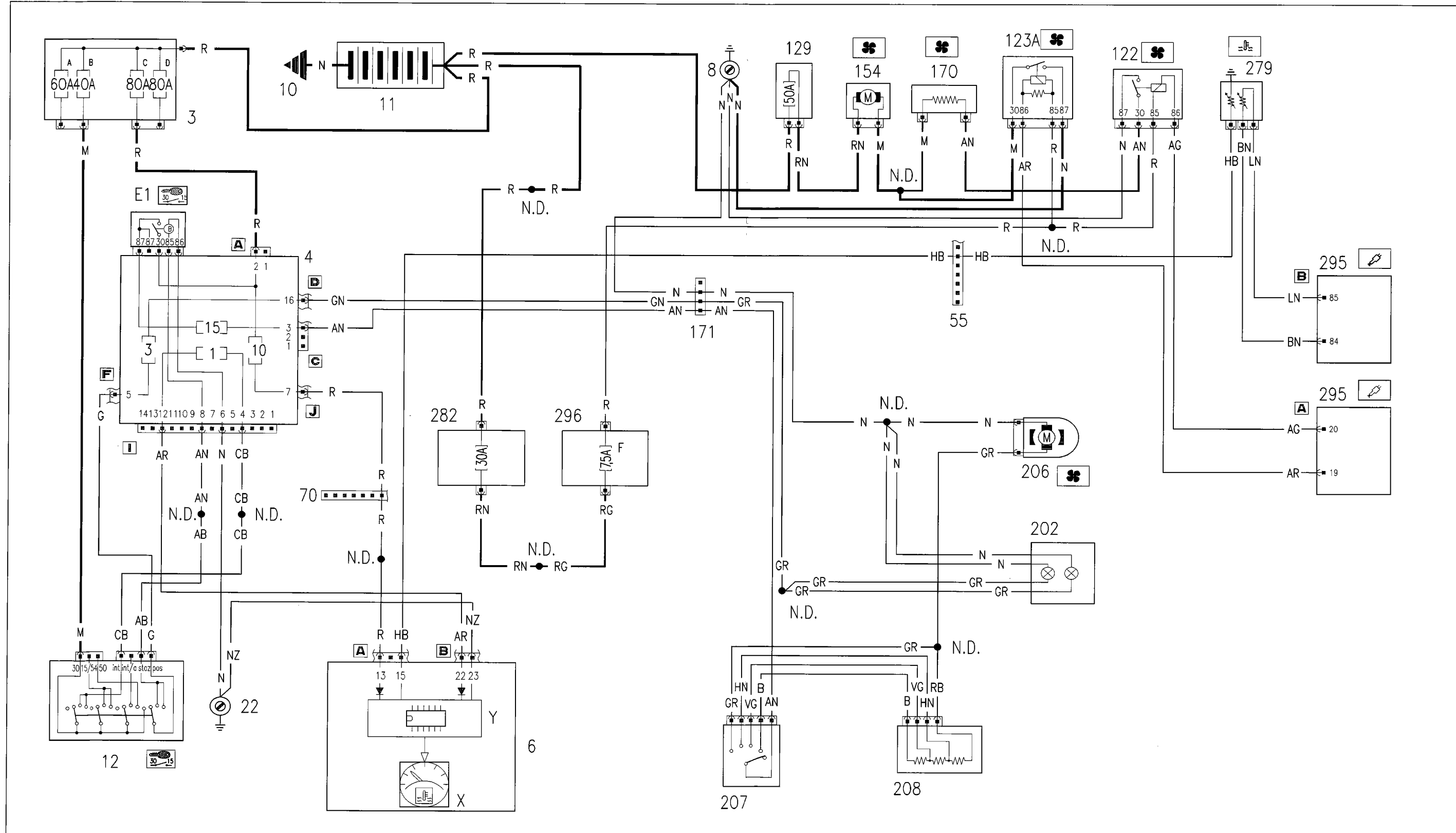


#### 55 Connection between front cables/engine pre-wiring



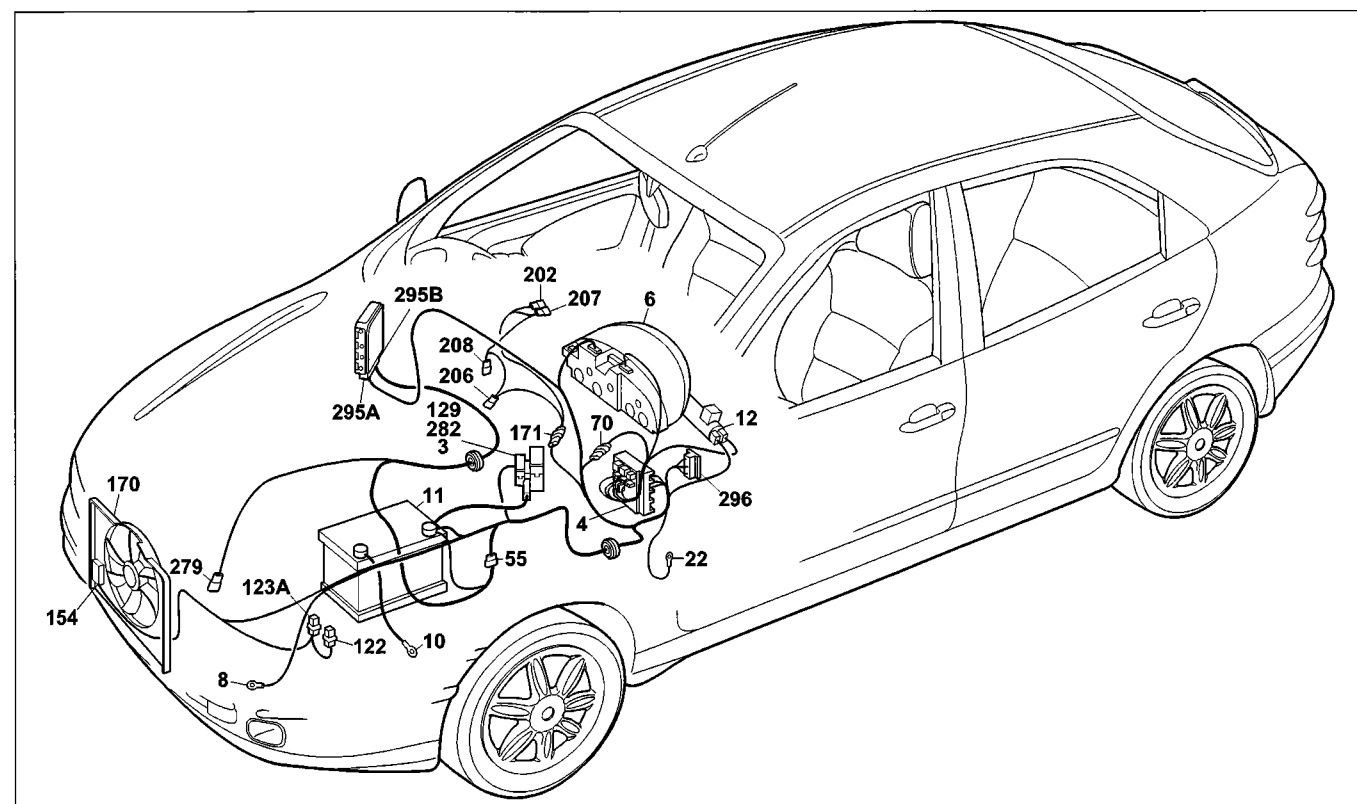
The cables concerned are marked in the wiring diagram with a square

Version without automatic air conditioning:  
Engine cooling with one fan - Engine coolant temperature gauge - Vehicle interior ventilation - Heater/air conditioning lighting





### 55.



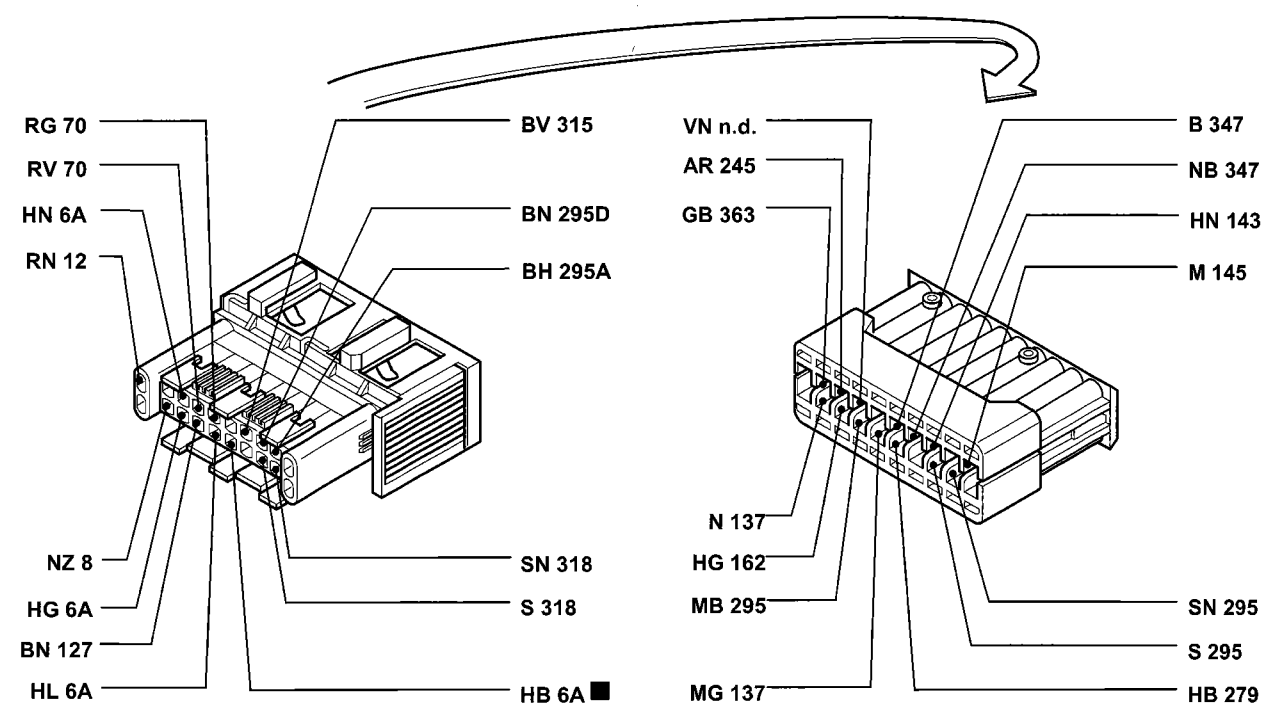
4A042NL01

Engine cooling with one fan - Engine coolant temperature gauge - Vehicle interior ventilation - Heater/air conditioning lighting

#### Component key

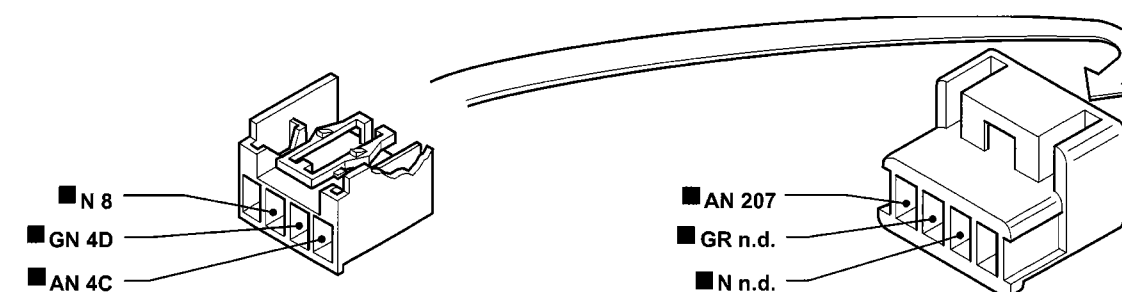
- |                                                                                                                                                                                                              |                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system (60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting optional equipment<br>D 80A fuse protecting junction unit | 129 50A power fuse protecting engine cooling fan                                                    |
| 4 Junction unit<br>E1 Switch discharge relay                                                                                                                                                                 | 154 Engine cooling fan                                                                              |
| 6 Instrument panel:<br>X Engine coolant temperature gauge<br>Y Electronic module                                                                                                                             | 170 Engine cooling fan limit resistor                                                               |
| 8 Left front earth                                                                                                                                                                                           | 171 Connection for heater unit cables                                                               |
| 10 Battery earth on bodyshell                                                                                                                                                                                | 202 Heater/air conditioning bulbs                                                                   |
| 11 Battery                                                                                                                                                                                                   | 206 Heater/air conditioning fan                                                                     |
| 12 Ignition switch                                                                                                                                                                                           | 208 Heater/air conditioning system limit resistor                                                   |
| 22 Left fascia earth                                                                                                                                                                                         | 279 Engine coolant temperature twin sender unit                                                     |
| 55 Connection between front cables/fuel level gauge                                                                                                                                                          | 282 7.5A fuse protecting Fiat CODE/electronic injection (60 for UNIJET)                             |
| 70 Connection between fascia/front leads                                                                                                                                                                     | 295 Injection/ignition electronic control unit 1910 TD UNIJET                                       |
| 122 Engine cooling fan low speed relay feed                                                                                                                                                                  | 296 Fuse holder base on front cable<br>F 7.5A fuse protecting electronic injection system/Fiat-CODE |
| 123A Engine cooling fan high speed relay feed                                                                                                                                                                | N.D. Ultrasound welding taped in cable loom                                                         |

#### 55 Connection between front cables/engine pre-wiring



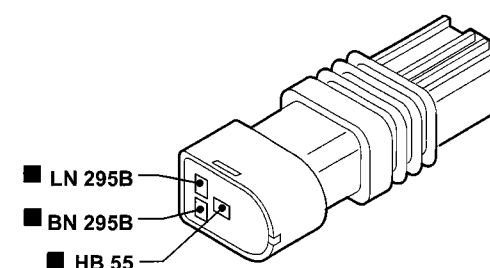
4A042NL02

#### 171 Connection for heater unit cables



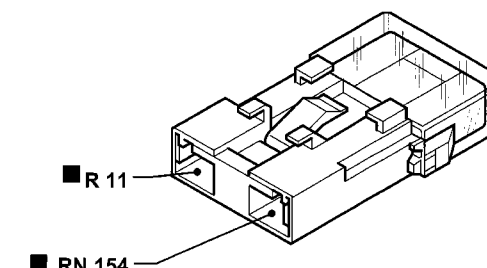
4A042NL03

#### 279 Engine coolant temperature twin sender unit (1910 JTD)



4A042NL04

#### 129 Power fuse protecting engine cooling fan (1910 JTD without air conditioning)

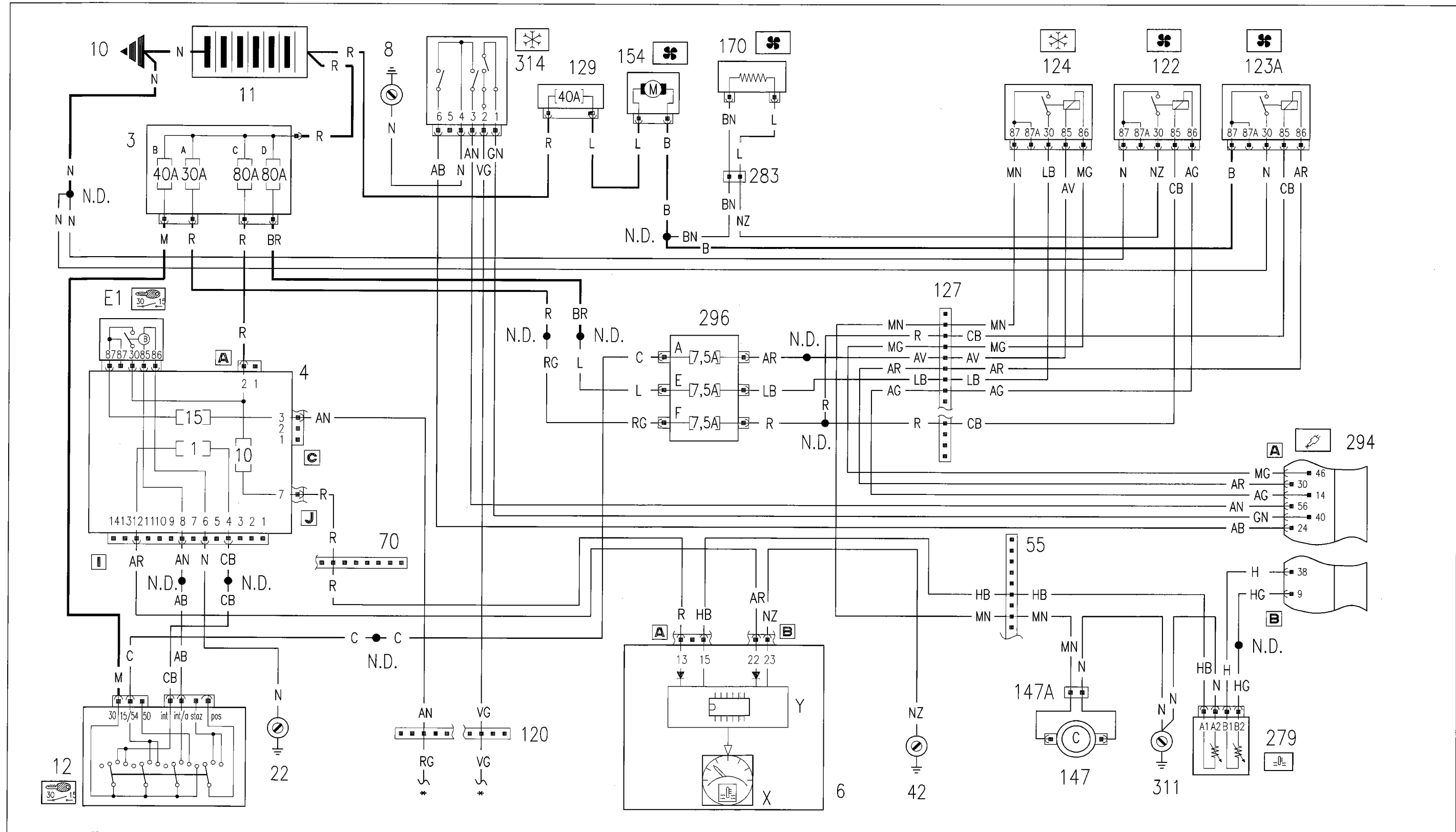


4A042NL05

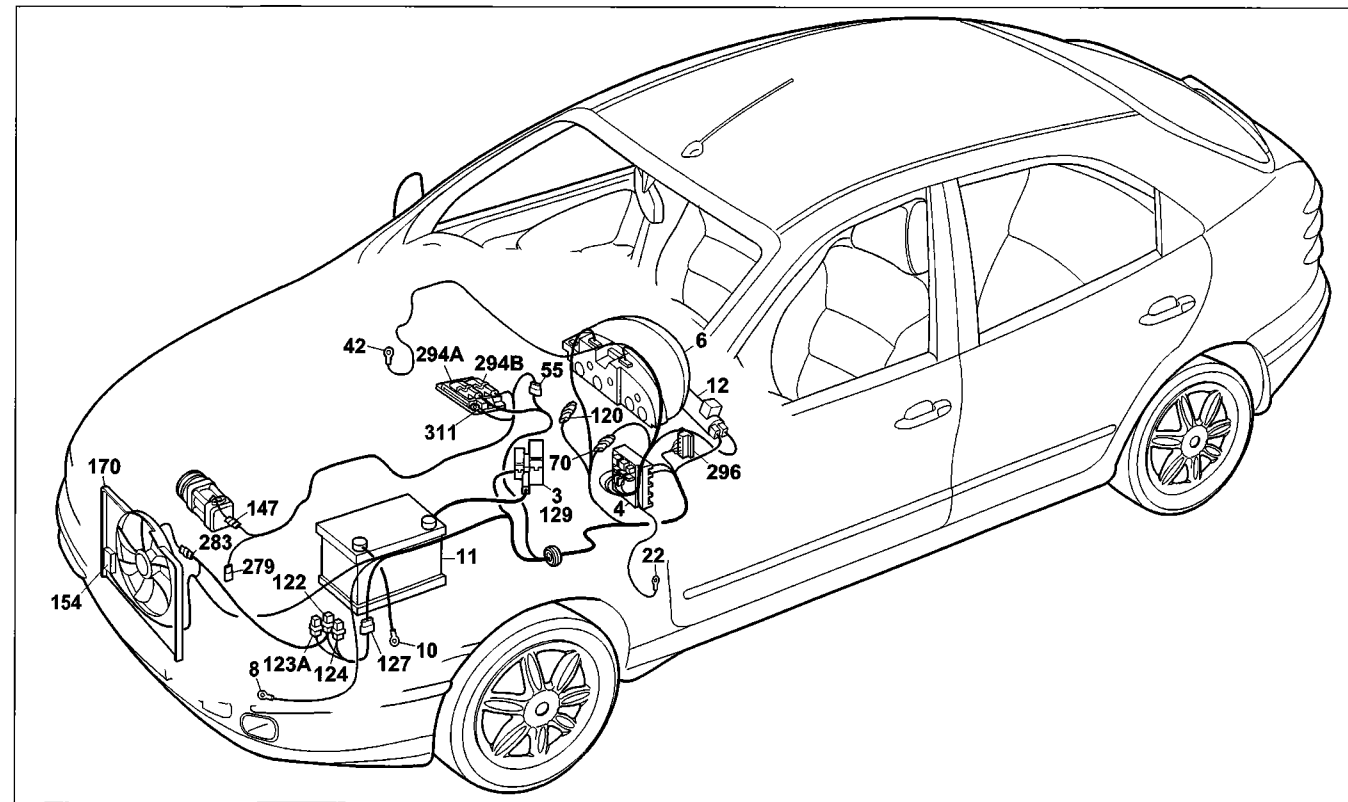
The cables concerned are marked in the wiring diagram with a square



Version with automatic air conditioning:  
Engine cooling with one fan - Engine coolant temperature gauge



\* See air conditioning wiring diagram



4A044NL01

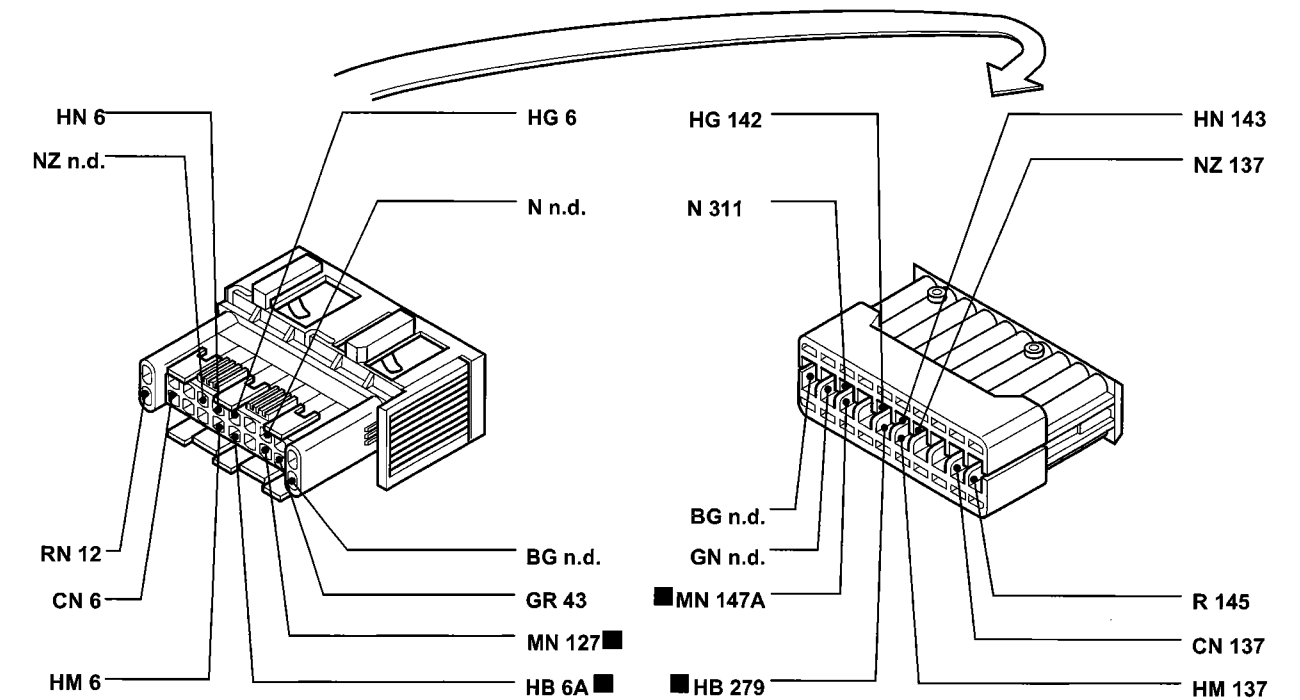
Version with automatic air conditioning:  
Engine cooling with one fan - Engine coolant temperature gauge

### Component key

- |                                                              |                                                                                |
|--------------------------------------------------------------|--------------------------------------------------------------------------------|
| 3 Power fusebox:                                             | 127 Connection between front left cable/cable on relay holder bracket          |
| A 30A fuse protecting injection system (60A for TD versions) | 129 50A power fuse protecting engine cooling fan                               |
| B 40A fuse protecting ignition system                        | 147 Compressor for air conditioning                                            |
| C 80A fuse protecting optional equipment                     | 147A Compressor for air conditioning                                           |
| D 80A fuse protecting junction unit                          | 154 Engine cooling fan                                                         |
| 4 Junction unit                                              | 170 Engine cooling fan limit resistor                                          |
| E1 Switch discharge relay                                    | 279 Engine coolant temperature twin sender unit                                |
| 6 Instrument panel:                                          | 283 Cable connection on mounting bracket/resistor                              |
| X Engine coolant temperature gauge                           | 294 Injection/ignition electronic control unit 1242                            |
| Y Electronic module                                          | 296 Fuse holder base on front cable                                            |
| 8 Left front earth                                           | A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm |
| 10 Battery earth on bodyshell                                | F 7.5A fuse protecting electronic injection system/Fiat-CODE                   |
| 11 Battery                                                   | 297 Air conditioning control unit                                              |
| 12 Ignition switch                                           | 311 Engine pre-wiring earth 1242 16V                                           |
| 22 Left facia earth                                          |                                                                                |
| 42 Right dashboard earth                                     |                                                                                |
| 55 Connection between front cables/fuel level gauge          |                                                                                |
| 70 Connection between facia/front leads                      |                                                                                |
| 120 Connection for air conditioning unit cables              |                                                                                |
| 122 Engine cooling fan low speed relay feed                  |                                                                                |
| 123A Engine cooling fan high speed relay feed                |                                                                                |
|                                                              | N.D. Ultrasound welding taped in cable loom                                    |

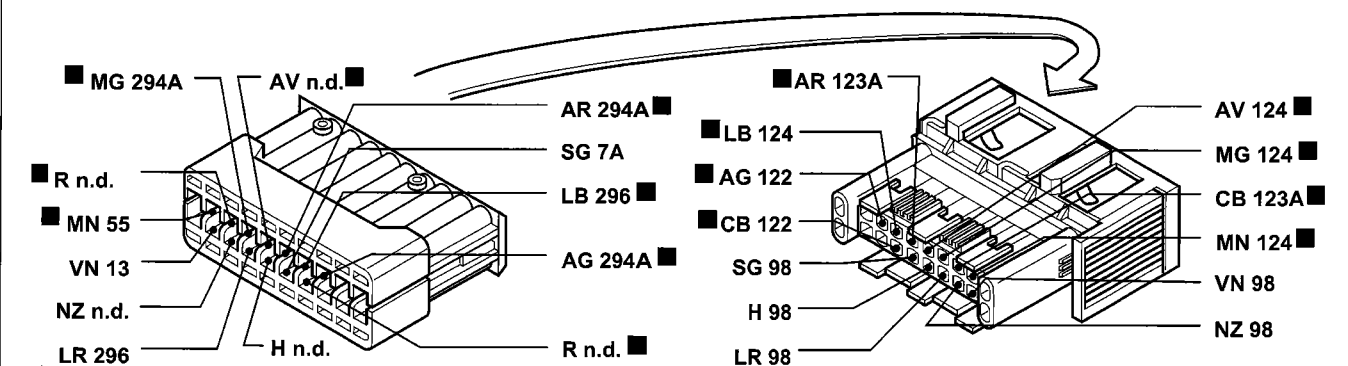
## 55.

### 55 Connection between front cables/engine pre-wiring



4A044NL02

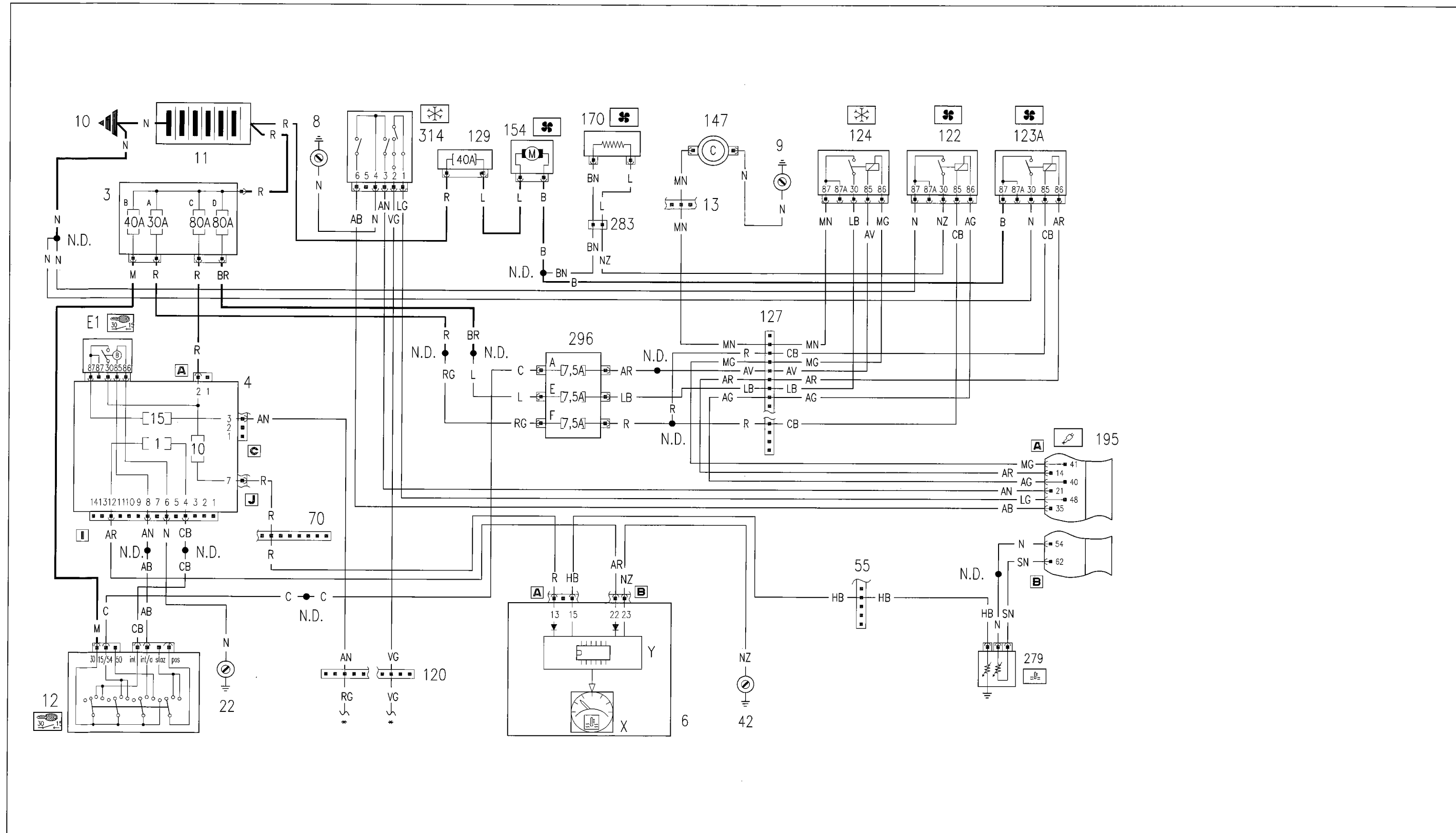
### 127 Connection between front left cables/cable on relay holder bracket



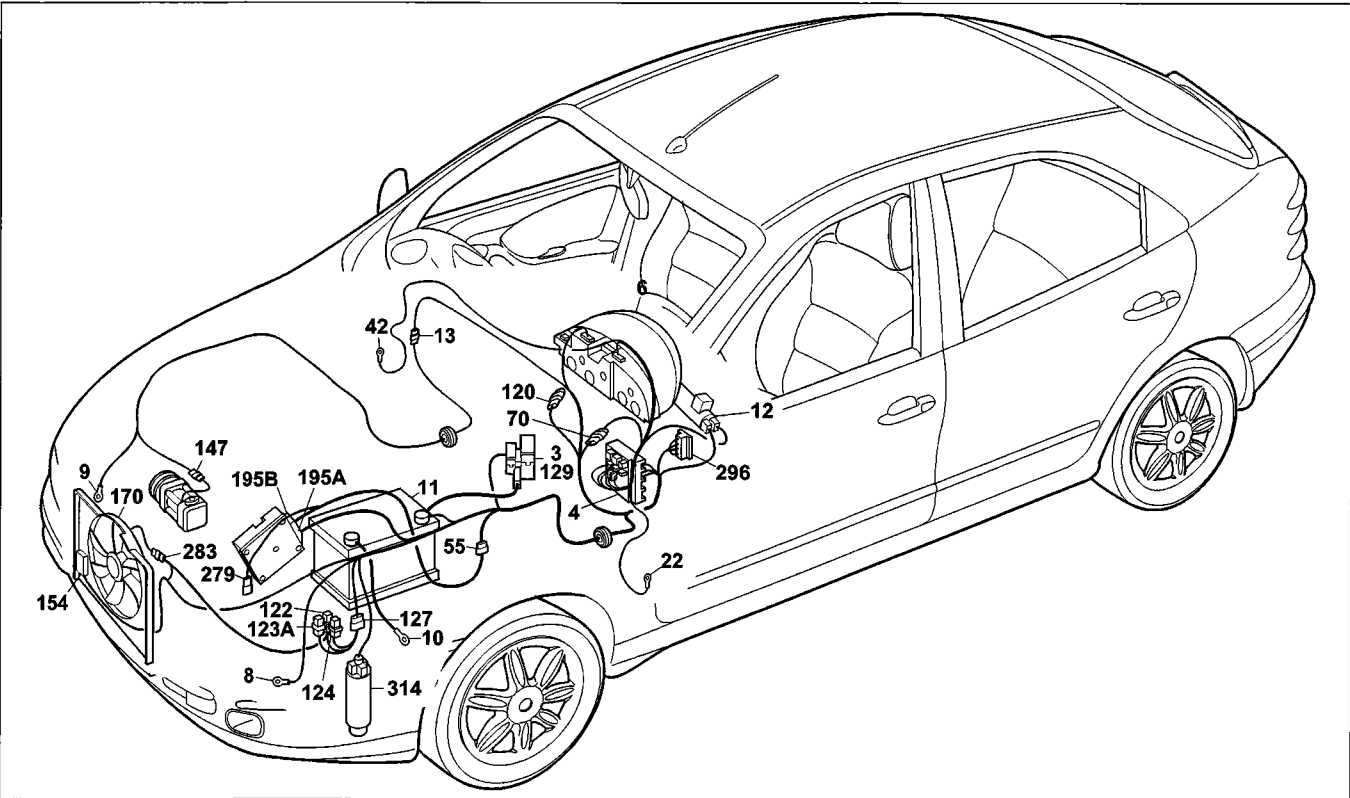
4A044NL03

The cables concerned are marked in the wiring diagram with a square

Version with automatic air conditioning:  
Engine cooling with one fan - Engine coolant temperature gauge



\* See air conditioning wiring diagram



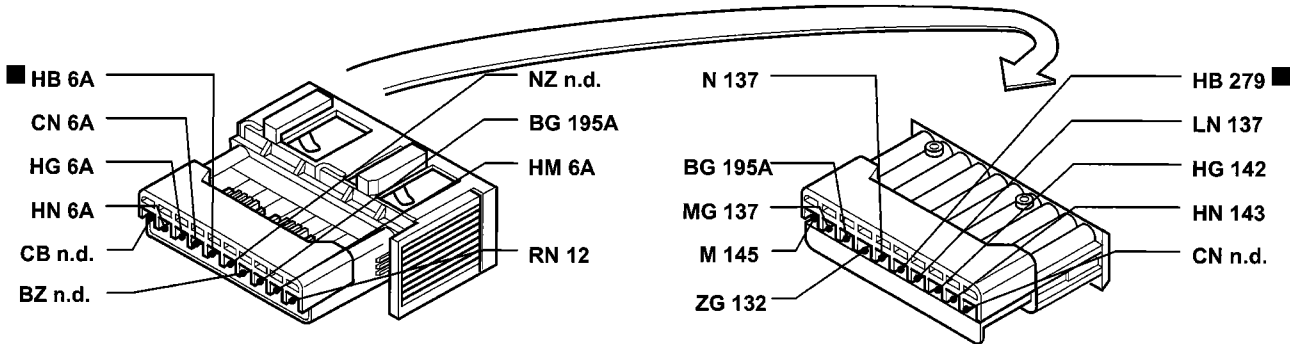
Version with automatic air conditioning:  
Engine cooling with one fan - Engine coolant temperature gauge

Component key

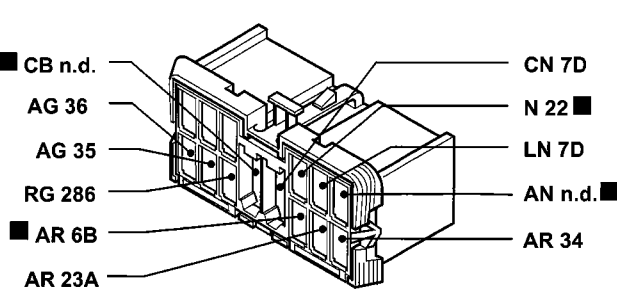
- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system<br>(60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting optional equipment<br>D 80A fuse protecting junction unit                                                                                                                                                                                                                                                                                                                                               | 123A Engine cooling fan high speed relay feed<br>124 Air conditioning compressor relay feed<br>127 Connection between front left cable/cable<br>on relay holder bracket<br>129 50A power fuse protecting engine cooling<br>fan<br>147 Compressor for air conditioning<br>154 Engine cooling fan<br>170 Engine cooling fan limit resistor<br>195 Injection/ignition electronic control unit<br>(1581)<br>279 Engine coolant temperature twin sender<br>unit<br>283 Cable connection on mounting bracket/<br>resistor<br>296 Fuse holder base on front cable<br>F 7.5A fuse protecting electronic injection<br>system/Fiat-CODE<br>314 Four stage pressure switch<br>N.D. Ultrasound welding taped in cable loom |
| 4 Junction unit<br>E1 Switch discharge relay<br>6 Instrument panel:<br>X Engine coolant temperature gauge<br>Y Electronic module<br>8 Left front earth<br>9 Right front earth<br>10 Battery earth on bodyshell<br>11 Battery<br>12 Ignition switch<br>13 Connection between right/left front cables<br>22 Left facia earth<br>42 Right dashboard earth<br>55 Connection between front cables/fuel level<br>gauge<br>70 Connection between facia/front leads<br>120 Connection for air conditioning unit cables<br>122 Engine cooling fan low speed relay feed |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

55.

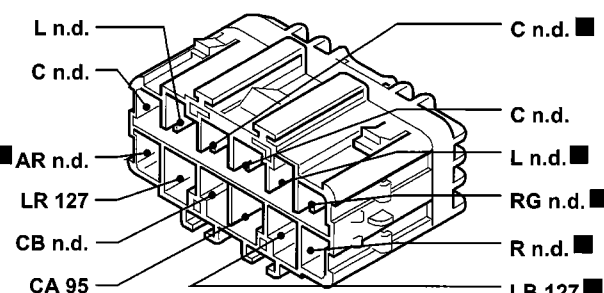
55 Connection between front cables/engine pre-wiring



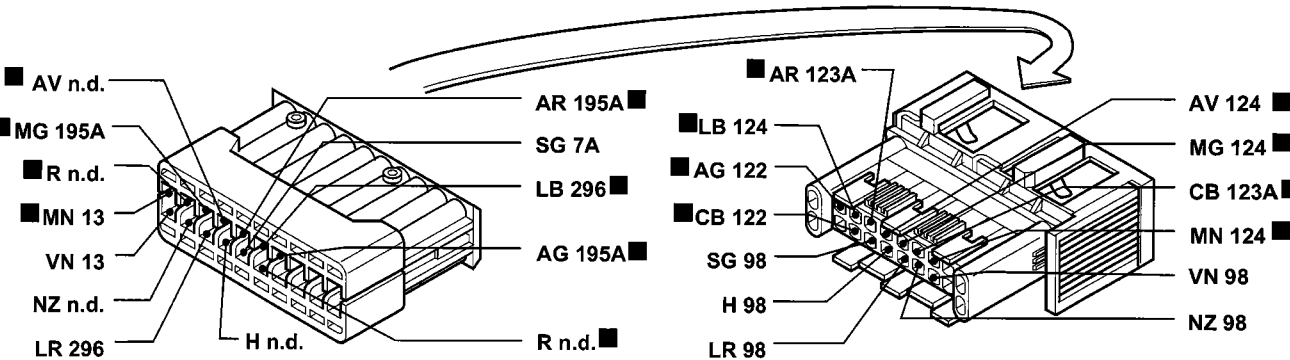
4l Junction unit



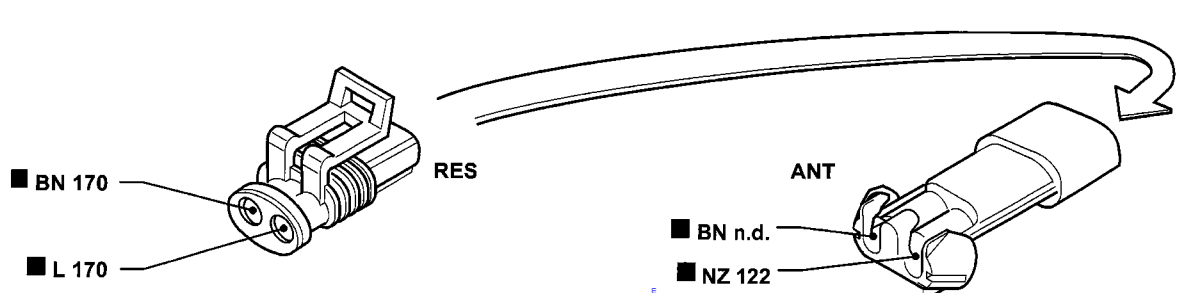
296 Fuse holder base on front cable



127 Connection between front left cables/cable on relay holder bracket



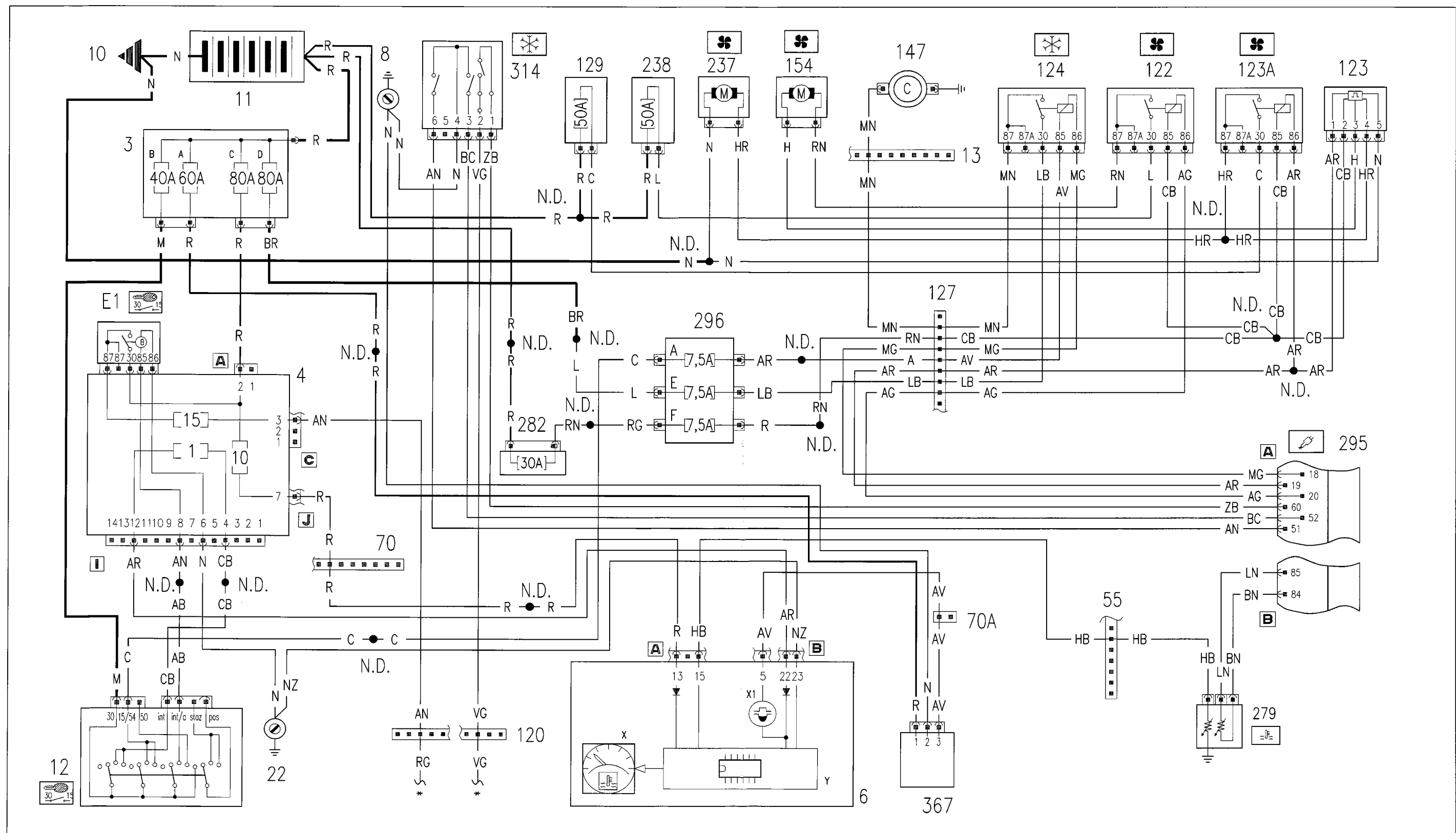
283 Connection between front/resistor cables



The cables concerned are marked in the wiring diagram with a square

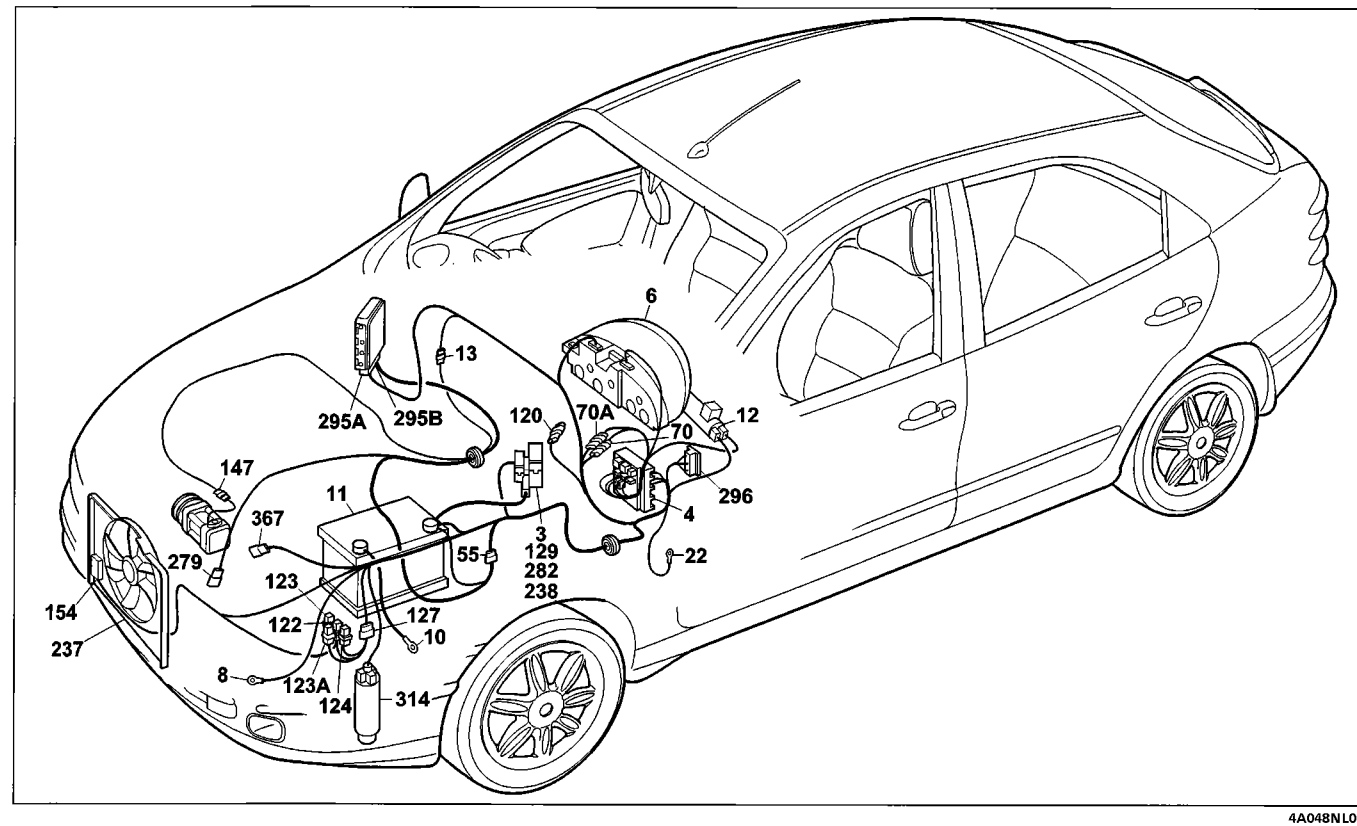
**Version with automatic air conditioning:**

**Engine cooling with two fans - Engine coolant temperature gauge - Water in fuel filter sensor**



\* See air conditioning wiring diagram



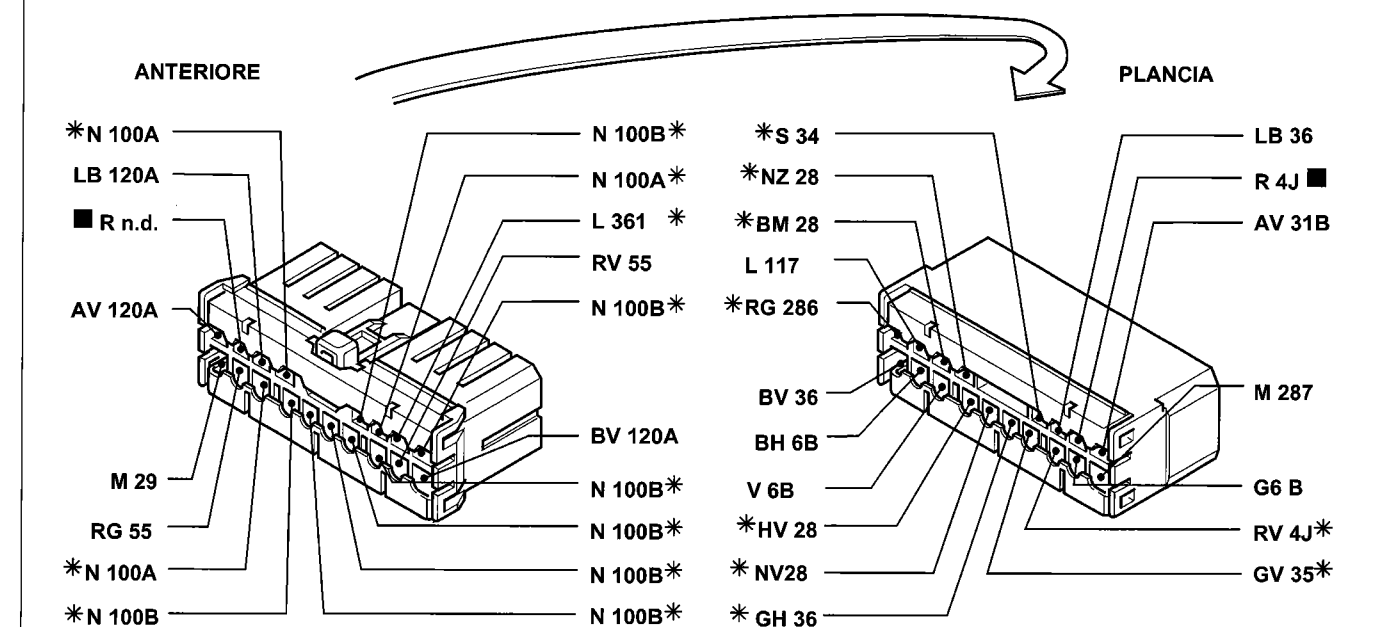


**Version with automatic air conditioning:**  
**Engine cooling with two fans - Engine coolant temperature gauge - Water in fuel filter sensor**

### Component key

- |      |                                                              |      |                                                                                                 |
|------|--------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------|
| 3    | Power fusebox:                                               | 124  | Air conditioning compressor relay feed                                                          |
|      | A 30A fuse protecting injection system (60A for TD versions) | 127  | Connection between front left cable/cable on relay holder bracket                               |
|      | B 40A fuse protecting ignition system                        | 129  | 50A power fuse protecting engine cooling fan                                                    |
|      | C 80A fuse protecting optional equipment                     | 147  | Compressor for air conditioning                                                                 |
|      | D 80A fuse protecting junction unit                          | 154  | Engine cooling fan                                                                              |
| 4    | Junction unit                                                | 237  | Additional engine cooling fan                                                                   |
|      | E1 Switch discharge relay                                    | 238  | 60A fuse protecting engine cooling fan                                                          |
| 6    | Instrument panel:                                            | 279  | Engine coolant temperature twin sender unit                                                     |
|      | X Engine coolant temperature gauge                           | 282  | 30A fuse protecting Fiat CODE/electronic injection (60 for UNIJET)                              |
|      | X1 Water in fuel filter sensor                               | 295  | Injection/ignition electronic control unit 1910 TD UNIJET                                       |
|      | Y Electronic module                                          | 296  | Fuse holder base on front cable<br>F 7.5A fuse protecting electronic injection system/Fiat-CODE |
| 8    | Left front earth                                             | 314  | Four stage pressure switch                                                                      |
| 10   | Battery earth on bodyshell                                   | 367  | Water in fuel filter sensor (JTD)                                                               |
| 11   | Battery                                                      | N.D. | Ultrasound welding taped in cable loom                                                          |
| 12   | Ignition switch                                              |      |                                                                                                 |
| 13   | Connection between right/left front cables                   |      |                                                                                                 |
| 22   | Left facia earth                                             |      |                                                                                                 |
| 55   | Connection between front cables/fuel level gauge             |      |                                                                                                 |
| 70   | Connection between facia/front leads                         |      |                                                                                                 |
| 120  | Connection for air conditioning unit cables                  |      |                                                                                                 |
| 122  | Engine cooling fan low speed relay feed                      |      |                                                                                                 |
| 123A | Engine cooling fan high speed relay feed                     |      |                                                                                                 |

## 70 Connection between dashborad/front cables



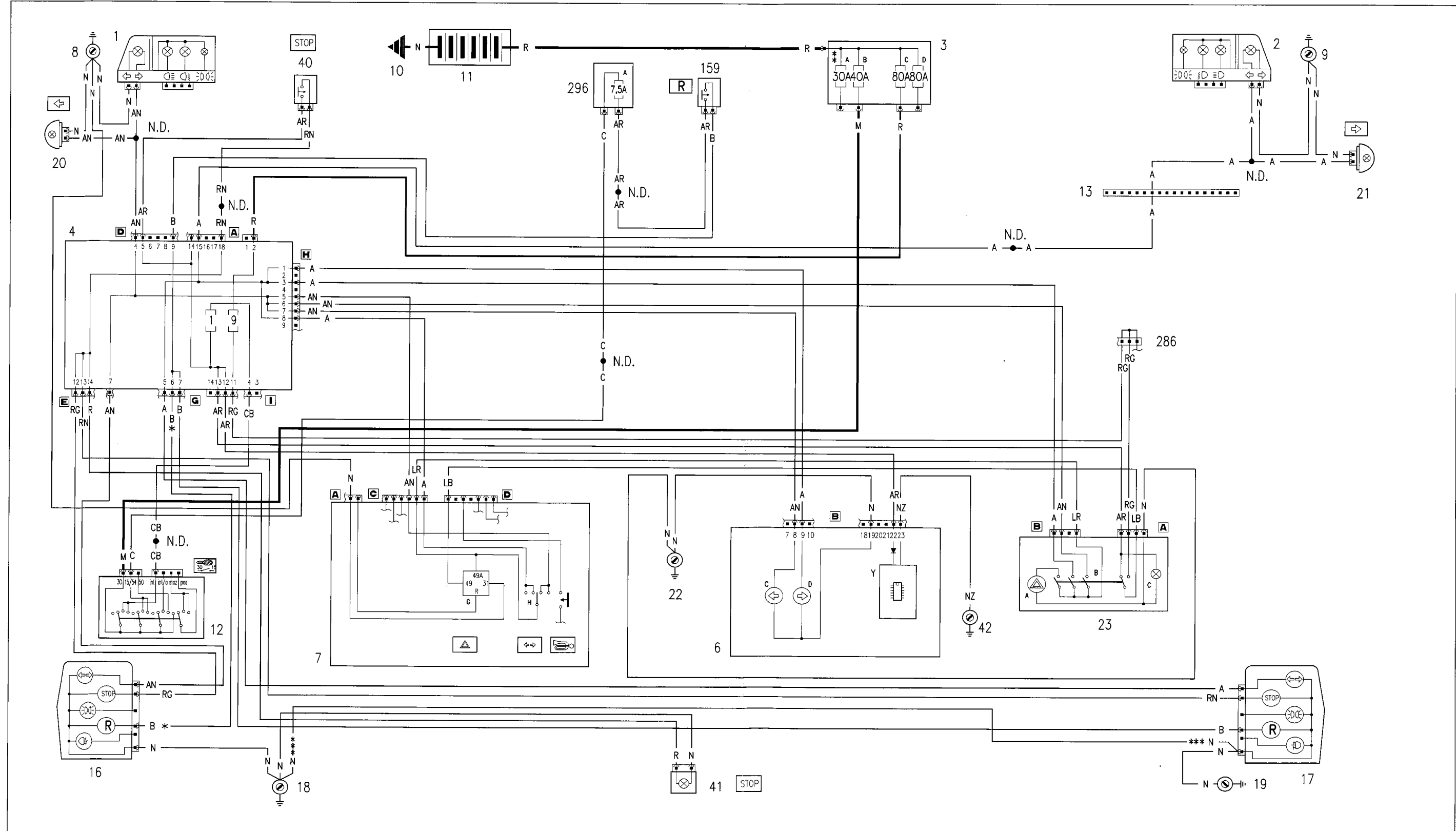
\* Variant connection for versions with alarm

The cables concerned are marked in the wiring diagram with a square



Trim level: SX - GT:

Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights -  
Brake lights failure warning light

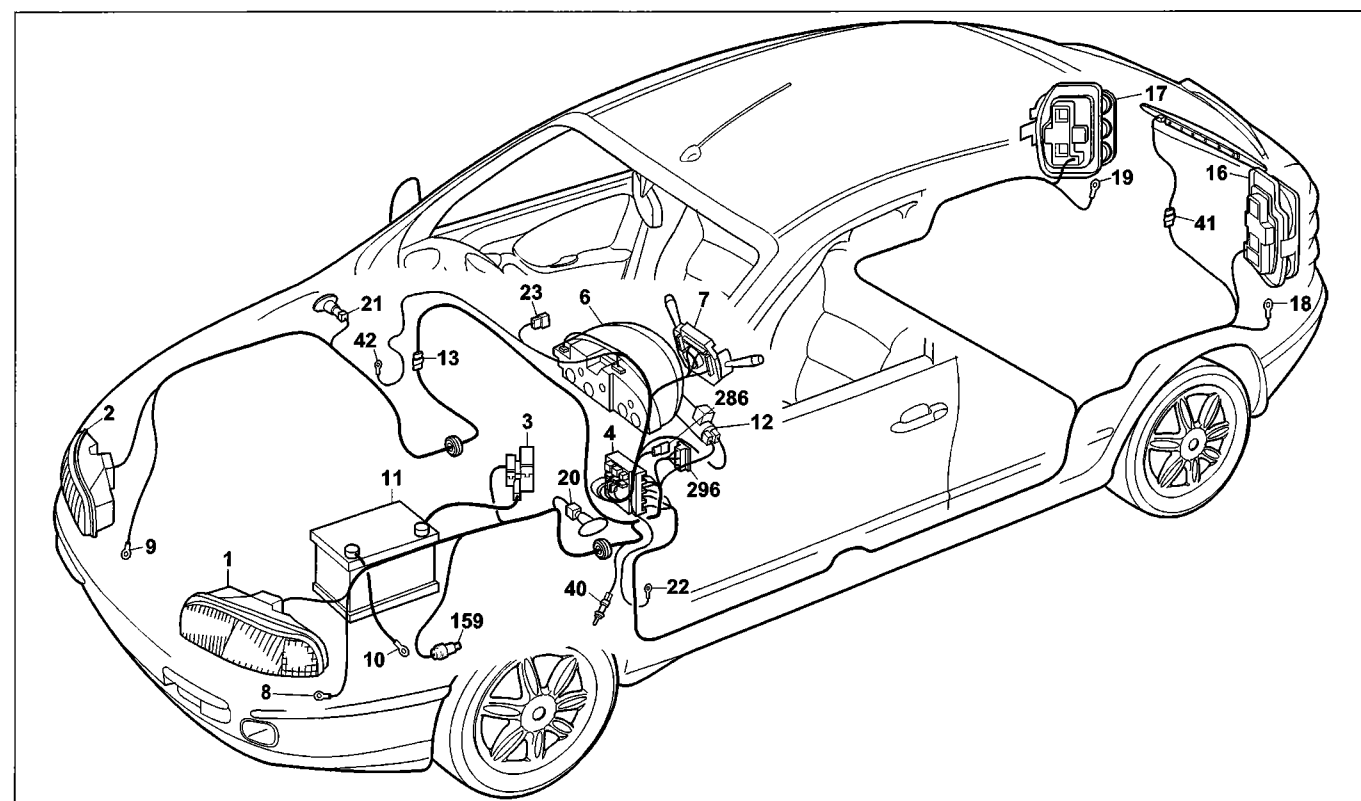


\* Non existent for the Bravo version

\*\* 60A fuse for the JTD version

\*\*\* Variant connection for the Brava version

### 55.



4A050NL01

Trim level SX – GT:

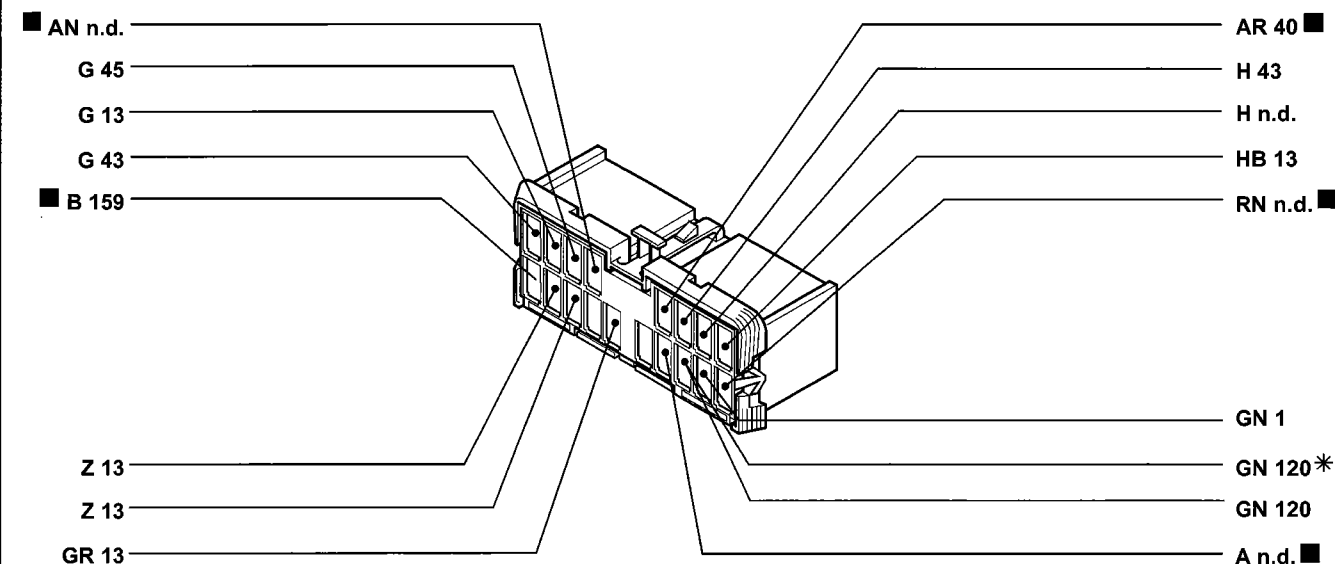
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights -  
Brake lights failure warning light

#### Component key

- |                                                              |                                                                                |
|--------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1 Left front light cluster                                   | 16 Left tail light cluster                                                     |
| 2 Right front light cluster                                  | 17 Right tail light cluster                                                    |
| 3 Power fusebox:                                             | 18 Left rear earth                                                             |
| A 30A fuse protecting injection system (60A for TD versions) | 19 Right rear earth                                                            |
| B 40A fuse protecting ignition system                        | 20 Left front side direction indicator                                         |
| C 80A fuse protecting optional equipment                     | 21 Right front side direction indicator                                        |
| D 80A fuse protecting junction unit                          | 22 Left facia earth                                                            |
| 4 Junction unit                                              | 23 Hazard warning lights switch unit                                           |
| 6 Instrument panel:                                          | A Hazard warning lights warning light                                          |
| C Left direction indicator warning light                     | B Hazard warning lights control switch                                         |
| D Right direction indicator warning light                    | C Hazard warning lights ideogram light                                         |
| Y Electronic module                                          | 40 Brake light control switch                                                  |
| 7 Stalk unit:                                                | 41 Additional brake light                                                      |
| H Direction indicators control switch                        | 42 Right dashboard earth                                                       |
| G Direction indicators/hazard warning lights switch          | 159 Reversing lights control switch                                            |
| 8 Left front earth                                           | 286 Circuit connection                                                         |
| 9 Right front earth                                          | 296 Fuse holder base on front cable                                            |
| 10 Battery earth on bodysell                                 | A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm |
| 11 Battery                                                   |                                                                                |
| 12 Ignition switch                                           |                                                                                |
| 13 Connection between right/left front cables                |                                                                                |

N.D. Ultrasound welding taped in cable loom

#### 4D Junction unit

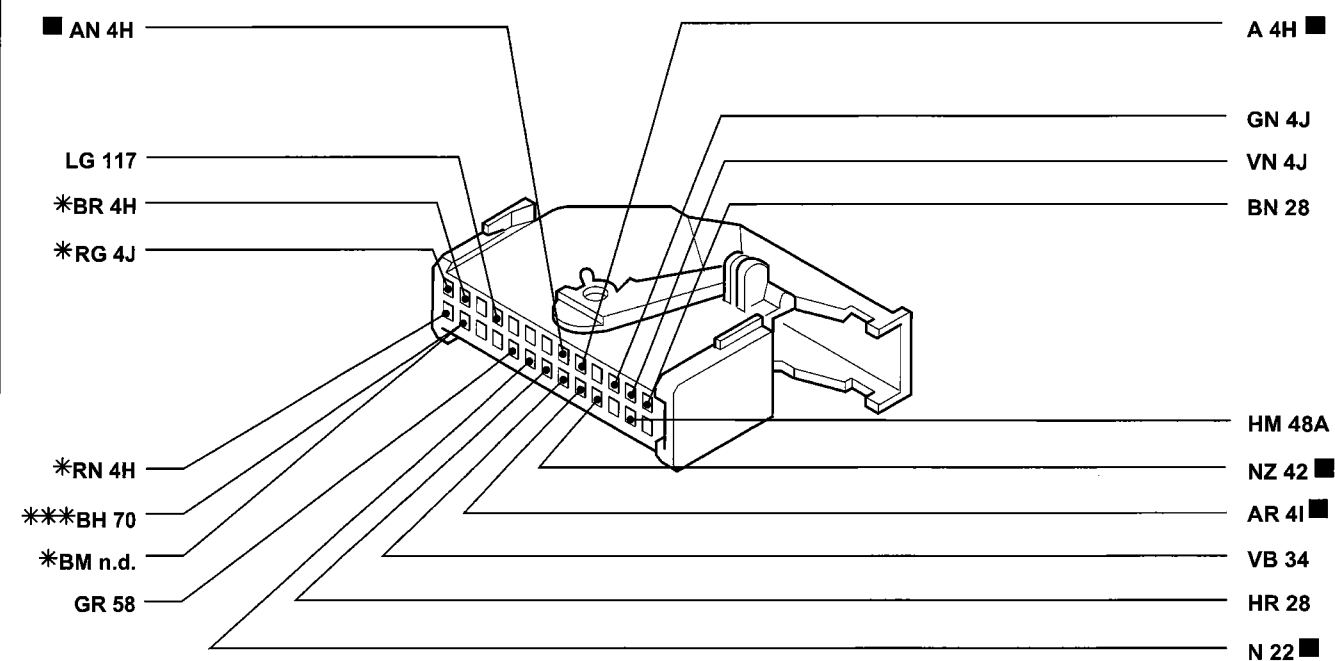


\* Variant connection for versions without air conditioning

\*\* Variant connection for versions with automatic transmission

4A050NL02

#### 6B Instrument panel



\* Non existent for SX-GT trim levels

\*\* Variant connection for versions with passenger AIR BAG

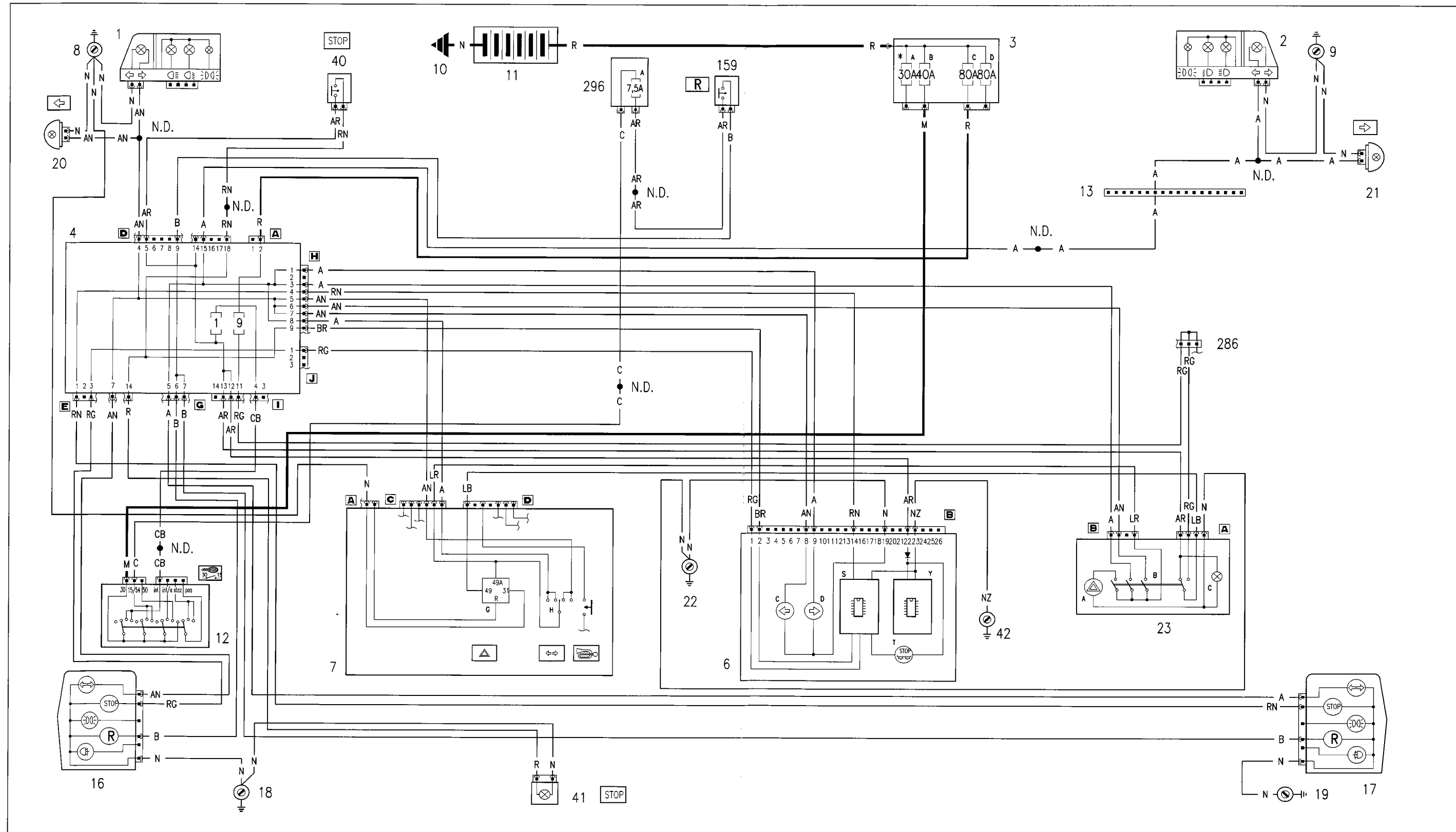
\*\*\* Variant connection for SX-GT trim levels with alarm

4A050NL03

The cables concerned are marked in the wiring diagram with a square

ELX trim level:

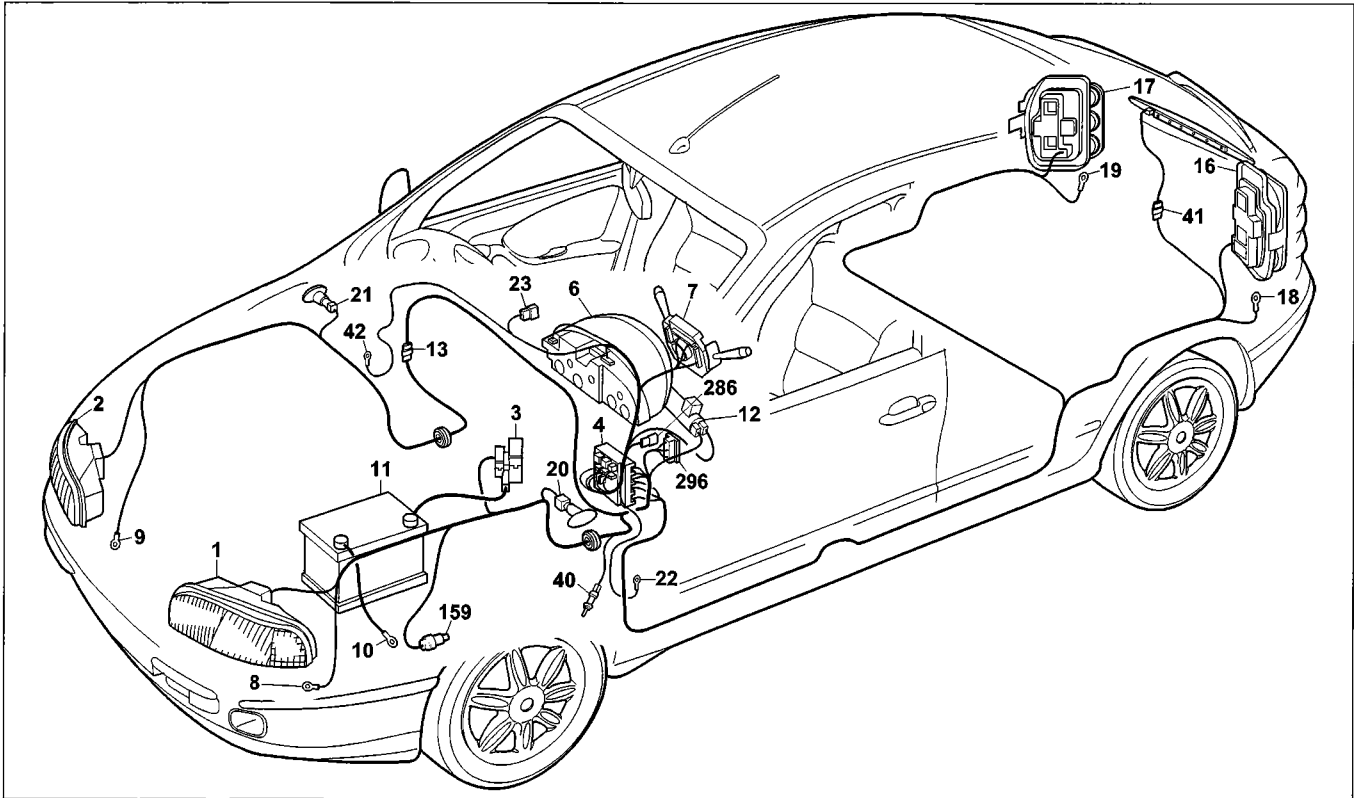
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights -  
Vehicle brake lights failure warning light



\* 60A fuse for the JTD version

4A051NL01

55.



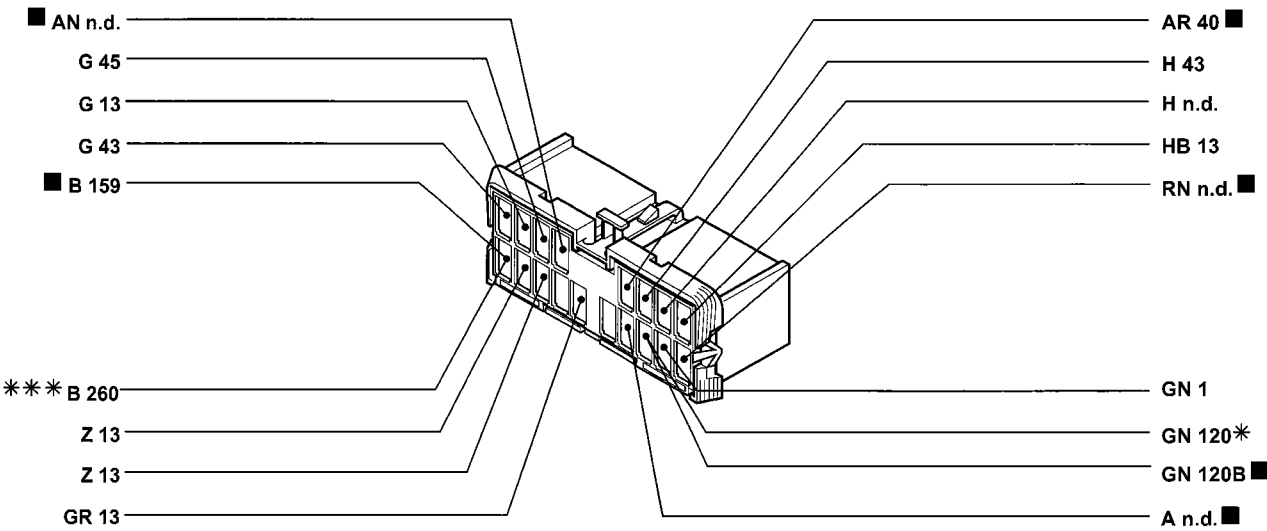
ELX trim level:  
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights -  
Vehicle brake lights failure warning light

Component key

- |                                                                 |                                                                                                                                                                                                               |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Left front light cluster                                      | 13 Connection between right/left front cables                                                                                                                                                                 |
| 2 Right front light cluster                                     | 16 Left tail light cluster                                                                                                                                                                                    |
| 3 Power fusebox:                                                | 17 Right tail light cluster                                                                                                                                                                                   |
| A 30A fuse protecting injection system<br>(60A for TD versions) | 18 Left rear earth                                                                                                                                                                                            |
| B 40A fuse protecting ignition system                           | 19 Right rear earth                                                                                                                                                                                           |
| C 80A fuse protecting optional equipment                        | 20 Left front side direction indicator                                                                                                                                                                        |
| D 80A fuse protecting junction unit                             | 21 Right front side direction indicator                                                                                                                                                                       |
| 4 Junction unit                                                 | 22 Left fascia earth                                                                                                                                                                                          |
| 6 Instrument panel:                                             | 23 Hazard warning lights switch unit                                                                                                                                                                          |
| C Left direction indicator warning light                        | A Hazard warning lights warning light                                                                                                                                                                         |
| D Right direction indicator warning light                       | B Hazard warning lights control switch                                                                                                                                                                        |
| S Brake lights failure electronic module                        | C Hazard warning lights ideogram light                                                                                                                                                                        |
| T Brake lights failure warning light                            | 40 Brake light control switch                                                                                                                                                                                 |
| Y Electronic module                                             | 41 Additional brake light                                                                                                                                                                                     |
| 7 Stalk unit:                                                   | 42 Right dashboard earth                                                                                                                                                                                      |
| H Direction indicators control switch                           | 159 Reversing lights control switch                                                                                                                                                                           |
| G Direction indicators/hazard warning lights<br>switch          | 286 Circuit connection                                                                                                                                                                                        |
| 8 Left front earth                                              | 296 Fuse holder base on front cable                                                                                                                                                                           |
| 9 Right front earth                                             | A 7.5A fuse protecting cooling sys-<br>tem/electronic injection; A.C. system;<br>Alarm; Direction indicators and warning<br>light; Hazard warning lights and warning<br>light; Brake lights; Reversing lights |
| 10 Battery earth on bodysheet                                   |                                                                                                                                                                                                               |
| 11 Battery                                                      |                                                                                                                                                                                                               |
| 12 Ignition switch                                              |                                                                                                                                                                                                               |

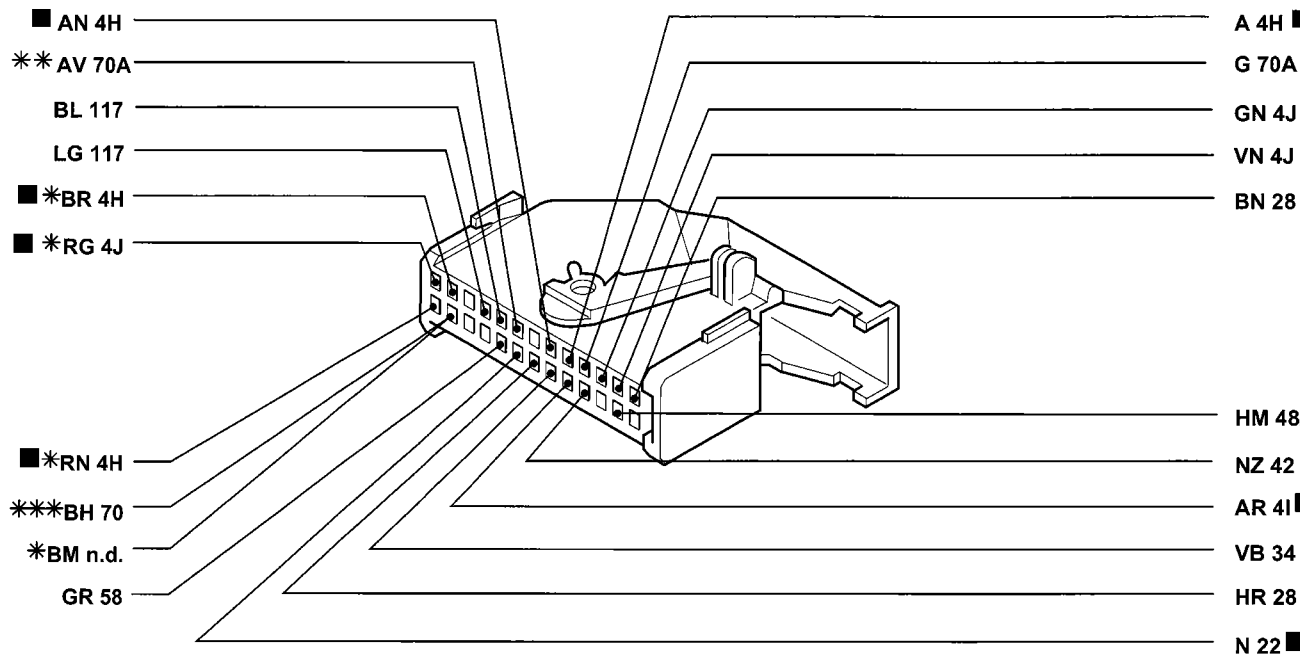
N.D. Ultrasound welding taped in cable loom

4D Junction unit



- \* Variant connection for versions without air conditioning
- \*\* Variant connection for JTD versions
- \*\*\* Variant connection for versions with automatic transmission

6B Instrument panel

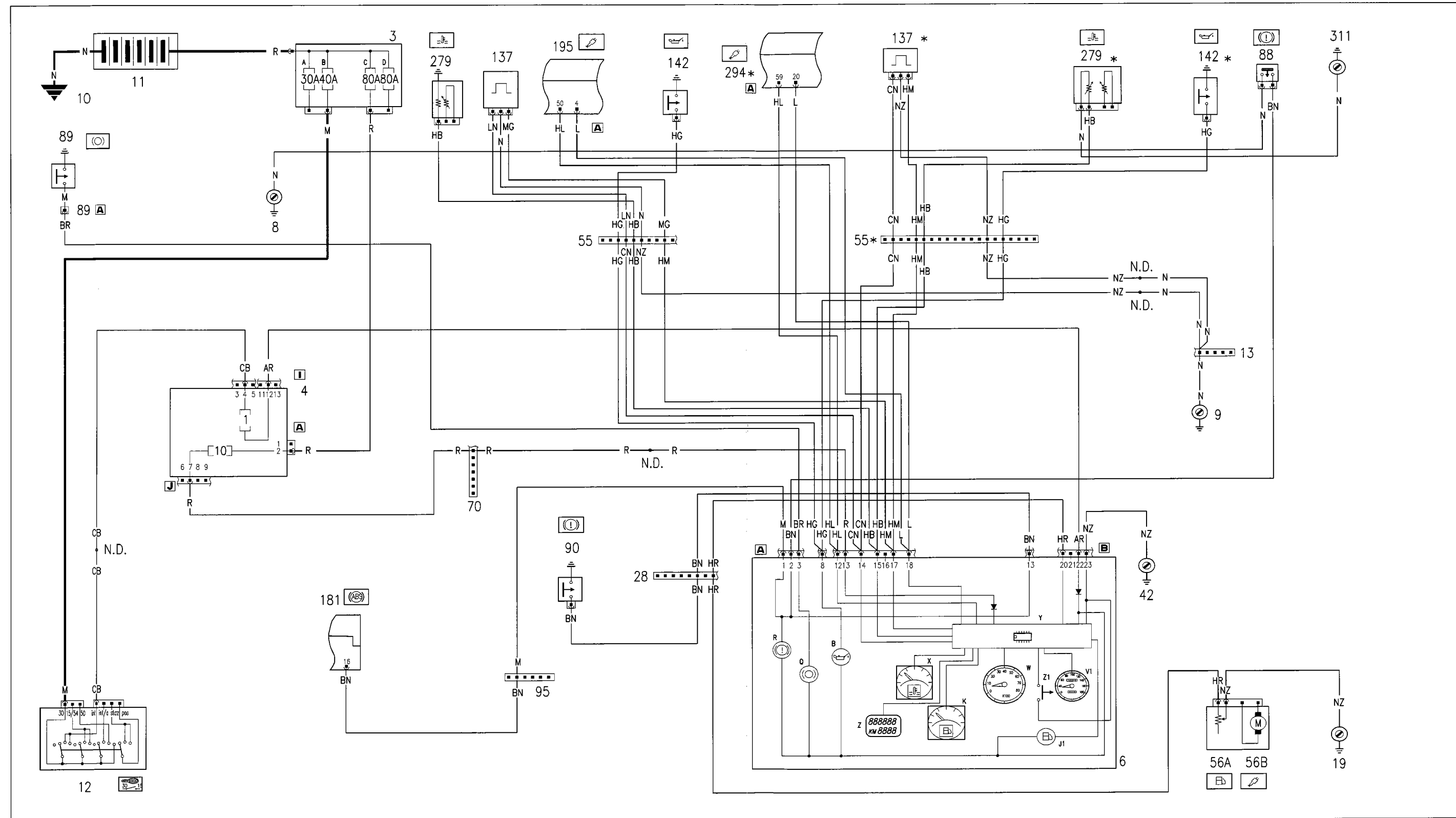


- \* Non existent for SX-GT trim levels
- \*\* Variant connection for versions with passenger AIR BAG
- \*\*\* Variant connection for SX-GT trim levels with alarm

The cables concerned are marked in the wiring diagram with a square

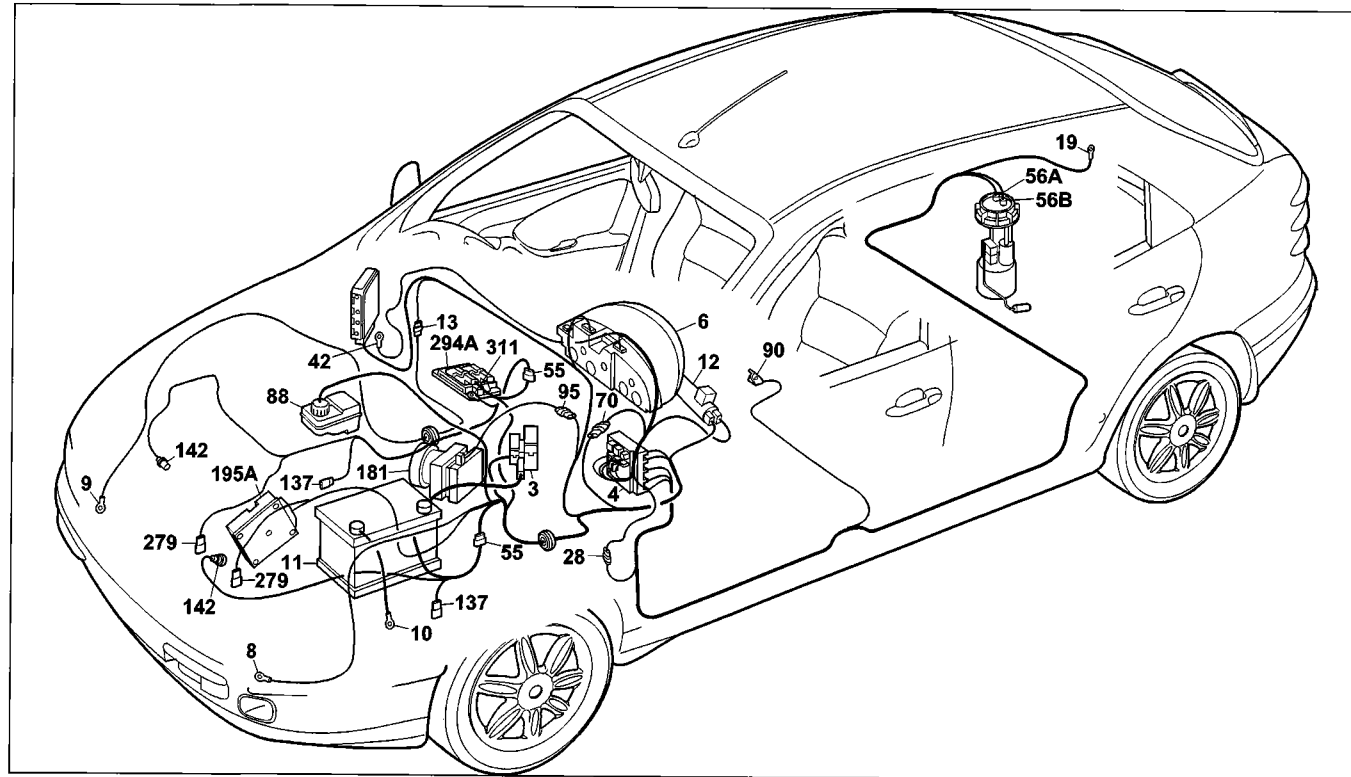
# 55.

Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter



\* Variant connection for the 1242 16V version





Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Milometer/trip meter display and zeroing button - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter

### Component key

- 3 Power fusebox:
  - A 30A fuse protecting injection system (60A for TD versions)
  - B 40A fuse protecting ignition system
  - C 80A fuse protecting optional equipment
  - D 80A fuse protecting junction unit
- 4 Junction unit
- 6 Instrument panel:
  - B Low engine oil pressure warning light
  - J1 Fuel reserve warning light
  - K Fuel gauge
  - Q Front brake pad wear warning light
  - R Handbrake applied/insufficient brake fluid level warning light
  - V1 Speedometer
  - W Rev counter
  - X Engine coolant temperature gauge
  - Y Electronic module
  - Z Milometer/trip meter display
  - Z1 Trip meter zeroing button
- 9 Right front earth
- 10 Battery earth on bodyshell
- 11 Battery
- 12 Ignition switch
- 13 Connection between right/left front cables
- 19 Right rear earth
- 28 Connection between dashboard/longitudinal cables
- 42 Right dashboard earth
- 55 Connection between front/fuel gauge cables
- 56 Fuel level gauge control unit
  - A Fuel level sensor
  - B Electric fuel pump
- 70 Connection between facia/front leads
- 88 Insufficient brake fluid level sensor
- 89 Left brake pad wear sensor
- 89A Left brake pad wear sensor cables
- 90 Switch indicating handbrake applied
- 95 Connection between front cables/anti-lock brakes A.B.S.
- 137 Vehicle speed sensor
- 142 Switch indicating insufficient engine oil pressure
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)
- 195 Injection/ignition electronic control unit (1581)
- 279 Engine coolant temperature twin sender unit
- 294 Injection/ignition electronic control unit (1242)
- 311 Engine pre-wiring earth
- N.D. Ultrasound welding taped in cable loom

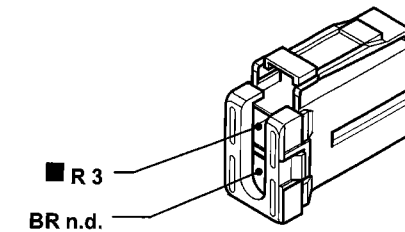
## Electrical equipment

### Interconnections

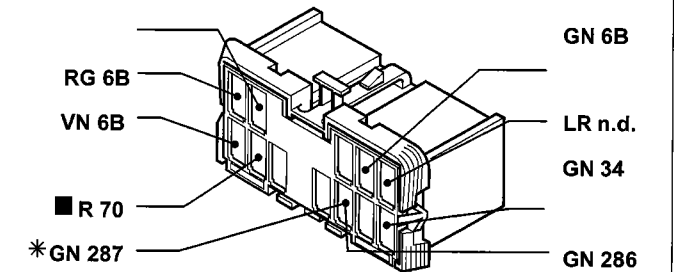
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# 55.

#### 4A Junction unit

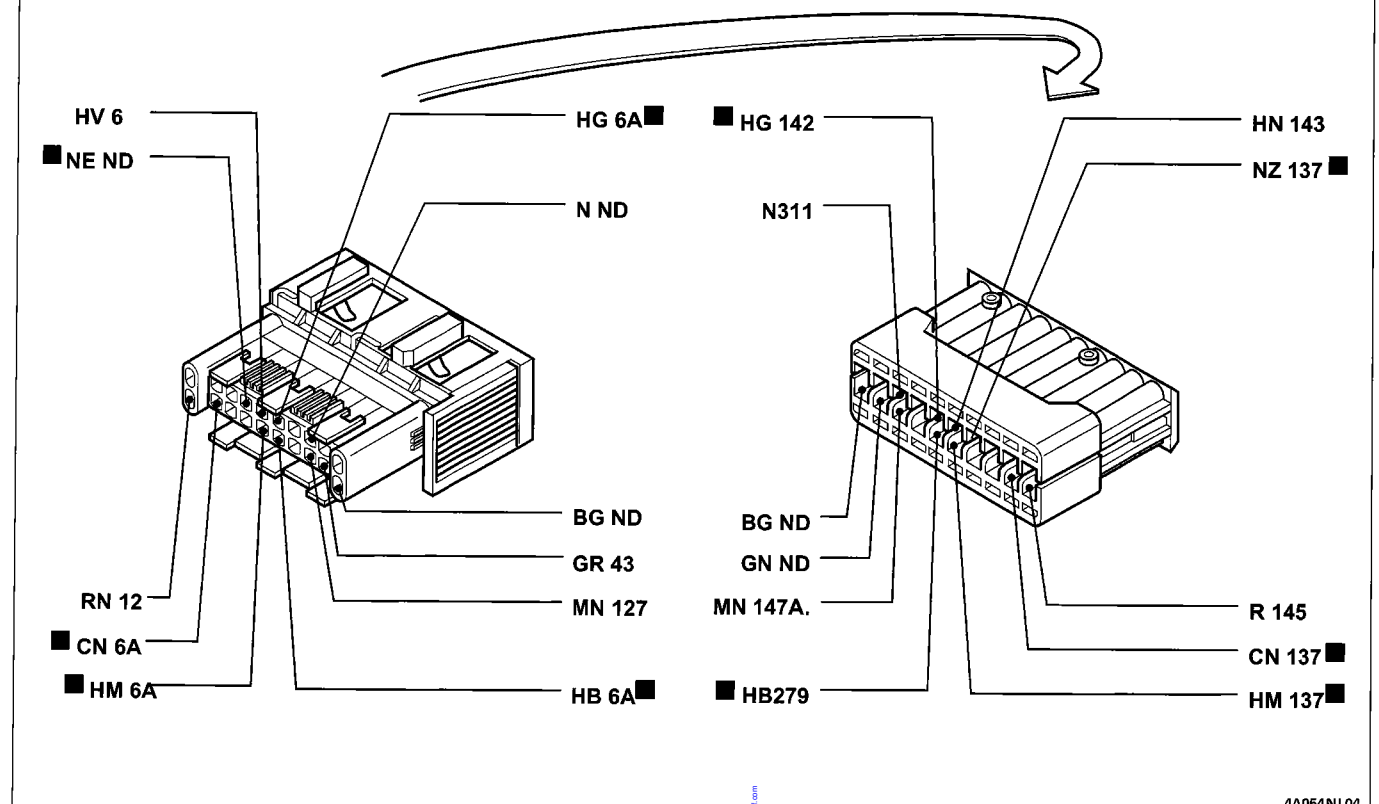


**4J** Junction unit



\* Variant connection for versions with radio phone

## 55 Connection between front cables/engine pre-wiring

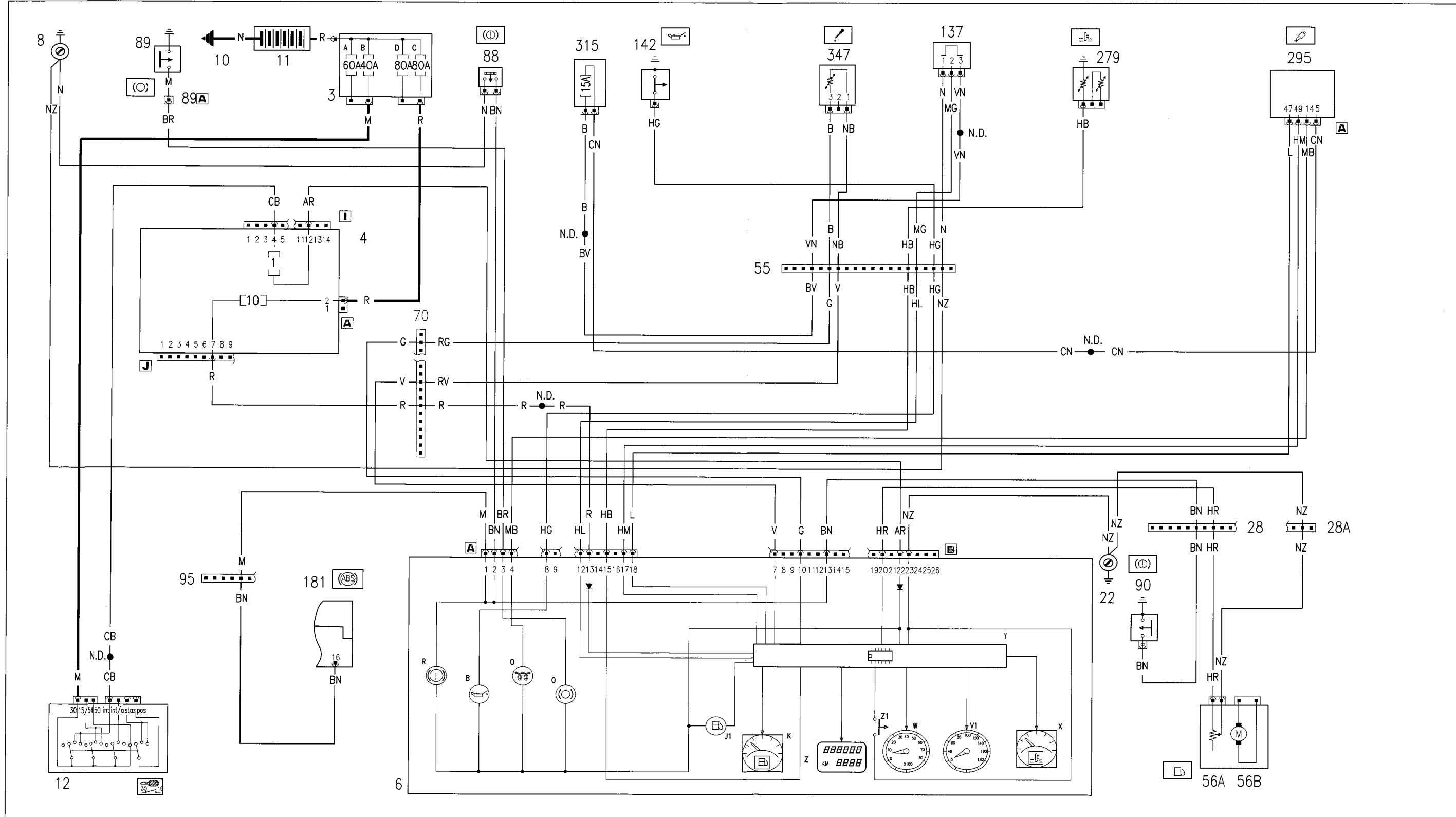


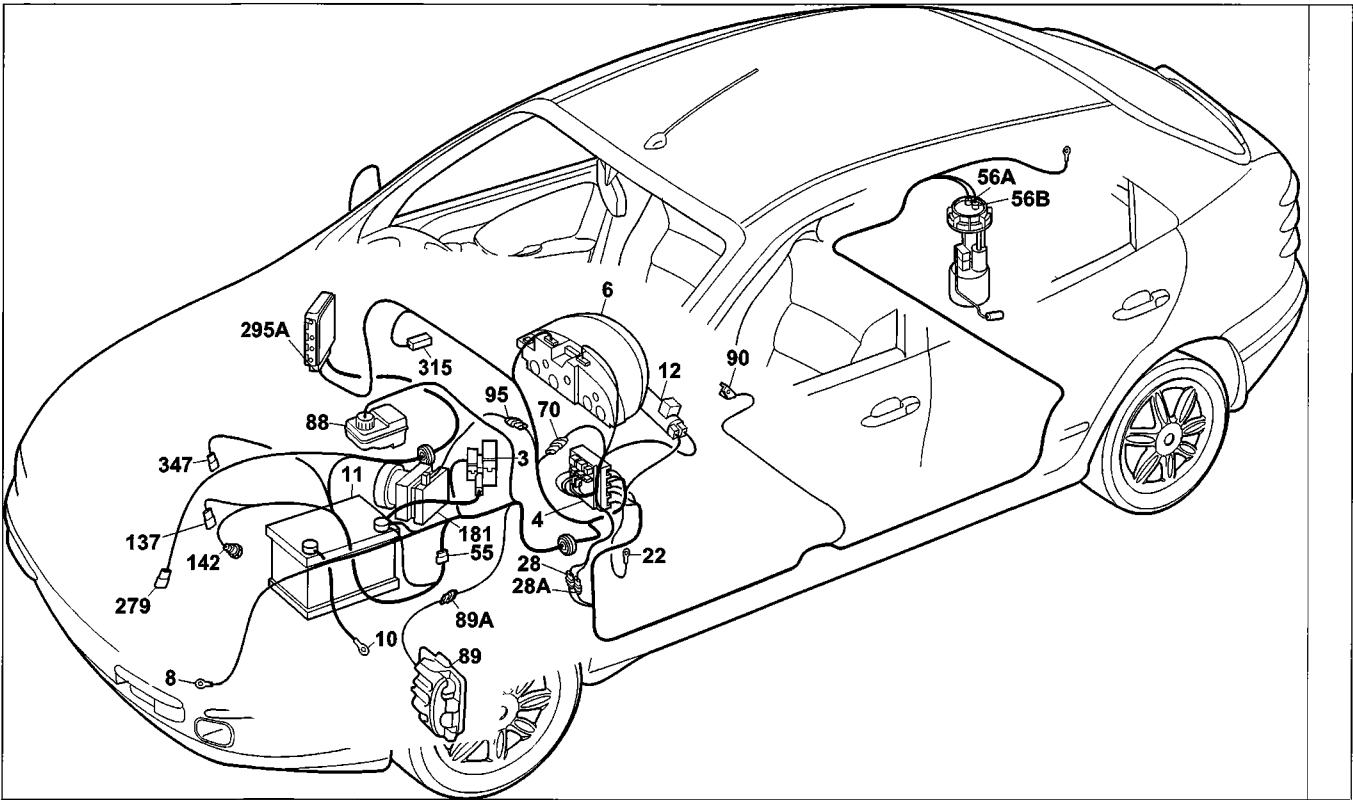
The cables concerned are marked in the wiring diagram with a square



**55.**

Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter - Milometer/trip meter display and zeroing button/engine oil level warning light - Heater plugs warning light





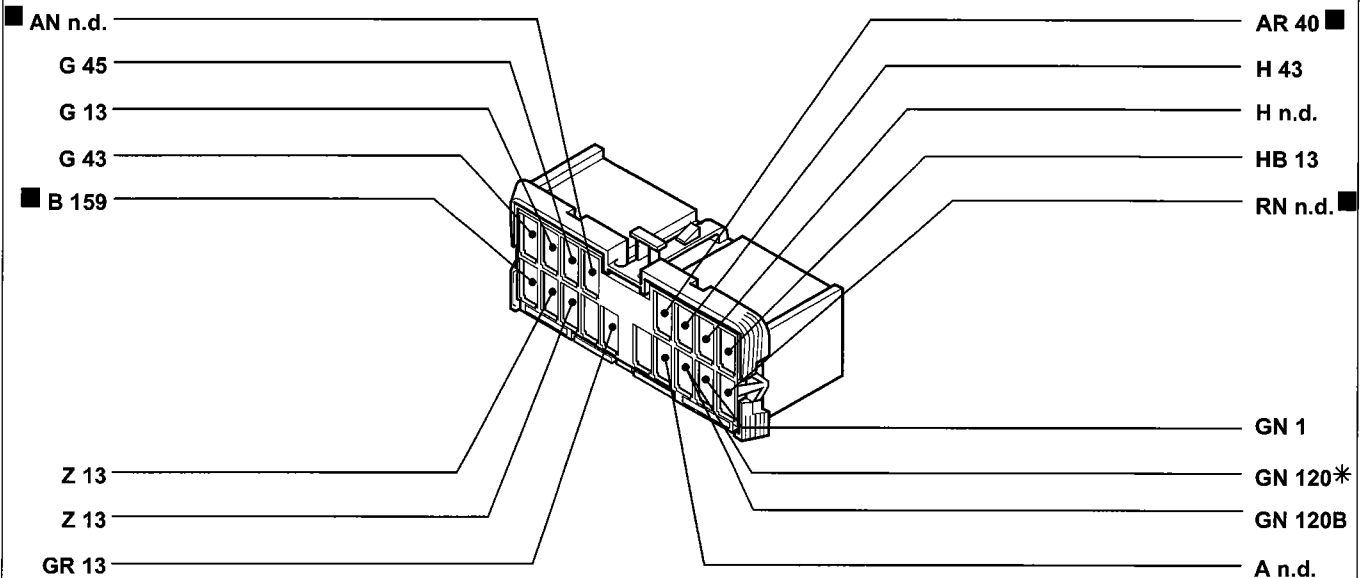
Fuel gauge and reserve warning light - Handbrake applied/insufficient brake fluid level warning light - Speedometer - Engine coolant temperature gauge - Insufficient engine oil pressure warning light - Front brake pad wear warning light - Rev counter - Milometer/trip meter display and zeroing button/engine oil level warning light - Heater plugs warning light

Component key

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system (60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting optional equipment<br>D 80A fuse protecting junction unit                                                                                                                                                                                                                                                                            | 11 Battery<br>12 Ignition switch<br>22 Left facia earth<br>28 Connection between dashboard/longitudinal cables<br>28A Connection between dashboard/longitudinal cables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 4 Junction unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 55 Connection between front/fuel gauge cables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 6 Instrument panel:<br>B Low engine oil pressure warning light<br>J1 Fuel reserve warning light<br>K Fuel gauge<br>O Heater plugs warning light<br>Q Front brake pad wear warning light<br>R Handbrake applied/insufficient brake fluid level warning light<br>V1 Speedometer<br>W Rev counter<br>X Engine coolant temperature gauge<br>X1 Water in fuel filter sensor<br>Y Electronic module<br>Z Milometer/trip meter display; engine oil level gauge<br>Z1 Trip meter zeroing button | 56 Fuel level gauge control unit<br>A Fuel level sensor<br>B Electric fuel pump<br>70 Connection between facia/front leads<br>88 Insufficient brake fluid level sensor<br>89 Left brake pad wear sensor<br>89A Left brake pad wear sensor cables<br>90 Switch indicating handbrake applied<br>95 Connection between front cables/anti-lock brakes A.B.S.<br>137 Vehicle speed sensor<br>142 Switch indicating insufficient engine oil pressure<br>181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)<br>279 Engine coolant temperature twin sender unit<br>295 Injection/ignition electronic control unit (1242)<br>315 15A fuse protecting electronic injection control unit<br>347 Engine oil level sensor |
| 8 Left front earth<br>10 Battery earth on bodyshell                                                                                                                                                                                                                                                                                                                                                                                                                                     | N.D. Ultrasound welding taped in cable loom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

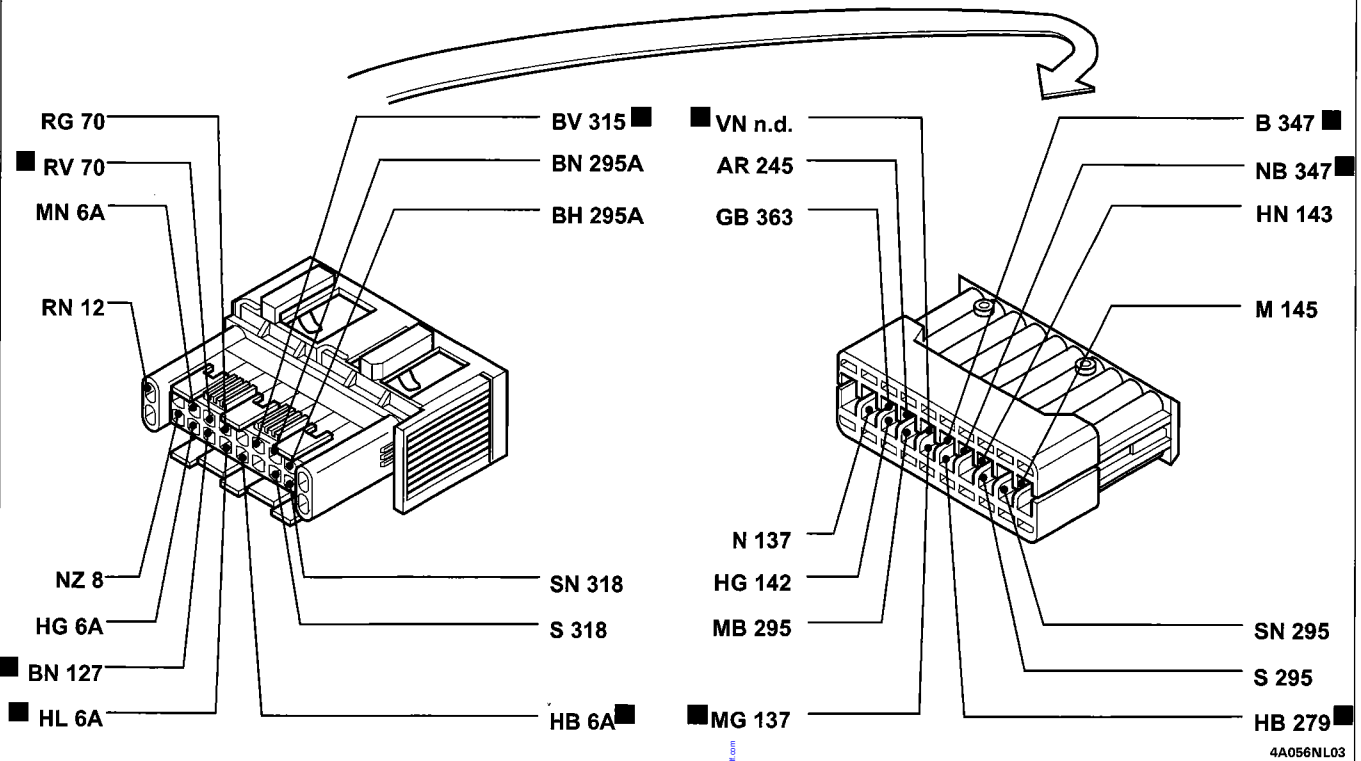
55.

4D Junction unit



\* Variant connection for versions with air conditioning

55 Connection between front cables/engine pre-wiring



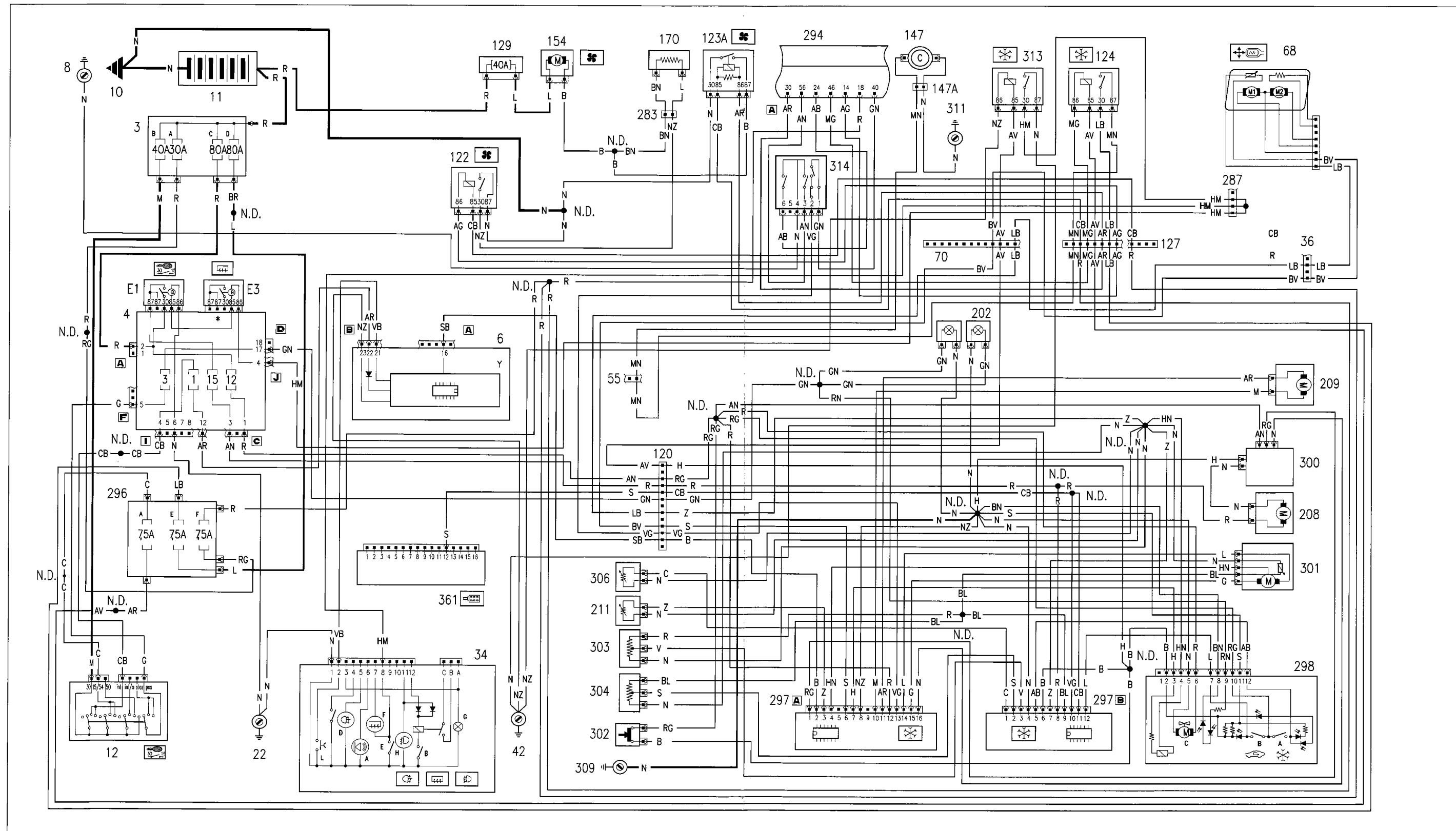
The cables concerned are marked in the wiring diagram with a square

# Electrical equipment

## Wiring diagrams

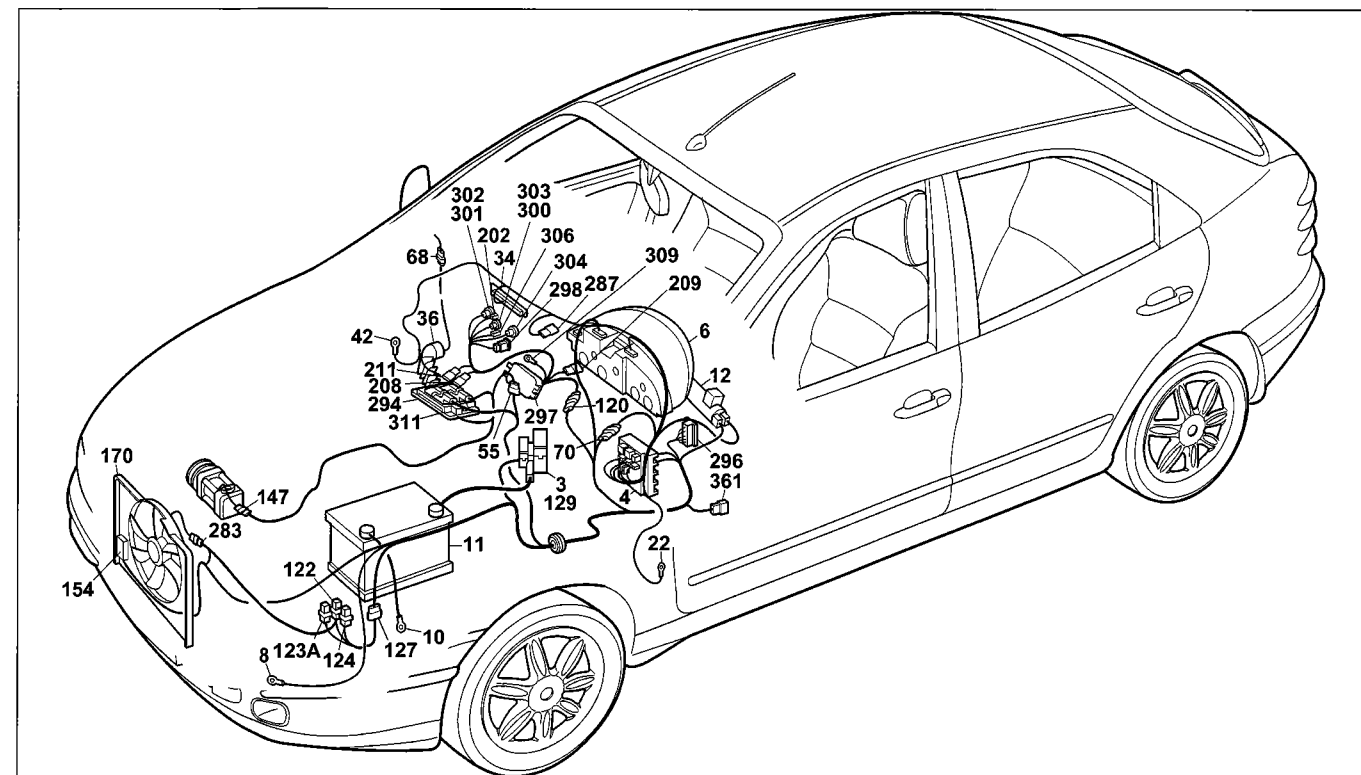
### 55.

Version without ABI:  
Automatic air conditioning



\* See heated rear windscreen wiring diagram

### 55.



4A058NL01

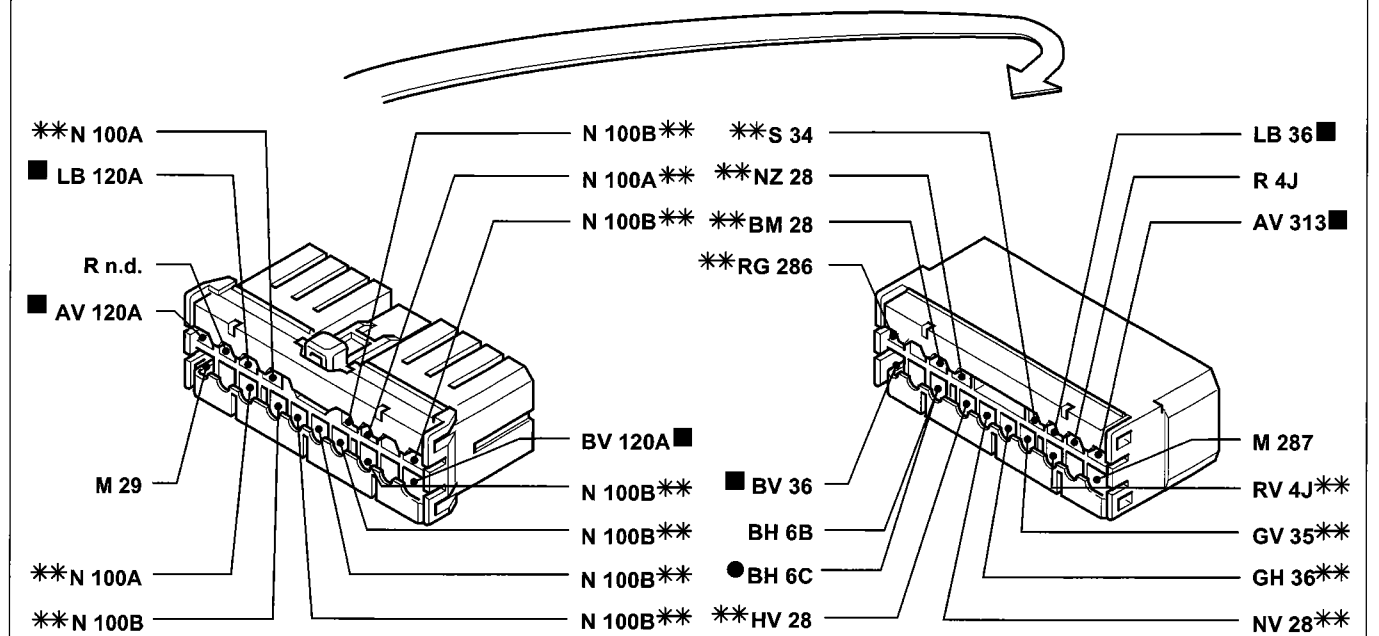
Version without ABI:  
Automatic air conditioning

#### Component key

- |                                                                       |                                                                                |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 3 Power fusebox:                                                      | 129 50A power fuse protecting engine cooling fan                               |
| A 30A fuse protecting injection system (60A for TD versions)          | 147 Compressor for air conditioning                                            |
| B 40A fuse protecting ignition system                                 | 147A Compressor for air conditioning                                           |
| C 80A fuse protecting optional equipment                              | 154 Engine cooling fan                                                         |
| D 80A fuse protecting junction unit                                   | 170 Engine cooling fan limit resistor                                          |
| 4 Junction unit                                                       | 202 Heater/air conditioning bulbs                                              |
| 6 Instrument panel:                                                   | 208 Air conditioning unit fan                                                  |
| Y Electronic module                                                   | 209 Outside/recirculation air flap control actuator                            |
| 8 Left front earth                                                    | 211 Electronic thermostat (N.T.C.)                                             |
| 10 Battery earth on bodyshell                                         | 283 Connection between front cable                                             |
| 11 Battery                                                            | 287 Short circuit connection                                                   |
| 12 Ignition switch                                                    | 294A Injection/ignition electronic control unit (1242)                         |
| 22 Left facia earth                                                   | 296 Fuse holder base on front cable                                            |
| 34 Switch control unit:                                               | A 7.5A fuse protecting cooling system/electronic injection; A.C. system; alarm |
| A Anti-theft device on warning light                                  | F 7.5A fuse protecting electronic injection system/Fiat CODE                   |
| B Rear fog lamps control switch                                       | E 7.5A fuse protecting climate control system                                  |
| C Rear fog lamps warning light                                        | 297 Air conditioning control unit                                              |
| E Heated rear windscreen control switch                               | 298 Recirculation control for heater/air conditioning                          |
| F Heated rear windscreen warning light                                | A Air conditioning control switch                                              |
| G Switch control panel ideogram light                                 | B Recirculation control switch                                                 |
| H Fog lights warning light                                            | C Fan sensor                                                                   |
| I Fog lights control switch                                           | 300 Heater fan electronic transformer                                          |
| L Outside temperature control switch                                  | 301 Vehicle interior mixture control actuator                                  |
| 36 Connection between dashboard/right front door cables               | 302 Maximum demisting control switch                                           |
| 42 Right dashboard earth                                              | 303 Interior ventilation potentiometer                                         |
| 55 Connection between front/fuel gauge cables                         | 304 Vehicle interior temperature potentiometer                                 |
| 68 Right electrically adjustable exterior rear view mirror            | 306 Treated air sensor                                                         |
| 70 Connection between facia/front leads                               | 309 Earth for air conditioning unit                                            |
| 120 Connection for air conditioning unit cables                       | 311 Engine pre-wiring earth (1242 16V)                                         |
| 122 Engine cooling fan low speed relay feed                           | 312 Power earth for electronic injection control unit                          |
| 123A Engine cooling fan high speed relay feed                         | 313 Air conditioning signal reversal relay                                     |
| 124 Air conditioning compressor control relay                         | 314 4 stage pressure switch                                                    |
| 127 Connection between front left cable/cable on relay holder bracket | 361 Diagnostic socket                                                          |

N.D. Ultrasound welding taped in cable loom

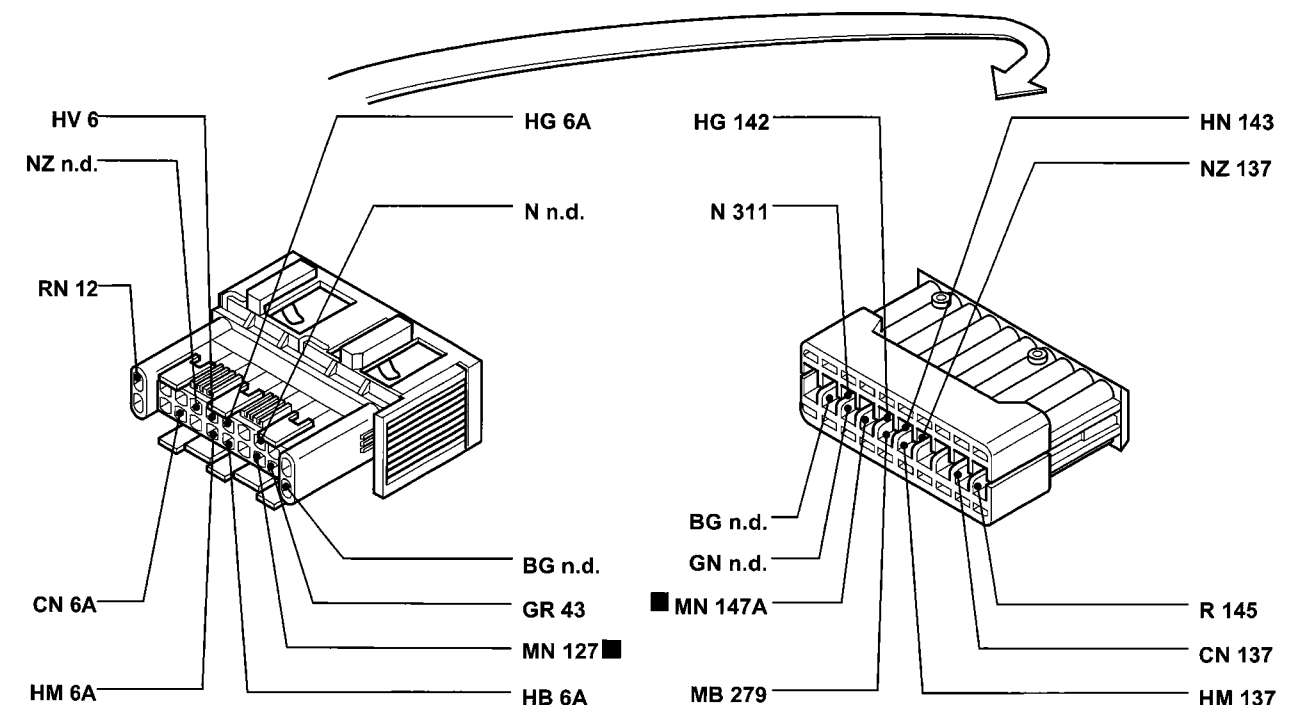
#### 70 Connection between dashborad/front cables



\*\* Variant connections for versions with alarm

4A058NL02

#### 55 Connection between front cables/engine pre-wiring



4A058NL03

The cables concerned are marked in the wiring diagram with a square

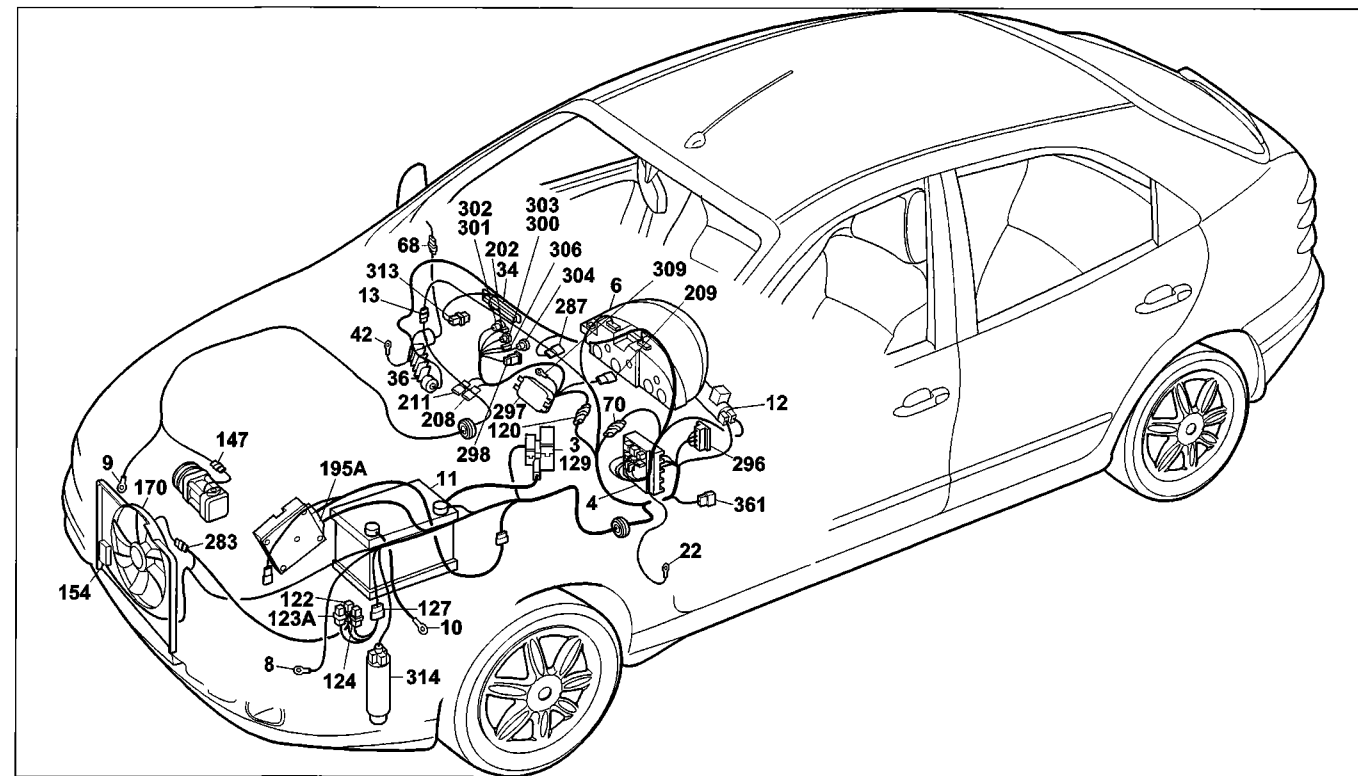
**55.**

Scmpo PDF Merge and Split Unregistered Version - <http://www.scmpo.com>



4A059NL01





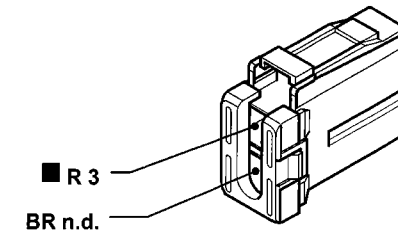
4A060NLO\*

**Version without ABI:**  
**Automatic air conditioning**

**Component key**

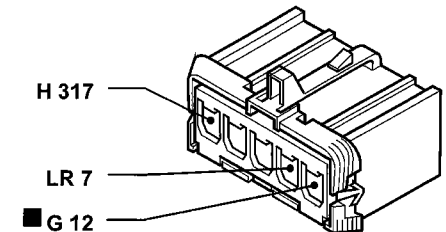
- |      |                                                            |      |                                                                              |
|------|------------------------------------------------------------|------|------------------------------------------------------------------------------|
| 3    | Power fusebox:                                             | 127  | Connection between front left cable/cable on relay holder bracket            |
| A    | 30A fuse protecting injection system (60A for TD versions) | 129  | 50A power fuse protecting engine cooling fan                                 |
| B    | 40A fuse protecting ignition system                        | 147  | Compressor for air conditioning                                              |
| C    | 80A fuse protecting optional equipment                     | 154  | Engine cooling fan                                                           |
| D    | 80A fuse protecting junction unit                          | 170  | Engine cooling fan limit resistor                                            |
| 4    | Junction unit                                              | 195  | Injection/ignition electronic control unit (1581)                            |
| E1   | Switch discharge relay                                     | 202  | Bulbs for heater/air conditioning unit; air conditioning unit fan            |
| E3   | Heated rear windscreen relay feed                          | 208  | Air conditioning unit fan                                                    |
| 6    | Instrument panel:                                          | 209  | Outside/recirculation air flap control actuator                              |
| Y    | Electronic module                                          | 211  | Electronic thermostat (N.T.C.)                                               |
| 8    | Left front earth                                           | 283  | Connection between front cable                                               |
| 9    | Right front earth                                          | 296  | Fuse holder base on front cable                                              |
| 10   | Battery earth on bodyshell                                 | A    | 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm |
| 11   | Battery                                                    | F    | 7.5A fuse protecting electronic injection system/Fiat CODE                   |
| 12   | Ignition switch                                            | E    | 7.5A fuse protecting climate control system                                  |
| 13   | Connection between right/left front cables                 | 297  | Air conditioning control unit                                                |
| 22   | Left facia earth                                           | 298  | Recirculation control for heater/air conditioning                            |
| 34   | Switch control unit:                                       | A    | Air conditioning control switch                                              |
| A    | Anti-theft device on warning light                         | B    | Recirculation control switch                                                 |
| B    | Rear fog lamps control switch                              | C    | Fan sensor                                                                   |
| D    | Rear fog lamps warning light                               | 300  | Heater fan electronic transformer                                            |
| E    | Heated rear windscreen control switch                      | 301  | Vehicle interior mixture control actuator                                    |
| F    | Heated rear windscreen warning light                       | 302  | Maximum demisting control switch                                             |
| G    | Switch control panel ideogram light                        | 303  | Interior ventilation potentiometer                                           |
| H    | Fog lights warning light                                   | 304  | Vehicle interior temperature potentiometer                                   |
| I    | Fog lights control switch                                  | 306  | Treated air sensor                                                           |
| L    | Outside temperature control switch                         | 309  | Earth for air conditioning unit                                              |
| 36   | Connection between dashboard/right front door cables       | 313  | Air conditioning signal reversal relay                                       |
| 42   | Right dashboard earth                                      | 314  | 4 stage pressure switch                                                      |
| 68   | Right electrically adjustable exterior rear view mirror    | 361  | Diagnostic socket                                                            |
| 70   | Connection between facia/front leads                       | N.D. | Ultrasound welding taped in cable loom                                       |
| 120  | Connection for air conditioning unit cables                |      |                                                                              |
| 122  | Engine cooling fan low speed relay feed                    |      |                                                                              |
| 123A | Engine cooling fan high speed relay feed                   |      |                                                                              |
| 124  | Air conditioning compressor control relay                  |      |                                                                              |

#### 4I Junction unit



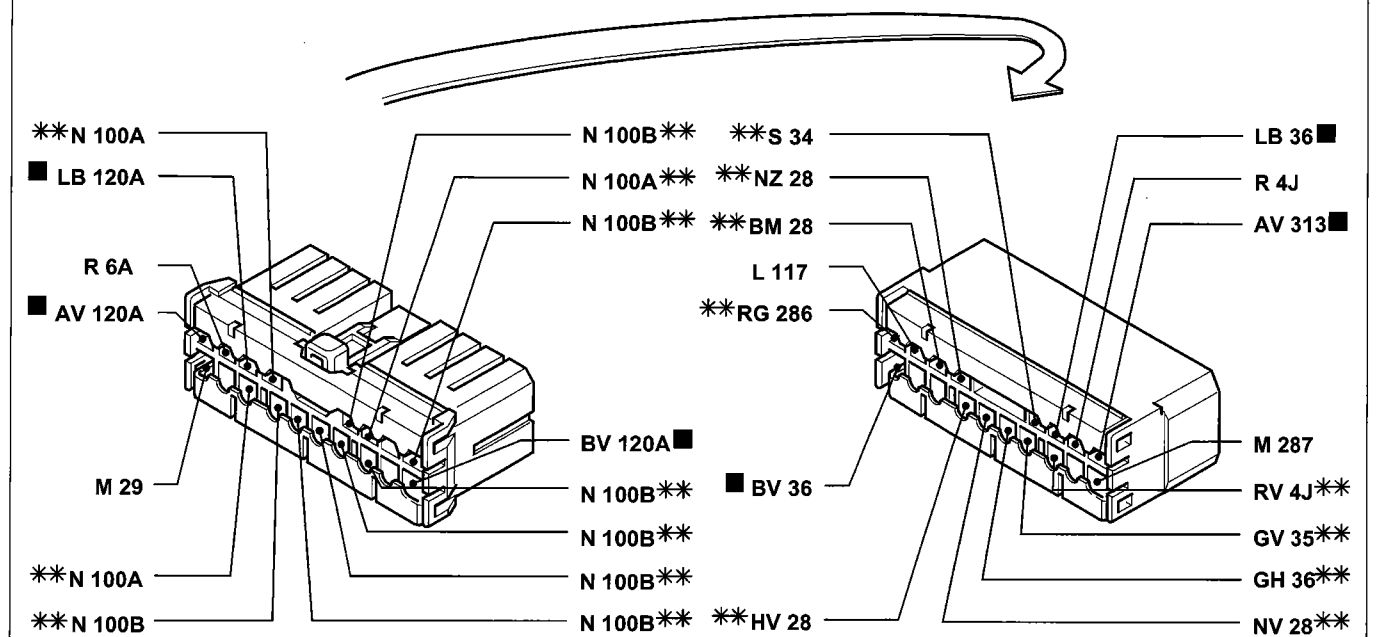
4A060NL02

**4F** Junction unit



A060NL03

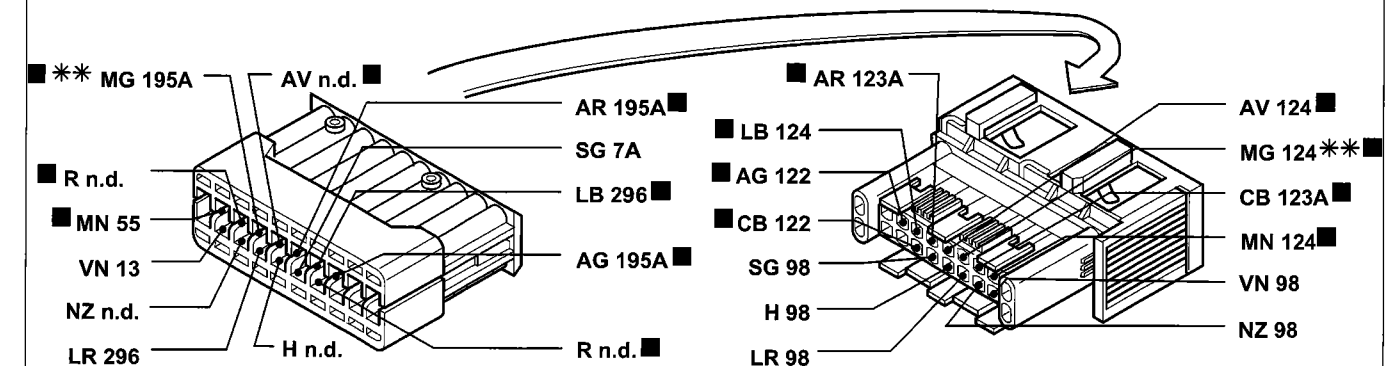
## 70 Connection between dashborad/front cables



\* Variant connection for versions with alarm

A060NL04

**127** Connection between front left cables/cable on relay holder bracket



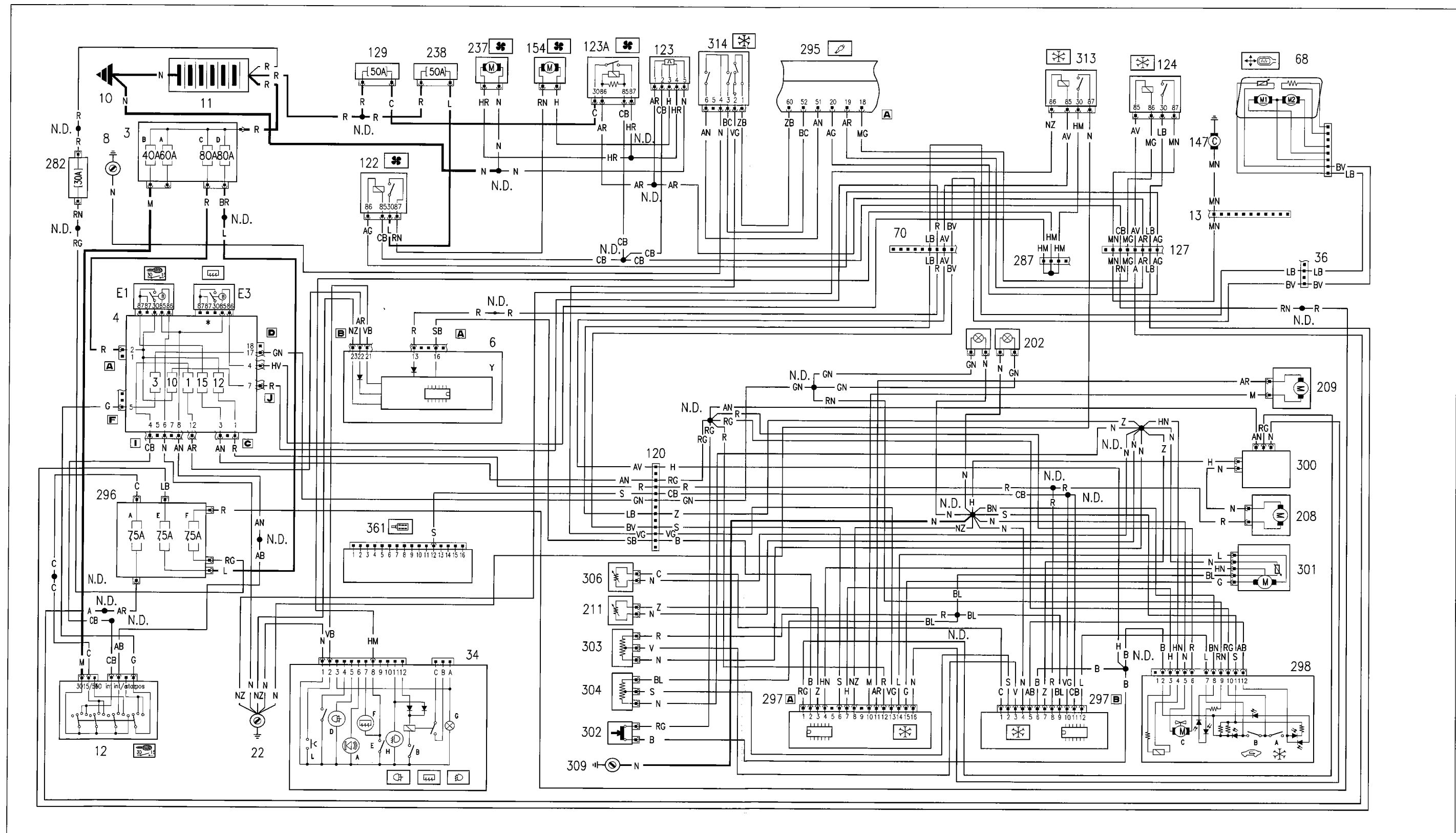
\* Variant connection for versions with automatic transmission

A060NL05

The cables concerned are marked in the wiring diagram with a square



Version without ABI:  
Automatic air conditioning



\* See heated rear windscreen wiring diagram

**12** Ignition switch



|      |                                                                   |     |                                                                                |
|------|-------------------------------------------------------------------|-----|--------------------------------------------------------------------------------|
| 3    | Power fusebox:                                                    | 202 | Bulbs for heater/air conditioning unit                                         |
|      | A 30A fuse protecting injection system (60A for TD versions)      | 208 | Air conditioning unit fan                                                      |
|      | B 40A fuse protecting ignition system                             | 209 | Outside/recirculation air flap control actuator                                |
|      | C 80A fuse protecting optional equipment                          | 211 | Electronic thermostat (N.T.C.)                                                 |
|      | D 80A fuse protecting junction unit                               | 237 | Additional engine cooling fan                                                  |
| 4    | Junction unit                                                     | 238 | 40A fuse protecting engine cooling fan                                         |
|      | E1 Switch discharge relay                                         | 282 | 30A fuse for Fiat CODE/electronic injection                                    |
| 6    | Instrument panel:                                                 | 287 | Short circuit connection                                                       |
|      | Y Electronic module                                               | 295 | Electronic injection/ignition electronic control unit                          |
| 8    | Left front earth                                                  |     | 1910 TD UNIJET                                                                 |
| 9    | Right front earth                                                 | 296 | Fuse holder base on front cable                                                |
| 10   | Battery earth on bodyshell                                        |     | A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm |
| 11   | Battery                                                           |     | F 7.5A fuse protecting electronic injection system/Fiat CODE                   |
| 12   | Ignition switch                                                   |     | E 7.5A fuse protecting climate control system                                  |
| 13   | Connection between right/left front cables                        | 297 | Air conditioning control unit                                                  |
| 22   | Left facia earth                                                  | 298 | Recirculation control for heater/air conditioning                              |
| 36   | Connection between dashboard/right front door cables              |     | A Air conditioning control switch                                              |
| 68   | Right electrically adjustable exterior rear view mirror           |     | B Recirculation control switch                                                 |
| 70   | Connection between facia/front leads                              |     | C Fan sensor                                                                   |
| 120  | Connection for air conditioning unit cables                       | 300 | Heater fan electronic transformer                                              |
| 122  | Engine cooling fan low speed relay feed                           | 301 | Vehicle interior mixture control actuator                                      |
| 123  | Engine cooling fan high speed timer                               | 302 | Maximum demisting control switch                                               |
| 123A | Engine cooling fan high speed relay feed                          | 303 | Interior ventilation potentiometer                                             |
| 124  | Air conditioning compressor control relay                         | 304 | Vehicle interior temperature potentiometer                                     |
| 127  | Connection between front left cable/cable on relay holder bracket | 306 | Treated air sensor                                                             |
| 129  | 50A power fuse protecting engine cooling fan                      | 309 | Earth for air conditioning unit                                                |
| 147  | Compressor for air conditioning                                   | 313 | Air conditioning signal reversal relay                                         |
| 154  | Engine cooling fan                                                | 314 | 4 stage pressure switch                                                        |
|      |                                                                   | 361 | Diagnostic socket                                                              |

Diagram 12 shows the connection between right and left front cables. The left connector has terminals labeled AB n.d., CB n.d., G 4F, and GV 7B. The right connector has terminals labeled C n.d., M 3, and RN 55.

4A062NL02

## 13 Connection between right/left front cables

Diagram 13 shows the connection between right and left front cables. The left connector has terminals labeled VN 127, SN 25, ZB n.d., V 2, H 2, MN 147, S 25, GR 2, G 44, A ND, Z 47, HB 44, Z 46, and N 9. The right connector has terminals labeled G 44, A n.d., Z 4D, Z 4D, HB 4D, N n.d., GR 4D, SN 7, VN 127, MN 127, V 4C, SG 132, H 4C, and S 8. A curved arrow indicates the connection between the two connectors.

4A062NL03

The diagram illustrates two views of a multi-pin connector assembly. A large curved arrow at the top indicates a transition or relationship between the two views.

**Left View Labels:**

- \*\*N 100A
- LB 120A
- R n.d.
- AV 120A
- M 29
- \*\*N 100A
- \*\*N 100B

**Right View Labels:**

- N 100B\*\*
- N 100A\*\*
- L 36
- RV 55
- N 100B\*\*
- BV 120A ■
- N 100B\*\*
- N 100B\*\*
- N 100B\*\*
- N 100B\*\*
- N 100B\*\*

**Top View Labels (from left to right):**

- \*\*S 34
- \*\*NZ 28
- \*\*BM 28
- L 117
- \*\*RG 286
- BV 36 ■
- V 6B
- BH 6B
- \*\*HV 28
- \*\*NV 28

**Bottom View Labels (from left to right):**

- LB 36 ■
- R 4J ■
- AV 313 ■
- M 287
- G 6B
- RV 4J\*\*
- GV 35\*\*
- GH 36\*\*

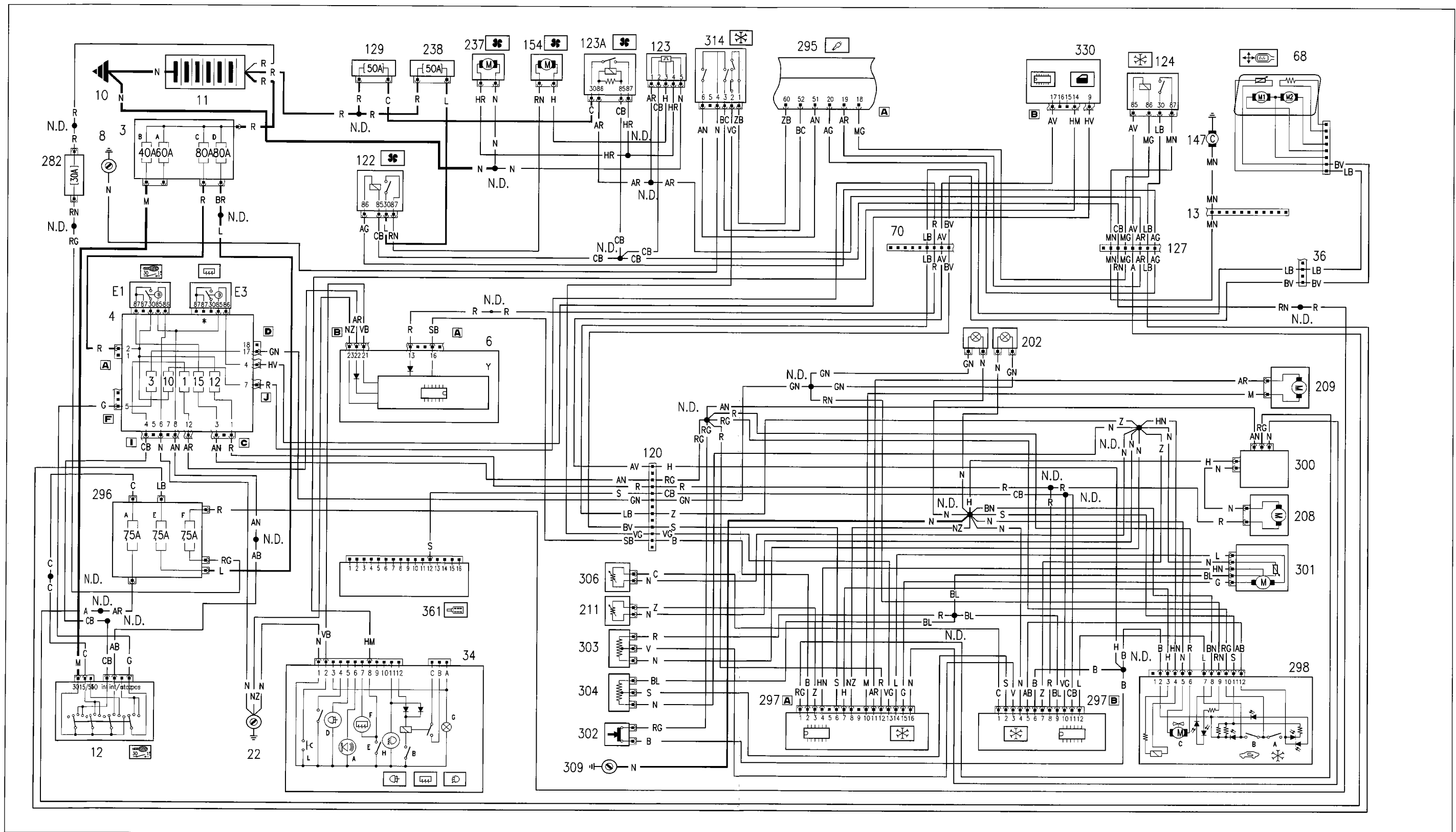
Print n° 506.670/22

# Electrical equipment

## Wiring diagrams

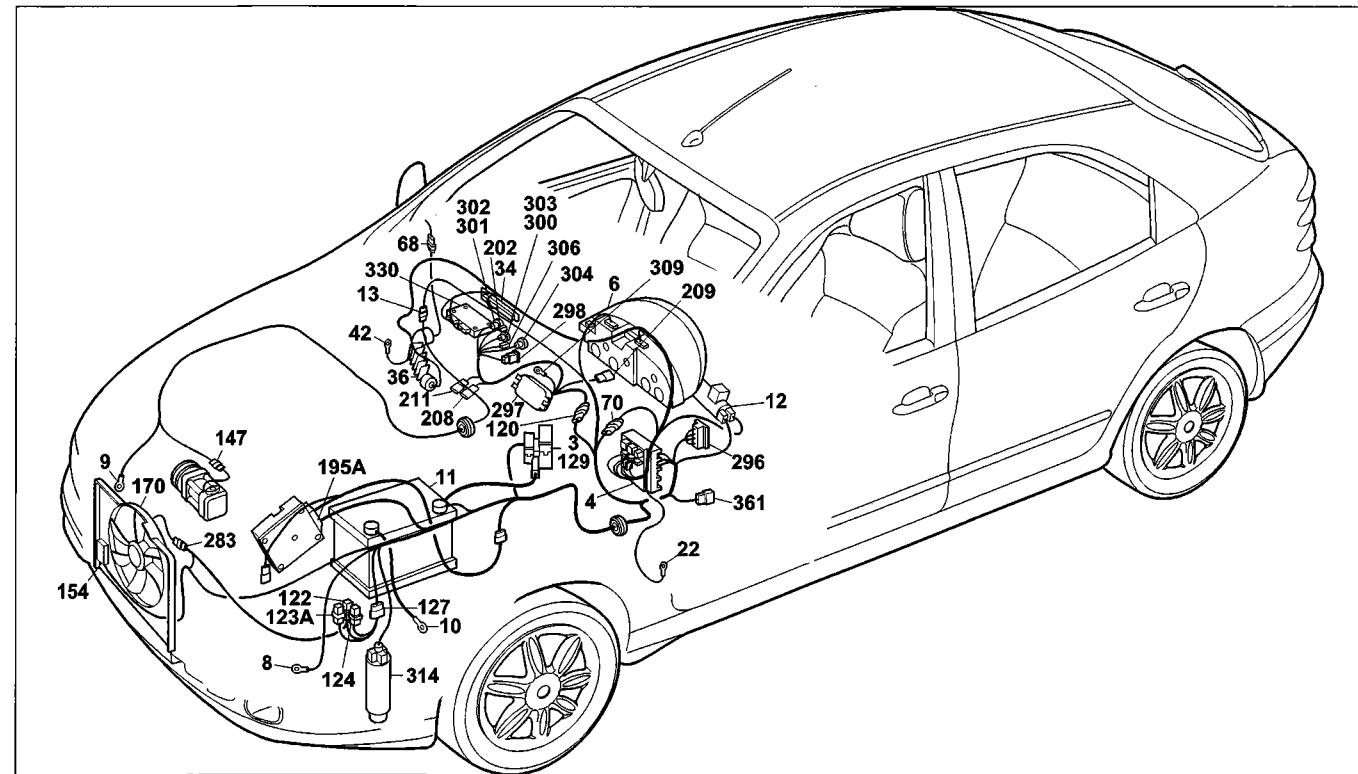
### 55.

Version with ABI:  
Automatic air conditioning



\* See heated rear windscreen wiring diagram

4A063NL01

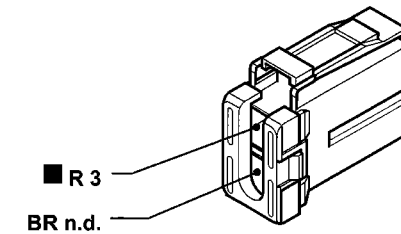


**Version with ABI:**  
**Automatic air conditioning**

### Component key

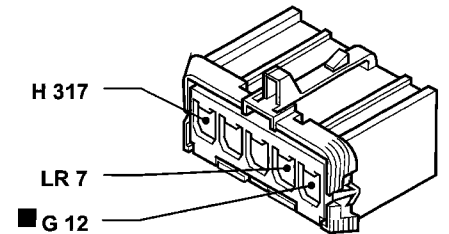
- |      |                                                              |      |                                                                                |
|------|--------------------------------------------------------------|------|--------------------------------------------------------------------------------|
| 3    | Power fusebox:                                               | 127  | Connection between front left cable/cable on relay holder bracket              |
|      | A 30A fuse protecting injection system (60A for TD versions) | 129  | 50A power fuse protecting engine cooling fan                                   |
|      | B 40A fuse protecting ignition system                        | 147  | Compressor for air conditioning                                                |
|      | C 80A fuse protecting optional equipment                     | 154  | Engine cooling fan                                                             |
|      | D 80A fuse protecting junction unit                          | 170  | Engine cooling fan limit resistor                                              |
| 4    | Junction unit                                                | 195  | Injection/ignition control unit. (1581)                                        |
|      | E1 Switch discharge relay                                    | 202  | Bulbs for heater/air conditioning unit; air conditioning unit fan              |
|      | E3 Heated rear windscreen relay feed                         | 208  | Air conditioning unit fan                                                      |
| 6    | Instrument panel:                                            | 209  | Outside/recirculation air flap control actuator                                |
|      | Y Electronic module                                          | 211  | Electronic thermostat (N.T.C.)                                                 |
| 8    | Left front earth                                             | 283  | Connection for front cable                                                     |
| 9    | Right front earth                                            | 296  | Fuse holder base on front cable                                                |
| 10   | Battery earth on bodyshell                                   |      | A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm |
| 11   | Battery                                                      |      | F 7.5A fuse protecting cooling system/electronic injection;                    |
| 12   | Ignition switch                                              |      | E 7.5A fuse protecting climate control system                                  |
| 13   | Connection between right/left front cables                   | 297  | Air conditioning control unit                                                  |
| 22   | Left facia earth                                             | 298  | Recirculation control for heater/air conditioning                              |
| 34   | Switch control unit:                                         |      | A Air conditioning control switch                                              |
|      | A Anti-theft device on warning light                         |      | B Recirculation control switch                                                 |
|      | B Rear fog lamps control switch                              |      | C Fan sensor                                                                   |
|      | D Rear fog lamps warning light                               | 300  | Heater fan electronic transformer                                              |
|      | E Heated rear windscreen control switch                      | 301  | Vehicle interior mixture control actuator                                      |
|      | F Heated rear windscreen warning light                       | 302  | Maximum demisting control switch                                               |
|      | G Switch control panel ideogram light                        | 303  | Interior ventilation potentiometer                                             |
|      | H Fog lights warning light                                   | 304  | Vehicle interior temperature potentiometer                                     |
|      | I Fog lights control switch                                  | 306  | Treated air sensor                                                             |
|      | L Outside temperature control switch                         | 309  | Earth for air conditioning unit                                                |
| 36   | Connection between dashboard/right front door cables         | 312  | Power earth for electronic injection control unit                              |
| 42   | Right dashboard earth                                        | 314  | 4 stage pressure switch                                                        |
| 68   | Right electrically adjustable exterior rear view mirror      | 330  | A.B.I. control unit                                                            |
| 70   | Connection between facia/front leads                         | 361  | Diagnostic socket                                                              |
| 120  | Connection for air conditioning unit cables                  | N.D. | Ultrasound welding taped in cable loom                                         |
| 122  | Engine cooling fan low speed relay feed                      |      |                                                                                |
| 123A | Engine cooling fan high speed relay feed                     |      |                                                                                |
| 124  | Air conditioning compressor control relay                    |      |                                                                                |

#### 4A Junction unit



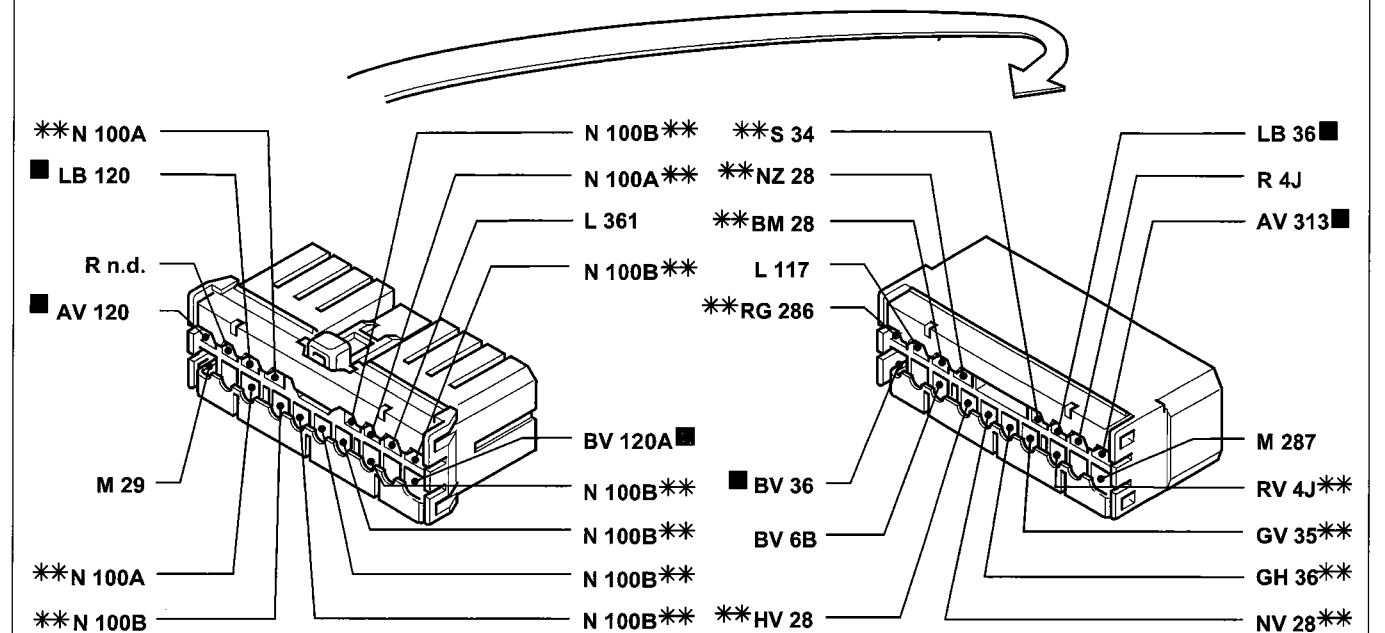
4A064NL02

**4F** Junction unit



A064NL03

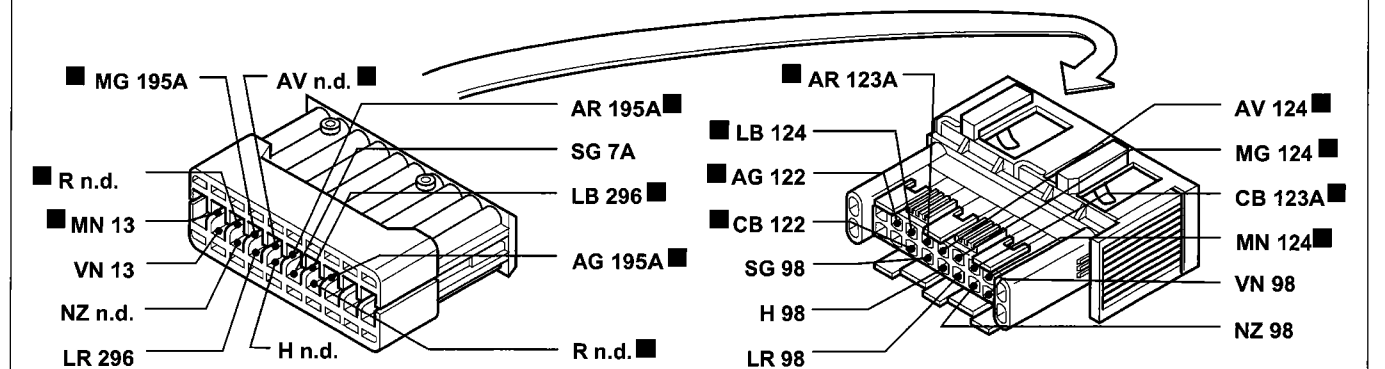
## 70 Connection between dashborard/front cables



\*\* Variant connection for versions with alarm

A064NL04

**127** Connection between front left cables/cable on relay holder bracket

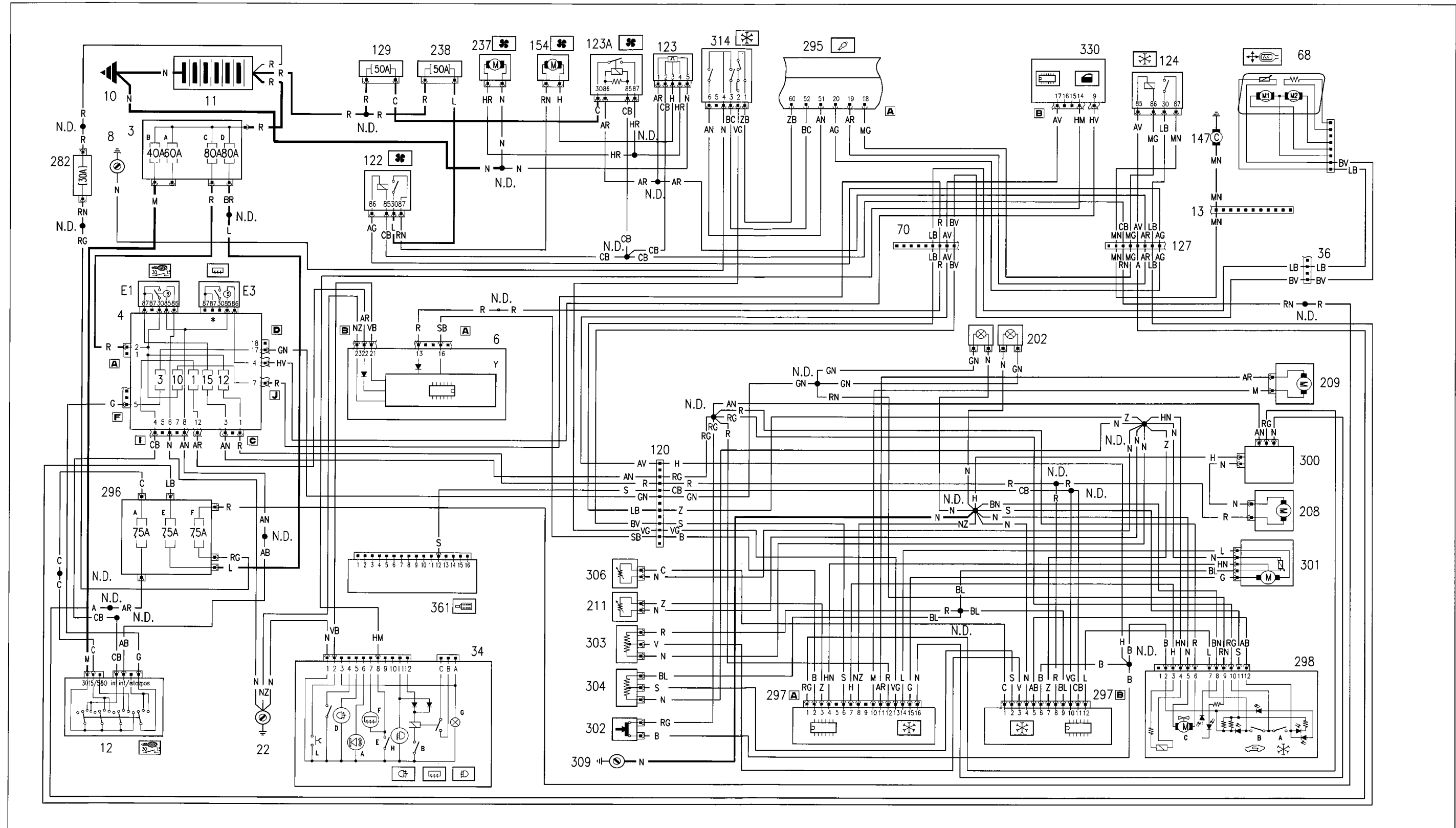


A064NL05

The cables concerned are marked in the wiring diagram with a square

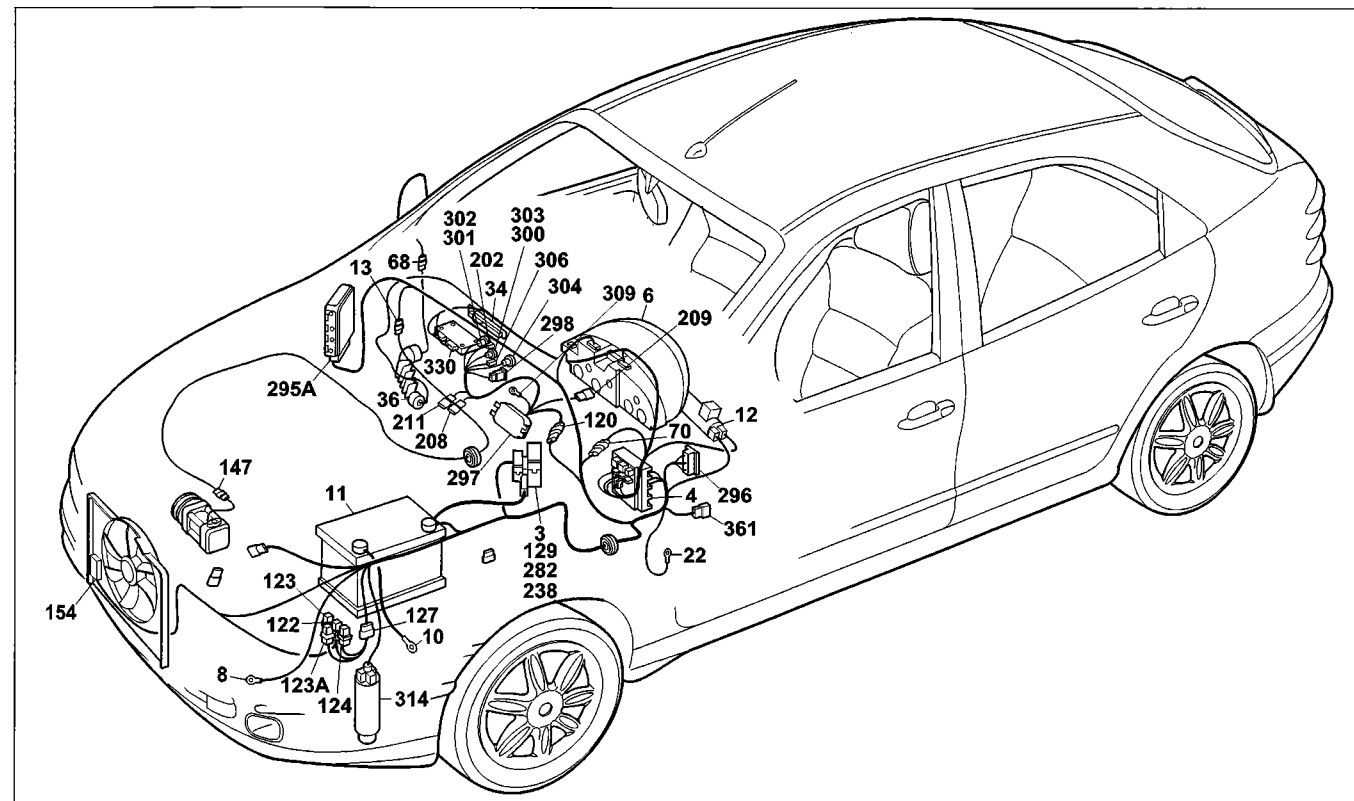


Version with ABI:  
Automatic air conditioning



\* See heated rear windscreen wiring diagram

55.



4A066NL01

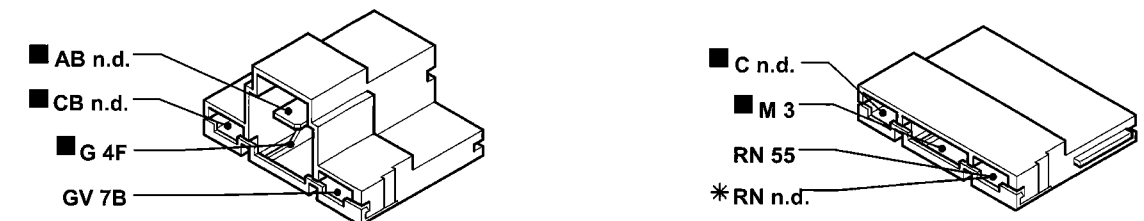
Version with ABI:  
Automatic air conditioning

### Component key

- |                                                                       |                                                                                |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 3 Power fusebox:                                                      | 202 Bulbs for heater/air conditioning unit;                                    |
| A 30A fuse protecting injection system (60A for TD versions)          | 208 Air conditioning unit fan                                                  |
| B 40A fuse protecting ignition system                                 | 209 Outside/recirculation air flap control actuator                            |
| C 80A fuse protecting optional equipment                              | 211 Electronic thermostat (N.T.C.)                                             |
| D 80A fuse protecting junction unit                                   | 237 Additional engine cooling fan                                              |
| 4 Junction unit                                                       | 238 50A fuse protecting engine cooling fan                                     |
| E1 Switch discharge relay                                             | 282 30A fuse for Fiat CODE/electronic injection                                |
| 6 Instrument panel:                                                   | 295 Injection/ignition electronic control unit 1910 TD UNI-JET                 |
| Y Electronic module                                                   | 296 Fuse holder base on front cable                                            |
| 8 Left front earth                                                    | A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm |
| 10 Battery earth on bodyshell                                         | F 7.5A fuse protecting cooling system/electronic injection;                    |
| 11 Battery                                                            | E 7.5A fuse protecting climate control system                                  |
| 12 Ignition switch                                                    | 297 Air conditioning control unit                                              |
| 13 Connection between right/left front cables                         | 298 Recirculation control for heater/air conditioning                          |
| 22 Left fascia earth                                                  | A Air conditioning control switch                                              |
| 34 Switch control unit                                                | B Recirculation control switch                                                 |
| 36 Connection between dashboard/right front door cables               | C Fan sensor                                                                   |
| 55 Connection between front/fuel level gauge cables                   | 300 Heater fan electronic transformer                                          |
| 68 Right electrically adjustable exterior rear view mirror            | 301 Vehicle interior mixture control actuator                                  |
| 70 Connection between fascia/front leads                              | 303 Interior ventilation potentiometer                                         |
| 120 Connection for air conditioning unit cables                       | 304 Vehicle interior temperature potentiometer                                 |
| 122 Engine cooling fan low speed relay feed                           | 306 Treated air sensor                                                         |
| 123 Engine cooling fan high speed timer                               | 309 Earth for air conditioning unit                                            |
| 123A Engine cooling fan high speed relay feed                         | 314 4 stage pressure switch                                                    |
| 124 Air conditioning compressor control relay                         | 330 A.B.I. control unit                                                        |
| 127 Connection between front left cable/cable on relay holder bracket | 361 Diagnostic socket                                                          |
| 129 50A power fuse protecting engine cooling fan                      |                                                                                |
| 147 Compressor for air conditioning                                   |                                                                                |
| 154 Engine cooling fan                                                |                                                                                |

N.D. Ultrasound welding taped in cable loom

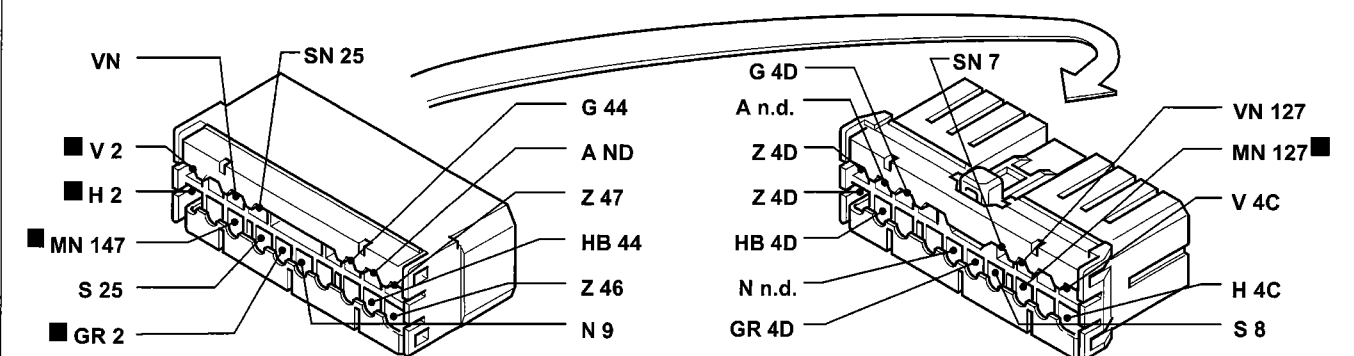
### 12 Ignition switch



\* Variant for the 1547 version with automatic transmission

4A066NL02

### 13 Connection between right/left front cables

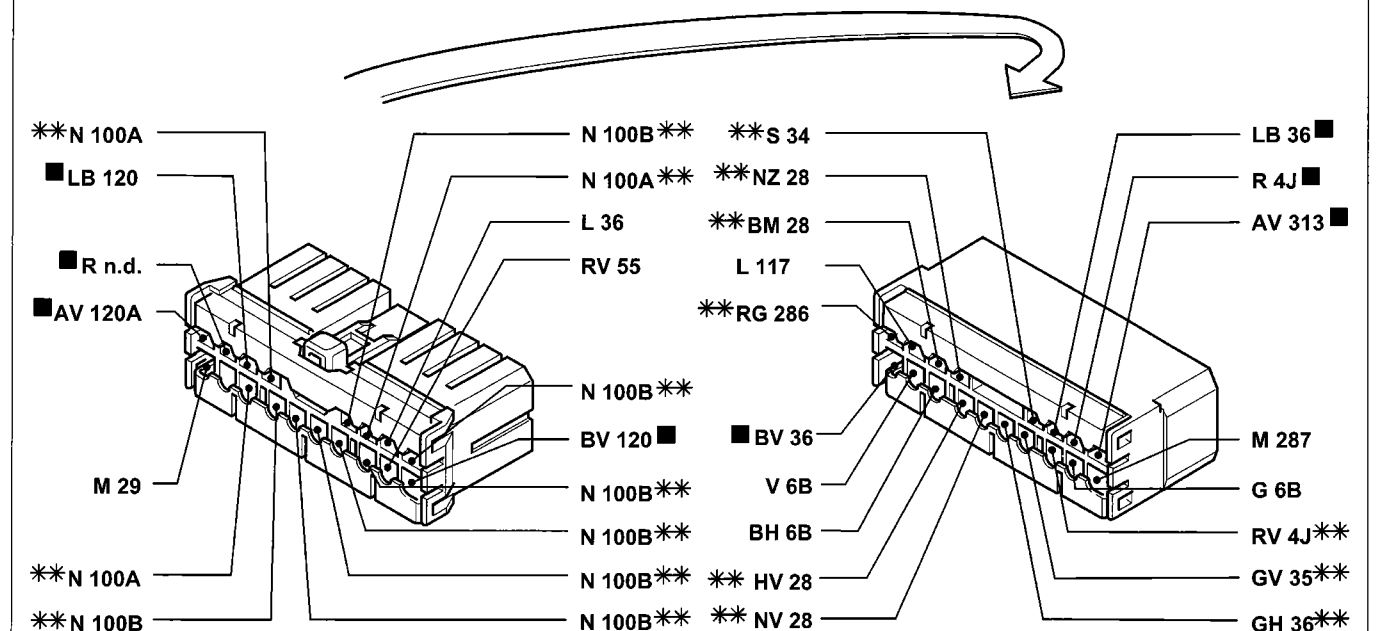


\* Variant for the 1581 version only

Only for 1242 and 1581 versions

4A066NL03

### 70 Connection between dashboard/front cables



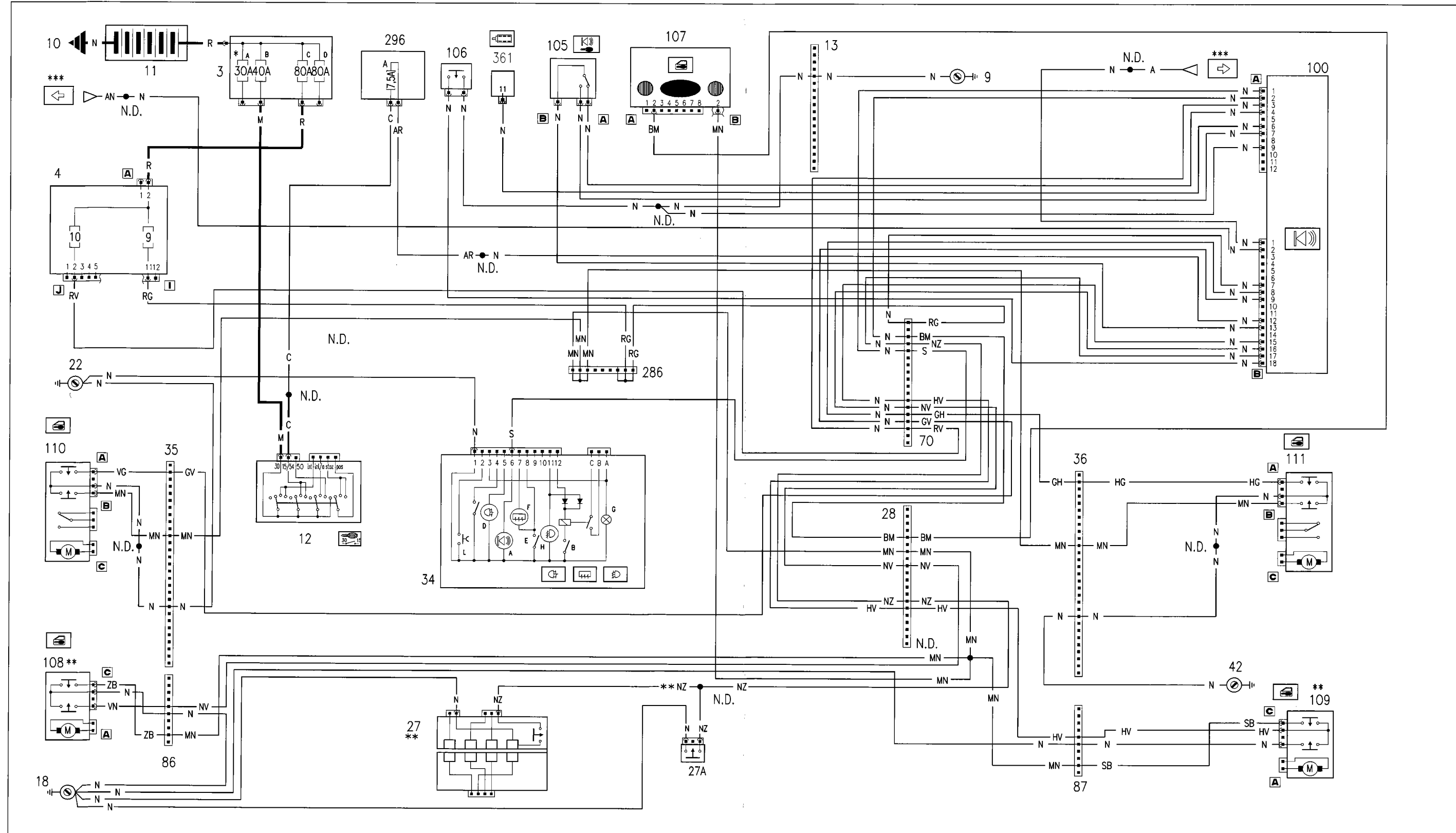
\*\* Variant connection for versions with alarm

4A066NL04

The cables concerned are marked in the wiring diagram with a square



SX-GT trim level  
Version without ABI:  
Alarm - Alarm on warning light



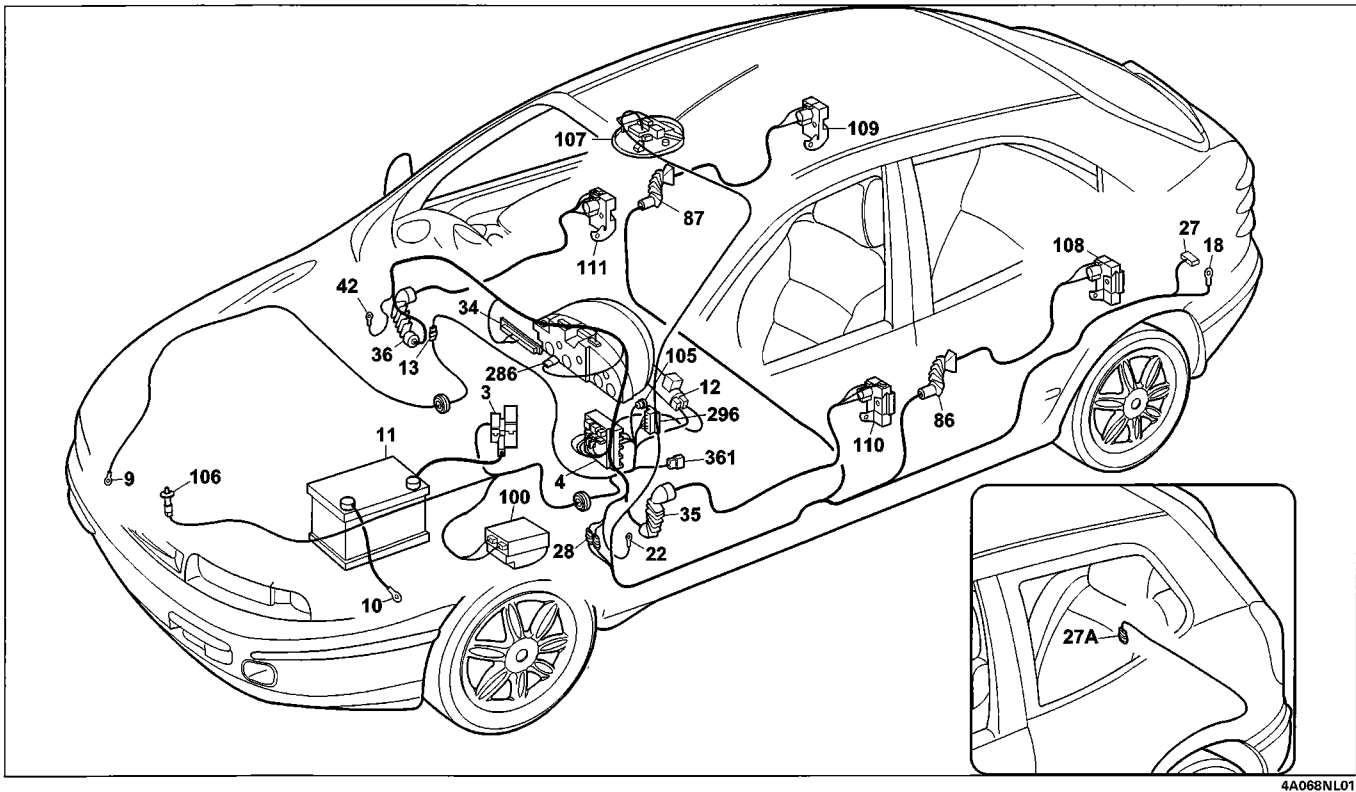
\* 60A fuse for TD versions

\*\* Non existent for the Bravo version

\*\*\* See SX-GT direction indicators wiring diagram

4A067NL01

55.



SX-GT trim level  
Version without ABI:  
Alarm - Alarm on warning light

Component key

- 3 Power fusebox:  
A 30A fuse protecting injection system (60A for TD versions)  
B 40A fuse protecting ignition system  
C 80A fuse protecting optional equipment  
D 80A fuse protecting junction unit

4 Junction unit

9 Right front earth

10 Battery earth on bodyshell

11 Battery

12 Ignition switch

13 Connection between right/left front cables

18 Left rear earth

22 Left facia earth

27 Contact board for rear connections with luggage compartment light switch incorporated

27A Button for luggage compartment light, switching on alarm and signalling tailgate open

28 Connection between dashboard/longitudinal cables

34 Switch control unit:  
A Anti-theft device on warning light  
B Rear fog lamps control switch  
C Rear fog lamps warning light  
E Heated rear windscreen control switch  
F Heated rear windscreen warning light  
G Switch control panel ideogram light  
H Fog lights warning light
- I Fog lights control switch  
L Outside temperature control switch

35 Connection between dashboard/left front door cables

36 Connection between dashboard/right front door cables

42 Right dashboard earth

70 Connection between facia/front leads

86 Connection between longitudinal/left rear door cables

87 Connection between longitudinal/right rear door cables

100 Anti-theft electronic control unit

105 Anti-theft deactivation switch

106 Anti-theft engagement switch

107A Central locking remote control receiver

108 Left rear door lock/anti-theft engagement switch

109 Right rear door lock/anti-theft engagement switch

110 Left front door lock/anti-theft engagement switch

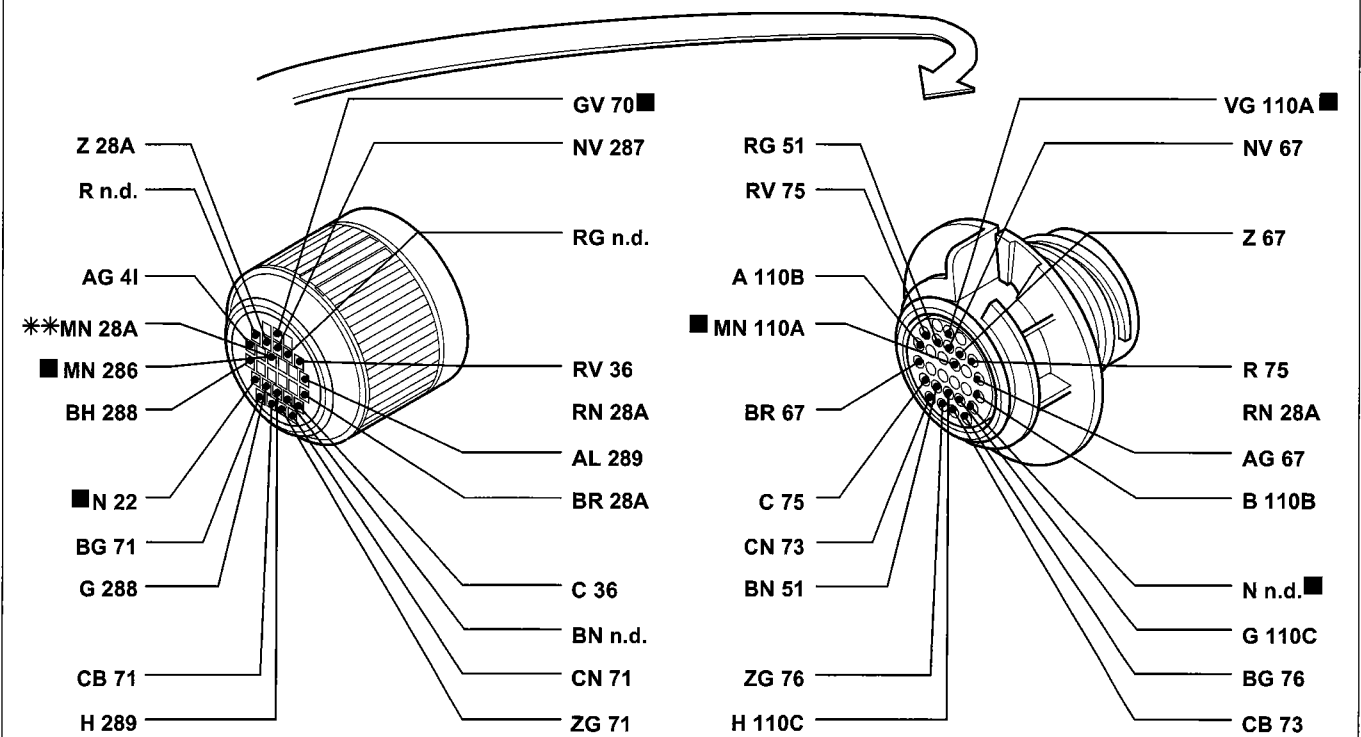
111 Right front door lock/anti-theft engagement switch

286 Short circuit connection

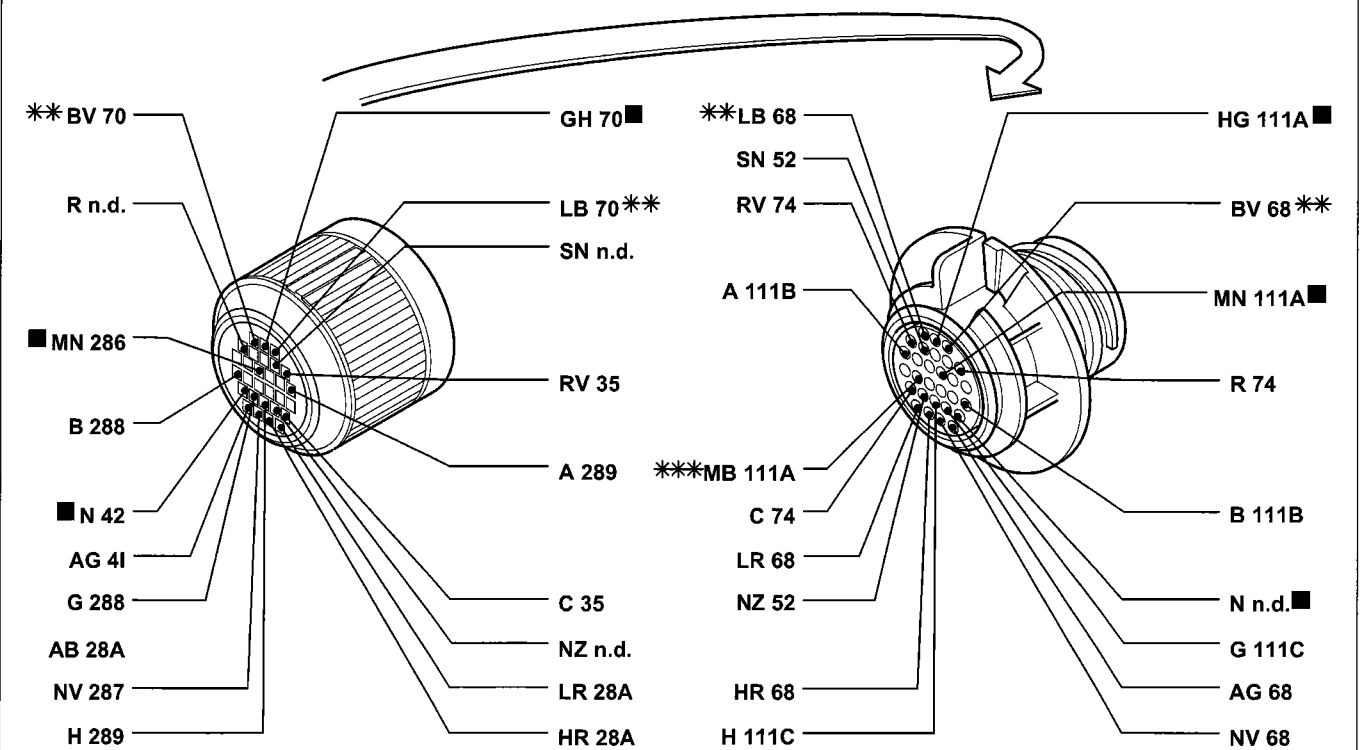
296 Fuse holder base on front cable  
A 7.5A fuse protecting cooling system/electronic injection; C.A. system; Alarm

361 Diagnostic socket
- N.D. Ultrasound welding taped in cable loom

35 Connection between dashboard/left front door cables



36 Connection between dashboard/right front door cables

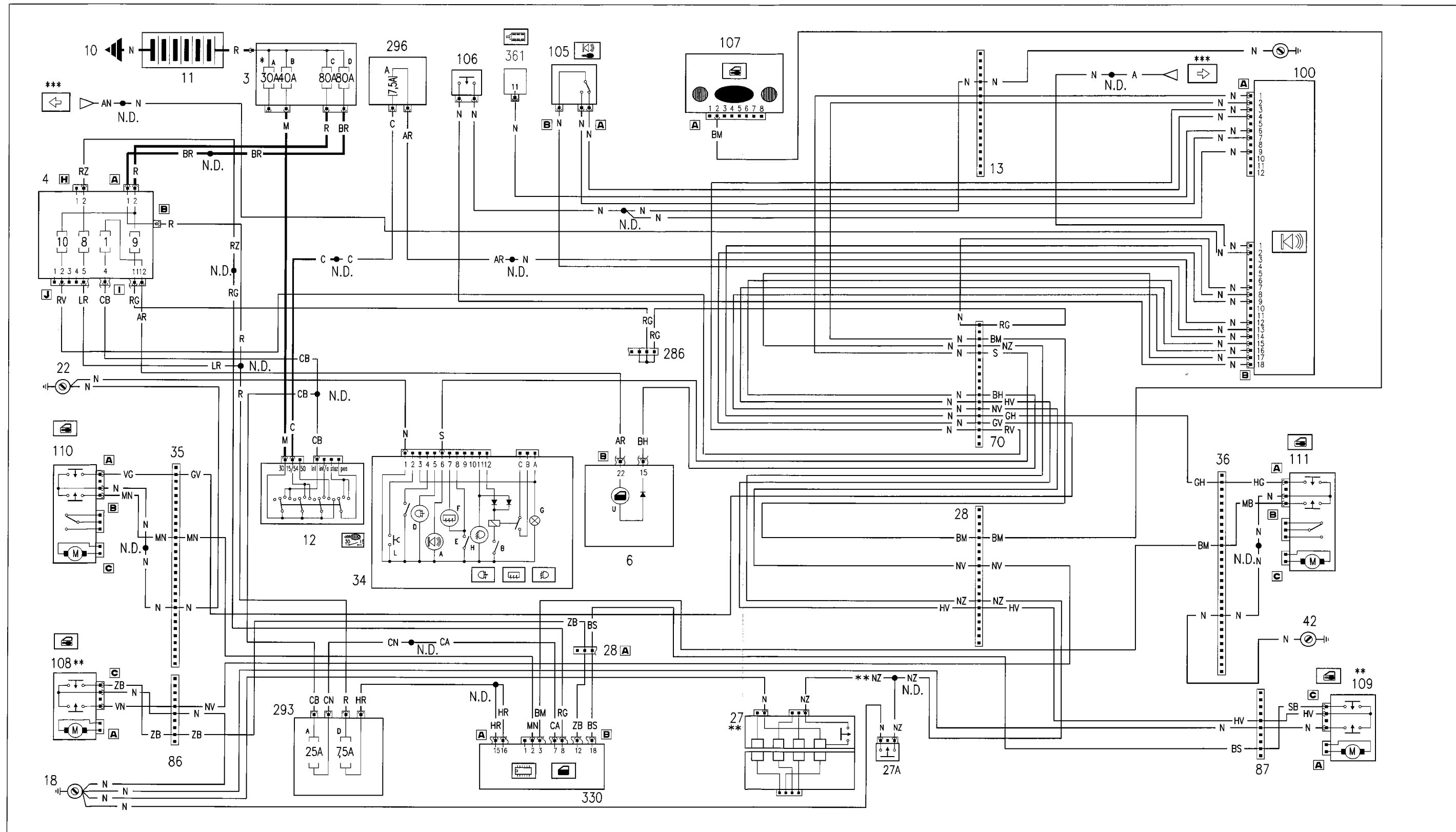


The cables concerned are marked in the wiring diagram with a square

**ELX trim level**

**Version with ABI:**

**Alarm - Alarm on warning light**

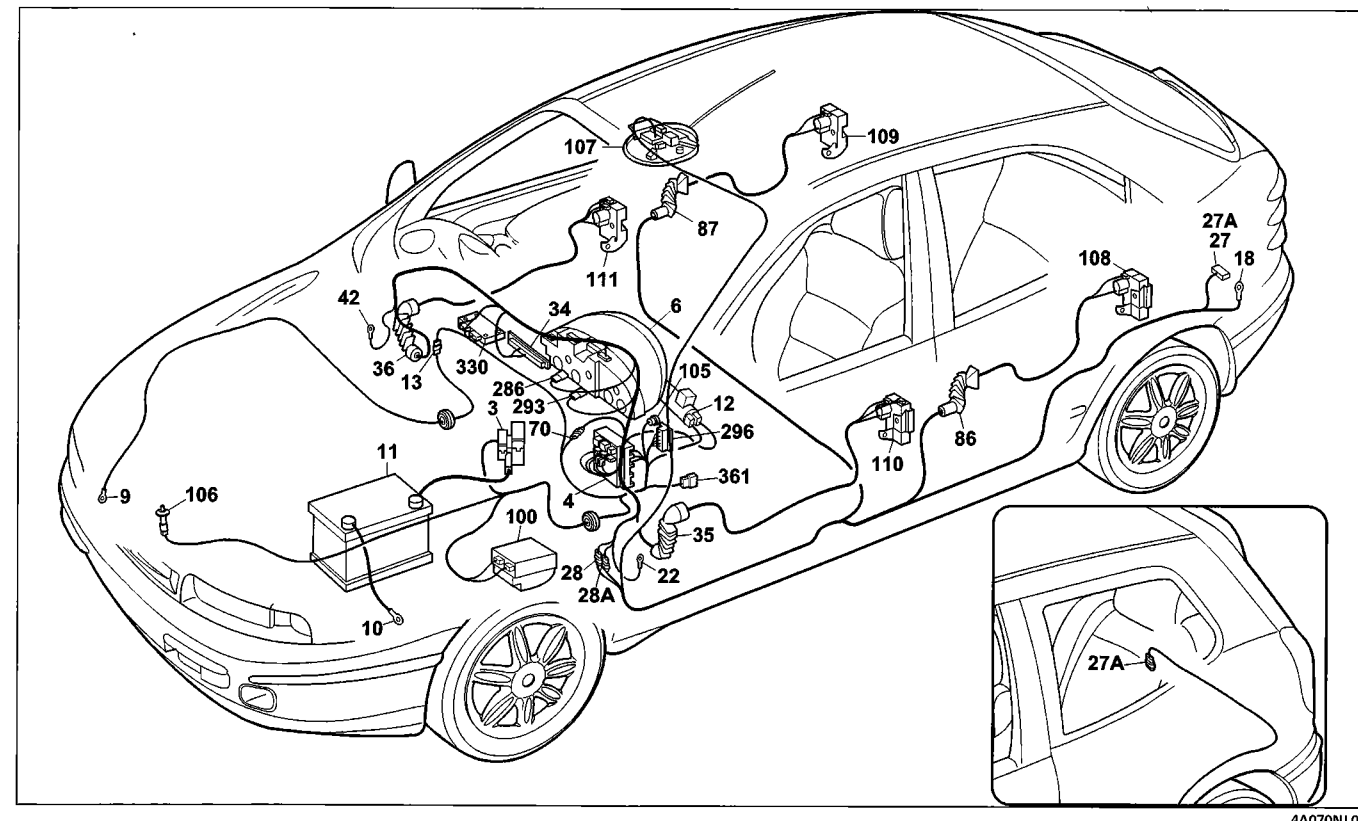


\* 60A fuse for TD versions

\*\* Non existent for the Bravo version

\*\*\* See direction indicators wiring diagram

### 55.

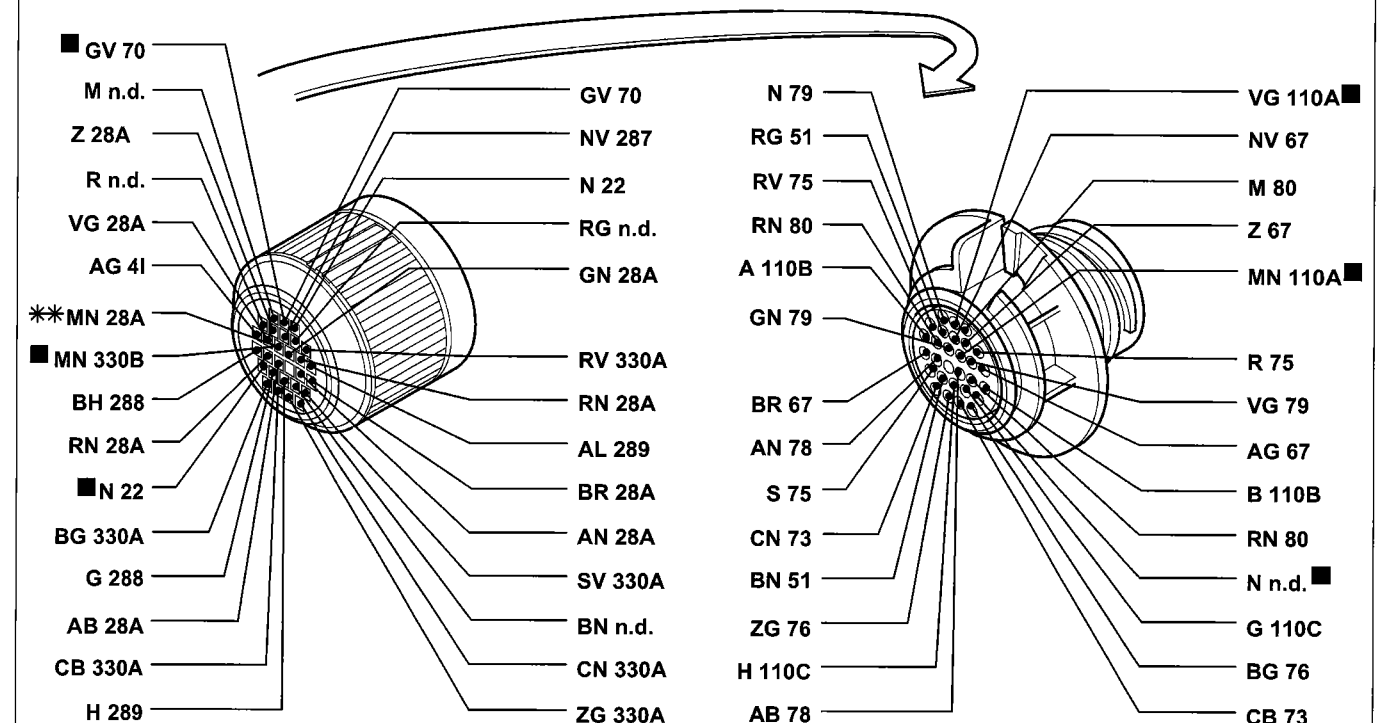


ELX trim level  
Version with ABI  
Alarm - Alarm on warning light

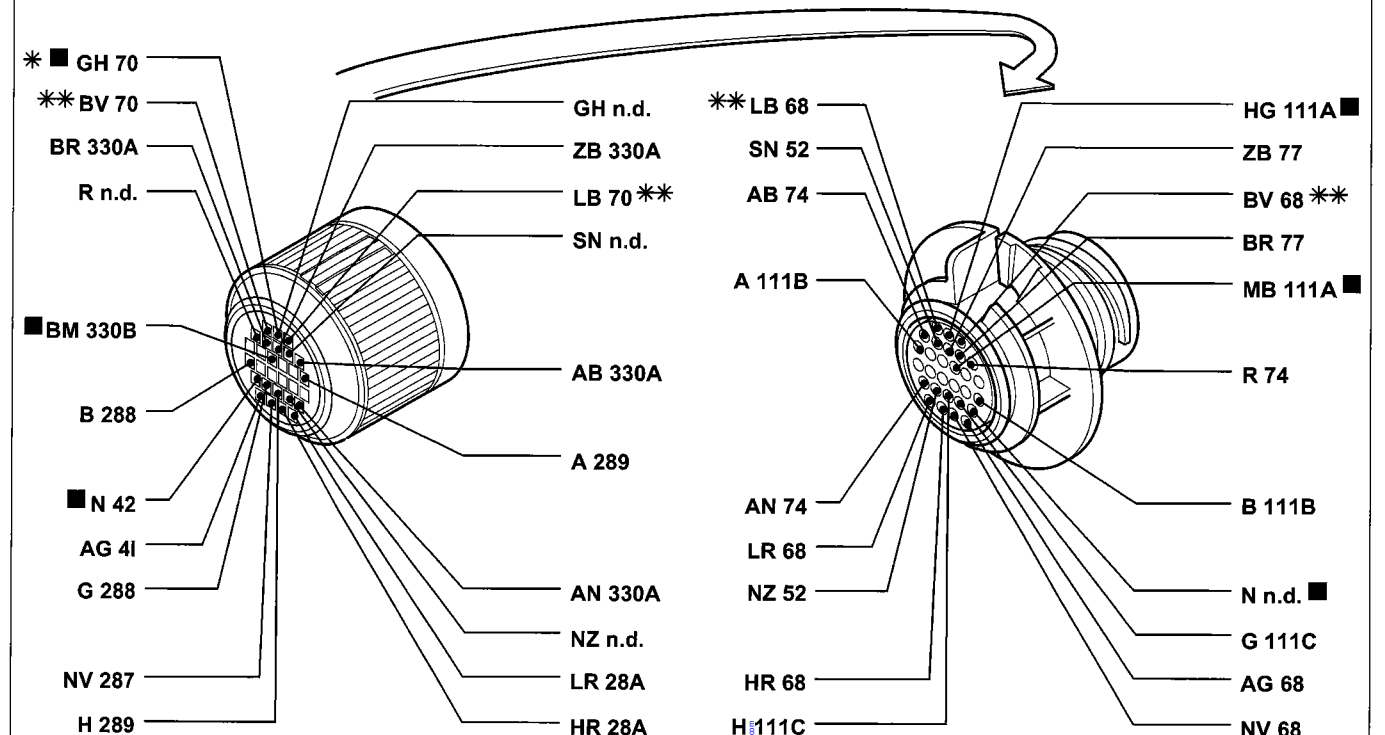
#### Component key

- |                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system (60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting optional equipment<br>D 80A fuse protecting junction unit                                                                                                                                                            | 36 Connection between dashboard/right front door cables                                                                                                                                        |
| 4 Junction unit                                                                                                                                                                                                                                                                                                                                                         | 42 Right dashboard earth                                                                                                                                                                       |
| 6 Instrument panel:<br>U Doors open warning light                                                                                                                                                                                                                                                                                                                       | 70 Connection between facia/front leads                                                                                                                                                        |
| 9 Right front earth                                                                                                                                                                                                                                                                                                                                                     | 86 Connection between longitudinal/left rear door cables                                                                                                                                       |
| 10 Battery earth on bodyshell                                                                                                                                                                                                                                                                                                                                           | 87 Connection between longitudinal/right rear door cables                                                                                                                                      |
| 11 Battery                                                                                                                                                                                                                                                                                                                                                              | 100 Anti-theft electronic control unit                                                                                                                                                         |
| 12 Ignition switch                                                                                                                                                                                                                                                                                                                                                      | 105 Anti-theft deactivation switch                                                                                                                                                             |
| 13 Connection between right/left front cables                                                                                                                                                                                                                                                                                                                           | 106 Anti-theft engagement switch                                                                                                                                                               |
| 18 Left rear earth                                                                                                                                                                                                                                                                                                                                                      | 107A Central locking remote control receiver                                                                                                                                                   |
| 22 Left facia earth                                                                                                                                                                                                                                                                                                                                                     | 108 Left rear door lock/anti-theft engagement switch                                                                                                                                           |
| 27 Contact board for rear connections with luggage compartment light switch incorporated                                                                                                                                                                                                                                                                                | 109 Right rear door lock/anti-theft engagement switch                                                                                                                                          |
| 27A Button for luggage compartment light, switching on alarm and signalling tailgate open                                                                                                                                                                                                                                                                               | 110 Left front door lock/anti-theft engagement switch                                                                                                                                          |
| 28 Connection between dashboard/longitudinal cables                                                                                                                                                                                                                                                                                                                     | 111 Right front door lock/anti-theft engagement switch                                                                                                                                         |
| 34 Switch control unit:<br>A Anti-theft device on warning light<br>B Rear fog lamps control switch<br>C Rear fog lamps warning light<br>E Heated rear windscreen control switch<br>F Heated rear windscreen warning light<br>G Switch control panel ideogram light<br>H Fog lights warning light<br>I Fog lights control switch<br>L Outside temperature control switch | 286 Short circuit connection                                                                                                                                                                   |
| 35 Connection between dashboard/left front door cables                                                                                                                                                                                                                                                                                                                  | 293 Fuse holder base on front cable<br>A 7.5A fuse protecting switch panel light; Radio phone; Radio; Electric mirrors<br>D 25A fuse protecting ABI control unit; Central locking control unit |
|                                                                                                                                                                                                                                                                                                                                                                         | 296 Fuse holder base on front cable<br>A 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                         | 330 ABI control unit                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                         | 361 Diagnostic socket                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                         | N.D. Ultrasound welding taped in cable loom                                                                                                                                                    |

#### 35 Connection between dashboard/left front door cables

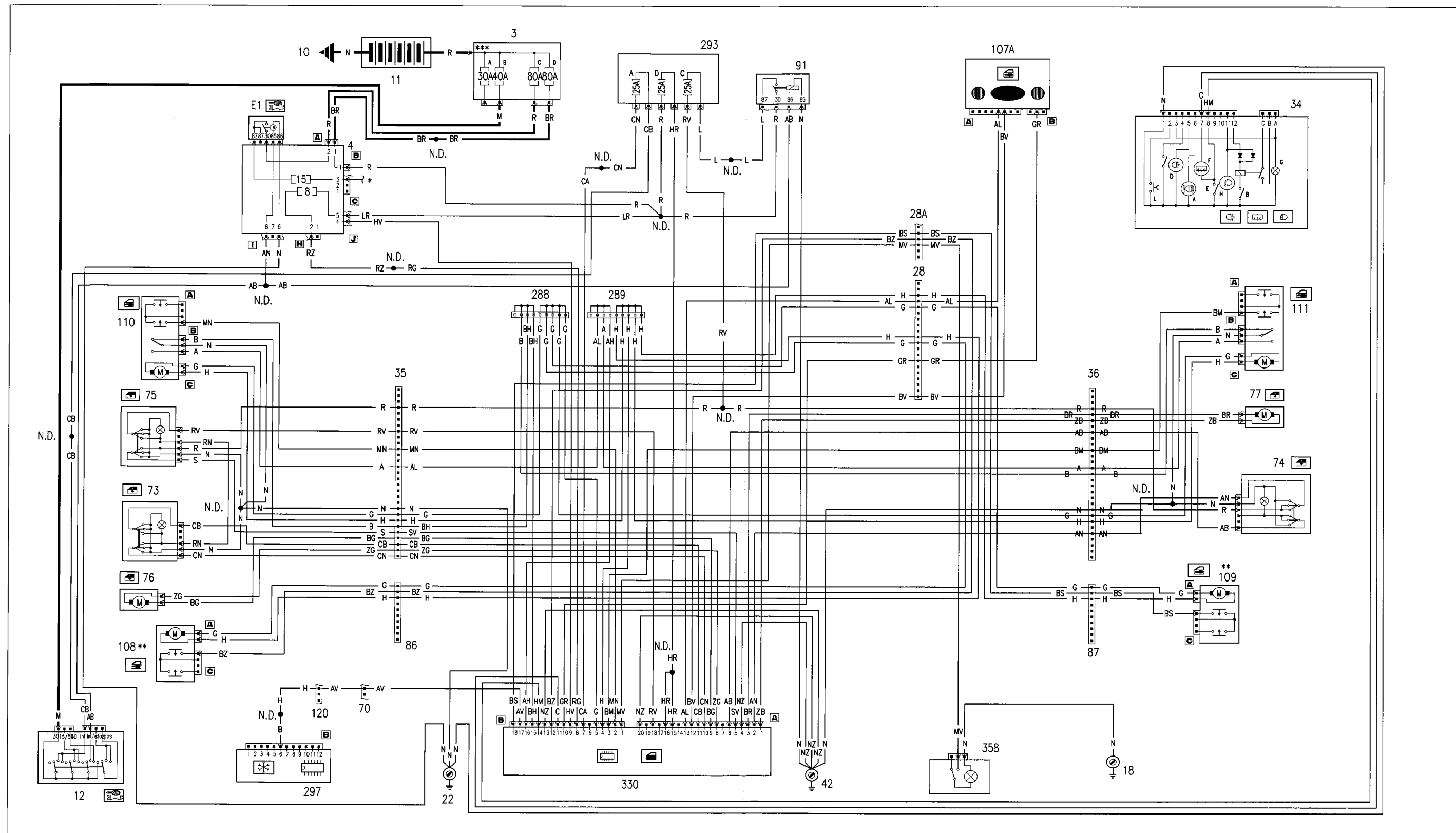


#### 36 Connection between dashboard/right front door cables



The cables concerned are marked in the wiring diagram with a square

### ELX GT trim level ABI control unit connections



\* 60A fuse for TD versions

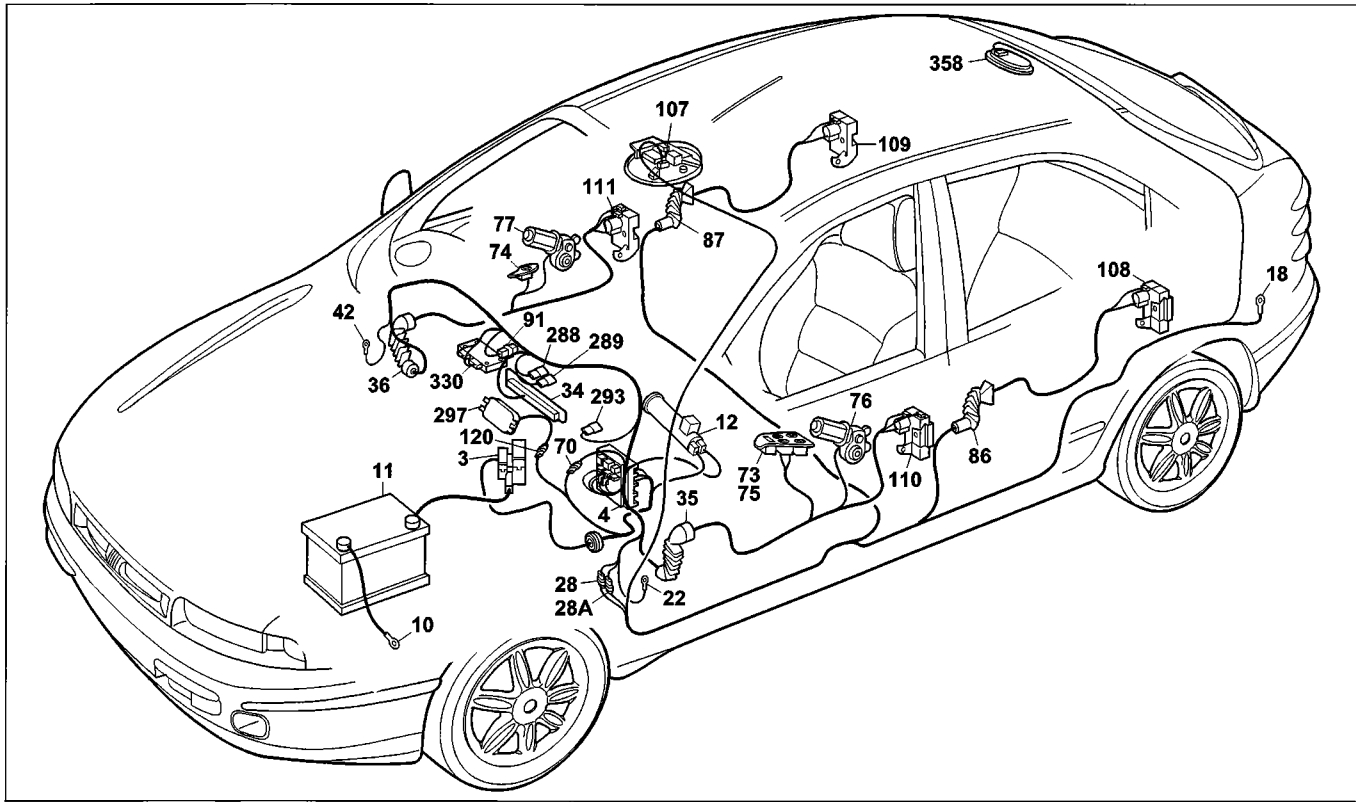
\*\* Non existent for the Bravo version

\*\*\* See direction indicators wiring diagram

4A071 NL01



55.

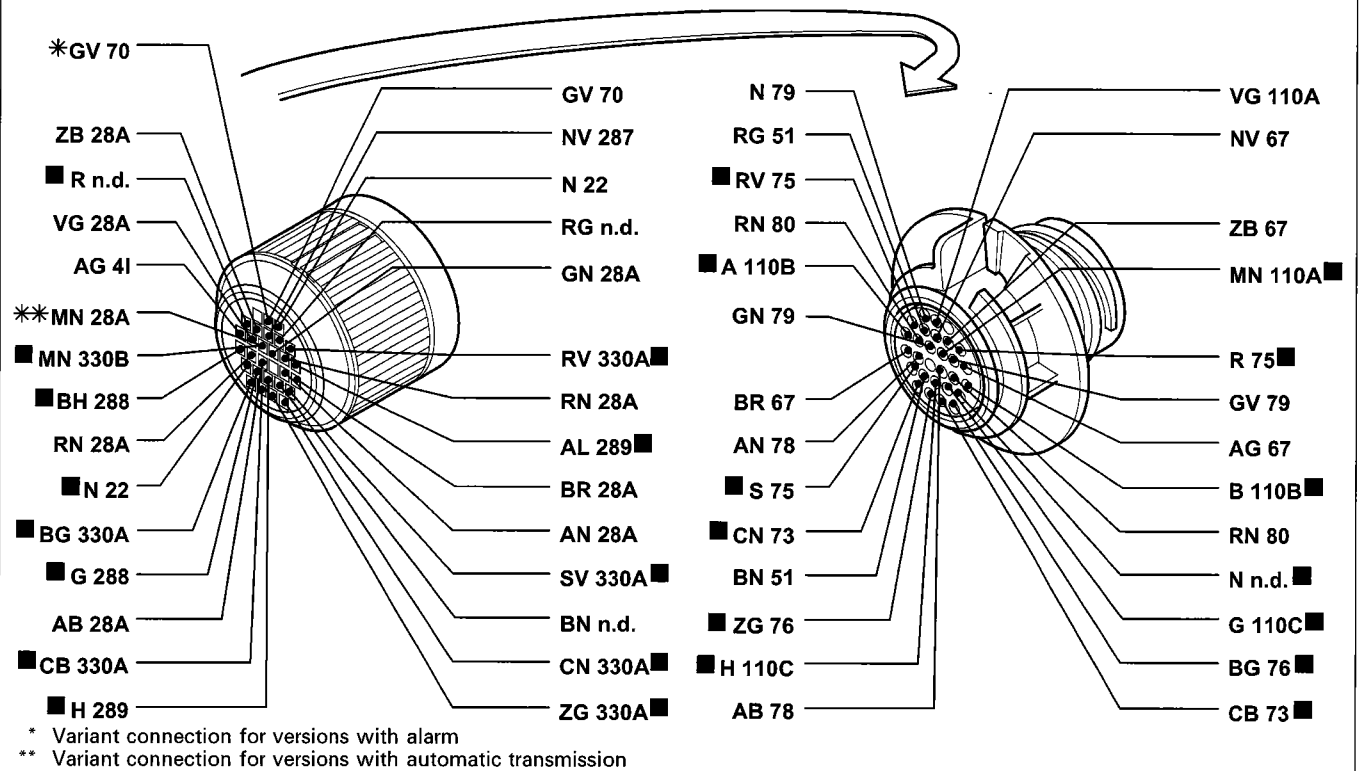


ELX GT trim level  
ABI control unit connections

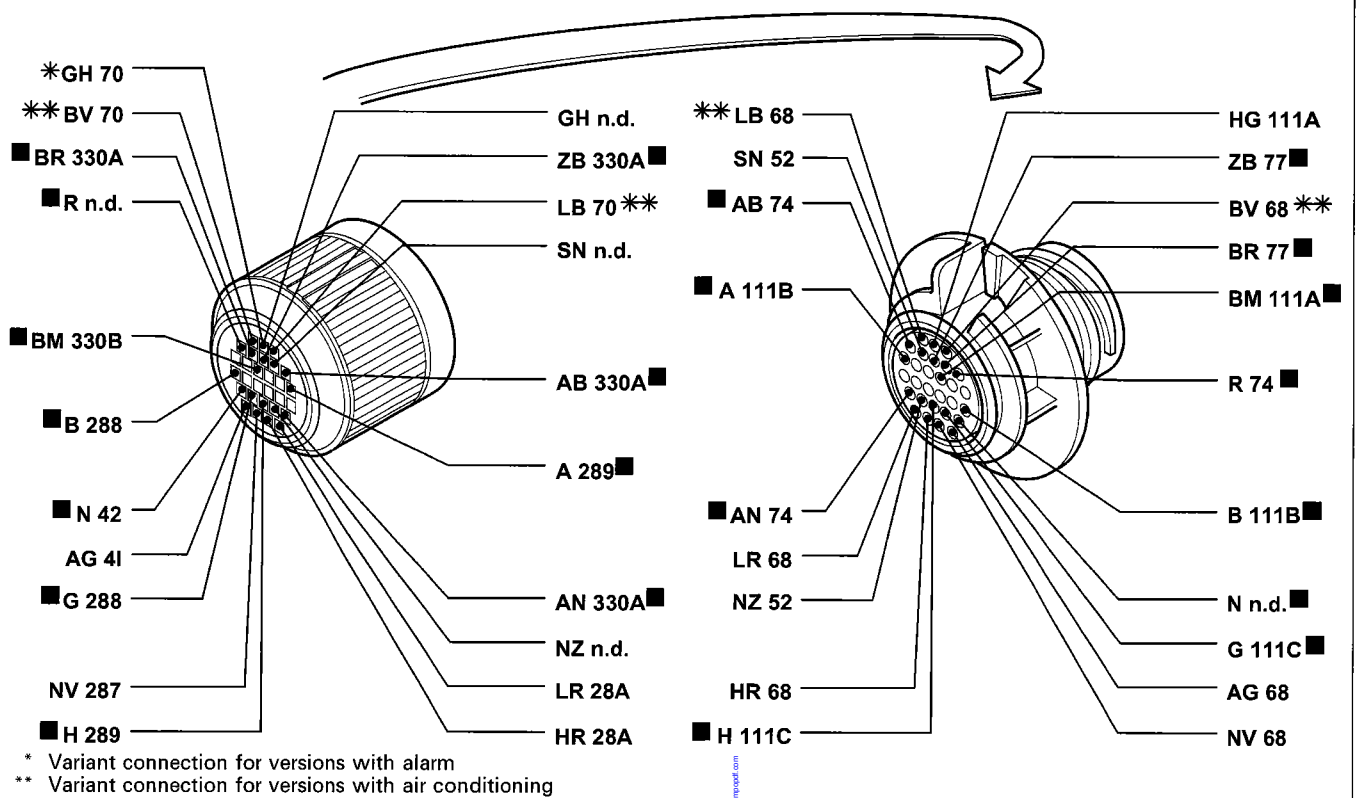
Component key

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system (60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting optional equipment<br>D 80A fuse protecting junction unit                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 74 Right front electric window control panel<br>75 Right front electric window control panel on left front door<br>76 Left front window motor<br>77 Right front window motor<br>86 Connection between longitudinal/left rear door cables<br>87 Connection between longitudinal/right rear door cables<br>91 Power relay<br>107A Central locking remote control receiver<br>108 Left rear door lock/anti-theft engagement switch<br>109 Right rear door lock/anti-theft engagement switch<br>110 Left front door lock/anti-theft engagement switch<br>111 Right front door lock/anti-theft engagement switch<br>120 Connection for air conditioning unit cables<br>288 Short circuit connection<br>289 Short circuit connection<br>293 Fuse holder base on dashboard cable<br>A 7.5A fuse protecting switch panel light; Radio telephone; Radio; Electric mirrors<br>D 25A fuse protecting ABI control unit; Central locking control unit<br>297 Air conditioning control unit<br>330 ABI control unit<br>358 Rear courtesy light<br>N.D. Ultrasound welding taped in cable loom |
| 4 Junction unit<br>E1 Switch discharge relay<br>10 Battery earth on bodyshell<br>12 Ignition switch<br>18 Left rear earth<br>22 Left facia earth<br>28 Connection between dashboard/longitudinal cables<br>28A Connection between dashboard/longitudinal cables<br>34 Switch control unit:<br>A Anti-theft device on warning light<br>B Rear fog lamps control switch<br>C Rear fog lamp relay feed<br>D Rear fog lamps warning light<br>E Heated rear windscreen control switch<br>F Heated rear windscreen warning light<br>G Switch control panel ideogram light<br>H Fog lights warning light<br>I Fog lights control switch<br>L Outside temperature control switch |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
- 35 Connection between dashboard/left front door cables  
36 Connection between dashboard/right front door cables  
42 Right dashboard earth  
70 Connection between facia/front leads  
73 Left front electric window control panel

35 Connection between dashboard/left front door cables



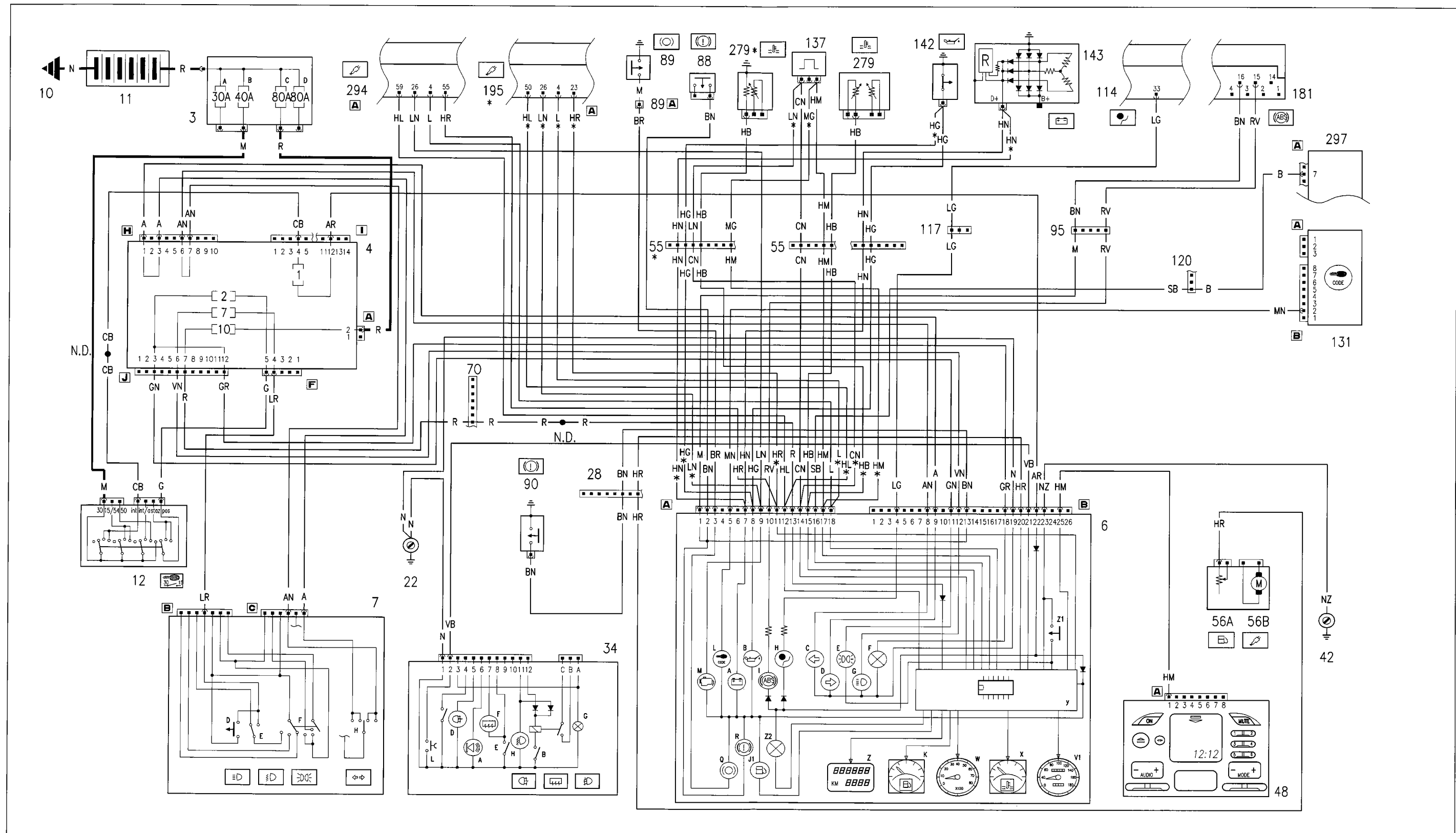
36 Connection between dashboard/right front door cables



The cables concerned are marked in the wiring diagram with a square

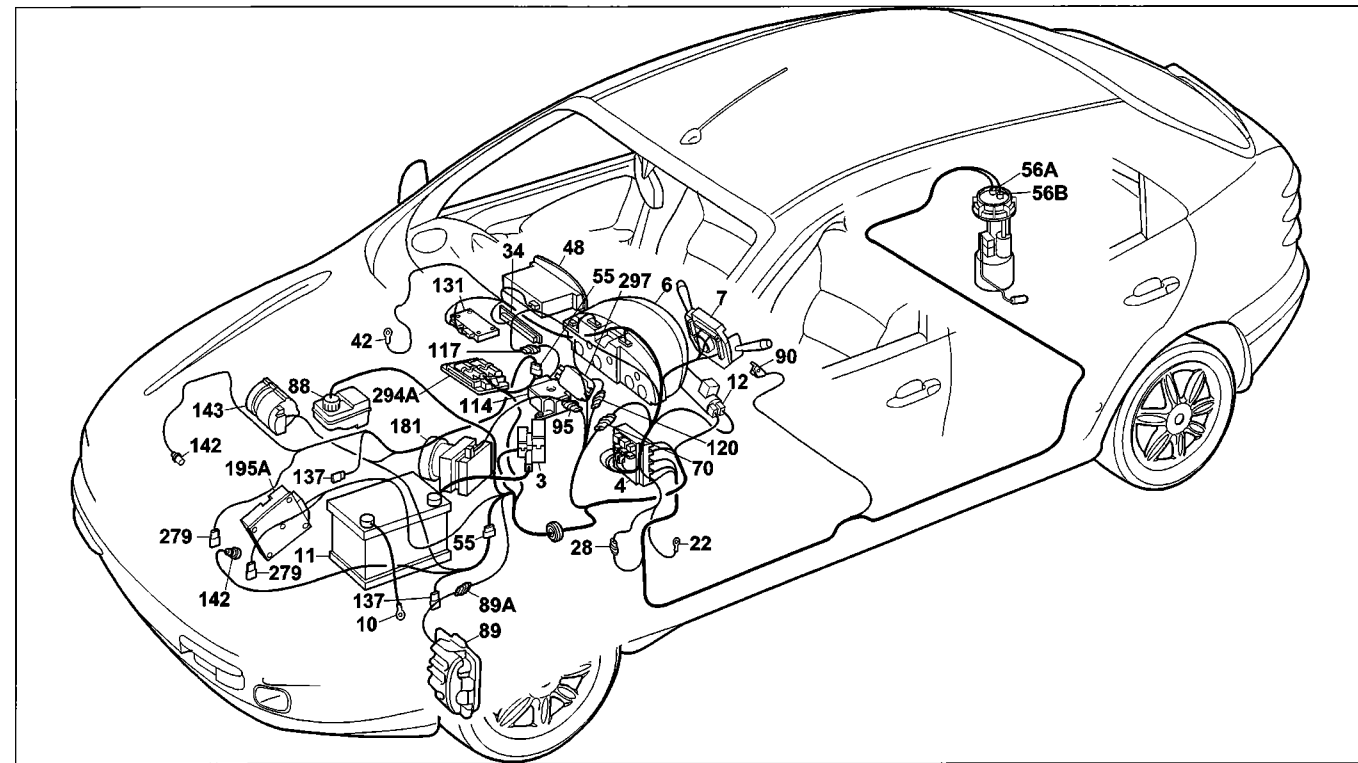


**SX-GT trim level**  
**Instrument panel connections**



\* Variant connection for the 1581 16V version

4A073NL01



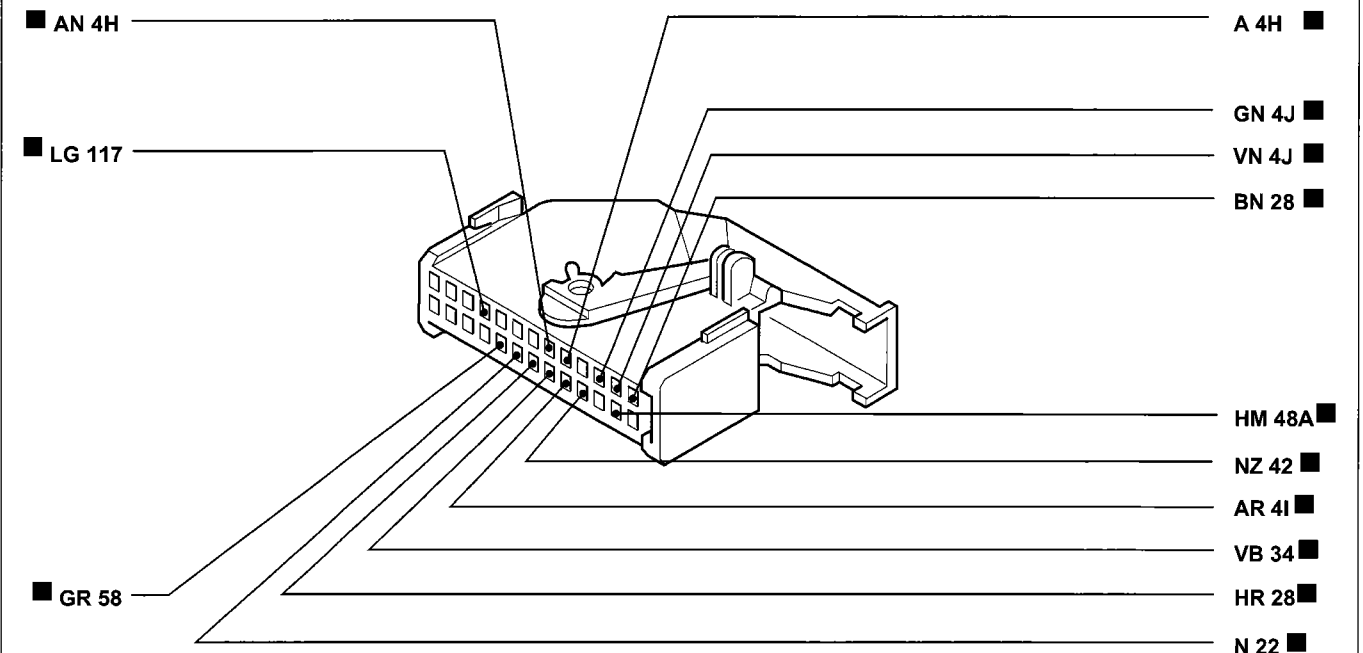
SX-GT trim level  
Instrument panel connections

### Component key

- |                                                                  |                                                                  |
|------------------------------------------------------------------|------------------------------------------------------------------|
| 3 Power fusebox:                                                 | 22 Left facia earth                                              |
| A 30A fuse protecting injection system (60A for TD versions)     | 28 Connection between dashboard/longitudinal cables              |
| B 40A fuse protecting ignition system                            | 34 Switch control unit:                                          |
| C 80A fuse protecting optional equipment                         | A Anti-theft device on warning light                             |
| D 80A fuse protecting junction unit                              | B Rear fog lamps control switch                                  |
| 4 Junction unit                                                  | C Rear fog lamps relay feed                                      |
| E1 Switch discharge relay                                        | D Rear fog lamps warning light                                   |
| 6 Instrument panel:                                              | E Heated rear windscreen control switch                          |
| A Battery recharging warning light                               | F Heated rear windscreen warning light                           |
| B Low engine oil pressure warning light                          | G Switch control panel ideogram light                            |
| C Left direction indicator warning light                         | H Fog lights warning light                                       |
| D Right direction indicator warning light                        | I Fog lights control switch                                      |
| E Side lights warning light                                      | L Outside temperature control switch                             |
| F Instrument panel ideograms light                               | 42 Right dashboard earth                                         |
| G Main beam headlamps warning light                              | 48 Radio receiver with clock                                     |
| H AIR BAG system failure warning light                           | 55 Connection between front/fuel gauge cables                    |
| I Anti-lock brakes failure warning light                         | 56 Fuel gauge                                                    |
| J1 Fuel reserve warning light                                    | A Fuel level sensor                                              |
| K Fuel gauge                                                     | B Electric fuel pump                                             |
| L Fiat-CODE failure warning light                                | 70 Connection for front dashboard cables                         |
| M Injection system failure warning light petrol/diesel           | 88 Insufficient brake fluid level sensor                         |
| N Maximum turbocharging pressure warning light                   | 89 Left brake pad wear sensor                                    |
| Q Front brake pad wear warning light                             | 89A Left brake pad wear sensor cables                            |
| R Handbrake applied/insufficient brake fluid level warning light | 90 Switch indicating handbrake applied                           |
| V1 Speedometer                                                   | 95 Connection between front cables/anti-lock brakes (A.B.S.)     |
| W Rev counter                                                    | 114 Air Bag electronic control unit                              |
| X Engine coolant temperature gauge                               | 117 Connection for EURO BAG/dashboard cables                     |
| Y Electronic module                                              | 120 Connection for air conditioning unit cables                  |
| Z Milometer/trip meter display                                   | 131 Fiat CODE electronic control unit                            |
| Z1 Trip meter zeroing button                                     | 137 Vehicle speed sensor                                         |
| Z2 Trip meter light                                              | 142 Switch indicating insufficient engine oil pressure           |
| 7 Stalk unit                                                     | 143 Alternator                                                   |
| D Headlamp flasher button                                        | 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.) |
| E Dipped/main beam headlamps control switch                      | 195 Injection/ignition electronic control unit (1581)            |
| F Side lights control switch                                     | 279 Engine coolant temperature twin sender unit                  |
| H Direction indicators control switch                            | 294 Injection/ignition electronic control unit (1242)            |
| 9 Right front earth                                              | 297 Injection control unit                                       |
| 10 Battery earth on bodysell                                     | N.D. Ultrasound welding taped in cable loom                      |
| 11 Battery                                                       |                                                                  |
| 12 Ignition switch                                               |                                                                  |
| 13 Connection between right/left front cables                    |                                                                  |

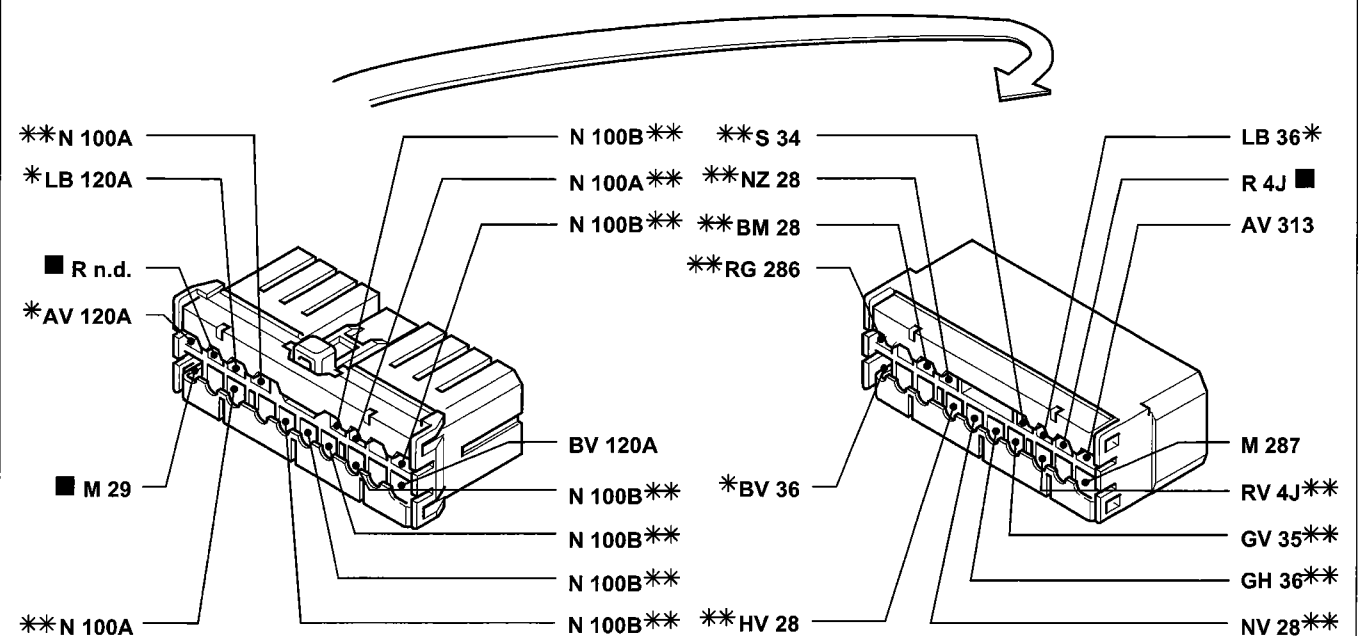
## 55.

### 6B Instrument panel



\* Non existent for SX-GT trim levels  
\*\* Variant for versions with alarm

### 70 Connection between dashborad/front cables

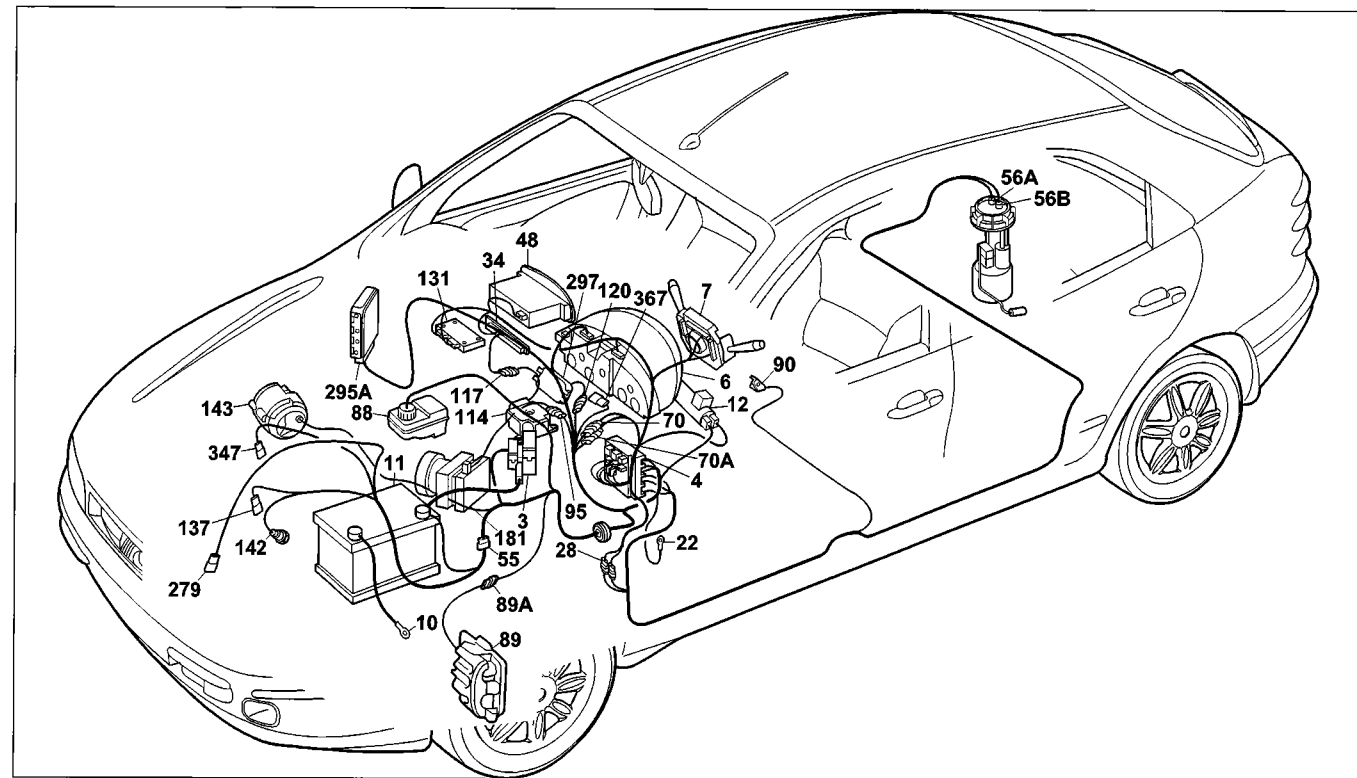


\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

The cables concerned are marked in the wiring diagram with a square

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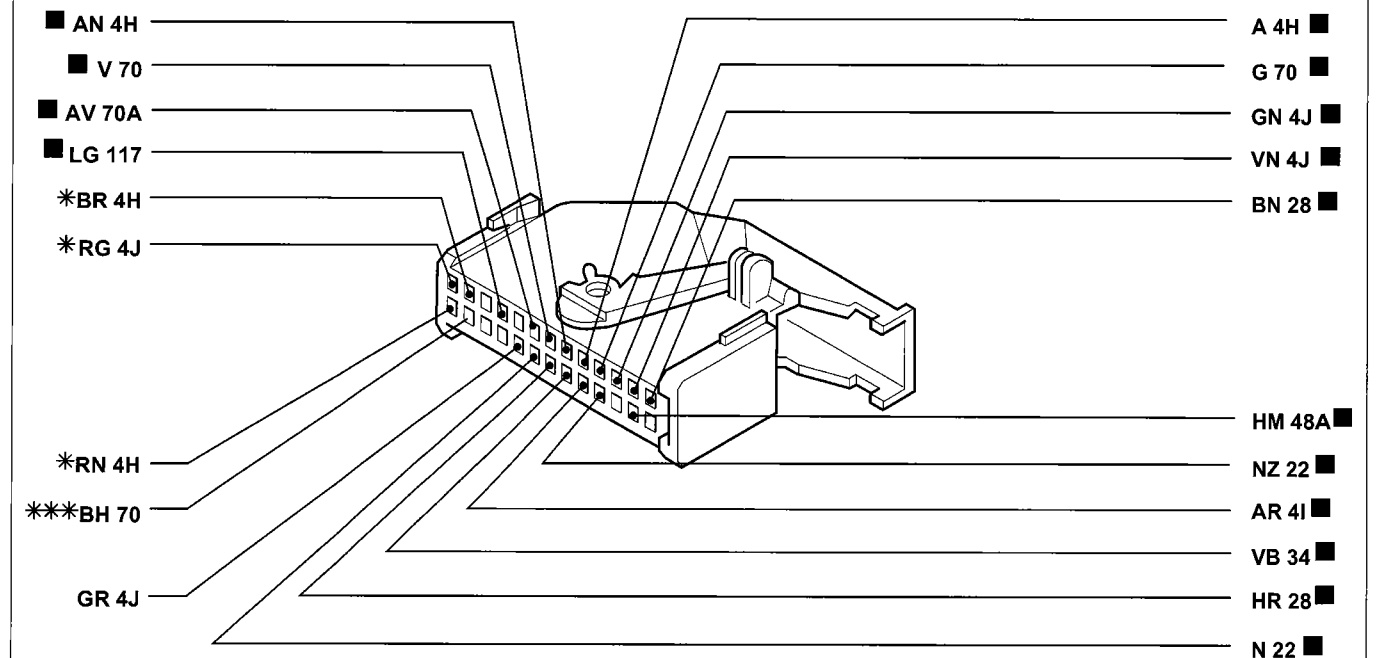
**SX-GT trim level**  
**Instrument panel connections**

### Component key

- |                                                                  |                                                                  |
|------------------------------------------------------------------|------------------------------------------------------------------|
| 3 Power fusebox:                                                 | 13 Connection between right/left front cables                    |
| A 30A fuse protecting injection system (60A for TD versions)     | 22 Left facia earth                                              |
| B 40A fuse protecting ignition system                            | 28 Connection between dashboard/longitudinal cables              |
| C 80A fuse protecting optional equipment                         | 34 Switch control unit                                           |
| D 80A fuse protecting junction unit                              | A Anti-theft device on warning light                             |
| 4 Junction unit                                                  | B Rear fog lamps control switch                                  |
| 6 Instrument panel:                                              | C Rear fog lamps relay feed                                      |
| A Battery recharging warning light                               | D Rear fog lamps warning light                                   |
| B Low engine oil pressure warning light                          | E Heated rear windscreen control switch                          |
| C Left direction indicator warning light                         | F Heated rear windscreen warning light                           |
| D Right direction indicator warning light                        | G Switch control panel ideogram light                            |
| E Side lights warning light                                      | H Fog light warning light                                        |
| F Instrument panel ideograms light                               | I Fog lights control switch                                      |
| G Main beam headlamps warning light                              | L Outside temperature control switch                             |
| H AIR BAG system failure warning light                           | 48 Radio receiver with clock                                     |
| I Anti-lock brakes failure warning light                         | 55 Connection between front/fuel gauge cables                    |
| J1 Fuel reserve warning light                                    | 56 Fuel gauge                                                    |
| K Fuel gauge                                                     | A Fuel level sensor                                              |
| L Fiat-CODE failure warning light                                | B Electric fuel pump                                             |
| M Injection system failure warning light petrol/diesel           | 70 Connection for front dashboard cables +70A                    |
| O Heater plugs warning light                                     | 88 Insufficient brake fluid level sensor                         |
| Q Front brake pad wear warning light                             | 89 Left brake pad wear sensor                                    |
| R Handbrake applied/insufficient brake fluid level warning light | 89A Left brake pad wear sensor cables                            |
| V1 Speedometer                                                   | 90 Switch indicating handbrake applied                           |
| W Rev counter                                                    | 95 Connection between front cables/anti-lock brakes (A.B.S.)     |
| X Engine coolant temperature gauge                               | 114 Air Bag electronic control unit                              |
| X1 Water in fuel filter sensor                                   | 117 Connection for EURO BAG/dashboard cables                     |
| Y Electronic module                                              | 120 Connection for air conditioning unit cables                  |
| Z Milometer/trip meter display engine oil level gauge            | 131 Fiat CODE electronic control unit                            |
| Z1 Trip meter zeroing button                                     | 137 Vehicle speed sensor                                         |
| Z2 Trip meter light                                              | 142 Switch indicating insufficient engine oil pressure           |
| 7 Stalk unit                                                     | 143 Alternator                                                   |
| D Headlamp flasher button                                        | 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.) |
| E Dipped/main beam headlamps control switch                      | 279 Engine coolant temperature twin sender unit                  |
| F Side lights control switch                                     | 295 Injection/ignition electronic control unit 1910 JTD          |
| H Direction indicators control switch                            | 297 Injection control unit                                       |
| 10 Battery earth on bodyshell                                    | 347 Engine oil level sensor                                      |
| 11 Battery                                                       | 367 Water in fuel filter sensor                                  |
| 12 Ignition switch                                               | N.D. Ultrasound welding taped in cable loom                      |

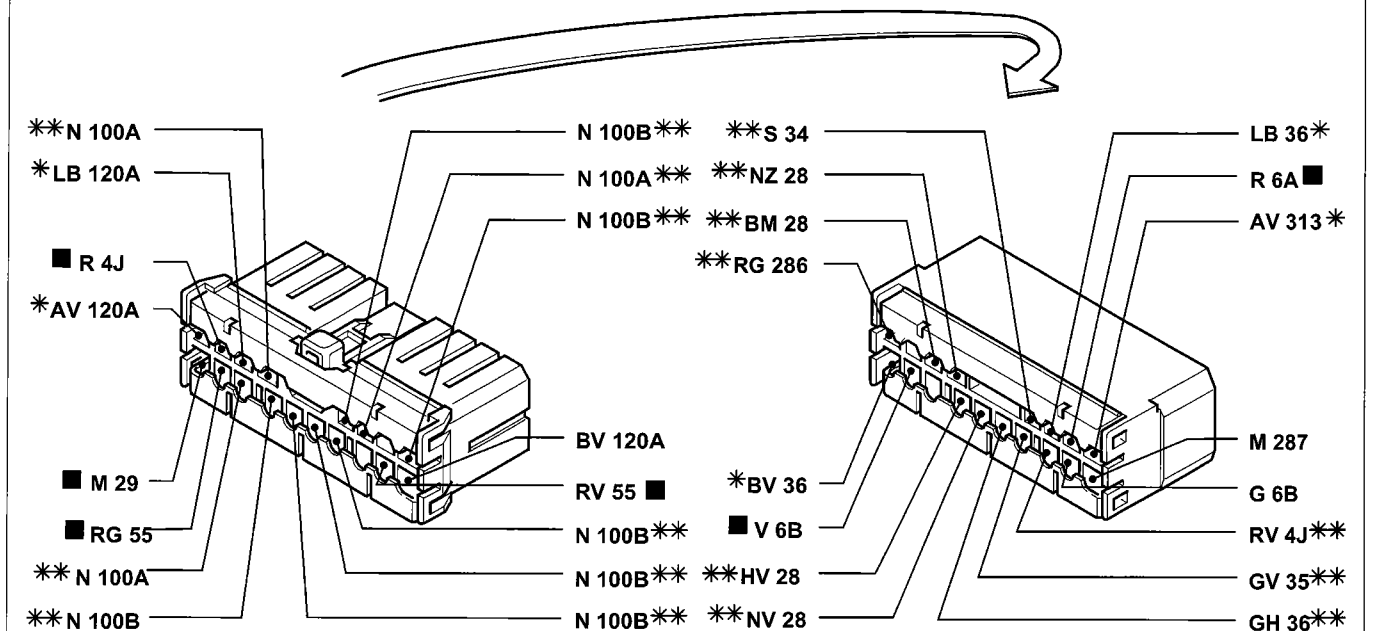
## 55.

### 6B Instrument panel



\* Non existent for SX-GT trim levels  
\*\* Variant for versions with alarm

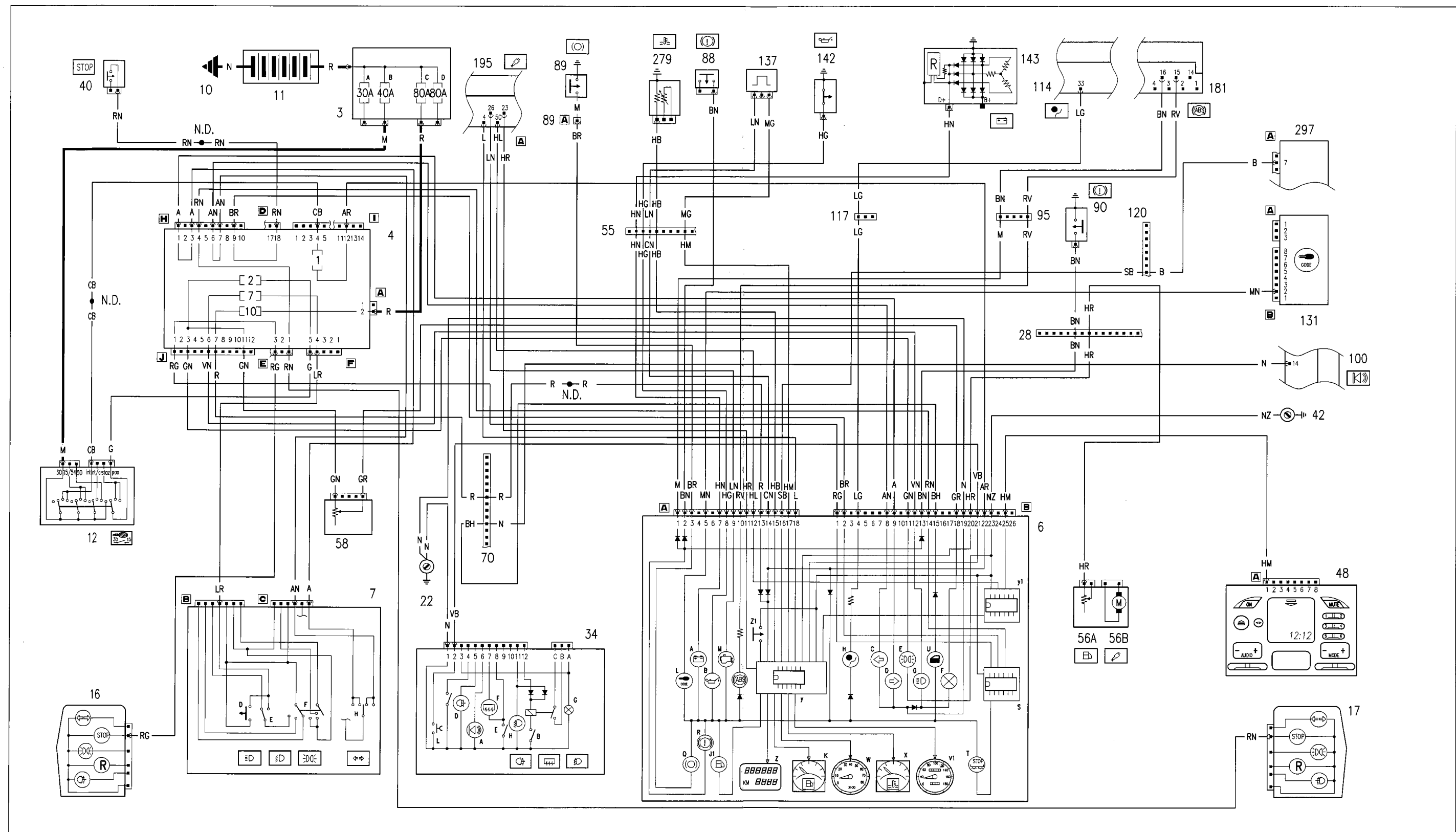
### 70 Connection between dashborad/front cables



\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

The cables concerned are marked in the wiring diagram with a square

**ELX trim level**  
**Instrument panel connections**





## 6B Instrument panel



|    |                                                                |      |                                                              |
|----|----------------------------------------------------------------|------|--------------------------------------------------------------|
| 3  | Power fusebox:                                                 | 17   | Right tail light cluster                                     |
|    | A 30A fuse protecting injection system (60A for TD versions)   | 22   | Left facia earth                                             |
|    | B 40A fuse protecting ignition system                          | 28   | Connection between dashboard/longitudinal cables             |
|    | C 80A fuse protecting optional equipment                       | 34   | Switch control unit:                                         |
|    | D 80A fuse protecting junction unit                            |      | A Anti-theft device on warning light                         |
| 4  | Junction unit                                                  |      | B Rear fog lamps control switch                              |
| 6  | Instrument panel:                                              |      | C Rear fog lamps relay feed                                  |
|    | A Battery recharging warning light                             |      | C Rear fog lamps warning light                               |
|    | B Low engine oil pressure warning light                        |      | E Heated rear windscreen control switch                      |
|    | C Left direction indicator warning light                       |      | F Heated rear windscreen warning light                       |
|    | D Right direction indicator warning light                      |      | G Switch control panel ideogram light                        |
|    | E Side lights warning light                                    |      | H Fog lights warning light                                   |
|    | F Instrument panel ideograms light                             |      | I Fog lights control switch                                  |
|    | G Main beam headlamps warning light                            |      | L Outside temperature control switch                         |
|    | H AIR BAG system failure warning light                         | 40   | Brake light control switch                                   |
|    | I Anti-lock brakes failure warning light                       | 42   | Right dashboard earth                                        |
| J1 | Fuel reserve warning light                                     | 48   | Radio receiver with clock                                    |
| K  | Fuel gauge                                                     | 55   | Connection between front/fuel gauge cables                   |
| L  | Fiat-CODE failure warning light                                | 56   | Fuel gauge                                                   |
| M  | Injection system failure warning light petrol/diesel           |      | A Fuel level sensor                                          |
| O  | Heater plugs warning light                                     |      | B Electric fuel pump                                         |
| Q  | Front brake pad wear warning light                             | 70   | Connection for front dashboard cables +70A                   |
| R  | Handbrake applied/insufficient brake fluid level warning light | 88   | Insufficient brake fluid level sensor                        |
| S  | Brake lights failure electronic module                         | 89   | Left brake pad wear sensor                                   |
| T  | Brake lights failure warning light                             | 89A  | Left brake pad wear sensor cables                            |
| U  | Doors open warning light                                       | 90   | Switch indicating handbrake applied                          |
| V1 | Speedometer                                                    | 95   | Connection between front cables/anti-lock brakes (A.B.S.)    |
| W  | Rev counter                                                    | 100  | Anti-theft electronic control unit                           |
| X  | Engine coolant temperature gauge                               | 114  | Air Bag electronic control unit                              |
| Y  | Electronic module                                              | 117  | Connection for EURO BAG/dashboard                            |
| Y1 | Speed control module                                           | 120  | Connection for air conditioning unit cables                  |
| Z  | Milometer/trip meter display engine oil level gauge            | 131  | Fiat CODE electronic control unit                            |
| Z1 | Trip meter zeroing button                                      | 137  | Vehicle speed sensor                                         |
| 7  | Stalk unit:                                                    | 142  | Switch indicating insufficient engine oil pressure           |
|    | D Headlamp flasher button                                      | 143  | Alternator                                                   |
|    | E Dipped/main beam headlamps control switch                    | 181  | Electro-hydraulic control unit for anti-lock brakes (A.B.S.) |
|    | F Side lights control switch                                   | 195  | Injection/ignition electronic control unit (1581)            |
|    | H Direction indicators control switch                          | 279  | Engine coolant temperature twin sender unit                  |
| 10 | Battery earth on bodyshe'll                                    | 295  | Injection/ignition electronic control unit 1910 JTD          |
| 11 | Battery                                                        | 297  | Injection control unit                                       |
| 12 | Ignition switch                                                |      |                                                              |
| 16 | Left tail light cluster                                        | N.D. | Ultrasound welding taped in cable loom                       |



## A078NL03

Print n° 506.670/22

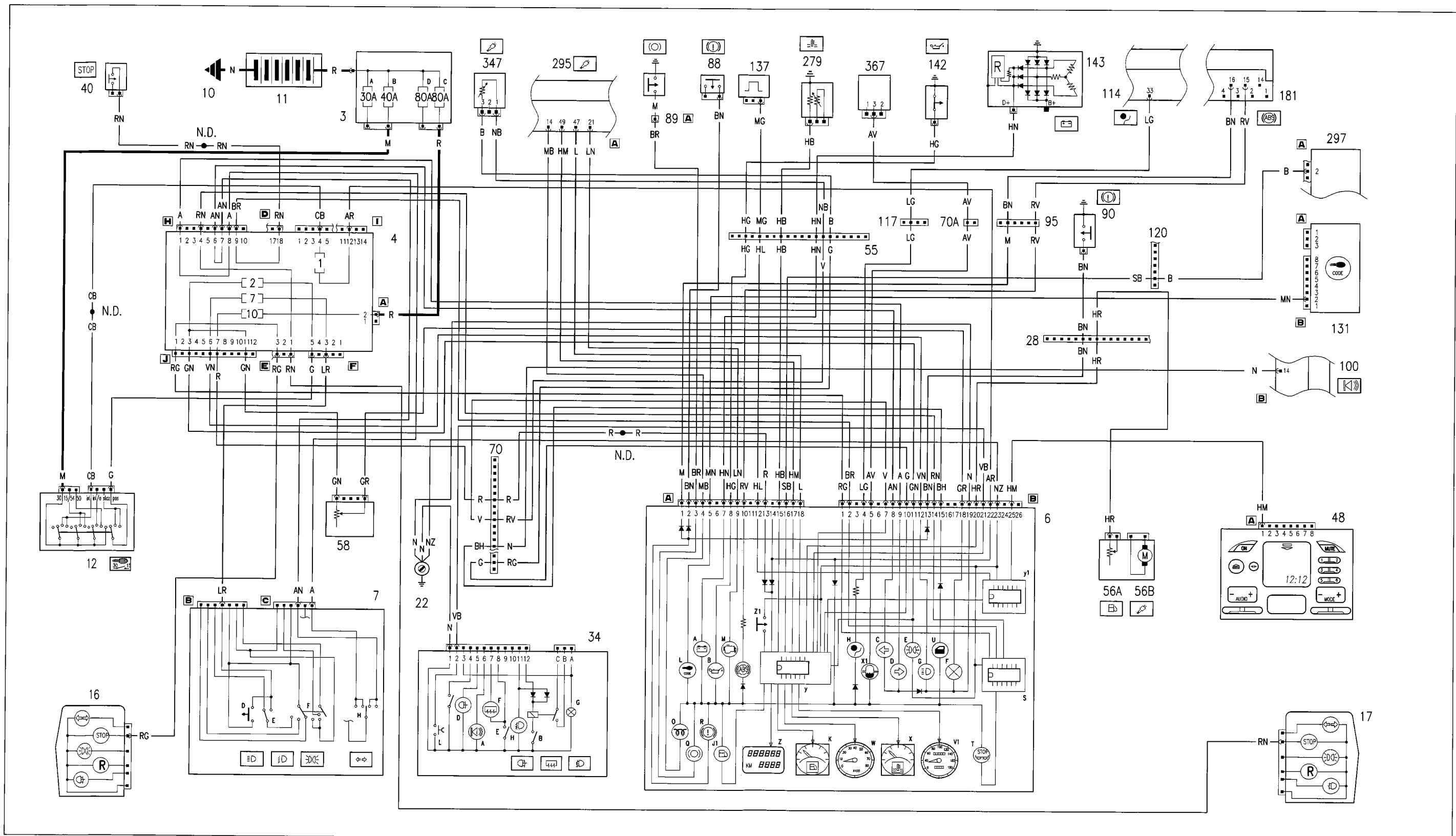


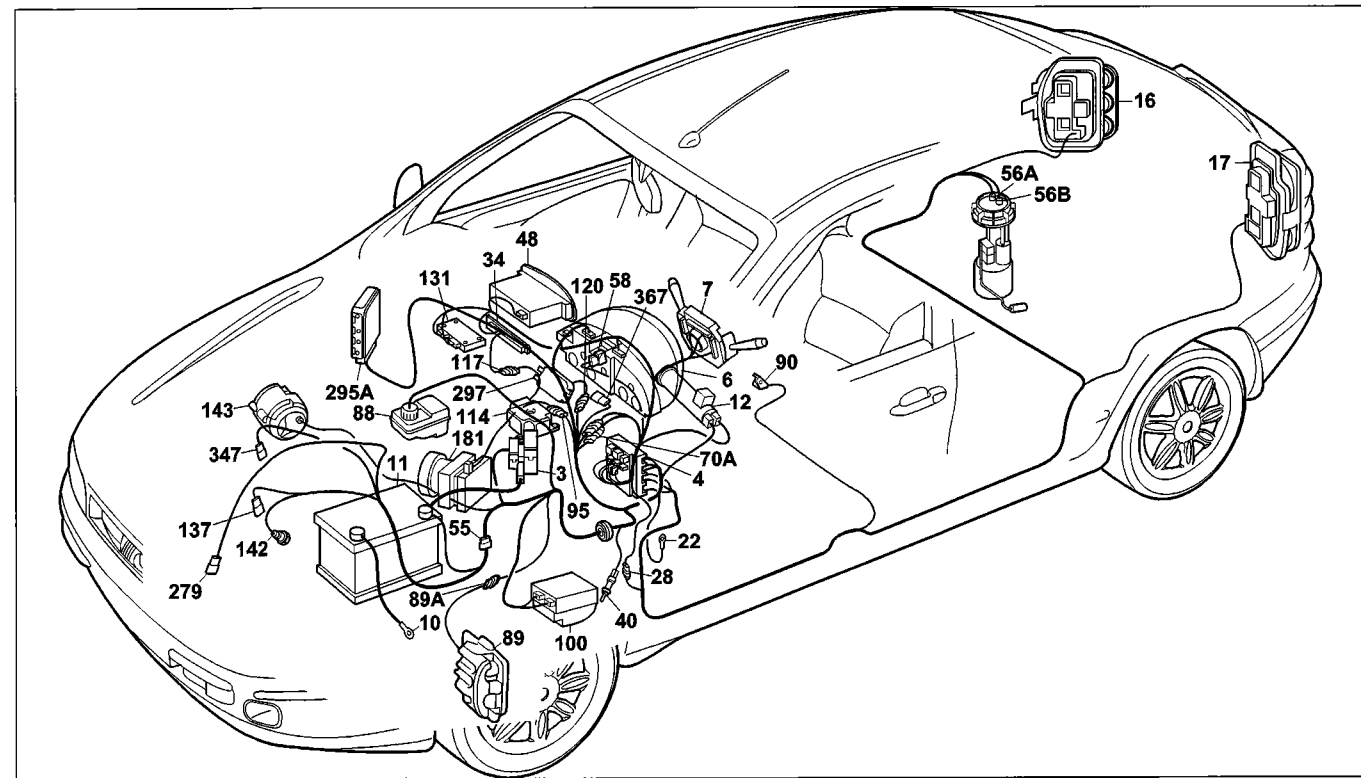
# Electrical equipment

## Wiring diagrams

### 55.

ELX trim level  
Instrument panel connections





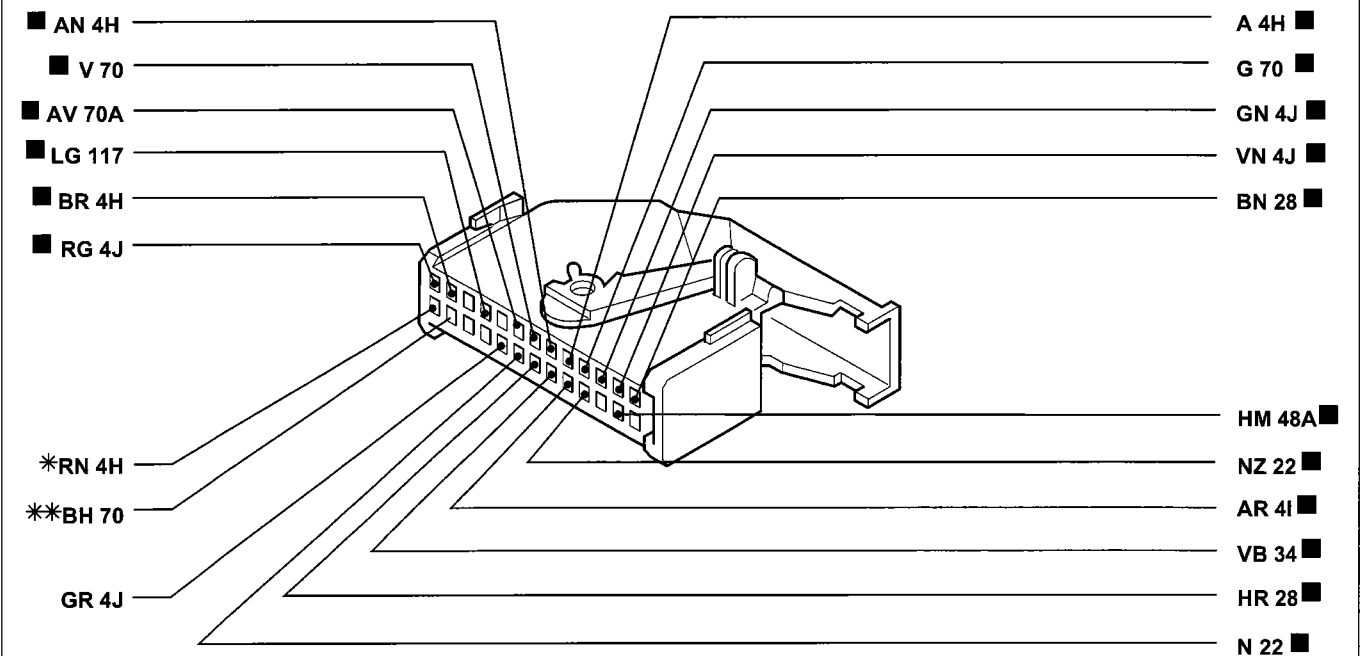
ELX trim level  
Instrument panel connections

### Component key

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Power fusebox:<br>A 30A fuse protecting injection system (60A for TD versions)<br>B 40A fuse protecting ignition system<br>C 80A fuse protecting optional equipment<br>D 80A fuse protecting junction unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 17 Right tail light cluster<br>22 Left facia earth<br>28 Connection between dashboard/longitudinal cables<br>34 Switch control unit<br>A Anti-theft device on warning light<br>B Rear fog lamps control switch<br>C Rear fog lamps relay feed<br>D Rear fog lamps warning light<br>E Heated rear windscreen control switch<br>F Heated rear windscreen warning light<br>G Switch control panel ideogram light<br>H Fog light warning light<br>I Fog lights control switch<br>L Outside temperature control switch<br>40 Brake light control switch<br>48 Radio receiver with clock<br>55 Connection between front/fuel gauge cables<br>56 Fuel gauge<br>A Fuel level sensor<br>B Electric fuel pump<br>70A Connection for front dashboard cables +70A<br>88 Insufficient brake fluid level sensor<br>89 Left brake pad wear sensor<br>89A Left brake pad wear sensor cables<br>90 Switch indicating handbrake applied<br>95 Connection between front cables/anti-lock brakes (A.B.S.)<br>100B Anti-theft electronic control unit<br>114 Air Bag electronic control unit<br>117 Connection for EURO BAG/dashboard<br>120 Connection for air conditioning unit cables<br>131 Fiat CODE electronic control unit<br>137 Vehicle speed sensor<br>142 Switch indicating insufficient engine oil pressure<br>143 Alternator<br>181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)<br>279 Engine coolant temperature twin sender unit<br>295 Injection/ignition electronic control unit 1910 JTD<br>297 Injection control unit<br>347 Engine oil level sensor<br>367 Water in fuel filter sensor<br>N.D. Ultrasound welding taped in cable loom |
| 4 Junction unit<br>6 Instrument panel:<br>A Battery recharging warning light<br>B Low engine oil pressure warning light<br>C Left direction indicator warning light<br>D Right direction indicator warning light<br>E Side lights warning light<br>F Instrument panel ideograms light<br>G Main beam headlamps warning light<br>H AIR BAG system failure warning light<br>I Anti-lock brakes failure warning light<br>J Fuel reserve warning light<br>K Fuel gauge<br>L Fiat-CODE failure warning light<br>M Injection system failure warning light petrol/diesel<br>O Heater plugs warning light<br>Q Front brake pad wear warning light<br>R Handbrake applied/insufficient brake fluid level warning light<br>S Brake lights failure electronic module<br>T Brake lights failure warning light<br>U Doors open warning light<br>V1 Speedometer<br>W Rev counter<br>X Engine coolant temperature gauge<br>Y Electronic module<br>Y1 Speed control module<br>Z Milometer/trip meter display; engine oil level gauge<br>Z1 Trip meter zeroing button |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 7 Stalk unit:<br>D Headlamp flasher button<br>E Dipped/main beam headlamps control switch<br>F Side lights control switch<br>H Direction indicators control switch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 10 Battery earth on bodysell<br>11 Battery<br>12 Ignition switch<br>16 Left tail light cluster                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

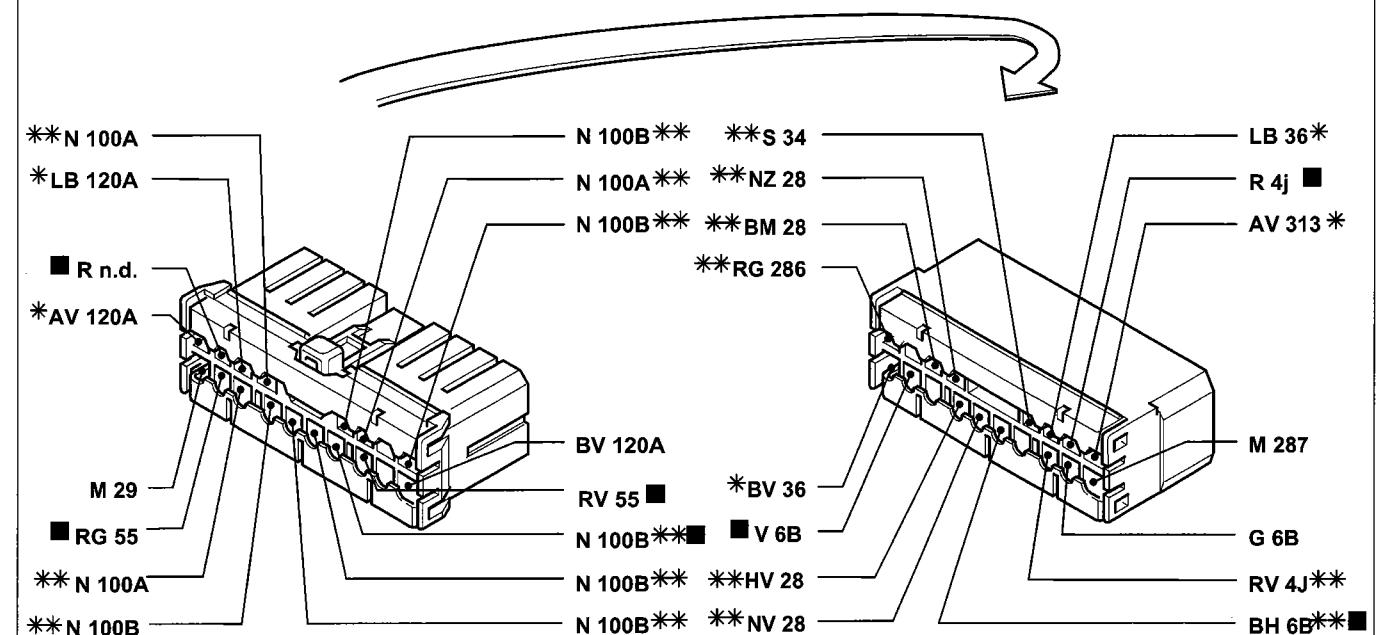
## 55.

### 6B Instrument panel



\* Non existent for SX-GT trim levels  
\*\* Variant for versions with alarm

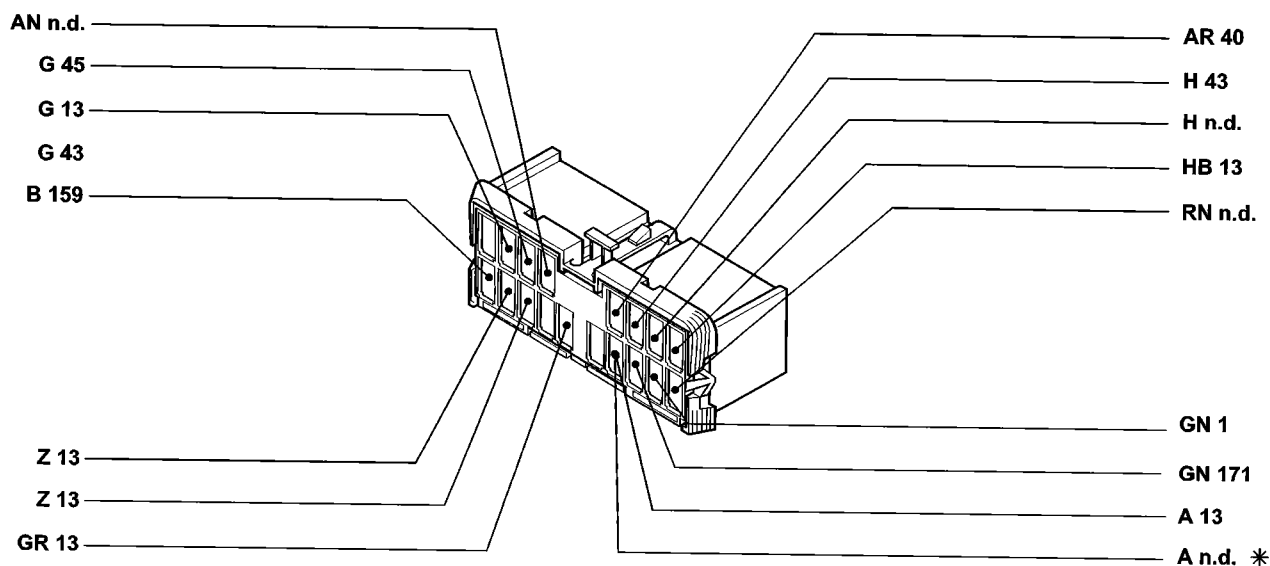
### 70 Connection between dashboard/front cables



\* Variant connection for versions with air conditioning  
\*\* Variant connection for versions with alarm

The cables concerned are marked in the wiring diagram with a square

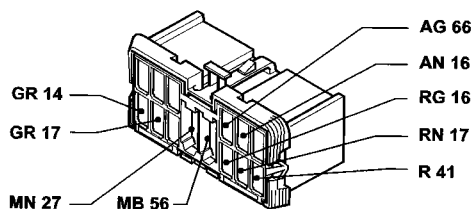
### 4D Junction unit



\* Only for versions with air conditioning

4A083NL01

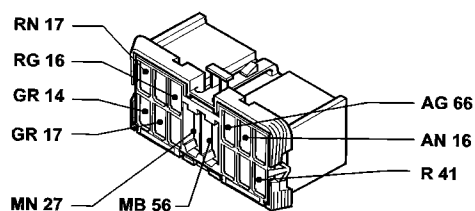
### 4E Junction unit



Only for BRAVA SX

4A083NL02

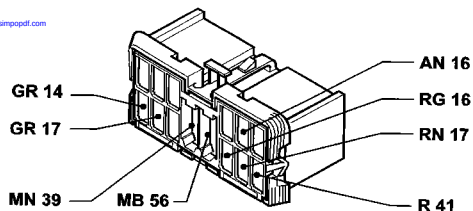
### 4E Junction unit



Only for BRAVA ELX

4A083NL03

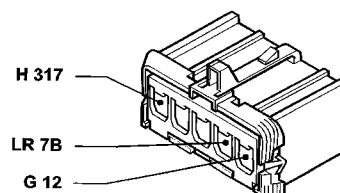
### 4E Junction unit



Only for BRAVO SX-GT

4A083NL04

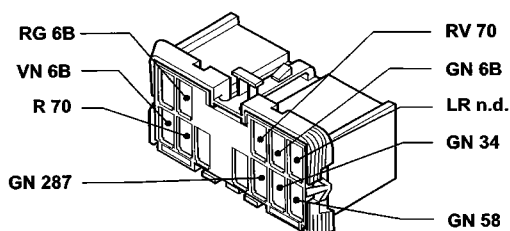
### 4F Junction unit



4A083NL05

### 55.

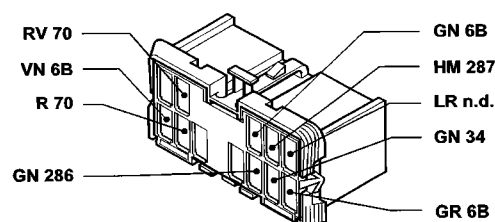
#### 4J Junction unit



Only for ELX-GT version

4A084NL01

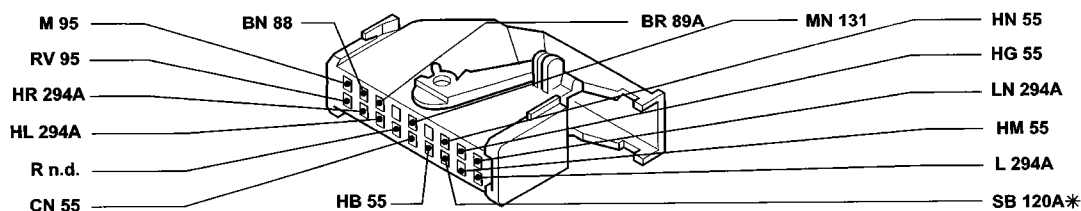
#### 4J Junction unit



Only for SX version

4A084NL02

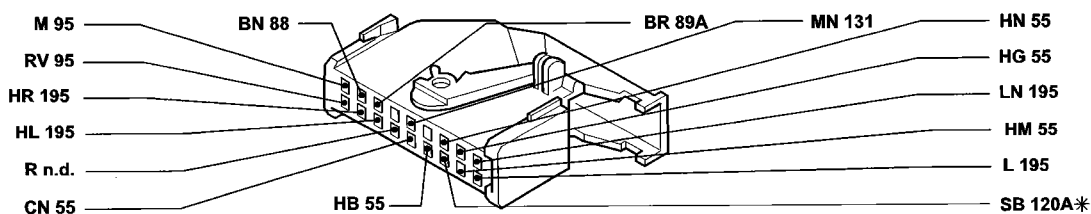
#### 6A Instrument panel (1242)



\* Only for versions with air conditioning

4A084NL03

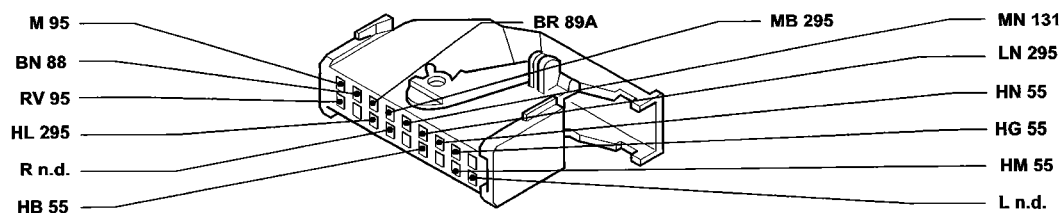
#### 6A Instrument panel (1581)



\* Only for versions with air conditioning

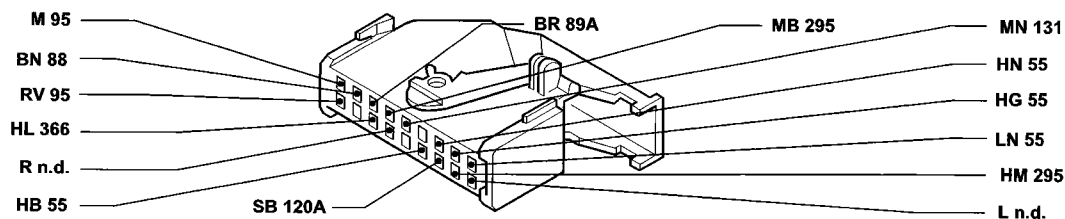
4A084NL04

#### 6A Instrument panel (JTD)



4A084NL05

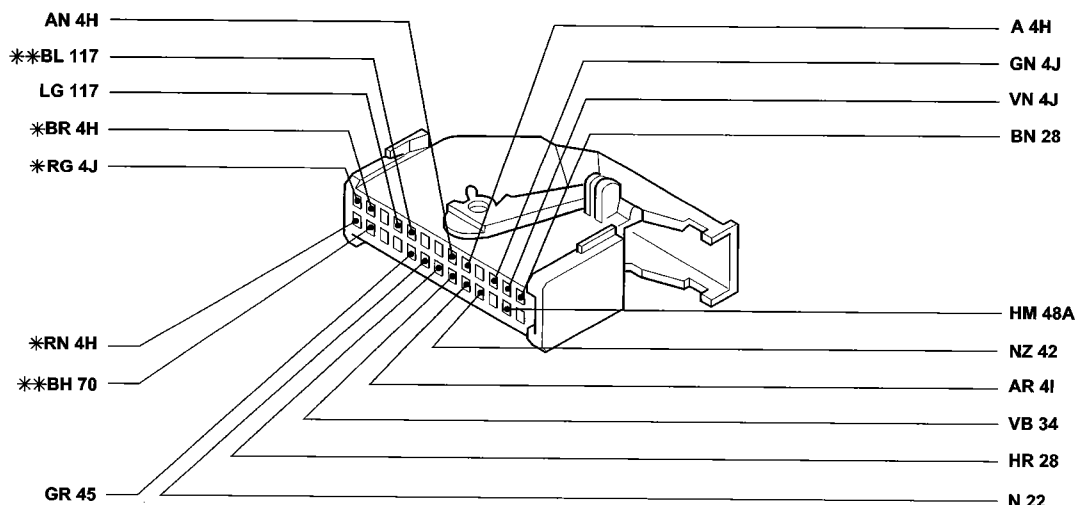
### 6A Instrument panel (JTD)



Only for versions with air conditioning

4A085NL01

### 6B Instrument panel (1242) (1581)



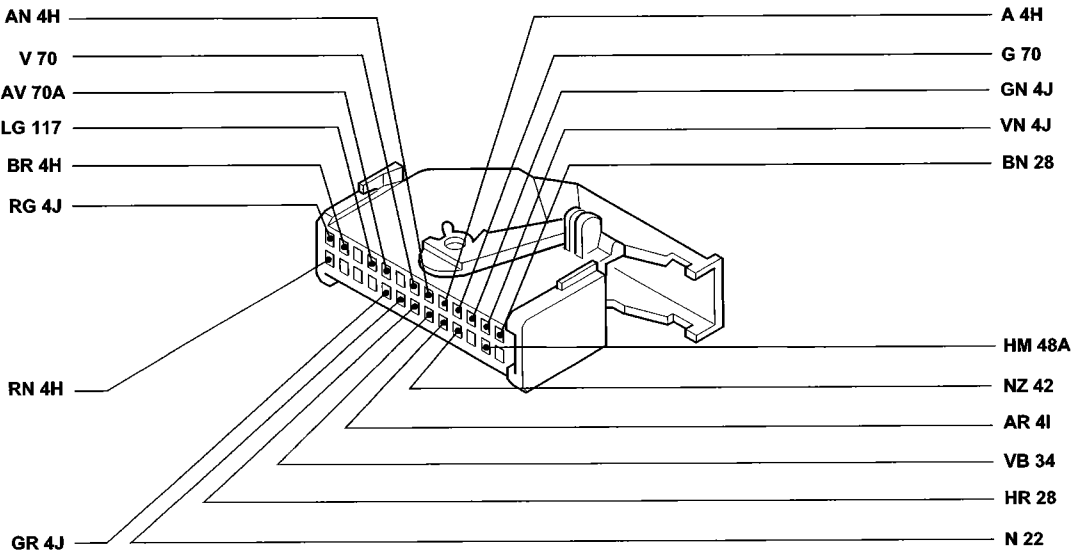
\* Only for GT version

\*\* Only for ELX version

4A085NL02

55.

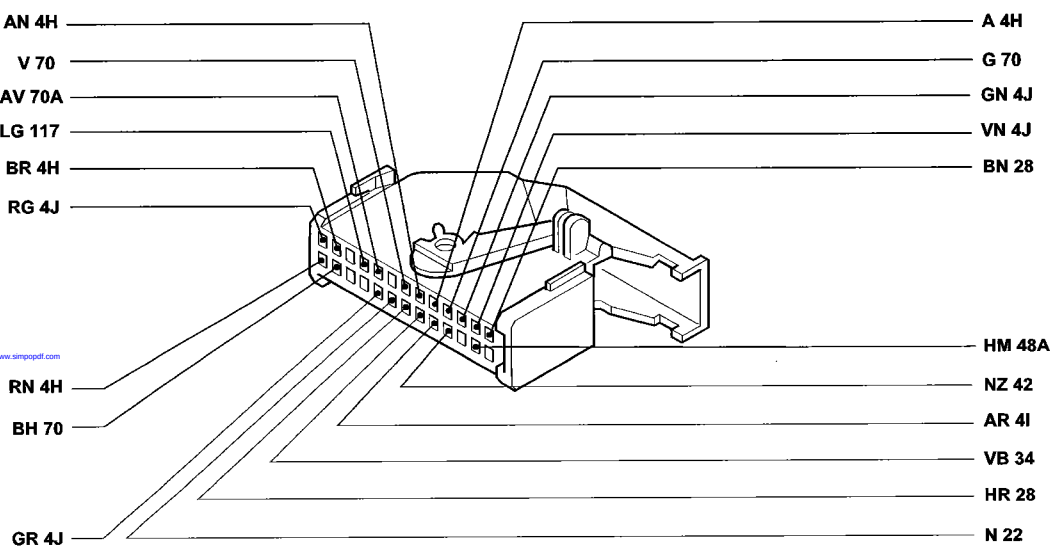
6B Instrument panel (SX/GT JTD)



\* Only for GT version

4A086NL01

6B Instrument panel (JTD)

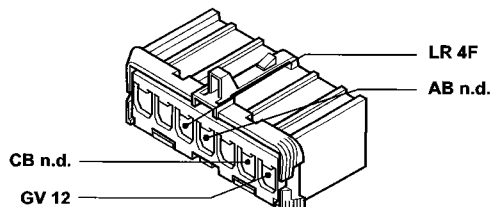


Only for ELX version

4A086NL02

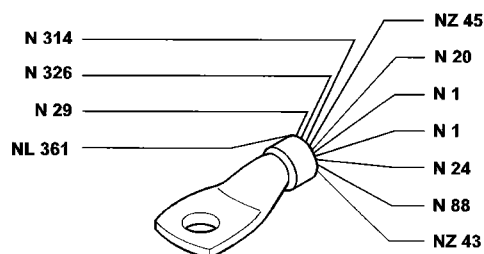


### 7B Steering column switch unit (JTD)



4A087NL01

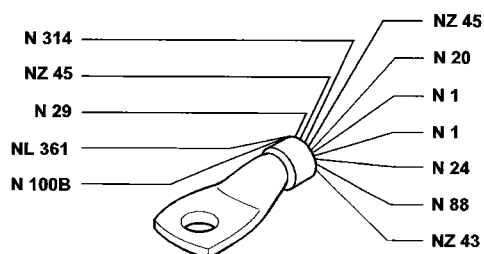
### 8 Left front earth (1242)



Only for ELX version

4A087NL02

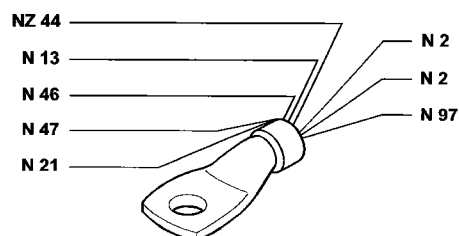
### 8 Left front earth (1581)



Only for ELX version

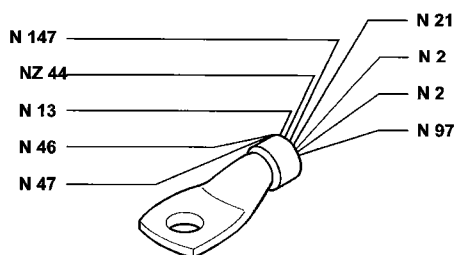
4A087NL03

### 9 Right front earth (JTD)



4A087NL04

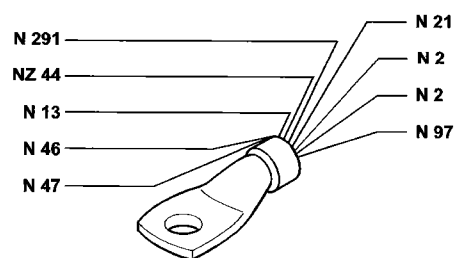
### 9 Right front earth (1581)



Only for SX version

4A087NL05

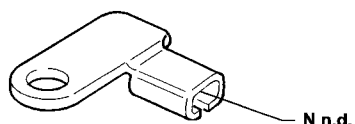
### 9 Right front earth (1242)



Only for SX version

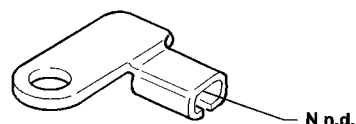
4A087NL06

### 10 Earth for battery on bodysell (1242)



4A087NL07

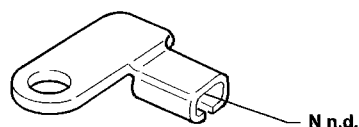
### 10 Earth for battery on bodysell (1581)



4A087NL08

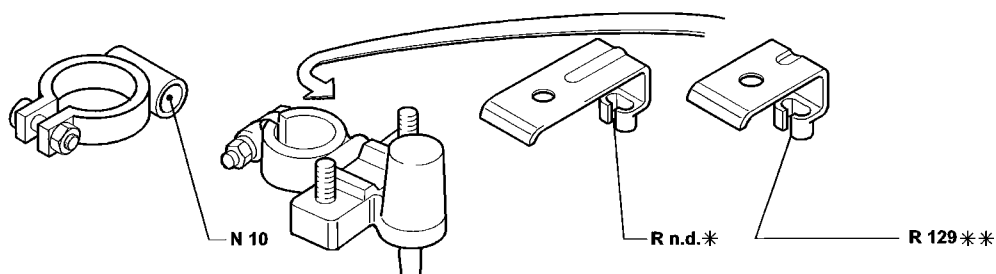
### 55.

#### 10 Earth for battery on bodyshell (JTD)



4A088NL01

#### 11 Battery



\* Variant for JTD

\*\* For 1242 - 1581 versions

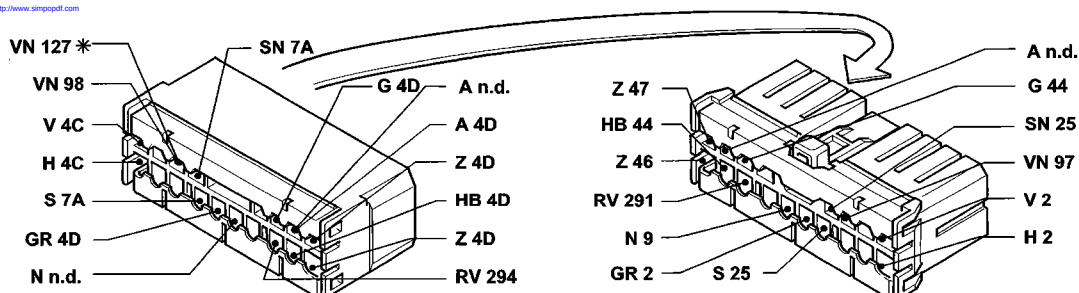
4A088NL02

#### 12 Ignition switch



4A088NL03

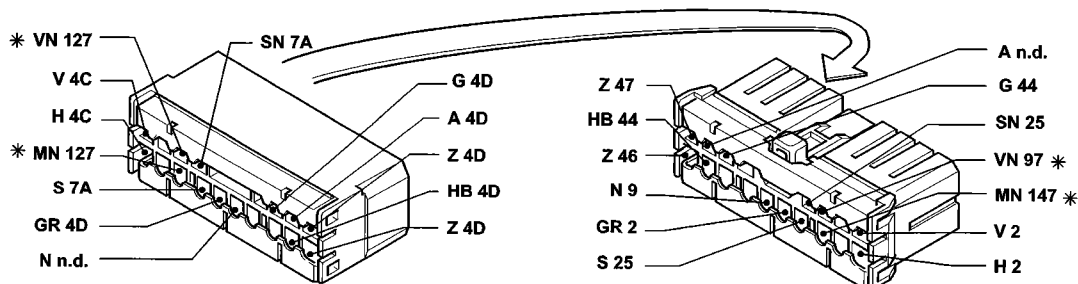
#### 13 Connection between right/left front cables (1242)



\* Only for ELX version

4A088NL04

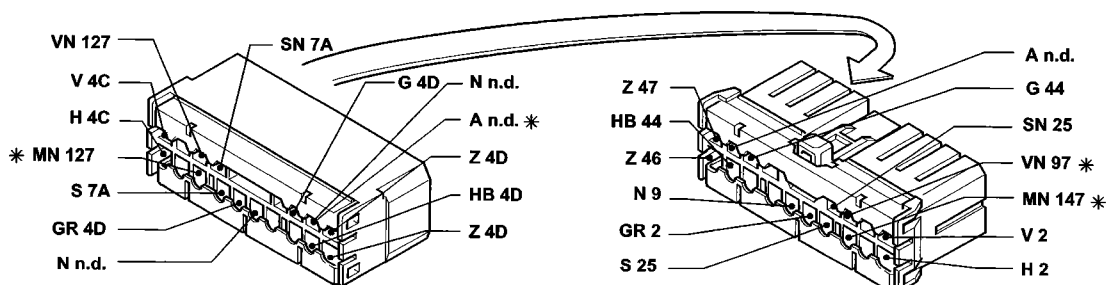
### 13 Connection between right/left front cables (1581)



\* Only for versions with air conditioning

4A089NL01

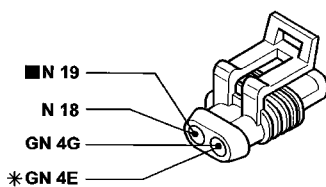
### 13 Connection between right/left front cables (JTD)



\* Only for versions with air conditioning

4A089NL02

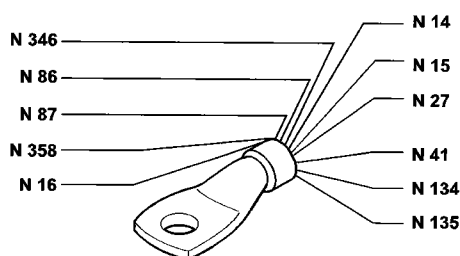
### 15 Right number plate light



\* Only for BRAVO with alarm SX-GT  
■ Only for BRAVO SX-GT version

4A089NL3

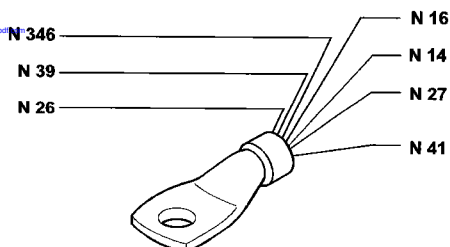
### 18 Left rear earth



\* Only for BRAVA SX version

4A089NL4

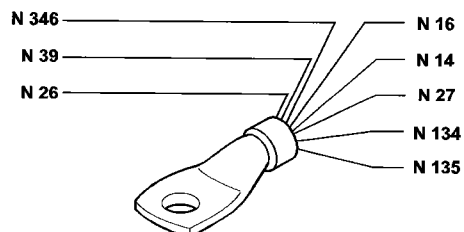
### 18 Left rear earth



Only for BRAVO SX-GT version

4A089NL5

### 18 Left rear earth

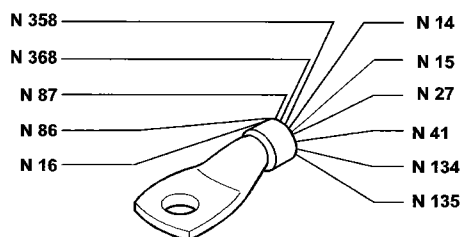


Only for BRAVO version with alarm SX-GT

4A089NL6

# 55.

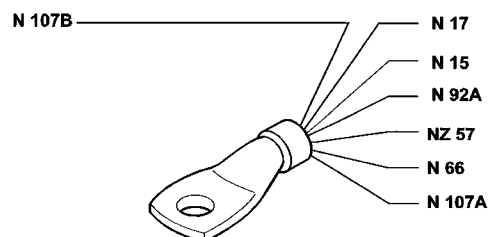
## 18 Left rear earth



Only for BRAVA ELX version

4A090NL01

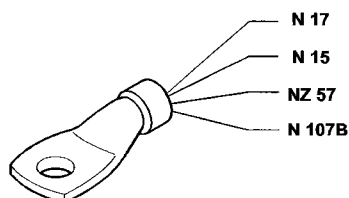
## 19 Right rear earth



Only for BRAVO SX-GT version with alarm

4A090NL02

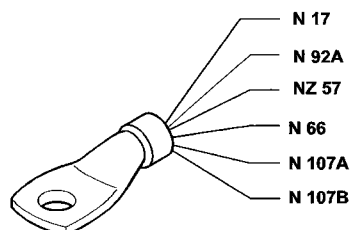
## 19 Right rear earth



Only for BRAVO SX-GT version

4A090NL03

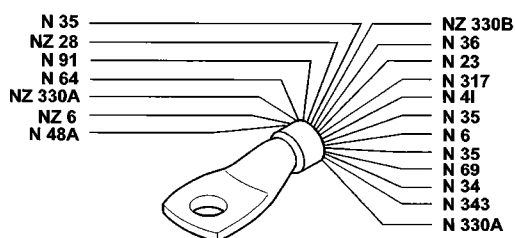
## 19 Right rear earth



Only for BRAVA SX-ELX version

4A090NL04

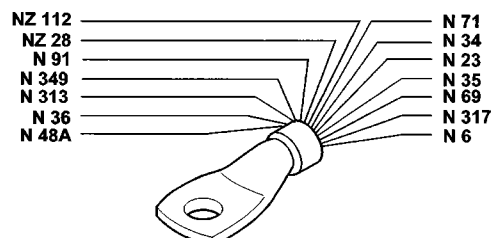
## 22 Left dashboard earth (GT/ELX)



\* Only for ELX version

4A090NL05

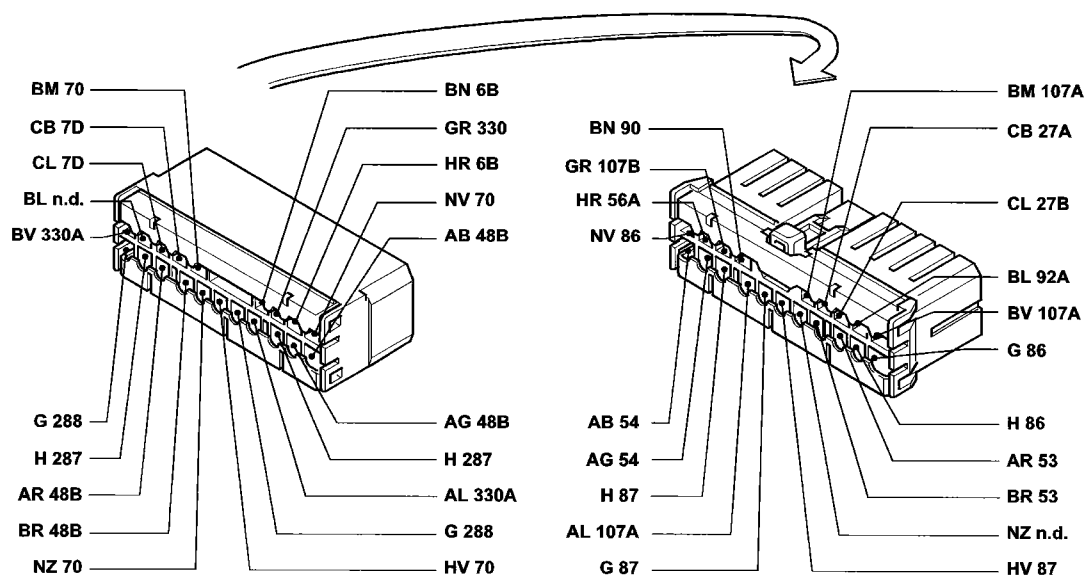
## 22 Left dashboard earth (JTD)



Only for SX version

4A090NL06

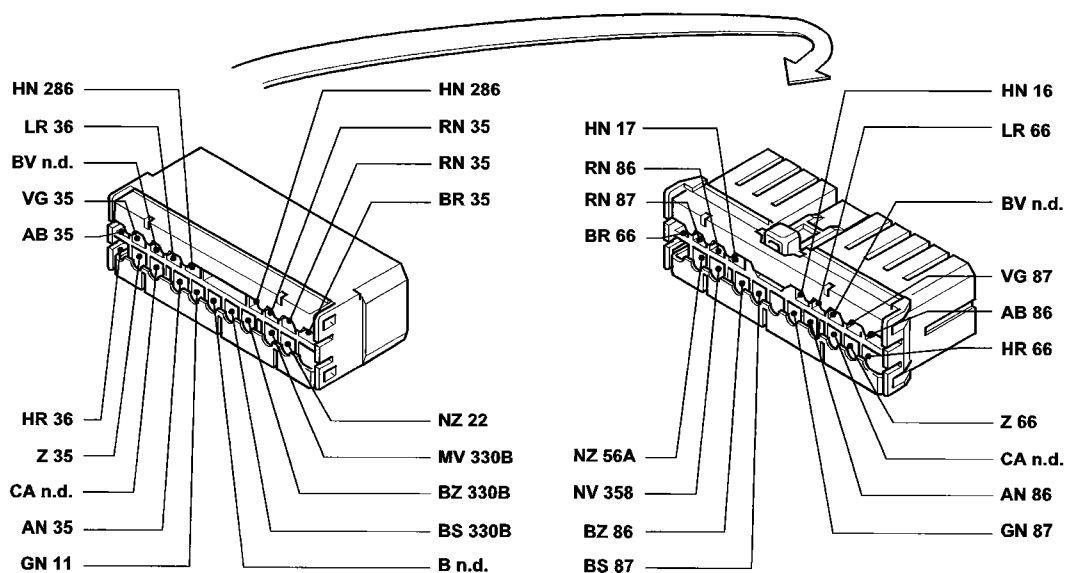
## 28 Connection between dashboard/longitudinal cables



Only for ELX version

4A091NL01

## 28A Connection between dashboard/longitudinal cables

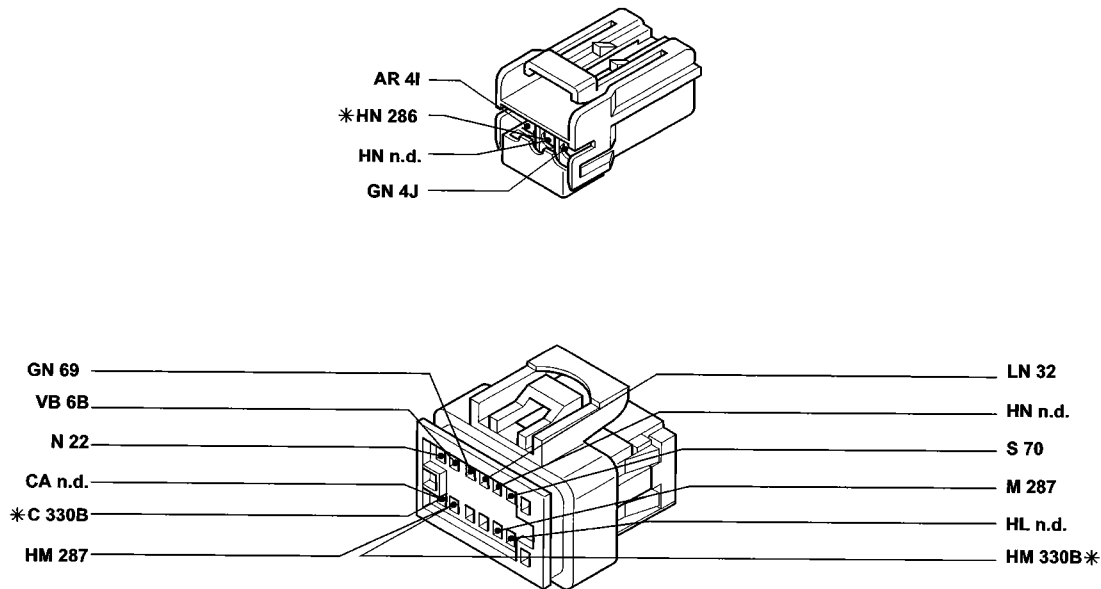


Only for ELX version

4A091NL02

### 55.

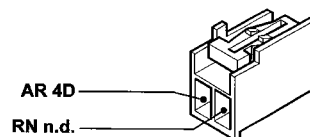
#### 34 Switch control unit



\* Only for GT-ELX versions (1242-1581)

4A092NL01

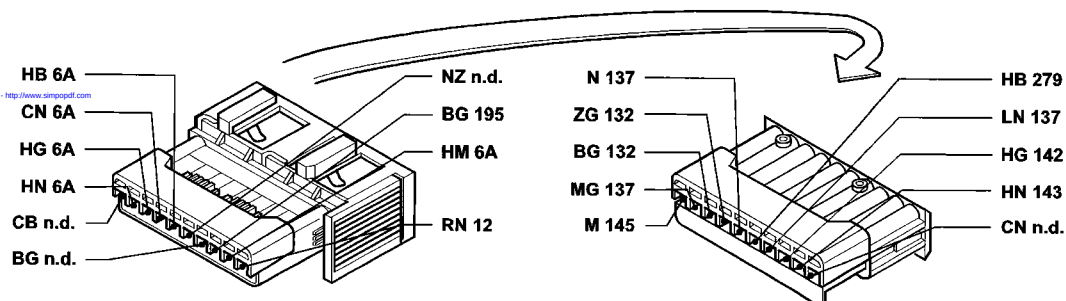
#### 40 Brake lights control switch



Only for SX-ELX version

4A092NL02

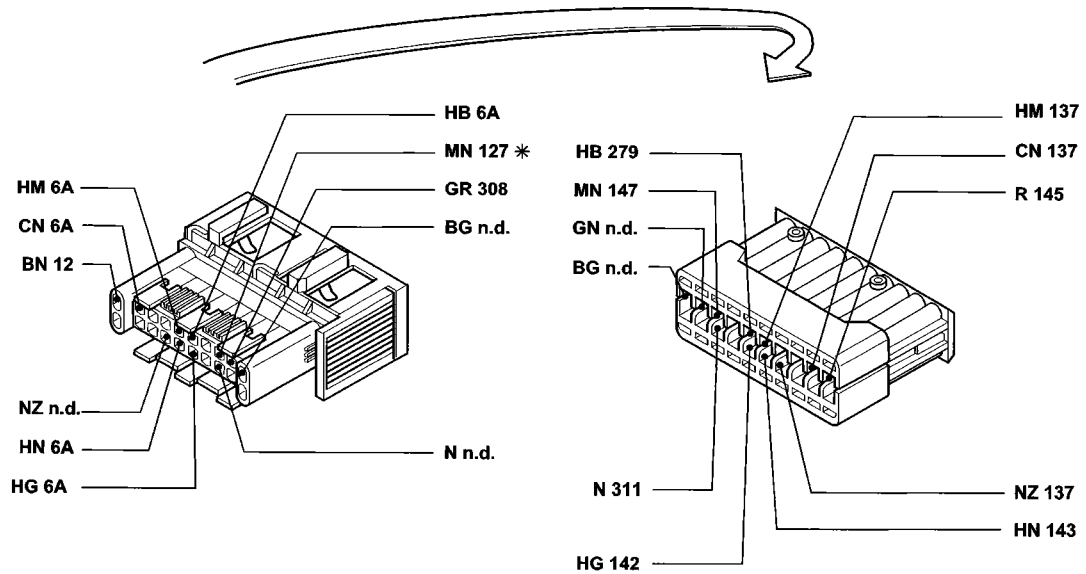
#### 55 Connection between front cables/engine pre-wiring (1581)



4A092NL03



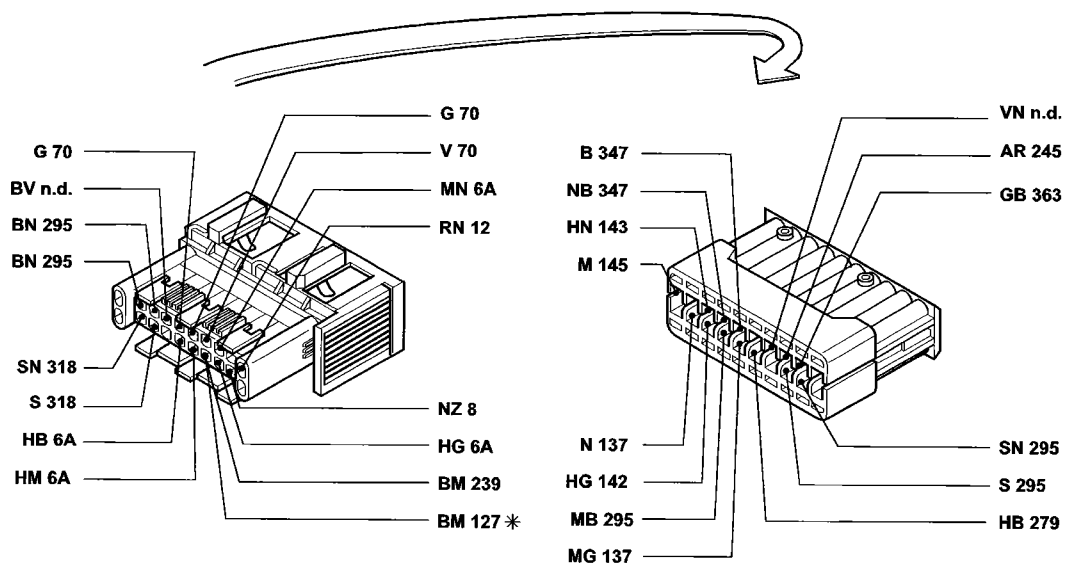
**55** Connection between front left cables/engine pre-wiring (1242)



\* Only for versions with air conditioning

4A093NL01

**55** Connection between front left cables/engine pre-wiring (JTD)

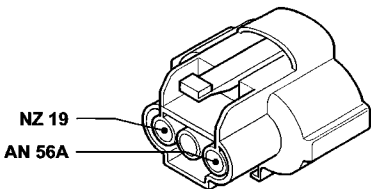


\*Only for versions with air conditioning

4A093NL02

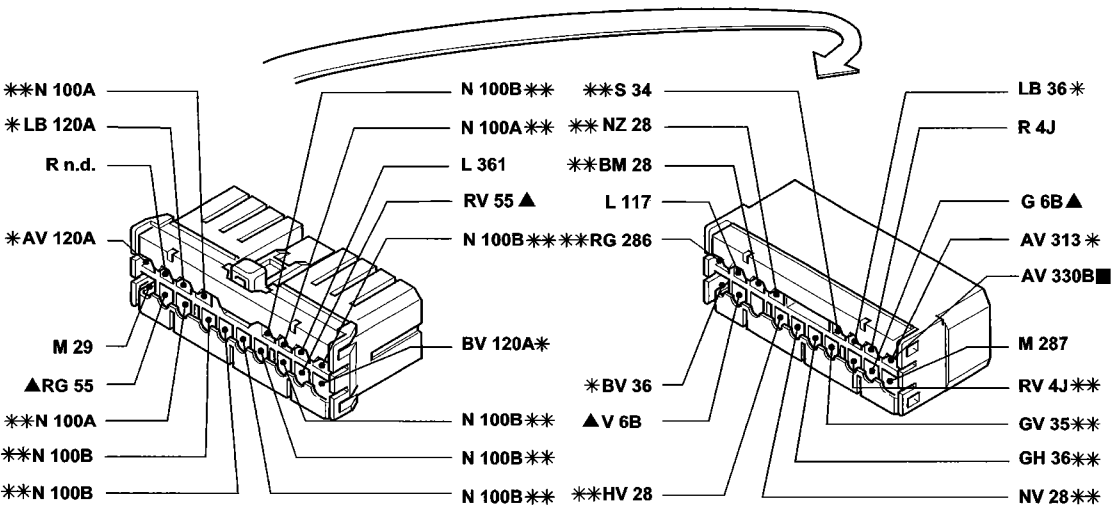
55.

57 Inertia switch



4A094NL01

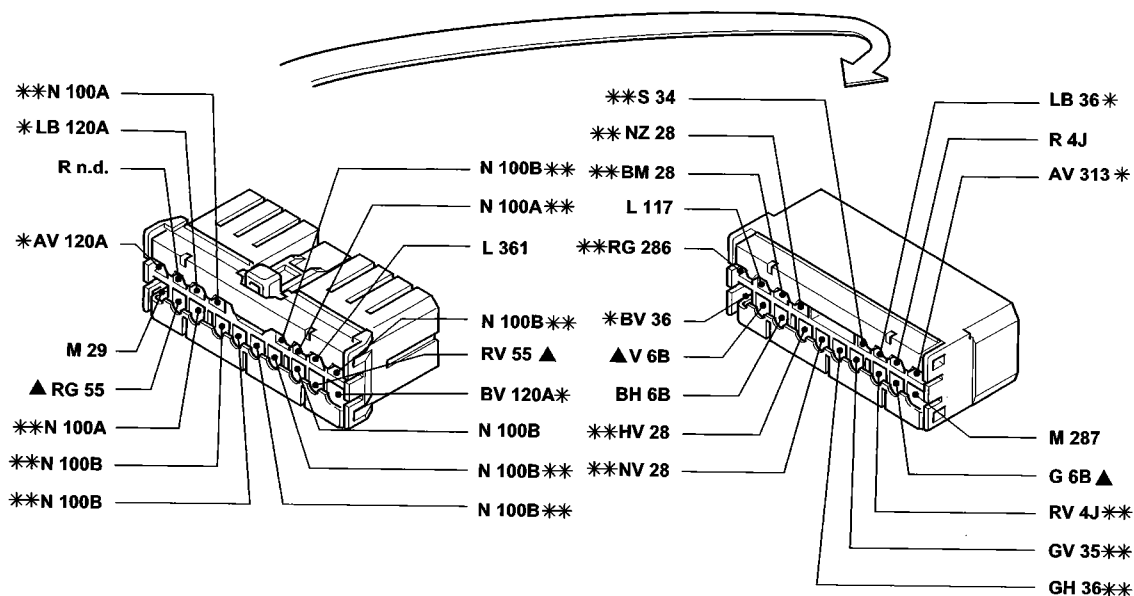
70 Connection between dashboard/front cables



Only for SX versions  
\* Only for versions with air conditioning  
\*\* Only for versions with alarm  
▲ Only for versions with ABI  
■ Only for JTD versions

4A094NL02

**70** Connection between dashboard/front cables



Only for ELX versions

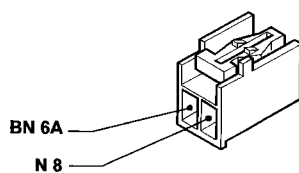
\* Only for versions with air conditioning

\*\* Only for versions with alarm

▲ Only for JTD versions

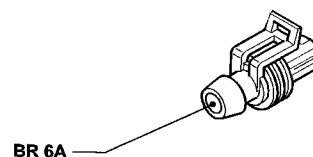
4A095NL01

**88** Insufficient brake fluid level sensor



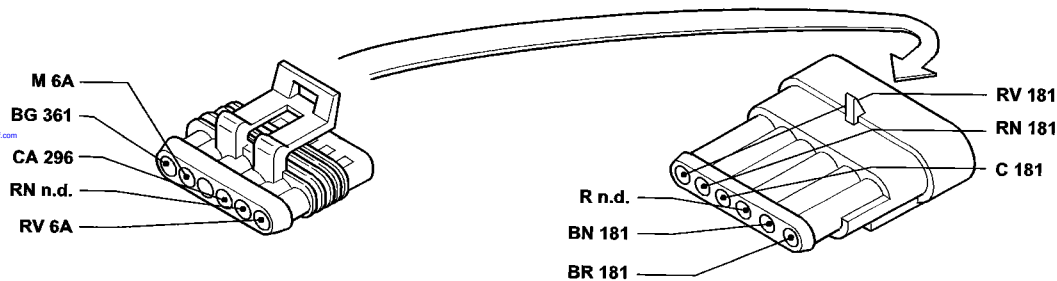
4A095NL02

**89** Left brake pad wear sensor



4A095NL03

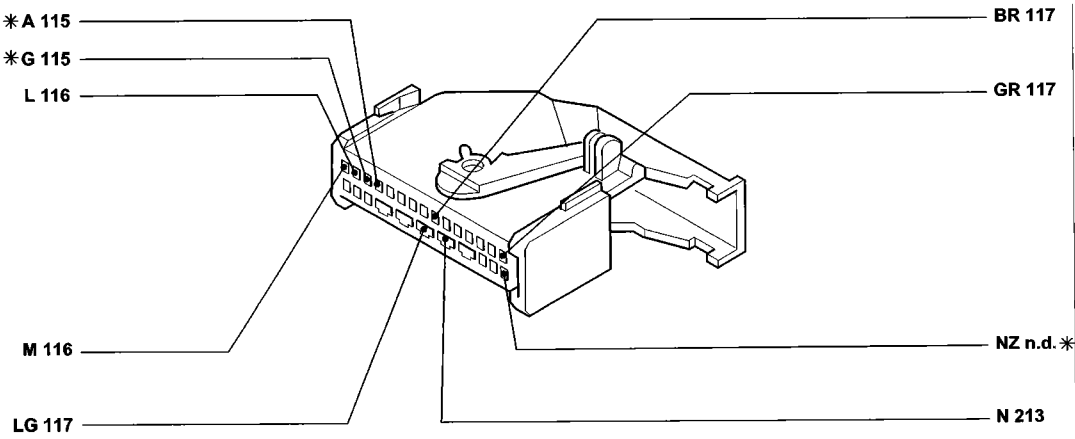
**95** Connection between front cables/anti-lock brakes



4A095NL04

55.

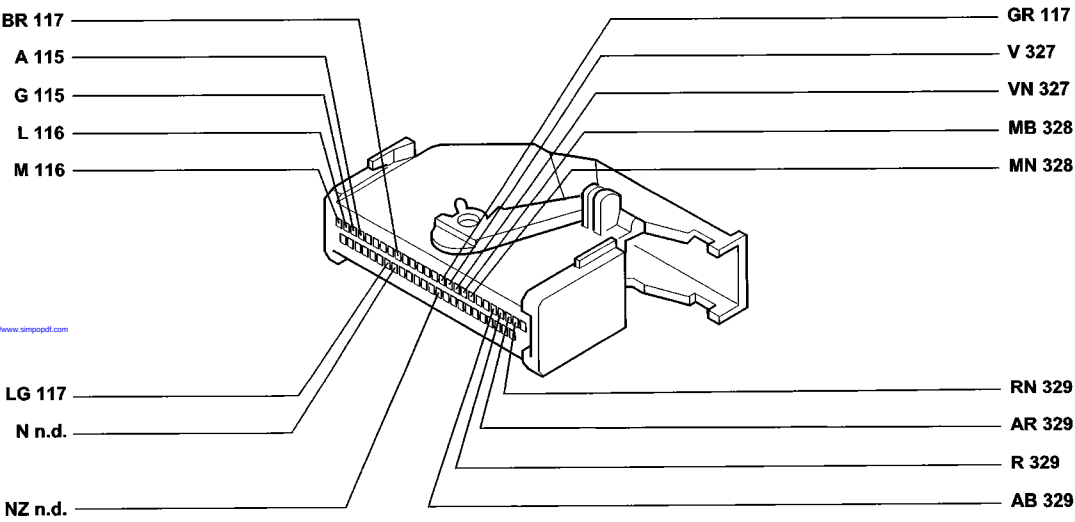
114 EURO-BAG electronic control unit



\* Only for versions with driver's and passenger EURO BAGs

4A096NL01

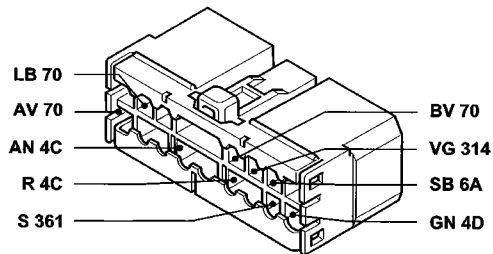
114 EURO-BAG electronic control unit



Only for versions with SIDE BAG

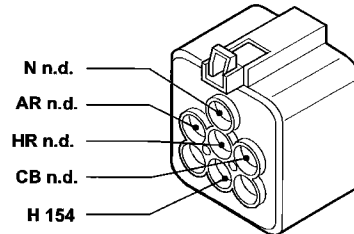
4A096NL02

### 120 Connection for air conditioning unit cables



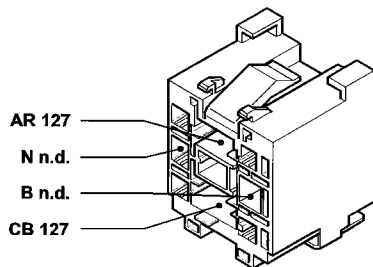
4A097NL01

### 123 Engine cooling fan high speed timer (JTD)



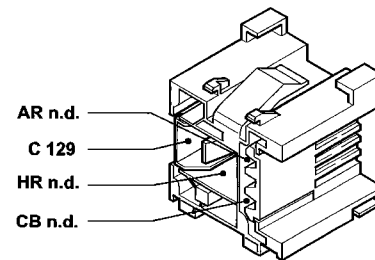
4A097NL02

### 123A Engine cooling fan high speed timer (1242/1581)



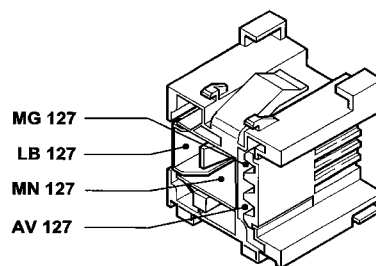
4A097NL03

### 123A Engine cooling fan high speed timer (JTD)



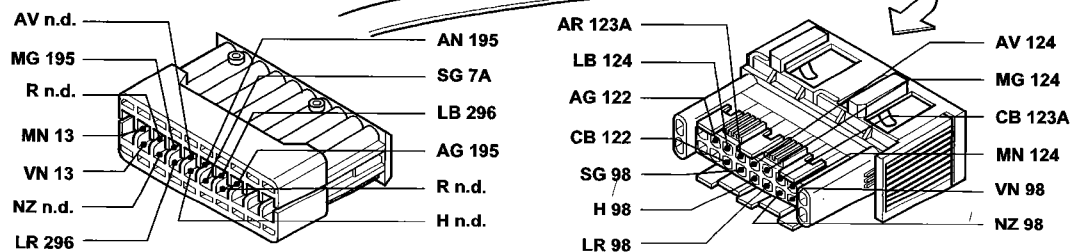
4A097NL04

### 124 Air conditioning compressor relay feed (JTD)



4A097NL05

### 127 Connection between front left cable/cable on relay holder bracket (1242/1581)

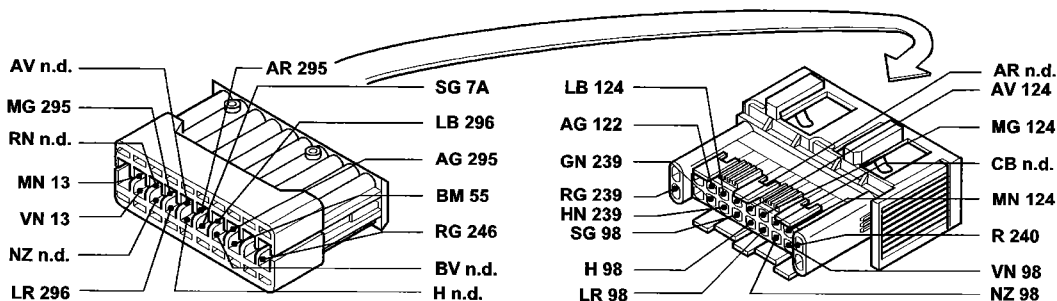


Only for versions with air conditioning

4A097NL06

### 55.

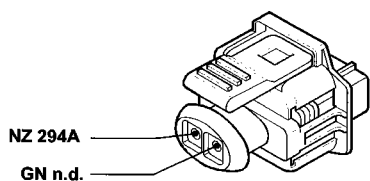
#### 127 Connection between front left cable/cable on relay holder bracket (JTD)



Only for versions with air conditioning

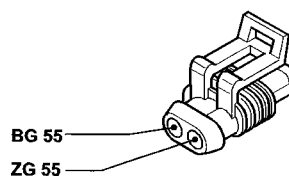
4A098NL01

#### 132 Petrol vapour cut out solenoid valve (canister) (1242)



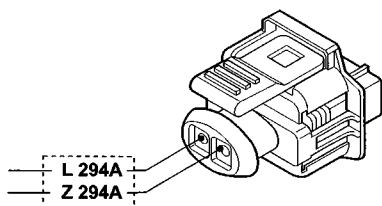
4A098NL02

#### 132 Petrol vapour cut out solenoid valve (canister) (1581)



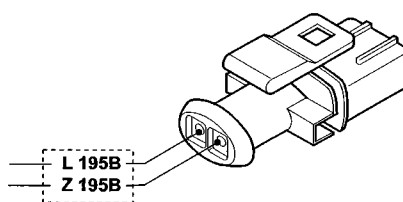
4A098NL03

#### 136 Detonation sensor (1242)



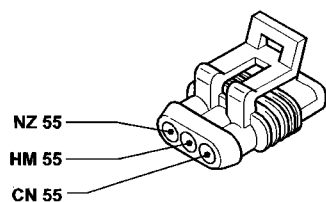
4A098NL04

#### 136 Detonation sensor (1581)



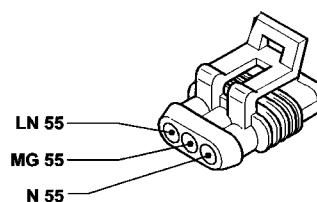
4A098NL05

#### 137 Vehicle speed sensor (1242)



4A098NL06

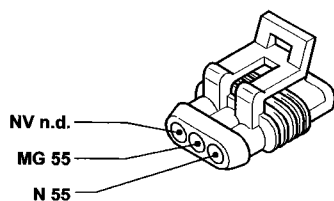
#### 137 Vehicle speed sensor (1581)



4A098NL07

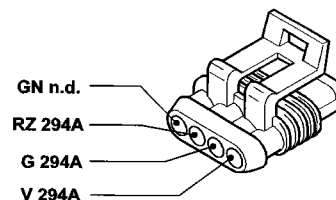


### 137 Vehicle speed sensor (JTD)



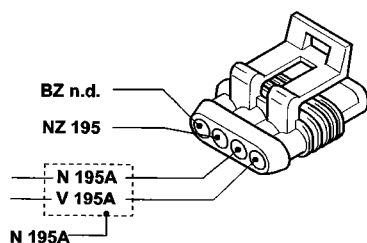
4A099NL01

### 141 Heated lambda sensor (1242)



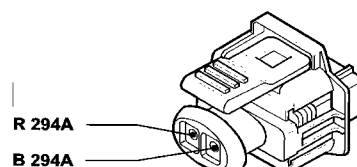
4A099NL02

### 141 Heated lambda sensor (1581)



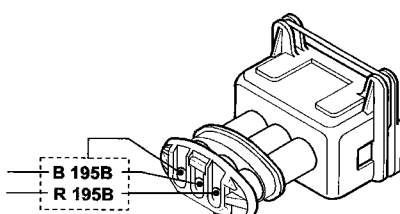
4A099NL03

### 144 Rpm and T.D.C. sensor (1242)



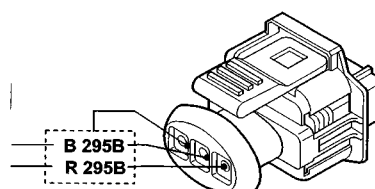
4A099NL04

### 144 Rpm and T.D.C. sensor (1581)



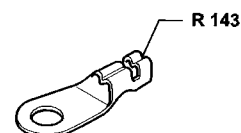
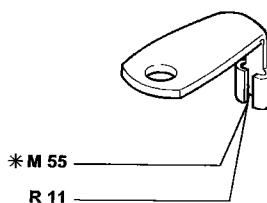
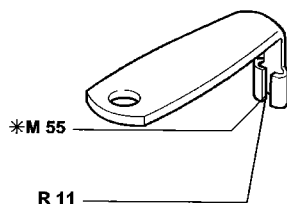
4A099NL05

### 144 Rpm and T.D.C. sensor (JTD)



4A099NL06

### 145 Starter motor



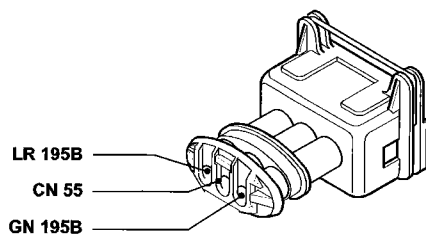
\* Valid for 1581 and JTD

4A099NL07

55.

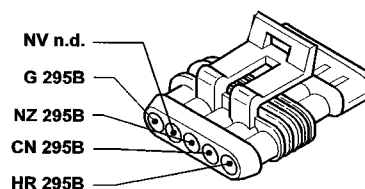
|                                                                                                                                                      |                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>147A</div> <div>Coupling for air conditioning compressor (1242)</div> <div><p>MN 55</p><p>N 311</p></div> <div>4A100NL01</div>                  | <div>147A</div> <div>Coupling for air conditioning compressor (1581)</div> <div><p>MN 13</p><p>N 9</p></div> <div>4A100NL02</div>                    |
| <div>147A</div> <div>Coupling for air conditioning compressor (JTD)</div> <div><p>MN 13</p></div> <div>4A100NL03</div>                               | <div>150</div> <div>Injection system relay feed (1242)</div> <div><p>CB n.d.</p><p>RG n.d.</p><p>RN n.d.</p><p>N 294A</p></div> <div>4A100NL04</div> |
| <div>150</div> <div>Injection system relay feed (1581)</div> <div><p>CB n.d.</p><p>RG n.d.</p><p>MB n.d.</p><p>SB 195</p></div> <div>4A100NL05</div> | <div>150</div> <div>Injection system relay feed (JTD)</div> <div><p>R n.d.</p><p>RG n.d.</p><p>CN n.d.</p><p>SB 295</p></div> <div>4A100NL06</div>   |
| <div>159</div> <div>Reversing lights control switch</div> <div><p>B 4D</p><p>AR n.d.</p></div> <div>4A100NL07</div>                                  | <div>161</div> <div>Ignition power module (1242)</div> <div><p>CR 294A</p><p>BG n.d.</p><p>CN 294A</p></div> <div>4A100NL08</div>                    |

### 161 Ignition power module (1581)



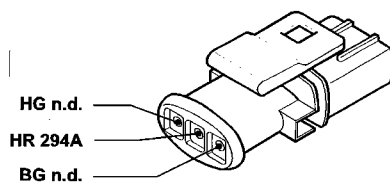
4A101NL01

### 167 Air flow meter (JTD)



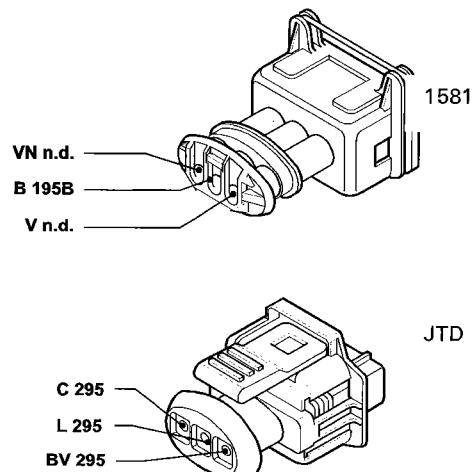
4A101NL02

### 168 Timing sensor 91242)



4A101NL03

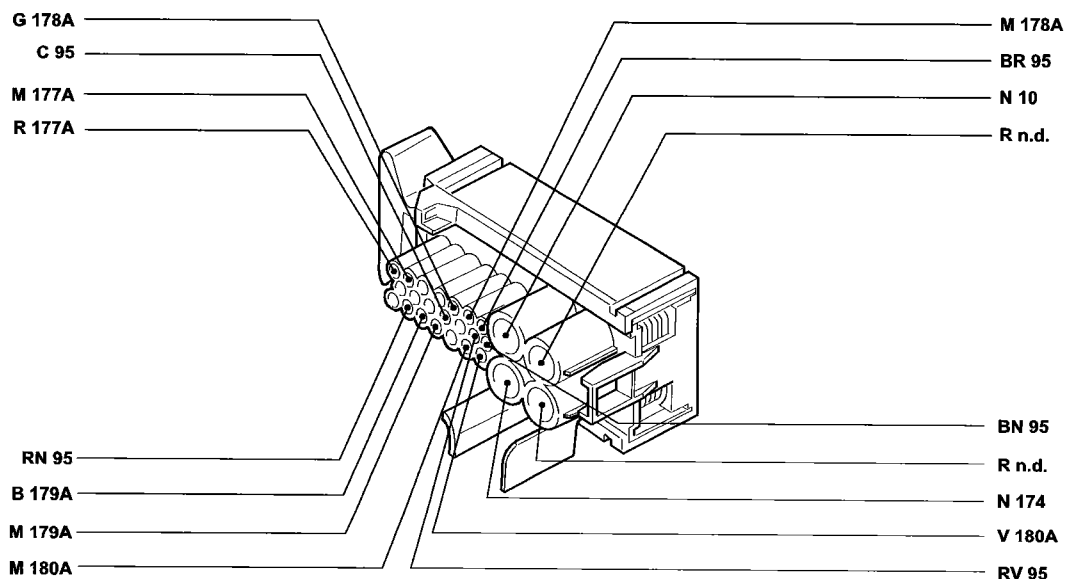
### 168 Timing sensor



4A101NL04

4A101NL05

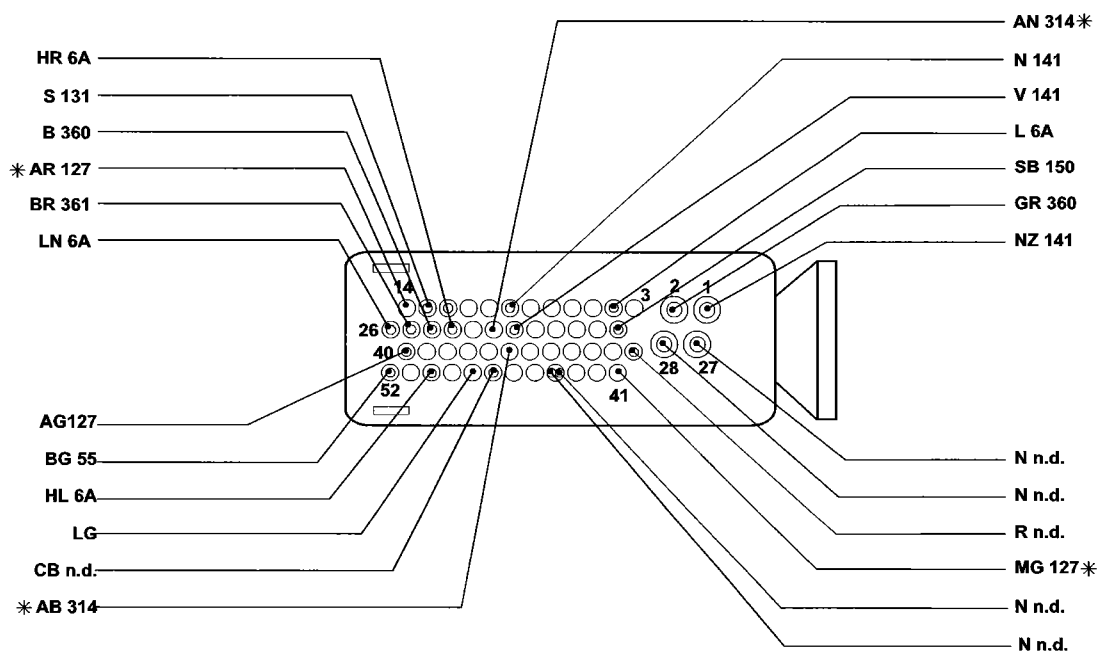
### 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.)



4A101NL06

# 55.

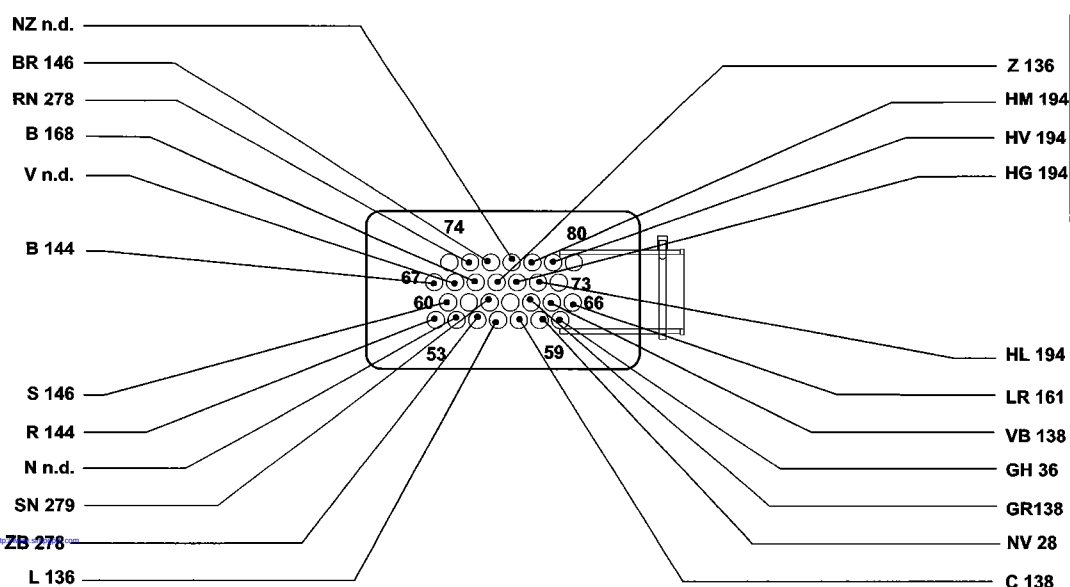
## 195A Ignition / injection electronic control unit (1581)



\* Only for versions with air conditioning

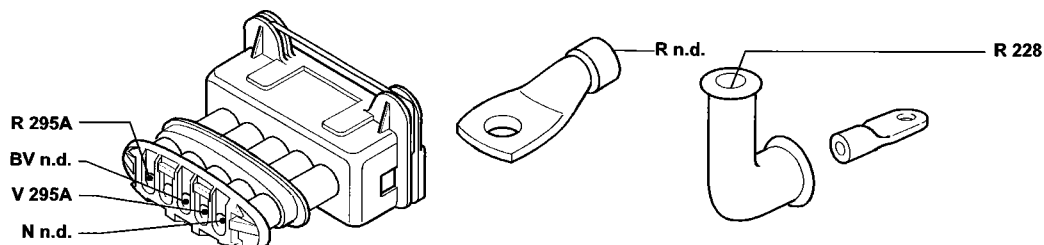
4A102NL01

## 195B Ignition / injection electronic control unit (1581)



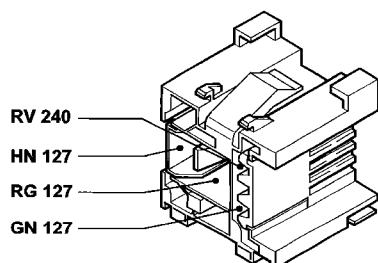
4A102NL02

### 201 Heater plugs control unit



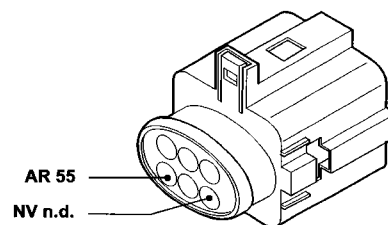
4A103NL01

### 239 Heated diesel filter relay



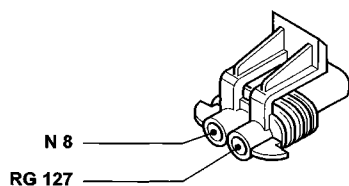
4A103NL02

### 245 EGR solenoid valve



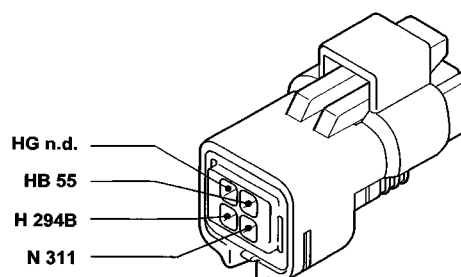
4A103NL03

### 246 Heated fuel filter



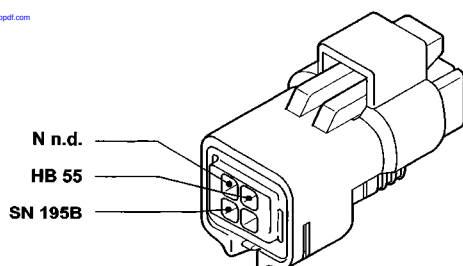
4A103NL04

### 279 Engine coolant temperature twin sender unit (1242)



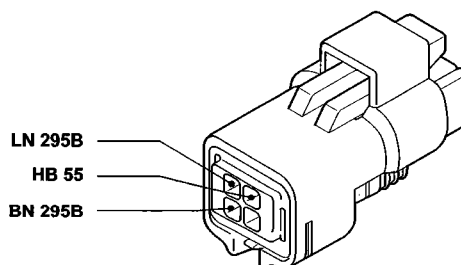
4A103NL05

### 279 Engine coolant temperature twin sender unit (1581)



4A103NL06

### 279 Engine coolant temperature twin sender unit (JTD)

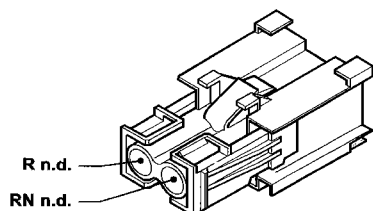


4A103NL07

### 55.

**282**

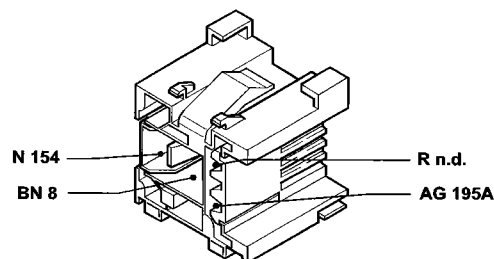
30A fuse protecting Fiat CODE/electronic injection (JTD)



4A104NL01

**284**

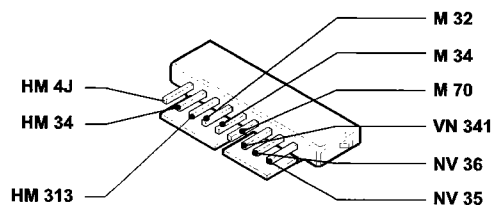
Engine cooling fan relay feed (1581 with heater)



4A104NL02

**287**

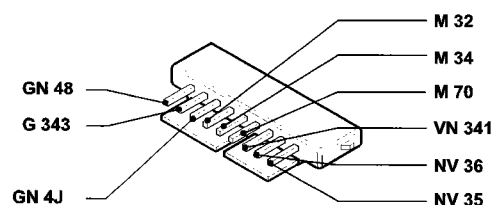
Short circuit connection (SX)



4A104NL03

**287**

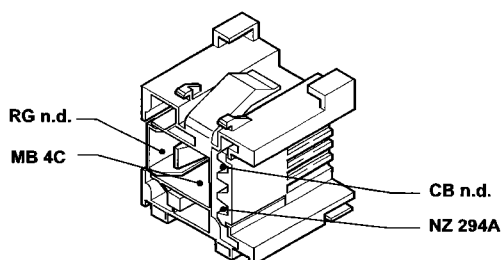
Short circuit connection (GT-ELX)



4A104NL04

**290**

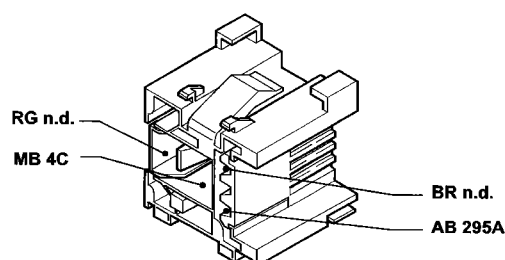
Fuel pump relay feed (1242)



4A104NL05

**290**

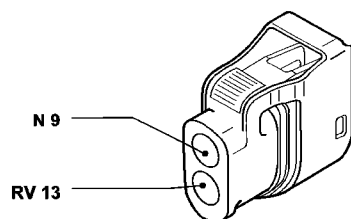
Fuel pump relay feed (JTD)



4A104NL06

**291**

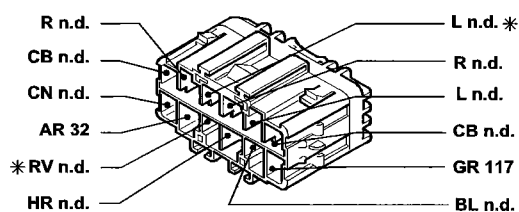
Sensor for power assisted steering pump (1242)



4A104NL07

**293**

Fuse holder base on dashboard cable

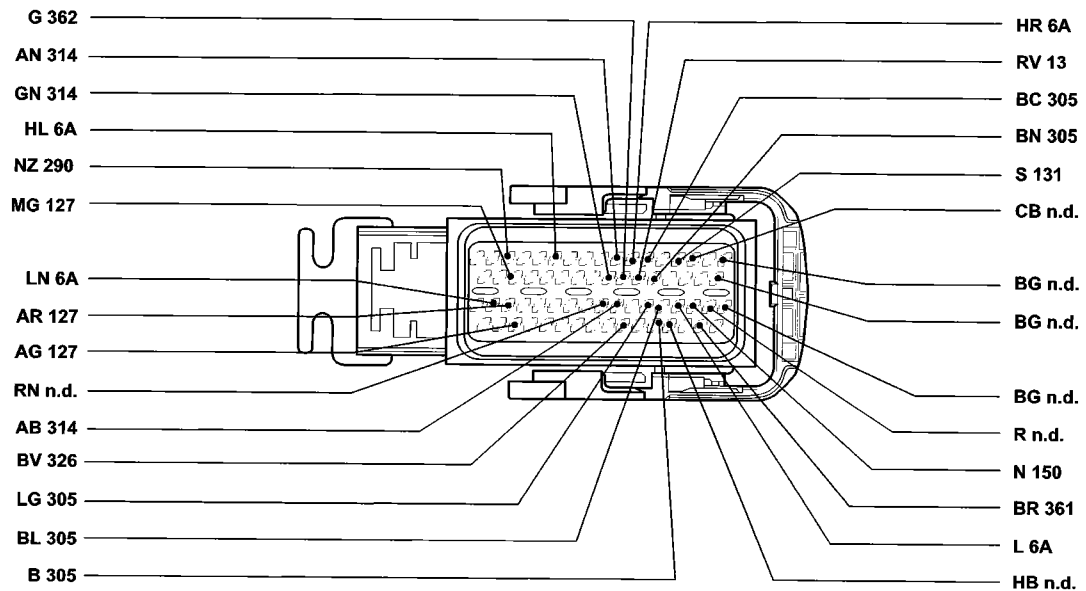


\* Non existent for SX version

4A104NL08



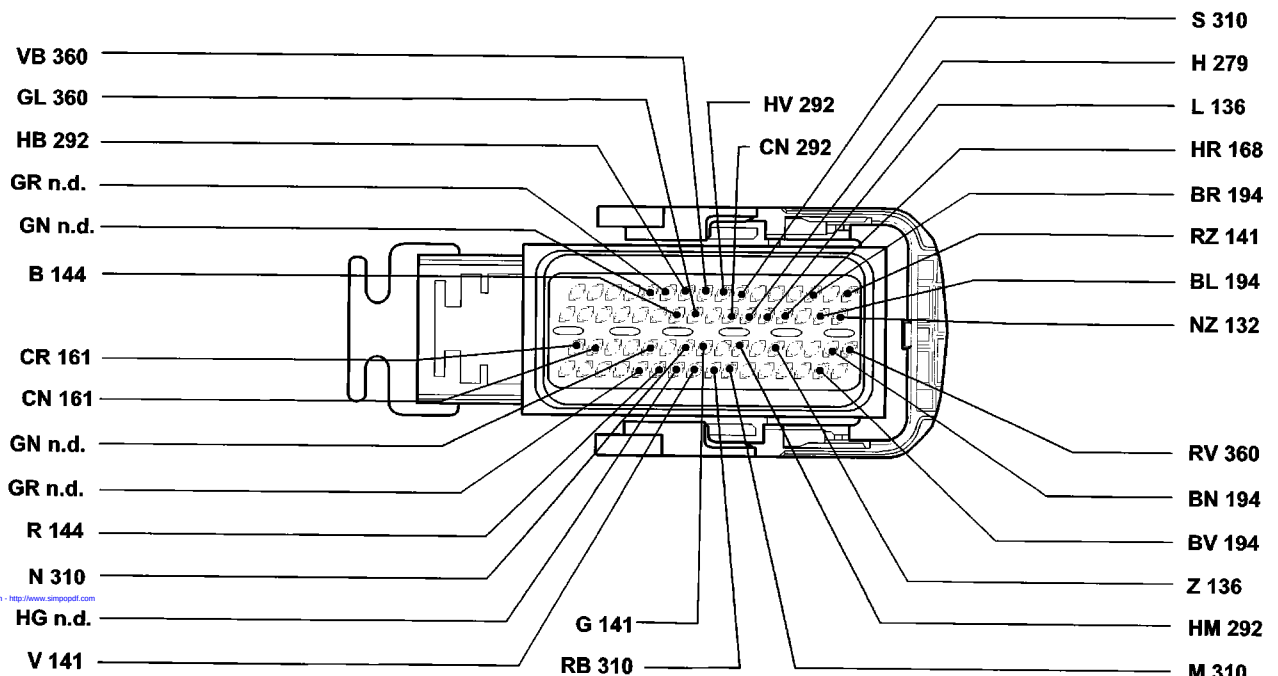
**294A** Injection/ignition electronic control unit (1242)



\* Only for versions with air conditioning

4A105NL01

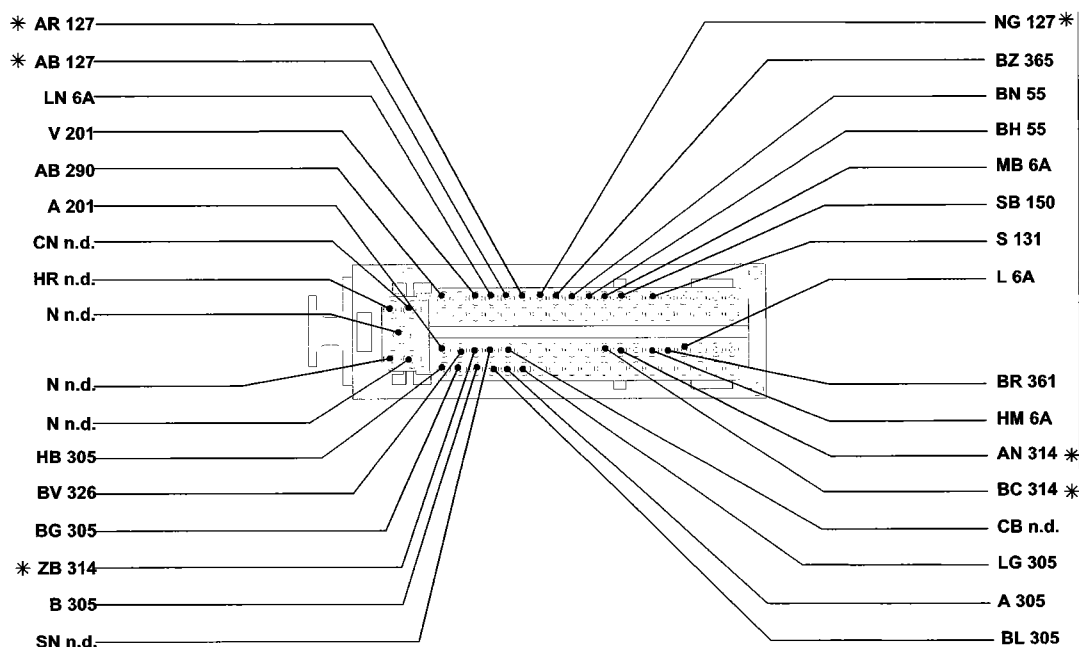
**294B** Injection/ignition electronic control unit (1242)



4A105NL02

# 55.

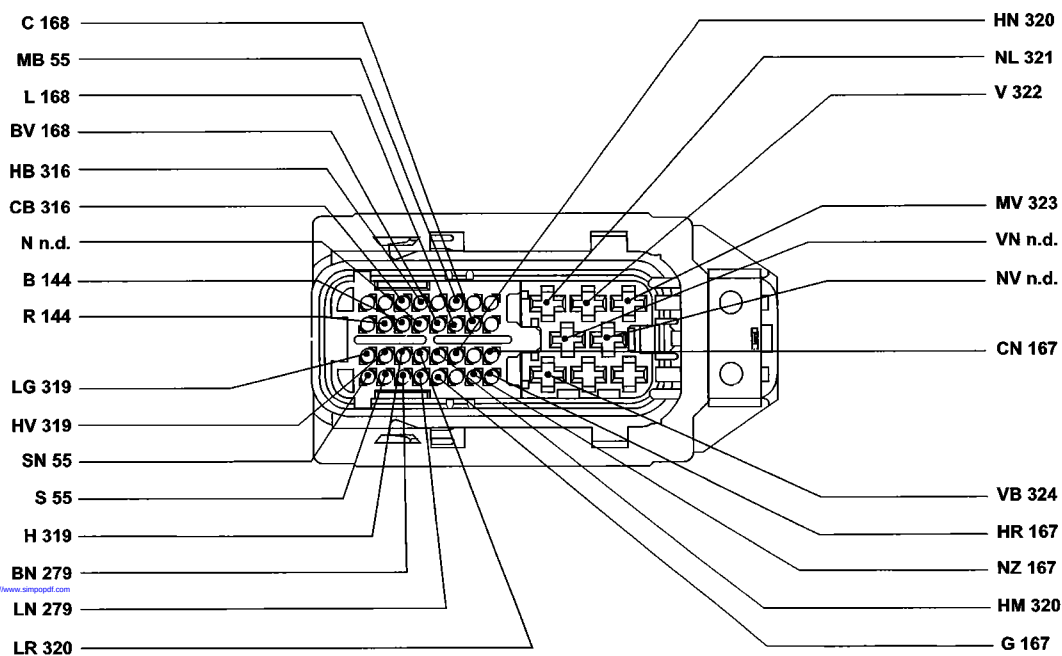
### 295A Injection/ignition electronic control unit (JTD)



\* Only for versions with air conditioning

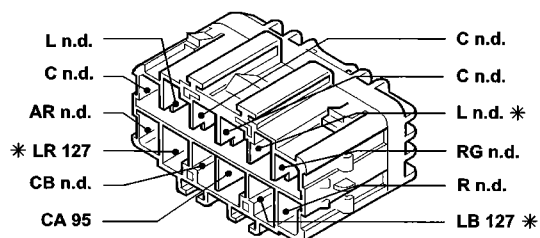
4A106NL01

### 295B Injection/ignition electronic control unit (JTD)



4A106NL02

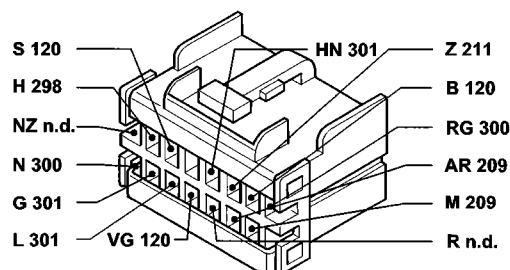
### 296 Fuse holder base on front cable



\* Only for versions with air conditioning

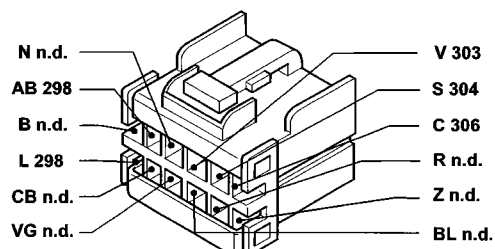
4A107NL01

### 297A Air conditioning control unit



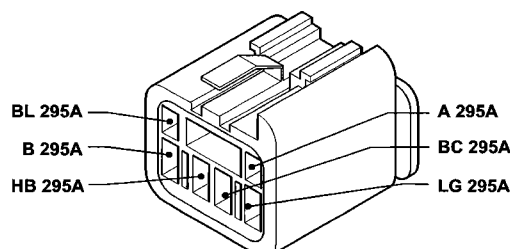
4A107NL02

### 297B Air conditioning control unit



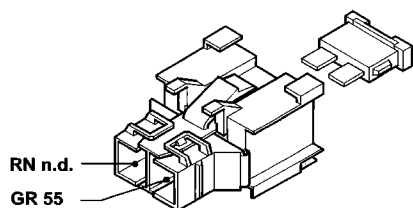
4A107NL03

### 305 Potentiometer on accelerator pedal (JTD)



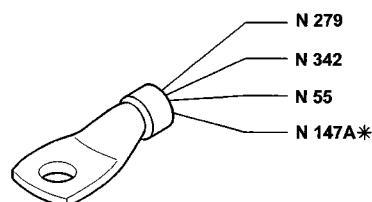
4A107NL04

### 308 15A fuse protecting canister solenoid valve (1242)



4A107NL05

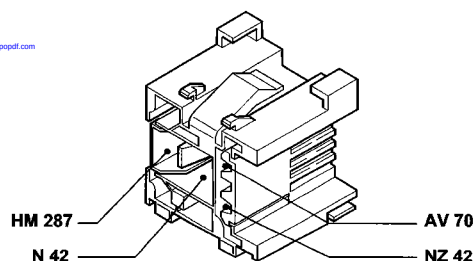
### 311 Engine pre-wiring earth (1242)



\* Only for versions with air conditioning

4A107NL06

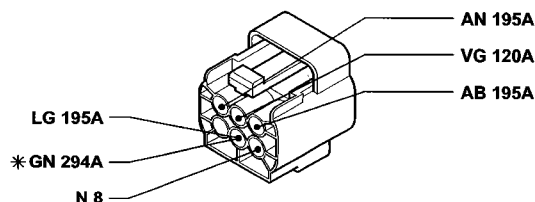
### 313 Air conditioning signal reversal relay



Only for versions with ABI

4A107NL07

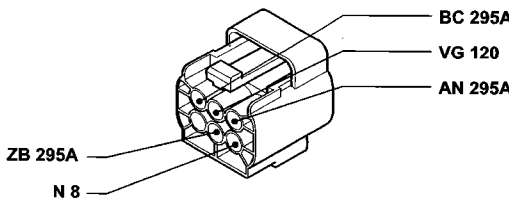
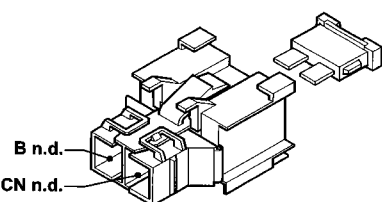
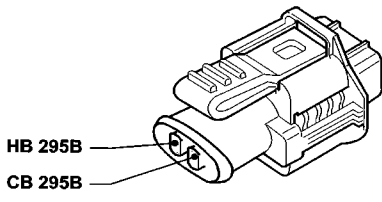
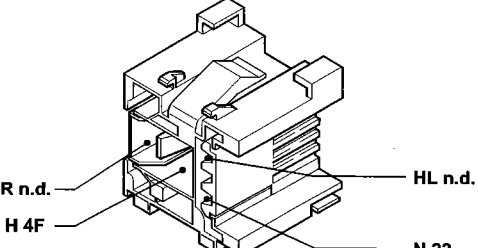
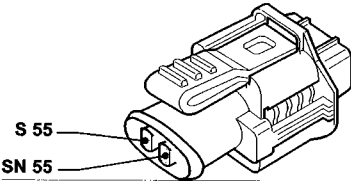
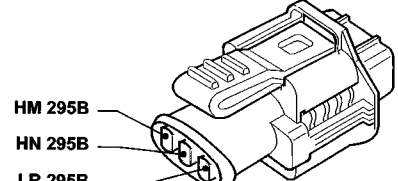
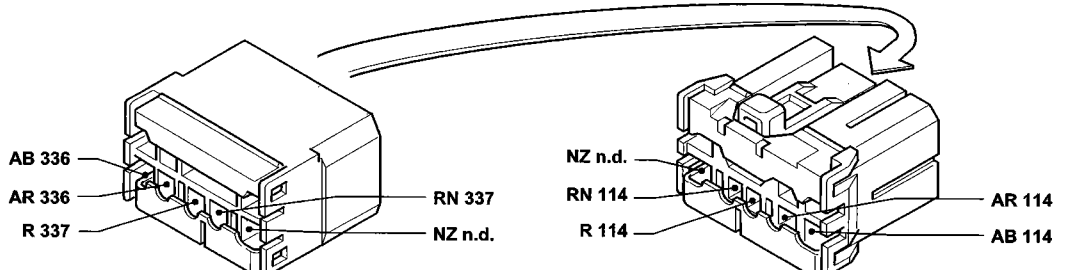
### 314 Four stage pressure switch (1242-1581)



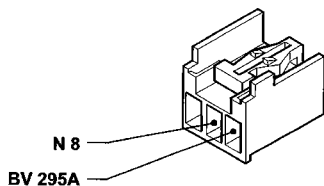
\* Only for versions with air conditioning

4A107NL08

### 55.

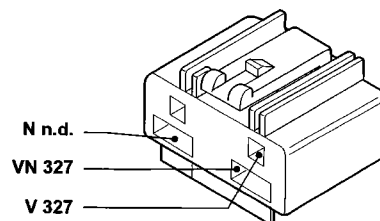
|                                                                                                                                                                                                                      |                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>314</b> Four stage pressure switch (JTD with air conditioning)</p>  <p>4A108NL01</p>                                          | <p><b>315</b> 15A fuse protecting electronic injection control unit (JTD)</p>  <p>4A108NL02</p> |
| <p><b>316</b> Fuel pressure regulator for injection system (JTD)</p>  <p>4A108NL03</p>                                             | <p><b>317</b> Main beam headlamp maintenance switch</p>  <p>4A108NL04</p>                      |
| <p><b>318</b> Fuel temperature sensor (JTD)</p>  <p>4A108NL05</p>                                                                 | <p><b>320</b> Fuel pressure regulator (JTD)</p>  <p>4A108NL06</p>                             |
| <p><b>329</b> EURO BAG connection with bridge on floor</p>  <p>Only for versions with Euro Bag and Side Bag</p> <p>4A108NL07</p> |                                                                                                                                                                                   |

### 326 Switch on clutch (JTD)



4A109NL01

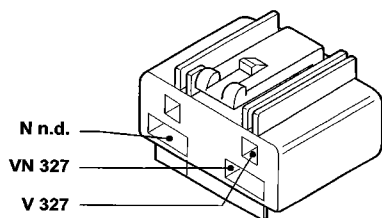
### 338 Driver's SIDE BAG



Only for versions with Euro Bag

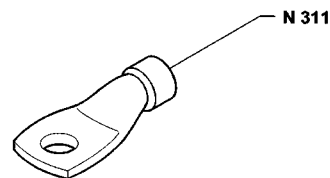
4A109NL02

### 339 Passenger SIDE BA



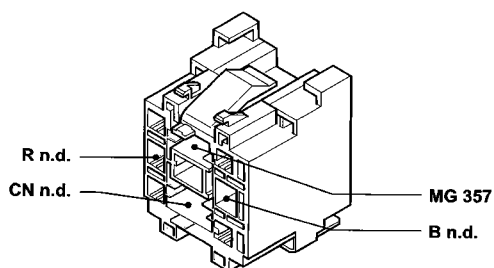
4A109NL03

### 342 Power earth for electronic injection (1242)



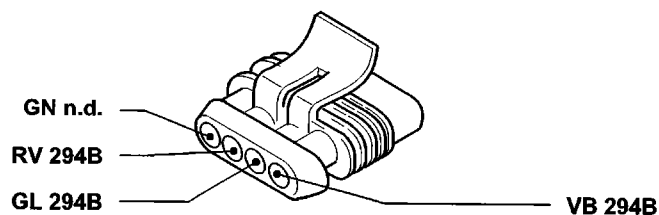
4A109NL04

### 352 50A relay for passenger compartment heating (JTD)



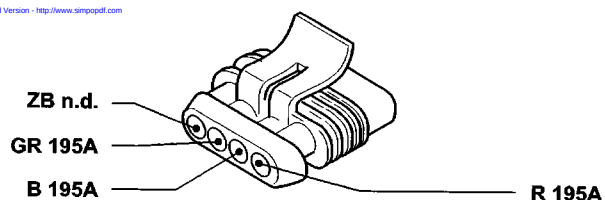
4A109NL05

### 360 Rear lambda sensor (1242)



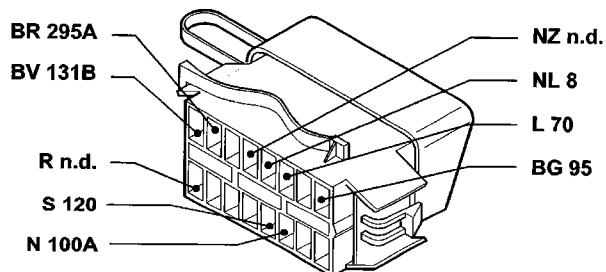
4A109NL06

### 360 Rear lambda sensor (1581)



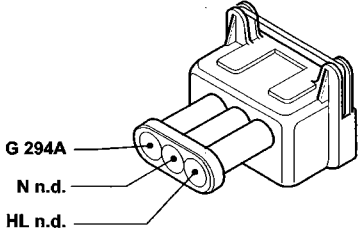
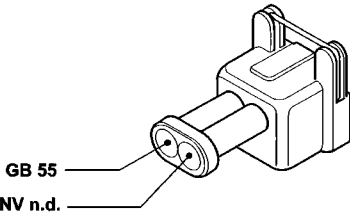
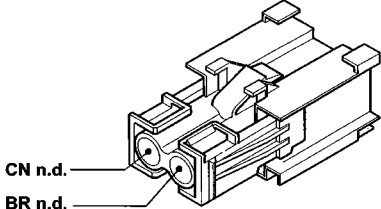
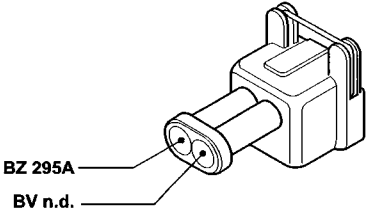
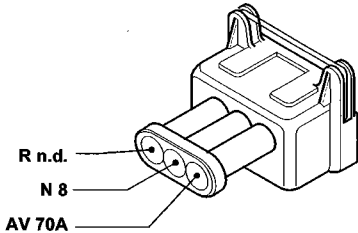
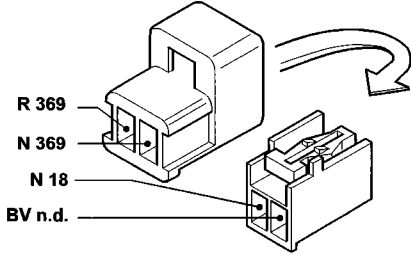
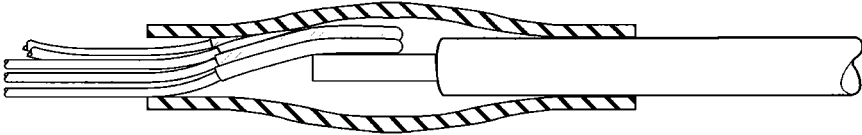
4A109NL07

### 361 EOBD diagnostic socket



4A109NL08

55.

|                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>362</div> <div>Accelerometer (1242)</div> <div><p>G 294A<br/>N n.d.<br/>HL n.d.</p></div> <div>4A110NL01</div>                                          | <div>363</div> <div>Throttle valve (JTD)</div> <div><p>GB 55<br/>NV n.d.</p></div> <div>4A110NL02</div>                                                  |
| <div>364</div> <div>7.5A fuse protecting electronic injection control unit/Fiat CODE (JTD)</div> <div><p>CN n.d.<br/>BR n.d.</p></div> <div>4A110NL03</div> | <div>365</div> <div>Waste gate valve (JTD)</div> <div><p>BZ 295A<br/>BV n.d.</p></div> <div>4A110NL04</div>                                             |
| <div>367</div> <div>Water in fuel filter sensor</div> <div><p>R n.d.<br/>N 8<br/>AV 70A</p></div> <div>4A110NL05</div>                                     | <div>368</div> <div>Connection between rear/lumbar adjustment cables</div> <div><p>R 369<br/>N 369<br/>N 18<br/>BV n.d.</p></div> <div>4A110NL06</div> |
| <div>N.D.</div> <div>Ultrasound welding taped in cable loom</div> <div></div> <div>P4A395I07</div>                                                        |                                                                                                                                                                                                                                            |

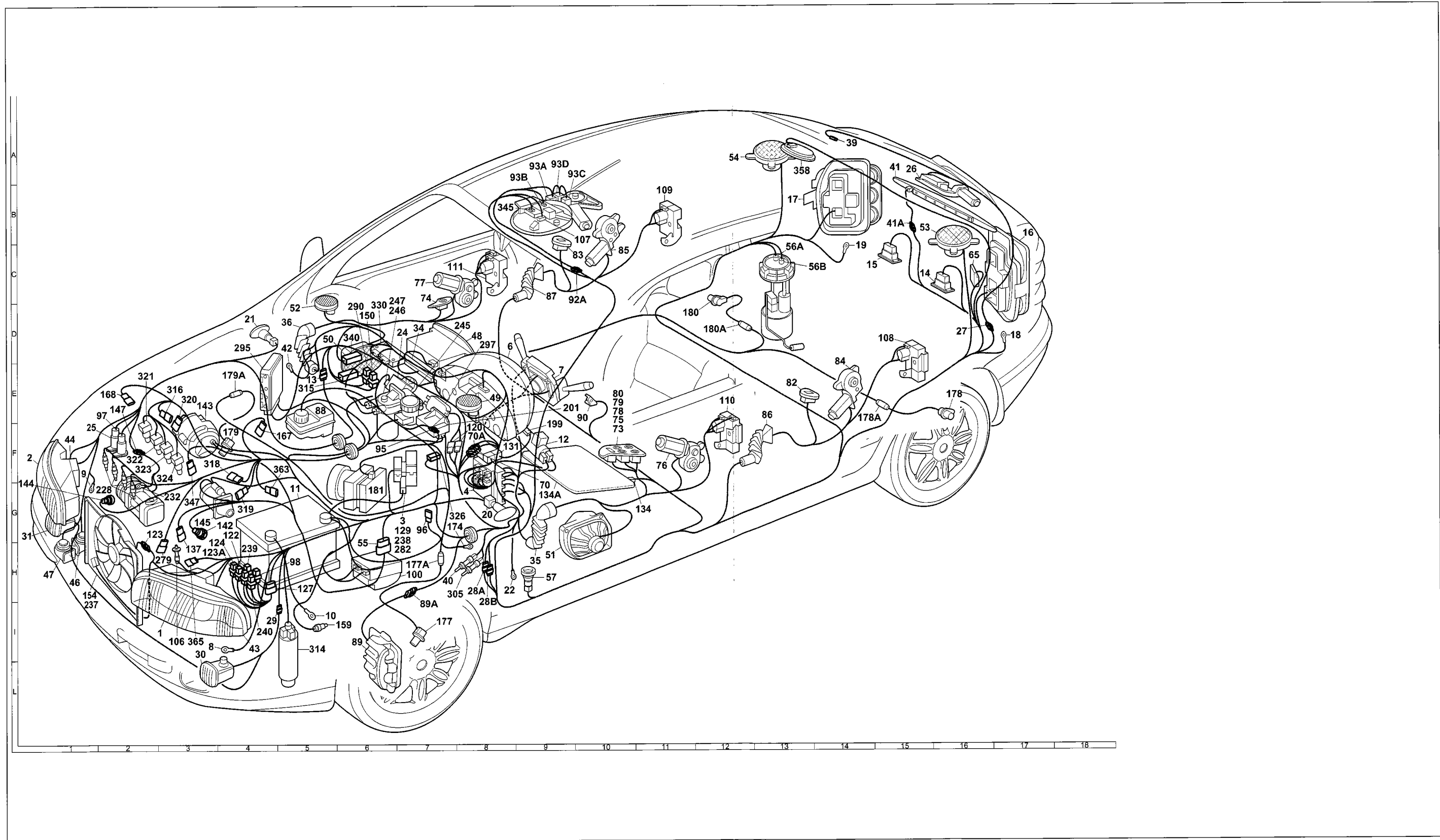






55.

Comprehensive perspective view showing location of cable loom and components (See key at end of wiring diagrams)

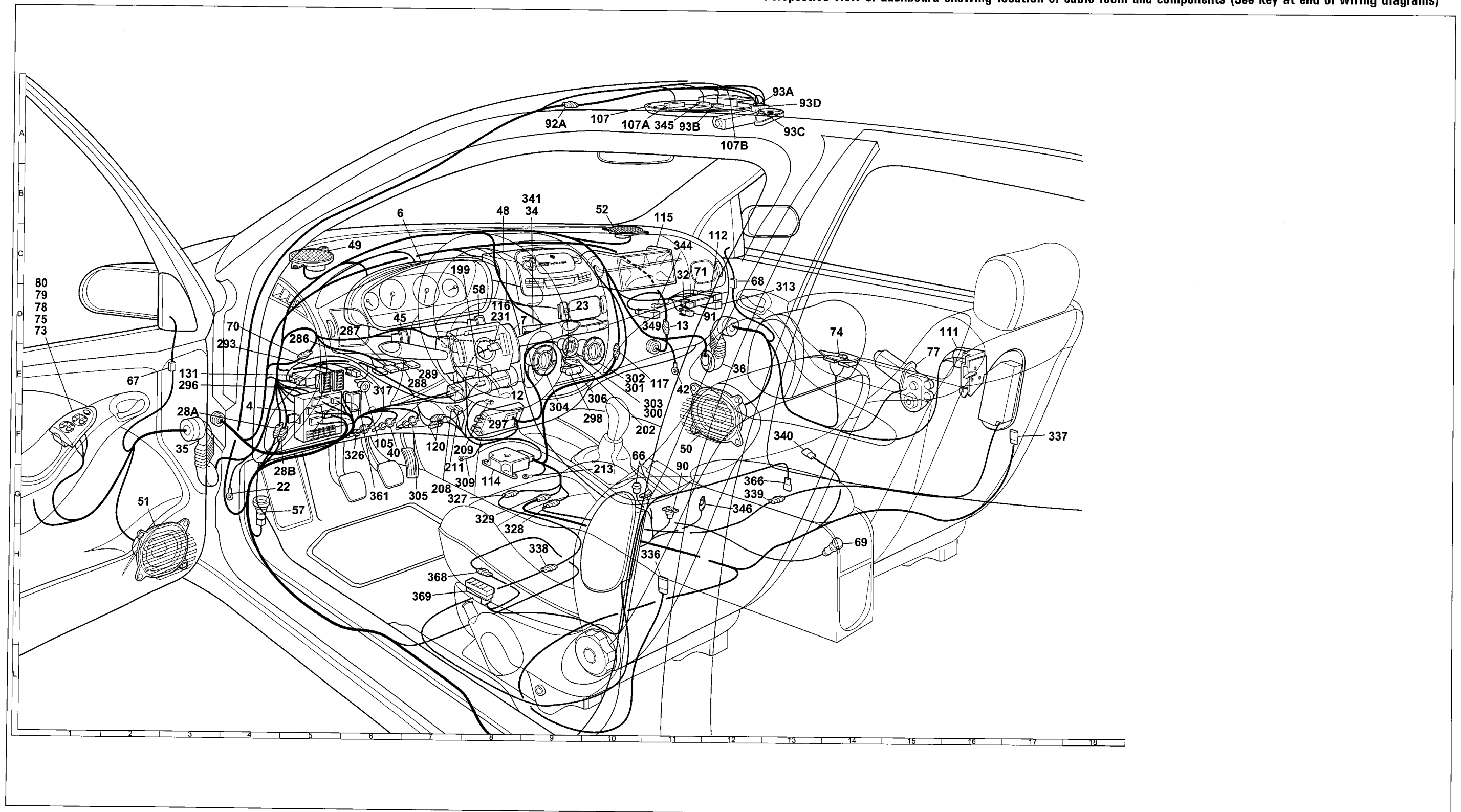




### 55.

Version without ABI

Perspective view of dashboard showing location of cable loom and components (See key at end of wiring diagrams)



4A112NL01

**Perspective view of dashboard showing location of cable loom and components (See key at end of wiring diagrams)**



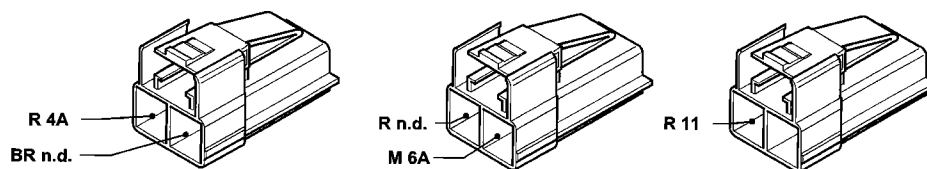
# Electrical system

## Connector blocks

2000 update

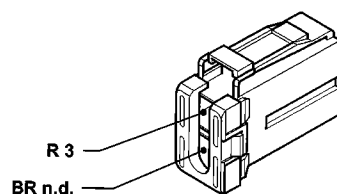
55.

### 3 Power fusebox



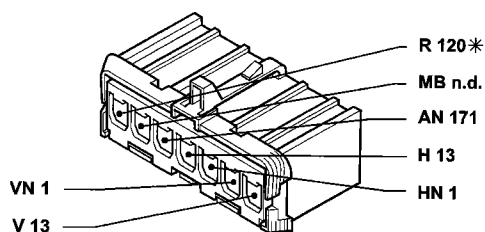
4A082NL01

### 4A Junction unit



4A082NL02

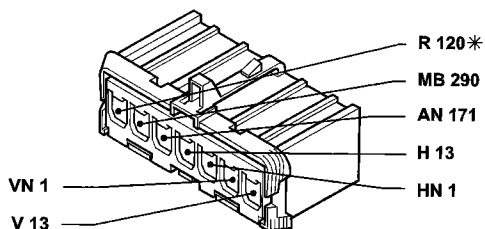
### 4C Junction unit (1581)



\* Only for versions with air conditioning

4A082NL03

### 4C Junction unit (1242) (JTD)



\* Only for versions with air conditioning

4A082NL04



Component key

- 1 Left front light cluster (13\*)

2 Right front light cluster (F1\*)

3 Power fusebox (G7\*)

A 30A fuse protecting injection system (60A for D versions)

B 40A fuse protecting ignition system

C 80A fuse protecting optional equipment

D 80A fuse protecting junction unit

4 Junction unit (G8\*) (E4\*\*)E1 Switch discharge relayE2 Horn relay feedE3 Heated rear windscreen relay feed

6 Instrument panel (D8\*) (B6\*\*)A Battery recharging warning lightB Low engine oil pressure warning lightC Left direction indicator warning lightD Right direction indicator warning lightE Side lights warning lightF Instrument panel ideogram lightG Main beam warning lightH EURO BAG system failure warning light

H1 Passenger EURO-BAG disabled warning lightI Anti-lock brakes failure warning light

J1 Fuel reserve warning lightK Fuel level gaugeL Fiat-CODE failure warning lightM Petrol/DS injection system failure warning lightN Maximum turbocharger pressure warning lightO Heater plugs warning lightQ Front brake pad wear warning lightR Handbrake applied/insufficient brake fluid level warning lightS Brake lights failure electronic moduleT Brake lights failure warning lightU Doors open warning ilght

V1 SpeedometerW Rev counterX Engine coolant temperature gaugeX1 Water in fuel filter warning light (JTD)Y Electronic moduleY1 Speed control moduleZ Milometer/trip meter displayZ1 Trip meter zeroing buttonZ2 Trip meter light

7 Steering column switch unit (E9\*) (D8\*\*)D Headlamp flasher buttonE Dipped/main beam headlamps control switchF Side lights control switch
- G Direction indicators/hazard warning lights switchH Direction indicators control switch

8 Left front earth (H4\*)

9 Right front earth (F2\*)

10 Battery earth on bodyshell (15\*)

11 Battery (F5\*)

12 Ignition switch (F9\*) (E8\*\*)Connection between right/left front cables

13 (E5\*) (D11\*)

14 Left number plate light (C15\*)

15 Right number plate light (C14\*)

16 Left rear light cluster (B17\*)

17S Left rear light cluster (B13\*)

18 Left rear earth (D17\*)

19 Right rear earth (C14\*)

20 Left front side direction indicator (G8\*)

21 Right front side direction indicator (D4\*)

22 Left dashboard earth (H8\*) (G3\*)

23 Hazard warning lights switch unit (D9\*)A Hazard warning lights warning lightB Hazard warning lights control switchC Hazard warning lights ideogram light

27 Contact board for rear connections with luggage compartment light switch incorporated (D16\*)

27A Button for luggage compartment light, engaging alarm and signalling tailgate open

28 Connection between dashboard/longitudinal cables (H8\*) (E3\*\*)

28A Connection between dashboard/longitudinal cables (H4\*)

29 Connection between front/fog light cables (H4\*)

30 Left fog light (13\*)

31 Right fog light (G1\*)

32 Fog lights relay feed (C11\*)

33 20A fuse protecting fog lights (C9\*)

34 Switch control unit (E7\*) (B8\*\*)A Anti-theft device on warning lightB Rear fog lamps control switchC Rear fog lamps relay feedD Rear fog lamp warning lightE Heated rear windscreen control switchF Heated rear windscreen warning lightG Switch panel ideogram lightH Fog lights warning lightI Fog lights control switchL Outside temperature control switch

35 Connection between dashboard/left front door cables (H9\*) (F3\*\*)

36 Connection between dashboard/right front door cables (D5\*) (D12\*\*)

40 Brake lights control switch (H7\*) (F7\*\*)

41 Additional brake light (A15\*)

- 41A Connection for additional brake light rear cables (B15\*)
- 42 Right dashboard earth (D5\*) (E11\*\*)
- 43 Left headlamp alignment corrector (H4\*)
- 44 Right headlamp alignment corrector (D6\*\*)
- 45 Headlamp alignment device control unit (D6\*\*)
- 48 Radio receiver with clock (D8\*) (B8\*\*)
- 55 Connection between front left cables/engine pre-wiring (H6\*)
- 56 Fuel gauge unitA Fuel level sensor (C13\*)B Electric fuel pump (C13\*)
- 58 Light dimmer (C7\*\*)
- 68 Right electrically adjustable exterior rear view mirror (C12\*\*)
- 70 Connection between dashborad/front cables (F8\*) (D4\*\*)
- 70A Connection between dashboard/front cables (JTD)
- 73 Left front electric window control buttons (F10\*) (D1\*\*)
- 74 Right front electric window control buttons (C7\*) (D14\*\*)
- 75 Right front electric window control buttons on left front door (F10\*) (D1\*\*)
- 76 Left front window motor (F11\*)
- 77 Right front window motor (C7\*) (D15\*\*)
- 80 Rear electric window inhibition switch (E10\*) (D1\*\*)
- 86 Connection between longitudinal/left rear door cables (E13\*)
- 87 Connection between longitudinal/right rear door cables (C9\*)
- 88 Insufficient brake fluid level sensor (E5\*)
- 89 Left brake pad wear sensor (16\*)
- 89A Left brake pad wear sensor cables (17\*)
- 90 Switch signalling handbrake applied (E10\*) (F11\*\*)
- 91 Power relay (D12\*\*)
- 92A Connection for electric sun roof cables (C10\*) (A9\*\*)
- 93A Electric sun roof control unit (A9\*) (A13\*\*)
- 93B Electric sun roof control button (A9\*) (A11\*\*)
- 93C Electric sun roof motor (A9\*) (B13\*\*)
- 93D Electric sun roof end of travel switch (A9\*) (A13\*\*)
- 95 Connection between front cables/anti-lock brakes (A.B.S.) (F7\*)
- 96 60A power fuse protecting electrical equipment (G7\*)
- 100 Alarm electronic control unit (H7\*)
- 105 Anti-theft disengagement switch (F6\*\*)
- 106 Anti-theft engagement switch (H2\*)
- 107A Central locking remote control receiver (B10\*) (A10\*\*)
- 108 Left rear central locking/alarm on switch (D15\*)
- 109 Right rear central locking/alarm on switch (B11\*)
- 110 Left front central locking/alarm on switch (E12\*)
- 111 Right front central locking/alarm on switch (C7\*) (D16\*\*)
- 114 EURO-BAG electronic control unit (G8\*\*)
- 115 Passenger EURO BAG (B11\*\*)
- 116 Driver's EURO BAG (D8\*\*)
- 117 Connection between EURO-BAG/dashboard cables (E11\*\*)
- 120 Connection for air conditioning unit cables (F8\*) (F7\*\*)
- 122 Engine cooling fan low speed relay feed (G4\*)
- 123 Engine cooling fan high speed timer (G3\*)
- 123A Engine cooling fan high speed relay feed (H5\*)
- 124 Air conditioning compressor control relay (H4\*)
- 127 Connection between front left cable/cable on relay holder bracket (H5\*)
- 129 Power fuse (50A) protecting engine cooling fan (G7\*)
- 131 Fiat-CODE electronic control unit (F8\*) (E3\*\*)
- 132 Petrol vapour cut out solenoid valve (canister) (E2\*)
- 136 Detonation sensor (F3\*)
- 137 Vehicle speed sensor (G5\*)
- 141 Heated lambda sensor (H3)
- 142 Switch signalling insufficient engine oil pressure (G4\*TD) (F1\*1242) (I2\*1581) (H4\*1747)
- 143 Alternator (E3\*)
- 144 Rpm and TDC sensor (F2\*)
- 145 Starter motor (G3\*)
- 147 Compressor for air conditioning (F3\*)
- 147A Coupling for air conditioning compressor
- 150 Injection system relay feed (D6\*) (C11\*\*)
- 154 Engine cooling fan (H1\*)
- 156 Spark plugs (F2\*)
- 159 Reversing lights control switch (I6\*)
- 161 Ignition power module (E3\*)
- 162 Injector (1) (E2\*)
- 163 Injector (2) (F2\*)
- 164 Injector (3) (F2\*)
- 165 Injector (4) (F3\*)
- 167 Air flow meter (F5\*)
- 168 Timing sensor (H1\*)
- 170 Engine cooling fan limit resistor (I1\*)
- 171 Connection for heater unit cables
- 174 Power earth for anti-lock brakes (A.B.S.) (I5\*)
- 177 Sensor on left front wheel for anti-lock brakes (A.B.S.) (I7\*)

- 177A Connection for cable for left front wheel sensor for anti-lock brakes (A.B.S.) (H7\*)
- 178 Sensor on left rear wheel for anti-lock brakes (A.B.S.) (E16\*)
- 178A Connection for cable for left rear wheel sensor for anti-lock brakes (A.B.S.) (E15\*)
- 179 Sensor on right front wheel for anti-lock brakes (A.B.S.) (F4\*)
- 179A Connection for cable for right front wheel sensor for anti-lock brakes (A.B.S.) (E4\*)
- 180 Sensor on right rear wheel for anti-lock brakes (A.B.S.) (D12\*)
- 180A Connection for cable for right rear wheel sensor for anti-lock brakes (A.B.S.) (D12\*)
- 181 Electro-hydraulic control unit for anti-lock brakes (A.B.S.) (G6\*)
- 194 Connection between injection cables/injector bridge (F2\*)
- 195 Ignition/ injection electronic control unit (1581) (H3\*)
- 199 Aerial for Fiat-CODE (F9\*) (C7\*\*)
- 201 Heater plugs control unit (E9\*)
- 202 Heater/air conditioning bulbs (E10\*\*)
- 206 Heater/air conditioning fan
- 207 Heater/air conditioning system speed control switch
- 208 Fan for air conditioning unit
- 211 Electronic thermostat (N.T.C.) (F7\*\*)
- 213 Earth for EURO BAG (F10\*\*)
- 231 Clock spring connector
- 237 Additional engine cooling fan (I1\*)I
- 238 50A fuse protecting engine cooling fan (H7\*)
- 239 Heated diesel filter relay (H4\*)
- 240 15A fuse protecting heated diesel filter relay (H7\*)
- 245 E.G.R. solenoid valve (D7\*)
- 246 Heated fuel filter (D6\*)
- 279 Engine coolant temperature twin sender unit (H2\*)
- 282 7.5A fuse protecting Fiat CODE/electronic injection (60 for UNIJET) (F7\*)
- 283 Connection between front cable/resistor (H3\*)
- 286 Short circuit connection (D5\*\*)
- 287 Short circuit connection (D6\*\*)
- 288 Short circuit connection (E7\*\*)
- 289 Short circuit connection (E7\*\*)
- 290 Fuel pump relay feed (D6\*) (C10\*\*)
- 291 Sensor for power assisted steering pump
- 292 Modular actuator (E4\*)
- 293 Fuse holder base on dashboard cable (E4\*\*)A 7.5A fuse protecting switch panel; Radio phone; Radio; Electric mirrors
- B 15A fuse protecting fog lights maintenance relay
- C 25A fuse protecting rear electric windows (non existent for SX versions)
- D 25A fuse protecting A.B.I. control unit; central locking
- E 20A fuse protecting current socket; cigar lighter; electric seats; electric sun roof
- F 10A fuse protecting EURO BAG
- 294 Injection/ignition electronic control unit (1242) (E5\*)
- 295 Injection/ignition electronic control unit 1910 UNIJET (D4\*)
- 296 Fuse holder base on front cableA 7.5A fuse protecting cooling system/electronic injection; A.C. system; Alarm
- B 20A fuse protecting windscreen wiper with A.B.I. or without A.B.I.
- C 7.5A fuse protecting electronic injection/cooling system Fiat-CODE
- D 10A fuse protecting ABS
- E 7.5A fuse protecting climate control system
- F 7.5A fuse protecting electronic injection system/Fiat CODE
- 297 Air conditioning control unit (E7\*) (E8\*\*)
- 298 Recirculation control for heater/air conditioning (F10\*\*)
- A Air conditioning control switch
- B Recirculation control switch
- C Fan sensor
- 300 Heater fan electronic transformer (E11\*\*)
- 301 Vehicle interior mixture control actuator (E10\*\*)
- 302 Maximum demisting control switch (E10\*\*)
- 303 Interior ventilation potentiometer (E11\*\*)
- 304 Vehicle interior temperature potentiometer (E10\*)
- 306 Treated air sensor
- 305 Potentiometer on accelerator pedal (H7\*)
- 306 Treated air sensor (F10\*\*)
- 307 15A fuse protecting injection system (D6\*) (C12\*\*)
- 308 15A fuse protecting canister solenoid valve (D6\*) (E12\*\*)
- 309 Earth for air conditioning unit (G8\*\*)
- 310 Absolute pressure and outside temperature sensor (E2\*)
- 311 Engine pre-wiring earth (1242 16V) (E5\*)
- 313 Air conditioning signal reversal relay (D12\*\*)
- 314 Four stage pressure switch (I5\*)
- 315 15A fuse protecting electronic injection control unit (1910 JTD) (E5\*)
- 316 Fuel pressure regulator for injection system (1910 JTD) (E3\*)
- 317 Headlamp maintenance remote control switch (E6\*\*)

- 318 Fuel temperature sensor (F3\*)
- 319 Fuel temperature sensor (F3\*)
- 320 Turbo pressure regulator (E3\*)
- 321 Injector 1 1910 JTD (F2\*)
- 322 Injector 2 1910 JTD (F2\*)
- 323 Injector 3 1910 JTD (F2\*)
- 324 Injector 4 1910 JTD (F2\*)
- 325 Connection between injection/left front cables (F5\*)
- 326 Switch on clutch (G8\*)
- 327 Conection with bridge on floor for left EURO BAG (G7\*\*)
- 328 Connection with bridge on floor for EURO BAG (G8\*\*)
- 329 Connection with bridge on floor (G8\*\*)
- 330 A.B.I. control unit (D7\*) (C12\*\*)
- 336 Driver's sensor for EURO BAG (H11\*\*)
- 337 Passenger side sensor for EURO BAG (F16\*\*)
- 338 Driver's SIDE BAG (H9\*\*)
- 339 Passenger SIDE BAG (G12\*\*)
- 342 Power earth for electronic injection (G4\*)
- 347 Engine oil level sensor (G3\*)
- 350 30A relay for passenger compartment heating
- 351 Safety relay for passenger compartment heating
- 352 50A relay for passenger compartment interior heating
- 353 70A fuse protecting heater plugs
- 354 N.T.C. sensor on heater supply pipe
- 355 Passenger compartment heater plugs
- 356 Heater plugs relay earth
- 357 Passenger compartment interior heater plugs control unit
- 358 Rear courtesy light (A13\*)
- 360 Rear Lambda sensor
- 361 EOBD diagnostic socket
- 362 Accelerometer
- 363 Throttle valve
- 364 7.5A fuse protecting electronic injection control unit/Fiat CODE (JTD)
- 365 Waste gate solenoid valve
- 366 Lumbar adjustment motor
- 367 Water in fuel filter sensor (JTD)
- 368 Connection between rear/lumbar adjustment cables
- 369 Lumbar adjustment

N.D. Ultrasound welding taped in cable loom

\* Co-ordinates of components in complete diagrammatic views from page 111 to page 113

\* Co-ordinates of components in complete diagrammatic views from page 114 to page 115

Cable colour code

- A Light blue
- B White
- G Yellow
- H Grey
- L Dark blue
- M Brown
- N Black
- R Red
- S Pink
- Z Purple
- AB Light blue-White
- AG Light blue-Yellow
- AN Light blue-Black
- AR Light blue-Red
- AV Light blue-Purple
- BG White-Yellow
- BL White-Dark blue
- BN White-Black
- BR White-Red
- BV White-Green
- BZ White-Purple
- CA Orange-Light blue
- CB Orange-White
- CN Orange-Black
- GN Yellow-Black
- GL Yellow-Dark blue
- GR Yellow-Red
- GV Yellow-Green
- HG Grey-Yellow
- HN Grey-Yellow
- HR Grey-Black
- HV Grey-Red
- LB Grey-Green
- LG Dark blue-White
- LN Dark blue-Yellow
- LR Dark blue-Black
- LV Dark blue-Green
- MB Brown-White
- MN Brown-Black
- NZ Black-Purple
- RB Red-White
- RG Red-Yellow
- RN Red-Black
- RV Red-Green
- SN Pink-Black
- VB Green-White
- VN Green-Black
- VR Green-Red
- ZB Purple-White