CHAPTER 13

Electronic Four-Wheel Steering Diagnosis and Service

Upon completion and review of this chapter, you should be able to:

- ❑ Perform a preliminary inspection on a four-wheel steering (4WS) system.
- ❑ Perform a trouble code diagnosis on a 4WS system with the ignition switch on.
- ❑ Perform a trouble code diagnosis on a 4WS system with the engine running.
- ❑ Remove and replace the rear steering actuator.
- ❑ Remove and replace the tie-rod ends on the rear steering actuator.
- ❑ Remove and replace tie rods and boots on the rear steering actuator.
- ❑ Remove and replace the rear main steering angle sensor.
- ❑ Remove and replace the rear sub steering angle sensor.
- ❑ Perform an electronic neutral check on a 4WS system.
- ❑ Adjust the front main steering angle sensor.
- ❑ Adjust the front sub steering angle sensor.
- ❑ Adjust the rear sub steering angle sensor.

Basic Tools

Basic technician's tool set

Service manual

Jumper wire

Floor jack

Safety stands

Wax marker

Silicone grease

Chassis lubricant

Cotter pins

Length of stiff wire

Service and adjustments on 4WS systems with adjustable sensors must be performed precisely as explained in the vehicle manufacturer's service manual. Inaccurate sensor adjustments may cause improper rear wheel steering operation, and this may result in reduced steering control. Always follow the service and adjustment procedures carefully and accurately!

A fail-safe mode may be called a backup mode.

Preliminary Inspection

Prior to any four-wheel steering diagnosis, the following concerns should be considered.

1. Have any suspension modifications been made that would affect steering?
2. Are the tire sizes the same as specified by the vehicle manufacturer?
3. Are the tires inflated to the pressure specified by the vehicle manufacturer?
4. Is the power steering belt adjusted to the vehicle manufacturer's specified tension?
5. Is the power steering pump reservoir filled to the proper level with the type of fluid specified by the vehicle manufacturer?
6. Is the engine idling at the speed specified by the vehicle manufacturer? Is the idle speed steady?
7. Is the steering wheel original equipment?

The Society of Automotive Engineers (SAE) J1930 terminology is an attempt to standardize electronics terminology in the automotive industry.

In the SAE J1930 terminology, the term malfunction indicator light (MIL) replaces other terms for computer system indicator lights.

Fail-Safe Function

If the four-wheel steering (4WS) control unit senses a failure in the system, the control unit switches to a **fail-safe mode.** In this mode, the control unit stores a trouble code or codes and illuminates the 4WS indicator light to inform the driver that a problem exists in the system. When this mode is entered, the 4WS control unit shuts off voltage to the rear steering unit and the rear wheels remain in the straight-ahead position.

The four-wheel steering control unit enters the **fail-safe mode** if a defect occurs in the system. In this mode, the rear wheels move to the centered position.

Damper Control

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When the 4WS control unit enters the fail-safe mode, a quick return of the rear wheels to the straight-ahead position would adversely affect steering under certain steering wheel and rear wheel positions. To prevent this action, the 4WS control unit energizes the damper relay when it enters the fail-safe mode. The rear steering actuator motor is spun by the steering shaft movement as this shaft is moved to the centered position by centering spring force. This action causes the motor armature to act as a voltage generator. The voltage generated by the armature is fed back through the damper relay to the motor armature. Under this condition, the motor rotation is slowed and the return spring slowly moves the rear steering shaft to the straight-ahead position. Without the action of the damper relay, the return spring would move the rear steering shaft quickly to the straight-ahead position.

Trouble Code Diagnosis

Road Test

CUSTOMER CARE: While discussing customers' automotive problems, always remain polite and never make statements that make customers feel uninformed about their vehicles.

The 4WS control unit stores a fault code and illuminates the 4WS indicator light if a defect occurs in the system, even if the defect is temporary. Always ask the customer about the conditions that caused the 4WS indicator light to come on, and duplicate this condition during a road test. If the 4WS light is not illuminated during the road test, the system is satisfactory electronically and does not require further electronic diagnosis. The troubleshooting procedures in the vehicle manufacturer's service manual assume that the problem is present at the time of diagnosis.

Trouble Code Display with Ignition Switch On

CAUTION: When diagnosing a computer system, never connect or ground any terminals unless instructed to do so in the vehicle manufacturer's service manual. This action may damage electronic components.

CAUTION: When diagnosing a computer system, never disconnect or connect any computer system component with the ignition switch on unless instructed to do so in the vehicle manufacturer's service manual. This action may damage the computer or system components.

CAUTION: When performing electronic diagnosis on a vehicle equipped with an air bag, most vehicle manufacturers recommend turning the ignition switch off, disconnecting the negative battery cable, and waiting one minute before proceeding with electronic component diagnosis or service.

CAUTION: When performing electronic diagnosis on a vehicle equipped with an air bag, follow all the service precautions recommended in the vehicle manufacturer's service manual. If these precautions are not followed, electronic components may be damaged.

Always follow the exact 4WS service and diagnostic procedures in the vehicle manufacturer's service manual. These procedures vary depending on the make and year of the vehicle.

The following are typical procedures for a Honda Prelude. These procedures should be avoided until after the diagnosis is complete because any of these procedures will erase trouble codes.

1. Disconnect the battery terminals.
2. Disconnect the 4WS control unit connector.
3. Remove the number 43 clock-radio 10-A fuse from the underhood fuse/relay box.

Follow these steps to obtain the trouble codes.

1. Remove the dual-terminal **service check connector** located behind the center console, and connect the two terminals in this connector with a jumper wire (Figure 13-1).
2. Turn on the ignition switch, but do not start the engine.
3. Observe the 4WS indicator light to read the trouble codes. Three longer flashes followed by a brief pause and one quicker flash indicates code 31. The codes are given in numerical order.
4. Record the fault codes.

When the two terminals on the **service check connector** are connected together, the 4WS computer supplies flash codes on the 4WS indicator light.

Trouble Code Display with Engine Running

The 4WS control unit actually contains two processing units that are referred to as the main and sub processing units. Each processing unit can store a maximum of ten trouble codes. If the trouble code diagnosis is performed with the engine running, the code display indicates whether the codes are stored in the main or sub processor.

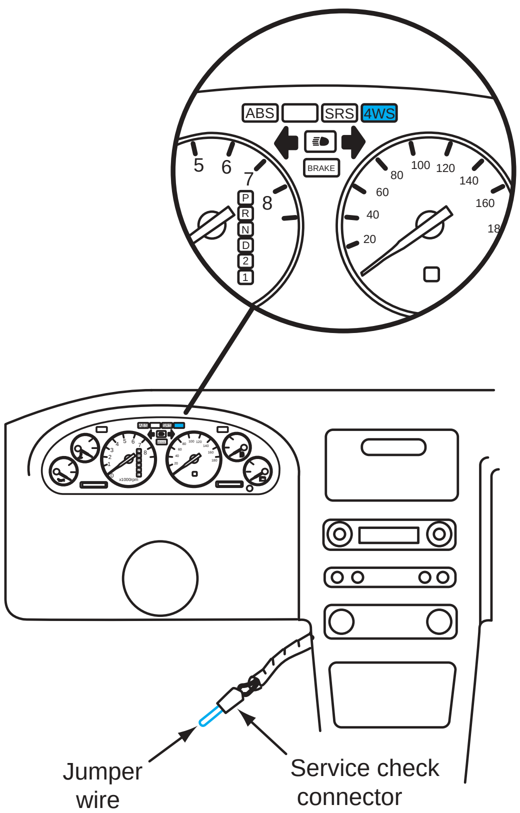

Figure 13-1 Dual-terminal service check connector positioned behind the center console.

When the service connector terminals are connected with a jumper wire and the engine is started, the 4WS indicator light follows this sequence if there are trouble codes in the main and sub processors.

1. blinks quickly once when the ignition switch is turned on
2. pauses for 3 seconds
3. displays codes stored in the main processor
4. pauses for 1.6 seconds
5. blinks quickly for 3 seconds to indicate a separation between the main and sub processor codes
6. pauses for 1.6 seconds
7. displays codes stored in the sub processor
8. pauses for 3 seconds, and then repeats the cycle (Figure 13-2)

Main Steering Angle Sensor Trouble Code

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If a defect occurs in the main steering angle sensor system, the clock-radio 10-A fuse must be disconnected to cancel the 4WS indicator light. When defects occur in other parts of the electronic 4WS system, the 4WS indicator light is cancelled when the ignition switch is turned off. However, the 4WS indicator light is illuminated again when the ignition switch is turned on, and the 4WS control unit detects the problem again.

Trouble Codes Representing Temporary Driving Conditions

Codes 70, 71, 73, and 74 represent problems resulting from abnormal or harsh driving conditions (Figure 13-3). When the 4WS control unit detects one of these problems, it does not illuminate the 4WS indicator light, but these codes are flashed during the diagnostic procedure.

Rear Steering Actuator Service

Rear Steering Actuator Removal

CAUTION: Many steering service and diagnostic procedures require the installation of the rear steering center lock pin in the rear steering actuator to lock this unit in the centered position. If this lock pin is not installed, diagnosis will be inaccurate.

CAUTION: Do not start the engine with the rear steering center lock pin in place. This action may damage the lock pin and rear steering actuator.

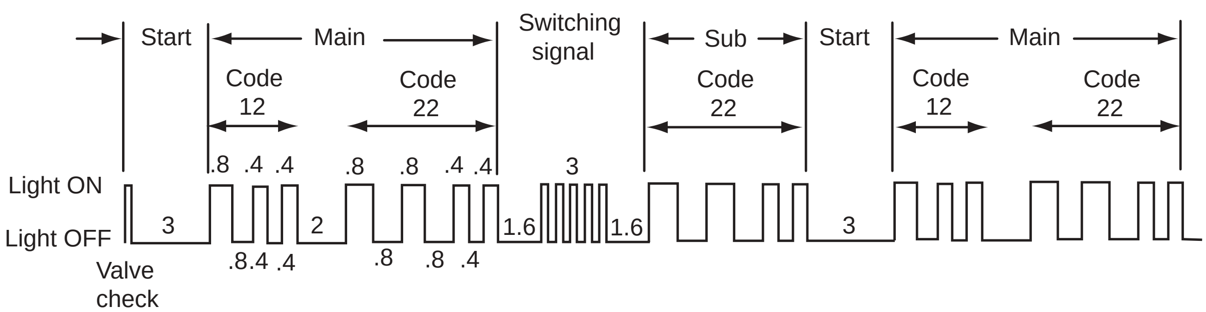

Figure 13-2 Trouble codes in main and sub processors obtained with engine running.

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DTC	OPERATION	4WS INDICATOR LIGHT
70	The ignition is turned from OFF to ON while driving.	ON
71	The car is driven aggressively with the driver and three passengers on board, or the steering wheel is turned with a rear wheel blocked by the curb, etc.	——
73	The engine is started while quick-charging the battery.	——
74	Driving the car with the parking brake ON.	ON 5 minutes after detection

Figure 13-3 Codes that represent problems caused by abnormal or harsh driving conditions.

SERVICE TIP: Do not attempt to disassemble the rear steering actuator other than tie rods, tie-rod ends, and sensors. This actuator is serviced as an assembly. Because individual parts for the actuator are not available, disassembly is a waste of time.

CAUTION: Use the tie-rod end removal tool carefully to avoid damage to the tie-rod boot.

WARNING: When turning the front wheels on a car with 4WS, keep your hands away from the rear steering mechanism and rear wheels to avoid hand injuries.

Follow these steps to remove the rear steering actuator.

1. Raise the vehicle on a hoist or lift the rear of the vehicle with a floor jack, and support the chassis with safety stands placed in the vehicle manufacturer's recommended locations.
2. Remove the cotter pin and nut from each tie-rod end.
3. Install a 12-millimeter (mm) nut on each tie-rod end until the nuts are flush with the tie-rod stud.
4. Install the special tool on the tie-rod end, and with the tool arms parallel, tighten the screw on the tool to loosen the tie-rod end (Figure 13-4). Repeat the procedure on both tie-rod ends.

Special Tools

Tie-rod end removal tool

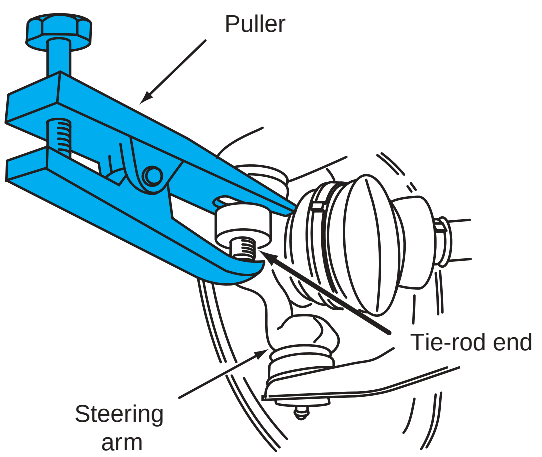

Figure 13-4 Removing a tie-rod end with a special tool.

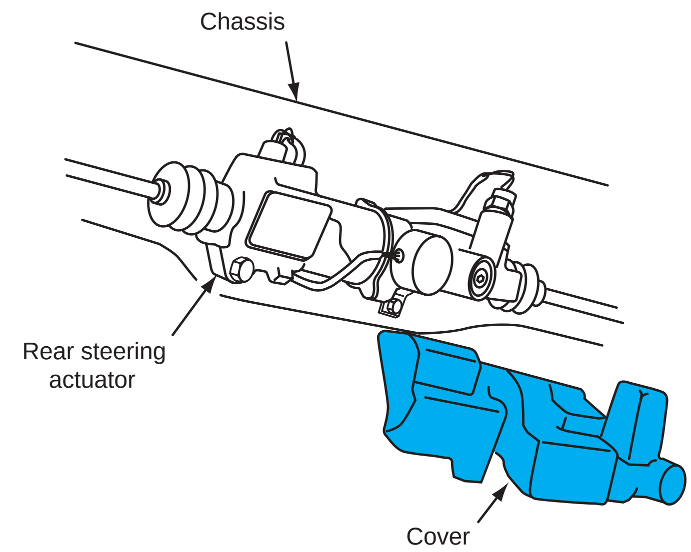

Figure 13-5 Removing the rear steering actuator cover.

The **rear steering center lock pin** locks the rear steering in the centered position for test and service purposes.

5. Remove the nuts from the tie rods and remove the tie rods from the steering arms.
6. Remove the rear steering actuator cover (Figure 13-5).
7. Remove the cap bolt and washer and install the **rear steering center lock pin** (Figure 13-6).
8. Remove the ground cable connector and all wiring harness connectors on the rear steering actuator (Figure 13-7).
9. Remove the four mounting bolts and bracket, and remove the rear steering actuator (Figure 13-8).

Tie Rod and Tie-Rod End Removal

Follow these steps for tie rod and tie-rod end removal.

1. Mark the relative position of the tie-rod end, locknut, and tie rod with a wax marker.
2. Hold the tie-rod end with a wrench and loosen the locknut (Figure 13-9).

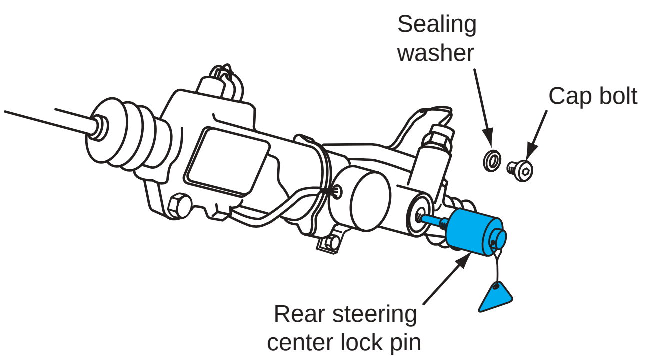

Figure 13-6 Removing the cap bolt and washer, and installing the rear steering center lock pin.

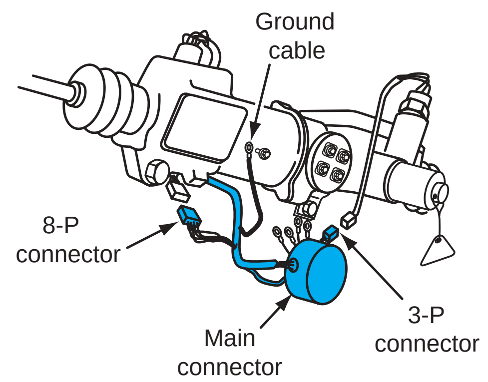

Figure 13-7 Removing the ground cable connector and all wiring harness connectors on the rear steering actuator.

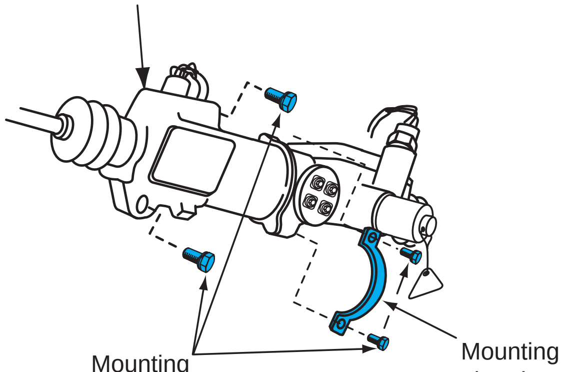

Figure 13-8 Removing the four mounting bolts, bracket, and rear steering actuator.

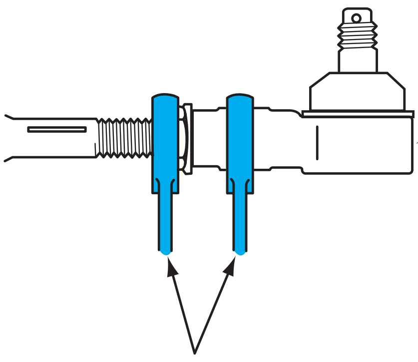

Figure 13-9 Loosening the tie-rod end locknut.

3. Remove the tie-rod end.
4. Remove the boot bands and clamps from the inner tie-rod ends (Figure 13-10).
5. Place the flat side of the rack holding tool toward the actuator housing and drive the special rack holding tool between the actuator housing and the stop washer with a soft hammer (Figure 13-11).
6. Straighten the tabs on the tie-rod lock washer.

Special Tools

Rack holding tool

SERVICE TIP: Hold the special holding tool firmly while loosening the tie rod to avoid applying rotational force to the shaft screw in the actuator.

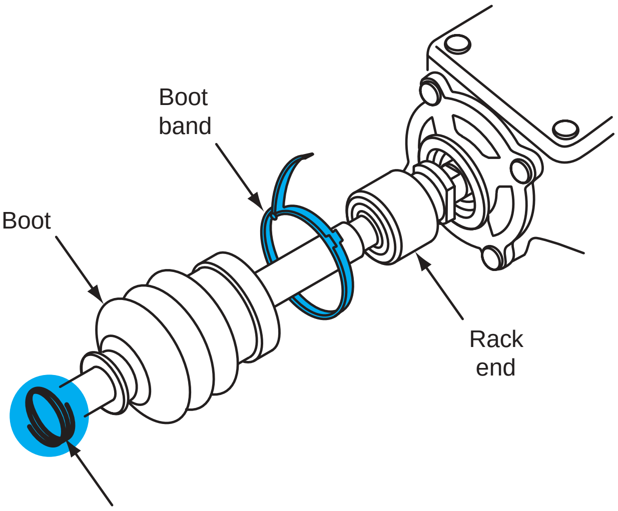

Figure 13-10 Removing boot bands and clamps from the inner tie-rod end.

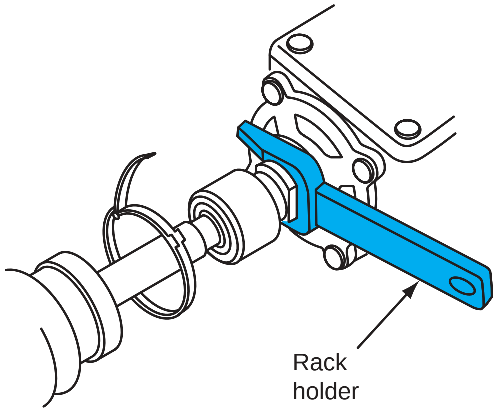

Figure 13-11 Installing the special rack holding tool between the actuator housing and the stop washer.

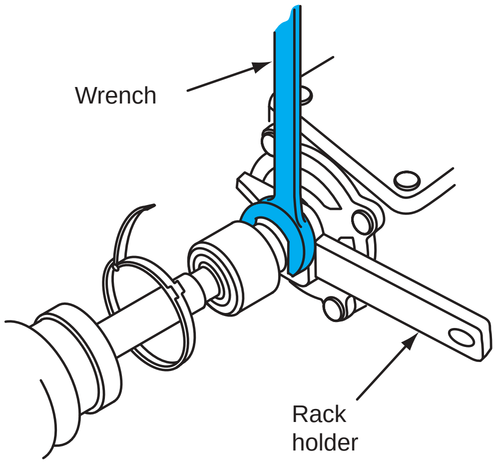

Figure 13-12 Removing the tie rod from the shaft screw.

7. Hold the shaft screw with the holding tool and loosen the tie rod with a wrench (Figure 13-12).
8. Thread the tie rod off the shaft screw and repeat this procedure on each tie-rod end.

Tie-Rod End Boot Removal and Replacement

Tie-rod end boots must be replaced if they are cracked, split, deteriorated, or loose.

Follow these steps to remove and replace the tie-rod end boots.

CAUTION: Do not put grease on the boot installation shoulder and tapered section of the ball pin in the tie-rod end. Grease may cause these components to become loose.

CAUTION: Do not allow dust, dirt, or foreign material to enter the tie-rod end ball joint or boot because this contamination causes rapid component wear.

1. Use a large screwdriver to pry the old boot from the tie-rod end.
2. Pack the interior of the new boot with the vehicle manufacturer's recommended grease and place a light coating of grease on the boot lip.
3. Wipe the grease off the sliding surfaces of the ball pin with a shop towel; then pack the lower area around the ball pin and body with grease (Figure 13-13).

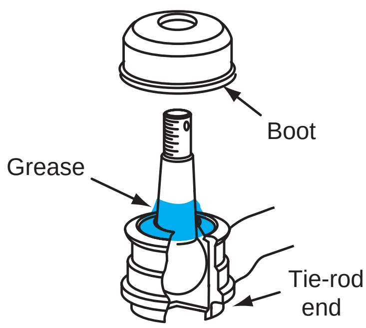

Figure 13-13 Packing the boot and tie-rod end with grease.

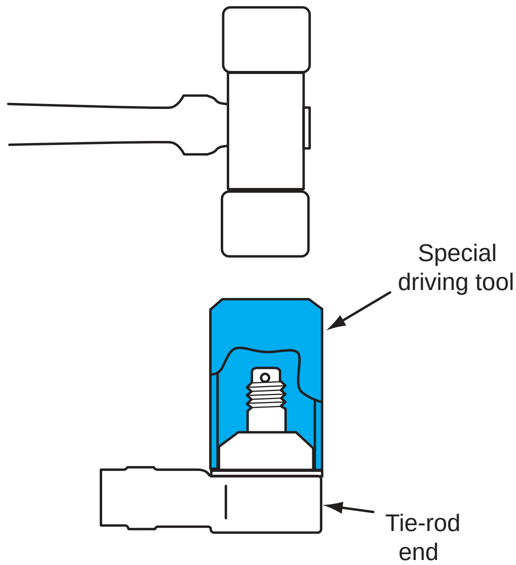

Figure 13-14 Driving the boot onto the tie-rod end with a special driving tool.

4. Use the special driving tool to install the new boot on the tie-rod end (Figure 13-14).
5. Wipe any grease from the tapered section of the ball pin with a shop towel. Apply sealant around the lower edge of the boot and tie-rod body.

Special Tools

Tie-rod boot driving tool

Installation of Tie Rods and Tie-Rod Ends

CAUTION: Never apply axial impact or rotational force to the shaft screw in the rear steering actuator. Either of these actions may cause internal actuator damage.

Inner tie-rod boots must be replaced if they are cracked, split, deteriorated, or damaged.

Follow these steps for tie rod and tie-rod end installation.

1. Install the tie-rod ends so the marks on the tie-rod ends, nuts, and tie rods are aligned, and tighten the tie-rod nuts to the specified torque.
2. Screw each inner tie rod onto the shaft screw while holding the lock washer so its tabs are in the inner tie-rod end. The stop washer must be installed on the shaft screw with the chamfered side facing outward (Figure 13-15).
3. Drive the special holding tool between the actuator housing and the stop washer with a soft hammer (Figure 13-16).
4. Hold the shaft screw with the holding tool and tighten the inner tie-rod end to the specified torque.
5. Bend the lock washer tabs against the flat on the inner tie-rod end.
6. Remove the special holding tool and apply silicone grease to the sliding surface of the tie rod (Figure 13-17). Place a light coating of silicone grease inside the tie-rod boot.
7. Apply the vehicle manufacturer's recommended grease to the circumference of the inner tie-rod joint housing.
8. Install the boots on the actuator housing; then install the boot bands with the locking tabs properly positioned in relation to the actuator housing (Figure 13-18).

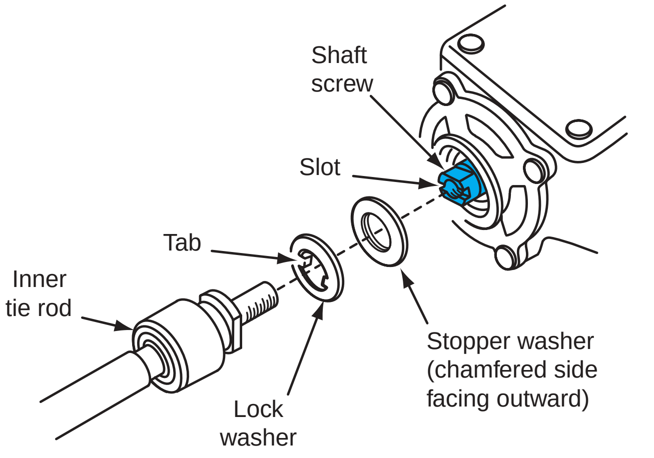

Figure 13-15 Installing the inner tie-rod end on the shaft screw.

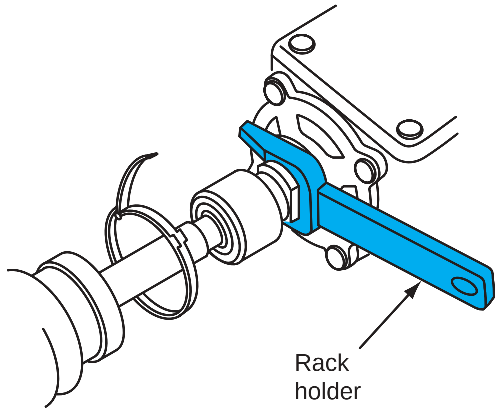

Figure 13-16 Installing the special tool to hold the shaft screw while tightening the inner tie-rod end.

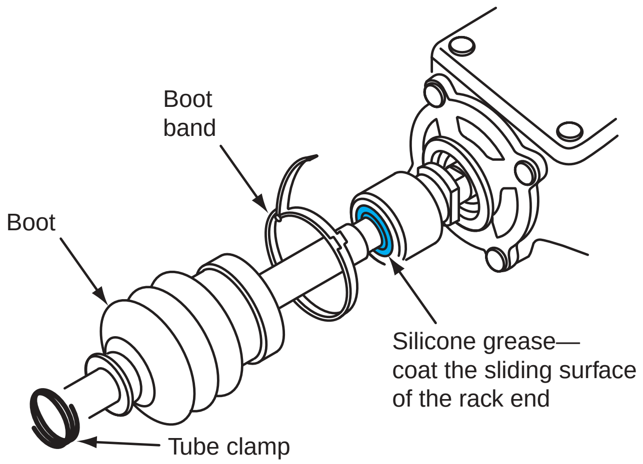

Figure 13-17 Lubrication of the inner tie-rod joint housing.

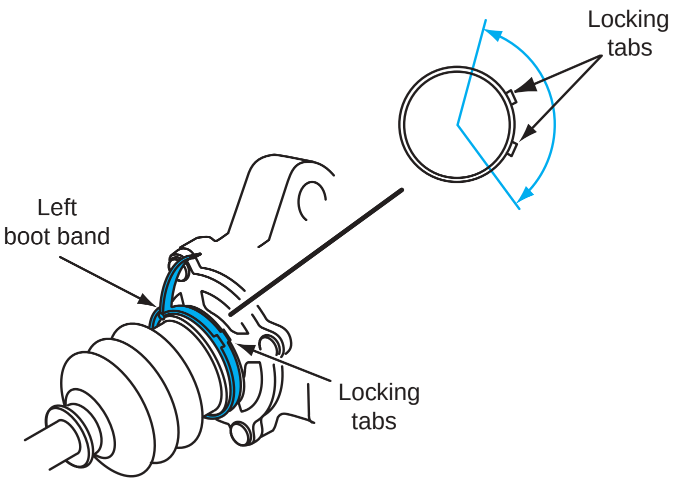

Figure 13-18 Proper boot band position in relation to the actuator housing.

CAUTION: While staking the boot clamps, be careful not to damage the inner tie-rod boots.

9. Tighten the boot bands and bend both sets of locking tabs over the band (Figure 13-19). Tap lightly on the doubled over portion of the band to reduce its height and stake the locking tabs firmly.

The **rear sub steering angle sensor** sends a voltage signal to the 4WS computer in relation to the amount of rack movement in the rear steering actuator.

Remove and Replace Rear Steering Actuator Sensors

Follow these steps to remove and replace the **rear sub steering angle sensor** and the **rear main steering angle sensor**.

1. Loosen the rear sub steering angle sensor locknut and rotate the sensor to thread it out of the housing (Figure 13-20). Discard the sensor O-ring.

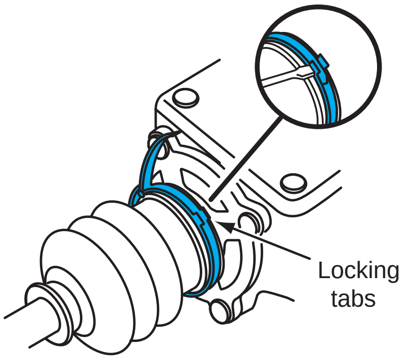

Figure 13-19 Tightening and staking the inner tie-rod boot clamps.

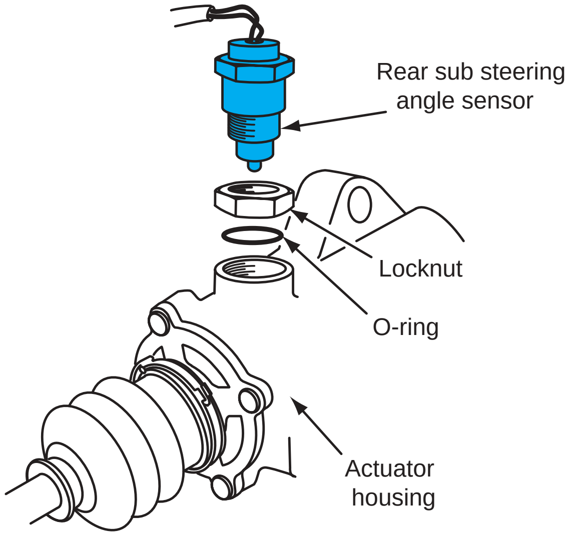

Figure 13-20 Removing the rear sub steering angle sensor.

The **rear main steering angle sensor** sends a voltage signal to the 4WS computer in relation to ball screw rotation in the rear steering actuator.

2. Remove the two mounting bolts in the rear main steering angle sensor, and then remove the sensor from the actuator housing (Figure 13-21). Note the position of the dowel pins, and discard the O-ring.

SERVICE TIP: Cover the rear main steering sensor and rear sub steering sensor openings in the actuator housing with masking tape or its equivalent to keep dirt and foreign material out of the actuator housing.

3. Install the locknut and a new O-ring on the rear sub steering angle sensor.

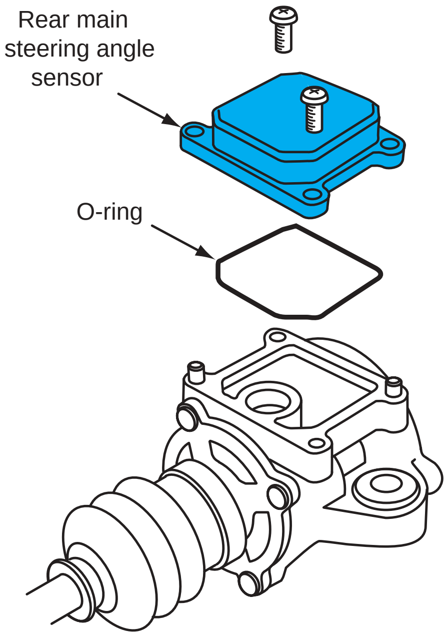

Figure 13-21 Removing the rear main steering angle sensor.

4. Place a light coating of grease on the O-ring and install the sensor in the actuator housing.
5. Rotate the sensor until it touches the tapered shaft and back it out one-half turn. Tighten the locknut finger tight. Final adjustment of the rear sub steering angle sensor is completed with the actuator installed in the vehicle.
6. Place a light coating of grease on the rear main steering angle sensor O-ring and install this O-ring on the sensor.
7. Install the rear main steering angle sensor and O-ring in the actuator housing with the dowel pins properly positioned, and tighten the mounting bolts to the specified torque.

Installing Rear Steering Actuator

Follow these steps for rear steering actuator installation.

1. Install the rear steering actuator and the four mounting bolts and bracket. The arrow on the bracket must face upward (Figure 13-22).
2. Tighten the rear steering actuator mounting bolts to the specified torque.

CAUTION: Tighten the castelated nut on the tie-rod ends to the specified torque, and then tighten these nuts enough to align the slots in the nut with the hole in the tie-rod pin. Do not loosen the nut to align the nut slots with the tie-rod pin hole. If this nut is loosened to align the slot with the hole, the tie-rod end may become loose in service.

3. Reconnect the tie-rod ends to the steering arms and tighten the castelated nut to the specified torque. If necessary, tighten the nut slightly to align the nut slots with the tie-rod pin hole.
4. Install the cotter pin in the nut and tie-rod end pin openings, and bend one leg of the cotter pin downward over the nut. Bend the other cotter pin leg upward over the top of the tie-rod end pin (Figure 13-23).
5. Check all the wiring connectors for contamination and clean as necessary. Install all the wiring connectors on the rear steering actuator and tighten all the terminal nuts to the specified torque (Figure 13-24).
6. Install the terminal cover on the rear main steering sensor terminals. Remove the rear steering lock pin and install the cap bolt and washer. Leave the steering actuator cover removed until after the final rear steering actuator adjustments.

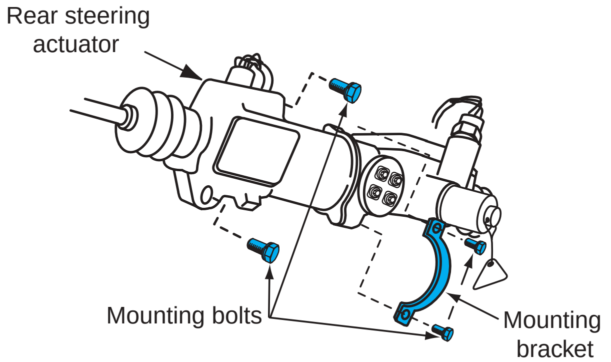

Figure 13-22 Installing the rear steering actuator, mounting screws, and bracket.

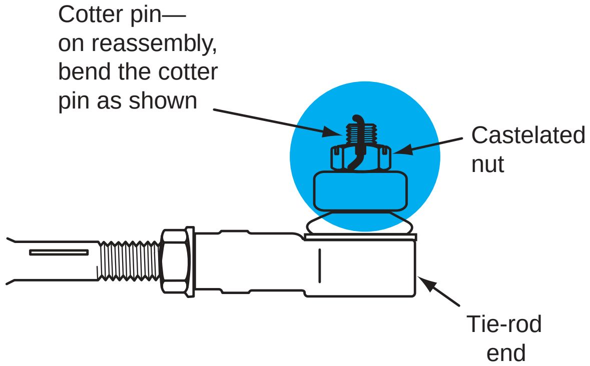

Figure 13-23 Proper installation of cotter pin in the tie-rod end.

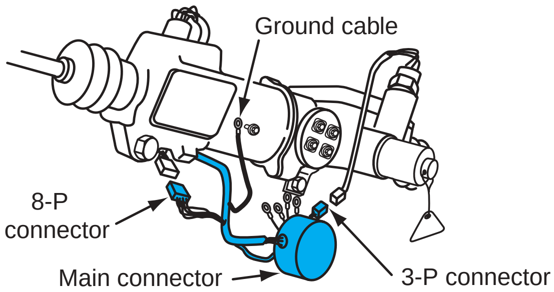

Figure 13-24 Installing wiring connectors on the rear steering actuator.

Rear Steering Actuator Adjustment

Electronic Neutral Check

Preliminary Checks

If the power to the 4WS control unit has been shut down for any of the following operations, start the engine and turn the steering wheel fully right and left.

1. Battery cables have been disconnected.
2. The 4WS control unit connector has been disconnected.
3. The number 43 clock-radio fuse has been disconnected.

CAUTION: Do not start the engine with the rear steering actuator lock pin in place. This action may damage the lock pin and rear steering actuator.

Prior to the electronic neutral check, be sure the steering wheel spoke is at the designated angle while driving straight ahead. Be sure the rear wheels are in the straight-ahead driving position before the electronic neutral check.

Steering Wheel Marking and Diagnostic Mode Entry

Follow these steps to mark the steering wheel, and enter the front steering sensor diagnostic mode.

1. Drive the vehicle on an alignment rack, and place all four wheels on turning radius gauge turntables. Be sure the wheels are in the center of the turntables with the wheels straight ahead and the turntables in the zero-degree position (Figure 13-25).

Special Tools

Turning radius gauge turntables

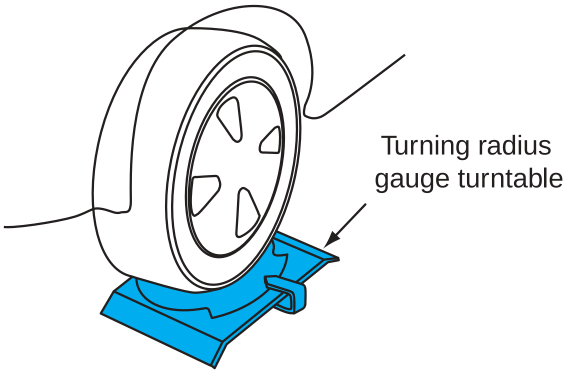

Figure 13-25 All four wheels must be on radius gauge turntables with the wheels straight ahead and the turntables in the zero-degree position.

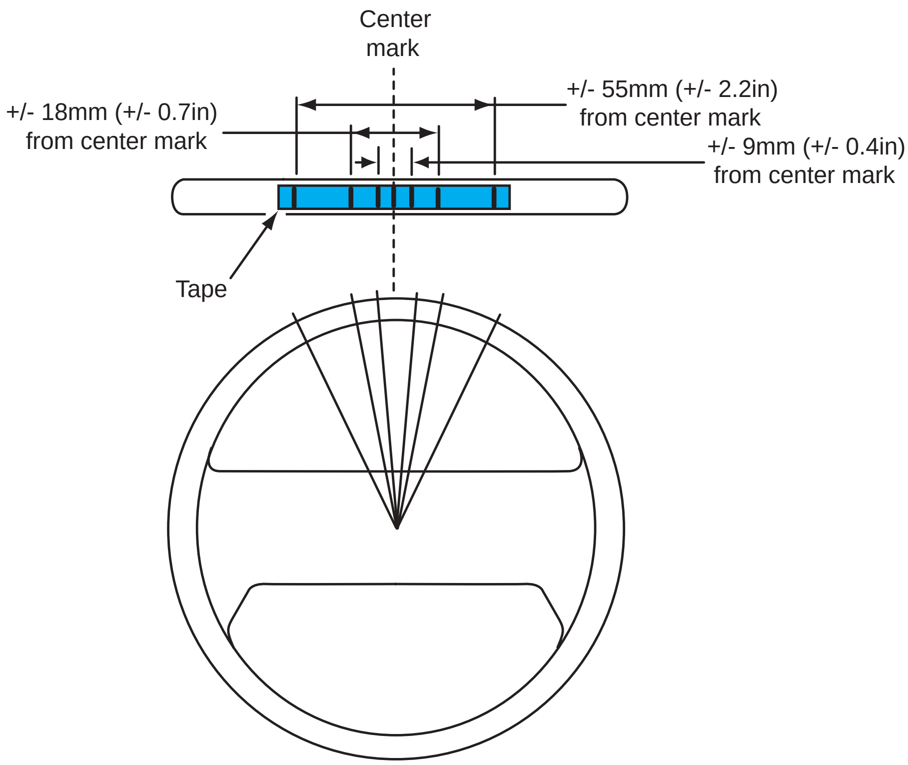

Figure 13-26 Steering wheel marking for electronically neutral check.

2. Place a piece of masking tape 12 in (300 mm) long on top of the steering wheel. Mark the tape at each of the following locations on the outer circumference of the wheel (Figure 13-26).
   - center, highest point on the wheel
   - 0.4 in (9 mm) right and left of the center mark
   - 0.7 in (18 mm) right and left of the center mark
   - 2.2 in (55 mm) right and left of the center mark
3. Bend a stiff piece of wire so it can be taped to the top of the dash with the outer end of the wire positioned over the steering wheel marks. Be sure the front wheels are straight ahead with the tip of the wire over the center mark on the steering wheel (Figure 13-27). Be sure the wire is securely taped to the top of the instrument panel.
4. Connect a jumper wire to the 4WS service check connector terminals. This is the same connection for obtaining 4WS control unit trouble codes. Check and verify the trouble codes prior to the electronic neutral check. The 4WS indicator light will not indicate the electronic neutral check and trouble codes at the same time.
5. Pull the parking brake fully on until the parking brake warning light is on, and turn on the ignition switch to set the front steering sensor test mode.

Front Sensor Inspection, Electronic Neutral Check

Follow these steps to check the front main steering sensor.

1. With the ignition switch on, turn the steering wheel slowly to the left and slowly to the right until the 4WS indicator light comes on. Repeat this step several times to find

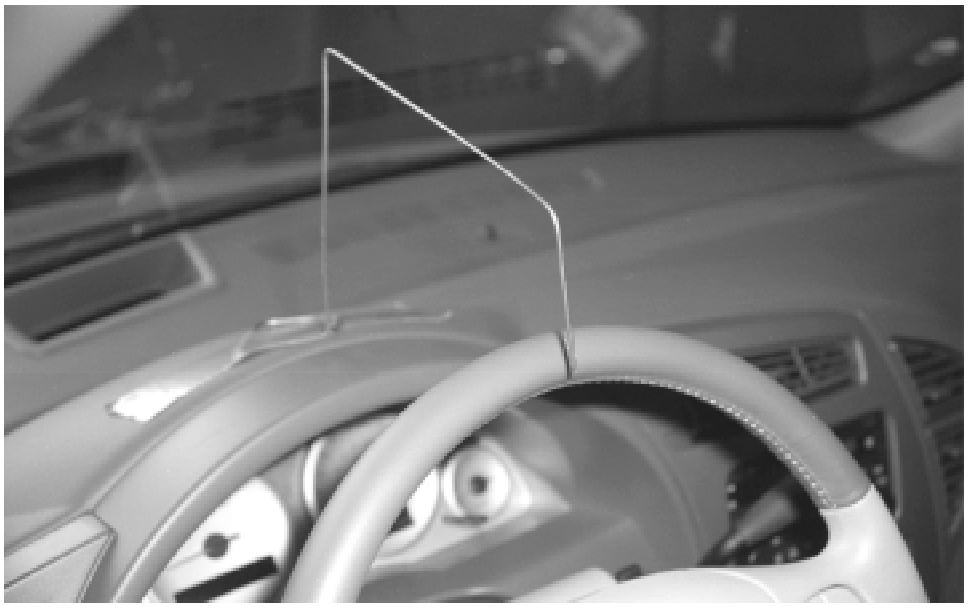

Figure 13-27 Front wheels straight ahead and wire pointer positioned over the center mark on the steering wheel.

the exact steering wheel position where the 4WS indicator light is illuminated for more than two seconds.

2. The 4WS indicator light should be illuminated when the steering wheel is 9 mm (0.4 in) to the left and right of the center mark on the steering wheel. If the 4WS indicator light comes on at a point outside of this specified range, the 4WS system requires adjustment.

Use the following procedure to check the front sub steering angle sensor:

The **front sub steering angle sensor** sends a voltage signal to the 4WS computer in relation to rack movement in the front steering gear.

1. Slowly turn the steering wheel to the left and right of the center position until the 4WS indicator light blinks at intervals of 0.2 seconds. Repeat this procedure several times to locate the exact steering wheel position where the indicator light begins blinking. The light should begin blinking within 2.2 in (55 mm) to the left or right of the center mark on the steering wheel.
2. If the 4WS indicator light does not begin flashing within this specified range, a 4WS system adjustment is necessary. After adjusting the front sub steering sensor, the 4WS indicator light should begin flashing when the steering wheel is turned 0.7 in (18 mm) to the left or right of the center mark on the steering wheel.

Rear Sensor Inspection, Electronic Neutral Check

Use the following procedure to complete the rear sensor inspection.

1. Release the parking brake and be sure the parking brake warning light is off. This causes the 4WS control unit to enter the rear steering sensor inspection mode.
2. Remove the rear cap bolt and sealing washer from the rear steering actuator and install the rear steering center lock pin until it bottoms in the actuator (Figure 13-28).
3. Position the front wheels in the straight-ahead position to prevent the rear wheels from steering if the engine is started by mistake.
4. Turn the ignition switch on and push the left rear wheel fully to the right by hand; then push this wheel fully to the left by hand while a coworker observes the 4WS

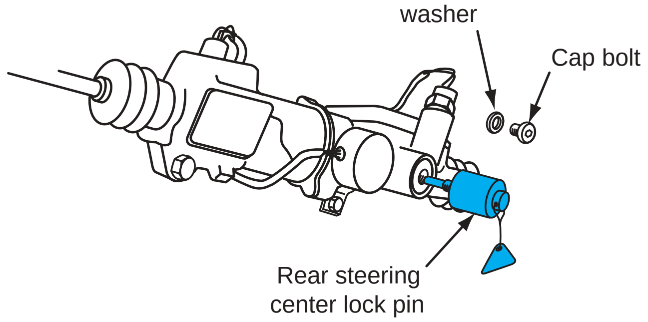

Figure 13-28 Removing the rear cap bolt and sealing washer, and installing the rear steering center lock pin.

indicator light (Figure 13-29). The 4WS indicator light should begin to flash at 0.2-second intervals when the left rear wheel is pushed to the left a small amount. If the 4WS indicator light does not flash, adjust the rear sub steering angle sensor.

5. With the ignition switch on, push the left rear wheel fully to the left by hand; then slowly push it to the right. The 4WS indicator light should be illuminated for more than two seconds when the left rear wheel is pushed to the right (Figure 13-30). If the 4WS indicator light is not illuminated, remove the rear main steering angle sensor and check it for damage.
6. Turn off the ignition switch.
7. Remove the rear steering center lock pin and install the cap bolt and washer. Tighten the cap bolt to the specified torque.
8. Remove the jumper wire from the service check connector.
9. Install the rear steering actuator cover.

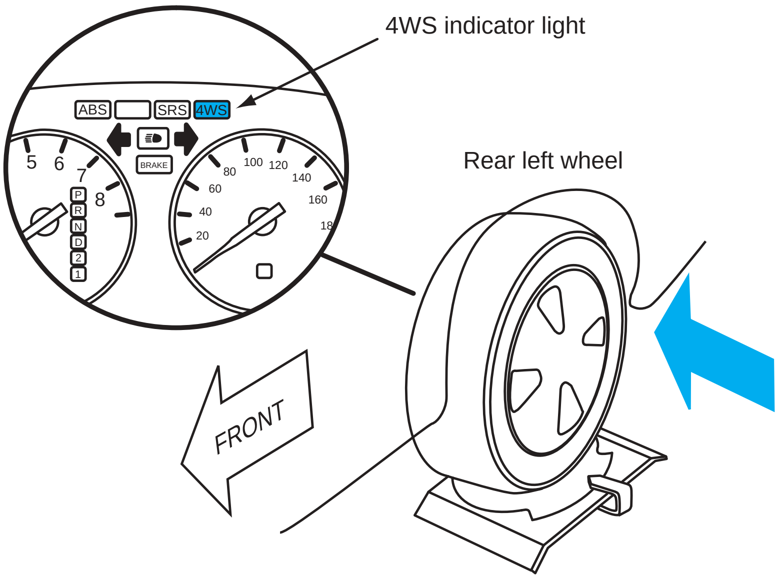

Figure 13-29 The 4WS indicator light should flash when the left rear wheel is pushed to the left, if the rear sub steering angle sensor is properly adjusted.

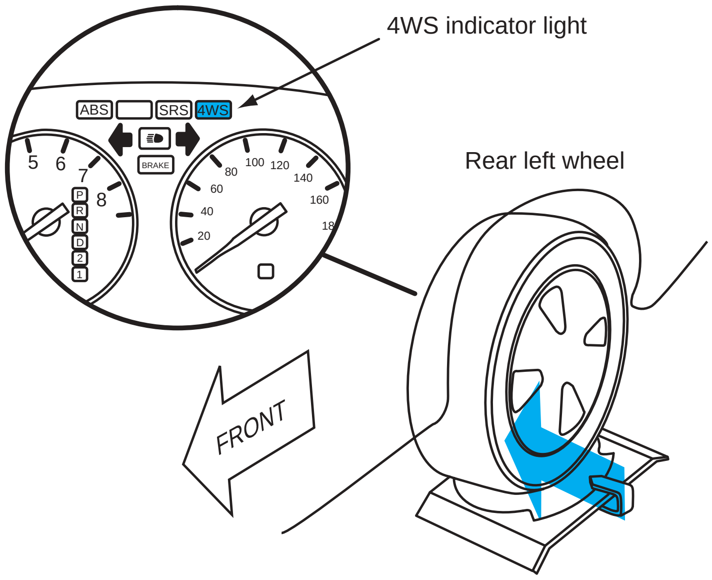

Figure 13-30 Pushing the left rear wheel to the right and observing the 4WS indicator light checks the rear main steering angle sensor.

Front Main Steering Angle Sensor Adjustment

The **front main steering angle sensor** sends a voltage signal to the 4WS computer in relation to steering wheel rotation.

Proceed as follows for the front main steering angle sensor adjustment.

1. Place the car on an alignment rack with each wheel on a turning radius gauge turntable. Turn the steering wheel fully to the right and then fully to the left; count the number of turns from fully right to fully left.
2. Turn the steering wheel back from full left exactly one-half the number of turns from fully right to fully left. This action centers the front steering rack. The steering wheel spoke should be within the vehicle manufacturer's specified number of degrees from the horizontal position. If the steering wheel is not within this specified position, proceed with the front main steering angle sensor adjustment and spoke angle adjustment.
3. Set the steering wheel so the front wheels are straight ahead, and remove the steering wheel retaining nut. Use a steering wheel puller to remove the steering wheel (Figure 13-31).

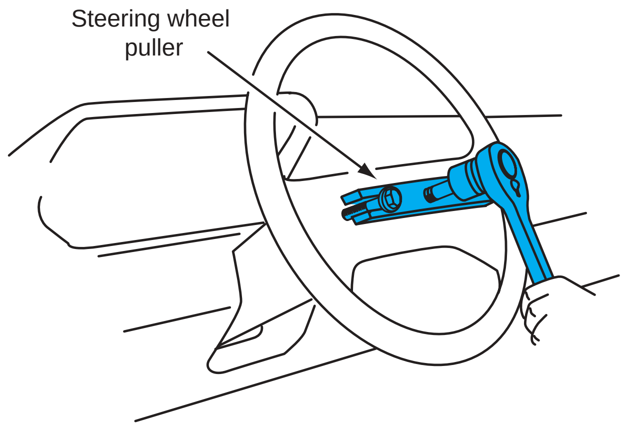

Figure 13-31 Removing the steering wheel.

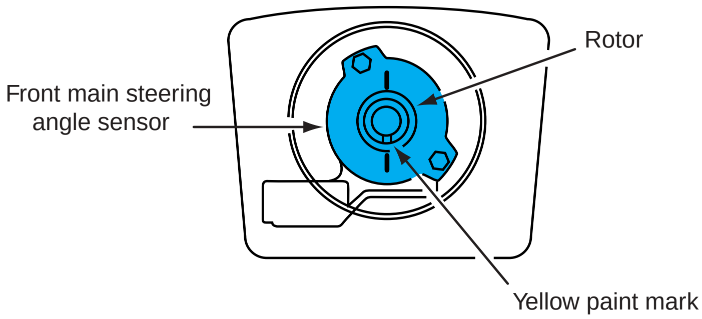

Figure 13-32 Yellow paint mark on the front main steering angle sensor indicating the electronically neutral sensor position.

4. Check to see if the yellow paint mark on the front main steering angle sensor is facing straight down (Figure 13-32). When this paint mark is facing down, the front main steering angle sensor is in the electronically neutral position.
5. If the yellow paint mark on the front main steering angle sensor is not facing downward, temporarily install the steering wheel with the spokes in the horizontal position. Turn the steering wheel until this yellow paint mark is facing downward.
6. Return the steering wheel to the horizontal position and remove the steering wheel.
7. Install the steering wheel, aligning it with the serration that makes the spoke angle closest to horizontal. Be sure the steering wheel openings fit over the pins on the **cable reel** for the air bag system (Figure 13-33). Do not push down hard on the steering wheel until the serrations and cable reel pins are properly aligned. When the serrations and cable reel pins are properly aligned, push the steering wheel down into place and install the retaining nut.
8. Hold the steering wheel and tighten the retaining nut to the specified torque.

The **cable reel** contains a conductive ribbon that connects the air bag module on top of the steering wheel to the air bag electrical system, while allowing steering wheel rotation.

Front Sub Steering Angle Sensor Adjustment

Use this procedure for the front sub steering angle sensor adjustment.

1. Raise the front and rear suspension with a floor jack and place safety stands under the proper chassis locations specified by the car manufacturer. All four wheels must be off the floor.

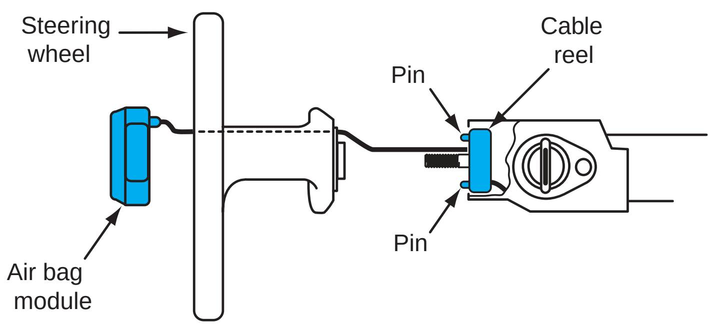

Figure 13-33 Proper alignment of the steering wheel openings and cable reel pins.

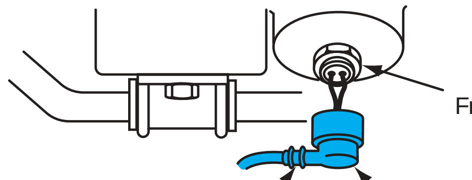

Figure 13-34 Cutting the tie strap and removing the front sub steering angle sensor cover.

2. Set the steering wheel in the straight-ahead driving position.
3. Connect a jumper wire across the 4WS system service check connector terminals.
4. Pull the parking brake on fully and turn on the ignition switch. Be sure the parking brake warning light is illuminated.
5. Turn the ignition switch off.
6. Cut the tie strap off the front sub steering angle sensor cover and remove this cover (Figure 13-34).
7. Remove the wiring harness from the clamp and disconnect the wiring harness connector.
8. Loosen the front sub steering angle sensor locknut; then tighten the locknut fully by hand. Back this locknut off three-quarters of a turn and connect the connector.
9. Be sure the front wheels are in the straight-ahead driving position and turn the steering wheel until the 4WS indicator light is illuminated. Keep the steering wheel in this position.
10. Slowly turn the front sub steering angle sensor clockwise until the 4WS indicator light goes off, and then mark the sensor position in relation to the housing.
11. Slowly rotate the front sub steering angle sensor counterclockwise until the 4WS indicator light begins to blink, and then mark the sensor in relation to the housing (Figure 13-35). Set the front sub steering angle sensor in the center of the range from where the light went off to where the light began to blink. Hold the sensor in this position and tighten the locknut to the specified torque.
12. Turn off the ignition switch. If the front sub steering angle sensor harness is twisted, disconnect the connector and straighten the harness. Install the harness in the clamp and install the sensor cover. Secure the cover with a new tie strap.
13. Perform the electronic neutral check described earlier in this chapter.

Rear Sub Steering Angle Sensor Adjustment

The rear main steering angle sensor is not adjustable.

Proceed with these steps to adjust the rear sub steering angle sensor.

1. Raise the front and rear suspension with a floor jack, and place safety stands under the proper chassis locations specified by the car manufacturer. All four wheels must be off the floor.
2. Connect a jumper wire across the terminals in the 4WS system service check connector, and be sure any trouble codes have been displayed.

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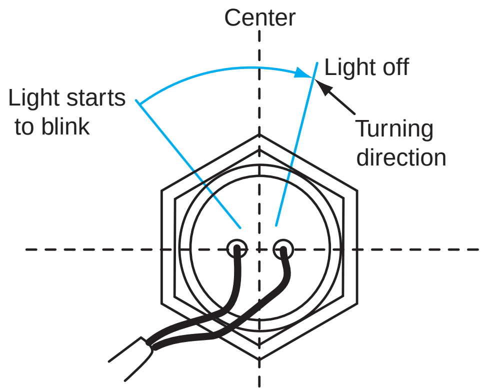

Figure 13-35 Adjusting the front sub steering angle sensor.

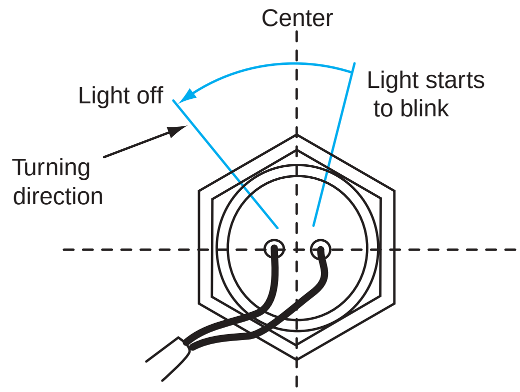

Figure 13-36 Adjusting the rear sub steering angle sensor.

3. Release the parking brake and turn the ignition switch on. Be sure the parking brake warning light goes off.
4. Turn off the ignition switch.
5. Remove the cap bolt and washer and install the rear steering center lock pin.
6. Remove the rear sub steering angle sensor wire from the clamp and disconnect the wiring harness connector.
7. Loosen the rear sub steering angle sensor locknut. Tighten this locknut fully by hand; then back it off approximately one-half turn.
8. Connect the rear sub steering angle sensor connector and set the front wheels in the straight-ahead driving position.
9. Turn on the ignition switch.
10. Push the left rear wheel fully to the left by hand, and then push this wheel slowly to the right until the 4WS indicator light comes on. This action places the main rear steering angle sensor in the electronically neutral position.
11. Slowly turn the rear sub steering angle sensor counterclockwise until the 4WS indicator light goes off, and mark the sensor in relation to the housing.
12. Slowly rotate this sensor clockwise until the 4WS indicator light starts to blink and mark the sensor in relation to the housing. Turn the sensor to the center position between where the indicator light went off and the light started to blink (Figure 13-36). Hold the sensor in this position and tighten the locknut to the specified torque.
13. Turn off the ignition switch.
14. If the rear sub steering angle sensor wiring is twisted, disconnect the connector, straighten the harness, and reconnect the connector.
15. Disconnect the jumper wire from the service check connector.
16. Remove the rear steering center lock pin and install the cap bolt and washer. Tighten the cap bolt to the specified torque.
17. Install the rear steering actuator cover and perform the electronic neutral check described earlier in this chapter.

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Photo Sequence 13 shows a typical procedure for diagnosing an electronically controlled four-wheel steering system.

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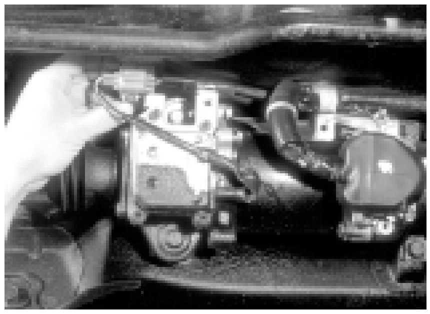
Photo Sequence 13
Typical Procedure for Diagnosing an Electronically Controlled Four-Wheel Steering System

P13-1 Road test the vehicle to check 4WS operation and indicator light.



P13-2 Raise the vehicle on a lift, and check all electrical connectors on the front steering gear and rear steering actuator.

P13-3 Lower the vehicle and locate the service check connector behind the center console.

P13-4 Look up the diagnostic procedure and trouble codes in the car manufacturer's service manual.

P13-5 Connect a jumper wire between the terminals in the service check connector.

P13-6 Turn on the ignition switch.

P13-7 Observe the 4WS indicator light flashes to obtain the fault codes.

P13-8 Turn off the ignition switch.

P13-9 Remove the jumper wire from the service check connector.

CASE STUDY

A customer complained about the 4WS indicator light coming on intermittently on a Honda Prelude with an electronic 4WS system. The technician asked the customer about any other steering problems, and the customer reported the car steered normally. The technician road tested the car, but the 4WS light did not come on, which indicated there were no electronic problems in the system. The customer was concerned about a possible safety hazard while driving this vehicle with the 4WS indicator light illuminated. In reply to this concern, the technician explained to the customer about the fail-safe function in the 4WS system and the rear wheels being centered in this mode.

The technician asked the customer about any recent service work completed on the vehicle. In response to this question, the customer replied that the car had been in a rear end collision recently, and when the body work was completed, the 4WS indicator light problem started occurring. The technician informed the customer that a 4WS system diagnosis and inspection should be performed.

Since the 4WS indicator light was not illuminated, the technician concluded that a trouble code diagnosis would probably not provide any diagnostic answers. However, the technician checked the system for codes in case there was a code caused by abnormal or harsh driving, which would not cause the indicator light to be illuminated.

When the technician raised the vehicle on a hoist, it was clearly visible that many of the rear suspension and body parts had been replaced recently. Even the rear steering actuator cover had been replaced. The technician removed the rear steering actuator cover to inspect the wiring on the actuator. All the wiring connectors were inspected, including the terminals on the rear main steering angle sensor. When the technician inspected the rear sub steering angle sensor wiring harness, he found this harness had been punctured by a sharp object near the sensor. The technician probed the sensor wires at the sensor and connected a pair of ohmmeter leads from each wire at the sensor to the corresponding colored wire in the sensor connector. Each wire showed a normal zero-ohm resistance. The technician repeated these ohmmeter connections and wiggled the wires at the damaged location. On one of the wires, the ohmmeter reading went to infinite while wiggling the wires, indicating an intermittent open circuit.

The technician replaced the rear sub steering angle sensor and performed the electronic neutral check and the rear sub steering angle sensor adjustment. During a road test, the 4WS indicator light did not come on.

Terms to Know

Cable reel
Fail-safe mode
Front main steering angle sensor
Front sub steering angle sensor
Rear main steering angle sensor
Rear steering center lock pin
Rear sub steering angle sensor
Service check connector

ASE-Style Review Questions

1. While discussing the fail-safe function:
Technician A says the 4WS indicator light is illuminated during the fail-safe function.
Technician B says the rear wheels steer normally when the 4WS control unit enters the fail-safe mode.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

2. While discussing the fail-safe function and damper control:
Technician A says the rear wheels move instantly to the centered position when the 4WS control unit enters the fail-safe mode.
Technician B says the return spring moves the rear wheels away from the centered position.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

3. While discussing trouble code diagnosis:
Technician A says the 4WS system service check connector is located under the driver's seat.
Technician B says when one of the service check connector terminals is grounded, the 4WS system enters the diagnostic mode.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

4. While discussing trouble code diagnosis:
Technician A says many 4WS system trouble codes are cancelled when the ignition switch is turned off.
Technician B says codes representing problems caused by abnormal or harsh driving conditions do not illuminate the 4WS indicator light.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

5. While discussing rear steering actuator service:
Technician A says the rear steering actuator is a replacement unit except for tie rods and sensors.
Technician B says the arrows on the rear steering actuator brackets must face downward.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

6. All of these statements about rear steering actuators and actuator service are true EXCEPT:
A. Axial impact on the shaft screw may damage the actuator.
B. Rotational force on the shaft screw may damage the actuator.
C. The engine may be started with the rear steering lock pin in place.
D. The shaft screw must be held with a special tool while loosening the tie rods.

7. While servicing and adjusting electronically controlled four-wheel steering systems:
A. the steering center lock pin must be installed in the left rear tie rod for many 4WS adjustments.
B. the electronic neutral check determines if the front or rear steering sensors require adjustment.
C. the electronic neutral check is performed with the rear wheels fixed in the straight-ahead position.
D. the 4WS indicator light is illuminated with the engine running if the inner tie rods are loose in the rear steering actuator.

8. While servicing and adjusting electronically controlled four-wheel steering systems:
A. the front main steering angle sensor is not adjustable.
B. the rear main steering angle sensor is adjustable.
C. removing the clock-radio fuse erases the diagnostic trouble codes.
D. if the 4WS light provides three long flashes followed by three short flashes in the diagnostic mode, code 3 is indicated.

9. While servicing and adjusting electronically controlled four-wheel steering systems:
A. in the diagnostic mode, the 4WS indicator light flashes quickly for 10 seconds between the main and sub processor DTCs.
B. a DTC may be set in the processor memory if the steering wheel is turned with a rear wheel against a curb and the engine running.
C. if the steering wheel is turned with the engine running and a rear wheel against a curb, the 4WS indicator light is illuminated.
D. driving the car with the parking brake on has no effect on the 4WS indicator light.

10. While servicing and adjusting electronically controlled four-wheel steering systems:
A. the 4WS indicator light will indicate DTCs and the electronic neutral check at the same time.
B. the parking brake must be released during the front steering sensor test mode.
C. the ignition switch must be on during the front steering test mode.
D. the brake pedal must be depressed during the rear steering test mode.

ASE Challenge Questions

1. While discussing electronic 4WS:
Technician A says jumping the two terminals of the service check connector with the engine off will display DTCs.
Technician B says jumping the service check connector then starting the engine displays the processor in which the codes are stored.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

2. The Honda Prelude 4WS system uses a main and a sub processing unit, each storing 10 trouble codes. If the 4WS light on the dash blinks quickly and repeatedly for three seconds, it means:
A. a DTC is stored in the main processor.
B. a DTC is stored in the sub processor.
C. the system is moving from the main to the sub processor memory.
D. a DTC sequence will be repeated.

3. Honda Prelude temporary "abnormal or harsh driving" 4WS DTCs range from _____ to _____ .
A. 07/14 **C.** 17/24
B. 70/74 **D.** 44/47

4. The Honda Prelude 4WS light has gone on and remains on.
Technician A says that before performing any diagnostic tests, the 10A fuse for the clock radio should be removed.
Technician B says to retrieve the DTC, the 4WS control unit connector must be disconnected.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

5. While discussing electronic 4WS:
Technician A says that after repairing a defect of the main steering angle sensor in the Honda Prelude 4WS system, fuse #43 must be removed to cancel the code.
Technician B says the battery terminal must be removed to cancel DTCs in parts of the Honda Prelude 4WS system other than the main steering angle sensor.
Who is correct?
A. A only **C.** Both A and B
B. B only **D.** Neither A nor B

Job Sheet 39

39

Name ______________________________ Date ______________

Retrieve Diagnostic Trouble Codes (DTCs), Four-Wheel Steering (4WS) System

Upon completion of this job sheet, you should be able to retrieve diagnostic trouble codes (DTCs) on four-wheel steering (4WS) systems.

ASE Correlation

This job sheet is related to ASE Automotive Suspension and Steering Task: *Inspect, diagnose, adjust, service, or replace components of electronically controlled steering systems.*

Tools and Materials

Jumper wire

Describe the Vehicle Being Worked On:

Year __________ Make ________________ Model ____________
VIN ____________________ Engine type and size ________________

Procedure

Task Completed

1. Be sure the ignition switch is off and remove the dual-terminal service check connector located behind the center console. Connect the two terminals in this connector with a jumper wire.

   Is the jumper wire properly connected? ☐ Yes ☐ No

   Instructor check ______________________________

2. Turn the ignition switch on, but do not start the engine. ☐
3. Observe the 4WS indicator light to read the diagnostic trouble codes (DTCs). Three longer flashes followed by a brief pause and one quicker flash indicates code 31. The codes are given in numerical order. ☐
4. List the DTCs provided with ignition switch on and the engine not running and include the DTC interpretation.

   1. ______________________________
   2. ______________________________
   3. ______________________________

5. Turn the ignition switch off and start the engine while observing the 4WS indicator light in the instrument panel. ☐
6. Does the 4WS indicator light blink once quickly when the ignition switch is turned on?

   4WS light operation: ☐ Satisfactory ☐ Unsatisfactory

   If the 4WS light operation is unsatisfactory, describe the light operation.

   ____

   ____

Task Completed

7. After the quick flash in step 6, did the 4WS indicator light pause for three seconds?
4WS light operation: ☐ Satisfactory ☐ Unsatisfactory
If the 4WS light operation is unsatisfactory, describe the light operation.
____
____

8. List the main processor DTCs displayed after the pause in step 7 and include the DTC interpretation.
1. ______________________________
2. ______________________________
3. ______________________________

9. Did the 4WS indicator light pause for 1.6 seconds after the DTCs displayed in step 8?
☐ Yes ☐ No
4WS light operation: ☐ Satisfactory ☐ Unsatisfactory
If the 4WS light operation is unsatisfactory, describe the light operation.
____
____

10. Did the 4WS indicator light blink quickly for three seconds to indicate a separation between the main and sub processor codes? ☐ Yes ☐ No
4WS light operation: ☐ Satisfactory ☐ Unsatisfactory
If the 4WS light operation is unsatisfactory, describe the light operation.
____
____

11. Did the 4WS indicator light pause for 1.6 seconds? ☐ Yes ☐ No
4WS light operation: ☐ Satisfactory ☐ Unsatisfactory
If the 4WS light operation is unsatisfactory, describe the light operation.
____
____

12. List the sub processor DTCs displayed after the pause in step 11, and include the DTC interpretation.
1. ______________________________
2. ______________________________
3. ______________________________

13. Did the 4WS indicator light pause for 3 seconds and then repeat the cycle?
☐ Yes ☐ No
4WS light operation: ☐ Satisfactory ☐ Unsatisfactory
If the 4WS light operation is unsatisfactory, describe the light operation.
____
____

14. On the basis of all the DTCs displayed, state the required diagnostic procedure to locate the exact cause of the defect(s) and explain the reasons for your diagnosis.
____
____

Instructor's Response ______________________________

Job Sheet 40

40

Name ______________________________ Date ______________

Remove and Replace Rear Steering Actuator

Upon completion of this job sheet, you should be able to remove and replace a rear steering actuator.

ASE Correlation

This job sheet is related to ASE Automotive Suspension and Steering Task: *Inspect, diagnose, adjust, service, or replace components of electronically controlled steering systems.*

Tools and Materials

Tie-rod end puller
Torque wrench

Describe the Vehicle Being Worked On:

Year __________ Make ________________ Model ______________
VIN ____________________ Engine type and size ________________

Procedure

Task Completed

1. Raise the vehicle on a hoist, or lift the rear of the vehicle with a floor jack, and support the chassis with safety stands placed under the chassis at the vehicle manufacturer's recommended locations. ☐
2. Remove the cotter pin and nut from each tie-rod end. ☐
3. Install a 12-millimeter (mm) nut on each tie-rod end until the nuts are flush with the tie-rod stud. ☐
4. Install the special tool on the tie-rod end and with the tool arms parallel, tighten the screw on the tool to loosen the tie-rod end. Repeat the procedure on both tie-rod ends. ☐
5. Remove the nuts from the tie rods and remove the tie rods from the steering arms. ☐
6. Remove the rear steering actuator cover. ☐
7. Remove the the cap bolt and washer and install the rear steering center lock pin.

   Is the rear steering center lock pin installed? ☐ Yes ☐ No

   Instructor check ____
8. Remove the ground cable connector and all wiring harness connectors on the rear steering actuator.

   Are the ground cable connector and all wiring harness connectors removed?
   ☐ Yes ☐ No

   Instructor check ____

Task Completed

☐

9. Remove the four mounting bolts and bracket and remove the rear steering actuator.

10. Install the rear steering actuator, the four mounting bolts, the and bracket. The arrow on the bracket must face upward.

Is the arrow on the bracket facing upward? ☐ Yes ☐ No

Instructor check ______________________________

11. Tighten the rear steering actuator mounting bolts to the specified torque.

Specified rear steering actuator mounting bolt torque ______________

Actual rear steering actuator mounting bolt torque ______________

CAUTION: Tighten the castelated nut on the tie-rod ends to the specified torque; then tighten these nuts enough to align the slots in the nut with the hole in the tie-rod pin. Do not loosen the nut to align the nut slots with the tie-rod pin hole. If this nut is loosened to align the slots with the hole, the nut may become loose in service.

12. Reconnect the tie-rod ends to the steering arms and tighten the castelated nut to the specified torque. If necessary, tighten the nut slightly to align the nut slots with the tie-rod pin hole.

Specified tie-rod end castelated nut torque ______________

Actual tie-rod end castelated nut torque ______________

13. Install the cotter pin in the nut and tie-rod end pin openings and bend one leg of the cotter pin downward over the nut. Bend the other cotter pin leg upward over the top of the tie-rod end pin.

Are the cotter pins properly installed in the tie-rod end nuts? ☐ Yes ☐ No

Instructor check ______________________________

14. Check all the wiring connectors for contamination, and clean as necessary. Install all the wiring connectors on the rear steering actuator and tighten all the terminal nuts to the specified torque.

Wiring terminal condition: ☐ Satisfactory ☐ Unsatisfactory

Specified wiring terminal nut torque ______________

Actual wiring terminal nut torque ______________

15. Install the terminal cover on the rear main steering sensor terminals. Remove the rear steering lock pin and install the cap bolt and washer. Leave the steering actuator cover removed until after the final rear steering actuator adjustments.

Is the rear steering lock pin removed? ☐ Yes ☐ No

Are the cap bolt and washer properly installed in the rear steering lock pin hole? _____

Instructor check ______________________________

Instructor's Response ______________________________

Job Sheet 41

41

Name ______________________________ Date ______________

Remove and Replace Rear Steering Actuator Tie Rods and Tie-Rod Ends

Upon completion of this job sheet, you should be able to remove and replace rear steering actuator tie rods and tie-rod ends.

ASE Correlation

This job sheet is related to ASE Automotive Suspension and Steering Task: *Inspect, diagnose, adjust, service, or replace components of electronically controlled steering systems.*

Tools and Materials

Torque wrench
Wax marker
Rack holding tool

Describe the Vehicle Being Worked On:

Year __________ Make ________________ Model ______________
VIN ____________________ Engine type and size ____________________

Procedure

Task Completed

1. Road test the vehicle and describe the steering problems that indicate the rear steering actuator tie rods and tie-rod ends require replacement.

____
____
____
____

2. Visually inspect the rear steering actuator tie rods and tie-rod ends, and list the parts that require replacement. Explain the reasons for your diagnosis.

____
____
____
____

3. Mark the relative position of the tie-rod end, locknut, and tie rod with a wax marker. h

   Are the tie rod, tie-rod end, and locknut properly marked? ☐ Yes ☐ No

4. Hold the tie-rod end with a wrench and loosen the locknut.

Task Completed

h **5.** Remove the tie-rod end.

h **6.** Remove the boot bands and clamps from the inner tie-rod ends.

h **7.** Place the flat side of the rack holding tool toward the actuator housing, and drive the special rack holding tool between the actuator housing and the stop washer with a soft hammer.

Is the rack holding tool properly installed with flat side toward the actuator housing?
☐ Yes ☐ No

h **8.** Straighten the tabs on the tie-rod lock washer.

Are the tabs straightened on tie-rod lock washer? ☐ Yes ☐ No

SERVICE TIP: Hold the special holding tool firmly while loosening the tie rod to avoid applying rotational force to the shaft screw in the actuator.

h **9.** Hold the shaft screw with the holding tool and loosen the tie rod with a wrench.

h **10.** Thread the tie rod off the shaft screw and repeat this procedure on each tie-rod end.

CAUTION: Do not allow dust, dirt, or foreign material to enter the tie-rod end ball joint or boot. This contamination causes rapid component wear.

CAUTION: Never apply axial impact or rotational force to the shaft screw in the rear steering actuator. Either of these actions may cause internal actuator damage.

11. Install the tie-rod ends so the marks on the tie-rod ends, locknuts, and tie rods are aligned, and tighten the tie-rod locknuts to the specified torque.

Marks on tie-rod ends, locknuts, and tie rods properly aligned? ☐ Yes ☐ No

Specified tie-rod end locknut torque ______________________

Actual tie-rod end locknut torque ______________________

Instructor check ______________________

12. Screw each inner tie rod onto the shaft screw while holding the lock washer so its tabs are in the inner tie-rod end. The stop washer must be installed on the shaft screw with the chamfered side facing outward.

Is the stop washer properly installed with chamfered side facing outward?
☐ Yes ☐ No

Instructor check ______________________

h **13.** Drive the special holding tool between the actuator housing and the stop washer with a soft hammer.

14. Hold the shaft screw with the holding tool and tighten the inner tie-rod end to the specified torque.

Specified inner tie-rod end torque ______________________

Actual inner tie-rod end torque ______________________

15. Bend the lock washer tabs against the flat on the inner tie-rod end.

Are the lock washer tabs bent against the flat on the inner tie-rod end?
☐ Yes ☐ No

Instructor check ______________________

Task Completed

16. Remove the special holding tool and apply silicone grease to the sliding surface of the tie rod. Place a light coating of silicone grease inside the tie-rod boot.

Is the sliding surface of the tie rod properly lubricated? ☐ Yes ☐ No

Is the inside surface of tie-rod boot properly lubricated? ☐ Yes ☐ No

Instructor check ______________________________

17. Apply the vehicle manufacturer's recommended grease to the circumference of the inner tie-rod joint housing. h

Is the circumference of inner tie-rod joint housing properly lubricated?
☐ Yes ☐ No

Instructor check ______________________________

18. Install the boots on the actuator housing and install the boot bands with the locking tabs properly positioned in relation to the actuator housing. h

Are the locking tabs properly positioned in relation to the actuator housing?
☐ Yes ☐ No

Instructor check ______________________________

CAUTION: While staking the boot clamps, be careful not to damage the inner tie-rod boots.

19. Tighten the boot bands and bend both sets of locking tabs over the band. Tap lightly on the doubled over portion of the band to reduce its height and stake the locking tabs firmly. h

Are the boot bands properly installed? ☐ Yes ☐ No

Are the locking tabs properly staked? ☐ Yes ☐ No

Instructor check ______________________________

Instructor's Response ______________________________

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ARTICLE BEGINNING

ENGINE PERFORMANCE
How To Use This Section

INTRODUCTION

NOTE: Because there are so many possible combinations of articles for the different manufacturers and models, the new hyper-text capabilities built into this product DO NOT apply to this article.

It is the purpose of this repair information system to help professional automotive technicians maintain top vehicle performance and correct driveability problems related to today's high tech vehicles.

Because of the limited amount of space allowable for the this product, our titles have been condensed to fit into the menus. An alphabetical designation has been added to the front of each title to allow the titles to be displayed in a way that reflects their respective order of use. References to the titles in some of the diagnostic flow charts sometimes will not correlate with the titles in the this product menu. If not, refer to the MENU CROSS-REFERENCE table below.

MENU CROSS-REFERENCE TABLE

Title	Associate Print (Book) Title:
A - ENGINE/VIN I D	Introduction
B - EMISSION APPLICATION	Emission Applications
C - TUNE-UP SPECS	Service & Adjustment Specifications
C - SPECIFICATIONS	Service & Adjustment Specifications
D - ADJUSTMENTS	On-Vehicle Adjustments
E - THEORY/OPERATION	Theory & Operation
F - BASIC TESTING	Basic Diagnostic Procedures
G - TESTS W/ CODES	Self-Diagnostics
H - TESTS W/O CODES	Trouble Shooting - No Codes
I - SYS/COMP TESTS	Systems & Component Testing
J - PIN VOLTAGE CHARTS	Pin Voltage Charts
K - SENSOR RANGE CHARTS	Sensor Operating Range Charts
L - WIRING DIAGRAMS	Wiring Diagrams
M - VACUUM DIAGRAMS	Vacuum Diagrams
N - REMOVE/INSTALL/OHAUL	Removal, Overhaul & Installation

Because of this we recommend that you read the rest of these

INTRODUCTION paragraphs to better understand why the information is presented in this new format.

The **A - ENGINE/VIN I D** article will help you identify the vehicle and its systems. It will also explain the VIN code and in many cases, show its location.

If you want "TUNE-UP" type information, see **D - ADJUSTMENTS** for the adjustment procedures. If you are familiar with the procedures, but need a quick way to find the specification, go to **C - TUNE-UP SPECS** or **C - SPECIFICATIONS** for the specifications pertaining to the vehicle.

When diagnosing driveability problems, first go to **F - BASIC TESTING**. This article is here to help eliminate wasted diagnostic time. If the basic systems are working properly, go to **G - TESTS W/ CODES**.

If the vehicle still is having a driveability problem or if the vehicle has no self-diagnostic system, go to **H - TESTS W/O CODES**. This article will help you diagnose the problem by symptom, locate the symptom exhibited by the vehicle, and inspect or test the items which may be causing the problem.

After finding which specific system or component requires testing, use the **I - SYS/COMP TESTS** article to tests the systems and components. We have also included (when available) pin voltage charts and sensor range charts. These can be found in **J - PIN VOLTAGE CHARTS** and **K - SENSOR RANGE CHARTS**.

Also included in this section are wiring diagrams and vacuum diagrams. These can be found in **L - WIRING DIAGRAMS** and **M - VACUUM DIAGRAMS**.

When all diagnostic tests have been performed and the problem has been discovered, it may be necessary to replace or overhaul the defective part. This information can be found in **N - REMOVE/INSTALL/OHAUL**.

The content of each of these articles is outlined below. As a summary of the driveability diagnosis, see **ROUTINE OUTLINE** in this article.

A - ENGINE/VIN ID

This article shows how to identify the model and engine by its Vehicle Identification Number (VIN). A model coverage chart shows each model and engine, the fuel system, ignition system and engine code. The engine serial number locations are also included in this article.

B - EMISSION APPLICATION

These charts identify the emission systems and sub-systems applicable to each model and engine combination.

C - TUNE-UP SPECS

This is a collection of quick-reference type specifications. This article is helpful when you are familiar with proper adjustment procedures and only need specifications. Included in this section are:

* Battery specifications.
* Fluid capacities.
* Replacement intervals.
* Belt adjustment.
* Engine Compression.
* Valve clearance.
* Valve Arrangement.
* Ignition coil specifications.

* High tension wire resistance.
* Spark plug type and gap.
* Firing order.
* Ignition timing.
* Fuel pump performance and injector resistance specifications
* Slow and fast idle speed and mixture specifications.
* Carbon monoxide (CO) level specifications.
* Throttle position sensor/switch specifications.

C - SPECIFICATIONS

This is a collection of quick-reference type specifications. This article is helpful when you are familiar with proper adjustment procedures and only need specifications. Included in this section are:

* Battery specifications.
* Fluid capacities.
* Replacement intervals.
* Belt adjustment.
* Engine Compression.
* Valve clearance.
* Valve Arrangement.
* Ignition coil specifications.

* High tension wire resistance.
* Spark plug type and gap.
* Firing order.
* Ignition timing.
* Fuel pump performance and injector resistance specifications
* Slow and fast idle speed and mixture specifications.
* Carbon monoxide (CO) level specifications.

* Throttle position sensor/switch specifications.

D - ADJUSTMENTS

This article contains the information that use to be included in the TUNE-UP section. Checking and adjusting valves, spark plugs, spark plug wires, base ignition timing and idle speed are found in this section. Use this article for routine maintenance. Also, if you have a driveability problem, ensure all on-vehicle adjustments are correct before proceeding with any diagnosis.

E - THEORY/OPERATION

This article covers basic theory and operation of engine performance-related systems and components. Before diagnosing vehicles or systems with which you are not completely familiar, read this article.

F - BASIC TESTING

When diagnosing driveability problems, there are certain "BASIC DIAGNOSTIC PROCEDURES" which must FIRST be performed. It is necessary to perform a careful, complete check of basic engine mechanical and electrical conditions, and verify spark availability and adequate fuel supply.

The procedures apply to both computerized and non-computerized systems. If all systems are okay, go to G - TESTS W/ CODES for vehicles with self-diagnostic systems or H - TESTS W/O CODES for diagnosis by symptom.

G - TESTS W/ CODES

Use this article to retrieve and interpret trouble codes from the engine computer self-diagnostic system. Once information is retrieved, diagnostic procedures are given to help pinpoint and repair computer system/component faults. Necessary steps for clearing trouble codes are also given. If faults indicated by trouble codes are not present at time of testing, proceed to TESTS W/O CODES for intermittent testing procedures.

H - TESTS W/O CODES

This article helps trouble shoot driveability problems based upon available "SYMPTOMS" and "INTERMITTENT TESTING" procedures. Procedures in this section should lead you to specific component or system tests which may or may not be computer

I - SYS/COMP TESTS

In this article, you will find tests for systems and components related to air induction systems (turbochargers), fuel control, ignition control, and emissions control systems.

J - PIN VOLTAGE CHARTS

PIN VOLTAGE CHARTS are supplied (where available) to speed up the diagnostic process. By checking pin voltages at the electronic control unit, it is possible to determine if the control unit is receiving and transmitting proper voltage signals.

K - SENSOR RANGE CHARTS

Use the SENSOR OPERATING RANGE CHARTS to determine if a sensor is out of calibration. A sensor that is out of calibration may not set a trouble code, but it will cause driveability problems.

L - WIRING DIAGRAMS

Use these WIRING DIAGRAMS to identify and trace component circuits, locate shorts and opens in circuits, and understand how individual circuits function as part of a system. The diagrams in this article are only for fuel, ignition and emission systems

M - VACUUM DIAGRAMS

The VACUUM DIAGRAMS will assist you in finding incorrectly routed vacuum hoses which may cause driveability problems or computer indicated malfunctions.

N - REMOVE/INSTALL/OHAUL

N - REMOVE/INSTALL/OHAUL contains information found in the sub-headings of REMOVAL, OVERHAUL & INSTALLATION. These are procedures and specifications required to remove, overhaul (if possible) and install components related to engine performance.

WHERE TO START

PERFORM BASIC INSPECTION

1) Verify customer complaint.

2) Perform visual inspection. See F - BASIC TESTING.
3) Test engine sub-system to determine that the following systems are functioning properly. See F- BASIC TESTING.

* Mechanical conditions (compression)
* Ignition output
* Fuel Delivery

4) Check air induction system for leaks.
5) Check & adjust basic engine settings listed below to ensure they are to specification. See D - ADJUSTMENTS.

* Ignition timing
* Idle speed

CHECK FOR TROUBLE CODES

1) If equipped with self-diagnostics, check for trouble codes. Refer to G - TESTS W/ CODES.
2) Repair causes of trouble code(s).
3) Clear control unit memory.

SYMPTOM DIAGNOSIS

1) If no self-diagnostics available, or no trouble codes present, identify symptom.
2) See trouble shooting procedure to repair complaint. See H - TESTS W/O CODES

TEST SYSTEM

1) Perform necessary systems and component tests. See I - SYS/COMP TESTS.
2) Verify that complaint is repaired.

SAFETY PRECAUTIONS

* Always refer to Engine Tune-Up Decal in engine compartment before performing tune-up. If manual and decal differ, always use decal specifications.
* DO NOT allow or create a condition of misfire in more than one cylinder for an extended period of time. Damage to converter may occur due to loading converter with unburned air/fuel mixture.
* Always turn ignition off and disconnect negative battery cable BEFORE disconnecting or connecting computer or other electrical components.

* DO NOT drop or shock electrical components such as computer,

airflow meter, etc.

* **DO NOT** use fuel system cleaning compounds that are not recommended by the manufacturer. Damage to gaskets, diaphragm materials and catalytic converter may result.
* Before performing a compression test or cranking engine using a remote starter switch, disconnect coil wire from distributor and secure it to a good engine ground, or disable ignition.
* Before disconnecting any fuel system component, ensure fuel system pressure is released.

* Use a shop towel to absorb any spilled fuel to prevent fire.
* **DO NOT** create sparks or have an open flame near battery.
* If any EFI components such as hoses or clamps are replaces, ensure they are replaced with components designed for EFI use.
* Always reassemble throttle body components with new gaskets, "O" rings and seals.
* If equipped with an inertia switch, **DO NOT** reset switch until fuel system has been inspected for leaks.
* Wear safety goggles when drilling or grinding.
* Wear proper clothing which protects against chemicals and other hazards.

END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION

COMMONLY USED ABBREVIATION

"A" ABBREVIATION TABLE

"A" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
A	Amperes
A/C	Air Conditioning
A/T	Automatic Transmission/Transaxle
AAP	Auxiliary Accelerator Pump
AB	Air Bleed
ABCV	Air Bleed Control Valve
ABDC	After Bottom Dead Center
ABRS	Air Bag Restraint System
ABS	Anti-Lock Brake System
AC	Alternating Current
ACC	A/C Clutch Compressor
ACCS	A/C Cycling Switch
ACCUM	Accumulator
ACCY	Accessory
ACT	Air Charge Temperature Sensor
ACV	Thermactor Air Control Valve
ADJ	Adjust or Adjustable
ADV	Advance
AFS	Airflow Sensor
AI	Air Injection
AIR or A.I.R.	Air Injection Reactor
AIS	Air Injection System
ALCL	Assembly Line Communications Link
ALDL	Assembly Line Diagnostic Link
ARC	Automatic Ride Control
ASCD	Automatic Speed Control Device
ASCS	Air Suction Control Solenoid
ASD	Auto Shutdown
ASDM	Air Bag System Diagnostic Module
ASV	Air Suction Valve
ATC	Automatic Temperature Control
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid
ATS	Air Temperature Sensor
AXOD	Automatic Transaxle Overdrive

Abs.	Absolute
Accy.	Accessory
Alt.	Alternator or Altitude
Amp.	Ampere
Assy.	Assembly
Auto.	Automatic
Aux.	Auxiliary
Avg.	Average

"B" ABBREVIATION TABLE

"B" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
B/P	Backpressure
BAC	By-Pass Air Control
BAP	Barometric Absolute Pressure Sensor
BARO	Barometric
BBDC	Before Bottom Dead Center
BCM	Body Control Module
BDC	Bottom Dead Center
BHP	Brake Horsepower
BLK	Black
BLU	Blue
BMAP	Barometric & Manifold Absolute Pressure Sensor
BOO	Brake On-Off Switch
BP	Barometric Pressure sensor
BPS	Barometric Pressure Sensor
BPT	Backpressure Transducer
BRN	Brown
BTDC	Before Top Dead Center
BTU	British Thermal Unit
BVSV	Bimetallic Vacuum Switching Valve
Baro.	Barometric
Batt.	Battery
Bbl.	Barrel (Example: 4-Bbl.)
Blst.	Ballast
Blwr.	Blower
Brkr.	Breaker

"C" ABBREVIATION TABLE

"C" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
o C	Celsius (Degrees)
C(3) I	Computer Controlled Coil Ignition
C(4)	Computer Controlled Catalytic Converter
CANP	Canister Purge solenoid
CARB	California Air Resources Board
CAT	Catalytic Converter
CB	Circuit Breaker
CBD	Closed Bowl Distributor
CBVV	Carburetor Bowl Vent Valve
cc	Cubic Centimeter
CCC	Computer Command Control
CCD	Computer Controlled Dwell
CCM	Central Control Module
CCO	Converter Clutch Override
CCOT	Cycling Clutch Orifice Tube
CCW	Counterclockwise
CDI	Capacitor Discharge Ignition
CEC	Computerized Engine Control
CFI	Central Fuel Injection
CID	Cubic Inch Displacement
CID	Cylinder Identification sensor
CIS	Continuous Injection System
CIS-E	Continuous Injection System-Electronic
CKT	Circuit
CLR	Clear
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO2	Carbon Dioxide
CONV	Convertible
CP	Canister Purge
CPA	Connector Position Assurance
CPS	Crank Position Sensor
CTS	Coolant Temperature Sensor
CV	Check Valve or Constant Velocity
CVC	Constant Vacuum Control
CW	Clockwise
CYL or Cyl.	Cylinder
Calif.	California
Carb.	Carburetor
Chrg.	Charging
Circ.	Circuit
Cntrl.	Control
Comp.	Compressor or Compartment
Conn.	Connector
Cont.	Continued
Conv.	Convertible or Converter

Cu. In.	Cubic Inch
Cyl.	Cylinder

"D" ABBREVIATION TABLE

"D" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
"D"	Drive
DBC	Dual Bed Catalyst
DC	Direct Current or Discharge
DDD	Dual Diaphragm Distributor
DERM	Diagnostic Energy Reserve Module
DFI	Digital Fuel Injection
DIC	Driver Information Center
DIS	Direct Ignition System
DIS	Distributorless Ignition System
DIST	Distribution
DISTR	Distributor
DK BLU	Dark Blue
DK GRN	Dark Green
DME	Digital Motor Electronics (Motronic System)
DOHC	Double Overhead Cam
DOT	Department of Transportation
DP	Dashpot
DRB-II	Diagnostic Readout Box
DVOM	Digital Volt/Ohm Meter (see VOM)
Def.	Defogger or Defroster
Def.	Defrost
Defog.	Defogger
Diag.	Diagnostic
Dist.	Distributor or Distribution
Dr.	Door

"E" ABBREVIATION TABLE

"E" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
EAC	Electric Assist Choke
EACV	Electric Air Control Valve
EBCM	Electronic Brake Control Module
ECA	Electronic Control Assembly

ECAT	Electronically Controlled Automatic Transaxle
ECM	Electronic Control Module
ECT	Engine Coolant Temperature Sensor
ECU	Electronic Control Unit or Engine Control Unit
EDF	Electric Drive Fan relay assembly
EDIS	Electronic Distributorless Ignition System
EEC	Electronic Engine Control
EECS	Evaporative Emission Control System
EEPROM	Electronically Erasable PROM
EFE	Early Fuel Evaporation
EFI	Electronic Fuel Injection
EGO	Exhaust Gas Oxygen sensor (see HEGO)
EGR	Exhaust Gas Recirculation system
EGRC	EGR Control solenoid or system
EGRV	EGR Vent solenoid or system
EMR	Emission Maintenance Reminder Module
ESA	Electronic Spark Advance
ESC	Electronic Spark Control
EST	Electronic Spark Timing
ETR	Emergency Tensioning Retractor
EVAP	Fuel Evaporative System
EVIC	Electronic Vehicle Information Center
EVO	Electronic Variable Orifice
EVP	EGR Valve Position Sensor
EVR	EGR Valve Regulator
EVRV	Electronic Vacuum Regulator Valve
Elect.	Electronic
Eng.	Engine
Evap.	Evaporative
Exc.	Except

"F" ABBREVIATION TABLE

"F" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
o F	Fahrenheit (Degrees)
F/B	Fuse Block
FBC	Feedback Carburetor
FI	Fuel Injector or Fuel Injection
FICD	Fast Idle Control Device
FIPL	Fuel Injector Pump Lever
FP	Fuel Pump
FPM	Fuel Pump Monitor
FPR-VSV	Fuel Pressure Regulator Vacuum Switching Valve

FWD	Front Wheel Drive
Fed.	Federal
Ft. Lbs.	Foot Pounds

"G" ABBREVIATION TABLE

"G" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
g	grams
GND or GRND	Ground
GRN	Green
GRY	Gray
Ga.	Gauge
Gals.	gallons
Gov.	Governor

"H" ABBREVIATION TABLE

"H" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
H/D	Heavy Duty
HAC	High Altitude Compensation
HC	Hydrocarbons
HEDF	High Speed Electro Drive Fan relay or circuit
HEGO	Heated Exhaust Gas Oxygen Sensor
HEGOG	HEGO Ground circuit
HEI	High Energy Ignition
HLDT	Headlight
HO	High Output
HP	High Performance
HSC	High Swirl Combustion
HSO	High Specific Output
HTR	Heater
HVAC	Heating
Headlt.	Headlight
Hg	Mercury
Hgt.	Height
Htr.	Heater
Hz	Hertz (Cycles Per Second)

"I" ABBREVIATION TABLE

"I" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
I.D.	Inside Diameter
IAC	Idle Air Control
IACV	Idle Air Control Valve
IC	Integrated Circuit
ID	Identification
IDM	Ignition Diagnostic Monitor
IGN	Ignition system or circuit
ILC	Idle Load Compensator
In. Hg	Inches of Mercury
INCH Lbs.	Inch Pounds
INFL REST	Inflatable Restraint
INJ	Injector or Injection
IP	Instrument Panel
IPC	Instrument Panel Cluster
ISA	Idle Speed Actuator
ISC	Idle Speed Control
ISS	Idle Stop Solenoid
ITS	Idle Tracking Switch
IVSV	Idle Vacuum Switching Valve
Ign.	Ignition
In.	Inches
Inj.	Injector

"J" ABBREVIATION TABLE

"J" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
J/B	Junction Block

"K" ABBREVIATION TABLE

"K" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
k/ohms	1000 ohms (kilo as in k/ohms)
Kg	Kilograms (weight)

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kg/cmy	Kilograms Per Square Centimeter
KAM	Keep Alive Memory
KAPWR	Keep Alive Power
KM/H	Kilometers Per Hour
KOEO	Key On Engine Off
KOER	Key On Engine Running
KS	Knock Sensor

"L" ABBREVIATION TABLE

"L" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
L	Liter(s)
L/D	Light Duty
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left Hand
LOS	Limited Operation Strategy
LT BLU	Light Blue
LT GRN	Light Green
LUS	Lock-Up Solenoid
Lbs.	Pounds
Lt(s).	Light(s)
Lugg.	Luggage

"M" ABBREVIATION TABLE

"M" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
mA	Milliamps
mV	Millivolts
mfd.	Microfarads
mm	Millimeters
M/T	Manual Transaxle or Transmission
MA PFI	Mass Air Sequential Port Fuel Injection system
MA or MAF	Mass Airflow
MAF	Mass Air Flow sensor
MAFS	Mass Airflow Sensor
MAP	Manifold Absolute Pressure sensor
MAT	Manifold Air Temperature
MCU	Microprocessor Control Unit

MCV	Mixture Control Valve
MEM-CAL	Memory Calibration Chip
MFI	Multiport Fuel Injection
MIL	Malfunction Indicator Light
MLP	Manual Lever Position
MPFI	Multi Point Fuel Injection
MPH	Miles Per Hour
MPI	Multi-Point (Fuel) Injection
Man.	Manual
Mech.	Mechanical
Mem.	Memory
Mtr.	Motor

"N" ABBREVIATION TABLE

"N" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
N.m	Newton-Meter
NA	Not Available
NDS	Neutral Drive Switch
NGS	Neutral Gear Switch
NOx	Oxides of Nitrogen
NPS	Neutral Pressure Switch
No.	Number
Nos.	Numbers

"O" ABBREVIATION TABLE

"O" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
O	Oxygen
O.D.	Outside Diameter
O/S	Oversize
O2	Oxygen
OC	Oxidation Catalyst
OCC	Output Circuit Check
OD	Overdrive
ODO	Odometer
OHC	Overhead Camshaft
ORG	Orange
OSC	Output State Check

Opt.	Option or Optional
oz.	Ounce
ozs.	Ounces

"P" ABBREVIATION TABLE

"P" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
"P"	Park
P/C	Printed Circuit
P/N	Park/Neutral
P/S	Power Steering
PAV	Pulse Air Valve
PC-SOL	Purge Control Solenoid
PCM	Powertrain Control Module
PCS	Purge Control Solenoid
PCSDM	Passenger Compartment Sensor/Diagnostic Module
PCV	Positive Crankcase Ventilation
PFE	Pressure Feedback EGR sensor or circuit
PFI	Port Fuel Injection (see MA SEFI)
PGM-CARB	Programmed Carburetor
PGM-FI	Programmed Fuel Injection
PIP	Profile Ignition Pickup
PNK	Pink
PPL	Purple
PRNDL	Park Reverse Neutral Drive Low
PROM	Programmable Read-Only Memory
psi	Pounds Per Square Inch
PSPS	Power Steering Pressure Switch
PTC	Positive Temperature Coefficient
PTO	Power Take-Off
PWR GND	Power Ground circuit
Pkg.	Package
Press.	Pressure
Prog.	Programmed or Programmable
Pts.	Pints
Pwr.	Power

"Q" ABBREVIATION TABLE

"Q" ABBREVIATION TABLE

ABBREVIATION	DEFINITION

Qts.	Quarts

"R" ABBREVIATION TABLE

"R" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
RABS	Rear Anti-Lock Brake System
RAC	Remote Accessory Control
RAM	Random Access Memory
RAP	Retained Accessory Power
RECIRC	Recirculation
RED	Red
RH	Right Hand
ROM	Read Only Memory
RPM	Revolutions Per Minute
RVB	Rear Vacuum Break
RWAL	Rear Wheel Anti-Lock Brake
RWD	Rear Wheel Drive
Recirc.	Recirculate or Recirculation
Reg.	Regulator
Rly.	Relay

"S" ABBREVIATION TABLE

"S" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
SAW	Spark Angle Word
SBC	Single Bed Converter
SBEC	Single Board Engine Controller
SC	Super Charged
SCC	Spark Control Computer
SCS	Air Suction Control Solenoid
SDM	Supplemental Restraint System Diagnostic Module
SDU	SRS Diagnostic Unit
SEN	Sensor
SES	Service Engine Soon
SFI	Sequential (Port) Fuel Injection
SIG RTN	Signal Return circuit
SIL	Shift Indicator Light
SIR	Supplemental Inflatable Restraint

ABBRE

SMEC	Single Module Engine Controller
SOHC	Single Overhead Cam
SOL or Sol.	Solenoid
SPFI	Sequential Port Fuel Injection
SPK	Spark Control
SPOUT	Spark Output Signal
SRS	Supplemental Restraint System (Air Bag)
SS 3/4-4/3	Shift Solenoid circuit
SSI	Solid State Ignition
STAR	Self-Test Automatic Readout
STI	Self Test Input circuit
STO	Self-Test Output
SUB-O2	Sub Oxygen Sensor
Sen. or Sens.	Sensor
Sol.	Solenoid
Sprchg.	Supercharger
Strg.	Steering
Susp.	Suspension
Sw.	Switch
Sys.	System

"T" ABBREVIATION TABLE

"T" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
T.V.	Throttle Valve
TAB	Thermactor Air By-Pass
TAC	Thermostatic Air Cleaner
TAD	Thermactor Air Diverter
TAN	Tan
TBI	Throttle Body Injection
TCC	Torque Converter Clutch
TCCS	Toyota Computer Control System
TDC	Top Dead Center
TDCL	Total Diagnostic Communication Link
TFI	Thick Film Ignition system
TGS	Top Gear Switch (cancels SIL in top gear)
THERMAC	Thermostatic Air Cleaner
THS	Transmission Hydraulic Switch
TP/TPS	Throttle Position Sensor
TPI	Tuned Port Injection
TPS	Throttle Position Sensor/Switch
TS	Temperature Sensor
TSB	Technical Service Bulletin

TTS	Transmission Temperature Switch
TV	Thermovalve
TWC	Three-Way Catalyst
Temp.	Temperature
Trans.	Transaxle/Transmission

"V" ABBREVIATION TABLE

"V" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
V	Valve
VAF	Vane Air Flow sensor or circuit
VAPS	Variable Assist Power Steering
VAT	Vane Air Temperature
VATS	Vehicle Anti-Theft System
VBATT	Vehicle Battery Voltage
VCC	Viscous Converter Clutch
VIN	Vehicle Identification Number
VIO	Violet
VLR	Volt Loop Reserve
VM	Vacuum Modulator
VM	Vane Meter
VOM	Volt-Ohmmeter (Analog)
VPWR	Vehicle Power supply voltage (10-14 volts)
VREF	Voltage Reference (ECA supplied reference voltage
VRV	Vacuum Regulator Valve
VSC	Vehicle Speed Control sensor or signal
VSS	Vehicle Speed Sensor or signal
VSV	Vacuum Switching Valve
Vac.	Vacuum
Volt.	Voltage

"W" ABBREVIATION TABLE

"W" ABBREVIATION TABLE

ABBREVIATION	DEFINITION
W/	With
W/O	Without
WAC	WOT A/C Cut-off switch or circuit
WAC	Wide Open Throttle A/C Switch
WHT	White

?**WOT**	?**Wide Open Throttle**	?
?**YEL**	?**Yellow**	?

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END OF ARTICLE

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ARTICLE BEGINNING

1993 GENERAL SERVICING
Compressor Refrigerant Oil Checking

*** PLEASE READ THIS FIRST ***

NOTE: For compressor applications, see COMPRESSOR APPLICATIONS TABLE below. DO NOT exceed A/C system refrigerant oil capacity, when servicing system. See REFRIGERANT OIL & REFRIGERANT SPECIFICATIONS TABLE.

COMPRESSOR APPLICATION

NOTE: Due to late changes, always refer to underhood A/C specification label in engine compartment or A/C compressor label while servicing A/C system. If A/C Specification label and specifications in this article differ, always use label specifications.

COMPRESSOR APPLICATION TABLE

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Application	Compressor
Acura	Nippondenso 10-Cyl.
Audi	
90	Zexel 6-Cyl.
100	Zexel 6-Cyl.
BMW	Nippondenso Or Seiko-Seiki
Chrysler Motors/Eagle	
Colt & Summit	Sanden FX105V Scroll
Colt Vista & Summit Wagon	Nippondenso 10PA15 10-Cyl.
Stealth	Sanden FX105VS Scroll
Ram-50	Sanden FX80 Scroll
Ford Motor Co.	
Capri	Nippondenso 10-Cyl.
Festiva	Nippondenso 6-Cyl.
General Motors & Geo	
LeMans	Harrison V5 5-Cyl.
Metro & Tracker	Nippondenso 10-Cyl.
Prizm	Nippondenso 10PA15 10-Cyl.
Storm	Diesel Kiki KC-50 Rotary Vane
Honda	
Accord	Nippondenso 10-Cyl. Or Hadsys RC-17S 7-Cyl.
Civic	Sanden Scroll

Civic Del Sol .... Sanden Scroll
Prelude .... Sanden Scroll
Hyundai
Elantra .... Sanden TRF-090 Scroll
Excel .... Sanden SD-709 7-Cyl.
Scoupe .... Nippondenso 10PA15C 10-Cyl.
Sonata .... Ford FX-15 10-Cyl.
Infiniti
G20 .... Atsugi NVR 140S Rotary Vane
J30 .... Calsonic V6 6-Cyl.
Q45 .... Calsonic V5 5-Cyl.
Isuzu (R-12)
Amigo .... Diesel Kiki DKS-13CH 6-Cyl.
Pickup
4-Cylinder .... Diesel Kiki DKS-13CH 6-Cyl.
V6 .... Harrison R4 4-Cyl. Radial
Stylus .... Diesel Kiki DKV-14D Rotary Vane
Rodeo
4-Cylinder .... Diesel Kiki DKS-17CH 6-Cyl.
V6 .... Diesel Kiki DKV-14D Rotary Vane
Trooper .... Diesel Kiki DKV-14D Rotary Vane
Isuzu (R-134a Option) (1)
Amigo, Pickup, Rodeo & Trooper
2.3L & 2.6L Engine .... Zexel R-134a 6-Cyl.
3.1L Engine .... Harrison R-134a R-4 4-Cyl. Radial
3.2L Engine .... Zexel R-134a Rotary Vane
Jaguar
XJS .... Sanden SD-709 7-Cyl.
XJ6 .... Sanden SD-7H15 7-Cyl.
Lexus .... Nippondenso 10PA20 10-Cyl.
Mazda
B2200 & B2600i .... Sanden 5-Cyl.
Miata .... Nippondenso TV12 Rotary Vane
MPV .... Nippondenso 10-Cyl.
MX-6 & 626 .... Panasonic Rotary Vane
Navajo .... Ford FX-15 10-Cyl.
MX-3, Protege & 323 .... Panasonic Rotary Vane
929 .... Panasonic Rotary Vane
RX7 .... Nippondenso TV12 Rotary Vane
Mercedes-Benz
190E .... Nippondenso 10PA15 10-Cyl.
300D/E, 400E & 500E .... Nippondenso 10PA17 10-Cyl.
300SE/SD, 400SE & 500SEL .... Nippondenso 10PA20 10-Cyl.
Mitsubishi
Diamante
R-12 .... Sanden FX105VS Scroll
R-134a .... Sanden MSC105
Diamante Wagon .... Nippondenso 10PA17C 10-Cyl A/C CO

Galant & Mirage .... Sanden FX105V Scroll
Eclipse .... Nippondenso 10PA17 10-Cyl.
Expo/Expo LRV .... Nippondenso 10PA17C 10-Cyl.
Pickup .... Sanden FX80 Scroll
Montero .... Nippondenso 10PA15 10-Cyl.
Precis .... Sanden SD-709 7-Cyl.
3000GT
R-12 .... Sanden FX105VS Scroll
R-134a .... Sanden MSC105

Nissan
Altima .... Zexel DKV-14C Rotary Vane
Maxima & 300ZX .... Zexel DKS-16H 6-Cyl.
Quest .... Ford FX-15 10-Cyl.
Pathfinder & Pickup .... Zexel DKV-14C Rotary Vane
Sentra & NX .... Zexel DKV-14D Rotary Vane
240SX .... Calsonic V5 5-Cyl.

Porsche
911 America Roadster,
RS America & Carrera 2/4 .... Nippondenso 10-Cyl.

Saab
900 .... Sanden 5-Cyl.
9000 .... Seiko-Seiki SS121 DN1 Rotary Vane

Subaru
Impreza .... Zexel Rotary Vane
Legacy .... Zexel DKS-15CH 5-Cyl.
Calsonic V5-15C 5-Cyl.
Loyale .... Hitachi MJS170-5DP 6-Cyl.
SVX .... Calsonic V5 5-Cyl.

Suzuki .... Nippondenso 10-Cyl.

Toyota
Camry .... Nippondenso 10PA17C 10-Cyl.
Celica
4A-FE Engine .... Nippondenso 10PA15C 10-Cyl.
3S-GTE & 5S-FE Engine .... Nippondenso 10PA17C/VC 10-Cyl.
Corolla .... Nippondenso 10PA15 10-Cyl.
Land Cruiser .... Nippondenso 10PA17 10-Cyl.
MR2 .... Nippondenso 10P13C 10-Cyl.
Paseo .... Matsushita Rotary Vane
Pickup & 4Runner .... Nippondenso 10-Cyl.
Previa .... Nippondenso 10PA17E 10-Cyl.
Supra .... Nippondenso 10-Cyl.
Tercel .... Matsushita TV10B Rotary Vane
T100 .... Nippondenso 10PA15 10-Cyl.

Volkswagen
Cabriolet .... Sanden SD-508 5-Cyl.
Or SD-709 7-Cyl.
Corrado SLC .... Sanden SD-709 7-Cyl.
EuroVan .... Sanden SD7H15 7-Cyl.

Golf, GTI & Jetta	Sanden SD7-V16/SD7-V16L 7-Cyl.
Fox	Nippondenso 6-Cyl.
Passat	Sanden SD7-V16/SD7-V16L 7-Cyl.
Volvo	
240	Seiko-Seiki SS-121DS5
850	Zexel DKS-15CH 6-Cyl.
940 & 960	Sanden SD-510 5-Cyl., Sanden SD-709 7-Cyl. Or Seiko-Seiki SS-121DS5

(1) - Standard equipment on some models built after 5/1/93.

REFRIGERANT OIL & REFRIGERANT CAPACITY

REFRIGERANT OIL & REFRIGERANT CAPACITY (ACURA THROUGH INFINITI)

Application	(1) Oil Ounces	Refrigerant Ounces
Acura		
Integra	(2) 2.0-3.4	32-34
Legend		
Sedan	(2) (3) 4.7	(4) 24.7-26.5
Coupe	(3) 4.7	24.7-26.5
Vigor	(2) 4.7-4.9	26.5-28.0
Audi		
90	7.8-9.2	(5) 23.0-24.8
100	7.8-9.2	(5) 21.0-22.8
BMW		
318 & 325 Series	3.4-4.8	(6) 35-36
525i & 535i	4.7-6.1	(6) 53.0-55.5
740i & 740iL	4.7-6.1	(6) 53.0-55.5
Chrysler Motors/Eagle		
Colt & Summit	(2) 4.4-5.1	26-30
Colt Vista & Summit Wagon	(2) 2.0-3.4	30
Ram-50	(2) 4.4-5.1	30
Stealth	(2) 4.6-6.0	29
Ford Motor Co.		
Capri	2.4-3.0	23-27
Festiva	10	25
General Motors & Geo		
LeMans	8.0	35
Metro	2.7	18
Prizm & Prizm LSi	6.0	25
Storm	5.1	21

Tracker	2.7	21
Honda		
Accord		
Nippondenso	3.0-4.1	28-30
Hadsys	4.1-4.3	28-30
Civic	4.0-4.7	21-23
Civic Del Sol	4.0-4.7	21-23
Prelude	(7) 4.3-5.0	21-23
Hyundai		
Excel	8.1	30-32
Scoupe	2-3	28-32
Elantra	4.0	32
Sonata	6.9-7.7	30-32
Infiniti		
G20	6.8	24-29
J30	8.5	(8) 24-26
Q45	9.7	38-42

(1) - Total system capacity, unless otherwise noted.
(2) - Compressor refrigerant oil capacity.
(3) - Capacity revised by manufacturer in Acura Service News bulletin number ASN 0793-02.
(4) - Use R-134a refrigerant and ND-Oil 8 (Part No. 38899-PR7-003).
(5) - Use R-134a refrigerant and Polyalkylene Glycol (PAG) oil.
(6) - Use R-134a and Poyalkylene Glycol Oil (Part No. 81-22-9-407-724).
(7) - Use R-134a refrigerant and PAG Refrigerant Oil (Part No. 38899-P13-003).
(8) - Use R-134a refrigerant and Type "S" Oil (Part No. KLH00-PAGS0).

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REFRIGERANT OIL & REFRIGERANT CAPACITY (ISUZU THROUGH MERCEDES)

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Application	(1) Oil Ounces	Refrigerant Ounces
Isuzu (R-12)		
Amigo	5.0	26
Pickup		
2.3L & 2.6L Engine	5.0	26
3.1L Engine	6.0	26
Rodeo		
2.6L Engine	5.0	26
3.2L Engine	5.0	26
Stylus	5.0	21
Trooper	5.0	30

Isuzu (R-134a Option) (3)		
Amigo & Pickup		
2.3L & 2.6L Engine	5.0	23
3.1L Engine	7.5-8.5	23
Rodeo	5.0	23
Trooper	5.0	26
Jaguar		
XJS	(2) 4.6	40
XJ6	(2) 4.5	(4) 40
Lexus		
ES300	(2) 3.5	32-35
GS300	(2) 4.0	(5) 28-32
LS400	(2) 2.8-3.5	(5) 32
SC300 & SC400	(2) 4.0	32-35
Mazda		
B2200 & B2600i	(2) 4.5	28
Miata	(2) 2.7-3.3	28
MPV		
Dual Unit	(2) 2.7-3.3	51
Single Unit	(2) 2.7-3.3	37
MX-3	(2) 5.0	28
MX-6 & 626	(2) 4.3	26
Protege & 323	(2) 3.9-4.6	28
Navajo	7.0	28-29
929	3.6	28
RX7	3.4-4.7	21
Mercedes-Benz		
190E	(2) 4.0	36
300D/E, 400E & 500E	(2) 5.4	(6) 36
300SE/SD, 400SE & 500SEL	(2) 5.4	(7) 43

(1) - Total system capacity, unless otherwise noted.
(2) - Compressor refrigerant oil capacity.
(3) - Standard equipment on some models built after 5/1/93. Use R-134a Swash Plate Compressor Oil (Part No. 2-90188-300-0)on 2.3L and 2.6L engine. Use R-134a R-4 Compressor Oil (Part No. 2-90222-320-0) on 3.1L engine. Use R-134a Rotary Vane Compressor Oil (Part No. 2-90188-301-0) on 3.2L engine.
(4) - Use R-134a refrigerant and PAG SP20 refrigerant oil.
(5) - Use R-134a refrigerant and ND-Oil 8 (Part No. 38899-PR7-003).
(6) - Use R-134a refrigerant and Densooil 8 (Part No. A 001 989 08 03).
(7) - Use R-134a refrigerant and Densooil 8 (Part No. A 001 989 08 03).Use 50 ounces if equipped with rear passenger compartment A/C-heater system.

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REFRIGERANT OIL & REFRIGERANT CAPACITY (MITSUBISHI THRU SUBARU)

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Application	(1) Oil Ounces	Refrigerant Ounces
Mitsubishi		
Diamante		
R-12	5.4-6.0	34-38
R-134a	(3) 5.7-6.4	26-28
Diamante Wagon	5.4	28
Eclipse	(2) 2.0-3.4	33
Expo/Expo LRV		
1.8L	(2) 3.4-4.0	30
2.4L	(2) 2.0-3.4	30
Galant	(2) 5.0-5.7	33
Mirage	(2) 4.4-5.1	26-30
Pickup	(2) 4.4-5.1	30
Montero	(2) 2.0-3.4	28
Precis	8.1	30-32
3000GT		
R-12	4.7-6.0	29
R-134a	(3) 4.7-6.0	26-28
Nissan		
Altima	(4) 6.8	25-28
Maxima	(5) 6.8	30-33
Pathfinder & Pickup	(4) 6.8	26-30
Quest		
Front A/C	7.0	36
Front & Rear A/C	10	56
Sentra & NX	6.8	23-26
240SX	8.0	29-32
300ZX	6.8	26-30
Porsche		
911 America Roadster, RS America & Carrera 2/4	4.6	(6) 29.5
Saab		
900	5.9	34-36
9000	6.6	(3) 33-34
Subaru		
Impreza	6.1	23-26
Legacy		
Zexel	(2) 2.4	29-32
Calsonic	(2) 3.2	29-32
Loyale	(2) 2.4	26-28
SVX	(2) 2.4	(7) 22-23

(1) - Total system capacity, unless otherwise noted.
(2) - Compressor refrigerant oil capacity.
(3) - Use SUN PAG 56 refrigerant oil.
(4) - Use R-134a refrigerant and Type "R" Oil (Part No. KLH00-PAGR0).
(5) - Use R-134a refrigerant and Type "S" Oil (Part No. KLH00-PAGS0).
(6) - Use R-134a refrigerant and Nippondenso ND8 refrigerant oil.
(7) - Use R-134a refrigerant and ZXL100 PG (DH-PS) Type "S"Oil (Part No. K0010PS000).

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REFRIGERANT OIL & REFRIGERANT CAPACITY (SUZUKI THROUGH VOLVO)

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Application	(1) Oil Ounces	Refrigerant Ounces
Suzuki		
Samurai	2.0-3.4	18
Sidekick	2.0-3.4	21-23
Swift	2.0-3.4	18
Toyota		
Camry	(2) 3.5	32-35
Celica	3.4-4.1	24-27
Corolla	3.4-4.1	25-28
Land Cruiser	3.4-4.1	30-34
MR2	3.4-4.1	28-32
Paseo	3.4-4.1	25-28
Pickup	3.4-4.1	24-29
Previa		
Without Rear A/C	3.4-4.7	32-35
With Rear A/C	3.4-4.7	41-44
Supra	(2) 4.1	(3) 23-27
Tercel	3.4-4.1	25-28
T100	3.4-4.1	(3) 21-25
4Runner	3.4-4.1	27-30
Volkswagen		
Cabriolet	4.6	30.0-31.8
Corrado SLC	3.9-4.4	35.0-36.8
EuroVan		
Without Rear A/C	4.6	(4) 34-35
With Rear A/C	8.2	(4) 48-49
Fox	5.7	41-42
Golf, GTI & Jetta	3.9	(4) 28-30
Passat	3.9-4.4	(4) 41.0-42.8
Volvo		
240	7.4	(5) 26
850		

Cold Climates	7.0	(5) 29
Hot Climates	7.0	(5) 26
940 & 960		
Sanden SD-510	4.8	(6) 32-34
Sanden SD-709	8.5	(6) 32-34
Seiko-Seiki	7.8	(6) 32-34

(1) - Total system capacity, unless otherwise noted.
(2) - Compressor refrigerant oil capacity.
(3) - Use R-134a refrigerant and ND-Oil 8 (Part No. 38899-PR7-003).
(4) - Use R-134a refrigerant and SP-10 PAG Oil (Part No. G 052 154 A2).
(5) - Use R-134a refrigerant and ZXL 100 PG Oil (Part No. 8708581-7).
(6) - Use R-134a refrigerant and PAG Oil (Part No. 8708581-9).
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

REFRIGERANT OIL

Only NEW, moisture-free refrigerant oil should be used in the air conditioning system. This oil is highly refined and dehydrated so moisture content is less than 10 parts per million. The oil container must be tightly closed at all times when not in use, or moisture from the air will be absorbed into the refrigerant oil.

SERVICING PRECAUTIONS

DISCHARGING SYSTEM

Discharge A/C system using approved refrigerant recovery/recycling equipment. Always follow recovery/recycling equipment manufacturer's instructions. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system.

DISCONNECTING LINES & FITTINGS

After system is discharged, carefully clean area around all fittings to be opened. Always use 2 wrenches when tightening or loosening fittings. Some refrigerant lines are connected with a coupling. Special tools may be required to disconnect lines. Cap or plug all openings as soon as lines are removed. DO NOT remove caps until connections of lines and fittings are completed.

CONNECTING LINES & FITTINGS

NOTE: All R-134a based systems use 1/2-16 ACME threaded fittings. Ensure all replacement parts match the connections of the system being worked on.

Always use a new gasket or "O" ring when connecting lines or fittings. Coat "O" ring with refrigerant oil and ensure it is not twisted during installation. Always use 2 wrenches to prevent damage to lines and fittings.

PLACING SYSTEM IN OPERATION

After component service or replacement has been completed and all connections have been made, evacuate system thoroughly with a vacuum pump. Charge system with proper amount of refrigerant and perform leak test. See REFRIGERANT OIL & REFRIGERANT SPECIFICATIONS article in GENERAL SERVICING for system capacities. Check all fittings that have been opened. After system has been leak tested, check system performance.

NOTE: Most compressors are pre-charged with a fixed amount of refrigerant (shipping) oil. Drain compressor oil from new compressor and add refrigerant oil to new compressor according to amount removed from old compressor. Always refer to underhood A/C specification label or A/C compressor label while servicing A/C system.

ATSUGI

ROTARY VANE

1) Before checking and adjusting oil level, operate engine at 1200 RPM. Set controls at maximum cooling and high blower motor speed for 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain compressor oil through compressor discharge port and measure oil amount.

3) If amount drained is less than 3 ounces, conduct leak tests at system connections. Repair or replace faulty parts as necessary. Check purity of oil and adjust oil level as follows.

4) If amount drained is 3 ounces or more, oil level is okay. Fill with same amount drained, using new oil. If amount drained is less than 3 ounces, pour in 3 ounces of new refrigerant oil.

COMPONENT REFRIGERANT OIL CAPACITIES (ATSUGI ROTARY VANE)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Ounces

Condenser	1.0-1.7
Evaporator	1.5-2.5
Receiver-Drier	0.5-0.8
Refrigerant Lines (1)	1.0-1.7

(1) - Add only if a refrigerant oil leak is indicated.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

BOSCH

6-CYLINDER

1) Before checking and adjusting oil level, operate compressor at engine idle speed, and set controls at maximum cooling and high blower motor speed for 20-30 minutes to return oil to compressor.

2) Stop engine and discharge refrigerant. See SERVICING PRECAUTIONS. Remove refrigerant oil level inspection plug on side of compressor. Oil should be at lower lip of threaded hole. If oil level is low, add new refrigerant oil as necessary. Replace inspection plug and tighten to 10-12 ft. lbs. (14-16 N.m).

CALSONIC

V5 5-CYLINDER & V6 6-CYLINDER

Infiniti & Nissan

1) Before checking and adjusting oil level, operate engine at 1200 RPM. Set controls at maximum cooling and high blower motor speed for 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant. See SERVICING PRECAUTIONS. Measure the amount of oil drained/discharged into refrigerant recovery/recycling equipment.

3) Remove compressor from vehicle. Drain compressor oil from compressor drain plug and measure oil amount. Add this amount to amount drained in step 2), to obtain total amount drained.

4) Fill compressor with total amount drained, using new oil. If any major components of the system were also replaced, determine the amount of additional oil needed. See appropriate COMPONENT REFRIGERANT OIL CAPACITIES table for specified amount.

COMPONENT REFRIGERANT OIL CAPACITIES (CALSONIC V5)
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Component	Ounces
Condenser	1.0-1.7
Evaporator	1.5-2.5

Receiver-Drier	0.5-0.8
Refrigerant Lines (1)	1.0-1.7

(1) - Add only if a refrigerant oil leak is indicated.
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COMPONENT REFRIGERANT OIL CAPACITIES (CALSONIC V6)
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Component	Ounces
Condenser	2.5
Evaporator	2.5
Receiver-Drier	0.2
Refrigerant Lines (1)	1.0

(1) - Add only if a refrigerant oil leak is indicated.
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Subaru

1) Before checking and adjusting oil level, operate engine at 1000-1500 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain compressor oil from compressor drain plug and measure oil amount.

3) Fill compressor with total amount drained, using new oil. If any major components of the system were also replaced, determine the amount of additional oil needed. See appropriate SUBARU COMPONENT REFRIGERANT OIL CAPACITIES table for specified amount.

SUBARU COMPONENT REFRIGERANT OIL CAPACITIES (LEGACY)
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Component	Ounces
Compressor	2.4
Condenser	1.7
Evaporator	2.4
Refrigerant Lines (1)	1.7

(1) - Add only if a refrigerant oil leak is indicated.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

SUBARU COMPONENT REFRIGERANT OIL CAPACITIES (SVX)
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Ounces
Compressor	2.4
Condenser	1.7

Evaporator	2.4
Refrigerant Lines (1)	1.7

(1) - Add only if a refrigerant oil leak is indicated.

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

DIESEL KIKI

ROTARY VANE

1) Before checking and adjusting oil level, operate engine at 800-1000 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and measure amount of oil drained.

3) If amount drained is less than 3 ounces (1.7 ounces on Geo Storm), conduct leak tests at system connections. Repair or replace faulty parts as necessary.

4) If amount drained is more 3 ounces (1.7 ounces on Geo Storm), oil level is okay. Fill compressor with same amount drained, using new oil. If amount drained is less than 3 ounces (1.7 ounces on Geo Storm), pour in 3 (1.7) ounces of new refrigerant oil.

5) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL CAPACITIES (DIESEL KIKI ROTARY VANE) table.

COMPONENT REFRIGERANT OIL CAPACITIES (DIESEL KIKI ROTARY VANE)

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Component	Ounces
Condenser	1.7
Evaporator	1.0
Receiver-Drier	1.0
Refrigerant Lines	0.3

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

5 & 6-CYLINDER

1) Before checking and adjusting oil level, operate engine at 800-1000 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and measure amount of oil drained.

3) If amount drained is less than 3 ounces, conduct leak tests at system connections. Repair or replace faulty parts as

necessary.

4) If amount drained is more 3 ounces, oil level is okay. Fill compressor with same amount drained, using new oil.

5) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL CAPACITIES (DIESEL KIKI 5 & 6-CYLINDER) table.

COMPONENT REFRIGERANT OIL CAPACITIES (DIESEL KIKI 5 & 6-CYLINDER)

Component	Ounces
Condenser	1.0
Evaporator	1.7
Receiver-Drier	1.0
Refrigerant Lines	0.3

FORD

FX-15 10-CYLINDER

1) Slowly discharge system. See SERVICING PRECAUTIONS. Remove A/C compressor. Drain compressor oil from suction and discharge ports. Measure amount drained and discard oil.

2) If amount drained from removed (old) compressor is between 3 and 5 ounces, add drained amount of new refrigerant oil into the NEW compressor through suction port.

3) If amount drained is less than 3 ounces, add 3 ounces to the NEW compressor. If amount drained is more than 5 ounces, add 5 ounces. Use new "O" rings on refrigerant lines. Install A/C compressor. Evacuate and recharge system. Perform leak test.

4) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL CAPACITIES (FX-15 10-CYLINDER) table.

COMPONENT REFRIGERANT OIL CAPACITIES (FX-15 10-CYLINDER)

Component	Ounces
Condenser	1.0
Evaporator	3.0
Receiver-Drier	(1) 2.0
Refrigerant Lines	(2) 1.0

(1) - On Hyundai Sonata and Mazda Navajo, drain oil from old receiver-drier. Add amount drained to amount specified.
(2) - Add only if a large oil leak is indicated.

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

HADSYS

7-CYLINDER

Honda (Accord)

1) Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain all oil from NEW compressor and fill compressor with 4 ounces of clean refrigerant oil.

2) Add one ounce of refrigerant oil when replacing evaporator. Add1/2 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

HARRISON

R4 4-CYLINDER

1) Before checking and adjusting oil level, operate engine at 800-1000 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and measure amount of oil drained.

3) If amount drained is less than one ounce, conduct leak tests at system connections. Repair or replace faulty parts as necessary. Fill compressor with 2 ounces, using new refrigerant oil.

4) If amount drained is more one ounce, oil level is okay. Fill compressor with same amount drained, using new oil.

5) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL CAPACITIES (HARRISON R4 4-CYLINDER) table.

COMPONENT REFRIGERANT OIL CAPACITIES (HARRISON R4 4-CYLINDER)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Ounces
Condenser	1.0
Evaporator	1.7
Receiver-Drier	1.0
Refrigerant Lines	0.3

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

V5 5-CYLINDER

1) If system is operable, run A/C system for several minutes to stabilize system. Turn off engine. Discharge system and remove

compressor. See SERVICING PRECAUTIONS. Remove drain plug and measure oil.

2) If one ounce or more is drained, add same amount. If less than one ounce is drained, add 2 ounces of new refrigerant oil to compressor.

3) If condenser is replaced, add one ounce. Add 3.5 ounces if accumulator is replaced. If evaporator is replaced or if a large refrigerant leak occurred, add 3 ounces of new refrigerant oil.

HITACHI

6-CYLINDER

1) Before checking and adjusting oil level, operate compressor at 1000-1500 engine RPM, and set controls at maximum cooling and high blower motor speed for about 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain oil from compressor through suction port. Measure amount of oil drained.

3) If amount drained is 2.4 ounces or more, fill with same amount using new oil. If amount drained is less than 2.4 ounces, fill with 2.4 ounces. Install compressor and recharge.

4) If A/C components are replaced, add refrigerant oil to system. Add 1.7 ounces if condenser is replaced. Add 2.4 ounces if evaporator is replaced. Oil does not need to be added if receiver-drier is replaced. Add 1.7 ounces of refrigerant oil only if a refrigerant oil leak is indicated.

MATSUSHITA

ROTARY VANE

Geo (Prizm)

1) If system is operable, run A/C system for several minutes to stabilize system. Turn off engine. Discharge system and remove compressor. See SERVICING PRECAUTIONS. Remove drain plug and measure oil.

2) If one ounce or more is drained, add same amount. If less than one ounce is drained, add 2 ounces of new refrigerant oil to compressor.

3) If condenser is replaced, add one ounce. Add 3.5 ounces if receiver-drier is replaced. If evaporator is replaced or if a large refrigerant leak occurred, add 3 ounces of new refrigerant oil.

Toyota

Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain oil from compressor through inlet and outlet ports. Fill compressor with 3.4-4.1 ounces of oil through suction port. Add 0.7 ounces if receiver-drier was replaced. When replacing condenser or evaporator, add 1.4-1.7 ounces of refrigerant oil.

NIPPONDENSO

ROTARY VANE

1) Before checking and adjusting oil level, operate compressor at engine idle speed, and set controls at maximum cooling and high blower motor speed for 20-30 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain compressor oil through compressor intake and discharge ports. Measure amount drained.

3) Fill compressor with same amount as drained, plus one ounce. When replacing condenser, add one ounce. When replacing evaporator, add 1 1/2 ounces. When replacing receiver-drier, add 1/3 ounce of new refrigerant oil.

6 & 10-CYLINDER

NOTE: Porsche and Suzuki compressor oil checking procedures are not available from manufacturer.

Acura & Honda

1) Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain all oil from NEW compressor and fill compressor with 3-4 ounces of clean refrigerant oil.

2) On Accord, add 5/6 ounce of refrigerant oil when replacing evaporator. Add 1/3 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

3) On Legend, add 2 ounces of refrigerant oil when replacing evaporator. Add one ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

4) On Integra, add one ounce of refrigerant oil when replacing evaporator. When replacing condenser, receiver-drier or hoses, add 1/3 ounce per component replaced.

5) On Vigor, add 1/2 ounce of refrigerant oil when replacing evaporator. Add 2/3 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

Chrysler Corp. (Colt Vista/Summit Wagon)

Add 2 ounces of refrigerant oil when replacing evaporator. Add one ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

Ford Motor Co.

On Capri, add 2-3 ounces when replacing compressor. Add one ounce of refrigerant oil when replacing condenser or evaporator. When replacing receiver-drier, add 1/2 ounce. On Festiva, drain and measure oil from receiver-drier. Add the amount drained plus one ounce. Add one ounce when replacing condenser. Add 3 ounces of refrigerant oil when replacing evaporator.

Geo, Hyundai & Mazda

Add one ounce of refrigerant oil when replacing condenser. Add 1-1 1/2 ounce when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

Lexus & Toyota

The use of refrigerant recovery/recycling is recommended by manufacturer. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system. Add 1 1/2 ounces of refrigerant oil when replacing condenser. Add 1 1/2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add1/2 ounce per component replaced.

Mercedes-Benz

Add 2/3 ounce of refrigerant oil when replacing condenser. Add 1 1/3 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced. If A/C system line has broken (sudden discharge), add1 1/3 ounces of refrigerant oil.

NOTE: On Mercedes-Benz vehicles with rear A/C, add 2/3 ounce of refrigerant oil when replacing rear condenser. When replacing rear A/C lines, add 1/3 ounce per line replaced.

Mitsubishi

1) On Eclipse, add 2/3 ounce of refrigerant oil when replacing condenser. Add one ounce when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

2) On Expo/Expo LRV and Montero, add one ounce of refrigerant oil when replacing condenser. Add 2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

Volkswagen (Fox)

1) The use of refrigerant recovery/recycling is recommended by manufacturer. After refrigerant recovery process is completed, the

amount of compressor oil removed must be measured and the same amount added to A/C system.

2) Add 1 1/2 ounce of refrigerant oil when replacing evaporator. When replacing condenser, add 1 1/3 ounce of refrigerant oil. Add one ounce of refrigerant oil when replacing receiver-drier (1 1/2 ounces if relief valve on receiver-drier has burst).

PANASONIC

ROTARY VANE

Mazda

Add 1 1/3 ounce of refrigerant oil when replacing condenser (1/2 ounce on MX-6 and 626). Add 2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce of refrigerant oil.

SANDEN

SCROLL

Chrysler/Mitsubishi

1) On Colt, Galant, Mirage, Pickup, Ram-50 and Summit, add 1/2 ounce of refrigerant oil when replacing condenser. Add 1 1/2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

2) On Stealth and 3000GT, add 1/2 ounce of refrigerant oil when replacing condenser. Add 2 ounces when replacing evaporator. When replacing receiver-drier or low-pressure hose, add 1/3 ounce per component replaced.

Honda

1) Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain all oil from NEW compressor and fill compressor with 4 ounces of clean refrigerant oil.

2) On Civic and Civic Del Sol, add 1 1/2 ounce of refrigerant oil when replacing evaporator. Add 2/3 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

3) On Prelude, add one ounce of refrigerant oil when replacing evaporator. When replacing other A/C components, add 1/3 ounce per component replaced (including hoses).

Hyundai

Add 1 1/2 ounces of refrigerant oil when replacing evaporator. Add one ounce when replacing condenser. When replacing receiver-drier, add 1/3 ounce of refrigerant oil.

5-CYLINDER

Mazda

Add one ounce of refrigerant oil when replacing condenser. Add 1 2/3 ounce when replacing evaporator. When replacing receiver-drier, add 1/2 ounce of refrigerant oil.

NOTE: Saab and Volvo (Sanden 5 or 7-cylinder) compressor oil checking procedures are not available from manufacturer.

7-CYLINDER

Hyundai & Mitsubishi (Excel & Precis)

1) Before checking and adjusting oil level, operate compressor at engine idle speed, and set controls at maximum cooling and high blower motor speed for 20-30 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and drain oil. Measure amount of oil drained. Install drain plug with new "O" ring.

3) If amount drained is 2.3 ounces or more, fill compressor with same amount using new oil. If amount drained is less than 2.3 ounces, fill with 2.3 ounces. Install filler plug. Install compressor and recharge system.

COMPONENT REFRIGERANT OIL CAPACITIES (SANDEN 7-CYLINDER)

Component	Ounces
Condenser	1.0
Evaporator	3
Receiver-Drier	1

Jaguar (XJS)

1) Operate engine at idle speed for 10 minutes, to return refrigerant oil to compressor. Stop engine. Discharge refrigerant. See SERVICING PRECAUTIONS. Clean area around compressor filler plug and remove plug slowly.

2) Determine angle at which compressor is mounted. Insert compressor dipstick diagonally until stop on dipstick contacts filler plug surface. See Fig. 1. Remove dipstick and note oil fill level. Each increment on dipstick represents one ounce of oil.

3) Determine amount of oil needed according to mounting angle. See COMPRESSOR OIL CAPACITIES (JAGUAR XJS) table for specified amount.

4) If necessary, correct compressor oil level. Install compressor oil plug, and tighten it to 72-108 INCH lbs. (8-12 N.m). Evacuate and recharge A/C system. Perform leak test.

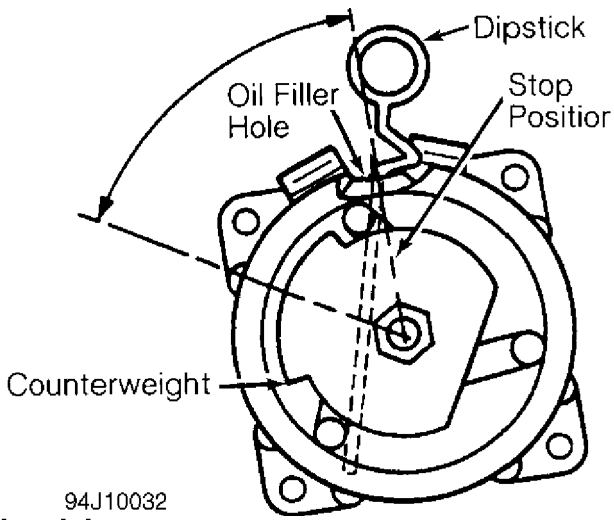

Fig. 1: Checking Jaguar XJS Compressor Oil Level (Sanden 7-Cylinder)
Courtesy of Jaguar Cars, Inc.

COMPRESSOR OIL CAPACITIES (JAGUAR XJS)

Mounting Angle (In Degrees)	Oil Level In Increments
0	3-5
10	4-6
20	5-7
30	6-8
40	7-9
50	8-10
60	9-11
90	10-12

Volkswagen

1) The use of refrigerant recovery/recycling is recommended by manufacturer. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system.

2) On Cabriolet, add 2/3 ounce of refrigerant oil when replacing evaporator. When replacing condenser or receiver-drier, add 1/3 ounce of refrigerant oil per component replaced.

3) On Corrado SLC, Golf, GTI, Jetta and Passat, add 2/3 ounce of refrigerant oil when replacing evaporator. When replacing condenser or receiver-drier, add 1/3 ounce of refrigerant oil per component replaced.

4) On EuroVan, add one ounce of refrigerant oil when replacing evaporator. Add 1/2 ounce when replacing condenser (2/3 ounce on vehicles with rear A/C). When replacing receiver-drier, add 1/3 ounce (2/3 ounce on vehicles with rear A/C).

SEIKO-SEIKI

ROTARY VANE

Saab (9000)

The A/C system is filled with 6.6 ounces of compressor oil. The compressor must be topped off with the specified amount. See COMPONENT REFRIGERANT OIL CAPACITIES (SEIKO-SEIKI ROTARY VANE) table. Topping off should be carried out on the high pressure side of the compressor.

COMPONENT REFRIGERANT OIL CAPACITIES (SEIKO-SEIKI ROTARY VANE)

Component	Ounces
Compressor	(1) 2.3
Condenser	1.3
Expansion Valve	0.6
Evaporator	1.3
Receiver-Drier	1.3
Refrigerant Lines	0.6

(1) - To avoid an excessive amount of oil in the A/C system, oil must be drained from the compressor before it is installed.

ZEXEL

NOTE: Isuzu and Subaru compressor oil checking procedures are not available from manufacturer.

ROTARY VANE

Nissan

1) Before checking and adjusting oil level, operate engine at 1200 RPM. Set controls at maximum cooling and high blower motor speed for 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant. See SERVICING PRECAUTIONS. Measure the amount of oil drained/discharged into refrigerant recovery/recycling equipment.

3) Remove compressor from vehicle. Drain compressor oil from compressor drain plug and measure oil amount. Add this amount to

amount drained in step 2), to obtain total amount drained.

4) Fill compressor with total amount drained, using new oil. If any major components of the system were also replaced, determine the amount of additional oil needed. See COMPONENT REFRIGERANT OIL CAPACITIES (ZEXEL ROTARY VANE & 6-CYLINDER) table for specified amount.

COMPONENT REFRIGERANT OIL CAPACITIES (ZEXEL ROTARY VANE & 6-CYLINDER)

Component	Ounces
Condenser	
Altima & Maxima	2.5
NX, Pickup, Sentra & 300ZX	1.0-1.7
Evaporator	
Altima & Maxima	2.5
NX, Pickup, Sentra & 300ZX	1.5-2.5
Receiver-Drier	
Altima & Maxima	0.2
NX, Pickup, Sentra & 300ZX	0.5-0.8
Refrigerant Lines (1)	1.0

(1) - Add only if a refrigerant oil leak is indicated.

6-CYLINDER

Audi

1) The use of refrigerant recovery/recycling is recommended by manufacturer. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system.

2) Add one ounce of refrigerant oil when replacing accumulator. When replacing condenser, add amount drained from condenser plus 1/3 ounce of refrigerant oil. When replacing evaporator, add amount drained from evaporator plus 2/3 ounce of refrigerant oil.

Nissan

1) Before checking and adjusting oil level, operate engine at 1200 RPM. Set controls at maximum cooling and high blower motor speed for 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant. See SERVICING PRECAUTIONS. Measure the amount of oil drained/discharged into refrigerant recovery/recycling equipment.

3) Remove compressor from vehicle. Drain compressor oil from compressor drain plug and measure oil amount. Add this amount to amount drained in step 2), to obtain total amount drained.

4) Fill compressor with total amount drained, using new oil. If any major components of the system were also replaced, determine the amount of additional oil needed. See COMPONENT REFRIGERANT OIL CAPACITIES (ZEXEL ROTARY VANE & 6-CYLINDER) table for specified amount.

Volvo (850)

1) Discharge refrigerant. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain compressor oil from compressor drain plug and measure oil amount. Add the same amount of oil as was drained from the old compressor.

2) Add 1 2/3 ounce of refrigerant oil when replacing evaporator. When replacing condenser or hoses, add 2/3 ounce of refrigerant oil per component replaced. Add 3 ounce of refrigerant oil when replacing receiver-drier.

END OF ARTICLE

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ARTICLE BEGINNING

1993 AIR CONDITIONING & HEAT
Compressor Servicing

READ THIS FIRST

NOTE: The purpose of this article is to provide GENERAL servicing overview. For more specific information, refer to the AUTO A/C-HEAT SYSTEM, MANUAL A/C-HEAT SYSTEM, or HEATER SYSTEM articles in this section.

NOTE: Due to variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced.

ATSUGI ROTARY VANE CLUTCH COIL R & I

Removal

When replacing compressor clutch, be careful not to scratch shaft or bend pulley. When removing center bolt, hold clutch disc with Clutch Holder (KV99231010). Using Hub Puller (KV998VR001), remove clutch disc. When removing pulley, remove lock nut with Hub Socket (KV99235160).

Installation

1) Tighten center bolt to 81-104 INCH lbs. (9.1-11.8 N.m). Tighten lock nut to 21-29 ft. lbs. (29-39 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm).

2) If clearance is not correct, replace adjustment shim(s). See Fig. 1. Break-in clutch by engaging and disengaging clutch about 30 times.

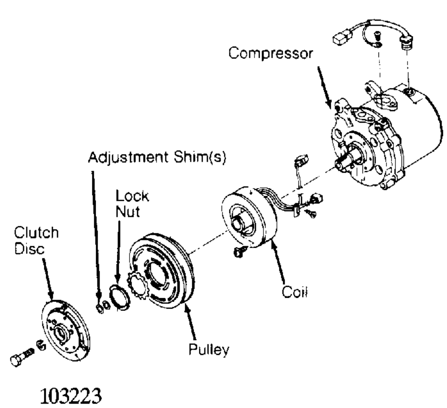

Fig. 1: Exploded View Of Compressor (Atsugi Rotary Vane)
Courtesy of Nissan Motor Co., U.S.A.

BOSCH 6-CYLINDER CLUTCH COIL R & I

Removal

1) Hold clutch plate and remove shaft nut. Using Clutch Plate Remover (64 5 00), remove clutch plate. Using snap ring pliers, remove circlip and remove pulley assembly.

2) If pulley bearing is being replaced, remove circlip at rear of pulley. Press bearing and spacer from pulley. Press in new bearing with spacer and replace circlip.

Installation

1) Clean all surfaces. Install pulley assembly on compressor and install circlip. Ensure clutch plate shim is in place on shaft. Install clutch plate and nut. Tighten nut to 13-15 ft. lbs. (18-20 N. m).

2) Using a feeler gauge, check clutch plate-to-pulley clearance. Clearance should be .028-.051" (.7-1.3 mm). If clearance is not correct, remove clutch plate and replace clutch plate shim. See Fig. 2.

BOSCH 6-CYLINDER SHAFT SEAL R & I

Removal

Remove clutch plate. Remove shaft key and circlip. Using Seal Seat Remover/Installer (64 5 030), remove seal seat. Using Seal Remover/Installer (64 5 040), turn seal slightly clockwise to disengage tangs and pull out shaft seal. Remove "O" ring seal.

Installation

1) Coat new "O" ring seal with refrigerant oil and install. Coat new shaft seal with refrigerant oil and install seal on Seal Remover/Installer(64 5 040). Ensure shaft seal and shaft machine surfaces align. Insert shaft seal and turn slightly counterclockwise to secure on shaft.

2) Using sleeve from Seal Seat Remover/Installer (64 5 030), push seal seat into compressor and install circlip. Install shaft key and clutch plate. Check compressor oil level before charging system.

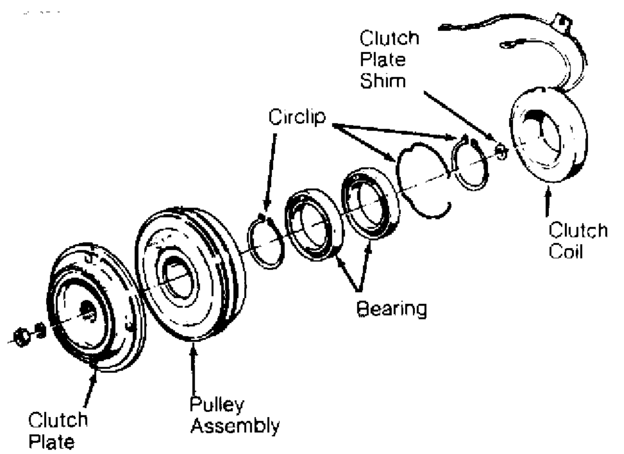

Fig. 2: Exploded View Of Compressor Clutch (Bosch 6-Cylinder)
Courtesy of BMW of North America, Inc.

CALSONIC V5 & V6 CLUTCH COIL R & I

NOTE: Calsonic V6 compressor servicing procedure is not available from manufacturer.

Removal

1) Remove shaft nut while holding clutch plate with Clutch Disc Wrench (J-39072). Install clutch disc Puller Set (J-39073-4, J-33013-1, J-33013-3) and remove clutch plate.

2) Remove snap ring. Use a universal gear puller to remove clutch pulley. See Fig. 3. Remove screw from clutch coil lead. Use puller to remove clutch coil.

Installation

1) To install clutch coil, reverse removal procedure. Ensure coil lead is installed in original position. Using puller set and Coil Jig (J-39073-1), carefully press clutch coil into place.

2) Install a new clutch pulley snap ring, being careful not to damage shaft seal. Press clutch plate into place. Install shaft nut and torque to 89-106 INCH lbs. (10-12 N.m).

3) Use a feeler gauge to check clutch plate-to-pulley clearance. Clearance should be .012-.024" (.30-.60 mm). If clearance is too large, remove shaft nut and again press in clutch plate. If clearance is too small, increase gap by pulling up clutch plate. DO NOT remove shaft nut.

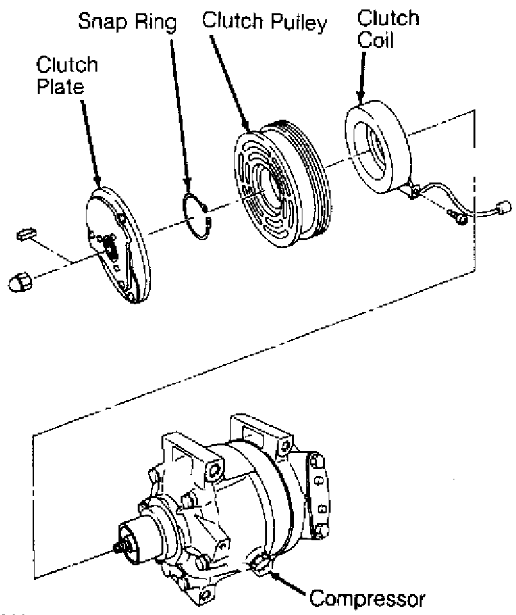

Fig. 3: Exploded View Of Compressor Clutch (Calsonic V5)
Courtesy of Nissan Motor Co., U.S.A.

DIESEL KIKI ROTARY VANE CLUTCH COIL R & I

Removal

1) Hold clutch disc using Clutch Holder (J-33939) and remove center bolt. Using Puller (J-33944-A) and Forcing Bolt (J-33944-4), remove clutch disc. Remove adjustment shim(s) and snap ring.

2) Remove pulley using Pilot (J-38424) and universal puller. Remove coil lead screw, clutch coil screws and coil. Remove snap ring and bearing if necessary.

Installation

1) Ensure coil lead is installed in original position. Install and tighten coil screws to 35-53 INCH lbs. (4-6 N.m). Press pulley onto compressor using Pulley Installer (J-33940). Install snap ring and adjustment shim(s).

2) Install clutch disc and tighten center bolt to 106-133 INCH lbs. (12-15 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in clutch by engaging and disengaging clutch 30 times.

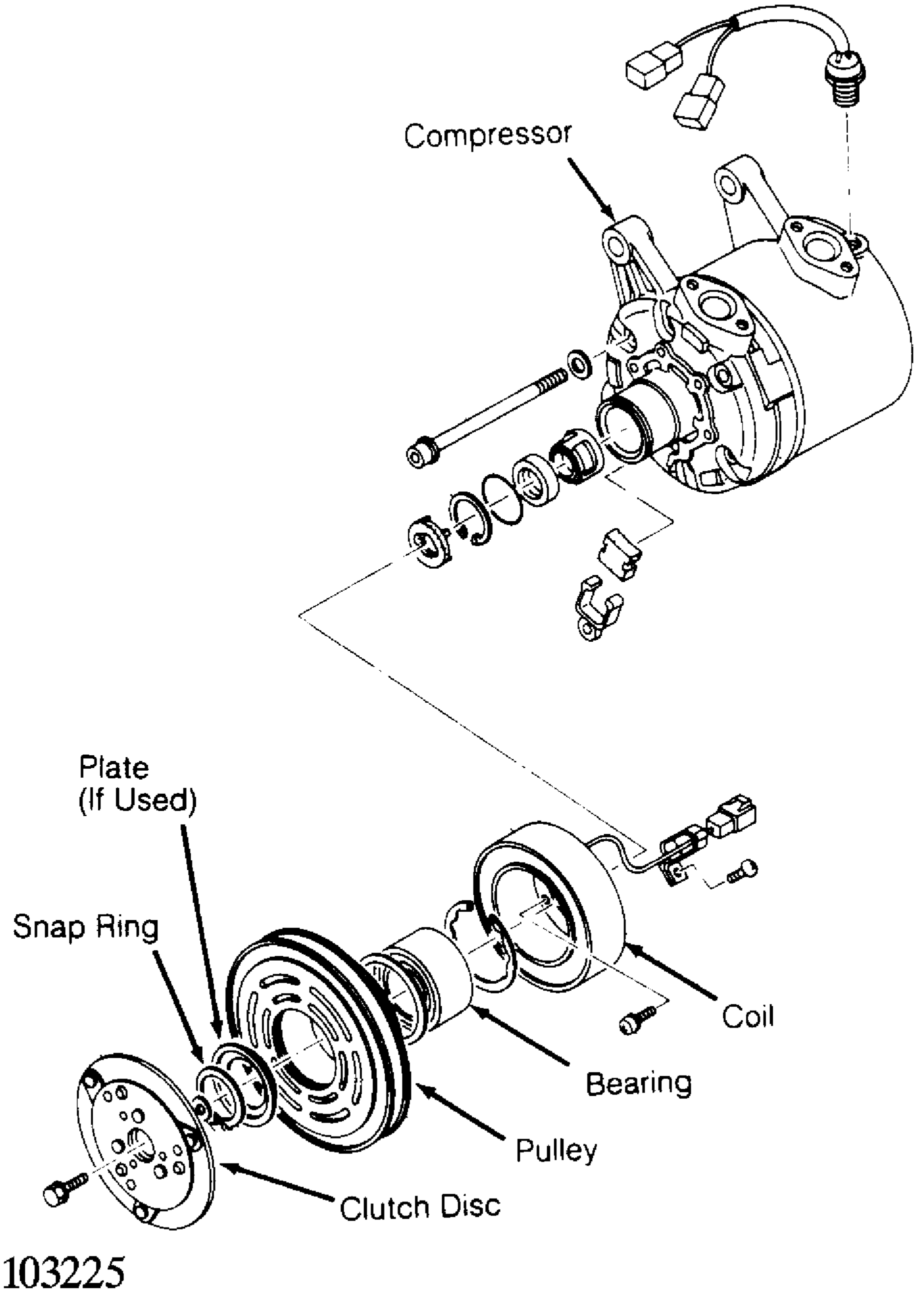

Fig. 4: Exploded View Of Compressor (Diesel Kiki Rotary Vane)
Courtesy of Nissan Motor Co., U.S.A.

DIESEL KIKI 6-CYLINDER CLUTCH COIL R & I

NOTE: Due to variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced.

Removal & Installation

1) Using Clutch Holder (J-33939) to prevent clutch disc from rotating, remove shaft bolt. Using Clutch Disc Puller (J-33944-A) and Forcing Bolt (J-33944-4), remove clutch disc. Remove shim(s) from compressor drive shaft or clutch disc. See Fig. 5.

2) Remove snap ring, cover and pulley. With Puller Guide (J-33943-A) in center of pulley, attach Crossbar (J-8433) to outside diameter of pulley. Tighten crossbar bolt against puller guide to remove pulley. Remove coil lead, screws, and coil.

3) To install, reverse removal procedure. Install cover snap ring with beveled side facing out. Install clutch disc and tighten center bolt to 133 INCH lbs. (15 N.m).

4) Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

DIESEL KIKI SHAFT SEAL R & I

Removal & Installation

1) Remove clutch coil. Remove and discard felt. Using Shaft Seal Cover Remover/Installer (J-33942), push down and turn remover clockwise to engage tangs to cover. Slowly remove seal cover from bore.

2) Remove shaft seal snap ring. Use Shaft Seal Remover (J-33942-B) to remove seal. Remove compressor through bolts, front head and "O" ring. If necessary, replace front and rear valve plates, reed valves, and "O" rings.

3) To install, reverse removal procedure. Coat "O" ring, shaft seal and seal seat with refrigerant oil. Place Shaft Seal Guide (J-34614) over end of compressor shaft. Ensure chamfered portion of shaft seal retainer aligns with chamfered portion on compressor shaft.

4) Install front head and tighten compressor through bolts, in a crisscross pattern, to 16 ft. lbs. (22 N.m). Install shaft seal cover and felt. See Fig. 5. Rotate compressor drive shaft 2-3 times to ensure compressor operates smoothly.

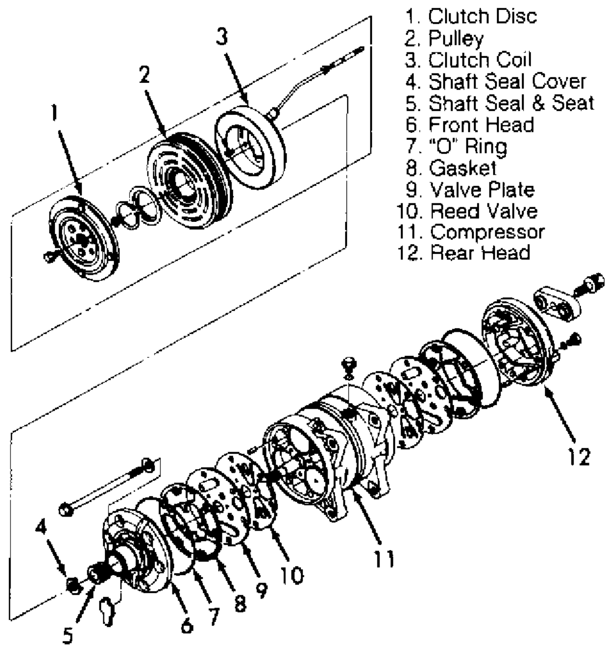

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Fig. 5: Exploded View Of Compressor (Diesel Kiki 6-Cylinder)
Courtesy of Isuzu Motor Co.

FORD FX-15 CLUTCH COIL R & I

Removal

1) Using Clutch Holder (000 41 0812 05), remove clutch plate bolt. Using an 8-mm bolt threaded into clutch plate, remove clutch plate and shim(s). See Fig. 6.

2) Remove snap ring and pulley assembly. Install Shaft Protector (49 UN01 047) over shaft seal opening. Use a 2-jaw puller to remove clutch coil from compressor.

Installation

1) Ensure clutch coil mounting surface is clean. Use Coil Installer (49 UN01 046) and 2-jaw puller engaged to rear side of compressor front mounts to press coil into place.

2) Install pulley assembly. Install pulley assembly snap ring with bevel side of snap ring facing out. Install shim(s) and clutch plate. Install a new clutch plate bolt and tighten to 97-115 INCH lbs. (11-13 N.m).

3) Use a feeler gauge to check clearance between clutch plate and pulley assembly. Clearance should be .018-.033" (.46-.84 mm). If clearance is incorrect, add or remove shims as necessary.

FORD FX-15 SHAFT SEAL R & I

Removal

1) Using Clutch Holder (000 41 0812 05), remove clutch plate bolt. Using an 8-mm bolt threaded into clutch plate, remove clutch plate and shim(s). See Fig. 6.

2) Remove shaft felt seal. Thoroughly clean seal area of compressor. Remove shaft seal snap ring. Position Shaft Seal Remover (49 UN01 044) over compressor shaft.

3) Push shaft seal remover downward against seal. Ensure end of shaft seal remover is engaged with inside of seal. Rotate shaft seal remover clockwise to expand remover tip inside seal. Pull shaft seal from compressor.

Installation

1) Lubricate shaft seal protector and shaft seal with refrigerant oil. Install shaft seal on shaft seal protector so lip seal is toward compressor (large end of shaft seal protector).

2) Install shaft seal protector on compressor shaft. Using Shaft Seal Installer (49 UN01 043), push shaft seal down seal protector until seal is seated.

3) Remove shaft seal installer and protector. Install a new shaft seal retaining snap ring and shaft seal felt. Install shim(s) and clutch plate. Install a new clutch plate retaining bolt and tighten to 97-115 INCH lbs. (11-13 N.m).

4) Use a feeler gauge to check clearance between clutch plate and pulley assembly. Clearance should be .018-.033" (.46-.84 mm). If clearance is incorrect, add or remove shims as necessary.

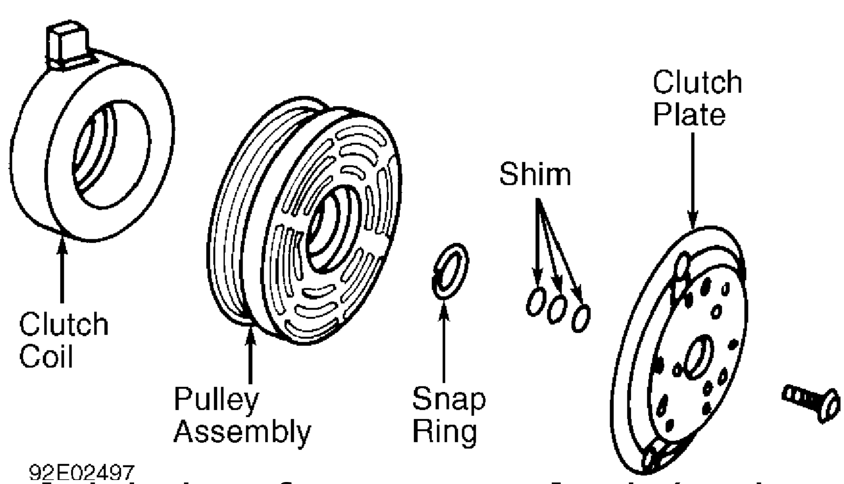

Fig. 6: Exploded View Of Compressor Clutch (Ford FX-15)
Courtesy of Mazda Motors Corp.

HADSYS 7-CYLINDER CLUTCH COIL R & I

Removal

Using Clutch Holder (J-37872), hold pressure plate and remove shaft bolt. Remove pressure plate and adjustment shim(s). See Fig. 7. Remove snap ring. Using universal puller, remove compressor pulley. Remove clutch coil.

Installation

Install clutch coil in reverse order of removal. Ensure snap ring is properly seated. Apply locking compound to shaft bolt and tighten it to 62 INCH lbs. (7 N.m). Ensure clearance between pressure plate and pulley is 0.012-0.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

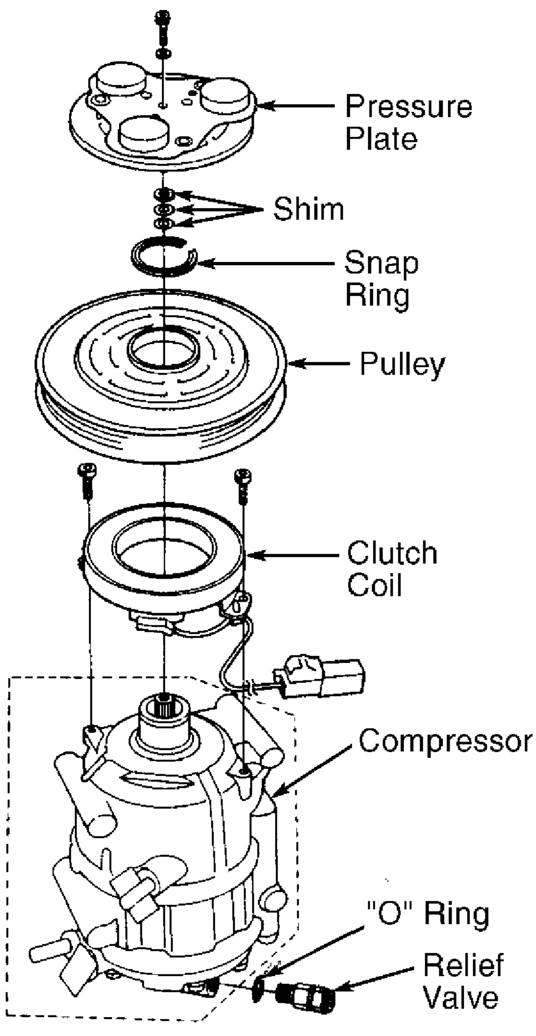

Fig. 7: Exploded View Of Compressor (Hadsys 7-Cylinder)
Courtesy of American Honda Motor Co., Inc.

HARRISON R4 4-CYLINDER CLUTCH COIL AND BEARING R & I

Removal

1) Clamp Holding Fixture (J-25008-A) in vise. Attach compressor to holding fixture. Use Clutch Hub Holder (J-33027) to hold clutch and remove shaft nut.

2) Thread Hub and Drive Plate Assembly Remover/Installer (J-37707) into hub. Hold body of remover with wrench and turn center bolt into remover body to remove clutch plate and hub assembly. Remove shaft key and save for installation.

3) Remove snap ring. Place Puller Guide (J-25031-1) in center of pulley housing. Engage universal puller to outer diameter of pulley (clutch rotor). See Fig. 8. Hold puller and tighten screw to remove pulley.

4) Invert pulley and place on work bench. Press out rotor bearing using handle and Bearing Remover (J-9398-A). Attach universal puller to outside diameter of clutch coil. Tighten bolt against puller guide to remove clutch coil.

CAUTION: DO NOT drive or pound on clutch hub or shaft.

Installation

1) Ensure clutch coil is installed in original position. Press pulley onto compressor using Installer (J-9481-A) and handle. Install shaft key into hub key groove. Allow key to project approximately 3/16" (4.8 mm) out of keyway.

2) Ensure frictional surface of clutch plate and clutch rotor are clean before installing clutch plate and hub assembly. Align shaft key with shaft keyway and place clutch plate and hub assembly onto compressor shaft.

3) Hold hub and drive plate remover/installer with wrench and tighten nut to press hub into shaft until there is a .020-.040" (.5-1.0 mm) air gap between plate and clutch rotor. Install a new shaft nut and tighten to 10 ft. lbs. (14 N.m). Ensure rotor is not rubbing on clutch plate.

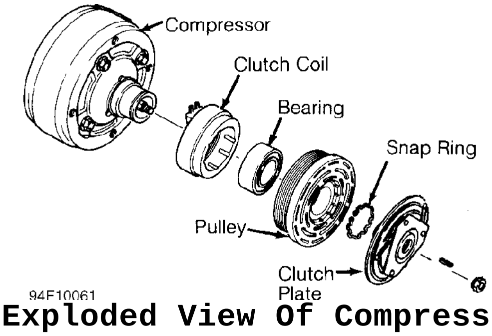

Fig. 8: Exploded View Of Compressor (Harrison R4 4-Cylinder)
Courtesy of Isuzu Motor Co.

HARRISON V5 5-CYLINDER CLUTCH COIL AND BEARING R & I

Removal

1) Clamp Holding Fixture (J-34992) in vise. Attach compressor to holding fixture. Use Clutch Hub Holder (J-33027-A) to hold clutch. Remove shaft nut using Socket (J-33022). SeeFig. 9.

2) Thread Clutch Plate and Hub Assembly Remover (J-33013-B) into hub. Hold body of remover with wrench and turn center bolt to remove clutch plate and hub assembly. Remove snap ring. Remove shaft key and save for installation.

3) Place Puller Guide (J-33023-A) in center of pulley housing. Engage Rotor/Bearing Puller (J-33020) to inner circle of slots in pulley (rotor). Hold rotor/bearing puller in place and tighten screw to remove pulley.

4) Remove screw from rotor/bearing puller. Invert assembly and place on work bench with rotor/bearing puller still engaged. Remove hub bearing using handle and Bearing Remover (J-9398-A).

5) With puller guide in place, attach Crossbar (J-8433-1) and Puller (J-33025) to outside diameter of clutch coil. Tighten crossbar Bolt (J-8433-3) against puller guide to remove clutch coil.

Installation

1) Ensure clutch coil is installed in original position. Press coil into position using crossbar, clutch Coil Installer (J-33024) and Through Bolts (J-34992-2). Stake compressor housing 120 degrees apart to secure coil.

2) Position Rotor/Bearing Installer (J-33017) and puller guide over inner race of bearing. Using through bolts, assemble crossbar over puller pilot and tighten through bolts onto holding fixture. Tighten crossbar bolt to press pulley/bearing assembly onto compressor.

3) Install shaft key into hub key groove. Allow key to project approximately 1/8" (3.2 mm) out of keyway. Align shaft key with shaft keyway and place clutch plate and hub assembly onto compressor shaft.

CAUTION: Do not drive or pound on clutch hub or compressor shaft, as compressor could be damaged internally.

4) Hold hex portion of Hub Installer (J-33013) with a wrench. Tighten center screw to press hub into shaft until there is .020-.030" (.50-.76 mm) air gap between frictional plate and clutch rotor.

5) Install new shaft nut with small diameter boss of nut against crankshaft shoulder. Use Socket (J-33022) and Clutch Hub Holder (J-33027-A). Tighten shaft nut to 12 ft. lbs. (16 N.m). Ensure pulley does not rub on clutch plate. SeeFig. 9.

HARRISON V5 5-CYLINDER SHAFT SEAL R & I

Removal

Remove clutch plate and hub assembly. Remove shaft seal snap ring. Thoroughly clean inside of compressor neck area around shaft and seal. Engage tangs of Seal Remover/Installer (J-23128-A) into recessed portion of seal and remove seal. Remove and discard "O" ring from compressor neck. Thoroughly clean inside of compressor neck and "O" ring groove.

Installation

1) Coat new "O" ring with refrigerant oil and install on "O" Ring Installer (J-33011). Install "O" ring into groove in compressor neck. Attach new seal to seal remover/installer. Dip shaft seal in clean refrigerant oil.

2) Place Seal Protector (J-34614) over compressor shaft. Push new seal over shaft protector. Install new seal snap ring with flat side against seal. Install clutch plate assembly.

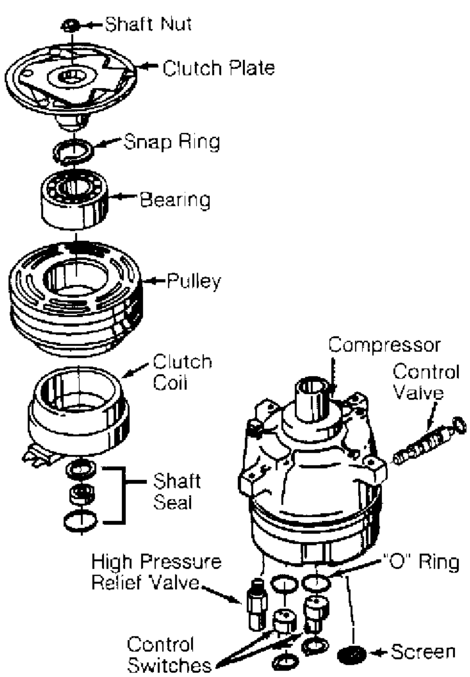

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Fig. 9: Exploded View Of Compressor (Harrison V5 5-Cylinder)
Courtesy of General Motors Corp.

HITACHI 6-CYLINDER CLUTCH COIL AND SEAL R & I

Removal

1) Hold clutch hub with Clutch Tightener (925770000). Remove shaft nut from shaft. Using Clutch Hub Remover (926130000), remove clutch hub. Use snap ring pliers to remove inner snap ring.

2) Remove pulley and bearing assembly. Remove screws securing clutch coil lead. Remove inner snap ring from clutch coil. Remove clutch coil from front cover.

3) Remove shaft key. Use snap ring pliers to remove shaft seal snap ring. Wrap a rag around compressor shaft. Using Injector Needle (92619000) and refrigerant can, slowly pressurize compressor at low pressure (suction) service port. See Fig. 10. Catch shaft seal seat in rag.

4) Insert Shaft Seal Remover/Installer (926120000) through open end of front cover. Slowly pull out remover/installer to remove shaft seal.

Installation

1) Ensure shaft seal contact surface is free of dirt. Lubricate with refrigerant oil. Using shaft seal remover/installer, insert shaft seal.

2) To install clutch coil and hub, reverse removal procedure. Tighten shaft nut to 14-15 ft. lbs. (19-21 N.m). Ensure clearance between pressure plate and pulley is 0.020-0.031" (.50-.80 mm).

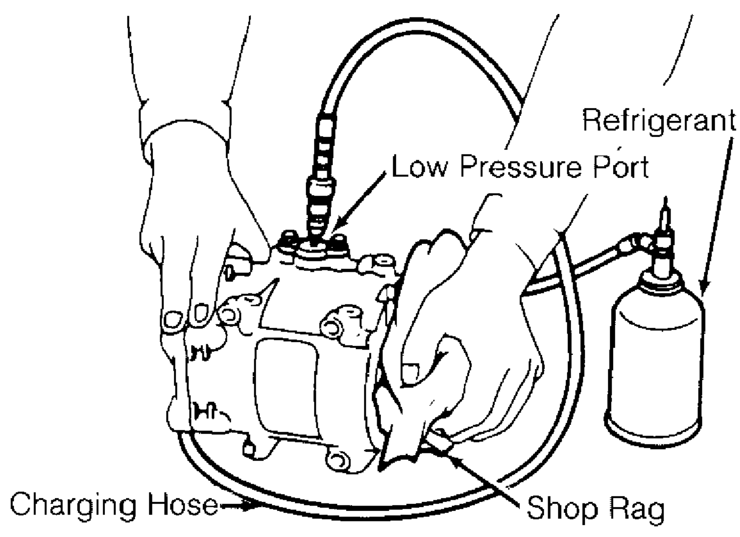

Fig. 10: Removing Compressor Shaft Seal Seat (Hitachi 6-Cylinder)
Courtesy of Subaru of America, Inc.

MATSUSHITA ROTARY VANE CLUTCH COIL R & I

Removal & Installation

1) Using Pressure Plate Holder (J-7624) and socket, remove

center bolt. Thread Puller (J-34878) onto pressure plate. Hold pressure plate with pressure plate holder and tighten puller to remove pressure plate.

2) Remove shim(s) from shaft. Remove snap ring and, using a plastic hammer, tap pulley off. Remove screw for clutch coil lead. Remove snap ring and clutch coil. See Fig. 11.

3) To install, reverse removal procedure. Tighten shaft bolt to 10 ft. lbs (14 N.m). Using feeler gauge, ensure clearance between pressure plate and pulley is .014-.026" (.35-.65 mm). If clearance is incorrect, add or remove shim(s) as necessary.

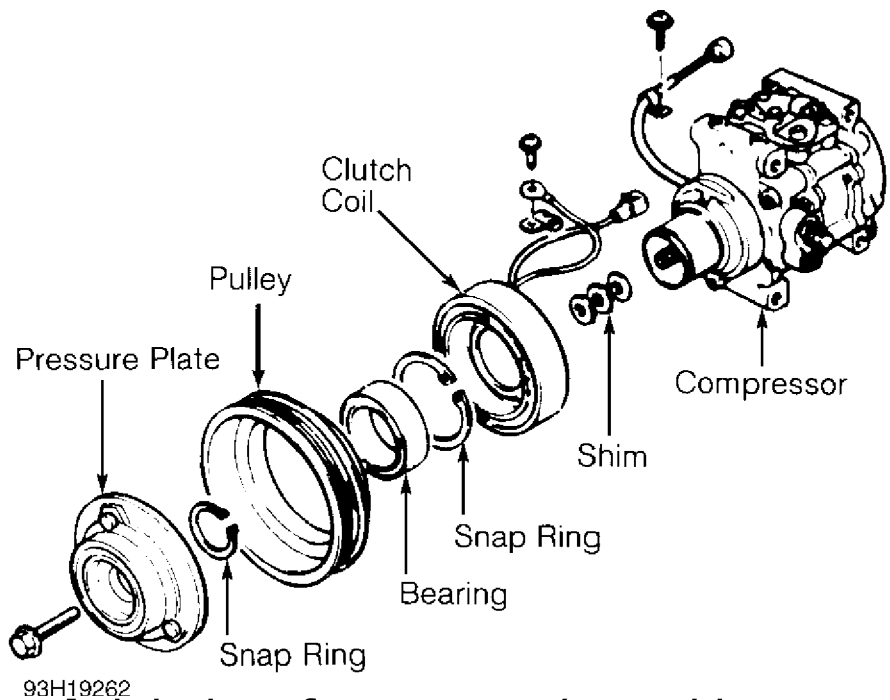

Fig. 11: Exploded View Of Compressor (Matsushita Rotary Vane)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NIPPONDENSO TV12 ROTARY VANE CLUTCH COIL R & I

Removal

1) Hold clutch disc with Clutch Holder (00007-10331) and remove shaft nut. Install Clutch Disc Remover (4992-02-020) and remove clutch disc and shims. See Fig. 12.

2) Remove pulley snap ring and tap pulley (with bearing) off of compressor with plastic hammer. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

Installation

To install, reverse removal procedure. Ensure pulley-to-clutch disc clearance is .016-.024" (.40-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

NIPPONDENSO TV12 DISCHARGE VALVE & SHAFT SEAL R & I

Removal

1) Drain and measure compressor oil in compressor. Remove discharge valve body through bolts. Remove discharge valve body bolts and body. Remove discharge valve plate and discharge valve.

2) Remove compressor through bolts and front and rear housing (oil separator case). Remove pins and gaskets. Remove shaft seal from shaft. Press shaft seal plate off of front housing (head cover).

Installation

To install components, reverse removal procedure. Tighten compressor through bolts to 19 ft. lbs. (26 N.m). Tighten discharge valve bolts to 41 INCH lbs. (4.6 N.m). Tighten discharge valve body and body through bolts to 96 INCH lbs. (10.8 N.m).

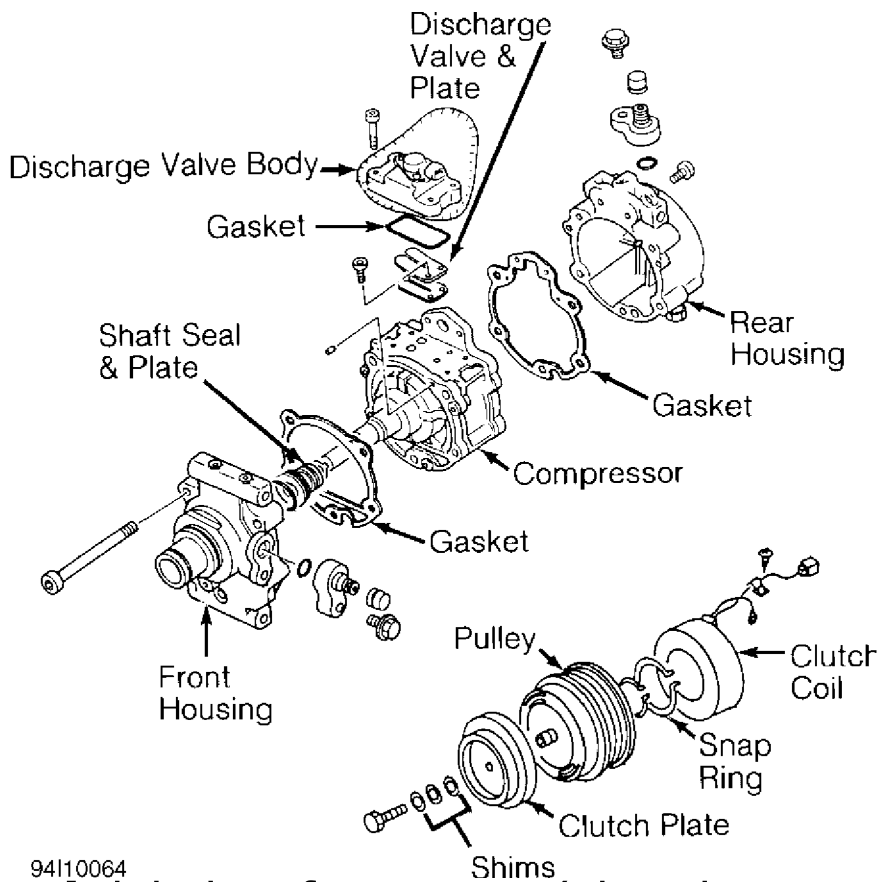

Fig. 12: Exploded View Of Compressor (Nippondenso TV12 Rotary Vane)
Courtesy of Mazda Motors Corp.

NIPPONDENSO 6 & 10-CYLINDER CLUTCH COIL AND BEARING R & I

NOTE: Due to variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced.

Removal

1) Hold clutch plate stationary and remove shaft bolt (or nut). Remove clutch plate using puller. Remove shim(s) from shaft and snap ring. Tap pulley off shaft with plastic hammer. If pulley cannot be removed by hand, use commercially available puller.

2) Remove snap ring, bearing, and seal (if equipped) from pulley. See Fig. 13. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

Installation

To install, reverse removal procedure. Ensure snap rings are installed with beveled side facing out. Tighten shaft bolt (or nut) to 13-14 ft. lbs. (17-19 N.m) on Fox, MR2 and Scoupe; 10-13 ft. lbs. (14-17 N.m) on all others. Ensure air gap between clutch plate and pulley is .024-.040" (.60-1.00 mm) on Fox and MR2; .014-.026" (.36-.66 mm) on all others. If air gap is incorrect, add or remove shim(s) as necessary.

NOTE: To check air gap, place a dial indicator on clutch plate. Apply voltage to clutch coil. Check air gap between clutch plate and drive pulley. Ensure air gap is as specified.

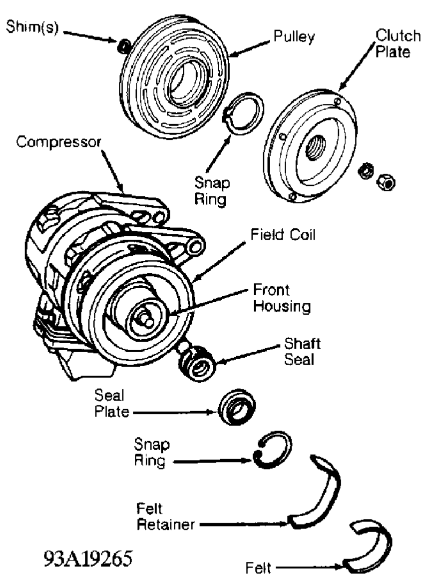

Fig. 13: Exploded View Of Compressor (Nippondenso 10-Cylinder)
Courtesy of Ford Motor Co.

NIPPONDENSO 6 & 10-CYLINDER SHAFT SEAL R & I

NOTE: On Chrysler and Mitsubishi, remove compressor through bolts and front housing to remove shaft seal. SeeFig. 14. Alternately tighten through bolts to 18-21 ft. lbs. (24-28 N.m).

Removal

1) Remove clutch plate and pulley. Remove shim(s) from shaft. Remove clutch coil if necessary. Remove felt and felt retainer (if equipped). Place shaft key remover on shaft and turn to remove key.

2) Remove seal plate snap ring. Engage plate remover on seal plate and pull up to remove seal plate. Engage shaft seal remover/installer to shaft seal and pull up to remove shaft seal from front housing.

Installation

1) Apply clean refrigerant oil to compressor housing bore. Lubricate shaft seal with refrigerant oil and install in front housing. Lubricate seal plate and install in front housing.

2) Install shaft key, snap ring, felt retainer and felt. With clutch plate installed, ensure air gap between clutch plate and pulley is .024-.040" (.60-1.00 mm) on Fox and MR2; .014-.026" (.36-.66 mm) on all others. If air gap is incorrect, add or remove shim(s) as necessary.

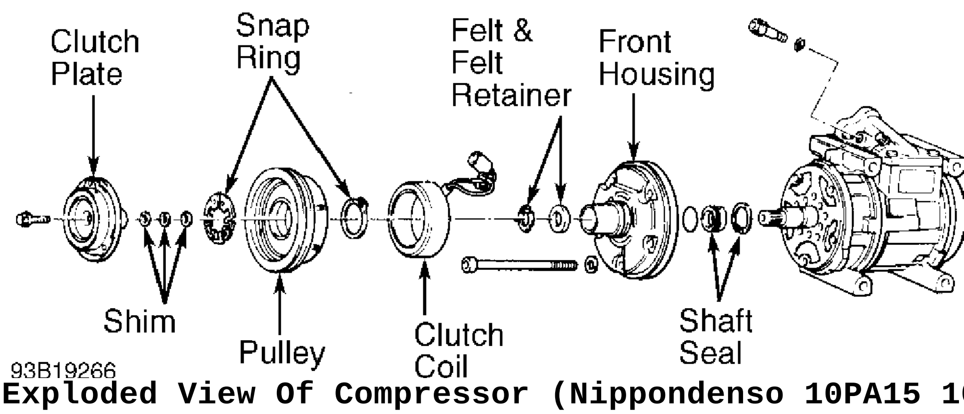

Fig. 14: Exploded View Of Compressor (Nippondenso 10PA15 10-Cylinder)
Courtesy of Chrysler Corp.

PANASONIC ROTARY VANE CLUTCH COIL R & I

Removal

Hold clutch disc stationary and remove shaft bolt. Remove clutch disc and shim(s) from shaft. Remove snap ring. Using a puller, remove pulley. Remove screw from clutch coil lead. Remove screws and field coil.

Installation

To install, reverse removal procedure. Tighten field coil screws to 30-57 INCH lbs. (3.4-6.4 N.m). Ensure pulley-to-armature gap is .016-.020" (.40-.50 mm). If air gap is incorrect, add or remove shim(s) as necessary. Tighten shaft bolt to 97-115 INCH lbs. (11-13 N.m).

PANASONIC ROTARY VANE DISCHARGE VALVE R & I

Removal & Installation

Remove compressor head cover. Remove discharge valve stopper and discharge valve. See Fig. 15. Install replacement discharge valve and stopper, reversing removal procedure. Tighten discharge valve bolts to 27-34 INCH lbs. (3.0-3.8 N.m). Tighten compressor head cover bolts to 89 INCH lbs. (10 N.m).

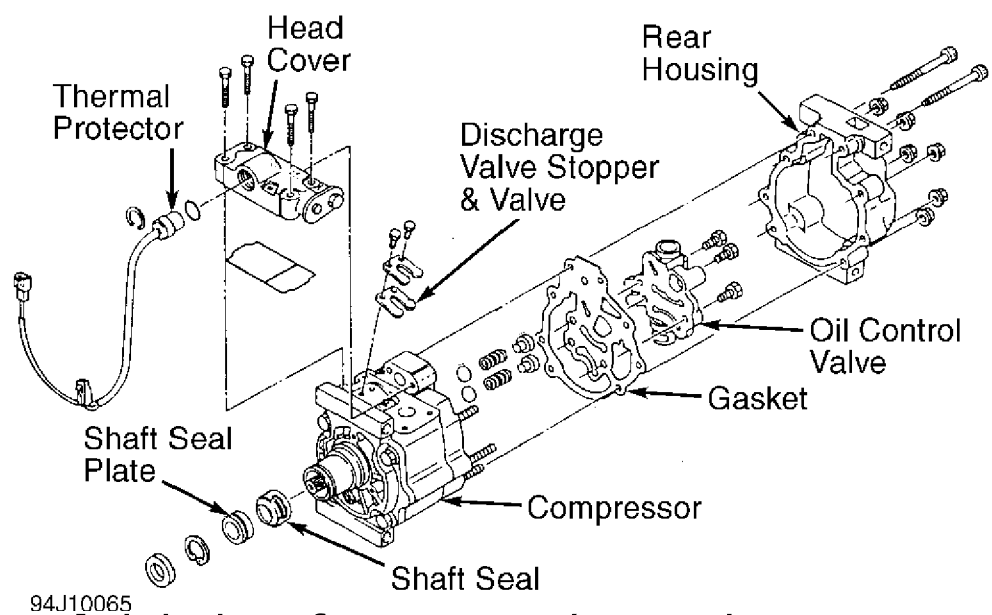

Fig. 15: Exploded View Of Compressor (Panasonic Rotary Vane)
Courtesy of Mazda Motors Corp.

PANASONIC ROTARY VANE OIL CONTROL VALVE R & I

Removal & Installation

Remove compressor rear cover. Remove oil control valve. Remove springs, valve, and rear cover seal. To install components, reverse removal procedure. Tighten oil control valve bolts to 89 INCH lbs. (10 N.m). Tighten rear cover nuts to 21 ft. lbs. (29 N.m) and bolts to 89 INCH lbs. (10 N.m).

PANASONIC ROTARY VANE SHAFT SEAL R & I

Removal & Installation

Remove clutch disc and shim(s). Remove felt seal and snap ring. Using Seal Plate Remover (49 B061 005), engage and remove shaft seal plate. Remove shaft seal with Seal Remover/Installer (49 B061 006). To install, reverse removal procedure. Coat new seal plate and seal with clean refrigerant oil. DO NOT touch seal surfaces with fingers.

SANDEN SCROLL CLUTCH COIL AND SHAFT SEAL R & I

NOTE: Due to variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced.

Removal (Chrysler & Mitsubishi Except Galant & Mirage)

1) Remove drive belt pulley (if equipped). Hold clutch plate using Pliers (MB991367) and Bolts (MB991386). Use a ratchet and socket to remove clutch hub nut.

2) Remove clutch plate. Remove snap ring with internal snap ring pliers. Remove clutch hub (rotor). Remove snap ring and clutch coil.

3) Using an awl, remove bearing cover and retainer. Using Bearing Remover (MB991456), engage bearing grooves. Place base of bearing remover over remover arms and tighten nut.

4) Tighten bearing remover bolt to withdraw bearing from compressor. Engage grooves of Shaft Seal Remover/Installer (MB991458) and pull straight up on shaft seal.

Installation (Chrysler & Mitsubishi Except Galant & Mirage)

1) To install shaft seal, ensure front housing is free of foreign objects. Lubricate Shaft Seal Protector (MB991459) and place over compressor shaft. Lubricate shaft seal and install using shaft seal remover/installer. Remove shaft seal protector.

2) Using a 21 mm socket or Drift (MB991301), carefully press bearing onto compressor shaft. Install clutch coil so that alignment pin is engaged. Install clutch coil snap ring with tapered side facing out.

3) Align armature plate with crankshaft spline. Tighten shaft nut to 12 ft. lbs (16 N.m). Using feeler gauge, ensure clearance between pressure plate and pulley is .016-.024" (.40-0.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

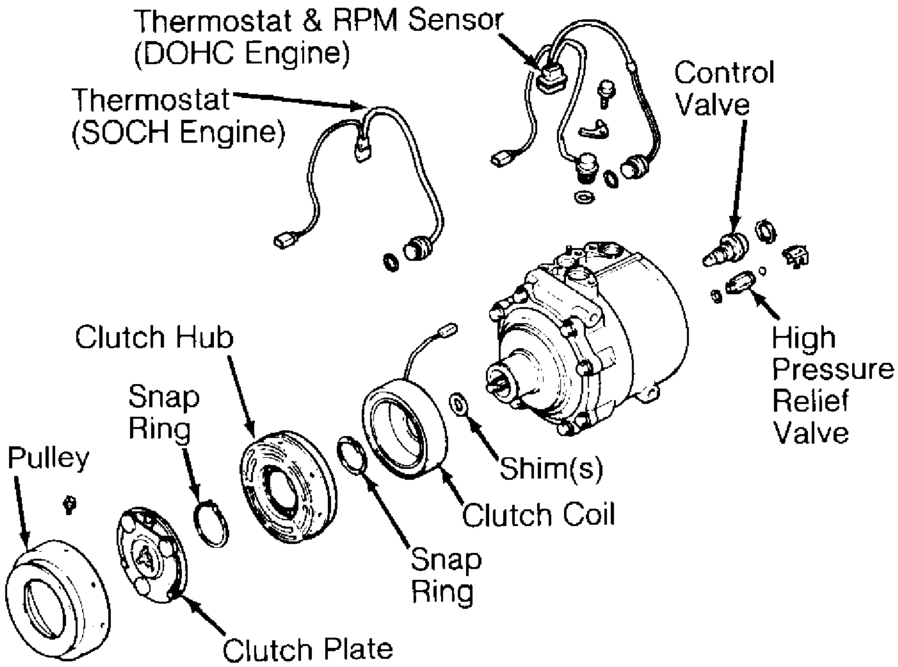

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Fig. 16: Exploded View Of Compressor (Sanden Scroll)
Courtesy of Chrysler Corp.

Removal (Chrysler & Mitsubishi Galant & Mirage)

1) Hold clutch plate by securing 2 box-end wrenches with two 6-mm bolts, 1" (25 mm) or longer. Holding bow-end wrenches, use a ratchet and socket to remove clutch hub nut.

2) Remove clutch plate. See Fig. 17. Remove snap ring with internal snap ring pliers. Remove clutch hub. Remove snap ring and clutch coil.

3) Remove front housing bolts. Remove front housing and "O" ring from compressor. Remove shaft seal from shaft. Remove snap ring from back side of front housing. Remove seal plate. Use brass drift and hammer to lightly tap shaft bearing from front housing. Remove felt seal.

NOTE: DO NOT touch sealing surfaces of shaft seal carbon ring and shaft seal plate.

Installation (Chrysler & Mitsubishi Galant & Mirage)

1) Lubricate shaft seal with compressor oil. Align notches on shaft seal with notches on shaft. Install shaft seal plate on front housing. Install front seal housing to compressor.

2) Use Drift (MB991301) to install felt into front housing. Ensure metal ring on felt faces up. Use drift to press bearing into front housing.

3) Align and install clutch coil. Install snap ring so tapered surface faces outward. Install clutch hub. Install snap ring.

Align clutch plate mark with shaft; where there are no splines on shaft.

4) Tighten clutch hub nut to 12 ft. lbs. (16 N.m). Using feeler gauge, measure clutch plate-to-clutch hub gap. If gap is not .012-.024" (.30-.60 mm), remove clutch assembly and add or remove shim(s).

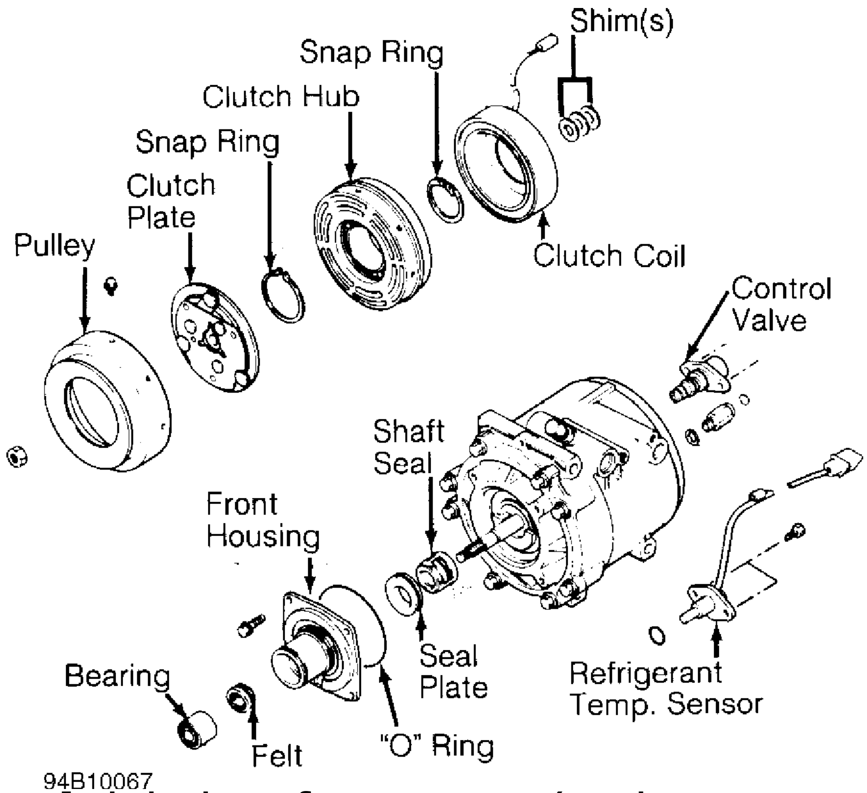

Fig. 17: Exploded View Of Compressor (Sanden FX105V Scroll)
Courtesy of Chrysler Corp.

Removal & Installation (Honda & Hyundai)

1) Remove shaft nut while holding clutch plate with Armature Holder (J-37872). Using Puller (07935-8050003), remove pressure plate and shim(s). See Fig. 16. Remove snap ring.

2) Place Seal Driver (07945-4150200) in center of pulley. Engage universal puller to outer diameter of pulley. DO NOT engage puller on belt area. Hold puller in place and tighten screw to remove pulley. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

3) To install clutch coil, reverse removal procedure. Align lug on clutch coil with hole in compressor. Install snap rings with chamfered side facing out. Tighten shaft nut to 12-14 ft. lbs. (16-19 N.m). Using feeler gauge, ensure clearance between pressure plate and pulley is .014-.026" (.35-.65 mm). If clearance is incorrect, add or remove shim(s) as necessary.

NOTE: Shaft seal removal and installation procedures not available from Honda or Hyundai.

SANDEN 5-CYLINDER CLUTCH COIL R & I

Removal

1) Hold clutch plate, using Holder (0000-41-0809-01), and remove shaft nut. Remove clutch plate using Puller (0000-41-0809-02). Remove shaft key and shim(s). Remove external front housing snap ring and internal bearing snap ring (if used).

2) Install Clutch Pilot (0000-41-0810-77), Pulley/Clutch Remover (0000-41-0810-76), and Puller (0000-41-0804-51/57) to remove pulley assembly. Remove snap ring and drive bearing out of pulley. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

Installation

1) Install new bearing, ensuring Bearing Installer (000-41-0804-43) contacts outer race of bearing. Install snap ring and ensure bearing turns freely.

2) Install clutch coil, ensuring lug on coil aligns with hole in front housing. Support compressor on rear mounting ears. Align rotor on front housing hub. Use bearing installer and Driver (0000-41-0810-59) to install pulley. With pulley seated, install snap ring(s). Install shim(s) and shaft key.

3) Place clutch plate over shaft and, using Shaft Protector (0000-41-0809-10), tap clutch plate into place. Install and tighten shaft nut to 25-32 ft. lbs. (34-44 N.m). Using feeler gauge, ensure clearance between clutch plate and pulley is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

SANDEN 5-CYLINDER CYLINDER HEAD & VALVE PLATE R & I

Removal & Installation

Remove compressor cylinder head (rear cover) bolts. Carefully pry cylinder head of compressor. Remove reed valve plate and gasket. To install components, reverse removal procedure. Tighten compressor cylinder head bolts, in a crisscross pattern, to 21-29 ft. lbs. (29-39 N.m).

SANDEN 5-CYLINDER SHAFT SEAL R & I

Removal

Remove shaft nut and clutch plate. Remove shaft key and shim(s). Carefully remove felt ring. Remove shaft seal seat snap ring. Using Seal Seat Remover/Installer (0000-41-0810-73), carefully remove seal seat. Using Shaft Seal Remover/Installer (0000-41-0812-11), carefully remove shaft seal.

Installation

1) Install Seal Protector (0000-41-0812-13) over shaft. Place new seal on remover/installer. DO NOT touch carbon sealing surface with fingers. Dip seal in refrigerant oil and install. Remove seal installer by turning counterclockwise.

2) Coat seal seat with refrigerant oil. Install seal seat using remover/installer. Install seal seat snap ring (with flat side down). Install shim(s), felt ring and shaft key. Install shaft nut and clutch plate. Ensure clearance between clutch plate and pulley is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

SANDEN 7-CYLINDER CLUTCH COIL AND BEARING R & I

NOTE: Due to variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced.

Removal

1) Install two 6-mm bolts, 1" (25 mm) or longer, in clutch plate holes. Using 2 box-end wrenches to hold bolts and to prevent clutch plate from turning, remove shaft nut.

2) Remove clutch plate using Clutch Plate Puller (09977-21100). Remove clutch shim(s) and bearing dust cover. Remove external front housing snap ring. See Fig. 18.

3) Remove pulley using universal puller. Detach clutch coil lead from compressor housing. Remove clutch coil snap ring and clutch coil. If necessary, remove snap ring and bearing.

Installation

1) Align clutch coil lug with hole in compressor housing, and install clutch coil. Install clutch coil snap ring. Install drive pulley using Drive Pulley Installer (09977-21811).

2) Install external bearing snap ring. Using Seal Installer (09977-21800), install bearing dust cover. After dust cover installation, ensure there is no contact between cover and front housing.

3) Install clutch shim(s) and clutch plate. Tighten shaft nut to 13-14 ft. lbs. (17-19 N.m). Using a dial indicator, check air gap between clutch plate and drive pulley. Apply voltage to clutch coil. Ensure air gap is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

NOTE: If compressor valve plate is serviced, tighten compressor cylinder head bolts to 25-26 ft. lbs. (34-35 N.m).

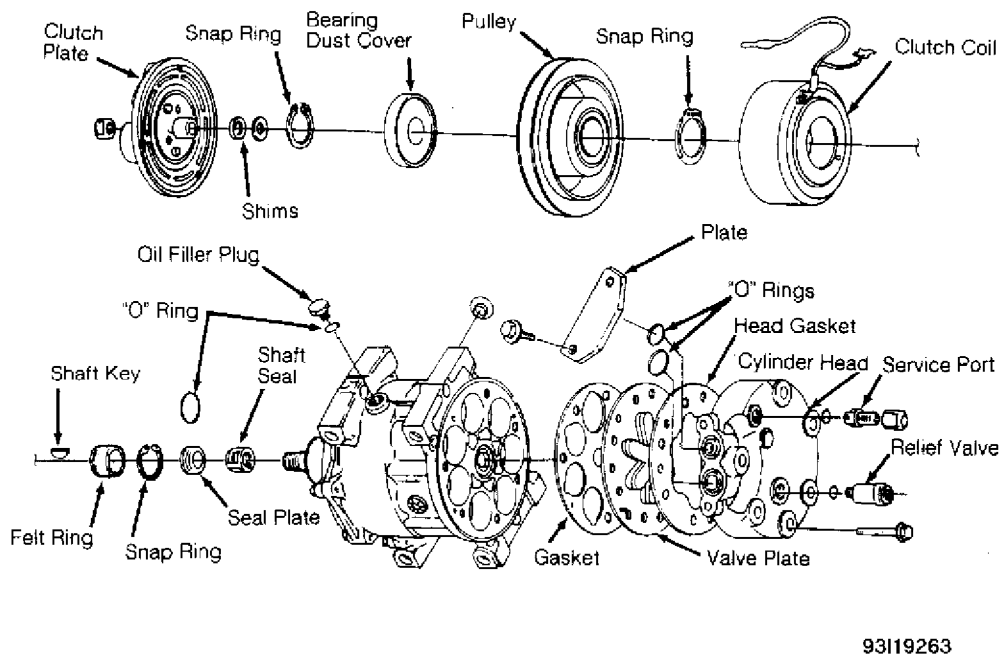

Fig. 18: Exploded View Of Compressor (Sanden 7-Cylinder)
Courtesy of Hyundai Motor Co.

SANDEN 7-CYLINDER SHAFT SEAL R & I

NOTE: Check compressor refrigerant oil level when replacing seals. See COMPRESSOR OIL CHECKING article in GENERAL SERVICING.

Removal

1) Remove clutch plate, shim(s) and bearing dust cover. Tap shaft key out of slot in compressor shaft. Remove seal retainer felt ring.

2) Remove shaft seal seat snap ring. Insert Seal Seat Remover/Installer (09977-21400) into front housing and turn to engage tangs on seat. Lift seal seat out.

3) Insert Seal Remover/Installer (09977-21510) into front housing and turn to engage tangs on seal. Carefully lift shaft seal out without scratching compressor shaft.

Installation

1) Install Shaft Seal Guide Sleeve (09977-21700) over compressor shaft. Dip seal in refrigerant oil and install seal on sleeve. Using seal remover/installer, rotate seal clockwise until seal is engaged. Remove seal remover/installer by turning it counterclockwise.

2) Coat seal seat with refrigerant oil and install seal with seal seat remover/installer. Remove shaft seal guide sleeve. Install

snap ring with beveled edge facing out. Install seal retainer felt ring using seal seat remover/installer.

3) Install shaft key and clutch plate. Tighten shaft nut to 13-14 ft. lbs. (17-19 N.m). Using a dial indicator, check air gap between clutch plate and drive pulley. Apply voltage to clutch coil. Ensure air gap is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

SEIKO-SEIKI ROTARY VANE

NOTE: Volvo Seiko-Seiki compressor servicing procedure is not available from manufacturer.

ZEXEL ROTARY VANE CLUTCH COIL AND BEARING R & I

Removal

1) Hold clutch disc using Clutch Disc Wrench (KV99231260) and remove center bolt. Using Clutch Disc Puller (KV99232340), remove drive plate and adjustment shim(s).

2) Remove snap ring. Remove pulley using Pilot (J-39023) and universal puller. Remove clutch coil. If necessary, remove snap ring and bearing. See Fig. 19.

Installation

1) Ensure coil lead is installed in original position. Install and tighten coil screws. Press pulley onto compressor using Pulley Installer (J-33940). Install snap ring and adjustment shim(s).

2) Install clutch disc and tighten center bolt to 11-13 ft. lbs. (15-18 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in clutch by engaging and disengaging clutch 30 times.

NOTE: Shaft seal assembly servicing procedure is not available from manufacturer. Use exploded view as a guide. See Fig. 19. Tighten thermal protector, if removed, to 11-13 ft.lbs. (15-18 N.m).

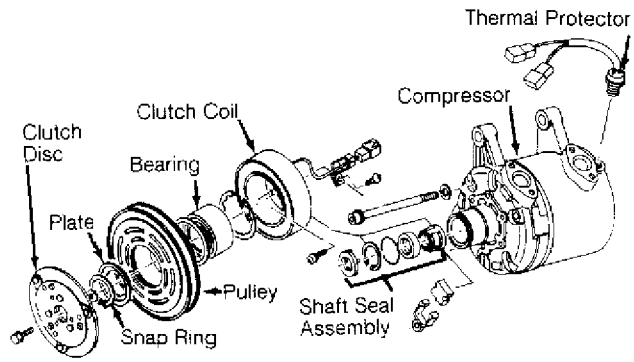

Fig. 19: Exploded View Of Compressor (Zexel Rotary Vane)
Courtesy of Nissan Motor Co., U.S.A.

ZEXEL 6-CYLINDER CLUTCH COIL AND BEARING R & I

NOTE: Volvo Zexel compressor servicing procedure is not available from manufacturer.

Removal (Audi)

1) Using Spanner Wrench (44-4), hold clutch hub stationary and remove shaft bolt. Remove clutch plate and shim(s) using Puller (VAG 1719) and Spanner Wrench (3212). See Fig. 20. Remove snap ring.

2) Place Spacer (VAG 1719/1) in center of pulley cavity. Attach Puller (US 1078) to outer diameter of pulley and remove pulley. Remove snap ring, bearing, and clutch coil as necessary.

Installation (Audi)

Ensure clutch coil lug fits into hole on compressor housing. Using Installer (VAG 1719/2), press on pulley and install snap ring. Install shim(s) and clutch plate. Tighten shaft bolt to 11 ft. lbs. (15 N.m). Using feeler gauge, ensure air gap between pulley and clutch disc is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

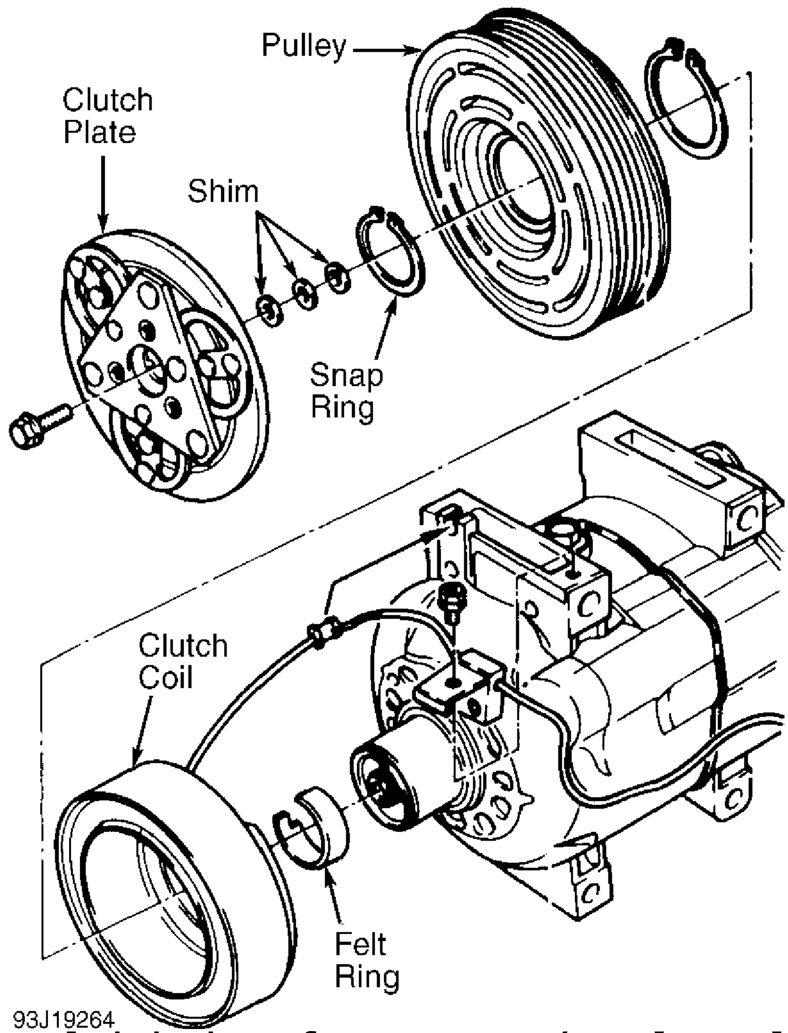

Fig. 20: Exploded View Of Compressor (Zexel 6-Cylinder)
Courtesy of Audi of America, Inc.

Removal (Nissan)

1) Using Clutch Disc Wrench (J-37877), hold clutch hub stationary and remove shaft nut. Remove adjustment shim(s) and clutch disc using Clutch Disc Puller (J-26571-A).

2) Bend lock washer away from lock nut. See Fig. 21. Remove lock nut with Wrench (J-37882). Remove pulley by hand or, if difficult to remove, use Pilot (J-26720-A) and universal puller. Remove snap ring, bearing, and clutch coil as necessary.

Installation (Nissan)

1) Ensure key is installed in compressor shaft keyway. Install pulley, lock washer and pulley. Tighten lock nut to 25-29 ft. lbs. (34-39 N.m). Bend lock washer against lock nut.

2) Install clutch disc and tighten shaft nut to 10-12 ft. lbs (14-16 N.m). Using feeler gauge, ensure air gap between pulley and clutch disc is .012-.024" (.30-.60 mm). If clearance is incorrect, add

or remove shim(s) as necessary. Break-in compressor clutch assembly by engaging and disengaging clutch 30 times.

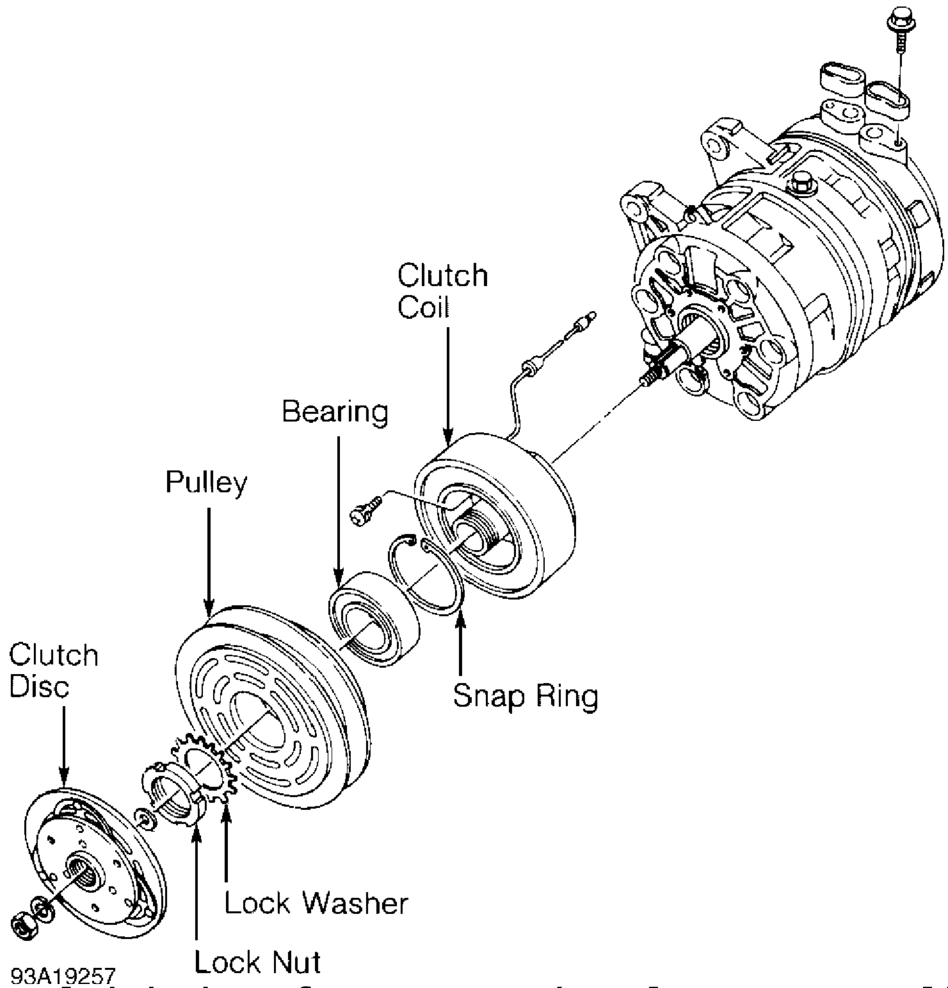

Fig. 21: Exploded View Of Compressor (Zexel DKS-16H 6-Cylinder)
Courtesy of Nissan Motor Co., U.S.A.

END OF ARTICLE

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ARTICLE BEGINNING

1993 AIR CONDITIONING & HEAT
A/C General Diagnostic Procedures

Diagnosis is an important first step in A/C system servicing. To save time and effort, systems should be carefully checked to identify the causes of poor performance. By using the following diagnostic charts, defective components or system problems can be quickly located. To identify problems that are specific to one system, refer to the repair section of this manual. The charts in this section apply to all systems.

PREPARATION FOR TESTING

1) Attach Low and High pressure gauges.
2) Start engine and allow to warm up.
3) Set system to COOL and blower to HIGH.
4) Open car doors and hood.
5) Run engine at fast idle for 2-3 minutes.

AIR CONDITIONING SYSTEM PERFORMANCE CHECK

AIR CONDITIONING SYSTEM PERFORMANCE CHECK TABLE

PERFORM TESTS:	SHOULD BE:	IF:
Temperature Check		Temperature Check Is:
* Switch to LOW blower.		
* Close doors.		
* Check outlet temperature.	35-45° F	Too warm - Check control lever operation, heater water valve, cooling system and gauge readings.
PERFORM TESTS:	**SHOULD BE:**	**IF:**
Visual Check		Visual Check Shows:
* Compressor	Quiet with no leaks	Noisy - Check belts, oil level, seals, gaskets, reed valves.
* Condenser	Free of obstructions	Blocked - Clean off. Plugged - Flush or

		replace.
* Receiver-Drier	Dry and warm to touch	Frosty - Check for restriction, replace desiccant.
* Sight Glass	Clear or few bubbles	Bubbly, foamy or streaks - Check gauge readings.
* High Side Lines	Dry and warm to touch	Frosty or very hot - Check for restriction or overcharge.
* Low Side Lines	Dry and cool to touch	Frosty or warm - Check for restriction, low charge or bad valve.
* Expansion Valve	Dry	Frosty - Check for moisture or restriction. Check sensing bulb.
* STV	Dry and cool to touch	Frosty or warm - Check gauge readings for valve malfunction.
* Evaporator	Dry and cold to touch	Freezing or warm - Check expansion valve, STV or thermoswitch.

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PERFORM TESTS:	SHOULD BE:	IF:
Gauge Readings		Gauge Readings are:
* High Side Gauge	See Pressure Chart	Above or below normal - See A/C Diagnosis.
* Low Side Gauge	See Pressure Chart	Above or below normal

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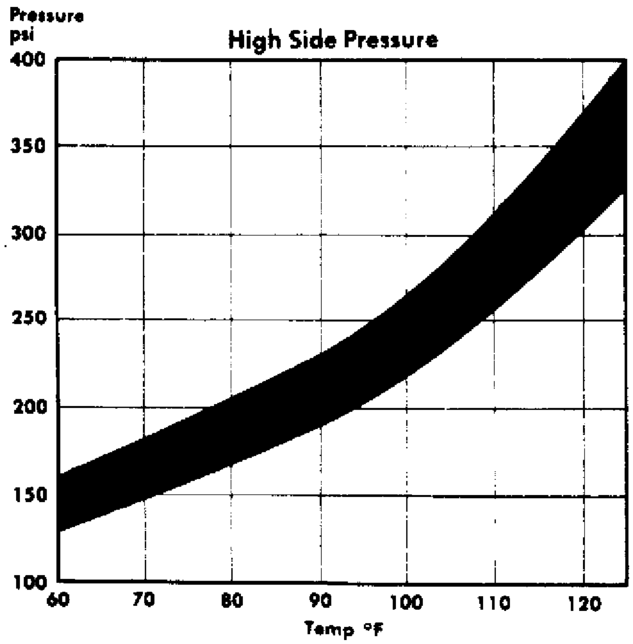

Fig. 1: Ambient Temperature/Pressure (R-12)

EVAPORATOR TEMPERATURE/PRESSURE

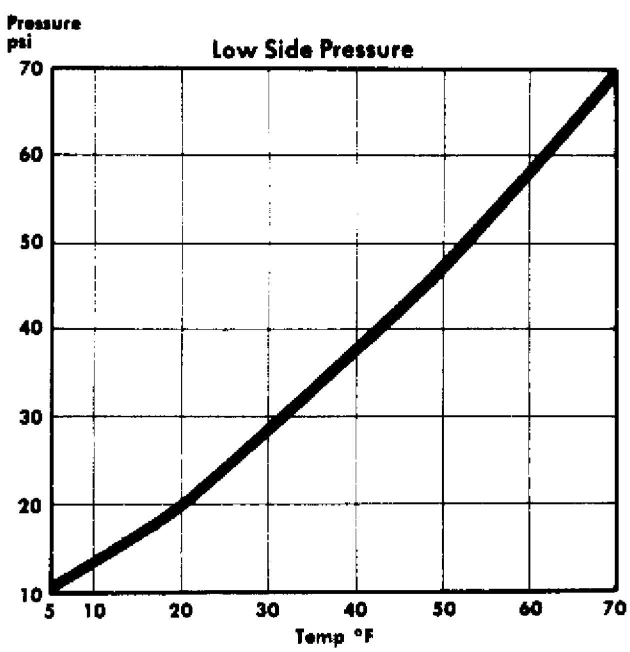

Fig. 2: Evaporator Temperature/Pressure (R-12)

A/C DIAGNOSIS W/GAUGES FOR SYS. W/INSUFFICIENT OR NO COOLING TABLE

Low Side Gauge	High Side Gauge	Other Symptoms (1)	Diagnosis
NORMAL	NORMAL	No or few bubbles in sight glass. High side gauge may go high. Low side gauge does not fluctuate with compressor on/off cycle.	Some Air & Moisture in System
NORMAL	NORMAL	Cools okay in morning but not during hot part of day. Bubbles in sight glass. Discharge air warm when low side gauge drops into vacuum.	Excessive Moisture in System
NORMAL	NORMAL	Thermostatic sw. sys. only- compressor cycles off & on too rapidly.	Defective Thermostatic Sw.
NORMAL to HIGH	NORMAL	Cycling clutch sys only - compressor doesn't turn on soon enough. Discharge air becomes warm as low side pressure rises.	Misadjusted Thermostatic Sw. or Defective Pressure Sensing Switch
LOW	LOW	Bubbles in sight glass. Outlet air slightly cool.	Low R-12 Charge
LOW	LOW	Sight glass clear. Outlet air very warm.	Excessively Low R-12 Charge
LOW	LOW	Outlet air slightly cool. Sweating or frost at expansion valve.	Expansion Valve Stuck Closed Screen Plugged or Sensing Bulb Malfunction
LOW	LOW	Outlet air slightly cool. High side line cool to touch. Sweating or frost on high side.	Restriction on High Side
LOW	HIGH	Evaporator outlet pipe cold. Low side goes into vacuum when blower is disconnected.	STV Stuck Open

HIGH	**LOW**	**Evaporator outlet pipe warm. Outlet air warm.**	**STV Stuck Closed**
HIGH	**LOW**	**Noise from compressor.**	**Compressor Malfunction**
HIGH	**HIGH**	**Outlet air warm. Liquid line very hot. Bubbles in sight glass.**	**Compressor Malfunction or R-12 Overcharge**
HIGH	**HIGH**	**Outlet air slightly cool. Bubbles in sight glass.**	**Large Amount of Air of Air & Moisture in System**
HIGH	**HIGH**	**Outlet air warm. Evaporator outlet sweating and frost.**	**Expansion Valve Stuck Open**

(1) - If equipped with a low refrigerant charge protection system, compressor operation may have stopped.

AIR CONDITIONING GENERAL TROUBLE SHOOTING

CONDITION & POSSIBLE CAUSE

Compressor Not Working

* **Compressor clutch circuit open.**
* **Compressor clutch coil inoperative.**
* **Poor clutch ground connection.**
* **Fan belts loose.**
* **Thermostatic switch inoperative.**
* **Thermostatic switch not adjusted.**
* **Ambient temperature switch open.**
* **Superheat fuse blown.**

Excessive Noise or Vibration

* **Missing or loose mounting bolts.**
* **Bad idler pulley bearings.**
* **Fan belts not tightened correctly.**
* **Compressor clutch contacting body.**
* **Excessive system pressure.**
* **Compressor oil level low.**
* **Damaged clutch bearings.**
* **Damaged reed valves.**

* Damaged compressor.

Insufficient or No Cooling; Compressor Working
* Expansion valve inoperative.
* Heater control valve stuck open.
* Low system pressure.
* Blocked condenser fins.
* Blocked evaporator fins.
* Vacuum system leak.
* Vacuum motors inoperative.
* Control cables improperly adjusted.
* Restricted air inlet.
* Mode doors binding.
* Blower motor inoperative.
* Temperature above system capacity.

HEATING GENERAL TROUBLE SHOOTING

CONDITION & POSSIBLE CAUSE

Insufficient, Erratic, or No Heat
* Low coolant level.
* Incorrect thermostat.
* Restricted coolant flow through heater core.
* Heater hoses plugged.
* Misadjusted control cable.
* Sticking heater control valve.
* Vacuum hose leaking.
* Vacuum hose blocked.
* Vacuum motors inoperative.
* Blocked air inlet.
* Inoperative heater blower motor.
* Oil residue on heater core fins.
* Dirt on heater core fins.

Too Much Heat
* Improperly adjusted cables.
* Sticking heater control valve.
* No vacuum to heater control valve.
* Temperature door stuck open.

Airflow Changes During Acceleration
* Vacuum system leak.
* Bad check valve or reservoir.

Air From Defroster At All Times
* Vacuum system leak.

* Improperly adjusted control cables.
* Inoperative vacuum motor.

Blower Does Not Operate Correctly

* Blown fuse.
* Blower motor windings open.
* Resistors burned out.
* Motor ground connection loose.
* Wiring harness connections loose.
* Blower motor switch inoperative.
* Blower relay inoperative.
* Fan binding or foreign object in housing.
* Fan blades broken or bent.

END OF ARTICLE

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ARTICLE BEGINNING

1993 GENERAL SERVICING
General Servicing Procedures

USING R-12 & R-134a REFRIGERANT

HANDLING/SAFETY PRECAUTIONS

1) Always work in a well-ventilated, clean area. Refrigerant R-134a is colorless and is invisible as a gas. Refrigerant (R-12 or R-134a) is heavier than oxygen and will displace oxygen in a confined area. Avoid breathing refrigerant vapors. Exposure may irritate eyes, nose and throat.

2) The system's high pressure can cause severe injury to eyes and skin if a hose were to burst. Always wear eye protection when working around A/C system and refrigerant. If necessary, wear rubber gloves or other protective clothing.

3) Refrigerant evaporates quickly when exposed to atmosphere, freezing anything it contacts. If liquid refrigerant contacts eyes or skin, DO NOT rub eyes or skin. Immediately flush affected area with cool water for 15 minutes and consult a doctor or hospital.

4) Never use R-134a in combination with compressed air for leak testing. Pressurized R-134a in the presence of oxygen (air concentrations greater than 60% by volume) may form a combustible mixture. DO NOT introduce compressed air into R-134a containers (full or empty), A/C system components or service equipment.

5) DO NOT expose A/C system components to high temperatures, steam cleaning for example, as excessive heat will cause refrigerant/system pressure to increase. Never expose refrigerant directly to open flame. If refrigerant needs to be warmed, place bottom of refrigerant tank in warm water. Water temperature MUST NOT exceed 125°F (52°C).

6) Use care when handling refrigerant containers. DO NOT drop, strike, puncture or incinerate containers. Use Department Of Transportation (DOT) approved, DOT 4BW or DOT 4BA, refrigerant containers.

7) Never overfill refrigerant containers. The safe filling level of a refrigerant container MUST NOT exceed 60% of the container's gross weight rating. Store refrigerant containers at temperature less than 125°F (52°C).

8) R-12 refrigerant (Freon) will be sold and stored in White containers, while R-134a refrigerant will be sold and stored in 30 or 50-pound Light Blue containers.

9) R-12 and R-134a refrigerants must never be mixed, as their desiccants and lubricants are not compatible. If the refrigerants are mixed, system cross-contamination or A/C system component failure may

occur. Always use separate servicing and refrigerant recovery/recycling equipment.

10) Follow equipment manufacturer instructions of all service equipment to be used. The Material Safety Data Sheet (MSDS), provided by refrigerant manufacturer/suppliers, contains valuable information regarding the safe handling of R-12 or R-134a refrigerants.

IDENTIFYING R-134a SYSTEMS & COMPONENTS

To prevent refrigerant cross-contamination, use following methods to identify R-134a based systems and components.

Fittings & "O" Rings

All R-134a based A/C systems use 1/2" - 16" ACME threaded fittings (identifiable by square threads) and quick-connect service couplings. See Fig. 1. Besides the use of these fittings, most manufacturers will use Green colored "O" rings in R-134a systems.

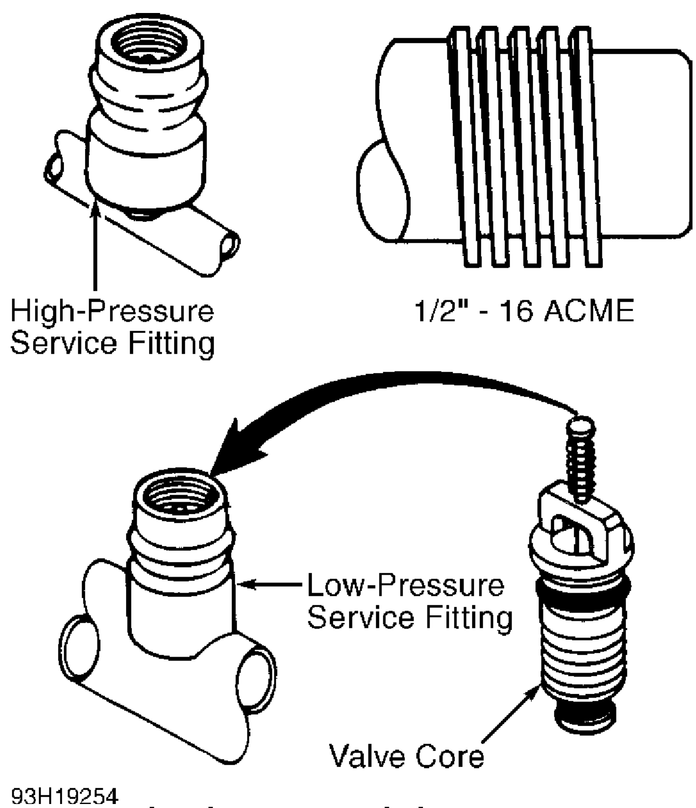

Fig. 1: R-134a Fittings & Quick Connect Service Couplings ID
Courtesy of Audi of America, Inc.

Underhood A/C Specification Labels

Most R-134a based systems will be identified through the use of Green or Light Blue underhood labels, or with R-134a refrigerant clearly printed on labels. See Fig. 2. Some manufacturers will identify R-12 based systems with White, Red, Silver or Gold underhood labels. Before servicing an A/C system, always determine which refrigerant is being used.

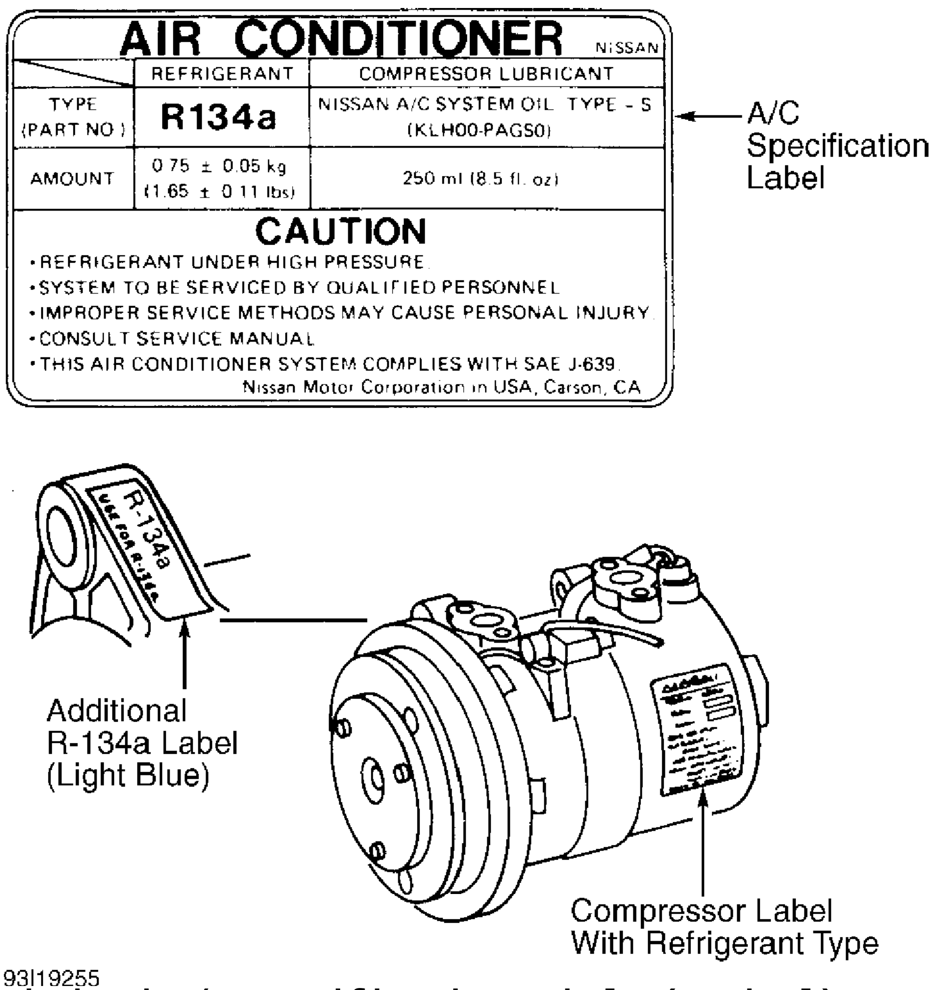

Fig. 2: Underhood A/C Specification Labels (Typical)
Courtesy of Nissan Motor Co., U.S.A.

Other Means Of Identification

Refrigerant R-134a, when viewed through a sight glass, may have a "milky" appearance due to the mixture of refrigerant and lubricating oil. As the refrigerant and oil DO NOT exhibit a "clear" sight glass on a properly charged A/C system, R-134a systems have no sight glass.

Audi, Mercedes-Benz and Volkswagen use Green bands/labels on condenser, refrigerant lines, receiver-drier and expansion valve. Lexus A/C system hoses and line connectors have a groove, a White line and "R-134a" marked on them. See Fig. 3.

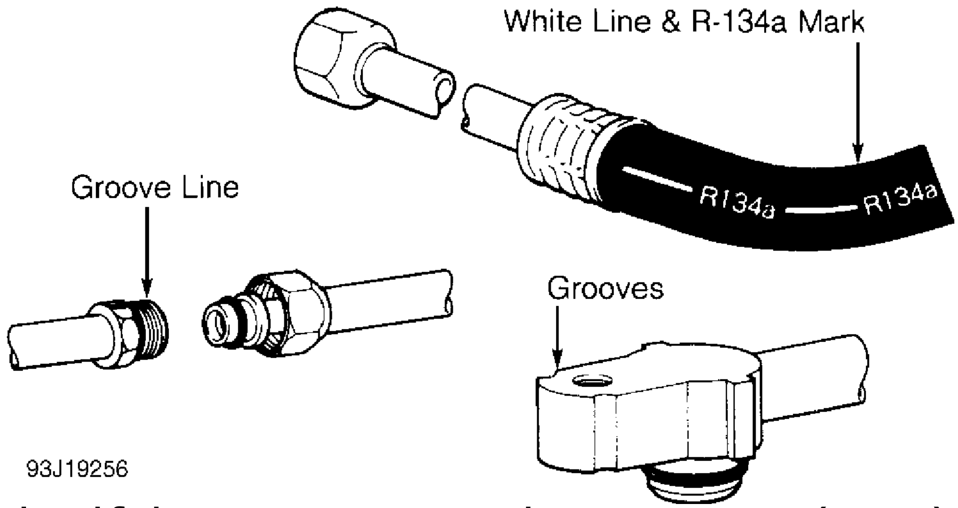

Fig. 3: Identifying R-134a Hose & Line Connectors (Lexus)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

REFRIGERANT OILS

Refrigerant R-12 based systems use mineral oil, while R-134a systems use synthetic/Polyalkylene Glycol (PAG) oils. Using a mineral oil based lubricant with R-134a will result in A/C compressor failure due to lack of proper lubrication.

Use ONLY specified oil for the appropriate system and A/C compressor. Always check the underhood A/C specification label or A/C compressor label before adding refrigerant oil to A/C compressor/system. See Fig. 2. The following R-134a refrigerant oils are currently available.

Lexus

PAG Refrigerant Oil (ND-OIL 8) with 10P/10PA swashplate (piston) compressor. Synthetic Refrigerant Oil (ND-OIL 9) with through-vane (rotary vane) compressor.

Mercedes-Benz

PAG Refrigerant Oil (001 989 08 03).

Nissan

PAG Refrigerant Oil (KLH00-PAGR0) with rotary vane compressor. PAG Refrigerant Oil (KLH00-PAGS0) with piston (swashplate) compressor.

Saab

PAG Refrigerant Oil (40 74 787).

NOTE: Synthetic/PAG oils absorb moisture very rapidly, 2.3-5.6% by weight, as compared to a mineral oil absorption rate of .005% by weight.

SERVICE EQUIPMENT

Because R-134a is not interchangeable with R-12, separate sets of hoses, manifold gauge set and recovery/recycling equipment are required to service vehicles. This is necessary to avoid cross-contaminating and damaging system.

All equipment used to service systems using R-134a must meet SAE standard J1991. The service hoses on the manifold gauge set must have manual (turn wheel) or automatic back-flow valves at the service port connector ends. This will prevent refrigerant from being released into the atmosphere.

For identification purposes, R-134a service hoses must have a Black stripe along its length and be clearly labeled SAE J2196/R-134a. The low pressure test hose is Blue with a Black stripe. The high pressure test hose is Red with a Black stripe, and the center test hose is Yellow with a Black stripe.

NOTE: Refrigerant R-12 service hoses will ONLY be labeled SAE J2196.

R-134a manifold gauge sets can be identified by one or all of the following:

* **Labeled FOR USE WITH R-134a on set**
* **Labeled HFC-134 or R-134a on gauge face**
* **Light Blue color on gauge face**

In addition, pressure/temperature scales on R-134a gauge sets are different from R-12 manifold gauge sets.

SYSTEM SERVICE VALVES

SCHRADER-TYPE VALVES

NOTE: Although similar in construction and operation to a tire valve, NEVER replace a Schrader-type valve with a tire valve.

Schrader valve is similar in construction and operation to a tire valve. When a test gauge hose with built-in valve core depressor is attached, Schrader stem is pushed inward to the open position and allows system pressure to reach gauge.

If test hose does not have a built-in core depressor, an adapter must be used. Never attach hose or adapter to Schrader valve unless it is first connected to manifold gauge set.

Refrigerant R-12 Schrader-type valve cores have TV5 thread size. Refrigerant R-134a Schrader-type valve cores use M6 (Metric)

threads. R-134a valve cores can be easily identified by use of "O" rings and external spring. See Fig. 1.

SERVICE VALVE LOCATIONS

SERVICE VALVE LOCATIONS TABLE

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Vehicle	High	Low
Audi	(12)	(13)
Acura	(2)	(3)
BMW	(4)	(5)
Chrysler, Eagle & Mitsubishi		
Colt, Mirage & Summit	(10)	(5)
Colt Vista & Summit Wagon	(10)	(11)
Diamante	(4)	(5)
Eclipse & Expo	(10)	(11)
Galant	(10)	(11)
Montero	(11)	(11)
Pickup & Ram-50	(10)	(11)
Precis	(10)	(10)
Stealth & 3000GT		
R-12	(1)	(1)
R-134a	(1)	(5)
Ford Motor Co.	(4)	(5)
General Motors	(12)	(12)
Geo	(4)	(5)
Honda	(4)	(5)
Hyundai		
Elantra & Scoupe	(4)	(5)
Excel & Sonata	(10)	(10)
Infiniti	(4)	(5)
Isuzu	(4)	(5)
Jaguar	(4)	(5)
Lexus	(4)	(5)
Mazda		
B2200 & B2600i	(8)	(8)
Miata, MPV Protege & 323	(4)	(5)
Navajo	(6)	(7)
All Others	(1)	(1)
Mercedes-Benz	(4)	(5)
Nissan	(4)	(5)
Porsche	(8)	(8)
Saab	(8)	(8)
Subaru		
Impreza	(1)	(1)
Legacy & Loyale	(4)	(5)
SVX	(9)	(9)

Suzuki	(4)	(5)
Toyota		
Pickup & 4Runner	(11)	(11)
All Others	(4)	(5)
Volkswagen	(4)	(5)
Volvo		
240	(4)	(5)
850	(1)	(5)
940 & 960	(14)	(14)

(1) - Information is not available from manufacturer.
(2) - On high pressure line (near top of condenser on Integra; near receiver-drier on Legend; on receiver-drier on Vigor). Use High-Side Adapter (J-25498).
(3) - On low pressure line (near battery on Integra; near right rear of engine on Legend; near compressor on Vigor).
(4) - On high pressure (discharge) hose/line.
(5) - On low pressure (suction) hose/line.
(6) - On high pressure line, between compressor and condenser.
(7) - On suction accumulator/drier.
(8) - On low and high pressure hoses, behind compressor.
(9) - On receiver/drier and low pressure hose (near compressor).
(10) - On compressor discharge hose and accumulator.
(11) - On compressor discharge and suction ports.
(12) - Front of condenser on right side.
(13) - Towards rear of compressor.
(14) - Single service valve on suction accumulator/drier.
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REFRIGERANT RECOVERY/RECYCLING

Refrigerant recovery/recycling equipment is used to remove refrigerant from vehicle's A/C system without polluting atmosphere. To remove and recycle refrigerant, connect the recovery/recycling system and follow instructions provided with the system.

The removed refrigerant is filtered, dried and stored in a tank within the recovery/recycling system until it is ready to be pumped back into the vehicle's A/C system. With refrigerant stored in the recovery/recycling system, A/C system can be opened without polluting atmosphere.

NOTE: Separate sets of hoses, gauges and refrigerant recovery/recycling equipment MUST be used for R-12 and R-134a based systems. DO NOT mix R-12 and R-134a refrigerants, as their refrigerant oils and desiccants are

not compatible. On systems with R-134a refrigerant, use Polyalkylene Glycol (PAG) wax-free refrigerant oil.

END OF ARTICLE

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ARTICLE BEGINNING

1993 Heater Systems

Prelude

A/C SYSTEM SPECIFICATIONS

SPECIFICATIONS TABLE

Application	Specification
Compressor Type	Sanden Scroll
Compressor Belt Deflection (1)	
New	13/64-9/32" (5-7 mm)
Used	25/64-15/32" (10-12 mm)
System Oil Capacity (2)	4.3-5.0 ozs.
Refrigerant Capacity (3)	21-23 ozs.
System Operating Pressures (4)	

(1) - With 22 lbs. (10 kg) pressure applied to center of belt.
(2) - Use PAG Refrigerant Oil (Part No. 38899-P13-003).
(3) - Use R-134a refrigerant.
(4) - See A/C SYSTEM PERFORMANCE test. See Fig. 5.

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in appropriate AIR BAG RESTRAINT SYSTEM article in ACCESSORIES & ELECTRICAL section.

CAUTION: Before disconnecting battery, removing fuse No. 43 or radio, obtain anti-theft code number from owner. After servicing, turn radio on. Word CODE will be displayed. Enter 5-digit code to restore radio operation.

DESCRIPTION

System is a cycling-clutch type with an expansion valve. Refrigerant system components include compressor, condenser, receiver-drier and evaporator. See Fig. 1. Evaporator case contains evaporator, expansion valve and A/C thermostat. Compressor clutch control components include Electronic Control Module (ECM), A/C compressor clutch relay, A/C pressure switch, A/C thermostat and compressor thermal protector. See ELECTRICAL COMPONENT LOCATIONS table.

Blower case contains blower motor, blower resistor, recirculated/fresh air door and recirculated/fresh air door motor. Heater case contains heater core, heater water valve, air mix (temperature blend) door, 3 airflow mode doors and an airflow mode door motor. Control panel, located in center of instrument panel, contains blower switch lever, A/C switch button, airflow mode buttons, recirculated/fresh air buttons and temperature lever.

ELECTRICAL COMPONENT LOCATIONS TABLE

Component	Location
A/C Compressor Clutch Relay	Left Front Corner Of
"	Engine Compartment
A/C Diode	Left Front Corner Of Engine Compartment
A/C Pressure Switch	Bottom Right End Of Condenser
A/C Thermostat	On Evaporator Case
Airflow Mode Door Motor	Left Side Of Heater Case
Blower Motor Relay	In Passenger Compartment Fuse/Relay Block
Blower Resistor	On Blower Case
Compressor Thermal Protector	On Compressor
Condenser Fan Relay	Left Front Corner Of Engine Compartment
Coolant Temperature Switch "A"	On Thermostat Housing
Coolant Temperature Switch "B"	On Coolant Outlet Housing
ECM	Below Passenger Side Of Instrument Panel, At Floor
Fan Timer Unit	Right Of Center Console, At Floor
Fuse/Relay Block	
Engine Compartment	Right Rear Corner Of Engine Compartment
Passenger Compartment	Behind Left Kick Panel
Radiator Fan Relay	In Engine Compartment Fuse/Relay Block
Recirculated/Fresh Air Door Motor	On Blower Case

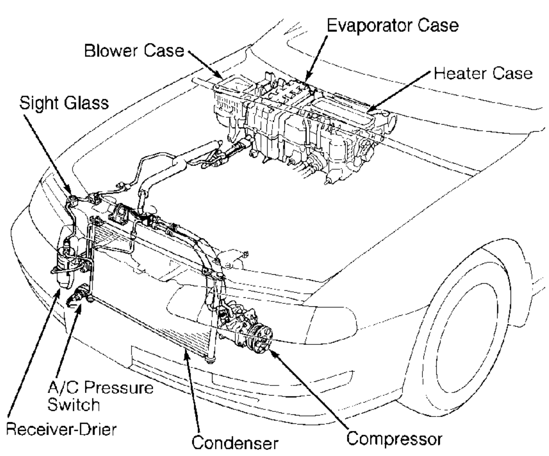

Fig. 1: Manual A/C-Heater System Component ID
Courtesy of American Honda Motor Co.

OPERATION

BLOWER MOTOR CONTROL

Blower motor power is supplied through contacts of blower motor relay. With blower switch in positions No. 1, 2 and 3, blower motor is grounded through blower resistors, reducing voltage to blower motor. With blower switch in maximum position, blower motor ground circuit by-passes blower resistors, allowing full battery voltage to blower motor.

RECIRCULATED/FRESH AIR CONTROL

Recirculated/fresh air control buttons on control panel control voltage to recirculated/fresh air door motor. Motor controls door position. In recirculated position, air from outside is shut off, and passenger compartment air enters blower case. In fresh position, outside air enters blower case.

TEMPERATURE CONTROL

Temperature lever on control panel operates 2 cables. One cable controls position of air mix door to direct air through or around heater core. Other cable controls position of heater water valve.

AIRFLOW MODE CONTROL

Airflow mode buttons on control panel control voltage to airflow mode door motor. Airflow mode door motor controls positions of 3 airflow mode doors. See Fig. 2. Door positions determine airflow modes (vent, heat/vent, heat, heat/defrost and defrost).

COMPRESSOR CLUTCH CONTROL

Power for compressor clutch is supplied through contacts of A/C clutch relay. If ECM receives A/C request signal, ECM grounds solenoid circuit of A/C clutch relay. ECM receives A/C request signal if all of following conditions exists:

* **Blower switch is on.**
* **A/C switch is on.**
* **A/C thermostat contacts are closed (contacts open if evaporator temperature approaches freezing).**
* **A/C pressure switch contacts are closed.**

CONDENSER FAN CONTROL

Power for condenser fan is supplied through contacts of condenser fan relay. Fan timer unit and ECM control the solenoid circuit of condenser fan relay. Condenser fan is on left side of radiator.

RADIATOR FAN CONTROL

Power for radiator fan is supplied through contacts of radiator fan relay. Fan timer unit and ECM control the solenoid circuit of radiator fan relay. Radiator fan is on right side of radiator.

ADJUSTMENTS

NOTE: For adjustments not covered in this article, see information in HEATER SYSTEM article.

DEFROST BLEED

1) Position of defrost door can be adjusted so no airflow or as much as 20 percent of airflow is distributed to defrost ducts when airflow control is in heat mode.

2) To adjust position of defrost door, turn ignition on. Set airflow control to heat mode. At airflow mode control motor, on left side of heater case, loosen adjusting screw at linkage. See Fig. 2. Adjust linkage to obtain desired amount of airflow. Tighten adjusting screw.

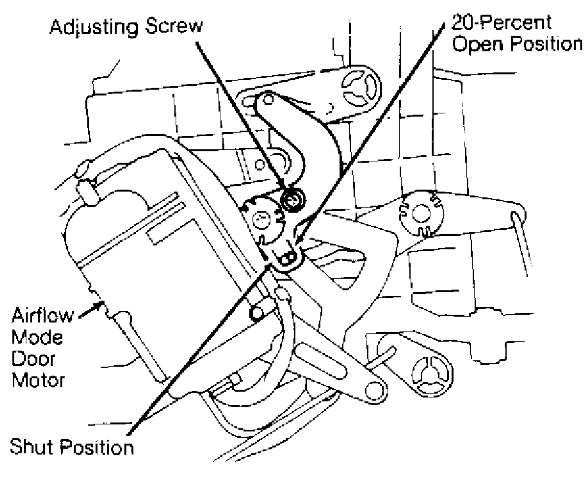

Fig. 2: Adjusting Defrost Bleed
Courtesy of American Honda Motor Co.

TROUBLE SHOOTING

* PLEASE READ THIS FIRST *

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in the AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIP section.

NOTE: For problems concerning blower motor, airflow mode (function) control and recirculated/fresh air control, see HEATER SYSTEM article.

RADIATOR FAN INOPERATIVE

1) Check fuse No. 47 (15-amp) in engine compartment fuse/relay block. If the fuse is okay, test radiator fan relay. See RELAY TEST under TESTING. If relay is okay, check voltage at terminal No. 4 of radiator fan relay socket. See Fig. 3.

2) If battery voltage is not present, replace engine compartment fuse/relay block. If battery voltage is present, connect jumper wire between terminals No. 2 and 4 of radiator fan relay socket. If radiator fan runs, go to step 5). If radiator fan does not run, go to next step.

3) Disconnect jumper wire. Disconnect radiator fan connector. Check continuity of Blue/Black wire between radiator fan relay terminal No. 2 socket and radiator fan. If continuity is not present, repair wire. If continuity is present, go to next step.

4) Check continuity of Black wire between radiator fan motor and chassis ground. If continuity is present, replace radiator fan motor. If continuity is not present, repair open Black wire between radiator fan and ground. If wire is okay, check for poor ground.

5) Disconnect jumper wire. Turn ignition on. Check voltage at terminal No. 3 of radiator fan relay socket. See Fig. 3. If battery voltage is present, repair open Blue/Red wire between radiator fan relay connector terminal No. 1 and A/C diode.

6) If battery voltage is not present, check voltage at Yellow wire terminal of fan timer connector. See Fig. 6. If battery voltage is not present, go to FAN TIMER INPUT TEST under TESTING. If battery voltage is present, repair open Yellow wire between fan timer unit and radiator fan relay connector terminal No. 3.

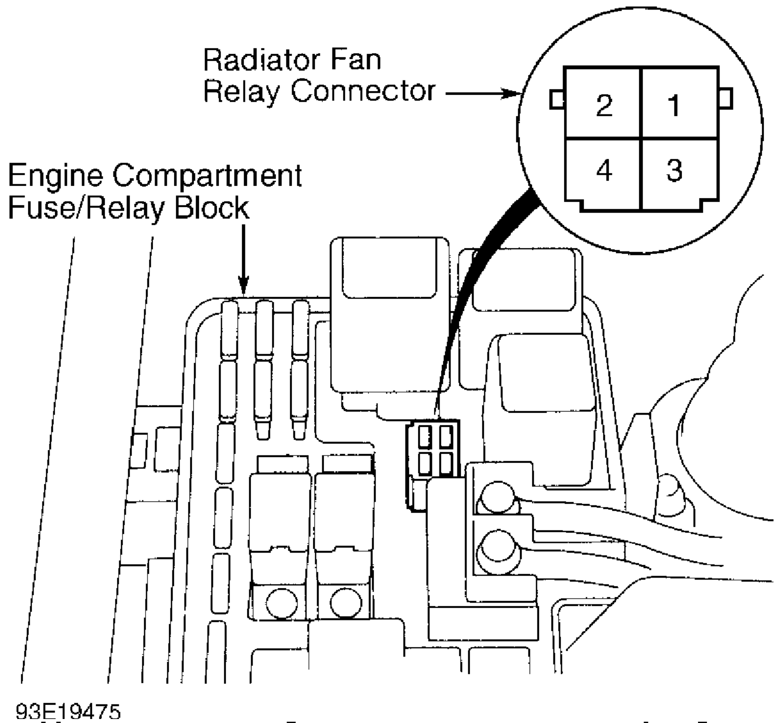

Fig. 3: Radiator Fan Relay Connector Terminal ID
Courtesy of American Honda Motor Co.

CONDENSER FAN INOPERATIVE

1) Check fuse No. 45 (15-amp) in engine compartment fuse/relay block. If fuse is okay, test the condenser fan relay. See RELAY TEST under TESTING. If relay is okay, check voltage at White/Green (or White) wire terminal of condenser fan relay connector.

2) If battery voltage is not present, repair open White/Green (or White) wire between engine compartment fuse/relay block and condenser fan relay. If battery voltage is present, connect jumper wire between White/Green (or White) wire terminal and Blue/Yellow wire terminal of condenser fan relay connector. If condenser fan runs, go to step 5).

3) If condenser fan does not run, disconnect jumper wire. Disconnect condenser fan connector. Check continuity of Blue/Yellow wire between condenser fan relay and condenser fan.

4) If continuity is not present, repair Blue/Yellow wire. If continuity is present, check continuity of Black wire between condenser fan motor and chassis ground. If continuity is not present, repair Black wire. If continuity is present, replace condenser fan motor.

5) Disconnect jumper wire. Turn ignition on. Check voltage at Yellow/White wire terminal of condenser fan relay connector. If battery voltage is present, repair open Blue/Red (or Blue) wire between condenser fan relay and A/C diode.

6) If battery voltage is not present, check voltage at Yellow/White wire terminal of fan timer unit connector. See Fig. 6. If battery voltage is not present, see FAN TIMER INPUT TEST under TESTING. If battery voltage is present, repair open Yellow/White wire between fan timer and condenser fan relay.

BOTH COOLING FANS INOPERATIVE FOR ENGINE COOLING, BUT OKAY FOR A/C

1) Disconnect coolant temperature switch "A" 2-pin connector. Turn on ignition. Check voltage at Blue/Red wire terminal of coolant temperature switch "A" connector. If battery voltage is not present, repair open Blue/Red wire between coolant temperature switch "A" and radiator or condenser fan relays.

2) If battery voltage is present, turn ignition off. Check continuity of Black wire between coolant temperature switch "A" and chassis ground. If continuity is not present, repair Black wire. If continuity is present, feel lower radiator hose. If hose is hot, replace coolant temperature switch "A". If hose is not hot, repair restriction in cooling system.

BOTH COOLING FANS ALWAYS INOPERATIVE

1) Check fuse No. 9 (15-amp) in passenger compartment fuse/relay block. Check fuses No. 45 (15-amp) and No. 47 (15-amp) in engine compartment fuse/relay block. If fuses are okay, disconnect electrical connectors from A/C pressure switch and A/C diode. Check continuity of Blue/Black wire between A/C pressure switch and A/C diode.

2) If continuity is not present, repair Blue/Black wire. If continuity is present, check A/C diode. See A/C DIODE TEST under TESTING. If A/C diode is okay, disconnect condenser fan relay connector. Check continuity of Blue/Red wire between A/C diode and condenser fan relay.

3) If continuity is not present, repair Blue/Red wire. If continuity is present, disconnect fan timer unit connector. Check continuity of Black wire between fan timer unit and chassis ground.

4) If continuity is not present, repair Black wire. If continuity is present, turn ignition on. Check voltage at terminal No. 3 (Black/Yellow wire) of fan timer unit connector. See Fig. 6. If battery voltage is not present, repair Black/Yellow wire. If battery voltage is present, replace fan timer.

COMPRESSOR CLUTCH DOES NOT ENGAGE (COOLING FANS OKAY)

1) Check fuse No. 11 (10-amp) in passenger compartment fuse/relay block. If fuse is okay, turn ignition on. Disconnect 2-pin A/C thermostat connector. Connect jumper wire between terminals of A/C

thermostat harness connector. Start engine and turn on A/C and heater fan switch.

2) If compressor clutch engages, replace A/C thermostat. If compressor clutch does not engage, turn engine off. Remove and test A/C compressor clutch relay. See RELAY TEST under TESTING. If relay is okay, go to next step.

3) Check battery voltage at Yellow/Black (or Black/Yellow) wire of A/C compressor clutch relay connector. See Fig. 4. If battery voltage is not present, repair Black/Yellow (or Yellow/Black) wire between fuse/relay block and relay. If battery voltage is present, go to next step.

4) Using a jumper wire, jumper between Yellow/Black (or Black/Yellow) and Red wire terminals of A/C compressor clutch relay connector. Start engine. If compressor clutch engages, go to step 6). If compressor clutch does not engage, disconnect jumper wire. Turn ignition off.

5) Disconnect the compressor clutch connector. Check continuity of Red wire between A/C compressor clutch relay and compressor clutch. If continuity does not exist, repair open Red wire. If continuity exists, check compressor clutch clearance. Refer to the A/C COMPRESSOR SERVICING article in this section. If clearance is okay, check compressor clutch coil. See COMPRESSOR CLUTCH COIL TEST under TESTING.

6) Disconnect jumper wire. Check battery voltage at Yellow/Black (or Black/Yellow) wire terminal of A/C compressor clutch relay. See Fig. 4. If battery voltage is not present, repair Yellow/Black (or Black/Yellow) wire between fuse/relay block and relay. If battery voltage is present, turn off ignition. Reconnect A/C compressor clutch relay connector.

7) Turn ignition on. Check voltage at Red/Blue wire terminal (A15) of ECM 26-pin connector. If battery voltage is not present, repair open Red/Blue wire between A/C compressor clutch relay and ECM. If battery voltage is present, go to next step.

8) Turn off A/C switch and blower switch. Check voltage at Blue/Black wire terminal (B5) of ECM 22-pin connector. If battery voltage is not present, repair open Blue/Black wire between A/C diode and ECM. If battery voltage is present, substitute a known good ECM and retest.

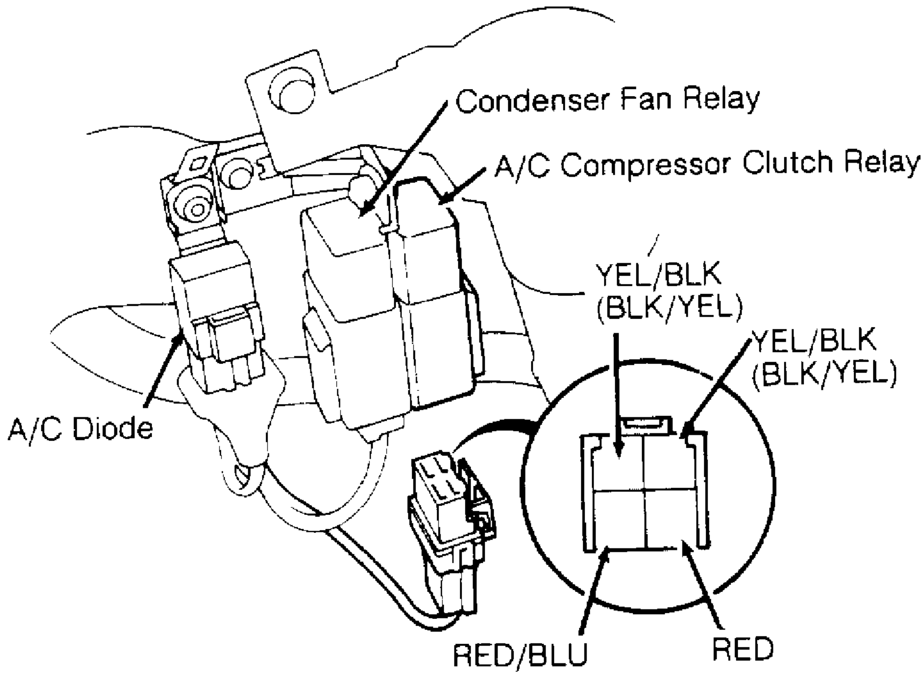

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Fig. 4: Compressor Clutch Relay Connector Terminal ID
Courtesy of American Honda Motor Co.

COMPRESSOR CLUTCH DOES NOT ENGAGE & COOLING FANS INOPERATIVE

NOTE: Check A/C refrigerant pressure before proceeding with this test.

1) Check fuses No. 9 (15-amp) and No. 11 (10-amp) in passenger compartment fuse/relay block. If fuses are okay, disconnect A/C pressure switch connector. Turn ignition on. Check voltage at Blue/Black wire terminal of A/C pressure switch connector.

2) If battery voltage is not present, repair open Blue/Black wire between A/C diode and A/C pressure switch. If battery voltage is present, turn ignition off. Check continuity across terminals of A/C pressure switch. If continuity does not exist, replace A/C pressure switch. If continuity exists, go to next step.

3) Reconnect A/C pressure switch connector. Disconnect A/C thermostat connector. Check battery voltage at Blue/Yellow wire terminal of A/C thermostat connector. If battery voltage is not present, repair open Blue/Yellow wire between A/C pressure switch and A/C thermostat. If battery voltage is present, go to next step.

4) Turn ignition off. Check continuity across terminals of A/C thermostat. If continuity does not exist, replace A/C thermostat. If continuity exists, remove radio. Disconnect 16-pin connector from A/C-heater control panel.

5) Check continuity in Blue/Red wire between A/C thermostat

and A/C-heater control panel 16-pin connector. If continuity does not exist, repair open Blue/Red wire. If continuity exists, test A/C switch. See **A/C SWITCH TEST** under **TESTING**. If A/C switch is okay, go to next step.

6) Disconnect A/C-heater control panel 7-pin connector. Check continuity of Green wire between A/C-heater control panel 7-pin and 16-pin connectors. If continuity does not exist, repair open Green wire. If continuity exists, go to next step.

7) Check continuity of Black wire between 7-pin connector and chassis ground. If continuity exists, replace blower switch. If continuity does not exist, repair open Black wire between heater fan switch and ground. If wire is okay, check for poor ground connection.

TESTING

* PLEASE READ THIS FIRST *

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all **SERVICE PRECAUTIONS** and **DISABLING & ACTIVATING AIR BAG SYSTEM** procedures in the **AIR BAG RESTRAINT SYSTEM** article in the **ACCESSORIES/SAFETY EQUIP** section.

A/C SYSTEM PERFORMANCE

1) Park vehicle out of direct sunlight. Open engine hood and front doors. Install A/C pressure gauges to the high and low side pressure ports of system. Determine relative humidity and ambient air temperature.

2) Set temperature control to maximum cool, mode control to vent and recirculation control to recirculate positions. Insert thermometer in center vent outlet. Turn blower fan switch to highest position. Start and run engine at 1500 RPM. Ensure there is nobody inside vehicle.

3) After running A/C for 10 minutes, check thermometer reading in center vent outlet and the high and low side system pressure to determine if A/C system is operating within range. See Fig. 5.

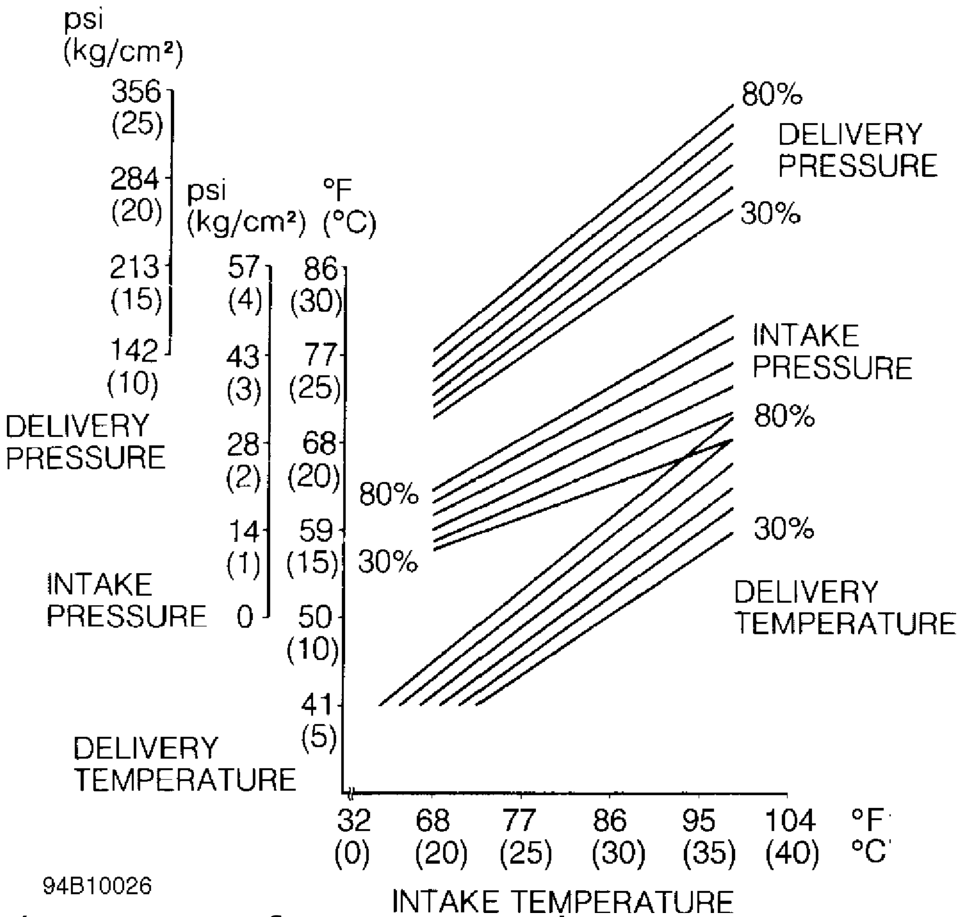

Fig. 5: A/C System Performance Test Chart
Courtesy of American Honda Motor Co., Inc.

FAN TIMER INPUT TEST

1) Turn ignition on. With fan timer connector attached to unit, test each wire at fan timer connector as follows.

2) Check voltage at terminal No. 1 (Black wire). See Fig. 6. If less than one volt is present, go to next step. If one or more volts are present, repair open Black wire.

3) Check voltage at terminal No. 7 (White/Green wire). If battery voltage is present, go to next step. If battery voltage is not present, check fuse No. 45 in engine compartment fuse/relay block. If fuse is okay, repair open White/Green wire.

4) Check voltage at terminal No. 6 (Black/Yellow wire). If battery voltage is present, go to next step. If battery voltage is not present, check fuse No. 19 (No. 23 on vehicles with air bag) in passenger compartment fuse/relay block. If fuse is okay, repair open Black/Yellow wire.

5) Check voltage at terminal No. 3 (Black/Yellow wire). If battery voltage is present, go to next step. If battery voltage is not present, check fuse No. 9 in passenger compartment fuse/relay block.

If fuse is okay, repair open Black/Yellow wire.

6) Check voltage at terminal No. 2 (Yellow/White wire). If battery voltage is present, go to next step. If battery voltage is not present, replace fan timer.

CAUTION: Before replacing fan unit, check for a short to ground in Yellow/White wire between fan timer and condenser fan relay, and in Yellow wire between fan timer and radiator fan relay. If a short to ground exists in these circuits, fan timer will be damaged.

7) Check voltage at terminal No. 4 (Yellow wire). If battery voltage is present, go to next step. If battery voltage is not present, replace fan timer.

8) Connect jumper wire between terminal No. 5 (Blue/Red wire) and ground. If condenser and radiator fans come on, go to next step. If condenser and radiator fans do not come on, check for open Blue/Red wire between fan timer and condenser and radiator fan relays. If Blue/Red wire is okay, check for open Yellow/White wire between fan timer and condenser fan relay, and in Yellow wire between fan timer and radiator fan relay. If wires are okay, replace condenser fan relay or radiator fan relay as necessary.

9) Ensure coolant temperature is less than 223°F (106°C). Check voltage at terminal No. 8 (White/Yellow wire). If 11 volts is present, fan timer inputs are okay. If 11 volts is not present, check continuity across connector terminals of coolant temperature switch "B". If there is no continuity, replace switch. If continuity exists, check for short to ground in White/Yellow wire between fan timer and coolant temperature switch "B". If White/Yellow wire is okay, replace fan timer.

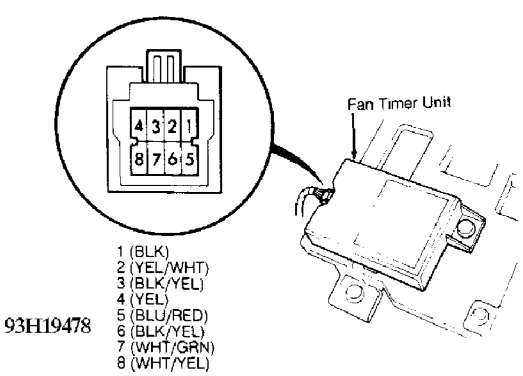

Fig. 6: Fan Timer Connector Terminal ID
Courtesy of American Honda Motor Co.

A/C THERMOSTAT TEST

1) Remove A/C thermostat. See EVAPORATOR, A/C THERMOSTAT & EXPANSION VALVE under REMOVAL & INSTALLATION. Connect ohmmeter across switch connector terminals. Dip capillary tube of thermostat into ice cold water.

2) As ohmmeter reading suddenly (not gradually) changes, note temperatures at which switch contacts open (cut-off) and close (cut-in). Cut-off temperature should be 31-35°F (0.5-1.5°C). Cut-in temperature should be 36-41°F (2.5-5.0°C). If cut-off and cut-in temperatures are not as specified, replace switch.

RELAY TEST

Compressor Clutch, Condenser Fan & Radiator Fan Relays - Disconnect connector of relay to be tested. Check continuity between relay terminals "A" and "B". See Fig. 7. If continuity exists, replace relay. If continuity does not exist, apply battery voltage across terminals "C" and "D". Check continuity across terminals "A" and "B". If continuity does not exist, replace relay. If continuity exists, relay is okay.

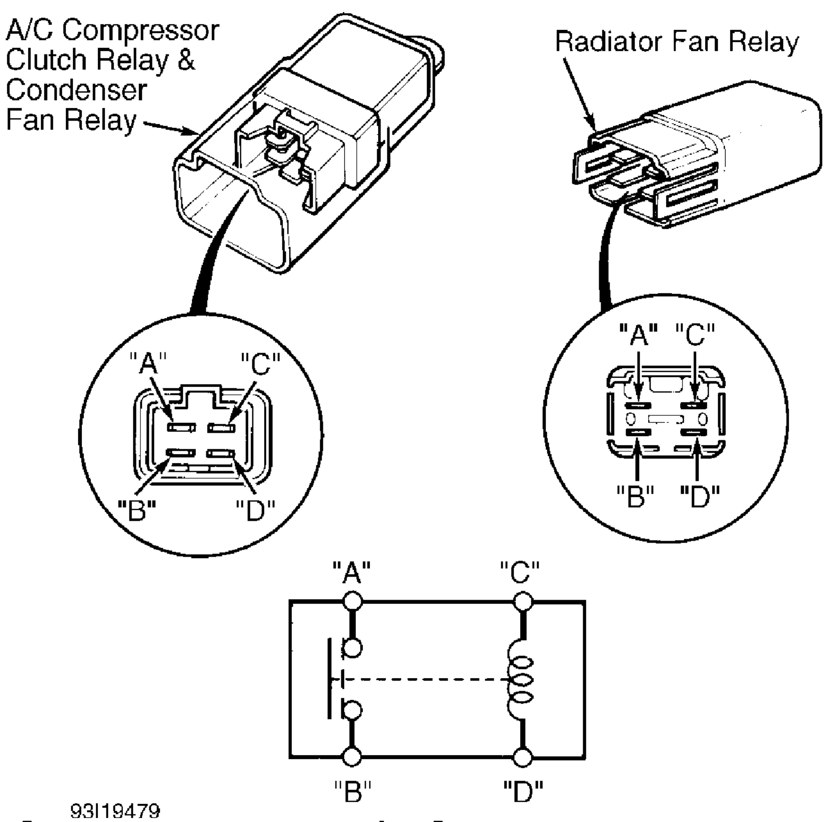

Fig. 7: Relay Connector Terminal ID
Courtesy of American Honda Motor Co.

A/C DIODE TEST

Check continuity between terminals "A" and "B" of A/C diode. See Fig. 8. Check continuity in both directions. Continuity should be present in one direction only. Replace A/C diode if continuity is not as specified.

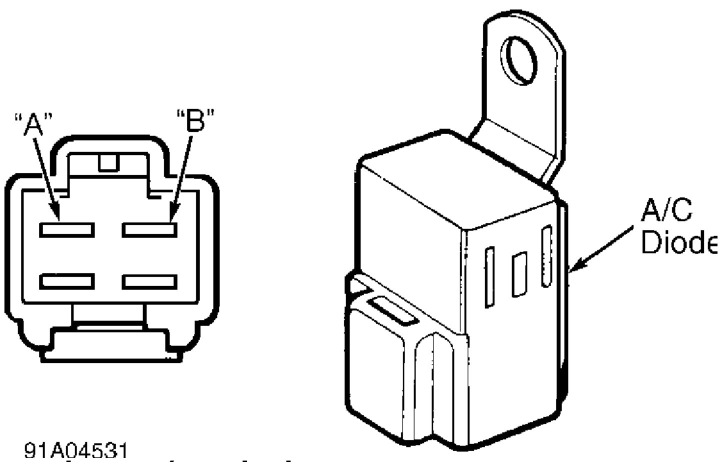

Fig. 8: Testing A/C Diode
Courtesy of American Honda Motor Co.

A/C SWITCH TEST

Remove A/C switch from control panel. With A/C switch off, continuity should not exist between A/C switch connector terminals No. 1 and 2. See Fig. 9. With A/C switch on, continuity should exist between terminals No. 1 and 2. If continuity is not as specified, replace switch.

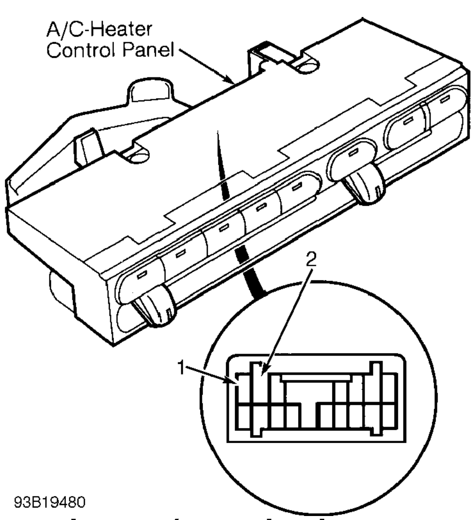

Fig. 9: Testing A/C Switch
Courtesy of American Honda Motor Co.

COMPRESSOR CLUTCH COIL TEST

Ensure compressor thermal protector is okay. See **COMPRESSOR THERMAL PROTECTOR TEST**. Check resistance between clutch connector and compressor body (ground). Replace clutch coil if resistance is not 3.1-3.4 ohms at 68°F (20°C).

COMPRESSOR THERMAL PROTECTOR TEST

Check continuity between compressor thermal protector terminals (on compressor). If continuity does not exist, replace compressor thermal protector.

REMOVAL & INSTALLATION

* PLEASE READ THIS FIRST *

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in the AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIP section.

CAUTION: When discharging air conditioning system, use only approved refrigerant recovery/recycling equipment. Make every attempt to avoid discharging refrigerant into the atmosphere.

2) Remove visor and Black face panel from instrument panel. Remove glove box. Remove passenger-side air bag assembly. Store assembly with pad facing upward. Remove air bag assembly stay and bracket. Disconnect A/C thermostat connector. Remove evaporator case bolts and evaporator case.

Installation

To install, reverse removal procedure. Evacuate and charge A/C system.

EVAPORATOR, A/C THERMOSTAT & EXPANSION VALVE

Removal

Remove evaporator case. Note where A/C thermostat sensor is inserted into evaporator fins. See Fig. 10. Pull A/C thermostat sensor out of evaporator fins. Remove screws and clips securing case halves together. Carefully separate case halves. Remove evaporator and A/C thermostat. Remove expansion valve, backing up fittings with wrench to prevent tube breakage.

Installation

To install, reverse removal procedure. Ensure A/C thermostat sensor is inserted into evaporator fins in its original location. See Fig. 10. If replacing evaporator, add one ounce of refrigerant oil to evaporator. Evacuate and charge A/C system.

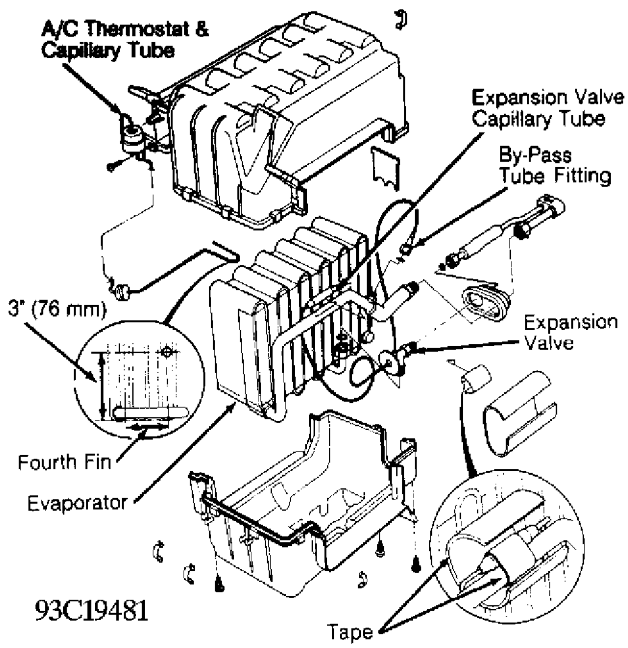

Fig. 10: Exploded View Of Evaporator Case
Courtesy of American Honda Motor Co.

COMPRESSOR THERMAL PROTECTOR

Removal & Installation

Remove thermal protector from compressor. It is not necessary to discharge refrigerant to remove compressor thermal protector. Apply silicone sealant to outer edge of compressor thermal protector before installing.

WIRING DIAGRAM

A/C-HEATER

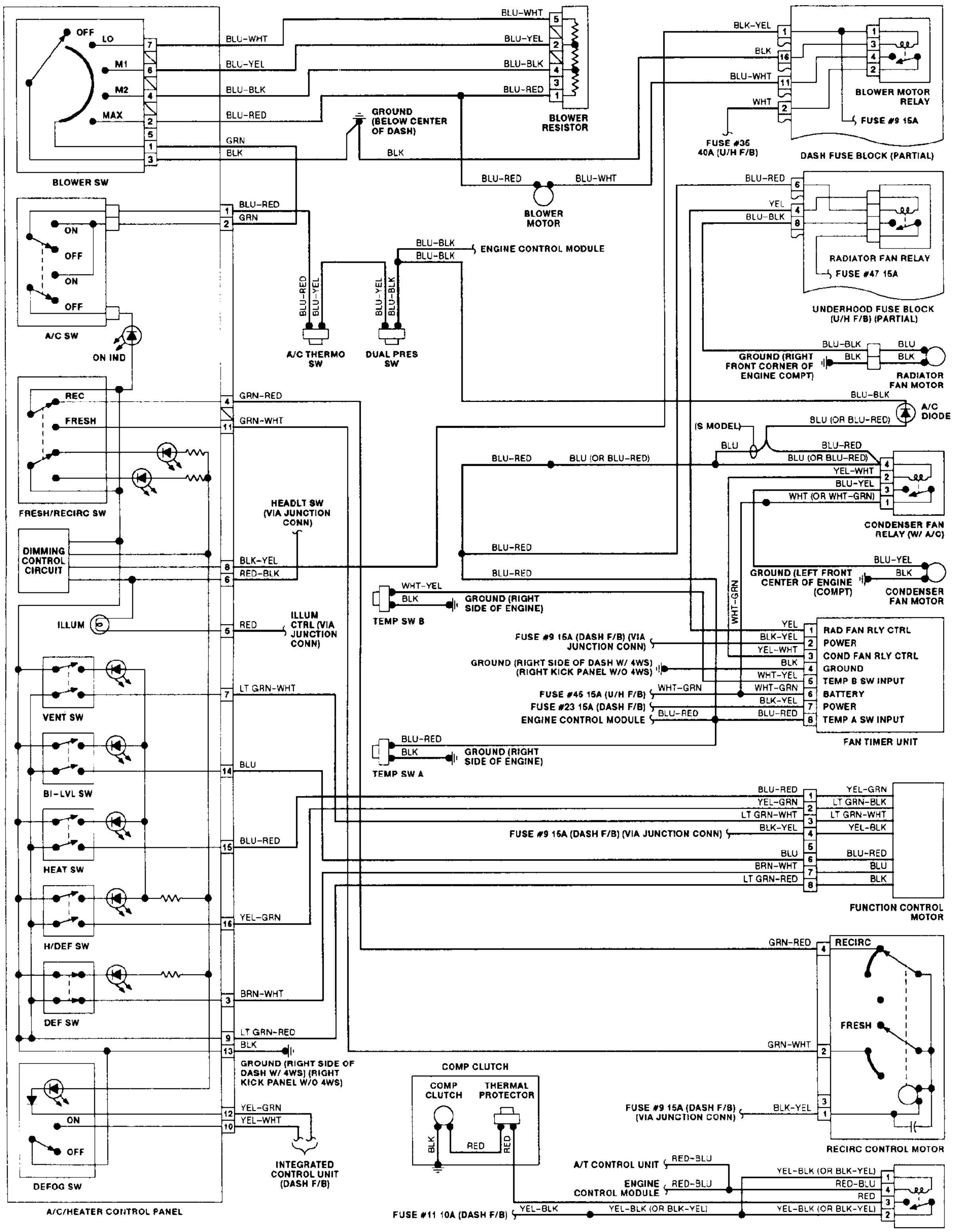

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Fig. 11: Manual A/C-Heater System Wiring Diagram

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Ft. Lbs. (N.m)
Compressor Bracket-To-Engine Bolt/Nut	36 (49)
Compressor-To-Compressor Bracket Bolt	16 (22)
Heater Case-To-Firewall Nut (1)	16 (22)
Refrigerant Pipe Connections	
At Compressor	16 (22)
At Hose Bracket (Above Radiator)	
Discharge	17 (23)
Suction	24 (33)
Inside Evaporator	
At By-Pass Tube	10 (14)
At Expansion Valve	17 (23)
	INCH Lbs. (N.m)
Blower Case Bolt/Nut	89 (10)
Evaporator Case Bolt/Nut	89 (10)
Heater Case Bolt/Nut (2)	89 (10)
Passenger-Side Air Bag Assembly Nut	89 (10)
Refrigerant Pipe Connections	89 (10)

(1) - In engine compartment.
(2) - In passenger compartment.

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END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES/SAFETY EQUIPMENT
Honda Air Bags

Accord, Civic, Civic Del Sol, Prelude

* PLEASE READ THIS FIRST *

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all WARNINGS and SERVICE PRECAUTIONS.

DESCRIPTION & OPERATION

NOTE: Outer insulation on SRS wiring harness is Yellow.

The Supplemental Restraint System (SRS) activates when the vehicle receives a sufficient front-end impact. System is composed of SRS control unit, driver-side air bag assembly, passenger-side air bag assembly (if equipped), left and right dash sensors, cowl sensor(s) inside SRS control unit, and cable reel. SeeFigs. 14-17. If vehicle battery voltage is low or lost, back-up power unit inside SRS control unit will activate SRS. For air bags to deploy, cowl sensor and at least one front sensor must input a signal to the SRS control unit.

SYSTEM OPERATION CHECK

When ignition is turned on, SRS indicator light will glow for about 6 seconds and then go off. If indicator does not glow, does not go off after about 6 seconds or glows while driving, system must be inspected as soon as possible. See DIAGNOSIS & TESTING.

SERVICE PRECAUTIONS

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

Observe these precautions when working with air bag systems:

* Disable SRS before servicing any SRS or steering column component. Failure to do this could result in accidental air bag deployment and possible personal injury. See DISABLING & ACTIVATING AIR BAG SYSTEM.
* After an accident, all SRS components, including harness and brackets, must be inspected. If any components are damaged or

bent, they must be replaced, even if a deployment did not occur. Check steering column, knee bolster, instrument panel steering column reinforcement plate and lower brace for damage. DO NOT service any component or wiring. If components or wiring are damaged or defective, replacement is necessary. DO NOT use components from another vehicle. Only use new replacement parts.

* After repairs, turn ignition on while ensuring any accidental air bag deployment will not cause injury. Ensure SRS indicator light is working properly and no system faults are indicated. See SYSTEM OPERATION CHECK.
* Always wear safety glasses when servicing or handling an air bag.
* Air bag module must be stored in its original special container until used for service. It must be stored in a clean, dry place, away from sources of extreme heat, sparks and high electrical energy.
* When placing a live air bag module on a bench or other surface, always face air bag and trim cover up, away from surface. This will reduce motion of module if it is accidentally deployed.
* After deployment, air bag surface may contain deposits of sodium hydroxide, which can irritate skin. Always wear safety glasses, rubber gloves and long-sleeved shirt during clean-up, and wash hands using mild soap and water. Follow correct disposal procedures. See DISPOSAL PROCEDURES.
* NEVER allow any electrical source near inflator on back of air bag module.
* When carrying a live air bag module, trim cover should be pointed away from your body to minimize injury in case of deployment.
* DO NOT probe a wire through insulator; this will damage wire and eventually cause failure due to corrosion.
* When performing electrical tests, always use SRS test harnesses recommended by manufacturer. See SPECIAL TOOLS. DO NOT use test probes directly on component connector pins or wires.
* When installing SRS wiring harnesses, ensure they will not be pinched or interfere with other vehicle components.
* Inspect all ground connections. Ensure they are clean and tight.
* DO not use any type of electrical equipment not specified by manufacturer. See SPECIAL TOOLS.
* If SRS is not fully functional for any reason, vehicle should not be driven until system is repaired. DO NOT remove any component or in any way disable system from operating normally. If SRS is not functional, park vehicle until repairs can be made.

SPECIAL TOOLS

To prevent air bag deployment when working on SRS, use recommended tools. See SRS RECOMMENDED TOOLS table. SeeFig. 1.

SRS RECOMMENDED TOOLS

Tool Name	Tool Number
Deployment Tool	07HAZ-SG00500
Digital Multimeter	KS-AHM-32-003
SRS Test Harness "A"	07MAZ-SL00500
SRS Test Harness "B"	07MAZ-SP00500
SRS Test Harness "C"	07LAZ-SL40300
SRS Test Harness "D"	07LAZ-SL40400

AIR BAG RE

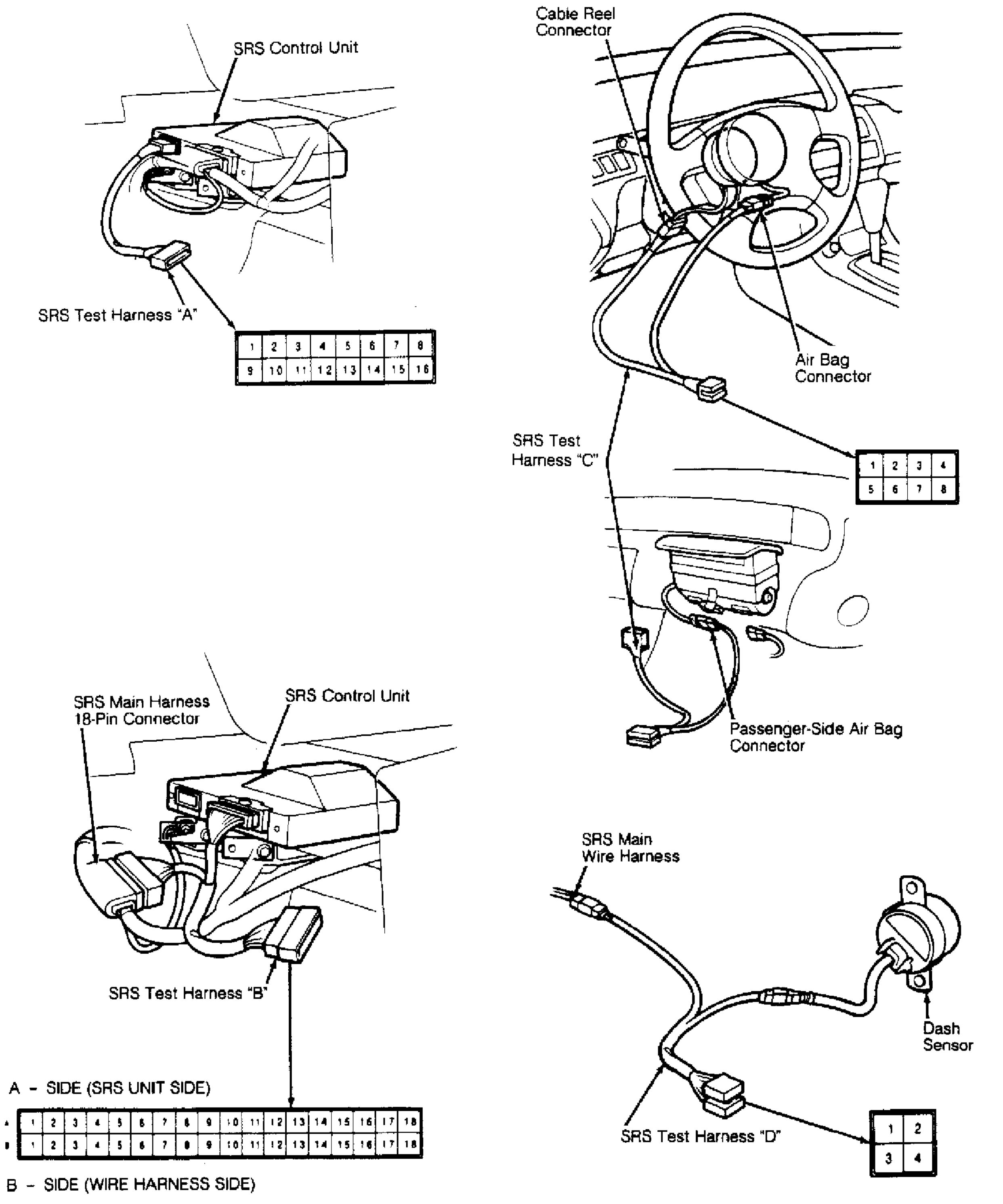

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Fig. 1: SRS Test Harness ID (Prelude Shown; Other Models Are Similar)
Courtesy of American Honda Motor Co., Inc.

DISABLING & ACTIVATING AIR BAG SYSTEM

* PLEASE READ THIS FIRST *

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

DISABLING AIR BAG SYSTEM

Driver-Side Air Bag

Disconnect both battery cables. Remove access panel from steering wheel. See Fig. 2. Remove Red short connector, located on inside of access panel. Disconnect air bag connector from cable reel connector. Connect Red short connector to air bag connector.

Passenger-Side Air Bag

Disable driver-side air bag. Open glove box (remove it on Accord and Civic). Disconnect air bag connector from main harness connector. See Figs. 3-5. Connect Red short connector to air bag connector.

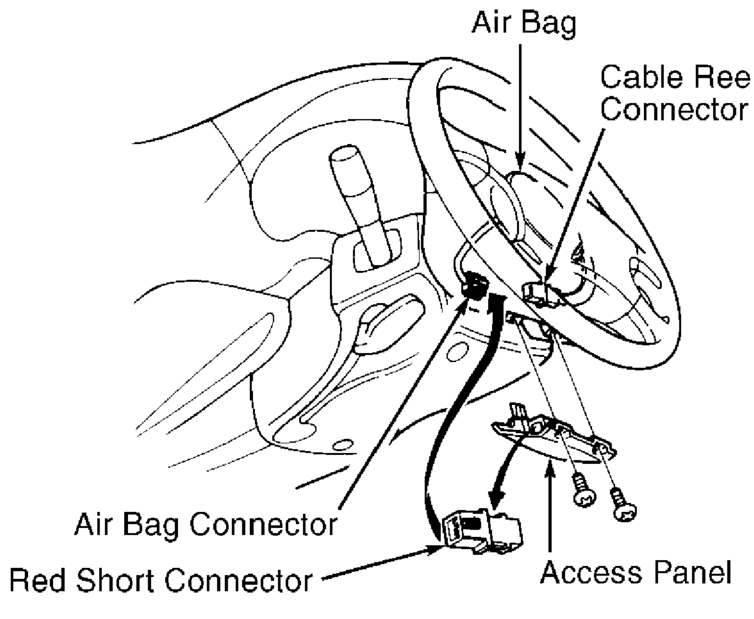

Fig. 2: Connecting Red Short Connector At Driver-Side Air Bag
Courtesy of American Honda Motor Co., Inc.

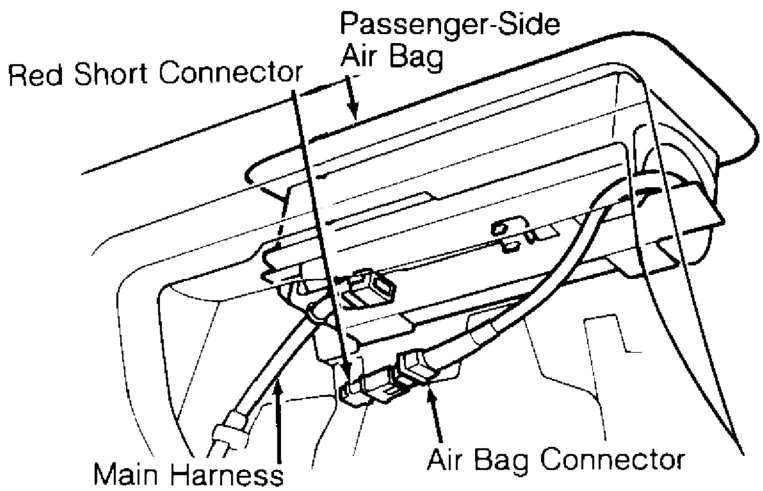

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Fig. 3: Connecting Red Short Conn. At Passenger-Side Air Bag (Accord)
Courtesy of American Honda Motor Co., Inc.

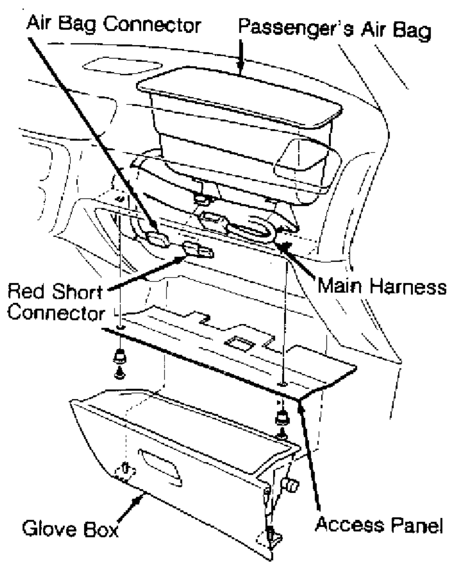

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Fig. 4: Connecting Red Short Conn. At Passenger-Side Air Bag (Civic)
Courtesy of American Honda Motor Co., Inc.

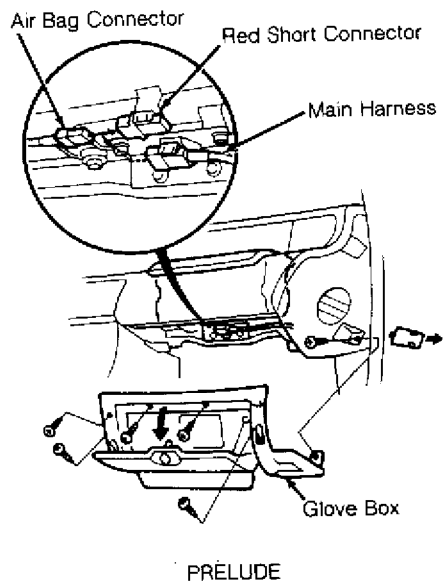

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Fig. 5: Connecting Red Short Conn. At Pass. Side Air Bag (Prelude)
Courtesy of American Honda Motor Co., Inc.

ACTIVATING AIR BAG SYSTEM

Remove Red short connector(s) that were installed at air bag(s) during disabling procedure. Reconnect air bag connector to cable reel connector and/or main harness connector. Return Red short connector to storage location. Check AIR BAG indicator light to ensure system is functioning properly. See SYSTEM OPERATION CHECK.

DISPOSAL PROCEDURES

DEPLOYED AIR BAG

Wrap deployed air bag assembly in a sturdy plastic bag and dispose of as any other part. Wear gloves and safety glasses when handling deployed air bag module.

UNDEPLOYED AIR BAG

WARNING: Disposing of an undeployed air bag may violate federal, state and/or local laws. Undeployed air bag assemblies contain substances which can cause illness or injury if handled improperly. When scrapping a vehicle, air bag must be deployed while mounted in vehicle. Wear safety glasses and gloves when handling air bag.

On-Vehicle (Scrapped Vehicle)

1) Before proceeding, see SERVICE PRECAUTIONS. Ensure air bag

assembly is securely mounted.

2) Disconnect battery cables. Follow procedure outlined on Deployment Tool (07HAZ-SG00500) to ensure it operates properly.

3) For driver-side air bag, remove access panel from steering wheel. See Fig. 2. Disconnect air bag connector from cable reel connector. For passenger-side air bag, open glove box (remove glove box on Accord and Civic). Disconnect air bag connector from main harness connector. See Figs. 3-5.

4) For all air bags, cut off air bag connector. Strip back wiring insulation about 1.00" (25.4 mm). Connect deployment tool's Yellow alligator clips to wire ends. See Fig. 6. Move deployment tool 30 feet away from air bag unit. Connect a 12-volt battery to deployment tool.

5) If Green light on tool glows, air bag ignitor circuit is defective and air bag cannot be deployed. In this case, return air bag unit to manufacturer in Honda-approved packaging.

6) If Red light glows, air bag is ready to be deployed. Depress deployment switch on tool to deploy air bag. Air bag may be too hot to touch for as long as 30 minutes after deployment. If air bag does not deploy, return air bag unit to manufacturer in Honda-approved packaging.

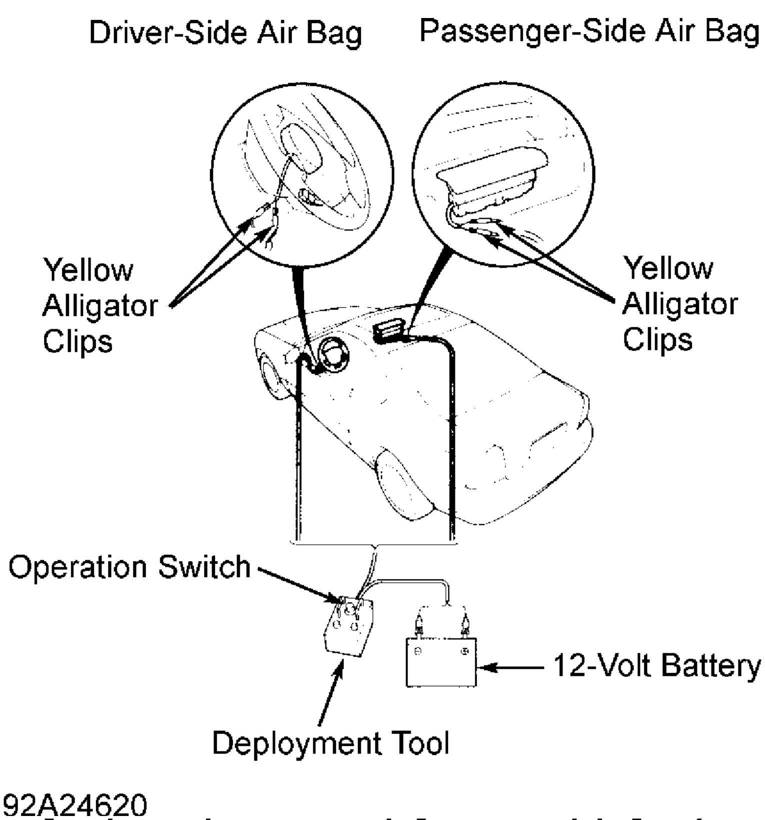

Fig. 6: Deploying Air Bag Module In Vehicle (Accord Shown; Others are Similar)
Courtesy of American Honda Motor Co., Inc.

Off-Vehicle

1) Before proceeding, see **SERVICE PRECAUTIONS**. Remove air bag assembly. Position air bag assembly face up, outdoors, on a flat surface at least 30 feet from any obstacles or people. Ensure Deployment Tool (07HAZ-SG00500) operates properly by following procedure outlined on tool. Disconnect Red short connector from air bag harness.

2) Cut off air bag connector. Strip back wiring insulation about 1.00" (25.4 mm). Connect deployment tool's Yellow alligator clips to wire ends. See Fig. 7. Move deployment tool 30 feet away from air bag unit. Connect a 12-volt battery to deployment tool.

3) If Green light on tool glows, air bag ignitor circuit is defective and air bag cannot be deployed. In this case, return air bag unit to manufacturer in Honda-approved packaging.

4) If Red light glows, air bag is ready to be deployed. Depress deployment switch on tool to deploy air bag. Air may be too hot to touch for as long as 30 minutes after deployment. If air bag does not deploy, return air bag unit to manufacturer in Honda-approved packaging.

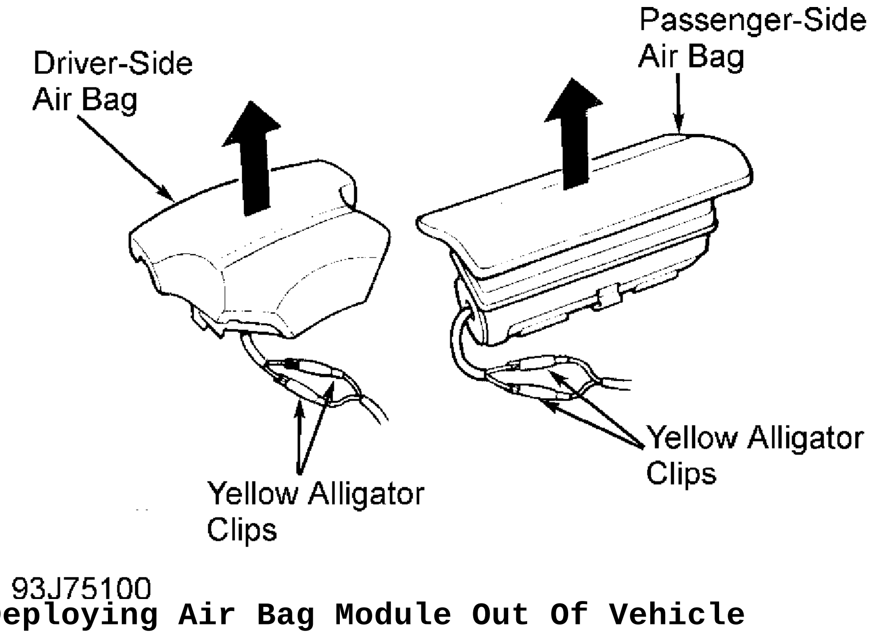

Fig. 7: Deploying Air Bag Module Out Of Vehicle
Courtesy of American Honda Motor Co., Inc.

POST-COLLISION INSPECTION

When a vehicle has been involved in a collision, certain components of the passive restraint system must be inspected or replaced. See **PASSIVE RESTRAINT SYSTEM INSPECTION** article in the **GENERAL INFORMATION** section for post-collision inspection information.

REMOVAL & INSTALLATION

* PLEASE READ THIS FIRST *

WARNING: Failure to follow air bag service precautions may result in air bag deployment and personal injury. See SERVICE PRECAUTIONS. After component replacement, ensure proper system operation. See SYSTEM OPERATION CHECK.

DRIVER-SIDE AIR BAG ASSEMBLY

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

Removal

Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Using a Torx T30 bit, remove bolts and air bag assembly.

Installation

To install, reverse removal procedure. Tighten air bag bolts to specification. See TORQUE SPECIFICATIONS table at the end of this article. Activate SRS. Check AIR BAG indicator light to ensure system is functioning properly. See SYSTEM OPERATION CHECK.

PASSENGER-SIDE AIR BAG ASSEMBLY

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

Removal

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Remove glove box.

2) On Prelude, remove tweeter (speaker) cover, visor and Black face panel from dashboard. On all models, remove air bag mounting nuts. Remove air bag assembly. SeeFigs. 8-10. Carefully lift air bag assembly out of dashboard.

Installation (Accord & Civic)

To install, reverse removal procedure. Tighten air bag bolts to specification. See TORQUE SPECIFICATIONS table at the end of this article. Activate SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Check AIR BAG indicator light to ensure system is functioning properly. See SYSTEM OPERATION CHECK.

Installation (Prelude)

1) Place air bag assembly in dashboard. Loosen 2 "L" bracket nuts. See Fig. 10. While pressing air bag assembly downward, rotate adjusting nuts until they touch lower part of air bag assembly.

2) Tighten air bag bolts to specification. See TORQUE SPECIFICATIONS table at the end of this article. Tighten "L" bracket nuts to specification. Activate SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Ensure system is functioning properly. See SYSTEM OPERATION CHECK.

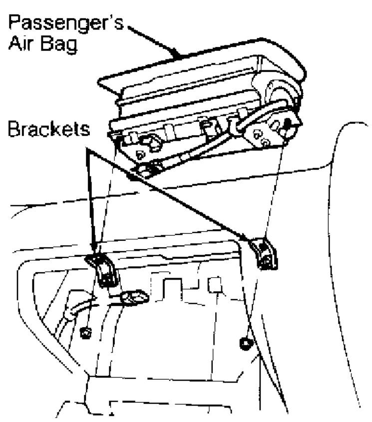

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Fig. 8: Removing/Installing Passenger-Side Air Bag (Accord)
Courtesy of American Honda Motor Co., Inc.

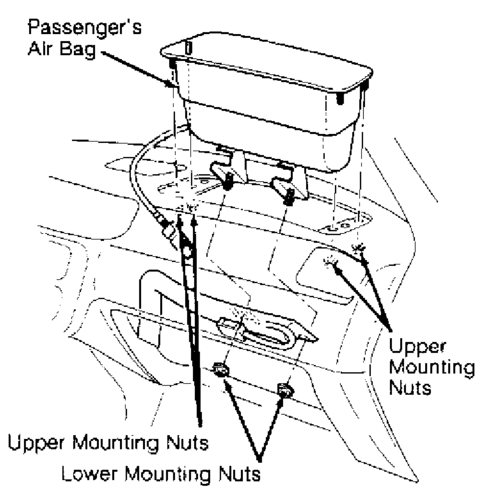

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Fig. 9: Removing/Installing Passenger-Side Air Bag (Civic)
Courtesy of American Honda Motor Co., Inc.

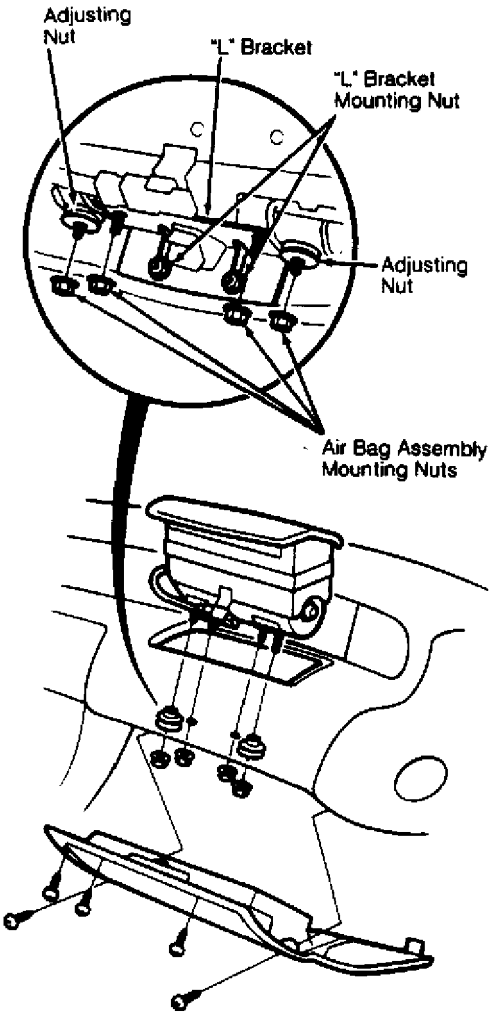

Fig. 10: Removing/Installing Passenger-Side Air Bag (Prelude)
Courtesy of American Honda Motor Co., Inc.

CABLE REEL

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

Removal

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Ensure front wheels are facing straight ahead.

2) Remove dashboard lower cover and knee bolster under steering column. On Prelude, remove air duct. On all models, disconnect cable reel 6-pin connector from SRS main harness at base of steering column. Remove connector holder.

3) Remove air bag assembly from steering wheel. See DRIVER-SIDE AIR BAG ASSEMBLY. Disconnect connectors from horn and cruise

control switches at steering wheel hub. Remove steering wheel nut. Mark steering wheel in relation to steering shaft. Remove steering wheel. Remove upper and lower column covers. SeeFig. 11. Remove cable reel and cancel sleeve.

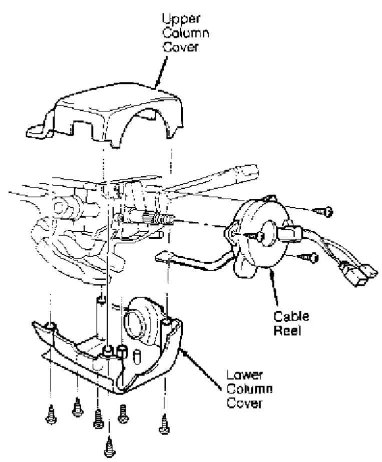

Fig. 11: Removing Steering Column Covers
Courtesy of American Honda Motor Co., Inc.

Installation

1) Align grooves in cancel sleeve with projections on cable reel. See Fig. 12. Install cancel sleeve and cable reel. Center cable reel. See CABLE REEL CENTERING under ADJUSTMENTS. Install column covers.

2) Install steering wheel. Reconnect electrical connectors. Install steering wheel nut. Tighten nut to specification. See TORQUE SPECIFICATIONS table at the end of this article. Install air bag assembly. Tighten bolts to specification.

3) To complete installation, reverse removal procedure. Activate SRS. Check AIR BAG indicator light to ensure system is functioning properly. See SYSTEM OPERATION CHECK.

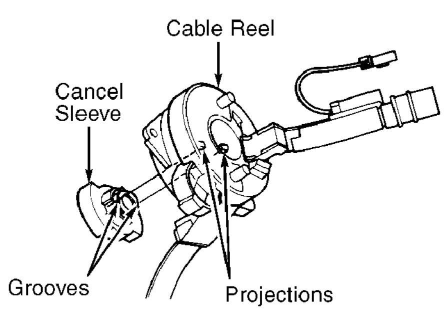

Fig. 12: Aligning Cable Reel & Cancel Sleeve (Typical)
Courtesy of American Honda Motor Co., Inc.

DASH SENSORS

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

Removal & Installation (Left)

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Dash sensor is located in left footwell. See Figs. 14-17.

2) On Accord, pull back carpeting. Remove steering joint cover at base of steering column. Pull back rubber floor pad. On Civic, Civic Del Sol and Prelude, remove footrest and door sill molding. Pull back carpeting. On all models, remove dash sensor protector and dash sensor.

3) To install, reverse removal procedure. Tighten dash sensor bolts to specification. See TORQUE SPECIFICATIONS table at the end of this article. Activate SRS. Ensure system is functioning properly. See SYSTEM OPERATION CHECK.

Removal & Installation (Right)

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Dash sensor is in right footwell. See Figs. 14-17.

2) Pull back carpeting. On Accord and Prelude, remove or reposition engine control unit (and automatic transmission control unit, if equipped) as necessary. On all models, disconnect dash sensor connector. Remove dash sensor protector. Remove dash sensor.

3) To install, reverse removal procedure. Tighten dash sensor bolts to specification. See TORQUE SPECIFICATIONS table at the end of this article. Activate SRS. Ensure system is functioning properly. See SYSTEM OPERATION CHECK.

SRS CONTROL UNIT

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

Removal (Accord)

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

2) SRS control unit is located under instrument panel, forward of center console. See Fig. 14. Pull down carpeting from both sides of center console. Remove harness protector bracket. Disconnect SRS control unit connector. Remove SRS control unit bolts. Remove SRS control unit through opening in passenger side of console.

Removal (Civic, Civic Del Sol & Prelude)

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

2) SRS control unit is located under instrument panel, forward of center console. See Figs. 15-17. Remove covers from right and left sides of SRS control unit. Disconnect SRS control unit connector. Remove SRS control unit bolts. Remove SRS control unit through opening on left side of console.

Installation (All Models)

To install, reverse removal procedure. Tighten SRS control unit bolts to specification. See TORQUE SPECIFICATIONS table at the end of this article. Activate SRS. Check AIR BAG indicator light to ensure system is functioning properly. See SYSTEM OPERATION CHECK.

ADJUSTMENTS

CABLE REEL CENTERING

After installing cable reel onto steering column shaft, rotate cable reel clockwise until it stops. Rotate cable reel counterclockwise about 2 turns until Yellow gear tooth lines up with mark on cover and arrow on cable reel label points straight up. See Fig. 13.

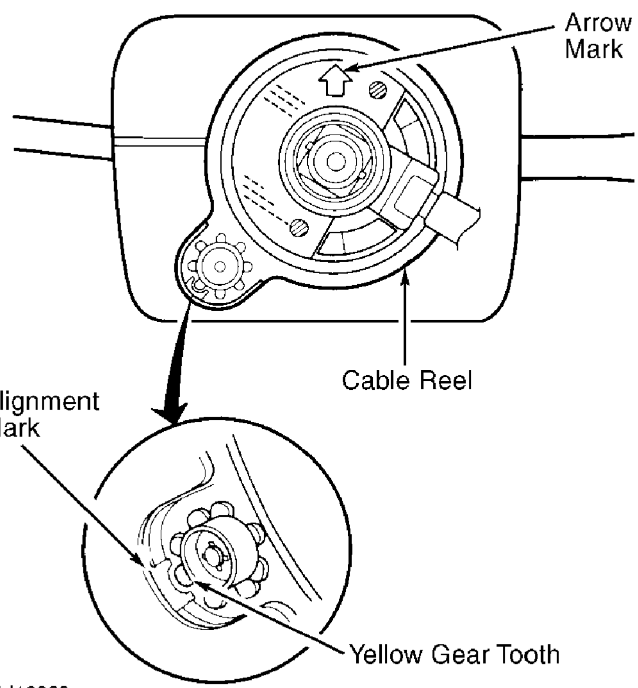

Fig. 13: Centering Cable Reel
Courtesy of American Honda Motor Co., Inc.

WIRE REPAIR

DO NOT attempt to repair SRS wiring or harness connectors. If SRS wiring or harness connectors are faulty, replace faulty wiring harness.

DIAGNOSIS & TESTING

* PLEASE READ THIS FIRST *

WARNING: Failure to follow air bag service precautions may result in air bag deployment and personal injury. See SERVICE PRECAUTIONS. After component replacement, ensure proper system operation. See SYSTEM OPERATION CHECK.

SELF-DIAGNOSTIC SYSTEM

NOTE: On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

WARNING: Before proceeding with any testing procedure, check condition of all SRS connectors and ground points. When attaching SRS test harnesses, push connectors straight in until they are secure. See Fig. 1. DO NOT bend connector pins. Always use SRS test harnesses recommended by manufacturer. See SPECIAL TOOLS under SERVICE PRECAUTIONS. DO NOT connect test probes directly to component connector pins or wires, as damage may result. Unless otherwise stated, always keep Red short connector on air bag connector when harness is disconnected.

SRS includes a self-diagnostic function that checks system for faults in SRS components and related wiring. A fault is present if SRS indicator light on instrument cluster:

* **Continues to glow after ignition is turned on and more than 6 seconds have elapsed.**
* **Glows or flashes while vehicle is driven.**

If SRS indicator light does not glow at all when ignition is turned on, see SRS INDICATOR DOES NOT GLOW. If SRS indicator light continues to glow after ignition has been turned on and more than 6 seconds have elapsed, or if it glows or flashes while vehicle is driven, see SRS INDICATOR GLOWS CONTINUOUSLY. If SRS indicator light comes on and another part of electrical system has failed, check for damage at fuse block.

SRS INDICATOR DOES NOT GLOW

NOTE: To identify test harness connector terminals, see Fig. 1. To locate SRS wiring harness connectors, see Figs. 14-17. On models with theft protection system, obtain 5-digit stereo security code from vehicle owner before disconnecting battery cable.

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

2) Reconnect battery cables. Turn ignition on. If other indicator lights are inoperative, go to next step. If other indicator lights are okay, go to step 4).

3) Check SRS warning light fuse in fuse block behind left side of instrument panel. See SRS FUSE IDENTIFICATION table. Replace fuse if blown. If fuse is okay, repair open circuit in harness between fuse and instrument cluster or replace instrument cluster.

SRS FUSE IDENTIFICATION TABLE

Application	Fuse No.
Accord	
SRS Indicator	1
SRS Power Supply	3
Civic & Civic Del Sol	
SRS Indicator	24
SRS Power Supply	25
Prelude	
SRS Indicator	13
SRS Power Supply	24

4) Turn ignition off. Disconnect SRS main harness 18-pin connector from SRS control unit. Turn ignition on. If SRS indicator glows, replace SRS control unit. If SRS indicator does not glow, turn ignition off.

5) Disconnect SRS main wiring harness 4-pin connector from main wiring harness. Turn ignition on. If SRS indicator glows, replace SRS main harness. If SRS indicator does not glow, turn ignition off.

6) Remove instrument cluster, and check SRS indicator bulb. Replace bulb if necessary. If bulb is okay, go to next step.

7) Turn ignition on. Check voltage between body ground and Blue wire terminal of dashboard (instrument cluster) 5-pin connector (18-pin connector on Accord). See Figs. 14-17. If voltage is 8.5 volts or more, go to next step. If voltage is less than 8.5 volts, go to step 9).

8) On Accord, repair short circuit in Blue wire of dashboard

(instrument panel) wiring harness. On Civic, Civic Del Sol and Prelude, replace dashboard SRS wiring harness.

9) Turn ignition off. Check voltage between Black and Yellow wire terminals (Black and Black/Yellow wire terminals on Civic and Civic Del Sol) of dashboard connector. See Figs. 14-17. Turn ignition on. If battery voltage is not present, go to next step. If battery voltage is present, go to step 11).

10) Check for continuity between body ground and Black wire terminal. If continuity is not present, repair open circuit in Black wire between instrument cluster and ground. If continuity is present, repair open circuit in Yellow wire (Black/Yellow wire on Civic and Civic Del Sol) between fuse block and instrument cluster.

11) Turn ignition off. Reconnect each connector to instrument cluster and SRS control unit. Connect Test Harness "A" (07MAZ-SL00500) to SRS control unit. See Fig. 1. Connect voltmeter between SRS test harness terminal No. 13 and ground.

12) Turn ignition on, noting voltage for 6 seconds after ignition is turned on. If voltage is more than 8.5 volts, replace SRS control unit. If voltage is 8.5 volts or less, replace instrument cluster.

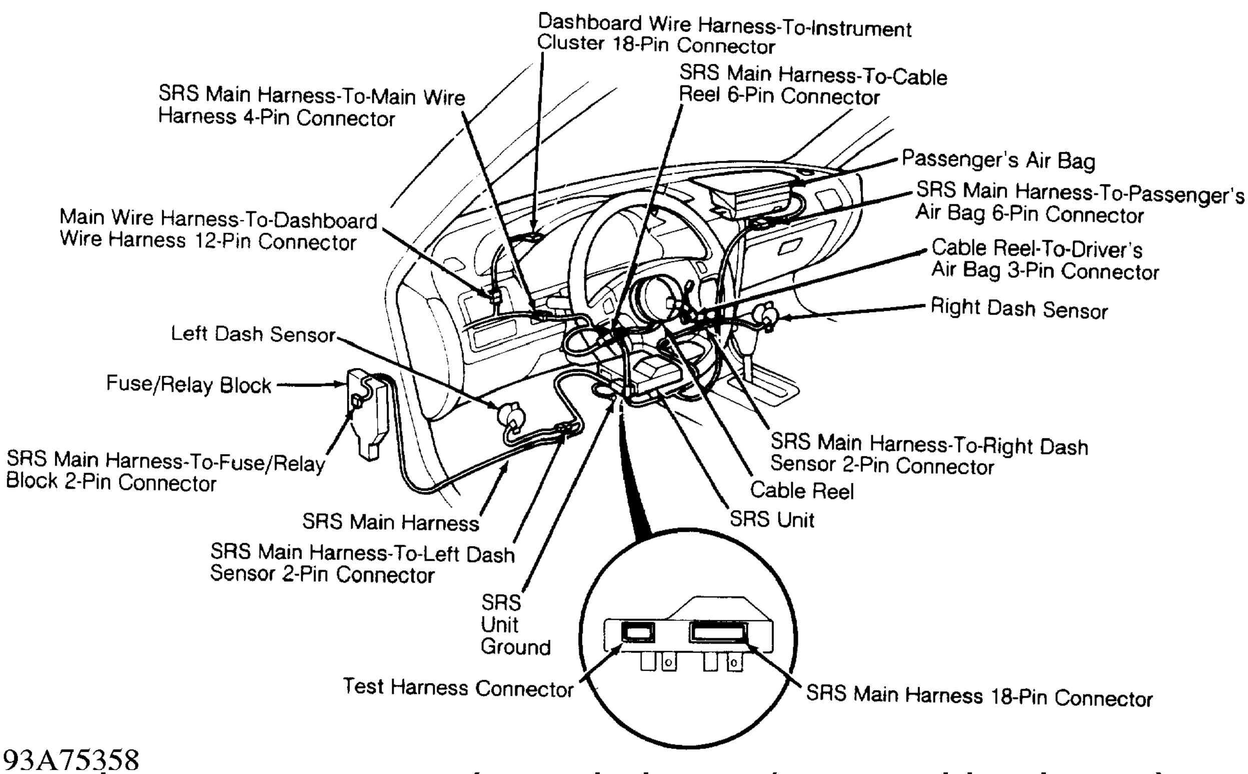

Fig. 14: Locating SRS Components (Accord Shown W/ Pass. Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

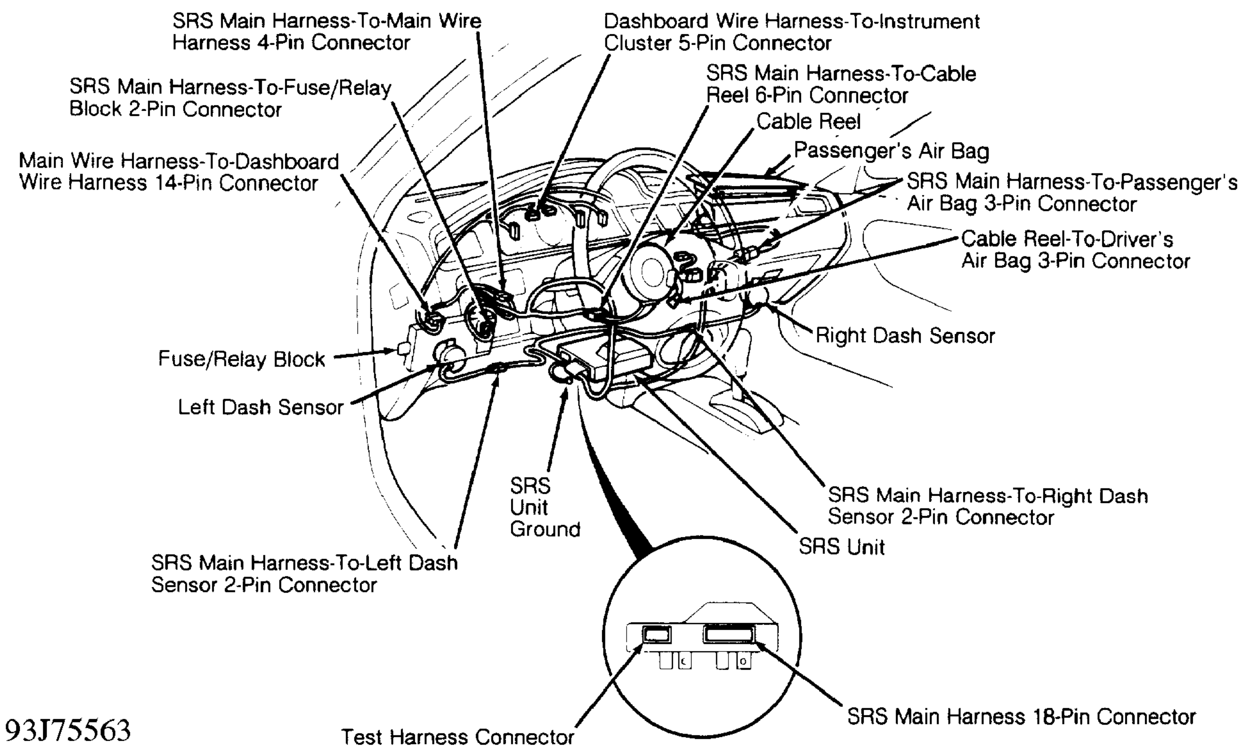

Fig. 15: Locating SRS Components (Civic Shown W/ Pass. Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

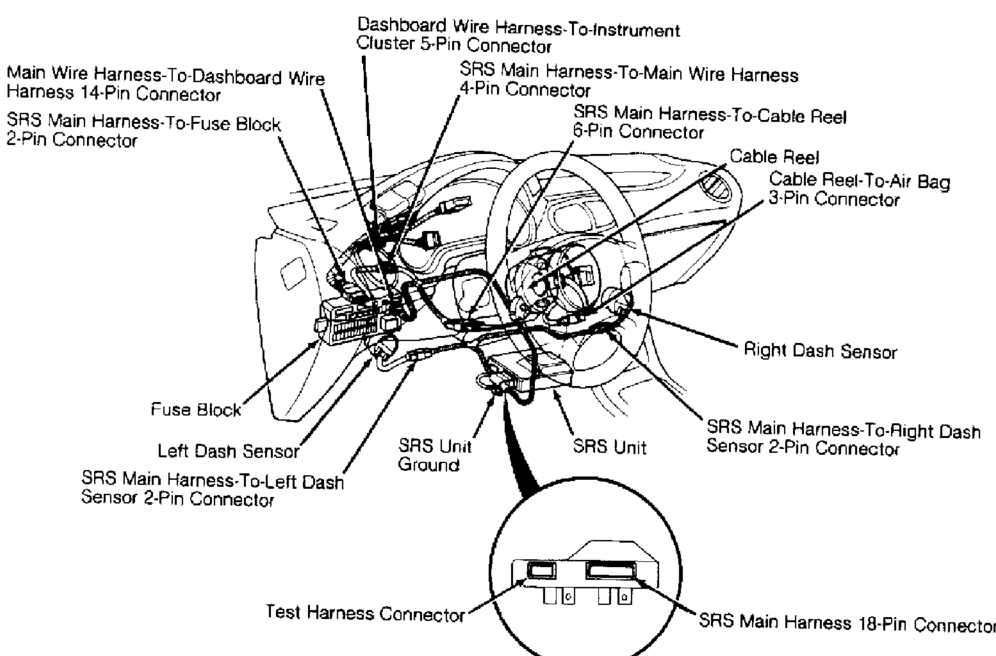

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Fig. 16: Locating SRS Components (Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

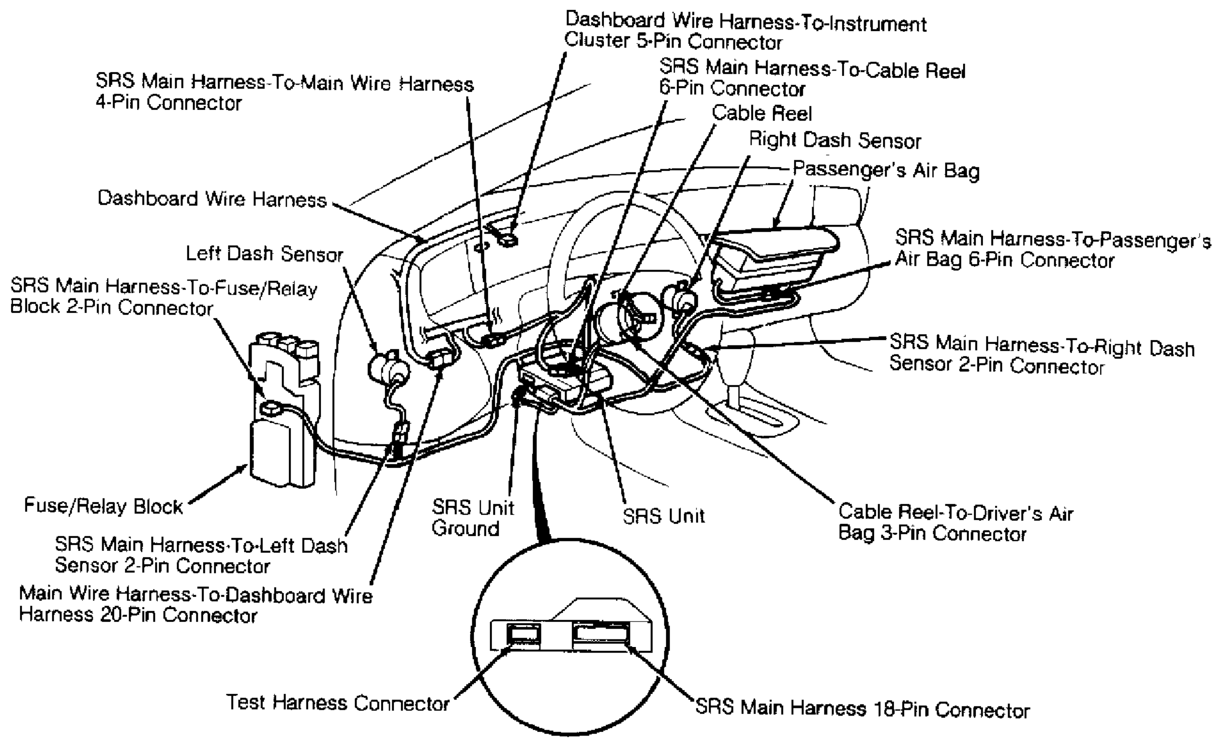

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Fig. 17: Locating SRS Components(Prelude Shown W/ Pass. Side Air Bag) Courtesy of American Honda Motor Co., Inc.

SRS INDICATOR GLOWS CONTINUOUSLY

NOTE: To identify test harness connector terminals, see Fig. 1. To locate SRS wiring harness connectors, see Figs. 14-17.

NOTE: Accord and Civic models without passenger-side air bags use 2 types of SRS control units that function in same way but produce different terminal voltages. Use correct voltage chart. To identify SRS control unit on Accord, see Fig. 18. To identify SRS control unit on Civic, check last 3 characters of SRS control unit part number.

Voltage Tests

1) Before proceeding, see SERVICE PRECAUTIONS. Ensure battery voltage is about 12 volts or more. Low battery voltage will result in false voltage readings during this test. DO NOT disconnect and disable air bag(s). Connect SRS test harness "A" to SRS control unit, but not to air bag. Turn ignition on.

2) Check voltage between ground and connector terminal No. 12 of SRS test harness "A". See Fig. 1. If voltage is present, repair poor ground in SRS control unit ground circuit or at SRS control unit bolts. Go to POOR SRS GROUNDS.

3) If no voltage is present, make a photocopy of appropriate voltage check chart. See Figs. 19-25. Check voltage between ground and specified connector terminals of test harness "A" (terminals are specified in top row). Record voltage readings in appropriate row.

4) Compare voltage readings with FAILURE MODE VOLTAGE ranges. If recorded readings match all FAILURE MODE VOLTAGE ranges in a particular row, proceed to appropriate probable failure mode (letter designation). See FAILURE MODE TESTS.

5) If recorded voltage readings do not match all FAILURE MODE VOLTAGE ranges in a particular row, replace SRS control unit with a known good unit and retest.

6) If all recorded voltage readings are now within normal ranges, replace original SRS control unit. If recorded voltage readings still do not match an entire row of FAILURE MODE VOLTAGE ranges, check condition of SRS system wiring harness connectors.

Poor SRS Grounds

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector. See Fig. 1. Check for continuity at SRS test harness "B" connector between terminal B5 and ground and between terminal B15 and ground.

2) If continuity is present in either circuit, replace SRS control unit and recheck voltages. If no continuity is present, SRS control unit ground, control unit mounting grounds or main harness is defective. Check control unit ground wire and mounting bolts. See Figs. 14-17. If necessary, replace main harness and recheck voltages.

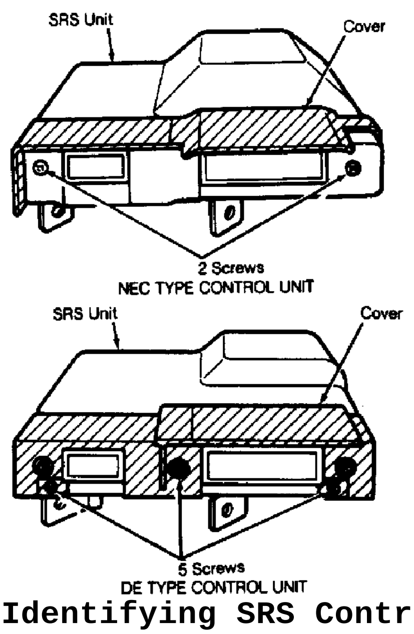

Fig. 18: Identifying SRS Control Units (Accord)
Courtesy of American Honda Motor Co., Inc.

Test Harness Terminal	1 SADH	2 SAPH	–	4 VCC	5 SV	–	–	–	–	10 BUC1	–	12 GND	13 IDC	14 M1	–	–	
Normal Voltage	4.3 – 5.6	4.3 – 5.6	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	8.5 – 13.6	8.4 – 10.9	–	–	Probable Failure Mode
Your voltage Reading		–	–			–	–	–	–		–				–	–	
Failure Mode Voltage	2.9 – 3.7	2.9 – 3.7	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	A Open in one cowl sensor.
	0	0	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	B Open in both cowl sensors. Short in one dash sensor. Short to driver's or passenger's airbag inflator.
*	8.7 – 11.2	8.7 – 11.2	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	C Short in cowl sensor or open in both dash sensors.
	5.7 – 7.4	5.7 – 7.4	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	D Open in one dash sensor.
	8.7 – 11.2	2.9 – 3.7	–	0	0	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	E Open in driver's airbag inflator or cable reel.
	2.9 – 3.7	8.7 – 11.2	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	F Open in front passenger's airbag inflator.
*	8.7 – 11.2	8.7 – 11.2	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	G Open in driver's and passenger's airbag inflator.
	4.3 – 5.6	4.3 – 5.6	–	0	0	–	–	–	–	11.5 – 14.5	–	0	2.0 – 8.5	8.4 – 10.9	–	–	H Blown SRS fuse (No. 3 10 A) or open in the wire.
	4.3 – 5.6	4.3 – 5.6	–	4.5 – 5.5	12.0 – 14.3	–	–	–	–	11.5 – 14.5	–	0	0 (8.5 – 13.6)	8.4 – 10.9	–	–	I Short (or open) in SRS indicator wire harness.

*When checking for failure mode C, check also for failure mode G (failure modes E and F).

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Fig. 19: SRS Voltage Check Chart (Accord With Passenger-Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

Test Harness Terminal	1 SADH	–	–	4 VCC	5 SV	–	–	–	–	10 BUC1	–	12 GND	13 IDC	14 M1	–	–	
Normal Voltage	5.1 – 7.0	–	–	4.5 – 5.5	12.0 – 14.0	–	–	–	–	10.5 – 14.5	–	0	8.5 – 13.0	10.5 – 14.5	–	–	Probable Failure Mode
Your voltage Reading		–	–			–	–	–	–		–				–	–	
Failure Mode Voltage	0	–	–	4.5 – 5.5	12.0 – 14.0	–	–	–	–	10.5 – 14.5	–	0	2.0 – 8.5	10.5 – 14.5	–	–	B Open in cowl sensor. Short in one dash sensor. Short to driver's airbag inflator.
*	10.5 – 14.5	–	–	4.5 – 5.5	12.0 – 14.0	–	–	–	–	10.5 – 14.5	–	0	2.0 – 8.5	10.5 – 14.5	–	–	C Short in cowl sensor or open in both dash sensors.
	7.1 – 9.5	–	–	4.5 – 5.5	12.0 – 14.0	–	–	–	–	10.5 – 14.5	–	0	2.0 – 8.5	10.5 – 14.5	–	–	D Open in one dash sensor.
*	10.5 – 14.5	–	–	4.5 – 5.5	12.0 – 14.0	–	–	–	–	10.5 – 14.5	–	0	2.0 – 8.5	10.5 – 14.5	–	–	E Open in driver's airbag inflator or cable reel.
	4.0 – 7.0	–	–	0	0	–	–	–	–	8.5 – 14.5	–	0	2.0 – 8.5	8.5 – 14.5	–	–	H Blown SRS fuse (No. 3, 10 A) or open in the wire.
	5.1 – 7.0	–	–	4.5 – 5.5	12.0 – 14.0	–	–	–	–	10.5 – 14.5	–	0	0 (8.5 – 13.0)	10.5 – 14.5	–	–	I Short (or open) in SRS indicator wire harness.

*When checking for failure mode C, check also for failure mode E.

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Fig. 20: SRS Voltage Check Chart (Accord W/o Pass. Side Air Bag - DE Control Unit)

Test Harness Terminal	1 SADH	–	–	4 VCC	5 SV	–	–	–	–	10 BUC1	–	12 GND	13 IDC	14 M1	–	–	Probable Failure Mode
Normal Voltage	4.3 –5.6	–	–	4.5 –5.5	12.0 –14.3	–	–	–	–	11.5 –14.5	–	0	8.5 –13.6	8.4 –10.9	–	–	
Your voltage Reading		–	–			–	–	–	–		–				–	–	
Failure Mode Voltage	2.9 –3.7	–	–	4.5 –5.5	12.0 –14.3	–	–	–	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	A Open in one cowl sensor.
	0	–	–	4.5 –5.5	12.0 –14.3	–	–	–	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	B Open in both cowl sensors. Short in one dash sensor. Short to driver's airbag inflator.
	8.7 –11.2	–	–	4.5 –5.5	12.0 –14.3	–	–	–	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	C Short in cowl sensor or open in both dash sensors.
	5.7 –7.4	–	–	4.5 –5.5	12.0 –14.3	–	–	–	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	D Open in one dash sensor.
	8.7 –11.2	–	–	0	0	–	–	–	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	E Open in driver's airbag Inflator or cable reel.
	4.3 –5.6	–	–	0	0	–	–	–	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	H Blown SRS fuse (No. 3, 10 A) or open in the wire.
	4.3 –5.6	–	–	4.5 –5.5	12.0 –14.3	–	–	–	–	11.5 –14.5	–	0	0 (8.5 –13.6)	8.4 –10.9	–	–	I Short (or open) in SRS indicator wire harness.

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Fig. 21: SRS Voltage Check Chart (Accord W/o Pass. Side Air Bag - NEC Control Unit)
Courtesy of American Honda Motor Co., Inc.

Test Harness Terminal	1 SADH	2 SAPH	–	4 VCC	5 SV	–	–	8 SADC	–	10 BUC1	–	12 GND	13 IDC	14 M1	–	–	Probable Failure Mode
Normal Voltage	4.3 –5.6	4.3 –5.6	–	4.5 –5.5	12.0 –14.3	–	–	5.6 –7.3	–	11.5 –14.5	–	0	8.5 –13.6	8.4 –10.9	–	–	
Your Voltage Reading		–	–			–	–		–		–				–	–	
Failure Mode Voltage	2.8 –3.7	2.8 –3.7	–	4.5 –5.5	12.0 –14.3	–	–	3.7 –4.9	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	A Open in one cowl sensor.
	0	0	–	4.5 –5.5	12.0 –14.3	–	–	0	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	B • Open in both cowl sensors. • Short in one dash sensor. • Short to driver's or passenger's airbag inflator.
	8.6 –11.3	8.6 –11.3	–	4.5 –5.5	12.0 –14.3	–	–	11.2 –14.6	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	C Short in cowl sensor or open in both dash sensors.
	5.7 –7.4	5.7 –7.4	–	4.5 –5.5	12.0 –14.3	–	–	7.4 –9.7	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	D Open in one dash sensor.
	8.6 –11.3	2.9 –3.7	–	4.5 –5.5	12.0 –14.3	–	–	3.7 –4.9	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	E Open in driver's airbag inflator or cable reel.
	2.9 –3.7	8.7 –11.2	–	4.5 –5.5	12.0 –14.3	–	–	3.7 –4.9	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	F Open in front passenger's airbag inflator.
	8.6 –11.3	8.6 –11.3	–	4.5 –5.5	12.0 –14.3	–	–	0	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	G Open in driver's and passenger's airbag inflator.
	4.3 –5.6	4.3 –5.6	–	0	0	–	–	5.6 –7.3	–	11.5 –14.5	–	0	2.0 –8.5	8.4 –10.9	–	–	H Blown SRS fuse (No. 24 10 A) or open in the wire.
	4.3 –5.6	4.3 –5.6	–	4.5 –5.5	12.0 –14.3	–	–	5.6 –7.3	–	11.5 –14.5	–	0	0 (8.5 –13.6)	8.4 –10.9	–	–	H Short (or open) in SRS indicator wire harness.

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Fig. 22: SRS Voltage Check Chart (Civic & Prelude W/ Pass. Side Air Bag)

Courtesy of American Honda Motor Co., Inc.

Test Harness Terminal	1 SADH	–	–	4 VCC	5 SV	–	–	8 SADC	–	10 BUC1	–	12 GND	13 IDC	14 M1	–	–	
Normal Voltage	4.3 −5.6	–	–	4.5 −5.5	12.0 −14.3	–	–	5.6 −7.3	–	11.5 −14.5	–	0	8.5 −13.6	8.4 −10.9	–	–	Probable Failure Mode
Your Voltage Reading		–	–			–	–		–		–				–	–	
Failure Mode Voltage	0	–	–	4.5 −5.5	12.0 −14.3	–	–	0	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	B • Open in cowl sensor. • Short in one dash sensor. • Short to driver's airbag inflator.
	8.6 −11.3	–	–	4.5 −5.5	12.0 −14.3	–	–	11.2 −14.6	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	C Short in cowl sensor or open in both dash sensors.
	5.7 −7.4	–	–	4.5 −5.5	12.0 −14.3	–	–	7.4 −9.7	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	D Open in one dash sensor.
	8.6 −11.3	–	–	4.5 −5.5	12.0 −14.3	–	–	0	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	E Open in driver's airbag inflator or cable reel.
	4.3 −5.6	–	–	0	0	–	–	5.6 −7.3	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	H Blown SRS fuse (No. 24 10 A) or open in the wire.
	4.3 −5.6	–	–	4.5 −5.5	12.0 −14.3	–	–	5.6 −7.3	–	11.5 −14.5	–	0	0 (8.5 −13.6)	8.4 −10.9	–	–	I Short (or open) in SRS indicator wire harness.

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Fig. 23: SRS Voltage Check Chart (Civic W/o Pass. Side Air Bag - A82 Control Unit)

Courtesy of American Honda Motor Co., Inc.

Test Harness Terminal	1 SADH	–	–	4 VCC	5 SV	–	–	8 SADC	–	10 BUC1	–	12 GND	13 IDC	14 M1	–	–	
Normal Voltage	4.3 −5.6	–	–	4.5 −5.5	12.0 −14.3	–	–	5.6 −7.3	–	11.5 −14.5	–	0	8.5 −13.6	8.4 −10.9	–	–	Probable Failure Mode
Your Voltage Reading		–	–			–	–		–		–				–	–	
Failure Mode Voltage	2.8 −3.7	–	–	4.5 −5.5	12.0 −14.3	–	–	3.7 −4.9	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	A Open in one cowl sensor.
	0	–	–	4.5 −5.5	12.0 −14.3	–	–	0	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	B • Open in both cowl sensors. • Short in one dash sensor. • Short to driver's airbag inflator.
	8.6 −11.3	–	–	4.5 −5.5	12.0 −14.3	–	–	11.2 −14.6	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	C Short in cowl sensor or open in both dash sensors.
	5.7 −7.4	–	–	4.5 −5.5	12.0 −14.3	–	–	7.4 −9.7	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	D Open in one dash sensor.
	8.6 −11.3	–	–	4.5 −5.5	12.0 −14.3	–	–	0	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	E Open in driver's airbag inflator or cable reel.
	4.3 −5.6	–	–	0	0	–	–	5.6 −7.3	–	11.5 −14.5	–	0	2.0 −8.5	8.4 −10.9	–	–	H Blown SRS fuse (No. 24 10 A) or open in the wire.
	4.3 −5.6	–	–	4.5 −5.5	12.0 −14.3	–	–	5.6 −7.3	–	11.5 −14.5	–	0	0 (8.5 −13.6)	8.4 −10.9	–	–	H Short (or open) in SRS indicator wire harness.

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Fig. 24: SRS Voltage Check Chart (Civic W/o Pass. Side Air Bag - N82 Control Unit - & Prelude W/o Pass. Side Air Bag)

Courtesy of American Honda Motor Co., Inc.

Test Connector Terminal	1 SADH	–	–	4 VCC	5 SV	–	–	–	–	10 BUC1	–	12 GND	13 IDC	14 M1	–	–	
Normal Voltage	3.5 −5.2	–	–	4.5 −5.5	12.0 −14.0	–	–	–	–	10.5 −14.5	–	0	9.0 −13.0	7.5 −11	–	–	Probable Failure Mode
Your Voltage Reading		–	–			–	–	–	–		–				–	–	
Failure Mode Voltage	0	–	–	4.5 −5.5	12.0 −14.0	–	–	–	–	10.5 −14.5	–	0	2.0 −9.0	7.5 −11	–	–	B •Short to airbag inflator body. (body ground) •Open in cowl sensor. •Short in dash sensor.
	7.5 −11	–	–	4.5 −5.5	12.0 −14.0	–	–	–	–	10.5 −14.5	–	0	2.0 −9.0	7.5 −11	–	–	C Short in cowl sensor or open in both dash sensors.
	5.3 −7.2	–	–	4.5 −5.5	12.0 −14.0	–	–	–	–	10.5 −14.5	–	0	2.0 −9.0	7.5 −11	–	–	D Open in one dash sensor.
	7.5 −11	–	–	4.5 −5.5	12.0 −14.0	–	–	–	–	10.5 −14.5	–	0	2.0 −9.0	7.5 −11	–	–	F Open in airbag inflator or cable reel.
	3.5 −5.2	–	–	0	0	–	–	–	–	8.5 −14.5	–	0	2.0 −9.0	6 −11	–	–	J Blown SRS fuse (No. 25) or open in the wire.
	3.5 −5.2	–	–	4.5 −5.5	12.0 −14.0	–	–	–	–	10.5 −14.5	–	0	0 (9.0 −13.0)	7.5 −11	–	–	K Short (or open) in SRS indicator wire harness.

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Fig. 25: SRS Voltage Check Chart (Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

FAILURE MODE TESTS

NOTE: To identify test harnesses connector terminals, see Fig. 1.

Mode "A"
Replace SRS control unit and recheck voltages.

Mode "B" (Accord, Civic & Prelude)

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

2) Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector. Reconnect driver-side air bag connector.

3) Check continuity between ground and terminals B1 and B7 of SRS test harness "B". If there is continuity at either terminal, go to step 6). If there is not continuity at either terminal, go to step 4).

4) Reconnect passenger-side air bag connector. Check continuity between ground and terminals B2 and B8 of SRS test harness "B". If there is continuity at either terminal, go to step 10). If there is not continuity at either terminal, go to step 5).

5) Check continuity between ground and terminals B4, B6, B12 and B16 of SRS test harness "B". If there is continuity at any

terminal, go to step 12). If there is not continuity at any terminal, go to step 13).

6) Disconnect cable reel 6-pin connector from SRS main harness under steering column. Connect SRS test harness "C" to cable reel side of connector, but not to driver-side air bag connector.

7) Check continuity between ground and terminals No. 4 and 5 of SRS test harness "C". If there is continuity at either terminal, go to step 8). If there is not continuity at either terminal, replace SRS main harness and recheck voltages.

8) Disconnect driver-side air bag connector. Connect SRS test harness "C" to cable reel side of connector and to driver-side air bag connector.

9) Check continuity between ground and terminals No. 7 and 8 of SRS test harness "C". If there is continuity at either terminal, replace driver-side air bag and recheck voltages. If there is not continuity at either terminal, replace cable reel and recheck voltages.

10) Disconnect passenger-side air bag connector. Connect SRS test harness "C" to air bag side of connector, but not to SRS main harness side of connector.

11) Check continuity between ground and terminals No. 7 and 8 of SRS test harness "C". If there is continuity at either terminal, replace passenger-side air bag and recheck voltages. If there is not continuity at either terminal, replace SRS main harness and recheck voltages.

12) Connect SRS test harness "D" between dash sensor and SRS main harness connector. Check continuity between ground and terminals No. 1 and 2 of SRS test harness "C". If there is continuity at either terminal, replace dash sensor. Recheck voltages. If there is not continuity at either terminal, replace SRS main harness. Recheck voltages.

13) Check resistance between terminals B4 and B6 (left dash sensor) and between terminals B12 and B16 (right dash sensor) of SRS test harness "B". If resistance is 3800-4200 ohms for both sensors, replace SRS control unit and recheck voltages.

14) If resistance is less than 3800 ohms for either sensor, connect SRS test harness "D" between dash sensor and SRS main harness. Check resistance between terminals No. 1 and 2 of SRS test harness "D". If resistance is 3800-4200 ohms, replace SRS main harness and recheck voltages. If resistance is less than 3800 ohms, replace dash sensor and recheck voltages.

Mode "B" (Civic Del Sol)

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

2) Disconnect SRS control unit connector. Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector.

3) Check for continuity between ground and terminals B1 and B7 of SRS test harness "B". If there is continuity, go to next step. If there is no continuity, go to step 8).

4) Disconnect cable reel 6-pin connector from SRS main harness under steering column. Connect SRS test harness "C" to cable reel 6-pin connector, but not to driver-side air bag connector.

5) Check for continuity between ground and terminals No. 4 and 5 of SRS test harness "C". If there is continuity, go to next step. If there is no continuity, replace SRS main harness and recheck voltages.

6) Disconnect driver-side air bag connector. Connect SRS test harness "C" to cable reel 6-pin and driver-side air bag connectors.

7) Check for continuity between ground and terminals No. 7 and 8 of SRS test harness "C". If there is no continuity, replace cable reel and recheck voltages. If there is continuity, replace driver-side air bag and recheck voltages.

8) Reconnect battery cables. Check resistance between terminals B4 and B6 (right dash sensor) and between terminals B12 and B16 (left dash sensor) of SRS test harness "B". If resistance is 3800-4200 ohms for both sensors, go to next step. If resistance is less than 3800 ohms for either sensor, go to step 10).

9) Check for continuity between ground and terminals B4, B6, B12 and B16 of SRS test harness "B". If there is no continuity, replace SRS control unit and recheck voltages. If there is continuity at any terminal, go to step 11).

NOTE: Left and right dash sensors cannot be checked at same time.

10) Connect SRS test harness "D" between dash sensor and SRS main harness. Check resistance between terminals No. 1 and 2 of SRS test harness "D". If resistance is 3800-4200 ohms, replace SRS main harness and recheck voltages. If resistance is not 3800 ohms, replace respective dash sensor and recheck voltages.

11) Connect SRS test harness "D" between dash sensor and SRS main harness. Check for continuity between terminals No. 1 and 2 of SRS test harness "D" and ground. If there is continuity, replace dash sensor and recheck voltages. If there is no continuity, replace SRS main harness and recheck voltages.

Modes "C" & "D"

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector.

2) On Accord with passenger-side air bag, check resistance between terminals B1 and B7 and between terminals B2 and B8 of SRS test harness "B". If resistance is less than 200 ohms across both sets of terminals, go to next step. If resistance is more than 200 ohms across either set of terminals, go to MODE "E" and MODE "F".

3) On all models, check resistance between terminals B4 and B6 and between terminals B12 and B16 of SRS test harness "B". If resistance is more than 5000 ohms for both sets of terminals, go to next step. If resistance is less than 5000 ohms for either set of terminals, replace SRS control unit and recheck voltages.

4) Connect SRS test harness "D" between dash sensor and SRS main harness. Check resistance between terminals No. 1 and 2 of SRS test harness "D". If resistance is more than 5000 ohms, replace dash sensor and recheck voltages. If resistance is less than 5000 ohms, replace SRS main harness and recheck voltages.

Mode "E"

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector.

2) On Accord without passenger-side air bag and with DE control unit, reconnect driver-side air bag connector. Check resistance between terminals B4 and B6 and between terminals B12 and B16 of SRS test harness "B". If resistance is more than 5000 ohms for both sets of terminals, go to MODES "C" & "D". If resistance is less than 5000 ohms for either set of terminals, replace SRS control unit. Recheck voltages.

3) On all models, check resistance between terminals B1 and B7 of SRS test harness "B". If resistance is more than 200 ohms, go to next step. If resistance is less than 200 ohms, replace SRS control unit and recheck voltages.

4) Disconnect cable reel 6-pin connector from SRS main harness under steering column. Connect SRS test harness "C" to cable reel 6-pin connector but not to driver-side air bag connector.

5) Check resistance between terminals No. 4 and 5 of SRS test harness "C". If resistance is more than 200 ohms, go to next step. If resistance is less than 200 ohms, replace SRS main harness and recheck voltages.

6) Disconnect driver-side air bag connector. Connect SRS test harness "C" to cable reel 6-pin connector and driver-side air bag connector. Check resistance between terminals No. 7 and 8 of SRS test harness "C". If resistance is more than 200 ohms, replace driver-side air bag and recheck voltages. If resistance is less than 200 ohms, replace cable reel and recheck voltages.

Mode "F" (Accord, Civic & Prelude)

1) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

2) Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector. Reconnect passenger-side air bag connector.

3) Check resistance between terminals B2 and B8 of SRS test harness "B". If resistance is more than 200 ohms, go to next step. If

resistance is less than 200 ohms, replace SRS control unit and recheck voltages.

4) Disconnect passenger-side air bag connector. Connect SRS test harness "C" to passenger-side air bag connector.

5) Check resistance between terminals 7 and 8 of SRS test harness "C". If resistance is more than 200 ohms, replace passenger-side air bag and recheck voltages. If resistance is less than 200 ohms, replace SRS main harness and recheck voltages.

Mode "F" (Civic Del Sol)

1) Before proceeding, see SERVICE PRECAUTIONS. Disconnect battery cables. Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector.

2) Check resistance between terminals B4 and B6 and between terminals B12 and B16 of SRS test harness "B". If resistance is more than 5000 ohms, go to MODES "C" & "D". If resistance is less than 5000 ohms, check resistance between terminals B1 and B7 of SRS test harness "B". If resistance is more than 200 ohms, go to next step. If resistance is less than 200 ohms, replace SRS control unit and recheck voltages.

3) Disconnect cable reel 6-pin connector from SRS main harness under steering column. Connect SRS test harness "C" to cable reel 6-pin connector but not to driver-side air bag connector.

4) Check resistance between terminals No. 4 and 5 of SRS test harness "C". If resistance is more than 200 ohms, go to next step. If resistance is less than 200 ohms, replace SRS main harness and recheck voltages.

5) Disconnect driver-side air bag connector. Connect SRS test harness "C" to cable reel 6-pin connector and driver-side air bag connector. Check resistance between terminals No. 7 and 8 of SRS test harness "C". If resistance is more than 200 ohms, replace driver-side air bag and recheck voltages. If resistance is less than 200 ohms, replace cable reel and recheck voltages.

Mode "G" (Accord With Passenger-Side Air Bag)

See MODE "E" and MODE "F" (ACCORD, CIVIC & PRELUDE).

Modes "G" (Civic & Prelude), "H" (Accord) & "J" (Civic Del Sol)

1) Turn ignition on. Check SRS power supply fuse in passenger compartment fuse block. See SRS FUSE IDENTIFICATION table under SRS INDICATOR DOES NOT GLOW. If fuse is okay, go to next step. If fuse is blown, replace it (repair short circuit if necessary).

2) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

3) Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector. Reconnect battery. Turn ignition on. Check voltage between ground and terminal B13 of SRS test harness

"B".

4) If battery voltage is present, replace SRS control unit and recheck voltages. If less than battery voltage is present, replace SRS main harness and recheck voltages.

Modes "H" (Civic & Prelude) & "I" (Accord)

1) Disconnect SRS main harness 4-pin connector from SRS main harness. Turn ignition on. Wait 6 seconds.

2) Check voltage between ground and Blue wire terminal of SRS main harness 4-pin connector (SRS main harness side of connector). If less than 8.5 volts is present, go to next step. If more than 8.5 volts is present, go to step 8).

3) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

4) Disconnect SRS main harness 18-pin connector from SRS control unit. Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector.

5) Reconnect battery. Check for continuity between ground and terminal B11 of SRS test harness "B".

6) If there is no continuity, go to next step. If there is continuity, replace SRS main harness and recheck voltages.

7) Check for continuity between terminal B11 of SRS test harness "B" and Blue wire terminal of SRS main harness 4-pin connector. If there is continuity, replace SRS control unit and recheck voltages. If there is no continuity, replace SRS main harness and recheck voltages.

8) Reconnect SRS main harness 4-pin connector to SRS main harness. Disconnect dashboard wiring harness 18-pin connector (5-pin connector on Prelude and Civic) from instrument cluster.

9) Turn ignition on. Wait 6 seconds. Check voltage between ground and Blue wiring terminal of dashboard wire harness 18-pin (or 5-pin) connector. If more than 8.5 volts is present, replace instrument cluster and recheck voltages. If less than 8.5 volts is present, repair dashboard wiring harness or replace SRS main harness.

Mode "K" (Civic Del Sol)

1) Disconnect SRS main harness 4-pin connector from SRS main harness. Turn ignition on.

2) Check voltage between ground and Blue wire terminal of SRS main harness 4-pin connector (SRS main harness side of connector). If less than 9 volts is present, go to next step. If more than 9 volts is present, go to step 8).

3) Before proceeding, see SERVICE PRECAUTIONS. Disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM.

4) Reconnect battery. Disconnect SRS main harness 18-pin connector from SRS control unit.

5) Connect SRS test harness "B" between SRS control unit and SRS main harness 18-pin connector. Check for continuity between grou

and terminal B11 of SRS test harness "B".

6) If there is no continuity, go to next step. If there is continuity, replace SRS main harness and recheck voltages.

7) Check for continuity between terminal B11 of SRS test harness "B" and Blue wire terminal of SRS main harness 4-pin connector. If there is continuity, replace SRS control unit and recheck voltages. If there is no continuity, replace SRS main harness and recheck voltages.

8) Reconnect SRS main harness 4-pin connector to SRS main harness. Disconnect dashboard wiring harness 5-pin connector from instrument cluster.

9) Turn ignition on. Wait 6 seconds. Check voltage between ground and Blue wire terminal of dashboard wiring harness 5-pin connector. If more than 9 volts is present, replace instrument cluster and recheck voltages. If less than 9 volts is present, repair dashboard wiring harness or replace SRS main harness as necessary.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Dash Sensor Bolts	16 (22)
Steering Wheel Nut	36 (50)
	INCH Lbs. (N.m)
Air Bag Bolt/Nut	84 (10)
"L" Bracket Adjusting Nut (Accord & Prelude)	84 (10)
SRS Control Unit Bolt	84 (10)

WIRING DIAGRAMS

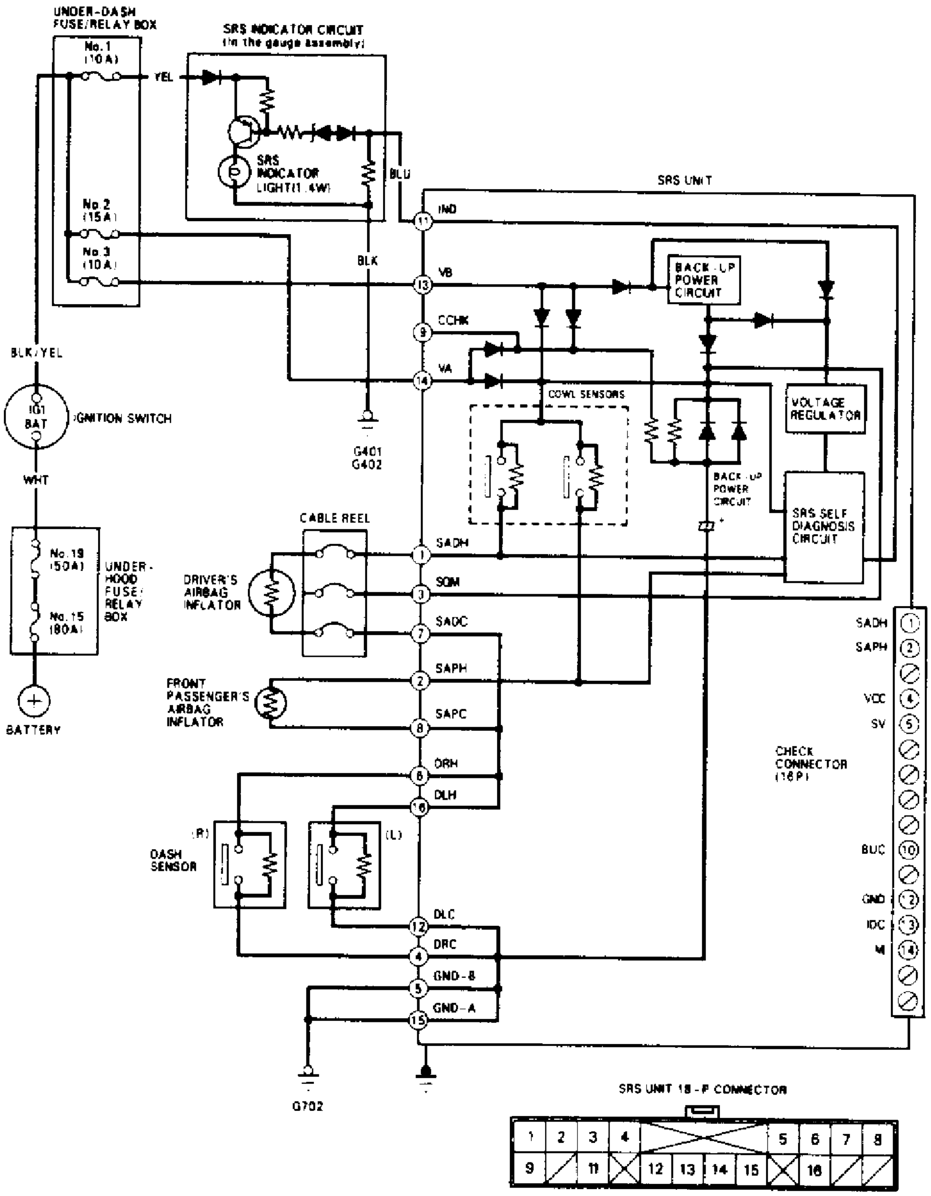

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Fig. 26: SRS Wiring Diagram (Accord With Passenger-Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

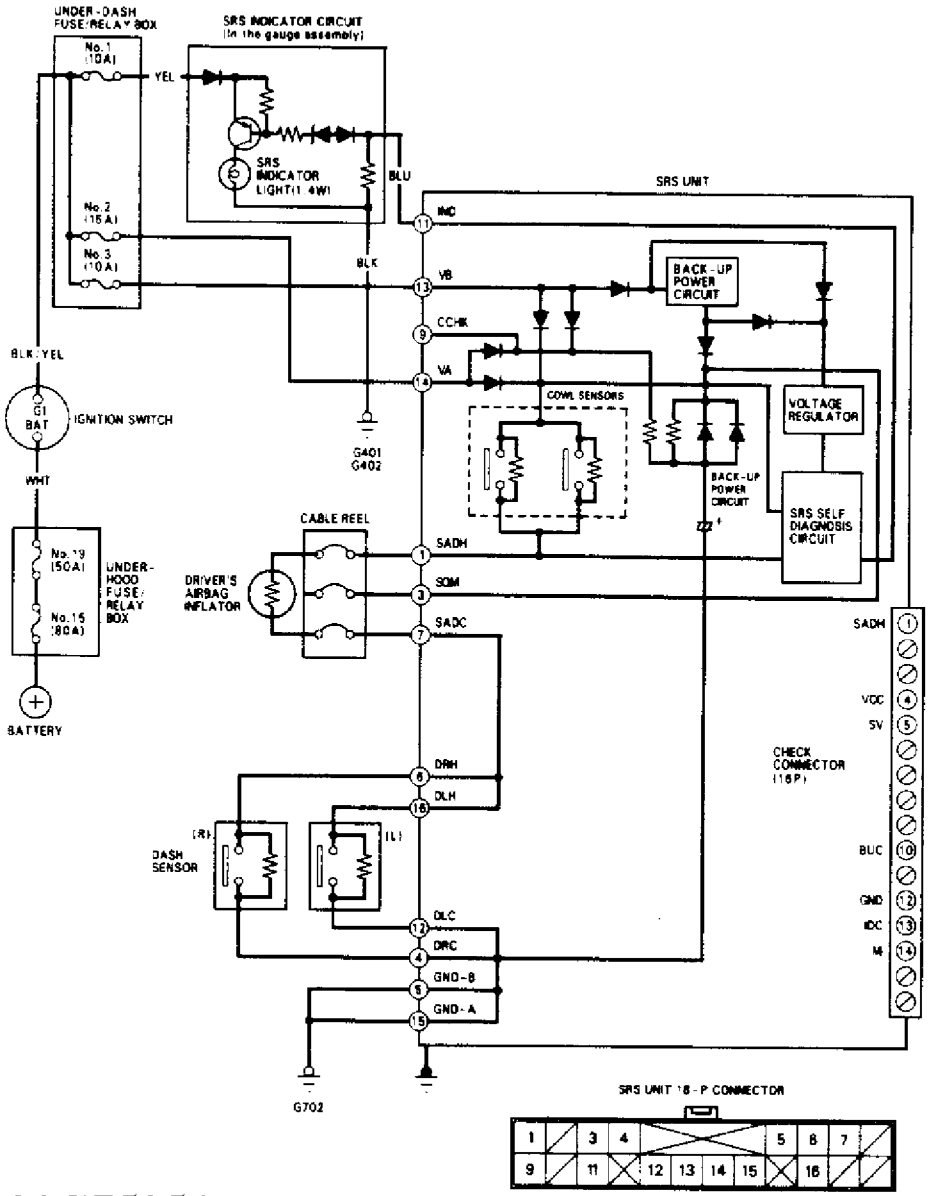

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Fig. 27: SRS Wiring Diagram (Accord Without Passenger-Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

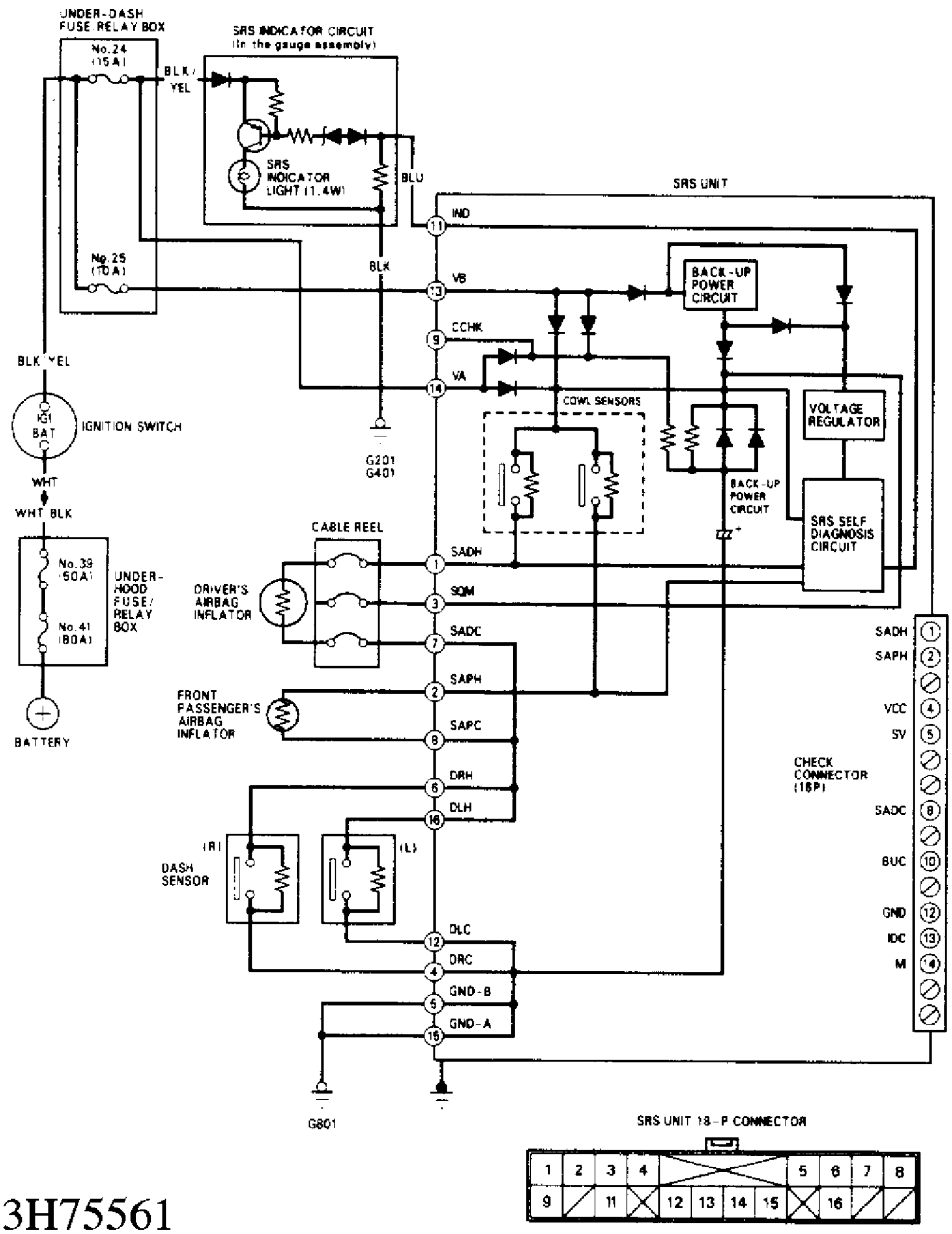

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Fig. 28: SRS Wiring Diagram (Civic With Passenger-Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

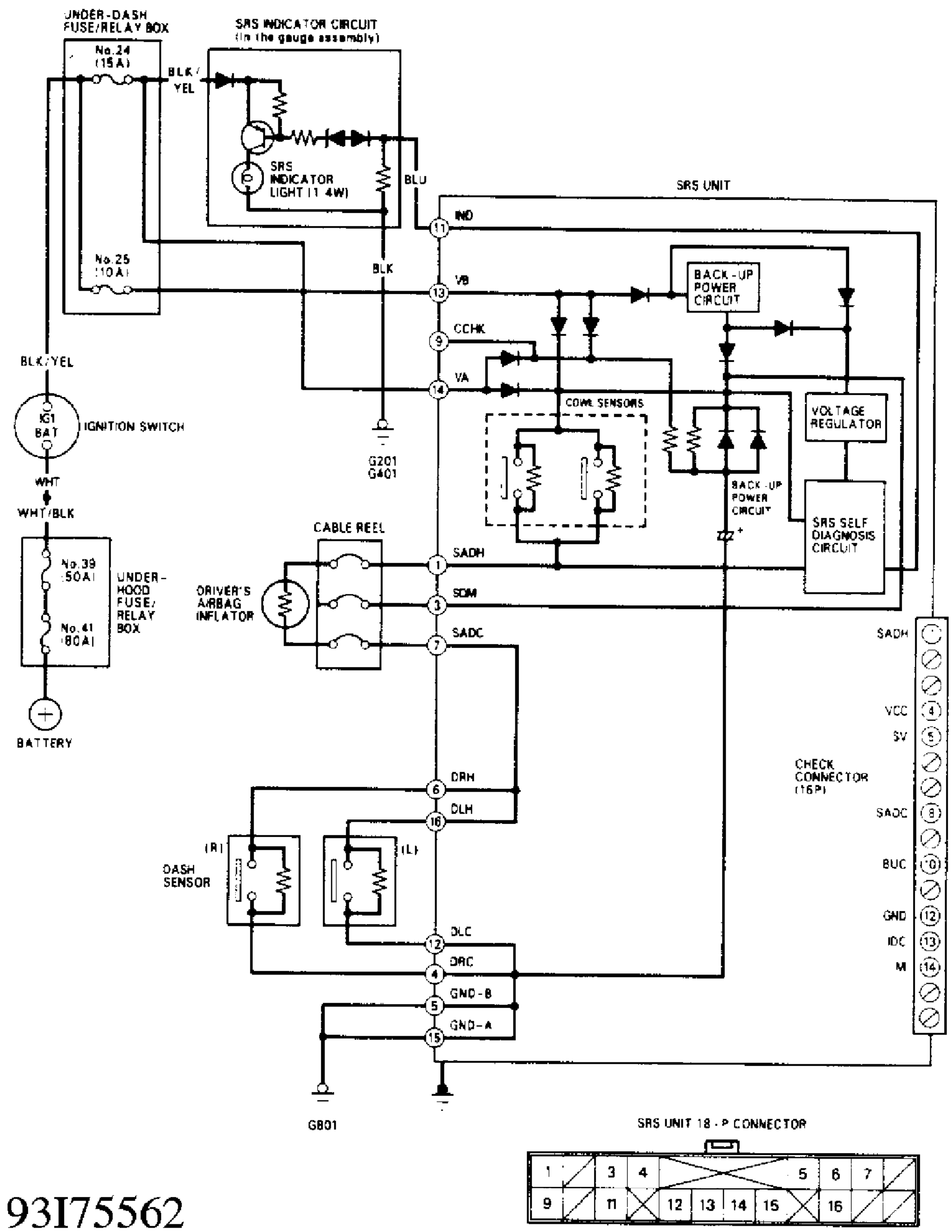

Fig. 29: SRS Wiring Diagram (Civic Without Passenger-Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

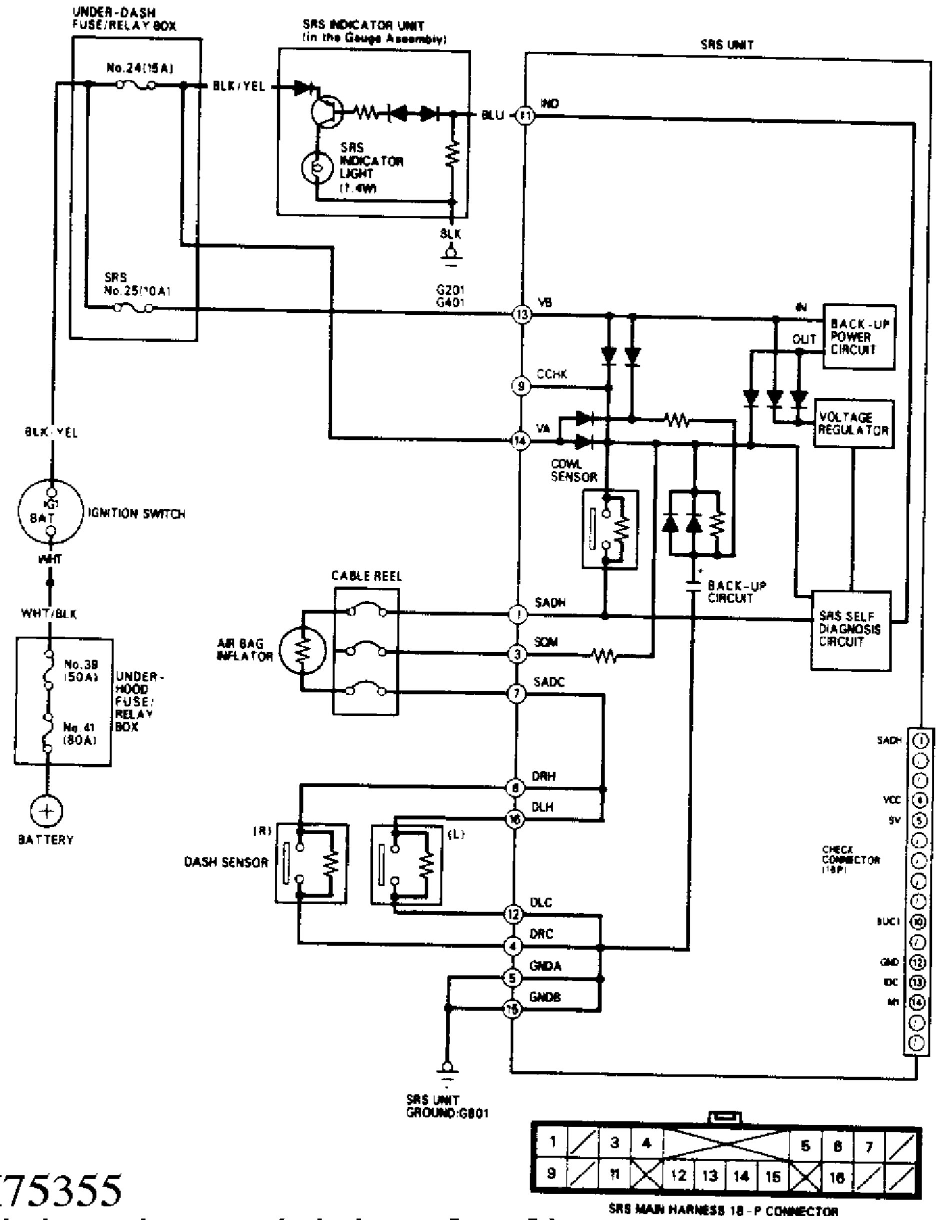

Fig. 30: SRS Wiring Diagram (Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

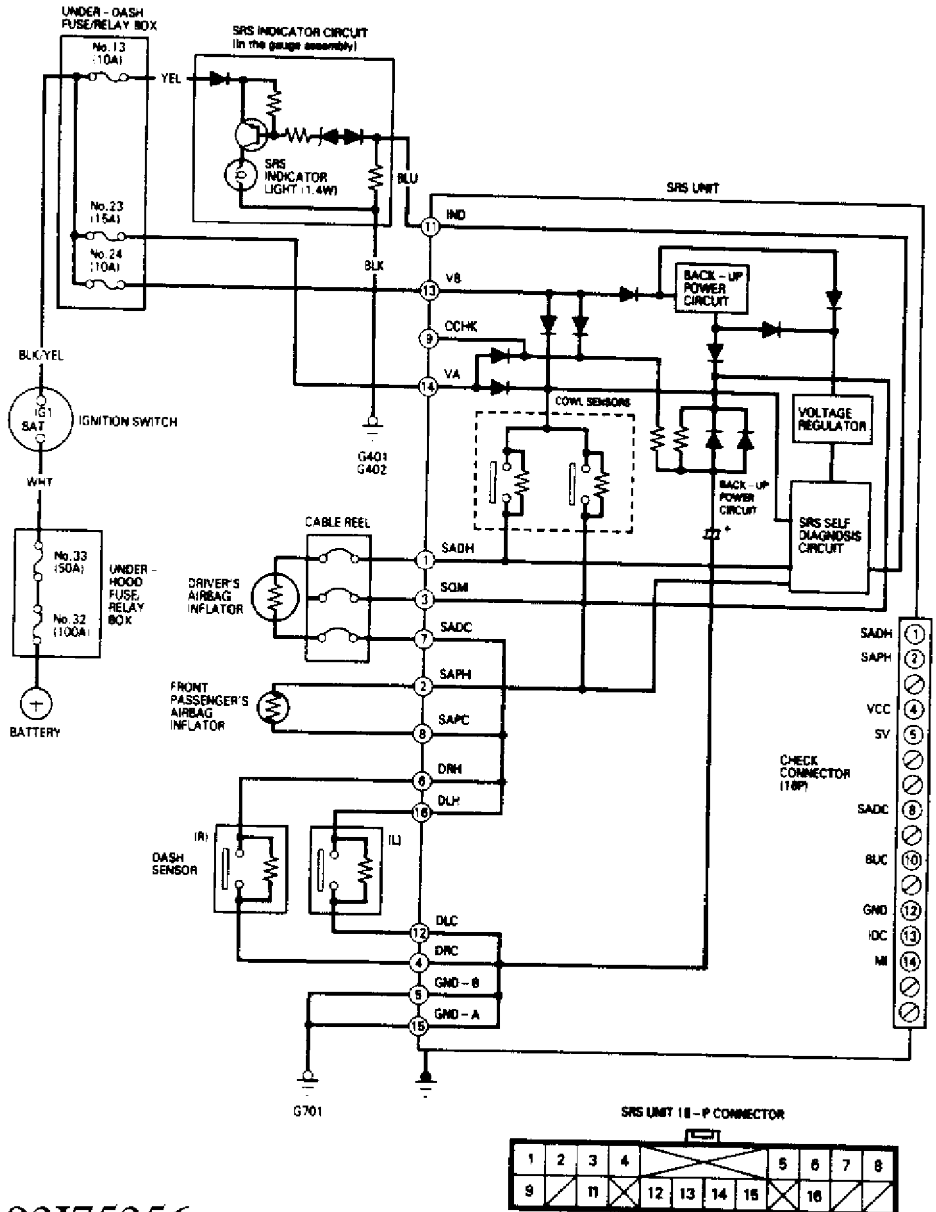

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Fig. 31: SRS Wiring Diagram (Prelude With Passenger-Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

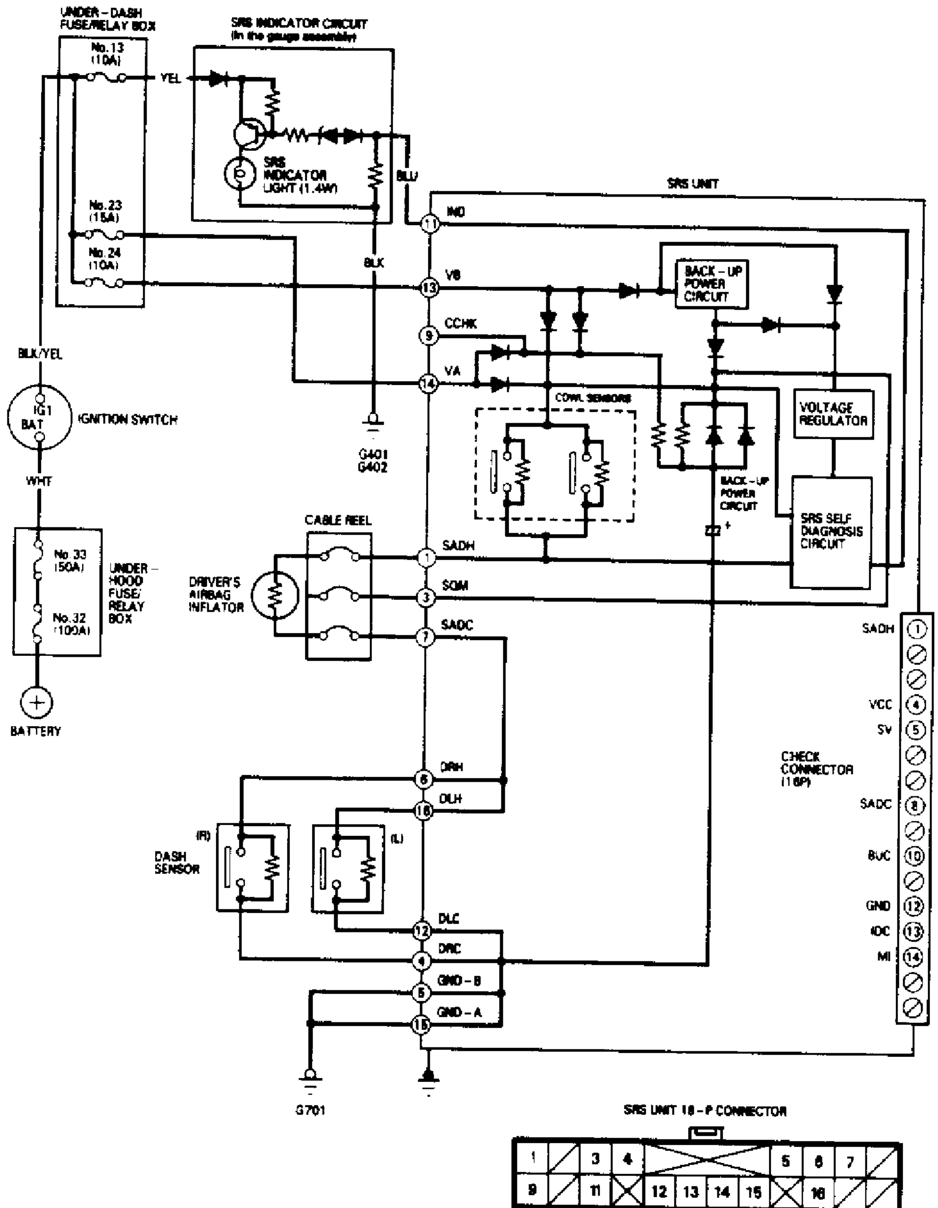

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Fig. 32: SRS Wiring Diagram (Prelude Without Passenger-Side Air Bag)
Courtesy of American Honda Motor Co., Inc.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ELECTRICAL
Honda Alternators & Regulators - Nippondenso

Prelude

DESCRIPTION

The Nippondenso alternator uses 4 positive and 4 negative diodes to rectify current. A voltage regulator, which is part of the alternator, controls charging system voltage.

Charging system incorporates Electric Load Detector (ELD), which measures load on the charging system. ELD sends signal to PGM-FI ECM, which controls voltage regulator. By adjusting voltage needs, PGM-FI ECM reduces mechanical load on engine for greater fuel economy.

NOTE: For wiring circuit information, see appropriate chassis wiring diagram in WIRING DIAGRAMS.

ADJUSTMENTS

ALTERNATOR BELT ADJUSTMENT TABLE

Application	(1) Deflection - In. (mm)
Prelude	13/32-15/32 (10-12)

(1) - Deflection is with 22 lbs. (10 kg) pressure applied midway on longest belt run.

TROUBLE SHOOTING

NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in the GENERAL INFORMATION section.

ON-VEHICLE TESTING

PRELIMINARY INSPECTION

Check alternator wiring harness connections and drive belt tension. Ensure battery is fully charged and connections at battery cables, alternator and main fuses are good. Check fuse No. 23 (15A). Replace fuse as necessary.

NOTE: If any fuse is blown, charge warning light will come on even if charging system is working properly.

ALTERNATOR OUTPUT TEST

1) With engine at normal operating temperature, remove alternator harness connector. See Fig. 1. Turn ignition switch to ON position.

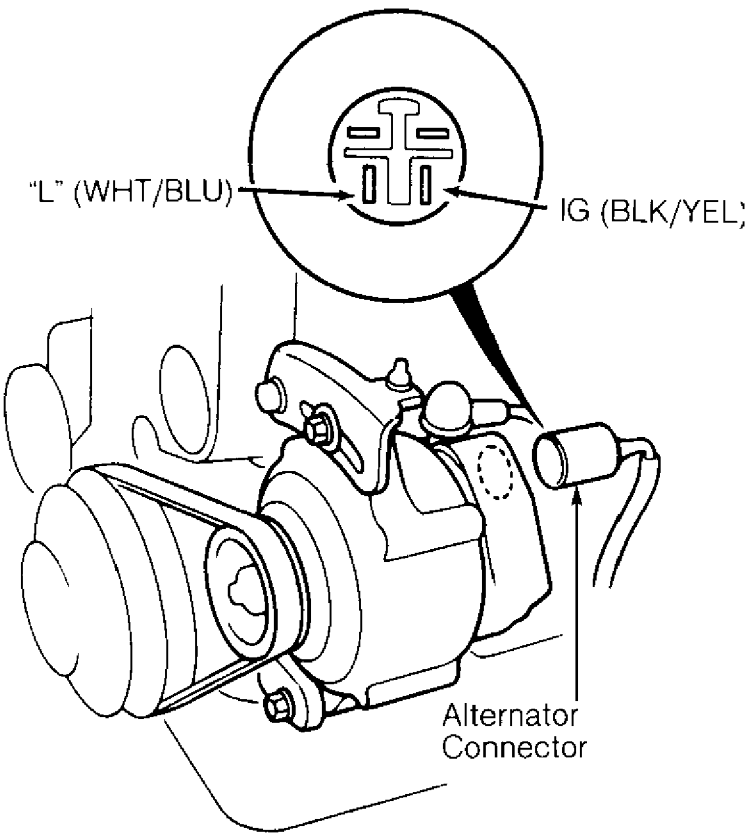

Fig. 1: Testing Alternator Output On Harness Connector Terminals
Courtesy of American Honda Motor Co., Inc.

2) Check for battery voltage between Black/Yellow wire terminal of harness connector and ground. Ensure battery voltage is also present between White/Green wire terminal and ground. If battery voltage is present, go to step 4).

3) If battery voltage is not present, check dash fuse No. 23 (15A). Check for open circuit in Black/Yellow wire between dash fuse box and alternator. Check for open circuit in White/Green wire between PGM-FI ECM and alternator.

4) Turn ignition off. Reconnect alternator harness connector. Connect alternator tester with integral carbon pile (Sun VAT-40) to

... No. 1. Ensure all accessories

are off. Start engine.

5) Operate engine at 2000 RPM and check output voltage. If voltage is greater than 15.1 volts, replace voltage regulator. Let engine idle. Set tester switch to position No. 2. Remove tester inductive pick-up, and zero ammeter. Reconnect inductive pick-up.

6) Operate engine at 2000 RPM and check voltage. If voltage is less than 13.9 volts, test battery. Using carbon pile function of tester, apply load until voltage drops to 12.0-13.5 volts. Amperage should be 30 amps or greater. With engine still at 2000 RPM, full-field charging system. See FULL FIELD TEST. Amperage should be 40 amps or greater.

7) If amperage is not within specification, replace alternator. If voltage is not within specification, replace defective internal voltage regulator.

FULL FIELD TEST

CAUTION: When performing full field test on alternator, charging voltage will increase quickly. DO NOT allow voltage to increase above 18 volts; electrical system will be damaged.

Remove protector from full field access hole, located at rear of alternator end cover. See Fig. 2. Insert screwdriver into hole of alternator, by-passing voltage regulator. Increase engine speed to 2000 RPM and monitor voltage and amperage increase. Voltage should be more than 15.1 volts. Amperage should be more than 40 amps. If amperage or voltage is less than specification, replace or repair alternator.

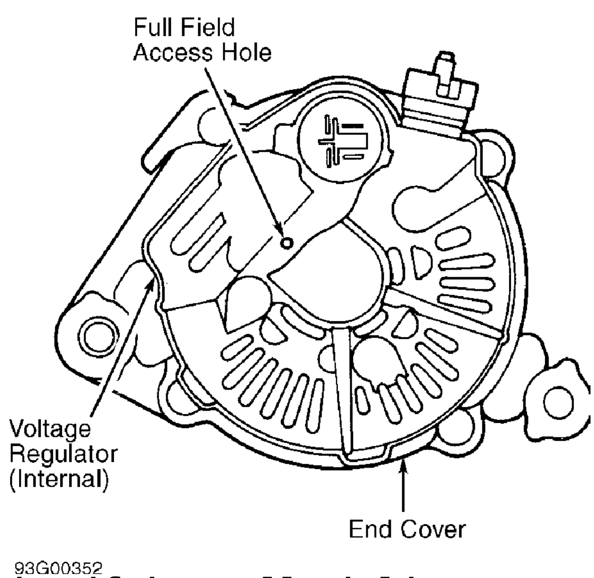

Fig. 2: Identifying Full Field Access Hole
Courtesy of American Honda Motor Co., Inc.

CHARGE WARNING LIGHT TEST

1) Perform preliminary inspection. See PRELIMINARY INSPECTION. Turn ignition on. If charge warning light comes on, go to step 3). If warning light remains off, remove alternator harness connector. See Fig. 1. Using jumper wire, momentarily connect White/Blue wire terminal to ground.

2) If warning light comes on, perform ALTERNATOR OUTPUT TEST. If warning light remains off, check for burned bulb, open circuit in White/Blue wire or open circuit in Black/Yellow wire between warning light and dash fuse box or between dash fuse box and ignition switch.

3) Start engine, and allow it to idle. If charge warning light goes out, turn off engine and go to step 4). If warning light remains on, perform ALTERNATOR OUTPUT TEST.

4) Turn ignition on. Disconnect alternator harness connector. Disconnect ABS control unit, integrated control unit and 4WS control unit. Check charge warning light after disconnecting each unit. Charge warning light should go out.

5) If warning light goes out, control unit disconnected before light going out is shorted. Replace faulty control unit. If warning light remains on, repair short circuit to ground in White/Blue wire between warning light and dash fuse box or between dash fuse box and voltage regulator.

BENCH TESTING

BRUSHES

Remove brush holder from alternator. Using vernier caliper, measure brush length. See Fig. 3. If brush length is not as specified, replace brushes. See BRUSH LENGTH SPECIFICATIONS table.

BRUSH LENGTH SPECIFICATIONS TABLE

Application	In. (mm)
Standard	.41 (10.5)
Limit	.22 (5.6)

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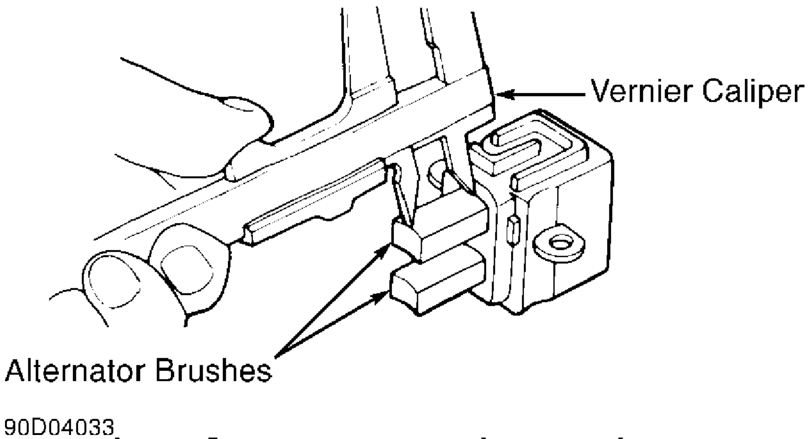

Fig. 3: Measuring Alternator Brush Length
Courtesy of American Honda Motor Co., Inc.

DIODE ASSEMBLY

1) Remove diode (rectifier) assembly from alternator. Check for continuity in both directions by reversing test probes between terminal "B" and terminals P(1), P(2), P(3) and P(4). Check for continuity in both directions between terminal "E" (ground) and terminals P(1), P(2), P(3) and P(4). See Fig. 4.

2) All diodes should show a low continuity reading in one direction and no continuity in opposite direction. If any diode does not test as specified, replace entire diode (rectifier) assembly.

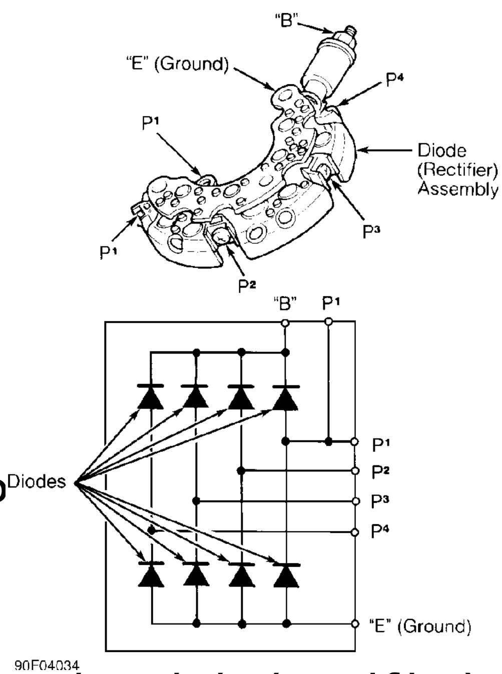

Fig. 4: Testing Diode (Rectifier) Assembly
Courtesy of American Honda Motor Co., Inc.

ROTOR

Using an ohmmeter, ensure continuity exists between rotor slip rings. See Fig. 5. If continuity does not exist, replace rotor assembly. Ensure continuity does not exist between slip rings and rotor or between slip rings and rotor shaft. If continuity exists, replace rotor.

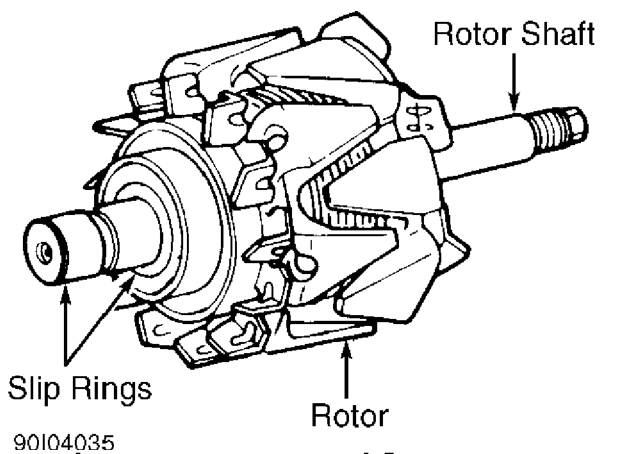

Fig. 5: Testing Rotor Assembly
Courtesy of American Honda Motor Co., Inc.

STATOR

Ensure continuity exists between each pair of leads on stator winding. See Fig. 6. If continuity does not exist, replace stator assembly. Ensure continuity does not exist between any stator winding lead and coil core. If continuity exists, replace stator assembly.

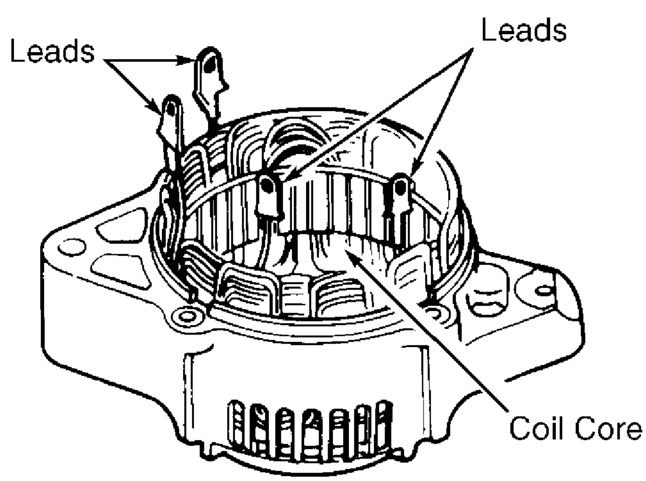

Fig. 6: Testing Stator Assembly
Courtesy of American Honda Motor Co., Inc.

OVERHAUL

NOTE: Use illustration for exploded view of alternator. See Fig. 7.

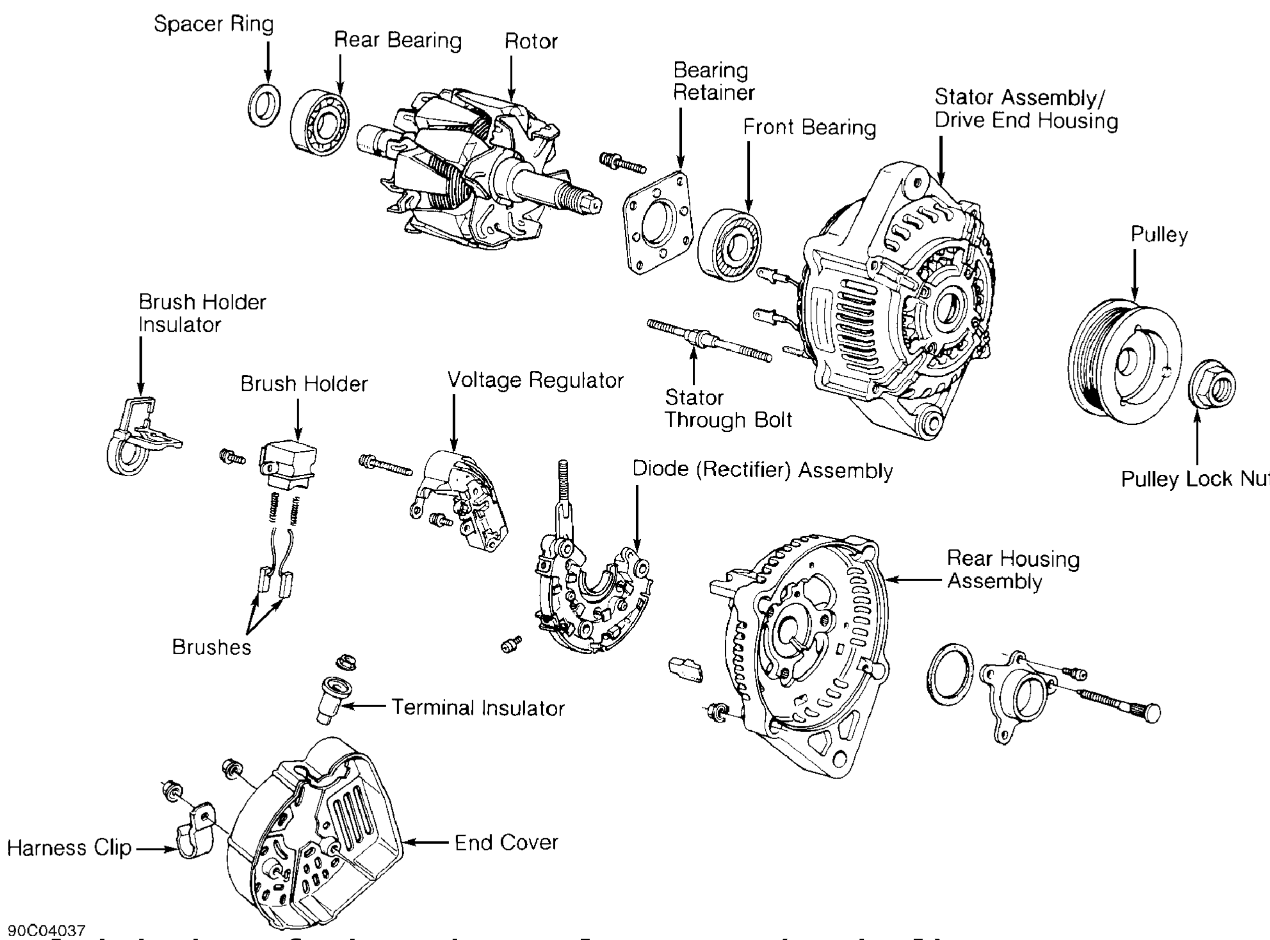

Fig. 7: Exploded View Of Nippondenso Alternator (Typical)
Courtesy of American Honda Motor Co., Inc.

END OF ARTICLE

ANTI-LOCK BRAKE SAFETY PRECAUTIONS
Article Text
1993 Honda Prelude
For Cadi Centre Nsk CA 95051
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Sunday, July 08, 2001 11:20AM

ARTICLE BEGINNING

GENERAL INFORMATION
Anti-Lock Brake Safety Precautions

* PLEASE READ THIS FIRST *

This article is intended for general information purposes only. This information may not apply to all makes and models. If vehicle is equipped with Anti-Lock Brake System (ABS), refer to appropriate ANTI-LOCK BRAKE SYSTEM article in the BRAKES section for description, operation, depressurizing, testing, system bleeding, trouble shooting and servicing of specific system.

WARNING: Failure to depressurize ABS could lead to physical injury.

ANTI-LOCK BRAKE SAFETY PRECAUTIONS

WARNING: Failure to depressurize ABS could lead to physical injury.

* NEVER open a bleeder valve or loosen a hydraulic line while ABS is pressurized.
* NEVER disconnect or reconnect any electrical connectors while ignition is on. Damage to ABS control unit may result.
* DO NOT attempt to bleed hyudarulic system without first referring to the appropriate ANTI-LOCK BRAKE SYSTEM article in the BRAKES section.
* Only use specially designed brake hoses/lines on ABS equipped vehicles.
* DO NOT tap on speed sensor components (sensor, sensor rings). Sensor rings must be pressed into hubs, NOT hammered into hubs. Striking these components can cause demagnetization or a loss of polarization, affecting the accuracy of the speed signal returning to the ABS control unit.
* DO NOT mix tire sizes. Increasing the width, as long as tires remain close to the original diameter, is acceptable. Rolling diameter must be identical for all 4 tires. Some manufacturers recommend tires of the same brand, style and type. Failure to follow this precaution may cause inaccurate wheel speed readings.
* DO NOT contaminate speed sensor components with grease. Only use recommended coating, when system calls for an anti-corrosion coating.
* When speed sensor components have been removed, ALWAYS check sensor-to-ring air gaps when applicable. These specifications can be found in each appropriate article.
* ONLY use rocommended brake fluids. DO NOT use silicone brake

fluids in an ABS equipped vehicle.

* When instlling transmittion devices (CB's, telephones, etc.) on ABS equipped vehicles, DO NOT locate the antenna near the ABS control unit (or any control unit).
* Disconnect all on-board computers, when using electric welding equipment.
* DO NOT expose the ABS control unit to prolonged periods of high heat (185 ^{o}F/85^{o}C for 2 hours is generally considered a maximum limit).

END OF ARTICLE

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ARTICLE BEGINNING

1993 BRAKES
Honda - Anti-Lock Brake System

Prelude

DESCRIPTION

The Anti-Lock Brake System (ABS) is designed to prevent wheel lock-up during hard braking, allowing driver to maintain vehicle control. System consists of control unit, accumulator, ABS pump (power unit), 4 speed sensors, modulator, warning light, master cylinder, power booster assembly and connecting wiring. SeeFig. 1.

NOTE: For more information on brake system, seeBRAKE SYSTEM article in BRAKES section.

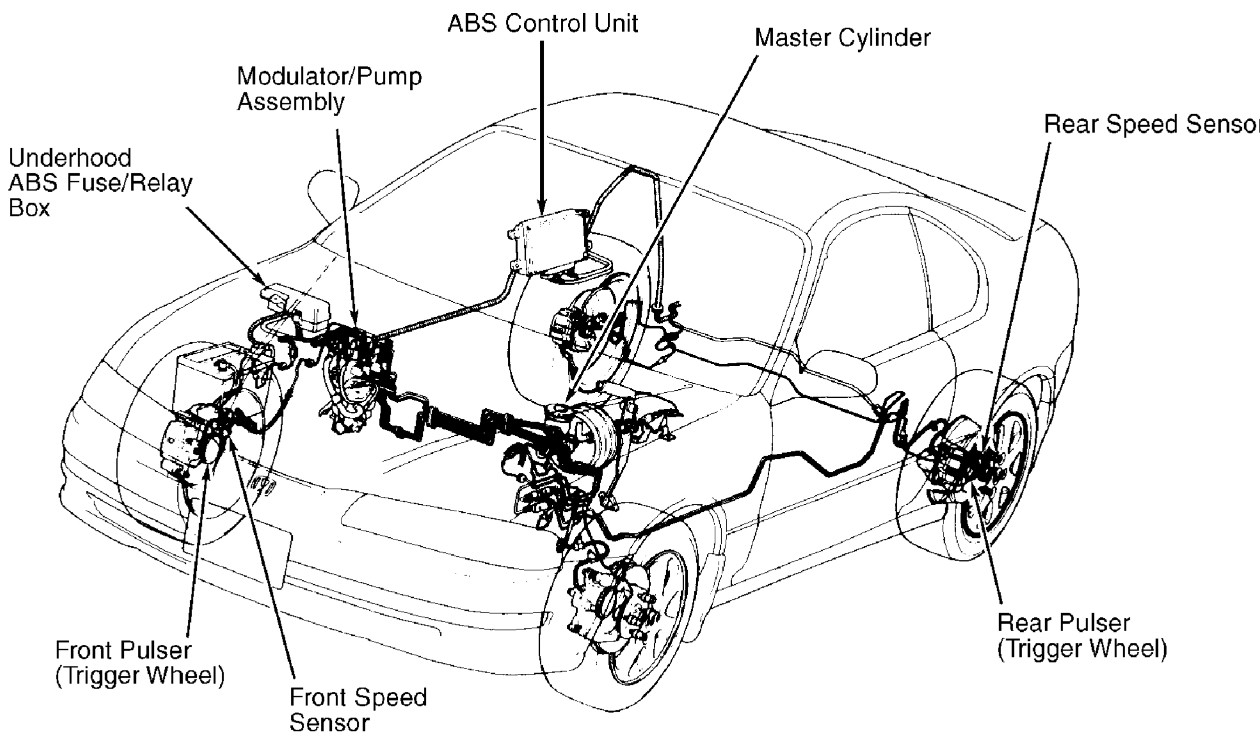

Fig. 1: Locating ABS Components (Typical)
Courtesy of American Honda Motor Co., Inc.

OPERATION

ABS PUMP (POWER UNIT)

The power unit consists of an electric motor, filter, guide, piston rod and cylinder body. Guide is positioned off-set to the center of the motor shaft. Rotation of motor and cylinder body provides the reciprocating motion to the piston rod. This pressurizes brake fluid which is fed to relief valve, accumulator and modulator.

As the motor rotates and pressure in the accumulator exceeds a predetermined level, the pressure switch is turned on. Upon receiving this switching signal, the control unit stops motor relay operation. If accumulator pressure does not reach predetermined level after motor has run continuously for at least 2 minutes, the control unit stops motor operation and turns on ABS warning light in instrument panel.

ACCUMULATOR

The accumulator is a pneumatic, nitrogen-gas filled reservoir which accumulates high-pressure brake fluid. Accumulator feeds high-pressure brake fluid to modulator valve through inlet side of solenoid valve. Accumulator charging pressure is 1721 psi (121 kg/cm^2). Maximum operating pressure is 3271 psi (230 kg/cm^2).

CONTROL UNIT

The control unit has a main function, sub-function, self-diagnostic function and fail-safe function.

Main Function

Controls overall ABS system operation by interpreting speed sensor signals and activating solenoid valve in modulator unit.

Sub-Function

Controls pump motor and self-diagnostic function.

Self-Diagnostic Function

Monitors the main ABS system. When an abnormality is detected, ABS warning light comes on.

Fail-Safe Function

When an abnormality is detected in the main system, solenoid valve operation is turned off by fail-safe relay. Under these conditions, the ABS system operates as a conventional brake system. The fail-safe function comes on with ABS warning light.

MODULATOR

The modulator consists of 4 modulator pistons and 3 solenoid valves. Individual pistons and solenoids are used for the front wheels. Individual modulator pistons are used for each rear wheel, but are connected to a single solenoid valve used for both rear wheels. The modulator pistons for the rear brakes have proportioning control valves to prevent rear wheel lock-up if ABS system malfunctions.

PRESSURE SWITCH

The pressure switch monitors accumulator pump pressure. When pressure switch is turned off, the control unit activates pump motor relay to operate ABS pump motor. If accumulator pressure does not reach predetermined level, ABS warning light comes on.

SPEED SENSOR

The speed sensor detects wheel rotation speed. Speed sensor consists of a permanent magnet, coil and trigger wheel (pulser). As trigger wheel rotates, the magnetic flux around the coil in each speed sensor alternates, generating a voltage frequency proportional to wheel rotation speed. These pulses are sent to the control unit to determine wheel speed.

BLEEDING BRAKE SYSTEM

HYDRAULIC SYSTEM BLEEDING

CAUTION: DO NOT spill brake fluid on painted surfaces. To avoid paint damage, clean any spilled brake fluid with a clean cloth and clear water, immediately.

Fill master cylinder with clean brake fluid. Fluid should meet DOT 3 or DOT 4 specifications. Bleed master cylinder with bleeder valves (if equipped). Bleed wheel positions in sequence. See BRAKE LINE BLEEDING SEQUENCE table.

BRAKE LINE BLEEDING SEQUENCE TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Sequence
Prelude	RR, LF, LR, RF

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

RELIEVING ACCUMULATOR/LINE PRESSURE

Drain brake fluid from master cylinder and modulator reservoir. Remove Red cap from maintenance bleeder screw. SeeFig. 2. Using ABS "T" Wrench (07HAA-SG00101), loosen maintenance bleeder screw. Turn "T" wrench one complete turn to relieve accumulator line pressure. Tighten bleeder screw, and install Red cap.

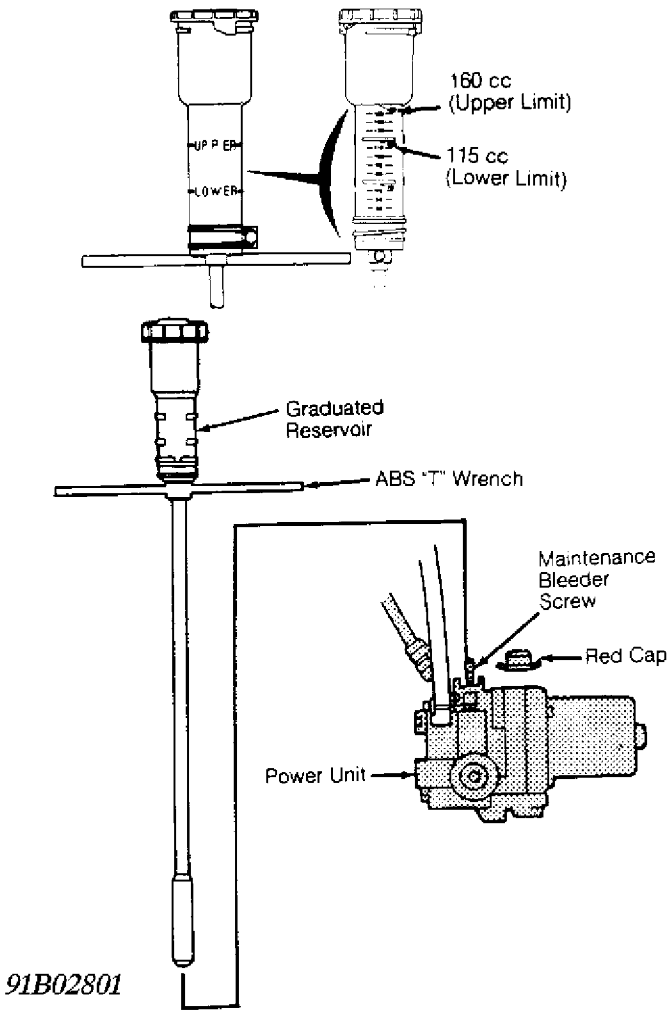

Fig. 2: Relieving Accumulator/Line Pressure (Typical)
Courtesy of American Honda Motor Co., Inc.

ACCUMULATOR, MODULATOR & ABS PUMP (POWER UNIT) BLEEDING

1) Ensure vehicle is on level ground. Ensure automatic transmission is in Park or manual transmission is in Neutral. Block wheels, and set parking brake. Turn ignition off. Connect ABS Tester (07HAJ-SG0010A or 07HAJ-SG0010B) to Orange 6-pin test connector, located under passenger's seat.

2) Fill modulator reservoir to MAX level. Start engine and allow to idle for a few minutes. Shut down engine and recheck fluid level. Relieve accumulator line pressure. See RELIEVING ACCUMULATOR/LINE PRESSURE.

NOTE: Depress brake pedal firmly when operating ABS tester.

3) Start engine and allow to idle for a few minutes. Turn mode selector to "2" position. While depressing brake pedal firmly, press START TEST button to operate modulator/pump. SeeFig. 3. There should be kickback on brake pedal. If there is no kickback or kickback is weak, repeat steps 2) and 3).

4) Turn mode selector to "3", "4" and "5". Perform steps 2) and 3) in each mode. Refill reservoir to MAX level.

ADJUSTMENTS

PARKING BRAKE

NOTE: Before adjusting parking brake, loosen park brake equalizer adjusting nut. Start engine, and depress brake pedal several times to set self-adjusting brakes before adjusting parking brake.

1) With rear brakes adjusted, raise and support rear of vehicle. Loosen equalizer nut, and pull parking brake lever up one notch. Tighten equalizer adjusting nut until rear wheels drag slightly.

2) Release parking brake lever. Rear wheels should rotate freely. Rear wheels should lock when parking brake lever is pulled up 6-10 clicks.

BRAKE WARNING LIGHT

To adjust parking brake light operation, turn ignition on. Bend switch plate down until light comes on when parking brake lever is pulled one notch, and goes out when lever is released.

TROUBLE SHOOTING

ANTI-LOCK (ABS) WARNING LIGHT

NOTE: ABS system is okay if ABS warning light goes out after engine is started.

Trouble Code Recognition

1) ABS control unit recognizes system related problems and causes ABS warning light to come on and stay on under any of following conditions:

* ABS pump runs longer than 2 minutes.
* Vehicle is driven with parking brake on longer than 30

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seconds.

* One rear wheel is locked.
* Wheel speed sensor does not transmit a signal.
* Vehicle is driven on extremely rough road.
* Low battery voltage.
* Operation time of solenoid valves exceeds a specified value and control unit indicates open circuit in solenoid circuit.
* Output signals from control unit are not transmitted to solenoid valves.
* Temporary loss of traction due to excessive cornering speed or starting from stuck condition (mud, snow or sand).

2) If ABS warning light comes on intermittently, use ABS Tester (07HAJ-SG0010A or 07HAJ-SG0010B) to confirm problem. See ABS FUNCTION TEST under DIAGNOSIS & TESTING.

3) ABS warning light comes on and trouble code is stored in control unit when insufficient battery voltage exists at control unit. If low battery voltage caused problem, recharge battery and clear trouble code(s). See CLEARING TROUBLE CODES under SELF-DIAGNOSTICS.

ABS Warning Light Does Not Come On

If ABS warning light does not come on when ignition is on:

* Check bulb.
* Check Yellow wire between fuse No. 13 and instrument cluster.
* Check Blue/Red wire between instrument cluster and control unit.
* Check control unit ground circuit.

ABS Warning Light Stays On Without Trouble Codes

If ABS warning light stays on and no trouble code(s) have been stored in control unit, check for following items:

* Loose or poor control unit connector.
* Blown ABS fuse No. B2 in underhood fuse/relay box.
* Open circuit in White wire between ABS fuse No. B2 and control unit.
* Open circuit in Black/Yellow wire between fuse No. 13 No. 9 and fail-safe relays.
* Short circuit in Blue/Red wire between instrument cluster and control unit.
* Open circuit in White/Blue wire between alternator and control unit.

If problem cannot be found, substitute a known good control unit, and retest.

ABS Warning Light Stays On With Trouble Codes

Turn ignition on. Ensure ABS warning light comes on. Start engine and observe ABS warning light. If ABS warning light stays on, retrieve and record trouble codes. See RETRIEVING TROUBLE CODES under SELF-DIAGNOSTICS. If ABS warning light goes out after engine starts, ABS system is okay.

DIAGNOSIS & TESTING

ABS FUNCTION TEST

WARNING: DO NOT drive vehicle with ABS tester connected to vehicle, or brake system failure may occur.

Preliminary Procedure

Confirm ABS warning light indicates system malfunction. See ANTI-LOCK (ABS) WARNING LIGHT under TROUBLE SHOOTING. Park vehicle on level surface. Block wheels, and put automatic transmission in Park or manual transmission in Neutral.

CAUTION: DO NOT move mode selector switch while TEST IN PROGRESS light is on.

Testing

1) With ignition off, connect ABS Tester (07HAJ-SG0010A or 07HAJ-SG0010B) to Orange 6-pin test connector, located under passenger's seat. Start engine. Release parking brake. Place mode selector to "1" position. Push START TEST button. SeeFig. 3. TEST IN PROGRESS light should come on. Within 1-2 seconds, all 4 monitor lights should come on. If tester lights do not illuminate, ABS tester is faulty.

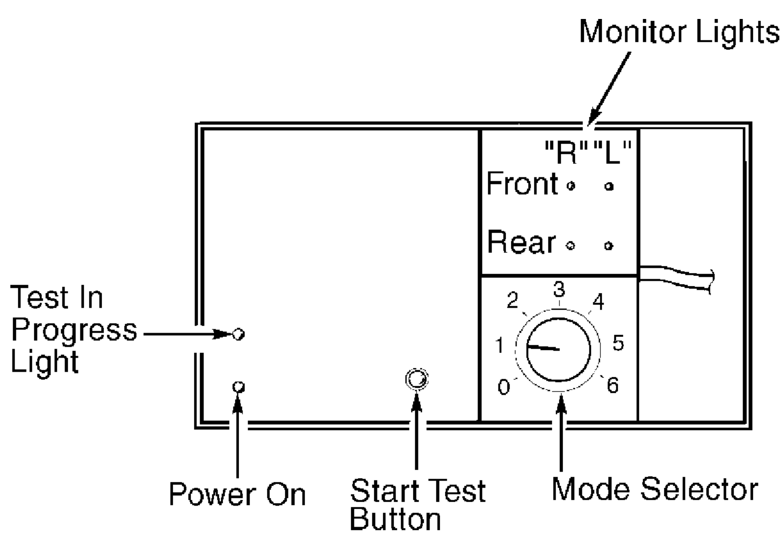

Fig. 3: Identifying ABS Tester Lights & Functions
Courtesy of American Honda Motor Co., Inc.

2) If ABS warning light comes on, 6-pin connector or ABS tester harness is faulty. Turn mode selector to "2" position. Press brake pedal. Push START TEST button. ABS warning light should not come on and kickback should be felt on brake pedal.

3) If ABS warning light comes on or kickback is not felt, see ANTI-LOCK (ABS) WARNING LIGHT under TROUBLE SHOOTING. Place mode selector in "3", "4" and then "5" positions. Repeat step 2) for each test mode. Results should be same as in test mode "2". If results are not same as in test mode "2", see ANTI-LOCK (ABS) WARNING LIGHT under TROUBLE SHOOTING.

4) Breakdown of each test mode is as follows:

Mode 1
Sends simulated driving signal of each wheel to control unit to check self-diagnostic circuit. No kickback should be felt in brake pedal.

Mode 2
Sends driving signal of each wheel, and then sends lock signal of left rear wheel to control unit. A kickback should be felt in brake pedal.

Mode 3
Sends driving signal of each wheel, and then sends lock signal of right rear wheel to control unit. A kickback should be felt in brake pedal.

Mode 4
Sends driving signal of each wheel, and then sends lock signal of left front wheel to control unit. A kickback should be felt in brake pedal.

Mode 5
Sends driving signal of each wheel, and then sends lock signal of right front wheel to control unit. A kickback should be felt in brake pedal.

5) If brake pedal does not kickback in Modes 2-5 as indicated and ABS indicator light does not come on, repeat function test several times. If test results remain the same. check for air in high pressure line, restriction in high pressure line or faulty modulator unit.

SPEED SENSOR TEST

1) Turn ignition off, and connect ABS Tester (07HAJ-SG0010A or 07HAJ-SG0010B) to Orange 6-pin test connector, located under passenger's seat. Turn ignition on. Place ABS tester mode selector to "0" position.

2) Raise and support vehicle so wheels can be turned. Place transmission in Neutral. Turn wheels by hand at one revolution per second. Appropriate monitor light should blink each time wheel is rotated.

3) In some instances, front wheels may not rotate fast enough to make tester light blink. If this happens, start engine. Slowly accelerate and decelerate front wheels. If light does not blink, check appropriate speed sensor, sensor air gap and wiring.

MODULATOR SOLENOID LEAK TEST

1) Park vehicle on level surface. Block wheels, and place automatic transmission in Park or manual transmission in Neutral. Turn ignition off. Connect ABS Tester (07HAJ-SG0010A or 07HAJ-SG0010B) to Orange 6-pin test connector, located under passenger's seat.

2) Remove modulator reservoir filter, and fill reservoir to MAX level. DO NOT use aerated brake fluid bled from power unit. Use ABS "T" Wrench (07HAA-SG00101) to relieve accumulator line pressure. See Fig. 2.

3) Start engine, and release parking brake. Place ABS tester mode selector to "1" position. Push START TEST button. See Fig. 3. With pump motor running, place finger over top of solenoid return tube inside modulator reservoir. See Fig. 4. If equipped with separator in reservoir, place finger over separator.

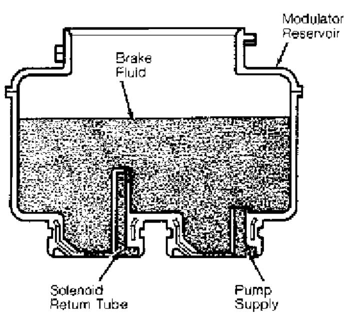

Fig. 4: Locating Sol. Return Tube In Modulator Reservoir (Typical)
Courtesy of American Honda Motor Co., Inc.

4) If brake fluid is felt coming from return tube or passing through separator, a solenoid is leaking. Proceed to next step. If brake fluid is not felt coming from return tube or through separator, solenoids are okay. Install modulator reservoir filter, and refill reservoir to MAX level.

5) Relieve accumulator line pressure again. Place ABS tester mode selector to "3", "4" and "5" positions. Repeat pressure relief procedure at least 3-4 times at each position. Repeat steps 3) and 4).

6) If solenoid leakage has stopped, install modulator reservoir filter, and refill reservoir to MAX level. If any solenoid is still leaking, replace modulator.

RELAY TEST

Check continuity between relay terminals "A" and "B". See Figs. 5 & 6. Continuity should not exist. Apply battery voltage across terminals "C" and "D". Continuity should exist between terminals "A" and "B". If continuity is not as indicated, replace relay.

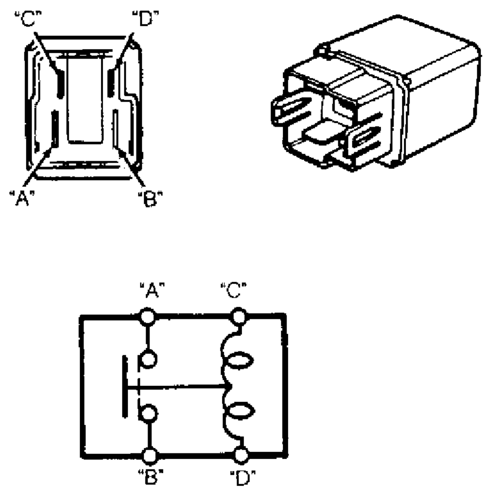

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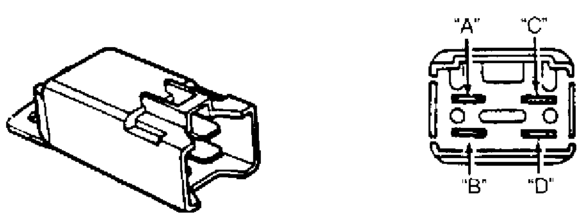
Fig. 5: Identifying Motor Relay Terminal
Courtesy of American Honda Motor Co., Inc.



93J46242

FAIL-SAFE RELAY

Fig. 6: Identifying Relay Terminals
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

ABS CONTROL UNIT

Removal & Installation

Open trunk and remove right side trim panel. Disconnect electrical connectors. Remove ABS control unit bolts, and remove

control unit. See Fig. 1. To install, reverse removal procedure. Turn ignition on and observe ABS warning light. ABS system is okay if ABS warning light goes out after engine is started.

ACCUMULATOR

WARNING: Accumulator contains high-pressure nitrogen gas. DO NOT puncture, expose to flame or attempt to disassemble accumulator. Explosion and serious injury could result.

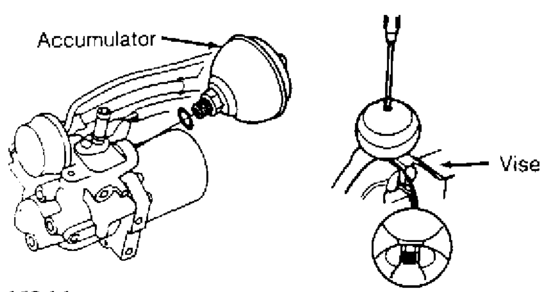
Removal & Installation

1) Relieve accumulator line pressure. See RELIEVING ACCUMULATOR/LINE PRESSURE under BLEEDING BRAKE SYSTEM. Secure pump assembly in vise. Using an open end wrench on accumulator mounting boss, unscrew and remove accumulator. See Fig. 7.

NOTE: Before disposal, accumulator pressure MUST be relieved. Failure to relieve accumulator pressure could result in explosion and serious injury.

2) To depressurize accumulator, secure accumulator in vise with relief plug pointing straight up. DO NOT tighten accumulator body in vise. SLOWLY turn relief plug 3 1/2 turns, and wait at least 3 minutes for all pressure to escape. Remove relief plug, and dispose of accumulator.

3) To install, reverse removal procedure. If necessary, bleed air from system. See ACCUMULATOR, MODULATOR and ABS PUMP (POWER UNIT) BLEEDING under BLEEDING BRAKE SYSTEM.



93B46244

Fig. 7: Removing & Depressurizing Accumulator
Courtesy of American Honda Motor Co., Inc.

SPEED SENSOR

Removal & Installation

Unplug speed sensor connector. Remove mounting bolts. Remove speed sensor from vehicle. To install, reverse removal procedure.

Ensure air gap between speed sensor and trigger wheel (pulser) is .016-.039" (.40-1.0 mm). If air gap exceeds specification at any point, probable cause is a distorted knuckle. Replace knuckle. See HUB & KNUCKLE under REMOVAL & INSTALLATION in SUSPENSION - FRONT article in SUSPENSION section.

PULSER (TRIGGER WHEEL)

Removal and installation procedures not available from manufacturer.

MODULATOR/PUMP ASSEMBLY

Removal & Installation

1) Relieve accumulator/line pressure. See RELIEVING ACCUMULATOR/LINE PRESSURE. Drain fluid from modulator assembly. Remove intake air duct and emission control box. Disconnect solenoid, pump motor and pressure switch connectors.

2) Disconnect brake pipes from modulator. Disconnect brake hose from modulator reservoir. Remove clamp from modulator bracket. Remove mounting bolts. Remove modulator assembly. To install, reverse removal procedure. Bleed hydraulic system. See BLEEDING BRAKE SYSTEM.

PRESSURE SWITCH

Removal & Installation

Secure modulator/pump assembly in vise. Remove banjo bolt and sealing washers. Remove pressure switch. To install, reverse removal procedure, using NEW sealing washers.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Banjo Bolt Fittings	26 (35)
Brake Line Flare Nuts	14 (19)
Modulator Mounting Bolts	16 (22)
Speed Sensor Mounting Bolts	16 (22)
	INCH Lbs. (N.m)
ABS Control Unit Mounting Bolts	84 (9.5)
ABS Pump Mounting Bolts	89 (10)
Accumulator Mounting Bolts	89 (10)
Maintenance Bleeder Screw	48 (5.4)

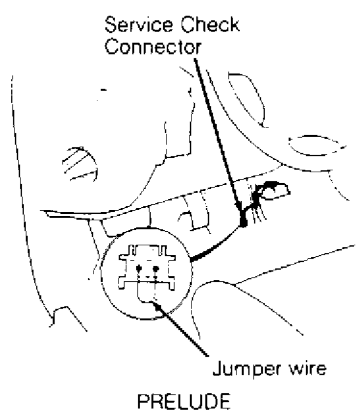
SELF-DIAGNOSTICS

RETRIEVING TROUBLE CODES

1) Turn ignition on (without engine running). Ensure ABS warning light comes on. Start engine, and observe ABS warning light. If warning light goes out, no trouble codes exist.

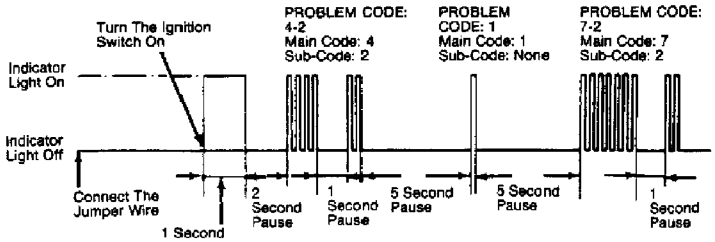
2) If ABS warning light stays on, turn ignition off. Remove access cover on passenger-side of center console to locate 2-pin connector. See Fig. 8. Install jumper wire between pins on 2-pin connector. Turn ignition on (without engine running). Record blinking ABS warning light sequence. See Fig. 9.

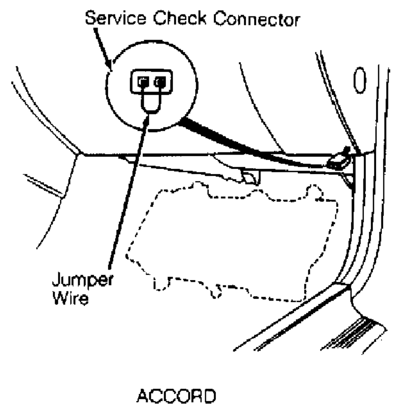
3) After ignition is turned on, ABS warning light will turn on for one second, then pause for 2 seconds before blinking first code. First code number indicates main code and second code number indicates sub code. Three codes can be set at once. To recheck sequence, turn ignition off for a few seconds, and then turn it on again. After trouble codes have been retrieved, conduct appropriate test procedures outlined in flow charts. See ABS SELF-DIAGNOSTIC FLOW CHARTS.



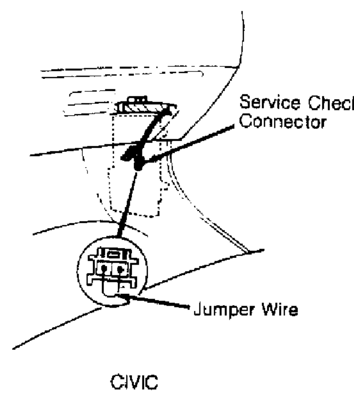
93E46239

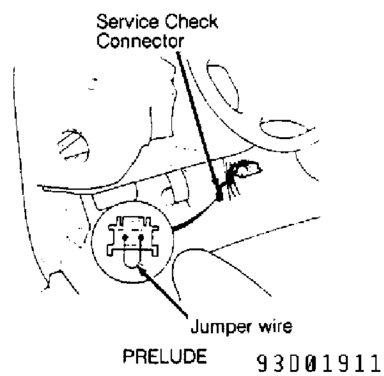
Fig. 8: Identifying Service Check Connector
Courtesy of American Honda Motor Co., Inc.





PROBLEM CODE		PROBLEMATIC COMPONENT/ SYSTEM	AFFECTED				OTHER COMPONENT
MAIN CODE	SUB-CODE		FRONT RIGHT	FRONT LEFT	REAR RIGHT	REAR LEFT	
1	–	Pump motor over-run	–	–	–	–	Pressure switch
	2	Pump motor circuit problem	–	–	–	–	Motor relay, Unit fuse, Motor fuse
	3	High pressure leakage	–	–	–	–	Solenoid
	4	Pressure switch	–	–	–	–	
	8	Accumulator gas leakage	–	–	–	–	
2	1	Parking brake switch-related problem	–	–	–	–	Brake fluid level switch BRAKE light
3	1	Pulser(s)	O				
	2			O			
	4				O	O	
4	1	Speed sensor	O				
	2			O			
	4				O		
	8					O	
5	–	Speed sensor(s)			O	O	Modulator
	4				O		
	8					O	
6	–	Fail-safe relay (Open, short)	–	–	–	–	Front or rear fail-safe relay
	1		–	–	–	–	Front fail-safe relay
	4		–	–	–	–	Rear fail-safe relay
7	1	Solenoid related problem (Open)	O				ABS B1 fuse
	2			O			Front fail-safe relay
	4				O	O	Rear fail-safe relay





93D01911

Fig. 9: Self-Diagnostics & Trouble Code Diagnosis Chart
Courtesy of American Honda Motor Co., Inc.

CLEARING TROUBLE CODES

With ignition off, remove ABS fuse No. B2 for at least 3 seconds. Install fuse, and turn ignition on. Observe ABS warning light. Codes are cleared if ABS warning light goes out after engine is started.

TROUBLE CODES

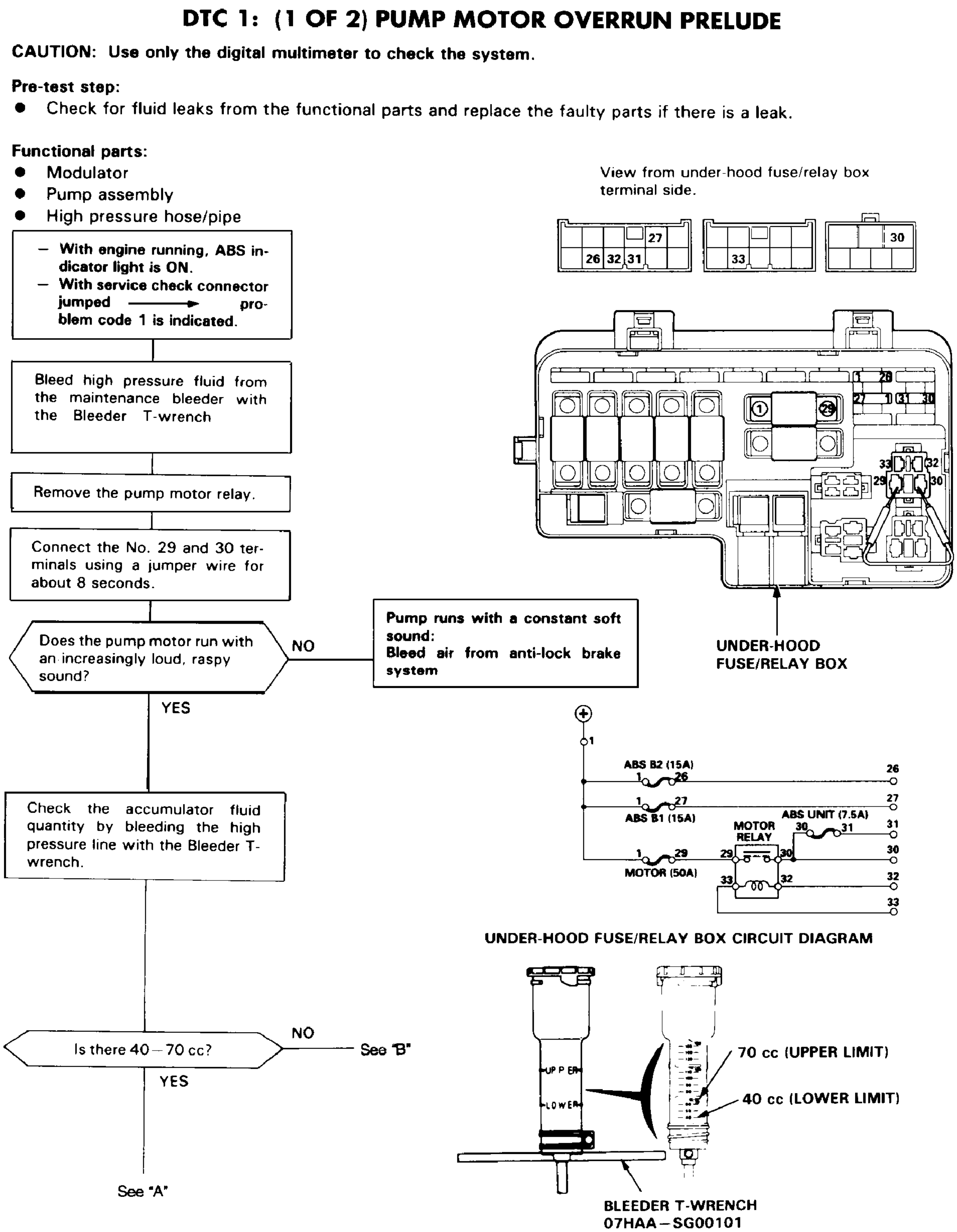
TROUBLE CODES TABLE

Code	System Affected
1 To 1-8	Hydraulically Controlled Components
2-1	Parking Brake Switch
3-1 To 3-4	Pulser(s)
4-1 To 4-8	Front & Rear Speed Sensor(s)
5 To 5-8	Rear Speed Sensor(s)
6 To 6-4	Front & Rear Fail-Safe Relay(s)
7-1 To 7-4	Front & Rear Solenoid(s)

ABS SELF-DIAGNOSTIC FLOW CHARTS

CODE 1 PUMP MOTOR OVERRUN

ANTI-LOCK E



93D02053

Fig. 10: Code 1 Flow Chart (1 Of 2), Pump Motor Overrun
Courtesy of American Honda Motor Co., Inc.

DTC 1: (2 OF 2) PUMP MOTOR OVERRUN PRELUDE

"B"

Connect the No. 29 and No. 30 terminals using a jumper wire for about 10 seconds.

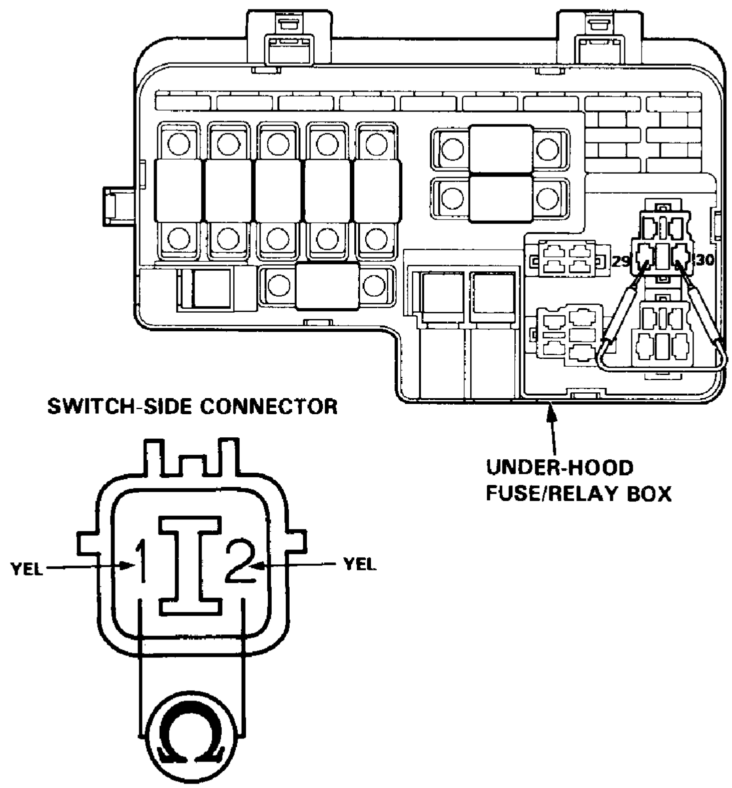
↓

Check if there is any change in the fluid level in the reservoir tank.

↓

Is there any change?

- NO → **Faulty pump motor (Relief valve is defective and open).**
- YES → **Faulty solenoid (leakage).**



"A"

Connect the No. 29 and No. 30 terminals using a jumper wire for about 10 seconds.

↓

Disconnect the pressure switch 2-P connector and check the continuity between the No. 1 (YEL) and No. 2 (YEL) terminals.

↓

Is there continuity?

- NO → **Faulty pressure switch.**
- YES → **Vehicle is OK at this time.**

93F02054

Fig. 11: Code 1 Flow Chart (2 Of 2), Pump Motor Overrun
Courtesy of American Honda Motor Co., Inc.

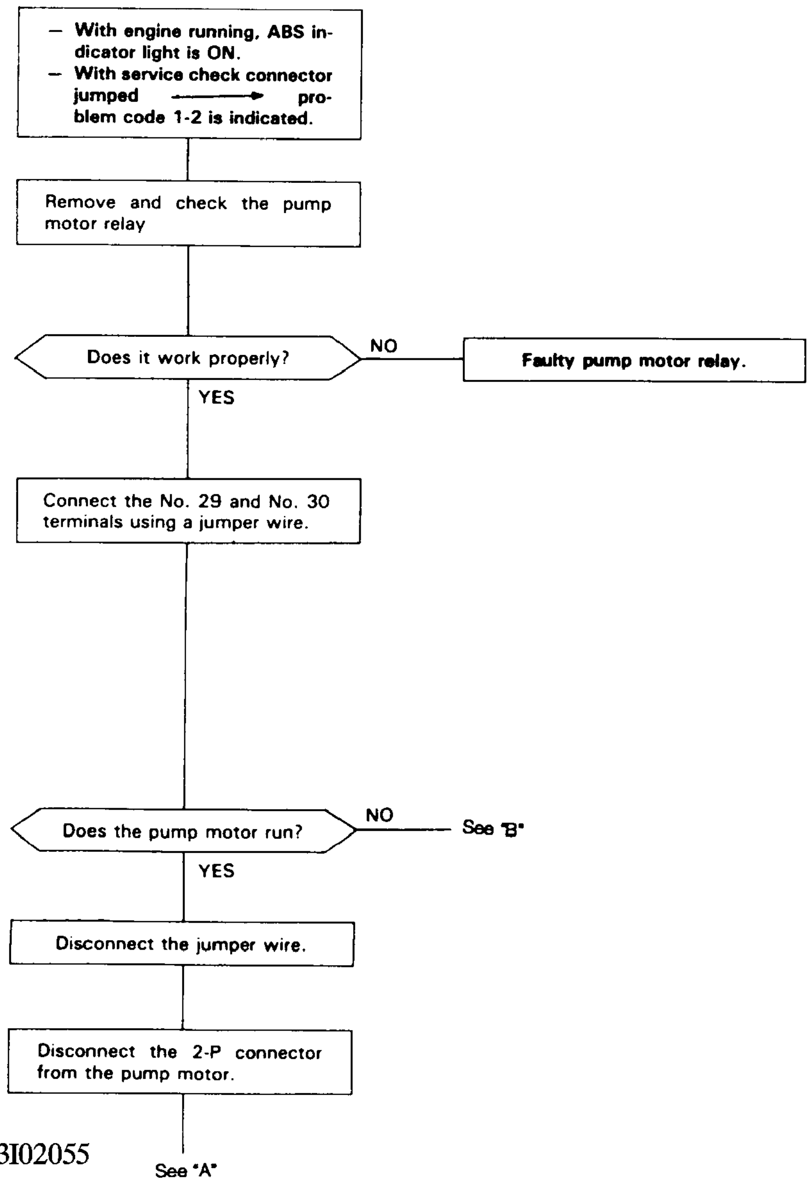
CODE 1-2 PUMP MOTOR CIRCUIT

Problem Code 1-2: Pump Motor Circuit Problem

CAUTION: Use only the digital multimeter to check the system.

NOTE: If a malfunction is detected, this code appears and the fail-safe function is activated. The indicator light comes ON after restarting the engine until the malfunction code is erased (by disconnecting the ABS B2 fuse for 3 seconds).

Pre-test steps:
- Check ABS MOTOR (50 A) FUSE
- Check ABS UNIT (7.5 A) FUSE
- Check for loose under-hood fuse/relay box connectors.



93I02055

Fig. 12: Code 1-2 Flow Chart (1 Of 3), Pump Motor Circuit
Courtesy of American Honda Motor Co., Inc.

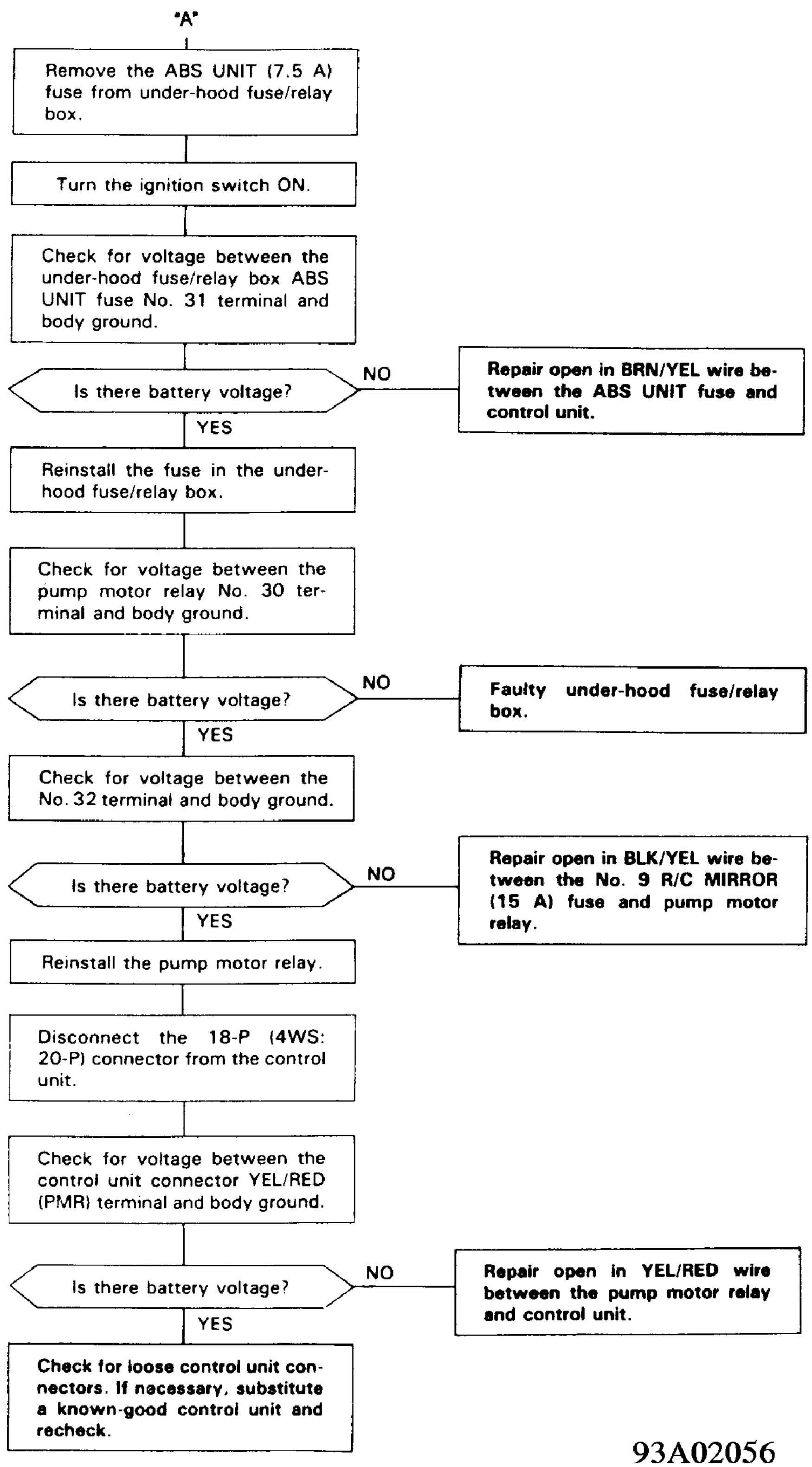
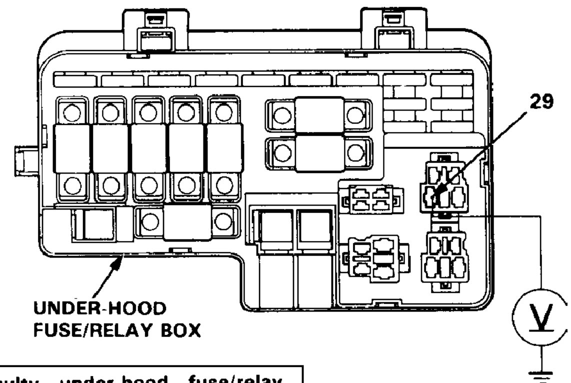


Fig. 13: Code 1-2 Flow Chart (2 Of 3), Pump Motor Circuit
Courtesy of American Honda Motor Co., Inc.

DTC 1-2: (3 OF 3) PUMP MOTOR CIRCUIT PRELUDE

"B"

Check for voltage between the No. 29 terminal and body ground.



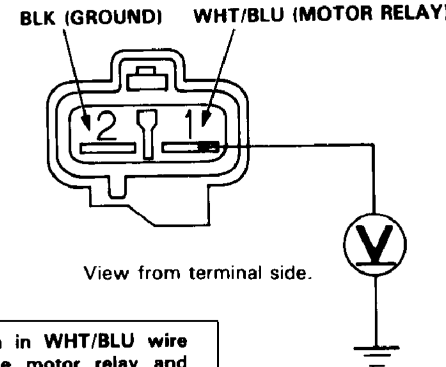
Is there battery voltage?

NO → Faulty under-hood fuse/relay box.

YES

Disconnect the 2-P connector from the pump motor.

Check for voltage between the No. 1 (WHT/BLU) terminal and body ground.

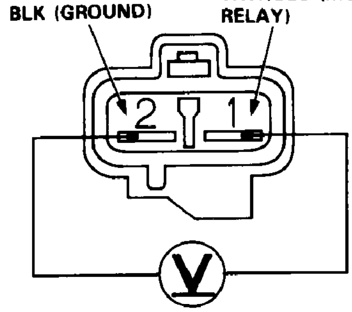


Is there battery voltage?

NO → Repair open in WHT/BLU wire between the motor relay and pump motor.

YES

Check for voltage between the No. 1 (WHT/BLU) terminal and No. 2 (BLK) terminal.



Is there battery voltage?

NO → Repair open in BLK wire between the pump motor and ground or poor ground

YES

Faulty pump motor.

93C02057

Fig. 14: Code 1-2 Flow Chart (3 Of 3), Pump Motor Circuit
Courtesy of American Honda Motor Co., Inc.

CODE 1-3 HIGH PRESSURE LEAKAGE

DTC 1-3 HIGH PRESSURE LEAKAGE PRELUDE

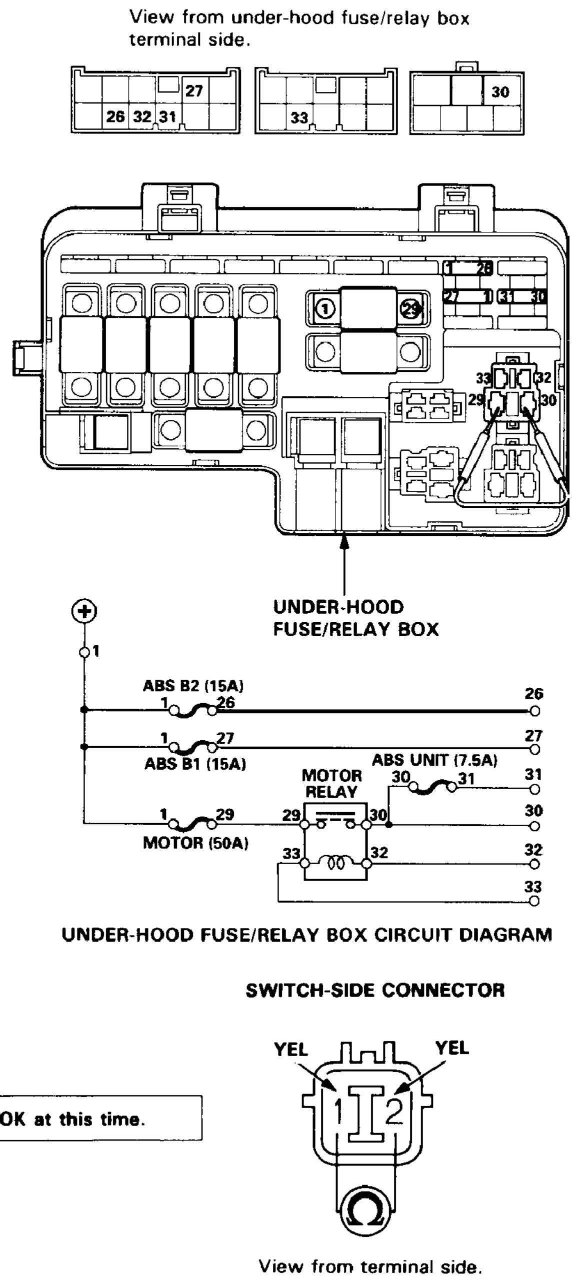
CAUTION: Use only the digital multimeter to check the system.

Pre-test steps:

- Check reservoir fluid level, and if necessary, fill to the MAX level.
- Check for fluid leaks from the functional parts and replace the faulty parts if there is a leak.

Functional parts:

- Modulator
- Pump assembly
- High pressure hose/pipe



- With engine running, ABS indicator light is ON.
- With service check connector jumped → problem code 1-3 is indicated.

↓

Bleed high pressure fluid from the maintenance bleeder with the Bleeder T-wrench

↓

Remove the pump motor relay.

↓

Connect the No. 29 and No. 30 terminals using a jumper wire for about 10 seconds.

↓

Disconnect the 2-P connector from the pressure switch.

↓

After 30 minutes, check for continuity between the No.1 (YEL) and No.2 (YEL) terminals on the switch side of connector.

↓

Is there continuity?

- YES → **Vehicle is OK at this time.**
- NO → **Faulty solenoid (leakage).**

93E02058

Fig. 15: Code 1-3 Flow Chart, High Pressure Leakage
Courtesy of American Honda Motor Co., Inc.

CODE 1-4 PRESSURE SWITCH CIRCUIT

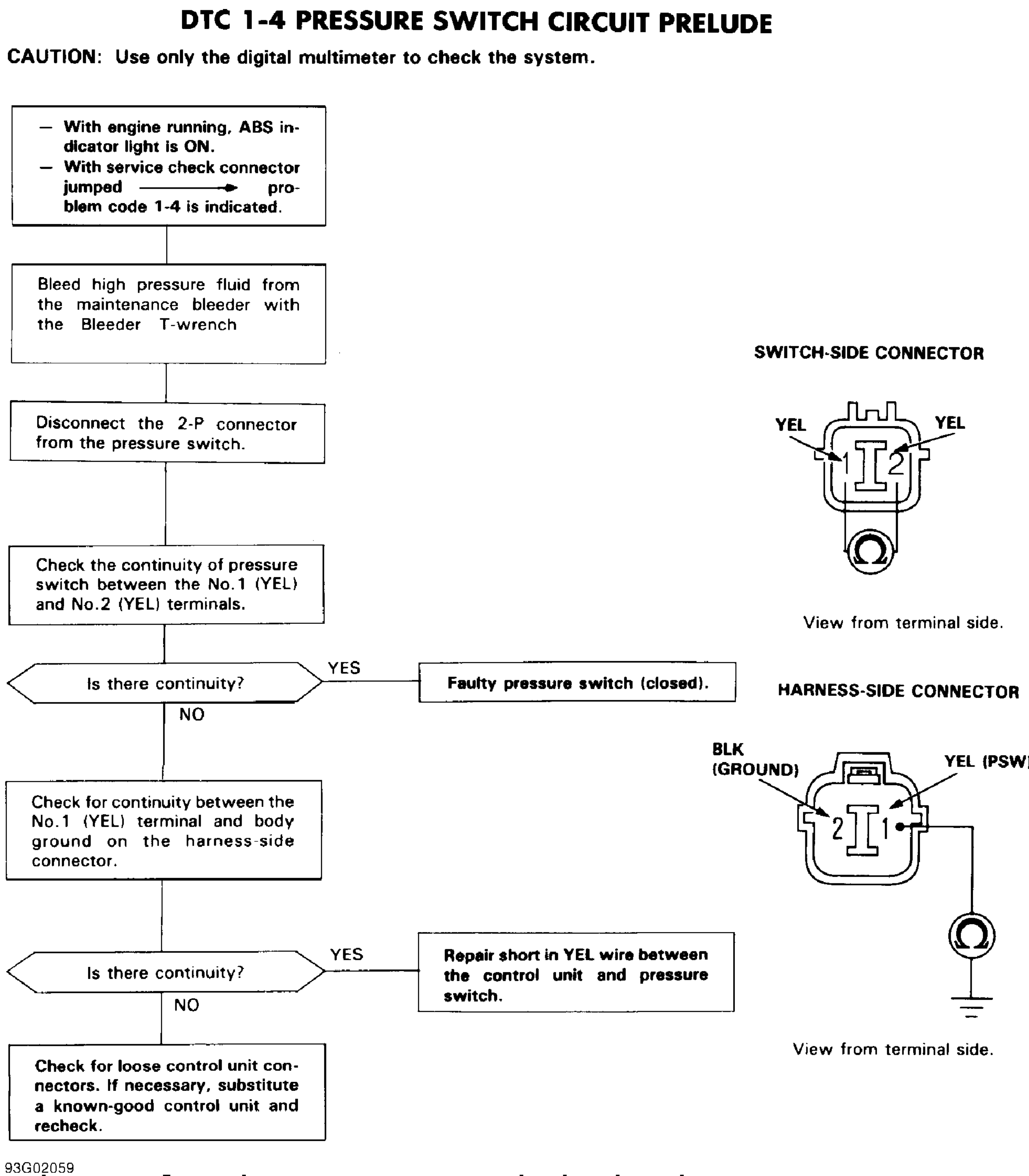


Fig. 16: Code 1-4 Flow Chart, Pressure Switch Circuit
Courtesy of American Honda Motor Co., Inc.

CODE 1-8 ACCUMULATOR GAS LEAKAGE

DTC 1-8 ACCUMULATOR GAS LEAKAGE PRELUDE

Check the following items:

- The relief plug is loose.
- The relief plug O-ring is out of place.
- Bleed the high pressure line with the Bleeder T-wrench. Operate the pump motor for 10 seconds and bleed the high pressure line again with the Bleeder T-wrench. If no fluid or more than 70 cc of fluid come out, it is likely that the gas has leaked out.

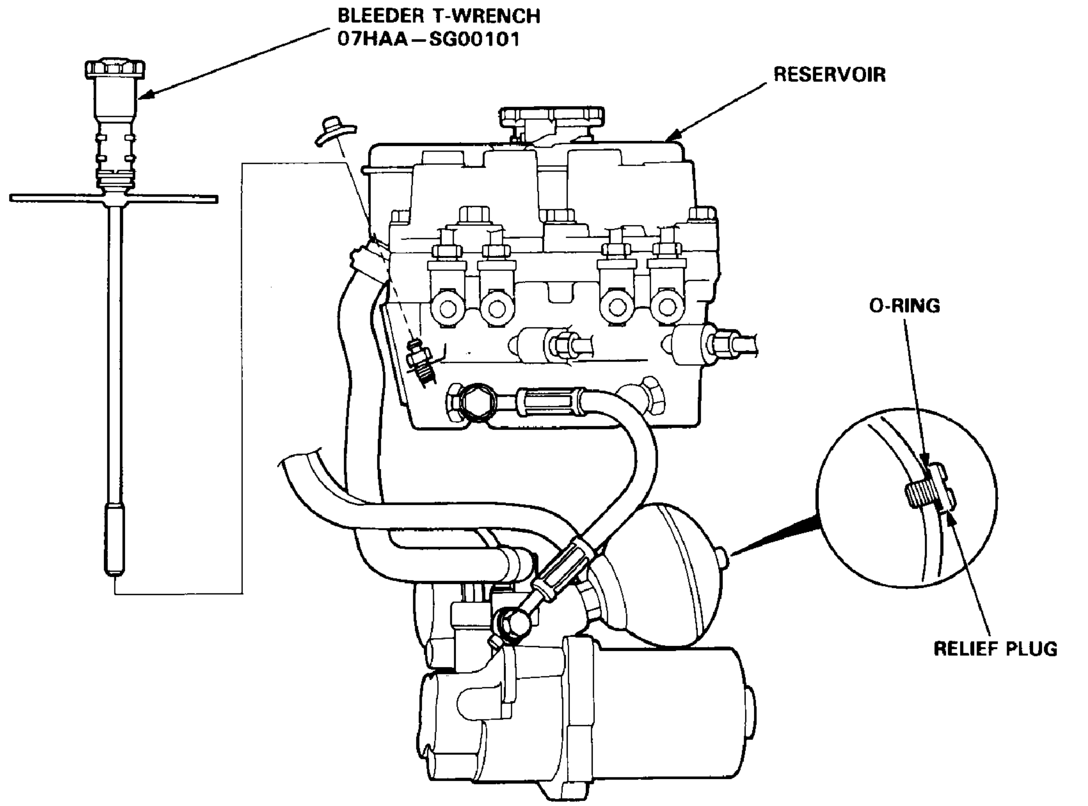


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Fig. 17: Code 1-8, Accumulator Gas Leakage
Courtesy of American Honda Motor Co., Inc.

CODE 2-1 PARKING BRAKE SWITCH

DTC 2-1 PARKING BRAKE SWITCH PRELUDE

If the parking brake has been released, the following items are possible causes. If they are OK, check the control unit connectors for good connection. If not loose or disconnected, substitute a known-good control unit and recheck.

NOTE: Before Troubleshooting Problem Code 2-1, remove the ABS B2 (15 A) fuse for 3 seconds to clear the control unit's memory, then test drive the car.
If the anti-lock brake system indicator light stays off, the probability is that the car was driven with the parking brake applied.

- The parking brake is applied for more than 30 seconds while driving.
- The brake fluid level in the master cylinder is too low.
- GRN/RED wire is shorted between the BRAKE indicator light and parking brake switch.
- GRN/RED wire is shorted between the BRAKE indicator light and brake fluid level switch.
- The BRAKE indicator light is blown.
- GRN/RED wire has an open between the BRAKE indicator light and the control unit.

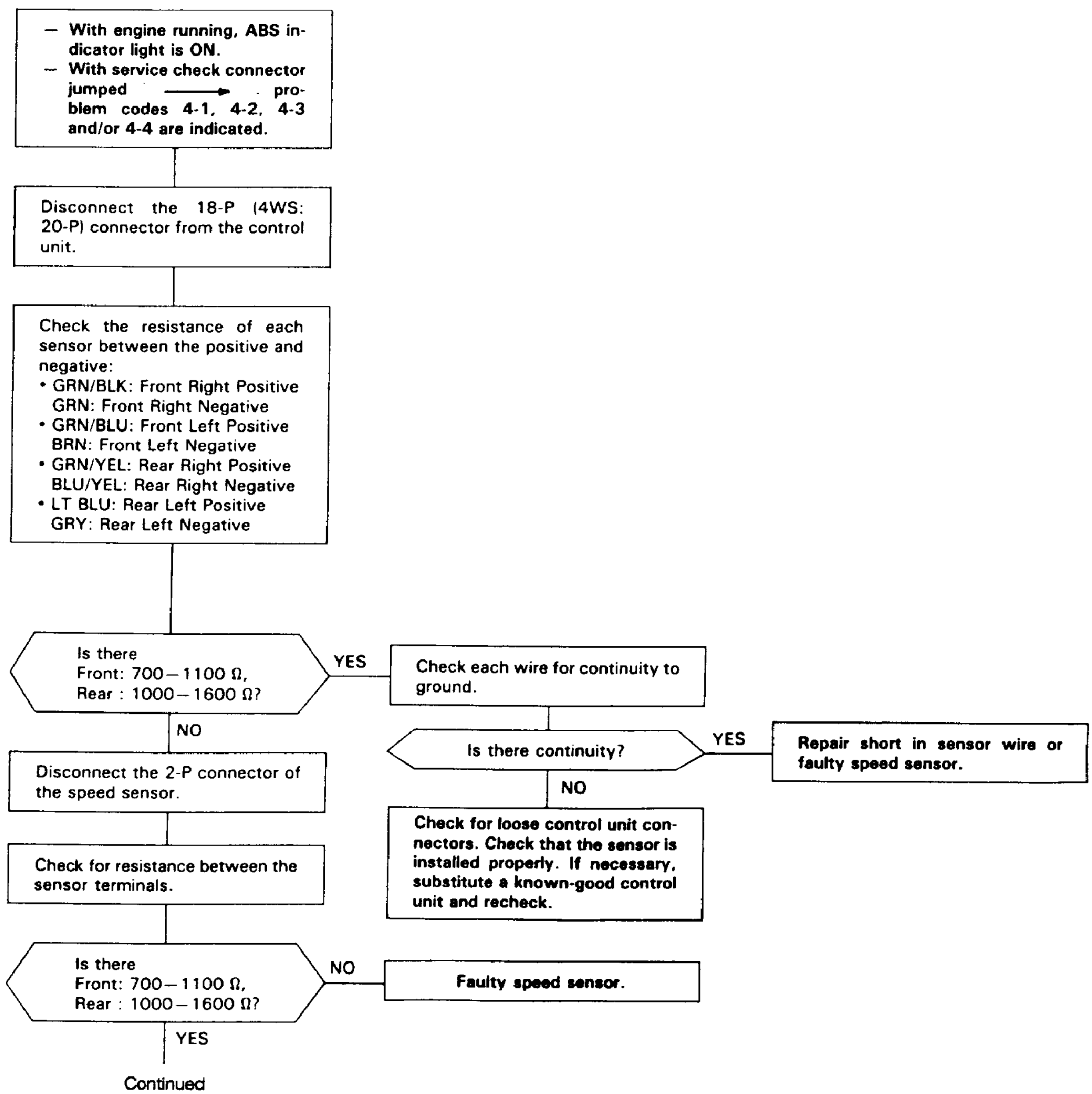
93G02243

Fig. 18: Code 2-1, Parking Brake Switch
Courtesy of American Honda Motor Co., Inc.

CODE 4-1 TO 4-8 SPEED SENSOR

CAUTION: Use only the digital multimeter to check the system.

NOTE: If a malfunction is detected, this code appears and the fail-safe function is activated. The indicator light may come ON after restarting the engine until the malfunction code is erased (by disconnecting the ABS B2 fuse for 3 seconds).



93A02061

Fig. 19: CODE 4-1 TO 4-8 Flow Chart (1 OF 2), SPEED SENSOR
Courtesy of American Honda Motor Co., Inc.

DTC 4-1, 4-2, 4-4 & 4-8: (2 OF 2) SPEED SENSOR PRELUDE

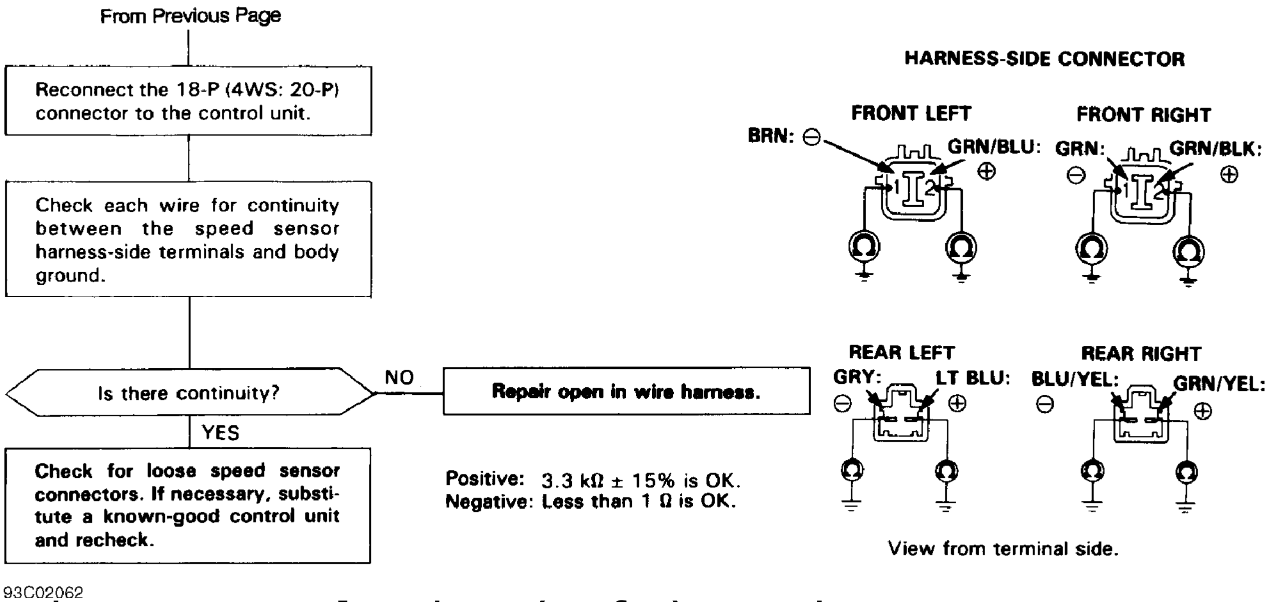


Fig. 20: Code 4-1 To 4-8 Flow Chart (2 Of 2), Speed Sensor
Courtesy of American Honda Motor Co., Inc.

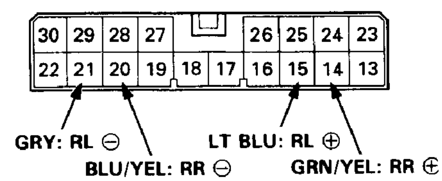
CODE 5 TO 5-8 SPEED SENSOR(S)

DTC 5, 5-4 & 5-8: (1 OF 2) SPEED SENSOR(S) PRELUDE

CAUTION: Use only the digital multimeter to check the system.

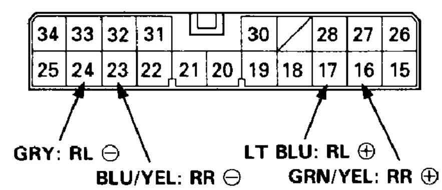
NOTE: If a malfunction is detected, this code appears and the fail-safe function is activated. The indicator light may come ON after restarting the engine until the malfunction code is erased (by disconnecting the ABS B2 fuse for 3 seconds.)

18-P CONNECTOR (2WS)



View from control unit terminal side.

20-P CONNECTOR (4WS)



View from control unit terminal side.

- **With engine running, ABS indicator light is ON.**
- **With service check connector jumped → problem code 5, 5-4 or 5-8 is indicated.**

↓

Disconnect the 18-P (4WS: 20-P) connector from the control unit.

↓

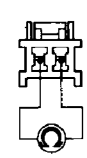
Check the resistance of each sensor between the positive and negative:
- GRN/YEL: Rear Right Positive
  BLU/YEL: Rear Right Negative
- LT BLU: Rear Left Positive
  GRY: Rear Left Negative

↓

Is there 1000 – 1600 Ω?

- YES → Check each wire for continuity to ground.
  - Is there continuity?
    - YES → **Repair short in sensor wire or faulty speed sensor.**
    - NO → Reconnect the 18-P (4WS: 20-P) connector to the control unit. → Connect the ALB checker to the inspection connector. → Check for ABS function in MODE 2 and 3.
      - Does it work properly?
        - NO → **Faulty modulator.**
        - YES → **Check for rear brake drag. If OK, substitute a known-good control unit and recheck.**
- NO → Disconnect the wire harness from speed sensor. → Check for resistance between the sensor terminals.
  - Is there 1000 – 1600 Ω?
    - NO → **Faulty speed sensor.**
    - YES → Continued On Next Page

SENSOR-SIDE CONNECTOR REAR



View from terminal side.

93E02063

Fig. 21: Code 5 To 5-8 Flow Chart (1 Of 2), Speed Sensor(s)
Courtesy of American Honda Motor Co., Inc.

DTC 5, 5-4 & 5-8: (2 OF 2) SPEED SENSOR(S) PRELUDE

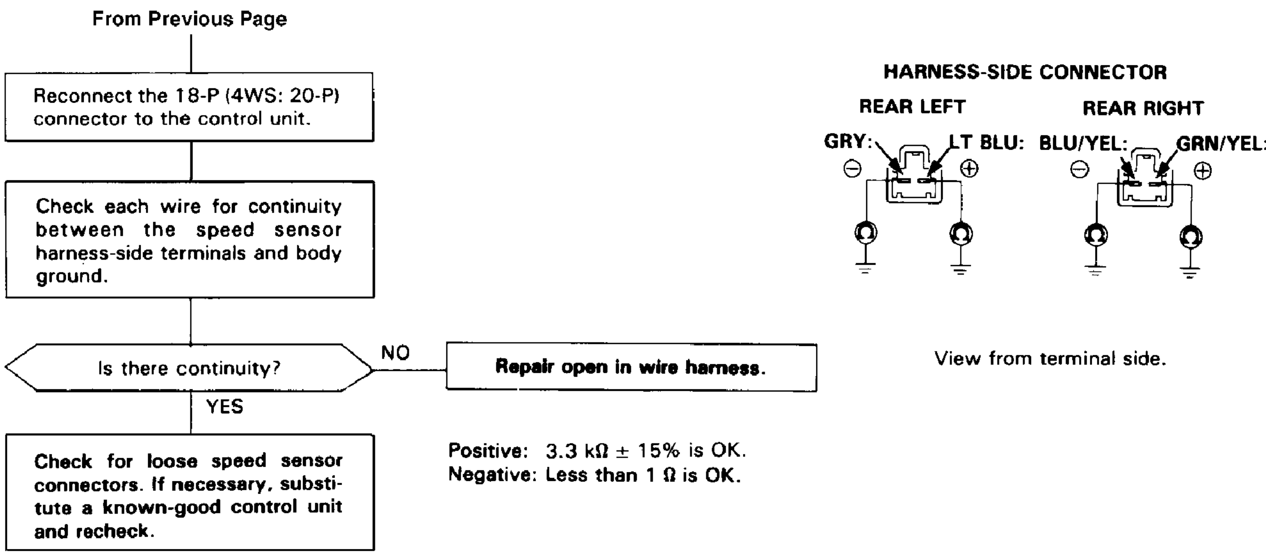


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Fig. 22: Code 5 To 5-8 Flow Chart (2 Of 2), Speed Sensor(s)
Courtesy of American Honda Motor Co., Inc.

CODE 6-1 FRONT FAIL-SAFE RELAY CIRCUIT

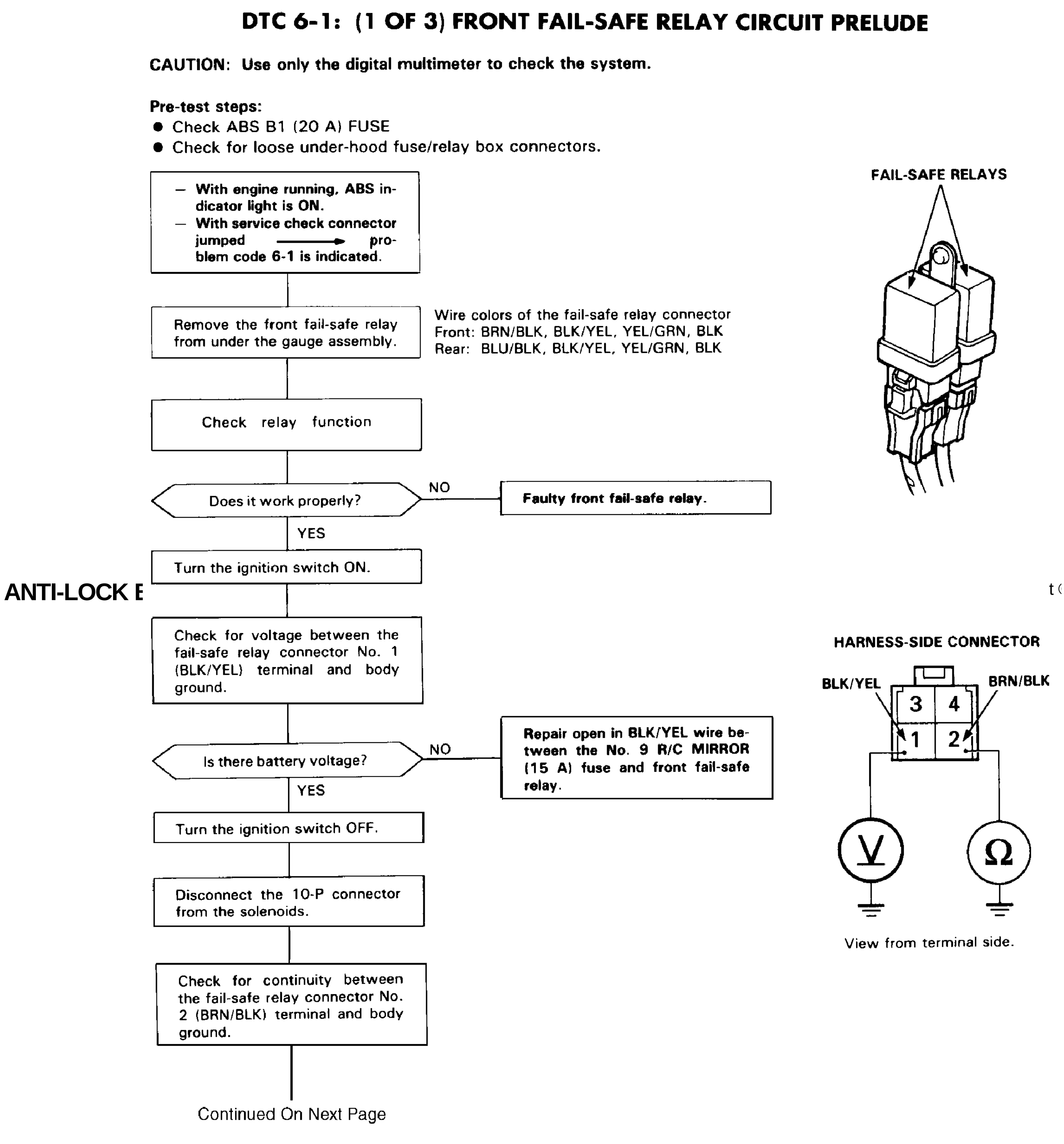


Fig. 23: Code 6-1 Flow Chart (1 Of 3), Front Fail-safe Relay Circuit
Courtesy of American Honda Motor Co., Inc.

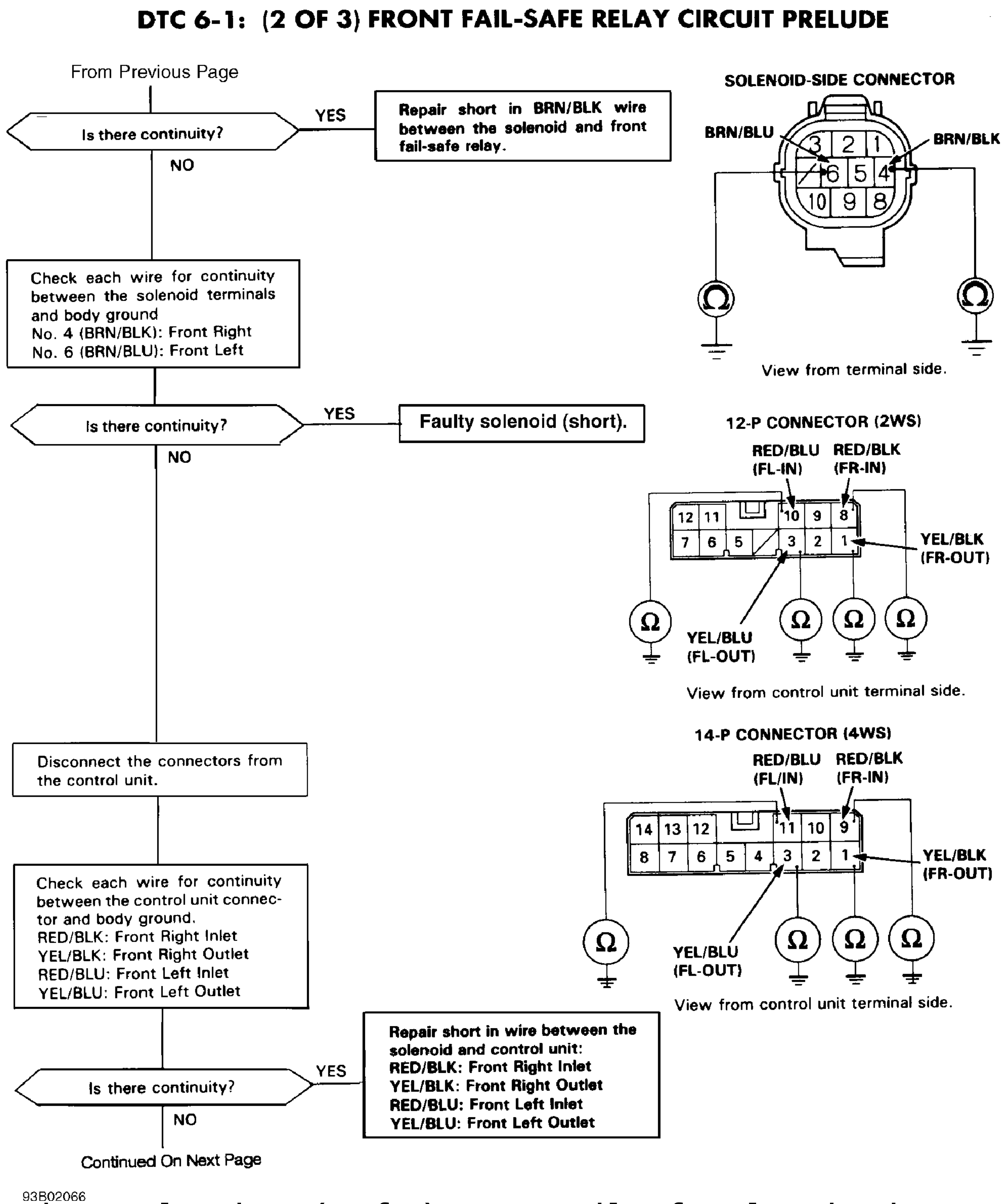


Fig. 24: Code 6-1 Flow Chart (2 Of 3), Front Fail-safe Relay Circuit
Courtesy of American Honda Motor Co., Inc.

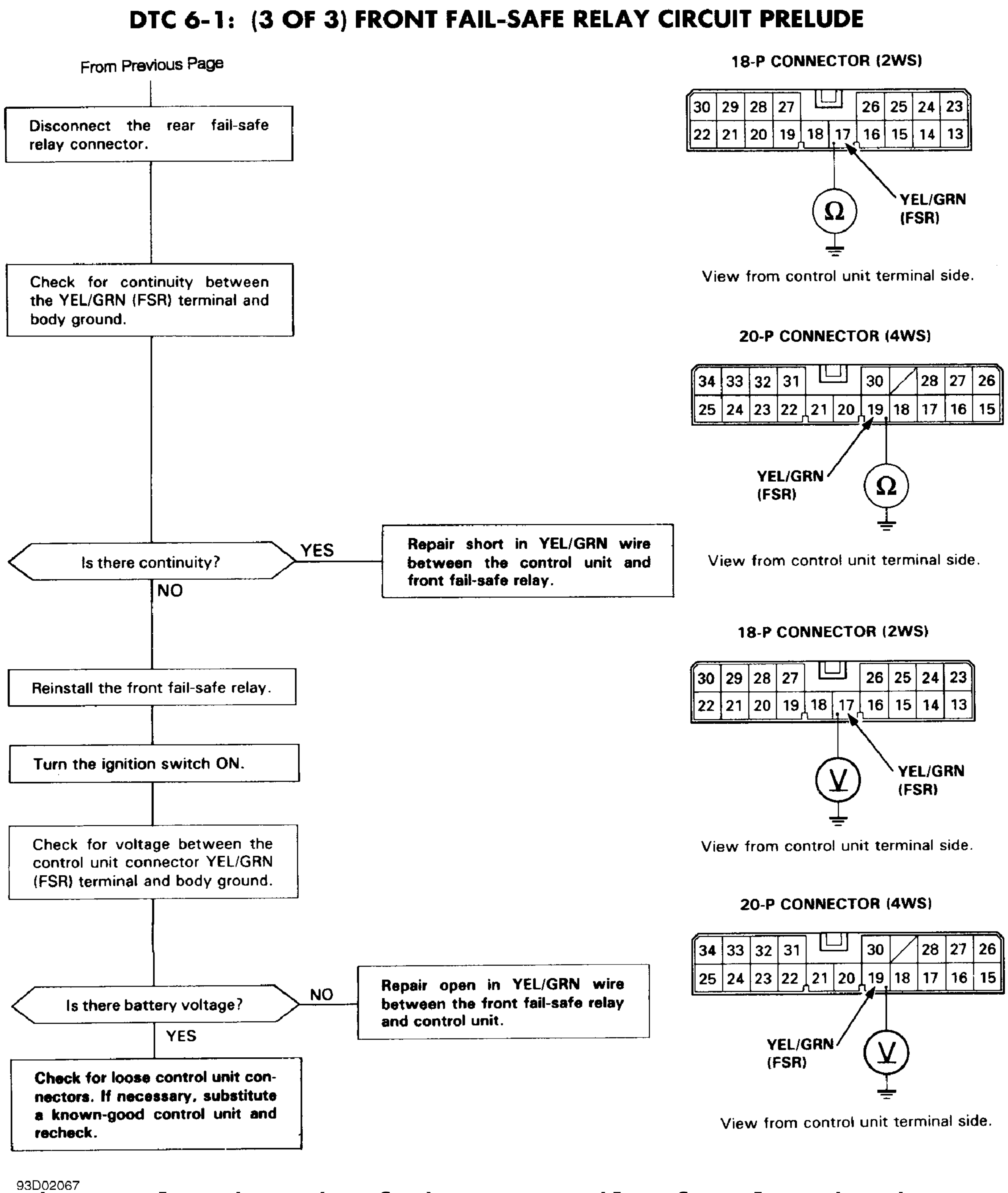


Fig. 25: Code 6-1 Flow Chart (3 Of 3), Front Fail-safe Relay Circuit
Courtesy of American Honda Motor Co., Inc.

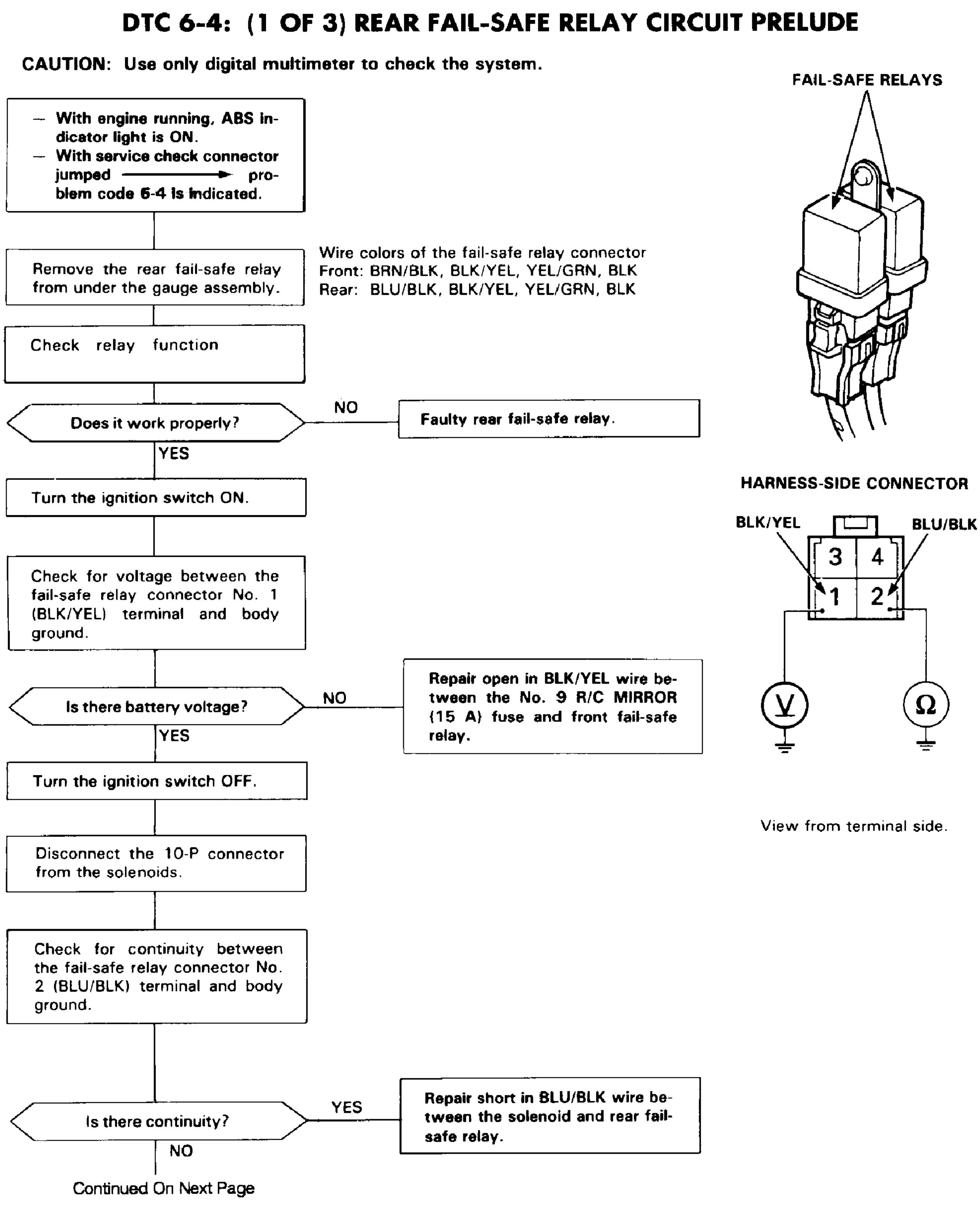


Fig. 26: Code 6-4 Flow Chart (1 Of 3), Rear Fail-safe Relay Circuit
Courtesy of American Honda Motor Co., Inc.

DTC 6-4: (2 OF 3) REAR FAIL-SAFE RELAY CIRCUIT PRELUDE

From Previous Page

Check for continuity between the solenoid No. 5 (BRN/WHT) terminal and body ground.

Is there continuity?

- YES → Faulty solenoid (short).
- NO ↓

Disconnect the connectors from the control unit.

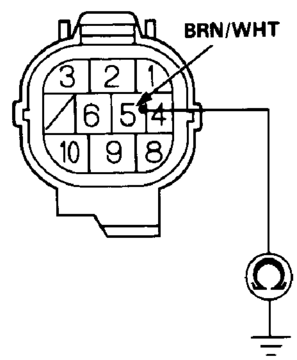
Check each wire for continuity between the control unit connector and body ground.
RED/WHT: Rear Inlet
YEL/WHT: Rear Outlet

Is there continuity?

- YES → **Repair short in wire between the solenoid and control unit:**
  RED/WHT: Rear Inlet
  YEL/WHT: Rear Outlet
- NO ↓

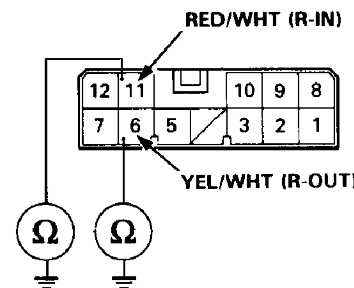
Continued On Next Page

SOLENOID-SIDE CONNECTOR



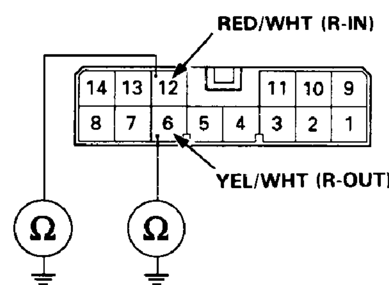
View from terminal side.

12-P CONNECTOR (2WS)



View from control unit terminal side.

14-P CONNECTOR (4WS)



View from control unit terminal side.

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Fig. 27: Code 6-4 Flow Chart (2 Of 3), Rear Fail-safe Relay Circuit
Courtesy of American Honda Motor Co., Inc.

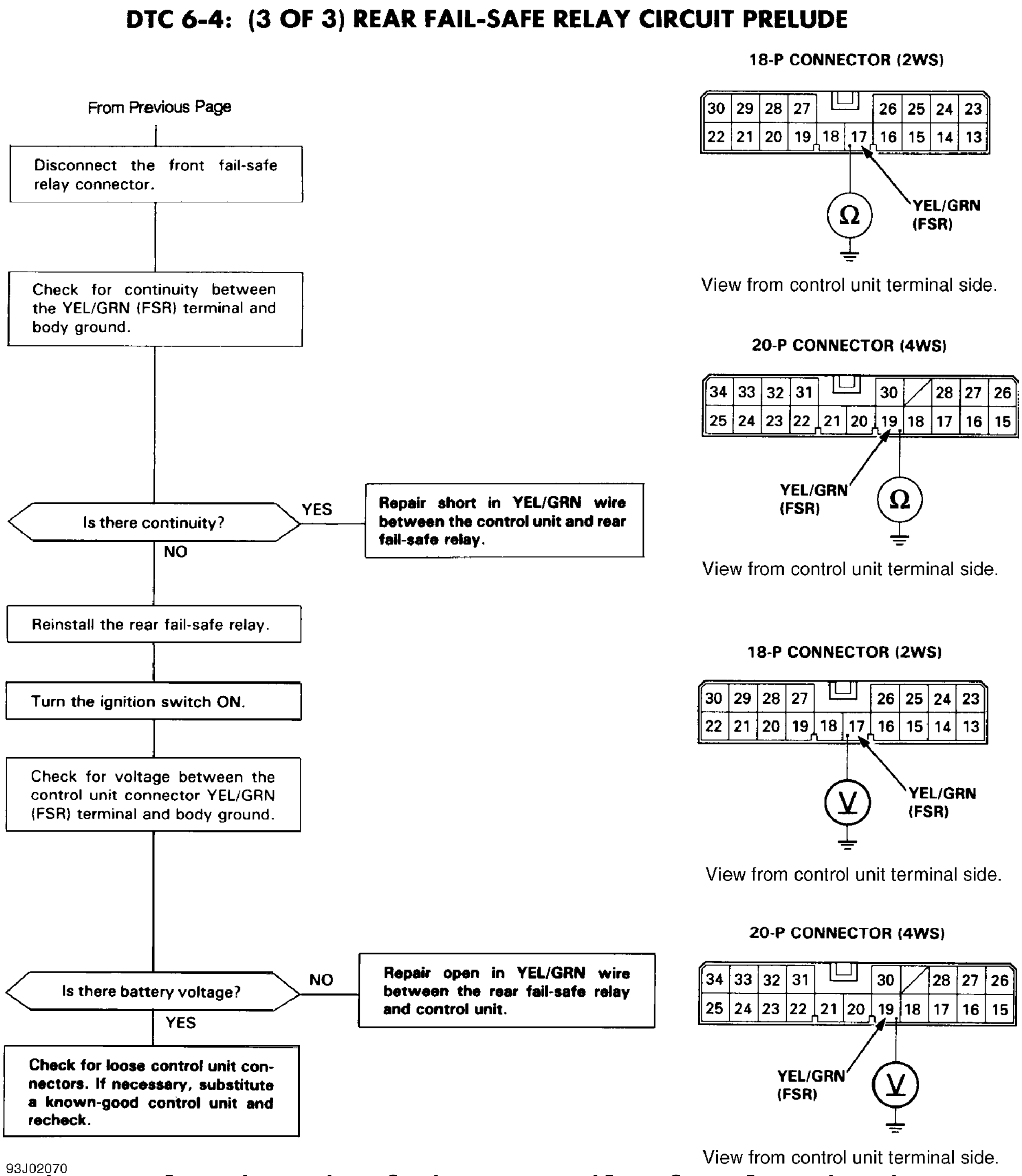


Fig. 28: Code 6-4 Flow Chart (3 Of 3), Rear Fail-safe Relay Circuit
Courtesy of American Honda Motor Co., Inc.

CODE 7-1 & 7-2 FRONT SOLENOID

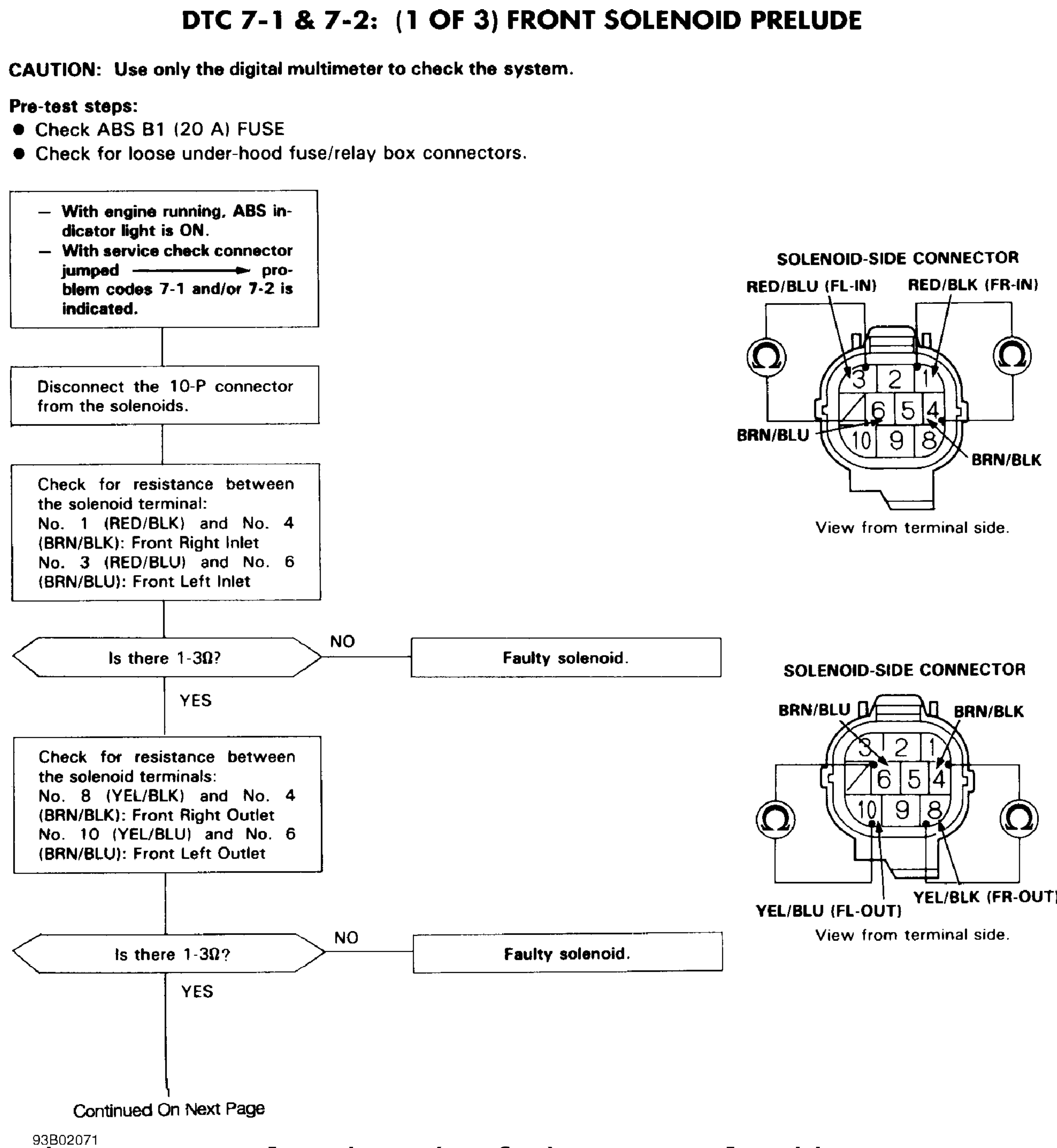
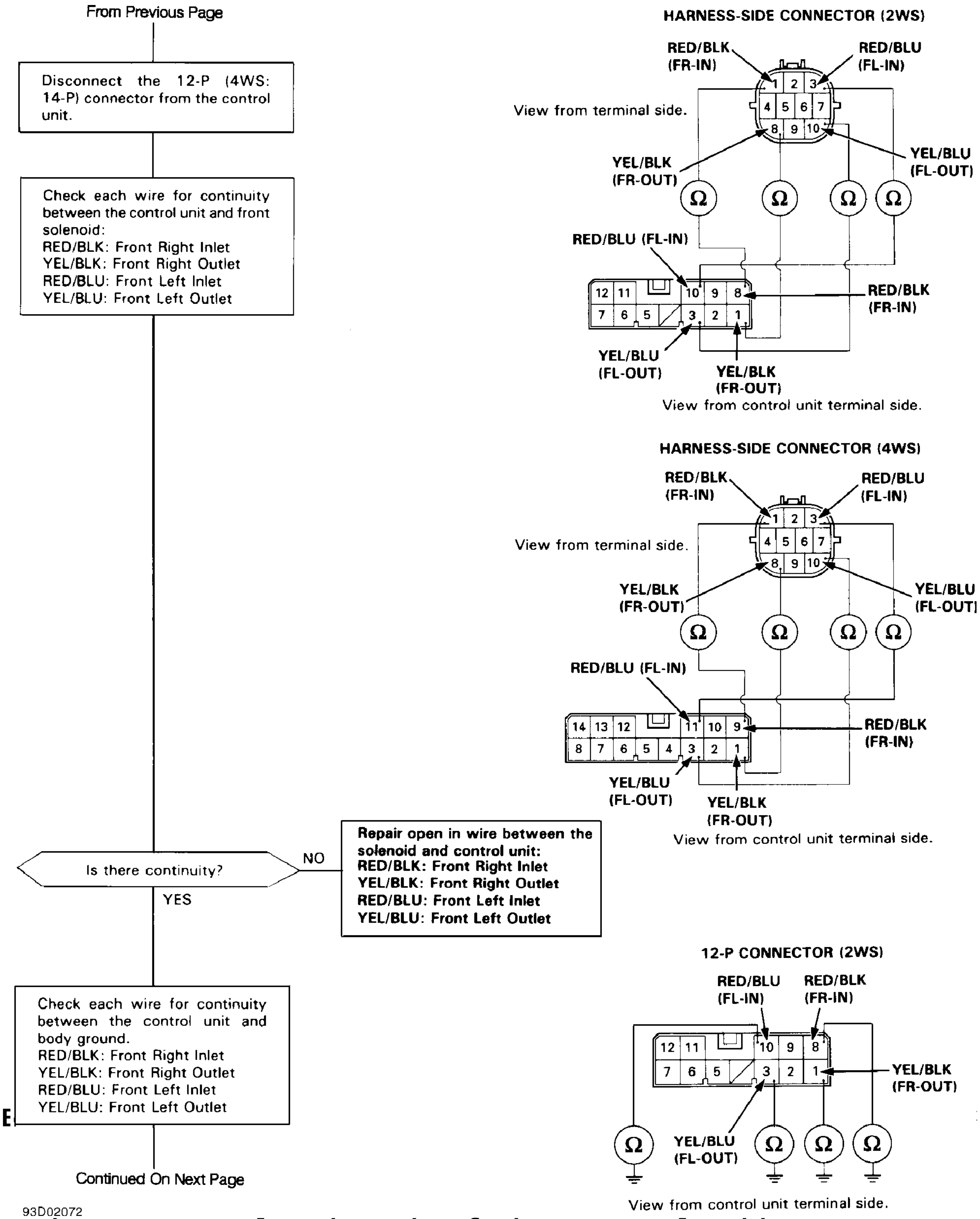


Fig. 29: Code 7-1 & 7-2 Flow Chart (1 Of 3), Front Solenoid
Courtesy of American Honda Motor Co., Inc.



ANTI-LOCK E

Fig. 30: Code 7-1 & 7-2 Flow Chart (2 Of 3), Front Solenoid
Courtesy of American Honda Motor Co., Inc.

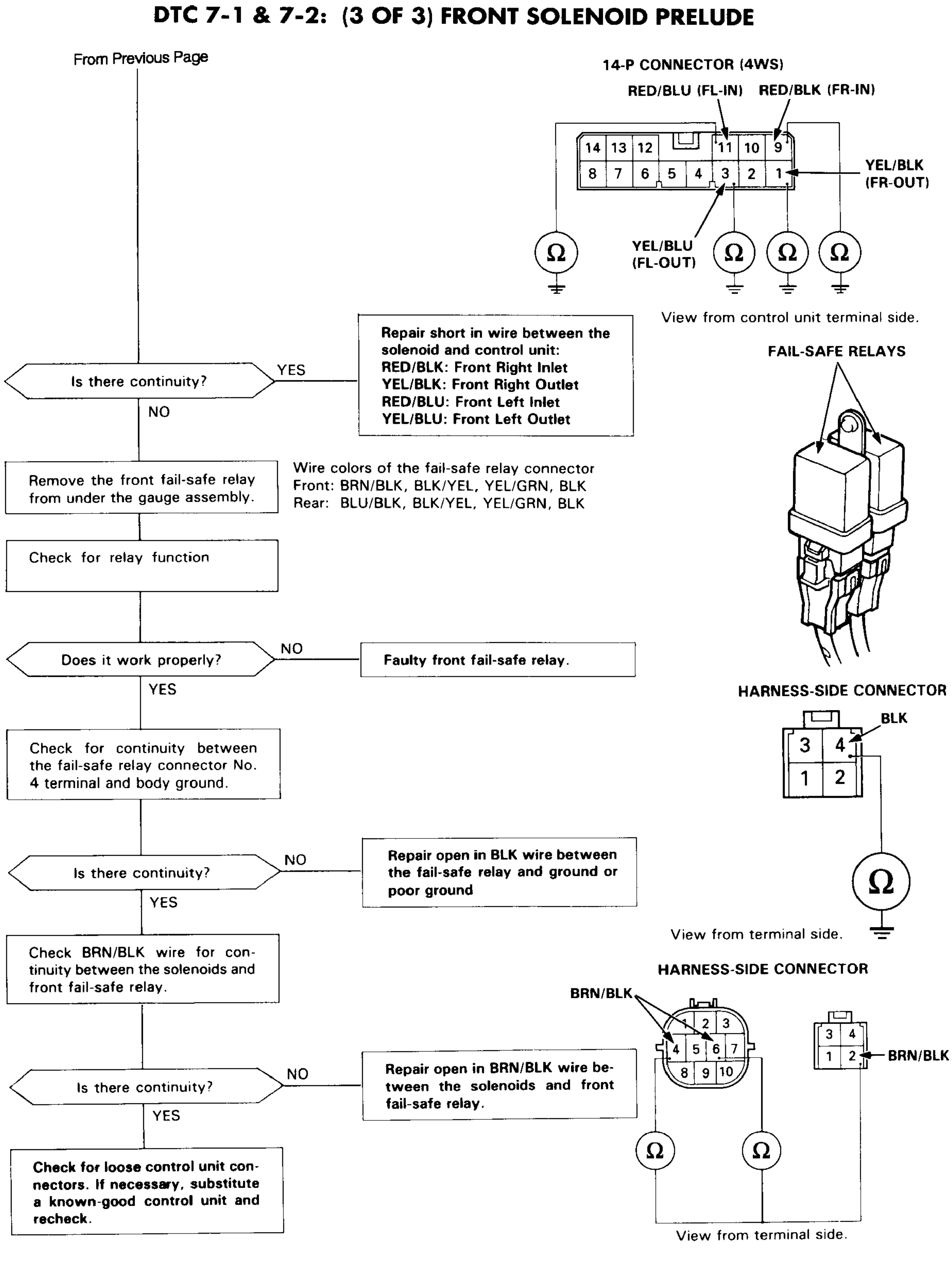


Fig. 31: Code 7-1 & 7-2 Flow Chart (3 Of 3), Front Solenoid
Courtesy of American Honda Motor Co., Inc.

CODE 7-4 REAR SOLENOID

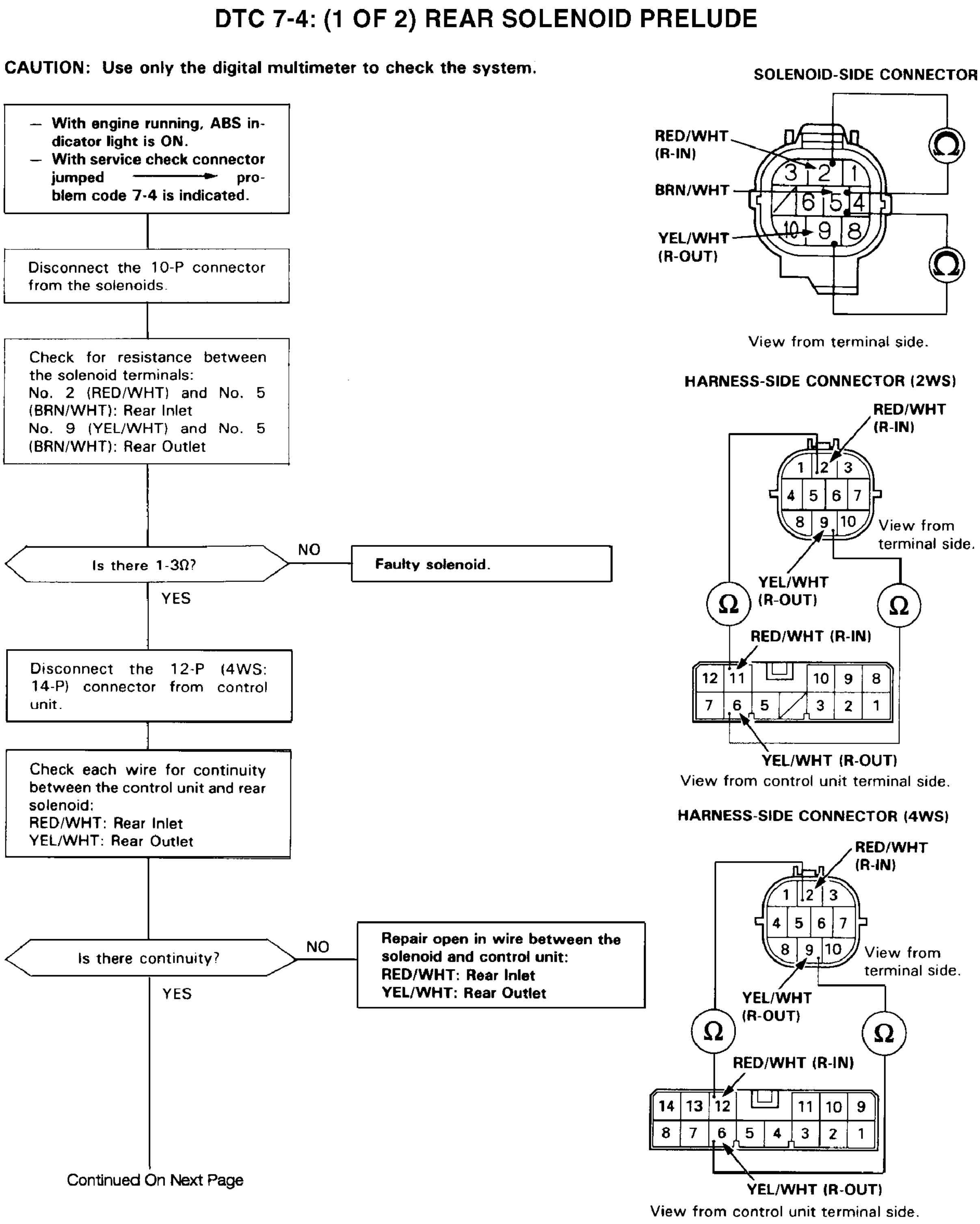


Fig. 32: Code 7-4 Flow Chart (1 Of 2), Rear Solenoid
Courtesy of American Honda Motor Co., Inc.

DTC 7-4: (2 OF 2) REAR SOLENOID PRELUDE

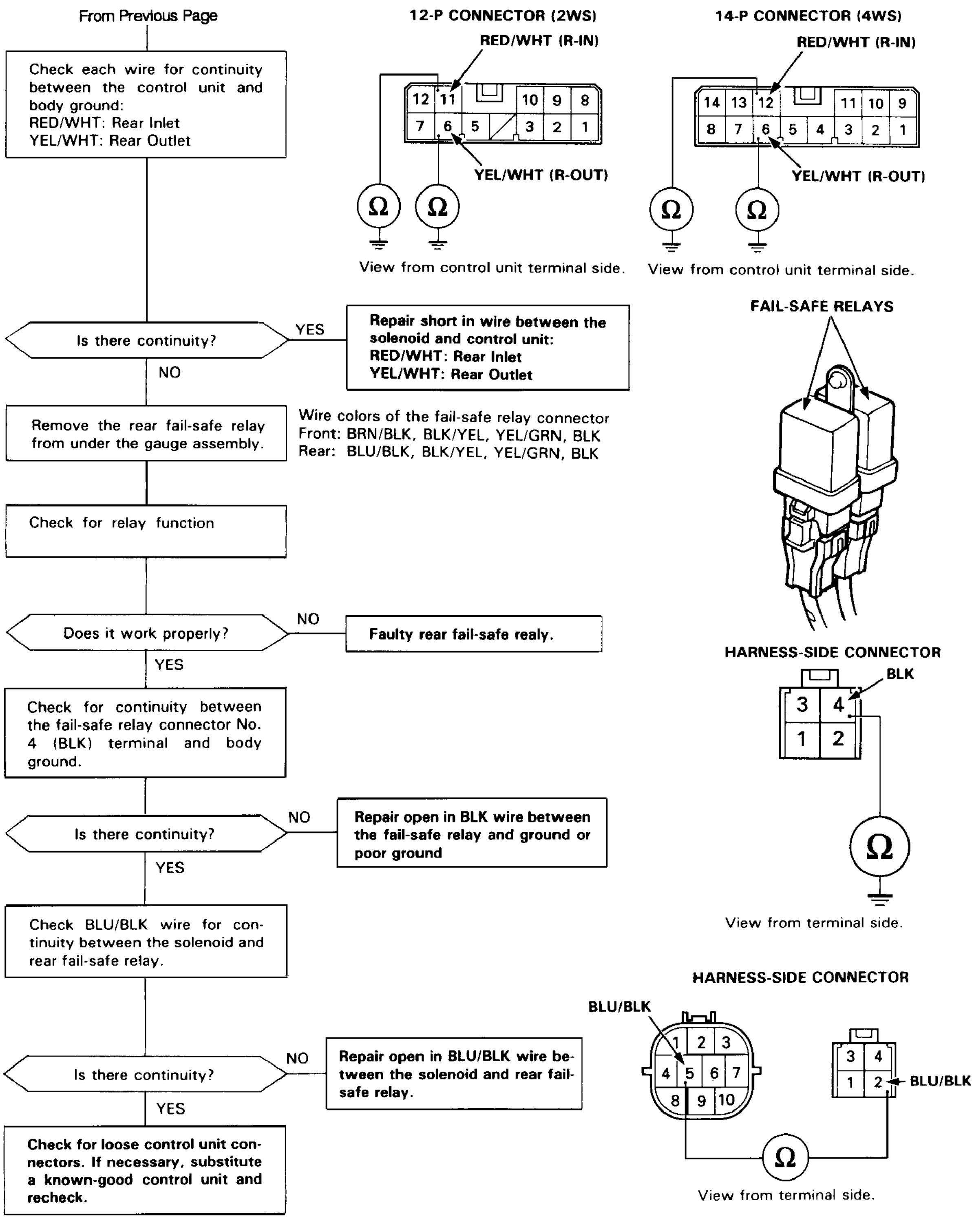


Fig. 33: Code 7-4 Flow Chart (2 Of 2), Rear Solenoid
Courtesy of American Honda Motor Co., Inc.

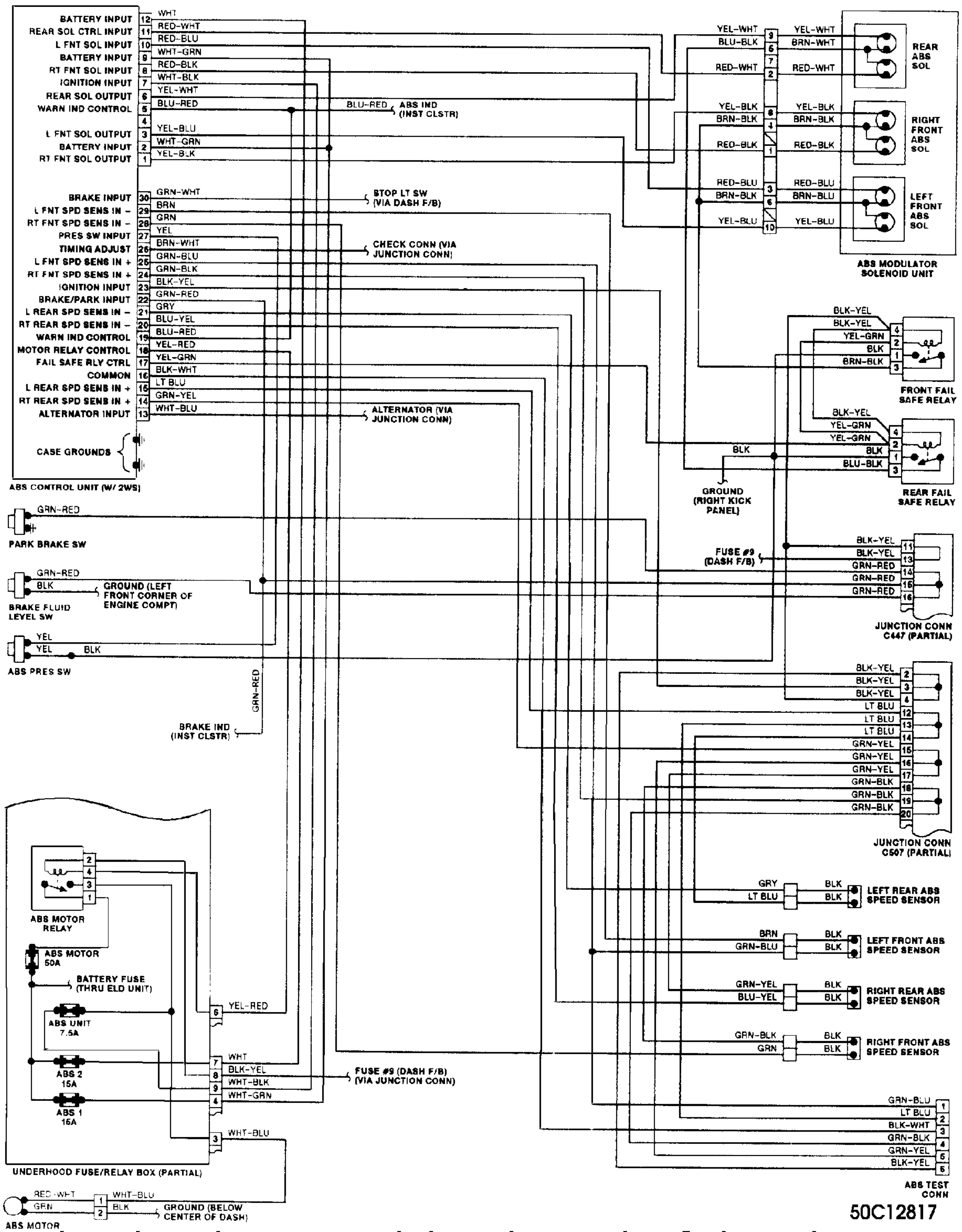


Fig. 34: Anti-Lock Brake System Wiring Diagram (Prelude 2WS)

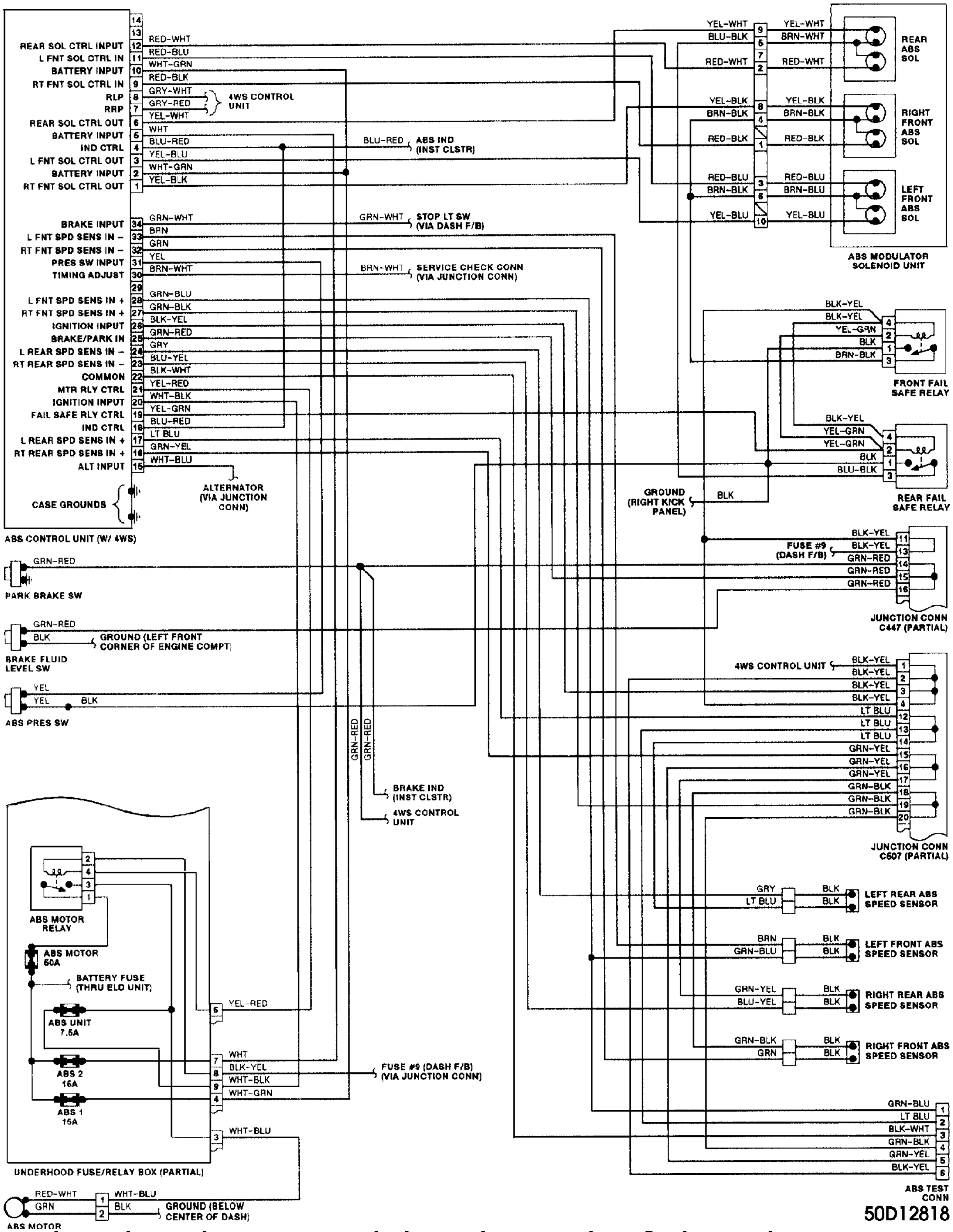


Fig. 35: Anti-Lock Brake System Wiring Diagram (Prelude 4WS)

END OF ARTICLE

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ARTICLE BEGINNING

AUTOMATIC TRANSMISSIONS
Honda MP1A Electronic Controls

APPLICATION

APPLICATION

Vehicle	Transaxle Model
1993-94 Prelude	MP1A

CAUTION: Vehicle is equipped with a Supplemental Restraint System (SRS). When servicing vehicle, use care to prevent accidental air bag deployment. All SRS electrical connections and wiring harness are covered withYellow insulation. SRS-related components are located in steering column, center console, instrument panel and lower panel on instrument panel. DO NOT use electrical test equipment on these circuits. It may be necessary to deactivate SRS before servicing components. See the AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIP section. Refer to the following menu:

* For 1993 models, see: AIR BAG RESTRAINT SYSTEM
* For 1994 models, see: AIR BAG RESTRAINT SYSTEM

NOTE: If negative battery cable is to be disconnected, obtain radio anti-theft code from customer before disconnecting negative battery cable. Radio anti-theft code must be re-entered into radio once negative battery cable is reconnected. To re-enter radio anti-theft code, turn ignition and radio on. When the word "CODE" is displayed on radio, re-enter radio anti-theft code by using the radio station preset buttons.

DESCRIPTION

Automatic transaxle is electronically controlled. Transaxle shifting and torque converter lock-up are controlled by Transmission Control Module (TCM). The TCM receives information from various input devices and uses information to control lock-up and shift control solenoid valves.

Transaxle is equipped with shift and key interlock systems.

Shift interlock system prevents shift lever from being moved from Park unless brake pedal is depressed and accelerator is in idle position. In case of a malfunction, shift lever can be released by placing ignition key in release slot near shift lever. Key interlock system prevents ignition key from being removed from ignition lock assembly unless shift lever is in Park.

The A/T gear position indicator on instrument panel contains lights to indicate which position A/T gear position switch on shift lever is in.

OPERATION

A/T GEAR POSITION INDICATOR

With ignition in RUN or START position, voltage is supplied to A/T gear position indicator, located on instrument panel. See Fig. 1. When shift lever is moved to designated gear position, A/T gear position switch completes the ground circuit for A/T gear position indicator on instrument panel. The light on A/T gear position indicator will be illuminated to indicate shift lever gear position. The TCM controls operation of the "D4" indicator light on A/T gear position indicator on instrument panel. The A/T gear position switch is mounted on driver's side of shift lever. SeeFigs. 5-8.

When headlights are turned on, voltage is supplied on Red/Black wire terminal on A/T gear position indicator. This changes light illumination from fixed illumination to being controlled by the dash light dimmer input on the Red wire.

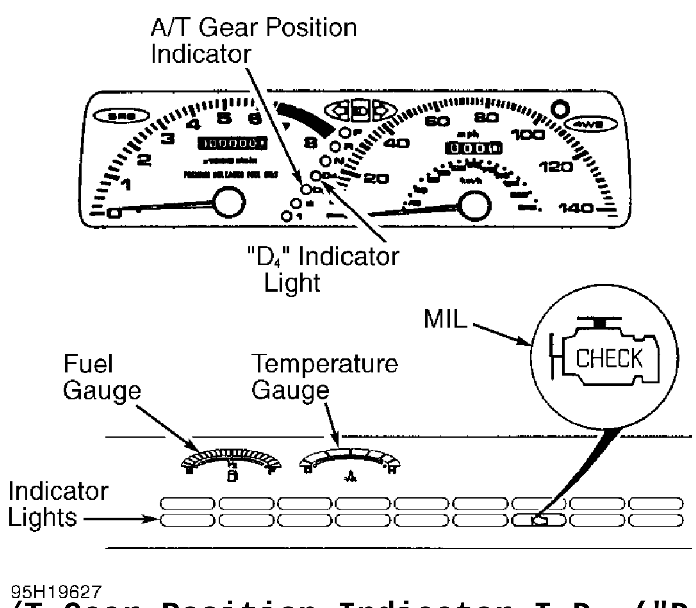

Fig. 1: A/T Gear Position Indicator I.D. ("D4" Light & MIL Light)
Courtesy of American Honda Motor Co., Inc.

SHIFT & KEY INTERLOCK SYSTEMS

Shift Interlock System

Shift interlock system prevents shift lever from being moved from Park unless brake pedal is depressed and accelerator is in idle position. In case of a malfunction, shift lever can be released by placing ignition key in release slot near shift lever. Voltage is provided to shift lock solenoid when ignition is on.

When brake pedal is depressed, battery voltage is applied to the TCM from brakelight switch. With accelerator pedal in idle position, a low voltage is applied to the TCM from the throttle position sensor. The TCM then supplies voltage to shift lock circuit in the interlock control unit. When A/T gear position switch is in Park position, interlock control unit then operates shift lock solenoid by controlling the ground circuit. When shift lock solenoid is energized, shift lever is released and can be moved.

Shift lock solenoid is mounted on driver's side of shift lever. See Figs. 2-3. The A/T gear position switch is located on side of shift lever. See Figs. 5-8. Interlock control unit is located above driver's side kick panel and contains a Gray 8-pin electrical connector. See Figs. 5-8.

Key Interlock System

Key interlock system prevents ignition key from being removed from ignition lock assembly unless shift lever is in Park. Voltage is provided to key interlock switch from No. 46 fuse (15-amp) in engine compartment fuse box. Engine compartment fuse box is located on passenger's side rear corner of engine compartment, near firewall. When ignition key is installed in ignition lock assembly, key interlock switch closes, providing voltage to key interlock solenoid and interlock control unit.

If shift lever is not in Park, interlock control unit activates key interlock solenoid by completing the ground circuit, preventing ignition key from being removed from ignition lock assembly. Key interlock switch and solenoid are located on ignition lock assembly. See Figs. 2-3. Interlock control unit is located above driver's side kick panel and contains a Gray 8-pin electrical connector. See Figs. 5-8.

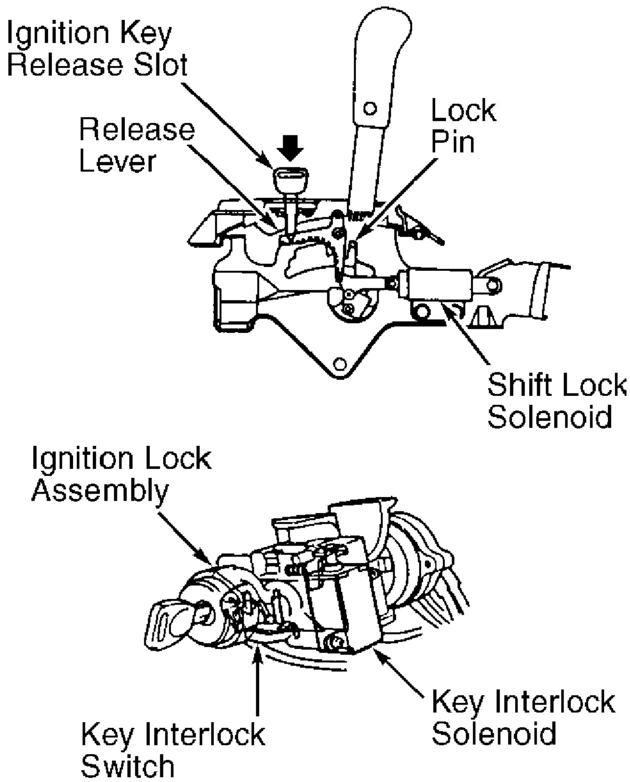

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Fig. 2: Shift & Key Interlock System Component I.D. (1 of 2)
Courtesy of American Honda Motor Co., Inc.

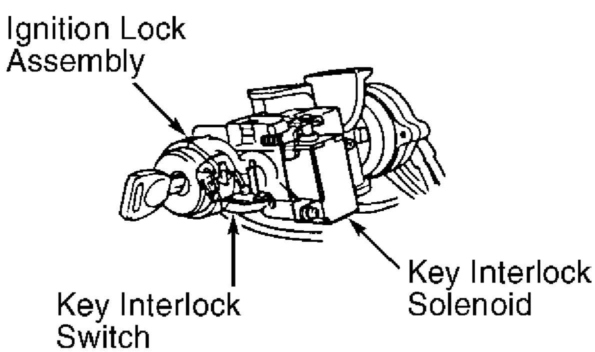

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Fig. 3: Shift & Key Interlock System Component I.D. (2 of 2)
Courtesy of American Honda Motor Co., Inc.

TRANSMISSION CONTROL MODULE (TCM)

The TCM receives information from various input devices and uses information to control lock-up and shift control solenoid valves. See Fig. 4. The TCM contains a self-diagnostic system, which will store fault code if failure or problem exists in the transaxle electronic control system. Fault code can be retrieved to determine transaxle problem area. Fault code may also be referred to as

Diagnostic Trouble Code (DTC). For information on self-diagnostic system, see SELF-DIAGNOSTIC SYSTEM. The TCM is located behind passenger's side kick panel. See Figs. 5-8.

TCM INPUT DEVICES

Air Conditioning Signal

The A/C clutch relay provides input signal to TCM to indicate A/C operation. The A/C clutch relay is located at driver's side front corner of engine compartment. See Figs. 5-8.

Brake Switch Signal

Brakelight switch provides input signal to TCM to indicate vehicle braking. Brakelight switch is located on brake pedal support. See Figs. 5-8.

Engine Coolant Temperature Sensor Signal

Engine Coolant Temperature (ECT) sensor delivers input signal to TCM to indicate engine coolant temperature. Engine coolant temperature sensor is located on cylinder head, below the distributor and contains a Green/White wire and a Yellow/Blue wire in the electrical connector. See Fig. 4.

Engine Speed Signal

An engine speed or RPM signal is delivered to TCM from ignition control module in the distributor.

Engine Control Module (ECM)

An upshift and downshift comparative input signal and shift acknowledgment input signal are sent between ECM and TCM. A 5-volt reference signal also exists between ECM and the TCM. The ECM is located on passenger's side floor panel, below the carpet. Refer to the Figs. 5-8.

Service Check Connector

Service check connector is used when retrieving fault codes for transaxle electronic control system diagnosis. When jumper wire is installed between service check connector electrical terminals, an input is delivered to TCM to display fault codes on "D4" indicator light on A/T gear position indicator on instrument panel. Service check connector is a 2-pin Blue or Gray connector, located below center of instrument panel, near center console. See Fig. 9.

Mainshaft & Countershaft Speed Sensor Signal

Mainshaft speed sensor delivers an input signal to TCM to indicate the speed of the mainshaft in the transaxle. Countershaft speed sensor delivers an input signal to TCM to indicate the speed of the countershaft in the transaxle. Countershaft and mainshaft speed

sensors are located on transaxle. See Figs. 5-8.

Throttle Position Sensor Signal

Throttle position sensor delivers an input signal to TCM to indicate throttle position. Throttle position sensor is mounted on throttle body. See Figs. 5-8.

Vehicle Speed Sensor Signal

Vehicle Speed Sensor (VSS) delivers an input signal to TCM to indicate the vehicle speed. Vehicle speed sensor is located on transaxle, below thermostat housing. See Figs. 5-8.

TCM OUTPUT DEVICES

Shift Control Solenoid Valves

The TCM controls transaxle shifting by delivering an output signal to shift control solenoid valves "A" and "B". Shift control solenoid valves are operated in accordance with gear position. See the SHIFT CONTROL SOLENOID VALVE OPERATION table. Shift control solenoid valves are located on the transaxle. See Figs. 5-8. Shift control solenoid valve "A" has a Blue/Yellow wire and solenoid valve "B" has a Green/White wire.

SHIFT CONTROL SOLENOID VALVE OPERATION

Shift Lever Position	Solenoid Valve "A"	Solenoid Valve "B"
"D" Or "D4" (1st Gear)	Off	On
"D" Or "D4" (2nd Gear)	On	On
"D" Or "D4" (3rd Gear)	On	Off
"D4" (4th Gear)	Off	Off
"R"	On	Off
"1"	On	Off
"2"	On	On

Lock-Up Control Solenoid Valves

The TCM controls torque converter lock-up by delivering an output signal to lock-up control solenoid valves "A" and "B". Lock-up control solenoid valves are operated in accordance with lock-up condition. See LOCK-UP CONTROL SOLENOID VALVE OPERATION table. Lock-up control solenoid valves are located on the transaxle. See Figs. 5-8. Lock-up control solenoid valve "A" has a Yellow wire and solenoid valve "B" has a Green/Black wire.

LOCK-UP CONTROL SOLENOID VALVE OPERATION

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Lock-Up Condition	Solenoid Valve "A"	Solenoid Valve "B"
No Lock-Up	Off	Off
Slight Lock-Up	On	(1)
Half Lock-Up	On	On
Full Lock-Up	On	On
Lock-Up During Deceleration	On	(1)

(1) - Solenoid valve will cycle on and off.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

"D4" Indicator Light

If a fault exists in transaxle electronic control system and fault code is stored, TCM will output fault signal by blinking "D4" indicator light on A/T gear position indicator on instrument panel. See Fig. 1.

Interlock Control Unit

When A/T gear position switch is in Park position, TCM provides voltage to shift lock circuit in interlock control unit if brake pedal is depressed and accelerator is in idle position. Interlock control unit then operates shift lock solenoid by controlling the ground circuit. When shift lock solenoid is energized, shift lever is released and can be moved. Interlock control unit is located above driver's side kick panel and contains aGray 8-pin electrical connector. See Figs. 5-8.

Self-Diagnostic Indicator

If an abnormality exists in transaxle electronic control system and fault code is stored in TCM memory, TCM will deliver an output signal to turn on and blink "D4" indicator light on A/T gear position indicator on instrument panel. SeeFig. 1. Fault code can be retrieved to identify problem area by installing jumper wire between service check connector electrical terminals. Fault codes with be displayed by blinking "D4" indicator light on A/T gear position indicator on instrument panel.

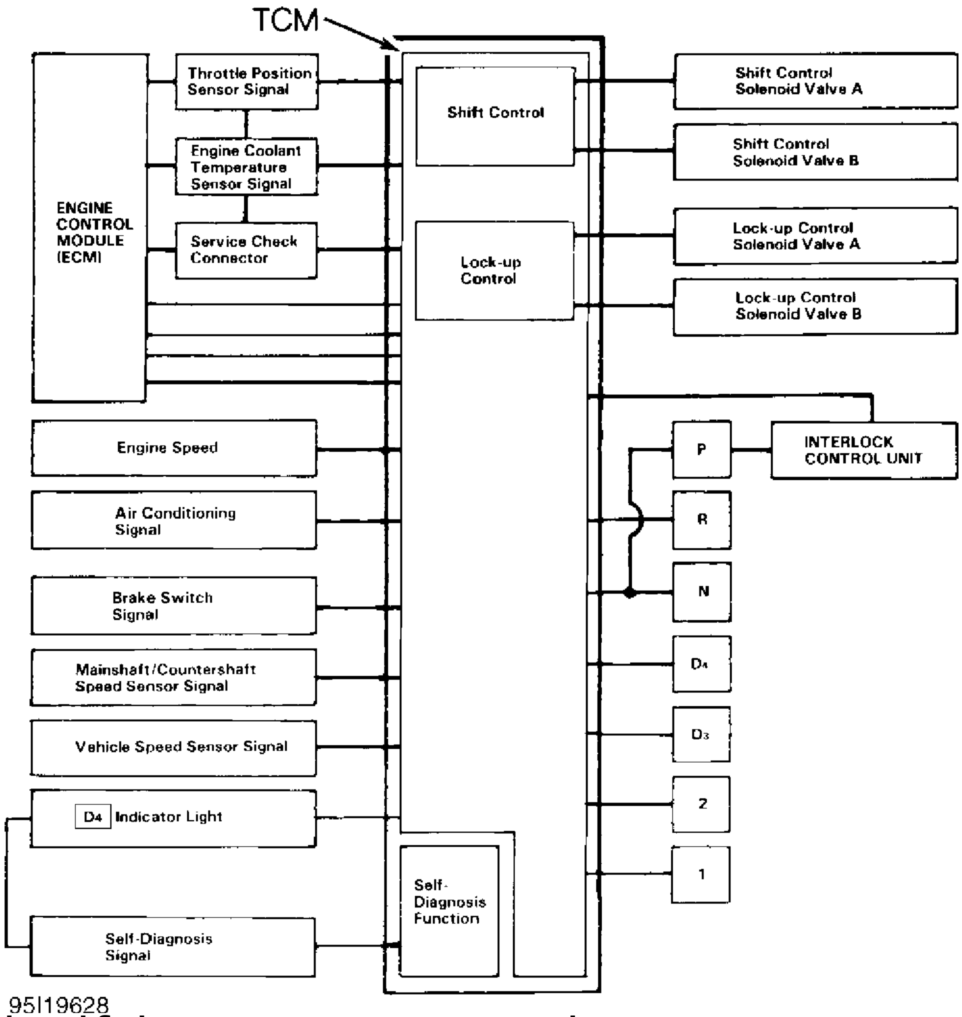

Fig. 4: Identifying Input & Output Devices
Courtesy of American Honda Motor Co., Inc.

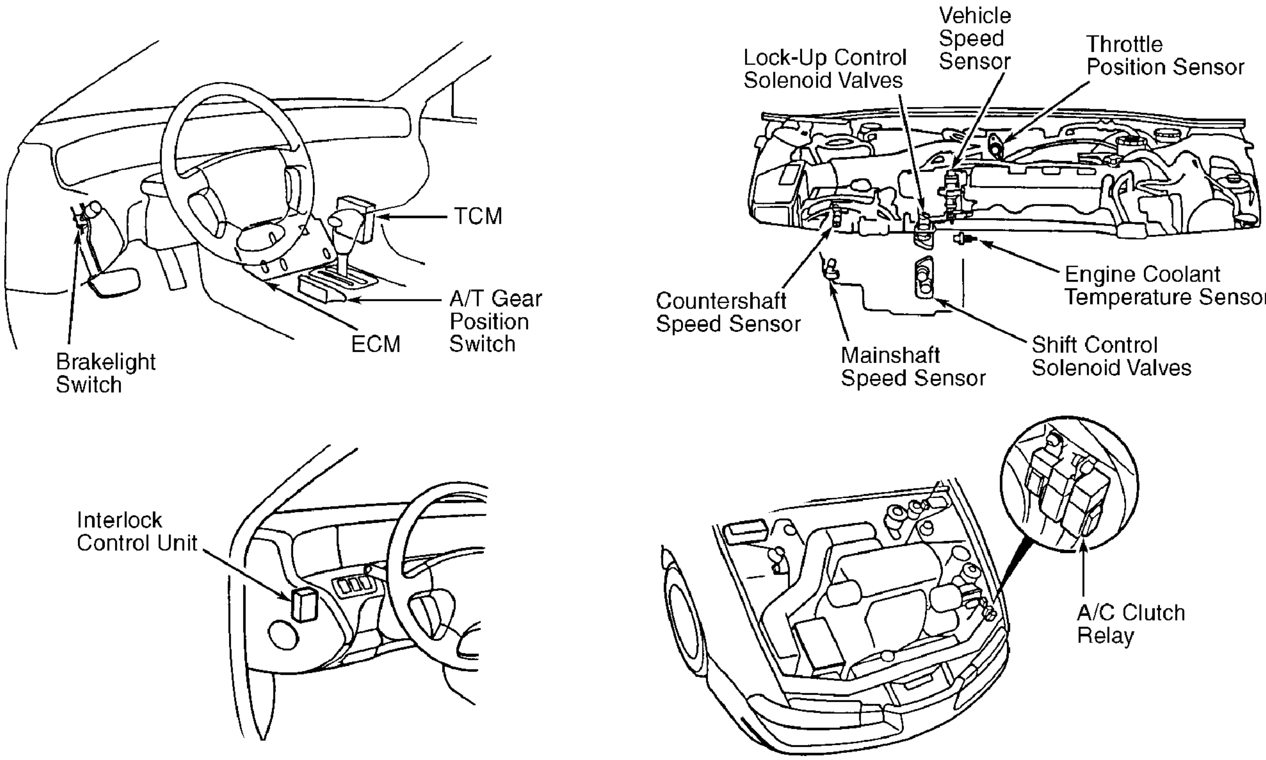

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Fig. 5: Identifying TCM Input & Output Device Locations
Courtesy of American Honda Motor Co., Inc.

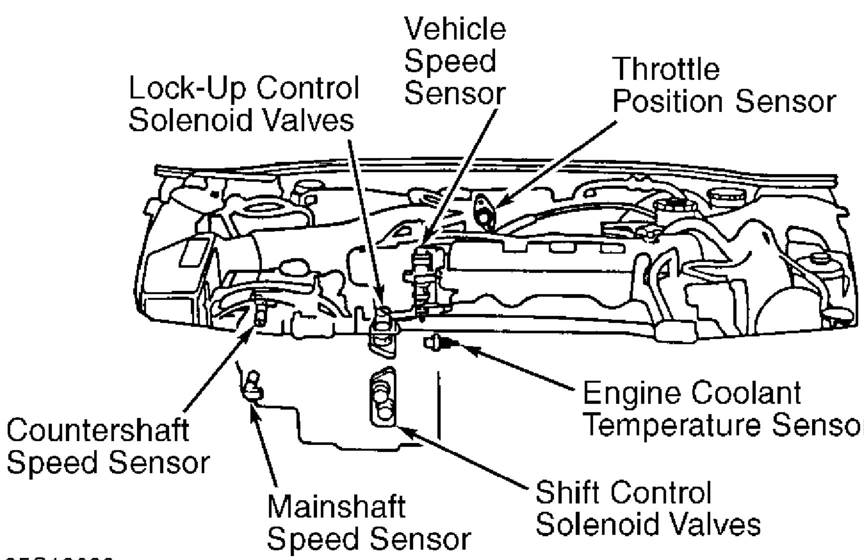

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Fig. 6: Identifying TCM Input & Output Device Locations
Courtesy of American Honda Motor Co., Inc.

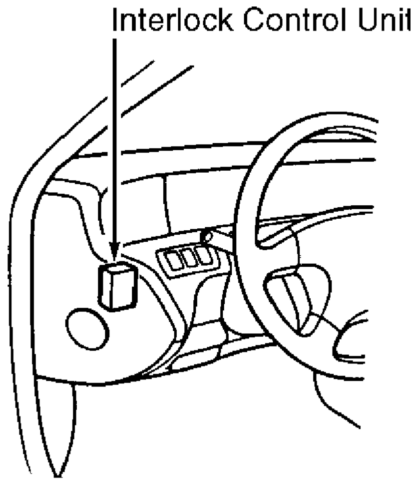

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Fig. 7: Identifying TCM Input & Output Device Locations
Courtesy of American Honda Motor Co., Inc.

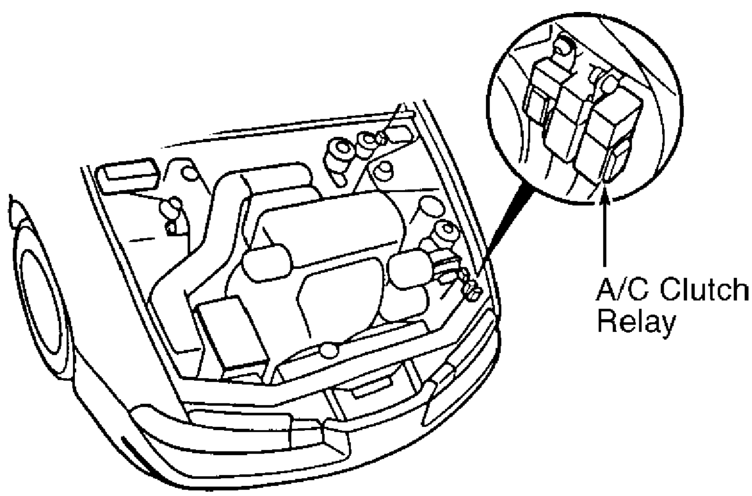

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Fig. 8: Identifying TCM Input & Output Device Locations
Courtesy of American Honda Motor Co., Inc.

SELF-DIAGNOSTIC SYSTEM

SYSTEM DIAGNOSIS

The TCM monitors transaxle operation. The TCM contains a self-diagnostic system, which stores fault code if failure or problem exists. Fault code may also be referred to as Diagnostic Trouble Code (DTC). If fault code is stored, TCM will blink "D4" indicator light on A/T gear position indicator on instrument panel. Fault code can be retrieved for diagnosing transaxle electronic control system. See RETRIEVING FAULT CODES.

RETRIEVING FAULT CODES

NOTE: When diagnosing transaxle, ensure "D4" indicator light is not turned on by problem in PGM-FI system by performing preliminary procedure. See **PRELIMINARY PROCEDURE** in the following heading. The PGM-FI system controls the fuel injection system.

NOTE: Before performing preliminary procedure, obtain radio anti-theft code from customer. Note radio preset stations, as radio stations and clock setting will be cleared and must be reset. Radio anti-theft code must be re-entered for radio operation.

Preliminary Procedure

1) Ensure ignition is off. Remove No. 43 clock-radio fuse (10-amp) in engine compartment fuse box for 10 seconds. Engine compartment fuse box is located on passenger's side rear corner of engine compartment, near firewall. This clears Engine Control Module (ECM) memory to ensure ECM has not turned on "D4" indicator light.

2) Reinstall fuse. To re-enter radio anti-theft code, turn ignition and radio on. When the word "CODE" is displayed on radio, re-enter radio anti-theft code by using the radio station preset buttons. Reset clock and radio stations. Perform diagnostic circuit check to ensure proper operation of "D4" indicator light. See the **DIAGNOSTIC CIRCUIT CHECK** procedure in the following heading.

Diagnostic Circuit Check

1) Turn ignition on. The "D4" indicator light on A/T gear position indicator on instrument panel should come on for about 2 seconds and then go off, indicating light circuit is operating properly. See Fig. 1. If indicator light functions as described, fault codes may be retrieved. See **TCM FAULT CODES**.

2) If "D4" indicator light does not come on as described or remains on steady, proceed to the appropriate diagnostic chart. See **TROUBLE SHOOTING FLOW CHARTS**.

TCM Fault Codes

1) With ignition off, install jumper wire between service check connector electrical terminals. Service check connector is a 2-pin Blue or Gray connector, located below center of instrument panel, near center console. See Fig. 9. This will place TCM in self-diagnostic mode.

CAUTION: DO NOT use the 3-pin connector located next to service check connector.

2) Turn ignition on. Fault codes will be displayed by

blinking "D4" indicator light on the A/T gear position indicator on instrument panel. See Fig. 1.

3) Fault codes will be displayed by short and long blinks. One long blink equals 10 short blinks. For example, if a long blink is followed by 4 short blinks, this indicates a Fault Code No. 14. See Fig. 10.

4) Once a fault code is obtained, determine probable cause and symptom. See the **FAULT CODE IDENTIFICATION** table. If any other fault codes except those listed are displayed, TCM is defective. For trouble shooting of fault codes, see **TROUBLE SHOOTING FLOW CHARTS**. Turn ignition off. Remove jumper wire from service check connector.

NOTE: If customer describes symptoms for Fault Code No. 3 and "D4" indicator light is off or Fault Code No. 6 or 11, it may be necessary to test drive vehicle to recreate the symptom and then check for trouble code with ignition still on.

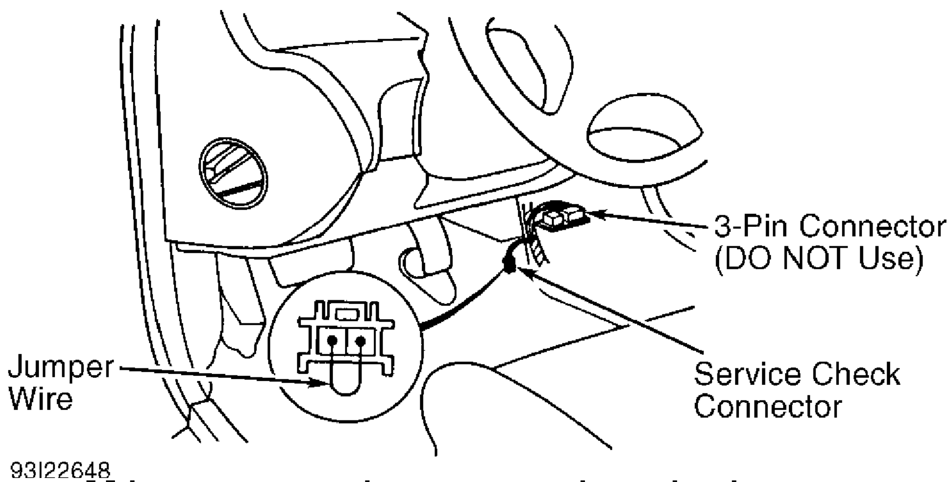

Fig. 9: Installing Jumper Wire In Service Check Connector
Courtesy of American Honda Motor Co., Inc.

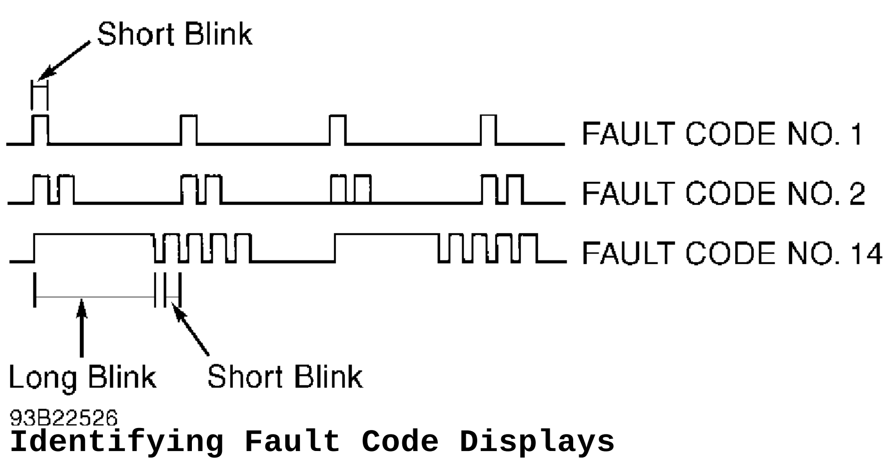

Fig. 10: Identifying Fault Code Displays
Courtesy of American Honda Motor Co., Inc.

FAULT CODE IDENTIFICATION

Fault Code (1) Number	Indicator Light Condition	(2) Probable (3) Cause	(4) (5) Symptom
1	Blinks	Defective Lock-Up Control Solenoid "A"	Lock-Up Clutch Does Not Engage Or Remains Engaged, Unstable Idle Speed
2	Blinks	Defective Lock-Up Control Solenoid "B"	Lock-Up Clutch Does Not Engage
3	Blinks Or Remains Off	Defective Throttle Position Sensor	Lock-Up Clutch Does Not Engage
4	Blinks	Defective Vehicle Speed Sensor	Lock-Up Clutch Does Not Engage
5	Blinks	Defective A/T Gear Position Switch	Lock-Up Clutch Does Not Engage, Fails To Shift Other Than 2nd-4th Gears
6	Off	Defective A/T Gear Position Switch	Lock-Up Clutch Does Not Engage, Lock-Up Clutch Engages & Disengages Fails To Shift Other Than 2nd-4th Gears
7	Blinks	Defective Shift Control Solenoid "A"	Fails To Upshift, Remains In 4th Gear
8	Blinks	Defective Shift	Remains In 1st Or 4th, Control Solenoid "B"
9	Blinks	Defective Countershaft Speed Sensor	Lock-Up Clutch Does Not Engage
10	Blinks	Defective Engine Coolant Temp. Sensor	Lock-Up Clutch Does Not Engage
11	Off	Defective Ignition	Lock-Up Clutch

```
                             Coil (Ignitor)           Does Not Engage
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
14  ........  Off  ....  Shorted Or Open  ......  Transaxle Jerks
                          Wire Between         Hard When Shifting
                          TCM Terminal
                      D16 & ECM, Faulty ECM
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
15 (6)  ....  Off ..  Defective Mainshaft  .....  Transaxle Jerks
                         Speed Sensor          Hard When Shifting
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
(1) - Number of blinks from "D4" indicator light on A/T gear
      position indicator on instrument panel with jumper wire
      installed in service check connector.
(2) - Operation of "D4" indicator light without jumper wire
      installed in service check connector.
(3) - Check listed component for probable cause. Also check
      wiring and connections of specified component.
(4) - If transaxle fails to shift from Park with the brake
      pedal depressed, check the brakelight signal. See
      BRAKELIGHT SIGNAL under TROUBLE SHOOTING.
(5) - If lock-up clutch does not engage or does not cycle on
      and off, check A/C signal. See A/C SIGNAL under
      TROUBLE SHOOTING.
(6) - Fault Code No. 15 does not necessarily indicate an
      electrical problem, as fault code may also be caused by
      an internal transaxle problem.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
```

CLEARING FAULT CODES

NOTE: Before clearing fault codes, obtain radio anti-theft code from customer. Note radio preset stations, as radio stations and clock setting will be cleared and must be reset. Radio anti-theft code must be re-entered for radio operation.

1) Once repairs have been performed, fault codes must be cleared from TCM memory. Ensure ignition is off. Remove No. 43 clock-radio fuse (10-amp) in engine compartment fuse box for 10 seconds. Engine compartment fuse box is located on passenger's side rear corner of engine compartment, near firewall.

2) This will clear TCM and ECM memories. Reinstall fuse. To re-enter radio anti-theft code, turn ignition and radio on. When the word "CODE" is displayed on radio, re-enter radio anti-theft code by using the radio station preset buttons. Reset clock and radio stations.

TROUBLE SHOOTING

A/C SIGNAL

NOTE: If A/C signal exists, torque converter lock-up clutch may not engage or cycle on and off.

1) Start engine. Turn blower switch and A/C switch to the ON position. Check if A/C compressor clutch engages.
2) If A/C compressor clutch does not engage, check A/C compressor clutch and wiring. If A/C compressor clutch engages, turn engine off. Ensure ignition is off. Remove passenger's side door sill molding and passenger's side kick panel. Pull carpet back for access to TCM, located behind passenger's side kick panel. See Figs. 5-8.
3) Disconnect 26-pin connector from TCM, located behind passenger's side kick panel. See Figs. 5-8. Connect voltmeter between terminal A22 (Red/Blue wire) and terminal A25 (Black/Red wire) or terminal A26 (Brown/Black wire) of 26-pin connector. Start engine. Note voltage with A/C compressor off.
4) If battery voltage does not exist, go to step 5). If battery voltage exists, A/C signal is okay. Check for loose TCM electrical connections. If electrical connections are okay, substitute TCM with a known good unit and recheck operation.
5) If battery voltage does not exist, check for open circuit in Red/Blue wire between terminal A22 and A/C clutch relay. A/C clutch relay is located at driver's side front corner of engine compartment. See Figs. 5-8.
6) Reinstall electrical connector on TCM. Reinstall passenger's side kick panel and passenger's side door sill molding.

BRAKELIGHT SIGNAL

NOTE: If no brakelight signal exists, transaxle may fail to shift from Park with brake pedal depressed and accelerator pedal in idle position.

1) Ensure brakelights come on when brake pedal is depressed. If brakelights come on, go to next step. If brakelights do not come on, check No. 41 fuse (15-amp) in engine compartment fuse box. Engine compartment fuse box is located on passenger's side rear corner of engine compartment, near firewall. If fuse is okay, repair brakelight signal circuit.
2) Ensure ignition is off. Remove passenger's side door sill molding and passenger's side kick panel. Pull carpet back for access to TCM, located behind passenger's side kick panel. See Figs. 5-8. Disconnect 26-pin and 22-pin electrical connectors from TCM.
3) Connect Test Harness (07LAJ-PT3010A) to 26-pin and 22-pin electrical connectors. See Fig. 11. DO NOT connect test harness to TCM.

4) Using Digital Volt-Ohmmeter (DVOM), measure voltage between terminals D2 and A25 or A26 on test harness with brake pedal depressed. Terminal numbers are located on test harness. See Fig. 11.

5) If battery voltage exists, brakelight signal to TCM is okay. Check for loose TCM electrical connections. If electrical connections are okay, substitute TCM with a known good unit and recheck operation.

6) If battery voltage does not exist, check for open circuit in the Green/White wire between terminal D2 and brakelight switch. Brakelight switch is located on brake pedal support. See Figs. 5-8.

7) Ensure ignition is off. Remove test harness. Reinstall electrical connectors on TCM. Reinstall passenger's side kick panel and passenger's side door sill molding.

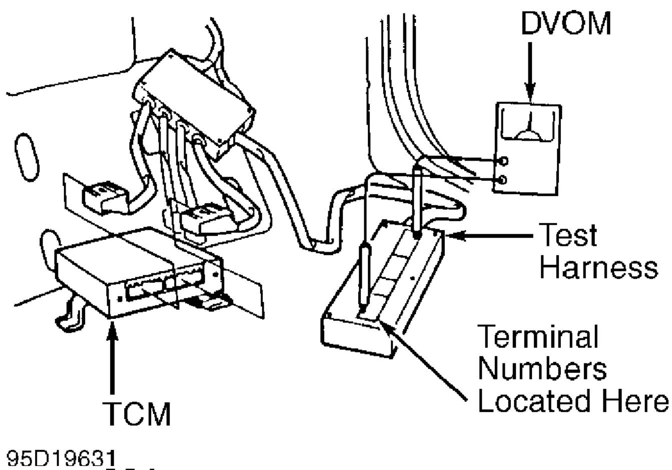

Fig. 11: Installing Test Harness
Courtesy of American Honda Motor Co., Inc.

SYSTEM TESTING

A/T GEAR POSITION INDICATOR

NOTE: If necessary, refer to wiring schematic when checking component wiring. See Figs. 18 and 19.

1) Remove instrument panel gauge assembly from instrument panel. On 1993 models, disconnect connector "A" (16-pin) and connector "B" (10-pin) from rear of instrument panel gauge assembly. Refer to the Figs. 12-13.

2) On 1994 models with luminescent gauges, disconnect connector "J" (5-pin), connector "H" (16-pin) and connector "T" (10-pin) from rear of instrument panel gauge assembly. See Fig. 14.

3) On 1994 models without luminescent gauges, disconnect connector "A" (16-pin) and connector "B" (10-pin) from rear of instrument panel gauge assembly.

4) On all models, check for voltage and continuity at electrical connectors as specified. See Figs. 12-14.

5) If necessary to check ground connections, G401, G402, G404 or G521, refer to the **GROUND CONNECTION LOCATIONS** table. Also, see Fig. 17.

GROUND CONNECTION LOCATIONS

Ground Connection	Location
G401	
1993	
4WS, VTEC & SR-V	Behind Passenger's Side Of Instrument Panel, Near Glove Box
S, Si & SR	Behind Passenger's Kick Panel, Above TCM
1994	Behind Passenger's Kick Panel, Above TCM
G402	Driver's Side Of Center Console, Near Shift Lever
G404	Passenger's Side Of Center Console, Near Shift Lever
G521	Below Driver's Seat, Near Seat Mount Rail

6) If necessary to check No. 13 fuse (10-amp), fuse is located in the fuse/relay box behind driver's side kick panel. See Figs. 5-8. If necessary to access TCM, TCM is located behind passenger's side kick panel.

7) If necessary to access ECM, the ECM is located on passenger's side floor panel, below the carpet. If necessary to access A/T gear position switch, A/T gear position switch is mounted on driver's side of shift lever. See Figs. 5-8.

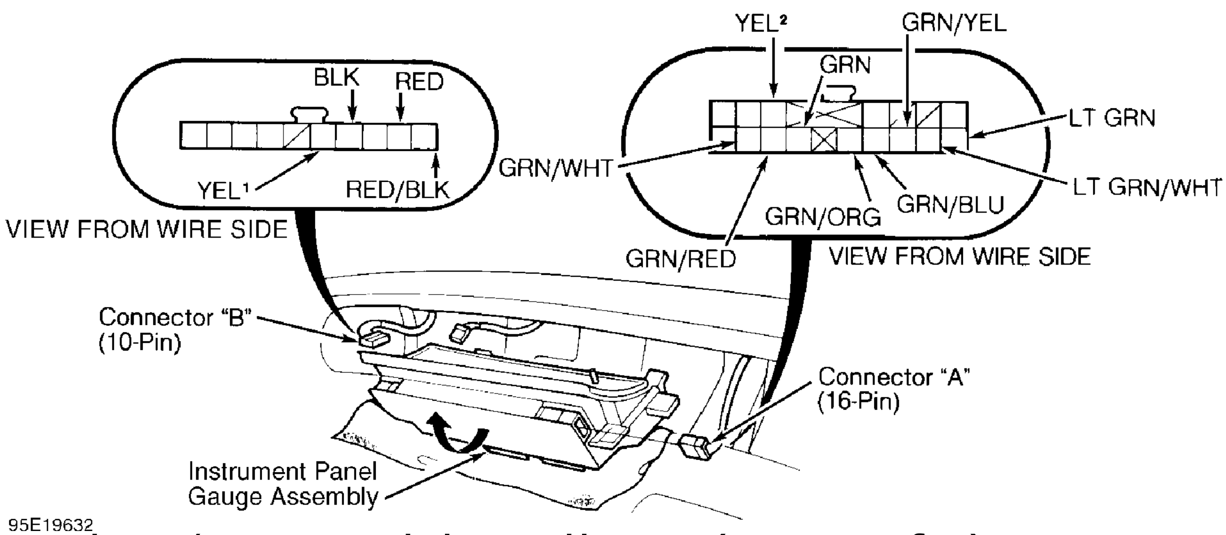

Fig. 12: Testing A/T Gear Position Indicator (1993, 1 of 2)
Courtesy of American Honda Motor Co., Inc.

NO.	WIRE	TEST CONDITION	TEST: DESIRED RESULT	POSSIBLE CAUSE
1	BLK	Under all conditions.	Check for continuity to ground: There should be continuity.	• Poor ground (G401, G402, G404). • An open in the wire.
2	YEL[1]	Ignition switch ON.	Check for voltage to ground: There should be battery voltage.	• Blown No. 13 (10 A) fuse. (In the under-dash fuse/relay box) • An open in the wire.
3	GRN/WHT	Shift lever in [P]. NOTE: Don't push the brake pedal.	Check for continuity to ground: There should be continuity. NOTE: There should be no continuity in any other position.	• Faulty A/T gear position switch. • Poor ground (G401, G402, G404). • An open in the wire.
	GRN/RED	Shift lever in [R].		
	GRN	Shift lever in [N].		
	GRN/BLU	Shift lever in [D3].		
	GRN/YEL	Shift lever in [2].		
	LT GRN/ WHT	Shift lever in [1].		
4	RED and RED/BLK	Combination light switch ON and dash lights brightness control dial on full bright.	Check for voltage between RED/BLK and RED terminals: There should be battery voltage.	• Faulty dash lights brightness control system. • An open in the wire.
5	GRN/ORN	Ignition switch ON and shift lever in any position except [D4].	Check for voltage to ground: There should be battery voltage for two seconds after the ignition switch is turned ON, and less than 1 V two seconds later.	• Faulty transmission control module (TCM). • An open in the wire.
6	YEL[2]	Ignition switch ON and shift lever in any position except [D4].	Check for voltage to ground: There should be less than 1 V for two seconds after the ignition switch is turned ON, and more than 5 V two seconds later.	• Faulty TCM. • An open in the wire.
7	LT GRN	Ignition switch ON.	Check for voltage to ground: There should be more than 11 V.	• Faulty ECM or TCM. • An open in the wire.

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Fig. 13: Testing A/T Gear Position Indicator (1993, 2 of 2)
Courtesy of American Honda Motor Co., Inc.

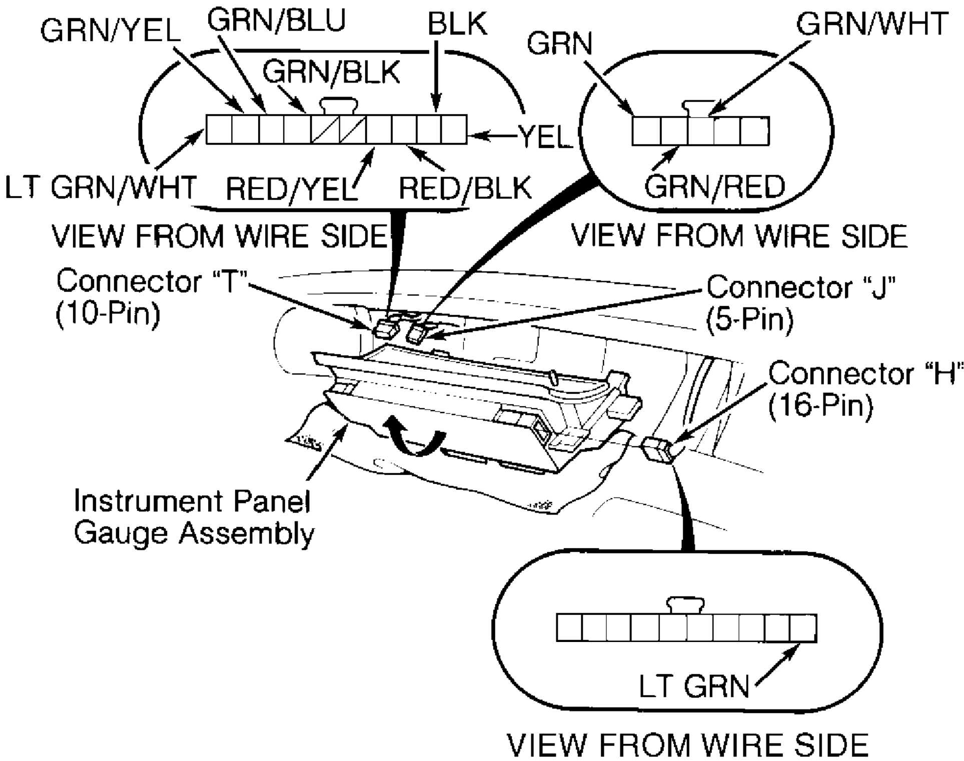

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Fig. 14: Testing A/T Gear Position Indicator (1994, 1 of 3)
Courtesy of American Honda Motor Co., Inc.

AUTO TRANS

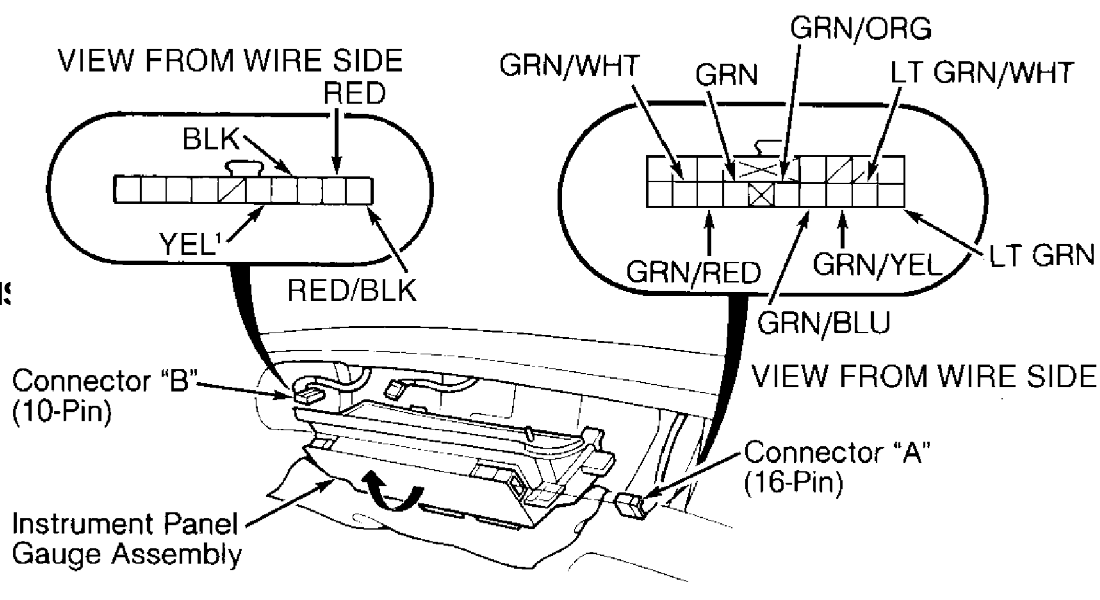

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Fig. 15: Testing A/T Gear Position Indicator (1994, 2 of 3)
Courtesy of American Honda Motor Co., Inc.

NO.	WIRE	TEST CONDITION	TEST: DESIRED RESULT	POSSIBLE CAUSE
1	BLK	Under all conditions	Check for continuity to ground: There should be continuity.	• Poor ground (G401, G402, G404, G521) • An open in the wire
2	YEL	Ignition switch ON	Check for voltage to ground: There should be battery voltage.	• Blown No. 13 (10 A) fuse (In the under-dash fuse/relay box) • An open in the wire
3	GRN/WHT	Shift lever in P NOTE: Don't push the brake pedal.	Check for continuity to ground: There should be continuity. NOTE: There should be no continuity in any other position.	• Faulty A/T gear position switch • Poor ground (G401, G402, G404, G521) • An open in the wire
	GRN/RED	Shift lever in R		
	GRN	Shift lever in N		
	GRN/BLU	Shift lever in D_3		
	GRN/YEL	Shift lever in 2		
	LT GRN/WHT	Shift lever in 1		
4	RED and RED/BLK	Combination light switch ON, and dash lights brightness control dial on full bright	Check for voltage between RED/BLK and RED terminals: There should be battery voltage.	• Faulty dash lights brightness control system • An open in the wire
5	GRN/ORN	Ignition switch ON, and shift lever in any position except D_4	Check for voltage to ground: There should be battery voltage for two seconds after the ignition switch is turned ON, and less than 1 V two seconds later.	• Faulty transmission control module (TCM) • An open in the wire
6	LT GRN	Ignition switch ON	Check for voltage to ground: There should be more than 11 V.	• Faulty ECM or TCM • An open in the wire

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Fig. 16: Testing A/T Gear Position Indicator (1994, 3 of 3)
Courtesy of American Honda Motor Co., Inc.

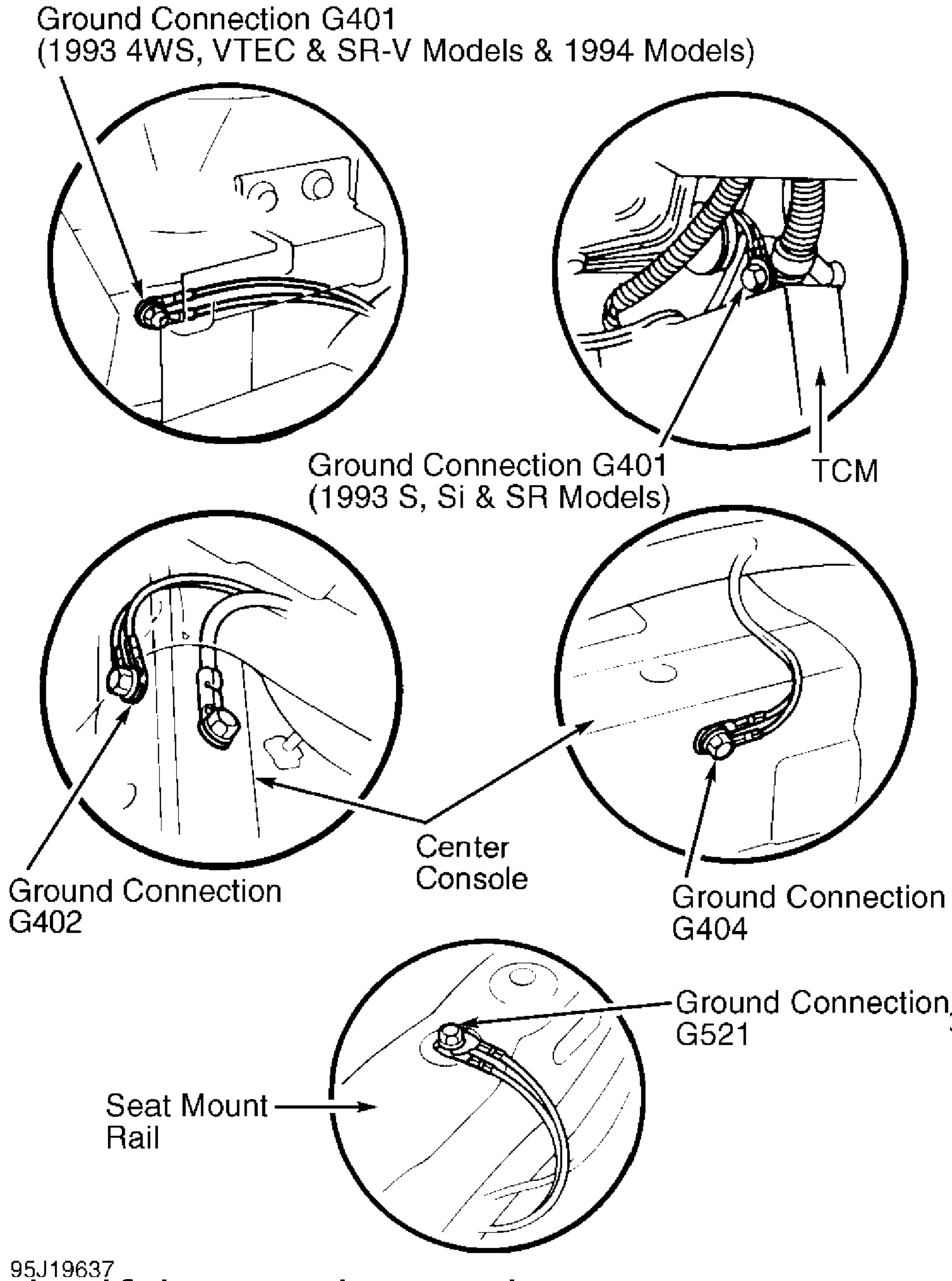

Fig. 17: Identifying Ground Connections
Courtesy of American Honda Motor Co., Inc.

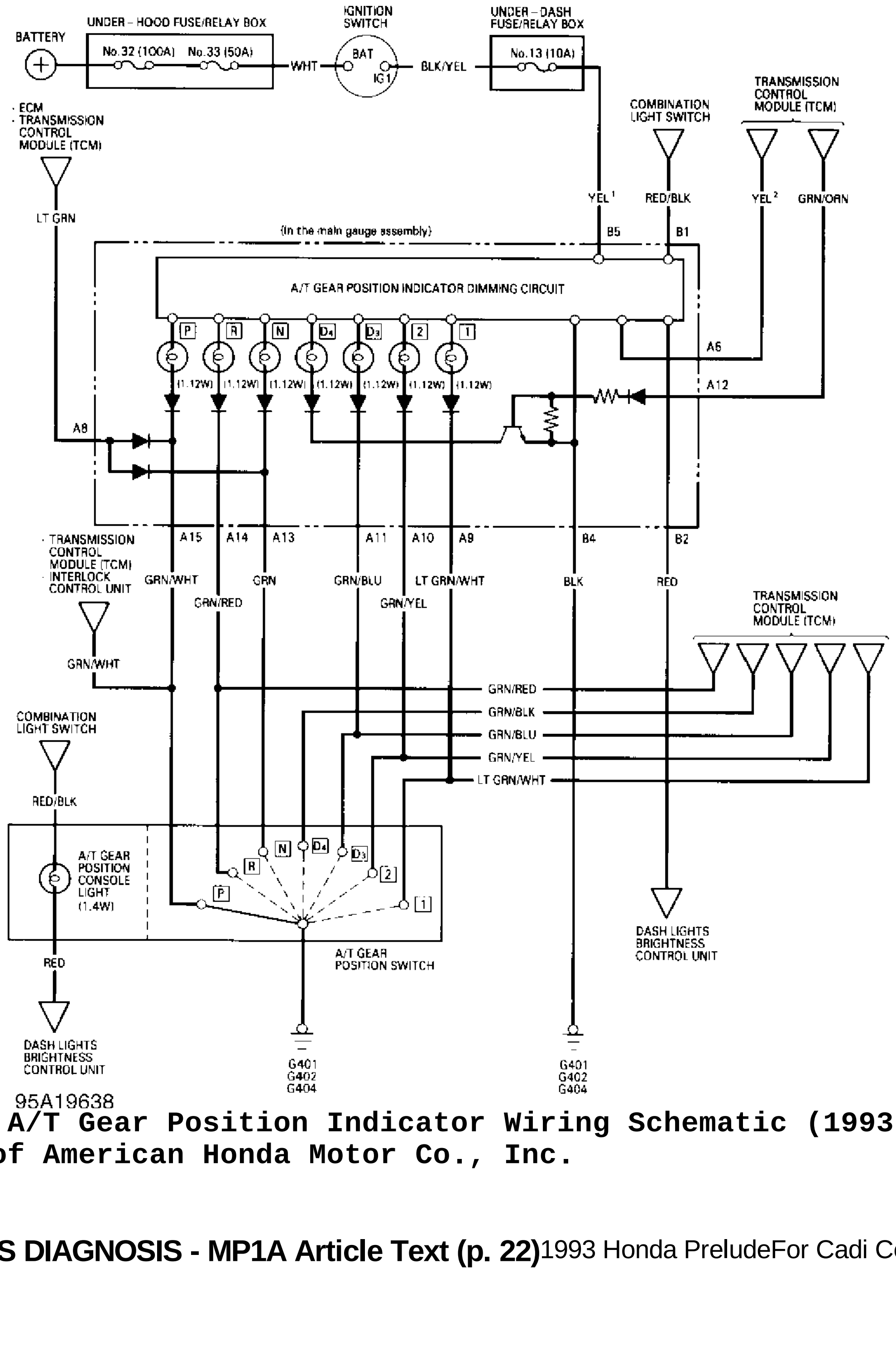

Fig. 18: A/T Gear Position Indicator Wiring Schematic (1993)
Courtesy of American Honda Motor Co., Inc.

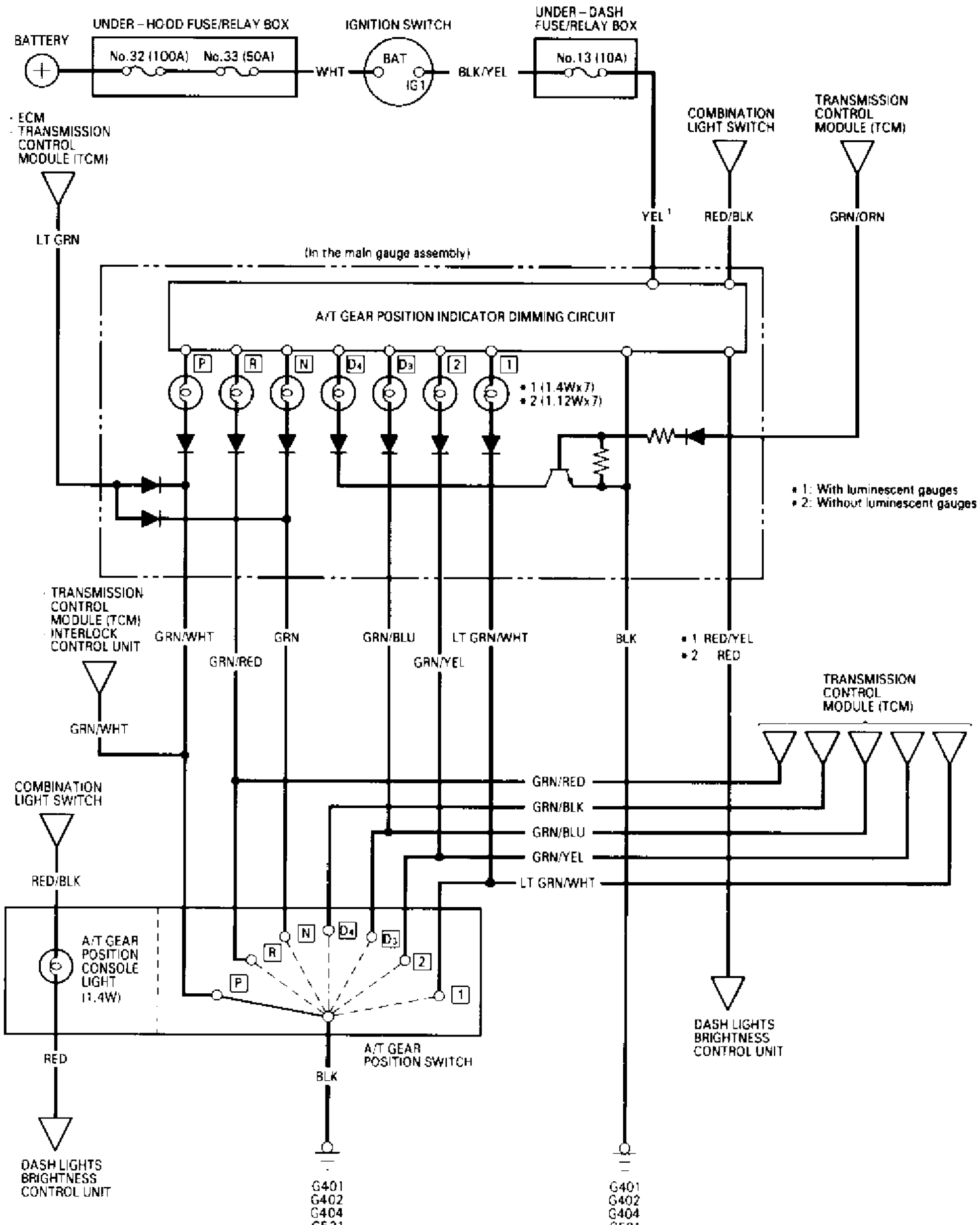

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Fig. 19: A/T Gear Position Indicator Wiring Schematic (1994)
Courtesy of American Honda Motor Co., Inc.

SHIFT & KEY INTERLOCK SYSTEMS

NOTE: If necessary, refer to wiring schematic when checking component wiring. See Fig. 20.

Shift Interlock System

1) To check system operation, ensure shift lever is in Park. Turn ignition on. Depress brake pedal with accelerator pedal in idle position.

2) If shift lock solenoid clicks, system is working properly. If shift lock solenoid fails to click, go to step 3). If shift lever cannot be moved from Park, check for proper installation procedure of shift lock solenoid. See **SHIFT LOCK SOLENOID** under **REMOVAL & INSTALLATION**. If shift lock solenoid installation is okay, check shift cable and shift components at transaxle.

3) Disconnect 8-pin electrical connector from interlock control unit. Interlock control unit is located above driver's side kick panel and contains a Gray 8-pin electrical connector. Refer to the Figs. 5-8.

4) Turn ignition on and depress brake pedal. Using voltmeter, check voltage at White/Green wire of 8-pin electrical connector and ground. Battery voltage should exist.

5) With brake pedal still depressed, depress accelerator pedal. Ensure brake pedal and accelerator are held down at the same time. Check voltage at White/Green wire of 8-pin electrical connector and ground. Battery voltage should not exist.

6) If voltage readings in steps 4) and 5) are as specified, go to step 8). If voltage is not as specified in steps 4) and 5), check No. 41 fuse (15-amp) in engine compartment fuse box. Engine compartment fuse box is located on passenger's side rear corner of engine compartment, near firewall. If fuse is okay, check for defective wiring.

7) If wiring checks okay, check for a defective brakelight switch or throttle position sensor. Refer to **BRAKELIGHT SWITCH** and **THROTTLE POSITION SENSOR** under **COMPONENT TESTING**. If all components are okay, substitute TCM and recheck operation.

8) Ensure shift lever is in Park. Using ohmmeter, check continuity between Green/White wire of 8-pin electrical connector and ground. Continuity should exist. If continuity exists, go to step 10).

9) If continuity does not exist, check the A/T gear position switch. See **A/T GEAR POSITION SWITCH** under **COMPONENT TESTING**. If the A/T gear position switch is okay, check for defective wiring or ground connections G401, G402, G404 and G521 (1994 models). See Fig. 17 and refer to the **GROUND CONNECTION LOCATIONS** table.

10) Ensure ignition is on. Using voltmeter, check voltage at Green wire of 8-pin electrical connector and ground. If battery voltage exists, wiring circuit is okay.

11) If battery voltage does not exist, check for defective No. 13 fuse (10-amp), located in fuse/relay box behind driver's side kick panel. If fuse is okay, check for defective wiring circuit. If wiring circuit checks okay, check the shift lock solenoid. Refer to **SHIFT LOCK SOLENOID** under **COMPONENT TESTING**.

GROUND CONNECTION LOCATIONS

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Ground Connection	Location

G401
  1993
    4WS, VTEC & SR-V .... Behind Passenger's Side Of Instrument
                                        Panel, Near Glove Box
    S, Si & SR .... Behind Passenger's Kick Panel, Above TCM
  1994 .... Behind Passenger's Kick Panel, Above TCM
G402 .... Driver's Side Of Center Console, Near Shift Lever
G404 ..... Passenger's Side Of Center Console, Near Shift Lever
G521 .... Below Driver's Seat, Near Seat Mount Rail
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Key Interlock System

1) Disconnect 8-pin electrical connector from interlock control unit. Interlock control unit is located above driver' side kick panel and contains a Gray 8-pin electrical connector. Refer to the Figs. 5-8.

2) Using ohmmeter, check continuity between Black wire of 8-pin electrical connector and ground. Continuity should exist. If continuity exists, go to step 4). If continuity does not exist, go to step 3).

3) Check for defective wiring or ground connections G401, G402, G404 and G521 (1994 models). See GROUND CONNECTION LOCATIONS table. See Fig. 17.

4) Ensure shift lever is in Park. Using ohmmeter, check continuity between Green/White wire of 8-pin electrical connector and ground. Continuity should exist. If continuity exists, go to step 8). If continuity does not exist, go to step 5).

5) Check for open circuit in Green/White wire between interlock control unit and A/T gear position switch. The A/T gear position switch is mounted on driver's side of shift lever. See Figs. 5-8. If Green/White wire is okay, go to step 6).

6) Check for open circuit in Black wire between A/T gear position switch and ground connection. Check for defective ground connections G401, G402, G404 and G521 (1994 models). See Fig. 17 and refer to the GROUND CONNECTION LOCATIONS table.

7) If Black wire and ground connection are okay, check A/T gear position switch. See the A/T GEAR POSITION SWITCH under COMPONENT TESTING.

8) Turn ignition lock assembly to ACC position. Using voltmeter, check for battery voltage at White/Red and White/Blue wires of 8-pin electrical connector and ground. If battery voltage exists, wiring circuit is okay.

9) If battery voltage does not exist, check No. 46 fuse (15-amp) in engine compartment fuse box. Engine compartment fuse box is located on passenger's side rear corner of engine compartment, near firewall. If fuse is okay, check for open circuit in White/Blue wire between No. 46 fuse and key interlock switch and key interlock solenoid. Key interlock switch and key interlock solenoid are located

on ignition lock assembly. See Figs. 2-3.

10) If White/Blue wire is okay, check key interlock solenoid. See KEY INTERLOCK SOLENOID under COMPONENT TESTING. If key interlock solenoid is okay, check for open circuit in White/Red and White/Blue wires between key interlock solenoid and interlock control unit.

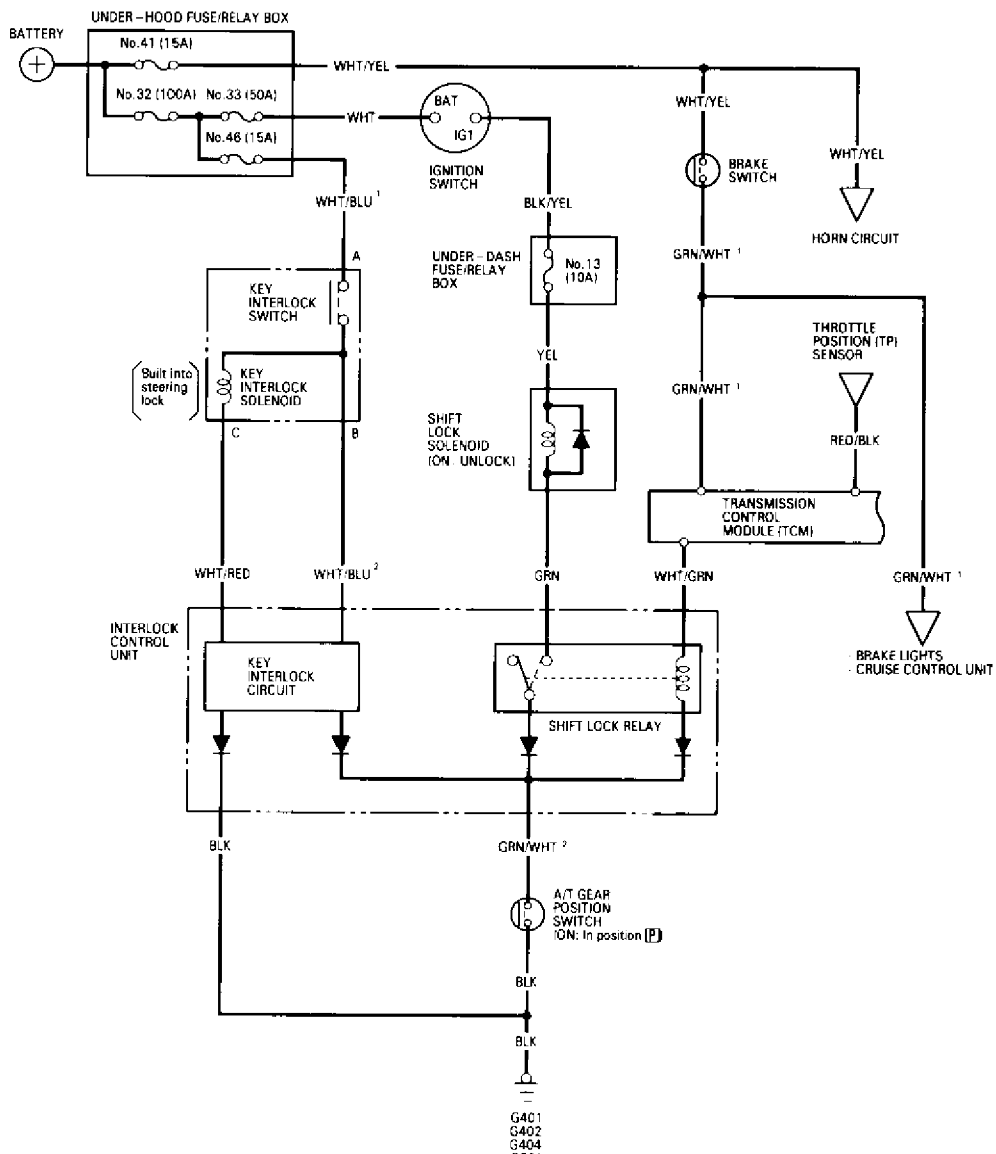

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Fig. 20: Shift & Key Interlock System Wiring Schematic
Courtesy of American Honda Motor Co., Inc.

COMPONENT TESTING

A/T GEAR POSITION SWITCH TEST

NOTE: The A/T gear position switch also contains back-up light

switch and neutral position switch. Back-up light and neutral position switch can also be checked when checking A/T gear position switch.

1) The A/T gear position switch is mounted on driver's side of shift lever. See Figs. 5-8. Remove center console.
2) Disconnect 3-pin and 12-pin electrical connectors at A/T gear position switch and note terminal identification. See Fig. 21.
3) Using an ohmmeter, check for continuity between specified terminals in relation to specific shift lever positions. Refer to the A/T GEAR POSITION SWITCH CONTINUITY table.

NOTE: Check continuity while moving shift lever back and forth in free play area of each gear position. DO NOT touch push button on shift lever when checking continuity.

4) If continuity is not as specified, A/T gear position switch may require adjustment. See A/T GEAR POSITION SWITCH under REMOVAL & INSTALLATION. If correct continuity cannot be obtained by adjusting A/T gear position switch, replace A/T gear position switch.

A/T GEAR POSITION SWITCH CONTINUITY SPECIFICATIONS

Shift Lever Position	Terminal Number
A/T Gear Position Switch	
"P"	8 & 11
"R"	7 & 8
"N"	6 & 8
"D4"	1, 5 & 8
"D"	2, 5 & 8
"2"	3, 5 & 8
"1"	4 & 8
Back-Up Light Switch	
"R"	9 & 10
Neutral Position Switch	
"P" & "N"	13 & 15

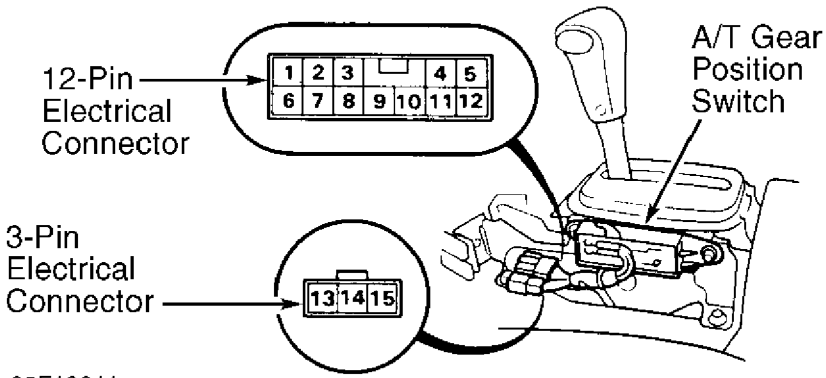

Fig. 21: Identifying A/T Gear Position Switch Connector Terminals
Courtesy of American Honda Motor Co., Inc.

BRAKELIGHT SWITCH TEST

1) Disconnect electrical connector from brakelight located on brake pedal support. See Figs. 5-8. Note brake switch terminal identification. See Fig. 22.

2) Using ohmmeter, check continuity between terminals "A" and "D" with brake pedal released. Continuity should exist.

3) Check continuity between terminals "B" and "C" with brake pedal depressed. Continuity should exist.

4) If continuity is not as specified, ensure brake pedal is properly adjusted so brakelight switch has proper travel for switch operation. If proper brakelight switch travel exists, replace brakelight switch.

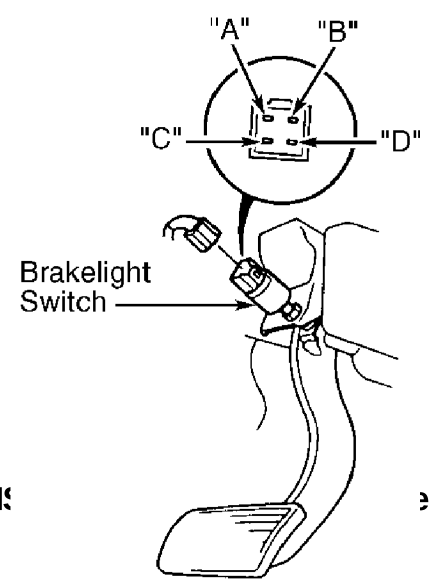

Fig. 22: Identifying Brakelight Switch Terminals
Courtesy of American Honda Motor Co., Inc.

COUNTERSHAFT SPEED SENSOR TEST

1) Countershaft speed sensor is located on transaxle. See Figs. 5-8. Disconnect electrical connector from countershaft speed sensor.

2) Using ohmmeter, measure resistance between terminals on countershaft speed sensor. Replace countershaft speed sensor if resistance is not 400-600 ohms at 70oF (20oC).

ENGINE COOLANT TEMPERATURE (ECT) SENSOR TEST

1) Engine coolant temperature sensor is located on cylinder head, below the distributor and contains a Green/White wire and a Yellow/Blue wire in the electrical connector. See Figs. 5-8. Disconnect electrical connector from engine coolant temperature sensor.

2) Using ohmmeter, check engine coolant temperature sensor resistance in accordance with engine coolant temperature. See Fig. 23. Replace engine coolant temperature sensor if resistance is not within specification.

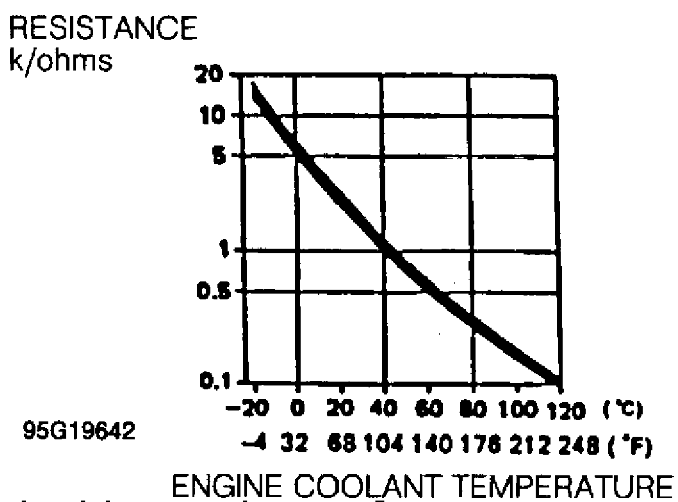

Fig. 23: Checking Engine Coolant Temperature Sensor Resistance
Courtesy of American Honda Motor Co., Inc.

KEY INTERLOCK SOLENOID TEST

1) Remove lower panel from steering column. Disconnect 8-pin electrical connector from main wiring harness and note terminal identification. See Fig. 24.

2) Using ohmmeter, check continuity between designated terminals with ignition lock assembly in ACC position. Refer to the KEY INTERLOCK SOLENOID CONTINUITY SPECIFICATIONS table.

3) Replace ignition lock assembly if continuity is not as specified, as key interlock solenoid cannot be serviced separately.

KEY INTERLOCK SOLENOID CONTINUITY SPECIFICATIONS

Ignition Key Position	Continuity Between Terminals
Key Installed	"A", "B" & "C"
Key Removed	"B" & "C"

4) Connect battery voltage and ground to terminals "A" and "C'. Ensure ignition key cannot be removed with battery voltage applied.

5) If ignition key cannot be removed, key interlock solenoid is okay. If ignition key can be removed, replace ignition lock assembly, as key interlock solenoid cannot be serviced separately.

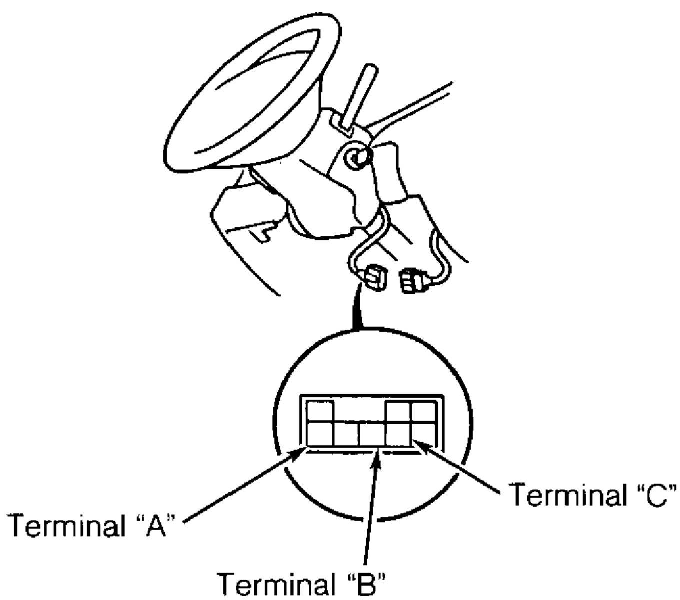

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Fig. 24: Identifying Key Interlock Solenoid Connector & Terminals
Courtesy of American Honda Motor Co., Inc.

LOCK-UP CONTROL SOLENOID VALVES TEST

1) Lock-up control solenoid valves are located on the transaxle. See Figs. 5-8. Disconnect electrical connector at lock-up control solenoid valves.

2) Using ohmmeter, measure resistance between terminal No. 1 (solenoid valve "A") or terminal No. 2 (solenoid valve "B") of lock-up control solenoid valve electrical connector and body ground. See Fig. 25.

3) Resistance should be 12-24 ohms. Replace lock-up control

solenoid valve assembly if resistance of either solenoid valve is not within specification.

4) To check lock-up control solenoid valve operation, ensure lock-up control solenoid valve body is grounded. Apply battery voltage to terminal No. 1 (solenoid valve "A") or terminal No. 2 (solenoid valve "B") of lock-up control solenoid valve electrical connector.

5) Clicking sound should be heard, indicating solenoid valve operation. Replace lock-up control solenoid valve assembly if either solenoid valve fails to operate.

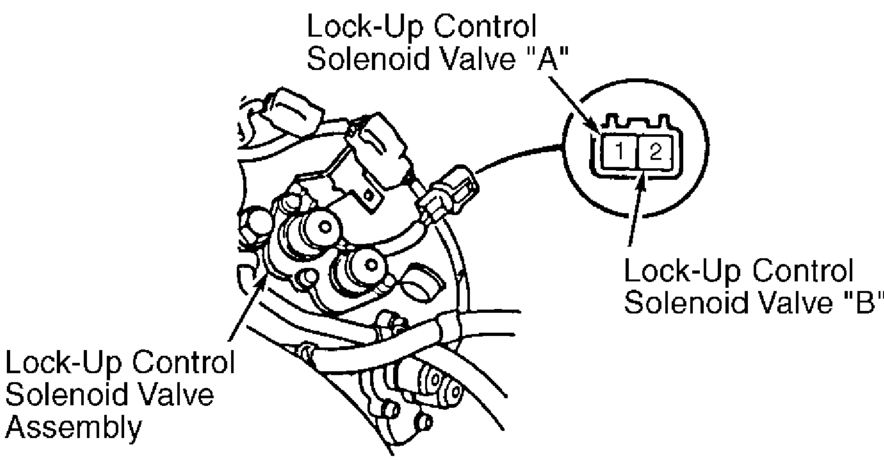


Fig. 25: Identifying Lock-Up Control Solenoid Valve Terminals
Courtesy of American Honda Motor Co., Inc.

MAINSHAFT SPEED SENSOR TEST

1) Mainshaft speed sensor is located on transaxle. See Figs. 5-8. Disconnect electrical connector from mainshaft speed sensor.

2) Using ohmmeter, measure resistance between terminals on mainshaft speed sensor. Replace mainshaft speed sensor if resistance is not 400-600 ohms at 70°F (20°C).

SHIFT CONTROL SOLENOID VALVES TEST

1) Shift control solenoid valves are located on transaxle. See Figs. 5-8. Disconnect electrical connector at shift control solenoid valves.

2) Using ohmmeter, measure resistance between terminal No. 1 (solenoid valve "A") or terminal No. 2 (solenoid valve "B") of shift control solenoid valve electrical connector and body ground. See Fig. 26.

3) Resistance should be 12-24 ohms. Replace shift control solenoid valve assembly if resistance of either solenoid valve is not within specification.

4) To check shift control solenoid valve operation, ensure solenoid valve body is grounded. Apply battery voltage to terminal No. 1 (solenoid valve "A") or terminal No. 2 (solenoid valve "B") of shift control solenoid valve electrical connector.

5) Clicking sound should be heard, indicating solenoid valve operation. Replace shift control solenoid valve assembly if either solenoid valve fails to operate.

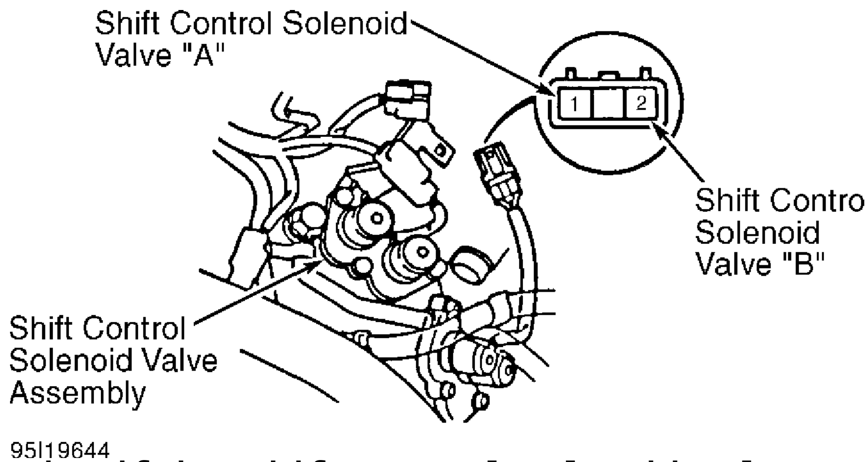


Fig. 26: Identifying Shift Control Solenoid Valve Terminals
Courtesy of American Honda Motor Co., Inc.

SHIFT LOCK SOLENOID TEST

1) Remove center console. Disconnect 3-pin connector from main wiring harness and note terminal identification. SeeFig. 27.

CAUTION: Battery voltage must be applied to proper shift lock solenoid terminals or diode inside shift lock solenoid will be damaged.

2) Momentarily connect battery positive terminal to terminal "A" and battery negative terminal to terminal "B". SeeFig. 27. Ensure shift lock solenoid operates with battery voltage applied. Replace shift lock solenoid if it solenoid does not operate.

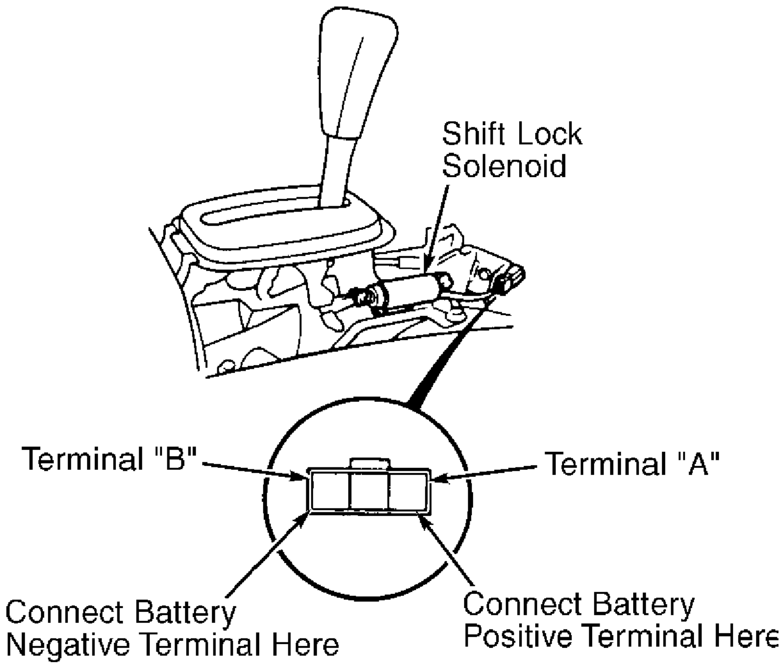


Fig. 27: Identifying Shift Lock Solenoid Connector & Terminals
Courtesy of American Honda Motor Co., Inc.

THROTTLE POSITION SENSOR (TPS) TEST

Throttle position sensor should input a .5-volt reference signal to TCM at closed throttle and approximately 4.5-volt signal at full throttle. Voltage should change smoothly as throttle valve is opened and closed. If voltage is not correct, check throttle position sensor wiring circuit. See WIRING DIAGRAMS. Individual component testing not available from manufacturer.

NOTE: If problem in throttle position sensor exists, throttle position sensor may set Fault Code No. 3 in TCM. See RETRIEVING FAULT CODES under SELF-DIAGNOSTIC SYSTEM

VEHICLE SPEED SENSOR (VSS) TEST

1) Vehicle speed sensor is located on transaxle, below thermostat housing. See Figs. 5-8. Ensure No. 23 fuse (15-amp) in fuse/relay box behind driver's side kick panel is okay. Replace fuse if necessary. If fuse is okay, disconnect 3-pin electrical connector at vehicle speed sensor.

2) Turn ignition on. Using voltmeter, measure voltage between the Black/Yellow wire and Black wire of 3-pin electrical connector. If battery voltage exists, proceed to step 5). If battery voltage does not exist, proceed to step 3).

3) Using ohmmeter, check for continuity betweenBlack wire of

3-pin electrical connector and body ground. If continuity exists, repair open circuit in Black/Yellow wire between 3-pin electrical connector and No. 23 fuse (15-amp) in fuse/relay box behind driver's side kick panel.

4) If continuity does not exist, check for open circuit in Black wire between 3-pin electrical connector and ground connection G101. See WIRING DIAGRAMS. Ground connection G101 is located on bolt at thermostat housing.

5) Using voltmeter, measure voltage between Orange and Black wires of 3-pin electrical connector. If about 5 volts exist, proceed to step 6). If about 5 volts does not exist, repair open circuit or short circuit to ground in Orange wire. The Orange wire goes to instrument panel gauge assembly, TCM, ECM, cruise control unit and 4 wheel steering (4WS) control unit (if equipped).

NOTE: Cruise control unit is located behind driver's side of instrument panel, near steering column. See Fig. 3. The 4WS control unit is located behind rear seat on driver's side, near shock tower. See Fig. 3.

6) Reconnect 3-pin electrical connector on vehicle speed sensor. Raise and support front of vehicle so front wheels are free to rotate. Using voltmeter, backprobe Orange wire on 3-pin electrical connector and connect it to body ground.

7) Place shift lever in Neutral. Ensure ignition is on. Rotate one front wheel while holding the other front wheel stationary.

8) Note that voltage reading pulses from zero volts to about 5 volts. If voltage pulses correctly, vehicle speed sensor is okay. If voltage does not pulse correctly, replace vehicle speed sensor.

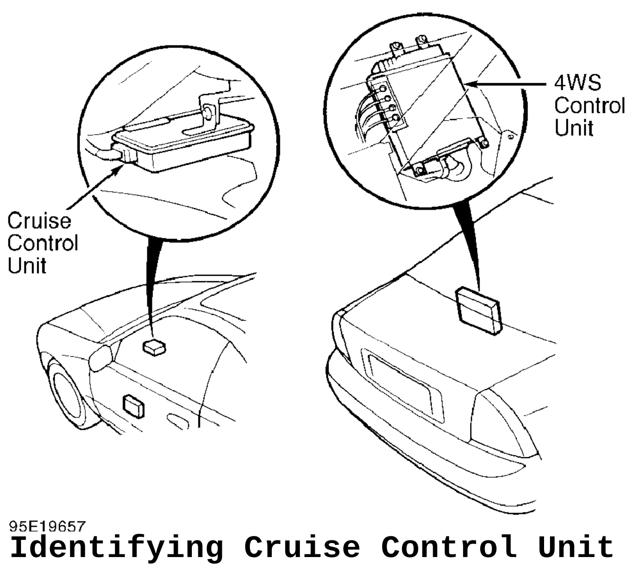


Fig. 28: Identifying Cruise Control Unit & 4WS Control Unit
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

A/T GEAR POSITION SWITCH R & I

Removal

Remove center console. Disconnect electrical connectors from A/T gear position switch. Remove nuts and A/T gear position switch.

Installation

1) Ensure parking brake is applied. Place switch slider on A/T gear position switch in neutral position. SeeFig. 29. Place shift lever in Neutral.

2) Install A/T gear position switch and nuts.DO NOT tighten nuts at this time, as A/T gear position switch must be adjusted.

3) To adjust A/T gear position switch, place shift lever in Park. Ensure retaining nuts are loose. Note electrical connector terminal identification. See Fig. 21.

4) Connect ohmmeter between terminals No. 8 and 11. Move A/T gear position switch toward rear of console until continuity exists between terminals No. 8 and 11. Free play at lock pin should be .079" (2.0 mm) maximum. See Fig. 29.

5) Tighten nuts. Check A/T gear position switch for correct continuity in all gears. See A/T GEAR POSITION SWITCH under COMPONENT TESTING. If proper adjustment cannot be obtained, check for damaged shift lever detent or bracket. Install electrical connector and center console.

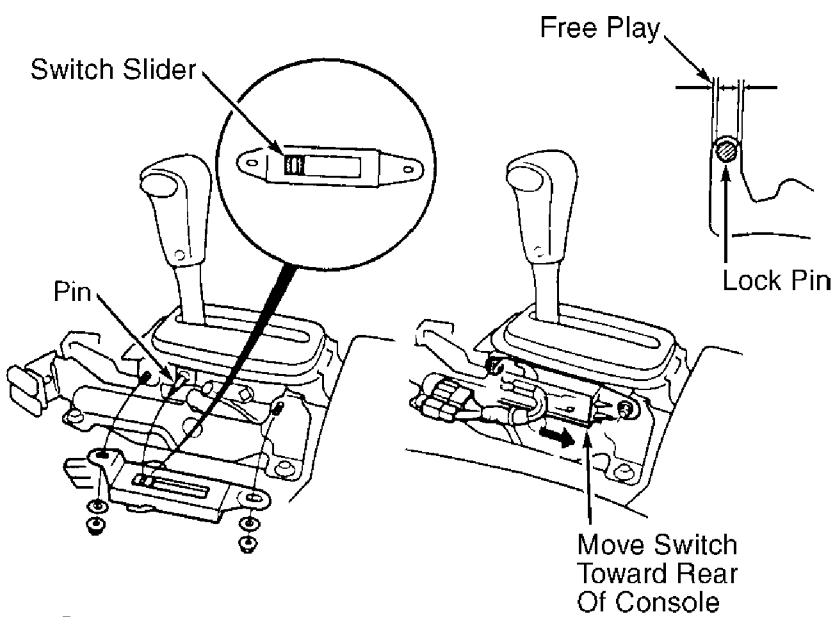


Fig. 29: Installing A/T Gear Position Switch
Courtesy of American Honda Motor Co., Inc.

BRAKELIGHT SWITCH R & I

Removal & Installation

1) Disconnect electrical connector. Remove lock nut and unscrew brakelight switch. To install, screw brakelight switch inward until brakelight plunger is fully depressed.

2) Back off brakelight switch 1/4 turn. Install and tighten lock nut. Install electrical connector. Ensure brakelights and cruise control operate properly.

COUNTERSHAFT SPEED SENSOR R & I

Removal & Installation

Countershaft speed sensor is located on transaxle. See Figs. 5-8. Remove bolt, countershaft speed sensor and "O" ring. To install, reverse removal procedure using NEW "O" ring. Tighten bolt to specification. See TORQUE SPECIFICATIONS.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR R & I

Removal

Engine coolant temperature sensor is located on cylinder head, below the distributor and contains a Green/White wire and a Yellow/Blue wire in the electrical connector. See Fig. 4. Drain cooling system. Remove engine coolant temperature sensor.

Installation

1) Install and tighten engine coolant temperature sensor. When refilling cooling system, open air bleed bolt on thermostat housing.

2) Fill the cooling system until coolant flows from the air bleed bolt. Tighten air bleed bolt to specification. Refer to the TORQUE SPECIFICATIONS table. Finish filling cooling system.

KEY INTERLOCK SOLENOID R & I

Removal & Installation

Key interlock solenoid cannot be serviced separately. Entire ignition lock assembly must be replaced.

LOCK-UP CONTROL SOLENOID VALVES R & I

Removal & Installation

1) Lock-up control solenoid valves are located on the transaxle. See Figs. 5-8. Disconnect electrical connector at lock-up control solenoid valves.

2) Remove bolts, lock-up control solenoid valve assembly and gasket. To install, reverse removal procedure using NEW gasket.

Tighten bolts to specification. See TORQUE SPECIFICATIONS.

MAINSHAFT SPEED SENSOR R & I

Removal & Installation

Mainshaft speed sensor is located on transaxle. Refer to the Figs. 5-8. Remove bolt, mainshaft speed sensor and "O" ring. To install, reverse removal procedure using NEW "O" ring. Tighten bolt to specification. See TORQUE SPECIFICATIONS.

SHIFT CONTROL SOLENOID VALVES R & I

Removal & Installation

1) Shift control solenoid valves are located on transaxle. See Figs. 5-8. Disconnect electrical connector at shift control solenoid valves.

2) Remove bolts, shift control solenoid valve assembly and gasket. To install, reverse removal procedure using NEW gasket. Tighten bolts to specification. See TORQUE SPECIFICATIONS.

SHIFT LOCK SOLENOID R & I

Removal

Remove center console. Disconnect electrical connector at shift lock solenoid. Remove pin from shift lock solenoid. Remove nuts and shift lock solenoid.

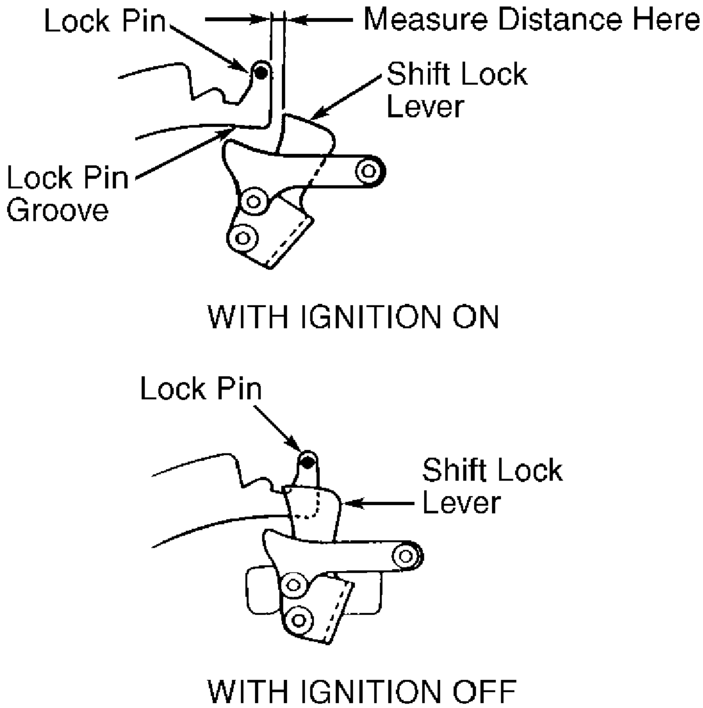
Installation

1) Install shift lock solenoid with NEW nuts snugly installed. Install pin and electrical connector.

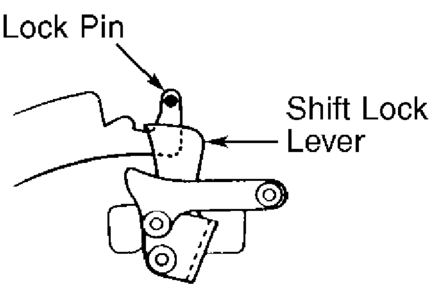
2) Turn ignition on (solenoid energized), ensure clearance between top of shift lock lever and lock pin groove is .094-.134" (2.4-3.4 mm). See Figs. 30-31.

3) If clearance is not as specified, loosen nuts and reposition shift lock solenoid until correct clearance is obtained. Once correct clearance is obtained, tighten nuts to specification. See the TORQUE SPECIFICATIONS table.

4) Turn ignition off (solenoid de-energized). Ensure lock pin is blocked by shift lock lever. See Figs. 30-31. Check solenoid operation several times.



93J22656
Fig. 30: Checking Shift Lock Solenoid Operation
Courtesy of American Honda Motor Co., Inc.



93A22657
Fig. 31: Checking Shift Lock Solenoid Operation
Courtesy of American Honda Motor Co., Inc.

TCM R & I

Removal & Installation

TCM is located behind passenger's side kick panel. Refer to the Figs. 5-8. Replacement information not available from manufacturer.

THROTTLE POSITION SENSOR R & I

Removal & Installation

Throttle position sensor is mounted on throttle body. Replacement information is not available from manufacturer.

VEHICLE SPEED SENSOR (VSS) R & I

NOTE: When servicing vehicle speed sensor,DO NOT lose vehicle speed sensor drive shaft located between vehicle speed sensor and power steering speed sensor.

Removal & Installation

Vehicle speed sensor is located on transaxle, below thermostat housing. See Figs. 5-8. Disconnect electrical connector at vehicle speed sensor. Remove bolts and vehicle speed sensor. To install, reverse removal procedure.

TROUBLE SHOOTING FLOW CHARTS

FLOW CHART USAGE

1) Use appropriate trouble shooting flow chart corresponding to fault code. Ensure ignition is off before disconnecting electrical connectors from TCM. The TCM is located behind passenger's side kick panel. See Figs. 5-8.

2) The TCM has a 26-pin and 22-pin electrical connectors. These are referenced as connectors 26P and 22P in trouble shooting flow charts.

3) Test Harness (07LAJ-PT3010A) may be required for use with trouble shooting flow chart. To install test harness, ensure ignition is off.

4) Remove passenger's side door sill molding and passenger's side kick panel. Pull carpet back for access to TCM, located behind driver's side kick panel. See Figs. 5-8. Disconnect 26-pin and 22-pin electrical connectors from TCM.

5) Connect test harness to 26-pin and 22-pin electrical connectors or TCM as instructed in trouble shooting flow chart. See Fig. 11.

6) Perform all tests using Digital Volt-Ohmmeter (DVOM). Perform measurements at designated terminals on test harness as instructed in trouble shooting flow chart. Terminal numbers are located on test harness. See Fig. 11.

7) On some fault code trouble shooting flow charts, technician will be instructed to see if Malfunction Indicator Light (MIL) is blinking. The MIL is located on instrument panel. Refer to the Fig. 1.

8) If MIL is blinking, PGM-FI system must be checked. Refer to the appropriate TESTING WITH CODES article in the ENGINE PERFORMANCE section. Refer to the following menu:

*** For 1993 models, see: G - TESTS W/CODES**

* For 1994 models, see: G - TESTS W/CODES

9) On some fault code charts, technician will be instructed to disconnect electrical connector from ECM or check wiring between ECM and TCM. The ECM is located on passenger's side floor panel, below the carpet. See Figs. 5-8.

10) Once all repairs are performed, ensure fault code is cleared from TCM memory. See CLEARING FAULT CODES under SELF-DIAGNOSTIC SYSTEM.

NOTE: The following charts and illustrations are courtesy of American Honda Motor Co., Inc.

DIAGNOSTIC CIRCUIT CHECK "D4" LIGHT ON STEADILY (IGNITION ON)

Refer to Fig. 32.

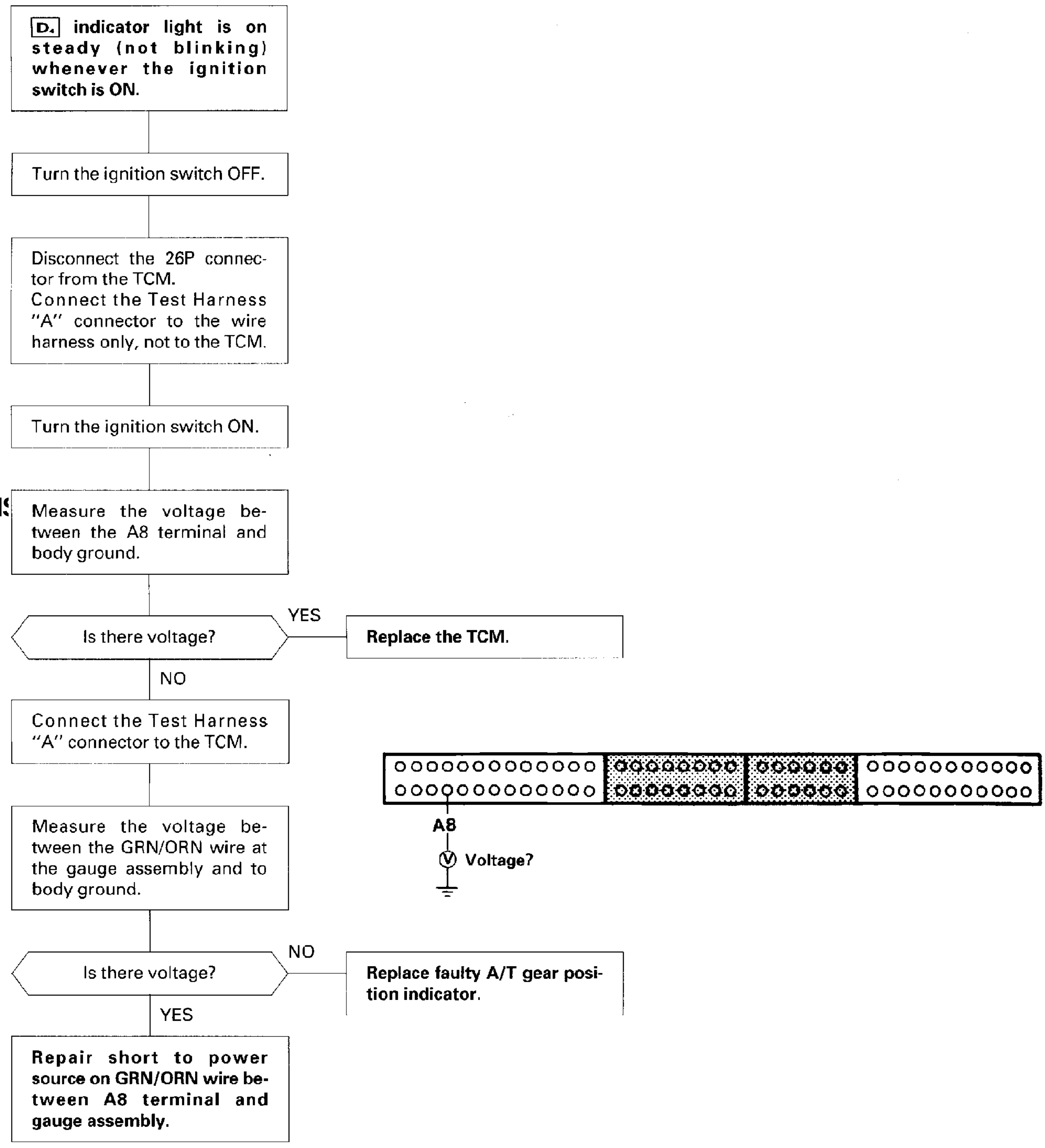


Fig. 32: Diagnostic Circuit Check "D4" Light Steadily (Ignition On)

DIAGNOSTIC CIRCUIT CHECK "D4" LIGHT WILL NOT COME ON

Refer to Figs. 33 and 34.

D4 indicator light does not come on with the ignition switch ON. (It should come on for about 2 seconds.)

Is the service check connector jumped?

YES → Disconnect the jumper wire and recheck.

NO ↓

Shift to D4 position.

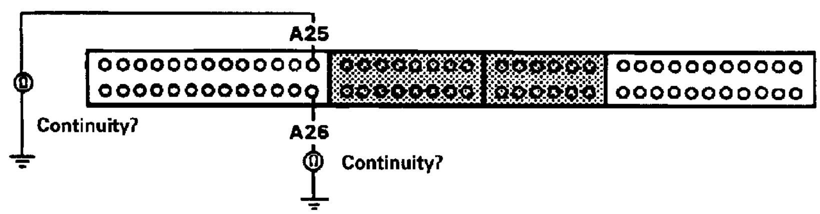
Does the D4 indicator light come on?

YES → Check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.

NO ↓

Turn the ignition switch OFF.

Disconnect the 26P connector from the TCM. Connect the Test Harness "A" connector to the wire harness only, not to the TCM



Check for continuity between the A25 terminal and body ground and A26 and body ground.

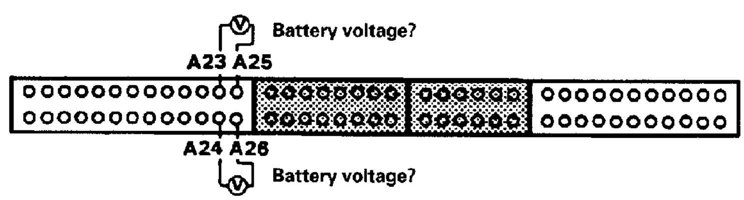
Is there continuity?

NO → Repair open BLK/RED or BRN/BLK wires between A 25 or A26 terminals and G 101.

YES ↓

Turn the ignition switch ON.

Measure the voltage between the A23 or A24 and A 25 or A26 terminals.



Is there battery voltage?

NO → Repair open or short in BLK/YEL wire between the A23 and/or A24 terminals and under-hood fuse/relay box.

YES ↓

Turn the ignition switch OFF.

Continued On Next Page

95G19659

Fig. 33: Circuit Check "D4" Light Will Not Come On (1 of 2)

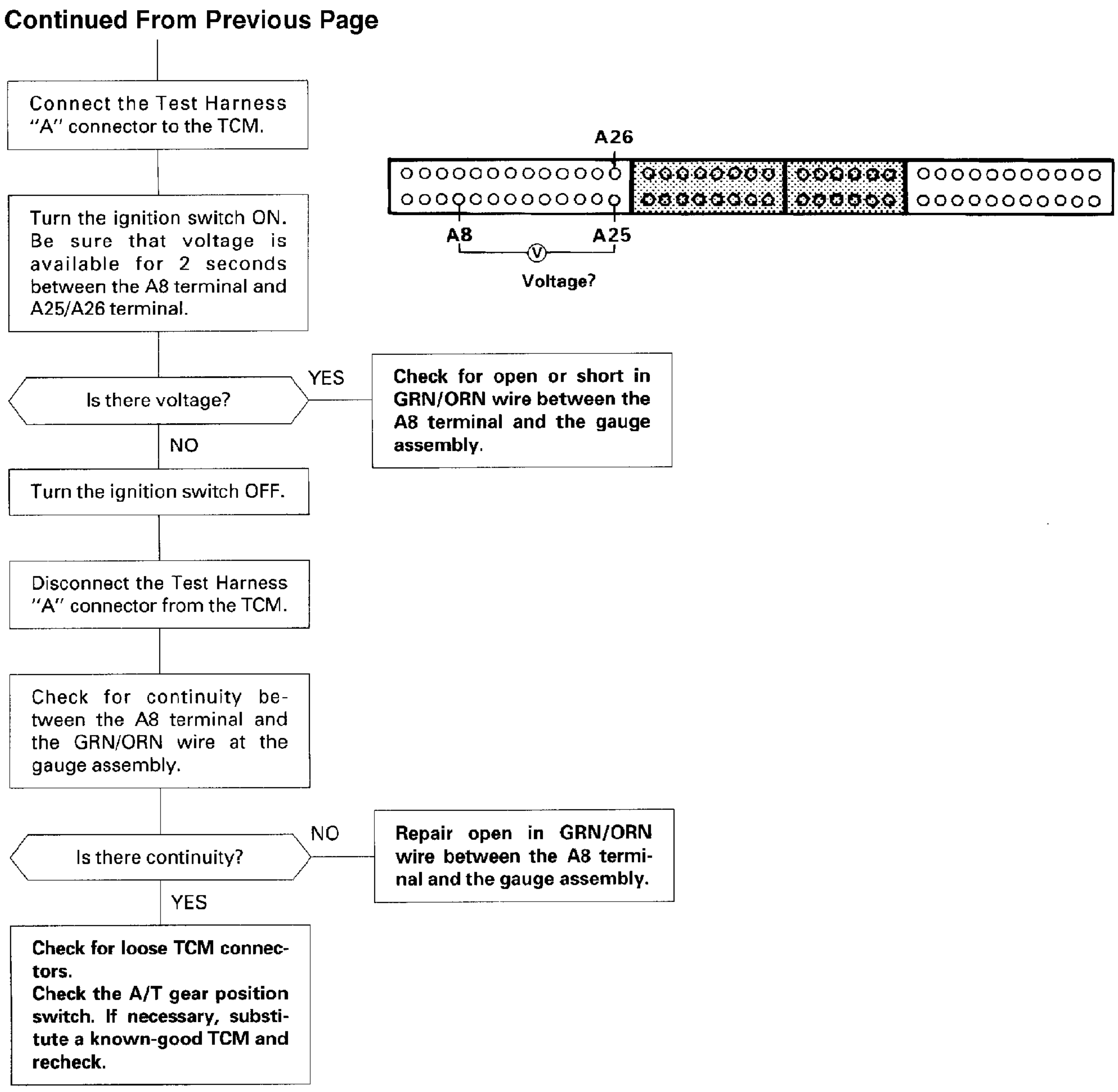
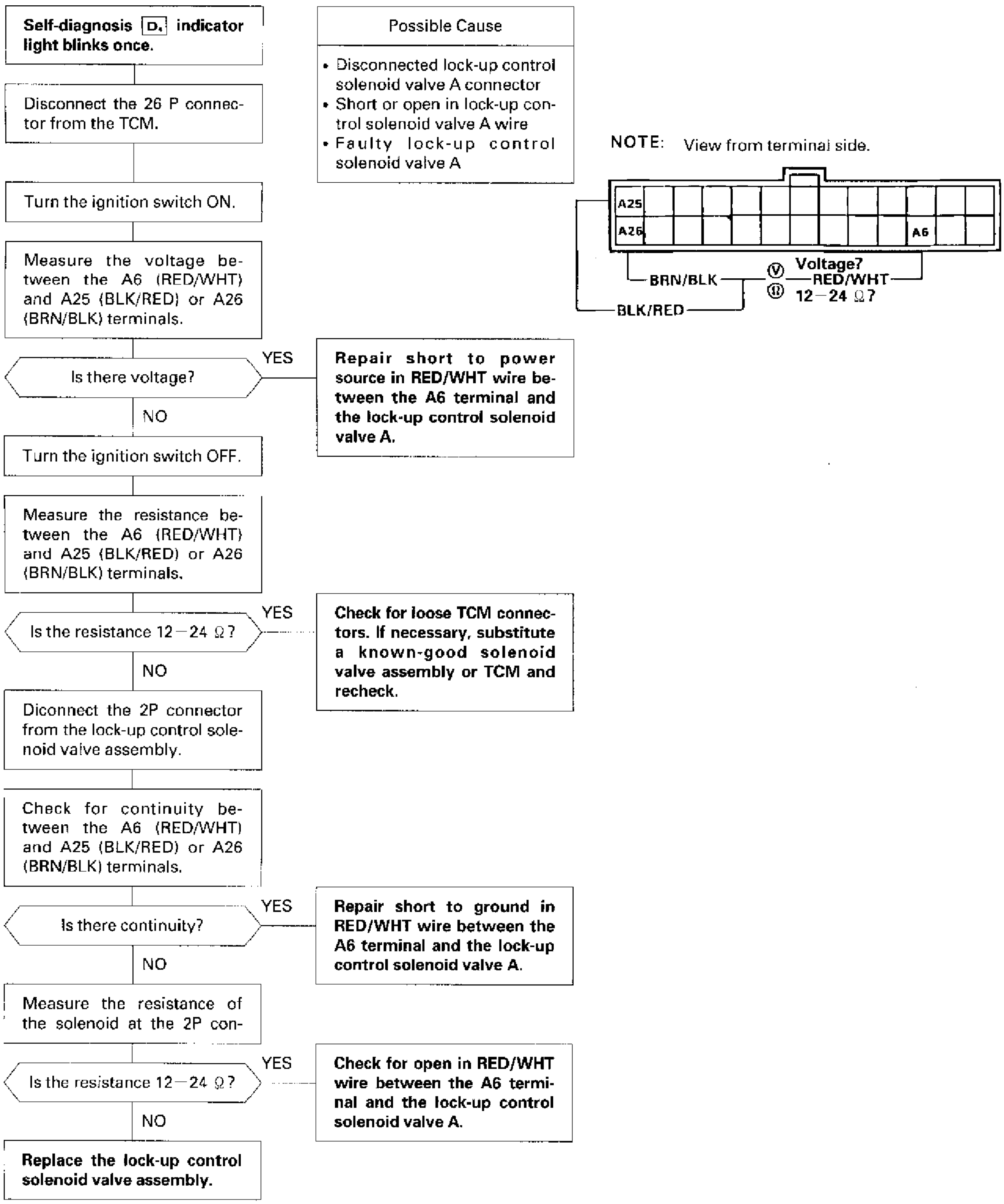


Fig. 34: Circuit Check "D4" Light Will Not Come On (2 of 2)

FAULT CODE NO. 1

NOTE: Connector is viewed from terminal end.

Refer to Fig. 35.



95A19661

FAULT CODE NO. 2

NOTE: Connector is viewed from terminal end.

Refer to Fig. 36.

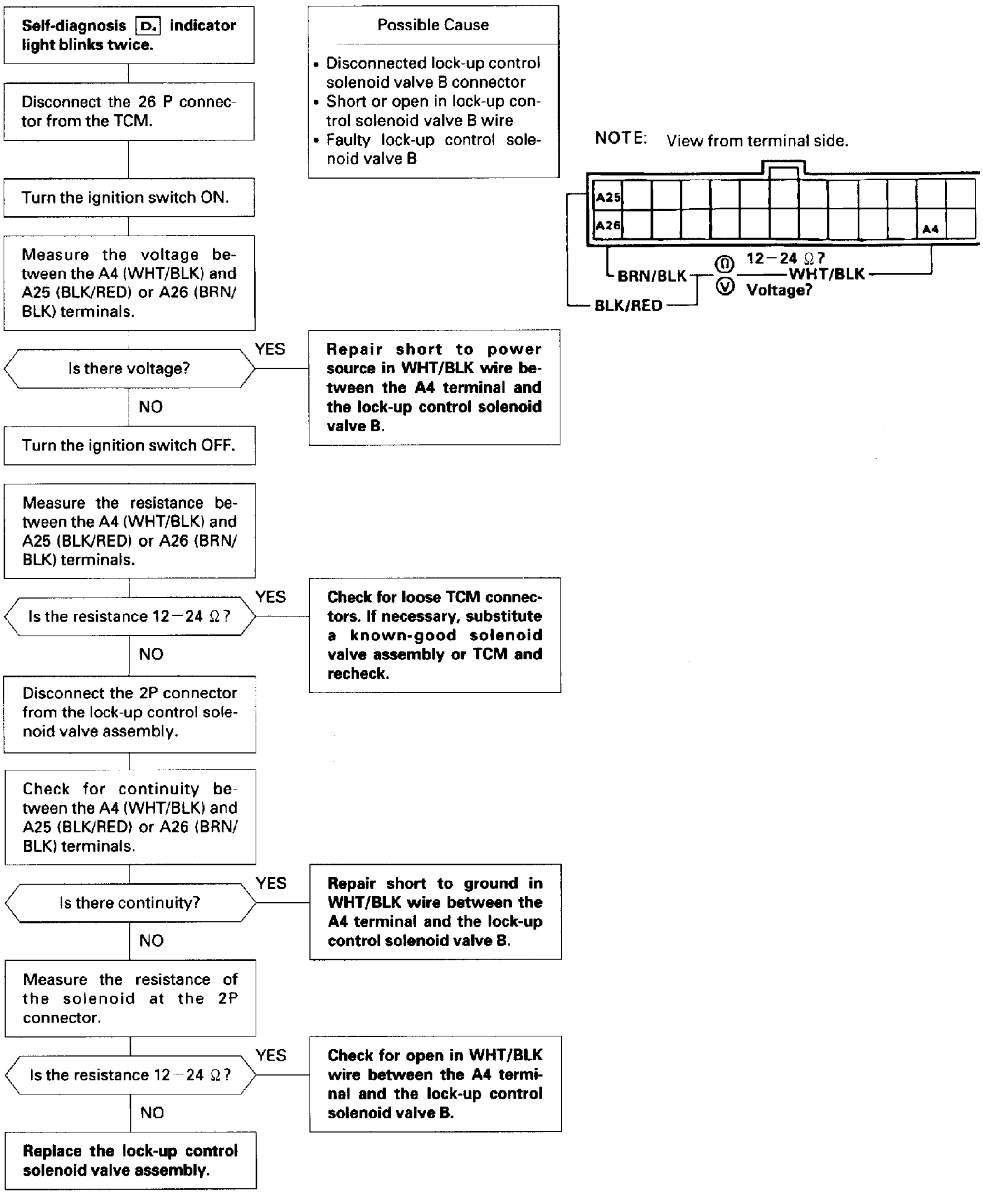


Fig. 36: Fault Code No. 2

FAULT CODE NO. 3

Refer to Fig. 37.

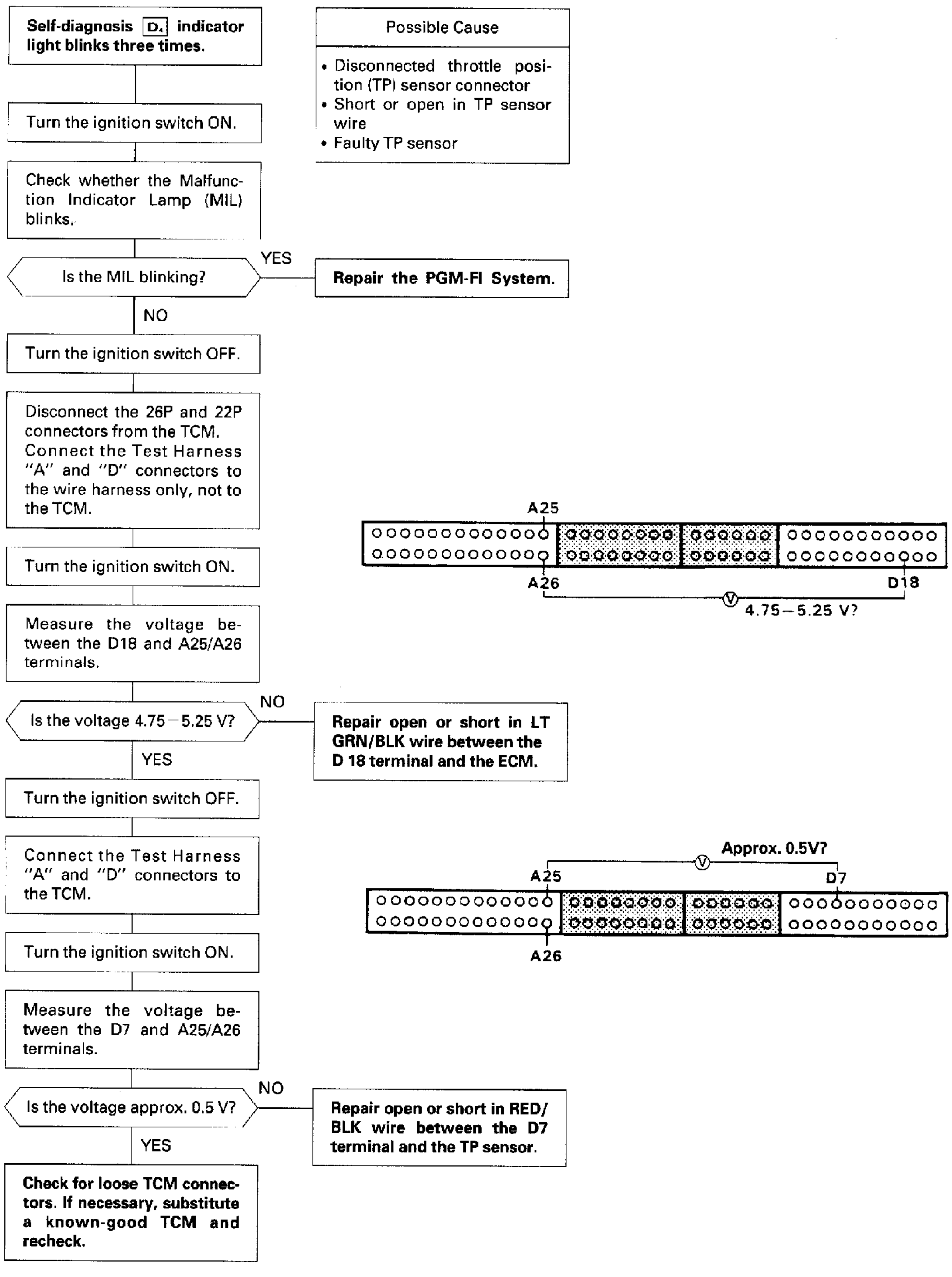


Fig. 37: Fault Code No. 3

FAULT CODE NO. 4

Refer to Fig. 38.

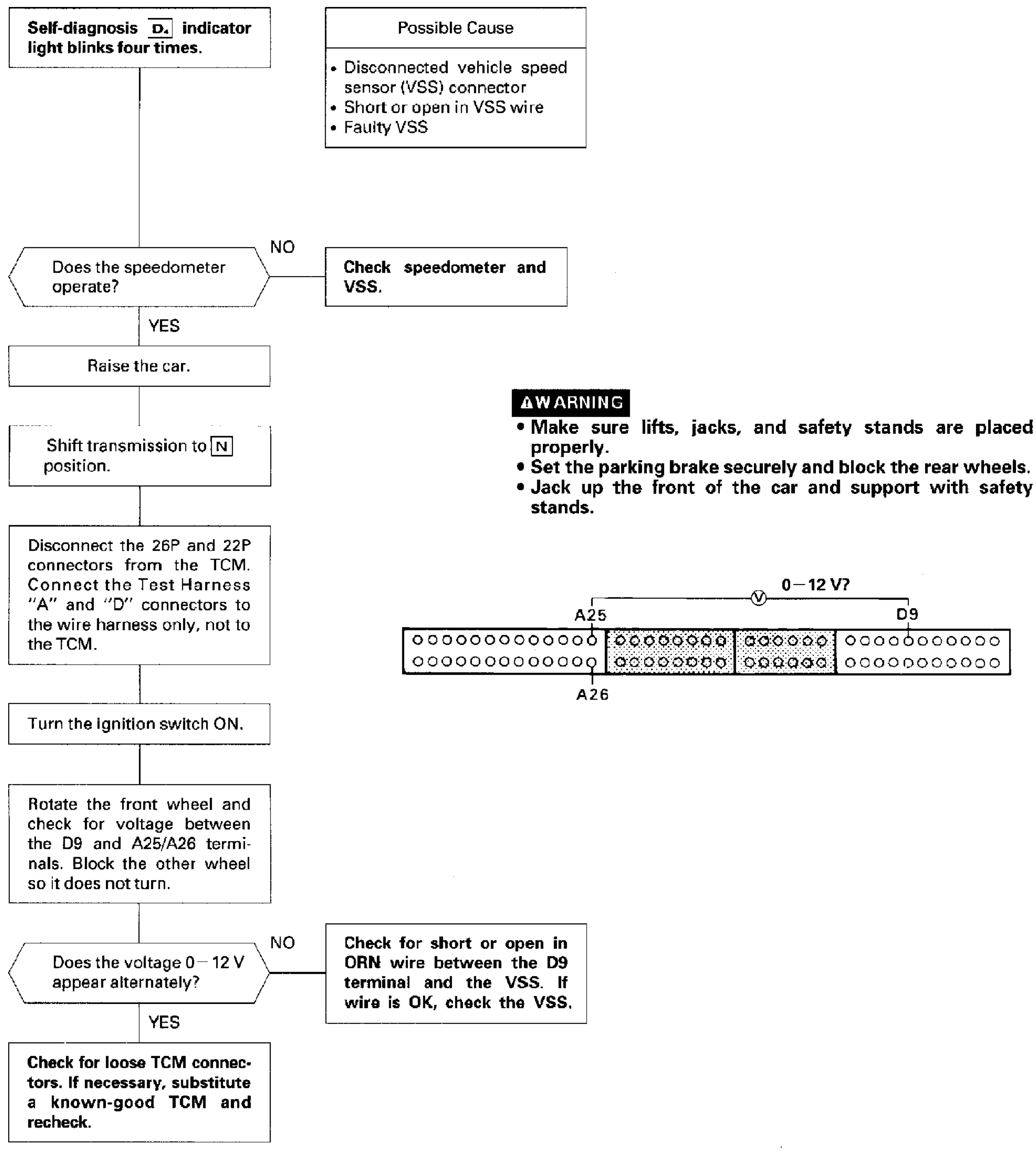


Fig. 38: Fault Code No. 4

FAULT CODE NO. 5

Refer to Figs. 39 and 40.

Self-diagnosis [D4] indicator light blinks five times.

Turn the ignition switch ON.

Observe the A/T gear position indicator, and select each position separately.

Do any indicators fail to light when shifted through all positions?

- YES → **See A/T gear position indicator inspection.**
- NO ↓

Possible Cause

- Short in A/T gear position switch wire
- Faulty A/T gear position switch

NOTE:
Code 5 is caused when the TCM receives two gear position inputs at the same time.

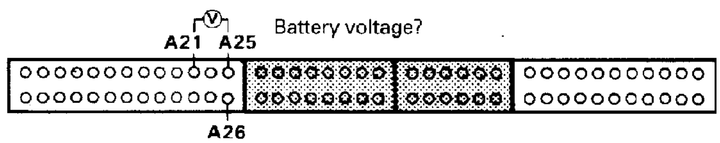
Turn the ignition switch OFF.

Connect the Test Harness between the TCM and connectors.

Turn the ignition switch ON.

Shift to other than [R] position.

Measure the voltage between the A21 and A25/A26 terminals.

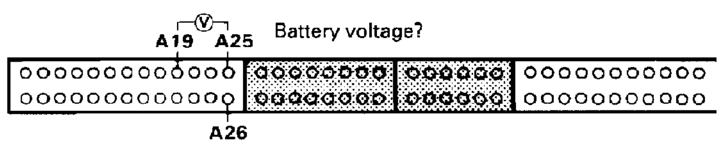


Is there battery voltage?

- NO → **Check for short in GRN/RED wire between the A21 terminal and the A/T gear position switch or A/T gear position indicator. If wire is OK, check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.**
- YES ↓

Shift to other than [N] and [P] position.

Measure the voltage between the A19 and A25/A26 terminals.



Is there battery voltage?

- NO → **Check for short in LT GRN wire between the A19 terminal and the A/T gear position indicator or a short in GRN/WHT or GRN wires between the A/T gear position indicator and the A/T gear position switch. If wire is OK, check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.**
- YES ↓

Continued On Next Page

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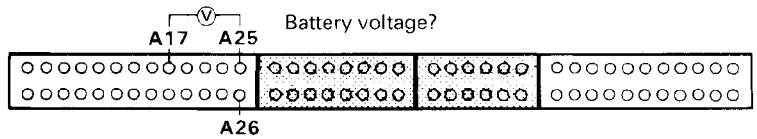
Fig. 39: Fault Code No. 5 (1 of 2)

Continued From Previous Page

Shift to other than $\boxed{D_4}$ position.

↓

Measure the voltage between the A17 and A25/A26 terminals.



↓

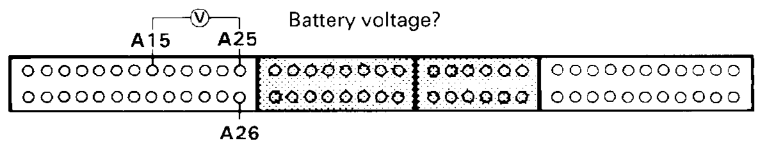
Is there battery voltage?

- NO → Check for short in GRN/BLK wire between the A17 terminal and the A/T gear position switch. If wire is OK, check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.
- YES ↓

Shift to other than $\boxed{D_3}$ position.

↓

Measure the voltage between the A15 and A25/A26 terminals.



↓

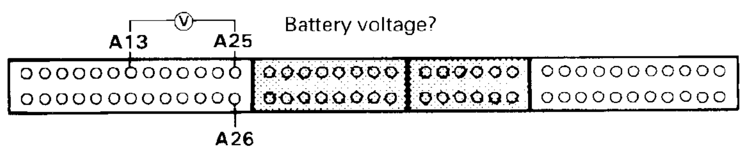
Is there battery voltage?

- NO → Check for short in GRN/BLU wire between the A15 terminal and the A/T gear position switch or A/T gear position indicator. If wire is OK, check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.
- YES ↓

Shift to other than $\boxed{2}$ position.

↓

Measure the voltage between the A13 and A25/A26 terminals.



↓

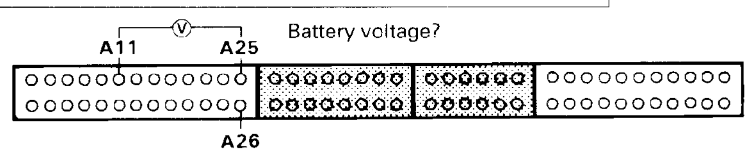
Is there battery voltage?

- NO → Check for short in GRN/YEL wire between the A13 terminal and the A/T gear position switch or A/T gear position indicator. If wire is OK, check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.
- YES ↓

Shift to other than $\boxed{1}$ position.

↓

Measure the voltage between the A11 and A25/A26 terminals.



↓

Is there battery voltage?

- NO → Check for short in LT GRN/WHT wire between the A11 terminal and the A/T gear position switch or A/T gear position indicator. If wire is OK, check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.
- YES ↓

Check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.

95F19666

Fig. 40: Fault Code No. 5 (2 of 2)

FAULT CODE NO. 6

Refer to Figs. 41 and 42.

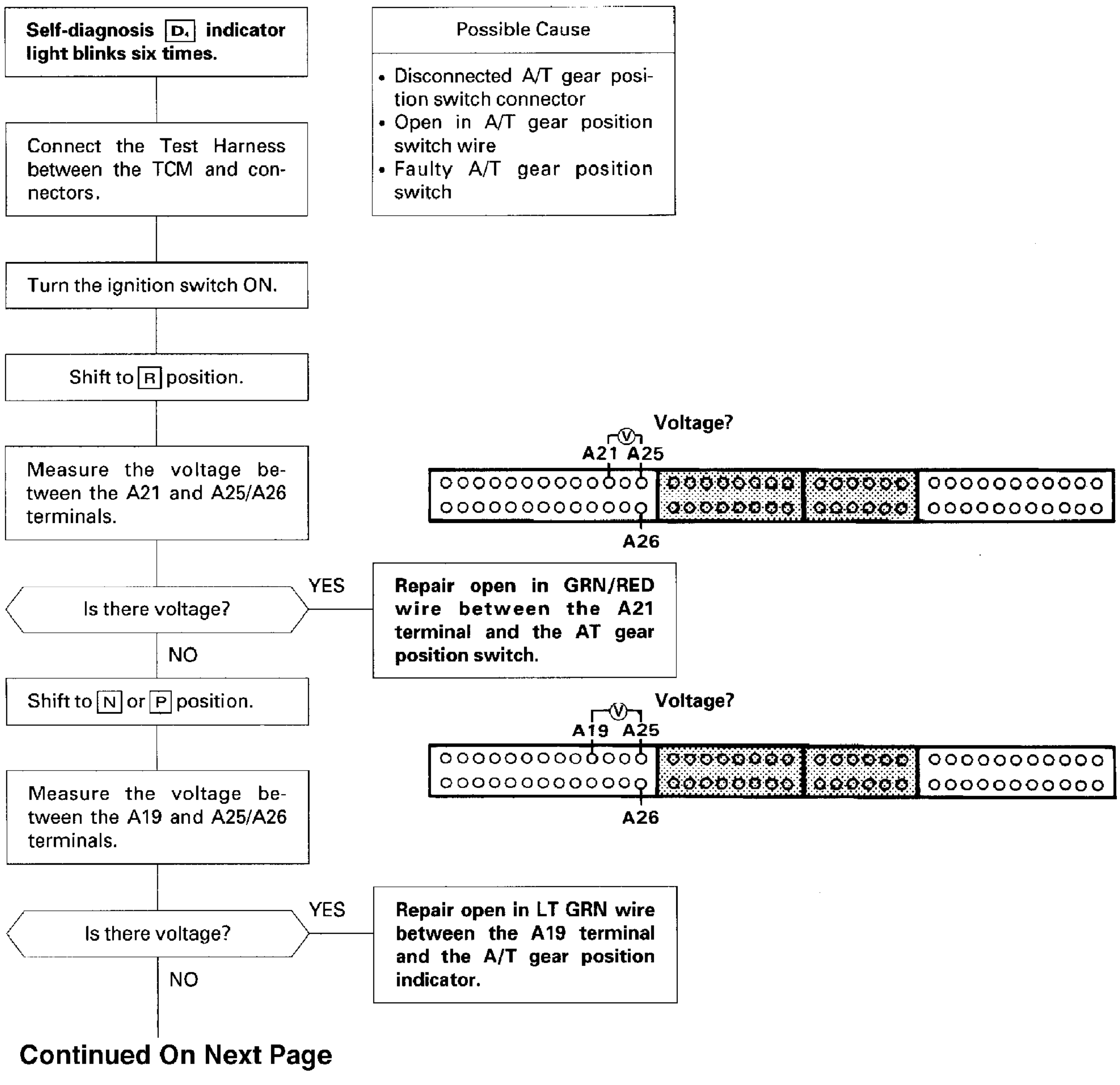
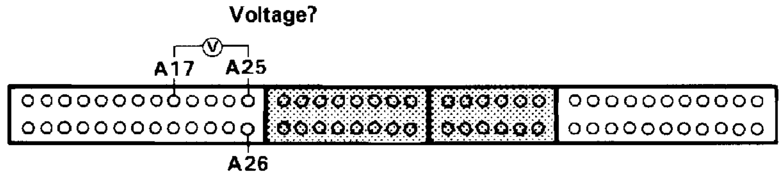


Fig. 41: Fault Code No. 6 (1 of 2)

Continued From Previous Page

Shift to $\boxed{D_4}$ position.

Measure the voltage between the A17 and A25/A26 terminals.



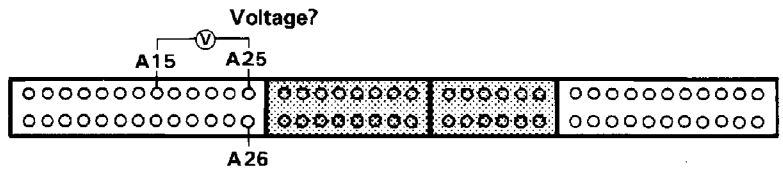
Is there voltage?

YES → **Repair open in GRN/BLK wire between the A17 terminal and the A/T gear position switch.**

NO ↓

Shift to $\boxed{D_3}$ position.

Measure the voltage between the A15 and A25/A26 terminals.



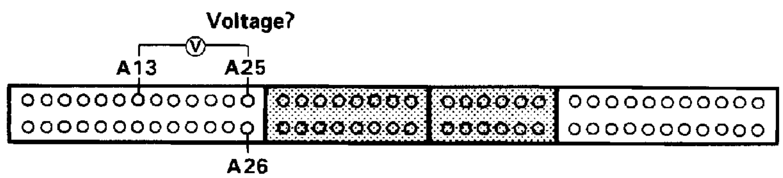
Is there voltage?

YES → **Repair open in GRN/BLU wire between the A15 terminal and the A/T gear position switch.**

NO ↓

Shift to $\boxed{2}$ position.

Measure the voltage between the A13 and A25/A26 terminals.



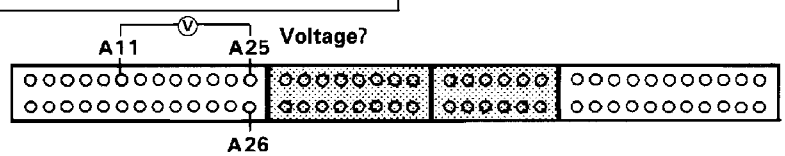
Is there voltage?

YES → **Repair open in GRN/YEL wire between the A13 terminal and the A/T gear position switch.**

NO ↓

Shift to $\boxed{1}$ position.

Measure the voltage between the A11 and A25/A26 terminals.



Is there voltage?

YES → **Repair open in LT GRN/WHT wire between the A11 terminal and the A/T gear position switch.**

NO ↓

Check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.

95H19668

Fig. 42: Fault Code No. 6 (2 of 2)

FAULT CODE NO. 7

NOTE: Connector is viewed from terminal end.

Refer to Fig. 43.

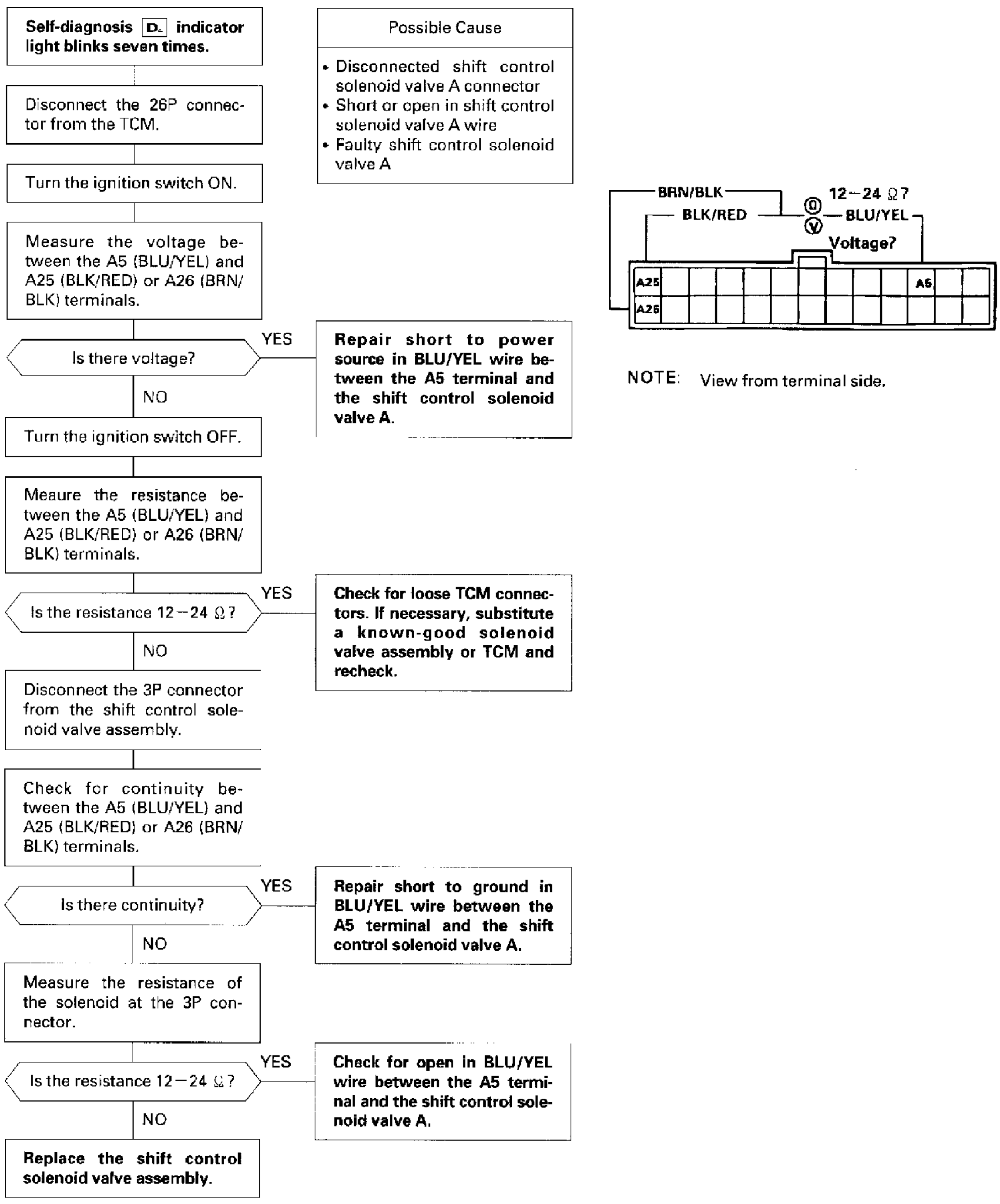


Fig. 43: Fault Code No. 7

NOTE: Connector is viewed from terminal end.

Refer to Fig. 44.

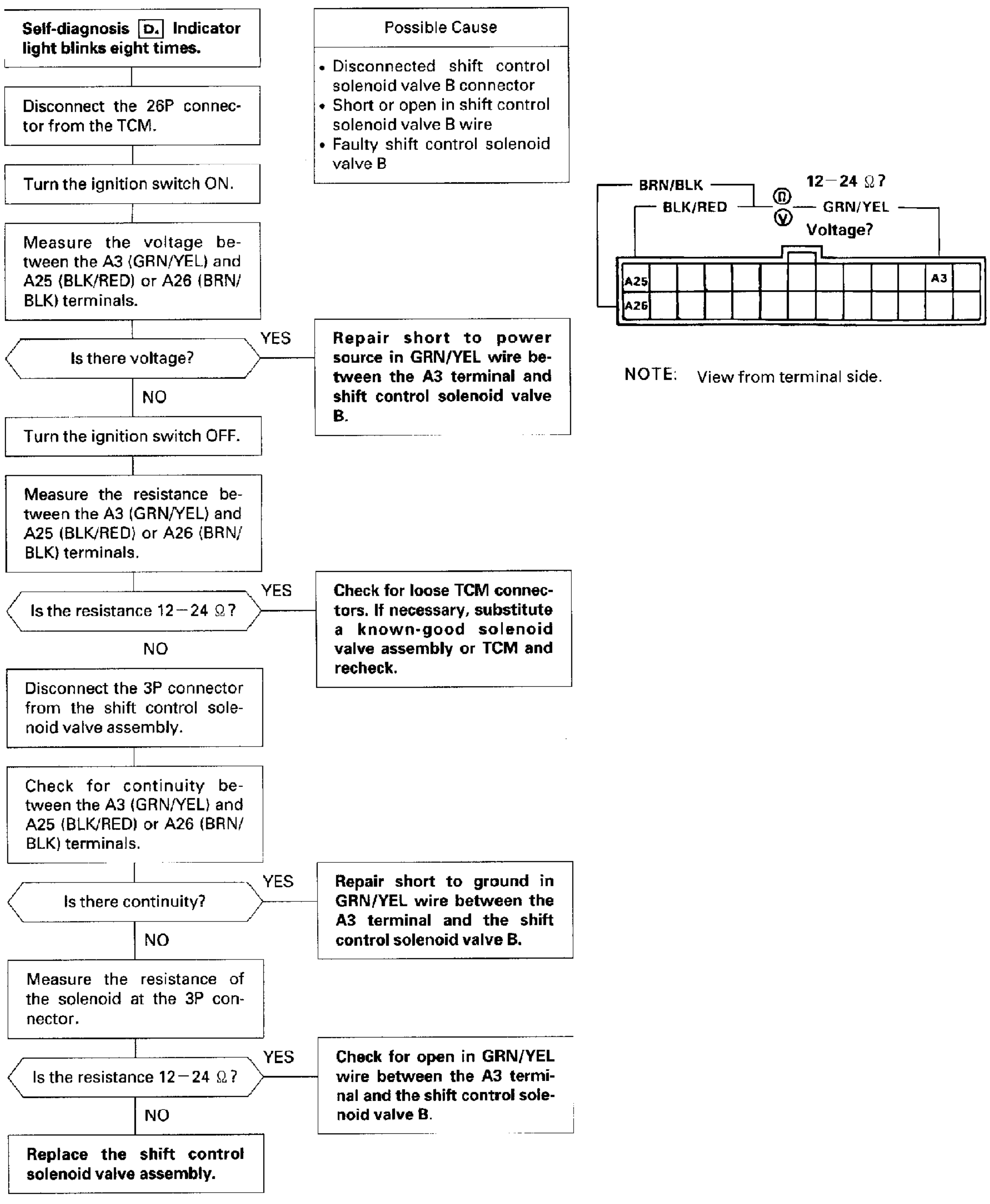


Fig. 44: Fault Code No. 8

Refer to Figs. 45 and 46.

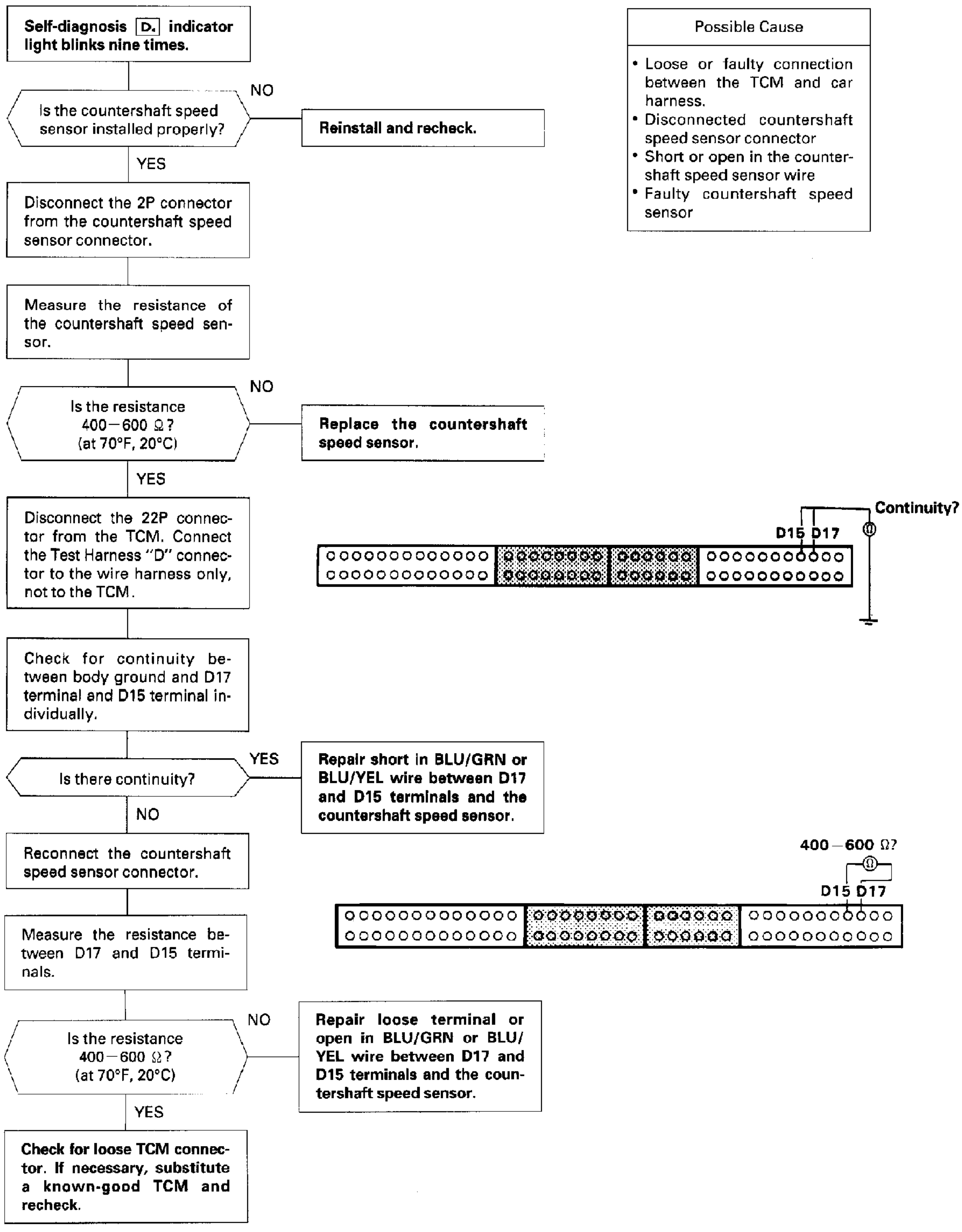


Fig. 45: Fault Code No. 9 (1 of 2)

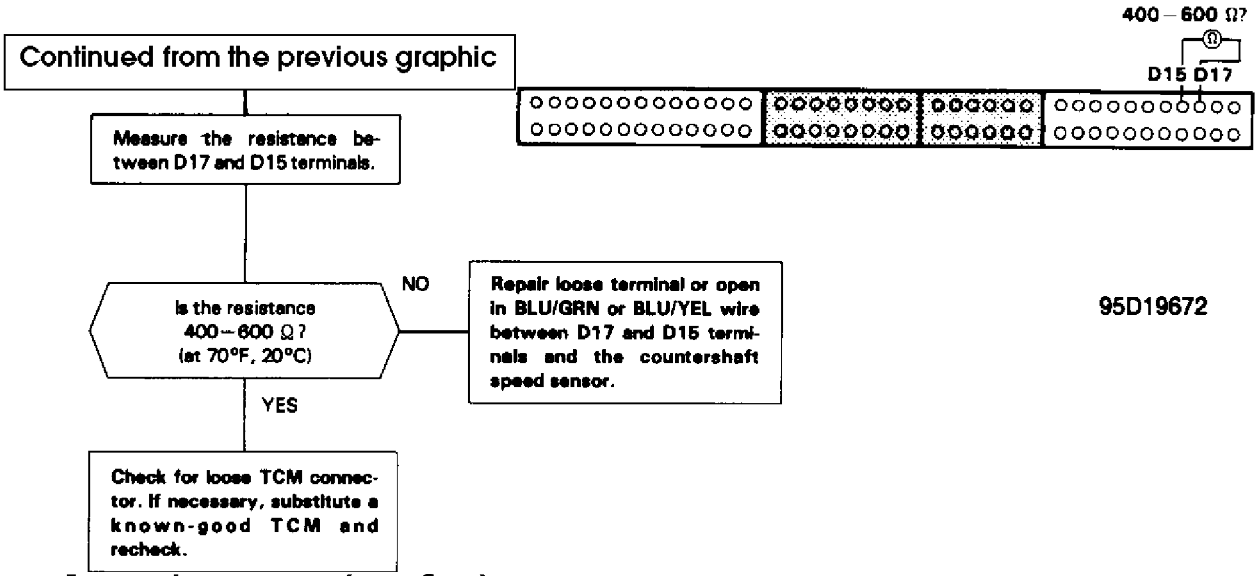


Fig. 46: Fault Code No. 9 (2 of 2)

FAULT CODE NO. 10

Refer to Fig. 47.

Self-diagnosis D4 indicator light blinks ten times.

Turn the ignition switch ON.

Check whether the Malfunction Indicator Lamp (MIL) blinks.

Is the MIL blinking?

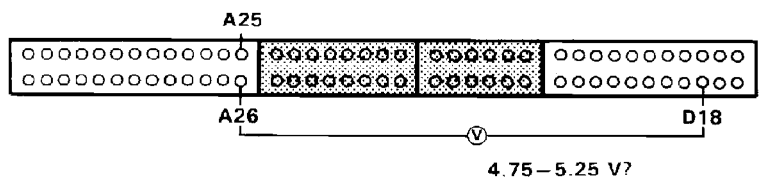
- YES → **Repair the PGM-FI System.**
- NO ↓

Turn the ignition swith OFF.

Disconnect the 26P and 22P connectors from the TCM. Connect the Test Harness "A" and "D" connectors to the wire harness only, not to the TCM.

Turn the ignition switch ON.

Measure the voltage between the D18 and A25/A26 terminals.



Is the voltage 4.75–5.25 V?

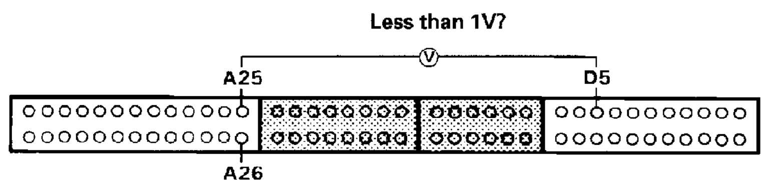
- NO → **Repair open or short in LT GRN/BLK wire between the D18 terminal and the ECM.**
- YES ↓

Turn the ignition switch OFF.

Connect the Test Harness "A" and "D" connectors to the TCM.

Start the engine and warm it up to normal operating temperature (the radiator fan comes on).

Measure the voltage between the D5 and A25/A26 terminals.



Is the voltage less than 1V?

- NO → **Repair open or short in YEL/BLU wire between the D5 terminal and the ECT sensor.**
- YES ↓

Check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.

Possible Cause
• Disconnected engine coolant temperature (ECT) sensor connector • Short or open in the ECT sensor wire • Faulty ECT sensor

95E19673

Fig. 47: Fault Code No. 10

FAULT CODE NO. 11

NOTE: Connector is viewed from terminal end.

Refer to Fig. 48.

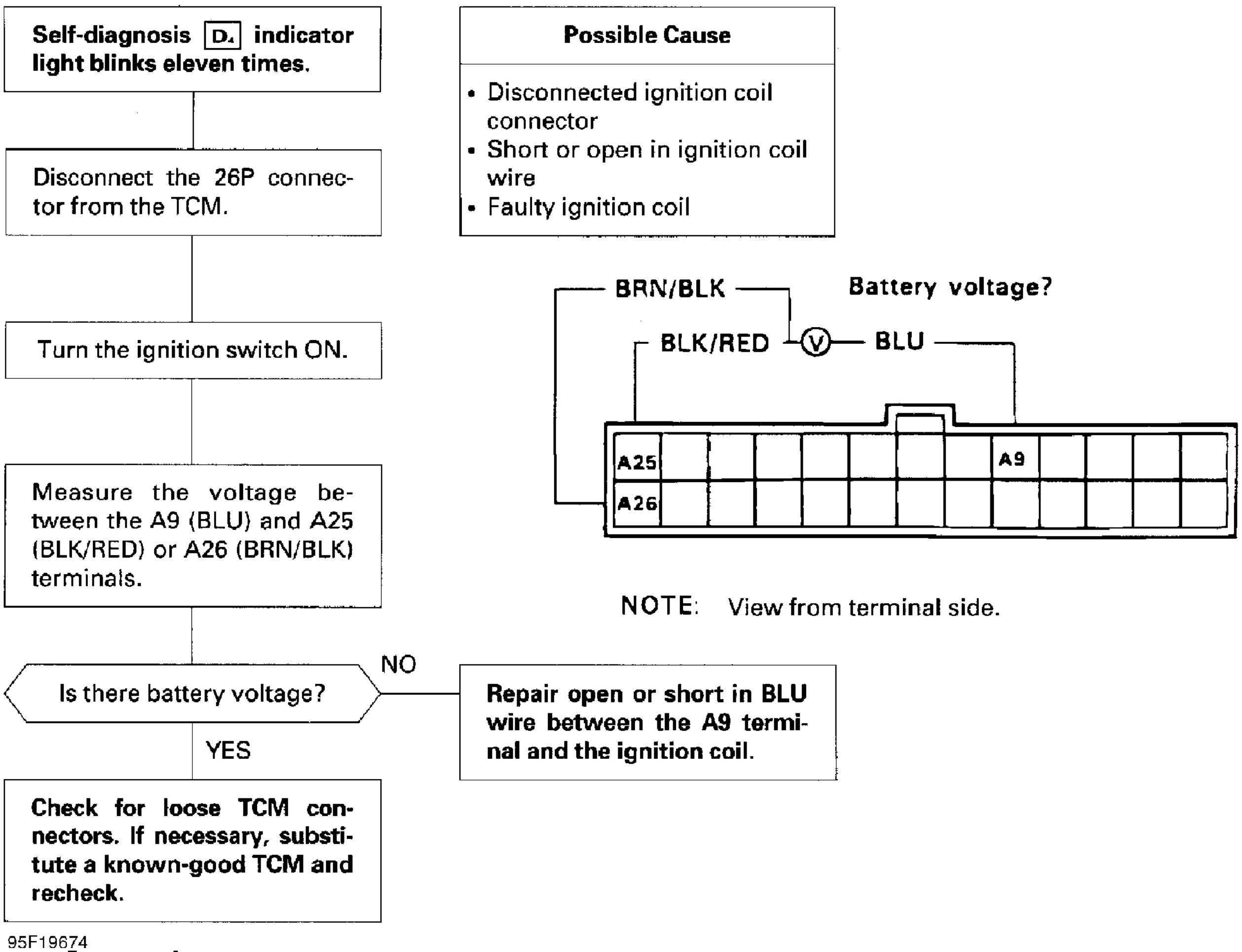


Fig. 48: Fault Code No. 11

FAULT CODE NO. 14

Refer to Figs. 49 and 50.

Self-diagnosis D4 indicator light blinks fourteen times.

Possible Cause

- Short or open in FAS (ORN/RED) wire
- Trouble in ECM

⚠WARNING

- **Make sure lifts, jacks and safety stands are placed properly, and hoist brackets are attached to the correct position on the engine.**
- **While testing, be careful of the rotating front wheels.**

Is the Malfunction Indicator Lamp (MIL) on?

YES → **Repair the PGM-FI System.**

NO ↓

Start the engine and warm it up to normal operating temperature (the radiator fan comes on).

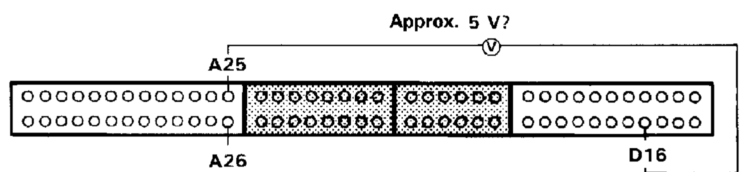
Shift to P position.

Turn the ignition switch OFF.

Connect the Test Harness between the TCM and connectors.

Turn the ignition switch ON and wait for at least two seconds.

Measure the voltage between the D16 (+) and A25/A26 (−) terminals.



Is there approx. 5V?

YES → **Check for loose TCM connectors. If necessary, substitute a known-good TCM and recheck.**

NO ↓

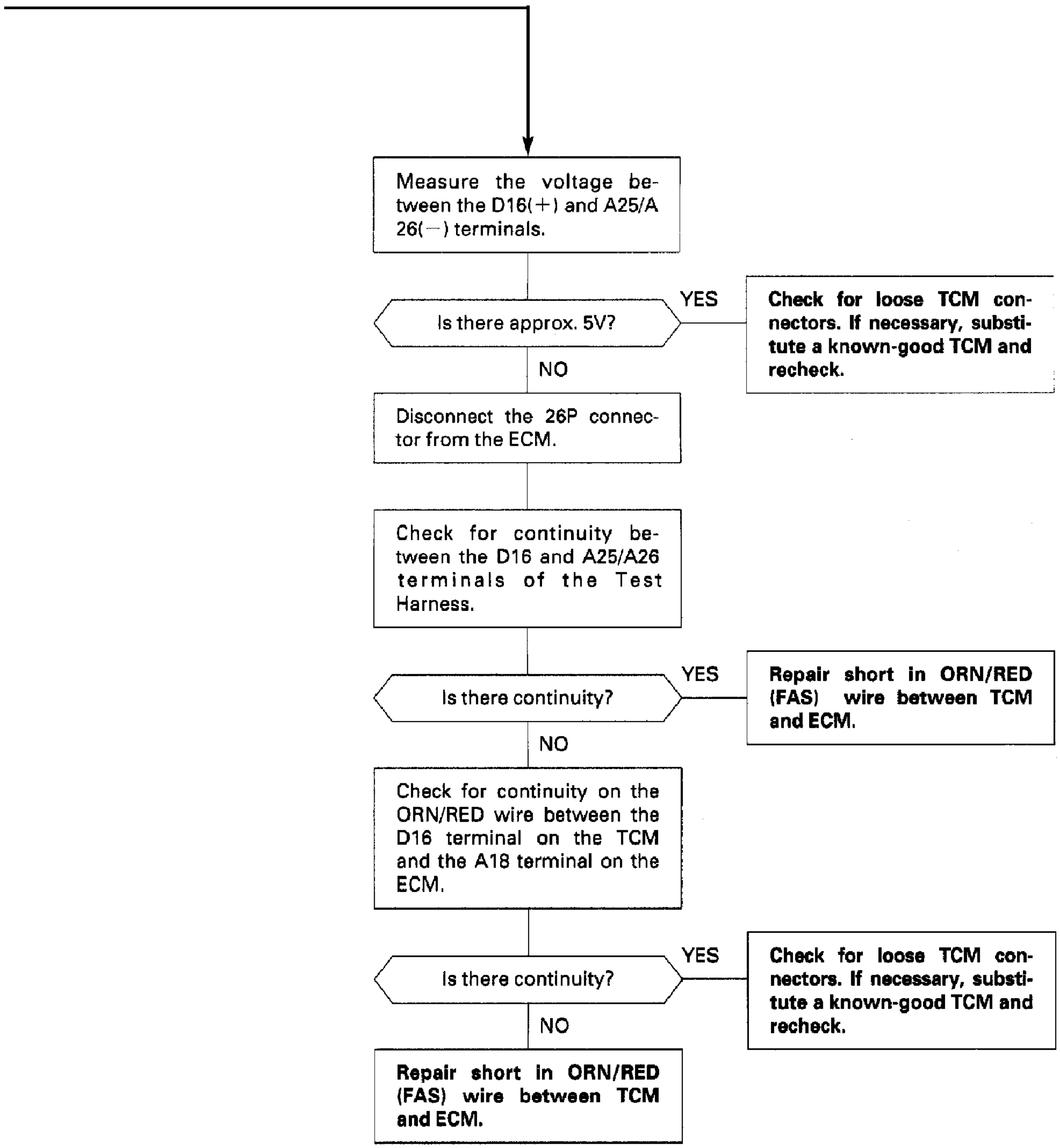
Turn the ignition switch OFF.

Disconnect the Test Harness from the TCM.
Leave connected to car harness.

Turn the ignition switch ON.

95G19875

Fig. 49: Fault Code No. 14 (1 of 2)



95H19676

Fig. 50: Fault Code No. 14 (2 of 2)

FAULT CODE NO. 15

Refer to Figs. 51 and 52.

NOTE:
A code 15 on the TCM doesn't always mean there's an electrical problem in the mainshaft or countershaft speed sensor circuit; code 15 may also indicate a mechanical problem in the transmission.

Self-diagnosis D. indicator light blinks fifteen times.

Possible Cause

- Disconnected mainshaft speed sensor connector
- Short or open in mainshaft speed sensor wire
- Faulty mainshaft speed sensor

Are the mainshaft and countershaft speed sensors installed properly?

NO → **Reinstall and recheck.**

YES

Disconnect the 2P connector from the mainshaft speed sensor.

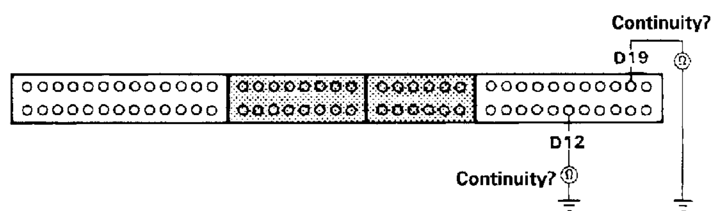
Measure the resistance of the mainshaft speed sensor.

Is the resistance 400 – 600 Ω ? (at 70°F, 20°C)

NO → **Replace the mainshaft speed sensor.**

YES

Disconnect the 22P connector from the TCM.
Connect the Test Harness "D" connector to the wire harness only, not to the TCM.



Check the continuity between D19 and D12 terminals and body ground.

Is there countinuity?

YES → **Repair short in ORN/BLU or WHT/BLU wires between D 19 and D12 terminals and the mainshaft speed sensor.**

NO

Reconnect the 2P connector to the mainshaft speed sensor.

95I19677

Fig. 51: Fault Code No. 15 (1 of 2)

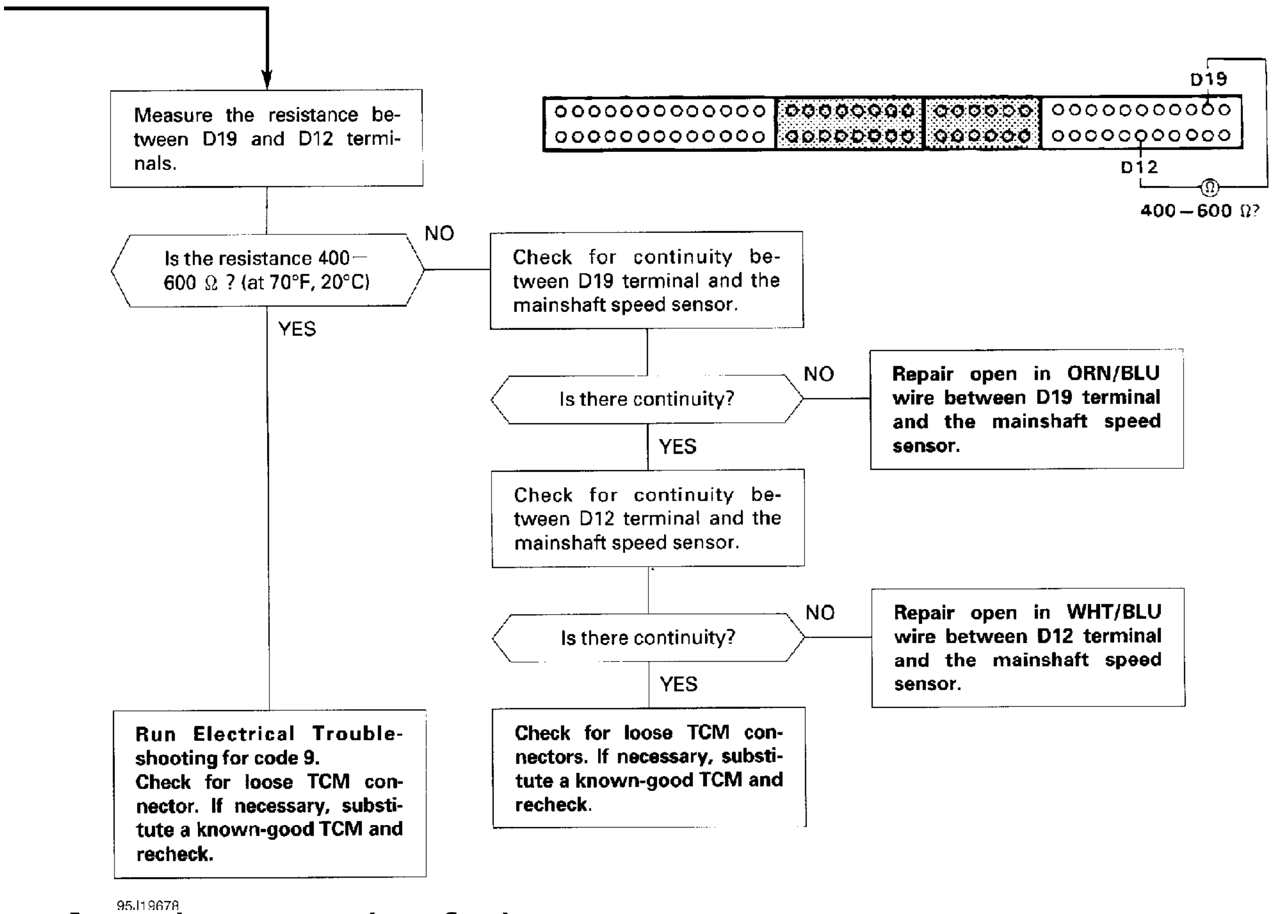


Fig. 52: Fault Code No. 15 (2 of 2)

WIRING DIAGRAMS

AUTO TRANS Nsk CA 95051Co

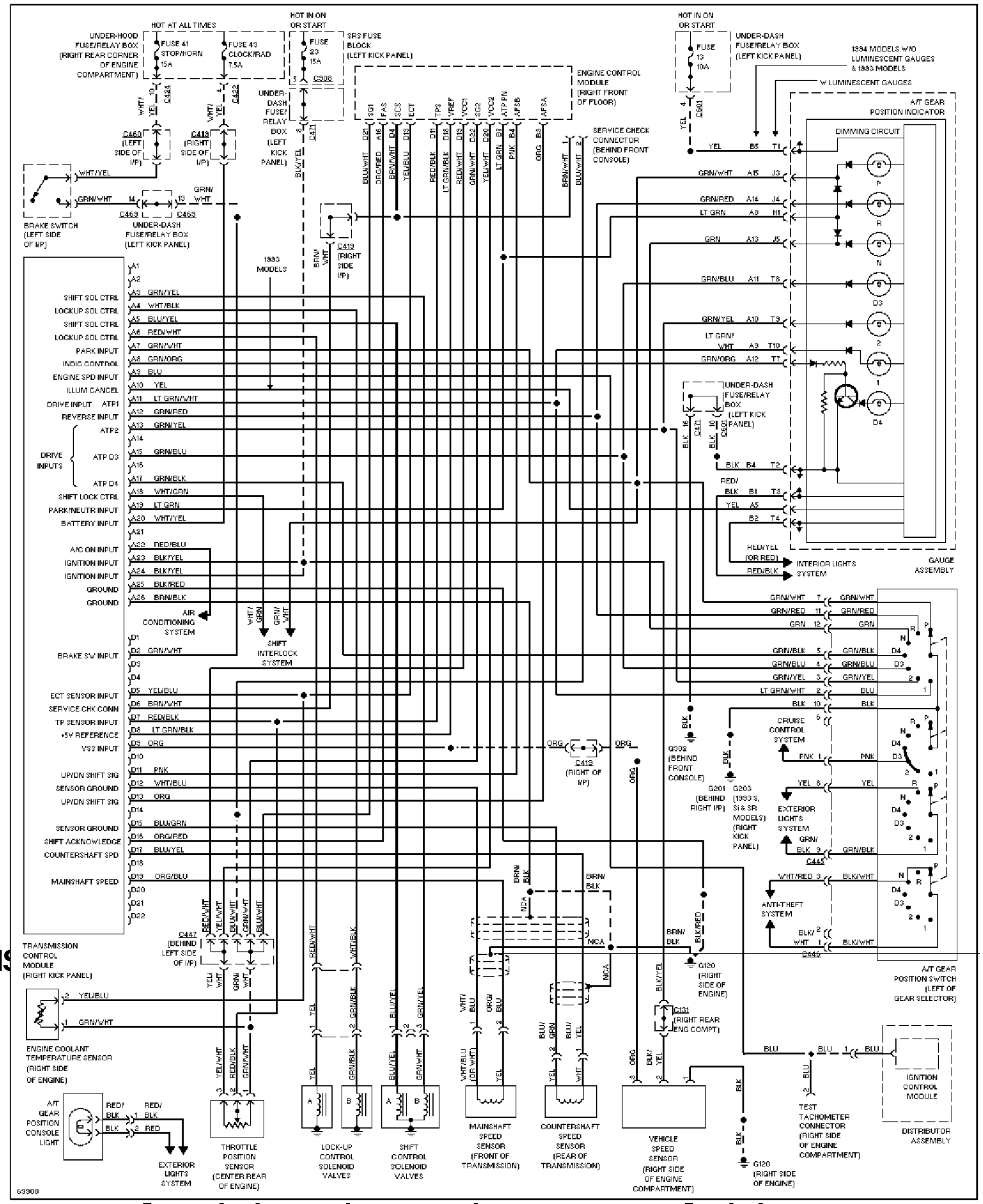


Fig. 53: Transaxle Wiring Diagram (1993-94 Prelude)

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	INCH Lbs.
Air Bleed Bolt	89 (10.0)
Countershaft Speed Sensor Bolt	106 (12.0)

```
Lock-Up Control Solenoid Valve Bolt  ......  106 (12.0)
Mainshaft Speed Sensor Bolt  ..............  106 (12.0)
Shift Control Solenoid Valve Bolt  ........  106 (12.0)
Shift Lock Solenoid Nut  ...................  89 (10.0)
```
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

END OF ARTICLE

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ARTICLE BEGINNING

1993 DRIVE AXLES
Honda Motors FWD Axle Shafts

Honda; Prelude

DESCRIPTION & OPERATION

Axle shafts transfer power from the transaxle to the driving wheels. Axle shafts consist of a shaft with a flexible Constant Velocity (CV) joint at each end. Inner CV joint is splined to transaxle. Outer CV joint is splined to hub assembly and secured by spindle shaft nut.

CV joint boots protect CV joints by maintaining proper lubrication and preventing contaminants from entering joint. Boots must be replaced when leakage or cracks are present. Inner CV joint can be repaired without replacing the assembly. Outer CV joint must be replaced as an assembly.

Inner CV joint is a plunging Tripod Joint (TJ), sometimes referred to as a tripod. The plunging action allows axle shaft length to change as suspension moves up and down. Outer CV joint, which is either a Double-Offset Joint (DOJ) or Birfield Joint (BJ), cannot be rebuilt.

TROUBLE SHOOTING

NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in GENERAL INFORMATION.

REMOVAL, DISASSEMBLY, REASSEMBLY & INSTALLATION

FWD AXLE SHAFT

Removal

1) Raise and support vehicle. Remove front wheels. Drain transaxle if removing right or both axle shafts. Draining transaxle is unnecessary if removing left axle shaft only. Spread locking tab on spindle nut and remove nut. Remove damper fork bolt and damper pinch bolt. Remove damper fork. See Fig. 1.

2) Remove lower ball joint cotter pin, and loosen castle nut half length of ball joint threads. Using a ball joint puller, separate ball joint from front hub. Remove ball joint castle nut. Lower control arm and steering knuckle. Pull steering knuckle outward and remove axle shaft from hub assembly. If necessary, use a plastic hammer to drive axle shaft out of hub.

NOTE: DO NOT pull on inner CV joint or disassembly may occur. Be careful not to damage seals.

3) Using a large screwdriver, carefully pry inner CV joint and shaft assembly about .5" (12.7 mm) out of transaxle, dislodging retaining ring from its groove at end of drive axle. Grip both sides of inner CV joint and remove axle shaft and CV joint from vehicle.

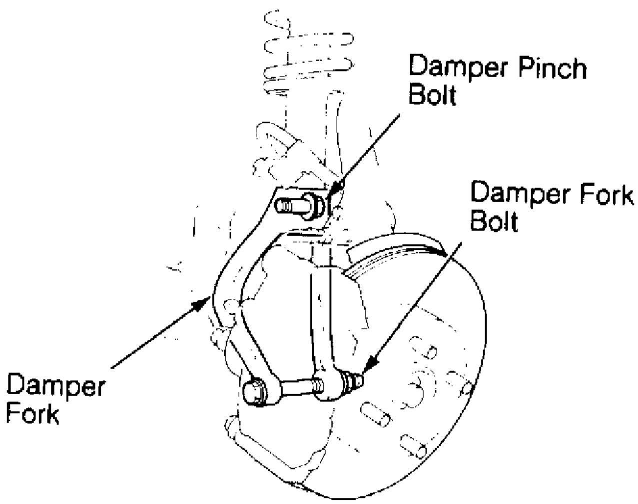

Fig. 1: Locating Damper Fork & Pinch Bolts
Courtesy of American Honda Motor Co., Inc.

NOTE: DO NOT attempt to disassemble outer CV joint; it must be replaced as an assembly. On inner CV joint, mark rollers and roller grooves for reassembly reference.

Disassembly

1) Remove axle shaft from vehicle, and place it on work bench. Remove and discard inner CV joint boot clamps. Slide boot toward outer CV joint to access inner CV joint. SeeFig. 2.

2) Index axle shaft, inner CV joint housing and spider roller to ensure reassembly in original positions. Remove housing from spider assembly. Index rollers and spider to ensure reassembly to original locations. Remove rollers from spider.

3) Remove snap ring securing spider to axle shaft, and remove spider. Remove snap ring, and slide boot off axle shaft. Remove outer CV joint boot clamps. Slide boot off axle shaft inner CV joint end. DO NOT attempt to disassemble outer CV joint. Replace outer CV joint as an assembly only.

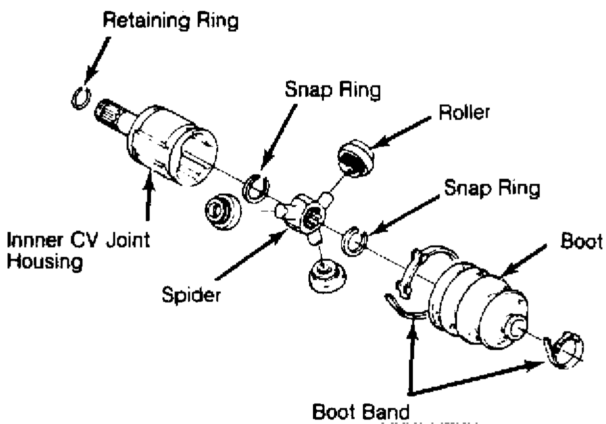

Fig. 2: Exploded View Of Inboard CV Joint Assembly (Typical)
Courtesy of American Honda Motor Co., Inc.

Reassembly

1) Thoroughly clean and inspect axle shaft for wear. Replace all defective parts. Wrap axle shaft splines using vinyl tape to prevent damage to dynamic damper and CV joint boots.

2) Install outer CV joint boot, dynamic damper and inner CV joint boot. Remove vinyl tape from axle shaft. DO NOT install CV joint boot clamps yet.

3) Install snap ring in groove on axle shaft. Install spider on axle shaft by aligning marks made at disassembly. Install snap ring into groove. Pack outer CV joint boot with molybdenum disulfide grease. Lube spider and inside bores of rollers.

4) Ensure rollers are aligned with marks made at disassembly and high side of rollers face outward. Install rollers. Pack inner CV joint and boot with molybdenum disulfide grease. Align housing marks made at disassembly and install housing on spider assembly.

5) Adjust standard length of axle shaft. SeeFig. 3. Refer to AXLE SHAFT LENGTH SPECIFICATIONS table. Position boots halfway between full compression and full extension and install NEW boot clamps.

AXLE SHAFT LENGTH SPECIFICATIONS TABLE

Application	In. (mm)
Left	
M/T	20.50-20.70 (520.9-525.9)
A/T	33.97-34.17 (862.9-867.9)
Right	20.00-20.20 (507.9-512.9)

CAUTION: Always use a NEW retaining ring when installing axle shaft.

6) Position dynamic damper to correct distance from edge of boot. See Fig. 4. See DYNAMIC DAMPER DISTANCE SPECIFICATIONS table.

Bend down lock tab of each boot clamp and lightly tap doubled-over portion of boot clamp to reduce clamp height. Install a NEW retaining ring on end of inner CV joint, and install axle shaft.

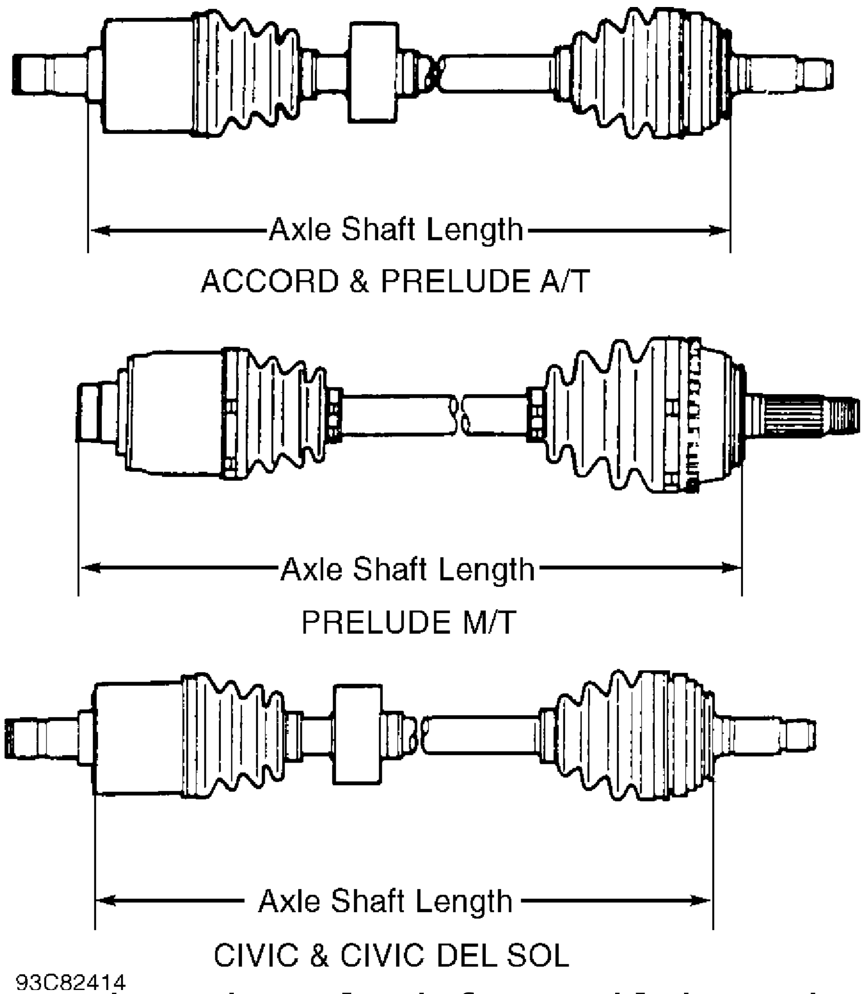

Fig. 3: Measuring Drive Axle Shaft Assembled Length
Courtesy of American Honda Motor Co., Inc.

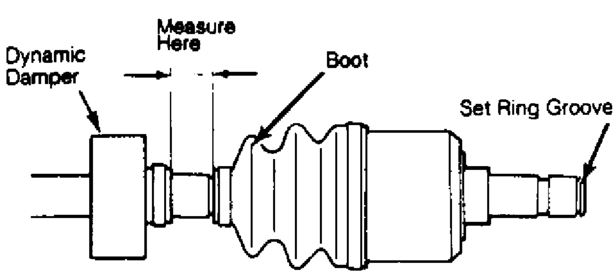

Fig. 4: Measuring Distance Between CV Boot & Dynamic Damper
Courtesy of American Honda Motor Co., Inc.

DYNAMIC DAMPER DISTANCE SPECIFICATIONS TABLE

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Application	In. (mm)
Prelude	6.10-7.70 (173.0-177.0)

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Installation

1) Slide axle into transaxle or intermediate shaft. Ensure inner joint housing locks into differential side gear groove and joint sub-axle bottoms in differential or intermediate shaft.

2) Install damper fork over drive shaft and onto lower control arm. Install damper in damper fork so aligning tab aligns with slot in damper fork. Loosely install damper pinch bolt using NEW damper fork nut.

3) Pull hub assembly away from axle shaft, and slide axle into hub assembly. Install and lightly tighten spindle shaft nut. Position ball joint in hub. Raise lower control arm using floor jack, and install ball joint nut. Tighten ball joint nut to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

4) Install and secure cotter pin. Remove floor jack. Tighten spindle nut to specification. Install wheels. Lower vehicle. With vehicle weight on damper, tighten damper pinch bolt to specification. Refill transaxle.

INTERMEDIATE SHAFT

Removal

1) Drain fluid from transaxle. Remove outer axle shaft assembly from intermediate shaft assembly. See FWD AXLE SHAFT. Remove bolts attaching intermediate shaft bearing support.

2) Remove intermediate shaft from transaxle assembly. Use care not to damage seal in transaxle by holding shaft in a horizontal position when removing.

Disassembly

1) Remove heat shield (if equipped). Remove intermediate shaft outer seal. Remove 38-mm external circlip. Press intermediate shaft out of shaft bearing and support.

2) Remove intermediate shaft inner seal, and remove 58-mm internal circlip. Press intermediate shaft bearing out of bearing support. Inspect all components for wear and damage, and replace components if necessary. See Fig. 5.

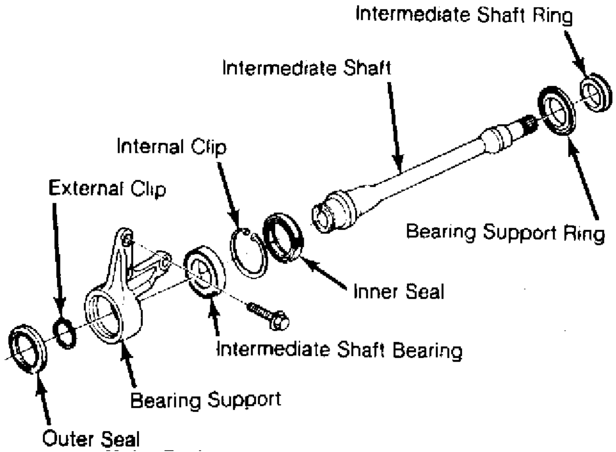

Fig. 5: Exploded View Of Intermediate Shaft Assembly (Typical)
Courtesy of American Honda Motor Co., Inc.

CAUTION: Ensure internal circlip is installed with tapered end facing out.

Reassembly

1) Press intermediate shaft bearing into bearing support. Seat 58-mm circlip in groove of bearing support with tapered end facing out.

2) Press intermediate shaft inner seal into bearing support. Press intermediate shaft into shaft bearing. Seat 38-mm external circlip in groove of intermediate shaft with tapered end facing out. Press outer seal into bearing support.

Installation

To install intermediate shaft assembly, reverse removal procedure. Add fluid to transaxle.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

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Application	Ft. Lbs. (N.m)
Damper Fork Nut	48 (65)
Damper Pinch Bolt	33 (45)
Intermediate Bearing Support Bolts	29 (39)
Lower Ball Joint Nut	37-44 (50-60)
Radius Rod Bolts	81 (110)
Radius Rod Nut	41 (55)
Spindle Nut	184 (250)
Wheel Lug Nuts	81 (110)

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END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Emission Applications

Accord, Civic, Civic del Sol, Prelude

EMISSION APPLICATIONS

EMISSION APPLICATIONS TABLE

```
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Engine & Fuel System                Emission Control Systems & Devices

Accord
  2.2L 4-Cyl. MPI
   Major Control Systems & Devices  .......  PCV, EVAP, TWC, EGR, SPK,
                                                     (1) O2, CEC, MIL
   Components & Other Related Devices  ........  EVAP-CPCS, EVAP-CPCV,
                                            EVAP-VC, EGR-CVCV, EGR-PS,
                                                       EGR-SOL, SPK-CC

Civic
  1.5L 4-Cyl. MPI
   Major Control Systems & Devices  ........  PCV, EVAP, TWC,(3) EGR,
                                              SPK,(1)(2) O2, CEC, MIL
   Components & Other Related Devices  ........  EVAP-CPCS, EVAP-CPCV,
                                                EVAP-VC,(3) EGR-CVCV,
                                                  (3) EGR-SOL, SPK-CC
  1.6L 4-Cyl. MPI
   Major Control Systems & Devices  ...........  PCV, EVAP, TWC, SPK,
                                                     (1) O2, CEC, MIL
   Components & Other Related Devices  ........  EVAP-CPCS, EVAP-CPCV,
                                                       EVAP-VC, SPK-CC

Civic Del Sol
  1.5L & 1.6L 4-Cyl. MPI
   Major Control Systems & Devices  ...........  PCV, EVAP, TWC, SPK,
                                                     (1) O2, CEC, MIL
   Components & Other Related Devices  ........  EVAP-CPCS, EVAP-CPCV,
                                                       EVAP-VC, SPK-CC

Prelude
  2.2L & 2.3L 4-Cyl. MPI
   Major Control Systems & Devices  ...........  PCV, EVAP, TWC, EGR,
                                                 SPK,(1) O2, CEC, MIL
   Components & Other Related Devices  ........  EVAP-CPCS, EVAP-CPCV,
                                            EVAP-VC, EGR-CVCV, EGR-PS,
```

EGR-SOL, SPK-CC

(1) - Heated O2 sensor.
(2) - Non-heated O2 sensor on Federal engine model D15B8.
(3) - Engine model D15Z1 only.

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ABBREVIATION DEFINITIONS

ABBREVIATION DEFINITION TABLE

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Abbreviation	Definition
CEC	Computerized Engine Controls
EGR	Exhaust Gas Recirculation
EGR-CVCV	EGR Constant Vacuum Control Valve
EGR-PS	EGR Position Sensor
EGR-SOL	EGR Solenoid
EVAP	Fuel Evaporative System
EVAP-CPCS	EVAP Canister Purge Control Solenoid
EVAP-CPCV	EVAP Canister Purge Control Valve
EVAP-VC	EVAP Vapor Canister
MIL	Malfunction Indicator Light
MPI	Multipoint Electronic Fuel Injection
O2	Oxygen Sensor
PCV	Positive Crankcase Ventilation
SPK	Spark Controls
SPK-CC	SPK Computer Controlled
TWC	Three-Way Catalyst

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ARTICLE BEGINNING

1993 BRAKES
Honda Brake System

Prelude

DESCRIPTION

Prelude uses front disc brakes. Rear brakes may be either disc type or self-adjusting drum type. Parking brake cable mechanism applies rear brakes.

BLEEDING BRAKE SYSTEM

BLEEDING PROCEDURES

Raise and support vehicle. Fill master cylinder to maximum. Check fluid level after bleeding each wheel position. Bleed brakes in sequence. See BRAKE LINE BLEEDING SEQUENCE table.

BRAKE LINE BLEEDING SEQUENCE TABLE

Application	Sequence
Prelude	RR, LF, LR, RF

ADJUSTMENTS

BRAKE PEDAL HEIGHT

Loosen brakelight switch lock nut, and back off switch until it no longer touches brake pedal. Loosen brake pedal push rod lock nut, and screw push rod in or out until correct pedal height is obtained. See BRAKE PEDAL HEIGHT SPECIFICATIONS table. Tighten lock nut to specification. See TORQUE SPECIFICATIONS TABLE.

BRAKE PEDAL HEIGHT SPECIFICATIONS TABLE

Application	Auto. Trans. In. (mm)	Man. Trans. In. (mm)
Prelude	7.3 (186)	6.5 (165)

BRAKE WARNING LIGHT

Brake warning light indicates parking brake is engaged and/or brake fluid level is low. To adjust parking brake light operation, turn ignition on. Bend switch plate down until light comes on when parking brake lever is pulled one notch and goes out when lever is released.

MASTER CYLINDER PUSH ROD

NOTE: Check and adjust master cylinder push rod-to-piston clearance before installing master cylinder.

1) Install Push Rod Adjustment Gauge (07JAG-SD40100) so gauge rod makes light contact with secondary piston of master cylinder. See Fig. 1. Ensure gasket is in position when adjusting rod clearance.

2) Remove push rod adjustment gauge from master cylinder, and install gauge onto brake booster. See Fig. 2. Tighten mounting nuts to specification. Using engine or outside vacuum source, apply at least 10 in. Hg vacuum to brake booster. Check clearance using feeler gauge. Ensure clearance is 0-.016" (0-.40 mm). Adjust push rod clearance by turning nut at end of push rod.

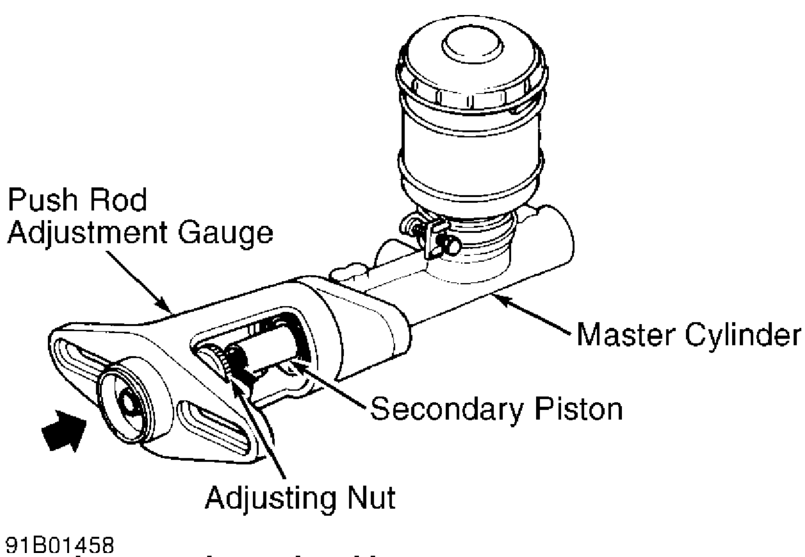

Fig. 1: Setting Push Rod Adjustment Gauge
Courtesy of American Honda Motor Co., Inc.

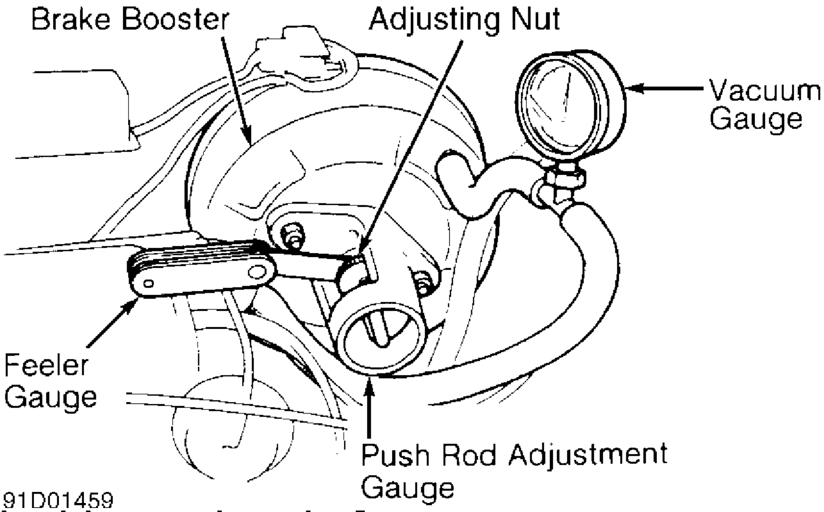

Fig. 2: Checking Push Rod Clearance
Courtesy of American Honda Motor Co., Inc.

PARKING BRAKE

NOTE: Before adjusting parking brake, loosen equalizer adjusting nut. Start engine, and depress brake pedal several times to set self-adjusting brakes before adjusting parking brake.

1) With rear brakes adjusted, raise and support rear of vehicle. Loosen equalizer nut, and pull parking brake lever up one notch. Tighten equalizer adjusting nut until rear wheels drag slightly.

2) Release parking brake lever. Rear wheels should rotate freely. Rear wheels should lock when parking brake lever is pulled up 6-10 clicks.

REAR DRUM BRAKE SHOES

Rear brake shoes will self-adjust through brake pedal action. No in-service adjustment is required.

STOPLIGHT SWITCH

1) Stoplight switch is located under dash, above brake pedal. To adjust, loosen lock nuts and turn switch until plunger is fully depressed (threaded end touching pedal arm pad).

2) Back off switch 1/4 turn, and tighten lock nuts. Clearance between threaded end of switch body and brake pedal switch contact pad should be about .012" (.30 mm). Ensure brakelights go off when pedal is released.

TESTING

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POWER BRAKE BOOSTER

Functional Test

1) Start engine. Turn ignition off. Depress brake pedal several times. Depress pedal firmly and hold pressure for 15 seconds. If pedal sinks, master cylinder, brake line or wheel cylinder is faulty.

2) With pedal depressed, start engine. If pedal sinks slightly, vacuum unit is working properly. If pedal height does not vary, booster or check valve is faulty.

Leak Test

1) With engine running, depress brake pedal. Turn ignition off. If pedal height does not change while depressed for 30 seconds, vacuum booster is okay. If pedal rises, vacuum booster is faulty.

2) Stop engine, and depress brake pedal several times using normal pressure. Pedal height should be low when first depressed. On consecutive applications, pedal height should gradually rise. If pedal height does not vary, check power brake booster check valve.

Check Valve Test

Disconnect power brake unit vacuum hose at booster. Start engine, and allow it to idle. Ensure vacuum is available at booster end of hose. If vacuum is not available, vacuum source or check valve is faulty. Repair vacuum source or replace check valve, and retest.

REMOVAL & INSTALLATION

FRONT DISC BRAKE PADS

Removal

1) Raise and support front of vehicle. Remove wheels. Remove caliper bolt and brakeline bracket bolts. Pivot caliper aside. Remove pads and pad shim. Remove pad retainers (if equipped).

2) Using a vernier caliper, measure brake friction pad thickness. Measurement does not include pad backing thickness. Minimum brake pad thickness is .06" (1.6 mm).

NOTE: Replace brake pads in axle sets of 4 pads. Ensure grease, brake fluid and other contaminants do not contact lining surface. Inspect and clean rotor, and resurface it if necessary.

Installation

1) Lubricate sliding surfaces with high temperature silicone grease. Install pad retainers. Apply Molykote M77 compound to back of

pads and both sides of pad shims.

2) Install inner and outer pad shims. Install brake pads. Ensure brake pad with pad wear indicator is installed inside. Loosen bleeder screw, and slowly push piston into caliper bore.

3) Tighten bleeder screw. Ensure brake fluid does not contaminate pads. Position caliper, and install lower guide pin or caliper bolts. Depress brake pedal several times to seat pads. Bleed brakes as necessary. See **BLEEDING BRAKE SYSTEM.**

FRONT BRAKE CALIPER

Removal

1) Raise and support front of vehicle. Remove wheels. Remove banjo bolt and copper washers connecting brake line to caliper. Plug hydraulic line and caliper.

2) Detach caliper guide pins or bolts, and remove caliper. DO NOT damage splash guard on upper caliper bolt side (if equipped) during removal. Remove disc pads, pad retainers, upper and lower anti-rattle springs and shim.

Installation

To install, reverse removal procedure. Install NEW copper banjo bolt washers when installing brake flexhose. Bleed brake system. See **BLEEDING BRAKE SYSTEM.**

FRONT BRAKE ROTOR

Removal & Installation

1) Raise and support vehicle. Remove wheels. Remove caliper assembly, and suspend it using wire. See **FRONT BRAKE CALIPER.** Attach dial indicator to caliper mount. Check rotor runout before removal. See **DISC BRAKE SPECIFICATIONS** table.

2) Detach and remove two 6-mm rotor retaining screws. Install two 8 x 1.25 x 12-mm bolts in existing holes. To prevent warpage, alternately turn bolts 2 turns at a time until disc can be removed from hub.

3) Clean rotor of all rust, and inspect rotor surfaces for cracks and grooves. Resurface or replace rotor as necessary. To install, reverse removal procedure. Tighten retaining screws. Bleed hydraulic system (if necessary). See **BLEEDING BRAKE SYSTEM.**

REAR DISC BRAKE PADS

Removal

Raise and support rear of vehicle. Remove wheels. Remove caliper shield (if equipped). Detach parking brake cable from caliper. Remove caliper mounting bolts. Remove caliper from bracket. Suspend caliper using wire. Remove brake pads.

Inspection

Using a vernier caliper, measure friction pad thickness. Service limit is .06" (1.5 mm).

Installation

1) Apply Molykote M77 compound to both sides of inner and outer pad shims. Install brake pads and shims. Rotate caliper piston clockwise in caliper (if necessary). Ensure cutout in piston aligns with tab on inner pad.

2) Avoid twisting piston boot. If boot is twisted, back out piston and reposition boot. Install brake caliper and parking brake cable. Install caliper shield. Tighten shield mounting bolts to specification. See **TORQUE SPECIFICATIONS TABLE.**

3) Pump brake pedal several times to seat pads. Bleed brakes as necessary. See **BLEEDING BRAKE SYSTEM.**

REAR BRAKE CALIPER

Removal

1) Raise and support rear of vehicle. Remove wheels. Detach caliper shield mounting bolts. Remove shield. Remove parking brake cable from caliper.

2) Remove banjo bolt and copper washers connecting brakeline to caliper. Plug hydraulic line and caliper. Detach caliper mounting bolts, and remove caliper.

Installation

To install, reverse removal procedure. Replace copper banjo bolt washers when installing brake flexhose. Bleed brake system. See **BLEEDING BRAKE SYSTEM.**

REAR BRAKE ROTOR

Removal & Installation

1) Raise and support vehicle. Remove wheels. Remove caliper assembly. See **REAR BRAKE CALIPER.** Suspend caliper using wire. Attach dial indicator to control arm assembly. Check rotor runout before removal. See **DISC BRAKE SPECIFICATIONS** table.

2) Detach and remove two 6-mm rotor retaining screws. Install two 8 x 1.25 x 12-mm bolts in existing holes. To prevent warpage, alternately turn bolts 2 turns at a time until disc can be removed from hub.

3) Clean rotor of all rust, and inspect rotor surfaces for excessive wear, cracks and grooves. Resurface or replace rotor as necessary. To install, reverse removal procedure. Tighten retaining screws. Bleed hydraulic system (if necessary). See **BLEEDING BRAKE SYSTEM.**

BRAKE DRUM

Removal & Installation

1) Raise and support vehicle. Remove rear wheels. Loosen parking brake. Pull brake drum off hub.

2) Inspect lining friction surface of drum for grooves, excessive wear and damage. Using an inside micrometer, measure I.D. of brake drum. If I.D. is not within specification, replace brake drum. See DRUM BRAKE SPECIFICATIONS table.

3) Resurface drum when new linings are installed. Replace drum if specification is exceeded. To install, reverse removal procedure.

REAR BRAKE SHOES

Removal

1) Raise and support rear of vehicle. Remove rear wheels and brake drums. Detach shoe tension pins by pushing in on retaining spring and turning tension pin 90 degrees to align with spring slot.

2) Lower brake shoe assembly to clear wheel cylinder, and remove lower return spring. Note original position of all springs. See Fig. 3.

CAUTION: Ensure wheel cylinder rubber dust covers are not damaged during brake shoe removal.

3) Remove brake shoe assembly. Disconnect parking brake cable from parking brake lever assembly. Remove upper return spring. Separate brake shoes. Remove self-adjuster bolt, lever and spring.

4) Pry off circlip, and remove washer, pivot pin and parking brake lever (if necessary). Mark parking brake lever for left or right position.

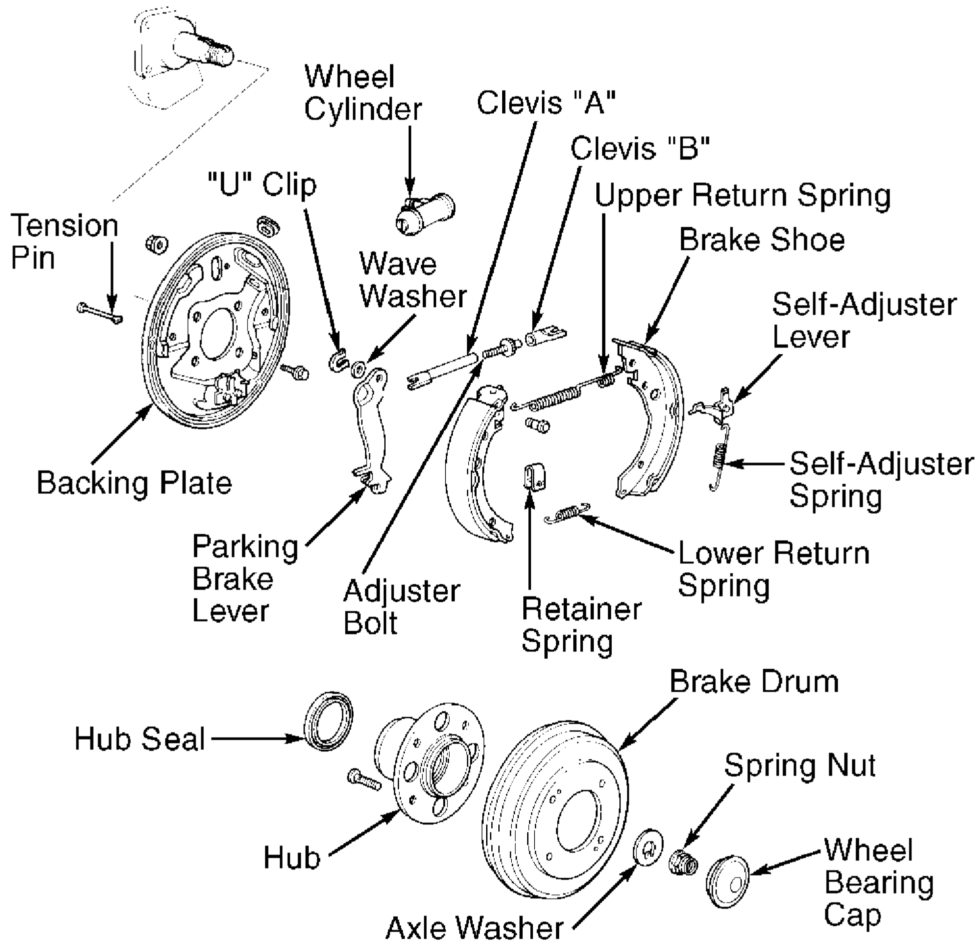

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Fig. 3: Exploded View Of Rear Drum Brake Assembly (Typical)
Courtesy of American Honda Motor Co., Inc.

Inspection

1) Check self-adjuster lever for worn or damaged ratchet teeth. Inspect brake shoes for distortion, nicks or burrs, and loose, glazed, cracked or oil-soaked linings. Check all springs for weakness and damage. Inspect brake linings for excessive wear and damage. Lining service limit is .080" (2.00 mm).

2) Replace linings (and springs) in axle sets only. Resurface brake drums when new linings are installed.

Installation

1) Apply light coat of high-temperature grease to threads of adjuster assembly, sliding surfaces of brake shoes and metal contact areas of backing plate. Install parking brake lever to brake shoe.

2) Screw in self-adjuster bolt until it stops. Install parking brake cable on lever. To complete installation, reverse removal procedure. Bleed system as necessary. See BLEEDING BRAKE SYSTEM.

3) Depress brake pedal several times to set self-adjusting brake. Adjust parking brake. See **PARKING BRAKE** under **ADJUSTMENTS.**

MASTER CYLINDER

Removal & Installation

Drain master cylinder reservoir. Disconnect fluid level switch connector. Disconnect brake fluid lines. Plug openings to prevent fluid loss and contamination. Remove master cylinder mounting nuts. Remove master cylinder. Bleed master cylinder before installation. To install, reverse removal procedure. Bleed system as necessary. See **BLEEDING BRAKE SYSTEM.**

POWER BRAKE BOOSTER

Removal

Power brake booster may be removed with master cylinder attached, if desired. Disconnect vacuum hose from power brake booster. From inside vehicle, remove retaining clip from booster rod pin on brake pedal. Remove pin from brake pedal. Remove brake booster mounting nuts. Remove power brake booster assembly from engine compartment.

Installation

Check length of brake booster rod. SeeFig. 4. Install power brake booster. Tighten mounting nuts to specification. See **TORQUE SPECIFICATIONS TABLE.** To complete installation, reverse removal procedure. Bleed system as necessary. See **BLEEDING BRAKE SYSTEM.**

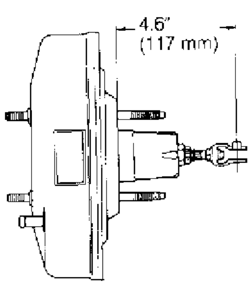

Fig. 4: Adjusting Power Brake Booster Push Rod Length
Courtesy of American Honda Motor Co., Inc.

REAR AXLE BEARINGS & OIL SEAL

NOTE: Prelude uses a permanently sealed bearing assembly that requires removal of hub assembly from vehicle. See **SUSPENSION - REAR** article in **SUSPENSION** section.

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DISC BRAKE CALIPER

CAUTION: DO NOT spill brake fluid on painted surfaces or damage to finish will result. DO NOT place fingers in front of piston when air pressure is used for removal.

NOTE: For exploded views of disc brake calipers, see**Figs. 5 and 6.**

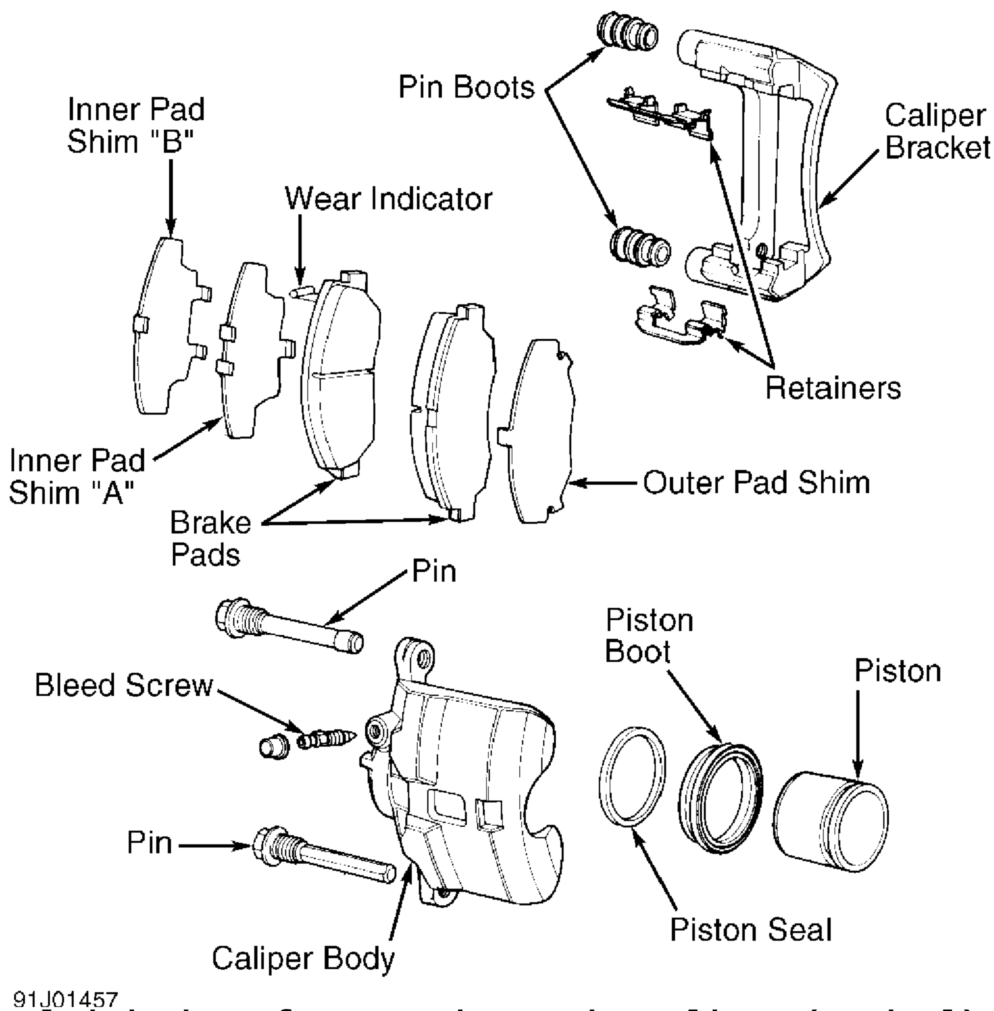

Fig. 5: Exploded View Of Front Disc Brake Caliper (Typical)
Courtesy of American Honda Motor Co., Inc.

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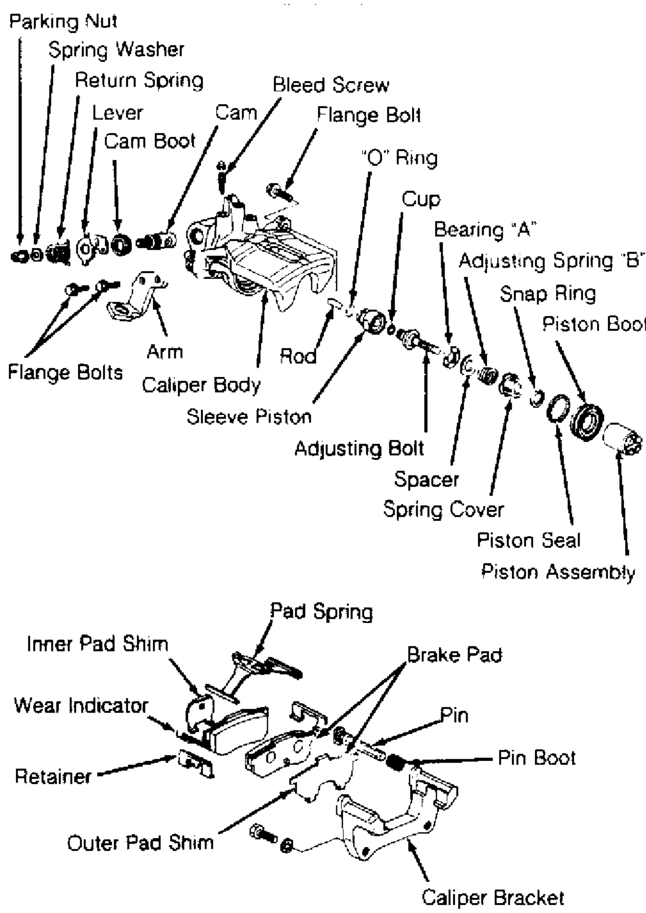

Fig. 6: Exploded View Of Rear Disc Brake Caliper (Typical)
Courtesy of American Honda Motor Co., Inc.

MASTER CYLINDER & POWER BRAKE BOOSTER

NOTE: Faulty master cylinder or power brake booster must be replaced as complete assembly. Overhaul procedure is not available from manufacturer.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Backing Plate Mounting Bolt	47 (64)
Brake Pedal Rod Lock Nut	11 (15)
Caliper Guide Pin Bolt	
Front	36 (49)
Rear	17 (23)
Caliper Mount Bracket Bolt	

Front	81 (110)
Rear	28 (38)
Flexhose-To-Caliper Banjo Bolt	26 (35)
Master Cylinder-To-Power Unit Nut	11 (15)
Power Booster Push Rod Lock Nut	11 (15)
Rear Spindle Nut	136 (185)
	INCH Lbs. (N.m)
Caliper Shield	89 (10)
Power Booster Mounting Nut	106 (12)
Rear Wheel Cylinder Mounting Nut	80 (9)

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DISC BRAKE SPECIFICATIONS

DISC BRAKE SPECIFICATIONS TABLE

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Application	In. (mm)
Disc Thickness	
Front	
Standard	.90 (23.0)
Minimum Refinish Limit	.83 (21.0)
Rear	
Standard	.39 (10.0)
Minimum Refinish Limit	.31 (8.0)
Parallelism	.0006 (.015)
Lateral Runout	.004 (.10)

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END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Service & Adjustment Specifications

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

Use this article to quickly find specifications related to servicing and on-vehicle adjustments. This is a quick-reference article to use when you are familiar with an adjustment procedure and only need a specification.

CAPACITIES

BATTERY SPECIFICATIONS

Application	Amp Hr. Rating
Accord & Civic	52
Civic Del Sol	36
Prelude	55

FLUID CAPACITIES

Application	Quantity
Crankcase (Includes Filter)	
Accord	4.0 Qts. (3.8L)
Civic & Civic Del Sol	3.5 Qts. (3.3L)
Prelude	
2.2L Engine (F22A1)	4.0 Qts. (3.8L)
2.2L Engine (H22A1)	5.1 Qts. (4.8L)
2.3L Engine (H23A1)	4.2 Qts. (4.0L)
Cooling System (Includes Heater)	
Accord	
Automatic Transaxle	7.5 Qts. (7.1L)
Manual Transaxle	7.0 Qts. (6.6L)
Civic & Civic Del Sol	
Automatic Transaxle	
1.5L Engine	4.6 Qts. (4.4L)
1.6L Engine	5.0 Qts. (4.7L)
Manual Transaxle	4.8 Qts. (4.5L)
Prelude	
Automatic Transaxle	

```
      2.2L Engine (F22A1)  ..........................  7.4 Qts. (7.0L)
      2.3L Engine (H23A1)  ..........................  7.7 Qts. (7.3L)
    Manual Transaxle
      2.2L Engine (F22A1)  ..........................  7.5 Qts. (7.1L)
      2.2L Engine (H22A1)  ..........................  8.2 Qts. (7.8L)
      2.3L Engine (H23A1)  ..........................  7.8 Qts. (7.4L)
Automatic Transaxle (Dexron-II)
  Accord
    Oil Change  .....................................  2.5 Qts. (2.4L)
    Overhaul  .......................................  6.3 Qts. (6.0L)
  Civic
    Oil Change  .....................................  3.0 Qts. (2.8L)
    Overhaul  .......................................  6.1 Qts. (5.8L)
  Civic Del Sol
    Oil Change  .....................................  2.9 Qts. (2.7L)
    Overhaul  .......................................  6.2 Qts. (5.9L)
  Prelude
    Oil Change  .....................................  2.5 Qts. (2.4L)
    Overhaul  .......................................  6.3 Qts. (6.0L)
Manual Transaxle (SAE 30W, 10W-40 & 20W-40)
  Accord
    Oil Change  .....................................  2.0 Qts. (1.9L)
    Overhaul  .......................................  2.1 Qts. (2.0L)
  Civic & Civic Del Sol
    Oil Change  .....................................  1.9 Qts. (1.8L)
    Overhaul  .......................................  2.0 Qts. (1.9L)
  Prelude
    Oil Change  .....................................  2.0 Qts. (1.9L)
    Overhaul  .......................................  2.1 Qts. (2.0L)
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QUICK-SERVICE

SERVICE INTERVALS & SPECIFICATIONS

REPLACEMENT INTERVALS

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Component	Interval (Miles)
Oil & Filter	7500
Air Filter	30,000
Brake Fluid	30,000
Coolant	45,000
Fuel Filter	60,000
Spark Plugs	30,000
Transaxle Fluid	30,000

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BELT ADJUSTMENT - ACCORD & PRELUDE

Application	(1) Deflection - In. (mm)
Alternator	13/32-15/32 (10-12)
A/C Compressor	13/32-15/32 (10-12)
Power Steering	9/16-5/8 (14-16)

(1) - With 22 lbs. (10 kg) pressure applied midway on longest belt run.

BELT ADJUSTMENT - CIVIC & CIVIC DEL SOL

Application	(1) Deflection - In. (mm)
Alternator	5/16-13/32 (8-10)
A/C Compressor	3/16-9/32 (5-7)
Power Steering	5/16-15/32 (8-12)

(1) - With 22 lbs. (10 kg) pressure applied midway on longest belt run.

MECHANICAL CHECKS

ENGINE COMPRESSION

Check engine compression at specified cranking speed, with engine at normal operating temperature, all spark plugs removed and throttle wide open.

ENGINE COMPRESSION (1)

Model	Standard psi (kg/cm^2)	Minimum psi (kg/cm^2)	Minimum RPM
Accord & Prelude	178 (12.5)	135 (9.5)	250
Civic & Civic Del Sol	185 (13.0)	135 (9.5)	250

(1) - Maximum variation between cylinders is 28 psi (2.0 kg/cm^2).

VALVE CLEARANCE

VALVE CLEARANCE ADJUSTMENT SPECIFICATIONS - ACCORD & PRELUDE

Model	Intake In. (mm)	Exhaust In. (mm)
Accord	.009-.011 (.23-.28)	.011-.013 (.28-.32)
Prelude		
2.2L Engine	.009-.011 (.23-.28)	.011-.013 (.28-.32)
2.3L Engine	.003-.004 (.07-.11)	.006-.007 (.15-.19)

VALVE CLEARANCE ADJUSTMENT SPECIFICATIONS - CIVIC & CIVIC DEL SOL

Model	Intake In. (mm)	Exhaust In. (mm)
All Models	.007-.009 (.17-.23)	.009-.011 (.23-.28)

IGNITION SYSTEM

IGNITION COIL

IGNITION COIL RESISTANCE - Ohms @ 68°F (20°C)

Application	Primary	Secondary
Accord & Prelude	.6-.8	14,400-21,600
Civic & Civic Del Sol	.6-.8	12,800-19,200

DISTRIBUTOR SENSORS

Triggering of fuel injectors is dependent upon pulsed voltage signals generated by TDC/CRANK/CYL sensors. For testing of these signals, see F - BASIC TESTING article in the ENGINE PERFORMANCE Section.

TDC/CRANK/CYL SENSOR RESISTANCE

Application	Ohms
Accord	260-500
Civic, Civic Del Sol & Prelude	350-700

HIGH TENSION WIRE RESISTANCE

HIGH TENSION WIRE RESISTANCE

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Application	Ohms
All Models	25,000 Maximum

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SPARK PLUGS

SPARK PLUG TYPE

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Application	NGK
Accord	ZFR5F-11
Civic	
1.5L Engine (D15B7)	ZFR5F-11
1.5L Engine (D15B8 & D15Z1)	ZFR4F-11
1.6L Engine (D16Z6)	ZFR5J-11
Civic Del Sol	
1.5L Engine	ZFR5F-11
1.6L Engine	ZFR6J-11
Prelude	
2.2L Engine	
F22A1	ZFR5F-11
H22A1	PZFR6F-11
2.3L Engine	ZFR6F-11

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SPARK PLUG SPECIFICATIONS

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Application	Gap In. (mm)	Torque Ft. Lbs. (N.m)
All Models	.039-.043 (1.0-1.1)	13 (18)

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FIRING ORDER & TIMING MARKS

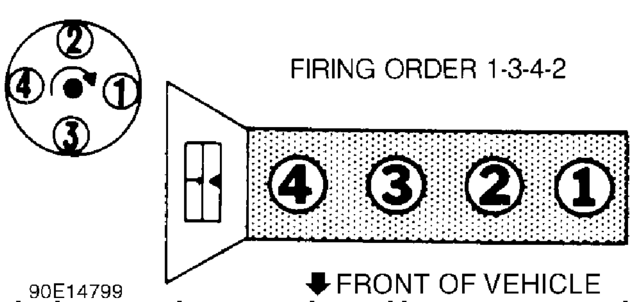

Fig. 1: Firing Order & Distributor Rotation (Accord)
Courtesy of American Honda Motor Co., Inc.

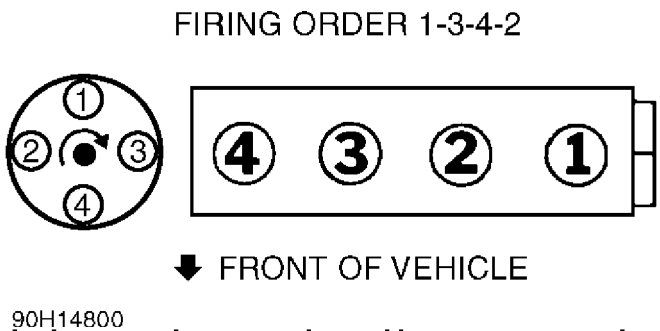

Fig. 2: Firing Order & Distributor Rotation (Civic & Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

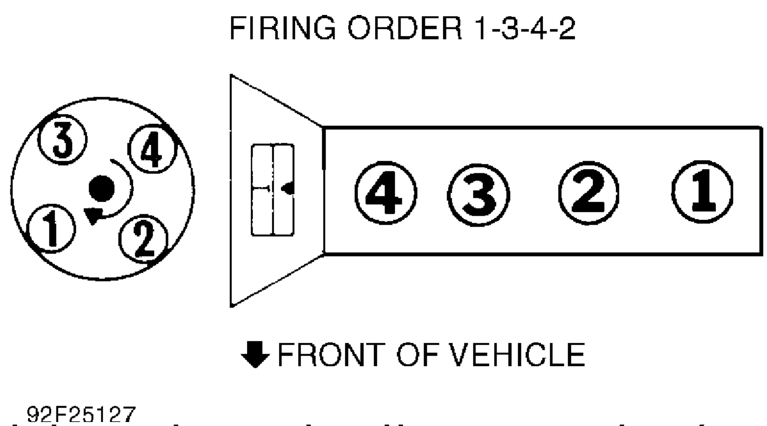

Fig. 3: Firing Order & Distributor Rotation (Prelude)
Courtesy of American Honda Motor Co., Inc.

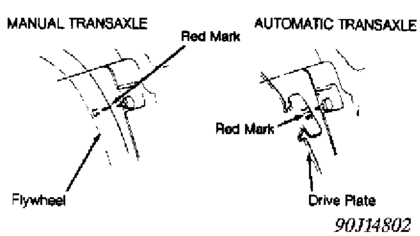

Fig. 4: Locating Ignition Timing Marks (Accord & Prelude)
Courtesy of American Honda Motor Co., Inc.

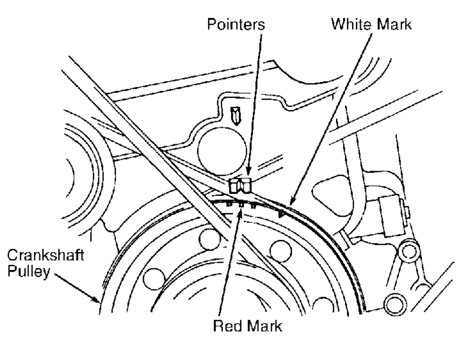

Fig. 5: Locating Ignition Timing Marks (Civic & Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

IGNITION TIMING

IGNITION TIMING (Degrees BTDC @ RPM)

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Application	Specification
Accord & Prelude	13-17 @ 700-800
Civic & Civic Del Sol	
1.5L Engine (D15B7)	
A/T	16 @ 700
M/T	16 @ 650
1.5L Engine (D15B8)	12 @ 650
1.5L Engine (D15Z1)	16 @ 600
1.6L Engine (D16Z6)	
A/T	16 @ 700
M/T	16 @ 650

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FUEL SYSTEM

FUEL PUMP

REGULATED FUEL PRESSURE (1)

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Application	At Idle psi (kg/cm^2)
Accord, Civic & Civic Del Sol	
Vacuum Hose Disconnected	40-47 (2.8-3.3)
Vacuum Hose Connected	30-38 (2.1-2.7)
Prelude	
2.2L Engine (F22A1)	
Vacuum Hose Disconnected	36-43 (2.5-3.0)
Vacuum Hose Connected	28-35 (2.0-2.5)
2.2L Engine (H22A1)	
Vacuum Hose Disconnected	33-40 (2.3-2.8)
Vacuum Hose Connected	25-32 (1.8-2.3)
2.3L Engine (H23A1)	
Vacuum Hose Disconnected	36-43 (2.5-3.0)
Vacuum Hose Connected	28-35 (2.0-2.5)

(1) - Measure regulated fuel pressure with vacuum hose connected and disconnected from pressure regulator.

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INJECTOR RESISTANCE

FUEL INJECTOR RESISTANCE

Application	Ohms
Accord & Prelude	
Injector	1.5-2.5
Injector Resistor	5-7
Civic & Civic Del Sol	
Injector	10-13

IDLE SPEED & CO MIXTURE

For further information on idle speed adjustments and specifications, see D - ADJUSTMENTS article in the ENGINE PERFORMANCE Section.

IDLE SPEED SPECIFICATIONS

Application (1)	RPM
Accord & Prelude	500-600
Civic & Civic Del Sol	370-470

(1) - With Electronic Air Control Valve (EACV) disconnected, headlights and cooling fan off and transmission in Neutral or Park.

IDLE CO LEVEL

Application	CO Level
All Models	0.1%

THROTTLE ANGLE (POSITION) SENSOR

NOTE: For testing procedures, refer to G - TESTS W/CODES or I - SYSTEM/COMPONENT TESTS article in the ENGINE PERFORMANCE Section.

THROTTLE ANGLE (POSITION) SENSOR VOLTAGE

Condition	Volts
Throttle Valve	
Fully Closed	.5

Wide Open 4.5
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END OF ARTICLE

CLUTCH
Article Text
1993 Honda Prelude
For Cadi Centre Nsk CA 95051
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Sunday, July 08, 2001 11:24AM

ARTICLE BEGINNING

1993 Clutch

Prelude

DESCRIPTION

The clutch assembly is a single disc type with a diaphragm spring pressure plate. All models use a hydraulically-controlled clutch system consisting of a master cylinder, release cylinder, release lever and release bearing.

ADJUSTMENTS

CLUTCH PEDAL

1) Loosen lock nut "A", and back off clutch pedal switch "A" until it breaks contact with clutch pedal. SeeFig. 1. Loosen lock nut "C", and turn clutch pedal push rod until correct pedal height is obtained. See CLUTCH PEDAL SPECIFICATIONS table. Tighten lock nut "C" to specification. See TORQUE SPECIFICATIONS table at the end of this article.

2) Turn clutch pedal switch "A" in until it contacts clutch pedal. Turn switch in another 1/4-1/2 turn. Tighten lock nut "A" to specification. Loosen lock nut "B" and clutch pedal switch "B". Measure clearance between floor board and clutch pedal with clutch pedal fully depressed. See DISENGAGEMENT HEIGHT (FROM FLOOR) table.

3) Release clutch pedal .6-.8" (15-20 mm) from fully depressed position, and hold it there. Adjust position of clutch pedal switch "B" so engine will start with clutch pedal in this position. Turn clutch pedal switch in another 1/4-1/2 turn. Tighten lock nut "B" to specification.

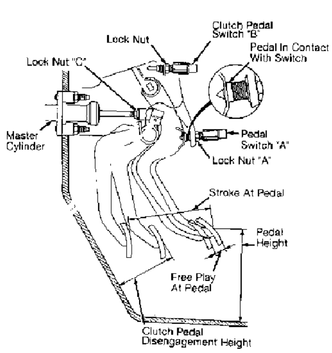

Fig. 1: Adjusting Clutch Pedal
Courtesy of American Honda Motor Co., Inc.

CLUTCH PEDAL SPECIFICATIONS TABLE

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Application	Free Play In. (mm)	Pedal Height In. (mm)
Prelude	.04-.28 (1.0-7.0)	7.5 (190)

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DISENGAGEMENT HEIGHT TABLE (FROM FLOOR)

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Application	In. (mm)
Prelude	3.7 (94)

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REMOVAL & INSTALLATION

CLUTCH ASSEMBLY

Removal

1) Remove positive and negative battery cables, and remove battery. Remove air intake hoses and battery base. Disconnect starter wiring, and remove starter. Disconnect transaxle ground cable. Disconnect back-up light switch. Remove shift cable stay and cables as an assembly. See Fig. 2.

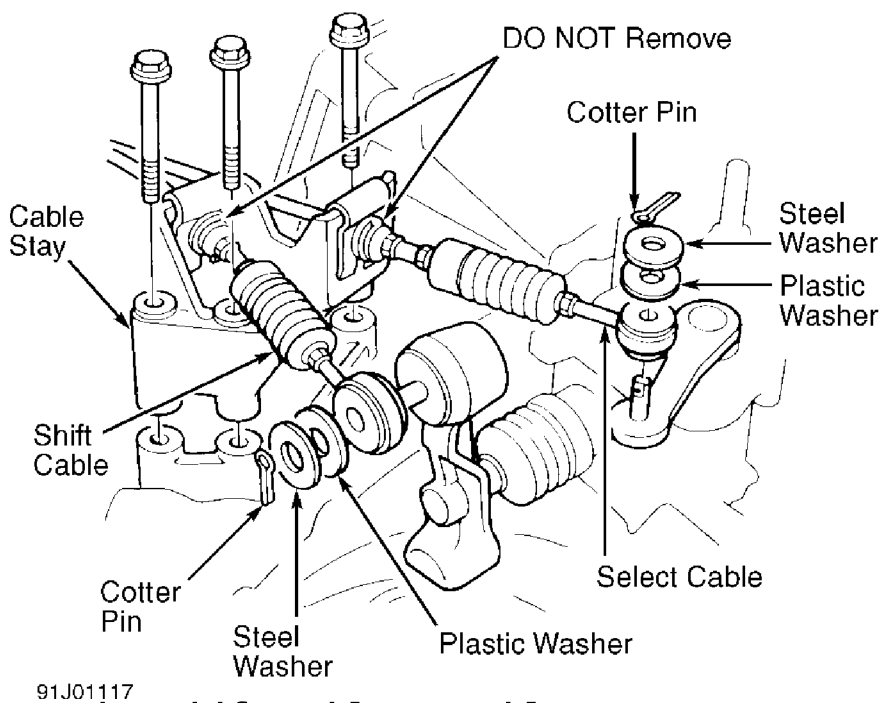

Fig. 2: Removing Shift Cable Assembly
Courtesy of American Honda Motor Co., Inc.

2) Disconnect electrical connector, and remove speed sensor, leaving hoses attached. Remove both front wheels. Remove undercarriage splash shield. Drain transaxle fluid. Remove clutch release cylinder, tubing and push rod. Remove clutch hose joint.

3) Remove clutch damper and support with wire. Remove center beam and header pipe. Separate left and right lower control arms from ball joints. Remove strut fork bolt. Pry drive shafts out of differential and intermediate shaft, and remove drive shafts. Lower bearing support, and remove intermediate shaft.

4) Remove right strut pinch bolt, and separate strut fork and strut damper. Remove right radius rod. Remove engine stiffener and clutch cover. Remove intake manifold bracket. Remove rear engine mount bracket stay and bracket. Remove transaxle housing mount bolt from engine side.

5) Place a transaxle jack under transaxle, and slightly raise transaxle to take weight off mounts. Remove transaxle mount, and loosen mount bracket bolts. Remove remaining transaxle housing mount bolts. Lower transaxle from engine.

Inspection

1) Check pressure plate diaphragm spring fingers for wear and unevenness on release bearing contact area. Check spring finger height using feeler gauge and Clutch Disc Aligner Assembly (07JAF-PM7011A, 07LAF-PT00110 and 07936-3710100).

2) Verify clearance between tool flange and finger is at least .02"(0.6 mm) for new pressure plate and at most .03" (0.8 mm) for existing pressure plate.

3) If necessary, install Ring Gear Holder Assembly (07924-PD20003) to hold flywheel stationary while pressure plate and clutch disc are being removed.

4) With pressure plate and clutch removed, inspect pressure plate surface for wear, cracks, burning and warpage. Maximum face warpage is .006" (.15 mm). Using straightedge and feeler gauge, measure clearance at several points.

5) Inspect clutch disc lining for slipping, excessive wear, burning and oil contamination. Measure disc thickness and rivet depth. Check for loose rubber torsion dampers. Replace disc if any dampers are loose. Check disc runout.

6) Inspect flywheel ring gear teeth for excessive wear and damage. Inspect flywheel surface for wear, burning and cracks. Check flywheel runout and flywheel pilot bearing.

Installation

1) Align flywheel dowels with dowel holes in clutch cover. Using clutch alignment tool and ring gear holder, install disc and pressure plate. Tighten bolts evenly in a crisscross pattern. Ensure 2 dowel pins are installed in clutch housing.

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NOTE: New spring clips must be used on both axle shafts. Slide axles in until spring clips engage differential.

2) Clean release bearing sliding surface. Apply molybdenum grease to release bearing sliding surface. Apply a light amount of grease to input shaft splines. DO NOT allow grease or dirt on clutch disc or pressure plate surfaces. To complete installation, reverse removal procedure. Refill fluid to proper level. Adjust clutch pedal height and free play.

CLUTCH MASTER CYLINDER

Removal & Installation

Pry out cotter pin, and pull pedal pin out of yoke. Disconnect and plug hydraulic line. Remove nuts and bolts attaching master cylinder to firewall. To install, reverse removal procedure. Refill master cylinder, and bleed air from system.

CLUTCH RELEASE CYLINDER

Removal & Installation

Disconnect clutch pipe from release cylinder. Remove release cylinder from transaxle clutch housing. To install, reverse removal procedure. Refill release cylinder, and bleed air from system.

OVERHAUL

NOTE: Manufacturer recommends replacement of faulty clutch master and release cylinders and does not provide overhaul procedures.

CLUTCH SPECIFICATIONS

CLUTCH SPECIFICATIONS TABLE

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Application	Range In. (mm)	Service Limit In. (mm)
Disc Thickness	.33-.36 (8.4-9.1)	.24 (6.1)
Flywheel Runout	.002 (.05)	.006 (.15)
Rivet Depth	.051 (1.30)	.008 (.20)

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TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

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Application	Ft. Lbs. (N.m)

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Battery Base Mounting Bolts	16 (22)
Flywheel Housing-To-Engine Bolts	47 (65)
Flywheel-To-Crankshaft Bolt	77 (105)
Front Wheel Lug Nuts	80 (109)
Intake Manifold Bracket Bolts	16 (22)
Intermediate Shaft Support Bolt	28 (39)
Master Cylinder Mounting Nuts	10 (14)
Pedal Adjuster Lock Nut "C"	13 (18)
Pressure Plate-To-Flywheel Bolts	19 (26)
Rear Mount-To-Transmission Bolt	28 (39)
Release Cylinder-To-Housing	16 (22)
Speed Sensor Mounting Bolts	14 (19)
Starter Mounting Bolts	55 (75)
	INCH Lbs. (N.m)
Pedal Adjuster Lock Nut "A"	10 (89)
Pedal Adjuster Lock Nut "B"	10 (89)

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END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION
Computer Relearn Procedures

All Models

* PLEASE READ THIS FIRST *

The following general procedures are to be used if driveability problems are encountered after power loss or battery has been disconnected. These procedures may provide an aid in eliminating these problems.

To reduce the possibility of complaints, after any service which requires battery power to be disconnected, vehicle should be road tested.

COMPUTER RELEARN PROCEDURES

Vehicles equipped with engine or transmission computers may require a relearn procedure after vehicle battery is disconnected. Many vehicle computers memorize and store vehicle operation patterns for optimum driveability and performance. When vehicle battery is disconnected, this memory is lost. The computer will use default data until new data from each key start is stored. As computer memorizes vehicle operation for each new key start, driveability is restored. Vehicle computers may memorize vehicles operation patterns for 40 of more key starts.

Customers often complain of driveability problems during relearn stage because vehicle acts differently then before being serviced. Depending on type and make of vehicle and how it is equipped, the following complaints (driveability problems) may exist:

* Harsh Or Poor Shift Quality
* Rough Or Unstable Idle
* Hesitation Or Stumble
* Rich Or Lean Running
* Poor Fuel Mileage

These symptoms and complaints should disappear after a number of drive cycles have been memorized. To reduce the possibility of complaints, after any service which requires battery power to be disconnected, vehicle should be road tested. If a specific relearn procedure is not available, the following procedure may be used:

Automatic Transmission

* Set parking brake, start engine in "P" or "N" position. Warm-up vehicle to normal operating temperature or until cooling fan cycles.
* Allow vehicle to idle for one minute in "N" position. Select "D" and allow engine to idle for one minute.
* Accelerate at normal throttle position (20-50%) until vehicle shifts into top gear.
* Cruise at light to medium throttle.
* Decelerate to a stop, allowing vehicle to downshift, and use brakes normally.
* Process may be repeated as necessary.

Manual Transmission

* Place transmission in Neutral position.
* Ensure emergency brake has been set and all accessories are turned off.
* Start engine and bring to normal operating temperature.
* Allow vehicle to idle in Neutral for one minute.
* Initial relearn is complete: process will be completed during normal driving.

Some manufacturers identify a specific relearn procedure which will help establish suitable driveability during relearn stage. These procedures are especially important if vehicle is equipped with and electronically controlled automatic transmission or transaxle. Always complete procedure before returning vehicle to customer.

END OF ARTICLE

COOLING SYSTEM SPECIFICATIONS

Article Text

1993 Honda Prelude
For Cadi Centre Nsk CA 95051
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Sunday, July 08, 2001 11:24AM

ARTICLE BEGINNING

1993 ENGINE COOLING
Honda Motors Cooling System Specifications

Honda; Prelude

NOTE: For water pump removal procedure,2.2L 4-CYL & 2.3L 4-CYL article in ENGINES.

COOLING SYSTEM SPECIFICATIONS

COOLING SYSTEM SPECIFICATIONS TABLE

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Application	Specification
Coolant Replacement Interval	(1)
Coolant Capacity (2)	
2.2L	
DOHC	8.0 Qts. (7.6L)
SOHC	
A/T	7.4 Qts. (7.0L)
M/T	7.5 Qts. (7.1L)
2.3L	
A/T	7.8 Qts. (7.4L)
M/T	7.6 Qts. (7.3L)
Pressure Cap	14-18 psi
Thermostat Opens	
Starts	169-176°F (76-80°C)
Fully Open	194°F (90°C)

(1) - 45,000 miles initially; 30,000 miles thereafter.
(2) - Including heater core and reservoir.

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COOLING SYSTEM BLEEDING

1) Set heater controls to maximum heat. Fill cooling system with a 50/50 mixture of coolant and water to bottom of filler neck. Loosen bleed bolt, located on thermostat housing.

2) Tighten bleed bolt when coolant flows from bleed bolt in steady stream without bubbles. With radiator cap off, start and operate engine to normal operating temperature (fan comes on at least twice). Add coolant as necessary. Install radiator cap.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Cruise Control Systems

Prelude

DESCRIPTION

The cruise control system uses mechanical, electrical and vacuum operated devices to maintain selected vehicle speed at more than 25 MPH. The cruise control unit receives command signals from cruise control main switch and cruise control SET/RESUME switch. It also receives operating signals from brakelight switch, ignition coil, speed sensor, clutch switch (M/T) or shift position switch (A/T).

The cruise control unit compares actual vehicle speed to selected speed. The brakelight switch releases system control of throttle when brake pedal is pressed. The clutch switch, shift position switch and cancel switch sends a disengage signal to the cruise control unit.

OPERATION

The cruise control system will set and automatically maintain any speed at more than 25 MPH. To set, ensure main switch is on. Press SET switch after reaching desired speed. Pressing SET switch with main switch on will cause CRUISE CONTROL light display to come on. Pushing main switch to off, will cancel cruise control system operation and erase vehicle speed from memory.

If system is disengaged temporarily by brakelight switch, clutch switch or shift position switch, press RESUME switch. With RESUME switch pressed and speed memory retained, vehicle automatically returns to previous set speed. Holding RESUME switch will gradually increase vehicle speed without having to depress accelerator pedal. This sends an acceleration signal input to cruise control unit. When RESUME switch is released, system is reprogrammed for new speed.

For gradual deceleration without pressing brake pedal, push SET switch and hold switch until desired speed is reached. This sends a deceleration signal input to cruise control unit. When desired speed is reached, release SET switch. This reprograms system for new speed.

TROUBLE SHOOTING

WARNING: All models are equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel, and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system and follow all service procedures. See appropriate AIR BAG RESTRAINT SYSTEM article in ACCESSORIES/SAFETY EQUIPMENT section.

Preliminary Checks

1) Before trouble shooting by symptom, check underdash fuses No. 13 (10-amp) and No. 14 (7.5-amp).

2) Check underhood fuses No. 32 (100-amp), No. 33 (50-amp) and No. 41 (15-amp). Replace fuses as necessary. Ensure horn and tachometer operate properly. Ensure all connections are clean and tight. For circuit identification, see appropriate chassis wiring diagram in the WIRING DIAGRAMS section.

NOTE: Check possible faults in order listed. Repair or replace components and circuits as necessary.

Cruise Control Will Not Set

1) Faulty main switch. Faulty SET/RESUME switch. Faulty cruise control unit inputs.

2) Faulty ground connection G401 (located under right side of dashboard, near base of windshield). Faulty ground connection G402 (located on left side of left side rail, on center console). Faulty ground connection G404 (located on top of left side rail, on center console).

3) Open one or more of the following wires:

* Light Green/Black wire between SET/RESUME switch and cruise control unit.
* Brown/White wire between cruise control actuator and cruise control unit.
* Brown/Black wire between cruise control actuator and cruise control unit.
* Brown/Red wire between cruise control actuator and cruise control unit.
* Orange wire between vehicle speed sensor and cruise control unit.
* Light Green wire between main switch and cruise control unit. Wire splices to brakelight switch.
* Light Green/Red wire between SET/RESUME switch and cruise control unit.
* Blue wire between ignition control module and cruise control unit.

Cruise Control Will Set, But Indicator Light Will Not Come On

1) Faulty dimming circuit for gauges. Open Yellow wire

between underdash fuse No. 13 (10-amp) and dashlight dimming circuit. Open Red wire between dashlight dimming circuit and cruise control unit.

2) Faulty ground connection G401 (located under right side of dashboard, near base of windshield). Faulty ground connection G402 (located on left side of left side rail, on center console). Faulty ground connection G404 (located on top of left side rail, on center console).

Cruise Speed Noticeably Higher Or Lower Than Setting

Incorrect actuator cable free play. Faulty actuator assembly. Faulty cruise control unit inputs. Faulty speed sensor signal.

Excessive Hunting When Trying To Achieve Set Speed

Incorrect actuator cable free play. Faulty actuator assembly. Faulty cruise control unit inputs. Faulty speed sensor signal.

Set Speed Will Not Hold, Even On Flat Road

Incorrect actuator cable free play. Faulty actuator assembly. Leaking or plugged actuator vacuum connections. Leaking vacuum reservoir. Faulty cruise control unit inputs. Faulty speed sensor signal.

Vehicle Will Not Decelerate Or Accelerate When Set Or Resume Button Is Pushed

1) Faulty SET/RESUME switch. Faulty cruise control unit inputs.

Set Speed Will Not Cancel When Clutch Pedal Is Pushed (M/T)

Faulty clutch switch. Faulty cruise control unit inputs. Open Pink wire between cruise control unit and clutch switch (M/T) or shift lever position switch (A/T).

Set Speed Will Not Cancel When Shift Lever Is Moved To Neutral (A/T)

Faulty shift lever position switch. Faulty cruise control unit inputs. Open Pink wire between cruise control unit and clutch switch.

Set Speed Will Not Cancel When Brake Pedal Is Pushed

Faulty brakelight switch. Faulty cruise control unit inputs. Open Gray and/or Green/White wires between brakelight switch and cruise control unit.

Set Speed Will Not Cancel When Main Switch Is Turned Off

Faulty main switch. Faulty cruise control unit inputs. Open Light Green wire between main switch and cruise control unit. Check wire splice to brakelight switch for poor connection.

Set Speed Will Not Resume When Resume Button Is Pressed With Main Switch On, But Set Speed Will Temporarily Cancel

Faulty SET/RESUME switch. Faulty cruise control unit inputs.

ADJUSTMENTS

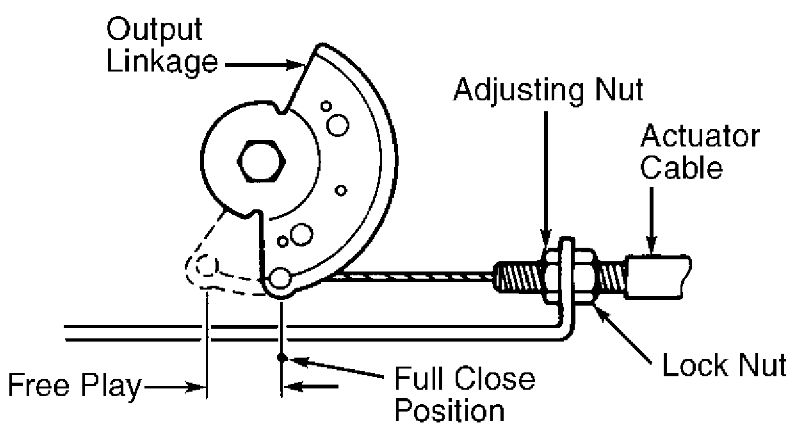
ACTUATOR CABLE

1) Ensure actuator cable operates smoothly without binding or sticking. Start engine. Measure actuator rod movement before cable pulls on accelerator lever (engine speed starts to increase). This is amount of cable free play. See Fig. 1. See ACTUATOR CABLE FREE PLAY SPECIFICATIONS table.

ACTUATOR CABLE FREE PLAY SPECIFICATIONS TABLE

Application	In. (mm)
All Models	.37-.49 (9.5-12.5)

2) If free play is not as specified, loosen lock nut and turn adjusting nut as necessary. See Fig. 1. Tighten lock nut and recheck free play. Test drive vehicle and ensure actual speed is within 2 MPH of set speed. If necessary, check throttle cable free play.



93H01480

Fig. 1: Adjusting Cruise Control Actuator Cable
Courtesy of American Honda Motor Co., Inc.

BRAKE PEDAL HEIGHT

1) Loosen brakelight switch lock nut, and back off switch until it no longer touches brake pedal. Loosen brake pedal push rod lock nut, and screw push rod in or out until correct pedal height is

obtained. See **BRAKE PEDAL HEIGHT SPECIFICATIONS** table. Tighten lock nut to specification. See **TORQUE SPECIFICATIONS**.

2) Screw in brakelight switch until plunger is fully pressed (threaded end touching pad on pedal arm). Back off switch until clearance between threaded end and pad is .012" (.30 mm) and tighten lock nut firmly. Ensure brakelights work when brake pedal is pressed.

BRAKE PEDAL HEIGHT SPECIFICATIONS TABLE

Application	Auto. Trans. In. (mm)	Man. Trans. In. (mm)
Prelude	7.3 (186)	6.5 (165)

CABLE REEL CENTERING

For cable reel centering procedure, see appropriate **AIR BAG RESTRAINT SYSTEM** article in the **ACCESSORIES/SAFETY EQUIPMENT** section.

CLUTCH PEDAL HEIGHT

1) Loosen clutch pedal switch (lower switch) lock nut, and back off switch until it no longer touches clutch pedal. Loosen clutch master cylinder push rod lock nut. Turn push rod to obtain a pedal height from floor of 7.5" (190 mm) and a stroke of 5.3-5.7"(135-145 mm). Pedal height is measured from middle of pedal face (with clutch released) to floor. Tighten clutch master cylinder push rod lock nut.

2) Thread in clutch pedal switch until it contacts pedal. Turn clutch pedal switch in an additional 1/4 to 1/2 turn. Tighten clutch pedal switch lock nut. Loosen clutch interlock switch (upper switch) lock nut. With clutch pedal fully pressed, measure clearance between clutch pedal and floor board. Measure from middle of pedal face to floor. Clearance should be a minimum of 3.7" (94 mm).

3) Release clutch pedal .59-.79" (15-20 mm) from fully pressed position, and hold pedal at this height. Adjust position of clutch interlock switch so engine will start with clutch pedal at this position. Turn clutch interlock switch in an additional 1/4 to 1/2 turn. Tighten clutch interlock switch lock nut.

SHIFT LEVER POSITION SWITCH

1) Turn ignition off. Set parking brake. Remove front console to access shift lever position switch located on side of shift lever mechanism. Disconnect shift lever position switch 12 or 14-pin connector. Ensure shift lever is in "P" position.

2) Loosen 2 shift lever position switch mounting bolts.

Slowly slide switch toward front or rear of vehicle while checking for continuity between shift lever position switch 12 or 14-pin connector terminals. See SHIFT LEVER POSITION SWITCH TERMINAL IDENTIFICATION table. See Fig. 2. Continuity should be present.

3) If adjustment is possible to get continuity, shift lever position switch is functioning properly. Tighten 2 shift lever position switch mounting bolts. Ensure vehicle starts with shift lever in "P" and "N" positions.

4) If adjustment is not possible to get continuity, check shift lever detent and bracket for damage. If no damage is evident, replace faulty shift lever position switch.

SHIFT LEVER POSITION SWITCH TERMINAL IDENTIFICATION TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Terminals
Prelude (1)	8 & 11

(1) - Shift lever position switch has a 12-pin connector.

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

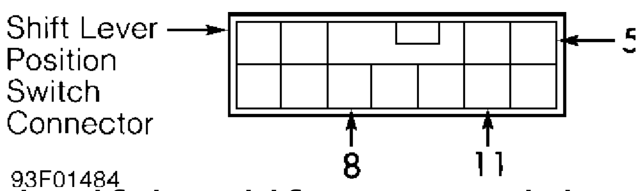


Fig. 2: Identifying Shift Lever Position Switch Connector
Courtesy of American Honda Motor Co., Inc.

DIAGNOSIS & TESTING

AIR BAG WARNING

WARNING: All models are equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel, and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system and follow all service procedures. See appropriate AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

RADIO THEFT PROTECTION SYSTEM CAUTION

CAUTION: Some models are equipped with stereo theft protection system. Obtain 5-digit security code before disconnecting battery cable.

ACTUATOR ASSEMBLY

NOTE: If testing results in replacement of actuator solenoid valve assembly, ensure NEW "O" rings are installed.

1) Turn ignition off. Disconnect actuator cable from actuator. Unplug 4-pin connector at actuator. Actuator is located on left side of engine compartment. Using jumper wires, connect battery voltage to terminal "D" of actuator connector and simultaneously ground terminals "A", "B" and "C" of actuator connector. See Fig. 3.

2) Disconnect actuator vacuum line at vacuum check valve. Connect a vacuum pump to actuator vacuum line. Ensure vacuum check valve is between vacuum pump and actuator. Apply vacuum to system.

3) Actuator rod should pull in completely. If actuator rod pulls in completely, go to step 5). If actuator rod pulls in partially or not at all, check for leaking vacuum line. Repair as necessary.

4) If vacuum line is not leaking, check actuator solenoid valve assembly. See ACTUATOR SOLENOID VALVE ASSEMBLY. If actuator solenoid valve assembly tests are okay, actuator solenoid valve assembly is okay electrically, but has a mechanical malfunction. Replace actuator solenoid valve assembly for mechanical malfunction.

5) With voltage still applied to actuator connector, try to pull actuator rod out by hand. If actuator rod cannot be pulled out by hand, go to next step. If actuator rod can be pulled out by hand, replace malfunctioning actuator assembly.

6) Disconnect ground wire from actuator connector terminal "C". See Fig. 3. Actuator rod should return to "rest" position. If actuator rod does not return to "rest" position, replace malfunctioning actuator solenoid valve assembly. If actuator rod returns to "rest" position, repeat steps 1) through 6), but when step 6) is reached, disconnect ground from actuator connector terminal "A" instead of "C". See Fig. 3.

7) If actuator rod returns to "rest" position after disconnecting ground from actuator terminal "A", actuator assembly is functioning properly. If actuator rod does not return to "rest" position after disconnecting ground from actuator terminal "A", replace malfunctioning actuator solenoid valve assembly.

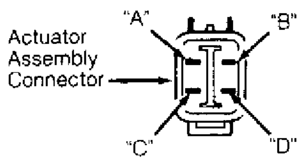


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Fig. 3: Identifying Actuator Assembly Connector
Courtesy of American Honda Motor Co., Inc.

ACTUATOR SOLENOID VALVE ASSEMBLY

1) Turn ignition off. Unplug actuator assembly 4-pin connector. Using a DVOM, measure resistance between actuator assembly 4-pin connector terminals. See Fig. 3.

2) See ACTUATOR SOLENOID VALVE ASSEMBLY RESISTANCE table. If resistance is as not as specified, replace actuator solenoid valve assembly. Ensure NEW "O" rings are installed.

ACTUATOR SOLENOID VALVE ASSEMBLY RESISTANCE TABLE

Solenoid	Terminals	Ohms
Safety	"A" & "D"	40-60
Vacuum	"B" & "D"	70-110
Vent	"C" & "D"	80-120

BRAKELIGHT SWITCH

1) Unplug 4-pin connector from brakelight switch. Using a DVOM, check for continuity between brakelight switch terminals "A" and "D". See Fig. 4. Continuity should exist. Check for continuity between brakelight switch terminals "B" and "C". Continuity should not exist.

2) Depress brake pedal and hold. Check for continuity between brakelight switch terminals "A" and "D". Continuity should not exist. Check for continuity between brakelight switch terminals "B" and "C". Continuity should exist. If continuity is not as specified, check brake pedal height. See BRAKE PEDAL HEIGHT under ADJUSTMENTS. If brake pedal height is okay, replace brakelight switch.

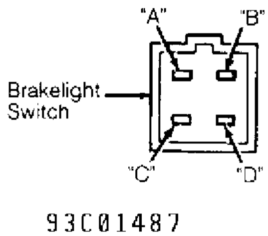

Fig. 4: Identifying Brakelight Switch Connector
Courtesy of American Honda Motor Co., Inc.

CABLE REEL

Cable reel testing procedures are incorporated into SET/RESUME switch testing. See SET/RESUME SWITCH.

CLUTCH SWITCH

1) Unplug 3-pin connector from clutch switch. Using a DVOM, check for continuity between clutch switch terminals "B" and "C". See Fig. 5. Continuity should exist. Depress clutch pedal and hold. Check for continuity between terminals "B" and "C".

2) Continuity should exist. If no continuity exists, check clutch pedal height. See CLUTCH PEDAL HEIGHT under ADJUSTMENTS. If clutch pedal height is okay, replace clutch pedal switch.

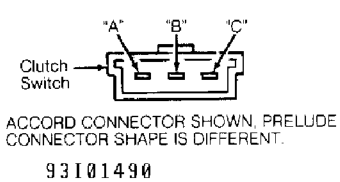

Fig. 5: Identifying Clutch Switch Terminals (Typical)
Courtesy of American Honda Motor Co., Inc.

DIMMER SWITCH CIRCUIT

1) Turn ignition off. Carefully pry dimmer switch from dashboard. Dimmer switch is removed with 2 other switches in a pod. Unplug dimmer switch 6-pin connector.

2) Using a DVOM, measure resistance of dimmer switch terminals "C" and "E". See Fig. 6. Resistance should be 8000-10,000 ohms. Resistance will vary slightly with temperature. If resistance is as specified, go to next step. If resistance is not as specified, replace dimmer switch.

3) Using a DVOM, measure resistance of dimmer switch terminals "D" and "E". See Fig. 6. Resistance should vary between zero and 10,000 ohms when dimmer switch dial is rotated. Resistance will vary slightly with temperature. If resistance is as specified, go to next step. If resistance is not as specified, replace dimmer switch.

4) Using a DVOM, check for continuity between dimmer switch terminals "B" and "F". See Fig. 6. If continuity exists, go to next step. If no continuity exists, replace dimmer switch.

5) Rotate dimmer switch past its dimmest setting until a "click" is heard. Using a DVOM, check for continuity between dimmer switch terminals "B" and "F". See Fig. 6. If no continuity exists, go to next step. If continuity exists, replace dimmer switch.

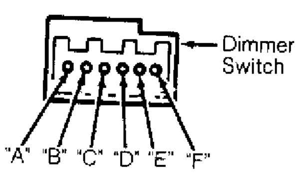

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Fig. 6: Identifying Dimmer Switch Terminals
Courtesy of American Honda Motor Co., Inc.

6) Remove 4 screws from sub-gauge assembly located in center of dashboard. Pull out sub-gauge assembly far enough to unplug electrical connectors. Remove sub-gauge assembly.

7) Access dashlight brightness control unit located behind sub-gauge assembly. Unplug dashlight brightness control unit 6-pin connector. See Fig. 6. With headlight switch on or off, use a DVOM to check for continuity between 6-pin connector Black wire and ground. If

continuity exists, go to next step. If no continuity exists, repair open Black wire or poor ground connection G401, located under right side of dashboard near base of windshield. Also check ground connection G402, located on left side of left side rail on center console.

8) With headlight switch on, use a DVOM to check for battery voltage between 6-pin connector Red/Black wire and ground. If battery voltage exists, go to next step. If battery voltage does not exist, replace blown underhood fuse No. 42 (20-amp), faulty headlight switch or repair open circuit in Red/Black wire.

9) With headlight switch on, use a jumper wire to ground 6-pin connector Red wire. If dashlights come on (full bright), go to next step. If dashlights do not come on, repair open circuit in Red/Black wire or Red wire for 6-pin connector.

10) Using a DVOM, measure resistance between 6-pin connector Red/Green wire and Red/White wire. Resistance should be 8000-12,000 ohms at all times when dimmer switch dial is rotated. Resistance will vary slightly with temperature. If resistance is as specified, go to next step. If resistance is not as specified, repair open circuit in Red/Green wire or Red/White wire or replace faulty dashlight brightness control unit.

11) Using a DVOM, measure resistance between 6-pin connector Red/Blue wire and Red/White wire. Resistance should vary between zero and 10,000 ohms when dimmer switch dial is rotated. Resistance will vary slightly with temperature. If resistance is as specified, go to next step. If resistance is not as specified, repair open circuit in Red/Blue wire or Red/White wire or replace faulty dashlight brightness control unit.

12) Ensure connection between 6-pin connector and dashlight brightness control unit is okay. See Fig. 7. If connection is okay, replace dashlight brightness control unit with a known good unit and check operation of cruise control indicator light.

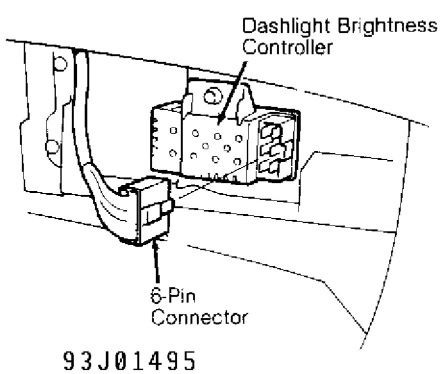


Fig. 7: Dashlight Brightness Controller
Courtesy of American Honda Motor Co., Inc.

MAIN SWITCH

1) Turn ignition and main switch off. Remove main switch. Using DVOM, check for continuity between main switch terminals "A" and "B", and terminals "C" and "E". See Fig. 8. If continuity exists, go to next step. If no continuity exists, replace defective bulb inside main switch. Recheck main switch continuity. If continuity is still not as specified, replace main switch.

2) Turn main switch on. Using a DVOM, check for continuity between main switch terminals "A" and "B", "C" and "E", and "B" and "D". See Fig. 8. If continuity exists, main switch is okay. If no continuity exists between terminals "B" and "D", replace main switch. If no continuity exists between main switch terminals "A" and "B" and terminals "C" and "E", go to next step.

3) Replace defective bulb inside main switch. Recheck main switch continuity. If continuity is still not as specified, replace main switch.

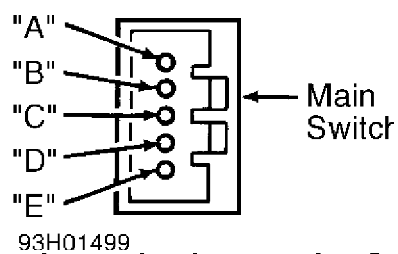


Fig. 8: Main Switch Terminal ID
Courtesy of American Honda Motor Co., Inc.

SET/RESUME SWITCH

1) Disable air bag system. See AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section. Connect SRS Test Harness "C" (07LAZ-SL40300) to cable reel 6-pin connector. Using a DVOM, check for continuity between SRS Test Harness "C" connector terminal No. 2 (Light Green/Red wire on cable reel harness) and terminal No. 3 (Blue/Red wire on cable reel harness) with SET pressed. See Fig. 9. If continuity exists, go to next step. If no continuity exists, go to step 3).

2) Using a DVOM, check for continuity between SRS Test Harness "C" connector terminal No. 1 (Light Green/Black wire on cable reel harness) and terminal No. 3 (Blue/Red wire on cable reel harness) with RESUME pressed. See Fig. 9. If continuity exists, SET/RESUME switch and cable reel are okay. If no continuity exists, go to next step.

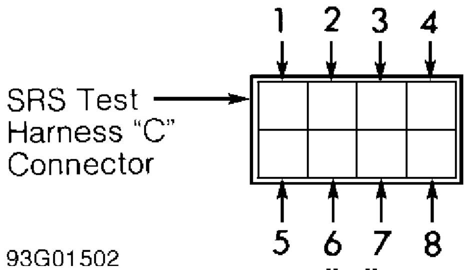


Fig. 9: SRS Test Harness "C" Terminal ID
Courtesy of American Honda Motor Co., Inc.

3) Remove SET/RESUME switch from steering wheel. See SET/RESUME SWITCH under REMOVAL & INSTALLATION. Using a DVOM, check for continuity between SET/RESUME switch terminals "A" or "A' " and "C" with SET pressed. See Fig. 10. If continuity exists, go to next step. If no continuity exists, replace SET/RESUME switch.

4) Using a DVOM, check for continuity between SET/RESUME switch terminals "A" or "A' " and "B" with RESUME pressed. See Fig. 10. If continuity exists, replace cable reel. See CABLE REEL under REMOVAL & INSTALLATION. If no continuity exists, replace SET/RESUME switch.

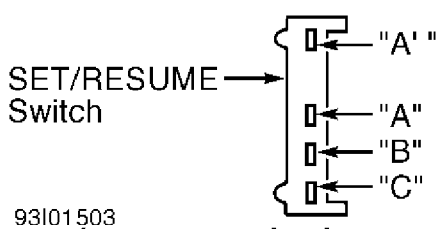


Fig. 10: SET/RESUME Switch Terminal ID
Courtesy of American Honda Motor Co., Inc.

SHIFT LEVER POSITION SWITCH

NOTE: Only A/T vehicles are equipped with shift lever position switch.

1) Remove front console to access shift lever position switch located on side of shift lever mechanism. Unplug shift lever position switch 12 or 14-pin connector.

2) Using a DVOM, check for continuity between shift lever position switch 12 or 14-pin connector terminals with shift lever in "2", "D" and "D4" positions. See SHIFT LEVER POSITION SWITCH TERMINAL IDENTIFICATION table. See Fig. 2.

3) Continuity should be present in each position. If continuity exists in each position, shift lever position switch is okay. If no continuity exists, go to next step.

4) Check shift lever position switch adjustment. See SHIFT LEVER POSITION SWITCH under ADJUSTMENTS. If shift lever position

switch adjustment is okay, replace shift lever position switch.

SHIFT LEVER POSITION SWITCH TERMINAL IDENTIFICATION TABLE

Application	Terminals
Prelude (1)	5 & 8

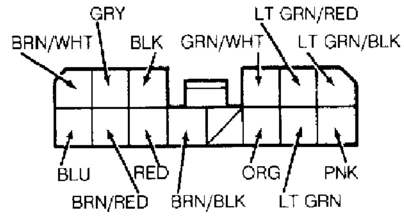
(1) - Shift lever position switch has a 12-pin connector.

CRUISE CONTROL UNIT INPUT

1) Turn ignition off. Remove dashboard lower left cover. Cruise control unit is located above steering column under dashboard. Unplug cruise control unit 13-pin connector.

2) Using a DVOM, perform cruise control unit input tests. See Fig. 11. If all input test results are okay, check cruise control unit connector for damage and proper fit to cruise control unit. If connector is okay and cruise control is still malfunctioning, replace cruise control unit.

- Numbers 1 through 13 refer to test numbers, not terminal numbers.
- Ground G101 is located at thermostat housing on engine. G101 is a 2-wire ground connection sharing one common ground.
- Ground G401 is located under right side of dashboard near base of windshield. G401 is a 2-wire ground connection sharing one common ground.
- Ground G402 is located under middle of dashboard on left side rail on center console. G402 is a 2-wire ground connection sharing one common ground.
- Ground G404 is located under middle of dashboard. G404 is a 2-wire ground connection sharing one common ground.



VIEW FROM WIRE SIDE

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No.	Wire	Test condition	Test: Desired result	Possible cause if result is not obtained
1	BLK	Under all conditions.	Check for continuity to ground: There should be continuity.	• Poor ground (G401, G402, G404) • An open in the wire.
2	LT GRN	Ignition switch ON and main switch ON.	Check for voltage to ground: There should be battery voltage.	• Blown No. 14 (7.5 A) fuse. (In the under-dash fuse/relay box) • Faulty main switch. • An open in the wire.
3	LT GRN/ BLK	RESUME button pushed.	Check for voltage to ground: There should be battery voltage.	• Blown No. 41 (15 A) fuse. (In the under-hood fuse/relay box) • Faulty SET/RESUME switch. • Faulty cable reel. • An open in the wire.
4	LT GRN/ RED	SET button pushed.		
5	PNK	M/T: Clutch pedal pushed. A/T: Shift lever in [2], [D3], or [D4].	Check for continuity to ground: There should be continuity. NOTE: There should be no continuity when the clutch pedal is released or when the A/T shift lever is in other positions.	• Faulty or misadjusted clutch switch (M/T). • Faulty or misadjusted A/T gear position switch. • Poor ground (G401, G402, G404). • An open in the wire.
6	BLU	Start the engine.	Check for voltage to ground: There should be battery voltage.	• Faulty ignition system or ECM. • An open in the wire.
7	ORG	Ignition switch ON and main switch ON. Raise the front of the car, rotate one wheel slowly.	Check for voltage between the ORN ⊕ and BLK ⊖ terminals: It should be 0—12—0—12 V repeatedly.	• Faulty vehicle speed sensor (VSS). • Poor ground (G101). • An open in the wire.
8	GRY	Ignition switch ON, main switch ON and brake pedal pushed, then released.	Check for voltage to ground: There should be 0 V with the pedal pushed, and battery voltage with the pedal released.	• Faulty brake switch. • An open in the wire.
9	GRN/WHT	Brake pedal pushed, then released.	Check for voltage to ground: There should be battery voltage with the pedal pushed, and 0 V with the pedal released.	• Faulty brake switch. • An open in the wire.
10	RED	Ignition switch ON.	Connect to ground: Cruise indicator in the gauge assembly comes on.	• Blown bulb. • Blown No. 13 (10 A) fuse. (In the under-dash fuse/relay box) • Faulty dimming circuit in the gauge assembly. • An open in the wire.
11	BRN/RED	Under all conditions.	Check for resistance to ground: There should be 80—120 Ω.	• Faulty actuator solenoid. • An open in the wire.
12	BRN/BLK	Under all conditions.	Check for resistance to ground: There should be 70—110 Ω.	
13	BRN/WHT	Under all conditions.	Check for resistance to ground: There should be 40—60 Ω.	

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Fig. 11: Cruise Control Unit Input Test
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

AIR BAG WARNING

WARNING: All models are equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system and follow all service procedures. See appropriate AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

CABLE REEL

For removal and installation procedure, See appropriate AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

SET/RESUME SWITCH

Removal & Installation

Carefully pry cover from side of SET/RESUME/CANCEL switch. Remove 2 screws attaching SET/RESUME/CANCEL switch to steering wheel. Remove SET/RESUME/CANCEL switch from steering wheel. To install, reverse removal procedure.

WIRING DIAGRAMS

See appropriate chassis wiring diagram in theWIRING DIAGRAMS section.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda On-Vehicle Adjustments

Accord, Civic, Civic Del Sol, Prelude

ENGINE MECHANICAL

Before performing any on-vehicle adjustments to fuel or ignition system, ensure engine mechanical condition is okay.

VALVE CLEARANCE

VALVE CLEARANCE ADJUSTMENT SPECIFICATIONS TABLE

Model	Intake In. (mm)	Exhaust In. (mm)
Accord	.009-.011 (.23-.28)	.011-.013 (.28-.32)
Civic & Civic Del Sol	.007-.009 (.17-.23)	.009-.011 (.23-.28)
Prelude		
2.2L Engine	.009-.011 (.23-.28)	.011-.013 (.28-.32)
2.3L Engine	.003-.004 (.07-.11)	.006-.007 (.15-.19)

DUAL OVERHEAD CAMSHAFTS (DOHC)

1) With engine cold, remove upper timing belt cover, valve cover, spark plugs and distributor cap. Adjustment of exhaust and intake valves are done at same time.

2) Rotate crankshaft to bring piston No. 1 to TDC on compression stroke. UP marks on camshaft pulleys should be at top and TDC grooves on camshaft pulleys should align with cylinder head surface. See Fig. 1. Distributor rotor should point to spark plug wire No. 1 on cap.

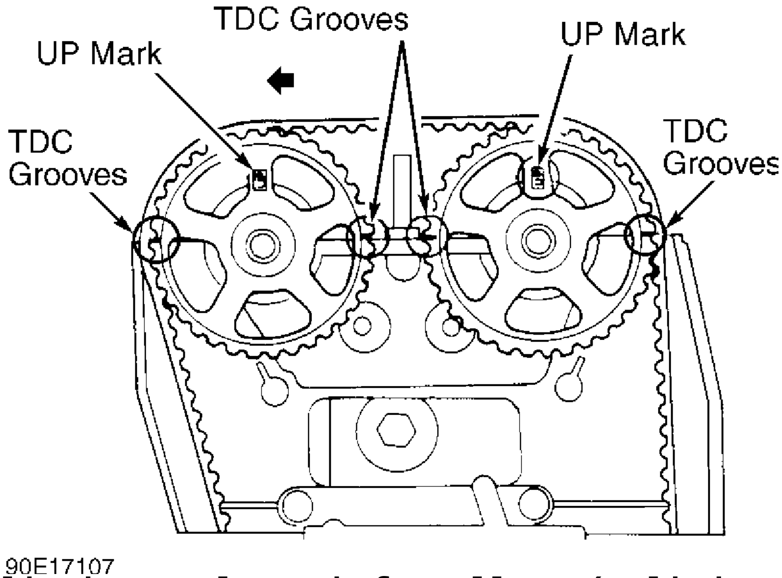

Fig. 1: Aligning Dual Camshaft Pulleys (Cylinder No. 1)
Courtesy of American Honda Motor Co., Inc.

3) Loosen lock nuts on valves for cylinder No. 1 and adjust valve clearances to specification. See Fig. 2. See VALVE CLEARANCE ADJUSTMENT SPECIFICATIONS table.

4) Tighten valve adjuster lock nuts to 20 ft. lbs. (27 N.m). Recheck valve clearance. Readjust valve clearance, if necessary.

5) Rotate crankshaft counterclockwise 180 degrees. Ensure cylinder No. 3 is at TDC. Adjust valves on cylinder No. 3. For remaining cylinders, repeat steps 3) - 5).

6) Replace valve cover and distributor cap. Tighten timing cover bolts and valve cover crown nuts to 7 INCH lbs. (10 N.m).

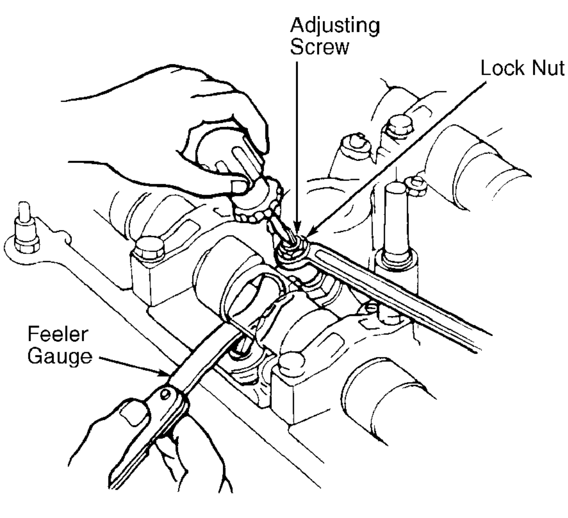

Fig. 2: Adjusting Valve Clearances (DOHC)
Courtesy of American Honda Motor Co., Inc.

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SINGLE OVERHEAD CAMSHAFT (SOHC)

1) With engine cold, remove timing belt upper cover, valve cover, spark plugs and distributor cap. Adjust exhaust and intake valves at the same time.

2) Rotate crankshaft to bring piston No. 1 to TDC on compression stroke. UP mark on camshaft pulley should be at top, and TDC grooves on camshaft pulley should align with cylinder head surface. See Fig. 3. Distributor rotor should point to spark plug wire No. 1 on distributor cap.

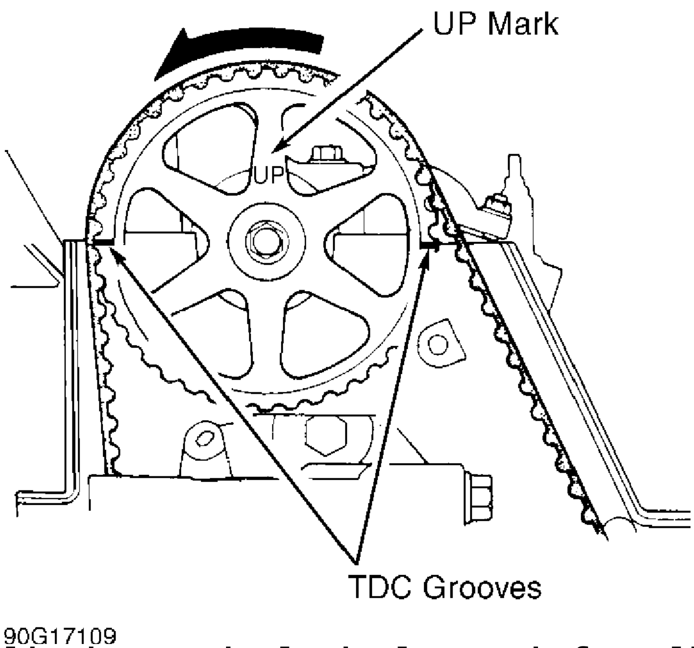

Fig. 3: Aligning Typical Single Camshaft Pulley (Cylinder No. 1)
Courtesy of American Honda Motor Co., Inc.

3) Loosen lock nuts on valves for cylinder No. 1, and adjust valve clearances to specification. See VALVE CLEARANCE ADJUSTMENT SPECIFICATIONS table. See Fig. 4.

4) Tighten valve adjuster lock nuts on Accord and Prelude to 14 ft. lbs. (20 N.m). Tighten valve adjuster lock nuts on Civic and Civic Del Sol with D15Z1 or D16Z6 engines to 14 ft. lbs. (20 N.m). On all other Civic and Civic Del Sol applications, tighten valve adjuster lock nuts to 10 ft. lbs. (14 N.m). Recheck valve clearance and repeat adjustment, if necessary.

5) Rotate crankshaft counterclockwise 180 degrees. Ensure cylinder No. 3 is at TDC. Adjust valves on cylinder No. 3. For remaining cylinders, repeat steps 3) through 5).

6) Replace valve cover and distributor cap. Tighten timing cover bolts and valve cover crown nuts to 7 INCH lbs. (10 N.m).

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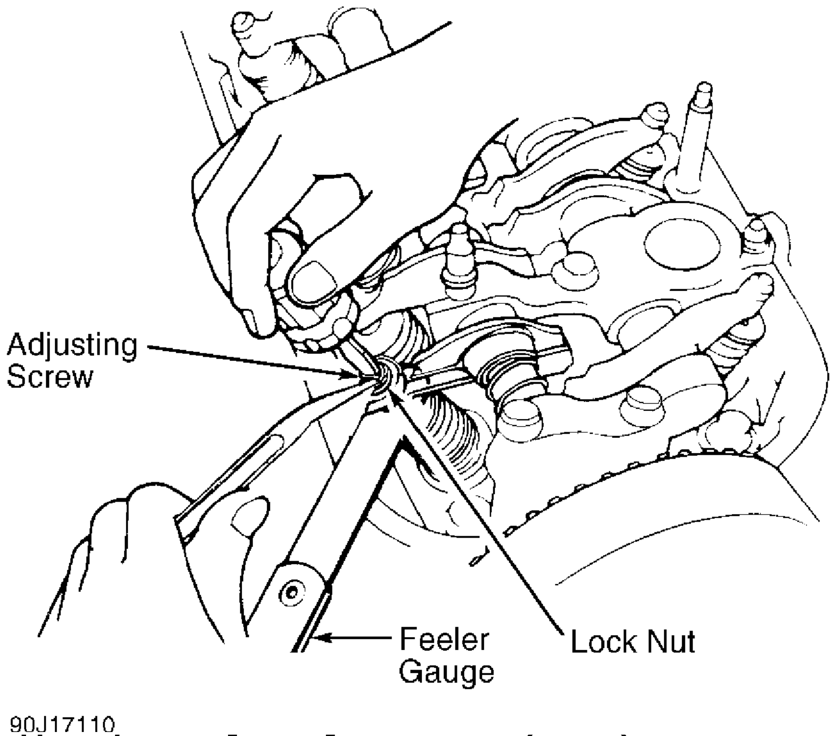

Fig. 4: Adjusting Valve Clearances (SOHC)
Courtesy of American Honda Motor Co., Inc.

IGNITION TIMING

Accord

1) Remove rubber cap from inspection window on bellhousing of cylinder block. Start and warm engine to normal operating temperature (cooling fan comes on). Connect a jumper wire between Orange/Red and Green/White wire terminals of ignition timing check connector located above passenger-side kick panel, under dash. SeeFig. 5.

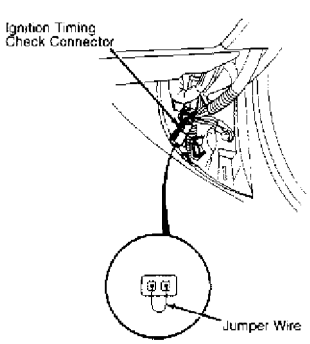

Fig. 5: Locating Ignition Timing Check Connector (Accord)
Courtesy of American Honda Motor Co., Inc.

2) Connect a timing light to spark plug wire No. 1. Check base ignition timing with timing light. See IGNITION TIMING table. TDC

mark (White) and timing mark (Red) are on flywheel (M/T) or drive plate (A/T). See Fig. 6.

3) Loosen hold-down bolts and rotate distributor to adjust timing. Tighten distributor hold-down bolts to 16 ft. lbs. (22 N.m). Recheck timing to ensure it hasn't changed.

4) Remove timing light. Remove jumper wire from ignition timing check connector. Install rubber cap to inspection window.

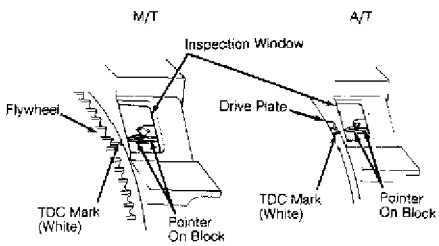

Fig. 6: Locating Ignition Timing Marks (Accord)
Courtesy of American Honda Motor Co., Inc.

IGNITION TIMING TABLE (Degrees BTDC @ RPM)

Application	Specification
Accord & Prelude	13-17 @ 700-800
Civic & Civic Del Sol	
1.5L Engine (D15B7)	
A/T	16 @ 700
M/T	16 @ 650
1.5L Engine (D15B8)	12 @ 650
1.5L Engine (D15Z1)	16 @ 600
1.6L Engine (D16Z6)	
A/T	16 @ 700
M/T	16 @ 650

Civic, Civic Del Sol & Prelude

1) To view timing marks on Prelude, remove rubber cap from inspection window on cylinder block by bellhousing. On Civic and Civic Del Sol, timing marks are on timing belt cover and crankshaft pulley. On all models, start and warm engine to normal operating temperature (cooling fan comes on). Connect timing light.

2) Ignition timing check connector is located behind passenger-side kick panel (Civic and Civic Del Sol) or under center of dash (Prelude). See Fig. 7 or 8. Connect jumper wire between Brown and Green/White wire terminals (Civic and Civic Del Sol) or Blue/White and Brown/White wire terminals (Prelude).

3) Check ignition timing and adjust to specification, if necessary. See IGNITION TIMING table. To adjust, loosen distributor hold-down bolts and turn distributor housing counterclockwise to

advance or clockwise to retard timing. Align pointer with Red timing mark.

4) Tighten distributor hold-down bolts to 16 ft. lbs. (22 N. m). Recheck timing. Remove jumper wire from ignition timing check connector. Reinstall cap into inspection window on Prelude.

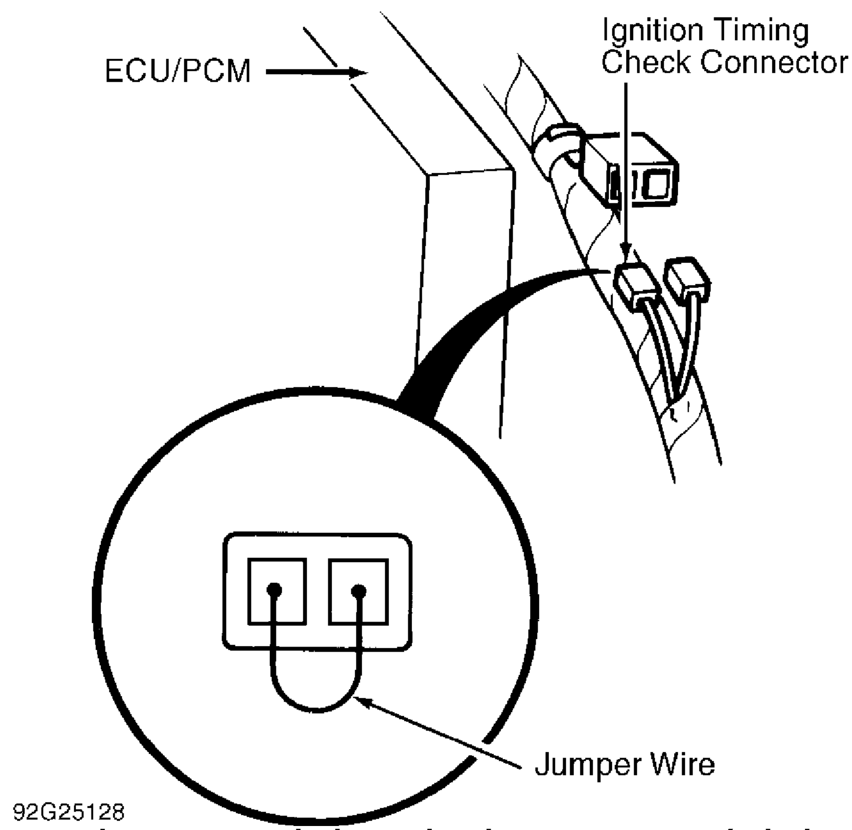

Fig. 7: Locating Ign. Timing Check Connector (Civic & Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

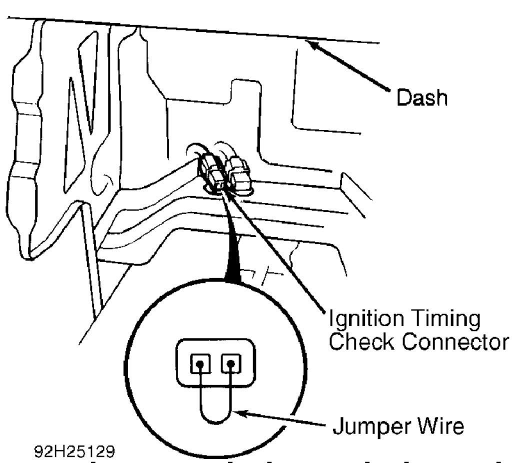

Fig. 8: Locating Ignition Timing Check Connector (Prelude)
Courtesy of American Honda Motor Co., Inc.

IDLE SPEED & MIXTURE

IDLE MIXTURE

NOTE: Idle mixture is computer-controlled and is not adjustable. Maximum CO level is .1%.

IDLE SPEED

1) Start and warm engine to normal operating temperature (cooling fan comes on). Connect tachometer. Disconnect 2-wire Idle Air Control (IAC) valve connector. Ensure all accessories and cooling fan are off.

2) Check idle speed (before ECM is reset). If necessary, adjust idle speed by turning idle adjusting screw. SeeFig. 9. See IDLE SPEED SPECIFICATIONS table.

3) Turn ignition off. Reconnect 2-wire IAC connector. Remove BACK-UP fuse (Accord, Civic and Civic Del Sol) or CLOCK RADIO fuse (Prelude) from underhood relay box for 10 seconds to reset ECM. Restart engine.

4) On Civic, Civic Del Sol and Prelude, check idle speed (after ECM reset) with all accessories off and transmission in Neutral or Park. On Accord, check idle speed (after ECM reset) with transmission in gear.

5) On all models, idle engine for one minute with various accessories on, and check idle speed. Idle speed should be stable and within specification. See IDLE SPEED SPECIFICATIONS table. If idle is not within specification, check vacuum hose connections. Check idle adjuster screw, fast idle valve and Idle Air Control (IAC) valve for proper operation.

6) If idle components are okay, check MAP sensor, Electronic Load Detector (ELD), fuel injector circuit, A/C signal circuit, EGR system and lock-up control solenoid (if equipped) for proper operation. For component testing procedures, see G - TESTS W/ CODES and I - SYS/COMP TESTS articles in the ENGINE PERFORMANCE Section.

On Civic VX there has been a revision as per TSB Number HSN-0894-02 dated August 1994. Idle engine for one minute with headlights (low) ON, and check idle speed.

IDLE SPEED SPECIFICATIONS TABLE

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Application	RPM
Accord & Prelude	
Before ECM Reset (1)	500-600
After ECM Reset (2)	
No Load	650-750

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Under Load	720-820
Civic & Civic Del Sol	
Before ECM Reset (1)	370-470
After ECM Reset (2)	
No Load	
A/T	650-750
M/T	
Except D15Z1 M/T	620-720
D15Z1 M/T	550-650
Under Load	
Except D15Z1 M/T	700-800
D15Z1 M/T	650-750

(1) - With Idle Air Control (IAC) valve disconnected, headlights and cooling fan off and transmission in Neutral or Park.
(2) - See IDLE SPEED under IDLE SPEED & MIXTURE.
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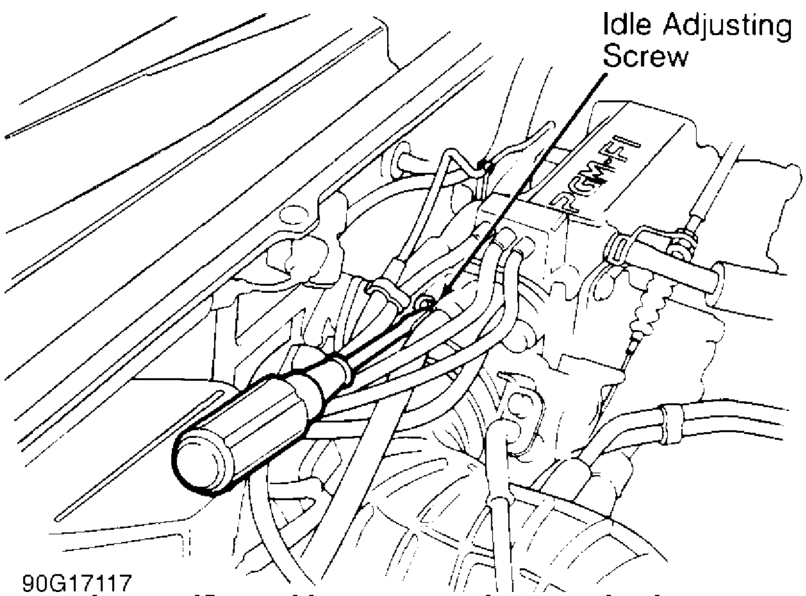

Fig. 9: Locating Idle Adj. Screw (Accord Shown; Other Models Similar)
Courtesy of American Honda Motor Co., Inc.

THROTTLE ANGLE (POSITION) SENSOR

NOTE: For testing procedures, refer to G - TESTS W/ CODES or I - SYS/COMP TESTS article in the ENGINE PERFORMANCE Section. See THROTTLE ANGLE (POSITION) SENSOR SPECIFICATIONS table.

THROTTLE ANGLE (POSITION) SENSOR SPECIFICATIONS TABLE
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Condition	Volts

```
Throttle Valve
 Fully Closed  ....................................  .5
 Wide Open  ....................................  4.5
```
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END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Rear Window Defoggers

Prelude

DESCRIPTION & OPERATION

Rear window defogger system uses a heating grid wire bonded to inside of window. Heat is regulated by a dash-mounted control switch with indicator light, relay and Integrated Control Unit (ICU). Power is supplied to control switch through a fuse in fuse/relay box. ICU will supply power to grid for 25 minutes, or until ignition is turned off.

TROUBLE SHOOTING

NOTE: When diagnosing vehicle by symptom, check for possible failures in the following order. When component tests are indicated, see appropriate procedure under TESTING.

DEFOGGER INOPERATIVE

Check for blown fuse No. 13 (10-amp) in dash fuse/relay box (located at left side kick panel). Check defogger timer circuit input (in ICU). Check for poor ground connections. Check for short or open in Black/Yellow wire.

INDICATOR LIGHT INOPERATIVE (DEFOGGER OPERATES)

Check for burned-out bulb. Check for short or open in Black/Yellow or Black wires.

INDICATOR LIGHT OPERATES (DEFOGGER INOPERATIVE)

Check for blown fuse No. 23 (30-amp) in underhood fuse/relay box. Perform defogger grid and defogger relay tests. Check for poor ground connections. Check for short or open in Yellow/Black, Yellow/Green or Black/Green wires.

OPERATION TIME TOO LONG OR TOO SHORT

Check defogger timer circuit input (in ICU). Check for open or disconnected terminal in Yellow/White wire.

TESTING

DEFOGGER SWITCH TEST

Remove heater control panel. With defogger switch in ON position, use an analog ohmmeter to check continuity between switch terminals No. 11 (Black wire) and No. 14 (Yellow/White wire). See Fig. 1. Continuity should exist. With switch in any position, check continuity between terminals No. 12 (Yellow/Green wire) and No. 16 (Black/Yellow wire). Continuity should exist. If continuity does not exist in either circuit, replace defogger switch.

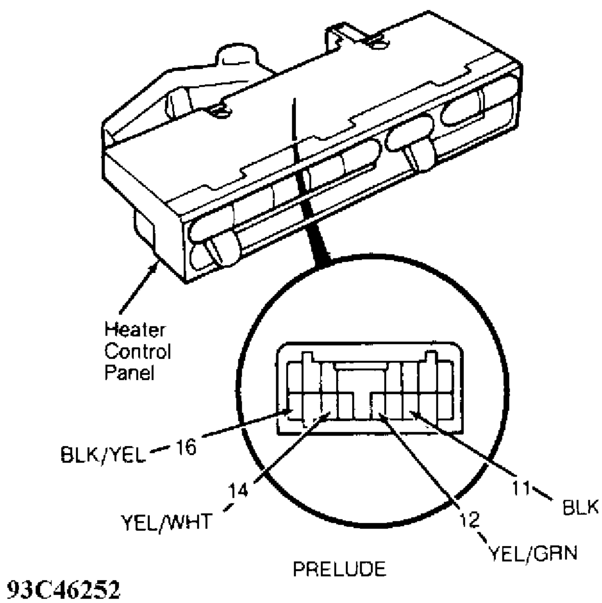

Fig. 1: Testing Defogger Switch
Courtesy of American Honda Motor Co., Inc.

DEFOGGER RELAY TEST

Remove defogger relay. Relay is located in underdash fuse/relay box at left side kick panel. Apply battery voltage to terminal "C", and ground terminal "D". SeeFig. 2. Use an ohmmeter to ensure continuity exists between terminals "A" and "B". Ensure continuity does not exist between terminals "A" and "B" when battery voltage is removed.

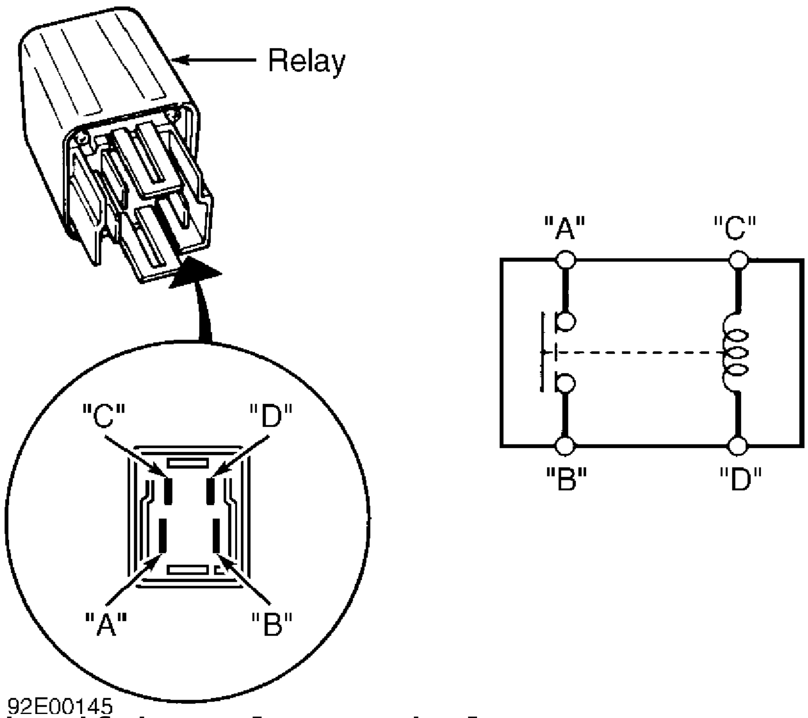

Fig. 2: Identifying Relay Terminals
Courtesy of American Honda Motor Co., Inc.

GRID FILAMENT TEST

1) Turn ignition and rear window defogger on. Using a voltmeter, check for voltage between defogger positive wire terminal and body ground. See Fig. 3. If voltage is present, go to next step. If voltage is not present, check for faulty defogger relay. Check for open in Black/Green defogger relay wire.

2) If voltage is present, use an ohmmeter to check for continuity between defogger negative wire terminal and body ground. If continuity does not exist, check for open in defogger ground wire. Connect voltmeter negative probe to defogger negative wire terminal. Connect voltmeter positive probe to center of each defogger grid wire.

3) If voltage is approximately 6 volts, defogger grid wire is okay. If voltage is greater than 6 volts, an open exists between center of defogger grid wire and negative side of center. If voltage is not present, an open exists between defogger grid wire and positive side of center. To locate break, move probe along grid wire until meter needle moves abruptly. See Fig. 3.

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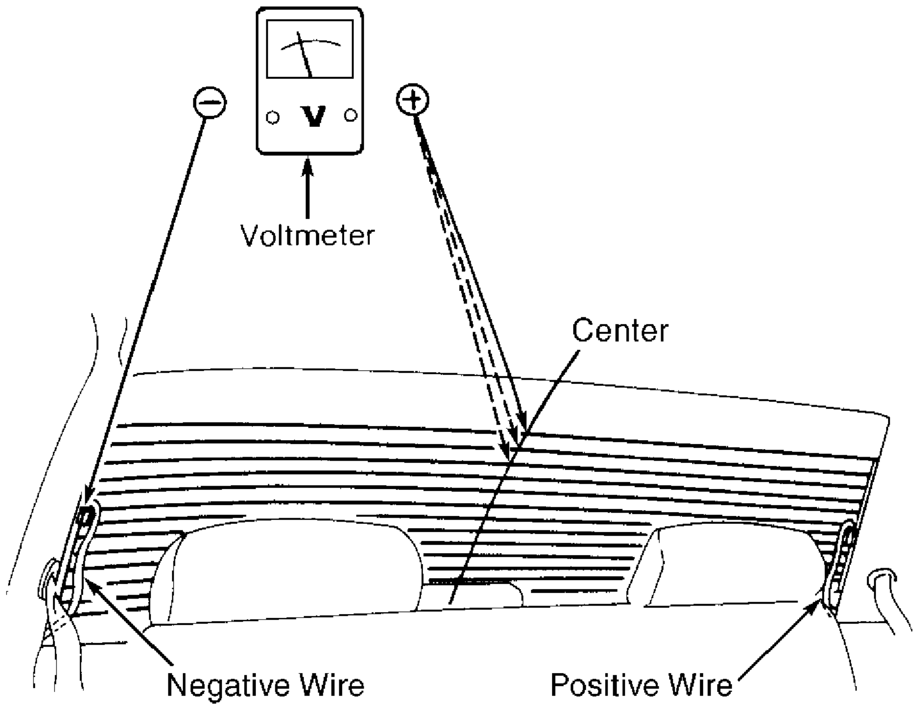

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Fig. 3: Testing For Broken Defogger Grid Wires
Courtesy of American Honda Motor Co., Inc.

ON-VEHICLE SERVICE

GRID FILAMENT REPAIR

Clean broken wire tips thoroughly. Place masking tape along both sides of broken wire. See Fig. 4. Apply Repair Paste (Dupont 4817) to broken section of grid. Remove masking tape after paste has dried. Wait 24 hours before using defogger.

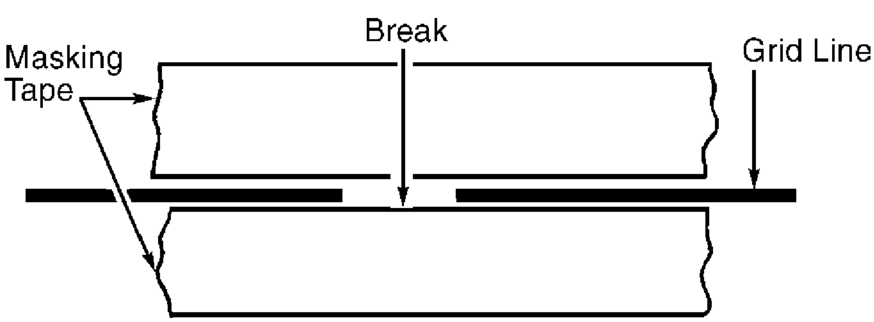

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Fig. 4: Repairing Rear Defogger Grid Filament

WIRING DIAGRAMS

See appropriate chassis wiring diagram in the WIRING DIAGRAMS

section.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Power Door Locks

Prelude

* PLEASE READ THIS FIRST *

WARNING: All models are equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel, and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system. See **AIR BAG RESTRAINT SYSTEM** article in the **ACCESSORIES/SAFETY EQUIPMENT** section.

DESCRIPTION & OPERATION

Power door locks are controlled by driver or front passenger switches which send signals to a control unit. The control unit sends appropriate signals to individual door lock actuators.

TROUBLE SHOOTING

NOTE: Ensure all component terminals and ground connections are clean and tight. Check possible faults in order listed. Repair or replace components and circuits as necessary.

NOTE: Some wires have been assigned a superscript to distinguish them from other wires of the same color. For example, the Yellow/Green(1) wire is not the same as the Yellow/Green(2) wire.

System Does Not Work At All
Blown fuse No. 44 in underhood fuse/relay box. Faulty control unit inputs. Open in White/Green wire.

No Doors Lock Using Driver's Door Lock Switch (Both Doors)
Faulty driver's door lock switch. Faulty control unit inputs. Open in Green/Red(1) or Green/White wire.

No Doors Lock Using Driver's Door Lock Switch (One Door)
Disconnected or obstructed door lock linkage. Faulty driver's or passenger's door lock actuator. Faulty control unit inputs. Open in

Yellow/Red or White/Red wire.

No Doors Lock Using Passenger's Door Lock Switch (Both Doors)
Faulty passenger's door lock switch. Faulty control unit inputs. Open in Black/White or Black/Red wire.

No Doors Lock Using Passenger's Door Lock Switch (One Door)
Disconnected or obstructed door lock linkage. Faulty driver's or passenger's door lock actuator. Faulty control unit inputs. Open in Yellow/Red or White/Red wire.

No Doors Lock Using Driver's Door Lock Knob; Ignition Key Out; Doors Closed (Both Doors)
Faulty driver's lock knob switch. Faulty control unit inputs. Open in Blue/Red or Blue/White(1) wire.

No Doors Lock Using Driver's Door Lock Knob; Ignition Key Out; Doors Closed (One Door)
Disconnected or obstructed door lock linkage. Faulty driver's or passenger's door lock actuator. Faulty control unit inputs. Open in Yellow/Red or White/Red wire.

No Doors Lock Using Passenger's Door Key Cylinder Switch (Both Doors)
Faulty passenger's door key cylinder. Faulty control unit inputs. Open in Black/White or Black/Red wire.

No Doors Lock Using Passenger's Door Key Cylinder Switch (One Door)
Disconnected or obstructed door lock linkage. Faulty driver's or passenger's door lock actuator. Faulty control unit inputs. Open in Yellow/Red or White/Red wire.

Doors Lock With Key In Ignition; Driver's Door Open
Faulty ignition key switch. Faulty driver's door switch. Faulty passenger's door switch. Faulty control unit inputs. Open in Blue/White(2), Green/Red(2) or Green/Blue wire.

TESTING

* PLEASE READ THIS FIRST *

WARNING: All models are equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel, and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system. See **AIR BAG RESTRAINT SYSTEM** article in the **ACCESSORIES/SAFETY EQUIPMENT** section.

ACTUATOR TEST

CAUTION: To prevent damage to the actuator motor, apply power and ground only momentarily.

1) Remove door panel. Unplug connector. Using fused jumper wire, connect battery voltage to actuator connector terminal No. 4. Momentarily connect terminal No. 5 to ground. Actuator should move to lock position. See Fig. 1. Check continuity between connector terminals No. 3 and 6. Continuity should exist.

2) Connect battery voltage to actuator connector terminal No. 5. Momentarily connect terminal No. 4 to ground. Actuator should move to unlock position. Check continuity between connector terminals No. 1 and 3. Continuity should exist. Replace actuator if operation or continuity is not as specified.

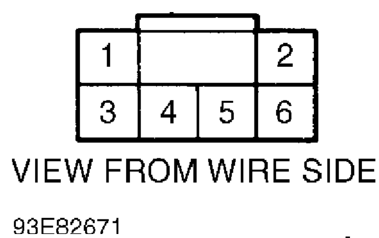
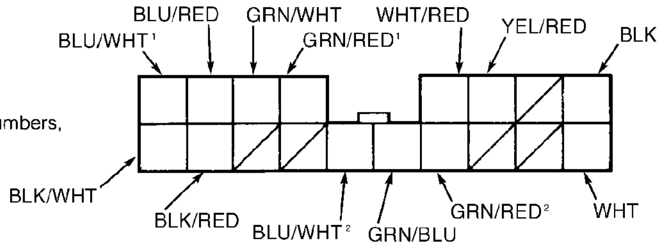


Fig. 1: Door Actuator Terminal ID
Courtesy of American Honda Motor Co., Inc.

CONTROL UNIT INPUTS

Remove left door panel. Using a DVOM, perform power door lock unit input tests. See Fig. 2. If all input test results are okay, inspect connector and terminals for damage and proper fit. If connector is okay and power door lock still malfunctions, replace power door lock control unit.

NOTE: Numbers 1 through 9 refer to test numbers, not terminal numbers.



VIEW FROM WIRE SIDE

Disconnect 18-pin connector to control unit.

No.	Wire	Test condition	Test: Desired result	Possible cause if result is not obtained
1	BLK	Under all conditions.	Check for continuity to ground: There should be continuity.	• Poor ground (G401, G402, G404). • An open in the wire.
2	WHT/RED and YEL/RED	Connect the YEL/RED terminal to the WHT terminal, and the WHT/RED terminal to the BLK terminal momentarily.	Check door lock operation: All doors should unlock.	• Fauly actuator. • An open in the wire.
		Connect the WHT/RED terminal to the WHT terminal, and the YEL/RED terminal to the BLK terminal momentarily.	Check door lock operation: All doors should lock.	

Reconnect 18-pin connector to control unit.

No.	Wire	Test condition	Test: Desired result	Possible cause if result is not obtained
3	WHT	Under all conditions.	Check for voltage to ground: There should be battery voltage.	• Blown No. 44 (15 A) fuse. (In the underhood fuse/relay box) • An open in the wire.
4	GRN/WHT	Driver's door lock switch in LOCK.	Check for voltage to ground: There should be 1 V or less.	• Faulty driver's door lock switch. • Poor ground (G401, G402, G404). • An open in the wire.
	GRN/RED¹	Driver's door lock switch in UNLOCK.		
5	BLK/RED	Passenger's door lock switch in LOCK.	Check for voltage to ground: There should be 1 V or less.	• Faulty passenger's door lock switch. • Poor ground (G401, G402, G404). • An open in the wire.
	BLK/WHT	Passenger's door lock switch in UNLOCK.		
6	BLU/WHT¹	Driver's door lock knob in LOCK.	Check for voltage to ground: There should be 1 V or less.	• Faulty driver's door lock actuator. • Poor ground (G401, G402, G404). • An open in the wire.
	BLU/RED	Driver's door lock knob in UNLOCK.		
7	GRN/BLU	Driver's door open.	Check for voltage to ground: There should be 1 V or less. NOTE: Before testing, remove No. 46 (15 A) fuse in the under-hood fuse/relay box.	• Faulty door switch. • Poor ground. • An open in the wire.
	GRN/RED²	Passenger's door open.		
8	BLU/WHT²	Ignition key is in the ignition switch.	Check for voltage to ground: There should be 1 V or less.	• Faulty ignition key switch. • Poor ground (G401, G402, G404). • An open in the wire.
9	BLK/RED	Passenger's door key cylinder in LOCK.	Check for voltage to ground: There should be 1 V or less as the switch is turned.	• Faulty passenger's door cylinder. • Poor ground (G401, G402, G404). • An open in the wire.
	BLK/WHT	Passenger's door key cylinder in UNLOCK.		

DOOR LOCK

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CAUTION: To prevent damage to the actuator, connect power and ground only momentarily.

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Courtesy of American Honda Motor Co., Inc.

Fig. 2: Power Door Locks Control Unit Input Test
Courtesy of American Honda Motor Co., Inc.

DOOR KEY SWITCH

1) Remove door panel. Unplug 6-pin connector from actuator. Set switch to lock position. Check continuity between terminals No. 1 and 3. Continuity should not exist. Check continuity between terminals No. 3 and 6. Continuity should exist. See Fig. 1.

2) Set switch to unlock position. Check continuity between terminals No. 1 and 3. Continuity should exist. Check continuity between terminals No. 3 and 6. Continuity should not exist.

DOOR LOCK SWITCHES

1) Remove door handle panel. Unplug 3-pin connector. Set switch to unlock position. Check continuity between terminals "A" and "B". Continuity should not exist. Check continuity between terminals "B" and "C. Continuity should exist. See Fig. 3.

2) Set switch to off position. Check continuity between terminals "A" and "B". Continuity should not exist. Check continuity between terminals "B" and "C". Continuity should not exist.

3) Set switch to lock position. Check continuity between terminals "A" and "B". Continuity should exist. Check continuity between terminals "B" and "C". Continuity should not exist. Replace switch if continuity is not as specified.

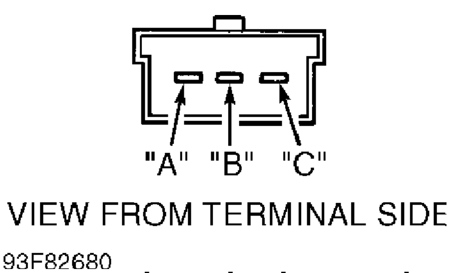

Fig. 3: Door Lock Switch Terminal ID
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

COMPUTER RELEARN CAUTION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in the **GENERAL INFORMATION** section before disconnecting battery.

ACTUATORS

Removal & Installation

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Remove door panel from door or tailgate. Remove plastic cover. Remove rear channel if necessary. Disconnect linkage. Unplug connector. Remove mounting screws and actuator. To install, reverse removal procedure.

CONTROL UNIT

Removal & Installation

Power door lock control unit is located behind left front door panel. Turn ignition off. Remove door panel. Unplug connector. Remove mounting screws and control unit. To install, reverse removal procedure.

DOOR LOCK SWITCHES

Removal & Installation

Remove trim plate. Unplug connector. Remove switch from trim plate. To install, reverse removal procedure.

WIRING DIAGRAMS

For circuit information, see appropriate wiring diagram in the WIRING DIAGRAMS section.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE COOLING
Honda Motors Drive Belt Adjustment Specifications

Honda; Prelude

NOTE: For water pump removal procedure, see2.2L 4-CYL & 2.3L 4-CYL article in ENGINES.

BELT ADJUSTMENT SPECIFICATIONS

BELT ADJUSTMENT TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	(1) Deflection In. (mm)
A/C Compressor	
New	13/32-31/64 (10.0-12.0)
Used	3/16-9/32 (4.5-7.0)
Alternator	
New	
With A/C	7/32-19/64 (5.5-7.5)
Without A/C	5/16-31/64 (8.0-10.0)
Used	
With A/C	13/32-31/64 (10.0-12.0)
Without A/C	25/64-1/2 (10.5-12.5)
Power Steering	
New	3/8-29/64 (9.5-11.5)
Used	17/32-21/32 (13.5-16.5)

(1) - Deflection is with 22 lbs. (10 kg) pressure applied midway on longest belt run.

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Theory & Operation

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

This article covers basic description and operation of engine performance-related systems and components. Read this article before diagnosing vehicles or systems with which you are not completely familiar.

AIR INDUCTION SYSTEM

Air Intake System

System consists of an air cleaner, air intake pipe, throttle body, Idle Air Control (IAC) valve, fast idle mechanism and intake manifold. On Accord with 2.2L (F22A6) engine and Prelude except 2.2L (F22A1) engine, a by-pass control system is used. A resonator chamber in the air intake pipe reduces noise as air is drawn into system.

By-Pass Control System

By-pass control system consists of 2 separate intake paths in intake manifold, a by-pass valve, a by-pass control diaphragm and a normally open by-pass control solenoid valve. ECM selects air intake path(s) most favorable for engine performance by operating by-pass valves to direct airflow through one or both intake paths. On Accord, the longer, smaller intake path is used for operation when engine speed is less than 4700 RPM. On Prelude, the longer, smaller intake path is used for operation when engine speed is less than 4600 RPM on 2.2L (H22A1) engine and 4800 RPM on 2.3L engine. The shorter, larger intake path is opened in addition to the smaller path for better performance at high RPM.

Intake Control System

The intake control system consists of an intake control diaphragm and an intake control solenoid valve. When engine speed drops to less than 3500-4000 RPM and engine air requirements drop, the ECM activates the intake control solenoid valve. This supplies intake manifold vacuum to intake control diaphragm. Intake control diaphragm closes off one of the 2 air intakes and, along with resonator chamber, reduces intake air noise.

Throttle Body

Throttle body is a single-barrel sidedraft type. Lower

portion of throttle valve is heated by engine coolant from cylinder head. Idle adjusting screw (to increase and decrease by-pass air) and canister/purge port are both located on top of throttle body.

VARIABLE VALVE TIMING

VARIABLE VALVE TIMING & LIFT ELECTRONIC CONTROL SYSTEM (VTEC)

Civic 1.5L (D15Z1)

Engine is equipped with 4 valves per cylinder. At low engine speeds, the primary intake valve operates with normal lift characteristics and secondary intake valve lifts slightly to prevent fuel accumulation in intake port.

When engine speed exceeds 2500 RPM and other conditions are met (determined by ECM), oil pressure is applied through a spool valve to timing and synchronizing pistons located in valve rocker arms. Synchronizing piston locks primary and secondary rocker arms together. In this way both valves operate at the higher lift and duration of the primary cam and valve. This system of locking rocker arms together is designated VTEC-E.

Civic & Civic Del Sol 1.6L (D16Z6)

VTEC system used on the 1.6L engine differs from the VTEC-E system used on the 1.5L engine. This system utilizes 3 different intake cam lobes and rocker arms. At low speed, the primary and secondary intake valves are operated by their own separate cam lobes. The connecting (middle) rocker is being operated by the high speed cam lobe at all times. At low speed the connecting rocker arm is not connected to either primary or secondary rocker arms or valves and has no effect on engine operation.

When engine speed exceeds 4800 RPM and other conditions are met (as determined by ECM), oil pressure is applied (through spool valve) to synchronizer pistons located in primary and connecting rocker arms. This locks primary, connecting (middle) and secondary rocker arms together so they are driven as a single unit by the higher lift and duration cam that operates the connecting (middle) rocker arm.

Prelude 2.2L (H22A1)

VTEC system used on the 2.2L (DOHC) engine functions in the same manner as the system on 1.6L engine in Civic and Civic Del Sol. Valve function changeover is accomplished when engine speed exceeds 4900 RPM and other conditions are met (as determined by ECM).

COMPUTERIZED ENGINE CONTROLS

ENGINE CONTROL MODULE (ECM)

Computerized engine controls are used to control fuel, ignition and emission control systems. Engine Control Module (ECM) receives input signals from various sensors and components. ECM then compares each signal with a preprogrammed parameter in its memory. Based on this comparison, output signals are then adjusted to allow vehicle to perform optimally under all operating conditions. ECM is located under passenger-side carpet on Accord and Prelude. On Civic and Civic Del Sol, ECM is located behind passenger-side kick panel.

NOTE: Components are grouped into 2 categories. First category covers INPUT DEVICES, which control or produce voltage signals monitored by ECM. Second category is OUTPUT SIGNALS, which are components controlled by ECM.

INPUT DEVICES

Vehicles are equipped with different combinations of input devices. Not all devices are used on all models. To determine component usage of a specific model, see appropriate wiring diagram in L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section. Available input signals include the following:

A/C Switch Signal

This switch signals ECM of demand for air conditioning. ECM then increases engine RPM to compensate for additional engine load.

Alternator (FR) Signal

This signals ECM when alternator field circuit is energized. ECM compensates for changes in idle speed and low battery voltage which can cause erratic injector pulse width.

Atmospheric Pressure (PA) Sensor

PA sensor converts atmospheric pressure into electrical signals and relays information to ECM.

Automatic Transmission Shift Position Signal

This signals ECM when transmission selector lever is in Park, Neutral or D4 position.

Battery Voltage (IGN.1)

This provides ECM with a battery voltage signal from ignition circuit when ignition is on.

Brake Switch Signal

This signals ECM when brake pedal is depressed.

Electric Load Detector (ELD)

This signals ECM when an electrical load (headlights, radio, etc.) exists so ECM can compensate for additional engine load.

Engine Coolant Temperature (ECT) Sensor

Coolant temperature sensor is a temperature-dependent variable resistor (thermistor). Resistance of thermistor decreases as coolant temperature increases.

Exhaust Gas Recirculation Valve Lift Sensor

EGR valve lift sensor detects amount of EGR valve lift and sends information to ECM. ECM uses this information, along with other sensor inputs, to determine regulation of EGR control solenoid valve.

Intake Air Temperature (IAT) Sensor

Intake air temperature sensor is a temperature-dependent variable resistor (thermistor). Thermistor resistance decreases as intake air temperature increases.

Knock Sensor (Prelude)

Sensor is located on engine block near oil filter. Sensor signals ECM when a knock condition exists. ECM adjusts timing to compensate.

Manifold Absolute Pressure (MAP) Sensor

MAP sensor converts manifold absolute pressure into electrical signals and sends signals to ECM. MAP sensor signals are a measurement of engine load.

Manual Transmission Clutch Switch (Civic)

Switch is mounted above clutch pedal. Switch signals ECM when clutch is engaged to provide for idle speed adjustment.

Oxygen (O2) Sensor

Oxygen sensor detects oxygen content of exhaust gases and sends signal to ECM, which varies air/fuel ratio to maintain a 14.7:1 ratio under most conditions. This ratio is most efficient for combustion and catalytic converter operation.

All models, except Civic with D15Z1 engine, use heated oxygen sensors. Civic with D15Z1 engine uses a heated linear air/fuel ratio type oxygen sensor which performs the same function as standard oxygen sensor, but over a wider range.

Power Steering Pressure Switch

This switch signals ECM when power steering load is high. ECM then compensates for load by increasing engine RPM.

Starter Signal

Signals ECM when engine is cranking.

TDC/CKP/CYP Sensor

TDC/CKP/CYP sensor is a combination sensor located inside distributor. Each sensor generates a separate signal. CKP sensor detects engine RPM to determine fuel injection timing and ignition of each cylinder. TDC sensor determines ignition timing at start-up (cranking) and detects when crank angle signal is abnormal. CYP sensor detects position of cylinder No. 1 for sequential fuel injection to each cylinder.

Throttle Position (TP) Sensor

Throttle position sensor is a 3-wire potentiometer connected to throttle shaft. As throttle position changes, throttle position sensor varies voltage signal monitored by ECM. Sensor voltage ranges from about one volt at closed throttle to about 5 volts at wide open throttle.

Valve Timing Oil Pressure Switch

Located on Variable Valve Timing Electronic Control (VTEC) spool valve, switch signals ECM when VTEC system is operating. Switch will set a code in case of failure in circuit.

Vehicle Speed Sensor/Pulser (VSS)

Vehicle speed signal is generated by speed sensor (sometimes called a speed pulser), which produces 4 pulses (switch closures to ground) per speedometer cable revolution.

OUTPUT SIGNALS

NOTE: Vehicles are equipped with different combinations of computer-controlled components. Not all components listed below are used on every vehicle. For theory and operation on each output component, refer to system indicated after component.

A/C Clutch Engagement Delay

See IDLE SPEED under FUEL SYSTEM.

Alternator

See CHARGING SYSTEM under MISCELLANEOUS CONTROLS.

By-Pass Control Solenoid Valve

See AIR INDUCTION SYSTEM.

CHECK ENGINE Light

See SELF-DIAGNOSTIC SYSTEM.

Cooling Fan Timer Unit

See COOLING SYSTEM under MISCELLANEOUS CONTROLS.

EGR Control Solenoid Valve

See EXHAUST GAS RECIRCULATION (EGR) SYSTEM under EMISSION SYSTEMS.

Fuel Injector

See FUEL CONTROL under FUEL SYSTEM.

Ignitor Unit

See IGNITION SYSTEM.

Intake Air Control Valve

See IDLE SPEED under FUEL SYSTEM.

Intake Control Solenoid Valve

See AIR INDUCTION SYSTEM.

Main Relay

See FUEL DELIVERY under FUEL SYSTEM.

Oxygen Sensor Heater

See FUEL CONTROL under FUEL SYSTEM.

Purge Control Cut-Off Solenoid Valve

See EVAPORATIVE EMISSION SYSTEM (EVAP) under EMISSION SYSTEMS.

Spool Solenoid Valve

See VARIABLE VALVE TIMING.

FUEL SYSTEM

FUEL DELIVERY

Fuel Injection

Fuel system consists of an in-tank high pressure electric fuel pump, main relay, fuel filter, pressure regulator, injectors and injector resistor(s). This system delivers pressure-regulated fuel to injectors and cuts fuel delivery when engine is not running.

Fuel Pump

Fuel pump consists of a DC motor, a circumference flow pump assembly, an internal relief valve for protecting fuel line system, an internal check valve for retaining residual pressure, an inlet port and discharge port. Pump assembly consists of impeller (driven by motor), pump casing (which forms pumping chamber) and pump cover.

Fuel Pressure Regulator

Fuel pressure regulator maintains proper fuel pressure to injectors. Regulator uses manifold vacuum to sense engine load and modifies fuel pressure to maintain driveability.

When manifold vacuum is high, vacuum diaphragm is drawn back, overcoming spring pressure. Excess fuel passes through pressure regulator and is returned to tank via fuel return line. When manifold vacuum decreases (engine load increases), spring pressure closes off return passage, thereby maintaining fuel pressure and volume.

Injector Resistor(s)

Injector resistor(s) lowers current supplied to injectors to prevent damage to injector coils, allowing injectors a faster response time.

Main Relay

Main relay contains 2 individual relays. One relay is energized whenever ignition is on. It supplies battery voltage to ECM, power to injectors and power for second relay. Second relay supplies power to fuel pump. Second relay is energized for 2 seconds when ignition switch is initially turned on and when engine is running.

FUEL CONTROL

Programmed Fuel Injection

Programmed fuel injection system is controlled by Powertrain Control Module (ECM). See POWERTRAIN CONTROL MODULE (ECM) in COMPUTERIZED ENGINE CONTROLS. The basic fuel injector duration is built into ECM memory. The ECM modifies basic injector duration according to input signals from various sensors to obtain final injector duration for fuel delivery.

Fuel Injector

Fuel injector consists of a solenoid, plunger needle valve and housing. When current is applied to solenoid coil, valve lifts and pressurized fuel is injected close to intake valve. Since needle valve lift and fuel pressure are constant, air/fuel ratio is determined by time valve is open (duration of current supplied to solenoid coil).

Injector is sealed by an "O" ring and seal ring at top and bottom. All seals, "O" rings and rubber mounts reduce injector operating noise and heat transfer.

Oxygen Sensor Heater

The oxygen sensor detects the oxygen content in exhaust gas and signals the ECM. ECM bases fuel injection duration on these signals. An internal heater, activated by the ECM, stabilizes sensor output for more accurate readings.

IDLE SPEED

A/C Clutch Engagement Delay

When ECM receives a demand for cooling from air conditioning system (A/C switch), it delays A/C clutch relay activation for a short time. This prevents compressor clutch from being energized until ECM enriches the fuel injection mixture, ensuring smooth transition into A/C mode without overloading engine.

Idle Air Control (IAC) Valve

Engine idle speed is controlled by IAC and fast idle valve. IAC varies amount of air by-passing throttle plate (into intake manifold) in response to signals from ECM. After engine starts, IAC opens for a short time to increase idle speed. Activation time is dependent upon engine coolant temperature. When coolant temperature is low, IAC is held open to obtain proper fast idle speed. After engine reaches normal operating temperature, IAC is activated only to maintain minimum idle speed.

Fast Idle Valve

Fast idle valve allows additional air to by-pass throttle plate into intake manifold. Increased idle speed prevents engine from running erratically during warm-up. Valve is controlled by a thermowax plunger, which contracts when cold and expands when hot.

IGNITION SYSTEM

IGNITION TIMING CONTROL

ECM has complete control of ignition timing. Timing is controlled in response to signals from various sensors. Input signals from TDC, CRANK and CYL, throttle angle, coolant temperature, and MAP sensors are all used by ECM to determine optimum ignition timing control.

Battery voltage is supplied through ignition switch to ignition coil and ignitor unit. ECM triggers ignitor unit based upon signals from TDC, CRANK and/or CYL and other sensors. High voltage from ignition coil is distributed to each spark plug by distributor.

EMISSION SYSTEMS

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

EGR System

EGR system reduces oxides of nitrogen (NOx) emissions by recirculating exhaust gases through EGR valve into intake manifold and back to combustion chambers.

System is composed of EGR valve, Constant Vacuum Control (CVC) valve and EGR control solenoid valve. EGR control solenoid valve is controlled by ECM, which analyzes input signals from EGR valve lift sensor and various sensors to provide optimum EGR flow.

EGR flow is cut when combustion gas temperatures are low (when the engine emits a relatively low NOx emission) to assure good colddriveability.

EGR Valve

When opened, EGR valve circulates exhaust gas through intake manifold and back into combustion chamber to be reburned, resulting in reduced combustion chamber temperature. Lower temperature reduces oxides of nitrogen (NOx) and helps to control spark knock.

EGR Control Solenoid Valve

When ECM determines it is necessary to recirculate exhaust gases, it grounds EGR control solenoid valve, regulating vacuum controlling EGR valve. By regulating vacuum to EGR valve, EGR flow is adjusted for optimum control of NOx emission.

Exhaust Gas Recirculation Valve Lift Sensor

The EGR valve lift sensor detects EGR valve lift and sends information to ECM. The ECM uses this information, along with other sensor inputs, to determine regulation of EGR control solenoid valve.

EVAPORATIVE EMISSION SYSTEM (EVAP)

Evaporative emission system minimizes fuel vapor escaping into atmosphere. For emission control applications and components used for each model and engine, see B - EMISSION APPLICATIONS and M - VACUUM DIAGRAMS articles in the ENGINE PERFORMANCE Section.

Charcoal Canister

Charcoal canister temporarily stores fuel vapor until it can be purged, drawn into engine and burned in combustion chamber.

Fuel Tank Vapor Control System

Fuel tank vapor control system consists of a fuel cut-off valve, liquid/vapor separator, a 2-way valve and fuel filler cap. All fuel vapor inside fuel tank is directed to charcoal canister through fuel cut-off valve and liquid/vapor separator.

Fuel cut-off valve and liquid/vapor separator prohibit liquid fuel from entering 2-way valve. When fuel vapor pressure in fuel tank is greater than set value of 2-way valve, valve opens and regulates flow of fuel vapor into canister. The 2-way valve regulates both pressure and vacuum in tank. The filler cap contains a relief valve to prevent excessive pressure or vacuum build-up.

Vapor Purge Control System

The vapor purge control system controls when charcoal canister is to be purged. Canister purging is accomplished when ECM activates purge control cut-off solenoid valve, allowing fresh air to be drawn through bottom of charcoal canister and into a port on throttle body.

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

The Positive Crankcase Ventilation (PCV) system is designed to prevent blow-by gases (in engine crankcase) from escaping into atmosphere. The PCV valve contains a spring-loaded plunger. When engine starts, plunger in PCV valve is lifted in proportion to intake manifold vacuum and blow-by gas is drawn directly into intake manifold.

SELF-DIAGNOSTIC SYSTEM

MALFUNCTION INDICATOR LIGHT (MIL)

When ignition is initially turned on, ECM supplies ground to illuminate Malfunction Indicator Light (MIL). The light remains on until vehicle starts. When an abnormal sensor signal occurs, ECM lights MIL, stores failure code in erasable memory and indicates code when diagnostic check connector is jumpered. For additional information, see G - TESTS W/ CODES article in the ENGINE PERFORMANCE Section.

MISCELLANEOUS CONTROLS

NOTE: Although not considered true engine performance-related systems, some controlled devices may affect driveability if they malfunction.

A/C CLUTCH

When a demand for air conditioning exists in A/C switch circuit, ECM supplies ground to A/C clutch relay to operate the A/C compressor. ECM can also change engine idle RPM to compensate for additional engine load.

CHARGING SYSTEM

Alternator

The internal ECM alternator control system monitors and adjusts voltage generated at alternator. To improve fuel economy, the

ECM reduces alternator output through the voltage regulator when engine is at normal operating temperatures and the ECM detects low amperage demand conditions.

COOLING SYSTEM

Cooling Fan Timer Unit

Located next to ECM on Prelude and in left side kick panel on Accord, timer unit works with ECM to determine when to activate the cooling fans. On Accord, timer unit applies voltage through fuse No. 29 (A/C) and fuse No. 39 (radiator) to fan relays when ECM indicates A/C switch is in ON position. On Prelude, timer unit applies voltage through fuse No. 45 (A/C) and fuse No. 47 (radiator) to fan relays when ECM indicates A/C switch is in ON position.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ELECTRICAL COMPONENT LOCATION
Honda Electrical Components

Honda; Prelude

SAFETY PRECAUTION

WARNING: When working on vehicles equipped with Supplemental Restraint System (IRS), never apply electrical voltage to the system. This could cause the SRS (air bag) to be deployed. For complete Air Bag Safety precautions see AIR BAGS article in ACCESSORIES/SAFETY EQUIPMENT Section.

BUZZERS, RELAYS & TIMERS

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Component	Component Location

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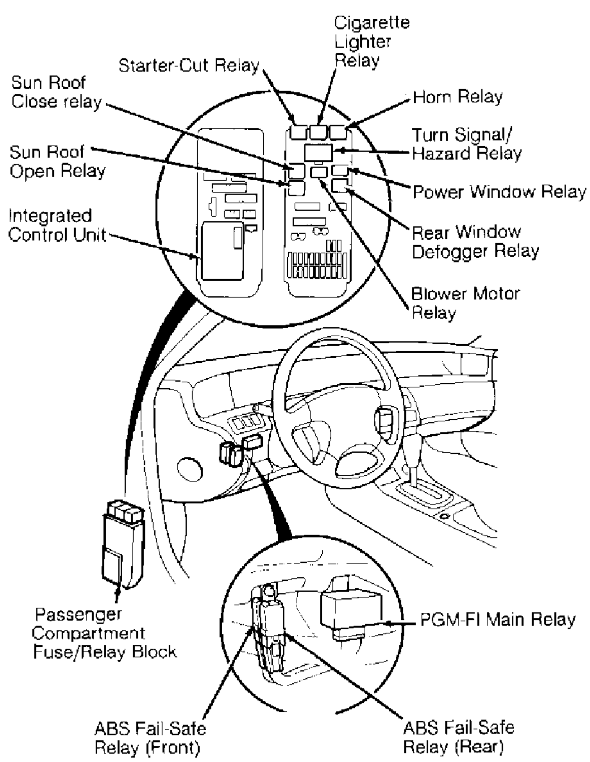

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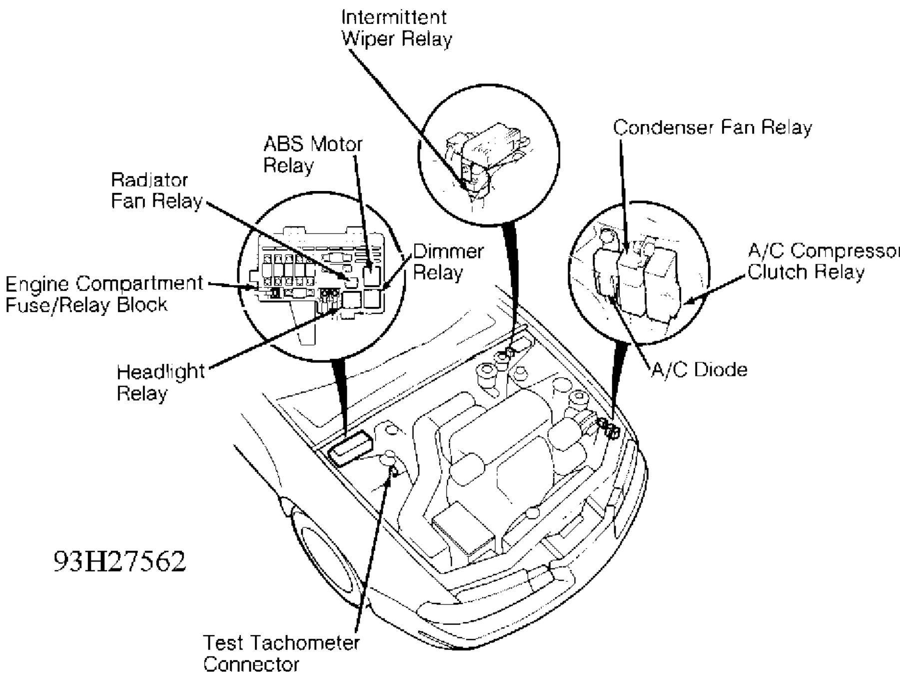
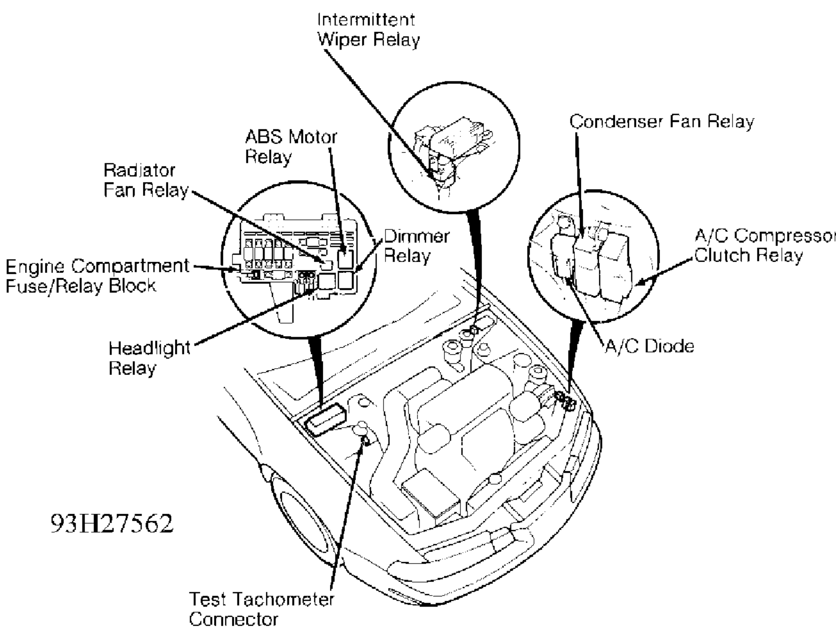
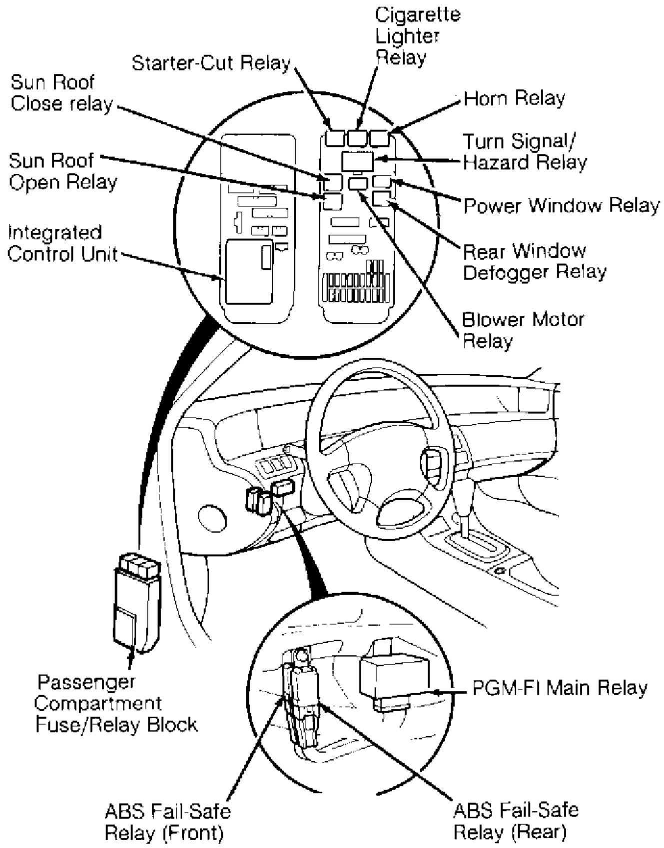
ABS Fail Safe Relays (Front & Rear)	Behind left side of dash, above clutch pedal bracket.



ABS Motor Relay	**In engine compartment fuse/relay block.**



A/C Compressor Clutch Relay	**On left front inner fender panel, behind headlight.**



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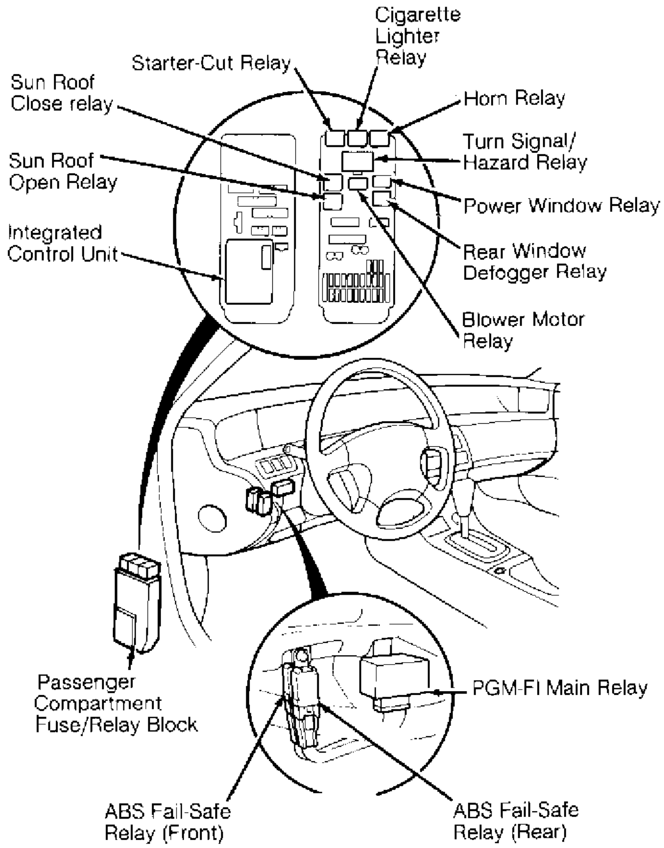
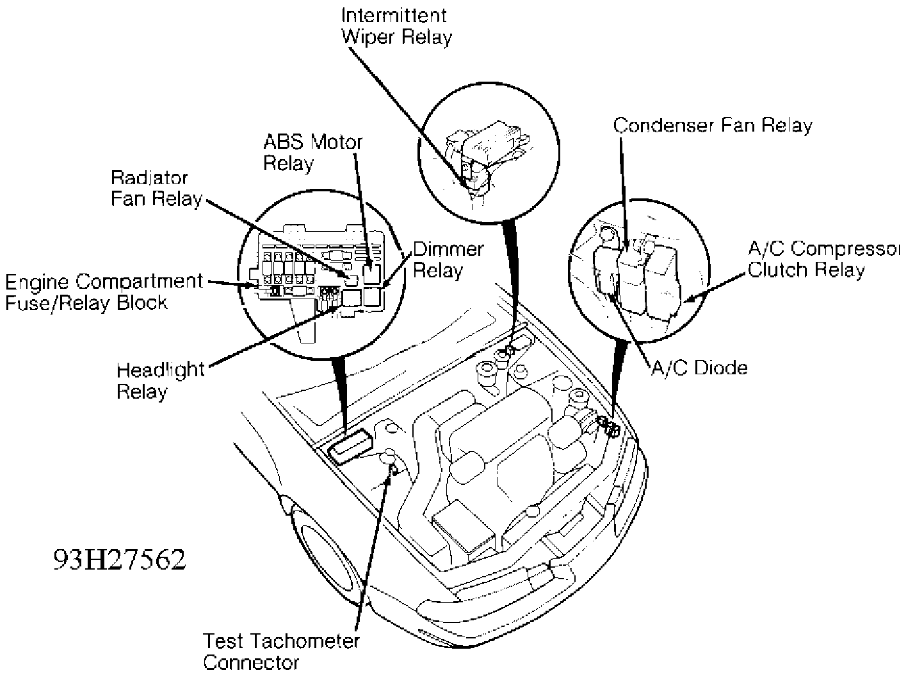
Blower Motor Relay	**In passenger compartment fuse/relay block.**

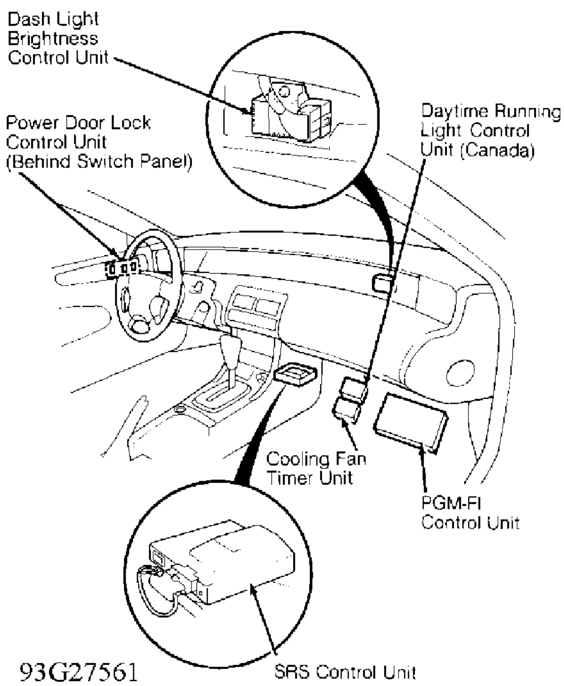


Cigarette Lighter Relay	In passenger compartment fuse/relay block.

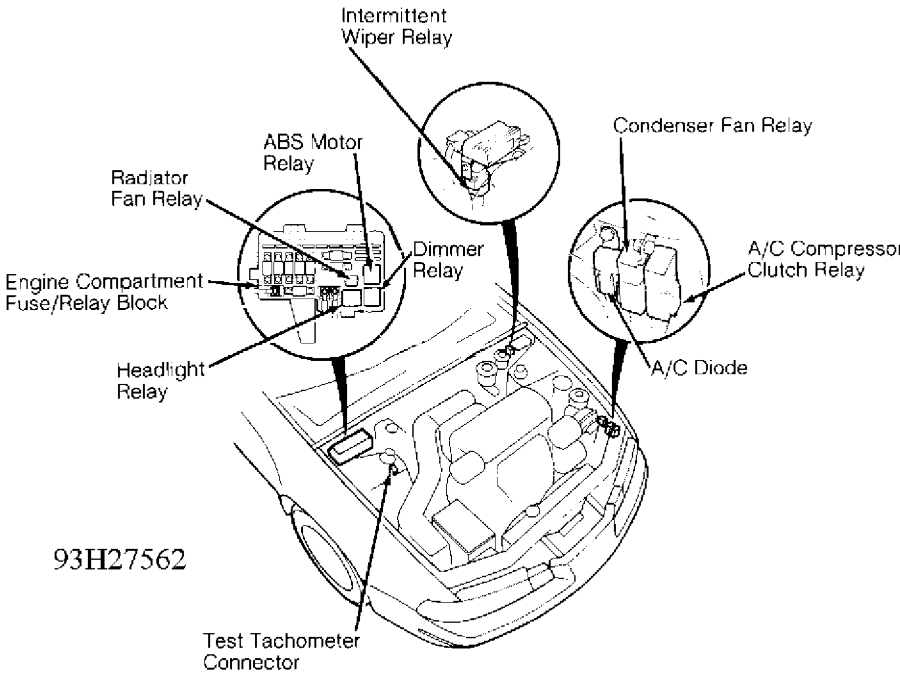
Chime	Behind left kick panel.



Condenser Fan Relay **On left front inner fender panel, behind headlight.**

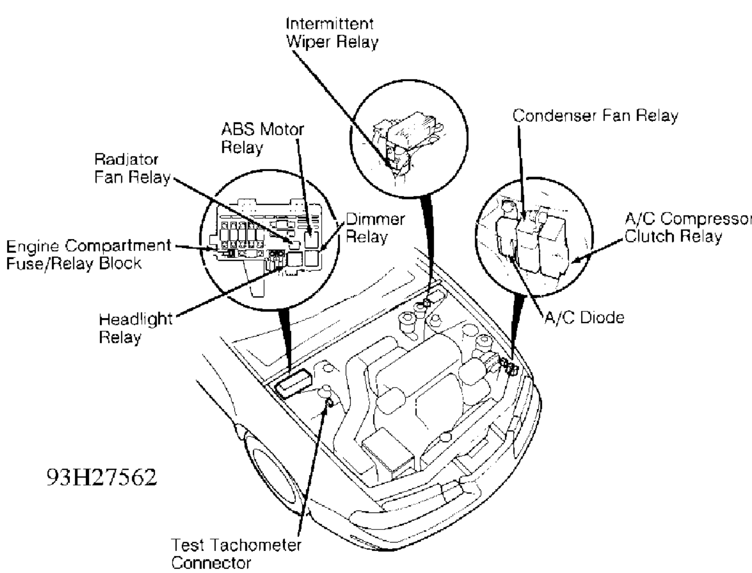


Cooling Fan Timer Unit **On passenger-side footwell, under carpet.**



Dimmer Relay **In engine compartment fuse/relay block.**

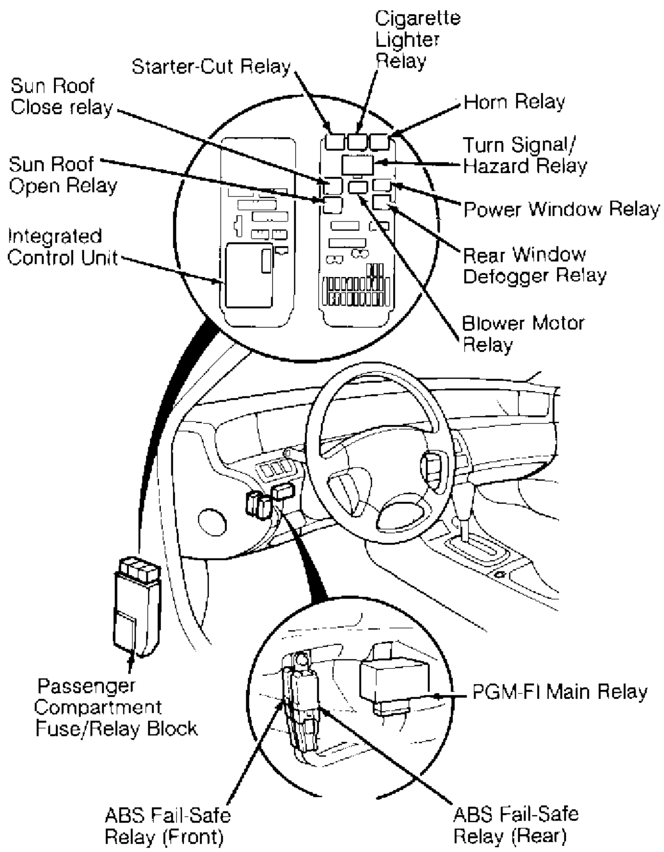
Foglight Relay **Behind left side of dash, above clutch pedal bracket.**



Headlight Relay **In engine compartment fuse/relay block.**

Heated Seats (Canada)

Seat Heater Relay	Under each front seat.
Seat Heater Main Relay	Behind left side of dash.



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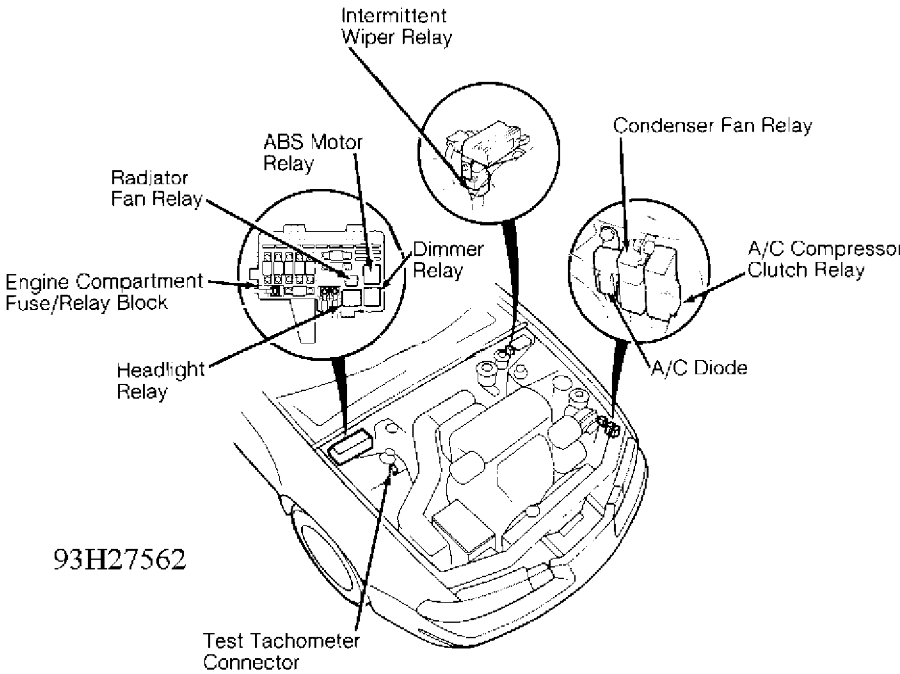
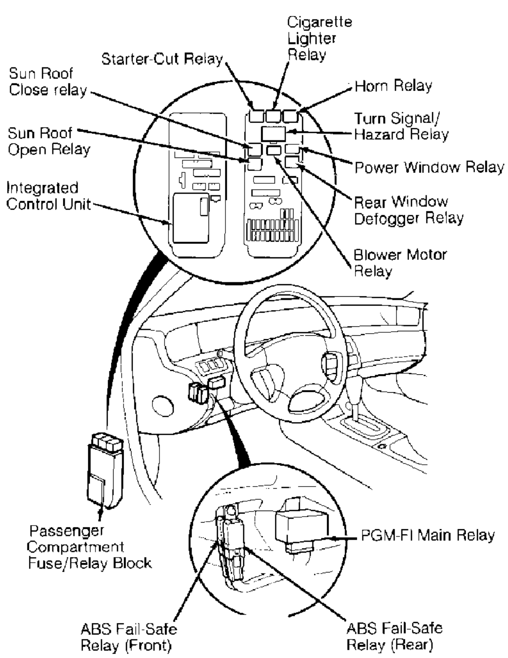
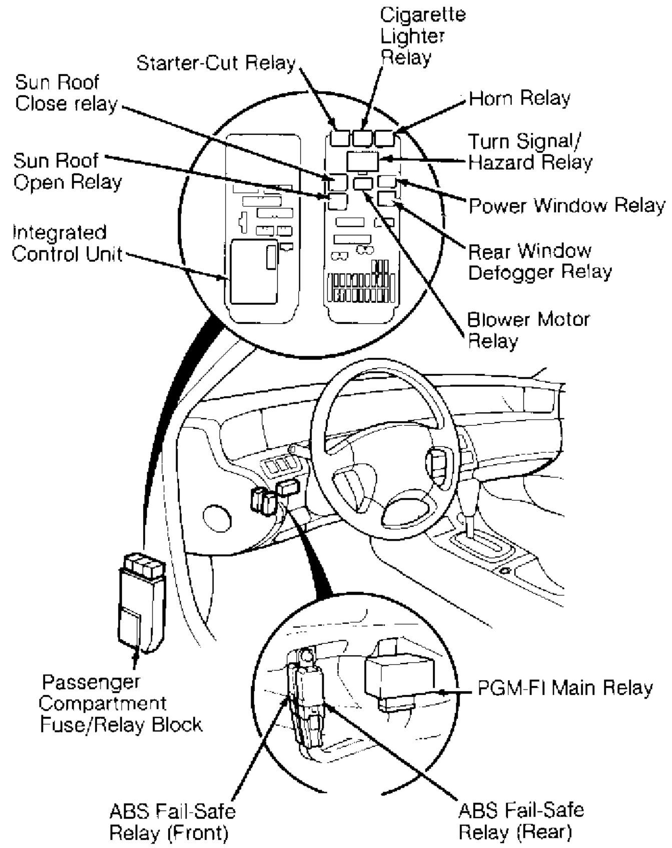
Horn Relay	In passenger compartment fuse/relay block.



Intermittent Wiper Relay — **On right rear corner of engine compartment, on firewall.**



PGM-FI Main Relay — **Behind left side of dash, above clutch pedal bracket.**



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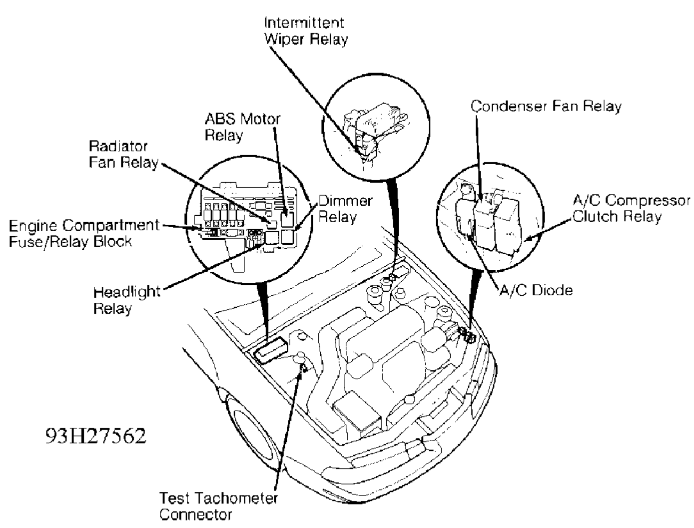
Power Window Relay **On passenger compartment fuse/relay block.**



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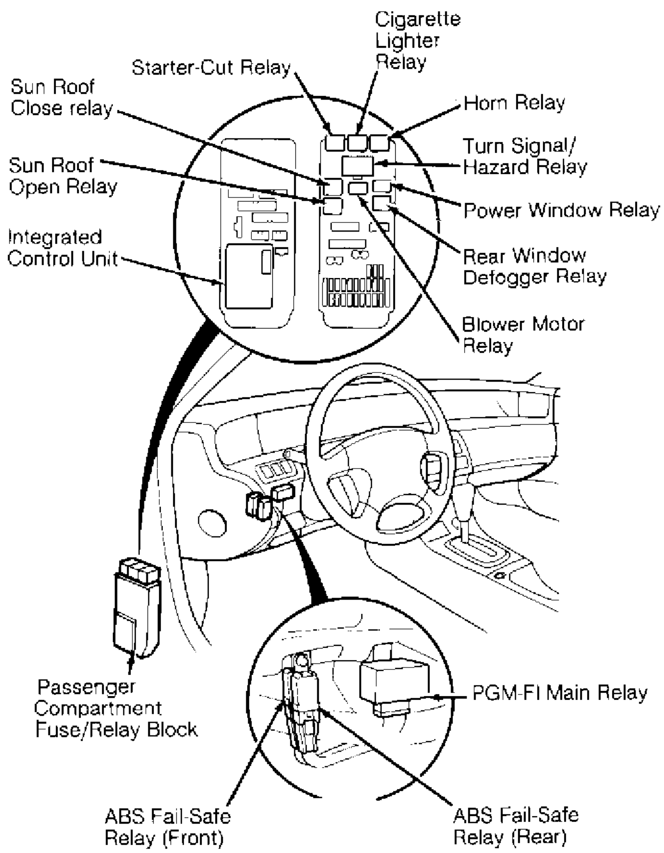
Radiator Fan Relay **In engine compartment fuse/relay block.**



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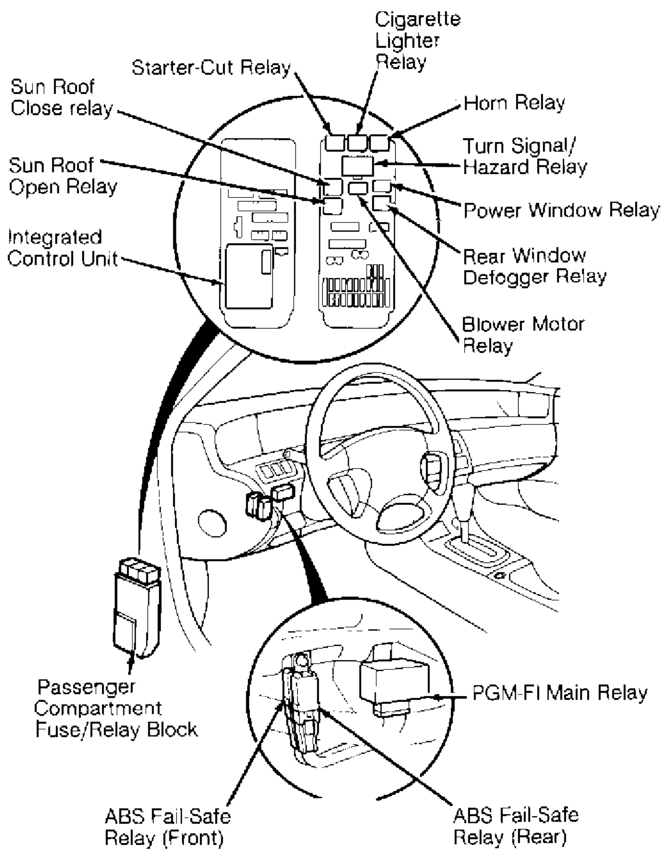
Rear Window Defogger Relay	**In passenger compartment fuse/relay block.**



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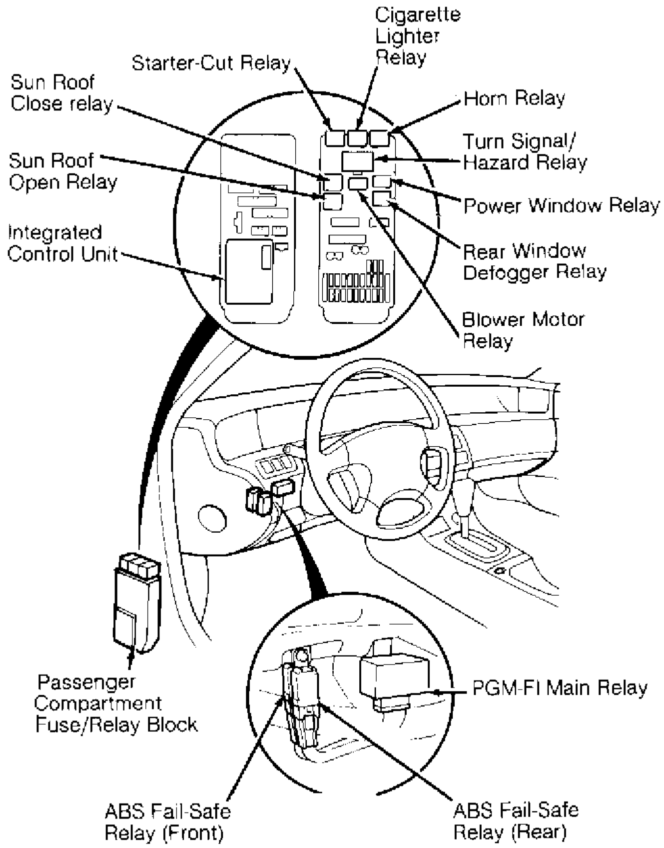
Starter-Cut Relay	**In passenger compartment fuse/relay block.**



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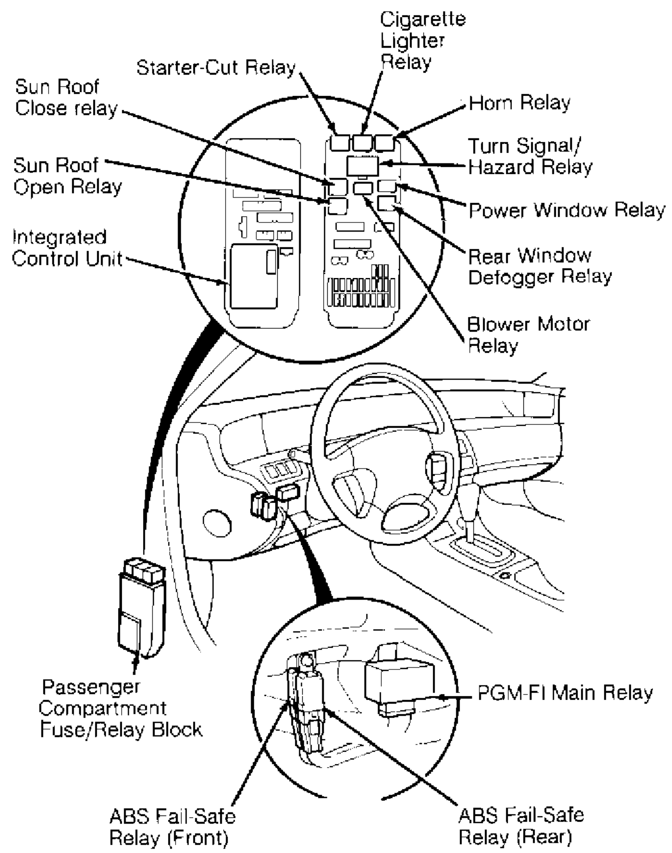
Sun Roof Relays (Open & Close)	**In passenger compartment fuse/relay block.**



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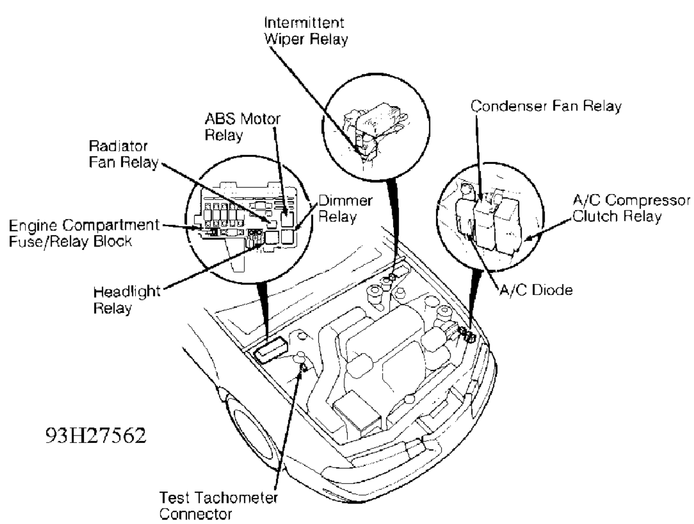
Turn Signal/Hazard Relay **In passenger compartment fuse/relay block.**



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Windshield/Wiper Intermittent Relay **In passenger compartment fuse/relay block.**

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CIRCUIT PROTECTION DEVICES

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Component	Component Location

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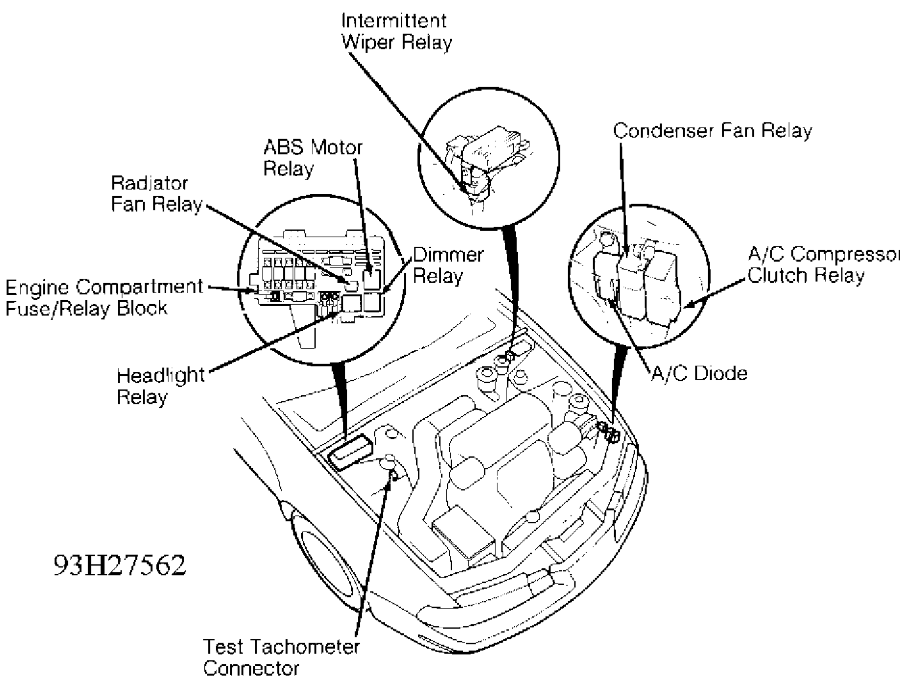
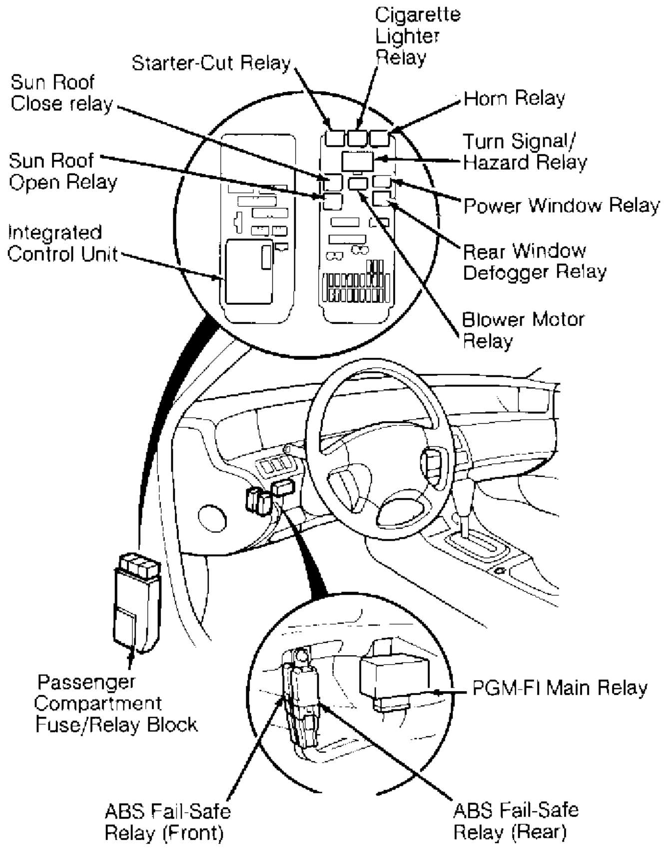
Fuse/Relay Blocks



Engine Compartment	On right front strut tower.



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Passenger Compartment	Behind left kick panel.

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CONTROL UNITS

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Component	Component Location
ABS Control Unit	Behind right quarter trim panel.
Cruise Control Unit	Behind left side of dash, above accelerator pedal bracket.

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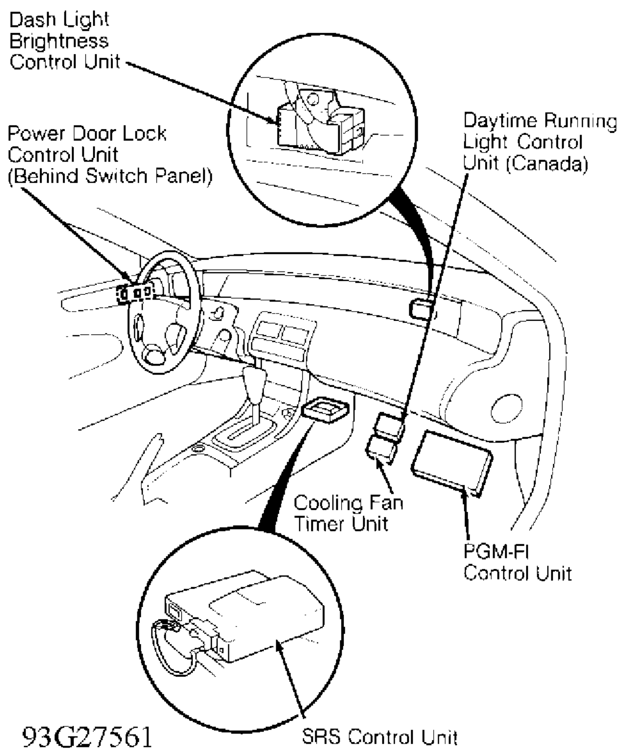
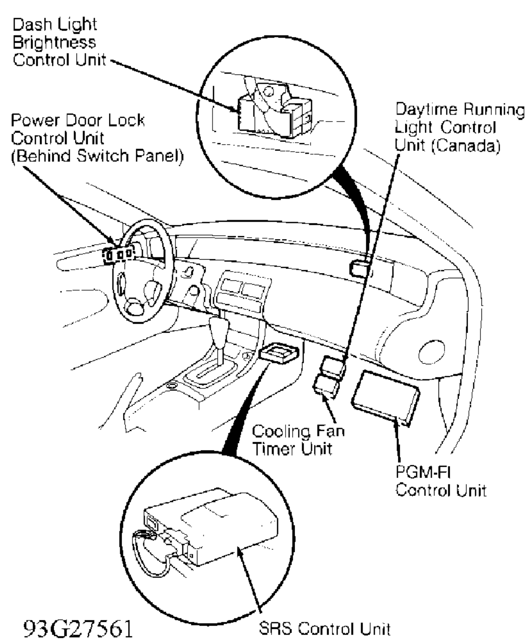
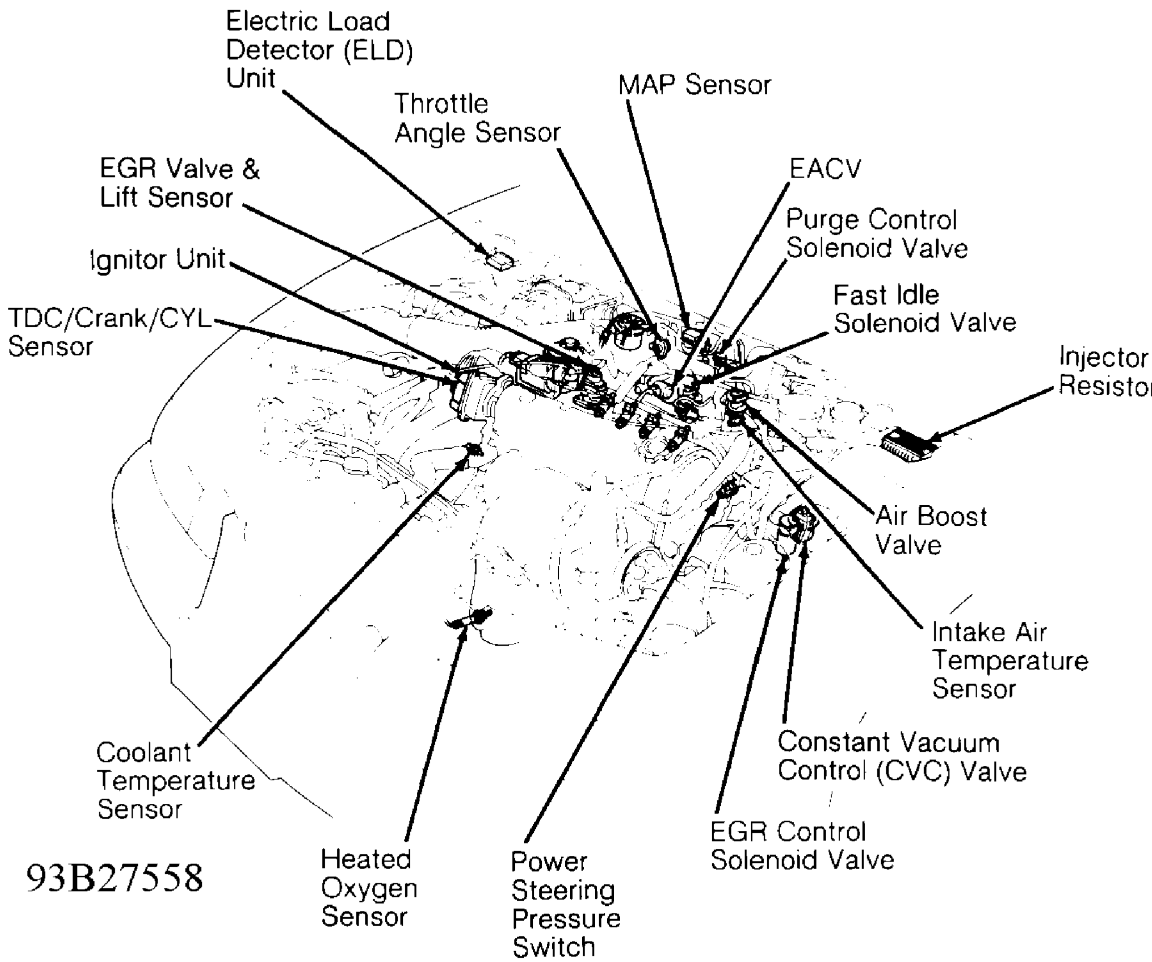


Dash Light Brightness Control Unit — **Behind right side of dash.**



Daytime Running Light (DRL) Control Unit (Canada) — **On passenger-side footwell, under carpet.**

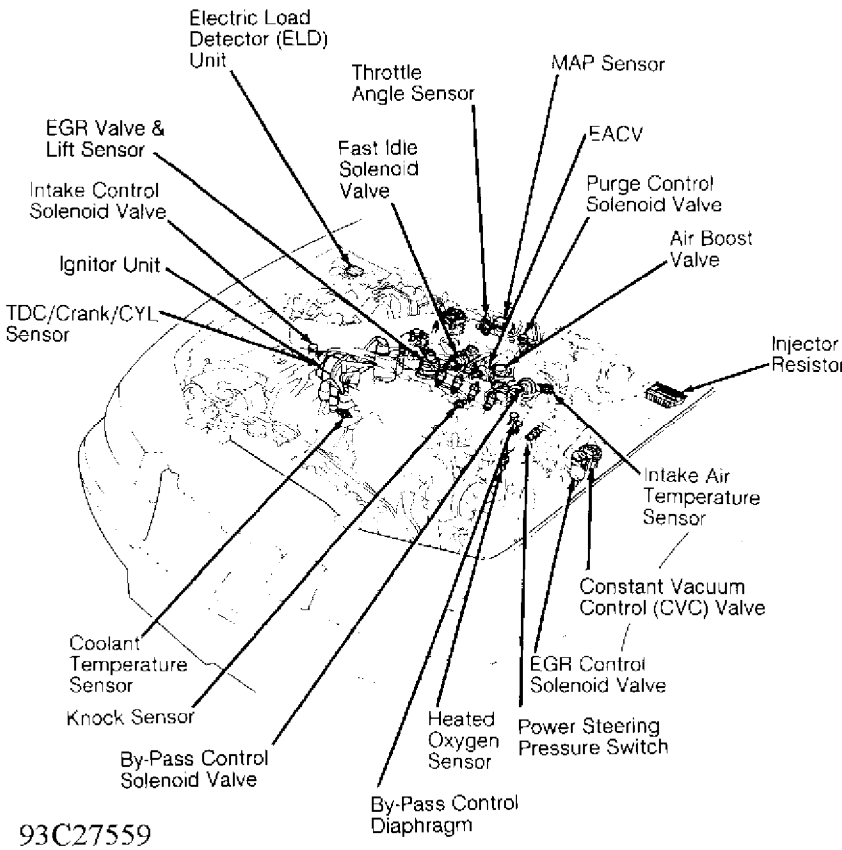
Electric Load Detector (ELD) Unit



2.3L DOHC

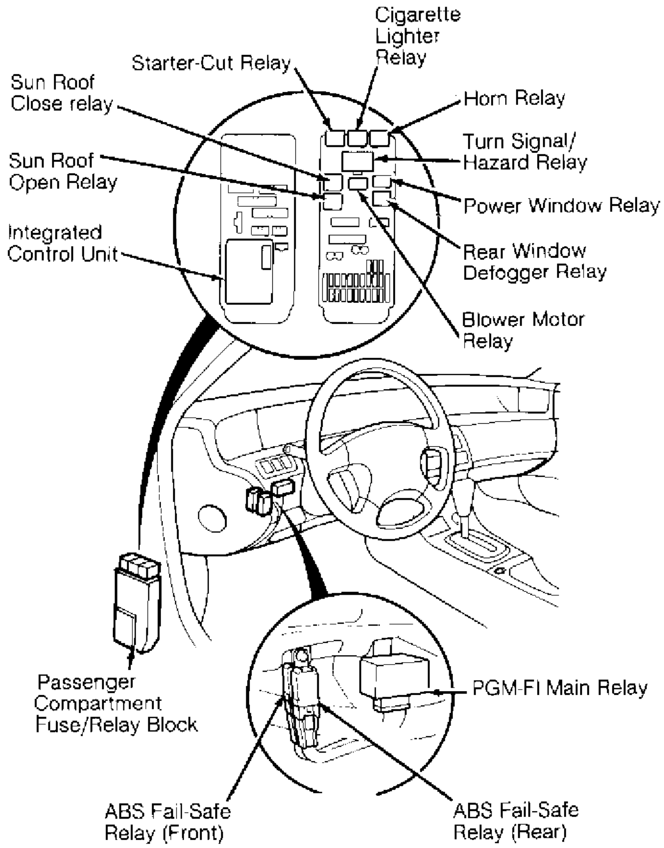
2.3L DOHC

On bottom of engine compartment fuse/relay block.



2.2L SOHC

2.2L SOHC	On bottom of engine compartment fuse/relay block.
Heated Seats (Canada)	
Seat Heater Relay	Under each front seat.
Seat Heater Main Relay	On left side of firewall.



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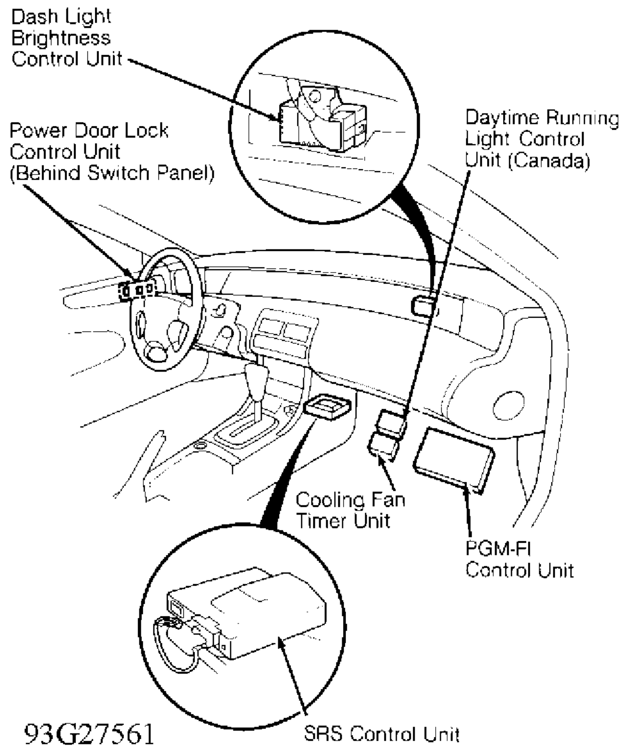
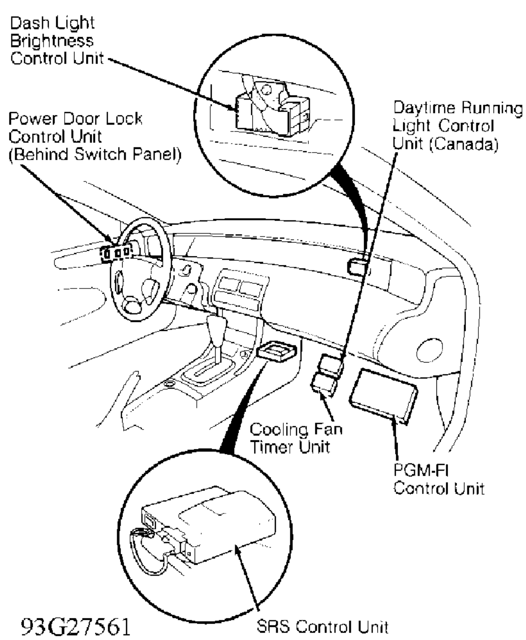
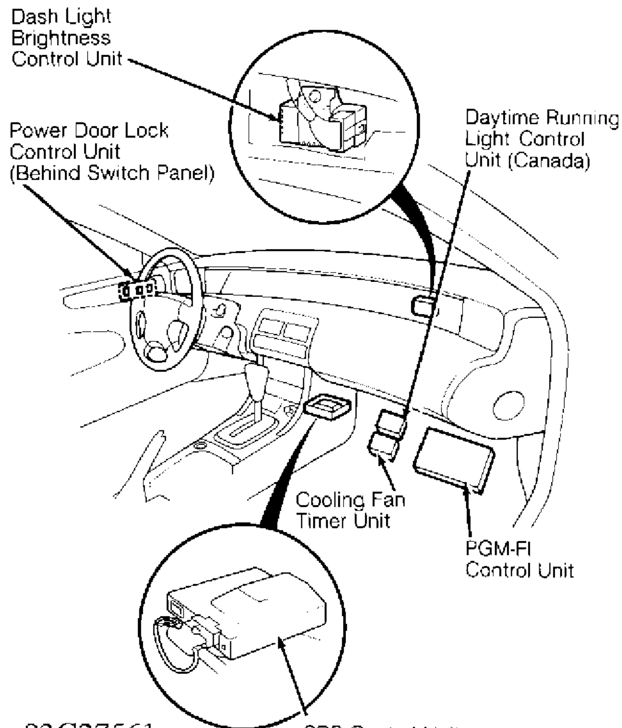
Integrated Control Unit	**Behind passenger compartment fuse/relay block.**
Interlock Control Unit	**Behind left side of dash, above kick panel.**



PGM-FI Control Unit — **On passenger-side footwell, under carpet.**



Power Door Lock Control Unit — **In driver's door, behind door panel.**



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SRS (Air Bag) Control Unit	Under evaporator housing, mounted on floor hump.
4WS Control Unit	Behind left rear seat.

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MOTORS

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Component Location
ABS Pump Motor	On right rear of engine compartment, near strut tower.
A/C-Heater System	
Blower Motor	Behind right side of dash.
Function Control Motor	On left side of evaporator housing.
Recirculation Control Motor	On right side of evaporator housing.
Condenser Fan Motor	Behind radiator, on driver's side.

Power Antenna Motor	In right side of trunk.
Sun Roof Motor	Center rear of sun roof, under headliner.
Windshield Washer Motor	Behind left front bumper, below washer fluid reservoir.
Windshield Wiper Motor	In left side of firewall.

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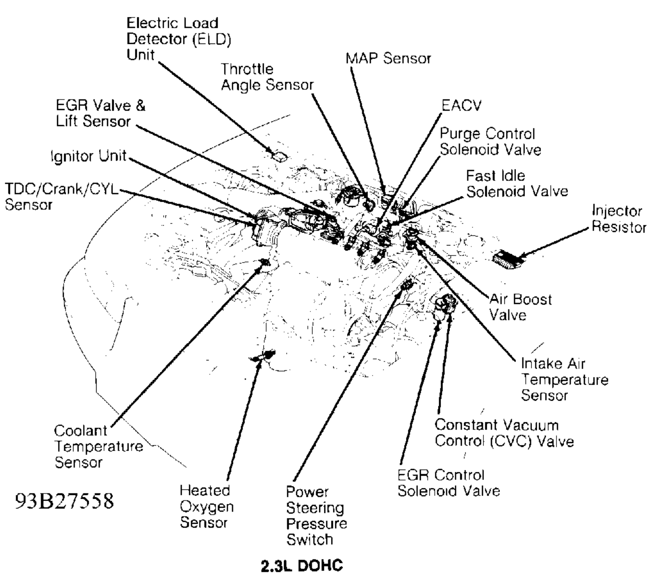
SENDING UNITS & SENSORS

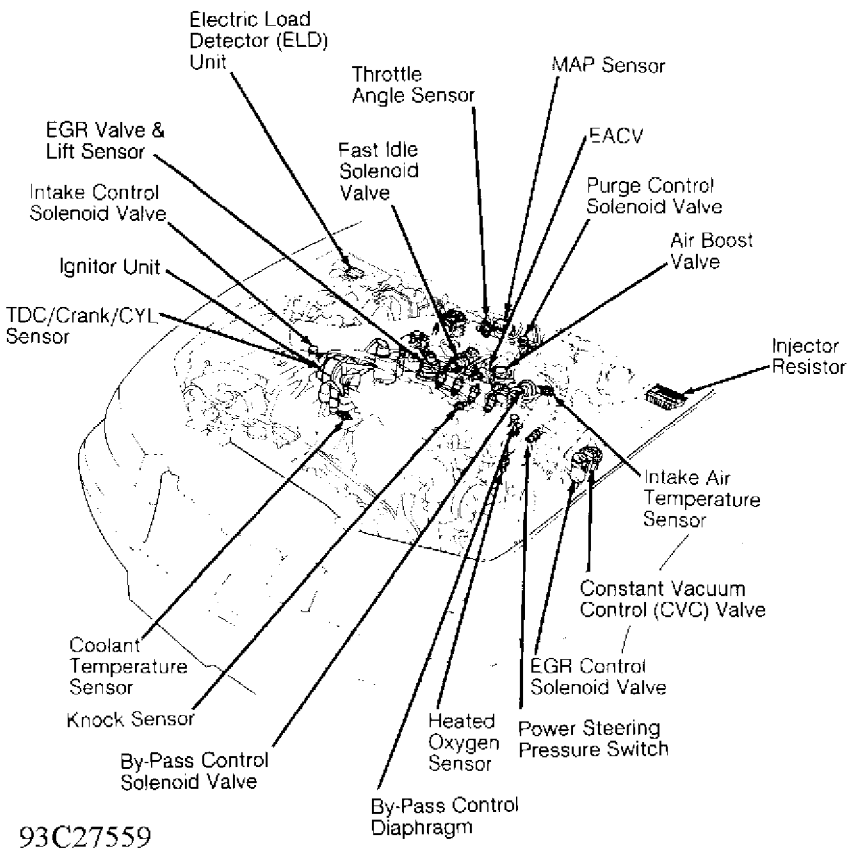
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Component Location
ABS Wheel Speed Sensors	On each wheel hub assembly.
A/T Speed Sensor	
Countershaft	On rear of transmission.
Mainshaft	On front of transmission.
Brakelight Failure Sensors	In each taillight assembly.
Coolant Temp. Sending Unit	On rear of cylinder head, near thermostat housing.

Coolant Temperature Sensor



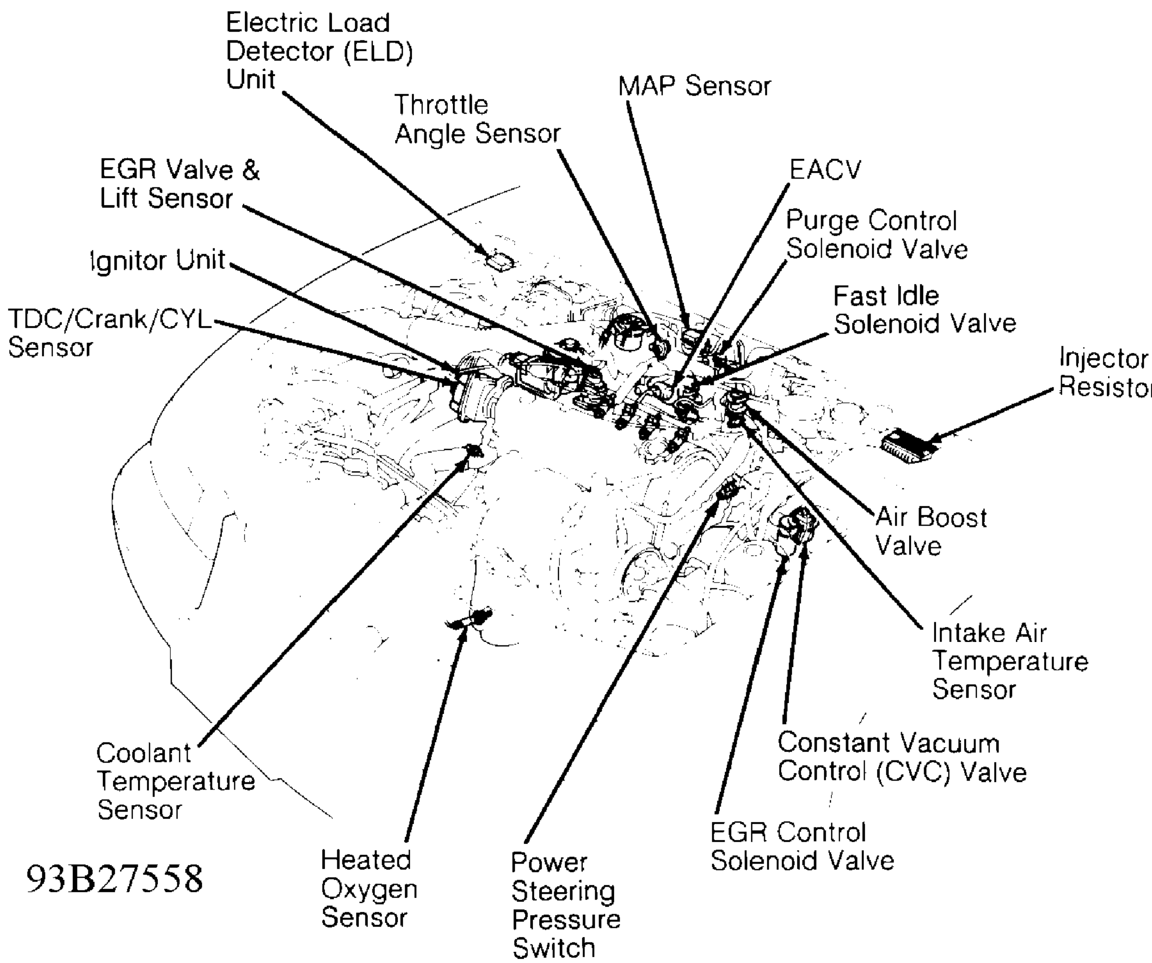
2.3L DOHC	On rear of cylinder head, near thermostat housing.



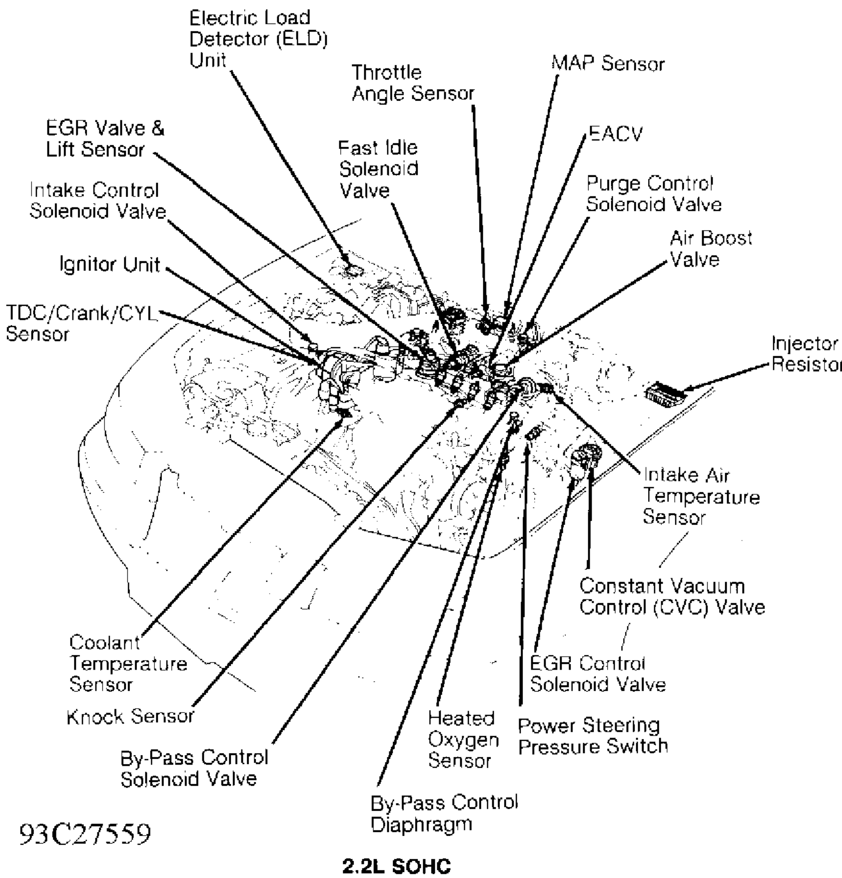
2.2L SOHC

2.2L SOHC **On rear of cylinder head, near thermostat housing.**

EGR Valve & Lift Sensor

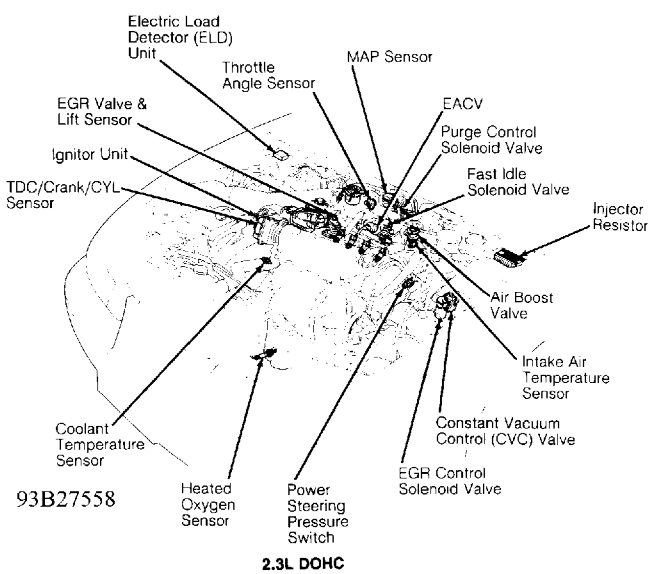

Electric Load Detector (ELD) Unit
Throttle Angle Sensor
MAP Sensor
EGR Valve & Lift Sensor
EACV
Purge Control Solenoid Valve
Ignitor Unit
Fast Idle Solenoid Valve
TDC/Crank/CYL Sensor
Injector Resistor
Air Boost Valve
Intake Air Temperature Sensor
Constant Vacuum Control (CVC) Valve
Coolant Temperature Sensor
EGR Control Solenoid Valve
Heated Oxygen Sensor
Power Steering Pressure Switch
93B27558

2.3L DOHC

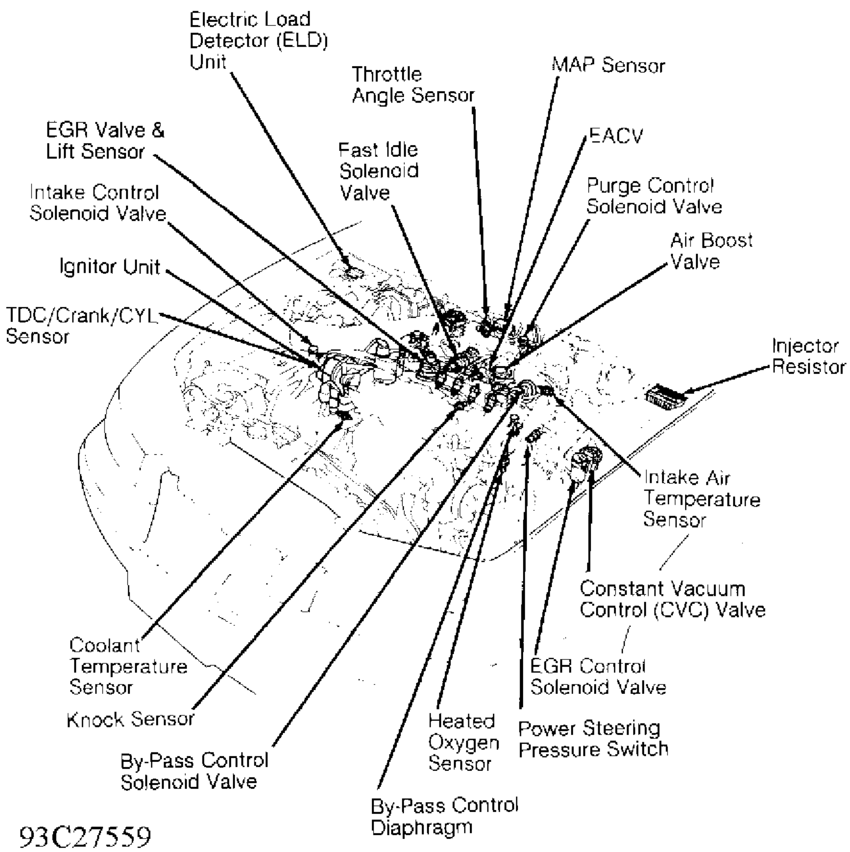


2.2L SOHC **On top of EGR valve.**

Intake Air Temperature Sensor



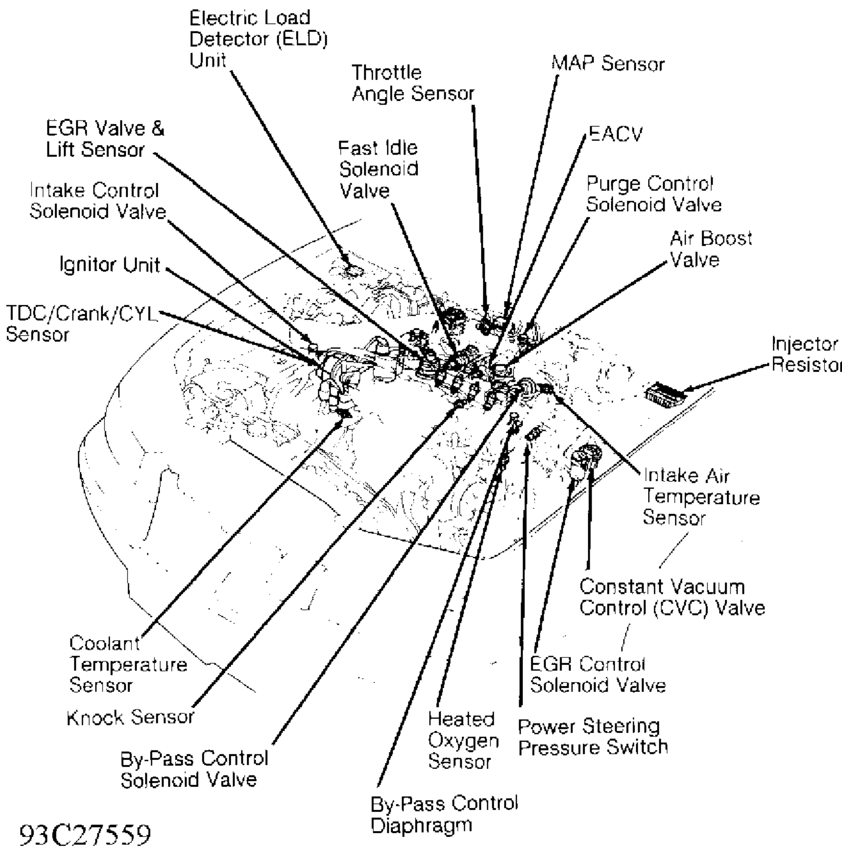
2.3L DOHC **On left front corner of intake chamber.**



2.2L SOHC

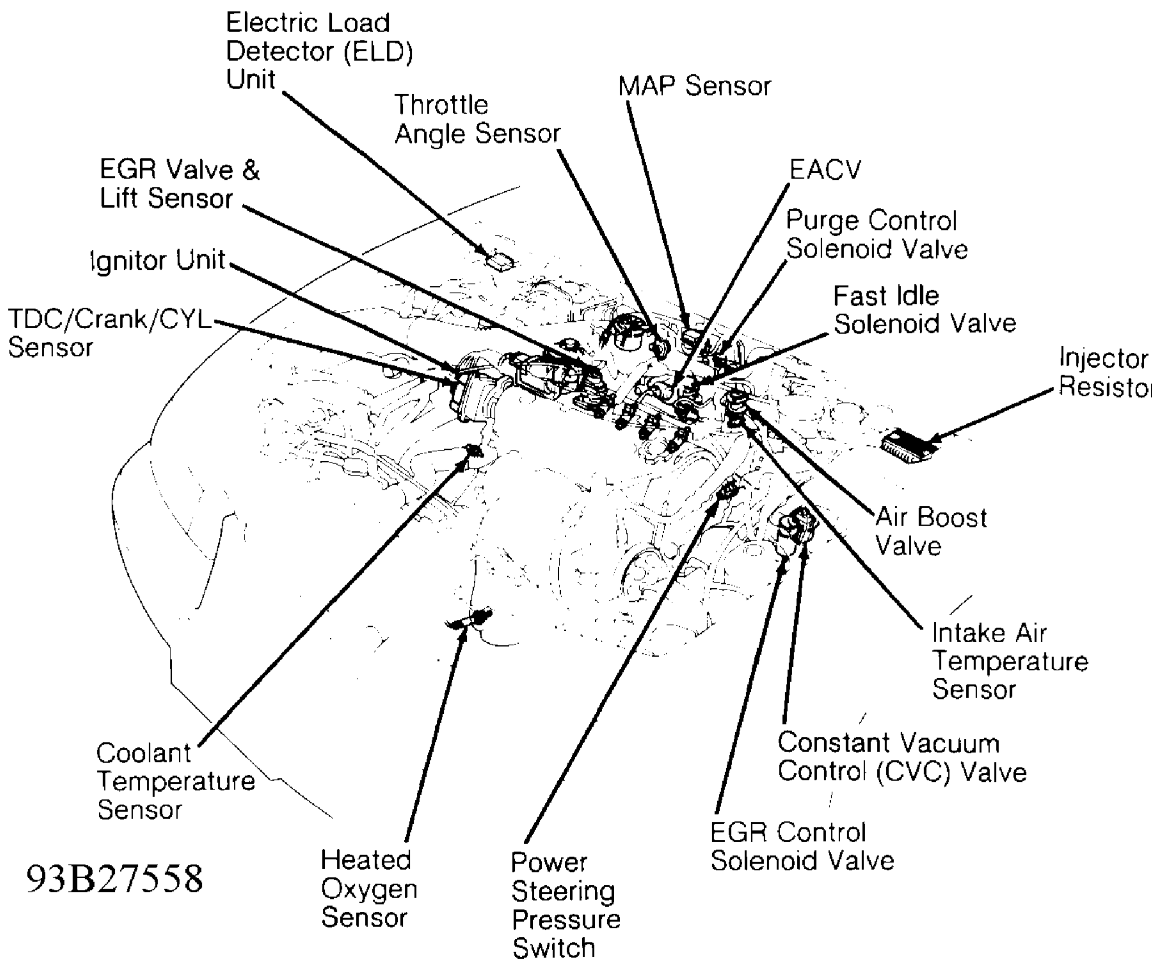
2.2L SOHC

On left front corner of intake chamber.



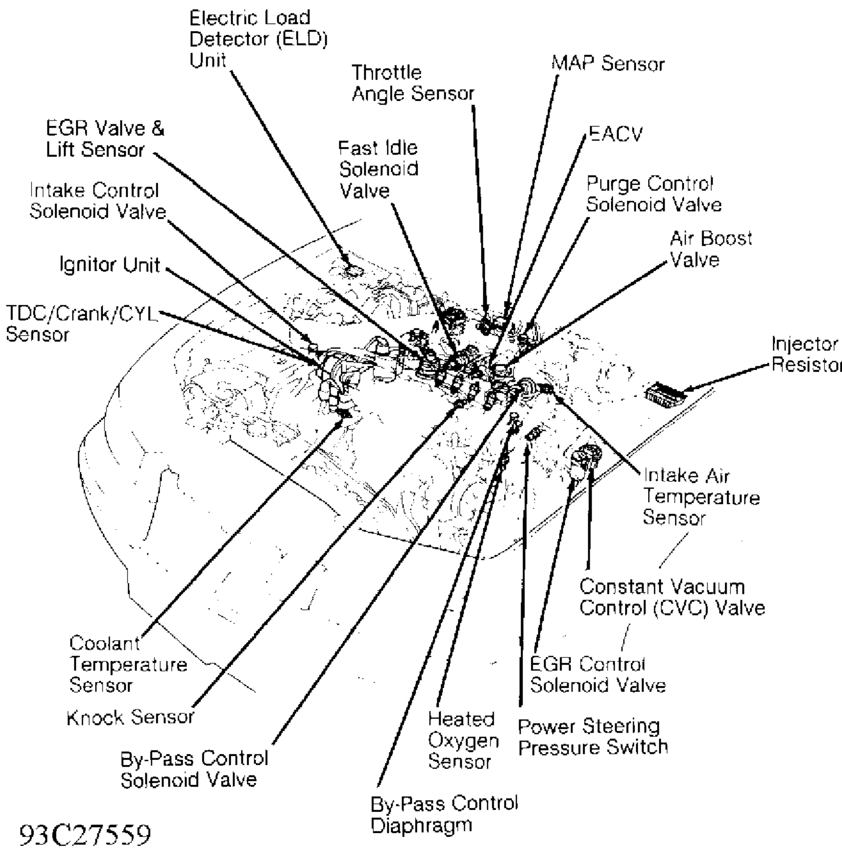
2.2L SOHC

Knock Sensor	On engine block, above oil filter.



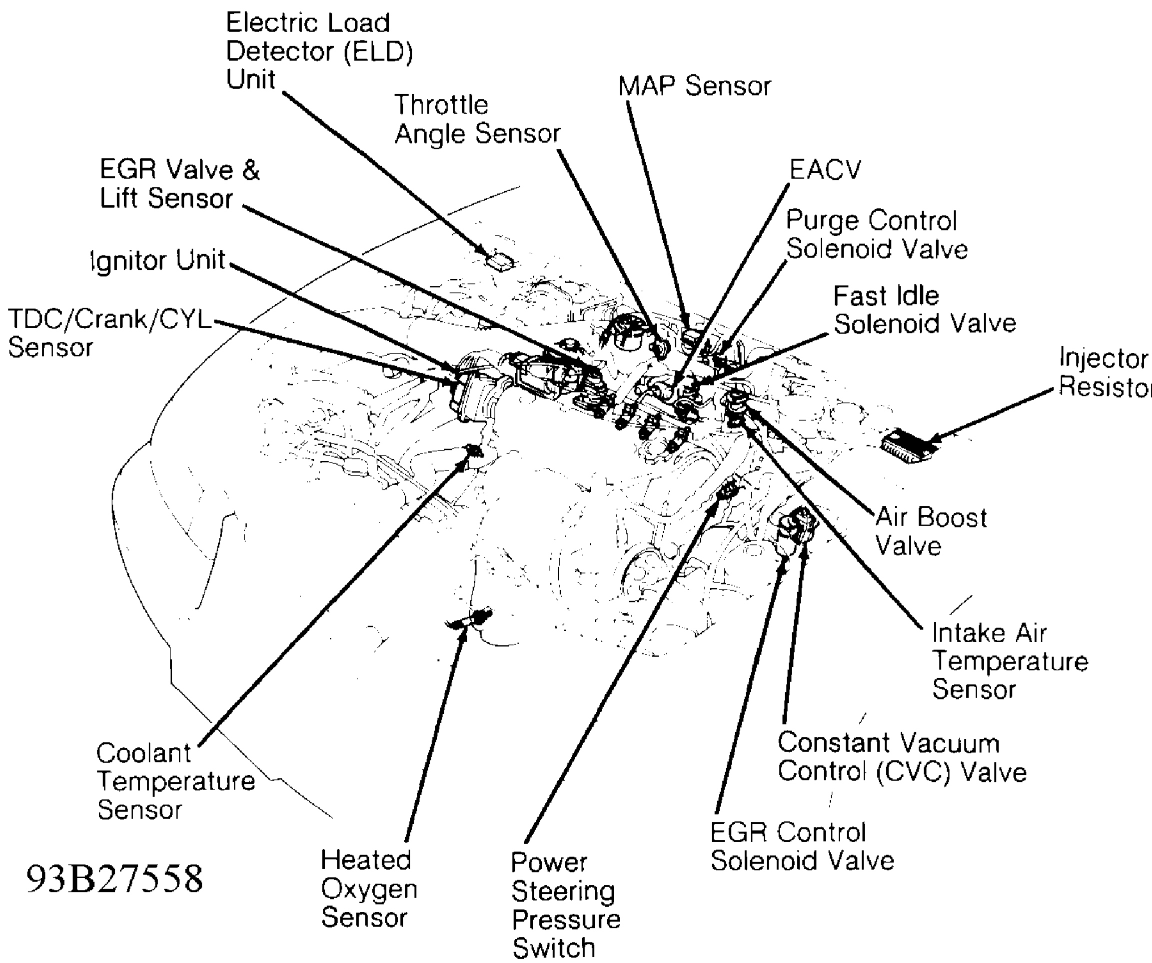
2.3L DOHC

2.3L DOHC **On center of firewall.**



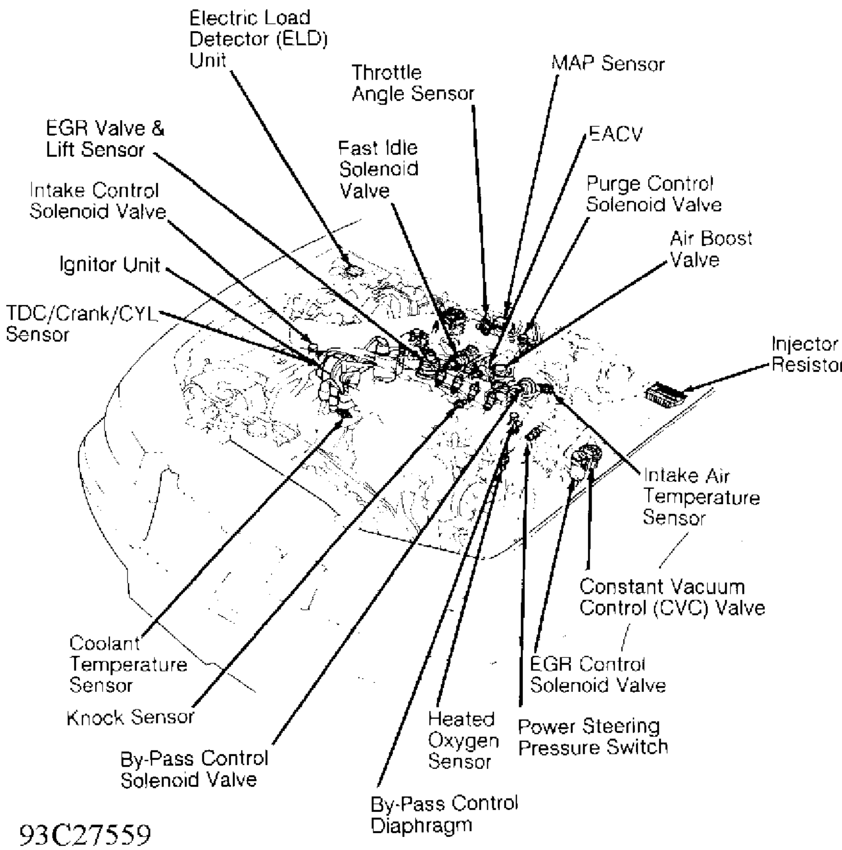
2.2L SOHC

2.2L SOHC	On center of firewall.
Power Steering Speed Sensor	On left and right
SRS (Air Bag) Dash Sensors	On left and right footwell, under carpet.
TDC/Crank/CYL Sensor	



2.3L DOHC

2.3L DOHC **In distributor assembly.**



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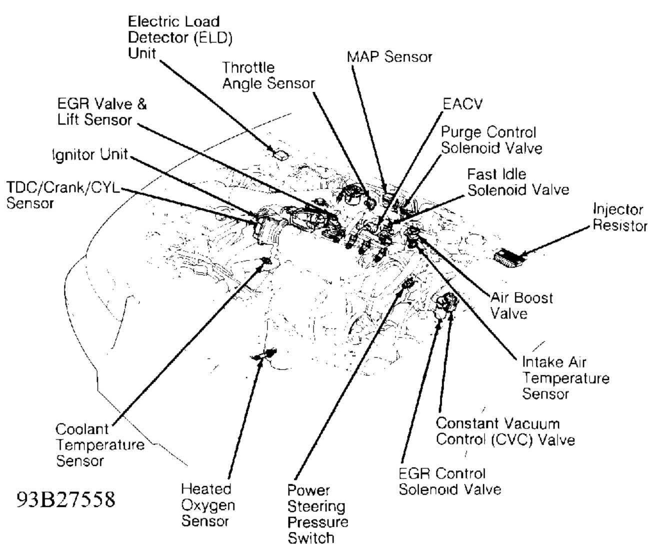
2.2L SOHC

2.2L SOHC In distributor assembly.

Throttle Angle Sensor



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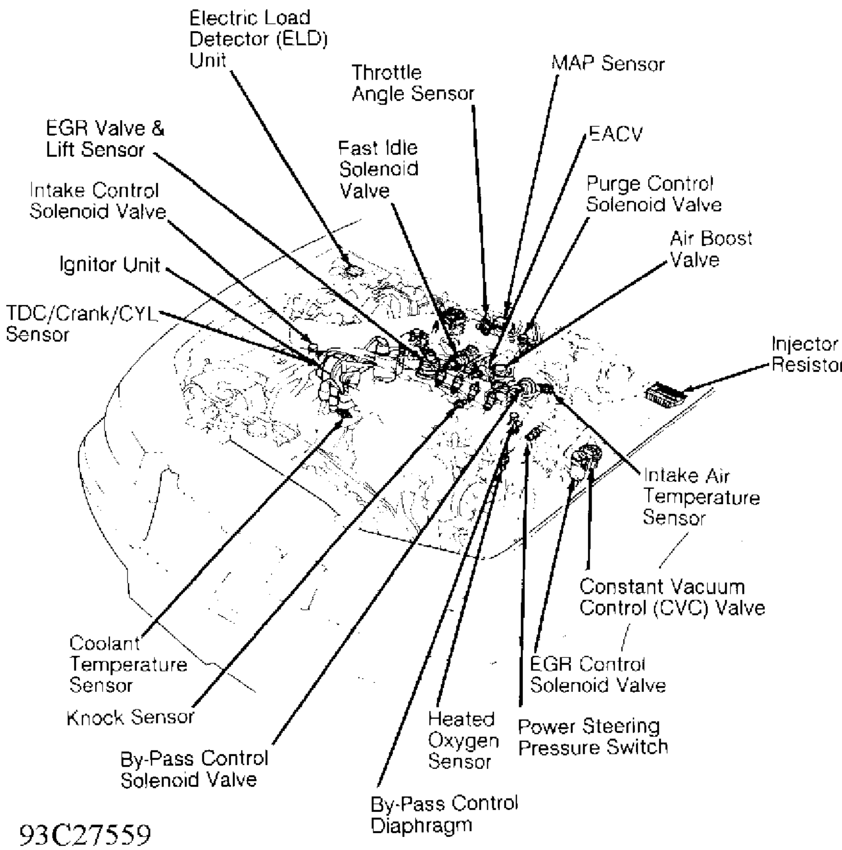
2.3L DOHC

2.3L DOHC On throttle body assembly.



2.2L SOHC

2.2L SOHC	On throttle body assembly.
Vehicle Speed Sensor	On top right of transaxle.
4WS Angle Sensors	
Front Steering	
Main Sensor	On left side of steering column.
Rear Steering	
Main Sensor	On left of rear actuator motor.
Sub Sensor	On right of rear actuator motor.

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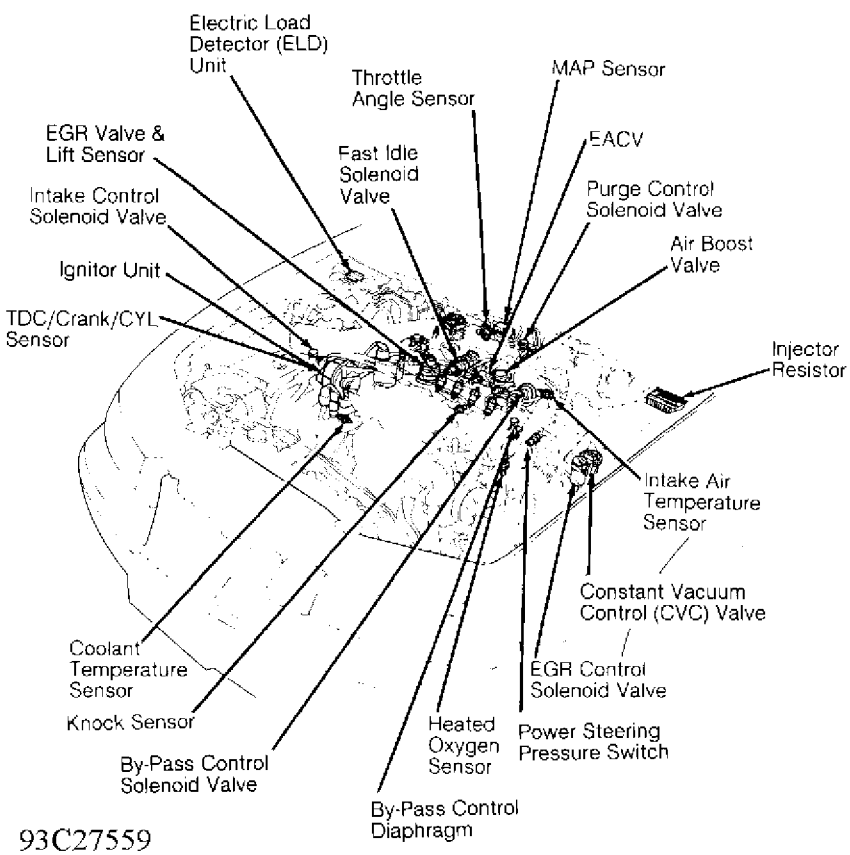
SOLENOIDS & SOLENOID VALVES

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Component Location

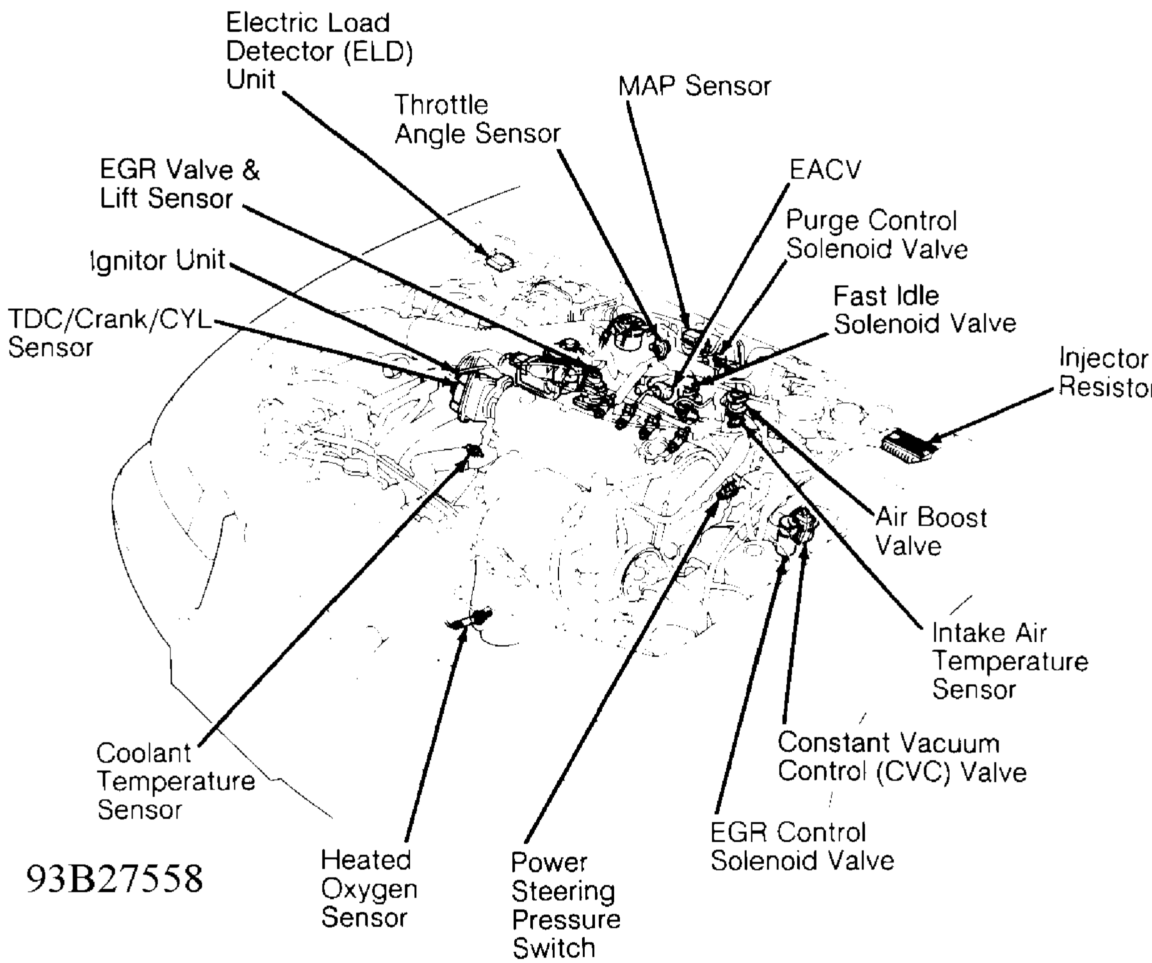
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

ABS Modulator Solenoid	**On ABS pump assembly, on right rear of engine compartment.**
Automatic Transmission	
Lock-Up Control Sol. Valves (A & B)	**On right front of transaxle.**
Shift Control Sol. Valves	**On top of transaxle, on bellhousing.**



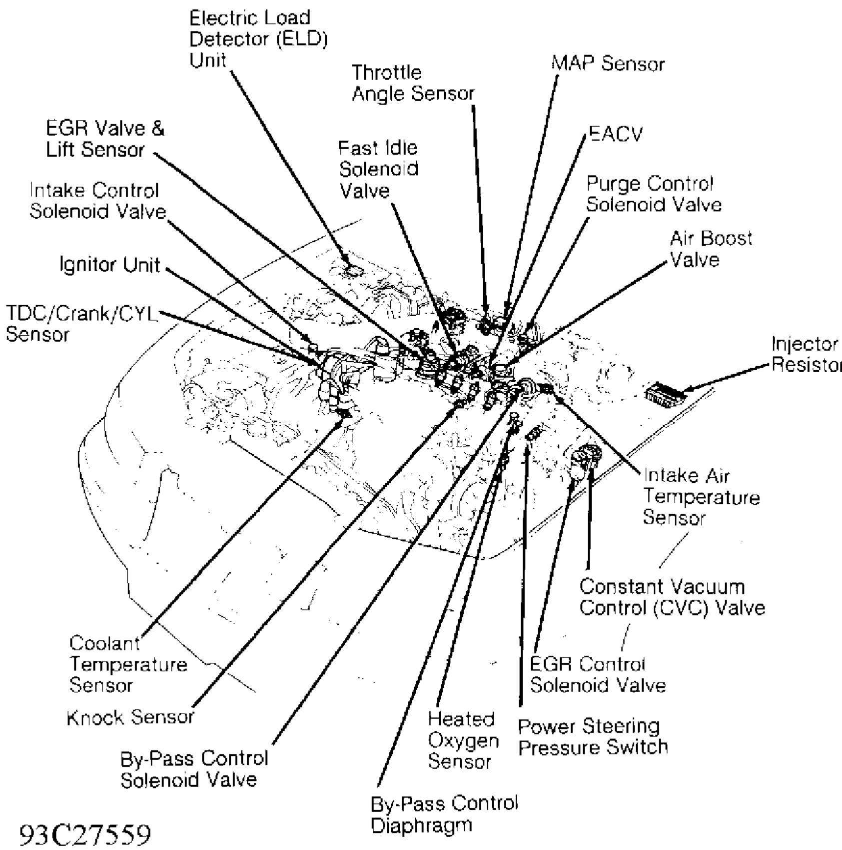
2.2L SOHC

By-Pass Ctrl. Sol. Valve (2.3L)	**Under intake manifold.**
EGR Control Solenoid Valve	



2.3L DOHC

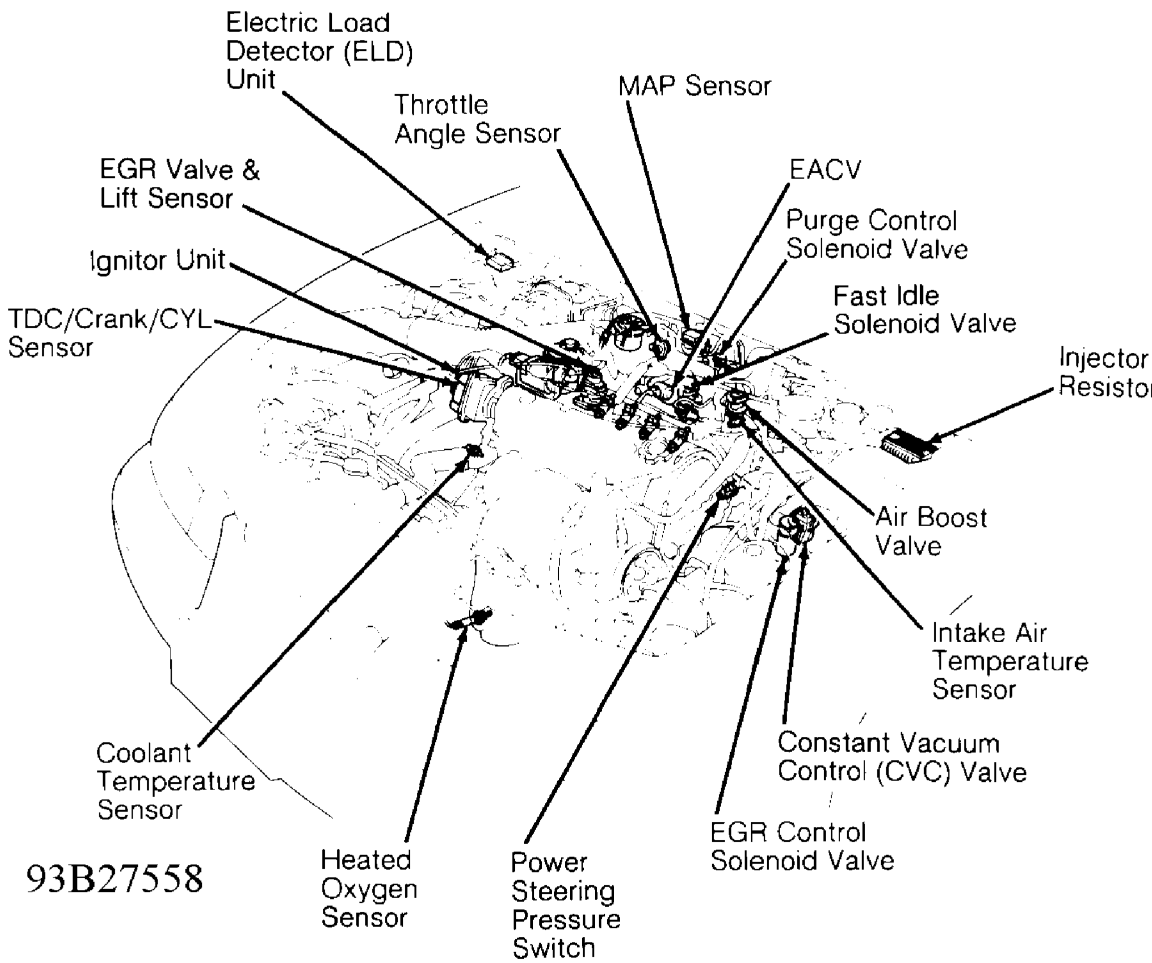
2.3L DOHC	**On left rear of engine compartment, behind strut tower.**



2.2L SOHC

2.2L SOHC	On left rear of engine compartment, behind strut tower.

Electronic Air Control Valve (EACV)

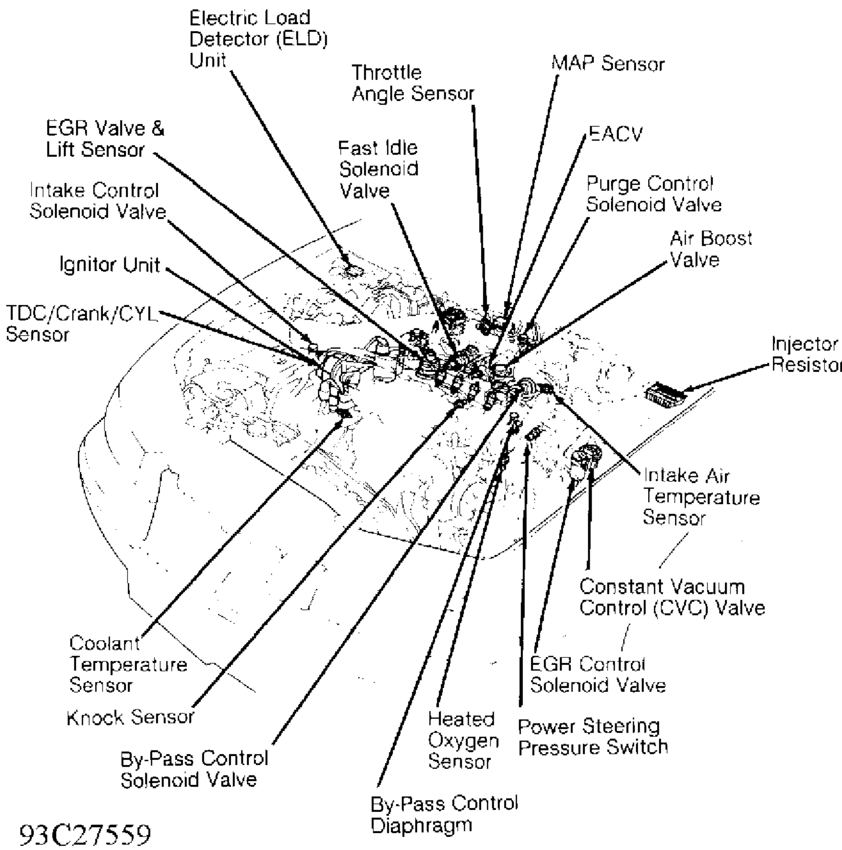


2.3L DOHC

2.3L DOHC

ELECTRICAL COMPONENT LOCATOR Article Text (p

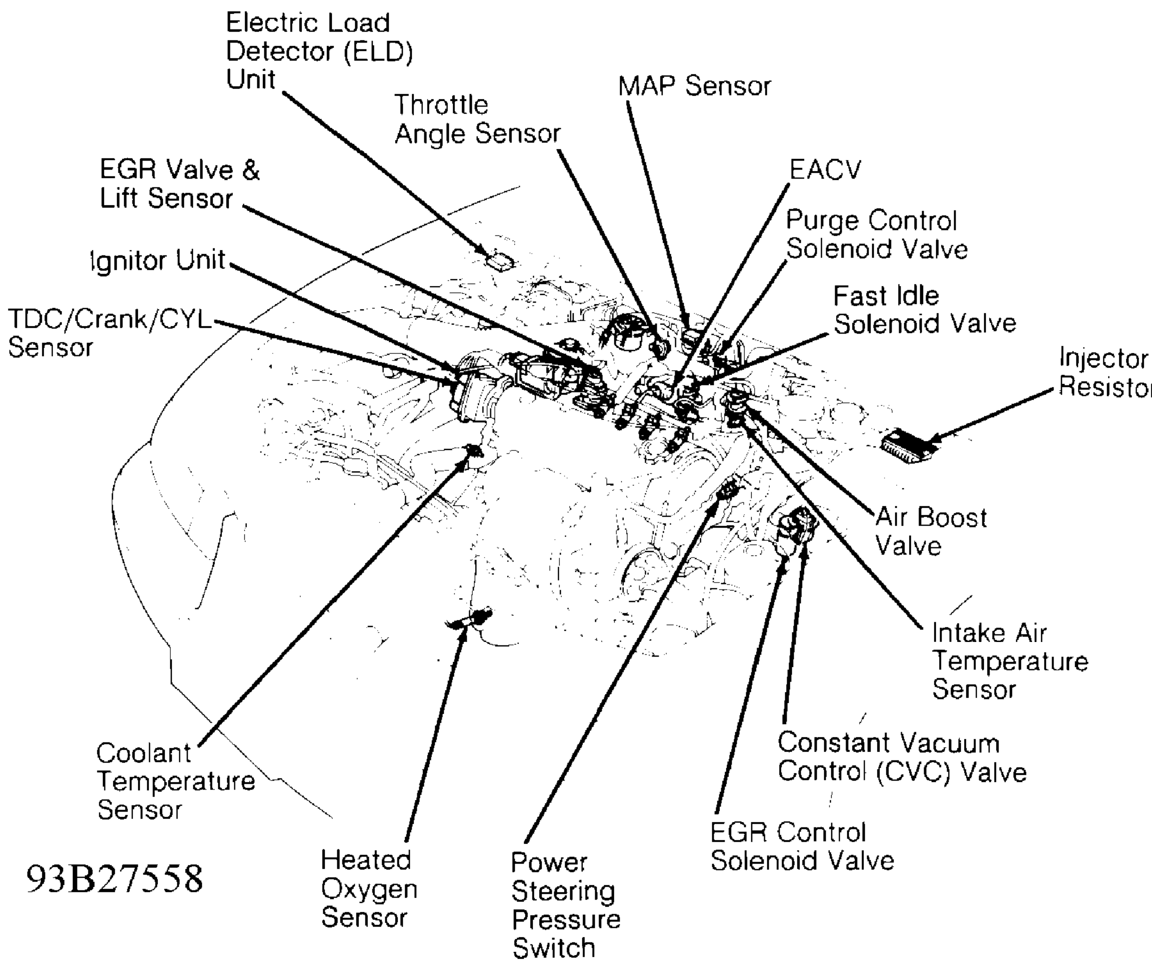
chamber.



2.2L SOHC

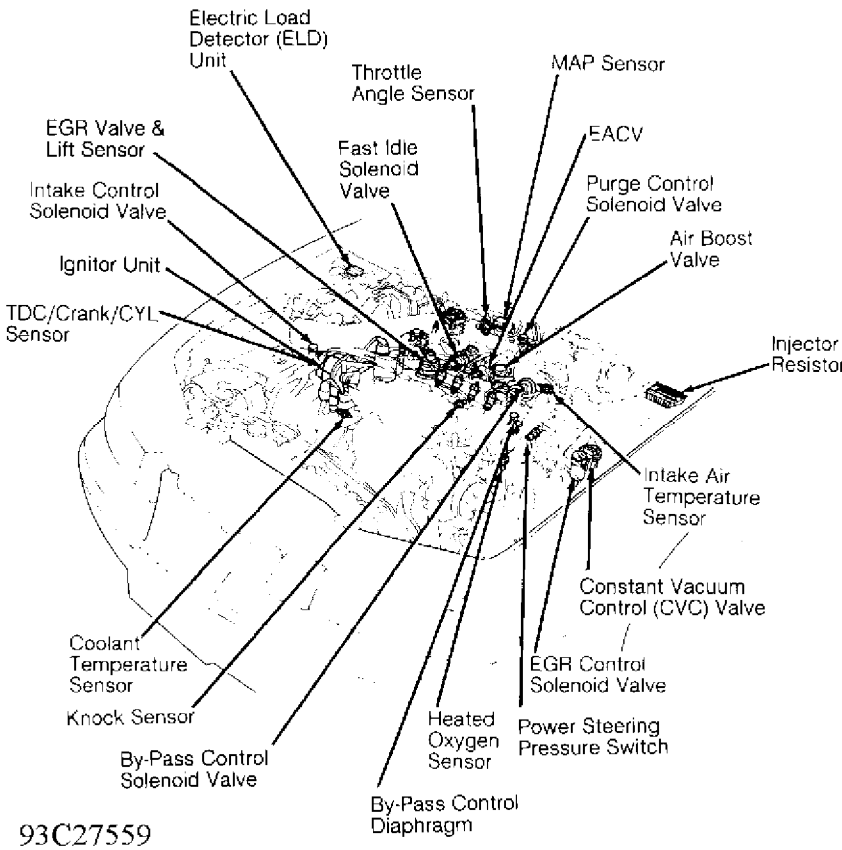
2.2L SOHC	On top of engine, on intake chamber.

Fast Idle Solenoid Valve



2.3L DOHC

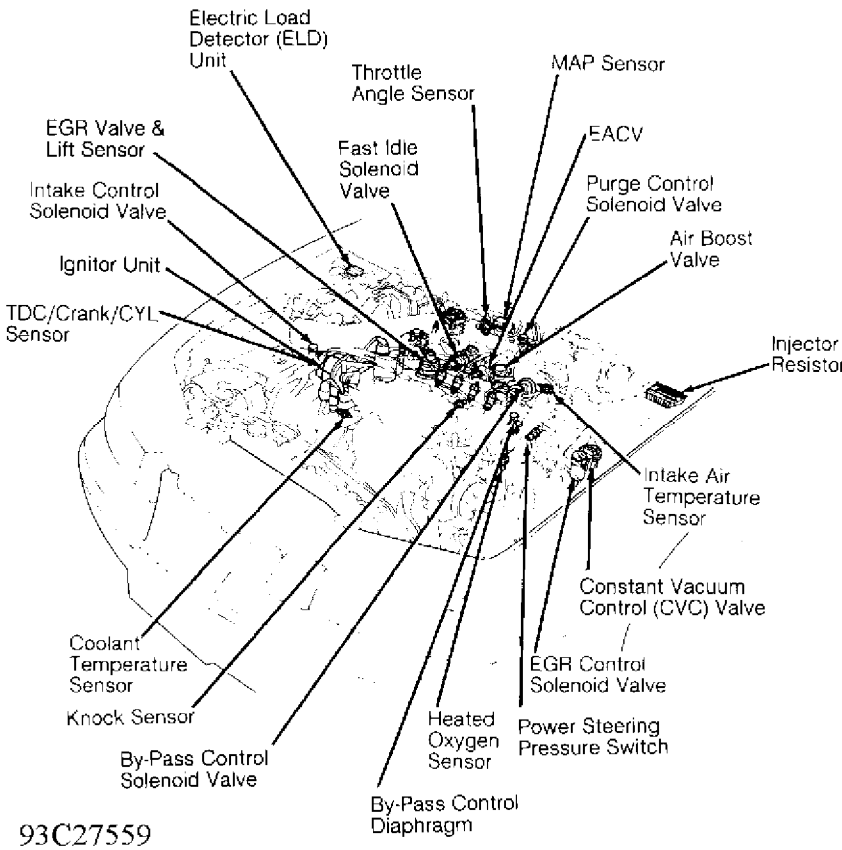
2.3L DOHC **On intake chamber, on left side of engine.**



2.2L SOHC

2.2L SOHC

On intake chamber, on left side of engine.

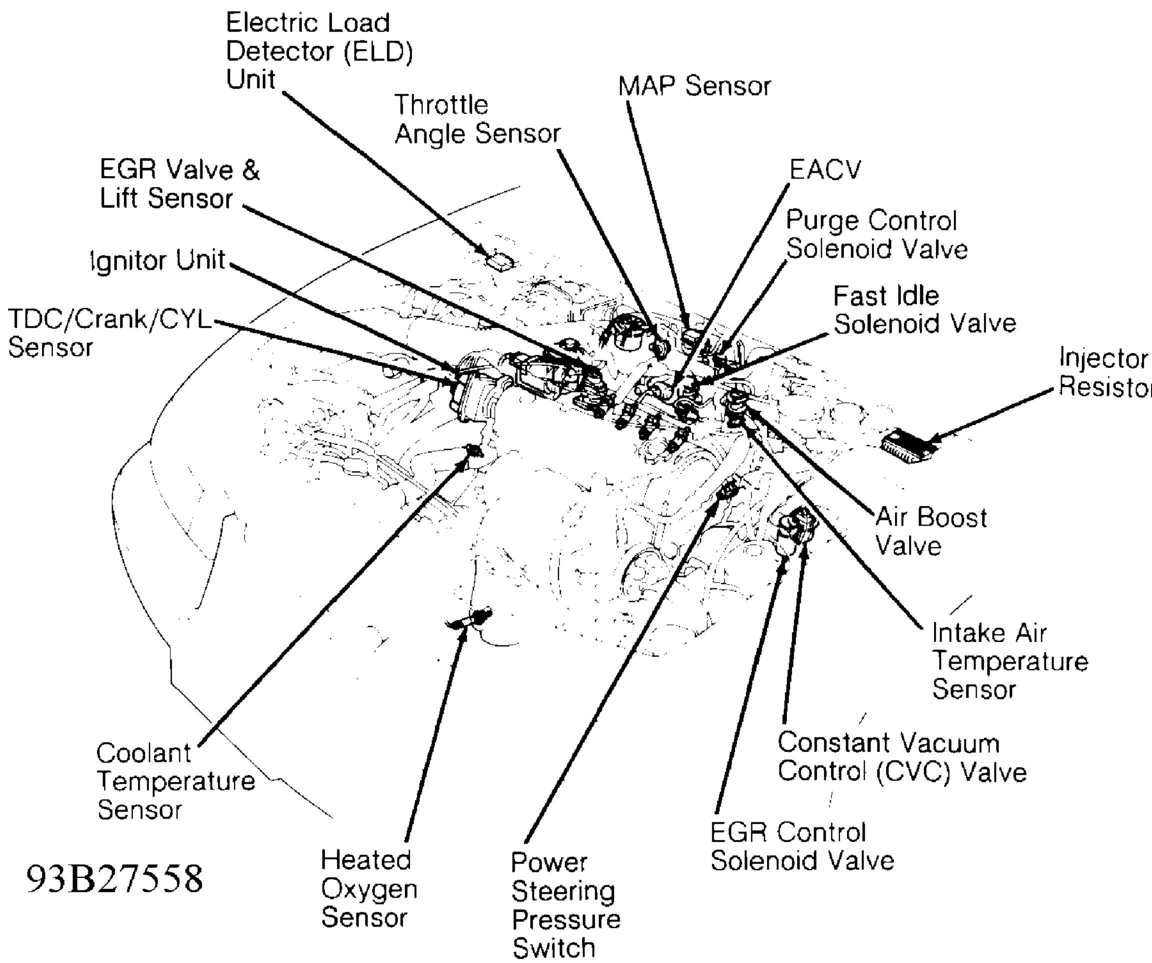


2.2L SOHC

Intake Control Solenoid Valve — **On right side of engine compartment, behind battery**

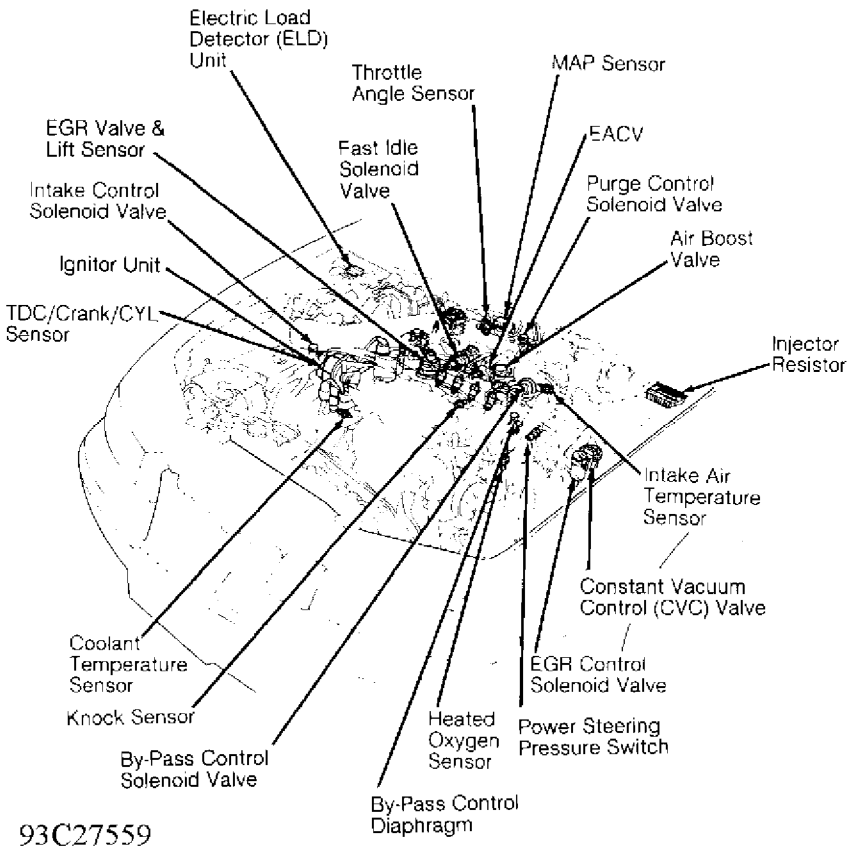
Key Interlock Solenoid — **On steering column lock assembly.**

Purge Control Solenoid Valve



2.3L DOHC

2.3L DOHC **On center of firewall.**



2.2L SOHC

2.2L SOHC	On center of firewall.
Shift Lock Solenoid	Under floor console, right of gear selector lever.

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SWITCHES

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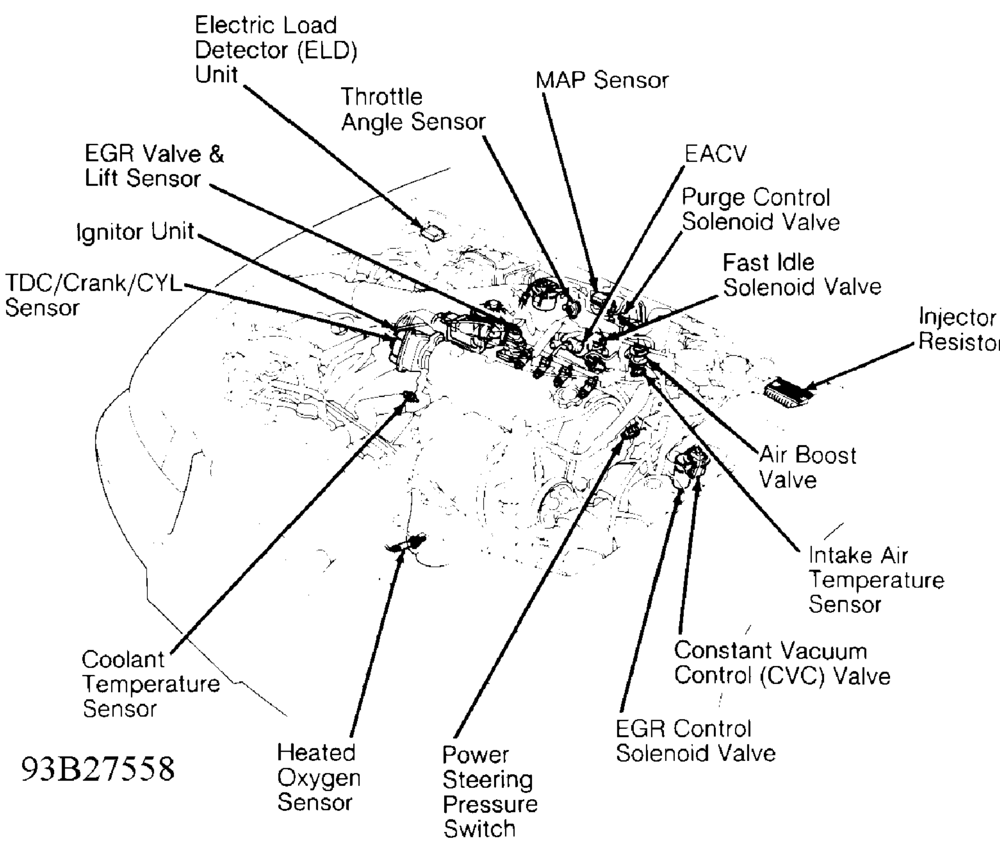
Component	Component Location
ABS Pressure Switch	On ABS motor assembly.
A/C Dual-Pressure Switch	On A/C line, on receiver drier.
A/C Thermostat Switch	Behind right side of dash.
Back-Up Light Switch (M/T)	On top right side of transmission.
Brake Fluid Level Switch	On brake fluid reservoir cap.

Brakelight Switch	**On top of brake pedal support.**
Clutch Interlock Switch	**On top of clutch pedal support.**
Clutch Switch	**On top of clutch pedal support.**
Coolant Temperature Switch	**On thermostat housing.**
Key Interlock Switch	**On steering lock assembly.**
Oil Pressure Switch	**Below oil filter.**
Parking Brake Switch	**Under floor console, bottom of parking brake lever.**

Power Steering Pressure Switch



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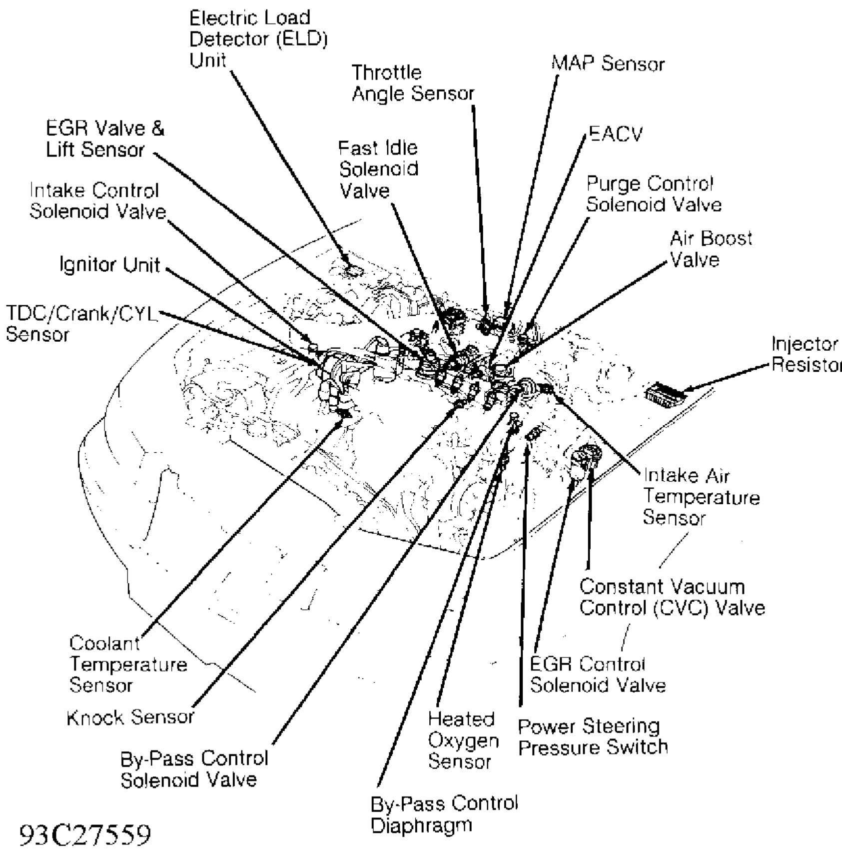
2.3L DOHC

2.3L DOHC	**On bottom left side of engine.**



2.2L SOHC

2.2L SOHC	On bottom left side of engine.
Seat Belt Switch	In driver's seat belt buckle assembly.
Shift Position Switch	Under floor console, left of gear selector lever.

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MISCELLANEOUS

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Component	Component Location

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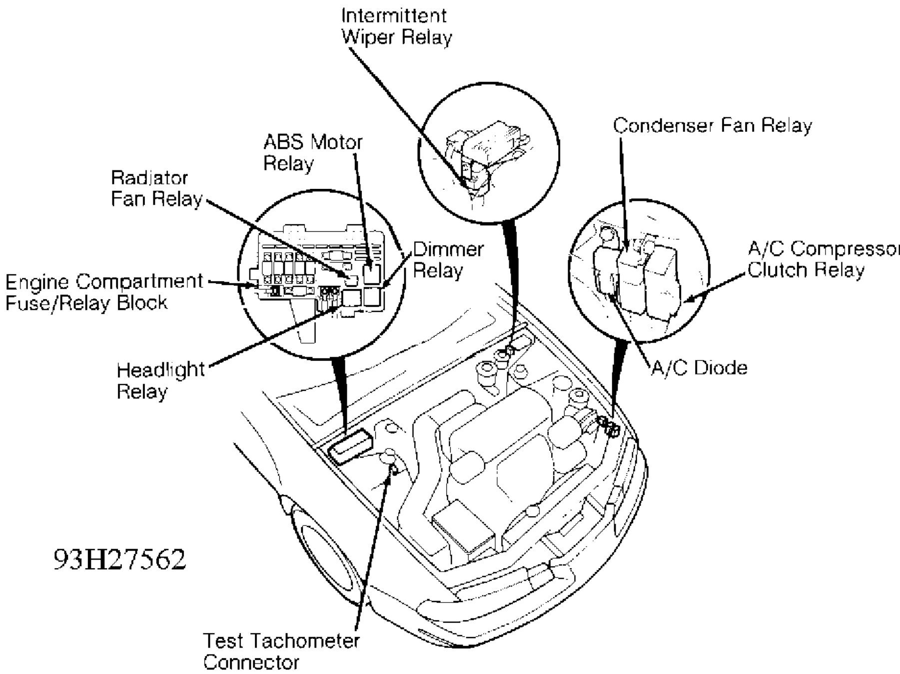
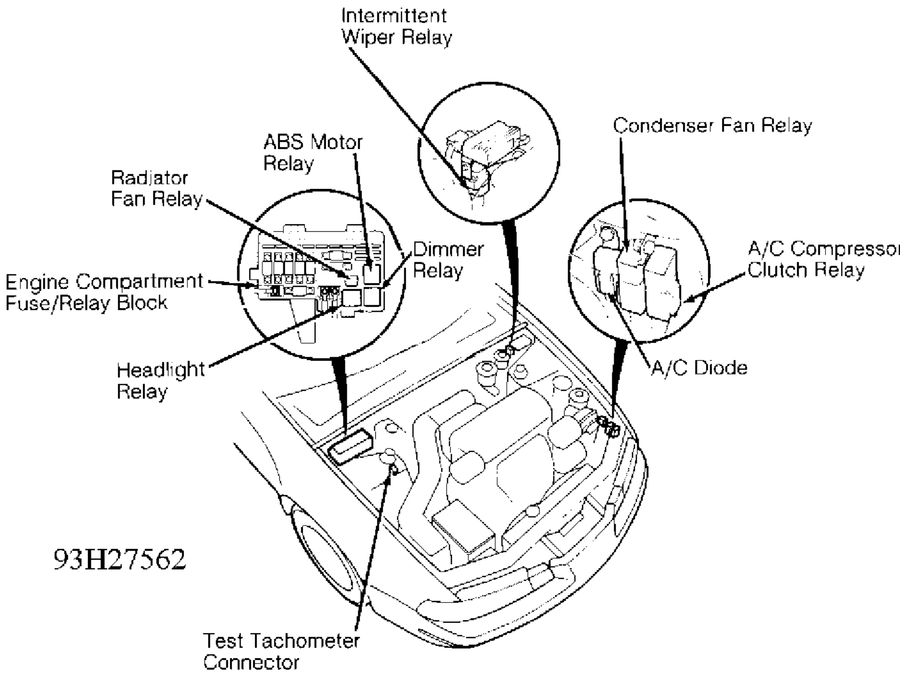


A/C Diode

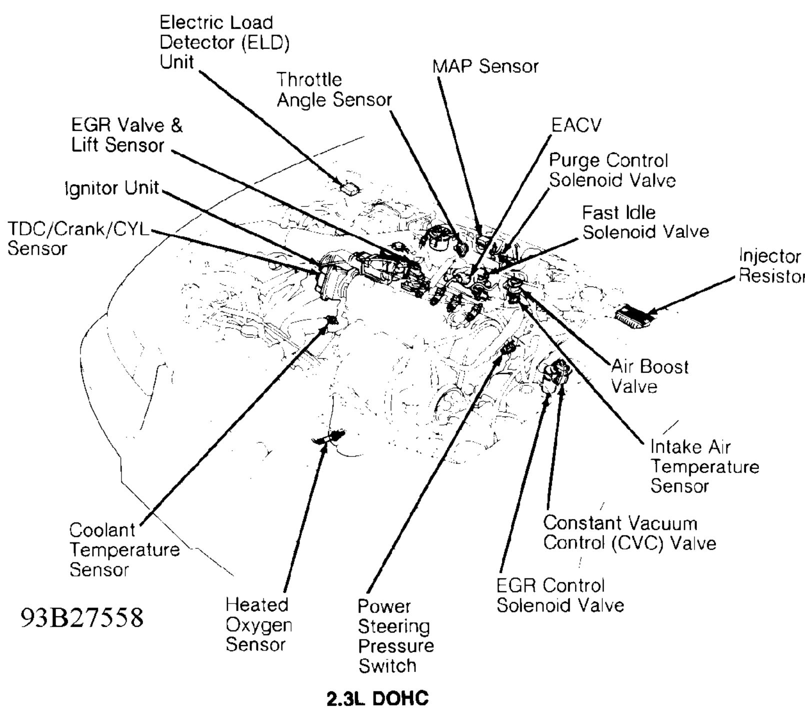
On left front inner fender panel, behind headlight.

Blower Resistor	**On blower housing, behind right side of dash.**
Diagnostic Test Connectors	
ABS	**Under passenger's seat.**
Data Link Connector	**Behind center console.**
Service Check Connector	**Behind center console.**



Test Tachometer | On right strut tower.

Injector Resistor



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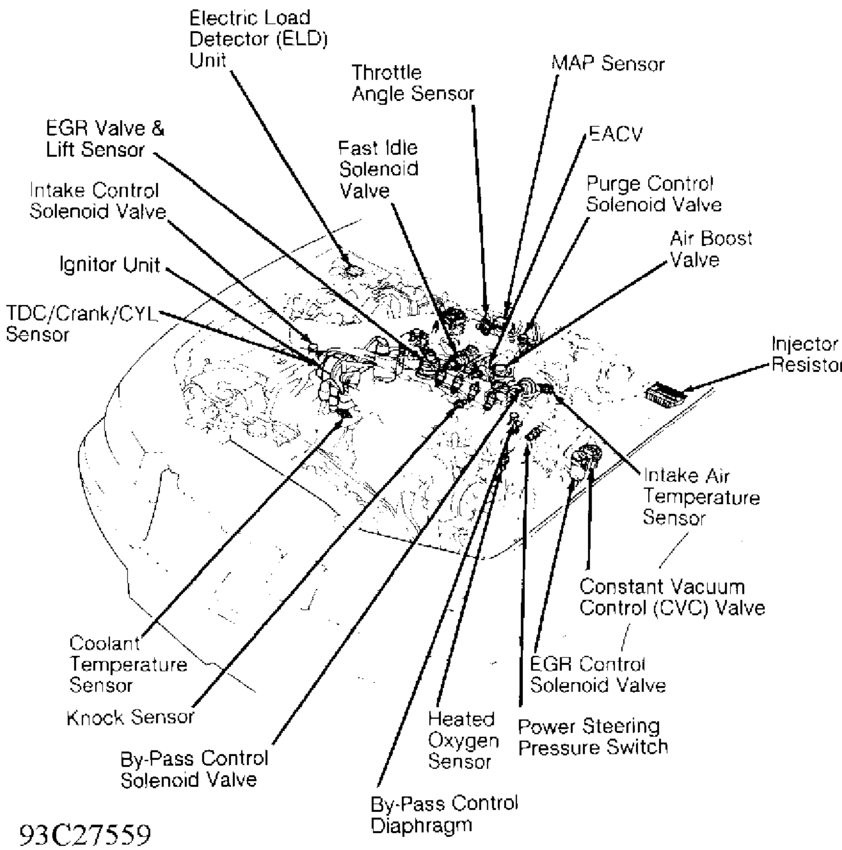
2.3L DOHC | On rear corner of engine compartment.



2.2L SOHC

2.2L SOHC	On rear corner of engine compartment.
Radio Noise Condenser	On right rear of engine compartment, on ignition coil.

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END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION
Electrostatic Discharge (ESD) Warning - Basic Information

All Makes amd Models

* PLEASE READ THIS FIRST *

NOTE: This article is intended for general information purposes only.

INTRODUCTION

All Electrostatic Discharge (ESD) sensitive components contain solid state circuits (transistors, diodes, semiconductors) that may become damaged when contacted with an electrostatic charge. The following information applies to all ESD sensitive devices. The ESD symbol shown in Fig. 1 may be used on schematics to indicate which components are ESD sensitive. See Fig. 1. Although different manufactures may display different symbols to represent ESD sensitive devices, the handling and measuring precautions and procedures are the same.

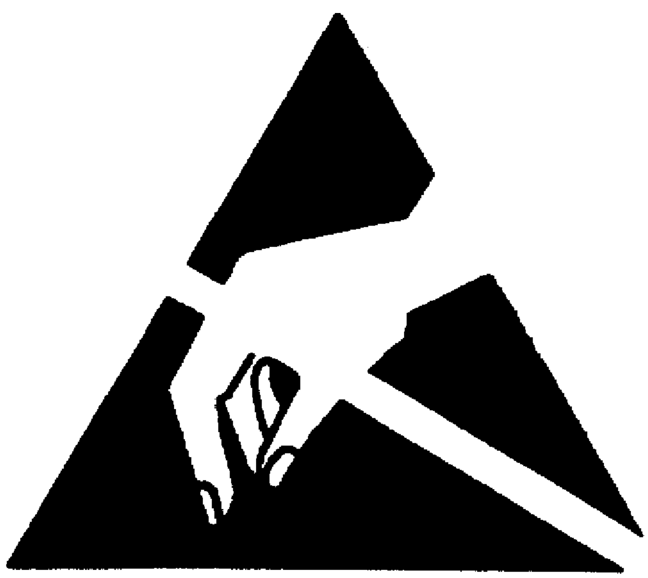

Fig. 1: Sample ESD Symbol

HANDLING STATIC-SENSITIVE CIRCUITS/DEVICES

When handling an electronic part that is ESD sensitive, the technician should follow these guidelines to reduce any possible electrostatic charge build-up on the technician's body and the electronic part.

1) Always touch a known good ground source before handling the part. This should be repeated while handling the part and more frequently after sitting down from a standing position, sliding across the seat or walking a distance.
2) Avoid touching electrical terminals of the part, unless instructed by a diagnostic procedure.
3) DO NOT open the package of a new part until it is time to install the part.
4) Before removing the part from its package, ground the package to a known good ground source.

CHECKING STATIC-SENSITIVE CIRCUITS/DEVICES

1) Solid State circuits in electronic devices are shown greatly simplified in schematics. See Fig. 2. Due to the simplification of the electronic devices on the schematic, resistance measurements could be misleading or could lead to an electrostatic discharge. Always follow the recommended diagnostic procedure.

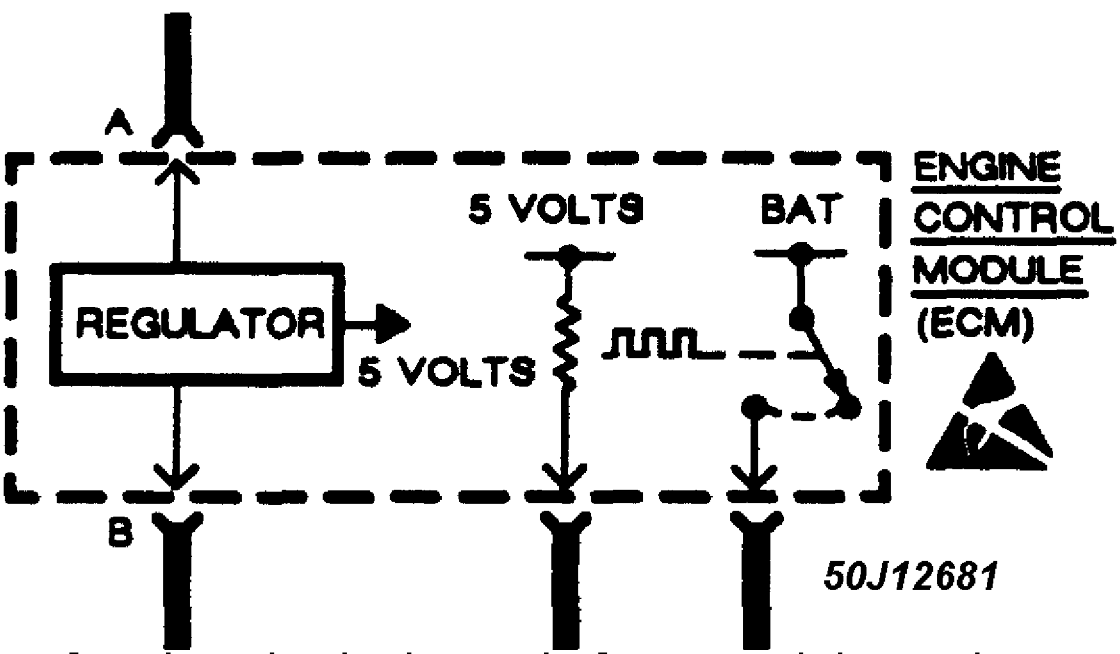

Fig. 2: Sample Schematic Showing Typical ESD Sensitive Device

2) Only measure resistance at the terminals of the devices when instructed by the recommended diagnostic procedure.
3) When using a voltmeter, be sure to connect the ground lead first.

END OF ARTICLE

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ARTICLE BEGINNING

1983-98 GENERAL INFORMATION
Emission Control Visual Inspection Procedures

All Models

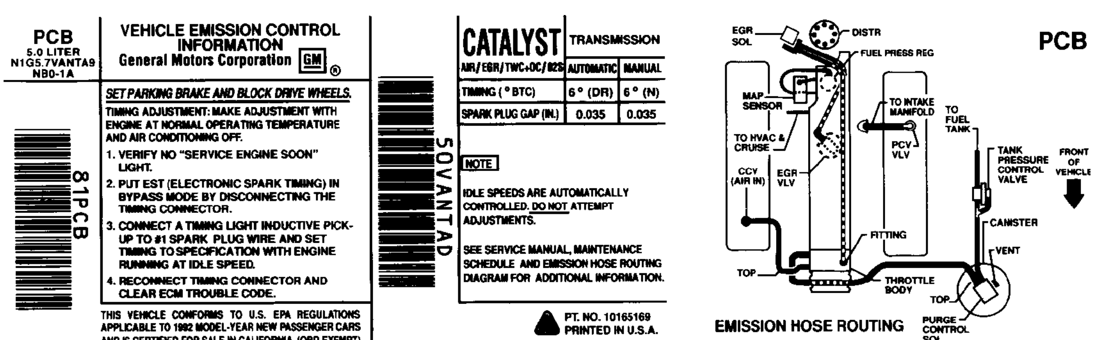
* PLEASE READ THIS FIRST *

This article is provided for general information only. Not all information applies to all makes and models. For more complete information, see appropriate article(s) in the ENGINE PERFORMANCE Section.

EMISSION CONTROL LABELS

The vehicle manufacturer's emission control label, also known as the underhood tune-up label or Vehicle's Underhood Emission Control System (VECI) label, is located in the engine compartment. Information regarding year model of vehicle, engine size, number of cylinders, emission equipment or type, engine tune-up specifications, whether vehicle was manufactured for sale in California or is a Federal vehicle, vacuum hose routing schematic, etc., can be found on this label. See Fig. 1.

In addition to the VECI label, some emission control inspection and maintenance programs may require an additional label to be affixed to the vehicle in special circumstances. For example, in California, a Bureau Of Automotive Repair (BAR) engine label may be affixed to the left door post. A BAR engine label is only used when the vehicle has an engine change, approved modification or is a Specially Constructed (SPCN) or an acceptable Gray market vehicle. Check your state's emission control inspection and maintenance laws to determine if a similar label is used.



93D04127

Fig. 1: Typical Emission Control Label
Courtesy of General Motors Corp.

EMISSION CONTROL VISUAL INSPECTION

* PLEASE READ THIS FIRST *

NOTE: The following emission control visual inspection procedures should be used as a guide only. When performing a visual inspection, always follow your state's recommended inspection procedures.

A visual inspection is made to determine if any required emission control devices are missing, modified or disconnected. Missing, modified or disconnected systems must be made fully operational before a vehicle can be certified.

POSITIVE CRANKCASE VENTILATION (PCV)

PCV controls the flow of crankcase fumes into the intake manifold while preventing gases and flames from traveling in the opposite direction. PCV is either an open or closed system. See Fig. 2 .

Ensure PCV system is installed as required. Verify valve, required hoses, connections, flame arresters, etc., are present, routed properly and in serviceable condition.

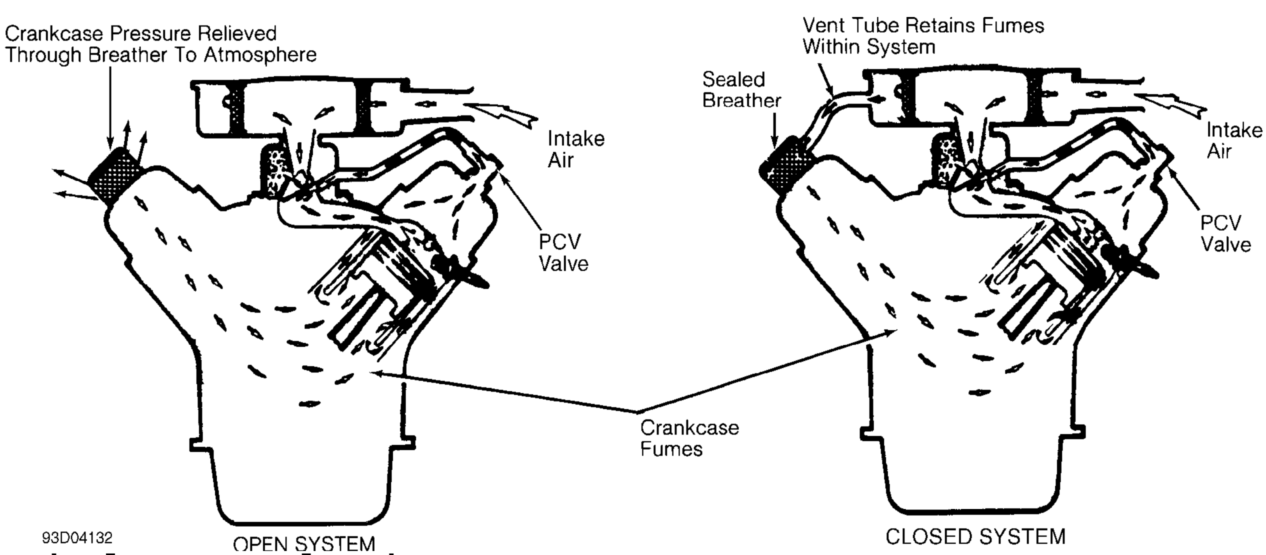


Fig. 2: Typical Open & Closed Type PCV System

THERMOSTATIC AIR CLEANER (TAC)

The TAC supplies warm air to air intake during cold engine operation. This system is active during cold engine warm-up only. Under all other operating conditions, air cleaner function is the same as any non-thermostatic unit.

Ensure required exhaust shroud, hot air duct, vacuum hoses and air cleaner components are present and installed properly. See Fig. 3. Ensure any required thermostatic vacuum switches are in place and vacuum hoses are installed and in serviceable condition. Also ensure air cleaner lid is installed right side up. Check for oversized air filter elements and for additional holes in the air cleaner housing.

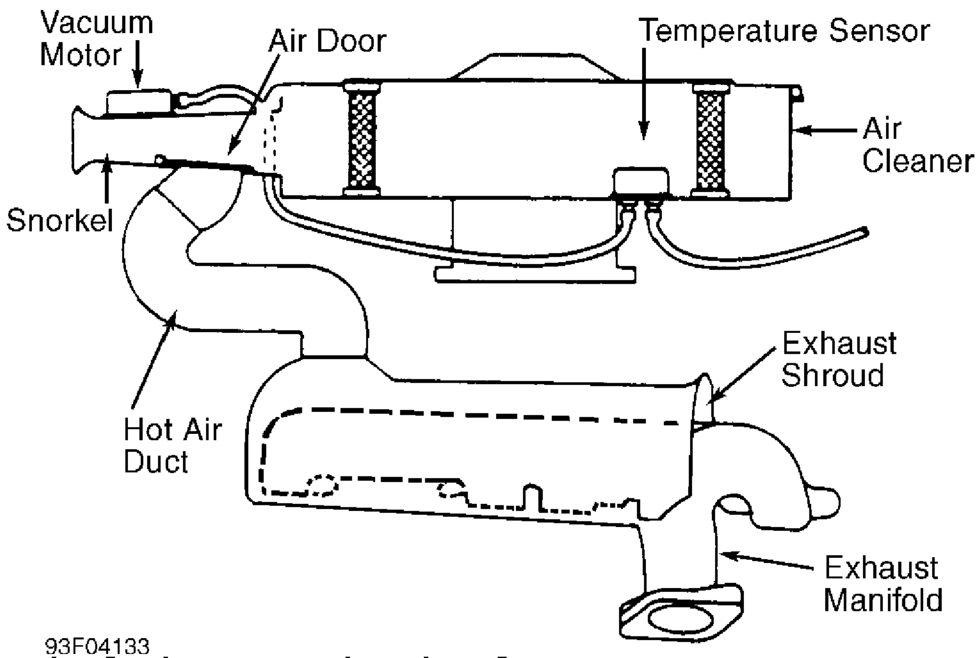


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Fig. 3: Typical Thermostatic Air Cleaner System

FUEL EVAPORATIVE SYSTEM (EVAP)

The EVAP system allows for proper fuel system ventilation while preventing fuel vapors from reaching the atmosphere. This means that vapors must be caught and stored while the engine is off, which is when most fuel evaporation occurs. When the engine is started, these fuel vapors can be removed from storage and burned. In most systems, storage is provided by an activated charcoal (or carbon) canister. See Fig. 4. On a few early systems, charcoal canisters are not used. Instead, fuel vapors are vented into the PCV system and stored inside the crankcase.

The main components of a fuel evaporation system are a sealed fuel tank, a liquid-vapor separator and vent lines to a vapor-storing canister filled with activated charcoal. The filler cap is normally not vented to the atmosphere, but is fitted with a valve to allow both pressure and vacuum relief.

Although a few variations do exist between manufacturers, basic operation is the same for all systems. Check for presence of vapor storage canister or cra

Ensure required hoses, solenoids, etc., are present and connected properly. Check for proper type fuel tank cap. Check for any non-OEM or auxiliary fuel tanks for compliance and the required number of evaporation canisters.

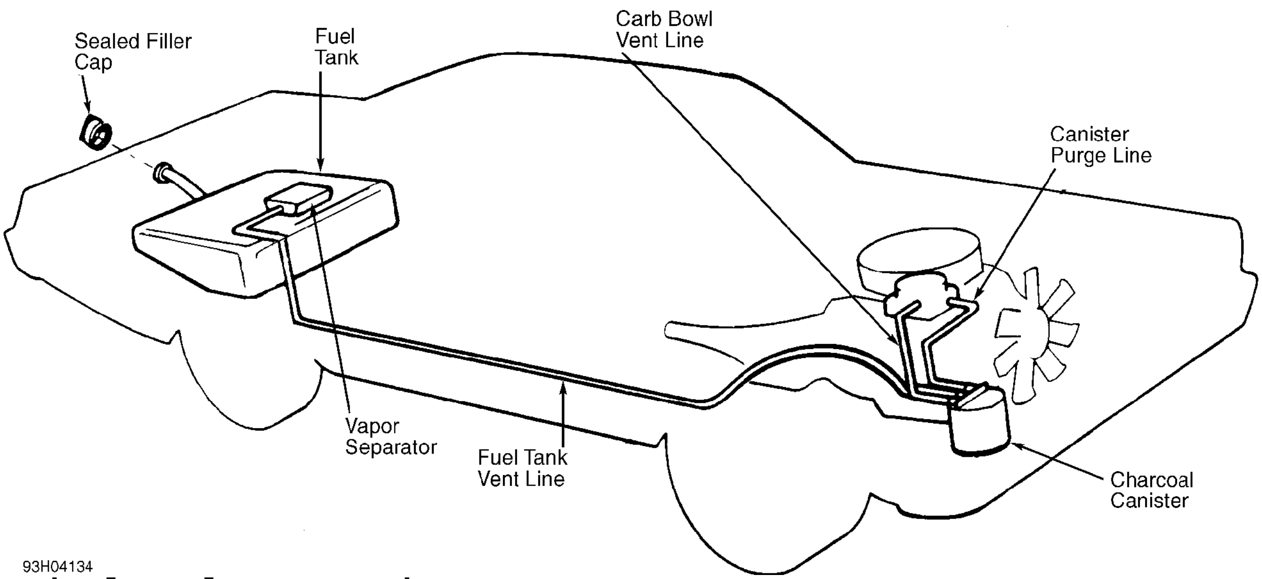

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Fig. 4: Typical Fuel Evaporative System

CATALYTIC CONVERTERS

Oxidation Catalyst (OC)

This type of converter is the most common. It may use pellets or monolith medium, depending upon application. SeeFig. 5. Platinum and palladium (or platinum alone) are used as catalyst in this type of converter.

Visually check for presence of catalytic converter(s). Check for external damage such as severe dents, removed or damaged heat shields, etc. Also check for pellets or pieces of converter in the tailpipe.

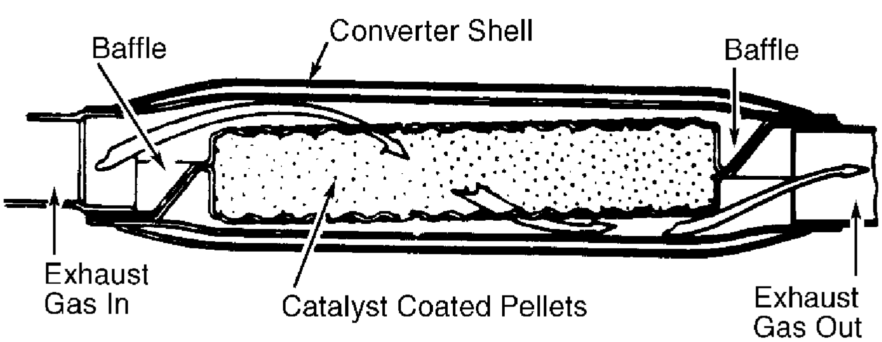

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Fig. 5: Typical Oxidation Catalytic Converter (Pellet Type) Shown; Typical Three-Way Catalytic Converter Is Similar
Courtesy of General Motors Corp.

Three-Way Catalyst (TWC)

This type of converter is nearly identical to a conventional converter with the exception of the catalyst. SeeFig. 5. The TWC converter uses rhodium, with or without platinum, as its catalyst. Rhodium helps reduce NOx emissions, as well as HC and CO.

Visually check for presence of catalytic converter(s). Also check for presence of any required air supply system for the oxidizing section of the converter. Check for external damage such as severe dents, removed or damaged heat shields, etc. Check for pellets or pieces of converter in the tailpipe.

Three-Way Catalyst + Oxidation Catalyst (TWC + OC)

This system contains a TWC converter and an OC converter in a common housing, separated by a small air space. SeeFig. 6. The 2 catalysts are referred to as catalyst beds. Exhaust gases pass through the TWC first. The TWC bed performs the same function as it would as a separate device, reducing all 3 emissions. As exhaust gases leave the bed, they pass through the air space and into the second (OC) converter catalyst bed.

Visually check for presence of catalytic converter(s). Check for external damage such as severe dents, removed or damaged heat shields, etc. Check for pellets or pieces of converter in the tailpipe.

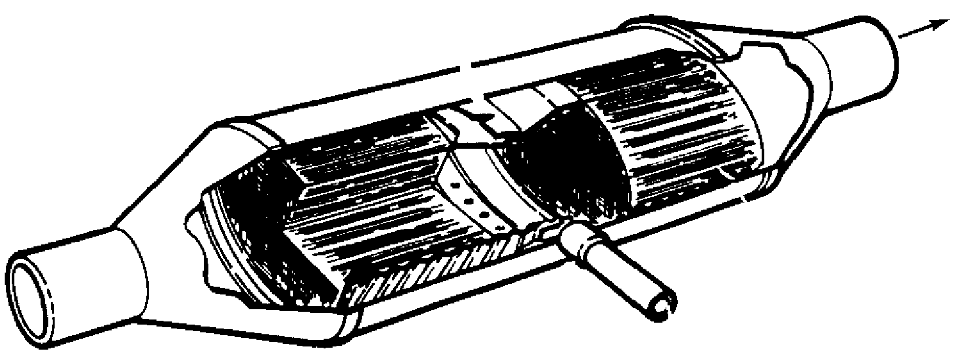

Fig. 6: Typical Three-Way + Oxidation Catalytic Converter
Courtesy of General Motors Corp.

FILL PIPE RESTRICTOR (FR)

A fuel tank fill pipe restrictor is used to prohibit the introduction of leaded fuel into the fuel tank. Unleaded gasoline pump dispensers have a smaller diameter nozzle to fit fuel tank of vehicle requiring the use of unleaded fuel (vehicles equipped with catalytic converter).

Visually inspect fill pipe restrictor(s) for tampering, i.e., restrictor is oversize or the flapper is non-functional. If vehicle is equipped with an auxiliary fuel tank, ensure auxiliary fuel tank is also equipped with a fill pipe restrictor.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

Single Diaphragm EGR Valve

This type uses a single diaphragm connected to the valve by a shaft. Diaphragm is spring-loaded to keep valve closed in the absence of vacuum. As throttle valves open and engine speed increases, vacuum is applied to the EGR vacuum diaphragm, opening the EGR valve. This vacuum signal comes from a ported vacuum source. Variations in the vacuum signal control the amount of exhaust gas that is recirculated. See Fig. 7.

Verify EGR valve is present and not modified or purposely damaged. Ensure thermal vacuum switches, pressure transducers, speed switches, etc., (if applicable) are not by-passed or modified. Ensure vacuum hose(s) to EGR valve is not plugged.

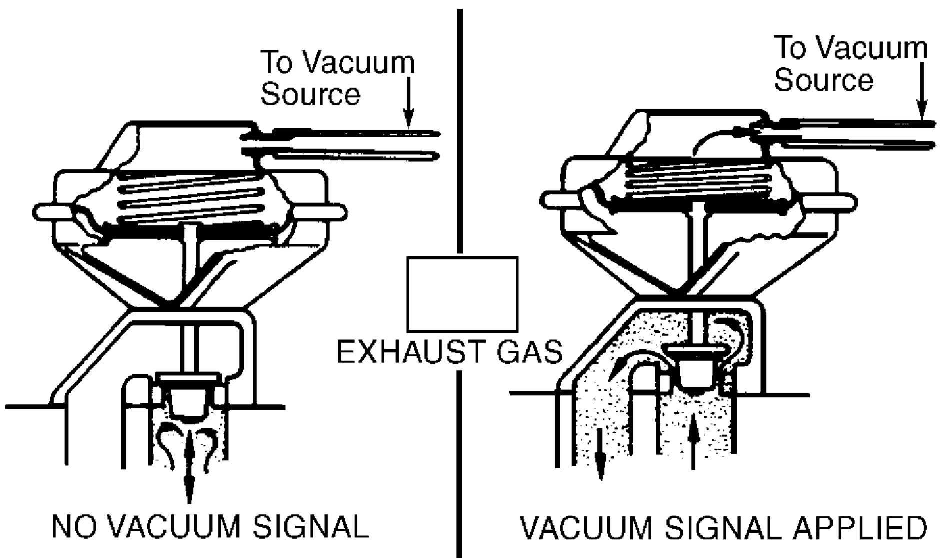

Fig. 7: Typical Single Diaphragm EGR Valve
Courtesy of General Motors Corp.

Dual Diaphragm EGR Valve

This type uses 2 diaphragms with different effective areas and 2 vacuum sources. Although similar to the single diaphragm type, the second diaphragm is added below the upper diaphragm and is rigidly attached to the valve seat. See Fig. 8. These diaphragms form a vacuum chamber which is connected to manifold vacuum.

During highway cruising when manifold vacuum is high in the center chamber, manifold vacuum tends to pull the valve closed.

However, the vacuum signal applied to the top side of the upper diaphragm overcomes the downward spring force and the manifold vacuum pull, due to the diaphragm's larger piston. This regulates the amount of EGR.

When manifold vacuum is low during acceleration, the higher vacuum signal opens the valve, permitting more EGR. When manifold vacuum is high during highway cruising, the valve is only partially opened, reducing the amount of EGR.

Verify EGR valve is present and not modified or purposely damaged. Ensure thermal vacuum switches, pressure transducers, speed switches, etc., (if applicable) are not by-passed or modified. Ensure vacuum hose(s) to EGR valve is not plugged.

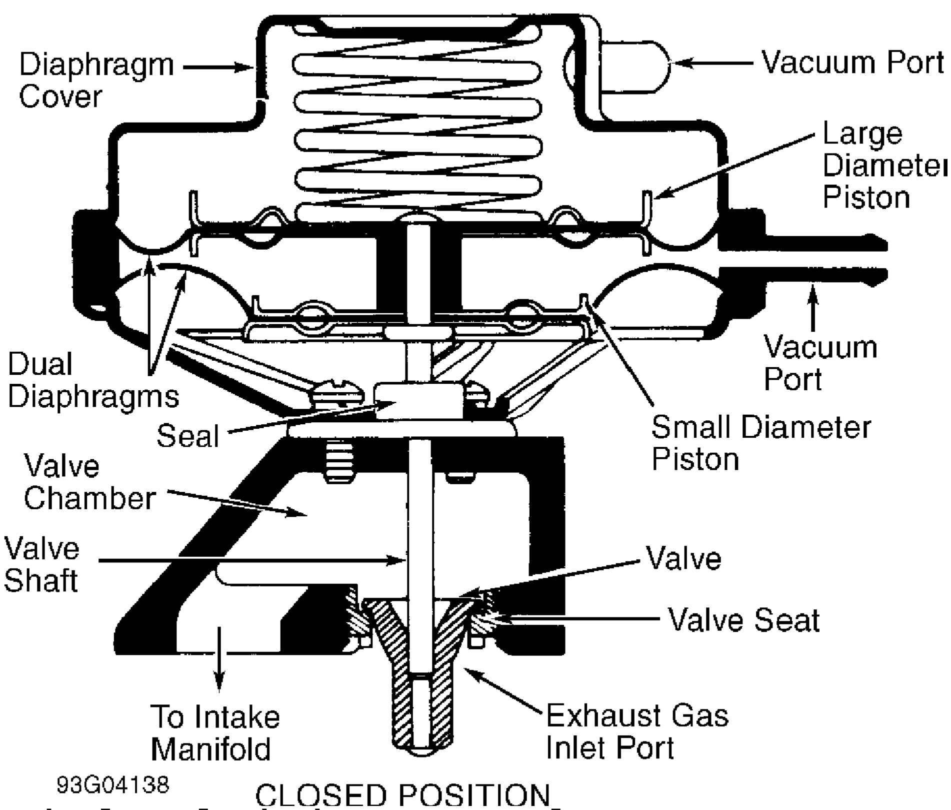

Fig. 8: Typical Dual Diaphragm EGR Valve
Courtesy of General Motors Corp.

Positive Backpressure EGR (BP/EGR) Valve

This type uses both engine vacuum and exhaust backpressure to control the amount of EGR. It provides more recirculation during heavy engine loads than the single diaphragm EGR valve.

A small diaphragm-controlled valve inside EGR valve acts as a pressure regulator. The control valve gets an exhaust backpressure signal through the hollow valve shaft. This exhaust backpressure exerts a force on bottom of control valve diaphragm. The diaphragm plate contains 6 bleed holes to bleed air into the vacuum chamber when backpressure valve is in open position. See Fig. 9.

Verify EGR valve is present and not modified or purposely damaged. Ensure thermal vacuum switches, pressure transducers, speed switches, etc., (if applicable) are not by-passed or modified. Ensure vacuum hose(s) to EGR valve is not plugged.

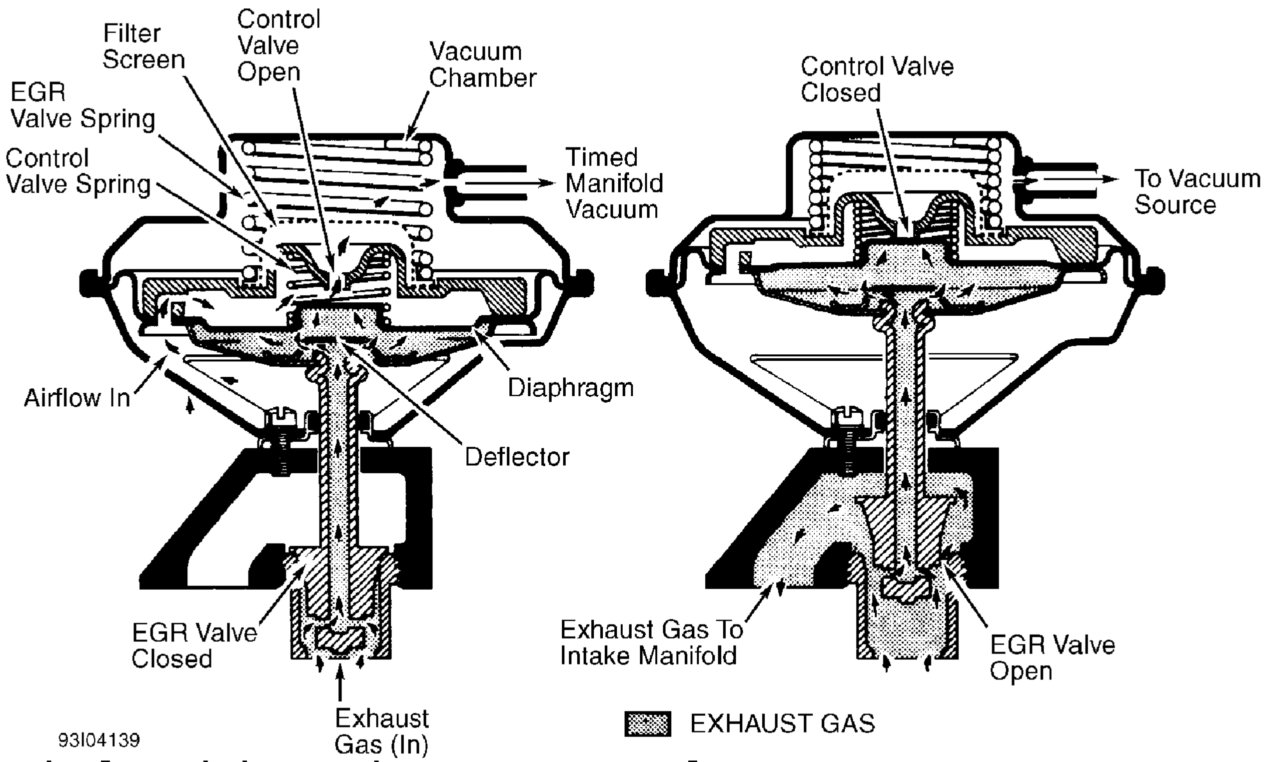

Fig. 9: Typical Positive Backpressure EGR Valve
Courtesy of General Motors Corp.

Negative Backpressure EGR (BP/EGR) Valve

This type has the same function as the positive BP/EGR valve except valve is designed to open with a negative exhaust backpressure. The control valve spring in the transducer is placed on the bottom side of the diaphragm. See Fig. 10.

When ported vacuum is applied to the main vacuum chamber, partially opening the valve, the vacuum signal from the manifold side (reduced by exhaust backpressure) is transmitted to the hollow stem of the valve. See Fig. 10. This enables the signal to act on the diaphragm, providing a specific flow. Thus, the EGR flow is a constant percentage of engine airflow.

Verify EGR valve is present and not modified or purposely damaged. Ensure thermal vacuum switches, pressure transducers, speed switches, etc., (if applicable) are not by-passed or modified. Ensure vacuum hose(s) to EGR valve is not plugged.

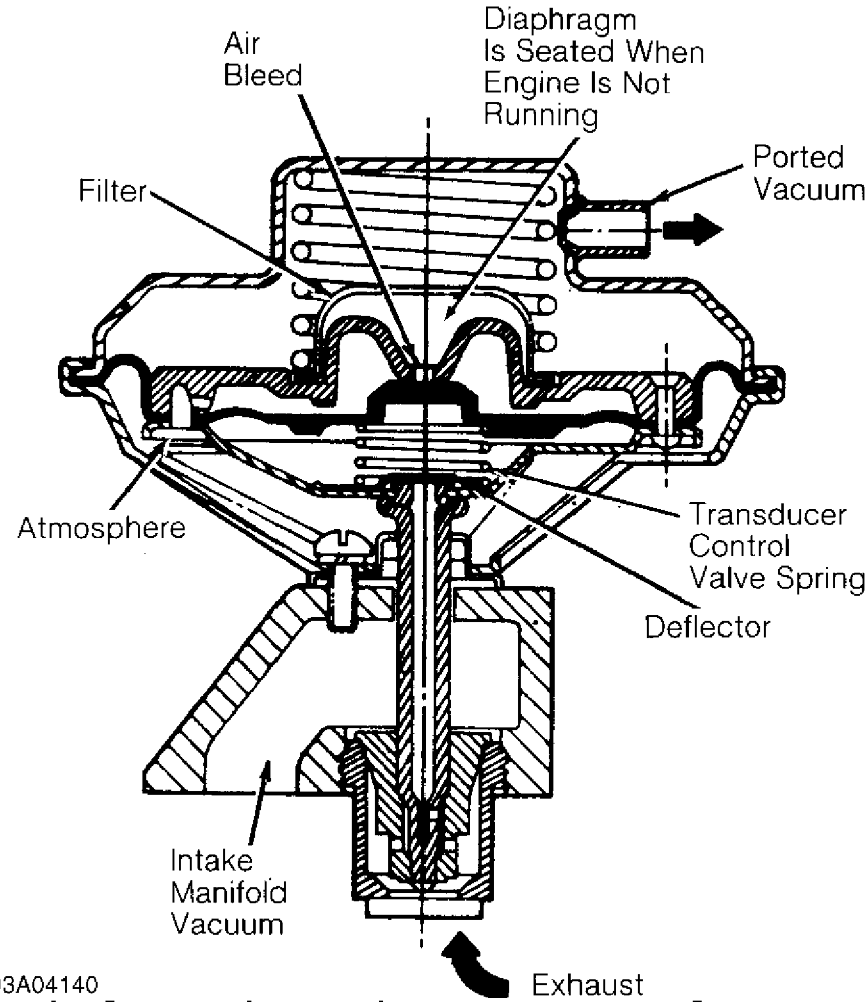

Fig. 10: Typical Negative Backpressure EGR Valve
Courtesy of General Motors Corp.

Digital EGR Valve

The digital EGR valve operates independently of engine manifold vacuum. This valve controls EGR flow through 3 orifices. These 3 orifices are opened and closed by electric solenoids. The solenoids are, in turn, controlled by the Electronic Control Module (ECM). When a solenoid is energized, the armature with attached shaft and swivel pintle is lifted, opening the orifice. SeeFig. 11.

The ECM uses inputs from the Coolant Temperature Sensor (CTS), Throttle Position Sensor (TPS) and Mass Airflow (MAF) sensors to control the EGR orifices to make 7 different combinations for precise EGR flow control. At idle, the EGR valve allows a very small amount of exhaust gas to enter the intake manifold. This EGR valve normally operates above idle speed during warm engine operation.

Verify EGR valve is present and not modified or purposely damaged. Ensure thermal vacuum switches, pressure transducers, speed switches, etc., (if applicable) are not by-passed or modified. Ensure

vacuum hose(s) to EGR valve is not plugged. Ensure electrical connector to EGR valve is not disconnected.

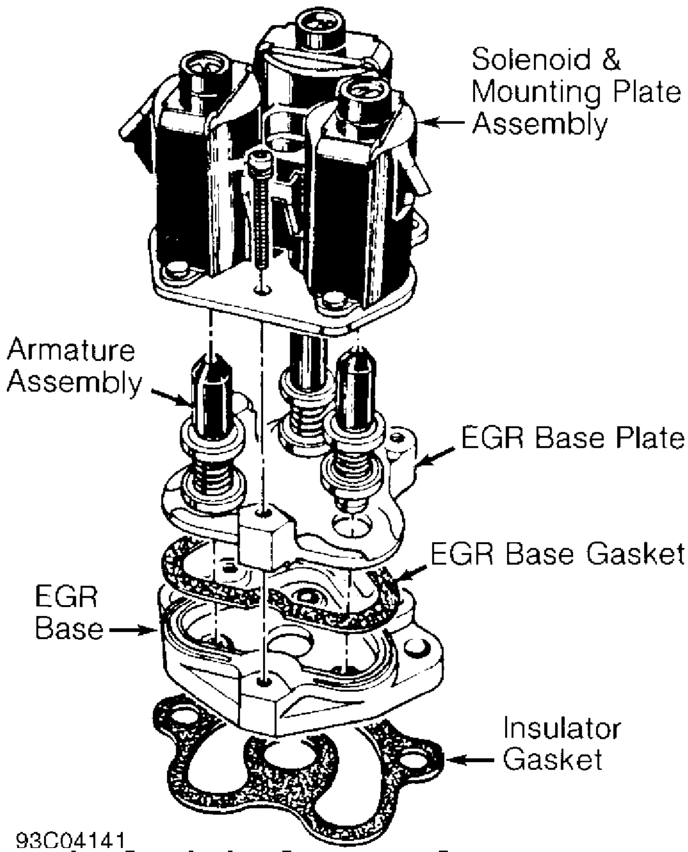

Fig. 11: Typical Digital EGR Valve
Courtesy of General Motors Corp.

Integrated Electronic EGR Valve

This type functions similar to a ported EGR valve with a remote vacuum regulator. The internal solenoid is normally open, which causes the vacuum signal to be vented off to the atmosphere when EGR is not controlled by the Electronic Control Module (ECM). The solenoid valve opens and closes the vacuum signal, controlling the amount of vacuum applied to the diaphragm. See Fig. 12.

The electronic EGR valve contains a voltage regulator, which converts ECM signal and regulates current to the solenoid. The ECM controls EGR flow with a pulse width modulated signal based on airflow, TPS and RPM. This system also contains a pintle position sensor, which works similarly to a TPS sensor. As EGR flow is increased, the sensor output increases.

Verify EGR valve is present and not modified or purposely damaged. Ensure thermal vacuum switches, pressure transducers, speed switches, etc., (if applicable) are not by-passed or modified. Ensure electrical connector to EGR valve is not disconnected.

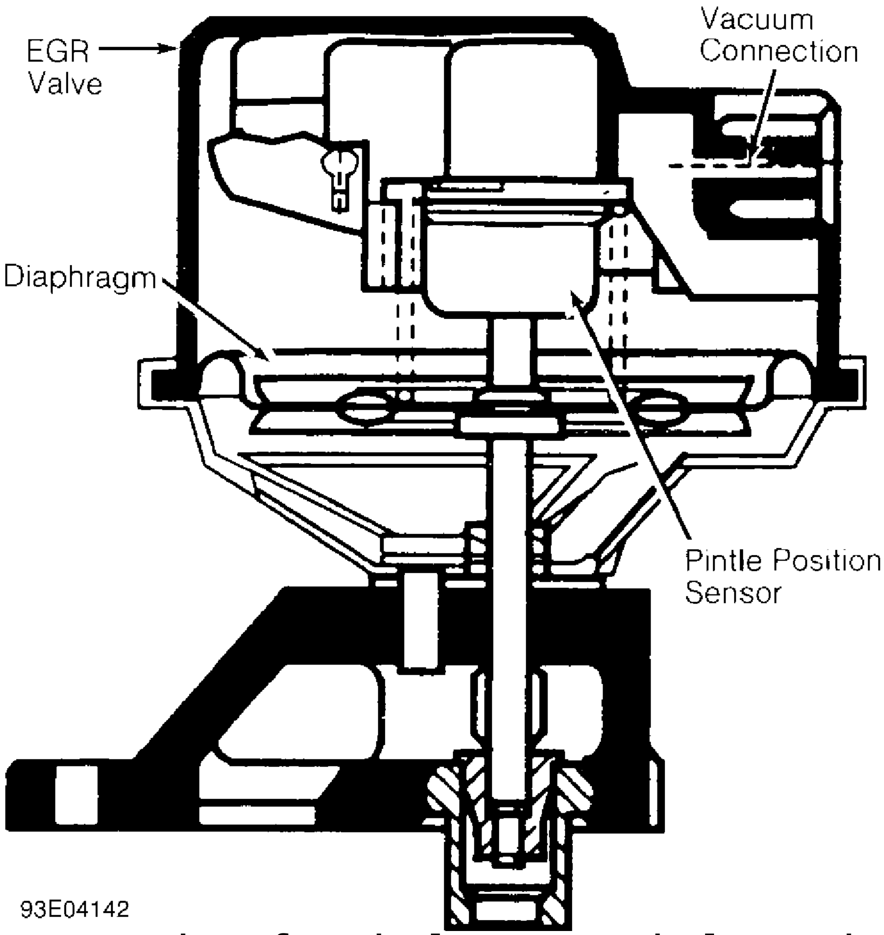

Fig. 12: Cutaway View Of Typical Integrated Electronic EGR Valve
Courtesy of General Motors Corp.

SPARK CONTROLS (SPK)

Spark control systems are designed to ensure the air/fuel mixture is ignited at the best possible moment to provide optimum efficiency and power and cleaner emissions.

Ensure vacuum hoses to the distributor, carburetor, spark delay valves, thermal vacuum switches, etc., are in place and routed properly. On Computerized Engine Controls (CEC), check for presence of required sensors (O2, MAP, CTS, TPS, etc.). Ensure they have not been tampered with or modified.

Check for visible modification or replacement of the feedback carburetor, fuel injection unit or injector(s) with a non-feedback carburetor or fuel injection system. Check for modified emission-related components unacceptable for use on pollution-controlled vehicles.

AIR INJECTION SYSTEM (AIS)

Air Pump Injection System (AP)

The air pump is a belt-driven vane type pump, mounted to engine in combination with other accessories. The air pump itself consists of the pump housing, an inner air cavity, a rotor and a vane assembly. As the vanes turn in the housing, filtered air is drawn in through the intake port and pushed out through the exhaust port. See Fig. 13.

Check for missing or disconnected belt, check valve(s), diverter valve(s), air distribution manifolds, etc. Check air injection system for proper hose routing.

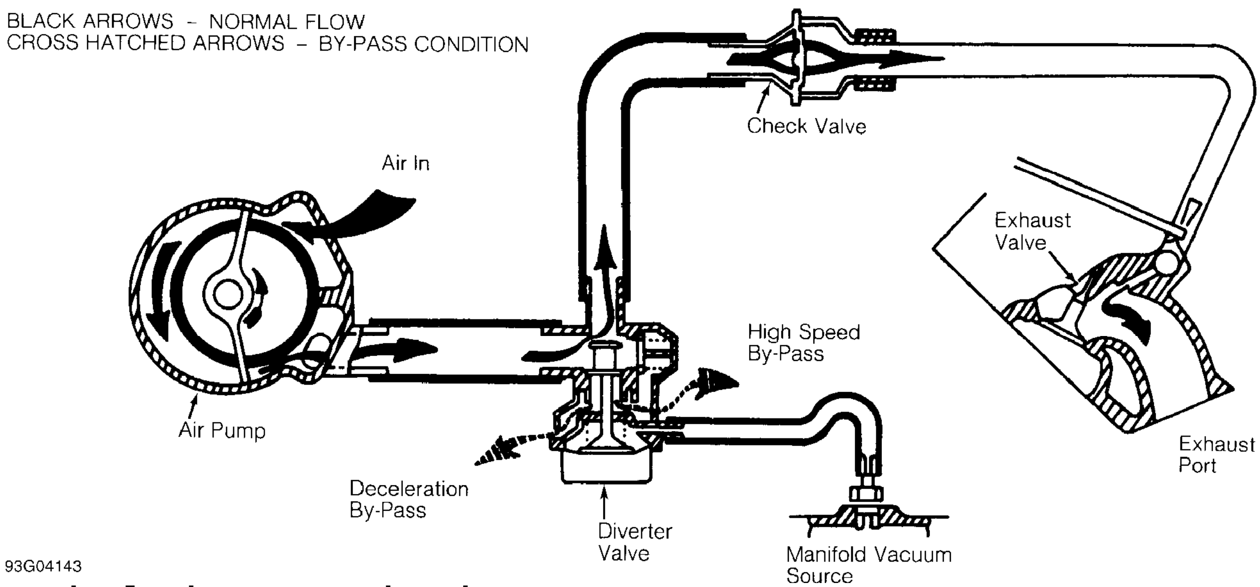

Fig. 13: Typical Air Pump Injection System
Courtesy of General Motors Corp.

Pulsed Secondary Air Injection (PAIR) System

PAIR eliminates the need for an air pump and most of the associated hardware. Most systems consists of air delivery pipe(s), pulse valve(s) and check valve(s). The check valve prevents exhaust gases from entering the air injection system. SeeFig. 14.

Ensure required check valve(s), diverter valve(s), air distribution manifolds, etc., are present. Check air injection system for proper hose routing.

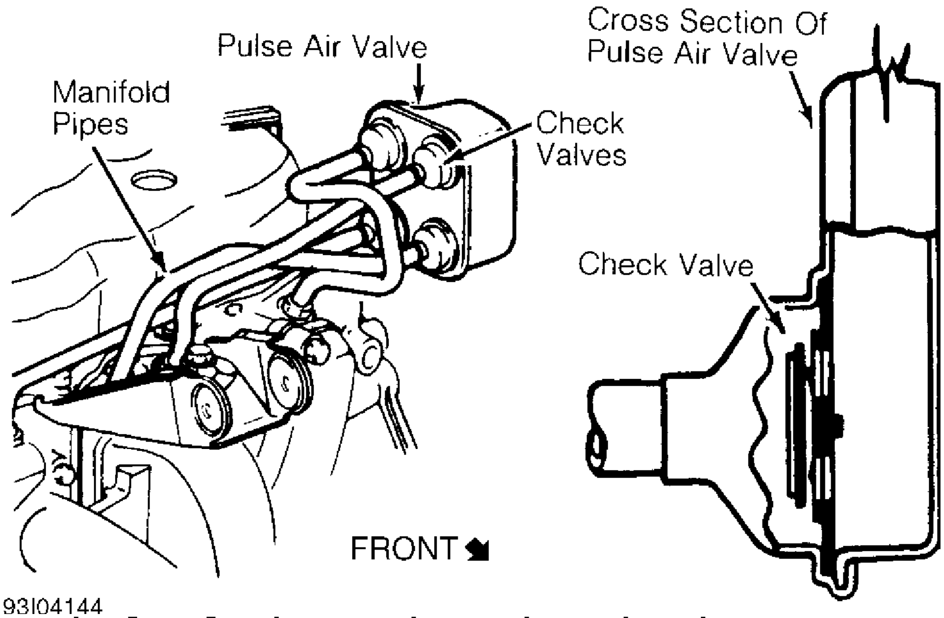

Fig. 14: Typical Pulsed Secondary Air Injection System
Courtesy of General Motors Corp.

OXYGEN SENSOR (O2)

The O2 sensor is mounted in the exhaust system where it monitors oxygen content of exhaust gases. Some vehicles may use 2 O2 sensors. The O2 sensor produces a voltage signal which is proportional to exhaust gas oxygen concentration (0-3%) compared to outside oxygen (20-21%). This voltage signal is low (about .1 volt) when a lean mixture is present and high (1.0 volt) when a rich mixture is present.

As ECM compensates for a lean or rich condition, this voltage signal constantly fluctuates between high and low, crossing a reference voltage supplied by the ECM on the O2 signal line. This is referred to as cross counts. A problem in the O2 sensor circuit should set a related trouble code.

COMPUTERIZED ENGINE CONTROLS (CEC)

The CEC system monitors and controls a variety of engine/vehicle functions. The CEC system is primarily an emission control system designed to maintain a 14.7:1 air/fuel ratio under most operating conditions. When the ideal air/fuel ratio is maintained, the catalytic converter can control oxides of nitrogen (NOx), hydrocarbon (HC) and carbon monoxide (CO) emissions.

The CEC system consists of the following sub-systems: Electronic Control Module (ECM), input devices (sensors and switches) and output signals.

EARLY FUEL EVAPORATION (EFE)

The EFE valve is actuated by either a vacuum actuator or a bimetal spring (heat-riser type). The EFE valve is closed when engine is cold. The closed valve restricts exhaust gas flow from the exhaust manifold. This forces part of the exhaust gas to flow up through a passage below the carburetor. As the exhaust gas quickly warms the intake mixture, distribution is improved. This results in better cold engine driveability, shorter choke periods and lower emissions.

Ensure EFE valve in exhaust manifold is not frozen or rusted in a fixed position. On vacuum-actuated EFE system, check EFE thermal vacuum valve and check valve(s). Also check for proper vacuum hose routing. See Fig. 15.

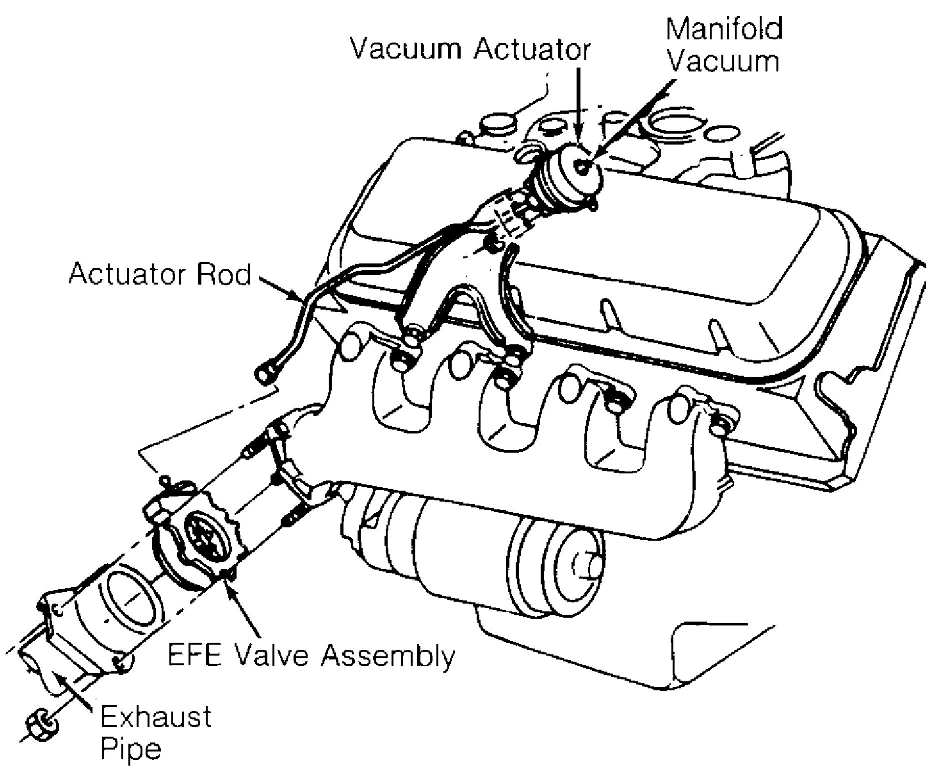

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Fig. 15: Typical Vacuum-Actuated EFE System
Courtesy of General Motors Corp.

EMISSION MAINTENANCE REMINDER LIGHT (EMR) (IF EQUIPPED)

If equipped, the EMR light (some models may use a reminder flag) reminds vehicle operator that an emission system maintenance is required. This indicator is activated after a predetermined time/mileage.

When performing a smog check inspection, ensure EMR indicator is not activated. On models using an EMR light, light should glow when ignition switch is turned to ON position and should turn off when engine is running.

If an EMR flag is present or an EMR light stays on with engine running, fail vehicle and service or replace applicable emission-related components. To reset an EMR indicator, refer to appropriate MAINTENANCE REMINDER LIGHTS in the MAINTENANCE section.

MALFUNCTION INDICATOR LIGHT (MIL)

The Malfunction Indicator Light (MIL) is used to alert vehicle operator that the computerized engine control system has detected a malfunction (when it stays on all the time with engine running). On some models, the MIL may also be used to display trouble codes.

As a bulb and system check, malfunction indicator light will glow when ignition switch is turned to ON position and engine is not running. When engine is started, light should go out.

END OF ARTICLE

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ARTICLE BEGINNING

1993 HONDA ENGINES
2.2L & 2.3L 4-Cylinder

Prelude

* PLEASE READ THIS FIRST *

NOTE: For engine repair procedures not covered in this article, see ENGINE OVERHAUL PROCEDURES - GENERAL INFORMATIONarticle in the GENERAL INFORMATION section.

ENGINE IDENTIFICATION

Engine serial number is located on exhaust side of engine block, near bellhousing. The first 5 characters of engine serial number are for engine identification. See ENGINE IDENTIFICATION CODE table.

ENGINE IDENTIFICATION CODES TABLE

Application	Engine Code
Prelude	
2.2L 4-Cylinder	
SOHC	F22A1
DOHC (VTEC)	H22A1
2.3L 4-Cylinder DOHC	H23A1

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

CAUTION: Always rotate engine in direction of normal rotation (counterclockwise as viewed from front of engine). Clockwise rotation may cause timing belt to slip.

2.2L SOHC

1) Adjust valves when engine temperature is 100F (38oC) or less. Remove valve cover. Rotate crankshaft counterclockwise until No. 1 piston is at TDC of compression stroke. UP mark on camshaft pulley will be at top. See Fig. 1. Align grooves on camshaft pulley with top surface of cylinder head. Distributor rotor should point toward No. 1 spark plug wire.

2) Adjust clearance for valves on No. 1 cylinder to specification. Loosen lock nut. Turn adjuster screw until clearance is as specified. See **VALVE CLEARANCE SPECIFICATIONS** table. Tighten lock nut.

3) Rotate crankshaft 180 degrees counterclockwise (camshaft pulley will turn 90 degrees). UP mark on camshaft pulley will be on exhaust side of engine. Adjust clearance on valves for No. 3 cylinder.

4) Rotate crankshaft 180 degrees counterclockwise. Grooves on camshaft pulley will align with cylinder head surface, and UP mark will face downward. Adjust clearance on valves for No. 4 cylinder.

5) Rotate crankshaft 180 degrees counterclockwise. UP mark on camshaft pulley will be on intake side. Adjust clearance on valves for No. 2 cylinder. Tighten crankshaft pulley bolt to specification if it loosened during adjustment procedure.

6) Apply nonhardening sealant to rounded surfaces of front and rear camshaft caps before installing valve cover gasket. Install valve cover. Tighten nuts to specification. See **TORQUE SPECIFICATIONS TABLE** at the end of this article.

VALVE CLEARANCE SPECIFICATIONS TABLE

Application	In. (mm)
2.2L	
DOHC	
Intake Valves	.006-.007 (.15-.19)
Exhaust Valves	.007-.008 (.17-.21)
SOHC	
Intake Valves	.009-.011 (.23-.28)
Exhaust Valves	.011-.012 (.27-.30)
2.3L	
Intake Valves	.004-.005 (.09-.13)
Exhaust Valves	.006-.007 (.15-.19)

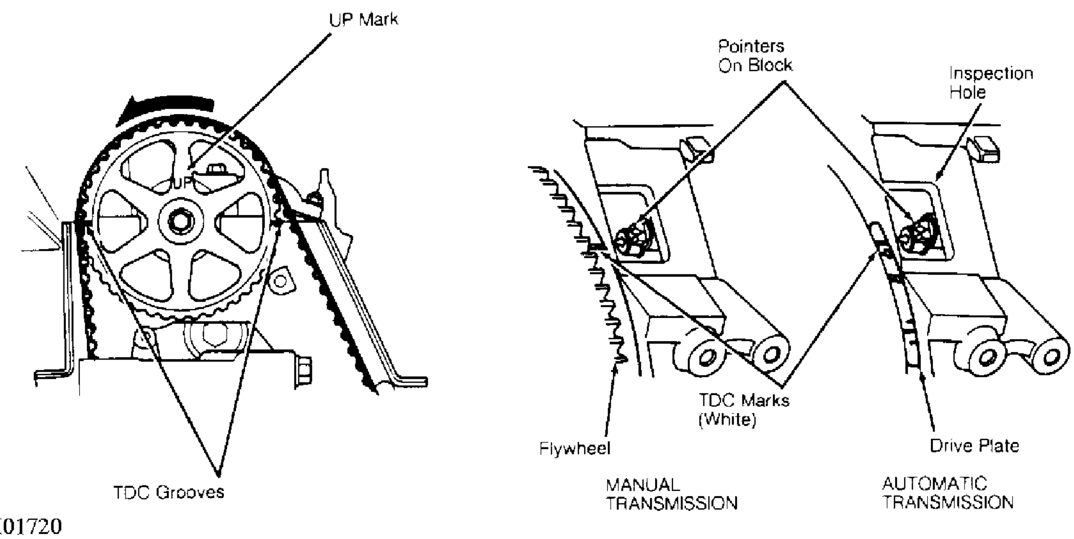

Fig. 1: Positioning Camshaft Sprocket For Valve Adjustment (2.2L SOHC)
Courtesy of American Honda Motor Co., Inc.

2.2L DOHC & 2.3L

1) Adjust valves when engine temperature is 100°F (38°C) or less. Remove valve cover. Rotate crankshaft counterclockwise until No. 1 piston is at TDC of compression stroke.

2) Ensure UP marks on camshaft sprockets are at top, and TDC grooves on sprockets are aligned with cylinder head surface. See Fig. 2. Adjust clearance on valves for No. 1 cylinder. Loosen lock nut. Turn adjuster screw until clearance is as specified. See VALVE CLEARANCE SPECIFICATIONS table.

3) Rotate crankshaft 180 degrees counterclockwise (camshaft sprockets turn 90 degrees) until No. 3 piston is at TDC of compression stroke. The UP marks will be on exhaust side. Adjust clearance on valves for No. 3 cylinder.

4) Rotate crankshaft 180 degrees counterclockwise so No. 4 piston is at TDC of compression stroke. UP marks will be at the bottom. Adjust clearance on valves for No. 4 cylinder.

5) Rotate crankshaft 180 degrees counterclockwise so No. 2 piston is at TDC of compression stroke. UP marks will be on intake side. Adjust clearances on valves for No. 2 cylinder.

6) Tighten crankshaft pulley bolt if necessary. See TORQUE SPECIFICATIONS TABLE at the end of this article. Apply nonhardening sealant to rounded surfaces of front and rear camshaft caps before installing valve cover gasket. Install valve cover. Tighten nuts to specification.

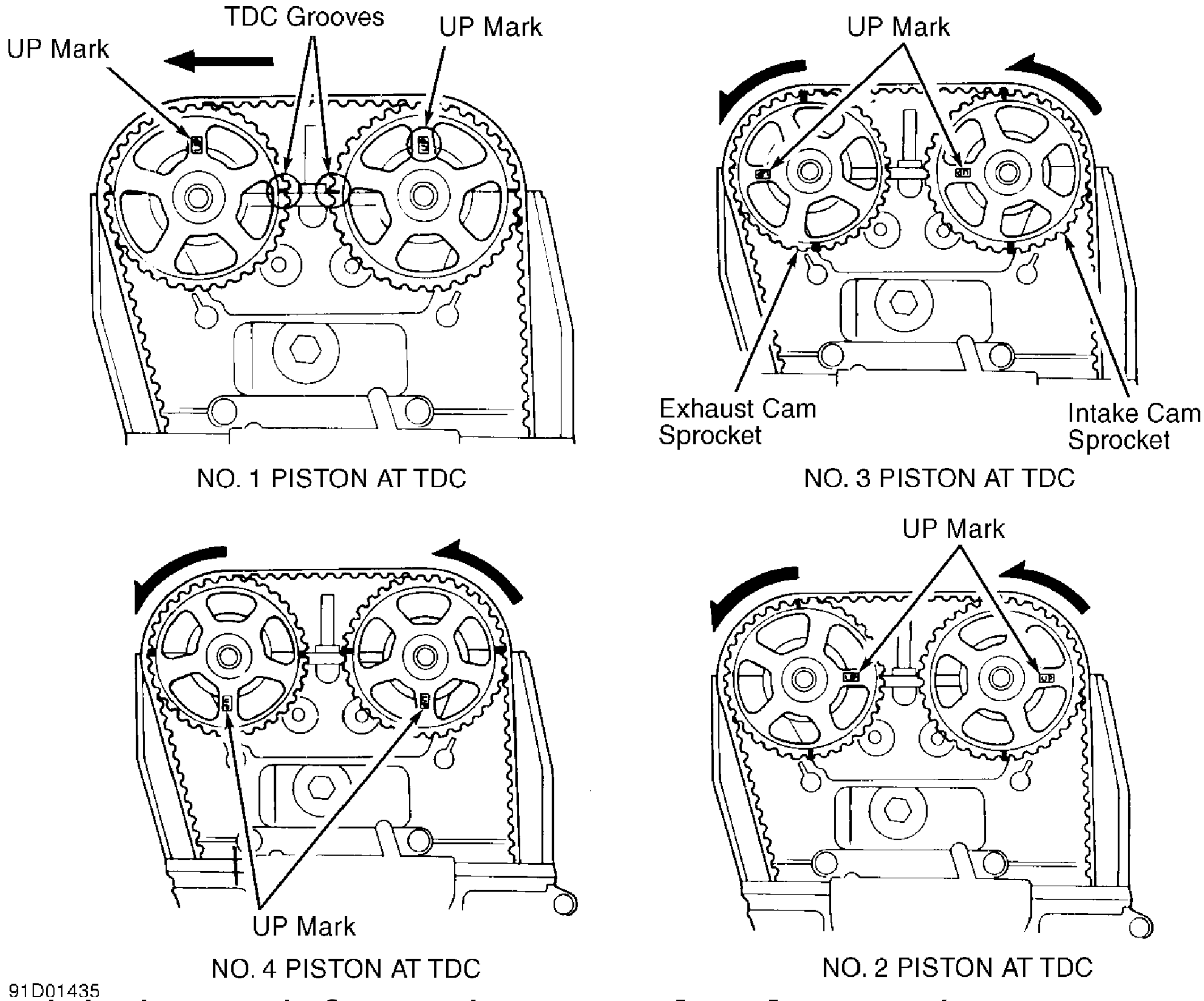

Fig. 2: Positioning Camshaft Sprockets For Valve Clearance (2.2L DOHC & 2.3L)
Courtesy of American Honda Motor Co., Inc.

TIMING BELT ADJUSTMENT

CAUTION: Always adjust timing belt tension with engine cold.

1) Rotate crankshaft counterclockwise until No. 1 piston is at TDC of compression stroke. See Fig. 1. Loosen, but do not remove, timing belt adjuster nut. See Fig. 3. Rotate crankshaft counterclockwise 3 teeth on camshaft pulley to create tension on timing belt.

2) Tighten adjuster bolt. Retighten crankshaft pulley bolt if it loosened while turning crankshaft. See TORQUE SPECIFICATIONS TABLE at the end of this article.

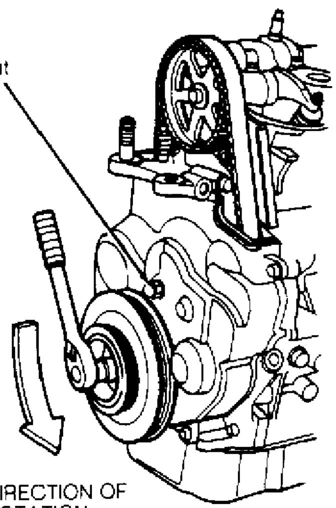

Fig. 3: Locating Timing Belt Adjuster Nut (Typical)
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses, and fuel lines before removal. Also place mating marks on other major assemblies before removal.

NOTE: Radio/cassette or radio/CD player may be equipped with an anti-theft protection circuit. Whenever battery is disconnected, radio will go into anti-theft mode. When battery is reconnected, radio will display CODE, and will be inoperative until proper code number is entered. Obtain code number before disconnecting battery.

FUEL PRESSURE RELEASE

CAUTION: Fuel system is under pressure. Release pressure before servicing fuel system components.

Remove fuel tank filler cap. Place a shop towel on top of fuel filter. Slowly loosen fuel injection service bolt to release fuel injection system pressure. See Fig. 4.

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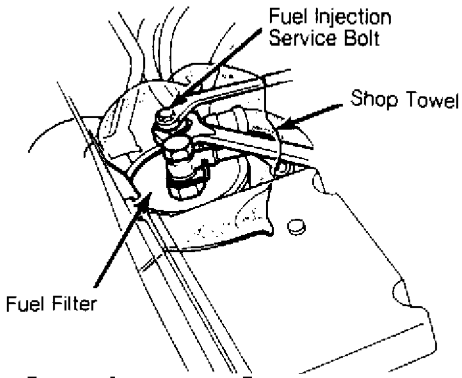

Fig. 4: Releasing Fuel System Pressure
Courtesy of American Honda Motor Co., Inc.

COOLING SYSTEM BLEEDING

1) Set heater controls to maximum heat. Fill cooling system with a 50/50 mixture of coolant and water to bottom of filler neck. Loosen bleed bolt, located on thermostat housing.

2) Tighten bleed bolt when coolant flows from bleed bolt in steady stream without bubbles. With radiator cap off, start and operate engine to normal operating temperature (fan comes on at least twice). Add coolant as necessary. Install radiator cap.

ENGINE

Removal

1) Disconnect battery cables. Remove battery and tray. Secure hood as far open as possible. Raise and support vehicle. Remove front wheels and splash shield. Drain engine oil, transaxle fluid, and coolant.

2) Lower vehicle. Remove air intake duct. Remove secondary Pulsed Air (PAIR) injection vacuum tank and bracket (if equipped). Remove battery, battery tray, battery cable, and starter cable. Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect fuel inlet hose.

3) Unplug connector from fuel injector resistor. Disconnect throttle cable at throttle body. Label and disconnect all terminals, clamps, and connectors on right side of engine compartment. Disconnect power cable from underhood fuse/relay box.

4) Disconnect brake booster hose and emission control hoses from intake manifold. Remove cruise control actuator. Disconnect engine ground cable at cylinder head. Remove power steering pump, leaving hoses connected. Remove A/C condenser fan shroud assembly. Install protective plate in place of shroud.

5) Remove A/C compressor, leaving hoses connected. Disconnect transmission cable. Disconnect A/T cooler lines (if equipped). Remove Vehicle Speed Sensor (VSS)/Power Steering (PS) speed sensor with

hydraulic lines attached.

6) On manual transaxles, remove select cable, shift cable and cable mounting bracket from transaxle. Remove clutch slave cylinder with hydraulic line attached. On automatic transaxles, remove shift cable. On all models, remove exhaust pipe and brace. Remove drive shafts. See FWD AXLE SHAFTS article in DRIVE AXLES.

7) Attach engine hoist chain to engine. Remove slack from chain. Remove front and rear engine mount brackets. Remove left engine mount. Remove transmission mount and bracket. Ensure engine is free of all attachments. Remove engine and transaxle from vehicle.

Installation

1) To install, reverse removal procedure. Tighten engine/transaxle mounts to specification, in sequence. SeeFig. 5.

NOTE: Improper tightening of engine/transaxle mount bolts will cause engine vibration and premature engine mount failure.

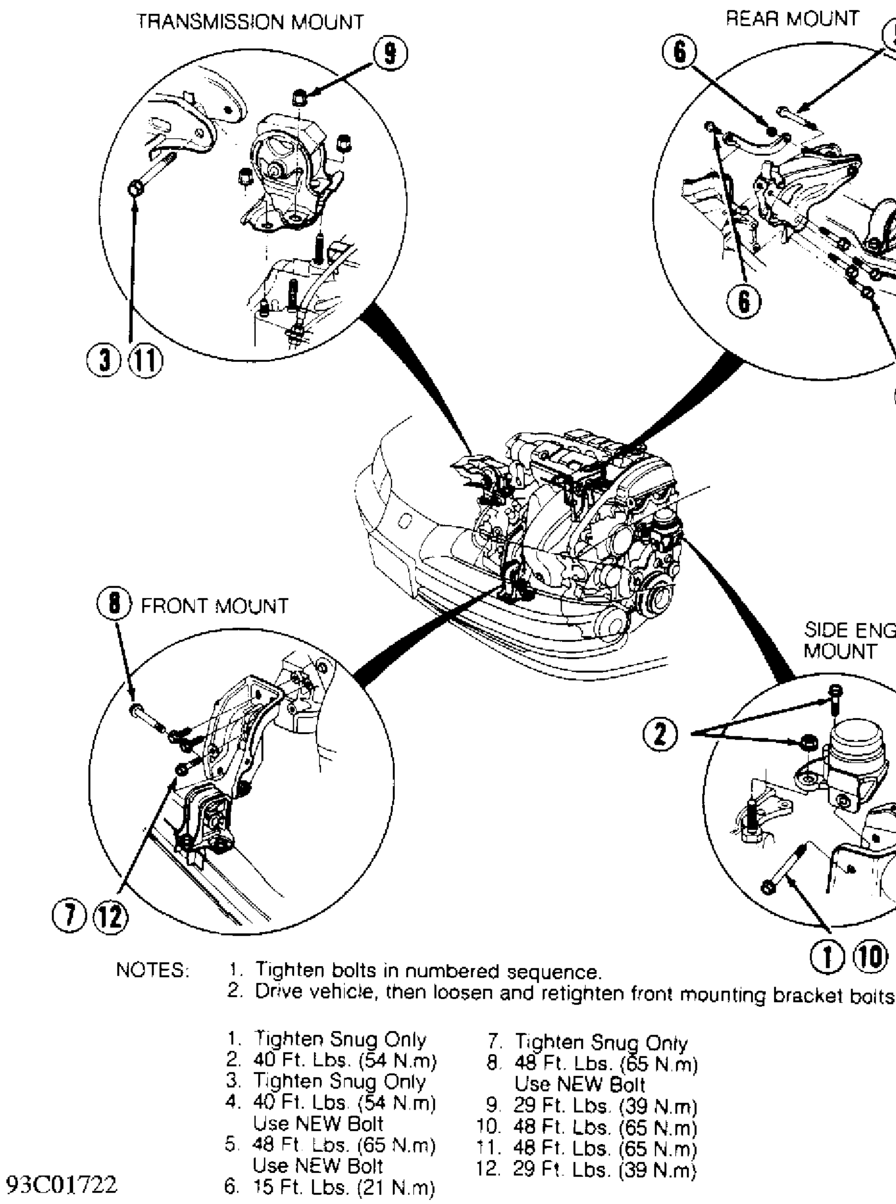

Fig. 5: Tightening Sequence For Engine/Transaxle Mounts
Courtesy of American Honda Motor Co., Inc.

2) Use NEW spring clips when installing drive axles. Install drive axles until spring clip clicks in groove of differential side gear. Ensure all wires and hoses are connected properly. Adjust throttle cable tension.

3) On M/T models, adjust clutch pedal free play. See CLUTCH PEDAL under ADJUSTMENTS in CLUTCH in the CLUTCHES section. On A/T

models, ensure gear position agrees with shift indicator. On all models, adjust drive belt tension. Restore all fluids to proper level. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING**.

INTAKE MANIFOLD

Removal (2.2L SOHC)

1) Disconnect battery negative cable. Drain cooling system. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Disconnect breather hose and vacuum tube. Remove air intake duct. Disconnect fuel hoses and charcoal canister hose. Disconnect brake booster and cruise control vacuum hoses.

2) Disconnect throttle cable at throttle body. On A/T models, disconnect throttle control cable. On all models, remove ignition coil, spark plug caps, and distributor. Unplug wiring at alternator. Disconnect all wiring at intake manifold. Disconnect radiator and heater hoses. Disconnect coolant by-pass hose and emission hoses from intake manifold. Remove thermostat housing.

3) Disconnect engine ground cable at cylinder head. Remove power steering pump, leaving hoses attached. Remove intake manifold bracket and manifold.

Removal (2.2L DOHC & 2.3L)

1) Disconnect battery negative cable. Drain cooling system. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Remove air intake duct. Disconnect fuel hoses and charcoal canister hose. Disconnect brake booster and cruise control vacuum hoses.

2) Disconnect throttle cable at throttle body. On A/T models, disconnect throttle control cable. Unplug wiring at alternator. Disconnect all wiring from cylinder head. Remove power steering pump, leaving hoses attached. Remove ignition coil. Disconnect upper radiator hose. Disconnect heater hose at intake manifold.

3) Disconnect coolant by-pass hose and emission hoses from intake manifold. Remove thermostat housing. Remove Intake Air By-pass (IAB) valve body assembly. Remove intake manifold bracket and manifold.

Installation

Clean gasket surfaces. Install intake manifold, using NEW gasket. Tighten nuts to specification in 3 stages. Tighten in a crisscross pattern, starting with inner nuts. See **TORQUE SPECIFICATIONS TABLE** at the end of this article. To complete installation, reverse removal procedure.

EXHAUST MANIFOLD

Removal

Remove exhaust manifold heat shield. Disconnect exhaust pipe from exhaust manifold. Unplug oxygen sensor electrical connector. Remove exhaust manifold bracket. Remove exhaust manifold retaining nuts and manifold. Remove gasket.

Installation

Clean gasket surfaces. Install exhaust manifold using NEW gasket. Using a crisscross pattern, tighten nuts to specification in 3 stages. See TORQUE SPECIFICATIONS TABLE at the end of this article.

CYLINDER HEAD

CAUTION: DO NOT remove cylinder head until coolant temperature is less than 100°F (38°C), or cylinder head damage may occur.

Removal (2.2L SOHC)

1) Disconnect battery negative cable. Drain cooling system. Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect breather hose and vacuum tube. Remove air intake duct. Disconnect fuel hoses and charcoal canister hose. Disconnect brake booster and cruise control vacuum hoses.

2) Disconnect throttle cable at throttle body. On A/T models, disconnect throttle control cable. On all models, remove ignition coil, spark plug caps, and distributor. Unplug wiring at alternator. Disconnect all wiring from cylinder head. Disconnect radiator and heater hoses. Disconnect coolant by-pass hose and emission hoses from intake manifold. Remove thermostat housing.

3) Disconnect engine ground cable at cylinder head. Remove power steering pump, leaving hoses attached. Remove intake manifold bracket and manifold.

4) Raise and support vehicle. Remove splash shield and front wheels. Remove heat insulator (A/C models). Disconnect exhaust pipe. Remove exhaust manifold bracket and exhaust manifold. Remove upper timing belt cover.

5) Loosen timing belt tension adjuster bolt. Push tensioner to release belt tension. Tighten adjuster bolt. Disengage timing belt from camshaft sprocket. Remove cylinder head bolts, 1/3 turn at a time, in reverse order of tightening sequence. SeeFig. 6. Remove cylinder head and gasket.

CAUTION: DO NOT crimp or bend timing belt more than 90 degrees or less than 1" (25 mm) radius.

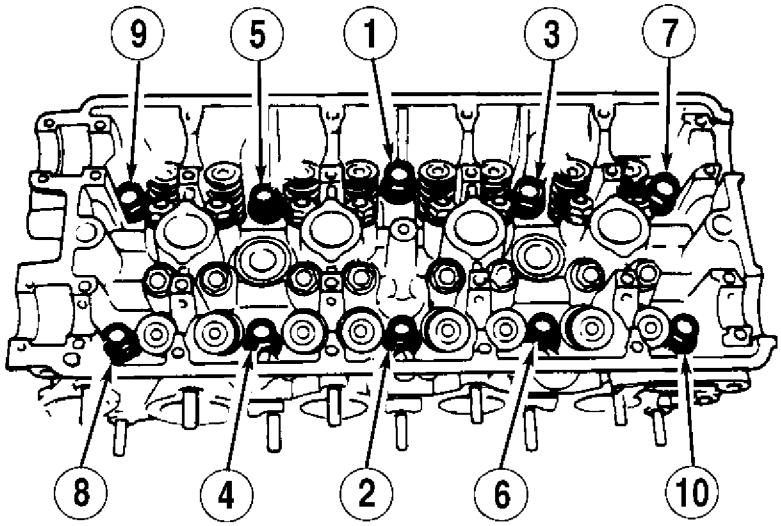

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Fig. 6: Tightening Sequence For Cylinder Head Bolts (2.2L SOHC)
Courtesy of American Honda Motor Co., Inc.

Removal (2.2L DOHC & 2.3L)

1) Disconnect battery negative cable. Drain cooling system. Release fuel pressure. See FUEL PRESSURE RELEASE. Remove air intake duct. Disconnect fuel hoses and charcoal canister hose. Disconnect brake booster and cruise control vacuum hoses.

2) Disconnect throttle cable at throttle body. On A/T models, disconnect throttle control cable. Unplug wiring at alternator. Disconnect all wiring from cylinder head. Remove power steering pump, leaving hoses attached. Remove ignition coil. Disconnect upper radiator hose. Disconnect heater hose at intake manifold.

3) Disconnect coolant by-pass hose and emission hoses from intake manifold. Remove thermostat housing. Remove Intake Air By-pass (IAB) valve body assembly. Remove intake manifold bracket and manifold. Disconnect exhaust pipe. Remove heat insulator (A/C models). Remove exhaust manifold bracket and exhaust manifold.

4) Remove cylinder head belt cover. Loosen timing belt tension adjuster bolt. Push tensioner to release belt tension. Tighten adjuster bolt. Disengage timing belt from camshaft sprockets. Remove camshaft pulleys.

5) Loosen all valve clearance adjuster screws. On 2.2L DOHC models, remove VTEC solenoid valve. On all models, remove camshaft bearing caps and camshafts. Remove engine mount bracket brace. Remove timing belt back cover. Remove cylinder head bolts, 1/3 turn at a time, in reverse order of tightening sequence. SeeFig. 7. Remove cylinder head and gasket.

CAUTION: DO NOT crimp or bend timing belt more than 90 degrees or less than 1" (25 mm) radius.

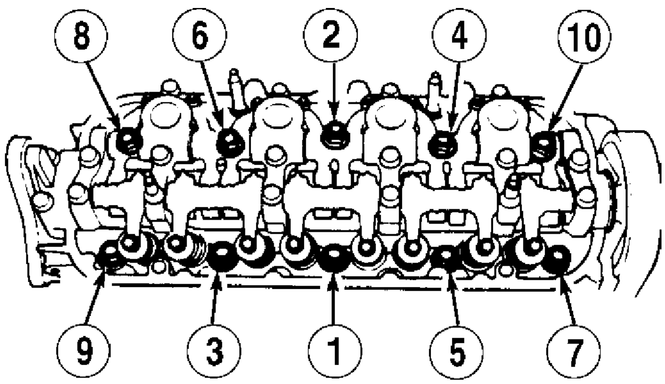

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Fig. 7: Tightening Sequence For Cylinder Head Bolts (2.2L DOHC & 2.3L)
Courtesy of American Honda Motor Co., Inc.

Inspection (All Models)

Ensure all mating surfaces are clean. Measure cylinder head for warpage. Resurfacing is not required if warpage is less than .002" (.05 mm). Resurface cylinder head if warpage is .002-.008" (.05-.20 mm). Maximum resurface limit is .008" (.20 mm). Ensure cylinder head dowel pins, oil control jet, and "O" ring are installed in block.

Installation (All Models)

1) Install NEW intake manifold gasket. Install intake manifold onto cylinder head. Tighten nuts to specification in a crisscross pattern, beginning with inner nuts. See TORQUE SPECIFICATIONS TABLE at the end of this article.

2) Ensure No. 1 piston and camshaft pulley are at TDC. Apply a light coating of engine oil to cylinder head bolts and washers. Install longer cylinder head bolt into position No. 3. Install remaining bolts. Tighten cylinder head bolts to specification in sequence, in 3 stages. See Fig. 6 or 7. See TORQUE SPECIFICATIONS TABLE at the end of this article.

3) To complete installation, reverse removal procedure. If reusing timing belt, install belt with arrow mark (made during removal procedure) in direction of original rotation. Adjust timing belt tension. See TIMING BELT ADJUSTMENT under ADJUSTMENTS.

4) Adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS. Fill and bleed air from cooling system. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.

CRANKSHAFT FRONT SEAL

Removal & Installation

Remove camshaft and balance shaft drive belts. See TIMING & BALANCE SHAFT BELTS. Remove crankshaft/oil pump seal. Apply a light

coat of engine oil to crankshaft and lip of new seal. Install seal using Seal Driver (07749-0010000). Ensure seal is fully seated. To complete installation, reverse removal procedure. See TORQUE SPECIFICATIONS TABLE at the end of this article.

TIMING & BALANCE SHAFT BELTS

Removal

1) Position crankshaft with No. 1 piston at TDC of compression stroke. See Fig. 1 or 2. Disconnect battery negative cable. Remove splash shield. Remove cruise control actuator, leaving cable connected. Remove power steering pump, leaving hoses connected.

2) Disconnect alternator wiring. Remove wiring harness from valve cover. Remove alternator and A/C belts (if equipped). Remove valve cover and middle timing belt cover. Remove side engine mount. Remove engine oil dipstick and tube. Remove crankshaft pulley bolt. Remove side engine mount. Remove engine oil dipstick and tube. Remove crankshaft pulley.

3) Support engine. Remove 2 rear bolts from engine center support beam. Lower engine enough to permit removal of lower timing belt cover. Remove rubber seal from belt tension adjuster nut. Remove lower timing belt cover.

4) Lock timing belt adjuster arm into position by installing one lower cover retaining bolt. Loosen belt tension adjuster bolt. Push belt tensioner to release tension from belt. Tighten adjuster bolt. Remove balance shaft and camshaft timing belts.

CAUTION: DO NOT rotate crankshaft or camshaft when removing and installing timing belts.

Inspection

With belt or belt covers removed, inspect belts for wear, cracks, or oil soaking. Inspect belt teeth for wear. Replace belt if worn, oil soaked, or cracked.

Installation

1) Align White mark on flywheel or drive plate (flexplate) with pointer on block. Ensure camshaft(s) is at TDC for No. 1 cylinder. See Fig. 1 or 2. Install camshaft timing belt. See Fig. 8. Align rear timing balance shaft belt pulley by inserting a 6 x 100 mm bolt 2.9 inches (74 mm) into alignment access hole. Align groove on front balance shaft pulley with pointer on oil pump body.

2) Install balance shaft and cam belts. Adjust belt tension. See TIMING BELT ADJUSTMENT under ADJUSTMENTS. Reverse removal procedure to complete installation. Tighten crankshaft pulley bolt to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

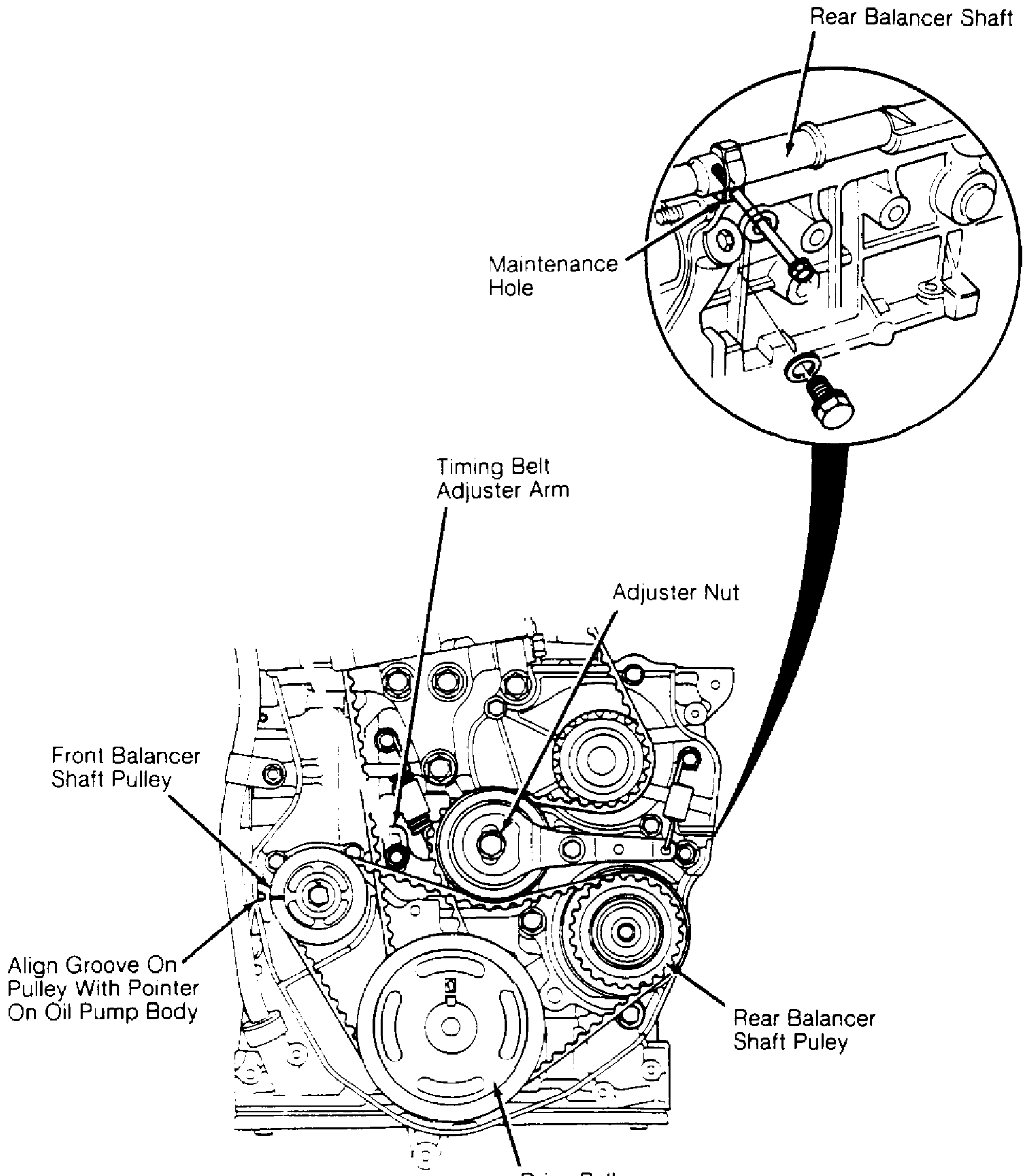

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Fig. 8: Removing/Installing Timing & Balance Shaft Belts
Courtesy of American Honda Motor Co., Inc.

ROCKER ARM

NOTE: DO NOT remove camshaft bearing cap (cam holder) bolts from

rocker arm assembly unless it is to be disassembled. The bolts keep cam holders, springs, and rocker arms on shaft.

Removal (2.2L SOHC)

1) Ensure No. 1 piston is at TDC of compression stroke. UP mark on camshaft pulley should be at top, and grooves on camshaft pulley should align with cylinder head surface. SeeFig. 1. Remove timing and balance shaft belts. See TIMING & BALANCE SHAFT BELTS.

2) Remove camshaft pulley retaining bolt, special washer, camshaft pulley, and key. Remove back cover. Place reference mark on distributor for installation reference. Remove distributor. Loosen all rocker arm adjuster screws.

3) Pry camshaft toward front of cylinder head. Attach dial indicator and zero it against pulley end of camshaft. Pry camshaft away from dial indicator to measure end play. See CAMSHAFT table under ENGINE SPECIFICATIONS. If end play exceeds limit, replace camshaft.

4) Unscrew camshaft bearing cap bolts by turning bolts 2 turns at a time in a crisscross pattern. DO NOT remove bearing cap (cam holder) bolts from rocker arm assembly. Bolts keep cam holders, springs, and rocker arms on shafts. SeeFig. 9. Remove rocker arm assembly.

NOTE: Mark rocker arm shaft assembly parts for installation reference.

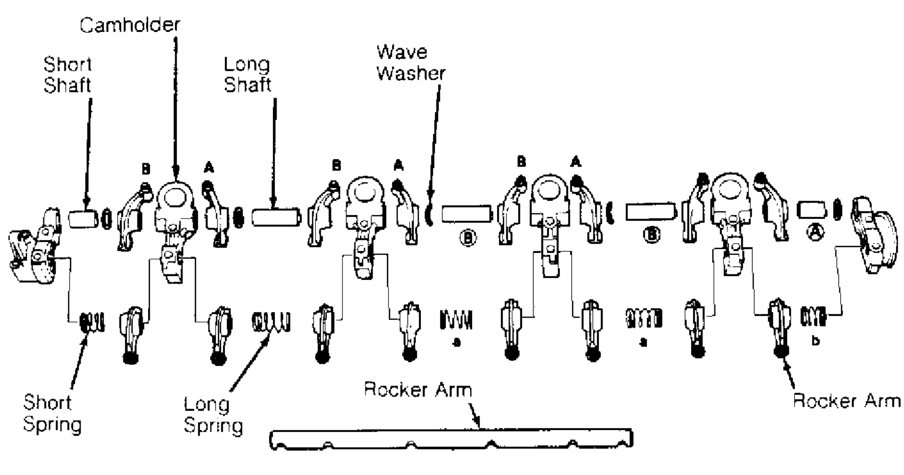

Fig. 9: Exploded View Of Rocker Arm Assembly (2.2L SOHC)
Courtesy of American Honda Motor Co., Inc.

Installation (2.2L SOHC)

1) Clean all components. Lubricate all components at contact

points before installation. Align intake rocker shafts projections with cam holder indents.

2) Position camshaft (if removed) onto cylinder head with keyway facing upward and No. 1 piston at TDC. Install camshaft seal. Apply gasket sealer to mating surfaces of cam holders No. 1 and 6. Loosen valve clearance adjusters before installing rocker shaft assembly.

3) Position rocker shaft assembly onto cylinder head. Ensure all rockers align with valves. Tighten mounting bolts 2 turns at a time in sequence. See Fig. 10. Install back cover. Install pulley. Tighten camshaft pulley bolt to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

4) To complete installation, reverse removal procedure. Adjust valves to specification. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS. Tighten all nuts and bolts to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

Removal & Installation (2.2L DOHC & 2.3L)

For removal and installation of rocker arms, see CAMSHAFT.

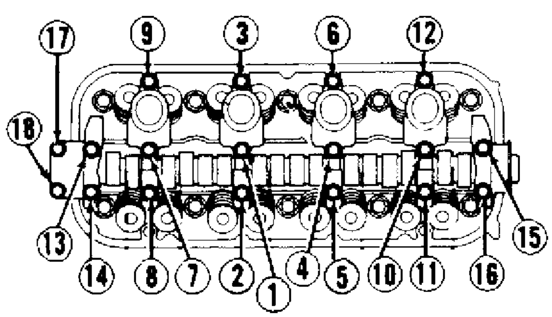

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Fig. 10: Tightening Sequence For Camshaft Bolts (2.2L SOHC)
Courtesy of American Honda Motor Co., Inc.

CAMSHAFT

NOTE: On 2.2L SOHC, DO NOT remove camshaft bearing cap (cam holder) bolts from rocker arm assembly unless it is to be disassembled. The bolts keep cam holders, springs, and rocker arms on shaft.

Removal & Installation (2.2L SOHC)

Remove rocker arm assembly. See ROCKER ARM. Carefully lift camshaft from cylinder head. To install camshaft, reverse removal procedure.

Removal (2.2L DOHC & 2.3L)

1) Ensure No. 1 piston is at TDC of compression stroke. Ensure UP marks on camshaft sprockets are at the top, and TDC grooves on camshaft sprockets align with cylinder head surface. See Fig. 2. Disengage timing belt from camshaft sprockets. See TIMING & BALANCE SHAFT BELTS.

2) Remove camshaft sprockets. Place reference mark on distributor for installation reference. Remove distributor. Loosen rocker arm adjuster screws. Measure camshaft end play. If end play exceeds limit, replace camshaft. See CAMSHAFT table under ENGINE SPECIFICATIONS.

3) Remove camshaft bearing cap bolts by turning bolts 2 turns at a time in reverse order of tightening sequence. Remove camshafts. Label rocker arms for installation reference. Remove rocker arms (if necessary). See Fig. 11 or 12.

NOTE: If rocker arms are removed from 2.2L DOHC, secure each set of rocker arms and control pistons together with a rubber band and mark to ensure rockers remain properly assembled and are installed in original position.

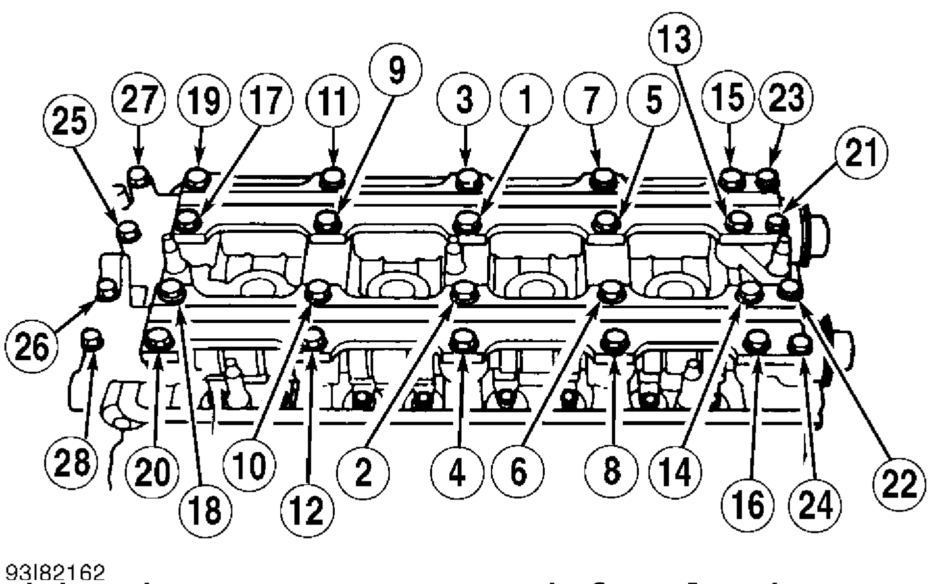

Fig. 11: Tightening Sequence For Camshaft Bolts (2.2L DOHC)
Courtesy of American Honda Motor Co., Inc.

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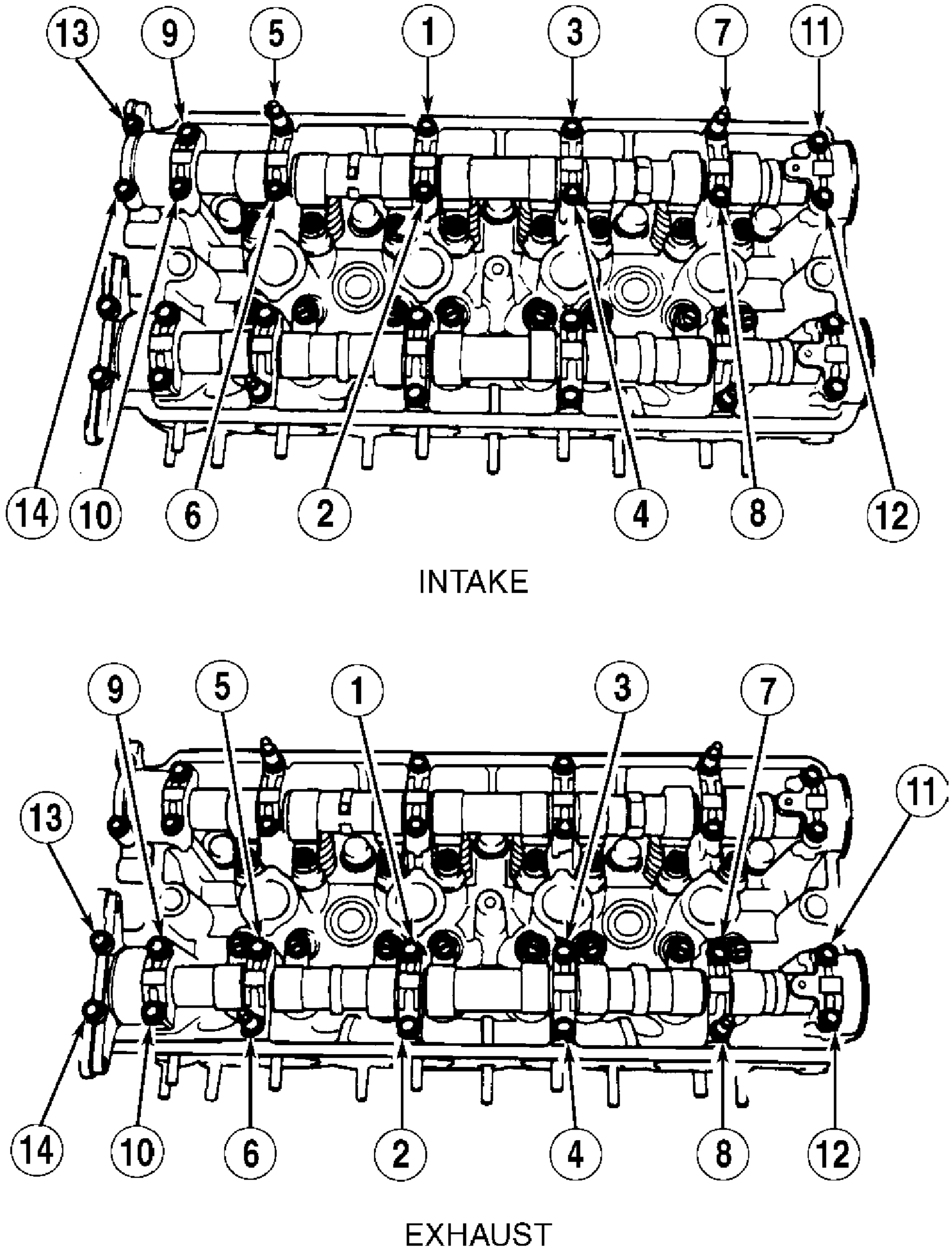

NOTES:

1. On intake camshaft, tighten all bolts except No. 5 and 7 to 88 INCH lbs. (10 N.m). Tighten Bolts No. 5 and 7 to 106 INCH lbs. (12 N.m).

2. On exhaust camshaft, tighten all bolts except No. 6 and 8 to 88 INCH lbs. (10 N.m). Tighten Bolts No. 6 and 8 to 106 INCH lbs. (12 N.m).

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Fig. 12: Tightening Sequence For Camshaft Bolts (2.3L)
Courtesy of American Honda Motor Co., Inc.

Installation (2.2L DOHC & 2.3L)

1) Lubricate camshaft journals and journal surfaces in caps and cylinder head. Install rocker arms, if removed, into their original positions. Install camshafts with keyway pointing upward (No. 1 piston at TDC).

2) Loosely install camshaft bearing caps at their original positions. Install new camshaft seals (if removed). Tighten each bolt in 2 stages, in sequence. See Fig. 11 or 12.

3) To complete installation, reverse removal procedure. Adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS. Adjust drive belt tension. See TIMING BELT ADJUSTMENT under ADJUSTMENTS.

BALANCE SHAFTS

Removal

1) Remove engine from vehicle. See ENGINE under REMOVAL & INSTALLATION. Remove oil pan, flywheel, and right side crankshaft oil seal cover. Remove timing belts. See TIMING & BALANCE SHAFT BELTS. Remove balance shaft drive gear case. Insert a screwdriver into front balance shaft to prevent rotation. Remove pulley.

2) Insert a bolt or dowel pin into maintenance hole of rear balance shaft. Remove baffle plate. Remove rear timing balance shaft gear. Remove oil pick-up and filter screen. Remove front cover/oil pump assembly. Remove thrust plate from rear balance shaft. Remove balance shafts.

Inspection

1) Measure balance shaft end play before removing end plates and front cover. See BALANCE SHAFTS table under ENGINE SPECIFICATIONS. If end play exceeds specification, inspect thrust plate and thrust surfaces. Thrust plates and thrust surface on oil pump body must not be changed by grinding or shimming.

2) Inspect surface of balance shaft journal and balance shaft bearing. Replace if worn, damaged, or discolored. When replacing front bearing on rear balance shaft, replace oil pump body. Measure diameter of front and rear ends of bearing journals. Taper should not exceed .002" (.05 mm). Using "V" blocks, support shaft on front and rear bearings. Measure journal runout and diameter. See BALANCE SHAFTS table under ENGINE SPECIFICATIONS.

Installation

1) Insert balance shafts into engine block. Install thrust plate onto front balance shaft. Install right side cover, using liquid gasket. Install parts within 20 minutes of gasket application. Allow 30 minutes after installation before filling engine with oil.

2) Lubricate balance shaft and inner oil pump seal. Install oil pump cover. Install oil pick-up and filter screen. Lubricate all

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thrust surfaces of balance drive gears. Hold rear balance shaft with dowel, and install driven gear. Hold front balance shaft with a screwdriver, and install driven pulley.

3) Use dowel or bolt to align rear balance shaft. Align groove on balance shaft pulley with pointer on balance gear case. Install balance gear case. See Fig. 13. There is an additional mark on one pulley tooth for belt alignment.

4) To complete installation, reverse removal procedure. Tighten all nuts and bolts to specifications. See **TORQUE SPECIFICATIONS TABLE** at the end of this article.

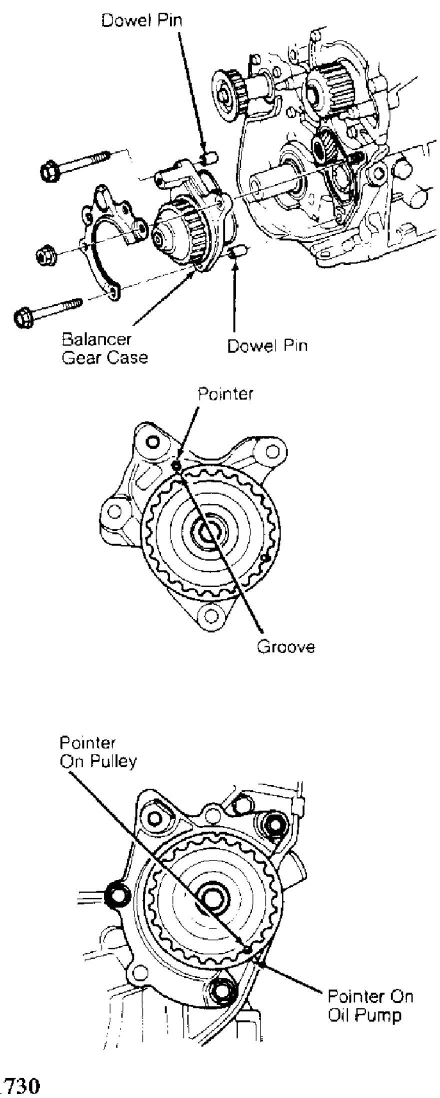

Fig. 13: Installing Balance Shafts
Courtesy of American Honda Motor Co., Inc.

REAR CRANKSHAFT OIL SEAL

Removal & Installation

1) Remove transaxle assembly. Remove flywheel or drive plate. See appropriate article in CLUTCH (manual transaxle) or TRANSMISSION SERVICING - A/T. Pry seal from rear seal plate. Clean crankshaft seal surface and seal plate. Lubricate seal lips and crankshaft with a light coating of oil.

2) Install seal with part number facing outward. Use Seal Driver (07749-0010000) to install seal into seal plate. Align hole in seal driver with pin on crankshaft. Drive seal in until driver bottoms against block. To complete installation, reverse removal procedure. Tighten all nuts and bolts to specifications. See TORQUE SPECIFICATIONS TABLE at the end of this article.

WATER PUMP

Removal

Disconnect battery negative cable. Drain cooling system. Remove timing and balance shaft belts. See TIMING & BALANCE SHAFT BELTS. Remove water pump bolts, water pump, and "O" ring.

Installation

Clean gasket surfaces. Install NEW "O" ring and water pump. To complete installation, reverse removal procedure. Tighten bolts to specifications. See TORQUE SPECIFICATIONS TABLE at the end of this article. Fill and bleed cooling system. See COOLING SYSTEM BLEEDING.

OIL PAN

Removal & Installation

Raise and support vehicle. Drain oil. Remove oil pan retaining bolts. Remove oil pan. Clean gasket surfaces. Before installing oil pan, apply nonhardening sealant to front and rear of gasket where curved area mates with side rail surfaces of oil pan gasket. Install oil pan. Tighten bolts to specification, in sequence. See Fig. 14. See TORQUE SPECIFICATIONS TABLE at the end of this article.

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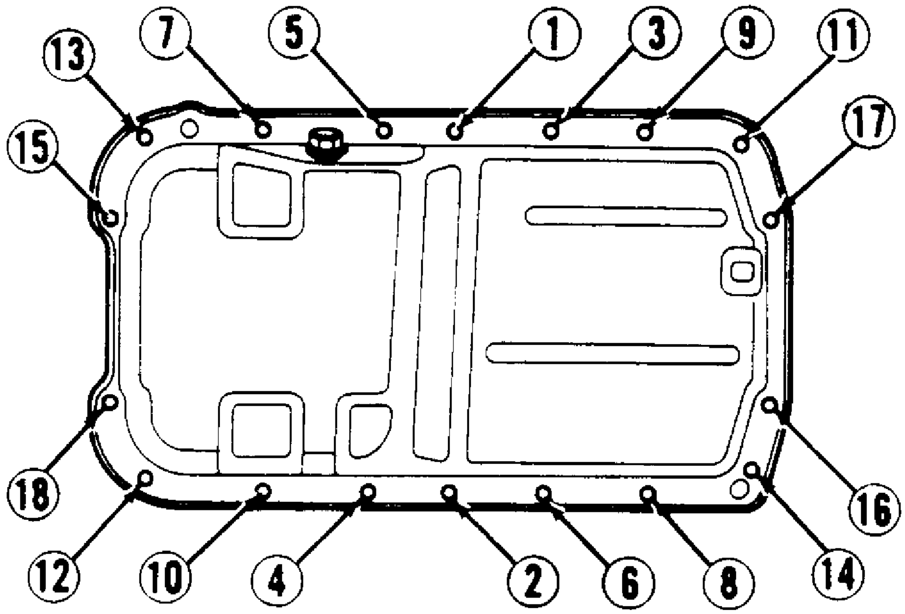

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Fig. 14: Tightening Sequence For Oil Pan Bolts
Courtesy of American Honda Motor Co., Inc.

OVERHAUL

CYLINDER HEAD

Cylinder Head

Ensure all mating surfaces are clean. Measure cylinder head warpage. If warpage is less than .002" (.05 mm), resurfacing is not required. If warpage is .002-.008" (.05-.20 mm), resurface cylinder head. Maximum resurface limit is .008" (.20 mm).

Valve Springs

Measure valve spring free length. Replace any spring shorter than minimum free length specification. See VALVE SPRING FREE LENGTH in appropriate VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS. Install springs with closer coils toward cylinder head. See appropriate VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS.

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Valve Stem Oil Seal Replacement

Mark valves and valve springs for reassembly reference. Tap each valve stem with a plastic mallet to loosen valve keepers. Remove valve keepers, collar, and spring. Use a valve seal puller to remove valve seals from valve guides.

NOTE: Intake and exhaust valve stem seals are NOT interchangeable. Intake seals have a White spring, and exhaust seals have a Black spring around neck of seal.

Valve Guide Inspection

Measure valve guide clearance with a dial indicator placed on valve head. Lift valve .4" (10 mm) from seat. Rock valve stem from side to side. Valve guides can be replaced if valve stem oil clearance is not within specification. See appropriate CYLINDER HEAD table under ENGINE SPECIFICATIONS.

Valve Guide Removal

1) Use a hot plate or oven to heat cylinder head to 300°F (150°C). Use valve guide driver, or fabricate valve guide remover from an air impact chisel. Using an air hammer and valve guide remover, drive valve guide 5/64" (2 mm) toward combustion chamber.

CAUTION: DO NOT heat cylinder head with a torch, or heat cylinder head hotter than 300°F (150°C). Excessive temperature may loosen valve seats.

2) Turn head over. Working from combustion chamber side of head, drive valve guide out toward camshaft side of head. If valve guide does not move, drill valve guide, using a 5/16" drill bit, then try to drive it out again.

CAUTION: Drill guides in extreme cases only. Cylinder head damage can occur if valve guide breaks.

Valve Guide Installation

1) Chill new valve guides in freezer for about one hour. Remove new valve guides from freezer as needed. Slip a 15/64" (6 mm) steel washer over valve guide driver.

2) Install new valve guides from camshaft side of cylinder head. Drive each guide into heated head until washer bottoms against head. If replacing all valve guides, reheat cylinder head as necessary.

3) Valve guide installed height must be as specified. See appropriate CYLINDER HEAD table under ENGINE SPECIFICATIONS. Using cutting oil, ream new valve guides by rotating Valve Guide Reamer (07HAH-PJ7010B for 2.2L, or 07984-657010C for 2.3L) clockwise the full length of valve guide bore. Measure valve stem oil clearance. See appropriate CYLINDER HEAD table under ENGINE SPECIFICATIONS.

NOTE: Always reface valve seat after replacing valve guide.

Valve Seats

Replacement procedure is not available from manufacturer.

Valves

Inspect valve for wear or burning. Measure valve dimensions after refacing. Replace any valve that does not meet specification. See appropriate VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS. Measure valve stem installed height after refinishing valve or seat. See appropriate CYLINDER HEAD table under ENGINE SPECIFICATIONS. Tap valve stems with plastic mallet after installation to seat spring retainers and keepers.

Valve Seat Correction Angles

Replace valve guides, if necessary, before refacing valve seats. After refacing, if seat width is too wide, use 60-degree stone to raise seat, or 30-degree stone to lower seat. Ensure valve seat margin is within specification. See appropriate CYLINDER HEAD table under ENGINE SPECIFICATIONS.

Valve Stem Installed Height

After servicing valves, measure valve stem installed height. See Fig. 15. If valve stem installed height exceeds specification for any valve, replace valve. See appropriate CYLINDER HEAD table under ENGINE SPECIFICATIONS. If valve stem installed height still exceeds limit, replace cylinder head.

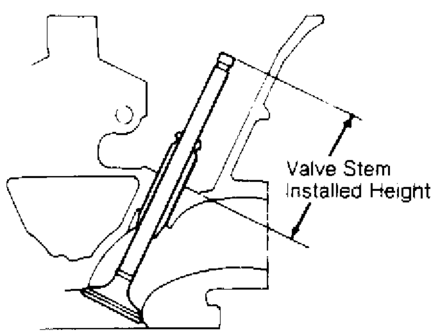

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Fig. 15: Measuring Valve Stem Installed Height
Courtesy of American Honda Motor Co., Inc.

VALVE TRAIN

Rocker Arm Shaft Assembly

Mark parts during disassembly for installation reference. Inspect rocker shafts (if equipped) and rocker arms for excessive wear or scoring. See Fig. 9. Service limit for clearance between rocker arm and rocker shaft is .003" (.08 mm). Replace shaft or rocker arms if worn beyond specification. Inspect rocker arm contact points for wear or scoring. Replace defective parts as necessary. Lubricate contact areas with engine oil before assembly.

CYLINDER BLOCK ASSEMBLY

NOTE: Reference numbers are for big end bore code, and do not indicate rod position in engine.

Piston & Rod Assembly

1) Each rod is sorted into one of 4 tolerance ranges. Size depends on crank journal bore. A number between 1 and 4 is stamped on side of rod big end. Any combination of numbers between 1 and 4 may be found in any engine.

2) Install piston and connecting rod so arrow on top of piston points toward timing belt, and connecting rod oil hole is toward intake manifold side of engine. See PISTON PIN INSTALLATION.

Fitting Pistons

1) Measure clearance between piston and cylinder bore. Piston clearance is difference between cylinder bore and piston diameter. See PISTONS, PINS, & RINGS table under ENGINE SPECIFICATIONS. If piston clearance exceeds service limit, rebore cylinder and install oversize piston.

2) Standard size pistons are marked with "A" or "B" on top of piston. For 2.2L SOHC, pistons are available in .010" (.25 mm) and .020" (.50 mm) oversize. For 2.2L DOHC and 2.3L, pistons are available in .010" (.25 mm) oversize. Standard cylinder block bore size is identified by letters "A" or "B" stamped on cylinder block.

3) Remove rings from piston. Clean piston thoroughly. Inspect piston for distortion and cracks. Measure piston diameter at location specified. If diameter is not within specification, replace piston. See PISTON, PINS & RINGS table under ENGINE SPECIFICATIONS.

Piston Rings

1) Using inverted piston, push new piston ring into cylinder bore .6-.8" (15-20 mm) from bottom. Measure piston ring end gap, using a feeler gauge. Repeat for each ring. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.

2) Clean piston ring grooves thoroughly. Install piston rings with identification mark toward top of piston. Using a feeler gauge, measure piston ring side clearance between ring and ring land.

3) If ring lands are excessively worn, replace piston. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS. Align piston ring end gaps properly on piston. See Fig. 16.

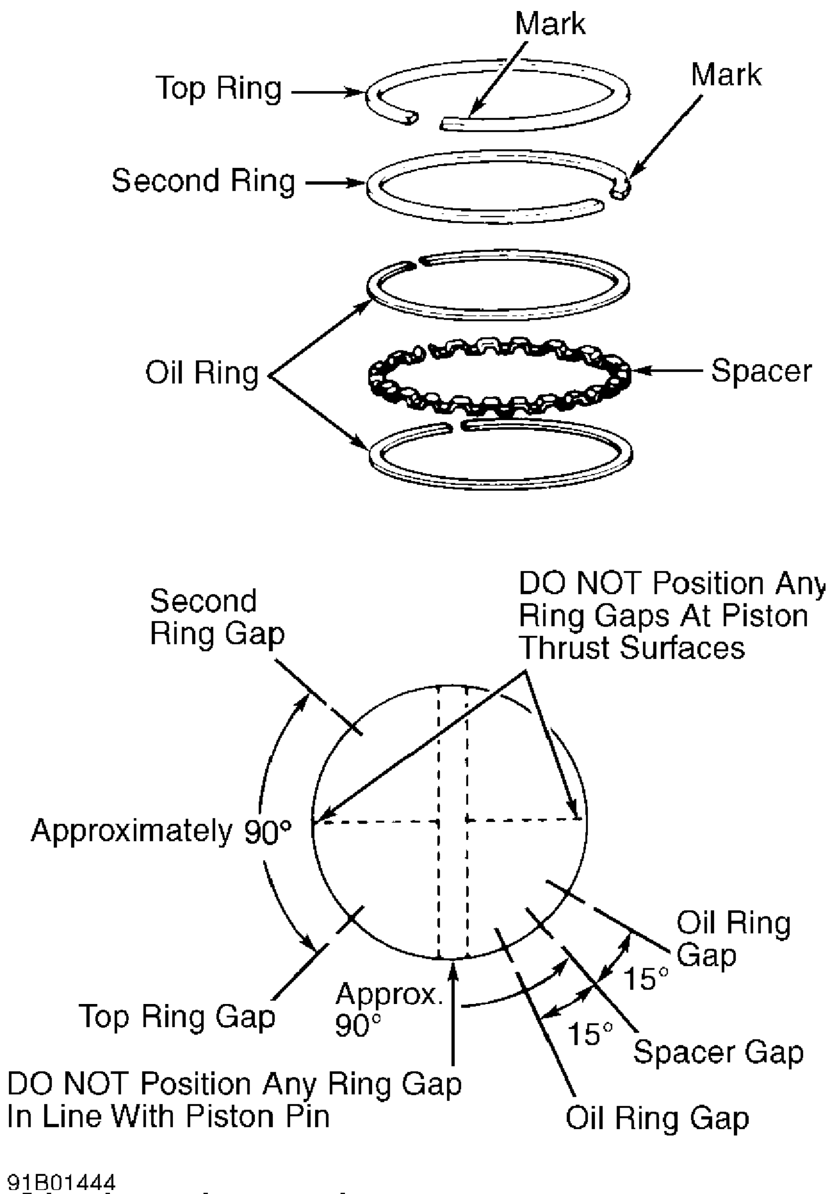


Fig. 16: Aligning Piston Rings
Courtesy of American Honda Motor Co., Inc.

Piston Pin Removal

1) Install Piston Base Head (07HAF-PL20102) and Piston Pin Base Insert (07GAF-PH60300) into Base (07973-6570500). Turn handle on Piston Pin Driver Head (07973-PE00320) so piston driver length is 2. 03" (51.5 mm).

2) Insert Piston Driver Shaft (07973-PE00310) into Pilot Collar (07GAF-PH70100). Place piston onto base. Press out piston pin. When removing or installing piston pin, place piston into press with embossed side facing up. Ensure recessed part of piston aligns with lugs on base insert.

NOTE: All replacement piston pins are oversize.

Piston Pin Inspection

1) Measure piston pin diameter. Measure piston pin bore in piston. Piston pin clearance is difference between the 2 measurements.

2) Piston pin clearance must be as specified in CONNECTING RODS table under ENGINE SPECIFICATIONS. If piston pin clearance is greater than specified, install an oversize piston pin and again measure clearance.

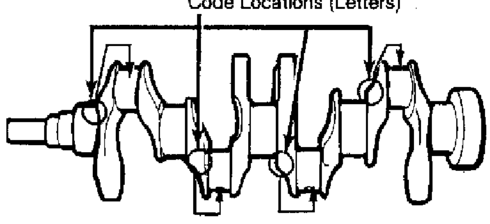
3) Determine difference between piston pin diameter and connecting rod small end bore. Interference fit between piston pin and connecting rod must be as specified in CONNECTING RODS table under ENGINE SPECIFICATIONS.

Piston Pin Installation

1) Ensure piston and connecting rod are positioned as shown. See Fig. 18. Turn handle on Piston Pin Driver (07973-PE00320) so piston driver length is 2.03" (51.5 mm).

2) Install Pilot Collar (07GAF-PR30100) into piston and connecting rod. Lubricate new piston pin lightly. Place piston onto base. Press in piston pin. See CONNECTING RODS table under ENGINE SPECIFICATIONS.

NOTE: A number code indicating connecting rod bore diameter is stamped on side of each connecting rod and cap. Connecting rod journal diameter codes (letters) are stamped on crankshaft counterweights. See Fig. 17. Use both codes when ordering replacement bearings.



Color Code Is On The Edge Of Bearing

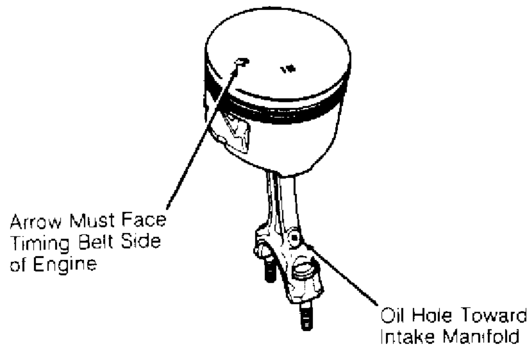
Larger Crank Bore →

Smaller Bearing (Thicker) →

	1	2	3	4
A	Red	Pink	Yellow	Green
B	Pink	Yellow	Green	Brown
C	Yellow	Green	Brown	Black
D	Green	Brown	Black	Blue

Smaller Rod Journal ↓ Smaller Bearing (Thicker) ↓

Fig. 17: Connecting Rod Journal & Bearing Identification Codes
Courtesy of American Honda Motor Co., Inc.



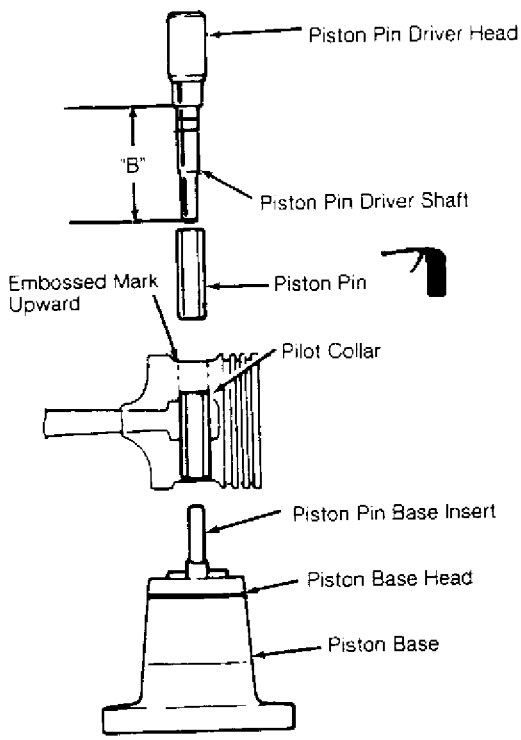


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Fig. 18: Installing Piston Pin
Courtesy of American Honda Motor Co., Inc.

Rod Bearings

1) Using Plastigage, measure rod bearing oil clearance. Tighten bearing cap to 35 ft. lbs. (47 N.m). See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

2) If oil clearance is incorrect, install a new bearing set

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(same color code) and again measure oil clearance. DO NOT shim or file cap to adjust oil clearance.

3) If oil clearance is still incorrect, try the next larger or smaller bearing. Measure oil clearance again. If proper oil clearance cannot be obtained by using larger or smaller bearings, replace crankshaft and repeat procedure.

Crankshaft & Main Bearings

1) Remove main bearing cap bridge and main bearing caps in reverse order of sequence shown in illustration. SeeFig. 19. Mark all bearing caps for reassembly reference. Lift crankshaft from block, being careful not to damage journals.

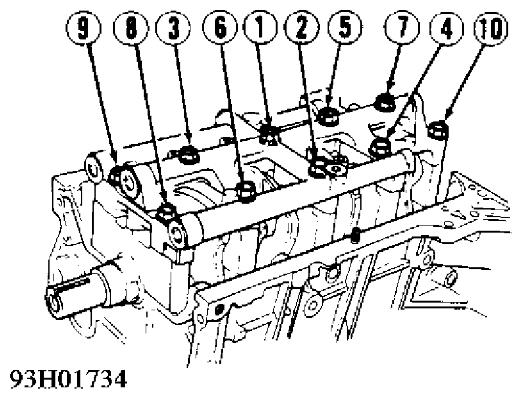
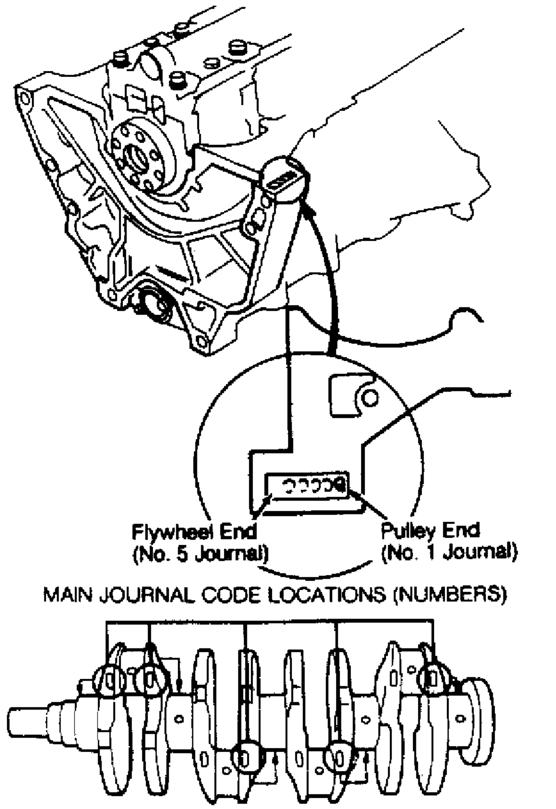


Fig. 19: Tightening Sequence For Main Bearings
Courtesy of American Honda Motor Co., Inc.

NOTE: A code consisting of a letter, number or a series of bars indicating main journal bore diameters is stamped on cylinder block, on oil pan mating surface. SeeFig. 20. Use these codes, together with crankshaft main journal diameter numbers, when ordering replacement bearings.



Color Code Is on Edge of Bearing → Larger Crank Bore

1 or A or I	2 or B or II	3 or C or III	4 or D or IIII

→ Smaller Bearing (Thicker)

1 or I	Pink	Pink/ Yellow	Yellow	Yellow/ Green
2 or II	Pink/ Yellow	Yellow	Yellow/ Green	Green
3 or III	Yellow	Yellow/ Green	Green	Green/ Brown
4 or IIII	Yellow/ Green	Green	Green/ Brown	Brown
5 or IIIII	Green	Green/ Brown	Brown	Brown/ Black
6 or IIIIII	Green/ Brown	Brown	Brown/ Black	Black

 Smaller Main Journal ↓ Smaller Bearing (Thicker) ↓ deFor Cadi Centre Nsk CA 95051Copyright © 1998

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Fig. 20: Main Bearing Identification Codes
Courtesy of American Honda Motor Co., Inc.

2) Using a lathe or "V" blocks to support crankshaft, measure crankshaft runout, out-of-round, and taper. If any measurement exceeds service limit, replace crankshaft. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** table under **ENGINE SPECIFICATIONS.**

3) Install crankshaft into block. Measure main bearing oil

clearance, using Plastigage. If engine is in vehicle, support counterweights, and measure only one bearing at a time. Before installing main bearing cap bolts, lubricate thrust washers and bolt threads. Tighten main bearing caps, in sequence, in 2 stages, first to 22 ft. lbs. (30 N.m), then to 55 ft. lbs. (75 N.m). SeeFig. 19.

4) If oil clearance is incorrect, install a new bearing set (same color code) and recheck oil clearance. If oil clearance is still incorrect, try next larger or smaller bearing and measure oil clearance once more. If proper oil clearance cannot be obtained by using larger or smaller bearings, replace crankshaft and repeat procedure.

Thrust Bearing

1) Measure crankshaft end play. If end play exceeds specification, inspect thrust washers and thrust surface of crankshaft. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

2) Replace worn parts as necessary. Thrust washer thickness is fixed. DO NOT change thrust washer thickness by grinding or shimming. Install thrust washers with grooved side out.

CAUTION: After replacing any rod or main bearing, idle engine until it reaches normal operating temperature, then an additional 15 minutes.

Cylinder Block

1) Measure cylinder block deck surface warpage. Service limit is .004" (.10 mm). Measure cylinder bore out-of-round and taper. If out-of-round or taper exceeds .002" (.05 mm), rebore cylinder for oversize pistons. If any cylinder exceed oversize bore service limit, replace cylinder block. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

2) If cylinder block is okay, hone cylinders to obtain a 60-degree crosshatch pattern. After honing, wash cylinder bores with hot soapy water. Air-dry cylinder bores, and apply engine oil to prevent rusting.

ENGINE OILING

ENGINE LUBRICATION SYSTEM

A rotor-type oil pump draws oil from oil pan and delivers it under pressure to main and connecting rod bearings. An oil hole in each connecting rod lubricates thrust side of piston and cylinder wall. An oil passage carries oil to camshaft and rocker arms. Oil spray lubricates valve stems.

Crankcase Capacity

On 2.2L SOHC, crankcase capacity, including oil filter, is 4.0 qts. (3.8L). Capacity is 5.2 qts. (4.9L) after engine overhaul.On 2.2L DOHC, crankcase capacity, including oil filter, is 5.1 qts. (4.8L). Capacity is 6.2 qts. (5.9L) after engine overhaul. On 2.3L, crankcase capacity is 4.5 qts. (4.3L). Capacity is 5.7 qts. (5.4L) after overhaul.

Oil Pressure

Measure oil pressure relief valve with engine temperature at 176oF (80oC). At idle, minimum oil pressure should be 10 psi (0.7 kg/cmy). At 3000 RPM, minimum oil pressure should be 50 psi (3.5 kg/cmy).

OIL PUMP

Removal & Disassembly

Raise and support vehicle. Drain engine oil. Remove timing belts. See TIMING & BALANCE SHAFT BELTS under REMOVAL & INSTALLATION. Remove oil pan and pick-up screen. Remove pump housing/front cover assembly. Remove pump cover from pump rotors. Remove oil seals.

Inspection

Measure pump clearances. See OIL PUMP SPECIFICATIONS table. Remove rotors and examine for wear or damage.

Reassembly & Installation

Replace oil seals and "O" rings. Position rotors into pump housing. Install rotor cover on pump housing. Apply locking fluid to cover screws, and tighten to 62 INCH lbs. (7 N.m). Fit dowel pins and NEW "O" rings to housing. To complete installation, reverse removal procedure.

OIL PUMP SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Specification
Standard	
Radial Clearance	
Inner Rotor-To-Outer Rotor	.001-.006" (.02-.16 mm)
Pump Body-To-Rotor	.004-.007" (.10-.19 mm)
Side Clearance	
Pump Body-To-Rotor	.001-.003" (.02-.07 mm)
Service Limit	
Radial Clearance	
Inner Rotor-To-Outer Rotor	.008" (.20 mm)
Pump Body-To-Rotor	.0083" (.21 mm)
Side Clearance	

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Pump Body-To-Rotor .... .005" (.12 mm)
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TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE
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Application	Ft. Lbs. (N.m)
A/C Compressor Bracket Bolt	33 (45)
Alternator Bracket Adjuster Bolt	16 (22)
Alternator Bracket Bolt	33 (45)
Camshaft Pulley Bolt	27 (37)
Connecting Rod Nut	35 (47)
Crankshaft Pulley Bolt	162 (220)
Cylinder Head Bolt (1)	
Stage 1	29 (40)
Stage 2	52 (70)
Stage 3	74 (100)
Distributor Mount Bolts	13 (18)
EGR Pipe-To-Exhaust Manifold	44 (60)
Engine Mount Bolts	(2)
Exhaust Manifold Bracket Bolt	16 (22)
Exhaust Manifold Nut (3)	24 (32)
Exhaust Manifold-To-Exhaust Pipe Nut	41 (55)
Exhaust Manifold-To-Heat Shield Bolt	16 (22)
Flywheel Bolt (3)	77 (105)
Intake Manifold Chamber Bolt/Nut	16 (22)
Intake Manifold-To-Cylinder Head Nut (3)	16 (22)
Main Bearing Cap Bolt	
Stage 1	22 (30)
Stage 2	55 (75)
Oil Pan Drain Plug	33 (45)
Oxygen Sensor	33 (45)
Power Steering Belt Adjuster Nut	31 (42)
Power Steering Pump Bracket Bolt	33 (45)
Shift Cable Bracket Bolt	16 (22)
Throttle Body Nut	16 (22)
Timing Belt Tension Adjuster Nut	33 (45)
Torque Converter Drive Plate Bolt (3)	54 (75)
Valve Adjuster Lock Nut	
2.2L	14 (20)
2.3L	20 (27)
	INCH Lbs. (N.m)
Camshaft Bearing Cap Bolt	(4)

EGR Pipe-To-Intake Manifold Nut	108 (12)
Fuel Filter Bracket Bolt	108 (12)
Oil Pan Bolt	108 (12)
Oil Pump Cover Screw	62 (7)
Oil Pump Housing Bolt	84 (9)
Oil Pump Screen Bolt	84 (9)
Thermostat Housing Bolt	108 (12)
Timing Belt Cover Bolt	108 (12)
Valve Cover Nut	90 (10)
Water Pump Bolt	108 (12)

(1) - Tighten in sequence. See Fig. 6 or 7.
(2) - Tighten in sequence. See Fig. 5.
(3) - Tighten in a crisscross pattern.
(4) - On 2.2L SOHC, tighten 6-mm bolts to 106 INCH lbs. (12 N.m), and tighten 8-mm bolts to 16 ft. lbs. (22 N.m). For 2.3L, see Fig. 12.

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ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS TABLE

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Application	Specification
Displacement	
2.2L	132 Cu. In. (2.2L)
2.3L	138 Cu. In. (2.3L)
Bore	
2.2L	
DOHC	3.43" (87 mm)
SOHC	3.35" (85 mm)
2.3L	3.43" (87 mm)
Stroke	
2.2L	
DOHC	3.57" (90.7 mm)
SOHC	3.74" (95 mm)
2.3L	3.74" (95 mm)
Compression Ratio	
2.2L	
DOHC	10.0:1
SOHC	8.8:1
2.3L	9.8:1
Fuel System	PFI
Horsepower @ RPM	

2.2L	
DOHC	190 @ 6800
SOHC	135 @ 5200
2.3L	160 @ 5800
Torque Ft. Lbs. @ RPM	
2.2L	
DOHC	158 @ 5300
SOHC	142 @ 4000
2.3L	156 @ 4500

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CRANKSHAFT, MAIN & CONNECTING

ROD BEARINGS SPECIFICATION

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATION TABLE

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Application	In. (mm)
Crankshaft	
End Play	
Standard	.004-.014 (.10-.35)
Service Limit	.018 (.45)
Runout	
Standard	.0012 (.030)
Service Limit	.0016 (.040)
Main Bearings	
Journal Diameter	
No. 1 & 2	1.9676-1.9685 (49.976-50.000)
No. 3	1.9674-1.9683 (49.972-49.996)
No. 4	1.9679-1.9688 (49.984-50.008)
No. 5	1.9680-1.9690 (49.988-50.012)
Journal Out-Of-Round	
Standard	.0002 (.005)
Service Limit	.0002 (.006)
Journal Taper	
Standard	.0002 (.005)
Service Limit	.0002 (.006)
Oil Clearance	
No. 1 & 2 Journals	
Standard	.0008-.0018 (.021-.045)
Service Limit	.002 (.050)
No. 3 Journal	
Standard	.0010-.0020 (.025-.049)
Service Limit	.0022 (.055)
No. 4 Journal	
Standard	.0005-.0015 (.013-.037)
Service Limit	.0020 (.050)

No. 5 Journal	
Standard	.0004-.0013 (.009-.033)
Service Limit	.0016 (.040)
Connecting Rod Bearings	
Journal Diameter	1.7707-1.7717 (44.976-45.000)
Journal Out-Of-Round	
Standard	.0002 (.005)
Service Limit	.0002 (.006)
Journal Taper	
Standard	.0002 (.005)
Service Limit	.0002 (.006)
Oil Clearance	
2.2L SOHC	
Standard	.0008-.0020 (.021-.049)
Service Limit	.0022 (.055)
2.2L DOHC & 2.3L	
Standard	.0011-.0022 (.027-.055)
Service Limit	.0024 (.060)

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CONNECTING RODS SPECIFICATIONS

CONNECTING RODS SPECIFICATION TABLE

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Application	In. (mm)
Piston Pin Diameter	
Standard	.8659-.8661 (21.994-22.000)
Oversize	.8660-.8663 (21.997-22.003)
Piston Pin-To-Rod Interference	.0005-.0013 (.012-.032)
Piston Pin-To-Piston Clearance	
2.2L SOHC	.0005-.0009 (.012-.024)
2.2L DOHC & 2.3L	.0005-.0010 (.012-.026)

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PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS SPECIFICATION TABLE

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Application	In. (mm)
2.2L SOHC	
Piston Clearance	
Standard	.0008-.0016 (.020-.040)
Service Limit	.002 (.05)
Piston Diameter (1)	
Standard	
Size "A"	3.3457-3.3461 (84.98-84.99)

Size "B" 3.3453-3.3457 (84.97-84.98)
Service Limit
Size "A" 3.3453 (84.97)
Size "B" 3.3449 (84.96)
Piston Pin Clearance
Standard .... .0005-.0009 (.012-.024)
Service Limit .... .0009 (.024)
Rings
No. 1
End Gap
Standard .... .008-.014 (.20-.35)
Service Limit .... .024 (.60)
Side Clearance
Standard .... .0014-.0024 (.035-.060)
Service Limit .... .005 (.13)
No. 2
End Gap
Standard .... .016-.022 (.40-.55)
Service Limit .... .028 (.70)
Side Clearance
Standard .... .0012-.0022 (.030-.055)
Service Limit .... .005 (.13)
No. 3 (Oil)
End Gap .... .008-.028 (.20-.71)
2.2L DOHC & 2.3L
Piston Clearance
Standard .... .0003-.0012 (.007-.030)
Service Limit .... .0016 (.04)
Piston Diameter (2)
Standard
Size "A" 3.4248-3.4253 (86.990-87.003)
Size "B" 3.4244-3.4249 (86.980-86.993)
Service Limit
Size "A" 3.4244 (86.980)
Size "B" 3.4240 (86.970)
Piston Pin Clearance
Standard .... .0005-.0010 (.012-.026)
Service Limit .... .0010 (.026)
Rings
No. 1
End Gap
Standard .... .010-.014 (.25-.35)
Service Limit .... .024 (.60)
Side Clearance
Standard .... .0014-.0024 (.035-.060)
Service Limit .... .005 (.13)
No. 2
End Gap

Standard	.024-.030 (.60-.75)
Service Limit	.028 (.90)
Side Clearance	
Standard	.0014-.0022 (.035-.055)
Service Limit	.005 (.13)
No. 3 (Oil)	
End Gap (3)	
Standard	.008-.020 (.20-.50)
Service Limit (3)	.024 (.60)
End Gap (4)	
Standard	.008-.028 (.20-.70)
Service Limit (4)	.031 (.80)

(1) - Measured .83" (21 mm) from bottom of piston skirt.
(2) - Measured .59" (15 mm) from bottom of piston skirt.
(3) - Teikoku manufacturer.
(4) - Riken manufacturer.

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CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK SPECIFICATION TABLE

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Application	In. (mm)
2.2L SOHC	
Cylinder Bore	
Standard Diameter	3.346-3.347 (85.00-85.02)
Service Limit	3.349 (85.07)
Maximum Taper	.002 (.05)
Maximum Deck Warpage	.004 (.10)
Maximum Rebore Limit	.02 (.5)
2.2L DOHC & 2.3L	
Cylinder Bore	
Standard Diameter	3.425-3.426 (87.00-87.02)
Service Limit	3.428 (87.07)
Maximum Taper	.002 (.05)
Maximum Deck Warpage	.004 (.10)
Maximum Rebore Limit	.010 (.25)

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VALVES & VALVE SPRINGS SPECIFICATION - 2.2L DOHC

VALVES & VALVE SPRINGS SPECIFICATION TABLE - 2.2L DOHC

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Application	Specification
Intake Valves	

Face Angle 45
Head Diameter .... 1.374-1.382" (34.90-35.10)
Margin
Standard .... .041-.053" (1.05-1.35 mm)
Service Limit .... .033" (.85 mm)
Stem Diameter
Standard .... .2156-.2159" (5.475-5.483 mm)
Service Limit .... .2144" (5.445 mm)
Exhaust Valves
Face Angle 45
Head Diameter .... 1.177-1.185" (29.90-30.10 mm)
Margin
Standard .... .065-.078" (1.65-1.95 mm)
Service Limit .... .057" (1.45 mm)
Stem Diameter
Standard .... .21556-.2159" (5.475-5.485 mm)
Service Limit .... .2144" (5.445 mm)
Valve Spring
Free Length
Intake
Inner
Chuo Hatsujo .... 1.645" (41.78 mm)
Nihon Hatsujo .... 1.644" (41.75 mm)
Outer
Chuo Hatsujo .... 1.778" (45.16 mm)
Nihon Hatsujo .... 1.802" (45.76 mm)
Exhaust
Inner
Chuo Hatsujo .... 1.548" (39.32 mm)
Nihon Hatsujo .... 1.546" (39.28 mm)
Outer
Chuo Hatsujo .... 1.839" (46.72 mm)
Nihon Hatsujo .... 1.840" (46.74 mm)
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VALVES & VALVE SPRINGS SPECIFICATION - 2.2L SOHC

VALVES & VALVE SPRINGS SPECIFICATION TABLE - 2.2L SOHC

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Application Specification

Intake Valves
Face Angle 45
Head Diameter .... 1.335-1.343" (33.9-34.10)
Margin
Standard .... .033-.045" (.85-1.15 mm)
Service Limit .... .026" (.65 mm)
Stem Diameter

Standard .... .2159-.2163" (5.485-5.495 mm)
Service Limit .... .2148" (5.455 mm)
Exhaust Valves
Face Angle 45
Head Diameter .... 1.138-1.146" (28.90-29.10 mm)
Margin
Standard .... .041-.053" (1.05-1.35 mm)
Service Limit .... .037" (.95 mm)
Stem Diameter
Standard .... .2146-.2150" (5.450-5.460 mm)
Service Limit .... .2134" (5.420 mm)
Valve Spring
Free Length
Intake
Chuo Hatsujo .... 2.1578" (54.810 mm)
Nihon Hatsujo .... 2.1582" (54.820 mm)
Exhaust
Chuo Hatsujo .... 2.1968" (55.800 mm)
Nihon Hatsujo .... 2.2157" (56.280 mm)
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VALVES & VALVE SPRINGS SPECIFICATION - 2.3L

VALVES & VALVE SPRINGS SPECIFICATION TABLE - 2.3L
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Application Specification

Intake Valves
Face Angle 45
Head Diameter .... 1.335-1.343" (33.90-34.10)
Margin
Standard .... .033-.045" (.85-1.15 mm)
Service Limit .... .026" (.65 mm)
Stem Diameter
Standard .... .2591-.2594" (6.580-6.590 mm)
Service Limit .... .2579" (6.550 mm)
Exhaust Valves
Face Angle 45
Head Diameter .... 1.138-1.146" (28.90-29.10 mm)
Margin
Standard .... .041-.053" (1.05-1.35 mm)
Service Limit .... .033" (.85 mm)
Stem Diameter
Standard .... .2579-.2583" (6.55-6.56 mm)
Service Limit .... .2567" (6.520 mm)
Valve Spring
Free Length
Intake & Exhaust .... 1.856" (47.14 mm)

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CYLINDER HEAD SPECIFICATION - 2.3L

CYLINDER HEAD SPECIFICATION TABLE - 2.3L

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Application	Specification
Cylinder Head	
Height	5.195-5.199" (131.95-132.05 mm)
Maximum Warpage	(1) .002-.008" (.05-.20 mm)
Valve Seats	
Intake & Exhaust Valve	
Seat Angle	45
Seat Width	
Standard	.049-.061" (1.25-1.55 mm)
Service Limit	.079" (2.00 mm)
Valve Guide Installed Height	
Intake	.52-.54 (13.2-13.7)
Exhaust	.54-.56 (13.7-14.2)
Valve Guide Oil Clearance	
Measured At Valve Head (Dial Indicator)	
Intake Valve	
Standard	.002-.004 (.04-.10)
Service Limit	.006 (.16)
Exhaust Valve	
Standard	.004-.006 (.10-.16)
Service Limit	.009 (.22)
Measured At Stem (Micrometer & Ball Gauge)	
Intake Valve	
Standard	.001-.002 (.02-.05)
Service Limit	.003 (.08)
Exhaust Valve	
Standard	.002-.003 (.05-.08)
Service Limit	.004 (.11)
Valve Stem Installed Height (2)	
Intake Valve	
Standard	1.550-1.568 (39.36-39.83)
Service Limit	1.578 (40.08)
Exhaust Valve	
Standard	1.542-1.560 (39.16-39.63)
Service Limit	1.570 (39.88)

(1) - Maximum resurface limit is .008" (.20 mm).
(2) - Measured from stem tip of installed valve to spring seat surface.

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CYLINDER HEAD SPECIFICATION - 2.3L

CYLINDER HEAD SPECIFICATION TABLE - 2.3L

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Application	Specification
Cylinder Head	
Height	5.195-5.199" (131.95-132.05 mm)
Maximum Warpage	(1) .002-.008" (.05-.20 mm)
Valve Seats	
Intake & Exhaust Valve	
Seat Angle	45
Seat Width	
Standard	.049-.061" (1.25-1.55 mm)
Service Limit	.079" (2.00 mm)
Valve Guide Installed Height	
Intake	.52-.54 (13.2-13.7)
Exhaust	.54-.56 (13.7-14.2)
Valve Guide Oil Clearance	
Measured At Valve Head (Dial Indicator)	
Intake Valve	
Standard	.002-.004 (.04-.10)
Service Limit	.006 (.16)
Exhaust Valve	
Standard	.004-.006 (.10-.16)
Service Limit	.009 (.22)
Measured At Stem (Micrometer & Ball Gauge)	
Intake Valve	
Standard	.001-.002 (.02-.05)
Service Limit	.003 (.08)
Exhaust Valve	
Standard	.002-.003 (.05-.08)
Service Limit	.004 (.11)
Valve Stem Installed Height (2)	
Intake Valve	
Standard	1.550-1.568 (39.36-39.83)
Service Limit	1.578 (40.08)
Exhaust Valve	
Standard	1.542-1.560 (39.16-39.63)
Service Limit	1.570 (39.88)

(1) - Maximum resurface limit is .008" (.20 mm).
(2) - Measured from stem tip of installed valve to spring seat surface.

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CYLINDER HEAD SPECIFICATION - 2.2L DOHC

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CYLINDER HEAD SPECIFICATION TABLE - 2.2L DOHC

Application	Specification
Cylinder Head	
Height	5.589-5.593" (141.95-142.05 mm)
Maximum Warpage	(1) .002-.008" (.05-.20 mm)
Valve Seats	
Intake & Exhaust Valve	
Seat Angle	45
Seat Width	
Standard	.049-.061" (1.25-1.55 mm)
Service Limit	.079" (2.00 mm)
Valve Guide Installed Height	
Intake	.52-.54 (13.2-13.7)
Exhaust	.54-.56 (13.7-14.2)
Valve Guide Oil Clearance	
Measured At Valve Head (Dial Indicator)	
Intake Valve	
Standard	.002-.004 (.05-.11)
Service Limit	.006 (.16)
Exhaust Valve	
Standard	.004-.006 (.10-.16)
Service Limit	.009 (.22)
Measured At Stem (Micrometer & Ball Gauge)	
Intake Valve	
Standard	.001-.002 (.02-.05)
Service Limit	.003 (.08)
Exhaust Valve	
Standard	.002-.003 (.05-.08)
Service Limit	.004 (.11)
Valve Stem Installed Height (2)	
Intake Valve	
Standard	1.475-1.494 (37.465-37.935)
Service Limit	1.503 (38.185)
Exhaust Valve	
Standard	1.463-1.482 (37.165-37.635)
Service Limit	1.492 (37.885)

(1) - Maximum resurface limit is .008" (.20 mm).
(2) - Measured from stem tip of installed valve to spring seat surface.

CYLINDER HEAD SPECIFICATION - 2.2L SOHC

CYLINDER HEAD SPECIFICATION TABLE - 2.2L SOHC

Application	Specification
Cylinder Head	
Height	3.935-3.939" (99.95-100.05 mm)
Maximum Warpage	(1) .002-.008" (.05-.20 mm)
Valve Seats	
Intake & Exhaust Valve	
Seat Angle	45
Seat Width	
Standard	.049-.061" (1.25-1.55 mm)
Service Limit	.079" (2.00 mm)
Valve Guide Installed Height	
Intake	.935-.955 (23.75-24.25)
Exhaust	.593-.620 (15.05-15.75)
Valve Guide Oil Clearance	
Measured At Valve Head (Dial Indicator)	
Intake Valve	
Standard	.0016-.0034 (.04-.09)
Service Limit	.006 (.16)
Exhaust Valve	
Standard	.004-.006 (.11-.16)
Service Limit	.009 (.22)
Measured At Stem (Micrometer & Ball Gauge)	
Intake Valve	
Standard	.0008-.0018 (.020-.045)
Service Limit	.003 (.08)
Exhaust Valve	
Standard	.002-.003 (.055-.080)
Service Limit	.005 (.12)
Valve Stem Installed Height (2)	
Intake Valve	
Standard	1.8994-1.9179 (48.245-48.715)
Service Limit	1.9278 (48.965)
Exhaust Valve	
Standard	1.9809-1.9994 (50.315-50.785)
Service Limit	2.0092 (51.035)

(1) - Maximum resurface limit is .008" (.20 mm).
(2) - Measured from stem tip of installed valve to spring seat surface.

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CYLINDER HEAD SPECIFICATION - 2.3L

CYLINDER HEAD SPECIFICATION TABLE - 2.3L

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Application	Specification

```
Cylinder Head
 Height  ..................  5.195-5.199" (131.95-132.05 mm)
 Maximum Warpage  ............  (1) .002-.008" (.05-.20 mm)
Valve Seats
 Intake & Exhaust Valve
 Seat Angle  .........................................  45
 Seat Width
  Standard  ....................  .049-.061" (1.25-1.55 mm)
  Service Limit  ........................  .079" (2.00 mm)
Valve Guide Installed Height
 Intake  ............................  .52-.54 (13.2-13.7)
 Exhaust  ...........................  .54-.56 (13.7-14.2)
Valve Guide Oil Clearance
 Measured At Valve Head (Dial Indicator)
 Intake Valve
  Standard ............................ .002-.004 (.04-.10)
  Service Limit ................................. .006 (.16)
 Exhaust Valve
  Standard ............................ .004-.006 (.10-.16)
  Service Limit ................................. .009 (.22)
 Measured At Stem (Micrometer & Ball Gauge)
 Intake Valve
  Standard ............................ .001-.002 (.02-.05)
  Service Limit ................................. .003 (.08)
 Exhaust Valve
  Standard ............................ .002-.003 (.05-.08)
  Service Limit ................................. .004 (.11)
Valve Stem Installed Height (2)
 Intake Valve
 Standard  ......................  1.550-1.568 (39.36-39.83)
 Service Limit  ............................  1.578 (40.08)
 Exhaust Valve
 Standard  ......................  1.542-1.560 (39.16-39.63)
 Service Limit  ............................  1.570 (39.88)

(1) - Maximum resurface limit is .008" (.20 mm).
(2) - Measured from stem tip of installed valve to spring
      seat surface.
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CAMSHAFT SPECIFICATIONS

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CAMSHAFT SPECIFICATIONS TABLE
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Application                                         In. (mm)

2.2L DOHC
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Standard	.002-.006 (.05-.15)
Service Limit	.020 (.50)
Journal Runout	
Standard	.0012 (.03)
Service Limit	.002 (.06)
Oil Clearance	
Standard	.002-.004 (.050-.089)
Service Limit	.006 (.15)
Lobe Height	
Intake	
Primary	1.3402 (34.041)
Mid	1.4510 (36.856)
Secondary	1.3768 (34.971)
Exhaust	
Primary	1.3285 (33.745)
Mid	1.4300 (36.323)
Secondary	1.3655 (34.683)
2.2L SOHC	
End Play	
Standard	.002-.006 (.05-.15)
Service Limit	.020 (.50)
Journal Runout	
Standard	.0006 (.015)
Service Limit	.001 (.03)
Oil Clearance	
Except Exhaust Journal No. 3	
Standard	.002-.004 (.050-.089)
Service Limit	.006 (.15)
Exhaust Journal No. 3	
Standard	.0039-.0055 (.100-.139)
Service Limit	.008 (.20)
Lobe Height	
Intake	1.5167 (38.526)
Exhaust	1.5266 (38.778)
2.3L	
End Play	
Standard	.002-.006 (.05-.15)
Service Limit	.020 (.50)
Journal Runout	
Standard	.0012 (.03)
Service Limit	.002 (.06)
Oil Clearance	
Standard	.002-.004 (.050-.089)
Service Limit	.006 (.15)
Lobe Height	
Intake	1.3252 (33.661)
Exhaust	1.3278 (33.725)

BALANCE SHAFTS SPECIFICATIONS

BALANCE SHAFTS SPECIFICATIONS TABLE

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Application	In. (mm)
End Play	
Front	.0040-.0138 (.100-.350)
Rear	.0024-.0070 (.060-.180)
Runout	.0008 (.020)
Oil Clearance	
No. 1 Journal (Rear)	
Standard	.0020-.0030 (.050-.075)
Service Limit	.0035 (.090)
No. 1 Journal (Front)	
Standard	.0026-.0046 (.066-.118)
Service Limit	.0047 (.120)
No. 2 Journal	
Standard	.0030-.0050 (.076-.128)
Service Limit	.0051 (.130)
No. 3 Journal	
Standard	.0026-.0046 (.066-.118)
Service Limit	.0047 (.120)

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END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE COOLING
Honda Motors Engine Cooling Fans

Honda; Prelude

NOTE: For water pump removal procedure, see2.2L 4-CYL & 2.3L 4-CYL article in ENGINES.

ELECTRIC COOLING FAN

NOTE: For wiring circuit information, see appropriate chassis wiring diagram in WIRING DIAGRAMS.

TROUBLE SHOOTING

Cooling & Condenser Fans Do Not Operate
If both fans are not operating, check:

* Fuses No. 9, 19 and 23 (15-amp) in underdash fuse box.
* Coolant temperature switches "A" and "B".
* Radiator fan control module.
* Ground circuit at condenser fan motor.
* Open or loose terminal in both Black/Yellow wire circuits between underdash fuse box and radiator fan timer.

Only One Fan Operates
If only one fan is operating, check:

* Fuses No. 33 (50-amp), No. 45 (15-amp) and No. 47 (15-amp) in underhood relay box.
* Radiator or condenser fan relay.
* Radiator or condenser fan motor.
* Ground circuits at radiator fan motor, coolant temperature switch "A" and coolant fan motor.
* Open or loose terminal in Blue/Black wire circuit between radiator fan relay and radiator fan motor.
* Open or loose terminal in Blue/Yellow wire circuit between condenser fan relay and condenser fan motor.
* Open or loose terminal in Blue/Red wire circuit between radiator fan relay, condenser fan relay and coolant temperature switch "A".

Radiator Fan Control Module Malfunction
If radiator fan control module is not operating properly, check:

* Fuses No. 33 (50-amp), No. 45 (15-amp) and No. 47 (15-amp) in underhood relay box.
* Radiator fan control module.
* A/C system.
* Ground circuits at coolant temperature switch "B" and radiator fan control module.
* Open or loose terminal in White/Yellow wire circuit between radiator fan control module and coolant temperature switch "B".
* Open or loose terminal in Blue/Red wire circuit between radiator fan relay, condenser fan relay and coolant temperature switch "A".
* Open or loose terminal in Black/Yellow wire circuit between underhood relay box and radiator fan control module.

COMPONENT TESTING

Radiator Fan Control Module

1) Perform following tests with ignition on and radiator fan control module connected. Any problem should be corrected before advancing through tests. Before performing any tests, check fuses No. 9, 19 and 23 in dash fuse box. Check fuses No. 32, 33, 45 and 47 in underhood fuse/relay box. Use illustration for radiator fan control module terminal identification. See Fig. 1. If all tests are okay, replace radiator fan control module with known good part.

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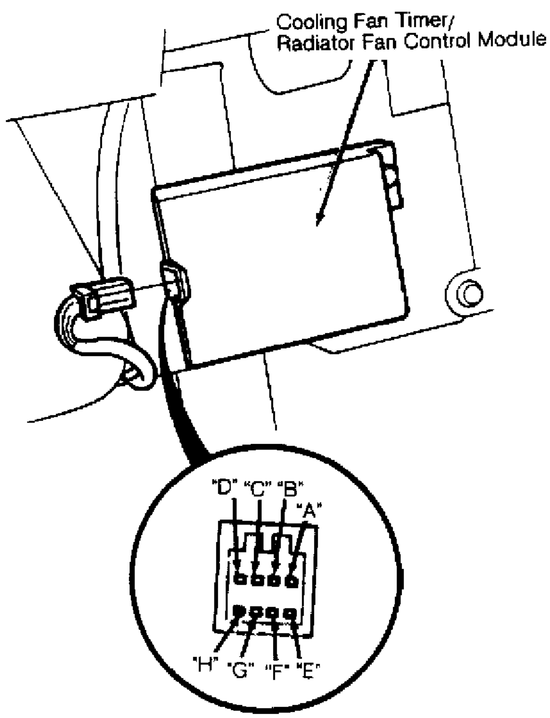

Terminal	Wire	Destination
A	BLK	Ground (G401, G402)
B	YEL/WHT	Condenser fan relay (Coil ⊕)
C	BLK/YEL	Power supply (For radiator fan and condenser fan relays by way of timer unit with ignition switch ON)
D	YEL	Radiator fan relay (Coil ⊕)
E	BLU/RED	Radiator fan and condenser fan relays (Coil ⊖)
F	BLK/YEL	IG1 (Timer reset signal)
G	WHT/GRN	Power supply (For fan timer unit with ignition switch OFF)
H	WHT/YEL	Coolant temperature switch B

93G00345

Fig. 1: Identifying Fan Control Module Terminals
Courtesy of American Honda Motor Co., Inc.

2) Check for voltage between terminal "A" (Black wire) and body ground. Voltage should be less than one volt. If result is not within specification, repair open to body ground.

3) Check terminal "G" (White/Green wire) for battery voltage. If battery voltage does not exist, recheck fuse No. 45. If fuse is

okay, repair open in White/Green wire.

NOTE: On Prelude, radiator fan control module has 2 Black/Yellow wires.

4) Check for battery voltage at terminal "F" (Black/Yellow wire). If battery voltage does not exist, recheck fuse No. 19 (without SRS) or fuse No. 23 (with SRS). If fuse is okay, repair open in Black/Yellow wire.

5) Check for battery voltage at terminal "C" (Black/Yellow wire). If battery voltage does not exist, recheck fuse No. 9. If fuse is okay, repair open in Black/Yellow wire.

6) Check for battery voltage at terminal "B" (Yellow/White wire). Check for battery voltage at terminal "D" (Yellow wire). If battery voltage does not exist on both terminals, replace radiator fan control module. Before connecting replacement radiator fan control module, check for continuity between Yellow/White wire and ground using an ohmmeter. Check for continuity between Yellow wire and ground. Continuity should not exist. If continuity exists, DO NOT connect control module.

7) Check for voltage between terminal "E" (Blue/Red wire) and body ground. Condenser fan and radiator fan should come on. If fans do not turn on, check for open in Blue/Red wire between radiator fan control module and condenser fan relay and radiator fan relay. If circuits are okay, check for open in Yellow/White wire between radiator fan control module and condenser fan relay. Also check for open in Yellow wire between radiator fan control module and radiator fan relay. If circuits are okay, test both fan relays.

8) Check for voltage at terminal "H" (White/Yellow wire). With coolant temperature less than 223°F (106°C), voltage should be about 11 volts. If result not within specification, check coolant temperature switch "B". Check for short to body ground. If ground is okay, replace radiator fan control module.

Coolant Temperature Switch "A"

1) Remove coolant temperature switch "A" from thermostat housing. Suspend temperature switch and thermometer in a container with a 50/50 mixture of coolant and water. DO NOT allow thermometer or temperature switch to touch bottom of container. Heat coolant mixture.

2) Check continuity between temperature switch terminals. On 2.2L SOHC and 2.3L engines, with coolant temperature greater than 194-199°F (90-93°C), continuity should exist. With coolant temperature 181-193°F (83-89°C), continuity should not exist.

3) On 2.2L DOHC engine, with coolant temperature greater than 198-208°F (92-98°C), continuity should exist. With coolant temperature 187-197°F (86-91C), continuity should not exist. If readings are not correct, replace switch.

Coolant Temperature Switch "B"

1) Remove coolant temperature switch "B" from thermostat housing.

2) With coolant temperature greater than 217-228°F (103-109°C) for switch "B", continuity should exist. With temperature 204-216°F (96-102°C), continuity should not exist. If readings are not correct, replace switch.

Fan Motor

Unplug 2-pin connector from fan motor. Connect battery power to either fan motor terminal. Connect ground to other fan motor terminal. Replace motor if it fails to run.

Relays

1) Remove radiator and condenser fan relays. On Prelude, both condenser and radiator fan relays are located inside underhood relay box.

2) On all models, connect positive battery power to relay terminal "C" and connect terminal "D" to ground. For terminal identification, see WIRING DIAGRAMS. Continuity should be present between relay terminals "A" and "B". No continuity should be present when battery power is disconnected.

WIRING DIAGRAMS

NOTE: For wiring circuit information, see appropriate wiring diagram.

END OF ARTICLE

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ARTICLE BEGINNING

Engine Overhaul Procedures - General Information
ALL PISTON ENGINES

* PLEASE READ THIS FIRST *

Examples used in this article are general in nature and do not necessarily relate to a specific engine or system. Illustrations and procedures have been chosen to guide mechanic through engine overhaul process. Descriptions of processes of cleaning, inspection, assembly and machine shop practice are included.

Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

ENGINE IDENTIFICATION

The engine may be identified from its Vehicle Identification Number (VIN) stamped on a metal tab. Metal tab may be located in different locations depending on manufacturer. Engine identification number or serial number is located on cylinder block. Location varies with manufacturer.

INSPECTION PROCEDURES

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

GENERAL

Engine components must be inspected to meet manufacturer's specifications and tolerances during overhaul. Proper dimensions and tolerances must be met to obtain proper performance and maximum engine life.

Micrometers, depth gauges and dial indicator are used for checking tolerances during engine overhaul. Magnaflux, Magnaglo, dye-check, ultrasonic and x-ray inspection procedures are used for parts inspection.

MAGNETIC PARTICLE INSPECTION

Magnaflux & Magnaglo

Magnaflux is an inspection technique used to locate material

flaws and stress cracks. The part in question is subjected to a strong magnetic field. The entire part, or a localized area, can be magnetized. The part is coated with either a wet or dry material that contains fine magnetic particles.

Cracks which are outlined by the particles cause an interruption in the magnetic field. The dry powder method of Magnaflux can be used in normal light. A crack will appear as an obvious bright line.

Fluorescent liquid is used in conjunction with a blacklight in a second Magnaflux system called Magnaglo. This type of inspection demands a darkened room. The crack will appear as a glowing line in this process. Both systems require complete demagnetizing upon completion of the inspection. Magnetic particle inspection applies to ferrous materials only.

PENETRANT INSPECTION

Zyglo

The Zyglo process coats the material with a fluorescent dye penetrant. The part is often warmed to expand cracks that will be penetrated by the dye. When the coated part is subjected to inspection with a blacklight, a crack will glow brightly. Developing solution is often used to enhance results. Parts made of any material, such as aluminum cylinder heads or plastics, may be tested using this process.

Dye Check

Penetrating dye is sprayed on the previously cleaned component. Dye is left on component for 5-45 minutes, depending upon material density. Component is then wiped clean and sprayed with a developing solution. Surface cracks will show up as a bright line.

ULTRASONIC INSPECTION

If an expensive part is suspected of internal cracking, Ultrasonic testing is used. Sound waves are used for component inspection.

X-RAY INSPECTION

This form of inspection is used on highly stressed components. X-ray inspection maybe used to detect internal and external flaws in any material.

PRESSURE TESTING

Cylinder heads can be tested for cracks using a pressure tester. Pressure testing is performed by plugging all but one of the holes in the head and injecting air or water into the open passage.

Leaks are indicated by the appearance of wet or damp areas when using water. When air is used, it is necessary to spray the head surface with a soap solution. Bubbles will indicate a leak. Cylinder head may also be submerged in water heated to specified temperature to check for cracks created during heat expansion.

CLEANING PROCEDURES

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

GENERAL

All components of an engine do not have the same cleaning requirements. Physical methods include bead blasting and manual removal. Chemical methods include solvent blast, solvent tank, hot tank, cold tank and steam cleaning of components.

BEAD BLASTING

Manual removal of deposits may be required prior to bead blasting, followed by some other cleaning method. Carbon, paint and rust may be removed using bead blasting method. Components must be free of oil and grease prior to bead blasting. Beads will stick to grease or oil soaked areas causing area not to be cleaned.

Use air pressure to remove all trapped residual beads from components after cleaning. After cleaning internal engine parts made of aluminum, wash thoroughly with hot soapy water. Component must be thoroughly cleaned as glass beads will enter engine oil resulting in bearing damage.

CHEMICAL CLEANING

Solvent tank is used for cleaning oily residue from components. Solvent blasting sprays solvent through a siphon gun using compressed air.

The hot tank, using heated caustic solvents, is used for cleaning ferrous materials only. DO NOT clean aluminum parts such as cylinder heads, bearings or other soft metals using the hot tank. After cleaning, flush parts with hot water.

A non-ferrous part will be ruined and caustic solution will be diluted if placed in the hot tank. Always use eye protection and gloves when using the hot tank.

Use of a cold tank is for cleaning of aluminum cylinder heads, carburetors and other soft metals. A less caustic and unheated solution is used. Parts may be lift in the tank for several hours without damage. After cleaning, flush parts with hot water.

Steam cleaning, with boiling hot water sprayed at high pressure, is recommended as the final cleaning process when using either hot or cold tank cleaning.

COMPONENT CLEANING

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

SHEET METAL PARTS

Examples of sheet metal parts are the rocker covers, front and side covers, oil pan and bellhousing dust cover. Glass bead blasting or hot tank may be used for cleaning.

Ensure all mating surfaces are flat. Deformed surfaces should be straightened. Check all sheet metal parts for cracks and dents.

INTAKE & EXHAUST MANIFOLDS

Using solvent cleaning or bead blasting, clean manifolds for inspection. If the intake manifold has an exhaust crossover, all carbon deposits must be removed. Inspect manifolds for cracks, burned or eroded areas, corrosion and damage to fasteners.

Exhaust heat and products of combustion cause threads of fasteners to corrode. Replace studs and bolts as necessary. On "V" type intake manifolds, the sheet metal oil shield must be removed for proper cleaning and inspection. Ensure that all manifold parting surfaces are flat and free of burrs.

CYLINDER HEAD REPLACEMENT

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

REMOVAL

Remove intake and exhaust manifolds and valve cover. Cylinder head and camshaft carrier bolts (if equipped), should be removed only when the engine is cold. On many aluminum cylinder heads, removal while hot will cause cylinder head warpage. Mark rocker arm or overhead cam components for location.

Remove rocker arm components or overhead cam components. Components must be installed in original location. Individual design rocker arms may utilize shafts, ball-type pedestal mounts or no rocker arms. For all design types, wire components together and identify according to the corresponding valve. Remove cylinder head bolts. Note length and location. Some applications require cylinder head bolts be removed in proper sequence to prevent cylinder head damage. See Fig. 1. Remove cylinder head.

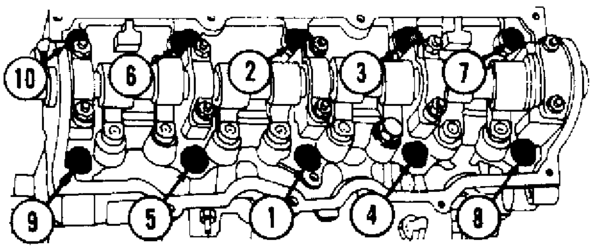

Fig. 1: Typical Cylinder Head Tightening or Loosening Sequence
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INSTALLATION

Ensure all surfaces and head bolts are clean. Check that head bolt holes of cylinder block are clean and dry to prevent block damage when bolts are tightened. Clean threads with tap to ensure accurate bolt torque.

Install head gasket on cylinder block. Some manufacturer's may recommend sealant be applied to head gasket prior to installation. Note that all holes are aligned. Some gasket applications may be marked so certain area faces upward. Install cylinder head using care not to damage head gasket. Ensure cylinder head is fully seated on cylinder block.

Some applications require head bolts be coated with sealant prior to installation. This is done if head bolts are exposed to water passages. Some applications require head bolts be coated with light coat of engine oil.

Install head bolts. Head bolts should be tightened in proper steps and sequence to specification. See Fig. 1. Install remaining components. Tighten all bolts to specification. Adjust valves if required. See **VALVE ADJUSTMENT** in this article.

NOTE: Some manufacturers require that head bolts be retightened after specified amount of operation. This must be done to prevent head gasket failure.

ENGINE OVER

VALVE ADJUSTMENT

Engine specifications will indicate valve train clearance and temperature at which adjustment is to be made on most models. In most cases, adjustment will be made with a cold engine. In some cases, both a cold and a hot clearance will be given for maintenance convenience.

On some models, adjustment is not required. Rocker arms are tightened to specification and valve lash is automatically set. On some models with push rod actuated valve train, adjustment is made at push rod end of rocker arm while other models do not require adjustment.

Clearance will be checked between tip of rocker arm and tip of valve stem in proper sequence using a feeler gauge. Adjustment is made by rotating adjusting screw until proper clearance is obtained. Lock nut is then tightened. Engine will be rotated to obtain all valve adjustments to manufacturer's specifications.

Some models require hydraulic lifter to be bled down and clearance measured. Different length push rods can be used to obtain proper clearance. Clearance will be checked between tip of rocker arm and tip of valve stem in proper sequence using a feeler gauge.

On overhead cam engines designed without rocker arms actuate valves directly on a cam follower. A hardened, removable disc is installed between the cam lobe and lifter. Clearance will be checked between cam heel and adjusting disc in proper sequence using a feeler gauge. Engine will be rotated to obtain all valve adjustments.

On overhead cam engines designed with rocker arms, adjustment is made at push rod end of rocker arm. Ensure that the valve to be adjusted is riding on the heel of the cam on all engines. Clearance will be checked between tip of rocker arm and tip of valve stem in proper sequence using a feeler gauge. Adjustment is made by rotating adjusting screw until proper clearance is obtained. Lock nut is then tightened. Engine will be rotated to obtain all valve adjustments to manufacturer's specifications.

CYLINDER HEAD OVERHAUL

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

DISASSEMBLY

Mark valves for location. Using valve spring compressor, compress valve springs. Remove valve locks. Carefully release spring compressor. Remove retainer or rotator, valve spring, spring seat and valve. See Fig. 2.

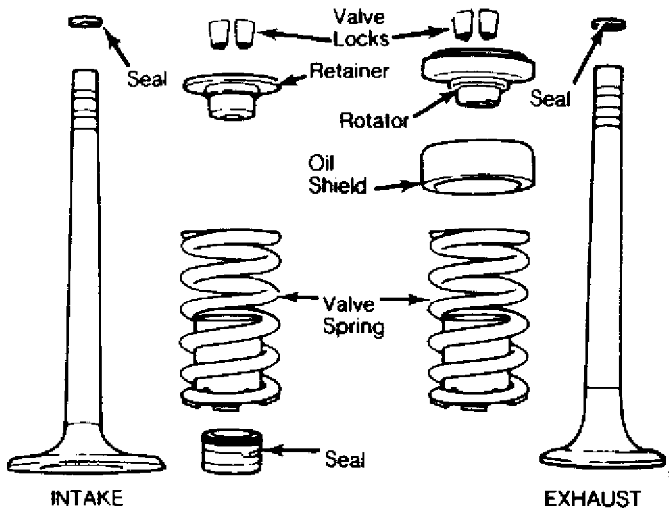

Fig. 2: Exploded View of Intake & Exhaust Valve Assemblies - Typical
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CLEANING & INSPECTION

Clean cylinder head and valve components using approved cleaning methods. Inspect cylinder head for cracks, damage or warped gasket surface. Place straightedge across gasket surface. Determine clearance at center of straightedge. Measure across both diagonals, longitudinal centerline and across the head at several points. See Fig. 3.

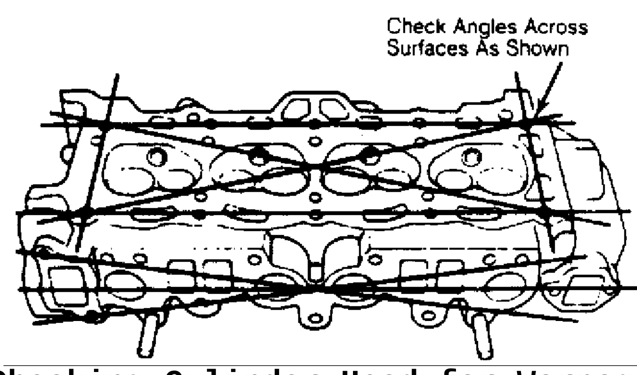

Fig. 3: Checking Cylinder Head for Warpage - Typical
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On cast cylinder heads, if warpage exceeds .003" (.08 mm) in a 6" span, or .006" (.15 mm) over total length, cylinder head must be resurfaced. On most aluminum cylinder heads, if warpage exceeds .002" (.05 mm) in any area, cylinder head must be resurfaced. Warpage specification may vary with manufacturer.

Cylinder head thickness should be measured to determine amount of material which can be removed before replacement is

required. Cylinder head thickness must not be less than manufacturer's specifications.

If cylinder head required resurfacing, it may not align properly with intake manifold. On "V" type engines, misalignment is corrected by machining intake manifold surface that contacts cylinder head. Cylinder head may be machined on surface that contacts intake manifold.

Using oil stone, remove burrs or scratches from all sealing surfaces.

VALVE SPRINGS

Inspect valve springs for corroded or pitted valve spring surfaces which may lead to breakage. Polished spring ends caused by a rotating spring, indicates that spring surge has occurred. Replace springs showing evidence of these conditions.

Inspect valve springs for squareness using a 90 degree straightedge. See Fig. 4. Replace valve spring if out-of-square exceeds manufacturer's specification.

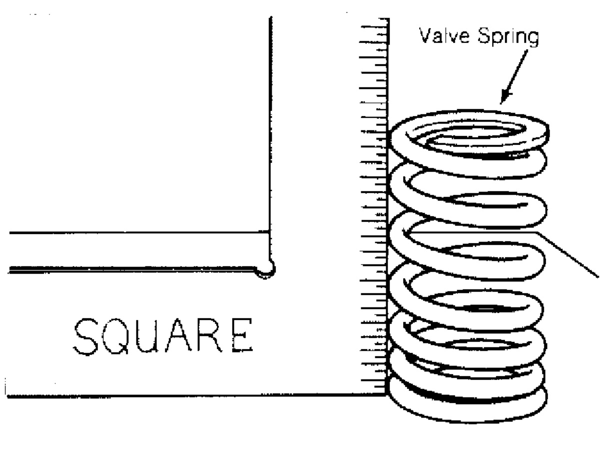

Fig. 4: Checking Valve Spring Squareness - Typical
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Using vernier caliper, measure free length of all valve springs. Replace springs if not within specification. Using valve spring tester, test valve spring pressure at installed and compressed heights. See Fig. 5.

Usually compressed height is installed height minus valve lift. Replace valve spring if not within specification. It is recommended to replace all valve springs when overhauling cylinder head.

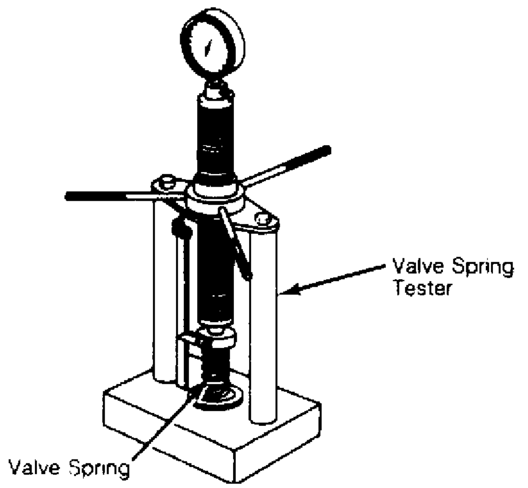

Fig. 5: Checking Valve Spring Pressure - Typical
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VALVE GUIDE

Measuring Valve Guide Clearance

Check valve stem-to-guide clearance. Ensure valve stem diameter is within specifications. Install valve in valve guide. Install dial indicator assembly on cylinder head with tip resting against valve stem just above valve guide. SeeFig. 6.

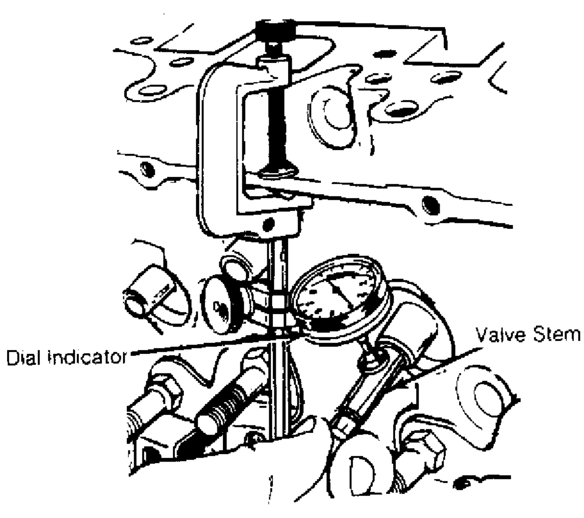

Fig. 6: Measuring Valve Stem-to-Guide Clearance - Typical
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Lower valve approximately 1/16" below valve seat. Push valve stem against valve guide as far as possible. Adjust dial indicator to zero. Push valve stem in opposite direction and note reading. Clearance must be within specification.

If valve guide clearance exceeds specification, valves with oversize stems may be used or valve guide must be replaced. On some applications, a false guide is installed, then reamed to proper specification. Valve guide reamer set is used to ream valve guide to obtain proper clearance for new valve.

Reaming Valve Guide

Select proper reamer for valve stem. Reamer must be of proper length to provide clean cut through entire length of valve guide. Install reamer in valve guide and rotate to cut valve guide. See Fig. 7.

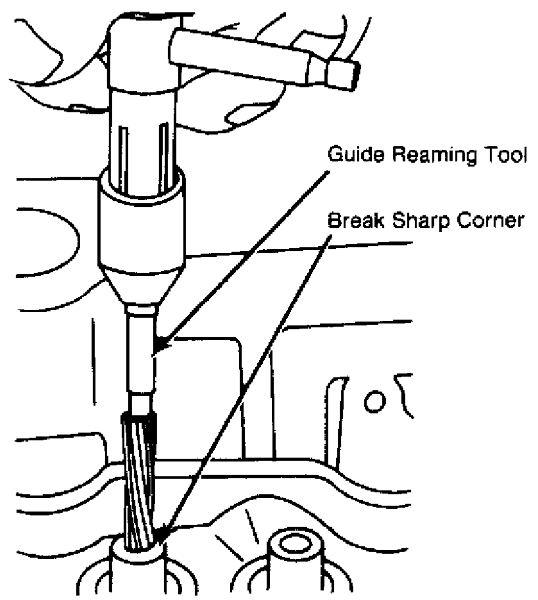

Fig. 7: Reaming Valve Guides - Typical
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Replacing Valve Guide

Replace valve guide if clearance exceeds specification. Valve guides are either pressed, hammered or shrunk in place, depending upon cylinder head design and type of metal used.

Remove valve guide from cylinder head by pressing or tapping on a stepped drift. See Fig. 8. Once valve guide is installed, distance from cylinder head to top of valve guide must be checked. This distance must be within specification.

Aluminum heads are often heated before installing valve guide. Guide is sometimes chilled in dry ice before installation. Combination of a heated head and chilled guide insures a tight guide fit upon assembly. The new guide must be reamed to specification.

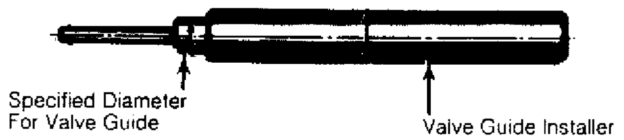

Fig. 8: Typical Valve Guide Remover & Installer
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VALVES & VALVE SEATS

Valve Grinding

Valve stem O.D. should be measured in several areas to indicate amount of wear. Replace valve if not within specification. Valve margin area should be measured to ensure that valve can be grounded. See Fig. 9.

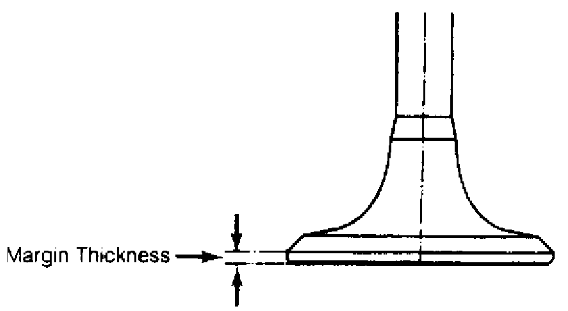

Fig. 9: Measuring Valve Head Margin - Typical
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If valve margin is less than specification, this will burn the valves. Valve must be replaced. Due to minimum margin dimensions during manufacture, some new type valves cannot be reground.

Resurface valve on proper angle specification using valve grinding machine. Follow manufacturer's instructions for valve grinding machine. Specifications may indicate a different valve face angle than seat angle.

Measure valve margin after grinding. Replace valve if not within specification. Valve stem tip can be refinished using valve grinding machine.

Valve Lapping

During valve lapping of recent designed valves, be sure to follow manufacturers recommendations. Surface hardening and materials used with some valves do not permit lapping. Lapping process will remove excessive amounts of the hardened surface.

Valve lapping is done to ensure adequate sealing between valve face and seat. Use either a hand drill or lapping stick with suction cup attached.

Moisten and attach suction cup to valve. Lubricate valve stem and guide. Apply a thin coat of fine valve grinding compound between valve and seat. Rotate lapping tool between the palms or with hand drill.

Lift valve upward off the seat and change position often. This is done to prevent grooving of valve seat. Lap valve until a smooth polished seat is obtained. Thoroughly clean grinding compound from components. Valve to valve seat concentricity should be checked. See VALVE SEAT CONCENTRICITY.

CAUTION: Valve guides must be in good condition and free of carbon deposits prior to valve seat grinding. Some engines contain an induction hardened valve seat. Excessive material removal will damage valve seats.

Valve Seat Grinding

Select coarse stone of correct size and angle for seat to be ground. Ensure stone is true and has a smooth surface. Select correct size pilot for valve guide dimension. Install pilot in valve guide. Lightly lubricate pilot shaft. Install stone on pilot. Move stone off and on the seat approximately 2 times per second during grinding operation.

Select a fine stone to finish grinding operation. Grinding stones with 30 and 60 degree angles are used to center and narrow the valve seat as required. See Fig. 10.

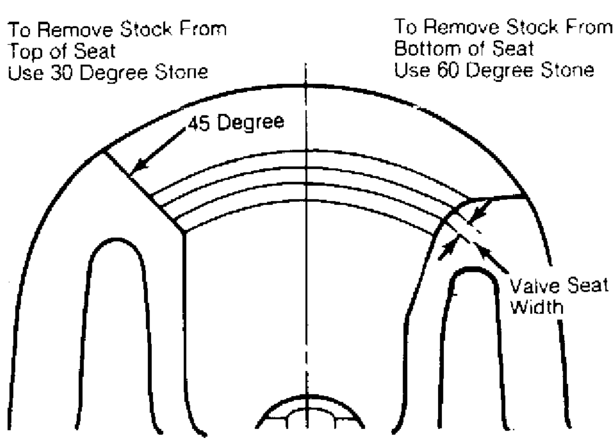

Fig. 10: Adjusting Valve Seat Width - Typical
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Valve Seat Replacement

Replacement of valve seat inserts is done by cutting out the old insert and machining an oversize insert bore. Replacement oversize insert is usually chilled and the cylinder head is sometimes warmed. Valve seat is pressed into the head. This operation requires specialized machine shop equipment.

Valve Seat Concentricity

Using dial gauge, install gauge pilot in valve guide. Position gauge arm on the valve seat. Adjust dial indicator to zero. Rotate arm 360 degrees and note reading. Runout should not exceed specification.

To check valve-to-valve seat concentricity, coat valve face lightly with Prussian Blue dye. Install valve and rotate it on valve seat. If pattern is even and entire seat is coated at valve contact point, valve is concentric with the seat.

REASSEMBLY

Valve Stem Installed Height

Valve stem installed height must be checked when new valves are installed or when valves or valve seats have been ground. Install valve in valve guide. Measure distance from tip of valve stem to spring seat. See Fig. 11. Distance must be within specifications.

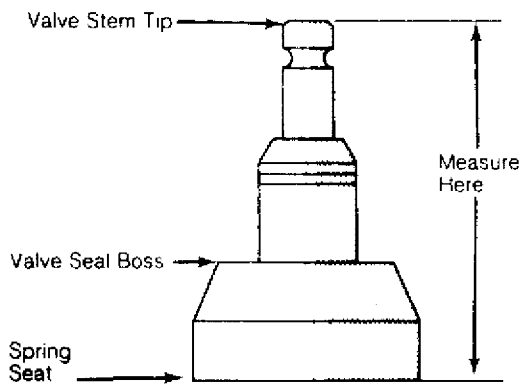

Fig. 11: Measuring Valve Stem Installed Height - Typical
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Remove valve and grind valve stem tip if height exceeds specification. Valve tips are surface hardened. DO NOT remove more than .010" (.25 mm) from tip. Chamfer sharp edge of reground valve tip. Recheck valve stem installed height.

VALVE STEM OIL SEALS

Valve stem oil seals must be installed on valve stem. See Fig. 2. Seals are needed due to pressure differential at the ends of valve guides. Atmospheric pressure above intake guide, combined with manifold vacuum below guide, causes oil to be drawn into the cylinder.

Exhaust guides also have pressure differential created by exhaust gas flowing past the guide, creating a low pressure area. This low pressure area draws oil into the exhaust system.

Replacement (On Vehicle)

Mark rocker arm or overhead cam components for location.

Remove rocker arm components or overhead cam components. Components must be installed in original location. Remove spark plugs. Valve stem oil seals may be replaced by holding valves against seats using air pressure.

Air pressure must be installed in cylinder using an adapter for spark plug hole. An adapter can be constructed by welding air hose connection to spark plug body with porcelain removed.

Install adapter in spark plug hole. Apply a minimum of 140 psi (9.8 kg/cmý) to adapter. Air pressure should hold valve closed. If air pressure does not hold valve closed, check for damaged or bent valve. Cylinder head must be removed for service.

Using valve spring compressor, compress valve springs. Remove valve locks. Carefully release spring compressor. Remove retainer or rotator and valve spring. Remove valve stem oil seal.

If oversized valves have been installed, oversized oil seals must be used. Coat valve stem with engine oil. Install protective sleeve over end of valve stem. Install new oil seal over valve stem and seat on valve guide. Remove protective sleeve. Install spring seat, valve spring and retainer or rotator. Compress spring and install valve locks. Remove spring compressor. Ensure valve locks are fully seated.

Install rocker arms or overhead cam components. Tighten all bolts to specification. Adjust valves if required. Remove adapter. Install spark plugs, valve cover and gasket.

VALVE SPRING INSTALLED HEIGHT

Valve spring installed height should be checked during reassembly. Measure height from lower edge of valve spring to the upper edge. DO NOT include valve spring seat or retainer. Distance must be within specifications. If valves and/or seats have been ground, a valve spring shim may be required to correct spring height. See Fig. 12.

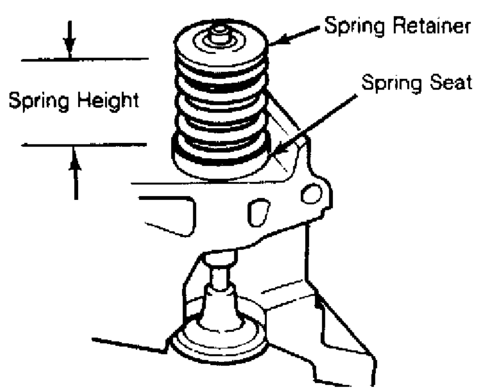

Fig. 12: Measuring Valve Spring Installed Height - Typical
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ROCKER ARMS & ASSEMBLIES

Rocker Studs

Rocker studs are either threaded or pressed in place. Threaded studs are removed by locking 2 nuts on the stud. Unscrew the stud by turning the jam nut. Coat the stud threads with Loctite and install. Tighten to specification.

Pressed in stud can be removed using a stud puller. Ream the stud bore to proper specification and press in a new oversize stud. Pressed in studs are often replaced by cutting threads in the stud bore to accept a threaded stud.

Rocker Arms & Shafts

Mark rocker arms for location. Remove rocker arm retaining bolts. Remove rocker arms. Inspect rocker arms, shafts, bushings and pivot balls (if equipped) for excessive wear. Inspect rocker arms for wear in valve stem contact area. Measure rocker arm bushing I.D. Replace bushings if excessively worn.

The rocker arm valve stem contact point can be reground, using special fixture for valve grinding machine. Remove minimum amount of material as possible. Ensure all oil passages are clear. Install rocker arms in original locations. Ensure rocker arm is properly seated in push rod. Tighten bolts to specification. Adjust valves if required. See VALVE ADJUSTMENT in this article.

Pushrods

Remove rocker arms. Mark push rods for location. Remove push rods. Push rods can be steel or aluminum, solid or hollow. Hollow pushrods must be internally cleaned to ensure oil passage to the rocker arms is cleaned. Check the pushrod for damage, such as loose ends on steel tipped aluminum types.

Check push rod for straightness. Roll push rod on a flat surface. Using feeler gauge, check clearance at center. Replace push rod if bent. The push rod can also be supported at each end and rotated. A dial indicator is used to detect bends in the push rod.

Lubricate ends of push rod and install push rod in original location. Ensure push rod is properly seated in lifter. Install rocker arm. Tighten bolts to specification. Adjust valves if required. See VALVE ADJUSTMENT in this article.

LIFTERS

Hydraulic Lifters

Before replacing a hydraulic lifter for noisy operation, ensure noise is not caused by worn rocker arms or valve tips. Hydraulic lifter assemblies must be installed in original locations. Remove the rocker arm assembly and push rod. Mark components for location. Some applications require intake manifold, or lifter cover removal. Remove lifter retainer plate (if used). To remove lifters, use a hydraulic lifter remover or magnet. Different type lifters are used. See Fig. 13.

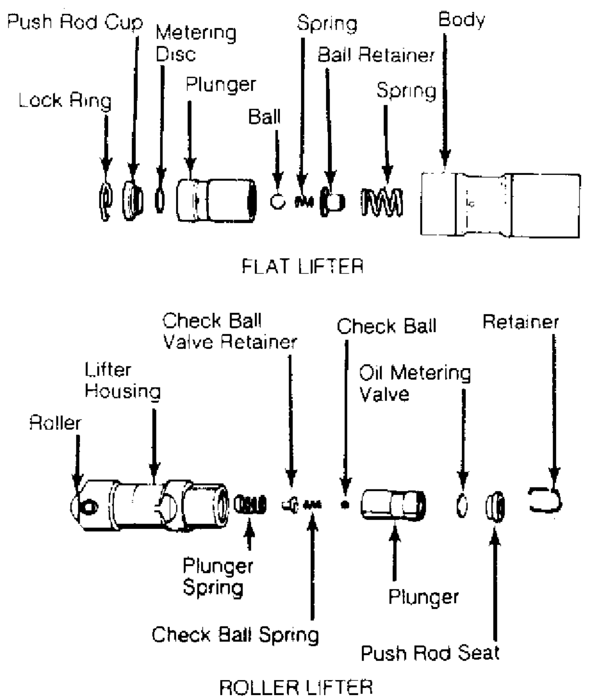

Fig. 13: Typical Hydraulic Valve Lifter Assemblies - Typical
This Graphic For General Information Only

On sticking lifters, disassemble and clean lifter. DO NOT mix lifter components or positions. Parts are select-fitted and are not interchangeable. Inspect all components for wear. Note amount of wear in lifter body-to-camshaft contact area. Surface must have smooth and convex contact face. If wear is apparent, carefully inspect cam lobe.

Inspect push rod contact area and lifter body for scoring or signs of wear. If body is scored, inspect lifter bore for damage and lack of lubrication. On roller type lifters, inspect roller for flaking, pitting, loss of needle bearings and roughness during rotation.

Measure lifter body O.D. in several areas. Measure lifter bore I.D. of cylinder block. Some models offer oversized lifters. Replace lifter if damaged.

If lifter check valve is not operating, obstructions may be preventing it from closing or valve spring may be broken. Clean or replace components as necessary.

Check plunger operation. Plunger should drop to bottom of the body by its own weight when assembled dry. If plunger is not free, soak lifter in solvent to dissolve deposits.

Lifter leak-down test can be performed on lifter. Lifter must be filled with special test oil. New lifters contain special test oil. Using lifter leak-down tester, perform leak-down test following manufacturer's instructions. If leak-down time is not within specifications, replace lifter assembly.

Lifters should be soaked in clean engine oil several hours prior to installation. Coat lifter base, roller (if equipped) and lifter body with ample amount of Molykote or camshaft lubricant. See Fig. 13. Install lifter in original location. Install remaining components. Valve lash adjustment is not required on most hydraulic lifters. Preload of hydraulic lifter is automatic. Some models may require adjustment.

Mechanical Lifters

Lifter assemblies must be installed in original locations. Remove rocker arm assembly and push rod. Mark components for location. Some applications require intake manifold or lifter cover removal. Remove lifter retainer plate (if used). To remove lifters, use lifter remover or magnet.

Inspect push rod contact area and lifter body for scoring or signs of wear. If body is scored, inspect lifter bore for damage and lack of lubrication. Note amount of wear in lifter body-to-camshaft contact area. Surface must have smooth and convex contact face. If wear is apparent, carefully inspect cam lobe.

Coat lifter base, roller (if equipped) and lifter body with ample amount of Molykote or camshaft lubricant. Install lifter in original location. Install remaining components. Tighten bolts to specification. Adjust valves. See VALVE ADJUSTMENT in this article.

PISTONS, CONNECTING RODS & BEARINGS

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

RIDGE REMOVAL

Ridge in cylinder wall must be removed prior to piston removal. Failure to remove ridge prior to removing pistons will cause piston damage in piston ring locations.

With the piston at bottom dead center, place a rag in the bore to trap metal chips. Install ridge reamer in cylinder bore. Adjust ridge reamer using manufacturer's instructions. Remove ridge using ridge reamer. DO NOT remove an excessive amount of material. Ensure ridge is completely removed.

PISTON & CONNECTING ROD REMOVAL

Note top of piston. Some pistons may contain a notch, arrow or be marked "FRONT". Piston must be installed in proper direction to prevent damage with valve operation.

Check that connecting rod and cap are numbered for cylinder location and which side of cylinder block the number faces. Proper cap and connecting rod must be installed together. Connecting rod cap must be installed on connecting rod in proper direction to ensure bearing lock procedure. Mark connecting rod and cap if necessary. Pistons must be installed in original location.

Remove cap retaining nuts or bolts. Remove bearing cap. Install stud protectors on connecting rod bolts. This protects cylinder walls from scoring during removal. Ensure proper removal of ridge. Push piston and connecting rod from cylinder. Connecting rod boss can be tapped with a wooden dowel or hammer handle to aid in removal.

PISTON & CONNECTING ROD

Disassembly

Using ring expander, remove piston rings. Remove piston pin retaining rings (if equipped). On pressed type piston pins, special fixtures and procedures according to manufacturer must be used to remove piston pins. Follow manufacturer's recommendations to avoid piston distortion or breakage.

Cleaning

Remove all carbon and varnish from piston. Pistons and connecting rods may be cleaned in cold type chemical tank. Using ring groove cleaner, clean all deposits from ring grooves. Ensure all deposits are cleaned from ring grooves to prevent ring breakage or sticking. DO NOT attempt to clean pistons using wire brush.

Inspection

Inspect pistons for nicks, scoring, cracks or damage in ring areas. Connecting rod should be checked for cracks using Magnaflux procedure. Piston diameter must be measured in manufacturers specified area.

Using telescopic gauge and micrometer, measure piston pin bore of piston in 2 areas, 90 degrees apart. This is done to check diameter and out-of-round.

Install proper bearing cap on connecting rod. Ensure bearing cap is installed in proper location. Tighten bolts or nuts to specification. Using inside micrometer, measure inside diameter in 2 areas, 90 degrees apart.

Connecting rod I.D. and out-of-round must be within specification. Measure piston pin bore I.D. and piston pin O.D. All components must be within specification. Subtract piston pin diameter

from piston pin bore in piston and connecting rod to determine proper fit.

Connecting rod length must be measured from center of crankshaft journal inside diameter to center of piston pin bushing using proper caliper. Connecting rods must be the same length. Connecting rods should be checked on an alignment fixture for bent or twisted condition. Replace all components which are damaged or not within specification.

PISTON & CYLINDER BORE FIT

Ensure cylinder is checked for taper, out-of-round and properly honed prior to checking piston and cylinder bore fit. See **CYLINDER BLOCK** in this article. Using dial bore gauge, measure cylinder bore. Measure piston at right angle to piston pin in center of piston skirt area. Subtract piston diameter from cylinder bore diameter. The difference is piston-to-cylinder clearance. Clearance must be within specification. Mark piston for proper cylinder location.

ASSEMBLING PISTON & CONNECTING ROD

Install proper fitted piston on connecting rod for proper cylinder. Ensure piston marking on top of piston marked is in correspondence with connecting rod and cap number. SeeFig. 14.

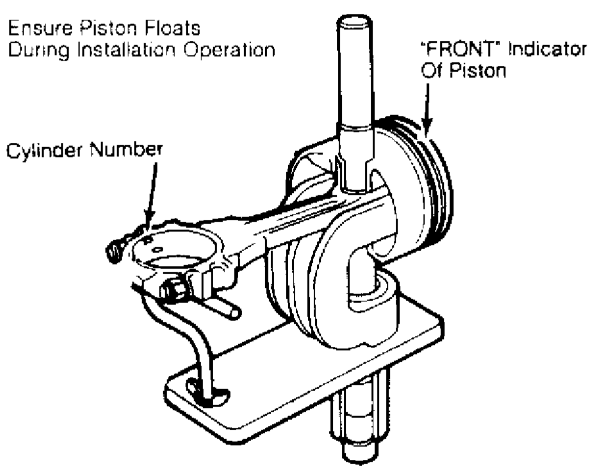

Fig. 14: Piston Pin Installation - Typical
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Lubricate piston pin and install in connecting rod. Ensure piston pin retainers are fully seated (if equipped). On pressed type piston pins, follow manufacturer's recommended procedure to avoid distortion or breakage.

CHECKING PISTON RING CLEARANCES

Piston rings must be checked for side clearance and end gap. To check end gap, install piston ring in cylinder which it is to be installed. Using an inverted piston, push ring to bottom of cylinder in smallest cylinder diameter.

Using feeler gauge, check ring end gap. See Fig. 15. Piston ring end gap must be within specification. Ring breakage will occur with insufficient ring end gap.

On some manufacturers, insufficient ring end gap may be corrected by using a fine file while other manufacturers recommend using another ring set. Mark rings for proper cylinder installation after checking end gap.

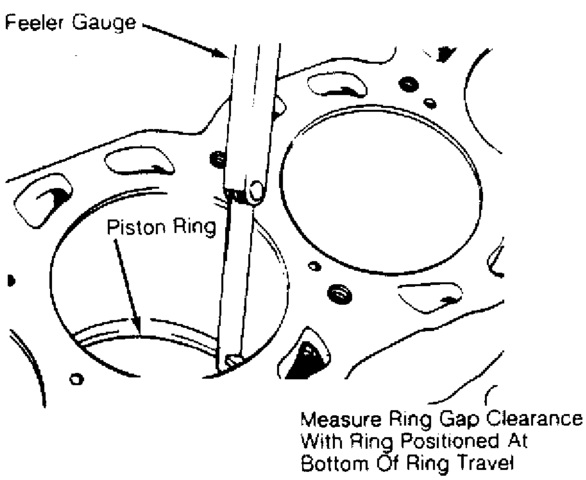

Fig. 15: Checking Piston Ring End Gap - Typical
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For checking side clearance, install rings on piston. Using feeler gauge, measure clearance between piston ring and piston ring land. Check side clearance in several areas around piston. Side clearance must be within specification.

If side clearance is excessive, piston ring grooves can be machined to accept oversized piston rings (if available). Normal practice is to replace piston.

PISTON & CONNECTING ROD INSTALLATION

Cylinders must be honed prior to piston installation. See **CYLINDER HONING** under **CYLINDER BLOCK** in this article.

Install upper connecting rod bearings. Lubricate upper bearings with engine oil. Install lower bearings in rod caps. Ensure bearing tabs are properly seated. Position piston ring gaps according to manufacturers recommendations. See Fig. 16. Lubricate pistons, rings and cylinder walls.

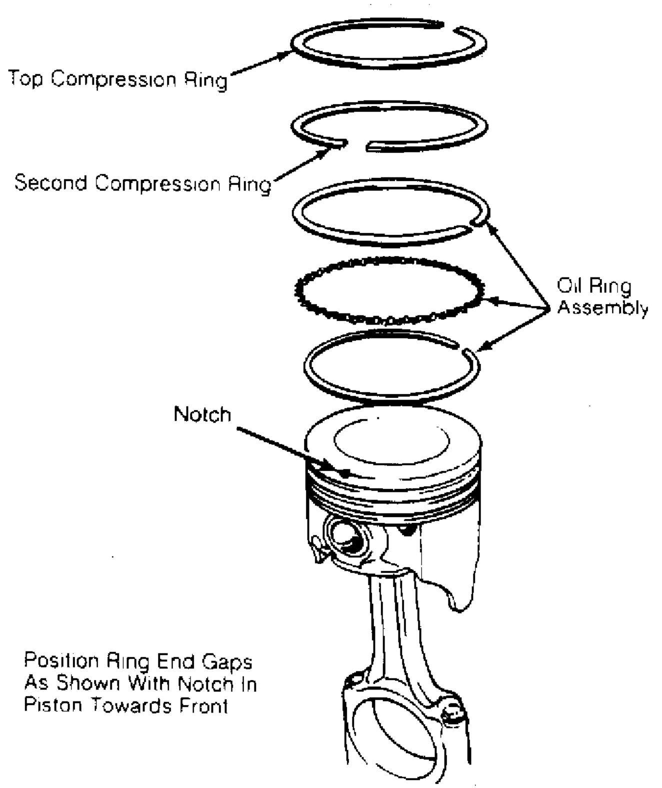

Fig. 16: Typical Piston Ring End Gap Positioning - Typical
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Install ring compressor. Use care not to rotate piston rings. Compress rings with ring compressor. Install plastic tubing protectors over connecting rod bolts. Install piston and connecting rod assembly. Ensure piston notch, arrow or "FRONT" mark is toward front of engine. See Fig. 17.

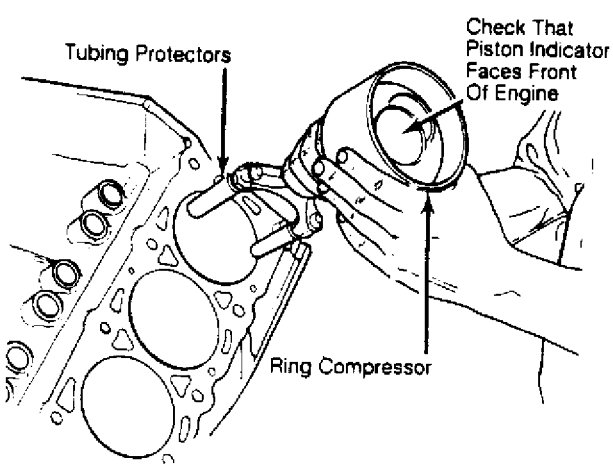

Fig. 17: Installing Piston & Connecting Rod Assembly - Typical
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Carefully tap piston into cylinder until rod bearing is seated on crankshaft journal. Remove protectors. Install rod cap and bearing. Lightly tighten connecting rod bolts. Repeat procedure for remaining cylinders. Check bearing clearance. See MAIN & CONNECTING ROD BEARING CLEARANCE in this article.

Once clearance is checked, lubricate journals and bearings. Install bearing caps. Ensure marks are aligned on connecting rod and cap. Tighten rod nuts or bolts to specification. Ensure rod moves freely on crankshaft. Check connecting rod side clearance. See CONNECTING ROD SIDE CLEARANCE in this article.

CONNECTING ROD SIDE CLEARANCE

Position connecting rod toward one side of crankshaft as far as possible. Using feeler gauge, measure clearance between side of connecting rod and crankshaft. See Fig. 18. Clearance must be within specifications.

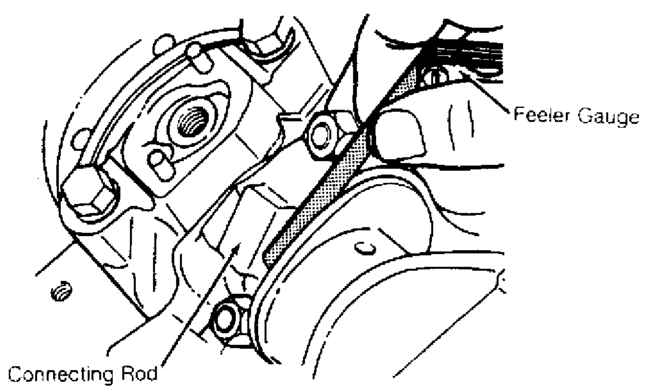

Fig. 18: Measuring Connecting Rod Side Clearance - Typical
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Check for improper bearing installation, wrong bearing cap or insufficient bearing clearance if side clearance is insufficient. Connecting rod may require machining to obtain proper clearance. Excessive clearance usually indicates excessive wear at crankshaft. Crankshaft must be repaired or replaced.

MAIN & CONNECTING ROD BEARING CLEARANCE

Plastigage Method

Plastigage method may be used to determine bearing clearance. Plastigage can be used with an engine in service or during reassembly. Plastigage material is oil soluble.

Ensure journals and bearings are free of oil or solvent. Oil or solvent will dissolve material and false reading will be obtained. Install small piece of Plastigage along full length of bearing journal. Install bearing cap in original location. Tighten

bolts to specification.

CAUTION: DO NOT rotate crankshaft while Plastigage is installed. Bearing clearance will not be obtained if crankshaft is rotated.

Remove bearing cap. Compare Plastigage width with scale on Plastigage container to determine bearing clearance. SeeFig. 19. Rotate crankshaft 90 degrees. Repeat procedure. this is done to check journal eccentricity. This procedure can be used to check oil clearance on both connecting rod and main bearings.

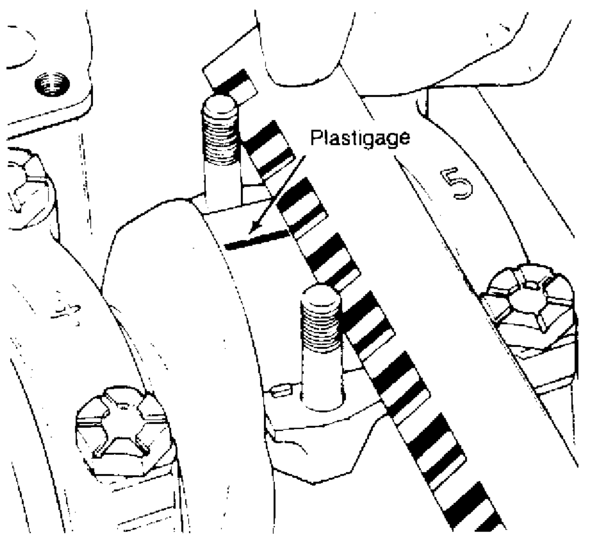

Fig. 19: Measuring Bearing Clearance - Typical
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Micrometer & Telescopic Gauge Method

A micrometer is used to determine journal diameter, taper and out-of-round dimensions of the crankshaft. See CLEANING & INSPECTION under CRANKSHAFT & MAIN BEARINGS in this article.

With crankshaft removed, install bearings and caps in original location on cylinder block. Tighten bolts to specification. On connecting rods, install bearings and caps on connecting rods. Install proper connecting rod cap on corresponding rod. Ensure bearing cap is installed in original location. Tighten bolts to specification.

Using a telescopic gauge and micrometer or inside micrometer measure inside diameter of connecting rod and main bearings bores. Subtract each crankshaft journal diameter from the corresponding inside bore diameter. This is the bearing clearance.

CRANKSHAFT & MAIN BEARINGS

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

REMOVAL

Ensure all main bearing caps are marked for location on cylinder block. Some main bearing caps have an arrow stamped on it which must face front of engine. Remove main bearing cap bolts. Remove main bearing caps. Carefully remove crankshaft. Use care not to bind crankshaft in cylinder block during removal.

CLEANING & INSPECTION

Thoroughly clean crankshaft using solvent. Dry with compressed air. Ensure all oil passages are clear and free of sludge, rust, dirt, and metal chips.

Inspect crankshaft for scoring and nicks. Inspect crankshaft for cracks using Magnaflux procedure. Inspect rear seal area for grooving or damage. Inspect bolt hole threads for damage. If pilot bearing or bushing is used, check pilot bearing or bushing fit in crankshaft. Inspect crankshaft gear for damaged or cracked teeth. Replace gear if damaged. Check that oil passage plugs are tight (if equipped).

Using micrometer, measure all journals in 4 areas to determine journal taper, out-of-round and undersize. SeeFig. 20. Some crankshafts can be reground to the next largest undersize, depending on the amount of wear or damage. Crankshafts with rolled fillet cannot be reground and must be replaced.

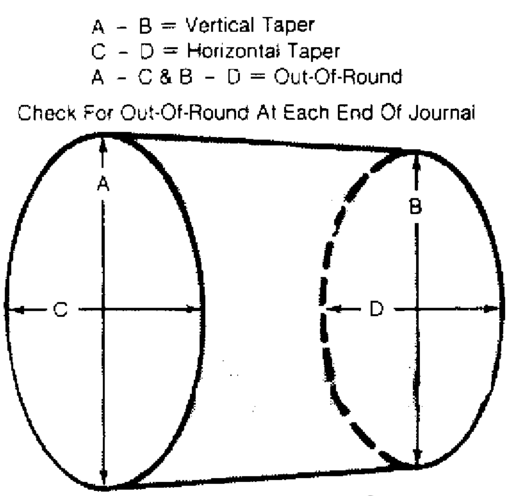

Fig. 20: Measuring Crankshaft Journal - Typical
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Crankshaft journal runout should be checked. Install crankshaft in "V" blocks or bench center. Position dial indicator with tip resting on the main bearing journal area. SeeFig. 21. Rotate crankshaft and note reading. Journal runout must not exceed specification. Repeat procedure on all main bearing journals. Crankshaft must be replaced if runout exceeds specification.

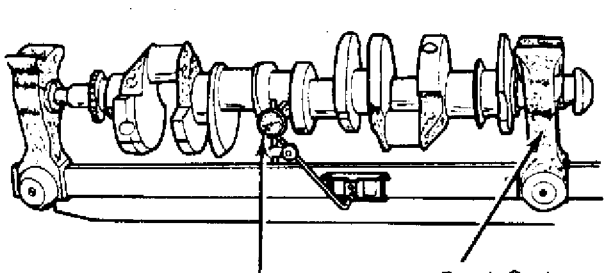

Fig. 21: Measuring Crankshaft Main Bearing Journal Runout - Typical
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INSTALLATION

Install upper main bearing in cylinder block. Ensure lock tab is properly located in cylinder block. Install bearings in main bearing caps. Ensure all oil passages are aligned. Install rear seal (if removed).

Ensure crankshaft journals are clean. Lubricate upper main bearings with clean engine oil. Carefully install crankshaft. Check each main bearing clearance using Plastigage method. See **MAIN & CONNECTING ROD BEARING CLEARANCE** in this article.

Once clearance is checked, lubricate lower main bearing and journals. Install main bearing caps in original location. Install rear seal in rear main bearing cap (if removed). Some rear main bearing caps require sealant to be applied in corners to prevent oil leakage.

Install and tighten all bolts except thrust bearing cap to specification. Tighten thrust bearing cap bolts finger tight only. Thrust bearing must be aligned. On most applications, crankshaft must be moved rearward then forward. Procedure may vary with manufacturer. Thrust bearing cap is then tighten to specification. Ensure crankshaft rotates freely. Crankshaft end play should be checked. See **CRANKSHAFT END PLAY** in this article.

CRANKSHAFT END PLAY

Dial Indicator Method

Crankshaft end play can be checked using dial indicator. Mount dial indicator on rear of cylinder block. Position dial indicator tip against rear of crankshaft. Ensure tip is resting against flat surface.

Pry crankshaft rearward. Adjust dial indicator to zero.

Pry crankshaft forward and note reading. Crankshaft end play must be within specification. If end play is not within specification, check for faulty thrust bearing installation or worn crankshaft. Some applications offer oversized thrust bearings.

Feeler Gauge Method

Crankshaft end play can be checked using feeler gauge. Pry crankshaft rearward. Pry crankshaft forward. Using feeler gauge, measure clearance between crankshaft and thrust bearing surface. See Fig. 22.

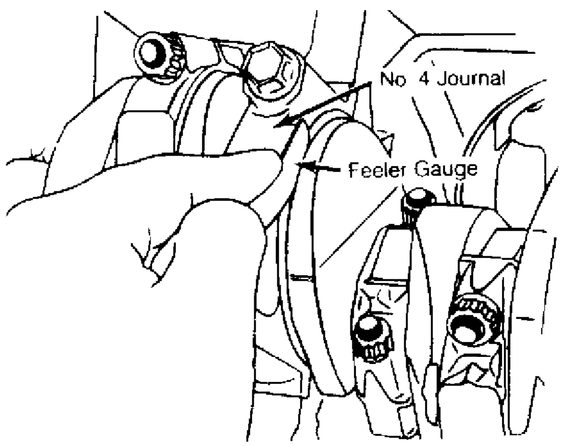

Fig. 22: Checking Crankshaft End Play - Typical
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Crankshaft end play must be within specification. If end play is not within specification, check for faulty thrust bearing installation or worn crankshaft. Some applications offer oversized thrust bearings.

CYLINDER BLOCK

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

BLOCK CLEANING

Only cast cylinder blocks should be hot tank cleaned. Aluminum cylinder blocks should be cleaned using cold tank method. Cylinder block is cleaned in order to remove carbon deposits, gasket residue and water jacket scale. Remove oil galley plugs, freeze plugs and cam bearings prior to block cleaning.

BLOCK INSPECTION

Visually inspect the block. Check suspected areas for cracks using the Dye Penetrant inspection method. Block may be checked for cracks using the Magnaflux method.

Cracks are most commonly found at the bottom of the cylinders, the main bearing saddles, near expansion plugs and between the cylinders and water jackets. Inspect lifter bores for damage. Inspect all head bolt holes for damaged threads. Threads should be cleaned using tap to ensure proper head bolt torque. Consult machine shop concerning possible welding and machining (if required).

CYLINDER BORE INSPECTION

Inspect the bore for scuffing or roughness. Cylinder bore is dimensionally checked for out-of-round and taper using dial bore gauge. For determining out-of-round, measure cylinder parallel and perpendicular to the block centerline. Difference in the 2 readings is the bore out-of-round. Cylinder bore must be checked at top, middle and bottom of piston travel area.

Bore taper is obtained by measuring bore at the top and bottom. If wear has exceeded allowable limits, block must be honed or bored to next available oversize piston dimension.

CYLINDER HONING

Cylinder must be properly honed to allow new piston rings to properly seat. Cross-hatching at correct angle and depth is critical to lubrication of cylinder walls and pistons.

A flexible drive hone and power drill are commonly used. Drive hone must be lubricated during operation. Mix equal parts of kerosene and SAE 20w engine oil for lubrication.

Apply lubrication to cylinder wall. Operate cylinder hone from top to bottom of cylinder using even strokes to produce 45 degree cross-hatch pattern on the cylinder wall. DO NOT allow cylinder hone to extend below cylinder during operation.

Recheck bore dimension after final honing. Wash cylinder wall with hot soapy water to remove abrasive particles. Blow dry with compressed air. Coat cleaned cylinder walls with lubricating oil.

DECK WARPAGE

Check deck for damage or warped head sealing surface. Place a straightedge across gasket surface of the deck. Using feeler gauge, measure clearance at center of straightedge. Measure across width and length of cylinder block at several points.

If warpage exceeds specifications, deck must be resurfaced.

If warpage exceeds manufacturer's maximum tolerance for material removal, replace block.

DECK HEIGHT

Distance from the crankshaft centerline to the block deck is termed the deck height. Measure and record front and rear main journals of crankshaft. To compute this distance, install crankshaft and retain with center main bearing and cap only. Measure distance from the crankshaft journal to the block deck, parallel to the cylinder centerline.

Add one half of the main bearing journal diameter to distance from crankshaft journal to block deck. This dimension should be checked at front and rear of cylinder block. Both readings should be the same.

If difference exceeds specifications, cylinder block must be repaired or replaced. Deck height and warpage should be corrected at the same time.

MAIN BEARING BORE & ALIGNMENT

For checking main bearing bore, remove all bearings from cylinder block and main bearing caps. Install main bearing caps in original location. Tighten bolts to specification. Using inside micrometer, measure main bearing bore in 2 areas 90 degrees apart. Determine bore size and out-of-round. If diameter is not within specification, block must be align-bored.

For checking alignment, place a straightedge along centerline of main bearing saddles. Check for clearance between straightedge and main bearing saddles. Block must be align-bored if clearance is present.

EXPANSION PLUG REMOVAL & INSTALLATION

Removal

Drill a hole in the center of expansion plug. Remove with screwdriver or punch. Use care not to damage sealing surface.

Installation

Ensure sealing surface is free of burrs. Coat expansion plug with sealer. Use a wooden dowel or pipe of slightly smaller diameter, install expansion plug. Ensure expansion plug is evenly located.

OIL GALLERY PLUG REMOVAL & INSTALLATION

Removal

Remove threaded oil gallery plugs using the appropriate wrench. Soft, press-in plugs are removed by drilling into plug and

installing a sheet metal screw. Remove plug with slide hammer or pliers.

Installation

Ensure threads or sealing surface is clean. Coat threaded oil gallery plugs with sealer and install. Replacement soft press-in plugs are driven in place with a hammer and drift.

CAMSHAFT

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

CLEANING & INSPECTION

Clean camshaft with solvent. Ensure all oil passages are clear. Inspect cam lobes and bearing journals for pitting, flaking or scoring. Using micrometer, measure bearing journal O.D.

Support camshaft at each end with "V" blocks. Position dial indicator with tip resting on center bearing journal. Rotate camshaft and note reading. If reading exceeds specification, replace camshaft.

Check cam lobe lift by measuring base circle of camshaft using micrometer. Measure again at 90 degrees to tip of cam lobe. Cam lift can be determined by subtracting base circle diameter from tip of cam lobe measurement.

Different lift dimensions are given for intake and exhaust cam lobes. Reading must be within specifications. Replace camshaft if cam lobes or bearing journals are not within specifications.

Inspect camshaft gear for chipped, eroded or damaged teeth. Replace gear if damaged. On camshafts using thrust plate, measure distance between thrust plate and camshaft shoulder. Replace thrust plate if not within specification.

CAMSHAFT BEARINGS

Removal & Installation

Remove the camshaft rear plug. The camshaft bearing remover is assembled with its shoulder resting on the bearing to be removed according to manufacturer's instructions. Tighten puller nut until bearing is removed. Remove remaining bearings, leaving front and rear bearings until last. These bearings act as guide for camshaft bearing remover.

To install new bearings, puller is rearranged to pull bearings toward the center of block. Ensure all lubrication passages of bearing are aligned with cylinder block. Coat new camshaft rear plug with sealant. Install camshaft rear plug. Ensure plug is even in cylinder block.

CAMSHAFT INSTALLATION

Lubricate bearing surfaces and cam lobes with ample amount of Molykote or camshaft lubricant. Carefully install camshaft. Use care not to damage bearing journals during installation. Install thrust plate retaining bolts (if equipped). Tighten bolts to specification. On overhead camshafts, install bearing caps in original location. Tighten bolts to specification. Check end play.

CAMSHAFT END PLAY

Using dial indicator, check end play. Position dial indicator on front of engine block. Position indicator tip against camshaft. Push camshaft toward rear of engine and adjust indicator to zero.

Move camshaft forward and note reading. Camshaft end play must be within specification. End play may be adjusted by relocating gear, shimming thrust plate or replacing thrust plate depending on manufacturer.

TIMING CHAINS & BELTS

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

TIMING CHAINS

Timing chains will stretch during operation. Limits are placed upon amount of stretch before replacement is required. Timing chain stretch will alter ignition timing and valve timing.

To check timing chain stretch, rotate crankshaft to eliminate slack from one side of timing chain. Mark reference point on cylinder block. Rotate crankshaft in opposite direction to eliminate slack from remaining side of timing chain. Force other side of chain outward and measure distance between reference point and timing chain. See Fig. 23. Replace timing chain and gears if not within specification.

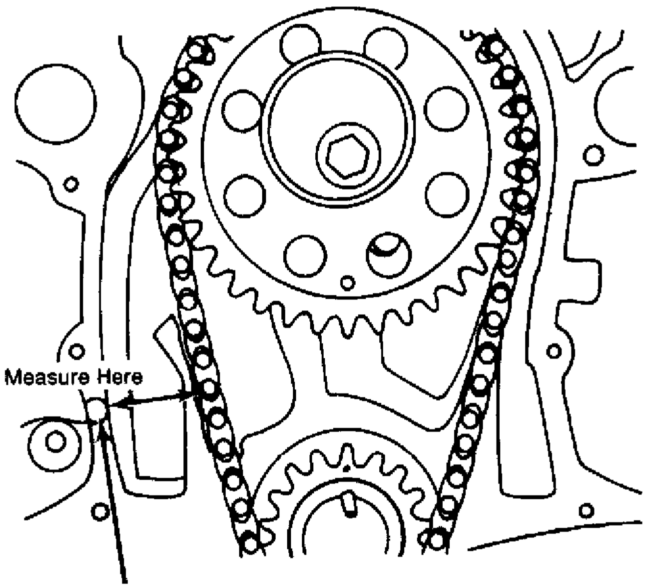

Fig. 23: Measuring Timing Chain Stretch - Typical
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Timing chains must be installed so that timing marks on camshaft gear and crankshaft gear are aligned according to manufacturer. See Fig. 24.

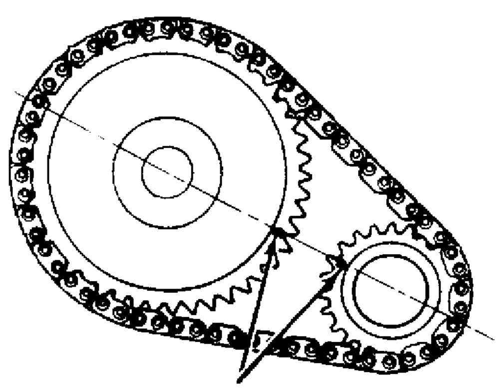

Fig. 24: Timing Gear Mark Alignment - Typical
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TIMING BELTS

Cogged tooth belts are commonly used on overhead cam engines. Inspect belt teeth for rounded corners or cracking. Replace belt if cracked, damaged, missing teeth or oil soaked.

Used timing belt must be installed in original direction of rotation. Inspect all sprocket teeth for wear. Replace all worn sprockets. Sprockets are marked for timing purposes. Engine is positioned so that crankshaft sprocket mark will be upward. Camshaft

sprocket is aligned with reference mark on cylinder head and timing belt is installed. See Fig. 25.

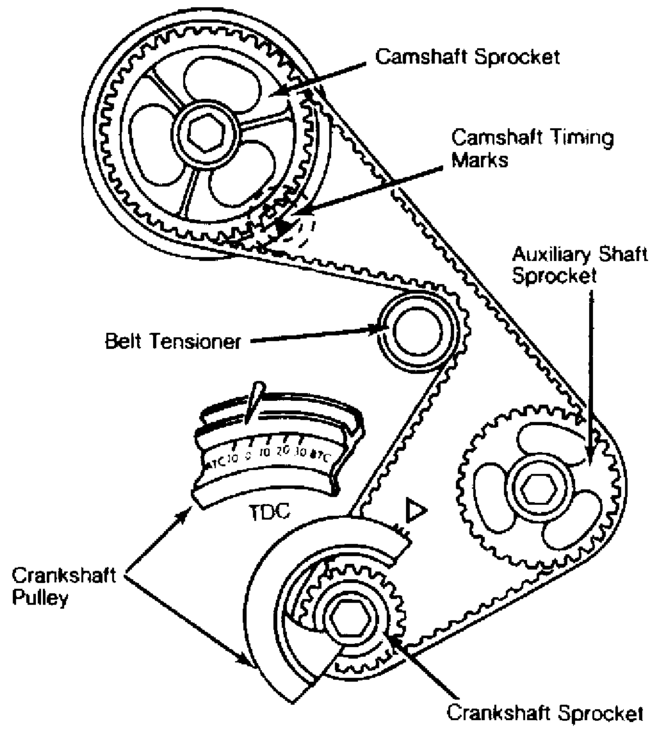

Fig. 25: Timing Belt Sprocket Alignment - Typical
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TENSION ADJUSTMENTS

If guide rails are used with spring loaded tensioners, ensure at least half of original rail thickness remains. Spring loaded tensioner should be inspected for damage.

Ensure all timing marks are aligned. Adjust belt tension using manufacturer's recommendations. Belt tension may require checking using tension gauge. See Fig. 26.

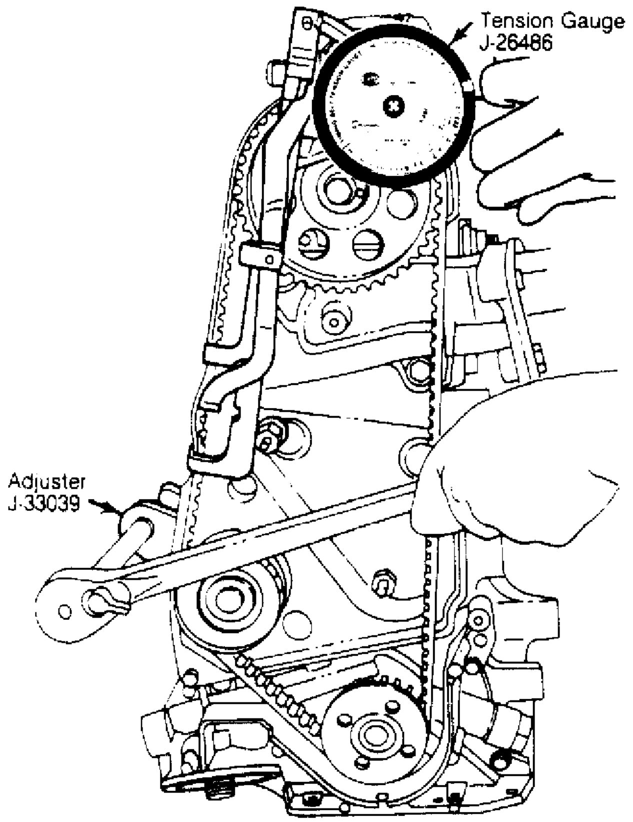

Fig. 26: Timing Belt Tension Adjustment - Typical
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TIMING GEARS

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

TIMING GEAR BACKLASH & RUNOUT

On engines where camshaft gear operates directly on crankshaft gear, gear backlash and runout must be checked. To check backlash, install dial indicator with tip resting on tooth of camshaft gear. Rotate camshaft gear as far as possible. Adjust indicator to zero. Rotate camshaft gear in opposite direction as far as possible and note reading.

To determine timing gear runout, mount dial indicator with tip resting on face edge of camshaft gear. Adjust indicator to zero. Rotate camshaft gear 360 degrees and note reading. If backlash or runout exceed specifications, replace camshaft and/or crankshaft gear.

REAR MAIN OIL SEAL

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

INSTALLATION

One-Piece Type Seal

For one-piece type oil seal installation, coat block contact surface of seal with sealer if seal is not factory coated. Ensure seal surface is free of burrs. Lubricate seal lip with engine oil and press seal into place using proper oil seal installer. SeeFig. 27.

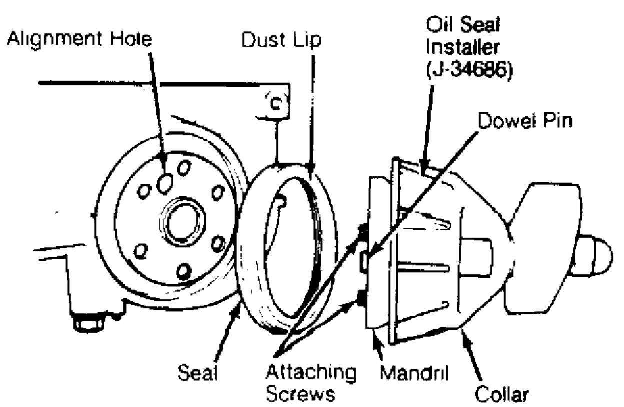

Fig. 27: Installing Typical One-Piece Oil Seal
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Rope Type Seal

For rope type rear main oil seal installation, press seal lightly into its seat. Using seal installer, fully seat seal in bearing cap or cylinder block.

Trim seal ends even with block parting surface. Some applications require sealer to be applied on main bearing cap prior to installation. See Fig. 28.

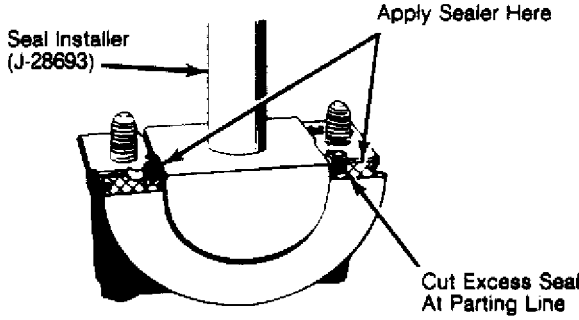

Fig. 28: Typical Rope Seal Installation
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Split-Rubber Type Seal

Follow manufacturers procedures when installing split-rubber type rear main oil seals. Installation procedures vary with engine type. See appropriate ENGINE article in this section. SeeFig. 29.

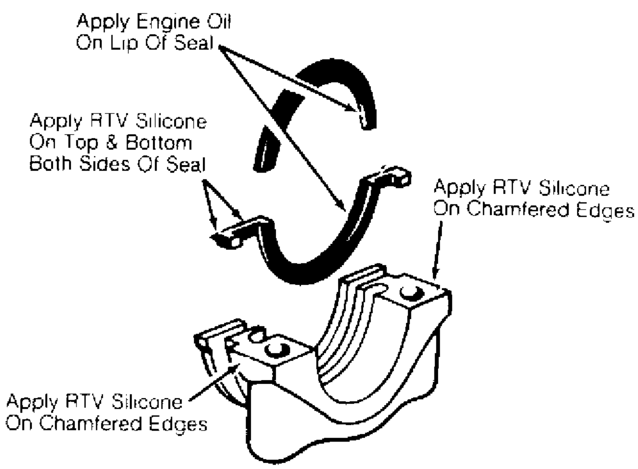

Fig. 29: Typical Split-Rubber Seal Installation
This Graphic For General Information Only

OIL PUMP

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

ROTOR-TYPE

Oil pump rotors must be marked for location prior to removal. See Fig. 30. Remove outer rotor and measure thickness and diameter. Measure inner rotor thickness. Inspect shaft for scoring or wear. Inspect rotors for pitting or damage. Inspect cover for grooving or

wear. Replace components if worn or damaged.

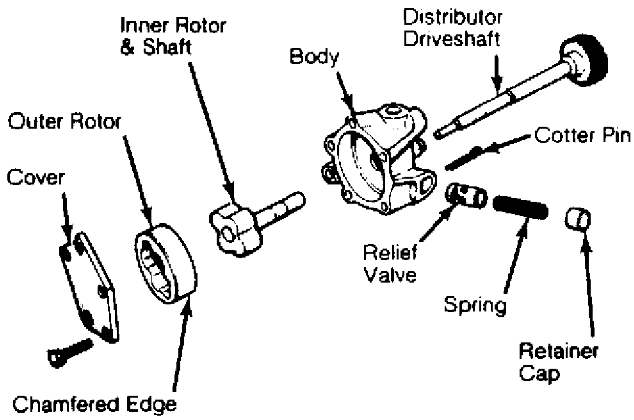

Fig. 30: Typical Rotor Type Oil Pump
This Graphic For General Information Only

Measure outer rotor-to-body clearance. Replace pump assembly if clearance exceeds specification. Measure clearance between rotors. See Fig. 31. Replace shaft and both rotors if clearance exceeds specifications.

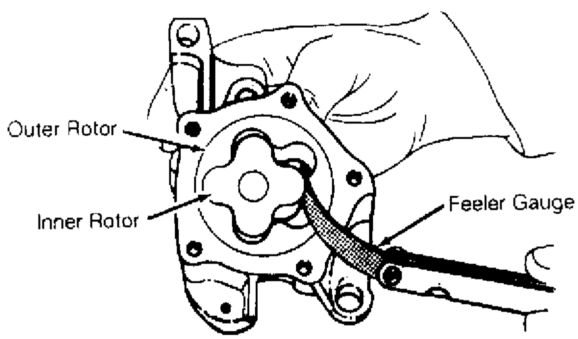

Fig. 31: Measuring Rotor Clearance - Typical
This Graphic For General Information Only

Install rotors in pump body. Position straightedge across pump body. Using feeler gauge, measure clearance between rotors and straightedge. Pump cover wear is measured using a straightedge and feeler gauge. Replace pump if clearance exceeds specification.

GEAR TYPE

Oil pump gears must be marked for location prior to removal. See Fig. 32. Remove gears from pump body. Inspect gears for pitting or damage. Inspect cover for grooving or wear.

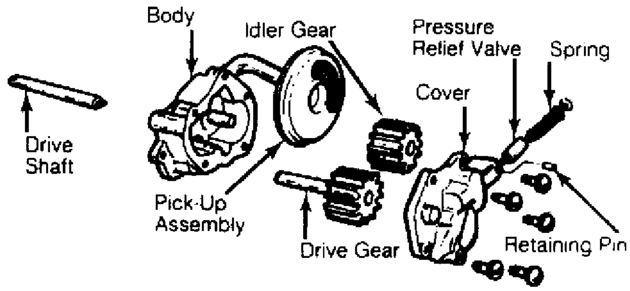

Fig. 32: Typical Gear Type Oil Pump
This Graphic For General Information Only

Measure gear diameter and length. Measure gear housing cavity depth and diameter. See Fig. 33. Replace components if worn or damaged.

Pump cover wear is measured using a straightedge and feeler gauge. Pump is to be replaced if warpage or wear exceeds specifications or mating surface of pump cover is scratched or grooved.

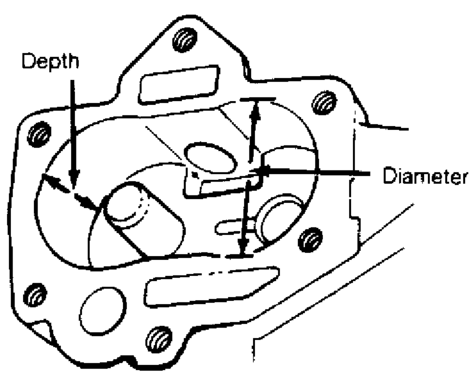

Fig. 33: Measuring Oil Pump Gear Cavity - Typical
This Graphic For General Information Only

BREAK-IN-PROCEDURE

* PLEASE READ THIS FIRST *

NOTE: Always refer to appropriate engine overhaul article in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.

ENGINE PRE-OILING

Engine pre-oiling should be done prior to operation to prevent engine damage. A lightly oiled pump will cavitate unless oil pump cavities are filled with engine oil or petroleum jelly.

Engine pre-oiling can be done using pressure oiler (if available). Connect pressure oiler to cylinder block oil passage such as oil pressure sending unit. Operate pressure oiler long enough to ensure correct amount of oil has filled crankcase. Check oil level while pre-oiling.

If pressure oiler is not available, disconnect ignition system. Remove oil pressure sending unit and replace with oil pressure test gauge. Using starter motor, rotate engine starter until gauge shows normal oil pressure for several seconds. DO NOT crank engine for more than 30 seconds to avoid starter motor damage.

Ensure oil pressure has reached the most distant point from the oil pump. Reinstall oil pressure sending unit. Reconnect ignition system.

INITIAL START-UP

Start the engine and operate engine at low speed while checking for coolant, fuel and oil leaks. Stop engine. Recheck coolant and oil level. Adjust if necessary.

CAMSHAFT

Break-in procedure is required when a new or reground camshaft has been installed. Operate and maintain engine speed between 1500-2500 RPM for approximately 30 minutes. Procedure may vary due to manufacturers recommendations.

PISTON RINGS

Piston rings require a break-in procedure to ensure seating of rings to cylinder walls. Serious damage may occur to rings if correct procedures are not followed.

Extremely high piston ring temperatures are produced obtained during break-in process. If rings are exposed to excessively high RPM or high cylinder pressures, ring damage can occur. Follow piston ring manufacturer's recommended break-in procedure.

FINAL ADJUSTMENTS

Check or adjust ignition timing and dwell (if applicable). Adjust valves (if necessary). Adjust carburetion or injection idle speed and mixture. Retighten cylinder heads (if required). If cylinder head or block is aluminum, retighten bolts when engine is cold. Follow the engine manufacturer's recommended break-in procedure and maintenance schedule for new engines.

NOTE: Some manufacturer's require that head bolts be retightened after specified amount of operation. This must be done

prevent head gasket failure.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Introduction

1993 MODEL COVERAGE

MODEL COVERAGE TABLE

MODEL	BODY/ENGINE (1)	ENGINE (2)	FUEL SYSTEM	IGNITION SYSTEM
Accord	CB7	2.2L (F22A1)(4)	MPI	Magnetic
	CB7	2.2L (F22A6)(5)	MPI	Magnetic
	CB9	2.2L (F22A1)(4)	MPI	Magnetic
	CB9	2.2L (F22A6)(5)	MPI	Magnetic
Civic	EH2	1.5L (D15B7)	MPI	Magnetic
	EH2	1.5L (D15B8)	MPI	Magnetic
	EH2	1.5L (D15Z1)(6)	MPI	Magnetic
	EH3	1.6L (D16Z6)(6)	MPI	Magnetic
Civic Del Sol	EG1	1.5L (D15B7)	MPI	Magnetic
	EH6	1.6L (D16Z6)(6)	MPI	Magnetic
Prelude	BA8	2.2L (F22A1)	MPI	Magnetic
	BB1	2.2L (H22A1) (6)(7)	MPI	Magnetic
	BB2	2.3L (H23A1) (6)(7)	MPI	Magnetic

(1) - Body/Engine ID is the fourth, fifth and sixth digits of VIN number.
(2) - Engine code is the first 5 characters of the 12 characters stamped or tagged on engine block.
(3) - Ignition timing is controlled by Engine Control Module (ECM).
(4) - With single intake and exhaust manifolds.
(5) - With dual intake and exhaust manifolds.

? (6) - Variable Valve Timing with Electronic Control (VTEC). ?
? (7) - Dual Overhead Camshafts (DOHC). ?
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VIN DEFINITION

(VIN)	J	H	M	C	B	7	6	6	*	P	C	0	0	0	0	0	1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1 - Indicates Nation of Origin.
2 - Indicates Manufacturer.
3 - Indicates Vehicle Type
4-6 - Indicates Body/Engine Type.
7 - Indicates Body and Transmission Type.
8 - Indicates Vehicle Grade.
9 - Indicates Check Digit (0-9 or X).
10 - Indicates Model Year.
11 - Indicates Assembly Plant.
12-17 - Indicates Plant Sequential Number.

MODEL YEAR VIN CODE APPLICATION TABLE

VIN Code	Model Year
M	1991
N	1992
P	1993

ENGINE CODE LOCATION

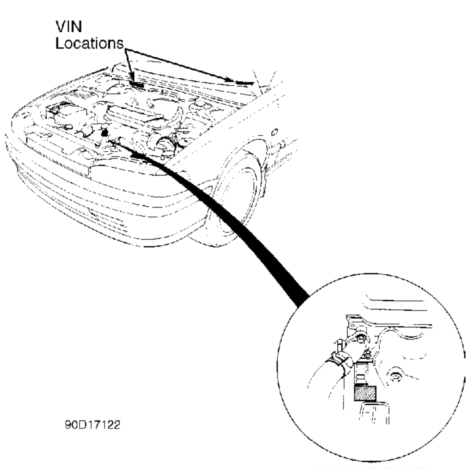

Fig. 1: Accord Engine Code Location
Courtesy of American Honda Motor Co., Inc.

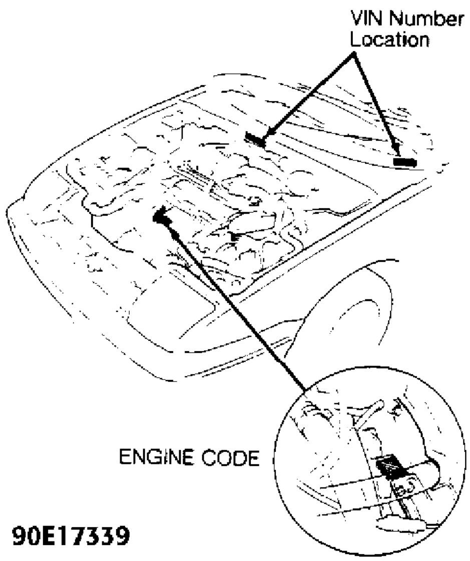

Fig. 2: Prelude Engine Code Location
Courtesy of American Honda Motor Co., Inc.

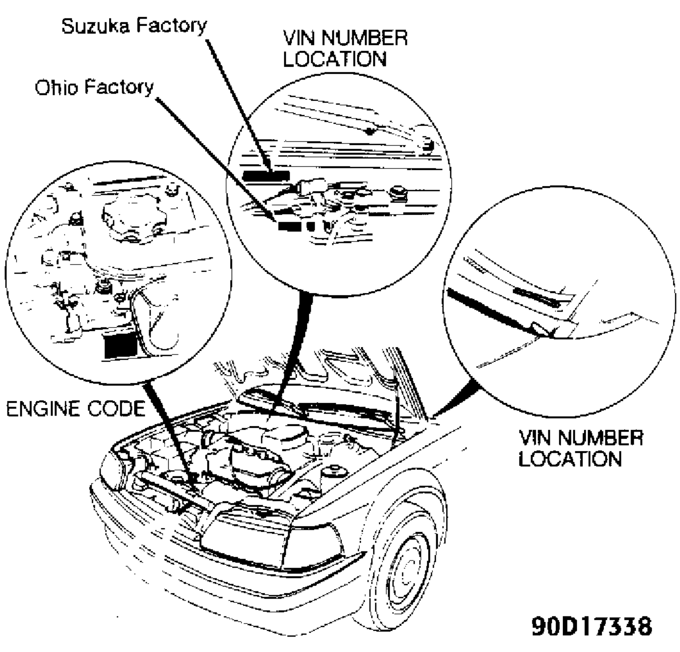

Fig. 3: Civic & Civic Del Sol Engine Code Location
Courtesy of American Honda Motor Co., Inc.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Basic Diagnostic Procedures

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

The following diagnostic steps will help prevent overlooking a simple problem. This is also where to begin diagnosis for a no-start condition.

The first step in diagnosing any driveability problem is verifying the customer complaint with a test drive vehicle under the conditions that the problem reportedly occurred.

Before entering self-diagnostics, perform a careful and complete visual inspection. Most engine control problems result from mechanical breakdowns, poor electrical connections or damaged/misrouted vacuum hoses. Before condemning computerized system, perform each test listed in this article.

NOTE: Perform all voltage tests with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure.

PRELIMINARY INSPECTION & ADJUSTMENTS

VISUAL INSPECTION

Visually inspect all electrical wiring for chafed, stretched, cut or pinched wiring. Ensure electrical connectors fit tightly and are not corroded. Ensure vacuum hoses are properly routed and not pinched or cut. See M - VACUUM DIAGRAMS article in the ENGINE PERFORMANCE Section to verify routing and connections. Inspect air induction system for possible vacuum leaks.

MECHANICAL INSPECTION

Compression

Check engine mechanical condition with a compression gauge, vacuum gauge, or an engine analyzer. See engine analyzer manual for specific instructions.

WARNING: DO NOT use ignition switch during compression tests on fuel injected vehicles. Use a remote starter to crank engine. Fuel injectors on many models are triggered by ignition switch during cranking mode, which can create a fire hazard or contaminate the engine's oiling system.

Check compression pressure with engine at normal operating temperature, all spark plugs removed, throttle valves wide open and at specified cranking speed. Crank engine at least 6 revolutions to determine engine compression. See ENGINE COMPRESSION table.

ENGINE COMPRESSION TABLE (1)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Model	Standard psi (kg/cm^2)	Minimum psi (kg/cm^2)	Minimum RPM
Accord & Prelude	178 (12.5)	135 (9.5)	250
Civic & Civic Del Sol	185 (13.0)	135 (9.5)	250

(1) - Maximum variation between cylinders is 28 psi (2.0 kg/cm^2).

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Exhaust System Backpressure

Exhaust system can be checked using a vacuum or pressure gauge. Remove O2 sensor or LAF sensor. Connect a 1-5 psi pressure gauge, and run engine at 2500 RPM. If exhaust system backpressure exceeds 1 3/4 - 2 psi (.12-.14 kg/cm^2), exhaust system or catalytic converter is plugged.

If using a vacuum gauge, connect vacuum gauge hose to intake manifold vacuum port and start engine. Observe vacuum gauge. Open throttle part way and hold steady. If vacuum slowly drops after stabilizing, check exhaust system for restrictions.

FUEL SYSTEM

WARNING: Always relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

FUEL PRESSURE

Relieving Fuel Pressure

Remove negative battery cable. Loosen fuel tank filler cap. Place clean shop rag around fuel filter. Slowly loosen 6-mm bolt on top of fuel filter (one complete turn) to relieve system pressure. Always replace washer under 6-mm bolt after loosening.

Basic Diagnosis

Begin basic diagnosis of fuel system by determining fuel system pressure. If fuel pump fails to run, inspect power supply to main relay. If all power supplies are present (i.e., battery, ignition and starter switch during cranking), perform functional test of main relay. See M - WIRING DIAGRAMS and I - SYS/COMP TESTS articles in the ENGINE PERFORMANCE Section.

Pressure Testing

1) Disconnect negative battery cable. Relieve fuel pressure. See RELIEVING FUEL PRESSURE. Connect Fuel Pressure Gauge (07406-0040001) at 6-mm bolt. Reconnect negative battery cable. Start engine, and note fuel pressure. If vehicle will not start, check for spark. If spark is present and no fuel pressure is evident, inspect fuel pump main relay.

2) Remove connector from fuel pump main relay. SeeFig. 1. Using a test light, check for power on Black/Yellow wire at fuel pump relay connector. If power is present, connect a jumper wire between Black/Yellow wire (B+) and Yellow wire (Yellow/Green wire on Civic & Civic Del Sol).

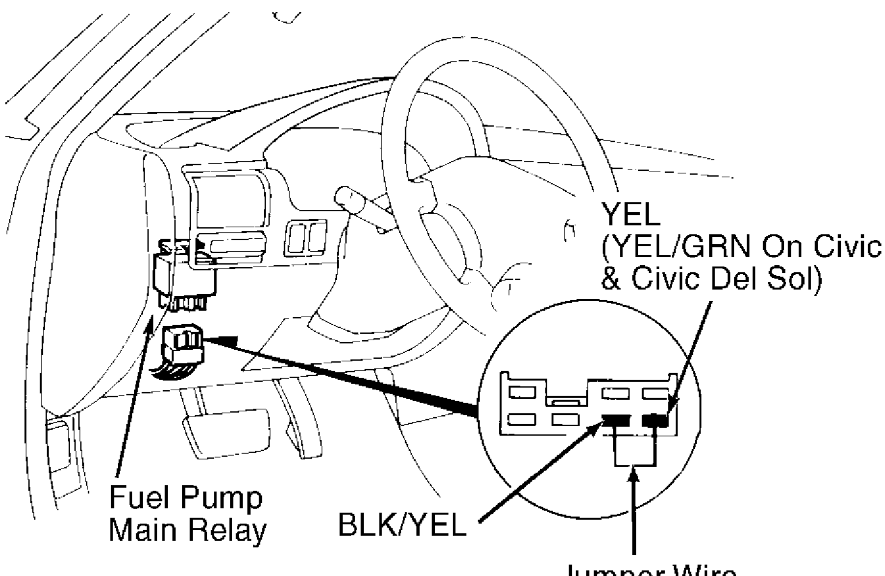

Fig. 1: Locating Fuel Injection Main Relay
Courtesy of American Honda Motor Co., Inc.

3) If fuel pump runs, go to step 4). If fuel pump fails to run, see I - SYS/COMP TESTS article in the ENGINE PERFORMANCE Section. If no voltage is present on Black/Yellow wire, check for open in wire between fuel pump main relay connector and fuse No. 2 on fuse box. Go to step 4) after repairing circuit.

4) Start engine. Disconnect vacuum hose from pressure regulator, and check for manifold vacuum. If vacuum is not present, check for restriction in vacuum port or hose. Plug vacuum hose and inspect fuel pressure gauge reading. Gauge reading should be within specification. See FUEL PRESSURE table. Pressure should drop slightly

when vacuum hose is reconnected.

REGULATED FUEL PRESSURE TABLE (1)

Application	At Idle - psi (kg/cm^2)
Accord, Civic & Civic Del Sol	
Vacuum Hose Disconnected	40-47 (2.8-3.3)
Vacuum Hose Connected	30-38 (2.1-2.7)
Prelude	
2.2L Engine (F22A1)	
Vacuum Hose Disconnected	36-43 (2.5-3.0)
Vacuum Hose Connected	28-35 (2.0-2.5)
2.2L Engine (H22A1)	
Vacuum Hose Disconnected	33-40 (2.3-2.8)
Vacuum Hose Connected	25-32 (1.8-2.3)
2.3L Engine(H23A1)	
Vacuum Hose Disconnected	36-43 (2.5-3.0)
Vacuum Hose Connected	28-35 (2.0-2.5)

(1) - Measure regulated fuel pressure with vacuum hose connected and disconnected from pressure regulator.

5) If pressure is higher than specified, inspect for pinched or clogged fuel return line between fuel rail and fuel tank. If no problem is found in fuel line, replace pressure regulator.

6) If pressure is less than specified, inspect for plugged fuel filter. If filter is not plugged, lightly pinch fuel return line. If pressure does not increase, replace fuel pump. If pressure increases, replace pressure regulator.

NOTE: If vehicle starts and runs, fuel pump main relay is okay.

IGNITION CHECKS

ELECTRONIC IGNITION SYSTEM

Spark

Check for spark at secondary coil wire and each spark plug wire using a spark tester. If spark is not present, continue with following tests. Check spark plug wire resistance on suspect wires. Resistance should be less than 25,000 ohms.

Ignition Coil Power Source

1) On Civic, remove distributor cap to check power source directly at coil. On all models, disconnect ignition coil primary

leads. Turn ignition on. Using voltmeter, check voltage between ground and Black/Yellow wire terminal of ignition coil harness.

2) Battery voltage should be present. If battery voltage is not present, check for open in Black/Yellow wire between coil and ignition switch.

Ignitor Power Source

Turn ignition off. Disconnect harness connector at distributor. Turn ignition on. Using voltmeter, check for battery voltage between ground and Black/Yellow wire of harness. If voltage is not present, check for open in Black/Yellow wire between ignition coil and harness connector. If wire is okay, check ignition coil resistance (for internal short to ground).

Ignitor Check

Check TDC/CRANK/CYL sensor resistance values. See TACH PULSE SIGNAL. Check power sources. If no problems are found and spark is not present, replace ignitor.

Ignition Coil Resistance (Accord & Prelude)

1) Remove primary and secondary leads from ignition coil. Using an ohmmeter, check resistance between primary terminals "A" and "C" ("A" and "B" for Prelude) of ignition coil. SeeFig. 2. Resistance should be .6-.8 ohm at room temperature.

2) On Accord, check resistance between terminals "B" and "D" of ignition coil (tachometer circuit). Resistance should be about 2090-2310 ohms at room temperature.

3) On all models, check secondary resistance between terminal "A" and secondary output terminal (coil tower). See IGNITION COIL RESISTANCE table. Check for continuity between terminals "A" and "B" ("A" and "C" for Prelude). Continuity should exist. If readings are not within specification, replace coil.

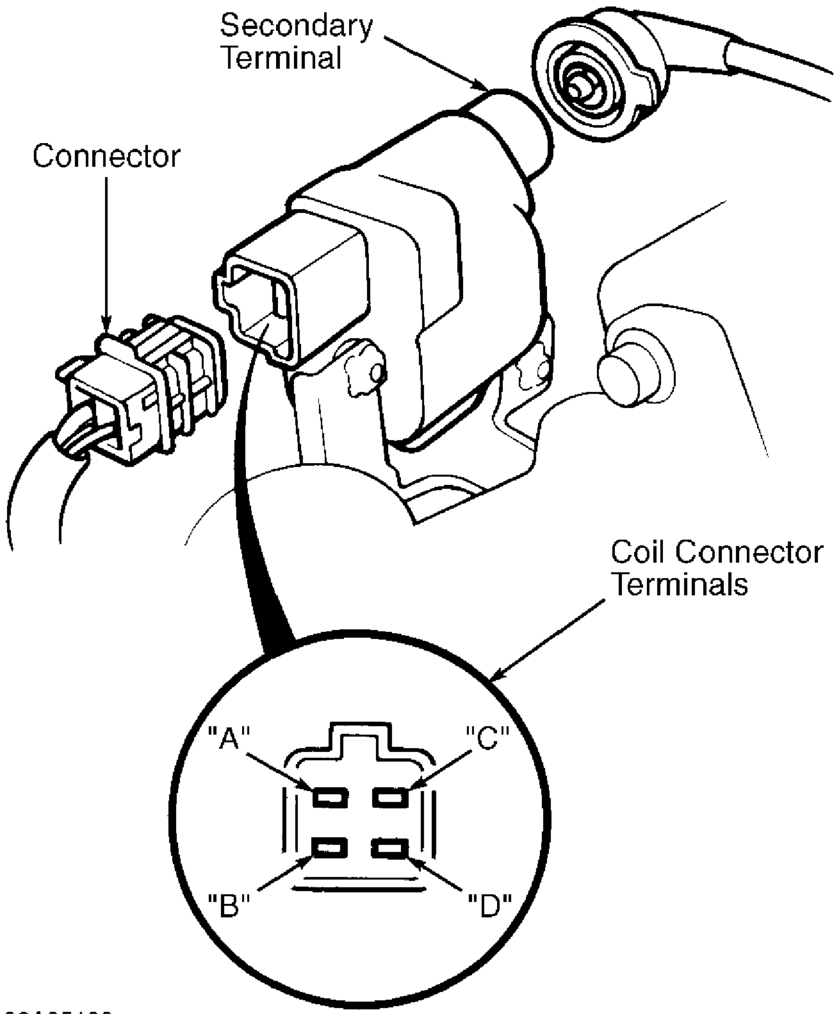

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Fig. 2: Identifying Ignition Coil Terminals (Accord & Prelude)
Courtesy of American Honda Motor Co., Inc.

IGNITION COIL RESISTANCE (TABLE - Ohms @ 68F (20C))

Application	Primary	Secondary
Accord & Prelude	.6-.8	14,400-21,600
Civic & Civic Del Sol	.6-.8	12,800-19,200

Ignition Coil Resistance (Civic & Civic Del Sol)

1) Turn ignition off. Remove distributor cap. Remove 2 Phillips screws retaining primary ignition leads to ignition coil. Remove primary leads from ignition coil. Using an ohmmeter, check resistance between primary terminals "A" and "B" on ignition coil. See Fig. 3. Resistance should be .6-.8 ohm at room temperature.

2) Check secondary resistance between terminal "A" and secondary output terminal (coil tower) at room temperature. See

IGNITION COIL RESISTANCE table. If readings are not within specification, replace coil.

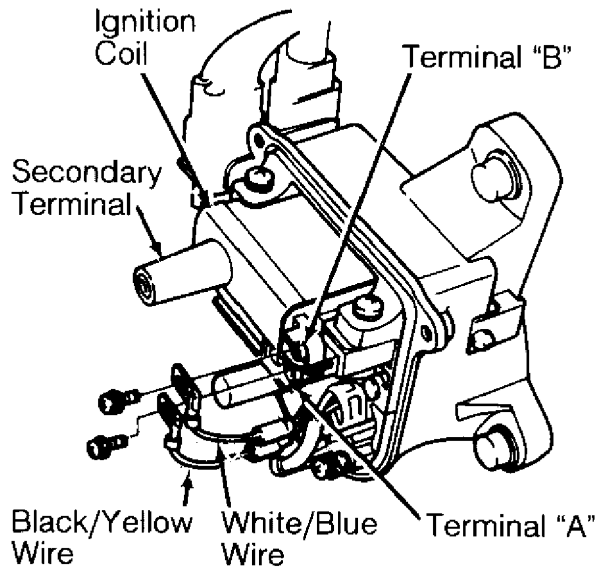

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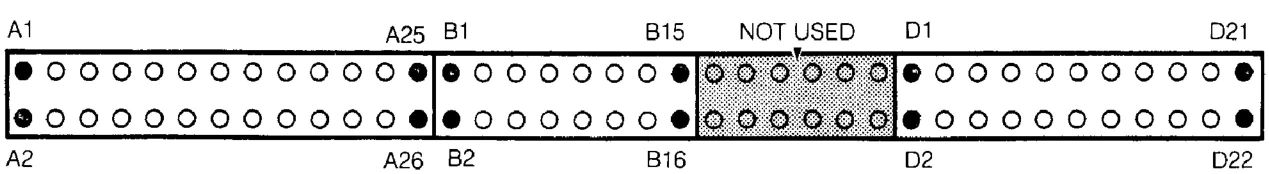
Fig. 3: Identifying Ignition Coil Terminals (Civic & Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

Tach Pulse Signal

1) Timing control and triggering of fuel injectors are based upon input signals from TDC/CRANK/CYL sensors. These sensors are simple Permanent Magnet (PM) generator pick-up coils.

2) Using a DVOM on low voltage scale (preferably with a bar-graph function), check for a pulsed low-voltage signal at proper Engine Control Module (ECM) harness terminals with engine cranking. See Fig. 4. See WIRING HARNESS & SENSOR RESISTANCE TEST table. If a pulsed signal is present, no fault is present. If pulsed signal is not present, check sensor and wiring integrity.



92E26660
Fig. 4: Identifying ECM Wire Harness Connector Terminals
Courtesy of American Honda Motor Co., Inc.

3) To test sensor and wiring integrity, turn ignition off. Disconnect connectors from ECM. Lightly probe appropriate ECM harness terminals to check for proper winding resistance of each sensor. See WIRING HARNESS & SENSOR RESISTANCE TEST table. If resistance is within specification, go to step 5). If resistance is not within specification, check resistance of TDC/CRANK/CYL sensor directly

sensor connector. See Fig. 5. See TDC/CRANK/CYL SENSOR RESISTANCE TEST table.

4) If sensor resistance is now within specification, repair opens, shorts or corrosion in wire harness between sensor(s) and ECM. If resistance is not within specification, replace sensor.

5) If resistance values in step 3) were within specification, check for continuity to ground at each ECM sensor terminal. If continuity is present, disconnect sensor(s) and recheck for continuity to ground at ECM harness sensor terminals. If continuity no longer exists, go to next step. If continuity to ground is still present, repair short to ground in ECM harness between ECM and sensor(s).

6) If continuity did not exist with sensor disconnected, check for continuity to ground on each sensor connector terminal. See Fig. 5. See TDC/CRANK/CYL SENSOR RESISTANCE TEST table. If continuity to ground exists, replace sensor.

WIRING HARNESS & SENSOR RESISTANCE TEST TABLE

Application	Terminals	Ohms
Accord		
CRANK	B15 & B16	260-500
CYL	B11 & B12	260-500
TDC	B13 & B14	260-500
Civic, Civic Del Sol & Prelude		
CRANK	B15 & B16	350-700
CYL	B11 & B12	350-700
TDC	B13 & B14	350-700

TDC/CRANK/CYL SENSOR RESISTANCE TEST TABLE

Application	Terminals	Wire Color
CRANK Sensor Wire		
1 Of 2	"B"	Blue/Green
2 Of 2	"F"	Blue/Yellow
CYL Sensor Wire		
1 Of 2	"D"	Orange
2 Of 2	"H"	White
TDC Sensor Wire		
1 Of 2	"C"	Orange/Blue
2 Of 2	"G"	White/Blue

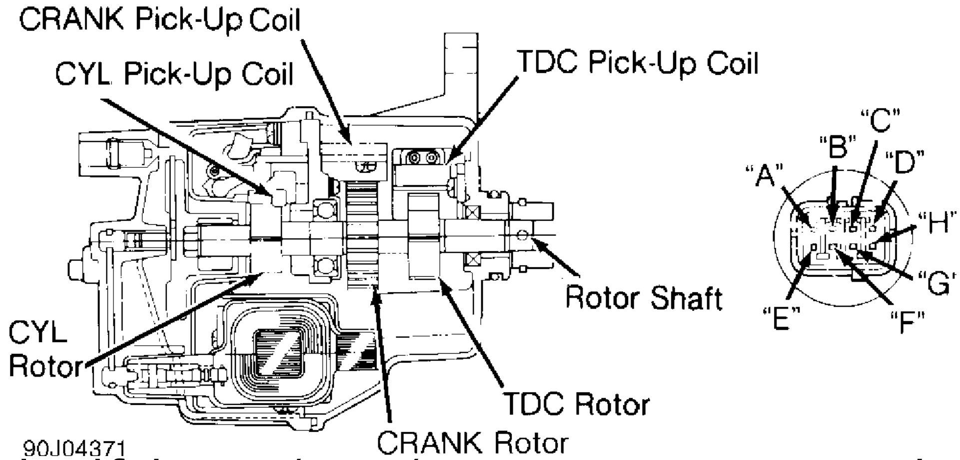


Fig. 5: Identifying TDC/CRANK/CYL Sensor Connector Terminals
Courtesy of American Honda Motor Co., Inc.

IDLE SPEED & IGNITION TIMING

Ensure idle speed and ignition timing are set to specification. See IDLE SPEED SPECIFICATIONS and IGNITION TIMING tables. For adjustment procedures, see D - ADJUSTMENTS article in the ENGINE PERFORMANCE Section.

IDLE SPEED SPECIFICATIONS TABLE

Application	(1) RPM
Accord & Prelude	500-600
Civic & Civic Del Sol	370-470

(1) - With Intake Air Control (IAC) valve disconnected, headlights and cooling fan off and transmission in Neutral or Park.

IGNITION TIMING TABLE (Degrees BTDC @ RPM)

Application	Specification
Accord & Prelude	13-17 @ 700-800
Civic & Civic Del Sol	
1.5L	
D15B7	
A/T	16 @ 700
M/T	16 @ 650
D15B8	12 @ 650
D15Z1	16 @ 600

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1.6L (D16Z6)	
A/T	16 @ 700
M/T	16 @ 650

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SUMMARY

If no faults were found while performing BASIC TESTING, proceed to G - TESTS W/ CODES article in the ENGINE PERFORMANCE Section. If no hard codes are found in self-diagnostics, proceed to H - TESTS W/O CODES article in the ENGINE PERFORMANCE Section for diagnosis by symptom (i.e., ROUGH IDLE, NO-START, etc.), or intermittent diagnosis procedures.

END OF ARTICLE

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ARTICLE BEGINNING

Fuses & Circuit Breakers
1992-95 Honda

Prelude

FUSES & CIRCUIT BREAKERS

FUSE PANEL LOCATION

NOTE: Replacing a fuse with one of a greater rating greatly increases chances of damaging electrical system. If replacement fuse with proper rating for circuit is not available, install one with a lesser rating.

Fuse box is located under dashboard on driver's side. Underhood relay panel is located on right side of engine compartment next to battery. A list of protected circuits and fuse ratings for each is found on a chart inside fuse box and on fuse panel cover.

UNDERDASH FUSE PANEL IDENTIFICATION (1992-95)

FUSES & CIF

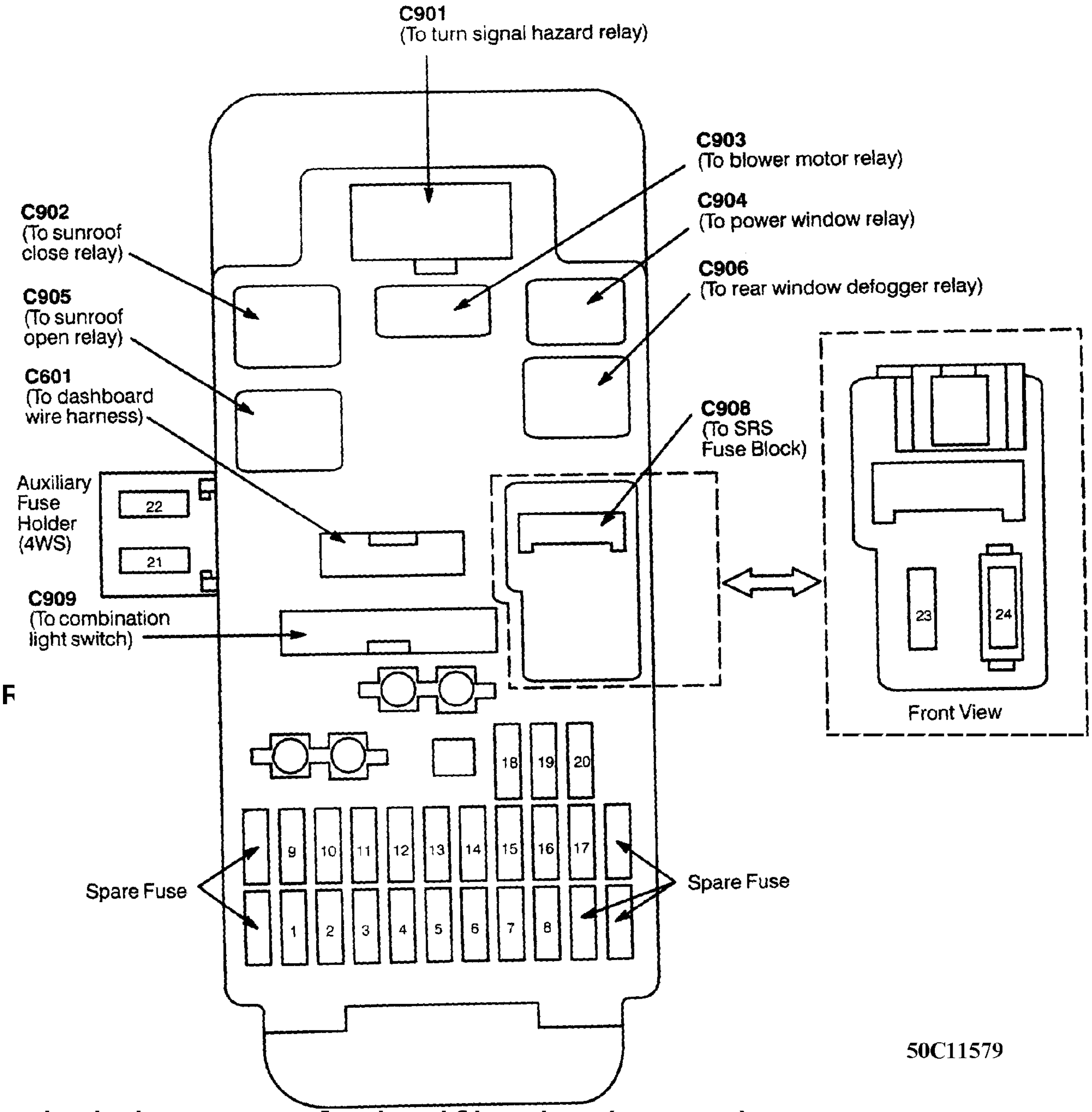

Fig. 1: Underdash Fuse Panel Identification (1992-95)
Courtesy of American Honda Motor Co., Inc.

1 - Not Used
2 - 7.5 Amp
    PGM-FI ECM, PGM-FI Main Relay, Starter Signal,
    Sub Gauge (Brake Check Circuit)
3 - 15 Amp
    Front Foglights (Option)
4 - 10 Amp
    PGM-FI Main Relay

```
 5 - Not Used
 6 - 15 Amp
        Seat Heater System (Canada)
 7 - 30 Amp
        Sun Roof Open Relay, Sun Roof Close Relay
 8 - 10 Amp
        Daytime Running Lights Control Unit (Canada)
 9 - 15 Amp
        Heater Control Panel, Power Mirror System, ABS Control Unit,
        4WS Control Unit, Fan Timer Unit, Mode/Recirc. Control Motor
        Heated Mirrors (Canada)
10 - Not Used
11 - 10 Amp
        Seat Heater Main Relay (Canada), A/C Compressor Clutch Relay,
        PGM-FI, ECU, Rear Window Defogger Relay
12 - 7.5 Amp
        Daytime Running Lights (Canada)
13 - 10 Amp
        Gauge Lights, Indicator Lights, Clock, Back-Up Lights
14 - 7.5 Amp
        Cruise Control System
15 - 20 Amp
        Driver's Power Window System
16 - 20 Amp
        Passenger's Power Window System
17 - 30 Amp
        Windshield Wiper System
18 - 10 Amp
        Stereo Radio/Cassette Player, Cigarette Lighter
19 - 15 Amp (Without SRS) (1992)
     Not Used (1993-94)
        PGM-FI Main Relay, A/T Control Unit, Fan Timer Unit, ELD Unit
20 - Not Used
21 - Not Used
22 - 10 Amp
        4WS Control Unit, 4WS Front & Rear Steering Angle Sensors
23 - 15 Amp
        SRS Unit, Transmission Control Module (TCM), PGM-FI,
        Radiator Fan Control Module, Vehicle Speed Sensor (VSS),
        Charging System
24 - 10 Amp
        SRS Unit
```

UNDERHOOD FUSE & RELAY PANEL IDENTIFICATION (1992-94)

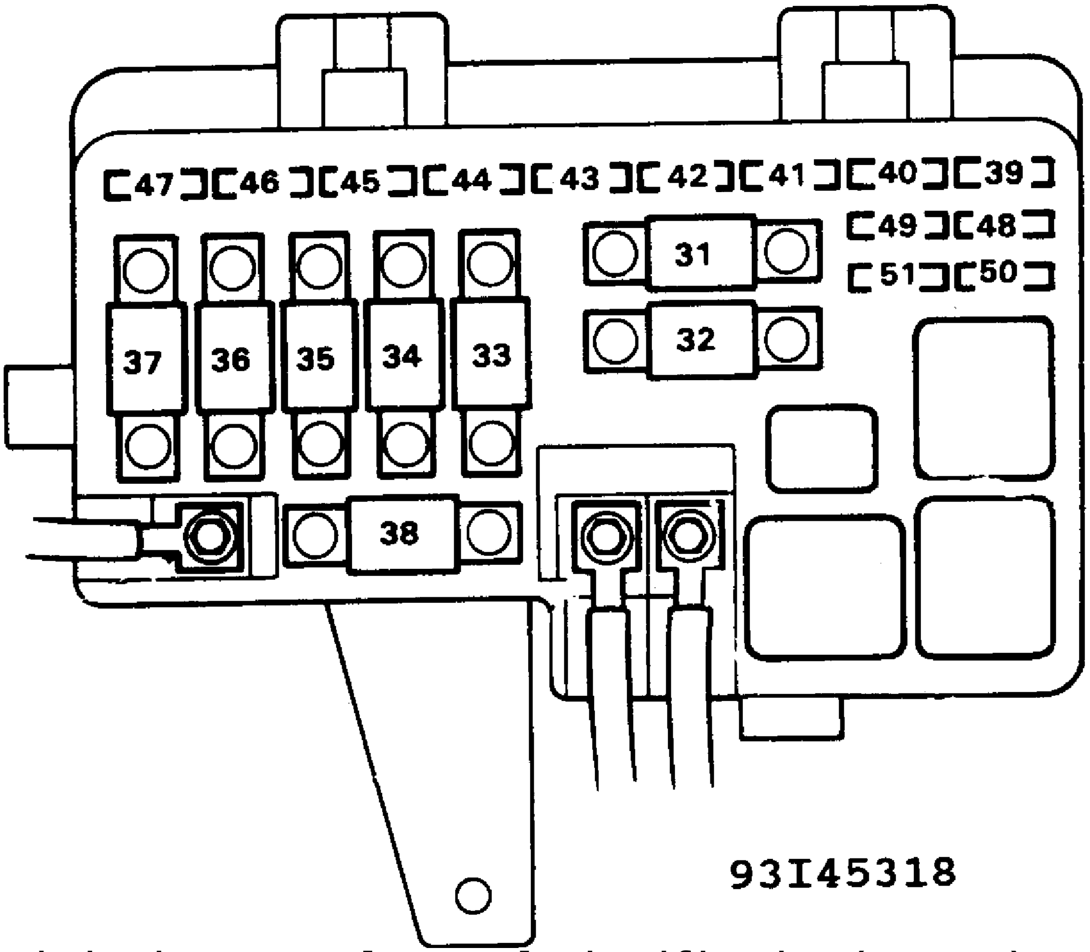

Fig. 2: Underhood Fuse & Relay Panel Identification (1992-94)
Courtesy of American Honda Motor Co., Inc.

WARNING: Always disconnect battery ground cable before servicing "high-current fuses. It is recommended that "high-current" fuses be replaced by a qualified technician.

31 - 50 Amp
ABS Motor Relay
32 - 100 Amp
Power Distribution
33 - 50 Amp
Ignition Switch (BAT)
34 - 40 Amp
Rear Window Defogger Relay
35 - 40 Amp
Blower Motor Relay
36 - 40 Amp
Seat Heaters (Canada), PGM-FI Main Relay, Fog Lights (1994)
37 - 40 Amp
Sun Roof System, Power Window System,

Daytime Running Lights Control Unit (Canada)
38 - 60 Amp
4WS Control Unit
39 - 15 Amp
Turn Signal/Hazard Relay, Hazard Lights
40 - 15 Amp
ABS Control Unit (B2)
41 - 15 Amp
Horns, Horn Relay (With SRS), Brakelights, Brakelight Signal
42 - 20 Amp
Parking Lights, Dash Lights
43 - 10 Amp
Clock, Stereo Sound System, 4WS Control Unit, Power Antenna
ECM, A/T Control Unit (TCM), PGM-FI (1994)
44 - 15 Amp
Power Door Lock Control Unit
45 - 15 Amp
Condenser Fan Motor, Fan Timer Unit
46 - 15 Amp
Ceiling Light, Cigarette Lighter Relay, Trunk Light, Ignition
Key Light, Interlock System
47 - 15 Amp
Radiator Fan Motor
48 - 7.5 Amp
ABS Control Unit
49 - 20 Amp
ABS Control Unit (B1)
50 - 20 Amp
Right Headlight
51 - 20 Amp
Left Headlight, High Beam Indicator Light,
Fog Light Relay (1994)

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Self-Diagnostics

Prelude

INTRODUCTION

If no faults were found while performing BASIC TESTING, proceed with self-diagnostics. If no Diagnostic Trouble Codes (DTCs) or only pass codes are present after entering self-diagnostics, proceed to H - TESTS W/O CODES article in the ENGINE PERFORMANCE Section for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.).

SELF-DIAGNOSTIC SYSTEM

Hard Failures

Hard failures cause Malfunction Indicator Light (MIL) to illuminate and remain on until problem is repaired. If light comes on and remains on (light may flash) during vehicle operation, cause of malfunction must be determined by retrieving DTCs and using TROUBLE CODE CHARTS. See RETRIEVING CODES. If a sensor fails, control unit will use a substitute value in its calculations to continue engine operation. In this condition, commonly known as limp-in mode, the vehicle runs but driveability will not be optimum.

Intermittent Failures

Intermittent failures may cause Malfunction Indicator light (MIL) to flicker or illuminate and go out after the intermittent fault goes away. The corresponding DTC will be retained in ECM memory. If related fault does not reoccur within 50 starter operations, related DTC will be erased from control unit memory. Intermittent failures may be caused by sensor, connector or wiring related problems. See INTERMITTENTS in H - TESTS W/O CODES article in the ENGINE PERFORMANCE Section.

MALFUNCTION INDICATOR LIGHT (MIL)

All models are equipped with an MIL. As a bulb check, light illuminates when ignition is on and engine is not running. MIL also illuminates when a system failure has been detected and a corresponding DTC has been set in ECM memory. Not all trouble codes will activate MIL. If MIL is on and no DTCs are in memory, see H - TESTS W/O CODES article in the ENGINE PERFORMANCE Section.

RETRIEVING CODES

With ignition off, insert jumper wire in service check connector terminals, located behind right side of dash on Accord, Civic and Civic Del Sol and near center console on Prelude. See Fig. 1. Turn ignition switch to ON position. Diagnostic Trouble Codes (DTCs) will be indicated by a series of long and short flashes on MIL. The number of long flashes indicates the number in the 10s column. The number of short flashes indicates the number in the 1s column. For example, 4 long flashes followed by 3 short flashes would indicate DTC 43.

See **TROUBLE CODE DEFINITION** table and proceed to appropriate **TROUBLE CODE CHART** for testing. All voltage tests should be performed with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless specifically stated differently in testing procedure.

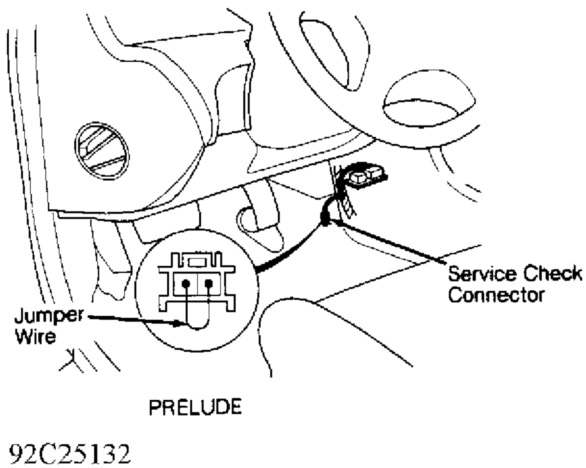

Fig. 1: Locating Service Check Connectors, Prelude
Courtesy of American Honda Motor Co.

DIAGNOSTIC TROUBLE CODE DEFINITION

DIAGNOSTIC TROUBLE CODE IDENTIFICATION TABLE

Code(1)	System Affected	Probable Cause
0	ECM	No Signal To ECM
1	Heated Oxygen Sensor (HO2S)	Problem In HO2S Circuit
3	MAP Sensor	Electrical Problem In MAP Sensor
4	Crank Angle Sensor (CKP)	Open Or Shorted Signal Circuit

5	MAP Sensor	Mechanical Problem In MAP Sensor
6	Engine Coolant Temperature (ECT) Sensor	Open Or Shorted Signal Circuit
7	Throttle Position (TP) Sensor	Open Or Shorted Signal Circuit
8	Crank Angle Sensor (TDC)	Open Or Shorted Signal Circuit
9	Crank Angle Sensor (CYP)	Open Or Shorted Signal Circuit
10	Intake Air Temperature(IAT)	Problem With Sensor
12	EGR System	No EGR Action
13	Barometric Pressure (BARO) Sensor	Problem With PA Circuit
14	Idle Air Control(IAC) Valve	Open Or Shorted Signal Circuit
15	Ignition Output Signal	Electrical Problem In Signal Circuit
16	Fuel Injector	Problem In Fuel Injector Circuit
17	Vehicle Speed Sensor (VSS)	Open Or Shorted Signal Circuit
19	A/T Lock-Up Control Solenoid Valve (Civic & Civic Del Sol)	Problem In Lock-Up Solenoid Circuit
20	Electrical Load Detector (ELD)	Problem With ELD Circuit
21	Spool Solenoid Valve (Civic & Civic Del Sol)	Problem With VTEC Spool Solenoid Circuit
22	VTEC Oil Pressure Switch (Civic & Civic Del Sol)	Problem In VTEC Oil Pressure Switch Circuit
23	Knock Sensor (Prelude)	Problem With Knock Sensor Circuit
30	A/T FI Signal A (Accord & Prelude)	Problem In A/T Control Unit And ECM Circuit

31	A/T FI Signal B (Accord & Prelude)	Problem In A/T Control Unit And ECM Circuit
41	Heated Oxygen Sensor (HO2S) Heater	Problem With HO2S Circuit
43	Fuel Supply System (Except D15Z1 Engine)	Problem With HO2S Circuit Or Fuel System
48	Heated Oxygen Sensor (HO2S - D15Z1 Engine)	Problem With HO2S Circuit

(1) - If codes other than these are indicated, repeat self-diagnosis. If code(s) reappear, substitute a known good ECM, and recheck codes. If code(s) clear, replace ECM.

ECM RESET PROCEDURE/CLEARING CODES

NOTE: Some models have an anti-theft code built into the radio circuit. Clearing codes cancels clock and radio settings; make note of settings before beginning reset procedure. After ECM reset, the radio will not function until code is entered.

To reset ECM, remove BACK UP fuse (CLOCK/RADIO fuse on Prelude) from underhood fuse/relay block. Leave fuse out for 10 seconds to reset ECM.

ECM LOCATION

On Accord and Prelude, ECM is located under carpet in passenger-side footwell. The ECM is located in passenger side kick panel on Civic and Civic Del Sol. See Fig. 1.

SUMMARY

If no hard trouble codes (or only pass codes) are present, driveability symptoms exist or intermittent codes exist, proceed to H - TESTS W/O CODES article in the ENGINE PERFORMANCE Section for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent diagnostic procedure.

DIAGNOSTIC TROUBLE CODE CHARTS

NOTE: In the following diagnostic trouble code charts, illustrations and schematics are courtesy of American Honda

Motor Co., Inc.

Using Diagnostic Trouble Code Charts

To use DIAGNOSTIC TROUBLE CODE CHARTS, see RETRIEVING CODES under SELF-DIAGNOSTIC SYSTEM. After codes have been recorded, proceed to appropriate DIAGNOSTIC TROUBLE CODE CHART.

When directed by chart to install ECM test harness, turn ignition off. Connect ECM Test Harness (07LAJ-PT3010A) between ECM and connector. See Fig. 2. Follow code chart directions.

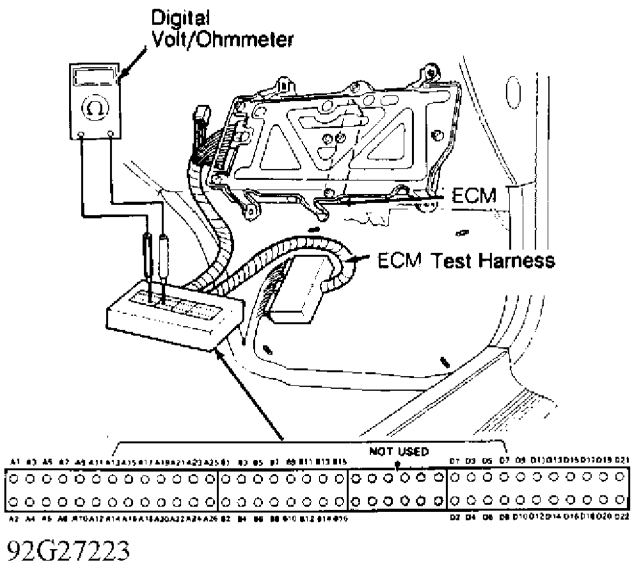

Fig. 2: Installing PGM-FI ECM Test Harness & Identifying Terminals
Courtesy of American Honda Motor Co., Inc.

CODE/NO CODE NO START TROUBLE SHOOTING

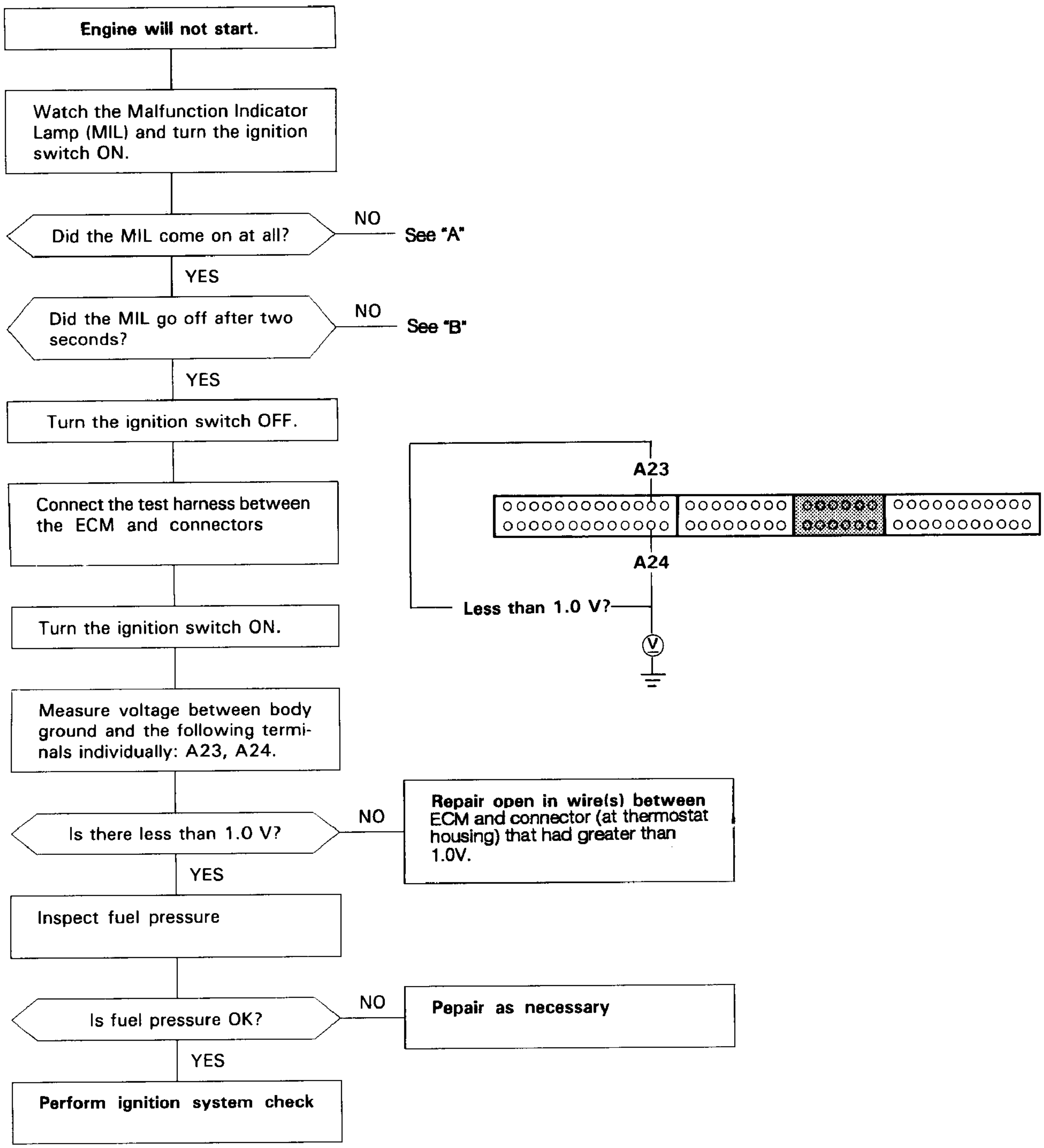

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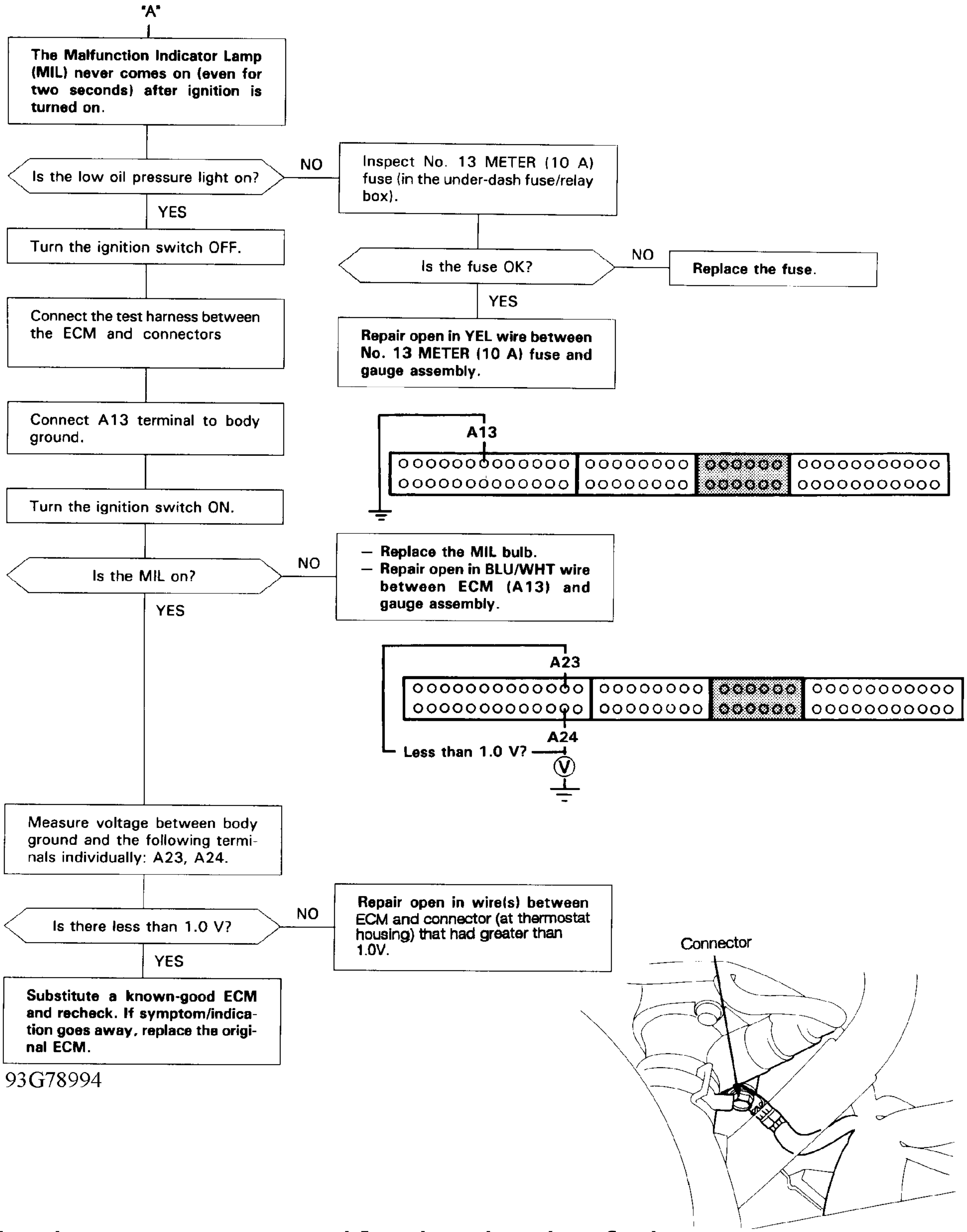
Fig. 3: Flowchart, No Start Trouble Shooting (1 of 5)
Courtesy of American Honda Motor Co., Inc.



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G - TESTS W

Fig. 4: Flowchart, No Start Trouble Shooting (2 of 5)
Courtesy of American Honda Motor Co., Inc.

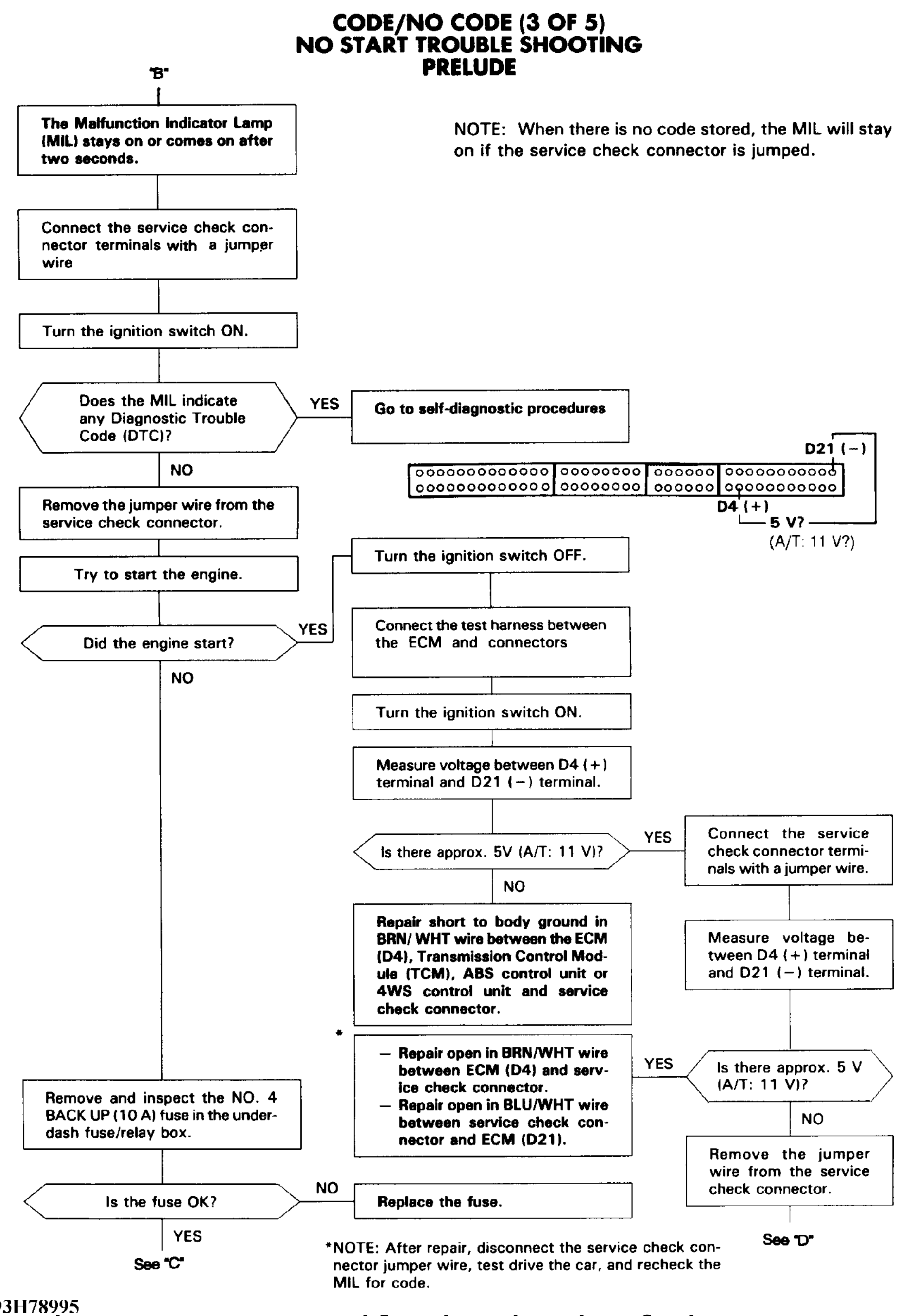
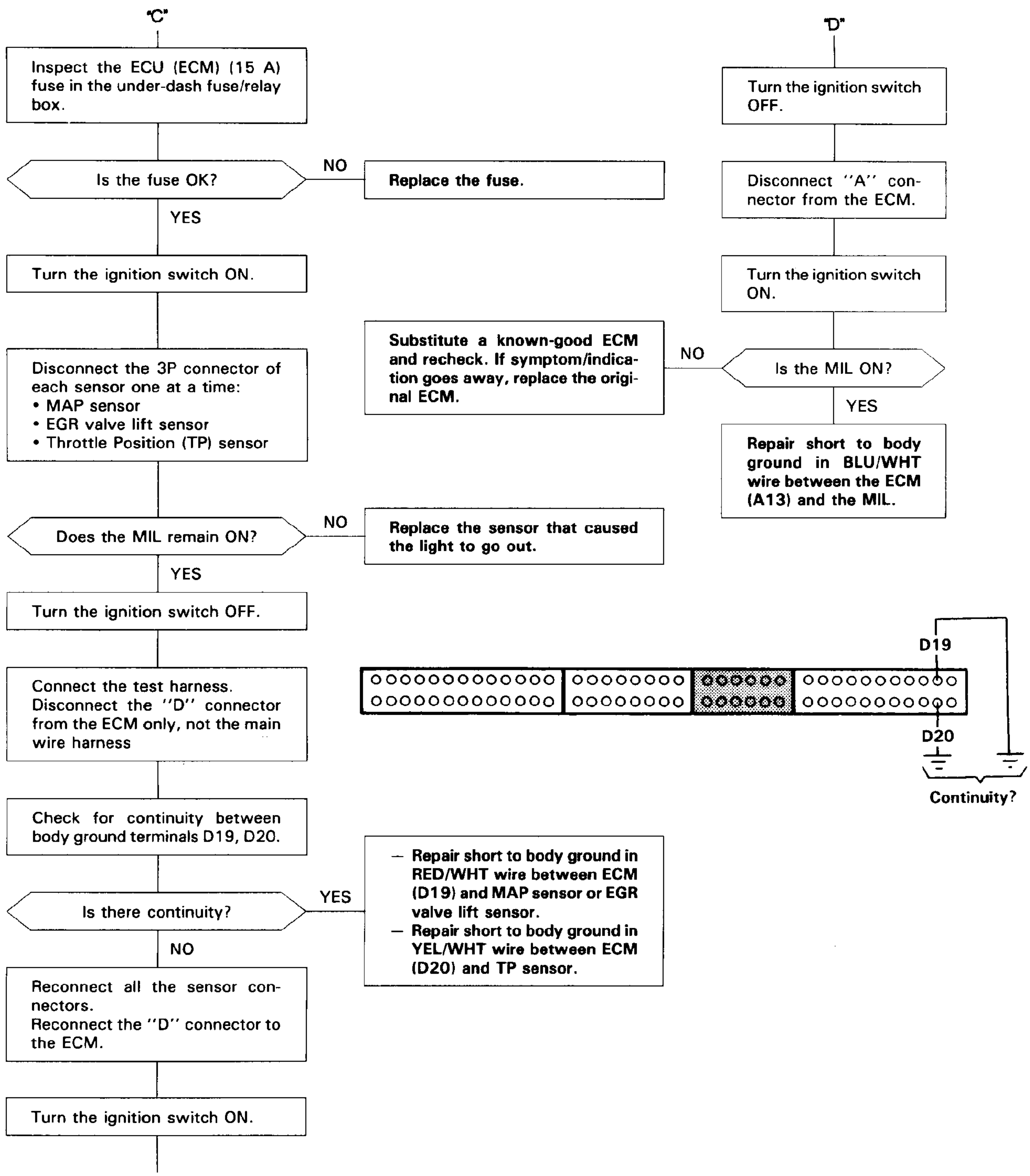


Fig. 5: Flowchart, No Start Trouble Shooting (3 of 5)
Courtesy of American Honda Motor Co., Inc.



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93I78996

Fig. 6: Flowchart, No Start Trouble Shooting (4 of 5)
Courtesy of American Honda Motor Co., Inc.

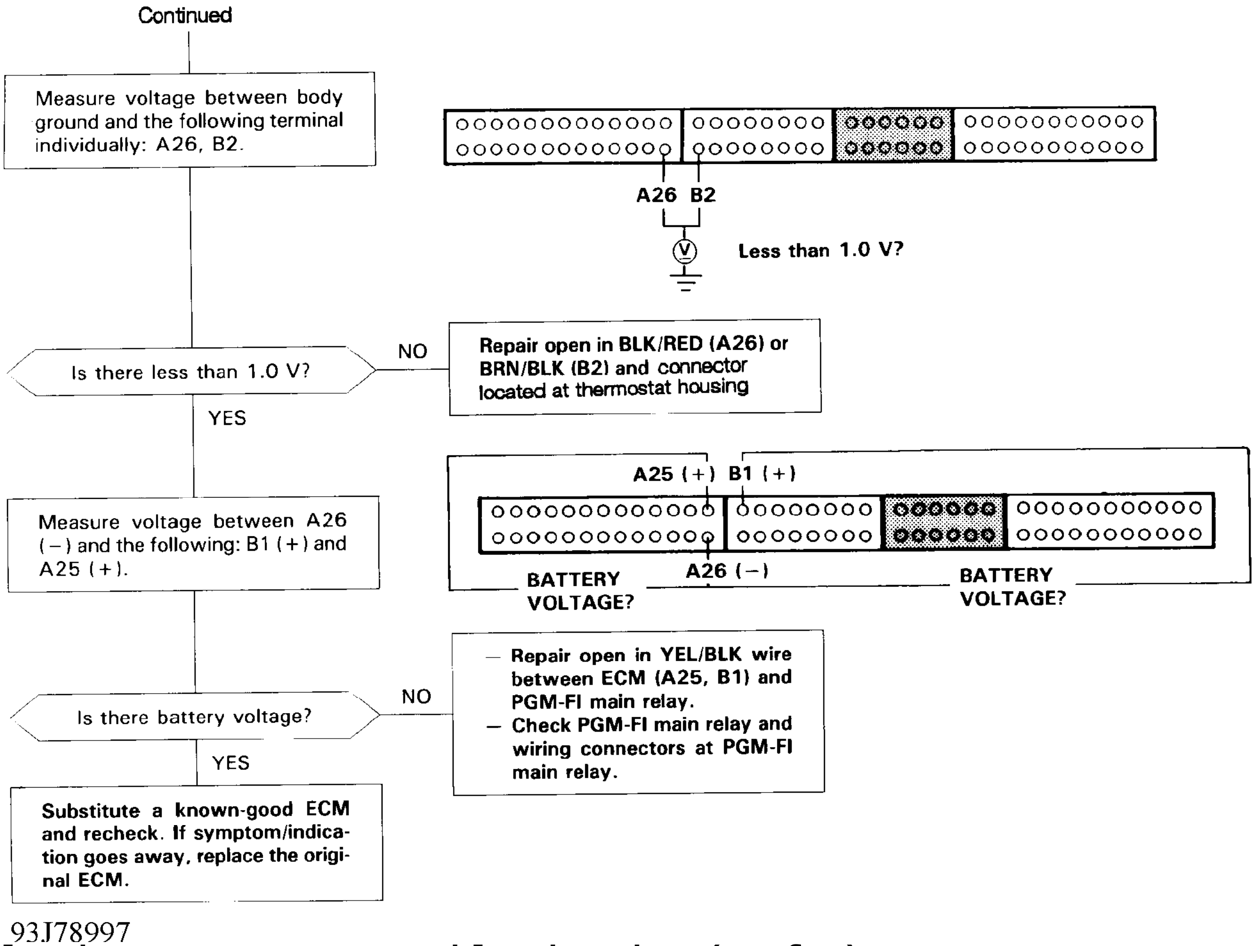
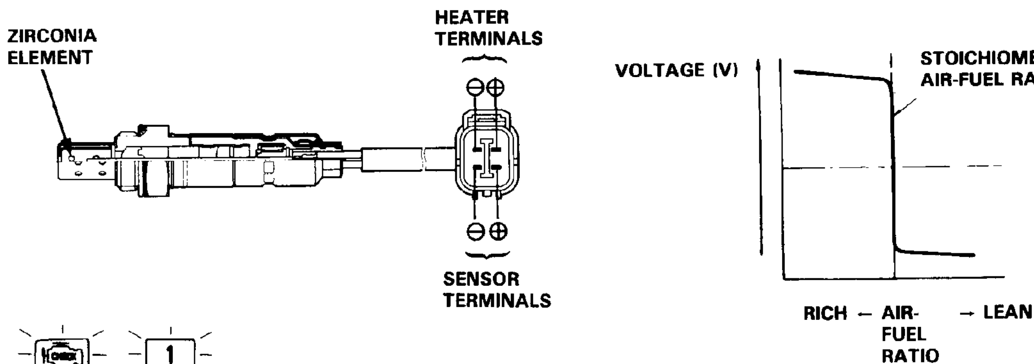


Fig. 7: Flowchart, No Start Trouble Shooting (5 of 5)
Courtesy of American Honda Motor Co., Inc.

CODE 1 - HEATED OXYGEN SENSOR (HO2S)

The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 1: A problem in the Heated Oxygen Sensor (HO2S) circuit.

The Heated Oxygen Sensor (HO2S) detects the oxygen content in the exhaust gas and signals the ECM. In operation, the ECM receives the signals from the sensor and varies the duration during which fuel is injected. The HO2S has an internal heater. The heater stabilizes the sensor's output. The HO2S is installed in the exhaust manifold (H23A1 engine (USA: Si/Canada: SR), H22A1 engine (USA: Si VTEC/Canada: SR-V): in the exhaust pipe A).



- The MIL has been reported on.
- With service check connector jumped code 1 is indicated.

Do the ECM Reset Procedure.

Warm up engine to normal operating temperature (the radiator fan comes on).

Run engine for 60 seconds.

Road test with the manual transmission in 4th gear (A/T: [2] position).
Starting at 1,600 rpm, accelerate using wide open throttle for at least 5 seconds. Then decelerate for at least 5 seconds with the throttle completely closed.

Is the MIL on and does it indicate code 1?

NO → Intermittent failure, system is OK at this time. Check for poor connections or loose wires at ECM, HO2S and connectors at right shock tower.

YES → Go To Code 43.

93A78998

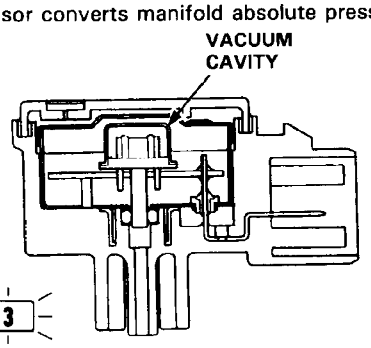
Fig. 8: Code 1 Flowchart, Heated Oxygen Sensor
Courtesy of American Honda Motor Co., Inc.

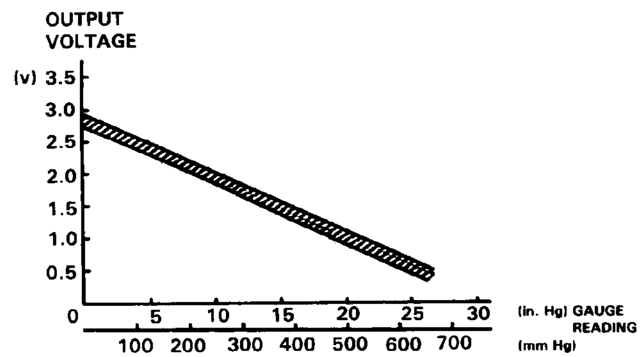
CODE 3 - MAP SENSOR CIRCUIT

3 — The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 3: An electrical problem in the Manifold Absolute Pressure (MAP) Sensor system.

5 — The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 5: A mechanical problem (vacuum leak) in the Manifold Absolute Pressure (MAP) Sensor System.

The MAP sensor converts manifold absolute pressure into electrical signals and inputs the ECM.





- Engine is warm and running.
- The MIL has been reported on.
- With service check connector jumped code 3 is indicated.

↓

Do the ECM Reset Procedure .

↓

Start the engine and allow it to idle.

↓

Is the MIL on and does it indicate code 3?

NO → Intermittent failure, system is OK at this time (test drive may be necesary). Check ECM, MAP Sensor and connector under left side of dash for poor connections and loose wires.

YES ↓

Turn the ignition switch OFF.

↓

Disconnect the 3P connector from the MAP sensor.

↓

Turn the ignition switch ON.

CONTINUED ON THE NEXT GRAPHIC

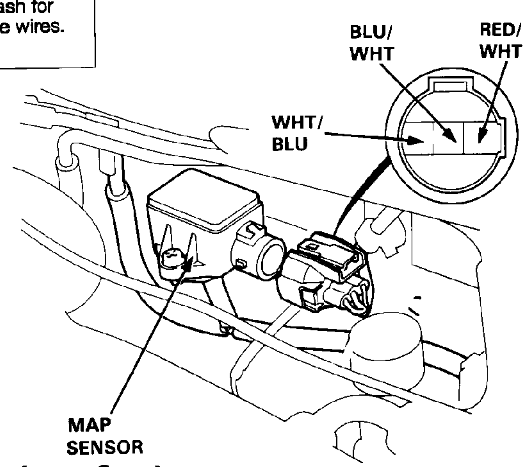


Fig. 9: Code 3 Flowchart, MAP Sensor Circuit (1 of 3)
Courtesy of American Honda Motor Co., Inc.

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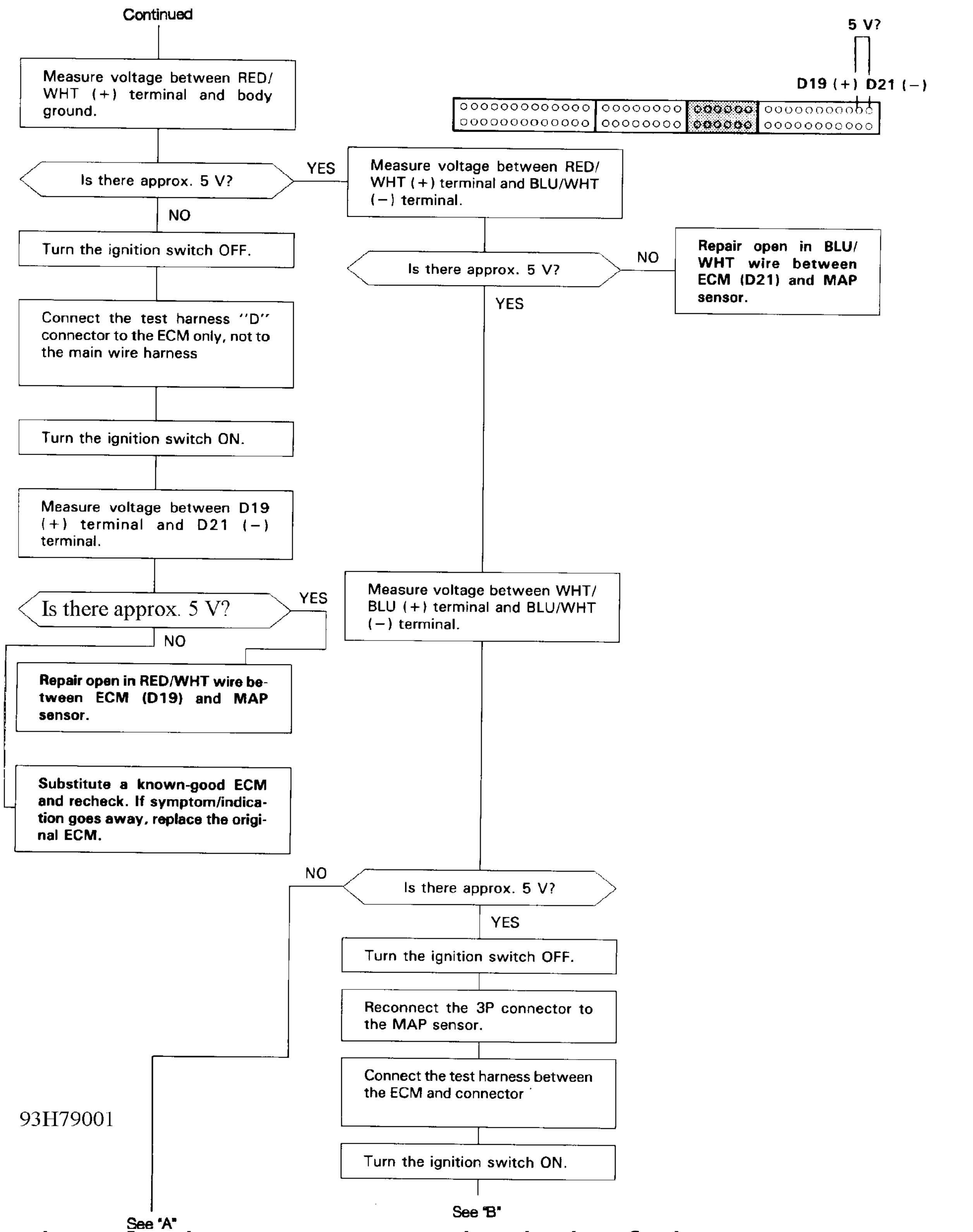


Fig. 10: Code 3 Flowchart, MAP Sensor Circuit (2 of 3)
Courtesy of American Honda Motor Co., Inc.

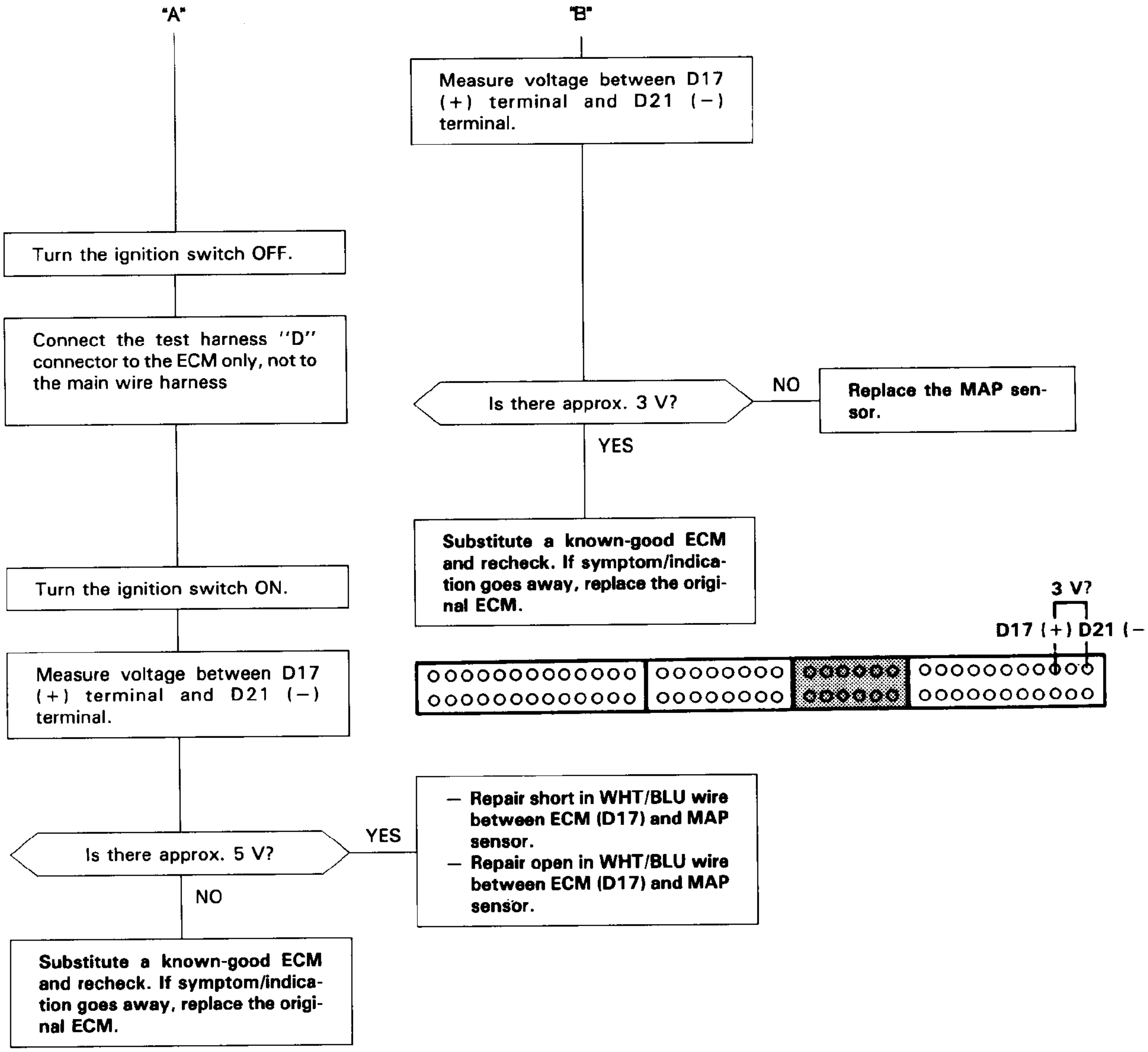


Fig. 11: Code 3 Flowchart, MAP Sensor Circuit (3 of 3)
Courtesy of American Honda Motor Co., Inc.

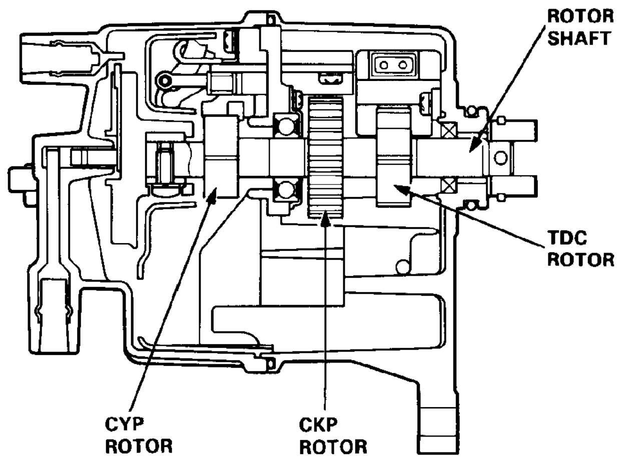
CODE 4, 8 AND/OR 9 - TDC/CKP/CYP SENSOR

The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 4: A problem in the Crankshaft Position (CKP) Sensor circuit.

The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 8: A problem in the Top Dead Center (TDC) Sensor circuit.

The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 9: A problem in the Cylinder Position (CYP) Sensor circuit.

The CKP Sensor determines timing for fuel injection and ignition of each cylinder and also detects engine speed. The TDC Sensor determines ignition timing at start-up (cranking) and when crank angle is abnormal. The CYP Sensor detects the position of No. 1 cylinder for sequential fuel injection to each cylinder.



4 8 or 9

- The MIL has been reported on.
- With service check connector jumped code 4, 8 and/or 9 are indicated.

Do the ECM Reset procedure.

Start the engine.

Is the MIL on and does it indicate code 4, 8 and/or 9?

NO → Intermittent failure, system is OK at this time (test drive may be necessary). Check ECM, TDC/CKP/CYP Sensor and connector at left shock tower for poor connections and loose wires.

YES ↓

Turn the ignition switch OFF.

Disconnect the 8P connector from the TDC/CKP/CYP sensor.

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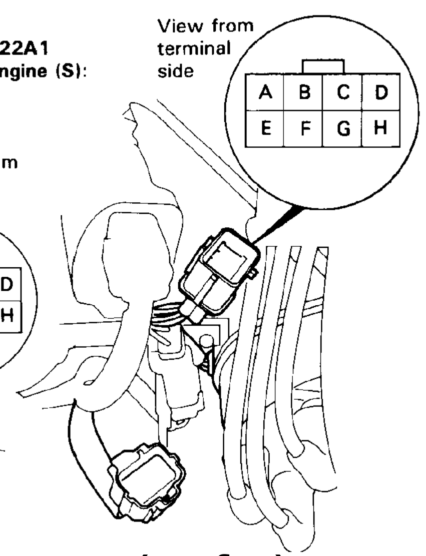
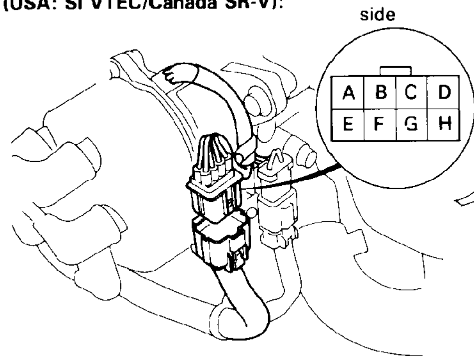
F22A1 engine (S):



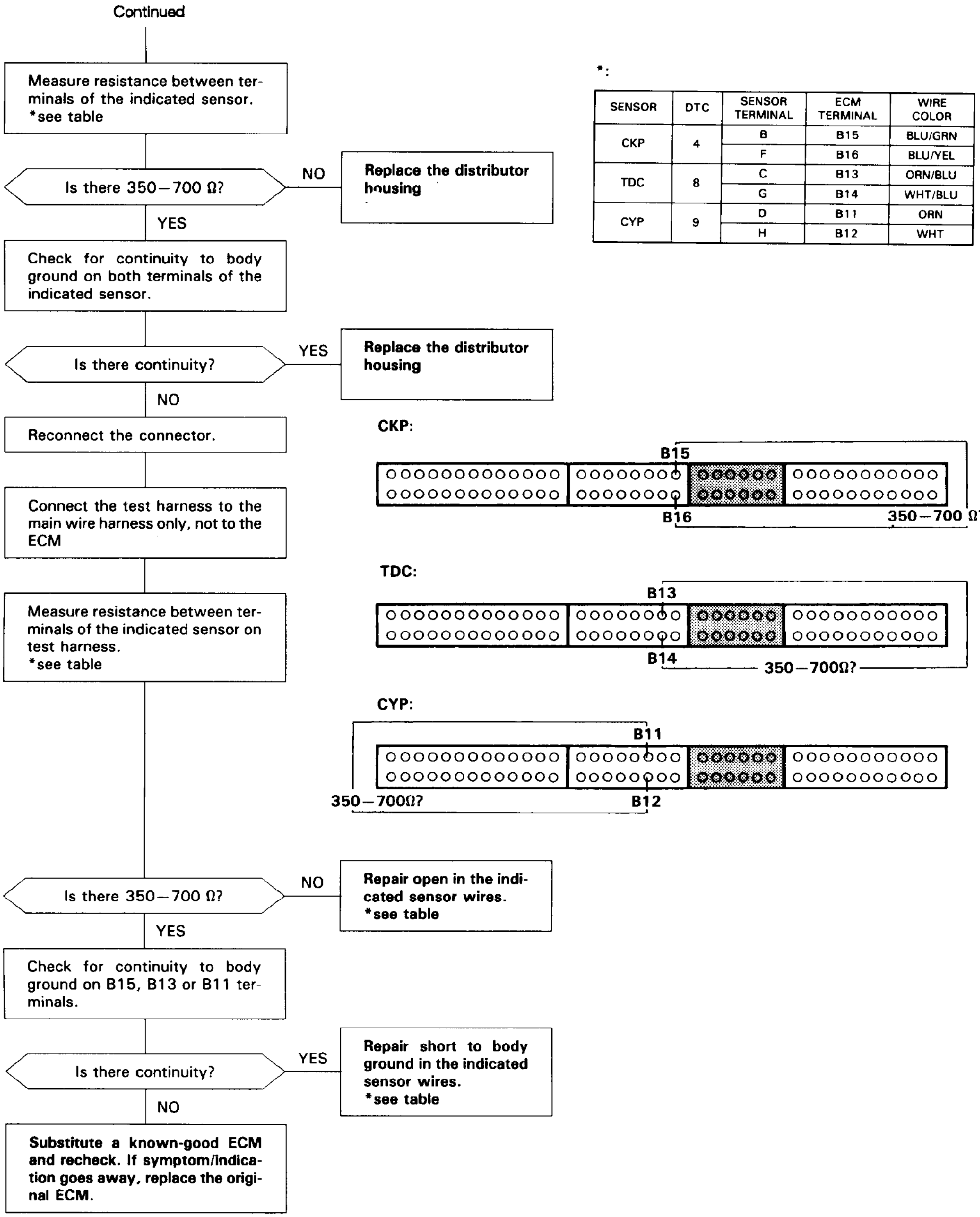
H23A1 engine (USA: Si/Canada: SR), H22A1 engine (USA: Si VTEC/Canada SR-V):



G - TESTS W

93B79005

Fig. 12: Code 4, 8 and/or 9 Flowchart, TDC/CKP/CYP Sensor (1 of 2)
Courtesy of American Honda Motor Co., Inc.



*:

SENSOR	DTC	SENSOR TERMINAL	ECM TERMINAL	WIRE COLOR
CKP	4	B	B15	BLU/GRN
		F	B16	BLU/YEL
TDC	8	C	B13	ORN/BLU
		G	B14	WHT/BLU
CYP	9	D	B11	ORN
		H	B12	WHT

Fig. 13: Code 4, 8 and/or 9 Flowchart, TDC/CKP/CYP Sensor (2 of 2)

Courtesy of American Honda Motor Co., Inc.

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CODE 5 - MAP SENSOR CIRCUIT

- The MIL has been reported on.
- With service check connector jumped code 5 is indicated.

Do the ECM Reset Procedure

Start the engine and keep engine speed at 2,000 rpm for one minute with the manual transmission in neutral (A/T: [P] or [N] position).

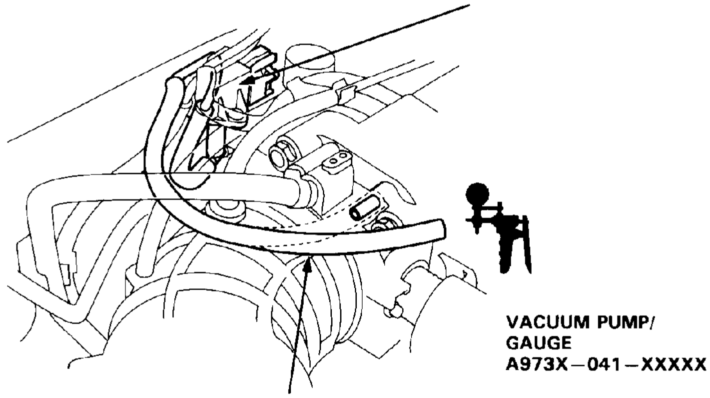
Is the MIL on and does it indicate code 5?

NO:
- Intermittent failure, system is OK at this time (test drive may be necessary).
- Check vacuum hoses, pipes and connections.
- Make sure all connectors are secure.

YES:

Turn the ignition switch OFF.

Disconnect #21 hose from the throttle body, connect vacuum pump to the hose and apply vacuum.



Does it hold vacuum?

NO: Connect a vacuum pump to the MAP sensor and apply vacuum.

Does it hold vacuum?

NO: Replace the MAP sensor.

YES: Repair vacuum leak in hose routing between MAP sensor and throttle body.

YES (first "Does it hold vacuum?"): Connect a T-fitting from a vacuum gauge between the throttle body and #21 hose.

Continued On Next Page

93D79007

Fig. 14: Code 5 Flowchart, MAP Sensor Circuit (1 of 2)
Courtesy of American Honda Motor Co., Inc.

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Continued

Start the engine.

Is there manifold vacuum?

NO: Remove restriction from throttle body.

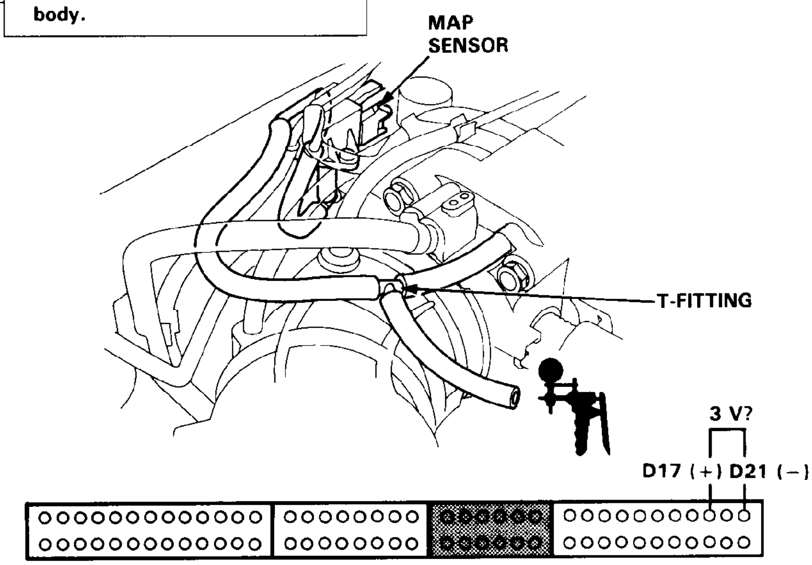
YES

Turn the ignition switch OFF.

Connect the test harness between the ECM and connectors

Turn the ignition switch ON.

Measure voltage between D17 (+) terminal and D21 (−) terminal.



Is there approx. 3 V?

NO: Replace the MAP sensor.

YES

Start the engine and allow it to idle.

Is there approx. 1 V?

NO: Replace the MAP sensor.

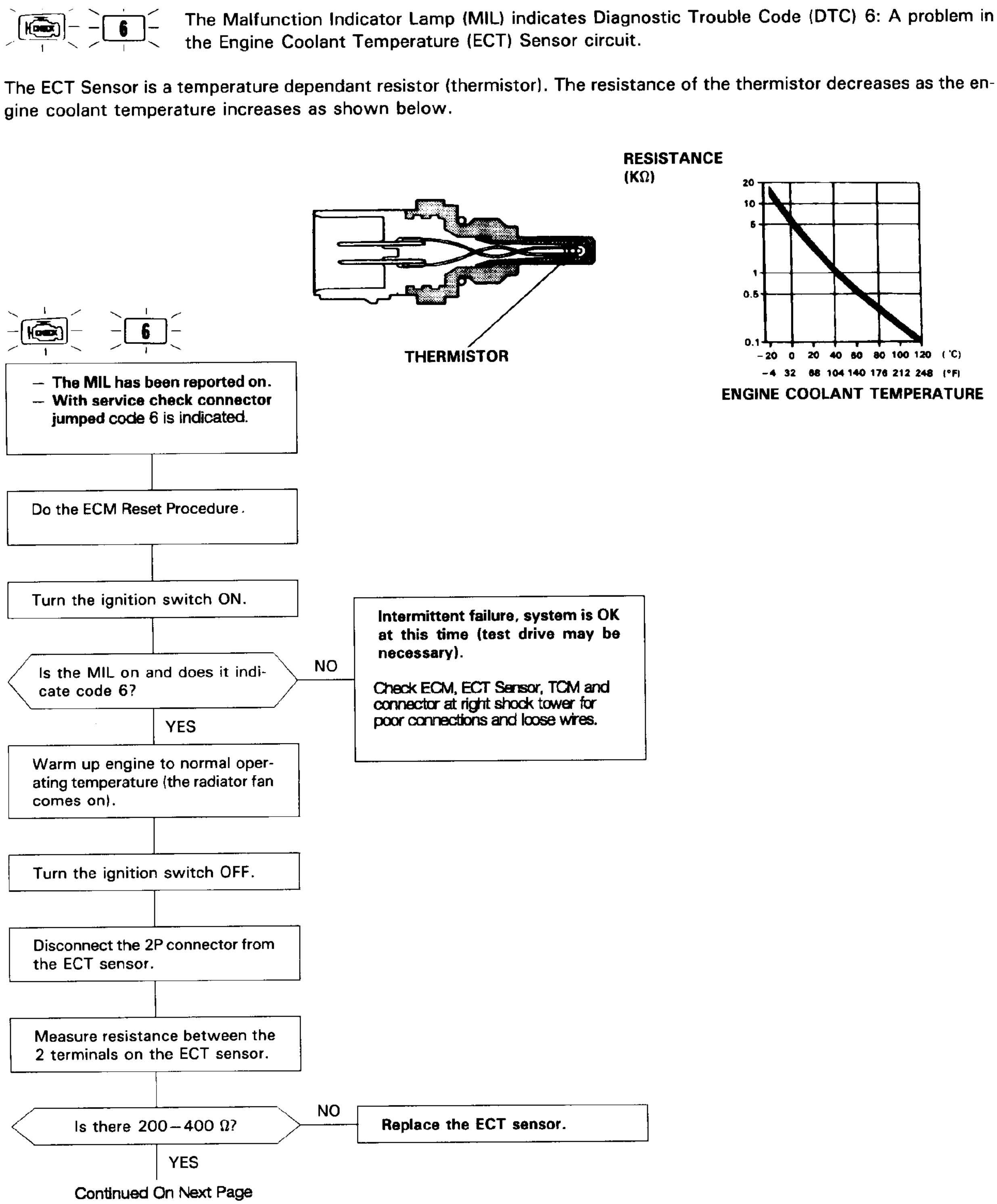
YES

Substitute a known-good ECM and recheck. If symptom/indication goes away, replace the original ECM.

93F79008

Fig. 15: Code 5 Flowchart, MAP Sensor Circuit (2 of 2)
Courtesy of American Honda Motor Co., Inc.

CODE 6 - ENGINE COOLANT TEMPERATURE (ECT) SENSOR



93F79009

Fig. 16: Code 6 Flowchart, Engine Coolant Temperature Sensor (1 of 2)
Courtesy of American Honda Motor Co., Inc.

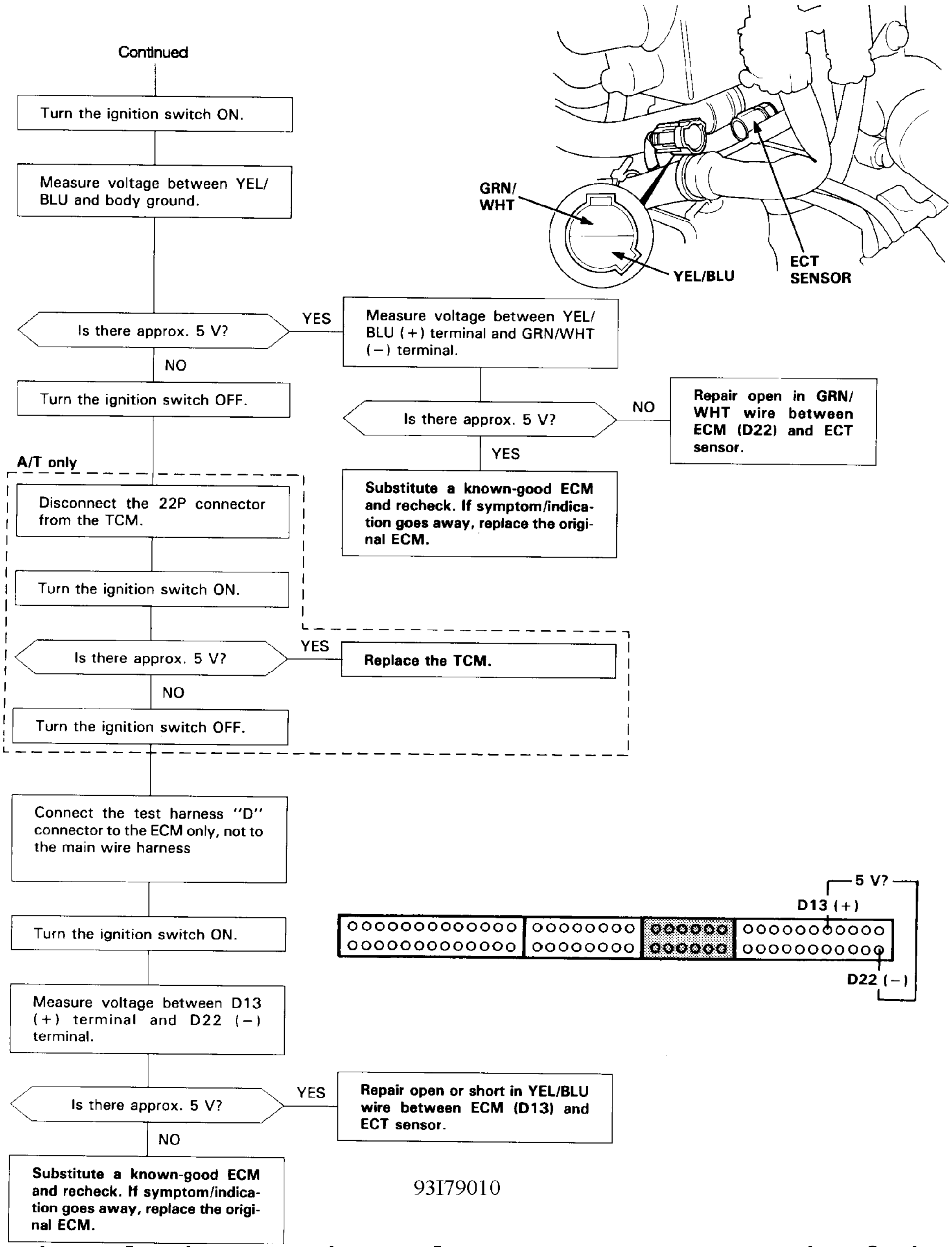


Fig. 17: Code 6 Flowchart, Engine Coolant Temperature Sensor (2 of 2)
Courtesy of American Honda Motor Co., Inc.

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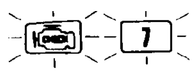
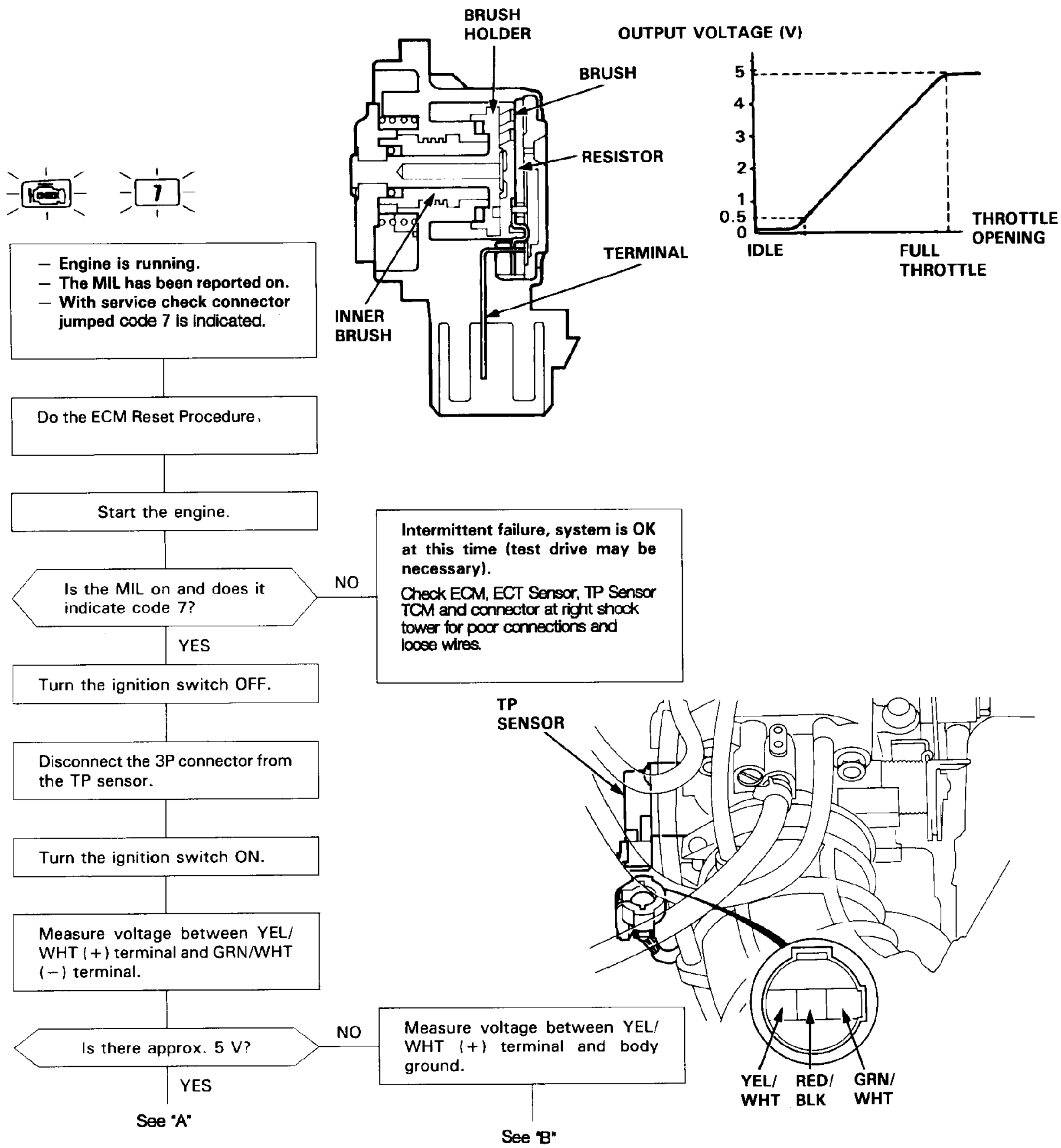
CODE 7 - THROTTLE POSITION (TP) SENSOR



The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 7: A problem in the Throttle Position (TP) Sensor circuit.

The TP Sensor is a potentiometer. It is connected to the throttle valve shaft. As the throttle position changes, the TP Sensor varies the voltage signal to the ECM.



93A79012

Fig. 18: Code 7 Flowchart, Throttle Position Sensor (1 of 2)
Courtesy of American Honda Motor Co., Inc.

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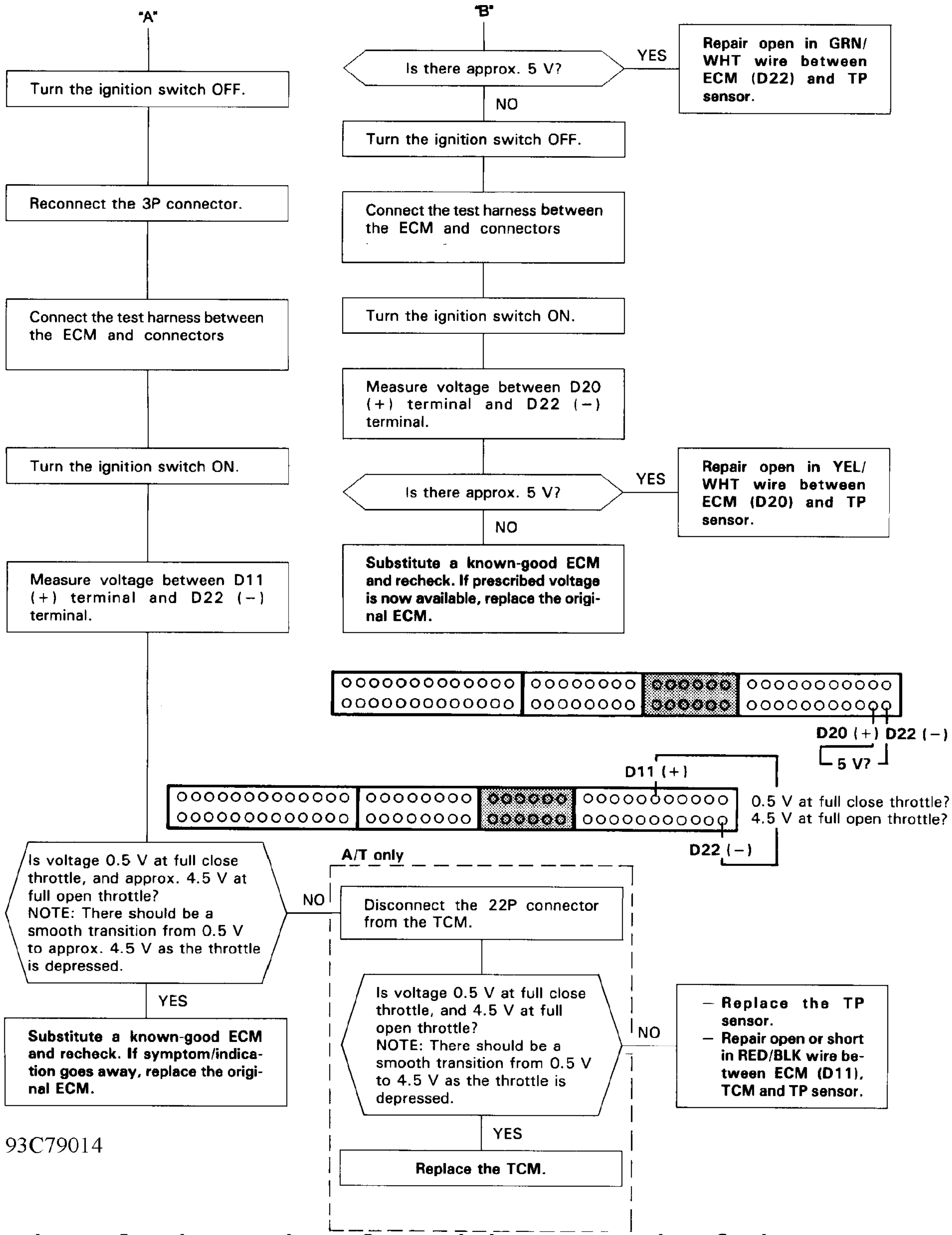

Fig. 19: Code 7 Flowchart, Throttle Position Sensor (2 of 2)
Courtesy of American Honda Motor Co., Inc.

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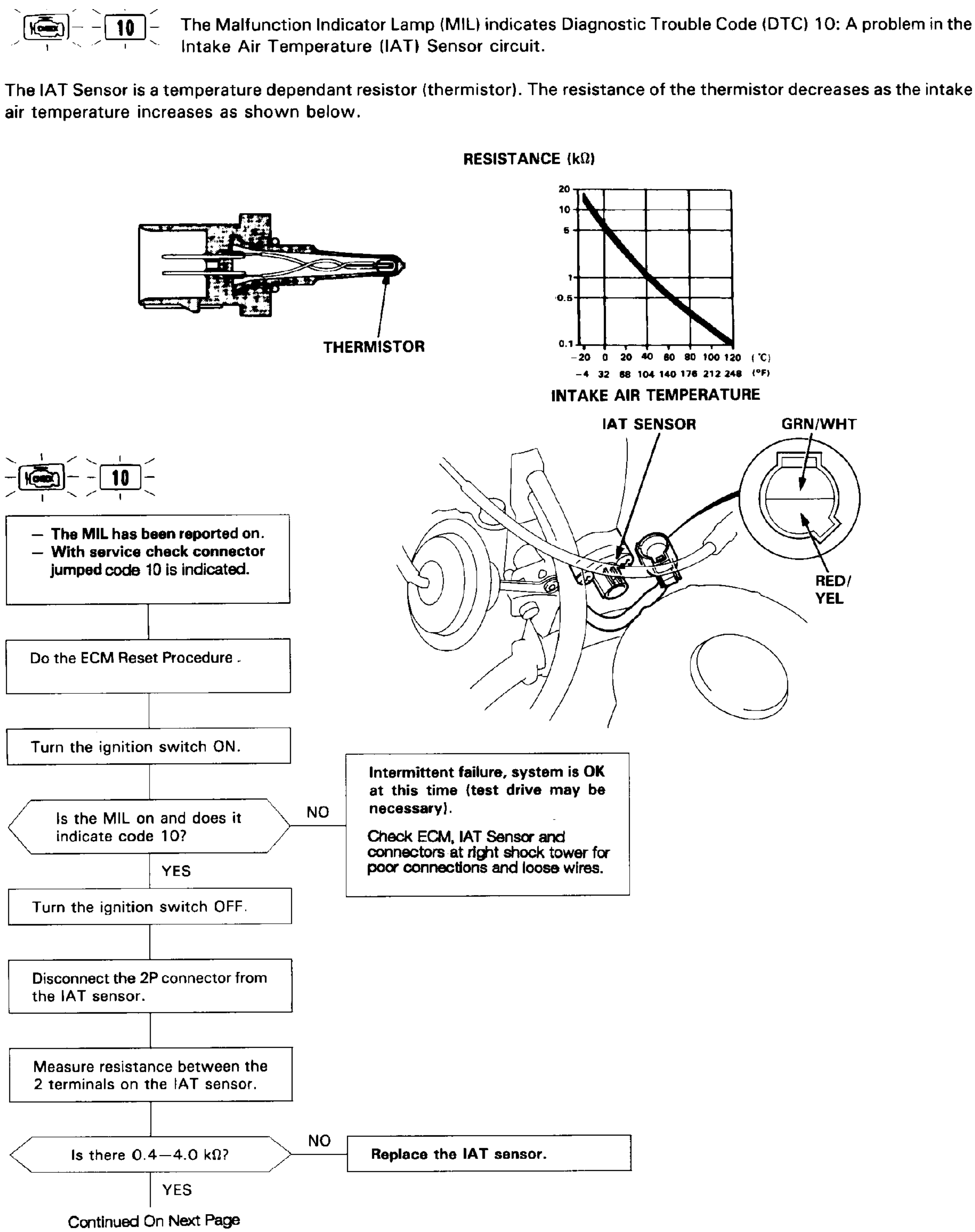
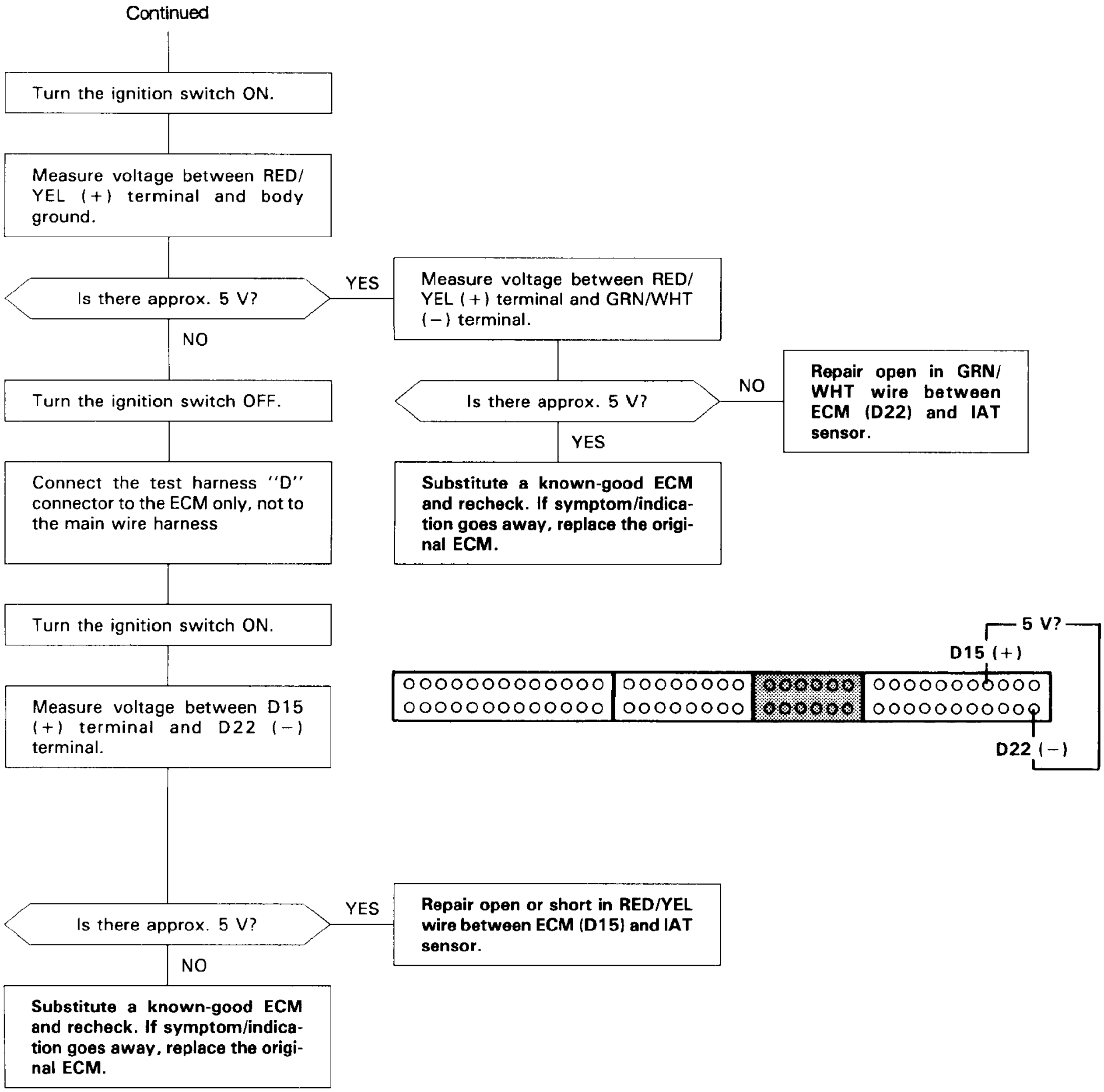
CODE 10 - INTAKE AIR TEMPERATURE (IAT) SENSOR



93H79019

Fig. 20: Code 10 Flowchart, Intake Air Temperature Sensor (1 of 2)
Courtesy of American Honda Motor Co., Inc.



93B79021

Fig. 21: Code 10 Flowchart, Intake Air Temperature Sensor (2 of 2)
Courtesy of American Honda Motor Co., Inc.

CODE 12 - EGR SYSTEM

- The MIL has been reported on.
- With service check connector jumped, code 12 is indicated.

↓

Do the ECM Reset Procedure

↓

Road test necessary: Warm up the engine to normal operating temperature (the radiator fan comes on).
Drive the car on the road for approx. 10 minutes. Keep the engine speed in the 1,700–2,500 rpm.

↓

Is the MIL on and does it indicate code 12?

- NO → Intermittent failure, system is OK at this time.
  Check for loose wires or poor connections at ECM, EGR control solenoid valve, EGR valve lift sensor, control box and connectors at right shock tower and under left side of dash.
- YES ↓

With the engine at idle, disconnect the #16 hose from the EGR valve and connect a vacuum pump/gauge to the hose.

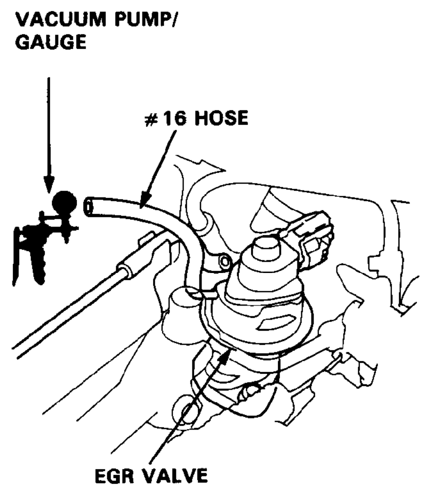
↓

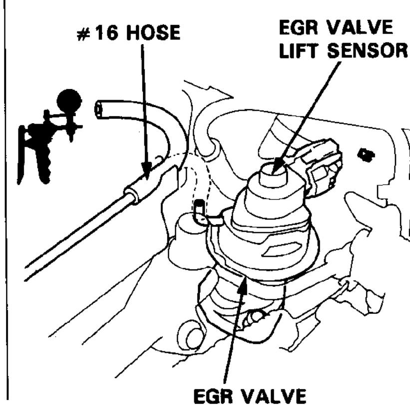
Is there any vacuum?

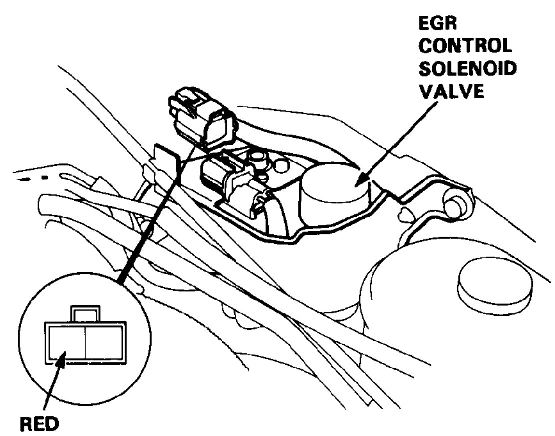
- YES → Disconnect 2P connector from the EGR control solenoid valve and check the #16 hose for vacuum again.
  See 'B'
- NO ↓

Move the vacuum pump/gauge to the EGR valve.

See 'A'







93H79159

G - TESTS W

Fig. 22: Code 12 Flowchart, EGR System (1 of 5)
Courtesy of American Honda Motor Co., Inc.

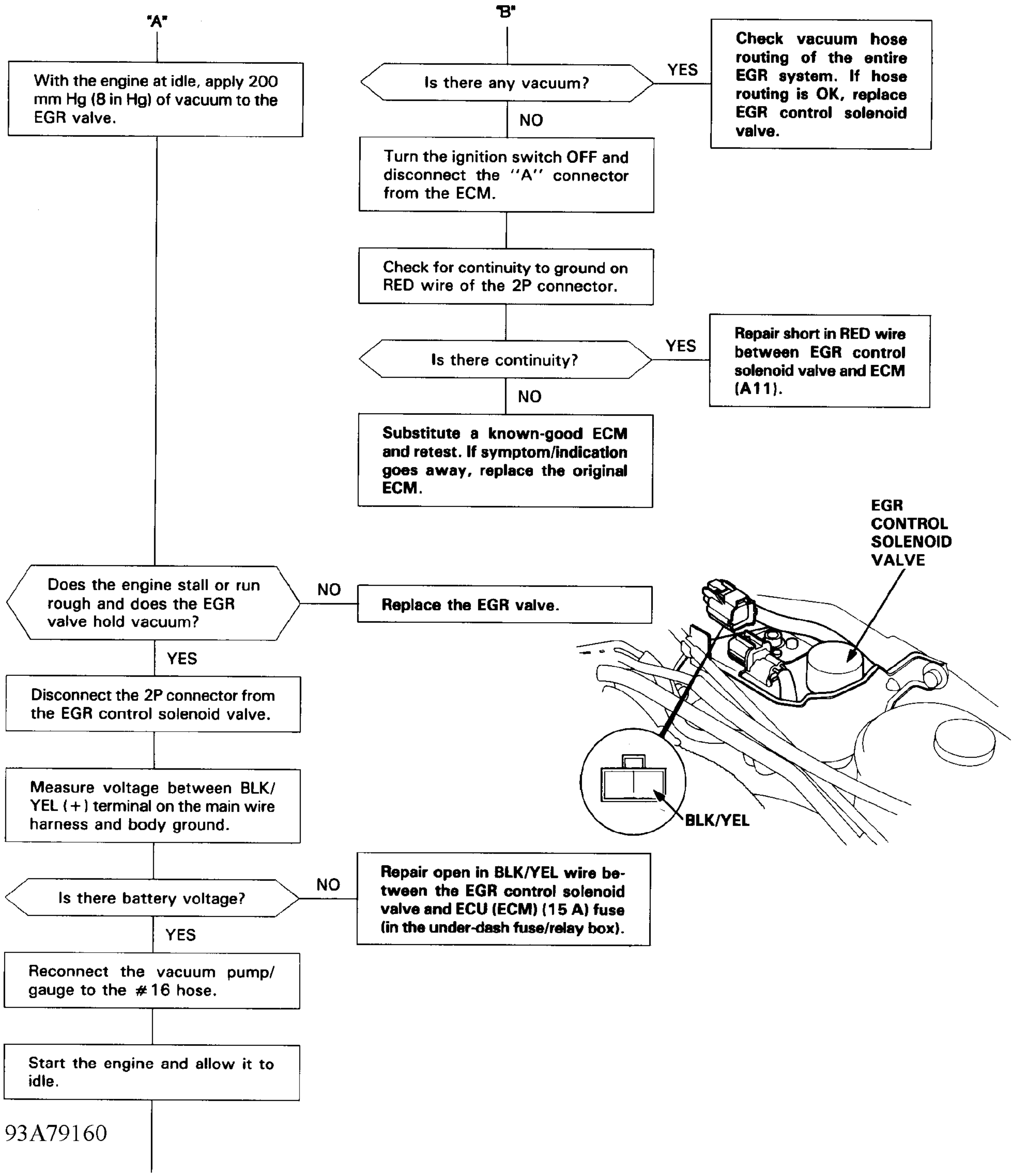
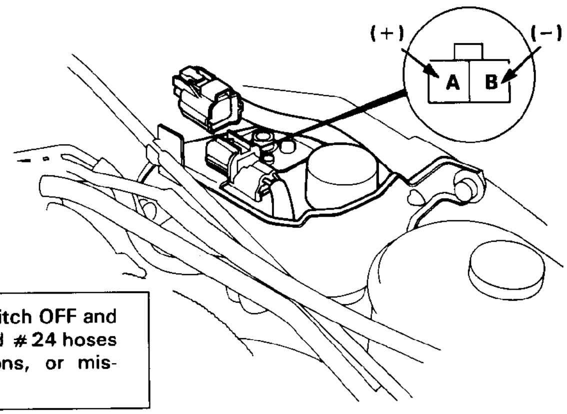


Fig. 23: Code 12 Flowchart, EGR System (2 of 5)
Courtesy of American Honda Motor Co., Inc.

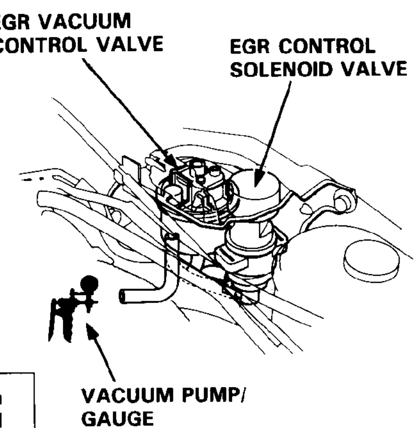
Continued

Connect battery power terminal to the A terminal of the 2P connector. While watching the vacuum gauge, ground the B terminal.



Is there approx. 200 mm Hg (8 in.Hg) within 1 second?

- NO: Turn the ignition switch OFF and inspect the #16 and #24 hoses for leaks, restrictions, or misrouting.
  - Are the hoses OK?
    - NO: Correct as necessary.
    - YES: Disconnect the lower hose on EGR control solenoid valve and connect a vacuum gauge to the hose.

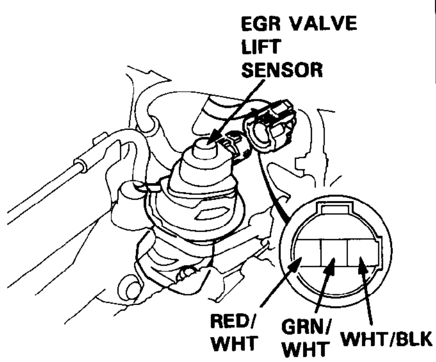


Start the engine and allow it to idle.

Is there 150−250 mm Hg (6−10 in.Hg) of vacuum?

- NO: Replace the EGR vacuum control valve.
- YES: **Replace the EGR control solenoid valve.**

- YES: Turn the ignition swith OFF and reconnect the 2P connector.



Disconnect 3P connector from the EGR valve lift sensor.

Turn the ignition switch ON.

Measure voltage between RED/WHT (+) terminal and GRN/WHT (−) terminal.

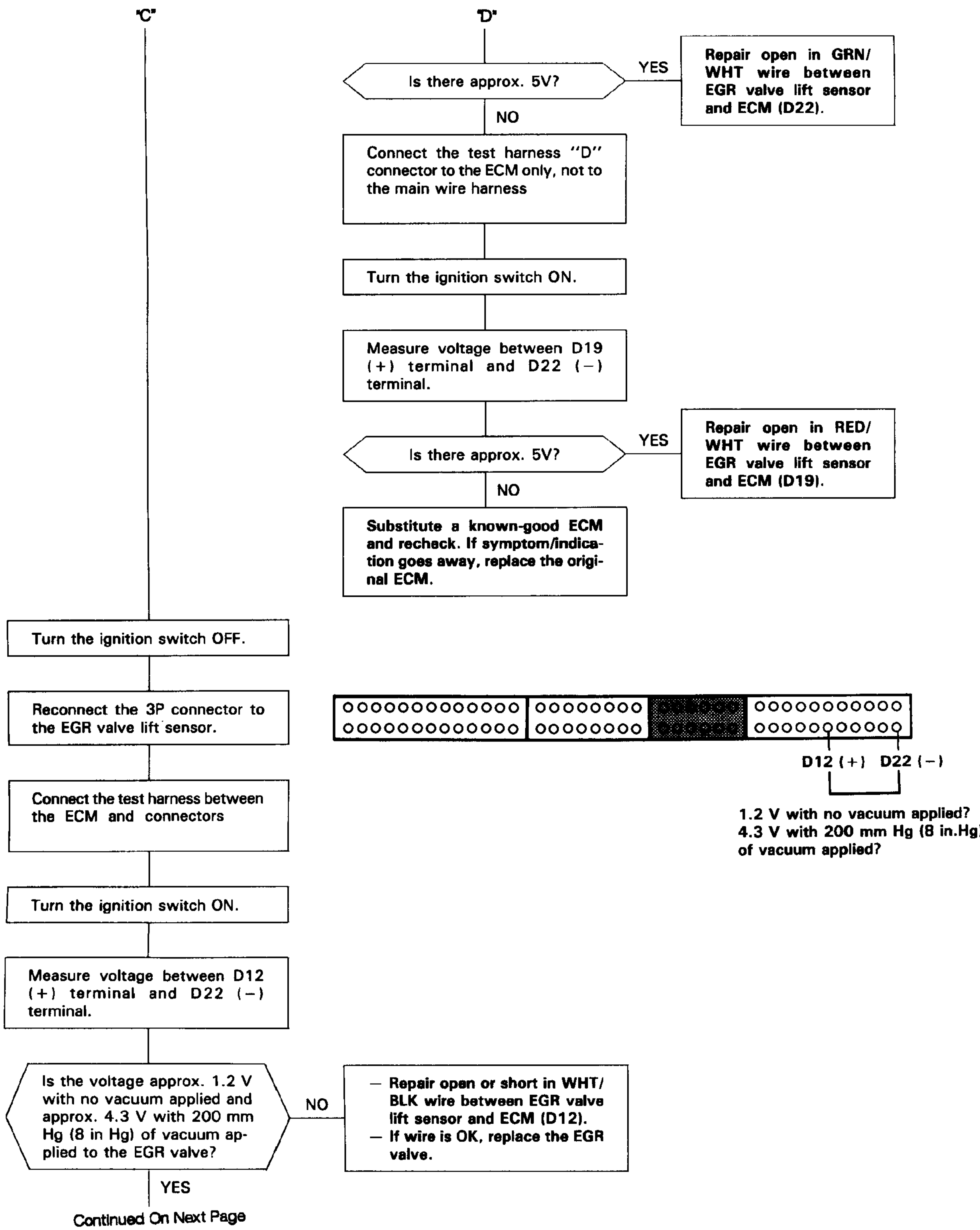
Is there approx. 5 V?

- NO: Measure voltage between RED/WHT (+) terminal and body ground.
  - See "D"
- YES: See "C"

93B79161

Fig. 24: Code 12 Flowchart, EGR System (3 of 5)

Courtesy of American Honda Motor Co., Inc.



93C79162

Fig. 25: Code 12 Flowchart, EGR System (4 of 5)
Courtesy of American Honda Motor Co., Inc.

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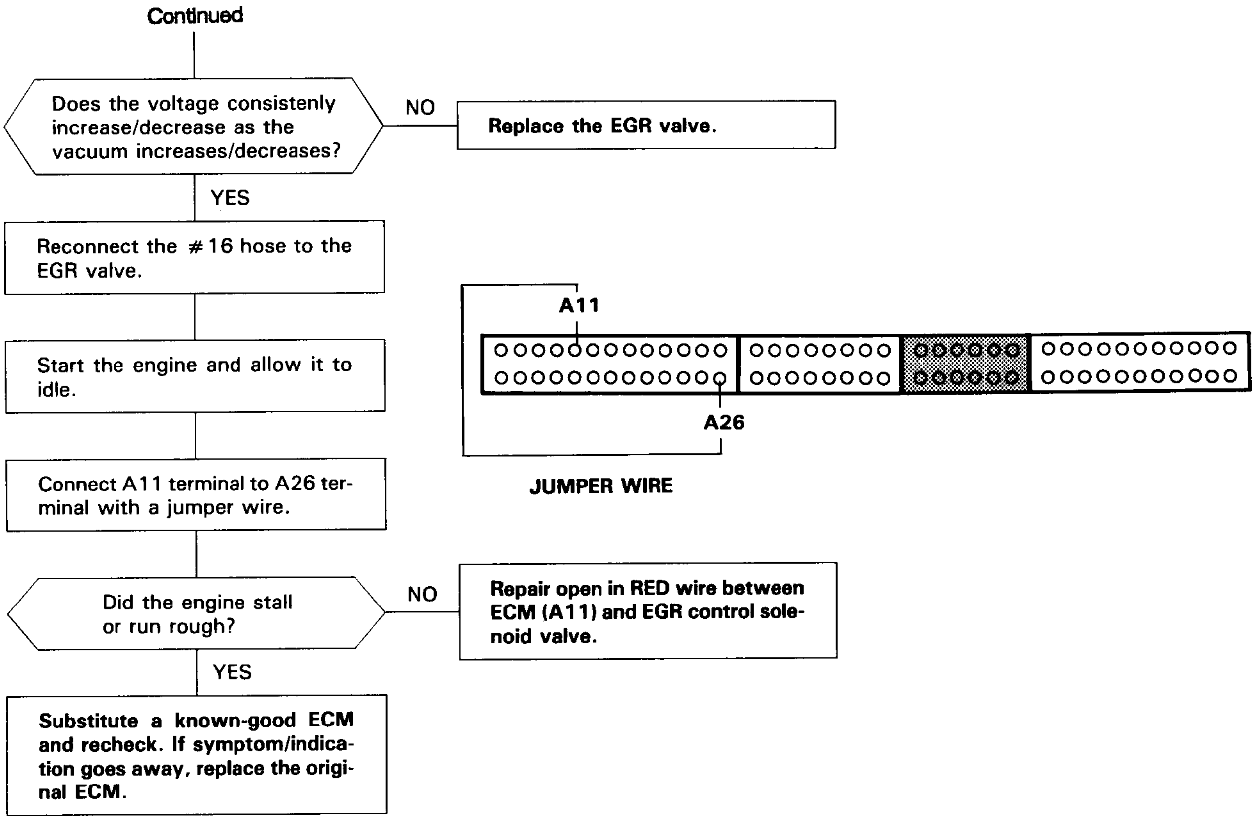
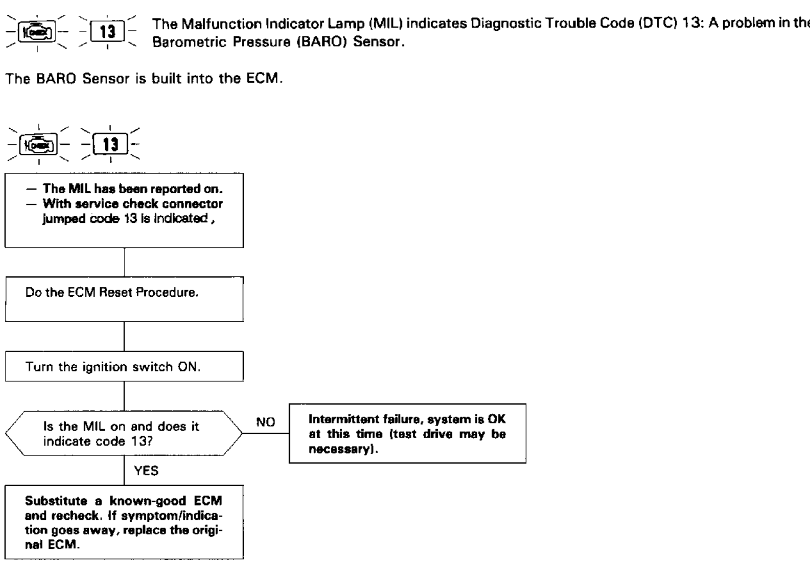


93D79163

Fig. 26: Code 12 Flowchart, EGR System (5 of 5)
Courtesy of American Honda Motor Co., Inc.

CODE 13 - BAROMETRIC PRESSURE (BARO) SENSOR



93C79022

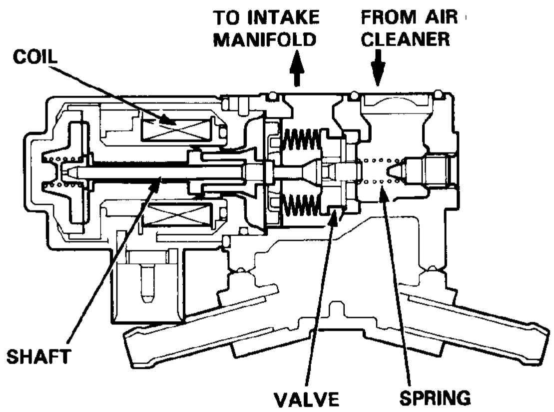
Fig. 27: Code 13 Flowchart, Barometric Pressure Sensor
Courtesy of American Honda Motor Co., Inc.

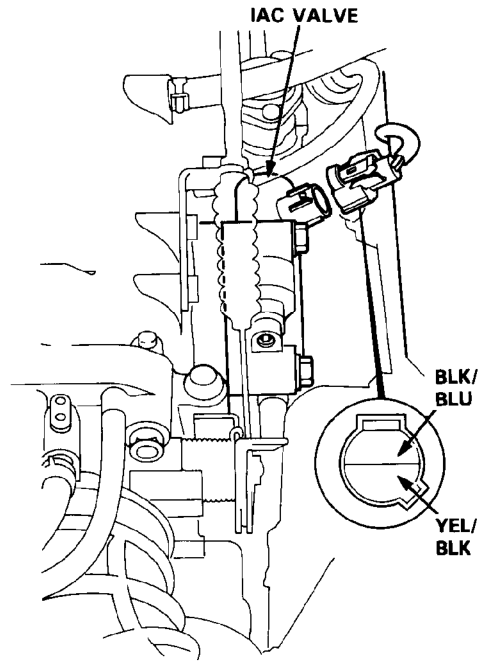
CODE 14 - IDLE AIR CONTROL (IAC) VALVE

14

The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 14: A problem in the Idle Air Control (IAC) Valve circuit.

The IAC Valve changes the amount of air bypassing the throttle body in response to a current signal from the ECM in order to maintain the proper idle speed.





14

- The MIL has been reported on.
- With service check connector jumped, code 14 is indicated.

Do the ECM Reset Procedure.

Start the engine.

Is the MIL on and does it indicate code 14?

NO → With the engine running and the accelerator pedal released, disconnect the 2P connector from the IAC valve.

Is there a reduction in engine rpm?

YES → Intermittent failure, system is OK at this time (test driving may be necessary).

Check for poor connections or loose wires at connector at right shock tower, IAC valve and ECM.

NO → Substitute a known-good IAC valve and retest.

YES → Remove the 2P connector from the IAC valve.

93D79023

Continued On Next Page.

Fig. 28: Code 14 Flowchart, Idle Air Control Valve (1 of 2)
Courtesy of American Honda Motor Co., Inc.

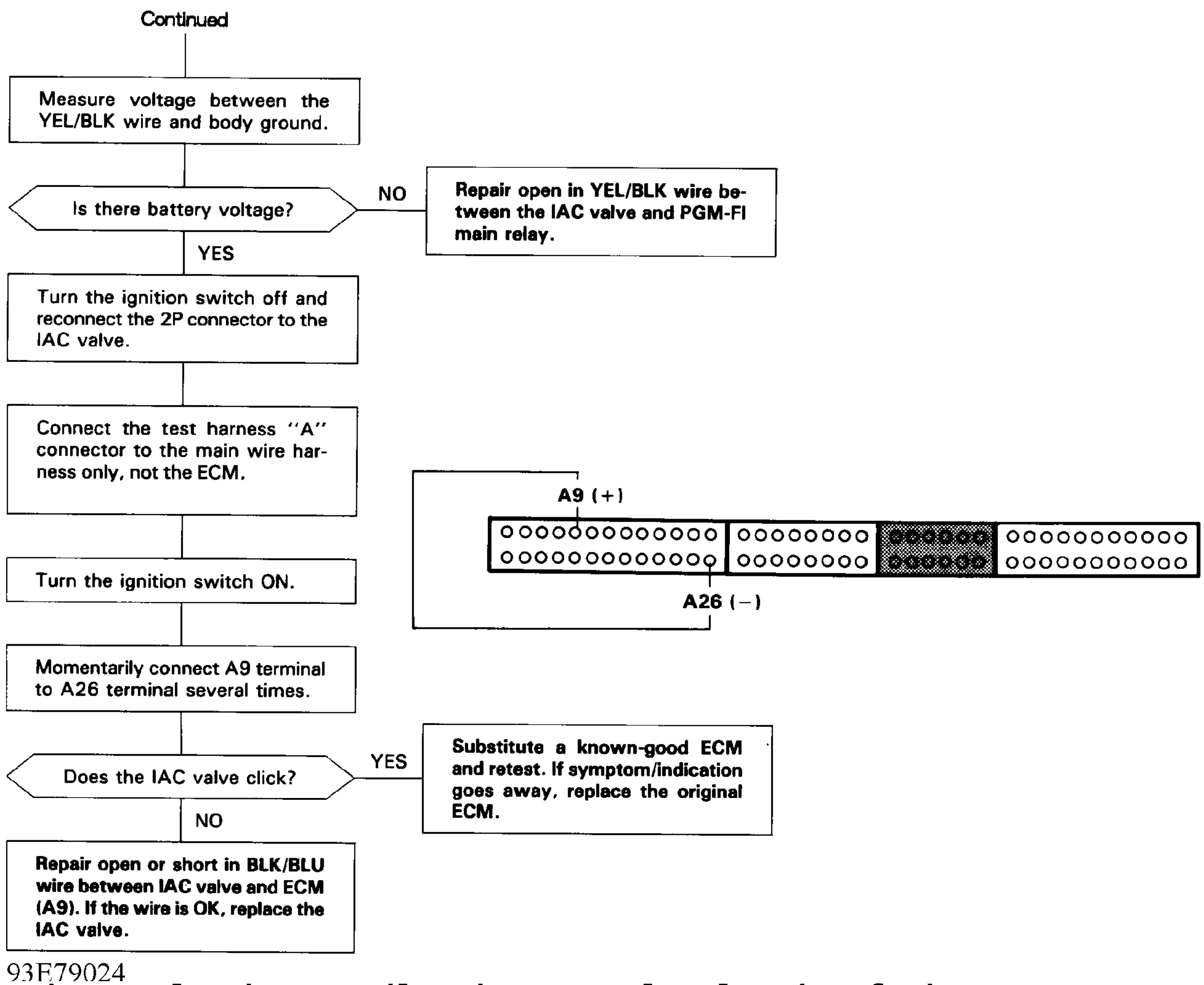


Fig. 29: Code 14 Flowchart, Idle Air Control Valve (2 of 2)
Courtesy of American Honda Motor Co., Inc.

CODE 15 - IGNITION OUTPUT SIGNAL

The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 15: A problem in the Ignition Output Signal circuit.

- The MIL has been reported on.
- With service check connector jumped code 15 is indicated.

Do the ECM Reset Procedure.

Start the engine.

NOTE: If the engine won't start, it may take 20 seconds of cranking to set the code.

Is the MIL on and does it indicate code 15?

NO → Intermittent failure, system is OK at this time (test drive may be necessary). Check ECM, Ignition Control Module (ICM) and connector at right shock tower for poor connections and loose wires.

YES ↓

Turn the ignition switch OFF.

Disconnect the 2P connector from the distributor.

Turn the ignition switch ON.

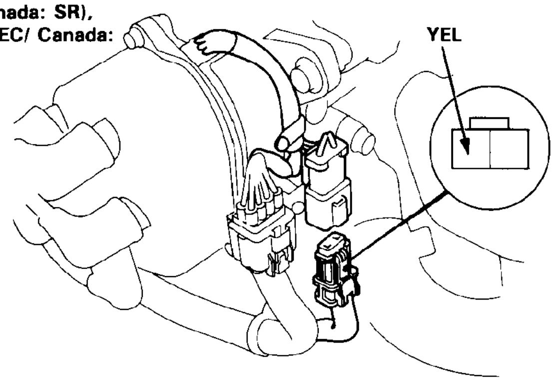
Measure voltage between YEL (+) terminal and body ground.

Is there battery voltage?

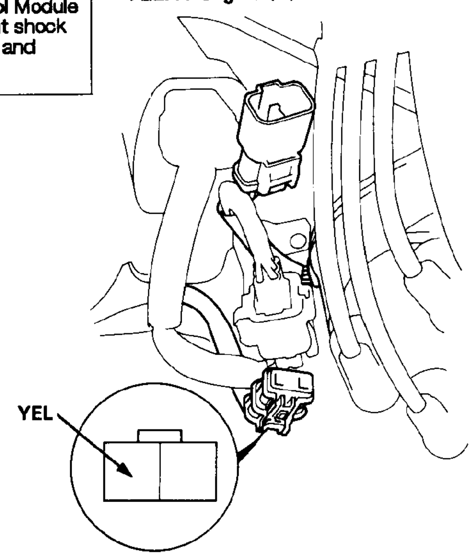
YES: See "A"

NO: See "B"

H23A1 engine (USA: Si/Canada: SR), H22A1 engine (USA: Si VTEC/ Canada: SR-V):



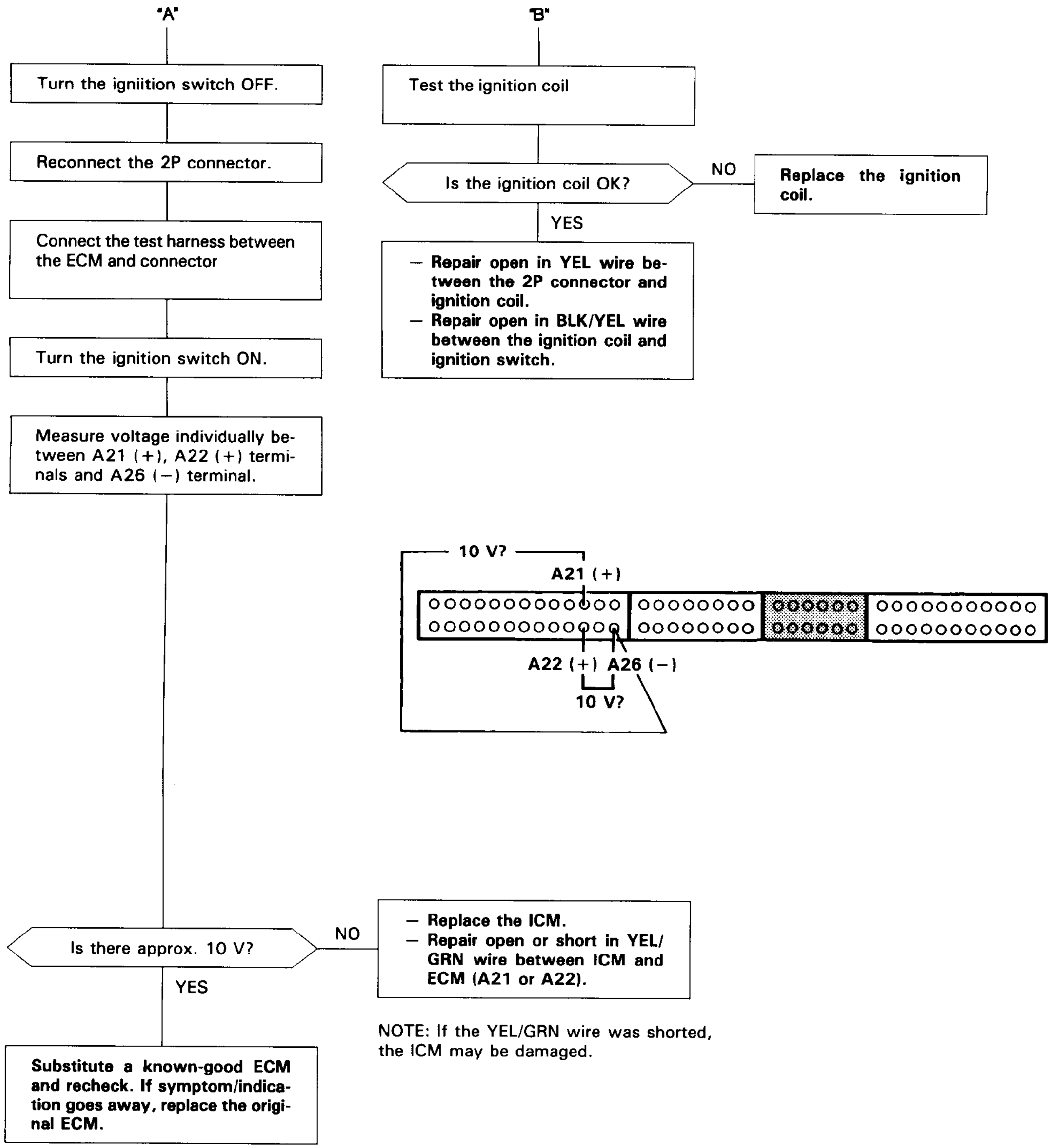
F22A1 engine (S):



G - TESTS W

93F79025

Fig. 30: Code 15 Flowchart, Ignition Output Signal (1 of 2)
Courtesy of American Honda Motor Co., Inc.



93I79028

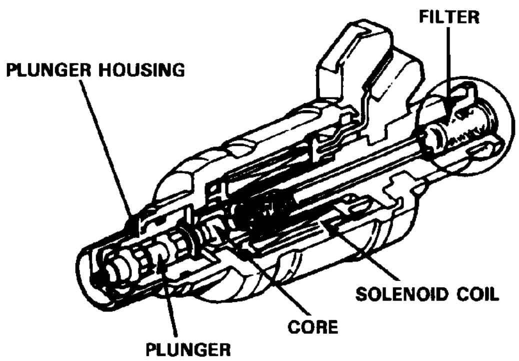
Fig. 31: Code 15 Flowchart, Ignition Output Signal (2 of 2)
Courtesy of American Honda Motor Co., Inc.

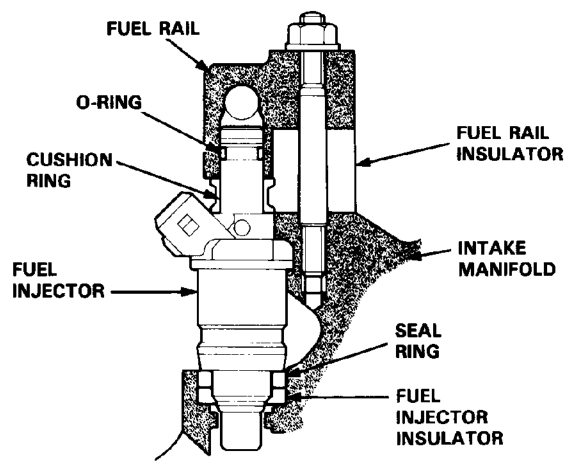
CODE 16 - FUEL INJECTORS

Troubleshooting Flowchart

16 The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 16: A problem in the Fuel Injector circuit.

The Fuel Injectors are a solenoid-actuated constant-stroke pintle type consisting of a solenoid, plunger needle valve and housing. When current is applied to the solenoid coil, the valve lifts up and pressurized fuel is injected. Because the needle valve lift and the fuel pressure are constant, the injection quantity is determined by the length of time that the valve is open (i.e., the duration the current is supplied to the solenoid coil). The Fuel Injector is sealed by an O-ring and seal ring at the top and bottom. These seals also reduce operating noise.





16

- The MIL has been reported on.
- With service check connector jumped, code 16 is indicated.

↓

Do the ECM Reset Procedure.

↓

Start the engine and allow it to idle.

NOTE: If engine will not start, it may take 10 seconds of cranking to set the code.

↓

Is the MIL on and does it indicate code 16?

NO → **Intermittent failure, system is OK at this time (test drive may be necessary).**

Check for poor connections or loose wires at connector at right shock tower, connector at each fuel injector, injector resistor and at ECM.

YES ↓

93D79031

Continued On Next Page.

Fig. 32: Code 16 Flowchart, Fuel Injectors (1 of 3)
Courtesy of American Honda Motor Co., Inc.

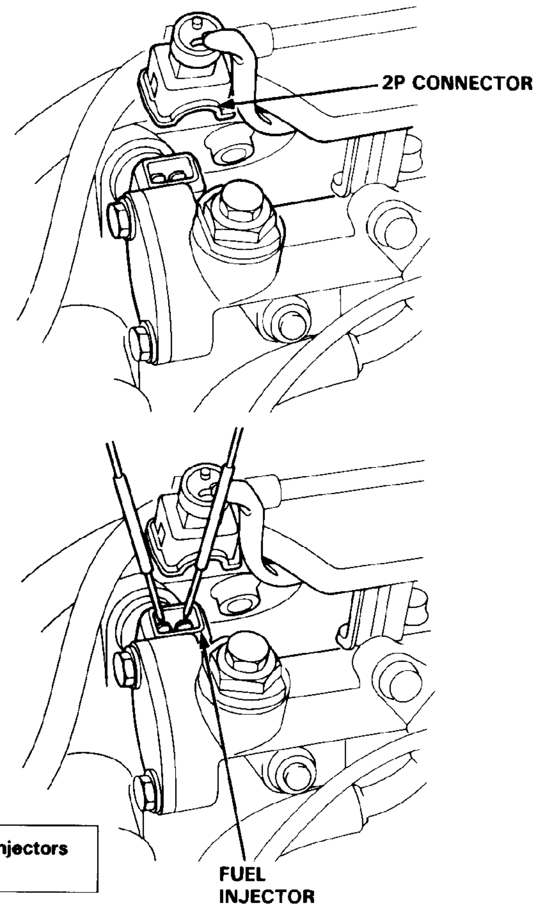
Continued

Start engine and listen at each fuel injector for a clicking sound.

Turn the ignition switch OFF.

Disconnect the 2P connector from the fuel injector that does not click.

Measure resistance between the 2 terminals of fuel injector.



Is there 1.5–2.5 Ω?

NO → **Replace the fuel injector/injectors that are not 1.5–2.5 Ω.**

YES ↓

Turn the ignition switch ON.

Measure voltage between RED/BLK (+) terminal in the 2P connector and body ground.

Is there battery voltage?

NO → Turn the ignition switch OFF.

Disconnect 6P connector from the injector resistor.

Turn the ignition switch ON.

Measure voltage between YEL/BLK (+) terminal and body ground.

See "B"

YES ↓

See "A"

93E79032

Fig. 33: Code 16 Flowchart, Fuel Injectors (2 of 3)
Courtesy of American Honda Motor Co., Inc.

"A"

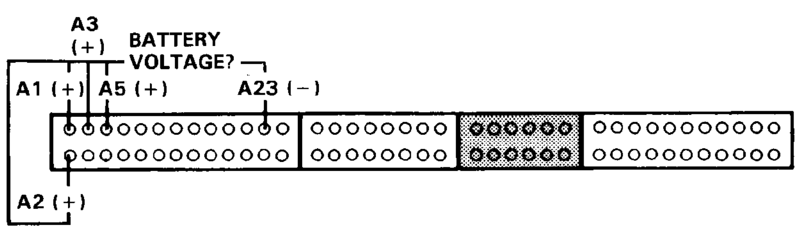
Reconnect the 2P connector to the fuel injector.

Turn the ignition switch OFF.

Connect the test harness between the ECM and connectors

Turn the ignition switch ON.

Measure voltage between A23 (−) terminal and following terminal:
- No. 1 fuel injector: A1 (+) terminal.
- No. 2 fuel injector: A3 (+) terminal.
- No. 3 fuel injector: A5 (+) terminal.
- No. 4 fuel injector: A2 (+) terminal.



Is there battery voltage?

NO → **Repair open in the wire between the ECM (A1, A3, A5 or A2) and the fuel injector.**

YES → **Substitute a known-good ECM and recheck. If symptom/indication goes away, replace the original ECM.**

"B"

Is there battery voltage?

NO → **Repair open in the YEL/BLK wire between the injector resistor and the PGM-FI main relay.**

YES → Test the injector resistor (see page 11-121).

Does the injector resistor test OK?

NO → **Replace the injector resistor.**

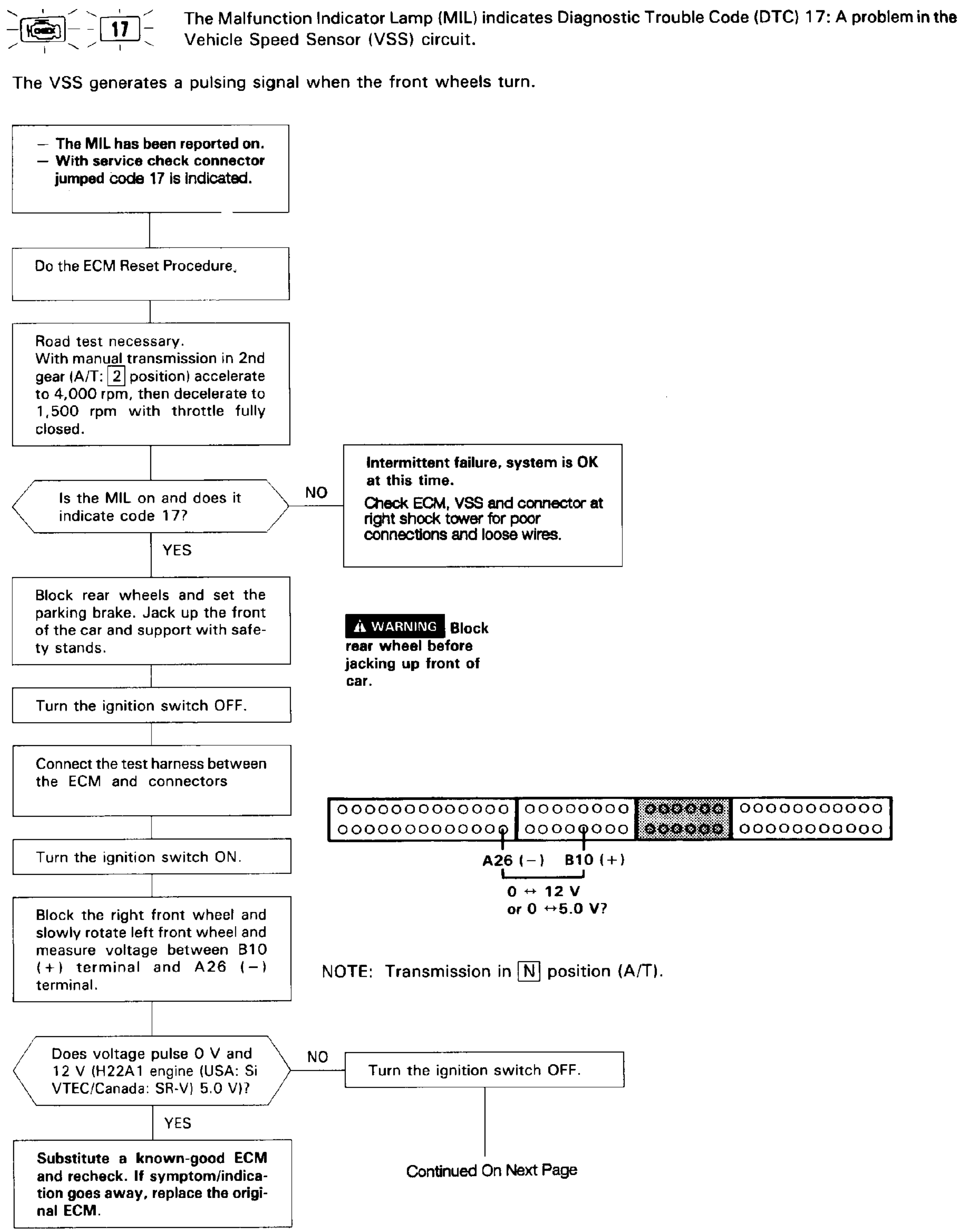
YES → **Repair open RED/BLK wire between the 2P connector and injector resistor.**

93F79033

Fig. 34: Code 16 Flowchart, Fuel Injectors (3 of 3)

Courtesy of American Honda Motor Co., Inc.

CODE 17 - VEHICLE SPEED SENSOR (VSS)



93G79034

Fig. 35: Code 17 Flowchart, Vehicle Speed Sensor (1 of 2)
Courtesy of American Honda Motor Co., Inc.

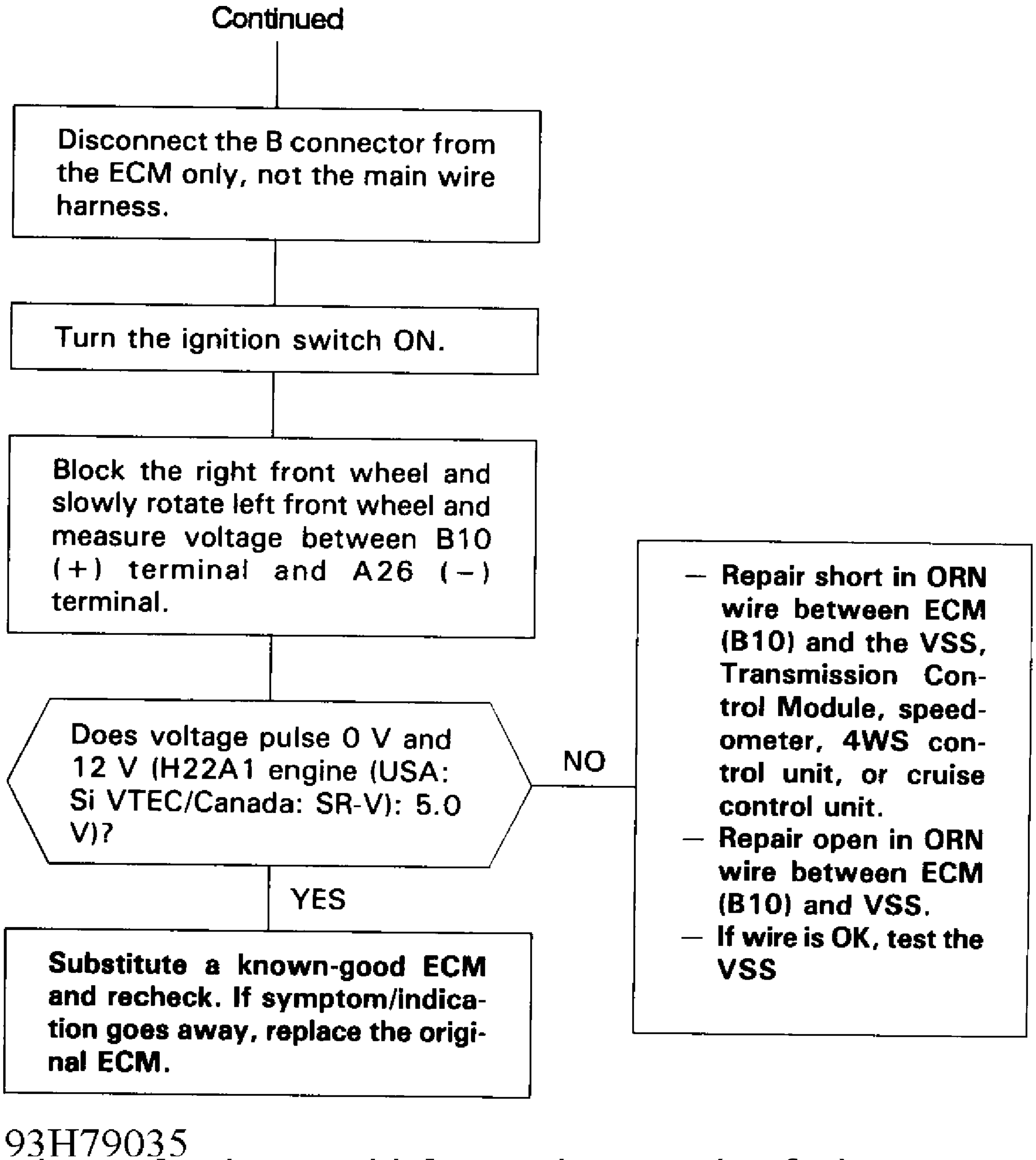


Fig. 36: Code 17 Flowchart, Vehicle Speed Sensor (2 of 2)
Courtesy of American Honda Motor Co., Inc.

CODE 20 - ELECTRICAL LOAD DETECTOR (ELD)

20 The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 20: A problem in the Electrical Load Detector (ELD) circuit.

With service check connector jumped code 20 is indicated.

Do the ECM Reset procedure.

Start engine and keep engine rpm at idle.
Turn on headlights.

Does the MIL indicate code 20?

- NO → **Intermittent failure, system is OK at this time (test drive may be necessary). Check for poor connections or loose wires at ECM and ELD.**
- YES ↓

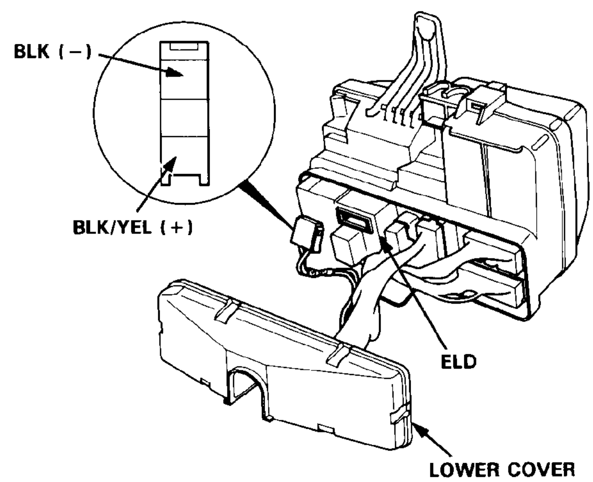
Turn the ignition switch OFF.

Remove the under-hood fuse/relay box and remove the fuse/relay box lower cover.

Disconnect the 3P connector from the ELD.

Turn the ignition switch ON.

Measure voltage between BLK/YEL (+) terminal and BLK (−) terminal.



Is there battery voltage?

- NO → Measure voltage between BLK/YEL (+) terminal and body ground.
  - Is there battery voltage?
    - YES → **Repair open in BLK wire between the 3P connector and G403 (located under middle of dash).**
    - NO → **Repair open in BLK/YEL wire between ECU (ECM) (15 A) fuse (in the under-dash fuse/relay box) and the 3P connector.**
- YES ↓

G - TESTS W 93I79036

Continued On Next Page

Fig. 37: Code 20 Flowchart, Electrical Load Detector (1 of 2)
Courtesy of American Honda Motor Co., Inc.

CODE 20 (2 OF 2)
ELECTRICAL LOAD DETECTOR (ELD)
PRELUDE

Continued

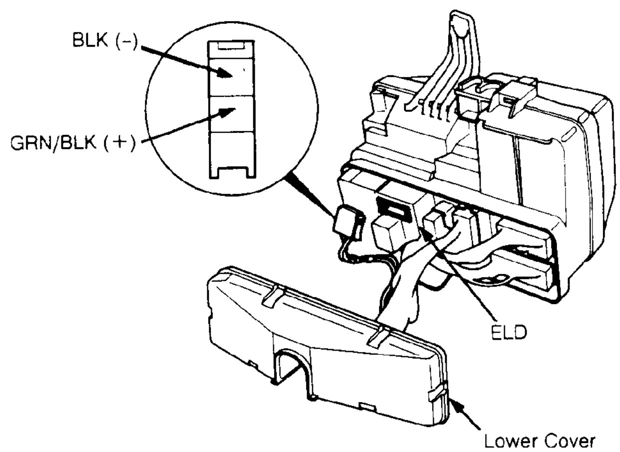
Measure voltage between GRN/BLK terminal and body ground.

Is there 4.5–5.0 V?

NO → **Repair open or short in GRN/BLK wire between ECM (D10) and the 3P connector. If wire is OK, substitute a known-good ECM and recheck.**

YES ↓

Turn the ignition switch OFF.



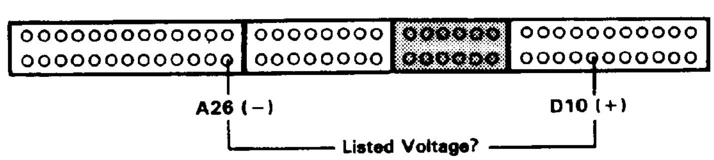
Connect the 3P connector to the ELD.

Connect the test harness between the ECM and connectors

Condition	Voltage
Headlight switch, first position (•)	1.5–3.0 V
Headlight switch, second position (●)	1.0–2.0 V

Start the engine and allow it to idle.

Under the conditions listed in the chart to the right, measure voltage between D10 (+) terminal and A26 (–) terminal.



Is the voltage listed in the chart available?

NO → **Replace the ELD.**

YES ↓

93J79037

Substitute a known-good ECM and recheck. If symptom/indication goes away, replace the original ECM.

Fig. 38: Code 20 Flowchart, Electrical Load Detector (2 of 2)
Courtesy of American Honda Motor Co., Inc.

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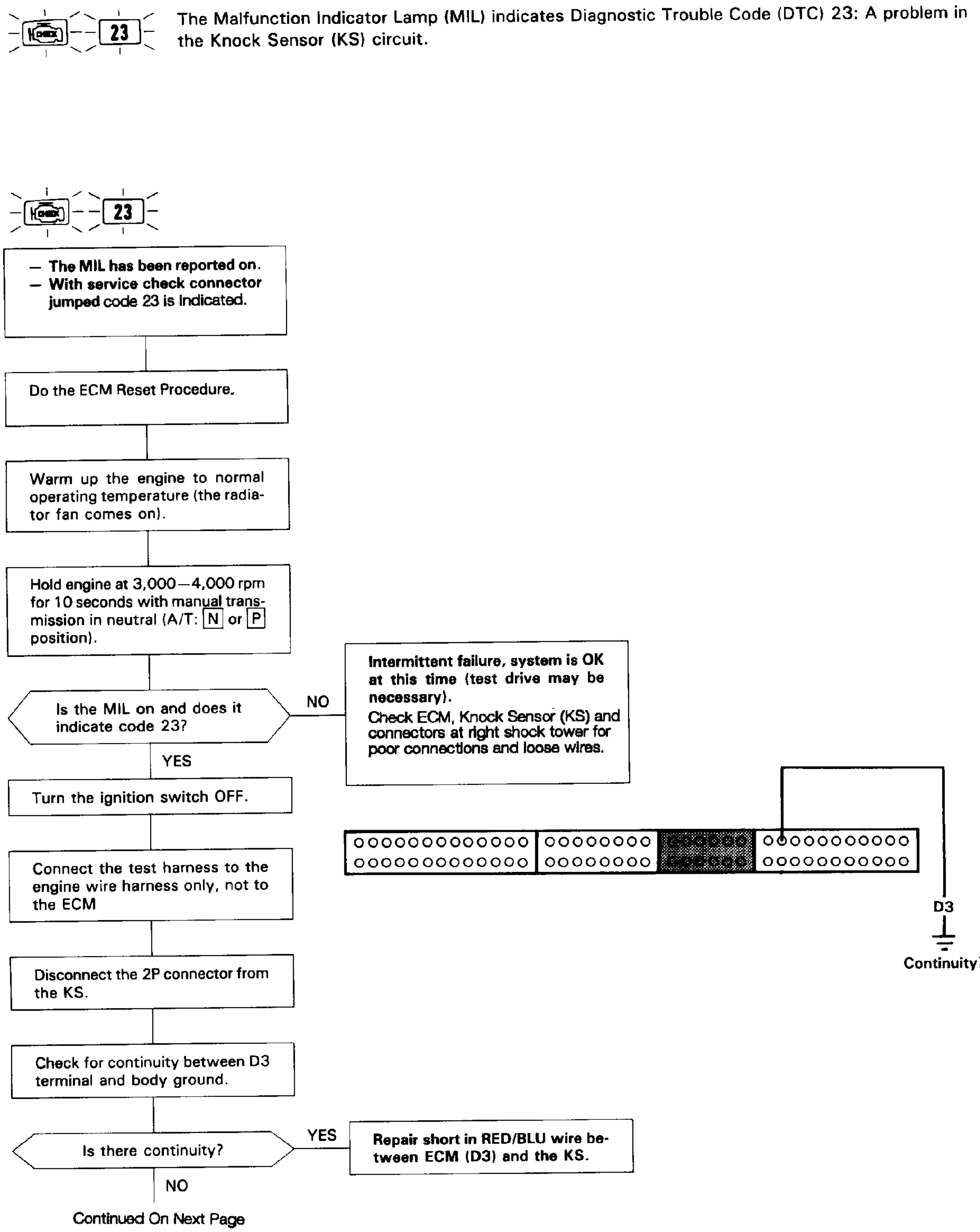
CODE 23 - KNOCK SENSOR (KS)



93E79040

Fig. 39: Code 23 Flowchart, Knock Sensor (1 of 2)
Courtesy of American Honda Motor Co., Inc.

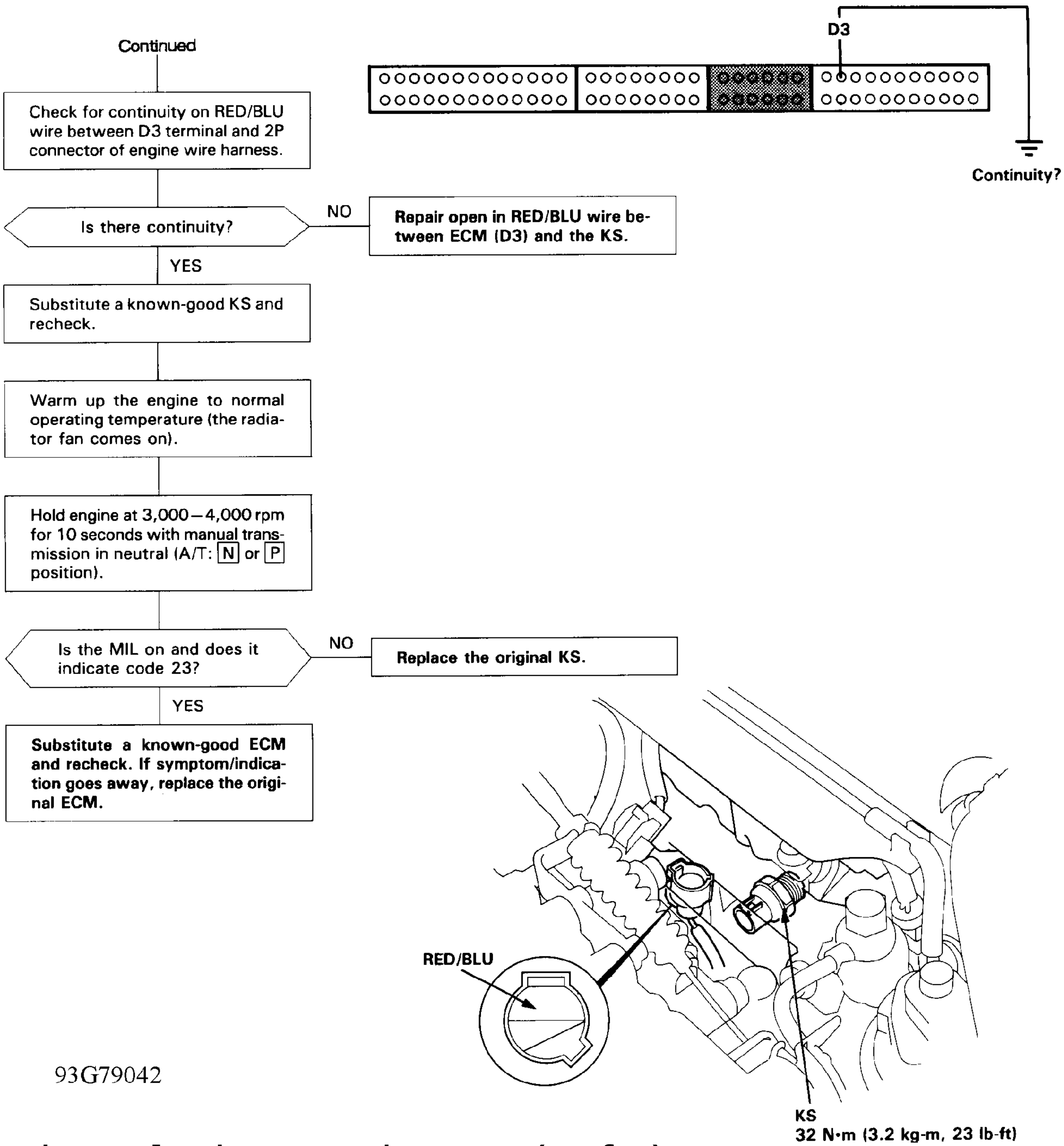
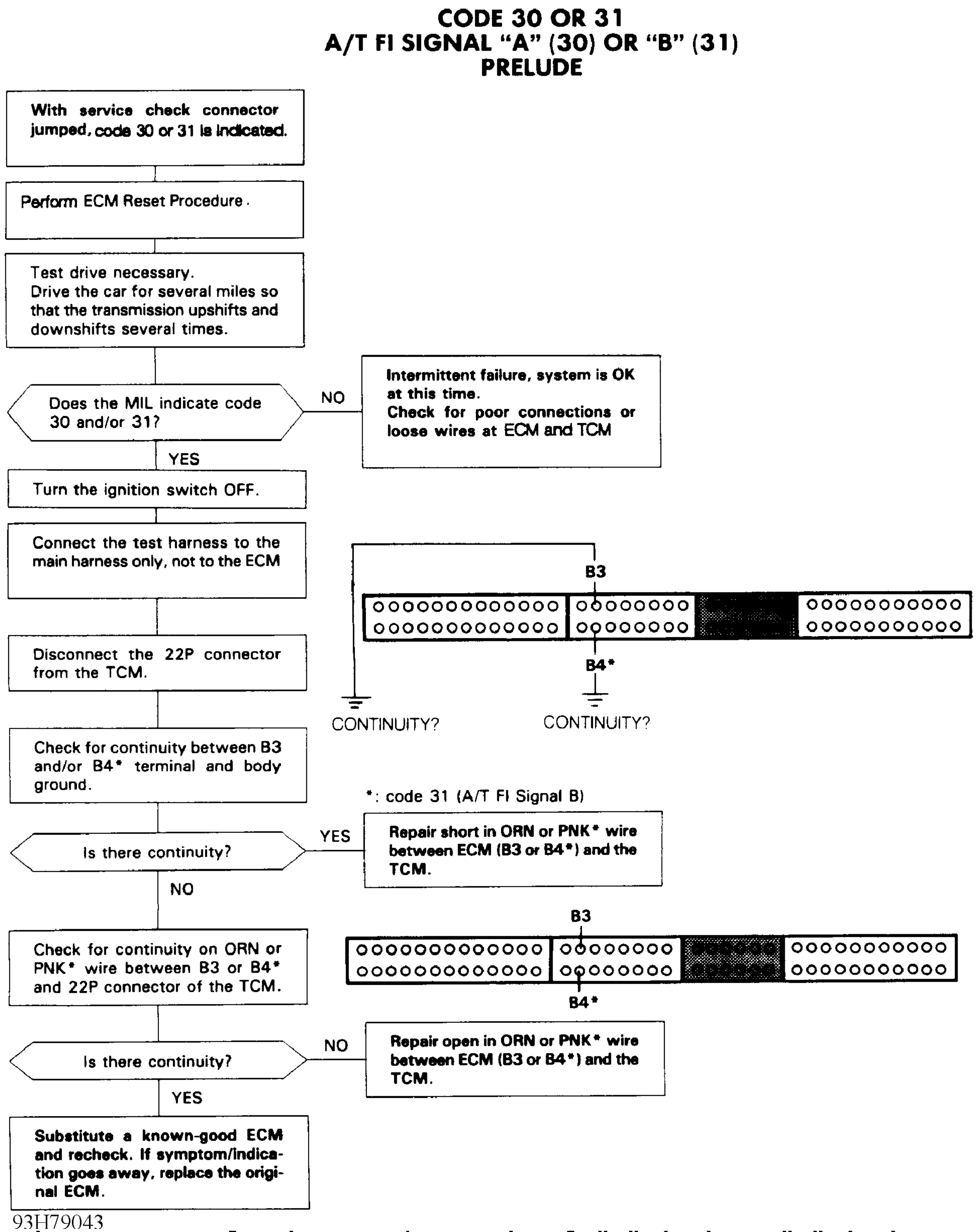


Fig. 40: Code 23 Flowchart, Knock Sensor (2 of 2)
Courtesy of American Honda Motor Co., Inc.

CODE 30 OR 31 - A/T FI SIGNAL "A" (30) OR "B" (31)



G - TESTS W

Fig. 41: Code 30 or 31 Flowchart, A/T FI Signal "A" (30) or "B" (31)
Courtesy of American Honda Motor Co., Inc.

CODE 41 - HEATED OXYGEN SENSOR (HO2S) HEATER

41

The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 41: A problem in the Heated Oxygen Sensor (HO2S) Heater circuit.

41

- Engine is running.
- The MIL has been reported on. With service check connector jumped code 41 is indicated.

Do the ECM Reset Procedure.

Start the engine.

Is the MIL on and does it indicate code 41?

NO → Intermittent failure, system is OK at this time (test drive may be necessary). Check for poor connections or loose wires at ECM, HO2S and connectors at right shock tower.

YES

Turn the ignition switch OFF.

Disconnect the 4P connector from the HO2S.

Measure resistance between terminals C and D on the HO2S.

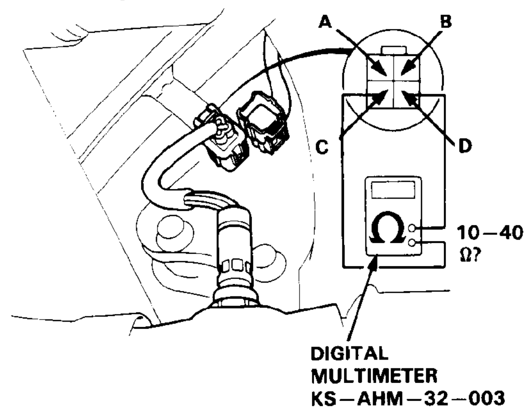
Is there 10−40 Ω?

NO → Replace the HO2S.

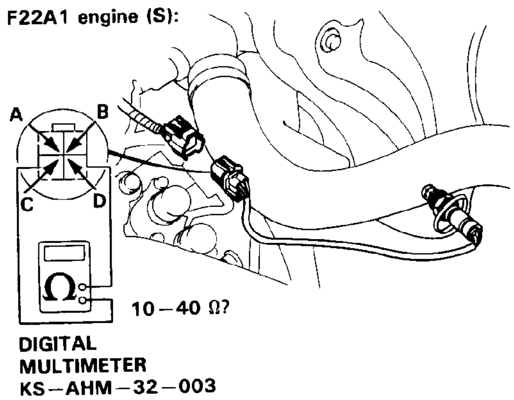
YES

Continued On Next Page

H23A1 engine (USA: Si/Canada: SR)
H22A1 engine (USA: Si VTEC/Canada: SR-V):



F22A1 engine (S):



93J79045

Fig. 42: Code 41 Flowchart, Heated Oxygen Sensor Heater (1 of 3)
Courtesy of American Honda Motor Co., Inc.

Continued

Check for continuity to body ground on terminals C and D of the HO2S.

Is there continuity?
- YES → **Replace the HO2S.**
- NO ↓

Check for continuity between terminal D and terminals A and B individually.

Is there continuity?
- YES → **Replace the HO2S.**
- NO ↓

Turn the ignition switch ON.

At HO2S harness, measure voltage between YEL/BLK (+) terminal and ORN/WHT (−) terminal.

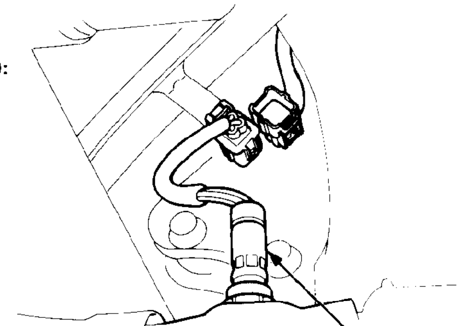
Is there battery voltage?
- YES → Disconnect the "A" connector from the ECM.
  - At HO2S harness, measure voltage between YEL/BLK (+) terminal and ORN/WHT (−) terminal.
  - Is there battery voltage?
    - YES → **Repair short in ORN/WHT wire between ECM (A6) and HO2S.**
    - NO → Reconnect the HO2S connector. → See "B"
- NO ↓

Measure voltage between YEL/BLK (+) terminal and body ground.

Is there battery voltage?
- NO → **Repair open in YEL/BLK wire between HO2S and PGM-FI main relay.**
- YES ↓

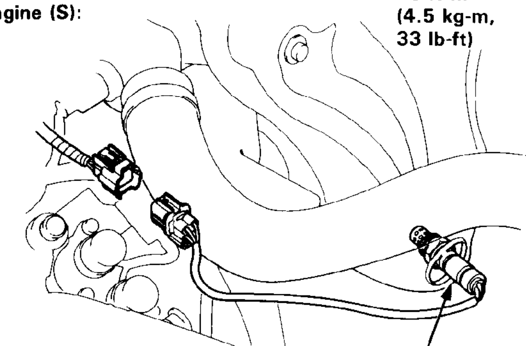
Turn the ignition switch OFF. → See "A"

H23A1 engine (USA: Si/Canada: SR), H22A1 engine (USA: Si VTEC/Canada: SR-V):



HO2S
45 N·m (4.5 kg-m, 33 lb-ft)

F22A1 engine (S):



HO2S
45 N·m (4.5 kg-m, 33 lb-ft)

93A79046

See "A"

See "B"

Fig. 43: Code 41 Flowchart, Heated Oxygen Sensor Heater (2 of 3)
Courtesy of American Honda Motor Co., Inc.

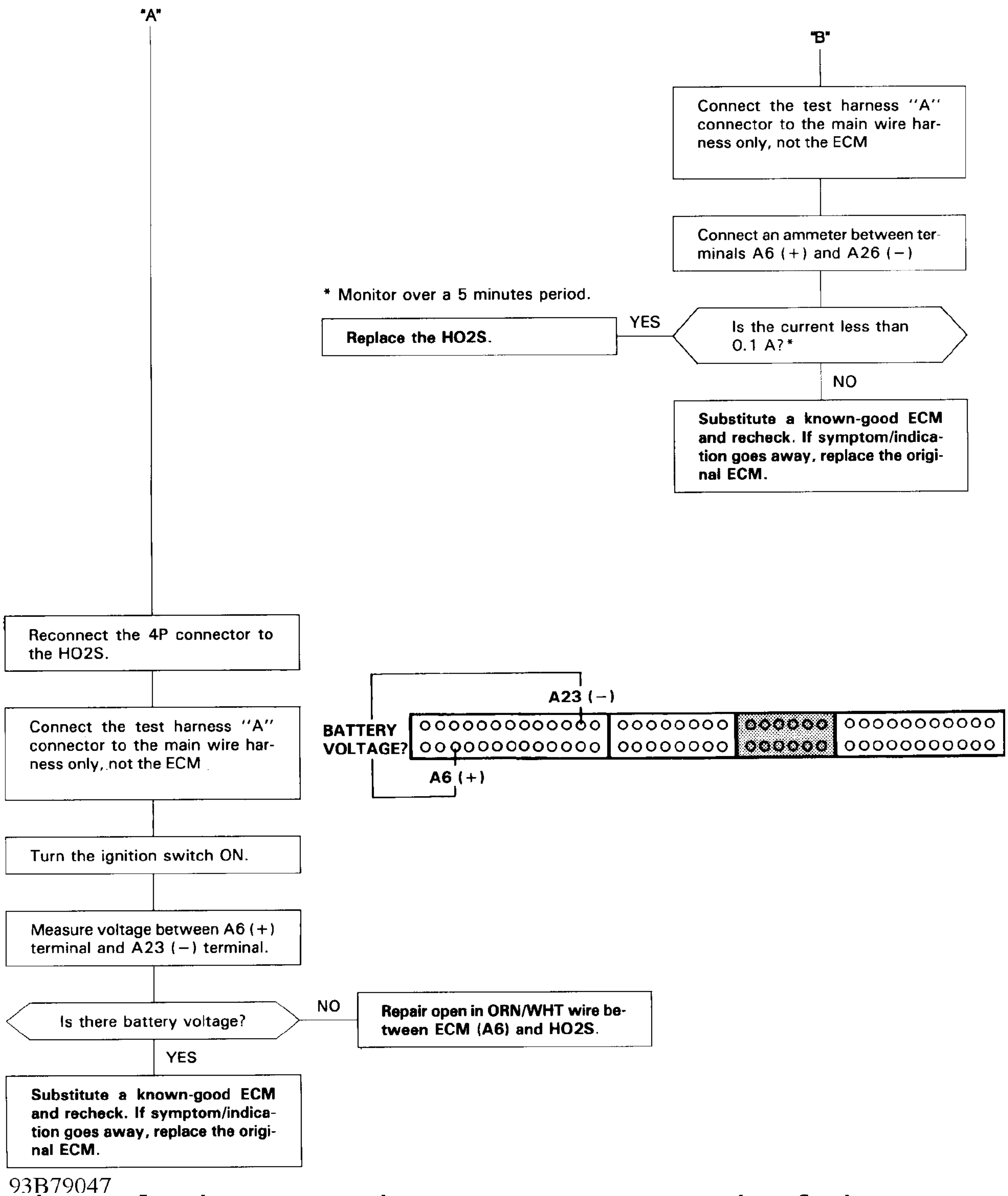
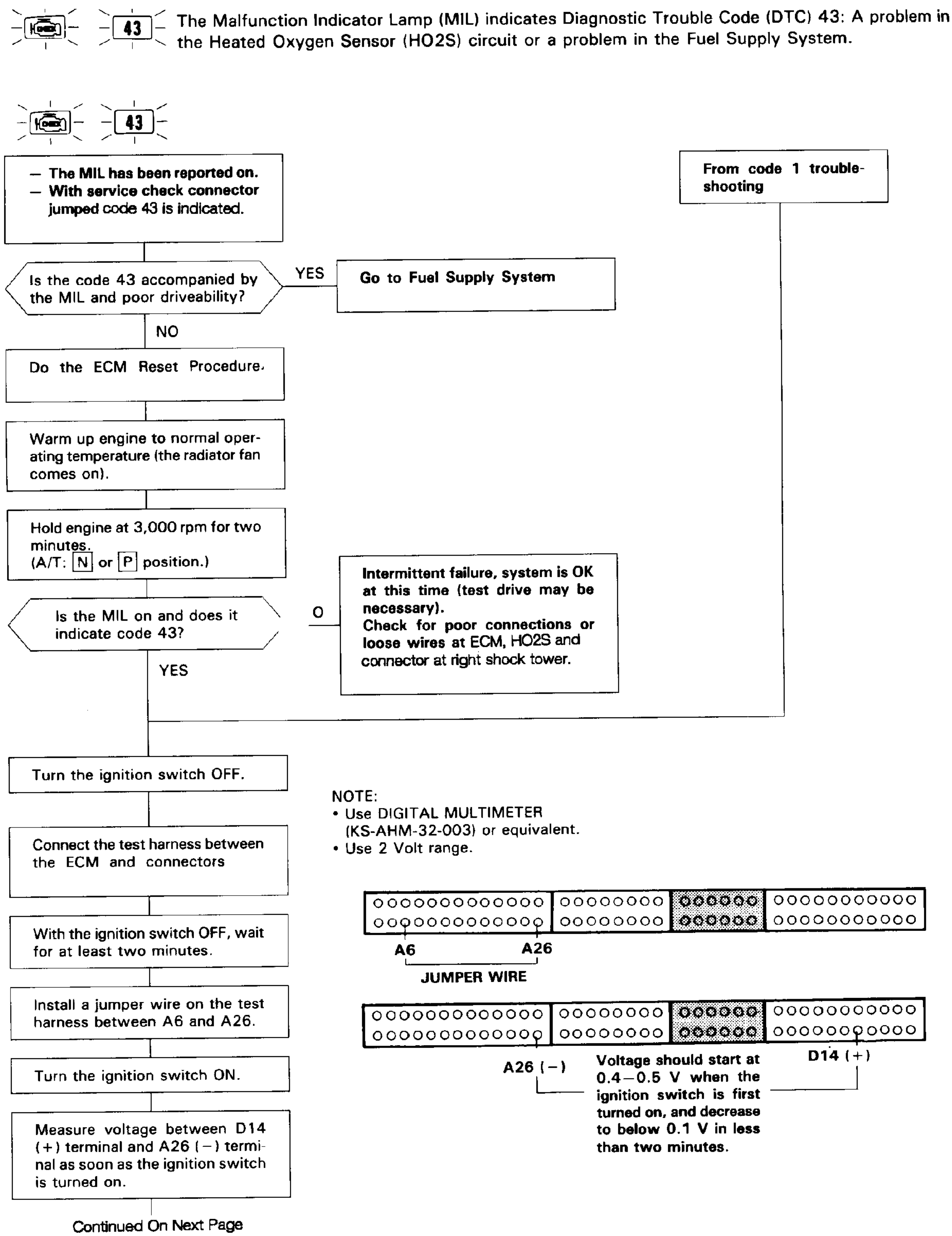


Fig. 44: Code 41 Flowchart, Heated Oxygen Sensor Heater (3 of 3)
Courtesy of American Honda Motor Co., Inc.

CODE 43 - FUEL SUPPLY SYSTEM



93C79048

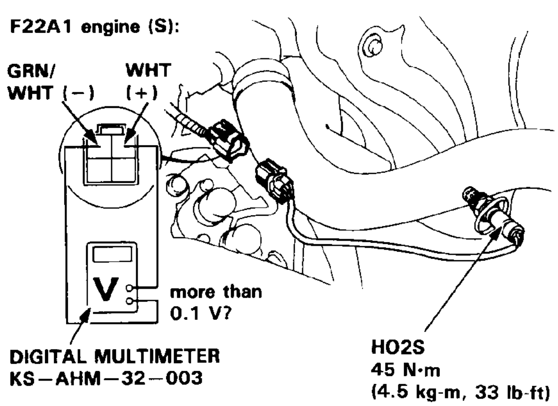
Fig. 45: Code 43 Flowchart, Fuel Supply System (1 of 2)

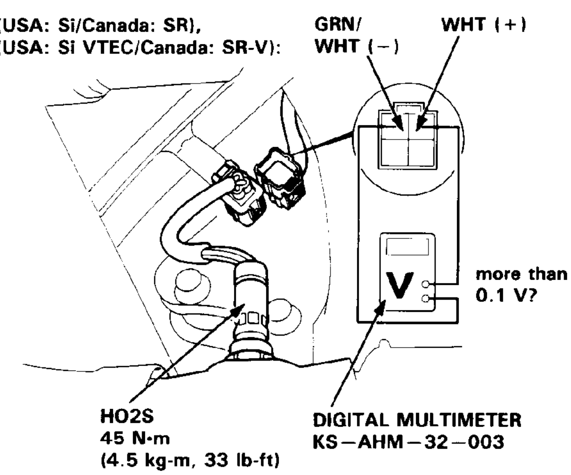
Courtesy of American Honda Motor Co., Inc.

Continued

Is there 0.1 V or less when the ignition switch is first turned on?

- **YES** → Disconnect the 4P connector from the HO2S.
  → Measure voltage between D14 (+) terminal and A26 (−) terminal.
  → **Is there more than 0.1 V?**
  - **YES** → **Replace the HO2S.**
  - **NO** → Disconnect the "D" connector from the main wire harness.
    → Measure voltage between D14 (+) terminal and A26 (−) terminal.
    → **Is there more than 0.1 V?**
    - **YES** → **Repair short in WHT wire between ECM (D14) and HO2S.**
    - **NO** → **Substitute a known-good ECM and recheck. If symptom/indication goes away, replace the original ECM.**
- **NO** → Disconnect the 4P connector from the HO2S.
  → Measure voltage at the engine wire harness side of the HO2S connector between GRN/WHT (−) and WHT (+).
  → **Is there more than 0.1 V?**
  - **YES** → **Replace the HO2S.**
  - **NO** → **Check for open in WHT wire between ECM (D14) and HO2S. If wire is OK, repair open in GRN/WHT wire between ECM (D22) and HO2S.**





93D79049
Fig. 46: Code 43 Flowchart, Fuel Supply System (2 of 2)
Courtesy of American Honda Motor Co., Inc.

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END OF ARTICLE

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GEAR TOOTH CONTACT PATTERNS
Article Text

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Sunday, July 08, 2001 11:29AM

ARTICLE BEGINNING

GENERAL INFORMATION
Gear Tooth Contact Patterns

*** PLEASE READ THIS FIRST ***

The following article is for **GENERAL INFORMATION** purposes only. Information does not **SPECIFICALLY** apply to all years, makes and models, but is to be used as a general reference guide.

INSPECTION

PRELIMINARY INSPECTION

Wipe lubricant from internal parts. Rotate gears and inspect for wear or damage. Mount dial indicator to housing, and check backlash at several points around ring gear. Backlash must be within specifications at all points. If no defects are found, check gear tooth contact pattern.

GEAR TOOTH CONTACT PATTERN

NOTE: Drive pattern should be well centered on ring gear teeth. Coast pattern should be centered, but may be slightly toward toe of ring gear teeth.

1) Paint ring gear teeth with marking compound. Wrap cloth or rope around drive pinion flange to act as brake. Rotate ring gear until clear tooth contact pattern is obtained.

2) Contact pattern will indicate whether correct pinion bearing mounting shim has been installed and if drive gear backlash has been set properly. Backlash between drive gear and pinion must be maintained within specified limits, until correct tooth pattern is obtained.

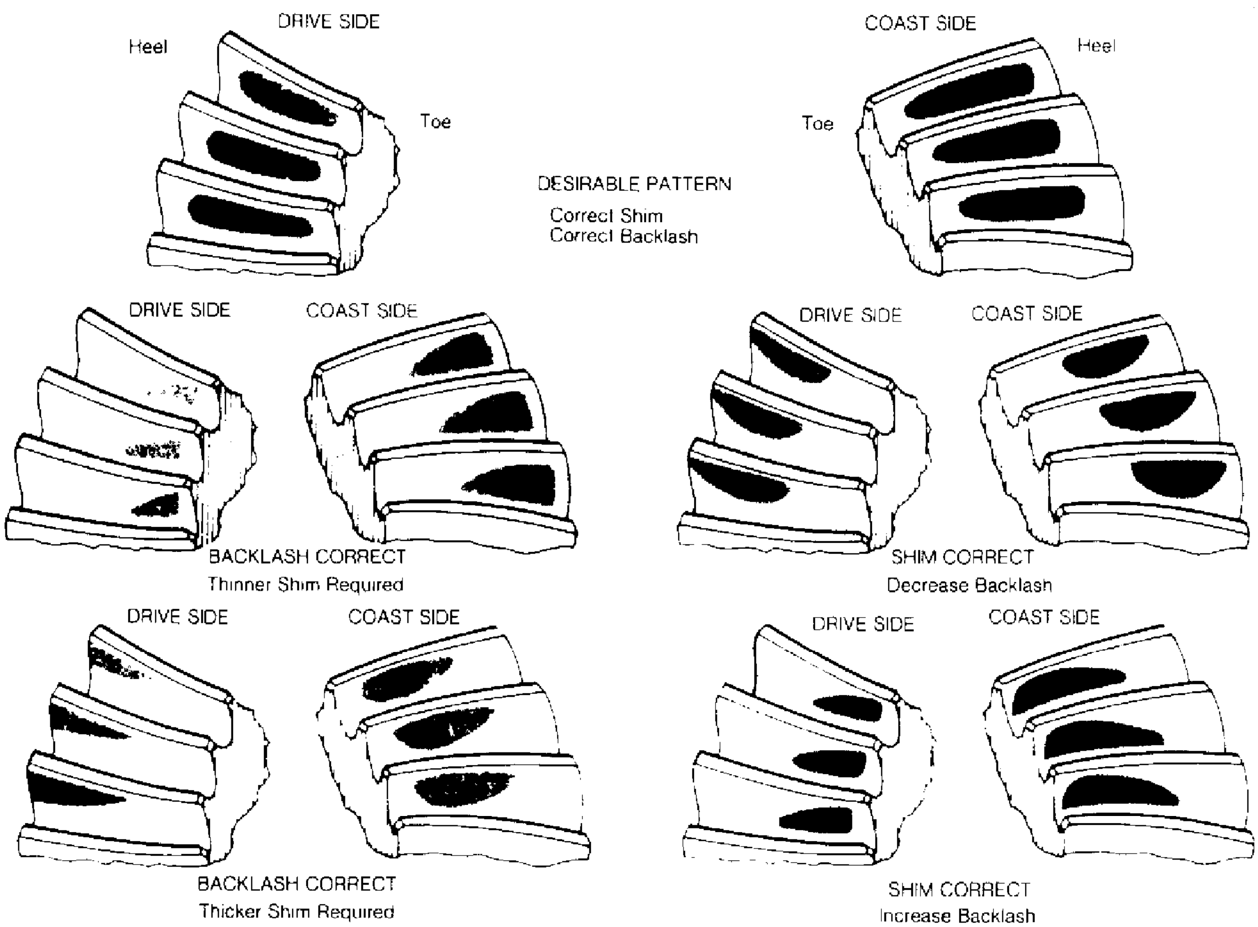

Fig. 1: Drive Axle Gear Tooth Patterns

ADJUSTMENTS

GEAR BACKLASH & PINION SHIM CHANGES

NOTE: Backlash is adjusted by either moving shims from one side of differential case to the other or by turning adjusting nuts on which side bearing races ride. Changing of pinion shims alters the distance from face of pinion of centerline of ring gear.

1) With no change in backlash, moving pinion further from ring gear moves drive pattern toward heel and top of tooth, and moves coast pattern toward toe and top of tooth.

2) With no change in backlash, moving pinion closer to ring gear moves drive pattern toward toe and bottom of tooth, and moves coast pattern toward heel and bottom of tooth.

3) With no change in pinion shim thickness, an increase in backlash moves ring gear further from pinion. Drive pattern moves

toward heel and top of tooth, and coast pattern moves toward heel and top of tooth.

4) With no change in pinion shim thickness, decrease in backlash moves ring gear closer to pinion gear. Drive pattern moves toward toe and bottom of tooth, and coast pattern moves toward toe and bottom of tooth.

END OF ARTICLE

GENERAL COOLING SYSTEM SERVICING
Article Text
1993 Honda Prelude
For Cadi Centre Nsk CA 95051
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Sunday, July 08, 2001 11:29AM

ARTICLE BEGINNING

GENERAL INFORMATION
General Cooling System Servicing

*** PLEASE READ THIS FIRST ***

The following article is for general information only. Information may not apply to all years, makes and models. See specific article in the ENGINE COOLING section.

DESCRIPTION

The basic liquid cooling system consists of a radiator, water pump, thermostat, electric or belt-driven cooling fan, pressure cap, heater, and various connecting hoses and cooling passages in the block and cylinder head.

MAINTENANCE

DRAINING

Remove radiator cap and open heater control valve to maximum heat position. Open drain cocks or remove plugs in bottom of radiator and engine block. In-line engines usually have one plug or drain cock, while "V" type engines will have 2, one in each bank of cylinders.

CLEANING

A good cleaning compound removes most rust and scale. Follow manufacturer's instructions in the use of cleaner. If considerable rust and scale has to be removed, cooling system should be flushed. Clean radiator air passages with compressed air.

FLUSHING

CAUTION: Some manufacturers use an aluminum and plastic radiator. Flushing solution must be compatible with aluminum.

Back Flushing
Back flushing is an effective means of removing cooling system rust and scale. The radiator, engine and heater core should be flushed separately.

Radiator
To flush radiator, connect flushing gun to water outlet of radiator and disconnect water inlet hose. To prevent flooding engine,

use a hose connected to radiator inlet. Use air in short bursts to prevent damage to radiator. Continue flushing until water runs clear.

Engine

To flush engine, remove thermostat and replace housing. Connect flushing gun to water outlet of engine. Flush using short air bursts until water runs clean.

Heater Core

Flush heater core as described for radiator. Ensure heater control valve is set to maximum heat position before flushing heater.

REFILLING

To prevent air from being trapped in engine block, engine should be running when refilling cooling system. After system is full, continue running engine until thermostat is open, then recheck fill level. Do not overfill system.

TESTING

THERMOSTAT

1) Visually inspect thermostat for corrosion and proper sealing of valve and seat. If okay, suspend thermostat and thermometer in a 50/50 mixture of coolant and water. SeeFig. 1. Do not allow thermostat or thermometer to touch bottom of container. Heat water until thermostat just begins to open.

2) Read temperature on thermometer. This is the initial opening temperature and should be within specification. Continue heating water until thermostat is fully open and note temperature. This is the fully opened temperature. If either reading is not to specification, replace thermostat.

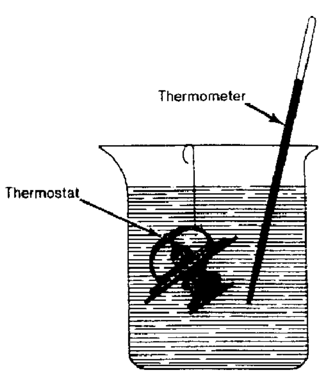

Fig. 1: Testing Thermostat in Anti-Freeze/Water Solution

PRESSURE TESTING

A pressure tester is used to check both radiator cap and complete cooling system. Test components as follows, following tool manufacturer's instructions.

Radiator Cap

Visually inspect radiator cap, then dip cap into water and connect to tester. Pump tester to bring pressure to upper limit of cap specification. If cap fails to hold pressure, replace cap.

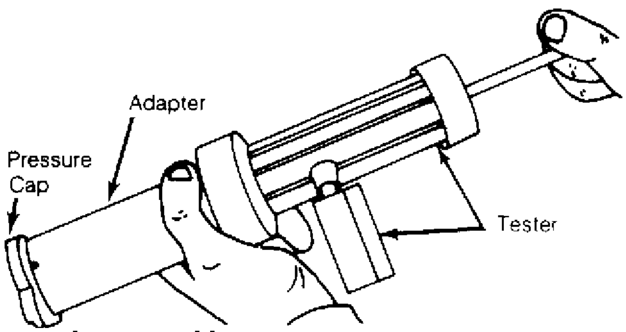

Fig. 2: Testing Radiator Pressure Cap

Cooling System

1) With engine off, wipe radiator filler neck seat clean. Fill radiator to correct level. Attach tester to radiator and pump until pressure is at upper level of radiator rating.

2) If pressure drops, inspect for external leaks. If no leaks are apparent, detach tester and run engine until normal operating temperature is reached. Reattach tester and observe. If pressure builds up immediately, a possible leak exists from a faulty head gasket or crack in head or block.

NOTE: Pressure may build up quickly. Release any excess pressure or cooling system damage may result.

3) If there is no immediate pressure build up, pump tester to within system pressure range (on radiator cap). Vibration of gauge pointer indicates compression or combustion leak into cooling system. Isolate leak by shorting each spark plug wire to cylinder block. Gauge pointer should stop or decrease vibration when leaking cylinder is shorted.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Trouble Shooting - No Codes

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

Before diagnosing symptoms or intermittent faults, perform steps in F - BASIC TESTING and G - TESTS W/ CODES articles in the ENGINE PERFORMANCE Section. Use this article to diagnose driveability problems existing when a hard fault code is not present.

NOTE: Some driveability problems may have been corrected by manufacturer with a revised Engine Control Module (ECM). Check with manufacturer for latest ECM application.

Symptom checks can direct the technician to malfunctioning component(s) for further diagnosis. A symptom should lead to a specific component, system test, or adjustment.

Use intermittent test procedures to locate driveability problems that DO NOT occur when the vehicle is being tested. These test procedures should also be used if a soft (intermittent) trouble code was present, but no problem was found during self-diagnostic testing.

NOTE: For specific testing procedures, see I - SYS/COMP TESTS article in the ENGINE PERFORMANCE Section. For specifications, see D - ADJUSTMENTS or C - SPECIFICATIONS articles in the ENGINE PERFORMANCE Section..

SYMPTOMS

SYMPTOM DIAGNOSIS

Symptom checks cannot be used properly unless the problem occurs while the vehicle is being tested. To reduce diagnostic time, ensure steps in F - BASIC TESTING and G - TESTS W/ CODES articles in the ENGINE PERFORMANCE Section have been performed before diagnosing a symptom. Symptoms available for diagnosis include:

* Engine Will Not Start
* Difficult Cold Start
* Fast Idle Out Of Specification
* Rough Idle When Warm
* Idle RPM High When Warm

* Idle RPM Low When Warm
* Stalling During Warm-Up
* Stalling After Warm-Up
* Misfire Or Rough Operation
* Emission Test Failure
* Lack Of Power

Recommended system and component checks may not apply to all vehicles.

ENGINE WILL NOT START

Check spark and fuel systems as outlined in F - BASIC TESTING and I - SYS/COMP TESTS articles in the ENGINE PERFORMANCE Section. Test ECM power and ground circuits. Check TDC/CRANK/CYL sensor and ignition output circuits.

DIFFICULT COLD START

Check coolant temperature, MAP, and TDC/CKP/CYP sensor circuits for malfunctions. On Accord, check fast idle valve for proper operation.

FAST IDLE OUT OF SPECIFICATION

Check idle adjusting screw setting. Check Idle Air Control (IAC) valve and fast idle valve for proper operation. Check coolant temperature sensor circuit for short circuit to power or ground.

ROUGH IDLE WHEN WARM

Check Idle Air Control (IAC) valve, MAP sensor, fuel injectors, and EGR system for proper operation.

IDLE RPM HIGH WHEN WARM

Check idle adjuster screw. Check Idle Air Control (IAC) valve, fast idle valve, oil pressure switch signal, vacuum hose connections, and A/C signal circuit.

IDLE RPM LOW WHEN WARM

Check idle adjuster screw. Check Idle Air Control (IAC) valve, fuel injector circuit, A/C signal circuit, oil pressure switch, A/T position signal, and electric load detector. Check lock-up control solenoid (if equipped) circuit.

STALLING DURING WARM-UP

Check Idle Air Control (IAC) valve, fast idle valve, and fuel system. Check coolant temperature sensor.

STALLING AFTER WARM-UP

Check fuel system, Idle Air Control (IAC) valve, and EGR control system.

MISFIRE OR ROUGH OPERATION

Check fuel injectors, MAP sensor, Idle Air Control (IAC) valve, and EGR system. Check TDC/CKP/CYP sensor and circuitry.

EMISSION TEST FAILURE

Check MAP sensor and oxygen sensor (or linear air/fuel ratio sensor). Check catalytic converter, EVAP, and fuel systems.

LACK OF POWER

Check MAP sensor, throttle position sensor, fuel injectors, air intake system, and catalytic converter. Check Variable Valve Timing (VTEC) spool valve (if equipped) and oil pressure switch operation (if equipped).

INTERMITTENTS

INTERMITTENT PROBLEM DIAGNOSIS

Intermittent fault testing requires duplicating circuit or component failure to identify problem. These procedures may lead to computer setting a fault code (on some systems) which may help in diagnosis.

If problem vehicle does not produce fault codes, monitor voltage or resistance with DVOM while attempting to reproduce conditions causing intermittent fault. A status change on DVOM indicates a fault has been located.

Use a DVOM to pinpoint faults. When monitoring voltage, ensure ignition is on or engine is running. Ensure ignition is off or negative battery cable is disconnected when monitoring circuit resistance. Status changes on DVOM during test procedures indicate area of fault.

TEST PROCEDURES

Intermittent Simulation

To reproduce conditions creating an intermittent fault, use following methods:

* Lightly vibrate component.
* Heat component.
* Wiggle or bend wiring harness.
* Spray component with water mist.
* Remove/apply vacuum source.

Monitor circuit/component voltage or resistance while simulating intermittent. If engine is running, monitor for self-diagnostic codes. Use test results to identify a faulty component or circuit.

END OF ARTICLE

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ARTICLE BEGINNING

1993 Heater Systems

Prelude

DESCRIPTION

The heating and ventilating system consists of heater control panel, heater assembly, blower assembly, heater ducts and hoses. See Fig. 1. On lever-type heater control panels, air source selection and air outlet distributions are controlled by sliding levers. Blower on-off speed and temperature are controlled by lever or rotating dial. On push button heater control panels, functions are controlled by various push buttons, levers or rotating dials.

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in appropriate AIR BAG RESTRAINT SYSTEM article in ACCESSORIES & ELECTRICAL section.

CAUTION: Radio is equipped with anti-theft circuitry. Obtain code number from owner before disconnecting battery, removing fuse No. 43 or removing radio. After service, turn on radio. When CODE appears, enter 5-digit code to restore operation.

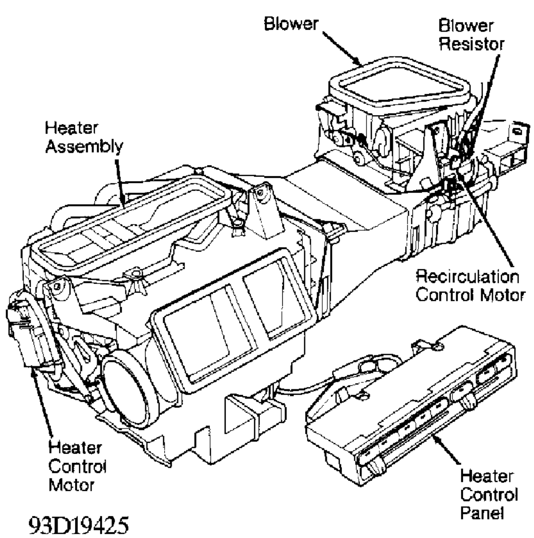

Fig. 1: Identifying Heater Assembly (Prelude)
Courtesy of American Honda Motor Co., Inc.

OPERATION

HEATER CONTROL PANEL

Air Source Select (Fresh Air & Recirculation) Lever/Buttons

To recirculate air inside vehicle, slide air select lever to recirculation position or press recirculation button, depending on control assembly type. Indicator light will come on, and outside air will be shut off.

Select the fresh air position with appropriate button or lever to circulate fresh air from outside vehicle; indicator light should come on. If equipped, ensure recirculation button is off.

Fan Switch

When fan switch is set to low, medium-low, medium-high or high position, fan will circulate warm, cool or outside air, depending on selected temperature and functions.

Temperature Control Lever/Dial

Depending on control assembly type, either slide appropriate lever from left to right or rotate dial clockwise for warmer air.

Function Control Lever/Buttons

Slide lever or push appropriate button to direct fresh or recirculated air to and from heater, defrosters and vents. Set function lever or button in vent (face) position. Outside air will now flow through side and center vents.

To ventilate, set temperature dial or lever to cold position. If equipped, ensure recirculation button is in OFF position. On all, select fresh air position with air select button or lever.

To defrost windshield or windows, set temperature lever or dial in hot position. Select defrost position with appropriate function button or lever, and switch on fan. Warmed (outside) air will flow from windshield and side defroster vents.

ADJUSTMENTS

AIR MIX CABLE/ROD

NOTE: Heater valve cable should always be adjusted whenever the air mix cable/rod has been disconnected. See **HEATER VALVE CABLE**.

Disconnect air mix cable. Slide temperature lever to COOL position. Connect cable to arm. Gently slide cable housing back to eliminate slack, and snap cable housing into clamp.

FUNCTION CONTROL CABLE

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NOTE: Prelude uses function control motor.

HEATER VALVE CABLE

NOTE: Air mix control cable/rod should be adjusted whenever heater valve cable has been disconnected. See AIR MIX CABLE/ROD.

Slide temperature control lever to COOL position. Disconnect cable from heater valve. Close heater valve by turning control arm toward cable clamp. Connect end of cable to control arm of heater valve. Using clip, secure cable housing into clamp.

RECIRCULATION CONTROL MOTOR ROD

Connect wire harness to recirculation control motor. See Fig. 1. Press recirculation button and manually open air door. Connect control rod to arm of air door while holding air door open. Ensure air door and linkage move smoothly.

TROUBLE SHOOTING

BLOWER MOTOR DOES NOT RUN

1) Check fuse No. 9 (15-amp.), located in underdash fuse/relay box and fuse No. 35 (40-amp.), located in underhood fuse/relay box. Replace as necessary.

2) If fuses are okay, turn ignition on. Using a jumper wire, jumper Blue/Red at 2-pin blower motor connector to ground. If blower motor runs, go to next step. If blower motor does not run, go to step 6).

3) Turn ignition off. Remove radio/cassette player. Disconnect 7-pin blower fan switch connector. Turn ignition on. Check for battery voltage between Blue/Red wire terminal and body ground.

4) If battery voltage is present, go to next step. If battery voltage is not present, repair open in Blue/Red wire between blower motor and blower fan switch.

5) Turn ignition off. Check for continuity in Black wire between blower fan switch and body ground. If continuity is present, replace blower fan switch. If there is no continuity, repair open in Black wire between blower fan switch and body ground. If wire is okay, check for a bad ground at switch.

6) Disconnect 2-pin connector at blower motor. Turn ignition on. Check for battery voltage between Blue/White wire terminal and body ground. If battery voltage is not present, go to next step. If battery voltage is present, replace blower motor.

7) Turn ignition off. Remove blower relay and test. See BLOWER MOTOR RELAY under TESTING. Replace blower motor relay if

faulty. If blower relay is okay, go to next step.

8) Check for battery voltage at blower relay socket terminal No. 4 (positive). If battery voltage is present, go to next step. If battery voltage is not present, repair open in White wire between heater blower 40-amp fuse in underhood relay/fuse box and blower relay socket terminal No. 4. See Fig. 2.

9) Turn ignition on. Check for battery voltage at blower relay socket terminal No. 1 (positive) and ground. If battery voltage is present, go to next step. If battery voltage is not present, replace underdash fuse/relay box.

10) Turn ignition off. Check for continuity between blower relay socket terminal No. 3 (positive) and ground. If continuity is present, repair open in Blue/White wire between blower motor relay and blower motor. If continuity does not exist, repair open in Blue/White wire between blower motor relay and blower motor.

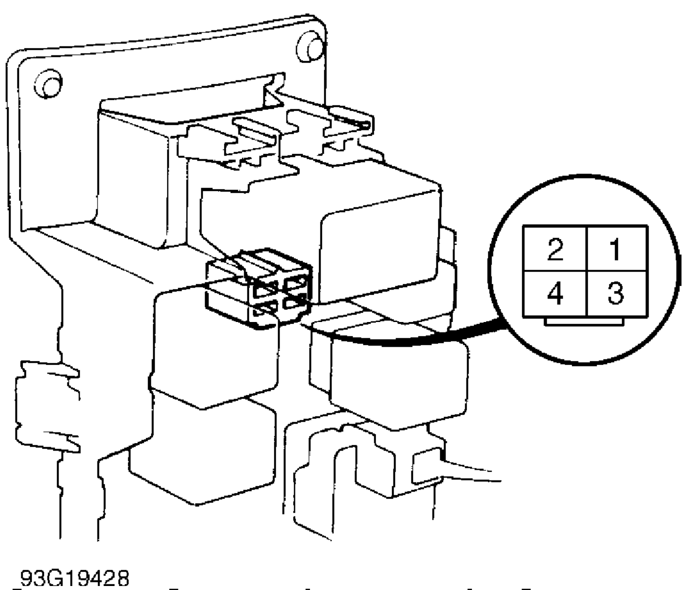

Fig. 2: Blower Relay Socket Terminal ID Located Inside Underdash Fuse/Relay Box

BLOWER MOTOR RUNS ONLY AT CERTAIN SPEEDS

1) Turn ignition on. Turn heater blower fan switch to OFF position. If blower fan motor does not run, go to step 4). If blower fan motor does run, turn ignition off. Remove radio/cassette player.

2) Disconnect 7-pin blower fan switch connector. Disconnect wire harness from heater resistor at blower case. Using an ohmmeter, check Blue/Black, Blue/Red, Blue/White and Blue/Yellow wires for continuity to ground.

3) If any wire has continuity to ground, repair short in wire(s) between heater fan switch and blower motor resistor. If there is no continuity to ground, replace fan switch.

4) Turn ignition off. Disconnect 5-pin connector from blower resistor at blower case. Measure resistance between blower motor resistor terminals No. 1 and 5. See Fig. 3. Resistance should be about 2.5 ohms. If resistance is not as specified, replace blower motor resistor. If resistance is as specified, go to next step.

5) Reconnect blower motor resistor connector. Remove radio/cassette player. Disconnect 7-pin connector from blower fan switch. Turn ignition on. At the heater fan switch 7-pin connector, ground each wire individually in the following order: Blue/White, Blue/Yellow, Blue/Black and Blue/Red wire terminals.

6) If blower motor operates at progressively higher speeds, replace heater fan switch. If blower motor does not operate at progressively higher speeds, repair open or cause of excessive resistance in appropriate wire(s) between heater fan switch and blower motor resistor.

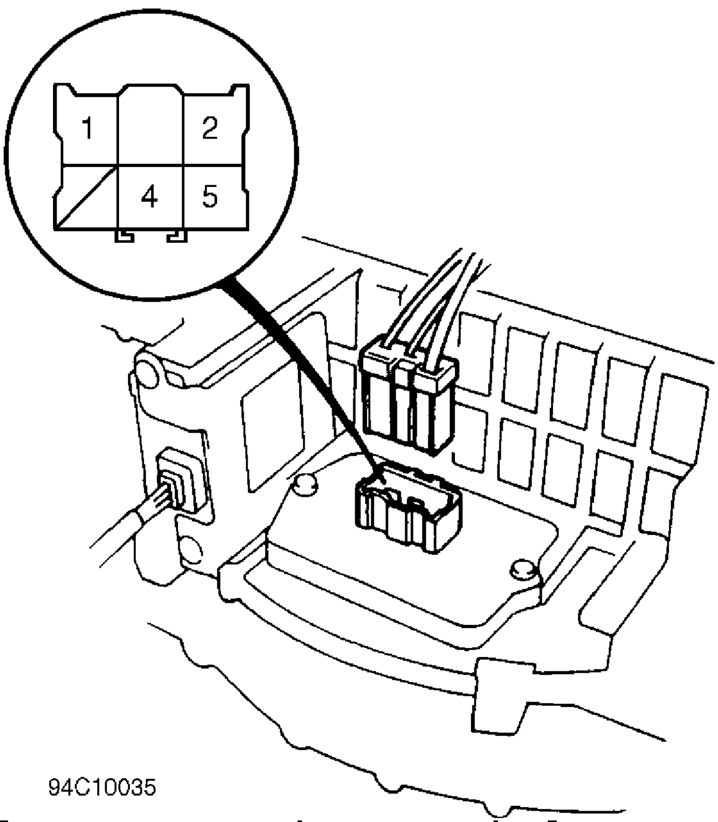

Fig. 3: Blower Motor Resistor Terminal ID
Courtesy of American Honda Motor Co., Inc.

FUNCTION CONTROL MOTOR MALFUNCTION

NOTE: Before beginning trouble shooting procedures, check function motor links and doors for binding or sticking.

1) Check fuse No. 9 (15-amp) in underdash fuse/relay box.

Replace fuse if faulty. If fuse is okay, disconnect 8-pin connector from function control motor. Turn ignition on.

2) Switch control panel function control back and forth several times from fresh to recirculation modes. If recirculation control motor runs, go to step 5). If recirculation control motor does not run, turn ignition off. Disconnect function control motor 8-pin connector.

3) Turn ignition on. Check voltage between Black/Yellow wire terminal and ground. If battery voltage is present, go to next step. If battery voltage is not present, repair open in Black/Yellow wire between underdash fuse/relay box and function control motor.

4) Turn ignition off. Remove radio/cassette player. Disconnect 16-pin heater control panel. Check continuity in Black wire between heater control panel and ground. If continuity exists, replace heater control panel. If continuity does not exist, check for open in Black wire between heater control panel and ground. If wire is okay, check for poor ground connection.

5) Turn ignition off. Disconnect function control motor 8-pin connector. Turn ignition on. Check for battery voltage at Black/Yellow wire terminal of function control motor harness connector and ground. If battery voltage exists, go to next step. If battery voltage does not exist, repair open in Black/Yellow wire between function control motor and underdash fuse/relay box. See WIRING DIAGRAM.

6) Turn ignition off. Perform test on function control motor. See FUNCTION CONTROL MOTOR under TESTING. Replace motor if faulty. If motor is okay, remove radio/cassette player. Disconnect 16-pin heater control panel.

7) Using an ohmmeter, check for continuity between Brown/White, Blue, Blue/Red, Yellow/Green, Light Green/White and Light Green/Red wires between function control motor harness connector and body ground. If continuity does not exist, go to next step. If continuity exists, repair short in affected wire(s).

8) Check for continuity in Brown/White, Blue, Blue/Red, Yellow/Green and Light Green/White wires in harness from control panel connector to function control motor harness connector. If continuity does not exist, repair open in affected wire. If continuity does exist, replace heater control panel.

RECIRCULATION CONTROL MOTOR MALFUNCTION

1) Check fuse No. 9 (15-amp), in underdash fuse/relay box. If fuse is okay, turn ignition on. Switch controls between the different ventilation modes (VENT, HEAT, etc.). Observe if recirculation control motor operates. If motor operates, go to step 4). If motor does not operate, go to next step.

2) Turn ignition off. disconnect 4-pin recirculation motor connector. Turn ignition on. Check for battery voltage between Black/Yellow wire and body ground. If battery voltage is present,

to next step. If battery voltage is not present, repair open in Black/Yellow wire between motor and fuse box.

3) Turn ignition off. Remove radio/cassette player. Disconnect 16-pin heater control panel harness connector. Check continuity in Black wire between heater control panel and ground. If continuity exists, replace heater control panel. If continuity does not exist, repair open in Black wire between heater control and ground.

4) Turn ignition off. Disconnect 4-pin recirculation control motor connector. Turn ignition on. Measure voltage between Black/Yellow wire terminal and ground. If voltage exists, go to next step. If voltage does not exist, check open in Black/Yellow wire between underdash fuse/relay box and recirculation control motor.

5) Turn ignition off. Test recirculation control motor. See RECIRCULATION CONTROL MOTOR under TESTING. Ensure recirculation control linkage and doors operate smoothly. Replace motor if faulty. If motor is okay, go to next step.

6) Remove radio/cassette player. Disconnect 16-pin heater control panel connector. Check continuity in Green/White and Green/Red wires between recirculation control motor and ground. If continuity does not exist, go to next step. If continuity exists, check for short in Green/White or Green/Red wires between recirculation control motor and heater control panel.

7) Check Green/White and Green/Red wires for battery voltage. If battery voltage is not present, go to next step. If battery voltage is present, check for short in Black/Yellow wire between recirculation control motor and heater control panel.

8) Check continuity in Green/White and Green/Red wires between recirculation control motor and heater control panel. If continuity exists, replace heater control panel. If continuity does not exist, check for open circuit in Green/White or Green/Red wires between recirculation control motor and heater control panel.

TESTING

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in appropriate AIR BAG RESTRAINT SYSTEM article in ACCESSORIES & ELECTRICAL section.

BLOWER MOTOR RELAY

Remove relay from underdash fuse/relay box. Connect 12-volt battery to terminals No. 3 and 4. See Fig. 4. Using ohmmeter, ensure continuity is present between terminals No. 1 and 2. Disconnect battery, and ensure continuity is no longer present between terminals

No. 1 and 2.

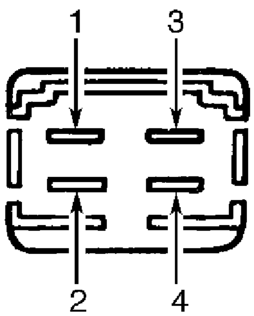

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Fig. 4: Blower Motor Relay Terminal ID (Accord Shown; Others Similar)
Courtesy of American Honda Motor Co., Inc.

FAN SWITCH

Check for continuity between specified terminals of fan switch. See FAN SWITCH CONTINUITY table. SeeFig. 5. If continuity is not present, replace fan switch.

FAN SWITCH CONTINUITY TABLE

Switch Position	Continuity Between Terminals
Low	1 & 3; 3 & 4
Medium-Low	1 & 3; 3 & 5
Medium-High	1 & 3; 3 & 6
High	1 & 2; 2 & 3

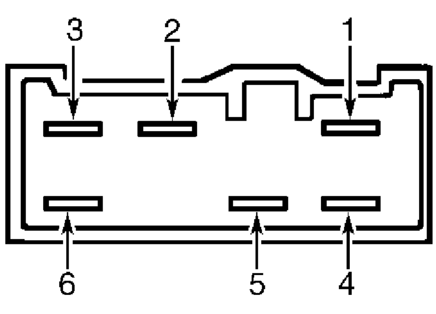

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Fig. 5: Fan Switch Connector Terminal ID
Courtesy of American Honda Motor Co., Inc.

AIR SOURCE SELECT SWITCH (FRESH & RECIRCULATED AIR)

Check for continuity between specified terminals. See AIR SOURCE SELECT SWITCH CONTINUITY table. SeeFig. 6. If continuity is not present, replace switch.

AIR SOURCE SELECT SWITCH CONTINUITY TABLE

Switch Position	Continuity Between Terminals
Fresh Air	"B" & "C"
Recirculation	"A" & "C"

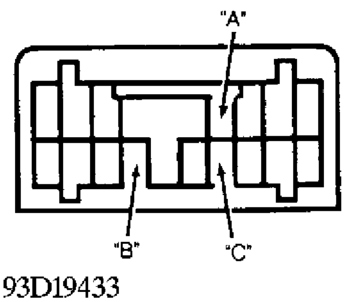

Fig. 6: Fresh & Recirculated Air Switch Connector Terminal ID
Courtesy of American Honda Motor Co., Inc.

FUNCTION CONTROL SWITCH

Check for continuity between specified terminals of function control switch. See FUNCTION CONTROL SWITCH CONTINUITY table. See Fig. 7. If continuity is not present, replace switch.

FUNCTION CONTROL SWITCH CONTINUITY TABLE

Switch Position	Continuity Between Terminals
Vent	13 & 7
Heat	13 & 15
Heat/Defrost	13 & 14
Defrost	13 & 3
Heat/Vent	13 & 16

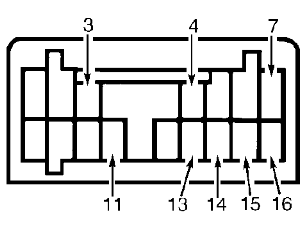

Fig. 7: Function Control Switch Terminal ID
Courtesy of American Honda Motor Co., Inc.

FUNCTION CONTROL MOTOR

1) Disconnect function control motor 8-pin connector. Connect jumper wires from battery positive terminal to terminal No. 1 of connector. Connect terminal No. 2 of connector to battery negative terminal. See Fig. 8.

2) Using a jumper wire, connect terminal No. 2 to terminals No. 3, 4, 5, 6 and 7 in order. Motor should operate as each terminal is connected to terminal No. 2. If motor fails to operate at any terminal, retest particular terminal after testing others. If motor fails to operate again, replace motor.

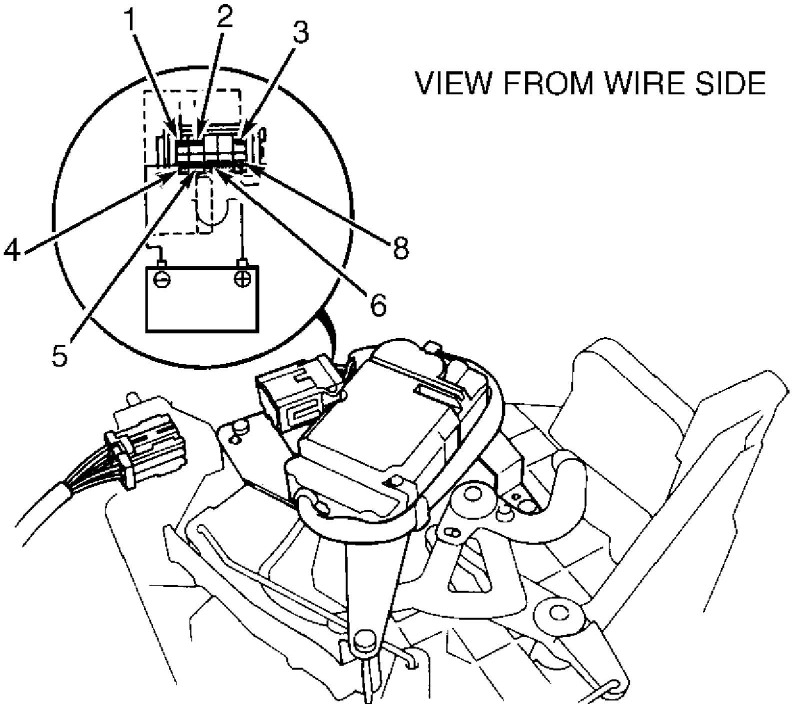

Fig. 8: Function Control Motor Connector Terminal ID
Courtesy of American Honda Motor Co., Inc.

RECIRCULATION CONTROL MOTOR

1) Turn ignition off. Disconnect 3-pin connector at recirculation motor. Connect battery positive terminal to terminal No. 1 (Black/Yellow wire) of recirculation control motor. SeeFig. 9.

2) Alternately connect terminals No. 2 and 3 (Green/White and Green/Red wires) to battery negative terminal. Motor should move to fresh air position and then to recirculation position. If motor does not operate as indicated, replace recirculation control motor.

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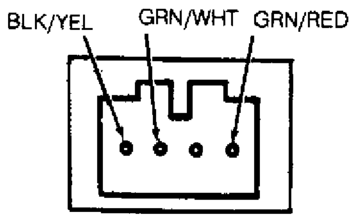

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Fig. 9: Recirculation Control Motor Connector Terminal ID
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in appropriate AIR BAG RESTRAINT SYSTEM article in ACCESSORIES & ELECTRICAL section.

BLOWER MOTOR

Removal

Disconnect negative battery cable. Disconnect wire connectors from blower fan motor. Remove 3 bolts and lower blower fan motor.

Installation

To install, reverse removal procedure. Check for air leaks at blower.

INSTRUMENT PANEL

NOTE: Radio may have a coded theft protection circuit. Ensure code is available before disconnecting battery, removing No. 43 (10-amp) fuse or removing radio.

Removal

1) Disable air bag system. Disconnect negative battery cable. Remove seat track covers and remove 4 track bolts from each seat. Disconnect electrical connectors and remove seats.

2) Wrap gearshift lever with clean shop towel. On manual transmission models, remove gearshift lever knob. On all models, remove screws and remove front console from vehicle.

3) Remove screws from center panel/radio assembly and pull outward. Disconnect electrical connectors from center panel/radio assembly.

4) Open glove box, and remove glove box screws and glove box.

Remove lower dash access cover and remove screws for lower instrument panel cover. Remove knee bolster under steering column.

5) Remove A/C duct under steering column. Remove upper and lower steering column covers. Remove nuts and bolts supporting steering column and lower column from dash area. Wrap steering column with shop towels to prevent damage during dash removal.

6) On 4-wheel steering models, ensure Supplemental Restraint short connector is installed on passenger-side air bag inflator connector before disconnecting air bag wire harness. Remove passenger-side air bag.

7) Remove bolt access panels on both side of dash. Disconnect electrical connectors and heater control cable. SeeFig. 10. Use protective tape on front pillars to protect dash during removal and installation. Remove 6 dash bolts. Lift and remove dash. Use care not to scratch or damage dash during removal.

Installation

To install, reverse removal procedure. Ensure electrical harness and heater control cable are not pinched when installing instrument panel.

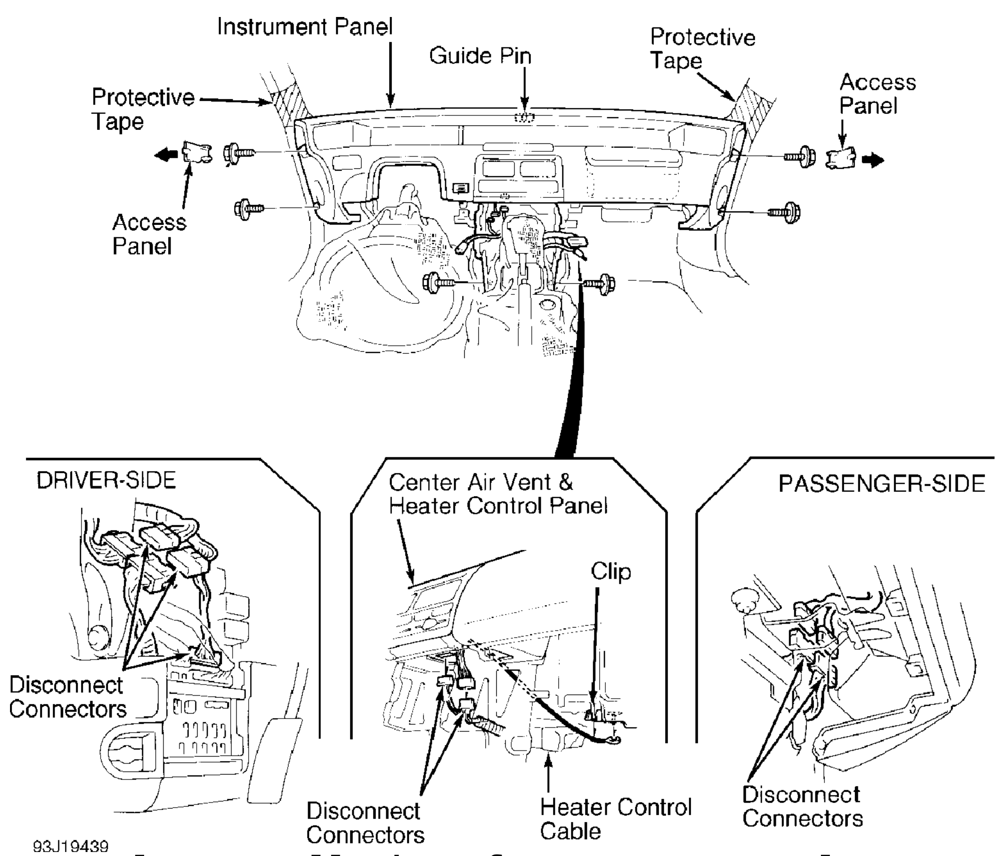

Fig. 10: Removal & Installation Of Instrument Panel
Courtesy of American Honda Motor Co., Inc.

HEATER CONTROL PANEL

NOTE: Radio may have a coded theft protection circuit. Ensure code is available before disconnecting battery, removing fuse No. 43, or removing radio.

Removal

1) Wrap gearshift lever with clean shop towel. On manual transmission models, remove gearshift lever knob.

2) On all models, remove screws and remove front console from vehicle. Remove screws from center panel/radio assembly and pull outward. Disconnect electrical connectors from center panel/radio assembly.

3) Disconnect air mix cable at heater box. Remove 3 screws and heater control panel/air vent assembly. Disconnect electrical connections as necessary.

Installation

To install, reverse removal procedure. Check cable adjustments. See ADJUSTMENTS.

HEATER ASSEMBLY & HEATER CORE

Removal

1) Drain radiator coolant. Place drip pan under heater hoses, and disconnect heater hoses at heater. Disconnect heater valve cable from heater valve.

2) Remove instrument panel. See INSTRUMENT PANEL under REMOVAL & INSTALLATION. Remove heater duct. Remove lower heater assembly nuts from inside engine compartment. Remove top heater assembly bolts.

3) Disconnect wiring harness from function control motor. Pull heater assembly away from body, and remove heater assembly. Remove heater core cover screws, and remove heater core.

Installation

To install, reverse removal procedure. Apply sealant to grommets. DO NOT interchange inlet and outlet heater hoses. Secure hose clamps. Loosen radiator bolt. Refill radiator and reservoir tank with coolant. Tighten bleed bolt after trapped air has escaped. Check cable adjustments. See ADJUSTMENTS.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

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Application	Ft. Lbs. (N.m)

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```
Heater Assembly Nut  .............................  16 (22)
Steering Column
  8-mm Bolt  ......................................  16 (22)
  8-mm Nut (Use New)  .............................  12 (16)
  10-mm Bolt  .....................................  29 (39)

                                              INCH Lbs. (N.m)

Blower Motor Bolt/Nut  ............................  89 (10)
Instrument Panel Bolt  ............................  89 (10)
Heater Assembly Bolt  .............................  89 (10)
Knee Bolster Bolt  ................................  89 (10)
Passenger-Side Air Bag Bracket Nut  ...............  89 (10)
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WIRING DIAGRAMS

HEATER SYS

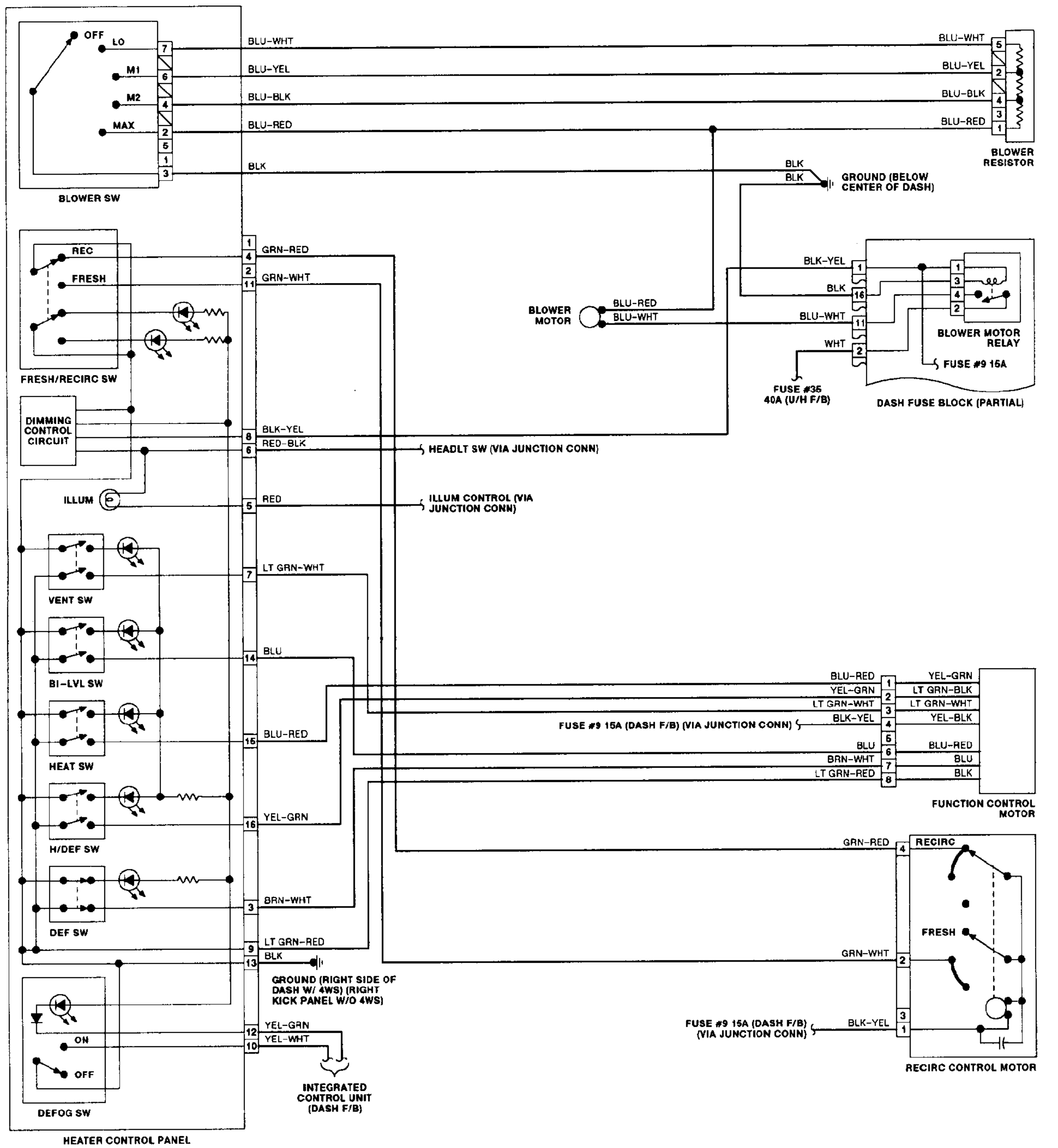

Fig. 11: Heater System Wiring Diagram

END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION
Using Wiring Diagrams

All Models

INTRODUCTION

Mitchell obtains wiring diagrams and technical service bulletins, containing wiring diagram changes from the domestic and import manufacturers. These are checked for accuracy and are all redrawn into a consistent format for easy use.

In the past, when cars were simpler, diagrams were simpler. All components were connected by wires and diagrams seldom exceeded 4 pages in length. Today, some wiring diagrams require more than 16 pages. It would be impractical to expect a service technician to trace a wire from page 1 across every page to page 16.

Removing some of the wiring maze reduces eyestrain and time wasted searching across several pages. Today the majority of Mitchell diagrams follow a much improved format, which permits space for internal switch details.

Wiring diagrams are drawn in a "top-down" format. The diagrams are drawn with the power source at the top of the diagram and the ground point at the bottom of the diagram. Components locations are identified on the wiring diagrams. Any wires that don't connect directly to a component are identified on the diagram to indicate where they go.

COLOR ABBREVIATIONS

COLOR ABBREVIATIONS TABLE

Color	Normal	Optional
Black	BLK	BK
Blue	BLU	BU
Brown	BRN	BN
Clear	CLR	CR
Dark Blue	DK BLU	DK BU
Dark Green	DK GRN	DK GN
Green	GRN	GN
Gray	GRY	GY
Light Blue	LT BLU	LT BU
Light Green	LT GRN	LT GN
Orange	ORG	OG

Pink	PNK	PK
Purple	PPL	PL
Red	RED	RD
Tan	TAN	TN
Violet	VIO	VI
White	WHT	WT
Yellow	YEL	YL

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IDENTIFYING WIRING DIAGRAM ABBREVIATIONS

NOTE: Abbreviations used on Mitchell diagrams are normally self-explanatory. If necessary see ABBREVIATIONS article in GENERAL INFORMATION.

IDENTIFYING WIRING DIAGRAM SYMBOLS

NOTE: Standard wiring symbol are used in Mitchell diagrams. The illustration below will help clarify any symbols that are not easily understood at a glance. Most components are labeled "Motor", "Switch" or "Relay" in addition to being drawn with the standard symbol.

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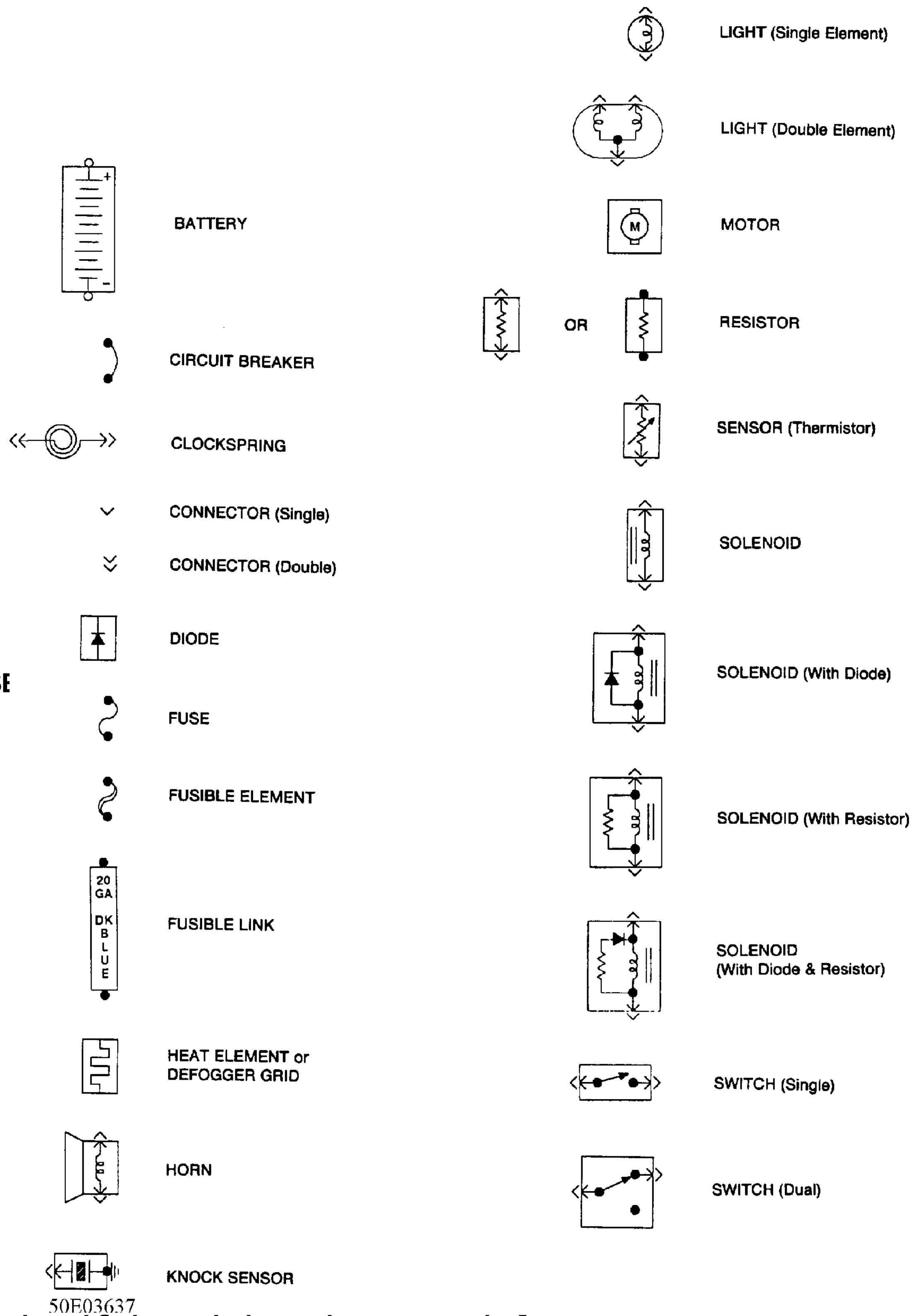

Fig. 1: Identifying Wiring Diagram Symbols

WIRING DIAGRAM COMPONENT LOCATIONS

When trying to locate a component in a wiring diagram and you don't know the specific system where it is located, use this handy component locator to find the system wiring diagram in which the component is located. Then, go to that system and locate the component within the wiring diagram.

For example, if you don't know the specific system in which the ignition switch is located, look up ignition switch in the wiring diagram component location tables and go to the appropriate wiring diagram(s) which contain either full or partial views of the ignition switch. The full view of the ignition switch is located in Power Distribution.

The first listing for the component will be the full or most complete view of the component. Additional listings will be partial views of the component. Not all components are used on all models.

All components will have a partial view in Ground Distribution and Power Distribution. Data Link Connectors show connecting circuits between modules. Alternate names for components may be listed in wiring diagram component locations tables.

WIRING DIAGRAM COMPONENT LOCATIONS TABLE

Component	Wiring Diagram
ABS Electronic Control Unit	Anti-Lock Brakes
	Data Link Connectors
ABS Hydraulic Unit	Anti-Lock Brakes
Acceleration Sensor	Anti-Lock Brakes
Accessory Delay Relay	Power Windows
A/C Compressor Clutch Relay	Engine Performance
A/C Sensor	Engine Performance
A/C Pressure Switch	Engine Performance
Adaptive Lamp Control Module	Exterior Lights
Air Bag(s)	Air Bag Restraint System
Air Bag Module	Air Bag Restraint System
Air Bag Sensor(s)	Air Bag Restraint System
Air Injection Pump Relay	Engine Performance
Air Temperature Sensor	Overhead Console
Alternator (Generator)	Generators & Regulators
Anti-Theft Control Module	Anti-Theft System
	Starters
Autolamp Control Relay	Headlight Systems
	Daytime Running Lights
Automatic Shutdown (ASD) Relay	Engine Performance
	Generators & Regulators
Autostick Switch	Engine Performance
Auxiliary Battery Relay	Generators & Regulators
Back-Up Lights	Back-Up Lights

HOW TO

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END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda System & Component Testing

Accord, Civic, Civic Del Sol, Prelude

NOTE: For testing and diagnosis of Civic Variable Valve Timing (VTEC) system, see CODE 21 and CODE 22 charts in G - TESTS W/ CODES article in the ENGINE PERFORMANCE Section.

INTRODUCTION

NOTE: Perform all voltage tests using a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure. Testing individual components does not isolate shorts or opens. Use ohmmeter to isolate wiring harness shorts or opens.

Before testing separate components or systems, perform procedures in F - BASIC TESTING article in the ENGINE PERFORMANCE Section. Since many computer-controlled and monitored components set trouble codes if they malfunction, also perform procedures in G - TESTS W/ CODES article in the ENGINE PERFORMANCE Section.

AIR INDUCTION SYSTEMS

AIR INTAKE SYSTEM

NOTE: DO NOT adjust by-pass valve full-close screw. Adjustment is preset at factory.

Intake Air By-Pass (IAB) Valve (Accord F22A6 & Prelude 2.3L)

1) Check valve shaft for binding and sticking. Check valve for smooth movement. Ensure tab on valve contacts stopper when valve is fully open. See Fig. 1.

2) Ensure tab of by-pass valve contacts full-close screw when valve is fully closed. If any fault is found, clean linkage and shafts using carburetor cleaner. If problem still exists after cleaning, disassemble intake manifold and inspect by-pass valve.

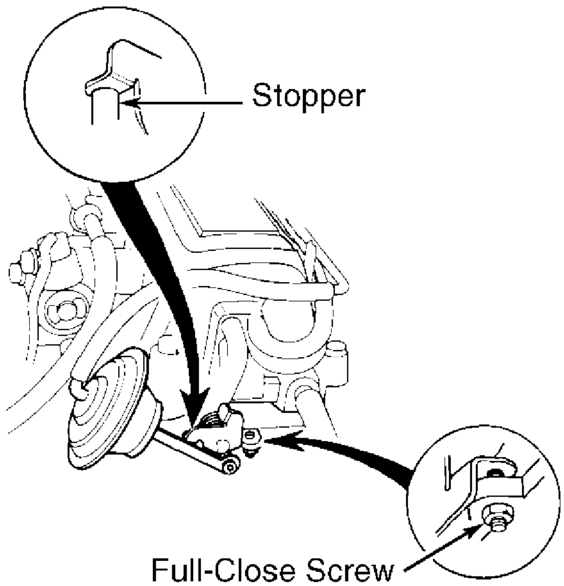


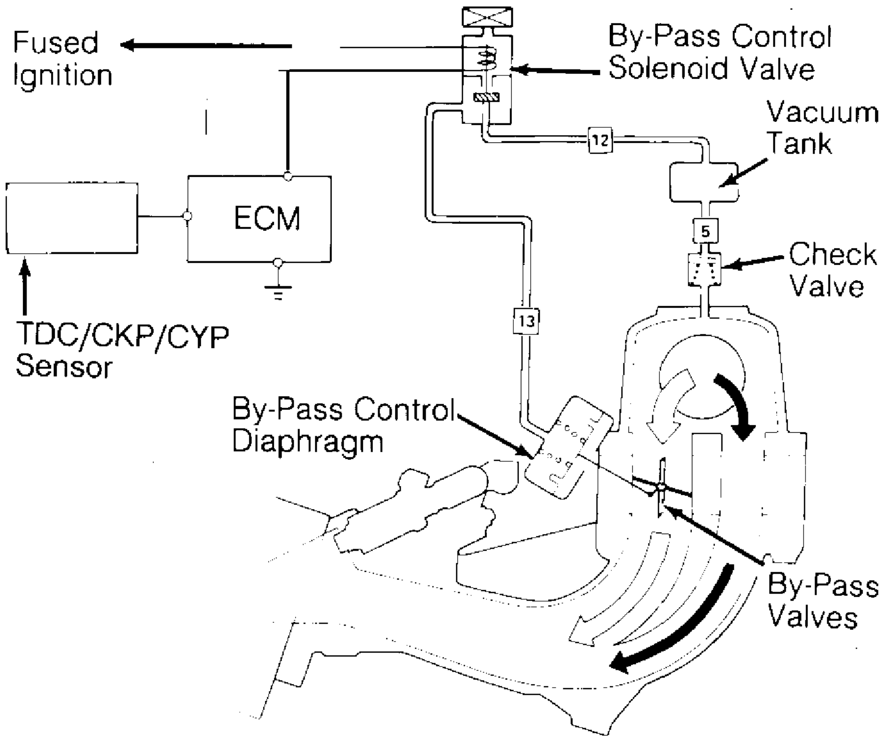
Fig. 1: Intake Air By-Pass Valve Linkage ID (Prelude Shown; Accord F22A6 Similar)
Courtesy of American Honda Motor Co., Inc.

IAB Control Solenoid Valve (Accord F22A6 & Prelude 2.3L)

Start and idle engine. Remove vacuum hose No. 13 from by-pass control diaphragm. See Fig. 2. Connect vacuum gauge to hose. If vacuum exists, go to next step. If vacuum does not exist, remove vacuum hose No. 12 from vacuum tank. Check for vacuum. If vacuum exists, go to step 3). If vacuum does not exist, repair blockage or leak between vacuum tank and intake manifold. Retest system.

2) Increase engine speed to 5000 RPM. Check for vacuum at hose No. 13. If vacuum does not exist, solenoid is okay. If vacuum exists, unplug connector at solenoid. Check for vacuum again. If vacuum still exists, replace solenoid valve. If vacuum no longer exists, solenoid valve is okay.

3) If vacuum existed in step 1), unplug connector at solenoid. Measure voltage between Black/Yellow (positive) wire terminal and Pink or Blue/Pink (negative) wire terminal. If battery voltage exists, replace by-pass control solenoid valve. If battery voltage does not exist, check continuity of harness wiring to solenoid valve.



Note: Boxes containing numbers indicate vacuum hose identification numbers, not components.

93H79050

Fig. 2: By-Pass Control System ID (Accord F22A6 & Prelude 2.3L)
Courtesy of American Honda Motor Co., Inc.

Intake Control Diaphragm (Accord & Prelude)

Connect vacuum pump to vacuum hose on intake control diaphragm. Apply vacuum. If diaphragm holds vacuum, intake diaphragm is okay. If vacuum does not hold, inspect vacuum line for improper connection and disconnected hose. If hose is okay, replace intake control diaphragm.

Intake Control Solenoid Valve (Accord & Prelude)

1) Start and idle engine. Remove upper vacuum hose from intake control solenoid valve, located at top of engine, on left side. Connect vacuum gauge to solenoid valve. If vacuum does not exist, go to step 2). If vacuum exists, increase engine speed to 3700 RPM (4200 RPM for Prelude). If vacuum still exists, go to step 4). If vacuum no longer exists, solenoid valve is okay.

2) Disconnect lower vacuum hose of solenoid valve from air chamber. Connect vacuum gauge. If vacuum exists, go to next step. If vacuum does not exist, inspect vacuum line for improper connection, cracks and blockage in hose. If vacuum line is okay, clean manifold port.

3) Unplug connector from intake control solenoid valve.

Measure voltage between Black/Yellow and White wire terminals. If battery voltage does not exist, solenoid valve is okay. If battery voltage exists, replace intake control solenoid valve.

4) If vacuum existed in step 2), unplug connector from solenoid valve. If vacuum no longer exists, solenoid valve is okay. If vacuum still exists, replace solenoid valve.

COMPUTERIZED ENGINE CONTROLS

ENGINE CONTROL MODULE (ECM)

Ground Circuits

1) Measure resistance to ground at appropriate ECM ground terminals. See POWER & GROUND CIRCUITS TERMINAL IDENTIFICATION table. See Fig. 3. Resistance should be zero ohms for each circuit. If resistance is not zero ohms, repair open to ground.

2) Connect negative lead of DVOM to a good ground. Connect positive lead to each ground terminal. With engine running, voltmeter should indicate less than 0.1 volt. If voltage is greater than 0.1 volt, check for open, corrosion, or loose connection on ground lead.

Power Circuits

1) Check for battery voltage between ECM power terminal and ground. See POWER & GROUND CIRCUITS TERMINAL IDENTIFICATION table. See Fig. 3. If battery voltage does not exist, check appropriate ECM fuse in underhood fuse box. See ECM POWER CIRCUITS FUSE IDENTIFICATION table. If fuse is okay, check for an open in wire between underhood fuse box and appropriate ECM power circuit terminal.

2) Turn ignition on. Check for battery voltage between appropriate ECM power circuit terminal and ground. See POWER & GROUND CIRCUITS TERMINAL IDENTIFICATION table. If battery voltage does not exist, check appropriate fuse in underhood fuse box. See ECM POWER CIRCUITS FUSE IDENTIFICATION table. If fuse is okay, check for an open in wire between fuse box and appropriate ECM power circuit terminal and check for a defective ignition switch.

POWER & GROUND CIRCUITS TERMINAL IDENTIFICATION TABLE

Application	(1) ECM Terminal
Ground Circuits	A23, A24, A26 & B2
Power Circuits	
Ignition Switch In OFF Position	D1
Ignition Switch In ON Position	A25 & B1

(1) - For terminal location, see Fig. 3.

ECM POWER CIRCUITS FUSE IDENTIFICATION TABLE

Application	Fuse
Accord, Civic & Civic Del Sol	
Ignition Switch In OFF Position	BACK-UP
Ignition Switch In ON Position	ECM
Prelude	
Ignition Switch In OFF Position	CLOCK
Ignition Switch In ON Position	BACK-UP

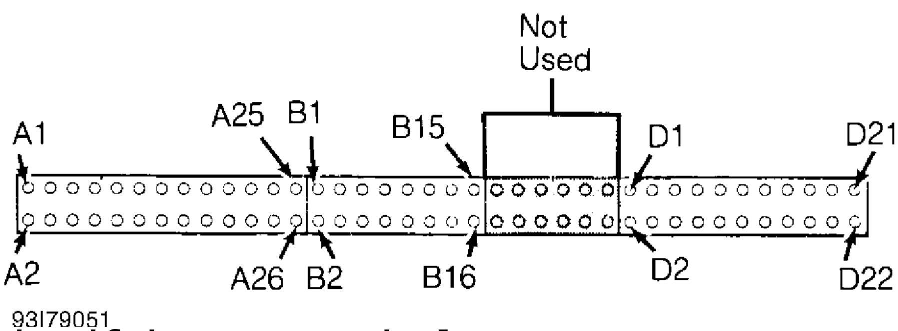


Fig. 3: Identifying ECM Terminals
Courtesy of American Honda Motor Co., Inc.

ENGINE SENSORS & SWITCHES

NOTE: Some test procedures require Test Harness (07LAJ-PT3010A) when testing certain components or systems. SeeFig. 4. Connect test harness between control unit and main wiring harness connectors.

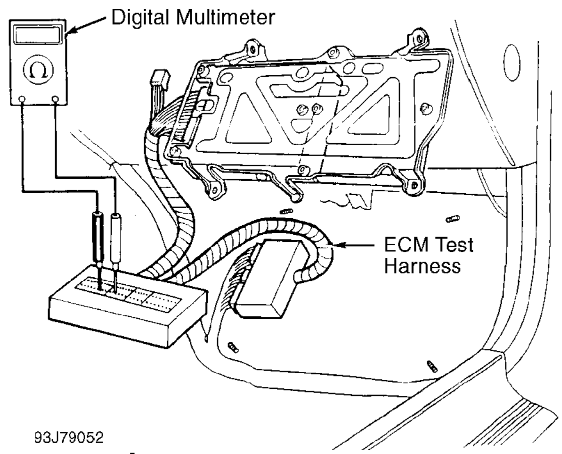


Fig. 4: Connecting Test Harness
Courtesy of American Honda Motor Co., Inc.

AIR CONDITIONING (A/C) SIGNAL SWITCH

Voltage Test

1) Connect test harness between ECM and main wiring harness. See Fig. 4. Unplug connector "B" from main harness, but not from ECM. Turn ignition on. Measure voltage between terminals A26 and B5. See Fig. 3.

2) If voltage is about 5 volts, go to step 3). If voltage is not as about 5 ohms, substitute known good ECM and retest system. If voltage is now about 5 ohms, replace ECM. If voltage is still not about 5 ohms, check and repair wiring between A/C switch and ECM. See L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

3) Turn ignition off. Reconnect main harness. Turn ignition on. Momentarily connect ECM terminals A15 and A26 together. If A/C clutch does not click, go to next step. If clutch clicks, start engine and turn A/C on. If A/C operates, A/C signal exists. If A/C does not operate, go to step 5).

4) Using jumper, connect Red/Blue wire from A/C compressor control unit to chassis ground. See L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section. If A/C clutch clicks, repair open circuit between ECM and A/C compressor control unit. If clutch does not click, repair A/C system. See appropriate MITCHELL(R) AIR CONDITIONING & HEATING SERVICE & REPAIR manual.

5) With engine running and A/C on, measure voltage between terminals A26 and B5. If voltage is less than one volt, substitute a known good ECM. If A/C now functions, replace ECM. If voltage is greater than one volt, repair open circuit between ECM and A/C switch. See L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

BAROMETRIC PRESSURE (BARO) SENSOR

Barometric pressure (BARO) sensor is built into ECM. See G - TESTS W/ CODES article in the ENGINE PERFORMANCE Section for testing.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Resistance Test

Start engine, and warm it to normal operating temperature. Unplug sensor connector. Sensor is located on front of engine, near distributor. Measure resistance between sensor terminals. If resistance is not 200-400 ohms, replace sensor.

EGR VALVE LIFT SENSOR

See EMISSION SYSTEMS & SUB-SYSTEMS.

HEATED OXYGEN (O2) SENSOR

NOTE: Heated oxygen sensor is also know as HO2S. Civic D15B8 uses non-heated oxygen sensor. See OXYGEN (O2) SENSOR.

Accord, Civic D15B7 & D16Z6, Civic Del Sol, & Prelude

1) Unplug connector at O2 sensor. Sensor is threaded into exhaust manifold or exhaust pipe. Measure resistance between terminals "A" and "B" of sensor connector. See Fig. 5 or 6. If resistance is 15-40 ohms, go to next step. If resistance is not 15-40 ohms, replace O2 sensor.

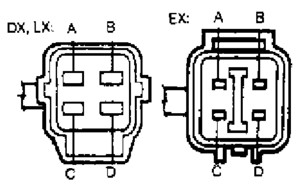


Fig. 5: Identifying Heated O2 Sensor Terminals (Accord)
Courtesy of American Honda Motor Co., Inc.

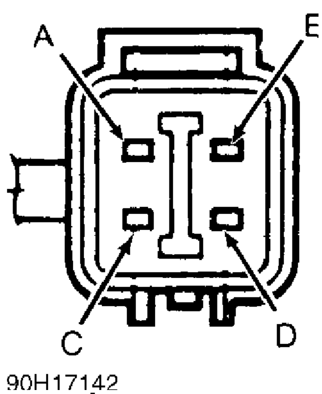


Fig. 6: Heated O2 Sensor Term. ID (Civic D15B7 & D16Z6, Civic Del Sol, & Prelude)
Courtesy of American Honda Motor Co., Inc.

2) Check for continuity to ground at sensor terminals "C" and "D". If continuity exists, replace O2 sensor. If continuity does not exist, go to next step.

3) Check for continuity between terminals "A" and "D" and between terminals "B" and "D". If continuity exists in either case, replace O2 sensor. If continuity does not exist, go to next step.

4) Turn ignition on. Measure voltage between Yellow/Black and Orange/Black wires at sensor connector. If battery voltage does not exist, go to next step. If battery voltage exists, go to step 7).

5) Measure voltage between Yellow/Black wire at connector and body ground. If battery voltage exists, go to next step. If battery voltage does not exist, repair open in Yellow/Black wire between sensor and main relay.

6) Turn ignition off. Reconnect wiring to sensor. Connect test harness connector "A" to main wiring harness only, not to ECM. Turn ignition on. Measure voltage between terminals A6 and A23. If battery voltage does not exist, repair open in Orange/Black wire between ECM and main relay. If battery voltage exists, replace ECM and retest system.

7) Unplug connector "A" from ECM. Measure voltage between Yellow/Black and Orange/Black wires at sensor connector. If battery voltage does not exist, go to next step. If battery voltage exists, repair short to voltage in Orange/Black wire between sensor and ECM.

8) Reconnect wiring to sensor. Connect test harness connector "A" to main wiring harness only, not to ECM. Connect ammeter between terminals A6 and A26. Monitor current for at least 5 minutes. If current is not less than 0.1 amp, temporarily substitute known good ECM. Retest system. If current is less than 0.1 amp, replace sensor.

Civic (D15Z1)

1) Turn ignition off. Connect test harness between ECM and main harness. See Fig. 4. Wait at least 3 minutes. Turn ignition on. Measure voltage between terminals D8 and D22. SeeFig. 3. If voltage is greater than 0.5 volt, go to next step. If voltage is not greater than 0.5 volt, check White/Blue wire between sensor and ECM for shorts. If wiring is okay, go to next step.

2) If voltage is greater than 5.0 volts, go to next step. If voltage is not greater than 5.0 volts, go to step 7).

3) Measure voltage between terminals D16 and D22. If voltage is greater than 0.5 volt, go to next step. If voltage is not greater than 0.5 volt, check Blue/Green wire between sensor and ECM for shorts.

4) If voltage between terminals D3 and D22 is 0.3-4.9 volts, go to next step. If voltage is not 0.3-4.9 volts, go to step 8).

5) Start engine, and warm it until radiator fan comes on. Measure voltage between terminals D16 and D22. If voltage is 2.6-2.8 volts, go to next step. If voltage is not 2.6-2.8 volts, go to step 9).

6) Measure voltage between terminals D14 and D22. If voltage is greater than 0.4 volt, replace ECM and retest system. If voltage is not greater than 0.4 volt, repair short in Orange/Blue wire between sensor and ECM.

7) Unplug connector from sensor. Sensor is threaded into exhaust manifold. Measure voltage between terminals D8 and D22. If voltage is greater than 5 volts, replace sensor. If voltage is not greater than 5 volts, replace ECM and retest system.

8) Turn ignition off. Unplug connector from sensor. Sensor is threaded into exhaust manifold. Turn ignition on. Measure voltage between White wire on harness connector and ground. If voltage is about 5 volts, replace sensor. If voltage is not about 5 ohms, repair open in White or Blue/Yellow wire between sensor and ECM.

9) Measure voltage between terminals D8 and D22. If voltage is less than 2.8 volts, replace ECM and retest system. If voltage is not less than 2.8 volts, repair open in White/Blue or Green/White wire between sensor and ECM.

INTAKE AIR TEMPERATURE (IAT) SENSOR

Resistance Test

Unplug sensor connector. On Accord and Prelude, sensor is located at top of engine, on left side. On Civic and Civic Del Sol, sensor is located on rear side of engine, near center. Measure resistance between sensor terminals. Resistance should be as specified. See INTAKE AIR TEMPERATURE (IAT) SENSOR RESISTANCE table. If resistance is not within specification, replace sensor.

INTAKE AIR TEMPERATURE (IAT) SENSOR RESISTANCE

Temperature oF (oC)	Resistance (Ohms)
-4 (-20)	15,000-18,000
68 (20)	1000-4000
176 (80)	200-400

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Voltage Test

1) Connect test harness between ECM and main harness. See Fig. 4. Turn ignition on. Measure voltage between terminals D19 and D21. See Fig. 3.

2) If voltage is about 5 volts, go to next step. If voltage is not about 5 volts, check wiring between sensor and ECM for continuity or shorts. If wiring is okay, replace MAP sensor.

3) Connect vacuum pump to MAP sensor. On Accord and Prelude, MAP sensor is located at top center of firewall. On Civic and Civic Del Sol, MAP sensor is located near throttle body. Apply vacuum. If MAP sensor does not hold vacuum, replace sensor.

OXYGEN (O2) SENSOR

NOTE: All models except Civic D15B8 use heated oxygen sensor. See HEATED OXYGEN (O2) SENSOR.

Civic (D15B8)

1) Turn ignition off. Connect test harness between ECM and vehicle wiring harness. See Fig. 4. Wait at least 2 minutes. Connect jumper between test harness terminals A6 and A26. Connect DVOM between

terminals A26 and D14. Turn ignition on. Immediately observe DVOM. Voltage should be 0.4-0.5 volt and decrease to 0.1 volt or less within 2 minutes. If voltage is not as specified, go to next step. If voltage is as specified, go to step 3).

2) Unplug connector from O2 sensor, threaded into exhaust manifold. Measure voltage at harness connector White and Green/White wires. If voltage is greater than 0.1 volt, replace O2 sensor. If voltage is not greater than 0.1 volt, repair open in White or Green/White wire between ECM and O2 sensor.

3) Unplug connector from O2 sensor, threaded into exhaust manifold. Measure voltage at harness connector White and Green/White wires. If voltage is not greater than 0.1 volt, go to next step. If voltage is greater than 0.1 volt, replace O2 sensor.

4) Unplug connector "D" from main wiring harness. Measure voltage between terminals A26 and D14. If voltage is greater than 0.1 volt, repair short to voltage in White wire between ECM and O2 sensor. If voltage is not greater than 0.1 volt, replace ECM and retest system.

POWER STEERING PRESSURE (PSP) SWITCH

1) Connect test harness between ECM and wiring harness. See Fig. 4. Turn ignition on. Measure voltage between test harness terminals B8 and A26. See Fig. 3. If voltage is greater than one volt, go to next step. If voltage is not greater than one volt, go to step 4).

2) Unplug connector on PSP switch. Switch is located on steering gear. On Accord, Civic and Civic Del Sol, connect jumper between Brown/Red and Black wire terminals. On Prelude, connect jumper between Red/Green and Black wire terminals.

3) On all models, check for voltage at test harness terminals A26 and B8. If voltage does not exist, replace PSP switch. If voltage exists, repair open in Brown/Red or Red/Green wire between ECM terminal B8 and PSP switch or Black wire between PSP switch and ground.

4) If voltage did not exist in step 1), start engine. Turn steering wheel slowly. Measure voltage between test harness terminals A26 and B8. If battery voltage exists, PSP signal is okay. If battery voltage does not exist, go to next step.

5) Turn ignition off. Unplug test harness connector "B" from main wiring harness only, not ECM. Turn ignition on. If battery voltage exists, go to next step. If battery voltage does not exist, replace ECM and retest system.

6) Reconnect harness connector "B" to main wiring harness. Unplug connector from PSP switch. If battery voltage exists, replace PSP switch. If battery voltage does not exist, repair short in Brown/Red or Red/Green wire between ECM terminal B8 and PSP switch.

TDC/CKP/CYP SENSOR

1) Unplug TDC/CKP/CYP sensor connector, located at distributor. Measure resistance between terminals "B" and "F". Measure resistance between terminals "C" and "G". Measure resistance between terminals "D" and "H". See Fig. 7. If resistance is 350-700 ohms for each pair, go to next step. If any measurement is not 350-370 ohms, replace distributor.

2) Check for continuity between each terminals B/F, D/H and chassis ground. If continuity exists on any terminal, replace distributor.

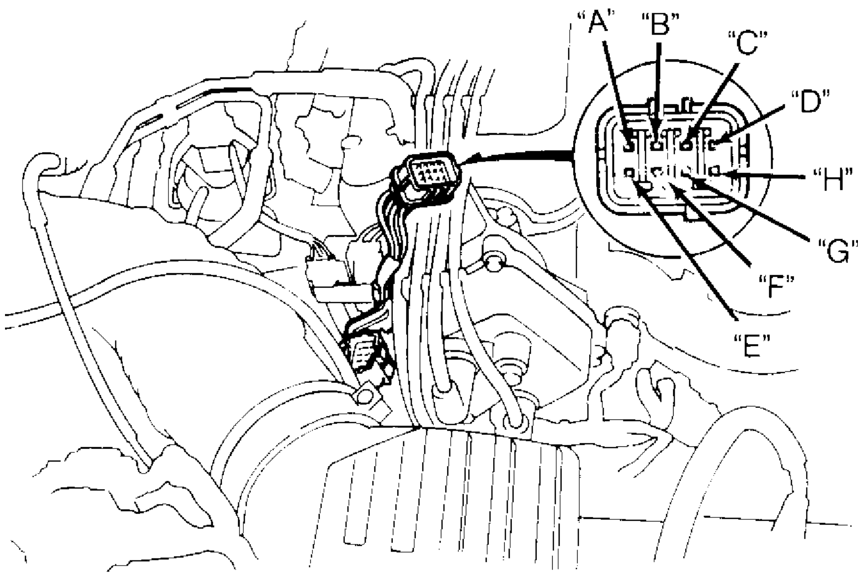


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Fig. 7: TDC/CKP/CYP Sensor Connector Term. ID (Accord Shown; Other Models Are Similar)
Courtesy of American Honda Motor Co., Inc.

THROTTLE POSITION (TP) SENSOR

1) Turn ignition off. Connect test harness between ECM and vehicle harness connector. See Fig. 4.

2) Turn ignition on. Measure voltage between test harness terminals D11 and D22. Open and close throttle while observing voltmeter. Voltage should be about 0.5 volt with throttle fully closed and 4.5 volts with throttle wide open. Voltage should change smoothly as throttle opens and closes.

3) If voltage is not as specified on Accord M/T, Civic, Civic Del Sol and Prelude M/T, replace TP sensor. If voltage is as specified, replace ECM and retest system.

4) On Accord A/T and Prelude A/T, unplug 22-pin connector from Transmission Control Module (TCM). TCM is located below center of dashboard. Measure voltage again as throttle is opened and closed. If

voltage does not change as specified in step 2), go to next step. If voltage now changes as specified, replace TCM.

5) If voltage is not as specified, check for short or open in Red/Black wire between ECM terminal D11 and TP sensor. If wire is okay, replace TP sensor. If problem still exists, see G - TESTS W CODES article in the ENGINE PERFORMANCE Section.

VEHICLE SPEED SENSOR (VSS)

1) Turn ignition off. Connect test harness between ECM and main harness connector. See Fig. 4. Raise and support front of vehicle so front wheels are free to rotate. Connect voltmeter between terminals B10 and A26. See Fig. 3.

2) Turn ignition on. Slowly rotate left front wheel. Voltage should pulse between zero and 5 volts. If voltage pulses as specified, replace ECM and retest system. If voltage does not pulse as specified, check for open or short in wiring between ECM terminal B10 and speed sensor. See L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section. If wiring is okay, replace defective VSS or ECM.

RELAYS & SOLENOIDS

RELAYS

Main Relay (PGM-FI)

1) If vehicle starts and continues to run, relay is okay. To test, remove main relay, located under left side of dash. Using jumper wires, connect terminal No. 6 to battery voltage. Connect terminal No. 8 to ground. See Fig. 8.

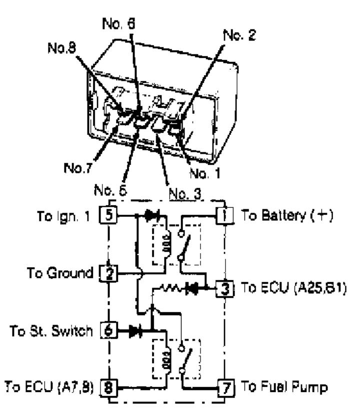

Fig. 8: Identifying PGM-FI Relay Terminals
Courtesy of American Honda Motor Co., Inc.

2) Check for continuity between relay terminals No. 5 and 7. Continuity should exist. If continuity does not exist, replace relay. Disconnect battery leads. Repeat measurement. Continuity should not

exist. If continuity is as specified, go to next step. If continuity is not as specified, replace relay.

3) Connect battery voltage to relay terminal No. 5. Connect terminal No. 2 to ground. Check for continuity between terminals No. 1 and 3. Continuity should exist. Disconnect battery leads. Repeat measurement. Continuity should not exist. If continuity is not as specified, replace relay.

4) Connect battery voltage to relay terminal No. 3. Connect terminal No. 8 to ground. Check for continuity between terminals No. 5 and 7. Disconnect battery leads. Repeat measurement. Continuity should not exist. If continuity is as specified, relay is okay. If continuity is not as specified, replace relay. If fuel pump still fails to operate, test main relay harness. See MAIN RELAY HARNESS under FUEL CONTROL under FUEL SYSTEM.

SOLENOIDS

IAB Control Solenoid (Accord F22A6 & Prelude 2.3L)

See AIR INDUCTION SYSTEMS.

Idle Air Control (IAC) Valve

See IDLE CONTROL SYSTEM.

EGR Control Solenoid Valve

See EXHAUST GAS RECIRCULATION (EGR) SYSTEM under EMISSION SYSTEMS & SUB-SYSTEMS.

Intake Air Control Solenoid Valve (Accord & Prelude)

See AIR INDUCTION SYSTEMS.

EVAP Purge Control Solenoid Valve

See FUEL EVAPORATION under EMISSION SYSTEMS & SUB-SYSTEMS.

FUEL SYSTEM

FUEL DELIVERY

NOTE: For fuel system pressure testing, see F - BASIC TESTING article in the ENGINE PERFORMANCE Section.

FUEL CONTROL

Fuel Injectors

Unplug connector at injector. Measure resistance between injector terminals. Resistance should be as specified. See FUEL INJECTOR RESISTANCE table. If resistance is not as specified, replace injector.

FUEL INJECTOR RESISTANCE TABLE

Application	Ohms
Accord & Prelude	
Injector	1.5-2.5
Injector Resistor	5.0-7.0
Civic & Civic Del Sol	
Injector (1)	10.0-13.0

(1) - Injectors have internal resistor.

Fuel Injector Resistor (Accord & Prelude)

Unplug injector resistor harness connector. Injector resistor is located over left front fenderwell on Accord and at upper left firewall on Prelude. Measure resistance between each injector resistor terminal ("B", "C", "D" and "E") and power terminal ("A"). See Fig. 9. Resistance should be 5-7 ohms for each pair of terminals. If any measurement is not as specified, replace injector resistor.

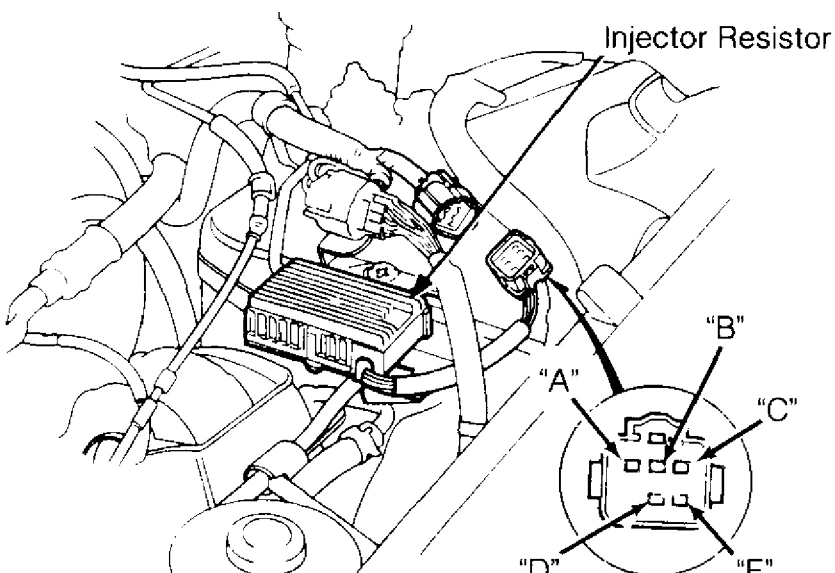

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Fig. 9: Injector Resistor Connector Term. ID (Accord Shown; Prelude Similar)
Courtesy of American Honda Motor Co., Inc.

Main Relay Harness

1) Turn ignition off. Unplug main relay harness connector. Check for continuity between connector terminal No. 2 and chassis ground. See Fig. 10. If continuity exists, go to next step. If continuity does not exist, repair open in Black wire from terminal No. 2 to ground. See L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE

Section.

2) Measure voltage between connector terminal No. 1 and body ground. If battery voltage exists, go to next step. If battery voltage does not exist, check wiring between battery and main relay and check ECM fuse in underhood relay box. Repair as necessary.

3) Turn ignition on. Measure voltage between relay connector terminal No. 5 and body ground. If battery voltage exists, go to next step. If battery voltage does not exist, check wiring from ignition switch and main relay. Check fuse No. 23 on Prelude, No. 2 on Accord, or AGC on Civic and Civic Del Sol. Check wiring from fuse box to main relay. Repair or replace as necessary.

4) Connect voltmeter to connector terminal No. 6 and body ground. Turn ignition switch to START position. If battery voltage exists, go to next step. If battery voltage does not exist, check wiring between ignition switch and main relay. Check fuse No. 9. Check wiring from fuse box to main relay. Repair or replace fuse or wiring as necessary.

5) Connect jumper between connector terminals No. 5 and 7. Turn ignition on. Fuel pump should operate. If fuel pump fails to operate, check fuel pump wiring.

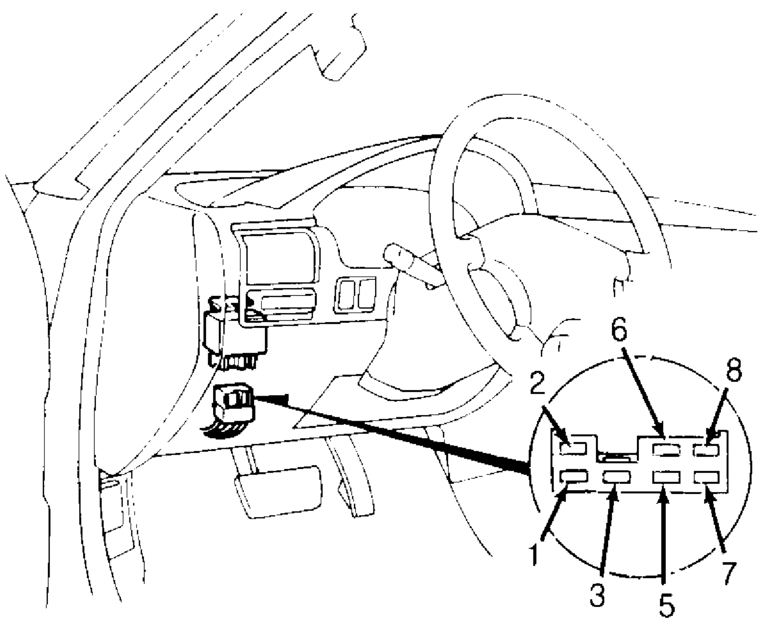

Fig. 10: Main Relay Harness Connector Term. ID (Accord Shown; Other Models Are Similar)
Courtesy of American Honda Motor Co., Inc.

IDLE CONTROL SYSTEM

Electric Load Detector

1) Connect ECM test harness between ECM and main harness. See

Fig. 4. Turn ignition on. Measure voltage between terminals D10 and A26. See Fig. 3.

2) Set headlight switch to first position. Voltage should be 1.8-2.8 volts for Accord, 2.5-3.5 volts for Civic and Civic Del Sol, and 1.5-3.0 volts for Prelude.

3) Set headlight switch to second position. Voltage should be .8-1.8 volts for Accord, 1.5-2.5 volts for Civic and Civic Del Sol, and 1.0-2.0 volts for Prelude. If voltage is not as specified, replace electric load detector. Electric load detector is located at far right side of firewall.

Idle Air Control (IAC) Valve

1) Turn ignition off. Unplug IAC valve connector. IAC is located near throttle body. Turn ignition on. Measure voltage between Yellow/Black wire on harness connector and ground. If battery voltage exists, go to next step. If battery voltage does not exist, repair Yellow/Black wire between IAC valve and PGM-FI main relay.

2) Turn ignition off. Connect test harness to vehicle wiring harness, not to ECM. See Fig. 4. Turn ignition on. Momentarily connect terminal A9 to terminal A26 (A23 on Civic Del Sol). If IAC valve clicks, temporarily substitute known good ECM and retest system. If IAC valve does not click, repair Black/Blue wire between IAC and ECM terminal A9.

Fast Idle Valve (Accord & Prelude)

1) Start engine. Remove fast idle valve cover. Fast idle valve is located near throttle body. Place finger on valve seat area. Check for airflow with engine cold and idling. If airflow does not exist, replace fast idle valve.

2) Warm engine to full operating temperature (cooling fan comes on). Verify valve is completely closed. Valve is leaking if suction can be felt in valve seat area. Replace valve if valve operation is not as specified.

Fast Idle Valve (Civic & Civic Del Sol)

1) Disconnect air intake duct from throttle body. Start engine. Place finger over lower port on throttle body. Check for airflow with engine cold and idling. If airflow does not exist, replace fast idle valve. Fast idle valve is located near throttle body.

2) Warm engine to full operating temperature (cooling fan comes on). Verify valve is completely closed. Valve is leaking if suction can be felt in lower port on throttle body. Replace fast idle valve if operation is not as specified.

NOTE: For basic ignition checks, see F - BASIC TESTING article in the ENGINE PERFORMANCE Section.

EMISSION SYSTEMS & SUB-SYSTEMS

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

EGR Valve

Ensure all connectors between EGR valve lift sensor and ECM are securely connected. Warm engine to full operating temperature. Disconnect vacuum hose from EGR valve. Connect vacuum pump to EGR valve. Apply vacuum. EGR valve should hold vacuum and engine should die once vacuum is applied. If results are not as specified, replace EGR valve.

Accord & Prelude

1) Start and idle engine. Disconnect hose No. 16 from EGR valve, located at top of engine. Connect vacuum pump/gauge to hose. If vacuum exists, go to next step. If vacuum does not exist, go to step 4).

2) On Accord, unplug 4-pin connector from control box, located at top of firewall, toward passenger side. On Prelude, unplug 2-pin connector from EGR control solenoid valve, located over left front fenderwell. On all models, check for vacuum on hose No. 16. If vacuum does not exist, go to next step. If vacuum exists, check EGR system vacuum hose routing. If hoses are okay, replace EGR control solenoid valve.

3) Turn ignition off. Unplug connector "A" from ECM. Check for continuity between ground and Pink wire on Accord, or Red wire on Prelude, at 2-pin connector. If continuity exists, repair short in appropriate wire. If continuity does not exist, replace ECM and retest system.

4) Connect vacuum pump/gauge to EGR valve. With engine idling, apply 8 in. Hg vacuum to EGR valve. If engine stalls or runs roughly, and EGR valve holds vacuum, go to next step. If engine operation remains same or EGR valve does not hold vacuum, replace EGR valve.

5) Turn ignition off. On Accord, unplug 4-pin connector from control box, located at top of firewall, toward passenger side. See Fig. 11. On Prelude, unplug 2-pin connector from EGR control solenoid valve, located over left front fenderwell. On all models, turn ignition on. Measure voltage between harness connector Black/Yellow wire and ground. If battery voltage exists, go to next step. If battery voltage does not exist, repair Black/Yellow wire between harness connector and fuse panel.

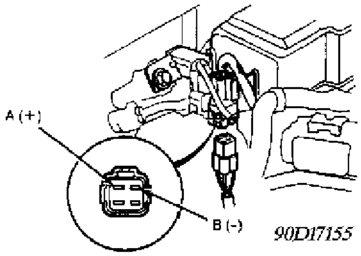

Fig. 11: Identifying EGR System Connector Terminals (Accord)
Courtesy of American Honda Motor Co., Inc.

6) Connect vacuum pump/gauge to hose disconnected in step 1). On Accord, connect fused jumper wire between positive battery terminal and Black/Yellow wire on control box connector. Observe voltmeter while connecting jumper wire between Pink wire on control box connector and negative battery terminal. Go to step 8).

7) On Prelude, connect fused jumper wire between positive battery terminal and Red wire on EGR solenoid valve connector. Observe voltmeter while connecting jumper wire between Black/Yellow wire on EGR solenoid valve connector and negative battery terminal.

8) On all models, gauge should indicate about 8 in. Hg within one second. If gauge indicates as specified, go to next step. If gauge does not indicate as specified, go to step 14).

9) Turn ignition off. Reconnect vehicle harness. Unplug 3-pin connector from EGR valve lift sensor, located on EGR valve. Turn ignition on. On Accord, measure voltage between Yellow/White and Green/White wires on harness connector; on Prelude, measure voltage between Red/White and Green/White wires on harness connector. If voltage is about 5 volts, go to step 10). If voltage is not about 5 volts, go to step 16).

10) Turn ignition off. Reconnect wiring to valve lift sensor. Connect test harness. See Fig. 4. Turn ignition on. Measure and record voltage between terminals D12 and D22 with no vacuum applied to EGR valve. Apply 8 in. Hg vacuum to EGR valve. Voltage should be about 1.2 volts with no vacuum applied and 4.3 volts with vacuum applied. If voltage is not as specified, go to step 11). If voltage is as specified, go to step 12).

11) Check for open or short circuit in White/Black wire between EGR valve and ECM terminal D12. If wire is okay, replace EGR valve.

12) Observe voltmeter as vacuum is applied and released. If voltage increases and decreases smoothly, go to next step. If voltage does not change smoothly, replace EGR valve.

13) Reconnect hose to EGR valve. Start and idle engine. Connect jumper between terminals A11 and A26. If engine stalls or runs roughly, replace ECM and retest system. If engine does not stall or run roughly, check for open in Pink (Accord) or Red (Prelude) wire between ECM terminal A11 and EGR control solenoid valve.

14) Turn ignition off. Inspect hoses No. 16 and 24 for leaks, restrictions and misrouting. If hoses are okay, go to next step. Make any repairs as necessary.

15) Disconnect lower hose from EGR control solenoid. Connect vacuum pump/gauge to hose. Start and idle engine. If 6-10 in. Hg vacuum exists, replace EGR solenoid valve. If vacuum is not 6-10 in. Hg, replace EGR valve.

16) Measure voltage at Yellow/White (Accord) or Red/White (Prelude) wire. If voltage is not about 5 volts, go to step 17). If voltage is about 5 volts, repair open in wire between EGR valve and ECM terminal D22.

17) Turn ignition off. Connect test harness connector "D" to ECM only, not to vehicle harness. Turn ignition on. Measure voltage between terminals D20 and D22. If voltage is about 5 volts, repair open in Yellow/White (Accord) or Red/White (Prelude) wire between EGR lift sensor and ECM terminal D20. If voltage is not about 5 volts, replace ECM and retest system.

Civic (D15Z1)

1) Start and idle engine. Disconnect vacuum hose from EGR valve, located to rear of distributor. Connect vacuum pump/gauge to hose. If vacuum exists, go to next step. If vacuum does not exist, go to step 4).

2) Unplug 2-pin connector from control box. Control box is located at top center of firewall. If vacuum no longer exists, go to next step. If vacuum still exists, check EGR system vacuum hose routing.

3) Turn ignition off. Unplug connector "A" from ECM. Check for a short in Pink/Green or Orange/Blue wire between EGR control solenoid valve and ECM terminal A11. If wire is okay, replace ECM and retest system.

4) Connect vacuum pump/gauge to EGR valve. Apply 8 in. Hg vacuum to EGR valve. If engine stalls or runs roughly, and EGR valve holds vacuum, go to next step. If engine operation remains same, or EGR valve does not hold vacuum, replace EGR valve.

5) Turn ignition off. Unplug 2-pin connector from control box, located at top center of firewall. Turn ignition on. Measure voltage between harness connector Black/Yellow wire and ground. If battery voltage exists, go to next step. If battery voltage does not exist, repair Black/Yellow wire between EGR control solenoid valve and fuse panel. EGR control solenoid valve is located in control box.

6) Reconnect vacuum pump/gauge to hose. Start and idle engine. Connect fused jumper wire between terminal "A" (Black/Yellow wire on mating harness connector) of control box connector and positive battery terminal. Observe vacuum gauge while connecting remaining control box terminal to ground.

7) If gauge indicates about 8 in. Hg within one second, go to next step. If gauge indication is not as specified, go to step 13).

8) Turn ignition off. Reconnect vehicle harness to control box. Unplug 3-pin connector from EGR valve. EGR valve is located behind distributor. Turn ignition on. Measure voltage between Yellow/White and Green/White wires at harness connector. If voltage is about 5 volts, go to next step. If voltage is not about 5 volts, go to step 15).

9) Turn ignition off. Reconnect vehicle harness to EGR valve. Connect test harness. See Fig. 4. Turn ignition on. Measure and record voltage between terminals D12 and D22 with no vacuum applied to EGR valve. Apply 8 in. Hg vacuum to EGR valve. Voltage should be about 1.2 volts with no vacuum applied and 4.3 volts with vacuum applied. If voltage is not as specified, go to step 10). If voltage is as specified, go to step 11).

10) Check for open or short circuit in White/Black wire between EGR valve and ECM terminal D12. If wire is okay, replace EGR valve.

11) Observe voltmeter as vacuum is applied and released. If voltage increases and decreases smoothly, go to next step. If voltage change is not as specified, replace EGR valve.

12) Reconnect hose to EGR valve. Start and idle engine. Connect jumper between terminals A11 and A26. If engine stalls or runs roughly, replace ECM and retest system. If engine does not stall or run roughly, repair open in Pink/Green or Orange/Blue wire between ECM terminal A11 and EGR control solenoid valve.

13) Turn ignition off. Check vacuum hoses for leaks, restrictions and misrouting. If hoses are okay, go to next step. Repair as necessary.

14) Disconnect lower hose from EGR control solenoid valve. EGR control solenoid valve is located in control box, at top center of firewall. Connect vacuum gauge/pump to hose. Start and idle engine. If gauge indicates 6-10 in. Hg vacuum, replace EGR control solenoid valve. If vacuum is not as specified, replace EGR vacuum control valve, located in control box.

15) Measure voltage between Yellow/White wire and body ground. If voltage is not about 5 volts, go to next step. If voltage is about 5 volts, repair open in Green/White wire between ECM terminal D22 and EGR valve.

16) Turn ignition off. Connect test harness. SeeFig. 4. Turn ignition on. Measure voltage between terminals D20 and D22. If voltage is about 5 volts, repair open in Yellow/White wire between EGR valve and ECM terminal D20. If voltage is not about 5 volts, replace ECM and retest system.

FUEL EVAPORATION

EVAP Purge Control Solenoid Valve

1) Disconnect vacuum hose from EVAP purge control diaphragm valve, located on charcoal canister. Connect vacuum gauge to hose.

Start and idle engine. Engine coolant temperature must be below 167oF (75oC) on all engines except D15Z1. On D15Z1, temperature must be below 158oF (70oC).

2) If vacuum does not exist, go to step 4). If vacuum exists, unplug connector at EVAP purge control solenoid valve. See EVAP PURGE CONTROL SOLENOID LOCATION table. Measure voltage between specified wires. See EVAP PURGE CONTROL SOLENOID CONNECTOR IDENTIFICATION table.

EVAP PURGE CONTROL SOLENOID LOCATION IDENTIFICATION TABLE

Application	Location
Accord	In Control Box On Firewall
Civic & Civic Del Sol	Left Of IAC Valve
Prelude	Near Throttle Position Sensor

EVAP PURGE CONTROL SOLENOID CONNECTOR IDENTIFICATION

Application	Positive Terminal Wire Color	Negative Terminal Wire Color
Accord & Prelude (4-Pin Connector)	Black/Yellow	Red/Green
Civic & Civic Del Sol (2-Pin Connector)	Yellow/Black	Red

3) If battery voltage exists, inspect vacuum hose for leaks, blockage and incorrect routing. If hose is okay, replace EVAP purge control solenoid valve. If voltage does not exist, measure voltage between positive terminal and chassis ground. If battery voltage does not exist, repair open circuit in appropriate positive wire. If voltage exists, check for open circuit between negative terminal and ECM. If wire is okay, replace ECM.

4) Warm engine to full operating temperature (cooling fan comes on). Turn off and restart engine. If vacuum now exists, go to CHARCOAL CANISTER. If vacuum does not exist, unplug connector at EVAP purge control solenoid valve.

5) If vacuum now exists, check for short circuit in negative wire between harness connector and ECM. If wire is okay, substitute known good ECM. Retest system. If system now operates properly, replace ECM. If vacuum still does not exist, check vacuum hose for leaks, blockage and improper routing. If hose is okay, replace EVAP purge control solenoid valve.

Charcoal Canister

Connect vacuum gauge to canister purge air hose, located a bottom of canister. See Fig. 12. Start engine. Increase engine speed to 3500 RPM. Vacuum should register on gauge within one minute. If results are not as specified, inspect purge hose for blockage. If hose is okay, replace charcoal canister.

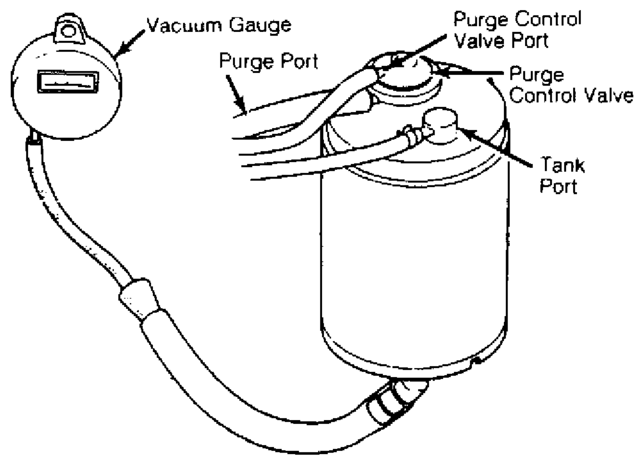

Fig. 12: Testing Charcoal Canister & Purge Control Valve
Courtesy of American Honda Motor Co., Inc.

2-Way Valve

1) Remove fuel filler cap. Disconnect vapor hose from fuel tank side of 2-way valve, located in fuel tank area. Install "T" fitting into hose. Connect vacuum gauge and vacuum pump to "T" fitting.

2) Slowly apply vacuum while observing vacuum gauge. Vacuum should stabilize momentarily at 0.2-0.6 in. Hg. If vacuum is as specified, go to next step. If vacuum is not as specified, replace 2-way valve. Retest system.

3) Move vacuum hose from vacuum to pressure fitting side of vacuum pump. Slowly pressurize vapor line while observing gauge. If pressure stabilizes at 0.4-1.4 in. Hg, valve is okay. If pressure stabilizes at less than 0.4 in. Hg or greater than 1.4 in. Hg, replace valve and retest.

POSITIVE CRANKCASE VENTILATION (PCV)

Inspect crankcase ventilation hoses and connections for leaks and clogging. Start engine. With engine at idle, pinch and release PCV hose. Valve should click. If valve does not click, check for vacuum at PCV valve end of hose. If manifold vacuum exists, replace PCV valve and recheck. If vacuum does not exist, clear blockage in hose.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Instrument Panels

Prelude

DESCRIPTION & OPERATION

The instrument panel contains a speedometer, tachometer (if equipped), fuel gauge, coolant temperature gauge, and warning light displays. Cross-coil type gauges, in which 2 intersecting coils are wound around a permanent magnet, are used. An electronic speedometer is used. Accord uses either an ND panel with 7 gauge lights or an NS panel with 5 gauge lights.

TESTING

FUEL GAUGE TEST

CAUTION: Turn ignition off before fuel gauge pointer reaches "F" mark. Failure to turn ignition off before pointer reaches "F" mark may damage fuel gauge.

1) Ensure ignition switch is in OFF position. Check fuse No. 13 (10-amp) in dash fuse box. If fuse is okay, remove luggage compartment carpet. Remove access panel. Disconnect 5-pin connector from fuel gauge sending unit.

2) Connect voltmeter positive lead to Yellow/Green wire and negative lead to body ground. Turn ignition switch to ON position. Indicated voltage should be 5-8 volts. If voltage is not as specified, check for open circuit in Yellow and/or Yellow/Green wire. Check for poor ground connection.

3) Turn ignition switch to OFF position. Connect Yellow/Green and Yellow/White wires with a jumper wire. Turn ignition switch to ON position. Ensure fuel gauge pointer starts to move toward "F" mark on gauge. If fuel gauge pointer does not move, replace gauge. If fuel gauge is okay, check sending unit.

FUEL GAUGE SENDING UNIT TEST

1) Ensure ignition switch is in OFF position. Remove fuel gauge sending unit access cover in luggage compartment. Disconnect connector from fuel gauge sending unit.

2) Remove fuel gauge sending unit. Use an ohmmeter to measure resistance between fuel gauge sending unit terminals with sending unit float held at empty (down), half-full (middle) and full (up)

positions. Compare readings with **FUEL GAUGE SENDING UNIT RESISTANCE** table. If resistance values are incorrect, replace fuel gauge sending unit.

FUEL GAUGE SENDING UNIT RESISTANCE TABLE

Float Position	Ohms
Empty	16-32
Half-Full	116-188
Full	239-314

TEMPERATURE GAUGE TEST

CAUTION: Turn ignition off before gauge pointer reaches "H" mark. Failure to turn ignition off before pointer reaches "H" mark may damage gauge.

CAUTION: Turn ignition off immediately after all gauge segments illuminate. Failure to turn ignition off immediately may damage gauge.

1) Ensure ignition switch is in OFF position. Disconnect and ground Red wire on coolant temperature gauge sender. Turn ignition switch on. Ensure all light segments of gauge illuminate properly.

2) If gauge light segments do not illuminate, check fuse No. 13 (10-amp). Check Red or Yellow wire for an open circuit. If fuse and wiring are okay, replace temperature gauge. If gauge is okay, test temperature gauge sending unit.

TEMPERATURE GAUGE SENDING UNIT TEST

1) Disconnect Red wire from temperature gauge sending unit. Use an ohmmeter to measure resistance of temperature gauge sending unit with engine cold. Start engine and allow coolant temperature to rise.

2) Measure temperature gauge sending unit resistance as coolant temperature rises. If resistance values differ from specifications, replace temperature gauge sending unit. See **TEMPERATURE GAUGE SENDING UNIT RESISTANCE** table.

TEMPERATURE GAUGE SENDING UNIT RESISTANCE TABLE

Temperature	Ohms
133°F (56°C)	142
185-212°F (85-100°C)	49-32

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

OIL PRESSURE SWITCH TEST

Disconnect Yellow/Red wire from oil pressure switch. Use an ohmmeter to check continuity of oil pressure switch. With engine off, continuity should exist between oil pressure switch terminal and ground. With engine running, continuity should not exist. If switch fails to operate as described, check engine oil level and oil pump pressure. If oil level and oil pump pressure are okay, replace pressure switch.

HAZARD WARNING SWITCH TEST

Remove center console trim panel. Remove retaining screw from switch. Slowly rotate switch clockwise and remove from console. Disconnect 6-pin connector. With hazard switch in specified position, use an ohmmeter to check continuity between switch terminals. See Fig. 1. If continuity is not as specified, replace hazard warning switch.

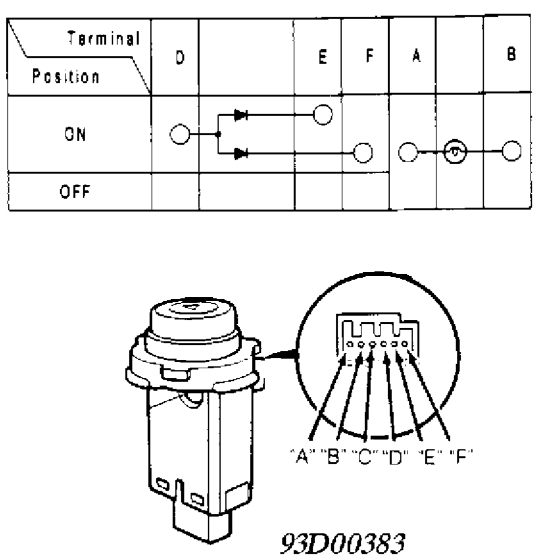

Fig. 1: Testing Hazard Warning Switch
Courtesy of American Honda Motor Co., Inc.

SPEED SENSOR INPUT TEST

1) Check 10-amp fuse No. 23 in dash fuse box. Disconnect 3-pin connector from speed sensor, located on right side of engine.
2) Use an ohmmeter to check continuity between Black wire and

ground. If continuity exists, go to next step. If continuity does not exist, check Black wire for an open circuit. Also check for poor ground.

3) Turn ignition switch to ON position. Use a voltmeter to check voltage between Black/Yellow wire and ground. If battery voltage is present, go to next step. If battery voltage is not present, check Black/Yellow wire for an open circuit.

4) With ignition on, check voltage between Orange wire and ground. If voltage is about 5 volts, go to next step. If voltage is not as specified, check Orange wire for an open circuit.

5) If continuity and voltage checks are okay, but speedometer/odometer/trip meter does not operate properly, replace speed sensor.

REMOVAL & INSTALLATION

INSTRUMENT CLUSTER

Removal & Installation

1) Remove speaker covers. Remove instrument visor from above instrument cluster. Remove black face panel from dash. Disconnect 6-pin connector from clock reset switch.

2) Remove main gauge assembly retaining screws. Place cloth over dash to protect main instrument panel. Remove main instrument panel, and disconnect its connectors. Remove sub instrument panel in similar manner. See Fig. 2. To install main and sub instrument panels, reverse removal procedure.

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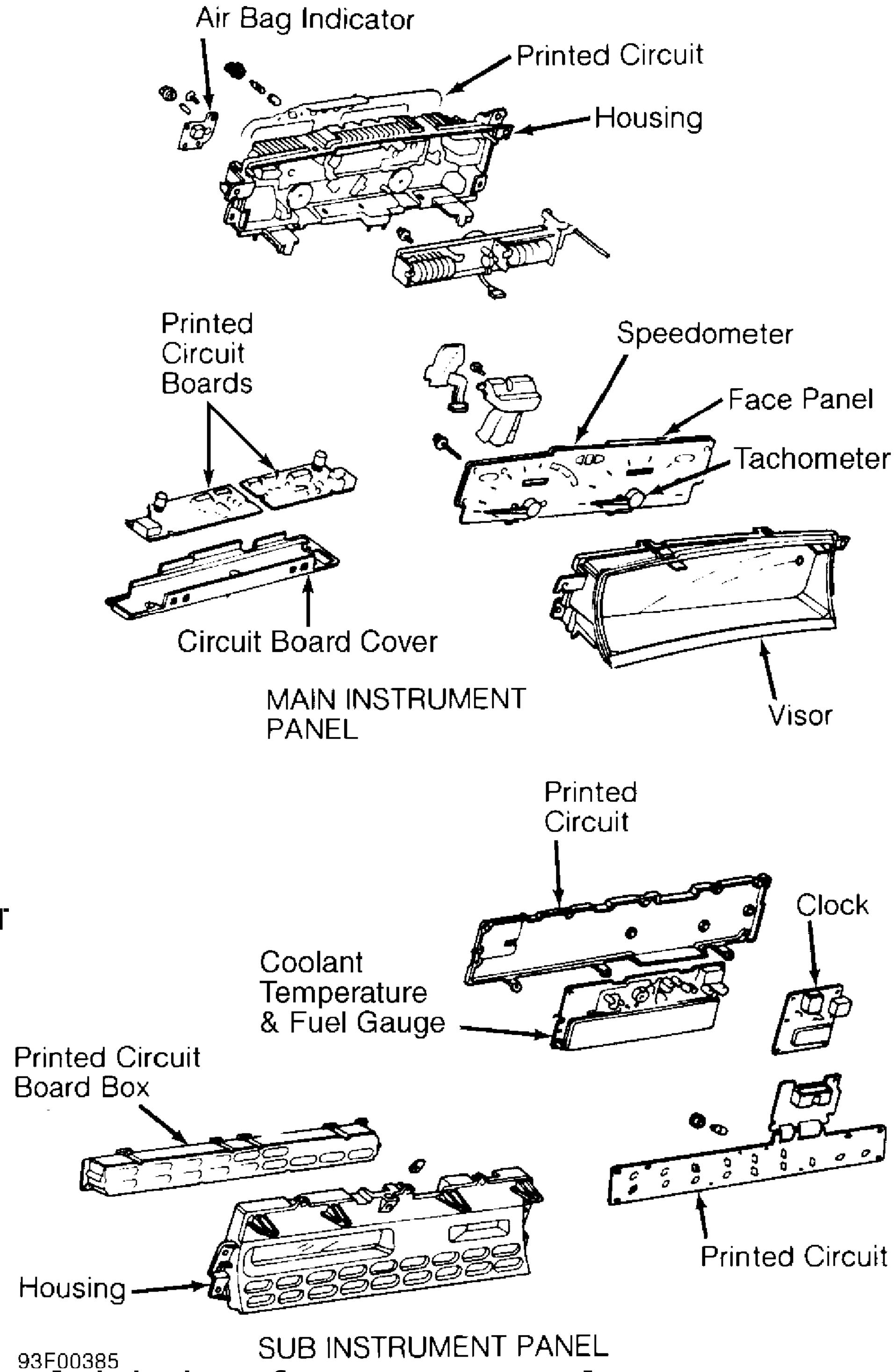

Fig. 2: Exploded View Of Instrument Panel
Courtesy of American Honda Motor Co., Inc.

WIRING DIAGRAMS

For circuit information, see appropriate wiring diagram in

the WIRING DIAGRAMS section.

END OF ARTICLE

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ARTICLE BEGINNING

Maintenance & Service Information
1973-96 Honda - Timing Belt Information

Accord, Accord (Canadian), Civic, Civic (Canadian), Civic CRX, Civic del Sol, Civic CVCC, Odyssey, Passport, Prelude

TIMING BELT INTERFERENCE VERIFICATION INFORMATION

TIMING BELT INTERFERENCE CAUTION

NOTE: CAMSHAFT DRIVE BELTS OR TIMING BELTS - The condition of camshaft drive belts should always be checked on vehicles which have more than 50,000 miles. Although some manufacturers do not recommend replacement at a specified mileage, others require it at 60,000-100,000 miles. A camshaft drive belt failure may cause extensive damage to internal engine components on most engines, although some designs do not allow piston-to-valve contact. These designs are often called "Free Wheeling". Many manufacturers changed their maintenance and warranty schedules in the mid-1980's to reflect timing belt inspection and/or replacement at 50,000-60,000 miles. Most service interval schedules shown in this section reflect these changes. Belts or components should be inspected and replaced if any of the following conditions exist:

* **Crack Or Tears In Belt Surface**
* **Missing, Damaged, Cracked Or Rounded Teeth**
* **Oil Contamination**
* **Damaged Or Faulty Tensioners**
* **Incorrect Tension Adjustment**

TIMING BELT INTERFERENCE CHECK MENU

TIMING BELT INTERFERENCE VERIFICATION TABLE (1)

Application	Engine	Replacement Interval (Miles)
Passenger Cars		
Accord		
1976-82	(2) 1.6L 4-Cyl.	(3) 60,000
1979-85	(2) 1.8L 4-Cyl.	(3) 60,000
1986-89	(2) 2.0L 4-Cyl.	(3) 60,000

1990-93 .... (2) 2.2L 4-Cyl. .... (4) 90,000
1994-96 .... (2) 2.2L 4-Cyl.
(Exc. EX & VTEC) .... (4) 90,000
(2) 2.2L 4-Cyl.
(EX & VTEC) .... (4) 90,000
1996 .... (2) 2.7L V6 .... (3) 60,000
Accord (Canadian)
1983 .... (2) 1.6L 4-Cyl. .... (3) 60,000
Civic
1973 .... (2) 1.2L 4-Cyl. .... (3) 60,000
1974-87 .... (2) 1.3L 4-Cyl. .... (3) 60,000
1980-89 .... (2) 1.5L 4-Cyl. .... (3) 60,000
1990-95 .... (2) 1.5L 4-Cyl. 90,000
1988-91 .... (2) 1.6L 4-Cyl. .... (3) 60,000
1990-96 .... (2) 1.6L 4-Cyl. 90,000
Civic (Canadian)
1980-83 .... (2) 1.3L 4-Cyl. .... (3) 60,000
Civic CRX
1984-89 .... (2) 1.3L 4-Cyl. .... (3) 60,000
(2) 1.5L 4-Cyl. .... (3) 60,000
1990-91 .... (2) 1.5L 4-Cyl. 90,000
1988-91 .... (2) 1.6L 4-Cyl. .... (3) 60,000
Civic del Sol
1988-94 .... (2) 1.6L 4-Cyl. 90,000
1992 .... (2) 1.6L 4-Cyl. (DOHC) 90,000
1993-96 ..... (2) 1.6L 4-Cyl. (SOHC) 90,000
Civic CVCC
1975-79 .... (2) 1.5L 4-Cyl. 90,000
Prelude
1980-82 .... (2) 1.6L 4-Cyl. .... (3) 60,000
1979-87 .... (2) 1.8L 4-Cyl. .... (3) 60,000
1986-87 .... (2) 2.0L 4-Cyl. .... (3) 60,000
1988-89 .... (2) 2.0L 4-Cyl. .... (3) 60,000
(2) 2.0L 4-Cyl. .... (3) 60,000
1990 .... (2) 2.0L 4-Cyl. 90,000
(2) 2.0L 4-Cyl. 90,000
(2) 2.1L 4-Cyl. 90,000
(2) 2.1L 4-Cyl. 90,000
1991 .... (2) 2.0L 4-Cyl. 90,000
(2) 2.1L 4-Cyl. 90,000
1992-96 .... (2) 2.2L 4-Cyl. .... (4) 90,000
(2) 2.3L 4-Cyl. .... (4) 90,000

Light Trucks
Odyssey
1995-96 .... (2) 2.2L 4-Cyl. 90,000
Passport
1994-96 .... (2) 2.6L 4-Cyl. 90,000

INTERFERENCE VEF

(2) 3.2L V6 90,000

(1) - Other interference engine applications may exist which are not indicated here.
(2) - Interference engine. Check for possible damage to piston(s) or valve(s) if there has been a timing belt failure.
(3) - Although the vehicle manufacturer does not recommend a specific scheduled maintenance interval, aftermarket belt manufacturers suggest the belt be replaced at 60,000 mile intervals.
(4) - Vehicle manufacturer recommends replacing all belts at the same time.

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END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Pin Voltage Charts

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

Pin voltage charts are supplied to reduce diagnostic time. Checking pin voltages at the Engine Module (ACM) determines whether it is receiving and transmitting proper voltage signals. Charts may also help determine if ACM harness is shorted or opened. SeeFigs. 1-15.

NOTE: Unless stated otherwise in testing procedures, perform all voltage tests using a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohms input impedance. Voltage readings may vary slightly due to battery condition or charging rate.

NOTE: For terminal identification on all models, seeFig. 1.

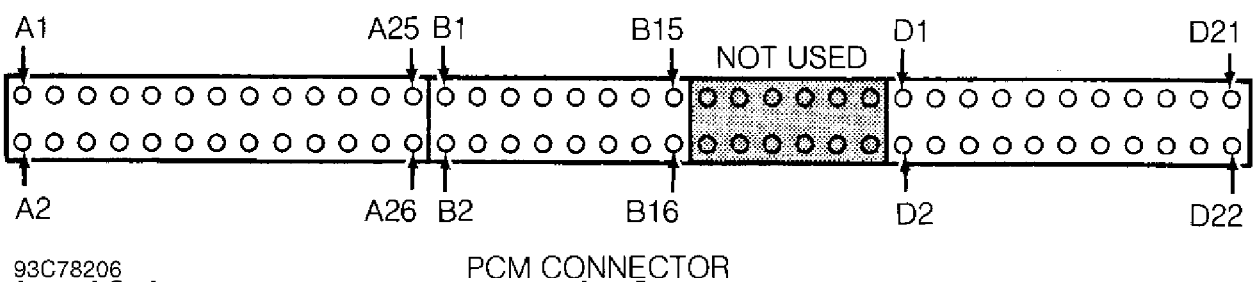

Fig. 1: Identifying ACM Connector Terminals
Courtesy of American Honda Motor Io., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Brown	A1	Injector No. 1	Battery Voltage With KOEO [1]
Yellow	A2	Injector No. 4	Battery Voltage With KOEO [1]
Red	A3	Injector No. 2	Battery Voltage With KOEO [1]
	A4 & A10	BLANK	N/A
Blue	A5	Injector No. 3	Battery Voltage With KOEO [1]
Orange/Black	A6	Heated Oxygen Sensor (HO2S) Circuit	Battery Voltage With KOEO [1]
Green/Black	A7 & A8	Fuel Pump Control Circuit	Battery Voltage With KOEO [1]
Black/Blue	A9	Intake Air Control (IAC) Valve	Battery Voltage KOEO [1] On Warm Engine
Pink	A11	EGR Control Solenoid Valve	N/A
Blue	A12	Radiator Fan & Compressor Fan Control Relay	N/A
Green/Red	A13	Malfunction Indicator Light (MIL) Circuit	N/A
	A14	BLANK	N/A
Red/Blue	A15	A/C Compressor Control Unit Signal	N/A
White/Green	A16	Alternator Control Circuit	N/A
Pink/Blue	A17	By-Pass Control Solenoid Valve	Battery Voltage With KOEO [1]
Brown/White	A18	A/T Control Unit Link (A/T Only)	N/A
White	A19	Intake Air Control (IAC) Solenoid Valve	Battery Voltage With KOEO [1]
Red/Green	A20	Purge Cut-Off Solenoid Valve Circuit	N/A
Yellow/Green	A21 & A22	Ignitor Control Circuit	About 10V KOEO [1]
Black	A23 & A24	Power Ground	Less Than 1V
Yellow/Black	A25	B + From Main Relay	Battery Voltage With KOEO [1]
Black/Red	A26	Ground	Less Than 1V

[1] - KOEO - Key on, engine off.

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Fig. 2: ACM Pin Voltage Chart For Connector Section "A" (Accord)
Courtesy of American Honda Motor Co., Inc.

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Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Yellow/Black	B1	B + From Main Relay	Battery Voltage With KOEO [1]
Brown/Black	B2	Ground	Less Than 1V
White/Red	B3	A/T Control Unit Link (A/T Only)	N/A
Green	B4	A/T Control Unit Link (A/T Only)	N/A
Blue/Black	B5	A/C Switch Input	About 5V KOER [2] (A/C Off); Below 1V (A/C On)
	B6	BLANK	N/A
Light Green	B7	Park/Neutral Switch (A/T)	Below 1V In P/N KOEO [1]; 5V In Other Positions
Red	B8	Power Steering Oil Pressure Switch	0V KOER [2]; B + While Turning Wheel
Blue/Red (A/T)	B9	Start Signal Input	Battery Voltage In START Position
Black/Green (M/T)	B9	Start Signal Input	Battery Voltage In START Position
Orange	B10	Vehicle Speed Sensor	Pulses 0-5V While Turning Left Front Wheel
Orange	B11	Crank Angle Sensor (CYL) Power	N/A
White	B12	Crank Angle Sensor (CYL) Signal	N/A
Orange/Blue	B13	Crank Angle Sensor (TDC) Power	N/A
White/Blue	B14	Crank Angle Sensor (TDC) Signal	N/A
Blue/Green	B15	Crank Angle Sensor (Crank) Power	N/A
Blue/Yellow	B16	Crank Angle Sensor (Crank) Signal	N/A
White/Yellow	D1	B + From Battery Through Fuse Box	Battery Voltage At All Times
Green/White	D2	Brake Switch Input Signal	0V KOEO [1] w/Brake Pedal Released; Battery Voltage w/Brake Pedal Depressed
	D3	BLANK	N/A
Orange/Red	D4	Service Check Connector	5V KOEO [1]
	D5 & D6	BLANK	N/A
	D7 & D8	BLANK	N/A
White/Red	D9	Alternator Charging Signal	About 5V KOEO [1]; Decreases Under Electrical Load (Headlights & Rear Defogger On) At Warm Idle
Green/Red	D10	Electrical Load Detector Circuit	4.5-5.0V KOEO [1]; 1.8-2.8V KOEO [1] With Headlight Switch In 1st Position; .8-1.8V In 2nd Position
Red/Black	D11	Throttle Angle Sensor Signal	About 0.5V KOEO [1] With Throttle Fully Closed; About 4.5V KOEO [1] With Throttle Fully Open
White/Black	D12	EGR Valve Lift Sensor	About 1.2V KOER [2] at Idle
Yellow/Green	D13	Coolant Temperature Sensor Signal	About 5V KOEO [1] (Varies With Temperature)
White	D14	Heated Oxygen Sensor (HO2S) Signal	0.4-0.5V When Ignition First Turned On; Decreases To Below 0.1V In Less Than 2 Minutes
Red/Yellow	D15	Intake Air Temperature Signal	0.5-4.5V KOEO [1] (Varies With Temperature)
	D16	BLANK	N/A
White/Blue	D17	MAP Sensor Signal	About 3V KOEO [1] (Varies w/Manifold Vacuum)
Lt. Green/Black	D18	A/T Control Unit Link (A/T Only)	N/A
Red/White	D19	Sensor Power	About 5V KOEO [1]
Yellow/White	D20	Sensor Power	About 5V KOEO [1]
Blue/White	D21	Sensor Ground	Less Than 1V
Green/White	D22	Sensor Ground	Less Than 1V

J - PIN VOLT

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[1] - KOEO - Key on, engine off. [2] - KOER - Key on, engine running.

Fig. 3: ECM Pin Voltage Chart For Connector Sections "B" & "D"(Accord)
Courtesy of American Honda Motor Co., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Brown	A1	Injector No. 1	Battery Voltage With KOEO [1]
Yellow	A2	Injector No. 4	Battery Voltage With KOEO [1]
Red	A3	Injector No. 2	Battery Voltage With KOEO [1]
Orange/White	A4	VTEC Spool Solenoid Valve Control	N/A
Light Blue	A5	Injector No. 3	Battery Voltage With KOEO [1]
Orange/Black	A6	Heated Oxygen Sensor (HO2S) Control	Battery Voltage With KOEO [1]
Green/Yellow	A7	Fuel Pump Control No. 1	Battery Voltage With KOEO [1]
Green/Yellow	A8	Fuel Pump Control No. 2	Battery Voltage With KOEO [1]
Green/White	A9	IAC Control	Battery Voltage With KOEO [1]
	A10 & A11	BLANK	N/A
Yellow/Green	A12	Cooling Fan	N/A
Green/Orange	A13	Malfunction Indicator Light (MIL) Control	Battery Voltage With KOEO [1]
	A14	BLANK	N/A
Black/Red	A15	Compressor Clutch Relay	Battery Voltage With A/C On
White/Yellow	A16	Alternator Output Signal	N/A
Light Green	A17	A/T Lock-Up Control	Battery Voltage With KOEO [1]
	A18	BLANK	N/A
Yellow	A19	A/T Lock-Up Control	Battery Voltage With KOEO [1]
Red	A20	Purge Control Solenoid	N/A
Red/Green	A21	Ignition Output Signal No. 1	About 10V With KOEO [1]
Red/Green	A22	Ignition Output Signal No. 2	About 10V With KOEO [1]
Black	A23 & A24	Ground	Less Than 1V
Yellow/Black	A25	B + From Battery Through Fuse Box	Battery Voltage At All Times
Black/Red	A26	Ground	Less Than 1V

[1] - KOEO - Key on, engine off.

93E78208

Fig. 4: ECM Pin Voltage Chart For Conn. Sect. "A" (Civic Exc. VX 1.5L)
Courtesy of American Honda Motor Co., Inc.

	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Yellow/Black	B1	B + From Battery Through Fuse Box	Battery Voltage At All Times
Brown/Black	B2	Ground	Less Than 1V
Green/Blue	B3	A/T Shift Selector Input	Battery Voltage With KOEO [1]
Green/Black	B4	A/T Shift Selector Input	Battery Voltage With KOEO [1]
Blue/Red	B5	A/C Request Input	Less Than 1V
	B6	BLANK	N/A
Green	B7	Park/Neutral Input	About 5V With KOEO [1]
Brown/Red	B8	Power Steering Switch Input	Battery Voltage (Steering Wheel Turning)
Blue/White	B9	Start Signal Input	Battery Voltage In Start Position
Yellow/Blue	B10	Vehicle Speed Sensor input	Pulses 0-12V (Wheels Turning)
Orange	B11	Cylinder Sensor Input Signal	N/A
White	B12	Cylinder Sensor Input Signal	N/A
Orange/Blue	B13	TDC Sensor Signal	N/A
White/Blue	B14	TDC Sensor Signal	N/A
Blue/Green	B15	Crank Angle Sensor Signal	N/A
Blue/Yellow	B16	Crank Angle Sensor Signal	N/A

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[1] - KOEO - Key on, engine off.

Fig. 5: ECM Pin Voltage Chart For Conn. Sect. "B" (Civic Exc. VX 1.5L)
Courtesy of American Honda Motor Co., Inc.

J - PIN VOLT

	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
White/Blue	D1	B + From Battery (Input)	Battery Voltage At All Times
Green/White	D2	Brakelight Switch Input	Battery Voltage At All Times
	D3	BLANK	N/A
Brown	D4	Test Connector (Timing Adjustment)	About 5V With KOEO [1]
	D5	BLANK	N/A
Orange/Blue	D6	VTEC Oil Pressure Switch Input	0.5-4.5V KOEO [1] (Varies With Pressure)
Light Blue	D7	Serial Data Link	N/A
	D8	BLANK	N/A
Pink	D9	Alternator FR Signal	About 4.5V With KOEO [1]
Green/Red	D10	ELD Unit Input	2.5-3.5V [2]; 1.5-2.5V [3]
Pink/Black	D11	Throttle Angle Sensor Input	.5V With Closed Throttle 4.5V With Wide Open Throttle
	D12	BLANK	N/A
Red/White	D13	Coolant Temperature Sensor Input	About 5V
Orange/Blue	D14	Sensor Input	Less Than .4V With Closed Throttle Greater Than .6V With Wide Open Throttle
Red/Yellow	D15	Intake Air Temperature Sensor Input	About 5V With KOEO [1]
	D16	BLANK	N/A
Pink/White	D17	Sensor Ground	Less Than 1V
White/Red	D18	Shift Lock Control	N/A
Yellow/Green	D19	Reference Voltage	About 5V With KOEO [1]
Yellow/White	D20	Reference Voltage	About 5V With KOEO [1]
Green/Blue [4]	D21	MAP Sensor Input	About 3V
Green/White	D22	Sensor Ground	Less Than 1V

[1] - KOEO - Key on, engine off.
[2] - Headlight switch in first position.
[3] - Headlight switch in second position.
[4] - Green/Blue on CX, EX & Si Models; Green/White on DX & LX Models.

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Fig. 6: ECM Pin Voltage Chart For Conn. Sect. "D" (Civic Exc. VX 1.5L)
Courtesy of American Honda Motor Co., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Brown	A1	Injector No. 1	Battery Voltage With KOEO [1]
Yellow	A2	Injector No. 4	Battery Voltage With KOEO [1]
Red	A3	Injector No. 2	Battery Voltage With KOEO [1]
Orange/White	A4	VTEC Spool Solenoid Valve Control	N/A
Light Blue	A5	Injector No. 3	Battery Voltage With KOEO [1]
Orange/Black	A6	Heated Oxygen Sensor Heater (HO2S)	Battery Voltage With KOEO [1]
Green/Yellow	A7	Fuel Pump Control No. 1	Battery Voltage With KOEO [1]
Green/Yellow	A8	Fuel Pump Control No. 2	Battery Voltage With KOEO [1]
Green/White	A9	IAC Valve Control	Battery Voltage With KOEO [1]
	A10	BLANK	N/A
Orange/Blue	A11	EGR Control Solenoid Valve	Battery Voltage With KOEO [1]
Yellow/Orange	A12	Cooling Fan	N/A
Green/Orange	A13	Malfunction Indicator Light (MIL) Control	Battery Voltage With KOEO [1]
	A14	BLANK	N/A
Black/Red	A15	Compressor Clutch Relay	Battery Voltage With A/C On
White/Yellow	A16	Alternator Output Signal	N/A
	A17 & A18	BLANK	N/A
	A19	BLANK	N/A
Red	A20	Purge Control Solenoid	N/A
Red/Green	A21	Ignition Output Signal No. 1	About 10V With KOEO [1]
Red/Green	A22	Ignition Output Signal No. 2	About 10V With KOEO [1]
Black	A23 & A24	Ground	Less Than 1V
Yellow/Black	A25	B + From Battery Through Fuse Box	Battery Voltage At All Times
Black/Red	A26	Ground	Less Than 1V

[1] - KOEO - Key on, engine off.

93J78211

Fig. 7: ECM Pin Voltage Chart For Connector Sect. "A" (Civic VX 1.5L)
Courtesy of American Honda Motor Co., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Yellow/Black	B1	B + From Battery Through Fuse Box	Battery Voltage At All Times
Brown/Black	B2	Ground	Less Than 1V
	B3 & B4	BLANK	N/A
Blue/Red	B5	A/C Request Input	About 5V With KOEO [1]
	B6	BLANK	N/A
Green	B7	M/T Clutch Switch	About 5V With KOEO [1]
Brown/Red	B8	Power Steering Switch Input	Battery Voltage (Steering Wheel Turning)
Blue/White	B9	Start Signal Input	Battery Voltage In START Position
Yellow/Blue	B10	Vehicle Speed Sensor Input	Pulses 0-12V (Wheels Turning)
Orange	B11	Cylinder Sensor Input Signal	N/A
White	B12	Cylinder Sensor Input Signal	N/A
Orange/Blue	B13	TDC Sensor Signal	N/A
White/Blue	B14	TDC Sensor Signal	N/A
Blue/Green	B15	Crank Angle Sensor Signal	N/A
Blue/Yellow	B16	Crank Angle Sensor Signal	N/A

[1] - KOEO - Key on, engine off.

93A78212

Fig. 8: ECM Pin Voltage Chart For Connector Sect. "B" (Civic VX 1.5L)
Courtesy of American Honda Motor Co., Inc.

J - PIN VOLT

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
White/Blue	D1	B + From Battery (Input)	Battery Voltage At All Times
Green/White	D2	Brakelight Switch Input	Battery Voltage At All Times
Blue/Yellow	D3	LAF Sensor	0.3-4.9V (Engine Warm)
Brown	D4	Test Connector (Timing Adjustment)	About 5V With KOEO [1]
	D5	BLANK	N/A
Orange/Blue	D6	VTEC Oil Pressure Switch Input	0.5-4.5V KOEO [1] (Varies With Pressure)
Light Blue	D7	Serial Data Link	N/A
White/Blue	D8	Sensor Input	Less Than 5V
Pink	D9	Alternator FR Signal	About 4.5V With KOEO [1]
Green/Red	D10	ELD Unit Input	2.5-3.5V [2]; 1.5-2.5V [3]
Pink/Black	D11	Throttle Angle Sensor Input	.5V With Closed Throttle 4.5V With Wide Open Throttle
White/Black	D12	EGR Valve Lift Sensor Input	1.2V Without Vacuum Applied 4.3V With 8 In. Hg Vacuum Applied
Red/White	D13	Coolant Temperature Sensor Input	About 5V
Orange/Blue	D14	Sensor Input	Less Than .4V With Closed Throttle Greater Than .6V With Wide Open Throttle
Red/Yellow	D15	Intake Air Temperature (IAT) Sensor Input	About 5V With KOEO [1]
Blue/Green	D16	Sensor Ground	Less Than 1V
Pink/White	D17	Sensor Ground	Less Than 1V
Pink/Green	D18	Economy Driving Indicator Control	N/A
Yellow/Green	D19	Reference Voltage	About 5V With KOEO [1]
Yellow/White	D20	Reference Voltage	About 5V
Green/Blue	D21	MAP Sensor Input	About 3V
Green/White	D22	Sensor Ground	Less Than 1V

[1] - KOEO - Key on, engine off.
[2] - Headlight switch in first position.
[3] - Headlight switch in second position.

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93B78213

Fig. 9: ECM Pin Voltage Chart For Connector Section "D" (Civic VX1.5L)

Courtesy of American Honda Motor Co., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Brown	A1	Injector No. 1	Battery Voltage With KOEO [1]
Yellow	A2	Injector No. 4	Battery Voltage With KOEO [1]
Red	A3	Injector No. 2	Battery Voltage With KOEO [1]
Orange/White	A4	VTEC Spool Solenoid Valve Control	N/A
Light Blue	A5	Injector No. 3	Battery Voltage With KOEO [1]
Orange/Black	A6	Heated Oxygen Sensor (HO2S) Control	Battery Voltage With KOEO [1]
Green/Yellow	A7	Fuel Pump Control No. 1	Battery Voltage With KOEO [1]
Green/Yellow	A8	Fuel Pump Control No. 2	Battery Voltage With KOEO [1]
Green/White	A9	IAC Valve Control	Battery Voltage With KOEO [1]
	A10 & A11	BLANK	N/A
Yellow/Green	A12	Cooling Fan	N/A
Green/Orange	A13	Malfunction Indicator Light (MIL) Control	Battery Voltage With KOEO [1]
	A14	BLANK	N/A
Black/Red	A15	Compressor Clutch Relay	Battery Voltage With A/C On
White/Yellow	A16	Alternator Output Signal	N/A
Light Green	A17	A/T Lock-Up Control	Battery Voltage With KOEO [1]
	A18	BLANK	N/A
Yellow	A19	A/T Lock-Up Control	Battery Voltage With KOEO [1]
Red	A20	Purge Control Solenoid	N/A
Red/Green	A21	Ignition Output Signal No. 1	About 10V With KOEO [1]
Red/Green	A22	Ignition Output Signal No. 2	About 10V With KOEO [1]
Black	A23 & A24	Ground	Less Than 1V
Yellow/Black	A25	B + From Battery Through Fuse Box	Battery Voltage At All Times
Black/Red	A26	Ground	Less Than 1V

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[1] – KOEO – Key on, engine off.

Fig. 10: ECM Pin Voltage Chart For Connector Sect. "A" (Civic Del Sol)

Courtesy of American Honda Motor Co., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Yellow/Black	B1	B + From Battery Through Fuse Box	Battery Voltage At All Times
Brown/Black	B2	Ground	Less Than 1V
Green/Blue	B3	A/T Shift Selector Input	Battery Voltage With KOEO [1]
Green/Black	B4	A/T Shift Selector Input	Battery Voltage With KOEO [1]
Blue/Red	B5	A/C Request Input	Less Than 1V
	B6	BLANK	N/A
Green	B7	Park/Neutral Input	About 5V With KOEO [1]
Brown/Red	B8	Power Steering Switch Input	Battery Voltage (Steering Wheel Turning)
Blue/White	B9	Start Signal Input	Battery Voltage In Start Position
Yellow/Blue	B10	Vehicle Speed Sensor input	Pulses 0-12V (Wheels Turning)
Orange	B11	Cylinder Sensor Input Signal	N/A
White	B12	Cylinder Sensor Input Signal	N/A
Orange/Blue	B13	TDC Sensor Signal	N/A
White/Blue	B14	TDC Sensor Signal	N/A
Blue/Green	B15	Crank Angle Sensor Signal	N/A
Blue/Yellow	B16	Crank Angle Sensor Signal	N/A

[1] - KOEO - Key on, engine off.

93D78215

Fig. 11: ECM Pin Voltage Chart For Connector Sect. "B" (Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

J - PIN VOLT

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
White/Blue	D1	B + From Battery (Input)	Battery Voltage At All Times
Green/White	D2	Brakelight Switch Input	Battery Voltage At All Times
	D3	BLANK	N/A
Brown	D4	Test Connector (Timing Adjustment)	About 5V With KOEO [1]
	D5	BLANK	N/A
Orange/Blue	D6	VTEC Oil Pressure Switch Input	0.5-4.5V KOEO [1] (Varies With Pressure)
Light Blue	D7	Serial Data Link	N/A
	D8	BLANK	N/A
Pink	D9	Alternator FR Signal	About 4.5V With KOEO [1]
Green/Red	D10	ELD Unit Input	2.5-3.5V [2]; 1.5-2.5V [3]
Red/Blue	D11	Throttle Position (TP) Sensor Input	.5V With Closed Throttle 4.5V With Wide Open Throttle
	D12	BLANK	N/A
Red/White	D13	Coolant Temperature Sensor Input	About 5V
White	D14	Heated Oxygen Sensor (HO2S) Input	0.4-0.5V When Ignition Is Turned On; Drops To Less Than 0.1V Within 1 Minute
Red/Yellow	D15	Intake Air Temperature (IAT) Sensor Input	About 5V With KOEO [1]
	D16	BLANK	N/A
Green/Blue	D17	MAP Sensor Input	About 3V
White/Red	D18	Shift Lock Control	N/A
Yellow/Green	D19	Reference Voltage	About 5V With KOEO [1]
Yellow/White	D20	Reference Voltage	About 5V With KOEO [1]
White	D21	Sensor Ground	Less Than 1V
Green/White	D22	Sensor Ground	Less Than 1V

[1] - KOEO - Key on, engine off.
[2] - Headlight switch in first position.
[3] - Headlight switch in second position.
[4] - Green/Blue on CX, EX & Si Models; Green/White on DX & LX Models.

93E78216

Fig. 12: ECM Pin Voltage Chart For Connector Sect. "D" (Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Brown	A1	Injector No. 1	Battery Voltage With KOEO [1]
Yellow	A2	Injector No. 4	Battery Voltage With KOEO [1]
Red	A3	Injector No. 2	Battery Voltage With KOEO [1]
Green/Yellow	A4	VTEC Solenoid Valve Control	N/A
Blue	A5	Injector No. 3	Battery Voltage With KOEO [1]
Orange/White	A6	Heated Oxygen Sensor (HO2S) Circuit	Battery Voltage With KOEO [1]
Green/Black	A7 & A8	Fuel Pump Control Circuit	Battery Voltage With KOEO [1]
Black/Blue	A9	Intake Air Control (IAC) Valve	About 10V KOEO [1] On Warm Engine
	A10 & A14	BLANK	N/A
Red	A11	EGR Control Solenoid Valve	N/A
Blue/Red	A12	Fan Relay Control	N/A
Blue/White	A13	Malfunction Indicator Light (MIL) Circuit	N/A
Red/Blue	A15	A/C Compressor Control Unit Signal	N/A
White/Green	A16	Alternator Output Signal	N/A
Pink	A17	By-Pass Control Solenoid Valve Control	N/A
Orange/Red	A18	FAS (A/T)	N/A
White	A19	Intake Control Solenoid	Battery Voltage With KOEO [1]
Red/Green	A20	Purge Cut-Off Solenoid Valve Circuit	N/A
Yellow/Green	A21 & A22	Ignitor Control Circuit	About 10V KOEO [1]
Black	A23 & A24	Power Ground	Less Than 1V
Yellow/Black	A25	B + From Main Relay	Battery Voltage With KOEO [1]
Black/Red	A26	Ground	Less Than 1V

[1] - Key on, engine off.

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Fig. 13: ECM Pin Voltage Chart For Connector Section "A" (Prelude)
Courtesy of American Honda Motor Co., Inc.

Wire Color	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
Yellow/Black	B1	B + From Main Relay	Battery Voltage With KOEO [1]
Brown/Black	B2	Ground	Less Than 1V
Orange	B3	Upshift/Downshift Comparative Input	N/A
Pink	B4	Upshift/Downshift Comparative Input	N/A
Blue/Black	B5	A/C Switch Input	About 5V With KOEO [1] & A/C Off; Less Than 1V KOER [2] With A/C & Blower On
	B6	BLANK	N/A
Light Green	B7	Park/Neutral Switch (A/T)	Less Than 1V In Park Or Neutral With KOEO [1]; 5V In Park Or Neutral With KOER [2]; Battery Voltage In All Other Positions
Red/Green	B8	Power Steering Oil Pressure Switch	0V KOEO [1]; Battery Voltage KOER [2] While Slowly Turning Steering Wheel
Blue/Red	B9	Start Signal Input	Battery Voltage In START Position (Clutch Depressed On M/T Models)
Orange	B10	Vehicle Speed Sensor	Pulses 0-12V While Turning Left Front Wheel
Orange	B11	Crank Angle Sensor (CYL) Power	N/A
White	B12	Crank Angle Sensor (CYL) Signal	N/A
Orange/Blue	B13	Crank Angle Sensor (TDC) Power	N/A
White/Blue	B14	Crank Angle Sensor (TDC) Signal	N/A
Blue/Green	B15	Crank Angle Sensor (Crank) Power	N/A
Blue/Yellow	B16	Crank Angle Sensor (Crank) Signal	N/A

[1] - KOEO - Key on, engine off.
[2] - KOER - Key on, engine running.

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Fig. 14: ECM Pin Voltage Chart For Connector Section "B" (Prelude)
Courtesy of American Honda Motor Co., Inc.

	Terminal ID.	Function/Description	Voltage Value (DC Volts Unless Otherwise Specified)
White/Yellow	D1	B + From Battery Through Fuse Box	Battery Voltage at All Times
Green/White	D2	Stoplight Switch	Battery Voltage at All Times
Red/Blue	D3	Knock Sensor	N/A
Brown/White	D4	Service Check Connector	About 5V (M/T); About 11V (A/T)
	D5	BLANK	N/A
Lt. Blue	D6	VTEC Pressure Switch Input	N/A
Lt. Green/Red	D7	Data Link Connector	N/A
	D8	BLANK	N/A
White/Red	D9	Alternator Charging Signal	About 4.5V KOEO [1]; Decreases Under Electrical Load (Headlights & Rear Defogger On) At Warm Idle
Lt. Green/Red	D10	ELD Input	N/A
Red/Black	D11	Throttle Position (TP) Sensor Signal	About 0.5V KOEO [1] With Throttle Fully Closed; About 4.5V KOEO [1] With Throttle Fully Open
White/Black	D12	EGR Valve Lift Sensor	About 1.2V KOEO
Yellow/Blue	D13	Coolant Temperature Sensor Signal	About 5V KOEO [1] (Varies With Temperature)
White	D14	Heated Oxygen Sensor (HO2S) Signal	0.4-0.5V When Ignition Is Turned On; Drops To Less Than 0.1V Within 2 Minutes
Red/Yellow	D15	Intake Air Temperature (IAT) Signal	0.5-4.5V KOEO [1] (Varies With Temperature)
	D16	BLANK	N/A
White/Blue	D17	MAP Sensor Signal	About 3V KOEO [1] (Varies With Manifold Vacuum)
Lt. Green/Black	D18	A/T Control Unit Link (A/T Only)	N/A
Red/White	D19	Reference Voltage	About 5V KOEO [1]
Yellow/White	D20	Reference Voltage	About 5V KOEO [1]
Blue/White	D21	Sensor Ground	Less Than 1V
Green/White	D22	Sensor Ground	Less Than 1V

J - PIN VOLT 93H78219

[1] - KOEO - Key on, engine off.

Fig. 15: ECM Pin Voltage Chart For Connector Section "D" (Prelude)
Courtesy of American Honda Motor Co., Inc.

END OF ARTICLE

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ARTICLE BEGINNING

1993 WHEEL ALIGNMENT
Honda - Jacking & Hoisting

Accord, Civic, Civic Del Sol, Prelude

JACKING & HOISTING

FLOOR JACK

1) Set parking brake. Block wheels that are not going to be lifted. When lifting rear of vehicle, place transmission in Reverse (M/T) or Park (A/T).

2) Place floor jack lift platform under lift bracket to raise vehicle. Front lift bracket is located under vehicle, on cross/center beam. Rear lift bracket is located under vehicle, near muffler. Place safety stands on reinforced support points of side body panels (between front and rear wheels).

EMERGENCY JACKING

Place manufacturer-supplied jack on reinforced support points of side body panels (between front and rear wheels).

HOIST

Place lift blocks on reinforced support points of side body panels (between front and rear wheels). These are same points as used with manufacturer-supplied jack.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Sensor Operating Range Charts

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

Sensor operating range information can help determine if a sensor is out of calibration. Although an out-of-calibration sensor may not set a trouble code, it may cause drive ability problems.

NOTE: Unless stated otherwise in test procedure, perform all voltage tests using a Digital Volt-Ohmmeter (DOOM) with a minimum 10-megohms input impedance.

COOLANT TEMPERATURE (ACT) SENSOR RESISTANCE TEST TABLE(1)

Temperature - oF (oC)	Ohms
-4 (-20)	15,000-18,000
68 (20)	1000-4000
176 (80)	200-400

(1) - Measure resistance across sensor terminals.

INTAKE AIR TEMPERATURE (NAT) SENSOR RESISTANCE TEST TABLE(1)

Temperature - oF (oC)	Ohms
-4 (-20)	15,000-18,000
68 (20)	1000-4000
176 (80)	200-400

(1) - Measure resistance across sensor terminals.

MAP SENSOR VOLTAGE TEST TABLE (1)

Vacuum Applied - In. Hag	Volts
0	2.8-3.0
5	2.3-2.5
10	1.8-2.0

15	1.3-1.5
20	.8-1.0
25	.3-.5

(1) - Measure voltage at appropriate ACM terminals. See L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

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ERG LIFT SENSOR VOLTAGE TEST TABLE (1)

Position	Volts (Approximate)
Fully Closed	1.2
Fully Open	4.3

(1) - Measure voltage at appropriate ACM terminals. See L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section. Voltage should increase smoothly as vacuum is applied.

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OXYGEN SENSOR VOLTAGE TEST TABLE (1)

Condition	Volts
Lean	Less Than 0.4
Rich	Greater Than 0.6

(1) - Measure voltage between ground and oxygen sensor terminal using a high-impedance DOOM.

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THROTTLE ANGLE (POSITION) SENSOR SPECIFICATIONS TABLE

Condition	(1) Volts
Throttle Valve	
Fully Closed	.5
Wide Open	4.5

(1) - Voltage change from fully closed to wide open should be smooth.

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VEHICLE SPEED SENSOR VOLTAGE TEST TABLE (1)

Application	Volts
Accord	(2) 0-12
Civic & Civic Del Sol	(2) 0-5

```
Prelude
 F22A1 & H23A1 Engines  ..................................... (2) 0-5
 H22A1 Engine  ............................................. (2) 0-12

(1) - Back Probe terminals at sensor.
(2) - Pulses between specification limits with sensor turning.
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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Wiring Diagrams

Accord, Civic, Civic Del Sol, Prelude

WIRING DIAGRAMS

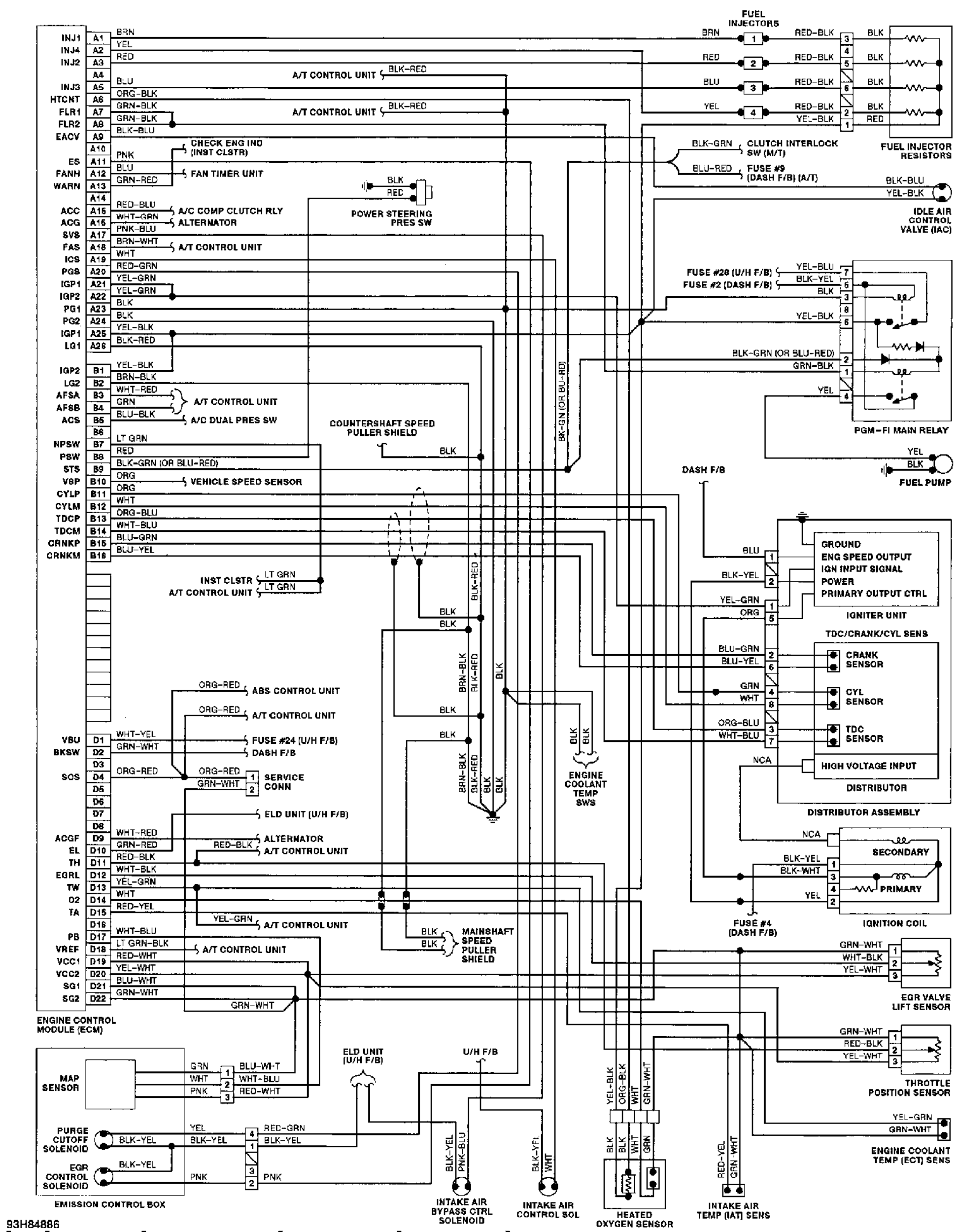

Fig. 1: Wiring Diagram (Accord 2.2L)

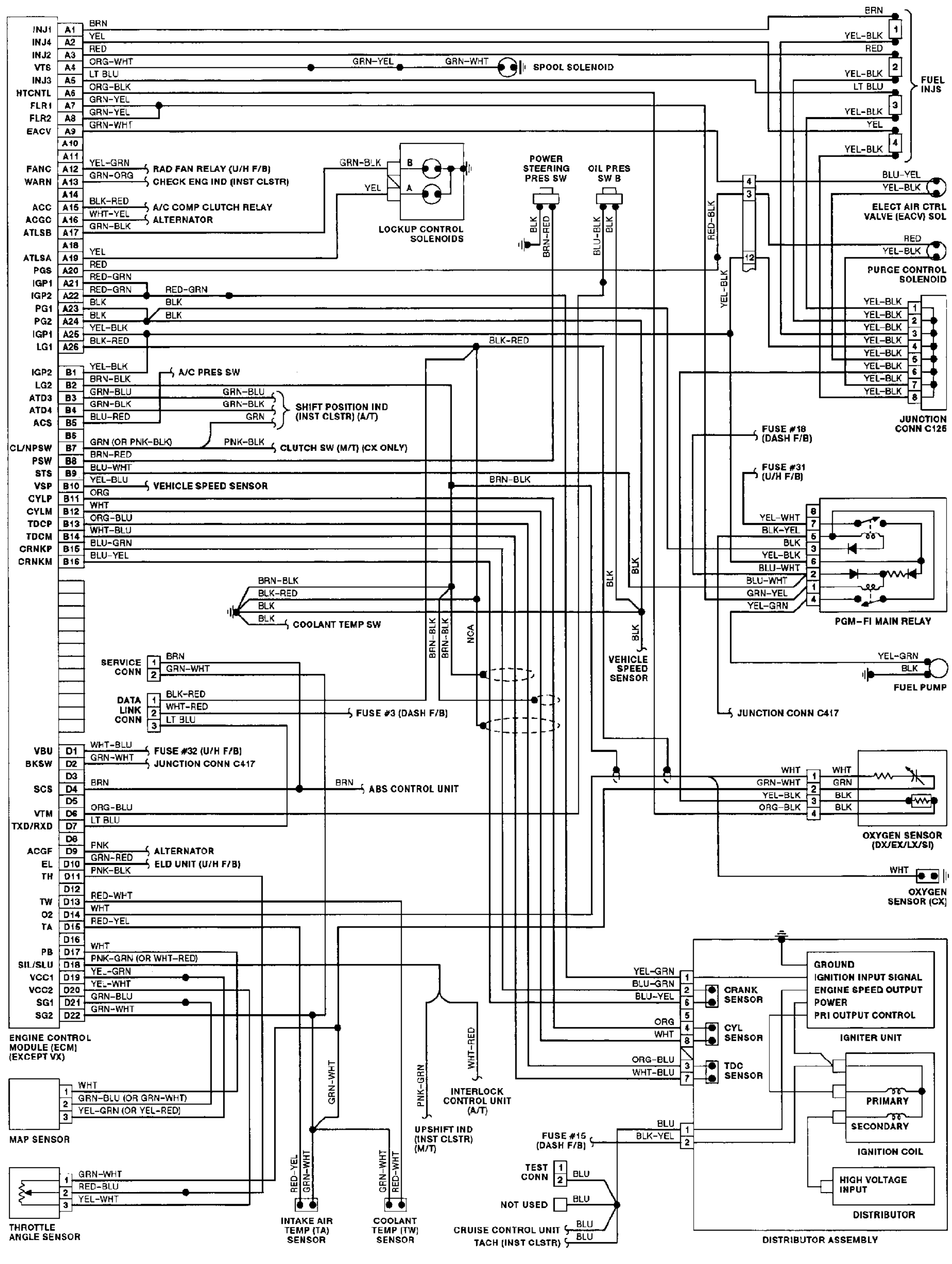

Fig. 2: Wiring Diagram (Civic 1.5L & 1.6L - Except VX)

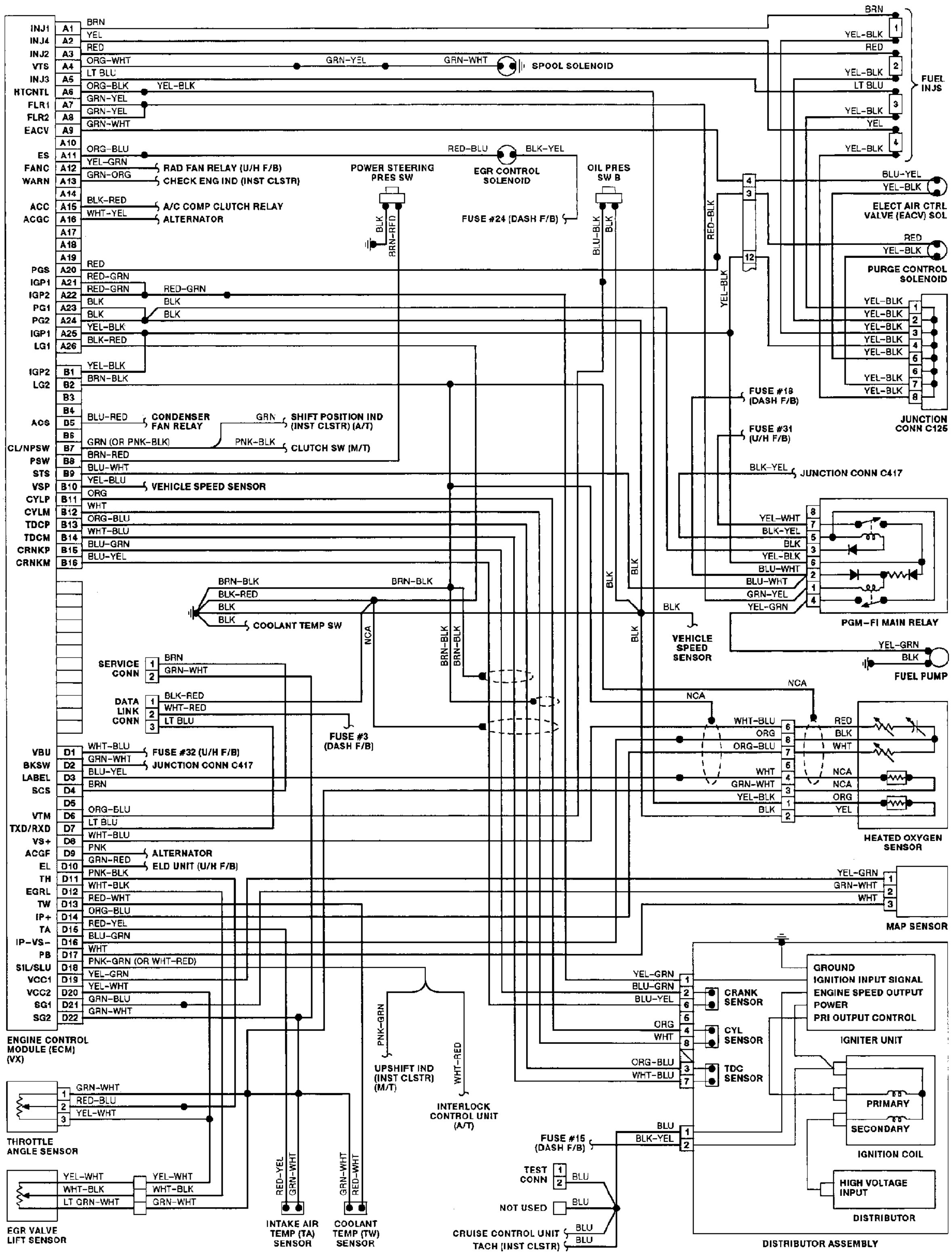

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Fig. 3: Wiring Diagram (Civic 1.5L - VX - VTEC-E)

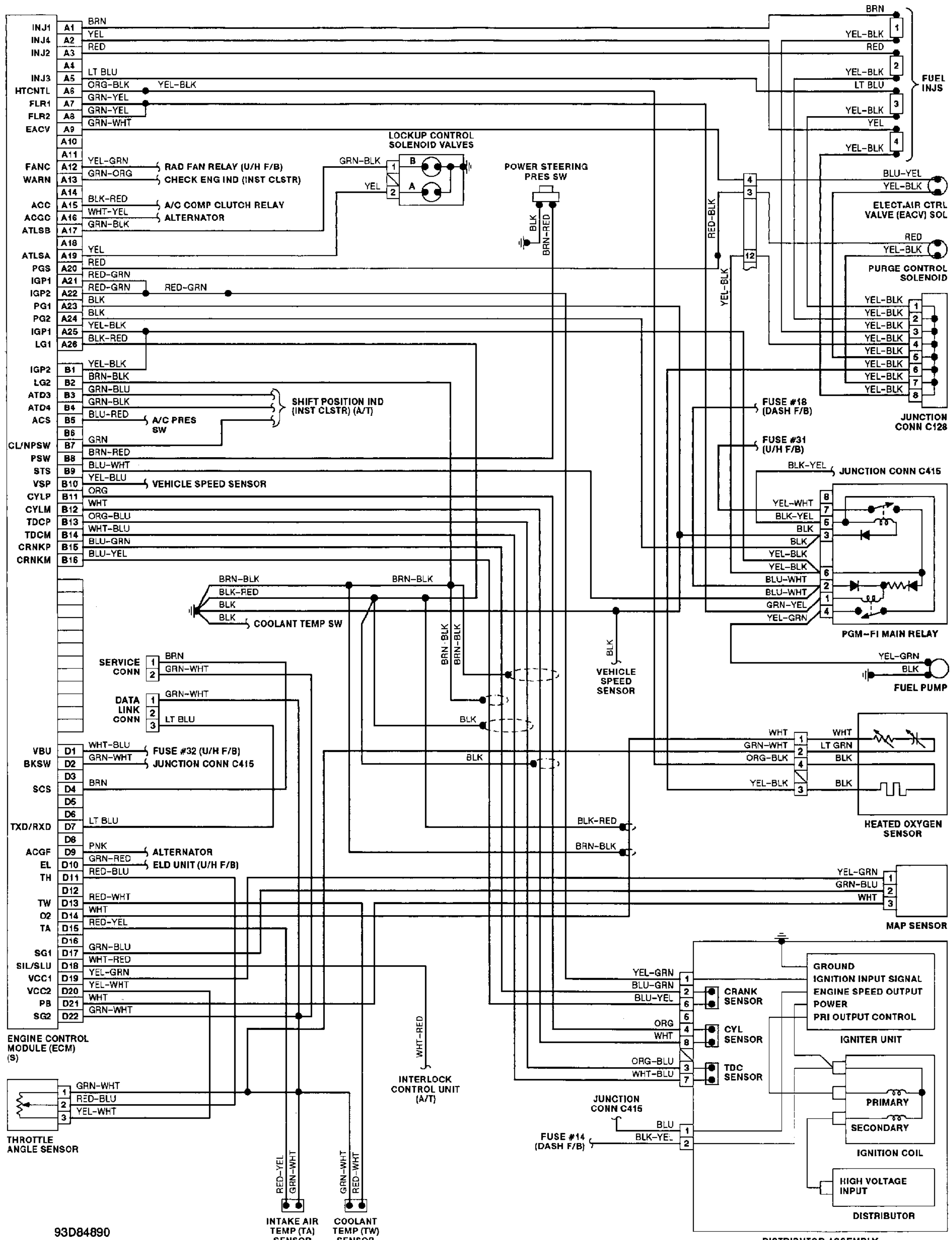

Fig. 4: Wiring Diagram (Civic Del Sol 1.5L - S)

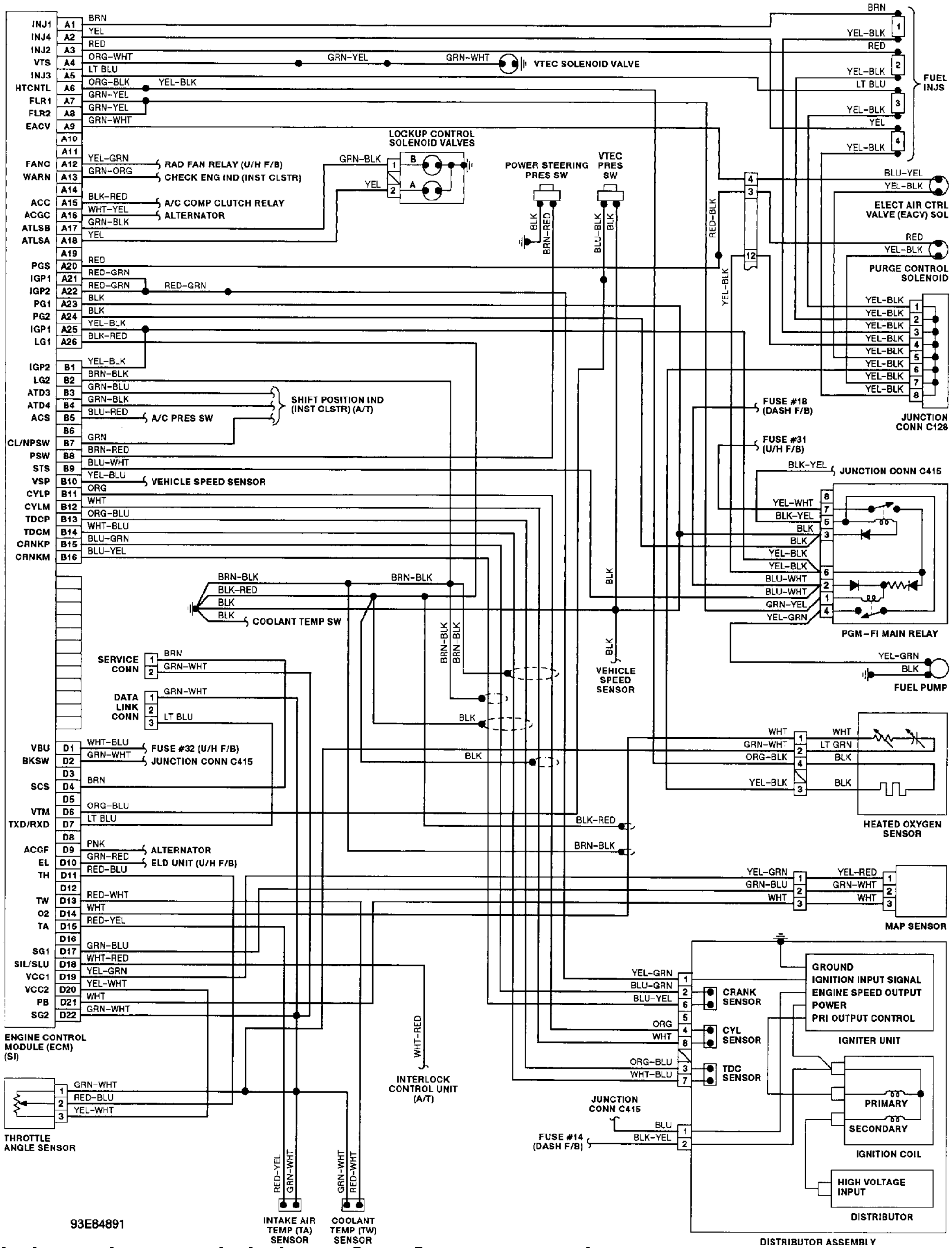

Fig. 5: Wiring Diagram (Civic Del Sol 1.6L - SI)

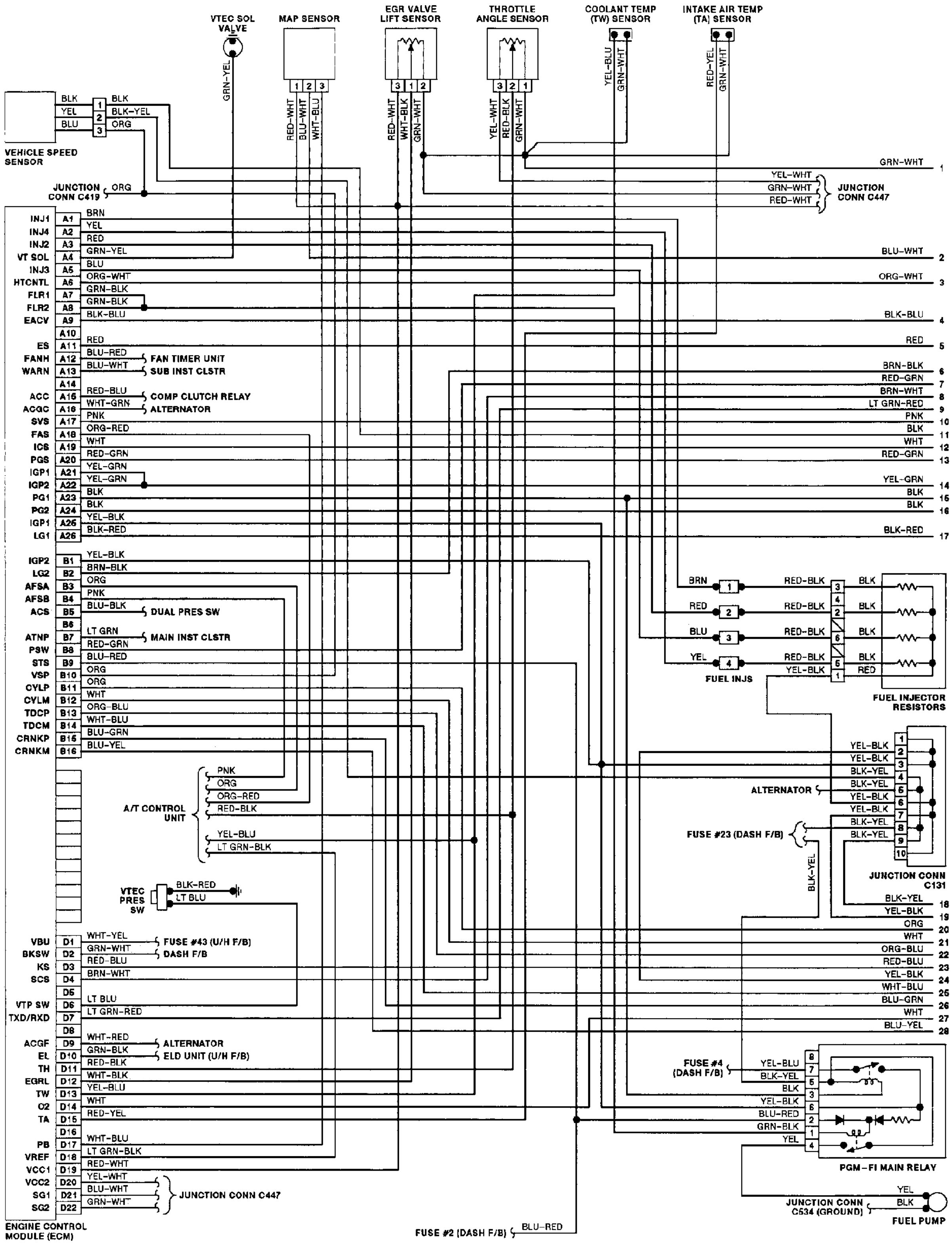

Fig. 6: Wiring Diagram (Prelude 2.2L & 2.3L - 1 Of 2)

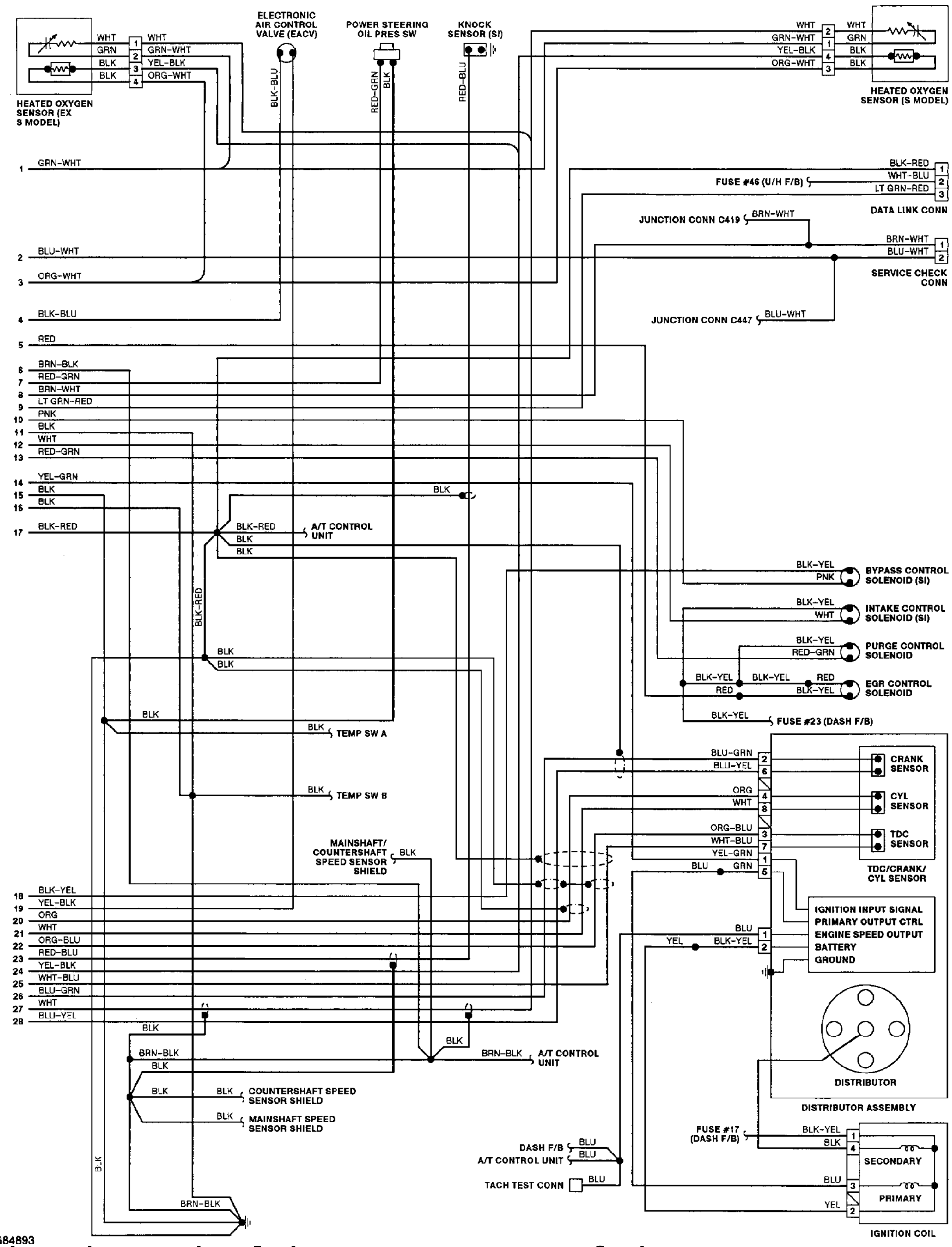

Fig. 7: Wiring Diagram (Prelude 2.2L & 2.3L - 2 Of 2)

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Vacuum Diagrams

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

This article contains underhood views or schematics of vacuum hose routing. Use these vacuum diagrams during the visual inspection in F - BASIC TESTING article in the ENGINE PERFORMANCE Section. This will assist in identifying improperly routed vacuum hoses which cause driveability and/or computer-indicated malfunctions.

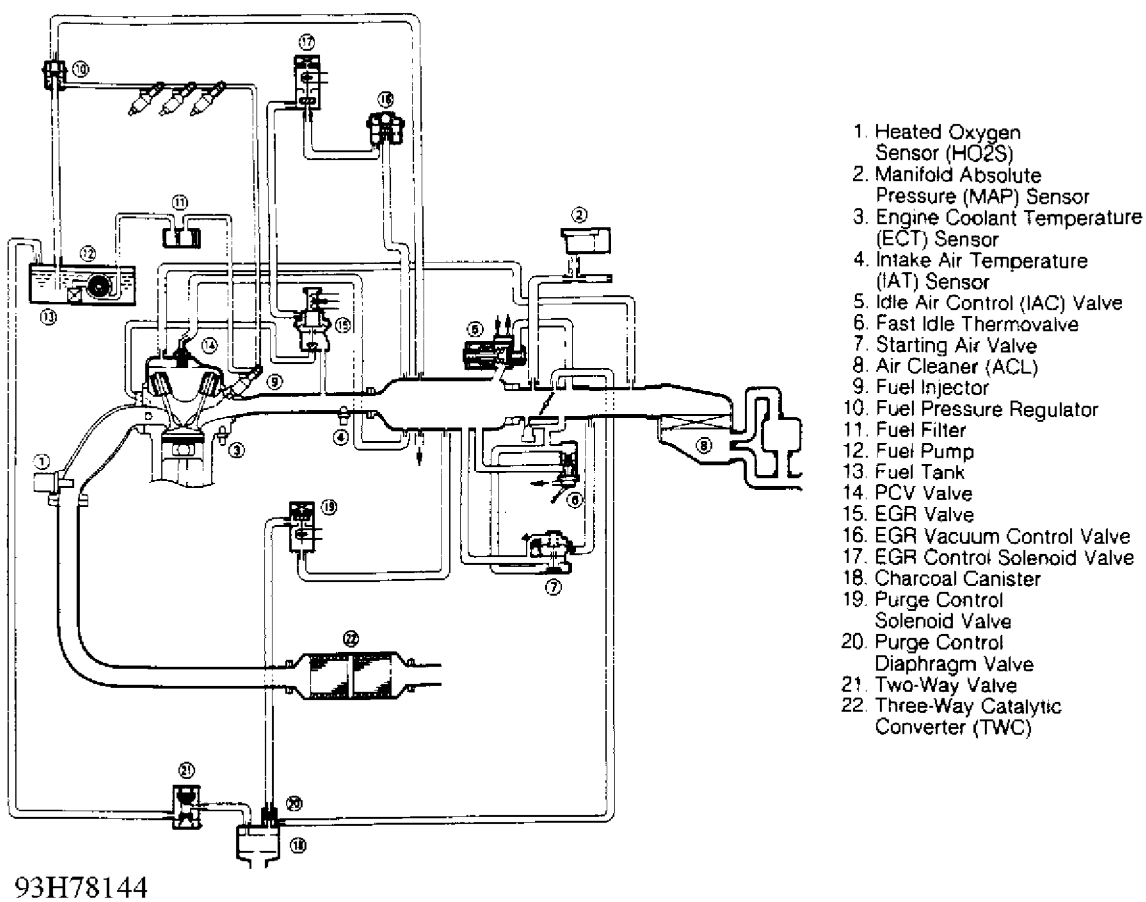
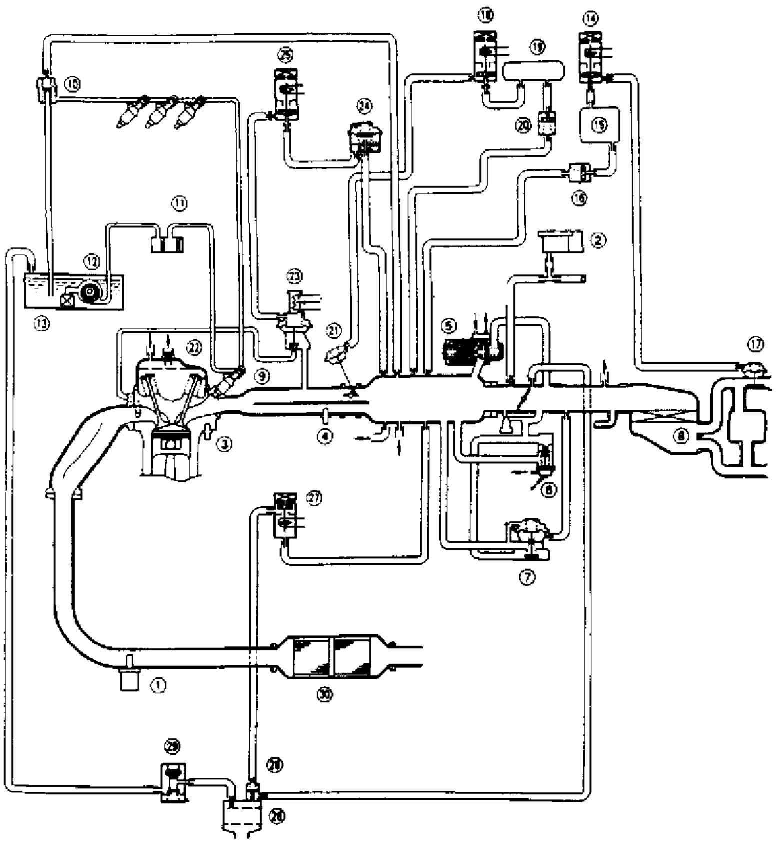


Fig. 1: Vacuum Diagram Without Components (Accord - F22A1 Engine)
Courtesy of American Honda Motor Co., Inc.



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1. Heated Oxygen Sensor (HO2S)
2. Manifold Absolute Pressure (MAP) Sensor
3. Engine Coolant Temperature (ECT) Sensor
4. Intake Air Temperature (IAT) Sensor
5. Idle Air Control (IAC) Valve
6. Fast Idle Thermovalve
7. Starting Air Valve
8. Air Cleaner (ACL)
9. Fuel Injector
10. Fuel Pressure Regulator
11. Fuel Filter
12. Fuel Pump
13. Fuel Tank
14. Intake Air Control Solenoid Valve
15. Intake Air Control Vacuum Tank
16. Intake Air Control Check Valve
17. Intake Air Control Diaphragm
18. Intake Air By-Pass (IAB) Control Solenoid Valve
19. Intake Air By-Pass Vacuum Tank
20. Intake Air By-Pass Check Valve
21. Intake Air By-Pass Control Diaphragm
22. PCV Valve
23. EGR Valve
24. EGR Vacuum Control Valve
25. EGR Control Solenoid valve
26. Charcoal Canister
27. Purge Control Solenoid Valve
28. Purge Control Diaphragm Valve
29. Two-Way Valve
30. Three-Way Catalytic Converter (TWC)

Fig. 2: Vacuum Diagram Without Components (Accord - F22A6 Engine)
Courtesy of American Honda Motor Co., Inc.

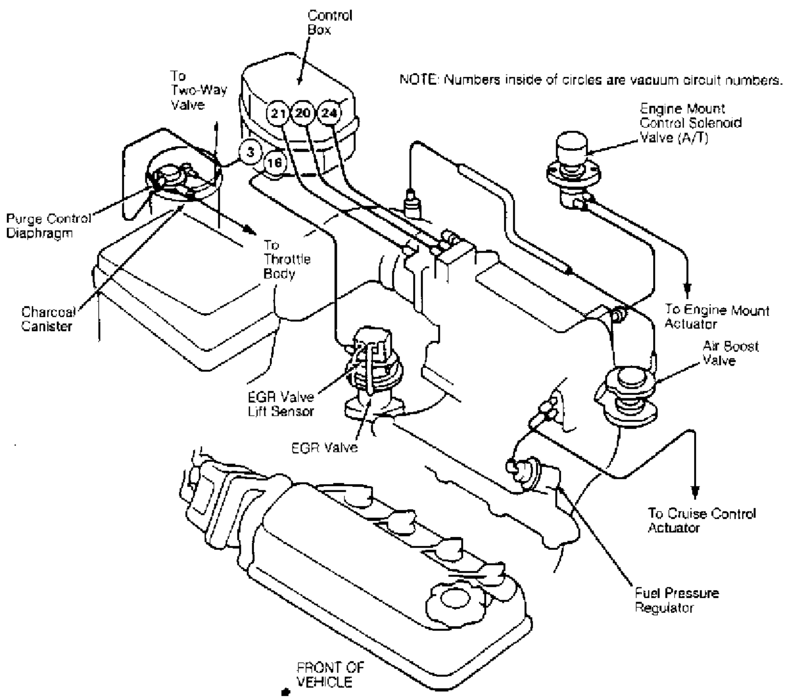


Fig. 3: Vacuum Diagram With Components (Accord - F22A1 Engine)
Courtesy of American Honda Motor Co., Inc.

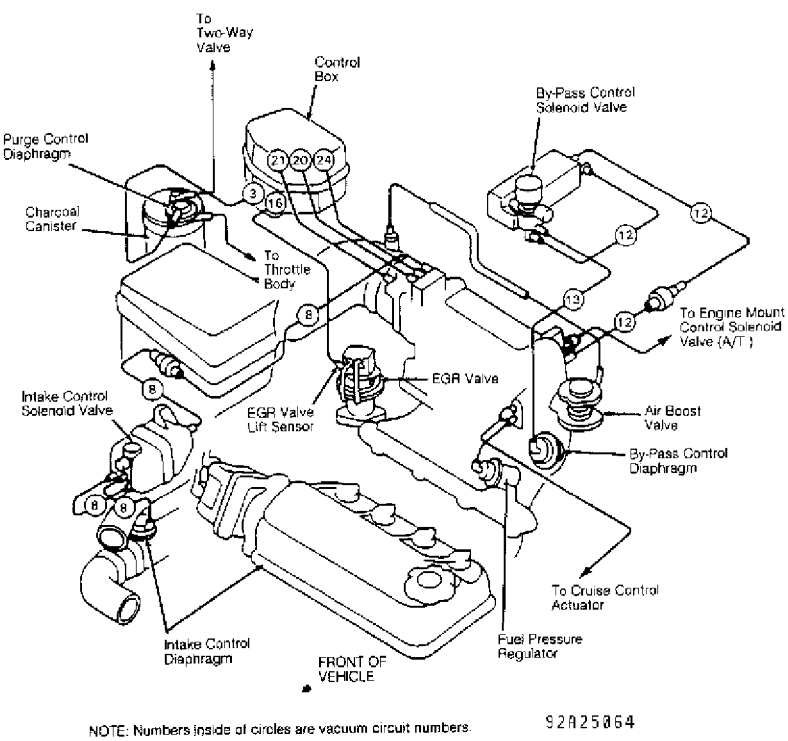


Fig. 4: Vacuum Diagram With Components (Accord - F22A6 Engine)
Courtesy of American Honda Motor Co., Inc.

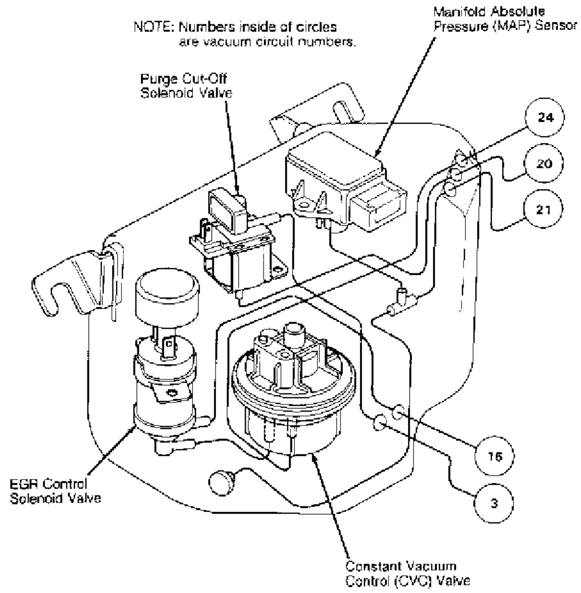


Fig. 5: Vacuum Components In Control Box (Accord)
Courtesy of American Honda Motor Co., Inc.

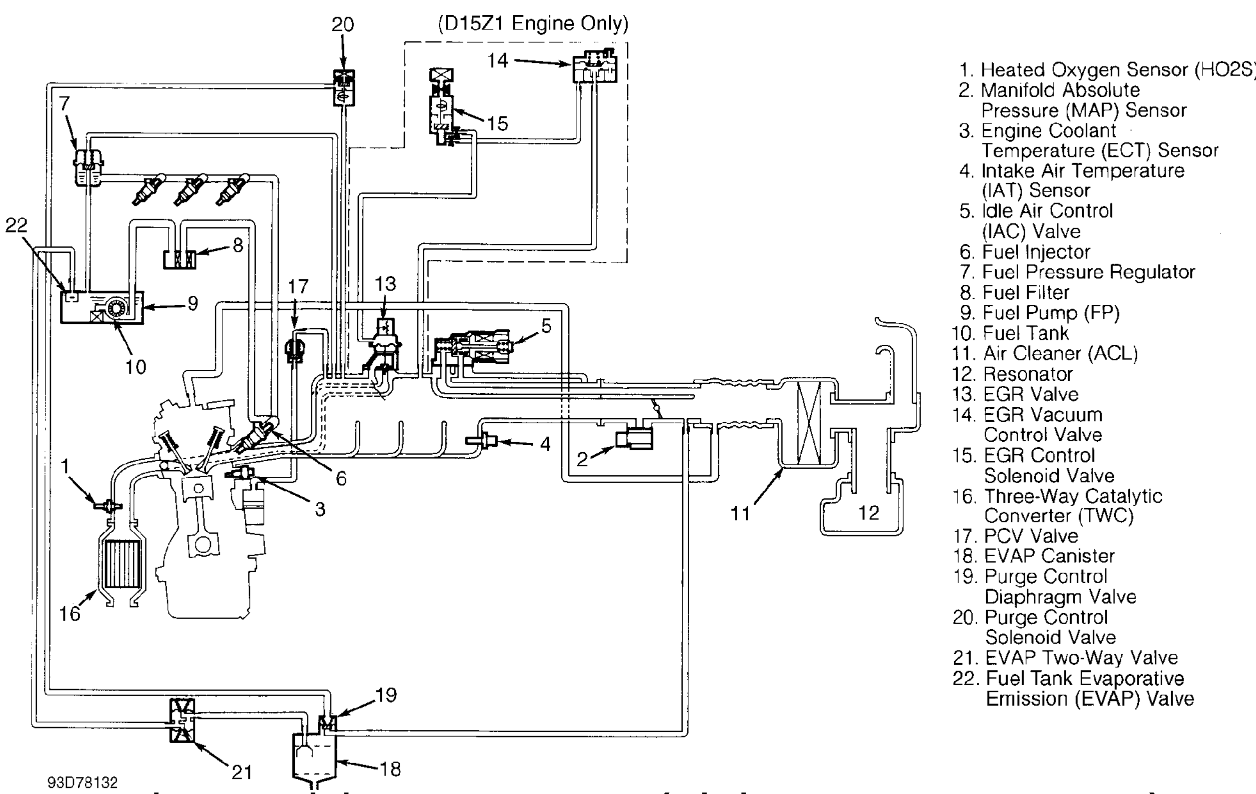


Fig. 6: Vacuum Diagram Without Components (Civic D15B8 & D15Z1 Eng.)
Courtesy of American Honda Motor Co., Inc.

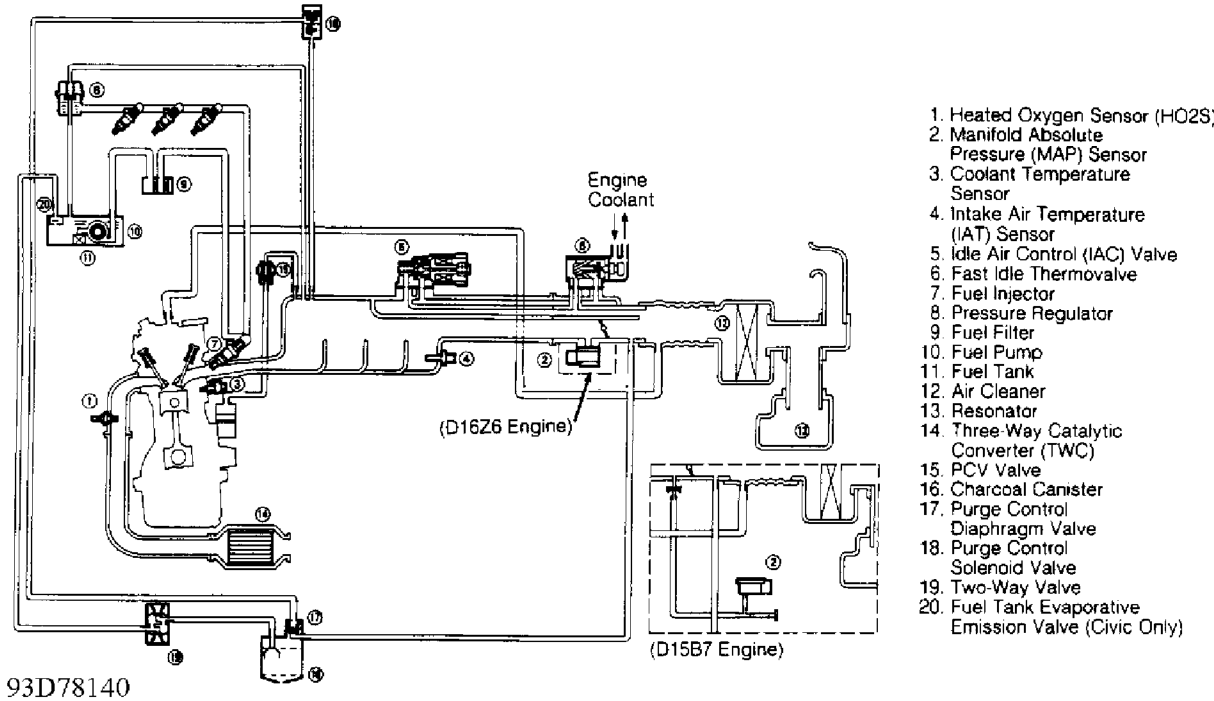


Fig. 7: Vacuum Diagram W/O Components (Civic/Del Sol D15B7 & D16B6 Eng.)
Courtesy of American Honda Motor Co., Inc.

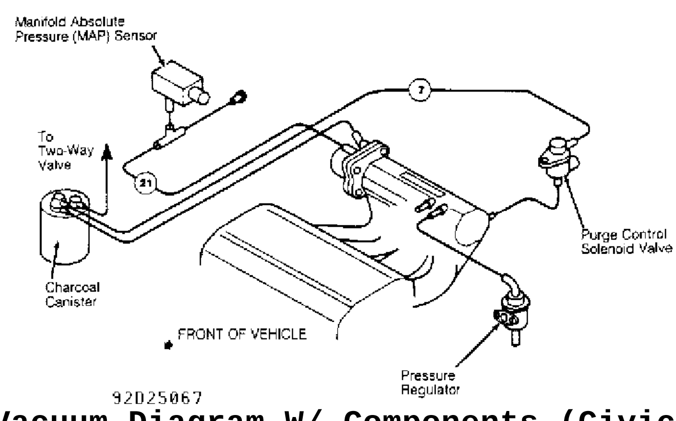


Fig. 8: Vacuum Diagram W/ Components (Civic/Del Sol D15B7 Eng.)
Courtesy of American Honda Motor Co., Inc.

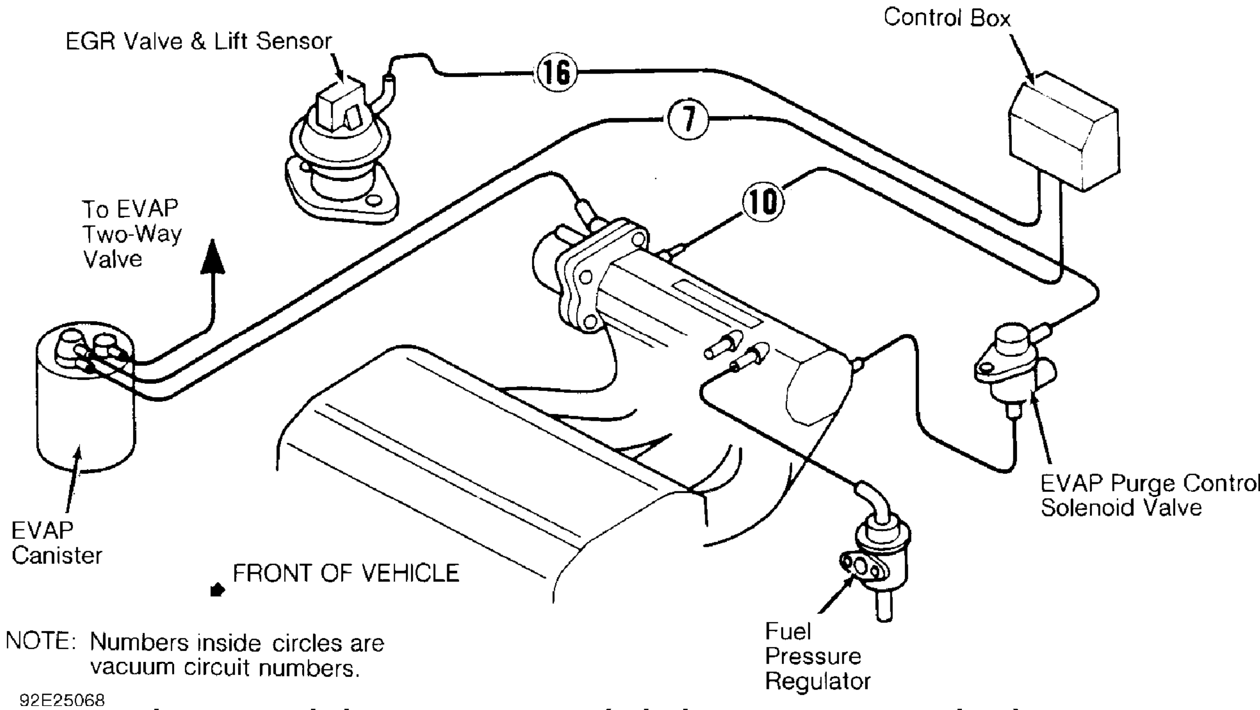


Fig. 9: Vacuum Diagram With Components (Civic - D15Z1 Engine)
Courtesy of American Honda Motor Co., Inc.

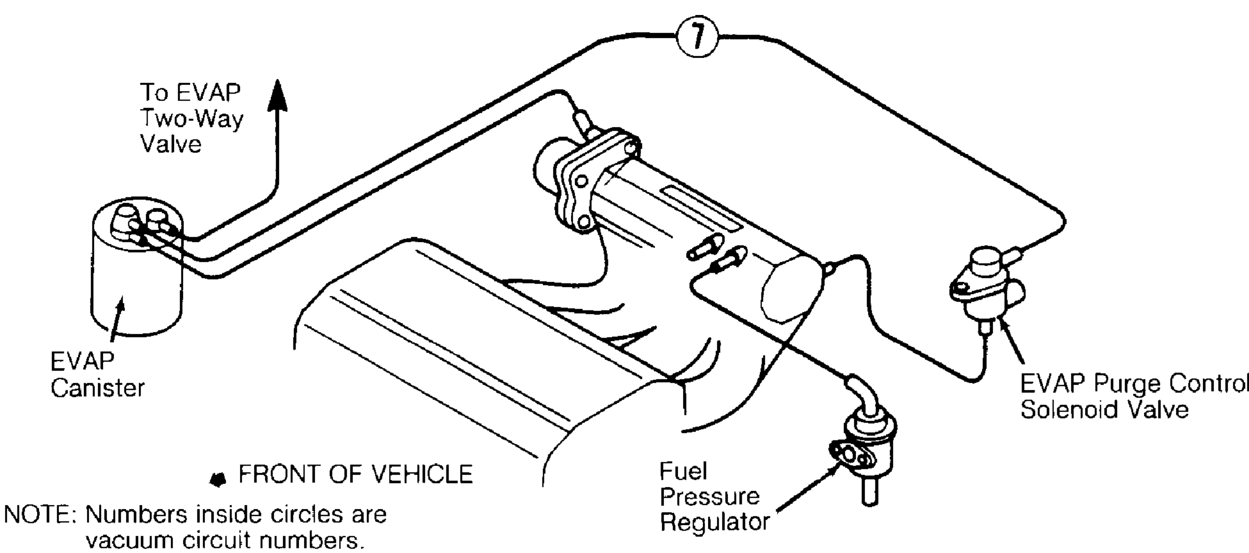


Fig. 10: Vacuum Diagram W/ Components (Civic/Del Sol D15B8 & D16Z6 Eng.)
Courtesy of American Honda Motor Co., Inc.

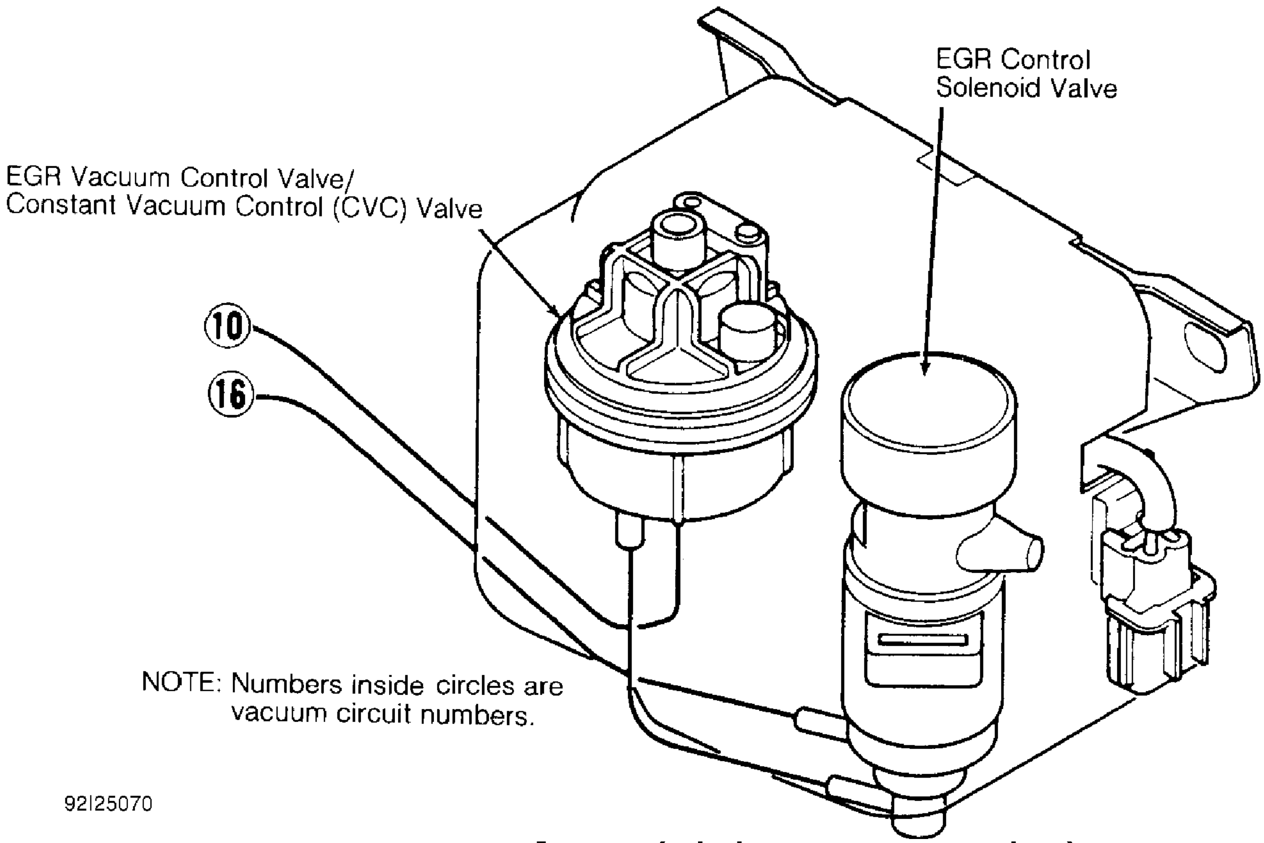
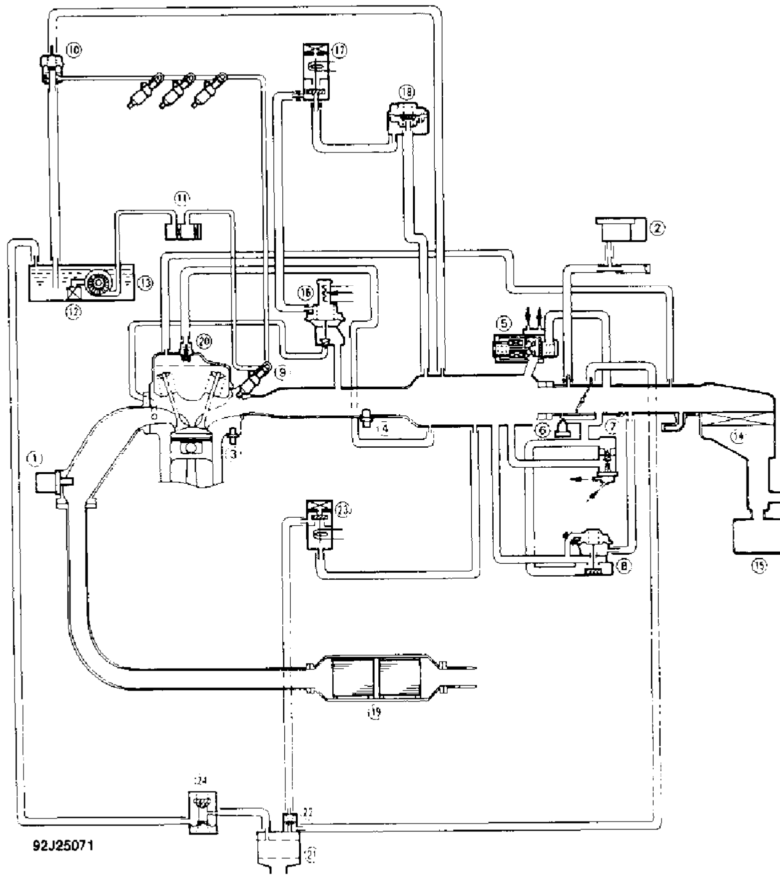


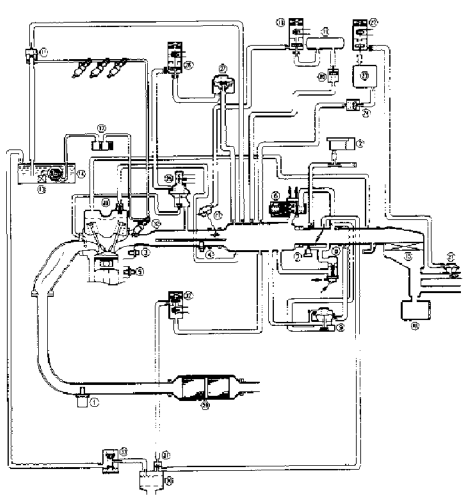
Fig. 11: Vacuum Components In Control Box (Civic - D15Z1 Engine)
Courtesy of American Honda Motor Co., Inc.



1. Heated Oxygen Sensor (HO2S)
2. Manifold Absolute Pressure (MAP) Sensor
3. Coolant Temperature Sensor
4. Intake Air Temperature (IAT) Sensor
5. Intake Air Control (IAC) Valve
6. Idle Adjusting Screw
7. Fast Idle Valve
8. Air Boost Valve
9. Fuel Injector
10. Pressure Regulator
11. Fuel Filter
12. Fuel Pump
13. Fuel Tank
14. Air Cleaner (ACL)
15. Resonator
16. EGR Valve & Lift Sensor
17. EGR Control Solenoid Valve
18. Constant Vacuum Control (CVC) Valve
19. Catalytic Converter
20. PCV Valve
21. Charcoal Canister
22. Purge Control Diaphragm Valve
23. Purge Control Solenoid Valve
24. Two-Way Valve

M - VACUUM

Fig. 12: Vacuum Diagram Without Components (Prelude - F22A1 Engine)
Courtesy of American Honda Motor Co., Inc.



1. Oxygen (O_2) Sensor
2. Manifold Absolute Pressure (MAP) Sensor
3. Coolant Temperature Sensor
4. Intake Air Temperature Sensor
5. Knock Sensor
6. Electronic Air Control Valve (EACV)
7. Idle Adjusting Screw
8. Fast Idle Valve
9. Air Boost Valve
10. Fuel Injector
11. Pressure Regulator
12. Fuel Filter
13. Fuel Pump
14. Fuel Tank
15. Air Cleaner
16. Resonator
17. By-Pass Control Diaphragm
18. By-Pass Control Solenoid Valve
19. Vacuum Tank
20. Check Valve
21. Intake Control Diaphragm
22. Intake Control Solenoid Valve
23. Vacuum Tank
24. Check Valve
25. EGR Valve
26. EGR Control Solenoid Valve
27. Constant Vacuum Control (CVC) Valve
28. Catalytic Converter
29. PCV Valve
30. Charcoal Canister
31. Purge Control Diaphragm Valve
32. Purge Control Solenoid Valve
33. Two-Way Valve

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Fig. 13: Vacuum Diagram W/O Components (Prelude H22A1 & H23A1 Eng.)
Courtesy of American Honda Motor Co., Inc.

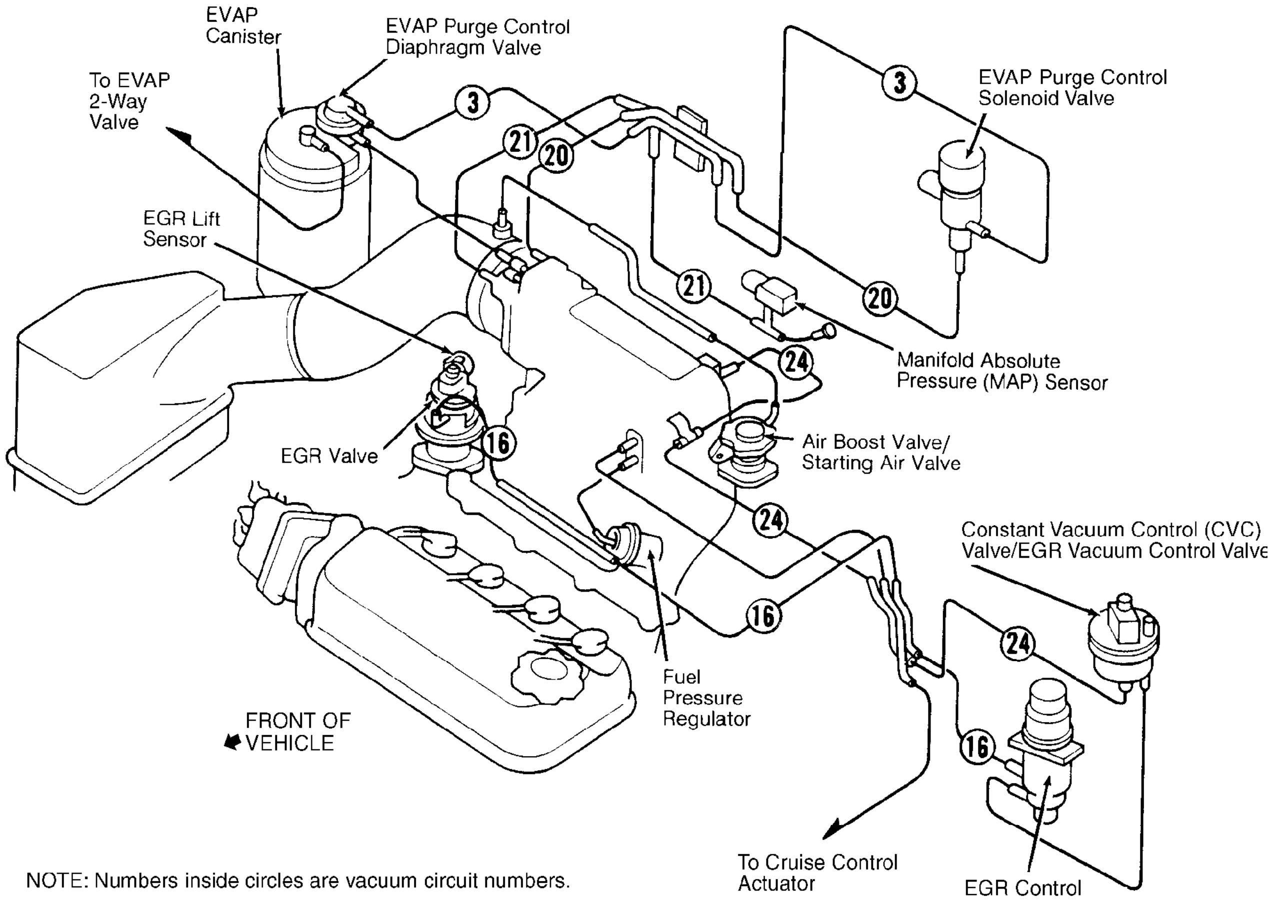

Fig. 14: Vacuum Diagram With Components (Prelude - F22A1 Engine)
Courtesy of American Honda Motor Co., Inc.

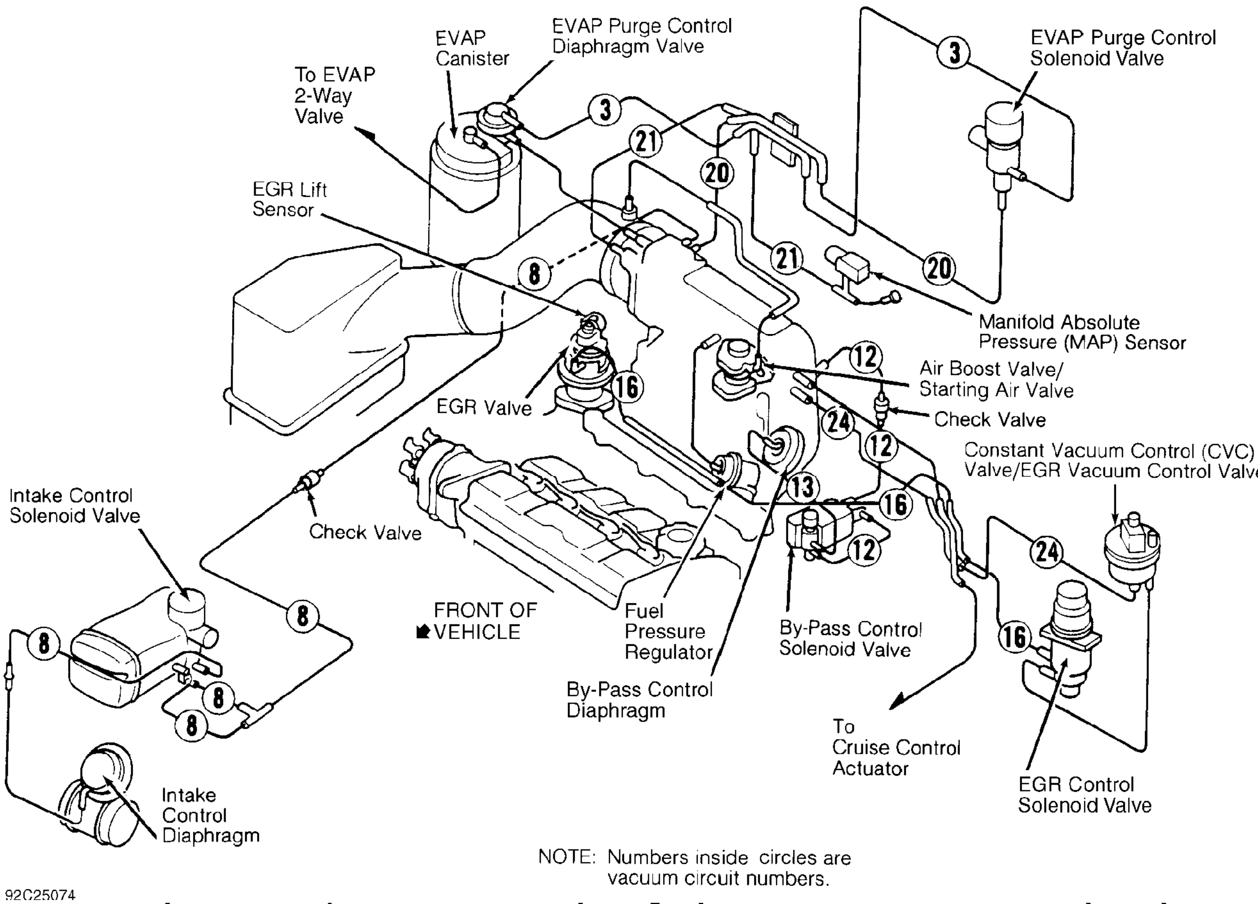

Fig. 15: Vacuum Diagram W/ Components (Prelude H22A1 & H23A1 Engines)
Courtesy of American Honda Motor Co., Inc.

END OF ARTICLE

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ARTICLE BEGINNING

1983-96 MAINTENANCE
Honda Maintenance & Service Intervals

Prelude

* PLEASE READ THIS FIRST *

NOTE: All SERVICE SCHEDULES are listed for normal service vehicles. If vehicle is operated under severe service conditions, see SEVERE SERVICE REQUIREMENTS (PERFORM W/SERVICE SCHEDULES)for items requiring additional maintenance.

NOTE: This article contains scheduled maintenance service information. Fluid types and capacities listed with each service in this article are only those necessary to perform that scheduled service. For specifications pertaining to fluid capacities for the entire vehicle, fuse and circuit breaker identification, wheel and tire size, battery type, warranty information, or model identification refer to the MAINTENANCE INFORMATION article in this section.

CAUTIONS & WARNINGS

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) AIR BAG SYSTEM

NOTE: See the AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT Section.

The SRS has no user-servicable parts. Always have servicing done by an authorized dealer.

When performing maintenance on air bag equipped vehicles always observe proper safety precautions.

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all warnings and service precautions. See appropriate AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

CAUTION: Disconnect negative battery cable before servicing any air bag system, steering column or passenger side dash component. After any repair, turn ignition key to the ON position from passenger's side of vehicle in case of accidental air bag inflation

ANTI-LOCK BRAKE SYSTEM (ABS)

CAUTION: Never mix different diameter tires. On loose or uneven surfaces, the ABS system may require longer stopping distances than conventional brake systems. Exercise caution when removing mud or snow from the wheels so as not to damage the ABS wiring or speed sensors.

BATTERY WARNING

WARNING: When battery is disconnected, vehicles equipped with computers may lose memory data. When battery power is restored, driveability problems may exist on some vehicles. These vehicles may require a relearn procedure. See appropriate COMPUTER RELEARN PROCEDURES article in the GENERAL INFORMATION section below.

REPLACING BLOWN FUSES

Before replacing a blown fuse, remove ignition key, turn off all lights and accessories to avoid damaging the electrical system. Be sure to use fuse with the correct indicated amperage rating. The use of an incorrect amperage rating fuse may result in a dangerous electrical system overload.

BRAKE PAD WEAR INDICATOR

Indicator will cause a squealing or scraping noise, warning that brake pads need replacement.

CATALYTIC CONVERTER

Continued operation of vehicle with a severe malfunction could cause converter to overheat, resulting in possible damage to converter and vehicle.

COOLANT (PROPYLENE-GLYCOL FORMULATIONS)

CAUTION: To avoid possible damage to vehicle use only ethylene-glycol based coolants with a mixture ratio from 44-68% anti-freeze. DO NOT use 100% anti-freeze as it will cause the formation of cooling system deposits. This results in coolant temperatures of over 300° F (149°C) which can melt plastics. 100% anti-freeze has a freeze point of only -8° F (-22°C).

CAUTION: Propylene-Glycol Mixtures has a smaller temperature range than Ethylene-Glycol. The temperature range (freeze-boil)

of a 50/50 Anti-Freeze/Water Mix is as follows:

Propylene-Glycol -26° F (-32°C) - 257° F (125°C)

Ethylene-Glycol -35° F (-37°C) - 263° F (128°C)

CAUTION: Propylene-Glycol/Ethylene-Glycol Mixtures can cause the destabilization of various corrosion inhibitors. Also Propylene-Glycol/Ethylene-Glycol has a different specific gravity than Ethylene-Glycol coolant, which will result in inaccurate freeze point calculations.

ELECTROSTATIC DISCHARGE SENSITIVE (ESD) PARTS

WARNING: Many solid state electrical components can be damaged by static electricity (ESD). Some will display a warning label, but many will not. Discharge personal static electricity by touching a metal ground point on the vehicle prior to servicing any ESD sensitive component.

ENGINE OIL

CAUTION: Never use non-detergent or straight mineral oil.

FUEL SYSTEM SERVICE

WARNING: Relieve fuel system pressure prior to servicing any fuel system component (fuel injection models).

HALOGEN BULBS

WARNING: Halogen bulbs contain pressurized gas which may explode if overheated. DO NOT touch glass portion of bulb with bare hands. Eye protection should be worn when handling or working around halogen bulbs.

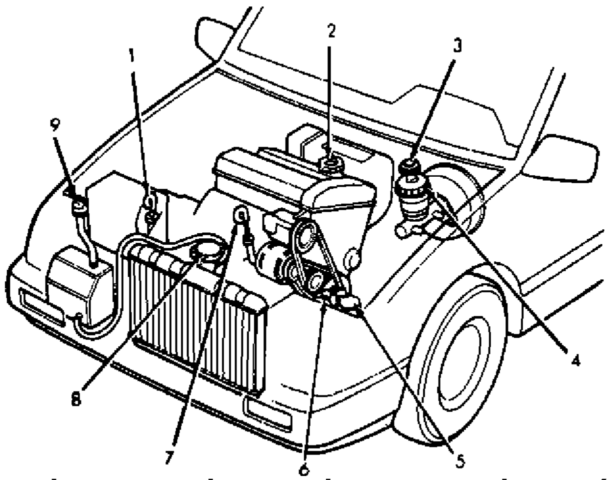
RADIATOR CAP

CAUTION: Always disconnect the fan motor when working near the radiator fan. The fan is temperature controlled and could start at any time even when the ignition key is in the OFF position. DO NOT loosen or remove radiator cap when cooling system is hot.

RADIATOR FAN

WARNING: Keep hands away from radiator fan. Fan is controlled by a thermostatic switch which may come on or run for up to 15 minutes even after engine is turned off.

SERVICE POINT LOCATIONS



1. Automatic Transmission Dipstick
2. Engine Oil Filler Cap
3. Clutch Fluid Reservoir
4 Brake Fluid Reservoir
5. Washer Fluid Reservoir
6. Power Steering Fluid Reservoir
7. Engine Oil Dipstick
8. Radiator Cap
9. Radiator Reserve Tank Cap

Fig. 1: Engine Service Point Locations (Typical)
Courtesy of American Honda Motor Co., Inc.

CAMSHAFT TIMING BELT REPLACEMENT INFORMATION

CAUTION: Failure to replace a faulty camshaft timing belt may result in serious engine damage.

The condition of camshaft drive belts should always be checked on vehicles which have more than 50,000 miles. Although some manufacturers do not recommend belt replacement at a specified mileage, others require it at 60,000-100,000 miles. A camshaft drive belt failure may cause extensive damage to internal engine components on most engines, although some designs do not allow piston-to-valve contact. These designs are often called "Free Wheeling".

Many manufacturers changed their maintenance and warranty schedules in the mid-1980's to reflect timing belt inspection and/or replacement at 50,000-60,000 miles. Most service interval schedules in this manual reflect these changes.

Belts or components should be inspected and replaced if any of the following conditions exist:

* **Cracks Or Tears In Belt Surface**
* **Missing, Damaged, Cracked Or Rounded Teeth**
* **Oil Contamination**
* **Damaged Or Faulty Tensioners**
* **Incorrect Tension Adjustment**

Replace camshaft timing belt at 90,000 mile intervals.

SEVERE & NORMAL SERVICE DEFINITIONS

NOTE: Use the Severe Service schedule if the vehicle to be serviced is operated under ANY (one or more) of these conditions:

Service is recommended at mileage intervals based on vehicle operation. Service schedules are based on the following primary operating conditions:

Normal Service

* Driven More Than 10 Miles Daily
* No Operating Conditions From Severe Service Schedule

Severe Service (Unique Driving Conditions)

* Short Trips In Freezing Temperatures
* Towing Or Commercial Use
* Driving In Salty (Or Other Corrosive Materials) Areas
* Severe Dust Conditions
* Hot Weather, Stop-And-Go Driving
* Extensive Idling

SEVERE SERVICE REQUIREMENTS (PERFORM W/SERVICE SCHEDULES)

NOTE: The following services are to be performed on vehicles subjected to severe service. See SEVERE & NORMAL SERVICE DEFINITIONS. This service is to be performed in addition to the normal services listed in the NORMAL MAINTENANCE SERVICE SCHEDULES.

SEVERE SERVICE CONDITIONS/ACTIONS TABLE

Condition	Action	Item	Perform Every (1)
Short Trips In Freezing Temperatures	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Towing	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	A/T Fluid	15,000 Miles or 12 Months
	Replace	M/T Fluid	15,000 Miles or 12 Months

	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Commercial Use	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Driving In Salty (Or Other Corrosive Materials) Areas	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Severe Dust Conditions	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Hot Weather, Stop-And-Go Driving	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Extensive Idling	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months

(1) - Perform these services at the mileage or number of months (since the last time), whichever comes first.

The following service schedules refer to vehicles driven under normal operating conditions. For vehicles driven under severe conditions, additional services may be necessary. See SEVERE SERVICE REQUIREMENTS (PERFORM W/SERVICE SCHEDULES)above in this article for additional service requirements.

7500 MILE (12,000 KM) SERVICE

7500 MILE (12,000 KM) SERVICE

Service Or Inspect
Check Fluid Levels
Inspect Coolant Hoses and Clamps
Inspect Brake System
Inspect Exhaust System
Inspect C/V Joint boots
Inspect Steering Linkage/Front Suspension
Lubricate Chassis
Rotate Tires and Adjust Air Pressure (Including Spare)

Replace
Engine Oil
Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	

1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

15,000 MILE (24,000 KM) SERVICE

15,000 MILE (24,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Valve Clearance
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Coolant Strength
?	Inspect Brake System
?	Check Exhaust System & Heat Shielding
?	Clean Battery and Battery Terminals
?	Inspect Fuel/Tank/Cap/Lines
?	Check Operation of Horn, Wipers/Washers & All Exterior Lights
?	Inspect Condition of Wiper Blades
?	Check Headlight Alignment
?	Check Seat Belt Webbing and Release Mechanisms
?	Check Parking Brake Operation

?	Check Shift/Clutch Interlock Operation
?	Inspect C/V Joint boots
?	Brake Discs & Calipers
?	Parking Brake
?	Clutch Release Arm Travel
?	Inspect Steering Linkage/Front Suspension
?	Lubricate Chassis
?	Suspension Mounting Bolts
?	Front Wheel Alignment
?	Steering Operation, Tie Rods, Gear Box & Boots
?	Power Steering System
?	Lubricate Weatherstripping with Silicone
?	Lubricate Door Hinges
?	Lubricate Door Locks
?	Check Body Drain Holes
?	Rotate Tires and Adjust Air Pressure
	Replace
?	Engine Oil
?	Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

MAINTE

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

22,500 MILE (36,000 KM) SERVICE

22,500 MILE (36,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Check Fluid Levels
Check Cooling System Hoses and Clamps
Check Exhaust System & Heat Shielding
Inspect C/V Joint boots
Inspect Power Steering System (If Equipped)
Inspect Steering Linkage/Front Suspension
Lubricate Chassis
Inspect Front Brake Pads & Rotors
Inspect Rear Brake Linings & Drums
Inspect Brake System Hoses & Lines
Inspect Shocks/Struts for Leakage
Inspect Tire Wear Pattern

- Rotate Tires and Adjust Air Pressure (Including Spare)

Replace

- Engine Oil
- Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

30,000 MILE (48,000 KM) SERVICE

30,000 MILE (48,000 KM) SERVICE

Service Or Inspect

- Verify Last Major Service Was Performed
- Valve Clearance
- Check Fluid Levels

?   ? Check Cooling System Hoses and Clamps ?

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?   ? Check Exhaust System & Heat Shielding ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Clean Battery and Battery Terminals ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Inspect/Adjust Accessory Drive Belts (Replace if Required) ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Clean Choke Mechanism (If Equipped) ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Blow-By Filter ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Crankcase Ventilation System ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? ABS System Operation ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Brake Hoses & Lines ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Brake Discs & Calipers ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Rear Brake Drums, Wheel Cylinders & Linings ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Parking Brake ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Clutch Release Arm Travel ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Suspension Mounting Bolts ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Front Wheel Alignment ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Rear Wheel Alignment (4WS Model) ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Steering Operation, Tie Rods, Gear Box & Boots ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Inspect C/V Joint boots ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Inspect Power Steering System (If Equipped) ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Suspension Bushings, Springs, Arms & Rear Jounce Bumpers ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Parking Brake System ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Inspect Shocks/Struts for Leakage ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Inspect Tire Wear Pattern ?

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?   ? Rotate Tires and Adjust Air Pressure (Including Spare) ?MAINTE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

Replace

- Engine Oil
- Oil Filter
- Spark Plugs
- Air Filter Element
- Manual Transmission Oil
- Automatic Transmission Fluid
- Drain, Refill and Bleed Brake System

Lubrication Specifications

Application	Specification
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	

MAINTE

1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

Service Labor Times

Application	Hours
1.8L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.0L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.1L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.2L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.3L DOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.2L DOHC VTEC	
Manual Transmission	4.4

37,500 MILE (60,000 KM) SERVICE

37,500 MILE (60,000 KM) SERVICE

Service Or Inspect
? Verify Last Major Service Was Performed
? Check Fluid Levels
? Check Cooling System Hoses and Clamps
? Check Exhaust System & Heat Shielding
? Inspect Brake System

?	Inspect C/V Joint boots
?	Inspect Steering Linkage/Front Suspension
?	Lubricate Chassis
?	Rotate Tires and Adjust Air Pressure (Including Spare)
	Replace
?	Engine Oil
?	Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

45,000 MILE (72,000 KM) SERVICE

45,000 MILE (72,000 KM) SERVICE

Service Or Inspect

? ? Verify Last Major Service Was Performed ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Valve Clearance ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Clutch Release Arm Travel ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Suspension Mounting Bolts ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Front Wheel Alignment ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Fluid Levels ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Cooling System Hoses and Clamps ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Clean Battery and Battery Terminals ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Exhaust System & Heat Shielding ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Operation of Horn, Wipers/Washers & All Exterior Lights?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Condition of Wiper Blades ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Headlight Alignment ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Seat Belt Webbing and Release Mechanisms ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Parking Brake Operation ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Shift/Clutch Interlock Operation ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect C/V Joint boots ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Power Steering System (If Equipped) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Steering Linkage/Front Suspension ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Lubricate Chassis ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Front Brake Pads & Rotors ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Rear Brake Linings & Drums ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Brake System Hoses & Lines ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Fuel Tank/Cap/Lines ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Shocks/Struts for Leakage ?MAINTE
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?	Inspect Tire Wear Pattern
?	Lubricate Weatherstripping with Silicone
?	Lubricate Door Hinges
?	Lubricate Door Locks
?	Check Body Drain Holes
?	Rotate Tires and Adjust Air Pressure
	Replace
?	Engine Oil
?	Oil Filter
?	Drain, Flush and Refill Engine Coolant

Lubrication Specifications

Application	Specification
Engine Coolant	50/50 Honda Recommended Anti-Freeze & Water
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Cooling System	4.7-6.7 Qts. (4.4-6.3L)
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

52,500 MILE (84,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Check Fluid Levels
Check Cooling System Hoses and Clamps
Check Exhaust System & Heat Shielding
Inspect Brake System
Lubricate Chassis
Inspect C/V Joint boots
Inspect Steering Linkage/Front Suspension
Rotate Tires and Adjust Air Pressure (Including Spare)

Replace
Engine Oil
Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)

1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

60,000 MILE (96,000 KM) SERVICE

60,000 MILE (96,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Idle Speed & Idle CO
?	Valve Clearance
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Clean Battery and Battery Terminals
?	Inspect/Adjust Accessory Drive Belts (Replace if Required)
?	EGR System
?	Secondary Air Supply System
?	Intake-Air Temperature Control System
?	Throttle Control System
?	Choke Mechanism (If Equipped)
?	Choke Opener Operation (If Equipped)
?	Evaporative Emission Control System
?	Ignition Timing & Control System

MAINTE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Distributor Cap & Rotor** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Ignition Wiring** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **PCV Valve** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Blow-By Filter** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Underhood Wiring Harnesses and Connections** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Emission Control Vacuum Hoses and Connections** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Fuel/Tank/Cap/Lines** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect C/V Joint boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Power Steering System (If Equipped)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Suspension Bushings, Springs, Arms & Rear Jounce Bumpers** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Lubricate Chassis** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Clutch Release Arm Travel** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Brake System** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Parking Brake System** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **ABS System Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Brake Hoses & Lines** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Brake Discs & Calipers** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Rear Brake Drums, Wheel Cylinders & Linings** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Suspension Mounting Bolts** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Front Wheel Alignment** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Rear Wheel Alignment (4WS Model)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Steering Operation, Tie Rods, Gear Box & Boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Shocks/Struts for Leakage** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA? **MAINTE**
? ? **Inspect Tire Wear Pattern** ?

- Rotate Tires and Adjust Air Pressure (Including Spare)

Replace

- Engine Oil
- Oil Filter
- Spark Plugs
- Air Filter Element
- Fuel Filter & Hoses (Including Auxiliary Filter)
- Blow-By Filter (Exc. Si Model)
- Manual Transmission Oil
- Automatic Transmission Fluid
- Rear Wheel Bearing Grease
- Anti-Lock Brake System High Pressure Hose (If Equipped)
- Drain, Refill and Bleed Brake System

Lubrication Specifications

Application	Specification
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)

MAINTE

1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	
1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

Service Labor Times

Application	Hours
1.8L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.0L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.1L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.2L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.3L DOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.2L DOHC VTEC	
Manual Transmission	5.7

67,500 MILE (108,000 KM) SERVICE

67,500 MILE (108,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Lubricate Chassis
?	Inspect C/V Joint boots
?	Inspect Steering Linkage/Front Suspension
?	Inspect Front Brake Pads & Rotors
?	Inspect Rear Brake Linings & Drums
?	Inspect Brake System Hoses & Lines
?	Rotate Tires and Adjust Air Pressure (Including Spare)

	Replace
?	Engine Oil
?	Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)

1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

75,000 MILE (120,000 KM) SERVICE

75,000 MILE (120,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Valve Clearance
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Clean Battery and Battery Terminals
?	Inspect Brake System
?	Check Operation of Horn, Wipers/Washers & All Exterior Lights
?	Inspect Condition of Wiper Blades
?	Check Headlight Alignment
?	Check Seat Belt Webbing and Release Mechanisms
?	Check Parking Brake Operation
?	Check Shift/Clutch Interlock Operation
?	Adjust Drive Belt Tension
?	Lubricate Chassis
?	Inspect C/V Joint boots
?	Inspect Power Steering System (If Equipped)

```
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Brake Discs & Calipers                                       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Parking Brake                                                ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Clutch Release Arm Travel                                    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Suspension Mounting Bolts                                    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Front Wheel Alignment                                        ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Steering Operation, Tie Rods, Gear Box & Boots               ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Weatherstripping with Silicone                     ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Door Hinges                                        ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Door Locks                                         ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Check Body Drain Holes                                       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Shocks/Struts for Leakage                            ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Tire Wear Pattern                                    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Rotate Tires and Adjust Air Pressure                         ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Replace                                                      ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Engine Oil                                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Oil Filter                                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Drain, Flush and Refill Engine Coolant                       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Lubrication Specifications                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Application                                          Specification ?
?                                                                   ?
? Engine Coolant  .........................  50/50 Honda Recommended?
?                                                Anti-Freeze & Water?
? Engine Oil                                                        ?
?   1983-96  ..................................  SAE 5W-30 API SG/SH?
?   1994-96 (VTEC)  ..........................  SAE 10W-30 API SG/SH?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Fluid Capacities                                             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA? MAINTE
? Application                                           (1) Quantity ?
```

Cooling System	4.7-6.7 Qts. (4.4-6.3L)
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

82,500 MILE (132,000 KM) SERVICE

82,500 MILE (132,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Inspect Brake System
?	Lubricate Chassis
?	Inspect C/V Joint boots
?	Inspect Steering Linkage/Front Suspension
?	Rotate Tires and Adjust Air Pressure (Including Spare)
	Replace
?	Engine Oil
?	Oil Filter
	Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

90,000 MILE (144,000 KM) SERVICE

90,000 MILE (144,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Valve Clearance
Check Fluid Levels
Check Cooling System Hoses and Clamps
Clean Battery and Battery Terminals
Inspect/Adjust Accessory Drive Belts (Replace if Required)
Check Exhaust System & Heat Shielding
Choke Mechanism (If Equipped)

?   ? **Blow-By Filter** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **ABS System Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Brake Hoses & Lines** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Brake Discs & Calipers** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Rear Brake Drums, Wheel Cylinders & Linings** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Check Operation of Horn, Wipers/Washers & All Exterior Lights**?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect Condition of Wiper Blades** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Check Headlight Alignment** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Check Seat Belt Webbing and Release Mechanisms** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Check Parking Brake Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Check Shift/Clutch Interlock Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect Spark Plug Wires** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect Distributor Cap** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect Fuel/Tank/Cap/Lines** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect C/V Joint boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect Power Steering System (If Equipped)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Clutch Release Arm Travel** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Suspension Mounting Bolts** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Front Wheel Alignment** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Rear Wheel Alignment (4WS Model)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Steering Operation, Tie Rods, Gear Box & Boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect Steering Linkage/Front Suspension** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Lubricate Chassis** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? **Inspect Front Brake Pads & Rotors** ?**MAINTE**
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

```
?   ?  Inspect Rear Brake Linings & Drums                          ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Brake System Hoses & Lines                          ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Shocks/Struts for Leakage                           ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Tire Wear Pattern                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Weatherstripping with Silicone                    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Door Hinges                                       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Door Locks                                        ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Check Body Drain Holes                                      ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Rotate Tires and Adjust Air Pressure                        ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Replace                                                     ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Engine Oil                                                  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Oil Filter                                                  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Air Filter Element                                          ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Spark Plugs                                                 ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Camshaft Timing Belt                                        ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Manual Transmission Oil                                     ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Automatic Transmission Fluid                                ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Transmission Oil                                            ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Drain, Refill and Bleed Brake System                        ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Lubrication Specifications                                  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Application                                          Specification ?
?                                                                  ?
? Brake Fluid  ......................  DOT 3 Or DOT 4 Specifications?
?                                           (See Fluid Reservoir Cap)?
? Engine Oil                                                       ?
?   1983-96  ..................................  SAE 5W-30 API SG/SH?
?   1994-96 (VTEC)  ..........................  SAE 10W-30 API SG/SH?
? Power Steering Fluid  ................  Honda Power Steering Fluid?MAINTE
```

Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	
1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

Service Labor Times

Application	Hours
1.8L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.0L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.1L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.2L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.3L DOHC (2)	

MAINTE

Automatic Transmission	4.6
Manual Transmission	4.4
2.2L DOHC VTEC (2)	
Manual Transmission	4.4

(1) - Add 2.5 hrs. to replace camshaft timing belt.
(2) - Add 2.9 hrs. to replace camshaft timing belt.

97,500 MILE (156,000 KM) SERVICE

97,500 MILE (156,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Check Fluid Levels
Check Cooling System Hoses and Clamps
Check Exhaust System & Heat Shielding
Inspect Brake System
Inspect C/V Joint boots
Inspect Steering Linkage/Front Suspension
Lubricate Chassis
Rotate Tires and Adjust Air Pressure (Including Spare)

Replace
Engine Oil
Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities	
Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

105,000 MILE (168,000 KM) SERVICE

105,000 MILE (168,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Valve Clearance
?	Brake Hoses & Lines
?	Brake Discs & Calipers
?	Clutch Release Arm Travel
?	Suspension Mounting Bolts
?	Front Wheel Alignment
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Clean Battery and Battery Terminals
?	Inspect Brake System

?	Check Operation of Horn, Wipers/Washers & All Exterior Lights
?	Inspect Condition of Wiper Blades
?	Check Headlight Alignment
?	Check Seat Belt Webbing and Release Mechanisms
?	Check Parking Brake Operation
?	Inspect Fuel/Tank/Cap/Lines
?	Check Shift/Clutch Interlock Operation
?	Inspect C/V Joint boots
?	Inspect Power Steering System (If Equipped)
?	Inspect Steering Linkage/Front Suspension
?	Lubricate Chassis
?	Lubricate Weatherstripping with Silicone
?	Lubricate Door Hinges
?	Lubricate Door Locks
?	Check Body Drain Holes
?	Rotate Tires and Adjust Air Pressure
	Replace
?	Engine Oil
?	Oil Filter
?	Flush and Refill Engine Coolant

Lubrication Specifications

Engine Coolant	50/50 Honda Recommended Anti-Freeze & Water
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities	
Application	**(1) Quantity**
Cooling System	4.7-6.7 Qts. (4.4-6.3L)
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

112,500 MILE (180,000 KM) SERVICE

112,500 MILE (180,000 KM) SERVICE

Service Or Inspect	
?	Verify Last Major Service Was Performed
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Inspect C/V Joint boots
?	Inspect Steering Linkage/Front Suspension
?	Lubricate Chassis
?	Rotate Tires and Adjust Air Pressure
Replace	
?	Engine Oil
?	Oil Filter

Lubrication Specifications	
Application	**Specification**
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities	
Application	**(1) Quantity**
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

120,000 MILE (192,000 KM) SERVICE

120,000 MILE (192,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Idle Speed & Idle CO
Valve Clearance
Alternator Drive Belt
Cooling System Hoses & Connections
EGR System
Secondary Air Supply System

? ? **Fuel Line Connections** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Intake-Air Temperature Control System** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Throttle Control System** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Choke Mechanism (If Equipped)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Choke Opener Operation (If Equipped)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Evaporative Emission Control System** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Ignition Timing & Control System** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Distributor Cap & Rotor** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Ignition Wiring** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **PCV Valve** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Blow-By Filter** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **ABS System Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Brake Hoses & Lines** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Brake Discs & Calipers** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Rear Brake Drums, Wheel Cylinders & Linings** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Fluid Levels** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Cooling System Hoses and Clamps** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect/Adjust Accessory Drive Belts (Replace if Required)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Exhaust System & Heat Shielding** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Clean Battery and Battery Terminals** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Underhood Wiring Harnesses and Connections** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Emission Control Vacuum Hoses and Connections** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Distributor Cap** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Ignition Timing** ? **MAINTE**
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

? ? Inspect Fuel/Tank/Cap/Lines ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect C/V Joint boots ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Clutch Release Arm Travel ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Suspension Mounting Bolts ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Front Wheel Alignment ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Rear Wheel Alignment (4WS Model) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Steering Operation, Tie Rods, Gear Box & Boots ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Power Steering System (If Equipped) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Steering Linkage/Front Suspension ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Lubricate Chassis ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Suspension Bushings, Springs, Arms & Rear Jounce Bumpers ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Parking Brake System ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Shocks for Leakage ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Tire Wear Pattern ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Rotate Tires and Adjust Air Pressure (Including Spare) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Replace ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Engine Oil ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Oil Filter ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Spark Plugs ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Spark Plug Wires ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Air Filter Element ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Blow-By Filter (Exc. Si Model) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Fuel Filter (Including Auxiliary Filter) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Manual Transmission Oil ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?**MAINTE**

- Automatic Transmission Fluid
- Fuel Filter & Hoses (Including Auxiliary Filter)
- Rear Wheel Bearing Grease
- Anti-Lock Brake System High Pressure Hose (If Equipped)
- Drain, Refill and Bleed Brake System

Lubrication Specifications

Application	Specification
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	
1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use MAINTE

dipstick (if available) to measure level.
(2) - Includes filter change.

Service Labor Times

Application	Hours
1.8L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.0L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.1L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.2L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.3L DOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.2L DOHC VTEC	
Manual Transmission	5.7

LUBRICATION SPECIFICATIONS

LUBRICATION SPECIFICATIONS TABLE

Application	Fluid Specifications
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Coolant	50/50 Honda Recommended Anti-Freeze & Water
Engine Oil	
1983-94	SAE 5W-30 API SG/SH
1994 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

FLUID CAPACITIES

FLUID CAPACITIES TABLE (1)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Quantity
A/C System R-12 Refrigerant	
1983-84	25 Ozs.
1985-87	26-30 Ozs
1988	29-34 Ozs.
1989	32-36 Ozs.
1990-91	30-34 Ozs.
1992-93	26-28 Ozs.
A/C System R-134a Refrigerant (2)	
1994-96	21-23 Ozs.
Cooling System	4.7-6.7 Qts. (4.4-6.3L)
Engine Oil (3)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1995-96 (VTEC)	5.1 Qts. (4.8L)
Fuel Tank	15.9 Gals. (60L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	
1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Use of R-12 in a R-134a system will result in SEVERE DAMAGE

(3) - Includes filter change.

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION

METRIC CONVERSIONS

METRIC CONVERSIONS

Metric conversions are making life more difficult for the mechanic. In addition to doubling the number of tools required, metric-dimensioned nuts and bolts are used alongside English components in many new vehicles. The mechanic has to decide which tool to use, slowing down the job. The tool problem can be solved by trial and error, but some metric conversions aren't so simple. Converting temperature, lengths or volumes requires a calculator and conversion charts, or else a very nimble mind. Conversion charts are only part of the answer though, because they don't help you "think" metric, or "visualize" what you are converting. The following examples are intended to help you "see" metric sizes:

LENGTH

Meters are the standard unit of length in the metric system. The smaller units are 10ths (decimeter), 100ths (centimeter), and 1000ths (millimeter) of a meter. These common examples might help you to visualize the metric units:

* **A meter is slightly longer than a yard (about 40 inches).**
* **An aspirin tablet is about one centimeter across (.4 inches).**
* **A millimeter is about the thickness of a dime.**

VOLUME

Cubic meters and centimeters are used to measure volume, just as we normally think of cubic feet and inches. Liquid volume measurements include the liter and milliliter, like the English quarts or ounces.

* **One teaspoon is about 4 cubic centimeters.**
* **A liter is about one quart.**
* **A liter is about 61 cubic inches.**

WEIGHT

The metric weight system is based on the gram, with the most common unit being the kilogram (1000 grams). Our comparable units are ounces and pounds:

* A kilogram is about 2.2 pounds.
* An ounce is about 28 grams.

TORQUE

Torque is somewhat complicated. The term describes the amount of effort exerted to turn something. A chosen unit of weight or force is applied to a lever of standard length. The resulting leverage is called torque. In our standard system, we use the weight of one pound applied to a lever a foot long, resulting in the unit called a foot-pound. A smaller unit is the inch-pound (the lever is one inch long).

Metric units include the meter kilogram (lever one meter long with a kilogram of weight applied) and the Newton-meter (lever one meter long with force of one Newton applied). Some conversions are:

* A meter kilogram is about 7.2 foot pounds.
* A foot pound is about 1.4 Newton-meters.
* A centimeter kilogram (cmkg) is equal to .9 inch pounds.

PRESSURE

Pressure is another complicated measurement. Pressure is described as a force or weight applied to a given area. Our common unit is pounds per square inch. Metric units can be expressed in several ways. One is the kilogram per square centimeter (kg/cm^2). Another unit of pressure is the Pascal (force of one Newton on an area of one square meter), which equals about 4 ounces on a square yard. Since this is a very small amount of pressure, we usually see the kiloPascal, or kPa (1000 Pascals). Another common automotive term for pressure is the bar (used by German manufacturers), which equals 10 Pascals. Thoroughly confused? Try the examples below:

* Atmospheric pressure at sea level is about 14.7 psi.
* Atmospheric pressure at sea level is about 1 bar.
* Atmospheric pressure at sea level is about 1 kg/cm^2.
* One pound per square inch is about 7 kPa.

CONVERSION FACTORS

CONVERSION FACTORS

TO CONVERT	TO	MULTIPLY BY
LENGTH		
Millimeters (mm)	Inches	.03937
Inches	Millimeters	25.4
Meters (M)	Feet	3.28084

Feet	Meters	.3048	
Kilometers(Km)	Miles	.62137	
AREA			
Square Centimeters (cmy)	Square Inches	.155	
Square Inches	Square Centimeters	6.45159	
VOLUME			
Cubic Centimeters	Cubic Inches	.06103	
Cubic Inches	Cubic Centimeters	16.38703	
Liters	Cubic Inches	61.025	
Cubic Inches	Liters	.01639	
Liters	Quarts	1.05672	
Quarts	Liters	.94633	
Liters	Pints	2.11344	
Pints	Liters	.47317	
Liters	Ounces	33.81497	
Ounces	Liters	.02957	
WEIGHT			
Grams	Ounces	.03527	
Ounces	Grams	28.34953	
Kilograms	Pounds	2.20462	
Pounds	Kilograms	.45359	
WORK			
Centimeter Kilograms	Inch Pounds	.8676	
Pounds/Sq. Inch	Kilograms/Sq.Centimeter	.07031	
Bar	Pounds/Sq. Inch	14.504	
Pounds/Sq. Inch	Bar	.06895	
Atmosphere	Pounds/Sq. Inch	14.696	
Pounds/Sq. Inch	Atmosphere	.06805	
TEMPERATURE			
Centigrade Degrees	Fahrenheit Degrees	(oCx(9)/5)+32	
Fahrenheit Degrees	Centigrade Degrees	(oF-32)x(5)/9	

CONVERSION FACTORS (Cont.)

INCHES	DECIMALS	mm
1/64	.016	.397
1/32	.031	.794
3/64	.047	1.191
1/16	.063	1.588
5/64	.078	1.984

?3/32	.094	2.381?
?7/64	.109	2.778?
?1/8	.125	3.175?
?9/64	.141	3.572?
?5/32	.156	3.969?
?11/64	.172	4.366?
?3/16	.188	4.763?
?13/64	.203	5.159?
?7/32	.219	5.556?
?15/64	.234	5.953?
?1/4	.250	6.350?
?17/64	.266	6.747?
?9/32	.281	7.144?
?19/64	.297	7.541?
?5/16	.313	7.938?
?21/64	.328	8.334?
?11/32	.344	8.731?
?23/64	.359	9.128?
?3/8	.375	9.525?
?25/64	.391	9.992?
?13/32	.406	10.319?
?27/64	.422	10.716?
?7/16	.438	11.113?
?29/64	.453	11.509?
?15/32	.469	11.906?
?31/64	.484	12.303?
?1/2	.500	12.700?
?33/64	.516	13.097?
?17/32	.531	13.494?
?35/64	.547	13.891?
?9/16	.563	14.288?
?37/64	.578	14.684?
?19/32	.594	15.081?
?39/64	.609	15.478?
?5/8	.625	15.875?
?41/64	.641	16.272?
?21/32	.656	16.669?
?43/64	.672	17.066?
?11/16	.687	17.463?
?45/64	.703	17.859?
?23/32	.719	18.256?
?47/64	.734	18.653?
?3/4	.750	19.050?
?49/64	.766	19.447?
?25/32	.781	19.844?
?51/64	.797	20.241?
?13/16	.813	20.638?
?53/64	.828	21.034?METRIC (

27/32	.844	21.431
55/64	.859	21.828
7/8	.875	22.225
57/64	.891	22.622
29/32	.906	23.019
59/64	.922	23.416
15/16	.938	23.813
61/64	.953	24.209
31/32	.969	24.606
63/64	.984	25.003
1	1.000	25.400

END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Power Mirrors

Prelude

DESCRIPTION & OPERATION

Power mirrors are controlled by a dual control switch assembly located on driver's door panel or instrument panel. The left/right switch directs current to desired mirror. The horizontal/vertical switch directs current to one of 2 motors located in mirror/motor assembly. Mirror and motors are removed and serviced as an assembly.

TESTING

POWER MIRROR FUNCTION TEST

Both Mirrors Inoperative

1) Check No. 9 fuse (15-amp). Replace as required. Remove power mirror switch, but do not disconnect switch from harness. See POWER MIRROR SWITCH under REMOVAL & INSTALLATION.

2) Turn ignition on. Using a voltmeter, check for voltage between Black/Yellow wire and ground. SeeFig. 1. If battery voltage exists, go to next step. If battery voltage does not exist, repair open circuit between mirror switch and fuse box.

3) Using an ohmmeter, check for continuity between Black wire and ground. If continuity does not exist, repair open circuit in Black wire or poor ground connection. If wiring is okay, substitute known good switch and retest.

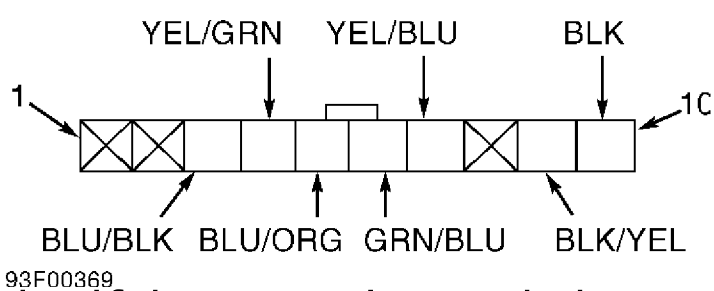

Fig. 1: Identifying Power Mirror Switch Connector
Courtesy of American Honda Motor Co., Inc.

Left Mirror Inoperative

1) Remove power mirror switch, but do not disconnect switch from harness. See POWER MIRROR SWITCH under REMOVAL & INSTALLATION.

Turn ignition on. Using jumper wires, connect Black/Yellow wire to Yellow/Blue wire, and either Blue/Orange or Yellow/Green wire to ground.

2) If mirror does not tilt down (or swing left), check for open in Blue/Orange or Yellow/Green wire between mirror switch and mirror. If wiring is okay, check mirror motor. See POWER MIRROR MOTOR TEST. If mirror operates correctly, check mirror switch. See POWER MIRROR SWITCH TEST.

Right Mirror Inoperative

1) Remove power mirror switch, but do not disconnect switch from harness. See POWER MIRROR SWITCH under REMOVAL & INSTALLATION. Turn ignition on. Using jumper wires, connect Black/Yellow wire to Green/Blue wire, and either Blue/Orange or Blue/Black wire to ground.

2) If mirror does not tilt down (or swing left), check for open in Blue/Orange or Blue/Black wire between mirror switch and mirror. If wiring is okay, check mirror motor. See POWER MIRROR MOTOR TEST. If mirror operates correctly, check mirror switch. See POWER MIRROR SWITCH TEST.

POWER MIRROR SWITCH TEST

Remove power mirror switch. See POWER MIRROR SWITCH under REMOVAL & INSTALLATION. Using an ohmmeter, check for continuity between appropriate mirror switch terminals. See POWER MIRROR SWITCH CONTINUITY TEST table. See Fig. 1. If switch fails any test, replace switch.

POWER MIRROR SWITCH CONTINUITY TEST TABLE

Application	Terminals No.
Left Mirror	
Off	4, 5, 7 & 10
Up	4, 7 & 10; 5 & 9
Down	4, 7 & 9; 5 & 10
Left	5, 7 & 9; 4 & 10
Right	5, 7 & 10; 4 & 9
Right Mirror	
Off	3, 5, 6 & 10
Up	3, 6 & 10; 5 & 9
Down	3, 6 & 9; 5 & 10
Left	5, 6 & 9; 3 & 10
Right	5, 6 & 10; 3 & 9

POWER MIRROR MOTOR TEST

Remove door trim panel. Disconnect power mirror 3-pin connector. See Fig. 2. Using jumper wires, connect specified terminals. Observe mirror for correct movement. See POWER MIRROR MOTOR TEST table. If mirror does not respond as specified, replace mirror assembly.

POWER MIRROR MOTOR TEST TABLE

Apply 12 Volts To Pin No.	Ground Pin No.	Mirror Operation
3	4	Up
4	3	Down
4	5	Left
5	4	Right

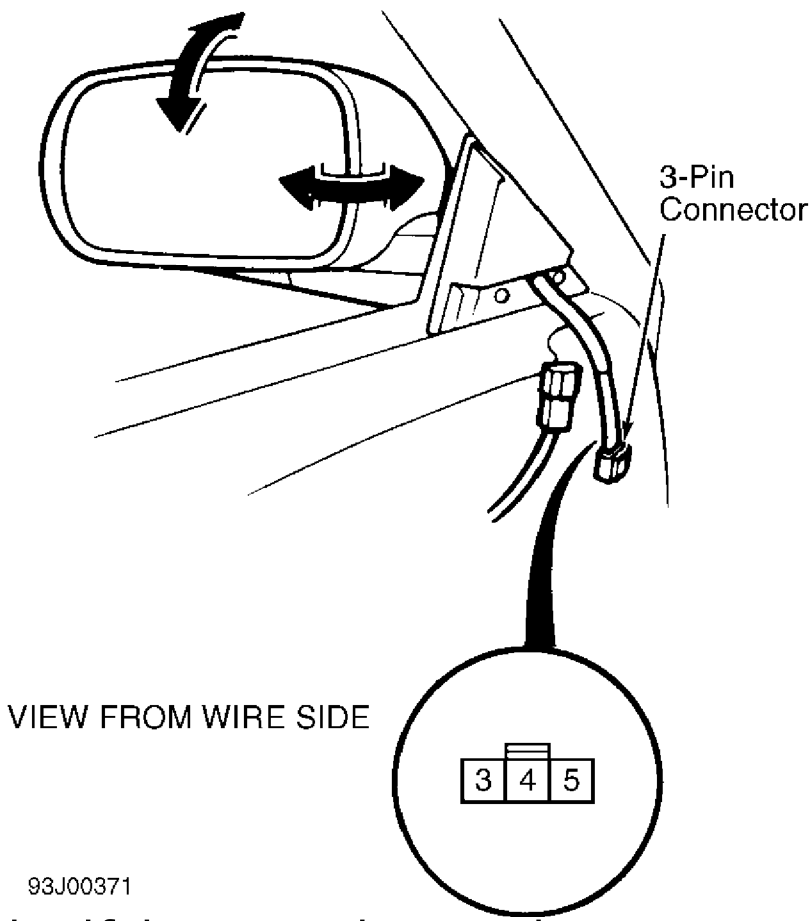

Fig. 2: Identifying Power Mirror 3-Pin Connector
Courtesy of American Honda Motor Co., Inc.

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POWER MIRROR SWITCH

Removal & Installation

Taking care to avoid damaging door panel or switch, pry switch from door panel. Disconnect 10-pin connector from switch. To install, reverse removal procedure. Ensure switch snaps firmly into door panel.

POWER MIRROR ASSEMBLY

Removal & Installation

Lower window. Pry out cover at base of mirror inside door. Remove door trim panel. Disconnect power mirror 3-pin connector. See Fig. 2. Remove 3 mirror mounting screws, and remove mirror. To install, reverse removal procedure.

WIRING DIAGRAMS

See appropriate chassis wiring diagram in theWIRING DIAGRAMS section.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ENGINE PERFORMANCE
Honda Removal, Overhaul & Installation

Accord, Civic, Civic Del Sol, Prelude

INTRODUCTION

Removal, overhaul and installation procedures (when given by manufacturer) are covered in this article. If component removal and installation is primarily an unbolt and bolt-on procedure, only a torque specification may be furnished.

IGNITION SYSTEM

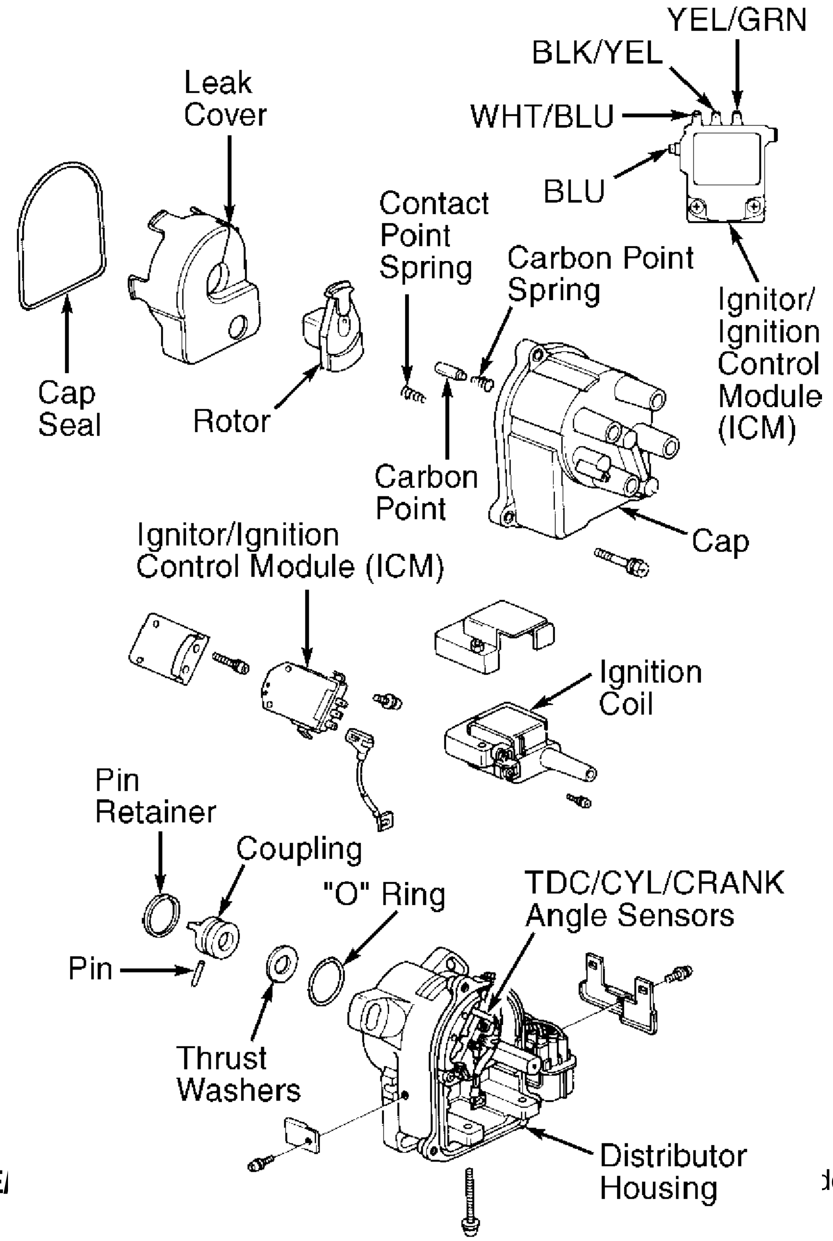
DISTRIBUTOR

Removal & Installation

Disconnect 2-pin and 8-pin connectors from distributor. Disconnect spark plug wires and coil wire from distributor cap. Remove distributor hold-down bolts. Remove distributor from cylinder head. To install, coat NEW "O" ring with engine oil and put into place. To complete installation, reverse removal procedure. Set timing to specification. See D - ADJUSTMENTS article.

NOTE: Lugs on distributor shaft and mating grooves in camshaft end are offset to eliminate possibility of installing distributor 180 degrees out of time.

NOTE: Manufacturer's overhaul instructions are not available. See Figs. 1 and 2.



N - REMOVE

deFor Cadi Centre Nsk CA 95051Cop

90J15031

Fig. 1: Exp. View Of Dist. W/ Internal Ignitor (Accord & Prelude)
Courtesy of American Honda Motor Co., Inc.

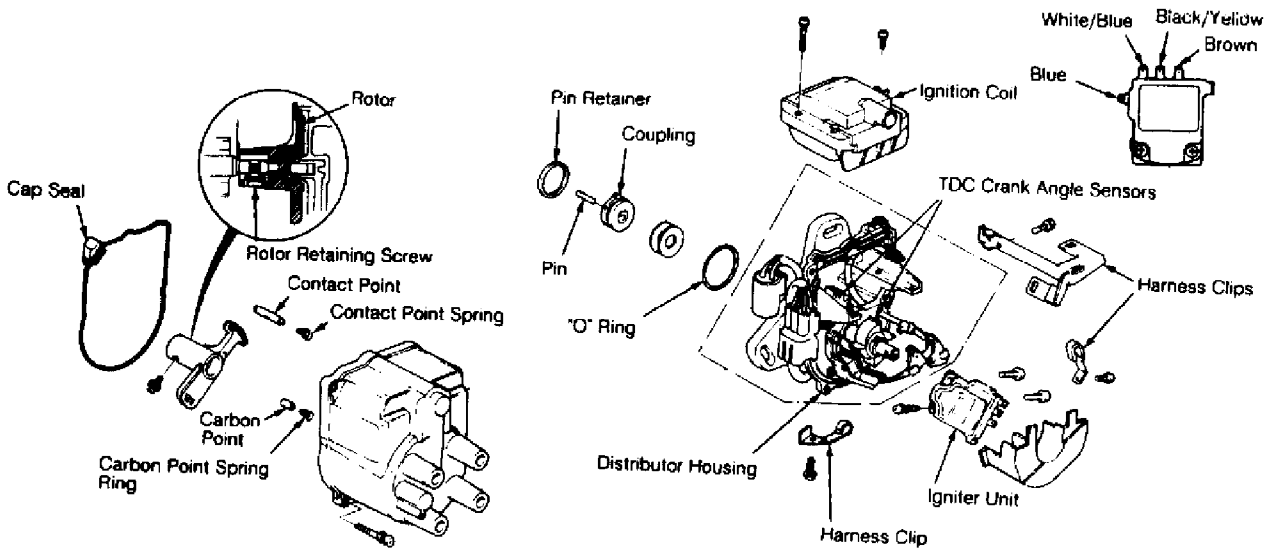


Fig. 2: Exp. View Of Dist. W/ Internal Ignitor (Civic & Civic Del Sol)
Courtesy of American Honda Motor Co., Inc.

IGNITION COIL

Removal & Installation (Civic & Civic Del Sol)

Ensure ignition switch is in OFF position. Remove distributor cap, cap seal and leak cover. Remove 2 screws to disconnect Black/Yellow and White/Blue wires from coil primary terminals. Remove 4 mounting screws. Slide ignition coil out of distributor housing.

NOTE: Accord and Prelude ignition coils are externally mounted in engine compartment. Removal and installation instructions are not necessary.

FUEL SYSTEM

WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel injection related component. DO NOT allow fuel to contact engine or electrical components.

FUEL SYSTEM PRESSURE RELEASE

To relieve fuel pressure, remove fuel filler cap. Disconnect

battery ground cable. Hold banjo bolt with proper wrench and slowly loosen service bolt on top of fuel rail. Place a shop towel on top of service bolt. Loosen service bolt one complete turn. Always install NEW washer between service and banjo bolts when loosened.

FUEL PUMP

WARNING: Keep open flames away from work area.

Removal & Installation

On Accord and Civic, remove fuel tank. On Civic, remove rear seat, remove access cover. On Prelude and Civic Del Sol, remove left maintenance access cover in luggage compartment. On all models, disconnect fuel lines and harness connector. Remove fuel pump mounting bolts. Remove fuel pump from fuel tank. To install, reverse removal procedure.

FUEL RAIL & INJECTORS

Removal

Relieve fuel pressure. See FUEL SYSTEM PRESSURE RELEASE under FUEL SYSTEM. Disconnect electrical connectors from injectors. Disconnect vacuum and fuel return hoses from fuel pressure regulator. Place a shop towel over hoses before disconnecting them. Loosen retaining nuts on fuel rail and harness holder. Disconnect fuel rail. Remove injectors from intake manifold.

Installation

Place NEW "O" rings on injectors, and coat with engine oil. Assemble injectors on fuel rail. Install fuel rail assembly into intake manifold. To complete installation, reverse removal procedure.

OXYGEN (O2) SENSOR

Removal & Installation (Accord & Prelude)

1) On models with double exhaust manifold outlets, O2 sensor is mounted in exhaust pipe just below exhaust header. On models with single outlet exhaust manifold, O2 sensor is mounted in exhaust manifold above exhaust pipe flange.

2) O2 sensor is equipped with a permanent pigtail which must be protected from damage when sensor is removed. Ensure sensor is free of contaminants. Avoid using cleaning solvents of any type. Sensor may be difficult to remove when engine temperature is less than 120°F (49°C). Always use anti-seize compound on threads prior to installation. Tighten sensor to specification.

Removal & Installation (Civic & Civic Del Sol)

O2 sensor is mounted in exhaust manifold above exhaust pipe flange. Sensor is equipped with a permanent pigtail which must be protected from damage when sensor is removed. Ensure sensor is free of contaminants. Avoid using cleaning solvents of any type. Sensor may be difficult to remove when engine temperature is less than 120°F (49°C). Always use anti-seize compound on threads prior to installation. Tighten sensor to specification.

THROTTLE BODY

NOTE: Torque throttle body mount nuts to 16 ft. lbs. (22 N.m).

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Ft. Lbs. (N.m)
Banjo Bolt	16 (22)
Distributor Retaining Nuts	16 (22)
Fuel Tank	
Drain Bolt	36 (50)
Mounting Nuts	16 (22)
Oxygen (O2) Sensor	33 (45)
Throttle Body Mounting Nuts	16 (22)
	INCH Lbs. (N.m)
Fuel Pump Retaining Nuts	48 (6)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

END OF ARTICLE

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ARTICLE BEGINNING

1989-95 ENGINE PERFORMANCE
Honda EGR Function Testing

All Models

EGR VALVE

Ported EGR Valve

1) Run engine to operating temperature and allow it to idle. Attach a vacuum gauge to EGR vacuum hose. Locate EGR vacuum solenoid.

2) Using a jumper wire, ground signal wire from ECM to EGR vacuum solenoid. Vacuum should be present at EGR vacuum hose. On some models, engine speed may have to be increased 3000-4000 RPM.

3) Connect a vacuum pump to EGR valve. Start engine. Apply vacuum to EGR valve. If engine runs rough or stalls, and gauge holds vacuum, EGR valve is functioning properly.

END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION
Passive Restraint System Inspection - Asian

* PLEASE READ THIS FIRST *

Follow all manufacturers servicing precautions when working with air bag systems. See SERVICE PRECAUTIONS in the appropriate AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

INTRODUCTION

When a vehicle equipped with passive restraint system has been involved in a collision, certain systems and components must be inspected and or replaced regardless of whether or not the air bag has deployed. Follow the manufacturer's guidelines provided in this article.

ACURA (1988-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - ACURA (1988-98)

Model	Year	(1) Location
Integra	1994-98	D/P
Legend	1991-95	D/P
	1988-90	DS
NSX	1993-98	D/P
	1991-92	DS
Vigor	1993-94	D/P
	1992	DS
2.2CL	1997	D/P
2.3CL	1998	D/P
2.5TL	1995-98	D/P
3.0CL	1997-98	D/P
3.2TL	1996-98	D/P
3.5RL	1996-98	D/P
SLX	1996-98	D/P

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES TABLE - ACURA (1988-98 EXCEPT SLX)

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Seat Belt Tensioners (If Equipped) * SRS Control Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Cable Reel * Dash or Impact Sensors (If Equipped) * Seat Belts * SRS Control Unit * Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring repairs. If SRS wiring or harness connectors are faulty, replace faulty wiring harness. * After vehicle is repaired, ensure AIR BAG warning light is functioning properly.

INSPECTION PROCEDURES TABLE - ACURA (1996-98 SLX)

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Sensing & Diagnostic Module (SDM)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Instrument Panel Braces * Instrument Panel Steering Column Reinforcement Plate * Seat Belts & Mounting Points * Knee Bolsters & Mounting Points * Steering Column * SRS Coil Assembly * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs. Replace harness.

HONDA (1991-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - HONDA (1991-98)

Model	Year	(1) Location
Accord	1993-98	D/P
	1991-92	DS
Civic	1994-98	D/P
	1992-93	DS
Civic del Sol	1994-97	D/P
	1993	DS
CR-V	1997-98	D/P
Odyssey	1995-98	D/P
Prelude	1994-98	D/P
SI 4WS	1992-93	D/P
Except SI 4WS	1992-93	DS
Passport	1995 1/2-98	D/P

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - HONDA (1991-98 EXCEPT PASSPORT)

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Seat Belt Tensioners (If Equipped) * SRS Control Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Cable Reel * Dash Sensors (1991-94) * Seat Belts * SRS Control Unit * Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring repairs. If SRS wiring or harness connectors are faulty,

		replace faulty wiring harness.
	*	After vehicle is repaired, ensure AIR BAG warning light is functioning properly.

INSPECTION PROCEDURES TABLE - HONDA (1995 1/2-98 PASSPORT)

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Sensing & Diagnostic Module (SDM)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Instrument Panel Braces * Instrument Panel Steering Column Reinforcement Plate * Seat Belts & Mounting Points * Knee Bolsters & Mounting Points * Steering Column * SRS Coil Assembly * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs. Replace harness.

HYUNDAI (1994-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - HYUNDAI (1994-98)

Model	Year	(1) Location
Accent	1995-98	D/P
Elantra	1996-98	D/P
	1994-95	DS
Sonata	1995-98	D/P
Tiburon	1997-98	D/P

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - HYUNDAI (1994-98)

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Module * Steering Column Clockspring
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Any Seat Belt In Use At Time Of Collision * Steering Column * Steering Wheel * Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring repairs. If SRS wiring or harness connectors are faulty, replace faulty wiring harness.

INFINITI (1990-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - INFINITI (1990-98)

Model	Year	(1) Location	Inspection Table
G20	1993-96	D/P	INFINITI-2
I30	1998	D/P, SI	INFINITI-1
	1997	D/P	INFINITI-1
	1996	D/P	INFINITI-2
J30	1997	D/P	INFINITI-1
	1994-96	D/P	INFINITI-2
	1993	D/P	INFINITI-3
M30	1990-92	DS	INFINITI-3
Q45	1998	D/P, SI	INFINITI-1
	1997	D/P	INFINITI-1
	1994-96	D/P	INFINITI-2
	1990-93	DS	INFINITI-3
QX4	1997-98	D/P	INFINITI-1

(1) - Location Definitions: D/P = Driver's & Passenger's Side,
DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES TABLE - INFINITI-1

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis * Satellite Sensor (1) * Seat Belt Pretensioners (2) * Side Air Bag Module (1)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Center Pillar Inner (1) * Instrument Panel * Seat (1) * Seat Belt Pretensioners (2) * Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* Inspect all SRS components for dents, deformities or rust. * After repairs are completed, check AIR BAG warning light to ensure system is functioning properly.
(1) - On side of impact. (2) - Except I30 and QX4.	

INSPECTION PROCEDURES TABLE - INFINITI-2

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis * Instrument Panel * Seat Belt Pretensioners (1)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* All Sensors (2) * Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* Inspect all SRS components for dents,

	deformities or rust.
	* After repairs are completed, check AIR BAG warning light to ensure system is functioning properly.

(1) - Except I30.
(2) - Except 1996 I30, 1995-96 J30 and 1995-96 Q45.

INSPECTION PROCEDURES TABLE - INFINITI-3

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis * Sensors In Affected Collision Area
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* All Sensors * Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* Inspect all SRS components for dents, deformities or rust. * After repairs are completed, check AIR BAG warning light to ensure system is functioning properly.

ISUZU (1990-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - ISUZU (1990-98)

Model	Year	(1) Location	Inspection Table
Hombre	1996-97	DS	ISUZU-1
Impulse	1990-92	DS	ISUZU-5
Oasis	1996-98	D/P	ISUZU-2
Rodeo	1996-98	D/P	ISUZU-3
	1995 1/2	D/P	ISUZU-3
Stylus	1991-93	DS	ISUZU-5
Trooper	1996-98	D/P	ISUZU-3
	1995	D/P	ISUZU-4

(1) - Location Definitions: D/P = Driver's & Passenger's Side,
DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - ISUZU-1

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Sensors In Area Of Accident Damage
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Instrument Panel Braces * Instrument Panel Steering Column Reinforcement Plate * Seat Belts & Mounting Points * Knee Bolster * Sensors In Area Of Accident Damage * SRS Coil Assembly
Comments	* Any sensor which the Diagnostic Energy Reserve Module (DERM) indicates as bad must be replaced. * If any components are damaged or bent, they must be replaced. * SRS wiring can be repaired following manufacturer's instructions.

INSPECTION PROCEDURES TABLE - ISUZU-2

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Seat Belt Tensioners (If Equipped) * SRS Control Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Cable Reel * Dash Sensors (1991-94) * Seat Belts * SRS Control Unit * Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced.?

	* DO NOT attempt SRS wiring repairs. If SRS wiring or harness connectors are faulty, replace faulty wiring harness. * After vehicle is repaired, ensure AIR BAG warning light is functioning properly.

INSPECTION PROCEDURES TABLE - ISUZU-3

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Sensing & Diagnostic Module (SDM)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Instrument Panel Braces * Instrument Panel Steering Column Reinforcement Plate * Seat Belts & Mounting Points * Knee Bolsters & Mounting Points * Steering Column * SRS Coil Assembly * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs. Replace harness.

INSPECTION PROCEDURES TABLE - ISUZU-4

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * All Sensors
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* SRS Coil Assembly * Instrument Panel Steering Column Reinforcement Panel * Instrument Panel Braces * Knee Bolsters * Seat Belts Mounting Points * Sensors In Area of Accident Damage * Steering Column
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs.

	Replace harness.

INSPECTION PROCEDURES TABLE - ISUZU-5

Action	Component or System
Replace After Deployment	* Air Bag Module
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Arming Sensor * Coil Assembly * Diagnostic Energy Reserve Module (DERM) * Forward Sensor * Instrument Panel-To-Steering Column Reinforcement * Knee Pad * Passenger Compartment Sensor * Steering Column * Wiring Harness & Brackets
Comments	* If any components are damaged or bent, they must be replaced.

KIA (1995-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - KIA (1995-98)

Model	Year	(1) Location
Sephia	1996-98	D/P
	1995 1/2	D/P
Sportage	1996-98	D/P

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - KIA (1995-98)

Action	Component or System

Replace After Deployment	* Air Bag Module(s)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Air Bag Diagnosis Control Unit * Clockspring * Impact Sensors Sensor Mountings (1) * Steering Column * Steering Wheel * Wiring Harness
Comments	* After repairs a completed, ensure Warning Light is functioning properly.
(1) - 1995 1/2 Sephia only.	

LEXUS (1990-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - LEXUS (1990-98)

Model	Year	(1) Location	Inspection Table
ES250	1990-91	DS	LEXUS-6
ES300	1998	D/P, SI	LEXUS-3
	1997	D/P	LEXUS-1
	1994-96	D/P	LEXUS-4
	1992-93	DS	LEXUS-5
GS300	1998	D/P, SI	LEXUS-3
	1993-97	D/P	LEXUS-4
GS400	1998	D/P, SI	LEXUS-3
LS400	1997-98	D/P, SI	LEXUS-3
	1995-96	D/P	LEXUS-1
	1993-94	D/P	LEXUS-4
	1990-92	DS	LEXUS-6
LX450	1996-97	D/P	LEXUS-1
LX470	1998	D/P	LEXUS-2
SC300	1996-98	D/P	LEXUS-1
	1993-95	D/P	LEXUS-4
	1992	DS	LEXUS-5
SC400	1996-98	D/P	LEXUS-1
	1993-95	D/P	LEXUS-4
	1992	DS	LEXUS-5

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - LEXUS-1

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Front Seat Belt Pretensioners (1)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Glove Compartment Door (2) * Instrument Panel * Instrument Panel Reinforcement * Spiral Cable * Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced.
(1) - 1995 LS400 only. (2) - 1997 ES300, 1996 LS400 and 1996-97 LX450 only.	

INSPECTION PROCEDURES TABLE - LEXUS-2

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Front Air Bag Sensors * Seat Belt Pretensioner
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Instrument Panel * Instrument Panel Reinforcement * Seat Belt Pretensioner * Spiral Cable Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs. Replace entire wiring harness.

INSPECTION PROCEDURES TABLE - LEXUS-3

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Seat Belt Pretensioner (1) * Side Air Bag Modules * Side Air Bag Sensor Assembly
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Glove Compartment Door (2) * Instrument Panel Instrument Panel Reinforcement * Seat Belt Pretensioner (1) * Spiral Cable * Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs. Replace entire wiring harness.

(1) - Except 1997 LS400.
(2) - 1997 LS400 only.

INSPECTION PROCEDURES TABLE - LEXUS-4

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Center Air Bag Sensor Assembly * Front Air Bag Sensors * Front Seat Belt Tensioners (1)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Glove Compartment Door (2) * Instrument Panel * Instrument Panel Reinforcement * Spiral Cable * Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

(1) - 1993-95 GS300 and 1993-94 LS400.
(2) - Except 1994-95 SC300 and SC400.

INSPECTION PROCEDURES TABLE - LEXUS-5

Action	Component or System
Replace After Deployment	* Air Bag Module * Center Air Bag Sensor Assembly * Front Air Bag Sensors
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Spiral Cable * Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

INSPECTION PROCEDURES TABLE - LEXUS-6

Action	Component or System
Replace After Deployment	* Air Bag Module * Front Air Bag Sensors
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Center Air Bag Sensor Assembly * Spiral Cable * Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

MAZDA (1990-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - MAZDA (1990-98)

Model	Year	(1) Location	Inspection Table
Miata	1995-97	D/P	MAZDA-1
	1994	D/P	MAZDA-2
	1990-93	DS	MAZDA-2
Millenia	1995-98	D/P	MAZDA-1
MPV	1996-98	D/P	MAZDA-1
	1995	DS	MAZDA-1
	1994	DS	MAZDA-2
MX-3	1994-95	D/P	MAZDA-2
MX-6	1995-98	D/P	MAZDA-1
	1994	D/P	MAZDA-2
	1993	DS	MAZDA-2
Pickup	1996-98	D/P	MAZDA-2
	1995-96	DS	MAZDA-2
Protege	1995-98	D/P	MAZDA-1
RX7	1994-95	D/P	MAZDA-2
	1990-93	DS	MAZDA-2
626	1995-98	D/P	MAZDA-1
	1994	D/P	MAZDA-2
	1993	DS	MAZDA-2
929	1992-95	D/P	MAZDA-2

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - MAZDA-1

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not	* Clockspring * Impact Sensors & Sensors Mountings * Steering Column * Steering Wheel * Wiring Harness

Deploy)	
Comments	* DO NOT attempt wiring harness repairs. Replace entire wiring harness. * Impact sensors must always be installed with arrow on sensor facing front of vehicle.

INSPECTION PROCEDURES TABLE - MAZDA-2

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Diagnosis Control Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Clockspring * Impact Sensors & Sensors Mountings * Steering Column Steering Wheel Wiring Harness
Comments	* DO NOT attempt wiring harness repairs. Replace entire wiring harness. * Impact sensors must always be installed with arrow on sensor facing front of vehicle.

MITSUBISHI (1990-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - MITSUBISHI (1990-98)

Model	Year	(1) Location	Inspection Table
Diamante	1997-98	D/P	MITSUBISHI-1
	1994-96	D/P	MITSUBISHI-2
	1992-93	DS	MITSUBISHI-2
Eclipse	1996-98	D/P	MITSUBISHI-1
	1995	D/P	MITSUBISHI-3
Expo	1994-95	DS	MITSUBISHI-1
Galant	1997-98	D/P	MITSUBISHI-1
	1994-96	D/P	MITSUBISHI-2
Mirage	1997-98	D/P	MITSUBISHI-1
	1995-96	D/P	MITSUBISHI-4
	1994	DS	MITSUBISHI-4

Montero	1996-98	D/P	MITSUBISHI-2
	1994-95	DS	MITSUBISHI-2
Montero Sport	1997-98	D/P	MITSUBISHI-2
Sigma	1990	DS	MITSUBISHI-3
3000GT	1997-98	D/P	MITSUBISHI-1
	1994-96	D/P	MITSUBISHI-2
	1991-93	DS	MITSUBISHI-2

(1) - Location Definitions: D/P = Driver's & Passenger's Side,
DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - MITSUBISHI-1

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * SRS Control Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Clockspring * Steering Column & Intermediate Joint * Steering Wheel * Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced.

INSPECTION PROCEDURES TABLE - MITSUBISHI-2

Action	Component or System
Replace After Deployment	* Air BagModule(s) * Front Impact Sensors * SRS Control Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Clockspring * Steering Column & Intermediate Joint * Steering Wheel * Wiring Harness

Comments	* If any components are damaged or bent, they must be replaced.

INSPECTION PROCEDURES TABLE - MITSUBISHI-3

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Clockspring * Front Impact Sensors * SRS Control Unit * Steering Column & Intermediate Joint * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced.

INSPECTION PROCEDURES TABLE - MITSUBISHI-4

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Control Unit
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Clockspring * Steering Column * Steering Wheel * Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced.

NISSAN (1989-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - NISSAN (1989-98)

Model	Year	(1) Location	Inspection Table
Altima	1998	D/P	NISSAN-3
	1995-97	D/P	NISSAN-4
	1994	D/P	NISSAN-6
	1993	DS	NISSAN-6
Frontier	1998	D/P	NISSAN-1
Maxima	1998	D/P, SI	NISSAN-2
	1997	D/P	NISSAN-3
	1995-96	D/P	NISSAN-4
	1994	D/P	NISSAN-5
	1992-93	DS	NISSAN-6
NX Coupe	1991-93	DS	NISSAN-6
Pathfinder	1996-98	D/P	NISSAN-5
Pickup	1996-97	DS	NISSAN-5
Pulsar NX	1989-90	DS	NISSAN-6
Quest	1997-98	D/P	NISSAN-3
	1996	D/P	NISSAN-4
	1994-95	DS	NISSAN-5
Sentra	1997-98	D/P	NISSAN-3
	1995-96	D/P	NISSAN-4
	1994	DS	NISSAN-5
	1993	DS	NISSAN-6
200SX	1997-98	D/P	NISSAN-3
	1995-96	D/P	NISSAN-4
240SX	1997-98	D/P	NISSAN-3
	1995-96	D/P	NISSAN-4
300ZX	1994-96	D/P	NISSAN-4
	1991-93	DS	NISSAN-6

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - NISSAN-1

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit Diagnosis

Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Crash Zone Sensor (1) * Instrument Panel * Passenger Deactivation Switch * Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring harness repairs.
(1) - 4WD only.	

INSPECTION PROCEDURES TABLE - NISSAN-2

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis * Side Air Bag Module (1) * Satellite Sensor (1)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Center Pillar Inner (1) * Instrument Panel * Seat (1) * Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring harness repairs.
(1) - On side of impact.	

INSPECTION PROCEDURES TABLE - NISSAN-3

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis
Inspect & If Damaged, Replace Component (Even If Air	* Instrument Panel * Spiral Cable * Steering Wheel * Wiring Harnesses

Bag Did Not Deploy)	
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring harness repairs.

INSPECTION PROCEDURES TABLE - NISSAN-4

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* All Sensors (1) * Instrument Panel * Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring harness repairs.
(1) - 300ZX Only.	

INSPECTION PROCEDURES TABLE - NISSAN-5

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* All Sensors (1) * Crash Zone Sensor (2) * Instrument Panel (3) * Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. DO NOT attempt SRS wiring harness repairs.
(1) - Except Pathfinder and Pickup.	

(2) - 4WD Pickup only.
(3) - Pathfinder only.

INSPECTION PROCEDURES TABLE - NISSAN-6

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Control Unit, Diagnosis * Sensors In Affected Collision Area
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* All Sensors Spiral Cable * Steering Wheel * Wiring Harnesses
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt SRS wiring harness repairs.

SUBARU (1992-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - SUBARU (1992-98)

Model	Year	(1) Location
Forester	1998	D/P
Impreza	1994-98	D/P
	1993	DS
Legacy	1995-98	D/P
	1992-94	DS
SVX	1994-97	D/P
	1992-93	DS

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - SUBARU (1992-98)

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Control Module * Front Impact Sensors (1) * Side Air Bag Sensors (2)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Air Bag Control Module * Combination Switch & Clockspring * Front Impact Sensors
Comments	* DO NOT attempt SRS wiring repairs. * If any components are damaged or bent, they must be replaced.
(1) - If Equipped. (2) - 1998 Legacy, on side of deployment.	

SUZUKI (1995-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - SUZUKI (1995-98)

Model	Year	(1) Location
Esteem	1995-98	D/P
Sidekick	1996-98	D/P
Swift	1995-98	D/P
X90	1996-98	D/P

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - SUZUKI (1995-98)

Action	Component or System
Replace After	* Air BagModule(s)

Deployment	* Sensing & Diagnostic Module (SDM)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Air Bag Warning Light * Combination Switch Assembly * Contact Coil * Forward Discriminating Sensor (1) * Instrument Panel Reinforcement * Knee Bolsters * Seat Belts & Mounting Points * SDM Bracket * Steering Column Bracket * Steering Column & Shaft Joints * Steering Wheel * Wiring Harness
Comments	* If any components are damaged or bent, they must be replaced.
(1) - Swift Only	

TOYOTA (1990-98)

AIR BAG APPLICATION

AIR BAG APPLICATION TABLE - TOYOTA (1990-98)

Model	Year	(1) Location	Inspection Table
Avalon	1998	D/P, SI	TOYOTA-1
	1996-97	D/P	TOYOTA-3
	1995	D/P	TOYOTA-4
Camry	1998	D/P, SI	TOYOTA-1
	1997	D/P	TOYOTA-3
	1996	D/P	TOYOTA-5
	1994-95	D/P	TOYOTA-6
	1992-93	DS	TOYOTA-9
Celica	1998	D/P	TOYOTA-2
	1996-97	D/P	TOYOTA-5
	1994-95	D/P	TOYOTA-7
	1990-93	DS	TOYOTA-10
Corolla	1998	D/P, SI	TOYOTA-1

	1996-97	D/P	TOYOTA-3
	1994-95	D/P	TOYOTA-6
	1993	DS	TOYOTA-9
Land Cruiser	1998	D/P	TOYOTA-2
	1995-97	D/P	TOYOTA-4
MR2	1994-95	D/P	TOYOTA-5
	1991-93	DS	TOYOTA-10
Paseo	1996-97	D/P	TOYOTA-3
	1993-95	DS	TOYOTA-9
Previa	1996-97	D/P	TOYOTA-3
	1994-95	D/P	TOYOTA-6
	1992-93	DS	TOYOTA-9
RAV4	1996-98	D/P	TOYOTA-3
Sienna	1998	D/P	TOYOTA-1
Supra	1997-98	D/P	TOYOTA-3
	1993-96	D/P	TOYOTA-5
	1990-92	DS	TOYOTA-10
Tercel	1998	D/P	TOYOTA-2
	1996-97	D/P	TOYOTA-3
	1995	D/P	TOYOTA-8
	1993-94	DS	TOYOTA-9
Tacoma	1998	D/P	TOYOTA-3
	1996-97	DS	TOYOTA-3
T100	1994-98	DS	TOYOTA-9
4Runner	1996-98	D/P	TOYOTA-4

(1) - Location Definitions: D/P = Driver's & Passenger's Side, DS = Driver's Side Only, SI = Side Impact.

INSPECTION PROCEDURES

INSPECTION PROCEDURES TABLE - TOYOTA-1

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Front Air Bag Sensors (1) * Seat Belt Pretensioner (2) * Seatback Assembly (2) (3) * Side Air Bag Modules (If Equipped) (2) * Side Air Bag Sensor Assembly (If equipped) (1)
Inspect & If Damaged, Replace Component	* Instrument Panel * Instrument Panel Reinforcement * Seatback Assembly (2)

(Even If Air Bag Did Not Deploy)	* Seat Belt Pretensioner (2) * Spiral Cable * Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs. Replace entire wiring harness.

(1) - Corolla and Sienna only. Replace both sensors.
(2) - On side of impact.
(3) - Avalon only.

INSPECTION PROCEDURES TABLE - TOYOTA-2

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Front Air Bag Sensors * Seat Belt Pretensioner (1)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Instrument Panel * Instrument Panel Reinforcement * Seat Belt Pretensioner (1) * Spiral Cable * Steering Wheel * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * DO NOT attempt wiring harness repairs. Replace entire wiring harness.

(1) - Land Cruiser and Tercel only.

INSPECTION PROCEDURES TABLE - TOYOTA-3

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Front Air Bag Sensor (1) * Instrument Panel (2) * Instrument Panel Reinforcement (2)

	* Spiral Cable (3) * Steering Wheel (3)
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Spiral Cable (4) * Steering Wheel (4) * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced.

(1) - 1998 RAV4 only.
(2) - Except 1996-97 Tacoma and 1998 Supra.
(3) - Except 1998 Tacoma.
(4) - 1998 Tacoma.

INSPECTION PROCEDURES TABLE - TOYOTA-4

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Glove Compartment Door * Instrument Panel * Instrument Panel Reinforcement * Spiral Cable * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced.

INSPECTION PROCEDURES TABLE - TOYOTA-5

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Center Air Bag Sensor Assembly

Action	Component or System
	* Front Air Bag Sensors * Instrument Panel * Instrument Panel Reinforcement * Spiral Cable * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

INSPECTION PROCEDURES TABLE - TOYOTA-6

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Center Air Bag Sensor Assembly * Front Air Bag Sensors * Glove Compartment * Glove Compartment Door * Instrument Panel * Instrument Panel Reinforcement * Spiral Cable * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

INSPECTION PROCEDURES TABLE - TOYOTA-7

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Center Air Bag Sensor Assembly * Center Console Bracket Support * Front Air Bag Sensors * Instrument Panel * Spiral Cable * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

INSPECTION PROCEDURES TABLE - TOYOTA-8

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Air Bag Sensor Assembly * Center Console Bracket Support * Instrument Panel Spiral Cable * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced.

INSPECTION PROCEDURES TABLE - TOYOTA-9

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Center Air Bag Sensor Assembly * Front Air Bag Sensors * Spiral Cable * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

INSPECTION PROCEDURES TABLE - TOYOTA-10

Action	Component or System
Replace After Deployment	* Air Bag Module(s) * Front Air Bag Sensors * Spiral Cable * Steering Wheel
Inspect & If Damaged, Replace Component (Even If Air Bag Did Not Deploy)	* Center Air Bag Sensor Assembly * Wiring Harness & Connectors
Comments	* If any components are damaged or bent, they must be replaced. * Wiring for Front Air Bag Sensors can be repaired following manufacturer's instructions.

END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Power Windows

Prelude

DESCRIPTION & OPERATION

A permanent magnet motor operates each of the power windows. The driver's master switch assembly controls all of the power window motors. The passenger's window switch controls only the passenger's power window motor. If the main switch is in OFF position, only driver's window may be operated. Passenger's window cannot be controlled by passenger's window switch, but can still be controlled from driver's master switch.

Power windows may be operated for about 10 minutes after ignition switch is turned from the "II" (ON) position to the "I" (ACCESSORY) or "0" (OFF/LOCK) positions. Time delay function is operative as long as neither front door has been opened.

AUTO mode permits driver's window to be fully lowered or raised without holding switch until window has reached the end of its travel. Moving switch past its first stop will engage AUTO mode. AUTO mode is controlled by a pulser integrated in driver's window motor assembly. Pulser cannot be serviced separately.

Power window control unit is integrated in power window master control switch. Control unit is not serviced separately.

TROUBLE SHOOTING

WARNING: All models are equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel, and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system. See AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

NOTE: Ensure all component terminals and ground connections are clean and tight. Check possible faults in order listed. Repair or replace components and circuits as necessary.

All Windows Inoperative

Blown fuse No. 37 in dash fuse box. Power window relay. Key-off timer circuit in integrated control unit. Open in Green/Black wire.

Driver's Window inoperative

Blown fuse No. 15 in dash fuse box. Faulty driver's window motor. Faulty window regulator. Master switch input. Open in White/Black wire.

Driver' Window Inoperative In AUTO

Faulty master switch. Faulty pulser (in driver's window motor). Master switch input. Open in Blue wire.

Passenger's Window Inoperative

Blown fuse No. 16 in dash fuse box. Faulty power window master switch. Faulty passenger's switch. Faulty passenger's window motor. Faulty window regulator. Open in Blue/Black wire.

All Windows Inoperative Within 10 Minutes Of Ignition Switch Turned Off

Blown fuse No. 37 in dash fuse box. Faulty door switches. Faulty key-off timer circuit in integrated control unit.

TESTING

MOTOR TEST

Driver's Window Motor Test

Remove door panel. Unplug 4-pin connector from motor. Using jumper wires, connect terminals No. 3 and 4 to battery voltage and ground. See Fig. 1. Check for motor operation. Reverse jumper wires and retest. Replace motor if it does not operation in both directions.

Passenger's Window Motor Test

Remove door panel. Unplug 2-pin connector from motor. Using jumper wires, connect connector terminals to battery voltage and ground. See Fig. 1. Check for motor operation. Reverse jumper wires and retest. Replace motor if it does not operation in both directions.

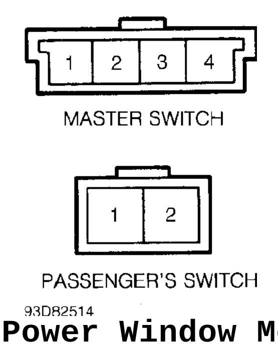

Fig. 1: Power Window Motor Connector Terminal ID
Courtesy of American Honda Motor Co., Inc.

PULSER TEST (DRIVER'S WINDOW MOTOR)

NOTE: Pulser is integral part of driver's window motor assembly. If pulser is defective, motor assembly must be replaced.

Connect test leads of analog ohmmeter to motor connector terminals No. 1 and 2. Using jumper wires, connect terminals No. 3 and 4 to battery voltage and ground. See Fig. 1. If ohmmeter needle does not alternately move back and forth while motor is operating, replace motor.

SWITCH INPUTS TEST

NOTE: Some wires have been assigned a superscript to distinguish them from other wires of the same color. For example, the Yellow/Green(1) wire is not the same as the Yellow/Green (2) wire.

Turn ignition off. Remove driver's door panel. Unplug connectors from master switch. Using a DVOM, perform appropriate switch input tests in Fig. 2. If all input test results are okay, inspect connector and terminals for damage and proper fit. If connector is okay and power windows still malfunction, replace master switch.

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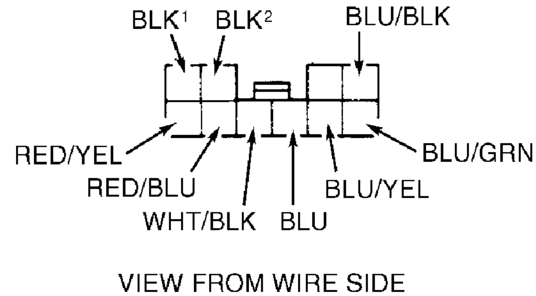
NOTE: Numbers 1 through 5 refer to test number, not terminal numbers.



POWER WIN

No.	Terminal	Test condition	Test: Desired result	Possible cause if result is not obtained
1	BLK[1]	Under all conditions.	Check for continuity to ground: There should be continuity.	• Poor ground • An open in the wire.
2	WHT/BLK BLU/BLK	Ignition switch ON.	Check for voltage to ground: There should be battery voltage.	• Blown No. 15 or 16 (20 A) fuse. (In the under-dash fuse/relay box) • Faulty power window relay. • An open in the wire.
3	RED/BLU and RED/YEL	Connect the WHT/ BLK terminal to the RED/BLU terminal, and the RED/YEL terminal to the BLK[1] terminal, then turn the ignition switch ON.	Check the driver's window motor: It should run.	• Faulty driver's window motor. • An open in the wire.
4	BLU/YEL and BLU/GRN	Connect the BLU/BLK terminal to the BLU/ GRN terminal, and the BLU/YEL terminal to the BLK terminal, then turn the ignition switch ON.	Check the passenger's window motor: It should run.	• Faulty passenger's window motor. • Faulty passenger's window switch. • An open in the wire.
5	BLU and BLK[2]	Connect the WHT/ BLK terminal to the RED/YEL terminal, and the BLK[2] terminal to the RED/BLU terminal, then turn the ignition switch ON.	Connect an analog ohmmeter to the BLU and BLK[2] terminals: The meter needle should move back and forth as the driver's window motor runs.	• Faulty pulser. • Faulty driver's window motor. • An open in the wire.

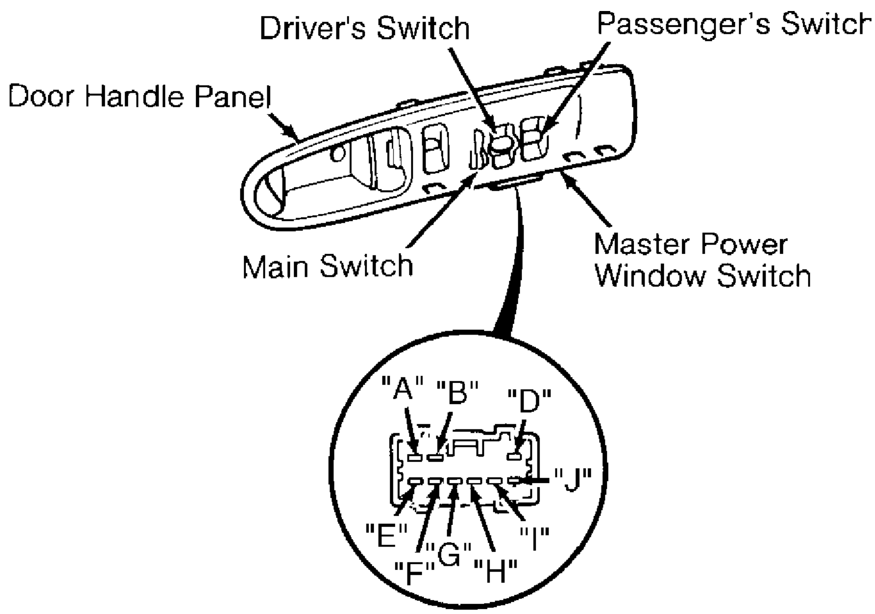
93F82540

Fig. 2: Switch Input Test (Prelude)
Courtesy of American Honda Motor Co., Inc.

SWITCH TEST

MASTER SWITCH TEST

Remove power window master switch. See MASTER POWER WINDOW SWITCH under REMOVAL & INSTALLATION. Using an ohmmeter, check resistance of switch terminals with switch in indicated positions. If continuity is not as specified, replace switch. SeeFig. 3. See POWER WINDOW MASTER SWITCH CONTINUITY TEST table.



93E82507

Fig. 3: Power Window Switch Terminal ID
Courtesy of American Honda Motor Co., Inc.

POWER WINDOW MASTER SWITCH CONTINUITY TEST TABLE

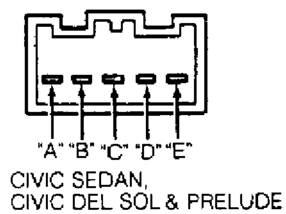
Position	Main Switch	Pin Continuity
Driver' Switch		
Off	(1)	"B", "E" & "F"
Up	(1)	"F" & "G"
Down	(1)	"E" & "G"
Down (AUTO)	(1)	"E" & "G"
Passenger's Switch		
Off	On	"A", "I" & "J"
	Off	"I" & "J"
Up	On	"D" & "I"; "A" & "J"
	Off	"D" & "I"
Down	On	"A" & "I"; "D" & "J"
	Off	"D" & "J"

(1) - Main switch position does not affect driver's switch operation.

PASSENGER'S WINDOW SWITCH TEST

Remove power window switch. See PASSENGER'S POWER WINDOW SWITCH under REMOVAL & INSTALLATION. Using an ohmmeter, check resistance of switch terminals with switch in indicated positions. If continuity is not as specified, replace switch. SeeFig. 4. See POWER

WINDOW PASSENGER'S SWITCH CONTINUITY TEST table.



93I46258

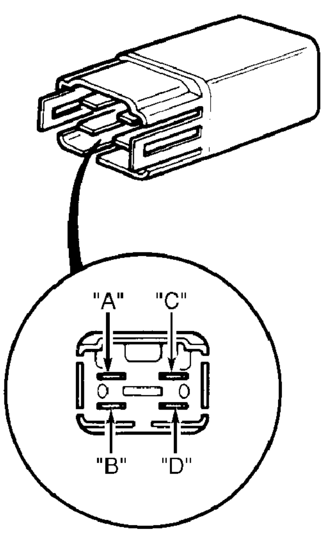
Fig. 4: Power Window Passenger's Switch Terminal ID (Typical)
Courtesy of American Honda Motor Co., Inc.

POWER WINDOW PASSENGER'S SWITCH CONTINUITY TEST TABLE

Switch Position	Continuity
Off	"B" & "C"; "D" & "E"
Up	"A" & "D"
Down	"A" & "B"

POWER WINDOW RELAY TEST

Remove power window relay from underhood fuse/relay box. Using jumper wires, connect terminals "C" and "D" to battery voltage and ground. See Fig. 5. If continuity does not exist between terminals "A" and "B", replace relay.



93E82515

Fig. 5: Power Window Relay Terminal ID
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

WINDOW MOTOR

Removal and installation procedures are not available from manufacturer.

POWER WINDOW SWITCH

Removal & Installation

Remove switch mounting screw. Disconnect wiring harness connector and remove switch assembly. To install, reverse removal procedure.

WIRING DIAGRAMS

For circuit information, see appropriate wiring diagram in the WIRING DIAGRAMS section.

END OF ARTICLE

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ARTICLE BEGINNING

Wheel Alignment
PRE-ALIGNMENT INSPECTION PROCEDURES

PRE-ALIGNMENT CHECKS

Before making wheel alignment adjustment, perform the following checks:

1) Tires should be equal in size and runout must not be excessive. Tires and wheels should be in balance, and inflated to manufacturer's specifications.

2) Wheel bearings must be properly adjusted. Steering linkage and suspension must not have excessive looseness. Check for wear in tie rod ends and ball joints.

3) Steering gear box must not have excessive play. Check and adjust to manufacturer's specifications.

4) Vehicle must be at curb height with full fuel load and spare tire in vehicle. No extra load should be on vehicle.

5) Vehicle must be level with floor and with suspension settled. Jounce front and rear of vehicle several times and allow it to settle to normal curb height.

6) If steering wheel is not centered with front wheels in straight-ahead position, correct by shortening one tie rod adjusting sleeve and lengthening opposite sleeve equal amounts.

7) Ensure wheel lug nuts are tightened to torque specifications.

END OF ARTICLE

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ARTICLE BEGINNING

1993 WHEEL ALIGNMENT
Honda - Riding Height Adjustment

Accord, Civic, Civic Del Sol, Prelude

RIDING HEIGHT ADJUSTMENT

Before adjusting alignment, check riding height. Riding height must be checked with vehicle on level floor and tires properly inflated. Passenger and luggage compartments must be unloaded. Bounce vehicle several times, and allow suspension to settle. Visually inspect vehicle from front to rear and from side to side for signs of abnormal height.

Measure riding height. See Fig. 1. Riding height between left and right sides of vehicle should vary less than one inch (25.4 mm). If riding height is not within specification, check suspension components and repair or replace them as necessary.

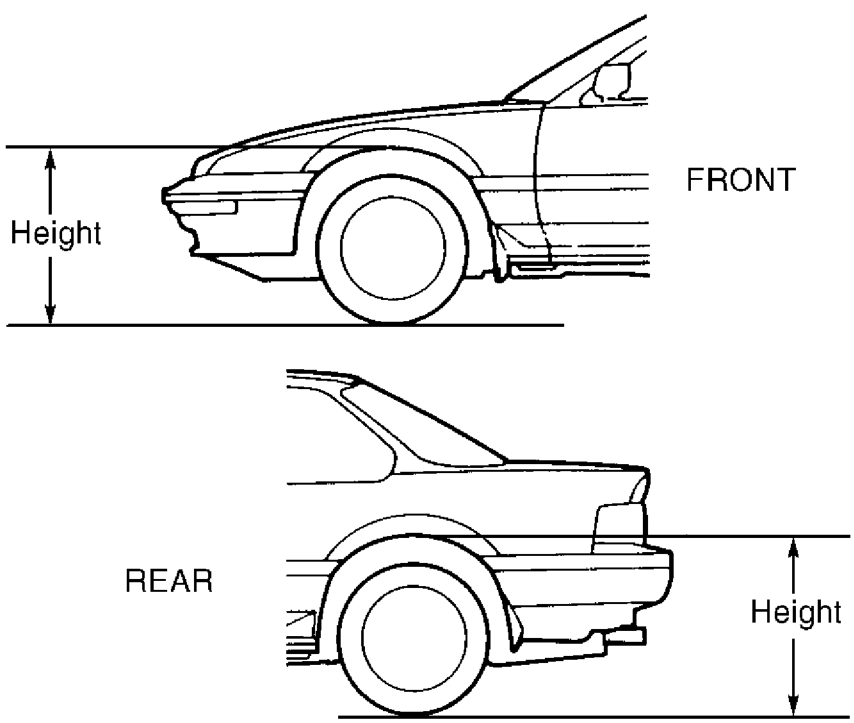

Fig. 1: Measuring Riding Height
Courtesy of American Honda Motor Co., Inc.

END OF ARTICLE

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ARTICLE BEGINNING

1983-96 MAINTENANCE
Honda Maintenance & Service Intervals

Prelude

* PLEASE READ THIS FIRST *

NOTE: All SERVICE SCHEDULES are listed for normal service vehicles. If vehicle is operated under severe service conditions, see SEVERE SERVICE REQUIREMENTS (PERFORM W/SERVICE SCHEDULES) for items requiring additional maintenance.

NOTE: This article contains scheduled maintenance service information. Fluid types and capacities listed with each service in this article are only those necessary to perform that scheduled service. For specifications pertaining to fluid capacities for the entire vehicle, fuse and circuit breaker identification, wheel and tire size, battery type, warranty information, or model identification refer to the MAINTENANCE INFORMATION article in this section.

CAUTIONS & WARNINGS

SUPPLEMENTAL RESTRAINT SYSTEM (AIR BAG)

NOTE: See the AIR BAGS article in the ACCESSORIES/SAFETY EQUIPMENT Section.

Modifications or improper maintenance, including incorrect removal and installation of the Supplemental Restraint System (SRS), can adversely affect system performance. DO NOT cover, obstruct or change the steering wheel horn pad in any way, as such action could cause improper function of the system. Use only plain water when cleaning the horn pad. Solvents or cleaners could adversely affect the air bag cover and cause improper deployment of the system.

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all warnings and service precautions. See appropriate AIR BAGS article in ACCESSORIES/SAFETY EQUIPMENT.

CAUTION: Disconnect negative battery cable before servicing any air bag system, steering column or passenger side dash component. After any repair, turn ignition key to the ON position from passenger's side of vehicle in case of

accidental air bag inflation

AIR CONDITIONER

Ensure the air conditioning system is sufficiently charged before using. Prolonged use of an under-charged system may damage the compressor.

AIR CONDITIONING SERVICING

CAUTION: Avoid breathing R-134a refrigerant and PAG lubricant vapors, exposure may irritate eyes, nose and throat. To remove R-134a from system use R-134a recycling equipment that meets SAE J2210 specifications. If accidental system discharge occurs, ventilate work area before resuming service.

WARNING: R-134a service equipment or vehicle A/C systems SHOULD NOT be pressure tested or leak tested with compressed air. Some mixtures of air/R134a have shown to be combustible at elevated pressures. These mixtures are dangerous and may cause fire and/or explosions. See AIR CONDITIONING SERVICE article in GENERAL INFORMATION section.

ANTI-LOCK BRAKE SYSTEM

The anti-lock brake system contains electronic equipment that can be susceptible to interference caused by improperly installed or high output radio transmitting equipment. Since this interference could cause the possible loss of the anti-lock braking capability, such equipment should be installed by qualified professionals.

On models equipped with anti-lock brake systems, ALWAYS observe the following cautions:

* **DO NOT attempt to bleed hydraulic system without first referring to the appropriate ANTI-LOCK BRAKE SYSTEM article in the BRAKES Section.**
* **DO NOT mix tire sizes. As long as tires remain close to the original diameter, increasing the width is acceptable. Rolling diameter must be identical for all 4 tires. Some manufacturers recommend tires of the same brand, style and type. Failure to follow this precaution may cause inaccurate wheel speed readings.**
* **Use ONLY recommended brake fluids. DO NOT use silicone brake fluids in an ABS-equipped vehicle.**

BATTERY WARNING

WARNING: When battery is disconnected, vehicles equipped with computers may lose memory data. When battery power is restored, driveability problems may exist on some vehicles. These vehicles may require a relearn procedure. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION section.

REPLACING BLOWN FUSES

Before replacing a blown fuse, remove ignition key, turn off all lights and accessories to avoid damaging the electrical system. Be sure to use fuse with the correct indicated amperage rating. The use of an incorrect amperage rating fuse may result in a dangerous electrical system overload.

BRAKE PAD WEAR INDICATOR

Indicator will cause a squealing or scraping noise, warning that brake pads need replacement.

CATALYTIC CONVERTER

Continued operation of vehicle with a severe malfunction could cause converter to overheat, resulting in possible damage to converter and vehicle.

Any modification to the exhaust system on turbo models, which reduces exhaust backpressure, will lead to lean fuel mixtures and excessive spark advance. This could cause serious engine damage.

ELECTROSTATIC DISCHARGE SENSITIVE (ESD) PARTS

WARNING: Many solid state electrical components can be damaged by static electricity (ESD). Some will display a warning label, but many will not. Discharge personal static electricity by touching a metal ground point on the vehicle prior to servicing any ESD sensitive component.

ENGINE OIL

CAUTION: Never use non-detergent or straight mineral oil.

FUEL SYSTEM SERVICE

WARNING: Relieve fuel system pressure prior to servicing any fuel system component (fuel injection models).

HALOGEN BULBS

Halogen bulbs contain pressurized gas which may explode if

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overheated. DO NOT touch glass portion of bulb with bare hands. Eye protection should be worn when handling or working around halogen bulbs.

RADIATOR & CONDENSER FINS

Radiator and condenser fins are very thin and easily damaged. Exercise extreme care when working around them.

RADIATOR CAP

CAUTION: Always disconnect the fan motor when working near the radiator fan. The fan is temperature controlled and could start at any time even when the ignition key is in the OFF position. DO NOT loosen or remove radiator cap when cooling system is hot.

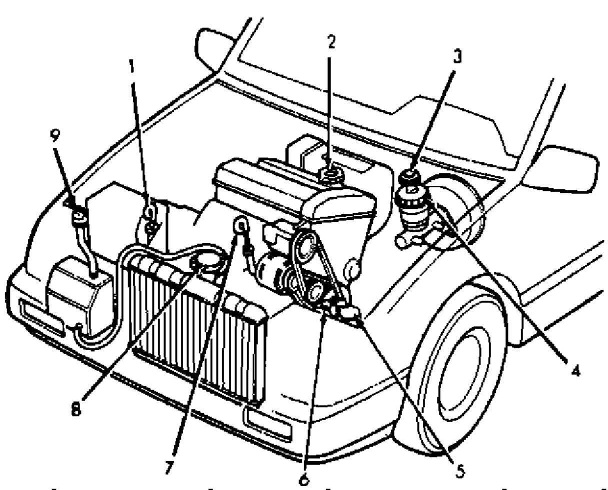
RADIATOR FAN

Keep hands away from radiator fan. Fan is controlled by a thermostatic switch which may come on or run for up to 15 minutes even after engine is turned off.

WASHER FLUID RESERVOIR

DO NOT use a vinegar/water combination in the windshield washer; it will damage the pump. Prolonged operation of the washer without fluid may damage the pump.

SERVICE POINT LOCATIONS



1. Automatic Transmission Dipstick
2. Engine Oil Filler Cap
3. Clutch Fluid Reservoir
4. Brake Fluid Reservoir
5. Washer Fluid Reservoir
6. Power Steering Fluid Reservoir
7. Engine Oil Dipstick
8. Radiator Cap
9. Radiator Reserve Tank Cap

Fig. 1: Engine Service Point Locations (Typical)
Courtesy of American Honda Motor Co., Inc.

SCHEDULE

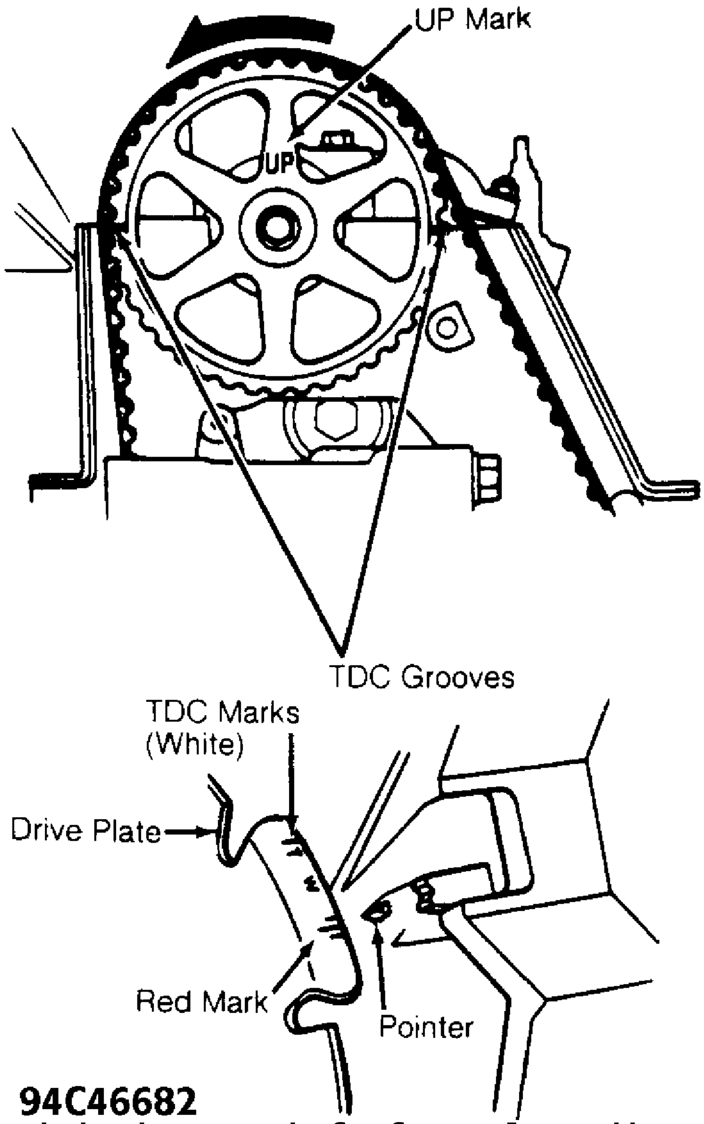


Fig. 2: Positioning Camshaft for Valve Adjustment (2.2L SOHC)
Courtesy of American Honda Motor Co., Inc.

NOTE: For more information regarding valve adjustment refer to the 2.2L 4-CYL & 2.3L 4-CYL article in the ENGINE MECHANICAL section.

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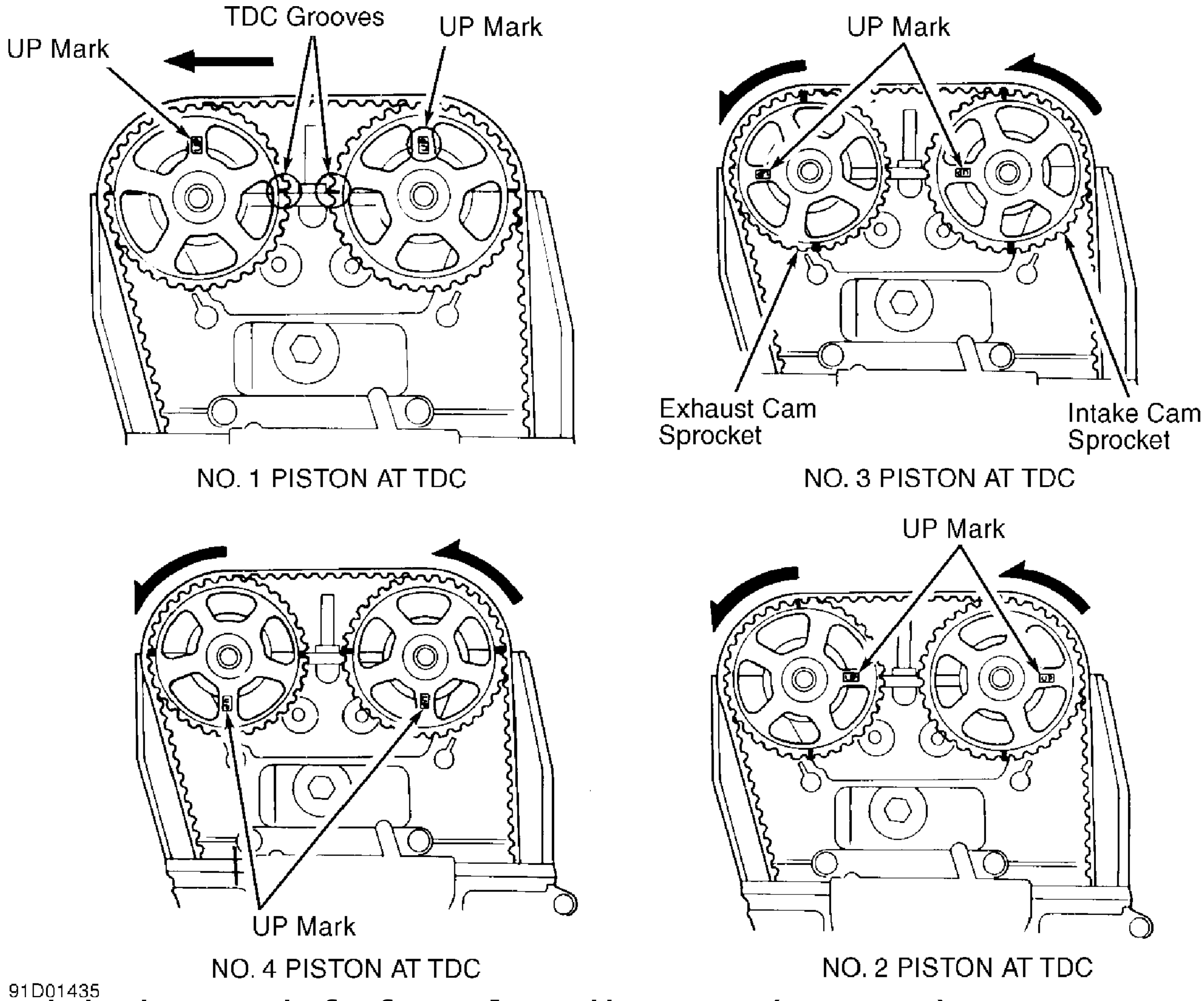

Fig. 3: Positioning Camshaft for Valve Adjustment (2.2 DOHC)
Courtesy of American Honda Motor Co., Inc.

NOTE: For more information regarding valve adjustment refer to the 2.2L 4-CYL & 2.3L 4-CYL article in the ENGINE MECHANICAL section.

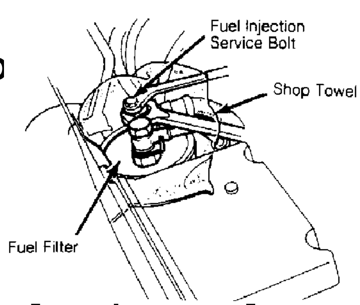

Fig. 4: Releasing Fuel System Pressure
Courtesy of American Honda Motor Co., Inc.

NOTE: For more information regarding fuel system service refer to the 2.2L 4-CYL & 2.3L 4-CYL article in the ENGINE MECHANICAL section.

CAMSHAFT TIMING BELT REPLACEMENT INFORMATION

CAUTION: Failure to replace a faulty camshaft timing belt may result in serious engine damage.

The condition of camshaft drive belts should always be checked on vehicles which have more than 50,000 miles. Although some manufacturers do not recommend belt replacement at a specified mileage, others require it at 60,000-100,000 miles. A camshaft drive belt failure may cause extensive damage to internal engine components on most engines, although some designs do not allow piston-to-valve contact. These designs are often called "Free Wheeling".

Many manufacturers changed their maintenance and warranty schedules in the mid-1980's to reflect timing belt inspection and/or replacement at 50,000-60,000 miles. Most service interval schedules in this manual reflect these changes.

Belts or components should be inspected and replaced if any of the following conditions exist:

* Cracks Or Tears In Belt Surface
* Missing, Damaged, Cracked Or Rounded Teeth
* Oil Contamination
* Damaged Or Faulty Tensioners
* Incorrect Tension Adjustment

Replace camshaft timing belt at 90,000 mile intervals.

SEVERE & NORMAL SERVICE DEFINITIONS

NOTE: Use the Severe Service schedule if the vehicle to be serviced is operated under ANY (one or more) of these conditions:

Service is recommended at mileage intervals based on vehicle operation. Service schedules are based on the following primary operating conditions:

Normal Service

* Driven More Than 10 Miles Daily
* No Operating Conditions From Severe Service Schedule

Severe Service (Unique Driving Conditions)

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* Short Trips In Freezing Temperatures
* Towing Or Commercial Use
* Driving In Salty (Or Other Corrosive Materials) Areas
* Severe Dust Conditions
* Hot Weather, Stop-And-Go Driving
* Extensive Idling

SEVERE SERVICE REQUIREMENTS (PERFORM W/SERVICE SCHEDULES)

NOTE: The following services are to be performed on vehicles subjected to severe service. See SEVERE & NORMAL SERVICE DEFINITIONS. This service is to be performed in addition to the normal services listed in the NORMAL MAINTENANCE SERVICE SCHEDULES.

SEVERE SERVICE CONDITIONS/ACTIONS TABLE

Condition	Action	Item	Perform Every (1)
Short Trips In Freezing Temperatures	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Towing	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	A/T Fluid	15,000 Miles or 12 Months
	Replace	M/T Fluid	15,000 Miles or 12 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Commercial Use	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Driving In Salty (Or Other Corrosive	Replace	Engine Oil & Filter	3,000 Miles or 3 Months

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Materials) Areas	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Severe Dust Conditions	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Hot Weather, Stop-And-Go Driving	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months
Extensive Idling	Replace	Engine Oil & Filter	3,000 Miles or 3 Months
	Replace	Radiator Coolant	START AT: 45,000 Miles; REPEAT EVERY SUBSEQUENT: 30,000 Miles or 24 Months

(1) - Perform these services at the mileage or number of months (since the last time), whichever comes first.

NORMAL MAINTENANCE SERVICE SCHEDULES

The following service schedules refer to vehicles driven under normal operating conditions. For vehicles driven under severe conditions, additional services may be necessary. See SEVERE SERVICE REQUIREMENTS (PERFORM W/SERVICE SCHEDULES) above in this article for additional service requirements.

7500 MILE (12,000 KM) SERVICE

7500 MILE (12,000 KM) SERVICE

	Service Or Inspect
?	Check Fluid Levels
?	Inspect Coolant Hoses and Clamps

- Inspect Brake System
- Inspect Exhaust System
- Inspect C/V Joint boots
- Inspect Steering Linkage/Front Suspension
- Lubricate Chassis
- Rotate Tires and Adjust Air Pressure (Including Spare)

Replace

- Engine Oil
- Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

15,000 MILE (24,000 KM) SERVICE

SCHED

15,000 MILE (24,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Valve Clearance
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Coolant Strength
?	Inspect Brake System
?	Check Exhaust System & Heat Shielding
?	Clean Battery and Battery Terminals
?	Inspect Fuel/Tank/Cap/Lines
?	Check Operation of Horn, Wipers/Washers & All Exterior Lights
?	Inspect Condition of Wiper Blades
?	Check Headlight Alignment
?	Check Seat Belt Webbing and Release Mechanisms
?	Check Parking Brake Operation
?	Check Shift/Clutch Interlock Operation
?	Inspect C/V Joint boots
?	Brake Discs & Calipers
?	Parking Brake
?	Clutch Release Arm Travel
?	Inspect Steering Linkage/Front Suspension
?	Lubricate Chassis
?	Suspension Mounting Bolts

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?	Front Wheel Alignment
?	Steering Operation, Tie Rods, Gear Box & Boots
?	Power Steering System
?	Lubricate Weatherstripping with Silicone
?	Lubricate Door Hinges
?	Lubricate Door Locks
?	Check Body Drain Holes
?	Rotate Tires and Adjust Air Pressure
	Replace
?	Engine Oil
?	Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

22,500 MILE (36,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Check Fluid Levels
Check Cooling System Hoses and Clamps
Check Exhaust System & Heat Shielding
Inspect C/V Joint boots
Inspect Power Steering System (If Equipped)
Inspect Steering Linkage/Front Suspension
Lubricate Chassis
Inspect Front Brake Pads & Rotors
Inspect Rear Brake Linings & Drums
Inspect Brake System Hoses & Lines
Inspect Shocks/Struts for Leakage
Inspect Tire Wear Pattern
Rotate Tires and Adjust Air Pressure (Including Spare)

Replace
Engine Oil
Oil Filter

Lubrication Specifications	
Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

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Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

30,000 MILE (48,000 KM) SERVICE

30,000 MILE (48,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Valve Clearance
Check Fluid Levels
Check Cooling System Hoses and Clamps
Check Exhaust System & Heat Shielding
Clean Battery and Battery Terminals
Inspect/Adjust Accessory Drive Belts (Replace if Required)
Clean Choke Mechanism (If Equipped)
Blow-By Filter
Crankcase Ventilation System
ABS System Operation

? ? Brake Hoses & Lines ?

? ? Brake Discs & Calipers ?

? ? Rear Brake Drums, Wheel Cylinders & Linings ?

? ? Parking Brake ?

? ? Clutch Release Arm Travel ?

? ? Suspension Mounting Bolts ?

? ? Front Wheel Alignment ?

? ? Rear Wheel Alignment (4WS Model) ?

? ? Steering Operation, Tie Rods, Gear Box & Boots ?

? ? Inspect C/V Joint boots ?

? ? Inspect Power Steering System (If Equipped) ?

? ? Suspension Bushings, Springs, Arms & Rear Jounce Bumpers ?

? ? Parking Brake System ?

? ? Inspect Shocks/Struts for Leakage ?

? ? Inspect Tire Wear Pattern ?

? ? Rotate Tires and Adjust Air Pressure (Including Spare) ?

? Replace ?

? ? Engine Oil ?

? ? Oil Filter ?

? ? Spark Plugs ?

? ? Air Filter Element ?

? ? Manual Transmission Oil ?

? ? Automatic Transmission Fluid ?

? ? Drain, Refill and Bleed Brake System ?SCHEDU

Lubrication Specifications

Application	Specification
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	
1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

Service Labor Times

Application	Hours
1.8L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4

SCHEDU

2.0L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.1L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.2L SOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.3L DOHC	
Automatic Transmission	4.6
Manual Transmission	4.4
2.2L DOHC VTEC	
Manual Transmission	4.4

37,500 MILE (60,000 KM) SERVICE

37,500 MILE (60,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Inspect Brake System
?	Inspect C/V Joint boots
?	Inspect Steering Linkage/Front Suspension
?	Lubricate Chassis
?	Rotate Tires and Adjust Air Pressure (Including Spare)
	Replace
?	Engine Oil
?	Oil Filter
	Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

45,000 MILE (72,000 KM) SERVICE

45,000 MILE (72,000 KM) SERVICE

Service Or Inspect
? Verify Last Major Service Was Performed
? Valve Clearance
? Clutch Release Arm Travel
? Suspension Mounting Bolts
? Front Wheel Alignment
? Check Fluid Levels
? Check Cooling System Hoses and Clamps
? Clean Battery and Battery Terminals

?   ? Check Exhaust System & Heat Shielding   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Check Operation of Horn, Wipers/Washers & All Exterior Lights?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Condition of Wiper Blades   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Check Headlight Alignment   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Check Seat Belt Webbing and Release Mechanisms   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Check Parking Brake Operation   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Check Shift/Clutch Interlock Operation   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect C/V Joint boots   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Power Steering System (If Equipped)   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Steering Linkage/Front Suspension   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Lubricate Chassis   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Front Brake Pads & Rotors   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Rear Brake Linings & Drums   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Brake System Hoses & Lines   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Fuel Tank/Cap/Lines   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Shocks/Struts for Leakage   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Inspect Tire Wear Pattern   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Lubricate Weatherstripping with Silicone   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Lubricate Door Hinges   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Lubricate Door Locks   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Check Body Drain Holes   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Rotate Tires and Adjust Air Pressure   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   Replace   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ? Engine Oil   ?SCHEDU
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

?	Oil Filter
?	Drain, Flush and Refill Engine Coolant

Lubrication Specifications

Application	Specification
Engine Coolant	50/50 Honda Recommended Anti-Freeze & Water
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Cooling System	4.7-6.7 Qts. (4.4-6.3L)
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

52,500 MILE (84,000 KM) SERVICE

52,500 MILE (84,000 KM) SERVICE

Service Or Inspect

?	Verify Last Major Service Was Performed
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding

- Inspect Brake System
- Lubricate Chassis
- Inspect C/V Joint boots
- Inspect Steering Linkage/Front Suspension
- Rotate Tires and Adjust Air Pressure (Including Spare)

Replace

- Engine Oil
- Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

60,000 MILE (96,000 KM) SERVICE

Service Or Inspect

?	?	**Verify Last Major Service Was Performed**	?
?	?	**Idle Speed & Idle CO**	?
?	?	**Valve Clearance**	?
?	?	**Check Fluid Levels**	?
?	?	**Check Cooling System Hoses and Clamps**	?
?	?	**Check Exhaust System & Heat Shielding**	?
?	?	**Clean Battery and Battery Terminals**	?
?	?	**Inspect/Adjust Accessory Drive Belts (Replace if Required)**	?
?	?	**EGR System**	?
?	?	**Secondary Air Supply System**	?
?	?	**Intake-Air Temperature Control System**	?
?	?	**Throttle Control System**	?
?	?	**Choke Mechanism (If Equipped)**	?
?	?	**Choke Opener Operation (If Equipped)**	?
?	?	**Evaporative Emission Control System**	?
?	?	**Ignition Timing & Control System**	?
?	?	**Distributor Cap & Rotor**	?
?	?	**Ignition Wiring**	?
?	?	**PCV Valve**	?
?	?	**Blow-By Filter**	?
?	?	**Inspect Underhood Wiring Harnesses and Connections**	?
?	?	**Inspect Emission Control Vacuum Hoses and Connections**	?
?	?	**Inspect Fuel/Tank/Cap/Lines**	?
?	?	**Inspect C/V Joint boots**	?

SCHEDU

? ? **Inspect Power Steering System (If Equipped)** ?
? ? **Suspension Bushings, Springs, Arms & Rear Jounce Bumpers** ?
? ? **Lubricate Chassis** ?
? ? **Clutch Release Arm Travel** ?
? ? **Inspect Brake System** ?
? ? **Parking Brake System** ?
? ? **ABS System Operation** ?
? ? **Brake Hoses & Lines** ?
? ? **Brake Discs & Calipers** ?
? ? **Rear Brake Drums, Wheel Cylinders & Linings** ?
? ? **Suspension Mounting Bolts** ?
? ? **Front Wheel Alignment** ?
? ? **Rear Wheel Alignment (4WS Model)** ?
? ? **Steering Operation, Tie Rods, Gear Box & Boots** ?
? ? **Inspect Shocks/Struts for Leakage** ?
? ? **Inspect Tire Wear Pattern** ?
? ? **Rotate Tires and Adjust Air Pressure (Including Spare)** ?
? **Replace** ?
? ? **Engine Oil** ?
? ? **Oil Filter** ?
? ? **Spark Plugs** ?
? ? **Air Filter Element** ?
? ? **Fuel Filter & Hoses (Including Auxiliary Filter)** ?
? ? **Blow-By Filter (Exc. Si Model)** ?**SCHEDU**

- ? Manual Transmission Oil
- ? Automatic Transmission Fluid
- ? Rear Wheel Bearing Grease
- ? Anti-Lock Brake System High Pressure Hose (If Equipped)
- ? Drain, Refill and Bleed Brake System

Lubrication Specifications

Application	Specification
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	
1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

SCHEDU

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

Service Labor Times

Application	Hours
1.8L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.0L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.1L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.2L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.3L DOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.2L DOHC VTEC	
Manual Transmission	5.7

67,500 MILE (108,000 KM) SERVICE

67,500 MILE (108,000 KM) SERVICE

Service Or Inspect
? Verify Last Major Service Was Performed
? Check Fluid Levels
? Check Cooling System Hoses and Clamps
? Check Exhaust System & Heat Shielding
? Lubricate Chassis
? Inspect C/V Joint boots
? Inspect Steering Linkage/Front Suspension

?	Inspect Front Brake Pads & Rotors
?	Inspect Rear Brake Linings & Drums
?	Inspect Brake System Hoses & Lines
?	Rotate Tires and Adjust Air Pressure (Including Spare)
	Replace
?	Engine Oil
?	Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

75,000 MILE (120,000 KM) SERVICE

75,000 MILE (120,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Valve Clearance** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Fluid Levels** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Cooling System Hoses and Clamps** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Exhaust System & Heat Shielding** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Clean Battery and Battery Terminals** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Brake System** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Operation of Horn, Wipers/Washers & All Exterior Lights**?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Condition of Wiper Blades** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Headlight Alignment** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Seat Belt Webbing and Release Mechanisms** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Parking Brake Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Shift/Clutch Interlock Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Adjust Drive Belt Tension** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Lubricate Chassis** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect C/V Joint boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Power Steering System (If Equipped)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Brake Discs & Calipers** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Parking Brake** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Clutch Release Arm Travel** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Suspension Mounting Bolts** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Front Wheel Alignment** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Steering Operation, Tie Rods, Gear Box & Boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Lubricate Weatherstripping with Silicone** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?**SCHEDU**
? ? **Lubricate Door Hinges** ?

? Lubricate Door Locks

? Check Body Drain Holes

? Inspect Shocks/Struts for Leakage

? Inspect Tire Wear Pattern

? Rotate Tires and Adjust Air Pressure

Replace

? Engine Oil

? Oil Filter

? Drain, Flush and Refill Engine Coolant

Lubrication Specifications

Application	Specification
Engine Coolant	50/50 Honda Recommended Anti-Freeze & Water
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Cooling System	4.7-6.7 Qts. (4.4-6.3L)
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.
(2) - Includes filter change.

82,500 MILE (132,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Inspect Brake System
?	Lubricate Chassis
?	Inspect C/V Joint boots
?	Inspect Steering Linkage/Front Suspension
?	Rotate Tires and Adjust Air Pressure (Including Spare)
	Replace
?	Engine Oil
?	Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)

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1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

90,000 MILE (144,000 KM) SERVICE

90,000 MILE (144,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Valve Clearance
Check Fluid Levels
Check Cooling System Hoses and Clamps
Clean Battery and Battery Terminals
Inspect/Adjust Accessory Drive Belts (Replace if Required)
Check Exhaust System & Heat Shielding
Choke Mechanism (If Equipped)
Blow-By Filter
ABS System Operation
Brake Hoses & Lines
Brake Discs & Calipers
Rear Brake Drums, Wheel Cylinders & Linings
Check Operation of Horn, Wipers/Washers & All Exterior Lights
Inspect Condition of Wiper Blades
Check Headlight Alignment

SCHED

? ? Check Seat Belt Webbing and Release Mechanisms ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Parking Brake Operation ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Shift/Clutch Interlock Operation ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Spark Plug Wires ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Distributor Cap ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Fuel/Tank/Cap/Lines ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect C/V Joint boots ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Power Steering System (If Equipped) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Clutch Release Arm Travel ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Suspension Mounting Bolts ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Front Wheel Alignment ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Rear Wheel Alignment (4WS Model) ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Steering Operation, Tie Rods, Gear Box & Boots ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Steering Linkage/Front Suspension ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Lubricate Chassis ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Front Brake Pads & Rotors ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Rear Brake Linings & Drums ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Brake System Hoses & Lines ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Shocks/Struts for Leakage ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Inspect Tire Wear Pattern ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Lubricate Weatherstripping with Silicone ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Lubricate Door Hinges ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Lubricate Door Locks ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? Check Body Drain Holes ?SCHED
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

- Rotate Tires and Adjust Air Pressure

Replace

- Engine Oil
- Oil Filter
- Air Filter Element
- Spark Plugs
- Camshaft Timing Belt
- Manual Transmission Oil
- Automatic Transmission Fluid
- Transmission Oil
- Drain, Refill and Bleed Brake System

Lubrication Specifications

Application	Specification
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)

1994-96 (VTEC)	5.1 Qts. (4.8L)
Transmission	
Automatic	
1983-91	3.0 Qts. (2.8L)
1992-96	2.5 Qts. (2.4L)
Manual	
1983-87	2.4 Qts. (2.3L)
1988-89	2.1 Qts. (2.0L)
1990-91	2.4 Qts. (2.3L)
1992-96	2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

Service Labor Times

Application	Hours
1.8L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.0L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.1L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.2L SOHC (1)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.3L DOHC (2)	
Automatic Transmission	4.6
Manual Transmission	4.4
2.2L DOHC VTEC (2)	
Manual Transmission	4.4

(1) - Add 2.5 hrs. to replace camshaft timing belt.

(2) - Add 2.9 hrs. to replace camshaft timing belt.

97,500 MILE (156,000 KM) SERVICE

97,500 MILE (156,000 KM) SERVICE

Service Or Inspect

? ? Verify Last Major Service Was Performed

? ? Check Fluid Levels

? ? Check Cooling System Hoses and Clamps

? ? Check Exhaust System & Heat Shielding

? ? Inspect Brake System

? ? Inspect C/V Joint boots

? ? Inspect Steering Linkage/Front Suspension

? ? Lubricate Chassis

? ? Rotate Tires and Adjust Air Pressure (Including Spare)

Replace

? ? Engine Oil

? ? Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)
1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

SCHEDU

105,000 MILE (168,000 KM) SERVICE

105,000 MILE (168,000 KM) SERVICE

	Service Or Inspect
?	Verify Last Major Service Was Performed
?	Valve Clearance
?	Brake Hoses & Lines
?	Brake Discs & Calipers
?	Clutch Release Arm Travel
?	Suspension Mounting Bolts
?	Front Wheel Alignment
?	Check Fluid Levels
?	Check Cooling System Hoses and Clamps
?	Check Exhaust System & Heat Shielding
?	Clean Battery and Battery Terminals
?	Inspect Brake System
?	Check Operation of Horn, Wipers/Washers & All Exterior Lights
?	Inspect Condition of Wiper Blades
?	Check Headlight Alignment
?	Check Seat Belt Webbing and Release Mechanisms
?	Check Parking Brake Operation
?	Inspect Fuel/Tank/Cap/Lines
?	Check Shift/Clutch Interlock Operation
?	Inspect C/V Joint boots

```
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Power Steering System (If Equipped)                      ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Steering Linkage/Front Suspension                        ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Chassis                                                ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Weatherstripping with Silicone                         ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Door Hinges                                            ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Door Locks                                             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Check Body Drain Holes                                           ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Rotate Tires and Adjust Air Pressure                             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Replace                                                          ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Engine Oil                                                       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Oil Filter                                                       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Flush and Refill Engine Coolant                                  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Lubrication Specifications                                       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Engine Coolant  .........................  50/50 Honda Recommended?
?                                                Anti-Freeze & Water?
? Engine Oil                                                            ?
?   1983-96  ..................................  SAE 5W-30 API SG/SH?
?   1994-96 (VTEC)  ..........................  SAE 10W-30 API SG/SH?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Fluid Capacities                                                 ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Application                                            (1) Quantity ?
?                                                                       ?
? Cooling System  .........................  4.7-6.7 Qts. (4.4-6.3L)?
? Engine Oil (2)                                                        ?
?   1983-87  ......................................  3.7 Qts. (3.5L)?
?   1988-89  ......................................  4.0 Qts. (3.9L)?
?   1990  .........................................  3.7 Qts. (3.5L)?
?   1991  .........................................  4.0 Qts. (3.9L)?
?   1992-96 (S)  ..................................  4.0 Qts. (3.8L)?
?   1992-96 (Si, 4WS)  ............................  4.5 Qts. (4.3L)?
?   1994-96 (VTEC)  ...............................  5.1 Qts. (4.8L)?
?                                                                       ?SCHEDU
? (1) - Capacities are recommended or calculated levels. Always use ?
```

dipstick (if available) to measure level.
(2) - Includes filter change.

112,500 MILE (180,000 KM) SERVICE

112,500 MILE (180,000 KM) SERVICE

Service Or Inspect
Verify Last Major Service Was Performed
Check Fluid Levels
Check Cooling System Hoses and Clamps
Check Exhaust System & Heat Shielding
Inspect C/V Joint boots
Inspect Steering Linkage/Front Suspension
Lubricate Chassis
Rotate Tires and Adjust Air Pressure

Replace
Engine Oil
Oil Filter

Lubrication Specifications

Application	Specification
Engine Oil	
1983-96	SAE 5W-30 API SG/SH
1994-96 (VTEC)	SAE 10W-30 API SG/SH

Fluid Capacities

Application	(1) Quantity
Engine Oil (2)	
1983-87	3.7 Qts. (3.5L)
1988-89	4.0 Qts. (3.9L)

1990	3.7 Qts. (3.5L)
1991	4.0 Qts. (3.9L)
1992-96 (S)	4.0 Qts. (3.8L)
1992-96 (Si, 4WS)	4.5 Qts. (4.3L)
1994-96 (VTEC)	5.1 Qts. (4.8L)

(1) - Capacities are recommended or calculated levels. Always use dipstick (if available) to measure level.

(2) - Includes filter change.

120,000 MILE (192,000 KM) SERVICE

120,000 MILE (192,000 KM) SERVICE

Service Or Inspect
? Verify Last Major Service Was Performed
? Idle Speed & Idle CO
? Valve Clearance
? Alternator Drive Belt
? Cooling System Hoses & Connections
? EGR System
? Secondary Air Supply System
? Fuel Line Connections
? Intake-Air Temperature Control System
? Throttle Control System
? Choke Mechanism (If Equipped)
? Choke Opener Operation (If Equipped)
? Evaporative Emission Control System
? Ignition Timing & Control System
? Distributor Cap & Rotor

? ? **Ignition Wiring** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **PCV Valve** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Blow-By Filter** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **ABS System Operation** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Brake Hoses & Lines** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Brake Discs & Calipers** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Rear Brake Drums, Wheel Cylinders & Linings** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Fluid Levels** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Cooling System Hoses and Clamps** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect/Adjust Accessory Drive Belts (Replace if Required)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Exhaust System & Heat Shielding** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Clean Battery and Battery Terminals** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Underhood Wiring Harnesses and Connections** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Emission Control Vacuum Hoses and Connections** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Distributor Cap** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Check Ignition Timing** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Fuel/Tank/Cap/Lines** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect C/V Joint boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Clutch Release Arm Travel** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Suspension Mounting Bolts** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Front Wheel Alignment** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Rear Wheel Alignment (4WS Model)** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Steering Operation, Tie Rods, Gear Box & Boots** ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? ? **Inspect Power Steering System (If Equipped)** ?SCHEDU
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?

```
?   ?  Inspect Steering Linkage/Front Suspension                    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Lubricate Chassis                                            ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Suspension Bushings, Springs, Arms & Rear Jounce Bumpers     ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Parking Brake System                                         ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Shocks for Leakage                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Inspect Tire Wear Pattern                                    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Rotate Tires and Adjust Air Pressure (Including Spare)       ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Replace                                                      ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Engine Oil                                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Oil Filter                                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Spark Plugs                                                  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Spark Plug Wires                                             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Air Filter Element                                           ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Blow-By Filter (Exc. Si Model)                               ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Fuel Filter (Including Auxiliary Filter)                     ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Manual Transmission Oil                                      ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Automatic Transmission Fluid                                 ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Fuel Filter & Hoses (Including Auxiliary Filter)             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Rear Wheel Bearing Grease                                    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Anti-Lock Brake System High Pressure Hose (If Equipped)      ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?   ?  Drain, Refill and Bleed Brake System                         ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
?      Lubrication Specifications                                   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Application                                          Specification ?
?                                                                   ?
? Brake Fluid  ......................  DOT 3 Or DOT 4 Specifications?
?                                          (See Fluid Reservoir Cap)?SCHEDU
```

? Engine Oil ?
? 1983-96 .... SAE 5W-30 API SG/SH?
? 1994-96 (VTEC) .... SAE 10W-30 API SG/SH?
? Power Steering Fluid .... Honda Power Steering Fluid?
? Transmission Fluid ?
? Automatic (Includes Differential) .... Dexron-IIE ATF?
? Manual (Includes Differential) .... SAE 10W-30 Or 10W-40?
? API SG?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Fluid Capacities ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Application (1) Quantity ?
? ?
? Engine Oil (2) ?
? 1983-87 .... 3.7 Qts. (3.5L)?
? 1988-89 .... 4.0 Qts. (3.9L)?
? 1990 .... 3.7 Qts. (3.5L)?
? 1991 .... 4.0 Qts. (3.9L)?
? 1992-96 (S) .... 4.0 Qts. (3.8L)?
? 1992-96 (Si, 4WS) .... 4.5 Qts. (4.3L)?
? 1994-96 (VTEC) .... 5.1 Qts. (4.8L)?
? Transmission ?
? Automatic ?
? 1983-91 .... 3.0 Qts. (2.8L)?
? 1992-96 .... 2.5 Qts. (2.4L)?
? Manual ?
? 1983-87 .... 2.4 Qts. (2.3L)?
? 1988-89 .... 2.1 Qts. (2.0L)?
? 1990-91 .... 2.4 Qts. (2.3L)?
? 1992-96 .... 2 Qts. (1.9L)?
? ?
? (1) - Capacities are recommended or calculated levels. Always use ?
? dipstick (if available) to measure level. ?
? (2) - Includes filter change. ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Service Labor Times ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? Application Hours ?
? ?
? 1.8L SOHC ?
? Automatic Transmission .... 5.9?
? Manual Transmission .... 5.7?
? 2.0L SOHC ?
? Automatic Transmission .... 5.9?
? Manual Transmission .... 5.7?
? 2.1L SOHC ?
? Automatic Transmission .... 5.9?
? Manual Transmission .... 5.7?SCHEDU

2.2L SOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.3L DOHC	
Automatic Transmission	5.9
Manual Transmission	5.7
2.2L DOHC VTEC	
Manual Transmission	5.7

LUBRICATION SPECIFICATIONS

LUBRICATION SPECIFICATIONS TABLE

Application	Fluid Specifications
Brake Fluid	DOT 3 Or DOT 4 Specifications (See Fluid Reservoir Cap)
Engine Coolant	50/50 Honda Recommended Anti-Freeze & Water
Engine Oil	
1983-94	SAE 5W-30 API SG/SH
1994 (VTEC)	SAE 10W-30 API SG/SH
Power Steering Fluid	Honda Power Steering Fluid
Transmission Fluid	
Automatic (Includes Differential)	Dexron-IIE ATF
Manual (Includes Differential)	SAE 10W-30 Or 10W-40 API SG

FLUID CAPACITIES

FLUID CAPACITIES TABLE (1)

Application	Quantity
A/C System R-12 Refrigerant	
1983-84	25 Ozs.
1985-87	26-30 Ozs
1988	29-34 Ozs.
1989	32-36 Ozs.
1990-91	30-34 Ozs.
1992-93	26-28 Ozs.
A/C System R-134a Refrigerant (2)	
1994-96	21-23 Ozs.
Cooling System	4.7-6.7 Qts. (4.4-6.3L)
Engine Oil (3)	

```
  1983-87  ..................................  3.7 Qts. (3.5L)
  1988-89  ..................................  4.0 Qts. (3.9L)
  1990  .....................................  3.7 Qts. (3.5L)
  1991  .....................................  4.0 Qts. (3.9L)
  1992-96 (S)  ..............................  4.0 Qts. (3.8L)
  1992-96 (Si, 4WS)  ........................  4.5 Qts. (4.3L)
  1995-96 (VTEC)  ...........................  5.1 Qts. (4.8L)
Fuel Tank  .................................  15.9 Gals. (60L)
Transmission
  Automatic
   1983-91  .................................  3.0 Qts. (2.8L)
   1992-96  .................................  2.5 Qts. (2.4L)
  Manual
   1983-87  .................................  2.4 Qts. (2.3L)
   1988-89  .................................  2.1 Qts. (2.0L)
   1990-91  .................................  2.4 Qts. (2.3L)
   1992-96  ...................................  2 Qts. (1.9L)

(1) - Capacities are recommended or calculated levels. Always use
      dipstick (if available) to measure level.
(2) - Use of R-12 in a R-134a system will result in SEVERE DAMAGE
(3) - Includes filter change.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
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END OF ARTICLE

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ARTICLE BEGINNING

1993 ELECTRICAL
Honda Starters - Mitsuba & Nippondenso Reduction Gear

Prelude

DESCRIPTION

Mitsuba and Nippondenso reduction gear starters are a 4-brush, solenoid-actuated type. Starter drive is equipped with an overrunning clutch. The brush holder assembly retains brushes and springs in the starter housing.

TROUBLE SHOOTING

NOTE: See **TROUBLE SHOOTING - BASIC PROCEDURES** article in the **GENERAL INFORMATION** section.

ON-VEHICLE TESTING

CRANKING TEST

NOTE: On M/T models, engine will not crank unless clutch pedal is fully depressed.

1) Disconnect ignition coil secondary wire from distributor and ground it.

NOTE: Use commercially available starter tester to perform cranking test. Follow manufacturer's instructions. If starter tester is unavailable, perform test as described in steps 2) through 6).

2) Connect voltmeter and ammeter to battery. SeeFig. 1. Connect tachometer to engine. Turn ignition switch to START position and crank engine. Check starter cranking voltage and current draw on appropriate meter. See **CRANKING TEST SPECIFICATIONS** table.

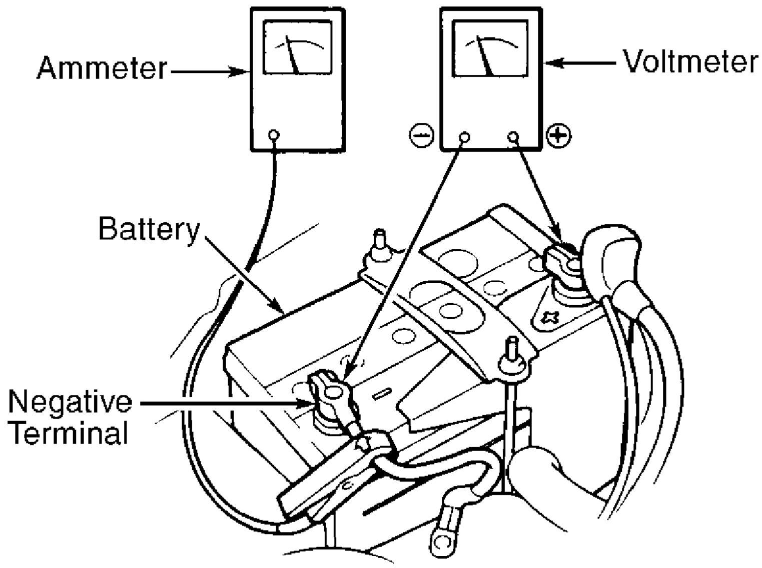

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Fig. 1: Starter Cranking Test
Courtesy of American Honda Motor Co., Inc.

3) If engine does not crank, check battery and battery cables. Check connections for looseness or corrosion. If engine still does not crank, by-pass ignition switch circuit as follows.

4) Disconnect Black/White wire from starter. Connect jumper wire from battery positive terminal to starter solenoid terminal. Engine should crank. If engine still does not crank, repair or replace starter.

5) If engine cranks, check for open circuit in Black/White wire between starter and ignition switch. Check connections for looseness or corrosion. Check ignition switch.

6) On A/T models, also check neutral/safety switch and connector. On M/T models, check starter relay, clutch interlock switch and connectors. See CLUTCH INTERLOCK SWITCH TEST.

CRANKING TEST SPECIFICATIONS TABLE

Application	Cranking Voltage (Volts)	Current Draw (Amps)
Prelude	8.5	380

CLUTCH INTERLOCK SWITCH TEST - M/T

1) If necessary, remove lower instrument panel cover and driver's side knee bolster to gain access to clutch interlock switch connector. Disconnect 2-pin connector from switch.

2) Check continuity between switch terminals. Ensure

continuity exists when clutch pedal is depressed. Continuity should not exist when clutch pedal is not depressed.

STARTER RELAY TEST - A/T

Locate and remove starter relay from vehicle. Connect battery between terminals "C" and "D". See Fig. 2. Ensure continuity exists between terminal "A" and "B". Disconnect battery from terminals "C" and "D". Continuity should no longer exist between terminals "A" and "B".

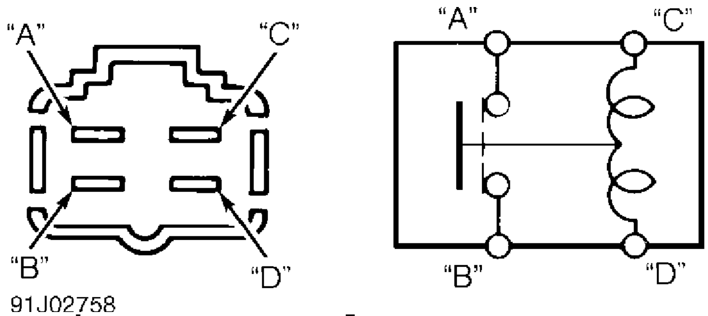

Fig. 2: Testing Starter Relay
Courtesy of American Honda Motor Co., Inc.

IGNITION SWITCH TEST

Remove lower instrument panel cover and driver's side knee bolster. Disconnect 6-pin connector from dash fuse box and 3-pin connector from main wire harness. See Fig. 3. Use an ohmmeter to check continuity at connector terminals with switch in indicated position. If continuity is not as specified, replace ignition switch.

IGNITION SWITCH CONTINUITY

Terminal / Position	WHT/BLK (ACC)	WHT (BAT)	BLK/YEL (IG1)	YEL (IG2)	BLK/WHT (ST)
0					
I	O	O			
II	O	O	O	O	
III		O	O		O

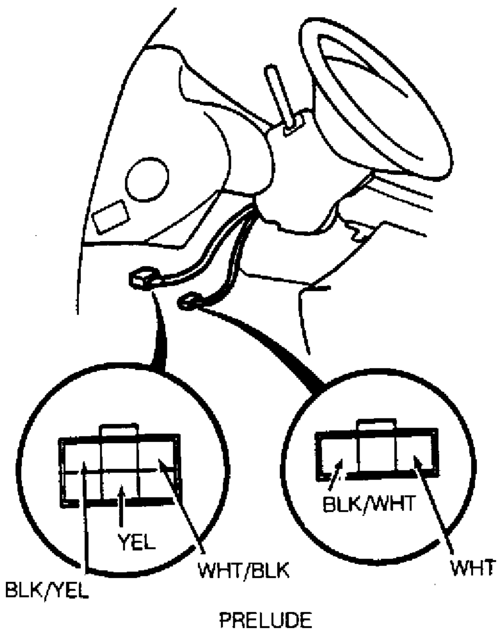

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Fig. 3: Testing Ignition Switch Continuity
Courtesy of American Honda Motor Co., Inc.

BENCH TESTING

SOLENOID TESTS

Pull-In Test

Check continuity between starter solenoid terminals "S" and "M". See Fig. 4. If continuity exists, pull-in coil is okay. If continuity does not exist, replace starter solenoid.

Hold-In Test

Check continuity between terminal "S" and armature housing (ground). See Fig. 4. If continuity exists, hold-in coil is okay. If continuity does not exist, replace starter solenoid.

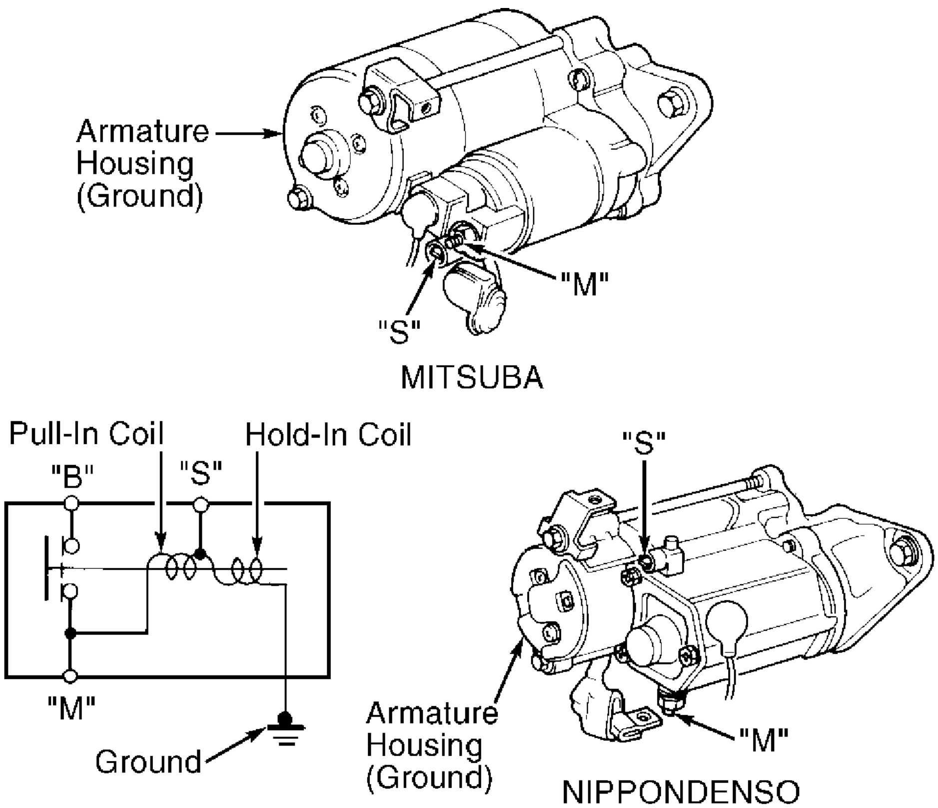

Fig. 4: Testing Starter Solenoid
Courtesy of American Honda Motor Co., Inc.

ARMATURE TEST

1) Place armature in growler. Turn on growler and hold hacksaw blade over armature. Slowly rotate armature. If armature attracts hacksaw blade or if hacksaw blade vibrates, armature is defective and must be replaced. If blade does not respond as described, go to step 2).

2) Remove armature from growler. Using an ohmmeter, check continuity between commutator and armature, and between commutator and shaft. Continuity should not exist. If continuity exists in either case, replace armature.

3) Check for continuity between each commutator segment. Continuity should exist. If an open circuit exists between any 2 segments, replace armature.

4) Inspect armature for wear or damage due to contact with field coil magnets. Clean commutator surface, and polish with No. 500-600 sandpaper if necessary. If surface is scored, out-of-round or pitted, turn commutator on a lathe.

5) If mica depth is not within specification, undercut with a hacksaw blade to minimum depth. See STARTER SPECIFICATIONS table.

BRUSH HOLDERS TEST

1) Using an ohmmeter, check continuity between the positive and negative brush holders (brackets). Continuity should not exist. If continuity exists, brush holder assembly is shorted and must be replaced.

2) Check brush length and spring tension. If brush length or spring tension is less than specification, replace brushes. See STARTER SPECIFICATIONS table. Ensure brushes move freely in holders.

FIELD WINDINGS TEST

1) Check continuity between brushes of field winding in armature housing. Ensure continuity exists. If continuity does not exist, replace field winding/armature housing assembly. SeeFig. 5.

2) Check continuity between each brush and armature housing (ground). Continuity should not exist. If continuity exists, replace field winding/armature housing assembly. SeeFig. 5.

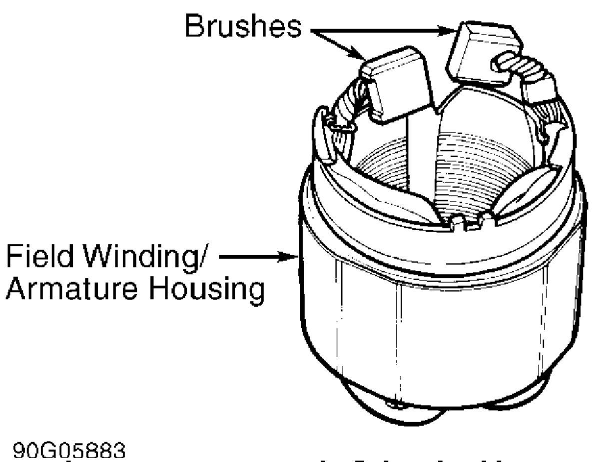

Fig. 5: Testing Starter Field Winding
Courtesy of American Honda Motor Co., Inc.

OVERRUNNING CLUTCH TEST

1) Rotate overrunning clutch on shaft. SeeFig. 6. If clutch does not lock when rotated in one direction and rotate smoothly in the other direction, replace overrunning clutch assembly.

2) Inspect starter drive gear for wear or damage. If gear is damaged, replace overrunning clutch assembly. Drive gear is not available separately.

NOTE: If starter drive gear teeth are damaged, check condition of flywheel or torque converter ring gear.

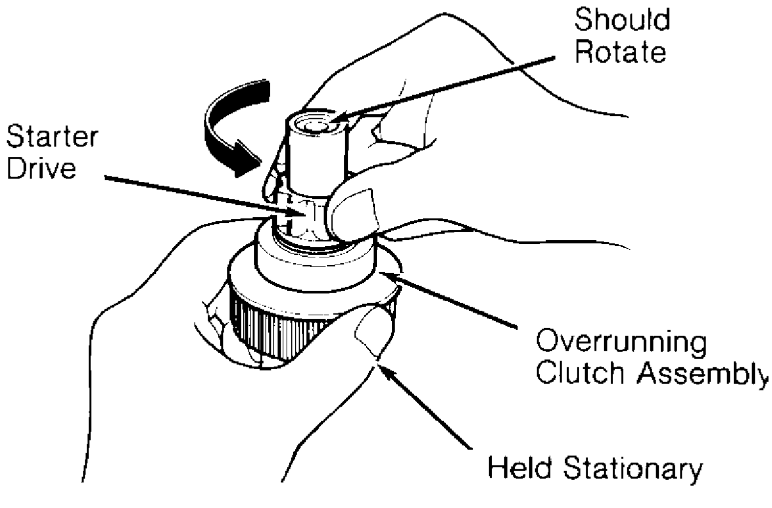

Fig. 6: Testing Overrunning Clutch
Courtesy of American Honda Motor Co., Inc.

OVERHAUL

NOTE: For starter overhaul, refer to exploded view of starter. See Fig. 7 or 8.

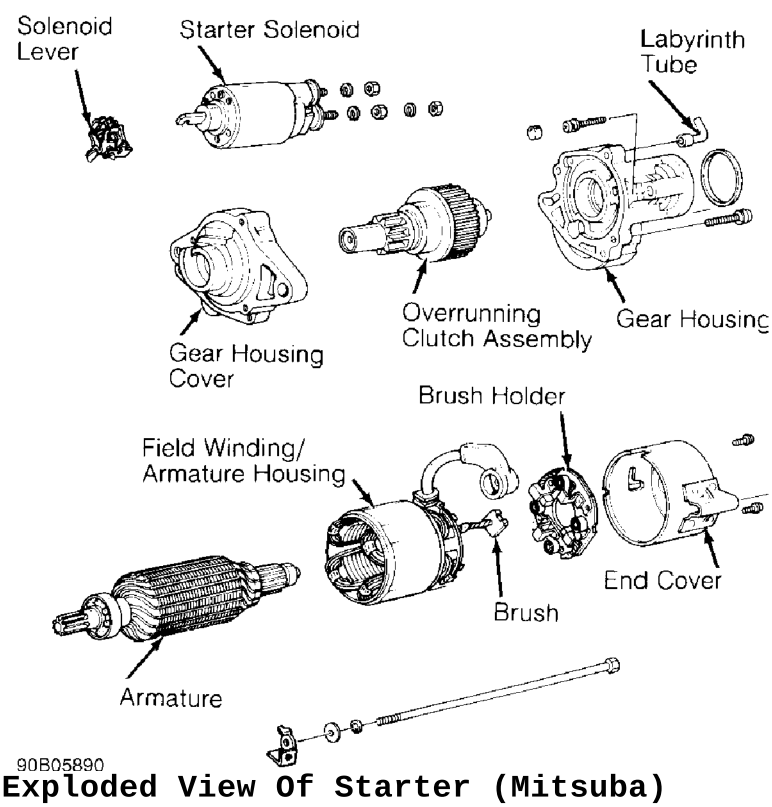

Fig. 7: Exploded View Of Starter (Mitsuba)
Courtesy of American Honda Motor Co., Inc.

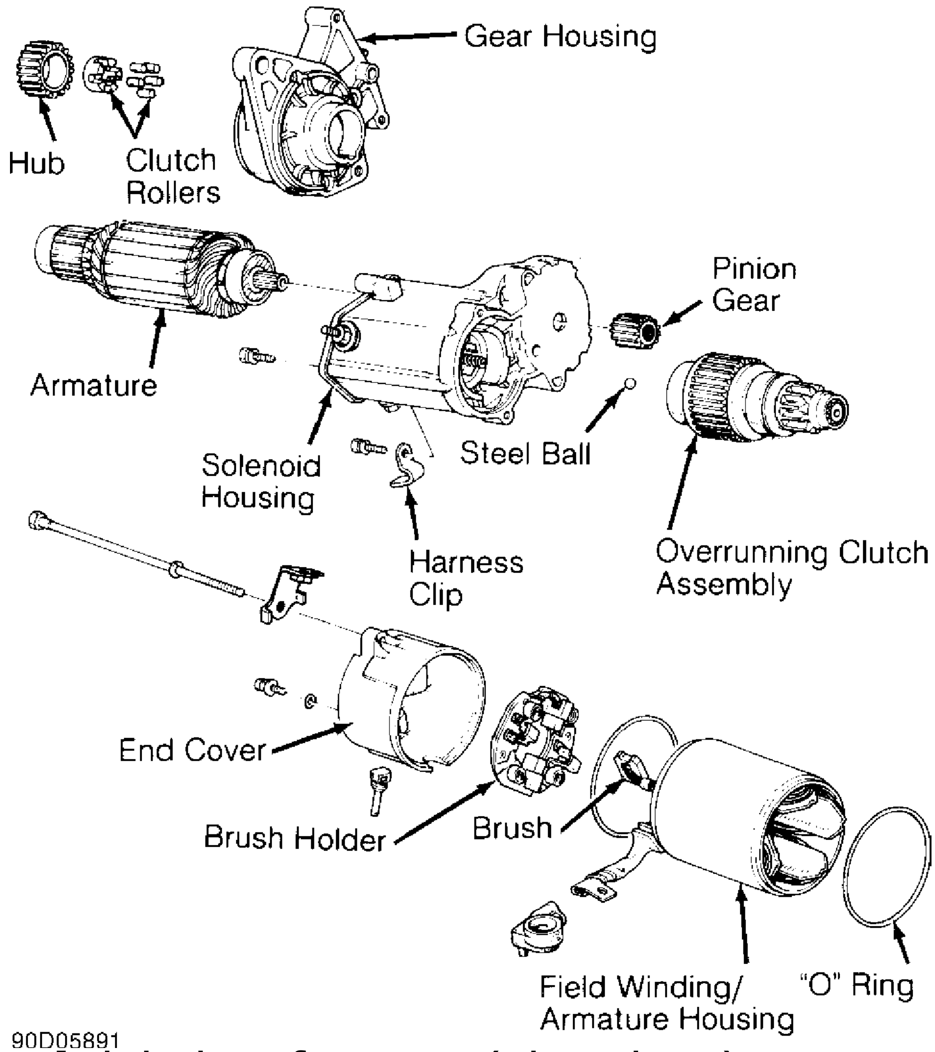

Fig. 8: Exploded View Of Starter (Nippondenso)
Courtesy of American Honda Motor Co., Inc.

STARTER SPECIFICATIONS

STARTER SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Specification
Brush Length (Minimum)	.39" (10.0 mm)
Brush Spring Tension	3.5-4.0 Lbs. (1.6-1.8 kg)
Commutator Diameter (Minimum)	
Mitsuba	1.08" (27.5 mm)
Nippondenso	1.14" (29.0 mm)
Commutator Mica Depth (Minimum)	
Mitsuba	.006" (.15 mm)
Nippondenso	.008" (.20 mm)
Commutator Runout (Maximum)	.002" (.05 mm)

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TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Ft. Lbs. (N.m)
Starter Mounting Bolts	33 (45)

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END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Steering Column Switches

Prelude

AIR BAG WARNING

WARNING: Before performing ANY tests or repairs on steering column switches, Supplemental Restraint System (SRS) MUST be disabled. See DISABLING & ACTIVATING AIR BAG SYSTEM. Accidental air bag deployment could cause serious bodily injury.

DISABLING & ACTIVATING AIR BAG SYSTEM

NOTE: Some models are equipped with stereo theft protection system. Technician should obtain 5-digit security code before disconnecting battery cable.

DISABLING AIR BAG

Disconnect both battery cables. Remove maintenance lid from bottom rear of steering wheel. Remove Red short connector, located on inside of maintenance lid. Disconnect connector between air bag and cable reel. Connect Red short connector to air bag side of connector. See Fig. 1.

ACTIVATING AIR BAG

1) To activate SRS, remove Red short connector from air bag side of connector and reconnect the connector between air bag and cable reel.
2) Return Red short connector to storage location on inside of maintenance lid. Install maintenance lid on back of steering wheel.
3) Reconnect battery cables. Check AIR BAG indicator light to ensure system is functioning properly.

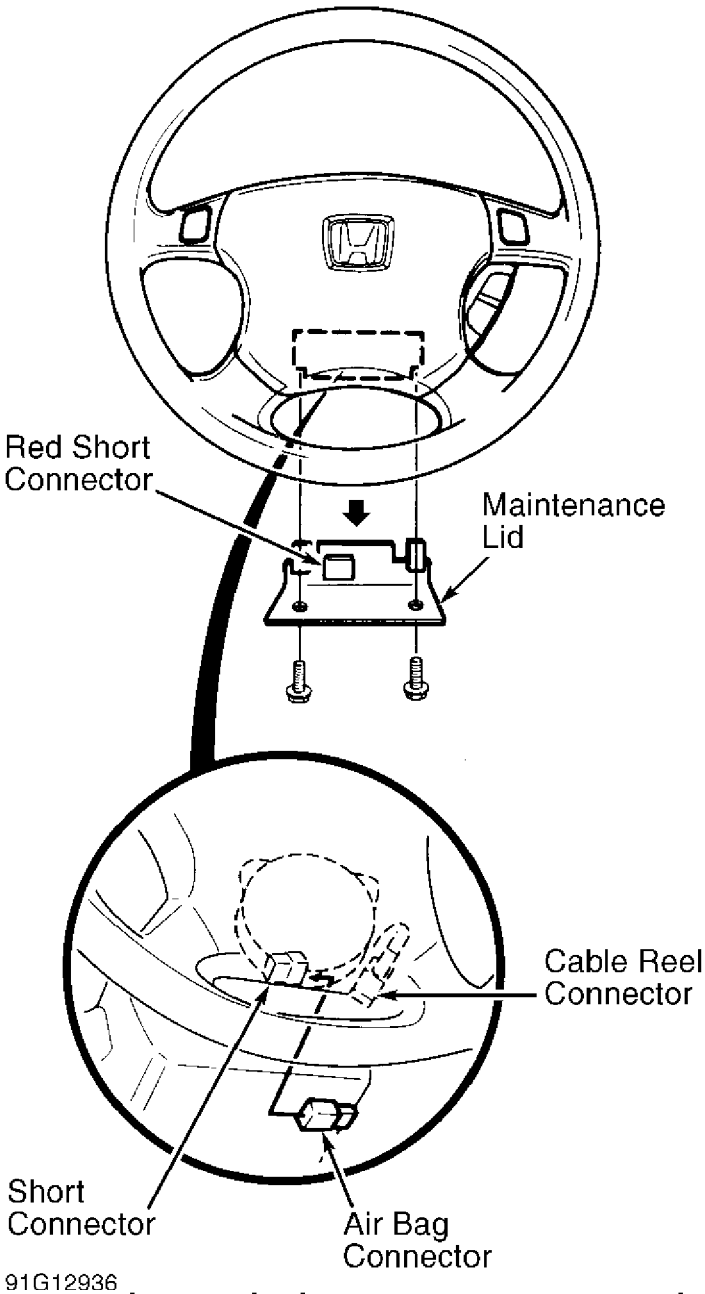

Fig. 1: Connecting Red Short Connector To Air Bag Connector
Courtesy of American Honda Motor Co., Inc.

TESTING

COMBINATION SWITCH

Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM. Remove instrument cluster lower trim panel. Disconnect combination switch 5-pin and 20-pin connectors. With combination switch in indicated positions, check continuity between specified

switch connector terminals. See Fig. 2.

HEADLIGHT SWITCH

Position			1	2	11	14	23
Headlight switch	OFF						
	•		O				O
	●	LOW	O				O
					O	O	
		HIGH	O				O
				O	O	O	
Passing switch (Headlight switch "OFF")	OFF						
	ON			O		O	
Passing switch (Headlight switch "●")	OFF						
	ON			O	O	O	

TURN SIGNAL SWITCH

Position	6		9	12
R	O	▸|		O
NEUTRAL				
L	O	▸|	O	

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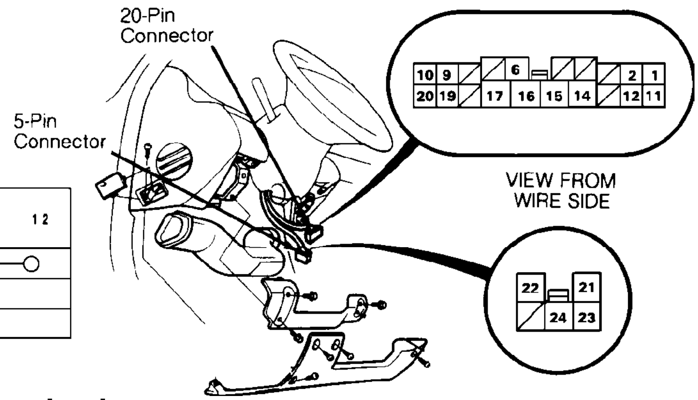

Fig. 2: Testing Headlight/Turn Signal Switch
Courtesy of American Honda Motor Co., Inc.

HAZARD WARNING SWITCH

Remove center console trim panel. Remove retaining screw from switch. Slowly rotate switch clockwise and remove from console. Disconnect 6-pin connector. With hazard switch in specified position, use an ohmmeter to check continuity between switch terminals. See Fig. 3. If continuity is not as specified, replace hazard warning switch.

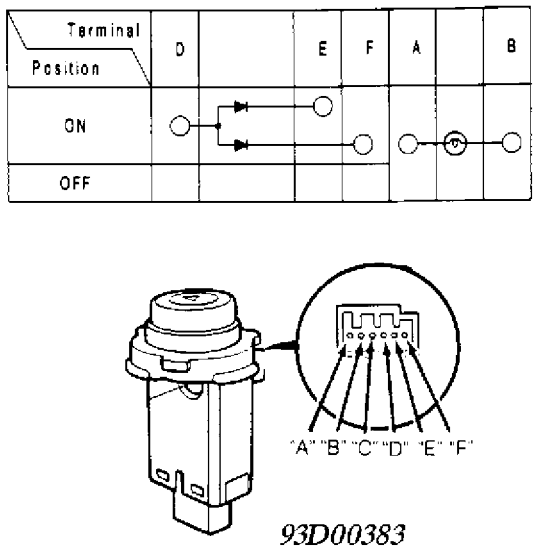

Fig. 3: Testing Hazard Warning Switch
Courtesy of American Honda Motor Co., Inc.

HORN SWITCH

1) Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM. Disconnect cable reel and main harness 6-pin connector. Connect SRS Test Harness "C" (07LAZ-SL40300) to cable reel side of 6-pin connector. Using an ohmmeter, check for continuity between test harness terminal No. 3 and ground with the horn switch depressed. Continuity should exist.

2) If continuity exists, switch is okay. If continuity does not exist, remove air bag assembly using T30 TORX screwdriver to remove retaining screws. Remove air bag assembly and place on workbench with pad surface facing up.

WARNING: Pad surface MUST face up. If air bag is stored face down, accidental deployment could propel assembly sufficiently to cause serious bodily injury.

3) With horn switch depressed, check for continuity between horn positive cable and steering column shaft. SeeFig. 4. Continuity should exist. If no continuity exists, replace horn switch.

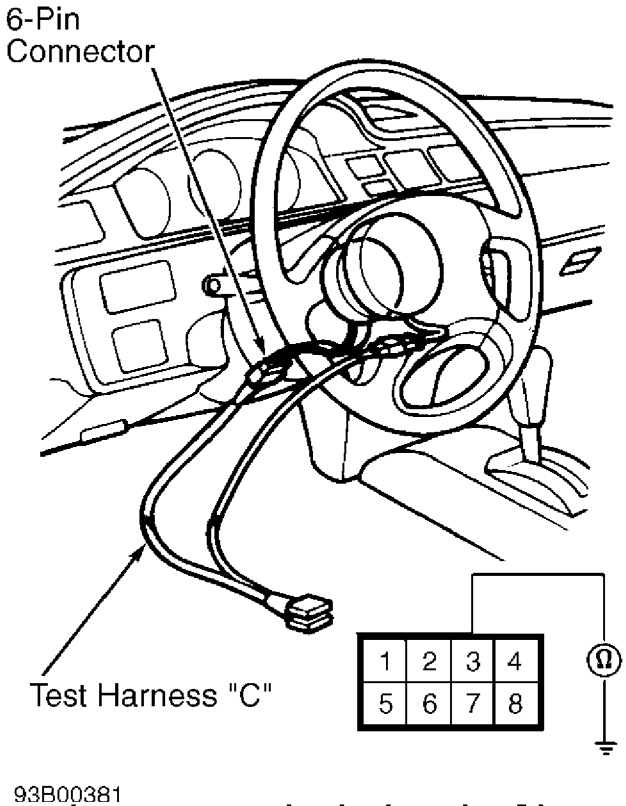

Fig. 4: Testing Horn Switch (Typical)
Courtesy of American Honda Motor Co., Inc.

IGNITION SWITCH

Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM. Disconnect 5-pin connector from dash fuse block. Disconnect 3-pin connector from main wiring harness. With ignition switch in indicated positions, check continuity between specified switch terminals. See Fig. 5.

IGNITION SWITCH CONTINUITY

Terminal / Position	WHT/BLK (ACC)	WHT (BAT)	BLK/YEL (IG1)	YEL (IG2)	BLK/WHT (ST)
0					
I	O	O			
II	O	O	O	O	
III		O	O		O

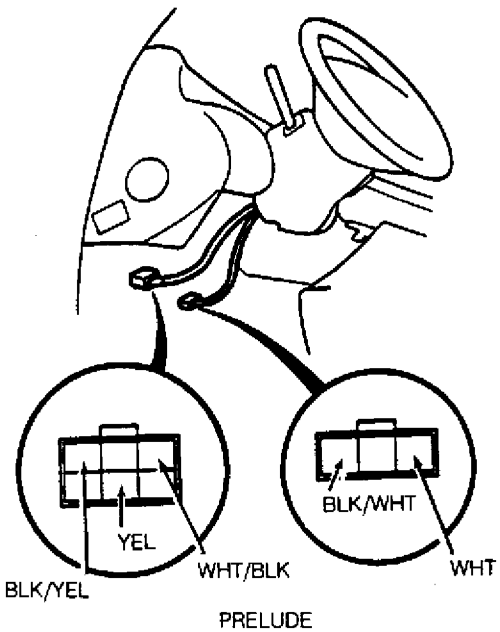

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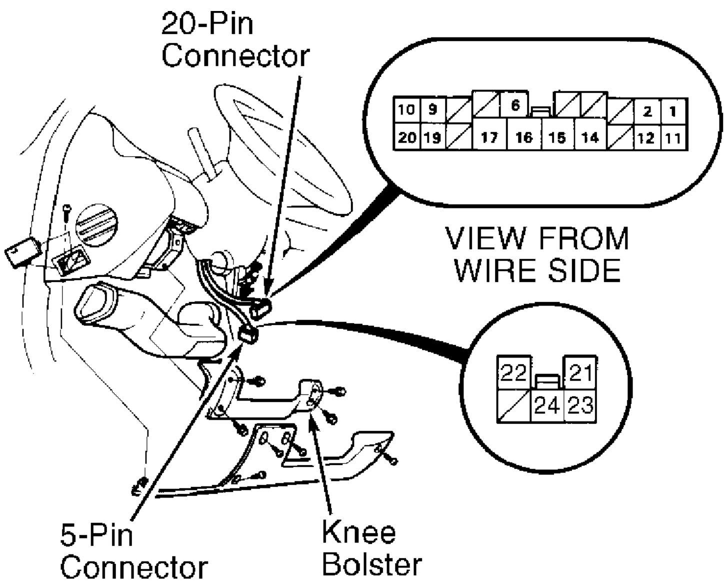
Fig. 5: Testing Ignition Switch
Courtesy of American Honda Motor Co., Inc.

WIPER SWITCH

Remove instrument cluster lower trim panel. Disconnect steering column 10-pin connector. Check continuity between specified switch connector terminals with wiper/washer switch in indicated positions. See Fig. 6. If continuity is not as specified, replace wiper/washer switch.



Position \ Terminal	14	15	16	17	21	22	24
OFF					O	—	O
INT		O	—	O	O	—	O
LO	O	—	—	—	O		
HI	O	—	—	—	—	O	
Mist switch "ON"	O	—	—	—	—	O	
Washer switch "ON"		O	O				

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Fig. 6: Testing Wiper/Washer Switch
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

STEERING WHEEL & HORN PAD

Removal & Installation

1) Disconnect negative battery cable. Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM. To remove air bag assembly, remove 2 Torx bolts using a T30 bit.

WARNING: Place air bag assembly on workbench. Pad surface MUST face up. If air bag is stored face down, accidental deployment could propel assembly sufficiently to cause serious bodily injury.

2) Remove steering wheel nut. See Fig. 7. Using a slight side-to-side motion, remove steering wheel assembly by pulling outward by hand. To install, reverse removal procedure.

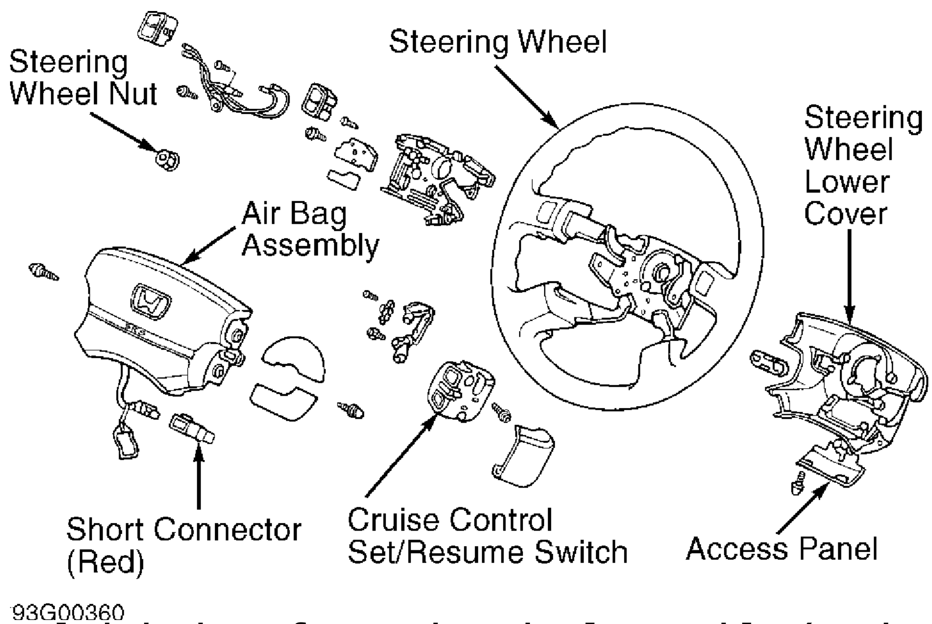

Fig. 7: Exploded View Of Steering Wheel Assembly (Typical)
Courtesy of American Honda Motor Co.

CAUTION: DO NOT install an air bag assembly that is dented, cracked or shows signs of having been dropped.

COMBINATION SWITCH

NOTE: Some models are equipped with stereo theft protection system. Technician should obtain 5-digit security code before disconnecting battery cable.

Removal & Installation

1) Before proceeding, disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM. Ensure front wheels are facing in straight-ahead position.

2) Cable reel is located under steering wheel, in upper steering column. See Fig. 8. Remove dashboard lower cover and knee bolster. Remove air duct. Disconnect cable reel connector from SRS main harness at base of steering column and remove connector holder.

3) Remove air bag assembly from steering wheel. See STEERING WHEEL & HORN PAD. Disconnect connectors from horn and cruise control switches. Remove steering wheel nut. Mark steering wheel-to-shaft position, and remove steering wheel. Remove upper and lower column covers. Disconnect combination switch connectors. Remove canceling sleeve, cable reel and combination switch. SeeFig. 9.

4) To install, reverse removal procedure. Before installing steering wheel, center cable reel by rotating it clockwise until it stops and then counterclockwise approximately 2 turns. Arrow mark should face up and Yellow gear tooth should be aligned with mark. See

Fig. 8.

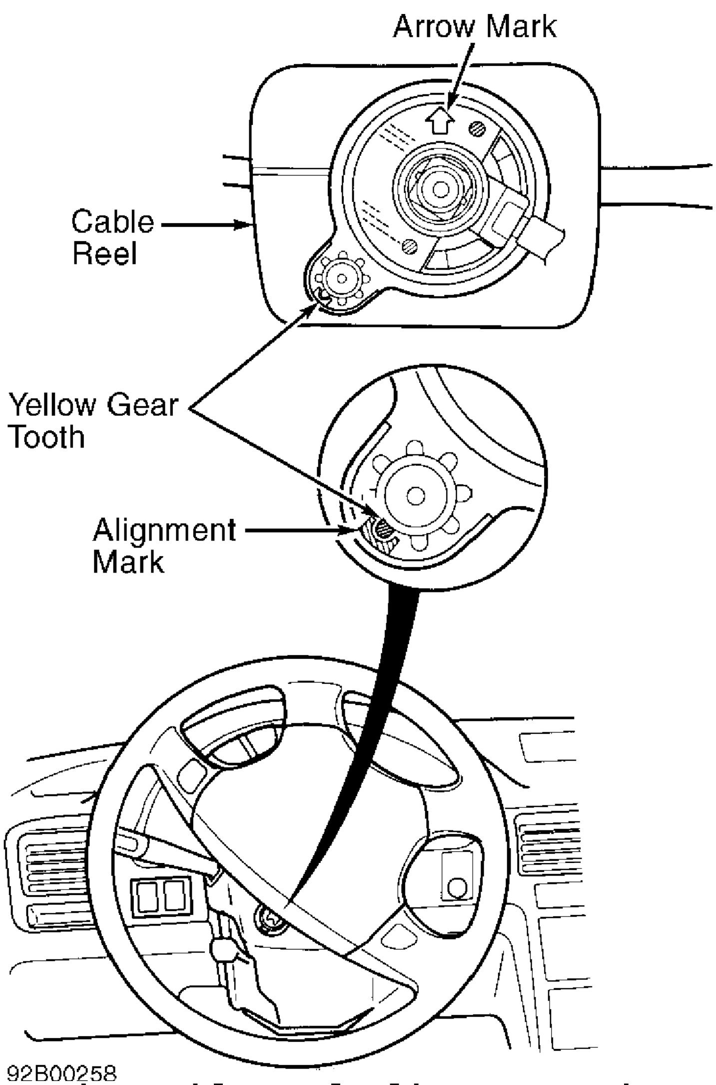

Fig. 8: Locating Cable Reel Alignment Marks
Courtesy of American Honda Motor Co., Inc.

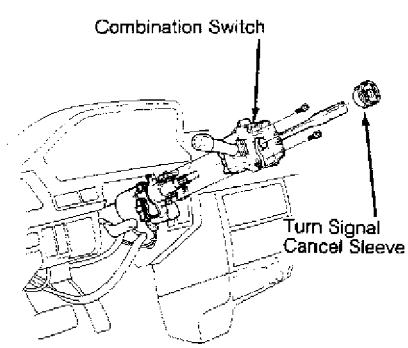

Fig. 9: Removing Turn Signal Cancel Sleeve & Combination Switch (Typical)
Courtesy of American Honda Motor Co.

IGNITION SWITCH (M/T)

Removal & Installation

1) Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM. Remove steering wheel. See STEERING WHEEL & HORN PAD. Remove steering column covers. Disconnect 5-pin connector from dash fuse box and 3-pin connector from main wire harness.

2) Insert ignition key and turn switch to "0" position. Remove 2 ignition switch mounting screws, and remove ignition switch. To install, reverse removal procedure.

STEERING LOCK ASSEMBLY (A/T)

Removal & Installation

1) Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM. Remove steering wheel. See STEERING WHEEL & HORN PAD. Remove instrument cluster lower trim panel. Remove left knee bolster and kick panel. Remove steering column covers.

2) Center punch 2 shear bolts holding lock assembly. Drill off heads of shear bolts, and remove shear bolts from lock assembly. Remove lock assembly. Install new lock assembly without key inserted. Loosely install new shear bolts. Ensure projection on ignition switch is aligned with hole in steering column.

3) Insert ignition key, and check for proper operation of steering wheel lock and freely turning ignition key. Tighten shear bolts until hex heads twist off. To complete installation, reverse removal procedure.

WIPER SWITCH

Removal & Installation

Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM. Remove dash lower trim cover and knee bolster. Remove steering column covers. Disconnect wiper/washer switch 8-pin connector. Remove 2 screws and wiper/washer switch. To install, reverse removal procedure.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

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Application	Ft. Lbs (N.m)
Steering Wheel Nut	37 (50)
	INCH Lbs. (N.m)

Air Bag Assembly Torx Bolts 89 (10)
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

END OF ARTICLE

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ARTICLE BEGINNING

1993 STEERING
Honda - Steering Column

Prelude

DESCRIPTION & OPERATION

A 2-piece safety steering column with a slip-joint flange connection is used. The steering column is supported by a column tube and a steering lock assembly. All models are equipped with standard driver's side air bag.

WARNING: Before performing ANY repairs on steering column or column components, Supplemental Restraint System (SRS) MUST be disabled. See DISABLING & ACTIVATING AIR BAG SYSTEM Accidental air bag deployment could cause serious bodily injury.

DISABLING & ACTIVATING AIR BAG SYSTEM

NOTE: Some models are equipped with stereo theft protection system. Technician should obtain 5-digit security code before disconnecting battery cable.

DISABLING AIR BAG

Disconnect both battery cables. Remove maintenance lid from bottom rear of steering wheel. Remove Red short connector, located on inside of maintenance lid. Disconnect connector between air bag and cable reel. Connect Red short connector to air bag side of connector. See Fig. 1.

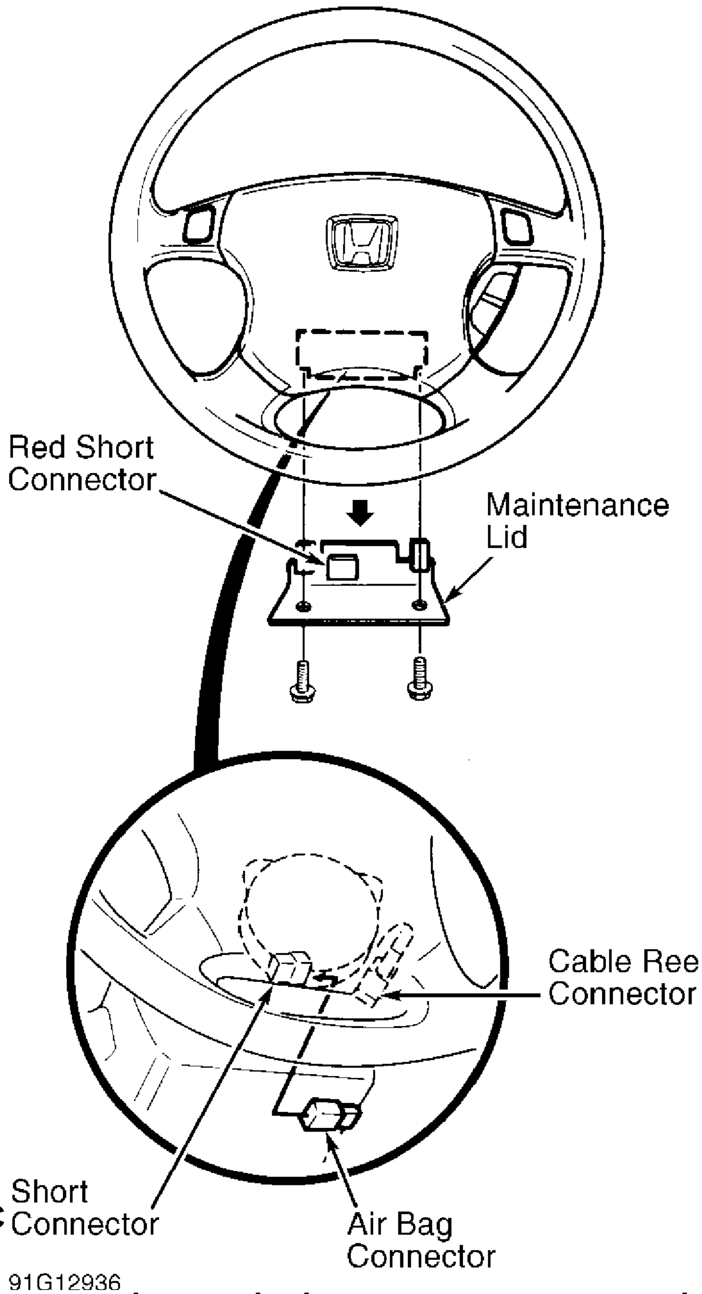

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Fig. 1: Connecting Red Short Connector To Air Bag Connector
Courtesy of American Honda Motor Co., Inc.

ACTIVATING AIR BAG

1) To activate SRS, remove Red short connector from air bag side of connector and reconnect the connector between air bag and cable reel.

2) Return Red short connector to storage location on inside of maintenance lid. Install maintenance lid on back of steering wheel.

3) Reconnect battery cables. Check AIR BAG indicator light to

ensure system is functioning properly.

REMOVAL & INSTALLATION

STEERING WHEEL & HORN PAD

Removal & Installation

1) Disconnect negative battery cable. Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM To remove air bag assembly, remove 2 Torx bolts using a T30 bit.

WARNING: Place air bag assembly on workbench. Pad surface MUST face up. If air bag is stored face down, accidental deployment could propel assembly sufficiently to cause serious bodily injury.

2) Remove steering wheel nut. SeeFig. 2. Using a slight side-to-side motion, remove steering wheel assembly by pulling outward by hand. To install, reverse removal procedure.

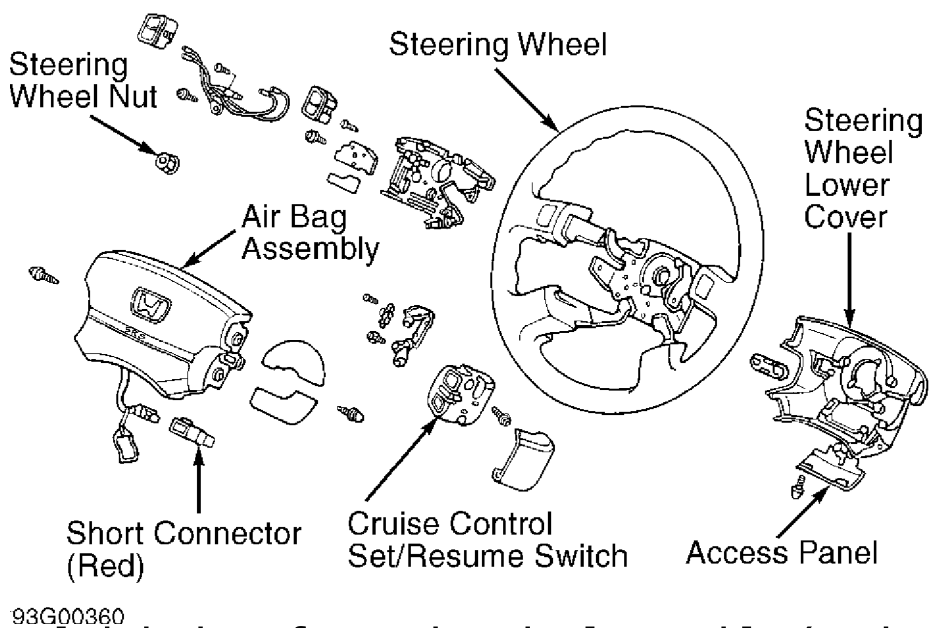

Fig. 2: Exploded View Of Steering Wheel Assembly (Typical)
Courtesy of American Honda Motor Co.

CAUTION: DO NOT install an air bag assembly that is dented, cracked or shows signs of having been dropped.

COMBINATION SWITCH

WARNING: Before performing ANY repairs on steering column or column components, Supplemental Restraint System (SRS) MUST be STEERI disabled. See DISABLING & ACTIVATING AIR BAG SYSTEM Accidental air bag deployment could cause serious bodily injury.

NOTE: Some models are equipped with stereo theft protection system. Technician should obtain 5-digit security code before disconnecting battery cable.

Removal & Installation

1) Before proceeding, disable SRS. See DISABLING & ACTIVATING AIR BAG SYSTEM Ensure front wheels are facing straight-ahead.

2) Cable reel is located under steering wheel, in upper steering column. See Fig. 3. Remove dashboard lower cover and knee bolster. Remove air duct. Disconnect cable reel connector from SRS main harness at base of steering column, then remove connector holder.

3) Remove air bag assembly from steering wheel. See STEERING WHEEL & HORN PAD. Disconnect connectors from horn and cruise control switches. Remove steering wheel nut. Mark steering wheel position to shaft and remove steering wheel. Remove upper and lower column covers. Disconnect combination switch connectors. Remove canceling sleeve, cable reel and combination switch. SeeFig. 4.

4) To install, reverse removal procedure. Before installing steering wheel, center cable reel by rotating it clockwise until it stops and then counterclockwise approximately 2 turns. Arrow mark should face up and Yellow gear tooth should be aligned with mark. See Fig. 3.

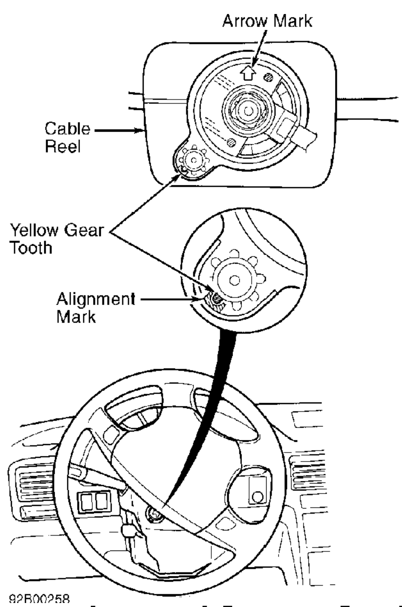

Fig. 3: Locating Cable Reel Alignment Marks (Typical)
Courtesy of American Honda Motor Co., Inc.

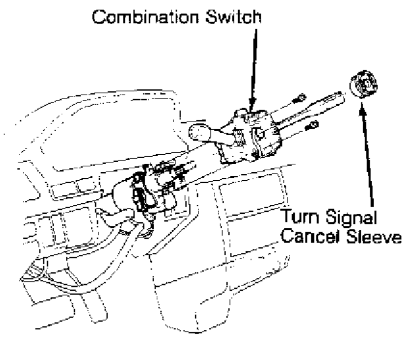

Fig. 4: Removing Turn Signal Cancel Sleeve & Combination Switch (Typical)
Courtesy of American Honda Motor Co.

TURN SIGNAL SWITCH

See COMBINATION SWITCH.

IGNITION SWITCH

WARNING: Before performing ANY repairs on steering column or column components, Supplemental Restraint System (SRS) MUST be disabled. See DISABLING & ACTIVATING AIR BAG SYSTEM Accidental air bag deployment could cause serious bodily injury.

Removal

Remove steering wheel and horn pad. See STEERING WHEEL & HORN PAD. Remove steering column covers. Disconnect ignition switch. Center punch 2 shear bolts and carefully drill heads off lock shear bolts. Remove bolts and switch.

Installation

1) Install ignition switch. Use NEW shear bolts and tighten loosely. Ensure pin on ignition switch is aligned with hole in steering column.

2) Insert key and check for proper operation of ignition switch. If switch operates properly, tighten shear bolts until heads break off. To complete installation, reverse removal procedure.

STEERING COLUMN

WARNING: Before performing ANY repairs on steering column or column components, Supplemental Restraint System (SRS) MUST be disabled. See DISABLING & ACTIVATING AIR BAG SYSTEM Accidental air bag deployment could cause serious bodily injury.

Removal

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1) Remove steering wheel and horn pad. See **STEERING WHEEL & HORN PAD**. Remove combination switch and set aside on vehicle floor. DO NOT disconnect combination switch connector. See **COMBINATION SWITCH**. If equipped with 4WS, remove main steering angle sensor over steering column. On all models, disconnect remaining wire connectors from left side fuse box, under dash.

2) Remove steering joint cover. Center tilt lock assembly. See Fig. 5. Remove steering joint bolts. Slide steering joint upward on column. Align steering joint upper bolt hole with groove around column. Loosely install upper bolt. See Fig. 6.

3) Loosen, but DO NOT REMOVE, column holder flange bolts. See Fig. 7. Remove upper and lower column covers. Remove holder flange bolts. Remove steering column assembly.

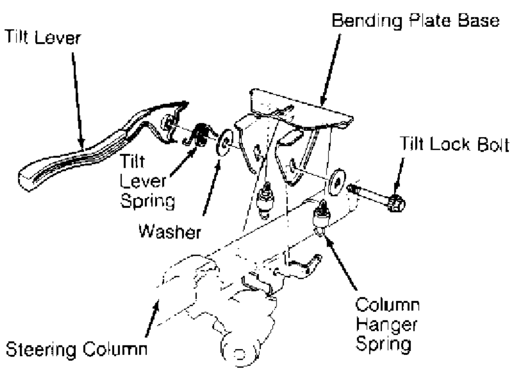

Fig. 5: Exploded View Of Tilt Lock Assembly (Typical)
Courtesy of American Honda Motor Co.

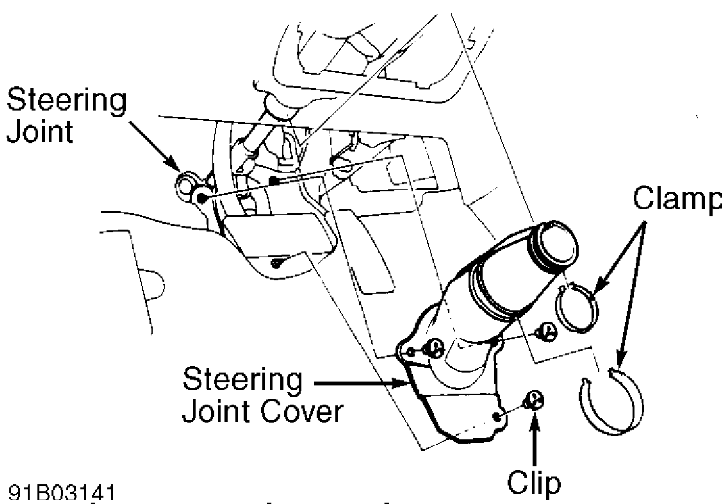

Fig. 6: Removing Steering Joint Cover
Courtesy of American Honda Motor Co.

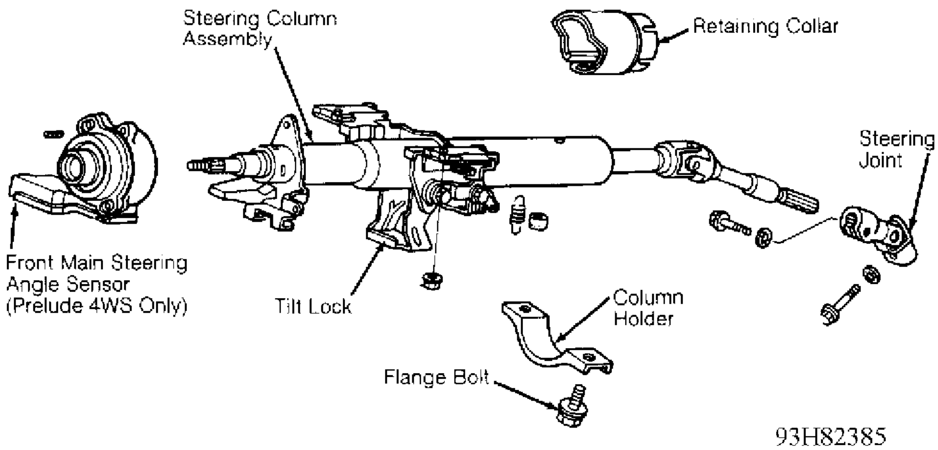

Fig. 7: Steering Column Assembly (Typical)
Courtesy of American Honda Motor Co.

Installation

1) Guide steering shaft through firewall. Align bolt hole in steering joint with slot in steering gear pinion shaft. Install steering joint on pinion shaft. Loosely install steering joint bolt. Install steering column and column holder flange bolts. Tighten bolts to specification. See TORQUE SPECIFICATIONS TABLE.

2) Connect ignition switch connector. Install steering joint cover. If equipped with 4WS, install main steering angle sensor over steering column. On all models, install combination switch, canceling sleeve and circlip. Install cable reel assembly, taking care to align slot in canceling sleeve with projection on cable reel.

3) Install SRS wire harness on underside of column bracket with clip. Install upper and lower column covers. Install air duct. Install driver's side knee bolster and dashboard lower cover. Install steering wheel and air bag assembly. See STEERING WHEEL & HORN PAD.

OVERHAUL

NOTE: Steering column overhaul is not recommended by manufacturer. If worn or damaged, replace steering column as an assembly.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Ft. Lbs. (N.m)
Lower Column Holder Flange Bolts	29 (39)
Lower Steering Joint Bolts	16 (22)
Steering Wheel Nut	37 (50)

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Tilt Lock Bolt	14 (20)

	INCH Lbs. (N.m)
Air Bag Assembly Torx Bolts	89 (10)
Tilt Lock Nut (Left-Hand Thread)	89 (10)
Tilt Lock Plate Bolt	89 (10)

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END OF ARTICLE

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ARTICLE BEGINNING

1993 STEERING
Honda - 4-Wheel Steering

Prelude

DESCRIPTION & OPERATION

The 4-Wheel Steering system consists of a rack and pinion steering gear at the front and a steering actuator at the rear. These units are linked electronically through the 4WS control unit. Steering information is supplied to the 4WS control unit by the front main steering angle sensor, front sub (secondary) steering angle sensor and the vehicle speed sensor. The control unit determines the best angle to steer the rear wheels. See Figs. 1 and 2.

The rear wheels are steered by the actuator motor which moves a rack connected to rear steering knuckles by tie rods. Rear wheel steering angle is determined by the rear main steering angle sensor and the rear secondary steering angle sensor. The control unit adjusts rear wheel steering angles according to differences of sensed steering angle and targeted steering angle.

Vehicle speed, determined by speed sensor mounted on transaxle, is supplied to 4WS control unit. At low speed, electronically controlled 4WS steers rear wheels in reverse direction of front wheels. At high speed, rear wheels are steered in same direction as front wheels.

4WS system incorporates a fail-safe function. In the event of system failure, integral spring centering and a damping mechanism will slowly center the rear wheels. Rear wheels remain centered until problem is corrected. See SELF-DIAGNOSTICS.

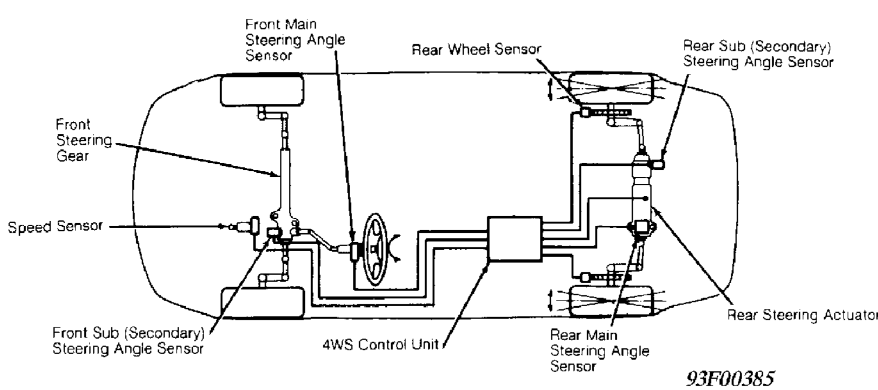

Fig. 1: Locating 4-Wheel Steering Components
Courtesy of American Honda Motor Co., Inc.

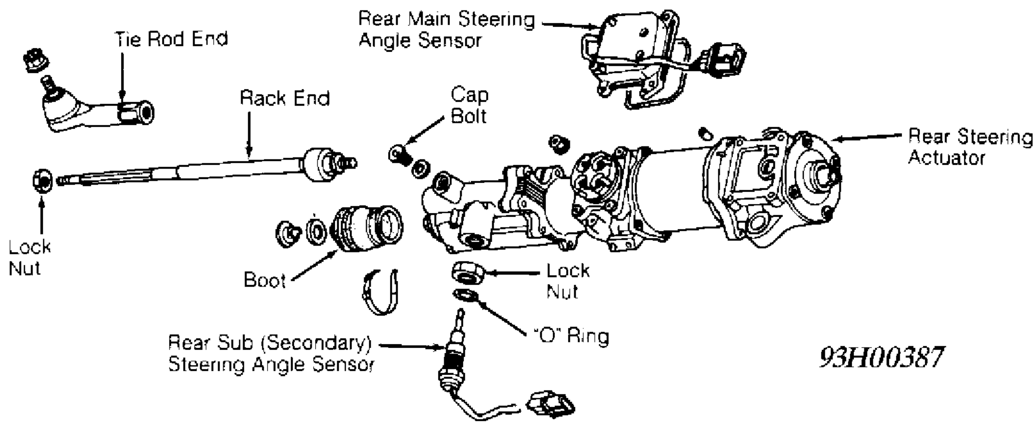

Fig. 2: Exploded View Of Rear Steering Actuator Assembly
Courtesy of American Honda Motor Co., Inc.

ADJUSTMENTS

CAUTION: All models are equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel, and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system. See AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

MAIN STEERING ANGLE SENSOR

NOTE: If power to 4WS control unit was shut down for battery replacement, 4WS control unit removal, or removal and/or replacement of No. 43 (10-amp) fuse from dash fuse box, 4WS control must be reset. To reset 4WS control unit, start engine and turn steering wheel to right lock then to left lock.

Front

1) Raise vehicle and place wheels on turning radius gauge turn tables. Position wheels in straight-ahead position. Check steering wheel position. If steering wheel spoke is NOT horizontal when wheels are in straight-ahead position, remove steering wheel. See STEERING WHEEL & HORN PAD under REMOVAL & INSTALLATION in STEERING COLUMN article in the STEERING section.

2) Check yellow paint mark on front main steering angle sensor. Mark should be pointed down. See Fig. 3. This indicates sensor is in neutral position. If mark is not as specified, loosely install

and turn steering wheel until yellow paint mark is pointed down. Install steering wheel with spoke as nearly horizontal as possible. Tighten steering wheel nut to specification. See TORQUE SPECIFICATIONS TABLE. Check front wheel alignment. Adjust alignment as necessary. See WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURES article in the WHEEL ALIGNMENT section.

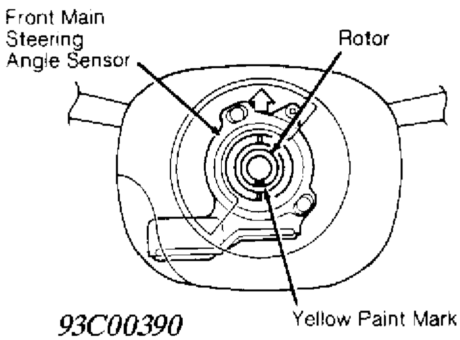

Fig. 3: Adjusting Front Main Steering Angle Sensor
Courtesy of American Honda Motor Co., Inc.

Rear

Rear main steering angle sensor is not adjustable. If test results are not within specification, remove sensor and inspect for wear or damage. If defective, replace sensor as a unit. See MAIN STEERING ANGLE SENSOR CHECK (REAR) under ANGLE SENSOR NEUTRAL TEST under TESTING.

SUB (SECONDARY) STEERING ANGLE SENSOR

Front

1) Ensure front main steering angle sensor is properly adjusted. See MAIN STEERING ANGLE SENSOR. Raise and support vehicle. Take 2-pin service connector (Blue wires) from behind center console. Connect terminals with jumper wire. See Fig. 4. 4WS indicator light will display problem codes. Record and verify problem codes before continuing with adjustments. See SELF-DIAGNOSTICS.

2) Turn ignition switch to ON position. Apply parking brake. Ensure parking brake light functions. Turn ignition switch to OFF position.

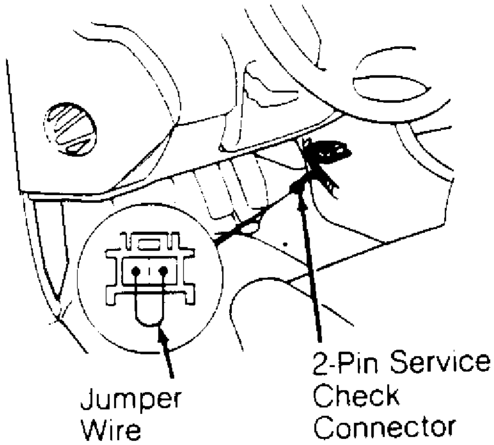

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Fig. 4: Locating Service Check Connector
Courtesy of American Honda Motor Co., Inc.

3) Secondary steering angle sensor is mounted on front steering gear. Remove cover from secondary steering angle sensor. Disconnect harness connector. Loosen sensor lock nut. Tighten lock nut by hand, then back it off about 3/4 turn. Connect harness connector. Turn ignition switch to ON position. Ensure steering wheel is in straight-ahead position. If main steering angle sensor is properly adjusted, 4WS indicator light will blink.

4) Slowly rotate secondary sensor clockwise to determine point where indicator light starts blinking and where it stops. See Fig. 5. Position secondary sensor in center of the range from where the indicator starts to blink to where it stops. Tighten secondary sensor lock nut to specification. See TORQUE SPECIFICATIONS TABLE. Ensure wire harness is not kinked. Install secondary sensor cover, and secure harness.

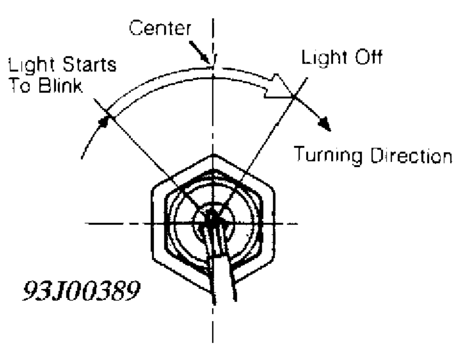

Fig. 5: Adjusting Sub (Secondary) Steering Angle Sensor
Courtesy of American Honda Motor Co., Inc.

Rear

1) Raise and support vehicle. Set steering wheel in straight-ahead position. Ensure front main steering angle sensor is properly adjusted. See **MAIN STEERING ANGLE SENSOR**.

2) Take 2-pin service connector (Blue wires) from behind center console. Connect terminals with jumper wire. See Fig. 4. 4WS indicator light will display problem codes. Record and verify problem codes before continuing with adjustments. See **SELF-DIAGNOSTICS**.

3) Release parking brake fully. Turn ignition switch to ON position. Ensure parking brake warning light is off. Turn ignition switch to OFF position.

CAUTION: DO NOT start engine with lock pin in actuator. Steering actuator will attempt to operate if wheel is turned while engine is running. Steering actuator damage will result. Set rear wheels in straight-ahead position to prevent damage if engine is started in error.

4) Remove rear actuator cover. Remove cap bolt and washer. Screw Locking Pin (07NAJ-SS00220A) into actuator as far as possible. Disconnect harness connector from rear secondary sensor. Loosen sensor lock nut. Tighten sensor fully by hand, then back it off about 1/2 turn. Connect harness connector.

5) Slowly rotate secondary angle sensor clockwise to determine point where indicator light starts blinking and where it stops. See Fig. 5. Position secondary angle sensor in center of the range from where the indicator starts to blink to where it stops. Tighten secondary angle sensor lock nut to specification. See **TORQUE SPECIFICATIONS TABLE**. Ensure wire harness is not kinked. Install secondary angle sensor cover and secure harness. Remove lock pin. Install cap bolt and washer. Remove jumper wire from service connector.

TESTING

ANGLE SENSOR NEUTRAL TEST

Preparation

1) Raise vehicle. Set each wheel in the center of turning radius gauge tables. Set wheels in straight-ahead position. Attach a piece of masking tape about 11.8" (300 mm) to top of steering wheel. Mark center line of steering wheel on tape. Add marks at appropriate measurement on both sides of center mark. See Fig. 6. Use heavy wire stock to make pointer. Attach pointer to dash aligned with center mark on steering wheel.

2) Take 2-pin service connector (Blue wires) from behind center console. Connect terminals with jumper wire. See Fig. 4. 4WS indicator light will display problem codes. Record and correct problem

codes before continuing with neutral check. SeeFigs. 7-10.

3) Apply parking brake and turn ignition switch to ON position. This will turn parking brake indicator light on and set front sensors in inspection mode.

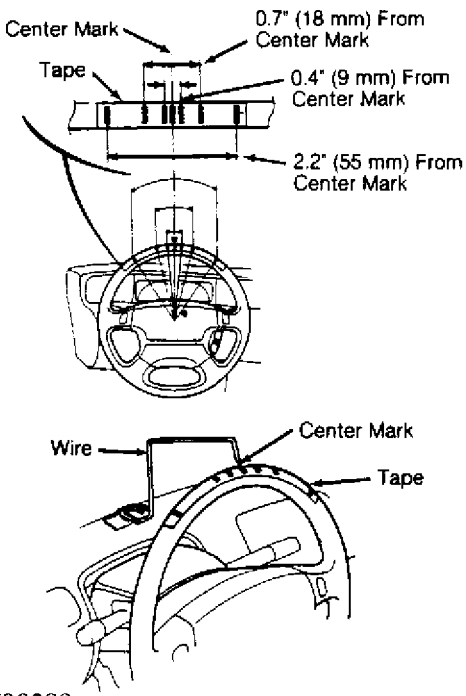

Fig. 6: Checking Steering Angle Sensor Centering
Courtesy of American Honda Motor Co., Inc.

Main Steering Angle Sensor Check (Front)

1) Turn ignition switch to ON position. Turn steering wheel slowly from center position to the left, then to the right past the center mark. Align center mark on steering wheel with pointer. Turn steering wheel slowly to the right, then to the left past the center mark. Repeat procedure several times until 4WS indicator light illumination point is positively identified. See STEERING ANGLE SENSOR TEST table.

NOTE: The 4WS indicator light may appear to blink near the point at which light comes on. To determine the point at which the indicator light is not blinking, the indicator light must remain on for more than 2 seconds.

2) The 4WS indicator light should come on within 0.4" (9 mm) on either side of center mark. If illumination point is not as specified, front main steering angle sensor must be adjusted. See MAINSTEERI

STEERING ANGLE SENSOR under **ADJUSTMENTS**.

Sub (Secondary) Steering Angle Sensor Check (Front)

1) Turn ignition switch to ON position (engine off). Turn steering wheel slowly from center position to the right, then to the left past the center mark. Align center mark on steering wheel with pointer. Turn steering wheel slowly to the left, then to the right past the center mark. Repeat procedure several times until center point of range where 4WS indicator light blinks is positively identified. See **STEERING ANGLE SENSOR TEST** table.

2) The 4WS indicator light should blink within 2.2" (55 mm) on either side of steering wheel center mark. If indicator light does not blink within the range specified, adjust front main steering angle sensor. See **MAIN STEERING ANGLE SENSOR** under **ADJUSTMENTS**. After adjustment, the center point should be within 0.7" (18 mm) on either side of steering wheel center mark.

Sub (Secondary) Steering Angle Sensor Check (Rear)

1) Release parking brake fully to set the rear sensors in inspection mode. Turn ignition switch to OFF position. Remove cap bolt and washer from rear steering actuator. Screw Lock Pin (07NAJ-SS0020A) into actuator as far as it will go.

CAUTION: DO NOT start engine with lock pin in actuator. Steering actuator will attempt to operate if wheel is turned while engine is running. Steering actuator damage will result. Set rear wheels in straight-ahead position to prevent damage if engine is started in error.

2) Turn ignition switch to ON position to check rear secondary steering angle sensor. Turn left rear wheel fully to the right by hand, then slowly turn wheel fully to the left. The 4WS indicator light should blink at intervals of 0.2 seconds when wheel is turned to the left. If indicator light does not blink, adjust rear secondary steering sensor. See **SUB (SECONDARY) STEERING ANGLE SENSOR** under **ADJUSTMENTS**.

Main Steering Angle Sensor Check (Rear)

1) Turn ignition switch to ON position to check rear main steering angle sensor. Turn left rear wheel fully to left by hand, then slowly turn wheel fully to the right. The 4WS indicator light should illuminate when wheel is turned to the right. If indicator light does not illuminate, remove rear main steering angle sensor and inspect for damage. If faulty, replace sensor.

NOTE: The 4WS indicator light may appear to blink near the point at which light comes on. To determine the point at which the indicator light is not blinking, the indicator light must remain on for more than 2 seconds.

2) Turn ignition to OFF position. Remove lock pin from rear steering actuator. Remove jumper wire from 2-pin service connector. Return service connector behind center console. Install any parts removed.

STEERING ANGLE SENSOR TEST TABLE

Sensor	Turn Wheels (Direction)	(1) 4WS Indicator Light Condition
Front Main	Front (To Right)	(2) On (Steady)
Front Secondary	Front (Left)	(3) Blinking
Rear Main	Rear (Left)	(4) Blinking
Rear Secondary	Rear (Right)	(4) Blinking

(1) - Ensure parking brake indicator light operates properly before testing steering angle sensors.
(2) - Pull up parking brake to set front sensors in inspection mode. The 4WS indicator light might appear to be blinking at a point near each end of the turning range.
(3) - The 4WS indicator light should blink at 0.2 second intervals. When light is indicating front main sensor position, the secondary steering angle sensor indicating condition is canceled.
(4) - Release parking brake to set rear sensors in inspection mode. Turn rear wheels slowly BY HAND with lock pin set in the rear actuator. Indicator light should blink at 0.2 second intervals.

SPEED SENSOR

See STEERING WHEEL TURNING FORCE under TESTING in STEERING SYSTEM - POWER article in the STEERING section.

REMOVAL & INSTALLATION

REAR STEERING ACTUATOR

Removal & Installation

1) Raise and support rear of vehicle. Using a Torx T-40 bit, remove cap bolt from actuator. See Fig. 2. Install Lock Pin (07NAJ-SS0020A) in actuator.

CAUTION: DO NOT start engine with lock pin in actuator. Steering actuator will attempt to operate if wheel is turned while engine is running. Steering actuator damage will result.

2) Remove cotter pin and nut from tie rod end. Using Tie Rod End Remover (07MAC-SL00200), separate tie rod end from knuckle.

3) Remove steering actuator cover. Disconnect connectors and terminals from actuator. Remove actuator mounting bolts. Remove steering actuator. To install, reverse removal procedure. Adjust rear sub steering angle sensor. See SUB (SECONDARY) STEERING ANGLE SENSOR under ADJUSTMENTS.

4WS CONTROL UNIT

Removal & Installation

Ensure ignition switch is in OFF position. Remove rear seat back. Disconnect harness connectors. Loosen terminal nuts and disconnect wires from control unit. Remove mounting screws. Remove control unit. To install, reverse removal procedure.

MAIN STEERING ANGLE SENSOR

WARNING: Before performing ANY repairs on steering column or column components, Supplemental Restraint System (SRS) MUST be disabled. See DISABLING & ACTIVATING AIR BAG SYSTEM in STEERING COLUMN article in the STEERING section. Accidental air bag deployment could cause serious bodily injury.

Removal & Installation (Front)

Remove steering wheel and combination switch. See STEERING COLUMN article in the STEERING section. Remove harness connector from front main steering angle sensor. Slide sensor off steering shaft. To install, reverse removal procedure.

Removal & Installation (Rear)

Disconnect harness connector. Loosen terminal nuts and disconnect wires from sensor. Remove sensor retaining screws. Remove sensor. Cover sensor port to prevent contamination. Inspect sensor for dirt or rust contamination. Clean as necessary. Coat NEW "O" ring with grease and install in sensor groove. To complete installation, reverse removal procedure.

SUB (SECONDARY) STEERING ANGLE SENSOR

Removal & Installation

Disconnect harness connector. Remove sensor cover screws and sensor cover. Loosen secondary sensor lock nut. Remove sensor and lock nut. To install, grease NEW "O" ring and install in sensor port. Screw

lock nut on secondary sensor. Screw secondary sensor into sensor port. Adjust sensor as necessary. See SUB (SECONDARY) STEERING ANGLE SENSOR under ADJUSTMENTS.

SPEED SENSOR

Removal

Remove speed sensor mounting bracket stay. Unplug harness connector. Remove speed sensor mounting bolt, and pull speed sensor from transmission housing. Disconnect and plug speed sensor hoses and plug fittings.

Installation

To install, reverse removal procedure. After installing sensor, turn steering wheel from lock to lock several times with engine idling to bleed air from system. Check for leaks.

OVERHAUL

REAR STEERING ACTUATOR

NOTE: Overhaul procedure not available from manufacturer.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Actuator Rack End-To-Rack	41 (55)
Rear Steering Actuator Bracket Bolts	29 (39)
Rear Steering Actuator Cap Bolt	16 (22)
Rear Steering Actuator Mounting Bolts	32 (44)
Steering Angle Sub (Secondary) Sensor Lock Nut	18 (25)
Steering Wheel Nut	37 (50)
Tie Rod End Nuts	37-44 (50-60)
Tie Rod End Lock Nut	33 (45)
	INCH Lbs. (N.m)
Rear Main Angle Sensor Bolts	89 (10)
4WS Control Unit Wire Terminal Nuts	71 (8)

SELF-DIAGNOSTICS

NOTE: Fail-safe function will activate when failure is detected in 4WS system. Rear wheels will be slowly centered, and will remain centered until problem(s) is corrected and codes are cleared.

RETRIEVING PROBLEM CODES

NOTE: The 4WS control unit may store 10 codes each in its main and secondary CPUs. Codes from the main CPU will be displayed first, followed by a 1.6 second pause and 3 seconds of rapid blinking. The codes stored in the secondary CPU will then be displayed. The cycle will repeat until ignition is turned off.

The 4WS indicator light will illuminate whenever a fault is sensed in system. Problem codes are stored in 4WS control unit even if condition is temporary. To retrieve problem codes, pull 2-pin service connector (Blue wires) from behind center console. Connect terminals with jumper wire. See Fig. 4. 4WS indicator light will display problem codes. Record codes and address them in numerical order. The 4WS indicator light will NOT come on when Code 71, 72 or 73 is set. Indicator light will flash these codes, if stored, when code retrieval function is activated. See Figs. 7-10.

CLEARING PROBLEM CODES

Problem codes may be cleared from system memory by removing clock/radio fuse No. 43 (10-amp), disconnecting 4WS control unit harness connector or by disconnecting battery.

STEERING S

PROBLEM CODE	FAIL-SAFE (F/S) ITEM			AFFECTED														ACTION
	SYSTEM	POINT	4WS CONTROL UNIT TERMINAL NUMBER	FRONT SUB STEERING ANGLE SENSOR	REAR SUB STEERING ANGLE SENSOR	FRONT MAIN STEERING ANGLE SENSOR	REAR MAIN STEERING ANGLE SENSOR	FRONT WHEEL SPEED SENSOR	*REAR LEFT WHEEL SPEED SENSOR	*REAR RIGHT WHEEL SPEED SENSOR	ABS CONTROL UNIT	4WS CONTROL UNIT	REAR ACTUATOR MOTOR	POWER SYSTEM HARNESS	ALTERNATOR	PARKING BRAKE	HARNESS CONNECTOR	
No code	–	—	7 + 23									○					○	1
No code	–	—	18 25 4 2 16 + 24									○			○		○	1
10	SUB STEERING ANGLE SENSOR	FRONT	22 26	○								○					○	1
11	SUB STEERING ANGLE SENSOR	REAR	29 17		○							○					○	1
12	SUB STEERING ANGLE SENSOR	FRONT	26 21	○								○					○	1
13	SUB STEERING ANGLE SENSOR	REAR	17 28		○							○					○	1
14	SUB STEERING ANGLE SENSOR	FRONT	—									○						Replace 4WS control unit
15	SUB STEERING ANGLE SENSOR	REAR	—									○						Replace 4WS control unit
16	SUB STEERING ANGLE SENSOR	FRONT	22 26 21	○								○					○	1
17	SUB STEERING ANGLE SENSOR	REAR	29 17 28		○							○					○	1
18	—	—	—									○						Replace 4WS control unit

1 - Go to SELF-DIAGNOSTIC FLOW CHARTS.

93D01874

Fig. 7: Identifying 4WS Problem Codes (1 Of 4)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE	FAIL-SAFE (F/S) ITEM			AFFECTED															ACTION
	SYSTEM	POINT	4WS CONTROL UNIT TERMINAL NUMBER	FRONT SUB STEERING ANGLE SENSOR	REAR SUB STEERING ANGLE SENSOR	FRONT MAIN STEERING ANGLE SENSOR	REAR MAIN STEERING ANGLE SENSOR	FRONT WHEEL SPEED SENSOR	*REAR LEFT WHEEL SPEED SENSOR	*REAR RIGHT WHEEL SPEED SENSOR	ABS CONTROL UNIT	4WS CONTROL UNIT	REAR ACTUATOR MOTOR	POWER SYSTEM HARNESS	ALTERNATOR	PARKING BRAKE	HARNESS CONNECTOR	
20	MAIN STEERING ANGLE SENSOR	FRONT	8 15	O		O						O					O	[1]
21		REAR	6 13		O		O					O					O	[1]
22		FRONT	8 15	O		O						O					O	[1]
23		REAR	6 13		O		O					O					O	[1]
24		FRONT	8 15	O		O						O					O	[1]
25		REAR	6 13		O		O					O					O	[1]
26		FRONT	—									O						Replace 4WS control unit
27		REAR	—									O						Replace 4WS control unit
28		FRONT	12	O		O						O					O	[1]
29		REAR	20		O		O					O					O	[1]
30	WHEEL SPEED	FRONT	19					O				O					O	[1]
31		REAR L	3						O		O	O					O	[1]
32		REAR R	1							O	O	O					O	[1]

[1] - Go to SELF-DIAGNOSTIC FLOW CHARTS.

93G01875

Fig. 8: Identifying 4WS Problem Codes (2 Of 4)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE	FAIL-SAFE (F/S) ITEM			AFFECTED														ACTION
	SYSTEM	POINT	4WS CONTROL UNIT TERMINAL NUMBER	FRONT SUB STEERING ANGLE SENSOR	REAR SUB STEERING ANGLE SENSOR	FRONT MAIN STEERING ANGLE SENSOR	REAR MAIN STEERING ANGLE SENSOR	FRONT WHEEL SPEED SENSOR	*REAR LEFT WHEEL SPEED SENSOR	*REAR RIGHT WHEEL SPEED SENSOR	ABS CONTROL UNIT	4WS CONTROL UNIT	REAR ACTUATOR MOTOR	POWER SYSTEM HARNESS	ALTERNATOR	PARKING BRAKE	HARNESS CONNECTOR	
33	WHEEL SPEED	REAR R/L	3 1								O	O					O	[1]
34	WHEEL SPEED	FRONT	19					O				O					O	[1]
35	WHEEL SPEED	REAR L	3						O		O	O						[1]
36	WHEEL SPEED	REAR R	1							O	O	O					O	[1]
37	WHEEL SPEED	REAR L	—									O						Replace 4WS control unit
38	WHEEL SPEED	VEHICLE SPEED	—									O						Replace 4WS control unit
40	4WS CONTORL UNIT	4WS CONTROL UNIT	—									O						Replace 4WS control unit
41	4WS CONTORL UNIT	4WS CONTROL UNIT	—									O						Replace 4WS control unit
42	4WS CONTORL UNIT	4WS CONTROL UNIT	—									O						Replace 4WS control unit
43	4WS CONTORL UNIT	4WS CONTROL UNIT	—									O						Replace 4WS control unit
44	4WS CONTORL UNIT	4WS CONTROL UNIT	—									O						Replace 4WS control unit
45	4WS CONTORL UNIT	4WS CONTROL UNIT	—									O						Replace 4WS control unit
46	4WS CONTORL UNIT	4WS CONTROL UNIT	—									O						Replace 4WS control unit
50	CONTROL LOGIC	Motor lock	C + D −									O	O				O	[1]
51	CONTROL LOGIC	Wheel caught in ditch; Motor malfunction	C + D −									O	O				O	[1]

[1] - Go to SELF-DIAGNOSTIC FLOW CHARTS.

93I01876

Fig. 9: Identifying 4WS Problem Codes (3 Of 4)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE	FAIL-SAFE (F/S) ITEM			AFFECTED														ACTION
	SYSTEM	POINT	4WS CONTROL UNIT TERMINAL NUMBER	FRONT SUB STEERING ANGLE SENSOR	REAR SUB STEERING ANGLE SENSOR	FRONT MAIN STEERING ANGLE SENSOR	REAR MAIN STEERING ANGLE SENSOR	FRONT WHEEL SPEED SENSOR	*REAR LEFT WHEEL SPEED SENSOR	*REAR RIGHT WHEEL SPEED SENSOR	ABS CONTROL UNIT	4WS CONTROL UNIT	REAR ACTUATOR MOTOR	POWER SYSTEM HARNESS	ALTERNATOR	PARKING BRAKE	HARNESS CONNECTOR	
60	POWER UNIT	MOTOR	C+·D- 33+·34-									O	O	O			O	1
61			C+·D-									O	O	O			O	1
62		Motor	33+·34-									O	O	O			O	1
63												O	O	O			O	1
64		4WS CONTROL UNIT	—									O						Replace 4WS control unit
65		4WS CONTROL UNIT	—									O						Replace 4WS control unit
70	TEMPORARY DRIVING CONDITIONS	—	25									O					O	Ask customer for symptoms, conditions
71		—	—									O						Ask customer for symptoms, conditions
72		—	4									O					O	Ask customer for symptoms, conditions
73		—										O			O			Ask customer for symptoms, conditions
74		—	14									O				O	O	Ask customer for symptoms, conditions

1 - Go to SELF-DIAGNOSTIC FLOW CHARTS.

93A01877

Fig. 10: Identifying 4WS Problem Codes (4 Of 4)
Courtesy of American Honda Motor Co., Inc.

SELF-DIAGNOSTIC FLOW CHARTS

4WS INDICATOR LIGHT CIRCUIT

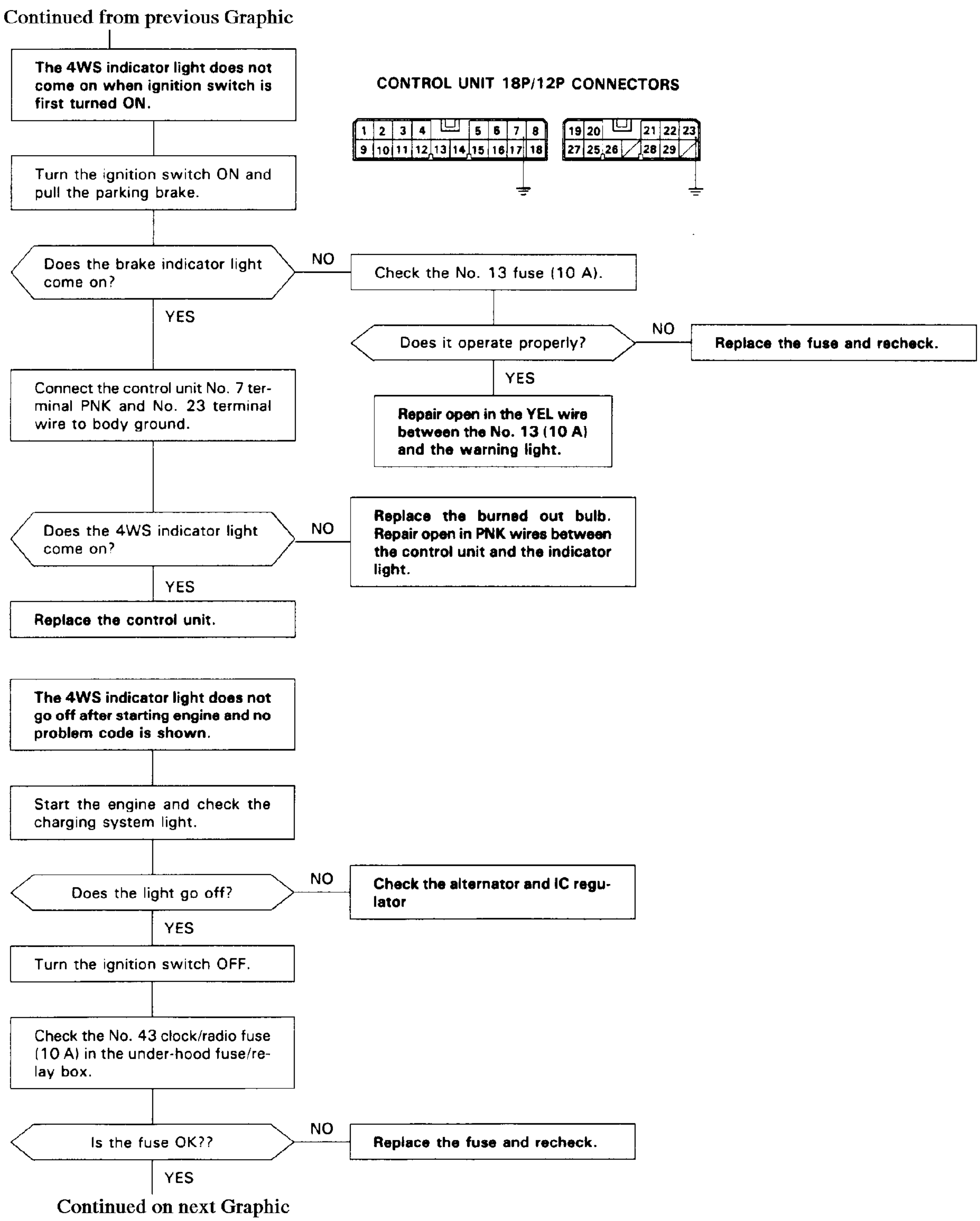

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Fig. 11: 4WS Indicator Light Circuit (1 Of 3)

Courtesy of American Honda Motor Co., Inc.

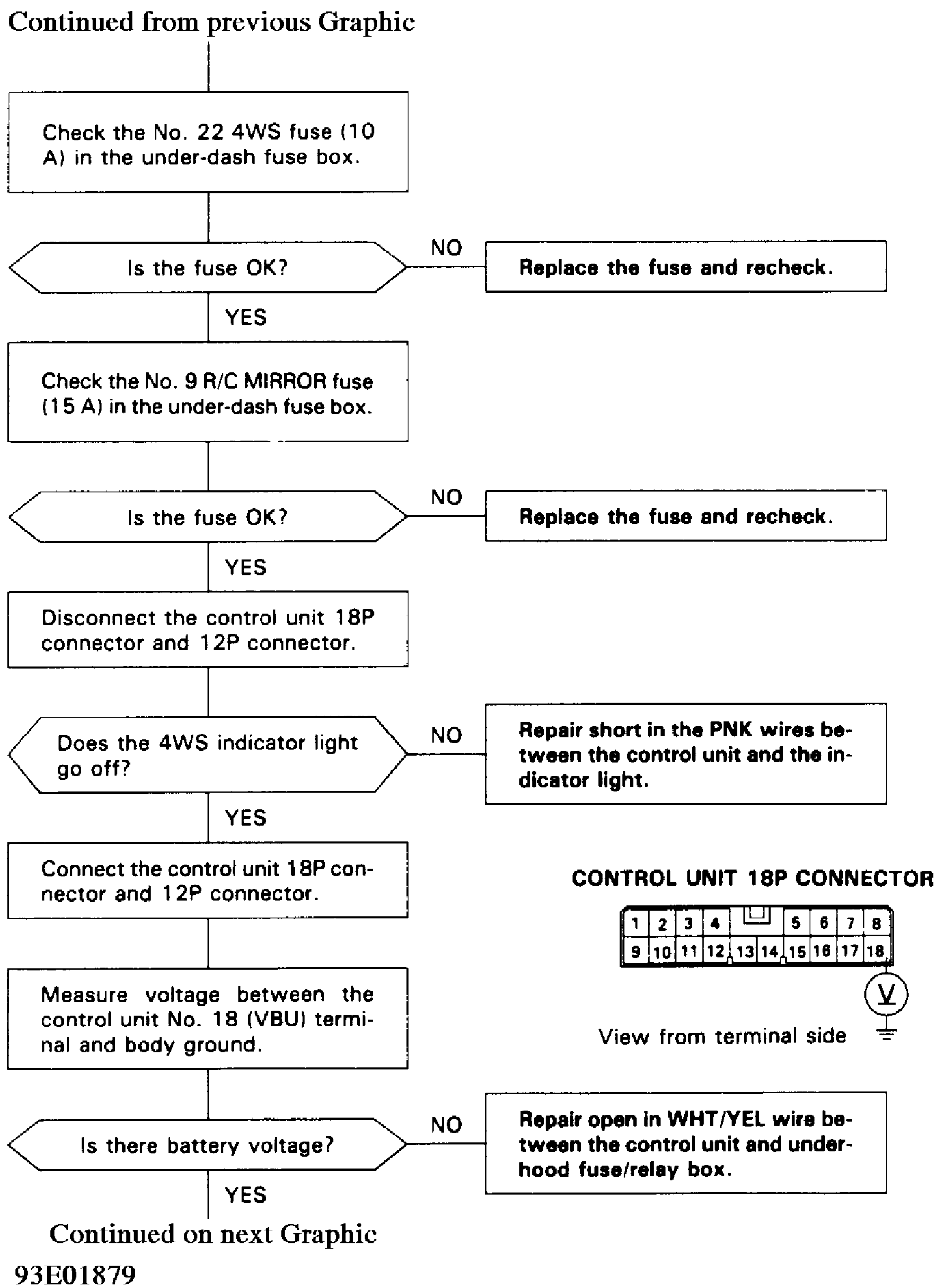

Fig. 12: 4WS Indicator Light Circuit (2 Of 3)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic

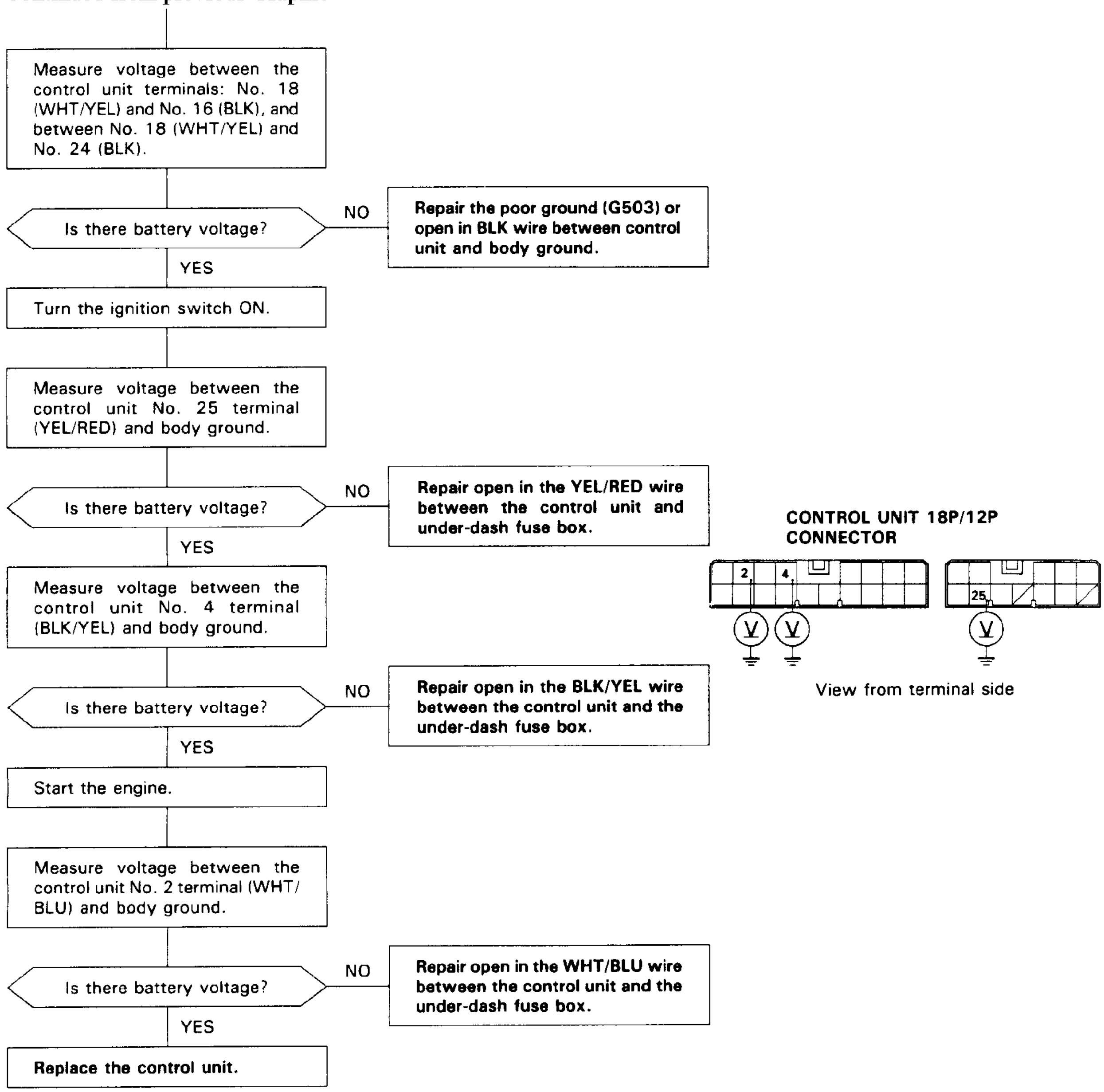

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Fig. 13: 4WS Indicator Light Circuit (3 Of 3)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 10, 12, 16

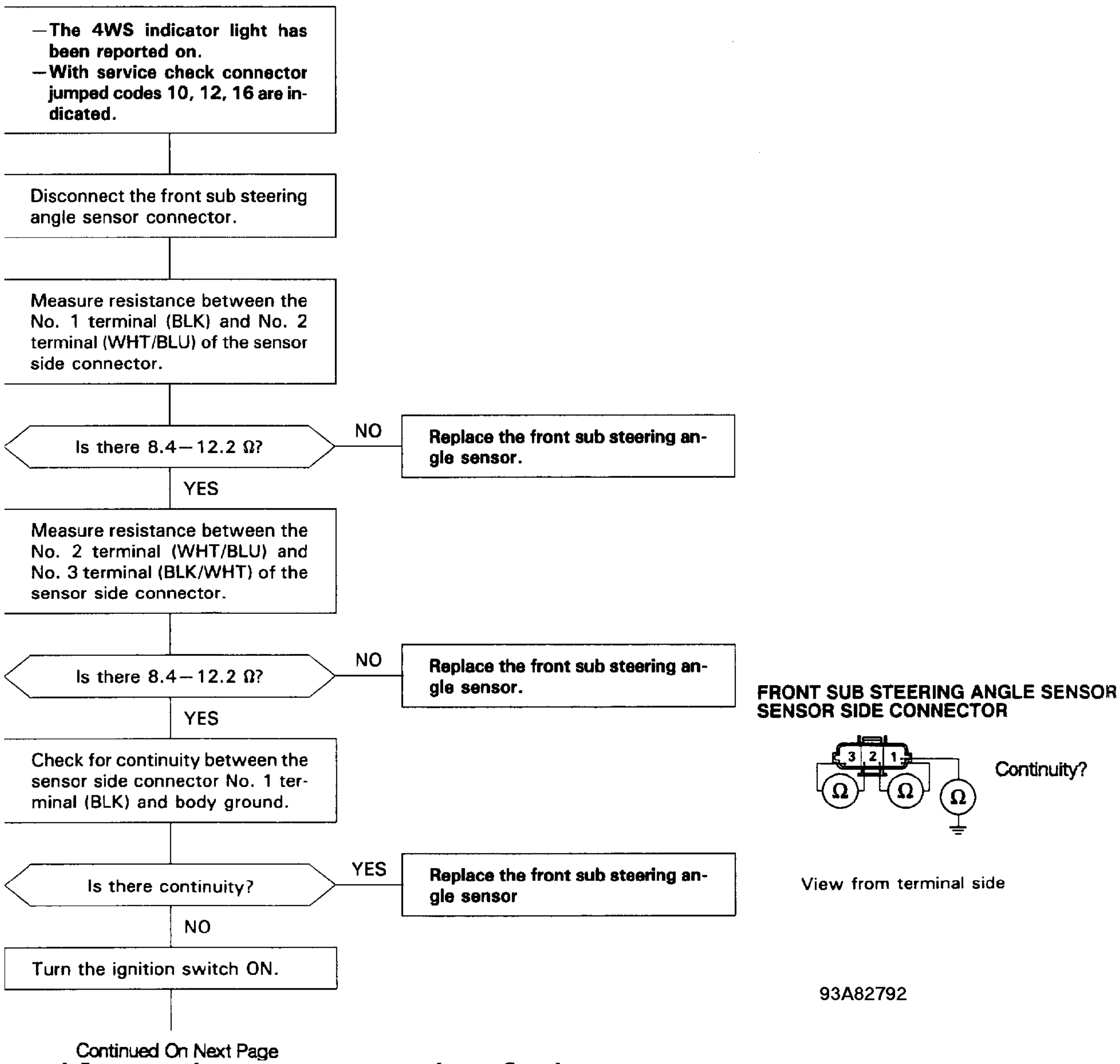
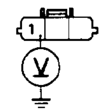


Fig. 14: Problem Code 10, 12, 16 (1 Of 5)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic

Measure the voltage between the control unit side of the sensor connector YEL/BLK wire and body ground.

FRONT SUB STEERING ANGLE SENSOR CONTROL UNIT SIDE CONNECTOR



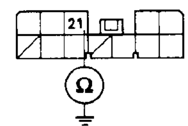
View from terminal side.

Is there approximately 2.5 V?

YES → Continued on next Graphic

NO → Disconnect the control unit 12P connector.

CONTROL UNIT 12P SENSOR SIDE CONNECTOR



View from terminal side.

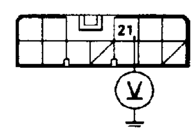
Check for continuity between the control unit No. 21 terminal (YEL/BLK) and body ground.

Is there continuity?

YES → **Repair short in the YEL/BLK wire between the control unit and the front sub steering angle sensor.**

NO → Connect the control unit 12P connector.

CONTROL UNIT 12P CONNECTOR



View from terminal side.

Measure voltage between the No. 21 terminal (YEL/BLK) of the control unit and body ground.

Is there approximately 2.5 V?

NO → **Replace the control unit.**

YES → **Repair open in the YEL/BLK wire between the control unit and the front sub steering angle sensor.**

Continued on next Graphic

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Fig. 15: Problem Code 10, 12, 16 (2 Of 5)
Courtesy of American Honda Motor Co., Inc.

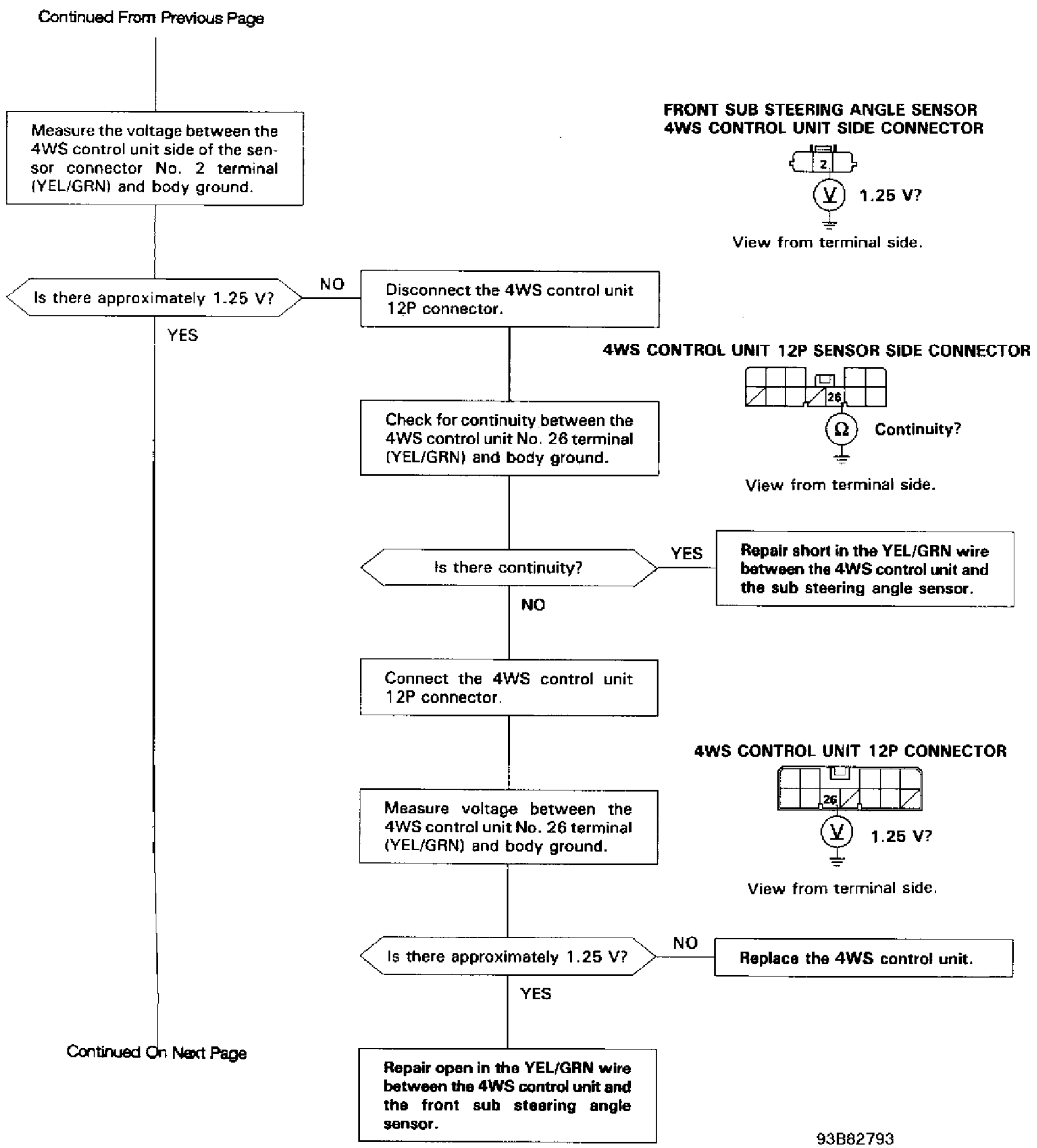


Fig. 16: Problem Code 10, 12, 16 (p. 3 of 5)
Courtesy of American Honda Motor Co., Inc.

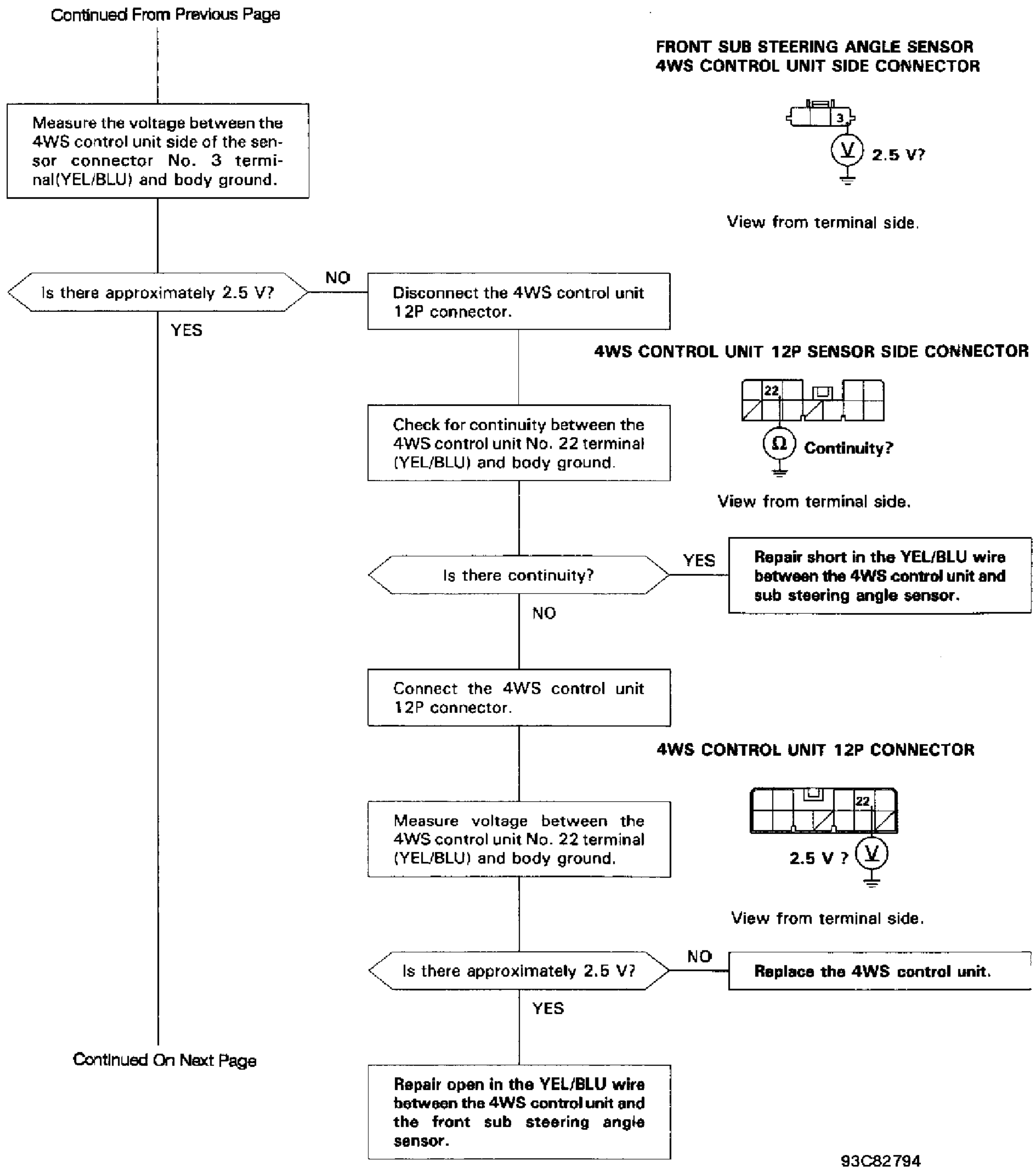
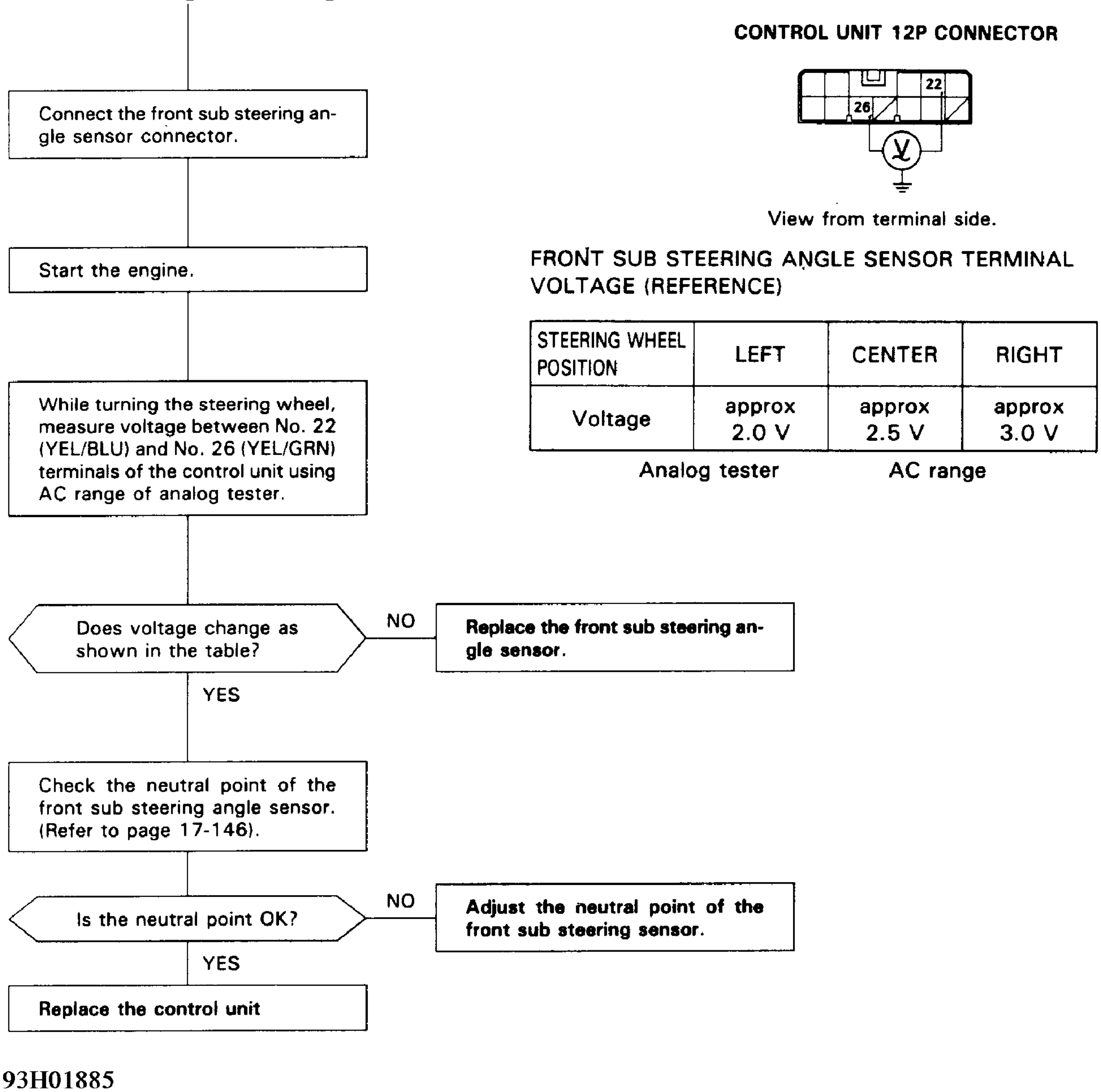


Fig. 17: Problem Code 10, 12, 16 (4 Of 5)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic



FRONT SUB STEERING ANGLE SENSOR TERMINAL VOLTAGE (REFERENCE)

STEERING WHEEL POSITION	LEFT	CENTER	RIGHT
Voltage	approx 2.0 V	approx 2.5 V	approx 3.0 V

Analog tester AC range

Fig. 18: Problem Code 10, 12, 16 (5 Of 5)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 11, 13, 17

- The 4WS indicator light has been reported on.
- With service check connector jumped codes 11, 13, 17 are indicated.

Disconnect the rear sub steering angle sensor connector.

Measure resistance between the No. 1 terminal (BLK/WHT), and the No. 2 terminal (WHT/BLU) of the sensor side connector.

Is there 8.4—12.2 Ω?
- NO → **Replace the rear sub steering angle sensor.**
- YES ↓

Measure resistance between the No. 2 terminal (BLK/WHT), and the No. 3 terminal (BLK) of the sensor side connector.

Is there 8.4—12.2 Ω?
- NO → **Replace the rear sub steering angle sensor.**
- YES ↓

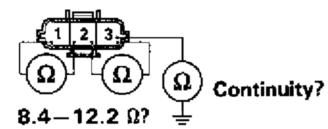
Check for continuity between the sensor side connector No. 3 terminal (BLK) and ground.

Is there continuity?
- YES → **Replace the rear sub steering angle sensor.**
- NO ↓

Turn the ignition switch ON.

Continued On Next Page

REAR SUB STEERING ANGLE SENSOR SENSOR SIDE CONNECTOR



View from terminal side.

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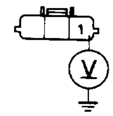
Fig. 19: Problem Code 11, 13, 17 (1 Of 5)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic

Measure the voltage between the control unit side of the sensor connector GRY wire and body ground.

REAR SUB STEERING ANGLE SENSOR CONTROL UNIT SIDE CONNECTOR



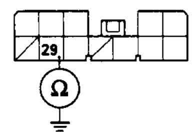
View from terminal side.

Is there approximately 2.5 V?

YES

NO → Disconnect the control unit 12P connector.

CONTROL UNIT 12P SENSOR SIDE CONNECTOR



View from terminal side.

Check for continuity between the control unit No. 29 terminal (GRY) and body ground.

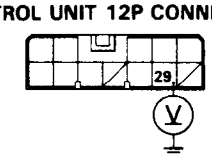
Is there continuity?

YES → **Repair short in the GRY wire between the control unit and the rear sub steering angle sensor.**

NO

Connect the control unit 12P connector.

CONTROL UNIT 12P CONNECTOR



View from terminal side.

Measure voltage between the control unit No. 29 terminal (GRY) and body ground.

Is there approximately 2.5 V?

NO → **Replace control unit.**

YES

Repair open in the GRY wire between thecontrol unit and the rear sub steering angle sensor.

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Fig. 20: Problem Code 11, 13, 17 (2 Of 5)
Courtesy of American Honda Motor Co., Inc.

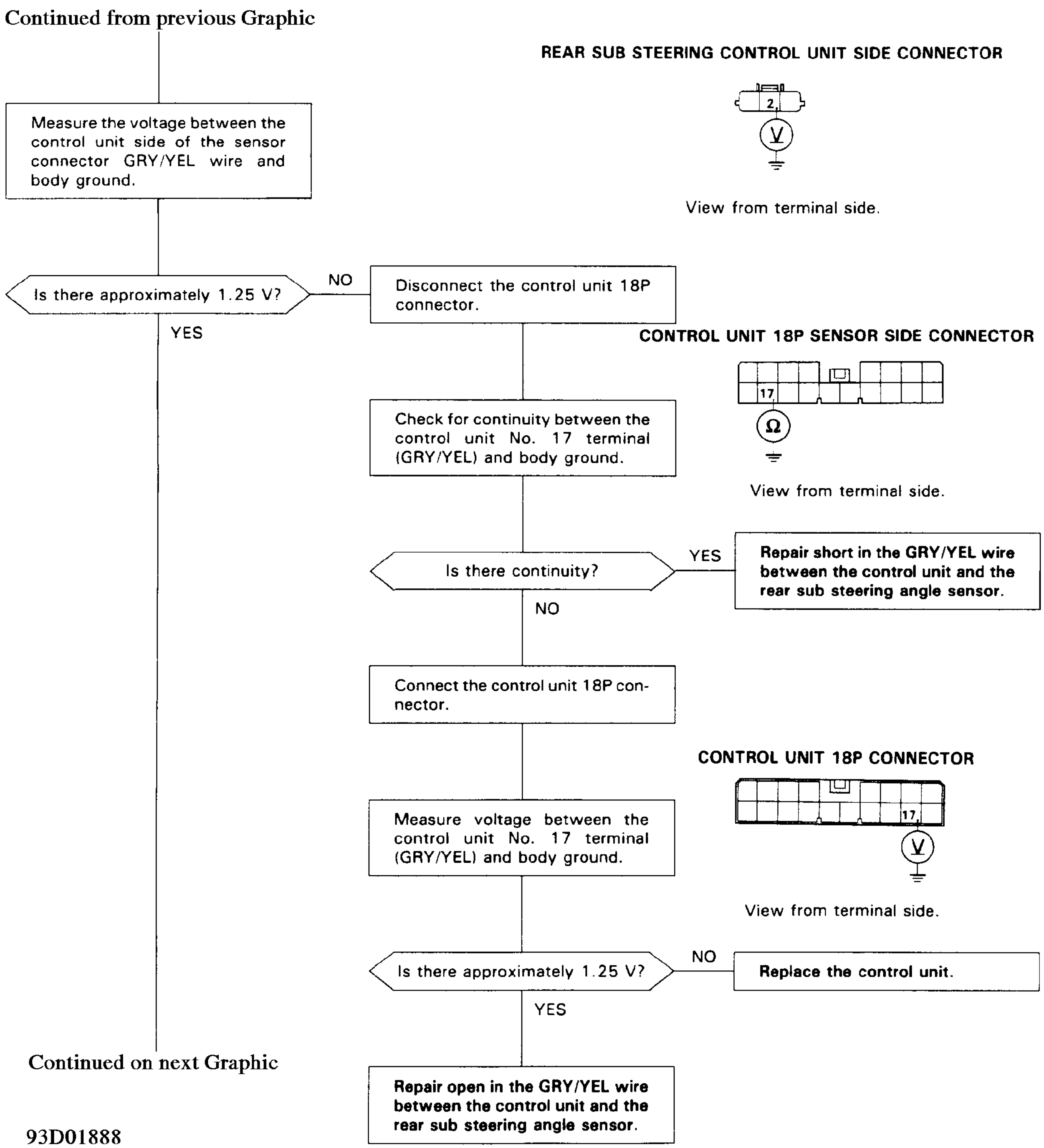


Fig. 21: Problem Code 11, 13, 17 (3 Of 5)
Courtesy of American Honda Motor Co., Inc.

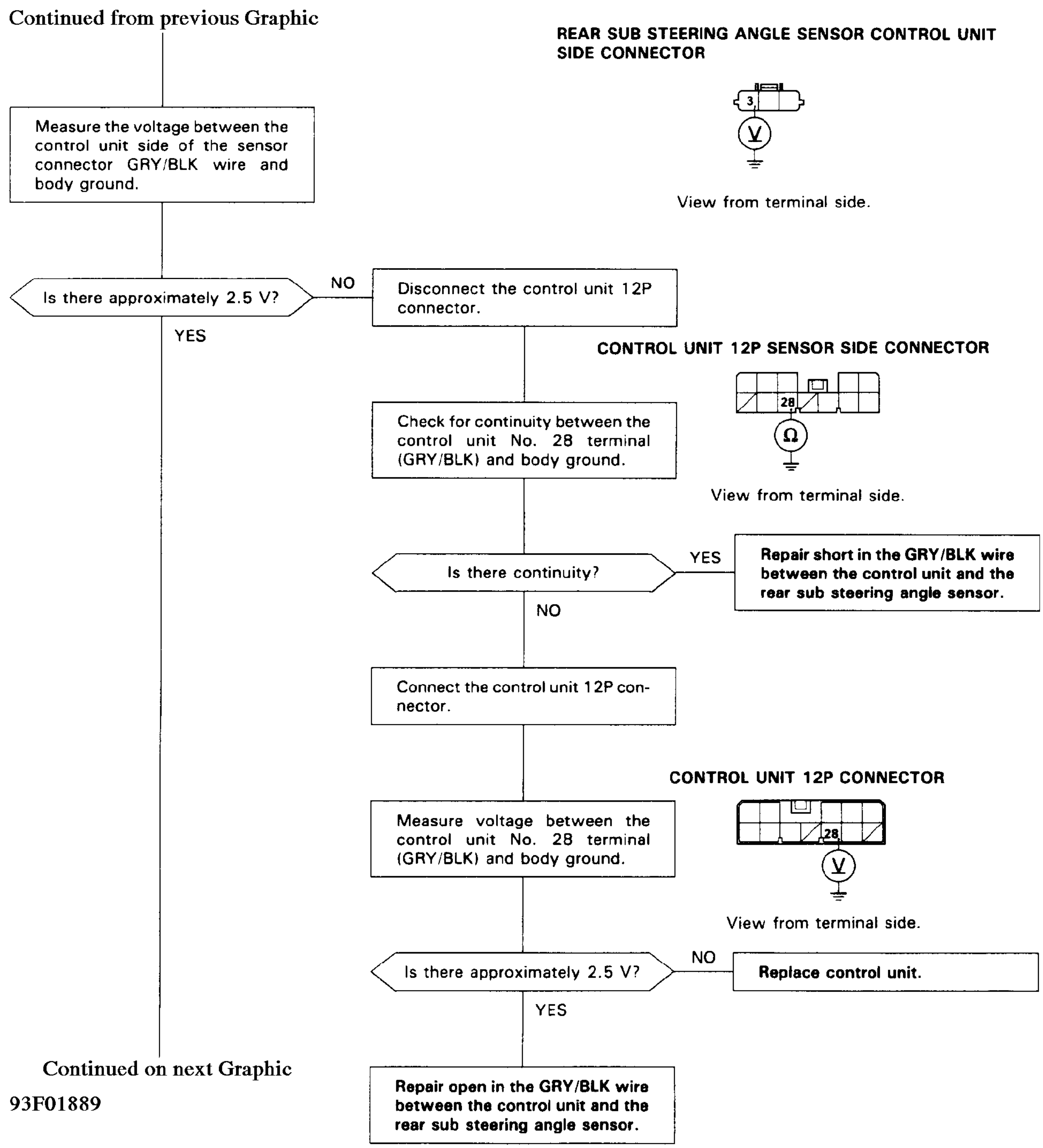
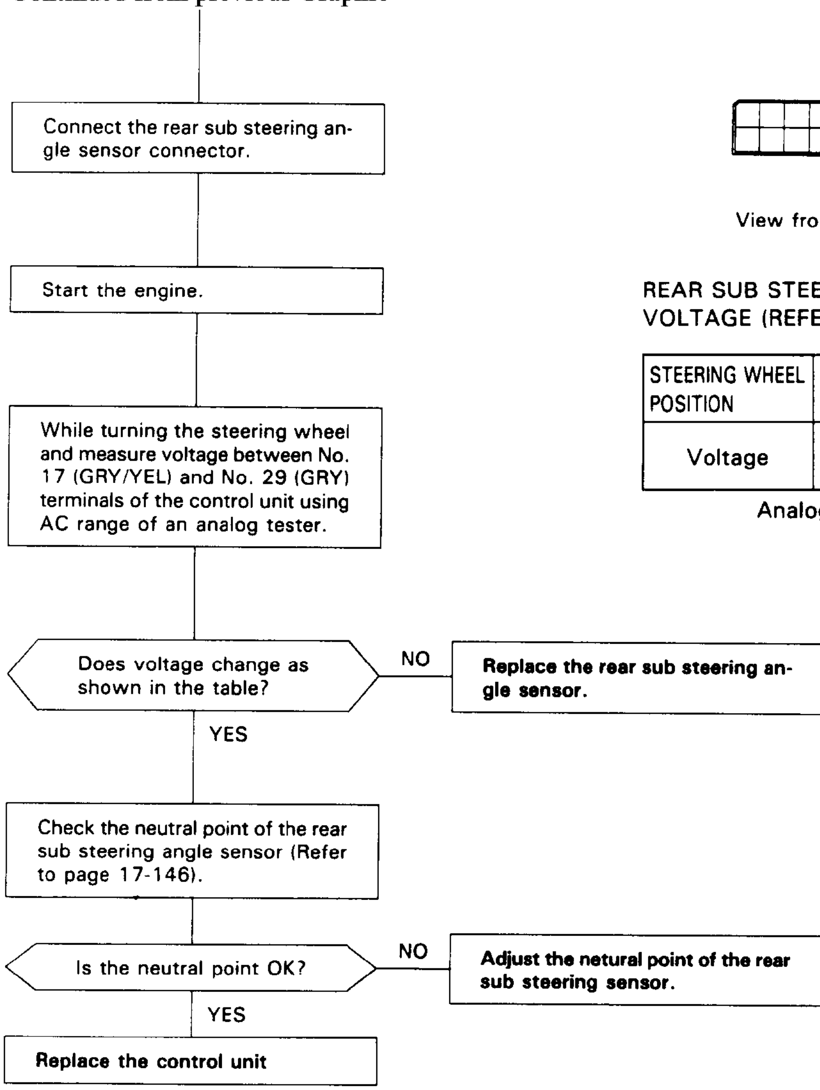
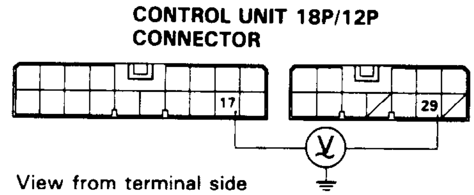


Fig. 22: Problem Code 11, 13, 17 (4 Of 5)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic





REAR SUB STEERING ANGLE SENSOR TERMINAL VOLTAGE (REFERENCE)

STEERING WHEEL POSITION	LEFT	CENTER	RIGHT
Voltage	approx 3.0 V	approx 2.5 V	approx 2.0 V

Analog tester AC range

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Fig. 23: Problem Code 11, 13, 17 (5 Of 5)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 20, 22, 24, 28

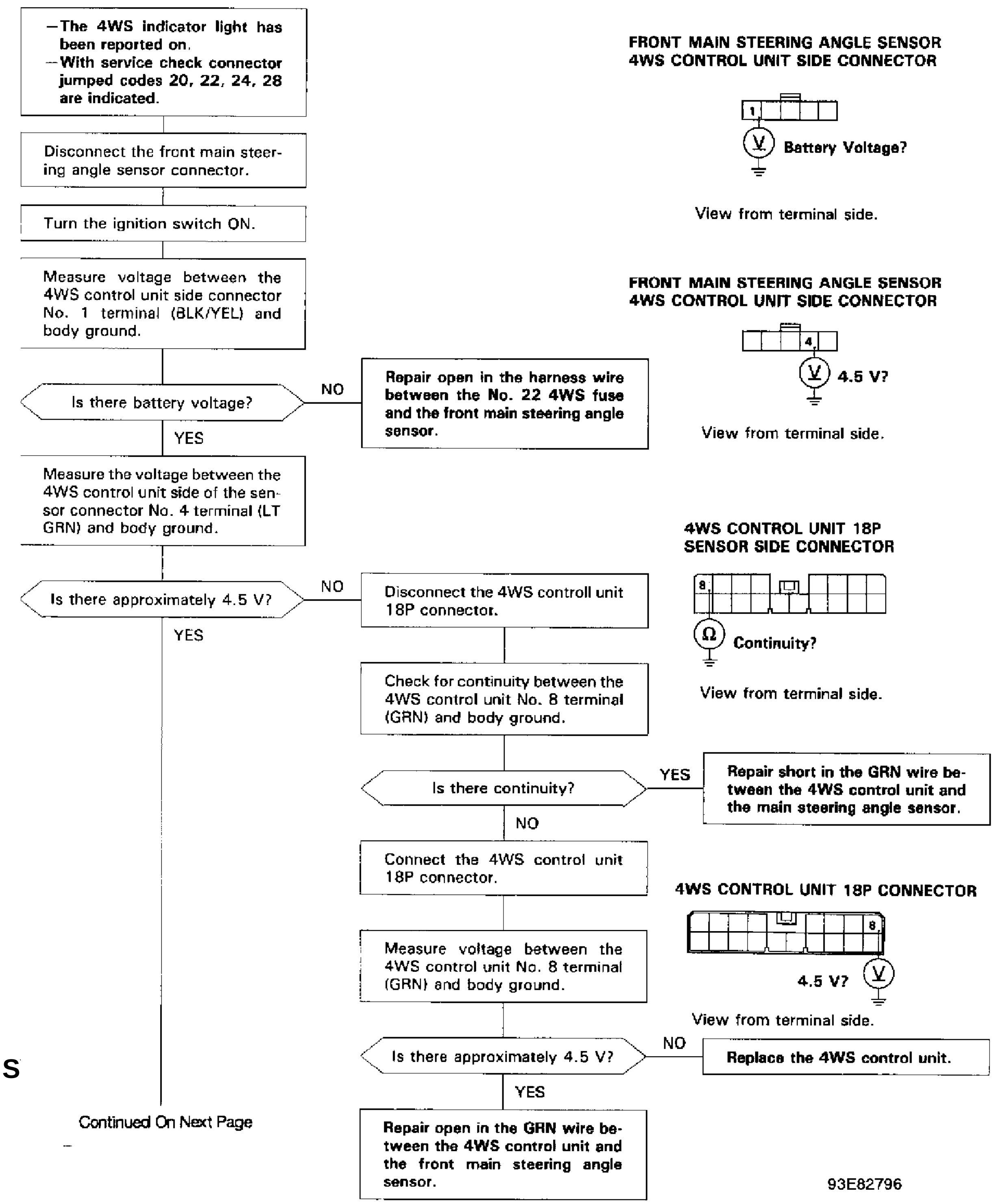

Fig. 24: Problem Code 20, 22, 24, 28 (1 Of 4)
Courtesy of American Honda Motor Co., Inc.

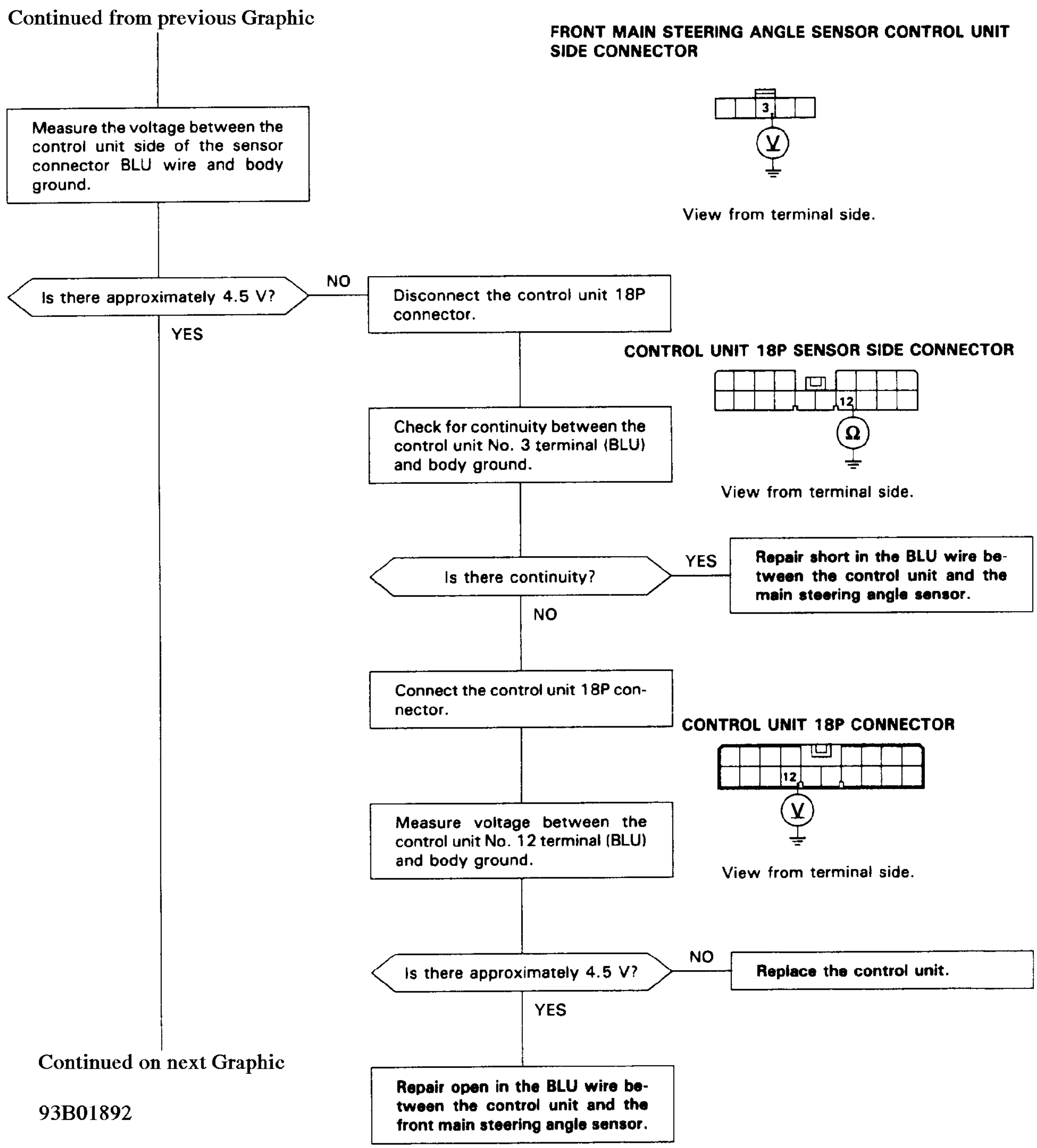

Fig. 25: Problem Code 20, 22, 24, 28 (2 Of 4)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic

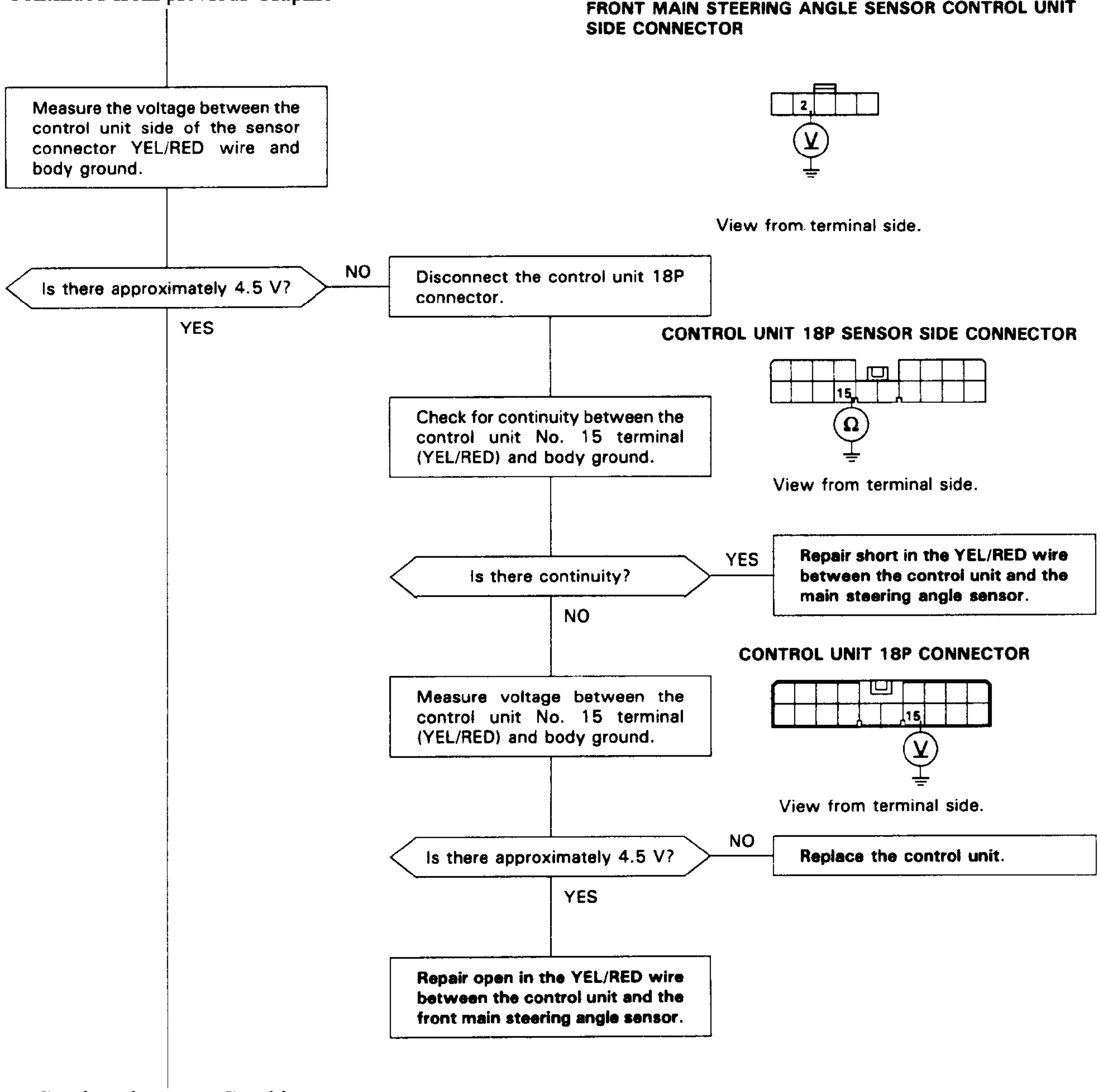

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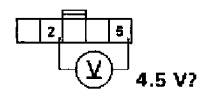
Fig. 26: Problem Code 20, 22, 24, 28 (3 Of 4)
Courtesy of American Honda Motor Co., Inc.

Continued From Previous Page

Check for voltage between the No.2 terminal (YEL/RED) and the No. 5 terminal (BLK) of the 4WS control unit side connector of the front main steering angle sensor.

FRONT MAIN STEERING ANGLE SENSOR 4WS CONTROL UNIT SIDE CONNECTOR



View from terminal side

Is there approximately 4.5 V?

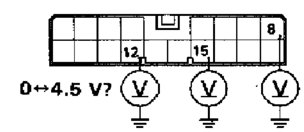
NO → **Repair the poor ground or open in the BLK wire between the front main steering angle sensor and body ground.**

YES

Reconnect the front main steering angle sensor 5P connector.

While turning the steering wheel, check for the signals between the following 4WS control unit terminals and the body ground with an analog voltmeter on the DC range.
A-phase:
Between the No. 8 terminal (GRN) and body ground: should pulse 0↔4.5 V rapidly (every 2°)
B-phase:
Between the No. 15 terminal (YEL/RED) and body ground: should pulse 0↔4.5 V rapidly (every 2°)
Z-phase:
Between the No. 12 terminal (BLU) and body ground: should pulse 0↔4.5 V once per steering wheel revolution

4WS CONTROL UNIT 18P CONNECTOR



View from terminal side

Are the signals available between the respective terminal and the body ground?

NO → **Replace the front main steering angle sensor.**

YES

Check the Z-phase neutral position

Is the Z-phase in the straight driving position?

NO → **Adjust the front main steering angle sensor neutral position**

YES

Perform troubleshooting for DTCs 10, 12, 16.

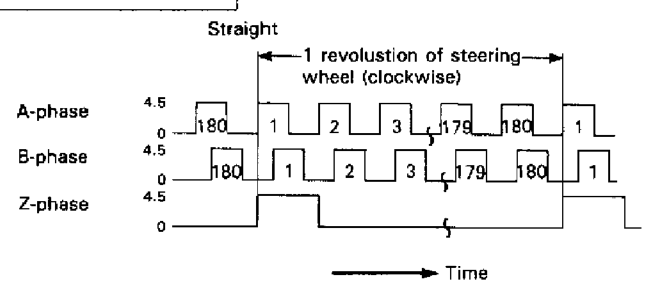


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Fig. 27: Problem Code 20, 22, 24, 28 (4 Of 4)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 21, 23, 25, 29 (1 OF 4)

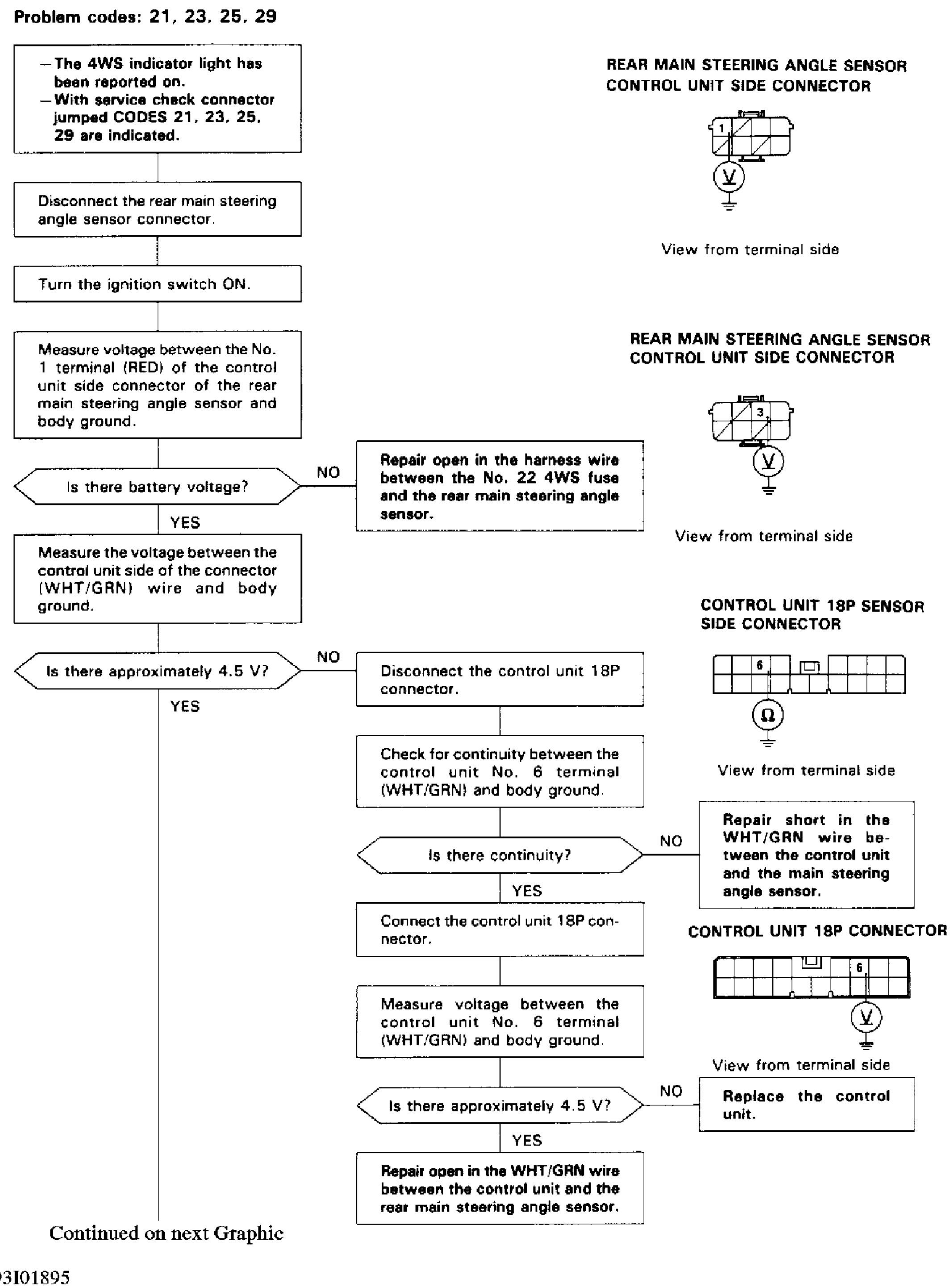


Fig. 28: Problem Code 21, 23, 25, 29 (1 Of 4)
Courtesy of American Honda Motor Co., Inc.

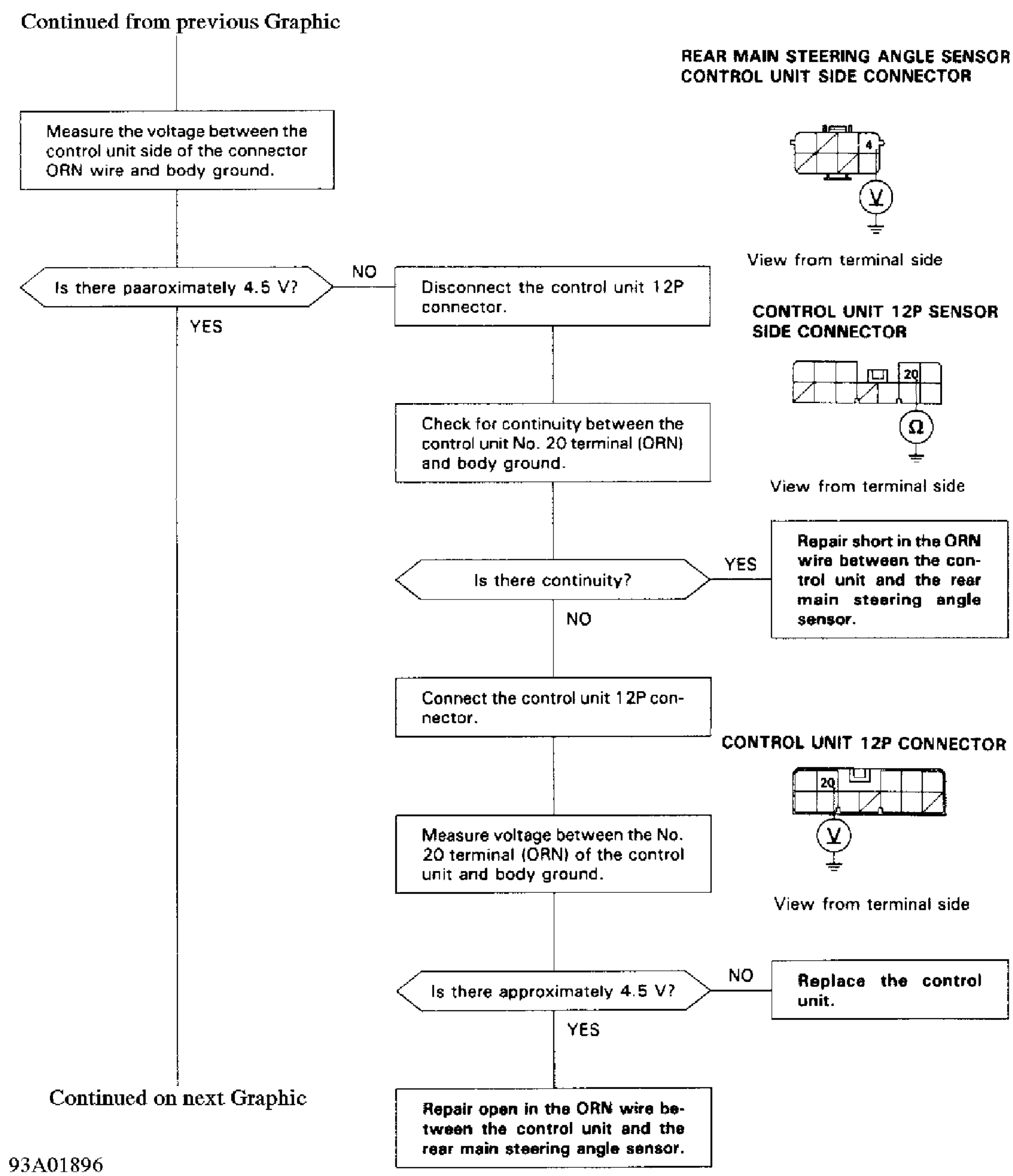


Fig. 29: Problem Code 21, 23, 25, 29 (2 Of 4)
Courtesy of American Honda Motor Co., Inc.

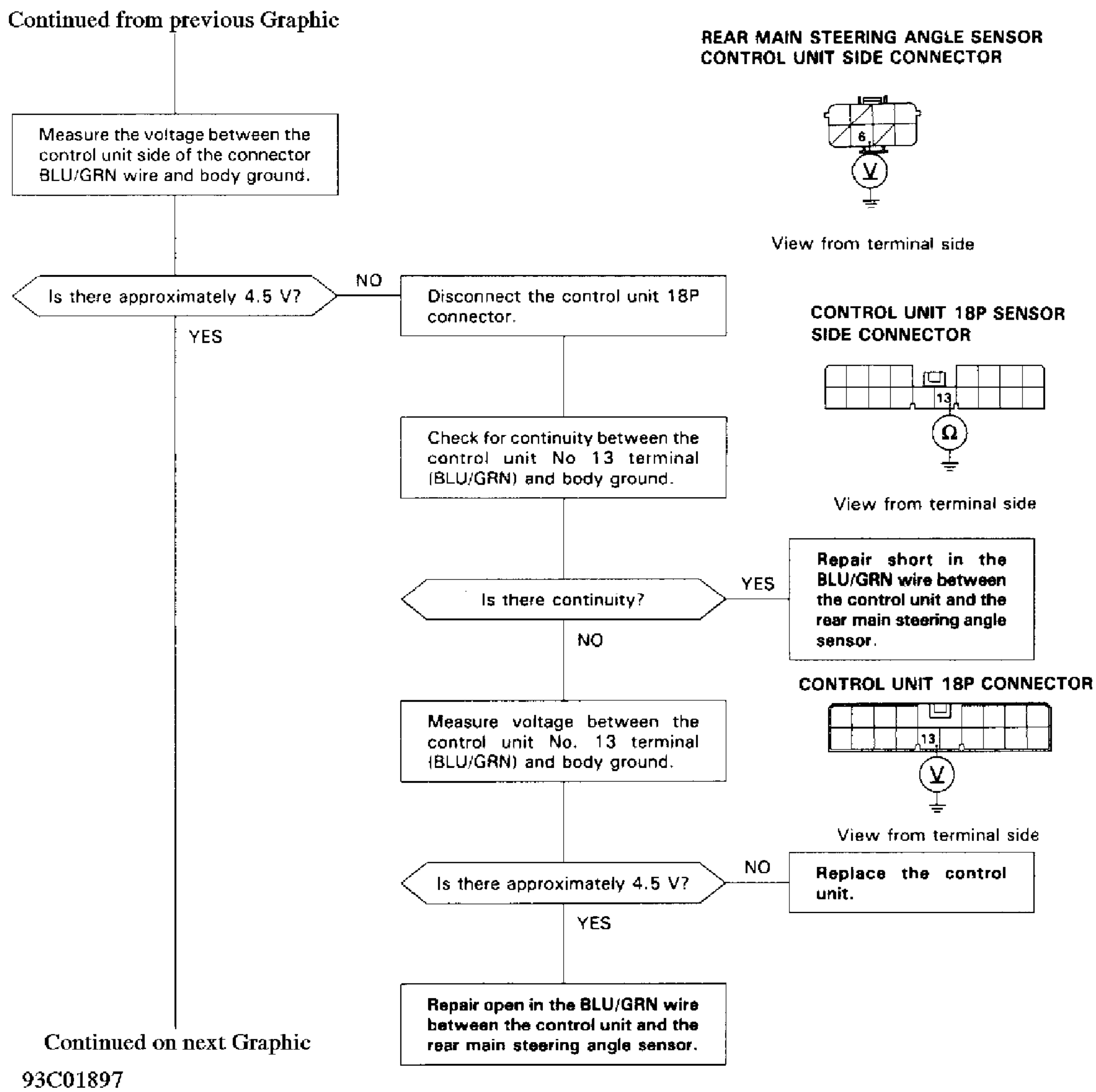


Fig. 30: Problem Code 21, 23, 25, 29 (3 Of 4)
Courtesy of American Honda Motor Co., Inc.

Continued from Previous Page

Measure voltage between the No.6 terminal (BLU/GRN) and the No. 8 terminal (RED) of the 4WS control unit side connector of the rear main steering angle sensor.

Is there approximately 4.5 V?

NO → **Repair open in the RED wire between the 4WS control unit and the rear main steering angle sensor.**

YES ↓

Reconnect the rear main steering angle sensor 8P connector.

While turning the steering wheel, check for the signals between the following 4WS control unit terminals and the body ground with an analog voltmeter on the DC range.
A-phase:
Between the No. 6 terminal (WHT/GRN) and body ground: should pulse 0↔4.5 V rapidly (every 2°)
B-phase:
Between the No. 13 terminal (BLU/GRN) and body ground: should pulse 0↔4.5 V rapidly (every 2°)
Z-phase:
Between the No. 20 terminal (ORN) and body ground: should pulse 0↔4.5 V once per steering wheel revolution

Are the signals available between the respective terminal and the body ground?

NO → **Replace the rear main steering angle sensor.**

YES ↓

Check the Z-phase neutral position

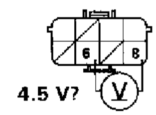
Is the Z-phase in the straight driving position?

NO → **Replace the rear actuator.**

YES ↓

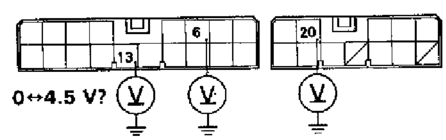
Perform troubleshooting of the DTCs 11, 13, 17.

REAR MAIN STEERING ANGLE SENSOR 4WS CONTROL UNIT SIDE CONNECTOR



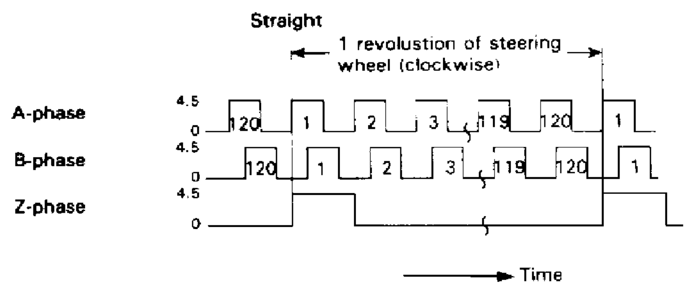
View from terminal side

4WS CONTROL UNIT 18P/12P CONNECTOR



View from terminal side

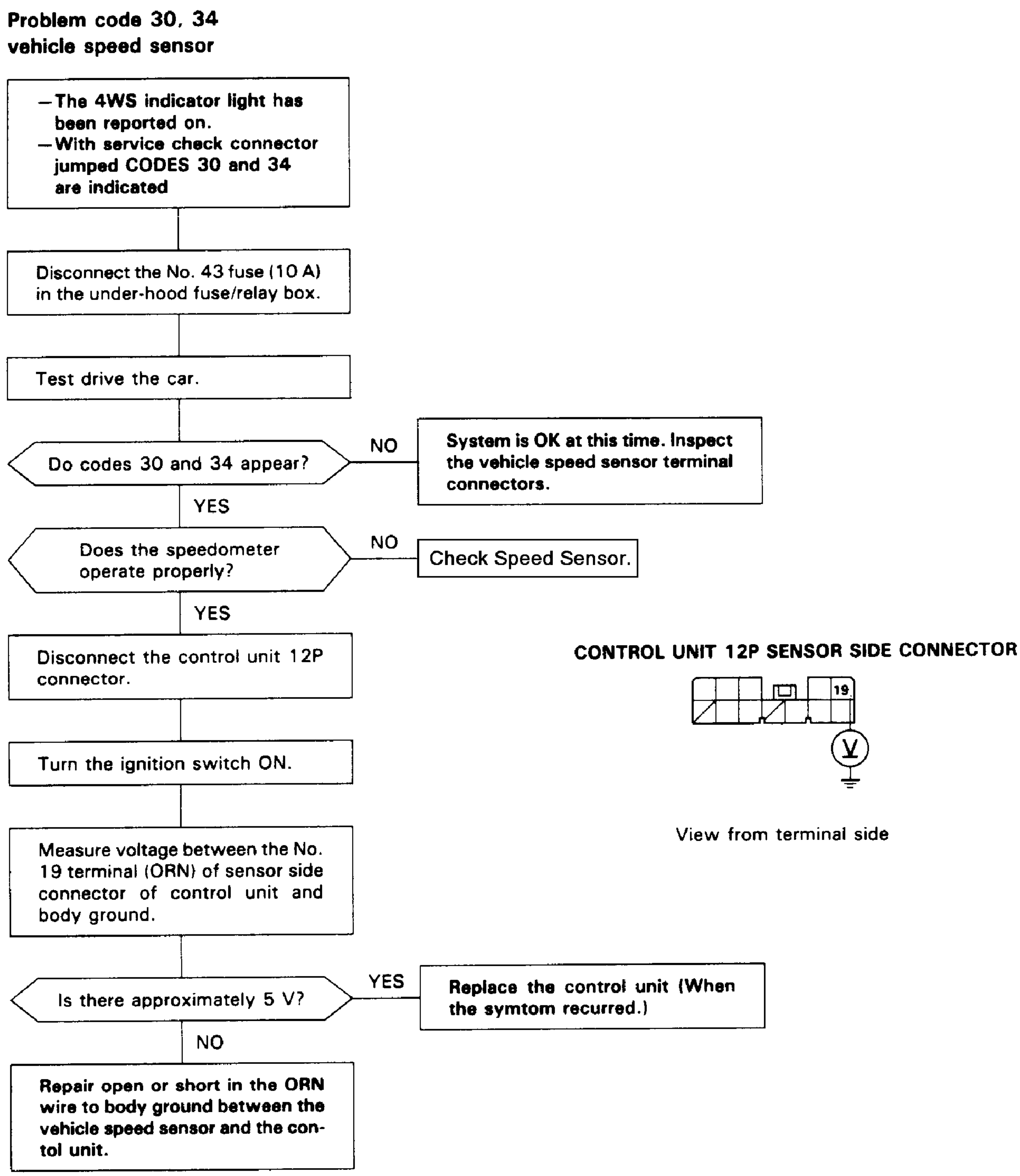
STEERING S



93G82798

Fig. 31: Problem Code 21, 23, 25, 29 (4 Of 4)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 30, 34



93G01899

Fig. 32: Problem Code 30, 34
Courtesy of American Honda Motor Co., Inc.

Problem code 31, 35

- The 4WS indicator light has been reported on.
- With service check connector jumped CODES 31 and 35 are indicated.

Start the engine.

Does the ABS light stay ON?

- NO: Go to problem in ABS system
- YES: Stop the engine. Then turn the ignition switch back ON.

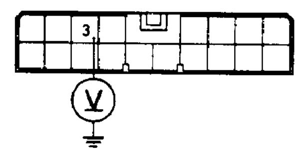
With the left rear wheel raised OFF ground, slowly rotate the wheel while checking for voltage between the 4WS control unit No. 3 terminal (GRY/WHT) and body ground.

Does the voltage alternate from zero to approximately 5 V?

- YES: Record the problem codes and clear the 4WS control unit. Test drive the car, if the problem code does not reappear, check the terminal connections of the 4WS control unit 18-P connector and the ABS control unit 14-P connector.
- NO

Continued on next Graphic

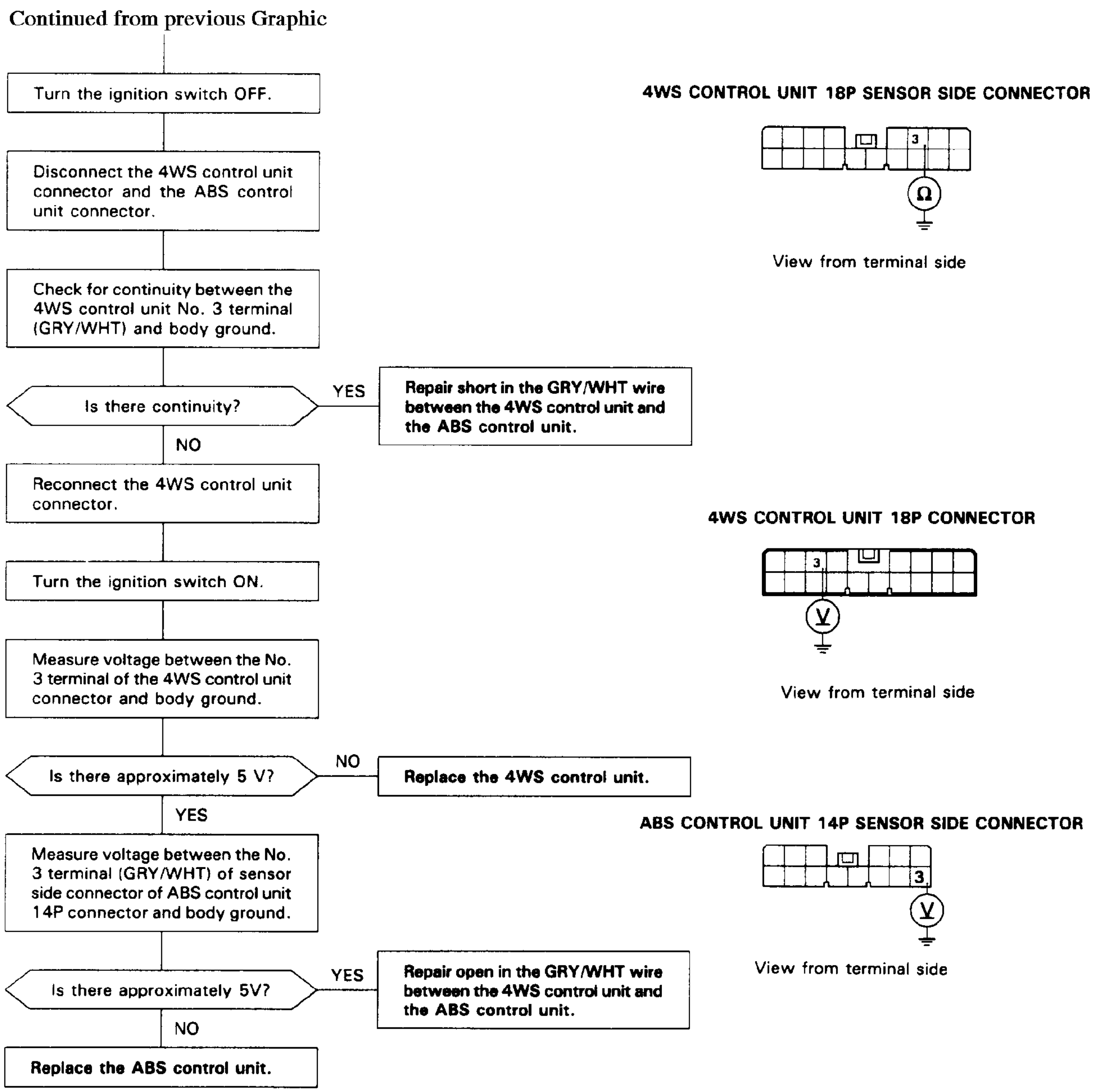
4WS CONTROL UNIT 18P CONNECTOR



View from terminal side

93A01900

Fig. 33: Problem Code 31, 35 (1 Of 2)
Courtesy of American Honda Motor Co., Inc.

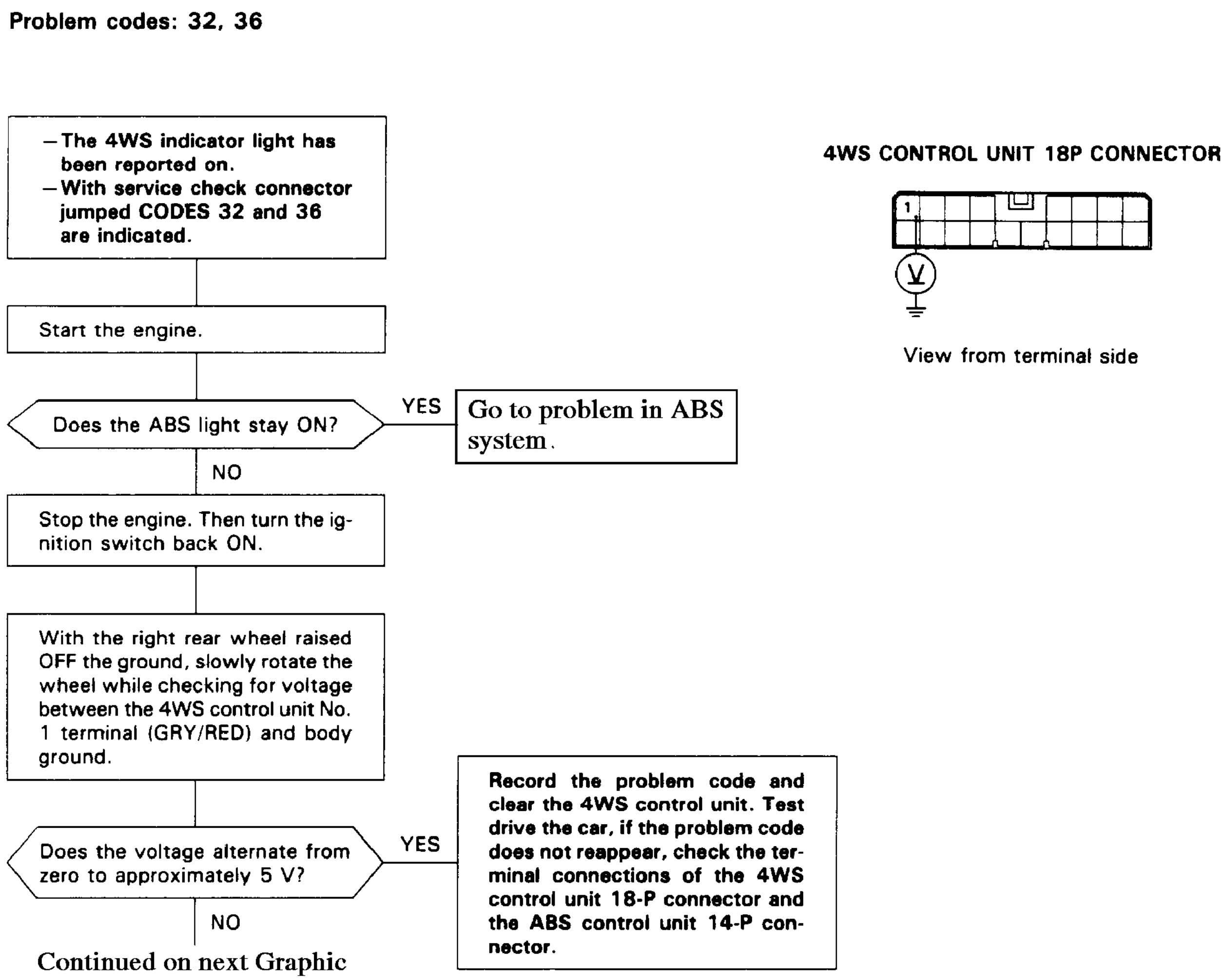


STEERING S

93C01901

Fig. 34: Problem Code 31, 35 (2 Of 2)
Courtesy of American Honda Motor Co., Inc.

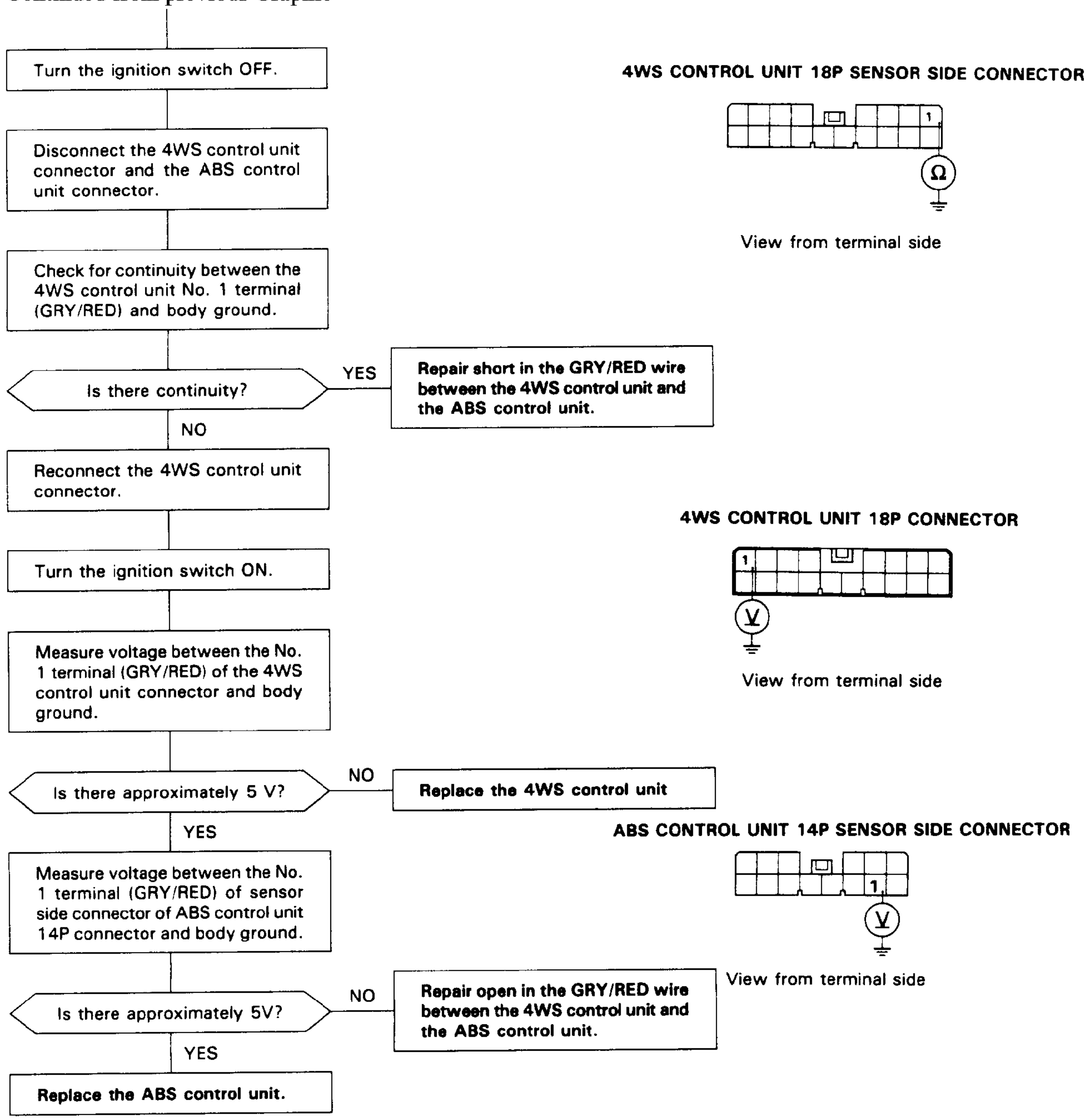
PROBLEM CODE 32, 36



93E01902

Fig. 35: Problem Code 32, 36 (1 Of 2)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic



STEERING S

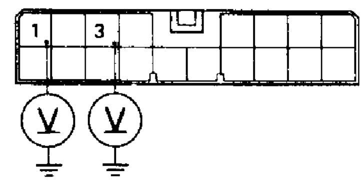
Fig. 36: Problem Code 32, 36 (2 Of 2)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 33 (1 OF 3)

Problem code: 33.

NOTE: Problem code 33 is memorized when the front wheels are turned at a speed of 30 km/h for 2 minutes with the front wheels raised off the ground and the rear wheels blocked. (Parking brake must be off to test this code.

4WS CONTROL UNIT 18P CONNECTOR



View from terminal side

–The 4WS indicator light has been reported on.
–With service check connector jumped CODE 33 is indicated.

Start the engine.

Does the ABS light stay ON?

NO → **Perform troubleshooting of the ABS system**

YES

Stop the engine. Then turn the ignition switch back ON.

Rotate the rear left wheel slowly and check for voltage between the 4WS unit control No. 1 terminal (GRY/RED) and body ground, and between the No. 3 terminal (GRY/WHT) and body ground.

Does the voltage from both rear wheel sensors alternate from zero to approximately 5 V?

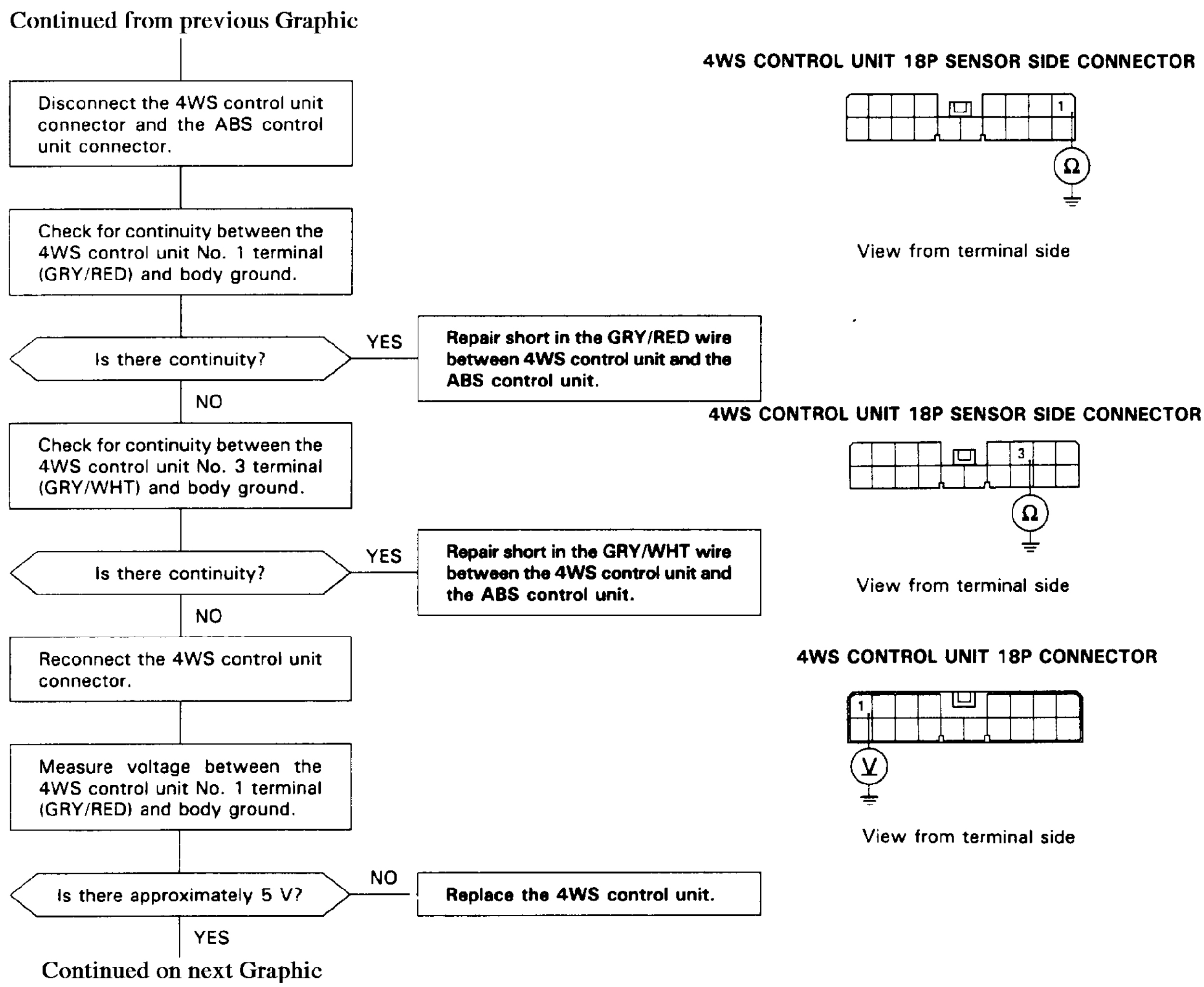
YES → **Record the problem code and clear the 4WS control unit. Test drive the car, if the problem code does not reappear, check the terminals connections of the 4WS control unit 18-P connector and the ABS control unit 14-P connector.**

NO

Continued on next Graphic

93I01904

Fig. 37: Problem Code 33 (1 Of 3)
Courtesy of American Honda Motor Co., Inc.

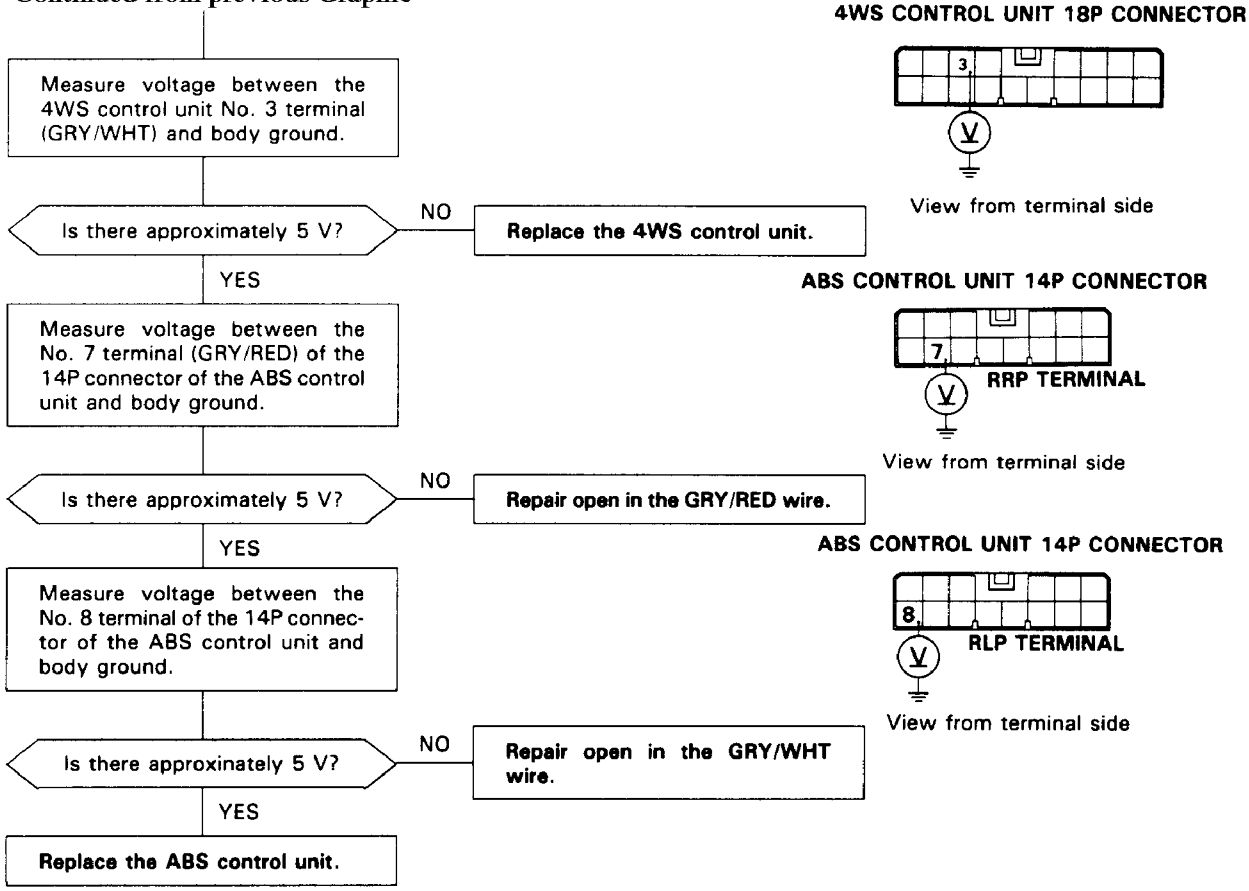


93B01905

Fig. 38: Problem Code 33 (2 Of 3)

Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic



93D01906

Fig. 39: Problem Code 33 (2 Of 3)
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 50

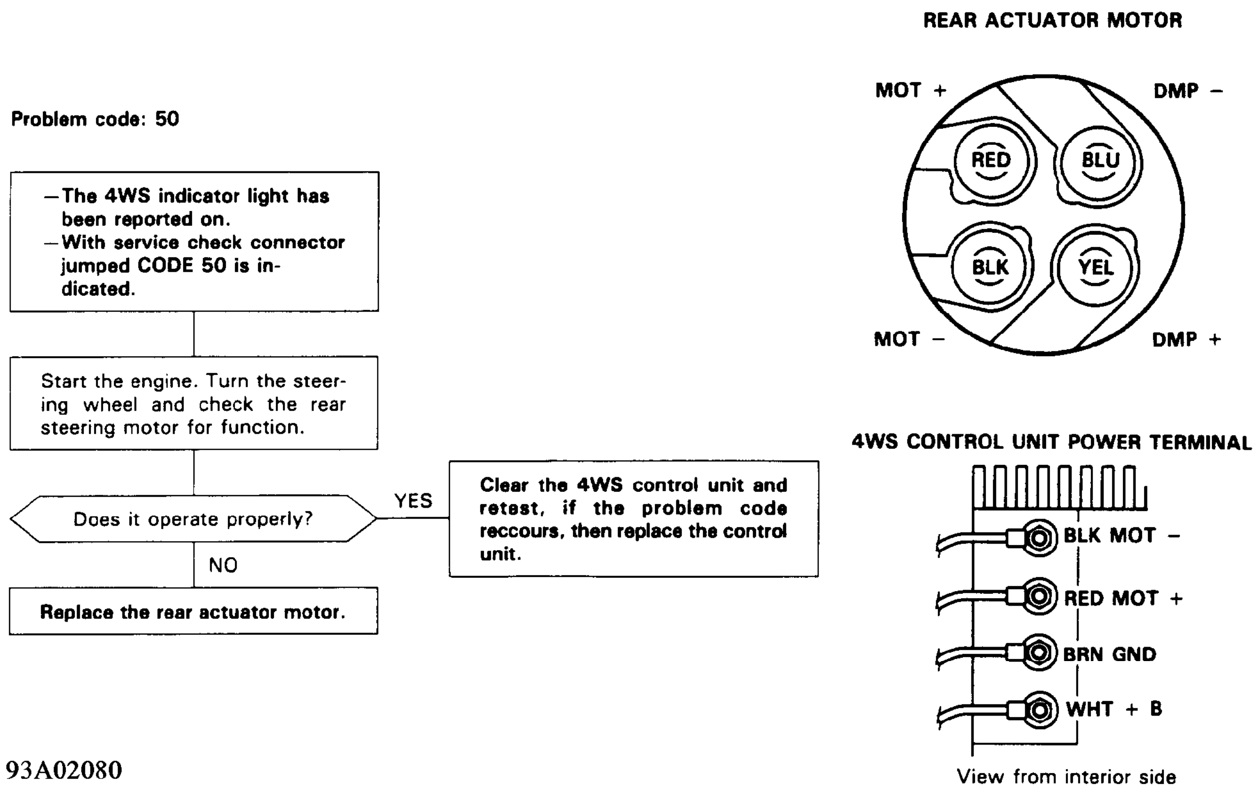


Fig. 40: Problem Code 50
Courtesy of American Honda Motor Co., Inc.

PROBLEM CODE 51

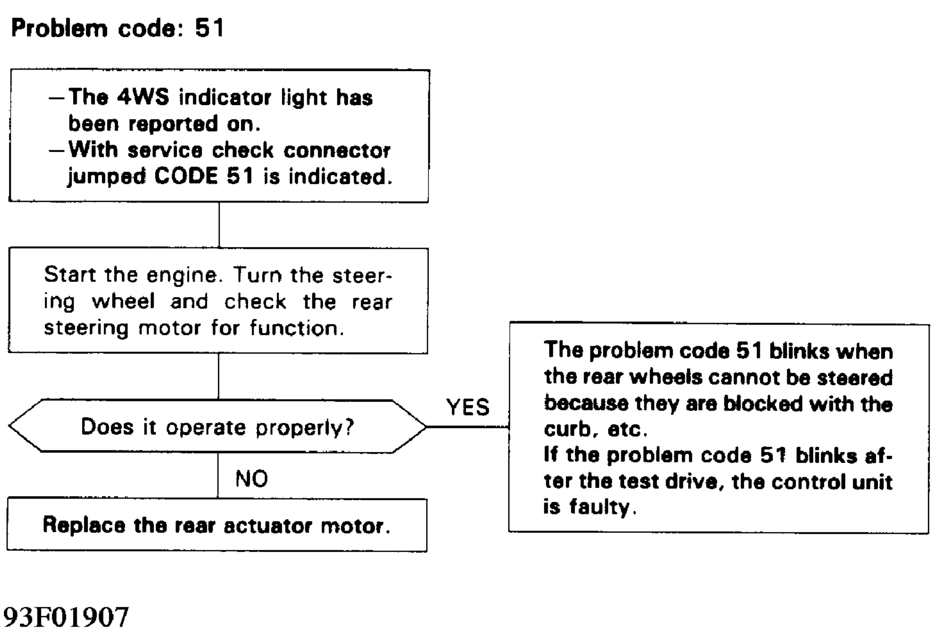


Fig. 41: Problem Code 51
Courtesy of American Honda Motor Co., Inc.

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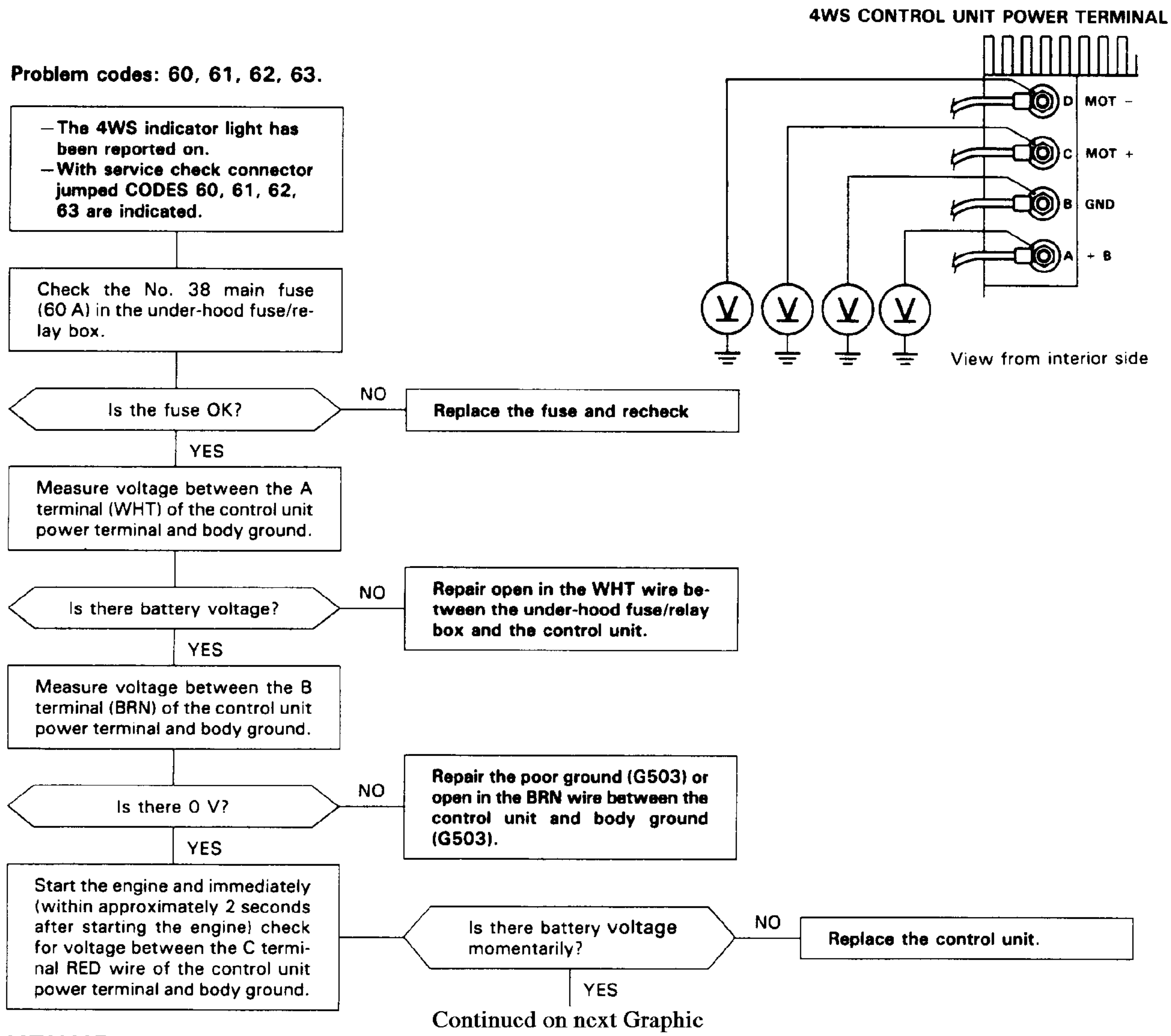
PROBLEM CODE 60, 61, 62, 63 (1 OF 3)



93E02237

Fig. 42: Problem Code 60, 61, 62, 63 (1 Of 3)
Courtesy of American Honda Motor Co., Inc.

Continued from previous Graphic

Stc, the engine and turn the ignition switch ON.

Measure voltage between the D terminal (BLK) of the control unit power terminal and body ground immediately after (within approximately 2 seconds) starting the engine.

Is there battery voltage momentarily?

- NO → Replace the control unit
- YES ↓

Measure voltage between the C terminal (RED) of the rear actuator motor and body ground immediately after (within approximately 2 seconds) starting the engine.

Is there battery voltage?

- NO → Repair open in the RED wire between the control unit and the rear actuator motor.
- YES ↓

Measure voltage between the D terminal (BLK) of the rear actuator motor and body ground immediately after (within approximately 2 seconds) starting the engine.

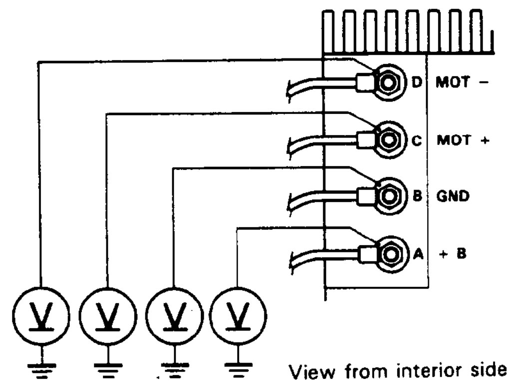
Is there battery voltage?

- NO → Repair open in the BLK wire between the control unit and the rear actuator motor.
- YES ↓

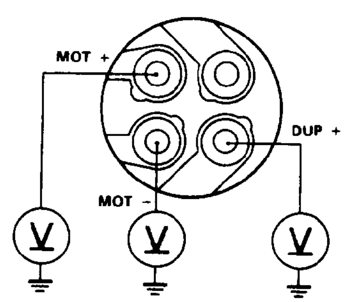
Measure voltage between the No. 33 terminal (YEL) of the rear actuator motor and body ground immediately after (within approximately 2 seconds) starting the engine.

Continued on next Graphic

4WS CONTROL UNIT POWER TERMINAL



ACTUATOR MOTOR

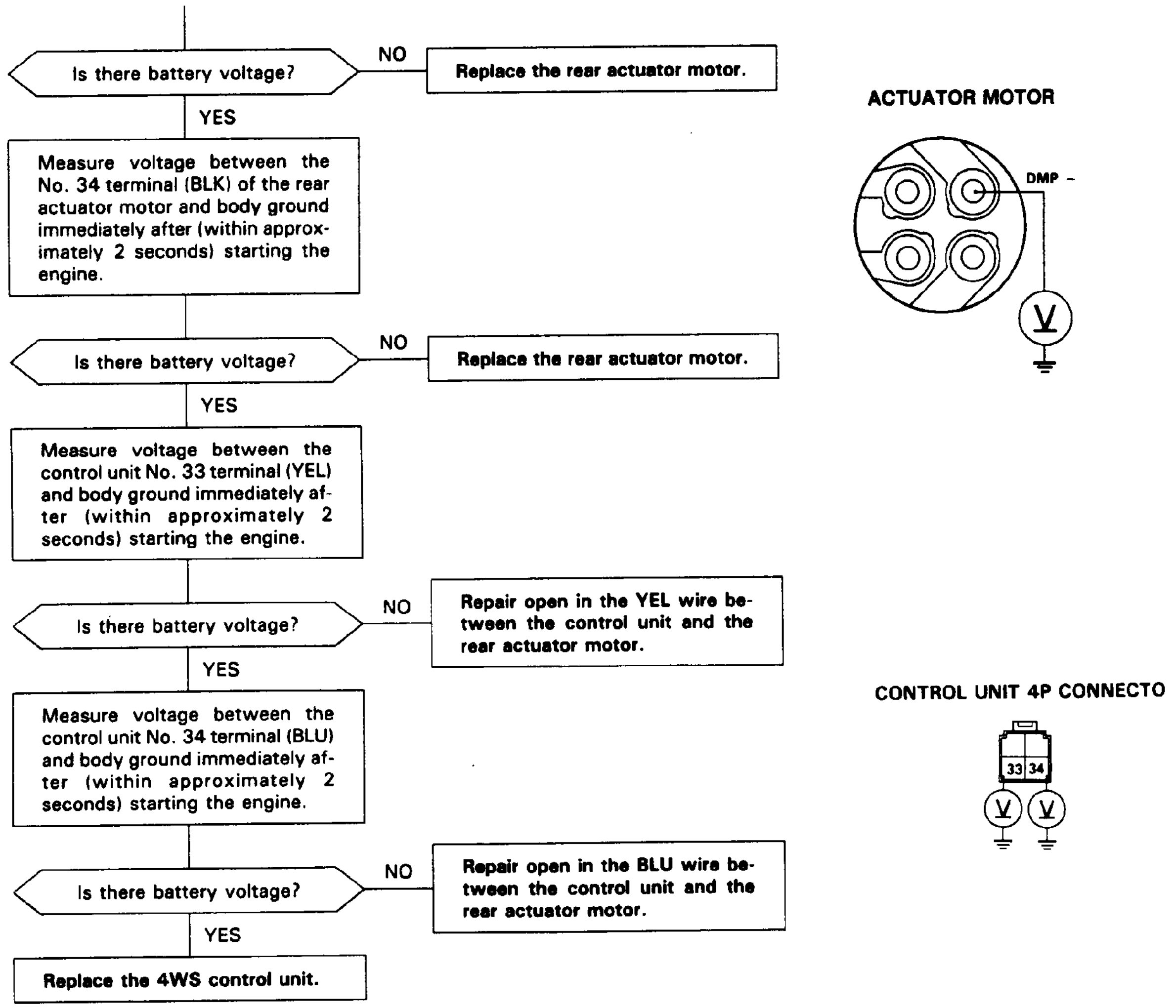


STEERING S

93H01908

Fig. 43: Problem Code 60, 61, 62, 63 (2 Of 3)
Courtesy of American Honda Motor Co., Inc.

CONTINUED FROM PREVIOUS GRAPHIC



93J01909

Fig. 44: Problem Code 60, 61, 62, 63 (2 Of 3)
Courtesy of American Honda Motor Co., Inc.

WIRING DIAGRAM

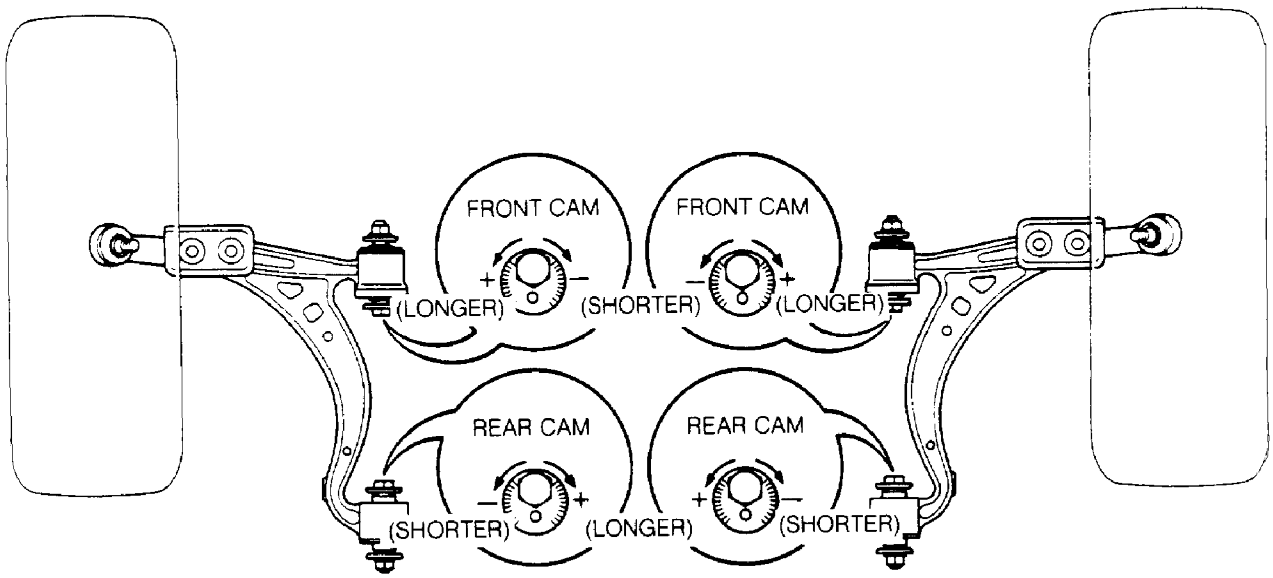


Fig. 45: 4-Wheel Steering Wiring Diagram

END OF ARTICLE

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ARTICLE BEGINNING

1993 STEERING
Honda - Power Steering

Prelude

DESCRIPTION & OPERATION

The power steering system consists of a power rack and pinion steering gear, hydraulic pump, fluid reservoir, valve body unit, vehicle speed sensor and hoses. Power assist is proportional to vehicle speed and steering load. Assist is high when vehicle speed is low, and lower as vehicle speed increases.

The vehicle speed sensor is a trochoid-rotor hydraulic pump, driven by a speedometer gear in the transmission. When the vehicle is in motion, the speed sensor pump relieves a portion of the hydraulic pressure, reducing power steering assist.

LUBRICATION

CAPACITY

POWER STEERING FLUID CAPACITIES TABLE

Application	Qts. (L)
Prelude	1.8 (1.7)

FLUID TYPE

Use only Honda (08208-311-61F) power steering fluid.

CAUTION: Using ATF or other power steering fluids will damage system.

FLUID LEVEL CHECK

Check fluid when engine is cold and not running. Fluid level should be between upper and lower marks on fluid reservoir. If fluid level is excessively low, check for leaks. Add fluid (if needed) and recheck. DO NOT overfill.

HYDRAULIC SYSTEM BLEEDING

Fill reservoir to proper level. Start engine and run at fast idle. Turn steering wheel from lock-to-lock, 2 or 3 times to bleed trapped air. Recheck fluid level.

ADJUSTMENTS

POWER STEERING PUMP BELT

BELT ADJUSTMENT SPECIFICATIONS TABLE

Application	(1) Deflection - In. (mm)
Prelude	9/16-5/8 (14-16)

(1) - Deflection is with 22 lbs. (10 kg) pressure applied midway on longest belt run.

PINION ROTATING FORCE & RACK SLIDING FORCE

Using Lock Nut Wrench (07916-SA500001), loosen guide screw lock nut. See Fig. 1 for component location. Using a 14-mm wrench, tighten guide screw to 36 INCH lbs. (4.1 N.m). Loosen guide screw according to GUIDE SCREW ADJUSTMENT SPECIFICATIONS table. Holding rack guide screw in place, tighten lock nut.

GUIDE SCREW ADJUSTMENT SPECIFICATIONS TABLE

Application	(1) Counter-Rotation (Degrees)
Prelude (2WS)	15-25

(1) - After rack guide screw has been tightened to 36 INCH lbs.(4.1 N.m).

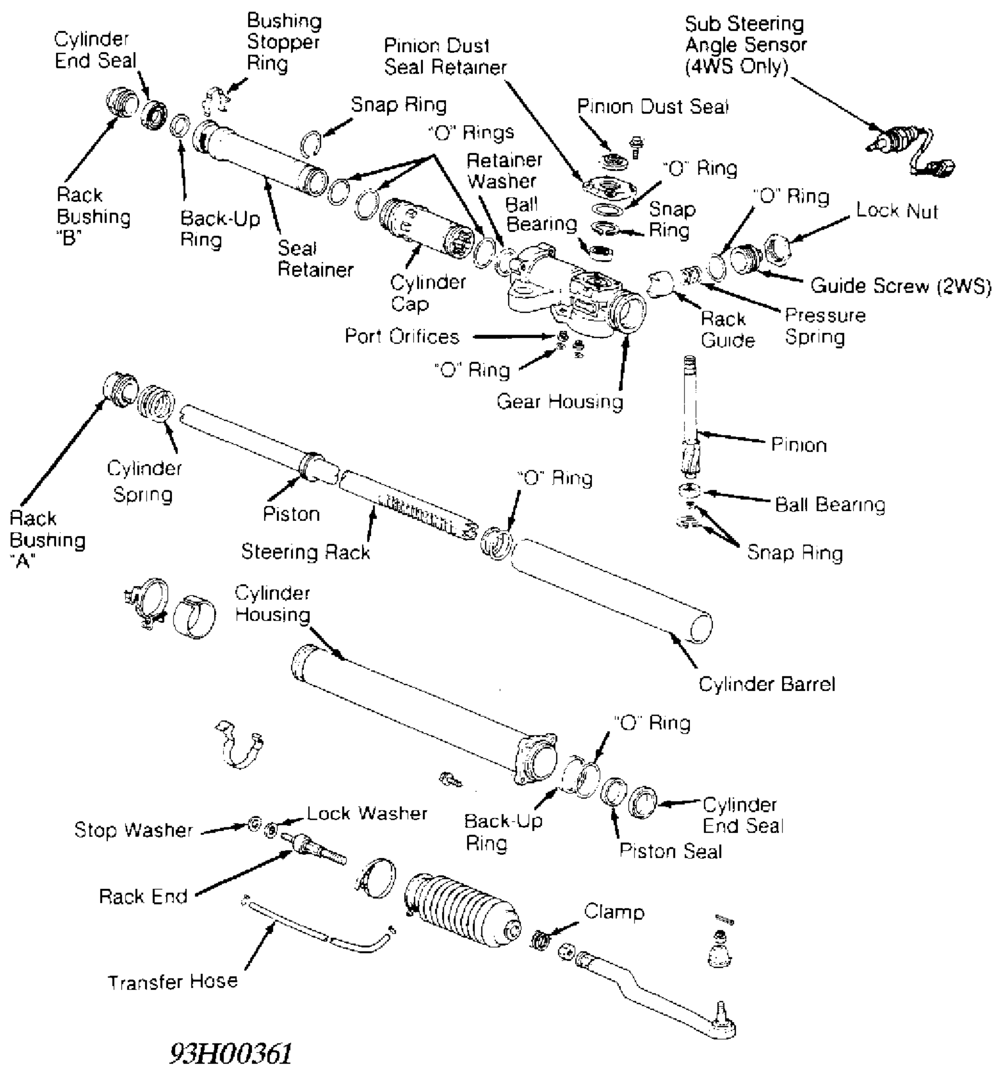

Fig. 1: Exploded View Of Power Rack & Pinion (Typical)
Courtesy of American Honda Motor Co., Inc.

TESTING

HYDRAULIC SYSTEM PRESSURE TEST

1) Check fluid level and belt tension. Adjust as necessary. Disconnect outlet hose from pump. Install Pressure Gauge Set (07406-0010001). Fully open shutoff and pressure control valves.

2) Start and idle engine. Turn steering wheel from lock to lock several times to warm fluid to operating temperature. Completely close shutoff valve.

CAUTION: DO NOT close shutoff valve for more than 5 seconds or pump will be damaged.

3) Gradually close pressure control valve until pressure gauge needle stabilizes. Read pressure. Fully open shutoff valve. Pump pressure should be 995-1138 psi (70-80 kg/cm^2). Replace pump if pressure is too low.

STEERING WHEEL TURNING FORCE

Low Speed Assist

1) Check fluid level and belt tension. Start and idle engine. Turn steering wheel from lock to lock several times to warm fluid. Attach a spring-tension scale to outer end of steering wheel spoke.

2) Ensure vehicle is on a clean, dry surface. With engine idling, pull on spring-tension scale until tires move. Reading should be less than 6.6 lbs. (3.0 kg.). If reading is more than specified, stop engine and disconnect hose between control unit and speed sensor at sensor. See Fig. 2. Plug hose and sensor fitting.

3) Start and idle engine. Pull on spring-tension scale until tires move. If reading is less than specified, replace speed sensor. If reading is more than specified, check rack and pinion.

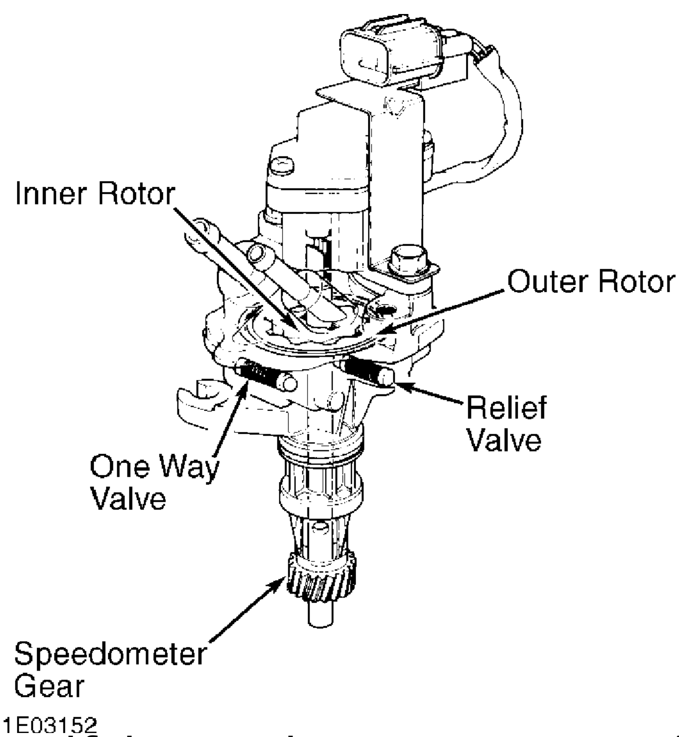

Fig. 2: Identifying Speed Sensor Components (Typical)
Courtesy of American Honda Motor Co., Inc.

Simulated High Speed Assist

1) Check fluid level and belt tension. Start and idle engine. Turn steering wheel from lock to lock to warm fluid. Stop engine. Disconnect hoses at speed sensor.

2) Connect By-Pass Tube Connector (07406-0010101) to hoses at speed sensor. See Fig. 3. This connects cut-off valve and control unit to reservoir hose, simulating speed sensor operation at more than 30 MPH.

3) Attach spring-tension scale to outer end of steering wheel spoke. With vehicle on clean, dry floor, start and idle engine. Pull on spring-tension scale until tires move.

4) If turning force is less than 11 lbs. (5.0 kg), speed sensor is okay. If turning force is greater than specification, check for a faulty speed sensor or sensor feed line restriction. Check power steering pump and steering gear for restrictions.

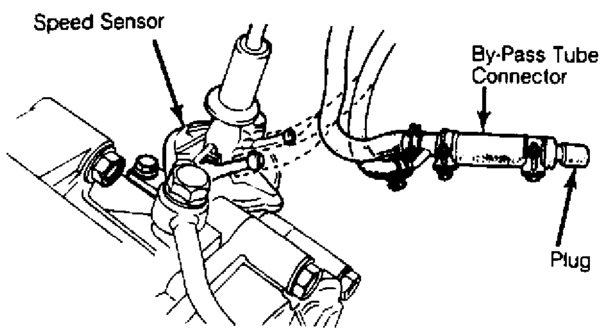

Fig. 3: Simulating High Speed Assist With By-Pass Tube Connector
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

POWER STEERING PUMP

Removal

Drain fluid. Disconnect inlet, outlet and return hoses at pump. Remove belt by loosening pump pivot and adjusting bolts. Remove pump retaining bolts and pump.

Installation

To install, reverse removal procedure. Adjust belt tension. Fill reservoir with new fluid. Bleed air from system. Check for leaks.

STEERING GEAR

Removal

1) Drain power steering fluid. Remove steering "U" joint from steering gear. Raise and support front of vehicle. Remove front wheels. Remove tie rod cotter pins. Partially loosen tie rod castle nuts. Using Ball Joint Remover (07941-6920002), disconnect tie rods from steering knuckles. Remove castle nuts and tie rods.

2) Remove center beam bolts and center beam. Disconnect oxygen sensor connector. Disconnect exhaust pipe at exhaust manifold. Remove steering gear splash guard. Clean steering gear and surrounding areas. Disconnect and plug fluid lines from control unit.

3) On A/T models, remove shift control cable from clamp. On all models, remove stabilizer bar. Disconnect left side tie rod end and slide tie rod completely to right. Slide unit to right until left tie rod clears frame. Lower unit and remove through left side wheel well.

Installation

To install, reverse removal procedure. Use new self-locking nuts if old nuts thread easily onto bolts. Use NEW exhaust pipe gaskets. Use NEW cotter pins when installing ball joints.

SPEED SENSOR

Removal

Remove speed sensor mounting bolts and pull speed sensor from transmission housing. Raise speedometer cable boot and remove retaining clip. Remove cable. Disconnect and plug speed sensor hoses and plug fittings.

Installation

To install, reverse removal procedure. After installing sensor, turn steering wheel from lock to lock several times with engine idling to bleed air from system. Check for leaks.

OVERHAUL

POWER STEERING PUMP FRONT SEAL

Disassembly

Remove pump from vehicle. See **POWER STEERING PUMP** under **REMOVAL & INSTALLATION**. Hold pulley using spanner wrench. Remove pulley nut and pulley. See Fig. 4. Loosen pump front cover bolts in a diagonal pattern. Remove cover. Using a screwdriver, pry out housing seal.

Reassembly

1) Ensure oil passage in front cover is clear. Using a 19-mm socket, install new oil seal. Install front cover bolts. Tighten bolts

diagonally to specification. See **TORQUE SPECIFICATIONS TABLE**. Install pulley. Tighten bolt to specification.

2) Turn pulley bolt using torque wrench to measure preload. Preload should be 71 INCH lbs. (8 N.m). Install and adjust belt. Add fluid. Bleed air from system. Check for leaks.

POWER STEERING PUMP

Disassembly

1) Remove pump from vehicle. See **POWER STEERING PUMP** under **REMOVAL & INSTALLATION**. Mount pump in vise. Hold pulley using spanner wrench. Remove bolt. If pulley is damaged, separate pulley from hub. Loosen front cover (flange) bolts. See Fig. 4. Remove cover. Pry oil seal from front cover.

2) Remove flow control valve from pump housing. Remove inlet joint, pump cover and "O" ring. Remove pump cam ring from housing. Remove pump rotor and vanes. Remove 2 rollers from side plate. Remove side plate and preload springs. Remove pump hosing "O" rings, circlip and driveshaft. Remove seal spacer, seal and pump shaft bearing.

NOTE: Replace power steering pump as an assembly if damage or excessive wear exist on pump hosing, side plate, rotor, vanes or pump cam ring,

Inspection

1) Ensure oil passage in front cover is clear. Inspect control valve and filter. Check control valve for wear, burrs or damage to edges of groove. Slip control valve into bore and check for smooth movement. Replace valve (if necessary).

2) Pressure check control valve. Attach a hose to hexagonal side of control valve. Submerge valve in Honda power steering fluid. Using no more than 14.2 psi (1 kg/cm^2), blow into hose and check for leakage.

3) If leak is found, disassemble and clean valve. Replace any shims found during disassembly. Retest for leakage. Replace valve if leak persists. Note if valve has an identification mark to determine correct replacement valve.

Reassembly

1) To reassemble, reverse disassembly procedure. Lubricate all "O" rings and seals before installing.

2) Lubricate gears and shafts with power steering fluid. Install front cover. Tighten front cover bolts diagonally. Using a 19-mm socket, install seal into front cover.

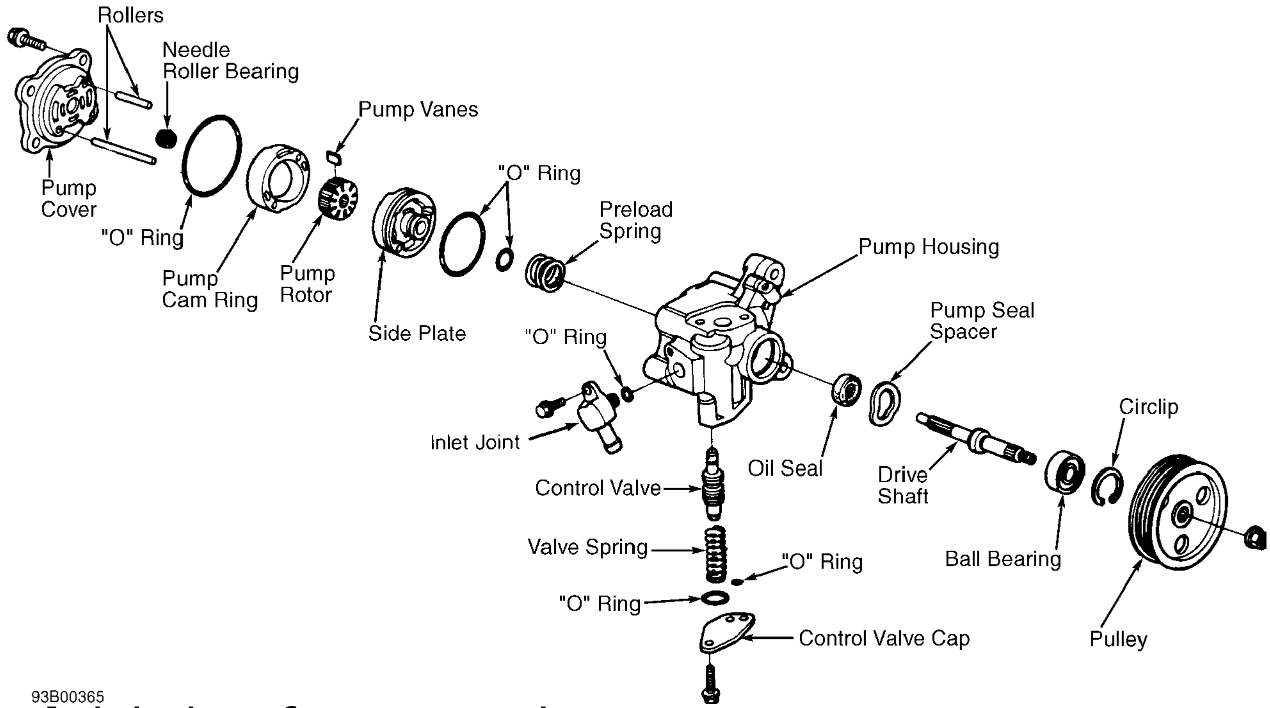

Fig. 4: Exploded View Of Power Steering Pump
Courtesy of American Honda Motor Co., Inc.

STEERING GEAR

Disassembly

1) Remove valve body from gear housing. SeeFig. 1. Loosen dust boot clamps. Pull dust boots away from cylinder barrel. Bend back tie rod lock washer tabs. Remove tie rod from rack.

2) Push rack into cylinder to protect rack from scratching. Loosen guide screw lock nut. Remove guide screw, spring and rack guide. Remove 4 pinion dust seal cap bolts.

3) Remove pinion dust seal cap (gear housing cap). Remove 28-mm snap ring from bottom of housing. Working from top of pinion (shaft), use a drift and mallet and lightly tap pinion from housing.

4) Remove snap ring from pinion. Using a bearing puller, remove bearing from pinion. Remove 4 cylinder housing-to-gear housing bolts. Remove cylinder housing, rack bushing and spring from housing. Pry out cylinder end seal.

5) Remove cylinder barrel, seal retainer, cylinder cap and steering rack from housing. Remove "O" ring and retainer washer from gear housing. Remove snap ring. Remove pinion holder and bearing from gear housing.

6) Remove cylinder barrel and seal retainer from steering rack. Remove "O" ring, snap ring and cylinder cap from seal retainer. Remove "O" rings from cylinder cap.

NOTE: Back-up rings in seal retainer are color coded. Always

replace with correct color code.

7) Remove rack bushing "B", back-up ring and end seal from seal retainer. Using a small screwdriver, carefully pry piston seal ring from steering rack. Remove "O" ring from steering rack.

Inspection

Check pinion holder and bearing for excessive play. Replace as necessary. Inspect needle bearings in gear housing for damage. If needle bearings are damaged, replace steering gear assembly.

Reassembly

Grease bearings and sliding surfaces before reassembly. Install pinion holder into housing. Install snap ring with tapered side facing out away from housing. Align snap ring ends with flat part of pinion holder. Adjust rack guide. See PINION ROTATING FORCE & RACK SLIDING FORCE under ADJUSTMENTS.

VALVE BODY UNIT

Disassembly

1) Remove 2 valve body-to-gear housing bolts. Remove "O" rings and port orifices from gear housing. Remove pinion shaft dust seal from valve body. See Fig. 5.

2) Remove 2 valve body cap flange bolts. Remove valve port and seal from side of valve body. Pull cut-off valve and spring from valve body. Remove valve body cap, cap seal and dowels from valve body.

3) Pushing reaction control valve to one side of valve body, remove roller from reaction control valve. Repeat procedure on other side of valve body to remove opposite roller. Remove control valve seal.

NOTE: Hold plungers with fingers to keep plungers from falling out when removing rollers.

4) Remove sensor orifice and "O" ring from valve body. Using a 1/16" drill bit filed flat on shank end, pry orifice from valve body.

5) Using same drill bit used for orifice, insert bit through valve body and push out damping orifice and "O" ring from behind.

Inspection

1) Check cut-off valve for signs of scratching and/or scoring. Insert cut-off valve into valve body, and ensure it slides smoothly in and out. If valve body is damaged, replace valve body and cut-off valve as a unit.

NOTE: Cut-off valve, control valve and plungers are sized to fit valve body. If any of these need replacement, ensure new part has same identification letter.

2) Inspect plungers for scoring or scratching. Insert plungers into valve body and check for smooth operation. Replace any damaged plunger. If valve body is damaged, replace valve body as a unit.

3) Check control valve for scoring or scratches. Insert reaction control valve into valve body and check for smooth operation. If valve body is damaged, replace valve body as a unit.

Reassembly

1) Clean all parts before reassembly. Coat plungers, cut-off valve and control valve with Honda power steering fluid. Replace "O" rings and seals.

2) Grease cap seal and port seal grooves to hold seals in place during reassembly. Use grease to hold "O" rings in place during reassembly. To complete reassembly, reverse disassembly procedure.

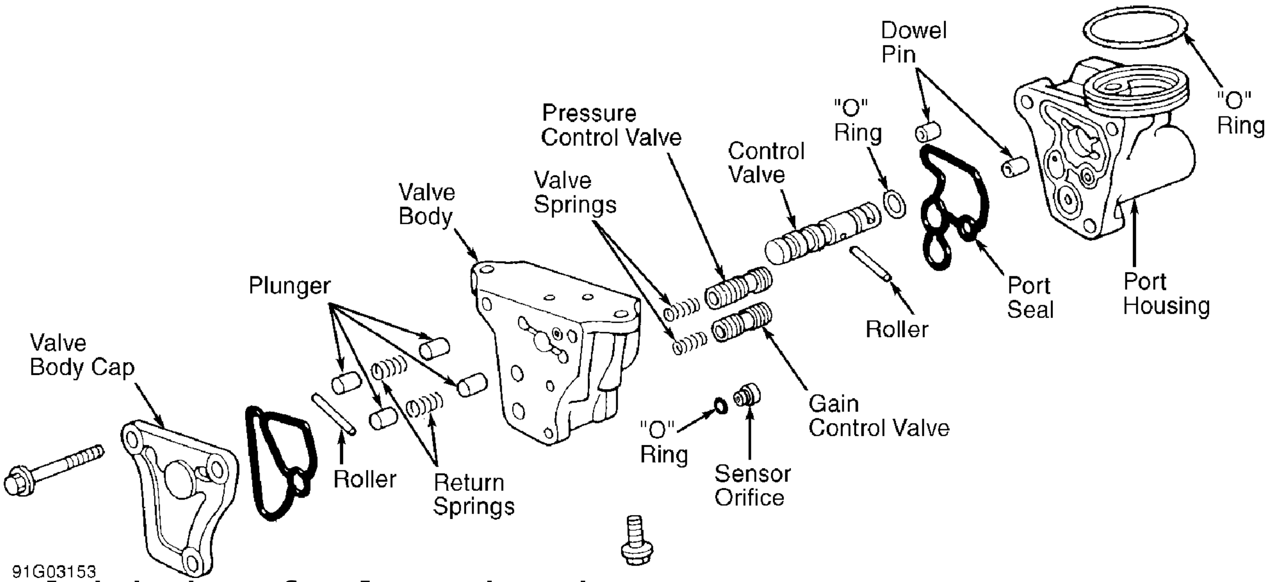

Fig. 5: Exploded View Of Valve Body Unit
Courtesy of American Honda Motor Co., Inc.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Cylinder Rack-To-Gear Housing Bolt	16 (22)
Hydraulic Fittings	

14-mm	28 (38)
17-mm	20 (27)
Pump Pulley Nut	48 (65)
Pump-To-Bracket Bolt	33 (45)
Speed Sensor Mounting Bolts	13 (18)
Steering Gear Mounting Bolts	29 (39)
Tie Rod End Nuts	33 (45)
Tie Rod-To-Rack	41 (55)
	INCH Lbs. (N.m)
All 6-mm Bolts	89 (10)
Hydraulic Fittings (12-mm)	106 (12)
Pump Front Cover Bolt	106 (12)

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END OF ARTICLE

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ARTICLE BEGINNING

1986-94 ACCESSORIES/SAFETY EQUIPMENT
Honda Power Sun Roof

Prelude

DESCRIPTION & OPERATION

Power sun roof is operated with ignition switch in ON position. Prelude is equipped with a steel sun roof. Sun roof slides rearward. Prelude uses a permanent magnet type motor to operative a cable drive to open and close sun roof. If sun roof power drive fails, sun roof can be operated manually by using a socket inserted through access hole near drive motor.

ADJUSTMENTS

CABLE DRIVE CLUTCH

Information not available from manufacturer.

SUN ROOF HEIGHT

Roof panel should be even with sun roof panel seal within 0. 06-0.09" (1.4-2.4 mm). See Fig. 1. If adjustment is required, remove sun roof inner liner. Remove sun roof panel mounting nuts. Install or remove shims between sun roof panel and panel bracket.

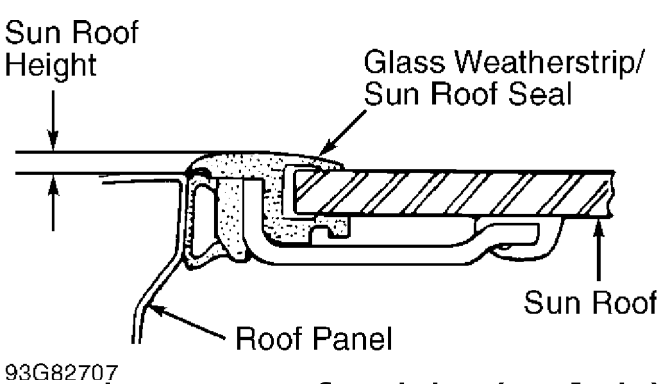

Fig. 1: Measuring Sun roof Height (Prelude)
Courtesy of American Honda Motor Co., Inc.

WIND DEFLECTOR

Open sun roof. Pry rail covers off both sides. Loosen mounting nuts. Adjust wind deflector forward or backward so deflector seal touches roof panel evenly across entire front edge. Measure wind

deflector height from top edge of deflector to roof panel at center of deflector. Deflector arm cannot be adjusted. If arm or deflector is damaged, replace wind deflector assembly.

MAINTENANCE

DRAIN TUBES

Periodically, pour a small amount of water into drain rails at edges of sun roof to ensure drain tubes remain clear. Water should drop from drain tubes at rear of right front and left rear wheel wells.

LUBRICATION

Periodic lubrication is not required. When components are removed for repair or replacement, apply multipurpose grease lightly to all moving parts, except cables. Use molybdenum grease on cable assemblies.

TROUBLE SHOOTING

CAUTION: Prelude is equipped with Supplemental Restraint System (SRS). SRS wiring harness is routed close to instrument cluster, steering wheel, and related components. All SRS wiring harnesses are covered by Yellow outer insulation. DO NOT use electrical test equipment on these circuits. Before working on steering column components, disable air bag system. See **AIR BAG RESTRAINT SYSTEM** article in ACCESSORIES & EQUIPMENT.

NOTE: Ensure all component terminals and ground connections are clean and tight. Check possible faults in order listed. Repair or replace components and circuits as necessary.

SUN ROOF DOES NOT MOVE, MOTOR RUNS

Clutch out of adjustment. Foreign matter jammed in guide. Outer cable not properly attached.

SUN ROOF DOES NOT MOVE, MOTOR DOES NOT RUN (ANY SWITCH)

Blown fuse No. 37 (40-amp) in underhood fuse/relay box. Blown fuse No. 7 (30-amp) or fuse No. 17 (30-amp) fuse in dash fuse box. Power window relay. Faulty sun roof motor. Open in White/Blue, Black/Yellow, Green/Yellow or Green/Red wire.

SUN ROOF DOES NOT MOVE, MOTOR DOES NOT RUN (OPEN SWITCH)

Faulty opening relay. Faulty closing relay. Faulty sun roof switch. Open in Green/Yellow or Green/Red wire.

SUN ROOF DOES NOT MOVE, MOTOR DOES NOT RUn (CLOSE SWITCH)

Faulty closing relay. Faulty opening relay. Faulty sun roof switch. Open in Green/Red or Green/Yellow wire.

TESTING

FUNCTION TEST

NOTE: Function test for Prelude is not available from manufacturer.

MOTOR TEST

Remove high mount brake light cover. Remove headliner. Unplug 2-pin connector from the motor. Using jumper wires, connect connector terminals to battery voltage and ground. Check for motor operation. Reverse jumper wires and retest. Replace motor if it does not operation in both directions.

RELAY TEST

NOTE: Sun roof system is equipped with separate relays for opening and closing functions.

Remove sun roof relay from dash fuse/relay box. Test continuity with an ohmmeter. Continuity should exist between terminals "B" and "C". See Fig. 2. Using jumper wires, connect terminals "D" and "E" to battery voltage and ground. If continuity does not exist between terminals "A" and "C", replace relay.

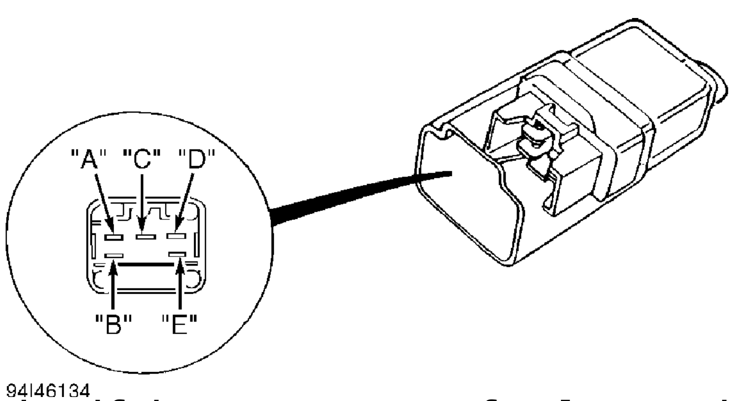

Fig. 2: Identifying Power Sun Roof Relay Terminals
Courtesy of American Honda Motor Co., Inc.

SWITCH TEST

Carefully remove sun roof switch from instrument panel. See SWITCH under REMOVAL & INSTALLATION. Using an ohmmeter, check resistance of switch terminals with switch in indicated positions. If continuity is not as specified, replace switch. SeeFig. 3.

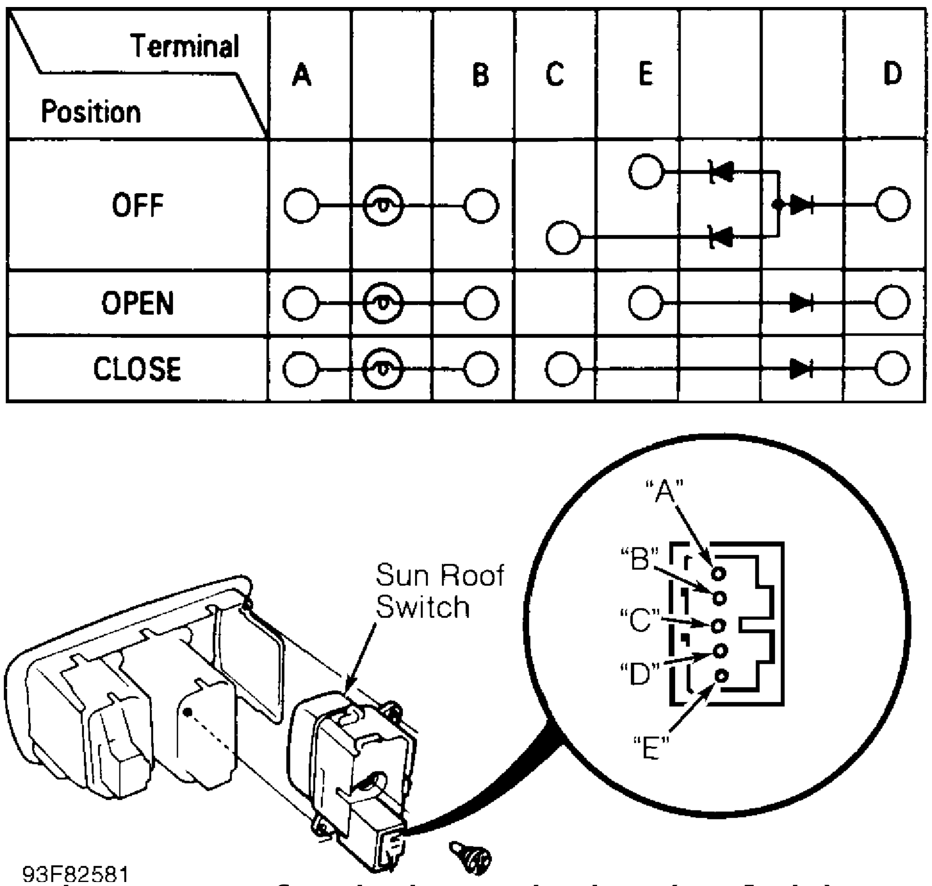

Fig. 3: Testing Sun Roof Switch Continuity (Prelude)
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

DRIVE CABLES

Removal & Installation

Remove sun roof frame and sun roof. See SUN ROOF. Remove rear drain channel and rear rail holder. Remove motor. Remove guide rail mounting nuts. Lift off guide rails. Remove outer cable assembly. Slide cable stay to rear and remove from guide rails. Remove lifter from inner cable end. Separate panel stay, lifter, slide stopper link and guide. Remove inner cable assembly. SeeFig. 4. To install, reverse removal procedure.

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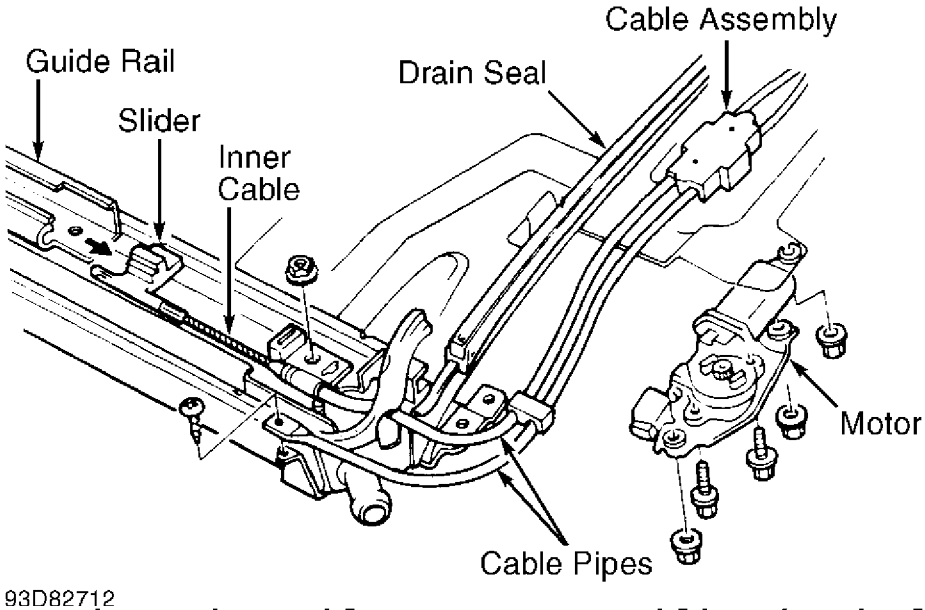

Fig. 4: Removing Drive Cable & Motor Assemblies (Typical)
Courtesy of American Honda Motor Co., Inc.

DRIVE MOTOR

Removal & Installation

Remove headliner. See HEADLINER. Unplug motor harness connector. Remove mounting bolts and nuts. Remove motor. To install, reverse removal procedure.

HEADLINER

NOTE: Headliner removal and installation is similar. It is not necessary to remove all listed components. Remove only components necessary to provide needed clearance.

Removal & Installation

Remove sun visors, dome light, rear view mirror, pillar trim and grab handles. Remove rear seat and front passenger's seat. Recline driver's seat fully. Remove retaining clips. DO NOT bend headliner, remove headliner starting at right rear corner. To install, reverse removal procedure.

SUN ROOF

Removal & Installation

Remove front roof trim. Align position "A" of frame to mounting screw. See Fig. 5. Remove mounting screws and clips. Slide sun roof slightly forward. Taking care not scratch sun roof liner, slide from under sun roof and remove it. Remove mounting screws from panel brackets on both sides. Lift up and remove sun roof panel. To

install, reverse removal procedure.

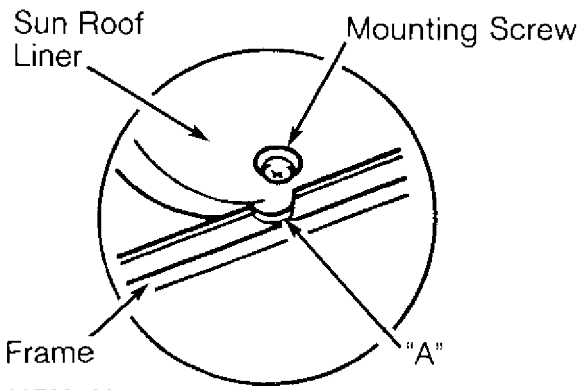

Fig. 5: Removing Sun Roof (Prelude)
Courtesy of American Honda Motor Co., Inc.

SWITCH

Removal & Installation

Carefully pry switch panel from instrument panel. Unplug connectors from switches. Remove retaining screws (if equipped) and separate switch from panel. To install, reverse removal procedure.

WIND DEFLECTOR

Removal & Installation

Open sun roof fully. Pry up rail cover and rail holder cover. Remove sun shade rail stopper and link stopper. Remove wind deflector retaining nuts and remove wind deflector. To install, reverse removal procedure. Adjust wind deflector. See WIND DEFLECTOR under ADJUSTMENTS.

WIRING DIAGRAM

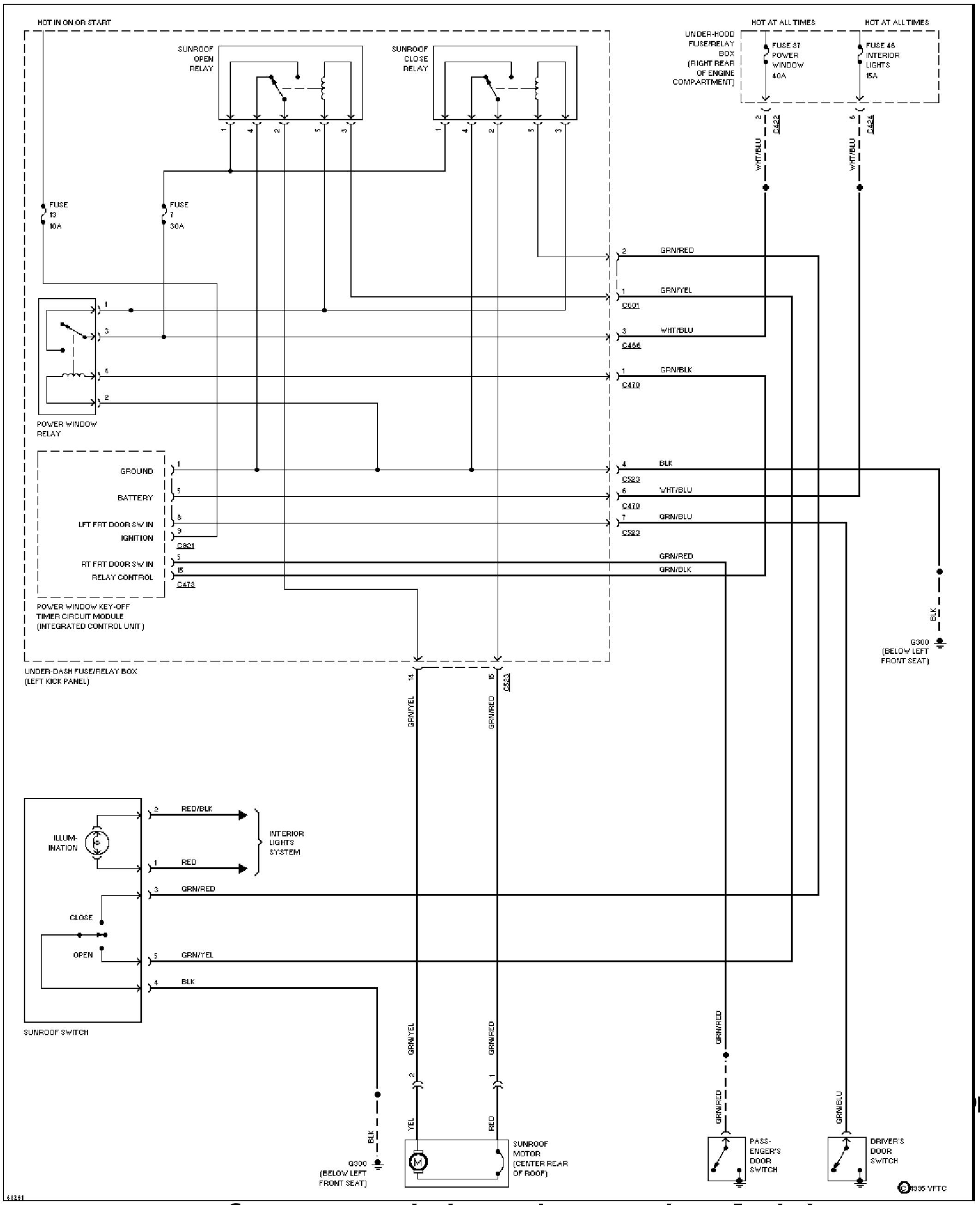

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Fig. 6: Power Sun Roof System Wiring Diagram (Prelude)

END OF ARTICLE

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ARTICLE BEGINNING

1993 SUSPENSION
Honda - Front Suspension

Prelude

DESCRIPTION

Prelude uses an independent, double wish-bone, strut type suspension. The coil-over strut assembly is attached to the steering knuckle through the lower control arm. See Fig. 1. The steering knuckle is attached to upper and lower control arms by ball joints. A stabilizer bar and strut rod are attached to the lower control arm.

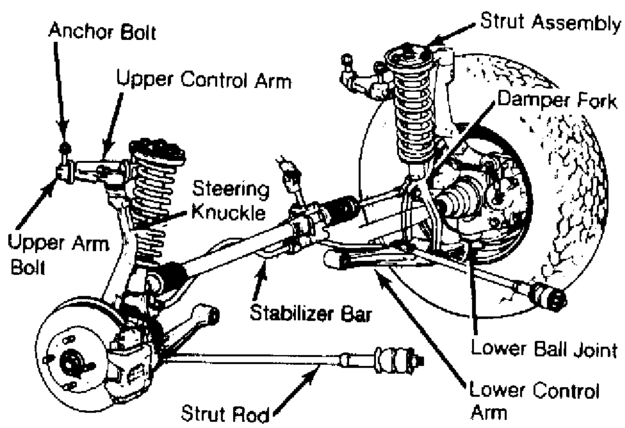

Fig. 1: Identifying Front Suspension Components (Typical)
Courtesy of American Honda Motor Co., Inc.

ADJUSTMENTS & INSPECTION

WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURES

NOTE: See **WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURES** article in **WHEEL ALIGNMENT** section.

WHEEL BEARING

Inspection

1) Wheel bearings require no adjustment. Bearings should be checked for excessive movement. Support vehicle, and remove wheel.

2) Install dial indicator with stem positioned on front hub surface. Move hub assembly inward. Note reading. Movement should be 0-.002" (0-.05 mm). If movement is not as specified, replace bearing. See **WHEEL BEARING** under **REMOVAL & INSTALLATION**.

REMOVAL & INSTALLATION

HUB & KNUCKLE ASSEMBLY

Removal

1) Loosen lug nuts with vehicle weight on tires. Pry lock tab away from spindle nut, and loosen nut. Raise and support vehicle. Remove lug nuts and spindle nut. Remove wheel assembly. Remove caliper assembly, and support it aside.

2) Remove brake disc retaining screws. Install two 8 x 12-mm bolts in brake disc, and tighten bolts to force brake disc from hub. Alternate tightening of bolts to prevent brake disc from binding on hub. Remove cotter pin and nut from tie rod end.

3) Using Ball Joint Remover (07MAC-SL00200), separate tie rod ball joint and lift tie rod end out of knuckle. Remove cotter pin from lower control arm ball joint, and loosen castle nut half length of joint threads. Using ball joint separator, separate lower ball joint from control arm.

4) Remove upper ball joint shield. SeeFig. 2. Remove cotter pin and upper ball joint stud nut. Using ball joint remover, separate ball joint from steering knuckle. Remove steering hub/knuckle assembly from axle shaft.

Installation

To install hub/knuckle, reverse removal procedure. Tighten bolts and nuts to specification. Use NEW spindle nut, and stake it after tightening. See TORQUE SPECIFICATIONS TABLE.

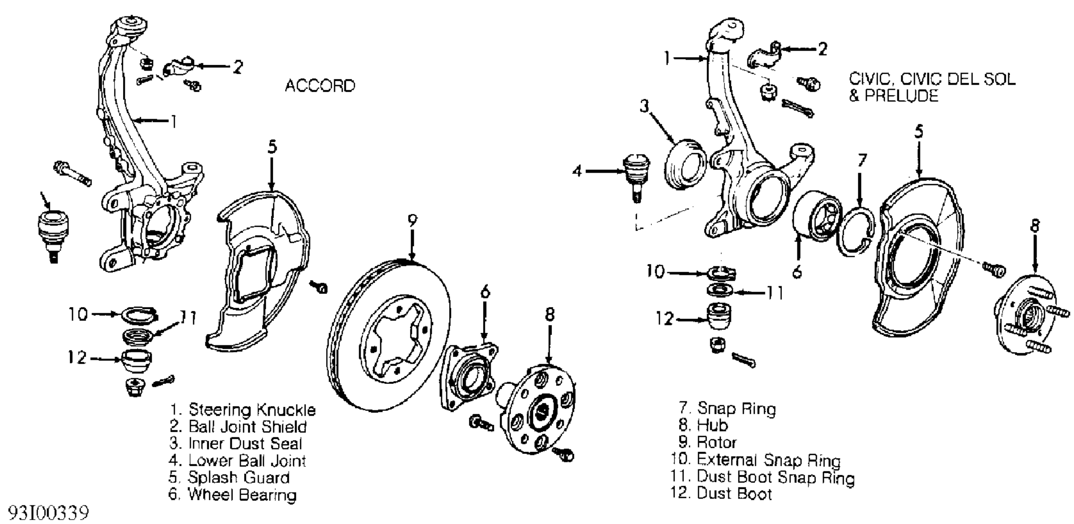

Fig. 2: Exploded View Of Steering Knuckle
Courtesy of American Honda Motor Co., Inc.

LOWER CONTROL ARM & BALL JOINT

Removal & Installation

Information is not available.

UPPER BALL JOINT

Removal & Installation

Information is not available.

UPPER CONTROL ARM

Inspection

Raise and support front of vehicle. Remove wheel assembly. Rock upper ball joint front to back. Upper control arm assembly must be replaced if play exists in bushings.

Removal

1) Raise and support front of vehicle. Remove wheel assembly. Remove cotter pin and nut from upper ball joint stud.

2) Using ball joint remover, separate upper ball joint from steering knuckle. Remove upper control arm anchor bolts-to-body retaining nuts. See Fig. 3. Remove upper control arm. Clamp each upper arm anchor bolt in a vise. Remove upper arm bushings.

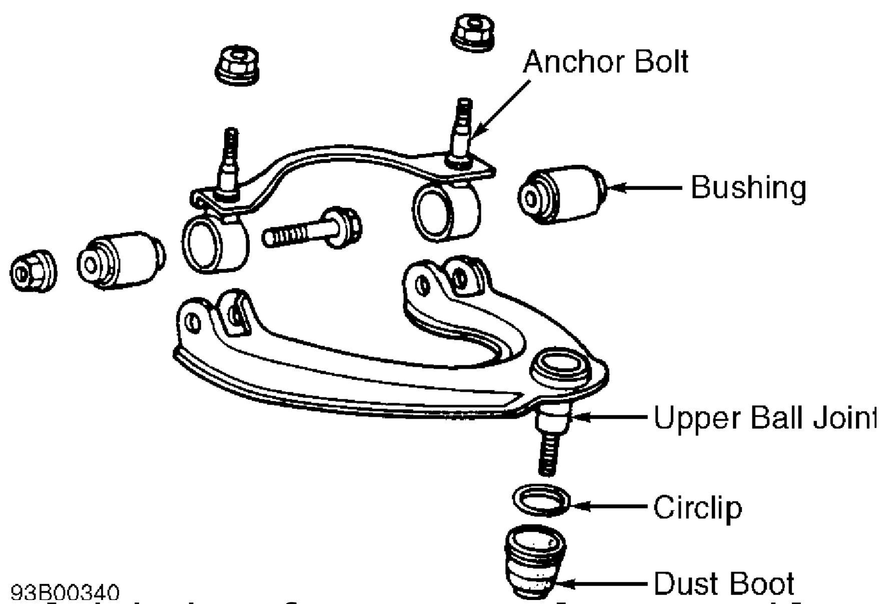

Fig. 3: Exploded View Of Upper Control Arm Assembly
Courtesy of American Honda Motor Co., Inc.

STRUT ASSEMBLY

Removal

Raise and support front of vehicle. Remove wheel assembly and brake hose clamp from strut. Remove strut-to-fork self-locking pinch bolt and strut fork bolt. Remove strut fork assembly. Remove cap and nuts from top of strut. Remove strut assembly.

WARNING: Strut contains pressurized nitrogen gas. To dispose of properly, drill a 5/64" (2.0 mm) hole at base of strut. Always wear eye protection when drilling.

Disassembly

Using a spring compressor, compress spring slightly to remove spring tension. Hold strut rod using an Allen wrench and remove nut retaining spring seat and mounting base. Slowly release spring compressor and lift spring off. Disassemble strut assembly, noting relative position of assembled parts. See Fig. 4.

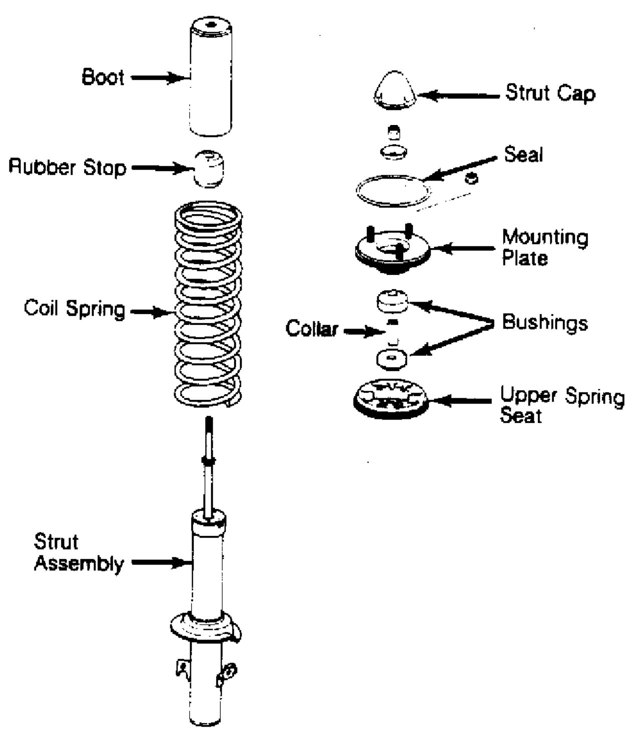

Fig. 4: Exploded View Of Strut Assembly (Typical)
Courtesy of American Honda Motor Co., Inc.

Reassembly

Check parts for cracks, deterioration and damage. Check shock absorber for leaks and improper operation. Replace strut if resistance is weak, uneven or jerky when strut is compressed. Replace worn or damaged parts. Position mounting base with one stud aligned with tab on strut housing. To complete reassembly, reverse disassembly procedure.

Installation

1) Install strut fork on lower control arm. Position strut assembly so tab on strut housing aligns with slot in fork. Align upper strut studs with strut tower holes. Place jack under knuckle, and raise it until vehicle just lifts off safety stands.

NOTE: Strut mount base nuts must be tightened with vehicle weight on strut.

2) Install upper strut mount nuts. Tighten strut assembly while strut is under load. Reverse removal procedure to complete installation. Tighten nuts and bolts to specification. See TORQUE SPECIFICATIONS TABLE.

WHEEL BEARING

Removal

1) Remove steering knuckle. See HUB & KNUCKLE ASSEMBLY. Remove splash guard. Using Front Hub Remover/Installer (07GAF-SE0100), press hub from steering knuckle. Remove bearing retaining snap ring and knuckle ring from knuckle. Press bearing out of knuckle.

2) Using bearing puller, remove outboard bearing from hub. Clean knuckle and hub thoroughly before reassembly.

Installation

Press new bearing into knuckle. DO NOT exceed 4000 lbs. (1814 kg) pressure. Install snap ring in knuckle groove. Install splash guard, and invert knuckle. Using press, install knuckle/bearing assembly onto hub. See Fig. 5. DO NOT exceed 4000 lbs. (1814 kg) pressure. To complete installation, reverse removal procedure.

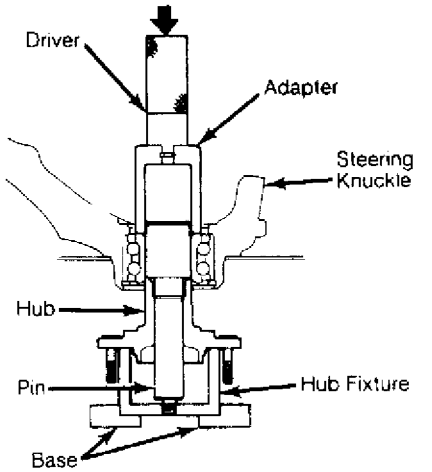

Fig. 5: Pressing Knuckle/Bearing Assembly Onto Hub
Courtesy of American Honda Motor Co., Inc.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Ft. Lbs. (N.m)
Ball Joint Nut	
Lower	37-44 (50-60)
Upper	40-48 (30-35)
Brake Caliper Mounting Bolt	81 (110)
Lower Control Arm Pivot Bolt	40 (54)
Spindle Nut	184 (250)
Stabilizer Bar Mounting Bolts	16 (22)
Strut Assembly Shaft Nut	22 (30)
Strut Fork Pinch Bolt	33 (45)
Strut Fork-To-Control Arm Nut	48 (65)
Tie Rod Lock Nut	32 (44)
Upper Control Arm Anchor Bolt Nut	48 (65)
Upper Control Arm Bushing Bolt (2)	22 (30)
Upper Strut Mounting Nut	29 (39)
Wheel Lug Nut	81 (110)
	INCH Lbs. (N.m)
Ball Joint Shield Bolt	89 (10.0)
Brake Line Clamp Bolt	89 (10)

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ARTICLE BEGINNING

1993 SUSPENSION
Honda - Rear Suspension

Prelude

DESCRIPTION

Prelude uses an independent strut type suspension. Suspension consists of a vertically-mounted strut, trailing arm, upper and lower control arms, knuckle, stabilizer bar and hub assembly. SeeFig. 1.

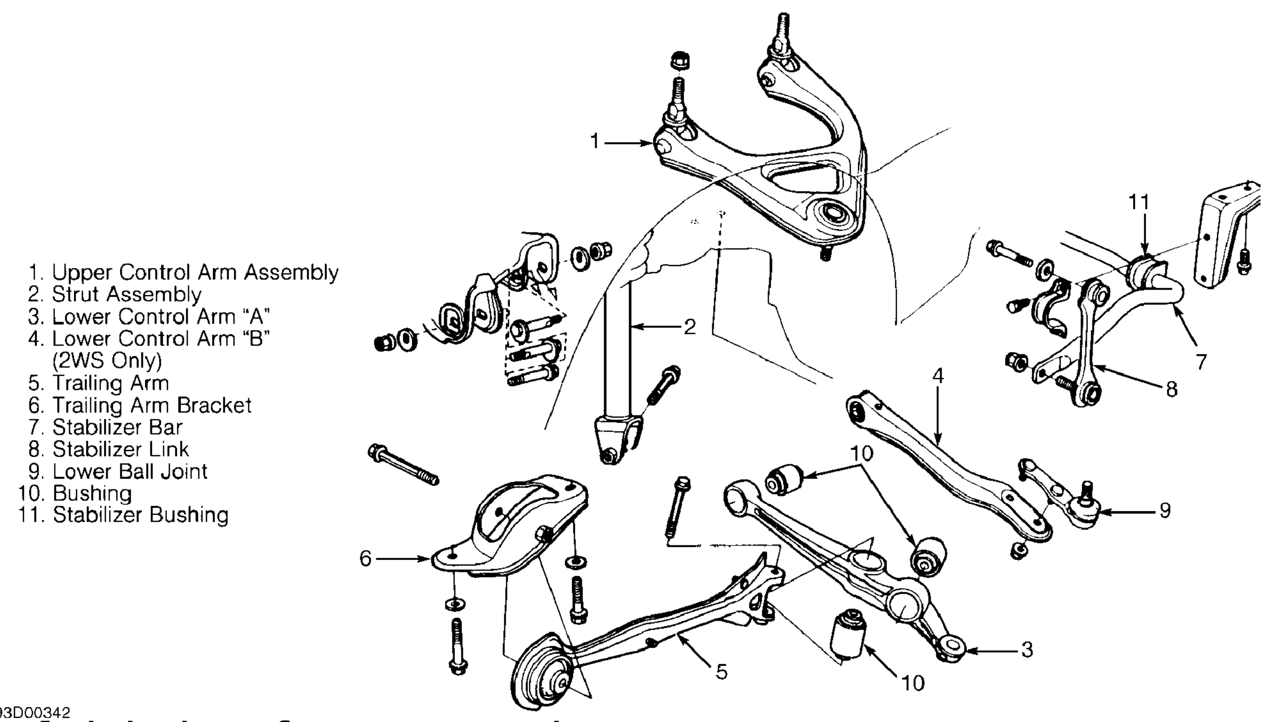

Fig. 1: Exploded View Of Rear Suspension
Courtesy of American Honda Motor Co., Inc.

ADJUSTMENTS & INSPECTION

WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURES

NOTE: See WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURESarticle in WHEEL ALIGNMENT.

WHEEL BEARING

Wheel bearings are not adjustable.

REMOVAL & INSTALLATION

CAUTION: Use NEW self-locking bolts if nut can be threaded easily past nylon locking area. Use NEW self-locking nuts any time one is removed. When tightening retaining bolts used on parts containing rubber mounting bushings, ensure vehicle weight is supported on strut assembly.

HUB & KNUCKLE ASSEMBLY

Removal

1) Raise and support vehicle. Remove lug nuts. Remove wheel assembly. Remove brake hose clamp. Remove caliper assembly, and wire it aside.

2) Remove two 6-mm disc retaining screws. Install two 8 x 12-mm bolts in brake disc, and tighten bolts to force brake disc from hub. Alternate tightening of bolts to prevent brake disc from binding on hub. Remove spindle nut and washer. Remove hub. Remove splash guard. Remove brake hose clamp. Remove speed sensor from knuckle, but DO NOT disconnect wire.

3) Remove spindle assembly from knuckle. Disconnect stabilizer bar from knuckle. Remove cotter pin, and loosen ball joint nut from lower control arm "B" (2-wheel steering) or tie rod end (4-wheel steering). See Fig. 2. Using ball joint separator, separate joint from knuckle. Remove cotter pin and nut from lower ball joint stud.

4) Using ball joint separator, separate lower ball joint from control arm. Remove upper ball joint cotter pin and nut. Using ball joint remover, separate ball joint from knuckle. Remove knuckle from vehicle.

Installation

To install, reverse removal procedure. Tighten bolts to specification. See TORQUE SPECIFICATIONS TABLE. Use NEW spindle nut, and stake it after tightening it to specification. Replace self-locking bolt if nut can be easily threaded past nylon lock area.

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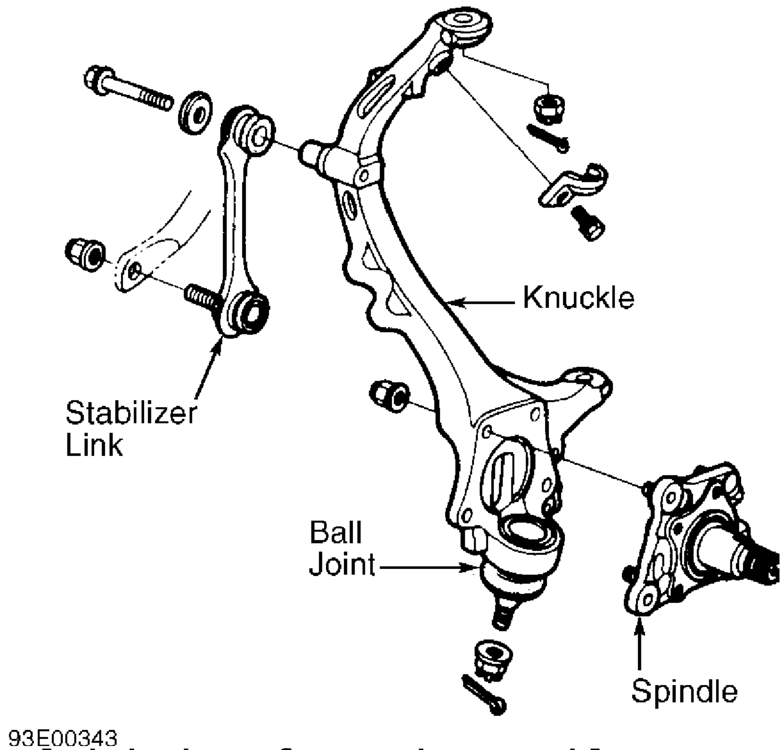

Fig. 2: Exploded View Of Steering Knuckle
Courtesy of American Honda Motor Co., Inc.

LOWER BALL JOINT

NOTE: **Lower ball joint removal information for (4WS) is not available from manufacturer.**

Removal & Installation (2WS)

Raise and support vehicle. Remove wheel assembly. Remove cotter pin and nut from lower ball joint. Using ball joint separator, separate ball joint from knuckle. Remove bolts securing ball joint to lower control arm "B". Remove lower ball joint. To install, reverse removal procedure.

STRUT ASSEMBLY

Removal

1) Lift carpet in luggage compartment, and remove 2 upper strut mounting base nuts. Raise and support vehicle. Remove wheel assembly. Remove brake hose clamp from strut. If necessary, remove speed sensor wire bracket. DO NOT remove speed sensor.

2) Remove upper ball joint shield. Remove cotter pin and upper ball joint nut. Using ball joint separator, separate ball joint from knuckle. Remove lower strut mounting bolt at lower control arm. Lower suspension, and remove strut assembly.

WARNING: Strut contains pressurized nitrogen gas. To properly dispose of strut, drill a 5/64" (2.0 mm) hole at base of strut. Always wear eye protection when drilling.

Disassembly

Note position of strut upper mounting studs for reassembly reference. Using spring compressor, compress strut assembly spring. DO NOT compress more than required to remove strut shaft nut. Remove strut shaft nut. Slowly release spring compressor. Disassemble strut assembly, noting location of components for reassembly reference. See Fig. 3.

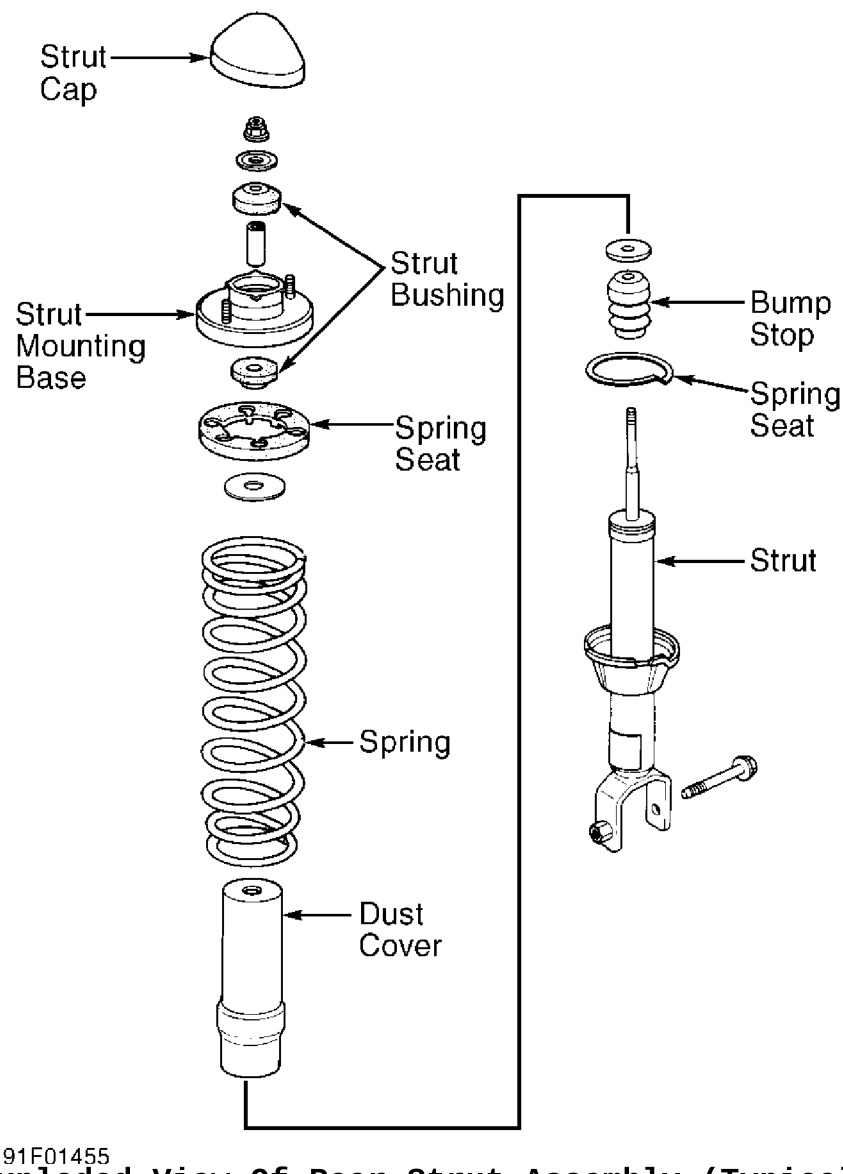

Fig. 3: Exploded View Of Rear Strut Assembly (Typical)
Courtesy of American Honda Motor Co., Inc.

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Inspection & Reassembly

Check for weak spring tension. Inspect components for deterioration and damage. Strut assembly must be replaced if rod does not move smoothly through full travel or signs of oil leakage exist. Replace worn or damaged components. To assemble, reverse disassembly procedure. Install NEW strut shaft nut. Tighten nut to specification. See appropriate TORQUE SPECIFICATIONS TABLE.

Installation

1) Lower rear suspension, and place strut assembly in its original position. Loosely install lower strut mounting bolt. Loosely install upper strut mounting nuts.

2) Raise rear suspension so strut assembly supports vehicle weight. Loosely install strut mounting. Reverse removal procedure for remaining components. Raise rear suspension until weight of car is on strut. Tighten bolts to specification. Install strut cap (if equipped).

NOTE: Ensure vehicle weight is supported on strut assembly before tightening lower strut mounting bolt to specification.

UPPER BALL JOINT

NOTE: Upper ball joint removal information is not available from manufacturer.

WHEEL BEARING

Removal & Installation

1) Raise and support vehicle. Remove wheel assembly and brake drum or rotor. See REAR BRAKE ROTOR or BRAKE DRUM under REMOVAL & INSTALLATION in BRAKE SYSTEM article in BRAKES section. Remove hub cap, nut, washer and hub bearing assembly. Replace hub and bearing assembly as a unit.

2) To install, reverse removal procedure using new hub retaining nut. Tighten nut to specification. See appropriate TORQUE SPECIFICATIONS table. Stake hub retaining nut against spindle.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

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Application	Ft. Lbs. (N.m)
Brake Line Clamp Bolts	16 (22)
Lower Ball Joint Nut	37-44 (50-60)
Lower Control Arm Pivot Bolt	

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2WS	61 (83)
4WS	48 (65)
Spindle Nut	136 (185)
Stabilizer Bar Mounting Bolts	16 (22)
Strut Assembly Lower Mounting Bolt	48 (65)
Strut Shaft Nut	22 (30)
Tie Rod Ball Joint Nut	37-44 (50-60)
Upper Control Arm Bracket	57 (77)
Wheel Lug Nuts	81 (110)

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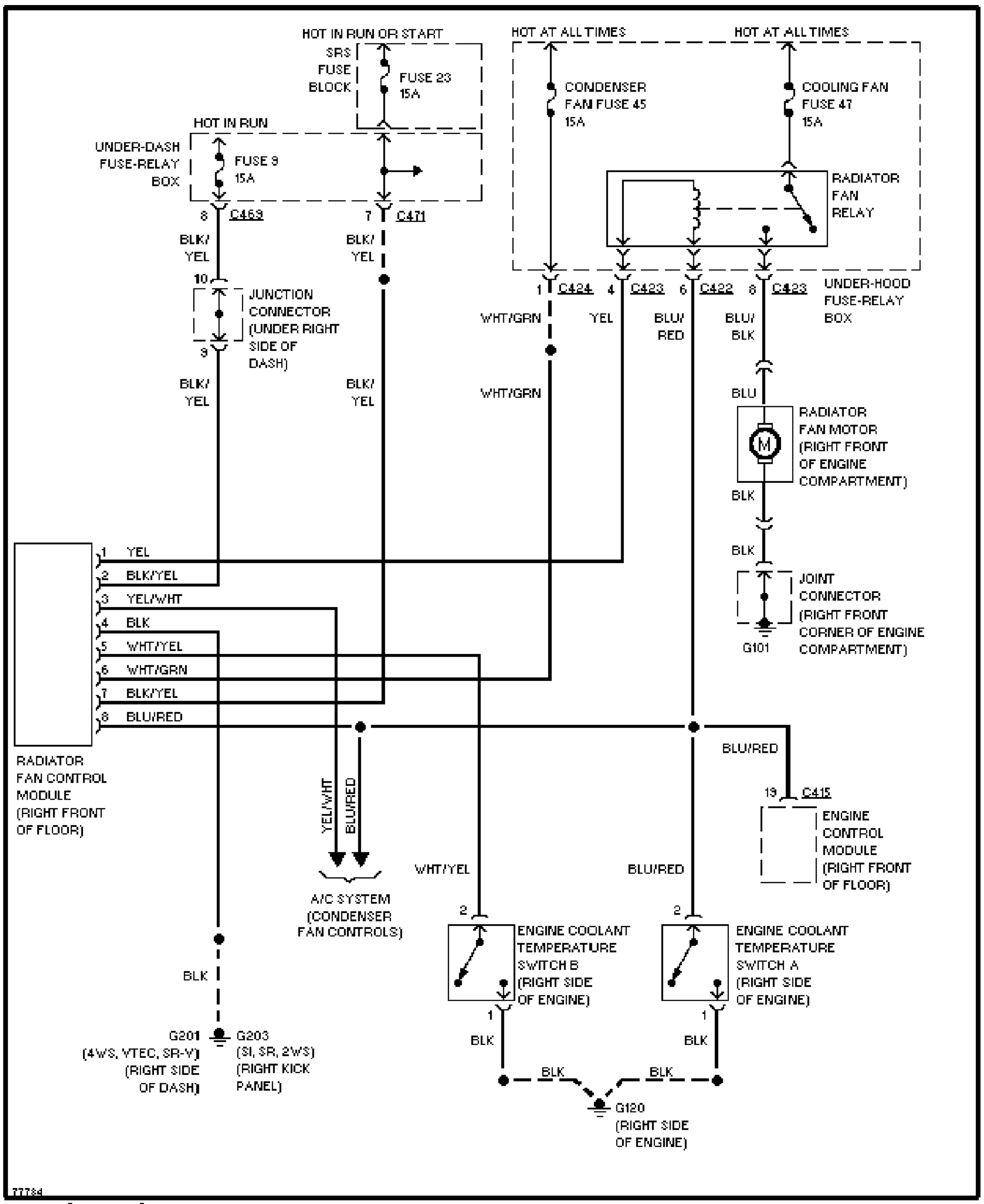
ARTICLE BEGINNING

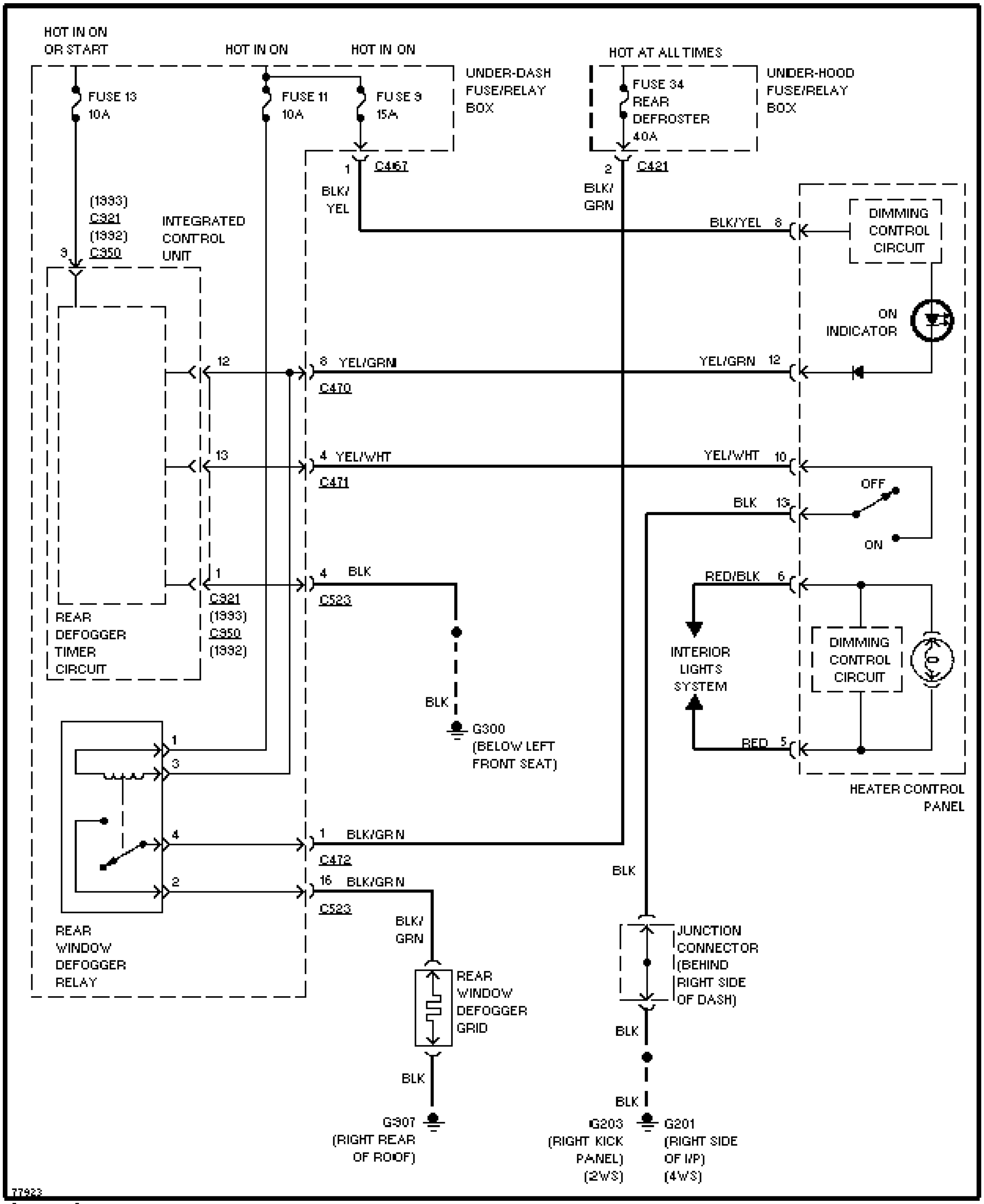
1993 System Wiring Diagrams
Honda - Prelude

COOLING FAN

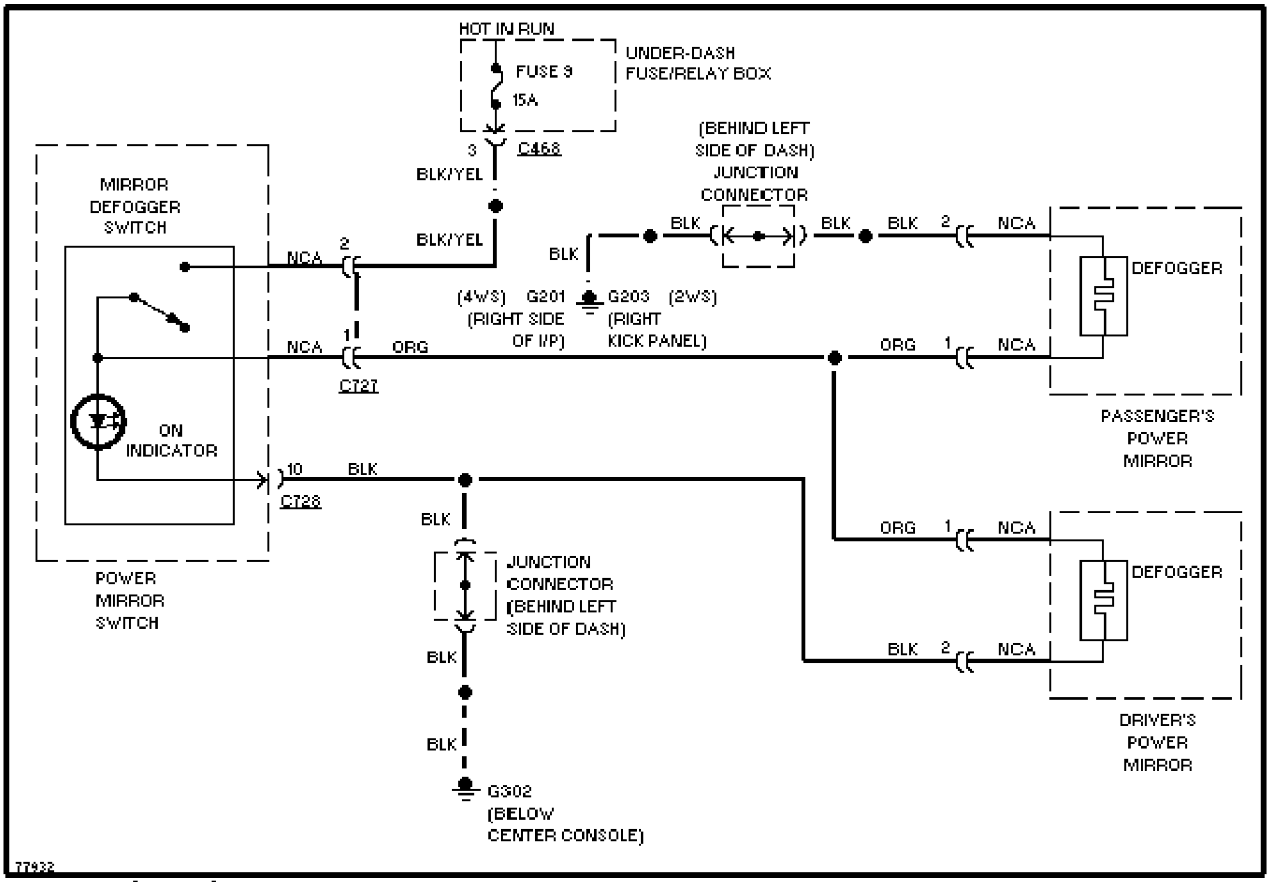


Cooling Fan Circuit

DEFOGGERS



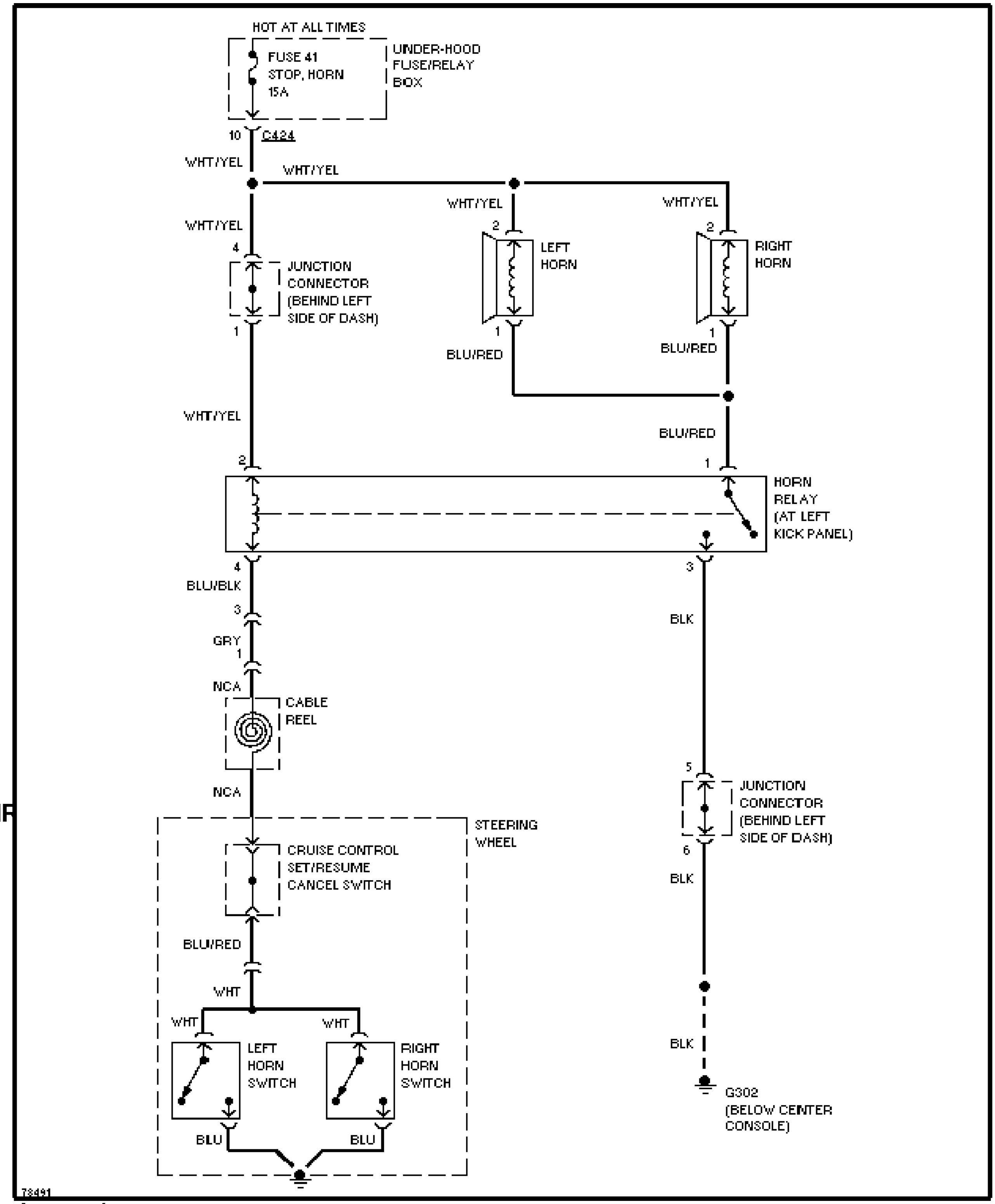
Defogger Circuit



Heated Mirrors Circuit

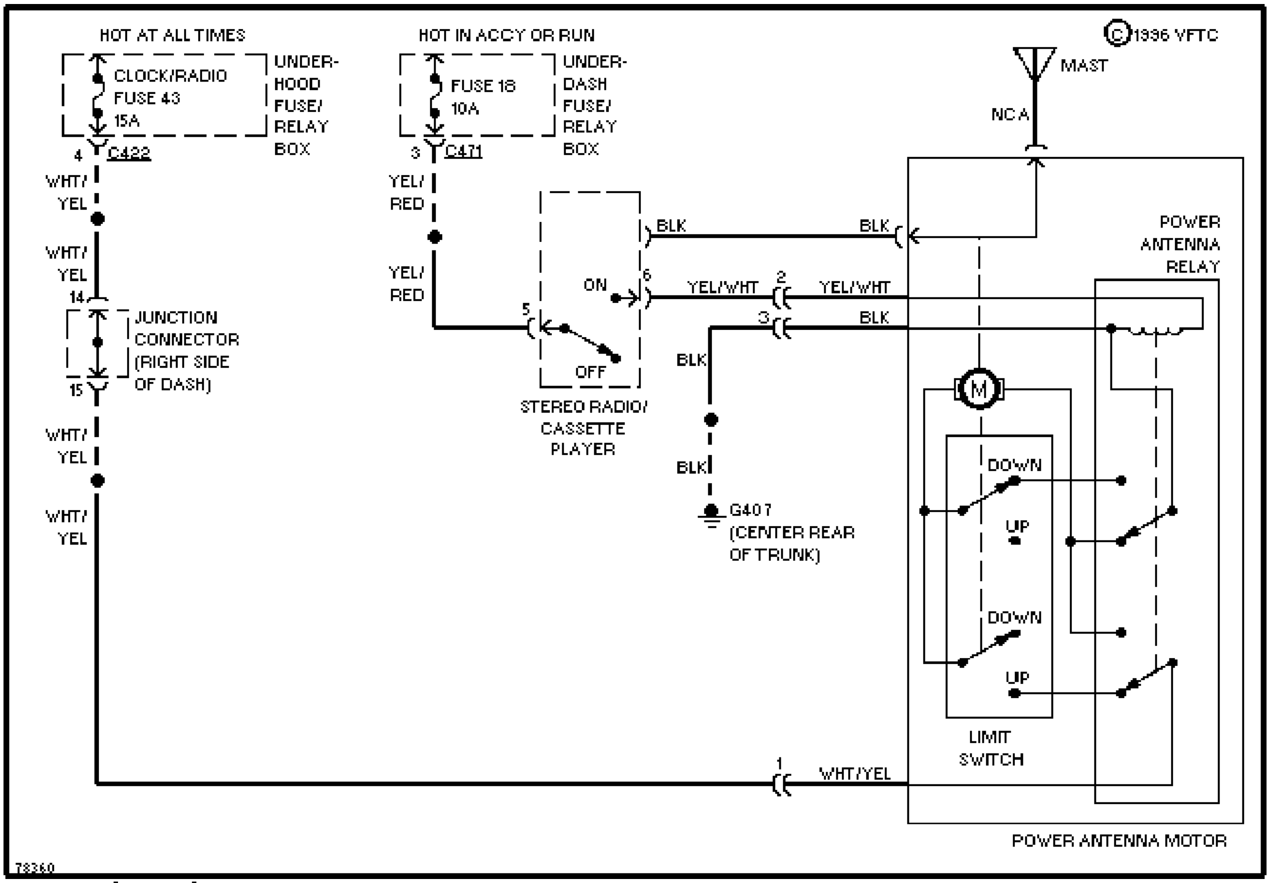
HORN

SYSTEM WIR



Horn Circuit, W/ SRS

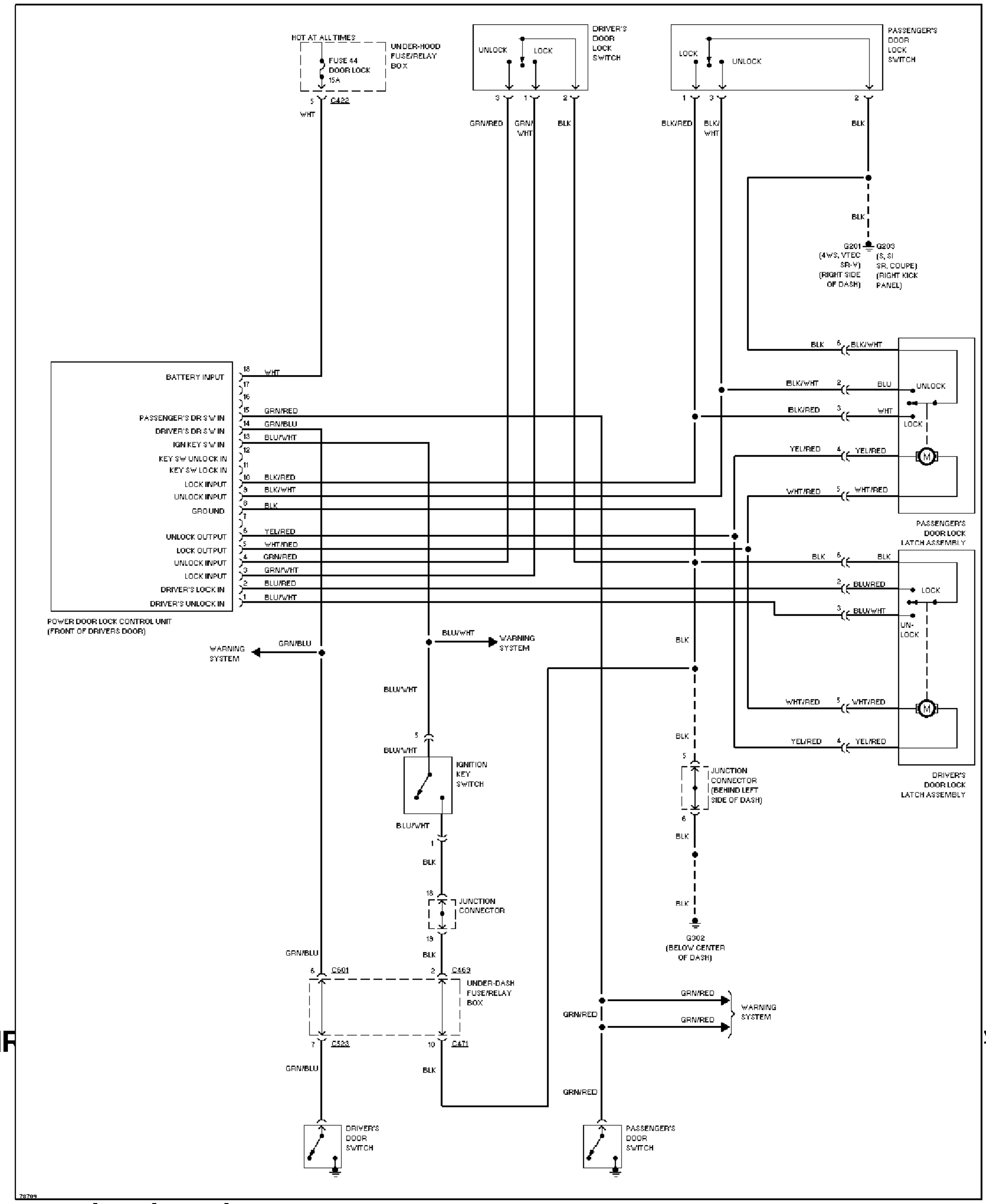
POWER ANTENNA



Power Antenna Circuit

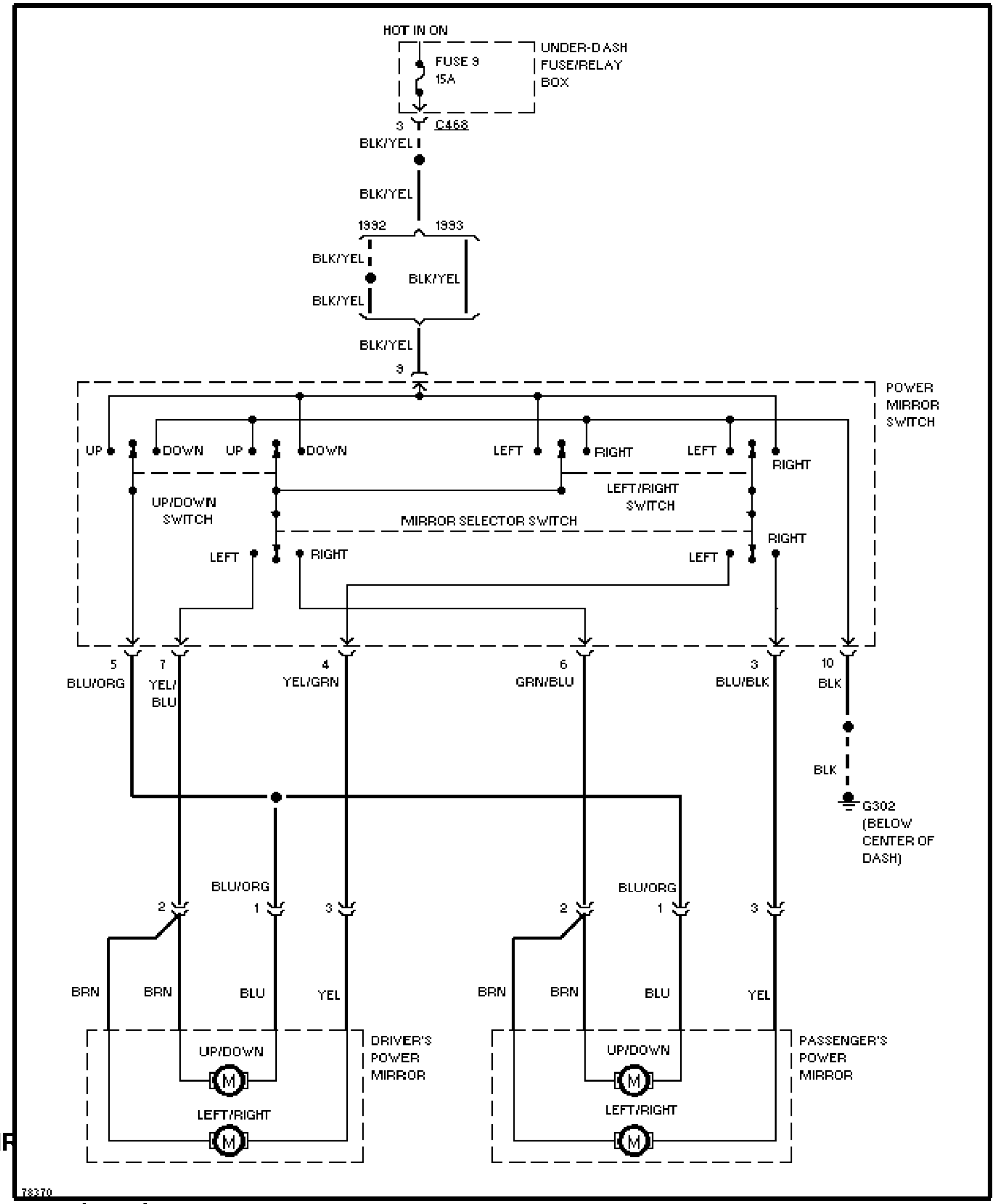
POWER DOOR LOCKS

SYSTEM WIR A 95051Copyright ©



Power Door Lock Circuit

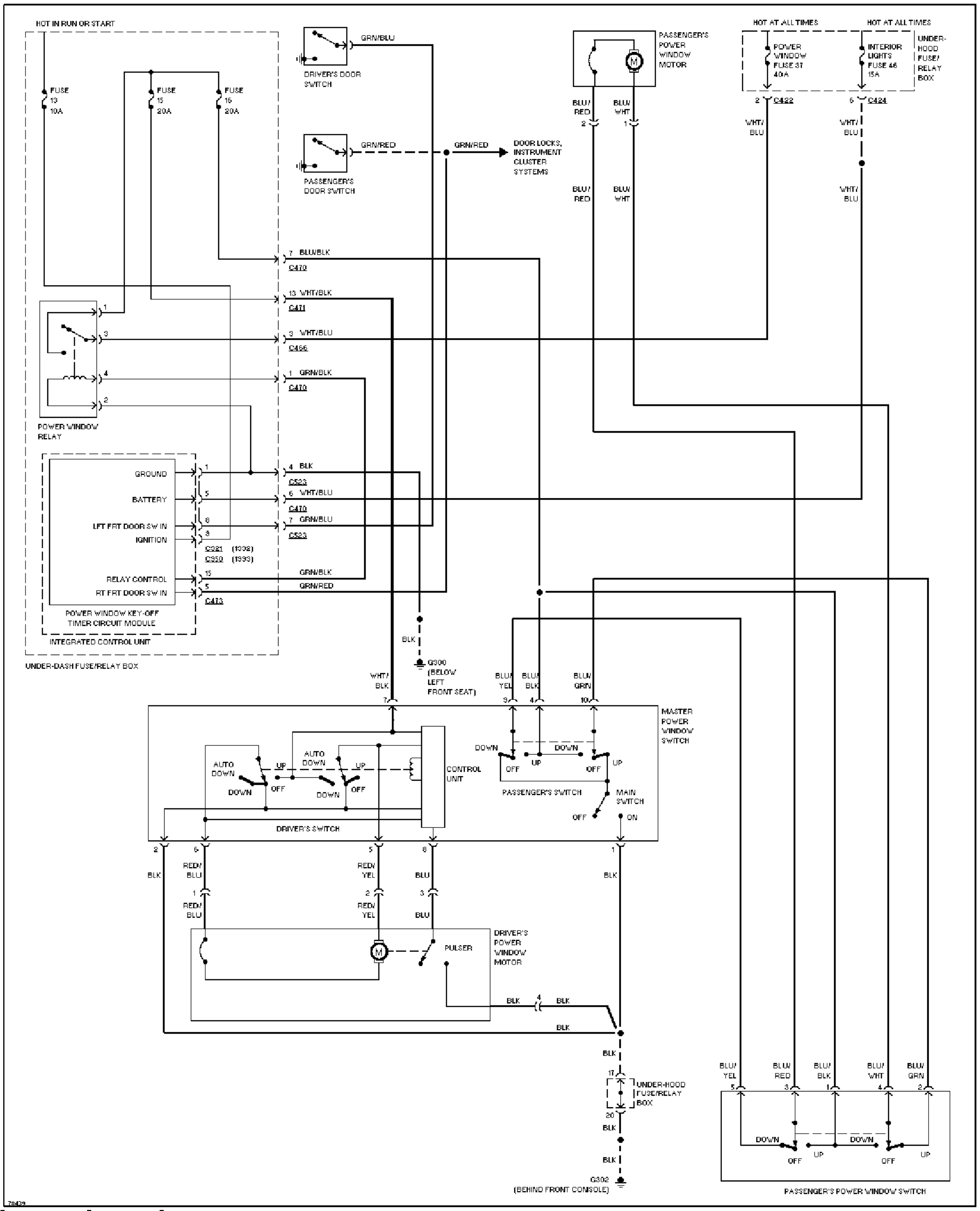
POWER MIRRORS



SYSTEM WIR

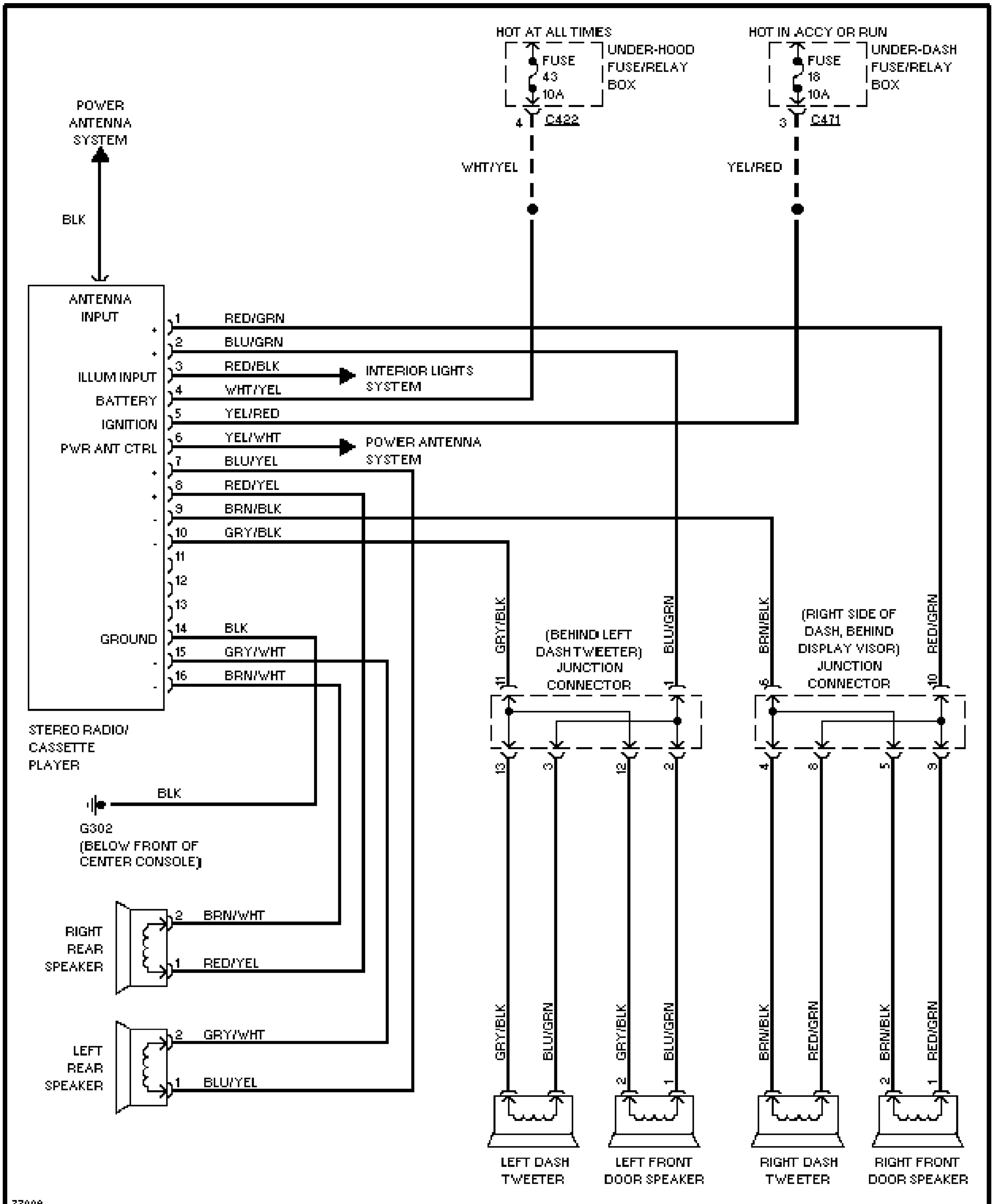
Power Mirror Circuit

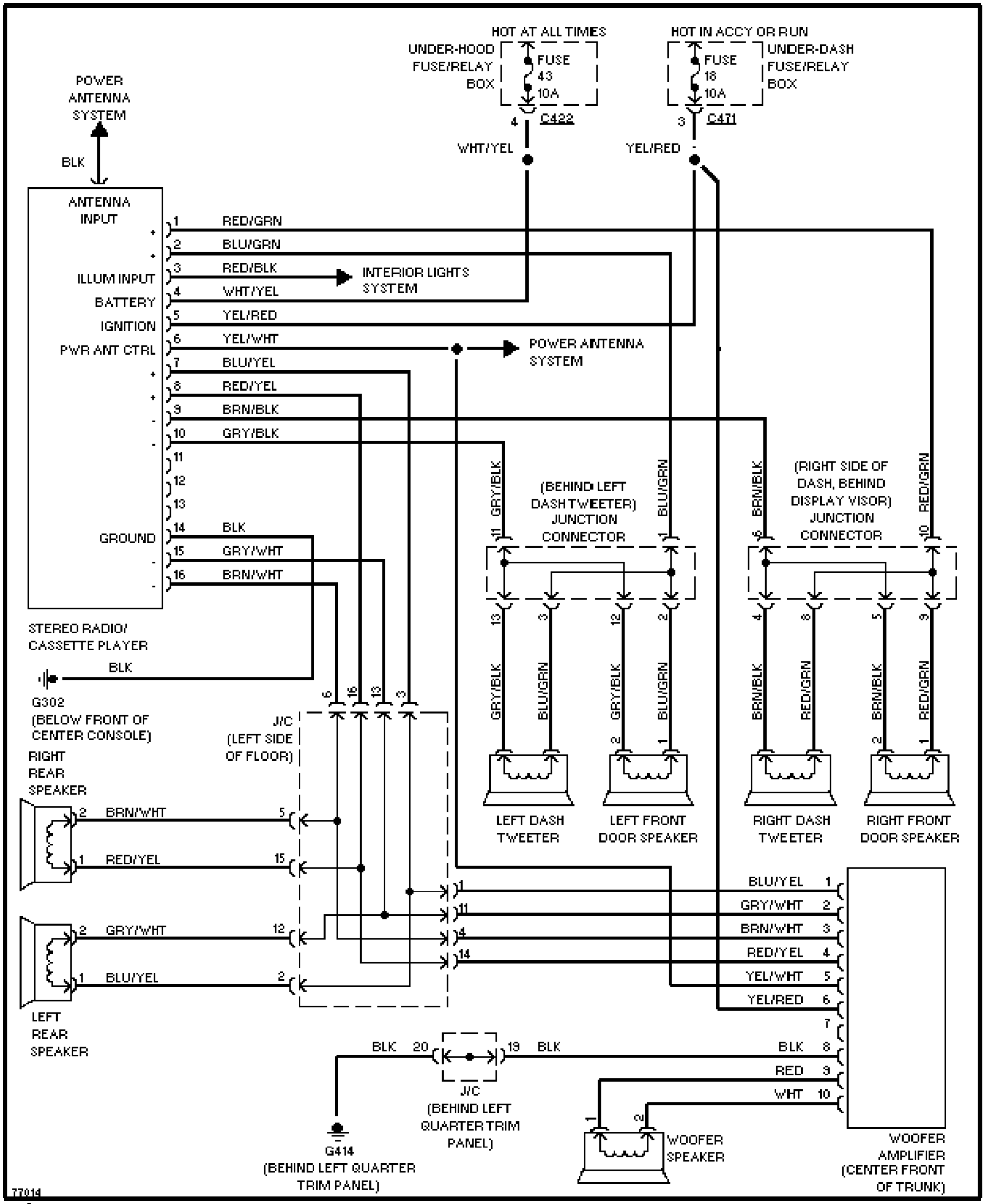
POWER WINDOWS



Power Window Circuit

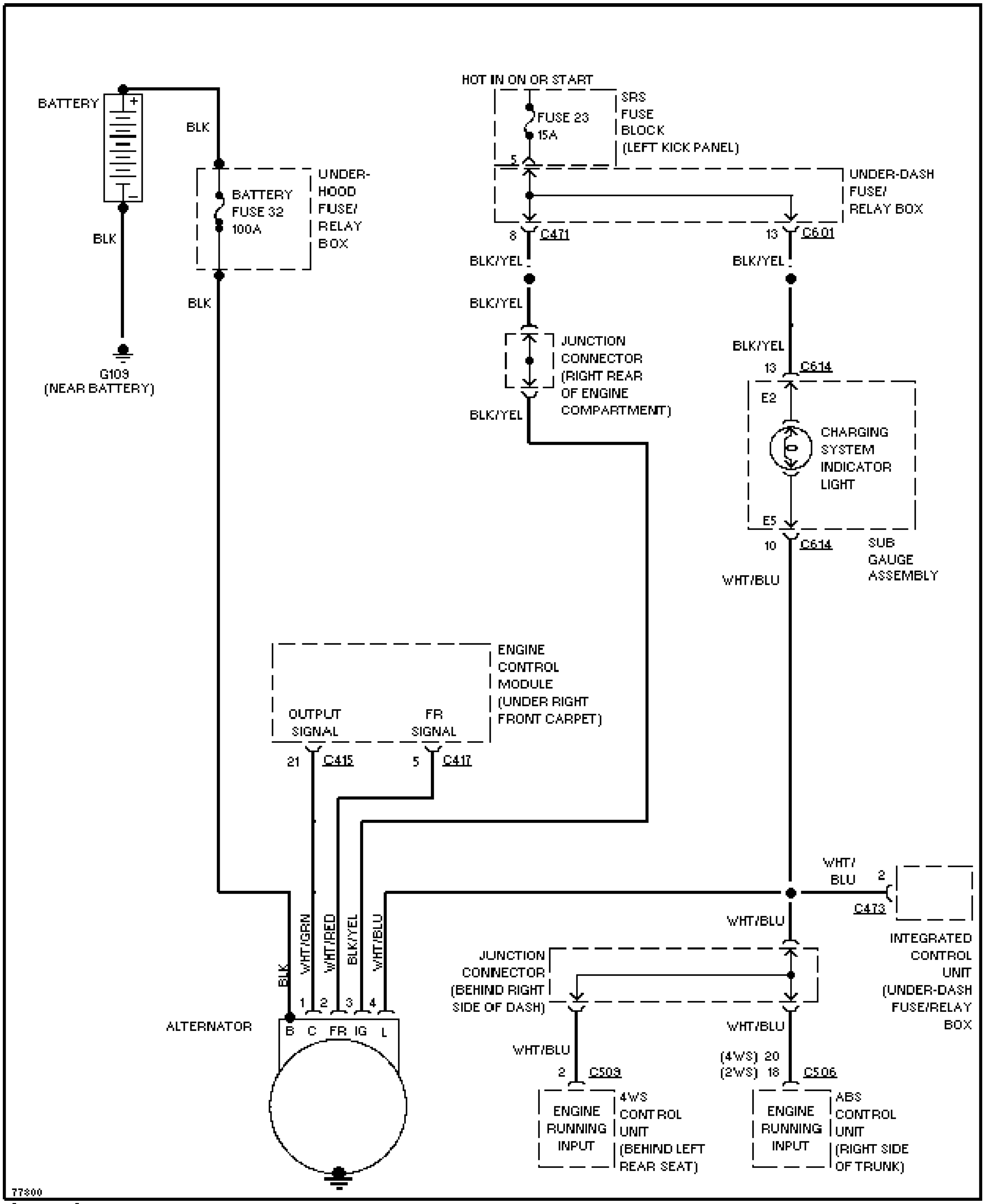
RADIO


HOT AT ALL TIMES
UNDER-HOOD FUSE/RELAY BOX
FUSE 43 10A
4
C422
WHT/YEL
HOT IN ACCY OR RUN
UNDER-DASH FUSE/RELAY BOX
FUSE 18 10A
3
C471
YEL/RED
POWER ANTENNA SYSTEM
BLK
ANTENNA INPUT
ILLUM INPUT
BATTERY
IGNITION
PWR ANT CTRL
GROUND
STEREO RADIO/ CASSETTE PLAYER
1 RED/GRN
2 BLU/GRN
3 RED/BLK
4 WHT/YEL
5 YEL/RED
6 YEL/WHT
7 BLU/YEL
8 RED/YEL
9 BRN/BLK
10 GRY/BLK
11
12
13
14 BLK
15 GRY/WHT
16 BRN/WHT
INTERIOR LIGHTS SYSTEM
POWER ANTENNA SYSTEM
BLK
G302 (BELOW FRONT OF CENTER CONSOLE)
RIGHT REAR SPEAKER
2 BRN/WHT
1 RED/YEL
LEFT REAR SPEAKER
2 GRY/WHT
1 BLU/YEL
(BEHIND LEFT DASH TWEETER) JUNCTION CONNECTOR
(RIGHT SIDE OF DASH, BEHIND DISPLAY VISOR) JUNCTION CONNECTOR
GRY/BLK
BLU/GRN
BRN/BLK
RED/GRN
LEFT DASH TWEETER
LEFT FRONT DOOR SPEAKER
RIGHT DASH TWEETER
RIGHT FRONT DOOR SPEAKER
77009

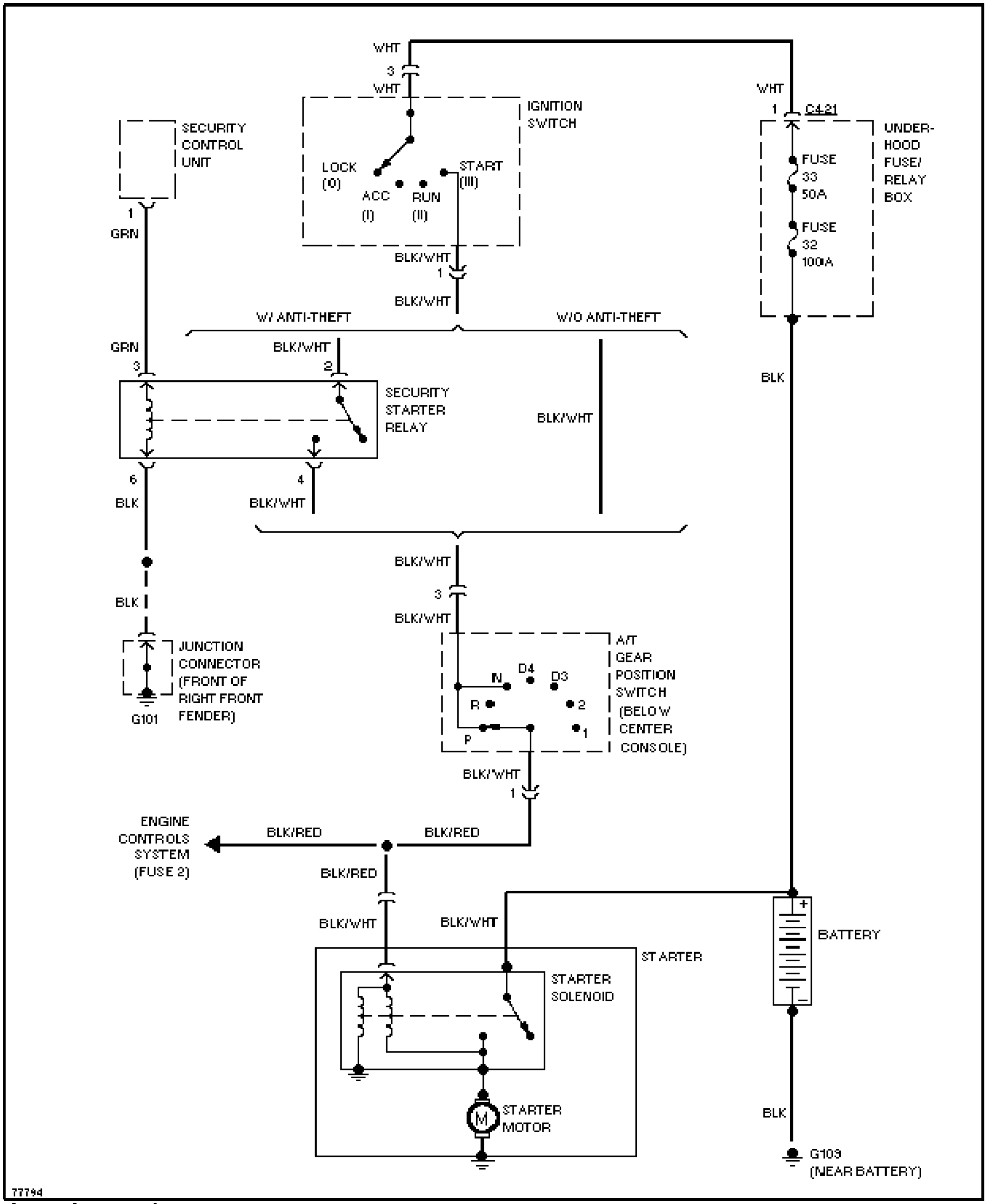


Radio Circuits, SR-V & VTEC

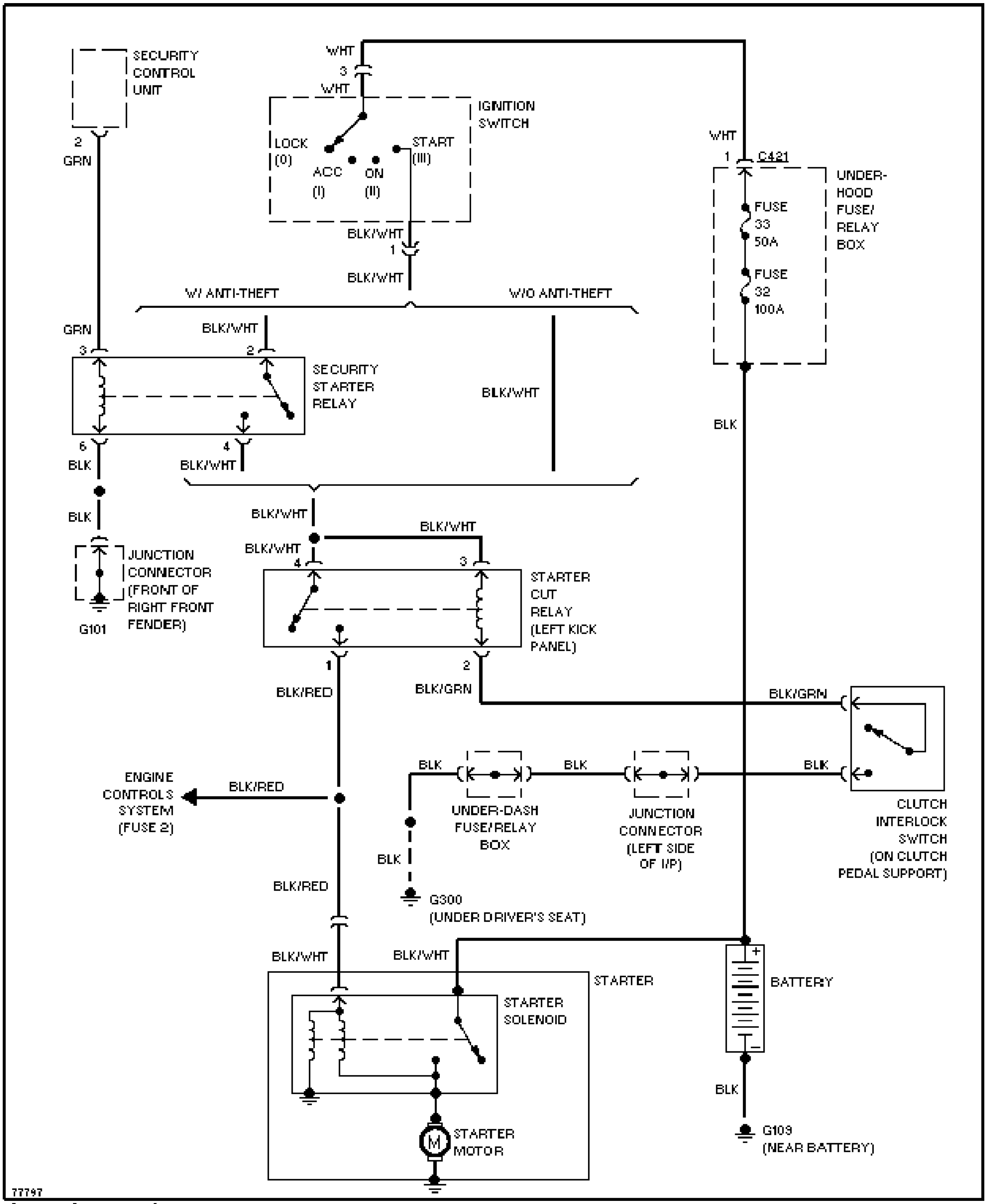
STARTING/CHARGING



Charging Circuit

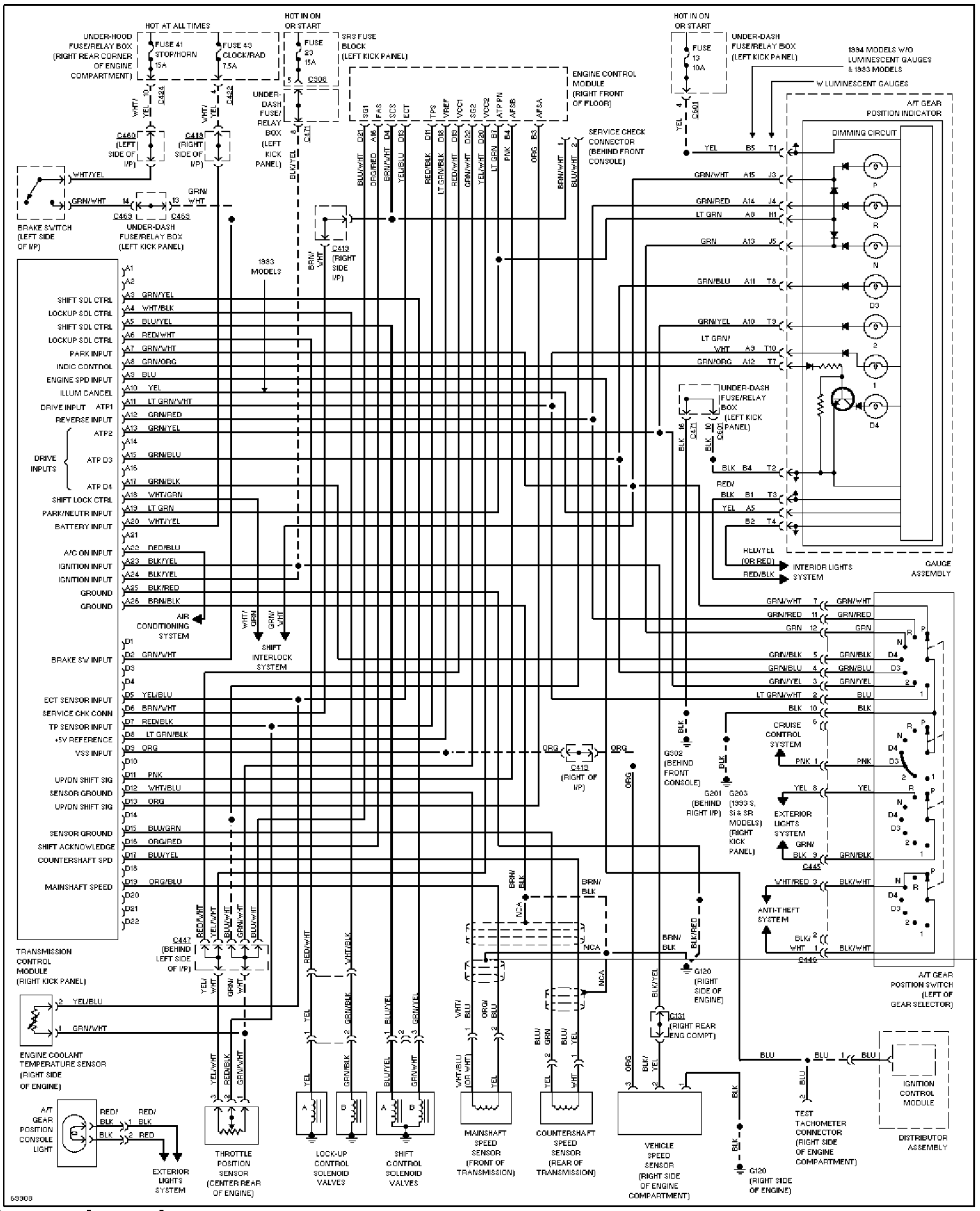


Starting Circuit, A/T



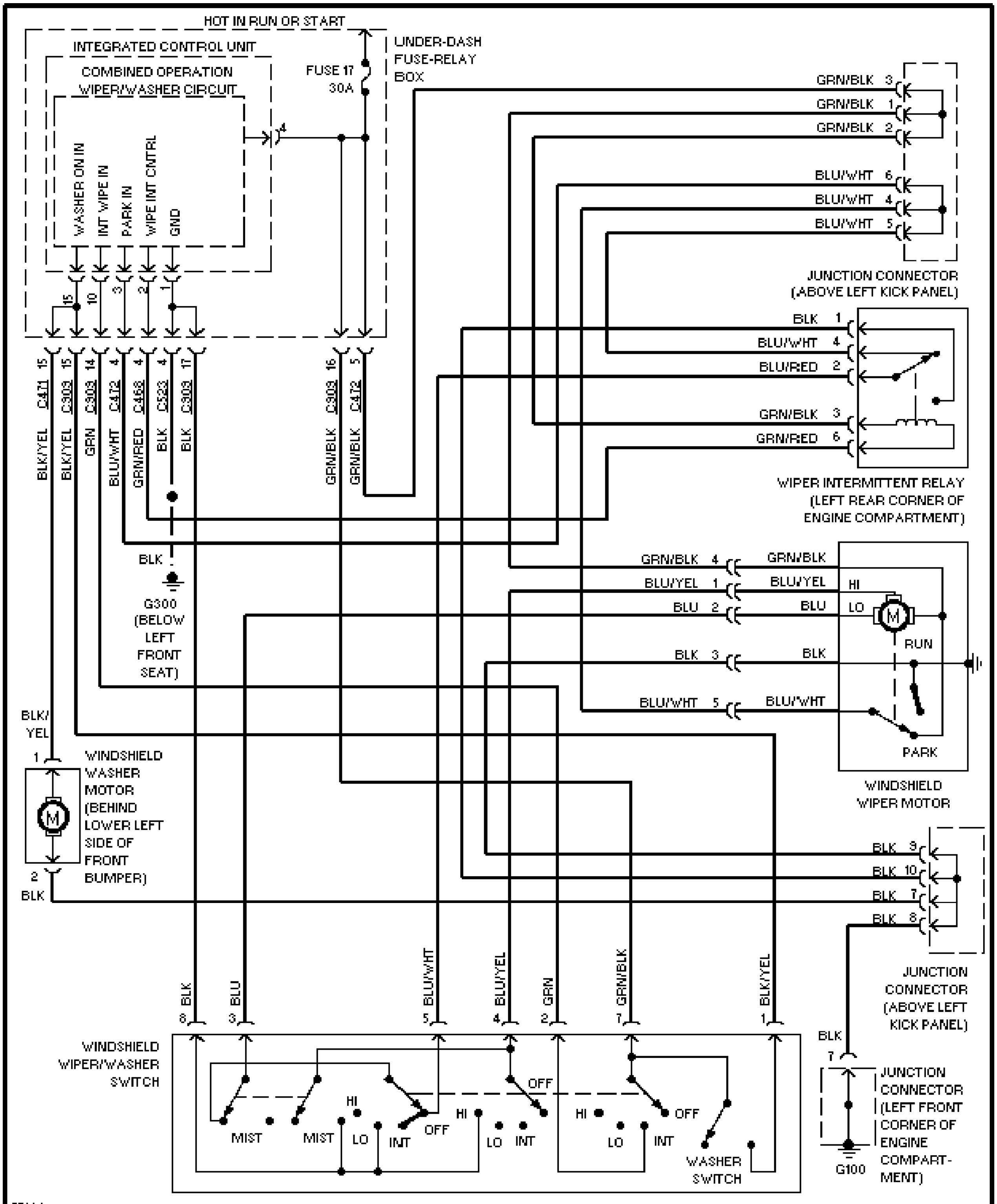
Starting Circuit, M/T

TRANSMISSION



Transmission Circuit

WIPER/WASHER



Wiper/Washer Circuit

END OF ARTICLE

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ARTICLE BEGINNING

1993 TRANSMISSION SERVICING
Honda Motors Transaxle Removal & Installation

Prelude

MANUAL TRANSAXLE

NOTE: For manual transaxle removal and installation procedures, see CLUTCH article in the CLUTCHES section.

AUTOMATIC TRANSAXLE

Removal

1) Disconnect negative battery cable and ground strap at transaxle. Disconnect positive battery cable. Remove battery and battery base. Remove drain plug, and drain transaxle fluid (remove fill plug to speed draining). Install drain plug with NEW washer, and tighten plug to specification. See TORQUE SPECIFICATIONS TABLE at the end of this article.

2) Disconnect wiring for starter motor, transaxle lock-up control solenoid and shift control solenoid. Remove starter. Disconnect mainshaft and countershaft speed sensor connectors. Remove complete air cleaner case assembly. Disconnect and remove throttle control cable at transaxle bracket.

3) Disconnect oil cooler hoses at joint pipes. Plug and support hoses aside. Remove transaxle upper mount bracket and rear stiffener. Remove vehicle speed sensor from transaxle without removing power steering hoses. Remove 4 upper transaxle mounting bolts.

CAUTION: When removing CV joint and drive axle assembly from transaxle, DO NOT pull on drive axle or knuckle. Inboard CV joint may separate. Pull on inboard joint.

4) Raise and support vehicle, and remove front wheels. Remove engine splash shield. Remove center crossmember bolts, and remove crossmember. Remove shock strut damper fork bolts and separate strut damper from fork. Remove right radius rod from control arm and frame. While prying on inboard CV joints, remove both drive axles from transaxle. Remove or support shafts aside. Protect inner CV joint spline from contamination by covering drive axle end by covering it with a plastic bag. Remove left intermediate shaft.

5) Remove engine stiffener bracket from between lower transaxle and engine block. Remove torque converter cover plate. Manually turn crankshaft pulley clockwise to access and remove 8 torque converter mounting bolts from torque converter drive plate.

6) Remove shift control cable from transaxle. Using wire, hang cable aside. DO NOT bend cable. Support transaxle using transmission jack. Remove lower bolts from rear engine mount bracket. With jack in place, remove remaining transaxle mounting bolts.

7) Separate transaxle from engine block far enough to disengage both 14-mm dowel pins, and then lower transaxle assembly.

Installation

1) To install transaxle, reverse removal procedure. Inspect drive plate for cracks, elongated holes and warpage. Replace drive plate if necessary.

2) Replace 26-mm spring clips on end of each inner CV joint splined shaft. Check shift control cable and throttle control cable. Adjust cables as necessary. See **TRANSMISSION SERVICING - A/T** article in AUTOMATIC TRANSMISSION SERVICING section.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

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Application	Ft. Lbs. (N.m)
Ball Joint-To-Knuckle Bolt	40 (54)
Center Beam Mounting Bolts	44 (60)
Center Beam Stiffener Bolts	29 (39)
Drain Plug	37 (50)
Drive Plate-To-Crankshaft Bolts	55 (75)
Engine Stiffener Mounting Bolts	33 (45)
Starter Mounting Bolts	33 (45)
Strut Damper Fork Bolt Lock Nut	48 (65)
Strut Damper Pinch Bolt	32 (44)
Transaxle-To-Engine Mounting Bolts	48 (65)
Wheel Lug Nuts	80 (109)
	INCH Lbs. (N.m)
Torque Converter Cover Bolts	108 (12)
Torque Converter Mounting Bolts	108 (12)

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END OF ARTICLE

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ARTICLE BEGINNING

1993 TRANSMISSION SERVICING
Honda Motors Automatic Transaxle

Honda; Prelude

IDENTIFICATION

Transaxles can be identified by identification tag located on bellhousing, near engine block, or on top of transaxle toward outer end.

AUTOMATIC TRANSAXLE APPLICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Model	Transaxle
Prelude	MP1A

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LUBRICATION

SERVICE INTERVALS

Change fluid every 30,000 miles or 24 months under normal driving conditions. If driven under severe conditions, change fluid every 15,000 miles or 12 months. Filter replacement and band adjustment are not required.

CHECKING FLUID LEVEL

With vehicle on level floor and at normal operating temperature, stop engine. Within one minute after turning engine off, unscrew dipstick and wipe it clean. Insert dipstick into filler hole (without screwing in), and check fluid level. Fluid level should be between FULL and LOW marks on dipstick.

RECOMMENDED FLUID

Use Dexron-II ATF.

FLUID CAPACITIES

TRANSAXLE REFILL CAPACITIES TABLE

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Application	Refill Qts. (L)	Dry Fill Qts. (L)

Prelude	2.5 (2.4)	6.4 (6.0)

DRAINING & REFILLING

1) Ensure transaxle is at normal operating temperature (cooling fan comes on). Remove transaxle drain plug to drain fluid. Install NEW plug gasket. Tighten drain plug to specification. See DRAIN PLUG TORQUE SPECIFICATIONS table.

DRAIN PLUG TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Prelude	37 (50)

2) Add fluid through dipstick hole. Start engine, and move gear selector lever through all selector positions 3 times. Ensure each gear engages. With selector lever in Neutral or Park, let transmission fluid warm to normal operating temperature. Shut off engine. Check fluid level. Add enough fluid to bring level to upper mark on dipstick.

ADJUSTMENTS

SHIFT CONTROL CABLE

1) Start engine, and move shift lever into Reverse. Verify transaxle engages in Reverse. With engine off, remove center console. Move shift lever into Neutral or Reverse. Remove lock pin from adjuster. Ensure adjuster and shift cable holes align perfectly. See Fig. 1.

2) Holes in end of adjuster are positioned to allow cable adjustments in 1/4 turn increments. Adjust shift cable if it is not perfectly aligned. Loosen lock nut, and adjust cable as necessary. Tighten lock nut. Install lock pin into adjuster. SeeFig. 1.

3) Lock pin should not bind during installation. Start engine, and check shift lever in all gears. Vehicle should start only with shift lever in Park or Neutral. Adjust neutral safety switch (if necessary). Install center console.

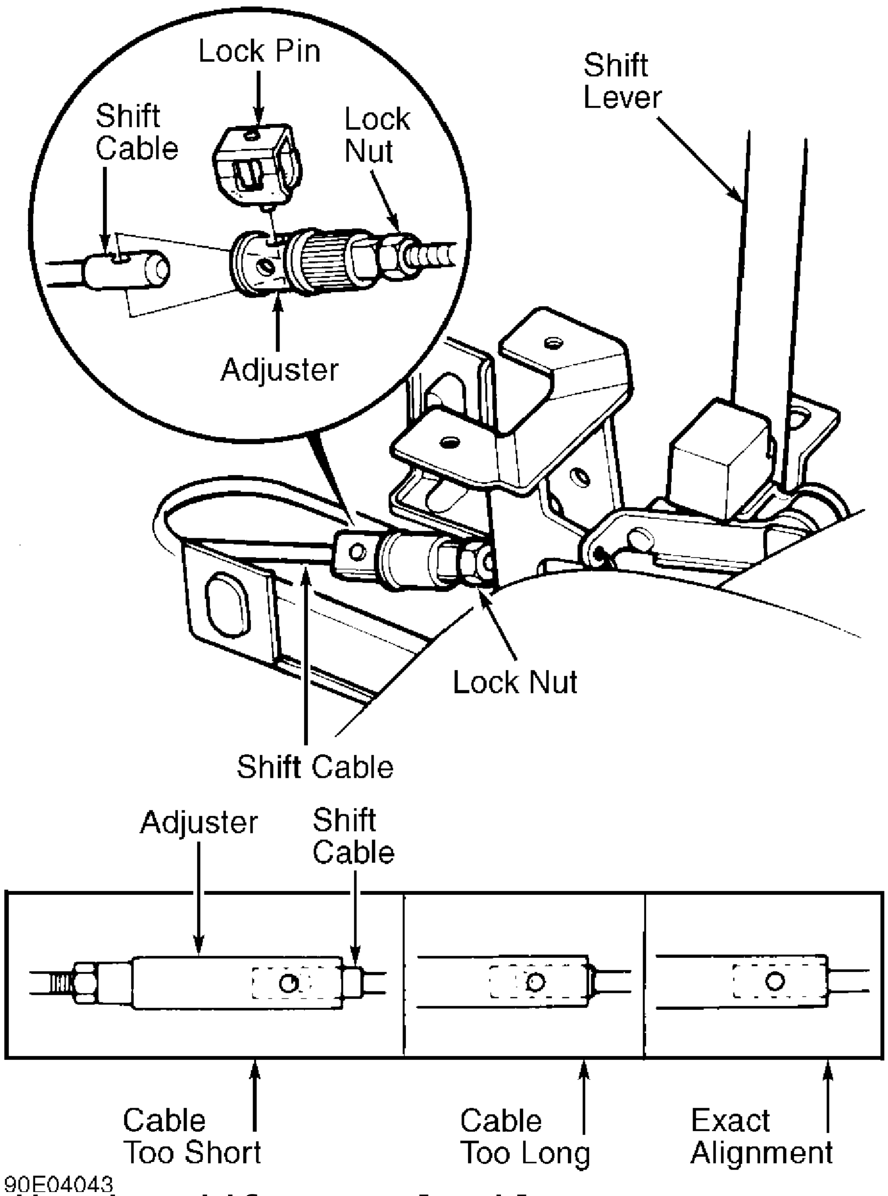

Fig. 1: Adjusting Shift Control Cable
Courtesy of American Honda Motor Co., Inc.

NEUTRAL SAFETY SWITCH

Neutral safety switch is located at bottom of shift lever, under center console. Ensure selector lever linkage is properly adjusted and vehicle starts only with shift lever in Park or Neutral. If vehicle starts in other gear positions, loosen 2 switch mounting screws and adjust switch.

THROTTLE CONTROL CABLE

NOTE: Before adjusting throttle control cable, ensure throttle

cable connecting accelerator pedal to throttle body linkage has .39-.47" (10-12 mm) deflection with throttle closed. If deflection is not as specified, loosen lock nuts and adjust throttle cable.

1) With engine idling at normal operating temperature (cooling fan comes on), loosen throttle control cable adjustment lock nuts at transaxle control lever bracket. SeeFig. 2.

2) Adjust lock nuts to synchronize movement of transaxle throttle control lever and throttle body throttle lever/linkage. Tighten adjustment lock nuts.

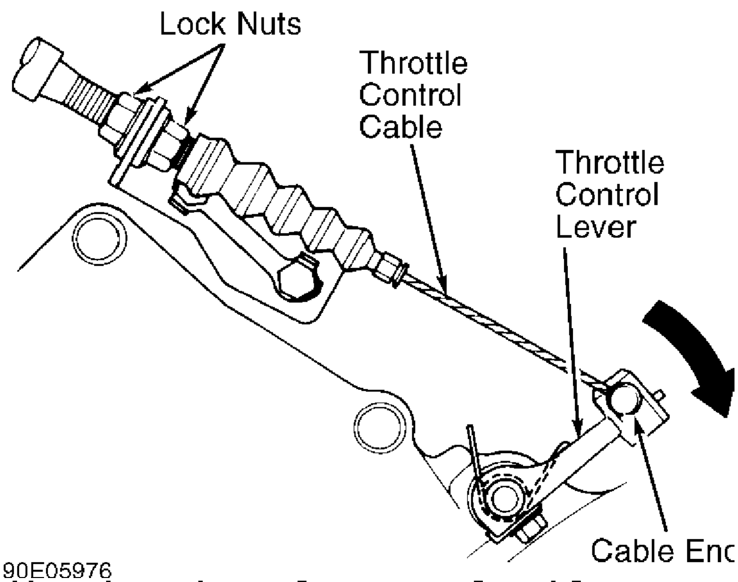

Fig. 2: Adjusting Throttle Control Cable
Courtesy of American Honda Motor Co., Inc.

END OF ARTICLE

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ARTICLE BEGINNING

1993 Manual Transmission Servicing

Honda; Prelude

IDENTIFICATION

MANUAL TRANSAXLE APPLICATIONS TABLE

Model	Transaxle Code
2.2L	M2L5
2.2L (VTEC)	M2F4
2.3L	M2S4

LUBRICATION

SERVICE INTERVALS

Change lubricant every 30,000 miles or 24 months.

CHECKING FLUID LEVEL

Check fluid level with transaxle at operating temperature. Ensure engine is off and vehicle is level. Remove fill plug on side of transaxle case. Fluid level should be at bottom of fill hole. Tighten oil filler plug to 33 ft. lbs. (45 N.m) and oil drain plug to 30 ft. lbs. (40 N.m).

RECOMMENDED FLUID

Under normal conditions, use SAE 30 or 20W-40 with a rating of SF or SG. On vehicles used mostly in cold climates, use 10W-30 or 10W-40.

FLUID CAPACITIES

TRANSAXLE REFILL CAPACITIES TABLE

Application	After Draining Qts. (L)	After Overhaul Qts. (L)
Prelude	2.0 (1.9)	2.1 (2.0)

ADJUSTMENTS

NOTE: External linkage adjustments are not required. Inspect gearshift linkage components for wear or damage. Replace components as required.

END OF ARTICLE

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ARTICLE BEGINNING

GENERAL TROUBLE SHOOTING

*** PLEASE READ THIS FIRST ***

NOTE: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

ACCESSORIES & ELECTRICAL

CHARGING SYSTEM TROUBLE SHOOTING

NOTE: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

BASIC CHARGING SYSTEM TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Vehicle Will Not Start	Dead battery	Check battery cells, alternator belt tension and alternator output
	Loose or corroded battery connections	Check all charging system connections
	Ignition circuit or switch malfunction	Check and replace as necessary
Alternator Light Stays On With Engine Running	Loose or worn alternator drive belt	Check alternator drive tension and condition, See Belt Adjustment in TUNE-UP article in the TUNE-UP section

	Loose alternator wiring connections	Check all charging system connections
	Short in alternator light wiring	See Indicator Warning Lights in STANDARD INSTRUMENTS in the ACCESSORIES & EQUIPMENT section
	Defective alternator stator or diodes	See Bench Tests in ALTERNATOR article
	Defective regulator	See Regulator Check in ALTERNATOR article
Alternator Light Stays Off With Ignition Switch ON	Blown fuse	See WIRING DIAGRAMS
	Defective alternator	See Testing in ALTERNATOR article
	Defective indicator light bulb or socket	See Indicator Warning Lights in STANDARD INSTRUMENTS in the ACCESSORIES & EQUIPMENT section
Alternator Light Stays OFF With Ignition Switch ON	Short in alternator wiring	See On-Vehicle Tests in ALTERNATOR article
	Defective rectifier bridge	See Bench Tests in ALTERNATOR article
Lights or Fuses Burn Out Frequently	Defective alternator wiring	See On-Vehicle Tests in ALTERNATOR article
	Defective regulator	See Regulator Check in ALTERNATOR article
	Defective battery	Check and replace as necessary

Ammeter Gauge Shows Discharge	Loose or worn drive belt	Check alternator drive belt tension and condition. See Belt Adjustment in TUNE-UP article in the TUNE-UP section
	Defective wiring	Check all wires and wire connections
	Defective alternator or regulator	See Bench Tests and On-Vehicle Tests in ALTERNATOR article
	Defective ammeter, or improper ammeter wiring connection	See Testing in STANDARD INSTRUMENTS in the ACCESSORIES & EQUIPMENT section

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Noisy Alternator	Loose drive pulley	Tighten drive pulley attaching nut
	Loose mounting bolts	Tighten all alternator mounting bolts
	Worn or dirty bearings	See Bearing Replacement ALTERNATOR article
	Defective diodes or stator	See Bench Test in ALTERNATOR article

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Battery Does Stay Charged	Loose or worn drive belt	Check alternator drive belt tension and condition. See Belt Adjustment in appropriate TUNE-UP article in the TUNE-UP section
	Loose or corroded battery connections	Check all charging system connections
	Loose alternator connections	Check all charging system connections
	Defective alternator or battery	See On-Vehicle Tests and Bench Tests in

		ALTERNATOR article
	Add-on electrical accessories exceeding alternator capacity	Install larger alternator
Battery Overcharged- Uses Too Much Water	Defective battery	Check alternator output and repair as necessary
	Defective alternator	See On-Vehicle Test and Bench Tests in ALTERNATOR article
	Excessive alternator voltage	Check alternator output and repair as necessary

IGNITION SYSTEM TROUBLE SHOOTING

NOTE: This is **GENERAL** information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to **SUBJECT**, **DIAGNOSTIC**, or **TESTING** articles available in the section(s) you are accessing.

Ignition Secondary Trouble Shooting Chart

```
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? START: Visually inspect Spark Plug Wires, Coil Wires,  ?
?        Plug Wire Boots, Rotor, and Distributor Cap for ?
?        signs of damage.                                ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
      UAAAA?                                            UAAAAAAAA?
      ? OK ?                                            ? NOT OK ?
      AAAAAU                                            AAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?               UAAAAAAAAAAAAAAAAAAAAAAAA?
? *  To test secondary ignition   ?               ? *  Repair or replace ?
?    system, modify a Spark Plug  ?               ?    damaged components ?
?    by attaching a ground wire   ?               ?    as necessary       ?
?    to the body of the plug and  ?               AAAAAAAAAAAAAAAAAAAAAAAAAU
?    widening the gap to 1/4-3/8".?
?    Disconnect spark plug wire   ?
?    and insert test plug. Ground ?
?    plug, crank engine, and      ?
```

```
?    check for spark.              ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
   UAAAAAAAAAAAA?                                   UAAAAAAAAAA?
   ? GOOD SPARK ?                                   ? NO SPARK ?
   AAAAAAAAAAAAAU                                   AAAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  If plug sparks, driveability ?  ? * Remove coil wire from the   ?
?    problem is most likely NOT   ?  ?   distributor and attach the ?
?    in the ignition system.      ?  ?   modified spark plug. Ground ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?   the plug and crank engine   ?
                                      ?   while checking for spark.   ?
                                      AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
   UAAAAAAAAAAAA?                                   UAAAAAAAAAA?
   ? GOOD SPARK ?                                   ? NO SPARK ?
   AAAAAAAAAAAAAU                                   AAAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  If plug has a good spark,    ?  ? *  Proceed to the IGNITION    ?
?    the problem is in the plug   ?  ?    PRIMARY TROUBLE SHOOTING   ?
?    wires, distributor cap, or   ?  ?    CHECK CHART below in this ?
?    rotor.  Replace components   ?  ?    article.                   ?
?    as necessary.                ?  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
```

Ignition Primary Trouble Shooting Chart

```
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? START: Visually inspect primary ignition wires for     ?
?        broken, frayed, split, or cut wires.  Also check?
?        for loose, corroded, or disconnected connectors.?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
      UAAAA?                                           UAAAAAAAAA?
      ? OK ?                                           ? NOT OK ?
      AAAAAU                                           AAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Check that battery voltage   ?  ? *  Repair or replace damaged ?
?    is at least 11.5 volts.      ?  ?    components as necessary.  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
    UAAAAAAAAA?                                         UAAAA?
    ? NOT OK ?                                          ? OK ?
    AAAAAAAAAAU                                         AAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Replace or recharge the      ?  ? * Check for battery voltage   ?
?    battery.                     ?  ?   at the positive terminal of ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?   the coil.                   ?
```

```
                                       AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
      UAAAA?                                          UAAAAAAAA?
      ? OK ?                                          ? NOT OK ?
      AAAAAU                                          AAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?   UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Check air Gap of the Pick-Up ?   ? * Check resistance of ballast ?
?    coil in the distributor.     ?   ?   resistor (if used) for the  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU   ?   correct resistance value.   ?
                 ?                     AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?                        ?
      UAAAA?                            UAAAAAAAA?                   ?
      ? OK ?                            ? NOT OK ?                   ?
      AAAAAU                            AAAAAAAAAU                   ?
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?   UAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?   ?
? *  Check Pick-Up coil for     ?   ? *  Adjust or replace as     ?   ?
?    correct resistance value.  ?   ?    necessary.               ?   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU   AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU   ?
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?                        ?
    UAAAAAAAA?                            UAAAA?                     ?
    ? NOT OK ?                            ? OK ?                     ?
    AAAAAAAAAU                            AAAAAU                     ?
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?   UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?   ?
? *  Replace Pick-Up coil if    ?   ? *  Check control module for ?   ?
?    not to specification.      ?   ?    good ground connections. ?   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU   AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU   ?
                                          UAAAA?                     ?
                                          ? OK ?                     ?
                                          AAAAAU                     ?
               UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?   ?
               ? *  If vehicle fails to run at this point, go to?   ?
               ?    the appropriate article in the ENGINE       ?   ?
               ?    PERFORMANCE section.                        ?   ?
               AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU   ?
                                     UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
               UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
            UAAAA?                                    UAAAAAAAA?
            ? OK ?                                    ? NOT OK ?
            AAAAAU                                    AAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?   UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Check wires from the battery/?   ? *  Replace ballast resistor   ?
?    ignition switch to the coil. ?   ?    if the measured resistance ?
?    Also check the coil primary  ?   ?    value is not within        ?
?    and secondary resistance.    ?   ?    specification.             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU   AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
```

STARTER TROUBLE SHOOTING

NOTE: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

BASIC STARTER TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Starter Fails to Operate	Dead battery or bad connections between starter and battery	Check battery charge and all wires and connections to starter
	Ignition switch faulty or misadjusted	Adjust or replace ignition switch
	Open circuit between starter switch ignition terminal on starter relay	Check and repair wires and connections as necessary
	Starter relay or starter defective	See Testing in STARTER article
	Open solenoid pull-in wire	See Testing in STARTER article
Starter Does Not Operate and Headlights Dim	Weak battery or dead cell	Charge or replace battery as necessary
	Loose or corroded battery connections	Check that battery connections are clean and tight
	Internal ground in starter windings	See Testing in STARTER article
	Grounded starter fields	See Testing in STARTERS
	Armature rubbing on pole shoes	See STARTER article
Starter Turns but Engine Does Not Rotate	Starter clutch slipping	See STARTER article
	Broken clutch housing	See STARTER article

	Pinion shaft rusted or dry	See STARTER article
	Engine basic timing incorrect	See Ignition Timing in TUNE-UP article
	Broken teeth on engine flywheel	Replace flywheel and check for starter pinion gear damage

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Starter Will Not Crank Engine	Faulty overrunning clutch	See STARTER article
	Broken clutch housing	See STARTER article
	Broken flywheel teeth	Replace flywheel and check for starter pinion gear damage
	Armature shaft sheared or reduction gear teeth stripped	See STARTER article
	Weak battery	Charge or replace battery as necessary
	Faulty solenoid	See On-Vehicle Tests in STARTER article
	Poor grounds	Check all ground connections for tight and clean connections
	Ignition switch faulty or misadjusted	Adjust or replace ignition switch as necessary

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Starter Cranks Engine Slowly	Battery weak or defective	Charge or replace battery as necessary
	Engine overheated	See ENGINE COOLING SYSTEM article
	Engine oil too heavy	Check that proper viscosity oil is used

	Poor battery-to-starter connections	Check that all between battery and starter are clean and tight
	Current draw too low or too high	See Bench Tests in STARTER article
	Bent armature, loose pole shoes screws or worn bearings	See STARTER article
	Burned solenoid contacts	Replace solenoid
	Faulty starter	Replace starter
Starter Engages Engine Only Momentarily	Engine timing too far advanced	See Ignition Timing in TUNE-UP article
	Overrunning clutch not engaging properly	Replace overrunning clutch. See STARTER article
	Broken starter clutch	See STARTER article
	Broken teeth on engine flywheel	Replace flywheel and check starter pinion gear for damage
	Weak drive assembly thrust spring	See STARTER article
	Weak hold-in coil	See Bench Tests in STARTER article
Starter Drive Will Not Engage	Defective point assembly	See Testing in STARTER article
	Poor point assembly ground	See Testing in STARTER article
	Defective pull-in coil	Replace starter solenoid
Starter Relay Does Not Close	Dead battery	Charge or replace battery as necessary

	Faulty wiring	Check all wiring and connections leading to relay
	Neutral safety switch faulty	Replace neutral safety switch
	Starter relay faulty	Replace starter relay
Starter Drive Will Not Disengage	Starter motor loose on mountings	Tighten starter attach bolts
	Worn drive end bushing	See STARTER article
	Damaged engine flywheel teeth	Replace flywheel and starter pinion gear for damage
	Drive yolk return spring broken or missing	Replace return spring
	Faulty ignition switch	Replace ignition switch
	Insufficient clearance between winding leads to solenoid terminal and main contact in solenoid	Replace starter solenoid
	Starter clutch not disengaging	Replace starter clutch
	Ignition starter switch contacts sticking	Replace ignition switch
Starter Relay Operates but Solenoid Does Not	Faulty solenoid switch, switch connections or	Check all wiring between relay and solenoid or replace relay or solenoid as necessary
	Broken lead or loose soldered connections	Repair wire or wire connections as necessary
Solenoid Plunger Vibrates When Switch is Engaged	Weak battery	Charge or replace battery as necessary
	Solenoid contacts	Clean contacts or

	corroded	replace solenoid
	Faulty wiring	Check all wiring leading to solenoid
	Broken connections inside switch cover	Repair connections or replace solenoid
	Open hold-in wire	Replace solenoid
Low Current Draw	**Worn brushes or weak**	**Replace brushes or brush springs as necessary**
High Pitched Whine During Cranking Before Engine Fires but Engine Fires and Cranks Normally	**Distance too great between starter pinion and flywheel**	**Align starter or check that correct starter and flywheel are being used**
High Pitched Whine After Engine Fires With Key released. Engine Fires and Cranks Normally	**Distance too small between starter pinion and flywheel Flywheel runout contributes to the intermittent nature**	

AIR CONDITIONING & HEAT

AIR CONDITIONING TROUBLE SHOOTING

WARNING: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

BASIC AIR CONDITIONING TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE
Compressor Not Working	u **Compressor clutch circuit open.** u **Compressor clutch coil inoperative.**

	u **Poor clutch ground connection.**
	u **Fan belts loose.**
	u **Thermostatic switch inoperative.**
	u **Thermostatic switch not adjusted.**
	u **Ambient temperature switch open.**
	u **Superheat fuse blown.**

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Excessive Noise or Vibration	u **Missing or loose mounting bolts.**
	u **Bad idler pulley bearings.**
	u **Fan belts not tightened correctly.**
	u **Compressor clutch contacting body.**
	u **Excessive system pressure.**
	u **Compressor oil level low.**
	u **Damaged clutch bearings.**
	u **Damaged reed valves.**
	u **Damaged compressor.**

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Insufficient or No Cooling; Compressor Working	u **Expansion valve inoperative.**
	u **Heater control valve stuck open.**
	u **Low system pressure.**
	u **Blocked condenser fins.**
	u **Blocked evaporator fins.**
	u **Vacuum system leak.**
	u **Vacuum motors inoperative.**
	u **Control cables improperly adjusted.**
	u **Restricted air inlet.**
	u **Mode doors binding.**
	u **Blower motor inoperative.**
	u **Temperature above system capacity.**

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HEATER SYSTEM TROUBLE SHOOTING

NOTE: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

BASIC HEATER SYSTEM TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE
Insufficient, Erratic, or No Heat	u **Low Coolant Level**

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u Incorrect thermostat.
u Restricted coolant flow through heater core.
u Heater hoses plugged.
u Misadjusted control cable.
u Sticking heater control valve.
u Vacuum hose leaking.
u Vacuum hose blocked.
u Vacuum motors inoperative.
u Blocked air inlet.
u Inoperative heater blower motor.
u Oil residue on heater core fins.
u Dirt on heater core fins.

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Too Much Heat
u Improperly adjusted cables.
u Sticking heater control valve.
u No vacuum to heater control valve.
u Temperature door stuck open.

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Air Flow Changes During Acceleration
u Vacuum system leak.
u Bad check valve or reservoir.

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Air From Defroster At All Times
u Vacuum system leak.
u Improperly adjusted control cables.
u Inoperative vacuum motor.

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Blower Does Not Operate Correctly
u Blown fuse.
u Blower motor windings open.
u Resistors burned out.
u Motor ground connection loose.
u Wiring harness connections loose.
u Blower motor switch inoperative.
u Blower relay inoperative.
u Fan binding or foreign object in housing.
u Fan blades broken or bent.

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BRAKES

BRAKE SYSTEM TROUBLE SHOOTING

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configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

BRAKE SYSTEM TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Brakes Pull Left or Right	Incorrect tire pressure	Inflate tires to proper pressure
	Front end out of alignment	See WHEEL ALIGNMENT
	Mismatched tires	Check tires sizes
	Restricted brake lines or hoses	Check hose routing
	Loose or malfunctioning caliper	See DISC BRAKES or BRAKE SYSTEM
	Bent shoe or oily linings	See DRUM BRAKES or BRAKE SYSTEM
	Malfunctioning rear brakes	See DRUM, DISC BRAKES or BRAKE SYSTEM
	Loose suspension parts	See SUSPENSION
Noises Without Brakes Applied	Front linings worn out	Replace linings
	Dust or oil on drums or rotors	See DRUM, DISC BRAKES or BRAKE SYSTEM
Noises With Brakes Applied	Insulator on outboard shoe damaged	See DISC BRAKES or BRAKE SYSTEM
	Incorrect pads or linings	Replace pads or linings
Brake Rough, Chatters or Pulsates	Excessive lateral runout	Check rotor runout

	Parallelism not to specifications	Reface or replace rotor
	Wheel bearings not adjusted	See SUSPENSION
	Rear drums out-of-round	Reface or replace drums
	Disc pad reversed, steel against rotor	Remove and reinstall pad
Excessive Pedal Effort	Malfunctioning power unit	See POWER BRAKES or BRAKE SYSTEM
	Partial system failure	Check fluid and pipes
	Worn disc pad or lining	Replace pad or lining
	Caliper piston stuck or sluggish	See DISC BRAKES or BRAKE SYSTEM
	Master cylinder piston stuck	See MASTER CYLINDERS or BRAKE SYSTEM
	Brake fade due to incorrect pads for linings	Replace pads or linings
	Linings or pads glazed	Replace pads or linings
	Worn drums	Reface or replace drums
Excessive Pedal Travel	Partial brake system failure	Check fluid and pipes
	Insufficient fluid in master cylinder	See MASTER CYLINDERS or BRAKE SYSTEM
	Air trapped in system	See BRAKE BLEEDING or BRAKE SYSTEM
	Rear brakes not adjusted	See Adjustments in DRUM BRAKES or BRAKE SYSTEM
	Bent shoes or linings	See DRUM BRAKES or

		BRAKE SYSTEM
	Plugged master cylinder cap	See MASTER CYLINDERS or BRAKE SYSTEM
	Improper brake fluid	Replace brake fluid

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Pedal Travel Decreasing	Compensating port plugged	See MASTER CYLINDERS or BRAKE SYSTEM
	Swollen cup in master cylinder	See MASTER CYLINDERS or BRAKE SYSTEM
	Master cylinder piston not returning	See MASTER CYLINDERS or BRAKE SYSTEM
	Weak shoe retracting springs	See DRUM BRAKES BRAKE SYSTEM
	Wheel cylinder piston sticking	See DRUM BRAKES or BRAKE SYSTEM

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Dragging Brakes	Master cylinder pistons not returning	See MASTER CYLINDERS BRAKE SYSTEM
	Restricted brake lines or hoses	Check line routing
	Incorrect parking brake adjustment	See DRUM BRAKES BRAKE SYSTEM
	Parking Brake cables frozen	See DRUM BRAKES BRAKE SYSTEM
	Incorrect installation of inboard disc pad	Remove and replace correctly
	Power booster output rod too long	See POWER BRAKE UNITS BRAKE SYSTEM
	Brake pedal not returning freely	See DISC, DRUM BRAKES BRAKE SYSTEM

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Brakes Grab or Uneven Braking Action	**Malfunction of combination valve**	**See CONTROL VALVE or BRAKE SYSTEM**
	Malfunction of power brake unit	**See POWER BRAKE UNITS or BRAKE SYSTEM**
	Binding brake pedal	**See DISC, DRUM BRAKES or BRAKE SYSTEM**
Pulsation or Roughness	**Uneven pad wear caused by caliper**	**See DISC BRAKES or BRAKE SYSTEM**
	Uneven rotor wear	**See DISC BRAKES or BRAKE SYSTEM**
	Drums out-of-round	**Reface or replace drums**

ENGINE MECHANICAL

COOLING SYSTEM TROUBLE SHOOTING

NOTE: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

COOLING SYSTEM TROUBLE SHOOTING

CONDITION	POSSIBLE CAUSE	CORRECTION
Overheating	**Coolant Leak**	**Fill/Pressure Test System**
	A/C Condenser Fins Clogged	**Remove/Clean Condenser**
	Radiator Fins Clogged	**Remove/Clean Radiator**
	Thermostat Stuck Closed	**Replace Thermostat**
	Clogged Cooling System Passages	**Clean/Flush Cooling**

		System
	Water Pump Malfunction	Replace Water Pump
	Fan Clutch Malfunction	Replace Fan Clutch
	Retarded Ignition Timing	Reset Ignition Timing
	Cooling Fan Malfunction	Test Cooling Fan/ Circuit
	Cooling Fan Motor Malfunction	Test Fan Motor
	Cooling Fan Relay Malfunction	Test Fan Relay
	Faulty Radiator Cap	Replace Radiator Cap
	Broken/Slipping Fan Belt	Replace Fan Belt
	Restricted Exhaust	Repair Exhaust System
Corrosion	Impurities In Coolant	Clean/Flush System
Coolant Leakage	Damaged hose	Replace Hose
	Leaky Water Pump	Replace Water Pump
	Damaged Radiator Seam	Replace/Repair Radiator
	Leaky Thermostat Cover	Replace Thermostat Cover
	Cylinder Head Problem	Check Head/Head Gasket
	Leaky Freeze Plugs	Replace Freeze Plugs
Recovery System Inoperative	Loose and/or Defective Radiator Cap	Replace Radiator Cap
	Overflow Tube Clogged and/or Leaking	Repair Tube
	Recovery Bottle Vent Restricted	Clean Vent

No Heater Core Flow		
	Collapsed Heater Hose	**Replace Heater Hose**
	Plugged Heater Core	**Clean/Replace Heater Core**
	Faulty Heater Valve	**Replace Heater Valve**

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GASOLINE ENGINE - MECHANICAL TROUBLE SHOOTING

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BASIC GASOLINE ENGINE - MECHANICAL TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Lopes At Idle	Intake manifold-to-head leaks	Replace manifold gasket, See ENGINES
	Blown head gasket	Replace head gasket, See ENGINES
	Worn timing gears, chain or sprocket	Replace gears, chain or sprocket
	Worn camshaft lobes	Replace camshaft, See ENGINES
	Overheated engine	Check cooling system, See COOLING
	Blocked crankcase vent valve	Remove restriction
	Leaking EGR valve	Repair leak and/or replace valve
	Faulty fuel pump	Replace fuel pump
Engine Has Low Power	Leaking fuel pump	Repair leak and/or replace fuel pump
	Excessive piston-to-bore clearance	Install larger pistons, See ENGINES
	Sticking valves or weak valve springs	Check valve train components, See ENGINES
	Incorrect valve timing	Reset valve timing, See ENGINES
	Worn camshaft lobes	Replace camshaft, See

		ENGINES
	Blown head gasket	Replace head gasket. See ENGINES.
	Clutch slipping	Adjust pedal and/or replace components, See ENGINES
	Engine overheating	Check cooling system, See COOLING
	Auto. Trans. pressure regulator valve faulty	Replace pressure regulator valve
	Auto. Trans. fluid level too low	Add fluid as necessary
	Improper vacuum diverter valve operation	Replace vacuum diverter valve
	Vacuum leaks	Inspect vacuum system and repair as required
	Leaking piston rings	Replace piston rings, See ENGINES

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Faulty High Speed Operation	Low fuel pump volume	Replace fuel pump
	Leaking valves or worn	Replace valves and/or springs, See ENGINES
	Incorrect valve timing	Reset valve timing,See ENGINES
	Intake manifold restricted	Remove restriction
	Worn distributor shaft	Replace distributor

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Faulty Acceleration	Improper fuel pump stroke	Remove pump and reset pump stroke
	Incorrect ignition timing	Reset ignition timing, See TUNE-UP
	Leaking valves	Replace valves, See ENGINES
	Worn fuel pump diaphragm or piston	Replace diaphragm or piston

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Intake Backfire	Improper ignition timing	Reset ignition timing, See TUNE-UP
	Faulty accelerator pump discharge	Replace accelerator pump
	Improper choke operation	Check choke and adjust as required
	Defective EGR valve	Replace EGR valve
	Fuel mixture too lean	Reset air/fuel mixture, See TUNE-UP

	Choke valve initial clearance too large	Reset choke valve initial clearance
Exhaust Backfire	Vacuum leak	Inspect and repair vacuum system
	Faulty vacuum diverter valve	Replace vacuum diverter valve
	Faulty choke operation	Check choke and adjust as required
	Exhaust system leak	repair exhaust system leak
Engine Detonation	Ignition timing too far advanced	Reset ignition timing, See TUNE-UP
	Faulty ignition system	Check ignition timing, See TUNE-UP
	Spark plugs loose or faulty	Retighten or replace plugs
	Fuel delivery system clogged	Inspect lines, pump and filter for clog
	EGR valve inoperative	Replace EGR valve
	PCV system inoperative	Inspect and/or replace hoses or valve
	Vacuum leaks	Check vacuum system and repair leaks
	Excessive combustion chamber deposits	Remove built-up deposits
	Leaking, sticking or broken valves	Inspect and/or replace valves
External Oil Leakage	Fuel pump improperly seated or worn gasket	Remove pump, replace gasket and seat properly
	Oil pan gasket broken or pan bent	Straighten pan and replace gasket
	Timing chain cover gasket broken	Replace timing chain cover gasket
	Rear main oil seal worn	Replace rear main oil seal
	Oil pan drain plug not seated properly	Remove and reinstall drain plug
	Camshaft bearing drain hole blocked	Remove restriction
	Oil pressure sending switch leaking	Remove and reinstall sending switch
Excessive Oil	Worn valve stems or guides	Replace stems

Consumption		**guides, See ENGINES**
	Valve "O" ring seals damaged	**Replace "O" ring seals, See ENGINES**
	Plugged oil drain back holes	**Remove restrictions**
	Improper PCV valve operation	**Replace PCV valve**
	Engine oil level too high	**Remove excess oil**
	Engine oil too thin	**Replace thicker oil**
	Valve stem oil deflectors damaged	**Replace oil deflectors**
	Incorrect piston rings	**Replace piston rings, See ENGINES**
	Piston ring gaps not staggered	**Reinstall piston rings, See ENGINES**
	Insufficient piston ring tension	**Replace rings, See ENGINES**
	Piston ring grooves or oil return slots clogged	**Replace piston rings, See ENGINES**
	Piston rings sticking in grooves	**Replace piston rings, See ENGINES**
	Piston ring grooves excessively worn	**Replace piston and rings, See ENGINES**
	Compression rings installed upside down	**Replace compression rings correctly, See ENGINES**
	Worn or scored cylinder walls	**Rebore cylinders or replace block**
	Mismatched oil ring expander and rail	**Replace oil ring expander and rail, See ENGINES**
	Intake gasket dowels too long	**Replace intake gasket dowels**
	Excessive main or connecting rod bearing clearance	**Replace main or connecting rod bearings, See ENGINES**

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No Oil Pressure	**Low oil level**	**Add oil to proper level**
	Oil pressure sender or gauge broken	**Replace sender or gauge**
	Oil pump malfunction	**Remove and overhaul oil pump, See ENGINES**
	Oil pressure relief valve sticking	**Remove and reinstall valve**
	Oil pump passages blocked	**Overhaul oil pump, See ENGINES**
	Oil pickup screen or tube blocked	**remove restriction**
	Loose oil inlet tube	**Tighten oil inlet tube**

	Loose camshaft bearings	Replace camshaft bearings, See ENGINES
	Internal leakage at oil passages	Replace block or cylinder head

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Low Oil Pressure	Low engine oil level	Add oil to proper level
	Engine oil too thin	Remove and replace with thicker oil
	Excessive oil pump clearance	Reduce oil pump clearance, See ENGINES
	Oil pickup tube or screen blocked	Remove restrictions
	Main, rod or cam bearing clearance excessive	Replace bearing to reduce clearance, See ENGINES

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High Oil Pressure	Improper grade of oil	Replace with proper oil
	Oil pressure relief valve stuck closed	Eliminate binding
	Oil pressure sender or gauge faulty	Replace sender or gauge

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Noisy Main Bearings	Inadequate oil supply	Check oil delivery to main bearings
	Excessive main bearing clearance	Replace main bearings, See ENGINES
	Excessive crankshaft end play	Replace crankshaft, See ENGINES
	Loose flywheel or torque converter	Tighten attaching bolts
	Loose or damaged vibration damper	Tighten or replace vibration damper
	Crankshaft journals out-of-round	Re-grind crankshaft journals
	Excessive belt tension	Loosen belt tension

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Noisy Connecting Rods	Excessive bearing clearance or missing bearing	Replace bearing, See ENGINES
	Crankshaft rod journal out-of-round	Re-grind crankshaft journal
	Misaligned connecting rod or cap	Remove rod or cap and realign
	Incorrectly tightened rod bolts	Remove and re-tighten rod bolts

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Noisy Pistons and Rings	Excessive piston-to-bore clearance	Install larger pistons, See ENGINES
	Bore tapered or out-of-round	Rebore block

	Piston ring broken	Replace piston rings, See ENGINES
	Piston pin loose or seized	Replace piston pin, See ENGINES
	Connecting rods misaligned	Realign connecting rods
	Ring side clearance too loose or tight	Replace with larger or smaller rings
	Carbon build-up on piston	Remove carbon

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Noisy Valve Train	Worn or bent push rods	Replace push rods, See ENGINES
	Worn rocker arms or bridged pivots	Replace push rods, See ENGINES
	Dirt or chips in valve lifters	Remove lifters and remove dirt/chips
	Excessive valve lifter leak-down	Replace valve lifters, See ENGINES
	Valve lifter face worn	Replace valve lifters, See ENGINES
	Broken or cocked valve springs	replace or reposition springs
	Too much valve stem-to-guide clearance	Replace valve guides, See ENGINES
	Valve bent	Replace valve, See ENGINES
	Loose rocker arms	Retighten rocker arms, See ENGINES
	Excessive valve seat run-out	Reface valve seats, See ENGINES
	Missing valve lock	Install new valve lock
	Excessively worn camshaft lobes	Replace camshaft, See ENGINES
	Plugged valve lifter oil holes	Eliminate restriction or replace lifter
	Faulty valve lifter check ball	Replace lifter check ball, See ENGINES
	Rocker arm nut installed upside down	Remove and reinstall correctly
	Valve lifter incorrect for engine	Remove and replace valve lifters
	Faulty push rod seat or lifter plunger	Replace plunger or push rod

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Noisy Valves	Improper valve lash	Re-adjust valve lash, See ENGINES
	Worn or dirty valve lifters	Clean and/or replace lifters
	Worn valve guides	Replace valve guides,

		See ENGINES
	Excessive valve seat or face run-out	Reface seats or valve face
	Worn camshaft lobes	Replace camshaft, See ENGINES
	Loose rocker arm studs	Re-tighten rocker arm studs, See ENGINES
	Bent push rods	Replace push rods, See ENGINES
	Broken valve springs	Replace valve springs, See ENGINES
Burned,Sticking or Broken Valves	Weak valve springs or warped valves	Replace valves and/or springs, See ENGINES
	Improper lifter clearance	Re-adjust clearance or replace lifters
	Worn guides or improper guide clearance	Replace valve guides, See ENGINES
	Out-of-round valve seats or improper seat width	Re-grind valve seats
	Gum deposits on valve stems, seats or guides	Remove deposits
	Improper spark timing	Re-adjust spark timing
Broken Pistons/Rings	Undersize pistons	Replace with larger pistons, See ENGINES
	Wrong piston rings	Replace with correct rings, See ENGINES
	Out-of-round cylinder bore	Re-bore cylinder bore
	Improper connecting rod alignment	Remove and realign connecting rods
	Excessively worn ring grooves	Replace pistons, See ENGINES
	Improperly assembled piston pins	Re-assemble pin-to -piston, See ENGINES
	Insufficient ring gap clearance	Install new rings, See ENGINES
	Engine overheating	Check cooling system
	Incorrect ignition timing	Re-adjust ignition timing, See TUNE-UP
Excessive Exhaust Noise	Leaks at manifold to head, or to pipe	Replace manifold or pipe gasket
	Exhaust manifold cracked or broken	Replace exhaust manifold, See ENGINES

ENGINE PERFORMANCE

CARBURETOR TROUBLE SHOOTING:

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BASIC COLD START SYMPTOMS TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Won't Start	Choke not closing	Check choke operation, see FUEL SYSTEMS
	Choke linkage bent	Check linkage, see FUEL SYSTEM
Engine Starts, Then Dies	Choke vacuum kick setting too wide	Check setting and adjust see, FUEL SYSTEMS
	Fast idle RPM too low	Reset RPM to specif- ication, see TUNE-UP
	Fast idle cam index incorrect	Reset fast idle cam index, see FUEL SYSTEMS
	Vacuum leak	Inspect vacuum system for leaks
	Low fuel pump outlet	Repair or replace pump, see FUEL SYSTEMS
	Low carburetor fuel level	Check float setting see FUEL SYSTEM
Engine Quits Under Load	Choke vacuum kick setting incorrect	Reset vacuum kick setting,see FUEL SYSTEMS

	Fast idle cam index incorrect	Reset fast idle cam index, see FUEL SYSTEM
	Incorrect hot fast idle speed RPM	Reset fast idle RPM, see TUNE-UP
Engine Starts, Runs Up,Then Idles, Slowly With Black Smoke	Choke vacuum kick set too narrow	Reset vacuum kick, see FUEL SYSTEMS
	Fast idle cam index incorrect	Reset fast idle cam index, see FUEL SYSTEMS
	Hot fast idle RPM too low	Reset fast idle RPM, see TUNE-UP

BASIC HOT START SYMPTOMS TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Won't Start	Engine flooded	Allow fuel to evaporate

BASIC COLD ENGINE DRIVEABILITY SYMPTOMS TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Stalls in Gear	Choke vacuum kick setting incorrect	Reset choke vacuum kick, see FUEL SYSTEMS
	Fast idle RPM incorrect	Reset fast idle RPM, see TUNE-UP
	Fast idle cam index incorrect	Reset fast idle cam see FUEL SYSTEMS
Acceleration Sag or Stall	Defective choke control switch	Replace choke control switch
	Choke vacuum kick setting incorrect	Reset choke vacuum kick see, FUEL SYSTEMS

	Float level incorrect (too low)	Adjust float level, FUEL SYSTEMS
	Accelerator pump defective	Repair or replace pump see FUEL SYSTEMS
	Secondary throttles not closed	Inspect lockout adjustment,see FUEL SYSTEMS
Sag or Stall After Warmup	Defective choke control switch	Replace choke control switch, see FUEL SYSTEMS
	Defective accelerator pump	Replace pump, see FUEL SYSTEMS
	Float level incorrect (too low)	Adjust float level, see FUEL SYSTEMS
Backfiring & Black Smoke	Plugged heat crossover system	Remove restriction

BASIC WARM ENGINE DRIVEABILITY SYMPTOMS TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Hesitation With Small Amount of Gas Pedal Movement	Vacuum leak	Inspect vacuum lines
	Accelerator pump weak or inoperable	Replace pump, see FUEL SYSTEMS
	Float level setting too low	Reset float level, see,FUEL SYSTEMS
	Metering rods sticking or binding	Inspect and/or replace rods, see FUEL SYSTEMS
	Carburetor idle or transfer system plugged	Inspect system and remove restriction
	Frozen or binding heated air inlet	Inspect heated air door for binding

Hesitation With Heavy Gas Pedal Movement	Defective accelerator pump	Replace pump, see FUEL SYSTEMS
	Metering rod carrier sticking or binding	Remove restriction
	Large vacuum leak	Inspect vacuum system and repair leak
	Float level setting too low	Reset float level, see FUEL SYSTEMS
	Defective fuel pump, lines or filter	Inspect pump, lines and filter
	Air door setting incorrect	Adjust air door setting, see FUEL

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DIESEL ENGINE TROUBLE SHOOTING

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NOTE: Diesel engines mechanical diagnosis is the same as gasoline engines for items such as noisy valves, bearings, pistons, etc. The following trouble shooting covers only items pertaining to diesel engines.

BASIC DIESEL ENGINE TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Won't Crank	Bad battery connections or dead batteries	Check connections and/or replace batteries
	Bad starter connections or bad starter	Check connections and/or replace batteries
Engine Cranks	Bad battery connections	Check connections

Slowly, Won't Start	or dead batteries	and/or replace batteries
	Engine oil too heavy	Replace engine oil

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Engine Cranks Normally, But Will Not Start	Glow plugs not functioning	Check glow plug system, see FUEL SYSTEMS
	Glow plug control not functioning	Check controller, see FUEL SYSTEMS
	Fuel not injected into cylinders	Check fuel injectors, see FUEL SYSTEMS
	No fuel to injection pump	Check fuel delivery system
	Fuel filter blocked	Replace fuel filter
	Fuel tank filter blocked	Replace fuel tank filter
	Fuel pump not operating	Check pump operation and/or replace pump
	Fuel return system blocked	Inspect system and remove restriction
	No voltage to fuel solenoid	Check solenoid and connections
	Incorrect or contaminated fuel	Replace fuel
	Incorrect injection pump timing	Re-adjust pump timing, see FUEL SYSTEMS
	Low compression	Check valves, pistons, rings, see ENGINES
	Injection pump malfunction	Inspect and/or replace injection pump

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Engine Starts, Won't Idle	Incorrect slow idle adjustment	Reset idle adjustment, see TUNE-UP
	Fast idle solenoid malfunctioning	Check solenoid and connections
	Fuel return system blocked	Check system and remove restrictions
	Glow plugs go off too soon	See glow plug diagnosis in FUEL SYSTEMS
	Injection pump timing incorrect	Reset pump timing, see FUEL SYSTEMS
	No fuel to injection pump	Check fuel delivery system
	Incorrect or contaminated fuel	Replace fuel
	Low compression	Check valves, piston, rings, see ENGINES
	Injection pump malfunction	Replace injection pump, see FUEL SYSTEMS

	Fuel solenoid closes in RUN position	Check solenoid and connections
Engines Starts/ Idles Rough W/out Smoke or Noise	Incorrect slow idle adjustment	Reset slow idle, see TUNE-UP
	Injection line fuel leaks	Check lines and connections
	Fuel return system blocked	Check lines and connections
	Air in fuel system	Bleed air from system
	Incorrect or contaminated fuel	Replace fuel
	Injector nozzle malfunction	Check nozzles, see FUEL SYSTEMS
Engines Starts and Idles Rough W/out Smoke or Noise, But Clears After Warm-Up	Injection pump timing incorrect	Reset pump timing, see FUEL SYSTEMS
	Engine not fully broken in	Put more miles on engine
	Air in system	Bleed air from system
	Injector nozzle malfunction	Check nozzles, see FUEL SYSTEMS
Engine Idles Correctly, Misfires Above Idle	Blocked fuel filter	Replace fuel filter
	Injection pump timing incorrect	Reset pump timing, see FUEL SYSTEMS
	Incorrect or contaminated fuel	Replace fuel
Engine Won't Return To Idle	Fast idle adjustment incorrect	Reset fast idle, see TUNE-UP
	Internal injection pump malfunction	Replace injection pump, see FUEL SYSTEMS
	External linkage binding	Check linkage and remove binding
Fuel Leaks On Ground	Loose or broken fuel line	Check lines and connections
	Internal injection pump seal leak	Replace injection pump, see FUEL SYSTEMS
Cylinder Knocking Noise	Injector nozzles sticking open	Test injectors, see FUEL SYSTEMS
	Very low nozzle opening pressure	Test injectors and/or replace
Loss of Engine Power	Restricted air intake	Remove restriction
	EGR valve malfunction	Replace EGR val

	Blocked or damaged exhaust system	Remove restriction and/or replace components
	Blocked fuel tank filter	Replace filter
	Restricted fuel filter	Remove restriction and/or replace filter
	Block vent in gas cap	Remove restriction and/or replace cap
	Tank-to-injection pump fuel supply blocked	Check fuel lines and connections
	Blocked fuel return system	Remove restriction
	Incorrect or contaminated fuel	Replace fuel
	Blocked injector nozzles	Check nozzle for blockage, see FUEL SYSTEMS
	Low compression	Check valves, rings, pistons, see ENGINES
Loud Engine Noise With Black Smoke	Basic timing incorrect	Reset timing, see FUEL SYSTEMS
	EGR valve malfunction	Replace EGR valve
	Internal injection pump malfunction	Replace injection pump, see FUEL SYSTEMS
	Incorrect injector pump housing pressure	Check pressure, see FUEL SYSTEMS
Engine Overheating	Cooling system leaks	Check cooling system and repair leaks
	Belt slipping or damaged	Check tension and/or replace belt
	Thermostat stuck closed	Remove and replace thermostat, see ENGINE COOLING
	Head gasket leaking	Replace head gasket
Oil Light on at Idle	Low oil pump pressure	Check oil pump operation, see ENGINES
	Oil cooler or line restricted	Remove restriction and/or replace cooler
Engine Won't Shut Off	Injector pump fuel solenoid does not return fuel valve to OFF position	Remove and check solenoid and replace if needed

VACUUM PUMP DIAGNOSIS

Excessive Noise	Loose pump-to-drive	Tighten screws

	assembly screws	
	Loose tube on pump assembly	Tighten tube
	Valves not functioning properly	Replace valves
Oil Leakage	Loose end plug	Tighten end plug
	Bad seal crimp	Remove and re-crimp seal

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FUEL INJECTION TROUBLE SHOOTING

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BASIC FUEL INJECTION TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE	CORRECTION
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Engine Won't Start (Cranks Normally)	Cold start valve inoperative	Test valve and circuit
	Poor connection;vacuum or wiring	Check vacuum and electrical connections
	Contaminated fuel	Test fuel for water or alcohol
	Defective fuel pump relay or circuit	Test relay and wiring
	Battery too low	Charge and test battery
	Low fuel pressure	Test pressure regulator and fuel pump, check for restricted lines and filters
	No distributor reference pulses	Repair ignition system as necessary

	Open coolant temperature sensor circuit	Test sensor and wiring
	Shorted W.O.T. switch in T.P.S.	Disconnect W.O.T. switch, engine should start
	Defective ECM	Replace ECM
	Fuel tank residual pressure valve leaks	Test for fuel pressure drop after shut down
Hard Starting	Disconnected hot air tube to air cleaner	Reconnect tube and test control valve
	Defective Idle Air Control (IAC) valve	Test valve operation and circuit
	Shorted, open or misadjusted T.P.S.	Test and adjust or replace T.P.S.
	EGR valve open	Test EGR valve and control circuit
	Poor Oxygen sensor signal	Test for shorted or circuit
	Incorrect mixture from PCV system	Test PCV for flow, check sealing of oil filter cap
Poor High Speed Operation	Low fuel pump volume	Faulty pump or restricted fuel lines or filters
	Poor MAP sensor signal	Test MAP sensor, vacuum hose and wiring
	Poor Oxygen sensor signal	Test for shorted or open sensor or circuit
	Open coolant temperature sensor circuit	Test sensor and wiring
	Faulty ignition operation	Check wires For

		cracks or poor connections, test secondary voltage with oscilloscope
	Contaminated fuel	Test fuel for water or alcohol
	Intermittent ECM ground	Test ECM ground connection for resistance
	Restricted air cleaner	Replace air cleaner
	Restricted exhaust system	Test for exhaust manifold back pressure
	Poor MAF sensor signal	Check leakage between sensor and manifold
	Poor VSS signal	If tester for ALCL hook-up is available check that VSS reading matches speedometer
Ping or Knock on Acceleration	Poor Knock sensor signal	Test for shorted or open sensor or circuit
	Poor Baro sensor signal	Test for shorted or open sensor or circuit
	Improper ignition timing	See VEHICLE EMISSION CONTROL LABEL (where applicable)
	Check for engine overheating problems	Low coolant, loose belts or electric cooling fan inoperative

NOTE: For additional electronic fuel injection trouble shooting information, see the appropriate article in the ENGINE TROUBLE SH

PERFORMANCE section (not all vehicles have Computer Engine Control articles). Information is provided there for diagnosing fuel system problems on vehicles with electronic fuel injection.

IGNITION SYSTEM TROUBLE SHOOTING

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Ignition Secondary Trouble Shooting Chart

```
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? START: Visually inspect Spark Plug Wires, Coil Wires,   ?
?        Plug Wire Boots, Rotor, and Distributor Cap for  ?
?        signs of damage.                                 ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
      UAAAA?                                        UAAAAAAAA?
      ? OK ?                                        ? NOT OK ?
      AAAAAU                                        AAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?          UAAAAAAAAAAAAAAAAAAAAAAAA?
? *  To test secondary ignition   ?          ? *  Repair or replace  ?
?    system, modify a Spark Plug  ?          ?    damaged components ?
?    by attaching a ground wire   ?          ?    as necessary       ?
?    to the body of the plug and  ?          AAAAAAAAAAAAAAAAAAAAAAAAAU
?    widening the gap to 1/4-3/8".?
?    Disconnect spark plug wire   ?
?    and insert test plug. Ground ?
?    plug, crank engine, and      ?
?    check for spark.             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
   UAAAAAAAAAAAA?                                  UAAAAAAAAAA?
   ? GOOD SPARK ?                                  ? NO SPARK ?
   AAAAAAAAAAAAAAU                                 AAAAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  If plug sparks, driveability ?  ? * Remove coil wire from the   ?
?    problem is most likely NOT   ?  ?   distributor and attach the  ?
?    in the ignition system.      ?  ?   modified spark plug. Ground ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?   the plug and crank engine   ?
                                     ?   while checking for spark.   ?
                                     AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
```

```
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
   UAAAAAAAAAAAAA?                                          UAAAAAAAAAAA?
   ? GOOD SPARK ?                                           ? NO SPARK ?
   AAAAAAAAAAAAAAU                                          AAAAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  If plug has a good spark,      ?  ? *  Proceed to the IGNITION     ?
?    the problem is in the plug     ?  ?    PRIMARY TROUBLE SHOOTING    ?
?    wires, distributor cap, or     ?  ?    CHECK CHART below in this   ?
?    rotor.  Replace components     ?  ?    article.                    ?
?    as necessary.                  ?  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU

         Ignition Primary Trouble Shooting Chart

UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? START: Visually inspect primary ignition wires for        ?
?        broken, frayed, split, or cut wires.  Also check   ?
?        for loose, corroded, or disconnected connectors.   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
      UAAAA?                                               UAAAAAAAAA?
      ? OK ?                                               ? NOT OK ?
      AAAAAU                                               AAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Check that battery voltage     ?  ? *  Repair or replace damaged   ?
?    is at least 11.5 volts.        ?  ?    components as necessary.    ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
    UAAAAAAAAA?                                              UAAAA?
    ? NOT OK ?                                               ? OK ?
    AAAAAAAAAAU                                              AAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Replace or recharge the        ?  ? * Check for battery voltage    ?
?    battery.                       ?  ?   at the positive terminal of  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?   the coil.                    ?
                                       AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
      UAAAA?                                               UAAAAAAAAA?
      ? OK ?                                               ? NOT OK ?
      AAAAAU                                               AAAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Check air Gap of the Pick-Up   ?  ? * Check resistance of ballast  ?
?    coil in the distributor.       ?  ?   resistor (if used) for the   ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?   correct resistance value.    ?
                ?                      AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?                       ?
      UAAAA?                                UAAAAAAAAA?              ?
      ? OK ?                                ? NOT OK ?               ? TROUB
```

```
      AAAAAU                              AAAAAAAAAU                  ?
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  ?
? *  Check Pick-Up coil for     ?  ? *  Adjust or replace as     ?  ?
?    correct resistance value.  ?  ?    necessary.               ?  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?
         UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?                       ?
    UAAAAAAAA?                              UAAAA?                   ?
    ? NOT OK ?                              ? OK ?                   ?
    AAAAAAAAAU                              AAAAAU                   ?
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  ?
? *  Replace Pick-Up coil if    ?  ? *  Check control module for ?  ?
?    not to specification.      ?  ?    good ground connections. ?  ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?
                                            UAAAA?                   ?
                                            ? OK ?                   ?
                                            AAAAAU                   ?
               UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  ?
               ? *  If vehicle fails to run at this point, go to?  ?
               ?    the appropriate article in the ENGINE        ?  ?
               ?    PERFORMANCE section.                         ?  ?
               AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  ?
                                   UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
               UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
            UAAAA?                                    UAAAAAAAA?
            ? OK ?                                    ? NOT OK ?
            AAAAAU                                    AAAAAAAAAU
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?  UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA?
? *  Check wires from the battery/?  ? *  Replace ballast resistor   ?
?    ignition switch to the coil. ?  ?    if the measured resistance?
?    Also check the coil primary  ?  ?    value is not within        ?
?    and secondary resistance.    ?  ?    specification.             ?
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAU
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STARTER TROUBLE SHOOTING

NOTE: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing.

BASIC STARTER TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Starter Fails	Dead battery or bad	Check battery charge

to Operate	connections between starter and battery	and all wires and connections to starter
	Ignition switch faulty or misadjusted	Adjust or replace ignition switch
	Open circuit between starter switch ignition terminal on starter relay	Check and repair wires and connections as necessary
	Starter relay or starter defective	See Testing in STARTER article
	Open solenoid pull-in wire	See Testing in STARTER article
Starter Does Not Operate and Headlights Dim	Weak battery or dead cell	Charge or replace battery as necessary
	Loose or corroded battery connections	Check that battery connections are clean and tight
	Internal ground in starter windings	See Testing in STARTER article
	Grounded starter fields	See Testing in STARTERS
	Armature rubbing on pole shoes	See STARTER article
Starter Turns but Engine Does Not Rotate	Starter clutch slipping	See STARTER article
	Broken clutch housing	See STARTER article
	Pinion shaft rusted or dry	See STARTER article
	Engine basic timing incorrect	See Ignition Timing in TUNE-UP article
	Broken teeth on engine flywheel	Replace flywheel and check for starter pinion gear damage
Starter Will Not Crank Engine	Faulty overrunning clutch	See STARTER article

	Broken clutch housing	See STARTER article
	Broken flywheel teeth	Replace flywheel and check for starter pinion gear damage
	Armature shaft sheared or reduction gear teeth stripped	See STARTER article
	Weak battery	Charge or replace battery as necessary
	Faulty solenoid	See On-Vehicle Tests in STARTER article
	Poor grounds	Check all ground connections for tight and clean connections
	Ignition switch faulty or misadjusted	Adjust or replace ignition switch as necessary

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Starter Cranks Engine Slowly	Battery weak or defective	Charge or replace battery as necessary
	Engine overheated	See ENGINE COOLING SYSTEM article
	Engine oil too heavy	Check that proper viscosity oil is used
	Poor battery-to-starter connections	Check that all between battery and starter are clean and tight
	Current draw too low or too high	See Bench Tests in STARTER article
	Bent armature, loose pole shoes screws or worn bearings	See STARTER article

	Burned solenoid contacts	Replace solenoid
	Faulty starter	Replace starter
Starter Engages Engine Only Momentarily	Engine timing too far advanced	See Ignition Timing in TUNE-UP article
	Overrunning clutch not engaging properly	Replace overrunning clutch. See STARTER article
	Broken starter clutch	See STARTER article
	Broken teeth on engine flywheel	Replace flywheel and check starter pinion gear for damage
	Weak drive assembly thrust spring	See STARTER article
	Weak hold-in coil	See Bench Tests in STARTER article
Starter Drive Will Not Engage	Defective point assembly	See Testing in STARTER article
	Poor point assembly ground	See Testing in STARTER article
	Defective pull-in coil	Replace starter solenoid
Starter Relay Does Not Close	Dead battery	Charge or replace battery as necessary
	Faulty wiring	Check all wiring and connections leading to relay
	Neutral safety switch faulty	Replace neutral safety switch
	Starter relay faulty	Replace starter relay
Starter Drive Will Not Disengage	Starter motor loose on mountings	Tighten starter attach bolts
	Worn drive end bushing	See STARTER article

	Damaged engine flywheel teeth	Replace flywheel and starter pinion gear for damage
	Drive yolk return spring broken or missing	Replace return spring
	Faulty ignition switch	Replace ignition switch
	Insufficient clearance between winding leads to solenoid terminal and main contact in solenoid	Replace starter solenoid
	Starter clutch not disengaging	Replace starter clutch
	Ignition starter switch contacts sticking	Replace ignition switch
Starter Relay Operates but Solenoid Does Not	Faulty solenoid switch, switch connections or	Check all wiring between relay and solenoid or replace relay or solenoid as necessary
	Broken lead or loose soldered connections	Repair wire or wire connections as necessary
Solenoid Plunger Vibrates When Switch is Engaged	Weak battery	Charge or replace battery as necessary
	Solenoid contacts corroded	Clean contacts or replace solenoid
	Faulty wiring	Check all wiring leading to solenoid
	Broken connections inside switch cover	Repair connections or replace solenoid
	Open hold-in wire	Replace solenoid
Low Current Draw	Worn brushes or weak	Replace brushes or brush springs as necessary

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High Pitched Whine During Cranking Before Engine Fires but Engine Fires and Cranks Normally	**Distance too great between starter pinion and flywheel**	**Align starter or check that correct starter and flywheel are being used**
High Pitched Whine After Engine Fires With Key released. Engine Fires and Cranks Normally	**Distance too small between starter pinion and flywheel Flywheel runout contributes to the intermittent nature**	

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TUNE-UP TROUBLE SHOOTING - GAS ENGINE VEHICLES

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BASIC SPARK PLUG TROUBLE SHOOTING CHARTS

CONDITION	POSSIBLE CAUSE	CORRECTION
Normal Spark Plug Condition	**Light Tan or Gray deposits**	**No Action**
	Electrode not burned or fouled	**No Action**
	Gap tolerance not changed	**No Action**
Cold Fouling or Carbon Deposits	**Overrich air/fuel mixture**	**Adjust air/fuel mixture, see ENGINE PERFORMANCE section**
	Faulty choke	**Replace choke assembly, see ENGINE PERFORMANCE section**
	Clogged air filter	**Clean and/or replace air filter**

	Incorrect idle speed or dirty carburetor	Reset idle speed and/ or clean carburetor
	Faulty ignition wires	Replace ignition wiring
	Prolonged operation at idle	Shut engine off during long idle
	Sticking valves or worn valve guide seals	Check valve train
Wet Fouling or Oil Deposits	Worn rings and pistons	Install new rings and pistons
	Excessive cylinder wear	Rebore or replace block
	Excessive valve guide clearance	Worn or loose bearing
Gap Bridged	Deposits in combustion chamber becoming fused to electrode	Clean combustion chamber of deposits
Blistered Electrode	Engine overheating	Check cooling system
	Wrong type of fuel	Replace with correct fuel
	Loose spark plugs	Retighten spark plugs
	Over-advanced ignition timing	Reset ignition timing see ENGINE PERFORMANCE
Pre-Ignition or Melted Electrodes	Incorrect type of fuel	Replace with correct fuel
	Incorrect ignition timing	Reset ignition timing see ENGINE PERFORMANCE
	Burned valves	Replace valves
	Engine Overheating	Check cooling system
	Wrong type of spark plug, too hot	Replace with correct spark plug, see ENGINE PERFORMANCE

Chipped Insulators	Severe detonation	Check for over-advanced timing or combustion
	Improper gapping procedure	Re-gap spark plugs
Rust Colored Deposits	Additives in unleaded fuel	Try different fuel brand
Water In Combus-tion Chamber	Blown head gasket or cracked head	Repair or replace head or head gasket

NOTE: Before diagnosing an electronic ignition system, ensure that all wiring is connected properly between distributor, wiring connector and spark plugs. Ignition problem will show up either as: Engine Will Not Start or Engine Runs Rough.

BASIC ELECTRONIC IGNITION TROUBLE SHOOTING CHARTS

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Won't Start	Open circuit between distributor and bulkhead connector	Repair circuit
	Open circuit between bulkhead connector and ignition switch	Repair circuit
	Open circuit between ignition switch and starter solenoid	Repair circuit
Engine Runs Rough	Fuel lines leaking or clogged	Tighten fitting, remove restriction
	Initial timing incorrect	Reset ignition timing see ENGINE PERFORMANCE
	Centrifugal advance malfunction	Repair distributor advance
	Defective spark plugs or wiring	Replace plugs or plug wiring

Component Failure	Spark arc-over on cap, rotor or coil	Replace cap, rotor or or coil
	Defective pick-up coil	Replace pick-up coil
	Defective ignition coil	Replace ignition coil
	Defective vacuum unit	Replace vacuum unit
	Defective control module	Replace control module

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BASIC ELECTRONIC IGNITION TROUBLE SHOOTING CHARTS - USING OSCILLOSCOPE PATTERNS

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CONDITION	POSSIBLE CAUSE	CORRECTION
Firing Voltage Lines are the Same, but Abnormally High	Retarded ignition timing	Reset ignition timing, see ENGINE PERFORMANCE section
	Fuel mixture too lean	Readjust carburetor, see ENGINE PERFORMANCE
	High resistance in coil wire	Replace coil wire
	Corrosion in coil tower terminal	Clean and/or replace coil
	Corrosion in distributor coil terminal	Clean and/or replace distributor cap
Firing Voltage Lines are the Same but Abnormally Low	Fuel mixture too rich	Readjust carburetor, see ENGINE PERFORMANCE
	Breaks in coil wire causing arcing	Replace coil wire
	Cracked coil tower causing arcing	Replace coil
	Low coil output	Replace coil
	Low engine compression	Determine cause and repair
One or More, But	Carburetor idle mixture	Readjust carburetor,

Not All Firing Voltage Lines are Higher Than Others	not balanced	see ENGINE PERFORMANCE
	EGR valve stuck open	Clean and/or replace valve
	High resistance in spark plug wires	Replace spark plug wires
	Cracked or broken spark plug insulator	Replace spark plugs
	Intake vacuum leak	Repair leak
	Defective spark plugs	Replace spark plugs
	Corroded spark plug terminals	Replace spark plugs

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One or More, But Not All Firing Voltage Lines Are Lower Than Others	Curb idle mixture not balanced	Readjust carburetor, see ENGINE PERFORMANCE
	Breaks in plug wires causing arcing	Replace plug wires
	Cracked coil tower causing arcing	Replace coil
	Low compression	Determine cause and repair
	Defective spark plugs	Replace spark plugs
	Corroded spark plugs	Replace spark plugs

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Cylinders Not Firing	Cracked distributor cap terminals	Replace distributor cap
	Shorted spark plug wire	Determine cause and repair
	Mechanical problem in engine	Determine cause and repair
	Defective spark plugs	Replace spark plugs
	Spark plugs fouled	Replace spark plugs

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BASIC DRIVEABILITY PROBLEMS TROUBLE SHOOTING TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
Hard Starting	Binding carburetor linkage	Eliminate binding
	Binding choke linkage	Eliminate binding
	Binding choke piston	Eliminate binding
	Restricted choke vacuum	Check vacuum lines for blockage
	Worn or dirty needle valve and seat	Clean carburetor, see ENGINE PERFORMANCE
	Float sticking	Readjust or replace float see the ENGINE PERFORMANCE section
	Incorrect choke adjustment	Reset choke adjustment see ENGINE PERFORMANCE
	Defective coil	Replace coil
	Improper spark plug gap	Regap spark plugs
	Incorrect ignition timing	Reset ignition timing see ENGINE PERFORMANCE
Detonation	Over-advanced ignition timing	Reset ignition timing see ENGINE PERFORMANCE
	Defective spark plugs	Replace spark plugs
	Fuel lines clogged	Clean fuel lines
	EGR system malfunction	Check and repair EGR system
	PCV system malfunction	Repair PCV system
	Vacuum leaks	Check and repair vacuum system
	Loose fan belts	Tighten or replace fan belts, see ENGINE PERFORMANCE

	Restricted airflow	Remove restriction
	Vacuum advance malfunction	Check distributor operation
Dieseling	Binding carburetor linkage	Eliminate binding
	Binding throttle linkage	Eliminate blinding
	Binding choke linkage or fast idle cam	Eliminate binding
	Defective idle solenoid	Replace idle solenoid see ENGINE PERFORMANCE
	Improper base idle speed	Reset idle speed, see see ENGINE PERFORMANCE
	Incorrect ignition timing	Reset ignition timing see ENGINE PERFORMANCE
	Incorrect idle mixture setting	Reset idle mixture, see ENGINE PERFORMANCE
Faulty Acceleration	Incorrect ignition timing	Reset ignition timing see ENGINE PERFORMANCE
	Engine cold and choke too lean	Adjust choke and allow engine to warm-up
	Defective spark plugs	Replace spark plugs
	Defective coil	Replace coil
Faulty Low Speed Operation	Clogged idle transfer slots	Clean idle transfer slots, see FUEL
	Restricted idle air bleeds and passages	Disassemble and clean carburetor, see FUEL
	Clogged air cleaner	Replace air filter
	Defective spark plugs	Replace spark plugs
	Defective ignition wires	Replace ignition wire see ENGINE PERFORMANCE

	Defective distributor cap	Replace distributor cap
Faulty High Speed Operation	Incorrect ignition timing	Reset ignition timing see ENGINE PERFORMANCE
	Defective distributor centrifugal advance	Replace advance mechanism
	Defective distributor vacuum advance	Replace advance unit
	Incorrect spark plugs or plug gap	Check gap and/or replace spark plugs
	Faulty choke operation	Check choke and repair as required
	Clogged vacuum passages	Remove restrictions
	Improper size or clogged main jet	Check jet size and clean, see FUEL
	Restricted air cleaner	Check filter and replace as necessary
	Defective distributor cap, rotor or coil	Replace cap, rotor or coil
Misfire at All Speeds	Defective spark plugs	Replace spark plugs
	Defective spark plug wires	Replace spark plug wires
	Defective distributor cap, rotor, or coil	Replace cap, rotor, or coil
	Cracked or broken vacuum hoses	Replace vacuum hoses
	Vacuum leaks	Repair vacuum leaks
	Fuel lines clogged	Remove restriction
Hesitation	Cracked or broken vacuum hoses	Replace vacuum hoses

	Vacuum leaks	Repair Vacuum leaks
	Binding carburetor linkage	Eliminate binding
	Binding throttle linkage	Eliminate binding
	Binding choke linkage or fast idle cam	Eliminate binding
	Improper float setting	Readjust float setting, see FUEL
	Cracked or broken ignition wires	Replace ignition wires

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Rough idle, Missing or Stalling	Incorrect curb idle or fast idle speed	Reset idle speed, see see ENGINE PERFORMANCE
	Incorrect basic timing	Reset ignition timing see ENGINE PERFORMANCE
	Improper idle mixture adjustment	Reset idle mixture, see ENGINE PERFORMANCE
	Improper feedback system operation	Check feedback system see ENGINE PERFORMANCE
	Incorrect spark plug gap	Reset spark plug gap, see ENGINE PERFORMANCE
	Moisture in ignition components	Dry components
	Loose or broken ignition wires	Replace ignition wires
	Damaged distributor cap or or rotor	Replace distributor cap or rotor
	Faulty ignition coil	Replace ignition coil
	Fuel filter clogged or worn	Replace fuel filter
	Damaged idle mixture screw	Replace idle mixture screw, see FUEL
	Improper fast idle cam	Reset fast idle cam

	adjustment	adjustment, see TUNE-see ENGINE PERFORMANCE
	Improper EGR valve operation	Replace EGR valve
	Faulty PCV valve air flow	Replace PCV valve
	Choke binding or improper choke setting	Reset choke or eliminate binding
	Vacuum leak	Repair vacuum leak
	Improper float bowl fuel level	Reset float adjustment, see FUEL
	Clogged air bleed or idle passages	Clean carburetor passages, see FUEL
	Clogged or worn air cleaner filter	Replace air filter
	Faulty choke vacuum diaphragm	Replace diaphragm, see ENGINE PERFORMANCE
	Exhaust manifold heat valve inoperative	Replace heat valve
	Improper distributor spark advance	Check distributor operation
	Leaking valves or valve components	Check and repair valvetrain
	Improper carburetor mounting	Remove and remount carburetor
	Excessive play in distributor shaft	Replace distributor
	Loose or corroded wiring connections	Repair or replace as required

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Engine Surges	Improper PCV valve airflow	Replace PCV valve
	Vacuum leaks	Repair vacuum leaks
	Clogged air bleeds	Remove restriction

	EGR valve malfunction	Replace EGR valve
	Restricted air cleaner filter	Replace air filter
	Cracked or broken vacuum hoses	Replace vacuum hoses
	Cracked or broken ignition wires	Replace ignition wires
	Vacuum advance malfunction	Check unit and replace as necessary
	Defective or fouled spark plugs	Replace spark plugs
Ping or Spark Knock	Incorrect ignition timing	Reset ignition timing see ENGINE PERFORMANCE
	Distributor centrifugal or vacuum advance malfunction	Check operation and replace as necessary
	Carburetor setting too lean	Readjust mixture setting, see ENGINE PERFORMANCE
	Vacuum leak	Eliminate vacuum leak
	EGR valve malfunction	Replace EGR valve
Poor Gasoline Mileage	Cracked or broken vacuum hoses	Replace vacuum hoses
	Vacuum leaks	Repair vacuum leaks
	Defective ignition wires	Replace wires
	Incorrect choke setting	Readjust setting, see ENGINE PERFORMANCE
	Defective vacuum advance	Replace vacuum advance
	Defective spark plugs	Replace spark plugs
	Binding carburetor power piston	Eliminate binding

	Dirt in carburetor jets	Clean and/or replace jets
	Incorrect float adjustment	Readjust float setting, see FUEL
	Defective power valve	Replace power valve, see ENGINE PERFORMANCE
	Incorrect idle speed	Readjust idle speed
Engine Stalls	Improper float level	Readjust float level
	Leaking needle valve and seat	Replace needle valve and seat
	Vacuum leaks	Eliminate vacuum leaks

VACUUM PUMP - DIESEL TROUBLE SHOOTING

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NOTE: Diesel engines mechanical diagnosis is the same as gasoline engines for items such as noisy valves, bearings, pistons, etc. The following trouble shooting covers only items pertaining to diesel engines.

VACUUM PUMP (DIESEL) TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Excessive Noise	Loose pump-to-drive assembly screws	Tighten screws
	Loose tube on pump assembly	Tighten tube
	Valves not functioning properly	Replace valves
Oil Leakage	Loose end plug	Tighten end plug
	Bad seal crimp	Remove and re-crimp seal

MANUAL TRANSMISSION

MANUAL TRANSMISSION TROUBLE SHOOTING

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MANUAL TRANSMISSION/TRANSAXLE TROUBLE SHOOTING

Condition	Possible Cause
Noisy In Forward Gears	.Low gear oil level, .Loose bell housing bolts, .Worn bearings or gears
Clunk On Deceleration (FWD Only)	.Loose engine mounts, .Worn inboard CV joints, .Worn differential pinion shaft, .Side gear hub counterbore in case worn oversize
Gear Clash When Shifting Forward Gears	.Clutch Out Of Adjustment, .Shift linkage damaged or out of adjustment, .Gears or synchronizers damaged, .Low gear oil level
Transmission Noisy When Moving (RWD Only) Quiet In Neutral With Clutch Engaged	.Worn rear outputshaft bearing
Gear Rattle	.Worn bearings, .Wrong gear oil, .Low gear oil, .Worn gears
Steady Ticking At Idle (Increases With RPM)	.Broken tooth on gear

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Gear Clash When Shifting Forward Gears .Worn or broken synchronizers

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Loud Whine In Reverse .Normal condition (1)

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Noise When Stepping On Clutch .Bad release bearing,
.Worn pilot bearing

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Ticking Or Screeching As Clutch Is Engaged .Faulty release bearing,
.Uneven pressure plate fingers

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Click Or Snap When Clutch Is Engaged .Worn clutch fork,
.Worn or broken front bearing retainer

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Transmission Shifts Hard .Clutch not releasing,
.Shift mechanism binding,
.Clutch installed backwards

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Will Not Shift Into One Gear, Shifts Into All Others .Bent shift fork,
.Worn detent balls

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Locked Into Gear, Cannot Shift .Clutch adjustment,
.Worn detent balls

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Transmission Jumps Out Of Gear .Pilot bearing worn,
.Bent shift fork,
.Worn gear teeth or face
.Excessive gear train end play
.Worn synchronizers
.Missing detent ball spring
.Shift mechanism worn or out of adjustment
.Engine or transmission mount bolts loose or out of adjustment
.Transmission not aligned

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Shift Lever Rattle .Worn shift lever or detents
.Worn shift forks
.Worn synchronizers sleeve

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Shift Lever Hops Under Acceleration		.Worn engine or transmission mounts

(1) - Most units use spur cut gears in reverse and are noisy

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POWERTRAIN

CLUTCH TROUBLE SHOOTING

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BASIC CLUTCH TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE	CORRECTION
Chattering or Grabbing	Incorrect clutch adjustment	Adjust clutch
	Oil, grease or glaze on facings	Disassemble and clean or replace
	Loose "U" joint flange	See DRIVE AXLES article
	Worn input shaft spline	Replace input shaft
	Binding pressure plate	Replace pressure plate
	Binding release lever	See CLUTCH article
	Binding clutch disc hub	Replace clutch disc
	Unequal pressure plate contact	Replace worn/misaligned components
	Loose/bent clutch disc	Replace clutch disc
	Incorrect transmission alignment	Realign transmission

	Worn pressure plate, disc or flywheel	Replace damaged components
	Broken or weak pressure springs	Replace pressure plate
	Sticking clutch pedal	Lubricate clutch pedal & linkage
	Incorrect clutch disc facing	Replace clutch disc
	Engine loose in chassis	Tighten all mounting bolts
Failure to Release	Oil or grease on clutch facings	Clean or replace clutch clutch disc
	Incorrect release lever or pedal adjustment	See CLUTCH article
	Worn or broken clutch facings	Replace clutch disc
	Bent clutch disc or pressure plate	Replace damaged components
	Clutch disc hub binding on input shaft	Clean or replace clutch disc and/or input shaft
	Binding pilot bearing	Replace pilot bearing
	Sticking release bearing sleeve	Replace release bearing and/or sleeve
	Binding clutch cable	See CLUTCH article
	Defective clutch master	Replace master cylinder
	Defective clutch slave	Replace slave cylinder
	Air in hydraulic system	Bleed hydraulic system
Rattling	Weak or broken release lever spring	Replace spring and check alignment
	Damaged pressure plate	Replace pressure plate

	Broken clutch return spring	Replace return spring
	Worn splines on clutch disc or input shaft	Replace clutch disc and/or input shaft
	Worn clutch release bearing	Replace release bearing
	Dry or worn pilot bearing	Lubricate or replace pilot bearing
	Unequal release lever contact	Align or replace release lever
	Incorrect pedal free play	Adjust free play
	Warped or damaged clutch disc	Replace damaged components
Slipping	Pressure springs worn or	Release pressure plate
	Oily, greasy or worn facings	Clean or replace clutch disc
	Incorrect clutch alignment	Realign clutch assembly
	Warped clutch disc or pressure plate	Replace damaged components
	Binding release levers or clutch pedal	Lubricate and/or replace release components
Squeaking	Worn or damaged release	Replace release bearing
	Dry or worn pilot or release bearing	Lubricate or replace assembly
	Pilot bearing turning in crankshaft	Replace pilot bearing and/or crankshaft
	Worn input shaft bearing	Replace bearing and seal
	Incorrect transmission alignment	Realign transmission
	Dry release fork between pivot	Lubricate release fork and pivot

Heavy and/or Stiff Pedal	Sticking release bearing sleeve	Replace release bearing and/or sleeve
	Dry or binding clutch pedal hub	Lubricate and align components
	Floor mat interference with pedal	Lay mat flat in proper area
	Dry or binding ball/fork pivots	Lubricate and align components
	Faulty clutch cable	Replace clutch cable
Noisy Clutch Pedal	Faulty interlock switch	Replace interlock switch
	Self-adjuster ratchet noise	Lubricate or replace self-adjuster
	Speed control interlock switch	Lubricate or replace interlock switch
Clutch Pedal Sticks Down	Binding clutch cable	See CLUTCH article
	Springs weak in pressure plate	Replace pressure plate
	Binding in clutch linkage	Lubricate and free linkage
Noisy	Dry release bearing	Lubricate or replace release bearing
	Dry or worn pilot bearing	Lubricate or replace bearing
	Worn input shaft bearing	Replace bearing
Transmission Click	Weak springs in pressure plate	Replace pressure plate
	Release fork loose on ball stud	Replace release fork and/or ball stud
	Oil on clutch disc damper	Replace clutch disc

Broken spring in slave cylinder	Replace slave cylinder

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DRIVE AXLE - NOISE DIAGNOSIS

Unrelated Noises

Some driveline trouble symptoms are also common to the engine, transmission, wheel bearings, tires, and other parts of the vehicle. Ensure cause of trouble actually is in the drive axle before adjusting, repairing, or replacing any of its parts.

Non-Drive Axle Noises

A few conditions can sound just like drive axle noise and have to be considered in pre-diagnosis. The 4 most common noises are exhaust, tires, CV/universal joints and wheel trim rings.

In certain conditions, the pitch of the exhaust gases may sound like gear whine. At other times, it may be mistaken for a wheel bearing rumble.

Tires, especially radial and snow, can have a high-pitched tread whine or roar, similar to gear noise. Also, some non-standard tires with an unusual tread construction may emit a roar or whine.

Defective CV/universal joints may cause clicking noises or excessive driveline play that can be improperly diagnosed as drive axle problems.

Trim and moldings also can cause a whistling or whining noise. Ensure none of these components are causing the noise before disassembling the drive axle.

Gear Noise

A "howling" or "whining" noise from the ring and pinion gear can be caused by an improper gear pattern, gear damage, or improper bearing preload. It can occur at various speeds and driving conditions, or it can be continuous.

Before disassembling axle to diagnose and correct gear noise, make sure that tires, exhaust, and vehicle trim have been checked as possible causes.

Chuckle

This is a particular rattling noise that sounds like a stick against the spokes of a spinning bicycle wheel. It occurs while decelerating from 40 MPH and usually can be heard until vehicle comes to a complete stop. The frequency varies with the speed of the vehicle.

A chuckle that occurs on the driving phase is usually caused by excessive clearance due to differential gear wear, or by a damaged tooth on the coast side of the pinion or ring gear. Even a very small tooth nick or a ridge on the edge of a gear tooth is enough the cause the noise.

This condition can be corrected simply by cleaning the gear tooth nick or ridge with a small grinding wheel. If either gear is damaged or scored badly, the gear set must be replaced. If metal has broken loose, the carrier and housing must be cleaned to remove particles that could cause damage.

Knock

This is very similar to a chuckle, though it may be louder, and occur on acceleration or deceleration. Knock can be caused by a gear tooth that is damaged on the drive side of the ring and pinion gears. Ring gear bolts that are hitting the carrier casting can cause knock. Knock can also be due to excessive end play in the axle shafts.

Clunk

Clunk is a metallic noise heard when an automatic transmission is engaged in Reverse or Drive, or when throttle is applied or released. It is caused by backlash somewhere in the driveline, but not necessarily in the axle. To determine whether driveline clunk is caused by the axle, check the total axle backlash as follows:

1) Raise vehicle on a frame or twinpost hoist so that drive wheels are free. Clamp a bar between axle companion flange and a part of the frame or body so that flange cannot move.

2) On conventional drive axles, lock the left wheel to keep it from turning. On all models, turn the right wheel slowly until it is felt to be in Drive condition. Hold a chalk marker on side of tire about 12" from center of wheel. Turn wheel in the opposite direction until it is again felt to be in Drive condition.

3) Measure the length of the chalk mark, which is the total axle backlash. If backlash is one inch or less, drive axle is not the source of clunk noise.

Bearing Whine

Bearing whine is a high-pitched sound similar to a whistle. It is usually caused by malfunctioning pinion bearings. Pinion bearings operate at drive shaft speed. Roller wheel bearings may whine in a similar manner if they run completely dry of lubricant. Bearing noise will occur at all driving speeds. This distinguishes it from gear whine, which usually comes and goes as speed changes.

Bearing Rumble

Bearing rumble sounds like marbles being tumbled. It is usually caused by a malfunctioning wheel bearing. The lower pitch is because the wheel bearing turns at only about 1/3 of drive shaft speed.

Chatter On Turns

This is a condition where the entire front or rear of vehicle vibrates when vehicle is moving. The vibration is plainly felt as well as heard. Extra differential thrust washers installed during axle repair can cause a condition of partial lock-up that creates this chatter.

Axle Shaft Noise

Axle shaft noise is similar to gear noise and pinion bearing whine. Axle shaft bearing noise will normally distinguish itself from gear noise by occurring in all driving modes (Drive, cruise, coast and float), and will persist with transmission in Neutral while vehicle is moving at problem speed.

If vehicle displays this noise condition, remove suspect axle shafts, replace wheel seals and install a new set of bearings. Re-evaluate vehicle for noise before removing any internal components.

Vibration

Vibration is a high-frequency trembling, shaking or grinding condition (felt or heard) that may be constant or variable in level and can occur during the total operating speed range of the vehicle.

The types of vibrations that can be felt in the vehicle can be divided into 3 main groups:

* Vibrations of various unbalanced rotating parts of the vehicle.
* Resonance vibrations of the body and frame structures caused by rotating of unbalanced parts.
* Tip-in moans of resonance vibrations from stressed engine or exhaust system mounts or driveline flexing modes.

DRIVE AXLE - RWD TROUBLE SHOOTING

NOTE: This is GENERAL information. This article is not intended to be specific to any unique situation or individual vehicle configuration. The purpose of this Trouble Shooting information is to provide a list of common causes to problem symptoms. For model-specific Trouble Shooting, refer to SUBJECT, DIAGNOSTIC, or TESTING articles available in the section(s) you are accessing. For definitions of listed noises or sounds, see DRIVE AXLE - NOISE DIAGNOSIS under POWERTRAIN.

DRIVE AXLE (RWD) TROUBLE SHOOTING

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CONDITION	POSSIBLE CAUSE	CORRECTION

TROUBLE SHO

Knocking or Clunking		
	Differential Side Gear Clearance	Check Clearance
	Worn Pinion Shaft	Replace Pinion Shaft
	Axle Shaft End Play	Check End Play
	Missing Gear Teeth	Check Differential/ Replace Gear
	Wrong Axle Backlash	Check Backlash
	Misaligned Driveline	Realign Driveline
Clinking During Engagement		
	Side Gear Clearance	Check Clearance
	Ring and Pinion Backlash	Check Backlash
	Worn/Loose Pinion Shaft	Replace Shaft/Bearing
	Bad "U" Joint	Replace "U" Joint
	Sticking Slip Yoke	Lube Slip Yoke
	Broken Rear Axle Mount	Replace Mount
	Loose Drive Shaft Flange	Check Flange
Click/Chatter On Turns		
	Differential Side Gear Clearance	Check Clearance
	Wrong Turn On Plates (1)	Replace Clutch Plates
	Wrong Differential Lubricant (1)	Change Lubricant
Knock Or Click	Flat Spot on Rear Wheel Bearing	Replace Wheel Bearing
Low Vibration At All Speeds		
	Faulty Wheel Bearing	Replace Wheel Bearing
	Faulty "U" Joint	Replace "U" Joint

Faulty Drive Shaft	Balance Drive Shaft
Faulty Companion Flange	Replace Flange
Faulty Slip Yoke Flange	Replace Flange

(1) - Limited slip differential only.

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FWD AXLE SHAFTS & CV JOINTS TROUBLE SHOOTING

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BASIC FWD AXLE SHAFTS & CV JOINTS TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE
Grease Leaks	CV boot torn or cracked
Clicking Noise on Cornering	Damaged outer CV
Clunk Noise on Acceleration	Damaged inner CV
Vibration or Shudder on Acceleration	Sticking, damaged or worn CV Misalignment or spring height

STEERING & SUSPENSION

MANUAL STEERING GEAR TROUBLE SHOOTING

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BASIC MANUAL STEERING GEAR TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE	CORRECTION
Rattle or Chucking Noise in Rack and Pinion	Rack and pinion mounting bracket loose	Tighten all mounting bolts
	Lack of/or incorrect lubricant	Correct as necessary
	Steering gear mounting bolts loose	Tighten all mounting bolts
Excessive Play	Front wheel bearing improperly adjusted	See FRONT SUSPENSION article
	Loose or worn steering linkage	See STEERING LINKAGE article
	Loose or worn steering gear shift	See MANUAL STEERING GEAR article
	Steering arm loose on gear shaft	See MANUAL STEERING GEAR article
	Steering gear housing bolts loose	Tighten all mounting bolts
	Steering gear adjustment too loose	See MANUAL STEERING GEAR article
	Steering arms loose on knuckles	Tighten and check steering linkage
	Rack and pinion mounting loose	Tighten all mounting bolts
	Rack and pinion out of adjustment	See adjustment in STEERING article
	Tie rod end loose	Tighten and check steering linkage
	Excessive Pitman shaft-to-ball nut lash	Repair as necessary
Poor Returnability	Lack of lubricant in ball joint or linkage	Lubricate and service systems
	Binding in linkage or ball	See STEERING LINKAGE

	joints	and SUSPENSION article
	Improper front end alignment	See WHEEL ALIGNMENT article
	Improper tire pressure	Inflate to proper pressure
	Tie rod binding	Inflate to proper pressure
	Shaft seal rubbing shaft	See STEERING COLUMN article
Excessive Vertical Motion	Improper tire pressure	Inflate to proper pressure
	Tires, wheels or rotors out of balance	Balance tires then check wheels and rotors
	Worn or faulty shock absorbers	Check and replace if necessary
	Loose tie rod ends or steering	Tighten or replace if necessary
	Loose or worn wheel bearings	See SUSPENSION article
Steering Pulls to One Side	Improper tire pressure	Inflate to proper pressure
	Front tires are different sizes	Rotate or replace if necessary
	Wheel bearings not adjusted properly	See FRONT SUSPENSION article
	Bent or broken suspension components	See FRONT SUSPENSION article
	Improper wheel alignment	See WHEEL ALIGNMENT article
	Brakes dragging	See BRAKES article

Instability	Low or uneven tire pressure	Inflate to proper pressure
	Loose or worn wheel bearings	See FRONT SUSPENSION article
	Loose or worn idler arm bushing	See FRONT SUSPENSION article
	Loose or worn strut bushings	See FRONT SUSPENSION article
	Incorrect front wheel alignment	See WHEEL ALIGNMENT article
	Steering gear not centered	See MANUAL STEERING GEARS article
	Springs or shock	Check and replace if necessary
	Improper cross shaft	See MANUAL STEERING GEARS article

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POWER STEERING TROUBLE SHOOTING

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BASIC POWER STEERING TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE	CORRECTION
Rattle or Chucking Noise	Pressure hoses touching engine parts	Adjust to proper clearance
	Loose Pitman shaft	Adjust or replace if necessary
	Tie rods ends or Pitman arm loose	Tighten and check system

	Rack and pinion mounts loose	Tighten all mounting bolts
	Free play in worm and	See POWER STEERING GEAR article
	Loose sector shaft or thrust bearing adjustment	See POWER STEERING GEAR
	Free play in pot coupling	See STEERING COLUMN article
	Worn shaft serrations	See STEERING COLUMN article
Growl in Steering Pump	Excessive pressure in hoses	Restricted hoses, see POWER STEERING GEAR article
	Scored pressure plates	See POWER STEERING GEAR article
	Scored thrust plates or rotor	See POWER STEERING GEAR article
	Extreme wear of cam ring	See POWER STEERING GEAR article
Rattle in Steering Pump	Vanes not installed	See POWER STEERING PUMP article
	Vanes sticking in rotor	See POWER STEERING PUMP article
Swish noise in Pump	Defective flow control valve	See POWER STEERING PUMP article
Groan in Steering Pump	Air in fluid	See POWER STEERING PUMP article
	Poor pressure hose connection	Tighten and check, replace if necessary
Squawk When Turning	Damper "O" ring on valve spool cut	See POWER STEERING PUMP article
Moan or Whine In Pump	Pump shaft bearing scored	Replace bearing and fluid

	Air in fluid or fluid level low	See POWER STEERING PUMP article
	Hose or column grounded	Check and replace if necessary
	Cover "O" ring missing or damaged	See POWER STEERING PUMP article
	Valve cover baffle missing or damaged	See POWER STEERING PUMP article
	Interference of components in pump	See POWER STEERING PUMP article
	Loose or poor bracket alignment	Correct or replace if necessary
Hissing When Parking	Internal leakage in steering gear	Check valved assembly first
Chirp in Steering Pump	Loose or worn power steering belt	Adjust or replace if necessary
Buzzing When Not Steering	Noisy pump	See POWER STEERING PUMP article
	Free play in steering shaft bearing	See STEERING COLUMN article
	Bearing loose on shaft serrations	See STEERING COLUMN article
Clicking Noise in Pump	Pump slippers too long	See POWER STEERING PUMP article
	Broken slipper springs	See POWER STEERING PUMP article
	Excessive wear or nicked rotors	See POWER STEERING PUMP article
	Damaged cam contour	See POWER STEERING PUMP article
Poor Return of Wheel	Wheel rubbing against turn signal	See STEERING COLUMN SWITCHES article

Flange rubbing steering gear adjuster	See STEERING COLUMN article
Tight or frozen steering shaft bearing	See STEERING COLUMN article
Steering gear out of adjustment	See POWER STEERING GEAR article
Sticking or plugged spool valve	See POWER STEERING PUMP article
Improper front end alignment	See WHEEL ALIGNMENT article
Wheel bearings worn or loose	See FRONT SUSPENSION article
Ties rods or ball joints binding	Check and replace if necessary
Intermediate shaft joints binding	See STEERING COLUMN article
Kinked pressure hoses	Correct or replace if necessary
Loose housing head spanner nut	See POWER STEERING GEAR article
Damaged valve lever	See POWER STEERING GEAR article
Sector shaft adjusted too tight	See ADJUSTMENTS in POWER STEERING GEAR article
Worm thrust bearing adjusted too tight	See ADJUSTMENTS in POWER STEERING GEAR article
Reaction ring sticking in cylinder	See POWER STEERING GEAR article
Reaction ring sticking in housing head	See POWER STEERING GEAR article
Steering pump internal leakage	See POWER STEERING PUMP article

	Steering gear-to-column misalignment	See STEERING COLUMN article
	Lack of lubrication in linkage	Service front suspension
	Lack of lubrication in ball joints	Service front suspension

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Increased Effort When Turning	High internal pump leakage	See POWER STEERING PUMP article
Wheel Fast Foaming, Milky Power Steering	Power steering pump belt slipping	Adjust or replace if necessary
Fluid, Low Fluid Level or Low Pressure	Low fluid level	Check and fill to proper level
	Engine idle speed to low	Adjust to correct setting
	Air in pump fluid system	See POWER STEERING PUMP article
	Pump output low	See POWER STEERING PUMP article
	Steering gear malfunctioning	See POWER STEERING GEAR article

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Wheel Surges or Jerks	Low fluid level	Check and fill to proper level
	Loose fan belt	Adjust or replace if necessary
	Insufficient pump pressure	See POWER STEERING PUMP article
	Sticky flow control valve	See POWER STEERING PUMP article
	Linkage hitting oil pan at full turn	Replace bent components

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Kick Back or Free Play	Air in pump fluid system	See POWER STEERING PUMP article

	Worn poppet valve in steering gear	See **POWER STEERING PUMP** article
	Excessive over center lash	See **POWER STEERING GEAR** article
	Thrust bearing out of adjustment	See **POWER STEERING GEAR** article
	Free play in pot coupling	See **POWER STEERING PUMP** article
	Steering gear coupling loose on shaft	See **POWER STEERING PUMP** article
	Steering disc mounting bolts loose	Tighten or replace if necessary
	Coupling loose on worm shaft	Tighten or replace if necessary
	Improper sector shaft adjustment	See **POWER STEERING GEAR** article
	Excessive worm piston side play	See **POWER STEERING GEAR** article
	Damaged valve lever	See **POWER STEERING GEAR** article
	Universal joint loose	Tighten or replace if necessary
	Defective rotary valve	See **POWER STEERING GEAR** article
No Power When Parking	Sticking flow control valve	See **POWER STEERING PUMP** article
	Insufficient pump pressure output	See **POWER STEERING PUMP** article
	Excessive internal pump leakage	See **POWER STEERING PUMP** article
	Excessive internal gear leakage	See **POWER STEERING PUMP** article

	Flange rubs against gear adjust plug	See STEERING COLUMN article
	Loose pump belt	Adjust or replace if necessary
	Low fluid level	Check and add proper amount of fluid
	Engine idle too low	Adjust to correct setting
	Steering gear-to-column misaligned	See STEERING COLUMN article

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No Power, Left Turn	Left turn reaction seal "O" ring worn	See POWER STEERING GEAR article
	Left turn reaction seal damaged/missing	See POWER STEERING GEAR article
	Cylinder head "O" ring damaged	See POWER STEERING PUMP article

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No Power, Right Turns	Column pot coupling bottomed	See STEERING COLUMN article
	Right turn reaction seal "O" ring worn	See POWER STEERING GEAR article
	Right turn reaction seal damaged	See POWER STEERING GEAR article
	Internal leakage through piston end plug	See POWER STEERING GEAR article
	Internal leakage through side plugs	See POWER STEERING GEAR article

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Lack of Effort in Turning	Left and/or right reaction seal sticking in cylinder head	Replace, see POWER STEERING GEAR article

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Wanders to One Side	Front end alignment incorrect	See WHEEL ALIGNMENT article
	Unbalanced steering gear valve	See POWER STEERING GEAR

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Low Pressure Due to Steering Pump	**Flow control valve stuck or inoperative**	**See POWER STEERING PUMP article**
	Pressure plate not flat against cam ring	**See POWER STEERING PUMP article**
	Extreme wear of cam ring	**Replace and check adjustments**
	Scored plate, thrust plate or rotor	**See POWER STEERING PUMP article**
	Vanes not installed properly	**See POWER STEERING PUMP article**
	Vanes sticking in rotor slots	**See POWER STEERING PUMP article**
	Cracked/broken thrust or pressure plate	**See POWER STEERING PUMP article**

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STEERING COLUMN TROUBLE SHOOTING

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BASIC STEERING COLUMN TROUBLE SHOOTING CHART

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CONDITION	POSSIBLE CAUSE	CORRECTION
Noise in Steering	**Coupling pulled apart**	**See STEERING COLUMNS article**
	Column not correctly aligned	**See STEERING COLUMNS article**
	Broken lower joint	**Replace joint**
	Horn contact ring not	**See STEERING COLUMN article**

	Bearing not lubricated	See STEERING COLUMN article
	Shaft snap ring not properly seated	Reseat or replace snap ring
	Plastic spherical joint not lubricated	See STEERING COLUMN article
	Shroud or housing loose	Tighten holding screws
	Lock plate retaining ring not seated	See STEERING COLUMN article
	Loose sight shield	Tighten holding screws
High Steering Shaft Effort	Column assembly misaligned	See STEERING COLUMN article
	Improperly installed dust shield	Adjust or replace
	Tight steering universal joint	See STEERING COLUMN article
High Shift Effort	Column is out of alignment	See STEERING COLUMN article
	Improperly installed dust shield	Adjust or replace
	Seals or bearings not lubricated	See STEERING COLUMNS article
	Mounting bracket screws too long	Replace with new shorter screws
	Burrs on shift tube	Remove burrs or replace tube
	Lower bowl bearing assembled wrong	See STEERING COLUMN article
	Shift tube bent or broken	Replace as necessary
	Improper adjustment of shift levers	See STEERING COLUMN article

Improper Trans. Shifting	Sheared shift tube joint	Replace as necessary
	Sheared lower shaft lever	Replace as necessary
	Improper shift lever adjustment	See STEERING COLUMN article
	Improper gate plate adjustment	See STEERING COLUMN article
Excess Play in Column	Instrument panel bracket bolts loose	Tighten bolts and check bracket
	Broken weld nut on jacket	See STEERING COLUMN article
	Instrument bracket capsule sheared	See STEERING COLUMN article
	Column bracket/jacket bolts loose	Tighten bolts and check bracket
Steering Locks in Gear	Release lever mechanism	See STEERING COLUMN article

SUSPENSION TROUBLE SHOOTING

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BASIC SUSPENSION TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Front End Noise	Loose or worn wheel	See Wheel Bearing Adjustment in SUSPENSION
	Worn shocks or shock mountings	Replace struts or strut mountings
	Worn struts or strut	Replace struts or strut

	mountings	mountings
	Loose or worn lower control arm	See SUSPENSION
	Loose steering gear-to-frame bolts	See STEERING
	Worn control arm bushings	See SUSPENSION
	Ball joints not lubricated	Lubricate ball joints & see Ball Joint Checking in SUSPENSION
Front Wheel Shake, Shimmy, or Vibration	Tires or wheels out of balance	Check tire balance
	Incorrect wheel alignment	See WHEEL ALIGNMENT
	Drive shaft unbalanced	Check drive shaft balance
	Loose or worn wheel bearings	See WHEEL ALIGNMENT
	Loose or worn tie rod ends	See SUSPENSION
	Worn upper ball joints	See Ball Joint Checking in SUSPENSION
	Worn shock absorbers	Replace shock absorbers
	Worn strut bushings	Replace strut bushings
Car Pulls to One Side	Mismatched or uneven tires	Check tire condition
	Broken or sagging springs	See SUSPENSION
	Loose or worn strut bushings	See SUSPENSION
	Improper wheel alignment	See WHEEL ALIGNMENT
	Improper rear axle alignment	Check rear axle alignment
	Power steering gear unbalanced	See STEERING

	Front brakes dragging	See BRAKES
Abnormal Tire Wear	Unbalanced tires	Check tire balance & rotation
	Sagging or broken springs	See SUSPENSION
	Incorrect front end alignment	See WHEEL ALIGNMENT
	Faulty shock absorbers	Replace chock absorbers
Scuffed Tires	Toe-In incorrect	See WHEEL ALIGNMENT
	Suspension arm bent or twisted	See appropriate SUSPENSION article
Springs Bottom or Sag	Bent or broken springs	See SUSPENSION
	Leaking or worn shock absorbers	Replace shock absorbers
	Frame misalignment	Check frame for damage
Spring Noises	Loose "U" Bolts	See SUSPENSION
	Loose or worn bushings	See SUSPENSION
	Worn or missing interliners	See SUSPENSION
Shock Absorber Noise	Loose shock mountings	Check & tighten mountings
	Worn bushings	Replace bushings
	Air in system	Bleed air from system
	Undercoating on shocks	Remove undercoating
Car Leans or Sways on Corners	Loose stabilizer bar	See SUSPENSION
	Faulty shocks or mountings	Replace shocks or mountings
	Broken or sagging springs	See SUSPENSION

Shock Absorbers Leaking	Worn seals or reservoir tube crimped	See SUSPENSION
Broken Springs	Loose "U" bolts	See SUSPENSION
	Inoperative shock absorbers	Replace shock absorbers

WHEEL ALIGNMENT TROUBLE SHOOTING

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BASIC WHEEL ALIGNMENT TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Premature Tire Wear	Improper tire inflation	Check tire pressure
	Front alignment out of tolerance	See ALIGNMENT SPECS in WHEEL ALIGNMENT section
	Suspension components worn	See SUSPENSION section
	Steering system components worn	See STEERING section
	Improper standing height	See WHEEL ALIGNMENT
	Uneven or sagging springs	See SUSPENSION section
	Bent wheel	See WHEEL ALIGNMENT
	Improper torsion bar adjustment	See SUSPENSION section
	Loose or worn wheel bearings	See WHEEL BEARING ADJ. in SUSPENSION section
	Worn or defective shock	Replace shock absorbers
	Tires out of balance	Check tire balance

Pulls to One Side	Improper tire inflation	Check tire pressure
	Brake dragging	See BRAKE section
	Mismatched tires	See WHEEL ALIGNMENT
	Broken or sagging spring	See SUSPENSION section
	Broken torsion bar	See SUSPENSION section
	Power steering valve not centered	See STEERING section
	Front alignment out of tolerance	See WHEEL ALIGNMENT section
	Defective wheel bearing	See WHEEL BEARINGS in SUSPENSION section
	Uneven sway bar links	See SUSPENSION section
	Frame bent	Check for frame damage
	Steering system bushing worn	See STEERING section

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Hard Steering	Idler arm bushing too tight	See STEERING LINKAGE in STEERING section
	Ball joint tight or seized	See SUSPENSION section
	Steering linkage too tight	See STEERING LINKAGE in STEERING section
	Power steering fluid low	Add proper amount of fluid
	Power steering drive belt loose	See STEERING section
	Power steering pump defective	See STEERING section
	Steering gear out of adjustment	See STEERING section
	Incorrect wheel alignment	See WHEEL ALIGNMENT

	Damaged steering gear	See STEERING section
	Damaged suspension	See SUSPENSION section
	Bent steering knuckle or supports	See SUSPENSION section
Vehicle "Wanders"	Strut rod or control arm bushing worn	See SUSPENSION section
	Loose or worn wheel bearings	See WHEEL BEARINGS in SUSPENSION section
	Improper tire inflation	Check tire pressure
	Stabilizer bar missing or defective	See SUSPENSION section
	Wheel alignment out of tolerance	See Adjustment in WHEEL ALIGNMENT section
	Broken spring	See SUSPENSION section
	Defective shock absorbers	Replace shock absorbers
	Worn steering & suspension components	See SUSPENSION section
Front End Shimmy	Tire out of balance/round	Check tire balance
	Excessive wheel runout	See WHEEL ALIGNMENT
	Insufficient or improper caster	See WHEEL ALIGNMENT section
	Worn suspension or steering components	See SUSPENSION section
	Defective shock absorbers	Replace shock absorber
	Wheel bearings worn or loose	See WHEEL BEARING ADJ. in SUSPENSION section
	Power steering reaction Bracket loose	See STEERING section
	Steering gear box (rack)	See STEERING section

	Steering gear adjustment loose	See STEERING section
	Worn spherical joints	See SUSPENSION section
Toe-In Not Adjustable	Lower control arm bent	See SUSPENSION section
	Frame bent	Check frame for damage
Camber Not Adjustable	Control arm bent	See SUSPENSION section
	Frame bent	Check frame for damage
	Hub & bearing not seated properly	See SUSPENSION section

END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION
Waveforms - Injector Pattern Tutorial

*** PLEASE READ THIS FIRST ***

NOTE: This article is intended for general information purposes only. This information may not apply to all makes and models.

PURPOSE OF THIS ARTICLE

Learning how to interpret injector drive patterns from a Lab Scope can be like learning ignition patterns all over again. This article exists to ease you into becoming a skilled injector pattern interpreter.

You will learn:

* How a DVOM and noid light fall short of a lab scope.
* The two types of injector driver circuits, voltage controlled & current controlled.
* The two ways injector circuits can be wired, constant ground/switched power & constant power/switched ground.
* The two different pattern types you can use to diagnose with, voltage & current.
* All the valuable details injector patterns can reveal.

SCOPE OF THIS ARTICLE

This is NOT a manufacturer specific article. All different types of systems are covered here, regardless of the specific year/make/model/engine.

The reason for such broad coverage is because there are only a few basic ways to operate a solenoid-type injector. By understanding the fundamental principles, you will understand all the major points of injector patterns you encounter. Of course there are minor differences in each specific system, but that is where a waveform library helps out.

If this is confusing, consider a secondary ignition pattern. Even though there are many different implementations, each still has a primary voltage turn-on, firing line, spark line, etc.

If specific waveforms are available in On Demand for the engine and vehicle you are working on, you will find them in the Engine Performance section under the Engine Performance category.

IS A LAB SCOPE NECESSARY?

INTRODUCTION

You probably have several tools at your disposal to diagnose injector circuits. But you might have questioned "Is a lab scope necessary to do a thorough job, or will a set of noid lights and a multifunction DVOM do just as well?"

In the following text, we are going to look at what noid lights and DVOMs do best, do not do very well, and when they can mislead you. As you might suspect, the lab scope, with its ability to look inside an active circuit, comes to the rescue by answering for the deficiencies of these other tools.

OVERVIEW OF NOID LIGHT

The noid light is an excellent "quick and dirty" tool. It can usually be hooked to a fuel injector harness fast and the flashing light is easy to understand. It is a dependable way to identify a no-pulse situation.

However, a noid light can be very deceptive in two cases:

* **If the wrong one is used for the circuit being tested. Beware: Just because a connector on a noid light fits the harness does not mean it is the right one.**
* **If an injector driver is weak or a minor voltage drop is present.**

Use the Right Noid Light

In the following text we will look at what can happen if the wrong noid light is used, why there are different types of noid lights (besides differences with connectors), how to identify the types of noid lights, and how to know the right type to use.

First, let's discuss what can happen if the incorrect type of noid light is used. You might see:

* **A dimly flashing light when it should be normal.**
* **A normal flashing light when it should be dim.**

A noid light will flash dim if used on a lower voltage circuit than it was designed for. A normally operating circuit would appear underpowered, which could be misinterpreted as the cause of a fuel starvation problem.

Here are the two circuit types that could cause this problem:

* **Circuits with external injector resistors. Used predominately on some Asian & European systems, they are used to reduce the available voltage to an injector in order to limit the current flow. This lower voltage can cause a dim flash on a noid light designed for full voltage.**

* Circuits with current controlled injector drivers (e.g. "Peak and Hold"). Basically, this type of driver allows a quick burst of voltage/current to flow and then throttles it back significantly for the remainder of the pulse width duration. If a noid light was designed for the other type of driver (voltage controlled, e.g. "Saturated"), it will appear dim because it is expecting full voltage/current to flow for the entire duration of the pulse width.

Let's move to the other situation where a noid light flashes normally when it should be dim. This could occur if a more sensitive noid light is used on a higher voltage/amperage circuit that was weakened enough to cause problems (but not outright broken). A circuit with an actual problem would thus appear normal.

Let's look at why. A noid light does not come close to consuming as much amperage as an injector solenoid. If there is a partial driver failure or a minor voltage drop in the injector circuit, there can be adequate amperage to fully operate the noid light BUT NOT ENOUGH TO OPERATE THE INJECTOR.

If this is not clear, picture a battery with a lot of corrosion on the terminals. Say there is enough corrosion that the starter motor will not operate; it only clicks. Now imagine turning on the headlights (with the ignition in the RUN position). You find they light normally and are fully bright. This is the same idea as noid light: There is a problem, but enough amp flow exists to operate the headlights ("noid light"), but not the starter motor ("injector").

How do you identify and avoid all these situations? By using the correct type of noid light. This requires that you understanding the types of injector circuits that your noid lights are designed for. There are three. They are:

* Systems with a voltage controlled injector driver. Another way to say it: The noid light is designed for a circuit with a "high" resistance injector (generally 12 ohms or above).
* Systems with a current controlled injector driver. Another way to say it: The noid light is designed for a circuit with a low resistance injector (generally less than 12 ohms) without an external injector resistor.
* Systems with a voltage controlled injector driver and an external injector resistor. Another way of saying it: The noid light is designed for a circuit with a low resistance injector (generally less than 12 ohms) and an external injector resistor.

NOTE: Some noid lights can meet both the second and third categories simultaneously.

If you are not sure which type of circuit your noid light is designed for, plug it into a known good car and check out the results. If it flashes normally during cranking, determine the circuit type by finding out injector resistance and if an external injector resistor is used. You now know enough to identify the type of injector circuit. Label the noid light appropriately.

Next time you need to use a noid light for diagnosis, determine what type of injector circuit you are dealing with and select the appropriate noid light.

Of course, if you suspect a no-pulse condition you could plug in any one whose connector fit without fear of misdiagnosis. This is because it is unimportant if the flashing light is dim or bright. It is only important that it flashes.

In any cases of doubt regarding the use of a noid light, a lab scope will overcome all inherent weaknesses.

OVERVIEW OF DVOM

A DVOM is typically used to check injector resistance and available voltage at the injector. Some techs also use it check injector on-time either with a built-in feature or by using the dwell/duty function.

There are situations where the DVOM performs these checks dependably, and other situations where it can deceive you. It is important to be aware of these strengths and weaknesses. We will cover the topics above in the following text.

Checking Injector Resistance

If a short in an injector coil winding is constant, an ohmmeter will accurately identify the lower resistance. The same is true with an open winding. Unfortunately, an intermittent short is an exception. A faulty injector with an intermittent short will show "good" if the ohmmeter cannot force the short to occur during testing.

Alcohol in fuel typically causes an intermittent short, happening only when the injector coil is hot and loaded by a current high enough to jump the air gap between two bare windings or to break down any oxides that may have formed between them.

When you measure resistance with an ohmmeter, you are only applying a small current of a few milliamps. This is nowhere near enough to load the coil sufficiently to detect most problems. As a result, most resistance checks identify intermittently shorted injectors as being normal.

There are two methods to get around this limitation. The first is to purchase an tool that checks injector coil windings under full load. The Kent-Moore J-39021 is such a tool, though there are others. The Kent-Moore costs around $240 at the time of this writing and works on many different manufacturer's systems.

The second method is to use a lab scope. Remember, a lab scope allows you to see the regular operation of a circuit in real WAVEFO time. If an injector is having an short or intermittent short, the lab scope will show it.

Checking Available Voltage At the Injector

Verifying a fuel injector has the proper voltage to operate correctly is good diagnostic technique. Finding an open circuit on the feed circuit like a broken wire or connector is an accurate check with a DVOM. Unfortunately, finding an intermittent or excessive resistance problem with a DVOM is unreliable.

Let's explore this drawback. Remember that a voltage drop due to excessive resistance will only occur when a circuit is operating? Since the injector circuit is only operating for a few milliseconds at a time, a DVOM will only see a potential fault for a few milliseconds. The remaining 90+% of the time the unloaded injector circuit will show normal battery voltage.

Since DVOMs update their display roughly two to five times a second, all measurements in between are averaged. Because a potential voltage drop is visible for such a small amount of time, it gets "averaged out", causing you to miss it.

Only a DVOM that has a "min-max" function that checks EVERY MILLISECOND will catch this fault consistently (if used in that mode). The Fluke 87 among others has this capability.

A "min-max" DVOM with a lower frequency of checking (100 millisecond) can miss the fault because it will probably check when the injector is not on. This is especially true with current controlled driver circuits. The Fluke 88, among others fall into this category.

Outside of using a Fluke 87 (or equivalent) in the 1 mS "min-max" mode, the only way to catch a voltage drop fault is with a lab scope. You will be able to see a voltage drop as it happens.

One final note. It is important to be aware that an injector circuit with a solenoid resistor will always show a voltage drop when the circuit is energized. This is somewhat obvious and normal; it is a designed-in voltage drop. What can be unexpected is what we already covered--a voltage drop disappears when the circuit is unloaded. The unloaded injector circuit will show normal battery voltage at the injector. Remember this and do not get confused.

Checking Injector On-Time With Built-In Function

Several DVOMs have a feature that allows them to measure injector on-time (mS pulse width). While they are accurate and fast to hookup, they have three limitations you should be aware of:

* They only work on voltage controlled injector drivers (e.g "Saturated Switch"), NOT on current controlled injector drivers (e.g. "Peak & Hold").
* A few unusual conditions can cause inaccurate readings.
* Varying engine speeds can result in inaccurate readings.WAVEFORMS

Regarding the first limitation, DVOMs need a well-defined injector pulse in order to determine when the injector turns ON and OFF. Voltage controlled drivers provide this because of their simple switch-like operation. They completely close the circuit for the entire duration of the pulse. This is easy for the DVOM to interpret.

The other type of driver, the current controlled type, start off well by completely closing the circuit (until the injector pintle opens), but then they throttle back the voltage/current for the duration of the pulse. The DVOM understands the beginning of the pulse but it cannot figure out the throttling action. In other words, it cannot distinguish the throttling from an open circuit (de-energized) condition.

Yet current controlled injectors will still yield a millisecond on-time reading on these DVOMs. You will find it is also always the same, regardless of the operating conditions. This is because it is only measuring the initial completely-closed circuit on-time, which always takes the same amount of time (to lift the injector pintle off its seat). So even though you get a reading, it is useless.

The second limitation is that a few erratic conditions can cause inaccurate readings. This is because of a DVOM's slow display rate; roughly two to five times a second. As we covered earlier, measurements in between display updates get averaged. So conditions like skipped injector pulses or intermittent long/short injector pulses tend to get "averaged out", which will cause you to miss important details.

The last limitation is that varying engine speeds can result in inaccurate readings. This is caused by the quickly shifting injector on-time as the engine load varies, or the RPM moves from a state of acceleration to stabilization, or similar situations. It too is caused by the averaging of all measurements in between DVOM display periods. You can avoid this by checking on-time when there are no RPM or load changes.

A lab scope allows you to overcome each one of these limitations.

Checking Injector On-Time With Dwell Or Duty

If no tool is available to directly measure injector millisecond on-time measurement, some techs use a simple DVOM dwell or duty cycle functions as a replacement.

While this is an approach of last resort, it does provide benefits. We will discuss the strengths and weaknesses in a moment, but first we will look at how a duty cycle meter and dwell meter work.

How A Duty Cycle Meter and Dwell Meter Work

All readings are obtained by comparing how long something has been OFF to how long it has been ON in a fixed time period. A dwell meter and duty cycle meter actually come up with the same answers using different scales. You can convert freely between them. See RELATIONSHIP BETWEEN DWELL & DUTY CYCLE READINGS TABLE

The DVOM display updates roughly one time a second, although some DVOMs can be a little faster or slower. All measurements during this update period are tallied inside the DVOM as ON time or OFF time, and then the total ratio is displayed as either a percentage (duty cycle) or degrees (dwell meter).

For example, let's say a DVOM had an update rate of exactly 1 second (1000 milliseconds). Let's also say that it has been measuring/tallying an injector circuit that had been ON a total of 250 mS out of the 1000 mS. That is a ratio of one-quarter, which would be displayed as 25% duty cycle or 15° dwell (six-cylinder scale). Note that most duty cycle meters can reverse the readings by selecting the positive or negative slope to trigger on. If this reading were reversed, a duty cycle meter would display 75%.

Strengths of Dwell/Duty Meter

The obvious strength of a dwell/duty meter is that you can compare injector on-time against a known-good reading. This is the only practical way to use a dwell/duty meter, but requires you to have known-good values to compare against.

Another strength is that you can roughly convert injector mS on-time into dwell reading with some computations.

A final strength is that because the meter averages everything together it does not miss anything (though this is also a severe weakness that we will look at later). If an injector has a fault where it occasionally skips a pulse, the meter registers it and the reading changes accordingly.

Let's go back to figuring out dwell/duty readings by using injector on-time specification. This is not generally practical, but we will cover it for completeness. You NEED to know three things:

* Injector mS on-time specification.
* Engine RPM when specification is valid.
* How many times the injectors fire per crankshaft revolution.

The first two are self-explanatory. The last one may require some research into whether it is a bank-fire type that injects every 360° of crankshaft rotation, a bank-fire that injects every 720°, or an SFI that injects every 720°. Many manufacturers do not release this data so you may have to figure it out yourself with a frequency meter.

Here are the four complete steps to convert millisecond on-time:

1) Determine the injector pulse width and RPM it was obtained at. Let's say the specification is for one millisecond of on-time at a hot idle of 600 RPM.

2) Determine injector firing method for the complete 4 stroke cycle. Let's say this is a 360° bank-fired, meaning an injector fires

each and every crankshaft revolution.

3) Determine how many times the injector will fire at the specified engine speed (600 RPM) in a fixed time period. We will use 100 milliseconds because it is easy to use.

Six hundred crankshaft Revolutions Per Minute (RPM) divided by 60 seconds equals 10 revolutions per second.

Multiplying 10 times .100 yields one; the crankshaft turns one time in 100 milliseconds. With exactly one crankshaft rotation in 100 milliseconds, we know that the injector fires exactly one time.

4) Determine the ratio of injector on-time vs. off-time in the fixed time period, then figure duty cycle and/or dwell. The injector fires one time for a total of one millisecond in any given 100 millisecond period.

One hundred minus one equals 99. We have a 99% duty cycle. If we wanted to know the dwell (on 6 cylinder scale), multiple 99% times .6; this equals 59.4o dwell.

Weaknesses of Dwell/Duty Meter

The weaknesses are significant. First, there is no one-to-one correspondence to actual mS on-time. No manufacturer releases dwell/duty data, and it is time-consuming to convert the mS on-time readings. Besides, there can be a large degree of error because the conversion forces you to assume that the injector(s) are always firing at the same rate for the same period of time. This can be a dangerous assumption.

Second, all level of detail is lost in the averaging process. This is the primary weakness. You cannot see the details you need to make a confident diagnosis.

Here is one example. Imagine a vehicle that has a faulty injector driver that occasionally skips an injector pulse. Every skipped pulse means that that cylinder does not fire, thus unburned O2 gets pushed into the exhaust and passes the O2 sensor. The O2 sensor indicates lean, so the computer fattens up the mixture to compensate for the supposed "lean" condition.

A connected dwell/duty meter would see the fattened pulse width but would also see the skipped pulses. It would tally both and likely come back with a reading that indicated the "pulse width" was within specification because the rich mixture and missing pulses offset each other.

This situation is not a far-fetched scenario. Some early GM 3800 engines were suffering from exactly this. The point is that a lack of detail could cause misdiagnosis.

As you might have guessed, a lab scope would not miss this.

RELATIONSHIP BETWEEN DWELL & DUTY CYCLE READINGS TABLE 1(1)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Dwell Meter (2)	Duty Cycle Meter

1o	1%
15o	25%
30o	50%
45o	75%
60o	100%

(1) - These are just some examples for your understanding.
It is okay to fill in the gaps.
(2) - Dwell meter on the six-cylinder scale.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

THE TWO TYPES OF INJECTOR DRIVERS

OVERVIEW

There are two types of transistor driver circuits used to operate electric fuel injectors: voltage controlled and current controlled. The voltage controlled type is sometimes called a "saturated switch" driver, while the current controlled type is sometimes known as a "peak and hold" driver.

The basic difference between the two is the total resistance of the injector circuit. Roughly speaking, if a particular leg in an injector circuit has total resistance of 12 or more ohms, a voltage control driver is used. If less than 12 ohms, a current control driver is used.

It is a question of what is going to do the job of limiting the current flow in the injector circuit; the inherent "high" resistance in the injector circuit, or the transistor driver. Without some form of control, the current flow through the injector would cause the solenoid coil to overheat and result in a damaged injector.

VOLTAGE CONTROLLED CIRCUIT ("SATURATED SWITCH")

The voltage controlled driver inside the computer operates much like a simple switch because it does not need to worry about limiting current flow. Recall, this driver typically requires injector circuits with a total leg resistance of 12 or more ohms.

The driver is either ON, closing/completing the circuit (eliminating the voltage-drop), or OFF, opening the circuit (causing a total voltage drop).

Some manufacturers call it a "saturated switch" driver. This is because when switched ON, the driver allows the magnetic field in the injector to build to saturation. This is the same "saturation" property that you are familiar with for an ignition coil.

There are two ways "high" resistance can be built into an injector circuit to limit current flow. One method uses an external solenoid resistor and a low resistance injector, while the other uses a high resistance injector without the solenoid resistor. See the left side of Fig. 1.

In terms of injection opening time, the external resistor voltage controlled circuit is somewhat faster than the voltage controlled high resistance injector circuit. The trend, however, seems to be moving toward use of this latter type of circuit due to its lower cost and reliability. The ECU can compensate for slower opening times by increasing injector pulse width accordingly.

NOTE: Never apply battery voltage directly across a low resistance injector. This will cause injector damage from solenoid coil overheating.

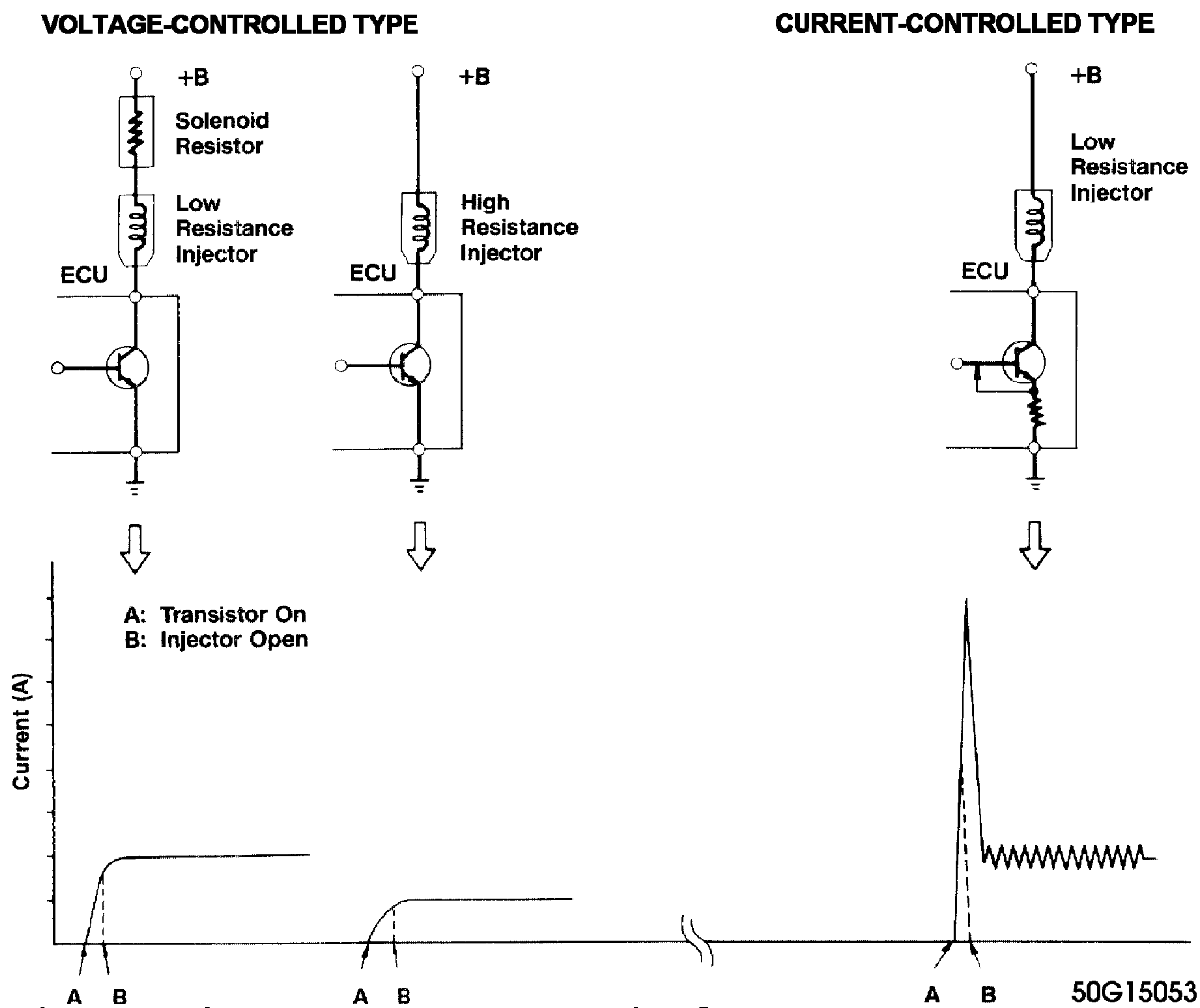

Fig. 1: Injector Driver Types - Current and Voltage

CURRENT CONTROLLED CIRCUIT ("PEAK & HOLD")

WAVEFO

The current controlled driver inside the computer is more complex than a voltage controlled driver because as the name implies, it has to limit current flow in addition to its ON-OFF switching function. Recall, this driver typically requires injector circuits with a total leg resistance of less than 12 ohms.

Once the driver is turned ON, it will not limit current flow until enough time has passed for the injector pintle to open. This period is preset by the particular manufacturer/system based on the amount of current flow needed to open their injector. This is typically between two and six amps. Some manufacturers refer to this as the "peak" time, referring to the fact that current flow is allowed to "peak" (to open the injector).

Once the injector pintle is open, the amp flow is considerably reduced for the rest of the pulse duration to protect the injector from overheating. This is okay because very little amperage is needed to hold the injector open, typically in the area of one amp or less. Some manufacturers refer to this as the "hold" time, meaning that just enough current is allowed through the circuit to "hold" the already-open injector open.

There are a couple methods of reducing the current. The most common trims back the available voltage for the circuit, similar to turning down a light at home with a dimmer.

The other method involves repeatedly cycling the circuit ON-OFF. It does this so fast that the magnetic field never collapses and the pintle stays open, but the current is still significantly reduced. See the right side of Fig. 1 for an illustration.

The advantage to the current controlled driver circuit is the short time period from when the driver transistor goes ON to when the injector actually opens. This is a function of the speed with which current flow reaches its peak due to the low circuit resistance. Also, the injector closes faster when the driver turns OFF because of the lower holding current.

NOTE: Never apply battery voltage directly across a low resistance injector. This will cause injector damage from solenoid coil overheating.

THE TWO WAYS INJECTOR CIRCUITS ARE WIRED

Like other circuits, injector circuits can be wired in one of two fundamental directions. The first method is to steadily power the injectors and have the computer driver switch the ground side of the circuit. Conversely, the injectors can be steadily grounded while the driver switches the power side of the circuit.

There is no performance benefit to either method. Voltage controlled and current controlled drivers have been successfully implemented both ways.

However, 95% percent of the systems are wired so the driver controls the ground side of the circuit. Only a handful of systems use the drivers on the power side of the circuit. Some examples of the latter are the 1970's Cadillac EFI system, early Jeep 4.0 EFI (Renix system), and Chrysler 1984-87 TBI.

INTERPRETING INJECTOR WAVEFORMS

INTERPRETING A VOLTAGE CONTROLLED PATTERN

NOTE: Voltage controlled drivers are also known as "Saturated Switch" drivers. They typically require injector circuits with a total leg resistance of 12 ohms or more.

NOTE: This example is based on a constant power/switched ground circuit.

* See Fig. 2 for pattern that the following text describes.

Point "A" is where system voltage is supplied to the injector. A good hot run voltage is usually 13.5 or more volts. This point, commonly known as open circuit voltage, is critical because the injector will not get sufficient current saturation if there is a voltage shortfall. To obtain a good look at this precise point, you will need to shift your Lab Scope to five volts per division.

You will find that some systems have slight voltage fluctuations here. This can occur if the injector feed wire is also used to power up other cycling components, like the ignition coil(s). Slight voltage fluctuations are normal and are no reason for concern. Major voltage fluctuations are a different story, however. Major voltage shifts on the injector feed line will create injector performance problems. Look for excessive resistance problems in the feed circuit if you see big shifts and repair as necessary.

Note that circuits with external injector resistors will not be any different because the resistor does not affect open circuit voltage.

Point "B" is where the driver completes the circuit to ground. This point of the waveform should be a clean square point straight down with no rounded edges. It is during this period that current saturation of the injector windings is taking place and the driver is heavily stressed. Weak drivers will distort this vertical line.

Point "C" represents the voltage drop across the injector windings. Point "C" should come very close to the ground reference point, but not quite touch. This is because the driver has a small amount of inherent resistance. Any significant offset from ground is an indication of a resistance problem on the ground circuit that needs repaired. You might miss this fault if you do not use the negative

battery post for your Lab Scope hook-up, so it is HIGHLY recommended that you use the battery as your hook-up.

The points between "B" and "D" represent the time in milliseconds that the injector is being energized or held open. This line at Point "C" should remain flat. Any distortion or upward bend indicates a ground problem, short problem, or a weak driver. Alert readers will catch that this is exactly opposite of the current controlled type drivers (explained in the next section), because they bend upwards at this point.

How come the difference? Because of the total circuit resistance. Voltage controlled driver circuits have a high resistance of 12+ ohms that slows the building of the magnetic field in the injector. Hence, no counter voltage is built up and the line remains flat.

On the other hand, the current controlled driver circuit has low resistance which allows for a rapid magnetic field build-up. This causes a slight inductive rise (created by the effects of counter voltage) and hence, the upward bend. You should not see that here with voltage controlled circuits.

Point "D" represents the electrical condition of the injector windings. The height of this voltage spike (inductive kick) is proportional to the number of windings and the current flow through them. The more current flow and greater number of windings, the more potential for a greater inductive kick. The opposite is also true. The less current flow or fewer windings means less inductive kick. Typically you should see a minimum 35 volts at the top of Point "D".

If you do see approximately 35 volts, it is because a zener diode is used with the driver to clamp the voltage. Make sure the beginning top of the spike is squared off, indicating the zener dumped the remainder of the spike. If it is not squared, that indicates the spike is not strong enough to make the zener fully dump, meaning the injector has a weak winding.

If a zener diode is not used in the computer, the spike from a good injector will be 60 or more volts.

Point "E" brings us to a very interesting section. As you can see, the voltage dissipates back to supply value after the peak of the inductive kick. Notice the slight hump? This is actually the mechanical injector pintle closing. Recall that moving an iron core through a magnetic field will create a voltage surge. The pintle is the iron core here.

This pintle hump at Point "E" should occur near the end of the downward slope, and not afterwards. If it does occur after the slope has ended and the voltage has stabilized, it is because the pintle is slightly sticking because of a faulty injector

If you see more than one hump it is because of a distorted pintle or seat. This faulty condition is known as "pintle float".

It is important to realize that it takes a good digital storage oscilloscope or analog lab scope to see this pintle hump

clearly. Unfortunately, it cannot always be seen.

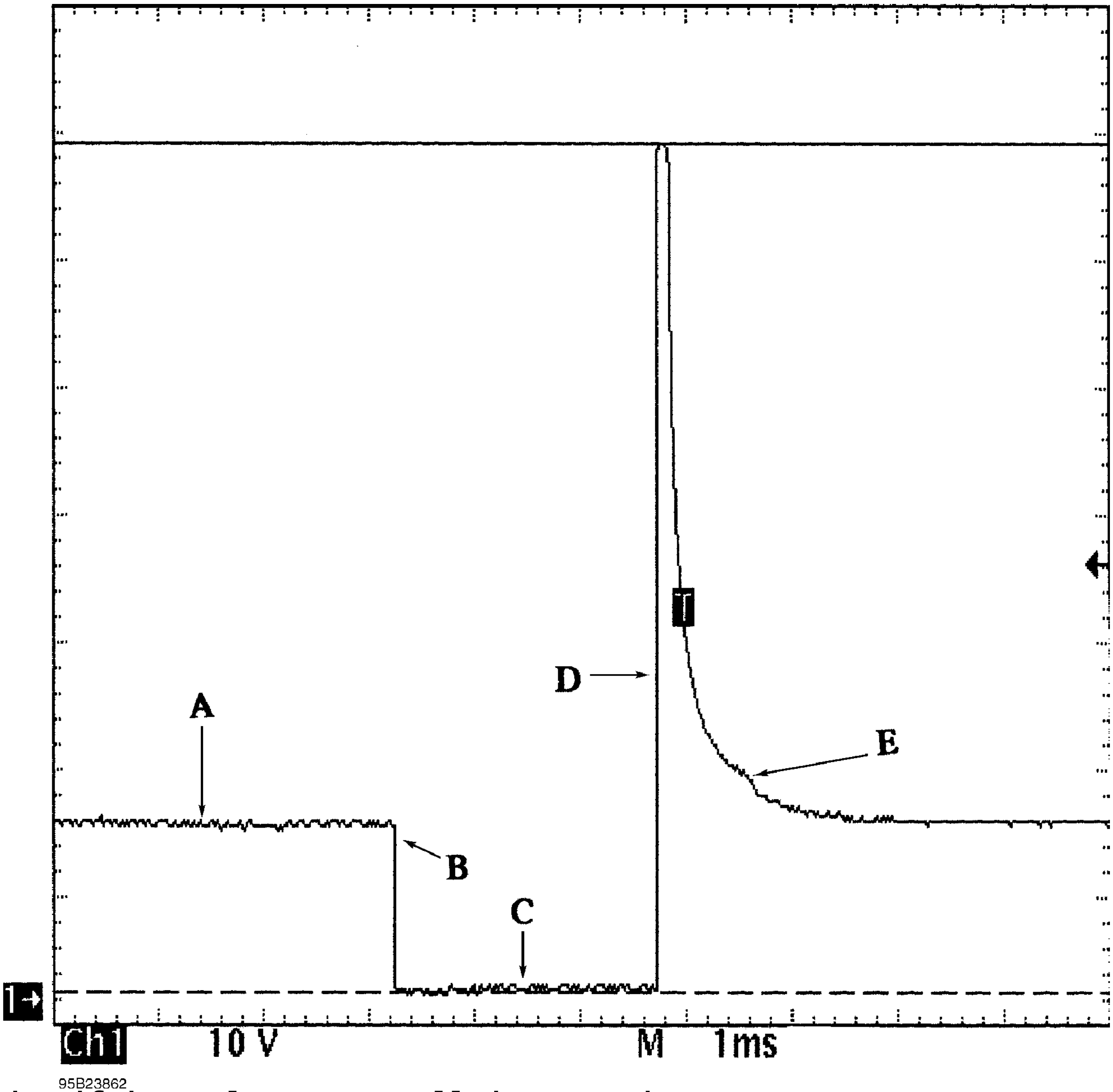

Fig. 2: Identifying Voltage Controlled Type Injector Pattern

INTERPRETING A CURRENT CONTROLLED PATTERN

NOTE: Current controlled drivers are also known as "Peak and Hold" drivers. They typically require injector circuits with a total leg resistance with less than 12 ohm.

NOTE: This example is based on a constant power/switched ground circuit.

*   See Fig. 3 for pattern that the following text describes.

Point "A" is where system voltage is supplied to the injector. A good hot run voltage is usually 13.5 or more volts. This point, commonly known as open circuit voltage, is critical because the injector will not get sufficient current saturation if there is a voltage shortfall. To obtain a good look at this precise point, you will need to shift your Lab Scope to five volts per division.

You will find that some systems have slight voltage fluctuations here. This could occur if the injector feed wire is also used to power up other cycling components, like the ignition coil(s). Slight voltage fluctuations are normal and are no reason for concern. Major voltage fluctuations are a different story, however. Major voltage shifts on the injector feed line will create injector performance problems. Look for excessive resistance problems in the feed circuit if you see big shifts and repair as necessary.

Point "B" is where the driver completes the circuit to ground. This point of the waveform should be a clean square point straight down with no rounded edges. It is during this period that current saturation of the injector windings is taking place and the driver is heavily stressed. Weak drivers will distort this vertical line.

Point "C" represents the voltage drop across the injector windings. Point "C" should come very close to the ground reference point, but not quite touch. This is because the driver has a small amount of inherent resistance. Any significant offset from ground is an indication of a resistance problem on the ground circuit that needs repaired. You might miss this fault if you do not use the negative battery post for your Lab Scope hook-up, so it is HIGHLY recommended that you use the battery as your hook-up.

Right after Point "C", something interesting happens. Notice the trace starts a normal upward bend. This slight inductive rise is created by the effects of counter voltage and is normal. This is because the low circuit resistance allowed a fast build-up of the magnetic field, which in turn created the counter voltage.

Point "D" is the start of the current limiting, also known as the "Hold" time. Before this point, the driver had allowed the current to free-flow ("Peak") just to get the injector pintle open. By the time point "D" occurs, the injector pintle has already opened and the computer has just significantly throttled the current back. It does this by only allowing a few volts through to maintain the minimum current required to keep the pintle open.

The height of the voltage spike seen at the top of Point "D" represents the electrical condition of the injector windings. The height of this voltage spike (inductive kick) is proportional to the number of windings and the current flow through them. The more current flow and greater number of windings, the more potential for a greater inductive kick. The opposite is also true. The less current flow or fewer windings means less inductive kick. Typically you should see a minimum 35 volts.

If you see approximately 35 volts, it is because a zener diode is used with the driver to clamp the voltage. Make sure the beginning top of the spike is squared off, indicating the zener dumped the remainder of the spike. If it is not squared, that indicates the spike is not strong enough to make the zener fully dump, meaning there is a problem with a weak injector winding.

If a zener diode is not used in the computer, the spike from a good injector will be 60 or more volts.

At Point "E", notice that the trace is now just a few volts below system voltage and the injector is in the current limiting, or the "Hold" part of the pattern. This line will either remain flat and stable as shown here, or will cycle up and down rapidly. Both are normal methods to limit current flow. Any distortion may indicate shorted windings.

Point "F" is the actual turn-off point of the driver (and injector). To measure the millisecond on-time of the injector, measure between points "C" and "F". Note that we used cursors to do it for us; they are measuring a 2.56 mS on-time.

The top of Point "F" (second inductive kick) is created by the collapsing magnetic field caused by the final turn-off of the driver. This spike should be like the spike on top of point "D".

Point "G" shows a slight hump. This is actually the mechanical injector pintle closing. Recall that moving an iron core through a magnetic field will create a voltage surge. The pintle is the iron core here.

This pintle hump at Point "E" should occur near the end of the downward slope, and not afterwards. If it does occur after the slope has ended and the voltage has stabilized, it is because the pintle is slightly sticking. Some older Nissan TBI systems suffered from this.

If you see more than one hump it is because of a distorted pintle or seat. This faulty condition is known as "pintle float".

It is important to realize that it takes a good digital storage oscilloscope or analog lab scope to see this pintle hump clearly. Unfortunately, it cannot always be seen.

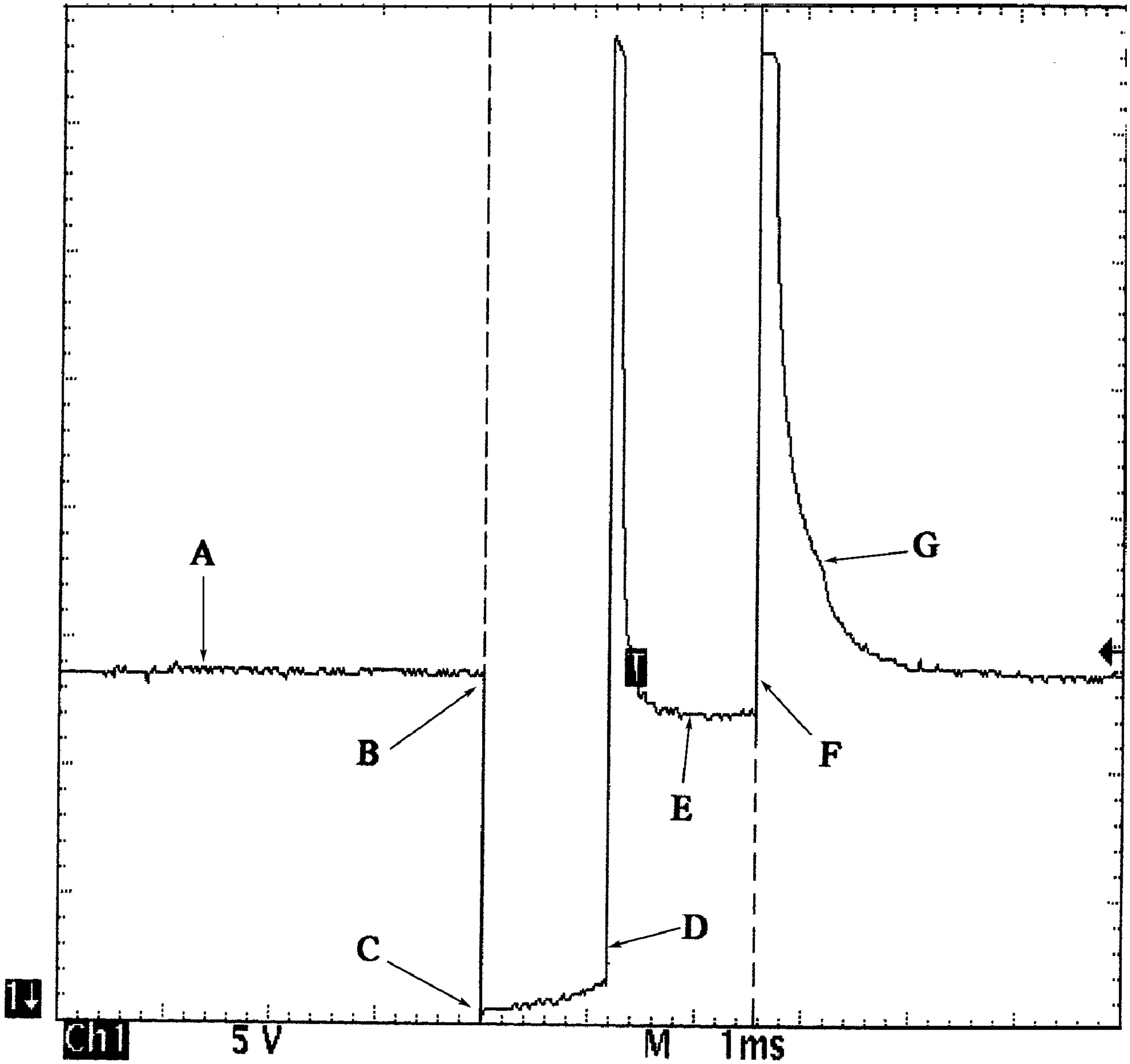

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Fig. 3: Identifying Current Controlled Type Injector Pattern

EXAMPLE #1 - VOLTAGE CONTROLLED DRIVER

The waveform pattern shown in Fig. 4 indicate a normal current waveform from a Ford 3.0L V6 VIN [U] engine. This voltage controlled type circuit pulses the injectors in groups of three injectors. Injectors No. 1, 3, and 5 are pulsed together and cylinders 2, 4, and 6 are pulsed together. The specification for an acceptable bank resistance is 4.4 ohms. Using Ohm's Law and assuming a hot run voltage of 14 volts, we determine that the bank would draw a current of 3.2 amps.

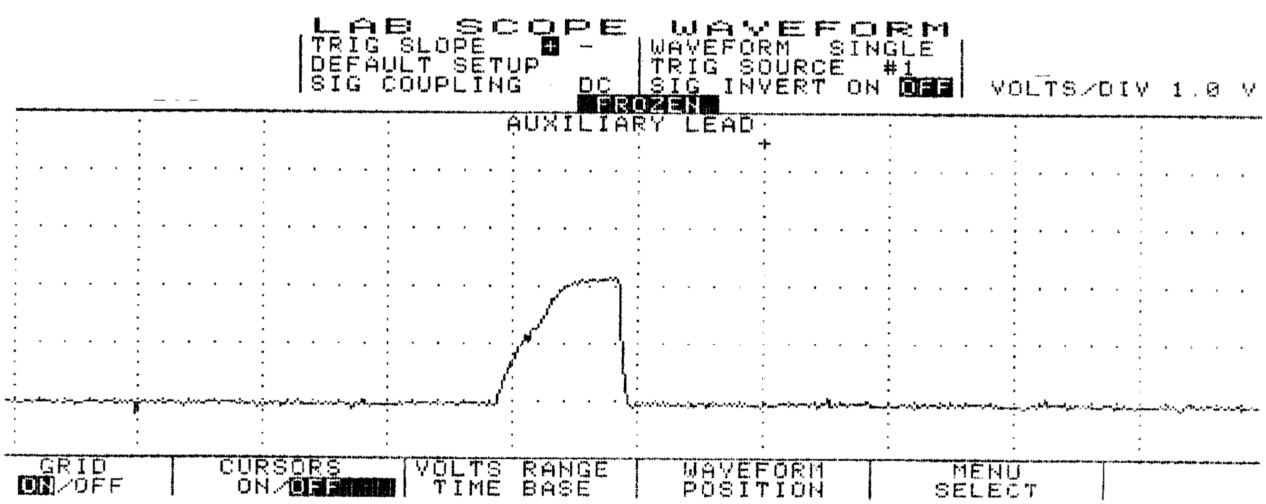
However this is not the case because as the injector windings become saturated, counter voltage is created which impedes the current flow. This, coupled with the inherent resistance of the driver's transistor, impedes the current flow even more. So, what is a known good value for a dynamic current draw on a voltage controlled bank of injectors? The waveform pattern shown below indicates a good parallel injector current flow of 2 amps. See Fig. 4.

Note that if just one injector has a resistance problem and partially shorts, the entire parallel bank that it belongs to will draw more current. This can damage the injector driver.

The waveform pattern in Fig. 5 indicates this type of problem with too much current flow. This is on other bank of injectors of the same vehicle; the even side. Notice the Lab Scope is set on a one amp per division scale. As you can see, the current is at an unacceptable 2.5 amps.

It is easy to find out which individual injector is at fault. All you need to do is inductively clamp onto each individual injector and compare them. To obtain a known-good value to compare against, we used the good bank to capture the waveform in Fig. 6. Notice that it limits current flow to 750 milliamps.

The waveform shown in Fig. 7 illustrates the problem injector we found. This waveform indicates an unacceptable current draw of just over one amp as compared to the 750 milliamp draw of the known-good injector. A subsequent check with a DVOM found 8.2 ohms, which is under the 12 ohm specification.



95D23864

Fig. 4: Injector Bank w/Normal Current Flow - Current Pattern

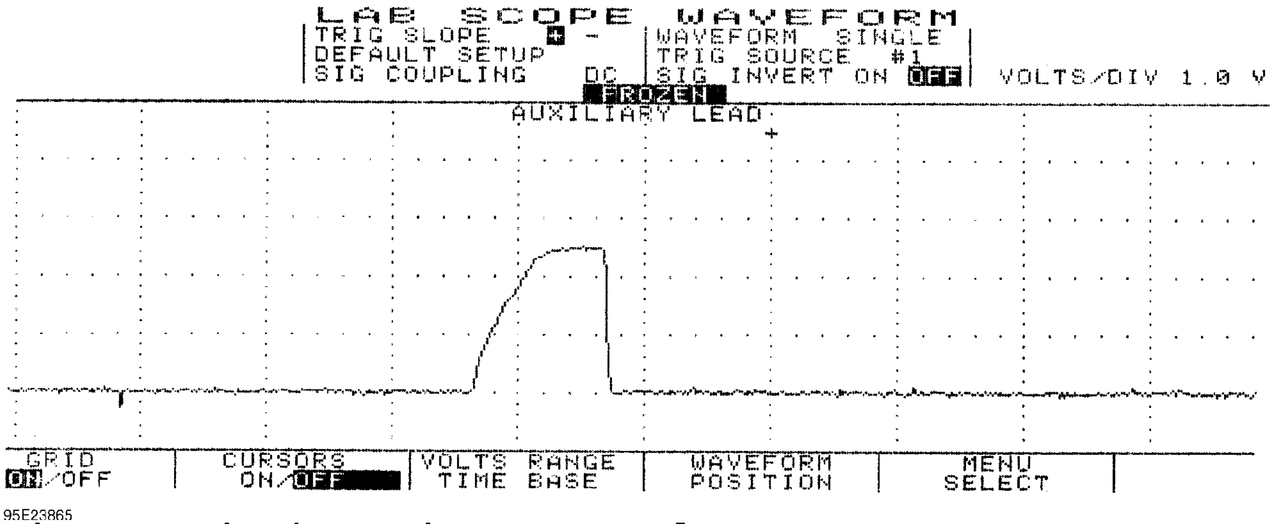


Fig. 5: Injector Bank w/Excessive Current Flow - Current Pattern

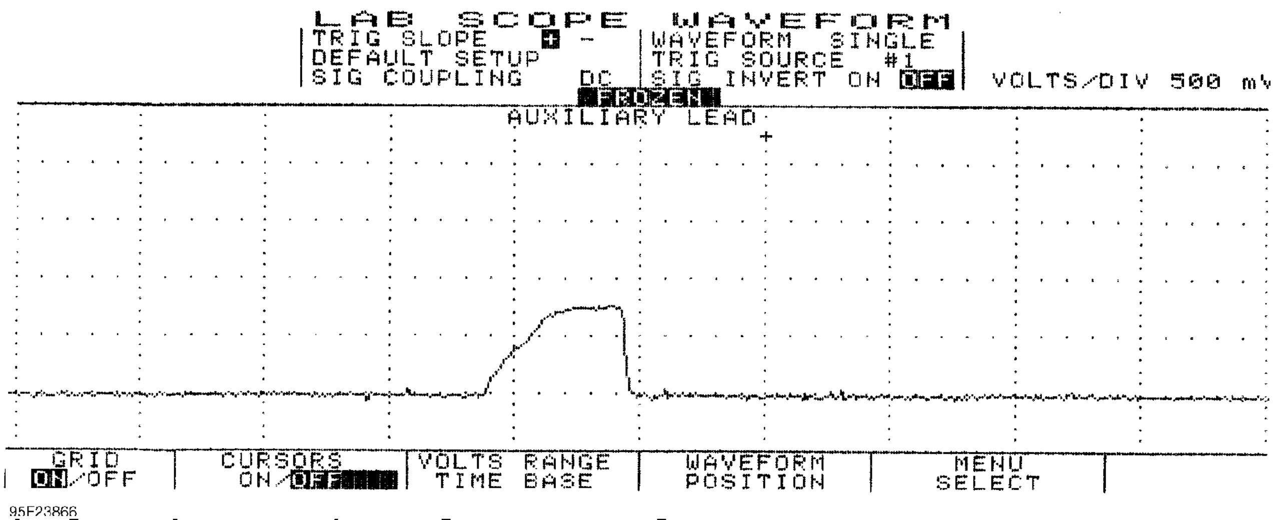


Fig. 6: Single Injector w/Normal Current Flow - Current Pattern

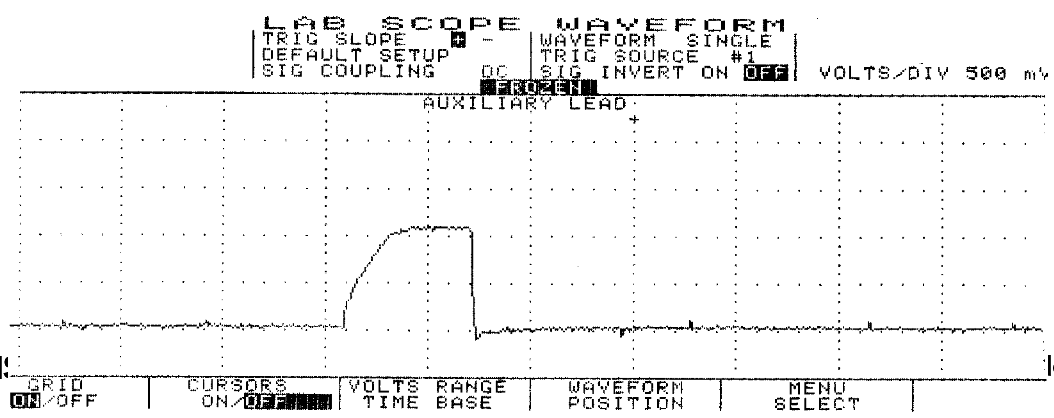


Fig. 7: Single Injector w/Excessive Current Flow - Current Pattern

EXAMPLE #2 - VOLTAGE CONTROLLED DRIVER

This time we will look at a GM 3.1L V6 VIN [T].Fig. 8 shows the 1, 3, 5 (odd) injector bank with the current waveform indicating about a 2.6 amp draw at idle. This pattern, taken from a known good vehicle, correctly stays at or below the maximum 2.6 amps current range. Ideally, the current for each bank should be very close in comparison.

Notice the small dimple on the current flow's rising edge. This is the actual injector opening or what engineers refer to as the "set point." For good idle quality, the set point should be uniform between the banks.

When discussing Ohm's Law as it pertains to this parallel circuit, consider that each injector has specified resistance of 12.2 ohms. Since all three injectors are in parallel the total resistance of this parallel circuit drops to 4.1 ohms. Fourteen volts divided by four ohms would pull a maximum of 3.4 amps on this bank of injectors. However, as we discussed in EXAMPLE #1 above, other factors knock this value down to roughly the 2.6 amp neighborhood.

Now we are going to take a look at the even bank of injectors; injectors 2, 4, and 6. See Fig. 9. Notice this bank peaked at 1.7 amps at idle as compared to the 2.6 amps peak of the odd bank (Fig. 8). Current flow between even and odd injectors banks is not uniform, yet it is not causing a driveability problem. That is because it is still under the maximum amperage we figured out earlier. But be aware this vehicle could develop a problem if the amperage flow increases any more.

Checking the resistance of this even injector group with a DVOM yielded 6.2 ohms, while the odd injector group in the previous example read 4.1 ohms.

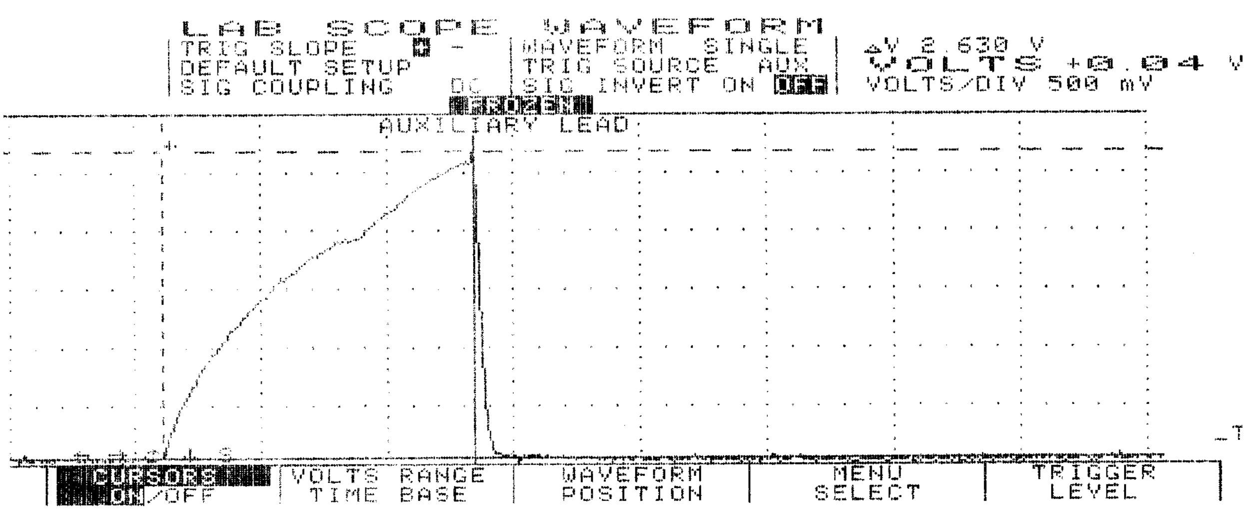
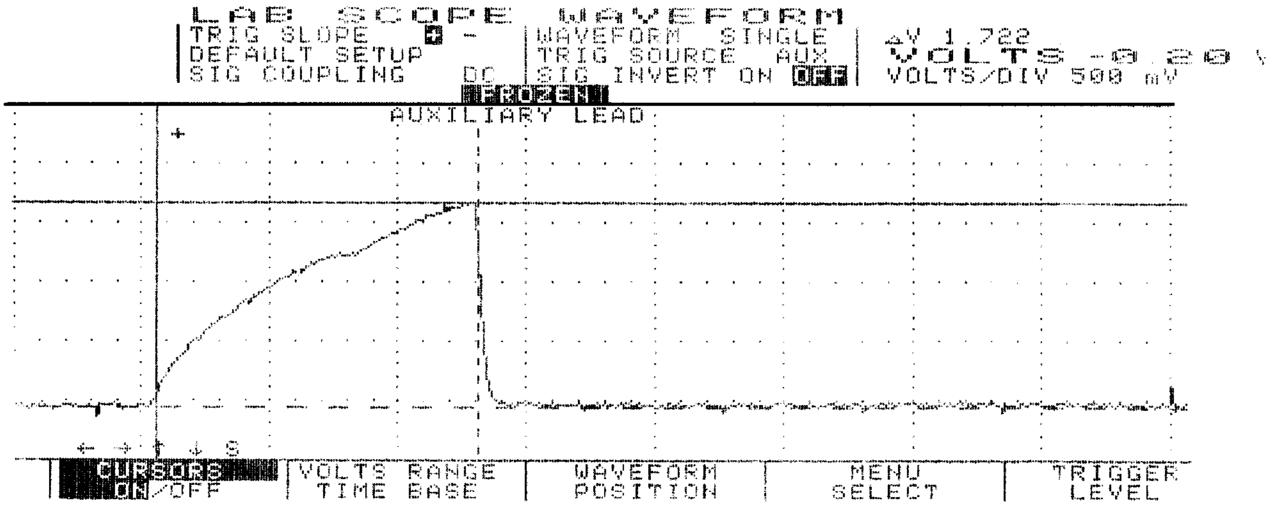


Fig. 8: Injector Odd Bank w/Normal Current Flow - Current Pattern



95F23874

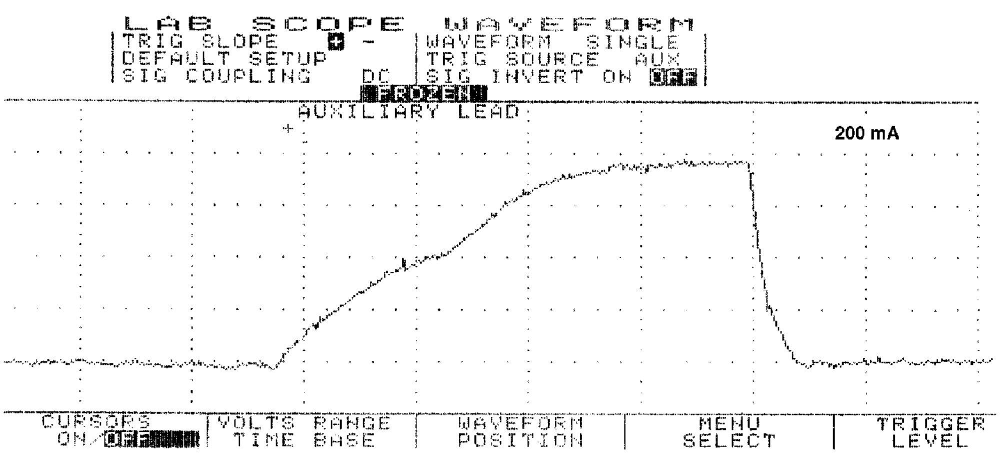
Fig. 9: Injector Even Bank w/Normal Current Flow - Current Pattern

EXAMPLE #3 - VOLTAGE CONTROLLED DRIVER

Example #3 is of a Ford 5.0L V8 SEFI.Fig. 10 shows a waveform of an individual injector at idle with the Lab Scope set on 200 milliamps per division. Notice the dimple in the rising edge. This dimple indicates the actual opening of the injector (set point) occurred at 400 milliamps and current peaked at 750 milliamps. This is a good specification for this engine.

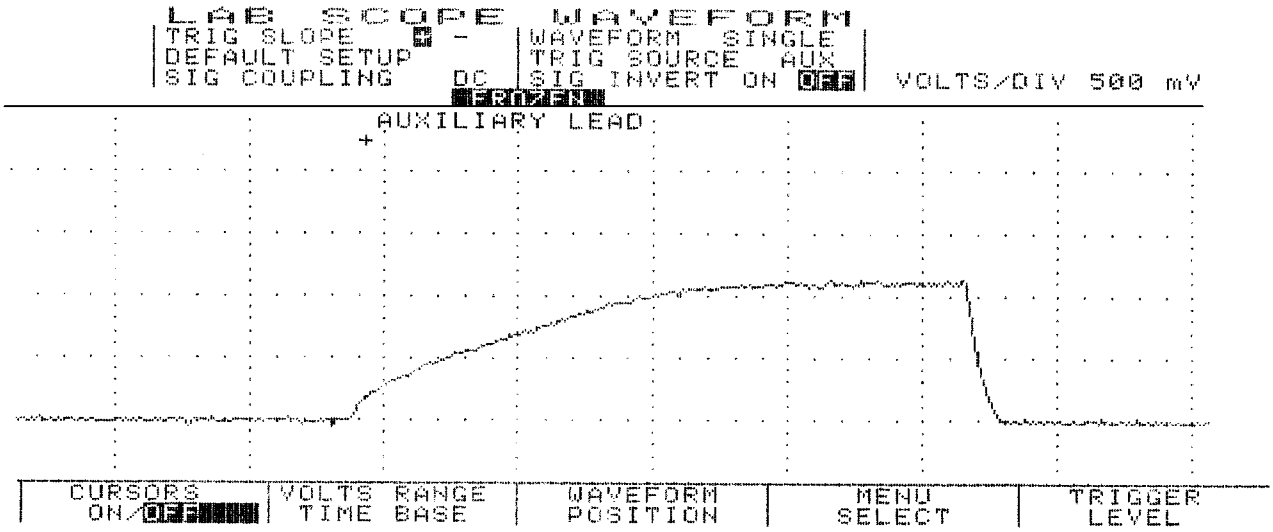
The next waveform pattern in Fig. 11 shows an abnormality with another injector. With the Lab Scope set on 500 milliamps per division, you can see that the current waveform indicates a 1200 milliamp draw. This is a faulty injector.

Abnormally low resistance injectors create excessive current draw, causing rough idle, and possible computer driver damage.



95G23875

Fig. 10: Single Injector w/Normal Current Flow - Current Pattern

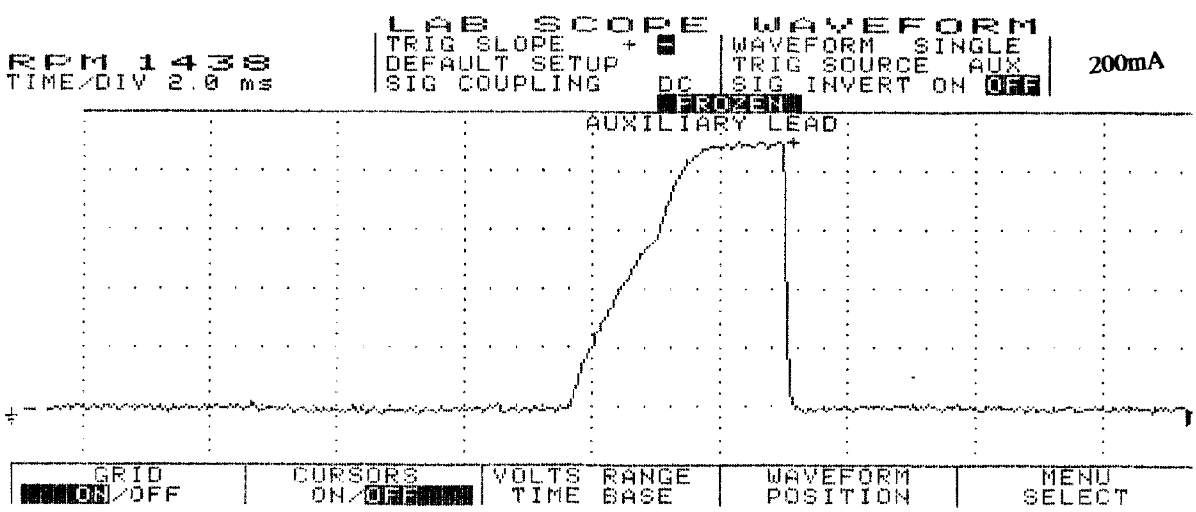


95H23876
Fig. 11: Single Injector w/Excessive Current Flow - Current Pattern

EXAMPLE #4 - CURRENT CONTROLLED DRIVER

Example #4 is of a Ford 4.6L SEFI VIN [W]. SeeFig. 12 for the known-good waveform pattern. This Ford system is different from the one above in EXAMPLE #3 as it peaks at 900 milliamps and the actual opening of the injector (set point) is just below 600 milliamps.

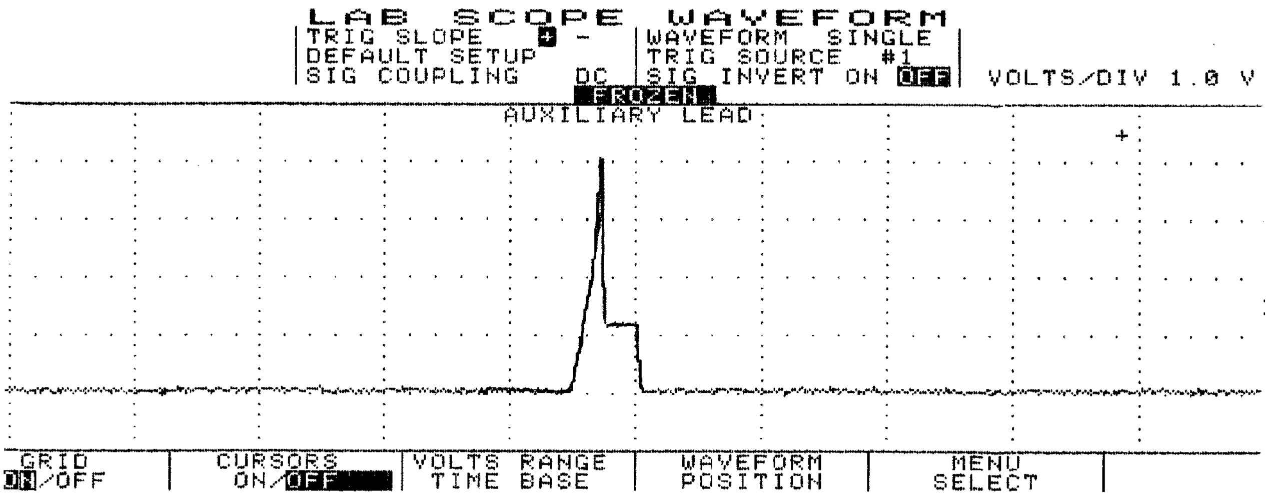
This is offered as a comparison against the Ford pattern listed above, as they are both Ford SEFI injectors but with different operating ranges. The point is that you should not make any broad assumptions for any manufacturer.



95D23872
Fig. 12: Single Injector w/Normal Current Flow - Current Pattern

EXAMPLE #5 - CURRENT CONTROLLED DRIVER

The known-good waveform in Fig. 13 is from a Chrysler 3.0L V6 PFI VIN [3]. It is a perfect example of the peak and hold theory. The waveform shows a 1-amp per division current flow, ramping to 4 amps and then decreasing to 1-amp to hold the injector open.

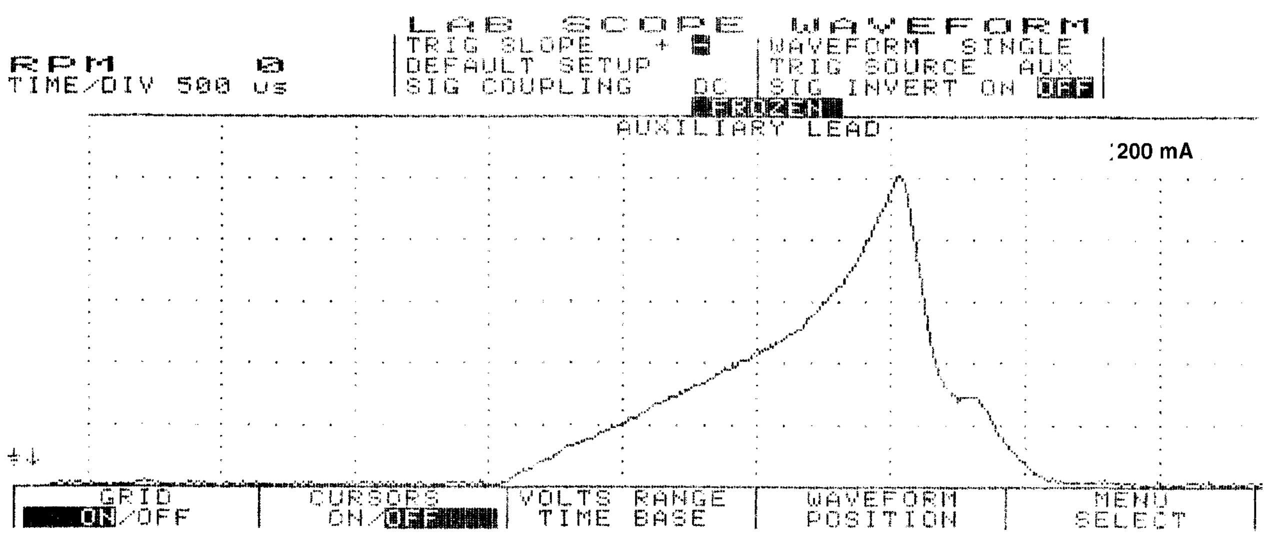


95H23868

Fig. 13: Injector Bank w/Normal Current Flow - Current Pattern

EXAMPLE #6 - CURRENT CONTROLLED DRIVER

This next known-good waveform is from a Ford 5.0L V8 CFI VIN [F]. See Fig. 14. The pattern, which is set on a 250 milliamps scale, indicates a 1.25 amp peak draw and a hold at 350 milliamps.



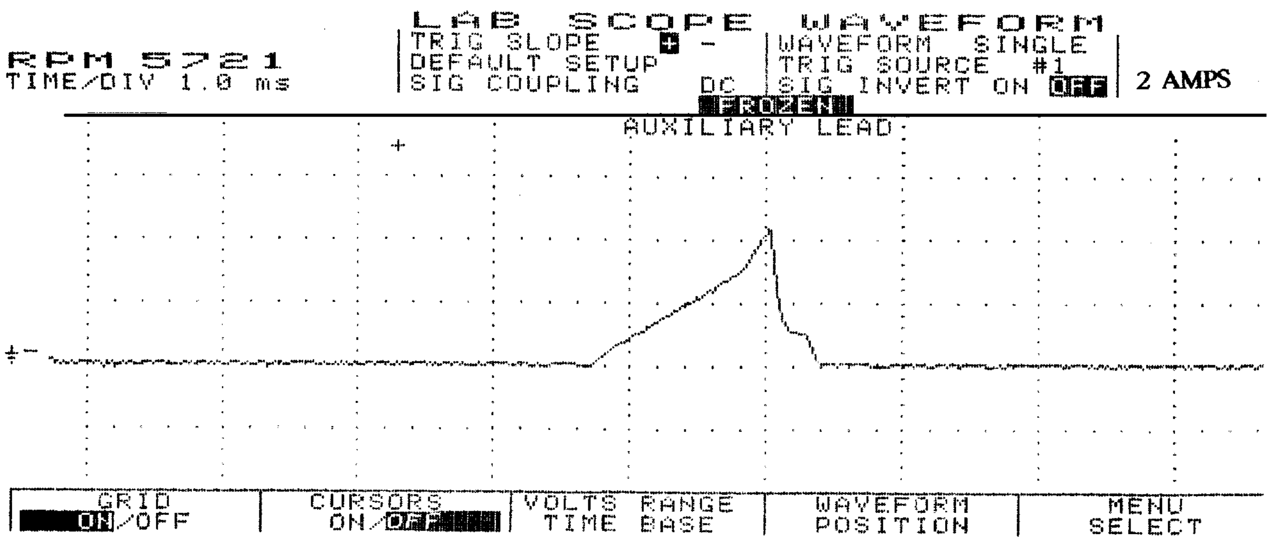
95I23869

Fig. 14: Single Injector w/Normal Current Flow - Current Pattern

EXAMPLE #7 - CURRENT CONTROLLED DRIVER

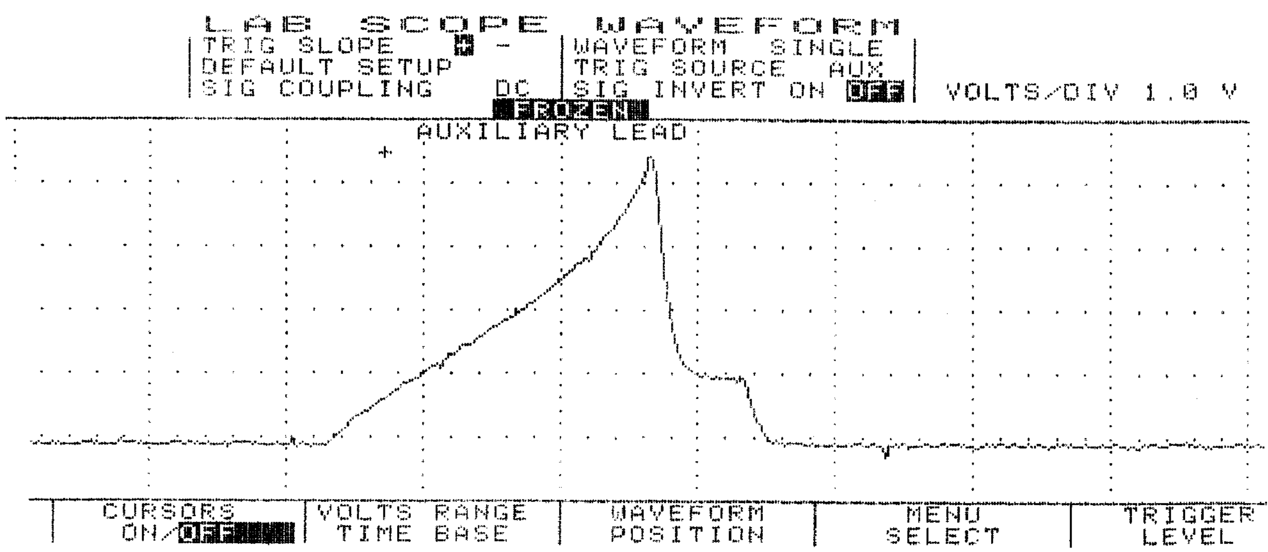
The known-good current controlled type waveform in Fig. 15 is from a GM 2.0L TBI VIN [1]. With the lab scope set at 2 amps per division, notice that this system peaks at 4 amps and holds at 1 amp.

The next waveform is from the same type of engine, except that it shows a faulty injector. See Fig. 16. Notice that the current went to almost 5 amps and stayed at 1 amp during the hold pattern. Excessive amounts of current flow from bad injectors are a common source of intermittent computer shutdown. Using a current waveform pattern is the most accurate method of pinpointing this problem.



95C23871

Fig. 15: Single Injector w/Normal Current Flow - Current Pattern

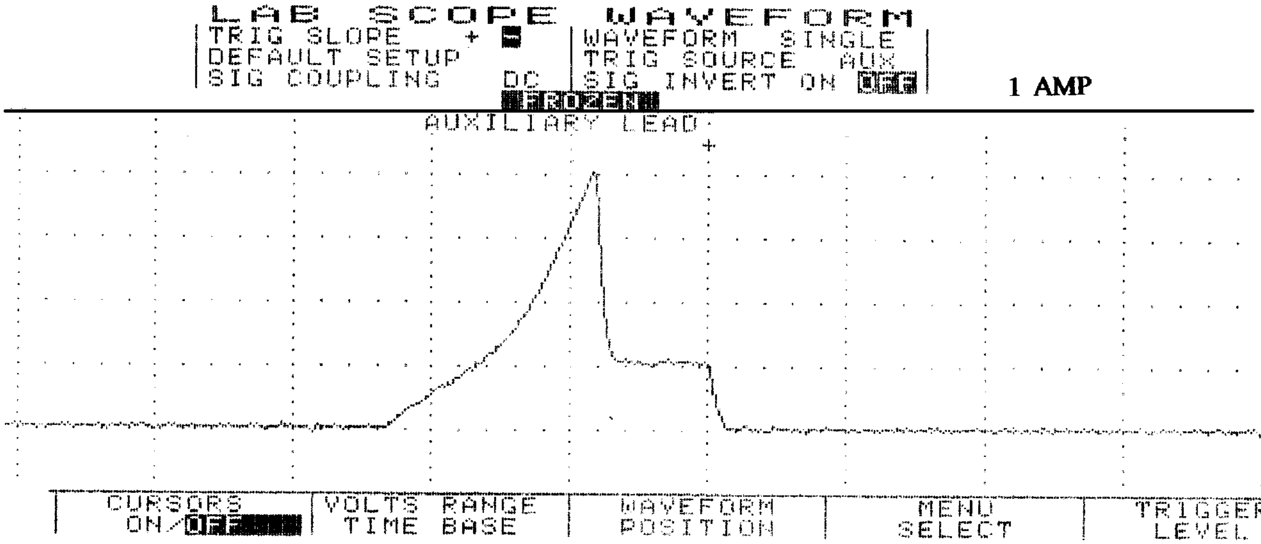


95I23877

Fig. 16: Single Injector w/Excessive Current Flow - Current Pattern

EXAMPLE #8 - CURRENT CONTROLLED DRIVER

This known-good CPI system waveform from a GM 4.3L V6 CPI VIN [W] peaks at 4 amps and holds at 1-amp. See Fig. 17 for waveform.



95B23870

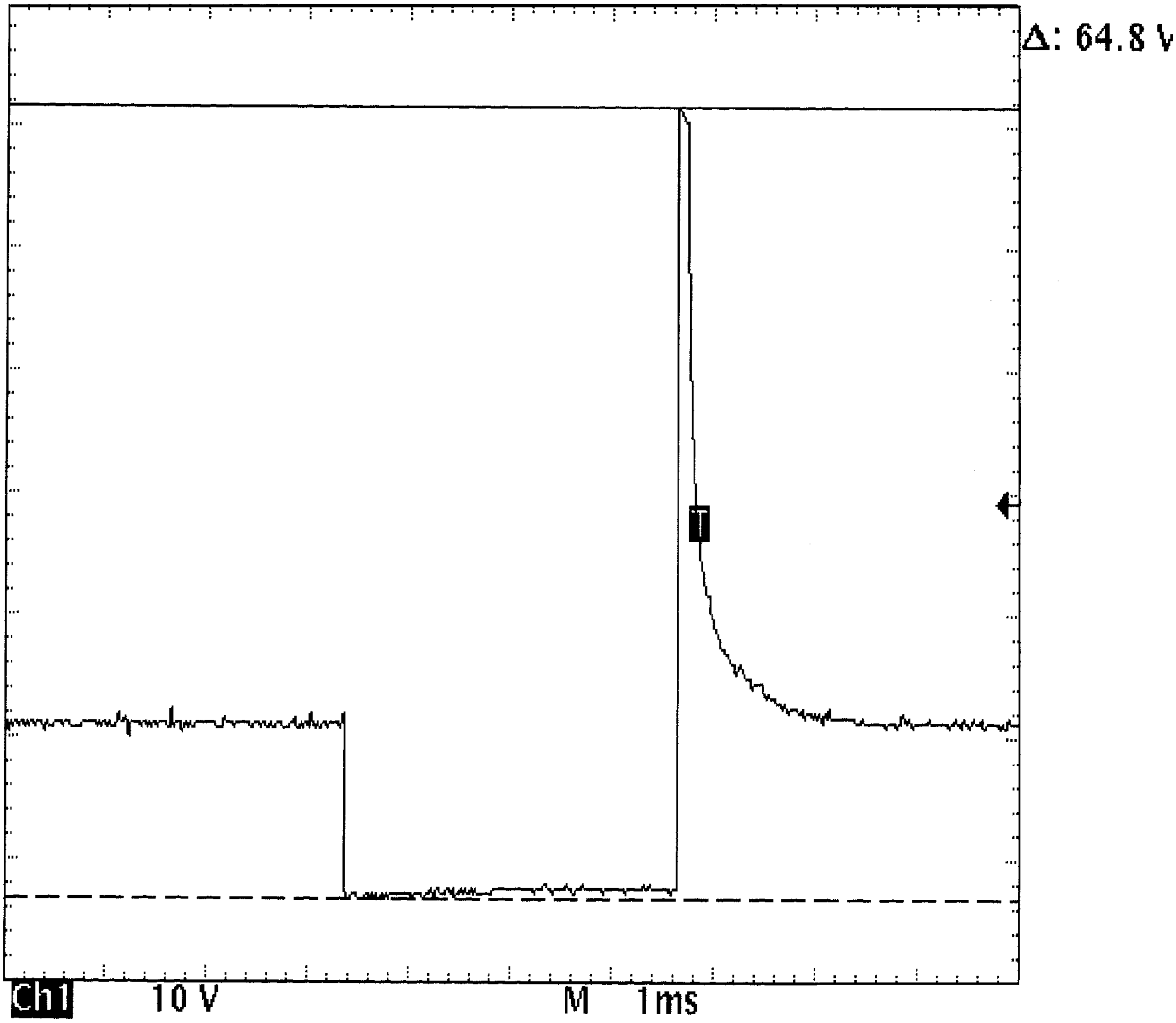
Fig. 17: Single Injector w/Normal Current Flow - Current Pattern

VOLTAGE WAVEFORM SAMPLES

EXAMPLE #1 - VOLTAGE CONTROLLED DRIVER

These two known-good waveform patterns are from a Ford 4.6L V8 VIN [W]. Fig. 18 illustrates the 64 volt inductive kick on this engine, indicating no clamping is occurring. The second pattern, Fig. 19, was taken during hot idle, closed loop, and no load.

WAVEFORMS



95E23857

Fig. 18: Injector Bank - Known Good - Voltage Pattern

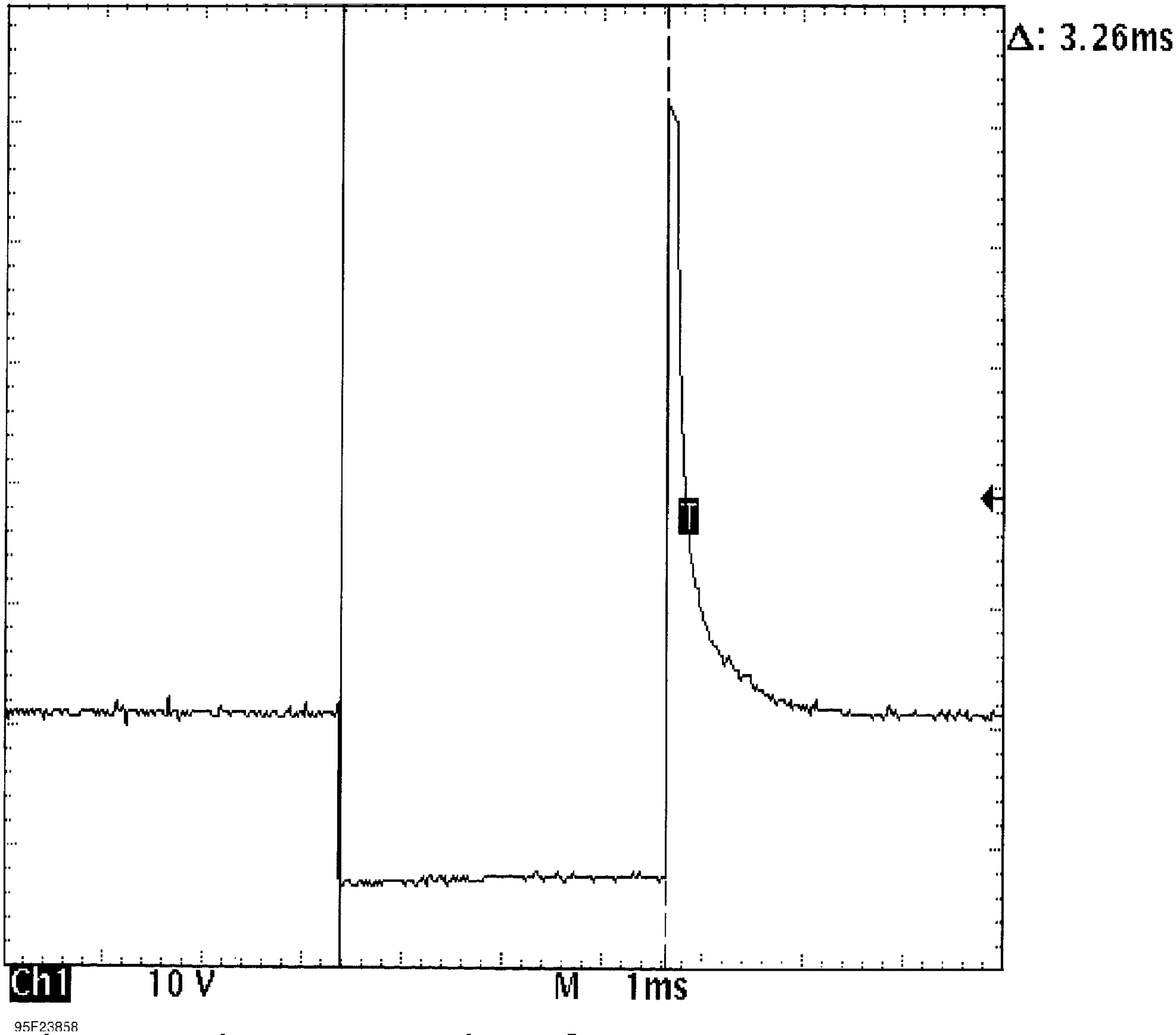


Fig. 19: Injector Bank - Known Good - Voltage Pattern

EXAMPLE #2 - VOLTAGE CONTROLLED DRIVER

The known-good waveform pattern inFig. 20 is from a GM 3.8L V6 PFI VIN [3]. It was taken during hot idle, closed loop and no load.

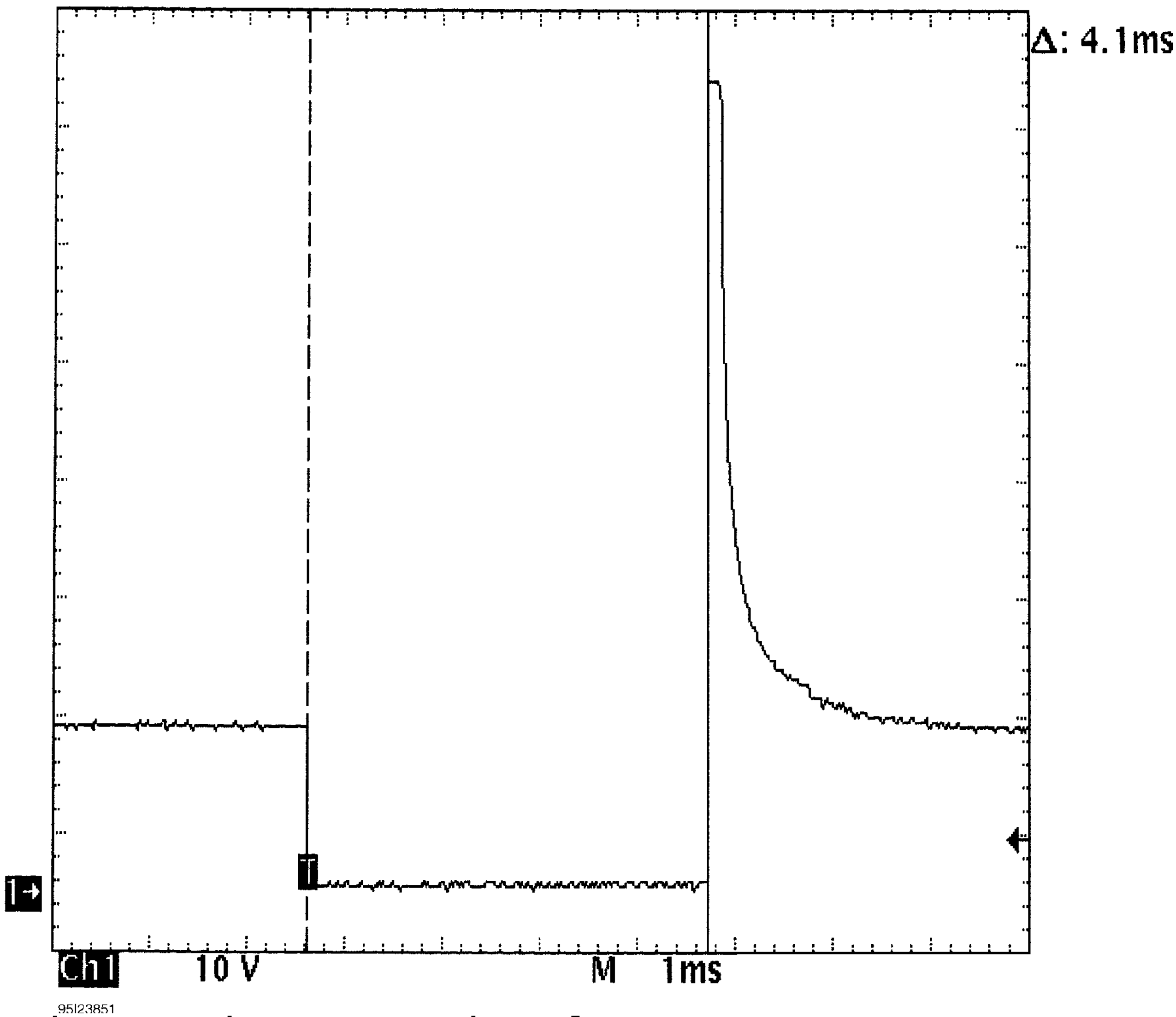
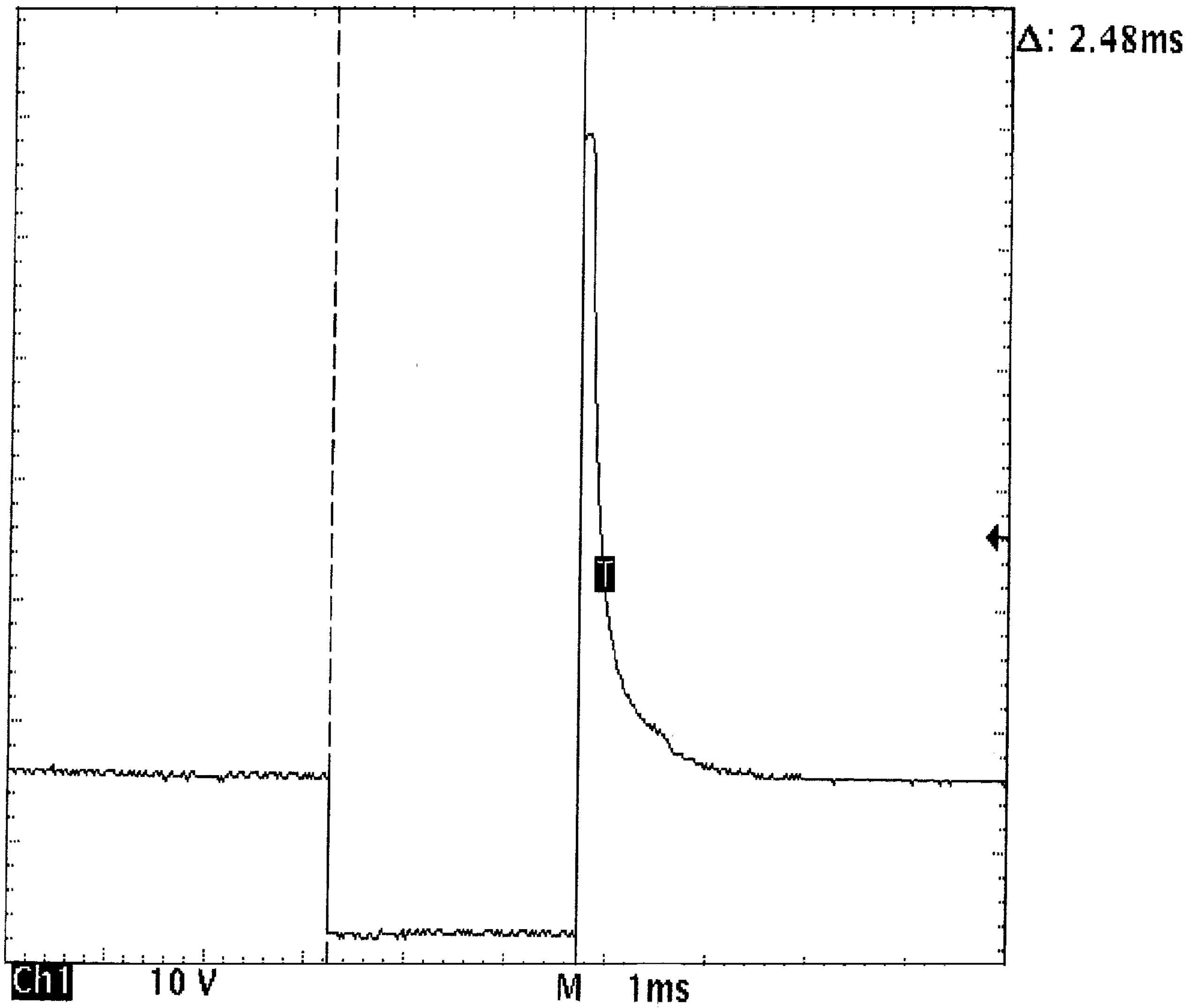


Fig. 20: Injector Bank - Known Good - Voltage Pattern

EXAMPLE #3 - VOLTAGE CONTROLLED DRIVER

This known-good waveform pattern, Fig. 21, is from a GM 5.0L V8 TPI VIN [F]. It was taken during hot idle, closed loop and no load.



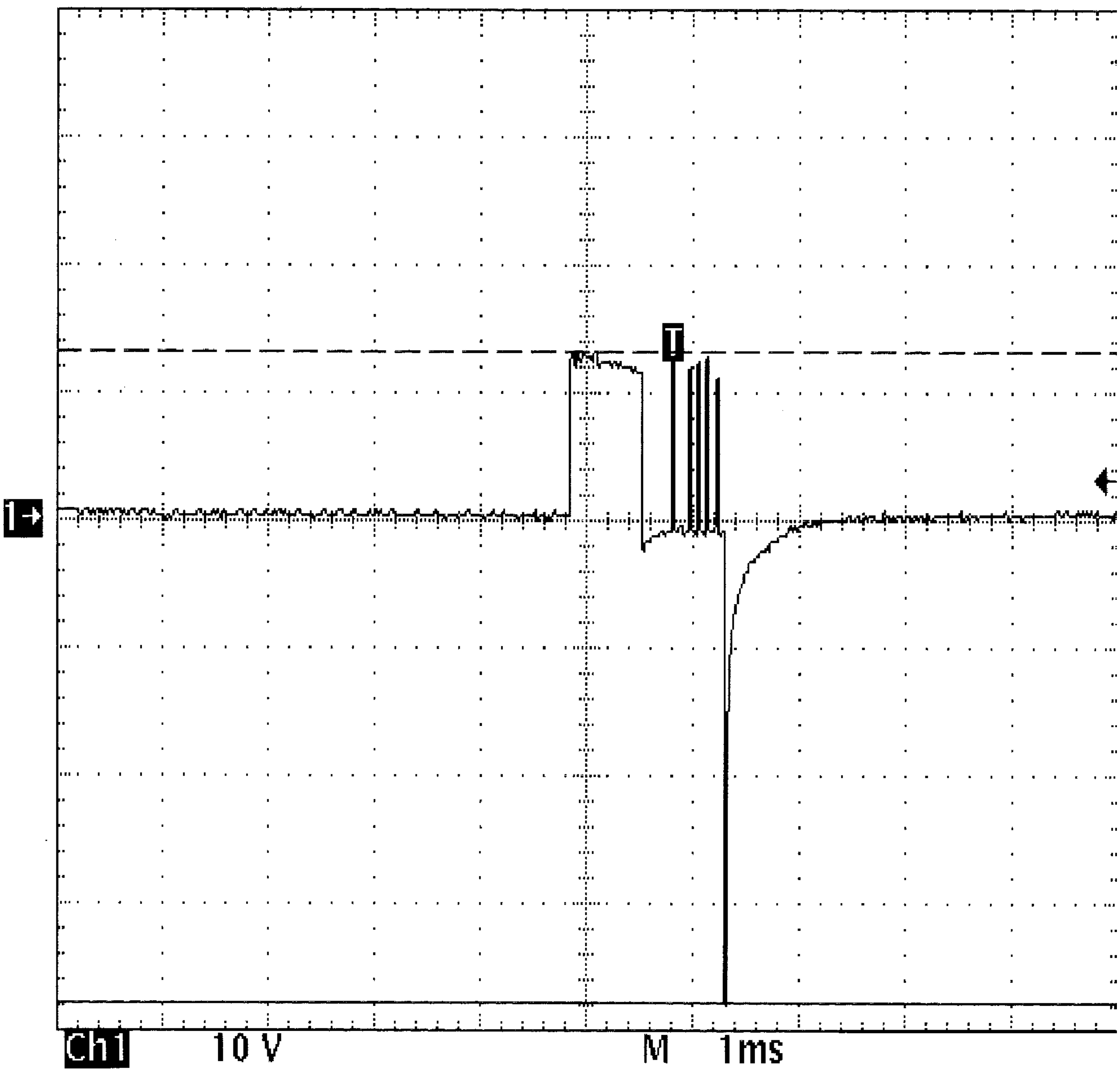
95G23859

Fig. 21: Injector Bank - Known Good - Voltage Pattern

EXAMPLE #4 - CURRENT CONTROLLED DRIVER

From 1984 to 1987, Chrysler used this type injector drive on their TBI-equipped engines. See Fig. 22 for a known-good pattern. Instead of the ground side controlling the injector, Chrysler permanently grounds out the injector and switches the power feed side. Most systems do not work this way.

These injectors peak at 6 amps of current flow and hold at 1 amp.



95J23860

Fig. 22: Single Injector - Known Good - Voltage Pattern

EXAMPLE #5 - CURRENT CONTROLLED DRIVER

These two known-good waveform patterns are from a Chrysler 3. 0L V6 VIN [3]. The first waveform, Fig. 23, is a dual trace pattern that illustrates how Chrysler uses the rising edge of the engine speed signal to trigger the injectors. The second waveform, Fig. 24, was taken during hot idle, closed loop, and no load.

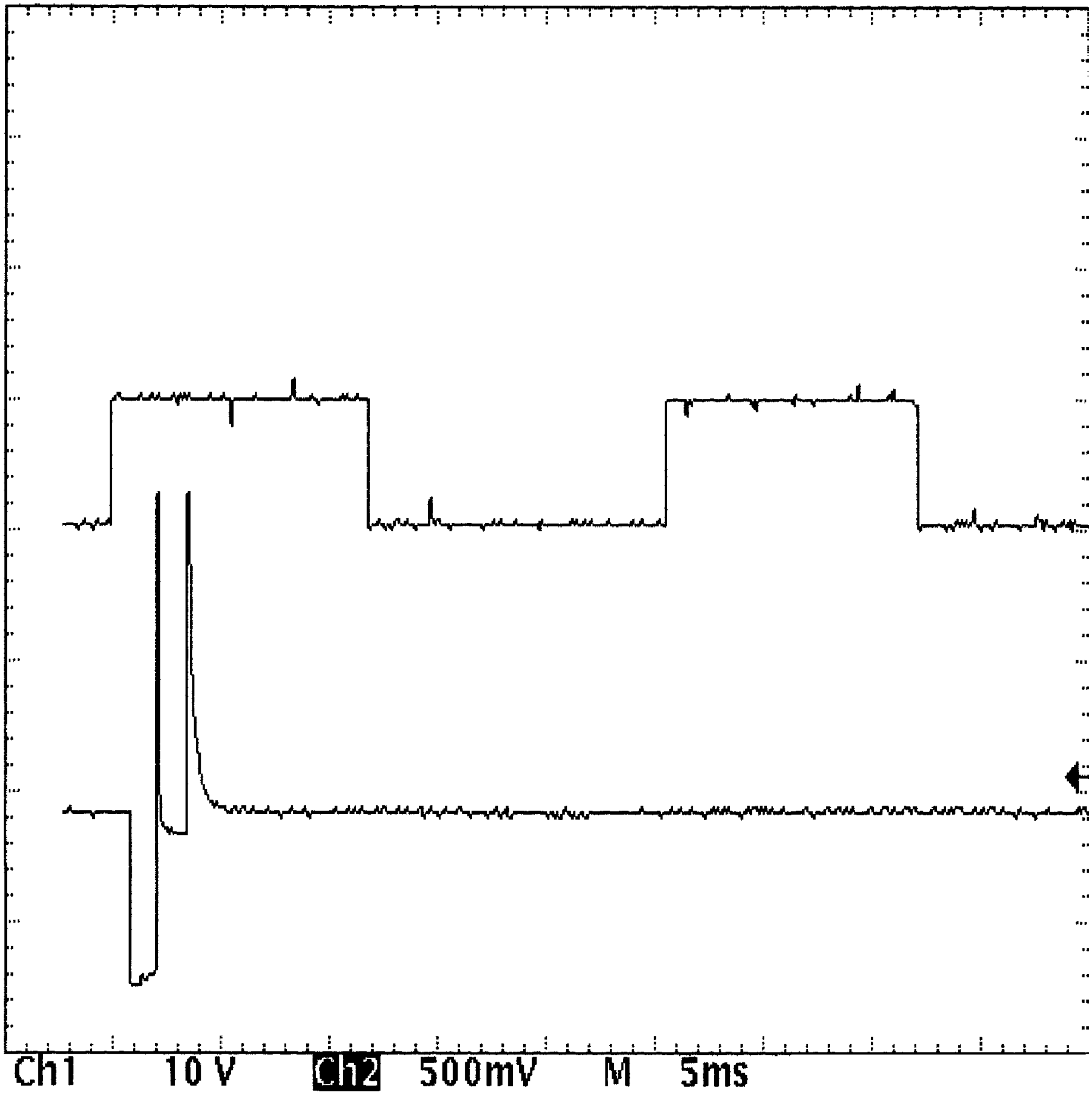
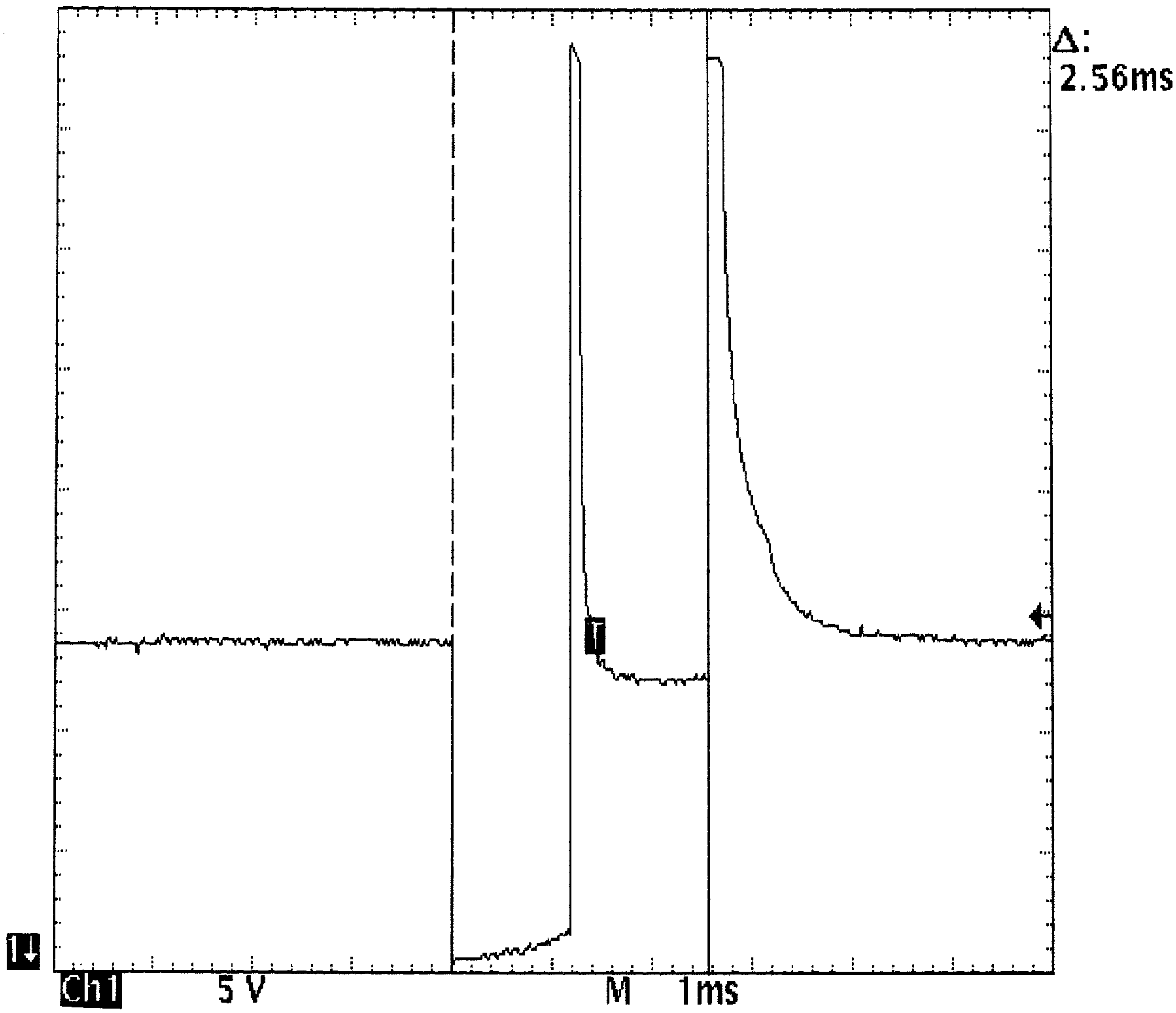


Fig. 23: Injector Bank - Known Good - Voltage Pattern

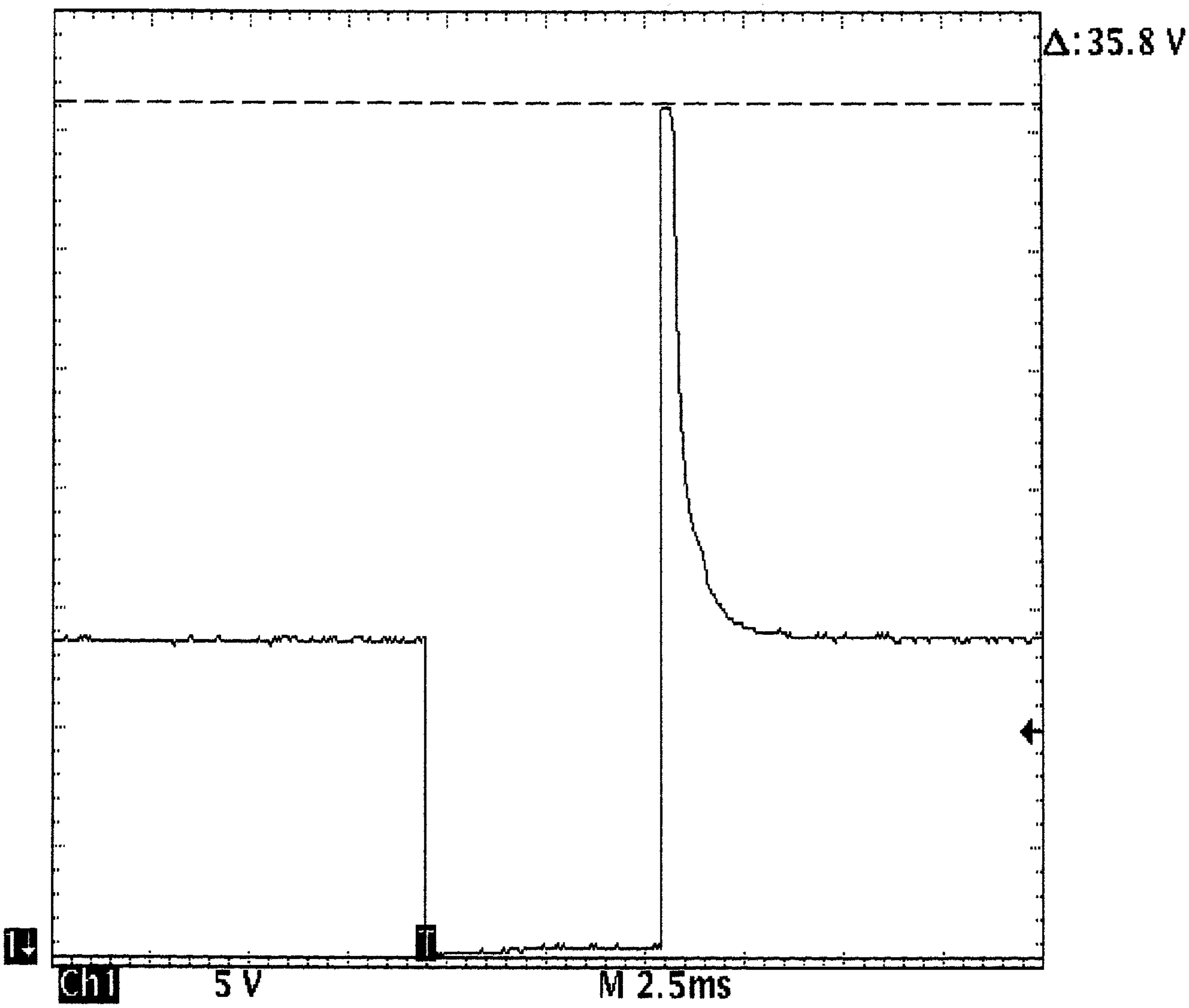


95B23854

Fig. 24: Injector Bank - Known Good - Voltage Pattern

EXAMPLE #6 - CURRENT CONTROLLED DRIVER

This known-good pattern from a Ford 3.0L V6 PFI VIN [U] illustrates that a zener diode inside the computer is used to clamp the injector's inductive kick to 35 volts on this system. See Fig. 25.

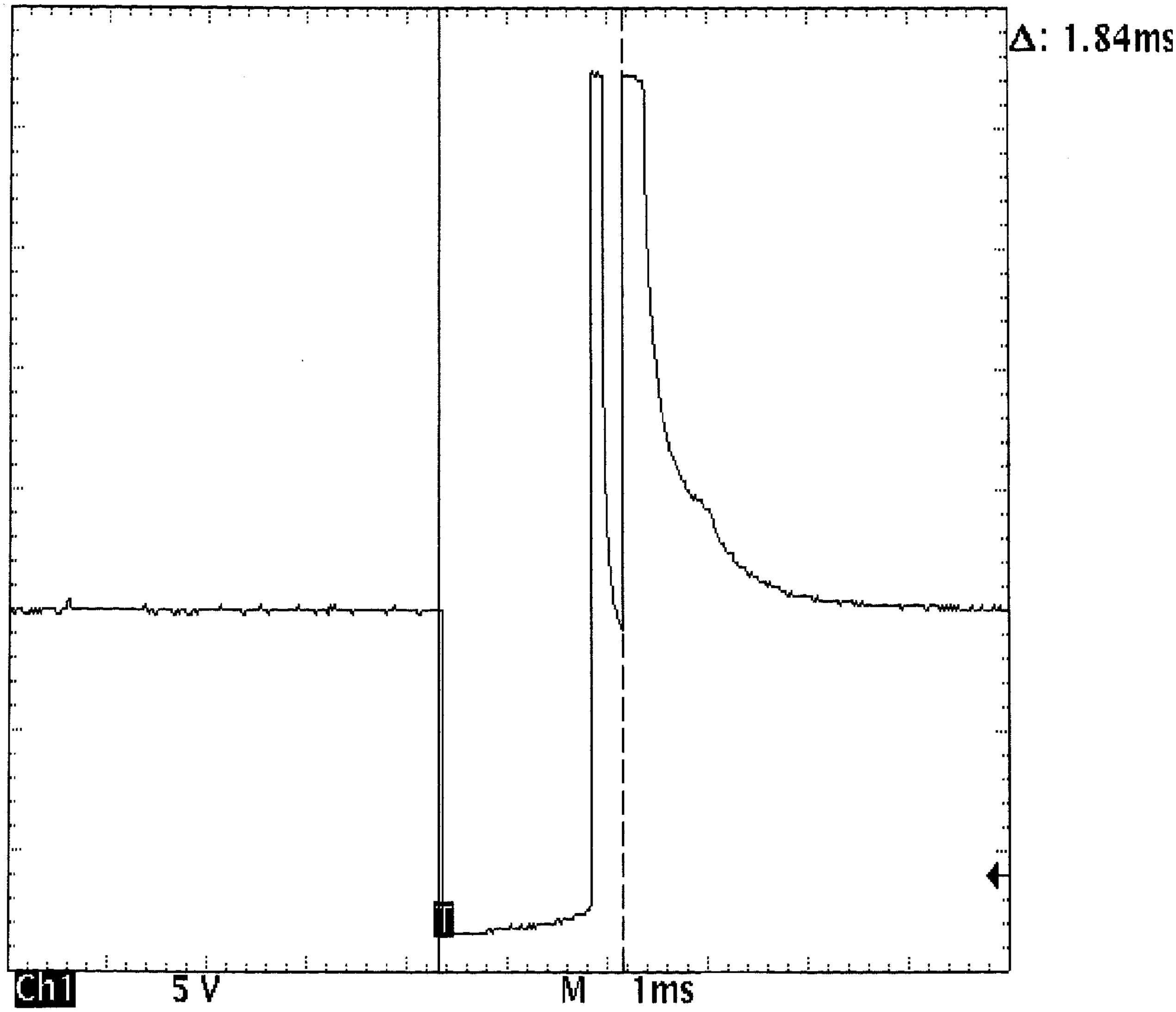


95J23852

Fig. 25: Injector Bank - Known Good - Voltage Pattern

EXAMPLE #7 - CURRENT CONTROLLED DRIVER

This known-good waveform from a Ford 5.0L V8 CFI VIN [F] was taken during hot idle, closed loop, and no load. SeeFig. 26.

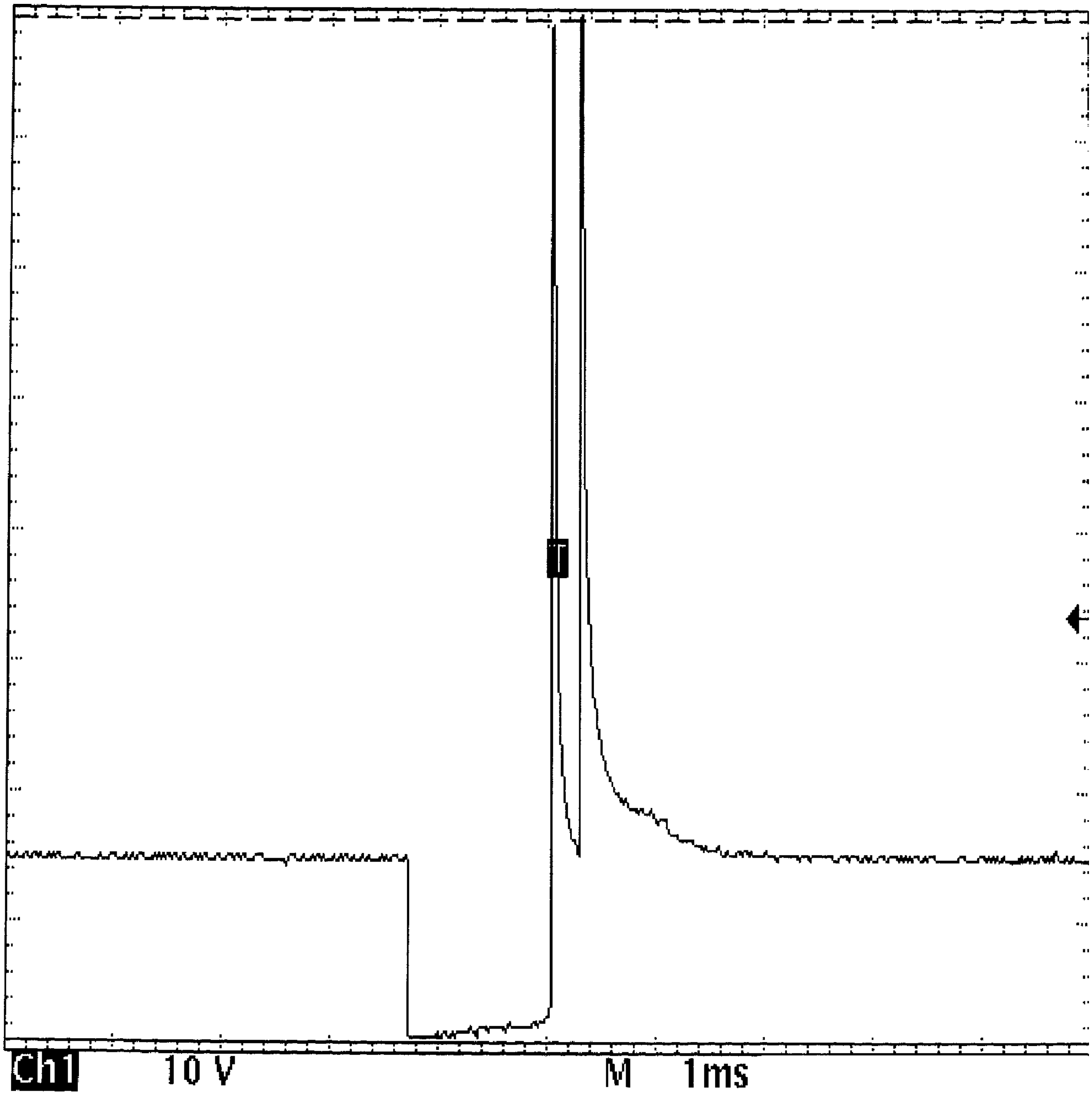


95D23856

Fig. 26: Single Injector - Known Good - Voltage Pattern

EXAMPLE #8 - CURRENT CONTROLLED DRIVER

These two known-good waveform patterns are from a GM 2.0L In-Line 4 VIN [1]. Fig. 27 illustrates the 78 volt inductive spike that indicates a zener diode is not used. The second waveform,Fig. 28, was taken during hot idle, closed loop, and no load.



95D23849

Fig. 27: Single Injector - Known Good - Voltage Pattern

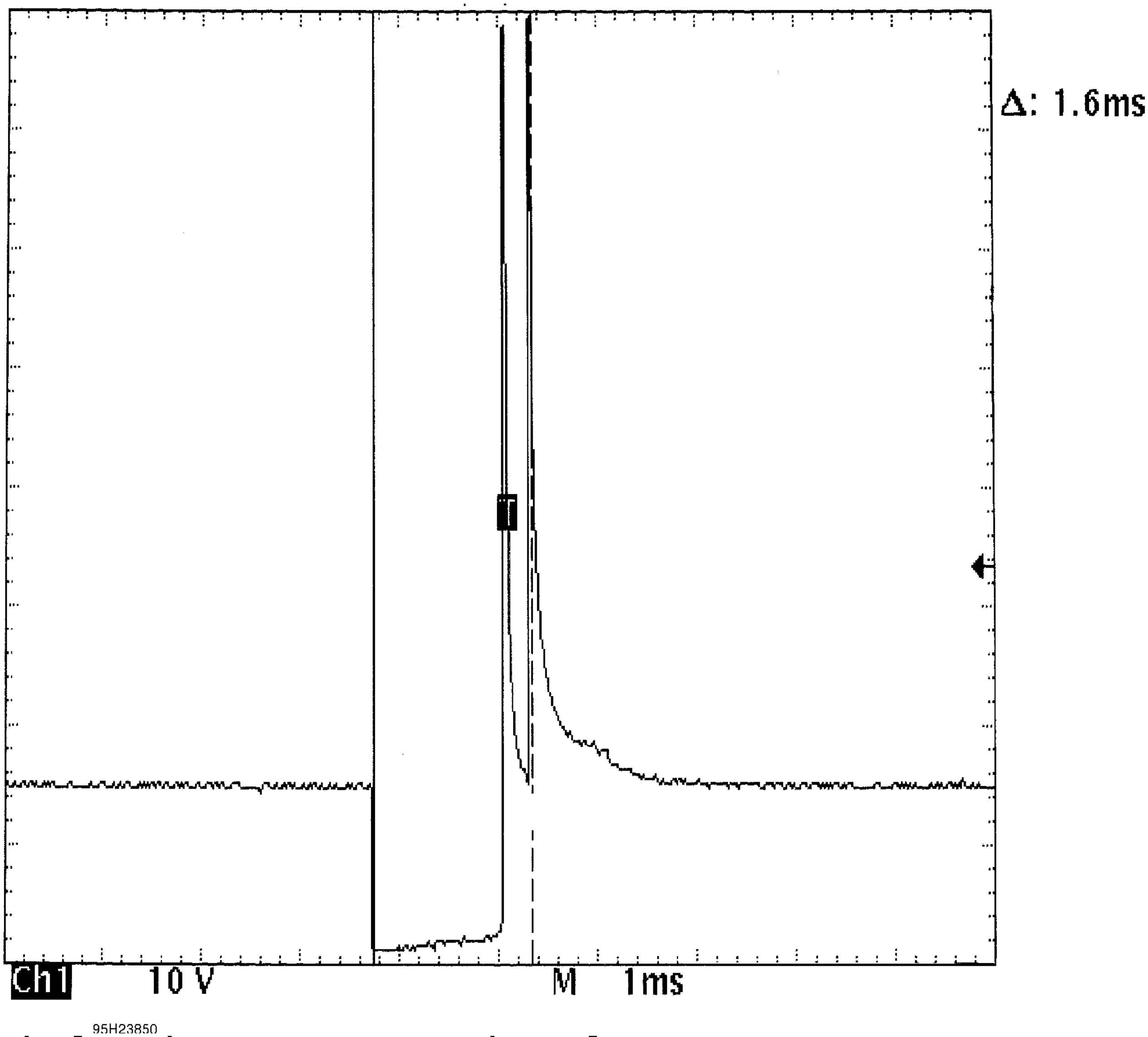


Fig. 28: Single Injector - Known Good - Voltage Pattern

END OF ARTICLE

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ARTICLE BEGINNING

1993 WHEEL ALIGNMENT
Honda - Specifications & Procedures

Prelude

* PLEASE READ THIS FIRST *

NOTE: Prior to performing wheel alignment, perform preliminary visual and mechanical inspection of wheels, tires and suspension components.

ANTI-LOCK BRAKE SAFETY PRECAUTIONS

* NEVER open a bleeder valve or loosen a hydraulic line while ABS is pressurized
* NEVER disconnect or reconnect any electrical connectors while ignition is on. Damage to ABS control unit may result.
* DO NOT attempt to bleed hydraulic system without first referring to the appropriate article.
* Only use specially designed brake hoses/lines on ABS-equipped vehicles.
* DO NOT tap on speed sensor components (sensor, sensor rings). Speed rings must be pressed, NOT hammered into hubs. Striking these components can cause demagnetization or a loss of polarization, affecting the accuracy of the speed signal returning to the ABS control unit.
* DO NOT mix tire sizes. Increasing the width, as long as tires remain close to the original diameter, is acceptable. Rolling diameter must be identical for all 4 tires. Some manufacturers recommend tires of the same brand, style and type. Failure to follow this precaution may cause inaccurate wheel speed readings.
* DO NOT contaminate speed sensor components with grease. Only use recommended anti-corrosion coating.
* When speed sensor components have been removed, ALWAYS check sensor-to-ring air gaps when applicable. These specifications can be found in each appropriate article.
* ONLY use recommended brake fluids. DO NOT use silicone brake fluids in an ABS-equipped vehicle.
* When installing transmitting devices (CB's, telephones, etc.) on ABS-equipped vehicles, DO NOT locate the antenna near the ABS control unit (or any control unit).
* Disconnect all on-board computers, when using electric welding equipment.
* DO NOT expose the ABS control unit to prolonged periods of

high heat (185°F/85°C for 2 hours is generally considered a maximum limit).

WHEEL ALIGNMENT PROCEDURES

NOTE: Wheel alignment should be checked and adjusted in following order: caster, front camber, rear camber, rear toe-in, front toe-in and steering wheel alignment.

CAMBER ADJUSTMENT

NOTE: Manufacturer recommends using commercially available computerized 4-wheel alignment equipment. Follow equipment manufacturer instructions to obtain current vehicle alignment settings. Use following procedures for necessary adjustments.

(Front)

Compare camber settings with vehicle manufacturer recommendations. See WHEEL ALIGNMENT SPECIFICATIONS table. If camber is incorrect, check for bent or damaged front suspension components. Replace faulty components. Recheck camber.

(Rear)

1) On 4-wheel steering models, install Rear Steering Center Lock Pin (07NAJ-SS0020A) in rear steering gear assembly. See Fig. 1. On all models, compare camber settings with vehicle manufacturer recommendations. See WHEEL ALIGNMENT SPECIFICATIONS table. If camber is incorrect, adjust rear camber by loosening upper arm lock nuts and moving knuckle/hub assembly in or out.

2) On 4-wheel steering models, check static steering wheel alignment. If steering wheel alignment is off by more than 13/64" (5 mm) at steering wheel hub, remove steering wheel and reposition it on splines.

3) Remove rear steering center lock pin, and install rear steering gear assembly cap bolt. Turn steering wheel, centering it in straight-ahead position. Secure steering wheel in this position, and check toe-in.

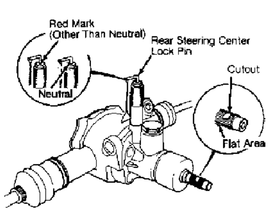

Fig. 1: Installing Rear Steering Center Lock Pin
Courtesy of American Honda Motor Co., Inc.

CASTER ADJUSTMENT

NOTE: Manufacturer recommends using commercially available computerized 4-wheel alignment equipment. Follow equipment manufacturer instructions to obtain current vehicle alignment settings. Use following procedures for necessary adjustments.

NOTE: DO NOT use more than 2 shims. If more than 2 shims are required to adjust caster angle, check for bent or damaged suspension components.

1) If caster needs adjustment, raise front of vehicle and support it using safety stands. Remove lock nut on end of radius (strut) rod. See Fig. 2. Remove radius rod bolts and radius rod from lower control arm.

2) Adjust caster angle by increasing or decreasing adjusting shims. A 1/8" (3.2 mm) thick shim changes caster angle by 0.41 degree (25 minutes). Caster angle can be adjusted a maximum of 0.83 degree (50 minutes). Tighten radius rod bolts and lock nut.

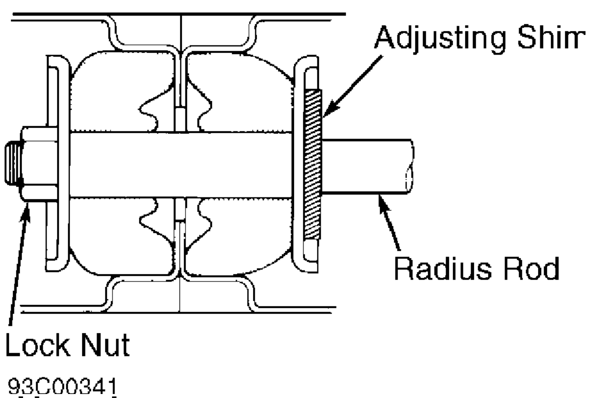

Fig. 2: Adjusting Caster
Courtesy of American Honda Motor Co., Inc.

TOE-IN ADJUSTMENT

NOTE: Manufacturer recommends using commercially available computerized 4-wheel alignment equipment. Follow equipment manufacturer instructions to obtain current vehicle alignment settings. Use following procedures for necessary adjustments.

(2-Wheel Steering)

1) Check caster and camber. Adjust if necessary. See WHEEL ALIGNMENT SPECIFICATIONS table. Secure steering wheel in straight-ahead position. Check rear toe-in.

2) If adjustment is needed, hold adjusting bolt on rear lower control arm and loosen lock nut. Adjust rear toe-in by turning adjusting bolt until toe-in is correct. Install NEW lock nut, and tighten it while holding adjusting bolt.

3) Check front toe-in. If adjustment is needed, loosen tie rod lock nuts and turn tie rods until toe-in is correct. Tighten tie rod lock nuts. Reposition tie rod boots if they are twisted.

(4-Wheel Steering)

1) Check caster and camber. Adjust if necessary. See WHEEL ALIGNMENT SPECIFICATIONS table. Set front main steering angle sensor in neutral position. Using jumper wire, jump service check connector to turn on 4WS indicator light in instrument cluster. See STEERING SYSTEM - 4-WHEEL article in STEERING section. Check front toe-in.

2) If adjustment is needed, loosen tie rod lock nuts and turn tie rods until toe-in is correct. After adjustment, tighten tie rod lock nuts. Reposition tie rod boots if they are twisted. Disconnect jumper wire.

3) Set rear main steering angle sensor in neutral position. Using jumper wire, jump service check connector to turn on 4WS indicator light in instrument cluster. See STEERING SYSTEM - 4-WHEEL article in STEERING section. Check rear toe-in. If adjustment is needed, loosen tie rod lock nuts and turn tie rods until toe-in is correct. After adjustment, tighten tie rod lock nuts. Reposition tie rod boots if they are twisted. Disconnect jumper wire.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Ft. Lbs (N.m)
Radius Rod Lock Nut	41 (55)
Spindle Nut	181 (250)
Tie Rod Lock Nut	33 (45)
Upper Control Arm Nuts	48 (65)
Wheel Lug Nuts	81 (110)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

WHEEL ALIGNMENT SPECIFICATIONS

WHEEL ALIGNMENT SPECIFICATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Application	Preferred	Range
(2WS)		

Camber (1)		
Front	0	-1 To 1
Rear	-0.75	-1.75 To 0.25
Caster (1)	2.67	1.67 To 3.67
Toe-In (2)		
Front	0 (0)	-0.08 To 0.08 (-2.0 To 2.0)
Rear	0.08 (2.0)	0 To 0.16 (0 To 4.0)
Toe-Out On Turns (1)		
Inner	36.33	.....
Outer	29.67	.....
(4WS)		
Camber (1)		
Front	0	-1 To 1
Rear	-0.75	-1.70 To 0.30
Caster (1)	2.67	1.67 To 3.67
Toe-In (2)		
Front	0 (0)	-0.08 To 0.08 (-2.0 To 2.0)
Rear	0.08 (2.0)	0 To 0.16 (0 To 4.0)
Toe-Out On Turns (1)		
Inner		
Front	36.33	.....
Rear	6	.....
Outer		
Front	29.67	.....
Rear	6.33	.....

(1) - Measurement in degrees.
(2) - Measurement in inches (mm).
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

END OF ARTICLE

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ARTICLE BEGINNING

GENERAL INFORMATION
Wheel Alignment Theory & Operation

ALL MODELS

*** PLEASE READ THIS FIRST ***

NOTE: This article is intended for general information purposes only. This information may not apply to all makes and models.

PRE-ALIGNMENT INSTRUCTIONS

GENERAL ALIGNMENT CHECKS

Before adjusting wheel alignment, check the following:

* Each axle uses tires of same construction and tread style, equal in tread wear and overall diameter. Verify that radial and axial runout is not excessive. Inflation should be at manufacturer's specifications.
* Steering linkage and suspension must not have excessive play. Check for wear in tie rod ends and ball joints. Springs must not be sagging. Control arm and strut rod bushings must not have excessive play. See Fig. 1.

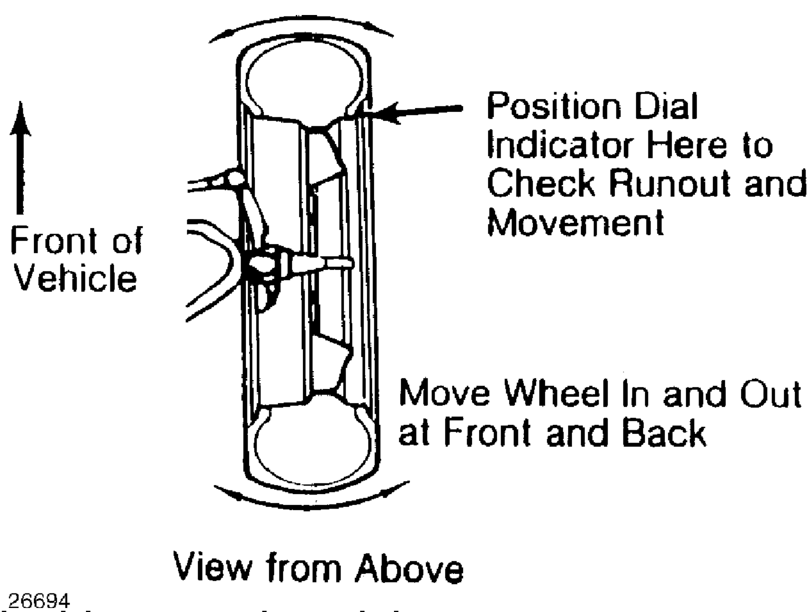


Fig. 1: Checking Steering Linkage

* Vehicle must be on level floor with full fuel tank, no

passenger load, spare tire in place and no load in trunk. Bounce front and rear end of vehicle several times. Confirm vehicle is at normal riding height.

* Steering wheel must be centered with wheels in straight ahead position. If required, shorten one tie rod adjusting sleeve and lengthen opposite sleeve (equal amount of turns). See Fig. 2.
* Wheel bearings should have the correct preload and lug nuts must be tightened to manufacturer's specifications. Adjust camber, caster and toe-in using this sequence. Follow instructions of the alignment equipment manufacturer.

CAUTION: Do not attempt to correct alignment by straightening parts. Damaged parts must be replaced.

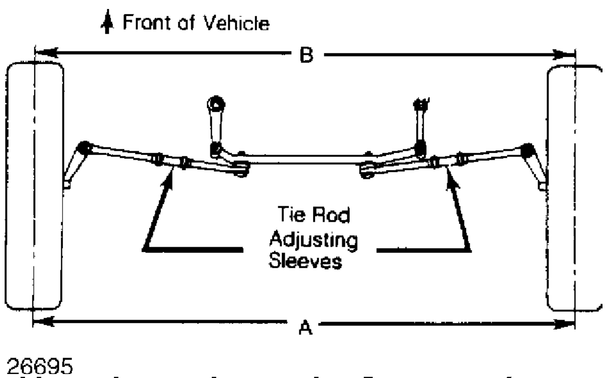


Fig. 2: Adjusting Tie Rod Sleeves (Top View)

CAMBER

1) Camber is the tilting of the wheel, outward at either top or bottom, as viewed from front of vehicle. SeeFig. 3.

2) When wheels tilts outward at the top (from centerline of vehicle), camber is positive. When wheels tilt inward at top, camber is negative. Amount of tilt is measured in degrees from vertical.

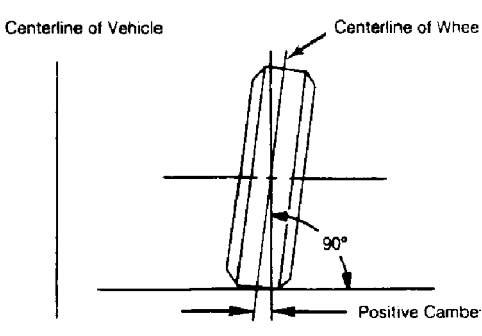
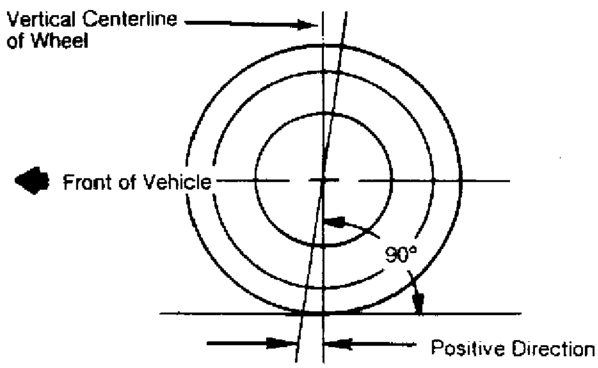


Fig. 3: Determining Camber Angle

CASTER

1) Caster is tilting of front steering axis either forward or backward from vertical, as viewed from side of vehicle. See Fig. 4.

2) When axis is tilted backward from vertical, caster is positive. This creates a trailing action on front wheels. When axis is tilted forward, caster is negative, causing a leading action on front wheels.



26697

Fig. 4: Determining Caster Angle

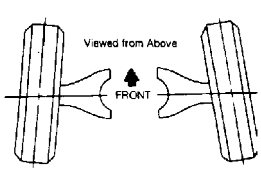
TOE-IN ADJUSTMENT

Toe-in is the width measured at the rear of the tires subtracted by the width measured at the front of the tires at about spindle height. A positive figure would indicate toe-in and a negative figure would indicate toe-out. If the distance between the front and rear of the tires is the same, toe measurement would be zero. To adjust:

1) Measure toe-in with front wheels in straight ahead position and steering wheel centered. To adjust toe-in, loosen clamps and turn adjusting sleeve or adjustable end on right and left tie rods. See Figs. 2 and 5.

2) Turn equally and in opposite directions to maintain steering wheel in centered position. Face of tie rod end must be parallel with machined surface of steering rod end to prevent binding.

3) When tightening clamps, make certain that clamp bolts are positioned so there will be no interference with other parts throughout the entire travel of linkage.



26698

Fig. 5: Wheel Toe-In (Dimension A Less Dimension B)

1) Toe-out on turns (turning radius) is a check for bent or damaged parts, and not a service adjustment. With caster, camber, and toe-in properly adjusted, check toe-out with weight of vehicle on wheels.

2) Use a full floating turntable under each wheel, repeating test with each wheel positioned for right and left turns. Incorrect toe-out generally indicates a bent steering arm. Replace arm, if necessary, and recheck wheel alignment.

STEERING AXIS INCLINATION

1) Steering axis inclination is a check for bent or damaged parts, and not a service adjustment. Vehicle must be level and camber should be properly adjusted. See Fig. 6.

2) If camber cannot be brought within limits and steering axis inclination is correct, steering knuckle is bent. If camber and steering axis inclination are both incorrect by approximately the same amount, the upper and lower control arms are bent.

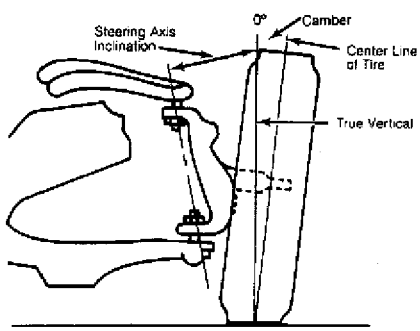


Fig. 6: Checking Steering Axis Inclination

END OF ARTICLE

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ARTICLE BEGINNING

1993 ACCESSORIES & EQUIPMENT
Honda Wiper/Washer Systems

Prelude

DESCRIPTION & OPERATION

A 2-speed wiper motor with intermittent feature is used on all models. Wiper switch is part of the combination switch on the steering column.

TROUBLE SHOOTING

Wipers Do Not Operate In Any Position
Blown fuse No. 17 (30-amp) in dash fuse block. Disconnected wiper linkage. Faulty wiper motor assembly. Faulty wiper switch. Poor ground. Inspect Green/Black wire for open circuit. Check for loose or disconnected terminals.

Wipers Do Not Operate In INT (Intermittent) Position
Faulty wiper switch. Faulty wiper motor assembly. Faulty intermittent wiper relay circuit. Inspect Green and Blue/White wires for open circuit. Check for loose or disconnected terminals.

Wipers Do Not Operate In LO Or HI Position
Faulty wiper switch. Faulty wiper motor assembly. Inspect Blue and Blue/Yellow wires for open circuit. Check for loose or disconnected terminals

Wipers Do Not Operate In MIST Position
Faulty mist switch.

Wipers Do Not Return To Park Position With Switch Turned Off
Faulty wiper motor assembly. Faulty wiper switch. Inspect Blue/White wire for open circuit. Check for loose or disconnected terminals.

Erratic Or No Intermittent Cycle
Faulty wiper switch. Faulty intermittent wiper relay circuit.

Little Or No Washer Fluid Is Pumped
Insufficient washer fluid in reservoir. Disconnected or blocked washer fluid hose. Clogged washer fluid nozzle. Faulty washer motor. Faulty washer switch. Poor ground. Inspect Black/Yellow wire for open circuit. Check for loose or disconnected terminals.

Wipers And Washer Do Not Work At Same Time

Faulty integrated control unit. Inspect Black/Yellow wire for open circuit. Check for loose or disconnected terminals.

TESTING

WIPER MOTOR TEST

1) Disconnect wiper motor 5-pin connector. Using jumper wires, connect positive battery terminal to Green/Black wire terminal and negative battery terminal to Blue wire terminal at wiper motor connector. Ensure wiper motor operates on low speed.

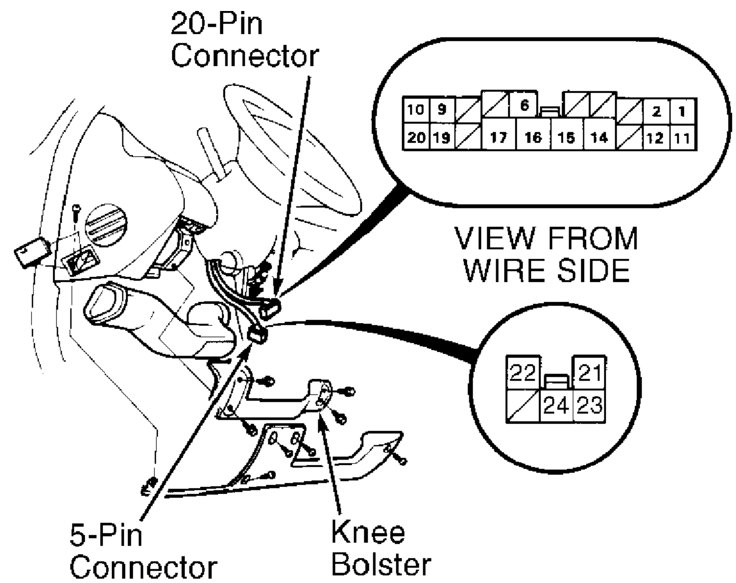
2) Using jumper wires, connect positive battery terminal to Green/Black wire terminal and negative battery terminal to Blue/Yellow wire terminal at wiper motor connector. Wiper motor should operate on high speed. Replace wiper motor if it fails to operate.

WASHER MOTOR TEST

Remove front bumper. Disconnect washer motor 2-pin connector. Connect battery voltage across washer motor terminals. Washer motor should operate smoothly. If motor runs smoothly but little or no washer fluid is pumped, check for disconnected or blocked washer fluid hose or a clogged pump outlet in motor.

WIPER/WASHER SWITCH TEST

Remove instrument cluster lower trim panel. Disconnect steering column 10-pin connector. Check continuity between specified switch connector terminals with wiper/washer switch in indicated positions. See Fig. 1. If continuity is not as specified, replace wiper/washer switch.



Position \ Terminal	14	15	16	17	21	22	24
OFF					O	—	O
INT		O	—	O	O	—	O
LO	O	—	—	—	O		
HI	O	—	—	—	—	O	
Mist switch "ON"	O	—	—	—	—	O	
Washer switch "ON"		O	O				

93D00375

Fig. 1: Testing Wiper/Washer Switch
Courtesy of American Honda Motor Co., Inc.

INTERMITTENT WIPER RELAY TEST

Remove intermittent wiper relay. Relay is located on right rear corner of engine compartment, next to fuse/relay block. With battery voltage applied across terminals "D" and "E", continuity should exist between terminals "A" and "C". See Fig. 2. With battery disconnected, continuity should exist between terminals "B" and "C". If continuity does not exist as indicated, replace relay.

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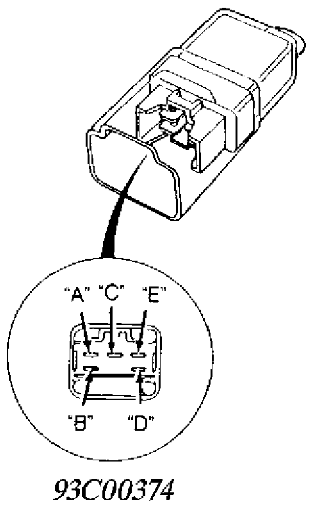

Fig. 2: Intermittent Wiper Relay Terminal ID
Courtesy of American Honda Motor Co., Inc.

REMOVAL & INSTALLATION

WIPER MOTOR

Removal & Installation

1) Open hood. Remove cap nuts from wiper arms. Carefully remove wiper arms. Remove hood seal and air scoop by prying off trim clips and removing screws.

2) Disconnect wiper motor 5-pin connector. Remove 3 bolts, nut and wiper linkage assembly. Remove wiper motor assembly. To install, reverse removal procedure.

WIPER/WASHER SWITCH

CAUTION: Air bag system MUST be disabled BEFORE removing any steering column component. See DISABLING & ACTIVATING AIR BAG SYSTEM in AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

Removal & Installation

Disable air bag system. Disconnect negative battery cable. Remove dash lower trim cover and knee bolster. Remove steering column covers. Disconnect wiper/washer switch 8-pin connector. Remove 2 screws and wiper/washer switch. To install, reverse removal procedure.

WASHER FLUID RESERVOIR & NOZZLE

Removal & Installation

Remove reservoir filler neck and inner fender. Remove 3 bolts and washer fluid reservoir. Disconnect hose and 2-pin connector from washer motor. Remove deflector, washer nozzles and washer fluid hoses as necessary. To install, reverse removal procedure.

WIRING DIAGRAMS

NOTE: For circuit information, see appropriate wiring diagram in the **WIRING DIAGRAMS** section.

END OF ARTICLE

WIRING DIAGRAM SYMBOLS
Article Text

1993 Honda Prelude
For Cadi Centre Nsk CA 95051
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Sunday, July 08, 2001 11:41AM

ARTICLE BEGINNING

WIRING DIAGRAMS
How To Use The Wiring Diagrams

WIRING DIAGRAMS

INTRODUCTION

The wiring diagrams and technical service bulletins, containing wiring diagram changes, are obtained from the domestic and import manufacturers. These are checked for accuracy and are all redrawn into a consistent format for easy use.

All diagrams are arranged with the front of the vehicle at the left side of the first page and the rear of the vehicle at the right side of the last page. Accessories are shown near the end of the diagram.

Components are shown in their approximate location on the vehicle. Due to the constantly increasing number of components on vehicles today, it is impossible to show exact locations.

In the past, when cars were simpler, diagrams were simpler. All components were connected by wires, and diagrams seldom exceeded 4 pages in length. Today some wiring diagrams require more than 16 pages. It would be impractical to expect a service technician to trace a wire from page 1 across every page to page 16.

Removing some of the wiring maze reduces eyestrain and time wasted searching across several pages. Today, the majority of diagrams now follow a much improved format, which permits space for internal switch details and connector shapes.

Any wires that don't connect directly to their components are identified on the diagram to indicate where they go. There is a legend on the first page of each diagram, detailing component location. It refers you to sub-systems, using grid NUMBERS at the top and bottom of the page and grid LETTERS on each side. This grid system works in a manner similar to that of a road map.

HOW TO USE THE WIRING DIAGRAMS

1) On the first page of the diagram, you will find a listing of major electrical components or systems. Locate the specific component or system you wish to trace. A grid number and letter will follow the component's name.

2) Use the grid NUMBERS (arranged horizontally across the top and bottom of each page) to find the page of the wiring diagram that contains the component you're seeking. When you reach this page, use the grid LETTERS on the side of the page to determine the component's vertical location.

3) Locate the circuit you need to service. The internals are shown for switches and relays to assist you in understanding how the circuit operates.

NOTE: In some of the newer wiring diagram articles in this product, there is a Legend for the wiring diagrams that has been created to make locating components easier. For these articles, there will be a COMPONENT LOCATION MENU title in the article main menu. These articles will also have the original legend available on the first graphic.

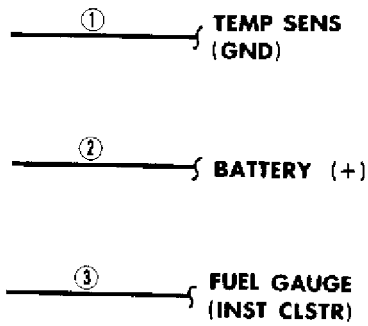

Fig. 1: Identifying Tie-Off Symbols

4) If the wires are not drawn all the way to another component (across several pages), a reference will tell you their final destination.

5) Again, use the legend on the first page of the wiring diagram to determine the grid number and letter of the referenced component. You can then turn directly to it without tracing wires across several pages.

6) The symbols shown in Fig. 1 are called tie-offs. The first tie-off shown indicates that the circuit goes to the temperature sensor, and is also a ground circuit.

7) The second symbol indicates that the circuit goes to a battery positive parallel circuit. The third symbol leads to a particular component and the location is also given.

8) The lines shown in Fig. 2 are called options. Which path or option to take depends on what engine or systems the vehicle has.

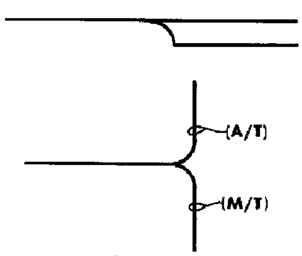

Fig. 2: Identifying Option Symbols

COLOR ABBREVIATIONS

Color	Normal	Optional
Black	BLK	BK
Blue	BLU	BU
Brown	BRN	BN
Clear	CLR	CR
Dark Blue	DK BLU	DK BU
Dark Green	DK GRN	DK GN
Green	GRN	GN
Gray	GRY	GY
Light Blue	LT BLU	LT BU
Light Green	LT GRN	LT GN
Orange	ORG	OG
Pink	PNK	PK
Purple	PPL	PL
Red	RED	RD
Tan	TAN	TN
Voilet	VIO	VI
White	WHT	WT
Yellow	YEL	YL

WIRING DIAGRAM SYMBOL IDENTIFICATION

NOTE: Standard wiring symbols are used on diagrams. The list below will help clarify any symbols that are not easily understood at a glance. Most components are labeled "Motor", "Switch" or "Relay" in addition to being drawn with the standard symbol.

WIRING DIAGRAM SYMBOLS

Views of the symbols used in the WIRING DIAGRAM articles are in the following graphics. See Figs. 3 through 25.

Fig. 3: Circuit Breaker

Fig. 4: Coil (Internal)

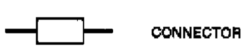

Fig. 5: Connector

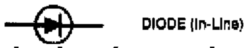

Fig. 6: Diode (In-Line)

Fig. 7: Diode (Internal)

Fig. 8: Diode (Light Emitting)

Fig. 9: Defogger Grid

Fig. 10: Fuse

Fig. 11: Fusible Link

Fig. 12: Ground

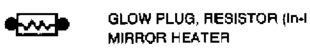

Fig. 13: Glow Plug Resistor (In-Line) or Mirror Heater

Fig. 14: Injector (Diesel) or Photocell (Gasoline)

Fig. 15: Internal Fuse, Thermal Limiter

Fig. 16: Lamp (Dual Element)

Fig. 17: Lamp (Single Element)

Fig. 18: Motor

Fig. 19: Resistor (Internal)

Fig. 20: Sensor, Thermistor

Fig. 21: Solenoid

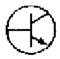

Fig. 22: Solid State Device, Transistor

Fig. 23: Switch (Internal)

Fig. 24: Two Pin Switch

Fig. 25: Variable Resistor or Potentiometer

END OF ARTICLE

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ARTICLE BEGINNING

1993 WIRING DIAGRAMS
Honda Wiring Diagrams

Honda; Prelude

IDENTIFICATION

COMPONENT LOCATION MENU

COMPONENT LOCATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Figure No. (Location)
ABS CONTROL UNIT (W/2WS)	9 (A-B 32)
ABS CONTROL UNIT (W/4WS)	10 (A-C 36)
ABS MOTOR	2 (A 7)
ALTERNATOR	1 (C 3)
ANTENNA MOTOR	16 (A 60)
AUTOMATIC TRANSMISSION CONTROL UNIT	8 (A-C 28)
BACK-UP LIGHT SWITCH (MANUAL TRANSMISSION)	16 (B 61)
BATTERY	1 (A 2)
BLOWER MOTOR	12 (A 47)
BRAKE FLUID LEVEL SWITCH	15 (D 58)
BRAKE SWITCH	10 (D 38)
CHIME	7 (E 24)
CIGARETTE LIGHTER & RELAY	15 (B 59)
CLUTCH INTERLOCK SWITCH (MANUAL TRANSMISSION)	1 (C 3)
COMBINATION SWITCH	13 (A-C 48)
COMPRESSOR CLUTCH RELAY	12 (E 47)
CONDENSER FAN RELAY	12 (B 47)
CRUISE CONTROL SYSTEM	10 (D-E 36-39)
DASH FUSE BLOCK (DASH F/B)	5,6 (A-E 17-22)
DASHLIGHT BRIGHTNESS CONTROLLER	13 (E 51)
DATA LINK CONN	4 (A 15)
DISTRIBUTOR ASSEMBLY	4 (D-E 15)
DOME LIGHT	13 (B 51)
DUAL PRESSURE SWITCH	12 (B 45)
EGR CONTROL SOLENOID	4 (C 15)
EGR VALVE LIFT SENSOR	3 (A 9)
ENGINE CONTROL MODULE (ECM)	3 (A-E 8)
FAIL SAFE RELAY (W/ 2WS)	9 (B 35)
FAIL SAFE RELAY (W/ 4WS)	10 (B 39)
FAN TIMER UNIT	12 (C 47)
FOG LIGHT RELAY	1 (D 3)
FOG LIGHT SWITCH	13 (D 48)

VEHICLE SPEED SENSOR	3 (A 8)
VTEC PRESSURE SWITCH	3 (D 8)
WASHER MOTOR	11 (E 40)
WIPER/WASHER SWITCH	11 (C-D 43)
4WS CONTROL UNIT	11 (A-C 40)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

GROUND LOCATION MENU

GROUND LOCATIONS TABLE

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Component	Figure No. (Location)
GROUND A: (RIGHT FRONT OF ENGINE COMPARTMENT)	1 (A 2)
GROUND B: (ON TRANSMISSION CASE)	1 (B 2)
GROUND C: (LEFT SIDE OF ENGINE COMPARTMENT)	1 (B 2)
GROUND D: (ENGINE MOUNT BRACKET)	1 (C 2)
GROUND E: (VALVE COVER)	1 (C 2)
GROUND F: (RIGHT FRONT CORNER OF ENGINE COMPARTMENT)	1 (D 3)
GROUND G: (LEFT FRONT CORNER OF ENGINE COMPARTMENT)	1 (E 3)
GROUND H: (BELOW CENTER OF DASH)	2 (A 7)
GROUND I: (RIGHT SIDE OF ENGINE)	4 (E 13)
GROUND J: (RIGHT REAR CORNER OF CEILING)	6 (B 23)
GROUND K: (BEHIND FRONT CONSOLE)	8 (E 30)
GROUND L: (BEHIND RIGHT SIDE OF DASH)	8 (E 31)
GROUND M: (BELOW CENTER OF DASH)	9 (E 32)
GROUND N: (RIGHT KICK PANEL)	11 (C 41)
GROUND O: (BEHIND LEFT REAR SEAT)	11 (C 41)
GROUND P: (RIGHT QUARTER PANEL AREA)	11 (C 41)
GROUND Q: (BEHIND LEFT REAR SEAT)	11 (C 41)
GROUND R: (CENTER OF REAR STEERING ACTUATOR)	11 (D 41)
GROUND S: (BEHIND LEFT SIDE OF FRONT CONSOLE)	12 (A 45)
GROUND T: (LEFT FRONT OF ENGINE COMPARTMENT)	12 (B 47)
GROUND U: (LEFT SIDE OF FLOOR)	13 (A 49)
GROUND V: (LEFT QUARTER PANEL AREA)	13 (B 49)
GROUND W: (CENTER REAR OF TRUNK)	16 (C 62)

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

WIRING DIAGRAMS

COMPONENT LOCATOR:

A/T CONTROL UNIT	A–C 28
ABS CONTROL UNIT (W/ 2WS)	A–B 32
ABS CONTROL UNIT (W/ 4WS)	A–C 38
ABS MOTOR	A 7
ALTERNATOR	C 3
ANTENNA MOTOR	A 60
BACK–UP LT SW (M/T)	B 61
BATTERY	A 2
BLOWER MOTOR	A 47
BRAKE FLUID LEVEL SW	D 58
BRAKE SW	D 38
CHIME	E 24
CIG LIGHTER & RELAY	B 59
CLUTCH INTERLOCK SW (M/T)	C 3
COMBINATION SW	A–C 48
COMP CLUTCH RELAY	E 47
CONDENSER FAN RELAY	B 47
CRUISE CONTROL SYSTEM	D–E 36–39
DASH FUSE BLOCK (DASH F/B)	A–E 17–22
DASHLIGHT BRIGHTNESS CONTROLLER	E 51
DATA LINK CONN	A 15
DISTRIBUTOR ASSEMBLY	D–E 15
DOME LT	B 51
DUAL PRES SW	B 45
EGR CONTROL SOLENOID	C 15
EGR VALVE LIFT SENSOR	A 9
ENGINE CONTROL MODULE (ECM)	A–E 8
FAIL SAFE RELAY (W/ 2WS)	B 35
FAIL SAFE RELAY (W/ 4WS)	B 39
FAN TIMER UNIT	C 47
FOG LT RELAY	D 3
FOG LT SW	D 48
FRONT MAIN STEERING ANGLE SENSOR	A 43
FUEL PUMP	E 11
FUEL TANK UNIT	C 55
FUNCTION CONTROL MOTOR	D 47
GEAR SELECT SW (A/T)	A–C 31
GROUND A	A 2
GROUND B	B 2
GROUND C	B 2
GROUND D	C 2
GROUND E	C 2
GROUND F	D 3
GROUND G	E 3
GROUND H	A 7
GROUND I	E 13
GROUND J	B 23
GROUND K	E 20
GROUND L	E 31
GROUND M	E 32
GROUND N	C 41
GROUND O	C 41
GROUND P	C 41
GROUND Q	C 41
GROUND R	D 41
GROUND S	A 45
GROUND T	B 47
GROUND U	A 49
GROUND V	B 49
GROUND W	C 62
HAZARD SW	C 48
HEATER CONTROL PANEL	A–E 44
HORN RELAY	E 35
IGNITION COIL	E 15
IGNITION KEY LT	E 27
IGNITION KEY SW	E 27
IGNITION SW	D–E 23
INTEGRATED CONTROL UNIT	A–C 24–27
INTERMITTENT WIPER RELAY	E 43
JUNCTION CONN C131	D 11
JUNCTION CONN C326	D–E 40
JUNCTION CONN C419	C–E 31
JUNCTION CONN C447	C 59
JUNCTION CONN C460	E 39
JUNCTION CONN C507 (W/ 2WS)	C 35
JUNCTION CONN C507 (W/ 4WS)	C 39
JUNCTION CONN C534	A 51
JUNCTION CONN C609	D–E 48
JUNCTION CONN C619	C 51
KEY INTERLOCK SW	E 28
LEFT BRAKE LT SENSOR	E 63
LEFT SEAT BELT SW	E 27
MAIN INSTRUMENT CLUSTER	A–B 52
PGM–FI MAIN RELAY	E 11
POWER DOOR LOCKS	D–E 56–59
POWER MIRROR SW	D 60
POWER WINDOWS	A–C 56–59
RADIATOR FAN MOTOR	E 7
REAR MAIN STEERING ANGLE SENSOR	A 43
RECIRC CONTROL MOTOR	E 47
RIGHT BRAKE LT SENSOR	A 63
SERVICE CHECK CONN	A 15
SRS CONTROL UNIT	D 32
SRS FUSE BLOCK	D 22
STARTER	A 3
STARTER CUT RELAY (M/T)	B 3
STEERING WHEEL	D–E 35
SUB INSTRUMENT CLUSTER	C–E 52
SUNROOF SW	D 51
TEMP SW	C 47
THROTTLE ANGLE SENSOR	A 10
TRUNK LATCH SW	B 51
UNDERHOOD FUSE BLOCK (U/H F/B)	B–D 4–7
VEHICLE SPEED SENSOR	A 8
VTEC PRES SW	D 8
WASHER MOTOR	E 40
WIPER/WASHER SW	C–D 43
4WS CONTROL UNIT	A–C 40

WIRING DIAC

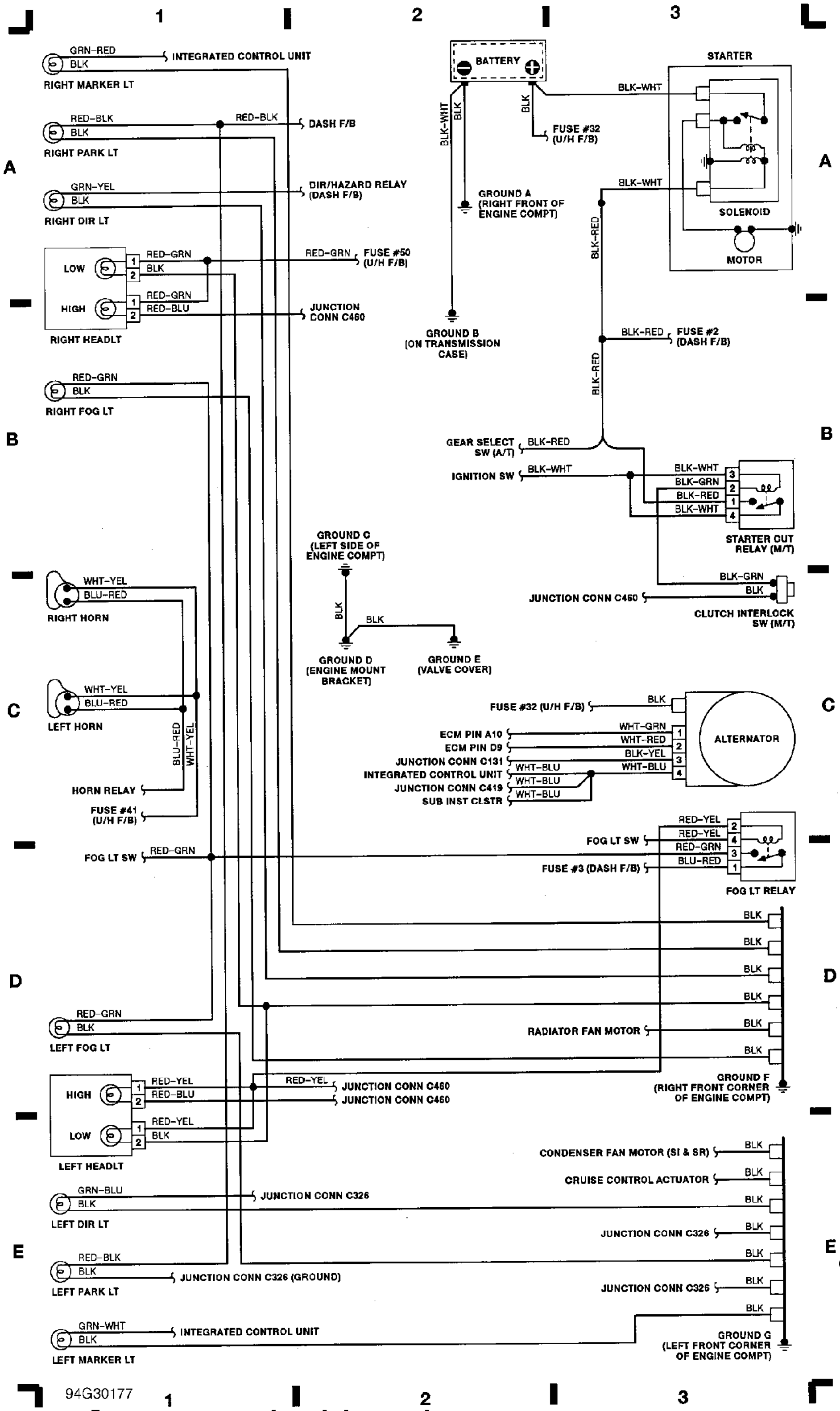

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Fig. 1: Battery, Starter, Alternator (Grid 1-3)

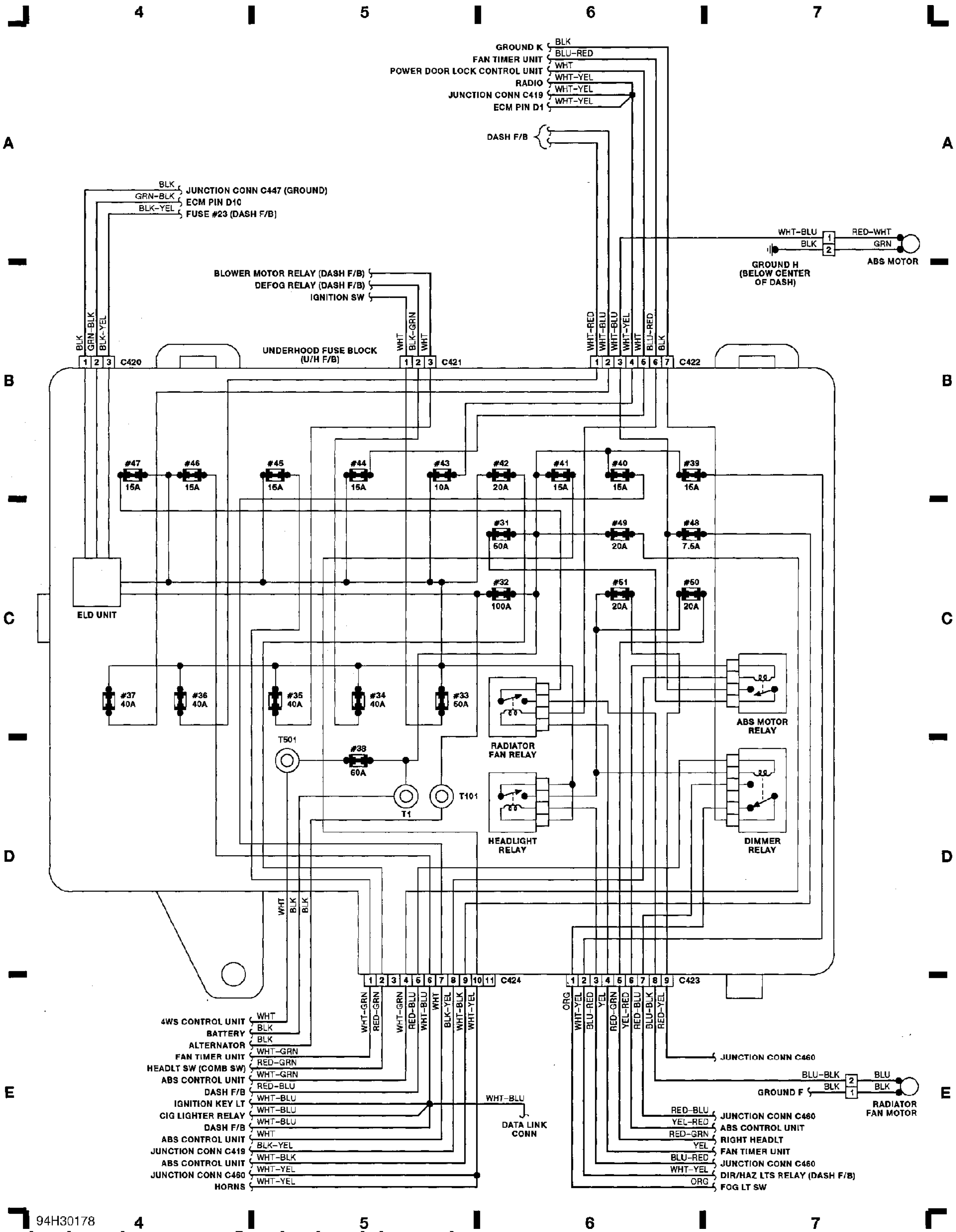

Fig. 2: Underhood Fuse Block (Grid 4-7)

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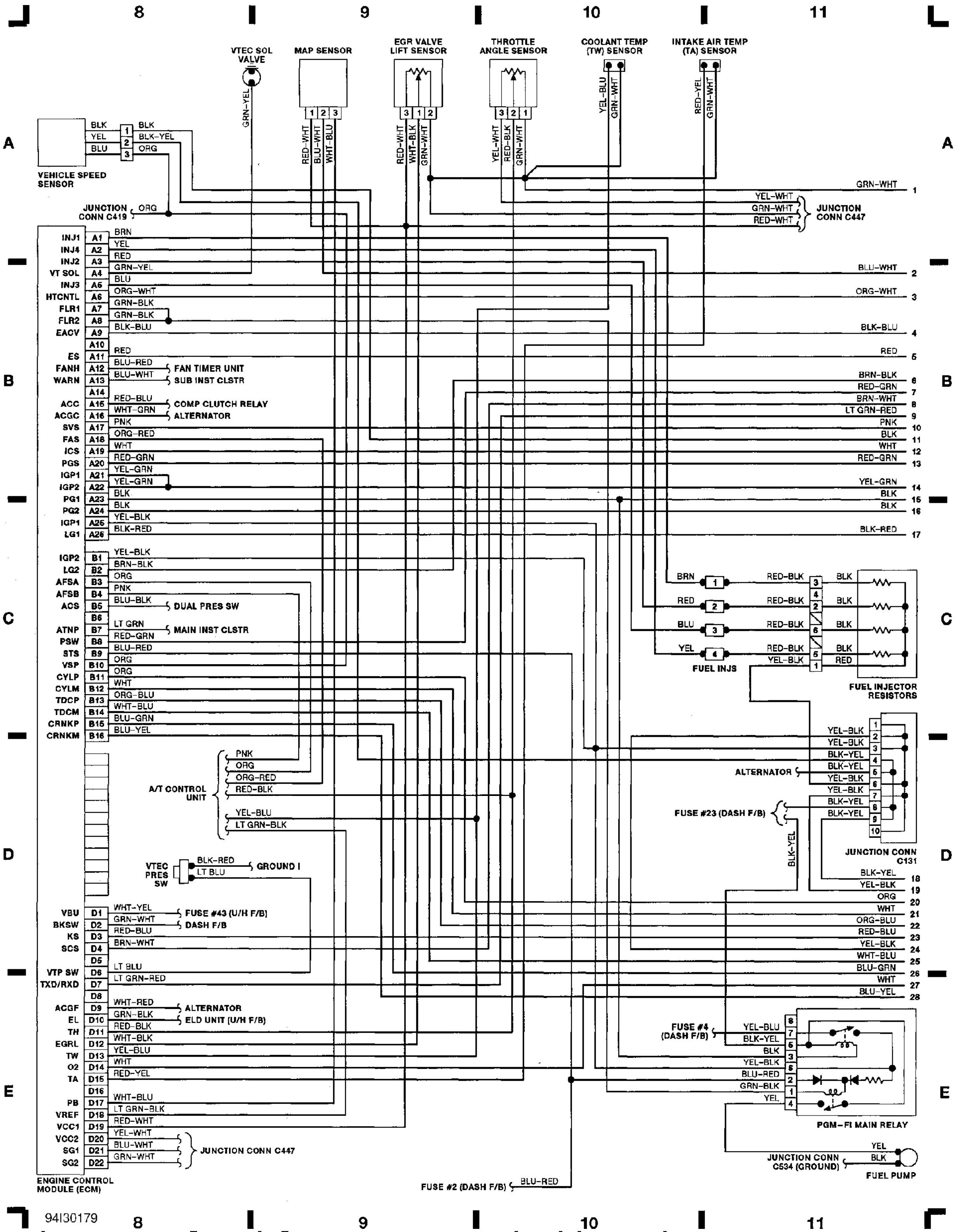

Fig. 3: Engine Control Module, Map Sensor (Grid 8-11)

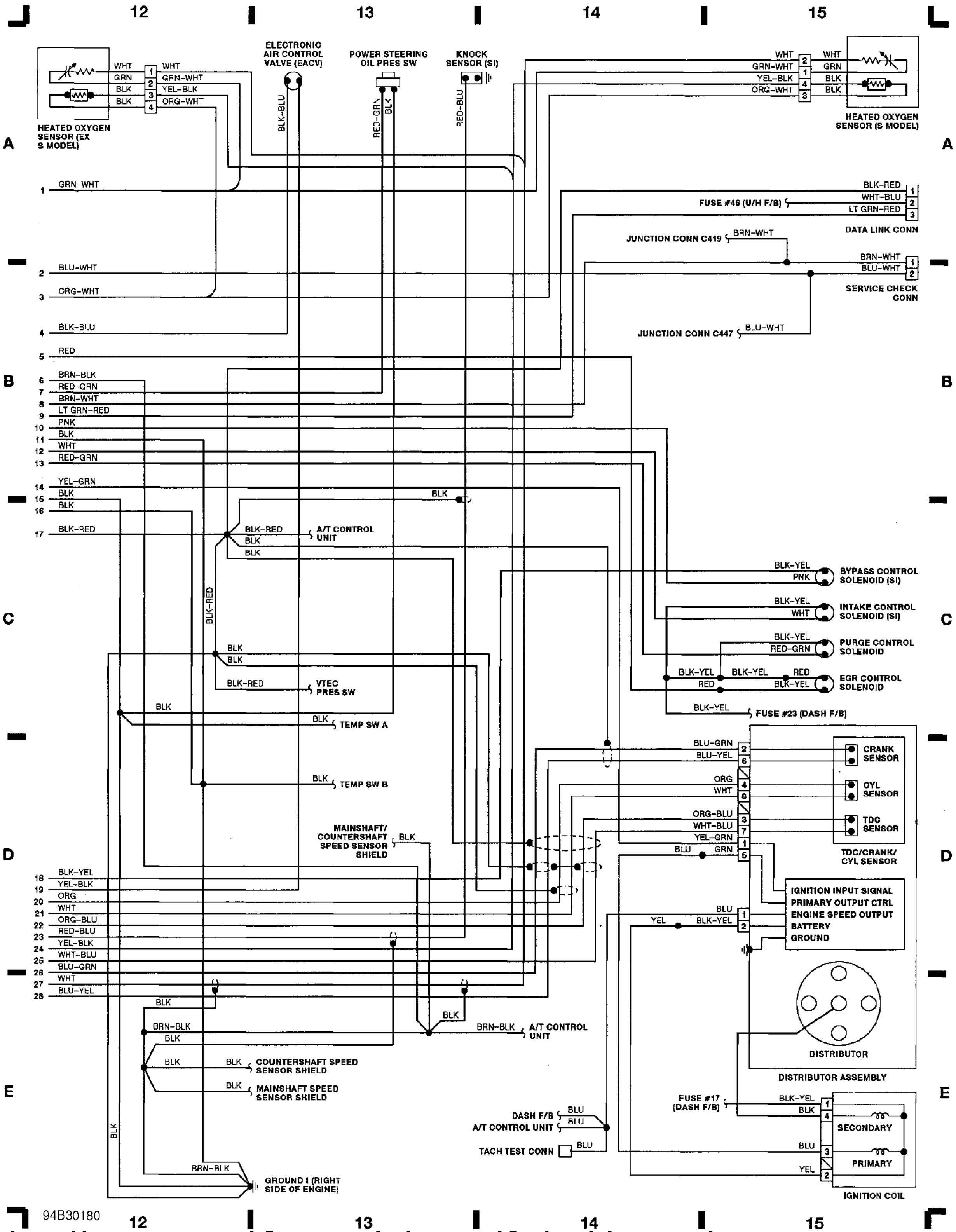

Fig. 4: Distributor Assembly, Ignition Coil (Grid 12-15)

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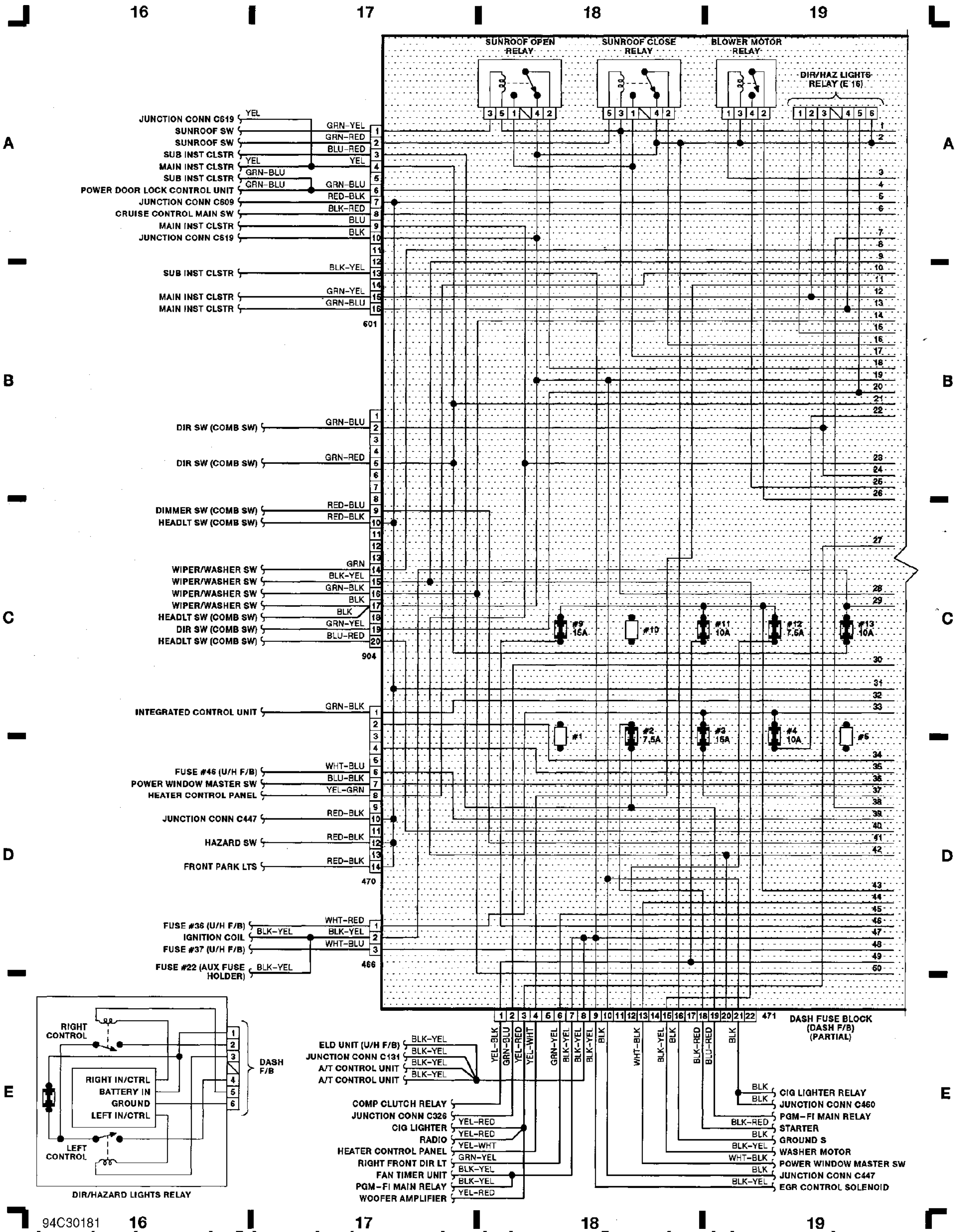

Fig. 5: Dash F/B (Partial), Dir/Hazard Lights Relay (Grid 16-19)

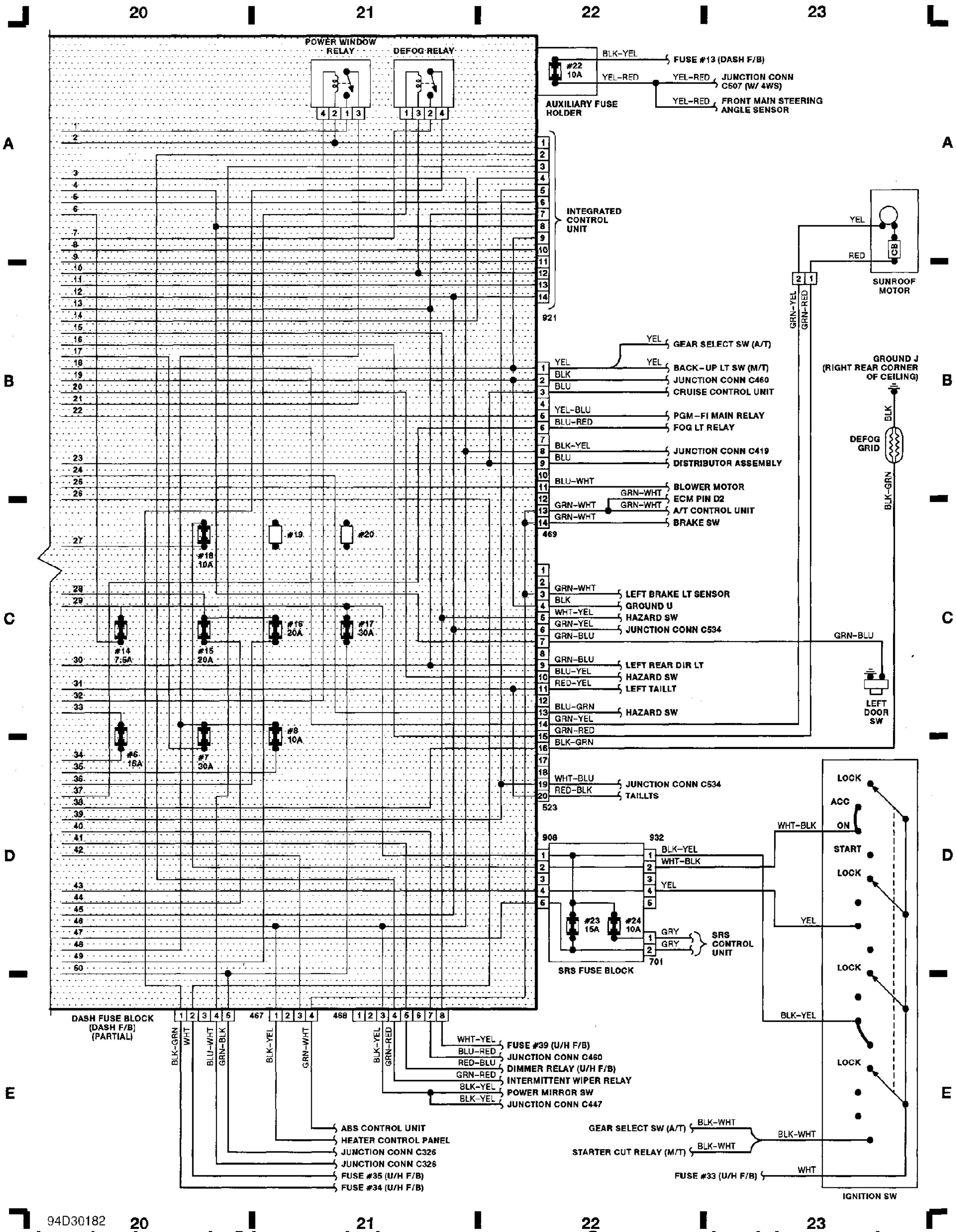

Fig. 6: Dash F/B (Partial), Ignition SW, Sunroof Motor (Grid 20-23)

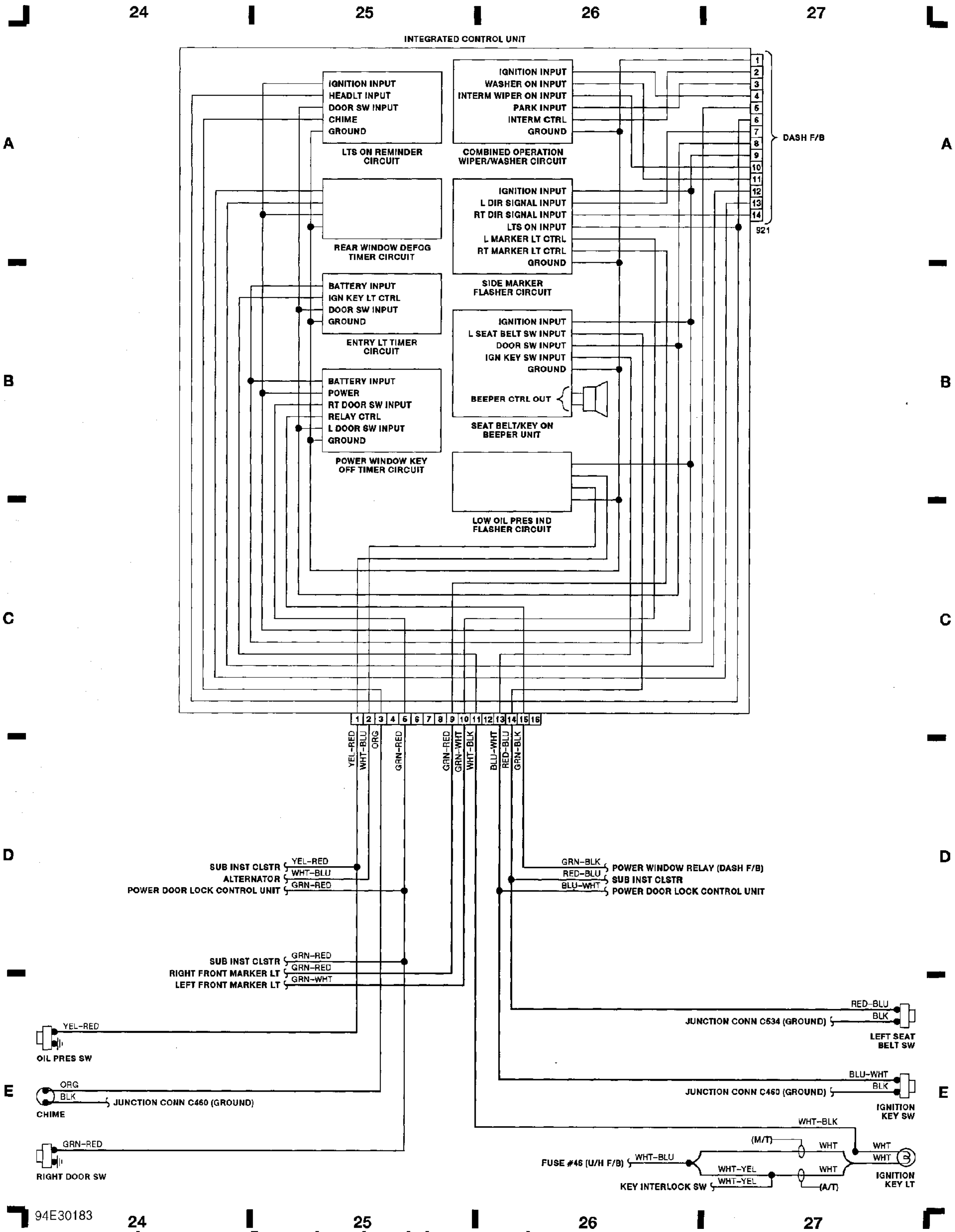

Fig. 7: Integrated Control Unit (Grid 24-27)

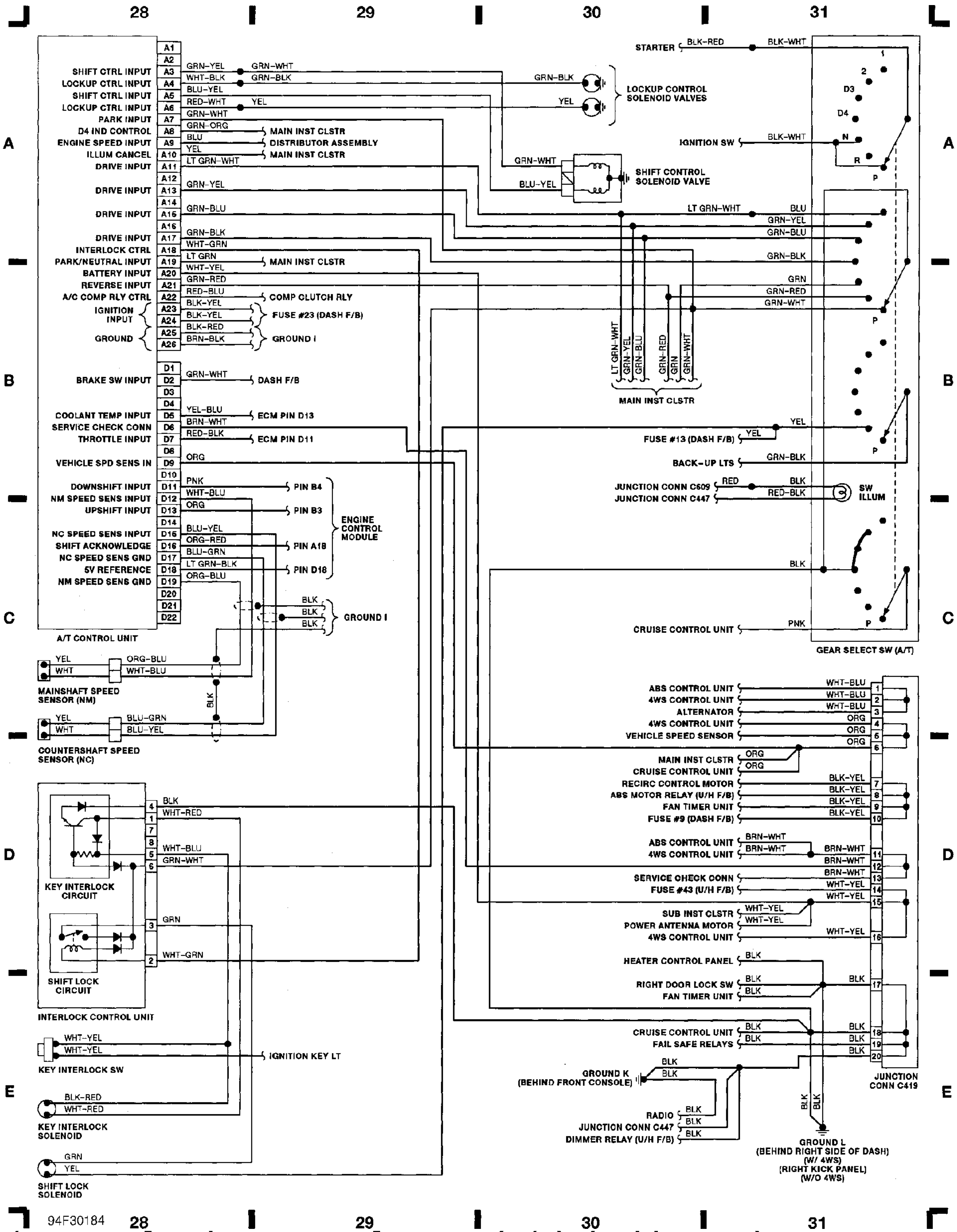

Fig. 8: A/T Control Unit, Gear Select SW (A/T) (Grid 28-31)

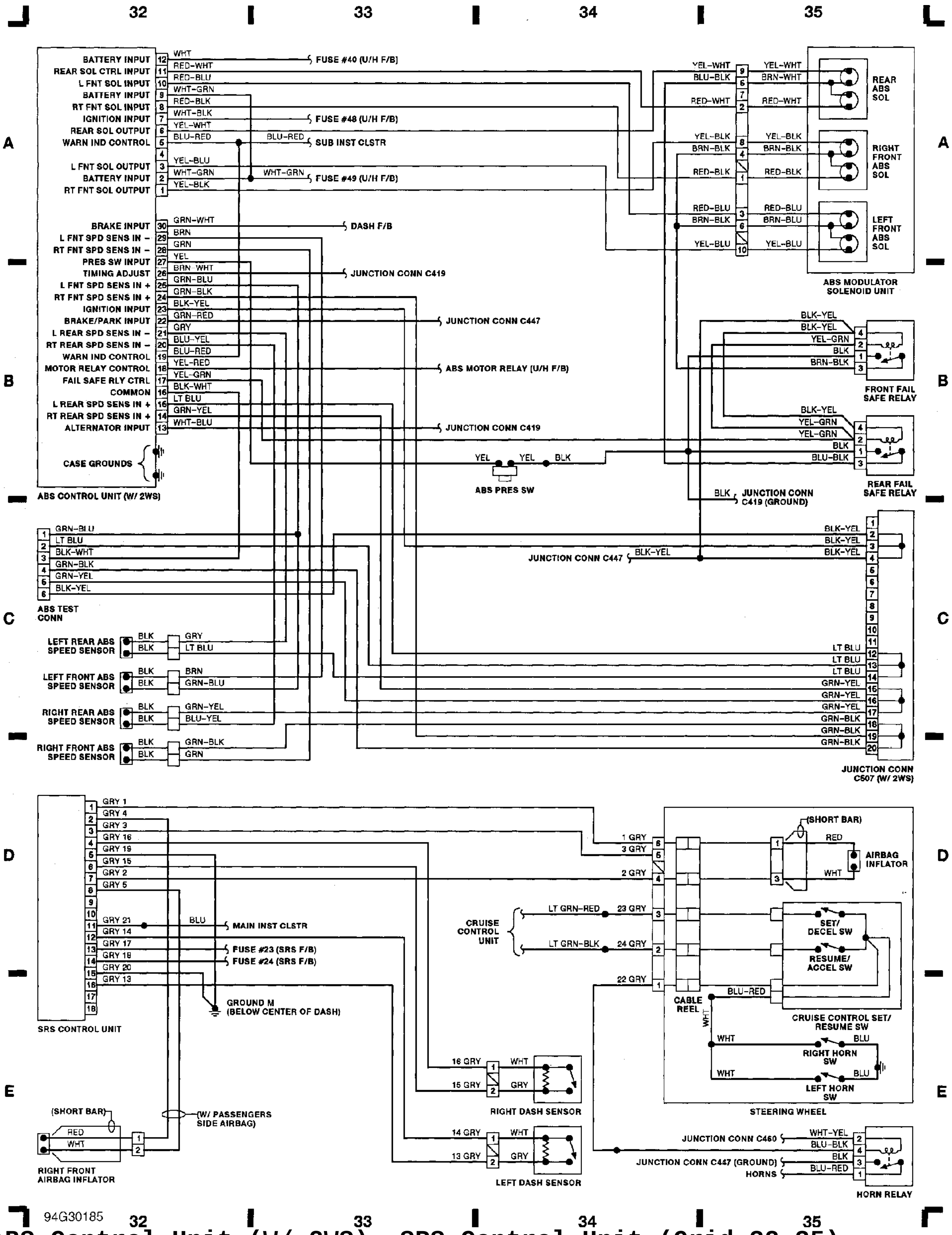

Fig. 9: ABS Control Unit (W/ 2WS), SRS Control Unit (Grid 32-35)

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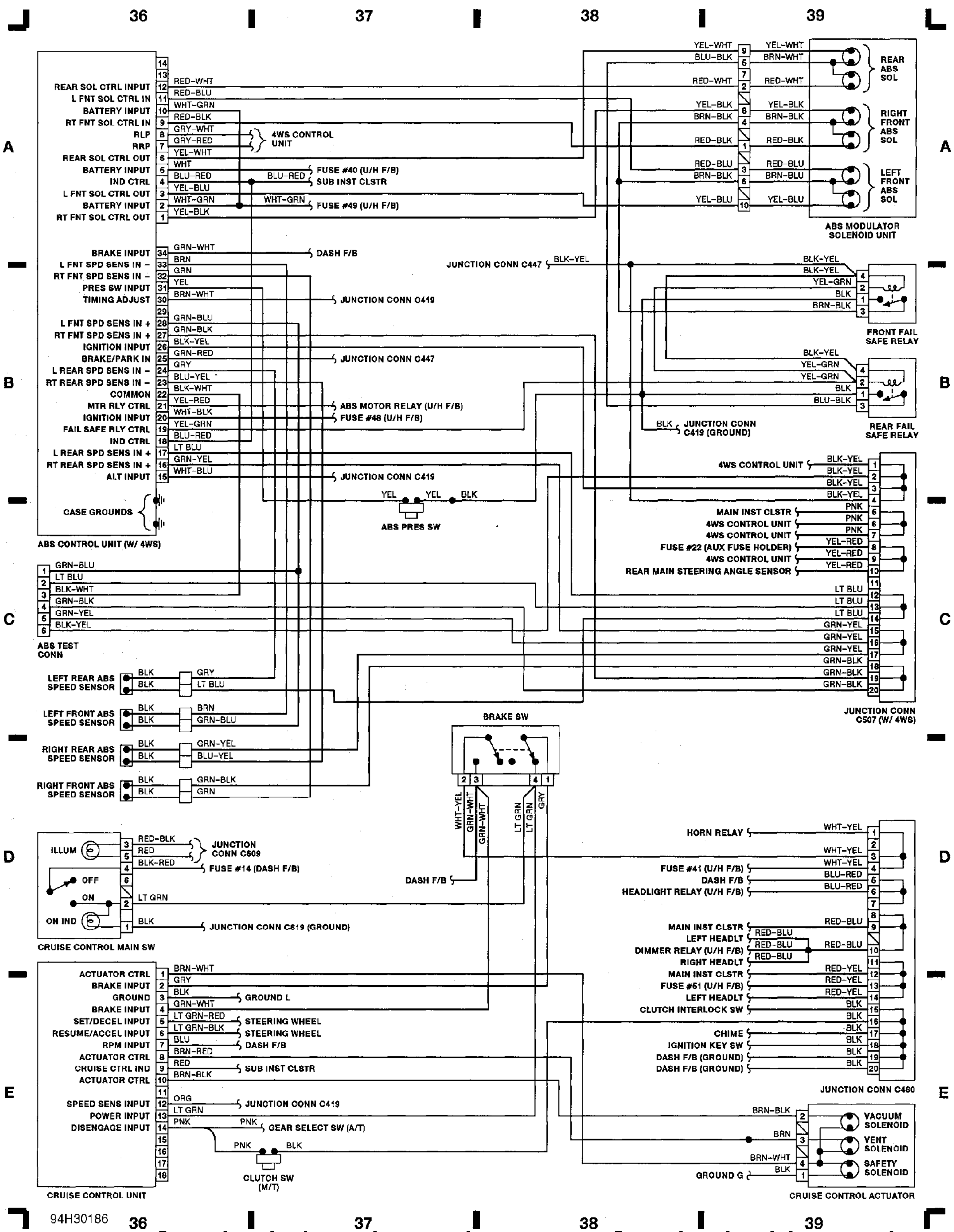

Fig. 10: ABS Control Unit (W/ 4WS), Cruise Control Unit (Grid 36-39)

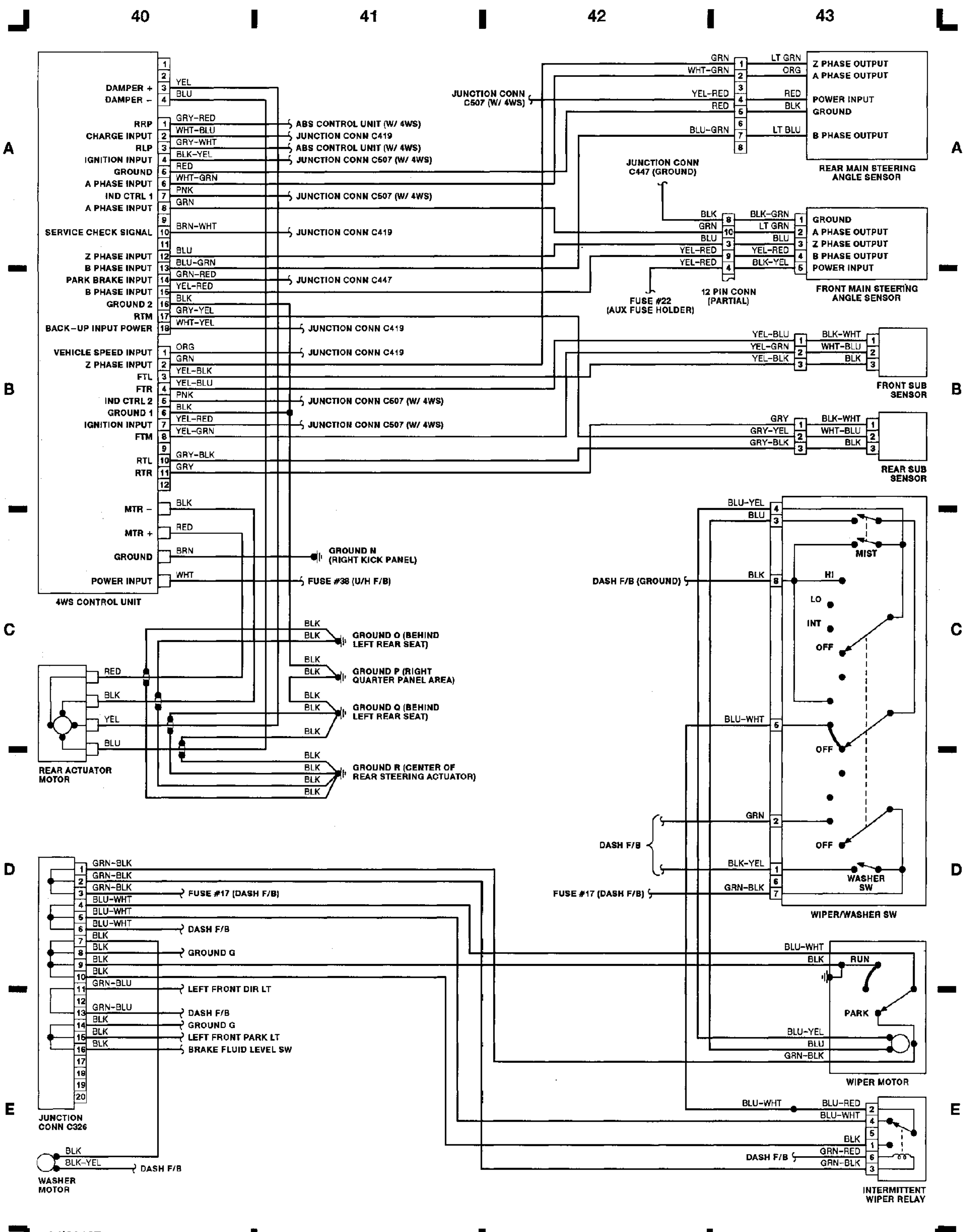

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Fig. 11: 4WS Control Unit, Wiper/Washer Motor (Grid 40-43)

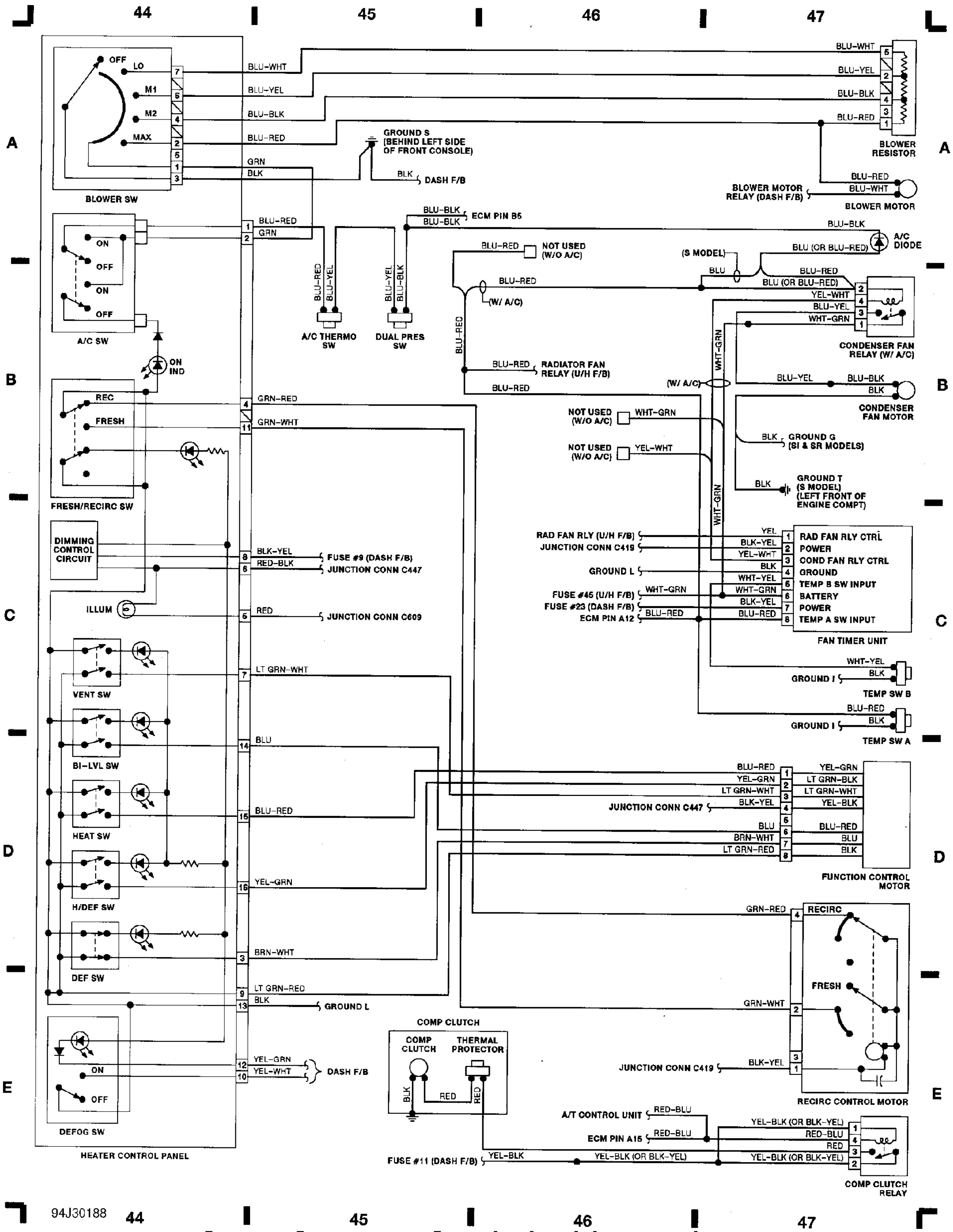

Fig. 12: Heater Control Panel, Comp Clutch (Grid 44-47)

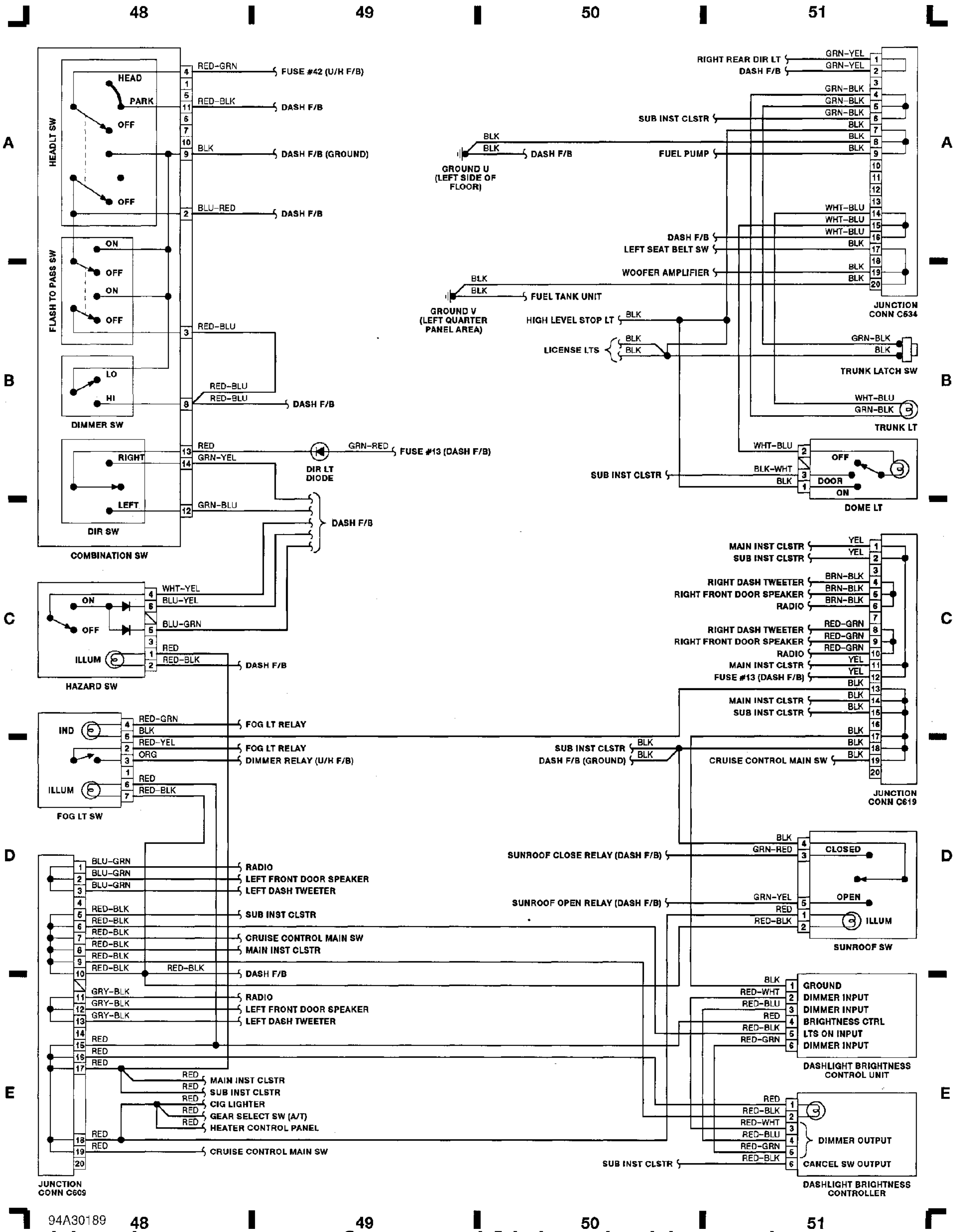

Fig. 13: Combination Sw, Sunroof Sw, Dashlights (Grid 48-51)

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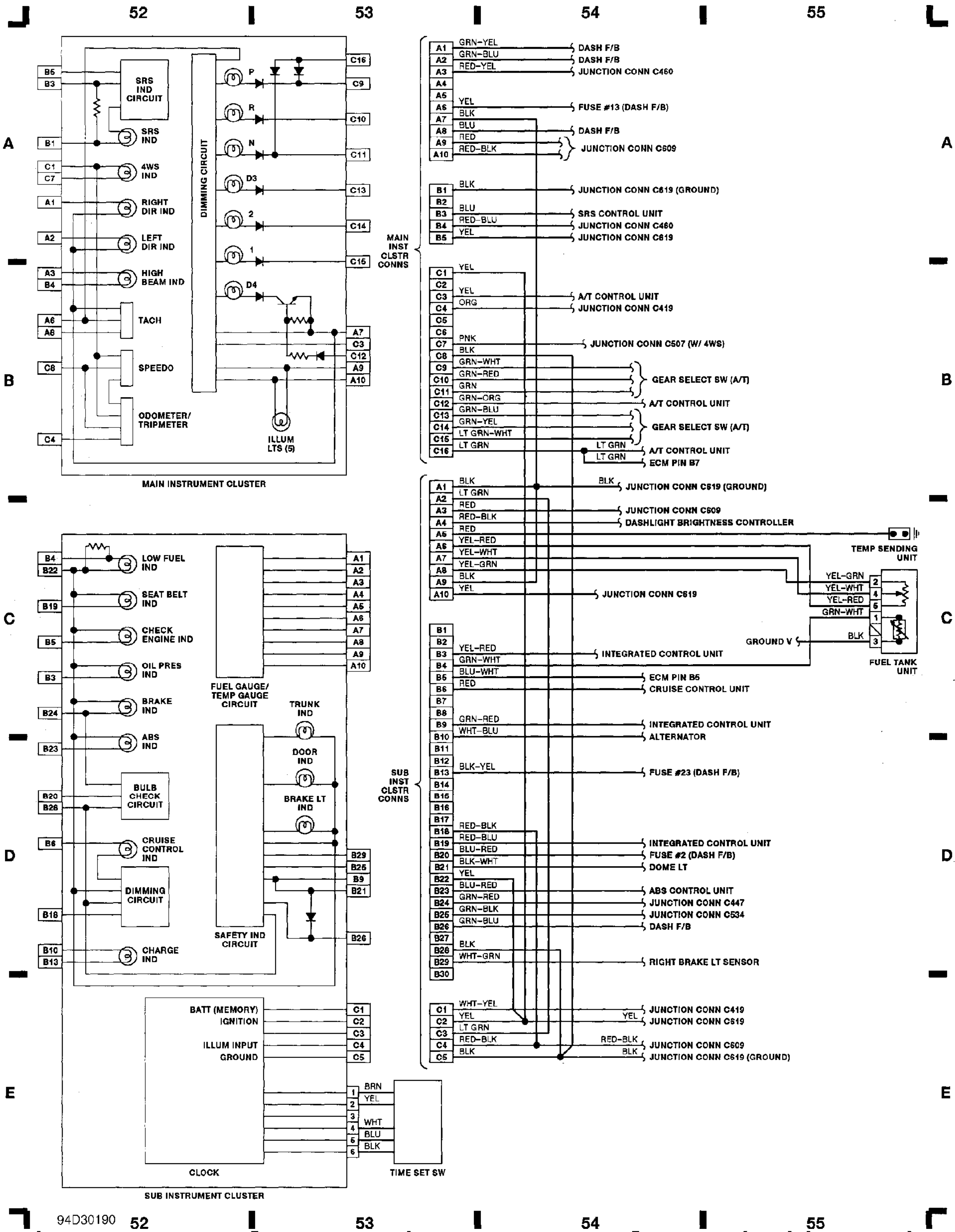

Fig. 14: Sub Instrument Cluster, Main Instrument Cluster (Grid 52-55)

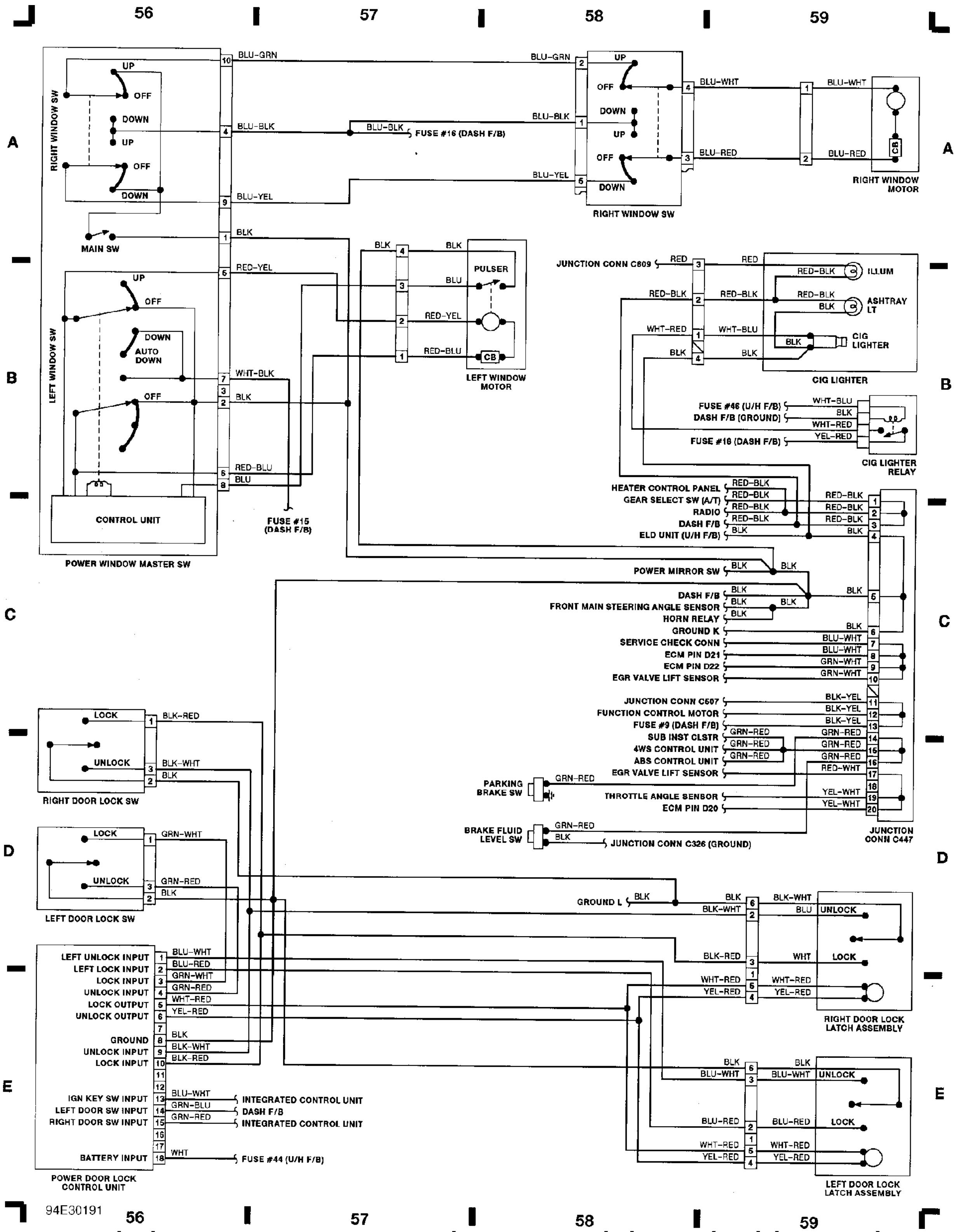

Fig. 15: Power Windows, Power Doors, Cigarette Lighter (Grid 56-59)

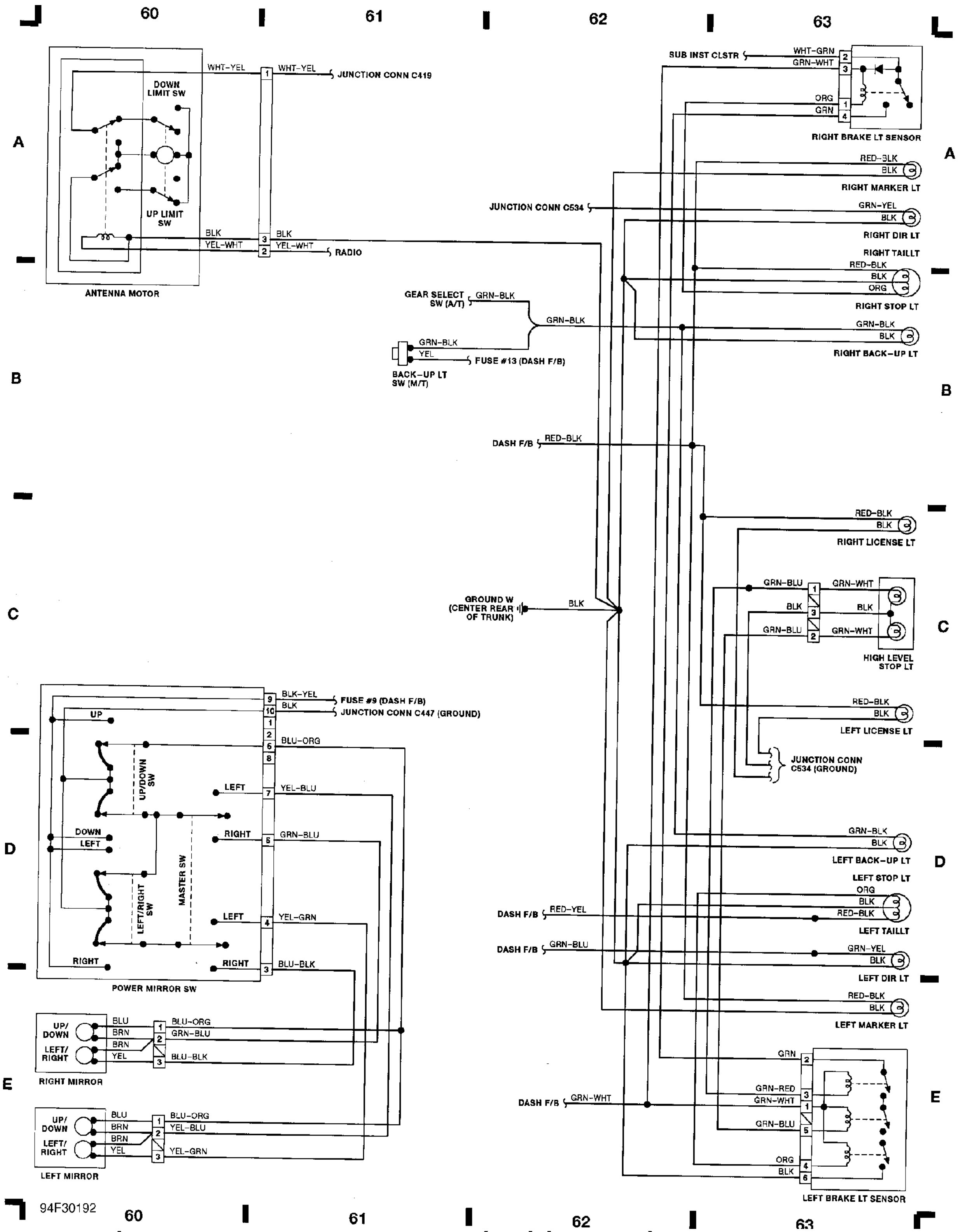

Fig. 16: Power Mirror SW, Antenna Motor (Grid 60-63)

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