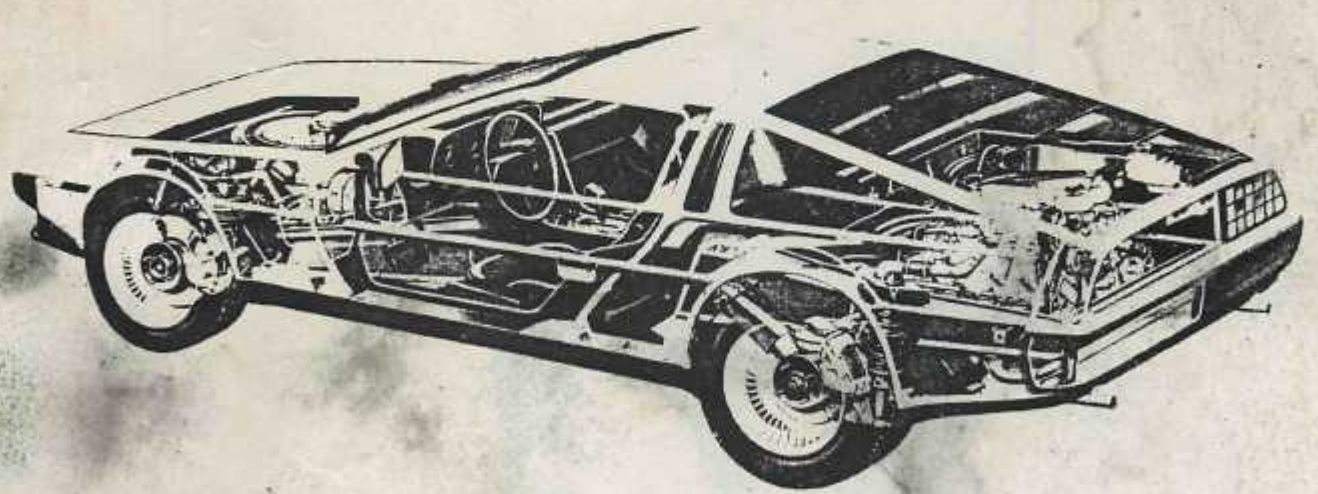
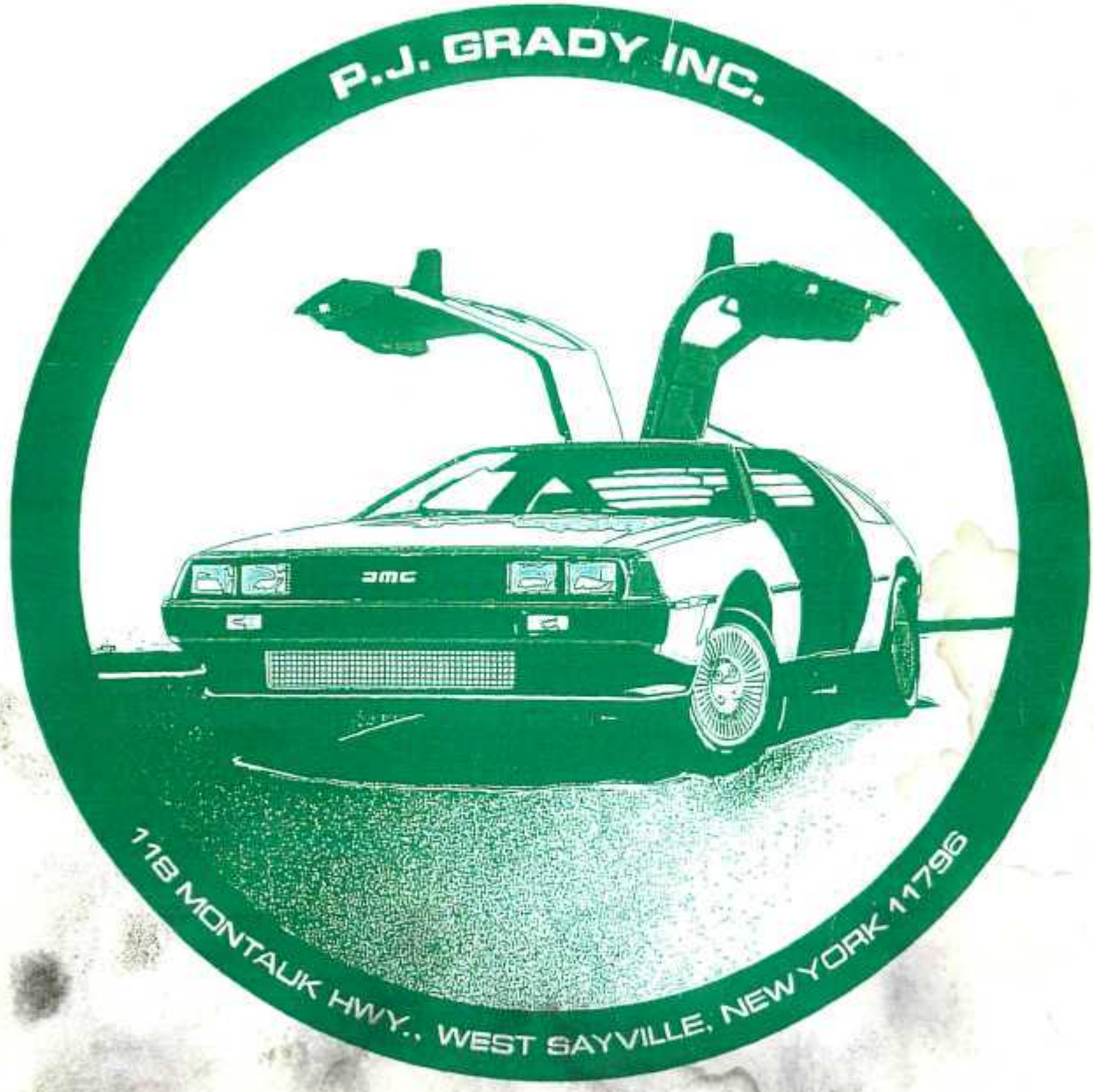
DMC

DELOREAN WORKSHOP MANUAL



P.J. GRADY INC. (631)589-6224 (800)350-7429 FAX (631)589-6241



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DE LOREAN WORKSHOP MANUAL

Part No. 113096

Issued by:

Technical Publications Department
De Lorean Motor Cars (1982) Ltd.
Dunmurry Industrial Estate
DUNMURRY, Co. Antrim
N. Ireland, BT17 9JJ

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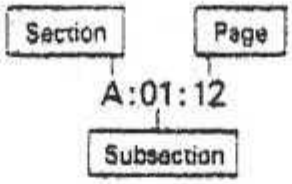
FOREWORD

Every possible care is taken during the manufacture of De Lorean cars to ensure they leave the factory capable of giving many miles of trouble free motoring. Proper servicing is absolutely essential if satisfactory performance is to be maintained.

Indexing System

The various units and systems of the vehicles are dealt with in sections designated by a letter. This is further divided into subsections which are identified by a number and a page number within the subsections.



Each section opens with a contents and index page so that any particular operation may be easily referred to.

General Data

Comprehensive information regarding dimensions tolerances and weights are given at the beginning of the manual and at the start of each section. Dimensions are given in both metric and imperial units.

SERVICE ORGANISATION

In order to provide the best possible service for owners, the dealer organisation throughout the world form a link between the owner and factory. All problems related to the servicing and repair of cars are dealt with through that organisation.

Dealers have the backing of the National Distributor and the factory Service Department.

Any communication relating to a De Lorean car should state the Vehicle Identification Number (VIN) which can be found by looking through the driver's side of the windshield, or on the driver's side door shut.

DE LOREAN GENUINE PARTS

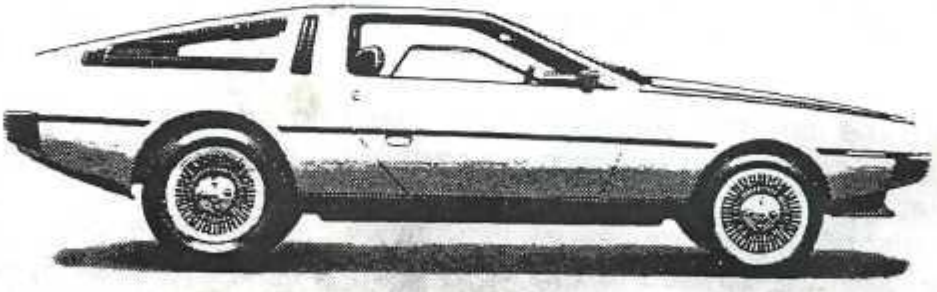
De Lorean genuine parts are identical to the high quality factory parts installed in new De Lorean cars.

DE LOREAN SPECIAL TOOLS

Certain service operations are made easier by the use of specially designed tools manufactured by Kent Moore Ltd.

These tools are essential to achieve the Flat Rate (Man Hour Schedule) Times approved by the factory.

The use of the tools is described under the appropriate sections and the relevant tools are listed at the beginning of each section.



GENERAL SAFETY HINTS

1. Use the correct spanner or driver for all fastening. When fitting new fastenings ensure the thread size is correct. Metric fastenings are predominantly, but not exclusively used.
2. Never walk under a car unless it is properly supported by stands.
3. Make sure jacks or stands are positioned safely and where they will not cause damage to the car.
4. Always disconnect the battery before working on electrical components or wiring.
5. When working in the engine compartment or under the car make sure the engine cannot be started accidentally.
6. Keep hands and clothing clear of electrically operated fans even when the ignition is OFF.
7. Take care not to inhale dust from brake pads — it contains asbestos which is a health hazard.
8. Treat gasoline (petrol) with great respect — avoid any sort of spark or flame. Do not start syphoning by mouth; drain fuel into a closed container.

LEGISLATION REQUIREMENTS

Most countries have stringent regulations governing the design and manufacture of cars, aimed mainly at maintaining standards of safety, noise and pollution. De Lorean cars conform to the homologation specifications required in the countries to which they are distributed.

Alterations to the car after purchase — by changing settings or adjustments, by addition of unapproved parts, or the fitting of unsuitable replacement parts — can result in deviation from the agreed specification. Such deviations can have legal consequences and you are therefore advised not to make alterations and to ensure that replacement parts are to the original specification.

SPECIFICATION CHANGES

The Company reserves the right to change the specification of the car from time to time without notice.

This is required in order to achieve the Company's objective for constant improvement. Before carrying out any repair refer to latest issue of the Service Bulletins, which are designed to advise any changes in specification or repair technique.

CONTENTS

	SECTION
GENERAL DATA	A
FUEL TANK	B
ENGINE	C
FUEL, EMISSION AND EXHAUST SYSTEM	D
CLUTCH	E
MANUAL TRANSMISSION	F
AUTOMATIC TRANSMISSION	G
STEERING	H
FRONT SUSPENSION	J
REAR SUSPENSION	K
BRAKES, WHEELS AND TYRES	L
ELECTRICAL SYSTEM AND INSTRUMENTS	M
HEATING AND AIR CONDITIONING	N
BODY	P

SUB-DIVIDED INTO THE FOLLOWING:
- GLASS REINFORCED PLASTIC (G.R.P.)
- STAINLESS STEEL
- INTERIOR

CHASSIS	R

General Data

CONTENTS

VEHICLE SPECIFICATION DATA A:01:01

ENGINE TUNING DATA A:02:01

TORQUE A:03:01

DIMENSIONS – GENERAL A:04:01

RECOMMENDED LUBRICANTS, FLUIDS AND CAPACITIES A:05:01

DMC MAINTENANCE A:06:01

PRE-DELIVERY INSPECTION A:07:01

LABEL IDENTIFICATION A:08:01

VEHICLE SPECIFICATION DATA

ENGINE

Number of cylinders	V6
Bore of cylinders	91 mm (3.58 in.)
Stroke of crankshaft	73 mm (2.87 in.)
Engine capacity	2849 cc (173.86 cu. in.)
Compression ratio	8.8 :1
Maximum power output	130 B.H.P. I.S.O. at 5,550 R.P.M. on 91 Octane Fuel (unleaded)
Maximum torque	208 Nm (153 ft. lbs.) at 2750 R.P.M.

COOLING SYSTEM

Type	Positive pressure closed system
Starts to open at	85° – 89°C (185° – 192°F)
Fully open at	100°C (212°F)
Circulation	Impellor type pump, thermostatically controlled
Fans	Electrically operated twin, thermostatically controlled

FUEL SYSTEM — FUEL INJECTION

Make/Type	Bosch K Jetronic continuous injection
Pump	Electric — immersed in fuel tank
Fuel Filter	Paper with nylon gauze
Line Pressure	4.8 to 5.0 bar (70 to 72 lb./sq. in.)
Injectors open at	3.5 to 4.1 bar (51 to 59 lb./sq. in.)
Rest pressure	2.95 bar (42.77 lb./sq. in.)
Control pressure	4.9 bar (71.05 lb./sq. in.)
Minimum output	120 litres/hour, 32 U.S. gallons/hour

IGNITION SYSTEM

Type	Bosch (Electronic contactless)
Rotation of Distributor	Clockwise — viewed from top of rotor arm
Firing order	1–6–3–5–2–4
Ignition Timing	13° ± 2° B.T.D.C. at 750 ± 50 R.P.M.
Spark Advance — Vacuum	5 in. hg. = 3°
	10 in. hg. = 12°
	15 in. hg. = 20°

IGNITION SYSTEM (Contd.)

Spark Advance — Mechanical	1000 R.P.M. = 0°
	2000 R.P.M. = 10°
	3000 R.P.M. = 14°
	4000 R.P.M. = 20°

ELECTRICAL DATA

System	12 v A C Delco Freedom II
Battery	12 v 75 AH Maintenance free
Alternator	Ducellier 80 Amp output or Motorola 90 Amp output

AUTOMATIC TRANSMISSION — TYPE 4141

Ratios: 1st	2.40
2nd	1.48
3rd	1.00
Reverse	1.92

MANUAL TRANSMISSION — TYPE 369

Ratios: 1st	3.36
2nd	2.06
3rd	1.38
4th	1.06
5th	0.82
Reverse	3.18

WHEELS AND TYRES

Wheels type	Cast light alloy
Size: Front	14" × 6" (357 mm × 152 mm)
Rear	15" × 8" (381 mm × 203 mm)
Spare	15" × 4" (381 mm × 102 mm)
Tyres type	Goodyear NCT steel belted radial
Size: Front	195/60 HR 14
Rear	235/60 HT 15
Spare	T125/70 D 15

General Data

A:01:03

STEERING

Type	Rack and Pinion with adjustable collapsible column
Turning circle	13.20 meters (43 ft.)
Wheel turns (lock to lock)	2.4

STEERING GEOMETRY

Tow-In	3 mm (0.12) per wheel
Caster Angle	3½° to 4° Positive
Camber Angle	0° to ½° Negative (Non Adjustable)
King Pin Inclination	6° + ½° – 0° (Non Adjustable)

BRAKES

Type		Power assisted — Discs front and rear
Disc Diameter:	Front	254 mm (10 in.)
	Rear	275 mm (10½ in.)

SUSPENSION

Front	Unequal length upper and lower control arms, coil springs, telescopic shock absorbers and stabilizer bar.
Rear	Diagonal trailing radius arms with upper and lower links, coil springs with telescopic shock absorbers.

HEATING AND A/C — Orifice tube type electrically operated clutch recycling.

CHASSIS/BODY — Epoxy coated steel backbone chassis, reinforced glass fibre underbody, grade 304 stainless steel body panels.

ENGINE TUNING DATA

Idle Speed	775 R.P.M. ± 50 R.P.M.		
C.O. reading at 950 R.P.M.	1% ± 0.3%		
Valve clearance (cold):			
Inlet	0.10 – 0.15 mm (0.004" – 0.006")		
Exhaust	0.25 – 0.30 mm (0.010" – 0.012")		
Valve Timing		LH	RH
Inlet opens	B.T.D.C.	9°	7°
closes	A.B.D.C.	45°	43°
Exhaust opens	B.B.D.C.	45°	43°
closes	A.T.D.C.	9°	7°

SPARK PLUGS

Type	Bosch HR 6 DS
Gap	0.6 – 0.7 mm (0.024" – 0.028")
Torque	17 – 20 Nm (13 – 15 ft./lbs.)

DESCRIPTION	TORQUE	REMARKS
CHASSIS: Fuel Tank Cover Plate	16 lb. ft. – 22 Nm	
Fuel Tank Front	8 lb. ft. – 11 Nm	
Horn Bracket Attachment	8 lb. ft. – 11 Nm	
Radiator Mounting Bracket to Frame	16 lb. ft. – 22 Nm	
Horn to Bracket	8 lb. ft – 11 Nm	
Radiator Stay Bracket to Frame	3 lb. ft. – 5 Nm	
REAR SUSPENSION: Trailing Arm Bush Attachment	16 lb. ft. – 22 Nm	
Lower Link Both Ends	INNER – OUTER 60 lb. ft. – 42 lb. ft. INNER – OUTER 80 Nm – 64 Nm	
Upper Link Both Ends	60 lb. ft. – 42 lb. ft. 80 Nm – 64 Nm	
Trailing Arm Hub to Carrier	75 lb. ft. – 55 Nm	
Outer Drive Shaft to Hub	270 lb. ft. – 370 Nm	
Travelling Arm to Pivot Bush	42 lb. ft. – 64 Nm	
Shaft to Inner and Outer Drive Shafts	30 lb. ft. – 40 Nm	
Parking Brake Cable Bracket to Hub Carrier	5½ lb. ft. – 7 Nm	
Caliper – Hub Carrier	40 lb. ft. – 55 Nm	
Flex Brake Pipe Attachment	12 lb. ft. – 16 Nm	
Wheels	60 lb. ft. – 80 Nm	

DESCRIPTION	TORQUE	REMARKS
TRANSMISSION AND FINAL DRIVE: Drain and Fill Plugs	15 lb. ft. – 20 Nm	
Mounts 8 mm 10 mm	18 lb. ft. – 25 Nm 26 36	
TRANSMISSION SHIFT LINKAGE: Auto and Manual Relay Pivot Bolts	16 lb. ft. – 22 Nm	
FRONT SUSPENSION: Caliper to Mounting Bracket	55 lb. ft. – 75 Nm	
Dust Shield	20 lb. ft. – 28 Nm	
Front Disc to Hub	20 lb. ft. – 28 Nm	Assemble with Loctite 601
Stub Axle to Steering Knuckle	165 lb. ft. – 220 Nm	
Hub Bearing to Stub Shaft	145 lb. ft. – 190 Nm	
Upper Control Arm Pivot Bolt	60 lb. ft. – 80 Nm	
Lower Control Arm Pivot Bolt	60 lb. ft. – 80 Nm	
Shock Absorber (Upper)	20 lb. ft. – 28 Nm	
Shock Absorber (Lower)	60 lb. ft. – 80 Nm	
Stabilizer Bar – Lower Control Arm	INNER – OUTER INNER – OUTER 44 lb. ft. – 68 lb. ft. 60 Nm – 90 Nm	
Stabilizer Bar Pivot (on Chassis)	26 lb. ft. – 36 Nm	
Flex Brake Pipe Attachment	12 lb. ft. – 16 Nm	
Upper Ball Joint to Steering Knuckle	35 lb. ft. – 50 Nm	
Lower Ball Joint to Steering Knuckle	35 lb. ft. – 50 Nm	
Body to Chassis	23 lb. ft. – 35 Nm	
Fixing Bolts	23 lb. ft. – 35 Nm	

General Data

A:03:03

DESCRIPTION	TORQUE	REMARKS
ENGINE: Engine Mounts	18 lb. ft. – 25 Nm	
A/C Compressor Bracket to Engine	12 lb. ft. – 16 Nm	
Heat Shields to Exhaust Crossover	8 lb. ft. – 11 Nm	
Exhaust Crossover Pipe to Manifold	30 lb. ft. – 40 Nm	
'U' Bolt Catalyst to Muffler	11 lb. ft. – 15 Nm	
Muffler Support Bracket on Engine	16 lb. ft. – 22 Nm 22 lb. ft. – 30 Nm	
Muffler Rubber Mounts	8 lb. ft. – 11 Nm	
BRAKE LINES: "T" Connections to Frame	8 lb. ft. – 11 Nm 16 lb. ft. – 22 Nm	
Flex Pipe to Frame	12 lb. ft. – 16 Nm	
Line Union through Frame	12 lb. ft. – 16 Nm	
RADIATOR: Fan Cowl to Radiator	5 lb. ft. – 7 Nm 8 lb. ft. – 11 Nm	
STEERING UNITS: Lower Column to Universal Joint to Rack Pinion and Upper Column	16 lb. ft. – 22 Nm	
Tie Rod to Steering Knuckle	26 lb. ft. – 36 Nm	
Tie Rod to Lock Nut	48 lb. ft. – 65 Nm	
Steering Rack Assembly to Frame	18 lb. ft. – 24 Nm	

TORQUE FIGURES

ENGINE		
Cylinder Head Tightening New Cylinder Head Gasket. Torque tighten to 45 lb. ft. – 61 Nm. Slacken off, pre-tighten to 15 lb. ft. – 20 Nm and then Angular tighten 115°. Re-tighten Cylinder Head. Slacken off, pre-tighten to 15 lb. ft. – 20 Nm and then Angular tighten 115°. Tightening main bearing Cap Nuts: Pre-tighten to 20 lb. ft. – 27 Nm and then Angular tighten 75°.		
DESCRIPTION	**TORQUE**	**REMARKS**
Big End Cap Nuts	34 lb. ft. – 46 Nm	
Flywheel Fixing Bolts	42 lb. ft. – 58 Nm	With Loctite 601
Converter Driving Plate Bolts	49 lb. ft. – 66 Nm	With Loctite 601
Sump Fixing Bolts	11½ lb. ft. – 16 Nm	
Crankshaft Pulley Fixing	135 lb. ft. – 183 Nm	With Loctite 601
Oil Pump Sprocket Bolts	4 lb. ft. – 6 Nm	
Chain Tensioner Blade Bolts	11 lb. ft. – 15 Nm	
Timing Cover Fixing Bolts	11 lb. ft. – 15 Nm	Bottom bolts with Loctite 601
Camshaft Sprocket Fixing Bolts	55 lb. ft. – 75 Nm	
Camshaft Pulley Fixing Bolts	74 lb. ft. – 100 Nm	
Camshaft Sprocket Access Plug	22 lb. ft. – 30 Nm	
Inlet Manifold Fixing Bolts	9 lb. ft. – 14 Nm	
Taper Seat Spark Plug (No Washer)	14 lb. ft. – 18 Nm	

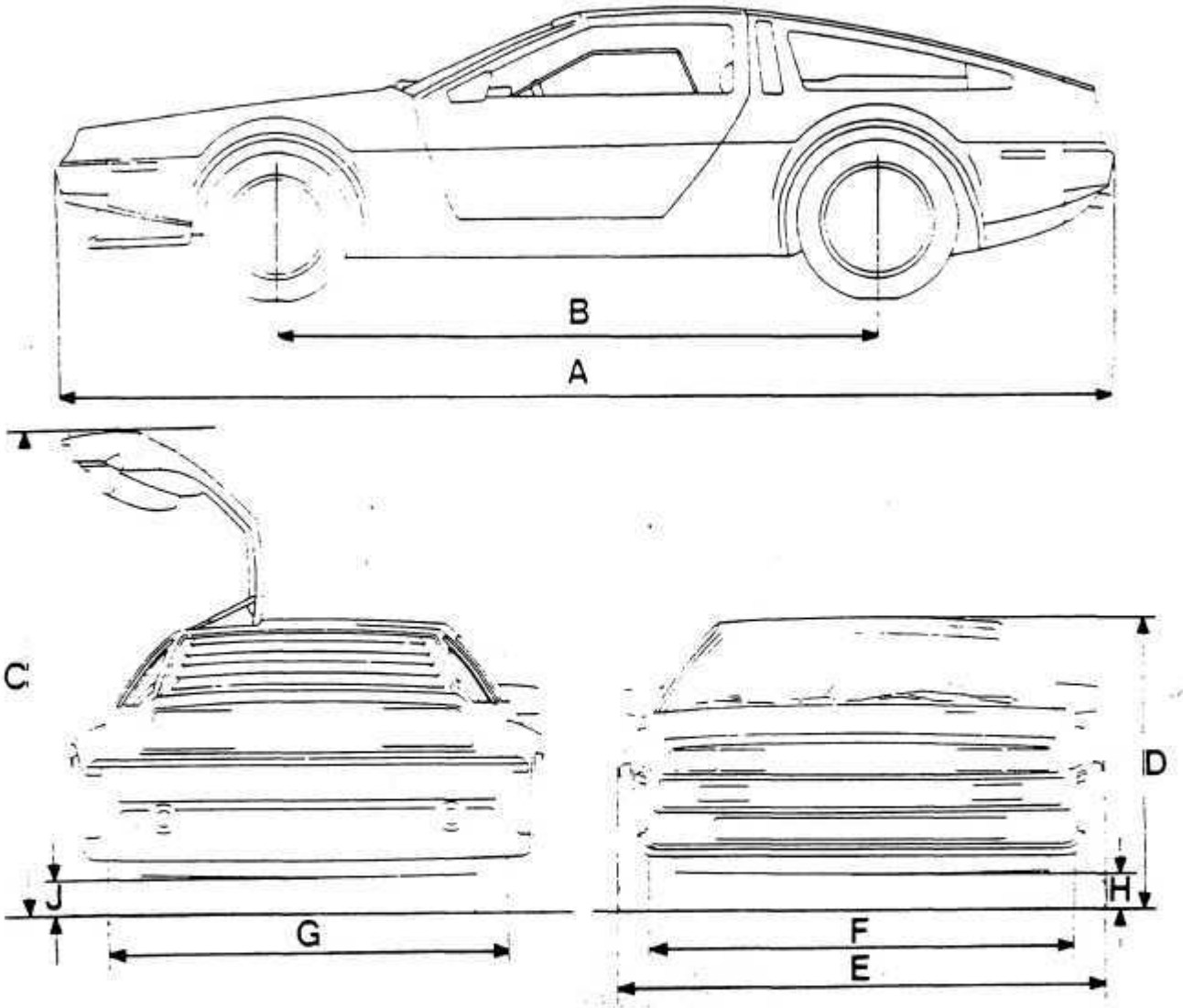
MANUAL TRANSMISSION

DESCRIPTION	TORQUE	REMARKS
Half Casing Bolts 8 mm	22½ lb. ft. – 31 Nm	
Diameter 10 mm	37 lb. ft. – 50 Nm	
Rear Cover Fixing Bolts 8 mm	18 lb. ft. – 25 Nm	
Diameter 10 mm	37 lb. ft. – 50 Nm	
Clutch Housing Fixing Bolts	37 lb. ft. – 50 Nm	
Reverse Gear Selector Bolts	26 lb. ft. – 35 Nm	
Crown Wheel Fixing Bolts	100 lb. ft. – 130 Nm	
Secondary Shaft Speedo Worm	105 lb. ft. – 135 Nm	
Bearing Plate Bolts	37 lb. ft. – 50 Nm	
Primary Shaft Nut	105 lb. ft. – 135 Nm	

AUTOMATIC TRANSMISSION

DESCRIPTION	TORQUE	REMARKS
Output Shaft (Planet Wheel Carrier) Nut	145 lb. ft. – 195 Nm	
Half Casing Assy. Bolts 8 mm Dia.	22½ lb. ft. – 31 Nm	
Half Casing Assy. Bolts 10mm Dia.	32 lb. ft. – 44 Nm	
Final Drive Pinion Nut	170 lb. ft. – 230 Nm	
F2 Brake Bolts	11 lb. ft. – 15 Nm	
Stator Support Fixing Bolts	24 lb. ft. – 33 Nm	
Converter Casing to Final Drive Casing Fixing Bolts	32 lb. ft. – 44 Nm	
Hydraulic Distributor Fixing Bolts	7½ lb. ft. – 10 Nm	
Crown Wheel Fixing Bolts	100 lb. ft. – 130 Nm	

DIMENSIONS — GENERAL



	Inches	Millimetres
A — Overall Length	166.00	4213
B — Wheel Base	95.00	2410
C — Height (Door Open)	77.20	1962
D — Height (Door Closed)	44.90	1140
E — Width	73.10	1856
F — Track — Front	62.60	1590
G — Track — Rear	62.80	1594
H — Ground Clearance — Front	5.60	142
J — Ground Clearance — Rear	6.10	155

RECOMMENDED LUBRICANTS, FLUIDS AND CAPACITIES

UNIT	CAPACITY			GRADE
	U.S. GALLONS	U.K. PINTS	LITRES	
ENGINE AND FILTER	1.72 1.78	11.4 11.8	6.5 6.75	15 W 40 20 W 40 ABOVE – 10°C (14°F) 20 W 50
				15 W 40 *10 W 30 BELOW – 10°C (14°F) 5 W 20
*THE USE OF 10 W 30 MULTI-GRADE OIL IS NOT ADVISABLE UNLESS THE TEMPERATURE WARRANTS IT HOWEVER IF A 10 W 30 MULTI-GRADE OIL IS USED TO ASSIST STARTING IN COLD WEATHER IT MAY REMAIN IN THE SUMP AS LONG AS THE TEMPERATURE DOES NOT RISE ABOVE – 10°C				
MANUAL GEARBOX (INCLUDES FINAL DRIVE)	0.97	6.5	3.7	TO MEET SPEC MIL – L 2105C OR API – GL5 *SAE 75W BELOW – 10°C (14°F) SAE 80W ABOVE – 10°C (14°F)
*WHERE SAE 75W OIL IS NOT AVAILABLE SAE 80W OIL MAY BE USED				
FINAL DRIVE AUTOMATIC	0.42	2.6	1.5	SAE 80W { MIL – L 2105C / API GL5
AUTOMATIC TRANSMISSION (CONVERTER)	1.57	10.5	6.0	ATF TYPE DEXTRON 11, ELF RENAULT MATIC D2 OR MOBIL ATE 220
BRAKE CIRCUIT		1.3	0.764	DOT 4
COOLING SYSTEM	2.9	19.37	11.0	ETHYLEN GLYCOL BASED (CONTAINING NO BORAX). MINIMUM 50 50 MIXTURE WITH WATER TO BE USED ALL YEAR ROUND AND REPLACED ANNUALLY
CLUTCH CIRCUIT		.66	0.378	DOT 4
WINDSHIELD WASHER RESERVOIR		9	5.5	
AIR CONDITIONING REFRIGERANT OIL	2.50 POUNDS		1.40 GRAMMES	SUNISO 5GS OR TEXACO CARPELLA 'E' OR EQUIVALENT R-12 – FREON OR ARCTON
FUEL TANK	13.5	11.5 IMP. GALLONS	51.6	91 OCTANE (UNLEADED)
WHEEL BEARINGS				SEALED FOR LIFE
STEERING RACK	0.3 U.S. PINT	.26	0.15	API SERVICE GL-5 (SAE – EP 90)

PRE-DELIVERY INSPECTION

After each operation has been completed tick corresponding box [✓]

VEHICLE INTERIOR

1. Check operation of instruments, controls, interior/exterior lights, horns, seat adjustment, window operation, electric door locks [ ]
2. Check wipers and washers, adjust as required [ ]
3. Check seat belts for condition and correct operation of mechanism and buckles [ ]
4. Check soft and hard trim for damage and attachment [ ]

VEHICLE EXTERIOR

5. Check and adjust tyre pressures including spare [ ]
6. Check wheel nut torque [ ]
7. Check alignment and adjust, if required, doors, hook and engine compartment lid and louvre [ ]
8. Check operation of hood and engine compartment lock [ ]
9. Check and adjust headlamps [ ]

UNDER HOOD

10. Check brake fluid [ ]
11. Check clutch fluid [ ]
12. Check windshield washer fluid [ ]
13. Check tool kit for completeness [ ]
14. Check luggage compartment light [ ]
15. Check carpet for fit and fastening [ ]

ENGINE COMPARTMENT

16. Check/Top up Engine oil [ ]
    Cooling mixture and protection [ ]
    Auto. transmission fluid [ ]
17. Check cooling system for leaks [ ]
18. Check fuel system for leaks [ ]
19. Check engine compartment light [ ]

ON HOIST

20. Check tyres for damage/specification [ ]
21. Check brake hoses/pipes for leaks, damage and chafing [ ]
22. Check gaiters of driveshafts for damage/leaks [ ]
23. Check steering/suspension linkages, ball joints and gaiters/boots for damage, and security [ ]
24. Check and top manual transmission oil and final drive oil (automatic) [ ]
25. Check exhaust for leaks/damage [ ]
26. Check coolant and fuel pipes for leaks/damage and chafing [ ]

ROAD OR ROLLER TEST

27. Check operation and function of engine drive performance [ ]
28. Operation of handbrake, foot brake, clutch, auto- transmission, kick down and shifting, steering, speedometer, heater and air conditioning [ ]
29. General check for squeaks and rattles [ ]

ON HOIST AFTER ROAD OR ROLLER TEST

Check and correct

30. Cooling system for leaks [ ]
31. Engine oil leaks [ ]
32. Transmission for leaks [ ]
33. Fuel system for leak [ ]
34. Brake system for leaks [ ]
35. Front Toe In [ ]
36. Rear Toe In [ ]
37. Clean exterior and interior [ ]

Work carried out by

Vehicle approved for delivery

Service Manager

DEALER CERTIFICATE

VIN No Stock No

PDI DATE MILES RO No

We hereby certify that this motor vehicle conforms to all applicable emission standards of the U S Environmental Protection Agency This certificate is being made upon the basis of

(1) our knowledge that the vehicle is covered by an EPA certificate of conformity based on written notification furnished by the manufacturer

(2) a visible inspection of emission control devices of portions thereof which are visible without removal or adjustment of any component or system of the vehicle Based on such inspection, there are no apparent deficiencies in the installation of such devices by the manufacturer ("emission control devices" is limited to all devices installed on a vehicle for the sole or primary purpose of controlling vehicle emissions and which were not in general use prior to 1968), and

performancy of all emission related preparation required by the manufacturer prior to the sale of the vehicle, as set forth in the post pre delivery service instructions provided by the manufacturer

vicle fails an EPA approved emission test prior to the expiration months or 4,000 miles (whichever occurs first) from the date or at the time of delivery of the vehicle to the ultimate purchaser (company cars and demonstrators), and the vehicle has been maintained and used in accordance with the written instructions for proper maintenance and use, then the vehicle manufacturer shall remedy the non conformity under the DMC emission performance warranty given to you

The dealer certification shall not be construed as either a representative or a warranty, express or complied, by the dealer that the emission control system or any part thereof is without defect or that the system will properly perform The emission performance warranty referred to above is solely that of the manufacturer

OWNER'S ACCEPTANCE CERTIFICATE

I have inspected the above vehicle and accept it without any visible damage and complete with owner's manual

owner's manual	[ ]	vehicle/emission/battery	[ ]
maintenance schedule/record	[ ]	tyres	[ ]
warranty statement/information	[ ]	sound system	[ ]

SIGNATURE/DATE

(Owner)

DMC

DMC MAINTENANCE

DMC

[ ] FIRST SERVICE 1,200 MILES (1,920 KM)

[ ] ONCE A YEAR OR AT 7,500 MILES (12,000 KM)

TICK APPROPRIATE BOX [✓]

NAME ..... TEL NO .....

ADDRESS ..... REG NO .....

..... DEL DATE .....

MILEAGE ..... VIN NO .....

TICK APPROPRIATE SERVICE REQUIRED	A	B	C	D
PREPARATION FOR WORK				
Fit seat, wing, steering and floor covers				
UNDERSIDE				
*Engine Drain and re-fill oil (without flushing)				
Oil Filter Replace				
Automatic Transmission Fluid Drain at 1,200 then every 15,000 miles				
Final Drive Drain at 1,200 then every 7,500 miles				
Manual Transmission Drain oil and refill				
Engine/Transmission Check leaks				
Steering Suspension Check play/leaks				
Drive Shafts Check play/leaks				
Gearbox/Sump/Timing Cover Check leaks				
Sump Tighten bolts				
Shock Absorbers Check mountings/leaks				
Brake Circuit Check leaks				
Check condition of flexible hoses				
Brake Pads/Disc Check wear/condition				
The following must be replaced or checked for condition every 45,000 miles (72,000 km)				
Brake Servo Filter				
Flexible Brake Hoses				
Brake Calipers				
and				
Master Cylinder Seals, Pistons, and complete units				
Replace brake fluid every 15,000 miles (24,000 km)				
Grease Ball Joints				
Fuel Lines Check condition/leaks				
Clutch Check hydraulic circuit for leaks				
ENGINE COMPARTMENT				
*Check and adjust driving belts				
Rocker Cover Check leaks				
Cooling System Check leaks/Top up if necessary Drain and refill system every 2 years or 15,000 miles				
Hoses Tighten clips				
Automatic Transmission Governor cable Check/Adjust if necessary				
*Exhaust System Check leaks and security				

TICK APPROPRIATE SERVICE REQUIRED	A	B	C	D
ENGINE				
*Rocker Arm Clearance Adjust if necessary				
Inlet/Exhaust Manifolds Check bolt tightness (inc. clamps)				
Fuel System Check leaks/Chafing				
Oxygen Sensor Renew every 30,000 miles U.S. only				
Air Conditioning Check compressor mounting bolts				
Check pipe condition/leaks				
Check refrigerant level				
Accelerator Cable Check for full throttle opening Lubricate linkages				
*Air Filter Replace if necessary				
PERFORM THE FOLLOWING IGNITION CHECKS				
*Engine stopped, ignition on, check				
battery voltage				
cranking speed				
coil output				
coil input				
At idling speed, check				
initial timing				
centrifugal timing				
vacuum advance				
At 1,500 R.P.M., check				
coil polarity (primary side)				
spark plug firing voltage				
spark plug firing voltage (snap acc.)				
*Replace plugs if necessary				
maximum coil output (plug lead removed)				
secondary resistance				
condenser				
alternator diodes				
At 1,200 R.P.M., check				
power balance				
charging voltage				
At engine idle, check (if necessary set CO and HC levels)				
Refer to workshop manual emission setting				

TICK APPROPRIATE SERVICE REQUIRED	A	B	C	D
WHEELS AND TYRES				
Tyres Check pressures including spare				
Check cuts/damage on inside/outside walls				
Check tyres comply to manufacturer's specification				
Check and adjust wheel alignment if necessary				
Torque tighten wheel nuts				
Check/top up brake and clutch reservoirs				
ELECTRICAL				
Headlamps Check and adjust beam (dipped beam)				
Check light intensity				
Headlamp Flasher Check operation				
Reverse Lamps Check operation				
Parking/Side Lights Check operation				
Rear Number Plate Lights Check operation				
Stop Lights Check operation				
Indicators/Hazard Warning Lights Check operation				
Internal, Luggage and Engine Compartment Lights Check operation				
Fascia Illumination and Warning Lights Check operation				
Horns Check operation				
Windscreen Wiper Adjust sweep				
Windscreen Washer Adjust jet if necessary				
Electric Windows Check operation/Adjust if necessary				
Seat Belts Check condition/fixing security				

NOTE

*Only these emission control maintenance items are considered to be required Maintenance as defined by the California Air Resources Board (A.R.B.) regulations, the maximum maintenance an owner in California must perform to fulfill the minimum requirements of the emission warranty. All other emission maintenance items are recommended maintenance as defined by such regulation. DMC urges that all emission control items be performed.

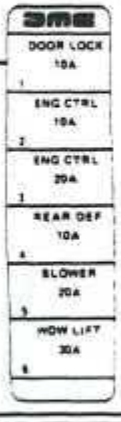
DURING THE COURSE OF SERVICING YOUR DE LOREAN CAR THE FOLLOWING REPAIRS HAVE BEEN NOTED AND REQUIRE ATTENTION

RECOMMENDED REPAIRS	URGENT	IMPORTANT

Service carried out by .....

LABEL IDENTIFICATION

1



2

CAUTION
DO NOT INTERCHANGE MODULES
SEE HAND BOOK

3

IMPORTANT
THIS VEHICLE IS
NEGATIVE GROUND

4

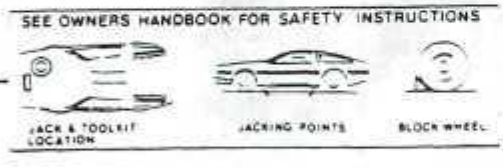
WARNING
BATTERIES PRODUCE EXPLOSIVE GASSES
KEEP SPARKS, FLAME, CIGARETTES
AWAY

5

6

BATTERY
ACCESS

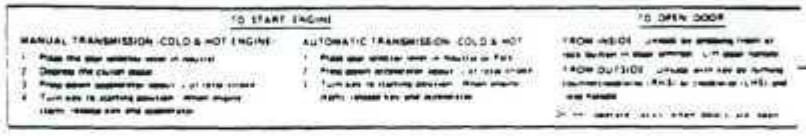
7



8

WARNING
RADIATOR FANS
MAY START AT ANY
TIME

9



10

11

ESSENCE SANS PLOMB SEULEMENT

UNLEADED GASOLINE ONLY

12

WARNING. Clean filler cap before removing. Use only 'DOT 4' fluid from a sealed container.

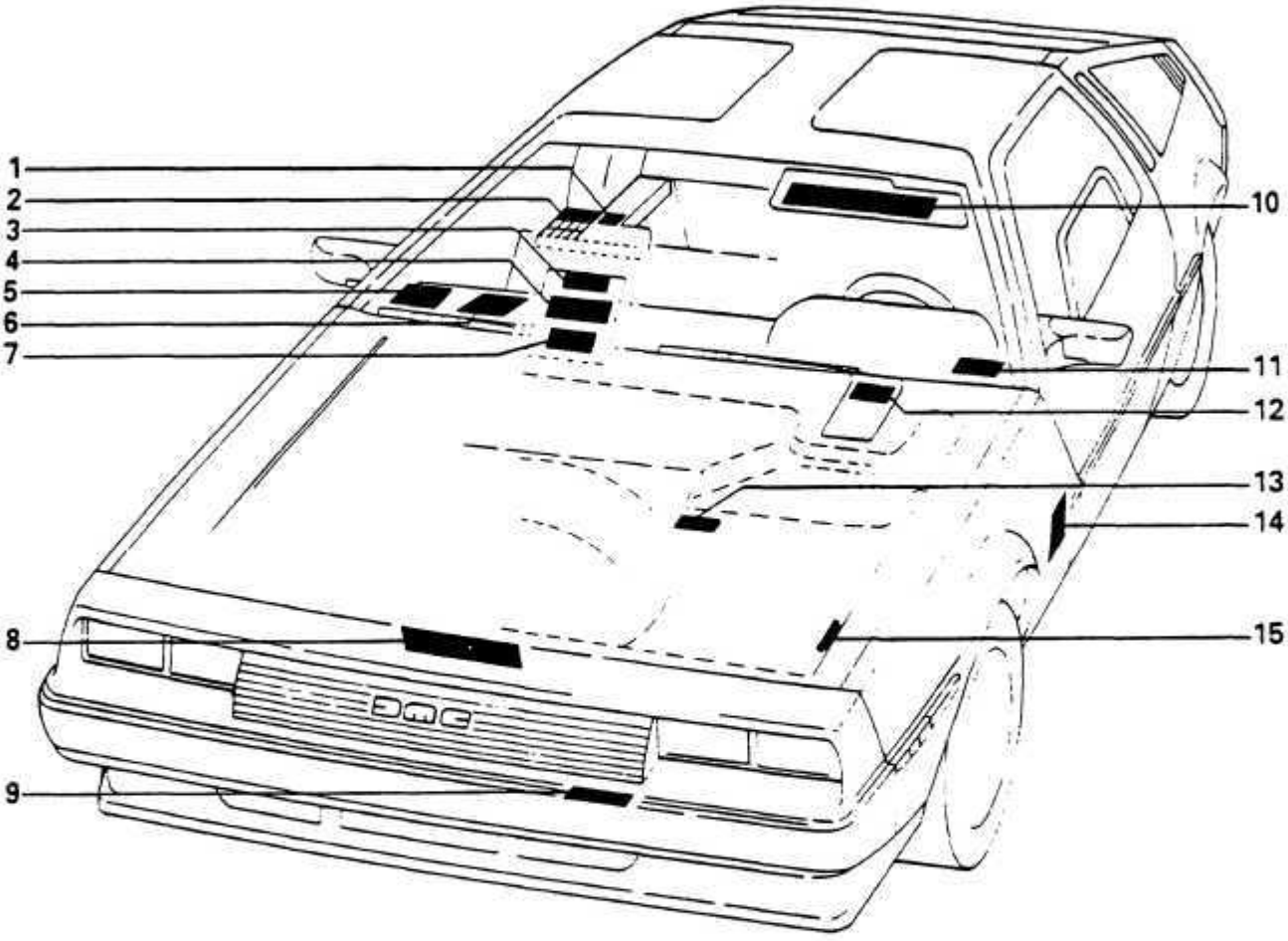
13

14

WINDSHIELD WASHER RESERVOIR

USE WATER OR DILUTED METHANOL

DO NOT FILL WITH OIL, GASOLINE, OR ANY OTHER OIL BASE MATERIAL



LABEL IDENTIFICATION

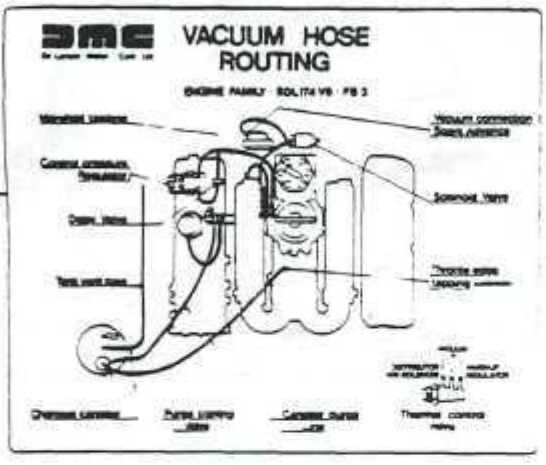
	DESCRIPTION	COUNTRY
1.	– Not Yet Applicable	
2.	– Electronic Module Warning Label	
3.	– Negative Ground Label (Battery Compartment)	
4.	– Battery Gas Warning Label	
5.	– California Assembly Line Decal	USA
6.	– Glove Box Placard	
7.	– Battery Access Label	
8.	– Jacking Instruction Label	
9.	– Radiator Fan Warning Label	
10.	– Engine Start and Operation Label	
11.	– Vehicle Identification Number	
12.	– Unleaded Gasoline Label	Canada/USA
13.	– Brake Fluid Warning Label	
14.	– Not Yet Applicable	
15.	– Windshield Washer Reservoir Label	

15

VEHICLE EMISSION CONTROL INFORMATION
THIS VEHICLE CONFORMS TO U.S.E.P.A. REGULATIONS APPLICABLE TO 1981 MODEL YEAR NEW MOTOR VEHICLES
CATALYST

16

VACUUM HOSE ROUTING



21

VEHICLE CAPACITY WEIGHT	400 LBS
DESIGNATED SEATING CAPACITY	2
RECOMMENDED COLD TIRE INFLATION PRESSURE	FRONT 22 P.S.I. REAR 30 P.S.I. SPARE 60 P.S.I.
PRESSURES APPLY TO ALL VEHICLE LOADING CONDITIONS UP TO VEHICLE CAPACITY WEIGHT SHOWN ABOVE	
RECOMMENDED TIRE SIZES	
FRONT 195/60HR - 14	
REAR 235/60HR - 15	
SPARE T125/70D - 15	125/98

22

VEHICLE EMISSION CONTROL INFORMATION

DMC

23

VEHICLE EMISSION CONTROL INFORMATION UPDATE

DMC

DELOREAN MOTOR CO. LTD

17

MANUFACTURED BY
DE LOREAN MOTOR CARS LTD
MONTH AND YEAR OF MANUFACTURE
GROSS VEHICLE WEIGHT RATING 1471 KG
GROSS AXLE WEIGHT RATING FRONT 582 KG
REAR 888 KG
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.
V I N
PASSENGER CAR 110675

MANUFACTURED BY
DE LOREAN MOTOR CARS LTD
MONTH AND YEAR OF MANUFACTURE
GROSS VEHICLE WEIGHT RATING 3244 LBS
GROSS AXLE WEIGHT RATING FRONT 1286 LBS
REAR 1958 LBS
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY AND BUMPER STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE
V I N
PASSENGER CAR 110675

18

COMPLIANCE WITH RADIO INTERFERENCE REGULATIONS

IMPORTANT
THIS VEHICLE IS
NEGATIVE GROUND

24

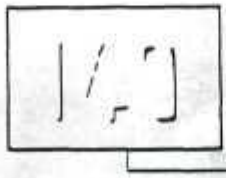
JUMP LEAD STARTING

IMPORTANT
See owners handbook for SAFETY instructions

25

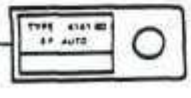
19

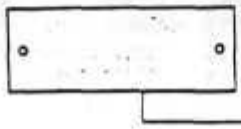
IMPORTANT. Use only FREON 12 or ARCTON 12 mixed with 'SUNISO 5GS' or TEXACO CAPELLA as a refrigerant.
Recommended operating charge 2·50lbs of 'FREON 12' or ARCTON 12' mixed with 1·8 cu ins of 'SUNISO 5GS' or 'TEXACO CAPELLA'
Compressor manufactured by Sankyo, Isesaki, Japan.



26

20





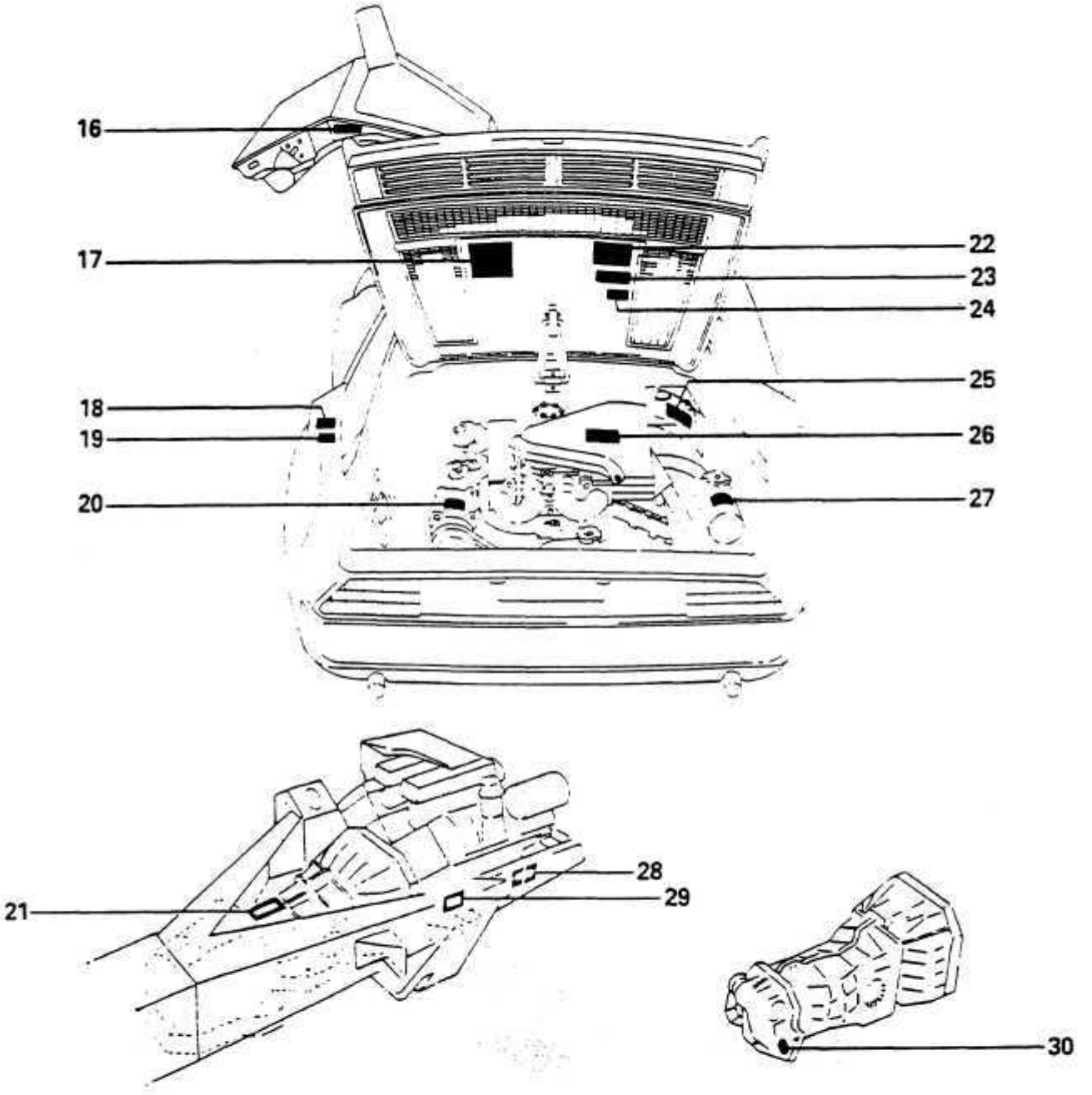
27

28

DANGER HOT WATER - REMOVE CAP SLOWLY
COOLANT FILLER TANK
Fill with 50% water 50% antifreeze containing aluminium inhibitor

29

30



DESCRIPTION	COUNTRY
16. – Catalyst Label	
17. – Vacuum Hose Routing	
18. – Federal Compliance Plate	Canada/USA
19. – Radio Interference Compliance Plate	Canada
20. – ACU Warning Label	
21. – Automatic Transmission Type/Number Plate	
22. – Vehicle Exhaust Emission Label	
23. – Emission Control Update Label	
24. – Negative Ground Label	
25. – Jump Start Label	
26. – Air Filter Element Label	
27. – Header Bottle Warning Label	
28. – Chassis Number	
29. – Engine Type/Number Plate	
30. – Manual Transmission Type/Number Plate	

Fuel Tank

Contents

FUEL TANK B:01:01

Fuel Tank

B:01:01

REMOVING – REFITTING

IMPORTANT

Be acutely aware of the fire and explosion hazard, when working on fuel system. Take every precaution to ensure that sparks, cigarettes, open flames etc. are kept well away from the work area.

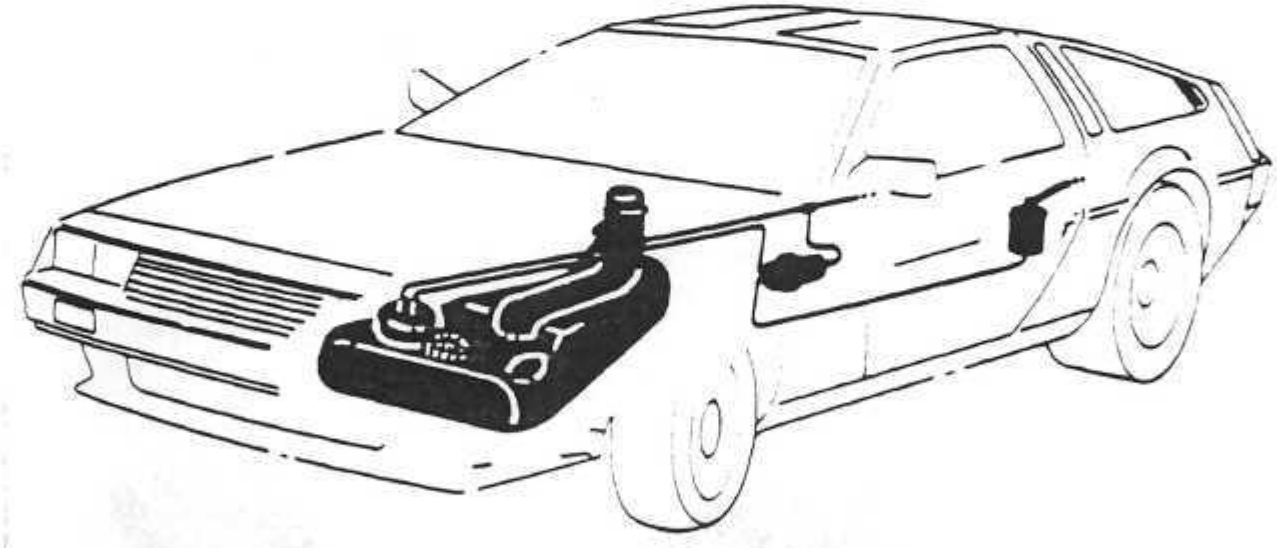


Fig. 1

B:01:02 Fuel Tank

REMOVING

This operation should only be attempted with the fuel tank empty. Use a syphon pump if necessary to transfer fuel into an appropriate container.

DISCONNECT BATTERY POSITIVE TERMINAL.

Remove access cover below spare wheel to gain access to fuel tank top.

Disconnect fuel supply and return pipes.

Disconnect electrical connections to fuel pump and fuel lever sensor unit. *Fig. 2*

Remove filler neck hose and breather hose from tank, and seal tank aperture.

Raise the car on a hoist.

Remove the bolts securing the protection plate (1) whilst providing alternative support for the tank. *Fig. 3*

Carefully withdraw tank downwards easing the tank between water pipes.

REFITTING

Before refitting a fuel tank examine the tank for any signs of damage or chaffing. Replace the tank if there is any doubt about its serviceability. Ensure the foam rubber protection strips are in place and in good condition (2). *Fig. 3*

Insert the tank from under the rear of the car, guiding it between the water pipes. Whilst supporting the tank, slide in the support protection plate and fit the bolts.

Refit the filler neck hose and breather hose

Re-connect electrical connections to fuel pump and fuel sender unit.

Re-connect fuel supply and return pipes.

Re-connect battery positive cable.

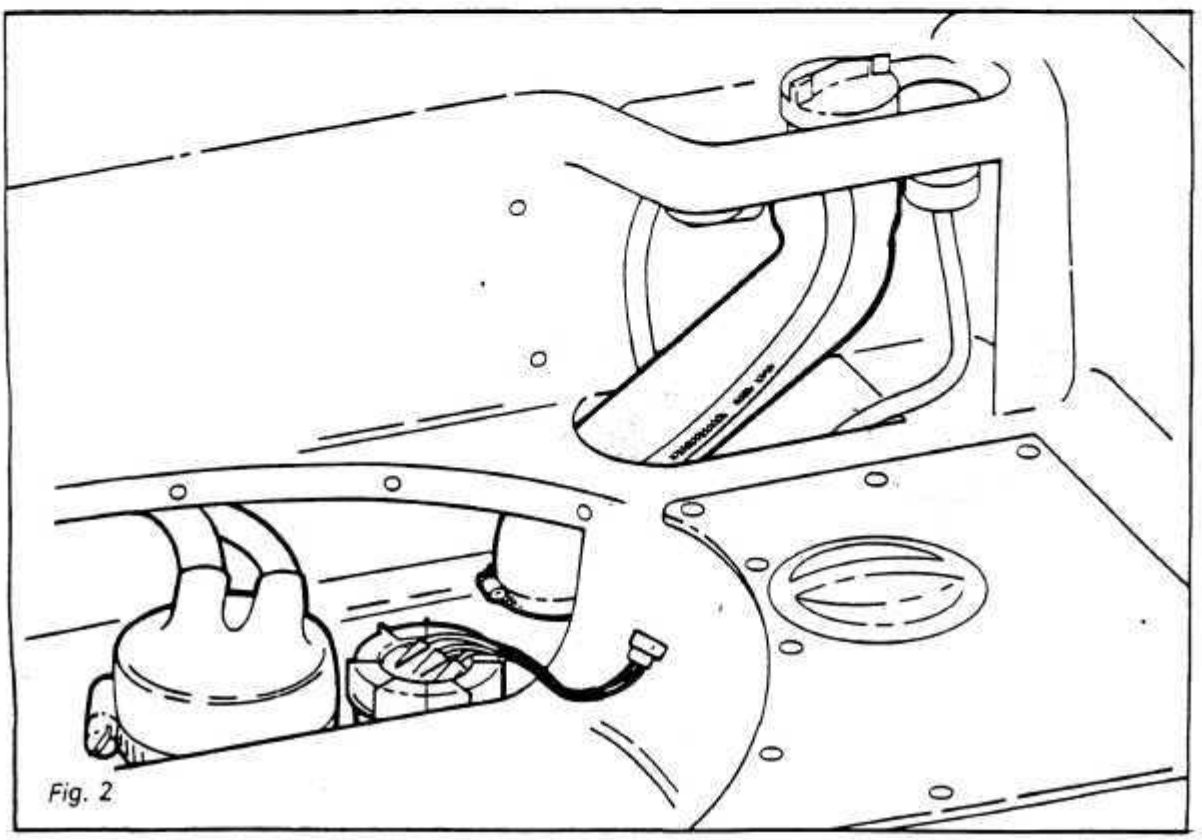


Fig. 2

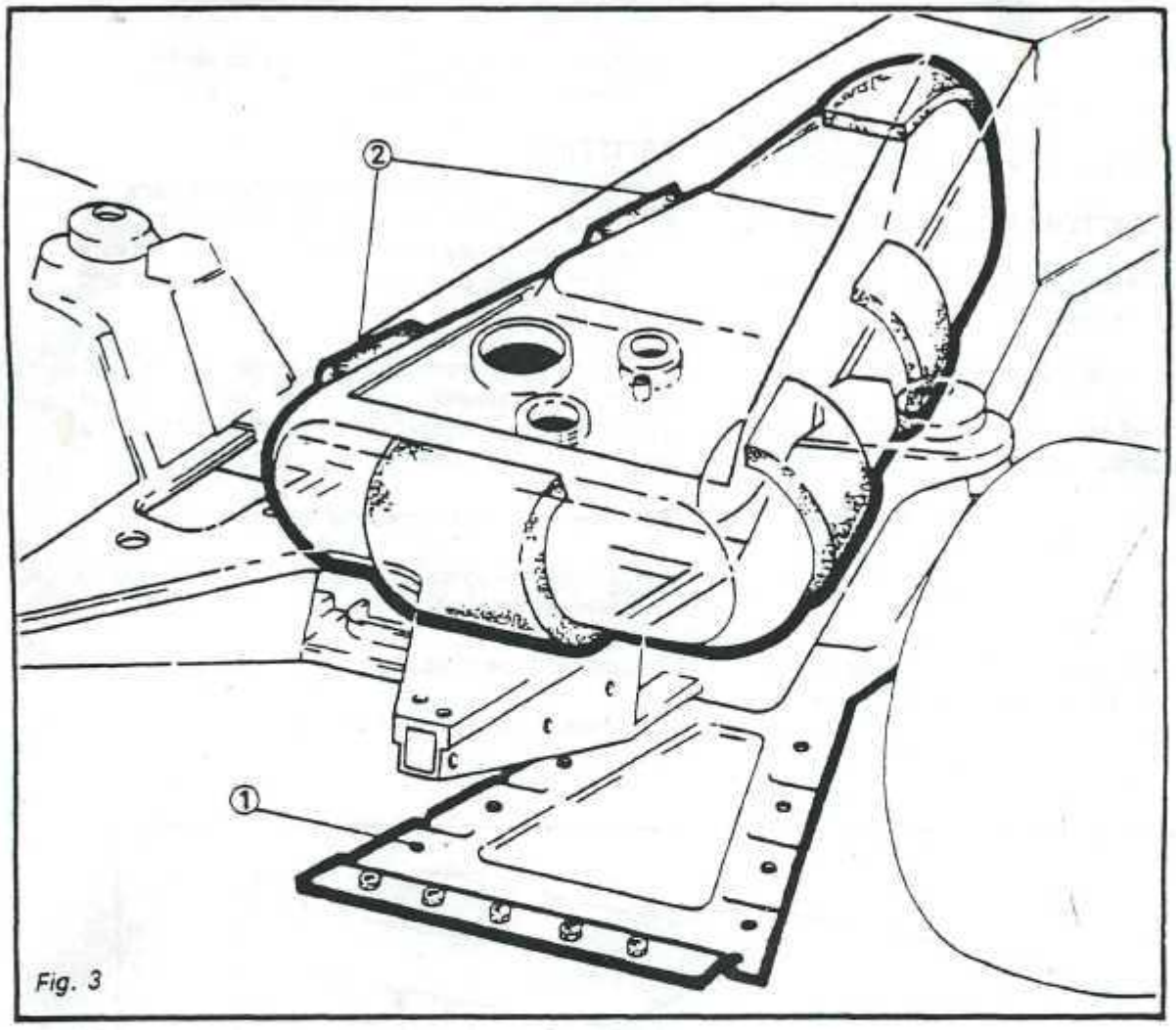


Fig. 3

Engine

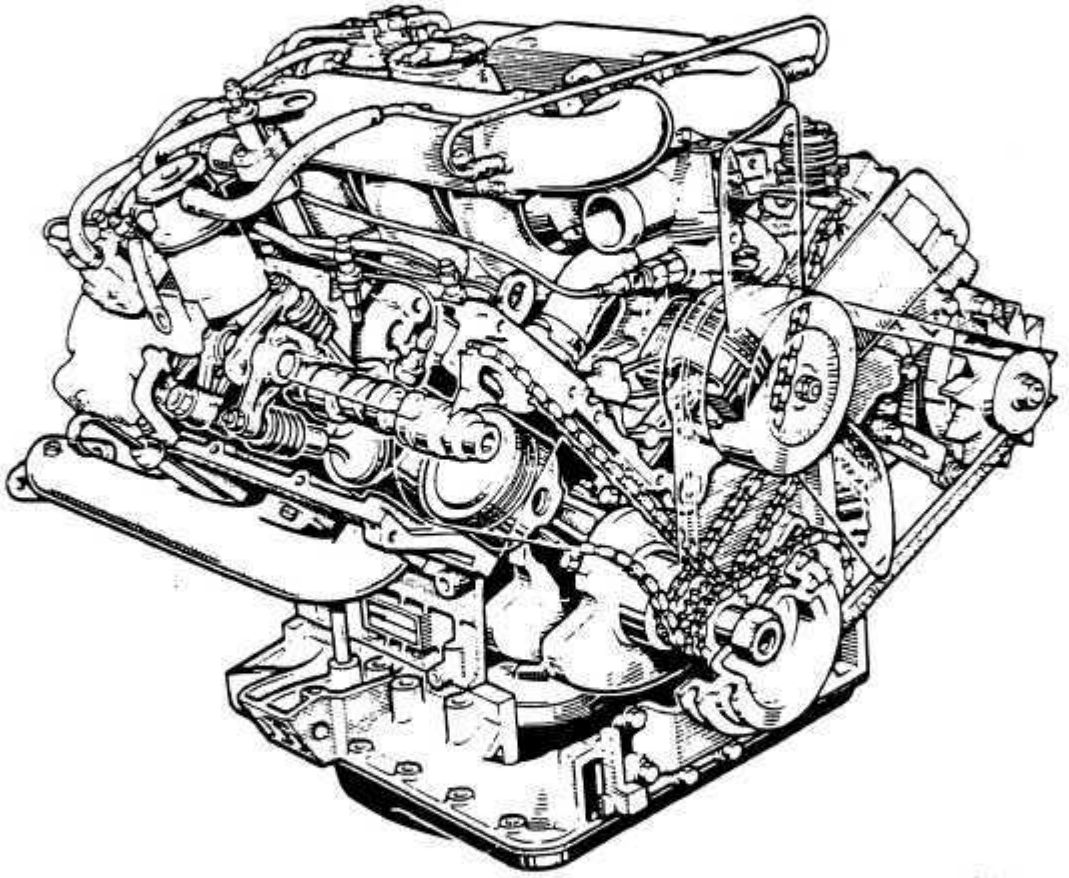
CONTENTS

GENERAL DESCRIPTION C:01:01
SPECIFICATION C:02:01
SPECIAL TOOLS C:03:01
ENGINE/GEARBOX C:04:01
CYLINDER HEADS C:05:01
LINERS—PISTONS C:06:01
CYLINDER BLOCK C:07:01
MAIN BEARING: Oil Seal Flywheel End C:08:01
MAIN BEARING: Oil Seal Timing End C:09:01
OIL PUMP C:10:01
OIL PRESSURE C:11:01
WATER PUMP C:12:01
INLET AIR MANIFOLD C:13:01
RADIATOR C:14:01

Engine

C:02:01

Specifications



Number of Cylinders	V6
Bore	91 mm (3.58 in)
Stroke	73 mm (2.87 in)
Engine Capacity	2849 cc (173.86 cu in)
Compression Ratio	8.8:1

Fig. 1

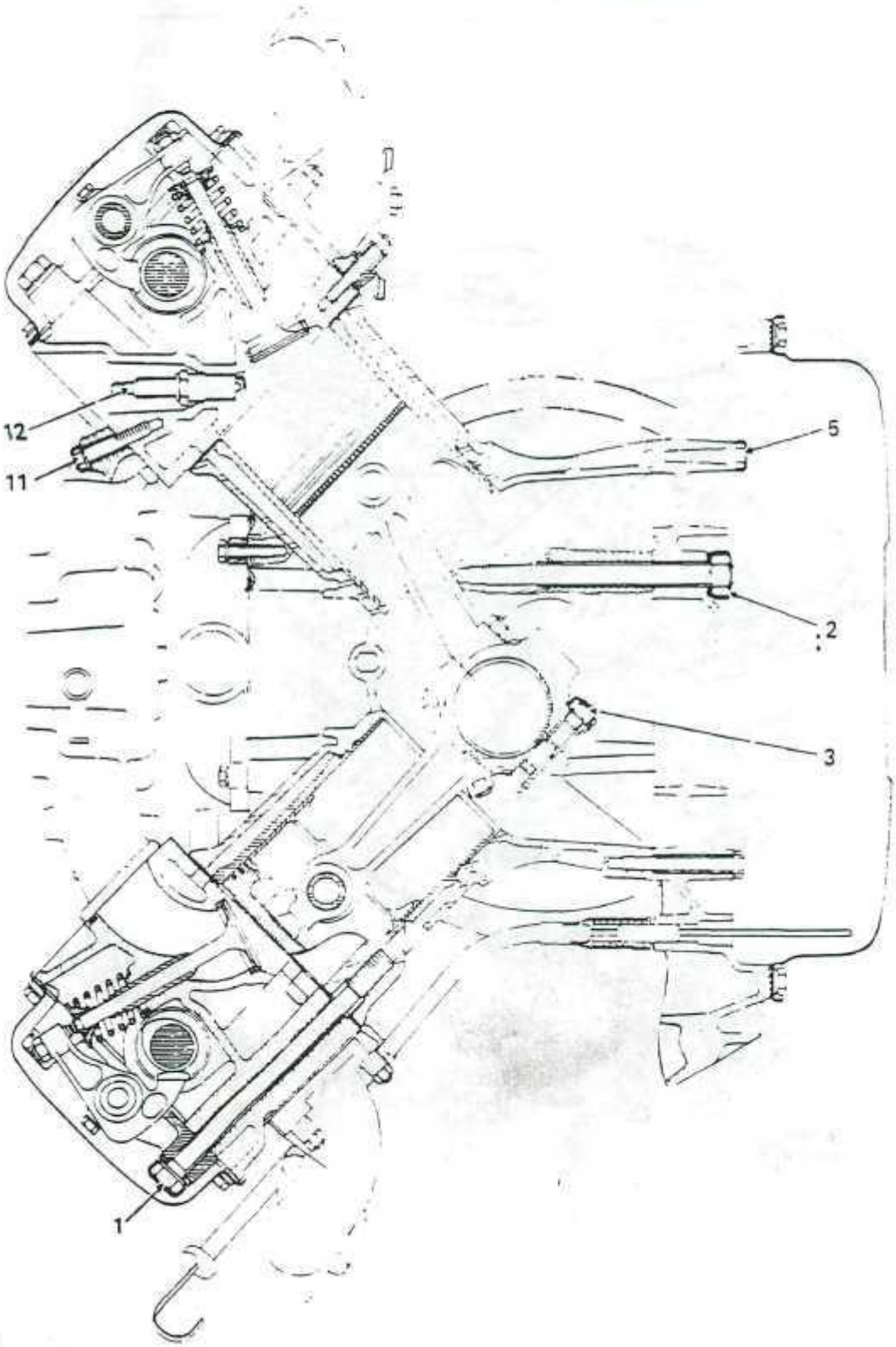


Fig. 2

TIGHTENING TORQUES—Figs. 3 and 4

NEW CYLINDER HEAD GASKET
Torque tighten to 45 lb ft (60 Nm) slacken off, pre-tighten to 15 lb ft (20 Nm) and then angular tighten 115° — (No. 1).

RETIGHTENING CYLINDER HEAD
Slacken off, pre-tighten to 15 lb ft (20 Nm) then angular tighten 115° — (No. 1).

TIGHTENING MAIN BEARING CAP NUTS
Pre-tighten to 20 lb ft (28 Nm) then angular tighten 75° — (No. 2).

No. 3	Big End Cap Nuts	35 lb ft (48 Nm)	
No. 4	Flywheel Fixing Bolts	45 lb ft (60 Nm)	With Loctite
No. 4	Converter Driving Plate Fixing Bolts	50 lb ft (68 Nm)	With Loctite
No. 5	Sump Fixing Bolts	11 lb ft (16 Nm)	
No. 6	Crankshaft Pulley Fixing Nut	135 lb ft (183 Nm)	With Loctite
	Oil Pump Sprocket Bolts	4 lb ft (6 Nm)	
No. 7	Chain Tensioner Blade Bolts	11 lb ft (15 Nm)	
No. 8	Timing Cover Fixing Bolts	11 lb ft (15 Nm)	Bottom Bolts with Loctite
No. 9	Camshaft Sprocket Fixing Bolts	60 lb ft (81 Nm)	
	Camshaft Stop Fixing Bolt	11 lb ft (15 Nm)	
No. 10	Camshaft Sprocket Access Plug	22 lb ft (30 Nm)	
No. 11	Inlet Manifold Fixing Bolts	11 lb ft (15 Nm)	
No. 12	Spark Plug	15 lb ft (20 Nm)	

CYLINDER HEADS
Rocker arm clearance adjustment
When cold (mm)
inlet 0.10 (.004")
exhaust 0.25 (.010")
Maximum bow of gasket face (mm) 0.05 (.002")
No resurfacing permitted.
Cylinder head height (mm) —
111,07 + 0,15 (4.373" + .006)

VALVE SEATS
Seat angle
inlet 30° + 0.25
exhaust 30° + 0.25

SEAT WIDTH (mm)
inlet 1.7—2.1 mm (0.067—0.0827 in)
exhaust 2.0—2.4 mm (0.0788—0.0945 in)

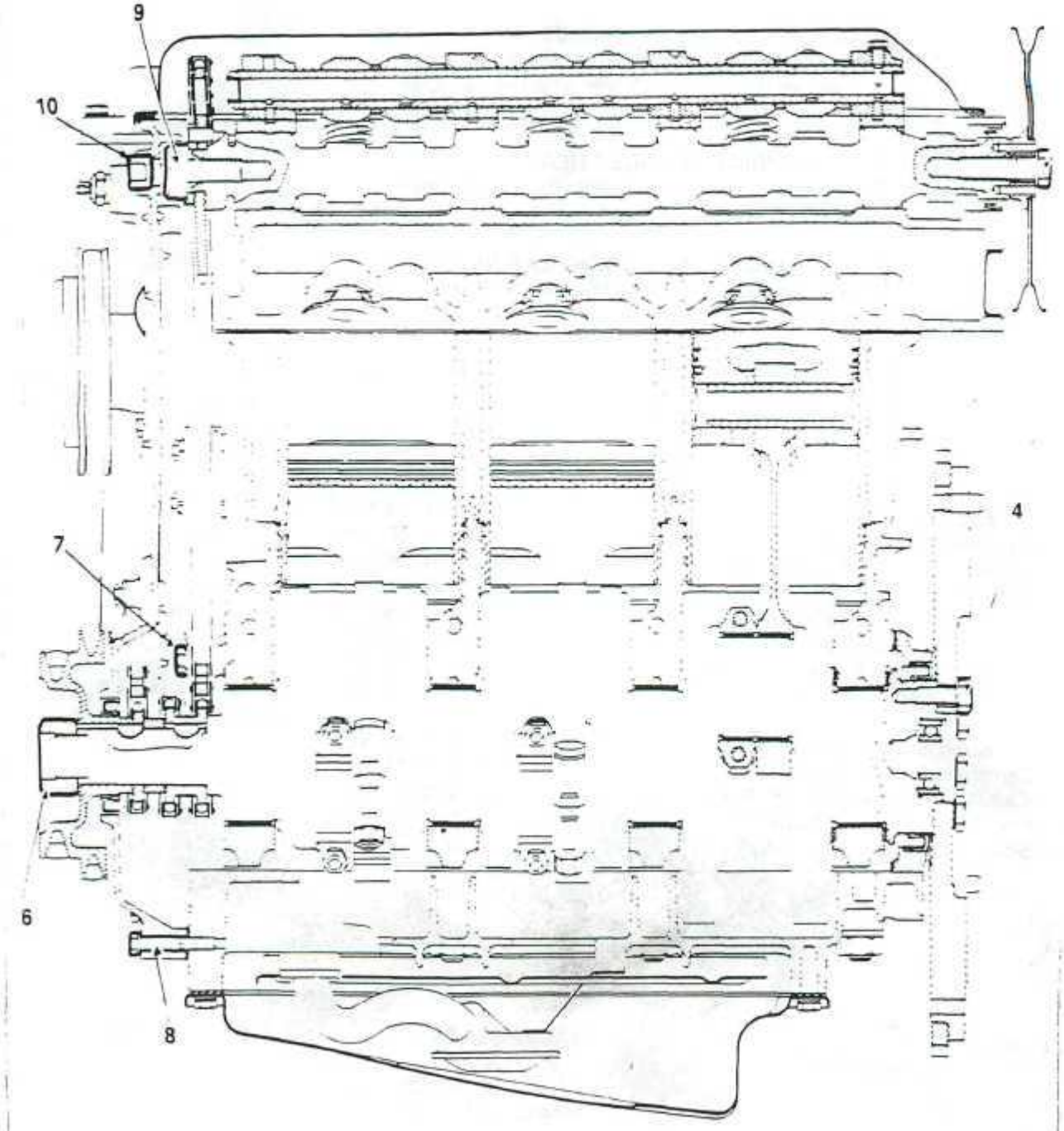


Fig. 3

VALVE GUIDES

Bore (mm) 8—8,022 (0.3150—0.3158 in)
External dia (mm)
nominal 13 mm (.512 in)
repair size
1st oversize 13.1 (.516 in)
2nd oversize 13.25 (.522 in)

Valve guide positions

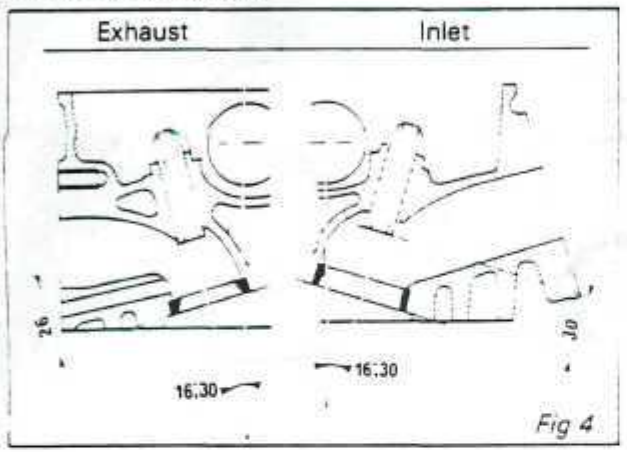


Fig 4

VALVES

Stem dia (mm)
Angle (included)
inlet 8 mm (0.315")
exhaust 8 mm (0.315")

VALVE SPRINGS

Inlet and Exhaust Valve Springs are identical.
Approx. free length (mm) 47.2 (1.858")
Length (mm) under load of

56.3 lbs	40 (1.268")
124 lbs	32.2 (1.268")
Length Coil Touching Coil (mm)	30 (1.181")
Wire Diameter (mm)	4,2 (1,153")
Coil Internal Dia (mm)	21.4 (.842")

CAMSHAFT

Number of Bearings	4
End Play (mm)	0,07 to 0,14 (.003" to .0055")

VALVE TIMING

With tappets adjusted to a clearance of 0,7 mm (.028")

		LH	RH
Inlet Valve Opens	BTDC	9°	7°
Inlet Valve Closes	ABDC	45°	43°
Exhaust Valve Opens	BBDC	45°	43°
Exhaust Valve Closes	ATDC	9°	7°

CONNECTING RODS

Bearing Shell Material: Aluminium-Tin

Side Clearance (mm)	0,20 to 0,38 (.008 to .015")

CRANKSHAFT

Number of Bearings	4
Main Bearing Shell Material: Aluminium-Tin	
End Play (mm)	0,07 to 0,27 (.003 to .010")
Thrust Washer Thickness (mm)	—2,30 —2,40 —2,45 —2,50 (—.0905 —.0944 —.0964 —.0984")
Roll-Hardened Main Bearing Journals:	
nominal diameter (mm)	70,062 (2.7583")
regrind diameter (mm)	69,762 (2.7465")
regrinding tolerance (mm)	0—0,019 (—.0007")

LINERS

Bore (mm)	91 mm (3.58 in)
Base Locating Diameter	93,48 (3.6803 in)
Liner Protrusion (mm)	0,16 to 0,23 (.006 to .009")
Liner Base Seal Thickness (mm)	
Blue Tag	0,087
White Tag	0,102
Red Tag	0,122
Yellow Tag	0,147

PISTONS

Gudgeon Pin Fitting: Press—fit in small end and free turning in piston.

FITTING DIRECTION:

Arrow Facing Timing Gear End.

Gudgeon Pin Length (mm)	72 (2.8346")
Gudgeon Pin Dia (mm)	
External	23,5 (.9252")
Bore	15 (.5906")
3 Piston Rings, Thickness (mm)	
1 Top Ring	1,5 (.059")
1 Taper Compression Ring	2 (.079")
1 Oil Scraper	4 (.158")
Gap Measurement:	Supplied Pre-adjusted.

After regrinding, the roll-hardened zone should remain intact over the 140° sector.

The zones concerned are those marked "A" and "B".

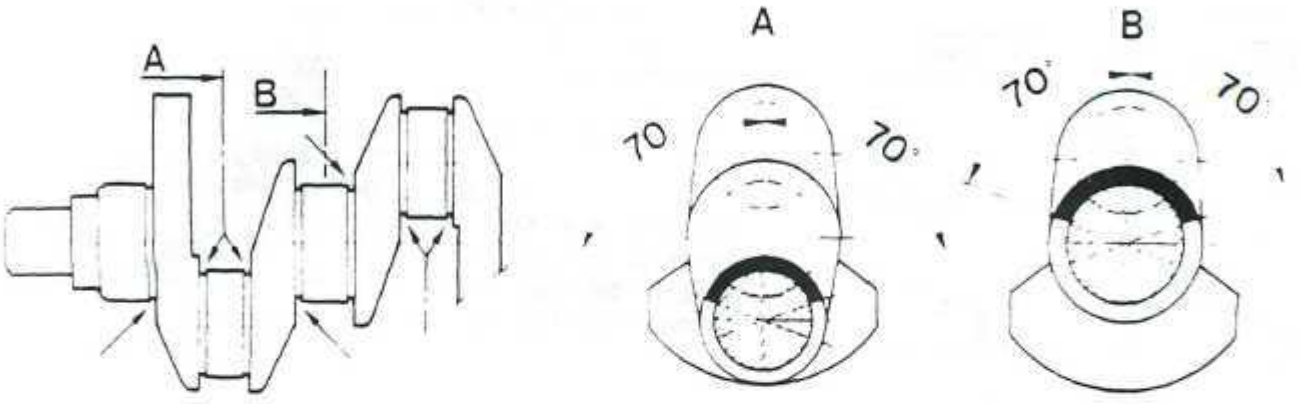


Fig. 5

OIL PUMP

Minimum oil pressure at 80°C

at 900 rpm (bar) 2,2 (32 psi)

at 4000 rpm (bar) 4,4 (64 psi)

CAMSHAFT

The camshafts differ: The R.H. camshaft has the distributor drive. *(Fig. 6)*

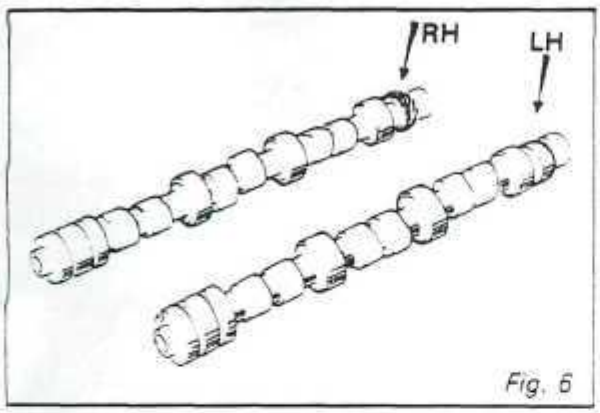


Fig. 6

CYLINDER HEAD GASKETS

The cylinder head gaskets differ: the L.H. head gasket has a large cut-out at one end. *(Fig. 7)*

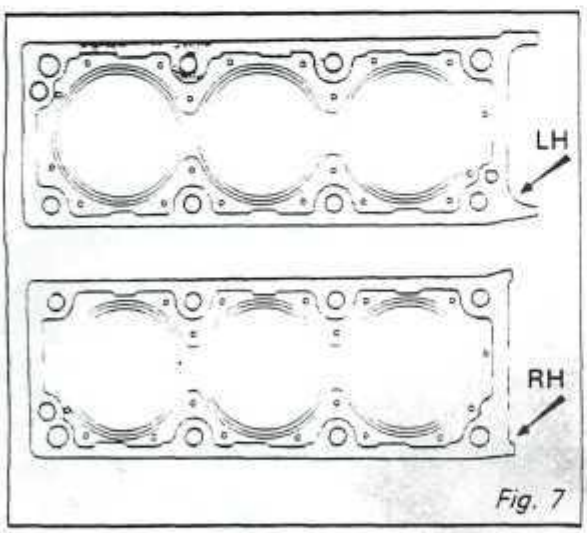


Fig. 7

CRANKSHAFT

The service crankshaft is not fitted with the clutch shaft spigot bearing. The spigot bearing must be inserted if the engine is mated to a manual gearbox. It is bonded in: smear the outside of the bearing with loctite. *(Fig. 8)*

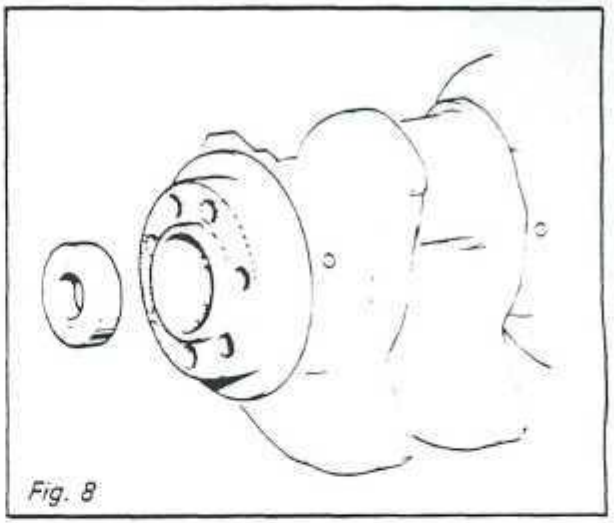


Fig. 8

Components which must be changed at each dismantling.

Flywheel fixing bolts.
Convertor driving plate fixing bolts.
Big-end cap nuts.

CYLINDER NUMBERING IN EACH BANK

The bank comprising cylinders 1, 2, and 3 is designated the L.H. bank or group and that for cylinders 4, 5, and 6 the R.H. bank or group. *Fig. 9*

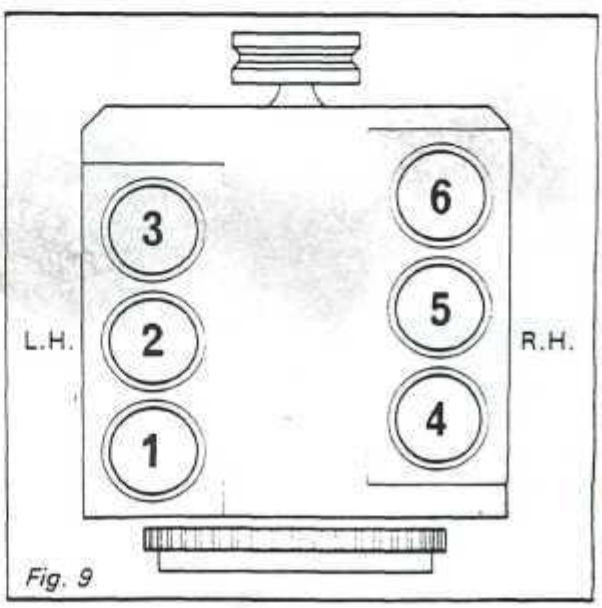


Fig. 9

Special Tools

Part No.	Description	Fig. No.
J.23907	PILOT BEARING PULLER	Not Illustrated
J.28847	DRAIN PLUG WRENCH	Not Illustrated
J.28851	ENGINE SUPPORT	Not Illustrated
J.28852	CYLINDER LINER CLAMPS (4)	Fig. 88
J.28853	MAIN BEARING RETAINING BLOCKS	Fig. 91
J.28854	PISTON PIN SERVICE SET	Fig. 71
J.28855	CYLINDER LEAD BREAKER BAR	Fig. 40
J.28856	CYLINDER LINER DEPTH GAUGE	Fig. 66
J.28857	ANGULAR TORQUE GAUGE	Fig. 38
J.28858	TIMING SPROCKET SUPPORT TOOL	Fig. 45
J.28859	FLYWHEEL LOCK	Not Illustrated
J.28860	REAR CRANKSHAFT PULLEY SEAL INSTALLER	Fig. 115
J.28861	FRONT CRANKSHAFT SEAL INSTALLER	Fig. 120
J.28872	OIL GAUGE	Fig. 129
J.28873	PIPE AND ADAPTOR FOR OIL GAUGE	Fig. 128

Engine/Gearbox

REMOVING

Disconnect battery.

Remove
rear louvre
engine compartment cover
air conditioning compressor drive belt
air conditioning compressor and set aside
air filter
ignition coil cover

Disconnect
rear light harness
coil lead
engine harnesses from their multi sockets

Remove
rear side markers and disconnect wiring harnesses

Remove
engine compartment lock and disconnect release cable

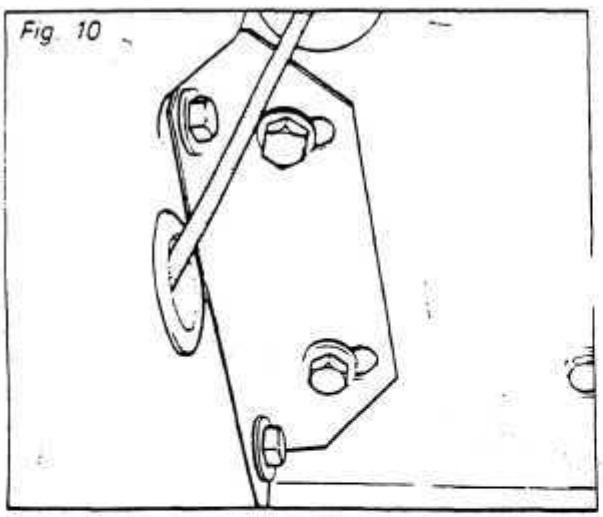


Fig. 10

Remove
rear fascia attachment bolts and remove fascia *(Figs. 10/11)*

Remove
exhaust muffler and heat shields
(See Section "D")

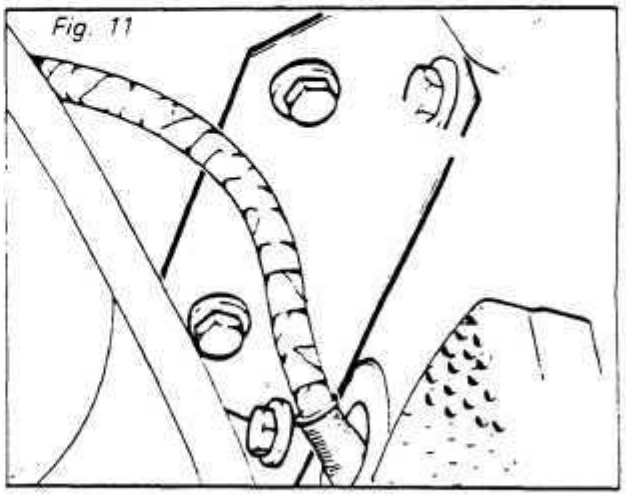


Fig. 11

Remove
chassis cross brace *(Fig. 12)*

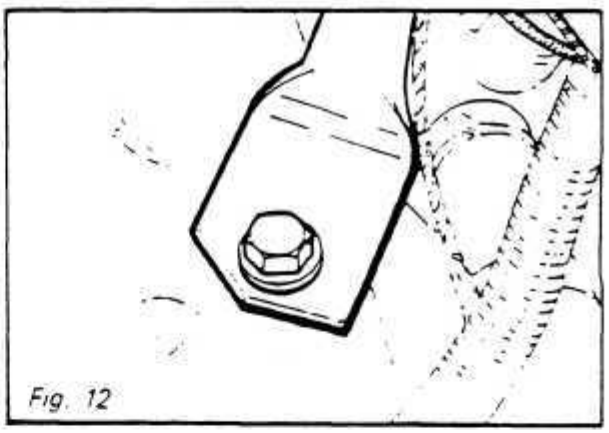


Fig. 12

Drain
coolant from cylinder block *(Fig 13)*
engine oil and transmission oil/ fluid if applicable

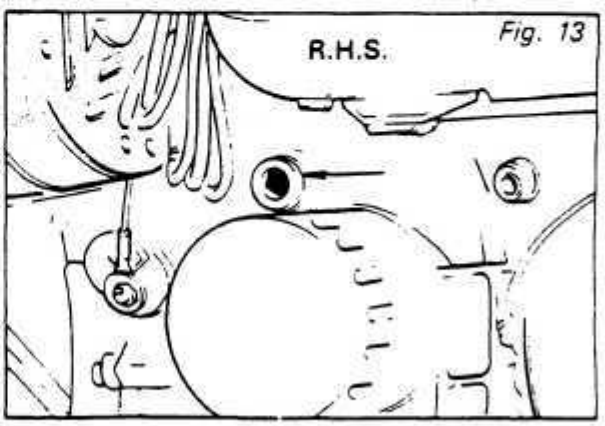
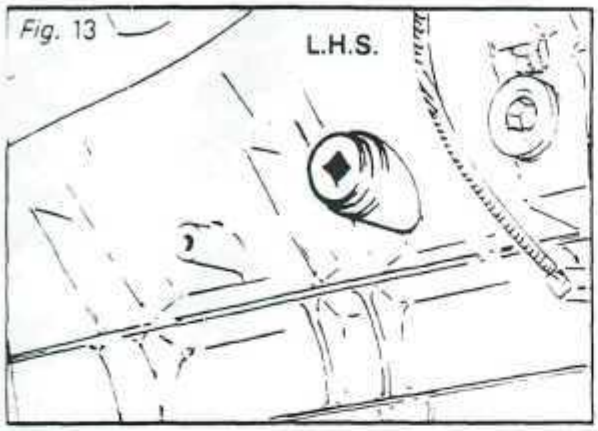
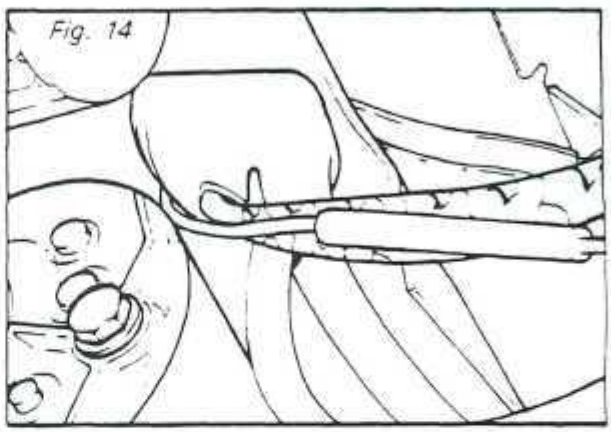
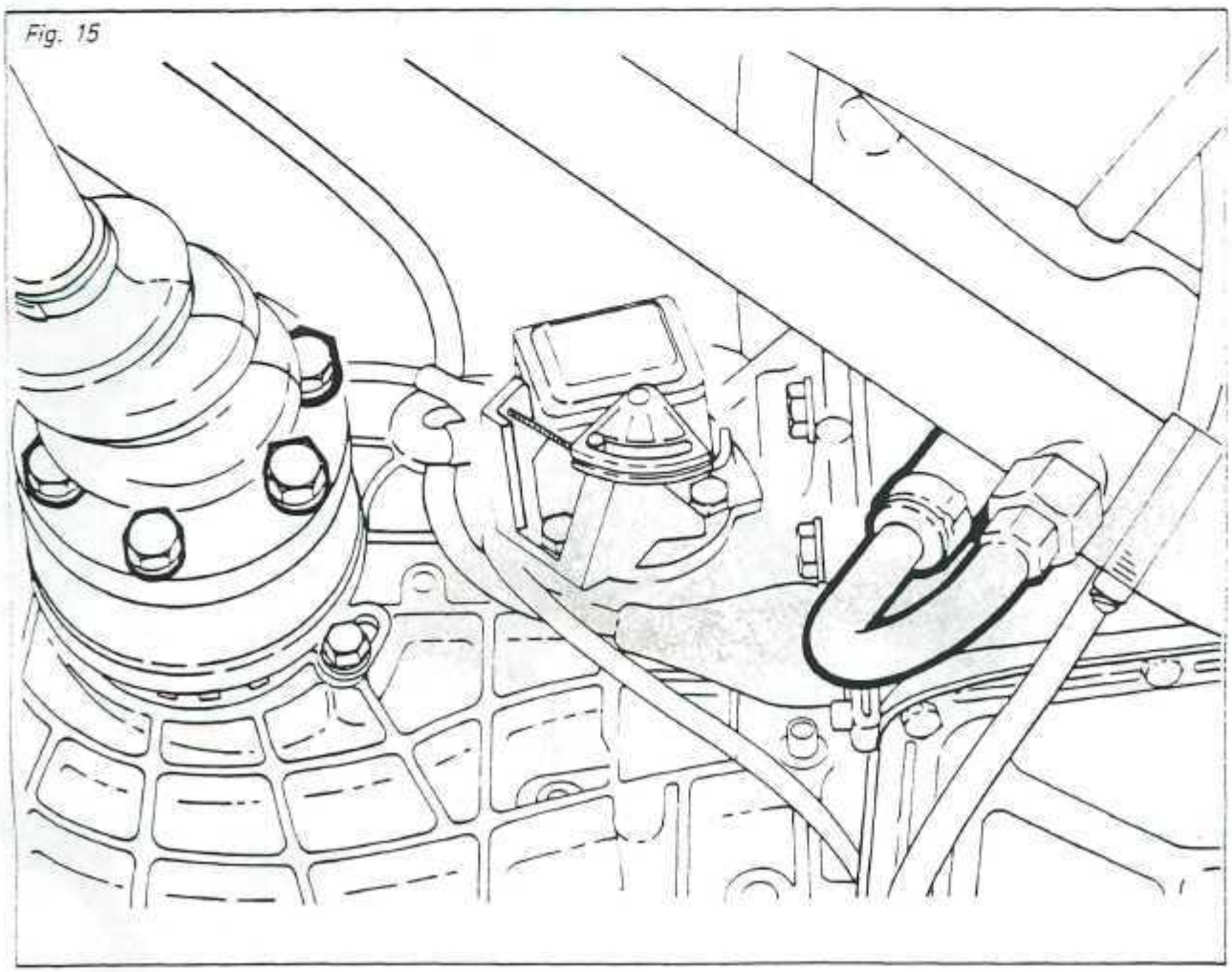


Fig. 13



Disconnect
heater hoses from control valve and cylinder head
heater bleed pipe from header tank
brake servo vacuum pipe
fuel feed to metering head
fuel return at bundy metal pipe connection
accelerator cable
starter positive cables *(Fig. 14)*
wiring harness at bulkhead (auto transmission only)





Remove
coolant hoses at engine

Remove
driveshaft retaining bolts
exhaust cross-over pipe *(Fig. 15)*

For automatic transmission disconnect oil cooler hoses at cooler end.

Disconnect gear change control (manual transmission).

For automatic transmission disconnect cable at relay lever.

Remove
gear box side mounting bolts *(Fig. 16)*
(R.H. illustrated)
Fit lifting sling to rings provided
(Figs. 17 & 18) (L.H.S.) *(Figs. 19 & 20)* (R.H.S.)
Take weight off engine and remove both mounting bolts. Pull engine forward and lift out.
(Fig. 21) (L.H.S. illustrated)

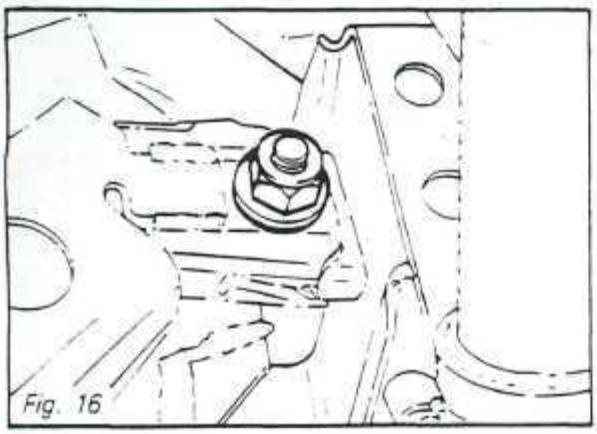


Fig. 16

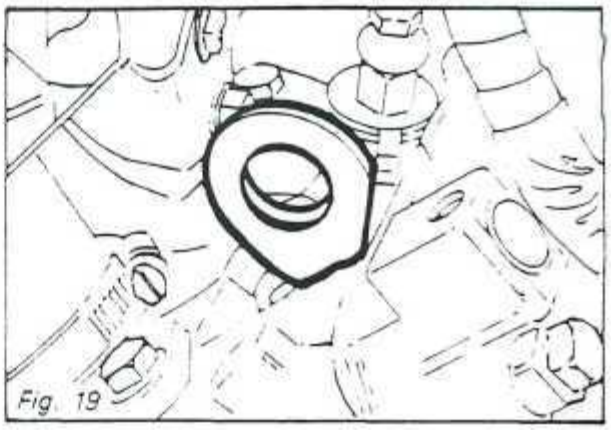


Fig. 19

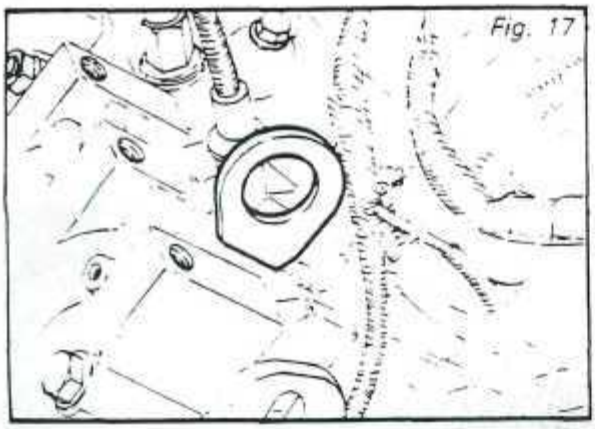


Fig. 17

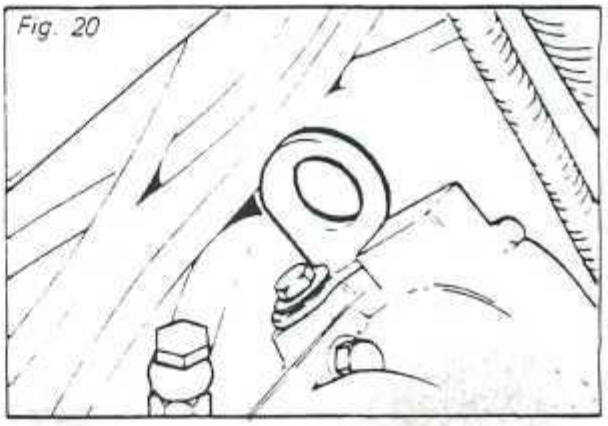


Fig. 20

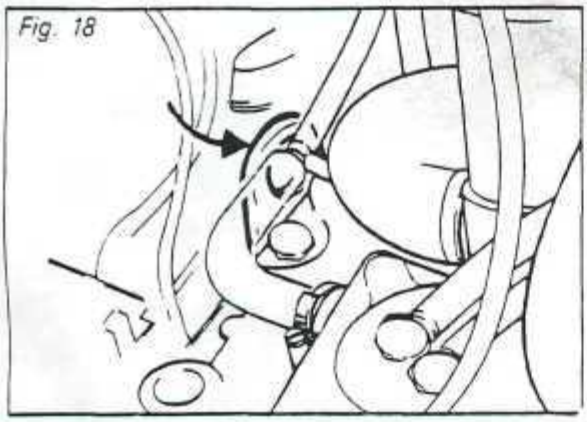


Fig. 18

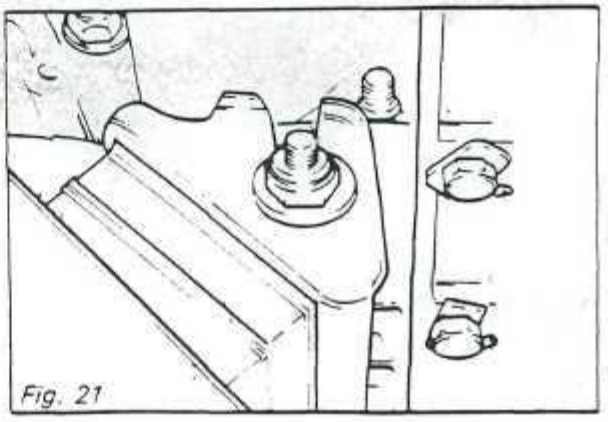


Fig. 21

Refitting is reverse of removal operation

SPECIAL POINTS CONCERNING REFITTING

Adjust the travel of the accelerator cable and gear change linkages.

For automatic transmission: adjust the governor cable travel and the selector cable travel.

CHECK:

Engine, gearbox or automatic oils and fill as necessary.
Fill and bleed cooling system.
Adjust all controls.

Cylinder Heads

RETIGHTENING—TIGHTENING
Before commencing the above operation, loosen the inlet manifold fixing bolts. Also the bolts securing the timing cover to the cylinder heads.

RETIGHTENING CYLINDER HEAD
This operation is to be carried out when the engine is cold (at least 2 hours after engine has stopped).

Cylinder heads should be retightened:

1. After a cylinder head has been replaced. Run engine until engine reaches normal operating temperature, i.e. when cooling fans have switched themselves on.
   After two hours, when engine is cold, repeat tightening procedure.

2. After a service exchange engine has been fitted. While engine is in its transit cradle (and easily accessible).

The vehicle need not return to workshop for cylinder head retightening when the above procedure is observed.

PRETIGHTENING—Fig. 22
Loosen bolt No. 1 and retorque tighten to 15 lb ft (20 Nm). Repeat the above on each bolt in the tightening sequence shown.

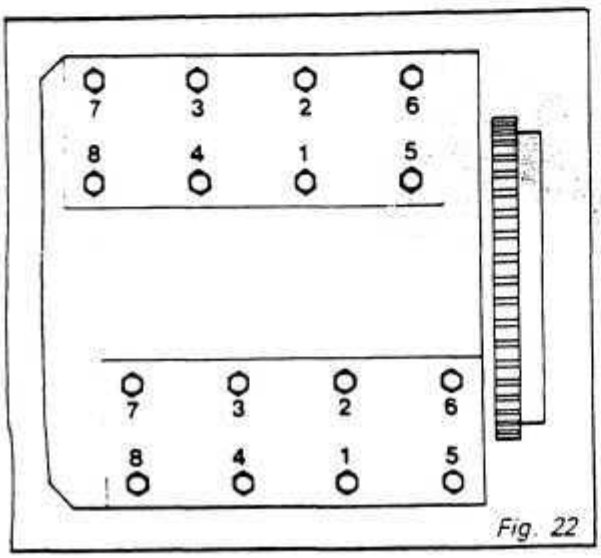
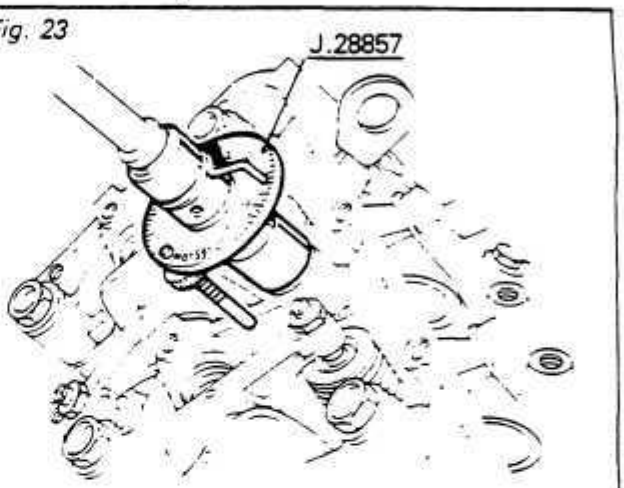


Fig. 22

ANGULAR TIGHTENING—Fig. 23
Slip graduated disc J.28857 over the socket before fitting the torque wrench J.28855. Turn the graduated disc clockwise until the locking stem rests against a solid object which will prevent the disc from turning.

Fig. 23



Adjust the moving pointer to angular tightening value 115°. Tighten bolt No. 1 until the moving pointer reaches "O". Repeat the above operation on each bolt in sequence shown. *(Fig 24)*

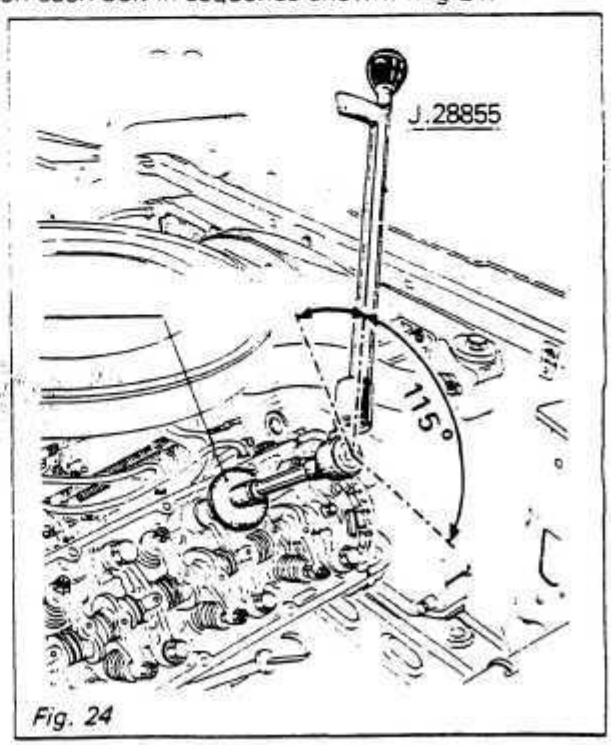


Fig. 24

TIGHTENING

This operation is carried out when the cylinder heads are fitted with new gaskets.

Pre-torque tighten all bolts to 15 lb/ft (20 Nm) then to 45 lb/ft (60 Nm) in the correct sequence to compress the head gaskets.

Loosen bolt No. 1 and retorque. Tighten it to 15 lb/ft (20 Nm).

Repeat the above on each bolt in the tightening sequence shown opposite.

Slip the graduated disc over the socket before fitting the torque wrench and lock it as previously.

Adjust the mobile pointer to angular tightening value 115°.

Tighten bolt No. 1 until the moving pointer reaches "0".

Repeat the above operation on each bolt in the sequence shown.

Then commence "retightening" operations after running the engine.

ADJUSTING ROCKER ARM CLEARANCES

Clearances with engine cold.
inlet: 0.10 (.004")
exhaust: 0.25 (.010")

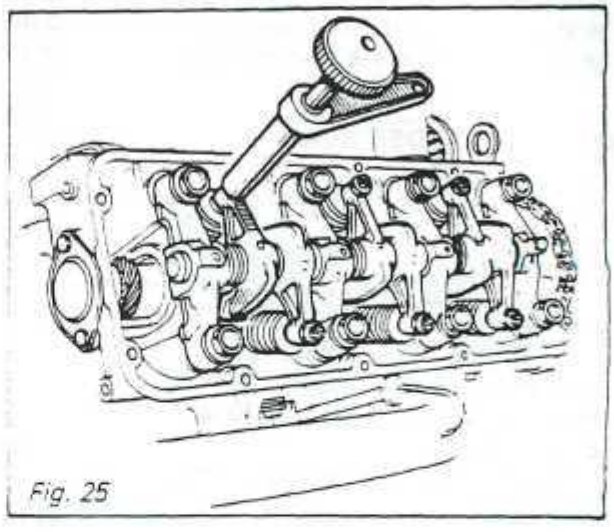
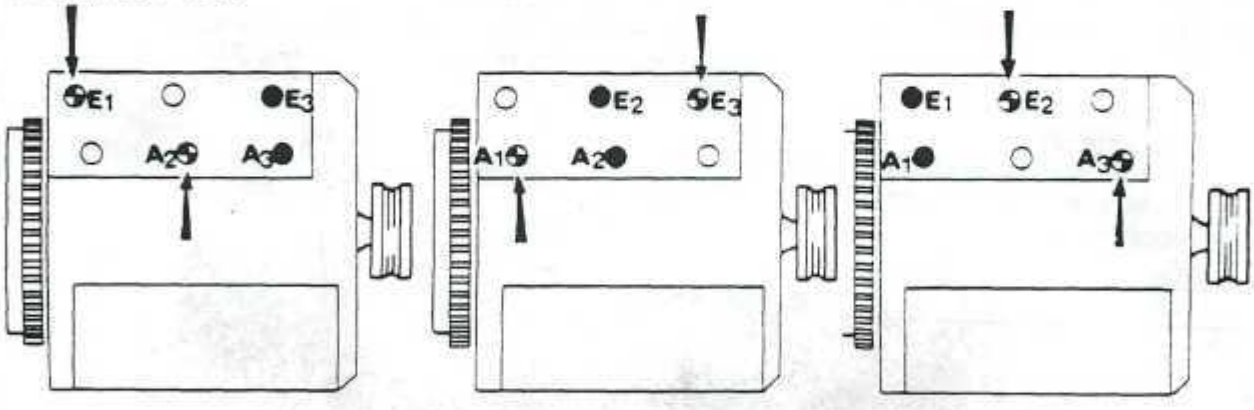


Fig. 25

FIRST METHOD

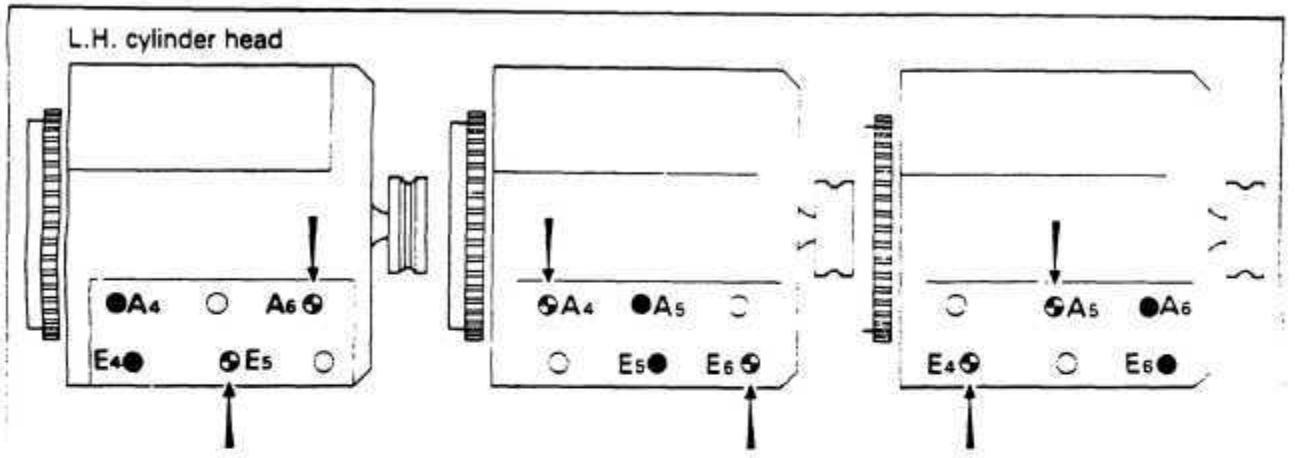
Adjust the rocker arms on each cylinder head in turn.

R.H. cylinder head.



● Rocker arms "on the rock"	◔ Rocker arms in position for adjustment	
	Inlet	Exhaust
I1 – E1	I3	E2
I2 – E2	I1	E3
I3 – E3	I2	E1

Fig. 26



● Rocker arms "on the rock"	◔ Rocker arms in position for adjustment	
	Inlet	Exhaust
I4 – E4	I6	E5
I5 – E5	I4	E6
I6 – E6	I5	E4

Fig. 27

SECOND METHOD

1. Set the piston in No. 1 cylinder to T.D.C. firing stroke, which corresponds to

   No. 5 cylinder rocker arms "on the rock"

   Timing mark on crankshaft pulley opposite pointer (O) on timing cover. *(Fig. 28)*

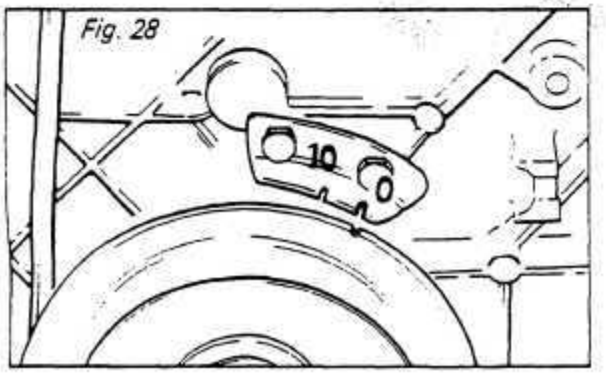


Fig. 28

Cylinder No. 1 on T.D.C. Firing Stroke	Adjust	
	Inlet	Exhaust
	I1	E1
	I2	E3
	I4	E6

2. Starting from pos. 1 turn the crankshaft one complete turn (360°) which corresponds to T.D.C. "End of Exhaust – commencement of inlet on cylinder No. 1".
   Cylinder No. 1 rocker arms "on the rock".
   Timing mark (O) on the crankshaft pulley opposite pointer (A) on timing cover.

Cylinder No. 1 on T.D.C. "End of Exhaust -commencement of inlet"	Adjust	
	Inlet	Exhaust
	I3	E2
	I5	E4
	I6	E5

CHANGING CYLINDER HEAD GASKETS

NOTE:
If only one cylinder head is to be removed, the operation may be performed without removing the timing cover using camshaft sprocket support tool (B) No. J.28858 to support the timing sprocket and maintain tension on timing chain. *(Fig. 29)*

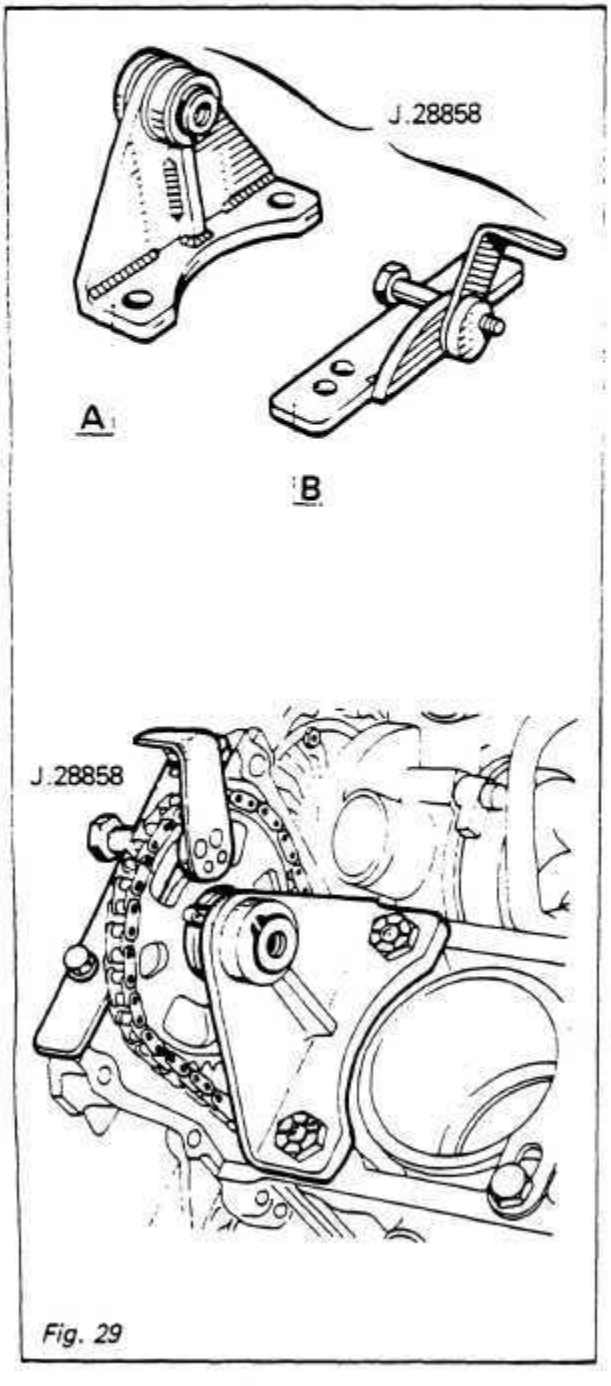


Fig. 29

The timing chain must not be allowed to become slack during this operation. The timing cover will have to be removed to release the tensioner if the chain is slackened accidentally.

The dummy bearing (A) will only be used if the crankshaft has to be turned, for example, when "piston and liner" assemblies are changed to prevent any alteration in the valve timing.

LH Cylinder
Disconnect battery
Drain cooling system
Remove intake manifold
Remove water pump hose leading to head
Disconnect any heater hoses leading to cylinder heads
Remove rocker cover and access plug for the camshaft sprocket bolt.

Turn the camshaft sprocket so that the drive pin (1) is at the top.
Unlock the camshaft sprocket fixing bolt (10 mm male hexagon key) *(Fig. 30)*
Fit the camshaft sprocket support on the timing cover.

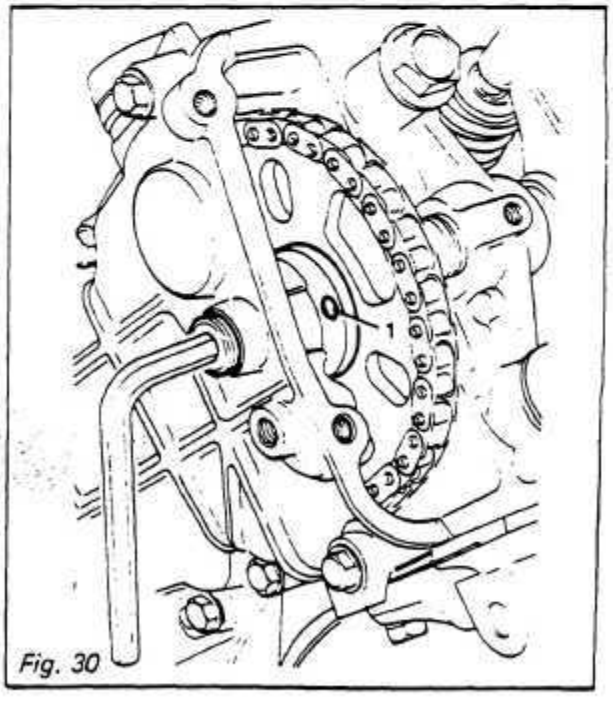


Fig. 30

Moderately tighten both bolts. Attach the camshafts sprocket to it with bolt (2) and nut (3), using a hole in the sprocket. *(Fig. 31)*

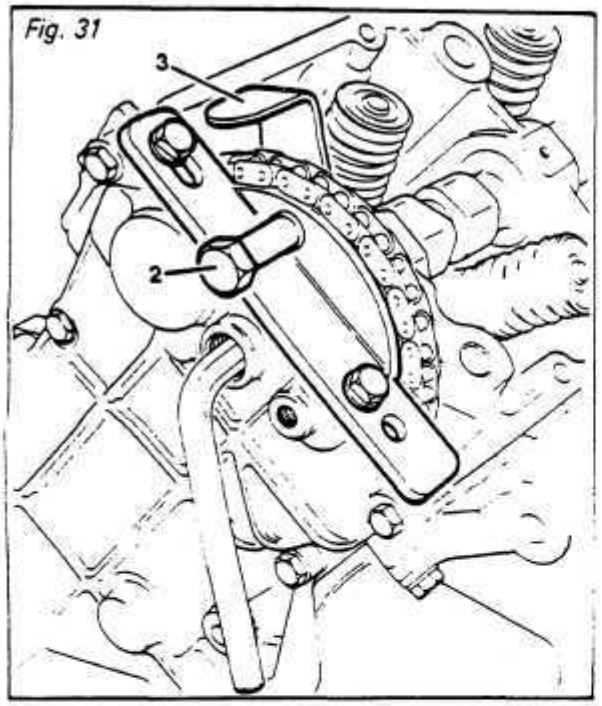


Fig. 31

Remove the cylinder head fixing bolts and rocker assembly.

Unscrew the camshaft flange and free the flange from its recess, unscrew the camshaft sprocket bolt carefully until the camshaft disengages the sprocket. *(Fig. 32)*

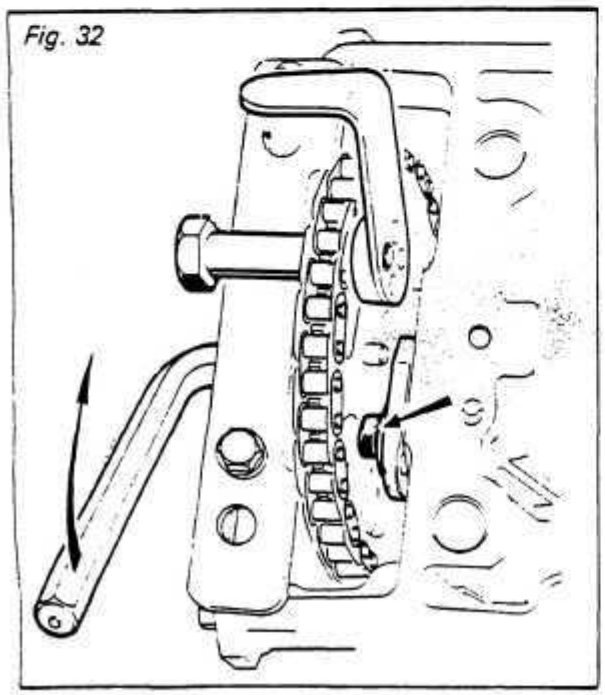


Fig. 32

Press the locating roll pins down at (A) and (B) using an old pushrod. *(Fig. 33)*

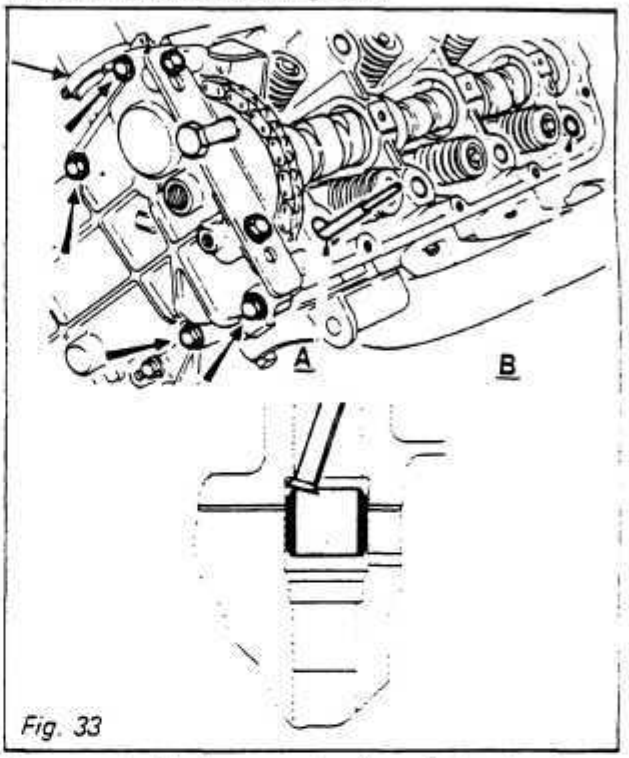


Fig. 33

Remove the 4 bolts securing the cylinder head to the timing cover.
Remove cylinder head bolts and remove rocker arm assembly.
Unstick the cylinder head gasket and remove the cylinder head, taking care not to unseat the liners.
Remove the cylinder head gasket.

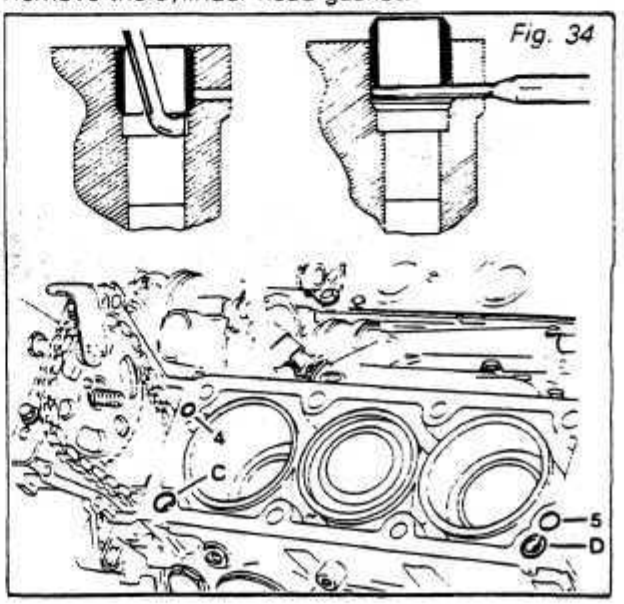


Fig. 34

Remove the cylinder head locating sleeves (C) and (D).
Use paint stripper to clean the gasket faces on the cylinder block and head.

Take care not to introduce any foreign matter into the oilways (4) and (5) which might block the rocker arm oil jet holes and lead to excessive wear of cam lobes and rocker fingers.

REFITTING

Check that the camshaft sprocket driving pin is uppermost. *(Fig. 35)*
Avoid any slackening of the timing chain. If it becomes slack accidentally then it is imperative that the timing cover be removed in order to release the tensioner.

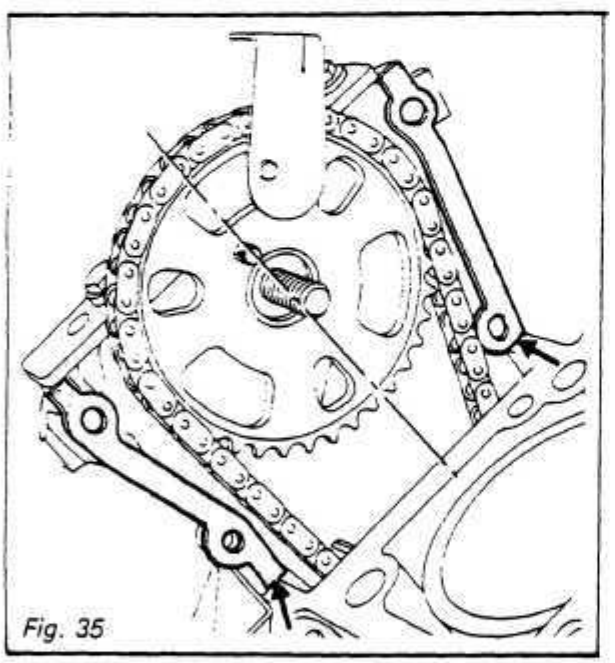


Fig. 35

In this case, use the dummy bearing to prevent the valve timing becoming out of phase.
Oil tightness between cylinder head and timing cover.
Cut the timing cover gasket off level with the cylinder head gasket face.
Cut sections from new gaskets to replace the above.
Use gasket cement to hold new gaskets in place and seal joint at cut area.
Insert a 3 mm (1/8") dia. pin punch into each locating roll pin hole and press the dowels against them. *(Fig. 36)*

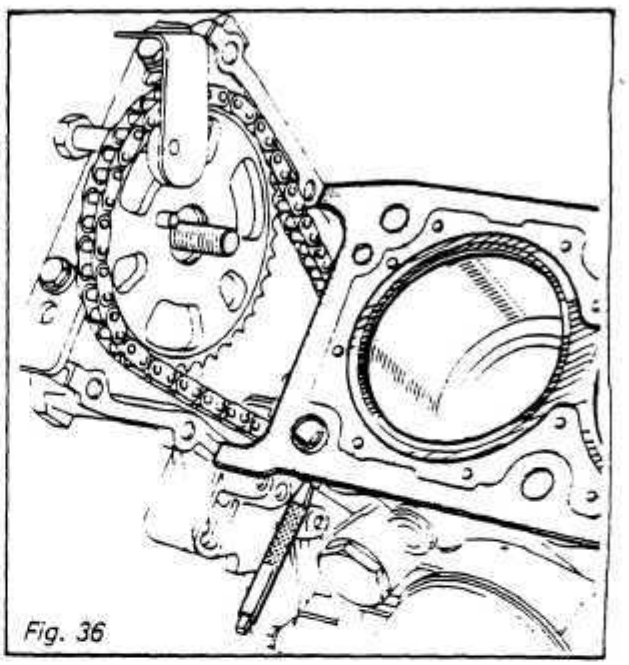


Fig. 36

Fit a new cylinder head gasket dry. Fit the cylinder head, taking care not to move the timing cover gaskets. Insert the timing cover fixing bolts and hand tighten them.
Line up the driving peg and hole and enter the camshaft into the sprocket carefully. Make sure

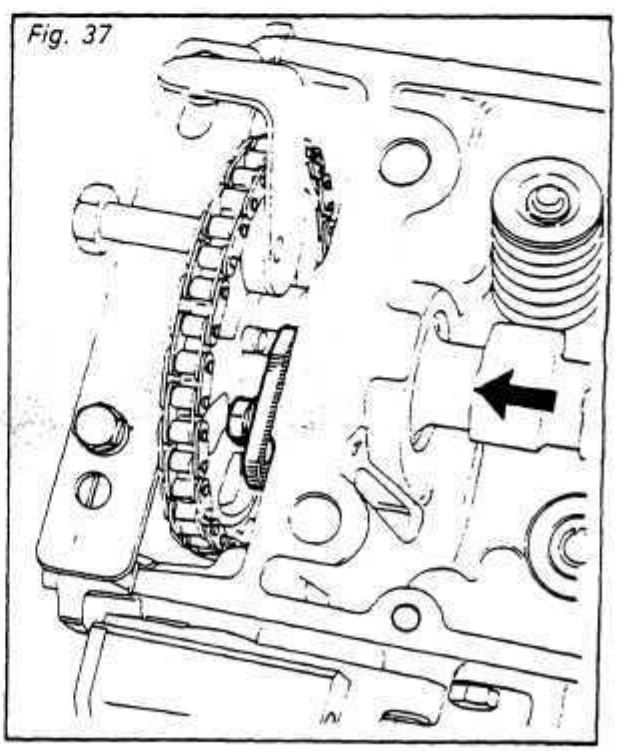


Fig. 37

that the camshaft top is fully withdrawn to allow the camshaft flange to pass through. Partially tighten the sprocket fixing bolt. *(Fig. 37)*

Remove sprocket support.

Push the camshaft stop fully home in its groove and torque. Tighten the bolt. Remove both pin punches.

Fit the rocker arm assembly and the cylinder head bolts.

Carry out the angular tightening operation.

Pre-tighten the bolts in the order shown to 15 lb/ft (20 mm) then tighten them to 45 lb/ft (60 mm) to compress gasket. Loosen bolt No. 1. Retighten it to 15 lb/ft (20 mm) then angular tighten it to 115°. Repeat for all the remaining bolts in the order shown.

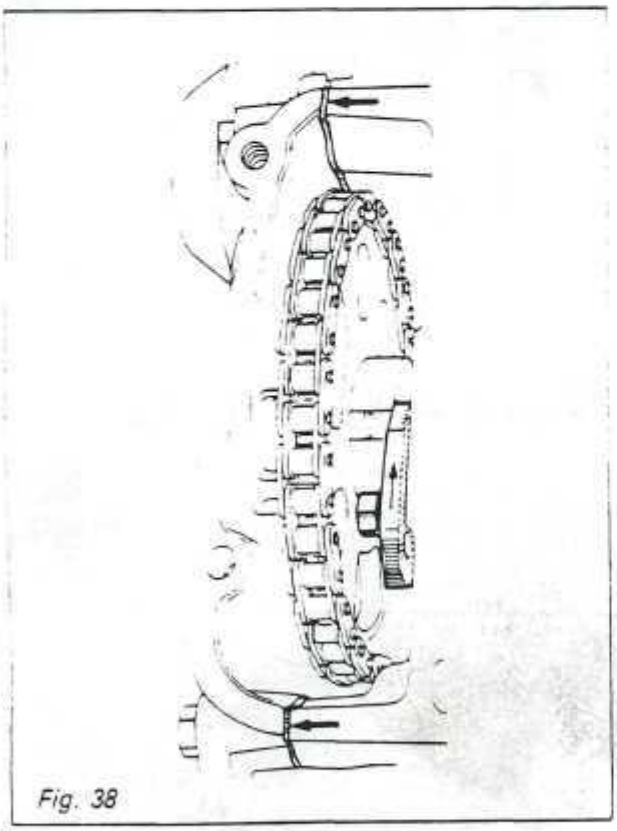


Fig. 38

Torque tighten
the timing cover bolts and cut the gaskets off flush. *(Fig. 38)*
the timing sprocket fixing bolt.
the access plug for the timing sprocket fixing bolt.

Fit the manifold using new gaskets.

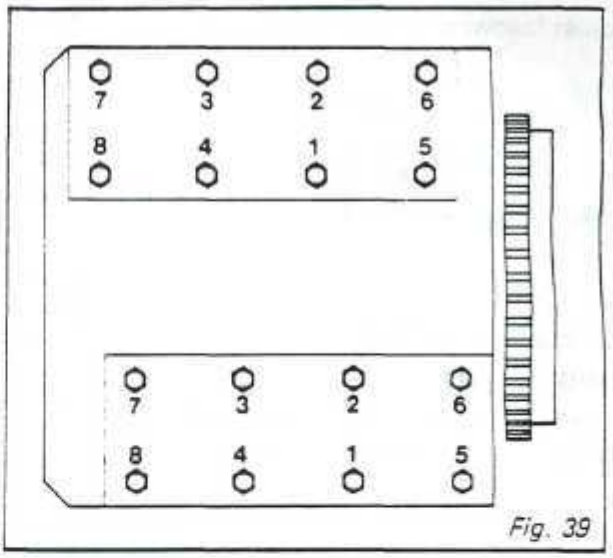


Fig. 39

Refit hoses and pipes.
Refit exhaust clamp.
Adjust the rocker arm clearances.
Fit the rocker cover.
Fill and bleed cooling system.
Run engine for 30 minutes.
Let the engine cool down for at least 2 hours then retighten the cylinder head. *(Fig. 39)*

RH CYLINDER HEAD

The removing and refitting operations for the RH cylinder head are identical to those of LH cylinder head with the exception of
the dipstick tube clip
diagnostic socket and bracket
and distributor

ADJUSTING VALVES—Fig. 22

Set the piston in No. 1 cylinder to TDC firing stroke, which corresponds to
No. 5 cylinder rocker arms "on the rock"
TDC mark on pulley is aligned with "O" mark on timing plate.

Check and adjust the following rocker arms in this position.

INLET	EXHAUST
Cyl No. 1	Cyl No. 1
Cyl No. 2	Cyl No. 3
Cyl No. 4	Cyl No. 6

Turn the crankshaft clockwise one complete turn and align TDC mark on pulley with "O" mark on timing plate.

Check and adjust following rocker arms in this position.

INLET	EXHAUST
Cyl No. 3	Cyl No. 2
Cyl No. 5	Cyl No. 4
Cyl No. 6	Cyl No. 5

CHANGING CYLINDER HEADS

DISMANTLING

Once a cylinder head has been removed lift out the camshaft and remove the spark plugs.

Remove
camshaft stop
exhaust manifold
coolant outlet pipe
engine lifting rings and diagnostic socket bracket (RH cylinder head)

Compress the valve springs using a valve spring compressor.

Remove the split cotters, topcups, springs and thrust washers; lay them out in their correct order. *(Fig. 40)*

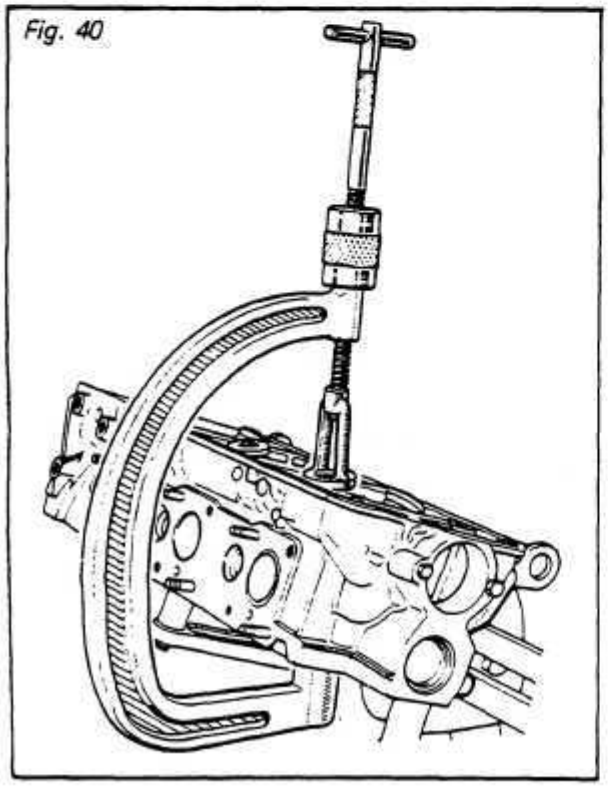


Fig. 40

RE-ASSEMBLING

Grind in the valves and check them for gas tightness

Clean the cylinder head carefully. Re-assemble the valves, fitting components in the following order: —

1 Thrust washer
2 Oil seal
3 Valve spring (closest coil facing cylinder head)
4 Cup washer
5 Split cotters *(Fig. 41)*

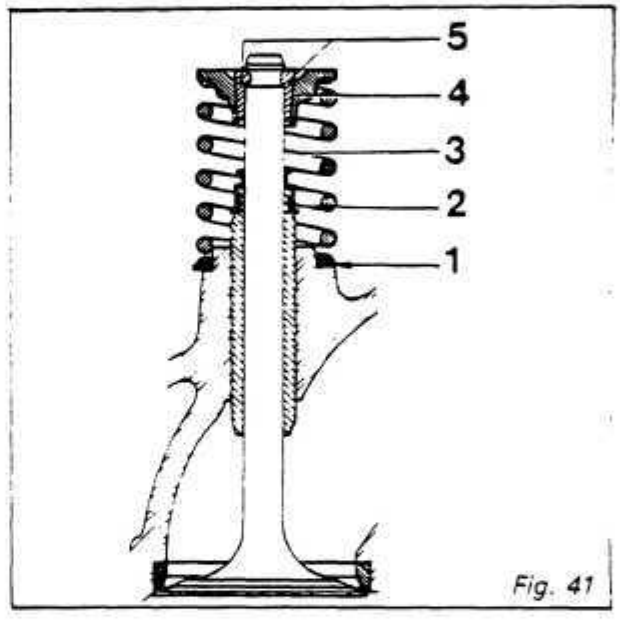


Fig. 41

Re-attach the components to the cylinder head.
Position of exhaust manifold gaskets:
Pip (A) on each gasket to face downwards.
(Fig. 42)

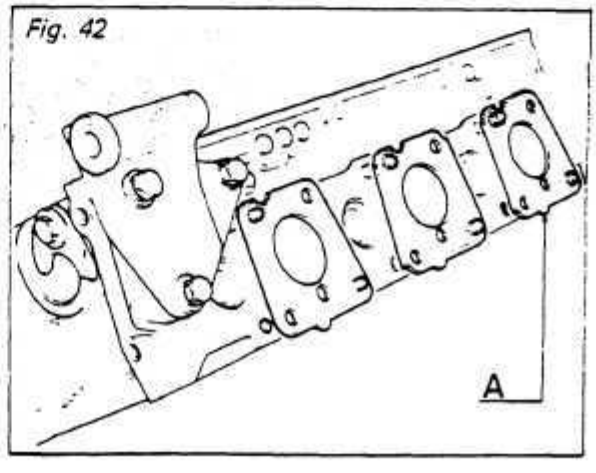


Fig. 42

ROCKER SHAFTS

DISMANTLING

The oilway plugs on the ends of the rocker shafts are press-fitted and cannot be removed.

Remove the set bolt, withdraw the parts and lay them out in order.

RE-ASSEMBLING

The RH and LH side rocker shaft assemblies are identical. They match their respective cylinder heads by turning the complete assembly round. The position of the rocker shaft must not be reversed because the oil feed holes (A) will be blocked; the rocker shafts must be fitted with their oil holes facing downwards. *(Fig. 43)*

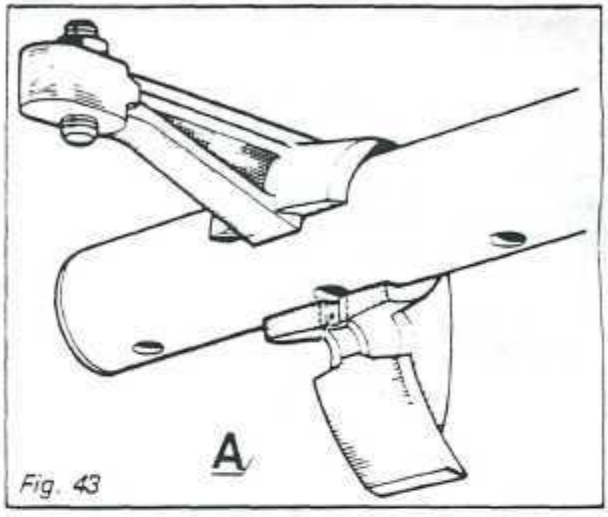


Fig. 43

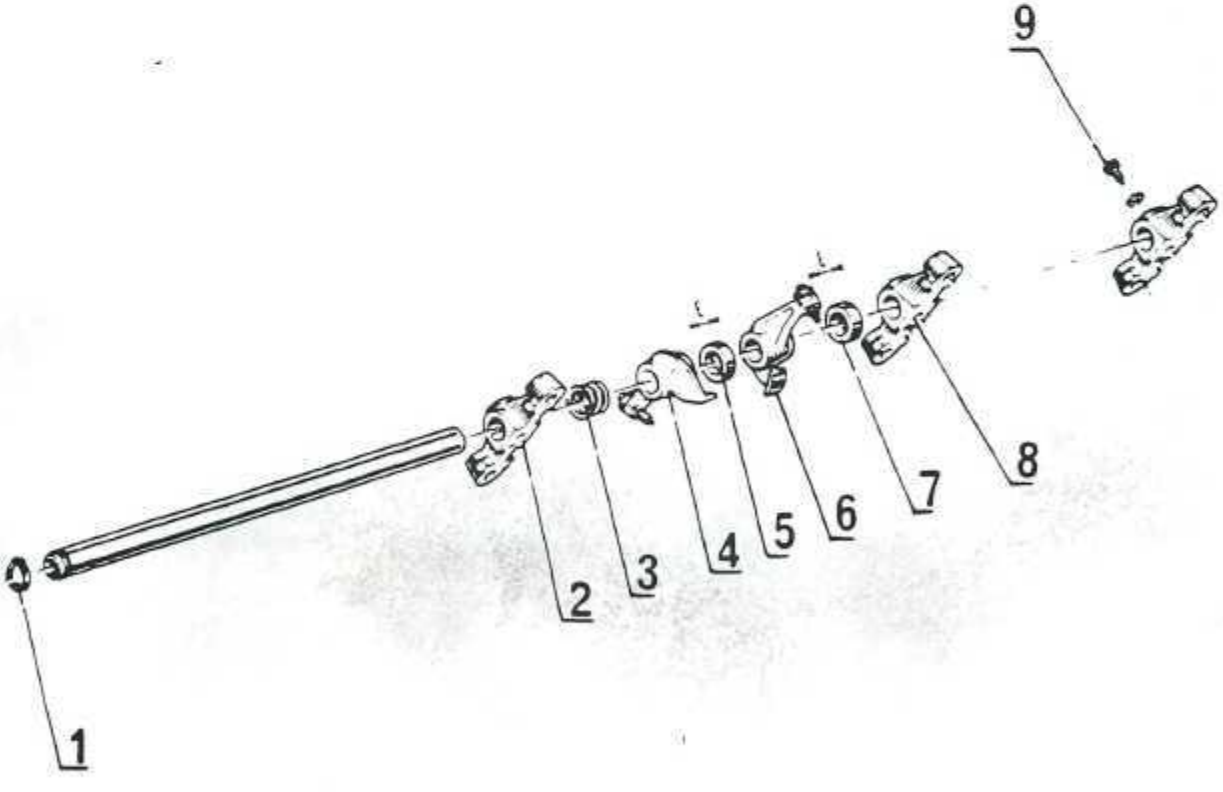


Fig. 44

Assemble in the following order *(Fig. 44)*

1 Snap ring
2 Bearing with flat on boss facing snap ring *(Fig. 45)*
3 Spacer spring
4 Rocker arm with tappet adjusting screw on left
5 Spacer "E" equals 5,35 mm thick
6 Rocker arm with tappet adjusting screw on right
7 Spacer "E" equals 8,2 mm thick
8 Bearing with flat on boss facing snap ring

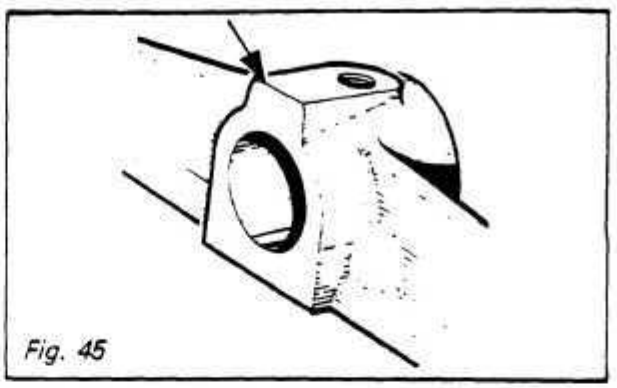


Fig. 45

Liners—Pistons

CHANGING

The engine need not be removed for this operation, furthermore, it is possible to change one individual "liner-piston" assembly.

It is not necessary to remove the timing cover and timing gear when one or more "liner" and "piston" assemblies belonging to one bank of cylinders (LH or RH) have to be changed.

Use the J28858 Tool. *(Fig. 46)*

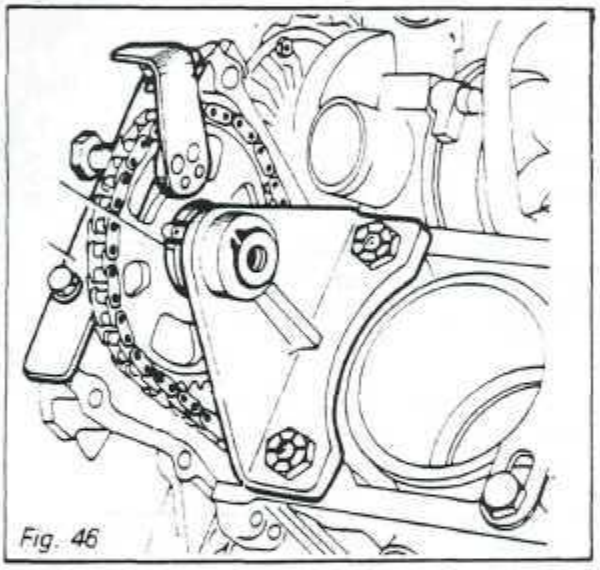


Fig. 46

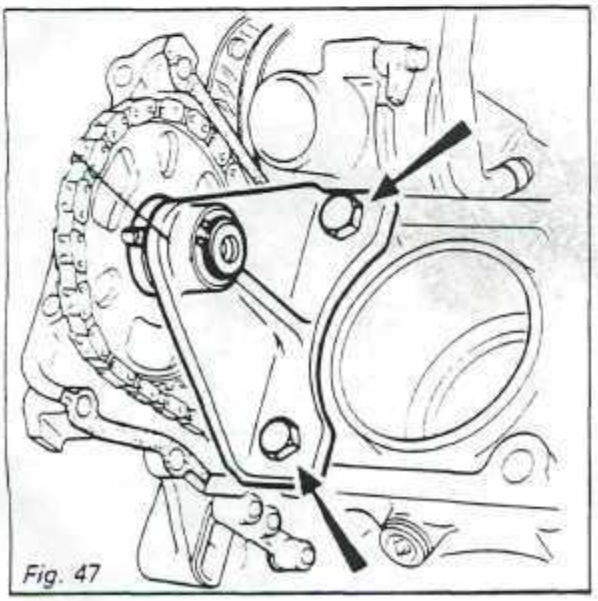


Fig. 47

Support (S) will be used as outlined in the chapter "Cylinder Heads—Changing the Gaskets".
Dummy bearing (F) will be fitted and this will allow the crankshaft to be turned in order to reach each big-end cap in turn without upsetting the timing phase.

FITTING THE DUMMY BEARING—Fig. 47

With support (S) already in position, fit dummy bearing (F) and tighten the camshaft sprocket fixing bolt moderately.
If a clearance exists between the underside of the dummy bearing bottom flange and the gasket face on the cylinder head, pack up with shims to prevent any slackening of the timing chain which may jam the tensioner in the forward position.
Moderately tighten both bolts. Remove support (S).

Removal of all six assemblies is dealt with in this chapter. As both cylinder heads have to be removed it is more practical to remove the timing gear.

Disconnect battery.
Drain the cooling system and sump (oil pan)

Remove
the air filter
inlet manifold
exhaust
timing cover (to loosen pulley nut, lock the flywheel)
oil pump driving sprocket and its chain
camshaft sprockets and their chains
oil pan (sump)
the suction pipe and gauge
anti-emulsion plate
and cylinder heads.

Refer to chapters "Cylinder Block" and "Cylinder Heads" for peculiar points dealing with the various dismantling operations.
Fit liner clamps J28852.
Mark the connecting rods, starting with No. 1 at the flywheel end, so that they match the cylinder numbers.
The nuts holding the six big-end caps cannot be unscrewed with the crankshaft in one position only. Work round in order of accessibility and withdraw the "liner-piston" assemblies one by one.

OVERHAULING—Fig. 38

Clean gasket faces on cylinder heads and cylinder block using paint stripper (protect oil holes) 4 and 5.

Take care not to let any foreign matter enter the oilways which could block the rocker arm jet holes and lead to excessive wear of cam lobes and rocker arm fingers.

Clean inside the cylinder block, particularly the locating flanges for the liner base seals and crankshaft.

Extract the cylinder head locating roll pins (C) and (D).

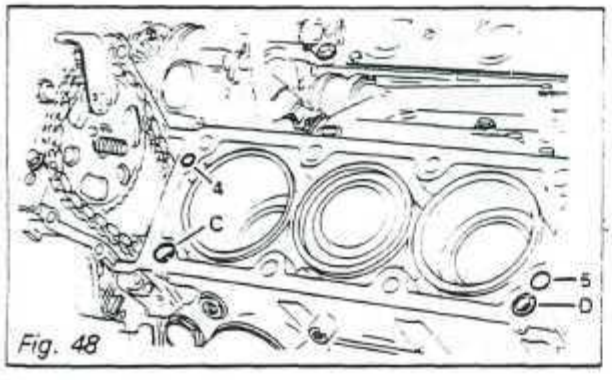


Fig. 48

Check condition of:
oil pump
and cylinder heads; check their gasket faces for truth (resurfacing not permitted)
Grind in the valves and re-cut the valve seats.
Change the "liner-piston" assemblies. *(Fig. 49)*

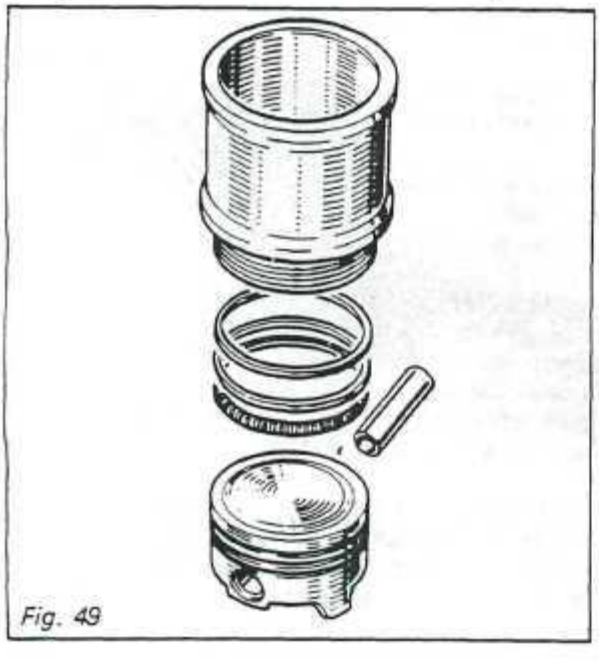


Fig. 49

LINER PROTRUSION

Excelnyl liner base seals are used in the engine.

They are available in the following thicknesses:

blue tag	0,087 mm (.0034")
white tag	0,102 mm (.004")
red tag	0,122 mm (.0048")
yellow tag	0,147 mm (.0058")

With liner base seals in position, the amount of liner protrusion above the cylinder block face should be

between 0,16 and 0,23 mm (.0063 to .0091")

work as close to 0,23 mm as possible.

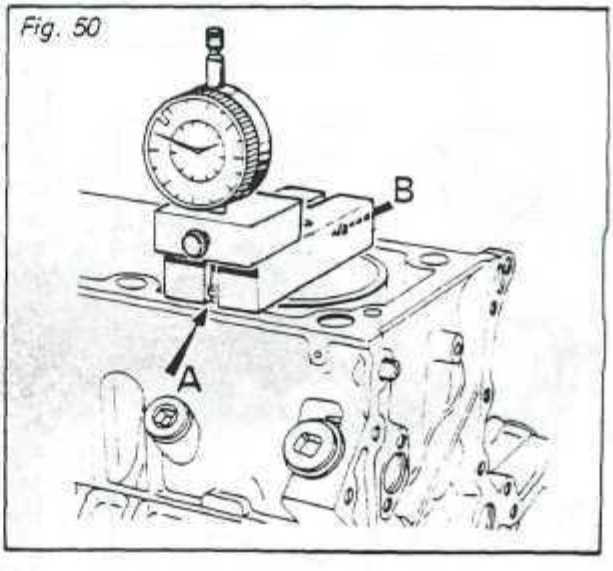
The new liners need not be inserted with an angular reference.

Difference in level liner to liner may be made by selective insertion.

To select the correct liner base seals, the amount of protrusion of each "liner-piston-connecting rod" assembly, without its seal, must be determined for each block of cylinders.

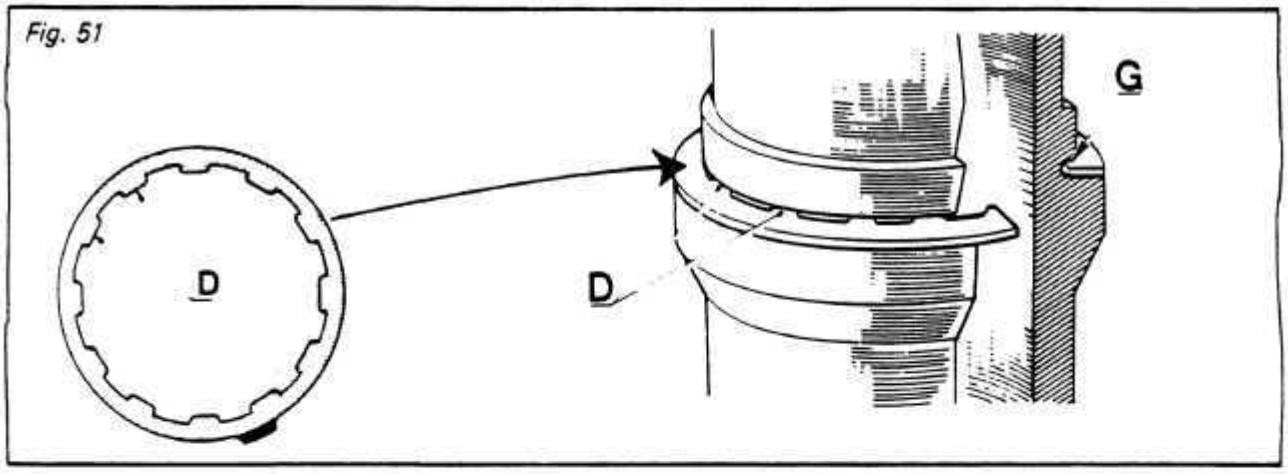
Check liner protrusions at (A) and (B) using thrust plate, bracket fitted with a clock gauge. J 28856 *(Fig. 50)*

Fig. 50



Subract the larger measurement from 0,23 mm to determine the thickness of the seal required.
Select a seal whose thickness is equal to, or just less than, the thickness calculated.

Fig. 51



EXAMPLE–Fig. 51
First measurement at A: 0,10 mm (.004")
Second measurement at B: 0,08 mm (.003")
Subtract 0,10 mm from 0,23 mm which leaves 0,13 mm (.005"). Select a seal with red tag, 0,122 mm (.0048") thick (average value)
Fit one seal of the same thickness to each liner and bend castellation (D) into recess (G).

Insert the liners so that the base seal colour tags are visible (spaced as shown in the sketch). *(Fig. 52)*

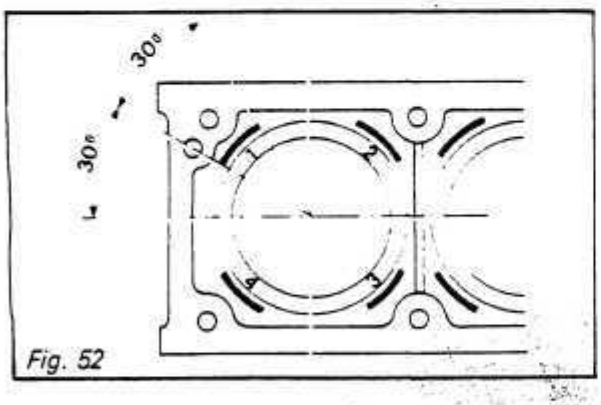


Fig. 52

Positions 1, 2, 3, or 4.
Check the protrusion of each liner in relation to the cylinder block.
If necessary, change the thickness of the seals in order to position the liners so that:

– the difference in protrusion between any two adjacent liners do not exceed 0,04 mm (.0016") within the permitted tolerance. *(Fig. 53)*
– and any differences are stepped from cylinder No. 1 to No. 3 (or 4 to 6) and vice versa.

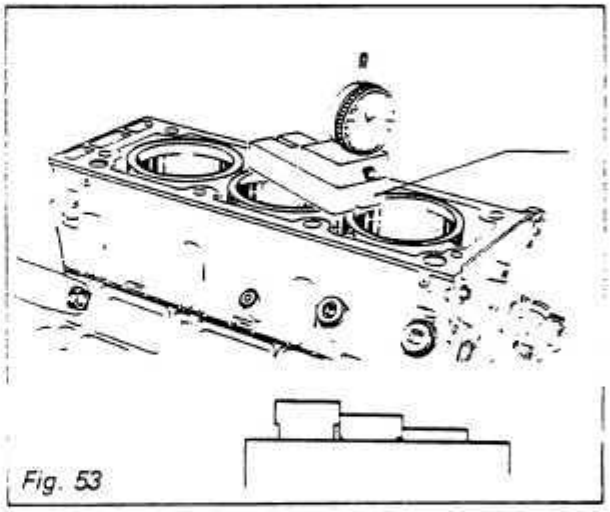


Fig. 53

Once the correct protrusions have been obtained, refit assemblies A, B, C, D, E, and F together, then number the liners, pistons and gudgeon pins 1 to 6 (No. 1 at flywheel end) so that they match the corresponding connecting rods. *(Fig. 54)*

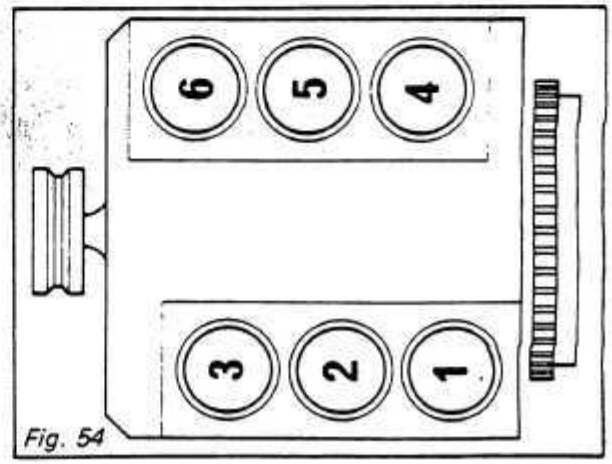


Fig. 54

GUDGEON PINS—TOOLING

The gudgeon pins are a press fit in the small ends and free turning in the pistons.
Use tooling J 28854 which is supplied in a box containing
piston supporting block
an extraction mandrel
piston thrust collar
inserting mandrels and guides.
We approved the use of an electric hot plate to make gudgeon pin insertion easy. The required temperature of 250°C is restricted to small end zone only. *(Fig. 55)*

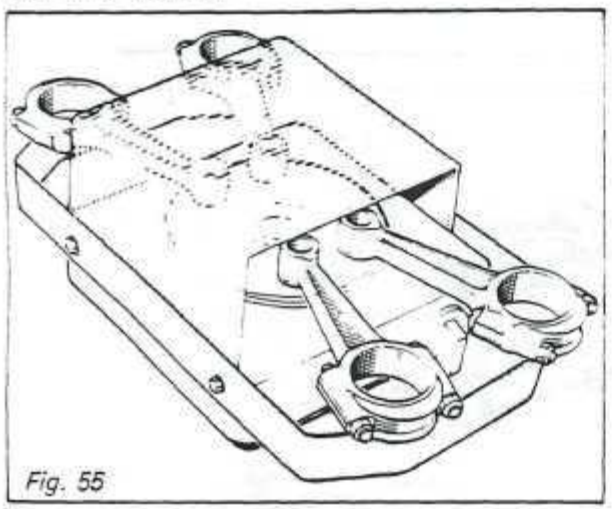


Fig. 55

EXTRACTING GUDGEON PINS

Rest the piston in the vee on the support base, with the gudgeon pin over the extraction hole. Press out the piston with the extracting mandrel (B). *(Fig. 56)*

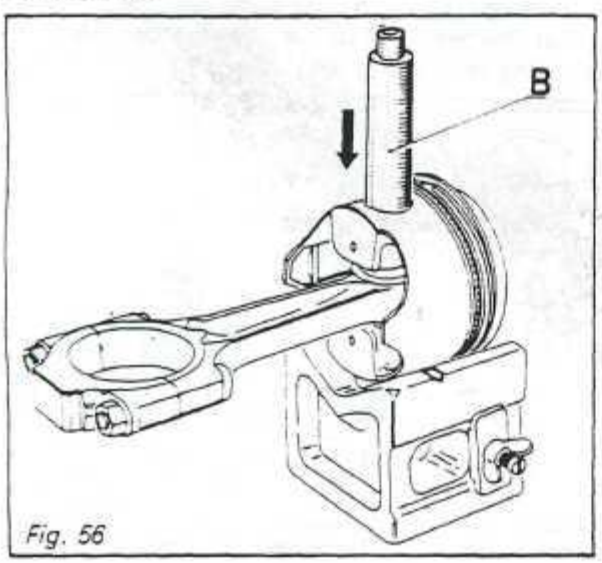


Fig. 56

INSERTING GUDGEON PINS

Preparing the connecting rods. Check the rods for truth (twist—out of square).
Selecting the bottom end components by cylinder bank.
The connecting rod big-ends are offset and have an extended flange (E) on one side (counter balanced side) in order that a pair of connecting rods can share a common crank pin. *(Fig. 57)*

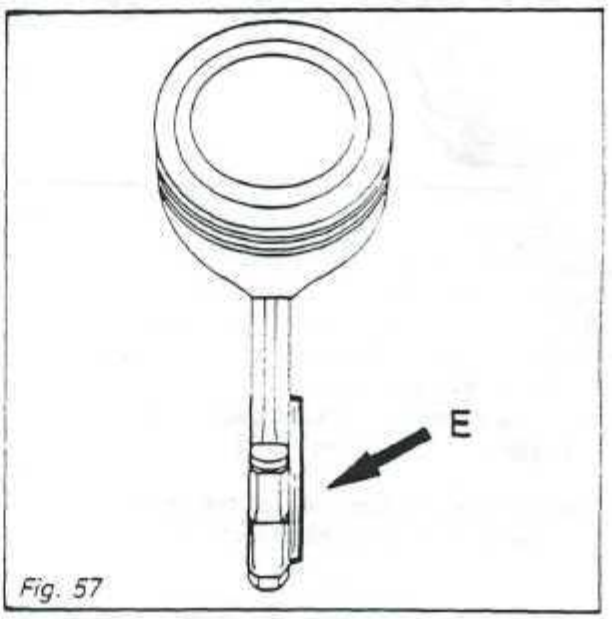


Fig. 57

ALIGNING THE PISTONS

All six pistons will be laid in turn on support base (A) with the arrow pointing upwards and with spot facing on the piston resting on thrust pad (C). Connecting rod—piston assemblies LH cylinder bank.
Spread the small ends on connecting rods 1-2-3 evenly round the hot plate, with extended flange (E) face downwards.

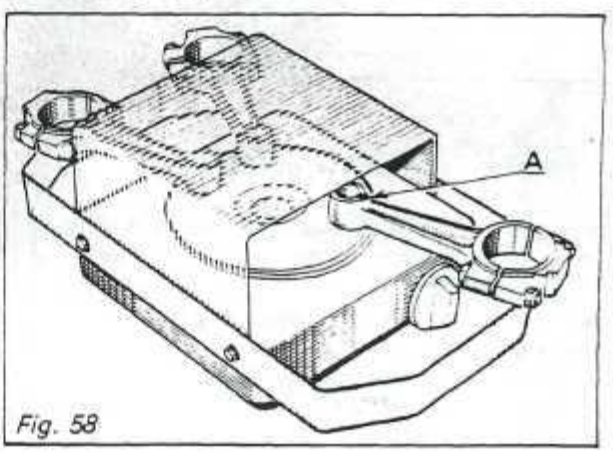


Fig. 58

Check that each small end is lying square on the *hot* plate. As the temperature guide, place a small piece of cored tinmans, solder with a melting pointing of about 250°C on each small end (A). Let them heat up until the solder melts. *(Fig. 58)*

PREPARING GUDGEON PINS

Check that each gudgeon pin rotates freely in its piston. Fit the gudgeon pins in turn to assembly mandrel (D). (Do not tighten; the gudgeon pin must be free to float between mandrel and guide.) *(Fig. 59)*

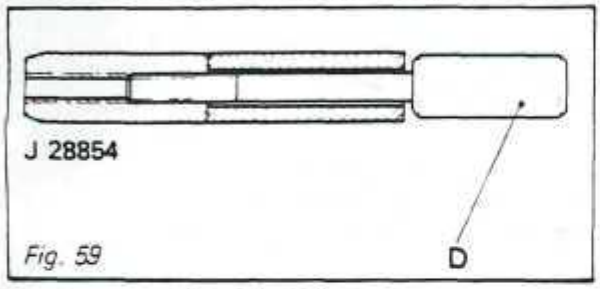


Fig. 59

Fit a thrust pad (C) *(Fig. 60)* which corresponds to the gudgeon pin on the support base (A) and clamp the piston to the support base with the clip; the spotfacing on the piston must rest on the thrust pad.

The following operations must be carried out rapidly so that heat loss is reduced to a minimum.

As soon as the piece of solder melts:

Wipe off the solder droplet

Insert locating guide (D) in the piston

Fit the connecting rod to the piston with one hand (extended flange (E) facing downwards)

Press in the piston pin quickly with other hand until the guide bottoms against the support base.

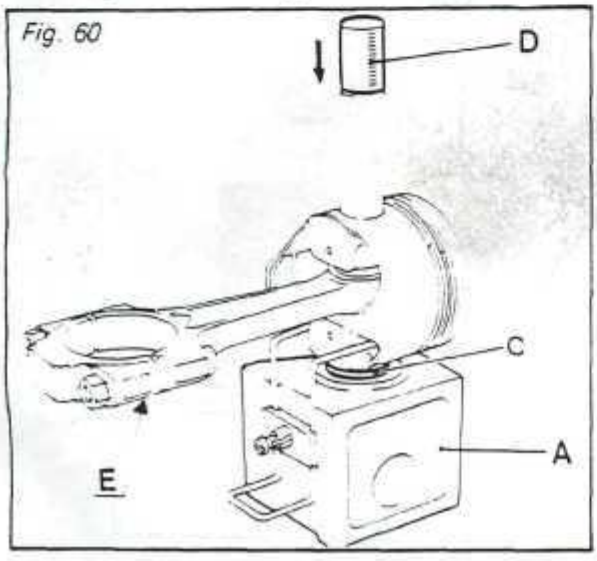


Fig. 60

After a few seconds, remove the connecting rod-piston assembly from the support base; unscrew the guide and remove the mandrel assembly.

Assemble the other two connecting rods in the same way.

Mark the three assemblies made up in this way so that they are immediately identifiable with the LH bank of cylinders. *(Fig. 61)*

Connecting rod-piston assemblies: RH cylinder bank.

Spread the small ends on connecting rods 4-5-6 evenly round the hot plate, with extended flange face downwards. Then carry out the assembly operations as indicated earlier, taking care to insert the gudgeons pins with extended flange (E) facing upwards.

Mark the three assemblies made up in this way so that they are immediately identifiable with RH bank cylinders. *(Fig. 61)*

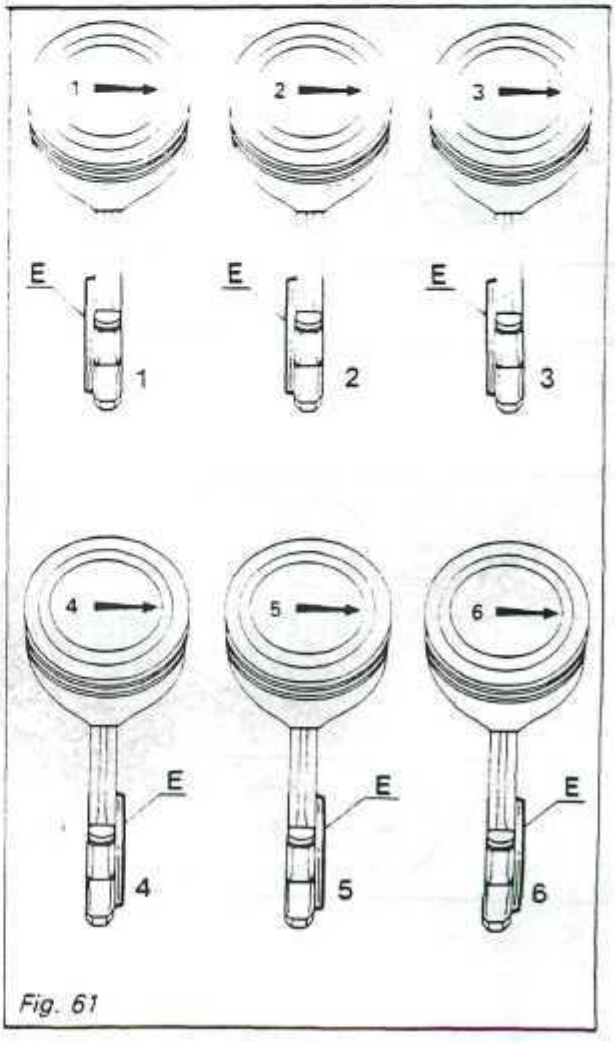


Fig. 61

ASSEMBLING THE PISTONS AND LINERS

Fitting piston rings. *(Fig. 62)*
The piston rings, which have their gaps pre-set, should be free in their grooves.
Faces with markings must face upwards towards the combustion chamber.

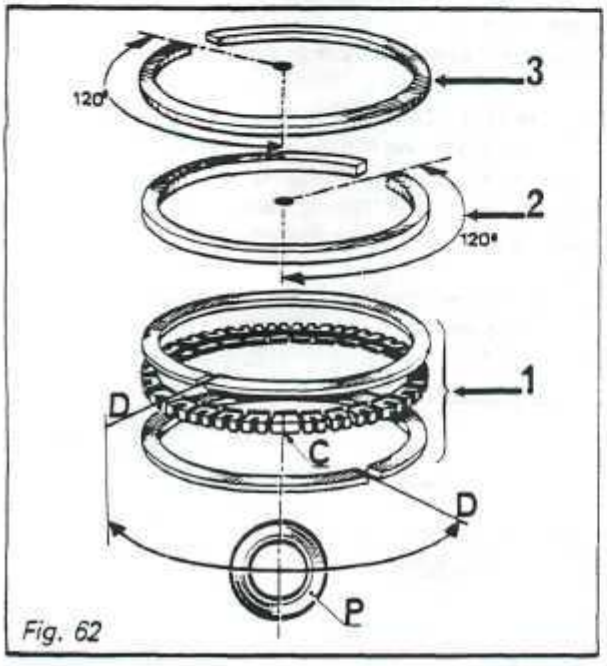


Fig. 62

1 Scraper Ring

Gap (C) in the expander in line with *centre of* gudgeon pin (P).

Gaps (D) on the rings offset about 20 to 50 mm (¾" to 1").

2 Taper Compression Ring
3 Top Ring

} Spaced evenly at 120° from the expander gap.

Lubricate the pistons.

Fit the connecting "rod-piston" assemblies into their respective liners using a piston ring clamp.

Fit the shell bearings to the big-ends. Insert No. 1 assembly in the cylinder block (arrow on the piston crown facing towards the timing gear end). *(Fig. 63)*

Fit No.1 big-end cap together with its shell bearing. Make sure that the assembly marks on the cap and rod match. *(Fig. 64)*

Screw up the cap nuts by hand. Clamp No. 1 liner with a liner clamp.

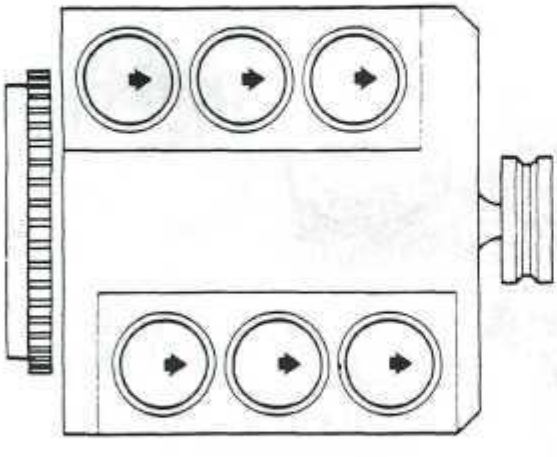
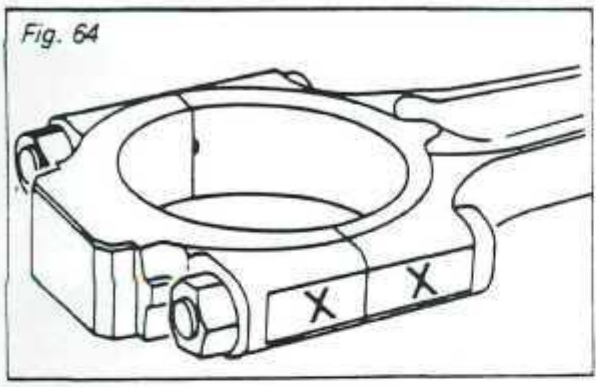


Fig. 63

Fig. 64



Proceed in the same way for assemblies No. 2-3-4-5- and 6 clamping the liners as assembly proceeds.

The cylinder heads,
Timing chains,
Timing cover,
Anti-emulsion plate, suction pipe and sump.

Refer to chapters "Cylinder Block-Changing" and "Cylinder Heads Changing".

Cylinder Block—Changing

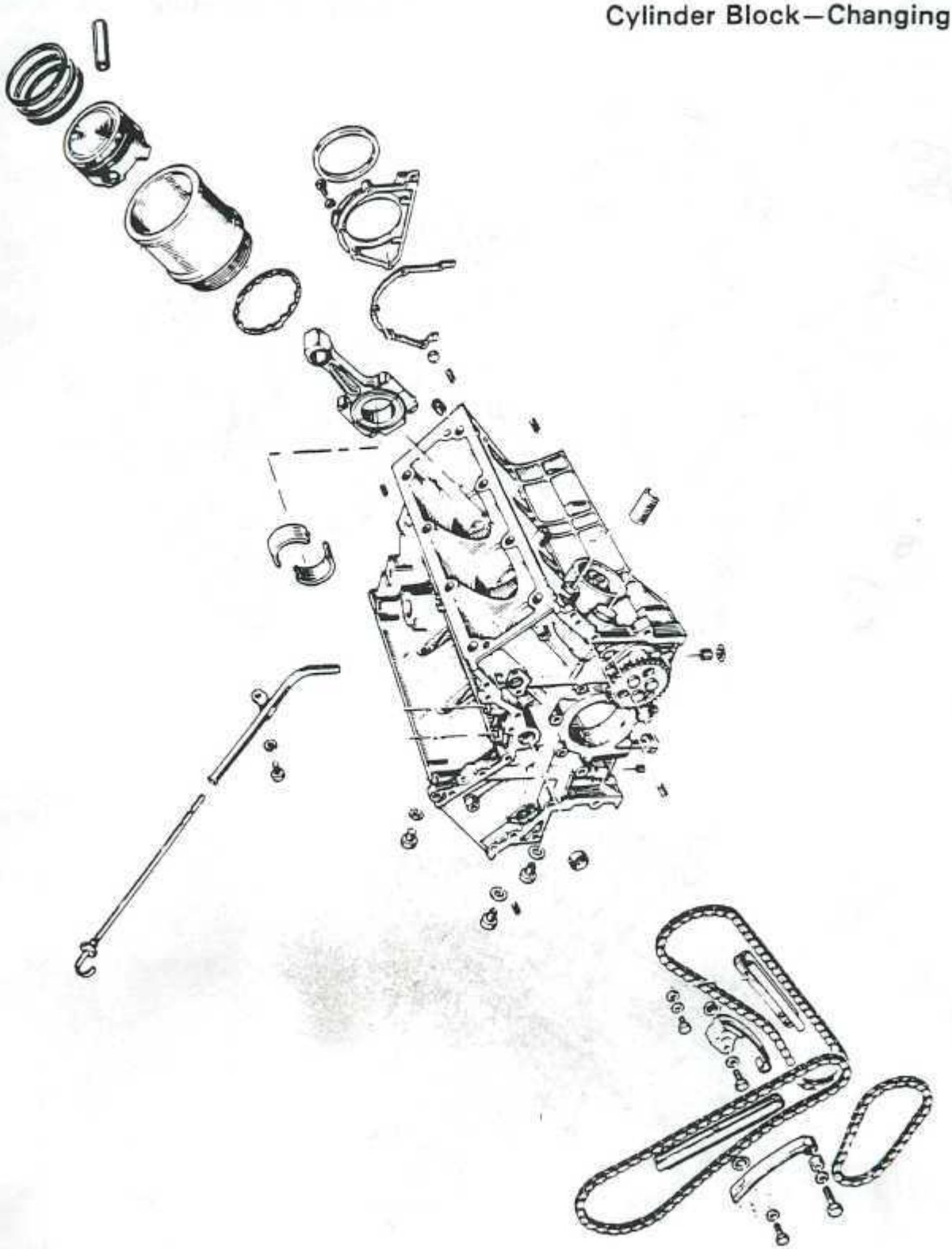


Fig. 65

Cylinder Block—Changing

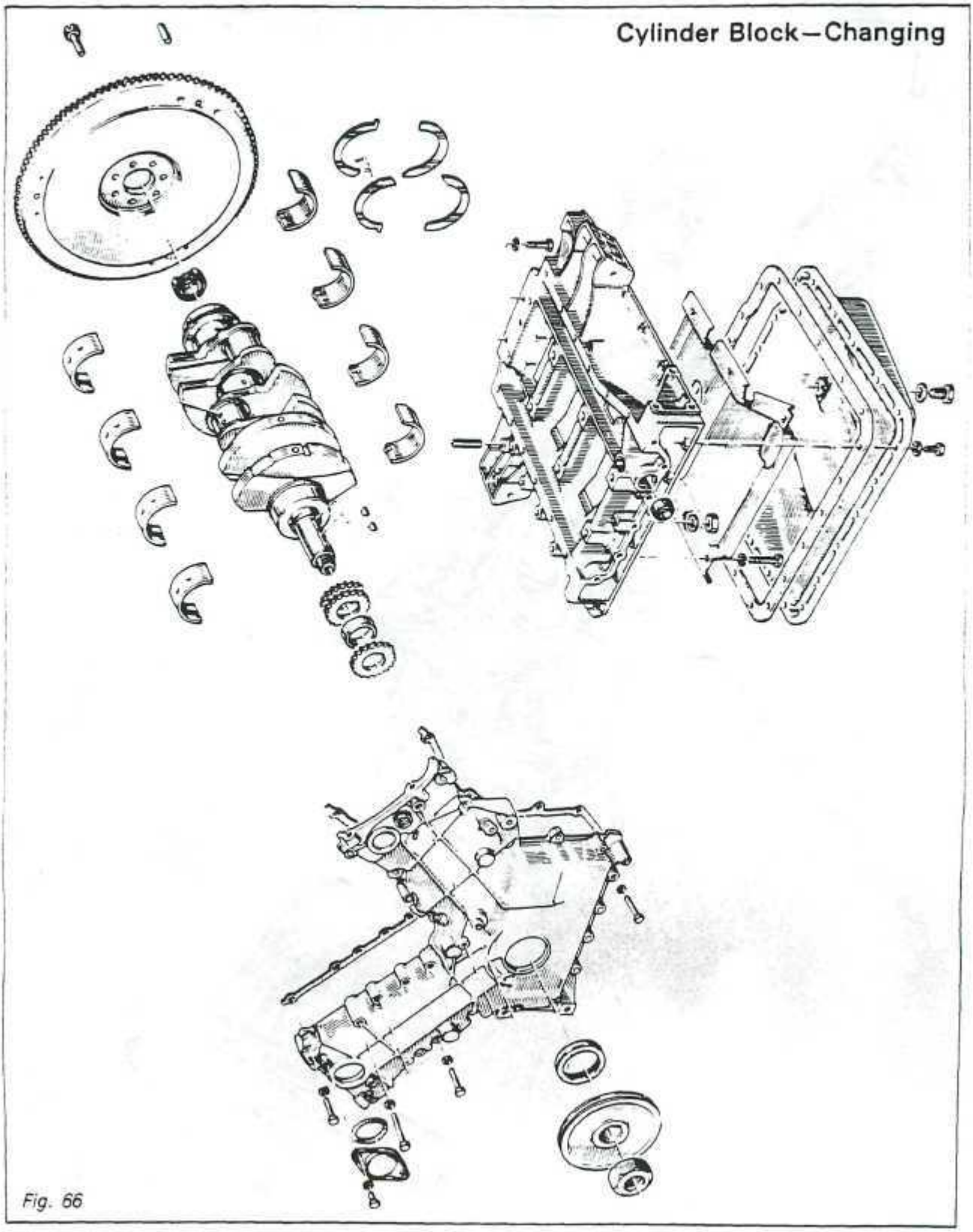


Fig. 66

Cylinder Block

CHANGING

Remove the engine.
Dismantling
Remove
clutch mechanism
flywheel or convertor driving plate
rear cover plate
oil filter
dipstick and tube
alternator and drive belt
distributor and leads
inlet manifold
the six rubber seal
and insulating blocks
water pump and hoses *(Fig. 67)*
fuel injection equipment
and crankshaft pulley fixing nut

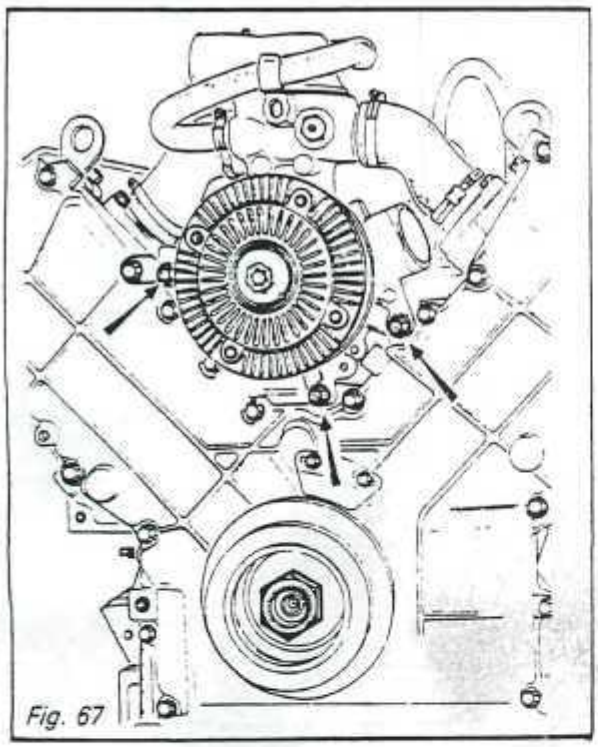


Fig. 67

Turn the crankshaft so that the keyway is vertical. *(Fig. 68)*

Remove the
pulley
the rocker covers
timing cover
and sprockets with oil pump driving chain (retain the key and spacer).

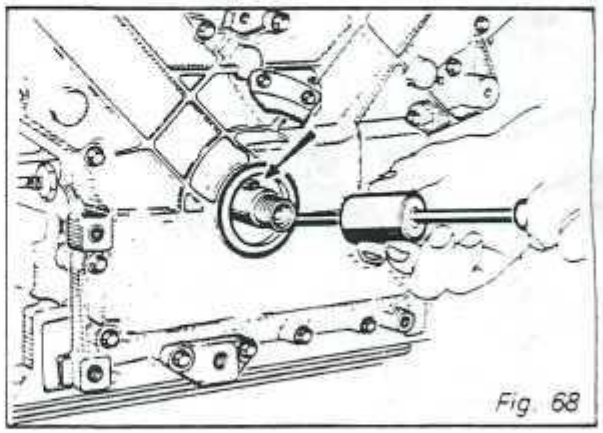


Fig. 68

Loosen the two camshaft fixing bolts.

Mark all the timing gear components according to side if they are to be re-used. *(Fig. 69)*

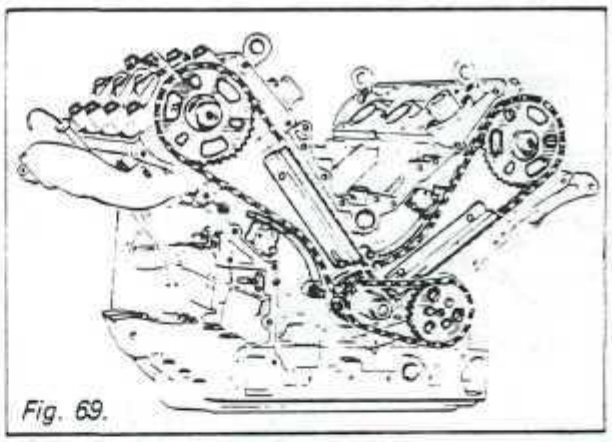


Fig. 69.

Release both chain tensioners by turning the ratchet mechanism anti-clockwise with a screw-driver. *(Fig. 70)*

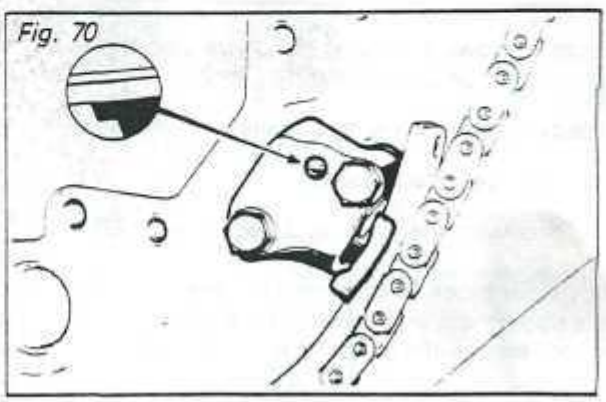


Fig. 70

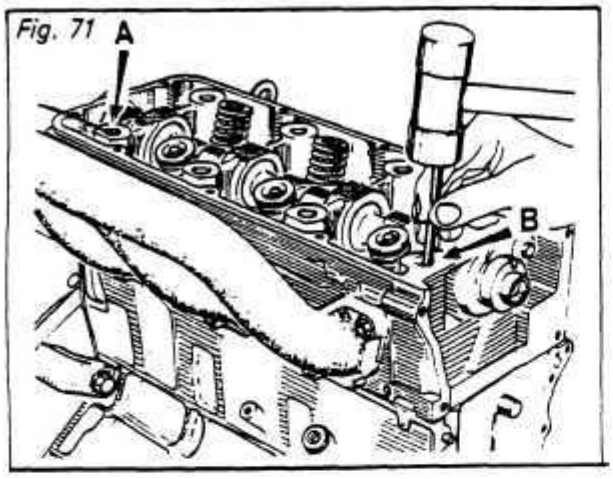


Fig. 71

Remove
the timing chains RH first
the tensioners and their shoes (retain the filters)
and oil pressure switch

Turn the cylinder block so that the RH bank of cylinders is uppermost.

Remove the rocker assembly. *(Fig. 71)*

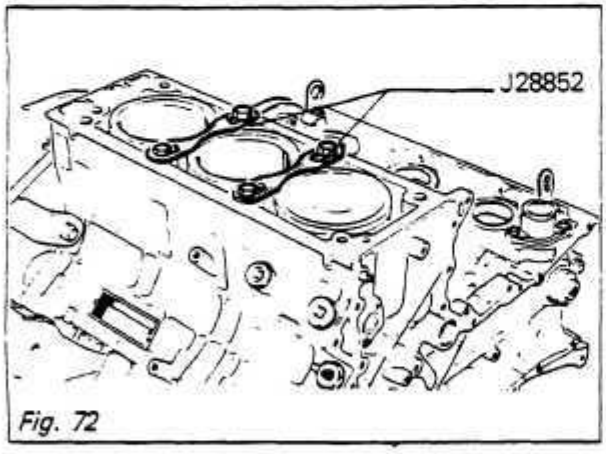


Fig. 72

Tap the locating dowels (A) and (B) down into the cylinder block with an old push rod.

Unstick the cylinder head using a mallet.

Remove the cylinder head gasket.

Clamp the liners with the clamps. J 28852 *(Fig. 72)*

Turn the cylinder block so that the LH bank of cylinders is uppermost and carry out the same operations to remove the LH cylinder head. *(Fig. 73)*

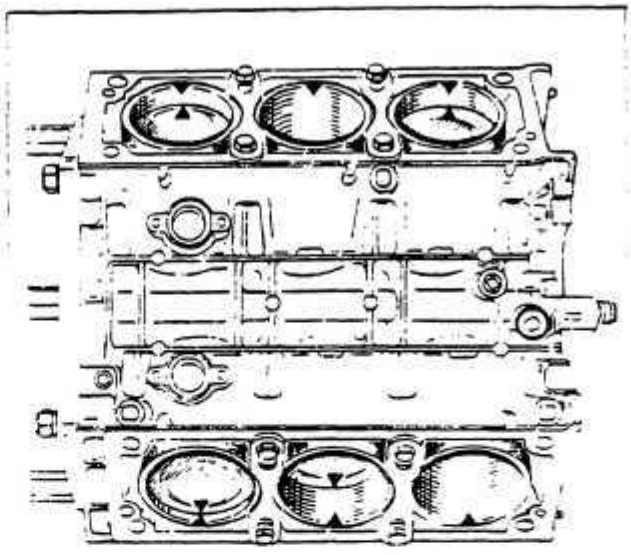


Fig. 73

Turn the engine over. *(Fig. 74)*

Remove
the sump
suction pipe and gauge
anti-emulsion plate
bottom casing
and intermediate main bearing caps after marking their positions.

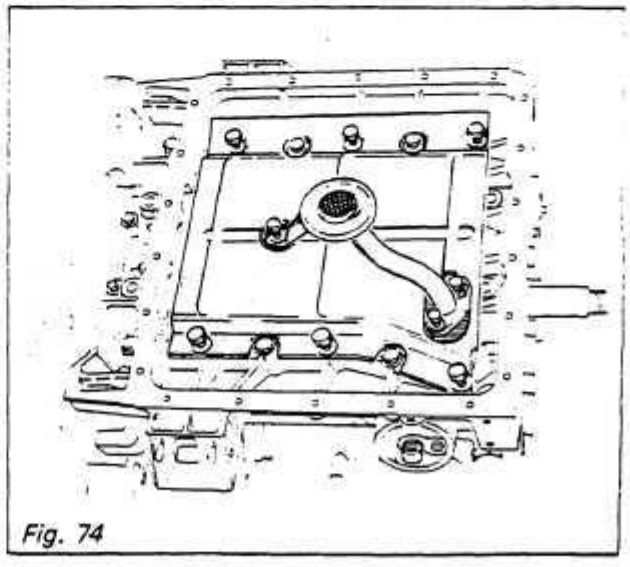


Fig. 74

Hold the front and rear main bearing caps with the two retaining blocks J 28853
which will keep the crankshaft in position. *(Fig. 75)*

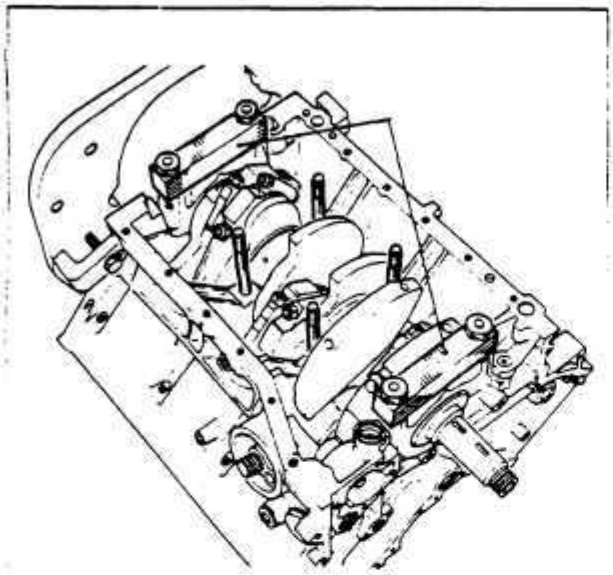


Fig. 75

Mark the connecting rods to match the cylinder numbering, starting at the flywheel end. *(Fig. 76)*

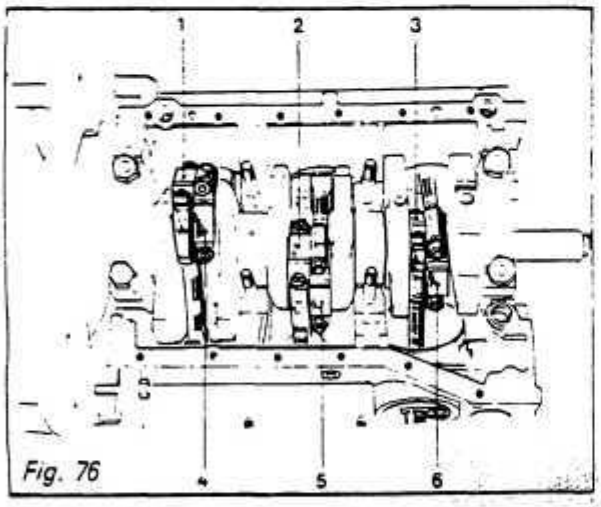


Fig. 76

Remove
the connecting rod big-end caps
liner retaining clamps
marked "liner-piston-connecting rod" assemblies
front and rear main bearing retaining caps and caps themselves
thrust half-washers
and crankshaft

Clean all parts and inspect them for condition.

Use extractor to remove the clutch shaft spigot bearing. *(Fig. 77)*

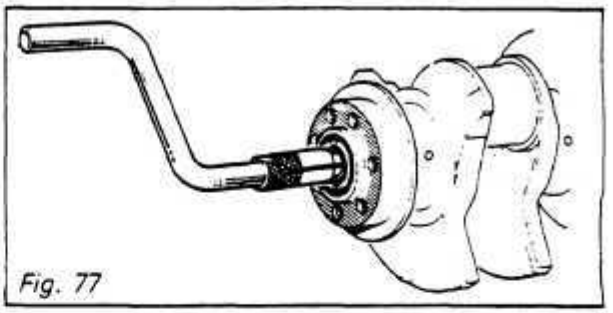


Fig. 77

RE-ASSEMBLING

Lubricate the parts as they are being assembled.
Always change gaskets, oil seals and lockwashers.
Make sure that the oilways are clean and that the oilway plugs are tight.
Check that the cylinder head fixing bolts run down the thread easily.
The new cylinder block is supplied with the oil pump already assembled.
Refit "liner-piston-conrod" assembly.
Refer to chapter changing pistons and liner replacement. *(Fig. 78)*

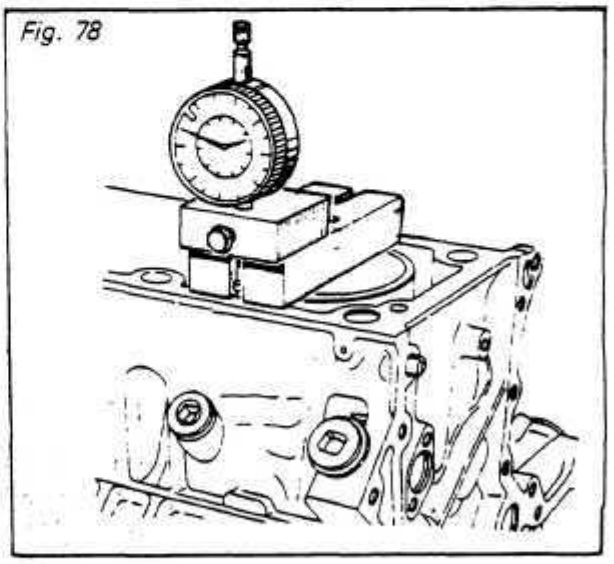


Fig. 78

Remove the assemblies. Turn the engine over. *(Fig. 79)*

Fit the upper halves of the main bearings (locating tags fully home)

Shells fitted with oil grooves are fitted to the block.
Shells without oil grooves are fitted to the main bearing caps.

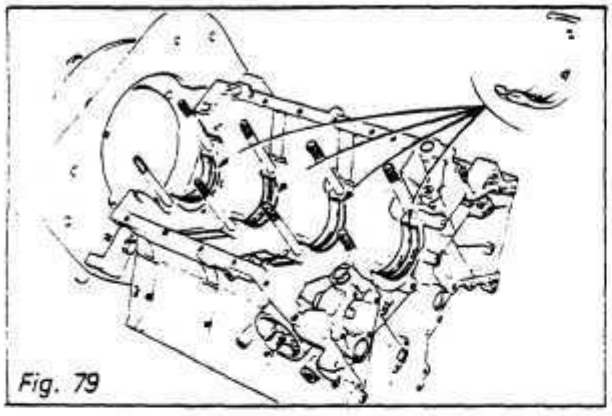


Fig. 79

Refit the crankshaft. *(Fig. 80)*

The nominal size top thrust half washers 2,30 mm (.0805") with the oil grooves facing the crankshaft flange.
The front and rear main bearing caps boss (A) facing the timing gear end.

Fit retaining block J 28853 astride the main bearing caps. Torque tighten the nuts to 20lb/ft.

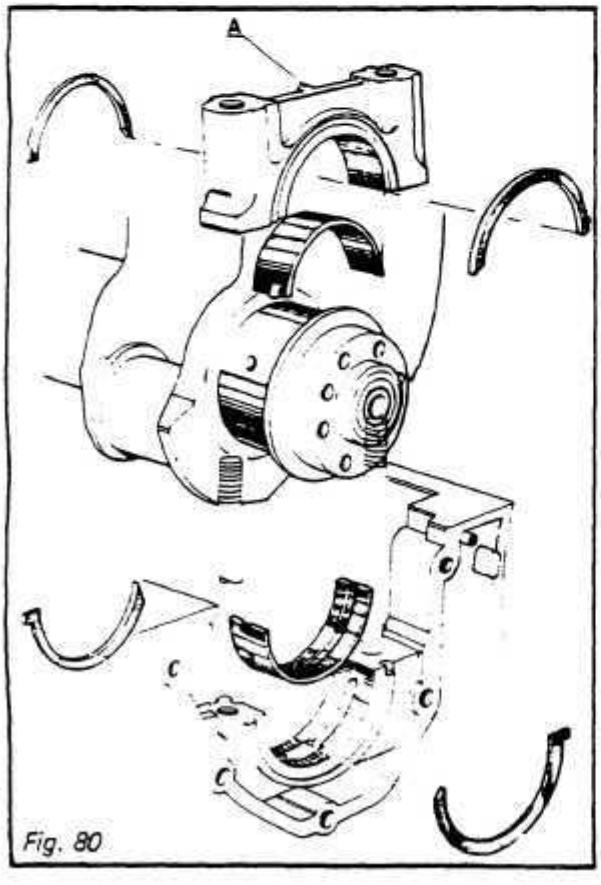


Fig. 80

Place a clock gauge on the end of the crankshaft and set it to zero. *(Fig. 97)*

Push the crankshaft towards the timing gear end. Read off the value of the end play. It should lie between 0,07 and 0,027 mm (.003 to .010").
If it is incorrect, change the thrust washers.
Fit the half shells to the connecting rods. *(Fig. 81)*

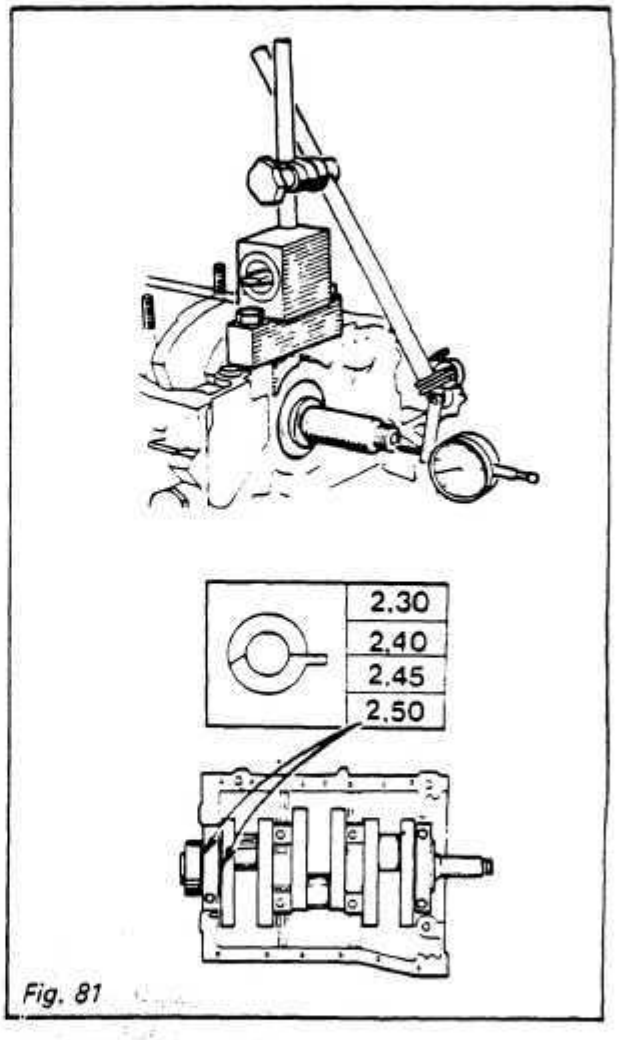


Fig. 81

ASSEMBLING THE "LINER-PISTON-CONNECTING ROD" ASSEMBLIES

Keep strictly to the markings made on dismantling to denote the correct way round and position of the various components.
Insert the assemblies in the order that they were marked during the liner protrusion check (numbered 1 to 6). *(Fig. 82)*
Clamp the first liner with a clamp.
Proceed in the same way for the other assemblies clamping the liners as assembly proceeds.

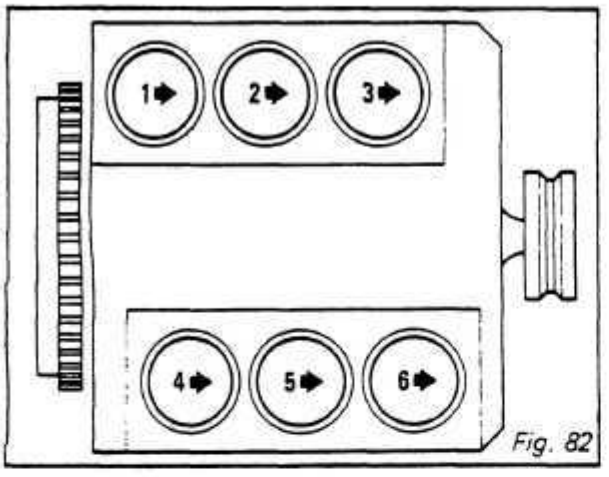


Fig. 82

Check that all the arrows on the piston crowns point towards the timing gear end.

Fit the big-end caps and torque tighten the new nuts.

Remove the main bearing retaining blocks.

Refit:
The intermediate main bearing caps bosses (A) facing towards the timing cover. *(Fig. 83)*

The rear plate fitted with its oil seal and if necessary, make the joint between plate and cylinder block flush. (Hand tighten the bolts).

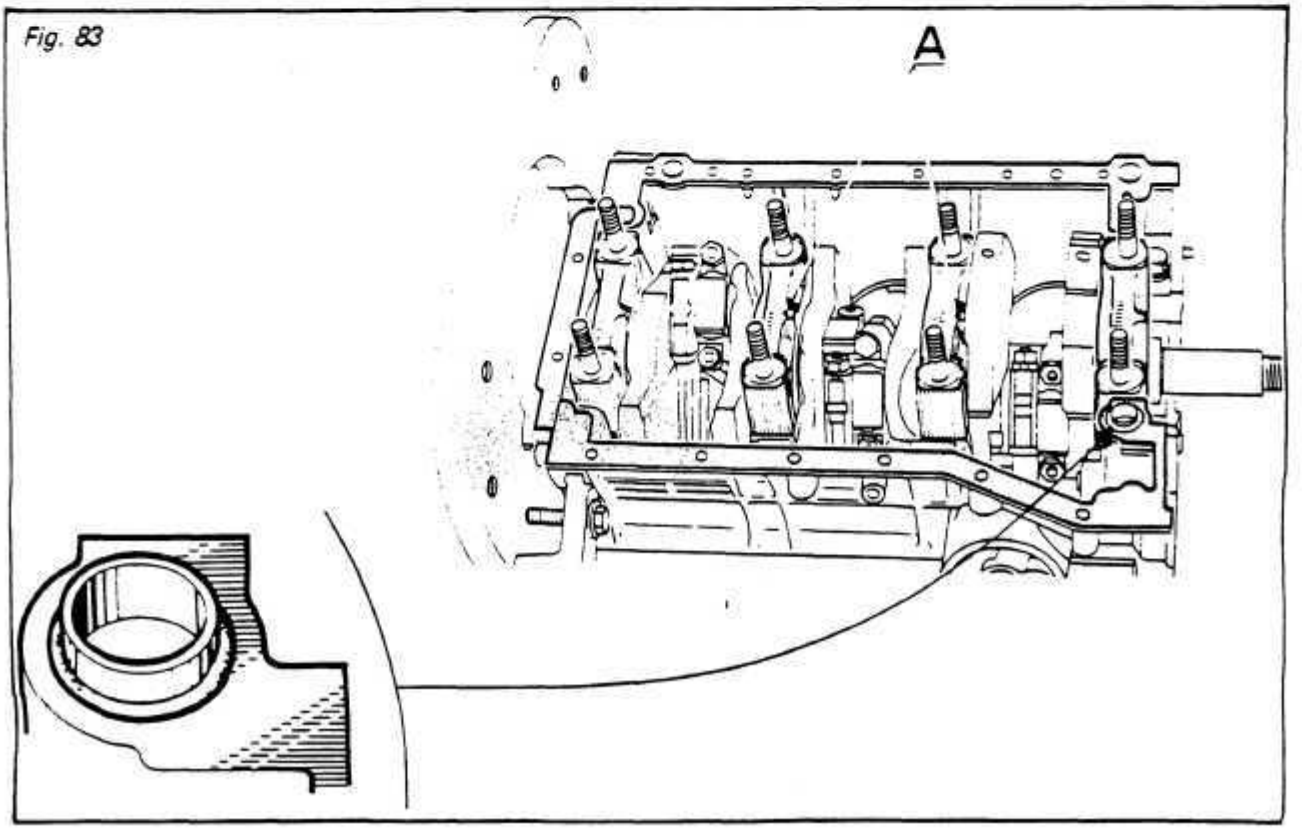
Fit a new "O" ring seal on the oil entry pipe and smear the assembly face with sealing compound.

FITTING THE BOTTOM CASING

It is essential that the bottom casing and cylinder block are absolutely flush at the clutch end in order to avoid distortion of the clutch housing when the gear box is fitted.

Refit
The bottom casing
The flat washers (boss under nut) and main bearing cap nuts without tightening
Another peripheral bolts also without tightening.
Align the bottom casing flush with the cylinder block using either
A clutch housing, tightening the four fixing bolts moderately *(Fig. 84)*
Or using two straight edges laid on the cylinder block in the latter case, check the alignment after tightening the fixing bolts.

Fig. 83



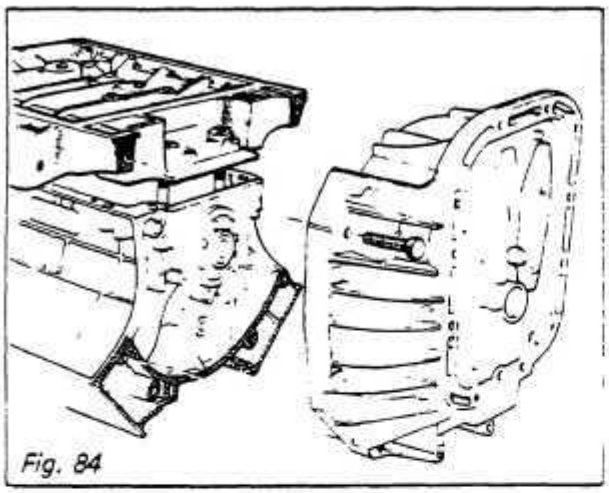


Fig. 84

ANGULAR TIGHTENING OF MAIN BEARING CAPS

Torque tighten the 8 nuts in sequence starting from centre main bearing cap and working outwards. *(Fig. 85)*
Slip the graduated disc over the socket before fitting the torque wrench.
Turn the graduated disc clockwise until the locking stem rests against a solid object which will prevent the disc from turning.
Adjust the moving pointer to the angular tightening value 75° for main bearing cap nuts.
Tighten the nuts until the moving pointer reaches "0".
Repeat the above operation on each nut.

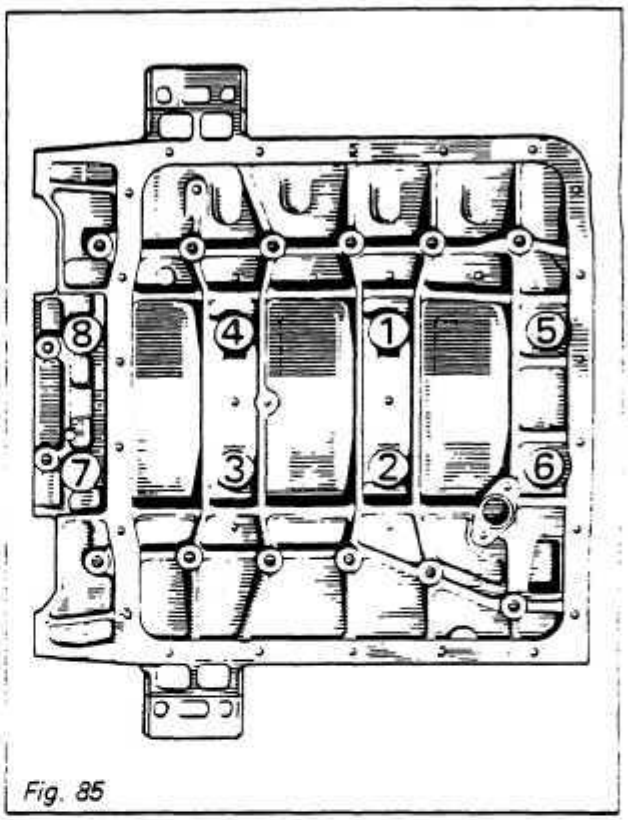
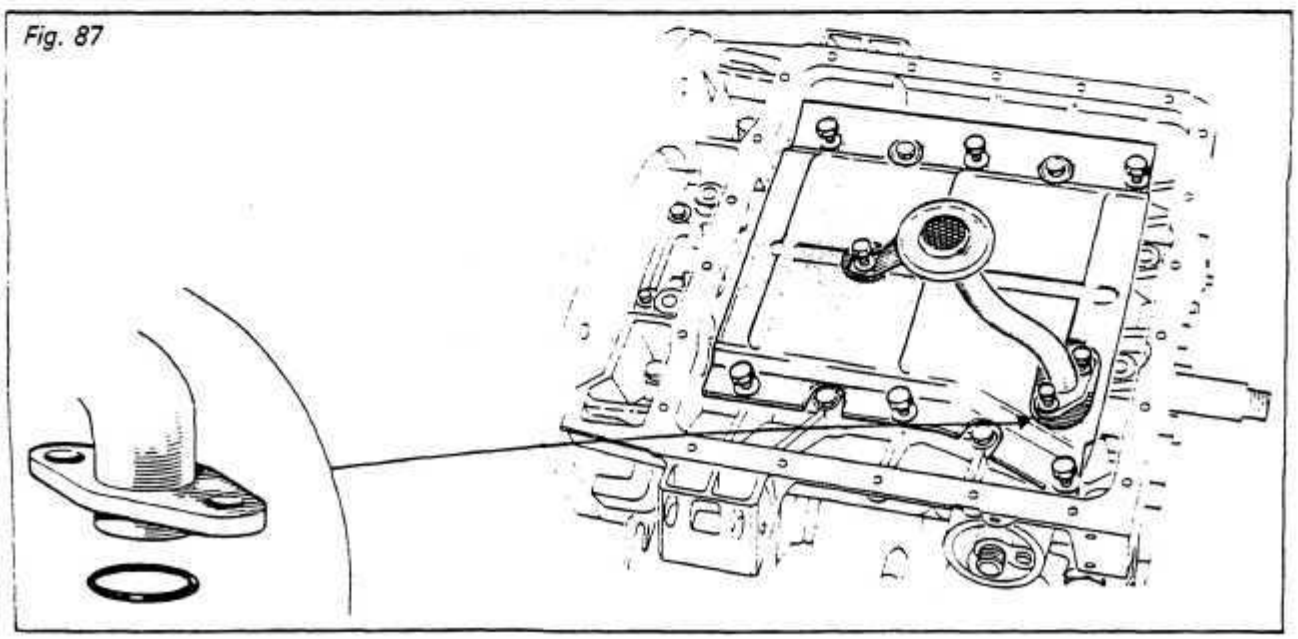


Fig. 85

REAR PLATE

Offer up the rear plate with its paper gasket. It is located laterally by dowel (A). Tighten bottom bolts (1) first followed by the 6 female capscrews. *(Fig. 86)*

Fig. 87



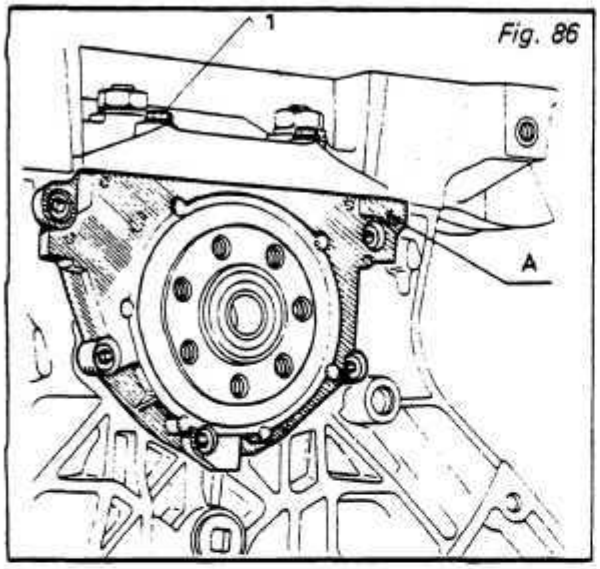


Fig. 86

Refit:
The anti-emulsion plate
The suction pipe fitted with a new "O" ring seal
A new cork gasket and the sump. *(Fig. 87)*

Turn engine over.

The crankshaft must be positioned as follows in order to set the valve timing.
Keyway vertical
No. 1 piston 15 mm (19/32") down its bore on the compression stroke (BTDC) to avoid the risk of contact with the valves. *(Fig. 88)*

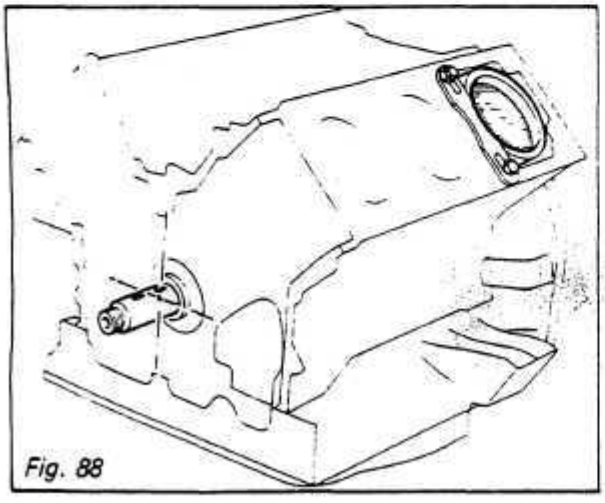


Fig. 88

FITTING CYLINDER HEADS
A—LH cylinder head: insert a pin punch into the side of each cylinder locating roll pin hole to prevent the latter being pushed down when the cylinder head is refitted. *(Fig. 89)*

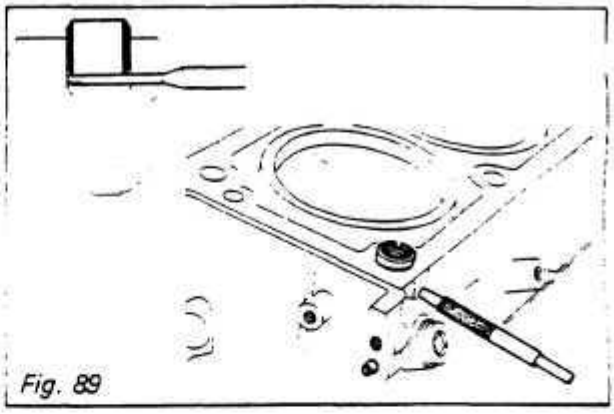


Fig. 89

Insert the roll pins and push them in until they rest on the pin punches.
Remove the liner clamps.
Fit the cylinder head gaskets dry.
Fit the cylinder head.
Line up the LH camshaft so that its slot (E) is positioned as shown. *(Fig. 90)*

This corresponds to the "on the rock" position of the rocker arms for No. 1 cylinder.
Remove the pin punches. Fit the rocker shaft assembly, taking care to place it the correct way.

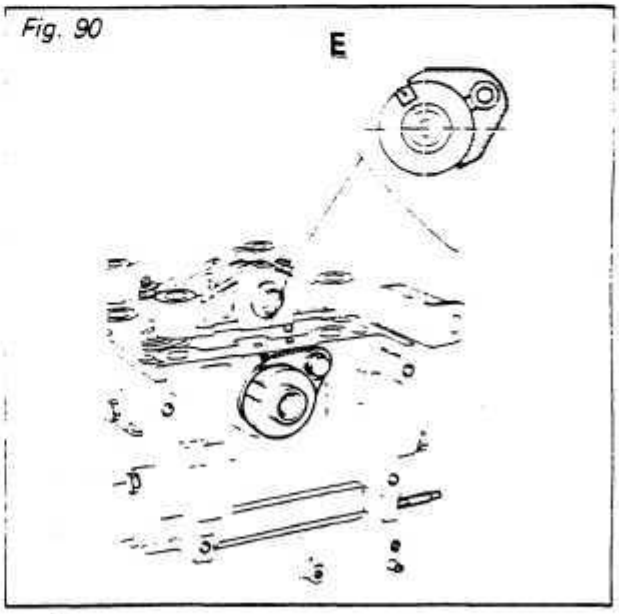


Fig. 90

A—RH cylinder head: carry out the same operation for the RH cylinder head. Line up the RH camshaft so that its slot (F) is positioned as shown. This corresponds to the "on the rock" position of the rocker arms for No. 6 cylinder. Fit the rocker arm assembly, taking care to place it the correct way round. *(Fig. 91)*

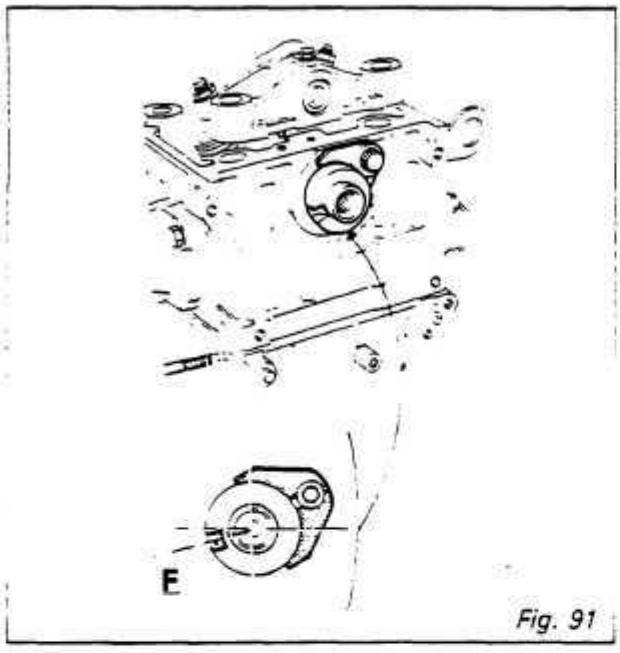


Fig. 91

Lubricate the cylinder head bolts and hand tighten them.

Torque tighten the cylinder heads on both banks.

Refit:
oil pressure switch
tensioner oil filter gauzes
both chain tensioners
the fixed shoes
tensioner blades
timing sprocket key and timing sprocket with timing mark facing outwards. *(Fig. 92)*

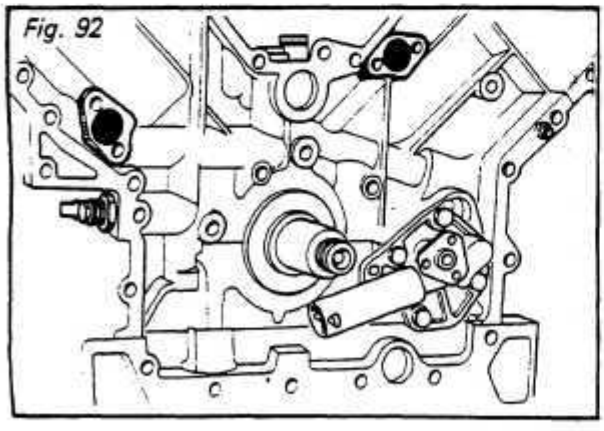


Fig. 92

VALVE TIMING LH SIDE

Turn the crankshaft clockwise so that the keyway centre lies on the centre line of the LH bank of cylinders. *(Fig. 93)*

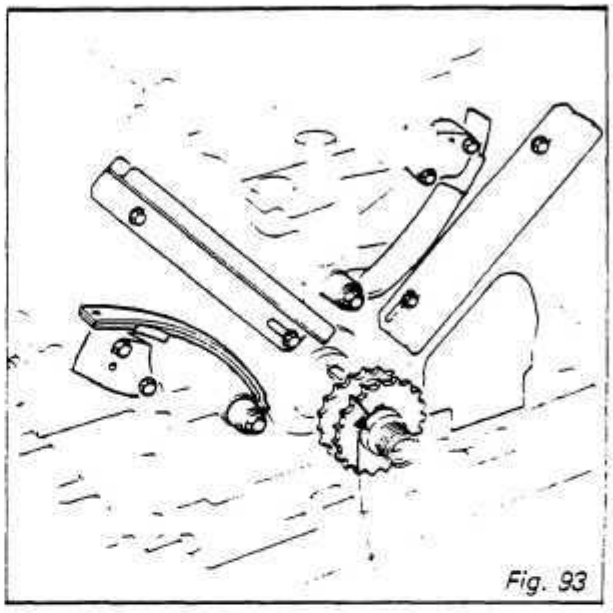


Fig. 93

Fit the timing chain to the LH sprocket, with the dual marking on the chain astride the timing mark on the sprocket.

Now fit the timing chain over the rear set of teeth on the timing double sprocket, with the single marking on the chain in line with the timing mark on the front of the double sprocket. *(Fig. 94)*

Fit the camshaft sprocket to the camshaft, taking care to ensure that the driving pin enters its slot.

Torque tighten the camshaft sprocket bolt while preventing the crankshaft from turning.

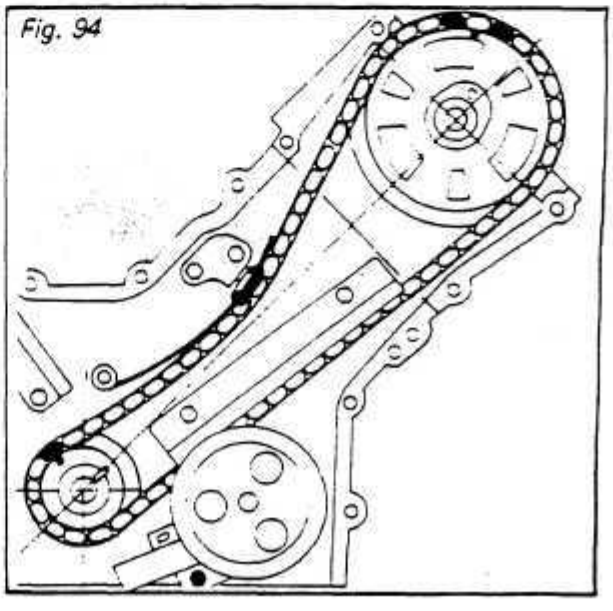


Fig. 94

VALVE TIMING RH

Turn the crankshaft through 150° (the timing mark on the crankshaft sprocket becomes in line with the oil pump cover bottom fixing bolt). *(Fig. 95)*

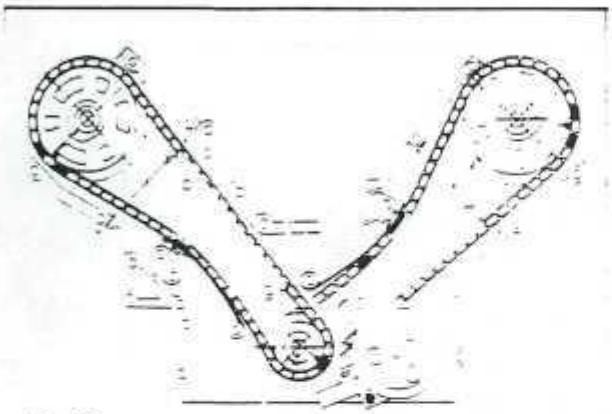


Fig. 95

Fit the timing chain to the RH sprocket, with the dual marking on the chain astride the timing mark on the sprocket.

Now fit the timing chain over the front set of teeth on the timing double sprocket, with the single marking on the chain in line with the timing mark on the front of the double sprocket. Torque tighten the camshaft sprocket bolt while preventing the crankshaft from turning.

Set both timing chain tensioners by turning the ratchet mechanism clockwise with a screw driver. Do not assist the tensioner to find their operational setting. *(Fig. 96)*

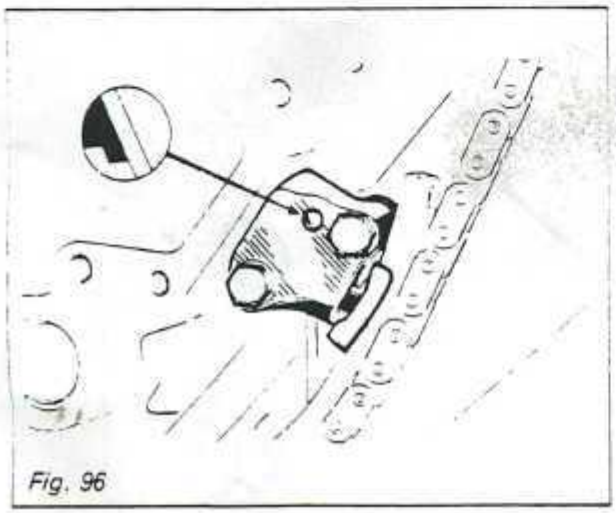


Fig. 96

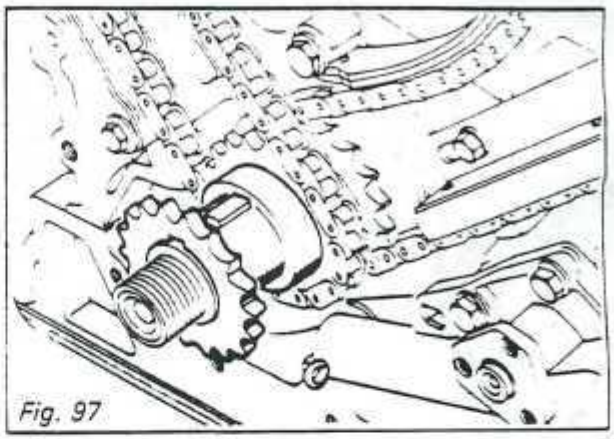


Fig. 97

Position the crankshaft with the keyway uppermost. *(Fig. 97)*

Refit:
The distance piece for the oil pump drive pinion,
The key,
And oil pump drive pinion,
The oil pump drive chain and sprocket, (assemble the bolts with loctite and torque tighten them. *(Fig. 98)*
The timing cover gaskets dry.
The timing cover (located by two dowels)
The fixing bolts (smear the bottom bolts with loctite)

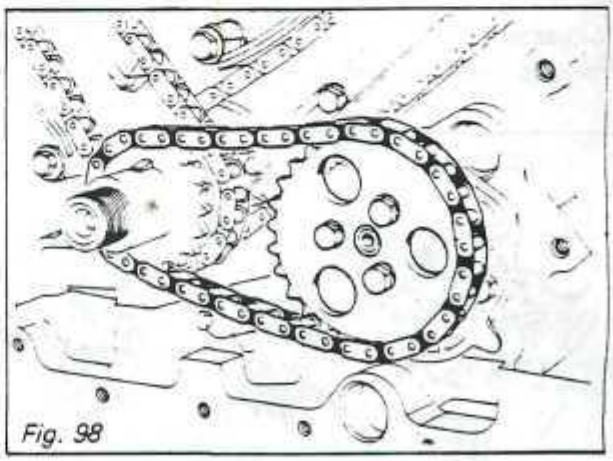


Fig. 98

Trim off the gaskets flush with the tops of the cylinder heads.

Refit:
The crankshaft pulley oil seal.
The pulley (oil seal bearing face lubricated). *(Fig. 99)*

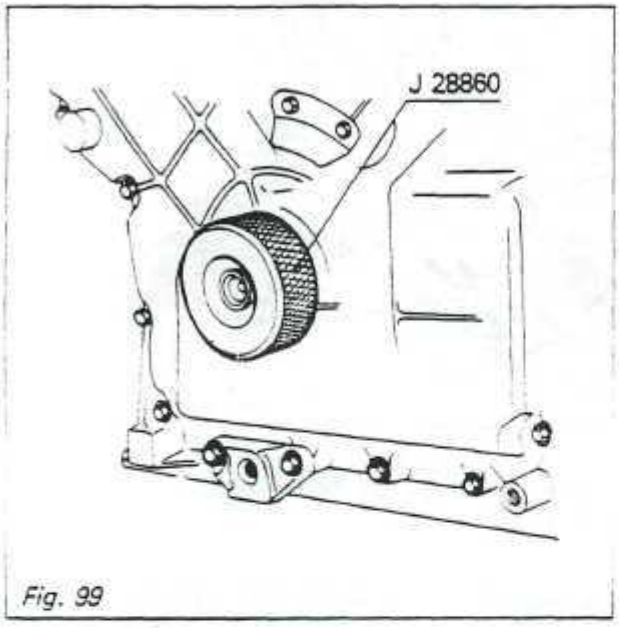


Fig. 99

Smear the crankshaft threads with loctite.
Prevent the crankshaft from turning.
Fit and torque tighten nut.

Refit:
The water pump complete with its hoses (inserting new "O" rings) *(Fig. 100)*

Insulating plates

Rubber seals round inlet tracts

Inlet manifold assembly

Alternator and its drive belt and distributor and leads

Adjust rocker arm clearances. Fit the rocker covers and spark plugs.
Remove the engine from the support.
Fit and tighten
the cylinder block drain plugs
and new oil filter (after injecting some oil through hole (A) to prime oil pump) *(Fig. 101)*

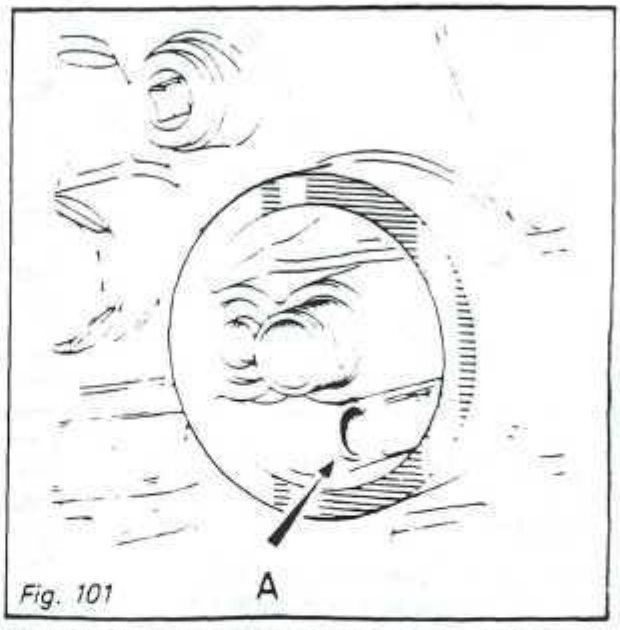


Fig. 101

Fit the main bearing oil seal using tool J28861
Fit the flywheel or convertor driving plate.
The final bolts are of the self locking type and they must be renewed after each dismantling; smear the threads with loctite.
Refit the dipstick tube smeared with loctite.

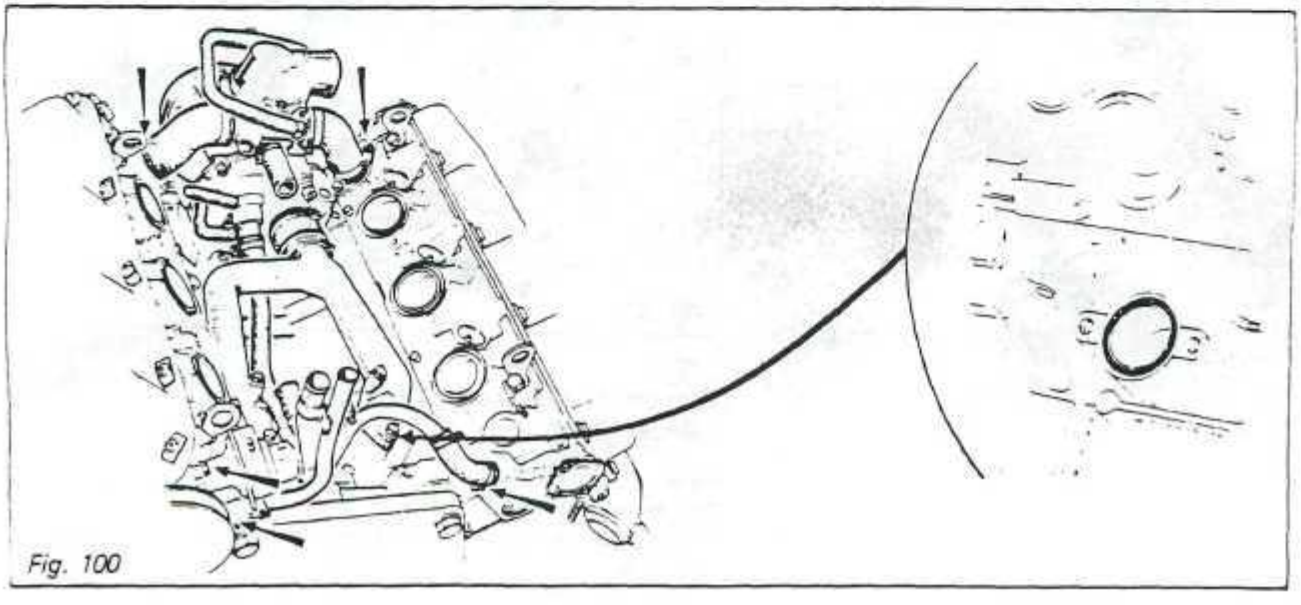


Fig. 100

Refit the engine to the vehicle.

Fill
The engine with oil
The cooling system
Adjust the controls, ignition and fuel injection.

Then run the engine for 30 minutes. Allow it to cool down for at least two hours, then re-tighten the cylinder heads.

Loosen bolt No. 1 and re-tighten it to 15 lb/ft (20mm). Repeat the above on each bolt in the order shown. *(Fig. 102)*

Slip graduated disc over the socket before fitting the torque wrench and angular tighten to 115°.

Repeat for each bolt in the order shown.

Adjust valve clearances.

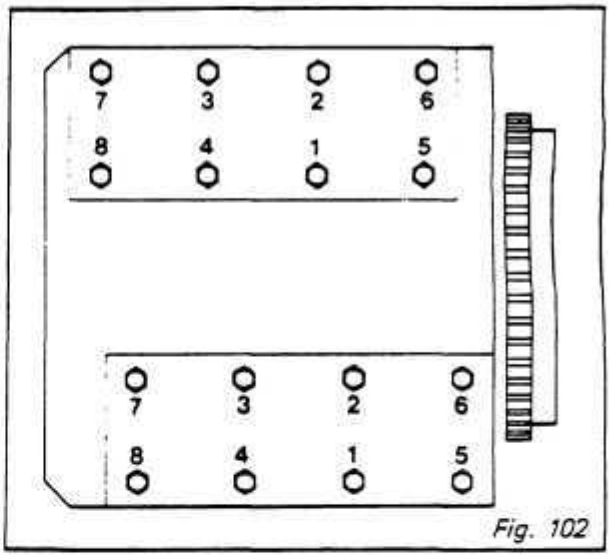


Fig. 102

Main Bearing Oil Seal—Flywheel End—Changing

REMOVING

Remove
the gearbox or automatic transmission
the clutch mechanism and disc if applicable
flywheel or convertor driving plate *(Fig. 103)*
Ease the oil seal out with a screw driver.
Special points concerning refitting.
Lubricate the new oil seal and insert it in the tool. J28861

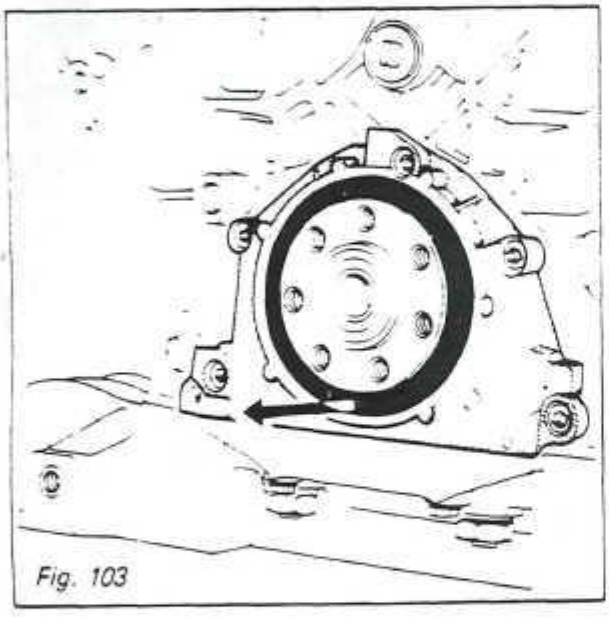


Fig. 103

Take extreme care when fitting as the oil seal lip is delicate.
Locate the seal by tapping on the end of the tool. (Fig. 104)

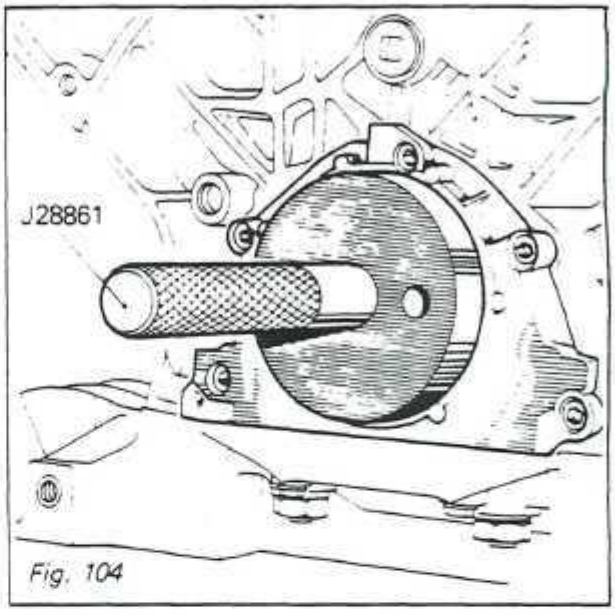


Fig. 104

Remove the tool by pulling and turning at the same time.
Smear the new bolts for the flywheel or convertor driving plate with loctite.
Note: Place one plate (A) on each side of the convertor driving plate. *(Fig. 105)*

Torque tighten bolts.
Convertor driving plate fixing bolts 50 lb/ft (68 mm).
Flywheel fixing bolts 45 lb/ft (60 mm).

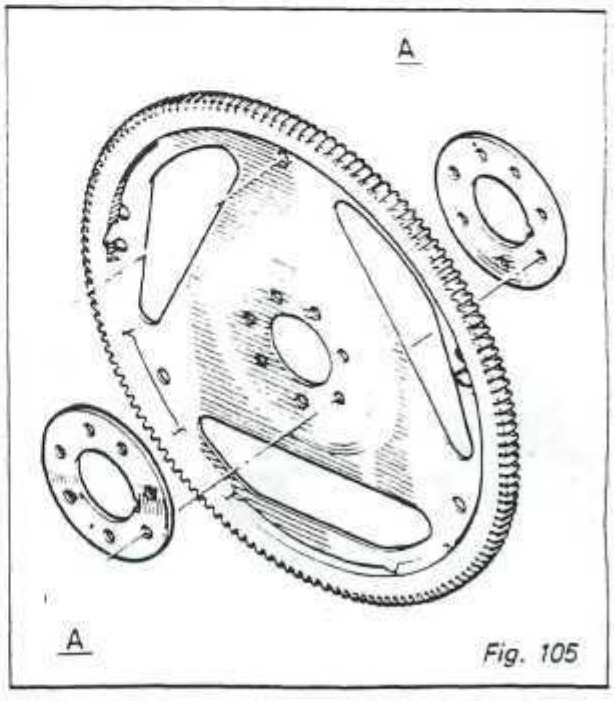


Fig. 105

Main Bearing Oil Seal—Timing Gear End—Changing

REMOVING

Remove
alternator drive belt
air conditioning drive belt
exhaust muffler
Rotate crankshaft until TDC timing mark on pulley is straight up. *(Fig. 106)*

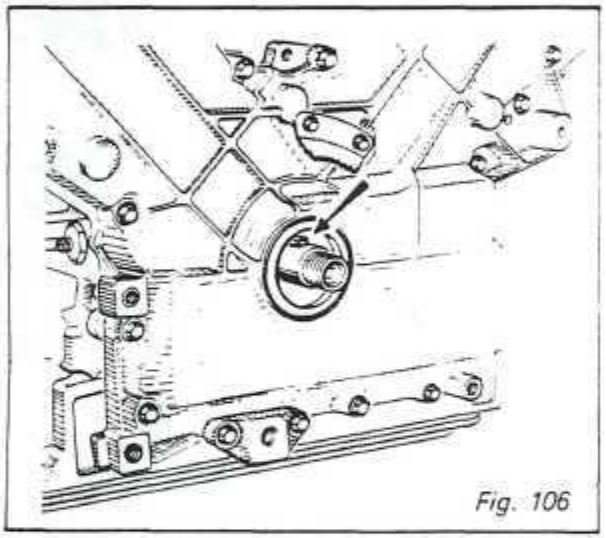


Fig. 106

Remove crankshaft pulley nut. Remove pulley. Extract the old oil seal with a screw driver; do not mark the oil seal location.

REFITTING

Lubricate the new seal, fit it to inserting tool J28860—offer up tool and seal, push the tool in until it contacts the timing cover which locates the oil seal correctly. *(Fig. 107)*

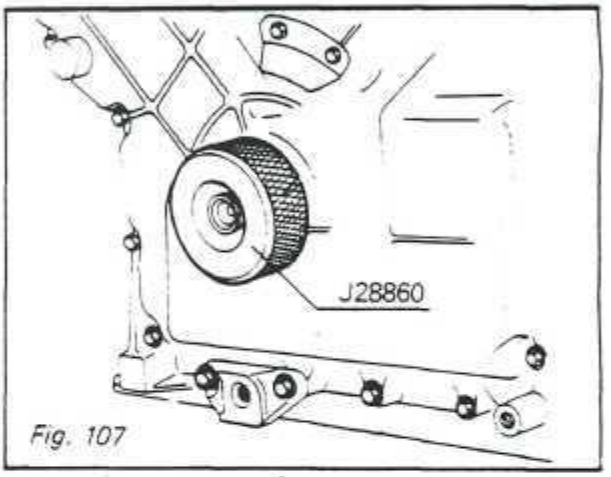


Fig. 107

Check the oil seal locating on the old pulley. Fit a new pulley if the old pulley is marked or worn; make sure it enters the key.
Smear the bolt with 1 or 2 drops of loctite and torque tighten the nut to 135 lb ft (183 nm).
Refit
exhaust muffler
alternator drive belt
air conditioning drive belt and tension

Oil Pump—Overhauling

REMOVING

Drain engine oil
Remove
alternator drive belt tensioner
air conditioning drive belt
air conditioning compressor
air filter
and rocker covers

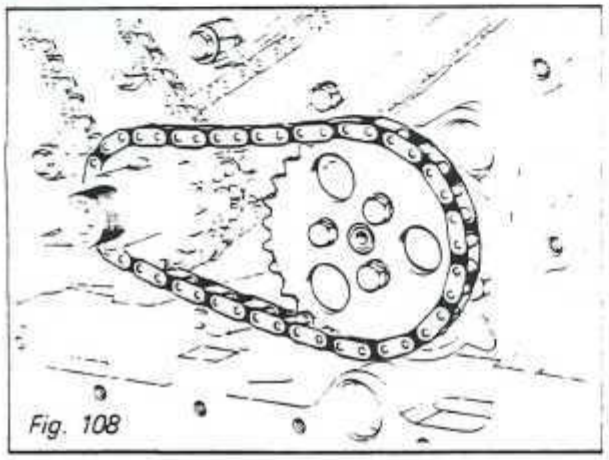


Fig. 108

Remove
exhaust muffler
crankshaft pulley nut
crankshaft pulley
and timing cover
Remove
the sprocket and chain *(Fig. 108)*
oil pump cover (never unstick the cover by tapping the release valve boss) (A) *(Fig. 109)*
and driven gear

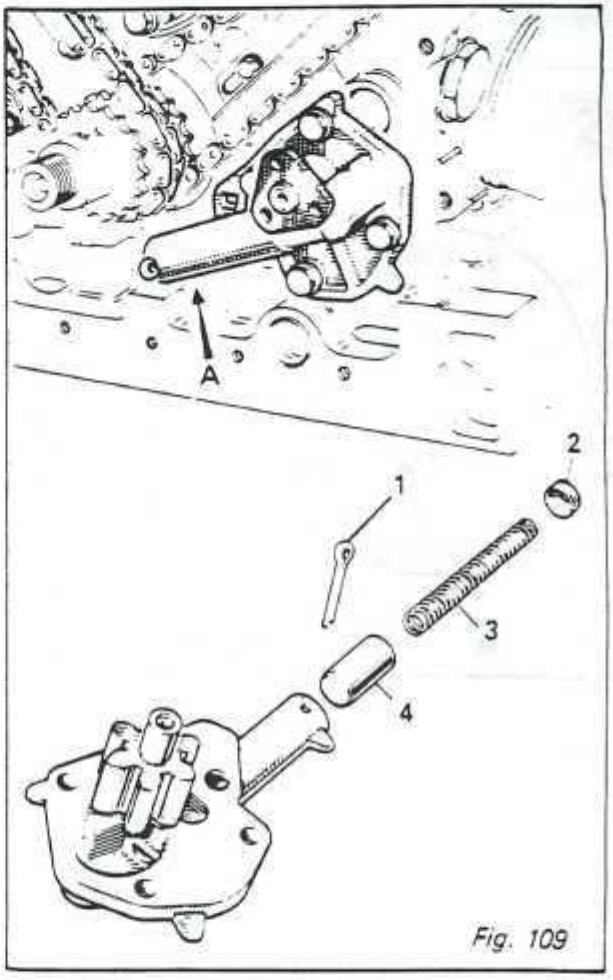


Fig. 109

DISMANTLING

Remove the split pin (1) and take out
the concave spring seat (2)
spring (3)
and release valve plunger (4)

OVERHAULING

Check
condition of components;
and location in cylinder block. *(Fig. 110)*

The complete oil pump assembly must be changed if any particular part is worn.

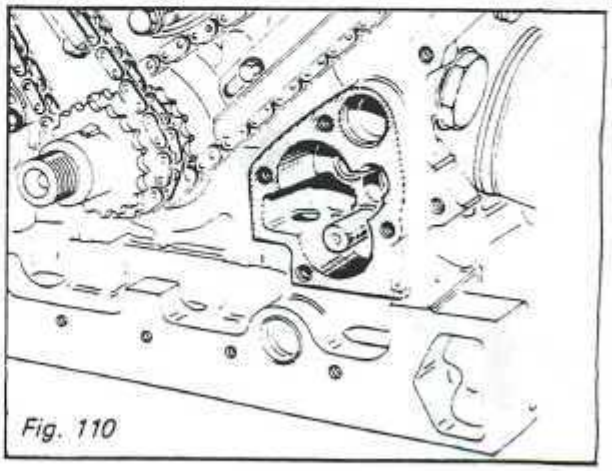


Fig. 110

REFITTING

Check oil pump rotation.
Make sure that the release valve plunger and spring seat are inserted the correct way round.

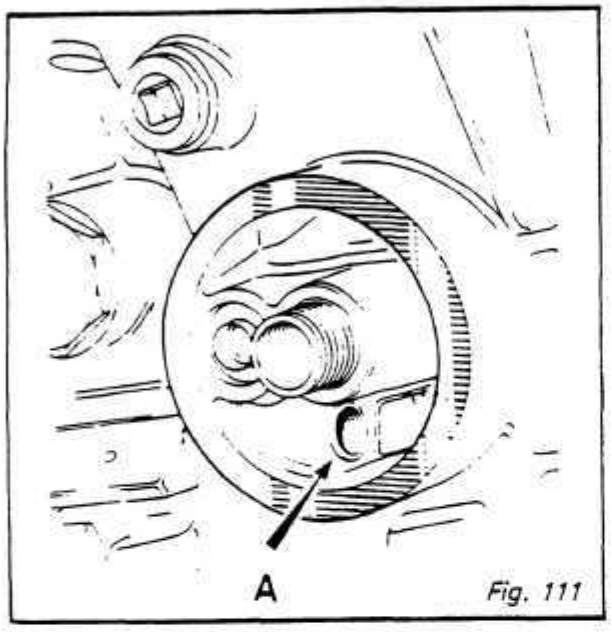


Fig. 111

SPECIAL POINTS CONCERNING REFITTING

Fit in position
the drive gear
and oil pump cover; tighten the driving plate bolts progressively to make sure that pump gears revolve freely.

Remove the oil filter and inject some engine oil through hole (A) with an oil can to prime the oil pumps. *(Fig. 111)*
Fit the oil pump sprocket bolts and the timing cover bottom bolts with loctite.
Torque tighten the pulley nut after smearing the crankshaft threads with loctite.

Refit
alternator drive belt and tension
rocker covers
air conditioning compressor
air conditioning drive belt and tension
exhaust muffler
Fill engine with correct quantity of recommended oil.
Make all necessary adjustments.

Oil Pressure Checking — Fig. 112

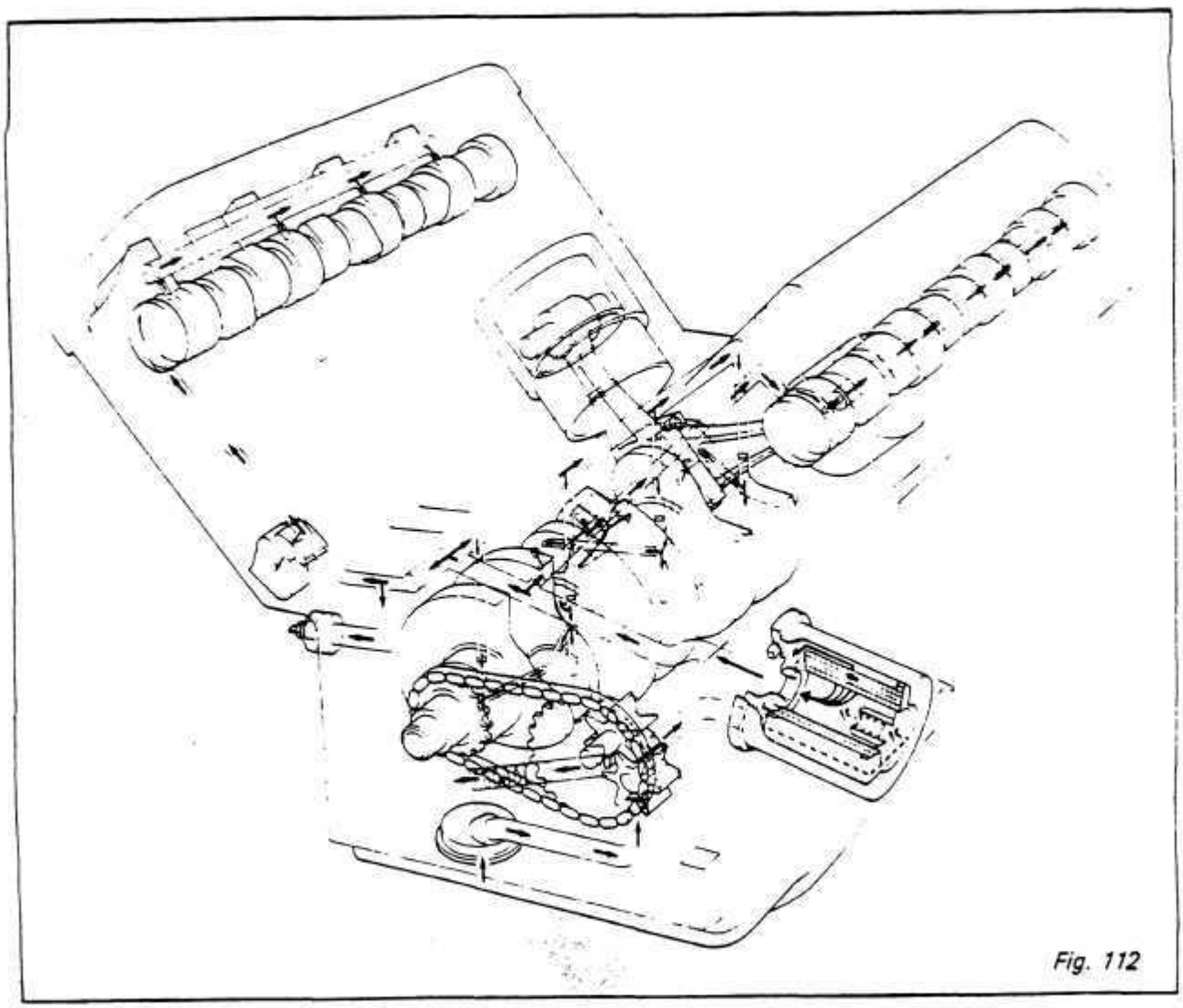


Fig. 112

The engine oil pressure must be checked when the engine is hot (80°C).
The oil pressure is to be checked using tools J28872 and J28873. *(Fig. 113 and 114)*

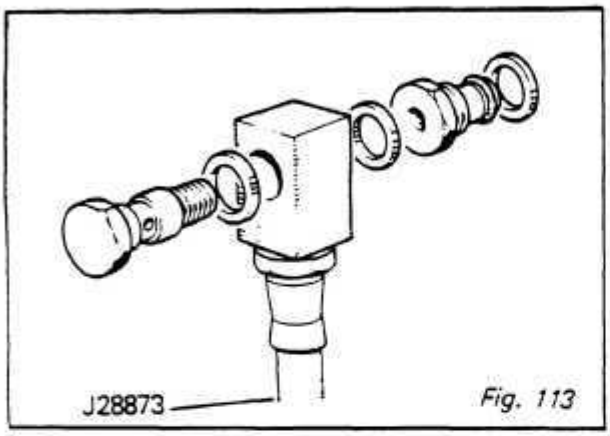


Fig. 113

Remove oil pressure sender then connect oil pressure checking gauge.
The oil pressure should be
32 psi (2,0 bars) min at 900 rpm
65 psi (4,4 bars) min at 4000 rpm

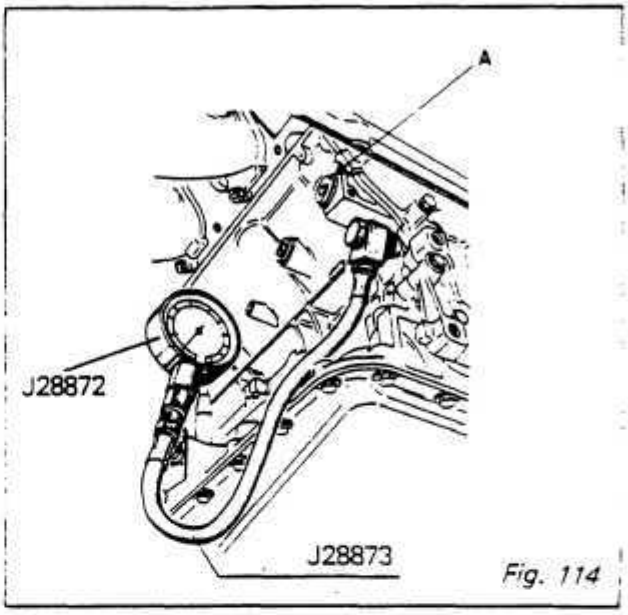


Fig. 114

Refit
the oil pressure sender using a new copper washer and top up engine oil if required.

Water Pump

REMOVING

Remove
intake manifold
alternator and A/C
drive belts
Loosen hose clamps securing water pump and heater hoses. *(Fig. 115)*

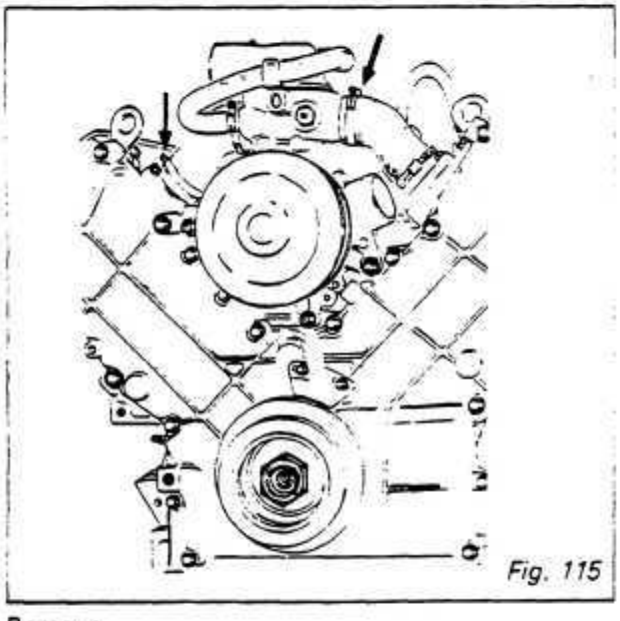


Fig. 115

Remove
coolant temperature switch wire.
water pump mounting bolts.
Remove water pump.

Remove
water pump body *(Fig. 116)*
coolant temperature switch
thermostat cover
and thermostat

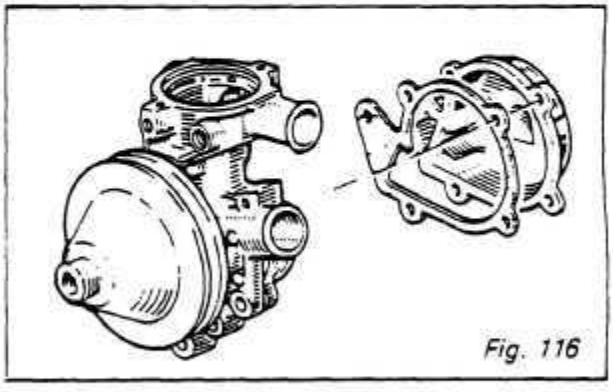


Fig. 116

FITTING

Clean the joint faces before fitting new gaskets.
Fit the thermostat to its cover the right way round. *(Fig. 117)*

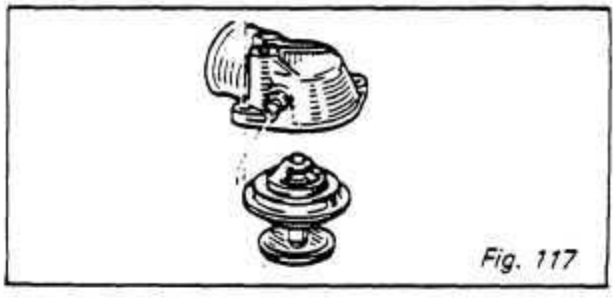


Fig. 117

Check that "O" rings are in position in the inlet manifold.

Tighten all hose clamps.

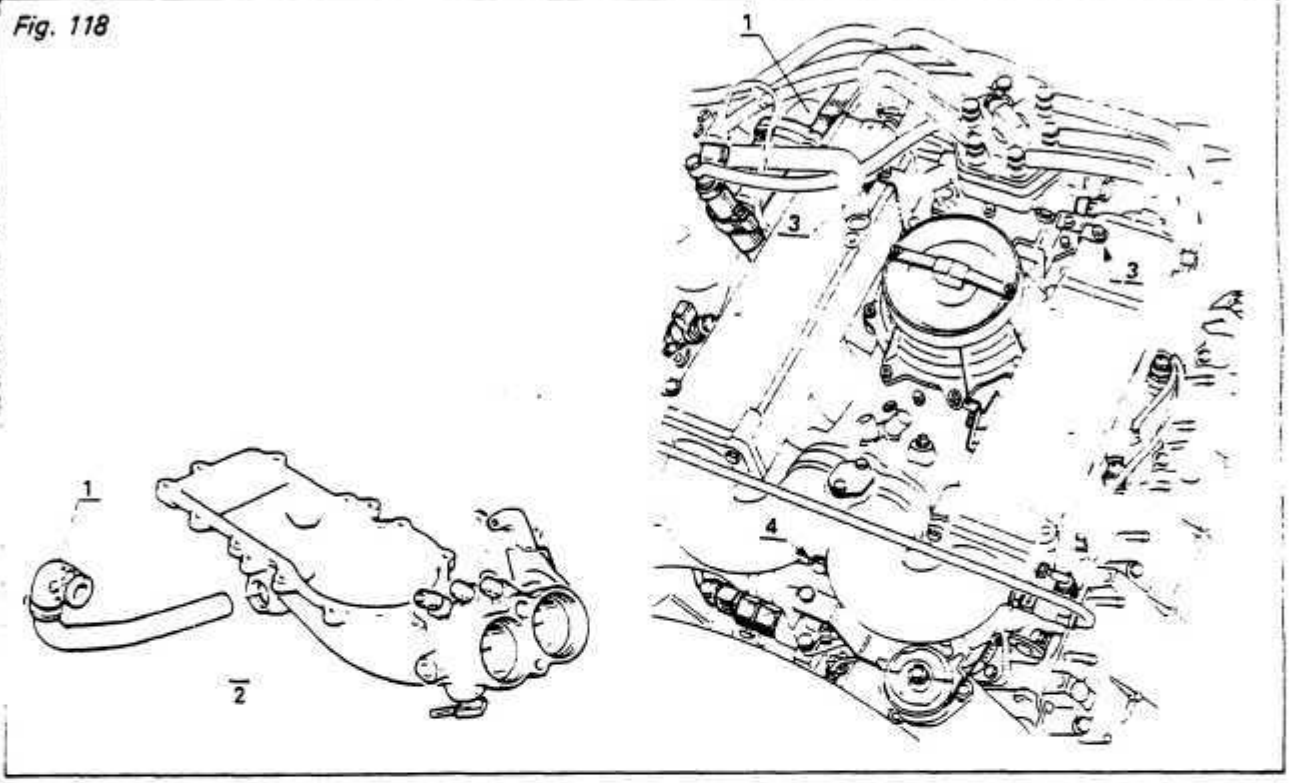
Refit alternator and A/C drive belts and tension.

Refit intake manifold.

Fill the cooling system.

Inlet Air Manifold

Fig. 118



LOWER AIR CASING

REMOVING

Remove air filter assembly. Unscrew the fuel unions on the fuel metering head.

Loosen the hose clip connecting air inlet pipe (1) to the idle speed control. *(Fig. 118)*

Turn the pipe to free the idle speed control hose and pull to release it from the lower air casing.

The pipe is assembled with an "O" ring (2) in the lower air casing for sealing purposes.

Remove idle speed control. Unscrew the 2 capscrews (3) and bolt (4) holding the lower air casing to the inlet manifold.

Disconnect arm (5) *(Fig. 119)* from the throttle linkage ball as follows: —

— rotate clip half a turn to free it then slide it along ⅜" to unlock the ball.

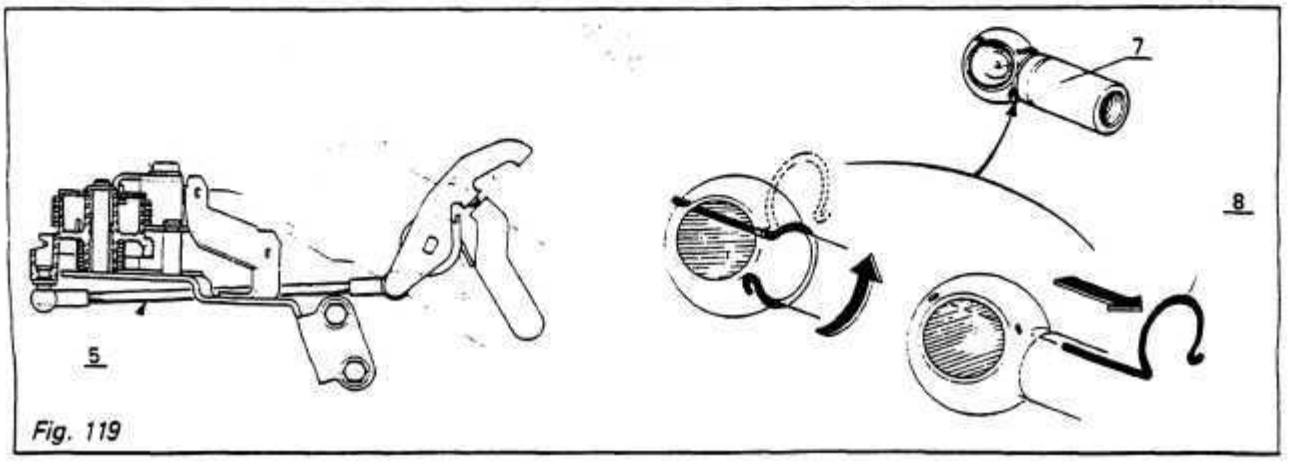


Fig. 119

NOTE: The arm has LH and RH threaded ends to assist adjustment.

The LH threaded end is identified by a groove (7) on the ball joint. Disconnect the HT wires from the distributor.

Free the lower casing rearwards to clear the air intake elbow rings and lift it at the back to pass over the distributor cap. Remove the lower casing and disconnect the vacuum pipes on the distributor.

REFITTING

Change all seals. There is a plastic seal at the elbow end of the air channel and an "O" ring at the lower casing end in the connecting rings.

Connect up the vacuum pipes.

Offer up the casing.

Screw in bolt (4) first to enable capscrews (3) to line up with their holes.

Tighten bolt (4) then capscrews (3). *(Fig. 118)*

Re-connect

The HT wires to the distributor cap
All fuel unions
The idle speed air pipe, after greasing the "O" ring in the lower casing
The idle speed control
The throttle arm ball joint, locking it correctly with the clip (8) *(Fig. 119)*

INLET AIR MANIFOLD

REMOVING

Remove lower air casing (see preceding page).
Unscrew the 4 manifold bolts (1). *(Fig. 120)*

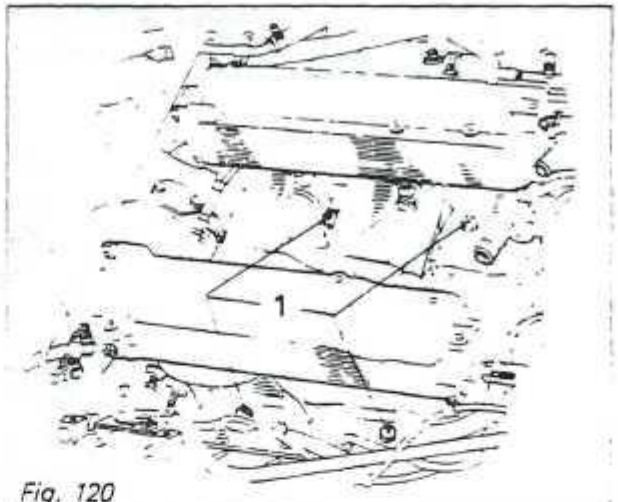


Fig. 120

REFITTING

Note the following

Change all gaskets and seals
Fit inlet sleeves
Reconnect the distributor vacuum pipe
Fit the fuel metering head/air flow meter in place
Remember to pass the control arm under the bracket
Screw the inlet sleeve bolt in a few threads so as to be able to lift up the back of the air flow meter to avoid the distributor cap
Screw in bolt (42) first parrly to line up capscrews (41) then tighten first

REFIT

The auxiliary air pipe
The throttle arm
Fuel pipes
Injectors
HT wires
Oil fume rebreathing and vacuum pipes
Connections
Idle speed control

Radiator

ENGINE COOLING

The vehicle has two (2) electric fans for radiator cooling mounted at the front of the vehicle. These fans are activated when the engine coolant temperature exceeds 97°C (206°F) and deactivated at 91°C (195°F). Operation of these fans is controlled by a temperature switch located on the coolant return pipe in the engine compartment.

The water pump, located at the rear of the engine, is belt driven by the crankshaft pulley. The thermostat is housed in the top of the water pump under the thermostat housing cover. The thermostat · :sing cover is equipped with an air bleed screw used to purge the air from the coolant system when refil

Coolant leaving the engine is directed through a series of pipes and hose couplings along the left side of the vehicle centre tunnel to the radiator. Coolant leaving the radiator is directed through a series of pipes and hose couplings along the right side of the vehicle centre tunnel to the engine.

The coolant expansion tank (fill point) located on the right side of the engine compartment, is connected to the coolant return pipe by a hose.

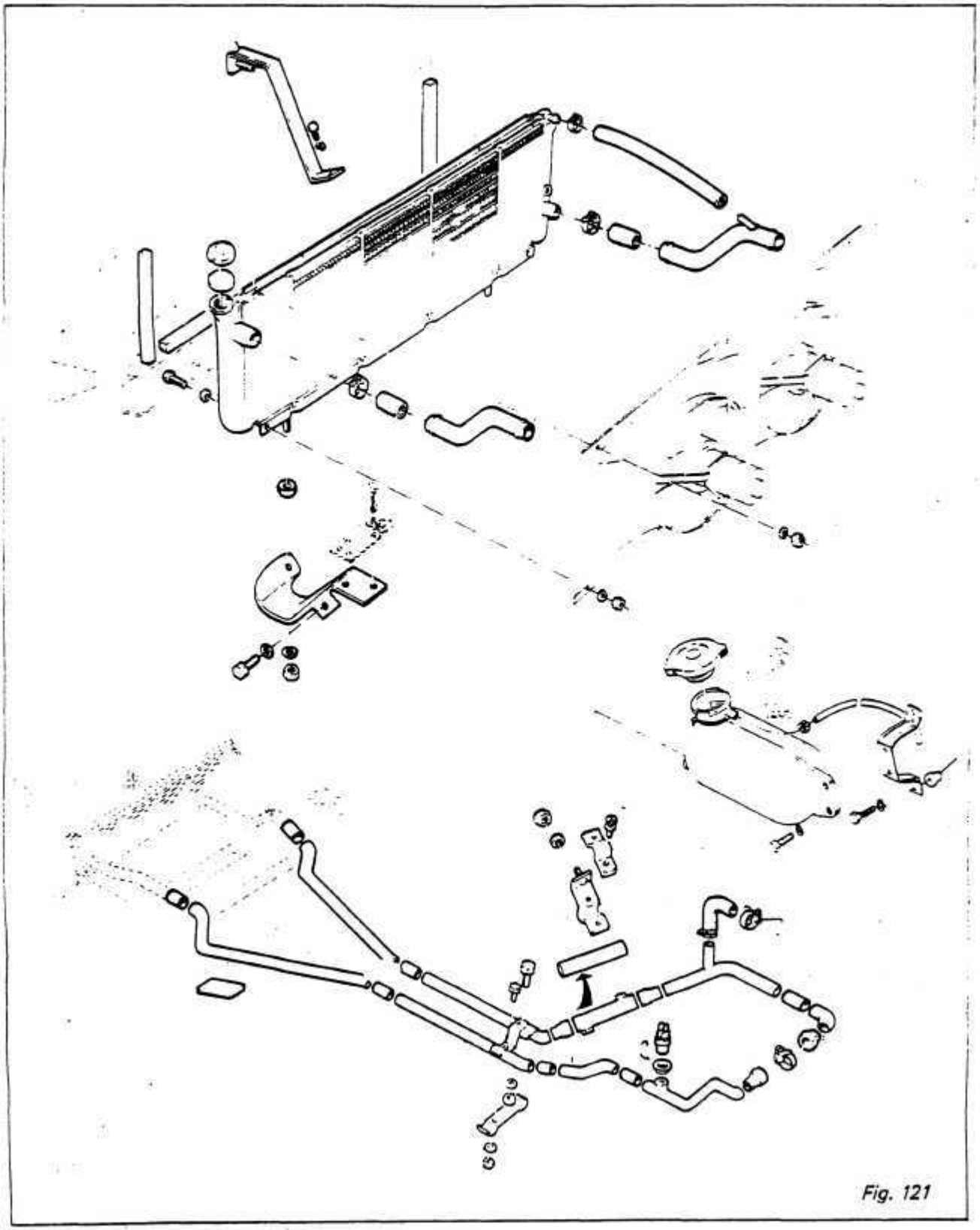


Fig. 121

Radiator

REMOVING

Release the radiator bottom hose connection and drain coolant, also release the outlet breather pipe connection from the RH top of the radiator.

Release the radiator top hose connection.

Release all screws securing the radiator air duct to the body and spoiler and withdraw duct downwards.

Remove the nuts, washers and rubber mountings securing the radiator to the lower support brackets.

Disconnect both horn leads. Remove three bolts securing each lower support bracket and horn bracket to frame and whilst providing alternative support for the radiator assembly, remove support brackets and horns with brackets.

With radiator assembly supported, remove each bolt securing radiator top support to frame.

Manoeuvre the radiator assembly sufficiently to gain access to and release nut securing each top support strut to radiator assembly. Remove brackets.

From top of radiator remove central nut and bolt securing fan housing to radiator and two nuts securing condenser.

From lower edge of radiator remove three nuts and bolts securing fan housing and two nuts securing condenser.

Ease condenser forwards and disengage mounting studs from radiator downwards between condenser and fan housing and remove.

Provide temporary support for condenser and fan housing.

REFITTING

With the fan housing assembly and condenser supported in position, insert the radiator between and engage the condenser mounting studs in the radiator top and bottom flanges. Fit nuts to all four studs.

Secure fan housing assembly to radiator with a central nut and bolt in the top flange, and three nuts and bolts along the bottom flange.

Secure the radiator top support struts to radiator assembly with nuts.

Ensure foam strip is fitted to underside of body, to about top of radiator assembly.

Raise the radiator assembly into position and secure top struts to frame with two bolts.

Check rubber bushes are fitted to radiator bottom studs before fitting lower support brackets onto studs and securing, with horn brackets, to frame using three bolts each side.

Fit second rubber bush, washer and nut onto each radiator bottom stud. Do not over-tighten nuts.

Connect horn leads. Slide radiator duct into position and secure with screws to body and spoiler.

Refit top hose, bottom hose and outlet breather pipe to radiator.

Refill cooling system with correct coolant mixture.

Fuel, Emission and Exhaust System

CONTENTS

FUEL INJECTION—GENERAL DESCRIPTION D:01:01

SPECIFICATIONS D:02:01

SPECIAL TOOLS D:03:01

EMISSION CONTROL SYSTEM D:04:01

IDLE SPEED CONTROL SYSTEM D:05:01

EVAPORATIVE EMISSION CONTROL SYSTEM D:06:01

AIR INLET SYSTEM D:07:01

IGNITION VACUUM ADVANCE CONTROL D:08:01

DECELERATION CONTROL D:09:01

REMOVING—REFITTING EXHAUST MUFFLER D:10:01

FUEL INJECTION—GENERAL DESCRIPTION

SYSTEM DESCRIPTION

The De Lorean is equipped with the Bosch K-Jetronic fuel injection system. This form of fuel induction by means of manifold injection permits the optimum adaptation of the air-fuel mixture to every operating phase of the engine. The K-Jetronic system ensures a lower pollutant level in the exhaust gas, high performance and increased fuel economy.

The K-Jetronic is a mechanical continuous fuel injection system which does not require any form of drive mechanism. An electric fuel pump mounted inside the tank provides fuel at a constant pressure to the mixture control unit. The control unit consists of an air flow sensor which measures the flow of air entering the engine, and a fuel distributor which is mechanically operated by the air flow sensor. The fuel distributor provides the injection valves with the correct amount of fuel. The fuel is injected into the inlet manifold immediately upstream of the intake valve. Injection takes place continuously, that is, without regard to the position of the intake valve. During the intake valve closed phase, the fuel is stored in the intake tubes of the manifold.

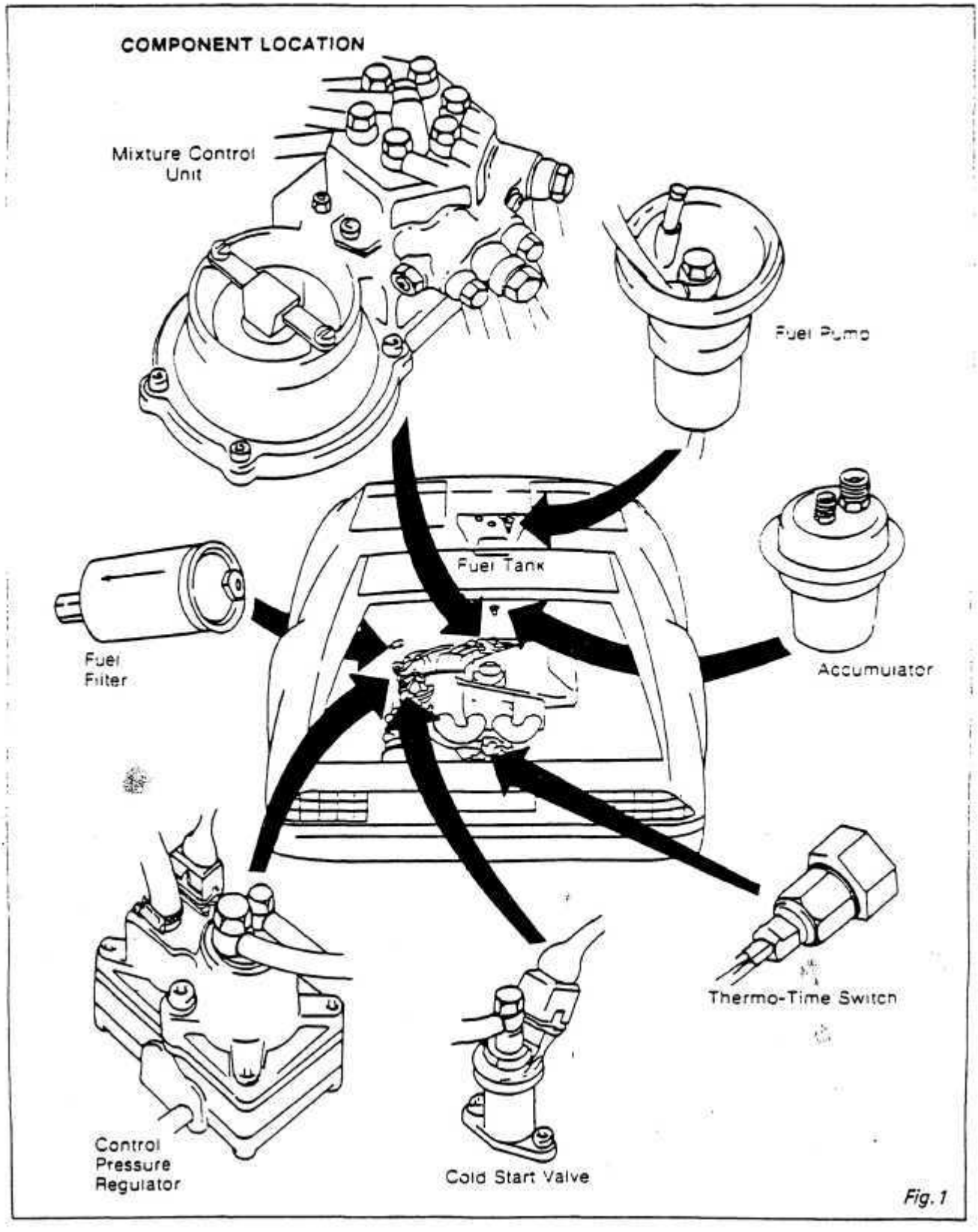
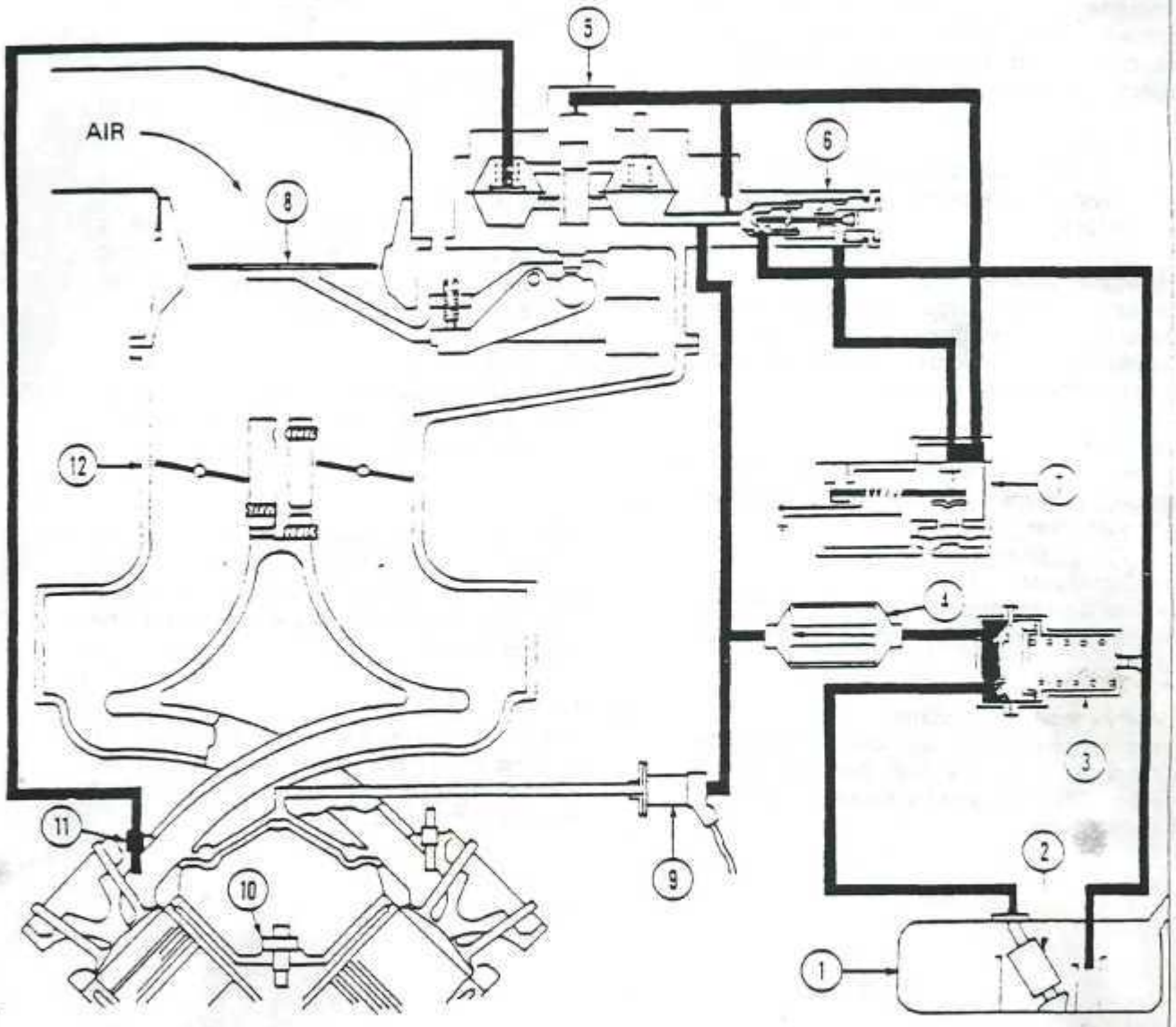

COMPONENT LOCATION
Mixture Control Unit
Fuel Pump
Fuel Tank
Fuel Filter
Accumulator
Thermo-Time Switch
Control Pressure Regulator
Cold Start Valve

Fig. 1

Fig. 2



1 FUEL TANK
2 FUEL PUMP
3 FUEL ACCUMULATOR
4 FUEL FILTER
5 FUEL DISTRIBUTOR
6 PRIMARY PRESSURE REGULATOR
7 CONTROL PRESSURE REGULATOR
8 AIR FLOW SENSOR
9 COLD START VALVE
10 THERMO-TIME SWITCH
11 INJECTORS
12 THROTTLE VALVES

D:01:04 Fuel, Emission and Exhaust System

COMPONENTS AND DESCRIPTION

1. Fuel Tank
   A moulded plastic fuel tank is located in the front wishbone of the frame. Access to the tank components is gained by removing the inspection panel inside the trunk.

2. Fuel Pump
   An electric rotary pump is used to provide fuel for the system. The pump is mounted inside the fuel tank.

3. Fuel Accumulator
   The accumulator keeps the system under pressure when the pump is not running. The accumulator is mounted inside the rear section of the frame backbone.

4. Fuel Filter
   A special filter is used to remove foreign particles from the fuel. The filter is mounted on the left rear frame rail.

5. Fuel Distributor
   The fuel distributor determines the necessary volume of fuel to be delivered to each injector.

6. Primary Pressure Regulator
   The primary pressure regulator controls the primary or main line fuel pressure in the system. The regulator is located inside the fuel distributor.

7. Control Pressure Regulator
   The control pressure regulator provides fuel enrichment during warm up and cold acceleration. The regulator is mounted on the left valve cover.

8. Air Flow Sensor
   The air flow sensor measures the amount of air entering the engine.

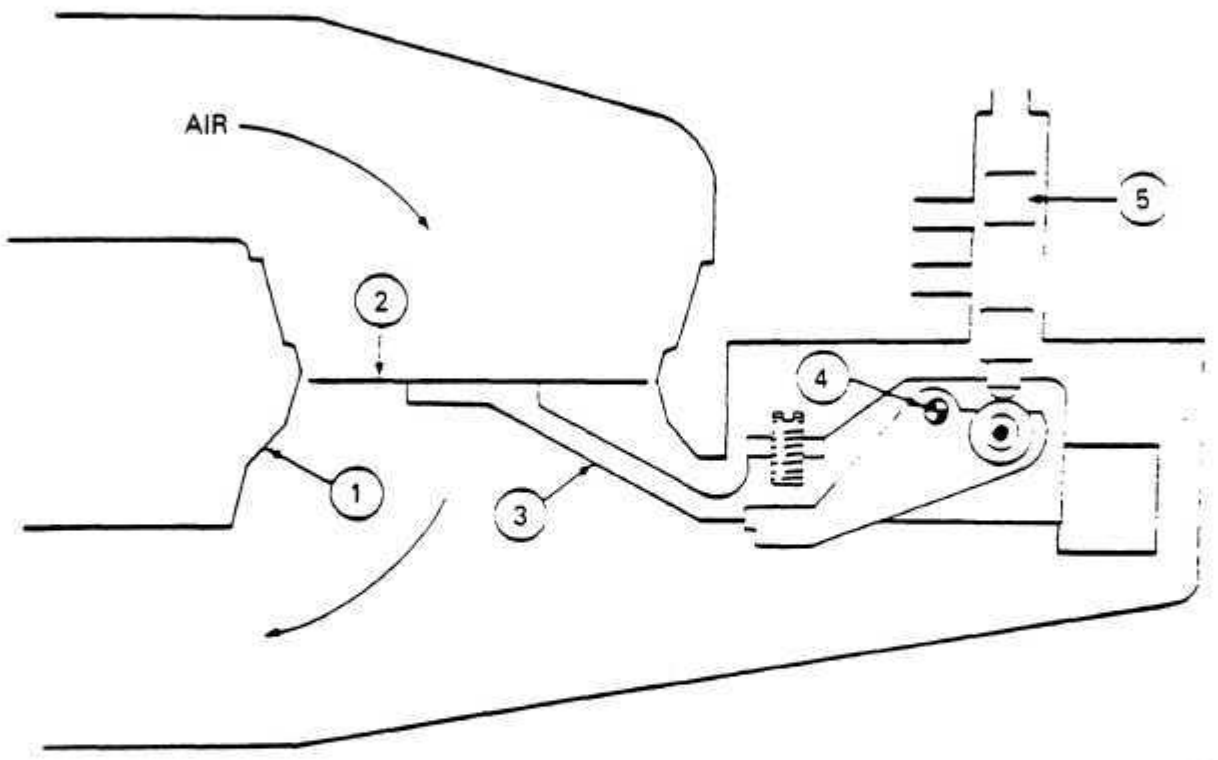
9. Cold Start Valve
   An electrically operated cold start valve is used to supply extra fuel to the engine during cold start conditions. The valve is mounted on the left side of the engine.

10. Thermo-Time Switch
    The thermo-time switch regulates injection time of the cold start valve. The switch is mounted in the thermostat housing.

11. Injectors
    The injectors are always open when the engine is running. Their main function is to atomize the fuel as it enters the intake chambers. The injectors are mounted in the cylinder heads.

12. Throttle Valves
    The throttle valves control the amount of air entering the engine. The throttle valves are located between the mixture control unit and the intake manifold.

SYSTEM OPERATION

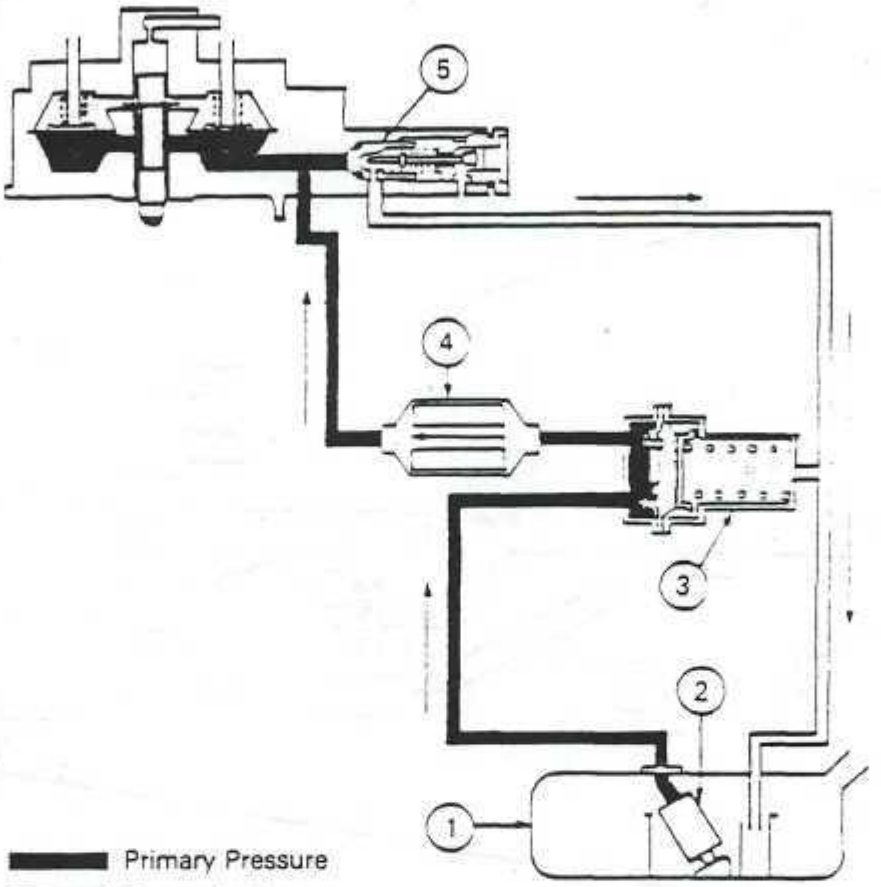


1 Air Funnel
2 Air Flow Sensor Plate
3 Balanced Lever Assembly
4 Pivot
5 Control Plunger

Fig. 3

AIR MEASUREMENT

The amount of air entering the engine is controlled by the throttle valves, engine speed, and engine load. Air flowing through the air funnel (1) moves the sensor plate (2) downward in direct proportion to the air volume. This movement is transferred by the balanced lever assembly (3) to the control plunger (5) located in the fuel distributor. *Fig. 3.*



1 Fuel Tank
2 Fuel Pump
3 Accumulator
4 Filter
5 Primary Pressure Regulator

Fig. 4

PRIMARY PRESSURE CIRCUIT

An electric fuel pump (2) runs constantly during cranking and when the engine is running. It supplies fuel to the lower chambers of the fuel distributor. Any fuel that is not used, returns to the fuel tank by passing through the primary pressure regulator (5).

The primary pressure regulator controls main line fuel pressure. If the main line pressure increases above a pre-set value, the pressure forces the regulator open. This allows fuel to return to the tank, maintaining a constant main line pressure. *Fig. 4.*

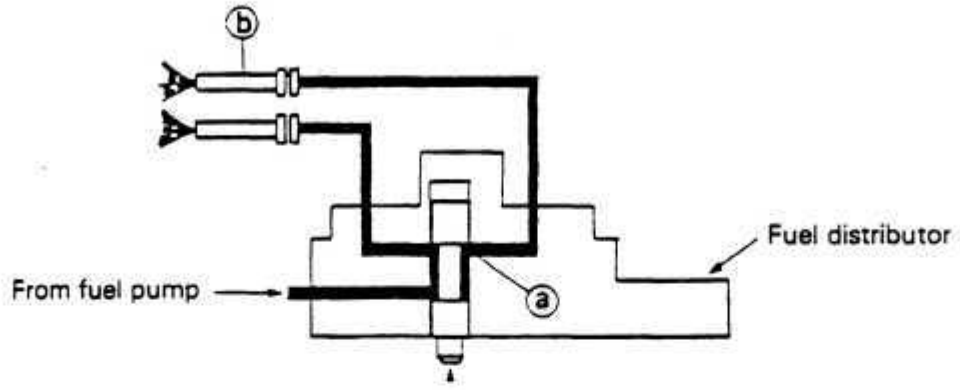


Fig. 5

FUEL DISTRIBUTION

Sensor plate movement causes the control plunger to move within a barrel containing one metering slot (a) per cylinder. As the control plunger rises, it allows an increased amount of fuel to be delivered to each injector (b) through the metering slots. The amount of fuel to the injectors is constantly controlled by the control plunger moving in relation to the amount of air entering the engine. *Fig. 5.*

In the actual fuel distributor, there are six chambers that are separated by a diaphragm (c). The lower chambers (a) are connected together and the upper chambers (b) are separated with each one containing a pressure differential valve. The pressure differential valves (d) ensure that each cylinder will receive the same volume of fuel as the control plunger rises or lowers. *Fig. 6.*

If the primary pressure decreases, the pressure regulator will close by opposing spring tension and restrict the amount of fuel returning to the tank. The movement of this regulator valve will maintain constant main line pressure and distributor lower chamber pressure regardless of engine fuel requirements or voltage fluctuations at the fuel pump. Main line pressure is regulated at approximately 5.2 Bar (75.4 PSI). The pump continuously circulates approximately 29 gallons of fuel per hour through the system.

The fuel accumulator (3) will charge during the first seconds of operation. this charging process will dampen initial fuel pump surge. when the engine is shut down, several check valves close throughout the system and prevent fuel from returning to the tank. The accumulator maintains pressure in the fuel system to prevent fuel vaporisation while the vehicle is not in use.

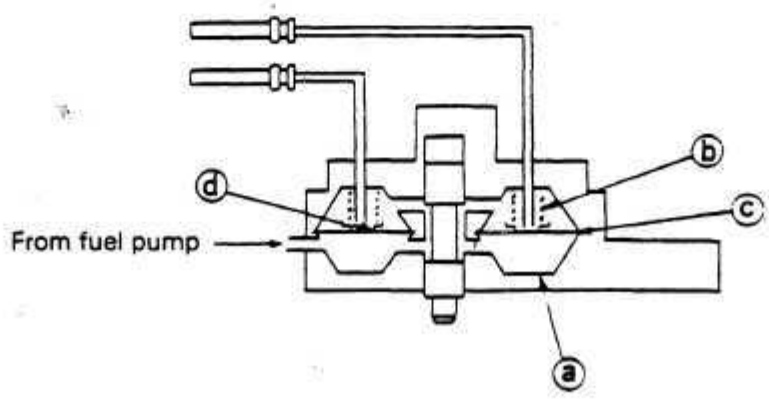


Fig. 6

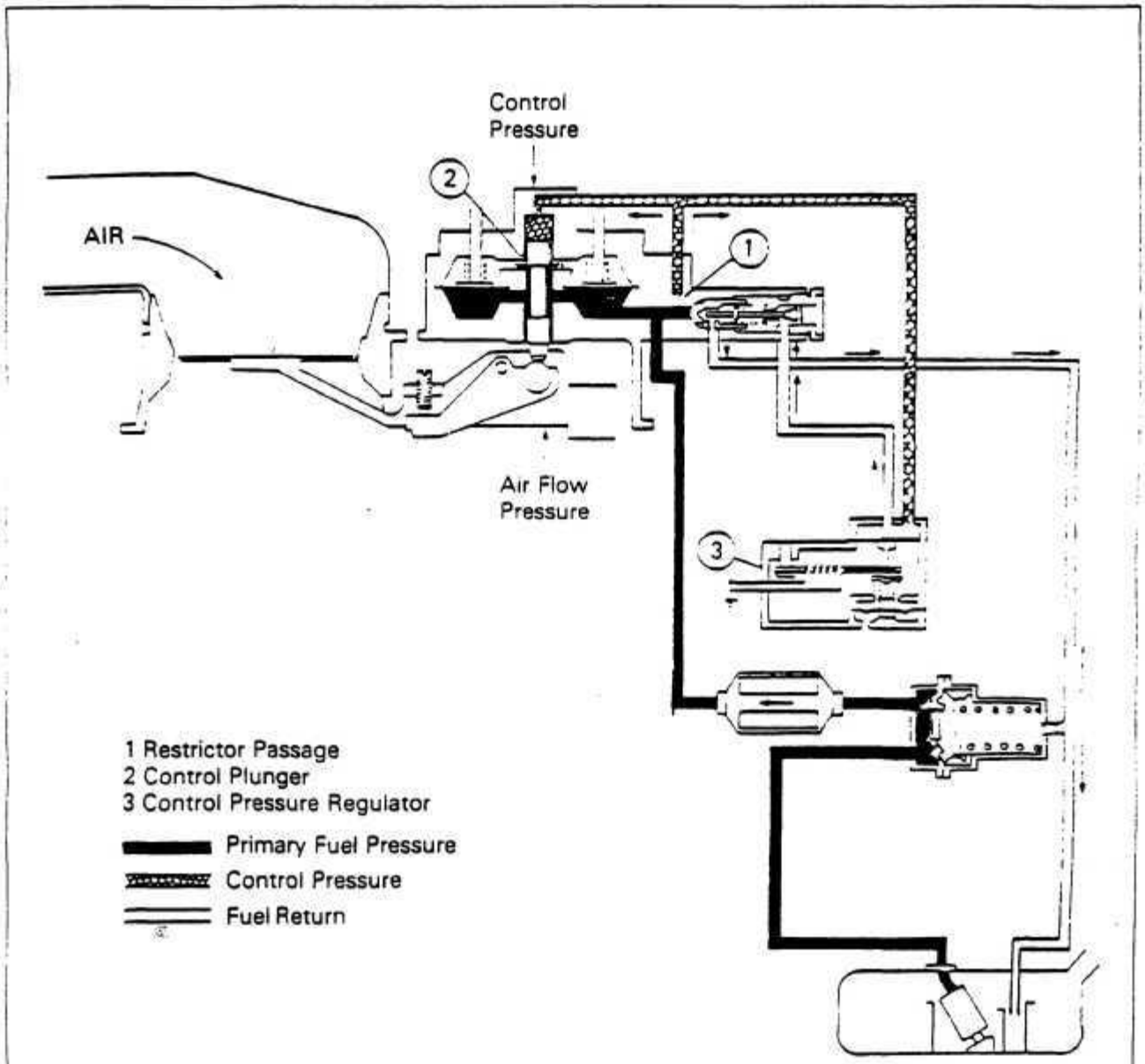


Fig. 7

CONTROL PRESSURE CIRCUIT

A *portion of main* line fuel is directed through a restrictor passage (1) to the top of the control plunger (2). This pressure circuit is referred to as the control pressure. The control pressure generates an opposing force to that originating from the air flow sensor plate. When the control pressure gulator (3) decreases the control pressure, the sensor plate will travel *further* downward per given air volume, thus increasing the amount of fuel injected to the engine (rich mixture). Increasing the control pressure will reduce the sensor plate travel with the same air volume reducing the amount of fuel injected to the engine (lean mixture). *Fig. 7*

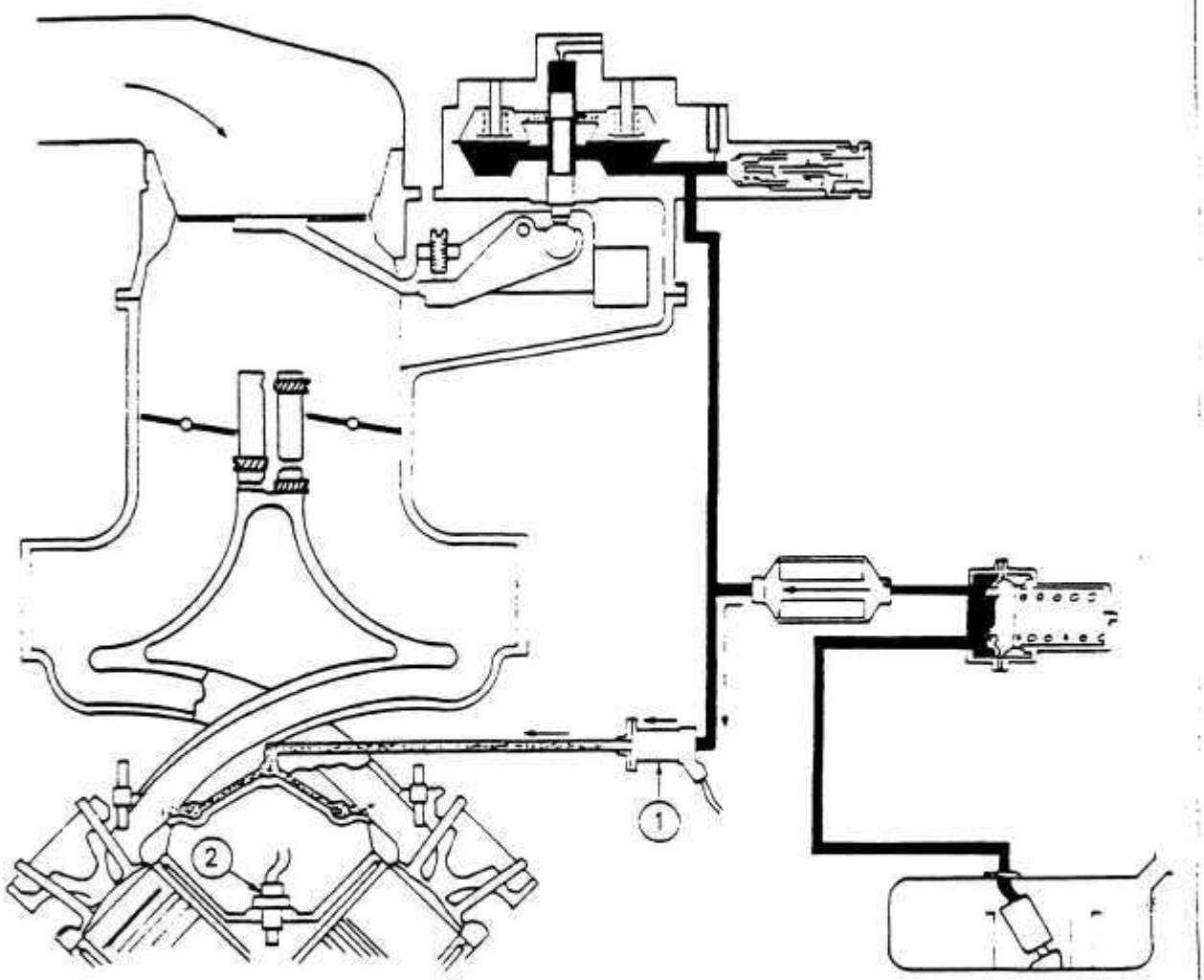


Fig. 8

COLD START CIRCUIT

The cold start circuit provides a richer fuel mixture to facilitate starting a cold engine. The circuit operates only when the engine temperature is below +35°C (95°F) and during the cranking process.

The cold start valve (1) is of the solenoid-operated type. The winding of an electro-magnet is fitted inside the valve. In the "off" position, the moveable armature of the electromagnet is forced against a seal by means of a spring. When the magnet is energised, the armature is pulled away from the seat and fuel is allowed to flow through the valve. A special nozzle atomizes the fuel as it leaves the valve and enters directly into the intake manifold. *Fig. 8.*

The thermo-time switch regulates the cold start valve injection time in relation to coolant temperature. when the coolant temperature is below approximately +35°C (95°F) the bimetal arm will bend enough to close the contact points. The closed contact points will provide a ground for the cold start valve, energising the electro-magnet and injecting additional fuel to the engine while it is being cranked. During cranking, voltage is also applied to the heating element in the thermo-time switch. The heating element will warm the bimetal arm and open the contact points to prevent excessive cold start injection (flooding). The length of time that it takes the heating element to open the contact points is dependent on the engine coolant temperature. *Fig. 9.*

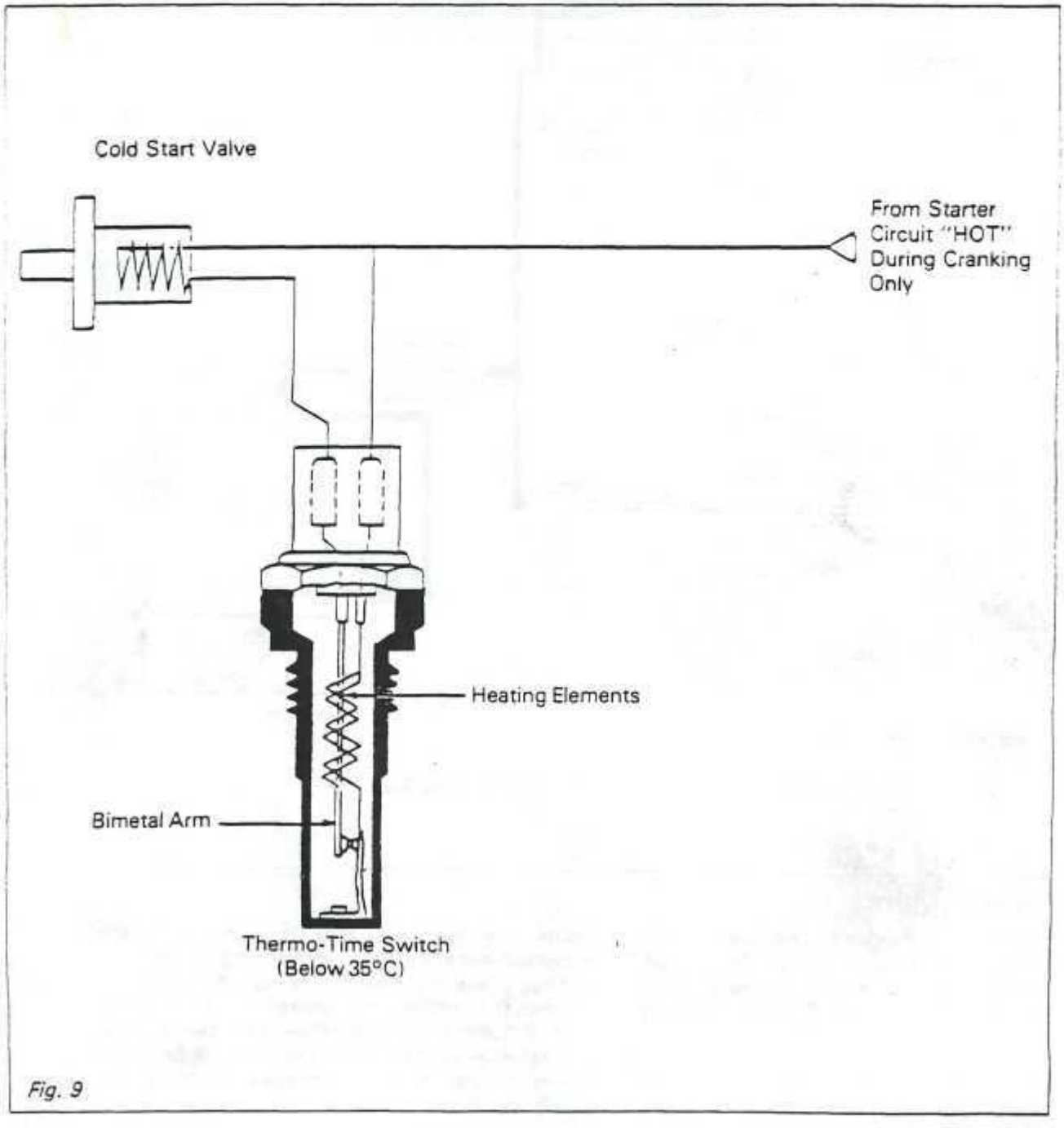


Fig. 9

WARM-UP CIRCUIT

During the engine warm-up period, it is necessary to provide a richer fuel mixture to improve driveability and eliminate hesitation during acceleration. The warm-up circuit performs this function by lowering the control pressure which allows the air sensor plate to move further downward for a given volume of air. *Fig. 10*

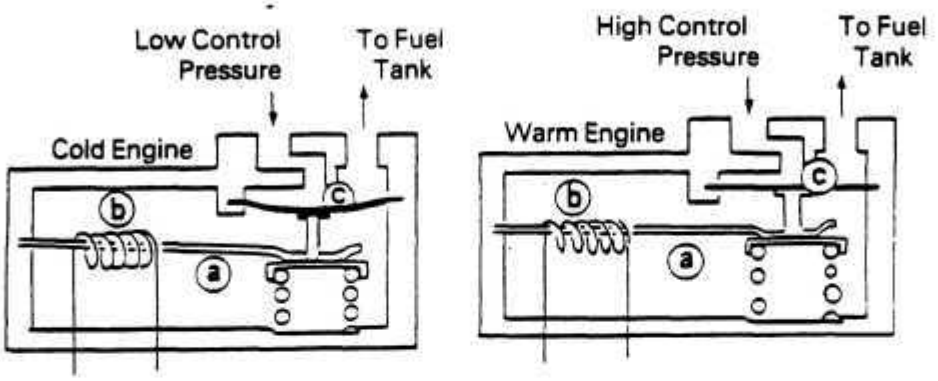


Fig. 10

CONTROL PRESSURE REGULATOR

Control pressure is determined by the control pressure regulator and varies between approximately 1.5 Bar (22 PSI) and 3.8 Bar (55 PSI). The control pressure regulator is mounted on the left valve cover and is affected by engine radiant temperature. At engine start-up the control pressure is determined by engine radiant temperature rather than ambient air temperature. The regulator contains both a bimetal arm (a) which reacts to the engine temperature, and an electrical heating element (b). As the bimetal arm bends, the circuit pressure changes by opening or closing a passage (c) which allows fuel to return to the tank. On a cold engine, the bimetal arm will open the passage allowing more fuel to return to the tank, lowering the control pressure. This enriches the fuel mixture. As the heating element warms the bimetal arm, the passage will gradually close and allow the control pressure to build to its maximum valve.

In the actual control pressure regulator, a dual heating element is used with the bimetal arm, plus an additional bimetal switch (d) is used. When the regulator temperature is below 15°C (59°F), the bimetal switch will open allowing only one heater to operate thus increasing the engine warm-up time. Closing of the bimetal switch above 15°C will permit both heaters to operate which in turn will reduce the engine warm-up time. *Fig. 11*

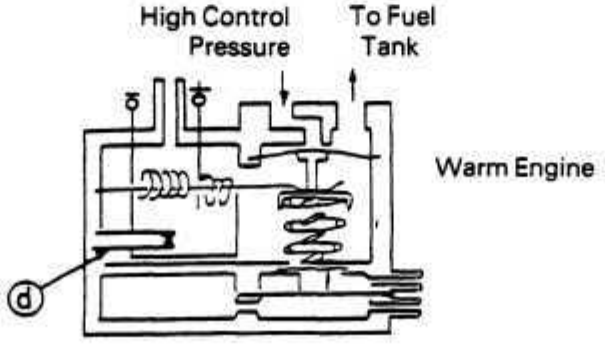


Fig. 11

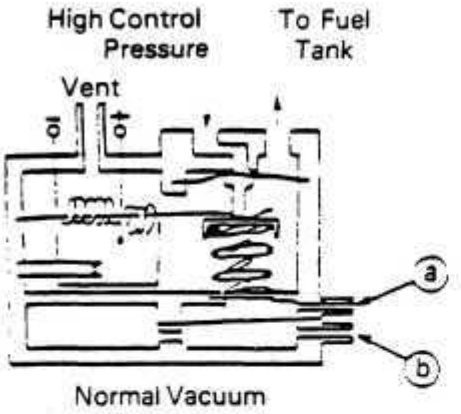


Fig. 12

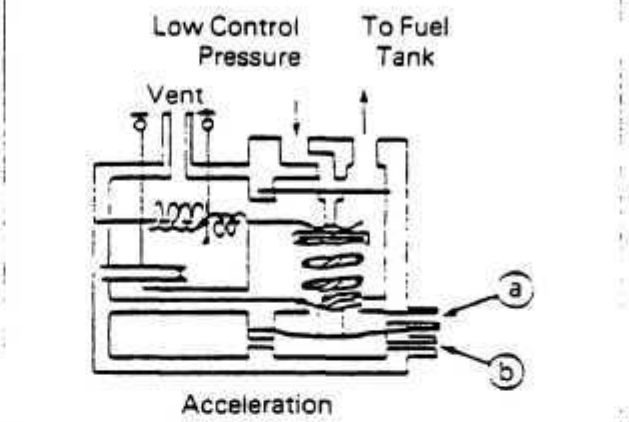


Fig 13

ACCELERATION ENRICHMENT CIRCUIT

The control pressure regulator is affected by engine manifold vacuum when the coolant temperature is below 40°C (104°F). Outlets (a) and (b) are both connected to the engine intake manifold. The hose to outlet (b) contains a delay valve. At coolant temperatures below 40°C the pressure increase (loss of vacuum) in the intake manifold during acceleration reaches the lower vacuum chamber later than it reaches the upper chamber due to the delay valve. The diaphragm separating these two chambers then deflects downwards opening the pressure regulator momentarily. This results in a very short "enrichment spike" in the air-fuel mixture. *Fig. 12–13.*

The vacuum delay valve (1) located in the hose connected to outlet (b) provides a 10 second delay during acceleration. After 10 seconds, the pressures above and below the diaphragm will equalise and the control pressure will return to normal.

The thermal vacuum control valve (2) opens at coolant temperatures below 40°C (104°F) to allow manifold vacuum to reach the control pressure regulator. Above 40°C, the acceleration enrichment circuit is inoperative. *Fig. 14.*

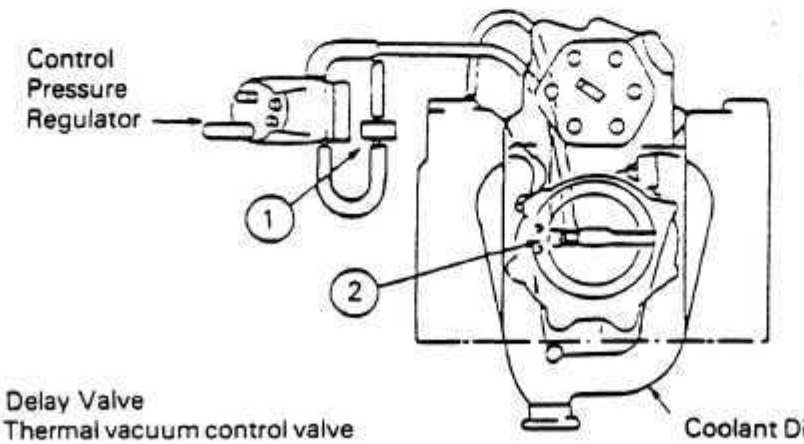
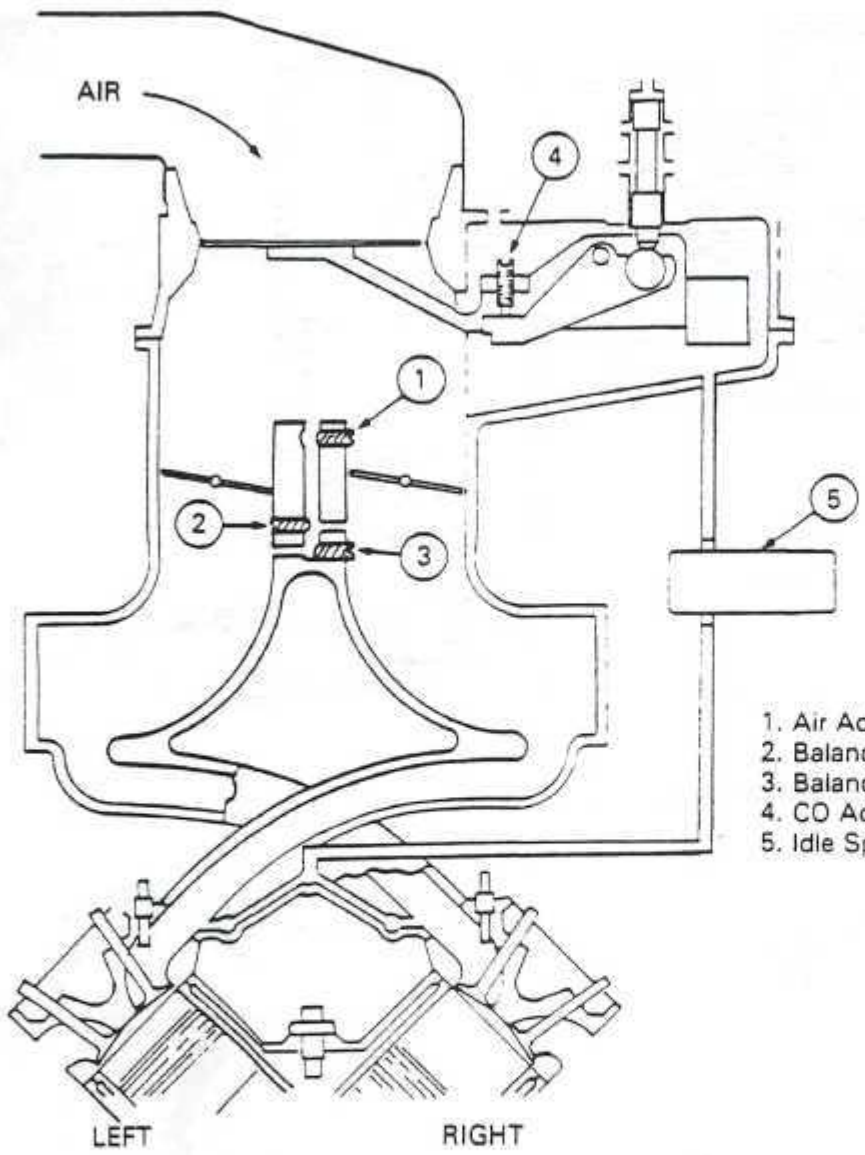


Fig. 14



1. Air Adjusting Screw
2. Balancing Screw-Left Bank
3. Balancing Screw-Right Bank
4. CO Adjustment Screw
5. Idle Speed Regulator

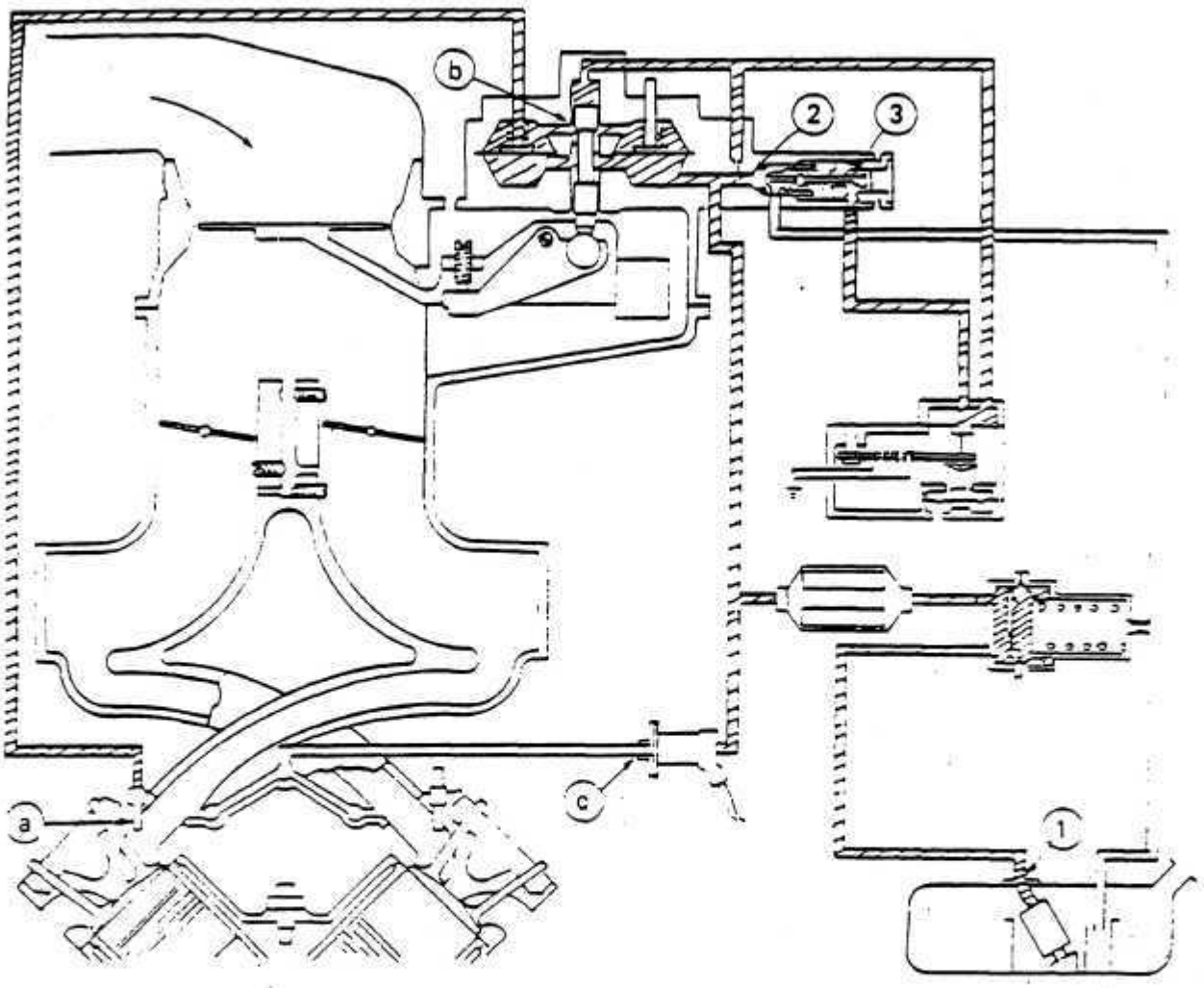
Fig. 15

IDLE CIRCUIT

The throttle body on the PRV V-6 engine contains an air adjusting screw (1) and two air balancing screws (2 and 3). These adjustment screws are not used on the De Lorean since an electronic idle speed control system is used. The air adjusting screw (1) should be fully seated to eliminate any air bypass at the throttle plates.

The idle speed regulator (5) allows the proper amount of air to bypass the closed throttle plates during an idle condition.

The CO adjusting screw (4) is used to control the amount of injected fuel in relation to the position of the air sensor plate. Turning this screw will increase or decrease the air-fuel ratio. This adjustment is performed at the factory and the access hole is plugged. *Fig. 15*



REST PRESSURE

1 Fuel Pump Check Valve
2 Primary Circuit Seal
3 Control Pressure Circuit Seal

Fig. 16

REST PRESSURE

When the fuel pump is not operating, it is necessary to retain fuel under pressure in all lines. This "rest" pressure will prevent vapour from forming in the lines and ensure instant re-starting. When the fuel pump stops, a check valve (1) and two seals (2 & 3) close, sealing off the fuel return lines to the tank. The accumulator will then maintain pressure in the system to prevent vaporisation.

In addition to the check valves and seals, it is important that the control plunger (b) returns to the closed position, all injectors (a) close tightly, cold start valve (c) closes tightly and all fuel connections are tight and leak free. *Fig. 16.*

ELECTRICAL CIRCUIT FUNCTION

If the engine coolant temperature is below 35°C (95°F) the thermo-time switch is closed providing a ground for the cold start valve. During cranking conditions, power is supplied to the cold start valve from the starter solenoid, activating the valve to inject additional fuel to the engine. If the cranking process takes longer than 8 to 15 seconds, the thermo-time switch heating element opens the switch, deactivating the cold start valve to prevent the engine from flooding. In this case, the thermo-time switch functions as a time switch.

If the temperature of the engine coolant is above 35°C (95°F) when the starting process is commenced, the thermo-time switch is open eliminating the cold start valve ground. In this case the thermo-time switch functions as an engine coolant temperature switch.

This circuit is equipped with an RPM relay which receives power from the main relay through fuse No. 1. The rotational speed of the engine produces ignition pulses at terminal No. 1 of the ignition coil. These pulses are processed by an electronic circuit in the RPM relay which closes the relay contacts. Current from No. 7 fuse is then supplied to the fuel pump and control pressure regulator.

The RPM relay remains closed as long as the ignition switch is "on" and the engine is running. If the pulses from terminal No. 1 of the ignition coil stop because the engine has stopped turning, the RPM relay opens about one second after the last pulse is received. This safety circuit prevents the fuel pump from pumping when the ignition switch is "on" but the engine is not running.

Another safety feature in the fuel pump circuit is the inertia switch. This switch provides the ground circuit for the electric fuel pump. In the case of an accident where high impact is involved, the inertia switch will open the circuit between the fuel pump and ground. This will prevent the fuel pump from pumping fuel out of a possible ruptured hose. The inertia switch also activates the door lock circuit to unlock the doors upon high impact.

The control pressure regulator receives power from the RPM relay when the engine is rotating. Thus current will heat the bimetal arm in the pressure regulator for proper engine warm-up operation.

The car is wired for a hot start relay. This relay can be installed if a hot starting problem is experienced in excessively hot regions of the country. When this relay is used, the cold start valve will inject intermittently during cranking when engine is hot.

SYSTEM REPAIR NOTES

1. The majority of the fuel injection components are sealed units and cannot be adjusted or repaired. Tampering with a sealed component will automatically void the component warranty. The following guide indicates component serviceability and authorised repairs:

   Fuel Pump:
   The fuel pump is not serviceable. The return check valve located in the fuel inlet cannot be replaced.

   Accumulator:
   Not serviceable.

   Fuel Filter:
   Not serviceable, replace when contaminated.

   Mixture Control Unit:
   - Fuel Distributor:
     The fuel distributor can be removed from the mixture control unit for replacement. Fuel distributor is not serviceable.
   - Primary Pressure Regulator:
     The regulator O-ring seals are replaceable and the primary pressure may be adjusted by adding or subtracting spring shims.
   - Air Flow Sensor Assembly:
     Sensor plate and arm assembly can be centred if a binding condition exists. Rest position of sensor plate can also be adjusted.

   Control Pressure Regulator:
   Not serviceable.

   Cold Start Valve:
   Not serviceable.

   Thermo-time Switch:
   Not serviceable.

   Fuel Injectors:
   Not serviceable.

   Throttle Valves:
   Throttle idle stop position is preset and should not be tampered with.

2. The largest problem affecting the operation of fuel injection components is dirt and moisture contamination. Therefore, precautions should be taken when working on the system to avoid contamination.

3. When replacing fuel lines or components, use only approved replacement parts that were designed for this system. Due to the high fuel pressures used in this system, do not attempt to splice fuel hoses.

4. After replacing any major fuel injection component, the engine idle speed and CO level should be checked and adjusted if necessary.

5. The RPM relay is located in the relay compartment behind the passenger seat. (See "Electrical System and Instruments" Section M).

6. The inertia switch is located under the left side of the dash panel and is mounted to the footwell wall, adjacent to the luggage compartment cover release. When the button on the inertia switch is in the "up" position the switch is in the "open" position. In this position the fuel pump will not operate and the door locks will move to the unlock position. To reset the inertia switch, depress the button or move to the "down" position.

7. Excessively high fuel pressures can be caused by a plugged fuel return line.

8. Positive pressure buildup in the fuel tank is normal for this system.

9. If it is necessary to adjust the CO level, the adjusting hole plug can be removed by drilling down to the hardened steel insert and threading a pulling tool into the plug.

SPECIFICATIONS

1. Electric fuel pump
   Fuel Delivery: Minimum 850 cm^3/30 sec. (1.8 pints/30 sec.)

2. Control pressure "COLD" (Regulator temp. below 40°C) *Fig. 17*

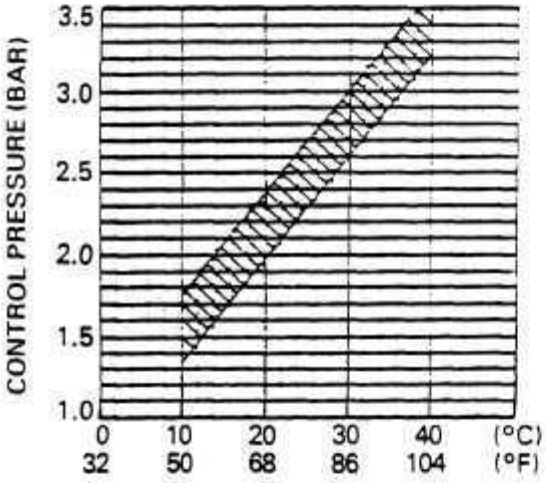


Fig. 17

3. Control Pressure "WARM" (Regulator temp. above 40°C)

   a. Test with intake manifold vacuum hoses disconnected from control pressure regulator — 3.4—3.8 Bar

   b. Connect vacuum pump to vacuum port on control pressure regulator which contains the delay valve — 1.4—1.8 Bar

   Vacuum Setting Value: 450-550 mbar (13.3-16.2 in Hg)

4. Primary Pressure

   Checking value — 4.9—5.5 Bar
   Setting value — 5.1—5.3 Bar

5. Rest pressure leakage test

   Rest Pressure — 3.3 Bar
   Minimum pressure after 10 min. — 1.7 Bar

6. Injection valves

   Opening pressure — 3.5—4.1 Bar

7. Control pressure regulator delay valve

   Time required to bleed-down from 16 in. Hg vacuum to 8 in. Hg — 10 ± 2 seconds

8. Acceleration enrichment thermal vacuum control valve.

   a. Fully closed at temperatures above 53°C (127°F).

   b. Must start to open at 48°C (118°F) when temperature is decreasing.

9. Thermo-time Switch.

Coolant Temperature	Contact Opening Time
−20°C (−5°F)	7.5 ± 2 seconds
35 ± 4°C (95°F)	0

10. Fuel line tightening torques:

M8 Bolt	10-12 Nm	(7-9 FT LB)
M10 Bolt	13-15 Nm	(9-11 FT LB)
M12 Bolt	20-24 Nm	(14-17 FT LB)
M14 Bolt	15-20 Nm	(11-14 FT LB)
M12 Cap Nut	15-20 Nm	(11-14 FT LB)
M14 Cap Nut	25-30 Nm	(18-22 FT LB)

11. Throttle idle stop adjustment: See "Engine" Section.

TEST GAUGE CONNECTION

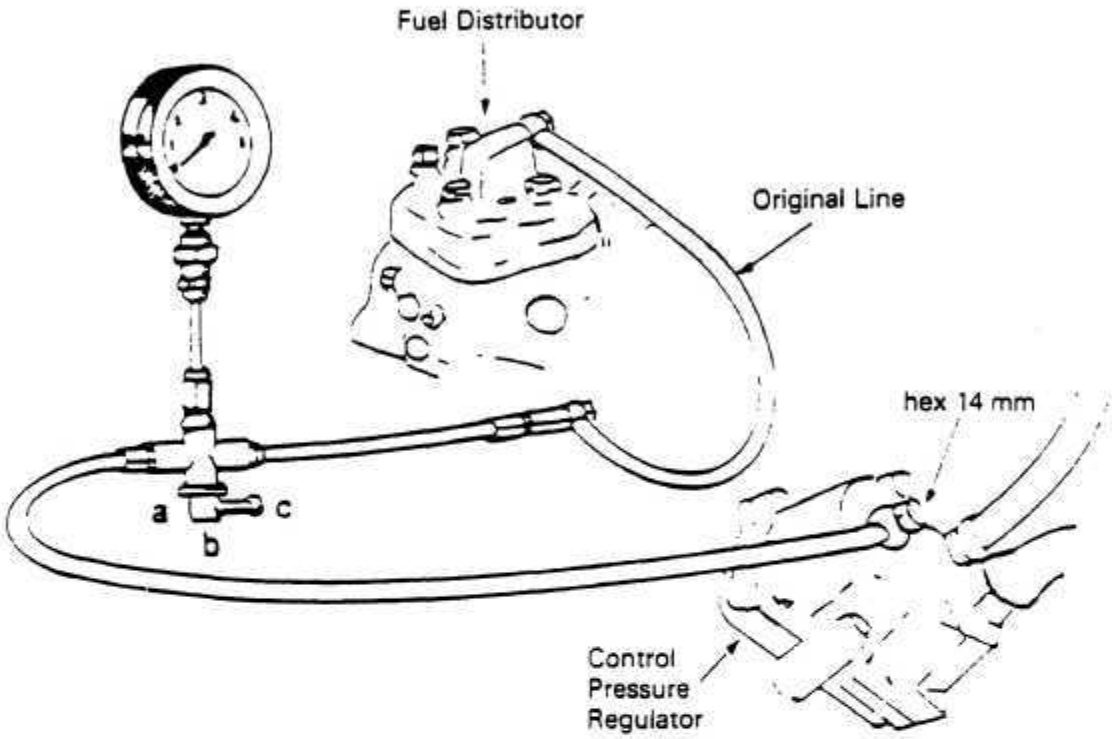


Fig. 18

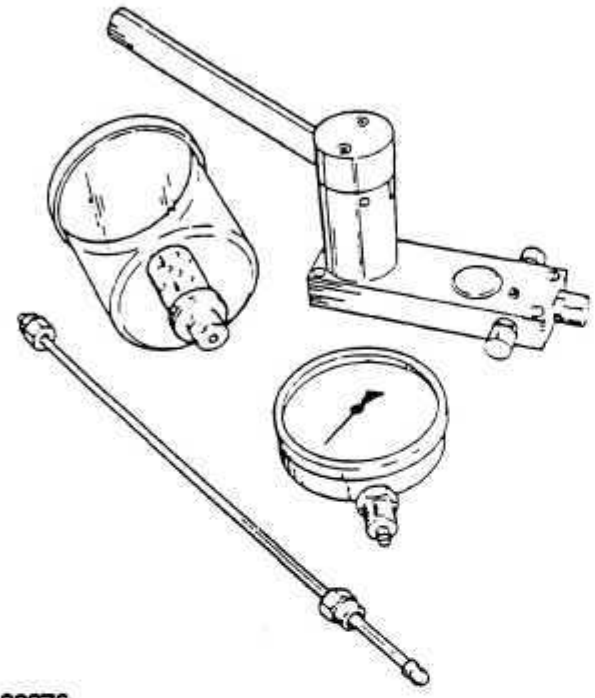
VALVE POSITION

"A"	Off
"B"	Check control pressure
"C"	Check primary pressure

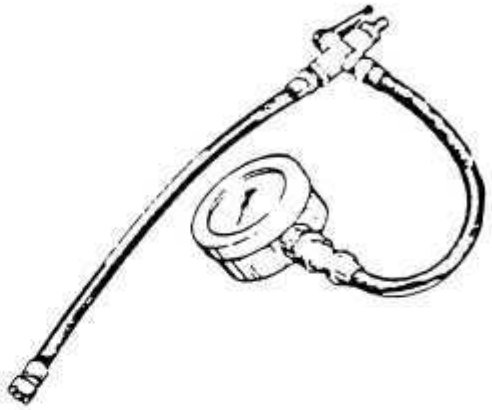
Note:
When checking fuel pressures, it is necessary to operate the fuel pump without the engine running. To by-pass the RPM relay, remove relay and connect a jumper wire between terminals No. 87 and No. 30 in the connector. The RPM relay is located in the relay compartment behind the passenger seat. (See "Electrical System and Instruments", Section M)

Caution: When connecting or disconnecting the test gauge, rest pressure will be present in the fuel system. Fuel fittings should be loosened slowly to avoid fuel spray in the engine compartment and a container should be available to drain fuel into.

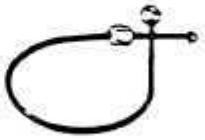
SPECIAL TOOLS



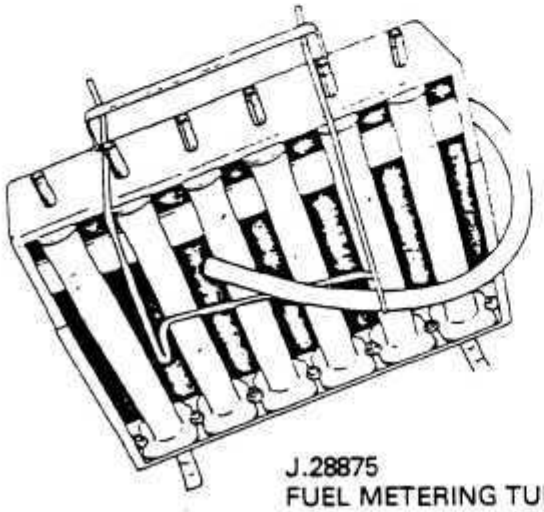
J.28876
INJECTOR VALVE TESTER



J.28872
PRESSURE GAUGE



J.28873
HOSE CONNECTOR



J.28875
FUEL METERING TUBES

J.28874
ADAPTOR NIPPLE

EMISSION CONTROL SYSTEM

CO EMMISSION ADJUSTMENT

IDLING* SPEED R.P.M.	CO % ON EACH BANK	MAX IMBALANCE PERMITTED
950*	1%	±0.3%

*(Setting idle only. Normal Engine R.P.M. 775 ± 50 R.P.M.)

The idle mixture adjustment must be sealed to comply with Federal Regulations. The idle mixture is set at the factory and is unlikely to require further adjustment throughout the life of the vehicle. If any malfunction in vehicle performance is noted it is essential to ensure that all other engine settings are checked prior to attempting the adjusting of the idle mixture.

The engine must be run in with air filter in position. The ignition system must be serviceable and correctly set. No air leaks must be present (Brake Vacuum Hose, Ignition Advance Capsule Pipe, Fuel Lines, Oil Vapour Rebreathing Pipes etc).

An infra red exhaust gas analyser must be used for this adjustment. Each exhaust down-pipe has a boss fitted with a plug which may be removed for fitting the exhaust analyser pipe in its place. Exhaust gas analyser comprises of two metal pipes which screw into each plug hold A3-way union joined together on one hand by the hoses to the metal pipes and on the other hand to the analyser.

The connection to the analyser must be air tight.

1. Plug in diagnostic plug and connect up rev counter to check engine R.P.M.
2. Switch Dwell operation for 6 cylinder engine.
3. Disconnect the electrical connection to the oxygen (lambda) sensor.
4. Ensure that the idle speed screw (1) common to both banks is fully closed.

Note:
DO NOT adjust the two individual bank by-pass screws as they are set at the engine manufacture plant.

5. Ensure that the air conditioning system is switched off.
6. Fit a link wire to the cooling fan switch to ensure the cooling fans are on continuously.
7. Start the engine and run it until it has reached normal working temperature (ie. cooling system thermostat open – water pipes hot).
8. Check that the engine speed is 775 ± 50 RPM and running smoothly.
9. Check ignition timing is 13° ± 2° at 775 RPM and adjust if necessary. Rev the engine to 2000 RPM and check that the timing is about 40° B.T.D.C.
10. Using idle speed screw common to both banks, adjust the idle speed to 950 RPM (temporary setting).
11. Check Dwell operation for duty cycle is 50% ± 3.0%.
12. To ensure that plugs are not "sooted" due to long idling, rev engine at 2000 RPM for 15 secs and start the next operation **immediately** afterwards.
13. With both taps on the T-piece of the sample hose open, and the plastic cap or fingertip blocking the hole for fuel adjustment, check that the idle CO level is 1% ± 0.3%.
    If not reset the fuel by removing the plastic cap or finger tip and turning the mixture screw (2) in the flap valve clockwise to increase the CO (richer) and anti-clockwise to reduce CO (leaner). Replace the plastic bung, reset the engine speed to 950 RPM rev the engine for a few seconds to 2000 RPM and check CO level when idle speed returns to 950 RPM. If outside the limits repeat the procedure until specification is met. *Fig. 19.*

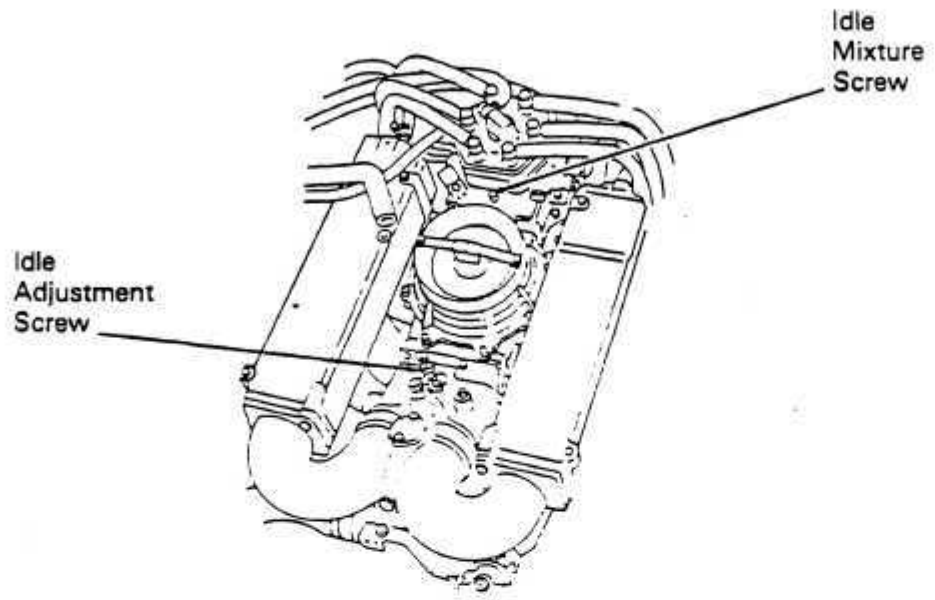


Fig. 19.

14. Note the Hydrocarbon reading at this point is no greater than 300 PPM.

15. By closing one tap on the sample hose T-piece, and then the other check that the CO level in each bank of cylinders is 1% ± 0.3%.

16. Re-connect the electrical connection to the oxygen sensor.

17. Check that the duty cycle is operating at an average setting between 45-55%. Total swing on the needle must be less than ± 10%

18. Re-connect the electrical connection to the oxygen sensor.

19. Using the idle speed screw common to both banks adjust the idle speed to 775 ± 50 RPM. This will normally require the screw to be fully closed.

20. Switch off the engine.

21. Insert the tamper proof plug in the mixture hole in the metering unit and drive home.

22. Remove exhaust sampling probes from the down pipe and insert the blanking plugs.

Note:
Section 203 of the Clean Air Act prohibits any person to remove or render inoperative any device specifically installed on the vehicle to ensure that the vehicle emission complies with control standards. It is essential therefore that components to the correct specification are fitted and specified engine settings are strictly adhered to.

TAMPER PROOF PLUG REMOVAL/REPLACEMENT

1. Remove the air/fuel metering unit and clamp in an inverted position in a vice.

2. Depress the air sensor plate in order to expose the underside of the hole in which the tamper proof plug is located.

EXTRACTION TOOL

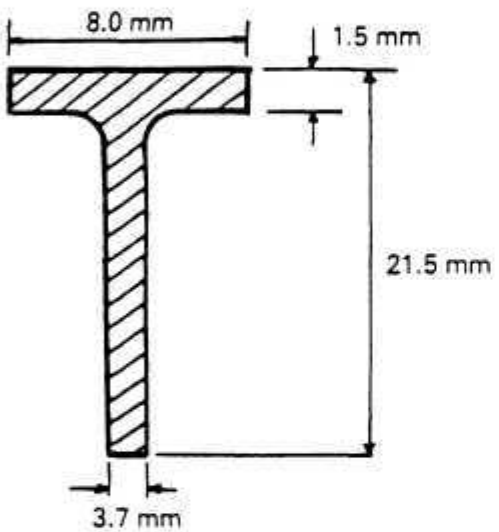


Fig. 20

3. With a pair of "pointed-nosed" pliers insert the extraction tool *(Fig. 20)* in the hole. The tool must be held vertically.

   NB. An appropriately sized nail cut to the requisite length is aptly suitable.

4. Close the sensor plate until it firmly constrains the extraction tool in position.

5. Apply sufficient pressure on the frame supporting the sensor plate to cause the extraction tool to force out the tamper proof plug. This pressure need not be excessive, the sensor plate arm acting as a lever, and can be applied manually or by tapping the frame with a plastic mallet. DO NOT apply force to the senor plate itself as serious damage could result.

6. Remove the extraction tool.

7. Re-install the air/fuel metering unit on the engine using a new gasket.

8. Adjust the idle CO as required.

9. Insert a new tamper proof plug (discard the old one) and gently tap home.

   NB. Repeated removal of the tamper proof plug will damage the hold in which it is inserted, to the extent that new plugs will no longer provide a press fit.

EMISSION SETTINGS AT HIGH ALTITUDE

To ensure compliance with the Emission Regulations at high altitude and maintain optimum fuel economy and driveability requires adjustment to engine settings. Full technical details on emission settings and tamperproofing are contained in Service Bulletins 30 and 40.

It is the responsibility of the DMC dealer to ensure that each new vehicle delivered for operation in a high altitude area has the emission settings adjusted prior to delivery. Additionally, the full throttle enrichment switch must be disconnected and isolated at the connector block located by the engine air cleaner. Care must be taken to ensure that on automatic transmission cars the full throttle enrichment switch lead (light green) is not confused with the kickdown switch lead (on earlier cars light green lead with dark green sleeve—on late cars light green lead with dark green tracer).

For absolute safety the car should be road tested afterwards to ensure that kickdown operates. A label confirming the adjustment (see sample label part number 110741) must be attached to the engine setting label in the engine compartment.

Any vehicle relocating permanently from a high to a low altitude area, or vice versa, will require the emission adjustment to be undertaken to achieve the standards applicable to vehicles originally sold at that altitude. The full throttle enrichment switch will have to be disconnected and isolated or reconnected as the case may be. Vehicles relocating

permanently into a high altitude area will require label part number 110741 attaching after adjustment, whereas vehicles relocating permanently to a low altitude area will require the original label removing.

Note:
It is not necessary to perform these adjustments for only a temporary visit to a high or low altitude area. Vehicle performance will remain adequate for any such temporary period.

LAMBDA CONTROL SYSTEM

The De Lorean uses a Lambda control system developed by Bosch. The Lambda system is used in conjunction with the K-Jetronic fuel injection and a three-way catalytic converter to control exhaust emissions.

Lambda control, used with a three-way catalytic converter, is capable of reducing the noxious emissions of carbon monoxide (CO), hydrocarbons (CH) and nitrogen oxides (NOx). A requirement for this action, however, is that the air-fuel ratio must be controlled to a high degree of accuracy so that the engine will operate within an "ideal" air-fuel mixture range.

LAMBDA CONTROL PRINCIPLE

The control principle employed is based on the fact that the Lambda sensor is continuously monitoring the exhaust gas and informing the fuel injection system to modify the mixture for minimum emissions.

Acting as a monitoring device, the oxygen sensor in the exhaust pipe provides data on whether the mixture is richer or leaner than the "ideal".

The Lambda electronic control unit (ECU) processes this data and sends a signal to the fuel injection system to change the amount of fuel injected into the engine. *(Fig. 21)*

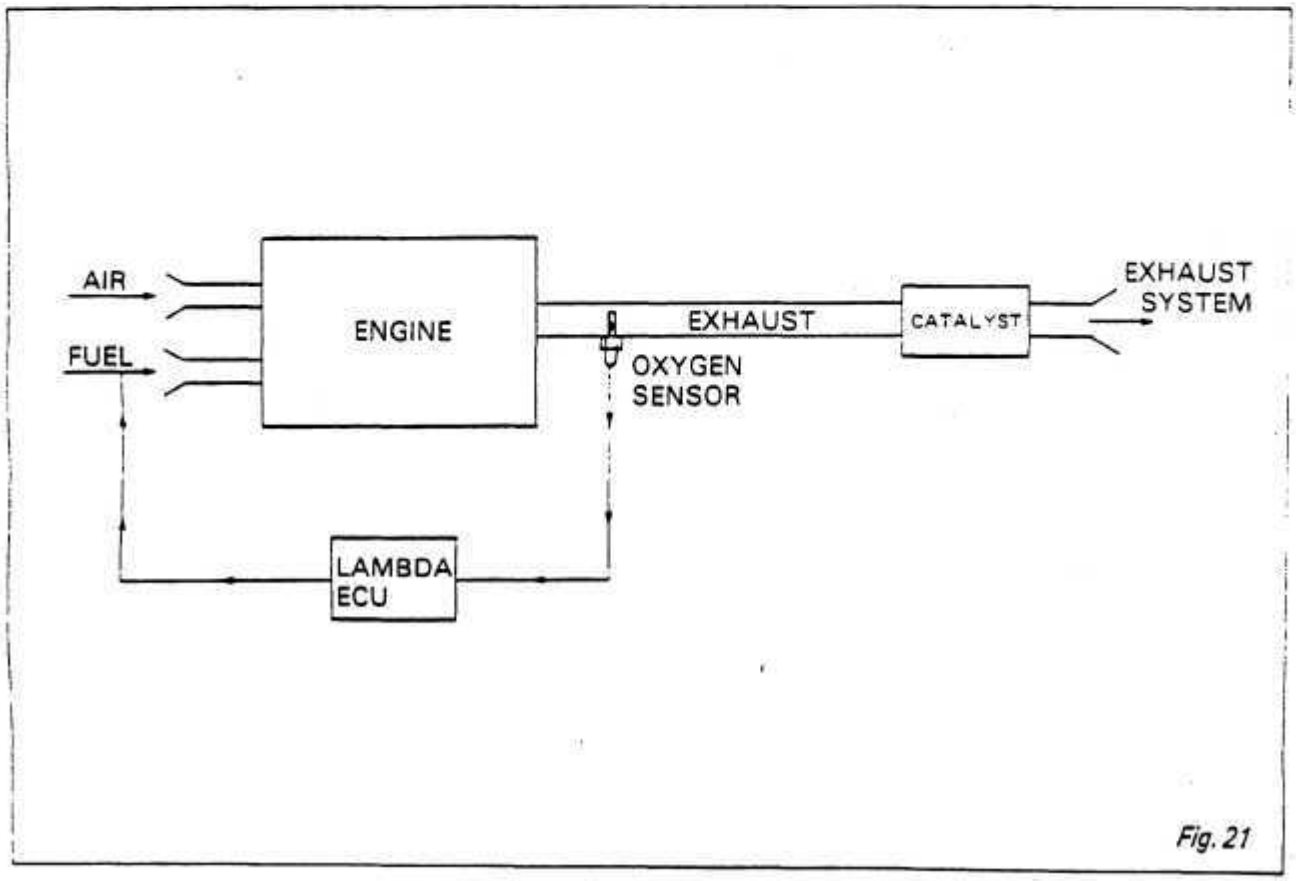


Fig. 21

SYSTEM OPERATION—OXYGEN SENSOR

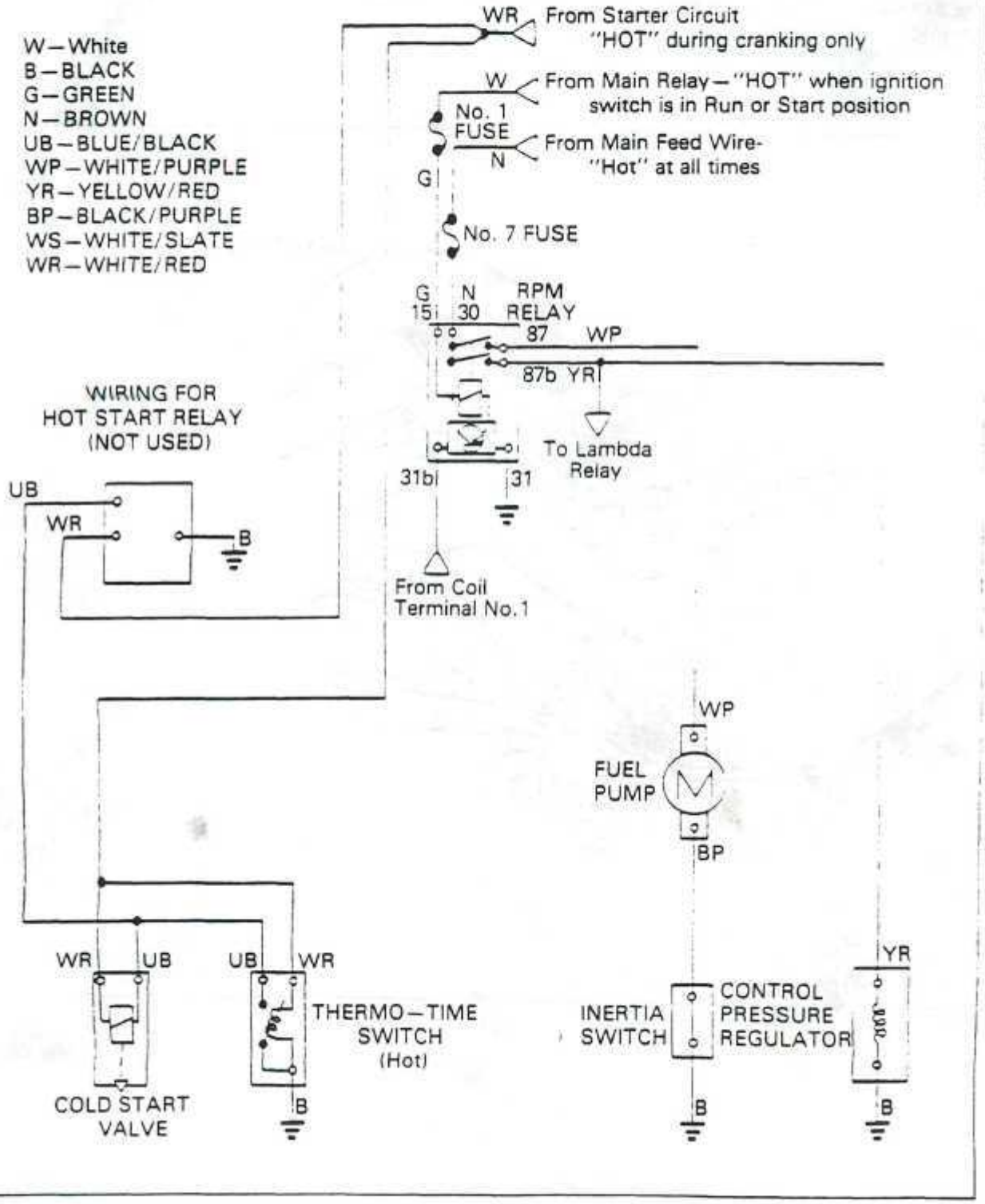
The oxygen sensor measures the amount of oxygen in the exhaust gases. As the sensor measures the exhaust gas, it produces an electrical signal which informs the Lambda ECU module if the engine is running richer or leaner than the "ideal" air-fuel mixture ratio.

The sensor is mounted in the exhaust pipe in a position where it will monitor the exhaust gas from both cylinder banks before it enters the catalytic converter. *Fig. 22.*

Fig. 22

Fig. 23

FUEL INJECTION WIRING



ELECTRONIC CONTROL UNIT (ECU)

The Lambda ECU module receives the voltage signal from the oxygen sensor and determines if the amount of fuel injected to the engine should be increased or decreased. The module will then signal the frequency valve to adjust the fuel Mixture. *(Fig. 24)*

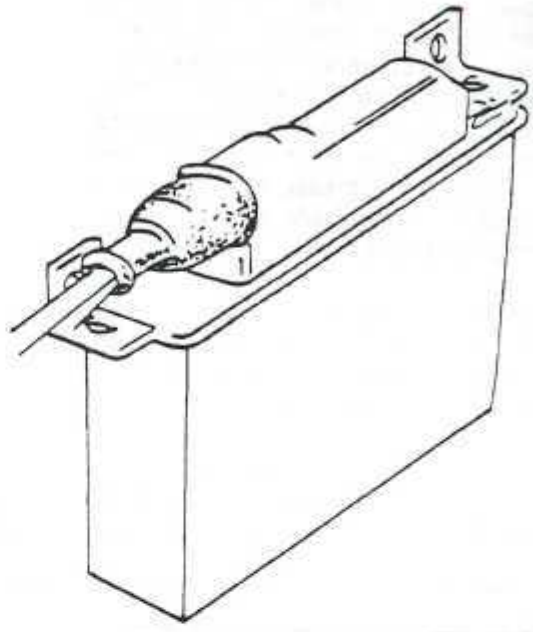


Fig. 24

FREQUENCY VALVE

The frequency valve regulates the pressure in the lower chambers of the fuel distributor. This regulation will affect the normal operation of the fuel distributor.

The frequency valve is an electrically operated valve. *(Fig. 25)*. It is mounted on the right valve cover and is connected to the lower chambers (primary pressure) of the fuel distributor and the return line to the fuel tank.

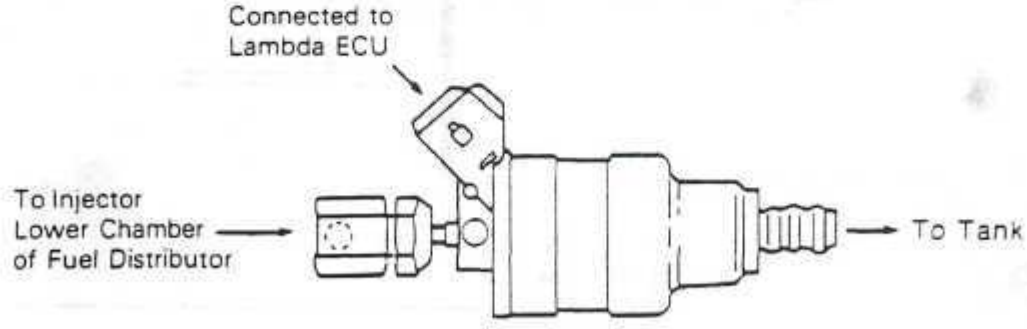


Fig. 25

When the frequency valve is open, the fuel pressure in all of the lower chambers will be reduced by allowing some of the fuel to return to the tank. When the lower chamber pressure is reduced, the diaphragm downward movement will increase the passage opening to the injectors. This will increase the volume of fuel being injected to the engine, enrichening the mixture. When the frequency valve closes, the pressure in the lower chambers will return to normal and the diaphragm will return to its original position. *(Fig. 26—27)*

The frequency valve operates at 70 cycles per second. The length of time the valve is held open during each cycle depends on the pulse ratio supplied by the Lambda ECU module.

The pulse ratio is the frequency valve open time versus closed time during one cycle of operation. A pulse ratio of 80/20 means that the frequency valve

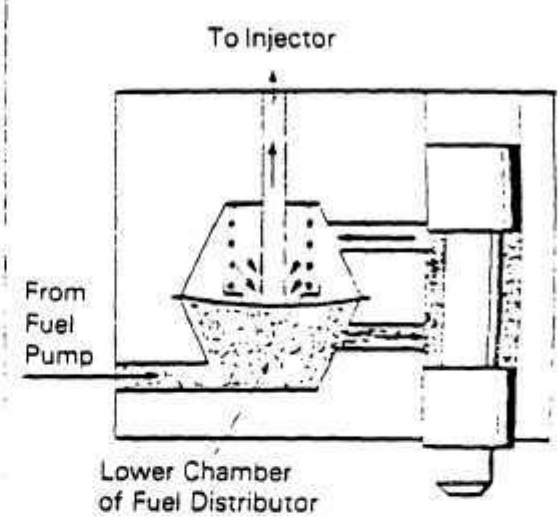


Fig 26

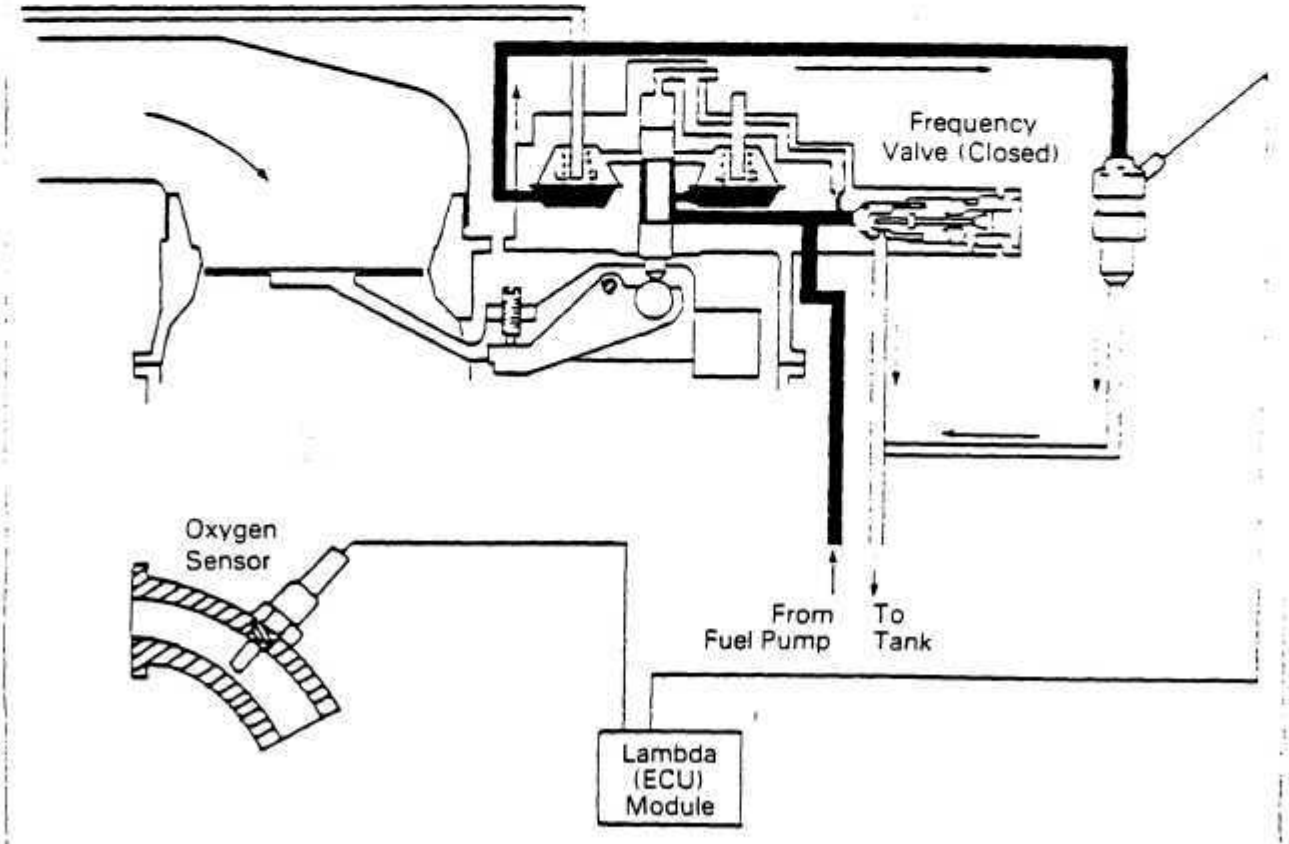


Fig. 27 **LAMBDA CONTROL SYSTEM**

is open 80 percent of the time and closed 20 percent of the time during one cycle of operation. *(Fig. 28)*

To operate the frequency valve at a pulse ratio of 80/20, the ECU module will allow current to flow through the frequency valve for 80 percent of one cycle and stop the current flow for the remaining 20 percent of the cycle. When current is flowing in the frequency valve, the electromagnet will energise and open the valve. *(Fig. 29)*

When the frequency valve is open, fuel from the lower chambers of the fuel distributor is released and routed back to the fuel tank. For example, if the exhaust gases reflect a lean condition, the oxygen sensor will signal the ECU module to change to a pulse ratio that will allow the frequency valve to remain open for a longer period. Therefore, an increased amount of fuel is fed from the lower chambers. This reduction of pressure in the lower chambers causes the diaphragm in the fuel distributor to deflect, injecting more fuel into the engine; the fuel mixture is now enriched. The oxygen sensor will then sense the enriched mixture and signal the ECU module to switch the frequency valve back to a shorter pulse ratio that will reduce the amount of fuel injected. This process repeats constantly to maintain the "ideal" air-fuel mixture ratio. *(Fig. 30)*

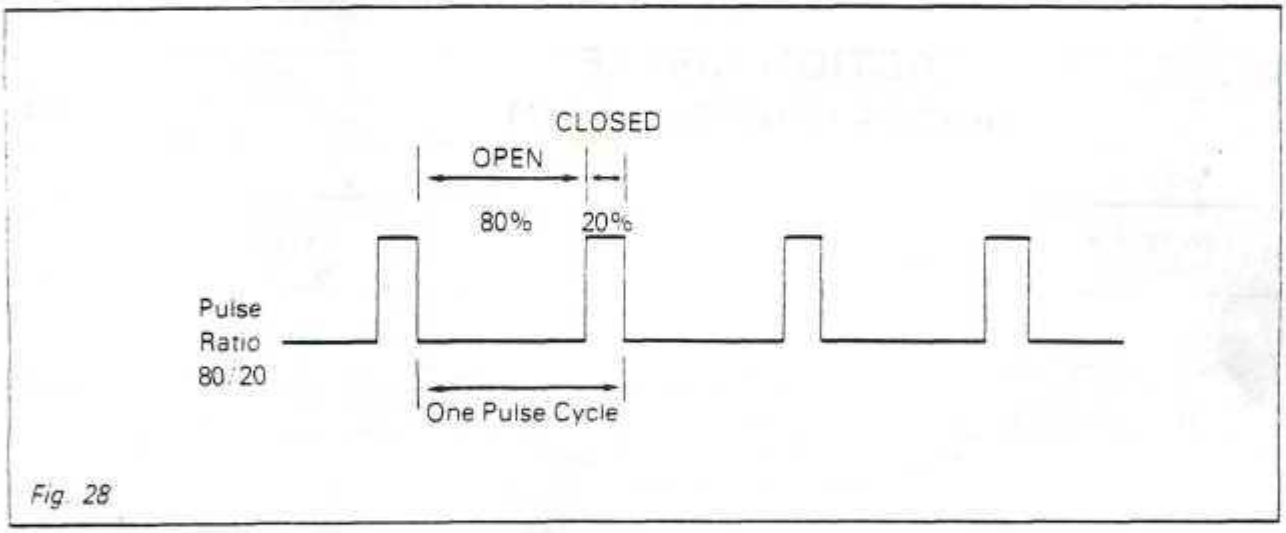


Fig. 28

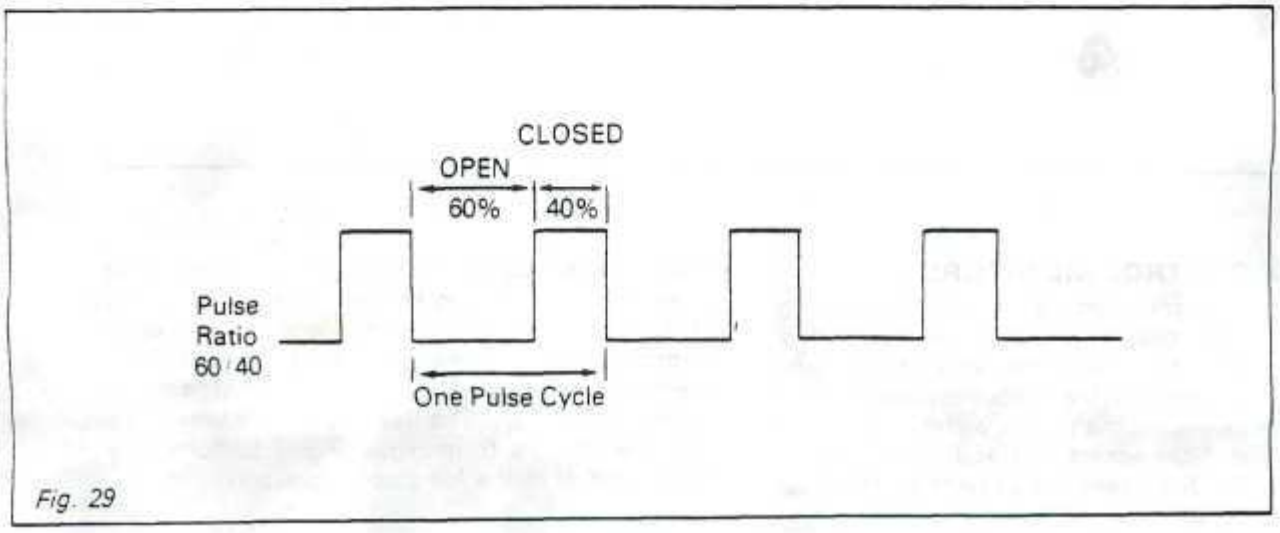


Fig. 29

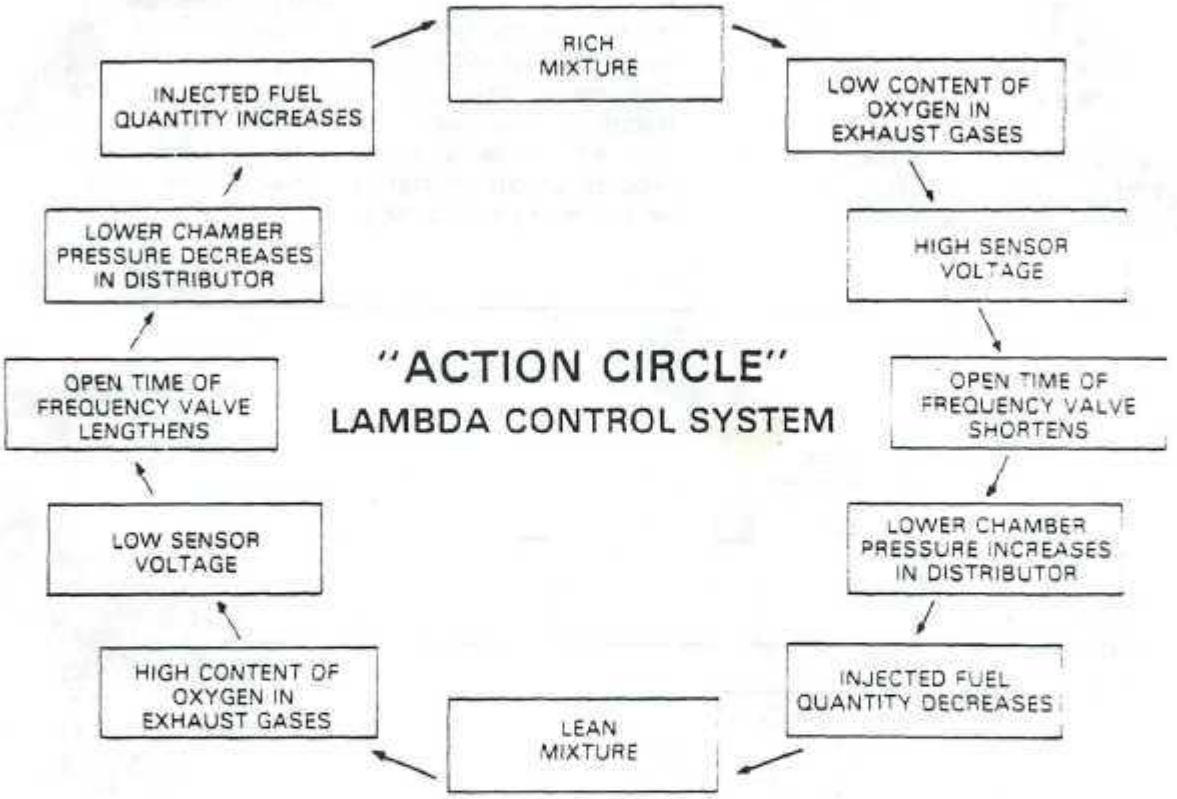
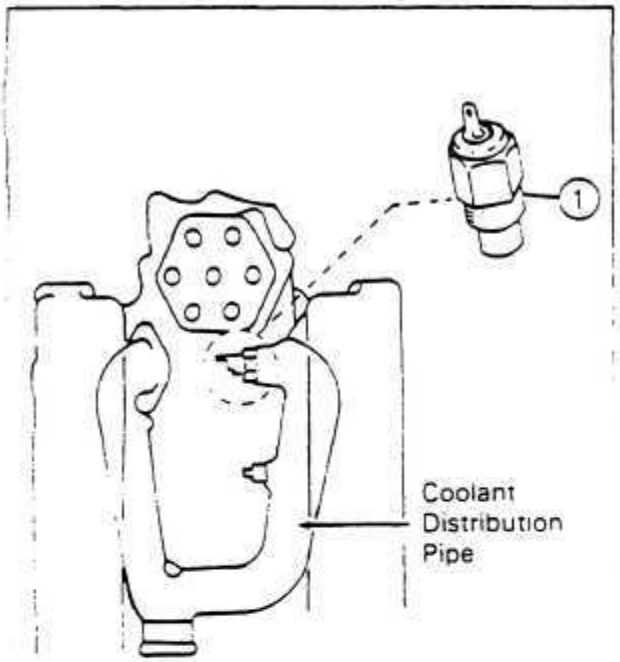


Fig. 30

SYSTEM CONTROL MONITORS

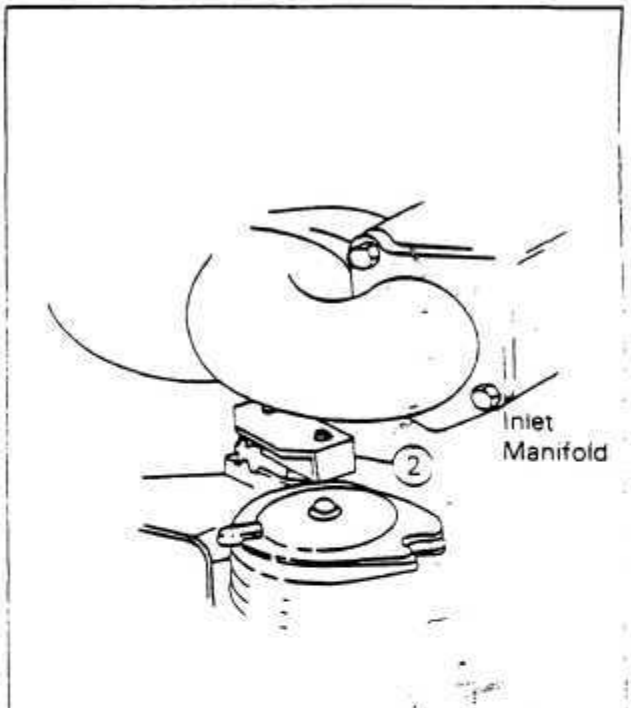
The oxygen sensor needs a minimum operating temperature to deliver a signal (approximately 300°C). In order to achieve driveability from start, the ECU module sets the frequency valve on a fixed pulse ratio until the sensor warms up. This is also the case if the sensor fails at any time during operation. The fixed ratio will provide a richer fuel mixture than normal.

The pulse ratio is controlled at another fixed value when the engine coolant temperature is below 15°C (59°F) or when the engine is at wide open throttle. These conditions are determined by a thermal switch *(Fig. 31)* (1) and a full throttle micro switch (2) *(Fig. 32)*. The fixed pulse ratio provides a rich fuel mixture to improve engine performance when cold or in the full throttle position.



LAMBDA THERMAL SWITCH

Fig. 31



FULL THROTTLE MICRO-SWITCH

Fig. 32

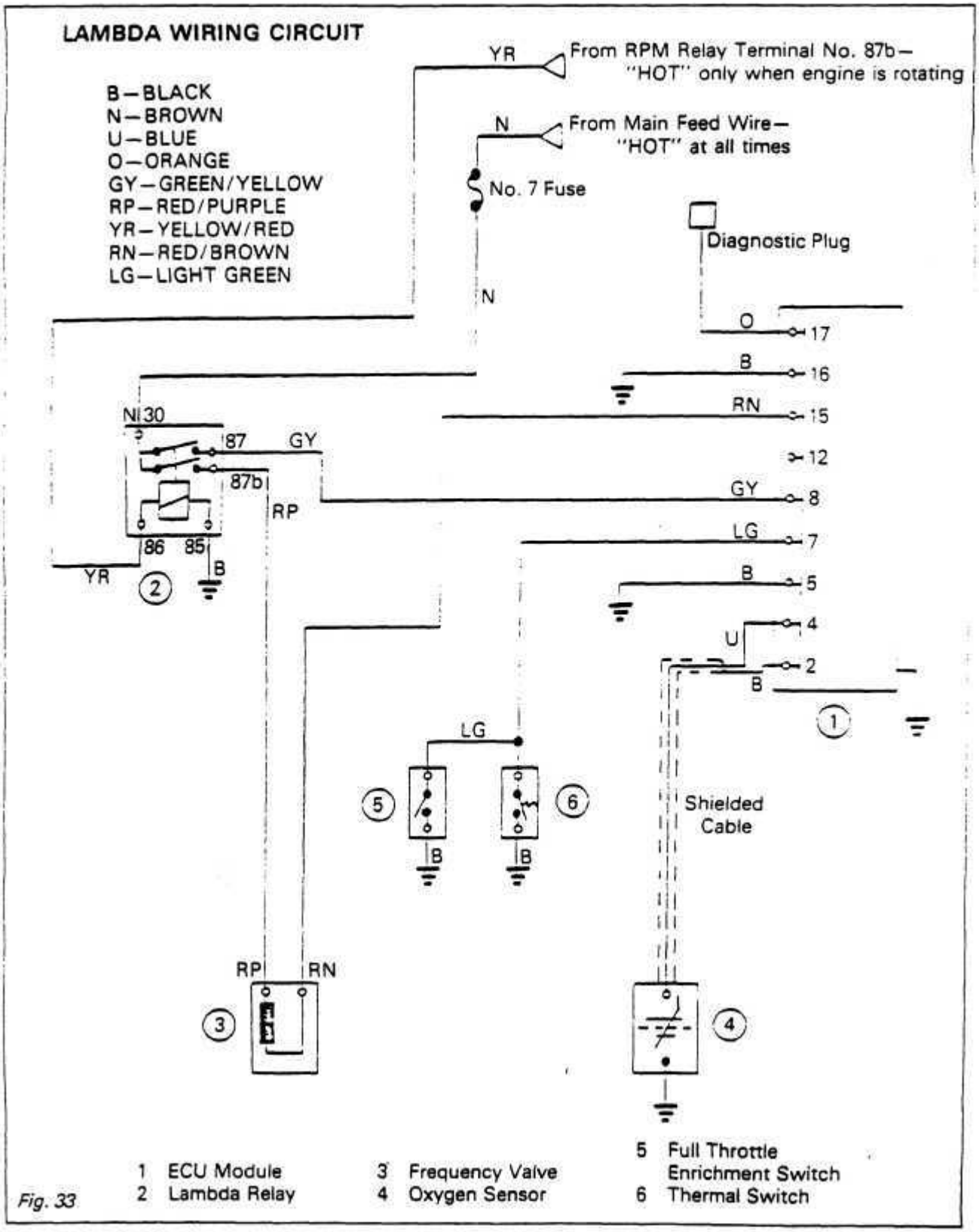
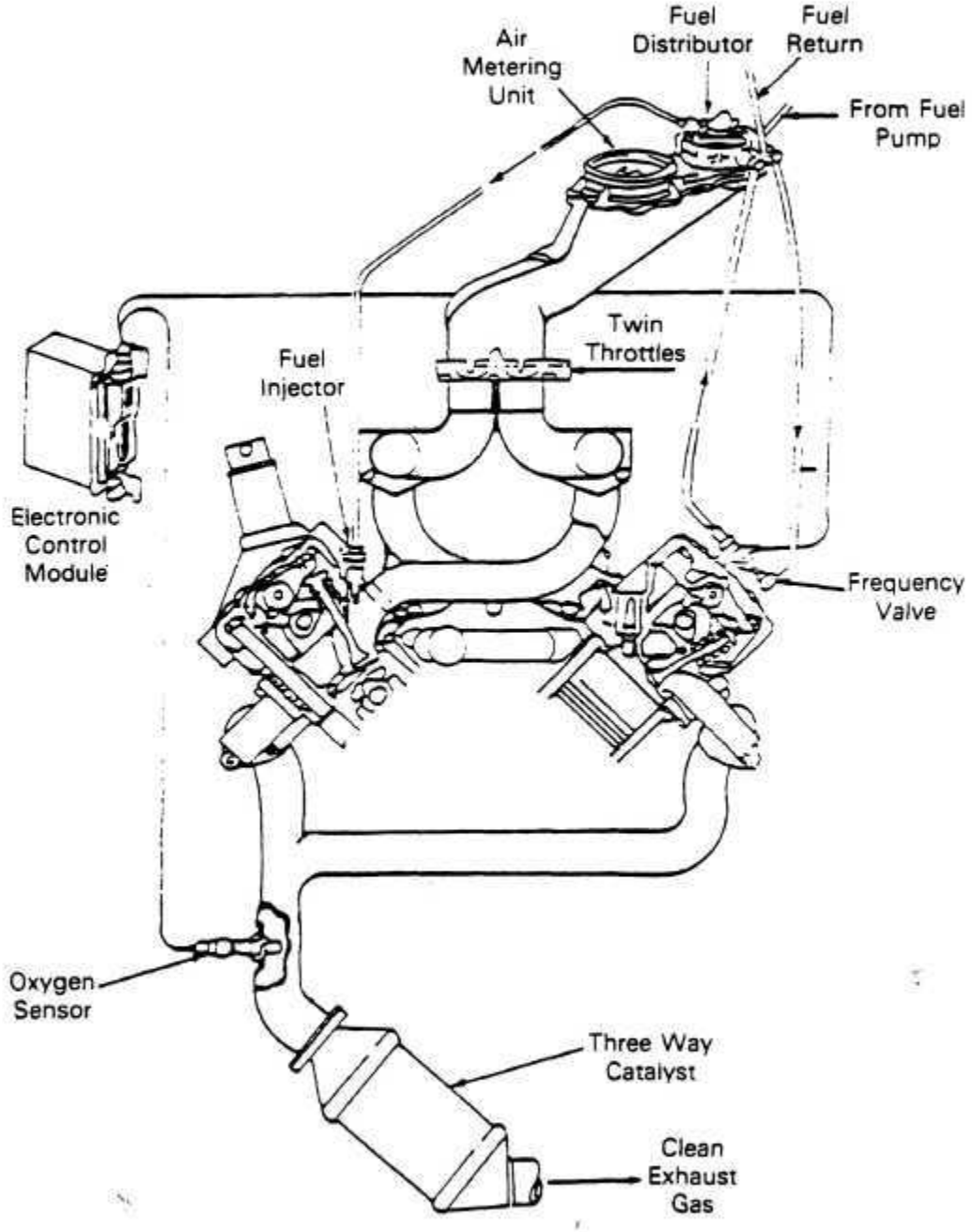

LAMBDA WIRING CIRCUIT
B—BLACK
N—BROWN
U—BLUE
O—ORANGE
GY—GREEN/YELLOW
RP—RED/PURPLE
YR—YELLOW/RED
RN—RED/BROWN
LG—LIGHT GREEN
YR
From RPM Relay Terminal No. 87b—
"HOT" only when engine is rotating
N
From Main Feed Wire—
"HOT" at all times
No. 7 Fuse
Diagnostic Plug
N
O
17
B
16
RN
15
12
GY
8
LG
7
B
5
U
4
2
B
1
N
30
87
GY
87b
RP
86
85
B
YR
2
LG
5
6
B
B
Shielded
Cable
RP
RN
3
4
1 ECU Module
2 Lambda Relay
3 Frequency Valve
4 Oxygen Sensor
5 Full Throttle
Enrichment Switch
6 Thermal Switch

Fig. 33



LAMBDA CONTROL SYSTEM

Fig. 34

ELECTRICAL CIRCUIT FUNCTION

The Lambda relay (2) receives power from the RPM relay and is energised only when the engine is rotating. When the relay is energised, the contacts close and voltage from fuse No. 7 is applied to the frequency valve (3) and the ECU module (1).

The oxygen sensor (4) generates a signal voltage (approximately 500 mv) which is carried by a screened cable to the module. The signal voltage will vary depending on the oxygen content in the exhaust gas. The less oxygen content in the exhaust (rich condition), the greater the signal voltage produced by the sensor.

During operation, the ECU module will analyse the oxygen sensor signal and send a pulse cycle signal to the frequency valve. This signal will allow a pulsating current flow to the valve which will turn it on and off as required. The pulse cycle can be measured by connecting a dwell meter to the diagnostic plug which is connected to terminal No. 17 of the ECU module.

The full-throttle enrichment switch (5) sends a ground signal to the ECU module when the throttle is in the wide-open position. The thermal switch (6) also sends a ground signal to the ECU module when the coolant temperature is below 15°C (59°F). These two switches override the oxygen sensor input to the ECU module, allowing a fixed pulse cycle to be sent to the frequency valve. *(Fig. 33)*

SYSTEM REPAIR NOTES

All of the Lambda system parts, with the exception of the throttle microswitch, are sealed units and cannot be adjusted or repaired. Tampering with a sealed unit will automatically void the warranty.

1. The Lambda ECU module is located in the module compartment behind the driver's seat. It is in the forward section of the compartment and is silver in colour.

2. When replacing the oxygen sensor, it is necessary to use an antiseize compound on the sensor threads. Do not allow any of the compound to get on the tube projecting from the sensor. Do not attempt to disconnect the wire lead directly at the sensor.

3. If it is necessary to supply power to the Lambda system when the engine is not running, by-pass the RPM relay by removing the relay and connecting a jumper wire between terminals No. 87b and No. 30 in the connector. The RPM relay is located in the relay compartment behind the passenger seat. (See "Electrical System and Instruments" Section M).

4. When checking the pulse ratio, a fluctuating dwell reading when the sensor is connected indicates that the system is operating. Readings above or below specifications could be caused by a rich or lean CO adjustment.

SPECIFICATIONS

1. Lambda Sensor:
   Torque specifications – 40 Nm (29 FT LB)

2. Thermal Switch
   Contact shall open at 15 ± 3°C (59°F)
   Close at max. of 5°C below its opening temperature

3. Throttle Micro-Switch
   Shall operate during the final 1.5 mm (0.060 IN) of throttle movement.

4. Fuel Line Tightening Torques:

M8 Bolt	10-12 Nm (7-9 FT LB)
M10 Bolt	13-15 Nm (9-11 FT LB)
M12 Bolt	20-24 Nm (14-17 FT LB)
M14 Bolt	15-20 Nm (11-14 FT LB)
M12 Cap Nut	15-20 Nm (11-14 FT LB)
M14 Cap Nut	25-30 Nm (18-22 FT LB)

5. Pulse Ratios:

   A. Normal Operation (Sensor connected and CO properly adjusted) –
   35-45° (reading pulsates)

   B. Oxygen sensor disconnected –
   40-50° (steady reading)

   C. Oxygen sensor lead disconnected.
   Ground lead –
   87° minimum (steady reading)

   D. Oxygen sensor lead disconnected.
   1.5 volts applied to lead –
   20° maximum (steady reading)

   E. Full throttle or engine cold (below 15°C or 59°F) –
   50-60° (steady reading)

IDLE SPEED CONTROL SYSTEM

SYSTEM DESCRIPTION

The De Lorean Sports Car is equipped with a Bosch electronic idle speed control system. This system is used to maintain an extremely accurate engine idle speed under all operating conditions.

IDLE SPEED CONTROL PRINCIPLE

The control principle used is based on the fact that an electronic control unit (ECU) module is constantly monitoring the engine speed during an idle condition and correcting this speed when necessary.

The idle speed regulator contains a rotary valve which controls the air flow through a duct that by-passes the throttle plates. During engine warm-up, for example, the engine speed is reduced due to friction. The idle speed regulator will open allowing additional air flow to the engine, increasing the RPM to specification. *(Fig. 35)*

SYSTEM OPERATION

The idle speed regulator is constructed in a similar fashion to that of an electric motor, its purpose is to control the position of a rotary valve mounted on its shaft. This valve controls the air flow through a duct that by-passes the throttle plates.

The regulator is mounted on the left side of the intake manifold. *(Fig. 36)*

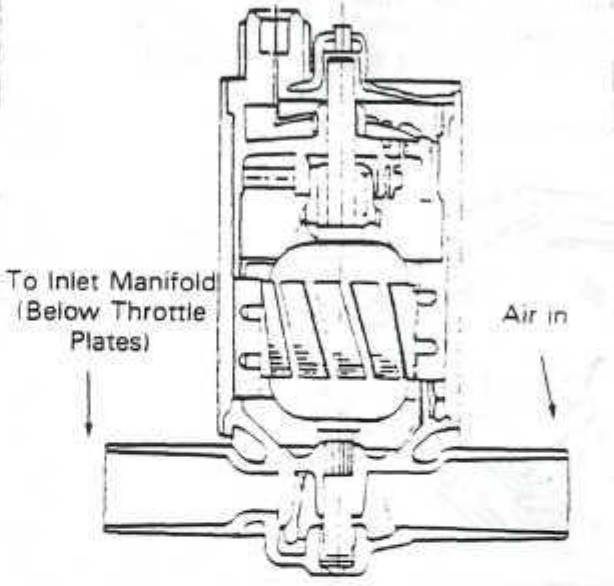


Fig. 36

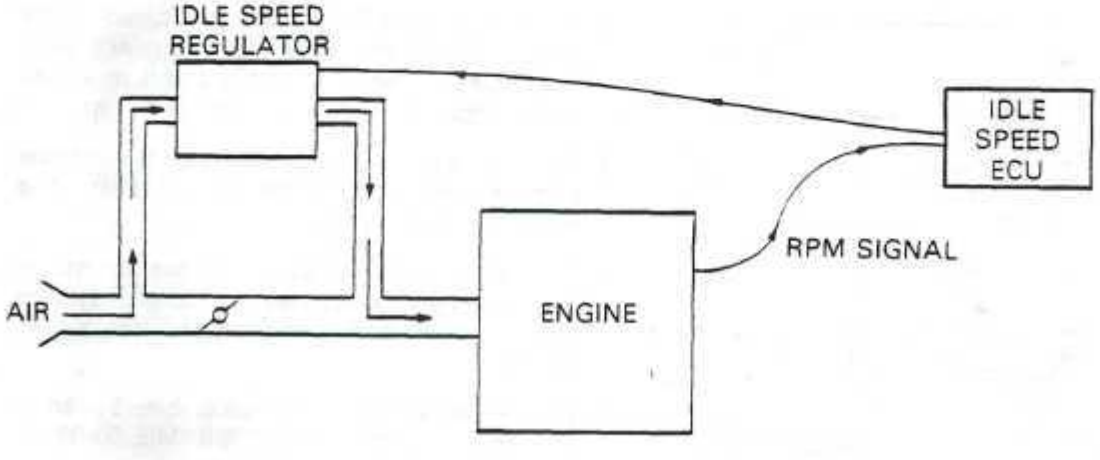


Fig. 35

The idle speed control system is only in operation when a microswitch *(Fig. 37)* (1) is closed by the throttle plates being in a fully closed position. This switch is located on the engine throttle linkage and allows the ECU module to operate. The ECU module senses engine speed from the tachometer and activates the idle speed regulator. The regulator changes the position of the rotary air valve in order to maintain a specified idle speed.

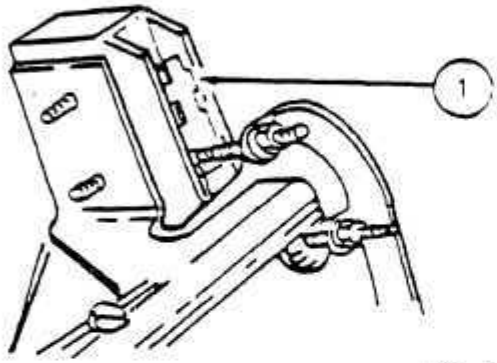
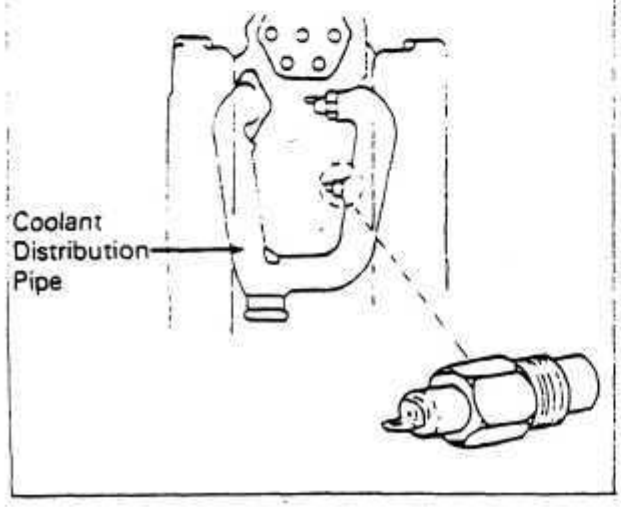


Fig. 37

At engine coolant temperatures below 15°C (59°F), a thermistor, located on the coolant distribution pipe, signals the ECU module to switch the regulator to a "wider" open position. This will increase the idle speed (fast idle) during the engine warm-up period. *(Fig. 38)*

Fig. 38



ELECTRICAL CIRCUIT FUNCTION

The ECU module (1) receives power through fuse No. 1 from the main relay when the ignition switch is in the "run" or "start" position.

When the throttle plates are fully closed, the microswitch (5) provides ground for the ECU module to begin operation. An idle speed diode (4) is used to prevent "feed back" to the ECU module from another circuit which also uses the idle speed microswitch to provide its ground.

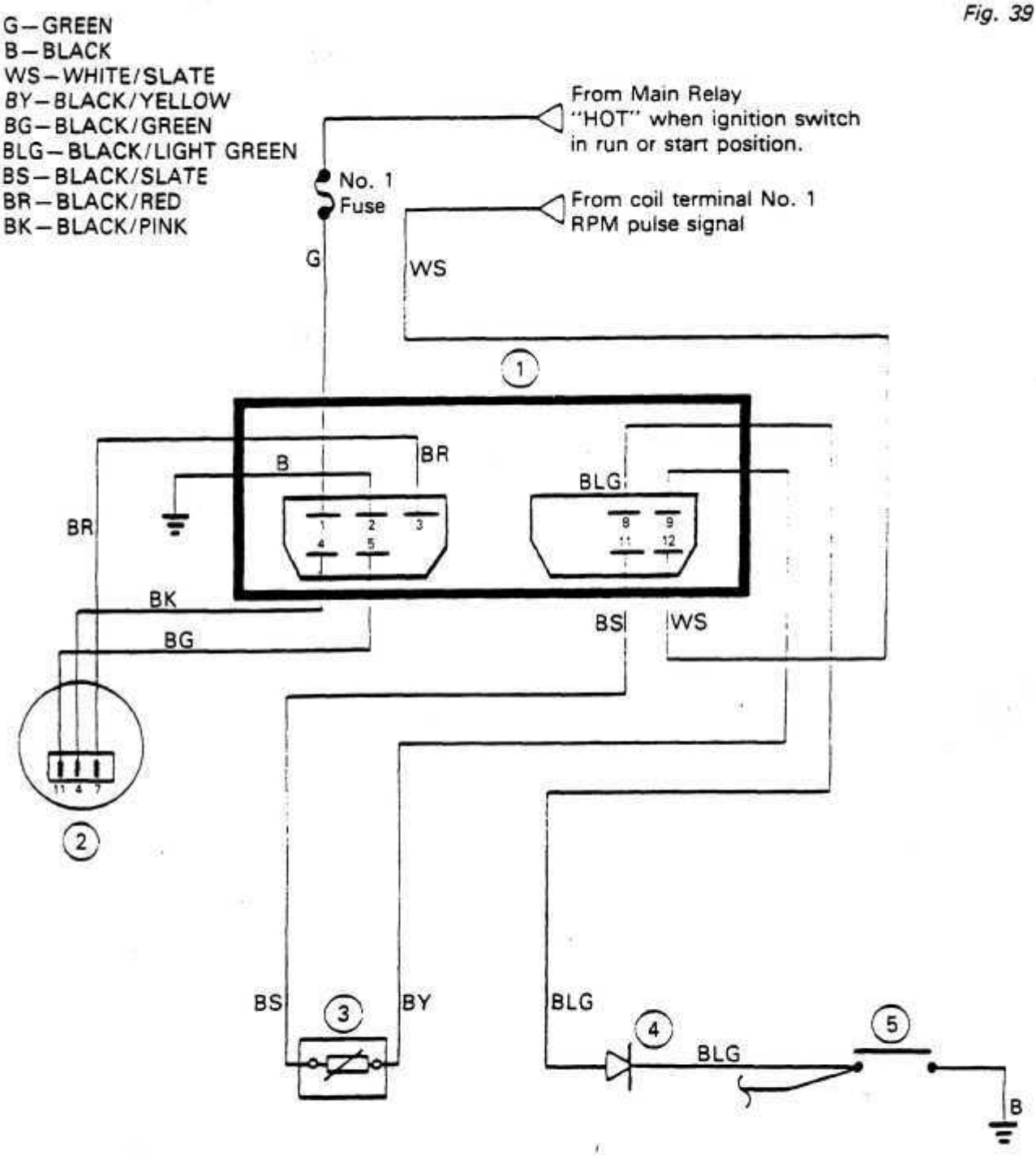
A thermistor (3), located in the coolant system distribution pipe, will activate another circuit within the ECU module when the coolant temperature is below 15°C (59°F). This circuit will provide a fast idle condition.

The ECU module receives an RPM signal from coil terminal No. 1. When the engine idle speed is above or below specifications, the ECU module activates the electric motor in the idle speed regulator (2). The signal from the module will run the motor in a forward or reverse direction which will open or close the rotary valve as necessary to achieve proper engine idle speed. *(Fig. 39)*

SYSTEM REPAIR NOTES

1. All of the idle speed control system parts are sealed units and cannot be adjusted or repaired. Tampering with a sealed unit will automatically void the warranty.
2. The idle speed ECU module is located in the module compartment behind the driver's seat. The module is black in colour and is mounted in the upper portion of the compartment.
3. The idle speed diode is located in the module compartment behind the driver's seat. The diode is black in colour.
4. The idle speed microswitch is not adjustable and is preset to activate the control system when the throttle plates are in the closed position.
5. Engine idle speed is not adjustable. Speed is elecronically controlled to 775 RPM ± 50 RPM.
6. Do not disconnect the idle speed regulator when adjusting the CO level. (See "Engine adjustments, tests and diagnosis" section)

Fig. 39



IDLE SPEED CONTROL CIRCUIT

1 ECU module
2 Idle Speed Regulator
3 Thermistor
4 Idle Speed Diode
5 Idle Speed Micro-Switch

COMPONENT LOCATION

IDLE SPEED CONTROL SYSTEM

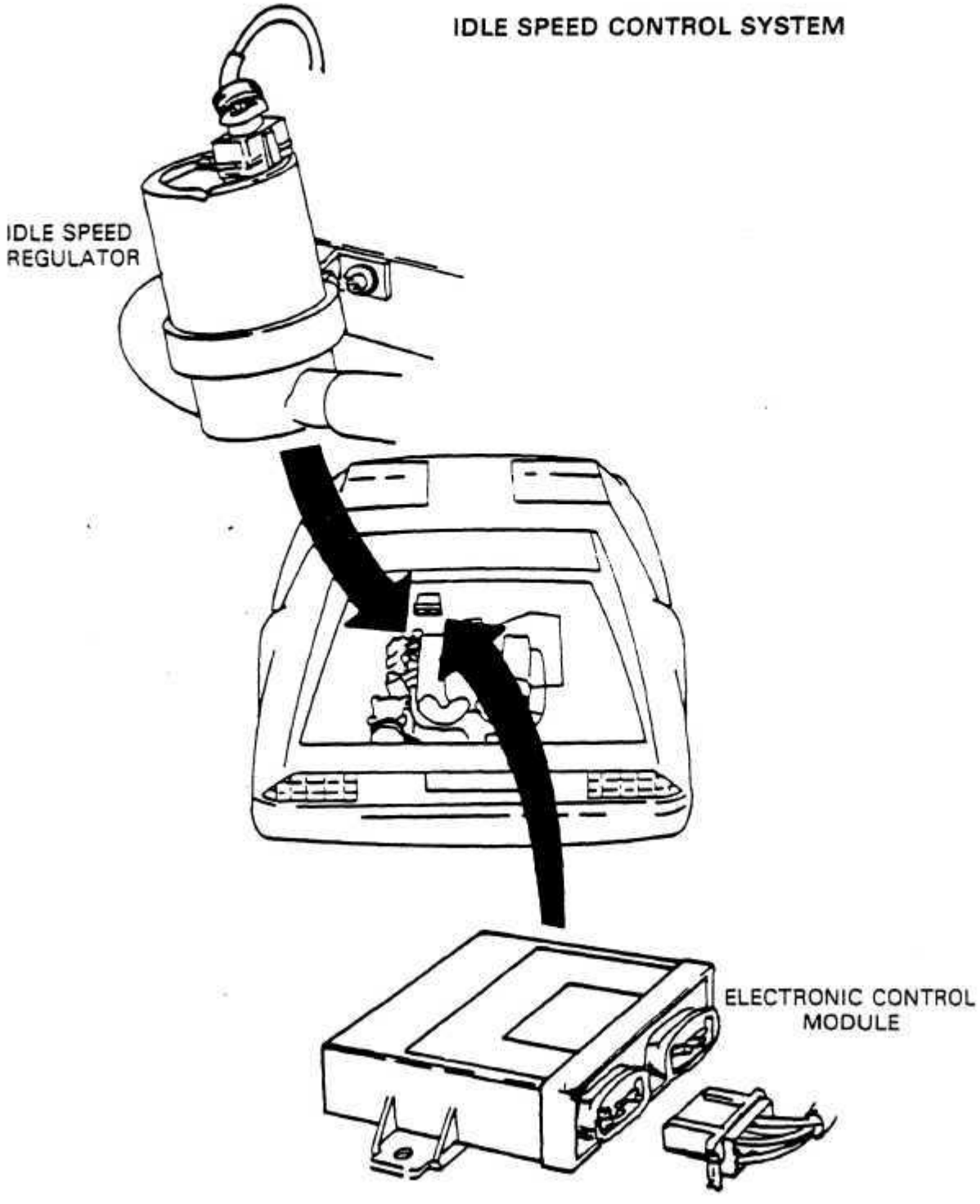


Fig. 40

EVAPORATIVE EMISSION CONTROL SYSTEM

SYSTEM DESCRIPTION

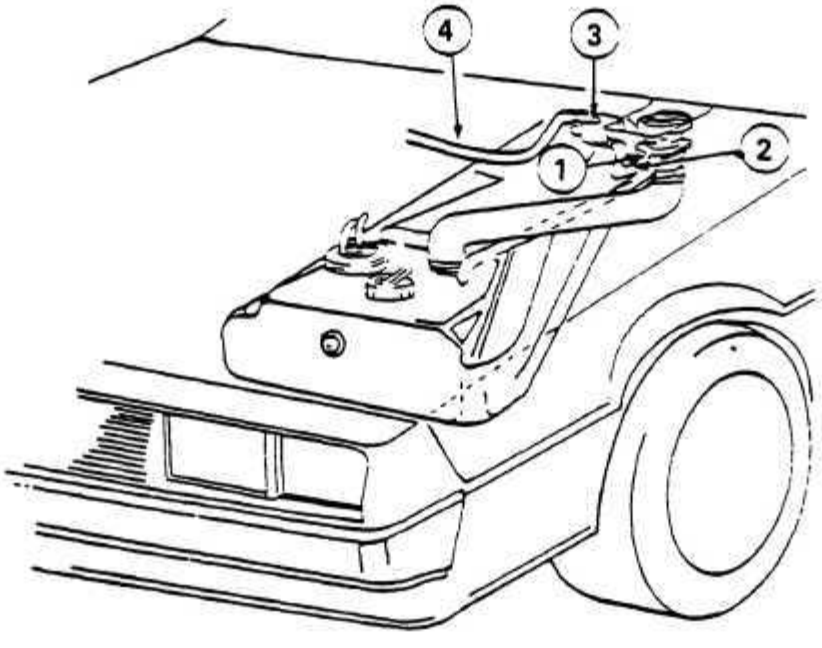
An evaporative emission control system consisting of the fuel tank, vapour lines, vapour storage cannister and a closed engine crankcase is used on the De Lorean.

The purpose of the system is to prevent fuel and oil vapours from entering the atmosphere. All vapours are stored within the system when the vehicle is not running. During operation, the vapours are purged from the system and burned in the engine. *(Fig. 41)*

SYSTEM OPERATION

The entire fuel system is sealed to prevent fuel vapour from escaping. Gasoline vapour in the fuel tank is routed through the vapour separating hose (2) and the roll-over valve (3) to a storage cannister in the rear of the car. When the engine is not running, fuel vapours will remain in the storage cannister.

In the event of a roll-over accident, the roll-over valve prevents liquid fuel from leaking out of the fuel tank and travelling through the vapour hose to the cannister (4).



1 Vapour Outlet
2 Vapour Separating Hose
3 Roll-Over Valve
4 Vapour Hose to Cannister

Fig. 41

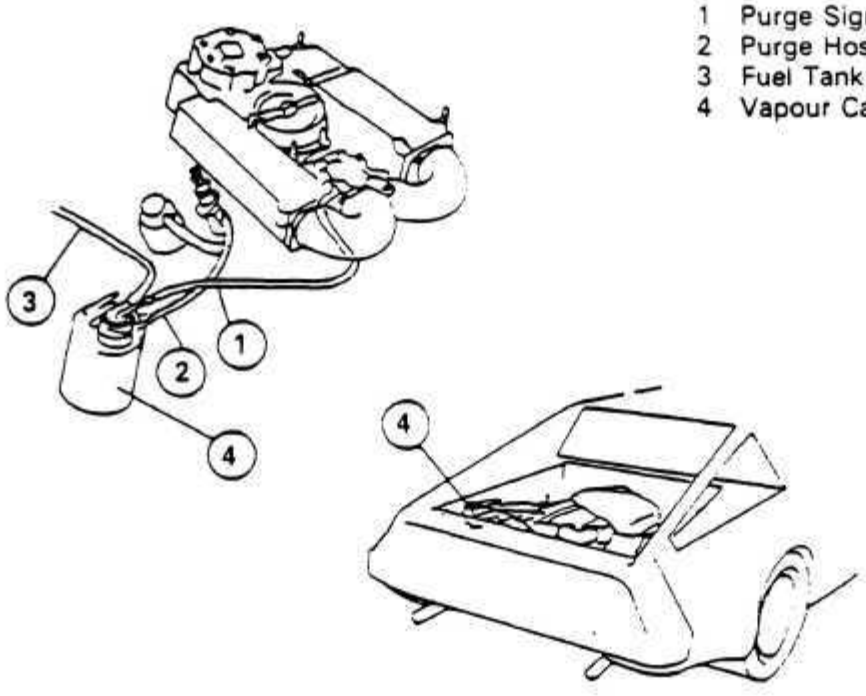


Fig. 42

A purge valve located inside the vapour cannister (4) controls the operation of the vapour storage system. When the engine throttle plates are opened, the purge signal hose (1) applies engine vacuum to the purge valve and opens a passage inside the vapour cannister. The purge hose (2) then connects the cold start air tube to the vapour cannister.

Opening of the purge valve allows the cannister to be purged of fuel vapours. These vapours are drawn into the cold start valve air tube which is connected to the air inlet system. The vapours are mixed with incoming air and burned in the combustion chambers.

The engine oil filter cap is also connected to the cold start valve air tube. This allows any engine vapours to be drawn from the crankcase through the left valve cover to the cold start valve air tube. An orifice in the air tube meters the amount of vacuum applied to the closed crankcase of the engine.

SYSTEM REPAIR NOTES

1. All connections must be tight and leak-free for the evaporative control system to operate properly.

2. Due to the design of the fuel injection system, it will be normal to have a slight amount of pressure in the fuel tank. This pressure will be noticed when removing the fuel filler cap.

3. A restricted vapour hose between the fuel tank and the vapour cannister will cause a vacuum to be created in the fuel tank and possible collapse of tank.

4. The closed crankcase system does not have an air inlet for air circulation within the crankcase. This system applies manifold vacuum to the crankcase which is completely sealed to outside air.

a. A plugged orifice in the cold start valve air tube or a plugged hose that connects the oil filler cap to the air tube would cause excessive pressure build up within the crankcase resulting in possible oil seal and/or gasket damage

b. An air leak in the engine crankcase will cause a lean running condition since the crankcase is connected to the intake manifold. Possible air leaks could be the oil dip stick not installed completely, oil filler cap not sealing properly, or leaking engine gaskets.

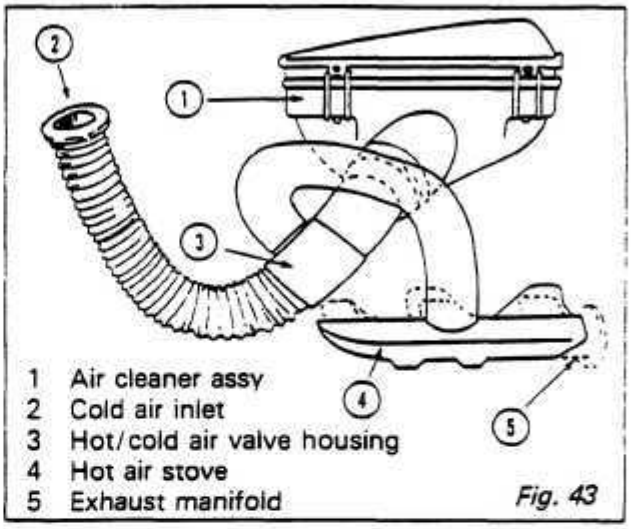
5. The vapour cannister is not serviceable and must be replaced as a complete assembly. The cannister is located inside the left rear body section and is attached to the cover plate which is fastened to the body with (4) bolts. *(Fig. 42)*

AIR INLET SYSTEM

DESCRIPTION AND OPERATION

The temperature of the incoming air to the engine is controlled to improve driveability and reduce exhaust emissions. The temperature of the air is controlled by the air valve housing (3) which is connected to the cold air inlet (2) and the hot air stove (4).

A wax thermostat inside the air valve housing determines the position of a flap controlling the incoming air. The flap is fully open to exhaust manifold heated air at temperatures below 15°C (59°F). As ambient temperature increases, the flap allows a mixture of hot and cold air to enter the engine until 25°C (77°F) is reached. At this time, the flap is fully closed to hot air and fully open to the outside cold air inlet. *Fig. 43*



1 Air cleaner assy
2 Cold air inlet
3 Hot/cold air valve housing
4 Hot air stove
5 Exhaust manifold

Fig. 43

IGNITION VACUUM ADVANCE CONTROL

***DESCRIPTION AND OPERATION*—Fig. 44**

The vacuum signal to the distributor advance is not present during idle and at low engine temperatures. Distributor advance is cut out at low temperatures to improve catalytic converter warm-up. A thermal vacuum control valve (A), located in a coolant passage, closes when the coolant temperature is below 40°C (104°F) to prevent manifold vacuum from reaching the distributor advance. Above 40°C, the control valve is open allowing vacuum to pass to the solenoid valve (B).

The electrically operated solenoid valve (B) is energised whenever the throttle plates are closed. Energising the solenoid closes the vacuum passage to the distributor advance, thus eliminating an over-advanced condition during idle or deceleration. Solenoid operation is controlled by a throttle micro-switch (C) which provides an electrical ground for the solenoid valve when the throttle plates are closed.

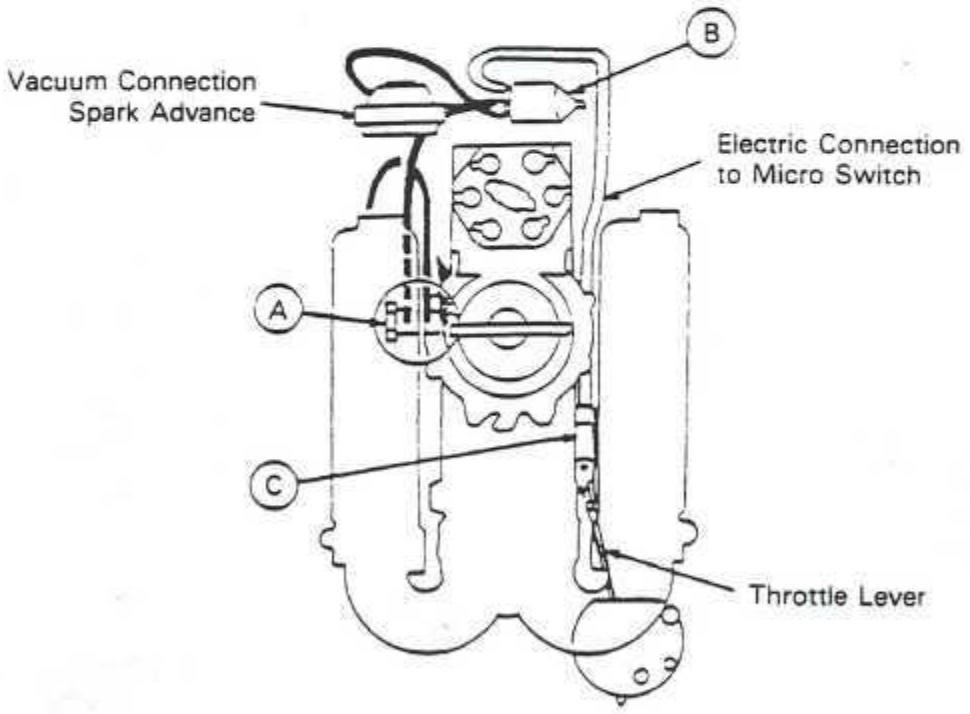


Fig. 44

DECELERATION CONTROL

DESCRIPTION AND OPERATION

During deceleration, a high manifold vacuum is created behind the closed throttle plates and lean condition occurs due to the loss of air flow through the air flow sensor. To eliminate this lean condition which causes high hydrocarbon emissions, a by-pass valve is located in each throttle plate.

The by-pass valves open when the manifold vacuum is above the normal idling vacuum. This allows enough air flow to by-pass the throttle plates and permit continued fuel injection. *Fig. 45.*

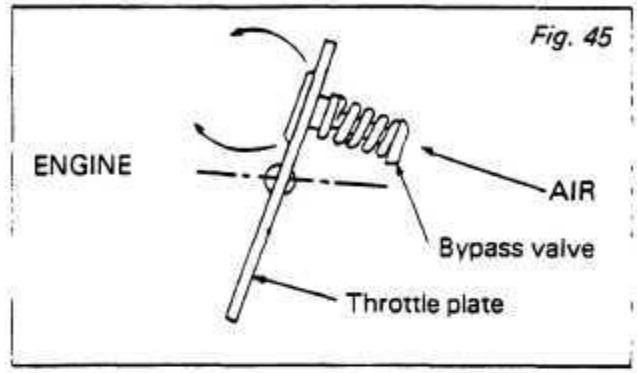


Fig. 45

REMOVING—REFITTING EXHAUST MUFFLER

REMOVING

Note:
Alternator must be loosened and pivoted to gain access to bracket bolts.

Release two bolts securing LH support bracket to engine.

Withdraw rubber mounting off muffler pin, and remove bracket.

Remove two nuts and bolts securing rubber mounting to RH muffler support bracket.

Remove three bolts securing RH muffler support bracket to engine.

Withdraw rubber mounting off muffler pin, and remove bracket.

Slide muffler pipe off catalyst pipe and remove muffler.

Remove bolts securing top muffler mounting bracket to engine.

Withdraw rubber mounting off mounting pin, and remove bracket.

Raise rear of car and release four nuts and bolts securing heatshield to muffler brackets and remove shield.

Loosen off catalyst/muffler joint U-clamp.

Before removing the two lower muffler mountings, provide alternative support for the muffler to avoid injury from sudden release and excessive strain on the pipe joint.

REFITTING

Reverse the removal procedure using exhaust sealant paste on the pipe joint, and tightening mounting brackets in their optimum position before tightening this clamp will distort the pipes and make removal very difficult.

REMOVING—REFITTING EXHAUST MUFFLER

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Withdraw rubber mounting off muffler pin, and remove bracket.

Remove two nuts and bolts securing rubber mounting to RH muffler support bracket.

Remove three bolts securing RH muffler support bracket to engine.

Withdraw rubber mounting off muffler pin, and remove bracket.

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Remove bolts securing top muffler mounting bracket to engine.

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Raise rear of car and release four nuts and bolts securing heatshield to muffler brackets and remove shield.

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Reverse the removal procedure using exhaust sealant paste on the pipe joint, and tightening mounting brackets in their optimum position before tightening this clamp will distort the pipes and make removal very difficult.

Clutch

Contents

CLUTCH/DESCRIPTION E:01:01

SPECIFICATIONS E:02:01

CLUTCH ASSEMBLY E:03:01

FLYWHEEL/PILOT BEARING E:04:01

CLUTCH PEDAL E:05:01

BLEEDING/FLUSHING E:06:01

MASTER CYLINDER E:07:01

SLAVE CYLINDER E:08:01

PIPING/RESERVOIR E:09:01

GENERAL DESCRIPTION

The vehicle, when equipped with the five speed manual transmission, uses a single dry disc type clutch. The clutch is hydraulically operated. The pressure plate is a diaphram spring type and the disc has a spring cushioned hub. A self-aligning, sealed ball-type throw-out bearing is used to depress the diaphram spring. The clutch has its own fluid reservoir and master cylinder which provides hydraulic pressure when the clutch pedal is depressed.

The clutch pedal is connected to the master cylinder with a pushrod. When the pedal is depressed, the pushrod exerts pressure against the master cylinder piston. Slave cylinder piston pressure causes the clutch fork to move the throw-out bearing against the pressure plate. As a diaphram spring is depressed, pressure on the disc is released and the clutch disengages. When the clutch pedal is released, the procedure is reversed and the clutch engages.

The clutch controls consist of a mechanical pedal assembly and a hydraulic control system. A clutch master cylinder, connected to the pedal assembly, converts mechanical movement into hydraulic movement. This pressure and movement is transmitted through a hydraulic pipe to the clutch slave cylinder where it is converted back to mechanical movement. The slave cylinder, connected to the clutch assembly, moves the clutch fork and release bearing, thus engaging or disengaging the clutch mechanism.

The hydraulic clutch system is self-adjusting, therefore no provisions are made for adjustment.

SPECIFICATIONS

Clutch Disc Diameter	235 mm (9.25")
Total Pedal Travel	150 mm (5.90")
Maximum Pedal Load	15 kg (33 lb.)
Pedal Free-Play	Non-Adjustable
Clutch Fluid	Dot 4 Hydraulic Fluid to SAE J 1703

Torque Specifications

Pressure Plate to Flywheel Bolts	20 NM (15 ft.(lb.)
Flywheel to Crankshaft Bolts	55 – 60 NM (41 – 45 ft./lb.)

Note:

Flywheel Bolts must be renewed after each dismantling. Apply Loctite 601 or equivalent on bolt threads.

Special Tools

J28863	Clutch Alignment Arbor
J23907	Pilot Bearing Puller

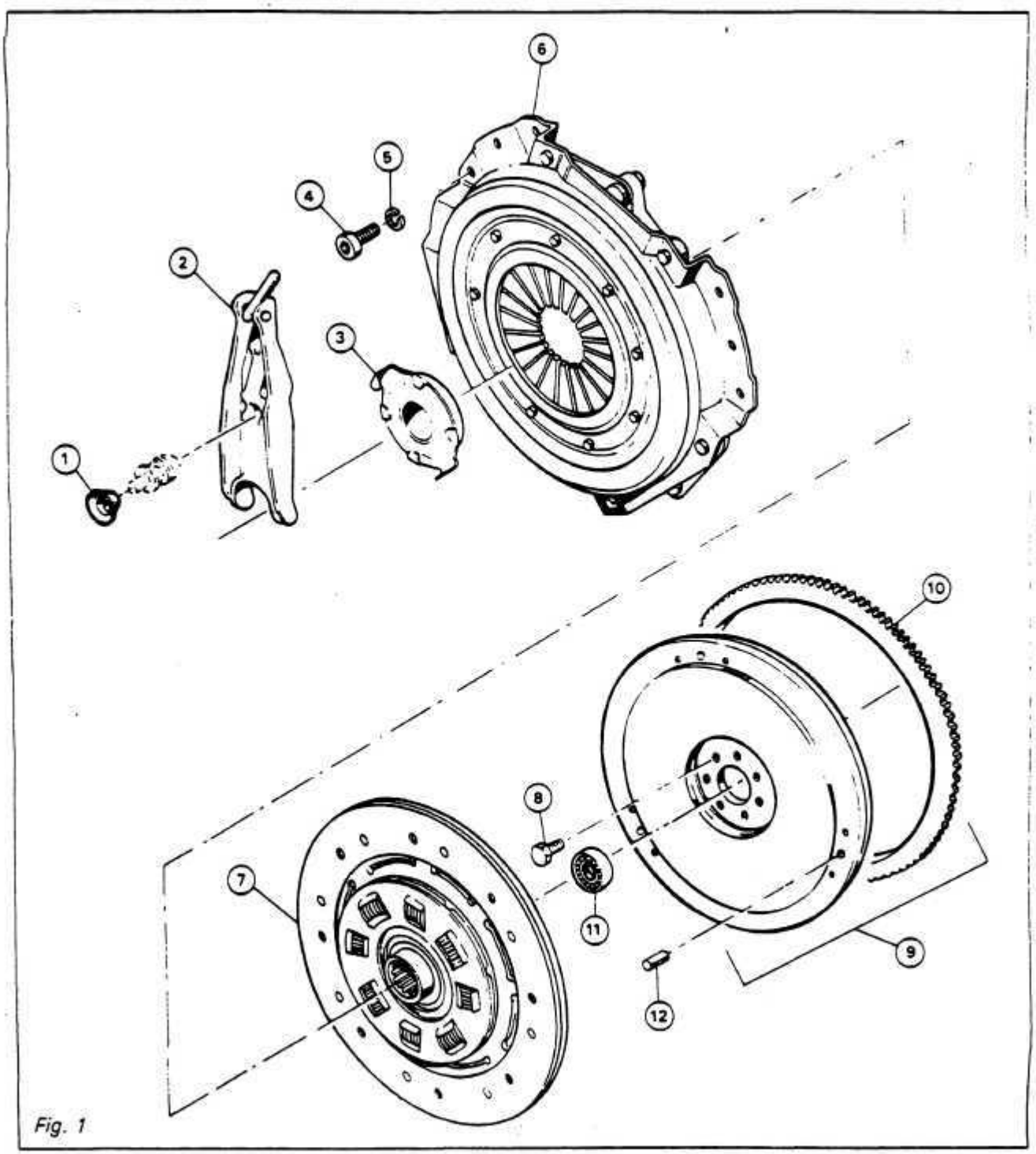


Fig. 1

1. — Dust Seal
2. — Fork, Clutch Release
3. — Bearing, Release
4. — Bolt, Pressure Plate
5. — Lock Washer
6. — Pressure Plate
7. — Clutch Disc
8. — Screw M9 × 100
9. — Flywheel Wiring Gear
10. — Ring Gear, Flywheel
11. — Pilot Bearing, Crankshaft
12. — Pin, Dowel

CLUTCH ASSEMBLY — Fig. 1

REMOVAL

1. Disconnect negative battery — blue cable — and raise vehicle on hoist.
2. Remove transmission as outlined in transmission section.
3. Install clutch alignment arbor, Tool J28863, to support the clutch assembly during removal. Mark the pressure plate and flywheel for indexing purposes during installation.
4. Loosen the pressure plate to flywheel attaching bolts evenly until spring pressure is released. Remove bolts, clutch and pressure plate.
5. Inspect flywheel for cracks, heat checking, runout or other defects. Replace or repair as required.

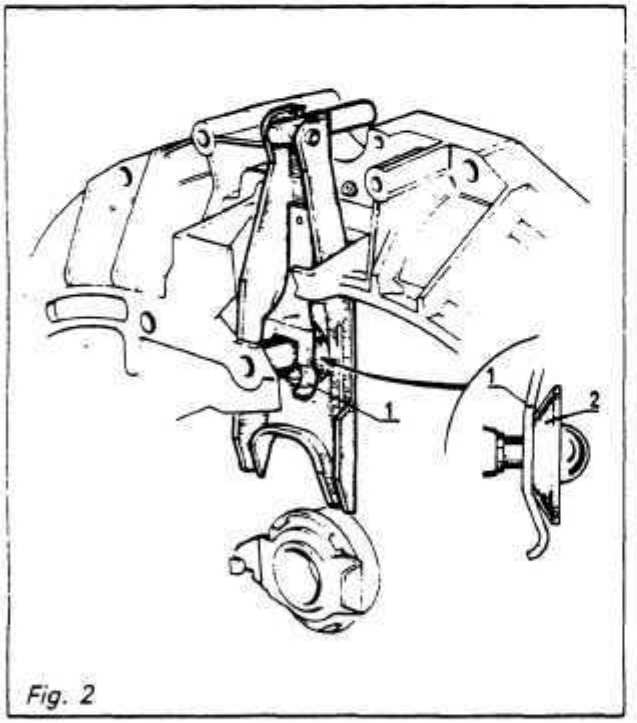


Fig. 2

6. Slide clutch release fork from ball stud. Remove fork and release bearing. *Fig. 2 and Fig. 3*
7. Inspect condition of clutch shaft pilot bearing. See pilot bearing section for replacement.

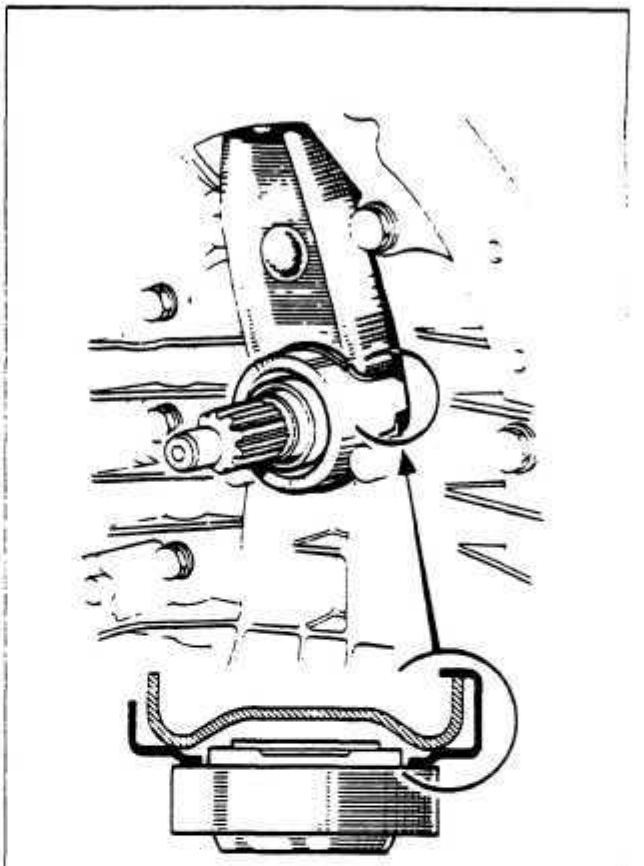


Fig. 34

INSTALLATION

1. Clean pressure plate and flywheel. They should be free of oil, grease, metal deposits or burned spots.
2. Position clutch disc and pressure plate in relative installed position and support them with alignment Tool J 28863.

   Note:
   Driven disc is installed with damper springs to transmission.
3. Align pressure plate and flywheel index marks.
4. Install bolts and tighten down evenly. Torque to proper specifications and remove clutch pilot tool.

5. Lubricate the release bearing contact surface on the pressure plate with Molykote BR2 grease. Lubricate clutch fork pivot and clutch shaft splines with graphite grease.

6. Install clutch fork and release bearing in the clutch housing.

7. Install transmission as outlined in transmission section.

8. Adjust shift linkage as outlined in transmission controls section.

FLYWHEEL/PILOT BEARING

FLYWHEEL

Removal

1. Disconnect negative battery cable and raise vehicle on hoist.
2. Remove transmission as outlined in transmission section.
3. Remove clutch as outlined in clutch section.
4. Mark flywheel and crankshaft for indexing purposes.
5. Remove flywheel attaching bolts and flywheel.

Installation

1. Reverse removal procedure.

Note:
Flywheel bolts must be replaced after each dismantling. Apply Loctite 601 or equivalent on bolt threads.

PILOT BEARING

Removal

1. Disconnect negative battery cable and raise vehicle on hoist.
2. Remove transmission as outlined in transmission section.
3. Remove clutch as outlined in clutch section.
4. Remove pilot bearing using tool J 23907.
5. Apply Loctite 601 or equivalent to outside of pilot bearing and install using suitable drift.

Installation

1. Reverse removal procedure.

CLUTCH PEDAL — Fig. 4

REMOVAL

1. Remove pedal box assembly as outlined in chassis frame and body section.
2. Remove spring clip and pivot pin connecting clutch pedal to clutch release shaft.
3. Remove spring clip retaining pedal shaft on right hand side of pedal box.
4. Draw out pedal shaft towards left hand side (at same time inserting short bar or screwdriver to retain accelerator and brake pedals) until clutch pedal is released.
5. Pedal pivot bushes may be replaced by knocking out old bushes and pressing in new.

INSTALLATION

1. Lubricate clutch pedal pivot bushes with grease.
2. Smear clutch release shaft pivot pin with molybdenum based grease and lightly oil shaft retaining clips and felt washer.
3. Position clutch pedal in pedal box, with spacer washer (if fitted) between left hand side of clutch pedal and pedal box.
4. Push pedal shaft through spacer washer (if fitted), clutch pedal, brake pedal, accelerator pedal, felt washer, plain washer, and into 'D' shaped hole in pedal box. Retain with spring clip.
5. Connect clutch release shaft to clutch pedal lever with pivot pin and retain with spring clip.
6. Wipe any excess lubricant from assembly and ensure all pedal pads are totally grease free.
7. Install pedal box assembly.

Clutch

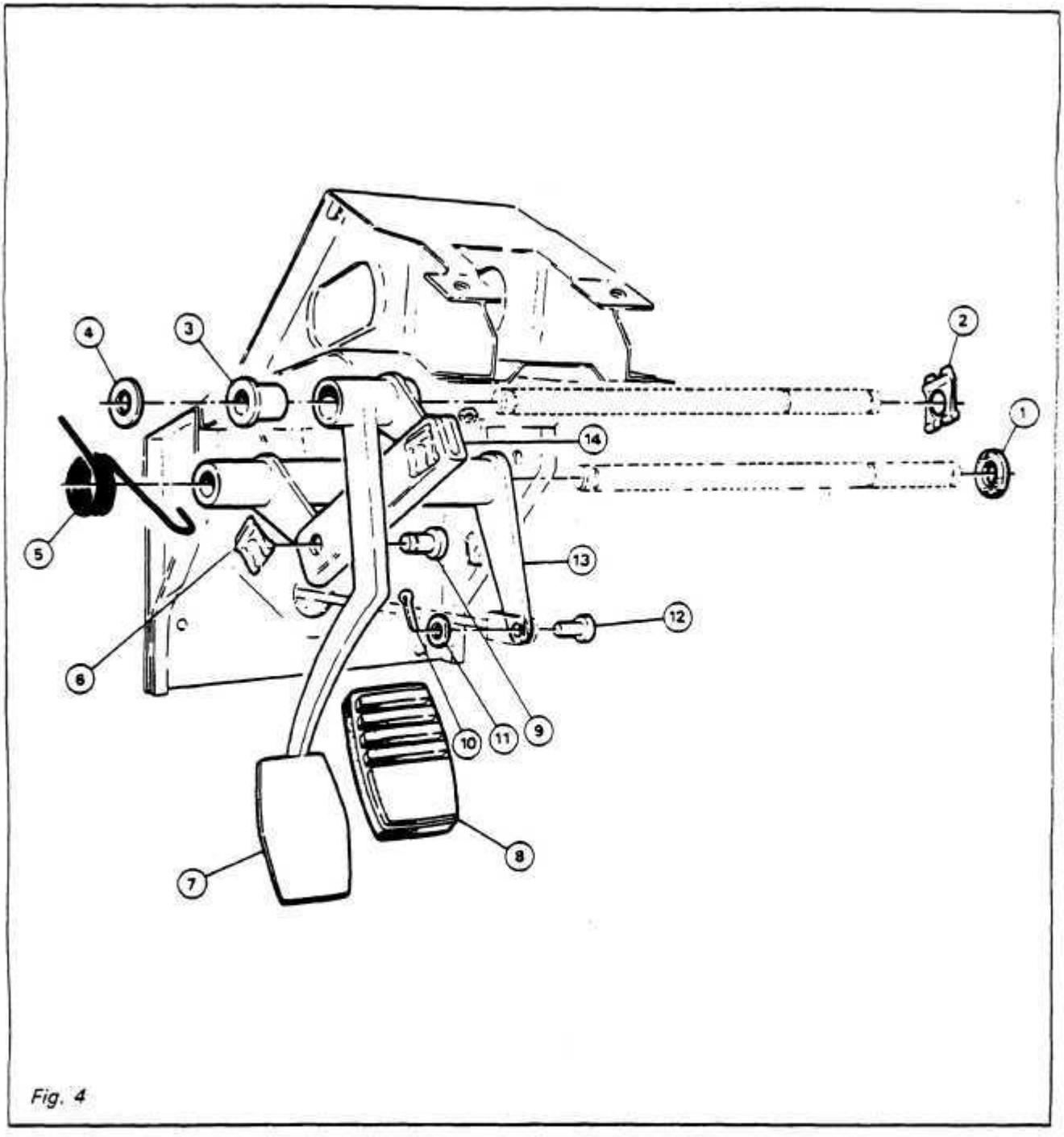


Fig. 4

1. — Felt Washer
2. — Retaining Clip
3. — Bush, Shift Brkt.
4. — Washer
5. — Spring, Clu. Ped. Ret.
6. — Screw M6 × 20
7. — Pedal, Clutch
8. — Pad. Brkt./Clu. Pedal
9. — Pivot Pin
10. — Pin
11. — Washer M8
12. — Clevis Pin, Clu. M./Cyl.
13. — Clutch Rel. Shaft
14. — Link, Mech. Clu. and Brkt.

BLEEDING AND FLUSHING

BLEEDING SYSTEM

1. Top up clutch fluid reservoir with specified fluid.

   Note:
   Ensure that reservoir fluid level is maintained throughout the bleeding procedure.

2. Connect one end of a hose to the bleedscrew and place the other end in a container.

3. Raise vehicle and open bleedscrew on clutch slave cylinder enough to allow the fluid to be pumped out.

4. Depress the clutch pedal through the full stroke, followed by three short, rapid strokes.

5. Close the bleedscrew before releasing the pedal on the last stroke. Release the pedal and allow it to return rapidly.

6. Open bleedscrew and repeat operation 4 and 5 until all the air is evacuated.

7. Remove bleed hose and top up reservoir to bring the level to within 10 mm (0.394 in.) of the bottom of the filler neck.

FLUSHING SYSTEM

It is recommended that the entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in the hydraulic system.

Flushing is also recommended if there is any doubt as to the grade of fluid or if there is any trace of contamination.

1. Remove fluid from clutch reservoir.

2. Top up reservoir with new fluid and perform bleeding operation. See "Bleeding Hydraulic System" procedures.

3. Continue to bleed until all of old fluid has been flushed from system.

CLUTCH MASTER CYLINDER

REMOVAL

1. Remove luggage compartment carpet and both access covers on left side of compartment.
2. Disconnect reservoir hose and clutch pipe from master cylinder and cap ends to prevent entrance of dirt.
3. Working from inside vehicle, remove clip and clevis pin securing master cylinder push rod to clutch release shaft.
4. Remove nuts securing master cylinder to pedal box.
5. Remove master cylinder from vehicle by pulling it out through forward access hole.

DISASSEMBLY

1. Clean outside of master cylinder thoroughly. Turn cylinder over and pump push rod by hand to drain all fluid. Always discard used fluid.
2. Carefully release crimps on metal retaining band securing dust cover. Do not damage metal band as it must be reused.
3. Pull back dust cover and remove circlip.
4. Remove plunger assembly by shaking cylinder or by compressed air pressure.
5. Lift leaf on spring retainer and separate spring assembly from plunger. *Fig. 5*
6. Compress spring to free valve stem from keyhole in spring retainer. Remove spring and valve assembly from spring retainer.

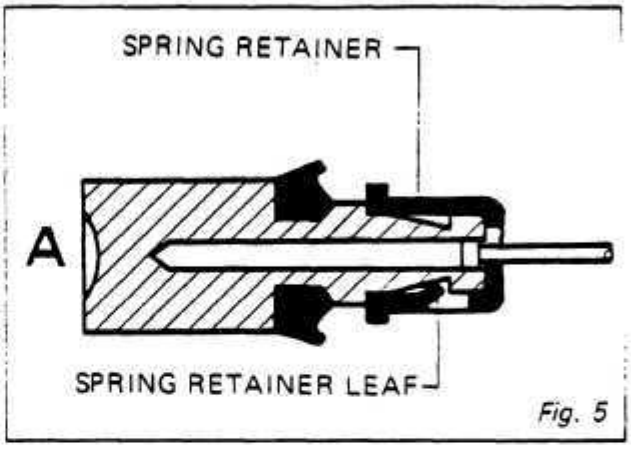


Fig. 5

7. Remove valve stem and spring washer from valve spacer.
8. Remove valve seal from valve stem and remove plunger seal from plunger.
9. Use clean brake fluid to clean all metal parts thoroughly. Air dry and place cleaned parts on clean paper or lint-free cloth.

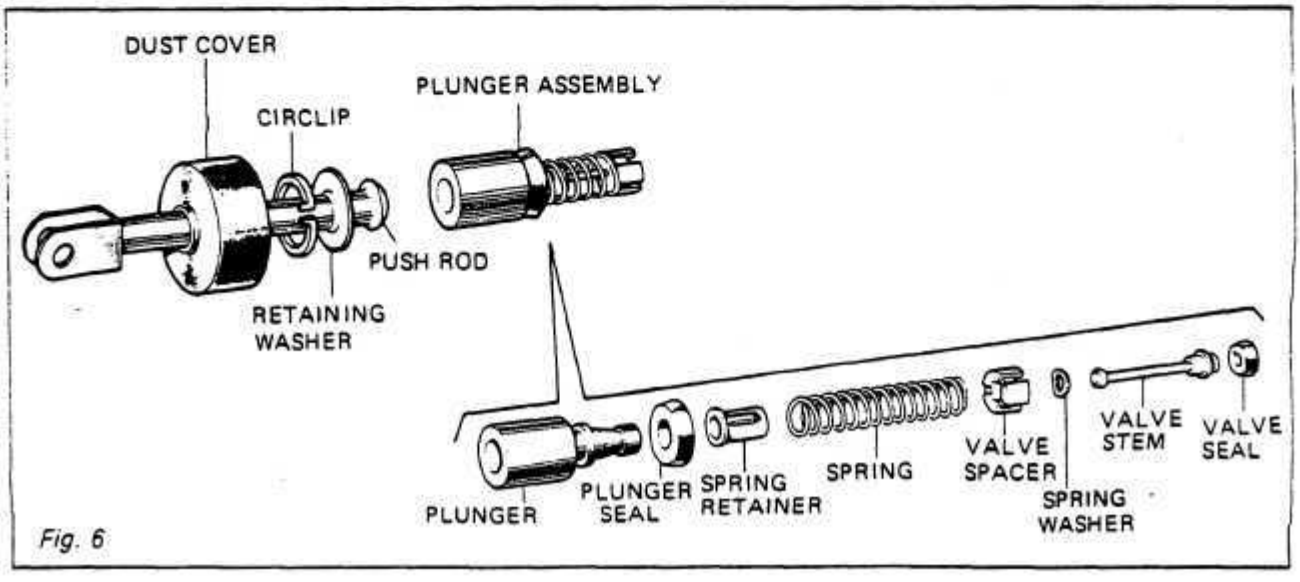


Fig. 6

Note:
Do not use any cleaning fluids that contain mineral oil.

10. *Examine* plunger and cylinder bore for visible score marks, ridges and corrosion. If bore or plunger are not smooth, cylinder must be replaced. *Fig. 6*

Note:
Polishing or honing the bore of the cylinder is **prohibited.**

REASSEMBLY

1. Use new parts from service kit when reassembling.
2. Lubricate new plunger seal with clean brake fluid and install seal on the plunger with lip facing valve assembly. *Fig. 6*
3. Lubricate new valve seal and fit seal, smallest diameter leading, on to valve head.

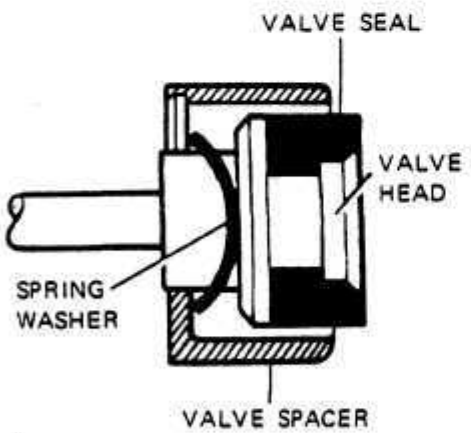


Fig. 7

4. Position new spring washer on valve stem so it "flares" away from valve stem shoulder. *Fig. 7*
5. Fit valve stem and spring washer into valve spacer.
6. Fit spring and spring retainer to valve assembly. Compress spring until valve stem passes through keyhole in spring retainer and engages in center.
7. Fit spring sub-assembly onto plunger and depress leaf of spring retainer to secure assembly.
8. Lubricate plunger assembly and cylinder bore with clean brake fluid. Insert plunger assembly into cylinder bore.
9. Fit new dust cover on push rod. Place push rod and retaining washer in master cylinder and install new circlip.
10. Smear dust cover and plunger bore entrance with rubber grease supplied in service kit.
11. Position dust cover over bore and install metal retaining band. Firmly press metal band against cover and crimp metal band in three (3) equally spaced places to secure.

INSTALLATION

1. Fit master cylinder on vehicle. Install and tighten two (2) mounting bolts. See torque specifications.
2. In car, connect master cylinder push rod to clutch release shaft using clevis pin, washer and retaining pin.
3. Connect reservoir hose to master cylinder.
4. Fit clutch pipe to master cylinder but do not tighten completely.
5. Top up reservoir with clean brake fluid and bleed air from master cylinder by depressing clutch pedal slowly. Repeat until all air has been evacuated. Tighten clutch pipe.
6. Install access covers and luggage compartment carpet.
7. Top up reservoir and perform clutch bleeding.

CLUTCH SLAVE CYLINDER

The clutch slave cylinder should not be disassembled. Replace the cylinder as an assembly if there are any signs of leakage or if a malfunction occurs.

REMOVAL

1. Raise vehicle on hoist.
2. After engine exhaust has cooled, disconnect clutch line from slave cylinder.
3. Remove two (2) bolts securing slave cylinder to clutch housing.
4. Remove slave cylinder.

Note:

Slave cylinder push rod does not have to be disconnected from clutch fork.

INSTALLATION

1. Reverse removal procedure.
2. Bleed clutch. See clutch bleeding section for procedure.

CLUTCH PIPING/RESERVOIR

CLUTCH PIPING

The clutch pipe leading from the clutch master cylinder to the slave cylinder clutch line is routed between the body and chassis. To replace the clutch pipe, it is necessary to remove the vehicle body from the chassis. See the "Body" section for removal and installation procedures.

CLUTCH RESERVOIR

Removal

1. Remove left hand vertical access cover inside luggage compartment.
2. Clamp reservoir hose and remove hose from master cylinder.
3. From inside vehicle, remove two (2) nuts securing reservoir.
4. Remove reservoir from vehicle.

Installation

1. Reverse removal procedures.

Manual Transmission

CONTENTS

GENERAL DESCRIPTION F:01:01

SPECIFICATIONS/SPECIAL TOOLS F:02:01

ON CAR SERVICE F:03:01

DIFFERENTIAL OIL SEAL F:04:01

REMOVAL/INSTALLATION F:05:01

OVERHAULING F:06:01

CONTROLS DESCRIPTION AND OPERATION F:07:01

DMC

GENERAL DESCRIPTION

The manual transmission is a constant mesh five speed. All forward gears are fully synchronised for ease of shifting. The aluminium case consists of two halves which, when repair is necessary, can be separated to provide easy access to internal parts. The final drive components are also contained within the transmission case. Both the final drive and transmission use the same lubricant eliminating the need for a separate final drive lube. *(Fig. 1)*

The power train consists of:

A. Primary (input) shaft
B. Secondary (output) shaft
C. Six driving gears
D. Six driven gears
E. One reverse slider gear

The selector control consists of:

A. Four shift rods and shift forks
B. One pivoting interlock
C. One selector lever and shaft
D. One selector shaft arm

All forward gear power flow is transferred via:

A. Primary shaft (input)
B. The selected driving gear (primary shaft)
C. The selected driven gear (secondary shaft)
D. Pinion shaft/final drive unit

Reverse gear power flow is transferred by means of:

A. Primary shaft
B. Reverse driving gear
C. Reverse slider gear
D. Reverse driven gear
E. Pinion shaft/final drive unit.

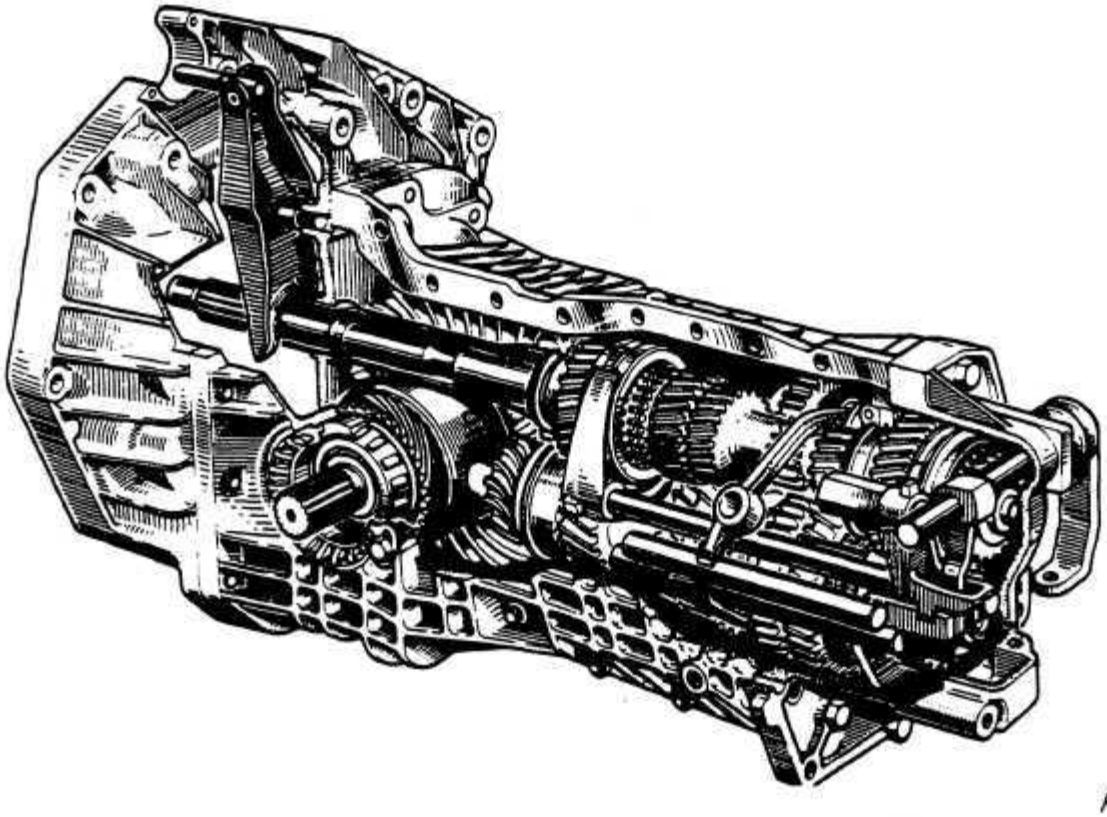


Fig. 1

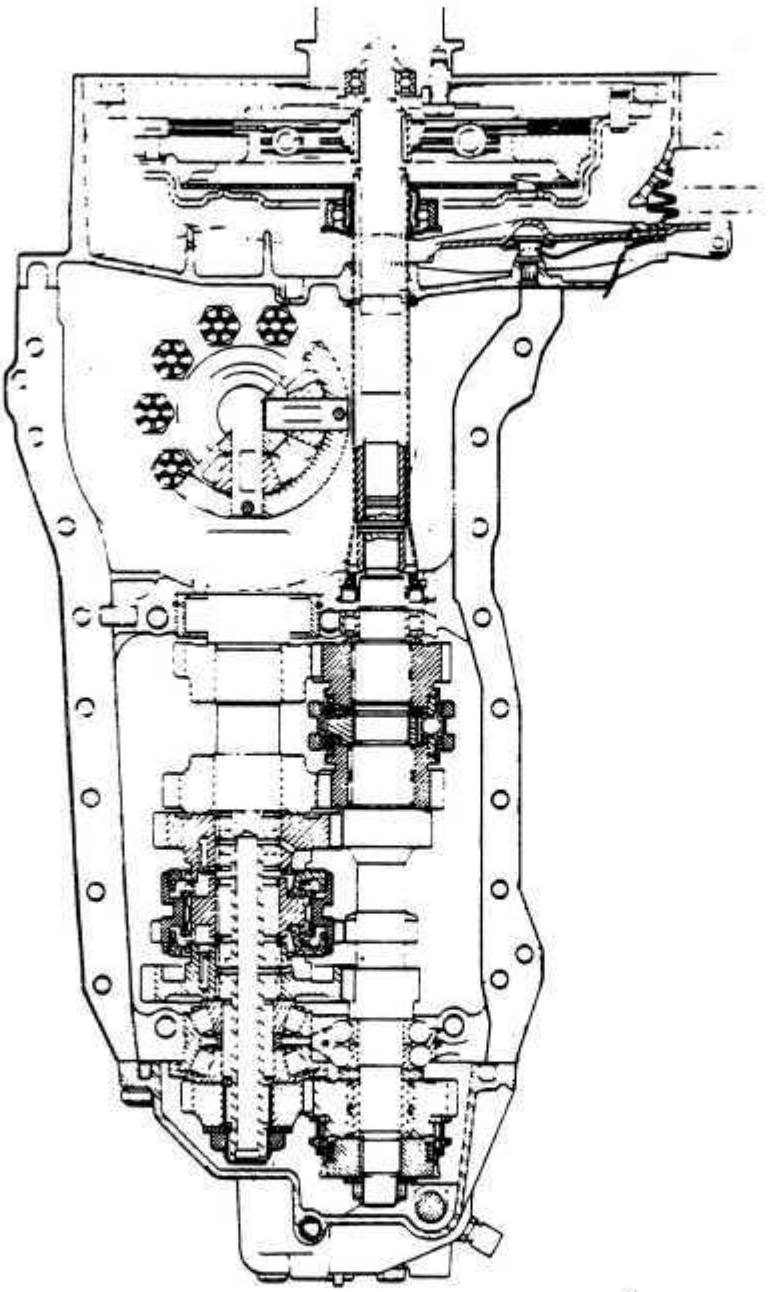


Fig. 2

All gears are selected manually by the driver using the gearshift lever attached to the selector lever mounted on the side of the transmission rear housing. Inside the rear housing, a selector shaft arm, attached to the selector shaft, fits through a slot in the pivoting interlock. When a gear is selected, the selector shaft arm moves the interlock to the desired position and moves the appropriate shift rod in or out depending on the gear selected. The shift fork attached to the shift rod moves the desired gear into the proper position while the synchroniser ring matches the speed of the two gears being coupled. This shift sequence is repeated for all forward gears. Reverse operation is the same with the exception of the synchroniser ring, which is not required, since the vehicle should be stationary when shifting to reverse. *(Fig. 2)*

SPECIFICATIONS

GEAR RATIOS

1st.	3.364	4th.	1.057
2nd.	2.059	5th.	0.8205
3rd.	1.381	Rev.	3.1818

FINAL DRIVE RATIO

3:44:1

LUBRICANT

Capacity: 3.7 litres (7.82 pints)
Viscosity: Below −10°C (−3°F) SAE 75
Above −10°C (−3°F) SAE 80
Classification: Must meet spec. MIL−L−2105C or API−GLS

DIFFERENTIAL

Backlash: Nonadjustable
Carrier Bearing Preload:
New Bearing 10−30 Nm (2.7 LB)
Used Bearings Must turn free without any play.

TORQUE SPECIFICATIONS

Transmission mount brackets to rear cover−
25 Newton Metres (18 FT/LB)
Clutch housing to engine shield−
20 Newton Metres (14 FT/LB)
Starter motor to clutch housing−
27 Newton Metres (19 FT/LB)
Flywheel protection shields to clutch housing−
20 Newton Metres (14 FT/LB)
Inner driveshaft to flange
Shift cable mount brackets to rear cover−
25 Newton Metres (18 FT/LB)
Transmission drain and fill plugs−
19 Newton Metres (13 FT/LB)
Rear cover to case−
20 Newton Metres (14.6 FT/LB)
Half-casing attaching bolts:
8 mm diameter 30 NM (22.5 FT/LB)
10 mm diameter 45−55 NM (34−41 FT/LB)
Clutch housing to case−
45−55 NM (34−41 FT/LB)
Differential ring gear to carrier−
120−140 NM (90−105 FT/LB)
Primary shaft nut−
120−150 NM (90−112.5 FT/LB)
Secondary shaft nut−
120−150 NM (90−112.5 FT/LB)
Bearing retaining plate to case−
45−55 NM (34−41 FT/LB)
Reverse shift fork to case−
12−14 NM (22−30 FT/LB)

SPECIAL TOOLS

J28869	Spring Compressor
J28866	Slide Bearing Cap Wrench
J33400	Seal Installer
J23907	Pilot Bearing Installer

ON CAR SERVICE

DRAIN AND REFILL

1. Raise the vehicle on a hoist.
2. With the transmission at operating temperature, remove the drain plug and allow oil to drain completely. *(Fig. 3)*
3. Install drain plug and tighten.
4. Remove the fill plug located on the side of the transmission case. *(Fig. 3)*
5. Fill the transmission with lubricant until the level of the oil is at the bottom edge of the fill plug hole. See specifications for proper specified lubricant.
6. Install the fill plug and tighten. *(Fig. 4)*

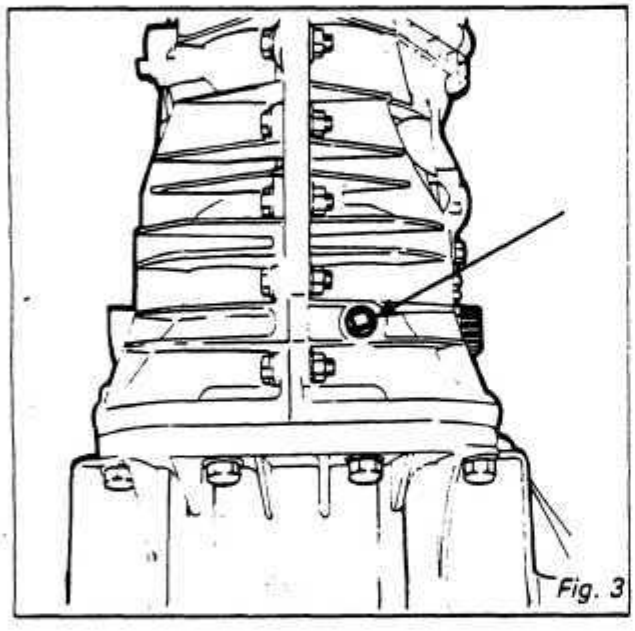


Fig. 3

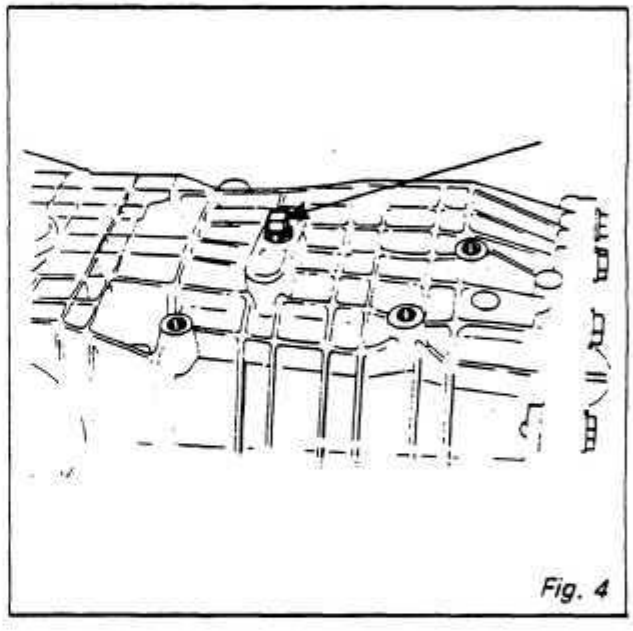


Fig. 4

DIFFERENTIAL OIL SEAL

REMOVAL

1. Raise the vehicle on a hoist.
2. Drain the transmission oil as previously described.
3. Disconnect the inner end of the inner driveshaft from the flange on the side that is going to be replaced.
4. Remove the retaining pin with pin punch securing the flange to the differential shaft. *(Fig. 5)*

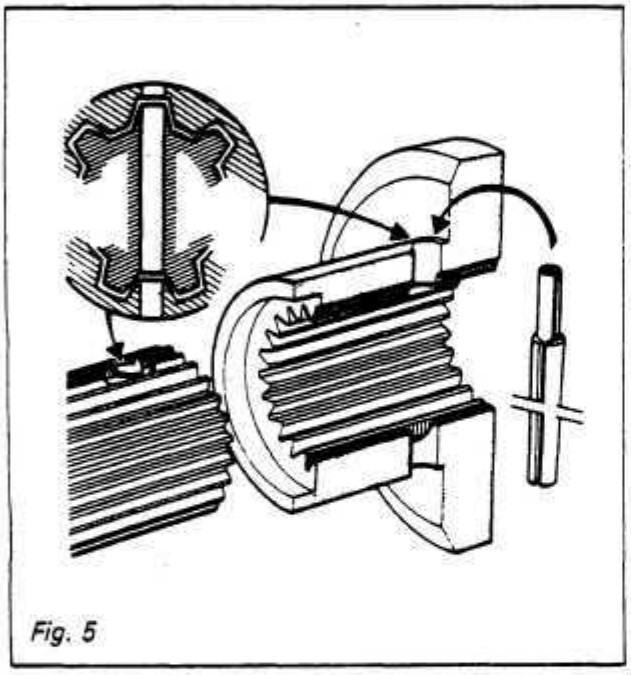


Fig. 5

5. Remove the driveshaft flange.
6. (a) Right Seal: Pry seal out of the transmission case using a suitable tool taking care not to damage case.

   (b) Left Seal:

   (1) Index mark the adjusting nut and transmission case for reinstallation. Remove the differential adjusting nut lock plate. *(Fig. 6)*

   (2) Unscrew the adjusting nut using Tool J28866 **counting the number of turns required to disengage the threads.** *(Fig. 7)*

   (3) Remove O-ring seal and pry out the lip seal using suitable tool taking care not to damage adjusting nut.

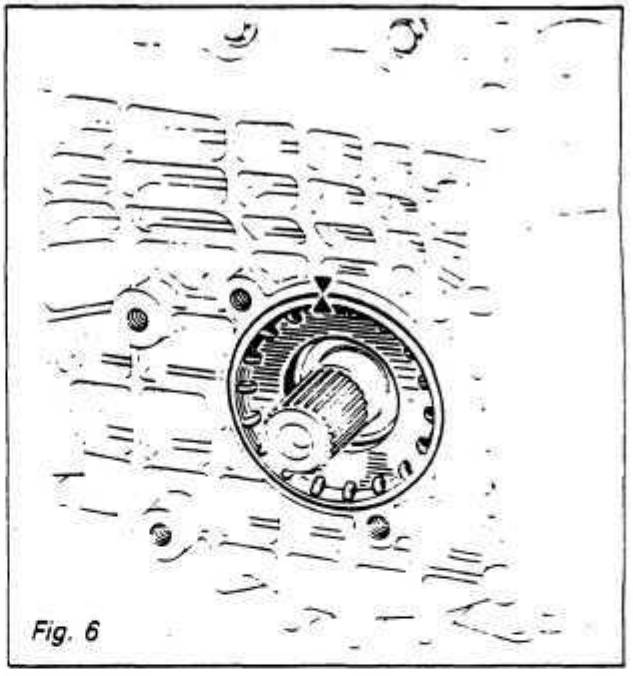


Fig. 6

INSTALLATION

1. (a) Right Side: Apply specified sealer CAF 33 to the outer edge of the new lip seal and install the seal in the transmission using a suitable drift.

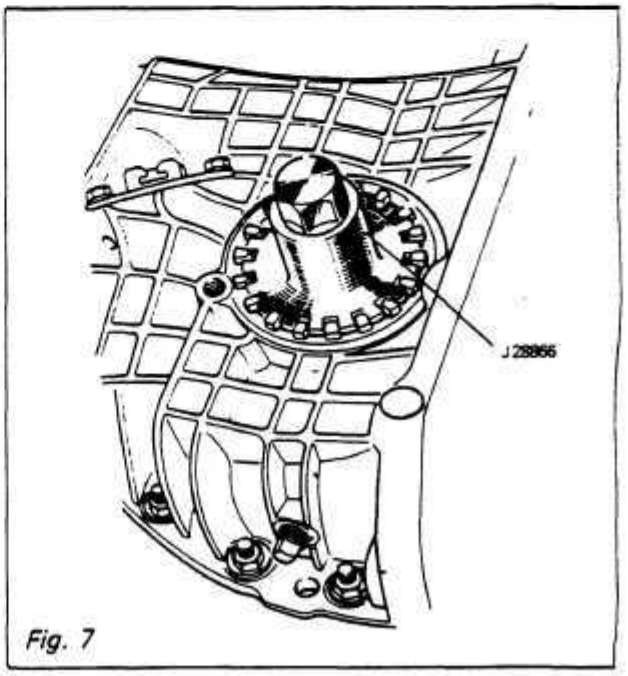


Fig. 7

(b) Left Side:

(1) Apply specified sealer to the outer edge of the new lip seal and install the seal in the adjusting nut using Tool J33400.

(2) Fit the new O-ring seal on the adjusting nut.

(3) Apply specified sealer to the adjusting nut threads and install nut into the transmission case.

(4) Thread the adjusting nut into the case the exact number of turns noted on removal. Align the index marks and install the adjusting nut lock plate and bolt.

(5) Align the retaining pin hole in the driveshaft flange with the retaining pin hole in the differential side gear shaft and position the flange accordingly.

(6) Insert the retaining pin.

(7) Connect the inner driveshaft to the driveshaft flange and torque bolts to specification.

(8) Fill the transmission with the recommended lubricant and lower the vehicle.

TRANSMISSION – REMOVAL/INSTALLATION – Fig. 8

REMOVAL

1. Disconnect the negative battery cable and raise the vehicle on a hoist.
2. Remove the right rear wheel. Mark the adjustment position of the parking brake cable and disconnect the cable from the brake lever and the mounting bracket. Move the cable clear of the transmission.
3. Disconnect the gear change tube from the bellcrank and the transmission. Remove the gear change tube.
4. Support the transmission and remove the bolts securing the left and right transmission mount brackets to the mounts.
5. Remove the mount brackets from the transmission end cover.
6. Lower transmission and remove the retaining clip, washer and clevis pin securing the shift cable.
7. Disconnect the shift cable mounting bracket from the end cover.
8. Disconnect the wires from the back-up light switch.
9. Disconnect the clutch hydraulic line (plastic) from the union leaving the steel line connected to the union and the clutch slave cylinder.
10. Remove the flywheel protection shield from the clutch housing.
11. Disconnect the plate securing the magnetic timing pick-up on left side of the clutch housing.
12. Remove the bolts securing the starter motor to the clutch housing and position starter out of the way.
13. Remove the bolts securing the transmission to the engine.
14. Using a suitable transmission jack, remove the transmission.
    NOTE: It is necessary to support the transmission and keep proper alignment between the engine and the transmission while separating the units.

INSTALLATION

NOTE: Engine/transmission pilot bearing should be replaced each time the transmission assembly is removed using Tool J23907.

1. To complete installation, reverse the removal procedures. Torque fasteners to specifications.

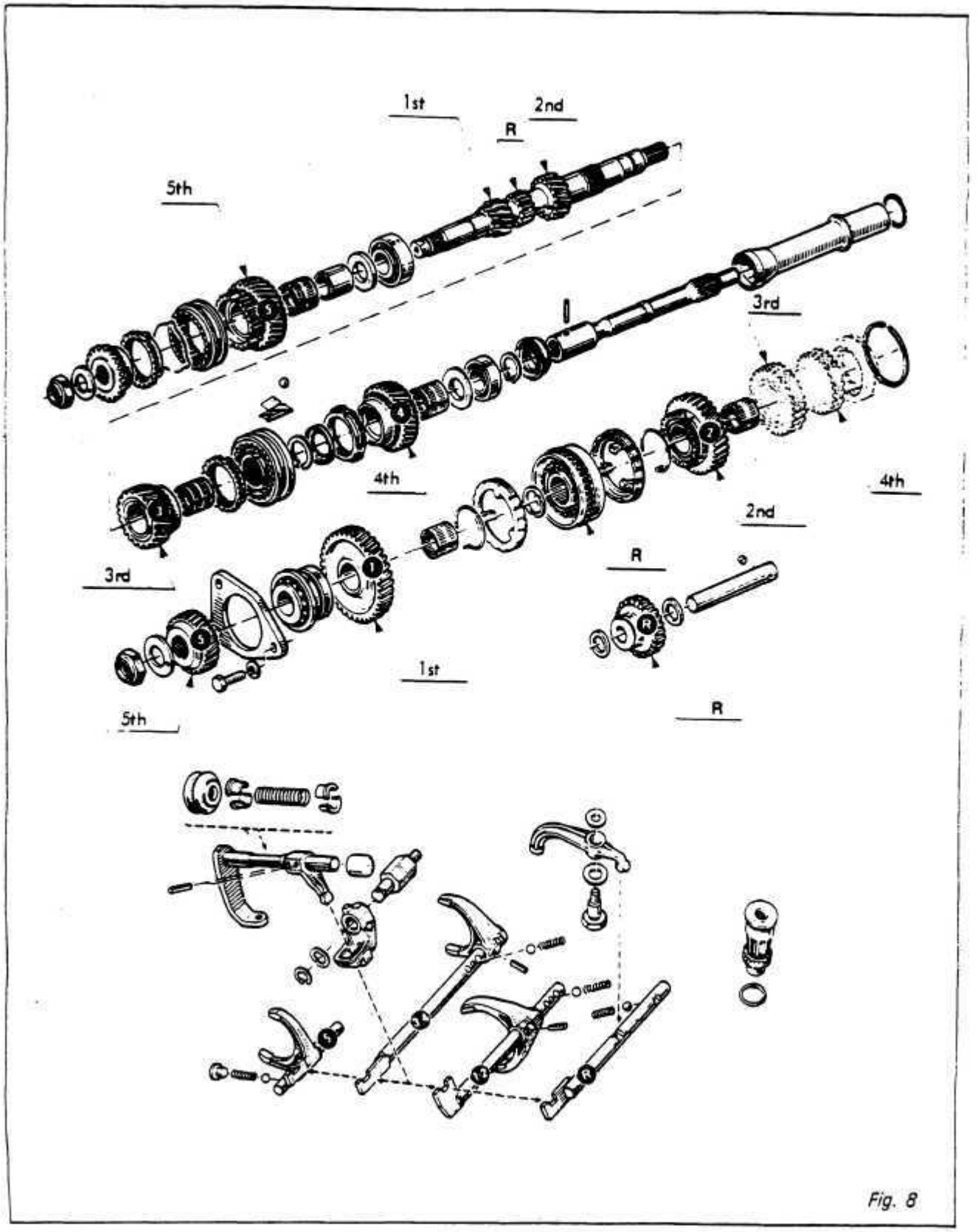


Fig. 8

OVERHAULING TRANSMISSION ASSEMBLY

UNIT DISASSEMBLY

1. Remove the clutch release bearing and clutch fork from the clutch housing. *(Fig. 9)*
2. Remove the clutch housing attaching bolts and remove housing from the transmission case.
3. Remove the 5th speed detent from end cover by removing the screw, spring and detent ball.
4. Remove the end cover attaching bolts (11) and remove end cover. *(Fig. 10).*
5. Select two (2) gears at the same time by moving any two (2) shift rods, to lock transmission. *(Fig. 11)*

   Remove both shaft nuts and discard. Remove both conical washers.

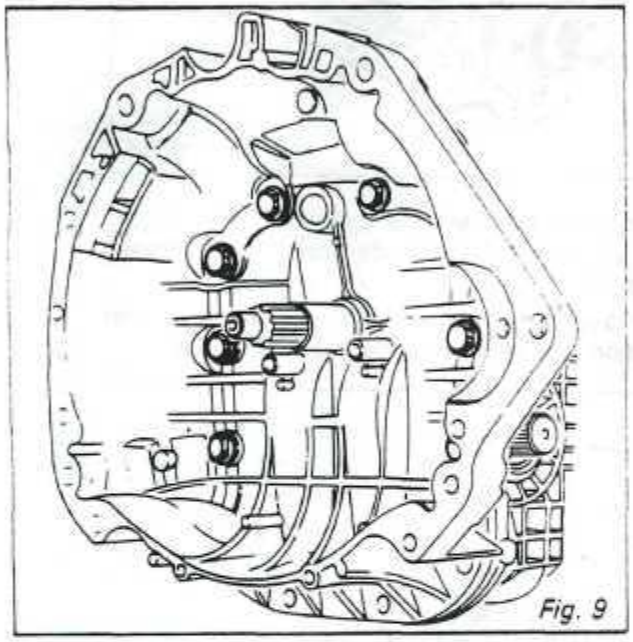


Fig. 9

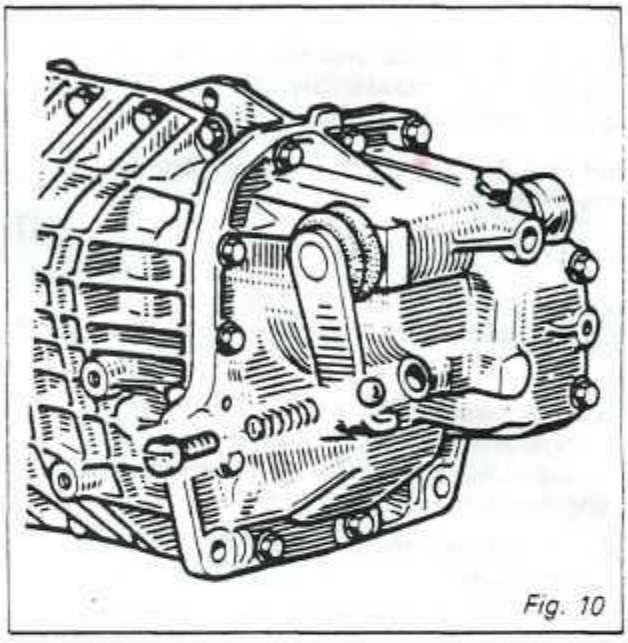


Fig. 10

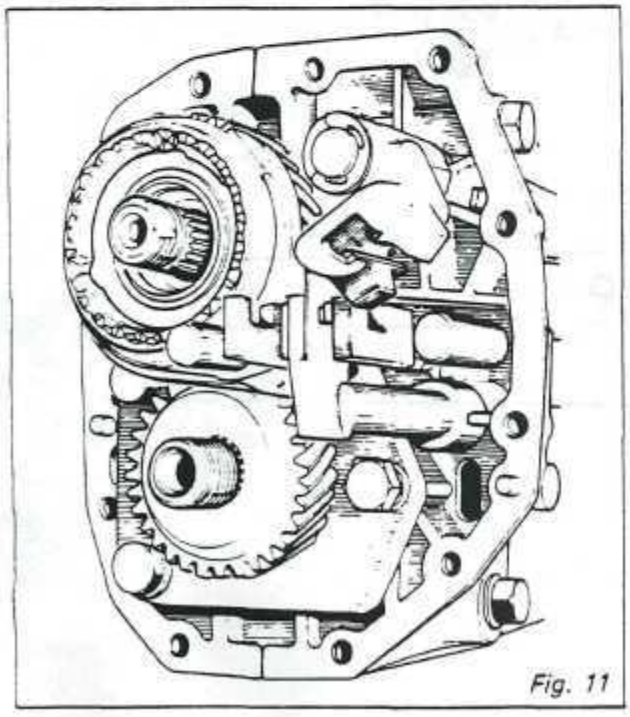


Fig. 11

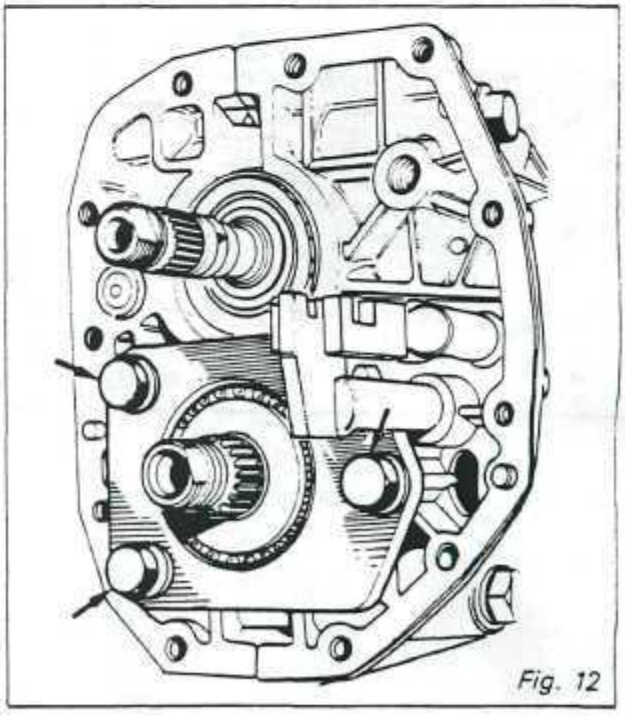


Fig. 12

NOTE: When removing the sliding gear assembly, be careful not to drop the needle roller half-bearings.

6. Remove the 5th speed sliding gear, shaft and fork as an assembly from the primary shaft. *(Fig. 12)*
7. Remove the needle bearing race and washer from the shaft.
8. Mark the 5th speed hub and sliding gear with marking paint for reassembly. Remove the sliding hub from the 5th speed gear.
9. Remove the 5th speed drive gear from the secondary shaft.
10. Remove the pivoting interlock assembly.
11. Remove three (3) bolts securing the roller bearing retaining plate and remove plate. *(Fig. 12)*
12. Remove the twenty (20) bolts, securing the half-casings and separate the cases by lifting up on the case half containing differential adjusting nut (left-hand case). *(Fig. 13)*

    NOTE: Do not use sharp metal tools to pry apart case halves.

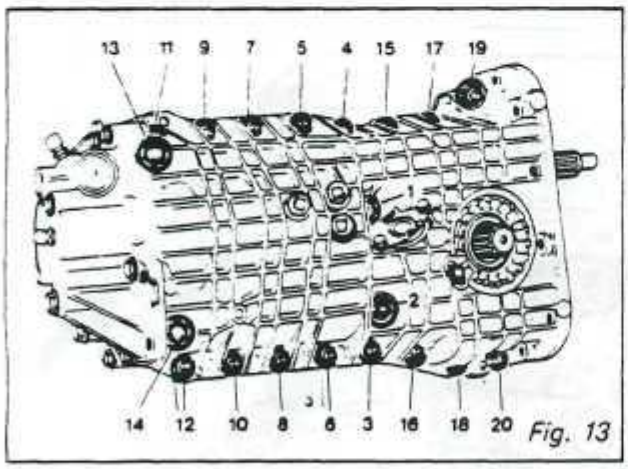


Fig. 13

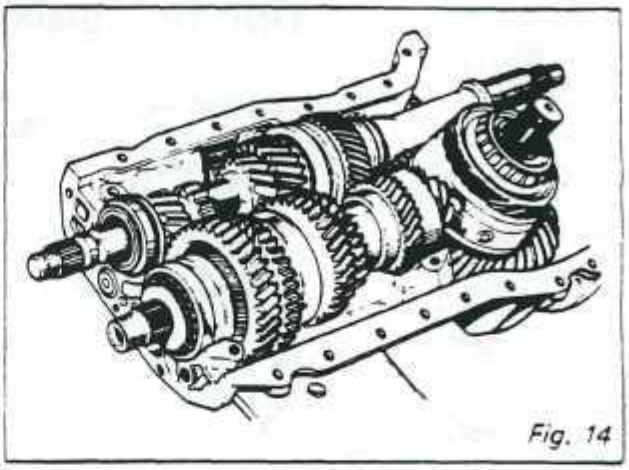


Fig. 14

13. Remove the differential assembly and lift out the primary and secondary shaft assemblies. *(Fig. 14)*
14. Remove the reverse gear shaft, gear, and friction washers from the case. *(Fig. 15)*

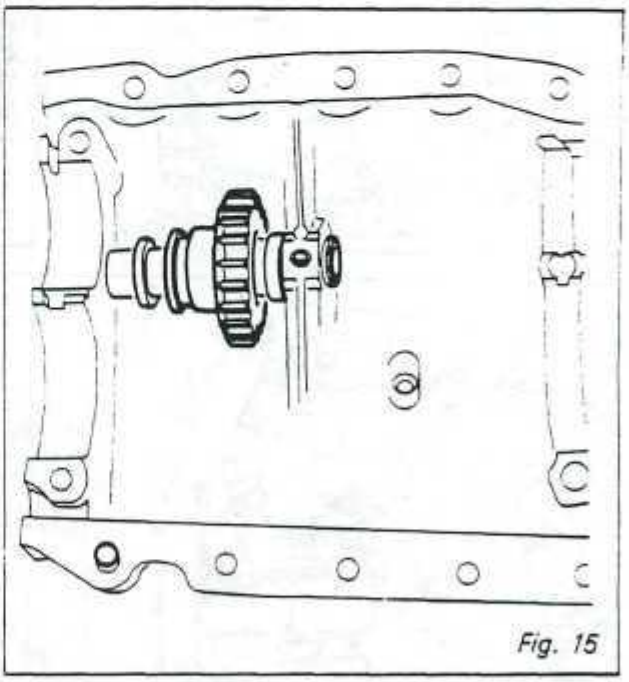


Fig. 15

UNIT REASSEMBLY

Before reassembly is performed, the differential carrier bearing preload must be adjusted.

1. Clean the half-case mating surfaces.
2. Insert the differential assembly in the right-hand half-casing.
3. Install left-hand case and torque tighten the bolts in the correct sequence. *(Fig. 13)*
4. Lubricate the threads on the ring nut and install in the case until it contacts the bearing race using Tool J28866.
5. Tighten the ring nut until all play is removed from the bearings.
6. Attach a piece of string to the differential housing and wrap around the housing several times.
7. Pull the string using a spring scale to measure the bearing preload. *(Fig. 16)* The reading is taken when there is a constant rotating movement of the differential.
8. Tighten differential nut until the proper reading is obtained.
   New Bearings: 10—30 NM (3—7 ft. lb.)
   Used Bearings: Differential should turn free without any play in the bearings.
9. Install adjusting nut lock plate and tighten bolt.
10. Remove left-hand case and differential assembly.
11. Insert the 3mm thick washer, the reverse gear and the 5mm thick washer into the half-case. Fit the reverse shaft in the case, washer, gear and washer. *(Fig. 17)*
    NOTE: Reverse gear must be installed with the shift fork flange facing the rear cover end of the transmission and the 3mm washer placed between the flange and the case.
12. Insert the secondary shaft assembly into the right-hand half-case.
    NOTE: When installing the secondary shaft, align the notch in the double roller bearing with the pin in the case.
13. Insert the primary shaft assembly into right-hand half-case, taking care that the flange of the clutch shaft tube seal is in the **inner groove** of the case. *(Fig. 18)*
14. Install the differential assembly into the right-hand half-case.
15. Coat the half-casing joint faces with specified sealer in accordance with its labelled precautions. Assemble the case-halves.
    NOTE: Use specified sealer, in accordance with its labelled precautions, on No. 1 bolt.
16. Torque tighten the half-case bolts in the proper sequence as shown. *(Fig. 19)*
17. Install the double taper roller bearing retaining plate and torque bolts. *(Fig. 20)*
18. Install the 5th speed gear, conical washer and nut onto the secondary shaft.
    NOTE: Install the conical washer with the cone side towards the nut.
19. Fit the bearing washer and needle bearing race onto the primary shaft.
20. Fit the synchro spring into the lower groove of the 5th speed sliding gear to the hub.
21. Install the 5th speed gear assembly, needle roller half-bearings and shift fork onto the primary shaft.
22. Install the 5th speed synchro ring and dog onto the primary shaft.
23. Install the conical washer and nut on the primary shaft.
    NOTE: Install the conical washer with the cone side towards the nut.

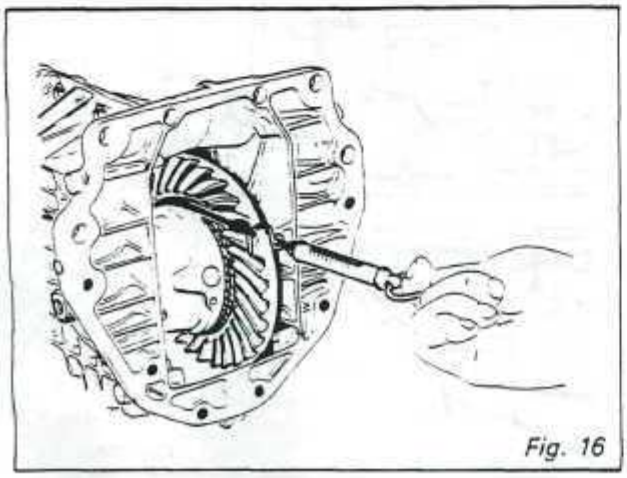


Fig. 16

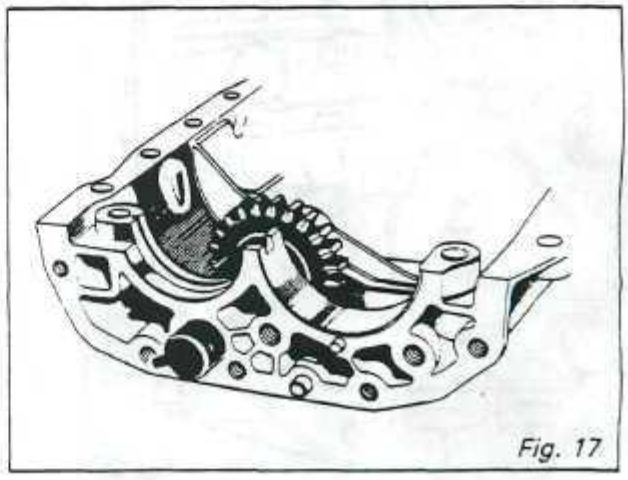


Fig. 17

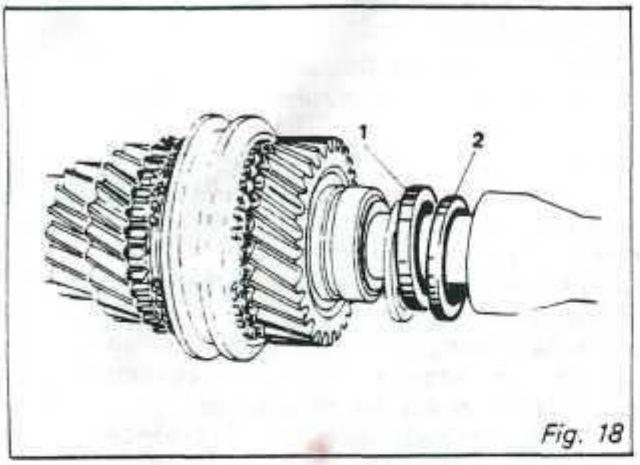


Fig. 18

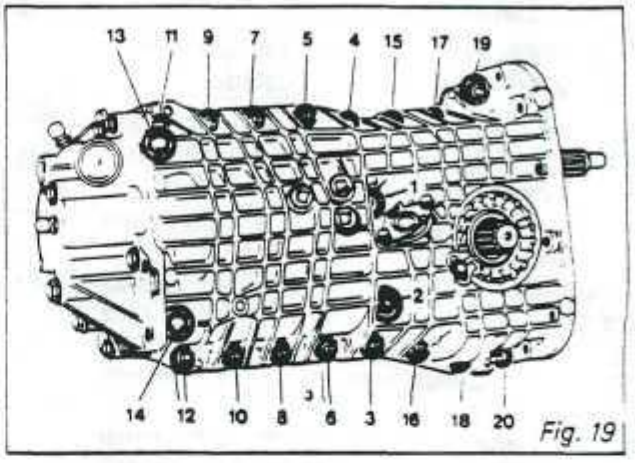


Fig. 19

24. Select two (2) speeds to lock the transmission from turning and torque the new primary and secondary shaft nuts.
    Stake the nuts to the shafts using a suitable soft nosed punch.
25. Place the shift rods in the neutral position (all rod notches aligned) and install the pivoting interlock. *(Fig. 21)*
26. Clean the joint faces on the rear cover and transmission case. Install the new gasket.
    Fit the rear cover making sure that the selector finger enters the pivoting interlock.
    Torque the rear cover bolts to specification.
27. Insert the 5th speed detent ball and spring into the rear cover.
    Coat the plug with specified sealer "Perfect-Seal" in accordance with its labelled precautions and install in the rear cover and tighten. Check operation of the shift linkage.

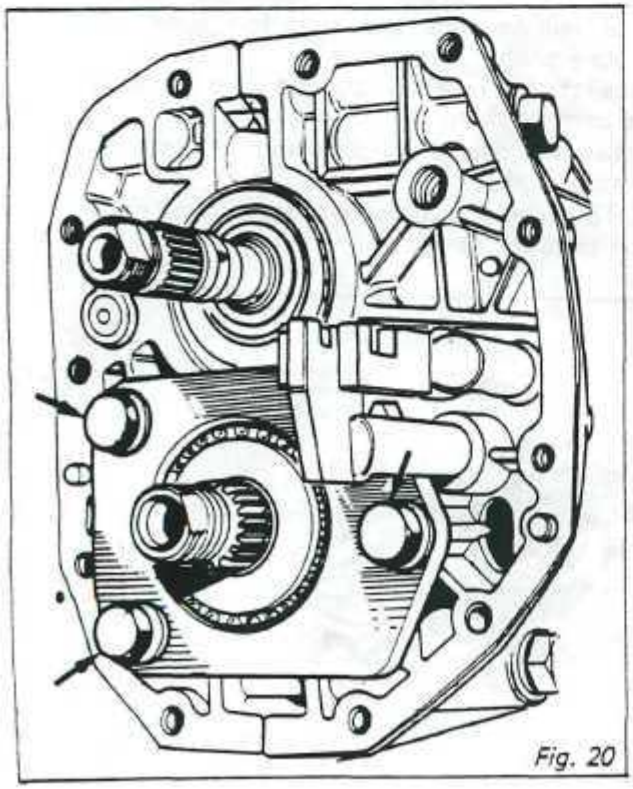


Fig. 20

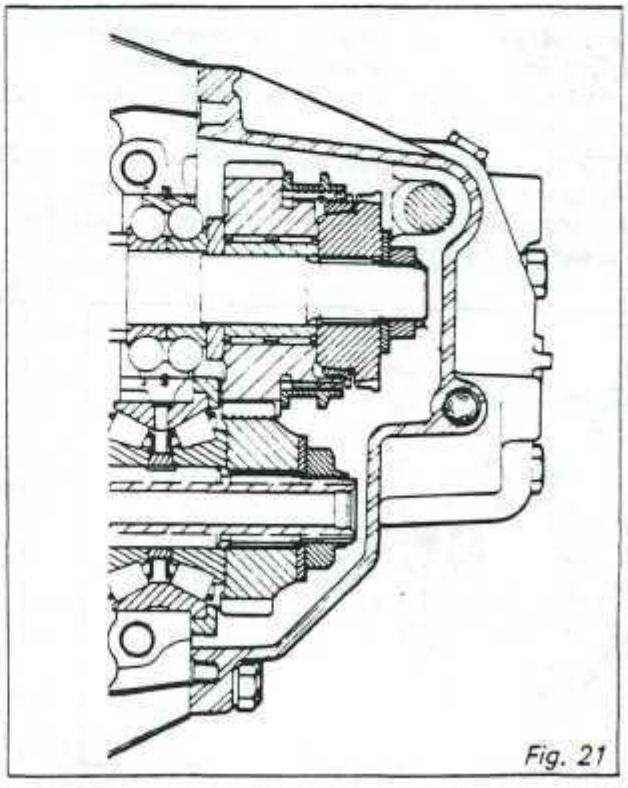


Fig. 21

28. Clean the joint faces of the clutch housing and transmission. Install the new gasket on the transmission case.
Install new O-ring seal on the clutch shaft tube.

29. Install the clutch housing and torque bolts.

30. Install the clutch fork onto the pivot in the clutch housing. The spring clips on the fork should be positioned to hold the dust boot against the clutch fork.

31. Install the throw-out bearing on the clutch fork.

UNIT REPAIR—PRIMARY SHAFT DISASSEMBLY

1. Remove the clutch shaft tube.

2. Separate the clutch shaft from primary shaft by removing the rollpin.

3. Remove the snap ring holding the bearing on the clutch end of the primary shaft.
Remove the bearing from the primary shaft.
NOTE: Do not drop the needle roller half-bearings when performing the next operation.

4. Remove the thrust washer and 4th speed driven gear. Remove the 4th speed synchro ring. *(Fig. 22)*
NOTE: Do not drop the three (3) balls and spring clips when performing the next operation.

5. Mark the position of the 3rd-4th speed sliding gear with marking paint. *(Fig. 23)*
Remove the sliding gear from the synchro hub. Retain the three (3) spring clips and balls.
NOTE: Do not drop the needle roller half-bearings when performing the following operation.

6. Remove the splined washer and synchro hub retaining lock ring.
Remove the 3rd speed driven gear, synchro ring and hub. *(Fig. 24)*

7. Remove the bearing from the differential end of the primary shaft with a suitable splitter extractor and press. *(Fig. 25)*

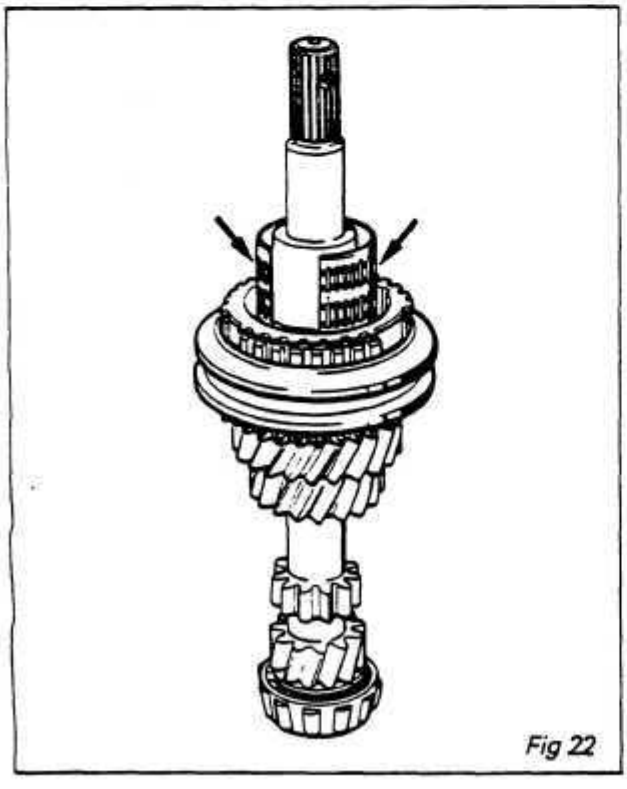


Fig 22

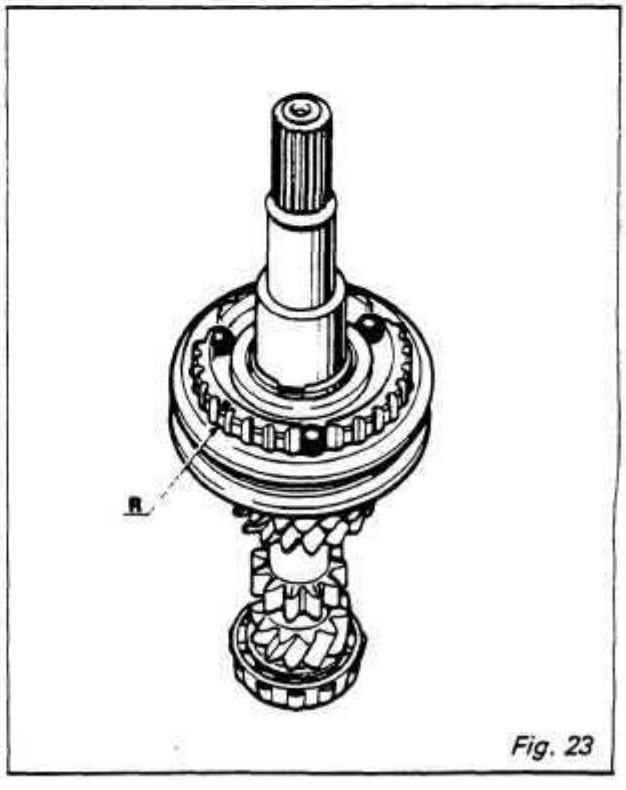


Fig. 23

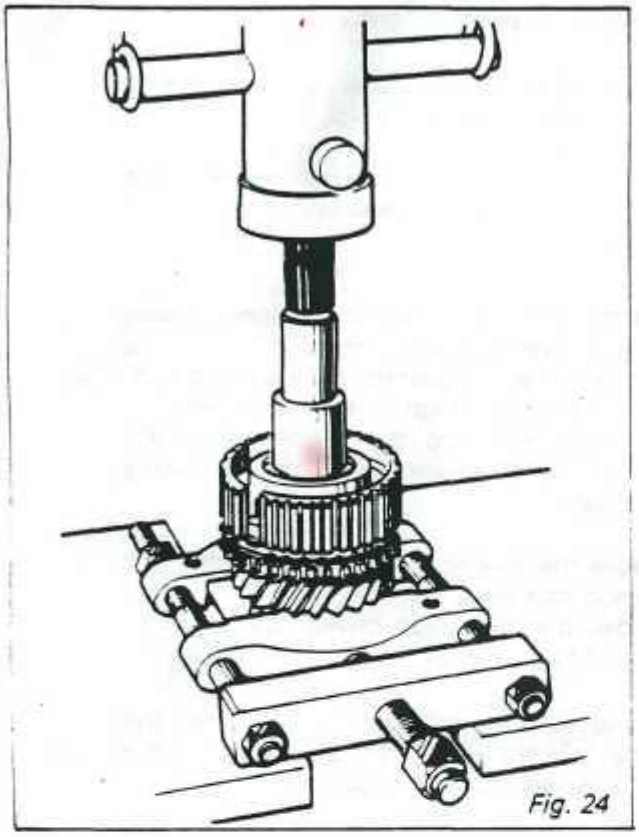


Fig. 24

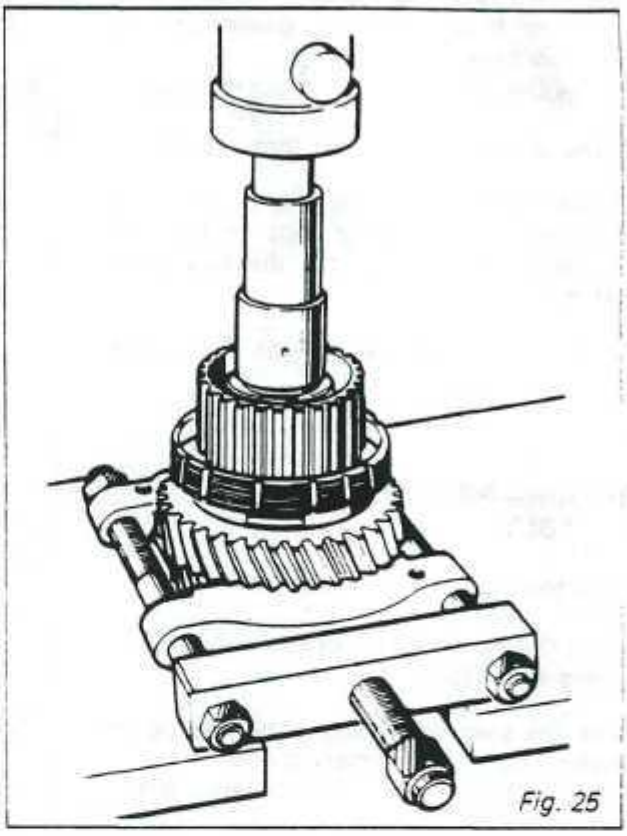


Fig. 25

REASSEMBLY

1. Install the 3rd speed gear, needle roller half-bearings and the 3rd speed synchro ring on the primary shaft.
2. Install the 3rd-4th speed synchro hub on the shaft with the larger offset facing the 4th speed gear.
   Install the hub lock ring.
3. Install the three (3) spring clips in the 3rd-4th speed sliding gear and three (3) detent rollers.
4. Install the washer over the hub lock ring. *(Fig. 26)*
5. Install the 4th speed synchro ring, 4th speed gear and the needle roller half-bearings.
6. Install the washer and bearing on the clutch end of the primary shaft.
   Install the bearing lock ring.
7. Install the bearing on the differential end of the primary shaft. *(Fig. 27)*
8. Install the oil seal on the clutch shaft end of the primary shaft.
9. Fit the clutch shaft on the primary shaft and install the rollpin.
10. Fit the clutch shaft tube onto the clutch shaft. seat the tube on the shaft seal by tapping gently.

SECONDARY SHAFT

DISASSEMBLY

1. Remove the double taper roller bearing from the secondary shaft.
   NOTE: Do not drop the needle half-bearings when performing the following operation.
2. Remove the 1st speed gear and the synchro ring.
3. Mark the position of the 1st-2nd sliding gear with marking paint.
   Remove the sliding gear. *(Fig. 28)*
4. Remove the synchro hub, synchro ring and 2nd speed gear.
   NOTE: The pinion bearing, 3rd gear and 4th gear cannot be removed.

Fig 26

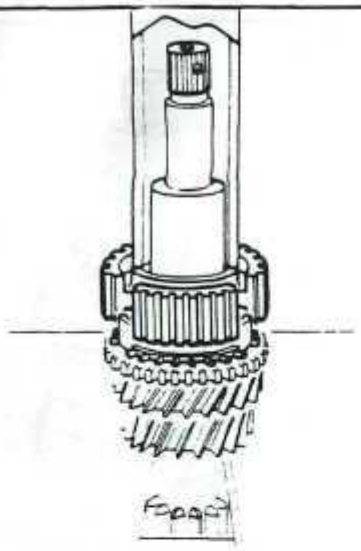


Fig. 28

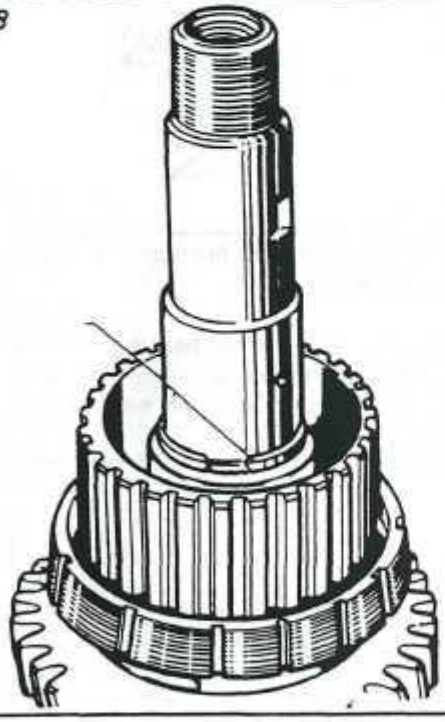
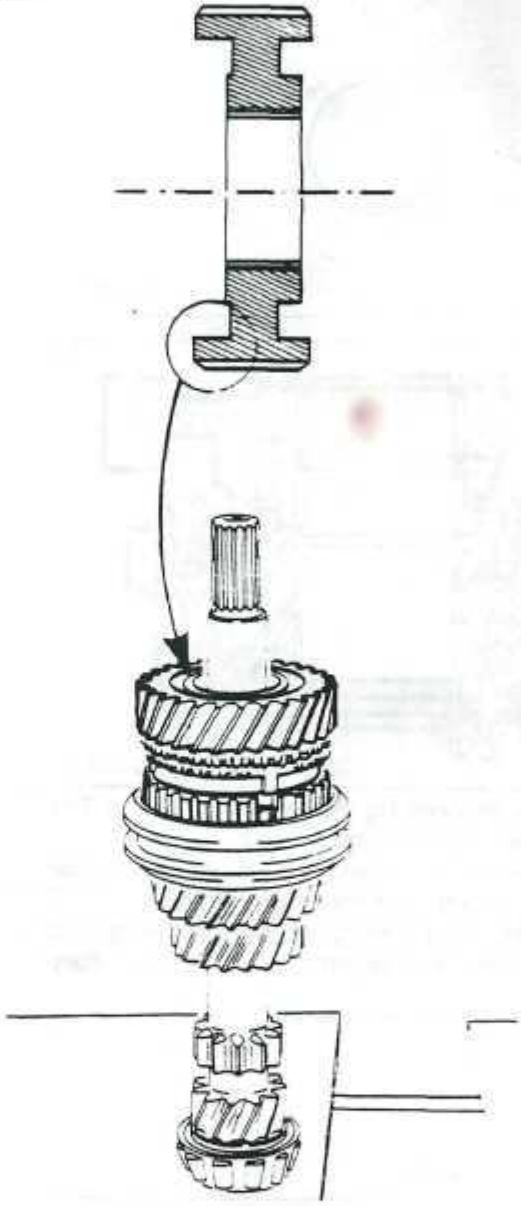


Fig. 27



REASSEMBLY

NOTE: The secondary shaft pinion and the ring gear are lapped together during manufacture. They must be replaced as a set.

1. Install the synchro spring on the 2nd speed gear so that it covers the three (3) notches. *(Fig. 29)*
2. Install the 2nd speed gear, synchro ring and needle roller half-bearings on secondary shaft. NOTE: The 2nd speed synchro ring is smaller than the 1st speed synchro ring.
3. Heat the 1st-2nd speed synchro hub to 250°C (428°F) on a hot plate.
4. Install the synchro hub on the secondary shaft with the offset towards 2nd gear. Press the synchro hub on until it touches the shoulder, keeping the synchro ring aligned and the lugs below the level of the shoulder to prevent damage. Continue pressure until the hub cools. Install the hub lock ring. *(Fig. 30 & Fig. 31)*

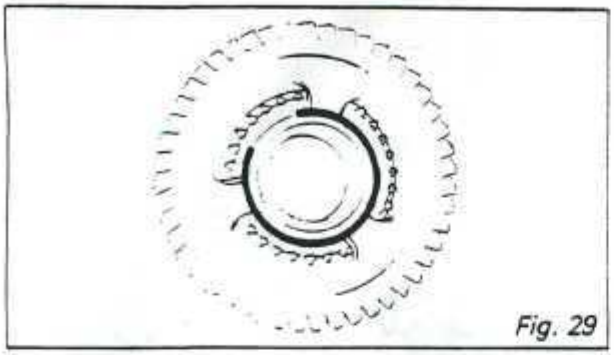


Fig. 29

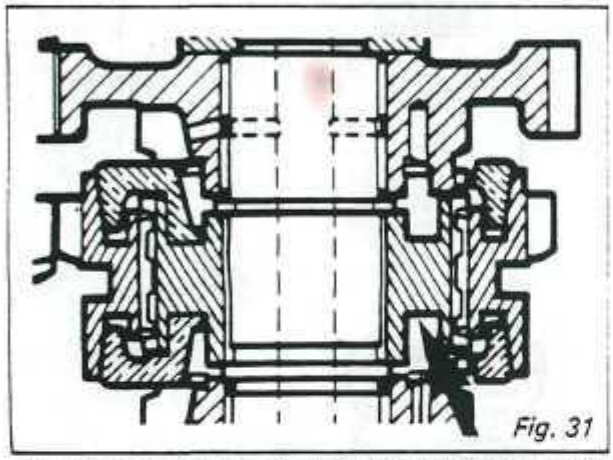


Fig. 31

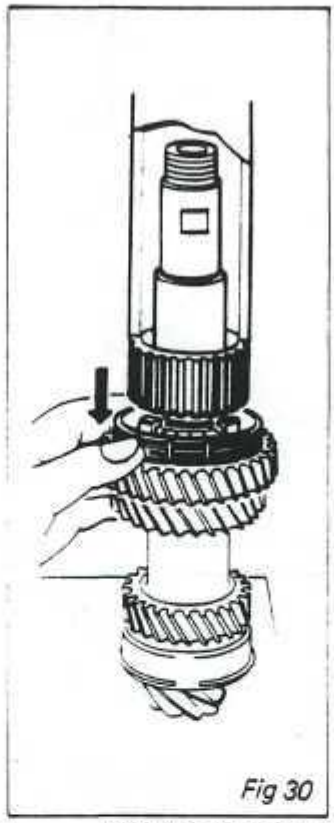


Fig 30

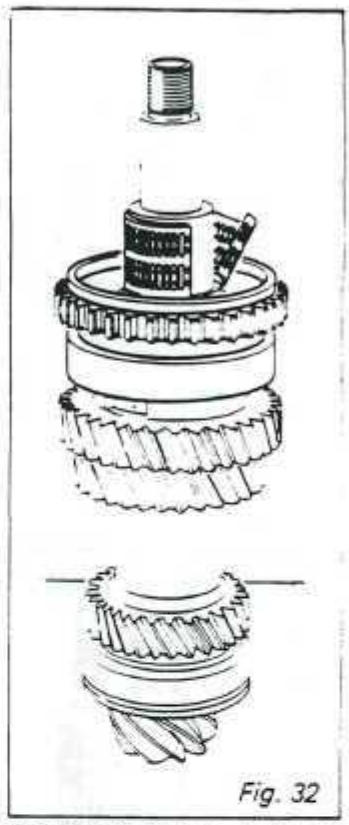


Fig. 32

5. Align the dismantling marks and fit the 1st-2nd sliding gear to the synchro hub.
6. Install the synchro spring on the 1st speed gear so that it covers the three (3) notches.
7. Install the 1st speed gear, synchro ring and needle roller half-bearings on the secondary shaft.

NOTE: The 1st speed synchro ring is larger than the 2nd speed synchro.

8. Install the double taper roller bearing on the secondary shaft with the shoulder on the bearing race facing the threaded end of the shaft. *(Fig. 32)*

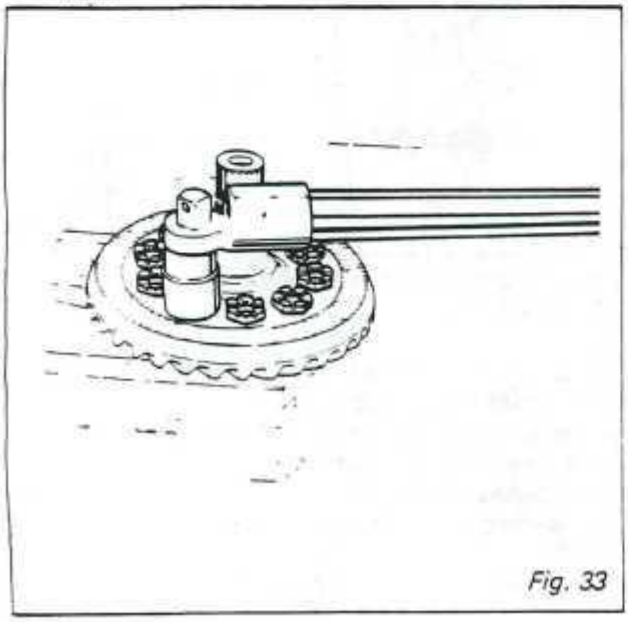


Fig. 33

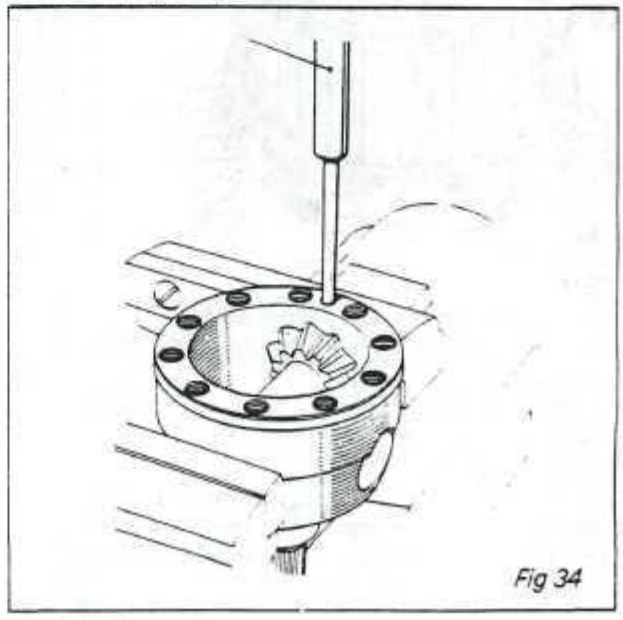


Fig 34

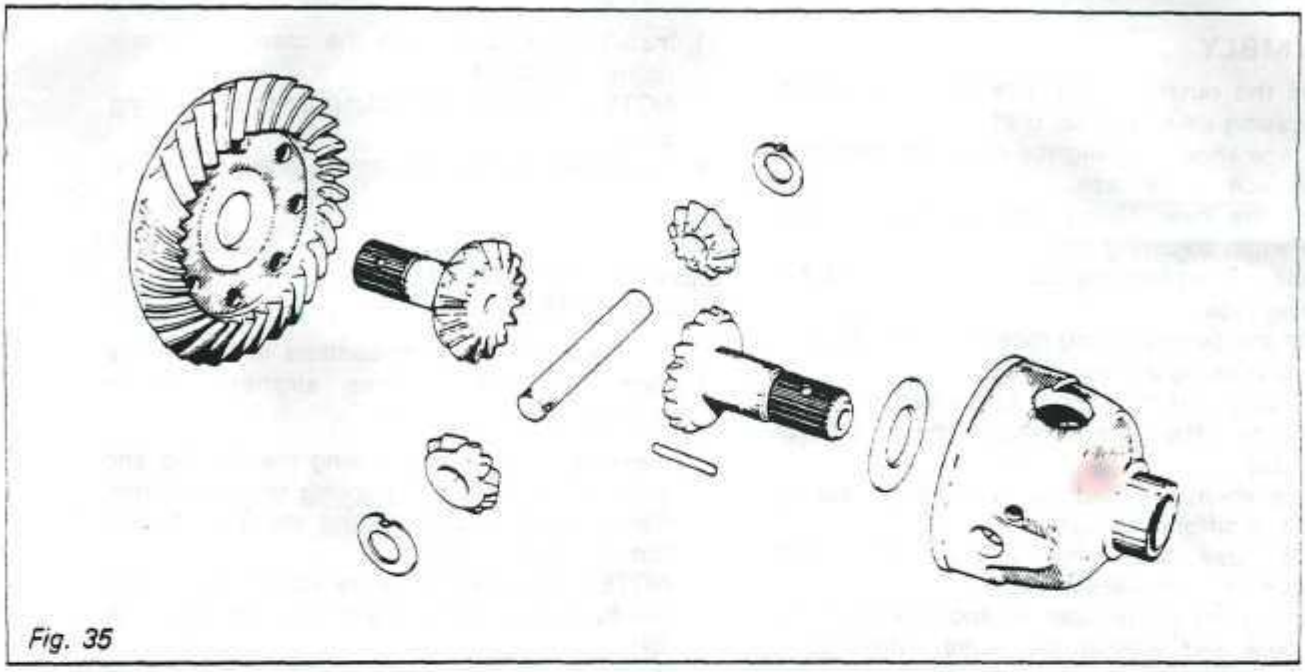


Fig. 35

DIFFERENTIAL ASSEMBLY

DISASSEMBLY

1. Remove the O-rings from the axle shafts.
2. Remove the carrier bearing from ring gear side of the differential using a suitable puller. If it is necessary, remove some of the ring gear bolts to aid in the installation of the puller. *(Fig. 33)*
3. Remove the ring gear bolts and ring gear.
4. Remove the side gear.
5. Remove the shaft retaining pin and remove the spider gear shaft. *(Fig. 34)*
6. Remove the spider gears and concave washers.
7. Remove the side gear and thrust washer.
8. Remove the remaining carrier bearing. Retain any shims that may be located between the bearing and the carrier. *(Fig. 35)*
9. Remove the bearing outer race from the right-hand half-case using Tool J23907. *(Fig. 36)*
10. Remove the driveshaft flange seal from the right-hand half-casing.
11. Remove the lockplate for the differential ring nut in the left-hand half-casing.
12. Remove the ring nut using Tool J28866. *(Fig. 37)*
13. Remove the seals from ring nut.
14. Remove the bearing outer race from the left-hand half-casing using a brass drift.

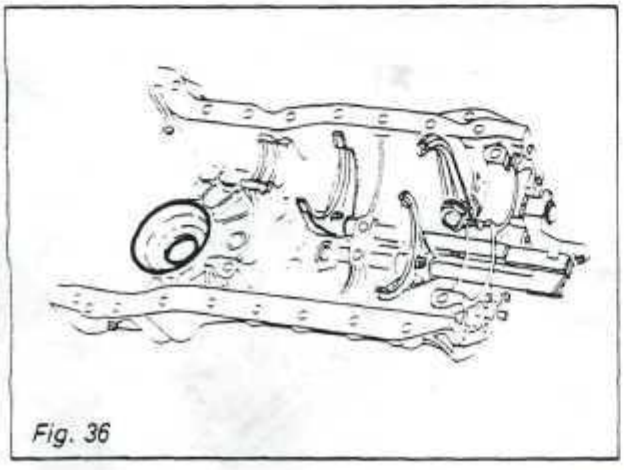


Fig. 36

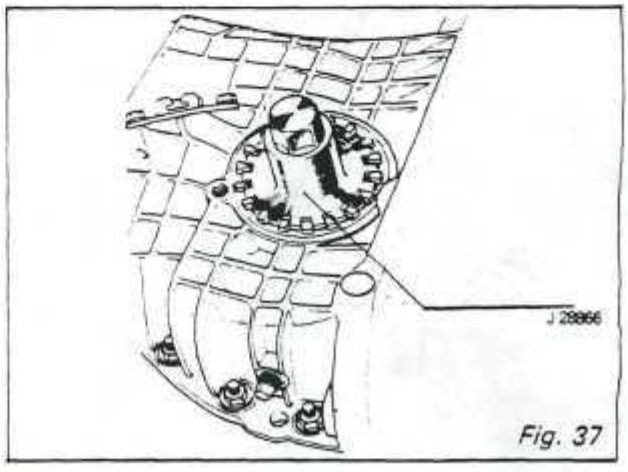


Fig. 37

REASSEMBLY

1. Install the outer bearing race in the left-hand half-casing using a brass drift.
   The race should be slightly recessed from the inside face of the case.
2. Install the new O-ring and lip seal on the differential adjusting nut.
3. Thread the nut into the case until it touches the bearing race.
4. Install the outer bearing race in the right-hand half-case using a brass drift.
   Make sure that the race is firmly seated.
5. Install the differential oil seal in the right-hand half-case.
6. Fit the shim(s) and press the carrier bearing onto the differential case.
   NOTE: Use the same shim(s) that were removed during disassembly.
7. Lubricate the thrust washer and side gear. Fit the gear and washer into case with the oil groove on the washer facing side gear.
8. Fit the spider gears and the concave washers into the case. Install the spider gear shaft and retaining pin.
9. Press the carrier bearing onto the ring gear. *(Fig. 38)*
10. Lubricate the side gear and fit the gear into the ring gear.
11. Install the ring gear on the case and torque tighten the bolts.
    NOTE: Use new self-locking bolts on the ring gear.
12. Install new O-ring seals on the side gear shafts.

GEARSHIFT CONTROLS DISASSEMBLY

NOTE: Place the gearshift controls in the neutral position (all rod notches aligned) before proceeding to the next step.

1. Remove the rollpins securing the 1st-2nd and shift fork and damping spring to its shift rod. Remove the rollpin securing the 3rd-4th shift fork to the shift rod.
   NOTE: The detent balls are spring loaded and will fly out when the shafts are removed. *(Fig. 39)*
2. Remove the 1st-2nd shift rod and withdraw the shaft from the fork spring and case. Extract the detent ball and spring.
3. Rotate the 3rd-4th shift rod and remove the rod from fork and case.
   Extract the detent ball and spring.
4. Remove the reverse gear locking bolt, securing the reverse shift fork.

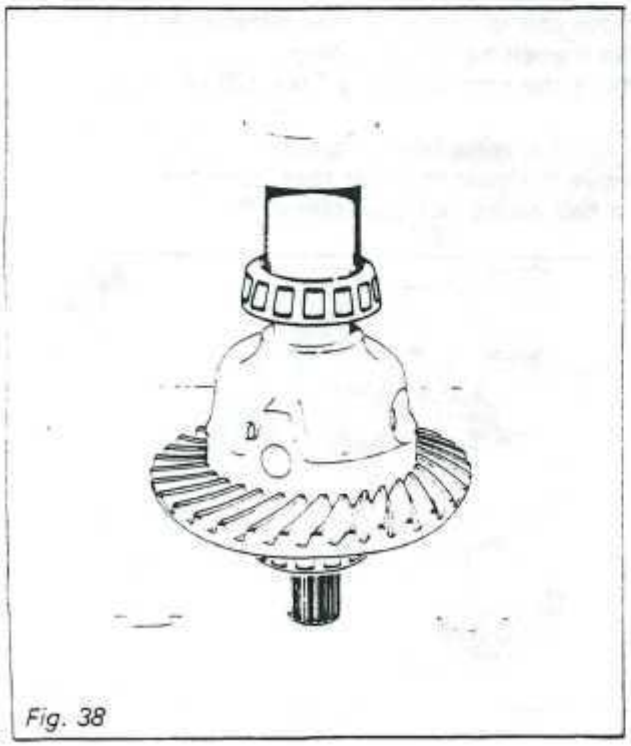


Fig. 38

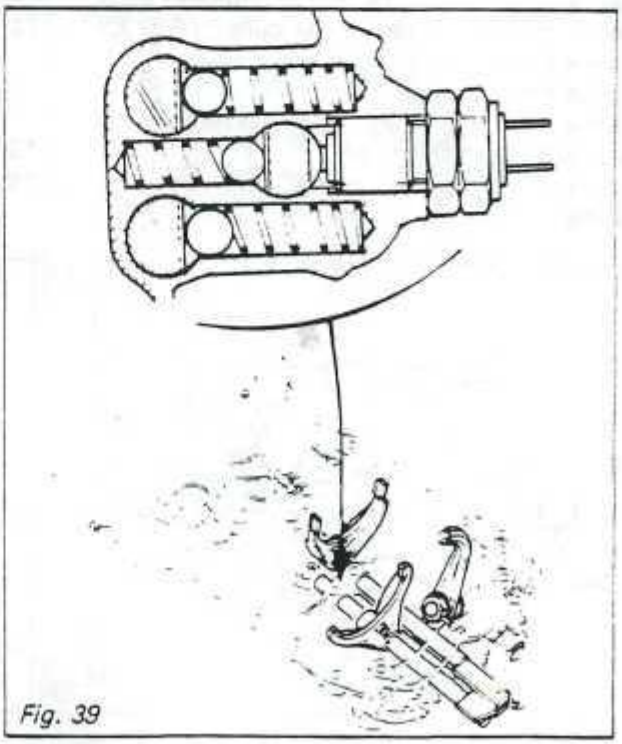


Fig. 39

5. Remove the reverse shift fork.
   NOTE: The detent ball is spring loaded and will fly out when the shaft is removed.
6. Remove the reverse shift rod from the case.
7. Remove the reverse light switch from the case.
8. Extract the detent ball and spring.

REASSEMBLY

NOTE: The reverse shaft detent spring is shorter than the other detent springs.

1. Insert the reverse shaft detent spring and ball into the half-casing through the reverse lights switch.
2. Depress the ball with a drift and insert the reverse shaft.
3. Install the reverse shift fork with the end of the arm fitted in slot on shaft.
4. Install the wave washer on the locking bolt and fasten fork to the case. Torque tighten the bolt.
   NOTE: The 3rd-4th and the 1st-2nd detent springs are the same length.
5. Insert the 3rd-4th detent spring and ball into the half-casing.
6. Depress the detent ball with a drift and insert the 3rd-4th shift rod into the case.
   NOTE: When installing the rollpins, the gap in the pin must face towards the rear cover.
7. Fit the 3rd-4th shift fork on the shift rod and insert the rollpin.
8. Insert the 1st-2nd detent spring and ball into the half-case.
   NOTE: When installing the rollpins, the gap in the pin must face towards the rear cover.
9. Fit the 1st-2nd shift fork and damping spring on the rod and insert the rollpins (3).
   NOTE: When installing the damping spring's outer rollpin, the top of this rollpin must be flush with the spring coil to avoid contact with the 1st speed gear.

REAR COVER

DISASSEMBLY

1. Compress the selector shaft spring with Tool J28869 and remove the two (2) half-bushes from each end of the spring. *(Fig. 40)*
2. Remove the rear cover plug and remove the selector fork rollpins, securing the fork to the shaft.
3. Remove the selector shaft and fork from the rear cover.
4. Remove the shaft seal from the rear cover.
5. Remove the selector shaft spring from the rear cover.

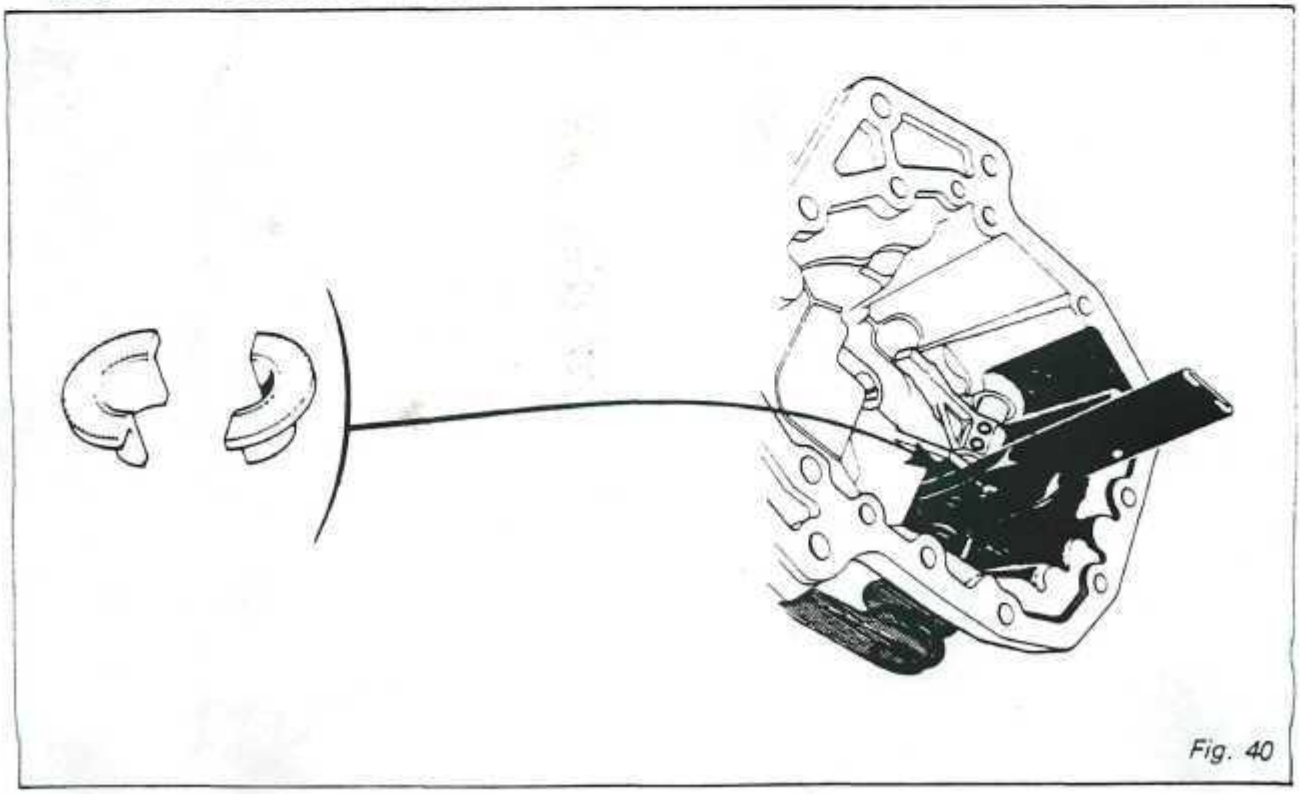


Fig. 40

REASSEMBLY

1. Install the selector shaft oil seal into the rear cover.
2. Insert the selector shaft spring and selector finger into the rear cover.
3. Place the bellows on the selector shaft and insert the shaft into the rear cover, spring and selector finger.
4. Install the rollpins securing the selector finger to the shaft.
5. Compress the spring using Tool J28869 and insert the two (2) half-bushes in each end of the spring.
6. Install the rear cover plug using specified sealer in accordance with its labelled precautions on the threads.

CONTROLS DESCRIPTION AND OPERATION

The transmission controls consist of a shift lever assembly, cross gate cable and two gear change tubes connected to a pivoting bellcrank.

The shift cable transmits left and right shift lever movement to the transmission selector shaft. Movement of this shaft controls the shift gate selection. A detent plate in the shift lever assembly limits cable travel to provide proper alignment of the selector shaft and shift rods within the transmission. The plate also provides reverse lock-out by requiring that shift lever be lifted up before it is moved into the reverse gate position.

The gear change tubes transmit fore and aft motion to the transmission selector shaft. this movement selects the gear change within the selected shift gate.

CHECKING ADJUSTMENT

1. Remove screws securing gear shift trim plate to the console. Lift rear of plate and pull out of vertical trim plate to gain access to shift lever assembly. Do not remove completely.
2. With transmission in neutral and shift lever in 3rd-4th gate, shift lever stop pin should be centred in cross gate guide plate notch.

NOTE: Shift mechanism in transmission is spring loaded to return to 3rd-4th gate when shift lever is released. *(Fig. 41)*

ADJUSTING CABLE

1. Raise vehicle on hoist.
2. Adjust shift cable to centre shift lever stop pin lengthening or shortening cable at transmission. This can be performed by changing position of cable housing lock nuts at cable mount bracket or by removing clevis pin at cable end and turning cable end.
   Shortening cable will move shift lever stop pin to right.
3. Install cable clevis pin and retaining clip or tighten cable housing lock nuts.
4. Lower vehicle and install gear shift trim plate on console. *(Fig. 42)*

GEAR CHANGE TUBE

Perform following adjustment if necessary to move the position of shift pattern closer to or further away from driver. The adjustment must also be performed if either of gear change tubes are replaced.

1. Raise vehicle on hoist.
2. Loosen lock nut on rear of rear gear change tube at transmission.

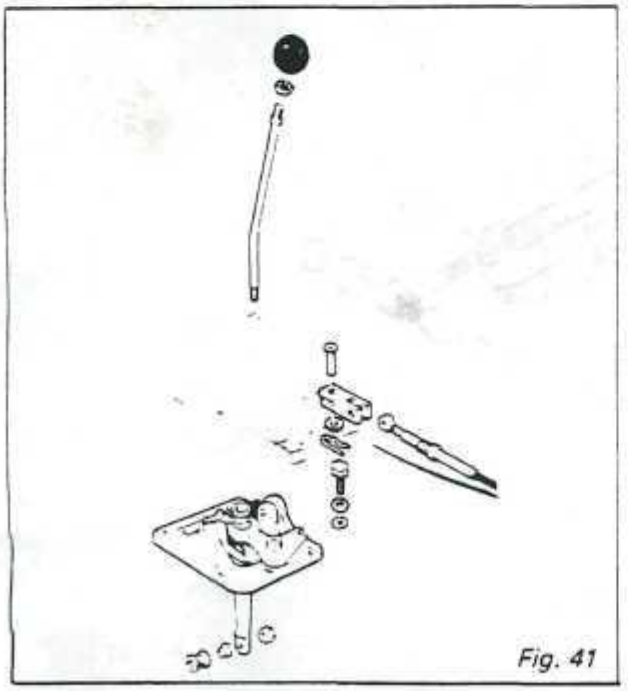


Fig. 41

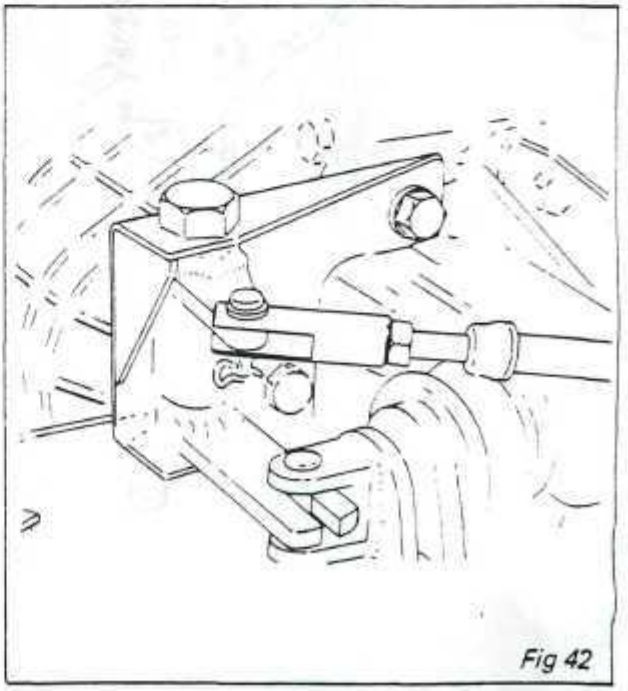


Fig 42

3. Disconnect tube from transmission arm and adjust tube until bellcrank is aligned at approximately 90 degrees to centreline of chassis when tube is connected and transmission is in neutral.
4. Working through access hole in chassis centre backbone, disconnect front gear change tube from bellcrank.
5. Loosen locknut on gear change tube and turn end of tube to adjust.
   Lengthening rod moves shift pattern closer to driver.
6. Tighten lock nut and install tube on bellcrank.

SHIFT LEVER ASSEMBLY
REMOVAL AND INSTALLATION

1. Remove gear shift knob.
2. Remove two screws securing gear shift trim plate to console. Disconnect wires and remove plate.
3. Remove retaining clip and pin securing shift cable to shift lever clevis.
4. Remove bolts securing shift lever assembly to chassis.
5. Disconnect front gear change tube by lifting assembly out of chassis to gain access to securing pivot bolt.
6. Remove shift lever assembly.
7. Reverse above procedure for installation.

SHIFT CABLE
REMOVAL AND INSTALLATION

1. Remove the gear shift knob.
2. Remove two screws securing gear shift trim plate to console. Disconnect wires and remove the plate.
3. Remove retaining clip and pin securing the shift cable to shift lever clevis.
4. Remove nut securing cable to chassis.
5. Raise vehicle on hoist and disconnect cable at transmission arm.
6. Remove rear cable adjusting nut and pull cable assembly out of mounting bracket.
7. Remove shift cable by pulling out of chassis.
   NOTE: Cable may be secured inside chassis backbone with tie strap.
8. Adjust cable. See cross gate cable adjustment procedure *(Fig. 43)*

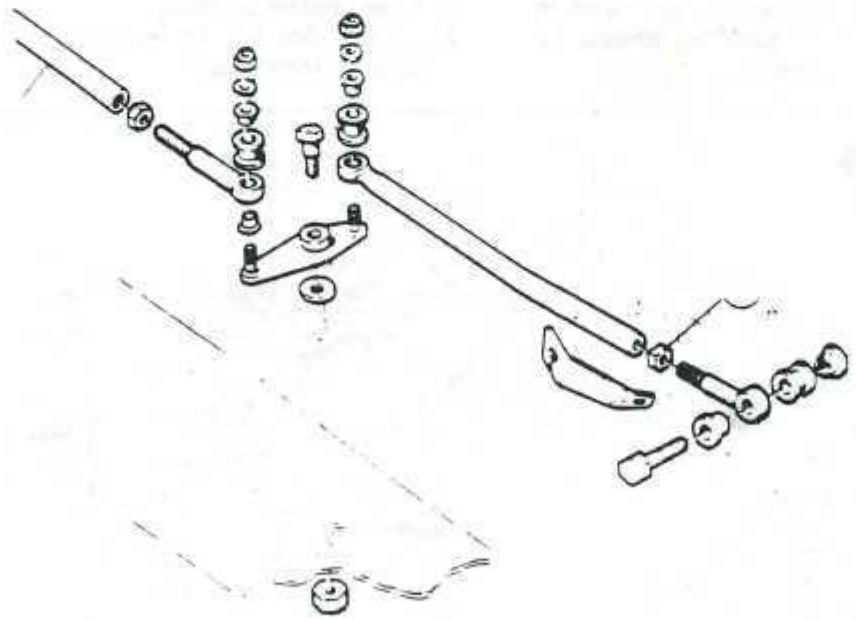


Fig. 43

Automatic Transmission

CONTENTS

GENERAL DESCRIPTION G:01:01

SPECIFICATION G:02:01

SPECIAL TOOLS G:03:01

DIAGNOSIS G:04:01

MAINTENANCE/ADJUSTMENT G:05:01

ON CAR SERVICE G:06:01

REMOVAL AND REFITTING G:07:01

COMPONENT REPAIR G:08:01

FINAL DRIVE G:09:01

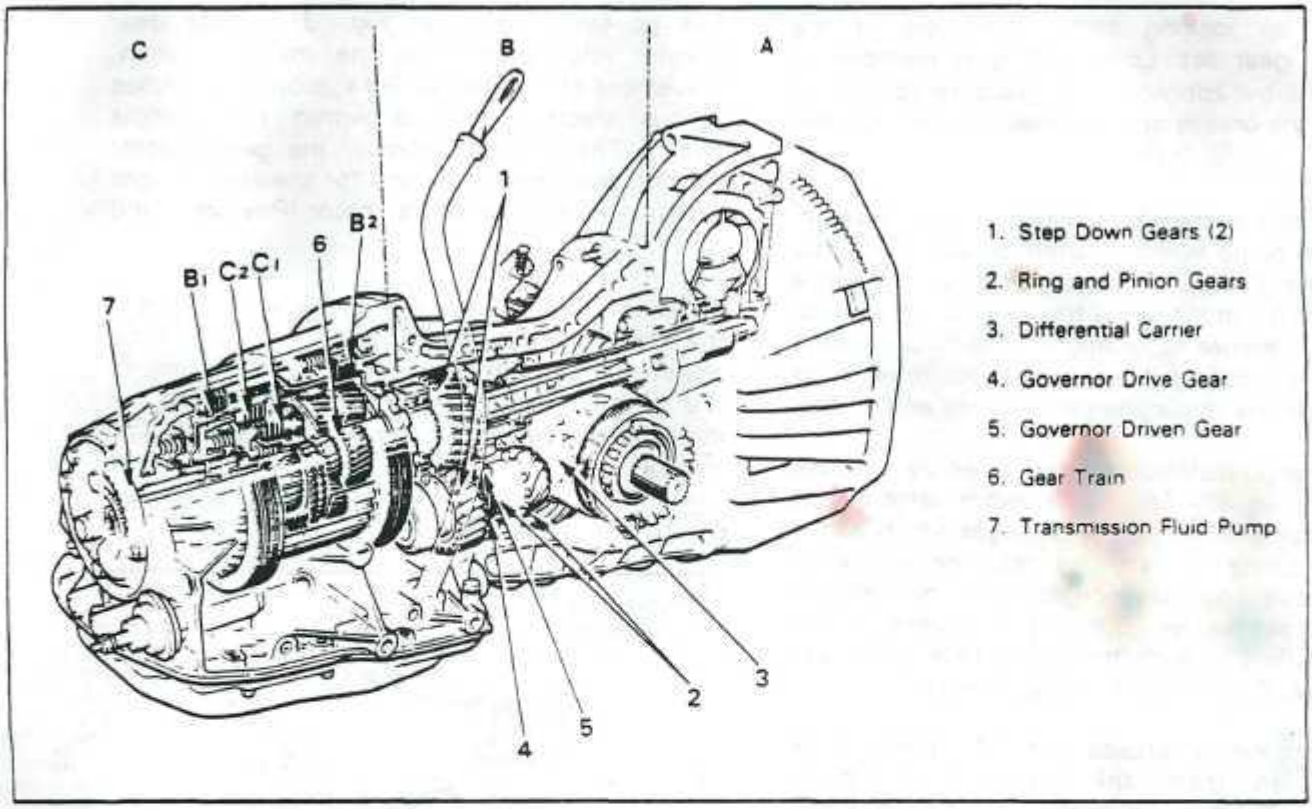


Fig. 1 AUTOMATIC TRANSMISSION – SECTIONAL VIEW

GENERAL DESCRIPTION

The three speed transmission is a fully automatic unit consisting primarily of a 3-element torque converter and a single planetary gear set. Two multiple disc clutches, two multiple disc brakes, and a one-way roller clutch provide the friction elements required to obtain the desired functions of the planetary gear set.

The transmission assembly consists of a torque converter unit final drive unit and a hydraulic transmission unit.

TORQUE CONVERTER UNIT (A):

The torque converter provides automatic clutch action, additional engine torque multiplication, and smooth coupling for transmitting engine torque to the mechanical assembly. The converter is of welded construction and is serviced as an assembly. The unit is made up of two vaned sections (turbine and pump) and a single stator mounted on a one-way roller clutch. Automatic clutch action and smooth coupling takes place when circulating fluid within the converter couples the two vaned sections together. Increased torque is brought about by the stator redirecting the fluid flow and providing an additional driving force against the turbine.

FINAL DRIVE UNIT (B):

The final drive transmits power from the hydraulic transmission to the driving wheels. The unit consists of a step-down gear, which lowers the drive centerline and a differential assembly. The differential is made up of a ring and pinion gear assembly and carrier housing containing two axle side gears and two spider gears, including a governor drive gear.

HYDRAULIC TRANSMISSION UNIT (C):

The hydraulic transmission receives power from the torque converter turbine and converts this power into three reduction ratios for forward movement and one reduction ratio for reverse movement. Forward and reverse gears are

achieved by locking certain members of the planetary gear set. Locking of gear members is performed by applying fluid pressure to one or more of the brakes and clutches (B1, B2, C1 and C2).

The hydraulic system is pressurized by an involute gear fluid pump which is shaft driven directly by the engine. A vacuum modulator is used to sense engine torque input to the transmission and adjust the fluid pressure accordingly. Line fluid pressure is increased during high torque requirements to ensure positive application of clutches and brakes.

Fluid pressure distribtion is performed by the valve body. A manually operated selector valve directs fluid pressure to the proper passages which lead to the appropriate brakes or clutches. The shift valves in the valve body are controlled by two electric solenoid ball valves. Opening or closing of the solenoids will activate the appropriate shift valve which will in turn create a gear change.

The electrical solenoids *Fig. 2* receive their information from the governor computer assembly. The gear driven governor is a low output alternator that produces current which varies with output shaft speed and throttle position. Current from the governor supplies information to the computer. Depending on governor current and gear selector position, the computer will activate or de-activate one or both of the solenoid valves, thus providing a gear ratio change at the proper speed. The governor computer also ensures that 1st gear cannot be selected above 22 MPH (35 km/h) on light throttle.

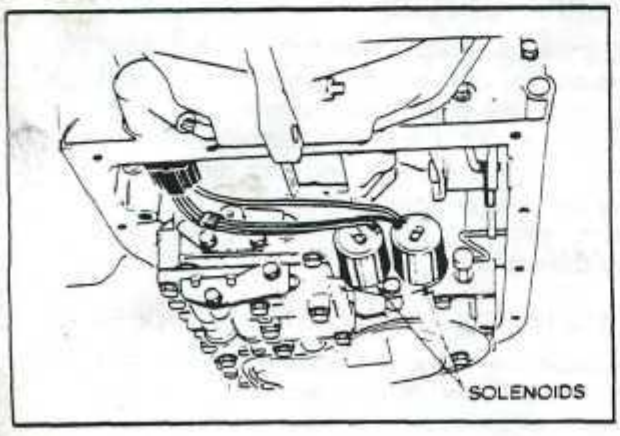


Fig. 2 VALVE BODY AND ELECTRIC SHIFT SOLENOIDS

The governor computer *Fig. 3* receives gear selector information from the multiple switch. Movement of the manual linkage opens or closes various electrical circuits within the multiple switch. These circuits identify the gear selector position and provide current for the reverse light (Position R) and the starter motor (Position P and N).

An electric microswitch is fitted *Fig. 4* at the end of the accelerator control bellcrank. In the full throttle position, the switch provides a ground for one of the governor computer circuits and causes an immediate down shift if the vehicle speed is slow enough.

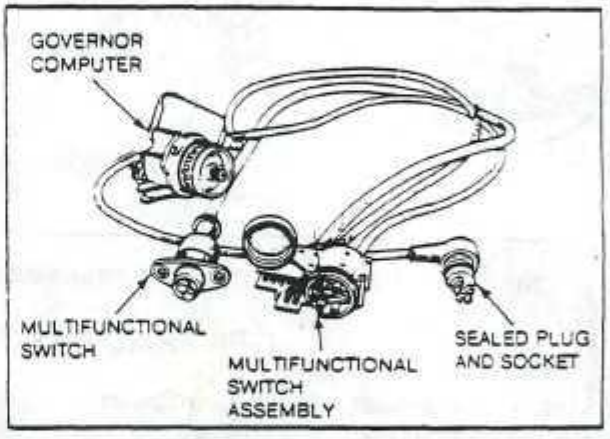


Fig. 3 GOVERNOR-COMPUTER ASSEMBLY

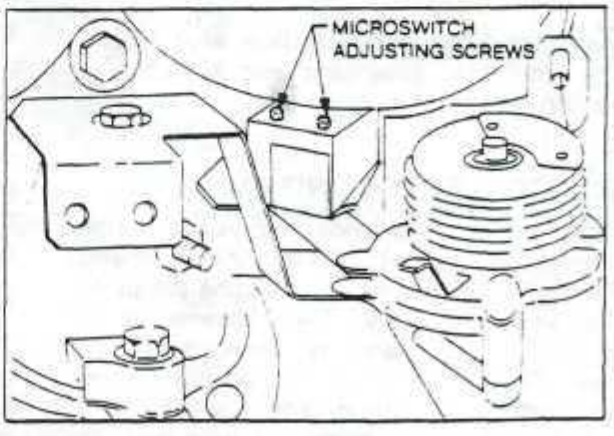


Fig. 4 MICROSWITCH

GENERAL SPECIFICATIONS

TYPE: 4141-80

RATIOS:

First	2.40:1
Second	1.48:1
Third	1:1
Reverse	1.92:1

TRANSMISSION LUBRICANT:

ATF Type Dextron II

BRAKE B-1:

Steel Discs	3
Lined Discs	3
Clutch Pack Clearance	1.05 – 2.85 mm (non-adjustable)
Thrust Plate Thickness	8.5 mm

BRAKE B-2:

Steel Discs	4
Lined Discs	3
Clutch Pack Clearance	1.0 – 1.5 mm (adjustable)

CLUTCH C-1:

Steel Discs	5
Lined Discs	4
Clutch Pack Clearance	1.05 – 3.75 mm (non-adjustable)

CLUTCH C-2:

Steel Discs	5
Lined Discs	4
Clutch Pack Clearance	1.0 – 2.0 mm (adjustable)
Spacer Sleeve Dimension	43.3 mm

FINAL DRIVE UNIT:

Ratio	3:44:1
Lubrication Capacity	3.6 pts. 1.6 L.
Lubrication Requirements	
(below – 10°C (– 3°F)	SAE 75
(above – 10°C (– 3°F)	SAE 80

TORQUE SPECIFICATIONS

	LOCATION	NM	LBS./FT.
1	Fluid Pan Attaching Bolts	3 – 4	2 – 3
2	Valve Body Attaching Bolts	9	7
3	Flex Plate to Crankshaft Attaching Bolts	67 – 70	50 – 52
4	Converter to Flex Plate Attaching Bolts	30 – 35	22 – 26
5	Fluid Pump Cover Bolts	10	8
6	Brake B-2 Housing Bolts	15	11
7	Output Shaft Nut (Planetary Carrier Shaft)	183 – 203	135 – 150
8	Ring Gear Bolts	122 – 142	90 – 105
9	Half-Case Assembly Bolts (8 mm dia.)	30	22
10	Half-Casing Assembly Bolts(10 mm dia.) (Transmission Case)	40 – 46	30 – 34
14	Final Drive Pinion Nut	223 – 244	165 – 180
13	Converter Housing to Final Drive Case Bolts	40 – 46	30 – 34
15	Stator Shaft Support Bolts	30 – 35	22 – 26
16	Transmission Mount to Case Attaching Bolts	24	18
17	Transmission Mount Through Bolts	35	26
18	Transmission Mount to Chassis Bolts	24	18
19	Dipstick Tube Attaching Bolts	24	18
12	Final Drive Case to Transmission Case Bolts	30	22
11	Half-Casing to Half-Casing Bolts	43	32

Notice:
The De Lorean contains many parts dimensioned in the metric system. During any service procedure, replacement fasteners must have the same measurements and strength as those fasteners removed, either metric or customary. The numbers on the heads of metric bolts and on the surface of metric nuts indicate their strength. Customary bolts use radial lines on their heads for strength indicators while most customary nuts do not have strength indicators. Mismatched or incorrect fasteners can result in vehicle damage or malfunction, or possibly personal injury. Fasteners removed from the vehicle should be reused in the same locations whenever possible except when indicated otherwise. When fasteners are not satisfactory for reuse, care should be taken to select a replacement fastener that is equivalent to the original quality.

Notice:
Torque specifications should not be exceeded. Fastener chemical treatments such as Loctite, etc. should be used as specified within the text.

SPECIAL TOOLS

TOOL NUMBER	TOOL DESCRIPTION
J 28866	Side Bearing Adjuster Nut Wrench
J 28847	Drain Plug Wrench
J 28859	Flex Plate Locking Tool
J 28864	Convertor Seal Installer
J 28868	Final Drive Pinion Lock
J 29351	C.1. Clutch Compressor
J 28867	Automatic Transmission Tool Set includes: —
J 28867/1	Dismantling Tool for C.2. — B.1. Assemblies
J 28867/2	C.1. and B.2. Piston Spring Compressing Tool
J 28867/3	Transmission Operating Clearance Adjusting Tool
J 28867/4	Output Shaft Planetary Carrier Oil Seal Inserting Tool
J 28867/5	Bearing Pre-load Checking Pulley

TRANSMISSION DIAGNOSIS

DIAGNOSIS PROCEDURE

1. Road test the vehicle and determine all irregularities.

Notice:
It is important to gain as much information as possible on the precise nature of any fault. Whenever possible, perform a complete diagnosis procedure an identify all symptoms.

2. Check and adjust transmission fluid level (see MAINTENANCE AND ADJUSTMENT section for proper level).

3. Check the condition of the transmission electrical system.
   a. Transmission fuse.
   b. Wiring connections on the governor computer wiring harness.
   c. Cut, broken or heat damaged wiring harnesses on the governor computer.
   d. Improper charging system voltage (vehicle alternator).

4. Check and adjust the gear shift selector linkage (see MAINTENANCE AND ADJUSTMENT section).

5. Check and adjust the governor control cable (see MAINTENANCE AND ADJUSTMENT section).

6. Check vacuum modulator connections and perform fluid pressure check and adjustment (see MAINTENANCE AND ADJUSTMENT section).

7. Inspect the transmission fluid for evidence of gear fluid contamination, burning or metallic particles.

8. Check the microswitch for proper operation; including inspection of the wiring for grounds and electrical continuity with a test light.

9. Evaluate the results of the previous checks and adjustments. Refer to the DIAGNOSIS CHART No. 1 and No. 2 *Figs. 6 and 7* and the COMPONENT APPLICATION CHART *Fig. 5* for final diagnosis of problem.

SELECTOR POSITION	GEAR	C1 CLUTCH	C2 CLUTCH	B2 BRAKE	B1 BRAKE	ROLLER CLUTCH	SOLENOID BALL VALVES	
							EL1	EL2
PARK		OFF	OFF	OFF	OFF	INEFFECTIVE	ON	ON
REVERSE		ON	OFF	OFF	ON	INEFFECTIVE	ON	ON
NEUTRAL		OFF	OFF	OFF	OFF	INEFFECTIVE	ON	ON
DRIVE	FIRST	OFF	OFF	ON	OFF	EFFECTIVE	ON	ON
	SECOND	OFF	ON	ON	OFF	INEFFECTIVE	OFF	ON
	THIRD	ON	ON	OFF	OFF	INEFFECTIVE	OFF	OFF
2	FIRST	OFF	OFF	ON	OFF	EFFECTIVE	ON	ON
	SECOND	OFF	ON	ON	OFF	INEFFECTIVE	OFF	ON
1	FIRST	ON	OFF	ON	OFF	INEFFECTIVE	*ON	ON
*BELOW 22 MPH (35 Km/h) ON LIGHT THROTTLE								

Fig. 5 COMPONENT APPLICATION CHART

MAINTENANCE AND ADJUSTMENT

Checking and Adding Transmission Fluid

1. Place vehicle on level ground and apply parking brake.
2. With the selector lever in the PARK position, start the engine and run long enough to achieve operating temperature (coolant fans begin to cycle — A/C off).
3. Check the fluid level with the transmission selector in the PARK position and the engine running at idle. The fluid level on the dipstick should be at the HOT.
4. If additional fluid is required, add sufficient fluid through the filler tube to bring the level to the proper mark on the dipstick. Do not overfill the transmission.

DIAGNOSIS CHART No. 1

FAULTS	CAUSES DUE TO TRANSMISSION AUXILIARIES	CAUSES OF ELECTRICAL ORIGIN	CAUSES OF HYDRAULIC ORIGIN	CAUSES OF MECHANICAL ORIGIN
ENGINE STALLS UNEVEN IDLING	② ③ ④ ⑬			
CREEP IN "N"	⑩		⑲	㉛
EXCESSIVE CREEP IN "D"	② ④		㉗	
SLIP WHEN MOVING OFF IN "D" OR "R"			① ⑫ ⑲ ㉟ ㉗	
SLIP WHEN MOVING OFF IN "D"				㉜
SLIP DURING GEAR CHANGING			⑫ ㉟ ⑲	
GRABS ON MOVING OFF	② ④		㉗	
GRABS DURING GEAR CHANGING	⑤	⑱	⑫ ⑬ ⑲ ㉟ ㊱	
INCORRECT GEAR CHANGING SPEEDS	④ ⑤ ⑥ ⑰	⑧ ⑯ ⑰ ㉞ ⑱		
NO DRIVE IN ANY RATIO	① ⑩		⑲	㉒ ㉓ ㉔ ㉕ ㉖ ㉗
NO DRIVE IN 1ST AND 2ND "AUTOMATIC"				㉑
NO DRIVE IN 2ND OR 3RD				㉙
NO DRIVE IN 3RD, NO ENG. BRAKING IN "R"				㉘
NO DRIVE IN REVERSE				㉚
NO DRIVE IN 1ST AUTO. BUT DRIVE IN 1ST GEAR "HOLD"				㉜
NO 1ST AUTOMATIC		⑧ ⑯ ⑱	⑲	㉜
NO 2ND AUTOMATIC		⑧ ⑯ ⑱	⑲	
NO 3RD AUTOMATIC		⑧ ⑯ ⑱	⑲	
NO 1ST GEAR "HOLD" NO 2ND GEAR "HOLD"	⑩	⑧ ⑯ ⑰ ⑱	⑲	
REMAINS IN 1ST AUTO.		⑧ ⑯ ⑰ ⑱	⑲	
REMAINS IN 3RD		⑦ ⑧ ⑯ ⑱	⑲	
SOME RATIOS UNOBTAINABLE AND SELECTOR LEVEL ABNORMAL	⑩			㉝
"PARK" FACILITY NOT WORKING	⑩			㉝
STARTER NOT WORKING	⑩	⑧ ⑰		
SMOKE FROM EXHAUST	⑬			

Fig. 6 DIAGNOSIS CHART 1

DIAGNOSIS CHART No. 2

		CHECK LIST
①	●	FLUID LEVEL
②	●	IDLE SPEED
③	●	ENGINE IGNITION SYSTEM
④	●	ACCELERATOR CONTROL
⑤	●	GOVERNOR CABLE
⑥	●	MICROSWITCH ADJUSTMENT
⑦	●	FUSES
⑧	●	HARNESSES, WIRING, PLUGS, SOCKETS, GROUNDS
⑨	●	COMPUTER SETTING
⑩	●	SELECTOR LEVER ADJUSTMENT
⑫	●	FLUID PRESSURE SETTING
⑬	■	VACUUM LEAKS
⑯	■	GOVERNOR/COMPUTER
⑰	■	MICROSWITCH
⑱	■	SOLENOID SHIFT VALVES
⑲	■	VALVE BODY
⑳	■	PRESSURE REGULATOR
㉑	■	STARTER SWITCH
㉒	▲	FLUID PUMP
㉓	▲	FLUID PUMP SHAFT
㉔	▲	TURBINE SHAFT
㉕	▲	FINAL DRIVE
㉖	▲	CONVERTER DRIVING PLATE
㉗	▲	CONVERTER
㉘	▲	CLUTCH C1
㉙	▲	CLUTCH C2
㉚	▲	BRAKE B1
㉛	▲	BRAKE B2
㉜	▲	ROLLER CLUTCH
㉝	▲	MANUAL CONTROL VALVE
㉞	■	CHARGING SYSTEM VOLTAGE
㉟	■	VACUUM MODULATOR
㊱	■	PICK-UP SCREEN
㊲	■	MULTIFUNCTION SWITCH

● Adjustment on installed transmission
■ Overhaul on installed transmission
▲ Overhaul on removed or dismantled transmission

Fig. 7 DIAGNOSIS CHART 2

MAINTENANCE/ADJUSTMENT

CHECKING AND ADDING FINAL DRIVE OIL

1. Raise the vehicle on a hoist.
2. Remove the final drive fill plug. *Fig. 8*
3. The oil level should be at the bottom of the fill plug hole. If necessary, add oil to bring level to proper height.

CHANGING FINAL DRIVE OIL

Notice:

The oil should be drained while hot.

1. Raise the vehicle on a hoist.
2. Remove the drain plug from the final drive case and all the oil thoroughly. *Fig. 8*
3. Install the drain plug and tighten with special tool wrench (J28847).
4. Remove the oil fill plug from the side of the final drive case and add gear oil until the oil level is at the bottom edge of the fill plug hole. *Fig. 8*
5. Install fill plug.
6. Lower vehicle on hoist.

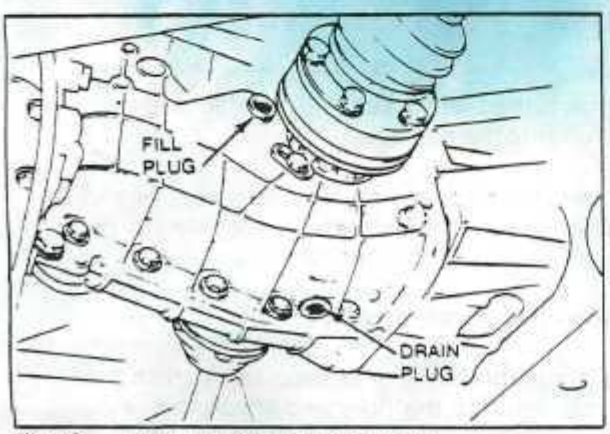


Fig. 8 **FINAL DRIVE DRAIN PLUG**

CHANGING THE TRANSMISSION FLUID

CAUTION: The fluid should be drained while hot.

SPECIAL CARE should be exercised to prevent physical contact with transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

1. Raise the vehicle on a hoist.
2. Remove the drain plug from the transmission fluid pan and allow the fluid to drain thoroughly. *Fig. 9*
3. Install the drain plug and tighten to ensure proper seating.

Notice:

A new copper washer should be installed each time drain plug is removed.

4. Lower the vehicle and add two quarts (1.89 liters) of transmission fluid through the filler tube.

Notice:

Use a funnel with a built-in 15/100 mesh filter.

5. With the selector level in the PARK position apply the parking brake, start the engine and let idle.
6. Add additional fluid to bring the fluid level to the proper mark on the dipstick.

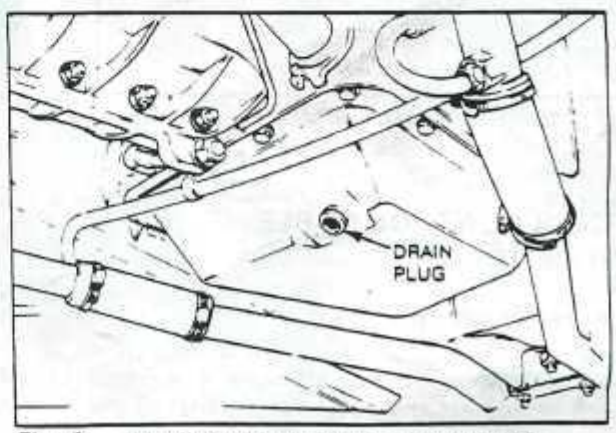


Fig. 9 **TRANSMISSION FLUID DRAIN PLUG**

SELECTOR LINKAGE ADJUSTMENT

1. Place car on chassis contact hoist and place the gear selector lever in the PARK position with park brake off. Ensure that the lever locking mechanism is fully seated and the lever is locked in position.

2. Raise the vehicle on a hoist and disconnect the shift tube from the bellcrank lever. *Fig. 10*

3. Place the transmission in PARK by rotating the bellcrank lever by hand. Ensure that the transmission is in the PARK position by holding one rear wheel and attempt to rotate the other rear wheel. The parking pawl should drop into position and lock the wheel.

4. Unlock the shift tube adjustment nut and lengthen or shorten the tube until it will slip over the bellcrank mounting stud.

5. Tighten the shift tube adjustment nut lock and connect the tube to the bellcrank.

6. Lower the vehicle on hoist.

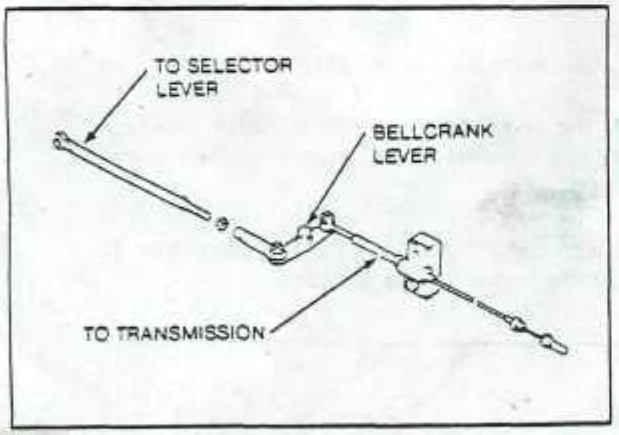


Fig. 10 **SHIFT TUBE ADJUSTMENT**

GOVERNOR CONTROL CABLE ADJUSTMENT

1. *Raise the vehicle* on a hoist.

2. With the engine turned off, use a suitable weight to depress the accelerator pedal to the floor (full throttle position). Check to ensure full throttle at engine is achieved.

3. Perform throttle cable adjustments if the throttle is not opening to the maximum before proceeding.

4. Loosen the cable lock nut and adjust the cable sleeve stop (G) at the governor end to obtain clearance (J) between the quadrant arms and the 0.3 – 0.5 mm (.012 – .020 in.). *Fig. 11*

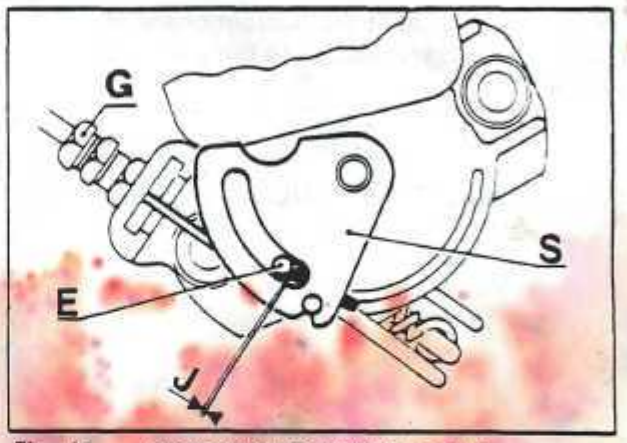


Fig. 11 **GOVERNOR CONTROL CABLE ADJUSTMENT**

Notice:
If the cable cannot be adjusted properly at the governor end, the cable housing can be lengthened or shortened at the throttle linkage end. Repeat the cable adjustment procedure after changing the housing position.

5. Tighten the locknut.

6. Lower the vehicle on hoist.

MICROSWITCH ADJUSTMENT

1. Working in the engine compartment with the engine turned off, open the throttle plates to the full throttle position.

2. Loosen the microswitch attaching screws and position the switch so that it is activated in the full throttle position. *Fig. 12*

3. Tighten the switch attaching screws.

4. Use a suitable weight or prop to depress the throttle pedal to the floor and check to ensure that the microswitch is activating by using a test light.

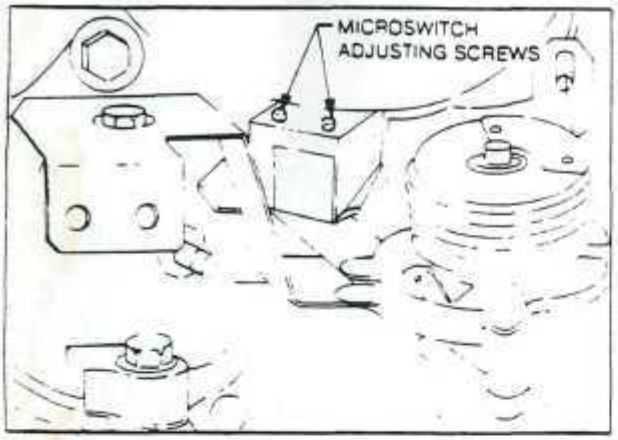


Fig. 12 **MICROSWITCH ADJUSTMENT**

TRANSMISSION FLUID PRESSURE ADJUSTMENT

1. Connect the transmission pressure gauge J21867 to the main line pressure fitting located at the front of the transmission below the transmission pump. *Fig. 13*

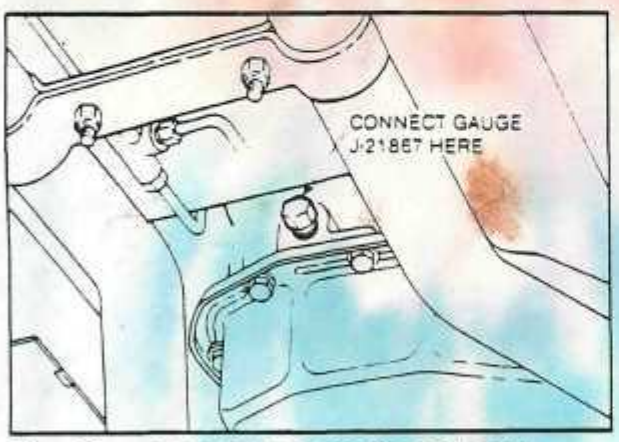


Fig. 13 **CHECKING TRANSMISSION FLUID PRESSURE**

2. Run the engine until transmission reaches normal operating temperature (coolant fans begin to cycle – A/C off).
3. Raise the vehicle on a hoist which will allow the rear wheels to turn freely.
4. Disconnect the vacuum hose from the vacuum modulator.
5. Start the engine, place the transmission sector lever in DRIVE, and run the rear wheels until 2,500 RPM is reached with the transmission shifted into third gear.
6. Read transmission fluid pressure; the pressure should be 8 Bar ± .2 (113 PSI ± 3) when the transmission fluid temperature is 80°C. (176°F.).
7. Adjust the fluid pressure by unlocking the retaining clip and rotating the vacuum modulator in its housing. *Fig. 14*

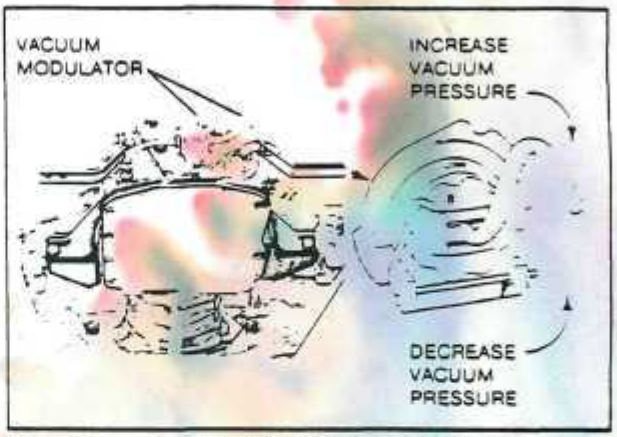


Fig. 14 **ADJUSTING TRANSMISSION FLUID PRESSURE**

Notice:

Turning the modulator clockwise will increase the fluid pressure. One notch of movement will change the pressure approximately 0.1 Bar (1.5 PSI).

8. Install the modulator retaining clip, refit the modulator vacuum hose, and remove the fluid pressure gauge and install plug.
9. Lower the vehicle, check and adjust transmission fluid level.

ON CAR SERVICE

FLUID PUMP AND/OR SEAL

Removal

1. Raise car on hoist.
2. Remove five (5) of six (6) fluid pump attaching bolts. Back out but do not remove remaining bolt as this will help prevent dropping gears upon pump housing separation from transmission assembly. *Fig. 15*

CAUTION: Special care should be exercised to prevent contact with transmission fluid as transmission fluid is scalding hot (80°C/176°F).

3. After separating pump assembly from transmission assembly, remove last bolt. Then remove pump assembly. Do not drop fluid pump gears when performing this operation. Paint mark the position of the gears for reassembly.

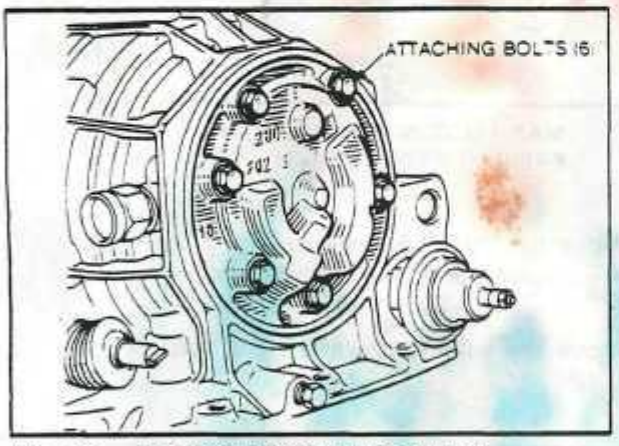


Fig. 15 **TRANSMISSION FLUID PUMP**

Installation

1. Lubricate the new "O" ring seal with transmission fluid and fit it on the fluid pump body.
2. Lubricate the fluid gears with transmission fluid and insert gears in the pump housing aligning the disassembly marks.

Notice:

The larger pump gear must be fitted with the chamfered edge facing the pump housing.

3. Fit the fluid pump drive in the center gear.
4. Position and secure the fluid pump to the transmission case and torque the belts (see torque specifications).

FLUID PAN AND/OR GASKET

Removal

1. Raise car on hoist.
2. Remove the transmission fluid pan drain plug and drain the fluid.

CAUTION: Special care should be exercised to prevent physical contact with the transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

3. Remove fluid pan attaching bolts and remove pan and gasket.

Installation

1. Clean the fluid pan and transmission mounting surfaces. Install the fluid pan using a new gasket and torque attaching bolts (see torque specifications).
2. Lower the vehicle and fill the transmission with fluid to the proper level (see MAINTENANCE AND ADJUSTMENT section).

ELECTRICAL SHIFT SOLENOIDS

Removal

1. Raise car on a hoist.
2. Remove the transmission fluid pan as previously described.
3. Disconnect the external wiring harness from the solenoid socket.
4. Depress the retaining lugs and remove the sealed socket from the transmission case.

5. Remove the solenoid mounting bolt and plate. *Fig. 16*

6. *Extract* both solenoids with wiring harness from *valve body*.

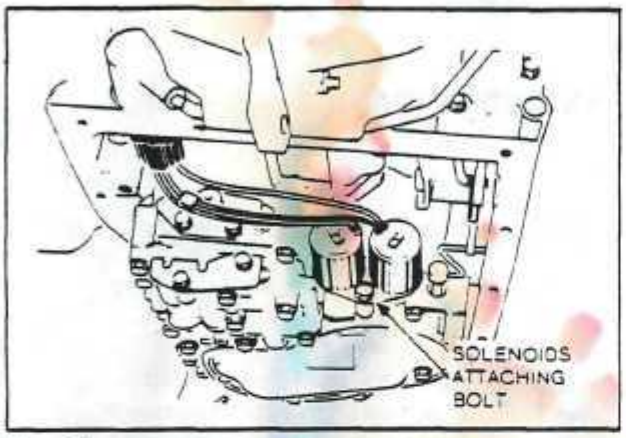


Fig. 16 **SHIFT SOLENOID REMOVAL**

Installation

1. Fit new "O" ring seals on the solenoids and install the solenoids in the valve body until they are fully sealed and seated.

Notice:

On the solenoid with the clear insulation wires must be fitted on the side next to the manual control valves.

2. Install the mounting plate and bolt.

3. Fit a new "O" ring seal on the seal socket and install the socket in the transmission case.

4. Connect the transmission wiring harness to the sealed socket.

5. Clean the fluid pan and transmission mounting surfaces. Install the fluid pan using a new gasket and torque tighten the attaching bolts (see torque specifications).

6. Lower the vehicle and fill the transmission with fluid to the proper level (see MAINTENANCE AND ADJUSTMENT section).

VALVE BODY

Removal

1. Raise the vehicle on a hoist and remove the electric shift solenoids as previously described.

2. Remove the manual control valve linkage by pushing the link into the quadrant arm and compressing the spring. This will disengage the other end of the link from the control valve. Remove the linkage. *Fig. 17*

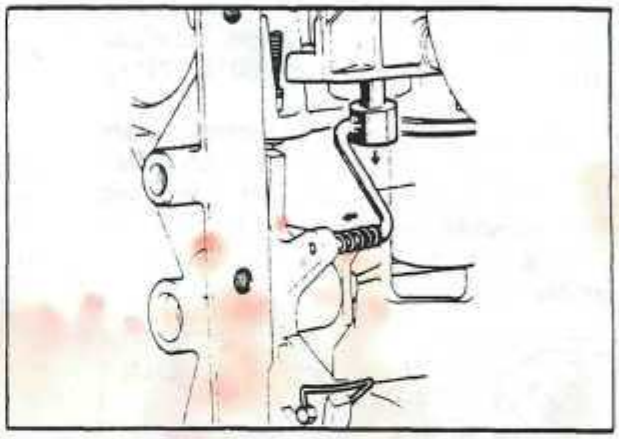


Fig. 17 **MANUAL CONTROL VALVE AND PARKING PAWL LINKAGE**

3. Remove the three (3) bolts securing the fluid pick-up screen and gasket and remove.

4. Remove the valve body attaching bolts only. *Fig. 18*

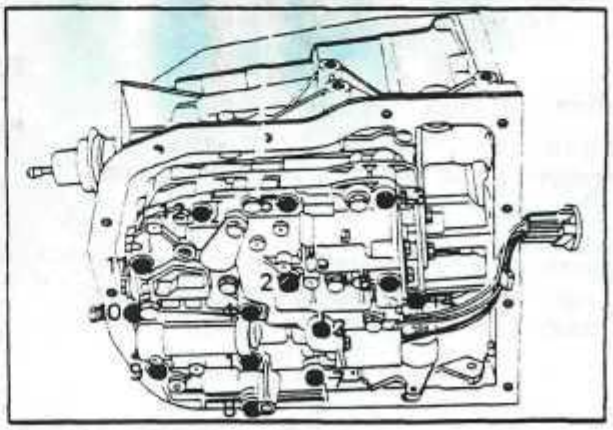


Fig. 18 **VALVE BODY ATTACHING BOLTS-SEQUENCE**

Notice:
DO NOT remove valve body assembly bolts. This assembly is not serviceable.

5. Remove the valve body plate and gaskets (2).

Installation

1. Clean the surfaces of the valve body, plate and transmission case. Place a new gasket, the plate and another new gasket on the valve body. Insert two (2) mounting bolts in the valve body to align the gaskets and plate. *Fig. 19*

2. Fit the valve body assembly to the transmission and install the remaining bolts. Torque tighten the bolts in the sequence shown. *Fig. 18*

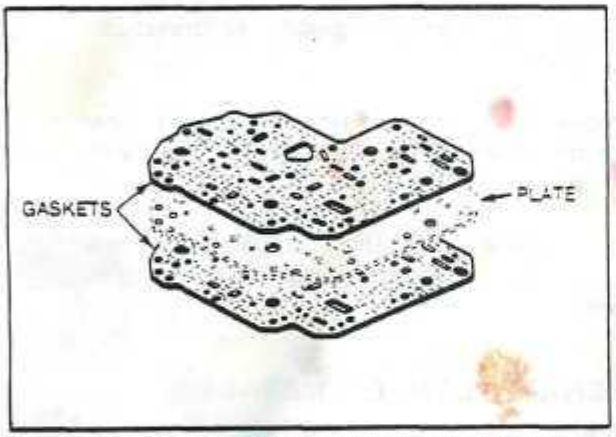


Fig. 19 VALVE BODY GASKETS AND PLATE

3. Fit a new gasket to the fluid pick-up screen install the screen on the valve body.

4. Re-fit the control valve linkage by inserting the spring end of the link into the quadrant arm first. Push the link in to compress the spring and fit the other end of the link in the control valve hole.

5. Install the electric shift solenoids and new pan gasket as previously described.

VACUUM MODULATOR

Replacement

1. Raise the vehicle on a hoist.

2. Disconnect the vacuum hose at the vacuum modulator.

3. Remove the vacuum modulator hold down clamp and remove the modulator assembly.

4. Remove the modulator retaining clip and unscrew the modulator from the adaptor housing.

5. Reverse the above procedure for installation.

6. Adjust the transmission fluid pressure (see MAINTENANCE AND ADJUSTMENT section for procedures).

GOVERNOR COMPUTER ASSEMBLY

Replacement

1. Working in the engine compartment, disconnect the chassis wiring harness from the governor computer wiring socket.

2. Remove the wiring socket from the mounting bracket.

3. Raise the vehicle on a hoist.

4. Remove the transmission fluid pan drain plug and drain the transmission fluid.

CAUTION: Special care should be exercised to prevent physical contact with the transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

5. Remove the fluid pan and gasket.

6. Disconnect the electric solenoid harness from the sealed socket in the case.

7. Remove the sealed socket from the transmission case. *Fig. 20*

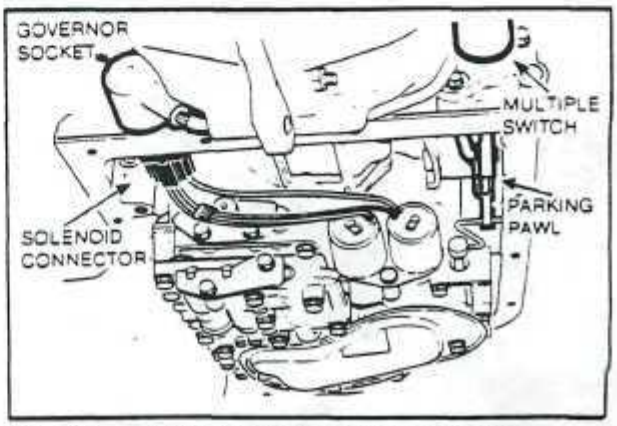


Fig. 20 GOVERNOR COMPUTER REMOVAL

8. Remove the bolts securing the multiple switch and remove the switch.
9. Disconnect the governor control cable from the governor computer.
10. Remove the bolts securing the governor computer to the case and extract the governor drive gear and assembly. *Fig. 21*

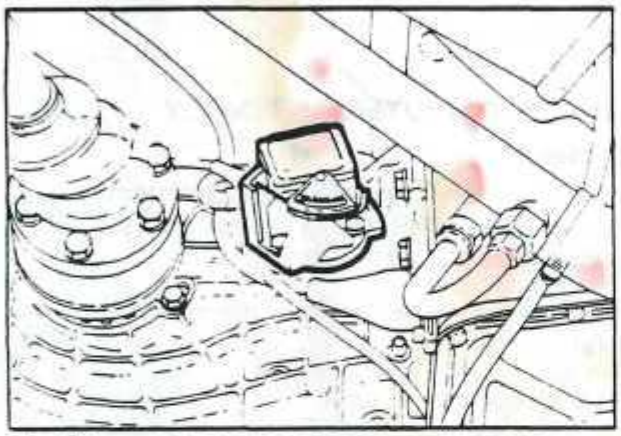


Fig. 21. **GOVERNOR COMPUTER ASSEMBLY REMOVAL**

11. Disconnect the wiring tie straps and remove the governor computer assembly and wiring harness. *Fig. 22*

Notice:
Steps 4, 5, and 6 may be omitted if the solenoid wiring harness is not defective. Mark the three (3) solenoid wires (M, J, and B) and remove the wires from the wiring socket. This will allow the removal of the governor computer without removing the transmission fluid pan.

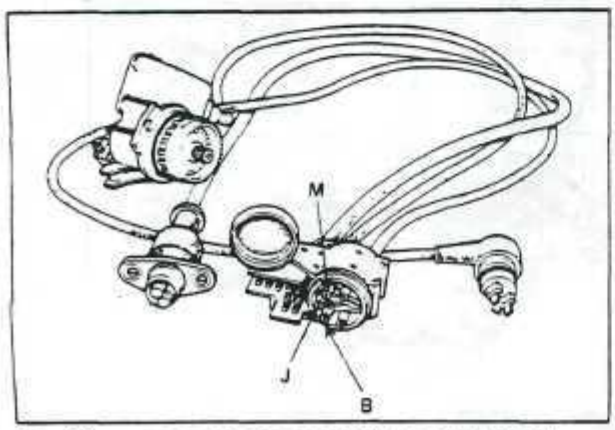


Fig. 22 **GOVERNOR COMPUTER ASSEMBLY**

12. Reverse the above procedures for installion. Use new "O" ring seals and gaskets. Torque tighten fastening bolts to the proper specifications (see torque specifications).
13. Fasten the wiring harness clear of the exhaust system using tie straps.
14. Adjust the governor control cable (see MAINTENANCE AND ADJUSTMENT section for procedure).

PARKING PAWL

Replace

1. Raise vehicle on a hoist.
2. Remove fluid pan and gasket as previously described.
3. Remove the clip retaining the parking pawl from the quadrant and remove parking pawl. *Fig. 20*
4. To complete installation, reverse removal procedures and torque fasteners to specifications.

DRIVESHAFT FLANGE/OIL SEAL

Removal

1. Raise vehicle on a hoist.
2. Drain the final drive gear oil.
3. Disconnect the inner end of the inner driveshaft from the driveshaft flange.

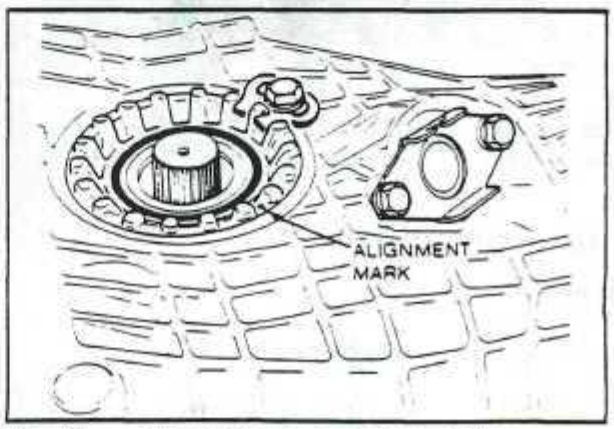


Fig. 23 **DIFFERENTIAL ADJUSTING NUT**

4. Remove the roll pin securing the inner driveshaft flange from the differential shaft.
5. Remove the driveshaft flange.
6. Remove the differential adjusting nut lock plate. Index mark the adjusting nut on the transmission case for installation. *Fig. 23*
7. Unscrew the adjusting nut using tool J28866. COUNT THE NUMBER OF TURNS REQUIRED TO DISENGAGE THE THREADS. *Fig. 24*

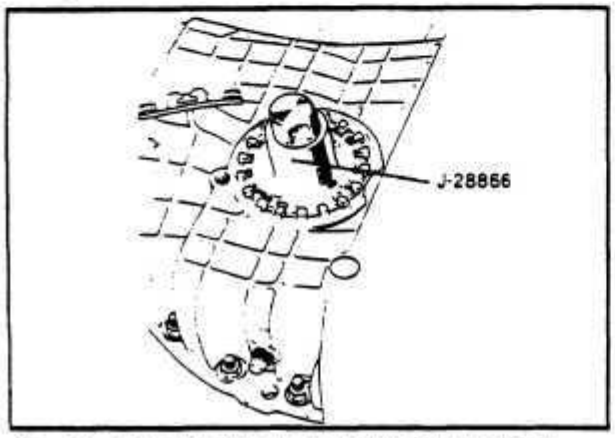


Fig. 24 **DIFFERENTIAL ADJUSTING NUT TOOL**

8. Remove the "O" ring seal and pry out the lip seal using a suitable tool taking care not to damage the machined surface.
9. Replace the side gear "O" ring seal.

Installation

1. Install the new lip seal in the adjusting nut using a suitable drift. Seat the seal with the lip facing the final drive area.
2. Fit the new "O" ring seal on the adjusting nut.
3. Thread the adjusting nut into the case. THE EXACT NUMBER OF TURNS NOTED ON REMOVAL. Align the index marks and install the adjusting nut lock plate. *Fig. 23*
4. Align the role pin hole in the driveshaft flange with the pin hole in differential side gear shaft and install the flange.
5. Align the roll pin hole and insert the roll pin.
6. Connect the inner driveshaft to the driveshaft flange and torque bolts (see torque specifications).
7. Fill the final drive with the recommended lubricant and lower the vehicle on the hoist.

TRANSMISSION MOUNTS

Replacement

1. Raise vehicle on a hoist.
2. Support the transmission to remove the weight from the mounts.
3. Remove the nyloc nut and the bolt securing the rubber mount to the transmission metal mount on each side of auto-case (L.H.S. Illustrated). *Fig. 25*

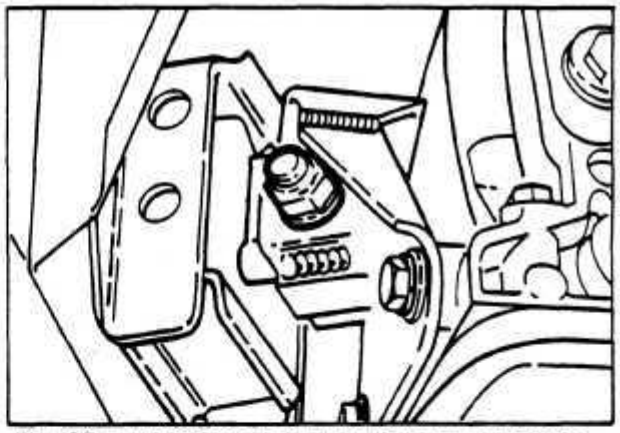


Fig. 25 **TRANSMISSION MOUNT REPLACEMENT**

4. Remove the bolts securing the rubber mount and bracket to the chassis frame. Remove the mount.
5. Reverse the above procedures to install the mount and torque fasteners to specifications.

REMOVAL AND REFITTING

1. Disconnect the negative battery cable.

2. Working in the engine compartment, disconnect the chassis wiring harness from the governor computer wiring socket. *Fig. 26*

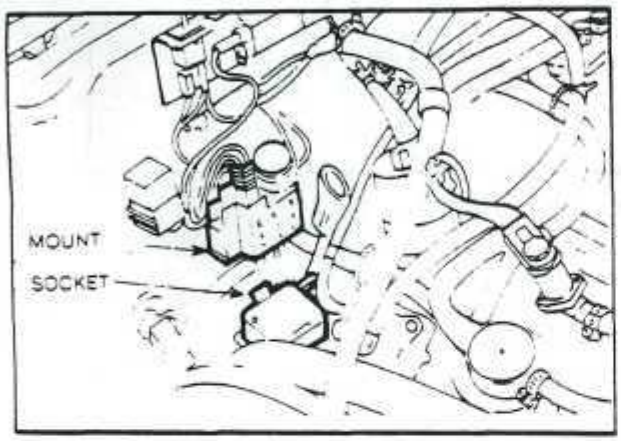


Fig. 26 **GOVERNOR COMPUTER WIRING SOCKET AND MOUNT**

3. Remove the wiring socket from the mounting bracket.

4. Raise the vehicle on a hoist and drain transmission fluid.

CAUTION: Special care should be exercised to prevent physical contact with transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

5. Disconnect the selector cable from the bellcrank.

6. Remove the clamp securing the selector cable to the chassis.

Notice:
It may be necessary to remove the trailing arm shield to gain access to the cable clamp securing nuts.

7. Disconnect the governor control cable from the governor.

8. Remove any tie-straps securing the governor computer wiring harness to the chassis.

Notice:
The governor and wiring will remain with the transmission upon removal.

9. Disconnect the engine vacuum hose from the modulator vacuum pipe.

10. Remove the right rear wheel and disconnect the parking brake cable from the caliper. Mover the brake cable clear of the transmission.

11. Remove the dipstick tube.

12. Disconnect the magnetic timing pick-up and plate on the side of the converter housing.

13. Disconnect the inner driveshaft from the driveshaft flanges.

14. Remove the bolts securing the starter motor to the converter housing.

15. Disconnect the transmission fluid cooler lines from the transmission.

16. Loosen the engine mount bolts and jack the front of the engine up to gain access to the converter inspection plate.

Notice:
Do not damage the rear fascia with the exhaust tail pipes while lifting the engine.

17. Remove the converter inspection plate.

18. Remove the bolts securing the torque converter to the flex plate.

19. Lower the engine.

20. Place a transmission jack under the transmission. Disconnect the transmission mounts and remove the mount brackets from the transmission.

21. Remove all of the bolts securing the transmission to the engine.

22. Jack the front of the engine up and lower the transmission as far as possible.

Notice:
Do not damage the rear fascia with the exhaust pipes. If the enlarged tail pipe extensions are used, it may be necessary to remove the muffler.

23. Install suitable converter retaining device to prevent converter from slipping off and carefully lower the transmission from the vehicle.

Installation

1. Reverse the removal procedures for installation. Torque tighten all fasteners (see torque specifications).

2. Adjust the governor control cable and selector linkage (see MAINTENANCE AND ADJUSTMENT section for procedures).

3. Fill the transmission and final drive with fluid/lubricant.

4. Adjust the transmission fluid pressure (see MAINTENANCE AND ADJUSTMENT section for procedures).

TORQUE CONVERTER SEAL

Replacement

1. Remove transmission as described in this section.

2. Remove the torque converter from the transmission.

3. Remove the converter seal from the housing.

4. Fit the new seal in the housing with the lip on the seal facing the transmission. Install the seal using Tool J28864 and a mallet. *Fig. 27*

5. Lubricate the seal with transmission fluid and install the torque converter. Rotate the converter until it engages with the pump drive, the turbine shaft and the stator support.

Notice:
Ensure that the converter is fully seated.

6. Install the transmission as outlined in the TRANSMISSION REPLACEMENT section.

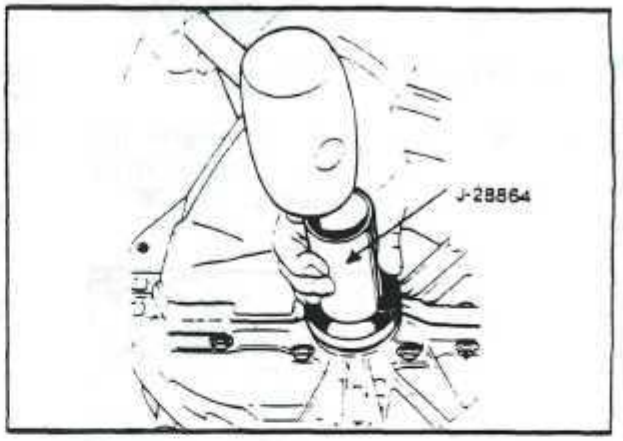


Fig. 27 **CONVERTER SEAL INSTALLATION**

FLEX PLATE

Replacement

1. Remove the transmission as described in this section.

2. Install the flex plate lock Tool J28859 and remove seven (7) flex plate bolts and discard. *Fig. 28*

3. Remove the lock tool, the flex plate and the reinforcement plates.

4. Install the flex plate by fitting a reinforcement plate, the flex plate, and then the other reinforcement plate on the flywheel.

5. Fasten the flex plate to the crankshaft using new bolts and Loctite 601 or equivalent. Torque tighten to specifications (see torque specifications).

Notice:
Use Tool J28859 to lock the flex plate while torquing bolts.

6. Install the transmission as described in this section.

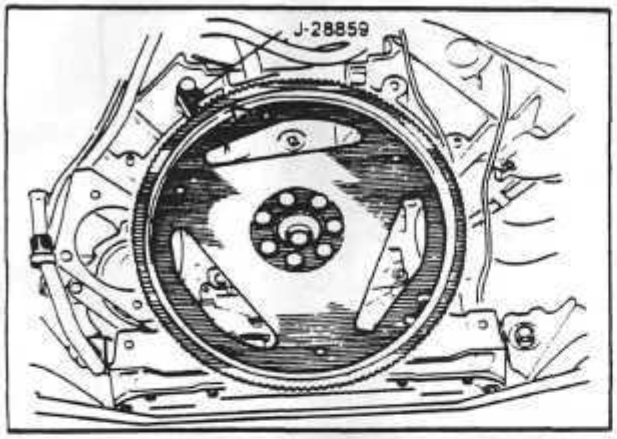


Fig. 28 **FLY WHEEL LOCKING TOOL**

UNIT SEPARATION

1. Drain the transmission fluid and final drive lubricant from the transmission assembly.
2. Remove the two (2) bolts securing the dipstick tube.
3. Remove the torque converter and fluid pump shaft. *Fig. 29*

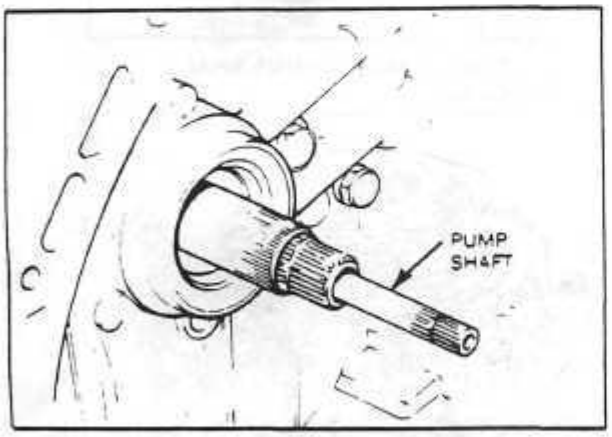


Fig. 29 **FLUID PUMP SHAFT**

4. Place the transmission in a vertical position, resting on the converter housing.
5. Remove the transmission fluid pan and gasket.
6. Remove the bolts securing the multiple switch and remove the switch. *Fig. 30*

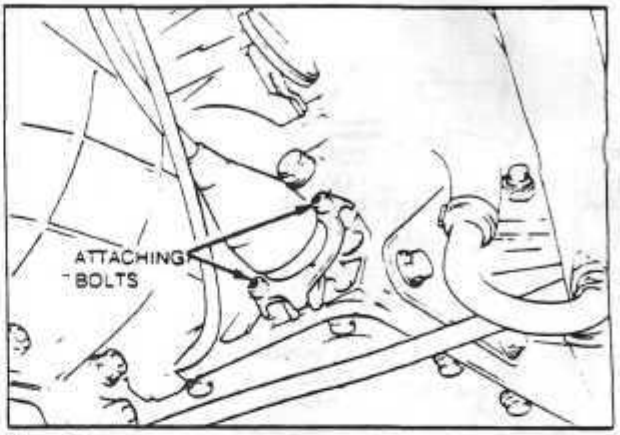


Fig. 30 **MULTIPLE SWITCH REMOVAL**

7. Release the retaining lugs on the wire connector and disconnect the solenoid wiring harness from the socket. *Fig. 31*

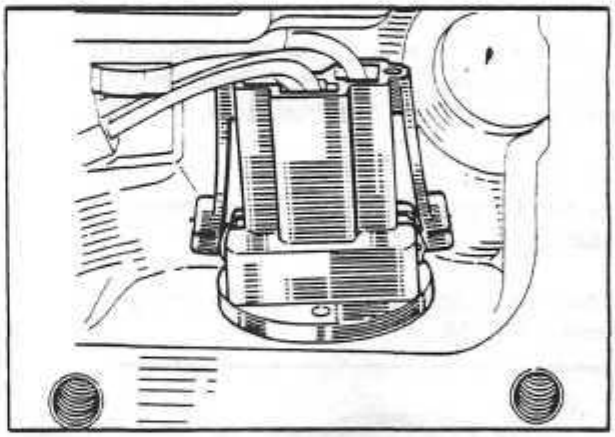


Fig. 31 **SHIFT SOLENOIDS CONNECTOR**

8. Remove the sealed socket from the case by pressing the two (2) plug retaining lugs together and pushing on the socket. *Fig. 32*

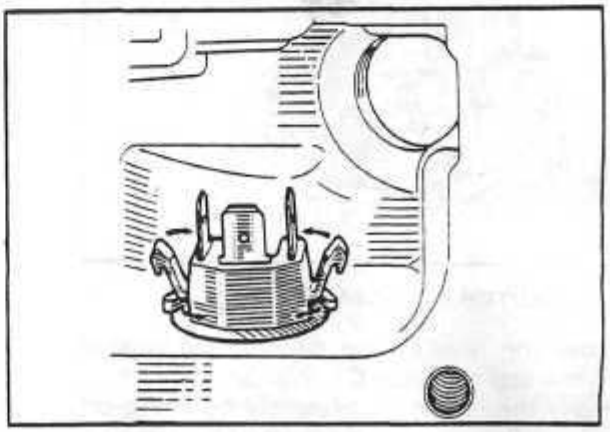


Fig. 32 **SEALED SOCKET PLUG**

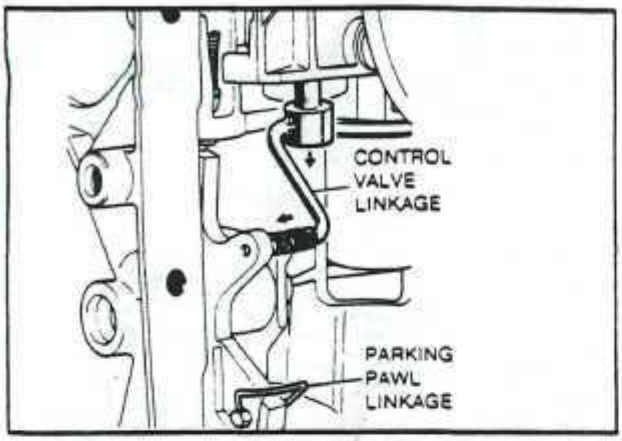


Fig. 33 **MANUAL CONTROL VALVE AND PARKING PAWL LINKAGE**

9. Remove the parking pawl link retaining clip and remove the link. *Fig. 33*

10. Remove the bolts securing the transmission to the final drive assembly. Lift the transmission up and separate from the final drive.

Notice:
There are two (2) securing bolts located inside the transmission.

11. Remove the clutch C2 assembly by lifting off vertically. *Fig. 34*

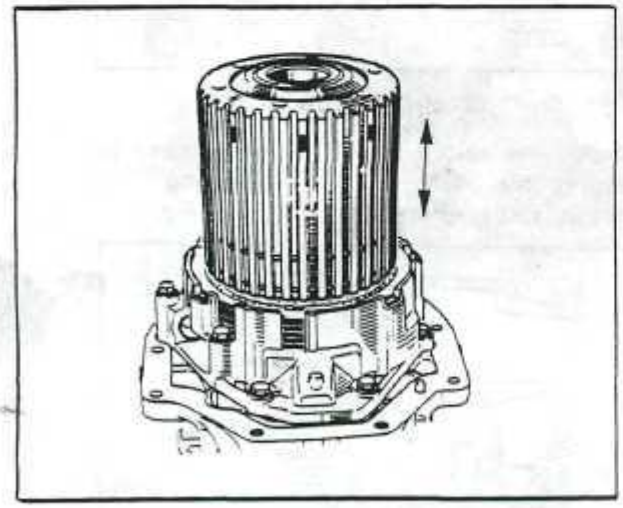


Fig. 34 **CLUTCH C-2 ASSEMBLY**

12. Remove the needle roller bearing and washer from the top of clutch C1. *Fig. 35*
Remove the clutch C1 assembly by lifting off vertically. Remove turbine shaft from clutch C1 using a soft metal drift. *Fig. 36*

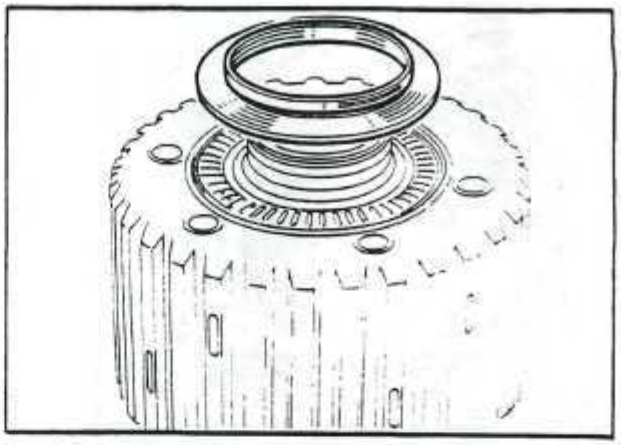


Fig. 35 **CLUTCH C-1 NEEDLE BEARING**

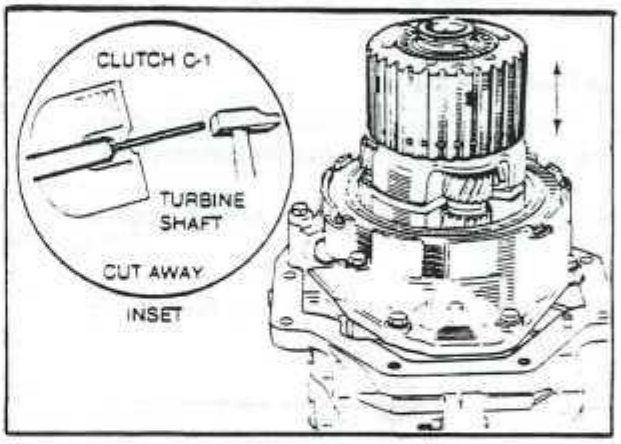


Fig. 36 **CLUTCH C-1 AND TURBINE SHAFT REMOVAL**

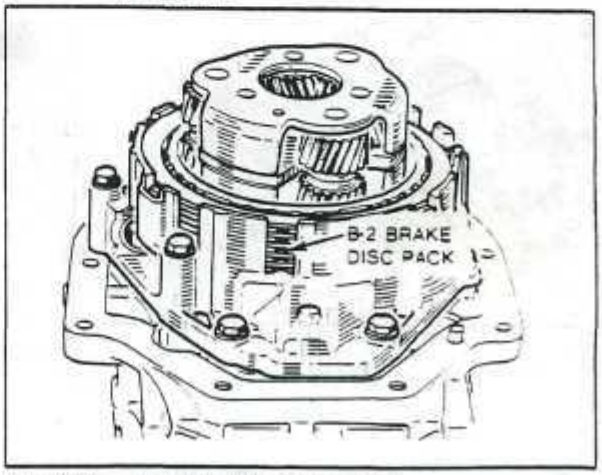


Fig. 37 **BRAKE B-2 DISC PACK**

13. Remove the thrust washer from the inside of the planetary gear carrier.

14. Remove the steel discs, lined discs and adjusting shim(s) from brake B2 housing. *Fig. 37*

Notice:
All of the transmission components except the planetary gear carrier, have been separated from the final drive unit.

Notice:
If it is necessary to repair or replace the planetary gear carrier, refer to the final drive COMPONENT REPAIR section for further instructions.

Notice:
If transmission repairs are required, refer to the TRANSMISSION DISASSEMBLY and COMPONENT REPAIR sections for further dismantling instructions.

Notice:
If final drive repairs are required, refer to the FINAL DRIVE DISASSEMBLY and COMPONENT REPAIR sections for further dismantling instructions.

UNIT REASSEMBLY

1. Check and adjust the operating clearance on brake B2.

When the transmission and final drive units are assembled together, there must be a proper amount of clearance between the B2 apply piston and the last brake disc to allow the brake B2 to function correctly.

The B2 apply piston is located in the transmission case and the brake discs are located in the final drive case; therefore, it is necessary to perform the following measurements on each unit to determine the amount of clearance that will exist when the two units are bolted together.

a. Install the B2 disc pack on the planet wheel carrier as follows:

   Fit the shim(s) that were removed, a steel disc, a lined disc, a steel disc and so on. Substitute the wave disc with a flat disc and fit on the pack last to obtain exact measurement.

b. Fit a new gasket on the final drive case and place the special tool J 28867/3 (part of A/T tool kit) in position.

   Use a depth gauge to measure the distance between the top face of the special tool and the last B2 disc. *Fig. 38* — "Y"

c. Subtract the measurement from 120 mm (4.724 in.) to obtain the final dimension. *Fig. 38* — "A"

Example:

120.00 mm	Set Value
− 62.97 mm	Distance Measurement "Y"
57.03 mm	Final Dimension "A"

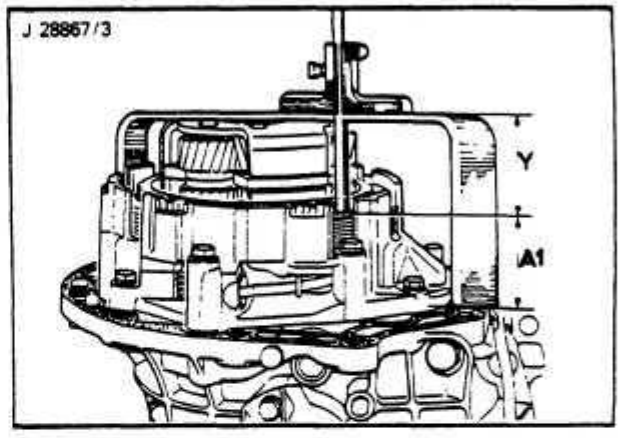


Fig. 38 **BRAKE B-2 OPERATING CLEARANCE**

d. Clean the mating surface of the transmission case and place a straight edge across the joint face.

   Use a depth gauge to measure the distance between the top face of the straight edge and the B2 apply piston. *Fig. 39*

   Notice:
   This distance is not adjustable.

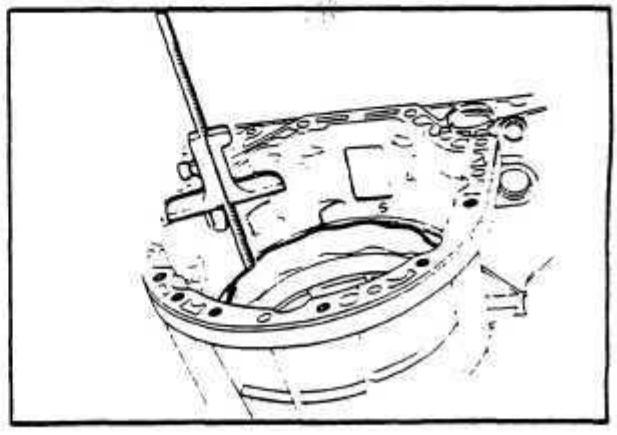


Fig. 39 **B-2 PISTON CHECKING LOCATION**

e. Use a micrometer to measure the thickness of the straight edge used in the above measurement.

Subtract this measurement from the distance measure obtained in Step "d" to determine the final dimension "B". *Fig. 40*

Example:

65.10 mm	Distance Measurement
−6.38 mm	Thickness of Straight Edge
58.72 mm	Final Dimension "B"

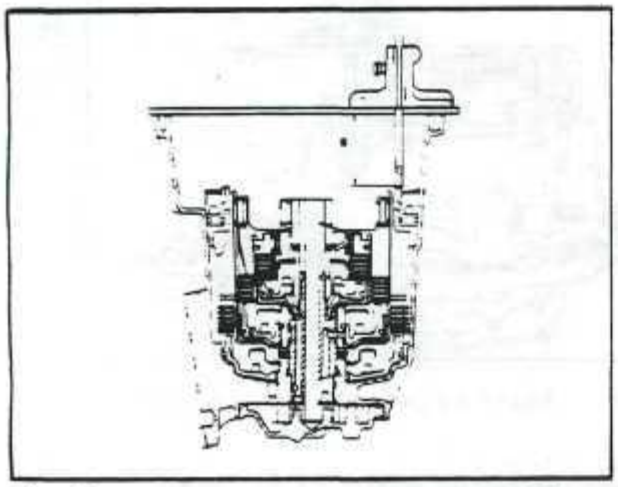


Fig. 40 **B-2 APPLY PISTON MEASUREMENT**

f. Calculate the operating clearance by subtracting the final dimension "A" (Step "c") from the final dimension "B" (Step "e").

Example:

58.72 mm	Dimension "B" *Fig. 40*
−57.03 mm	Dimension "A" *Fig. 38*
1.69 mm	Clearance

This clearance must be 1.1 – 1.5 mm (.043 – .059 in.). If the clearance is not within specifications, shims may be added or subtracted or a different thickness shim may be used between the B2 disc pack and the planetary carrier. Do not use more than two (2) shims to obtain the proper clearance.

g. Remove the disc pack and fit the proper adjustment shim(s).

h. Remove the substitution steel disc and fit the wave disc on the pack. Re-fit the disc pack on the planetary gear carrier.

2. Check and adjust the transmission end play.

When the transmission and final drive units are assembled together, there must be a proper amount of end play clearance between the mechanical components within the transmission. Incorrect clearance will result in premature failure.

It is necessary to perform the following measurements to determine the amount of clearance that will exist when the two units are bolted together.

a. Clean the contact face of the final drive case and remove the thrust washer from the planetary gear carrier.

b. Position the special measuring tool J 28867-4 (part of the A/T tool kit) on the final drive case without the gasket. *Fig. 41*

Use a depth gauge to measure the distance "X" *Fig. 41* from the top face of the special tool to the top of the planetary carrier shaft. THRUST WASHER REMOVED.

c. Subtract "X" *Fig. 41* from 120 mm (4.724 in.) to obtain the dimension "A". *Fig. 41*

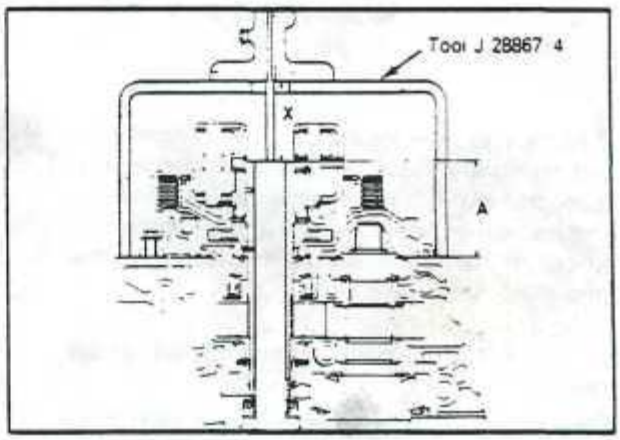


Fig. 41 **PLANETARY CARRIER TO FINAL DRIVE CASE MEASUREMENT**

Example:

120.00 mm	Set Value
−46.46 mm	Distance Measurement "X"
73.54 mm	Final Dimension "A"

d. Install clutch C2 in the transmission case. Rotate the clutch until it engages all of the brake B1 discs and is fully seated. *Fig. 42*

e. Fit the washer on clutch C2 with the flange on the washer facing towards clutch C2. *Fig. 42*

f. Place the needle roller bearing on top of the washer with the needles facing the washer. *Fig. 42*

g. Install clutch C1 in the transmission case. Rotate the clutch until it engages all of the discs of the clutch C2 and is fully seated.

h. Place the thrust washer on the hub of clutch C1. *Fig. 42*

i. Clean the contact surface of the transmission case and place a straight edge across the face of the transmission. *Fig. 42*

Notice:
A new gasket must be positioned on the transmission housing prior to performing this measurement.

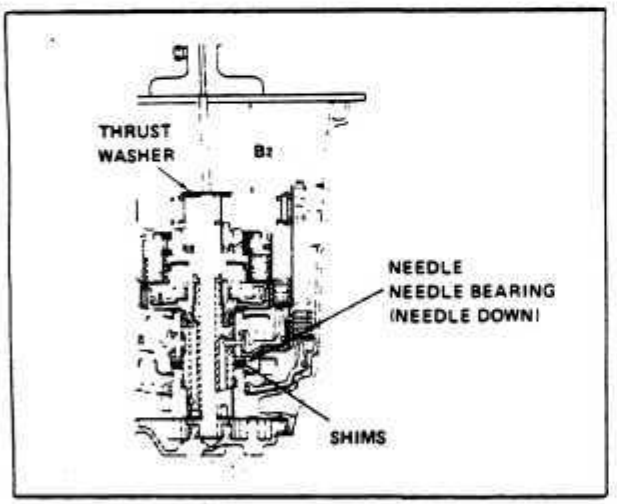


Fig. 42 **TRANSMISSION END PLAY ADJUSTMENT**

Use a depth gauge to measure the distance "B" from the top of the straight edge to the top of the thrust washer on the hub. *Fig. 42*

j. Use a micrometer to measure the thickness of the straight edge.

Subtract the thickness of the straight edge from the distance measurement to obtain dimension "B".

Example:

74.33 mm	Distance Measurement
−74.10 mm	Thickness of Straight Edge
.23 mm	Dimension "B"

k. Calculate the end play clearance by *subtracting* dimension "A" *Fig. 41* from dimension "B". *Fig. 42*

Example:

74.10 mm	Dimension "B"
−73.54 mm	Dimension "A"
0.56 mm	End Play Clearance

End play clearance should be between 0.37 – 0.74 mm (90.015 – 0.029 in.). If the clearance is not within specifications, it will be necessary to increase or decrease the thickness of the shim(s) located between the transmission case and clutch C2. *Fig. 42*

Shims are available in the following thicknesses.

0.25 mm (.010 in.)
0.5 mm (.020 in.)
0.7 mm (.028 in.)
0.8 mm (.031 in.)

Notice:
If the end play clearance cannot be adjusted properly, it will be necessary to perform the planetary gear carrier height adjustment and then repeat the end play clearance adjustment. (See Final Drive COMPONENT REPAIR section for height adjustment procedures.)

l. Remove the thrust washer, clutch C1, needle bearing, washer, and clutch C2 from the case.

m. Remove the washer and needle roller bearing from the hub in the bottom of the transmission case. Fit the proper adjustment shims on the hub to give the specified end play clearance.

n. Re-fit the needle roller bearing with the needles facing upwards and place the washer on top of the bearing.

o. Install two (2) new sealing rings on the hub. Ensure that the ring ends are *properly* connected. Lubricate the seal rings with transmission fluid.

3. Fit the thrust washer in the planetary gear carrier with the grooves in the washer facing up (towards sun gear).

4. Install clutch C1 and turbine shaft into the planetary gear carrier.

5. Lubricate the needle roller bearing with automatic transmission fluid and install on clutch C1 with the needles facing upwards.

6. Install the thrust washer on top of the needle roller bearing with the flange on the washer facing upwards.

7. Install the clutch C2. Rotate the clutch until it is fully seated and engaged with clutch C1.

Notice:
Ensure that the clutch is fully seated and in contact with the needle roller bearing and thrust washer.

8. Clean the mating surfaces on the transmission and final drive cases. Fit a new gasket on the final drive case.

9. Align the splines on the discs in brake B1 before fitting the transmission case onto the final drive. This will allow the clutch C2 drum to enter the disc pack without difficulty.

10. Carefully place the transmission case on the final drive while maintaining alignment between the clutch C2 drum and brake B1 discs. After the transmission case is fully seated, install the case attaching bolts and torque tighten. (See specifications.)

11. Install the parking pawl link and fit the retaining clip.

12. Fit a new "O" ring seal on the solenoid wiring socket and install the socket in the case until it is fully seated. Connect the solenoid wiring harness to the socket.

13. Fit a new "O" ring seal on the multiple switch and install the switch in the transmission case.

14. Clean the mating surfaces on the fluid pan and transmission case. Fit a new gasket and install the fluid pan. Torque the attaching bolts. (See torque specifications.)

15. Lubricate the turbine shaft with transmission fluid and install grooved end at the shaft into the transmission. Ensure that the shaft is fully seated and retained by the spring clip. Lubricate the fluid pump shaft with transmission fluid and install. Rotate the shaft to ensure that it is fully engaged and the pump is free turning.

16. Install the torque converter. Rotate the converter while installing until the converter engages the turbine shaft and the fluid pump shaft.

17. Fit a new "O" ring seal on the dipstick tube and install the tube.

TRANSMISSION UNIT

TRANSMISSION UNIT DISASSEMBLY AND REASSEMBLY

Notice:
The transmission/final drive unit separation procedure must be performed before starting with transmission disassembly.

SEE – ON CAR SERVICE – FOR DISASSEMBLY, INSPECTION AND ASSEMBLY PROCEDURES FOR:

- Manual control valve
- Pick up screen and gasket
- Valve body and gaskets
- Vacuum modulator
- Electric shift solenoids
- Fluid pump

TRANSMISSION COMPONENT REPAIR

BRAKE B2 – Fig. 43

1 – **Piston Support Outer Seal**
2 – **Piston Support**
3 – **Piston Seal (Square Section/Inner)**
4 – **Piston Seal (Square Section/Outer)**
5 – **Piston**
6 – **Return Springs**
7 – **Spring Retaining Plate**
8 – **Lock Ring**
9 – **Wave Disc**
10 – **Steel Discs (4)**
11 – **Lined Discs (3)**
12 – **B2 Operating Clearance Adjusting Shims**

Disassembly

1. Remove the tension on the B-2 piston return springs using the special tool (part of the A T Tool Kit). Tighten the tool until the ring on the tool bottoms against the piston *Fig. 44*. Remove the lock ring securing the spring plate.

Notice:
Do not over-tighten the tool. When the ring on the tool contacts the face of the piston, the coil springs are fully compressed.

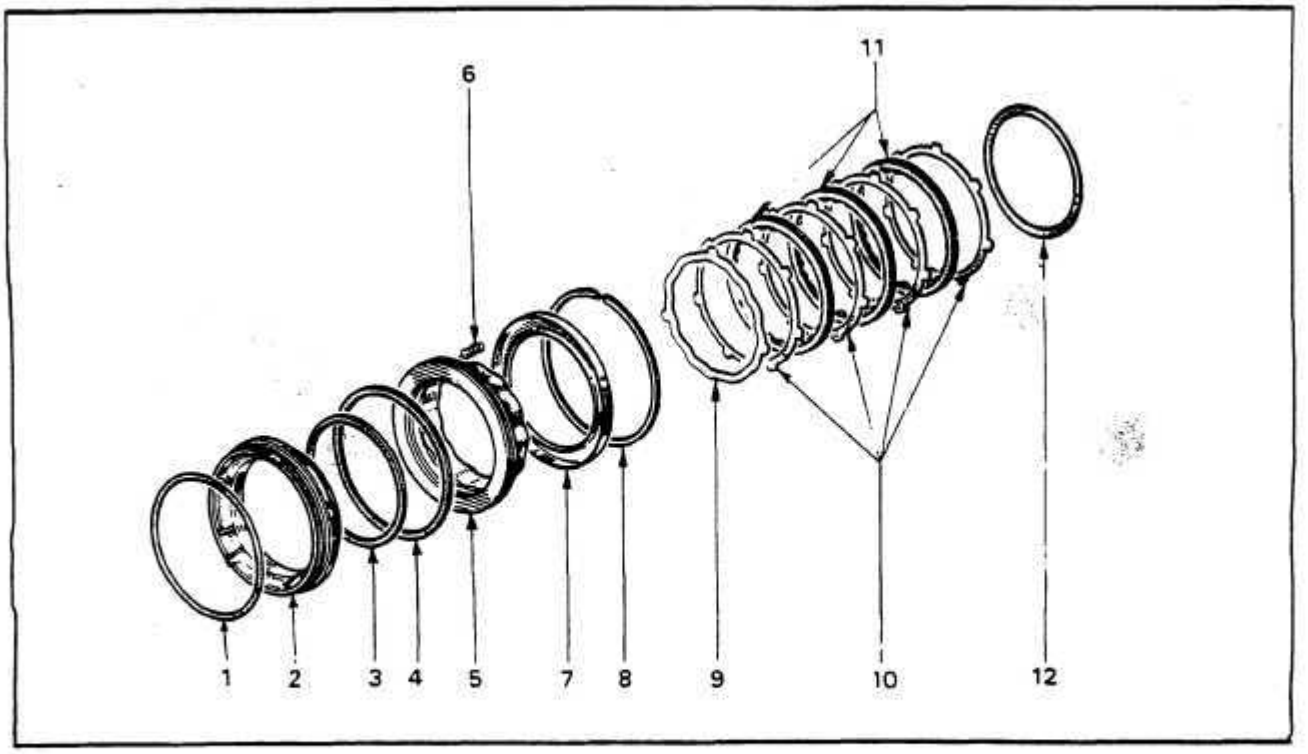


Fig. 43 BRAKE B-2 DISASSEMBLED

2. Remove the special tool and remove the retaining plate and the coil springs.

3. Remove the piston from the transmission case.

4. Separate the piston from the support and remove the seals 1, 3 and 4. *Fig. 43*

5. Remove the brake B2 discs and adjusting shim(s) from the planetary gear carrier housing (on the final drive unit).

Reassembly

Clean and inspect all parts for damage and scoring.

1. Lubricate the two (2) square section seals and fit the outer seal on the piston. Fit the inner seal in the groove on the inside of the piston. *Fig. 43*

2. Lubricate the new support seal with transmission fluid and fit on the piston support. *Fig. 43*

3. Lubricate the support and insert it in the piston. Ensure that it is fully seated.

4. Lubricate the piston assembly with transmission fluid and install in the transmission case.

Notice:
Ensure that the three (3) lugs on the piston support mate with the large groove in the transmission case.

5. Fit the piston return springs and spring retaining plate on the piston. Tighten the spring compressor J 28867/2 until the tool contacts the face of the piston and install the lock ring. *Fig. 44*

7. Remove the tool and insure that the piston is properly seated by placing a straight edge across the face of the case and measuring the distance to the piston in three (3) different locations. The readings should be the same.

8. Fit the adjustment shim(s) on the planetary gear carrier.

9. Alternately fit a steel disc, a lined disc, a steel disc and so on.

10. Fit the wave disc on top of the last steel disc in the B2 disc pack.

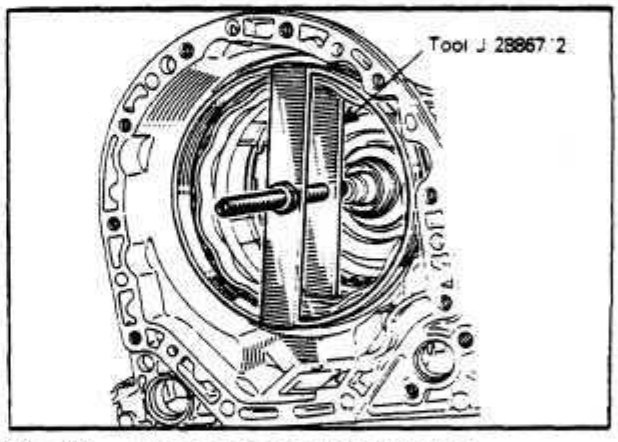


Fig. 44 **BRAKE B-2 PISTON REMOVAL**

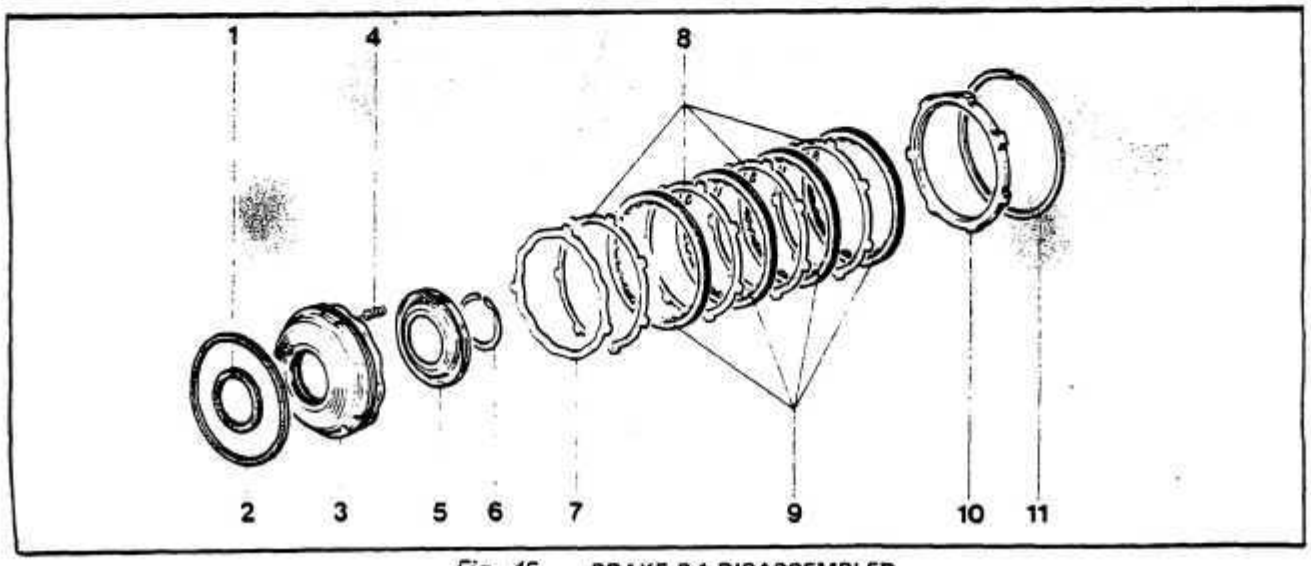


Fig. 45 **BRAKE B-1 DISASSEMBLED**

BRAKE B-1 — Fig. 45

1 – Piston Seal (Square Section/Inner)
2 – Piston Seal (Square Section/Outer)
3 – Piston
4 – Return Springs
5 – Spring Retaining Plate
6 – Lock Ring
7 – Wave Disc
8 – Steel Discs (3)
9 – Lined Discs (3)
10 – Pressure Plate
11 – Lock Ring

Disassembly

1. Remove Brake B-2 piston as outlined in the previous section.

2. Remove the lock ring, pressure plate, and discs from the transmission case. *Fig. 46*

3. Remove the two (2) sealing rings from the hub in the bottom of the case.

Notice:
The rings have locking ends that are released by pushing on the ring on the opposite side of the lock and depressing one side of the lock at the same time. After the lock is released, expand the ring with snap ring pliers and remove. *Fig. 47*

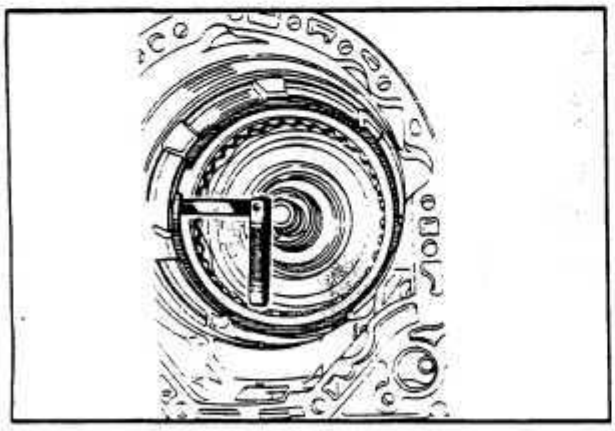


Fig. 46 BRAKE B-1 DISC PACK

4. Remove the washer, roller thrust bearing and adjustment shims from the hub in the bottom of the case.

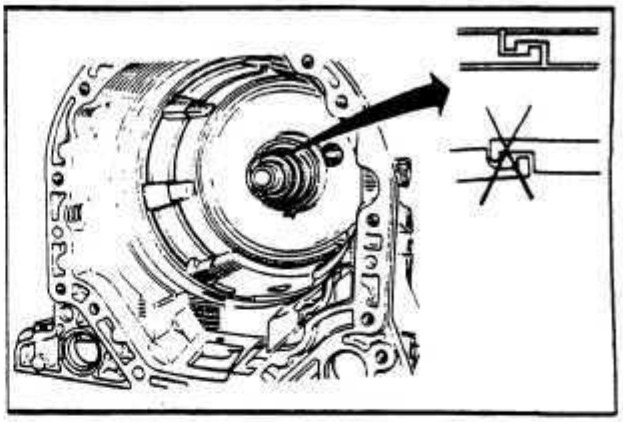


Fig. 47 TRANSMISSION CASE HUB SEAL

5. Compress the B1 piston return springs with the special tool J 28867/1 (part of the A T Tool Kit) and remove the lock ring securing the spring retaining plate. *Fig. 48*

6. Remove the special tool and remove the spring retaining plate and coil springs.

7. Remove the piston from the case and remove the piston seals.

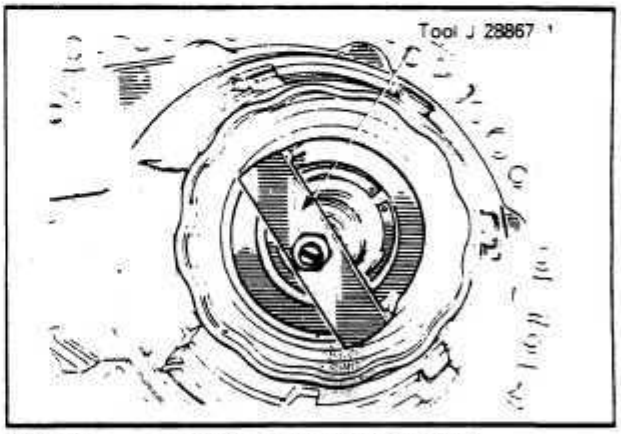


Fig. 48 BRAKE B-1 PISTON REMOVAL

Reassembly

Clean all parts and inspect for damage or scoring.

1. Lubricate the two (2) square section seals with transmission fluid and fit them to the piston. *Fig. 49*

2. Lubricate the inside of the case with transmission fluid. Position a strip of thin plastic sheet in the transmission case to prevent damage to the outer piston seal when installing the piston.

3. Lubricate the piston with transmission fluid and insert the piston into the case aligning the locating boss on the piston with the hole in the transmission case. *Fig. 49*

4. Remove the plastic sheet and ensure that the piston is properly seated.

5. Fit the return springs and spring retaining plate on the piston.

6. Position the lock ring on top of the hub and install the special spring compressing tool. Compress the springs and install the lock ring. *Fig. 48*

7. Remove the spring compressor tool and fit the end play adjustment shims on the hub.

Notice:
DO NOT install the two (2) sealing rings on the hub until the transmission end play has been adjusted. (Part of the transmission reassembly procedure.)

8. Lubricate the needle thrust bearing with transmission fluid and fit the bearing on the hub with the needles facing upwards.

9. Fit the washer on top of the needle bearing.

10. Fit the wave disc on the B-1 piston. *Fig. 45*

11. Lubricate the new discs with transmission fluid and alternately install a steel disc, a lined disc, a steel disc, and so on. *Fig. 45*

Notice:
There should be three (3) steel and three (3) lined discs.

12. Fit the pressure plate on top of the last lined disc and install the lock ring. *Fig. 46*

13. Check the disc pack clearance using a feeler gauge. The clearance should be 1.05 – 2.85 mm (.014 – .112 in.). *Fig. 50*

Notice:
If the clearance is incorrect, recheck the assembly procedure as this clearance cannot be adjusted.

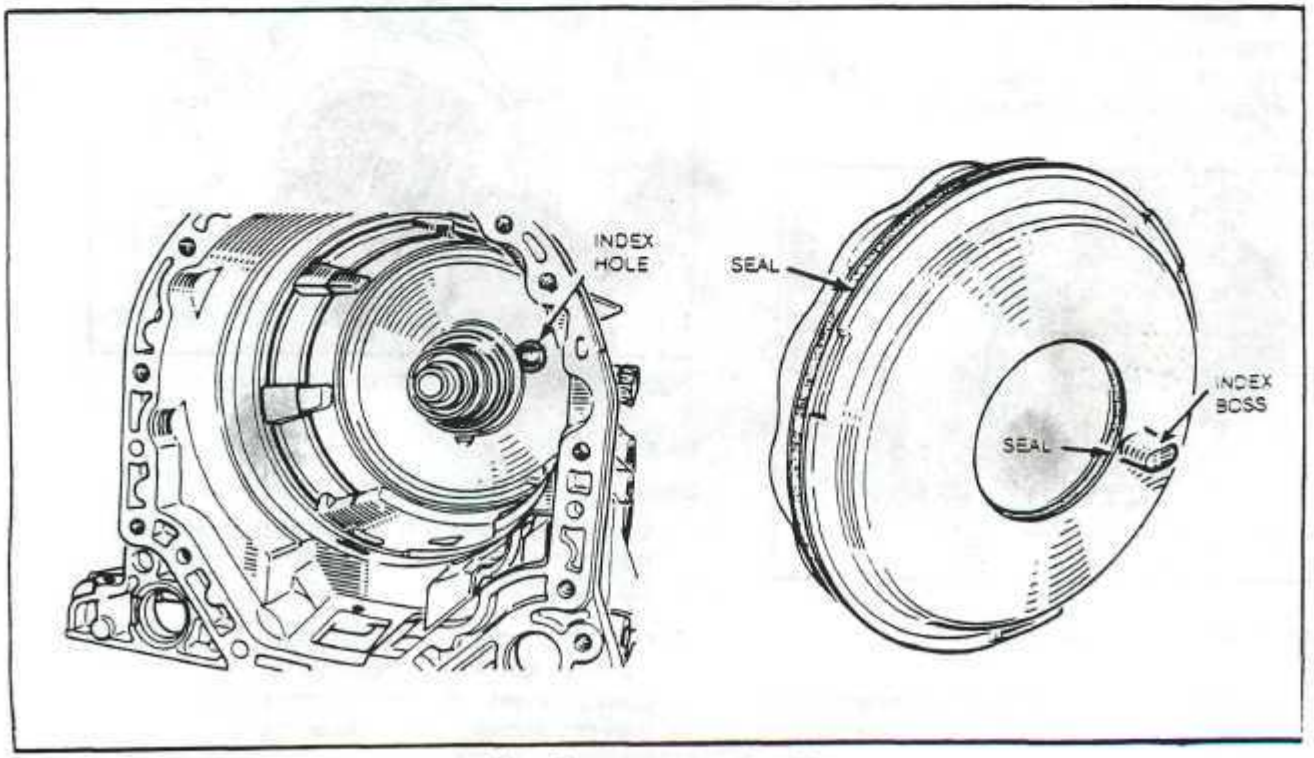


Fig. 49 BRAKE B-1 PISTON

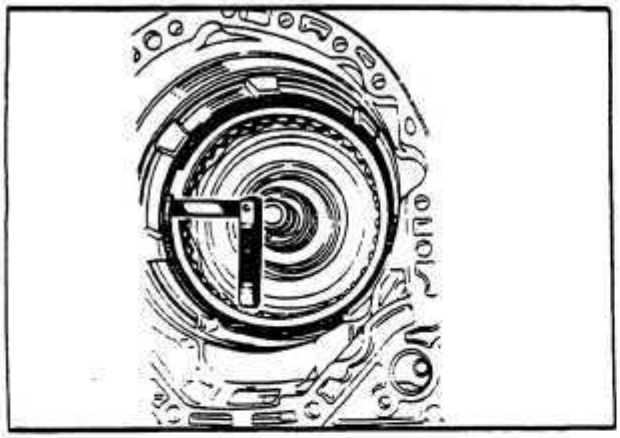


Fig. 50 BRAKE B-1 DISC PACK

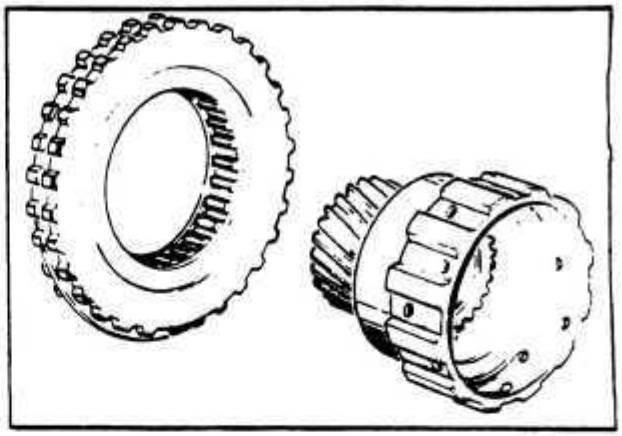


Fig. 52 INPUT GEAR ROLLER CLUTCH ASSEMBLY

ROLLER CLUTCH

The roller clutch is part of the clutch C1 assembly and must be removed from the assembly for repair.

Disassembly

1. Remove the turbine shaft from the clutch C1 by using a brass drift and hammer to free the shaft from the retaining clip.

2. Remove the roller clutch assembly from the clutch C1 housing as follows:

   Install the special tool J 29351 (part of the A/T Tool Kit) on the clutch housing aligning the depressing screws with the holes in the clutch housing. Tighten the screws evenly until the lock ring is released and pull the assembly free from the housing. *Fig. 51*

3. Separate the input gear hub from the roller clutch and outer hub assembly. *Fig. 52*

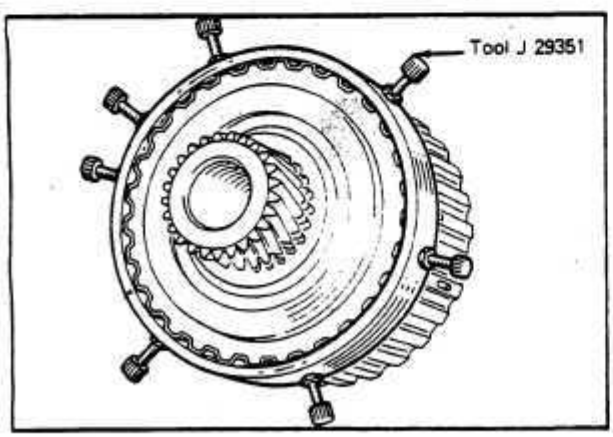


Fig. 51 CLUTCH C-1

4. Remove the upper thrust sleeve, roller clutch, and lower thrust sleeve from the outer hub. *Fig. 53*

Reassembly

Clean and inspect roller clutch parts for any damage or scoring.

1. Fit the lower thrust sleeve in the outer hub. *Fig. 53*

2. Lubricate the roller clutch with transmission fluid and install in the hub with the shoulder on the clutch to the outside of the outer hub. *Fig. 53*

3. Fit the upper thrust sleeve on the clutch and install the input gear hub.

4. Check the operation of the roller clutch. When holding the outer hub, the sun gear on the input gear hub must be free to rotate clockwise and lock itself when an attempt is made to turn it counter-clockwise. *Fig. 54*

5. Fit the roller clutch assembly in the clutch C1 housing. Depress the lock ring and insert the assembly until it is fully seated and the lock ring is in position.

Notice:
Do not fit the turbine shaft to the clutch C1 as it will have to be removed for transmission reassembly adjustments.

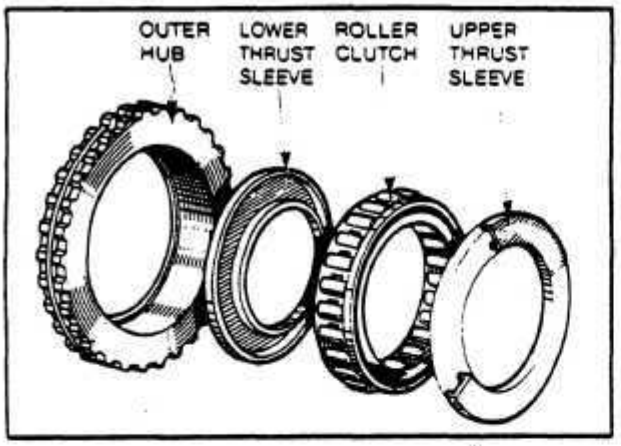


Fig. 53 ROLLER CLUTCH DISASSEMBLED

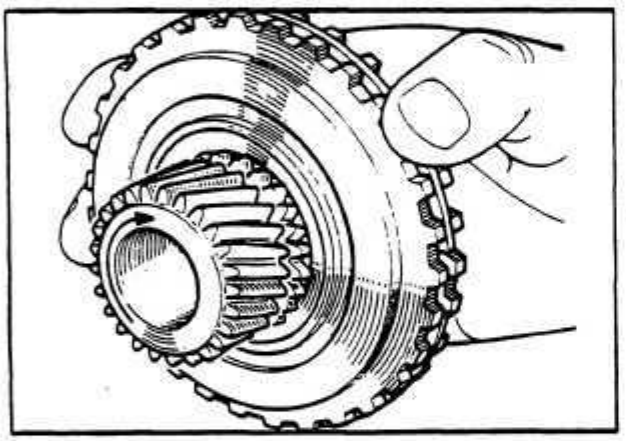


Fig. 54 ROLLER CLUTCH OPERATION

CLUTCH C-1 — Fig. 55

1 – Piston Seal (Lip-Type/Outer)
2 – Piston Seal (Square Section/Inner)
3 – Piston
4 – Return Springs
5 – Spring Retaining Plate
6 – Lock Ring
7 – Wave Disc
8 – Steel Discs (5)
9 – Lined Discs
10 – Input Gear Hub
11 – Outer Hub
12 – Inner Thrust Sleeve
13 – Roller Clutch
14 – Outer Thrust Sleeve
15 – Needle Thrust Bearing
16 – Clutch Housing

Disassembly

1. Remove the roller clutch assembly. (See ROLLER CLUTCH in component repair section for procedures.)

2. Remove the steel and lined clutch discs (5 steel, 4 lined).

3. Remove the needle thrust bearing.

4. Compress the piston return springs using the special tool J 28867/2 (part of the A/T Tool Kit) and remove the lock ring securing the spring retaining plate. *Fig. 56*

5. After removing the special tool, remove the spring retaining plate and coil springs.

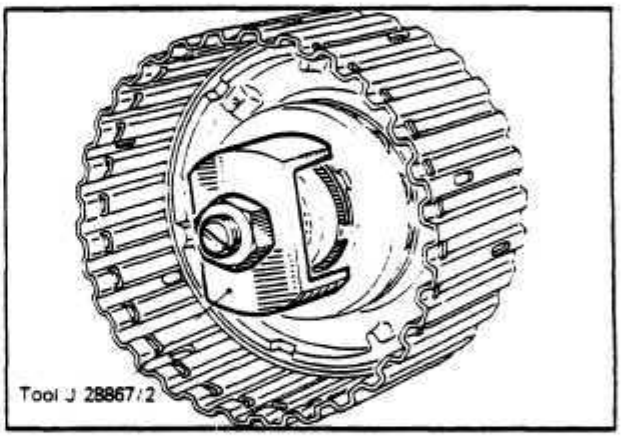


Fig. 56 C-1 PISTON REMOVAL

6. Remove the piston from the clutch housing. Remove the inner and outer seals from the piston. *Fig. 57*

7. Remove the external sealing ring from the clutch housing by compressing one side of the locking tab to release the lock. *Fig. 59*

Reassembly

Clean and inspect all parts for damage or scoring.

1. Lubricate the new piston seals with clean transmission fluid.

   Fit the square section seal inside the piston and lip-type seal on the outside of the piston with the lip facing the bottom. *Fig. 57*

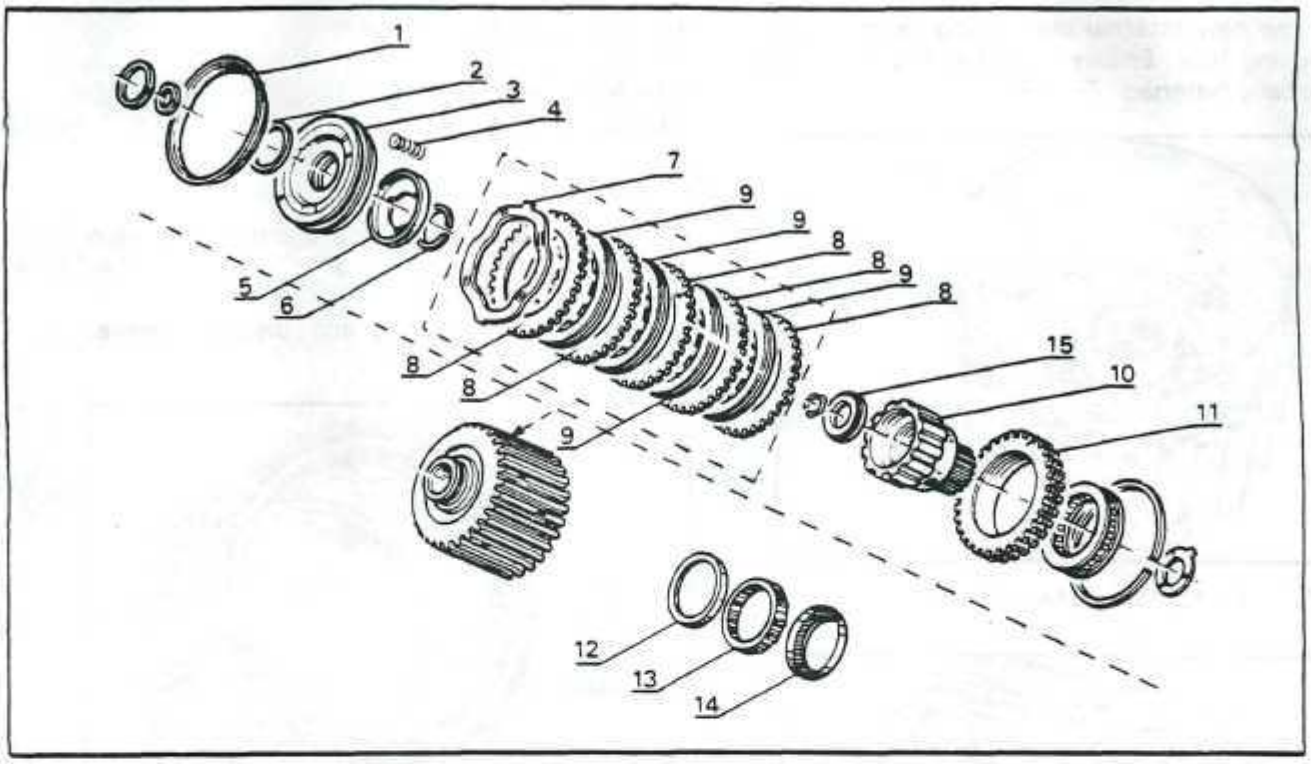


Fig. 55 CLUTCH C-1 DISASSEMBLED

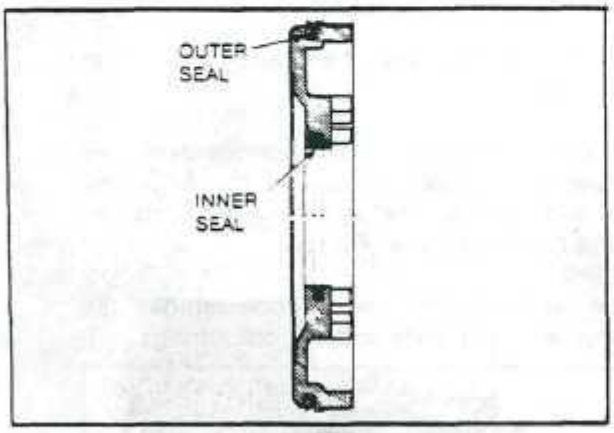


Fig. 57 C-1 PISTON SEALS

2. Check and ensure that the clutch depressurizing ball in the piston is clean and free to move in its seat.

3. Lubricate the inside of the clutch housing with transmission fluid and position a strip of thin plastic sheet in the clutch housing. Insert the piston into the housing and press into position by hand. *Fig. 58*

Remove the plastic sheet and rotate the piston to ensure that it is free and fully seated.

4. Fit the piston return springs, retaining plate, and lock ring on the piston.

5. Compress the retaining plate using the special tool and install the lock ring. Make sure that the three (3) lugs on the retaining plate are holding the lock ring in position when the tool is removed. *Fig. 56*

6. Fit the wave disc on the piston.

7. Lubricate the clutch discs with transmission fluid and alternately install a steel disc, a lined disc, a steel disc and so on (5 steel, 4 lined).

8. Lubricate the needle thrust bearing with transmission fluid and place the bearing on the hub with the needle facing up.

9. Insert the roller clutch assembly into the clutch housing until the lock ring is locked in its groove.

10. Fit the new external sealing ring to the clutch housing hub. Ensure that the ring locks are properly fastened. *Fig. 59*

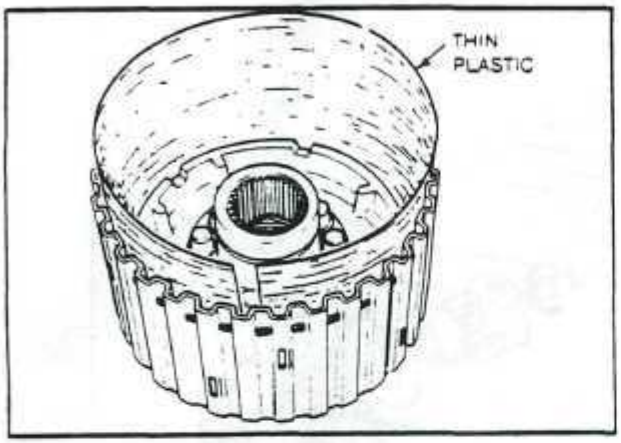


Fig. 58 C-1 PISTON INSTALLATION

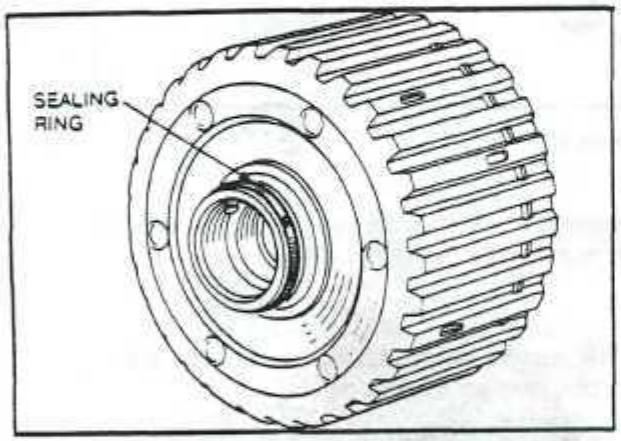


Fig. 59 CLUTCH C-1 HUB SEAL

Notice:
Do not fit the turbine shaft to the clutch C1 as it will have to be removed for transmission re-assembly adjustments.

CLUTCH C-2 — Fig. 60

1 – Piston Seal (Lip-Type/Outer)
2 – Piston
3 – Clutch Housing Hub Seal
4 – *Return Springs*
5 – Spring Retaining Plate
6 – Lock Ring
7 – Wave Disc
8 – Steel Discs (5)
9 – Lined Discs (4)
10 – Distance Sleeve
11 – Lock Ring
12 – Ring Gear
13 – Lock Ring

Disassembly

1. Remove the lock ring and the ring gear from the clutch housing. *Fig. 61*

2. Remove the lock ring and distance sleeve. *Fig. 62*

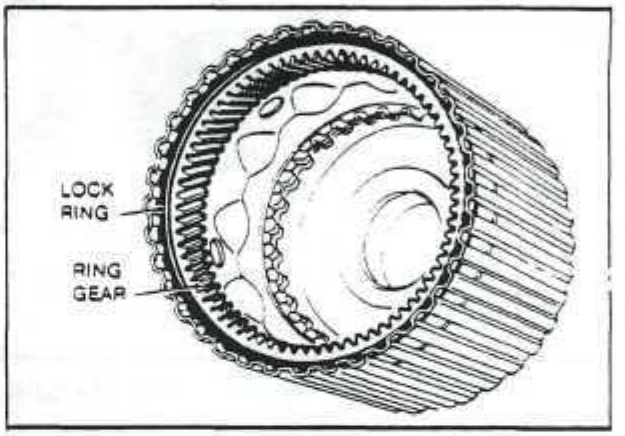


Fig. 61 C-2 RING GEAR

3. Remove the steel and lined clutch discs from the housing.

4. Compress the piston return springs using the special tool J 28867/1 (part of the A/T Tool Kit) and remove the lock ring securing the spring retaining plate. *Fig. 63*

5. After removing the special tool, remove the spring retaining plate and the coil springs.

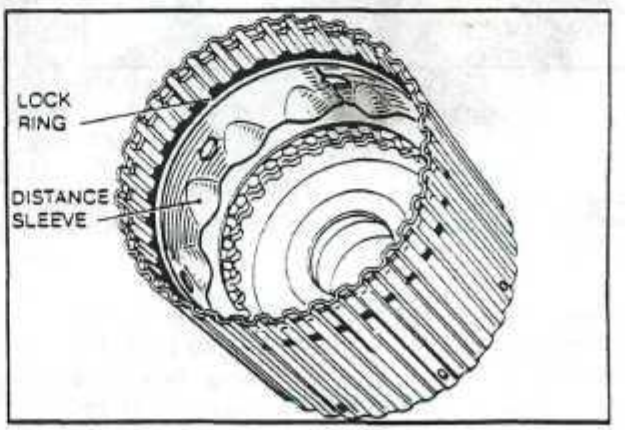


Fig. 62 C-2 DISTANCE SLEEVE

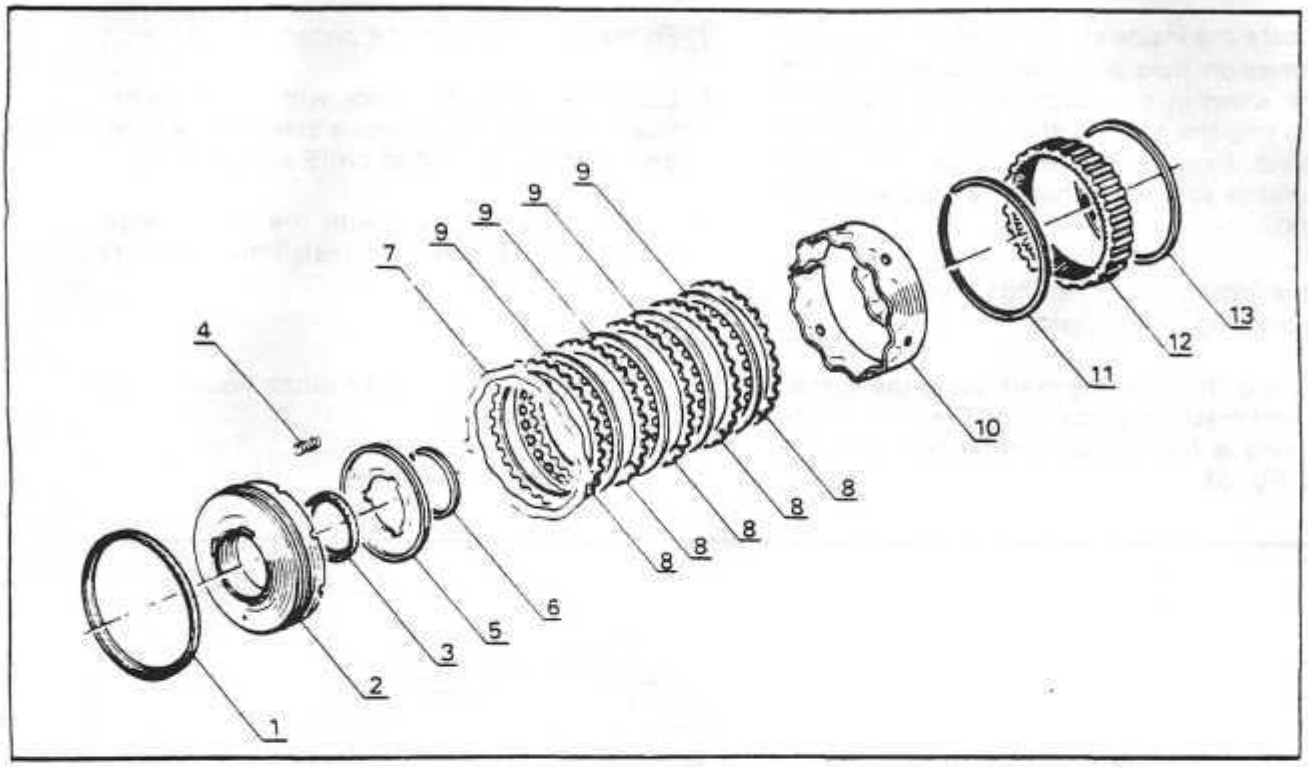


Fig. 60 CLUTCH C-2 DISASSEMBLED

6. Remove the piston from the clutch housing.
7. Remove the seal from the piston. *Fig. 64*
8. Remove the seal from the clutch housing using a hooked tool. *Fig. 65*

Reassembly

Clean and inspect all parts for damage or scoring.

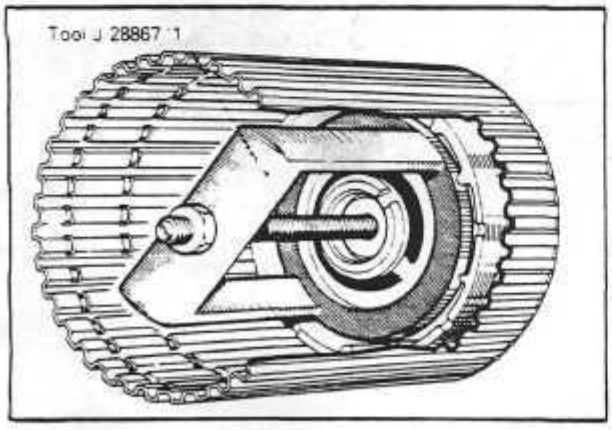


Fig. 63 C-2 PISTON REMOVAL

1. Lubricate the new piston with transmission fluid and fit on the piston with the lip on the seal facing the bottom of the piston. *Fig. 64*
2. Check and ensure that the clutch depressurizing ball in the piston is clean and free to move in its seat.
3. Lubricate the new clutch housing hub seal with transmission fluid and install on the hub with the lip facing the bottom of the housing.

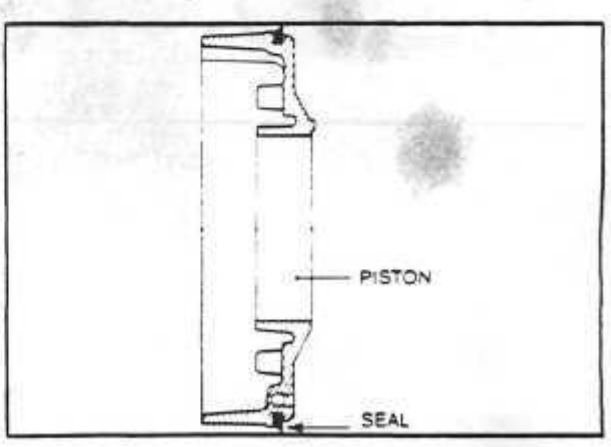


Fig. 64 C-2 PISTON SEAL

4. Lubricate the inside of the clutch housing with transmission fluid and position a strip of thin plastic sheet in the clutch housing. Insert the piston into the housing and press into position by hand. Remove the plastic sheet and rotate the piston to ensure that it is free and fully seated.

5. Fit the piston return springs, retaining plate and lock ring on the piston.

6. Compress the retaining plate using the special tool and install the lock ring. Ensure that the lock ring is fully seated before removing the tool. *Fig. 63*

7. Fit the wave plate on the piston. *Fig. 60*

8. Lubricate the clutch discs with transmission fluid and alternately install a steel disc, a lined disc, a steel disc and so on (5 steel, 4 lined).

9. Fit the distance sleeve with the waved edge against the last steel disc. Install the lock ring.

Notice:

10. Insert the ring gear into the clutch housing and install the lock ring.

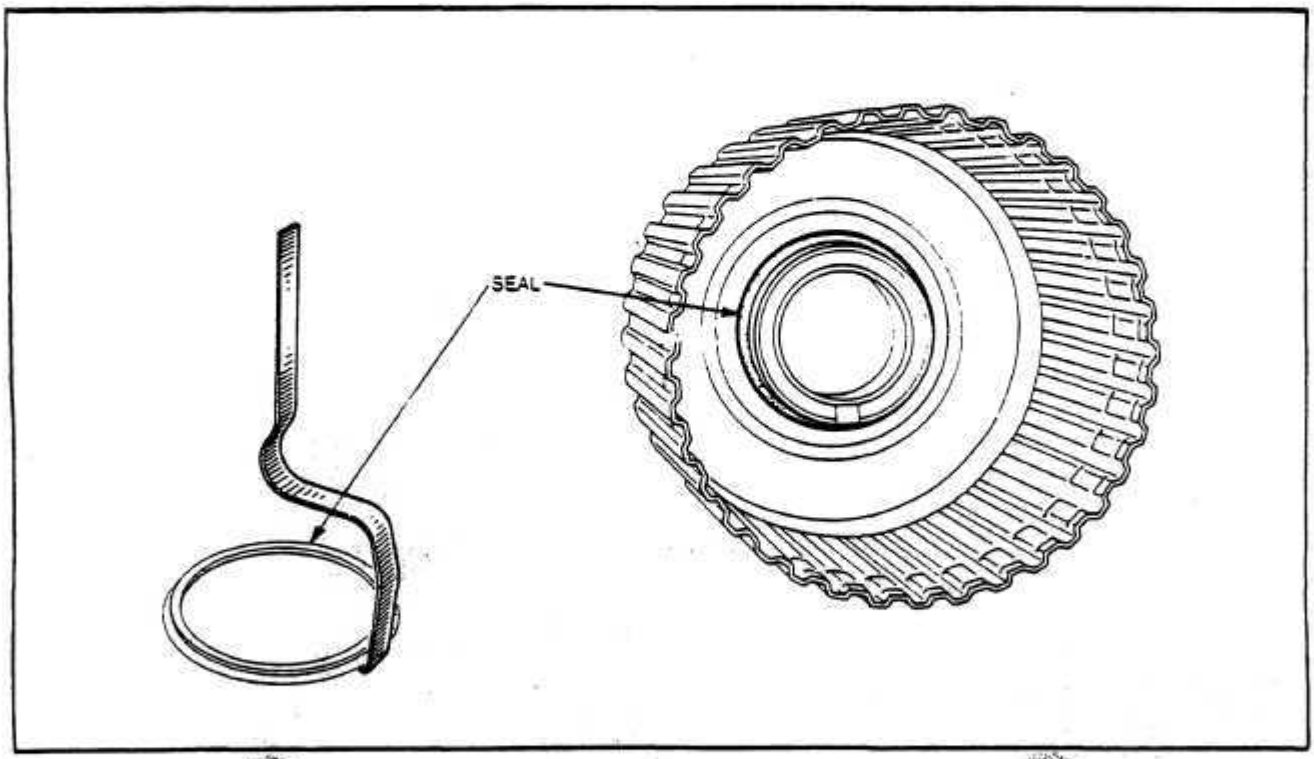


Fig. 65 CLUTCH C-2 HOUSING SEAL

FINAL DRIVE UNIT

FINAL DRIVE DISASSEMBLY

Notice:
Perform the transmission/final drive unit separation procedure before starting with final drive assembly.

1. Remove the governor computer and drive gear from the case.
2. Remove the torque converter housing. *Fig. 66*
3. Remove the bolts securing the planetary gear carrier housing to the case and remove the carrier assembly and gasket. *Fig. 67*
4. Fasten special Tool J28868 to the final drive case to lock the pinion gear in place. Loosen the pinion gear nut. *Fig. 68*

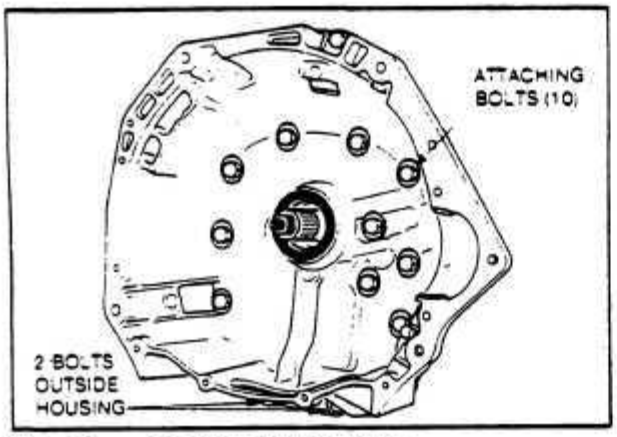


Fig. 66 **CONVERTER HOUSING**

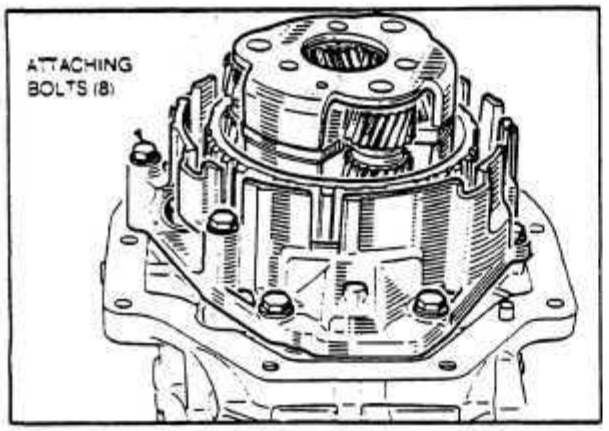


Fig. 67 **PLANETARY GEAR HOUSING**

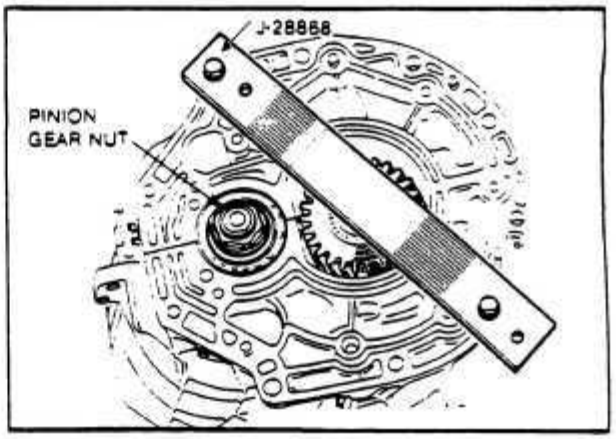


Fig. 68 **PINION GEAR NUT REMOVAL**

5. Remove the half-casing assembly bolts. With the final drive positioned as shown, remove the upper half-case. *Fig. 69*

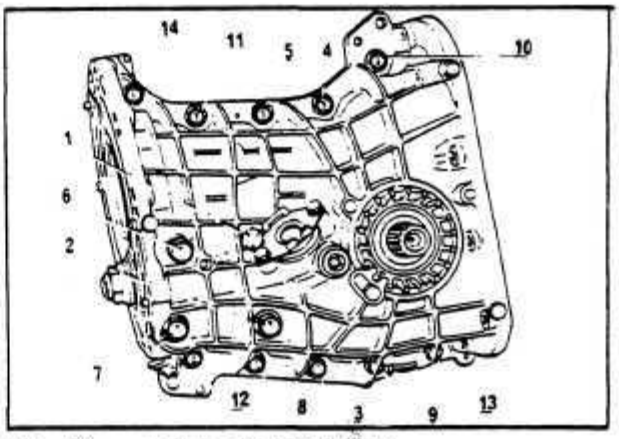


Fig. 69 **HALF CASING BOLTS**

Notice:
Do not use metal tools to pry apart the case.

6. Remove the pinion gear assembly, converter shaft tube and seal, planetary shaft bearing and preload adjustment shims, and the differential carrier assembly. *Fig. 70*

Notice:
If repair of the individual components is required, refer to the Final Drive COMPONENT REPAIR section for further dismantling procedures.

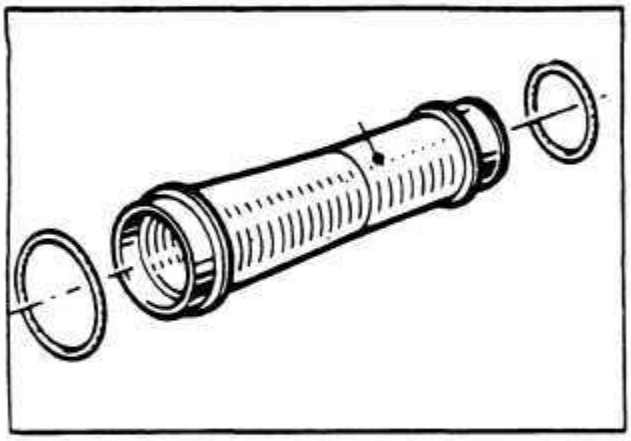


Fig. 70 CONVERTER SHAFT TUBE

FINAL DRIVE COMPONENT REPAIR

Planetary Gear Carrier — Fig. 71

1 – Nut
2 – Shim Set (Planetary Carrier Height)
3 – Roller Bearing
4 – Output Gear
5 – Lip Seal
6 – Spacer Sleeve
7 – Roller Bearing
8 – Shim Set (Bearing Pre-Load)
9 – Housing
10 – Spacer
11 – Needle Bearing
11 – Park Socket
12 – Needle Bearing
13 – Washer
14 – Brake Hub
15 – Planetary Gear Set
16 – Thrust Washer

Disassembly

1. Remove the carrier shaft locknut.
2. Remove the roller bearing and output gear using a suitable puller. *Fig. 71*
3. Remove the spacer sleeve No. 6 from the carrier shaft and separate the planetary carrier from the housing. *Fig. 71*
4. Remove the spacer No. 10 and park sprocket No. 11 from the carrier shaft. *Fig. 71*
5. Remove the needle bearing No. 12 and washer No. 13 from the carrier shaft. *Fig. 71*
6. Remove the brake hub No. 14 and thrust washer No. 16 from the carrier shaft. *Fig. 71*
7. Remove the seal No. 5 and roller bearing No. 7 from the housing. *Fig. 71*

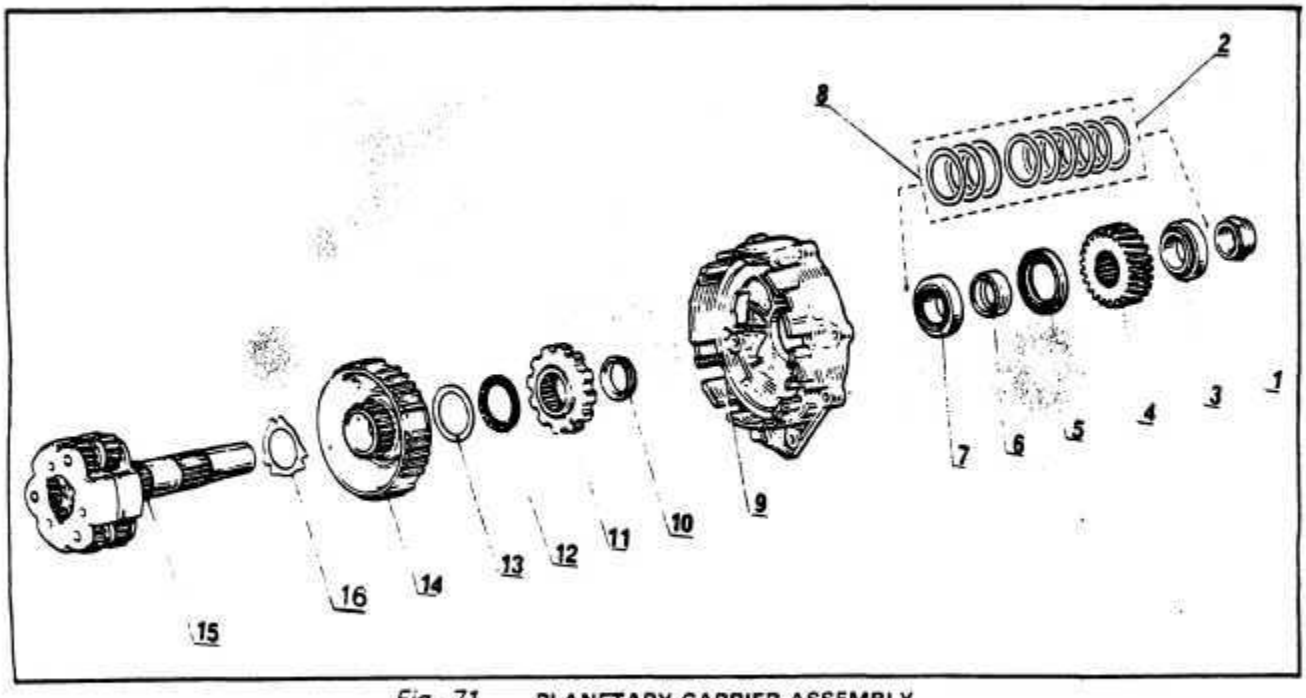


Fig. 71 PLANETARY CARRIER ASSEMBLY

8. Remove the outer bearing race and planetary carrier shims from the housing using a brass drift. Retain the shims for reassembly. *Fig. 72*

9. Remove the parking pawl by releasing the retracting spring and remove the pivot pin.

Reassembly

1. Lubricate the thrust washer No. 16 with automatic transmission fluid and install on the carrier shaft. *Fig. 71*

2. Install the brake Hub No. 14 on the carrier shaft. *Fig. 71*

3. Lubricate the needle bearing with automatic transmission fluid and install the washer and needle bearing on the carrier shaft.

Notice:
Place the needle bearing on top of the washer with the needles facing the washer.

4. Install the park sprocket on the carrier shaft with its diameter flange facing the bearing.

5. Install the spacer No. 10 on the carrier shaft with its larger diameter facing the park sprocket. *Fig. 71*

6. Fit the parking pawl in the housing and install the pivot pin. Attach the retracting spring to the pawl.

7. Fit the bearing race planetary carrier clearance shims (removed during disassembly) and the bearing outer race in the housing. Ensure that the race is fully seated. *Fig. 72*

8. Install the planetary gear carrier in the housing.

Notice:

Do not install the lip seal in the housing at this time.

9. Install the roller bearing and spacer sleeve on the carrier shaft.

10. Install the output gear on the carrier shaft WITH THE GROOVE IN THE GEAR FACING UPWARD.

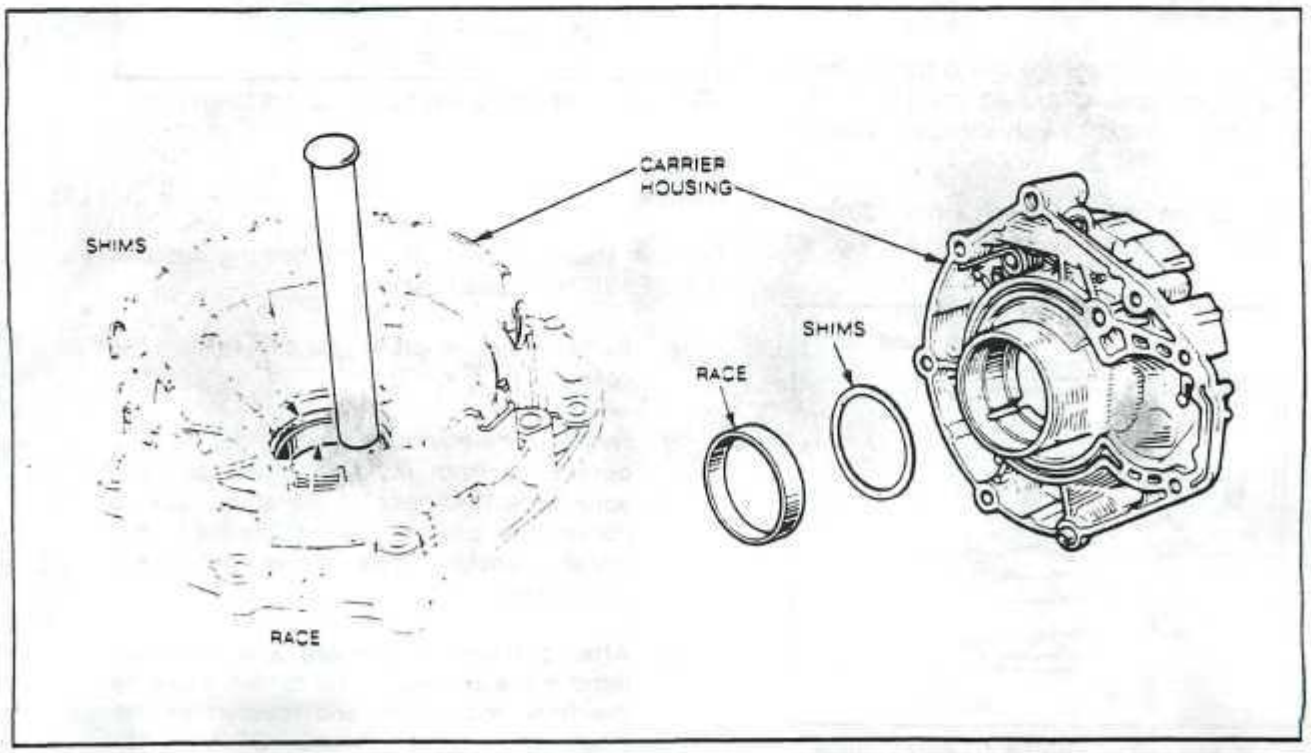


Fig. 72 PLANETARY CARRIER CLEARANCE SHIMS

11. Install the roller bearing and new lock nut on the carrier shaft. Torque tighten the nut but do not lock (peen) the nut to the shaft (see torque specifications).

12. Perform the planetary gear carrier height adjustment as follows:

    a. Reassemble the final drive half-cases leaving the differential ring and pinion assembly out of the case. Torque tighten case bolts (see torque specifications).

    b. Fit the pre-load shims in the case and install the carrier bearing race using a brass drift.

    c. Lubricate both planetary carrier bearings with gear oil and install the carrier assembly in the final drive case using a new gasket. Torque tighten the bolts (see torque specifications).

    d. Clean the contact face of the final drive case and ensure that the thrust washer has been removed from the top of the planetary carrier shaft.

    e. Position the special measuring tool J 28867/3 (part of the A/T Tool Kit) on the final drive case.

Use a depth gauge to measure the distance from the top face of the special tool to the top of the planetary carrier shaft (with thrust washer removed). *Fig. 73*

    f. Subtract the measurement from 120 mm (4.724 in.) to obtain dimension "A". *Fig. 73*

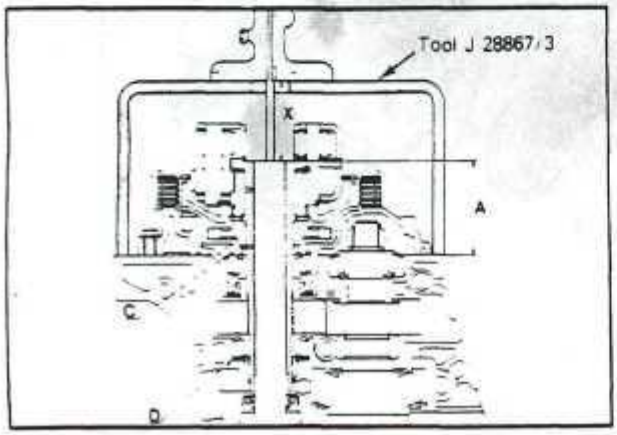


Fig. 73 PLANETARY CARRIER TO FINAL DRIVE CASE MEASUREMENT

13. Perform the planetary gear carrier bearing pre-load adjustment as follows:

    a. Install the planetary carrier and gasket in the final drive case. Torque tighten the bolts (see torque specifications).

    b. Wrap a piece of string around the planetary gear carrier and pull with a spring scale to measure the bearing pre-load. *Fig. 74*

Take the measurement while the carrier is rotating. The bearing pre-load should be:

New Bearings: 5 – 12 Nm (1 – 3 lb. ft.).
Used Bearings: Turn free without play.

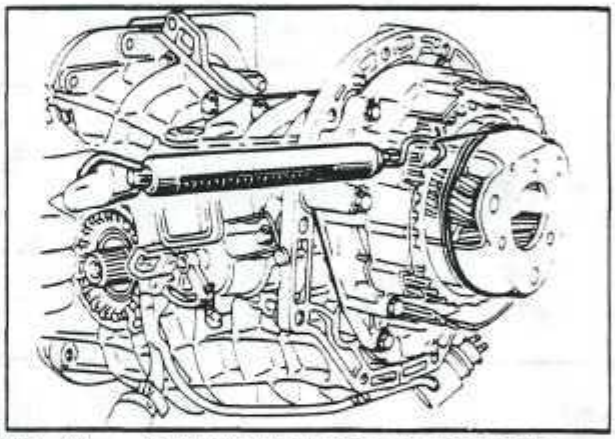


Fig. 74 BEARING PRE-LOAD ADJUSTMENT

Notice:

Perform steps "c" and "d" if the bearing pre-load is NOT WITHIN specification:

    c. Remove the planetary gear carrier from the case.

    d. Remove the planetary gear carrier bearing outer race from the final drive case and adjust the thickness of the shim pack to obtain the proper bearing pre-load. Re-install planetary gear carrier and check adjustment.

    e. After pre-load is checked and adjusted, remove the planetary gear carrier, separate the final drive case, and reassemble the final drive (see FINAL DRIVE RE-ASSEMBLY section for procedures).

Notice:
If the differential adjusting nuts were not moved and the pinion gear assembly was not disassembled, the differential adjustments will not have to be performed during final drive reassembly.

Example:

120.00 mm	Set Value
– 46.48 mm	Distance Measurement X
73.52 mm	Dimension A

f. The final dimension should be as near as possible to 73.6 mm (2.898 in.). If it is not close to 73.6 mm, the thickness of the shim pack under the bearing race C *Fig. 73* in the planetary housing will have to be increased or decreased.

g. Remove and disassemble the planetary gear carrier assembly.

h. Remove the bearing race from the planetary gear carrier housing and adjust the shim pack to obtain the proper final dimension measurement.

i. Install the bearing race using a brass drift. Fit the roller bearing in the race and install the new lip-seal.

j. Reassemble the planetary gear carrier and torque tighten the lock nut. Lock (peen) the nut to the shaft (see torque specifications).

DIFFERENTIAL PINION GEAR — Fig. 75

1 – Roller Bearing (Inner)
2 – Governor Drive Gear
3 – Secondary Gear
4 – Spacer
5 – Roller Bearing (Outer)
6 – Nut

Disassembly

1. Remove the nut, roller bearing, and spacer from the pinion gear.
2. Remove the secondary gear and governor drive gear.
3. Remove the inner pinion bearing from the shaft using a hydraulic press.

Reassembly

Notice:
The ring and pinion gears are not serviced separately. If one part is damaged, they must be replaced as a set.

1. Press the inner pinion bearing onto the pinion gear shaft.
2. Install the governor drive gear.
3. Install the secondary gear with the flat face of the gear towards the head of the pinion gear.
4. Install the spacer with the larger diameter end facing the secondary gear.
5. Install the outer pinion bearing and nut.

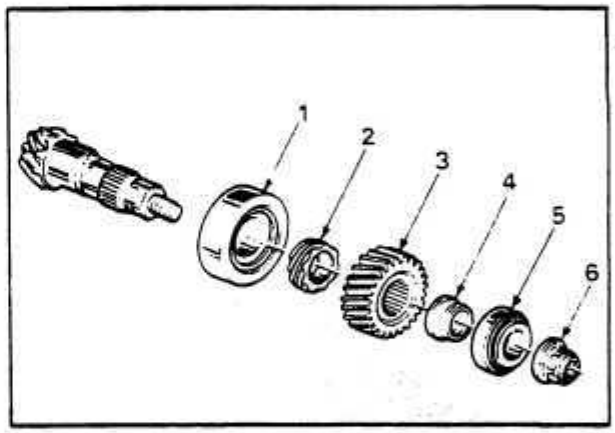


Fig. 75 FINAL DRIVE PINION ASSEMBLY

Notice:
Do not tighten the nut at this time.

Notice:
Pinion gear adjustments will be performed in the Final Drive REASSEMBLY section.

DIFFERENTIAL CARRIER — Fig. 76

1 – Carrier
2 – Carrier Bearing
3 – "O" Ring Seal
4 – Concave Washer
5 – Spider Gear
6 – Shaft
7 – Pin

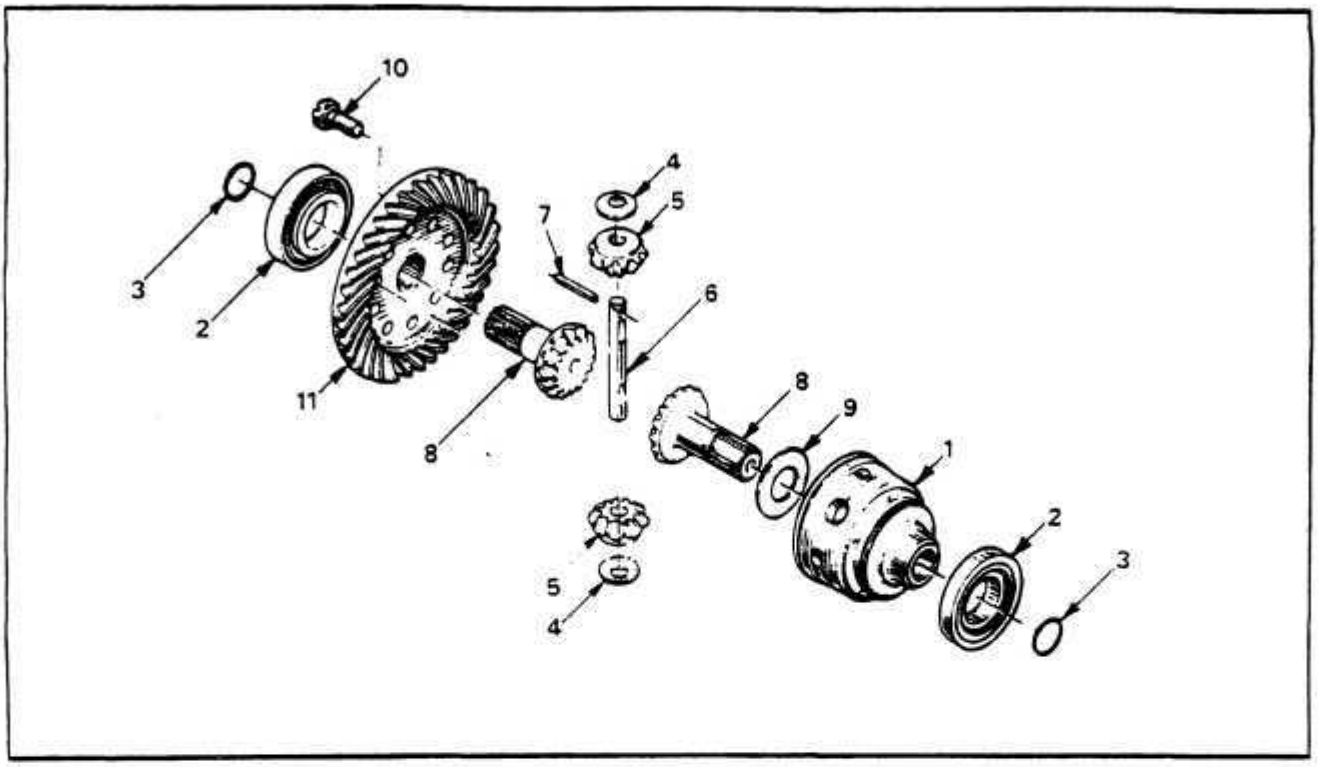


Fig. 76 FINAL DRIVE ASSEMBLY EXPLODED

8 – Side Gear
9 – Thrust Washer
10 – Bolt
11 – Ring Gear

Disassembly

1. Remove both "O" ring seals from the side gear shifts.
2. Remove the carrier bearing on the ring gear side using a suitable puller. *Fig. 77*

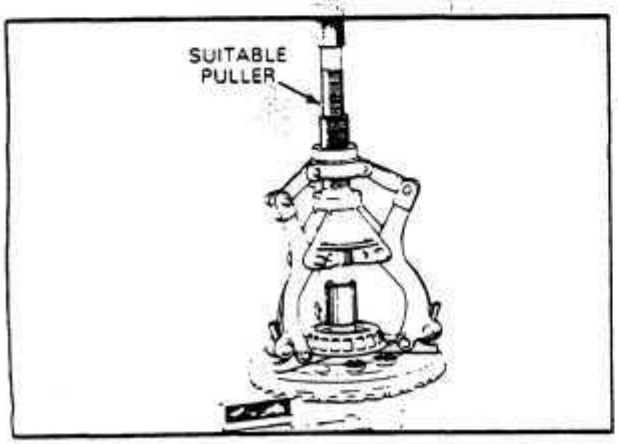


Fig. 77 CARRIER BEARING

Notice:
Remove some of the ring gear bolts if necessary to install the puller.

3. Remove the ring gear and side gear from the carrier.
4. Remove the lock pin from the spider gear shaft.
5. Remove the spider gear shaft, both spider gears, and both concave washers.
6. Remove the side gear and thrust washer from the carrier.
7. Remove the carrier bearing using a press.
8. Remove the lock plates securing the differential adjusting nuts to the final drive half-cases. Remove the adjusting nuts using Tool J28866. *Fig. 78*
9. Remove the "O" ring seals and lip seals from the adjusting nuts.
10. Remove the outer bearing races from both half-cases using a brass drift.

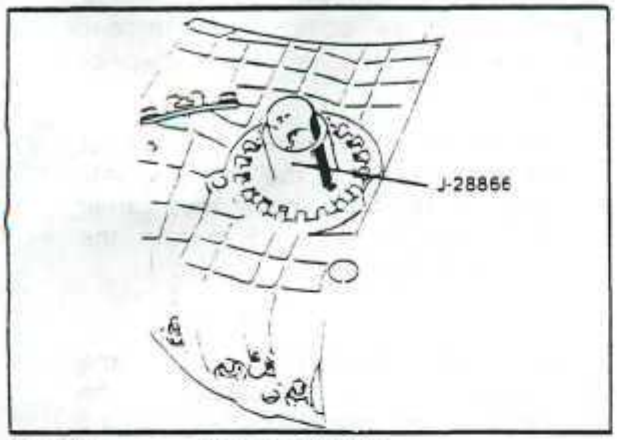


Fig. 78 SIDE GEAR TOOL

Reassembly

Clean and inspect all parts for damage or scoring.

1. Lubricate the thrust washer with gear oil and place on the side gear with the lubricating groove in the washer facing the gear.
2. Install the side gear with the thrust washer in the carrier.
3. Lubricate the concave washers and place the washers and spider gears in the carrier.
4. Lubricate the spider gear shaft and insert in the carrier aligning the pin hole in the shaft with the hole in the carrier.
5. Insert the spider gear shaft lock pin in the carrier hole to secure the shaft.
6. Lubricate the side gear and position the gear in the carrier.
7. Install the ring gear using new bolts and torque tighten the bolts (see torque specifications).
8. Install both carrier bearings using a press.
9. Fit the "O" ring seals on both side gear shafts.
10. Install the carrier bearing races in the half-cases. Drive the race into the case until it is slightly recessed.
11. Install new "O" ring seals and lip seals on the differential adjusting nuts.
12. Lubricate the seals and screw the adjusting nuts into the half-cases until they contact the bearing races.

Notice:
Carrier adjustments will be performed in the FINAL DRIVE REASSEMBLY section.

FINAL DRIVE REASSEMBLY

Notice:
If the planetary gear carrier was disassembled for repair, ensure that the bearing pre-load and carrier height adjustments are performed before re-assembly of the final drive. See FINAL DRIVE COMPONENT REPAIR section for adjustment procedures.

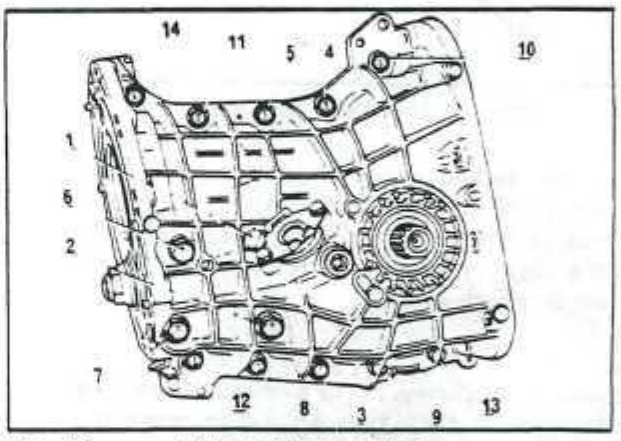


Fig. 79 HALF-CASING BOLTS

1. Adjust the pinion bearing pre-load as follows:
   a. Clean the final drive half-cases and their mating surfaces. Lubricate the pinion bearings with gear oil and fit the pinion gear assembly in the half-case.
   b. Assemble the half-cases and torque tighten the case bolts in the sequence shown. *Fig. 79*
   c. Lock the pinion gear with Tool J28868 and torque the pinion nut (see torque specifications). DO NOT lock (peen) the nut at this stage.
   d. Remove the pinion lock tool and attach the measuring tool (part of the A. T Tool Kit) to the pinion nut. *Fig. 80*

Wrap a piece of string around the tool J 28867/5 and measure the pre-load by pulling the string with a spring scale. Take the reading while the pinion gear is rotating.

New Bearings: 20 – 35 Nm (4.5 – 7 lb./ft.)
Used Bearings: Turn freely without play.

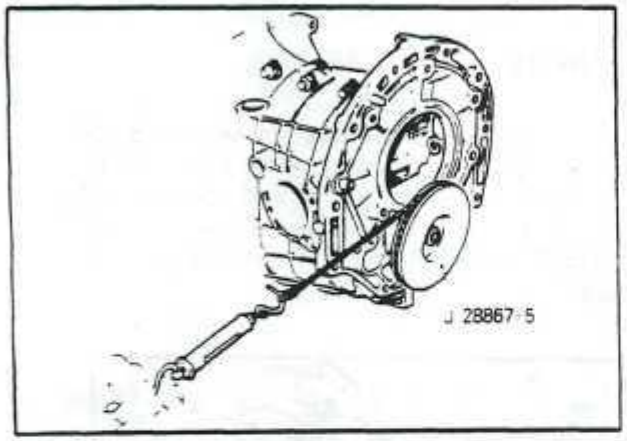


Fig. 80 **PINION BEARING PRE-LOAD**

e. If the reading is not within specifications, adjust the pre-load by loosening the pinion nut, remove the pinion gear assembly from the case, and change the thickness of the adjusting sleeve. *Fig. 75*

Notice:
Decreasing the thickness of the sleeve between the secondary gear and the bearing will increase the pre-load.

f. Repeat the adjustment operation until the proper reading is obtained.

g. Loosen the pinion nut and remove the pinion gear assembly from the half-cases.

2. Adjust the differential carrier bearing pre-load as follows:

a. Remove the lock plates securing the differential adjusting nuts on both of the half-casings.

b. Unscrew both of the differential carrier adjusting nuts one complete turn.

c. Lubricate the differential carrier bearings with gear oil and fit the differential carrier assembly in the half-cases.

d. Assemble the half-casings and torque tighten the case bolts in the proper sequence *Fig. 79* (see torque specifications).

e. Tighten the differential carrier adjusting nut on the opposite side of the ring gear until all play is removed from the carrier bearings. Use Tool J28866 to turn the adjusting nut. *Fig. 78*

Notice:
This procedure is necessary to offset the differential carrier in the half-cases. If the differential carrier is not offset properly, a binding condition will occur between the ring gear and the pinion gear when the final drive is completely reassembled.

f. Wrap a piece of string around the differential carrier housing and measure the pre-load by pulling on the string with a spring scale. Take the reading while the carrier is rotating. *Fig. 81*

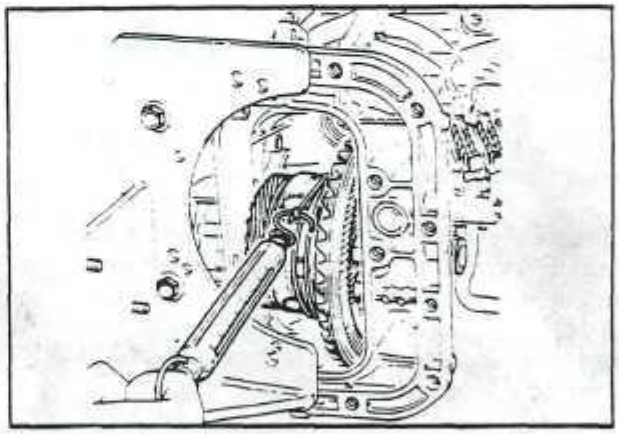


Fig. 81 **DIFFERENTIAL CARRIER PRE-LOAD**

New Bearings: 10 – 30 Nm (2.5 – 6.5 lb./ft.)
Used Bearings: Free turning without play.

g. Tighten either of the differential carrier adjusting nuts until the proper reading is obtained.

h. Mark the position of both adjusting nuts in relation to the half-casings after the final setting has been obtained.

i. Remove the case bolts and separate the half-cases.

3. Fit the pinion gear assembly in the half-case along with the differential carrier assembly.

Notice:
The carrier must be installed first and then the pinion gear is placed in the case.

4. Apply specified sealing compound to the half-case mating surfaces and assemble the cases. Torque tighten the case bolts in the proper sequence. *Fig. 79*

Notice:
Apply specified sealing compound on the 10 mm diameter case bolts.

5. Install Tool J28868 and torque tighten the pinion shaft nut (see torque specifications).

Lock the nut to the shaft by peening the end of the nut. Remove the pinion gear locking tool.

6. Fit the planetary gear carrier adjustment shims in the final drive case.

Notice:
Use the same shims that were removed if the planetary gear carrier was not disassembled for repair. If the carrier was repaired, use the shims that were specified in the adjustment procedure in the COMPONENT REPAIR section.

Install the bearing race using a brass drift. Ensure that the race is fully seated in the case.

7. Fit a new gasket and install the planetary gear carrier assembly in the case. Torque tighten the mounting bolts (see torque specifications).

8. Perform the ring/pinion gear backlash adjustment as follows:

   Notice:
   When performing the following adjustment, the differential adjusting nuts must be adjusted equally to maintain the proper carrier bearing pre-load.

   a. Remove excessive backlash between the ring and pinion gears by loosening the adjusting nut on the carrier bearing opposite the ring gear, and tighten the other adjusting nut an equal amount. Use Tool J28866 to turn the adjusting nuts.

   b. Attach a dial indicator to the final drive case and set the indicator tip on the outer edge of a ring gear tooth. *Fig. 82*

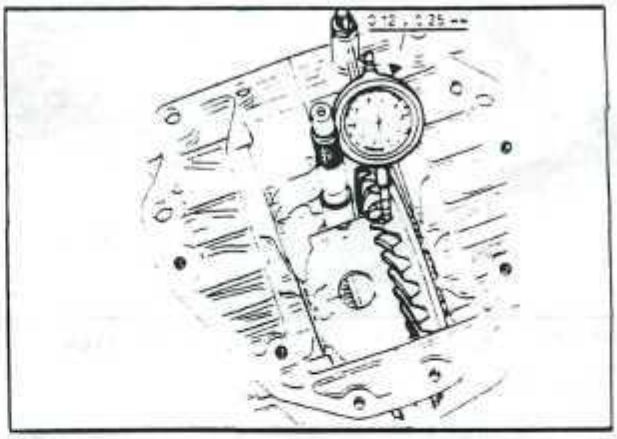


Fig. 82 **RING GEAR BACKLASH**

   c. Zero dial indicator and check backlash. Clearance between the ring and pinion gear should be 0.12 – 0.25 mm (.005 – .010 in.).

   d. Turn the differential adjusting nuts an equal amount until the backlash is within specifications. Install the adjusting nut locktabs.

9. Install the new planetary shaft lip seal in the final drive case using the special tool J 28867 4 (part of the A/T Tool Kit). *Fig. 83*

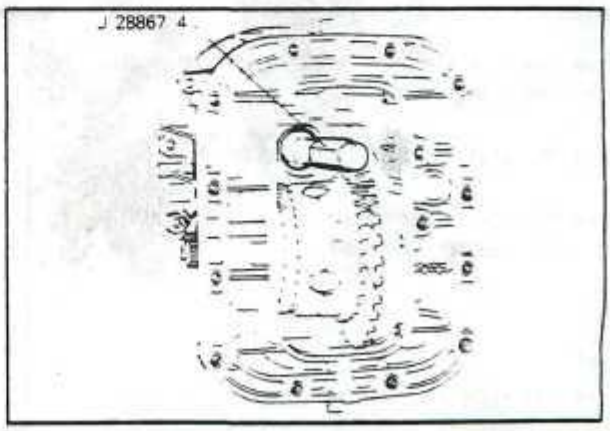


Fig. 83 **PLANETARY SHAFT SEAL**

Notice:
Fit the seal in the case with the lip facing the differential area.

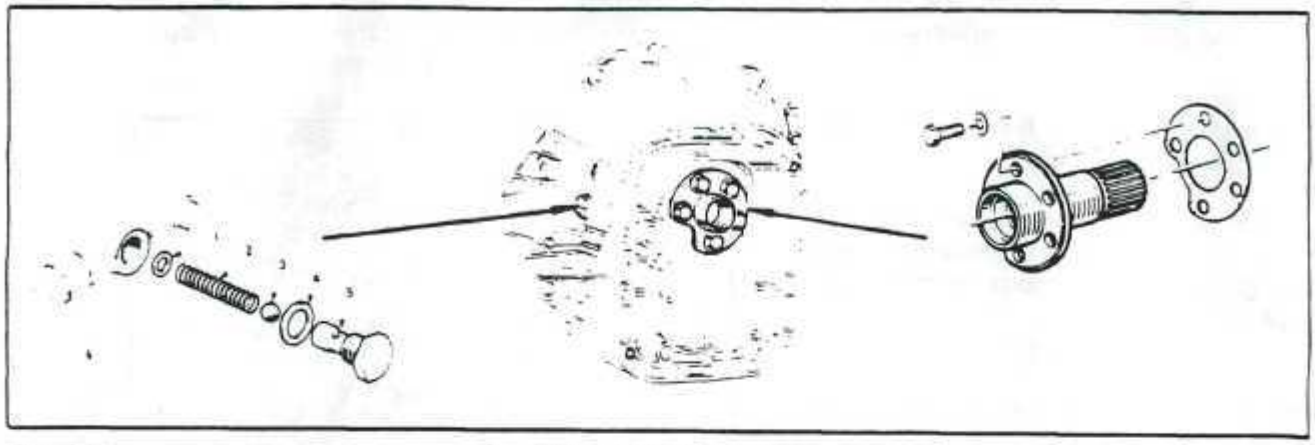


Fig. 84 CONVERTER HOUSING

10. Fit new "O" ring seals on each end of the converter shaft tube and install the tube in the final drive case.

11. Install the converter housing on the final drive case using a new gasket. Torque tighten the housing bolts (see torque specifications).

12. Fit a new "O" ring seal on the governor-computer and install the governor and drive gear in the case.

CONVERTER HOUSING

Disassembly

1. Remove the torque converter seal from the converter housing.

2. Remove the stator shaft and gasket. *Fig. 84*

3. Remove the converter return safety valve, ball, spring, and washer. *Fig. 84*

Notice:

If the check ball rolls into the fluid passage, it can be recovered by removing the fluid cooler line fitting.

Reassembly

1. Fit a new seal on the return safety valve.

2. Fit the washer and spring into the converter housing.

3. Position the check ball on the spring and install the valve in the housing.

4. Install the new torque converter seal in the housing using Tool J28864. *Fig. 85*

5. Install the stator shaft and gasket on the converter housing. Torque tighten the bolts (see torque specifications).

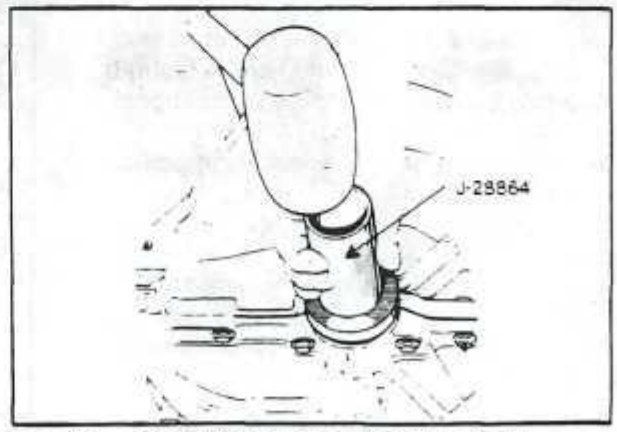


Fig. 85 CONVERTER SEAL INSTALLATION

Steering

CONTENTS

GENERAL DESCRIPTION H:01:01

SPECIFICATIONS H:02:01

STEERING WHEELPAD H:02:01

COLUMN TRIM CANOPY H:02:01

STEERING COLUMN H:03:01

STEERING COLUMN IGNITION LOCK ASSEMBLY H:04:01

STEERING COLUMN UNIVERSAL JOINT . . . H:05:01

RACK AND PINION ASSEMBLY H:06:01

RACK AND PINION TIE ROD BOOTS . . . H:07:01

TIE ROD ENDS H:08:01

Steering

H:01:01

GENERAL DESCRIPTION

The steering system consists of a collapsible steering column assembly, an intermediate shaft assembly and a rack and pinion type steering unit.

The steering column assembly is supported in the driving compartment with an adjustable (up and down) bracket. Each end of the steering column shaft is splined. The upper splined end is designed to accept the steering wheel. The lower splined end of the steering column shaft fits through an opening in the driver's foot well and is sealed with a gasket and plate.

The lower end of the steering column shaft is secured to the upper universal joint of the intermediate shaft. The lower universal joint of the intermediate shaft is secured to the splined stub shaft of the steering gear.

The steering gear unit consists of a rack and pinion assembly, tie rod assemblies and the rod ends. Each end of the rack and pinion assembly is protected from the elements with a flexible rubber boot which is secured with two (2) clamps. The adjustable tie rod ends, for adjusting toe-in specifications, are fastened to the steering knuckles. *Fig. 1*

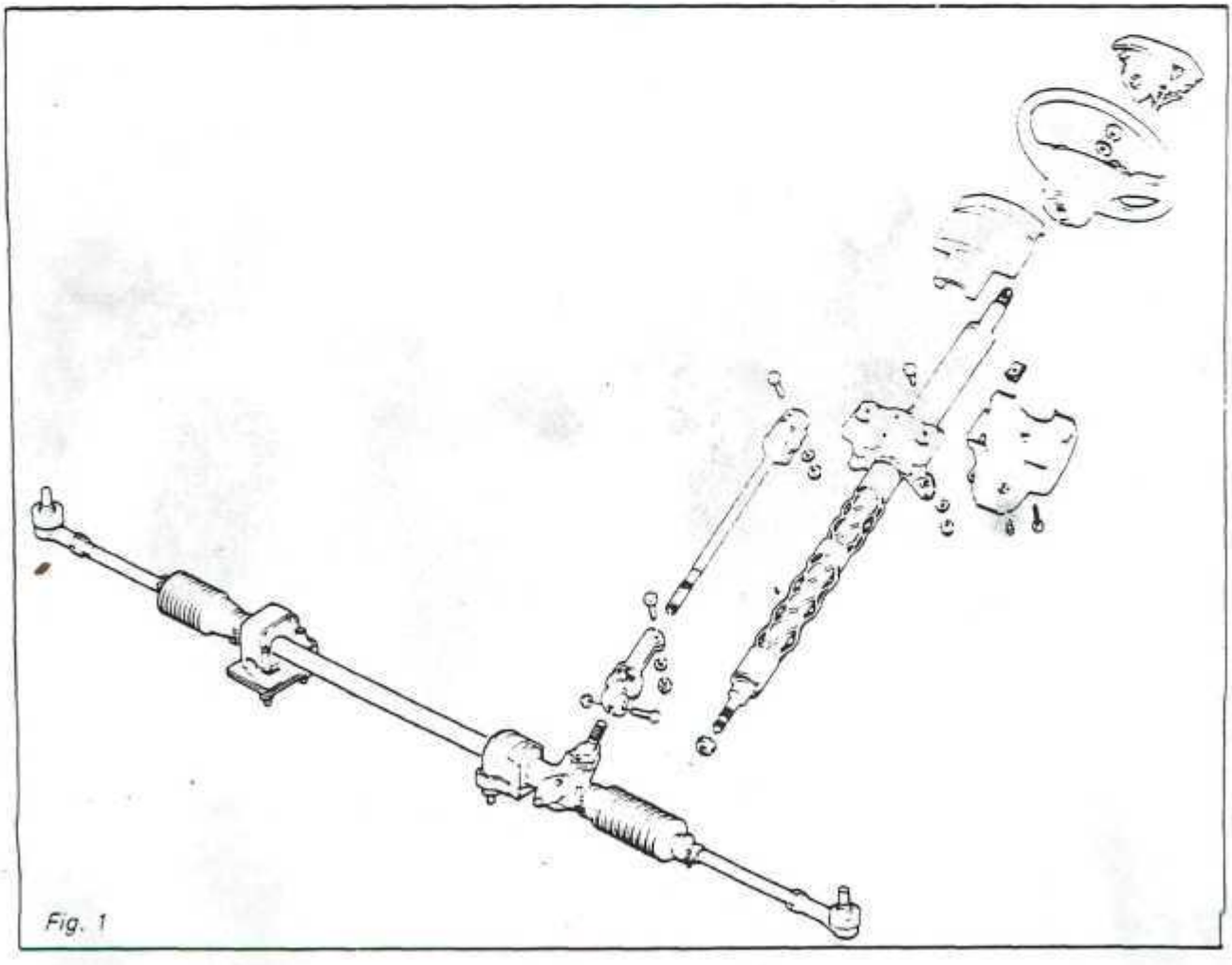


Fig. 1

TORQUE SPECIFICATIONS

Location	Wrench Size	Thread Size	NM Torque	Ft/lb Torque
Lower column to universal joint to rack pinion and intermediate column.	11 & 13 mm		20	14.60
Steering rack assembly to chassis from impact extension.	13 mm	8	25	18.25
Tie rod end lock nut.	14 mm	$\frac{7}{16}$	36	26.28
Tie rod end to steering knuckle.				

STEERING WHEELPAD

REMOVAL

1. Pull out steering wheel centre trim pad. Pad is retained by four (4) mounting pins moulded on backside of pad.
2. Remove centre steering wheel mounting nut.
3. Using steering wheel puller tool, remove steering wheel from column.

INSTALLATION

1. Position the front wheels in the straight ahead position.
2. Position steering wheel in a centre position onto the steering column making sure that the steering wheel tabs on the hub of steering wheel mounting face engage the turn signal switch rotor. Install steering wheel retaining nut and torque to specification.
3. Reinstall steering wheel trim cover.

COLUMN TRIM CANOPY

REMOVAL

1. Lower steering column to its lowest adjustable position.
2. Working under the column, remove three (3) screws securing lower trim canopy to upper trim canopy—
3. Separate upper and lower trim canopy and remove from car.

INSTALLATION

To complete installation, reverse the removal procedure.

STEERING COLUMN

REMOVAL

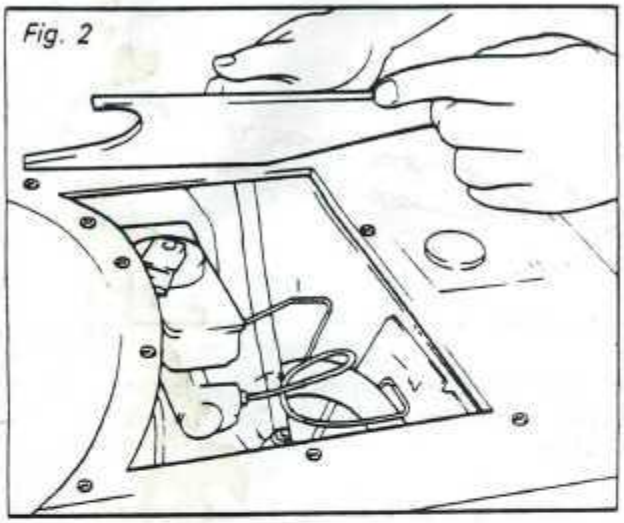


Fig. 2

1. Open luggage compartment cover. Remove carpeting, and remove brake master cylinder access cover from luggage compartment floor. Remove access cover at fuel filler neck inside luggage compartment. *Fig. 2*

2. Remove pinch bolt securing upper universal joint to steering column assembly. *Fig. 3*

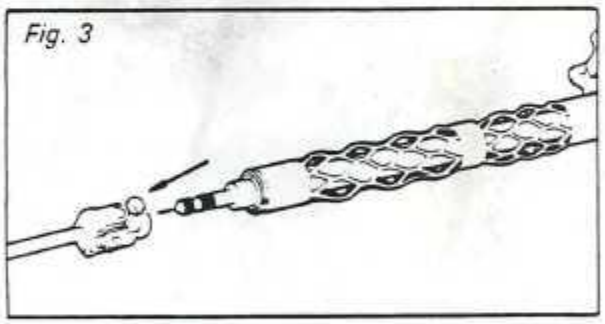


Fig. 3

3. Loosen pinch bolt clamping lower universal joint to steering column intermediate shaft. Slide steering column intermediate shaft into lower universal joint and off the steering column assembly.

4. Disconnect wiring harnesses from steering column switches and position out of the way.

5. Remove driver's knee pads from both sides of the steering column by removing the four (4) nuts securing each knee pad.

6. Remove instrument cluster support bracket from cluster.

7. Remove two (2) bolts securing steering column assembly to pedal box.

8. Remove steering column assembly.

9. Working on bench, remove steering wheel trim pad and steering wheel assembly.

10. Loosen multifunction switch assembly retaining band screw located on the underside of column and slide switch assembly off column.

11. Remove both shear bolts securing ignition lock assembly to column (by drilling and then using pin punch to turn bolts). Transfer lock assembly to replacement column. *Fig. 4*

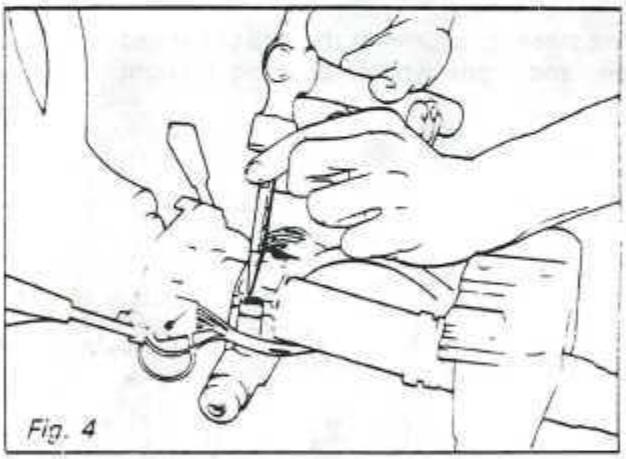


Fig. 4

INSTALLATION

1. Inspect the condition of the rubber bush in the pedal box. Replace if necessary.

2. Guide steering column assembly through passenger compartment opening.

3. Position and secure steering column support to pedal box and secure to instrument cluster support bracket. Torque fasteners to specifications.

4. Reinstall screws securing instrument cluster support bracket to cluster.

5. Position and secure ignition lock assembly to column with shear bolts.

   Note:
   Shear bolts are designed to allow bolt heads to break off when torque has been achieved.

6. Position and secure multifunction switch to steering column.

   Note:
   The "nub" on the turn signal cancelling cam must be pointing towards the turn signal lever in order to operate properly.

7. Connect steering column electrical harnesses.

8. Position and secure both driver's instrument column knee pads.

9. Position and secure steering wheel to steering column and torque to specification. Install steering wheel trim pad.

10. With the steering column in the straight ahead position, and front wheels pointing straight ahead, slide the upper universal joint onto the steering column assembly and secure the pinch bolt. Torque to specification. *Fig. 5*

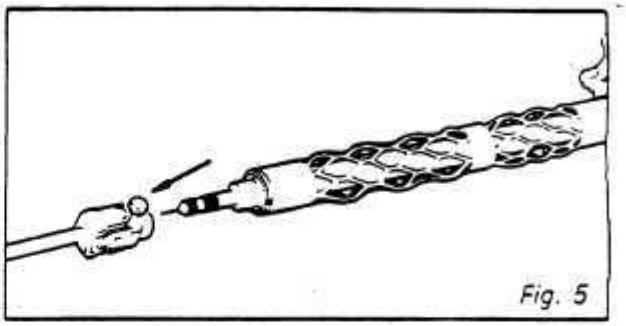


Fig. 5

11. Tighten pinch bolt securing intermediate shaft to lower universal joint. Torque to specification.

12. Position and secure both access covers in the luggage compartment. Reposition carpeting. Close luggage compartment hood.

13. Check operation of all column mounted switches.

STEERING COLUMN IGNITION LOCK ASSEMBLY

REMOVAL

1. Remove driver's knee pads from both sides of the steering column by removing four (4) nuts securing each knee pad.

2. Remove instrument cluster support bracket from cluster.

3. Remove two (2) bolts securing steering column support to pedal box assembly. Lower steering column assembly onto seat. *Fig. 6*

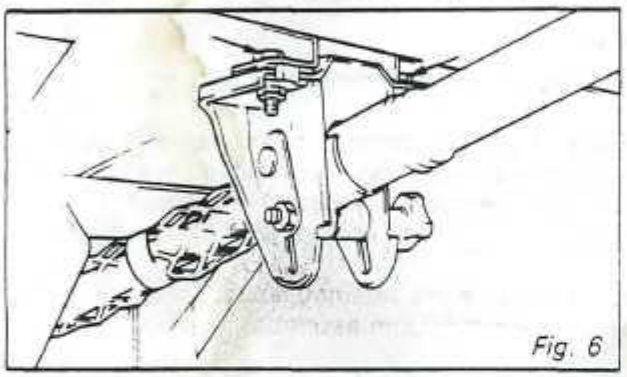


Fig. 6

4. Remove three (3) screws securing column's trim collar to upper trim collar. Separate upper and lower trim collars and remove from car.

5. Remove set screw securing ignition switch to ignition lock assembly and remove ignition switch from lock assembly.

6. Using a pin punch remove both shear bolts securing ignition lock assembly and remove ignition lock assembly.

INSTALLATION

To complete installation, reverse removal procedures and torque fasteners to specification.

Note:

The shear bolts supplied with the service replacement ignition lock assembly are designed to allow bolt heads to break off when torque has been achieved.

STEERING COLUMN UNIVERSAL JOINT

REMOVAL – Fig. 7

1. Raise luggage compartment cover.
2. Remove luggage compartment carpeting. Remove brake master cylinder reservoir access cover from luggage compartment floor.

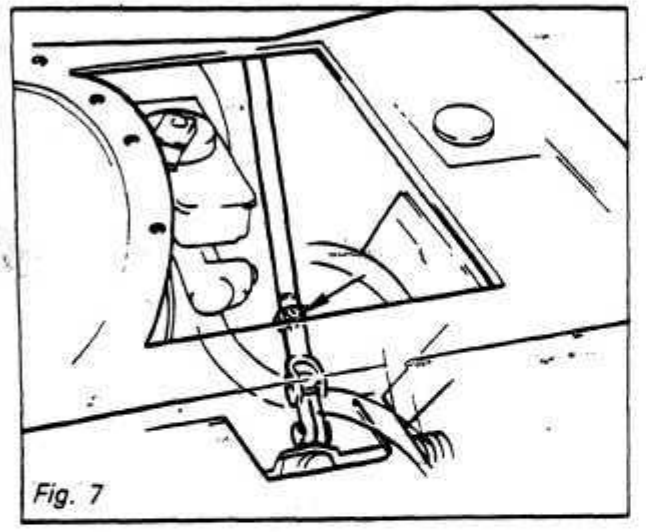


Fig. 7

3. Remove pinch bolts securing universal joint to steering column intermediate shaft and steering rack pinion shaft.
4. Slide universal joint up intermediate shaft sufficient to disengage universal joint from pinion shaft. Slide universal joint off intermediate shaft and remove from car.

INSTALLATION

1. Slide replacement universal joint onto intermediate shaft sufficient to allow joint to be engaged to pinion shaft.
2. With front wheels in straight ahead position and the steering wheel centred, slide the universal joint onto steering rack pinion shaft and secure both universal joint pinch bolts. Torque to specification.
3. Position and secure access cover and luggage compartment carpeting.
4. Close luggage compartment hood.

COLUMN INTERMEDIATE SHAFT

Removal

1. Raise luggage compartment hood.
2. Remove luggage compartment carpeting. Remove brake master cylinder reservoir access cover from luggage compartment floor and remove fuel filter neck access cover.
3. Remove pinch bolts securing upper universal joint to steering column assembly.
4. Loosen pinch bolt securing intermediate shaft in universal joint and remove intermediate shaft.

Installation

1. Slide intermediate shaft into lower universal joint and loosely tighten pinch bolt.
2. With front wheels in straight ahead position and the steering wheel centered, slide the upper universal joint with the lower steering column attached onto the upper steering column. Torque pinch bolts to specification.
3. Position and secure access covers in luggage compartment and close luggage compartment cover.

RACK AND PINION ASSEMBLY – REPLACE

REMOVAL

1. Raise car on hoist.
2. Remove both front tyre and wheel assemblies.
3. Remove both tie rod ends to steering knuckle nuts and separate tie rod ends from steering knuckles with the appropriate tool.
4. Remove the pinch bolt securing the steering column universal joint to the steering rack pinion shaft.
5. Loosen pinch bolt securing the universal joint to the intermediate shaft and slide the universal joint up the intermediate shaft sufficient to disengage universal joint from pinion shaft.
6. Remove both pairs of steering rack clamp nuts and remove the clamps.
7. Remove the lateral restraint bracket from underneath the RH rubber steering mount rack.
8. Remove rubber mounts by rotating mounts and prying them off rack and pinion assembly.
9. Slide rack and pinion assembly out from the LH side of chassis frame. *Fig. 8*
10. Transfer both the rod ends to replacement unit.

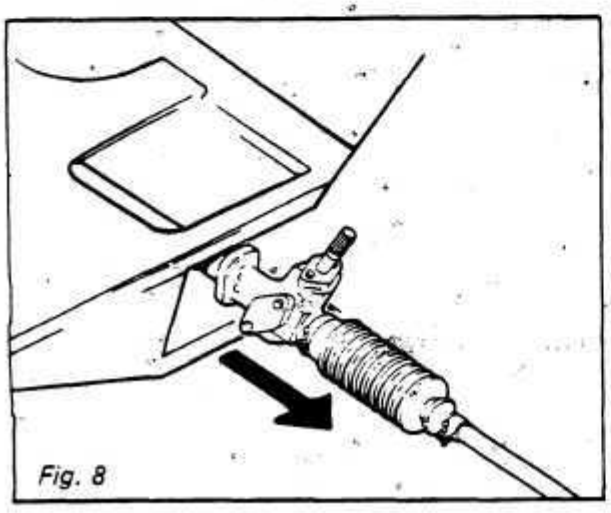


Fig. 8

INSTALLATION

1. Guide replacement rack assembly into chassis from left side.
2. Position LH rubber mount onto rack assembly and rotate the rubber mount onto its proper position.
3. Position the RH rubber mount onto the rack assembly and rotate the rubber mount into the proper position.
4. Position lateral restraint bracket underneath the RH mounting making sure that the rack assembly collar is engaged between the two (2) tabs of the restraint bracket.
5. Make sure both rubber mounts are positioned so that the rack assembly collar fits securely in each mount.
6. Position a steering rack clamp over each rubber mount and locate in chassis frame. Secure each clamp with two nuts and washers inserted through the chassis frame openings.
7. Evenly tighten the four (4) clamp nuts while checking the proper location of the rubber mount and torque to specification.
8. Position and secure the tie rod ends to steering knuckle and torque to specification.
9. With the front hub in the straight ahead position and the steering wheel centred, slide the steering column universal joint onto the rack assembly pinion shaft and secure the pinch bolt. Position the lower universal joint so as to provide maximum clearance from the chassis frame. Torque both pinch bolts to specification.
10. Reinstall tyre and wheel assemblies. Torque to specification.
11. Lower car, and with car at normal ride height, check toe-in and adjust if necessary.

RACK AND PINION TIE ROD BOOTS – ONE OR BOTH

REMOVAL

1. Remove rack and pinion assembly as previously described.
2. Loosen inner and outer boot(s) clamp screws and remove boot(s) clamps and discard.
3. Slide damaged boot(s) off tie rod(s).

INSTALLATION

1. (a) If replacing one (1) boot, add ⅓ pint of specified lubricant to steering rack assembly via the left end before proceeding.

   (b) If replacing both boots, position and secure with new clamps one (1) boot invert the steering rack assembly and add **⅓ pint of specified lubricant** via the left end.

   Notice:
   In order to properly add lubricant to rack and pinion assembly, the rack and pinion assembly MUST BE removed and filled from LEFT side (pinion end) only.

2. Position and secure with new clamps replacement boot (or second boot).
3. Install rack and pinion assembly as previously described.

TIE ROD END – ONE OR BOTH

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly (or assemblies).
2. Remove tie rod end to steering knuckle nut(s) and separate tie rod end(s) from steering knuckle(s) with appropriate tool.
3. Remove tie rod end(s) from tie rod(s).

INSTALLATION

1. Install replacement tie rod end(s) on tie rod(s)
2. Position and secure tie rod end(s) to steering knuckle(s) and grease tie rod end(s) via its fitting. Torque nut(s) to specification.
3. Position and secure tyre and wheel assembly (or assemblies) and torque to specification.
4. Lower car, and with car at setting height:
   (a) Front cross member to ground 140 mm (5.5 inches).
   (b) This should be checked by means of a wooden block depth to be 140 mm (5.5 inches) which should be placed beneath the front cross member (it may be necessary to lift the front of the vehicle or load the luggage compartment to ensure that the chassis cross member rests on the block.
   (c) Check toe-in and adjust track.
   (d) Ensure the steering wheel is in the dead ahead position. Ensure all road dirt is removed from the threads of the track rod arms. With the aid of suitable tracking equipment check wheel alignment. ANGULAR WHEEL ALIGNMENT TOE IN ½ DEGREE (PER WHEEL) +0 −10 minutes.

ADJUSTING

Hold ball joint firm with wrench (A) and undo locknut (B) using grips rotate steering rod (C) in for toe-in and vice versa. *Fig. 9*

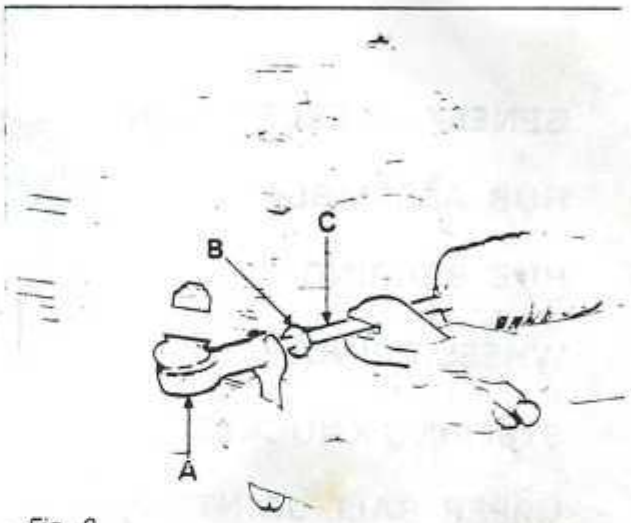


Fig. 9

Note:

IT IS IMPORTANT TO ADJUST LEFT AND RIGHT HAND TRACK ROD EVENLY ENSURING THAT THE SAME NUMBER OF THREADS ARE EXPOSED BOTH SIDES.

Remove wood block from underside of cross member and roll vehicle backwards and forwards to eliminate wind up. Refit wood block to chassis cross member and re-check. Continue this procedure until specifications are met.

On completion of adjustment tighten locknuts (B) to 65 NM (48 ft/lbs)

GENERAL DESCRIPTION

The front suspension is fully independent with upper and lower control arms, stabilizer bar *and steering* knuckle assembly. Telescopic shock absorbers, secured to the chassis frame tower at the absorber's upper end and to the lower control arm at the absorber's lower end, are positioned through the coil springs.

The single front spindle bearing supports the hub assembly on the spindle which is fastened to the steering knuckle. The steering knuckle is secured to the upper and lower control arms with upper and lower ball joints and to the steering system with an adjustable tie rod. *Fig. 1 and Fig. 2*

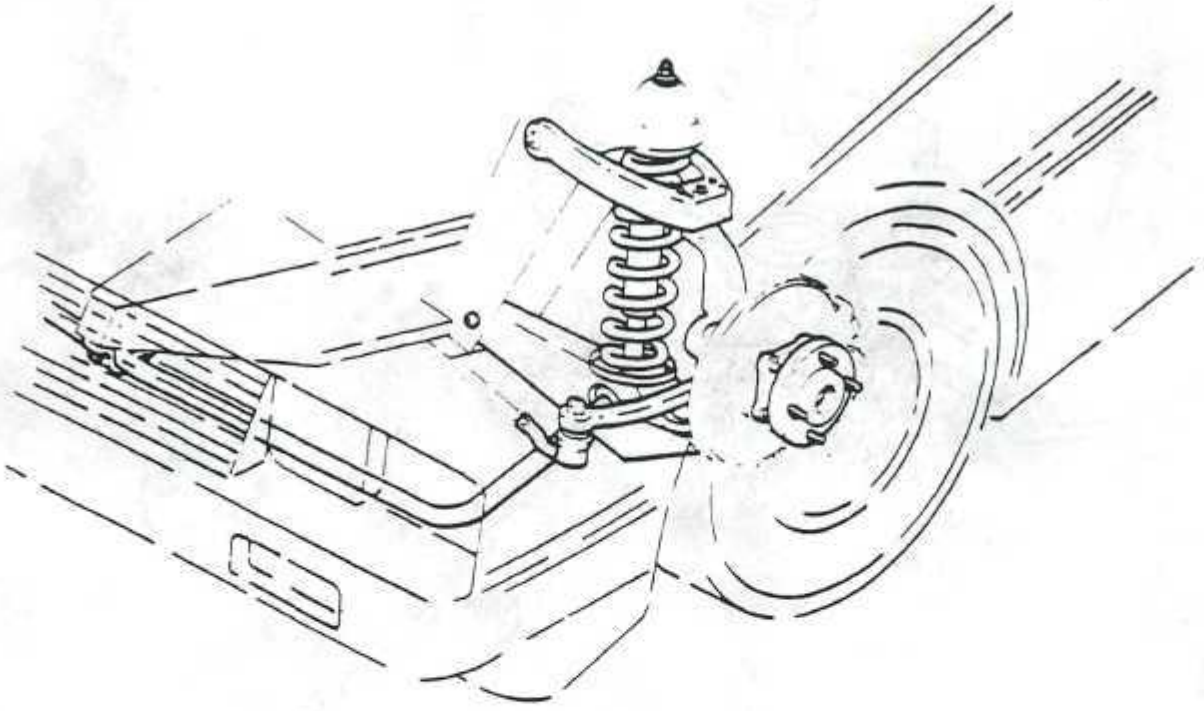


Fig. 1

Front Suspension

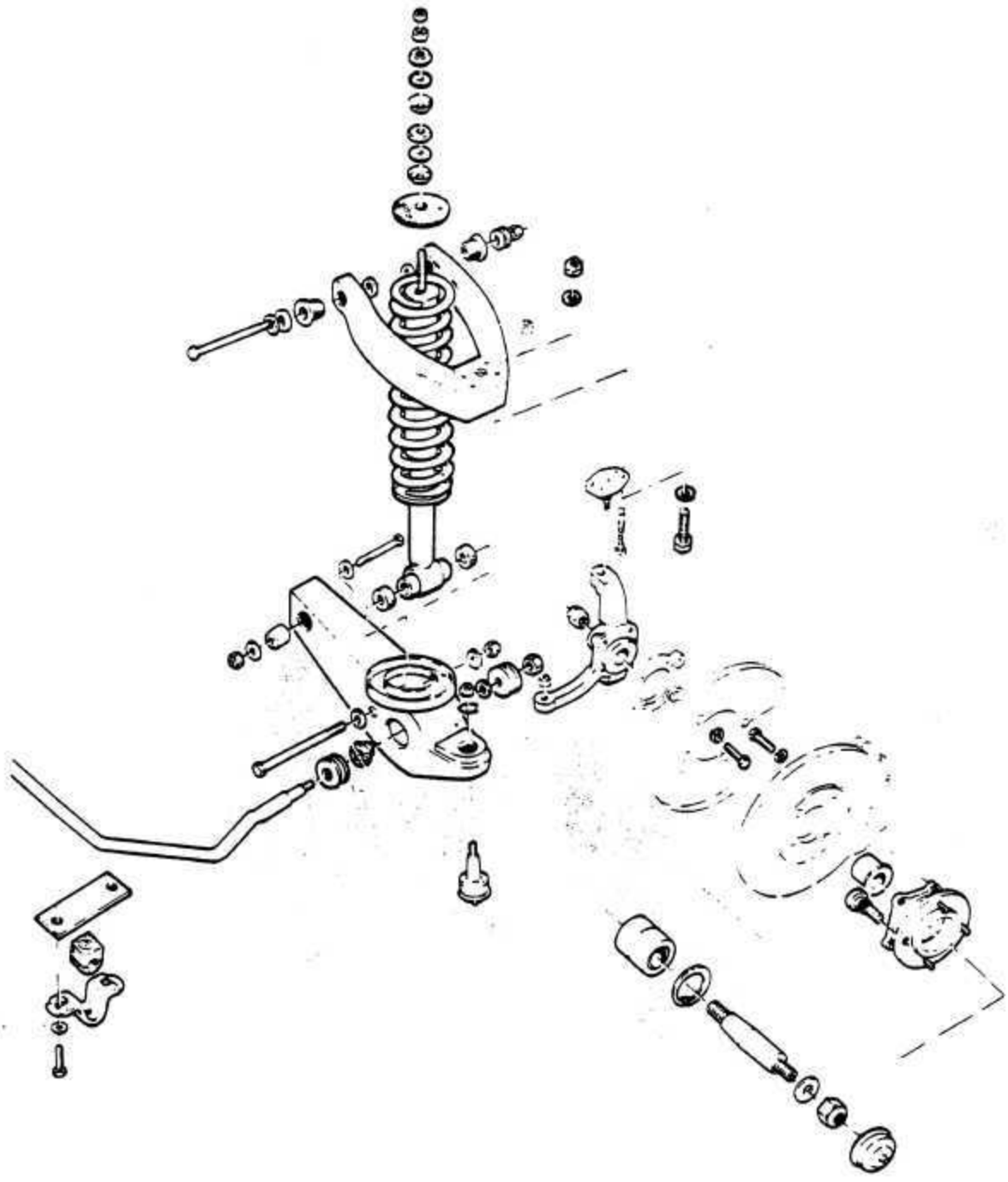


Fig. 2

HUB ASSEMBLY – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect speedometer cable at wheel spindle.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by brake hose. *Fig. 3*

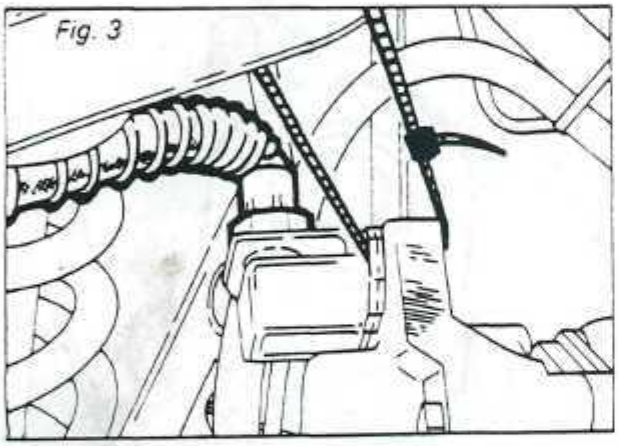


Fig. 3

5. When working on left side, remove speedometer drive cap from centre of hub. *Fig. 4*

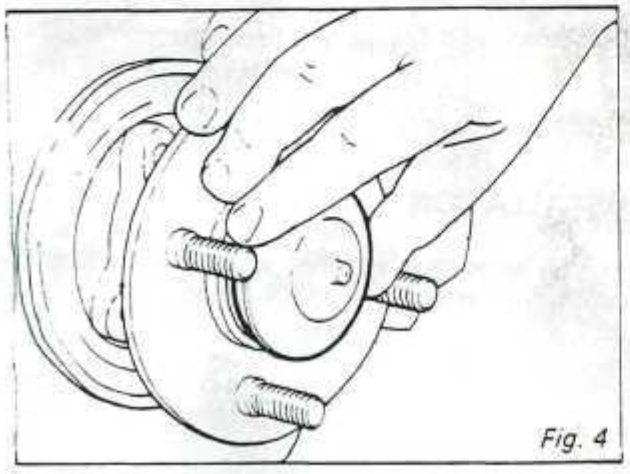


Fig. 4

6. Remove hub nut and "D" washer. *Fig. 5*

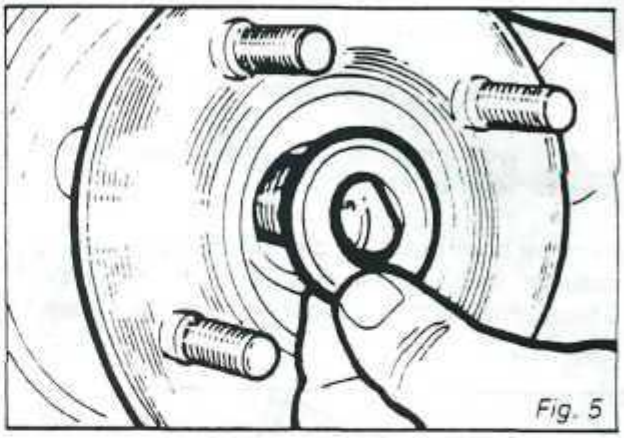


Fig. 5

7. Remove hub and brake disc assembly.
8. Working on bench, remove four (4) bolts securing brake disc to hub. *Fig. 6*

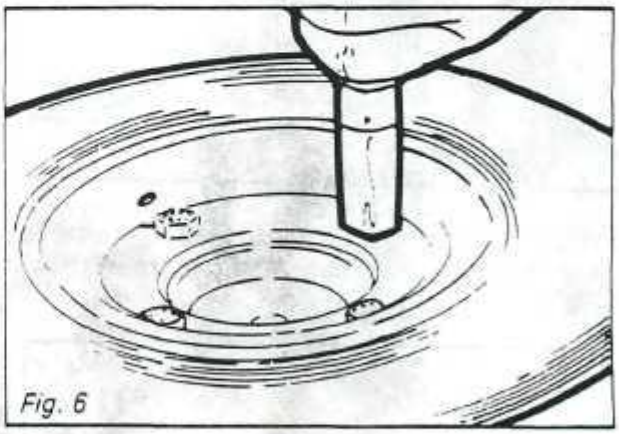


Fig. 6

9. Remove snap ring, retaining hub bearing to hub assembly.

INSTALLATION

Reverse removal procedures starting with Step 8 and torque fasteners to specification.

HUB BEARING – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect speedometer cable.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by brake hose. *Fig. 7*

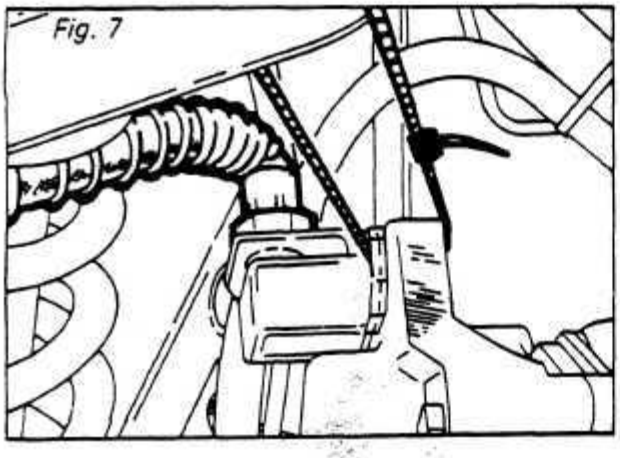


Fig. 7

5. When working on left side, remove speedometer drive cap from centre of hub. *Fig. 8*

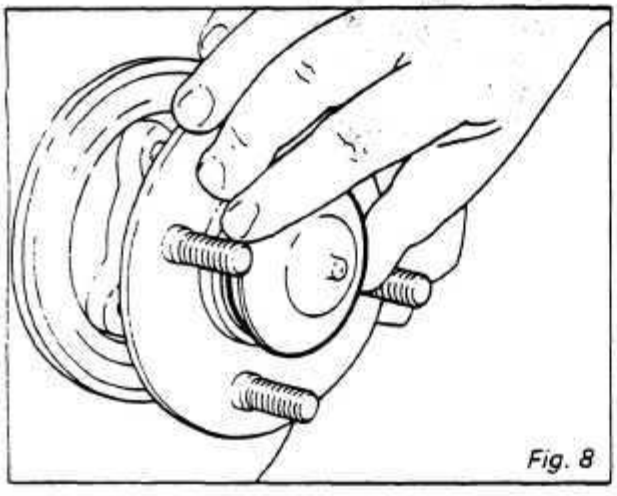


Fig. 8

6. Remove hub nut and "D" washer.
7. Remove hub and brake disc assembly.
8. Remove snap ring, retaining hub bearing to hub assembly. Remove hub bearing by pressing.
9. Press new hub bearing into hub assembly. *Fig. 9*

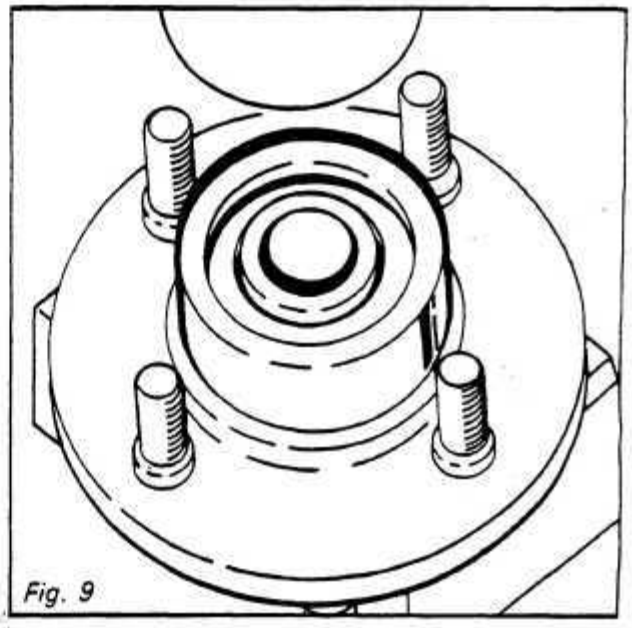


Fig. 9

10. Position and secure hub bearing snap ring.

INSTALLATION

Reverse removal procedure starting with Step 7 and torque fasteners to specification.

WHEEL SPINDLE

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect the speedometer cable.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by brake hose.
5. When working on left side, remove speedometer drive cap from centre of hub.
6. Remove hub nut and "D" washer.
7. Remove hub and brake disc assembly.
8. Using a tie rod end remover, disconnect tie rod end from steering knuckle.
9. Remove brake disc spacer.
10. With front suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.
11. Remove nut securing upper ball joint to steering knuckle and separate ball joint from steering knuckle. Remove steering knuckle assembly.
12. Remove spindle retaining nut. (On left side, nut is removed with speedometer 90° angle drive.)
13. Press spindle from steering knuckle as shown in *Fig. 10*

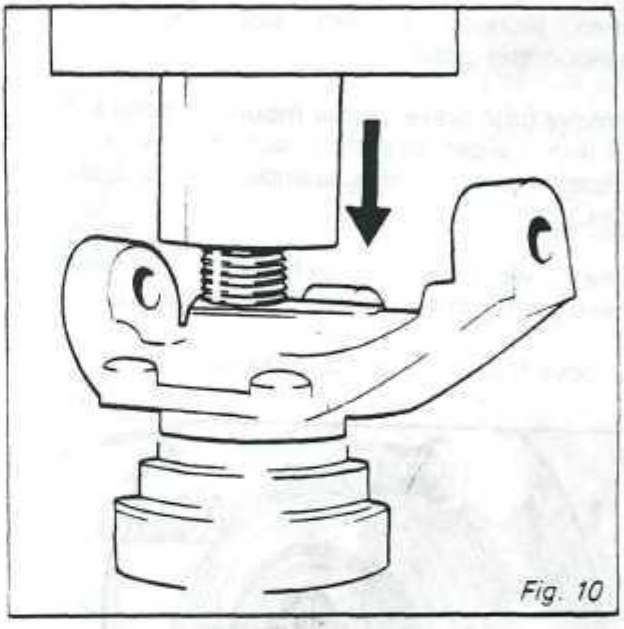


Fig. 10

INSTALLATION

1. Position spindle into steering knuckle. Install spindle retaining nut and torque to specification.
2. To complete installation, reverse removal procedures starting with Step 11 and torque fasteners to specification.

STEERING KNUCKLE – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect speedometer cable.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by its brake hose.
5. When working on left side, remove speedometer drive cap from centre of hub.
6. Remove hub nut and "D" washer. *Fig. 11*

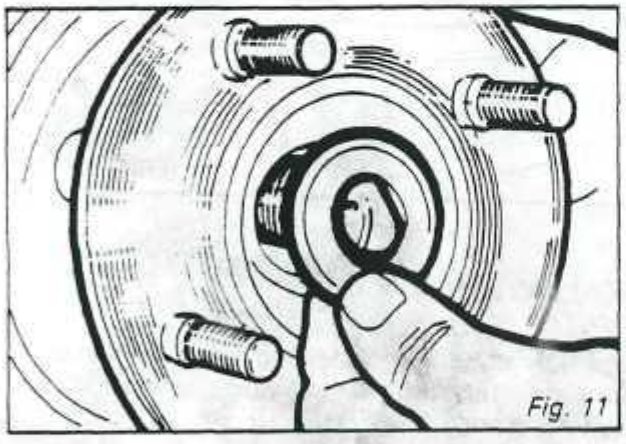


Fig. 11

7. Remove hub and brake disc assembly.
8. Using a tie rod-end remover, disconnect tie rod end from steering knuckle.
9. Remove brake disc spacer.
10. With front suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.
11. Remove nut securing *upper* ball joint to steering knuckle and separate ball joint from steering knuckle. Remove steering knuckle assembly.
12. Remove spindle retaining nut. (On left side, nut is removed with speedometer 90° angle drive.)
13. Press spindle from steering knuckle.
14. Remove four (4) bolts securing brake disc dustshield and caliper mounting bracket to steering knuckle assembly.

INSTALLATION

1. Position and secure brake disc dustshield and caliper mounting bracket to steering knuckle.
2. Position spindle into steering and install spindle retaining nut and torque to specification.
3. To complete installation, reverse removal procedures starting with Step 11 and torque fasteners to specification.

UPPER BALL JOINT – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. With front suspension at full travel, remove nut securing upper ball joint to steering knuckle and separate ball joint from steering knuckle. Steering knuckle should be supported by wire, and care should be exercised not to allow the steering knuckle assembly to pivot outward.
4. Using nut cracker or splitter remove four (4) fasteners securing the upper ball joint to the upper control arm and remove ball joint.

Note:
Previously serviced ball joints will be secured with nuts and bolts.

INSTALLATION

1. Position and secure ball joint. Install ball joint boot, grease ball joint via its fitting, and torque fasteners supplied with ball joint to specification.
2. To complete installation, reverse the removal procedure and torque fasteners to specification.

LOWER BALL JOINT – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.

2. Remove tyre and wheel assembly.

3. With front suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle. Suspend upper control arm and steering knuckle assembly inside the wheel opening and position out of the way.

4. Disconnect and remove stabilizer bar.

5. Remove shock absorber lower mounting through bolt and nut. Remove shock absorber upper mounting nut and remove shock absorber.

6. Place jack stands under lower control arm and lower car sufficient enough to compress coil spring, using a suitable spring compressing tool. Raise car and remove spring.

7. Remove lower control arm pivot bolt and remove control arm from car.

8. Working on bench, remove the lower ball joint protective boot and remove lower ball joint retaining snap ring.

9. Press ball joint from control arm. *Fig. 12*

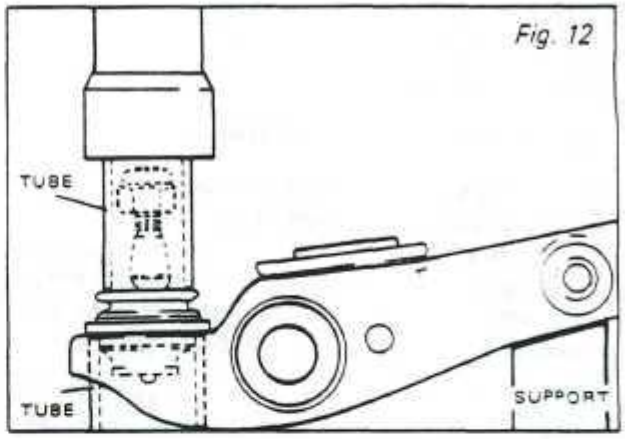


Fig. 12

INSTALLATION

1. Press new ball joint into lower control arm. *Fig. 13*

2. Install ball joint retaining snap ring and install new boot.

3. To complete installation, reverse the removal procedures. Torque fasteners to specification and fill lower ball joint with grease via the fitting.

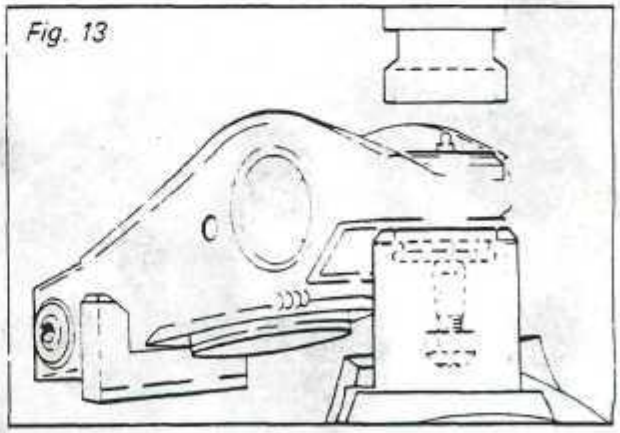


Fig. 13

UPPER CONTROL ARM/BUSHINGS – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly.
2. With suspension at full travel, remove nut securing upper ball joint to steering knuckle and separate ball joint from steering knuckle. The steering knuckle should be supported by wire and care should be exercised not to allow the steering knuckle assembly to pivot outward.
3. Remove the upper control arm pivot bolt nut and remove pivot bolt. Remove control arm assembly from car.
4. With upper control arm assembly removed from car and using an arbor press, press the control arm bushings from control arm. *Fig. 14*
5. Press new control arm bushings into control arm.
6. If control arm is being replaced, a new upper service ball joint must be installed into the upper control arm. By positioning and securing service replacement ball joint, install ball joint boot. Grease ball joint via its fittings and torque fasteners supplied to specification.

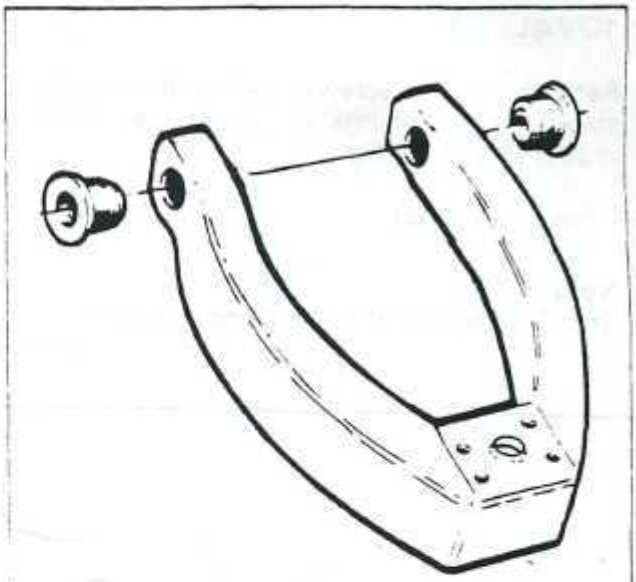


Fig. 14

Note:
Service replacement upper control arms are supplied with new bushings installed.

INSTALLATION

To complete installation, reverse the removal procedures and torque fasteners to specification.

STABILIZER BAR/BUSHINGS

REMOVAL

1. Remove two (2) screws, each side securing stabilizer bar bushings at front chassis, front impact extension. *Fig. 15*
2. Raise car on hoist.

Note:
Step 3 is required if bar is being replaced.

3. Remove nut securing stabilizer bar to lower control arm assembly. Repeat on other side and remove stabilizer bar.
4. Using a brass drift, drive out stabilizer bushings in the lower control arm.

INSTALLATION

To complete installation, reverse removal procedure and torque fasteners to specifications.

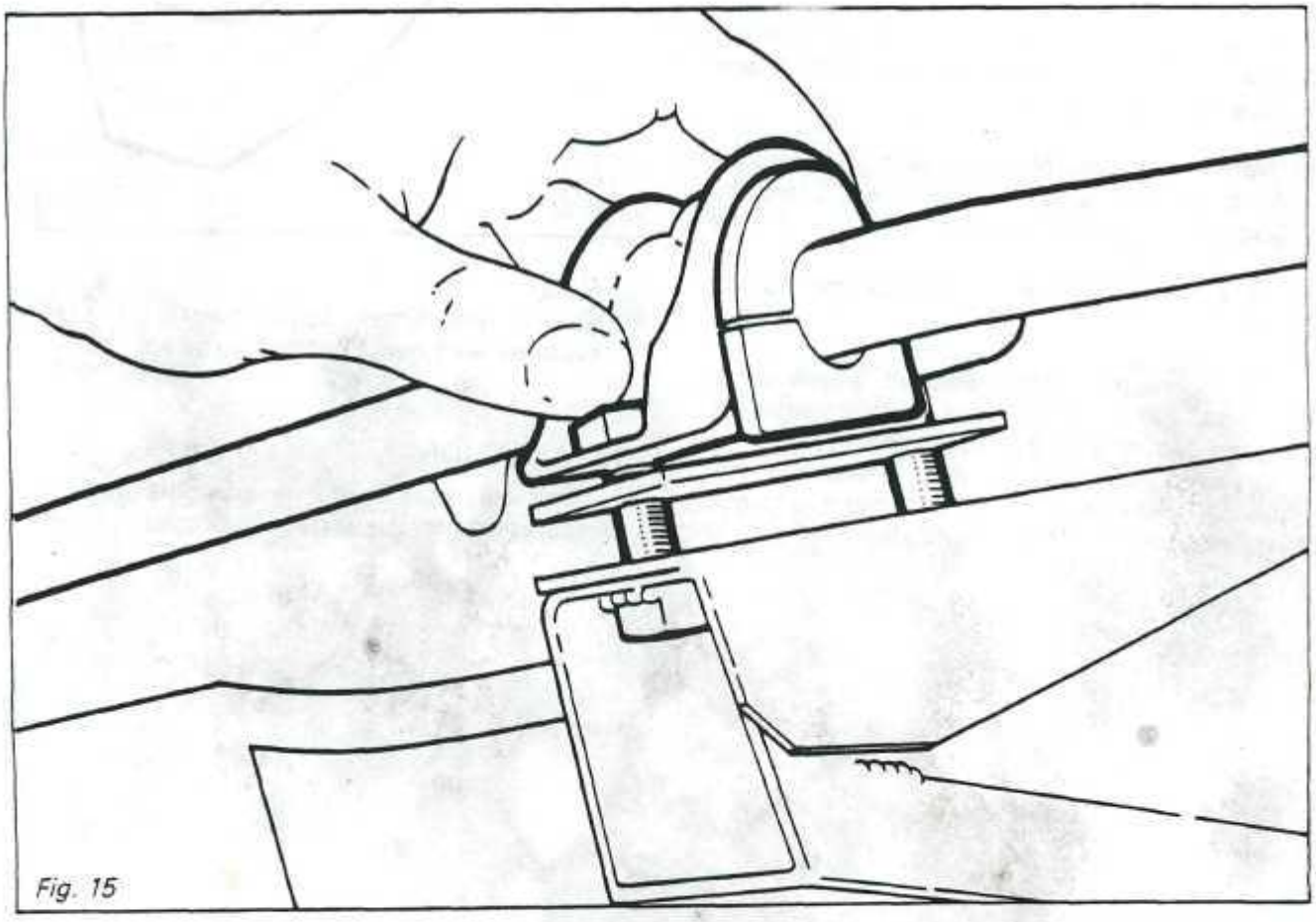


Fig. 15

LOWER CONTROL ARM/BUSHINGS – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. With suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.
4. Suspend upper control arm/steering knuckle assembly inside wheel opening and position out of way.
5. Remove four (4) screws securing both stabilizer bar bushing brackets to front chassis frame impact extension.
6. Remove nut securing stabilizer bar to lower control arm and position stabilizer bar out of the way.
7. Remove shock absorber lower mounting through bolt and nut. Remove shock absorber upper mounting nut and remove shock absorber from car.
8. Place jack stand under lower control arm and lower car sufficient enough to compress coil spring. Compress spring using the service tool, raise car and remove spring from car.

CAUTION: Compressed coil springs are considered very dangerous. Extreme care should be exercised to prevent personal injury.

9. Remove lower control arm pivot bolt nut and remove bolt. Remove lower control arm from car.
10. Using an arbor press, press out control arm bushing.

Note:
Service replacement lower control arms have new bushings and ball joints installed.

11. Press new bushing into lower control arm.
12. Press new ball joint into lower control arm and secure with new snap ring. Install and secure ball joint boot and grease ball joint via its fittings.

INSTALLATION

To complete installation, reverse procedure. Torque fasteners to specification.

SHOCK ABSORBER – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly.

2. Remove shock absorber lower mounting through bolt nut and remove through bolt. *Fig. 16*

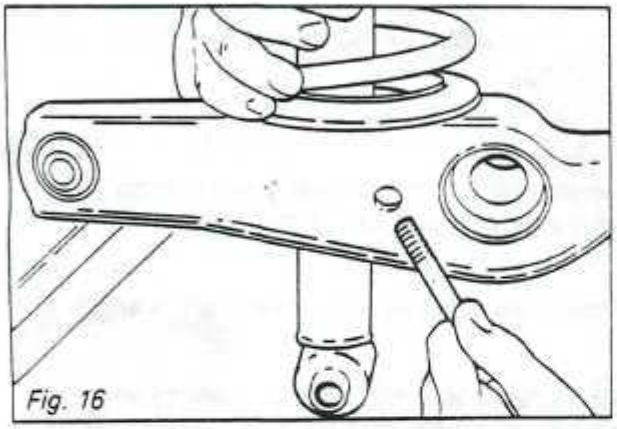


Fig. 16

Note:
It may be necessary to place a jack stand under the lower control arm and lower the car sufficient to relieve any side load which may be on the through bolt.

3. Remove shock absorber upper mounting nut and remove shock absorber through the bottom of lower control arm. *Fig. 17*

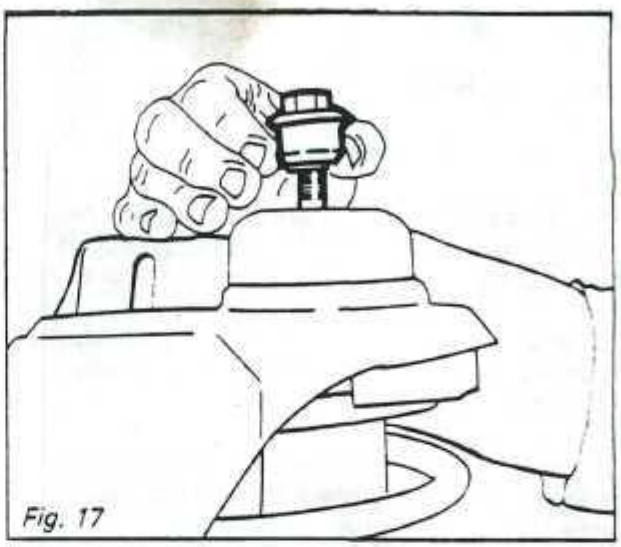


Fig. 17

Note:
The location and placement of the upper shock absorber mounting bushes and caps should be noted prior to removal to ensure proper placement upon reassembly.

INSTALLATION

To complete installation, reverse removal procedure. Torque fasteners to specification.

Note:
Compressing the coil spring by lightly lowering the car on the hoist may assist the installation.

COIL SPRING – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist, and remove tyre and wheel assembly.

2. With suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.

3. Suspend upper control arm/steering knuckle assembly inside the wheel opening and position out of the way.

4. Remove four (4) screws securing both stabilizer bar bushing brackets to front chassis frame impact extension.

5. Remove nut securing stabilizer bar to lower control arm and position stabilizer bar out of the way.

6. Remove shock absorber lower mounting through bolt nut and remove through bolt.

   Note:
   It may be necessary to place a jack stand under the lower control arm and lower the car sufficient to relieve any side load which may be on the through bolt.

7. Remove shock absorber upper mounting nut and remove shock absorber through the bottom of the control arm.

   Note:
   The location and the placement of the upper shock absorber mounting bushes and cups should be noted prior to removal to assure proper placement upon reassembly.

   Note:
   Compressing the coil spring by lowering the car on the hoist may assist in removing the shock absorber by gaining additional coil spring clearance, or use service tool to compress spring.

8. Place jack stand under lower control arm and lower the car sufficient enough to compress the coil spring, or use a suitable spring compressing tool: raise car and remove the spring and insulator pad from the car.

   CAUTION: Compressed coil springs are considered very dangerous. Extreme care should be exercised to prevent personal injury.

INSTALLATION

1. Apply S.M.P. grease on any spring to chassis frame contact area. Position spring insulator into cavity.

2. To complete installation, reverse removal procedures and torque fasteners to specification.

TORQUE SPECIFICATIONS

MOUNTING AREA	Nm Torque	Ft./lb. Torque
Brake caliper to mounting bracket	75	55
Brake disc dustshield	28	20
Front disc to hub (W/LOCTITE 601)	28	20
Spindle to steering knuckle nut	220	165
Spindle bearing to spindle nut	190	145
Upper control arm pivot bolt/nut	80	60
Lower control arm pivot bolt/nut	80	60
Shock absorber, upper	28	20
Shock absorber, lower	80	60
Stabilizer bar at lower control arm	75	55
Stabilizer bar pivot (on chassis)	36	26
Brake hose attaching screw	16	12
Upper ball joint to steering knuckle	60	45
Lower ball joint to steering knuckle	60	45

Rear Suspension

Contents

GENERAL DESCRIPTION K:01:01

UPPER LINK/BUSHINGS K:02:01

LOWER LINK/BUSHINGS K:03:01

HUB CARRIER K:04:01

TRAILING ARM K:05:01

TRAILING ARM BUSHINGS K:06:01

SHOCK ABSORBER/COIL SPRING K:07:01

TOE-IN ALIGNMENT ADJUSTMENT K:08:01

TORQUE SPECIFICATIONS K:09:01

DMC

GENERAL DESCRIPTION – Fig. 1 and 2

The rear suspension is a fully independent type with a radius arm (trailing), upper and lower links and a rear hub carrier. Telescopic shock absorbers, secured to the chassis frame at the absorbers upper end and to the rear hub carrier and the absorbers lower end, are positioned through the coil springs.

The rear hub carrier is attached to the chassis frame with upper and lower links as well as the radius arm.

Rear suspension toe-in is achieved by shimming the radius arm at its frame attaching location.

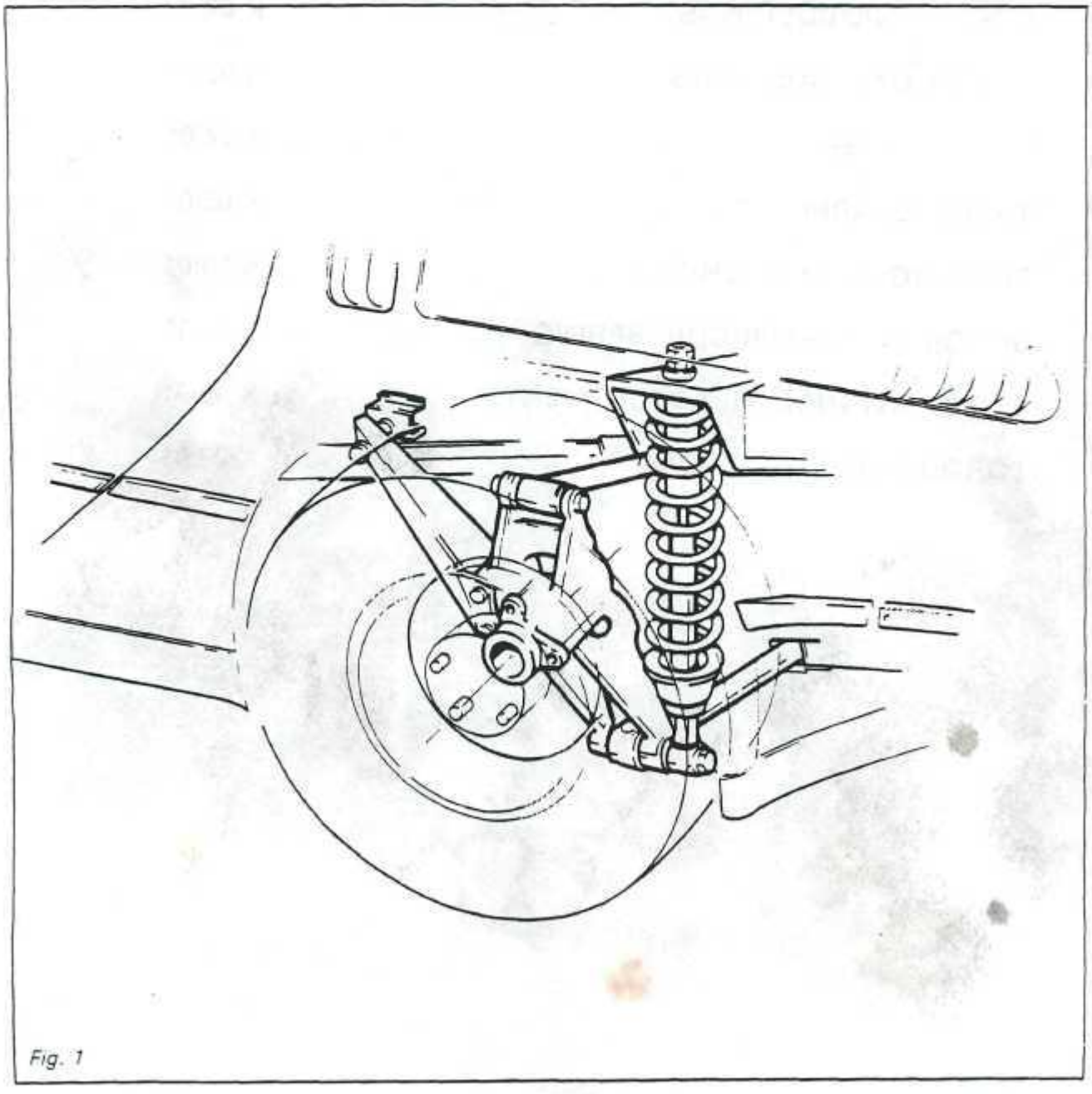


Fig. 1

Rear Suspension

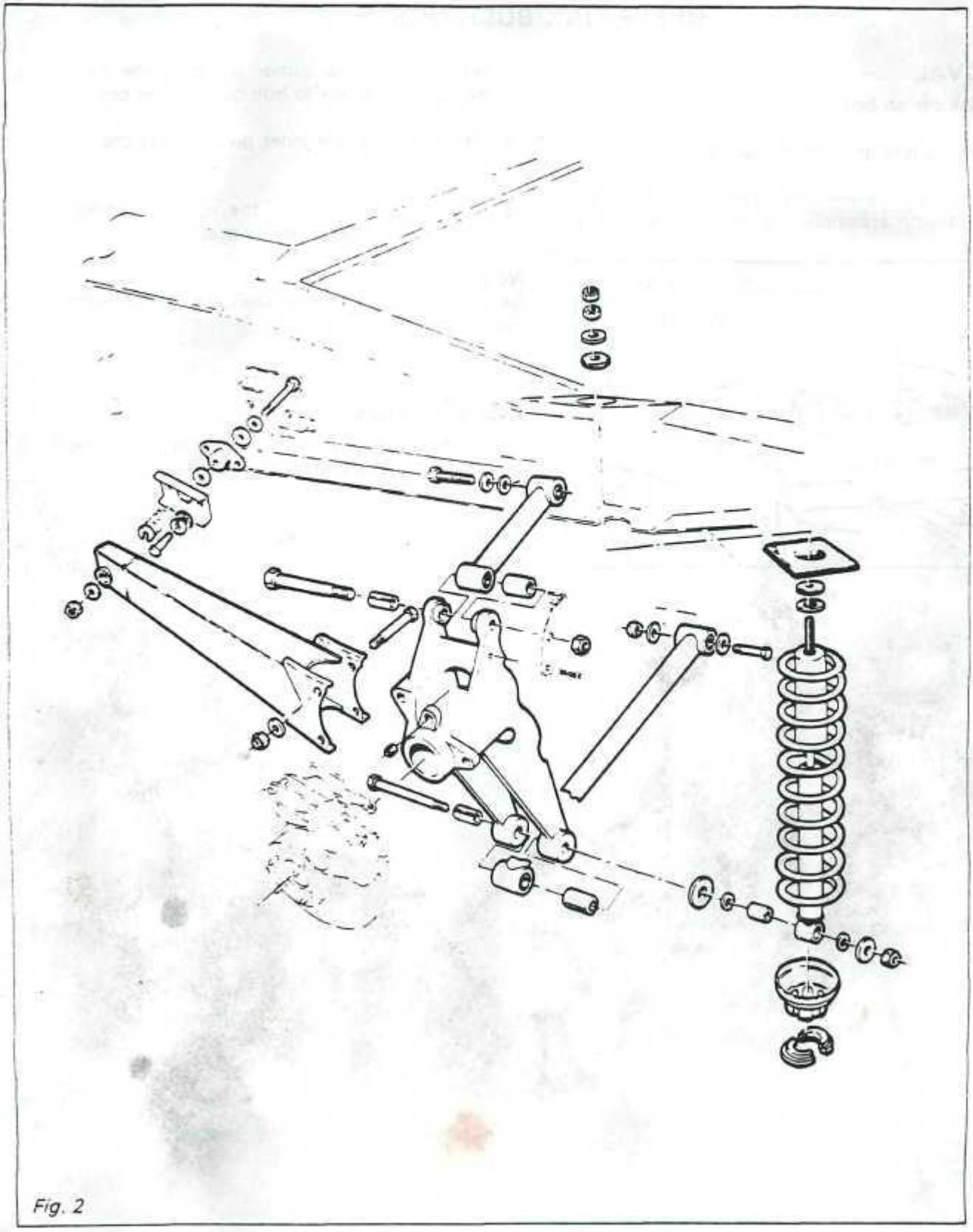


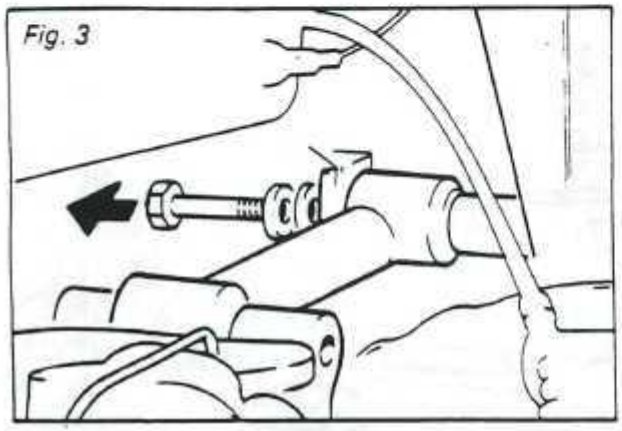
Fig. 2

UPPER LINK/BUSHINGS

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. Using jack relieve the tension on the rear suspension assembly, and remove the nut and washer from hub carrier to upper link bolt. Remove upper link to hub carrier pivot bolt.
4. Remove upper link inner pivot bolt at chassis frame. *Fig. 3*
5. Check the condition of the rubber bushings and replace if necessary by pressing them out.

Fig. 3



Note:
Service replacement upper links are supplied with new bushings installed.

INSTALLATION

1. To install, reverse the removal procedures and torque fasteners to specifications.

Notice:
Fasteners must be torqued with car resting on its suspension.

LOWER LINK/BUSHINGS

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.

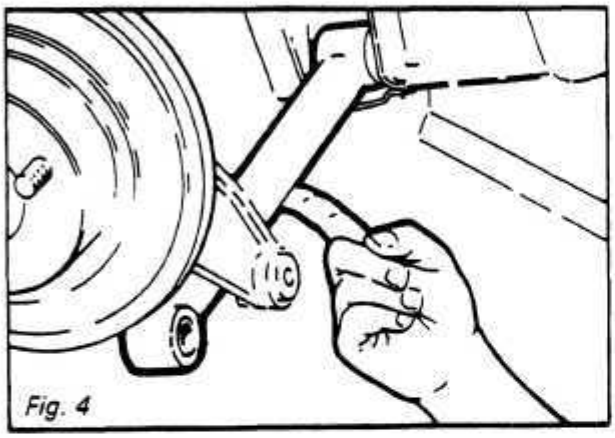


Fig. 4

3. Supporting the rear suspension with a jack stand to relieve tension remove the nut and washer from the hub carrier to lower link pivot bolt.
4. Remove the lower link to chassis frame, pivot bolt and nut and remove lower link. *Fig. 4*
5. Check the condition of the rubber bushings and replace if necessary by pressing them out.

Note:
Service replacement lower links are supplied with new bushings installed.

INSTALLATION

1. To install, reverse the removal procedures and torque fasteners to proper specifications.

Notice:
Fasteners must be torqued with car resting on its suspension.

HUB CARRIER

REMOVAL

1. Raise car on hoist.
2. Remove rear tyre and wheel assembly.
3. Remove screws securing the trailing arm shield to chassis frame and remove shields.
4. Remove six (6) bolts securing the inner driveshaft to out driveshaft.
5. Loosen hub nut (righthand thread, both sides).
6. Disconnect brake hose to rear brake line. Clamp hose and line ends.
7. Unclip metal brake line from trailing arm.
8. Disconnect park brake cable from park brake caliper lever arm by removing the split pin and clevis.
9. Remove two (2) bolts securing brake caliper assembly to hub carrier. Remove caliper assembly. *Fig. 5*

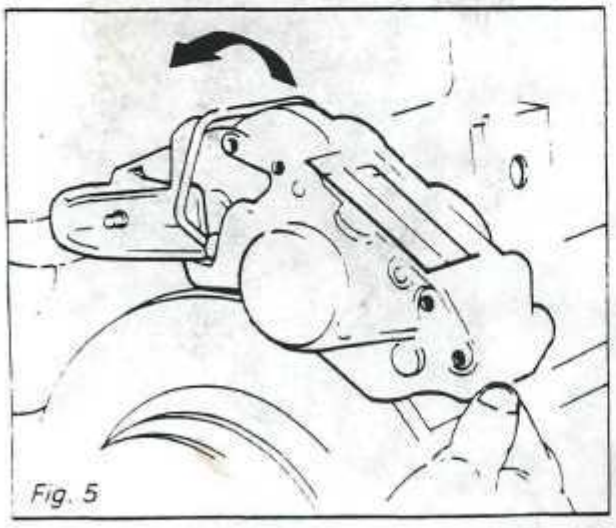


Fig. 5

10. Remove hub nut and pull off brake disc and hub assembly.
11. Remove two (2) nuts and bolts, securing trailing arm to hub carrier and disconnect trailing arm from hub carrier. *Fig. 6*

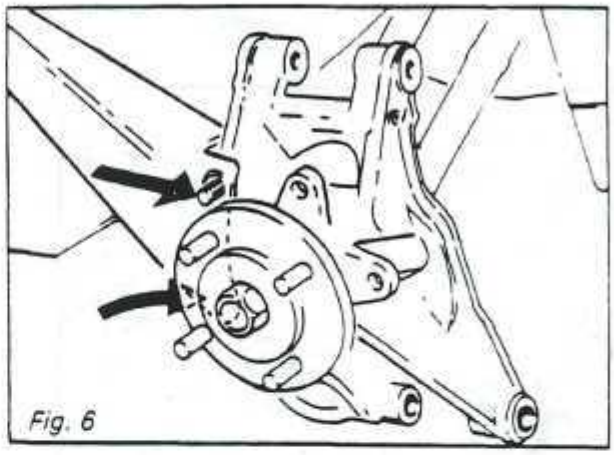


Fig. 6

12. Support the trailing arm to avoid straining the brake hose or pivot bushing.
13. Remove nuts from both upper and lower hub carrier pivot bolts. Remove bolt securing park brake cable to hub carrier.
14. Support the hub carrier with a jack stand while removing the upper and lower pivot bolt.
15. Remove hub carrier from car.

INSTALLATION

1. To install hub carrier, reverse the removal procedures and torque fasteners to specifications.

   Notice:
   Fastener must be torqued with car resting on its suspension.

2. Bleed brake system.
3. Check rear suspension for specified toe-in alignment and adjust if necessary.
4. Adjust park brake cables.

TRAILING ARM – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly.
2. Remove screws securing the trailing arm shield to chassis frame and remove shield.
3. Disconnect brake hose to rear brake line. Cap hose and line.
4. Unclip brake line from trailing arm.
5. Disconnect hand brake cable from hand brake caliper lever arm by removing the split pin and clevis.
6. Remove two (2) bolts securing brake caliper assembly to hub carrier. Remove caliper assembly. *Fig. 7*
7. Remove brake disc.
8. Remove two (2) nuts and bolts, securing trailing arm to hub carrier and disconnect trailing arm from hub carrier.
9. Remove trailing arm pivot bolt and nut. Remove trailing arm from car. Inspect trailing arm bushing for damage and replace if necessary. *Fig. 8*

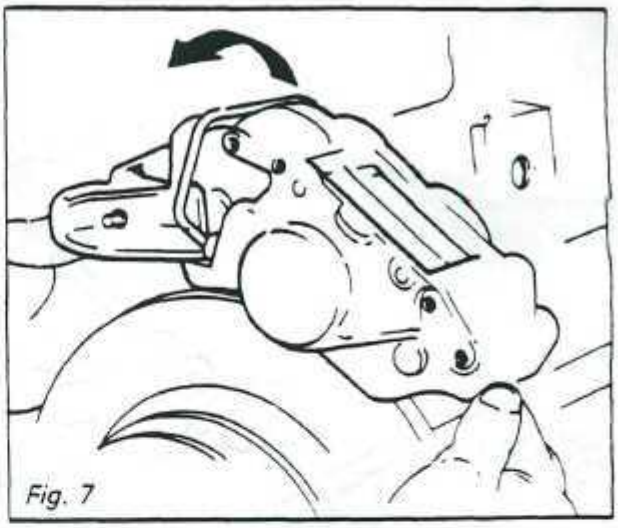


Fig. 7

INSTALLATION

1. To complete installation reverse the removal procedure, torque fasteners to specification.

   Notice:
   Fasteners must be torqued with car resting on its suspension.

2. Bleed brake system.
3. Check car suspension for specified toe-in alignment and adjust if necessary.
4. Adjust hand brake cable(s) if necessary.

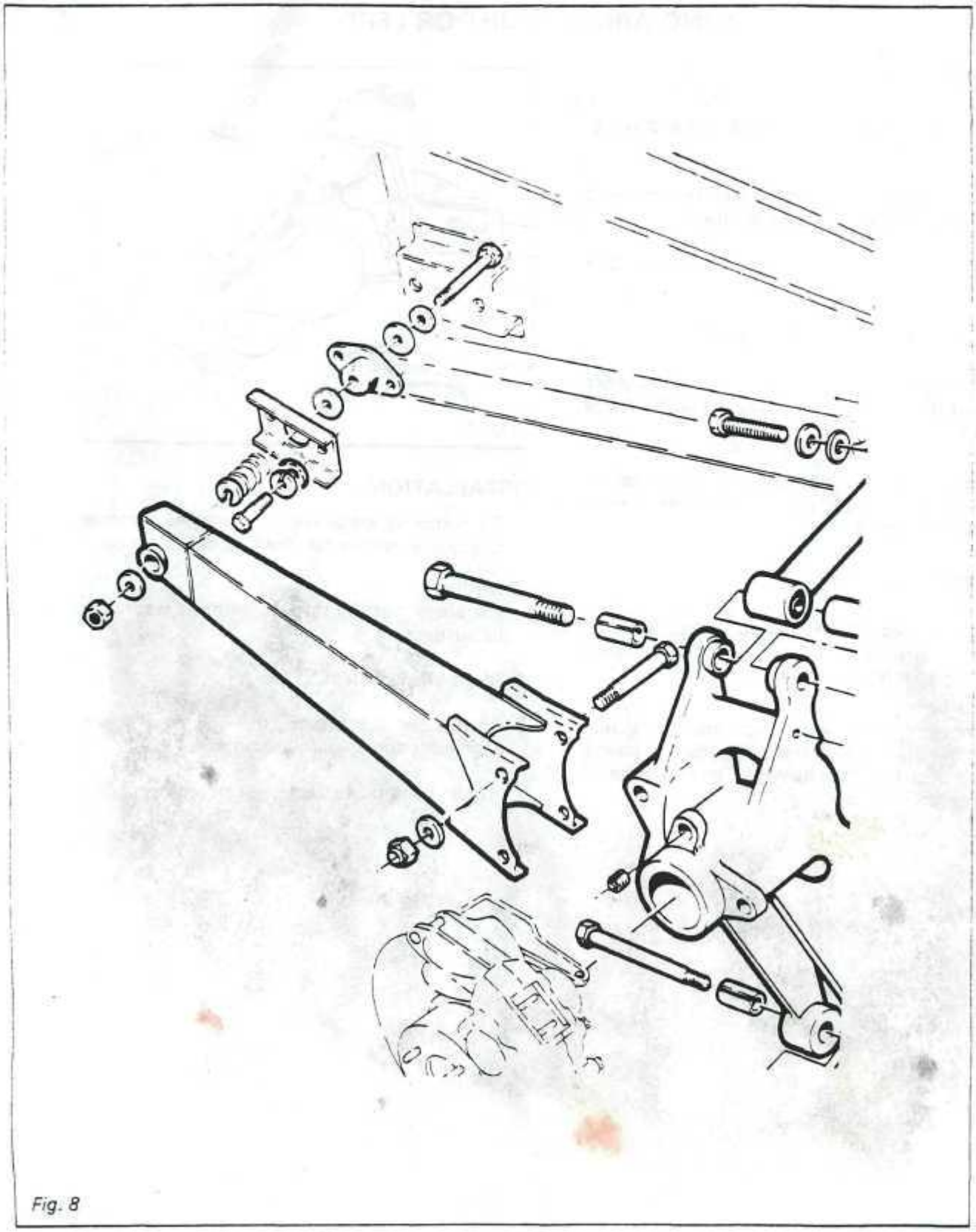


Fig. 8

TRAILING ARM BUSHING – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove trailing arm pivot bolt and nut. Position trailing arm out of the way to gain access to bushing retaining plate.

   Note:

   Quantity of removed shim washers should be noted and replaced upon installation.

3. Remove both bushing mounting plate nuts and bolts. Remove plate and bushing.
4. Fit new bushing. Reverse removal procedures and torque fasteners.
5. Check rear suspension for specified tow-in alignment and adjust if necessary.

SHOCK ABSORBER/COIL SPRING

REMOVAL AND INSTALLATION OF REAR SPRING AND SHOCK ABSORBER

Removal

1. Raise rear of car on jack and place on axle stands.
2. Remove rear wheels and tyre assemblies.
3. Place jack under rear hub carrier to remove pressure from rear spring.
4. Compress rear spring using a suitable compression tool.
5. Remove lower mounting nylon nut and washers.
6. Remove upper mounting nut and washers.
7. Pull lower part of shock absorber clear of lower pivot bolt and carefully remove spring and shock absorber assembly from the car.
8. Remove shock absorber from rear spring.
9. Carefully remove spring compression tool from rear spring.

Note:
Coil spring can be dangerous. A spring compression tool must be used at all times to fit and remove coil springs.

Installation

1. To reassemble, reverse removal procedure and torque components to specification.

TOE-IN ALIGNMENT ADJUSTMENT

1. Check rear wheels for rim run out. Maximum tolerance is .406 mm (.16 inch).

2. Check tyre pressures. 30 p.s.i. 2.06 bar.

3. Check and ensure no abnormal wear in suspension, joints, wheel bearings.

4. Place vehicle on flat surface.

5. Check and, if necessary, adjust setting height 140 mm (5.5 inches). *Fig. 9.* This measurement must be taken from the centre of the rear crossmember.

   It is important to note that the vehicle setting height must be attained prior to checking or adjusting the suspension.

   It may be necessary to lift the rear of the vehicle or load the vehicle to obtain the specified setting height.

6. Proceed with wheel alignment per the directions of the manufacturer of the alignment equipment used.

Note:
Where equipment directions indicate to jounce the suspension, substitute with, check and ensure specified setting height is maintained.

ALIGNMENT SPECIFICATIONS – REAR

Toe-In 3 mm (0.12 inch) per wheel
CAMBER ¼° to ¾° negative and non-adjustable

Note:
If camber specifications do not fall within the specified tolerance, check for damaged suspension components.

7. Remove trailing arm shields.

8. Loosen trailing arm pivot bolt 'A' *Fig. 10*

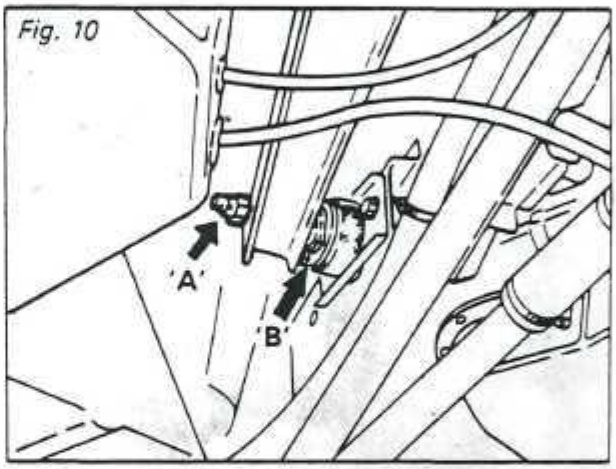


Fig. 10

9. Remove or add the required amount of shims (Part No. 106680) to obtain the specified tolerance. 'B' *Fig. 10*

   Note:
   1 Shim = 1.1° ($\frac{1}{16}$ inch)

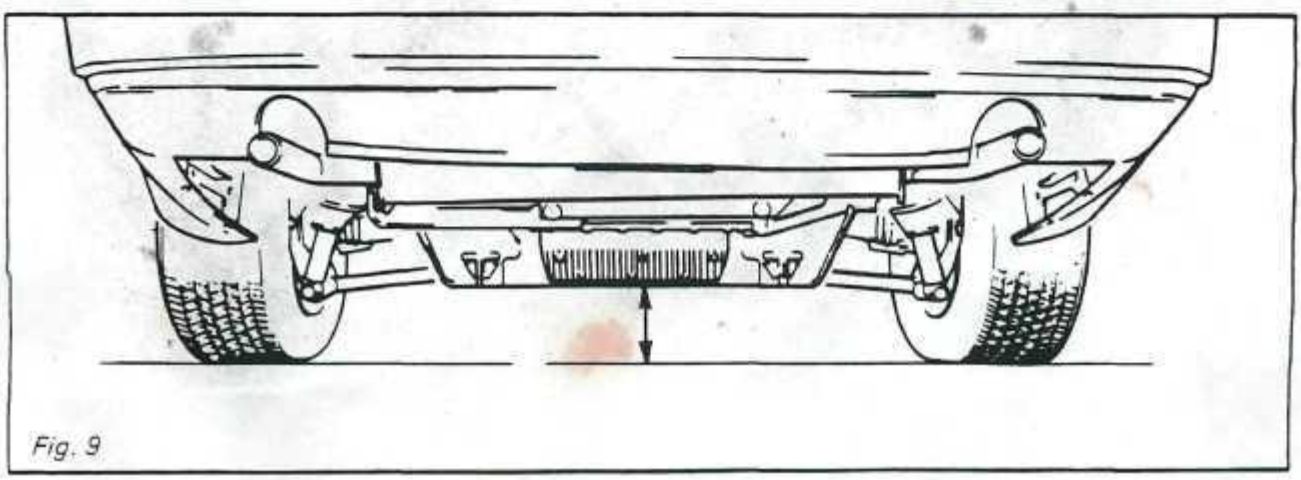


Fig. 9

10. Proceed with wheel alignment per directions of manufacturers of alignment equipment used.

11. Torque trailing arm pivot bolt 'A' *Fig. 10* to 75 Nm (55 ft./lbs.)

12. Check adjustment.

FIGURE CONVERSION TABLE

FRACTIONAL INCHES/DECIMAL DEGREES

1/32 = .06°	30/32 = .58°
1/16 = .13°	15/16 = .64°
3/32 = .19°	11/32 = .70°
1/8 = .26°	3/4 = .77°
5/32 = .32°	13/32 = .83°
3/16 = .38°	7/8 = .90°
7/32 = .45°	15/32 = .96°
1/4 = .51°	1/2 = 1.02°

TORQUE SPECIFICATIONS

REAR SUSPENSION

Important Note:
TORQUE SPECIFICATIONS SHOULD NOT BE EXCEEDED.

Trailing arm bush attachment	M8 × 13	22	16
Lower link both ends	½" × 19	80	60
Upper link both ends	½" × 19	80	60
Trailing arm hub to carrier	M12 × 19	75	55
Outer drive shaft to hub	M22 × 32	370	270
Trailing arm to pivot bush	M12 × 19	75	55
Shaft to inner and outer drive shafts	M10 × 17	40	30
Parking brake cable bracket to hub carrier	M6 × 10	7	5.5
Caliper — hub carrier	$\frac{7}{16}$" × 16	55	40
Flex brake pipe attachment	$\frac{3}{8}$" × 15	16	12
Wheels	M12 × 19	80	60

Brakes, Wheels and Tyres

CONTENTS

GENERAL DESCRIPTION L:01:01
SPECIFICATIONS L:02:01
FRONT BRAKE PADS L:03:01
FRONT BRAKE CALIPER L:04:01
REAR BRAKE PADS L:05:01
REAR BRAKE CALIPER L:06:01
BRAKE SERVO L:07:01
AIR/NOISE FILTERS L:08:01
BRAKE MASTER CYLINDER/FLUID RESERVOIR L:09:01
BRAKE PEDAL L:10:01
BRAKE BLEEDING PROCEDURE L:11:01
WHEELS AND TYRES L:12:01

GENERAL DESCRIPTION

The vehicle is equipped with a four wheel, vacuum assisted, hydraulic disc brake system. The disc brakes are applied with separate front and rear hydraulic circuits. The hydraulic pressure for these circuits originates at a tandem master cylinder which is operated with push rods. Brake application is assisted with the aid of a mechanical/vacuum power servo unit which is activated by brake pedal application. The park brake mechanically operates the rear brakes only.

Each wheel assembly is equipped with a fixed caliper containing two opposing pistons (attached to knuckle or carrier), a brake disc (positioned over the hub and wheel studs) and a set of brake pads.

In addition to the service brake calipers and pads, the rear brakes are equipped with independent and separate park brake caliper and pad assemblies. The park brake calipers and pads are operated with the park brake lever inside the driver's compartment by means of two (2) separate cables to provide park and emergency braking of the rear discs. The park brake caliper and pad assemblies are secured to the rear service brake calipers. The park brake caliper and pad assemblies are self-adjusting by means of a spring loaded racheting pawl incorporated within the caliper apply lever.

The tandem master cylinder consists of two (2) independent cylinders in a single casting. Should one cylinder or system fail, the other system will remain operational. Each hydraulic system (front and rear) has a separate brake fluid supply well in the brake fluid reservoir which is mounted to the top of the master cylinder. The brake fluid reservoir is equipped with a float actuated, low fluid warning indicator. However, this system is not equipped with a low pressure indicator, a metering valve, proportioning valve or a combination of these valves.

The power assist from the brake servo unit is developed by engine vacuum. Engine vacuum, obtained from an intake manifold fitting, is applied to both sides of a diaphragm inside the servo unit. Depressing the brake pedal will allow atmospheric pressure to enter one side of the diaphragm. This difference in pressure develops the power assist used in applying the brake systems. The servo unit is located between the brake pedal and master cylinder. The apply pressure is transferred through two (2) in-line push rods. Should a vacuum failure occur, the two (2) push rods will act as a single rod and the brakes will continue to operate in the unassisted, conventional manner; however, additional brake pedal effort will be required. A vacuum check valve is used in the supply line where it connects to the servo unit. This check valve prevents vacuum loss from the servo unit after the engine stops running and provides enough vacuum reserve for emergency brake application. *(Fig. 1)*

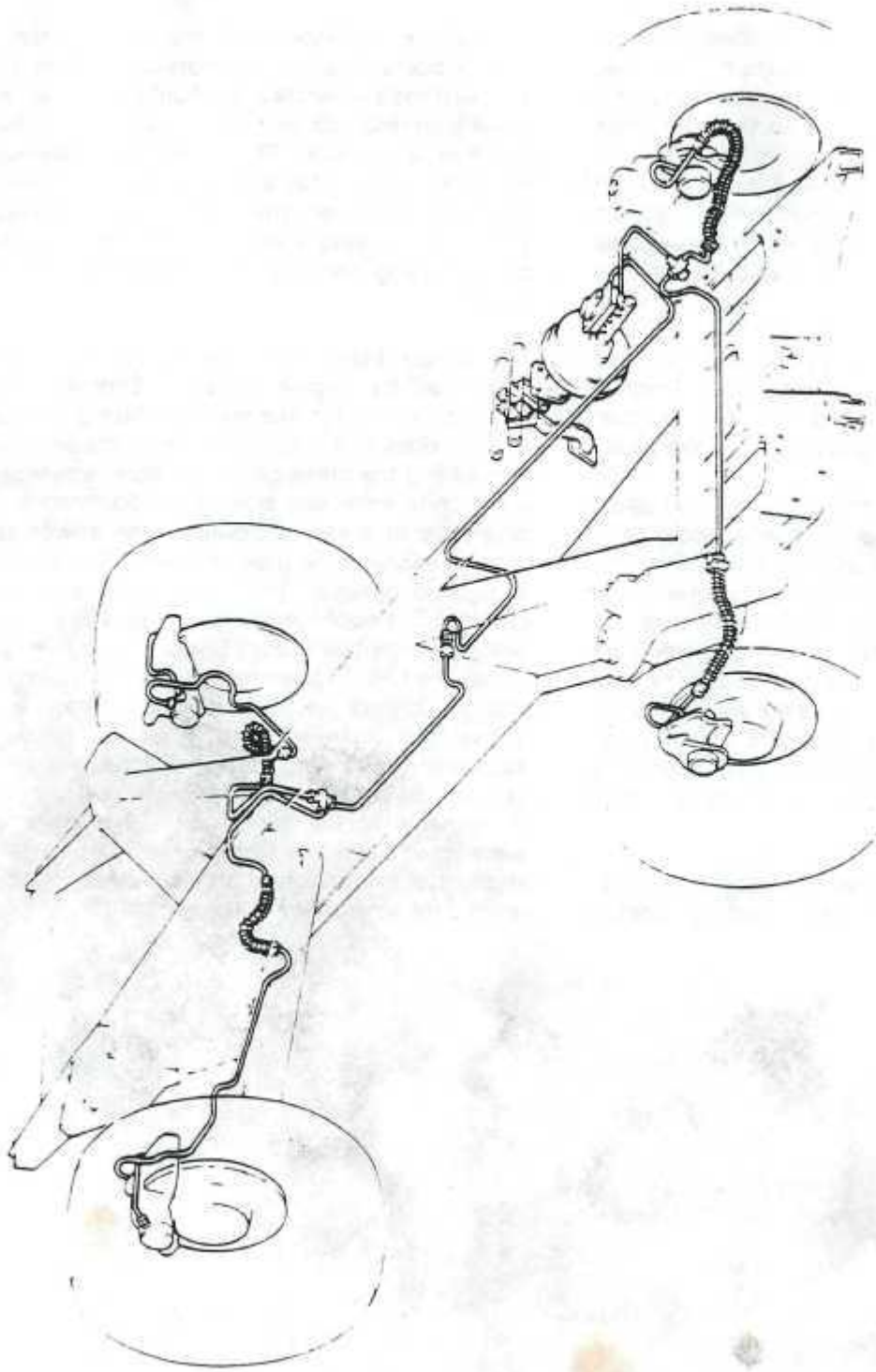


Fig. 1

SPECIFICATIONS

Brake Type	Power Assistance Discs Front and Rear
Boost Ratio	2.2 to 1
Diameter of Vacuum Servo	190 mm (7½")
Effective Braking Area Front	1800 Sq Cms (279 Sq Ins)
Effective Braking Area Rear	1690 Sq Cms (262 Sq Ins)
Disc Diameter Front	254 mm (10")
Disc Diameter Rear	276 mm (10½")
Hand Brake	Mechanical Self Adjusting Acting on Both Rear Discs
Brake Fluid Specification	D.O.T. 4/SAE J1703 (Hydraulic Fluid)

FRONT BRAKE PADS

INSPECTION

1. Raise car on hoist and remove front tyre and wheel assemblies.
2. Measure the thickness of the brake lining material on all pads. If the thickness of brake lining material on one or both pads is less than $\frac{1}{8}$" thick (3 mm) replace all pads.
   NOTE: Always replace pads in complete sets, on both sides.
3. Install tyre and wheel asemblies and torque to specification.
4. Lower car.

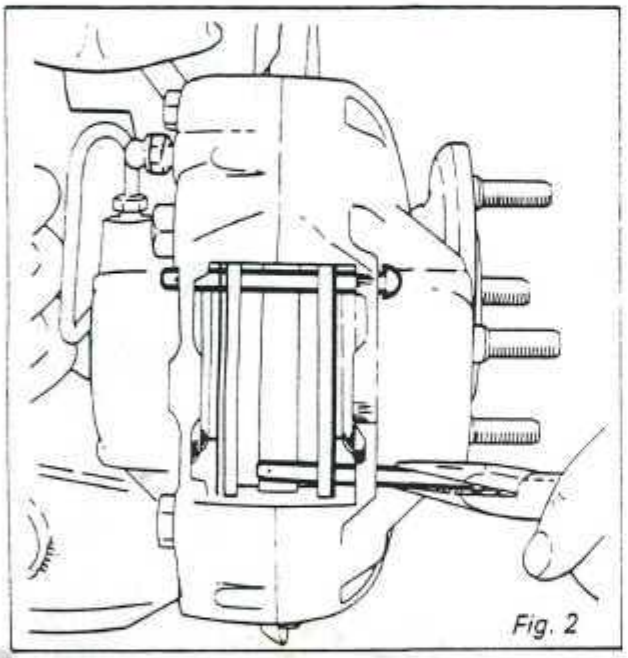


Fig. 2

FRONT BRAKE DISC PADS—REPLACE

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
   NOTE: When disc pads are being replaced, all pads on both front wheels should be replaced at the same time.
3. Clean the exterior of the caliper assemblies with a wire brush and note the location and position of damping shims.
4. Remove pad retaining pin clips from retaining pins and remove pad retaining pins. *(Fig. 2)*
   NOTE: Inspect the condition of the clips. If worn or corroded, install new clips on re-assembly. *(Fig. 3)*
5. Remove the disc pads from the caliper assembly.
6. Inspect piston dust covers for damage, deterioration or leakage. Replace as required.

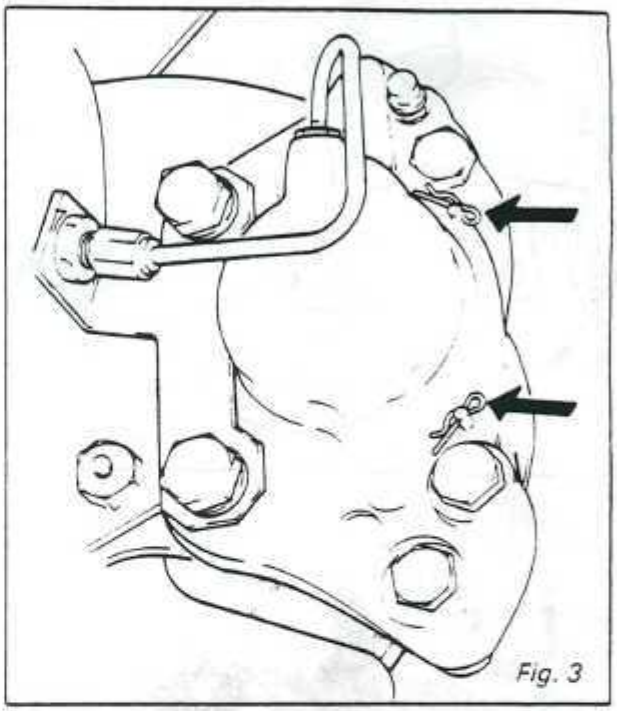


Fig. 3

INSTALLATION

1. Remove protective cap on brake fluid reservoir and place a clean shop towel over the opening to catch any displaced brake fluid.
2. Evenly press each piston back into its bore.
3. Clean pad gap area of caliper before installing new pads.
4. Using new anti-squeal shims, smear the special grease provided on both sides of the anti-squeal shims and on the back plates of the new pads.
   NOTE: Make certain no grease gets on the brake pad lining material.
5. Insert new brake pads and anti-squeal shims. The anti-squeal shims are to be placed between each brake pad and piston with the arrow shaped perforation pointing in the direction of disc rotation. *(Fig. 4)*
6. Install the pad retaining pins and secure with pin retaining clips.
7. Repeat this procedure on the other side.
8. Slowly pump the brake pedal to move the pistons and pads up to the disc.

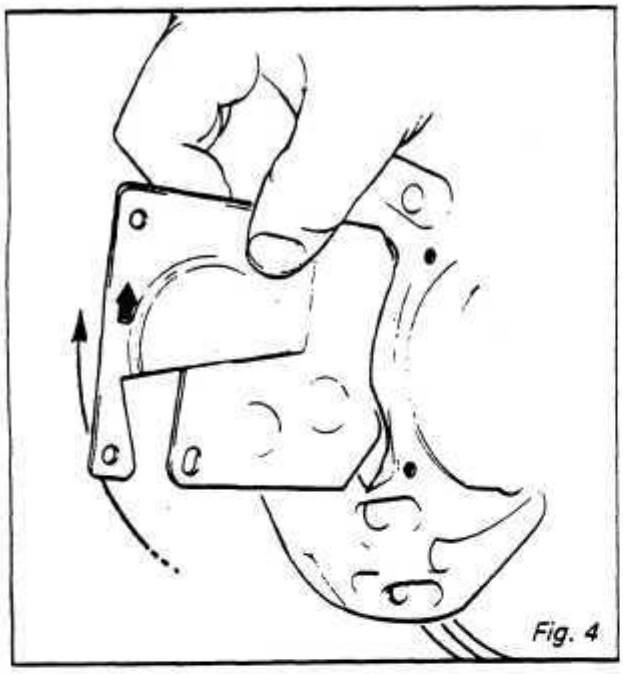


Fig. 4

9. Brake bleeding is generally unnecessary, but check the brake fluid reservoir for the proper fluid level ("MAX" mark on reservoir) and top up with fresh brake fluid as required.
10. Install tyre and wheel assemblies and torque to specification.
11. Lower car on hoist.

FRONT BRAKE CALIPER

REMOVAL

1. Remove brake disc pads as previously described.
2. Disconnect brake line at caliper and cap.
3. Remove two bolts securing the disc caliper assembly to the hub carrier and remove caliper. *(Fig. 5)*
   NOTE: Any shims removed between the mounting faces should be noted so they can be replaced in the same position upon installation.

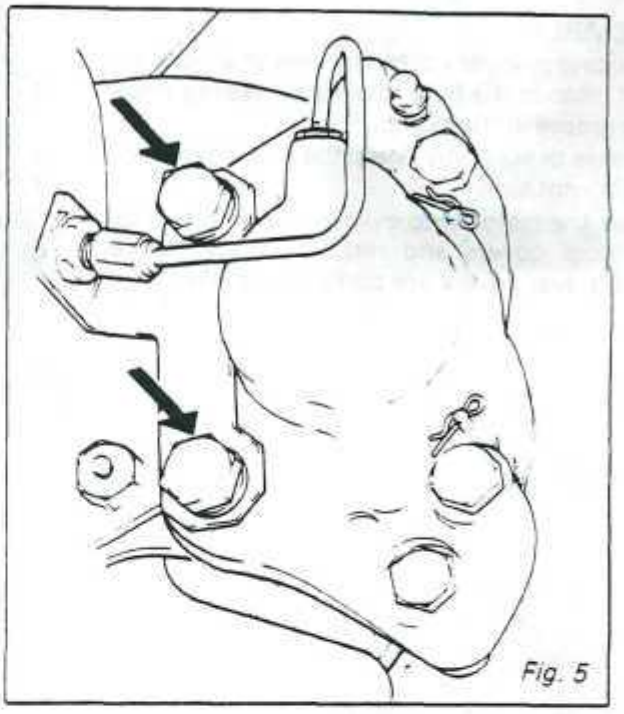


Fig. 5

INSTALLATION

1. To complete installation, reverse the removal procedure.
2. Torque fasteners to specification and bleed brake system.

UNIT DISASSEMBLY

1. Remove the caliper assembly as previously described.
2. Remove caliper piston dust cover retaining ring and remove piston dust covers. *(Fig. 6)*
3. Pack a clean piece of shop towel between the pistons and then drive them from the cylinder bores by applying clean compressed shop air to the inlet connection.
   CAUTION: Care should be exercised that fingers are kept well clear from the gap area and eye protection should also be worn as there may be fluid spray.
4. Remove piston sealing ring from bore.
   NOTICE: Care should be exercised not to damage the bore or locating groove.
5. Remove dust cap and unscrew bleed screw.

NOTICE: No attempt should be made to remove the bolts and separate the two halves of the caliper body.

INSPECTION

1. Clean all parts thoroughly with Girling cleaning fluid or fresh, clean specified brake fluid. (DOT 4 only).
2. Examine the cylinder bores and pistons carefully for signs of damage, abrasion, scuffing or corrosion. New pistons may be

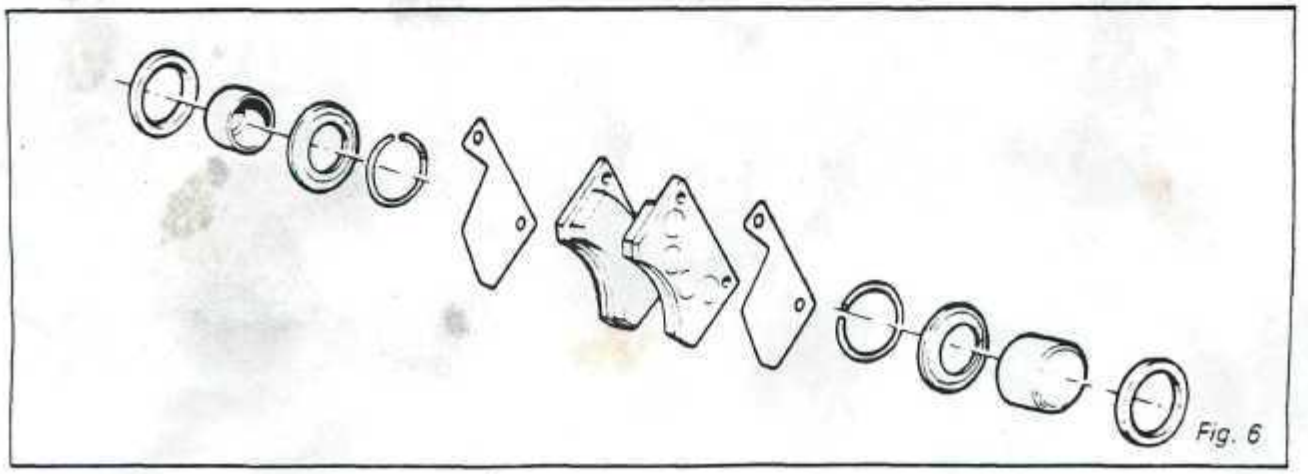


Fig. 6

installed. If the cylinder bore is damaged, the caliper must be replaced.

REASSEMBLY

1. Lubricate cylinder bores and new sealing rings with clean brake fluid and install sealing rings into groove in the bore.
2. For ease of assembly, keep the dust covers dry and do not lubricate.
3. Insert the piston into cylinder bore and install the dust covers and retaining rings. Make certain dust covers are correctly installed.

INSTALLATION

1. Position the caliper to the hub assembly ensuring shims originally removed between the mounting faces are correctly positioned. Torque to specification.
2. Replace pads retaining pins and retaining pin clips.
3. Reconnect brake pipe and bleed system.
4. Install tyre and wheel assembly. Torque to specification.
5. Lower car on hoist.

REAR BRAKE PADS

REAR BRAKE PADS—INSPECTION

1. Raise car on hoist and remove rear tyre and wheel assemblies.
2. Measure thickness of brake lining material on all parts. If the thickness of brake lining material on one or both parts is less than $\frac{1}{8}$" thick (3 mm) replace pads.
   NOTE: always replace pads in complete sets on both sides.
3. Install tyre and wheel assemblies and torque to specification.
4. Lower car.

REAR BRAKE DISC PADS—REPLACE

1. Raise car on hoist and remove both rear tyre and wheels assemblies.
   NOTE: When brake disc pads are being replaced, all service pads on both rear wheels should be replaced at the same time.
2. Clean exterior of caliper assemblies with wire brush.
3. Remove pad retaining pin clips from retaining pins and remove pad retaining pins.
   NOTE: Inspect condition of clips. If worn or corroded install new clips on reassembly.
4. Remove disc pads and damping shims from caliper assemblies.
5. Inspect piston dust covers for damage, or deterioration. Replace as required.

INSTALLATION

1. Remove brake fluid reservoir cap and place a clean shop towel in opening to catch any displaced fluid.
   Remove protective cap on bleed screw and open bleed screw one full turn to prevent fluid pressure from building up when caliper pistons are pushed back.
2. Evenly press each piston back into its bore.
3. Torque tighten the bleed screw to specification.
4. Clean pad gap area of caliper before installing new pads.
5. Insert new brake pads.
6. Install brake pad retaining pins and secure with pin retaining clips.
7. Repeat this procedure on other rear caliper.
8. Slowly pump brake pedal to move pistons and pads up to disc.
9. Brake bleeding is generally unnecessary, but check brake fluid reservoir for proper fluid level (MAX mark on reservoir) and top up with fresh brake fluid as required.
10. Install tyre and wheel assemblies and torque to specification.
11. Lower car.

REAR BRAKE CALIPER

REMOVAL

1. Remove brake disc pads as previously described.
2. Disconnect hydraulic brake line at rear caliper and cap.
3. Disconnect park brake cable from park brake caliper lever arm by removing backing off locknut. *(Fig. 7)*
4. Remove two (2) bolts securing brake caliper assembly to hub carrier and remove caliper assembly. *(Fig. 8)*

INSTALLATION

1. To complete installation, reverse the removal procedure.
2. Torque fasteners to specification and bleed brake system.

UNIT DISASSEMBLY

1. Remove brake caliper assembly as previously described.
2. Remove caliper piston dust covers retaining ring and remove piston dust covers.
3. Pack a clean piece of shop towel between the pistons and then drive them from cylinder bores by applying clean compressed shop air to brake line inlet connection.
   CAUTION: Care should be exercised that fingers are kept well clear from the caliper gap area and eye protection should also be worn as there may be some fluid spray.
4. Remove piston sealing ring from caliper bore.
   NOTE: Care should be exercised not to damage the bore or locating groove.
5. Remove dust cap and uncrew bleed screw.

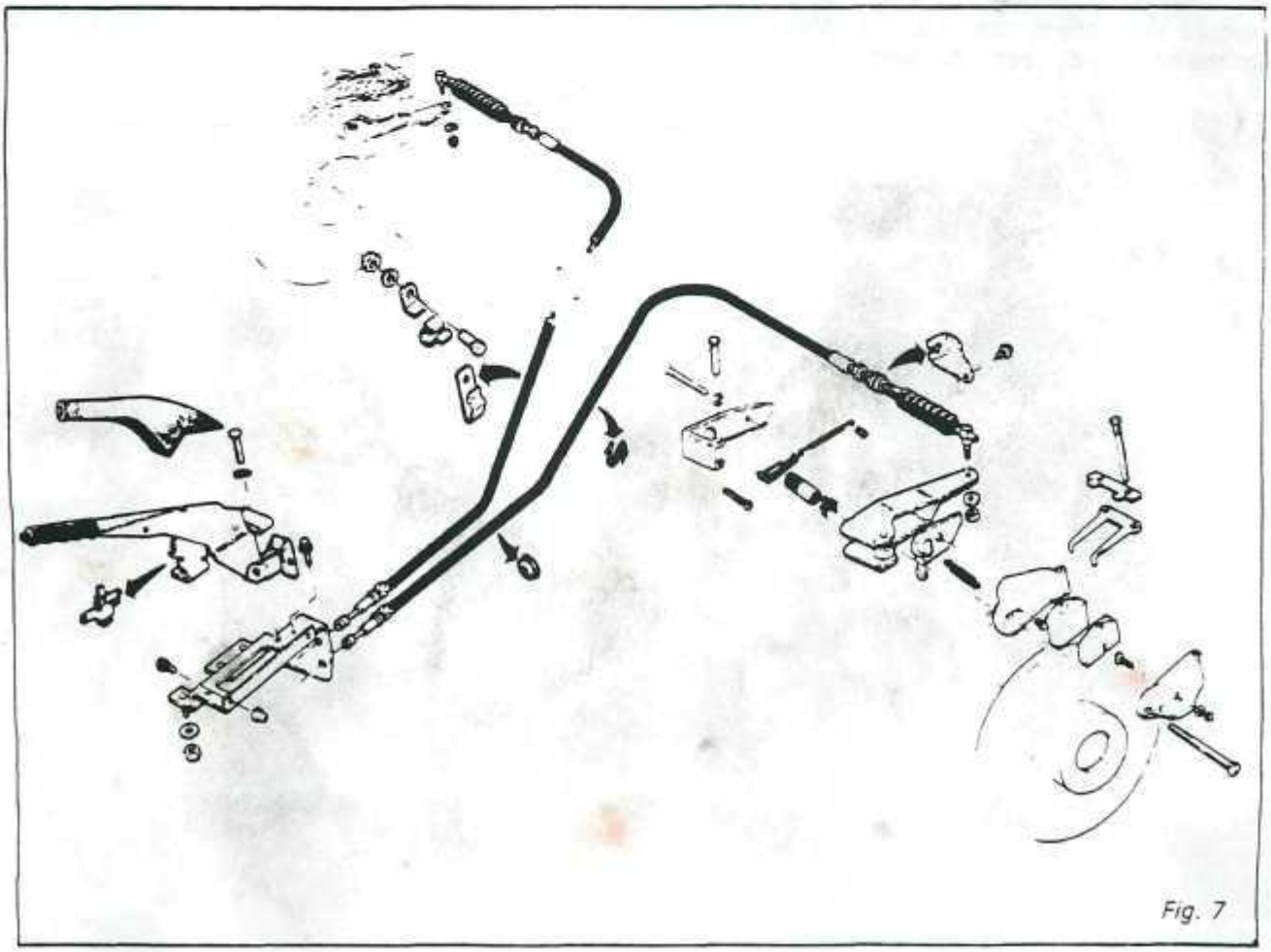


Fig. 7

NOTICE: No attempt should be made to remove the bolts and separate the two halves of the caliper body.

UNIT INSPECTION

1. Clean all parts thoroughly with Girling cleaning fluid or fresh, clean specified brake fluid (DOT 4 only).
2. Examine cylinder bores and pistons carefully for signs of damage, abrasion, scuffing or corrosion.
3. New pistons may be installed. However, if cylinder bore is damaged, replace caliper.

UNIT REASSEMBLY

1. Lubricate cylinder bore and new sealing ring with fresh clean brake fluid and install sealing ring into groove in bore.
   NOTE: For ease of assembly, keep dust cover dry and do not lubricate.
2. Insert piston into cylinder bore and position and secure dust cover retaining ring. Make certain the cover is correctly installed.

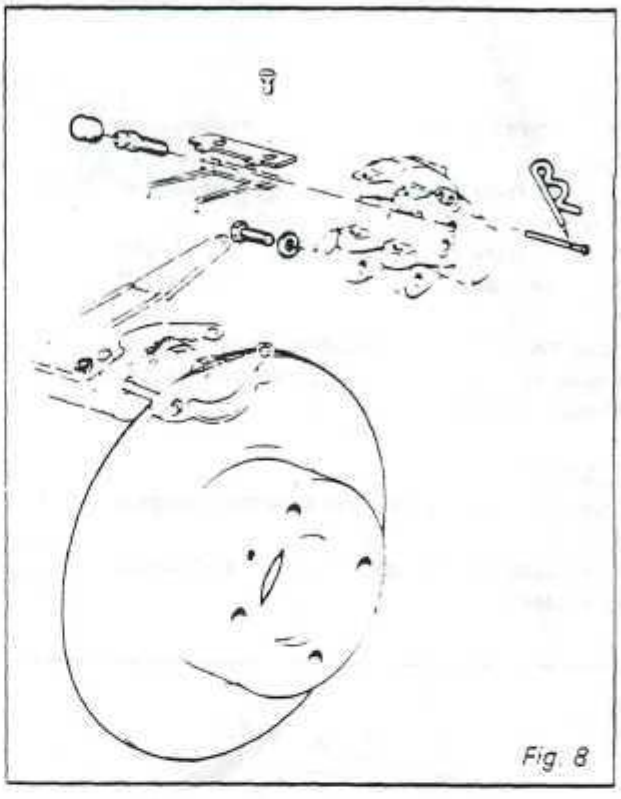


Fig. 8

BRAKE SERVO

REMOVAL—Fig. 9

1. Working inside car, remove spring clip and clevis pin from push rod fork.
2. Remove filler neck and master cylinder access covers from inside luggage compartment.
3. Remove two (2) nuts and washers 1 securing master cylinder to power brake servo and remove.
4. Disconnect vacuum pipe 2 from check valve 3 on brake servo.
5. Remove four (4) bolts securing brake servo mounting bracket to pedal box assembly.
6. Remove brake servo assembly from car.
7. Remove mounting bracket from servo unit by removing four (4) nuts.

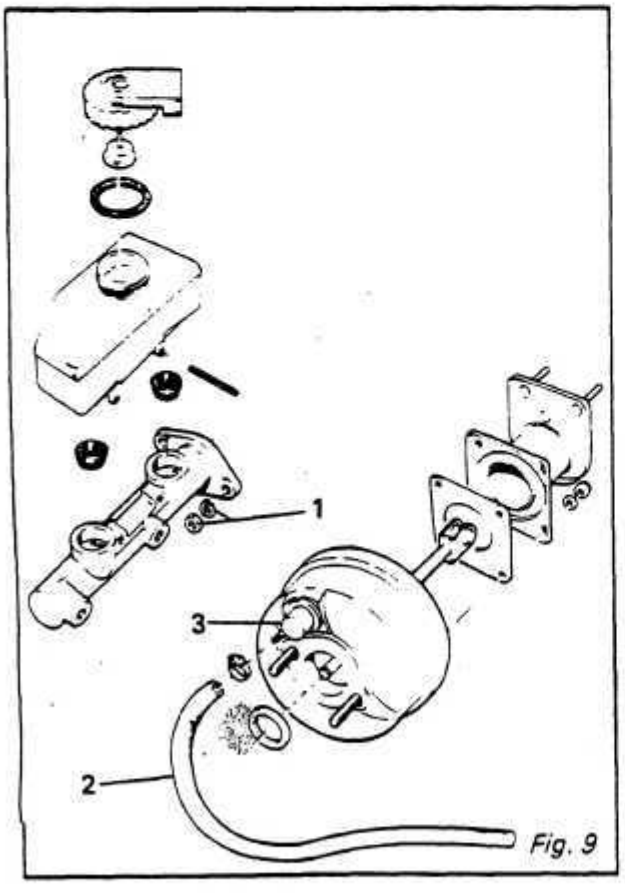


Fig. 9

INSTALLATION

1. Fit mounting bracket to brake servo, and torque to specification.
2. Position and secure brake servo assembly complete with mounting bracket, to the pedal box and torque the four (4) bolts to specification.
3. Install new seal between master cylinder and brake servo and ensure breather groove in servo-flange is clear.
4. Position the master cylinder to brake servo and secure with two (2) nuts and washers. Torque to specification.
5. Check vacuum pipe to valve on brake servo. Secure with clamp.
6. Position and secure the fuel filler neck and master cylinder access covers.
7. Working inside car, connect fork on input rod, to pedal relay lever by inserting the grease smeared clevis pin and spring clip.

CHECK VALVE—REMOVAL

1. Remove the fuel filler neck and master cylinder access covers from inside the luggage compartment.
2. Remove the check valve 3 by pulling on nozzle while exerting side thrust. Use a screwdriver between the rubber grommet and the valve flange taking care not to damage the unit. *(Fig. 9)*

NOTE: When removing the grommet ensure that it does not drop into the vacuum chamber.

INSTALLATION

1. Lubricate the ribs of the new check valve and install a new grommet into the brake servo.
2. Push in the check valve, so that it is located squarely on its seating, and the stem is in the original direction.

AIR/NOISE FILTERS

REMOVAL

1. Remove the power brake unit as previously described.
2. Pull back the dust cover and filter retainer, hook out the filters, and cut to remove from input rod.

INSTALLATION

1. Cut new filters to same length as old. Install over input rod and press into the neck of the valve body.
2. Reinstall the filter retainer and dust cover. NOTE: If the dust cover is damaged replace as necessary.

SEAL AND PLATE ASSEMBLY – REMOVAL

1. Remove the power brake unit as previously described.
2. Remove the seal and plate assembly from the front shell recess by gripping the centre rib and pulling off.

INSTALLATION

1. Wipe clean the output rod and recess wall. Lubricate the new seal and plate assembly.
2. Wipe clean the front mating face of the unit and with plate side leading, install the new seal and plate assembly over the rod and into the recess.

BRAKE MASTER CYLINDER/FLUID RESERVOIR

REMOVAL—Fig. 10

1. Remove access cover from inside luggage compartment.
2. Disconnect electrical connection to master cylinder cap.
3. Disconnect brake lines from master cylinder, and cap to reduce spillage of brake fluid.
4. Remove two (2) nuts securing master cylinder to power brake unit, and remove master cylinder.
   A small screwdriver with the end rounded and polished is required to remove the seals.
5. Remove the filler cap and drain off surplus brake fluid; remove rubber washer.
6. Remove the fluid reservoir from the master cylinder, by removing the two (2) roll pins.
7. Remove the fluid reservoir and lever out the seals 2. *(Fig. 10)*

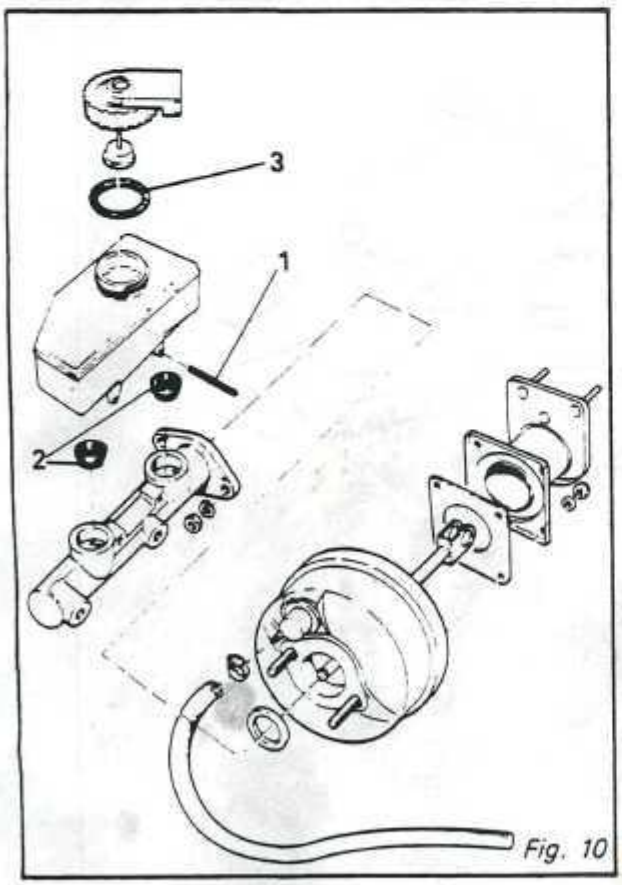


Fig. 10

INSTALLATION

1. To install the fluid reservoir lubricate the seals and press the fluid reservoir into position on the cylinder. Install the fluid reservoir retaining pins and pin retaining clips.
2. Install a new rubber washer 3 in the filler cap and screw the cap onto the reservoir.
3. Locate the master cylinder on the studs of the brake servo unit.
4. Install the two (2) locking washers and nuts and torque to specification.
5. Remove covers/plugs and connect brake lines to master cylinder.
6. Torque the brake line nuts to specification.
7. Connect electrical connection to the cap on the master cylinder.
8. Position and secure the access cover from inside the luggage compartment.
9. Refill and bleed the brake system.

TESTING THE OPERATION OF THE LOW FLUID WARNING DEVICE.

1. Press the small rubber diaphragm located on the reservoir cap, if the brake warning light (on the instrument cluster) illuminates, the operation of the low fluid warning is correct.
   NOTE: This warning light will not indicate fault conditions in the braking system, other than the two functions explained.

TESTING THE OPERATION OF THE PARKING BRAKE REMINDER

1. Apply the parking brake, if the brake warning light illuminates, then it indicates that the operation of the parking brake reminder is correct.
2. If the light does not illuminate check for bulb failure or continuity of electrical circuit.

BRAKE PEDAL

REMOVAL

NOTE: Manual Transmission — *(Fig. 11)* — this procedure may be performed wth the pedal box installed; Automatic Transmission — *(Fig. 12)* — the pedal must first be removed from the car.

1. Remove the spring clip and clevis pin connecting the brake pedal.
2. Remove the spring clip retaining the pedal shaft from the right side of the pedal box.
3. Move the pedal shaft towards the left hand side (at the same time inserting a short bar or screwdriver to retain the accelerator pedal) sufficiently to release the brake pedal.
4. The pedal pivot bushes may be replaced by knocking out the old bushes and pressing in the new.

INSTALLATION

1. Lubricate the brake pedal pivot bushes with SMP white lithium based grease.
2. Smear the relay link clevis pin with a molybdenum based grease and lightly oil the shaft retaining clip and felt washer.
3. Position the brake pedal in the pedal box and push the pedal shaft through brake pedal, accelerator pedal, felt washer, plain washer and into the 'D' shaped hole in the pedal box. Retain with screw.
4. Connect the relay link to the brake pedal lever with the clevis pin and retain with its spring clip.
5. Wipe any excess lubricant from the assembly and ensure that all pedal pads are totally grease free.

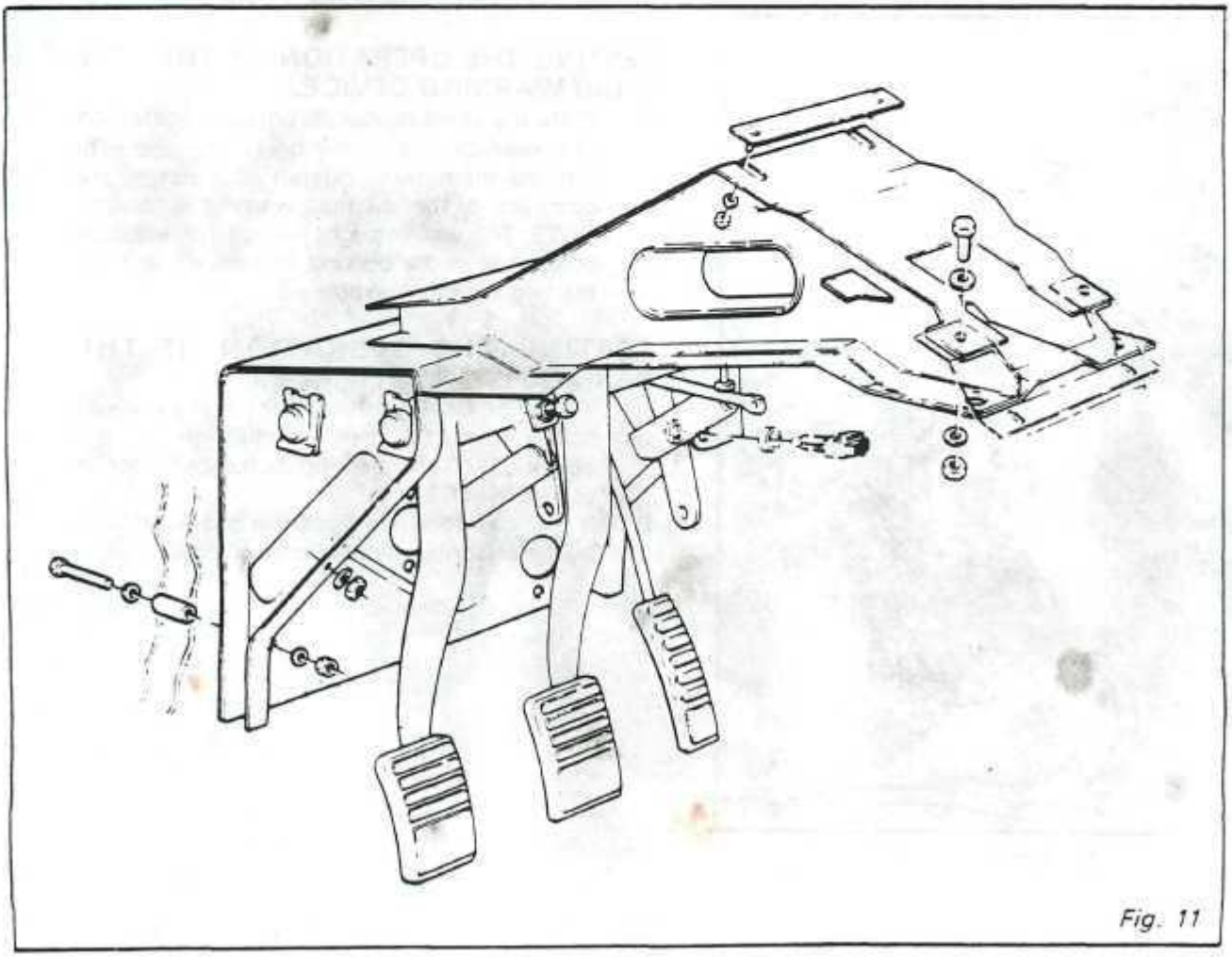


Fig. 11

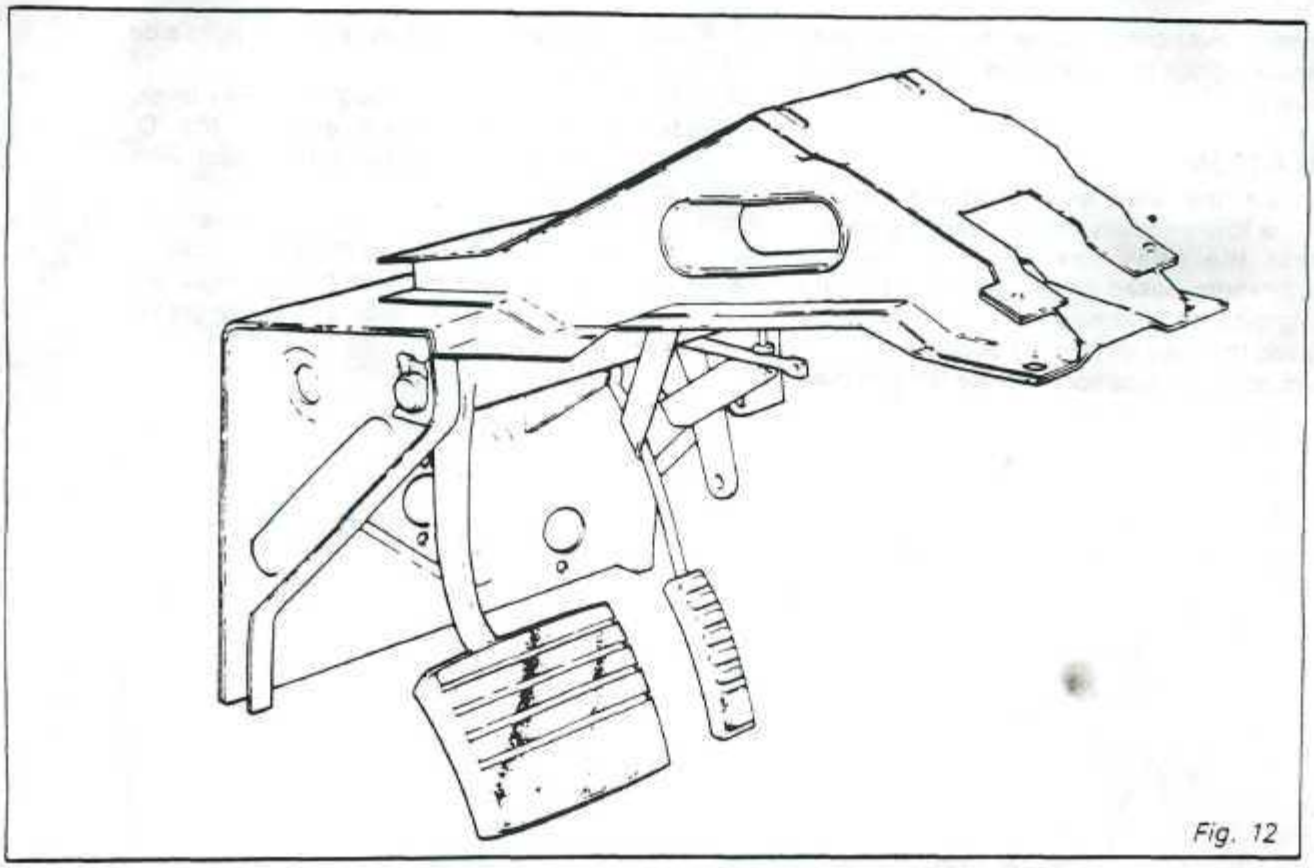


Fig. 12

6. Automatic transmission only. Install the pedal box assembly. *(Fig. 12)*

PEDAL RELAY LEVER (MANUAL ONLY) - REMOVAL

1. Remove the pedal box assembly from car.
2. Remove the spring clips and clevis pins connecting the relay links to the relay levers.
3. Remove the spring clip retaining the pedal shaft from the right side of the pedal box.
4. Draw out the relay shaft towards the left side to release the relay levers, with their springs.
5. The relay lever pivot bushes may be replaced by knocking out the old bushes and pressing in the new. *(Fig. 11)*

INSTALLATION

1. Lubricate the relay pedal pivot with SMP grease.
2. Smear the relay link clevis pin with molybdenum based grease and lightly oil the shaft retaining clips and felt washer.
3. Position the relay levers in the pedal box with the spacer washer (if fitted) between the left side of the clutch relay lever and the pedal box, and the springs in their locations.
4. Push the relay shaft through the spacer washer, clutch relay lever, brake relay lever, felt washer, plain washer and into the 'D' shaped hole in the pedal box. Retain with spring clip.
5. Connect the relay links to the relay levers with the clevis pins and retain with their spring clips.
6. Wipe any excess lubricant from the assembly and ensure that all pedal pads are totally grease free.
7. Install the pedal box assembly. *(Fig. 11)*

PEDAL RELAY LEVER (AUTOMATIC) — REMOVAL

1. Remove the spring clip and clevis pin connecting the relay link to relay lever.
2. Remove the spring clip retaining the pedal shaft from the right side of the pedal box. *(Fig. 12)*
3. Draw out the relay shaft towards the left hand side to release the relay lever with its spring.

4. The relay lever pivot bushes may be replaced by knocking out the old bushes and pressing in the new.

INSTALLATION

1. Lubricate the relay lever pivot bushes with SMP, a low viscosity lithium based grease.
2. Smear the relay link clevis pin with a molybdenum based grease and lightly oil the spring clips and felt washer.
3. Position the relay lever in the pedal box with its return spring in position and the felt and plain washer between the relay lever and right side of the pedal box.
4. Push the relay shaft through the relay lever, felt washer, plain washer and into the 'D' shaped hole in the pedal box. Retain with spring clip.
5. Connect the relay link to the relay lever with the clevis pin and retain with its spring clip.
6. Wipe excess lubricant from the assembly and ensure that all pedal pads are totally grease free.

BRAKE BLEEDING PROCEDURE

BRAKE SYSTEM BLEEDING – MANUALLY

Whenever any part of the brake system has been disconnected or when the level of brake fluid in the reservoir becomes so low as to allow air to be drawn into the master cylinder, bleeding the air from the brake system is required.

If brake component seals are worn or deteriorated it is possible for air to enter the caliper piston bores without any indication of leaking brake fluid and thus creating a 'spongy' pedal feel. This spongy pedal feel is the usual indication of air in the system.

NOTICE: It is important that cleanliness be strictly practiced during the entire brake bleeding procedure. Care should be exercised to ensure that dirt or water are not allowed to enter the brake system, especially at the reservoir.

BLEEDING PROCEDURE

1. Inspect brake fluid reservoir for proper fluid level (at MAX mark) and top up if necessary with fresh, unused brake fluid of the specified grade (DOT 4) (SAE 1703).
   NOTICE: Never use brake fluid which has been bled from any system to top up the fluid in the reservoir as it may be contaminated or aerated.
   NOTICE: Periodically inspect the level of brake fluid in the brake reservoir during the bleeding procedure. Care should be exercised not to allow the level of fluid to drop to a point where air could enter the hydraulic system via the reservoir.

   A clean glass container holding approximately ½" of clean, unused brake fluid (DOT 4) should be used to receive the brake fluid being bled from the system. In addition, the end of the transparent drain tube should always be immersed in this fluid during the bleeding procedure.

   When bleeding the brake system it is important to start with the **longest length** of hydraulic line first.
2. With the engine off, remove the vacuum reserve in the brake servo booster by applying the brakes several times.
3. Raise car on hoist.
   When bleeding all four wheels, the following sequence **MUST** be followed:
   A. RIGHT REAR
   B. LEFT REAR
   C. RIGHT FRONT
   D. LEFT FRONT
4. Install a box end wrench over the caliper bleeder screw and install a transparent drain hose over the bleeder screw. The drain hose should then be placed into the receiving container with the other end immersed in brake fluid.
5. Repeat the following steps for each wheel in the sequence previously listed:
   A) Fully depress the brake pedal **slowly one time and hold.**
   B) Loosen the bleed screw to purge the air from the line.
   C) Re-tighten the bleed screw.
   D) Slowly release the brake pedal and wait 5 seconds to allow the master cylinder piston to fully retract.
   E) Repeat A through D until brake fluid containing no bubbles emerges from the drain tube.

   NOTICE: There may be a small amount of red fluid discharged from the drain tube on the initial bleeding of the brake system. This fluid is test fluid used by the manufacturer during production and is not harmful to the system.

   NOTICE: Top-up the brake fluid reservoir as required during the bleeding procedure making certain air is not drawn into the system.
6. Lower car and top up brake fluid reservoir as required.

BRAKE SYSTEM BLEEDING—PRESSURE TECHNIQUE

Bleeding the brake system with available pressure bleeder tools considerably assists in performing this procedure. These tools are equipped with brake fluid holding tanks pressurised.

The variety of equipment consists of a holding tank partially filled with brake fluid and a rubber hose which is intended to be connected to master cylinder adapter suitably designed to be installed on specific master cylinder reservoirs. Compressed air is then placed in the holding tank which forces the brake fluid into the brake hydraulic system via the master cylinder reservoir.

Pressure bleeding equipment must be of the diaphragm type, that having a rubber diaphragm between the brake fluid and the air supply to prevent moisture, air or other contaminants from entering the brake hydraulic system.

Brakes, Wheels and Tyres

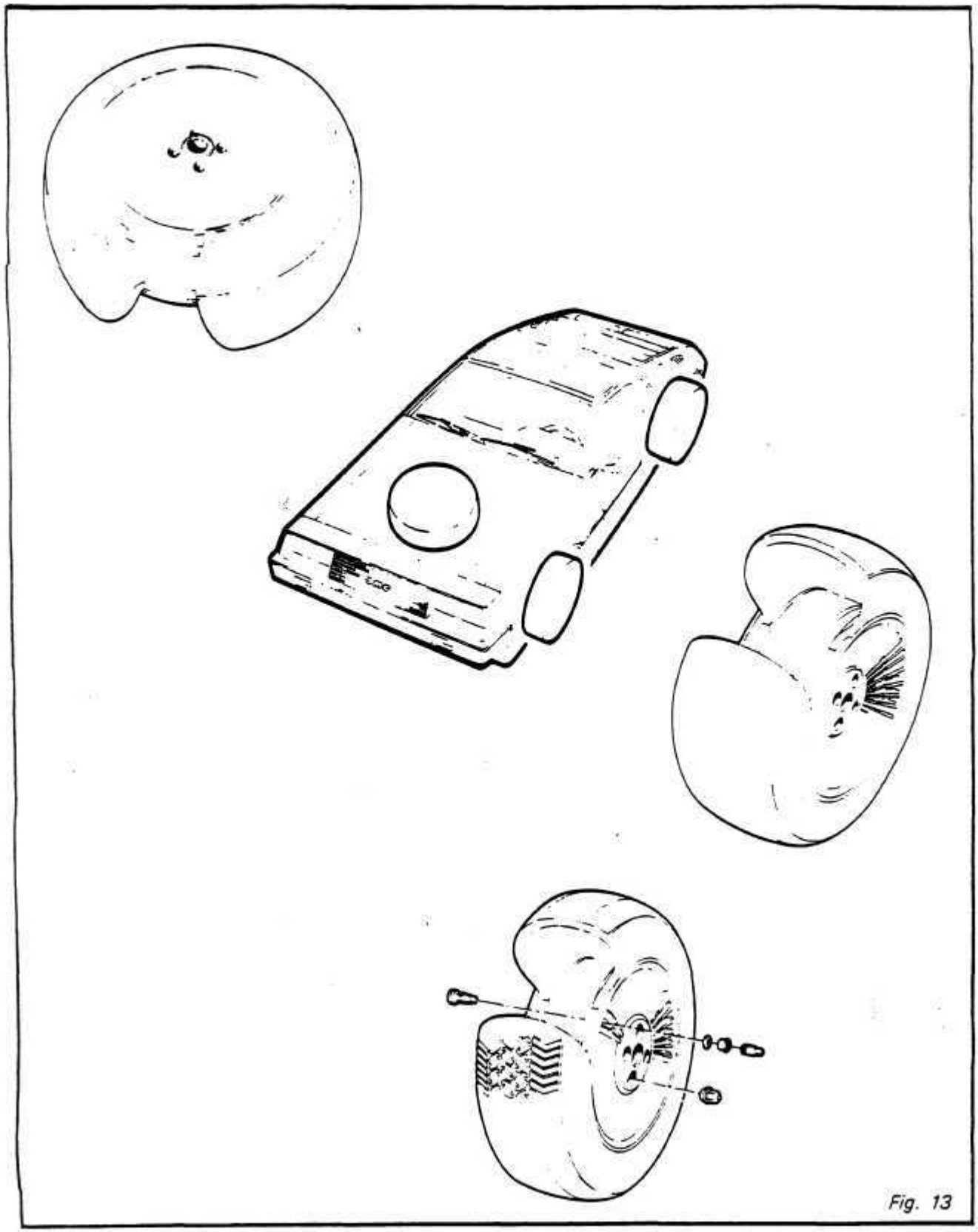


Fig. 13

WHEELS AND TYRES

WHEELS—Fig. 13

The wheels are a four bolt locating aluminium alloy LM25KD with 45 ribs equally spaced at 8°, with windows between.

The maximum run out of the wheel is 0.5 (.080") measured at any location on either tyre seat.

SPARE WHEEL

The spare wheel and tyre assembly is for emergency use only. The maximum speed advised is 50 mph, and the tyre pressure should be kept at 60 PSI.

To conserve tyre tread the spare wheel should be returned to the storage area as soon as the standard tyre can be repaired or replaced.

WHEEL SIZES

Front Wheel	14" × 6" (375mm × 152mm)
Rear Wheel	15" × 8" (381mm × 203mm)
Spare Tyre	15" × 4" (381mm × 102mm)

CLEANING

Using a brush with nylon or natural bristles only, the wheel should be washed with warm water and detergent.

TYRES:

The tyres are steel belted tubeless radials.

TYRE SIZES:

Front	195/60 HR 14
Rear	235/60 HR 15
Spare	T125/70 D15

TYRE PRESSURES: for normal and high speed driving.

	Normal	High Speed
Front	23LB F/IN²	29LB F/IN²
Rear	30LB F/IN²	34LB F/IN²
Spare	60LB F/IN²	

GENERAL INFORMATION

1. Wheel nuts should be torqued to 100Nm (70 LB FT). The wheel nuts should be tightened alternately to the correct torque.
2. Never use oil or grease on the studs or nuts. Improperly tightened nuts could eventually allow the wheel to come off, while the car is moving, causing loss of control.
3. Tyres should be checked at regular intervals, for tread depth and external cuts in the fabric, exposure of ply or cord structure, lumps or bulges.
4. It is essential that the wheel and tyre assembly are balanced regularly and that the geometry (tracking) is checked as recommended in the Steering Section (H).

Electrical System and Instruments

CONTENTS

IGNITION SYSTEM M:01:01

STARTER M:02:01

DIAGNOSTIC SOCKET M:03:01

DUCELLIER ALTERNATOR M:04:01

MOTOROLA ALTERNATOR M:05:01

BATTERY M:06:01

FUSES AND FUSE BOX M:07:01

HORNS M:08:01

WINDSHIELD WASHERS M:09:01

INSTRUMENT CLUSTER WARNING LIGHT IDENTIFICATION M:10:01

LIGHTING SYSTEM M:11:01

IGNITION SWITCH M:12:01

HAZARD WARNING LIGHT SWITCH M:13:01

DOOR LIGHT SWITCH M:14:01

ENGINE COOLING M:15:01

RADIO M:16:01

DOOR ELECTRICS M:17:01

ELECTRIC WIRING DIAGRAMS M:18:01

IGNITION SYSTEM

The ignition system is comprised of Battery, Ignition Switch, Coil with certain special features, Electronic Unit, Distributor with inductive pick-up, two Resistances and Sparking Plugs.

DISTRIBUTOR

The Distributor is driven by a spiral gear on the camshaft and rotates in a clockwise direction. The breaker points in the distributor have been replaced by a pulse generator consisting of a Stator, Detecting Coil and Permanent Magnet.

The pulse generator is connected to an Electronic Control Unit (E.C.U.) in which the signal from the Distributor is converted and amplified. The E.C.U. is connected to the coil.

Ignition spark advance is achieved by mechanical advance and a vacuum diaphram unit. The advance is mechanically controlled, according to engine speed, by governor weights inside the Distributor body and according to engine load by vacuum control acting directly on the base plate. As vacuum advance does not operate at idling speed due to the butterfly plates being closed, a correctly retarded spark is obtained for starting.

Note:
The dwell angle cannot be read, neither can it be adjusted.

REMOVING – REFITTING (DISTRIBUTOR) – Fig. 1

Note:
The mixture regulator must be removed to reach the distributor. Mark the following before removing the distributor:

1. Position of distributor body in relation to cylinder head.
2. Position of rotor arm in relation to cylinder head.

This will aid reassembly and avoid having to retime the ignition:

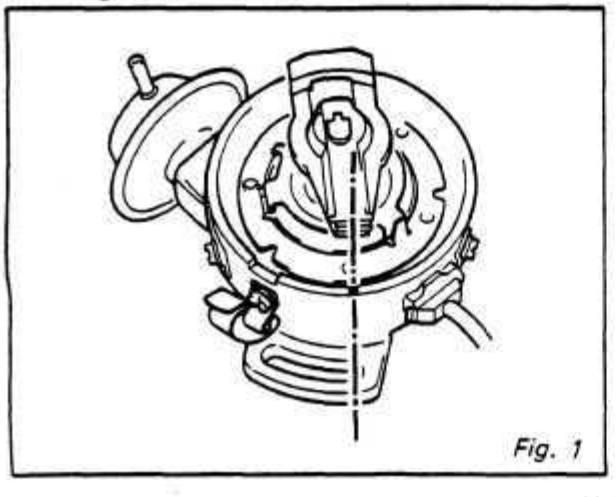


Fig. 1

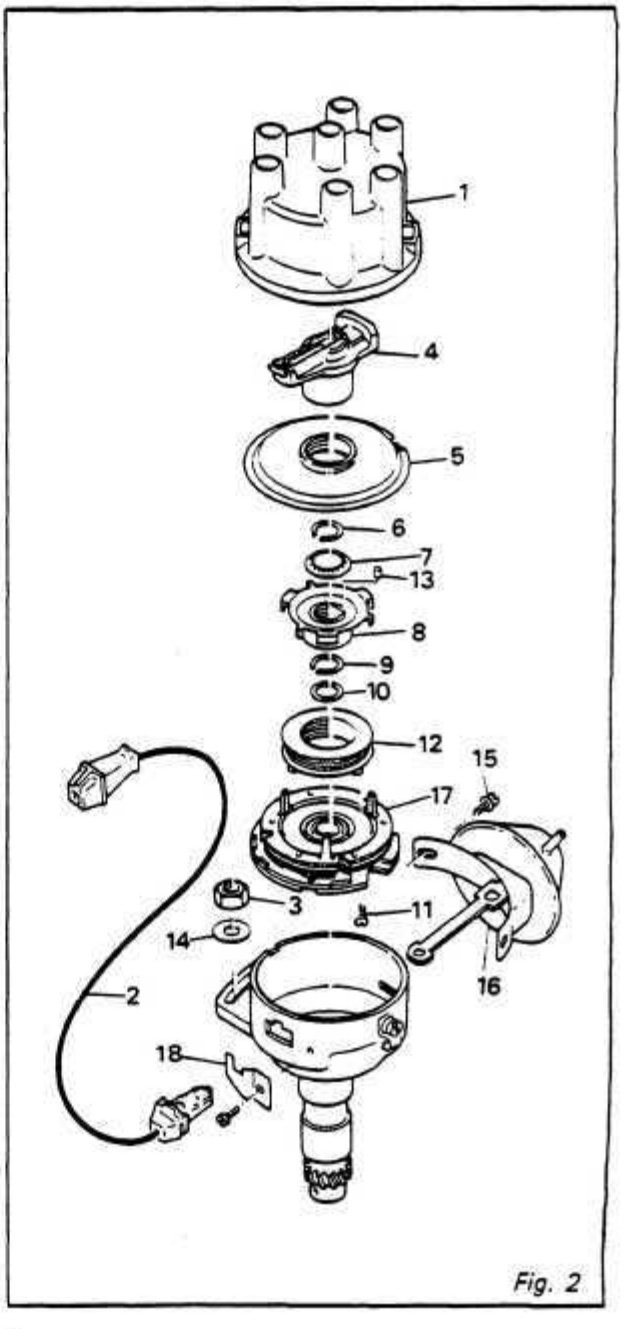


Fig. 2

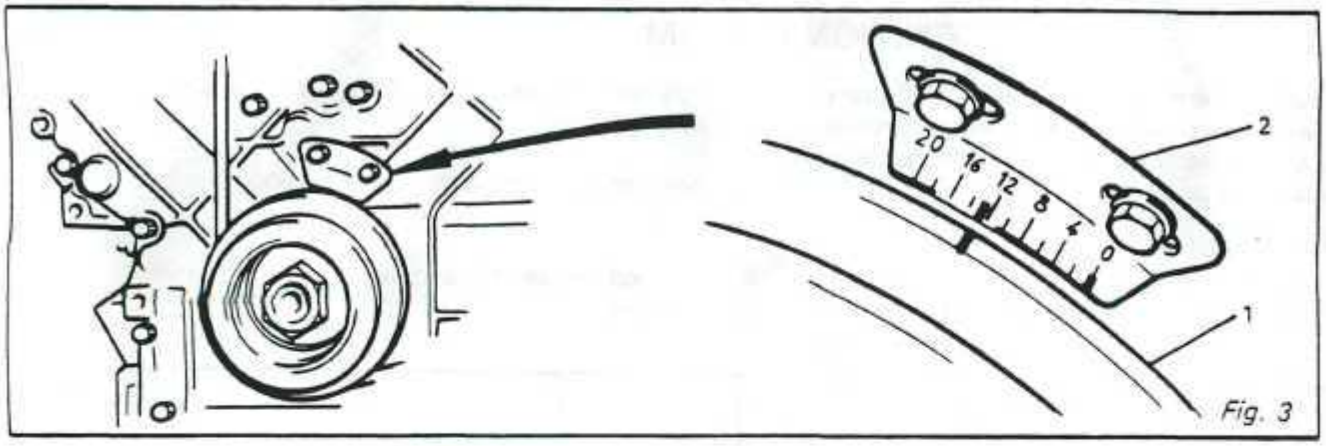


Fig. 3

1. Disconnect Battery.
2. Remove Distributor Cap (1). *Fig. 2*
3. Disconnect wire (2) between E.C.U. and Distributor.
4. Unscrew distributor retaining nut (3) and washer (14).
5. Remove Distributor.

REFITTING — Figs. 2 and 3

Follow the marks made on dismantling, check the Timing and adjust if required.

If in doubt as to the position of the Distributor proceed as follows for a first approximate setting:—

1. Set cylinder No. 1 to T.D.C. — firing stroke (line up marks on Crankshaft Pulley (1) and Calibrated Bracket (2) attached to the Timing Chain cover).
2. Line up the Rotor Arm (3) to the No. 1 Cylinder mark on Distributor Body (4). Note that the Distributor Spindle is driven by spiral gears and allow for this when lowering, also make sure Timing Adjustment Slot passes over the Fixing Stud. Then refit the Mixture Regulator (Gaskets must be renewed).

SETTING THE IGNITION TIMING — Fig. 4

There are two slots cut into the Crankshaft Pulley indicating No. 1 and No. 6 Cylinder T.D.C. A Timing Plate (2) is provided on the Timing Cover indicating 0° to 20° advance. The engine must be running at 775 ± 50 R.P.M. for this adjustment.

1. Connect up Strobe Light (3) to Cylinder No. 1 or No. 6.
2. Set the Crankshaft Pulley (1) Timing Slot opposite the Fixed Timing Line 13° by means of moving the Distributor.

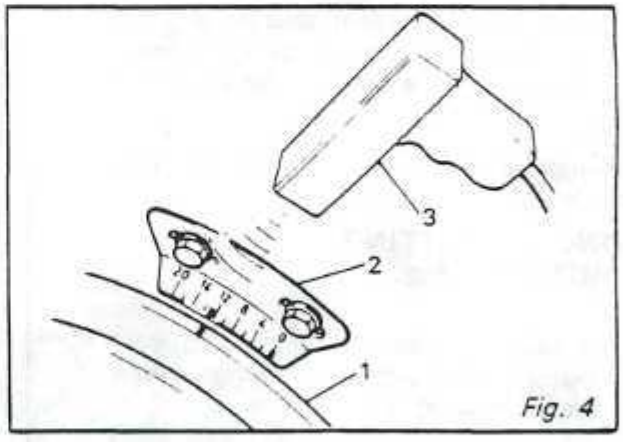


Fig. 4

DISMANTLING DISTRIBUTOR — Fig. 2

1. Remove Distributor Cap (1), Rotor Arm (4) and Dust Cover (5).
2. Unscrew Bracket (18) to remove low Tension Wire (2).
3. Remove Circlip (6) and Starwasher (7), holding Rotor (8), lever Rotor (8) off, with two screw drivers.
4. Remove Circlip (9) and Compensating Washer(s) (10).

5. Remove Screws (15) and withdraw Vacuum Valve (16), withdraw Coil Magnet (12) and Base Plate (17) as an assembly.

6. Remove three Screws (11) and remove Coil Magnet (12). Take care not to lose the Rotor Key (13).

ELECTRONIC CONTROL UNIT (E.C.U.) — Fig. 5

The E.C.U. module controls the operation of the ignition coil and determines the proper dwell angle. The module is a sealed component and must be replaced as a unit when confirmed as the cause of ignition breakdown. The module monitors engine operation by the varying voltage pulses it receives from the pulse generator in the Distributor. This then converts the signal received which breaks this current suddenly to obtain induced H.T. current at the coil output terminal.

This H.T. current is sent to each spark via a rotor arm in the same way as in the conventional distributor.

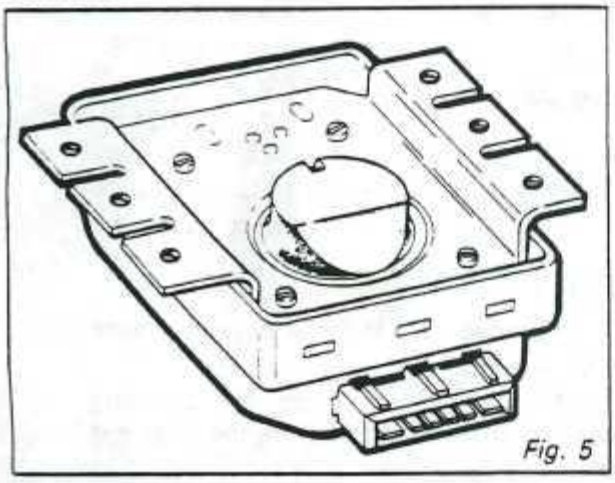


Fig. 5

COMPENSATING RESISTOR — Fig. 6

A dual resistance ballast resistor is used to control primary circuit voltage and current flow.

When the ignition is switched "on" the current flow is reduced by both resistors to prevent overheating of the coil. In operation to provide increased coil voltage for starting the engine, one half of the ballast resistor is by-passed during the engine cranking process to reduce the circuit resistance. The coil primary voltage and current will increase thus increasing secondary output voltage.

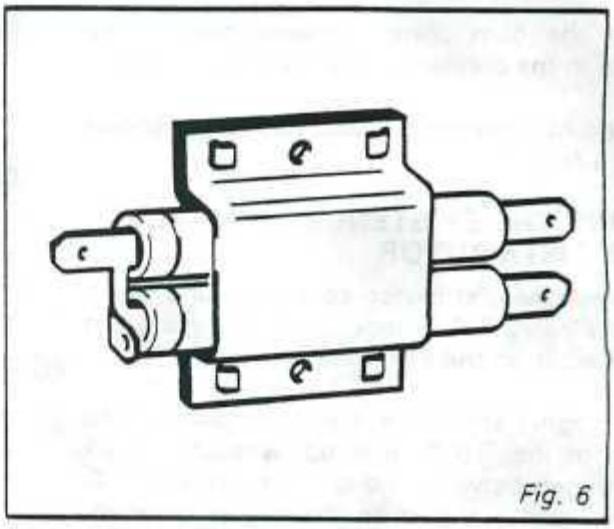


Fig. 6

CHECKING THE TRANSISTORIZED IGNITION SYSTEM

Preliminary Checks

1. Disconnect plug lead from plug, fit replacement spark plug in the lead.

2. Earth plug to cylinder head and get a colleague to crank engine, a spark should jump the gap in the plug.

Each plug should be checked, if no spark occurs, check components.

CHECKING THE COMPONENTS

Checking the resistances:
Connect an ohm meter across the terminals on both resistances. Meter should indicate approximately 0.5 ohm/Resistance.

Checking the Ignition Coil:
L.T. circuit connect an ohm meter between Battery + terminal and distributor terminals on the ignition coil, meter should indicate approximately 1 ohm.

H.T. circuit connect the ohm meter between the Battery + terminal and H.T. output socket on the ignition coil, meter should indicate approximately 7000 ohm.

WARNING: THESE RESISTANCES ARE HIGH.

Checking the Distributor:
Connect the ohm meter between the two terminals in the L.T. connector, meter should indicate approximately 1000 ohm.

Connect the ohm meter between one of the terminals in the connector and distributor body.

Meter should show open circuit. Resistance shows there is a fault.

PROVING THE EXISTENCE OF A FAULT IN THE DISTRIBUTOR

Disconnect the distributor connector and insert two wires from a T.D.C. pick up into the sockets in the connector on the electronic unit side.

Take a magnet and move it smartly towards and away from the T.D.C. pick up. Should a spark jump the gap between the ignition coil and H.T. lead the distributor must be changed or replaced.

If the ignition is faulty when the engine is running:

It is adviseable to change the electronic unit when misfiring or jerky operation occurs, only after first checking the following:

- Spark Plugs
- H.T. Leads
- Position Plug Leads
- Distributor
- Ignition Coil

Checking the Curves on the Oscilloscope:
The control voltage curve cannot be checked on the oscilloscope and this voltage cannot be altered. Only the H.T. curve can be checked in the same way as for a conventional distributor.

The dwell angle cannot be read neither can it be adjusted.

SPECIFICATIONS

Distributor

Rotation	: Clockwise
Firing Order	: 1-6-3-5-2-4
Resistor Value	0.5 ohm each (1.0 ohm total)
Ignition Timing	: 13° ± 2° B.T.D.C. at 775 ± 50 rpm
Centrifugal Advance	: 1000 rpm = 0° 2000 rpm = 10° 3000 rpm = 14° 4000 rpm = 20°
Vacuum Advance	: 5 in HG = 3° 10 in HG = 12° 15 in HG = 20°
Induction Coil Resistance	: 895 – 1,275 ohm
Trigger/Stator air gap	: 0.25 mm (use non magnetic feeler gauge)

Coil

Primary Winding Resistance	: 0.95 – 1.4 ohm at 20°C
Secondary Winding Resistance	: 5.5 – 8.5 kohms
Average Current Value Through Primary Winding at idle	: 3.2 amps
Spark Plugs	: Bosch HR6 DS
Spark Plug Gap	: 0.6 mm to 0.7 mm (.024 to .028)
Spark Plug Tightening Torque	: 17 – 20 Nm (13 to 15 ft./lb.)

Precautions

- Never disconnect an H.T. wire with engine running.
- Any H.T. wire disconnected for checking purposes must be earthed before the engine is started.
- When the engine is running dangerously high, voltages which may prove fatal are present in this circuit.

STARTER

REMOVING — Fig. 7

DISCONNECT BATTERY
REMOVE OIL FILTER (1)
RAISE R.H. REAR OF VEHICLE
REMOVE THE THREE BOLTS (2)
TILT THE STARTER (3)
DISCONNECT THE WIRES
REMOVE STARTER (3)
REMOVE COVER (4)

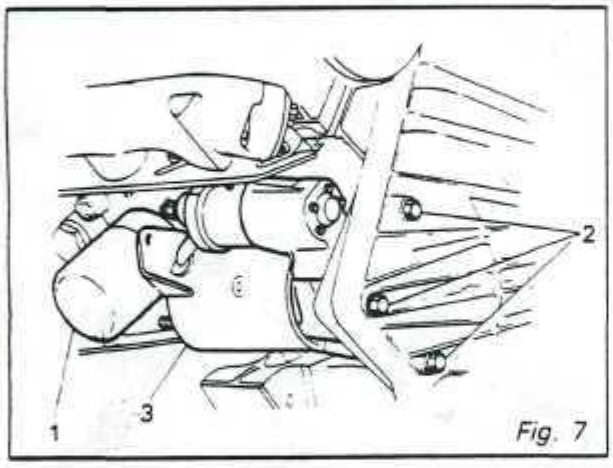


Fig. 7

REFITTING — Figs. 7 and 8

SPECIAL POINTS

LOCATE THE COVER ON THE CLUTCH DOWEL (5)

REVERSE THE REMOVAL PROCEDURE FOR REFITTING

Lubricate the bearings sparingly with oil and the spiral splines of the armature shaft with Mobil 22 Anderol 761 grease.

DISMANTLING THE STARTER — Fig. 9

Having removed the starter from vehicle:—

1. Remove the nut (1) and washer (2) which secures the Solenoid Terminal.
2. Remove the nuts (3) and washers (4) which secures the Solenoid to the starter.

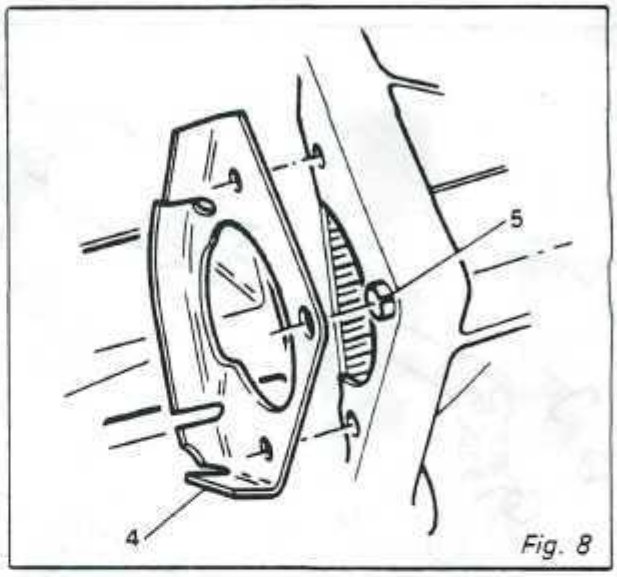


Fig. 8

3. Withdraw Solenoid (5) from Fixing Bracket (15).
4. Remove the Bearing Bosch Cap (6) off the End Plate (9).
5. Undo Screw (7) at the end of the Shaft with an impact driver in direction of rotation of the Armature.
6. Remove the Long Bolts (8).
7. Pull back End Plate (9).
8. Raise the Brushes (10) with a Hooked Tool.
9. Remove End Plate (9).
10. Remove the Cylindrical Pin (11) and Plastic Sleeve (12) which are between the Pivot Arm (16) and the Fixing Bracket (15).
11. Remove Rubber Grommet (13) and Washer (14) from Fixing Bracket (15).
12. Withdraw the Pivot Arm (16), Fixing Bracket (15) and Field Coil Assembly (17) from Armature (28).

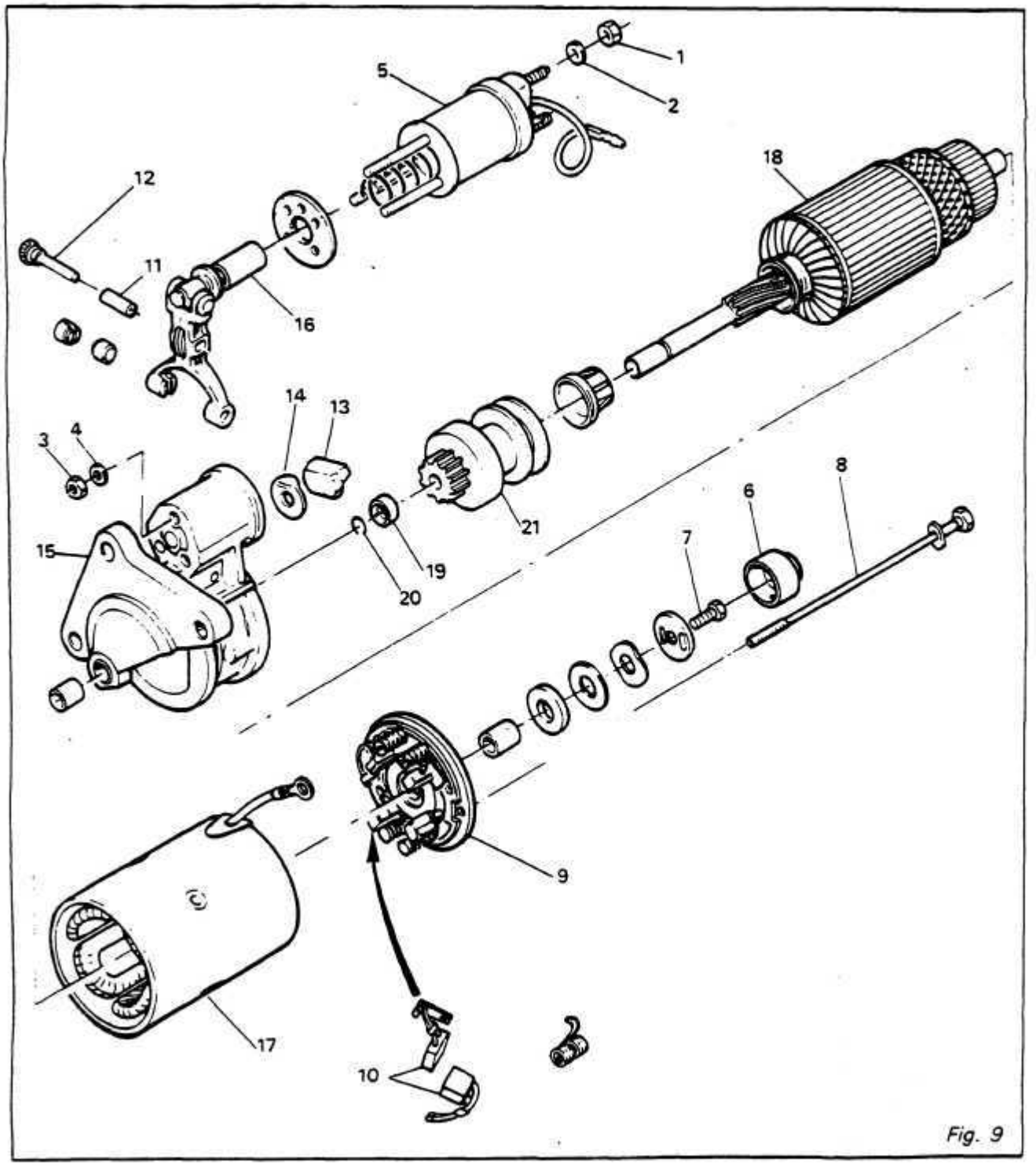


Fig. 9

REMOVING THE ROLLER CLUTCH ASSEMBLY – Fig. 9

Removal of the Roller Clutch Assembly necessitates the withdrawal of the Collar (19). A tube of appropriate diameter may be used to drive this down the shaft.

1. Remove the Spring Ring (20).
2. Remove Collar (19) and Roller Clutch Assembly (21).

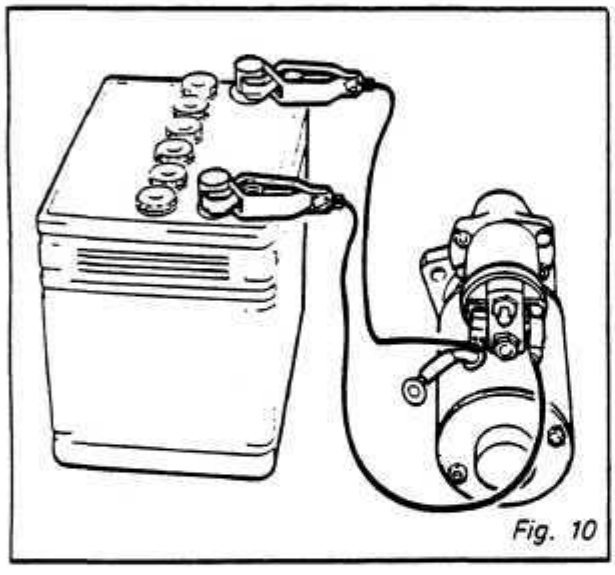


Fig. 10

ADJUSTING THE SOLENOID – STARTER DRIVE FORK – Fig. 10 and 11

Activate the solenoid as shown.

Check in this position that clearance (A) between the pinion and stop is 1.5 mm (.059"). *Fig. 11*

Turn the fork eccentric pivot pin to adjust if necessary.

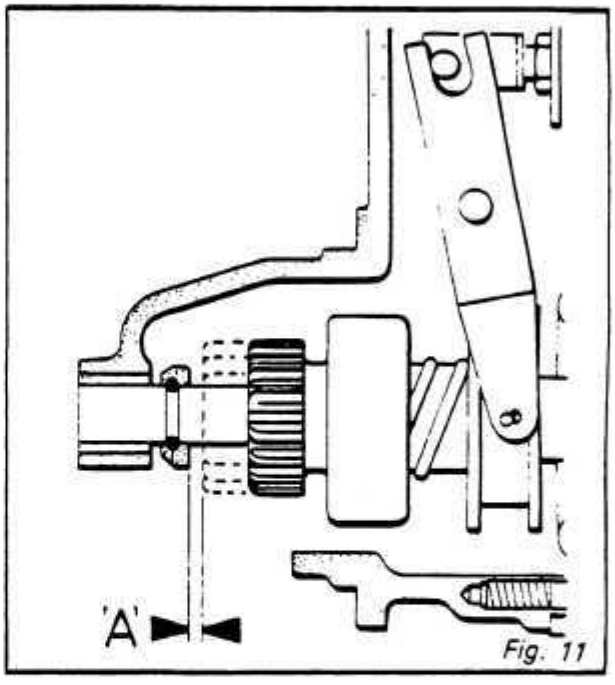
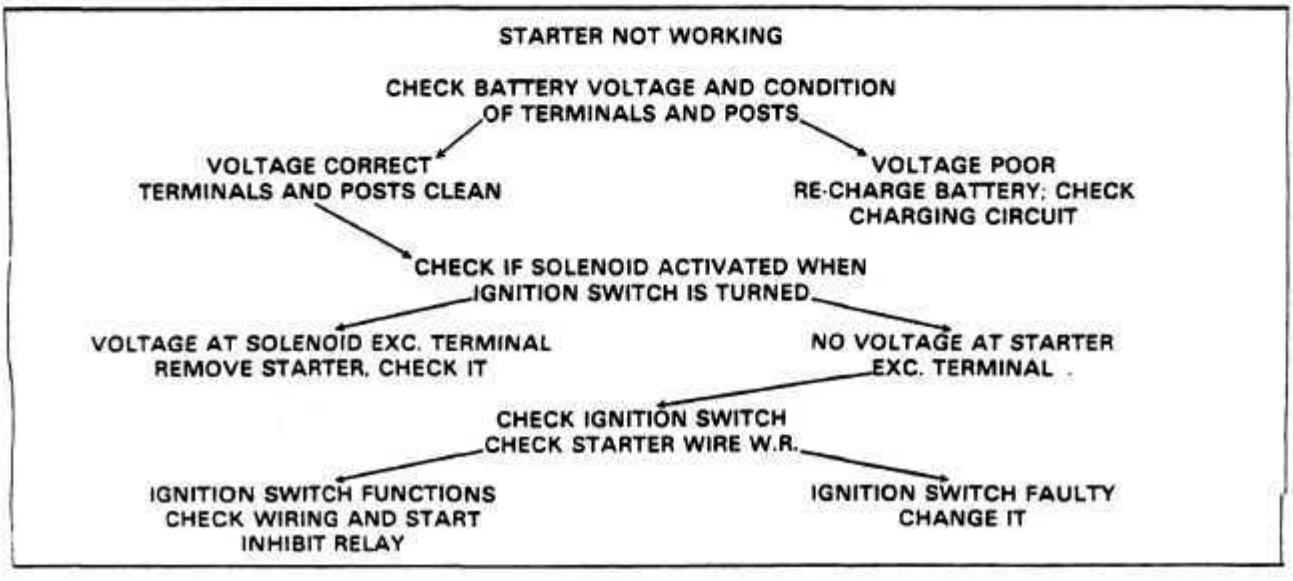


Fig. 11

FAULT DIAGNOSIS



STARTER SOLENOID

Inrush current	: 50 – 60 amps
Holding current	: 8 – 10 amps
Pull in voltage	: 8
Voltage supply	: 12

STARTER

Type	: Paris-Rhone D10E59
Battery rates voltage	: 12 volts
Locked torque	: 28 Nm (20.6 ft./lb.)
Current draw	: 540 amps
Voltage	: 7 volts
Maximum output	: 130 KW
Voltage	: 9.4 volts
Current draw	: 260 amps
Torque	: 10 Nm (7.40 ft./lb.) 1300 rpm
Minimum no load	: 4000 rpm
Voltage	: 11.5 volts
Maximum current draw	: 60 amps
Mounting on motor	: By flange (3 holes)
Clockwise running	: (pinion side)
Number of teeth	: 9
Diametral pitch	: 2.116/1.814
Spring tension on new brushes	: About 15.5 Newtons (3.3 lbs.) ± 10%

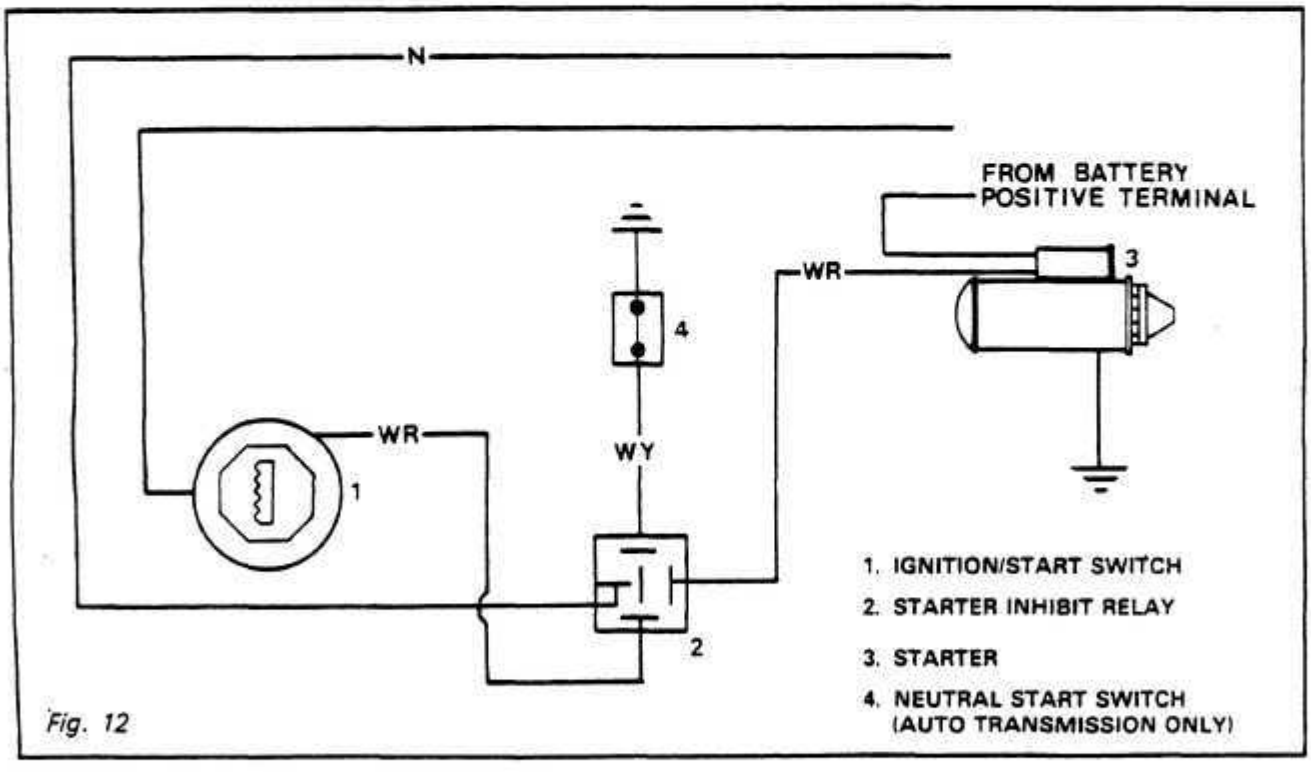


Fig. 12

CIRCUIT OPERATION

On turning the ignition key (1) to the starting position, current flows through the start inhibit relay (2) and on to ground via the transmission wiring harness completing the circuit to the Solenoid (3). When the vehicle is equipped with an automatic transmission, the neutral start switch (4) must be in the "neutral" or "park" position to complete the circuit.

The Solenoid has a two-fold function, that of a relay and drive. When the Solenoid is activated, it establishes contact between positive cable from the battery and starter.

DIAGNOSTIC SOCKET

DIAGNOSIS SOCKET — Fig. 13

The Diagnostic Socket on the engine enables the following to be carried out direct with approved instruments: —

- Checking H.T. circuit
- Duty cyle frequency valve
- Initial advance setting
- Checking the development of centrifugal and vacuum curves
- Measuring engine R.P.M.

Wire Connections

A Lambda Electronic Control Unit Orange. Frequency Valve Monitor

B Feed Wire Purple. Battery Feed

C T.D.C. Pick-Up on Cylinder Block

D Earth. Yellow wire

Terminal Allocation	Wire Colour
1. T.D.C. Signal Pick-Up	RED
2. Diagnostic Socket Earth (ground)	YELLOW
3. Lambda Electrical Control Unit	BLACK
4. T.D.C. Signal Pick-Up	WHITE
5. T.D.C. Pick-Up Screening	
6. Feed	GREY

Fig. 14

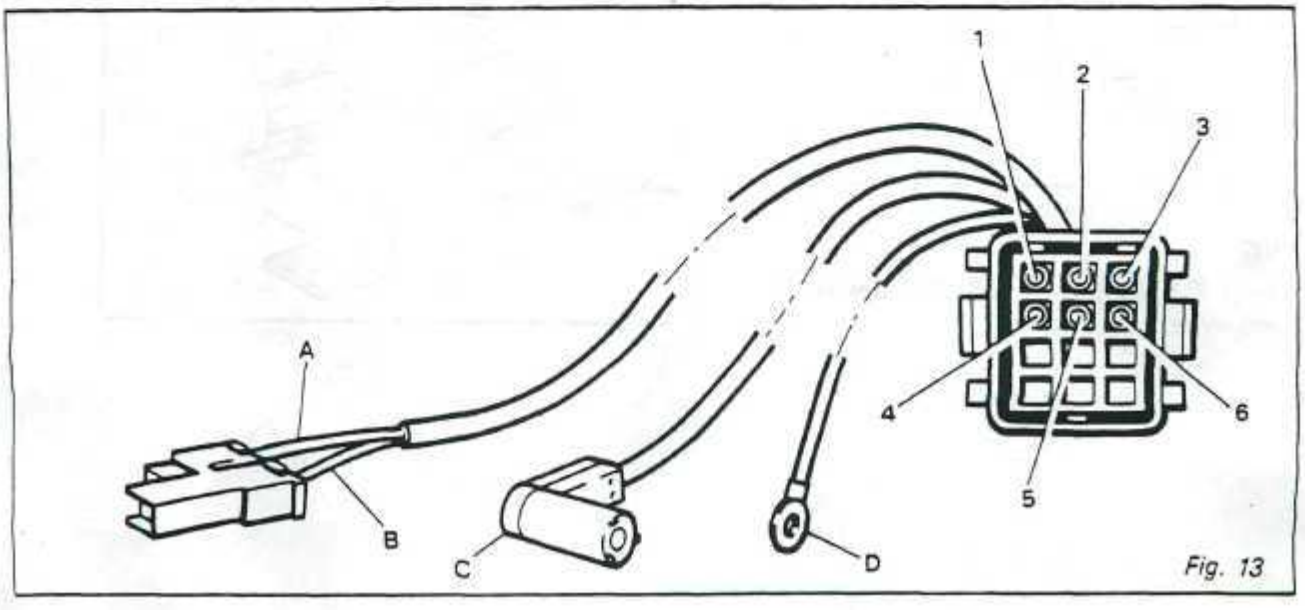


Fig. 13

REMOVING — Figs. 13, 14 and 15

1. Disconnect Battery.
2. Remove Diagnostic Socket (1) by pressing on Lugs (2) and pull down Socket out of Bracket (3). *Fig. 14*
3. Disconnect Earth Wire, Lambda Control Wire and Feed Wire.
4. Remove Screw (4), holding Pick-Up (5) and remove. *Fig. 15*

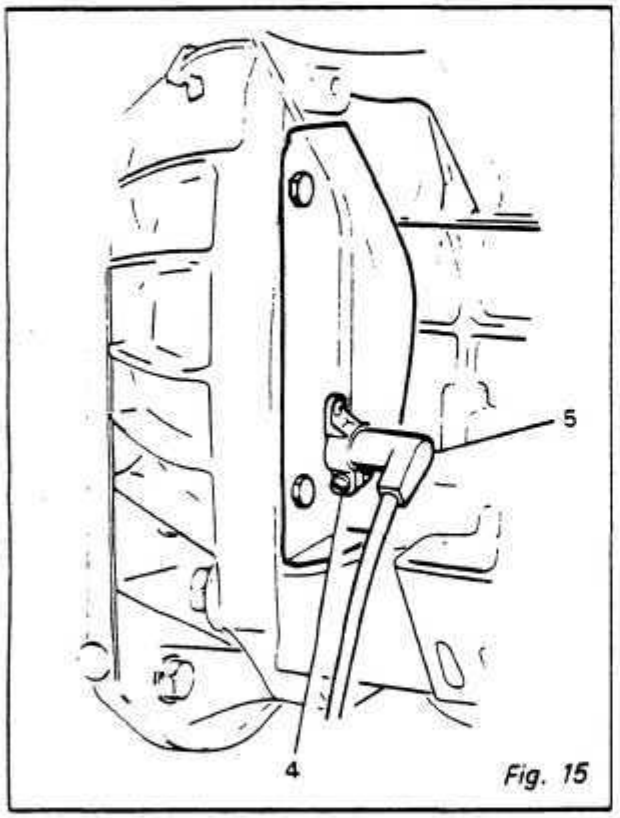


Fig. 15

REFITTING

1. Reconnect Earth Wire, Lambda Control Wire and Feed Wire.
2. Re-clip Diagnostic Socket into Bracket.

NEW PICK-UP — Fig. 16

The pick-up (5) has three Lugs which set its position. Bring the three Lugs into contact with the Flywheel (6) and tighten Screw (4).

RE-USING AN OLD PICK-UP

If the Lugs are worn, push the pick-up (5) in until it touches the Flywheel (6). Mark its position and withdraw it 1 mm A (.040" A). Tighten Screw (4).

RE-FIT ADJUSTING PICK-UP

The pick-up (5) should be set 0, to 1 mm A (.020" to .040" A) from Flywheel (6).

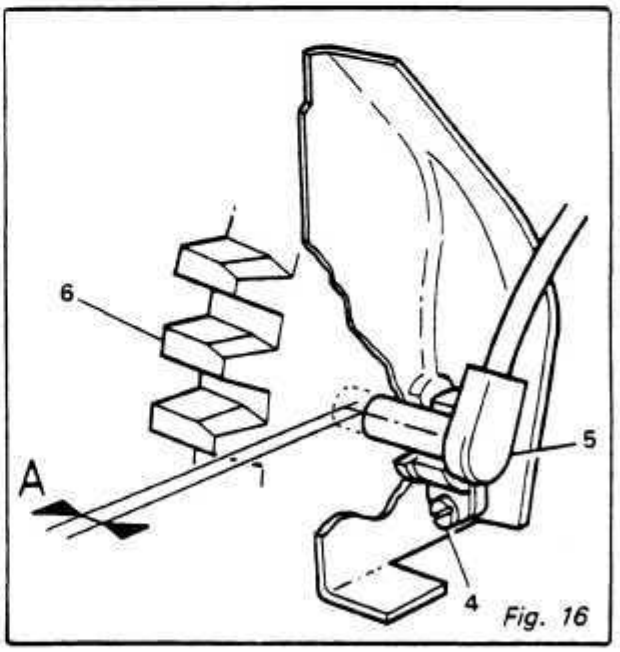


Fig. 16

DUCELLIER ALTERNATOR

REMOVING — Fig. 17

1. Disconnect Battery.
2. Disconnect Wires to Alternator.
3. Remove the Tension Bolt (1).
   Note position of Tensioning Bracket (2).
4. Remove Drive Belt (3).
5. Remove Fixing Bolts (4).
6. Lift out of car.

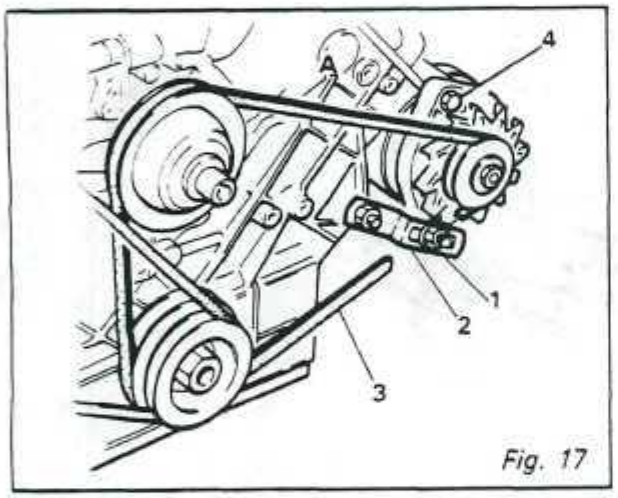


Fig. 17

REFITTING

Carry out the removal operations in reverse order. Retension the drive belt. The belt must be depressed 6 — 10 mm (¼" – ⅜") with moderate thumb pressure midway between pulleys, as shown by "A".

PRECAUTIONS TO BE TAKEN TO PREVENT DAMAGE TO THE CHARGING CIRCUIT

1. Never earth the alternator or regulator "E X C" terminal or its wire.
2. Never cross the regulator wires.
3. Never disconnect the regulators or battery when the alternator is turning.
4. Always disconnect the battery before removing the alternator.

Note:
When an alternator is turning, its positive terminal (+), must always be connected to the battery and its negative terminal (–) together with the battery negative (–) terminal connected to earth.

DUCELLIER

BUILT IN REGULATOR

CHECKING OUTPUT

Connect a voltmeter across the battery posts.

1. Read off battery voltage.
2. Start engine and accelerate until the voltmeter needle remains steady on the regulated voltage.
3. The voltage should read between 13.5 volts and 15.0 volts.

Check out and correct the following faults before replacing an alternator: —

If the customer complains of a charging fault, although the warning light functions correctly.

If the regulated voltage is less than 13.5 v, check the alternator as the fault may be due to: —

1. A defective diode.
2. Phase out.
3. Carboned tracks.
4. Defective regulator.

REMOVING REGULATOR — Fig. 18

1. Disconnect battery.
2. Remove hex bolts holding voltage regulator (1) and regulator guard (2).
3. Remove screw, nuts and washers holding plastic terminal guard and disconnect wires from voltage regulator (1).
4. Remove screws, holding cover on voltage regulator (1) and disconnect wires to regulator (3).

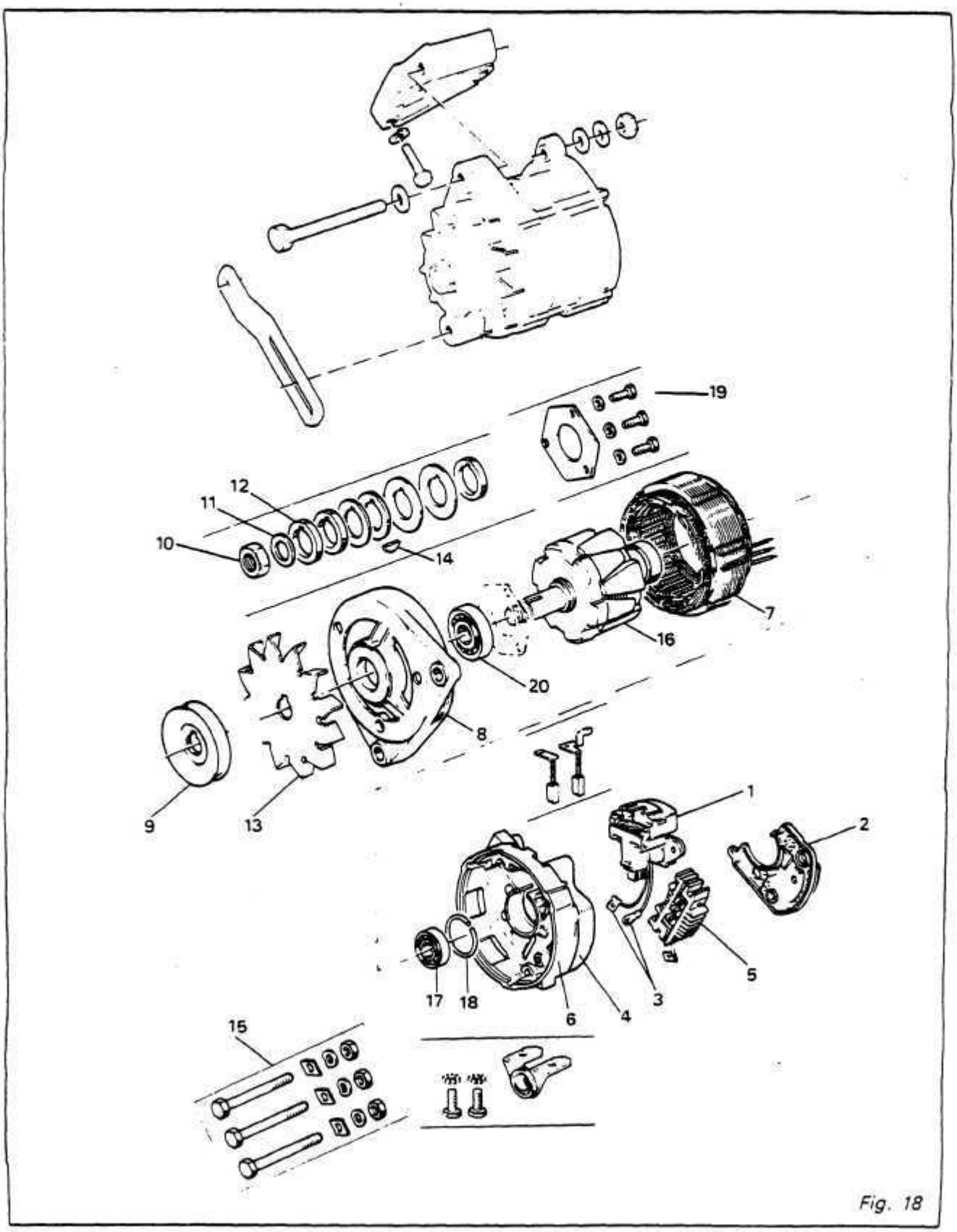


Fig. 18

REMOVING THE DIODE CARRIER — Fig. 18

Remove alternator from vehicle.

1. Remove screw, nuts and washers holding plastic terminal guard (4).
2. Unsolder the three diode carrier wires.
3. Remove wires from voltage regulator (1).
4. Remove diode carrier (5). **Never** dismantle the diode bridge.

The instrument panel has a red warning light which works as follows: —

- On switching on ignition it is illuminated.
- As soon as engine starts it goes out.
- If it is illuminated when the engine is running there is a charging fault.
- If the warning light fails to be illuminated on switching on ignition, check the following.

CHECK

1. That no connectors are loose or disconnected.
2. That the bulb has not blown.

If the warning light is illuminated while engine is running there is a charging fault which may be due to: —

1. Broken alternator belt.
2. Broken charging wire.
3. Alternator internal fault (rotor, stator, diodes or brushes).
4. Regulator fault.

REMOVING THE BRUSH CARRIER — Fig. 18

Note:
The alternator need not be removed for the operation. The brush carrier (1) being fixed to the regulator is removed in the same way as the voltage regulator.

REMOVING THE STATOR

1. Remove the voltage regulator (1).
2. Remove the diode carrier (5).
3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).
4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws, with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).
5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).
6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.
7. Remove the nuts, washers, and through bolts (15).
8. Separate the drive end bracket (8) from the stator (7), slip ring end bracket (6) and rotor assembly (16). Withdraw the stator (7) from the slip ring end bracket (6).

REMOVING THE ROTOR

1. Remove the voltage regulator (1).
2. Remove the diode carrier (5).
3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).
4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).
5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).
6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.

7. Remove the nuts, washers and through bolts (15).

8. Separate the drive end bracket (8) from the stator (7), slip ring end bracket (6) and rotor assembly (16). Withdraw the stator (7) from the slip ring end bracket (6).

9. With suitable levers remove rotor (16) from slip ring end bracket (6). *Fig. 19*

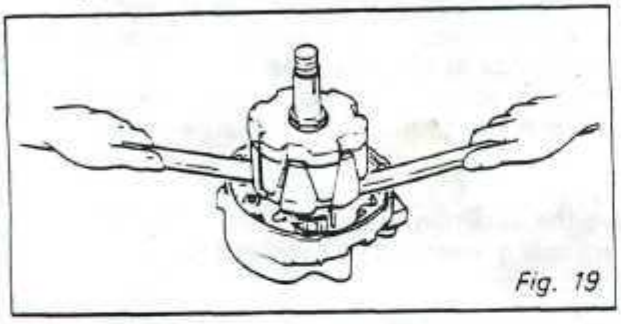


Fig. 19

REMOVING — REAR BEARING — Fig. 18

1. Remove the voltage regulator (1).

2. Remove the diode carrier (5).

3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).

4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).

5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).

6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.

7. If the bearing remains on the spigot of the rotor assembly (16) use suitable puller for removal of bearing. *Fig. 20*

8. If the bearing is in the slip ring end bracket (6), fill the bearing aperture with thick grease and drive a well fitting drift through the inner race of the bearing (17) which will be forced out by the hydraulic lock created by the grease. *Fig. 21*

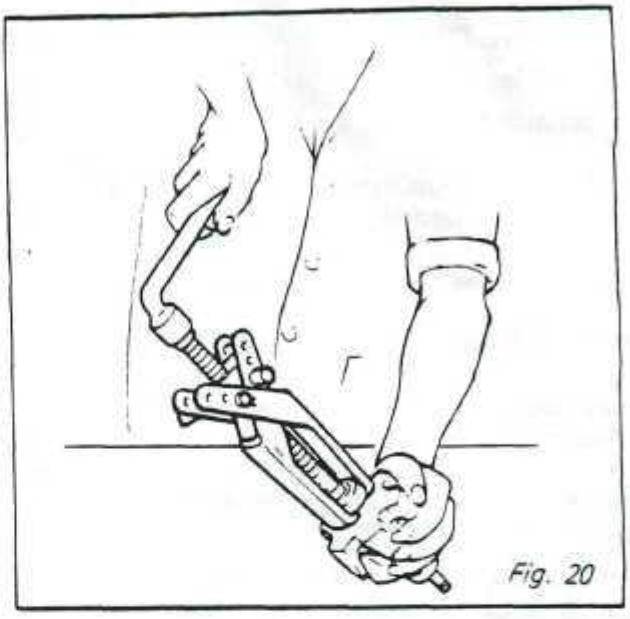


Fig. 20

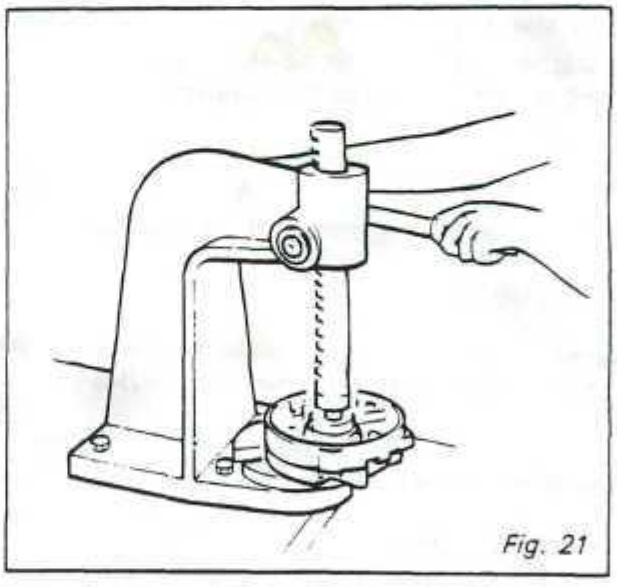


Fig. 21

REFITTING

1. Clean the grease from the aperture taking care not to damage the "O" ring (18).

2. Position the new bearing (17) on the shaft with the shielded side towards the rotor (16).

3. Press it firmly onto its locating shoulder in rear housing (6).

4. Pack the bearing with grease.

REMOVING DRIVE END BEARING — Fig. 18

1. Remove the voltage regulator (1).
2. Remove the diode carrier (5).
3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).
4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).
5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).
6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.
7. Remove the nuts, washers and through bolts (15).
8. Separate the drive end bracket (8) from the stator (7), slip ring end bracket (6) and rotor assembly (16). Withdraw the stator (7) from the slip ring end bracket (6).
9. With suitable levers remove rotor (16) from slip ring end bracket (6). *Fig 19.*
10. Remove the three bolts (19) and washers securing the bearing retainer to the drive end bracket (8) and press out the bearing (20).

REPLACING

1. Pack the new bearing with grease.
2. Place the bearing (20) in the drive end bracket (8) with shielded side towards the rotor (16).
3. Re-fit the bearing retainer (19) and three bolts and washers.

TO REASSEMBLE ALTERNATOR

Refitting is a reversal of the dismantling procedures with attention to the following points:

1. Align the marks made on dismantling when assembling the end brackets (6 and 8) and stator (7).
2. Tighten the through bolts (15) evenly and check that the rotor (16) turns freely in its bearings (20 and 17) before fitting the voltage regulator (1).
3. Ensure the insulating washer is fitted over the main output terminal before fitting diode carrier (5).