

..... CARLINE

1994

SERVICE MANUAL



CAMARO



FIREBIRD

BOOK 1 of 2

Includes all except Driveability and
Emissions (6E) Electrical Diagnosis (8A)

GMP/94F-1

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SCHEDULED MAINTENANCE SERVICES

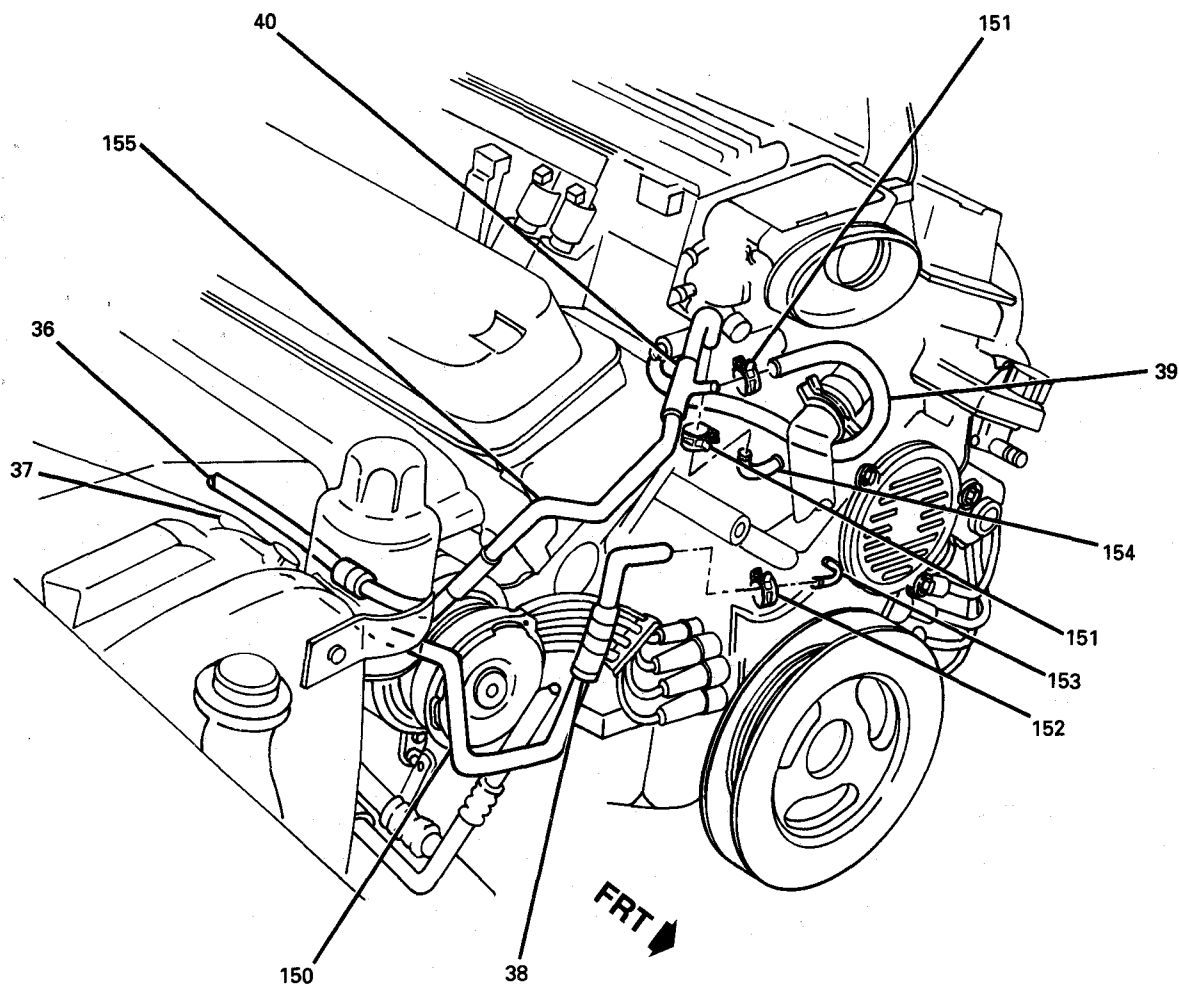
SCHEDULE II

Follow schedule II ONLY if none of the driving conditions specified in Schedule I apply.

ITEM NO.	TO BE SERVICED	WHEN TO PERFORM	The services shown in this schedule up to 75 000 km (45,000 miles) are to be performed after 75 000 km (45,000 miles) at the same intervals.					
		Kilometers (Miles) or Months, Whichever Occurs First						
			KILOMETERS (000)	12.5	25	37.5	50	62.5
		MILES (000)	7.5	15	22.5	30	37.5	45
1.	Engine Oil Change*	Every 12 500 km (7,500 mi.) or 12 mos.	•	•	•	•	•	•
	Oil Filter Change*	At first and then every other oil change	•		•		•	
2.	Chassis Lubrication	Every 12 500 km (7,500 mi.) or 12 mos.	•	•	•	•	•	•
3.	Tire & Wheel Assembly Inspection & Rotation	At 12 500 km (7,500 mi.) and then every 25 000km (15,000mi.)	•		•		•	
4.	Serpentine Drive Belt Inspection	Every 50 000 km (30,000 mi.) or 24 mos.				•		
5.	Cooling System Service*							
6.	Transmission Service	See explanation for service interval.						
7.	Spark Plug Assembly Replacement*							
8.	Spark Plug Wire Assembly Inspection*‡	Every 50 000 km (30,000 mi.)				•		
9.	Air Cleaner & Crankcase Ventilation Filter Replacement*					•		
10.	Fuel Tank Cap & Lines Inspection*‡					•		

‡ The U.S. Environmental Protection Agency has determined that the failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion of vehicle useful life. General Motors, however, urges that all recommended maintenance services be performed at the indicated intervals and the maintenance be recorded in section E of the owner's maintenance schedule.

• An Emission Control Service.



- 36 PIPE, HEATER HOSE OUTLET
- 37 PIPE, HEATER HOSE INLET
- 38 VALVE, FLOW CONTROL
- 39 HOSE, THROTTLE BODY HEATER RETURN
- 40 VALVE, BLEED
- 150 HOSE ASSEMBLY, HEATER INLET
- 151 CLAMP, HEATER OUTLET FRONT HOSE
- 152 CLAMP, HEATER INLET FRONT HOSE
- 153 PIPE, HEATER INLET
- 154 PIPE, HEATER OUTLET
- 155 HOSE ASSEMBLY, HEATER OUTLET

Figure 23 – Heater Hose Assembly and Heater Hose Pipes (5.7L LT1 Engine)

SECTION 1B1

MANUAL CONTROL AIR CONDITIONING

CAUTION: This vehicle is equipped with Supplemental Inflatable Restraint (SIR). Refer to **CAUTIONS** in Section 9J under "ON-VEHICLE SERVICE" and the SIR Component and Wiring Location View in Section 9J before performing service on or around SIR components or wiring. Failure to follow **CAUTIONS** could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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GENERAL DESCRIPTION

OVERVIEW

Figures 1 through 3

The air conditioning system (C60) delivers air that has been heated or cooled and dehumidified for occupant comfort. It also provides power ventilation, and windshield assembly defrosting and side window defogging.

During most operating conditions, outside air is drawn through the heater and air conditioning module assembly by the blower motor assembly. Additional out-

side air is also forced into the vehicle by forward movement of the vehicle.

Within the heater and air conditioning evaporator module assembly, air is pushed by the blower motor assembly through the evaporator, then through the heater core assembly, depending on the temperature valve setting, and into the passenger compartment. For air conditioning or defroster operation at ambient temperatures above 7°C (45°F), the refrigeration system will chill the evaporator to almost freezing. As the air passes through the evaporator, the air temperature drops which causes moisture in the air to condense on the evaporator core fins.

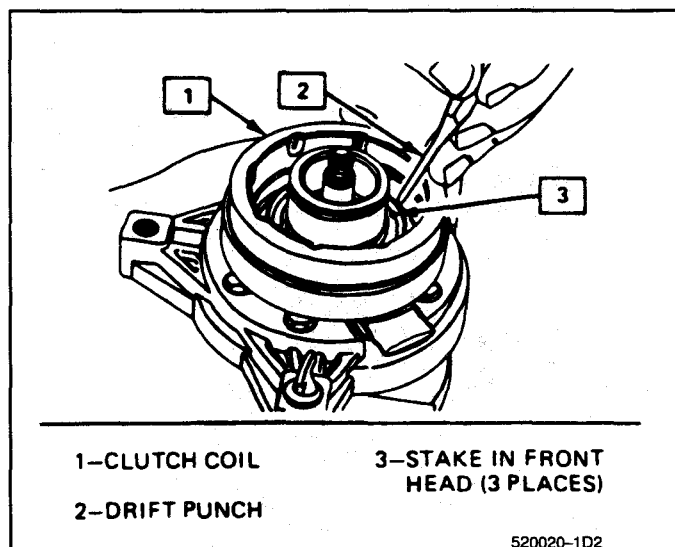


Fig. 16 Staking Clutch Coil to Front Head

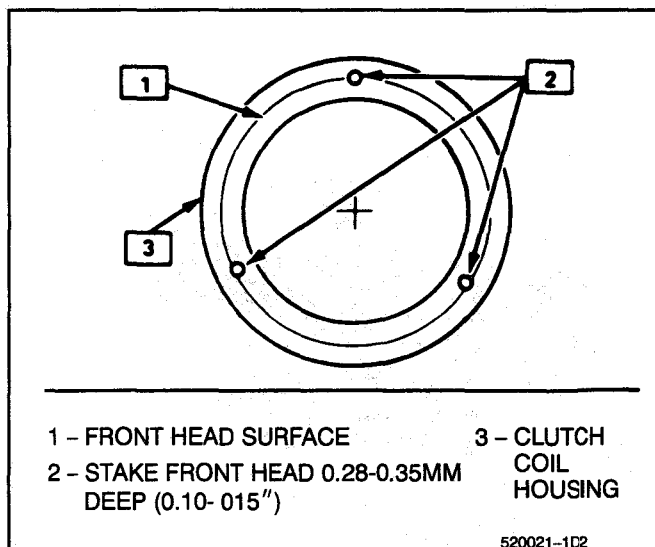


Fig. 17 Details of Stakes in Front Head for Clutch Coil

5. When coil is fully seated on the front head, use a 1/8" diameter drift punch and stake the front head at three places 120 degrees apart (Fig. 16), to ensure clutch coil remains in position.

- Stake size should be only one-half the area of the punch tip and be only approximately 0.28-0.35mm (.010-.015") deep (Fig. 17).

6. Install rotor and bearing assembly and the clutch plate and hub assembly as described previously.

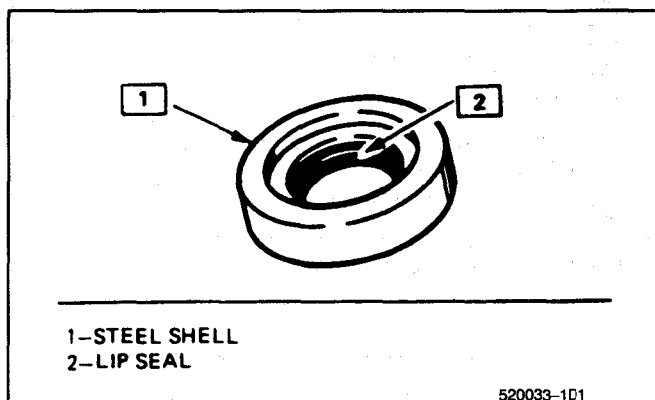


Fig. 18 Compressor Shaft Seal

MAJOR COMPRESSOR REPAIR PROCEDURES

When replacing the shaft seal assembly (Fig. 18), pressure relief valve or control switches (Fig. 19), it will be necessary to recover the refrigerant. Other than clutch repair procedures, the same holds true for any disassembly of the compressor.

A clean workbench covered with a sheet of clean paper, and a place (clean trays, etc.) for all parts being removed and replaced is important, as is the use of proper clean service tools.

NOTICE: Any attempt to use makeshift or inadequate service tools or equipment may result in damage and/or improper compressor operation.

All parts required for servicing the internal compressor are protected by a preservative process and packaged in a manner which will eliminate the necessity of cleaning, washing or flushing of the parts. The parts can be used in the internal assembly just as they are removed from the service package. **Seals and protective packaging should be left intact until just prior to installation.**

If the compressor rear head, front head or cylinder and shaft assembly is to be serviced or replaced, the oil in the compressor must be drained, measured, recorded and replaced.

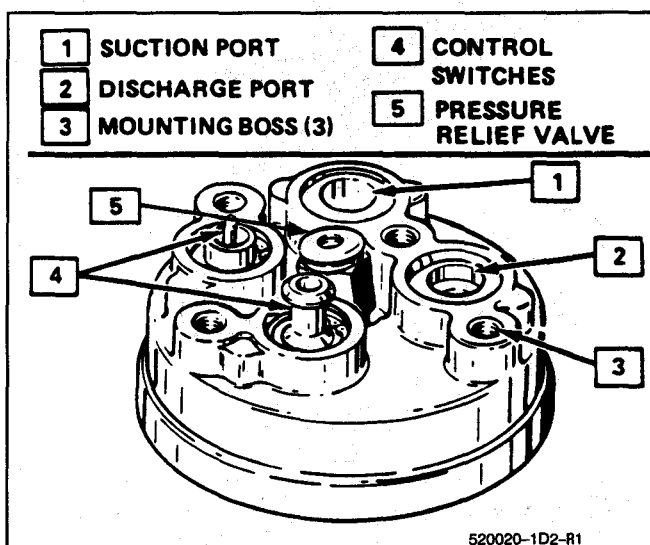
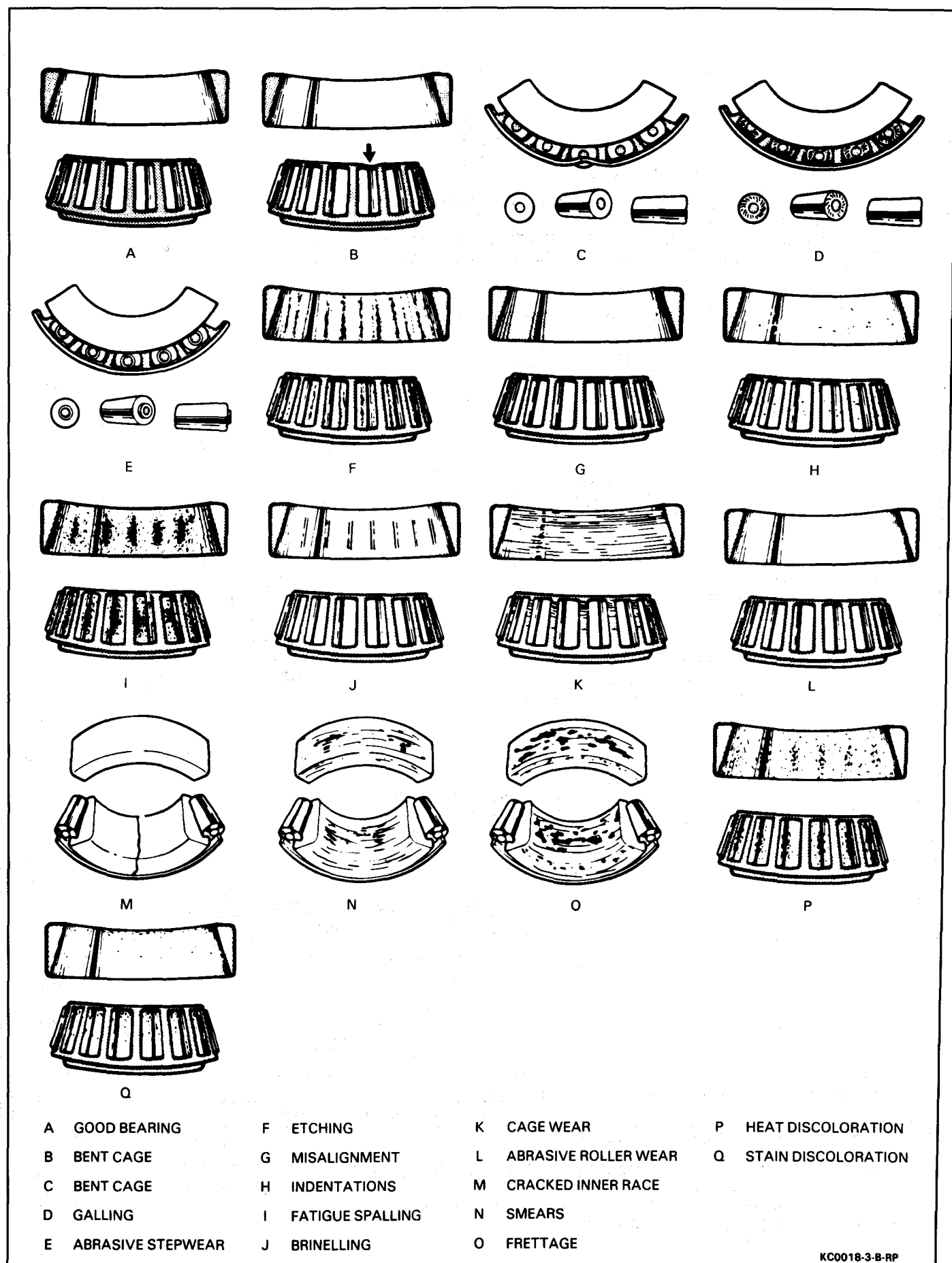


Fig. 19 Compressor - Rear Head

COMPRESSOR SHAFT SEAL REPLACEMENT

Seal Leak Detection

A shaft seal should not be changed because of small amounts of oil found on an adjacent surface but only after actual refrigerant leakage is found using an approved leak detector, J 39400 or equivalent.



KC0018-3-B-RP

Figure 18 - Tapered Roller Bearing Diagnosis

Install or Connect

Inspect

Lines for:

- Cracks.
- Dents.
- Damage to threads.

Replace as needed.

1. New O-ring seals (23) to valve end of lines (25) or (26).
2. Cylinder line assemblies (25) or (26) to gear assembly (30).

Notice: Carefully align threads on all fittings and finger tighten to avoid stripping and cross-threading.

Tighten

- Valve end fittings to 16.9 N•m (12.5 lb. ft.).
- Cylinder end fittings to 27.0 N•m (20 lb. ft.).

PINION SEAL, DUST SEAL and BEARING ANNULUS ASSEMBLY Figures 1, 2, 10 Thru 15

Tools Required:

- J 29810 Stub Shaft Seal Protector
- 14 mm Crowfoot Wrench

Remove or Disconnect

1. Rack and pinion steering assembly from vehicle (see Section 3B).
2. Adjuster plug lock nut (15) from adjuster plug (see Figure 10).

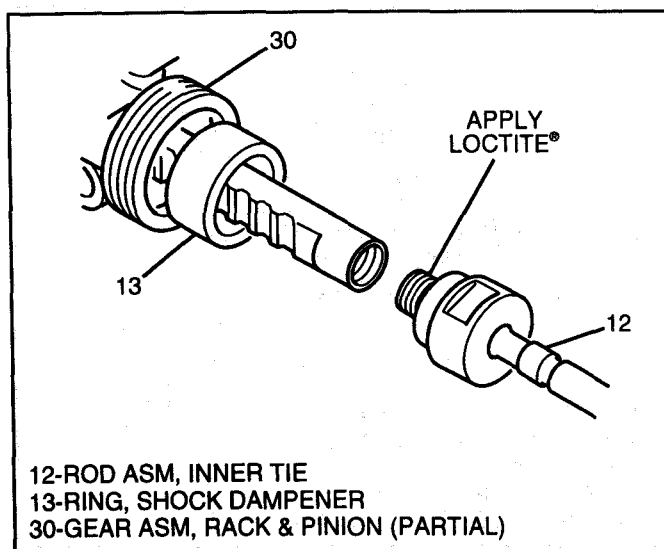


Figure 8 Inner Tie Rod Installation

3. Adjuster plug from gear assembly (30).
4. Adjuster spring and rack bearing.
5. Retaining ring (17) from valve bore of gear assembly (30).
6. Dust cover (33) from bottom of gear assembly (30) (see Figure 11).

Notice: Stub shaft must be held to prevent damage to the pinion teeth.

7. Hex lock nut (32) from lower end of pinion and valve assembly, while holding stub shaft with 14 mm Crowfoot Wrench (see Figure 11).

Notice: DO NOT hammer or pound on pinion and valve assembly. This will cause damage or loosen the drive pin.

Important

- When performing the following procedure, do not remove pinion and valve assembly from gear assembly. Press pinion and valve assembly only far enough to allow removal of bearing annulus and seal. Pinion and valve assembly removal is not required.

8. Use an arbor press (see Figure 12). Press on threaded end of pinion until it is possible to remove stub shaft dust seal (18), stub shaft seal (20), and stub shaft bearing annulus assembly (21) (see Figure 13).

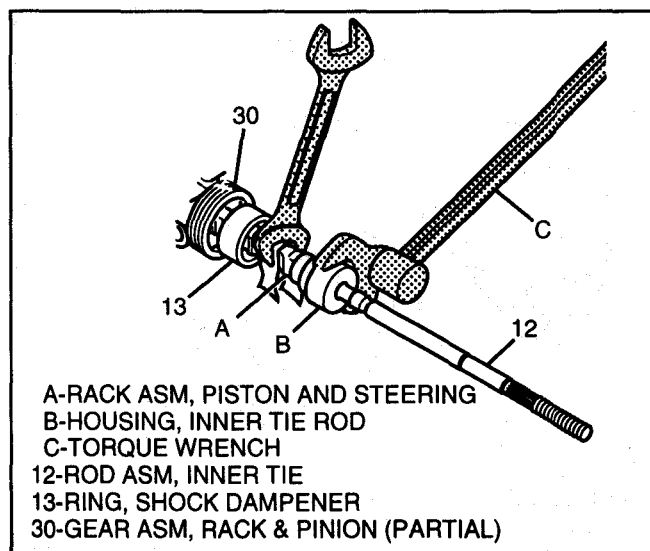


Figure 9 Inner Tie Rod Tightening

STABILIZER SHAFT

Figure 24

Remove or Disconnect

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Stabilizer shaft link assembly. Refer to "Stabilizer Shaft Link Assembly" in this section.
3. Bolts/screws (13).
4. Clamps (14).
5. Stabilizer shaft (11).
6. Insulators (16).
7. Bolts/screws (30).
8. Bracket assemblies (31).

Install or Connect

NOTICE: See "Notice" on page 3C-1 of this section.

1. Position bracket assemblies (31) to side rail.
2. Hand start bolts/screws (30).

Tighten

- Bolts/screws (30) to 55 N•m (41 lb. ft.).
3. Place insulators (16) over stabilizer shaft (11).

Important

- The slit of the insulator must face the front of the vehicle.
4. Position clamps (14) over insulators (16) and stabilizer shaft (11).
 5. Bolts/screws (13).

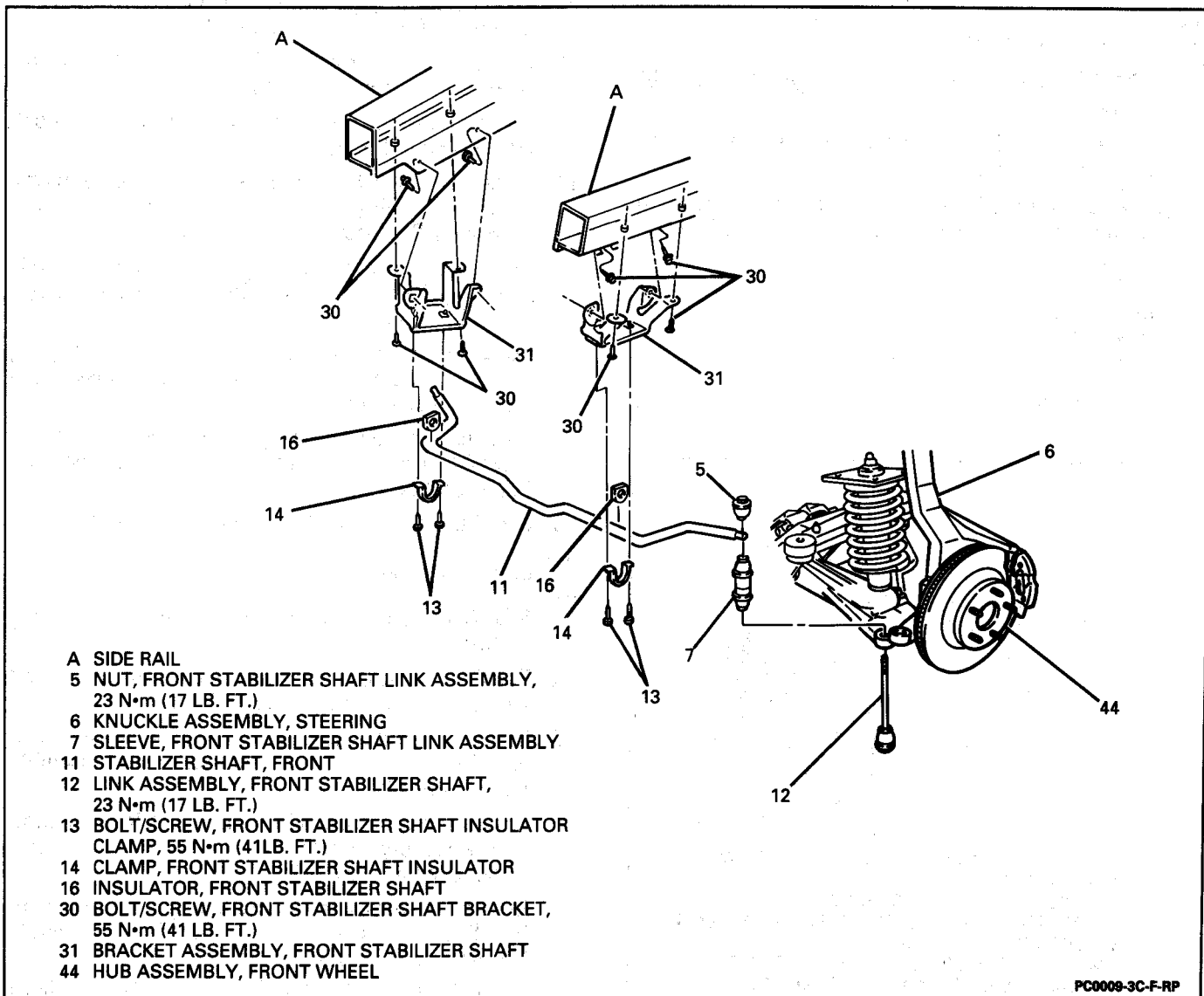


Figure 24 – Stabilizer Shaft

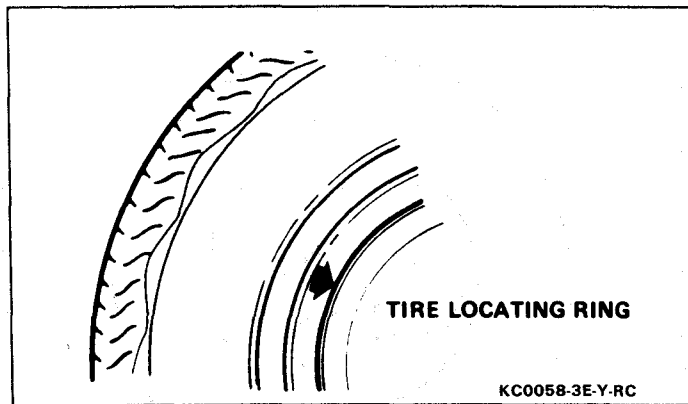


Figure 10 – Tire Locating Ring

On vehicles with P245/50ZR16 tires, special rotation provisions must be followed because the tires are directional. See Figure 9 for the recommended rotation.

Rotate the tires. If you have directional tires, be sure the color-coded arrows on the tires point in the direction the tires roll. Balance the tire and wheel assemblies using nylon-coated wheel balance weights. Adjust tire pressures and tighten wheel nuts to the specified torque. Refer to “Wheel Assembly Removal and Installation” in this section.

TIRE MOUNTING AND DISMOUNTING

Figure 10

Use a tire changing machine to mount or dismount tires. Follow the equipment manufacturer's instructions. Do not use hand tools or tire irons to change a tire as they may damage the tire beads, wheel assembly rim or flanges.

NOTICE: Do not lubricate the tire beads or wheel assembly rim with a lubricant containing silicone. Silicone will allow the tire to rotate on the wheel assembly rim, throwing the tire and wheel assembly out of balance.

NOTICE: Do not attempt to break the tire bead loose before the tire has completely deflated. It takes about 70 seconds for the air to completely exhaust from a large tire. If the valve stem assembly is removed before this amount of time, the bead breaker on the tire changing machine could put enough force on the tire to bend the wheel assembly at the mounting surface. This could result in vibration, shimmy and cracking of the wheel assembly. Completely deflate the tire before attempting to break the tire bead loose.

Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove old rubber and light rust or corrosion. Before mounting or dismounting a tire, the bead area should be well-lubricated with GM P/N 9985555 (50 percent lubricant and 50 percent water) or equivalent.

CAUTION: To avoid serious personal injury, do not stand over the tire when inflating. The bead may break when it

snaps over safety hump. Do not exceed 280 kPa (40 psi) pressure when inflating any tire if beads are not seated. If 280 kPa (40 psi) pressure will not seat beads, deflate, relubricate and inflate. Overinflation may cause the bead to break and cause serious personal injury.

- After mounting, inflate tire so that beads are completely seated, but never exceed 280 kPa (40 psi).



Important

- When mounting blackwall tires, be sure the TPC specification number faces the outboard side of the vehicle.

Install the valve stem assembly and inflate to the pressure specified on the tire placard. Check the locating rings of the tire to be sure they show around the rim flanges on both sides of the wheel assembly.

Steel Wheel Assembly Mounting Surface Check

Figures 11 and 12

1. Place straight edge (about eight to nine inches long) with both hands on inboard mounting surface of wheel assembly.
2. Try to rock straight edge up and down.
 - The outer ring of mounting surface is normally raised above everything else inside it. If surface has been bent on a tire changer, it will be raised above outer ring and straight edge will rock on this position.
3. Repeat steps 1 and 2 at three or four different positions on inboard mounting surface.
4. If wheel assembly is bent, it must be replaced. Refer to “Wheel Assembly Removal and Installation” in this section.

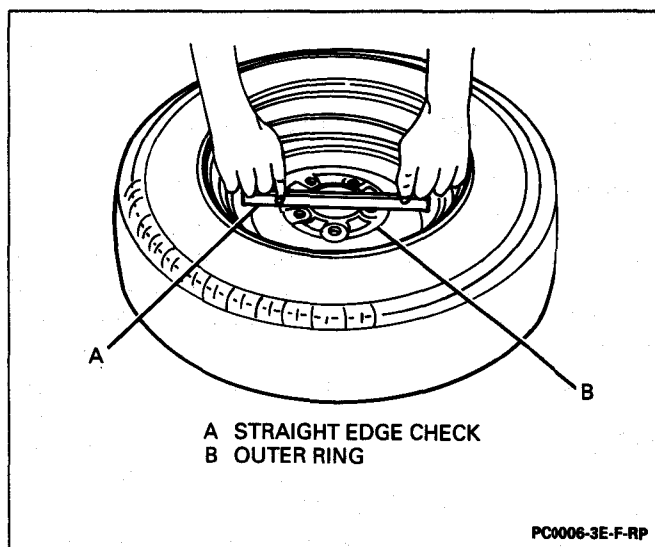


Figure 11 – Steel Wheel Assembly Mounting Surface Check

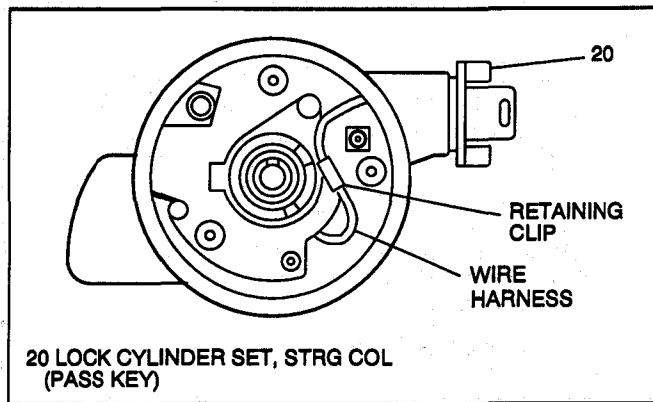


Figure 11 - Routing Pass Key Wire Harness

1. Pass key lock cylinder (20).
 - A. Wire terminal through column and snap retaining clip into hole in housing.
 - B. Lock cylinder (20) connector to vehicle wire harness.

2. Lock retaining screw (18).

Tighten

- Tighten screw (18) to 2.5 N·m (22 lb.in.).
3. Key from pass key lock cylinder set (20).
 4. Buzzer switch assembly (16).
 5. Reinstall key in pass key lock cylinder set (20).
 - Key in "OFF-LOCK" position.
 6. Turn signal switch assembly (12) wire harness through steering column.
 - A. Let switch hang freely.
 - B. Switch connector to bulkhead connector.
 7. Coil assembly (3) wire harness through column.
 - Let coil hang freely.

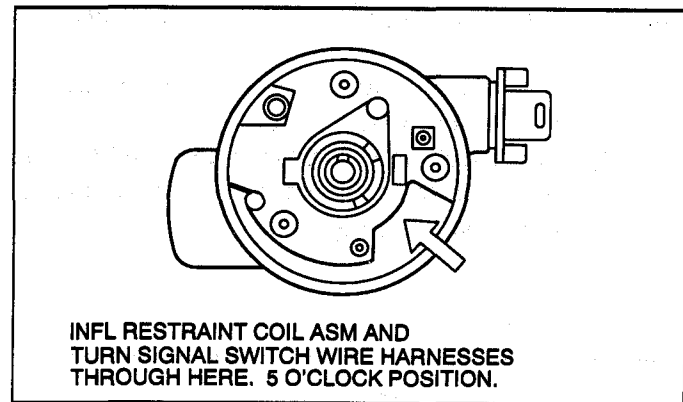


Figure 12 - Wire Harnesses through Column

8. Turn signal switch assembly (12) and screws (9).

Tighten

- Tighten screws (9) to 3.4 N·m (30 lb.in.).

9. Signal switch arm (11) with screw (10).

Tighten

- Tighten screw (10) to 2.3 N·m (20 lb.in.).

10. Hazard knob assembly and multi-function lever. (See Section 3F)
11. Inner race (14).
12. Upper bearing inner race seat (13).
13. Upper bearing spring (8).
14. Turn signal cancelling cam assembly (7).
 - Lubricate with grease, synthetic (service kit).
15. Shaft lock (6).
16. New shaft lock retaining ring (5) using J 23653-C to push down shaft lock (6).
 - Ring (5) must be firmly seated in groove on shaft.

NOTICE: Set steering shaft so that block tooth on upper steering shaft (56) is at the 12 o'clock position, wheels on vehicle should be straight ahead, then set ignition switch to "LOCK" position, to ensure no damage to coil assembly (3). (See Figure 26 for steering shaft orientation)

17. Wave washer (4).

GENERAL SPECIFICATIONS

Rear Axle Type	Semi-Floating Hypoid
Drive and Torque	Through 4 Arms
Ring and Drive Pinion Gear Set Type	Hypoid
Rear Axle Lubricant Capacity	1.65 L (2.90 pt.)
Rear Axle Lubricant	
Standard Differential	GM P/N 12345977 Axle Lubricant or SAE 80W-90 GL-5 Gear Lubricant or equivalent
Limited Slip Differential	118 ml (4 fl. oz.) GM P/N 1052358 Limited Slip Differential Lubricant and GM P/N 12345977 Axle Lubricant or SAE 80W-90 GL-5 Gear Lubricant or equivalent
Pinion Gear Seal Lubricant	GM P/N 1050169 or equivalent
Gear Marking Compound	GM P/N 1052351 or equivalent

LIMITS FOR FITTING AND ADJUSTING

Differential Drive Pinion Gear Inner and Outer Bearing Preload (Measured at Drive Pinion Gear Nut)	
New Bearing Assemblies	1.7 – 3.4 N•m (15 – 30 lb. in.) Rotating Torque with New Seal
Used Bearing Assemblies	1.0 – 1.7 N•m (10 – 15 lb. in.) Rotating Torque with New Seal
Total Assembly Preload (Measured at Drive Pinion Gear Nut)	
New Bearing Assemblies	3.6 – 6.2 N•m (32 – 55 lb. in.) Rotating Torque with New Seal
Used Bearing Assemblies	1.8 – 3.1 N•m (16 – 28 lb. in.) Rotating Torque with New Seal
Differential Ring Gear-to-Differential Drive Pinion Gear Backlash	0.13 – 0.23 mm (0.005" – 0.009")

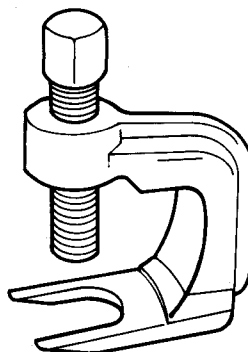
REAR AXLE ASSEMBLY USAGE

RING GEAR DIAMETER	AXLE GEAR RATIO	REAR BRAKE DRUM DISC	TEETH RING GEAR: PINION	AXLE RATIO
7.62"	2.73	—	41:15	GU2
		DISC		
	3.23	CAST IRON DRUM	42:13	GU5
		DISC		

PC0032-4B-F-RP

SPECIAL TOOLS

1

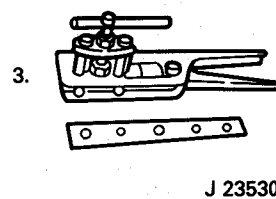
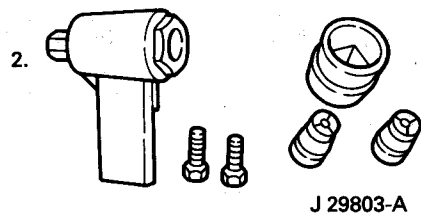
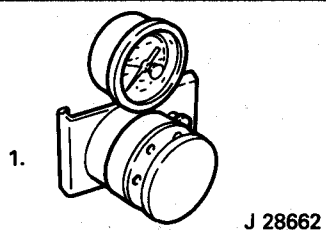


J 6627-A

1 WHEEL STUD REMOVER

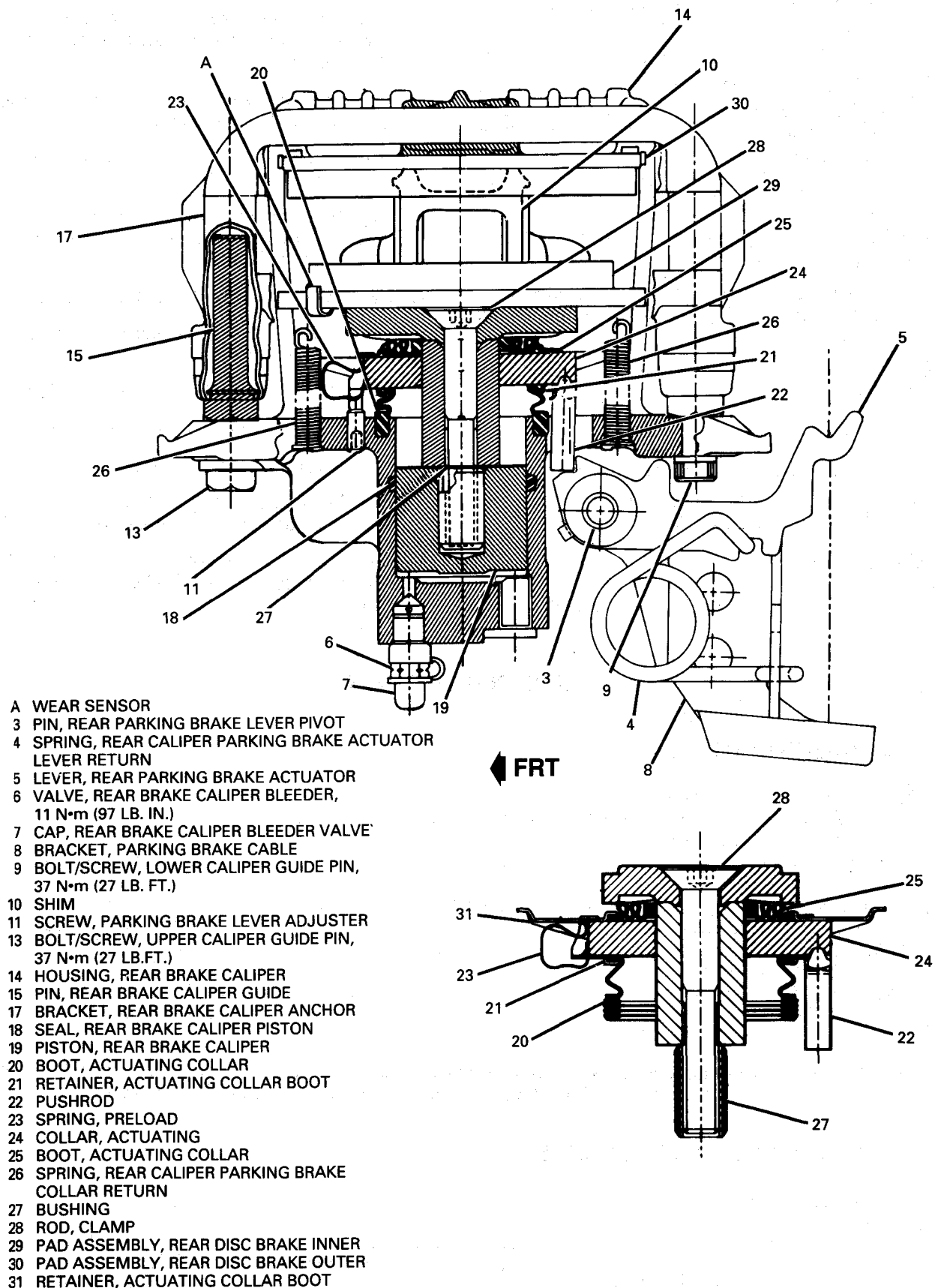
MC1001-3E-B-RP

SPECIAL TOOLS



1. BRAKE PEDAL EFFORT GAGE
2. ISO FLARING KIT
3. BRAKE LINE FLARING TOOL (45° SINGLE AND DOUBLE)

PC0013-5-F-RP



Tech 1 Method

Select "F2: DTC(s)" for diagnostic trouble codes. After DTCs have been viewed completely, Tech 1 will ask, "CLEAR DTCs"?; answer "YES." Tech 1 will then read, "HISTORY DATA WILL BE LOST. CLEAR DTCs"? Answer "YES" and DTCs will be cleared.

Ignition Cycle Default

If no diagnostic trouble codes occur for 100 drive cycles [a drive cycle occurs when the ignition is turned "ON" and the vehicle is driven faster than 16 km/h (10 mph)], any existing DTCs are automatically cleared from the EBCM memory.

INTERMITTENTS AND POOR CONNECTIONS

As with most electronic systems, intermittent malfunctions may be difficult to accurately diagnose. The following is a method to try to isolate an intermittent malfunction, especially wheel speed circuitry.

If an ABS malfunction occurs, the ABS warning lamp will be "ON" during the ignition cycle in which the malfunction was detected. If it is an intermittent problem which seems to have corrected itself (ABS warning lamp "OFF"), a diagnostic trouble code will be stored. Also stored will be the history data of the DTC at the time the malfunction occurred. The Tech 1 must be used to read DTC history data.

Most intermittents are caused by faulty electrical connections or wiring. Refer to "Intermittents and Poor Connections" in SECTION 8A-4 for a very detailed explanation of how to locate and repair intermittent conditions.

TECH 1 DIAGNOSTICS

The Tech 1, when plugged into the DLC, becomes part of the vehicle's electronic system. The Tech 1 can perform the following functions:

- Display ABS data.
- Display and clear ABS diagnostic trouble codes.
- Control ABS components.
- Perform extensive ABS diagnosis.
- Provide diagnostic testing for intermittent ABS conditions.

Each test mode has specific diagnosis capabilities which depend upon various keystrokes. In general, five keys control sequencing: "YES," "NO," "EXIT," up arrow and down arrow. The F0 through F9 keys select operating modes, perform functions within an operating mode, or enter DTC or model year designations.

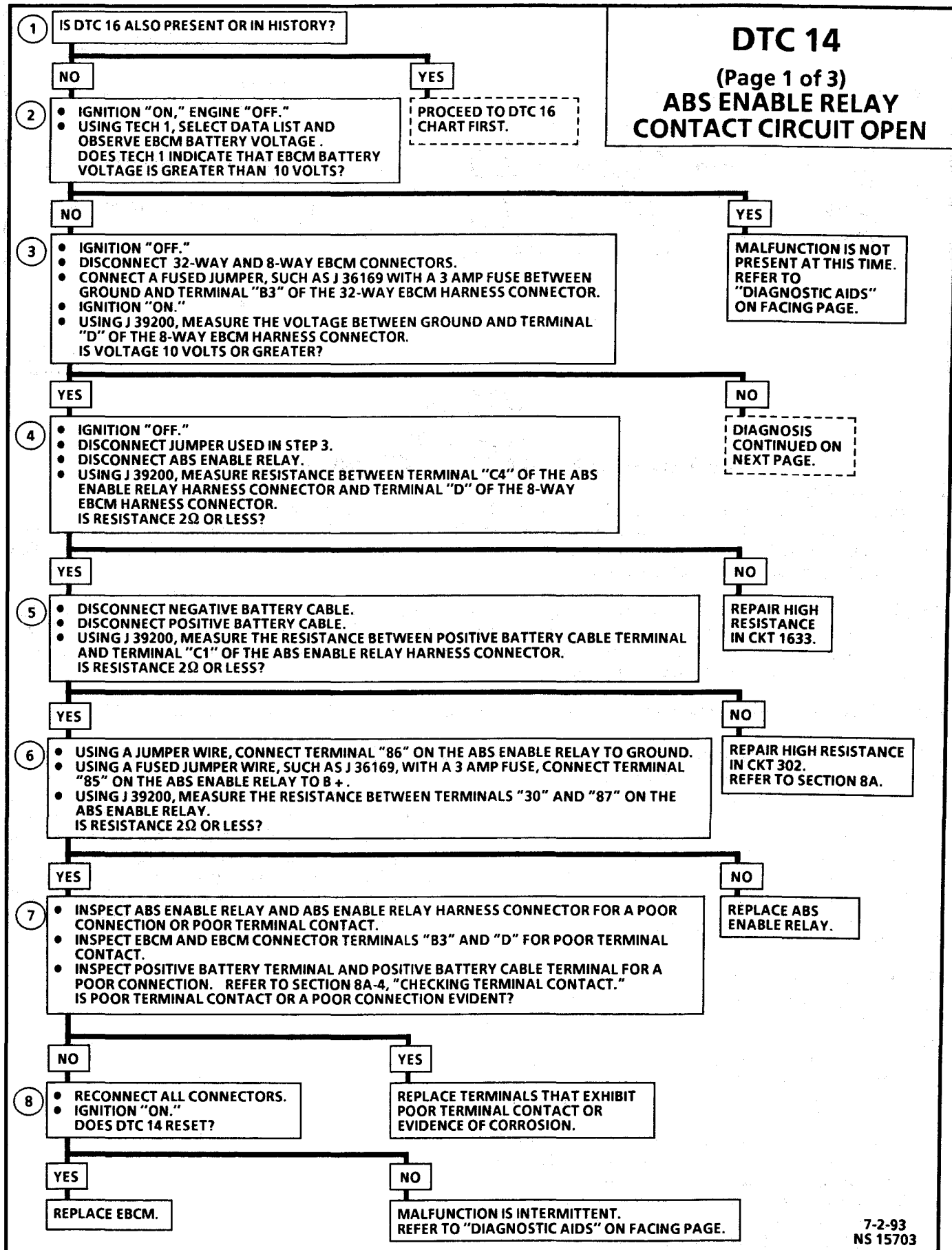
In general, the Tech 1 has six test modes for diagnosing the ABS. The six test modes are as follows:

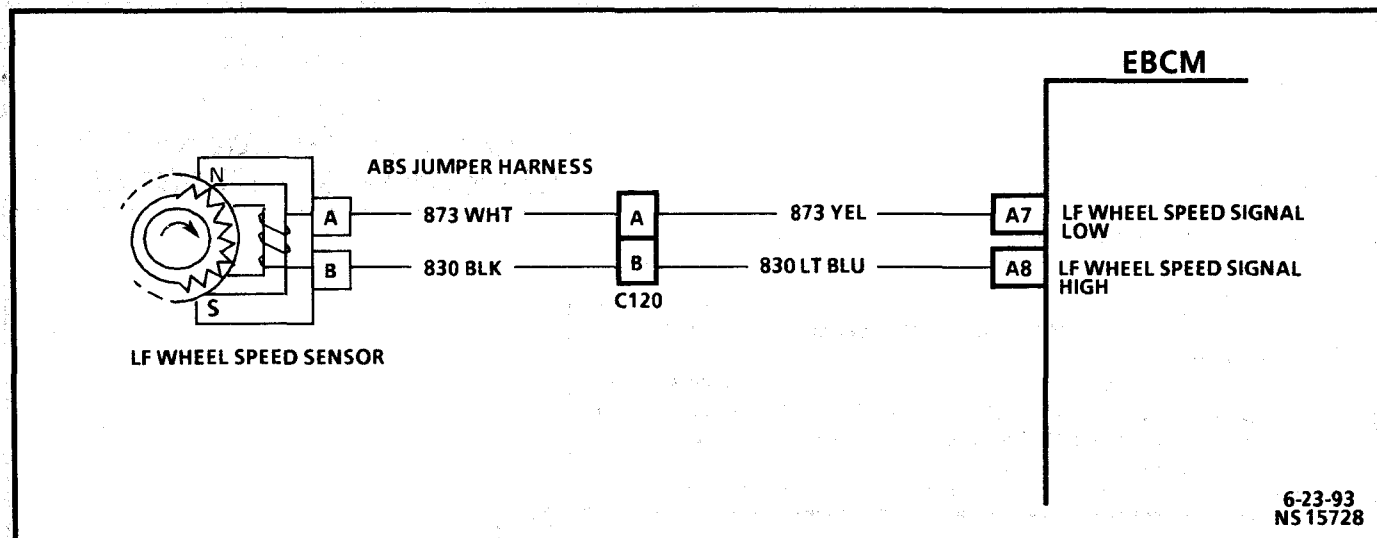
- **MODE F0: DATA LIST** - In this test mode, the Tech 1 continuously monitors wheel speed data, brake switch status and other inputs and outputs.
- **MODE F1: DTC HISTORY** - In this mode, DTC history data is displayed. This data includes how many ignition cycles since the DTC occurred, along with other information for the last DTC set. The first five and last DTC set are included in the DTC history data.
- **MODE F2: DIAGNOSTIC TROUBLE CODES** - In this test mode, diagnostic trouble codes stored by the EBCM, both current ignition cycle and history, may be displayed or cleared.
- **MODE F3: SNAPSHOT** - In this test mode, the Tech 1 captures data before and after a system malfunction (auto trigger) from a forced manual key press, or from a DTC setting.
- **MODE F4: MISC. TESTS** - In this test mode, the Tech 1 performs various ABS functional tests to assist in problem isolation during troubleshooting.
- **MODE F5: MOTOR REHOME** - In this mode, the Tech 1 commands the EBCM to rehome the motors on the hydraulic modulator/master cylinder assembly. This mode should **ALWAYS** be used prior to bleeding the brake system.

Enhanced Diagnostics

Enhanced diagnostic information, found in the DTC HISTORY function of the Tech 1, is designed to provide the service technician with specific malfunction occurrence information. For each of the first five and the very last diagnostic trouble code stored, data is stored to identify the specific DTC, the number of occurrences, and the number of drive cycles since the malfunction first and last occurred [a drive cycle occurs when the ignition is turned "ON" and the vehicle is driven faster than 16 km/h (10 mph)]. However, if a malfunction is present, the drive cycle counter will increment by turning the ignition "ON" and "OFF." These first five diagnostic trouble codes are also stored in the order of occurrence. The order in which the first five DTCs occurred can be useful in determining if a previous malfunction is linked to the most recent malfunction, such as an intermittent wheel speed sensor which later becomes completely open.

During difficult diagnosis situations, this information can be used to identify malfunction occurrence trends. Did the malfunction only occur once over a large number of drive cycles, indicating an unusual condition present when it occurred?





DTC 32

(Page 3 of 3)

LF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring often referred to as the air gap.

DTC Will Set When: DTC 32 can be set anytime after initialization. If either of the left front wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

10. Checks for a short to ground in CKT 873.
11. Checks for a short to ground in CKT 830.
12. Checks for a short to ground in the wheel speed sensor jumper harness.
13. Verifies that the wheel speed sensor is not internally shorted to ground.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle

over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

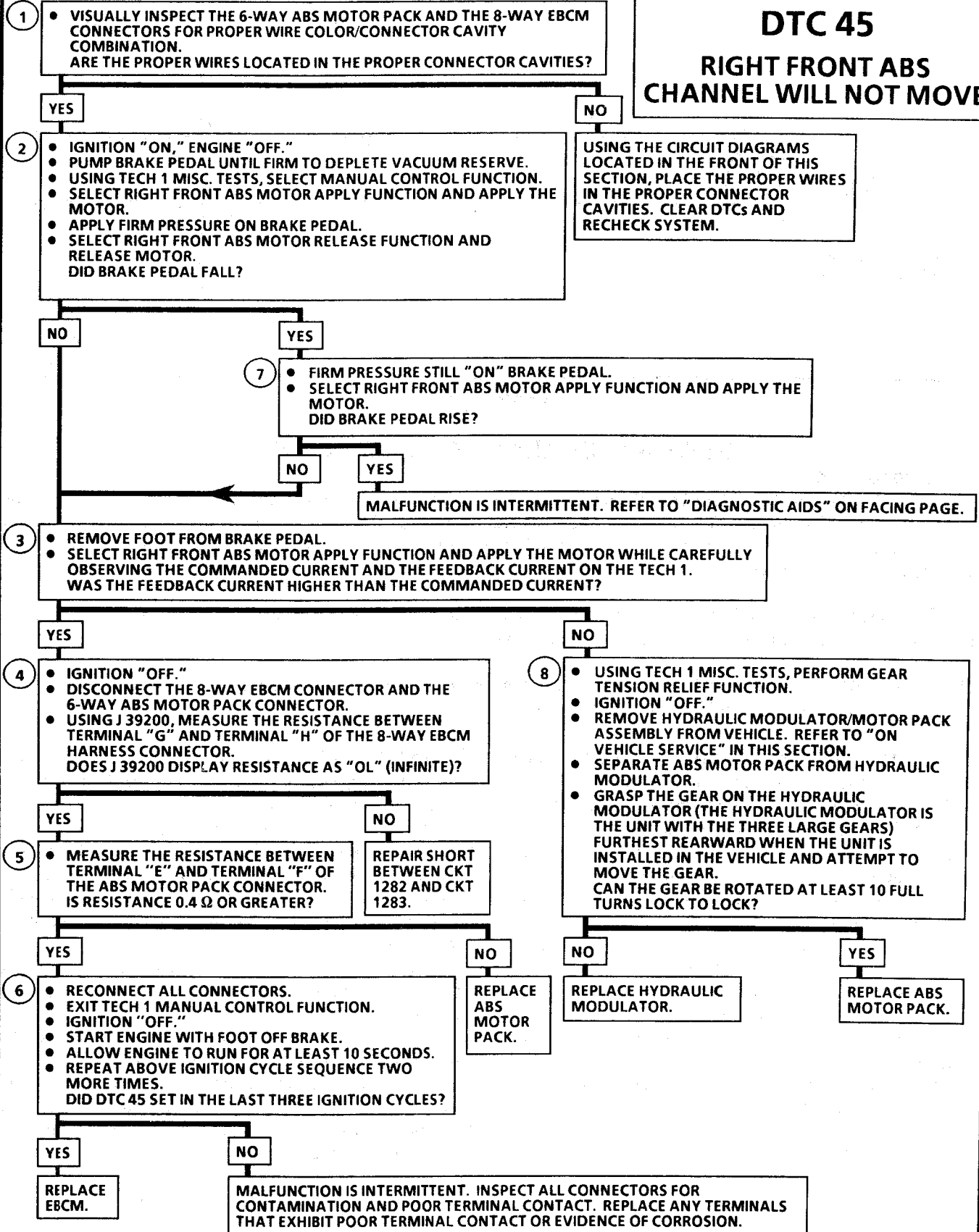
Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

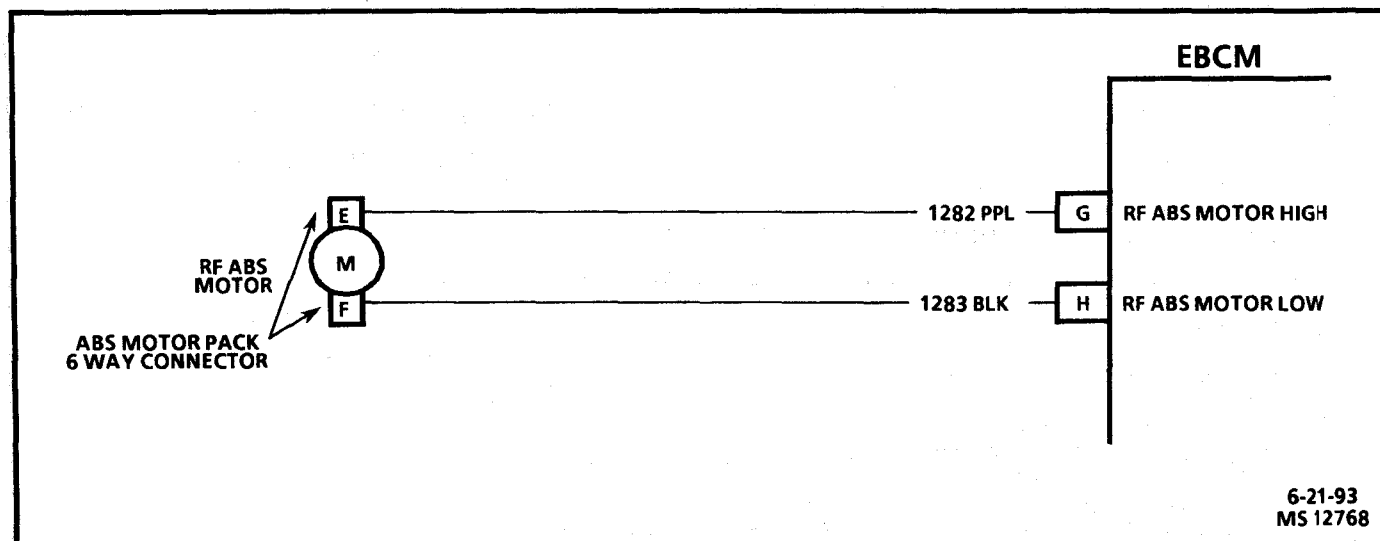
When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

DTC 45

RIGHT FRONT ABS CHANNEL WILL NOT MOVE



* AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN.



DTC 61

RIGHT FRONT ABS MOTOR CIRCUIT OPEN

Circuit Description:

This DTC identifies an ABS motor that cannot be energized due to an open in its circuitry. This malfunction will not allow proper front ABS operation.

DTC Will Set When: DTC 61 can be set only when the ABS motor is commanded "OFF." If the EBCM detects an out of range voltage on either of the right front ABS motor circuits indicating an open circuit, a malfunction exists.

Action Taken: An open motor will not activate when requested. A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for proper resistance of the ABS motor.
2. Checks for an open in the ABS motor "HIGH" circuitry.
3. Checks for an open in the ABS motor "LOW" circuitry.
4. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise ABS motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the ABS motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

DTC 91

OPEN BRAKE SWITCH DURING DECELERATION

IS DTC 95 CURRENTLY SET?

NO

YES

PROCEED TO DTC 95 DIAGNOSTIC CHART.

1

- IGNITION "ON."
- USING TECH 1, SELECT "F0: DATA LIST."
- APPLY LIGHT PRESSURE ON BRAKE PEDAL, WHILE MONITORING BRAKE SWITCH STATUS ON TECH 1. DOES TECH 1 INDICATE BRAKE SWITCH "ON" WITHIN 1 INCH OF TRAVEL?

NO

YES

MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

2

- WITH PRESSURE STILL APPLIED TO BRAKE PEDAL, OBSERVE REAR BRAKE LAMPS. ARE BRAKE LAMPS "ON"?

YES

NO

3

- IGNITION "OFF."
- DISCONNECT 32-WAY EBCM CONNECTOR.
- IGNITION "ON."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B12" OF THE 32-WAY EBCM HARNESS CONNECTOR WHILE APPLYING FIRM PRESSURE ON BRAKE PEDAL. IS VOLTAGE 10 VOLTS OR GREATER?

YES

NO

4

- INSPECT 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B12" FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF TERMINAL CONTACT OR CORROSION.
- RECONNECT ALL CONNECTORS.
- DRIVE VEHICLE AND PERFORM A MODERATELY HARD ABS STOP. DOES DTC 91 OR 92 SET AS A CURRENT DTC?

YES

NO

REPLACE EBCM.

MALFUNCTION IS MOST LIKELY DUE TO A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

5

- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B" OF THE BRAKE SWITCH. IS VOLTAGE 10 VOLTS OR GREATER?

YES

NO

6

- MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "C" OF THE BRAKE SWITCH WHILE APPLYING FIRM PRESSURE ON BRAKE PEDAL. IS VOLTAGE 10 VOLTS OR GREATER?

NO

YES

MISADJUSTED OR FAULTY BRAKE SWITCH. ADJUST OR REPLACE SWITCH AS NECESSARY.

REPAIR OPEN CKT 820.

REPAIR OPEN OR SHORTED CKT 140 AND REPLACE 20 AMP STOP HAZARD FUSE 6.

5. Banjo bolt O-rings from brake combo valve and hydraulic modulator.

Important

- If hydraulic modulator is to be replaced, install the three gears in the same location on replacement hydraulic modulator. Refer to "Gear Replacement" in this section.
- No repair of the hydraulic modulator is authorized. Replace as an assembly.
- Refer to SECTION 5A for repair of brake combo valve.
- Use new transfer tube assemblies when assembling the hydraulic modulator/brake combo valve assembly. Make sure two O-rings are properly installed on each transfer tube.

Assemble

1. Two transfer assemblies.
 - Lubricate transfer tube assembly O-rings with clean brake fluid.
 - Install transfer tube assemblies in ports in hydraulic modulator and push in by hand to bottom.
2. Lubricate new banjo bolt O-ring with clean brake fluid and install into the brake combo valve and hydraulic modulator.
3. Hydraulic modulator to brake combo valve.
 - Hold brake combo valve and rock into position on hydraulic modulator inserting transfer tube assemblies into brake combo valve ports.
4. Two hydraulic modulator to brake combo valve banjo bolts.

Tighten

- Banjo bolts to 16 N·m (12 lb. ft.).
5. With the hydraulic modulator upside down, and the gears facing you, rotate each hydraulic modulator gear counterclockwise until movement stops. This procedure will position the pistons very close to the top of the modulator bore simplifying the brake bleeding procedure (refer to Figure 12).
 6. Motor pack to hydraulic modulator.
 7. Gear cover to hydraulic modulator/motor pack assembly.

MASTER CYLINDER

Refer to SECTION 5A for repair of master cylinder.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

ABS Hydraulic Modulator	
Bleeder Valves	9.0 N·m (80 lb. in.)
ABS Hydraulic Modulator	
Solenoid Torx® Head	
Bolt	4.5 N·m (40 lb. in.)
Electronic Brake Control	
Module (EBCM) Nut . . .	25 N·m (18.5 lb. ft.)
ABS Hydraulic Modulator	
Mounting Bolt	9.0 N·m (80 lb. in.)
Three Hydraulic Modulator	
Brake Pipe Tube Nuts . .	32 N·m (24 lb. ft.)
Two Brake Combination Valve	
Brake Pipe Tube Nuts . .	18 N·m (13 lb. ft.)
Two Master Cylinder Brake	
Pipe Tube Nuts	32 N·m (24 lb. ft.)
Modulator Drive Gear Nuts .	8.5 N·m (75 lb. in.)
Torx® Head Screws	
Attaching Gear Cover . . .	4.0 N·m (35 lb. in.)
Four Torx® Head Screws	
Attaching Motor Pack . .	4.5 N·m (40 lb. in.)
Two Banjo Bolts Attaching	
Brake Combination Valve	
to ABS Hydraulic	
Modulator	16 N·m (12 lb. ft.)

SPECIAL TOOLS

Figure 22

The J 39200 High Impedance Multimeter is the only DVM authorized for use in diagnosing and servicing the ABS VI system.

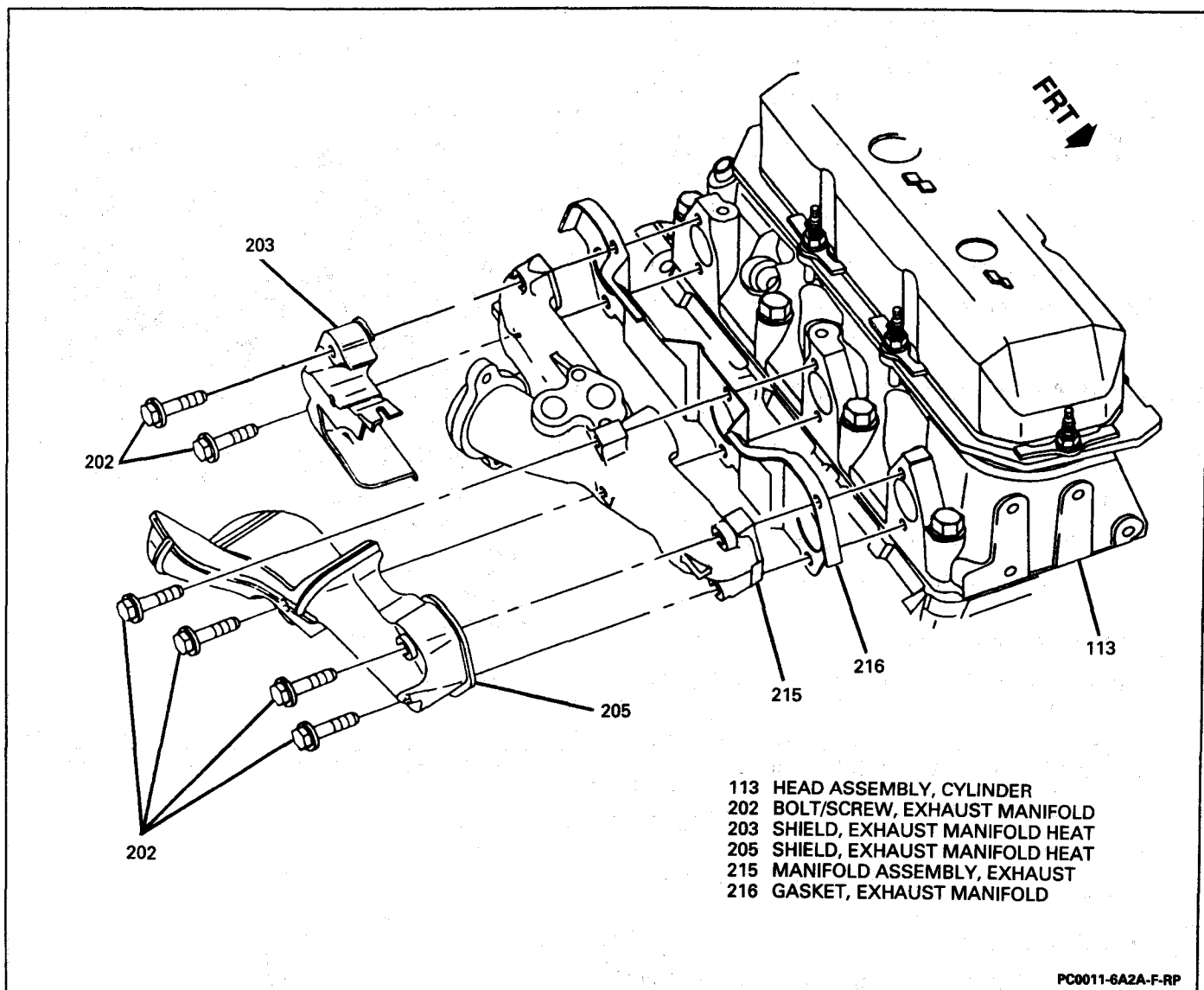


Figure 12 - Right Exhaust Manifold Assembly

**Clean**

- Exhaust manifold and cylinder head sealing surfaces.

**Install or Connect**

NOTICE: See "Notice" on page 6A2A-1 of this section.

- Exhaust manifold gasket (216).
- Exhaust manifold assembly (215) and heat shields (203 and 205).
- Exhaust manifold front and middle bolts/screws (202).

**Tighten**

- Exhaust manifold bolts/screws (202) to 25 N•m (18 lb. ft.).

- EGR valve adapter and flexible pipe. Refer to SECTION 6E3.
- Generator rear "Y" brace. Refer to SECTION 6D3.
- Generator. Refer to SECTION 6D3.
- A/C compressor. Refer to SECTION 1B.
- Oxygen sensor electrical connector.
- Serpentine drive belt. Refer to "Serpentine Drive Belt and Tensioner Assembly" in this section.
- Raise and suitably support vehicle. Refer to SECTION 0A.
- Transmission filler tube. Refer to SECTION 7A.
- A/C compressor rear bracket bolts/screws. Refer to SECTION 1B.

GENERAL DESCRIPTION

ENGINE CONSTRUCTION

Figures 1 through 4

Cylinder Block

The cylinder block is made of cast alloy iron and has six cylinders arranged in a "V" shape with three cylinders in each bank. The cylinder banks are set at a 60° angle from each other.

The right bank cylinders are (1,3,5) and the left bank cylinders are (2,4,6).

Four main bearings support the crankshaft which is retained by bearing caps that are machined with the block for proper alignment and clearances.

Cylinder Head

The cast iron cylinder heads have individual intake and exhaust ports for each cylinder. Valve guides are integral, and rocker arms are retained on individual threaded studs with locking nuts.

Crankshaft and Bearings

The crankshaft is cast nodular iron with deep rolled fillets on all six crankpins and all four main journals. Four steel-backed aluminum bearings are used, with the #3 bearing being the end-thrust bearing.

Camshaft and Drive

The camshaft is cast alloy iron with tapered 13.2 mm wide lobes, offset from the lifters and tapered to provide positive valve lifter rotation. The camshaft is supported by four journals and includes an oil pump drive gear.

Pistons and Connecting Rods

The pistons are cast aluminum with steel struts using two compression rings and one oil control ring. The piston pin is offset 0.8 mm towards the major thrust side. This allows a gradual change in thrust pressure against the cylinder wall as the piston travels its path. Pins are chromium steel and have a floating fit in the pistons. They are retained in the connecting rods by a press fit.

Connecting rods are made of forged steel. Full pressure lubrication is directed to the connecting rods by drilled oil passages from the adjacent main bearing journal.

Valve Train

A very simple ball-pivot and rocker type valve train is used. Motion is transmitted from the camshaft through the hydraulic lifter and pushrod to the rocker arm. The rocker arm pivots on its ball and transmits the camshaft motion to the valve. The rocker arm ball locates on a stud, threaded into the head, and is retained by a nut. The pushrod is located by a guide

plate held under the rocker arm stud, assuring that the rocker arm operates in the plane of the valve.

Intake Manifold

The intake manifold is a two-piece cast aluminum unit. It centrally supports a fuel rail with six fuel injectors.

Exhaust Manifolds

The exhaust manifolds are cast nodular iron.

ENGINE LUBRICATION

Figures 5 through 8

Full pressure lubrication, through a full flow oil filter is furnished by a gear type oil pump. Oil is drawn up through the pickup screen and tube, and passed through the pump to the oil filter.

The oil filter is a full flow paper element unit. An oil filter bypass is used to ensure adequate oil supply, should the filter become plugged or develop excessive pressure drop. The bypass is designed to open at 69-83 kPa (10-12 psi).

A new priority oil delivery system supplies oil first to the crankshaft journals. The passages supplying oil to the crankshaft main bearings also supply oil to the camshaft bearings through intersecting vertical drilled holes. Oil from the crankshaft main bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft. The front cam bearing has a 0.25 mm deep slot on its outside diameter to supply oil to the cam sprocket thrust face, and oil passages from the camshaft journals supply oil to the hydraulic lifters.

The hydraulic lifters pump oil up through the pushrods to the rocker arms. Oil draining back from the rocker arms is directed by cast dams in the crankcase casting to supply the camshaft lobes. Oil also drains past specific hydraulic lifter flats to oil camshaft lobes directly.

DISASSEMBLY

FLYWHEEL

Figure 9

Remove or Disconnect

1. Retainer bolts (36) and retainer.
2. Flywheel (33).

DRAINING THE ENGINE

Remove or Disconnect

1. Oil drain plug (9) and drain engine oil.
2. Oil filter (45).
3. Coolant drain plugs (69 and 70) and drain coolant.

1. Cylinder head bolts (115).
2. Cylinder head (113). Carefully remove all varnish, soot and carbon to the bare metal. **DO NOT** use a motorized wire brush on any gasket sealing surface.
3. Valve guides as shown in Figure 51.
4. Valves (125 and 132) of carbon, oil and varnish.
 - Remove varnish by soaking in carburetor cleaning fluid.
 - Do not scratch the valve stem with the wire brush.
5. Threaded holes.
6. Remains of sealer from plug holes.

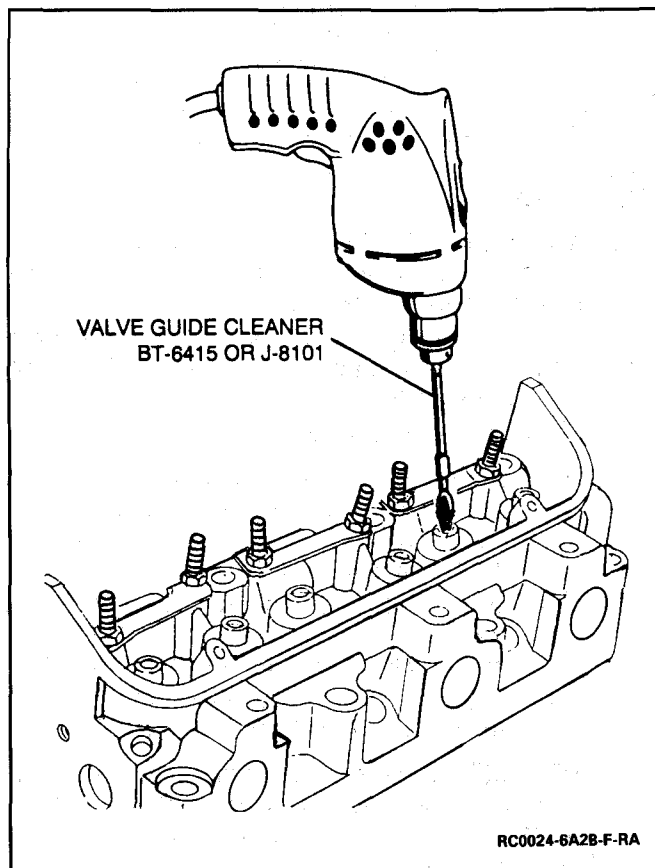


Figure 51 Cleaning Valve Guide

**Inspect**

1. Cylinder head bolts (115) for damaged threads or stretching, and damaged heads caused by improper use of tools.

**Important**

- Suspect bolts must be replaced.

2. Cylinder head (113) for cracks, especially between valve seats and in the exhaust ports.
3. Cylinder head deck for corrosion, sand particles in head, and porosity.

**Important**

- Do not attempt to weld the cylinder head, replace it.

4. Cylinder head deck, intake and exhaust manifold mating surfaces for flatness as shown in Figure 52. These surfaces may be re-conditioned by milling. If the surfaces are "out of flat" by more than 0.1mm (0.004 inch), the surface should be milled. If more than 0.25 mm (0.010 inch) of metal must be removed from the head, it should be replaced.
5. All threaded holes for damage. Threads may be reconditioned with thread inserts. Refer to "Thread Repair" in this section.
6. Cooling jacket plugs seating surfaces.
7. Valve seats for excessive wear and burned spots.

- Since the valve guide serves to support and center the valve grinder, it is essential that the valve guide is cleaned properly. If the valve guide requires reaming, measure valve guide clearance to determine if an oversized valve will be required. **This procedure must be performed before valve seats can be reconditioned.**

- If a burnt valve condition exists, it may be necessary to recondition the valve seat. At no time should there be less than 4 mm of valve seat material remaining after reconditioning.

- Valve seats may be reconditioned by grinding. Follow the grinder manufacturer's instructions. Refer to "Engine Specifications" in this section for seat angles. If, after grinding, the new seat is too wide, it may be narrowed by using a 70° stone. The 70° stone will raise the seat.

8. Valve stem tip for wear.
9. Valve lock (131 and 139) and oil seal grooves for chipped or worn lands. Replace the valve if chipped or worn.
10. Valve face for burning or cracking. If pieces are broken off, inspect the corresponding piston and cylinder head area for damage.
11. Valve stem for burrs and scratches. Burrs and **minor** scratches may be removed with an oil stone.
12. Valve stem for straightness and valve head for bending or distortion. Use "V" blocks. Bent or distorted valves must be replaced.
13. Valve face for grooving. If the groove is so deep that refacing would result in a knife edge, the valve must be replaced.
14. The valve face may be ground to specifications if it is otherwise in good condition. If the valve face cannot be grounded within the limits given, it must be replaced. Refer to "Engine Specifications" in this section.
15. Valve spring dampers (127 and 134) for broken pieces or cracks. Replace if damaged.

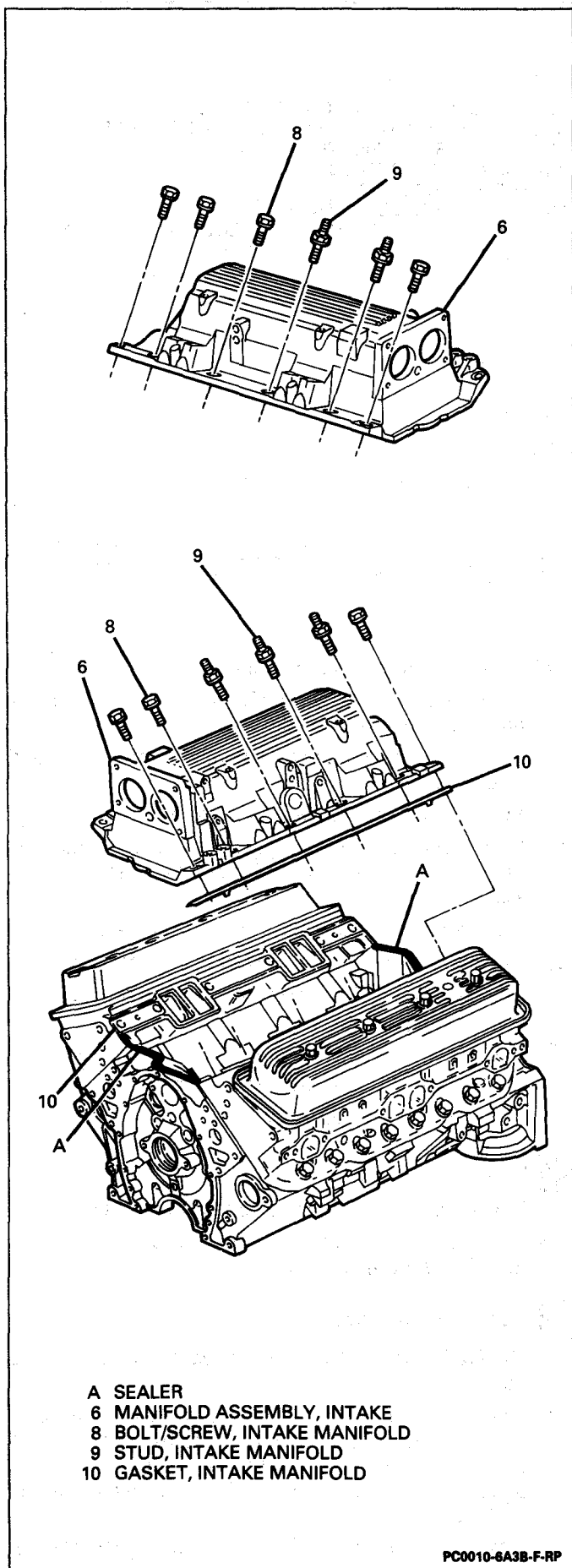


Figure 5 - Intake Manifold Assembly

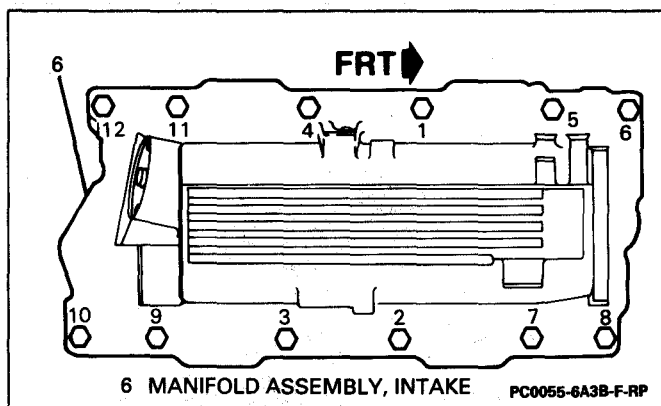


Figure 6 - Intake Manifold Tightening Sequence

Tighten

- Intake manifold bolts/screws (8) and studs (9) in a first pass to 8 N•m (71 lb. in.) in sequence as shown in Figure 6. Tighten in sequence in a second pass to final specifications of 48 N•m (35 lb. ft.).
4. Throttle body assembly (3), gasket (5) and throttle body bolts/screws (4).

Tighten

- Throttle body bolts/screws (4) to 26 N•m (19 lb. ft.).
5. Coolant hoses to throttle body assembly (3).
 6. Generator rear brace. Refer to SECTION 6D3.
 7. Accelerator control/cruise control servo cable adjuster assembly, if equipped. Refer to SECTION 5E2.
 8. Accelerator cable bracket, bolts/screws and cables.

Tighten

- Accelerator cable bracket bolts/screws to 10 N•m (90 lb. in.).
9. Secondary air injection pipe assembly and nuts.

Tighten

- Secondary air injection pipe exhaust manifold fitting to 34 N•m (25 lb. ft.).
 - Secondary air injection pipe flange nuts to intake manifold assembly to 25 N•m (19 lb. ft.).
10. EGR valve assembly and nuts.
 11. EGR control valve relay and nut.

Tighten

- EGR valve nuts to 22 N•m (16 lb. ft.).
 - EGR control valve relay nut to 22 N•m (16 lb. ft.).
12. Emission canister purge solenoid and bracket bolt/screw.

Service	
Intake	0.093 mm (0.0037") MAX.
Exhaust	0.119 mm (0.0047") MAX.
Valve Spring	
Free Length	51.1 mm (2.01")
Pressure	
Closed	360 - 395 N at 45.2 mm (81 - 89 lb. at 1.78")
Open	1121 - 1208 N at 33.1 mm (252 - 272 lb. at 1.305")
Installed Height	
Intake	45.2 mm (1.78")
Exhaust	45.2 mm (1.78")
Valve Lift	
Intake	11.43 mm (0.450")
Exhaust	11.68 mm (0.460")

- E. Measure gaging plastic at its widest using scale provided with gaging plastic. Refer measurements to "Specifications" in this section.
- F. If clearance is greater than specified, select an undersize bearing (101) and re-measure clearance.
- G. If clearance cannot be brought to specifications, regrind crankpin. If crankpin is already at maximum undersize, replace crankshaft assembly (98).

OIL PUMP ASSEMBLY

Figure 38



Disassemble

1. Oil pump cover bolts/screws (97) and pump cover (96).
 - Matchmark gear teeth for reassembly.
2. Driven gear (86), drive gear (94), driveshaft (89) and retainer (95) from housing assembly (87).
3. Oil pressure relief valve pin (90), relief valve (92), spring (91) and plug (93).
4. Screen assembly (88) from housing assembly (87), if replacement is necessary.
 - Mount housing assembly (87) in a soft-jaw vise and extract screen assembly (88).
 - Screen assembly (88) is serviced as a unit. Do not disturb pipe on screen.



Clean

1. All parts in cleaning solvent.
2. Dry parts with compressed air.



Inspect

- Housing assembly (87) and cover (96) for cracks, scoring, casting imperfections, and damaged threads.
- Drive gear shaft. If loose in housing assembly (87), replace oil pump.
- Pressure relief valve (92) for scoring and sticking.
 - Burrs may be removed with a fine oil stone.
- Relief valve spring (91) for loss of tension.
- Screen assembly (88) for broken wire mesh or screen, or looseness.
 - If pipe is loose or has been removed from screen, screen assembly (88) must be replaced.
- Gears for chipping, galling, and wear.
- Drive gear (94) and driveshaft (89) for looseness and wear.



Important

- If wear is noted, replace entire pump assembly.

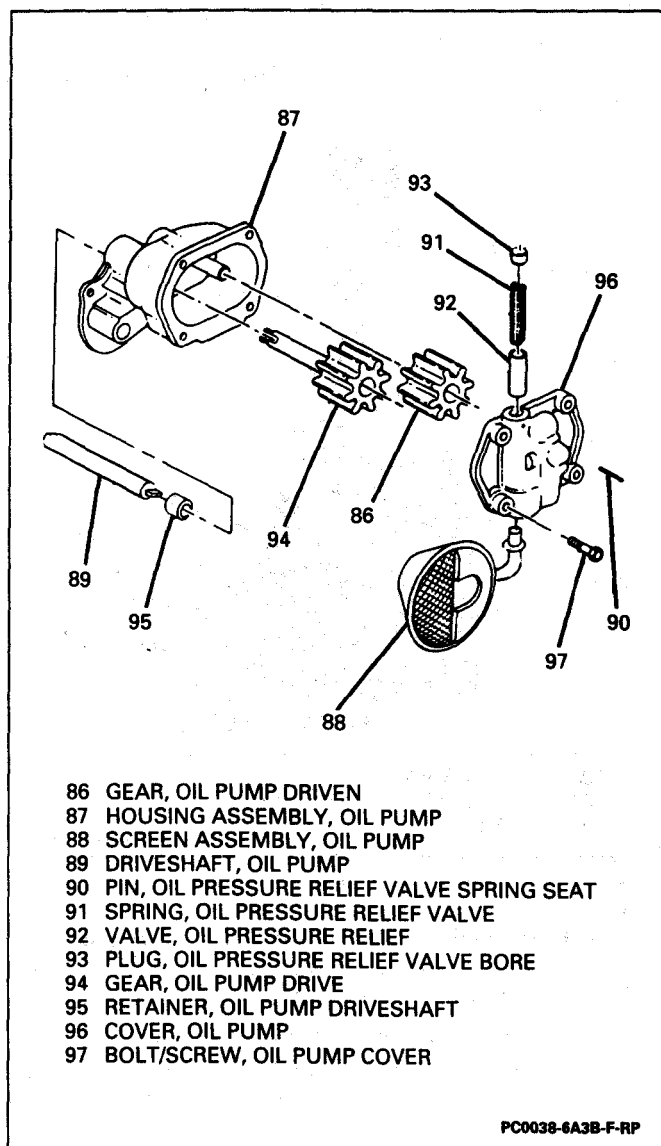


Figure 38 – Oil Pump Components



Assemble

Tool Required:

J 21882 Oil Suction Pipe Installer

NOTICE: See "Notice" on page 6A3B-1 of this section.



Important

- Be careful not to twist, shear, or collapse screen assembly while installing it to oil pump assembly.
1. A new screen assembly (88), if previously disassembled, to housing assembly (87).
 - A. Mount housing assembly (87) in a soft-jaw vise.
 - B. Apply sealer to end of pipe.
 - C. Tap pipe into place using J 21882 and a plastic-faced hammer.
 2. Relief valve (92), spring (91), plug (93) and pin (90).

**Important**

- With the engine running, add coolant to the radiator until the level reaches the bottom of the filler neck.

14. Open air bleed valves. When bubbles disappear and only coolant is visible, close heater air bleed valve.

- Place a shop towel under the bleed valves to prevent coolant from splashing onto distributor assembly.

CAUTION: Under some conditions, Ethylene Glycol in engine coolant is flammable. To avoid being burned when adding engine coolant, do not spill it on the exhaust system or on hot engine parts.

15. Fill the cooling system again after these procedures are completed.

NOTICE: Use Ethylene Glycol antifreeze meeting GM specification 1825-M to provide required freezing and corrosion protection – at least 50-percent solution, – 37°C (– 34°F).

**Important**

- When refilling the engine cooling system, add two engine coolant supplemental sealant pellets GM P/N 3634621 or equivalent) and coolant antifreeze meeting GM specification 2025-M.

16. Install the radiator cap assembly.

**Inspect**

- For leaks, after running engine until normal operating temperature is reached.

NOTICE: “LOW COOLANT” warning/indicator lamp may come on after this procedure. After operating vehicle so engine heats up and cools down three times, if “LOW COOLANT” warning/indicator lamp does not go out, or fails to come on at ignition check and coolant is above “FULL COLD” mark in reservoir assembly, refer to SECTION 8A. If at any time the “TEMP” warning/indicator lamp comes on, immediate action is required. Turn off engine and allow vehicle to cool. Do not remove coolant recovery reservoir cap at this time.

17. Test coolant concentration. Refer to “Testing the Coolant Concentration” in this section.

ALUMINUM RADIATOR SERVICE

Figures 3 and 4

This radiator uses an aluminum core with plastic side tanks. The core and side tanks can be replaced separately. Core repair is easily made with the hot melt adhesive method. A transmission oil cooler may be located in one of the side tanks. The drain cock is located on the lower part of one of the tanks.

The following components are serviceable:

- Radiator core.

- Tanks and gaskets. (Tanks cannot be repaired if broken or cracked).
- Oil cooler and gaskets.
- Drain cock and gaskets.

Precautions

CAUTION: Failure to follow any one of these procedures could result in personal injury or components damage.

- Do not remove radiator cap while engine is at normal operating temperature. Cooling system will release scalding fluid and steam under pressure if cap is removed while engine and radiator are still hot.
- Do not use boil-out tanks or any tank that has been used for copper or brass radiators.
- Do not open hood if steam or coolant can be seen escaping from engine compartment.
- Do not remove cap on coolant recovery reservoir if an engine over temperature is suspected.

Diagnosis

Leak Testing

Some core leaks can be detected by adding water to the radiator. Clean the core so the damaged area is easier to find.

On-Vehicle Pressure Testing

Figure 5

Tool Required:

J 24460-01 Cooling System Tester

1. Ensure that radiator hose clamps and heater hose clamps are properly positioned and secured.
2. Inspect connections for leaks. Repair as required.

CAUTION: To avoid being burned, do not remove radiator cap assembly while engine assembly is at normal operating temperature. The cooling system will release scalding fluid and steam under pressure if radiator filler cap assembly is removed while engine assembly and radiator assembly are still hot.

3. Remove radiator filler cap assembly.
4. Fill cooling system to base of radiator assembly neck.
5. Attach J 24460-01 to radiator assembly neck.
 - Follow instructions supplied with J 24460-01.
6. Build up pressure to no more than 138 kPa (20 psi).
7. System should hold pressure for about two minutes.
 - A. If a measurable amount of pressure drops in less than two minutes, check for leak.
 - B. Mark leaking area and remove radiator assembly for repair. Refer to “Radiator Assembly” in this section.

FUEL SENDER ASSEMBLY SERVICE

Figure 10

Remove or Disconnect

1. Relieve fuel system pressure (see "Fuel System Pressure Relief").
2. Drain fuel tank (see "Draining Fuel Tank").
3. Fuel tank (see "Fuel Tank Replacement").
4. Fuel sender assembly (see "Fuel Sender Assembly Replacement").

Disassemble

1. Support fuel sender assembly with one hand and grasp strainer with other hand.
 - Rotate strainer in one direction and pull fuel strainer off of pump. Discard strainer after inspection.

Inspect

- Fuel pump strainer. If strainer is contaminated, the fuel tank should be cleaned.
- Fuel pump inlet for dirt and debris. If found, fuel pump and reservoir should be replaced.

- If fuel pump and reservoir is being replaced, proceed to step 2. -

2. Vent hose and fuel return hose from under cover.

3. Quick-connect fitting on fuel feed hose (see "Servicing Quick-Connect Fittings").
4. Electrical connector from fuel pump.
5. Pry locking tabs on bottom of fuel reservoir, lift reservoir to clear locking tabs and pull reservoir downward to clear guides on fuel sender.
6. Bumper on fuel sender.

Assemble

1. New bumper on fuel sender.
2. Align tabs on reservoir with guide on fuel sender, push upward to stop on top of reservoir and snap locking tabs over ramps on bottom of reservoir.
3. Fuel vent and return hose.
4. Quick-connect fitting on fuel feed hose (see "Servicing Quick-Connect Fittings").
5. Electrical connector on fuel pump.
6. Push new fuel pump strainer onto fuel pump inlet. Push on outer edge of strainer ferrule until fully seated.

Install or Connect

1. Fuel sender assembly (see "Fuel Sender Assembly Replacement").
2. Fuel tank and check for leaks (see "Fuel Tank Replacement").

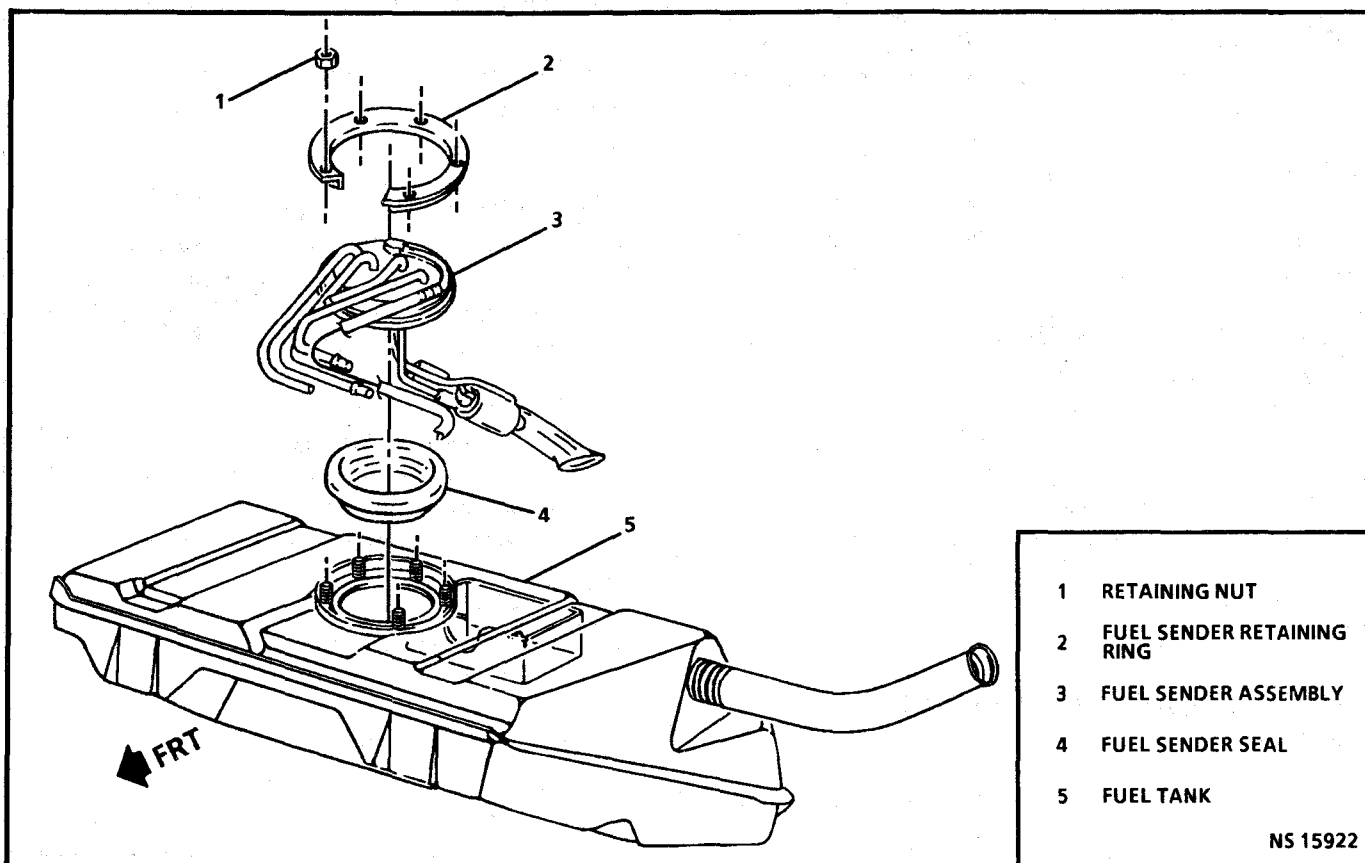


Figure 9 - Fuel Sender Assembly Replacement

PROBLEM	CAUSE
1. HIGH PITCHED WHINE DURING CRANKING (BEFORE ENGINE FIRES) BUT ENGINE CRANKS AND FIRES OK.	DISTANCE TOO GREAT BETWEEN STARTER DRIVE PINION AND FLYWHEEL ASSEMBLY.
2. HIGH PITCHED "WHINE" AFTER ENGINE FIRES, AS IGNITION KEY IS BEING RELEASED. ENGINE CRANKS AND FIRES OK. THIS INTERMITTENT COMPLAINT IS OFTEN DIAGNOSED AS "STARTER HANG-IN" OR "SOLENOID WEAK."	DISTANCE TOO SMALL BETWEEN STARTER DRIVE PINION AND FLYWHEEL ASSEMBLY. FLYWHEEL ASSEMBLY RUNOUT CONTRIBUTES TO THE INTERMITTENT NATURE.
3. A LOUD "WHOOOP" AFTER THE ENGINE FIRES BUT WHILE THE STARTER DRIVE PINION IS STILL HELD ENGAGED. SOUNDS LIKE A SIREN IF THE ENGINE IS REVVED WHILE STARTER DRIVE PINION IS ENGAGED.	A NEW STARTER DRIVE ASSEMBLY WILL OFTEN CORRECT THIS PROBLEM.
4. A "RUMBLE," "GROWL" OR (IN SEVERE CASES) A "KNOCK" AS THE STARTER MOTOR ASSEMBLY IS COASTING DOWN TO A STOP AFTER STARTING THE ENGINE.	MOST PROBABLE CAUSE IS A BENT OR UNBALANCED STARTER ARMATURE. A NEW STARTER ARMATURE WILL OFTEN CORRECT THIS PROBLEM.

PC6004-6D2-D-RP

Figure 4 – Starter Motor Assembly Noise Diagnosis

- Electrical leads from starter motor assembly (15 or 20).

- Note position of wires before disconnecting.

- Starter motor assembly (15 or 20).

Install or Connect

NOTICE: See "Notice" on page 6D2-1 of this section.

NOTICE: Before attaching electrical leads, tighten inner nuts on the solenoid terminals. If the nuts are not tight, solenoid cap may be damaged during installation of leads. Tighten inner nut of "BAT" terminal to 9 N•m (80 lb. in.) on both PG-250 and SD210 starter motor assemblies.

- Electrical leads to starter motor assembly (15 or 20).

Tighten

- Starter solenoid switch "BAT" terminal outer nut to 9 N•m (80 lb. in.).
- Starter solenoid switch "S" terminal nut to 2.5 N•m (22 lb. in.).

- Starter motor assembly (15 or 20) to engine assembly.

- Bolts/screws (16 and 17 or 21).

Tighten

- Bolts/screws (16 and 17 or 21) to 47 N•m (35 lb. ft.).

Measure

- Pinion-to-flywheel clearance (see Figure 6). Add shims (13 and 14 or 18 and 19) if necessary.

- Exhaust crossover pipe to the manifolds. Refer to SECTION 6F.

- Lower vehicle.

- Battery negative cable assembly.

Tighten

- Battery negative cable assembly to 15 N•m (11 lb. ft.).

UNIT REPAIR

STARTER SOLENOID SWITCH REPLACEMENT

5.7L LT1 Engine

Figure 7

When a "no crank and no sound" starter motor assembly condition exists, check solenoid switch (23) before disassembling starter motor assembly. Solenoid switch (23) can be checked without removal. Refer to "Cleaning, Inspection and Testing" in this section. Solenoid switch (23) must be replaced with drive housing (36). For removal and installation procedures, refer to "PG-250 Starter Motor Assembly Disassembly" and "PG-250 Starter Motor Assembly" in this section.

3.4L L32 Engine

Figure 8

Remove or Disconnect

- Starter solenoid switch nut (61).
- Field lead from solenoid switch "M" terminal.
- Nuts (62) and solenoid switch heat shield (71).
- Starter solenoid switch clamp bolts/screws (63) and clamp (66).
- Starter solenoid switch (56).

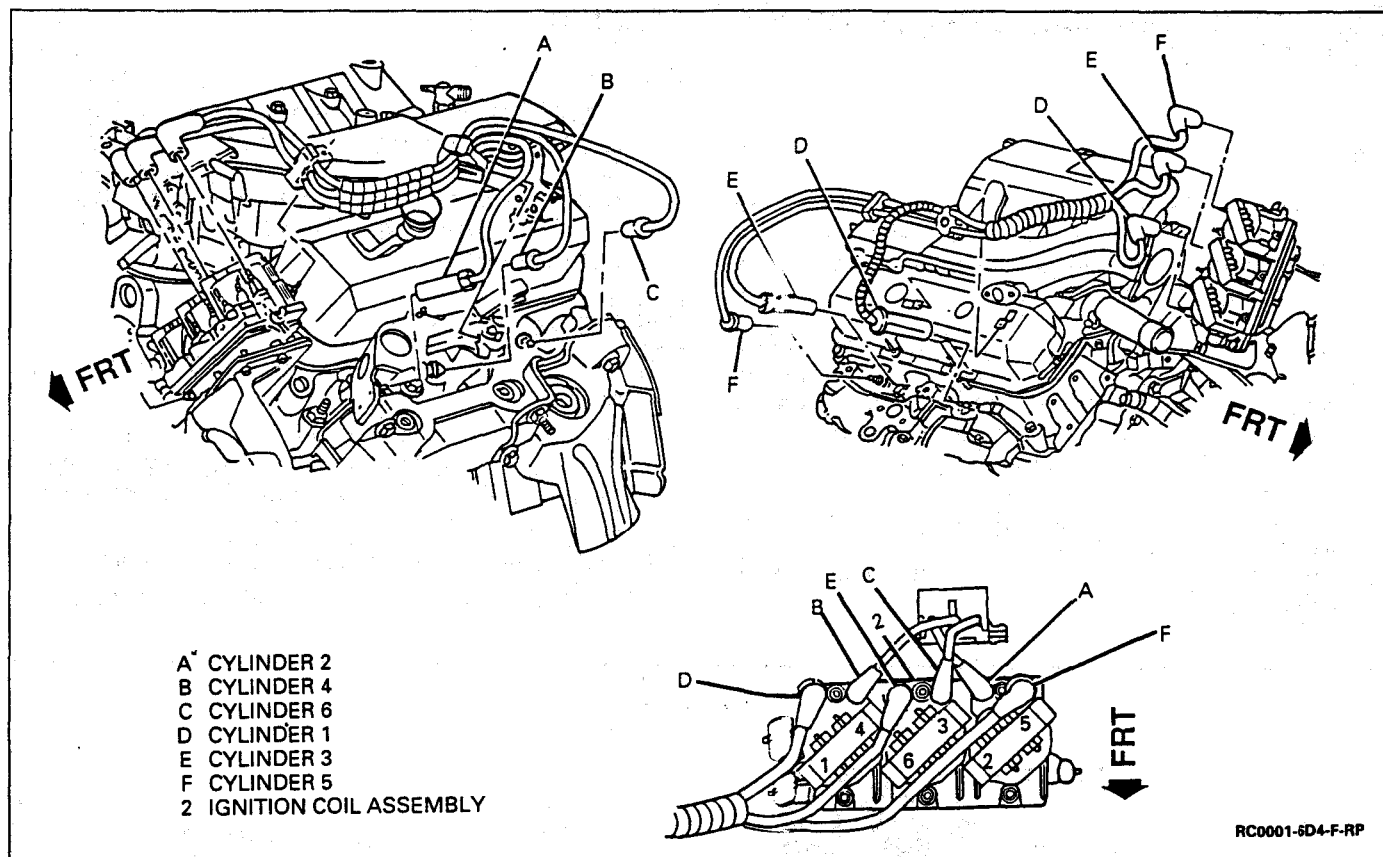


Figure 3 - Spark Plug Wire Harness Assembly Routing (3.4L L32 Engine)

Important

- Clean dirt and debris from spark plug recess areas.

3. Spark plugs from cylinder head assemblies.

Install or Connect

NOTICE: Be sure spark plugs thread smoothly into cylinder head assemblies and are fully seated. Cross-threading or failing to fully seat spark plugs can cause overheating of spark plugs, exhaust blow-by, or thread damage. Follow recommended torque specifications carefully. Over or under-tightening can also cause severe damage to cylinder head assemblies or spark plugs.

1. Spark plugs to cylinder head assemblies.

Tighten

- Spark plugs to 15 N•m (11 lb. ft.).
2. Spark plug wire harness assemblies, routed properly as note during removal.

DISTRIBUTOR (5.7L LT1 ENGINE)

Figure 4

Remove or Disconnect

1. Be sure ignition switch is in "OFF" or "LOCK" position.

2. Water pump assembly. Refer to SECTION 6B.
3. Crankshaft balancer assembly. Refer to SECTION 6A3A.
4. Spark plug wire harness assemblies from distributor assembly (1).
5. Four-terminal PCM connector from distributor assembly (1).
6. Distributor bolts/screws (3).
7. Distributor assembly (1).

A. Pull distributor assembly forward until driveshaft (4) disengages from end of camshaft assembly.

B. Mark top surface of driveshaft (4), for alignment during installation.

Install or Connect

NOTICE: See "Notice" on page 6D4-1 of this section.

1. Distributor driveshaft (4) into distributor assembly (1), if removed.
 - Turn driveshaft (4) until alignment mark made during removal is on top.
2. Distributor assembly (1) into position with drive-shaft (4) in end of camshaft assembly.
3. Distributor bolts/screws (3).

Tighten

- Bolts/screws (3) to 11 N•m (97 lb. in.).

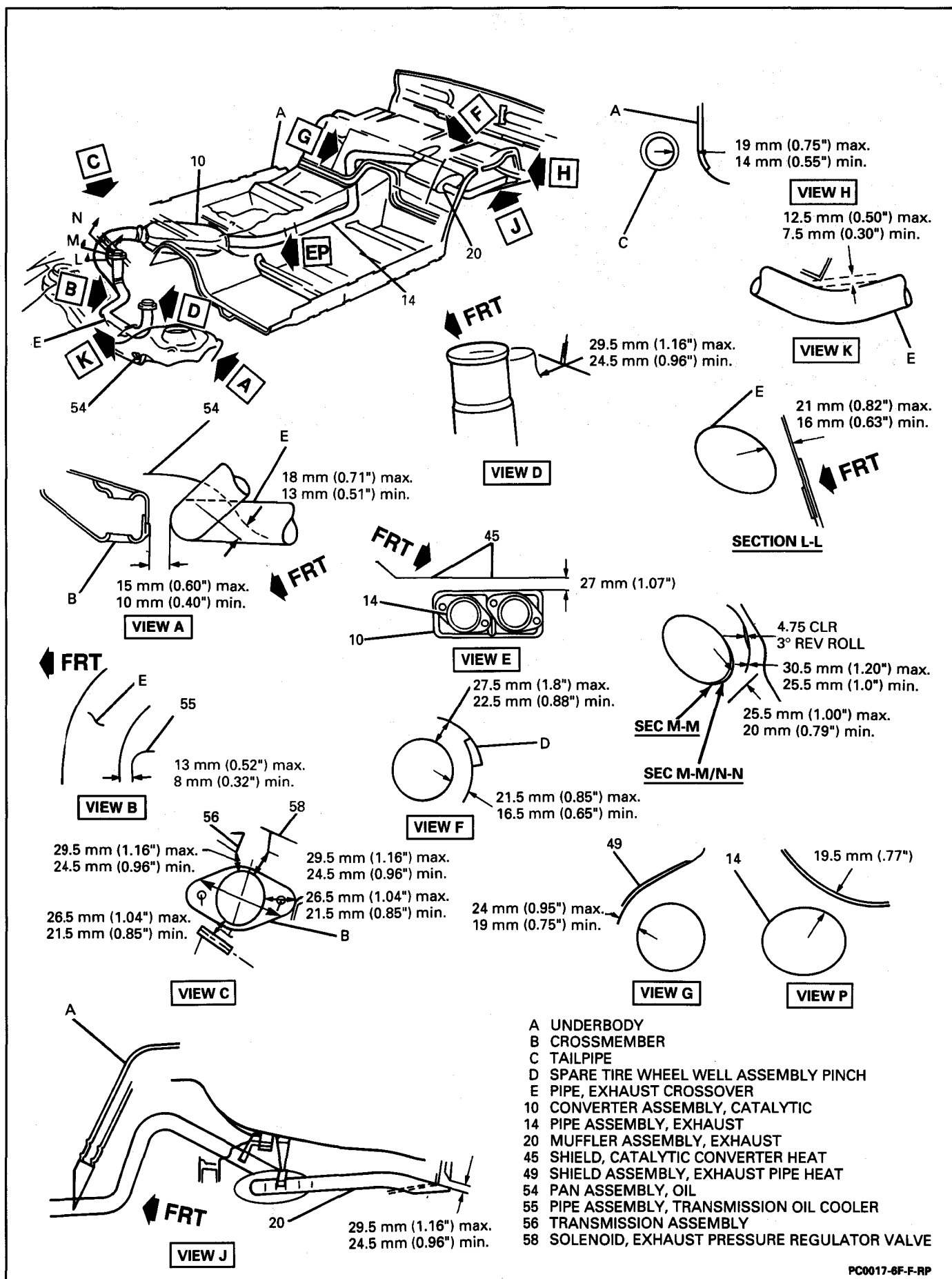


Figure 13 - Exhaust System Clearance Dimensions (5.7L LT1 Engine)

10. Catalytic converter hanger assembly. Refer to SECTION 6F.
11. Bolts/screws (840) from cover (839).
12. Cover (839) from transmission assembly (838).
13. Bolts/screws (842) from converter assembly (1).
14. Flywheel assembly (841) from converter assembly (1).
15. Move catalytic converter heat shield as necessary. Refer to SECTION 6F.
16. Automatic transmission range selector lever cable assembly. Refer to "Automatic Transmission Range Selector Lever Cable Assembly" in this section.
17. Transmission oil cooler pipe assemblies from transmission oil cooler pipe clips.
18. Electrical connectors at transmission assembly (838).
19. Bolts/screws (843 or 845).
20. Transmission fluid level indicator assembly.
21. Separate transmission assembly (838) from engine block.
22. Transmission oil cooler lines.
23. Lower transmission assembly (838) from vehicle.

Install or Connect

NOTICE: See "Notice" on page 7A-1 of this section.

1. Raise transmission assembly (838) into vehicle.
2. Transmission oil cooler lines.
3. Align transmission assembly (838) to engine block.
4. Transmission fluid level indicator assembly.
5. Bolts/screws (843 or 845).

Tighten

- Bolts/screws (843) to 47 N•m (35 lb. ft.).
- Bolts/screws (845) to 95 N•m (70 lb. ft.).

6. Electrical connectors to transmission assembly (838).
7. Transmission oil cooler pipe and hose assemblies to transmission oil cooler pipe clips.
8. Automatic transmission range selector lever cable assembly. Refer to "Automatic Transmission Range Selector Lever Cable Assembly" in this section.
9. Reposition catalytic converter heat shield. Refer to SECTION 6F.
10. Flywheel assembly (841) to converter assembly (1).
11. Bolts/screws (842) to converter assembly (1).

Tighten

- Bolts/screws (842) to 63 N•m (46 lb. ft.).

12. Converter cover (839) to transmission assembly (838).
13. Bolts/screws (840) to cover (839).

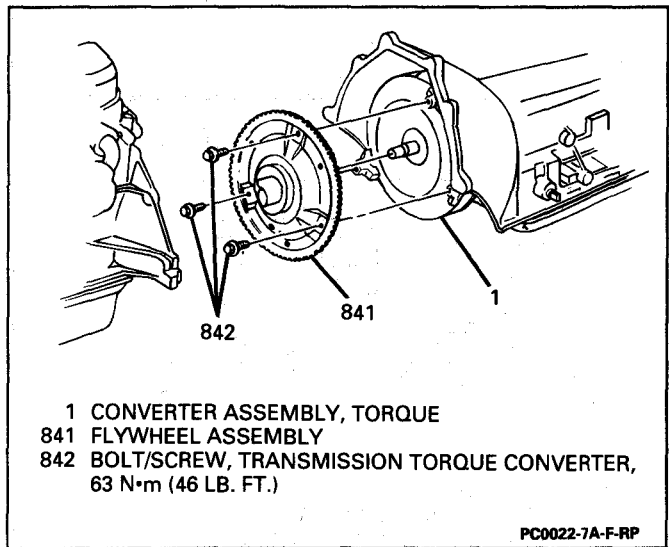


Figure 25 – Torque Converter Assembly-to-Flywheel Assembly

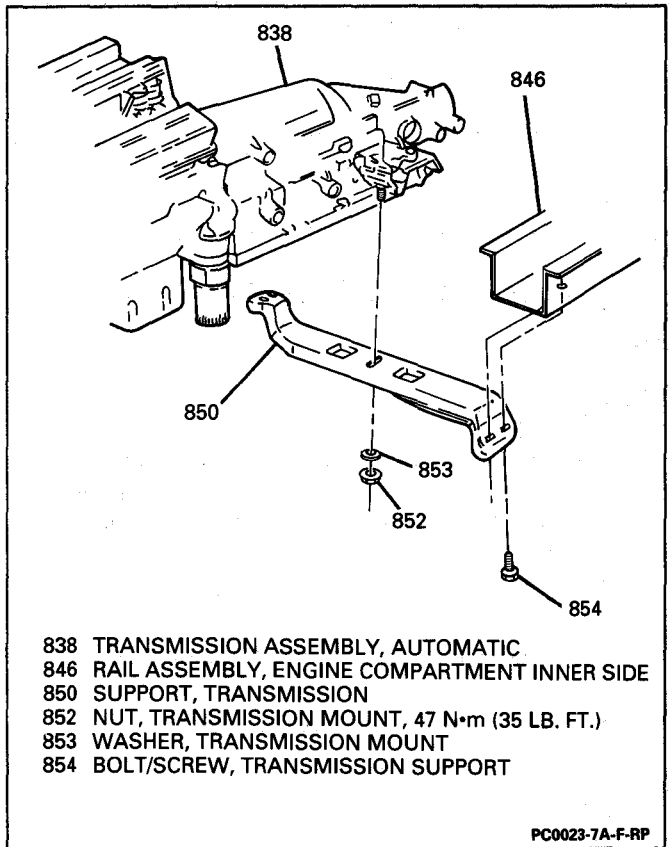


Figure 26 – Automatic Transmission Assembly Mounting

Tighten

- Bolts/screws (840) to 10 N•m (89 lb. in.).

14. Catalytic converter hanger assembly. Refer to SECTION 6F.
15. Rear axle torque arm. Refer to SECTION 3D.
16. Support (850) to transmission assembly (838) and rail assembly (846).

3-4 UPSHIFTS**EXAMPLE ONLY** (Refer to 1994 Hydra-matic 4L60-E Shift Speed Chart for Vehicle Application.)**TECH 1 INFORMATION**

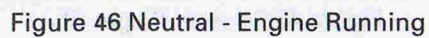
	3RD GEAR	4TH GEAR
ENGINE SPEED	1757 RPM	1617 RPM
TRANS OUTPUT SPD	1456 RPM	1534 RPM
TRANS FLUID TEMP	42°C	42°C
THROTTLE ANGLE	20 %	21 %
TRANS RANGE SW	DRIVE 4	DRIVE 4
COMMANDED GEAR	3	4
1-2 SOL 2-3 SOL	OFF OFF	ON OFF

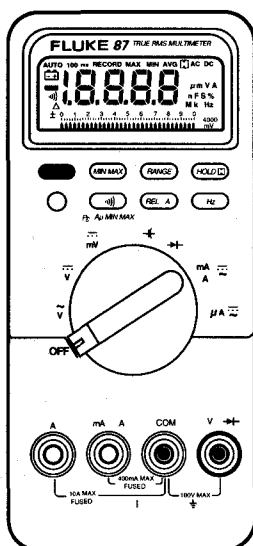
* THERE IS APPROXIMATELY 2 SECONDS OF DATA MISSING BETWEEN EACH COLUMN

NO 3-4 UPSHIFT

- TRANS OUTPUT SPD must be greater than 1250 RPM to upshift
 - Refer to 1993 HYDRA-MATIC 4L60-E SHIFT SPEED CHART
- ENGINE SPEED will drop approximately 100 RPM during a shift
- PRNDL SWITCH should match the selected gear range
 - In Drive 2 the transmission will not upshift to 3rd or 4th gears
 - In Drive 3 the transmission will not upshift to 4th gear but TCC will normally apply
- THROTTLE ANGLE should equal 0% at idle and 100% at wide-open-throttle
- If COMMANDED GEAR changes from 3 to 4 and the vehicle does not shift (ENGINE SPEED should drop approximately 100 RPM)
 - Refer to Diagnosis Charts (6E3).

Figure 18 Example of TECH 1 Information (3-4 Upshifts)





**FLUKE 87 TRUE RMS
MULTIMETER
J 39200**

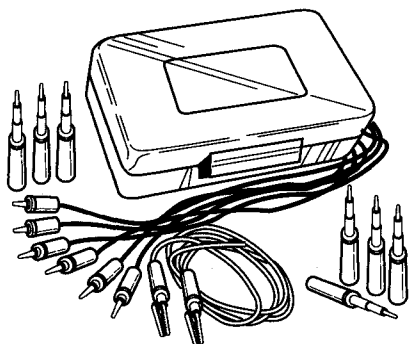
VOLTMETER – Voltage position measures magnitude of voltage when connected in parallel to an existing circuit. A digital voltmeter with a 10 meg ohm input impedance is used because this type of meter will not load down the circuit and result in faulty readings. Some circuits require accurate low voltage readings because they have a very high resistance.

AMMETER – When used as an ammeter, this meter accurately measures extremely low current flow. Refer to meter instructions for more information.

- Selector must be set properly for both function and range. DC is used for most automotive measurements.

OHMMETER – Measures resistance of circuit directly in ohms. Refer to meter instructions for more information.

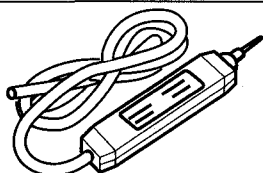
- OL display in all ranges indicates open circuit.
- Zero display in all ranges indicates a short circuit.
- An intermittent connection in a circuit may be indicated by a digital reading that will not stabilize on the circuit.
- Autoranges to the 400 Ω , 4 k Ω , 40 k Ω , 400 k Ω , 4 M Ω , or 40 M Ω resistance range.



J 35616-A

CONNECTOR TEST ADAPTER KIT

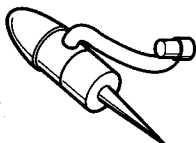
Assortment of flexible connectors to adapt a multimeter or jumper cords to connectors.



J 34636

CIRCUIT TESTER

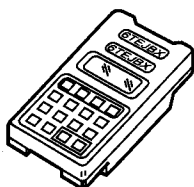
Used for checking all relays and solenoids before connecting them to a new ECM. Measures the circuit resistance and indicates pass or fail via green or red LED. Amber LED indicates current polarity. Can also be used as a non-powered continuity checker.



J 34142-A

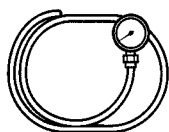
UNPOWERED TEST LIGHT

Used for checking wiring for complete circuit, short to ground, or voltage.



TECH 1 TESTER

Used to check solenoids and other electronic components. Can record vehicle data during dynamic testing, and turn some electronic components on and off.



J 21867

UNIVERSAL PRESSURE GAUGE SET

(9 Ft. Hose; 0-300 PSI)

Used for checking line pressure, pump output (min., max.) in all gear ranges.

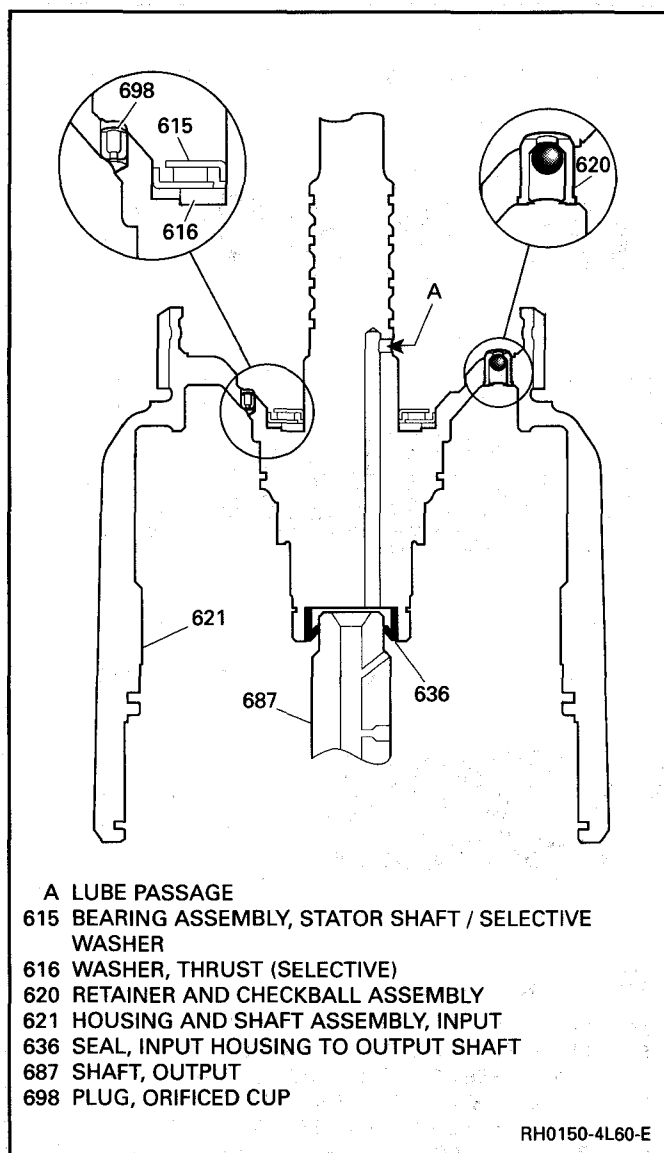


Figure 54 Input Housing Check Valve Ball

Inspect

Figures 54 and 56

- Turbine shaft O-ring seal (618) for:
 - Damage.
 - Nicks or cuts.
- Input housing check valve ball (620):
 - The ball must move freely.
 - Leak check the ball with solvent.

Important

- If the 3-4 clutch plates are burned or worn and a cause is not found during diagnosis or disassembly, replacement of the retainer and checkball assembly may be required (Figure 54).

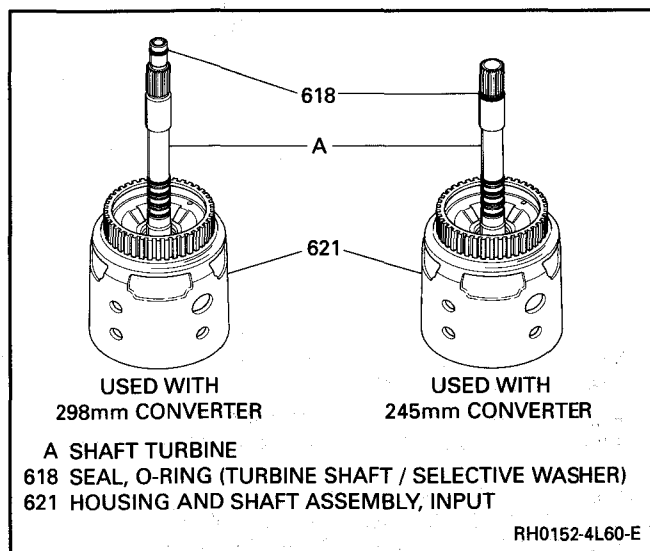


Figure 56 Views of the Input Housing

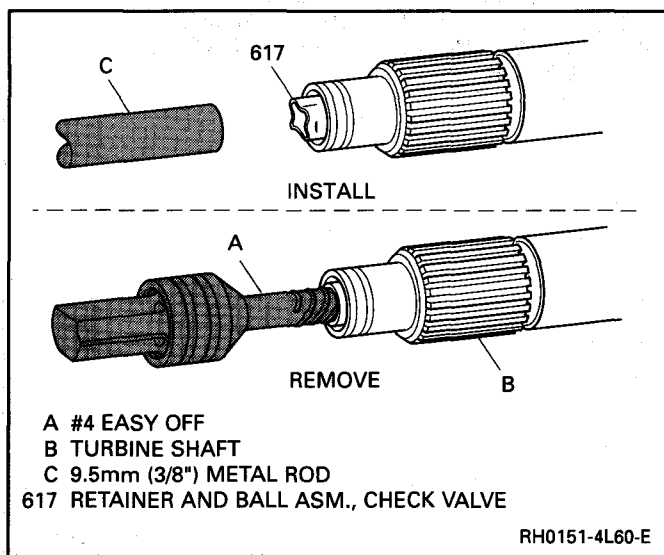


Figure 55 Retainer and Ball Assembly – Replacement

Remove or Disconnect

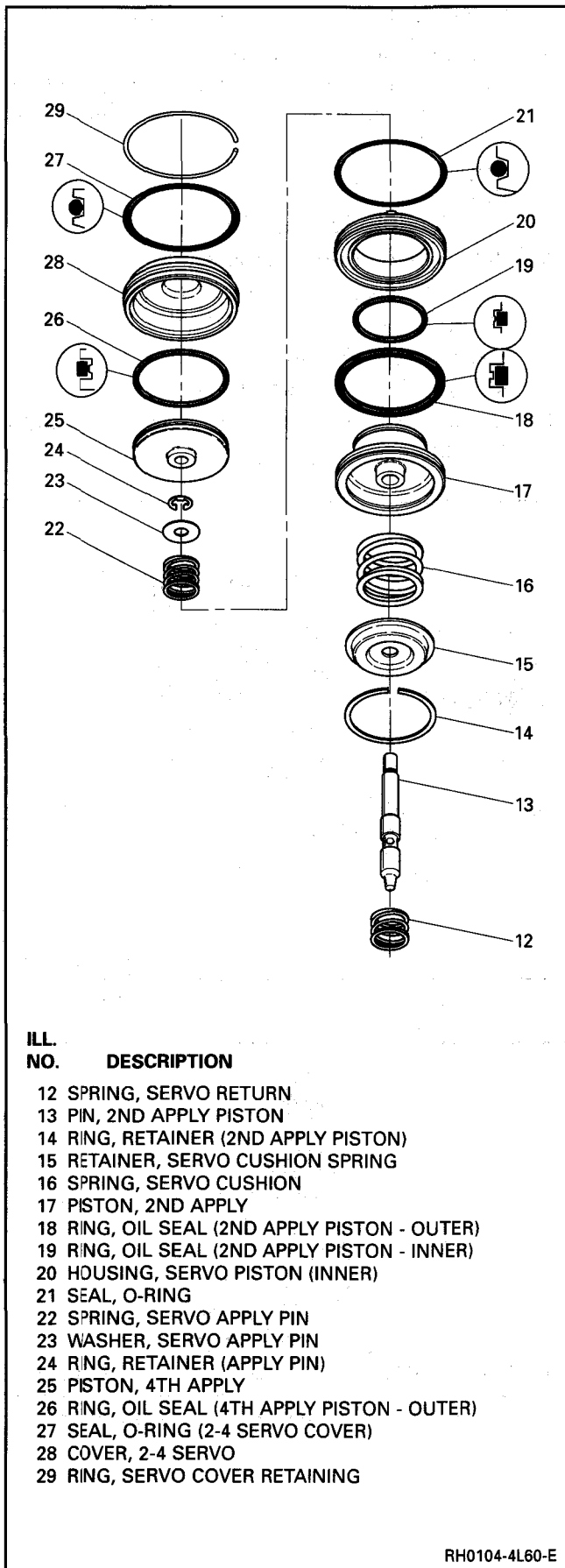
Figure 57

- Tap out retainer and ball assembly.

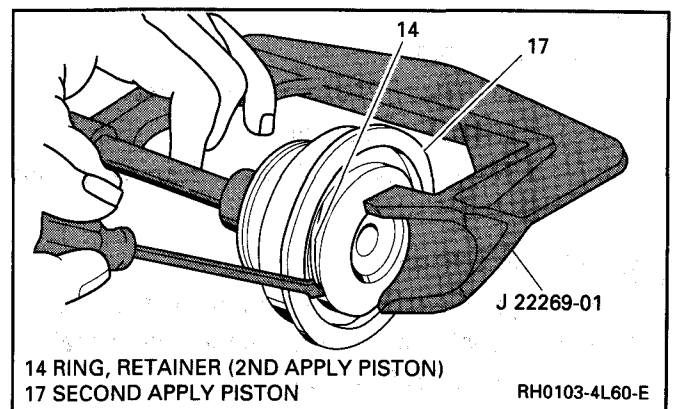
Install or Connect

Figures 55 and 57

- Using same tools, tap in retainer and ball assembly until shoulder is seated in housing.

**Assemble****Figures 118 through 120**

1. Cushion spring (16) into the 2nd apply piston (17).
2. Cushion spring retainer (15) on the cushion spring.
3. Install J 22269-01.
 - A. Compress the retainer past the snap ring groove in the 2nd apply piston.
 - B. Install the retainer ring (14).
4. The 2nd apply piston (17) onto the apply pin (13)
 - Retainer goes toward the shoulder of the pin.
5. Servo apply pin spring (22) on the pin.
6. Servo apply pin washer (23) and retaining clip (24).
7. Inner (19) and outer (18) seals on the 2nd apply piston (17).
 - Retain with Transjel™ J 36850 or equivalent.
8. O-ring seal (21) on servo piston housing.
9. Servo piston inner housing (20) on the 2nd apply piston.
10. Seal ring (26) onto the 4th apply piston.
11. The 4th apply piston (25) onto the apply pin.
12. Return spring (12) on the pin.
13. Servo piston assembly into the servo bore.
14. O-ring seal (21) on the servo cover.
 - Lubricate the seal with Transjel™ J 36850 or equivalent.
15. Servo cover (28) into the servo bore.
16. Install J 29714.
 - A. Compress the servo cover.
 - B. Install the retainer ring (29).

**Figure 119 2nd Servo Piston – Assembly****Figure 118 2-4 Servo Assembly**

Tighten

- Transmission control bolts/screws (19) to 17 N•m (13 lb. ft.).
4. Boot assembly (24).
 5. Boot bolts/screws (23).

Tighten

- Boot bolts/screws (23) to 1.7 N•m (15 lb. in.).
6. Front floor console trim plate assembly. Refer to SECTION 8C.

MANUAL TRANSMISSION CONTROL LEVER HANDLE ASSEMBLY (6-SPEED)

Figure 4

Remove or Disconnect

1. Front floor console trim plate assembly. Refer to SECTION 8C.
2. Control lever handle bolts/screws (27).
3. Control lever handle assembly (26).

Install or Connect

NOTICE: See "Notice" on page 7B-1 of this section.

1. Control lever handle assembly (26).
2. Control lever handle bolts/screws (27).

Tighten

- Control lever handle bolts/screws (27) to 25 N•m (18 lb. ft.).
3. Front floor console trim plate assembly. Refer to SECTION 8C.

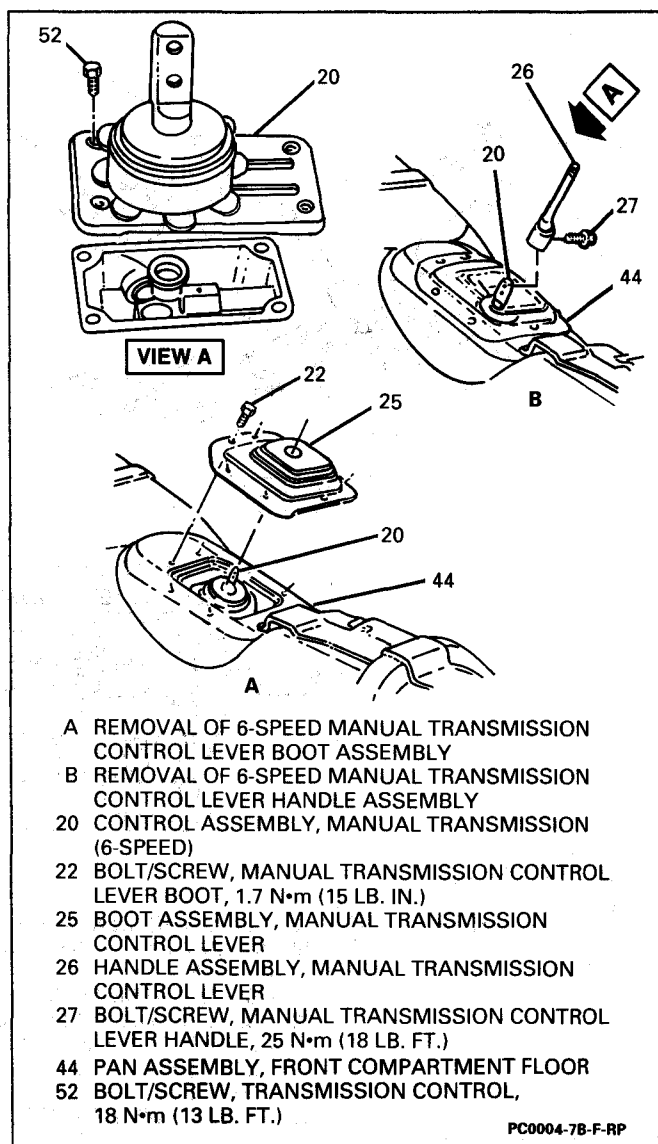


Figure 4 – Manual Transmission Control, Handle, and Boot Assemblies (6-Speed)

MANUAL TRANSMISSION CONTROL ASSEMBLY (6-SPEED)

Figure 4

Remove or Disconnect

1. Front floor console trim plate assembly. Refer to SECTION 8C.
2. Handle bolts/screws (27).
3. Handle assembly (26).
4. Boot bolts/screws (22).
5. Boot assembly (25).
6. Transmission control bolts/screws (52).
7. Control assembly (20).

Install or Connect

NOTICE: See "Notice" on page 7B-1 of this section.

Clean

- Sealant from manual transmission extension housing.
 - Sealant from control assembly (20), if reinstalling.
1. Apply a continuous 3 mm (1/8-inch) bead of RTV Sealant GM P/N 12345739, or equivalent to manual transmission extension housing-to-control assembly sealing surface.
 2. Control assembly (20).
 3. Transmission control bolts/screws (52).

Tighten

- Transmission control bolts/screws (52) to 18 N•m (13 lb. ft.).
4. Boot assembly (25).
 5. Boot bolts/screws (22).

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Catalytic Converter-to-Transmission Nut	52 N·m (38 lb. ft.)
Transmission-to-Flywheel Housing Bolt	75 N·m (55 lb. ft.)
Extension Housing Bolt	30 N·m (22 lb. ft.)
Transmission Cover-to-Case Bolt.....	13 N·m (115 lb. in.)
Front Bearing Retainer Bolt	20 N·m (15 lb. ft.)
Countershaft Retainer Bolt	20 N·m (15 lb. ft.)
Reverse Pivot Bolt	27 N·m (20 lb. ft.)
Fill Plug	27 N·m (20 lb. ft.)
Drain Plug	27 N·m (20 lb. ft.)
Support-to-Rail Bolt	54 N·m (40 lb. ft.)
Transmission Mount-to-Transmission Bolt	54 N·m (40 lb. ft.)
Transmission Mount-to-Support Nut.....	47 N·m (35 lb. ft.)
Transmission Mount-to-Support Bolt	54 N·m (40 lb. ft.)
Speed Sensor Retainer Bolt	10 N·m (89 lb. in.)
Shift Control Assembly Boot Screw	6 N·m (53 lb. in.)
Shift Control Assembly Bolt	17 N·m (13 lb. ft.)
Vehicle Speed Sensor Retainer Bolt.....	10 N·m (89 lb. in.)
Torque Arm Outer Bracket Nut	41 N·m (30 lb. ft.)
Torque Arm-to-Rear Axle Differential Nut	133 N·m (98 lb. ft.)

LUBRICANT SPECIFICATIONS

Lubricant Capacity (approximate).....	2.8 Liters (2.96 quarts)
Lubricant Recommended	Dexron®-IIE

SPEEDOMETER GEAR CHART

SPEEDOMETER GEAR CHART						
TIRE SIZE	AXLE RATIO	TRANSMISSION	DRIVE GEAR		DRIVEN GEAR	
			COLOR	TEETH	COLOR	TEETH
P215/65R15 P235/55R16 P245/50ZR16	3.08	M39	RED	9	GREY	22
P215/65R15 P245/50ZR16	3.42	MB1 MK6	PURPLE	7	WHITE	19

MC0004-7B-F-RP

UNIT ASSEMBLY

SHIFT RAIL ASSEMBLIES AND GEAR CLUSTERS

Figure 27

Tool Required:

J 36850 Transmission Assembly Lube



Install or Connect

- Lubricate all components as assembly progresses. Use J 36850 Transmission Assembly Lube or equivalent.
- 1. Selective shims (7 and 102). Refer to "Input Shaft/Mainshaft and Countershaft" under "Shimming Procedures" in this section.
- 2. Input shaft bearing race (8).
- 3. Countershaft bearing race (103).
- 4. Input shaft (10) and 4th gear blocker ring (12).
- 5. Shift rail assembly (149) to mainshaft assembly.
- 6. Mainshaft assembly with shift rail assembly (149).
- 7. Countershaft assembly.
 - A. Lift up mainshaft assembly enough to install countershaft assembly.
 - B. Countershaft assembly.
 - C. Lift mainshaft assembly enough to rotate input shaft (10) to engage synchronizer keys (16) with 4th gear blocker ring (12).
- 8. 5th/6th and reverse shift rail (140).
 - Align slots of shift rail levers with interlock plate (156).

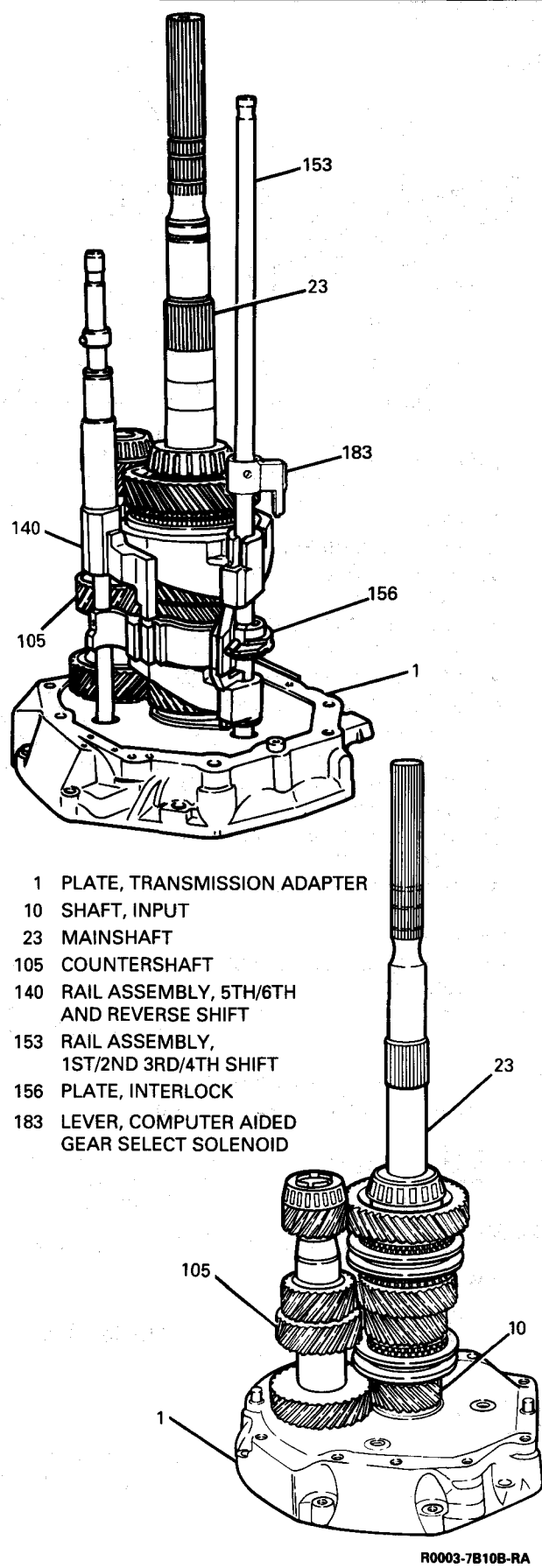


Figure 27 Shift Rail Assemblies and Gear Clusters

SECTION 8

ELECTRICAL

BODY AND CHASSIS

CONTENTS

Electrical Diagnosis	Section 8A
Lighting Systems and Horns	Section 8B
Instrument Panel, Gages and Console	Section 8C
Windshield Wiper/Washer System	Section 8E

3. Bolts/screws (67) attaching brackets (68) to instrument panel carrier.
4. Brackets (68) and attached radio assembly (66) from instrument panel carrier.
5. Instrument panel wiring harness electrical connectors from radio assembly (66).
6. Bolts/screws (65) and nuts (64) attaching radio assembly (66) to brackets (68), if necessary.
7. Radio assembly (66) from brackets (68), if necessary.

Install or Connect

NOTICE: See "Notice" on page 8C-1 of this section.

1. Brackets (68) to radio assembly (66), if removed.
2. Bolts/screws (65) and nuts (64) attaching brackets (68) to radio assembly (66), if removed.

Tighten

- Nuts (64) to 2.8 N•m (25 lb. in.).
3. Instrument panel wiring harness electrical connectors to radio assembly (66).
 4. Brackets (68) and attached radio assembly (66) to instrument panel carrier.
 5. Bolts/screws (67) attaching brackets (68) to instrument panel carrier.

Tighten

- Bolts/screws (67) to 1.8 N•m (16 lb. in.).
6. Bolts/screws (16) attaching trim plate assembly (15) to instrument panel assembly.

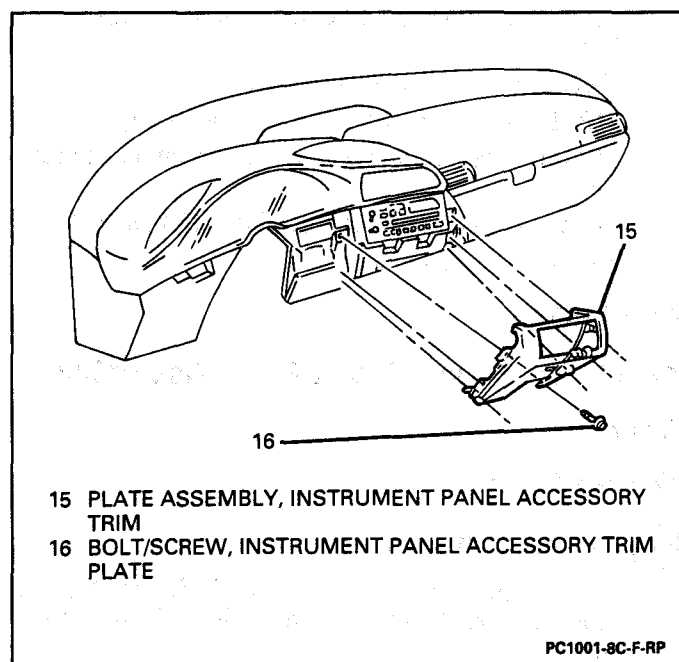


Figure 1 – Instrument Panel Accessory Trim Plate Assembly – (Chevrolet)

7. Driver knee bolster assembly. Refer to "Driver Knee Bolster Assembly and Deflector" in this section.

Pontiac

Figures 3 and 4

Remove or Disconnect

1. Driver knee bolster assembly. Refer to "Driver Knee Bolster Assembly and Deflector" in this section.
2. Trim plate assembly (15) from instrument panel assembly (40).
3. Bolt/screw (63) from instrument panel tie bar assembly, if necessary.
4. Retainer (62) and bolt/screw (65) from bracket (27).
5. Radio assembly (66).
6. Bolts/screws (67) attaching brackets (68) to instrument panel carrier.
7. Brackets (68) and attached radio assembly (66) from instrument panel carrier.
8. Instrument panel wiring harness electrical connectors from radio assembly (66).
9. Bolts/screws (65) and nuts (64) attaching radio assembly (66) to brackets (68), if necessary.
10. Radio assembly (66) from brackets (68), if necessary.

Install or Connect

NOTICE: See "Notice" on page 8C-1 of this section.

1. Brackets (68) to radio assembly (66), if removed.
2. Bolts/screws (65) and nuts (64) attaching brackets (68) to radio assembly (66), if removed.

Tighten

- Nuts (64) to 2.8 N•m (25 lb. in.).
3. Instrument panel wiring harness electrical connectors to radio assembly (66).
 4. Brackets (68) and attached radio assembly (66) to instrument panel carrier.
 5. Bolts/screws (67) attaching brackets (68) to instrument panel carrier.

Tighten

- Bolts/screws (67) to 1.8 N•m (16 lb. in.).
6. Radio assembly (66) to instrument panel assembly (40).
 7. Retainer (62) and bolt/screw (65) to bracket (27).
 8. Bolt/screw (63) to instrument panel tie bar assembly, if removed.

Tighten

- Bolt/screw (63) to 1.9 N•m (17 lb. in.).

Low Speed Operation

In the LO position of the wiper switch, battery voltage is applied to the wiper motor connector at terminal "B" through CKT 143 and terminal "E" through CKT 112, with voltage applied to terminal "D" through CKT 113.

The circuit board supplies power to the wiper motor, which runs continuously through the low speed relay.

High Speed Operation

In the HI position of the wiper switch, battery voltage is applied at terminals "B", "C" and "E" of the wiper motor assembly through CKTs 143, 92 and 112. Voltage also is applied to terminal "D" through CKT 113.

Park Position Operation

When turned OFF from any position, the wipers complete the last sweep and park. When the wiper switch is in OFF, the wiper motor assembly has battery voltage applied to terminal "B" only, from CKT 143. When the end of sweep switch opens, the control circuit reverses the wiper motor which activates the external depressed park mechanism. The wiper motor continues to run until the park switch opens.

Washer Operation

When the washer switch is turned to ON, battery voltage is applied to terminal "D" of the wiper motor assembly through CKT 113. The washer switch also applies voltage to terminal "A" which turns ON the washer pump through CKTs 94 and 228. The wiper motor has voltage applied through the low speed relay and operates at low speed for 2 to 4 wipes.

When the washer switch is held ON, the wiper motor circuit board will keep the washer pump ON only as long as the washer switch is held ON.

If the wipers had been in DELAY, LO or HI, they would return to that operation after the wash cycle. If in OFF, they then return to park position after 2 to 4 wipes.

Mist Operation

When the wiper switch is moved to MIST and released, the wipers make one sweep at low speed and return to park position. If the wiper switch is held in MIST, the wipers will continue to operate until the switch is released. The circuit operation is the same as that of low speed.

DIAGNOSIS

COMPONENT LOCATIONS

- Refer to Figure 4 for a list of component locations.

TROUBLESHOOTING HINTS

Figure 2

- Make the following checks before beginning System Diagnosis.
 1. Check fuse 14. If open, check for short to ground through CKT 143 and replace fuse.
 2. Check that all system connectors are mated firmly.
 3. If washer does not operate, check that:
 - Washer reservoir is filled.
 - Hoses are correctly attached.
 - Hoses are not cut, kinked or pinched.
 - Nozzles are not clogged.
 - Connector seal at washer pump is not damaged or missing.
 4. Check for binding or broken wiper arm linkage.
- Refer to System Diagnosis.

SYSTEM DIAGNOSIS

- Perform the System Check (Figure 5), then refer to the Symptom Table (Figure 6) for the appropriate diagnostic procedures.

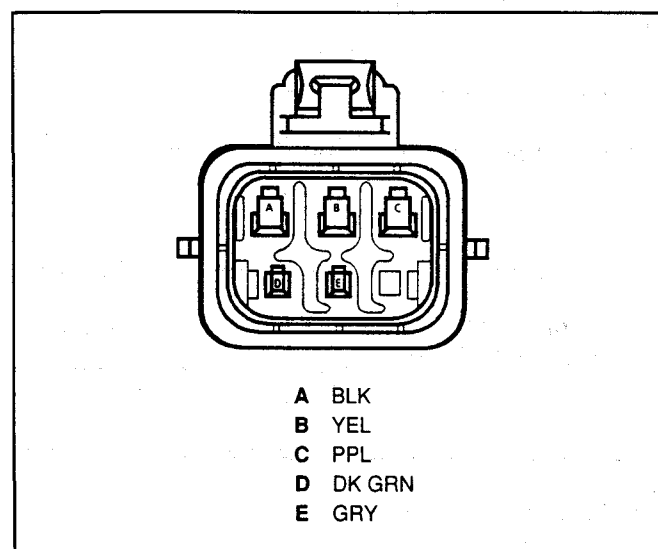


Figure 3 – Wiper Motor Wiring Harness Connector

1. Press and hold "HR" (hour) until the correct hour appears.
2. Press and hold "MIN" (minute) until the correct minute appears.

There will be a two-second delay before the clock goes into the time-set mode.

Push Buttons

To preset six AM stations and six FM1 stations or six FM2 stations:

1. Tune in desired station.
2. Press and hold one of the six push buttons until display shows "SET." Whenever pressing that button, the preset station will return.

Repeat these steps for each push button.

Speaker Adjustment

Balance Knob: Press "BAL" knob to release the knob. Turn the knob to move the sound between the right and left speakers. Push "BAL" knob back in to store it when not adjusting.

Fade Knob: Press "FADE" knob to release the knob. Turn the knob to move the sound between the front and rear speakers. Push "FADE" knob back in to store it when not adjusting.

Steering Wheel Controls

Vehicles equipped with this radio have steering wheel controls for the audio system. With steering wheel controls, use the buttons on the steering wheel to:

1. Turn the radio on or off.
2. Adjust the volume.
3. Choose AM, FM1 or FM2.
4. Use the "SEEK" and "RECALL" functions.
5. Choose one of the preset stations.

Setting the Graphic Equalizer

Use the levers to set the bass, midrange and treble until you get the sound you want. The 40, 100, 250 and 625 levers adjust the bass; 1.6K is midrange, and 4K and 12K control the treble. The 1.6K lever may be set in the middle position and then the other levers may be moved up or down until a satisfactory amount of bass and treble is achieved.

Compact Disc Player

With the radio assembly on, insert the disc into the slot, label side up (player pulls it in). "CD" will appear on the display and track 1 will begin to play. If the disc comes back out and "ERR" appears on display, check to see if:

- Disc is upside down.
- Disc is dirty, scratched or wet.
- Too much moisture is in the air.
- Temperature is too hot or too cold.

"RECALL"

Press "RECALL" to see current track number. Press "RECALL" again within five seconds to see time elapsed

in current track on the display. The track number also appears when the disc is inserted.

"PREV" (Previous)

Press "PREV" to play track again. If held or pressed more than once, the disc will return to previous track. If "PREV" is pressed within eight seconds from start of track, the disc will go to the beginning of the previous track and begin to play. If "PREV" button is pressed after eight seconds into the track, the disc will go to the beginning of the current track and begin to play.

To Play Next Selection

Press "NEXT" or "SEEK ▲" when you want to hear the next track now (before the present track is finished). If "NEXT" or "SEEK ▲" is held or pressed more than once, the disc will advance farther.

To Replay Current Selection

Press "PREV" or "SEEK ▼" to play a track again. If you press and hold these buttons or press more than once, the disc will return to previous tracks.

"FWD" (Forward)

Press and hold "FWD" to advance quickly within a track. Release it to resume playing. The radio will play during this operation.

"REV" (Reverse)

Push "REV" and hold it to return quickly to a favorite passage on the disc. Release it to resume playing.

"RDM" (Random)

Press this button and the player chooses a random order of tracks to play. When the final random track has been played, the disc will play the same random selection again. Press "RDM" again for a different selection of tracks.

To Stop Disc Player

Any of the following steps will stop the disc player:

- Turn the power off or turn the ignition key off. The disc stays in the player and will resume playing at the point where it stopped.
- Press "AM/FM" to stop playing the disc and switch to the radio. Press "CD/PLAY" to restart the disc at the point where it stopped.
- Press "EJECT" to eject the disc or stop the disc and switch to radio. "EJECT" will work with the ignition or radio off. Press "EJECT" to load a disc when the radio is off.

SETTING RADIO ANTI-THEFT FEATURE

Delco®-Loc II and Theftlock is a security feature which can be used or ignored. If ignored, the radio assembly will play normally. If used, the radio assembly will be useless if stolen because it won't turn on.

This is how to enter a secret code into the radio assembly. If battery power is lost for any reason, the secret code must be entered again before the radio assembly will turn on.

COMPONENT	LOCATION	SECTION 8A-201-PG	FIG.	CONN
C200D (48 cavities)	Part of I/P Harn, between LH kick panel and Steering Column	47	72	202-2
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	46	67	202-16
C230 (10 cavities)	Under RH side of I/P, behind kick panel	46	67	202-7
G103 (LT1)	RH side of Engine Block, just above Starter (2 rings, 2 wires)	25	42	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	46	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and ECM breakout			
S110 (L32)	Engine Harn, approx 7 cm from main branch and ECM breakout			
S205	I/P Harn, approx 31 cm from Convenience Center breakout			
S209	I/P Harn, approx 24 cm from Convenience Center breakout			
S215	I/P Harn, approx 30 cm before DLC breakout			
S223	I/P Harn, approx 4 cm before DLC breakout			

For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Check the Ignition Key for a cracked resistor pellet or a pellet that is dirty or coated. Also check that the Ignition Key is free from excess plastic around the resistor pellet contacts.
2. Check owner's Ignition Key using the J 35628-A Interrogator or equivalent. If the Key Code window shows "E", replace the owner's key. (See "Key Replacement," page 9D-15.)
3. Check the key pellet sensing contacts in the Ignition Lock Cylinder by looking into the key opening. If the contacts are damaged or not silver in color, replace the Lock Cylinder.
4. Check for an open "PCM IGN Fuse 5" or "PCM BATT Fuse 4". Also check the I/P Fuse Block contacts for each fuse.
5. If the Theft Deterrent Relay must be replaced, also check CKT 6 to the Starter Solenoid for a possible short. A short may have caused the relay to fail.
6. To check the contacts to the key and the wires in the Steering Column, disconnect the connector near the base of the column. Use the J 39200 DVM set on "MIN MAX" to measure the resistance back to the key at this connector while you turn and adjust the Steering Wheel. If there is any change or intermittent reading, replace the Lock Cylinder and the Steering Column wires that come with it. See SECTION 3F5.
7. Check for a broken (or partially broken) wire inside of the insulation which could cause system malfunction but prove "GOOD" in a continuity/voltage check with a system disconnected. These circuits may be intermittent or resistive when loaded, and if possible, should be checked by monitoring for a voltage drop with the system operational (under load).

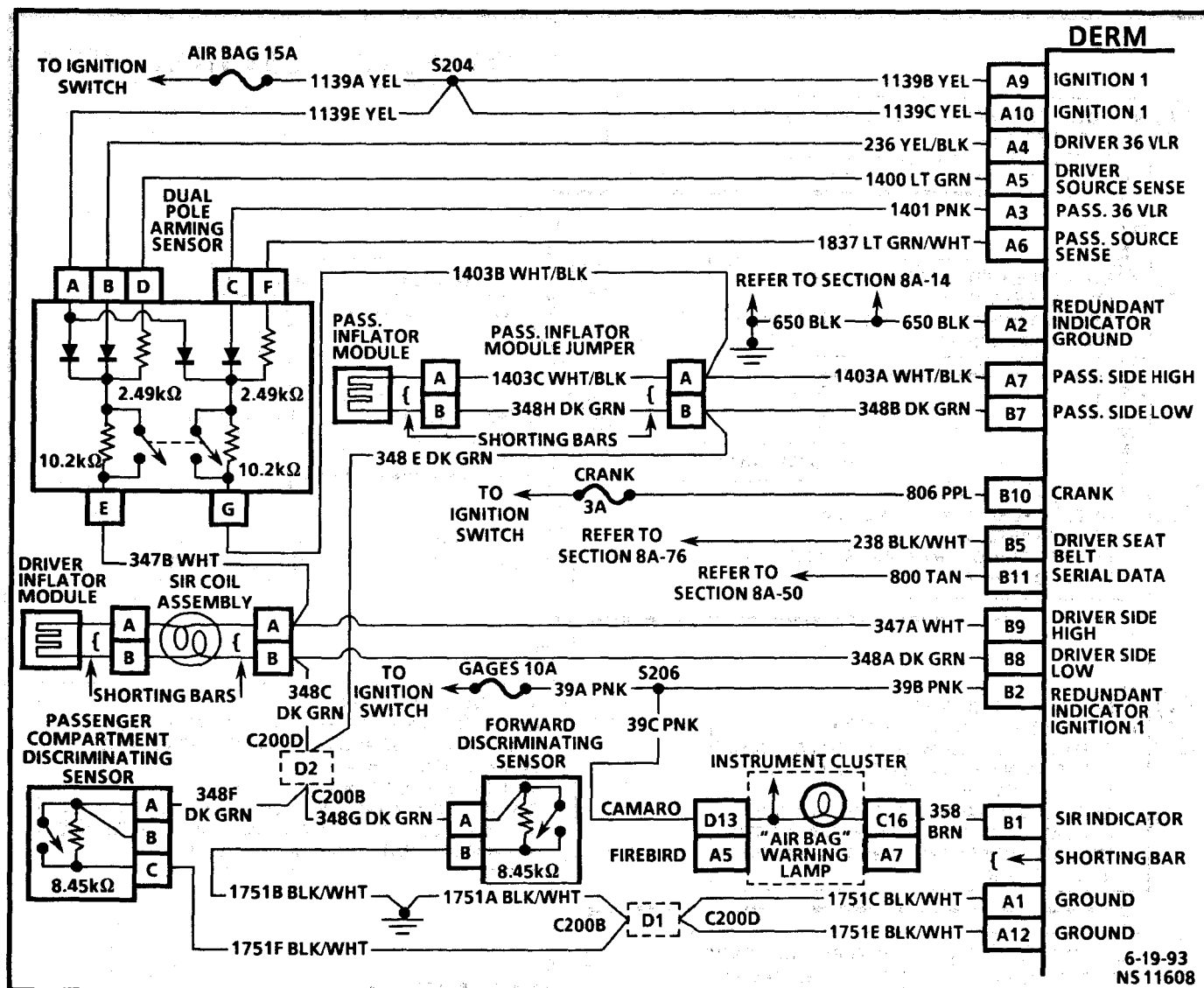


CHART A
DERM INTEGRITY CHECK

Circuit Description:

When the DERM recognizes "Ignition 1" voltage, applied to terminals "A9" and "A10", is in the normal operating voltage range, the "AIR BAG" warning lamp is flashed 7 times to verify operation. At this time the DERM performs "Turn-ON" tests followed by "Continuous Monitoring" tests. When no malfunctions are detected the DERM proceeds to the "Initiator Assembly Resistance Test." When a malfunction is detected the DERM sets a current diagnostic trouble code and illuminates the "AIR BAG" warning lamp. The DERM will clear current diagnostic trouble codes and move them to a history file when the malfunction is no longer detected and/or the ignition switch is cycled, except for DTC 51. DTC 51 can only be cleared using a scan tool "Clear Codes" command.

Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test confirms a current malfunction. If no current malfunction is occurring (history DTC set) the "Diagnostic Aids" for the appropriate diagnostic trouble code should be referenced. The DERM should not be replaced for a history diagnostic trouble code.
2. This test checks for a malfunction introduced into the SIR system during the diagnostic process. It is extremely unlikely that a malfunctioning DERM would cause a new malfunction to occur during the diagnostic process.
3. When all circuitry outside the DERM has been found to operate properly, as indicated by the appropriate diagnostic chart, then and only then should the DERM be replaced.

DTC 22**DRIVER INITIATOR CIRCUIT
RESISTANCE LOW**

WAS THE "SIR DIAGNOSTIC SYSTEM CHECK" PERFORMED?

YES

NO

WHEN MEASUREMENTS ARE REQUESTED IN THIS CHART USE J 39200 DVM WITH CORRECT TERMINAL ADAPTER FROM J 35616-A. WHEN A CHECK FOR PROPER CONNECTION IS REQUESTED REFER TO "INTERMITTENTS AND POOR CONNECTIONS" IN SECTION 8A-4. WHEN A WIRE, CONNECTOR OR TERMINAL REPAIR IS REQUESTED USE J 38125-A TERMINAL REPAIR KIT AND REFER TO "WIRING REPAIR" IN THIS SECTION.

GO TO THE "SIR DIAGNOSTIC SYSTEM CHECK."

1 IS DTC 16 ALSO CURRENT?

NO

YES

- 2
- IGNITION SWITCH "OFF."
 - DISCONNECT DRIVER AND PASSENGER INFLATOR MODULES, YELLOW 2-WAY CONNECTORS LOCATED NEAR THE BASE OF THE STEERING COLUMN AND BEHIND THE I/P COMPARTMENT DOOR ASSEMBLY.
 - CONNECT J 38715 SIR DRIVER/PASSENGER LOAD TOOL TO STEERING COLUMN HARNESS CONNECTOR AND PASSENGER INFLATOR MODULE HARNESS CONNECTOR.
 - IGNITION SWITCH "ON."
- IS DTC 22 CURRENT?

- IGNITION SWITCH "OFF."
- DISCONNECT DRIVER AND PASSENGER INFLATOR MODULES, YELLOW 2-WAY CONNECTORS LOCATED NEAR THE BASE OF THE STEERING COLUMN AND BEHIND THE I/P COMPARTMENT DOOR ASSEMBLY.
- REPAIR SHORT FROM CKT 347 TO CKT 1403.

YES

NO

- 3
- IGNITION SWITCH "OFF."
 - DISCONNECT SIR DRIVER/PASSENGER LOAD TOOL.
 - DISCONNECT DERM.
 - MEASURE RESISTANCE ON DERM HARNESS CONNECTOR FROM TERMINAL "B8" TO TERMINAL "B9".
- DOES J 39200 DISPLAY "OL" (INFINITE)?

- 4
- IGNITION SWITCH "OFF."
 - DISCONNECT SIR DRIVER/PASSENGER LOAD TOOL FROM STEERING COLUMN HARNESS CONNECTOR.
 - REMOVE INFLATOR MODULE FROM STEERING WHEEL, REFER TO SECTION 3F.
 - CONNECT SIR DRIVER/PASSENGER LOAD TOOL TO INFLATOR MODULE CONNECTOR ON STEERING COLUMN.
 - RECONNECT STEERING COLUMN CONNECTOR TO STEERING COLUMN HARNESS CONNECTOR.
 - IGNITION SWITCH "ON."
- IS DTC 22 CURRENT?

YES

NO

GO TO CHART A.

REPAIR SHORT FROM
CKT 347 TO CKT 348.

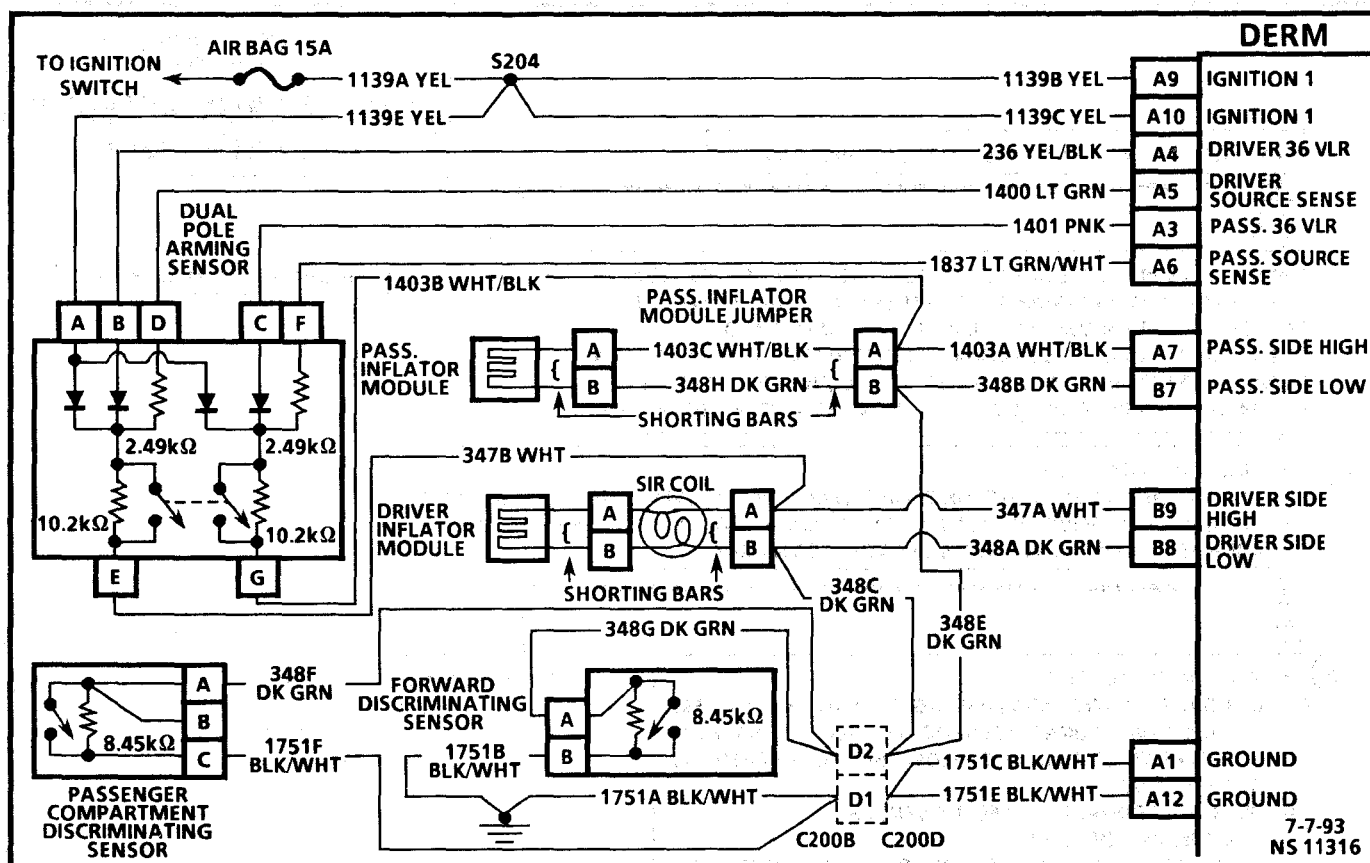
YES

NO

- IGNITION SWITCH "OFF."
- REPLACE SIR COIL, REFER TO SECTION 3F5B.

- IGNITION SWITCH "OFF."
- REPLACE DRIVER INFLATOR MODULE, REFER TO SECTION 3F.

- RECONNECT ALL SIR SYSTEM COMPONENTS, ENSURE ALL COMPONENTS ARE PROPERLY MOUNTED.
- CLEAR SIR DIAGNOSTIC TROUBLE CODES.
- REPEAT "SIR DIAGNOSTIC SYSTEM CHECK."



DTC 43

DRIVER SOURCE FEED LOW

Circuit Description:

During normal, non-deployment operation of the SIR system the DERM monitors the voltage supplied through the dual pole arming sensor to the high side of the driver deployment loop at the "Driver Source Sense" terminal "A5". This measured voltage will have a value approximately equal to "Driver 36 VLR." When the voltage measured at "Driver Side Low" terminal "B8" is in its normal operating range, indicating driver deployment loop integrity has been maintained, while simultaneously the voltage measured at "Driver Source Sense" is a specified amount below "Driver 36 VLR" for 500 milliseconds DTC 43 is set.

DTC Will Set When: The voltage measured at "Driver Side Low" terminal "B8" is within a specified percentage of "Driver 36 VLR" while simultaneously the voltage measured at "Driver Source Sense" terminal "A5" is a specified amount below "Driver 36 VLR" for 500 milliseconds. This test is run every 100 milliseconds during the "Continuous Monitoring" tests.

Action Taken: DERM turns "ON" the "AIR BAG" warning lamp and sets a diagnostic trouble code.

DTC Will Clear When: The voltage measured at "Driver Side Low" terminal "B8" is within a specified percentage of "Driver 36 VLR" while simultaneously the voltage measured at "Driver Source Sense" terminal "A5" is within a specified amount of "Driver 36 VLR" for 500 milliseconds.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test checks for an open in "Driver Source Sense" circuit.
2. This test checks for a short from the "Driver Source Sense" circuit to ground.
3. The test determines whether the malfunction is due to increased resistance across the "Driver

Source Sense" resistor in the dual pole arming sensor.

Diagnostic Aids: An intermittent condition is likely to be caused by a poor connection to the DERM at terminal "A5", a poor connection to the dual pole arming sensor at terminal "D", an open or short to ground in CKT 1400 or a partial open inside the dual pole arming sensor.

3. When a discriminating sensor or arming sensor is replaced, it **MUST** be oriented with the arrow on the sensor pointing toward the front of the vehicle. It is very important for the discriminating sensors and arming sensor to be located flat on the mounting surface, parallel to the vehicle datum line. It is important that the sensor mounting surface is free of any dirt or other foreign material.
4. Do not apply power to the SIR system unless all components are connected or a diagnostic chart requests it, as this will set a diagnostic trouble code.
5. The "SIR Diagnostic System Check" must be the starting point of any SIR diagnostics. The "SIR Diagnostic System Check" will verify proper "AIR BAG" warning lamp operation and will lead you to the correct chart to diagnose any SIR malfunctions. **Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacements.**

REPAIRS AND INSPECTIONS REQUIRED AFTER AN ACCIDENT

Important

- If any SIR system components are damaged, they must be replaced. If SIR component mounting points are damaged, they must be repaired or replaced.
- Never use SIR parts from another vehicle. This does not include remanufactured parts purchased from an authorized GM dealer; they may be used for SIR repairs.
- Do not attempt to service discriminating sensors, the dual pole arming sensor, the DERM, the SIR coil assembly, or the inflator modules. Service of these items is by replacement only.
- Verify the part number of replacement inflator modules. Some GM inflator modules look identical but contain different internal components.

CAUTION: Proper operation of the sensors and Supplemental Inflatable Restraint (SIR) system requires that any repairs to the vehicle structure return it to the original production configuration. Deployment requires, at a minimum, replacement of the sensors in the area of accident damage, the inflator module, and dimensional inspection of the steering column. Any visible damage to the DERM mounting bracket(s) requires replacement, sensors in the area of accident damage must be replaced, and the steering column must be dimensionally inspected, whether deployment occurred or not.

Accident With Deployment - Component Replacement and Inspections

Certain SIR components must be replaced or inspected for damage after a frontal crash involving air bag deployment. Those components are:

- Inflator modules.
- Sensors, if in the area of accident damage.

Important

- Refer to "Sensor Replacement Guidelines" below for important information on sensor replacement in both deployment and non-deployment crashes.
- SIR coil assembly Inspect wiring and connector for any signs of scorching, melting, or damage due to excessive heat. Replace if damaged. Refer to SECTION 3F5B.

Accident With or Without Deployment - Component Inspections

Certain SIR and restraint system components must be inspected after any crash, whether the air bag deployed or not. Those components are:

- Steering column - Dimensionally inspect per "Checking Steering Column for Accident Damage" in SECTION 3F5B.
- Sensors, if in the area of accident damage.

Important

- Refer to "Sensor Replacement Guidelines" below for important information on sensor replacement in both deployment and non-deployment crashes.
- Knee bolsters and mounting points - Inspect for any distortion, bending, cracking, or other damage.
- I/P steering column reinforcement plate - Inspect for any distortion, bending, cracking, or other damage.
- I/P braces - Inspect for any distortion, bending, cracking, or other damage.
- Seat belts and mounting points - Refer to "Seat Belts" in SECTION 10-5.

Sensor Replacement Guidelines

SIR sensor replacement policy requires replacement of the sensors in the area of accident damage only.

The "area of accident damage" is defined as that area of the vehicle which is crushed, bent, or damaged in other ways. An example might be a significant front-end collision in which the forward portions of the vehicle have contacted another vehicle, tree, guardrail, etc.

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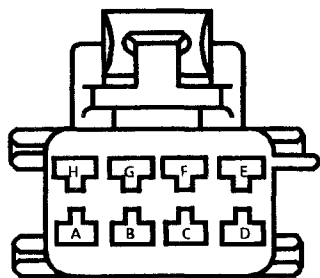
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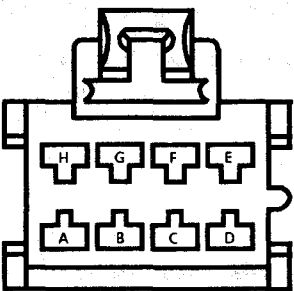
ELECTRICAL DIAGNOSIS: AU0



12064766

8-WAY F METRI-PACK 150 SERIES
BLU

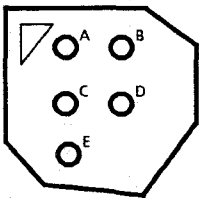
KEYLESS ENTRY RECEIVER (C1)



12064998

8-WAY F METRI-PACK 280 SERIES
BLK

KEYLESS ENTRY RECEIVER (C2)



12004680

5-WAY F PIN GRIP SERIES
BLK/WHT

POWER DOOR LOCK SWITCH, LH AND RH

COMPONENT	LOCATION	SECTION		FIG.	CONN
		8A-201-PG			
Courtesy Lamp, Left Rear	Mounted in left sail panel				
Courtesy Lamp, Right Rear	Mounted in right sail panel				
Data Link Conn (DLC)	Mounted to I/P Tie Bar, below and right of Steering Column				202-11
Dome Lamp	On roof, near hatch	4	6		
Door Lock Actuator, LH	Inside rear of left door	17	31		
Door Lock Actuator, RH	Inside rear of right door	17	31		
Hatch Release Actuator	Center of end panel, in Cargo Compartment	30	57		
Hatch Release Relay	Mounted to right side of SIR Bracket, behind I/P	22	41		202-21
Hatch Release Switch	Left of Steering Column, in knee bolster pad	31, 38	60, 67		
I/P Dimmer Switch	Lower LH side of I/P	37, 38	66, 67		202-23
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15		202-23
Keyless Entry Receiver	Behind RH side kick panel, in molded pocket	40	71		202-23
Power Door Lock Switch, LH	Mounted in left door armrest	18	33		202-24
Power Door Lock Switch, RH	Mounted in right door armrest	18	33		202-24
Rear Compartment Lamp	Center of rear compartment below Hatch Release Actuator	30	58		
Rear Dome Light Switch	Center of end panel, in Cargo Compartment	30	57		
C200C (13 cavities)	Part of Cross Car Harn, between LH kick panel and Steering Column	25	49		202-2
C200D (48 cavities)	Part of I/P Harn, between LH kick panel and Steering Column	25	49		202-2

HANDLING PRECAUTIONS FOR PLASTICS

Abbreviation	Material name	Heat resisting temperature °C (°F)	Resistance to gasoline and solvents	Other cautions
PE	Polyethylene	80 (176)	Gasoline and most solvents are harmless.	Flammable
PVC	Polyvinyl chloride	90 (194)	Gasoline and most solvents are harmless if applied for a very short time (wipe up quickly).	Poison gas is emitted when burned.
PP	Polypropylene	90 (194)	Gasoline and most solvents are harmless.	Flammable
ABS	Acrylonitrile butadiene styrene resin	90 (194)	Avoid gasoline and solvents.	Avoid brake fluid.
AES	Acrylonitrile ethylene styrene	90 (194)	Avoid gasoline and solvents.	Avoid brake fluid.
PMMA	Polymethyl methacrylate	90 (194)	Avoid gasoline and solvents.	Avoid brake fluid.
PUR	Polyurethane	90 (194)	Gasoline and most solvents are harmless.	Avoid brake fluid.
AAS	Acrylonitrile acrylic rubber styrene	95 (203)	Avoid gasoline and solvents.	Avoid brake fluid.
PPE	Polyphenylene ether	110 (230)	Avoid gasoline and solvents.	
POM	Polyacetal	120 (248)	Gasoline and solvents are harmless.	Avoid battery acid.
PC	Polycarbonate	120 (248)	Avoid gasoline and solvents.	
PA, PAG PAGG	Polyamide (Nylon)	150 (302)	Gasoline and most solvents are harmless.	Avoid immersing in water.
FRP	Fiber reinforced plastics	170 (338)	Gasoline and most solvents are harmless.	
PPC	Polypropylene composite	115 (239)	Gasoline and most solvents are harmless.	Flammable
PBT	Polybutylene terephthalate	140 (284)	Gasoline and most solvents are harmless.	
TPR	Thermoplastic rubber	80 (176)	Avoid gasoline and solvents.	
TPE	Thermoplastic elastomer	80 (176)	Avoid gasoline and solvents.	

1. When repairing and painting a portion of the body adjacent to plastic parts, consider their characteristics (influence of heat and solvent) and remove them if necessary or take suitable measures to protect them.
2. Plastic parts should be repaired and painted using methods suiting the materials.

Figure 14 – Plastics Handling Precautions

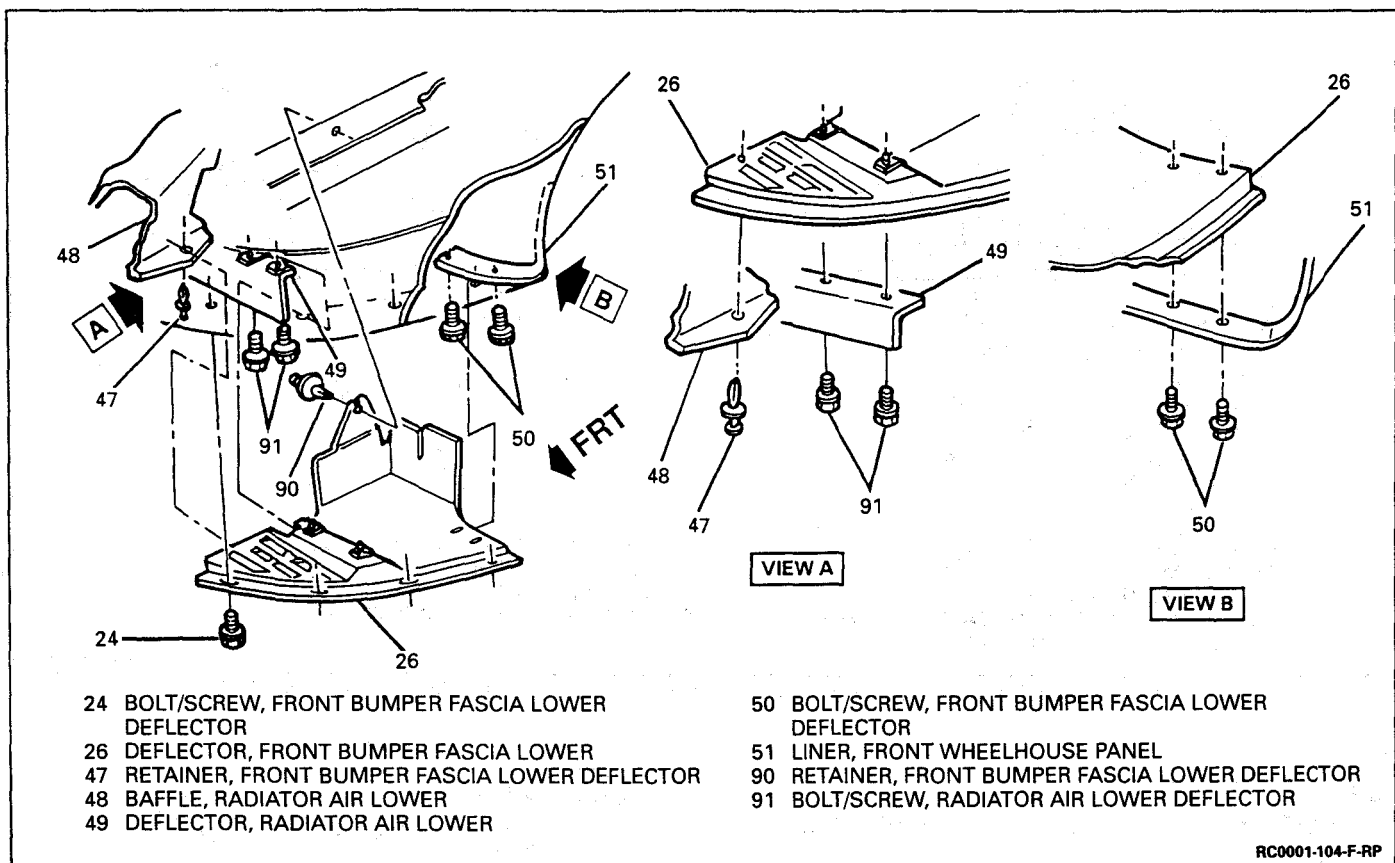


Figure 8 – Front Bumper Fascia Lower Deflector (Left Side Shown, Right Side Similar)

3. Bolts/screws (91) to radiator air lower deflector (49) and front lower deflector (26).

**Tighten**

- Bolts/screws (91) to 5.5 N•m (49 lb. in.).
4. Bolts/screws (24 and 50) to wheelhouse panel liner (51) and front lower deflector (26).
 5. Retainers (90).

REAR BUMPER ASSEMBLY**Rear Bumper Fascia***Figure 9***Remove or Disconnect**

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Retainers (69 and 70).
3. Bolts/screws (71).
4. Nuts (53).
5. Lower vehicle.
6. Rear end finish panel assembly. Refer to SECTION 10-8.
7. Compact spare tire and jack assembly.
8. Retainers (67).
9. Nuts (54 and 55).
10. Rear bumper fascia (68).

11. Rear body wiring harness connector from rear fascia wiring harness connector.

**Install or Connect**

NOTICE: See “Notice” on page 10-4-1 of this section.

1. Rear body wiring harness connector to rear fascia wiring harness connector.
2. Rear bumper fascia (68).
3. Nuts (54 and 55).

**Tighten**

- Nuts (54 and 55) to 10 N•m (89 lb. in.).
4. Retainers (67).
 5. Compact spare tire and jack assembly.
 6. Rear end finish panel assembly. Refer to SECTION 10-8.
 7. Raise and suitably support vehicle. Refer to SECTION 0A.
 8. Nuts (53).

**Tighten**

- Nuts (53) to 10 N•m (89 lb. in.).
9. Bolts/screws (71).

**Tighten**

- Bolts/screws (71) to 2 N•m (18 lb. in.).

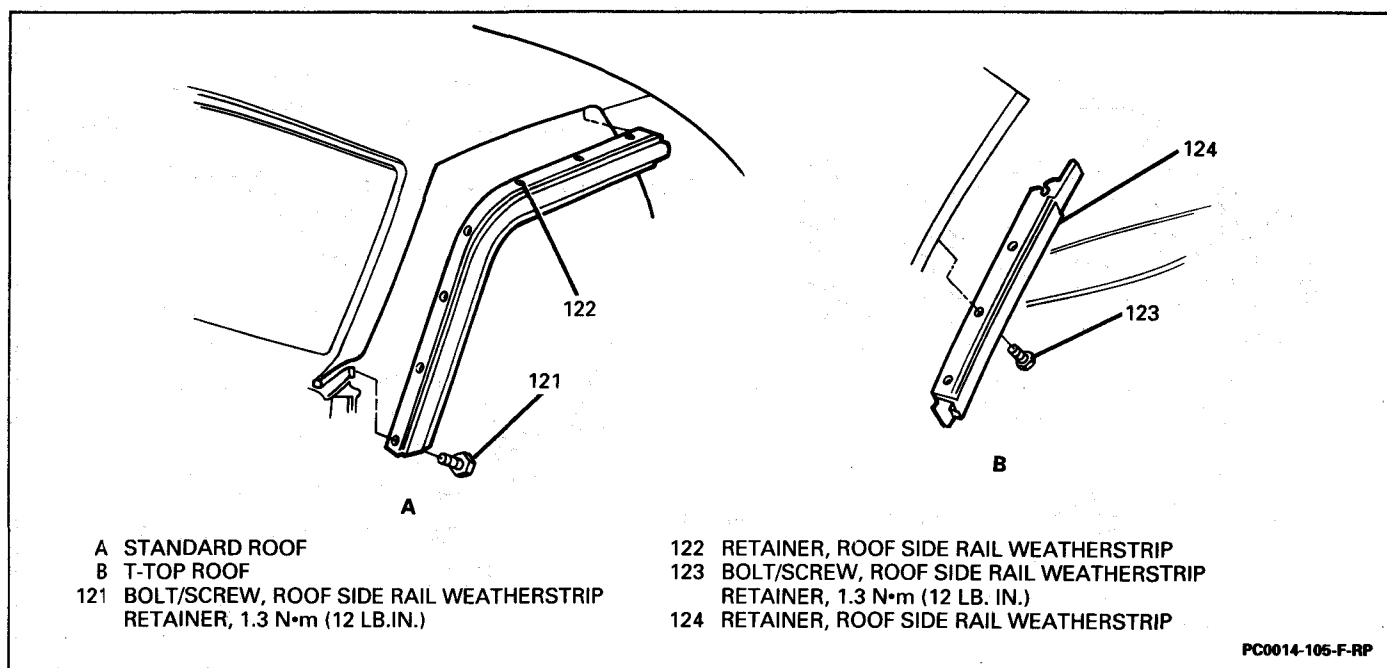


Figure 36 – Roof Side Rail Weatherstrip Retainer

2. Roof side rail weatherstrip retainer bolts/screws (121 or 123).

**Tighten**

- Bolts/screws (121 or 123) to 1.3 N•m (12 lb. in.).

3. Front side door weatherstrip assembly. Refer to SECTION 10-6.

- B. Determine amount of adjustment needed. Refer to Figures 37 or 38 for hood panel assembly alignment specifications.

- C. Open hood panel assembly.

- D. Change height by turning the hood bumper assemblies up or down.

- E. Repeat above steps until hood panel assembly is properly aligned.

BODY PANEL ADJUSTMENT AND ALIGNMENT

Figures 18, 37 and 38

Hood Panel Assembly Adjustment

The hood panel assembly, front fender assemblies and hood hinges are “net build,” therefore minimum adjustment can be made. If the door panel assembly can not be brought into specifications shown in Figures 37 or 38 by loosening hood hinge bolts/screws and/or adjusting the hood adjust front bumper assemblies, the structural body should be checked for damage or misalignment.

Raising or Lowering Rear Corners of Hood Panel Assembly

**Adjust**

- Hood adjust front bumper assembly.
 - A. Close hood panel assembly firmly.

Fore and Aft Adjustment

A minimum adjustment can be obtained by loosening the hood hinge bolts/screws (76) and nuts (77), then sliding forward or rearward. For best appearance, adjust one side at a time.

**Adjust**

NOTICE: See “Notice” on page 10-5-1 of this section.

- Hood panel assembly.
 - A. Loosen hood hinge to body bolts/screws (76) and nuts (77).
 - B. Move hood panel assembly forward or rearward. Refer to Figures 37 and 38 for hood panel assembly alignment specifications.

**Tighten**

- Hood hinge nuts (77) to 25 N•m (18 lb. ft.).
- Hood hinge bolts/screws (76) to 10 N•m (89 lb. in.).

Front Side Door Window Regulator Handle Assembly

Figure 40

Remove or Disconnect

Tool Required:

J 9886-01 Door Handle Clip Remover

1. Handle assembly (26) by pushing J 9886-01 between handle assembly (26) and spacer (24) to release clip.
2. Spacer (24) from spindle.

Install or Connect

1. Spacer (24) to spindle.
NOTICE: Strike handle assembly with mallet at hub when installing to avoid damage.
2. Handle assembly (26).
 - A. Position handle assembly (26) to spindle pointing forward if window assembly is up, or rearward if window assembly is down.
 - B. Tap handle assembly (26) with mallet until snap ring in handle assembly (26) engages groove in spindle.

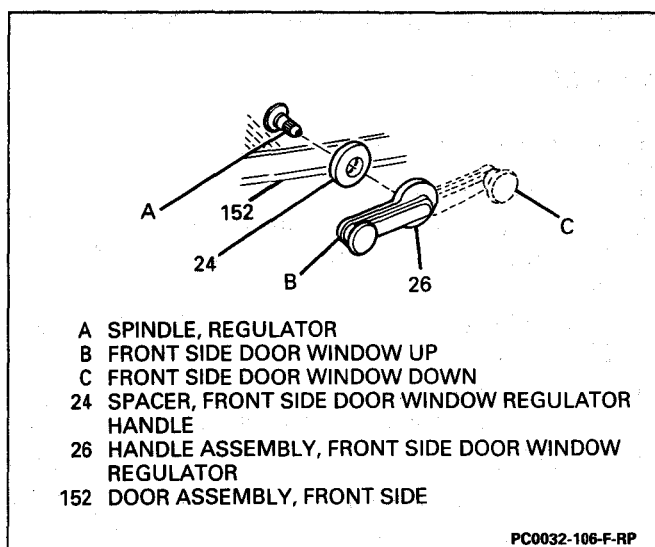


Figure 40 – Front Side Door Window Regulator Handle Assembly (Typical)

Front Side Door Lock Assembly

Figure 41

CAUTION: Do not attempt to repair a broken lock assembly. A lock malfunction may result in serious bodily injury. A broken lock assembly must be replaced.

Remove or Disconnect

1. Raise window.
2. Front side door trim assembly. Refer to "Front Side Door Right and Left Trim Assemblies" in this section.
3. Front side door water deflector as needed. Refer to "Front Side Door Water Deflector" in this section.
4. Electrical connector from lock assembly (9), if equipped.
5. Inside handle rod assembly (47) from clip (15).
6. Clip (15) using needlenose pliers.
 - Discard clip (15).
7. Locking rod (49) from clip (17).
8. Clip (17) using needlenose pliers.
 - Discard clip (17).
9. Outside handle rod (13) from retainer (12).
 - A. Use right-angle needlenose pliers to squeeze retainer tabs and pull retainer (12) through hole.
 - B. Unscrew retainer (12) from outside handle rod (13).
 - Discard retainer (12).

10. Lock cylinder rod (14) from clip (11).
11. Clip (11) from lock assembly (9) using needlenose pliers.
 - Discard clip (11).
12. Bolts/screws (10).
13. Lock assembly (9) through access hole.

Install or Connect

NOTICE: See "Notice" on page 10-6-1 of this section.

1. Lock assembly (9) through access hole.
2. Bolts/screws (10).

Tighten

- Bolts/screws (10) to 10 N•m (89 lb. in.).
3. New clip (11) into lock assembly.
 - Use GM P/N 16606936.
4. Lock cylinder rod (14) into clip (11).
5. New retainer (12) to lock assembly (9).
 - Use GM P/N 16623993.
6. Outside handle rod (13) to retainer (12).
 - A. Line up lower end of outside handle rod (13) to retainer (12).
 - B. Snap outside handle rod (13) into back half of retainer (12).
 - C. Snap retainer cover closed over threaded part of outside handle rod (13).
7. New clip (17) to lock assembly (9).
 - Use GM P/N 16606936.
8. Locking rod (49) to clip (17).
9. New clip (15) to lock assembly (9).
 - Use GM P/N 16606936.
10. Inside handle rod assembly (47) to clip (15).
11. Electrical connector to lock assembly (9), if equipped.

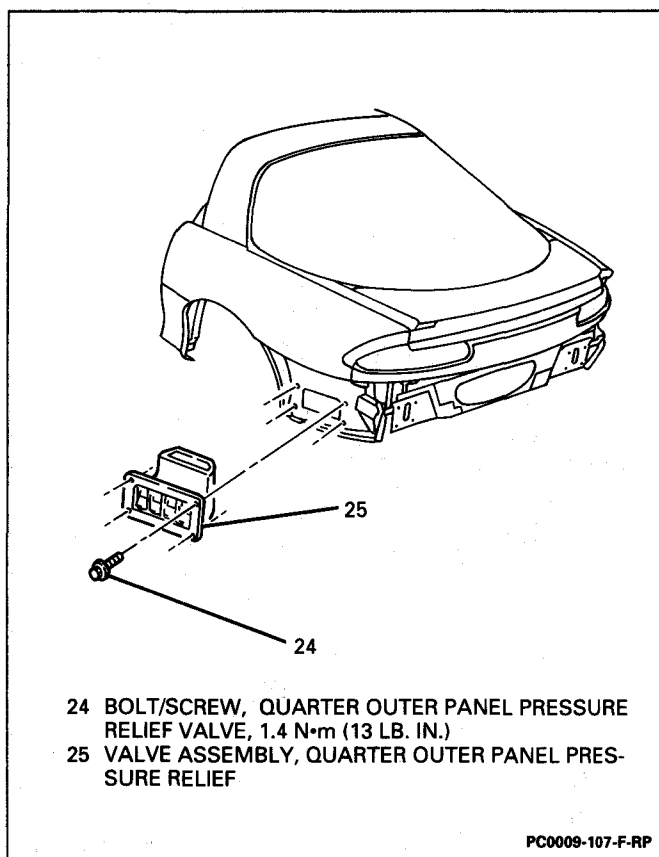


Figure 12 – Quarter Outer Panel Pressure Relief Valve Assembly

Rear Quarter Center Molding Assembly

Figure 13

Remove or Disconnect

- Molding assembly (26) from body surface.
 - A. Hold hot air gun 304 mm (12 inches) from surface of molding assembly (26).
 - B. Apply heat, using circular motion for about 30 seconds.
 - C. Using care, peel molding assembly (26) from body surface.

Install or Connect

- Molding assembly (26) to body surface.
 - A. Body surface must be warm, 21°C (70°F), clean and wax free.
 - B. If installing a new part, remove adhesive backing.
 - C. When installing a previously removed part, or a partially loosened part, apply a thin, even film of GM P/N 1052621 adhesive to adhesive portion of molding assembly (26).
 - D. Align and press molding assembly (26) into position.

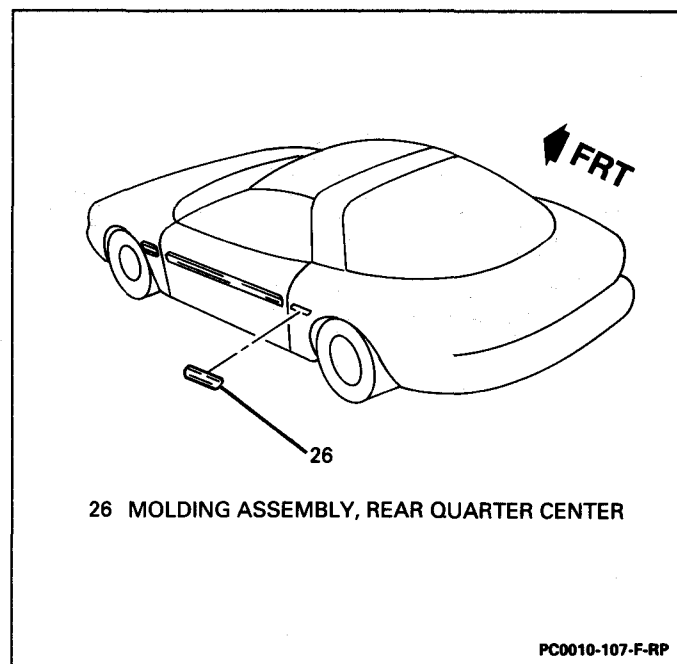


Figure 13 – Rear Quarter Center Molding Assembly (Typical)

FUEL TANK FILLER DOOR

Figure 14

Remove or Disconnect

1. Fuel tank filler pocket assembly. Refer to “Fuel Tank Filler Pocket Assembly” in the following procedure.
2. Install fuel tank filler cap.
3. Drill out four rivets (27).
4. Fuel tank filler door assembly (28).
 - It may be necessary to gently pry back sound insulating material around filler door hinge.

Remove or Disconnect

1. Fuel tank filler door assembly (28).
2. Four rivets (27).
 - Install rivets alternately top to bottom.
3. Remove fuel tank filler cap.
4. Fuel tank filler pocket assembly. Refer to “Fuel Tank Filler Pocket Assembly” in the following procedure.

FUEL TANK FILLER POCKET ASSEMBLY

Figure 15

Remove or Disconnect

1. Open fuel tank filler door assembly (28) and remove cap.
2. Two bolts/screws (29).
3. Fuel tank filler pocket assembly (30).

GENERAL DESCRIPTION

ROOF

Figure 1

The information in this section provides service procedures that apply to all roof components.

ON-VEHICLE SERVICE

HEADLINING PANEL ASSEMBLY

Figure 2

The headlining panel assembly (3) is partially held in place with headlining panel tape (1) and a retainer (2). When the interior moldings, sunshade assemblies and dome lamp housing assembly are installed, the headlining panel assembly (3) is completely held in place.

Remove or Disconnect

1. Open rear compartment lift window.
2. Sunshade assemblies. Refer to "Sunshade Assembly" in this section.
3. Dome lamp housing assembly. Refer to "Dome Lamp" in this section.
4. Windshield side upper garnish molding assemblies. Refer to "Windshield Side Upper Garnish Molding Assembly (Without Lift-Off Window Assemblies)" or "Windshield Side Upper Garnish Molding Assembly (With Lift-Off Window Assemblies)" in this section.
5. Quarter trim finish panel assemblies. Refer to SECTION 10-7.
6. Loosen seat belt escutcheons and slide down seat belt assemblies.
7. Retainer (2) from headlining panel assembly (3).
8. Headlining panel assembly (3).
 - A. Pull carefully on headlining panel assembly (3) to remove from roof panel assembly.
 - B. Slide seat belt assemblies through seat belt slots.
 - C. Remove headlining panel assembly (3) from vehicle through rear compartment lift window opening.

Install or Connect

1. Peel backing from new headlining panel tape (1) and apply to depressions in roof panel assembly.
2. Headlining panel assembly (3).
 - A. Place headlining panel assembly (3) in vehicle through rear compartment lift window opening.
 - B. Insert seat belt assemblies into seat belt slots.
 - C. Pull dome lamp electrical connector through opening.
 - D. Apply pressure at centerline of headlining panel assembly (3) to engage headlining panel tape (1).

3. Retainer (2) to headlining panel assembly (3).
4. Slide seat belt escutcheons up seat belt assemblies and snap into retractor.
5. Quarter trim finish panel assemblies. Refer to SECTION 10-7.
6. Windshield side upper garnish molding assemblies. Refer to "Windshield Side Upper Garnish Molding Assembly (Without Roof Lift-Off Window Assemblies)" or "Windshield Side Upper Garnish Molding Assembly (With Roof Lift-Off Window Assemblies)" in this section.
7. Dome lamp housing assembly. Refer to "Dome Lamp" in this section.
8. Sunshade assemblies. Refer to "Sunshade Assembly" in this section.
9. Close rear compartment lift window.

SUNSHADE ASSEMBLY

Figure 3

Remove or Disconnect

1. Bolts/screws (4).
2. Sunshade assembly (5).

Install or Connect

NOTICE: See "Notice" on page 10-9-1 of this section.

1. Sunshade assembly (5).
 - Position sunshade support to headlining panel assembly.
2. Bolts/screws (4).

Tighten

- Bolts/screws (4) to 1.7 N•m (15 lb. in.).

INTERIOR LIGHTING

Dome Lamp

Figure 4

Remove or Disconnect

1. Bolts/screws (7).
 - Loosen enough to pull dome lamp housing assembly (6) from headlining panel assembly.
2. Dome lamp housing assembly (6) by pulling from headlining panel assembly.
3. Electrical connector.

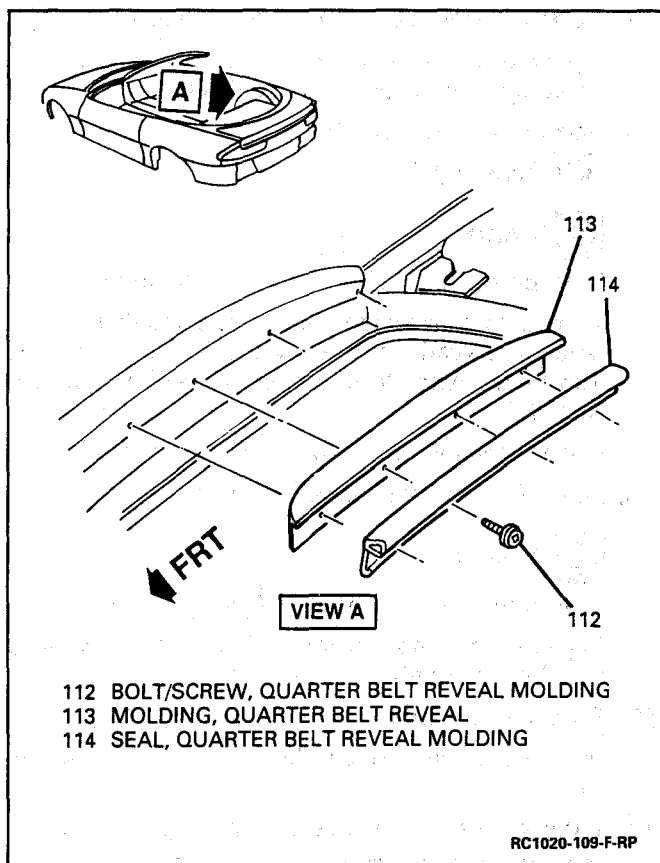


Figure 27 – Quarter Belt Reveal Molding – (Chevrolet)

Tighten

- Bolts/screws (112) to 5 N•m (44 lb. in.) (Chevrolet) or 1.7 N•m (15 lb. in.) (Pontiac).

5. Raise folding top assembly.

Folding Top Side Rail Garnish Molding

Figure 29

Remove or Disconnect

1. Lower folding top assembly to suitable working position.

CAUTION: Refer to “Caution” under “Disconnecting the Battery Negative Cable Assembly” in SECTION 0A.

2. Battery negative cable assembly.
3. Side rail weatherstrip assembly. Refer to “Folding Top Side Rail Weatherstrip Assemblies” in this section.
4. Side rail weatherstrip retainer. Refer to “Folding Top Side Rail Weatherstrip Retainers” in this section.
5. Side rail garnish molding bolts/screws (115).
6. Side rail garnish molding (116).

Install or Connect

NOTICE: See “Notice” on page 10-9-1 of this section.

1. Side rail garnish molding (116).
2. Side rail garnish molding bolts/screws (115).

Tighten

- Bolts/screws (115) to 5 N•m (44 lb. in.).

3. Side rail weatherstrip retainer. Refer to “Folding Top Side Rail Weatherstrip Retainers” in this section.
4. Side rail weatherstrip assembly. Refer to “Folding Top Side Rail Weatherstrip Assemblies” in this section.
5. Battery negative cable assembly.
6. Raise folding top assembly.

Folding Top Cover Retention Cable Assembly

Figures 12, 13, 17 and 22

Remove or Disconnect

1. Lower folding top assembly to suitable working position.

CAUTION: Refer to “Caution” under “Disconnecting the Battery Negative Cable Assembly” in SECTION 0A.

2. Battery negative cable assembly.
3. Mark folding top cover fabric along front edge of number one bow assembly (39).
4. Front cover number one bow retainer bolts/screws (52).

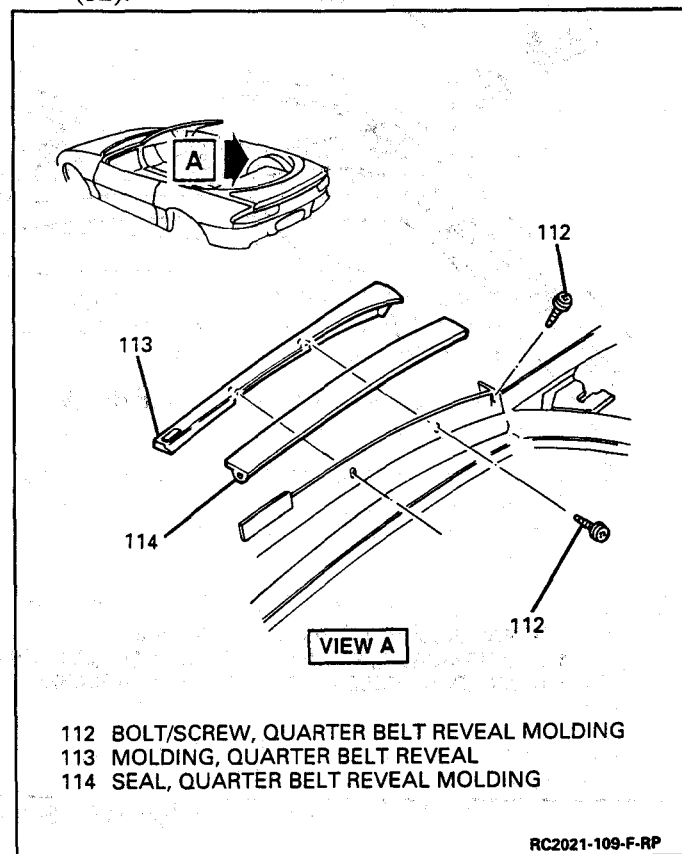
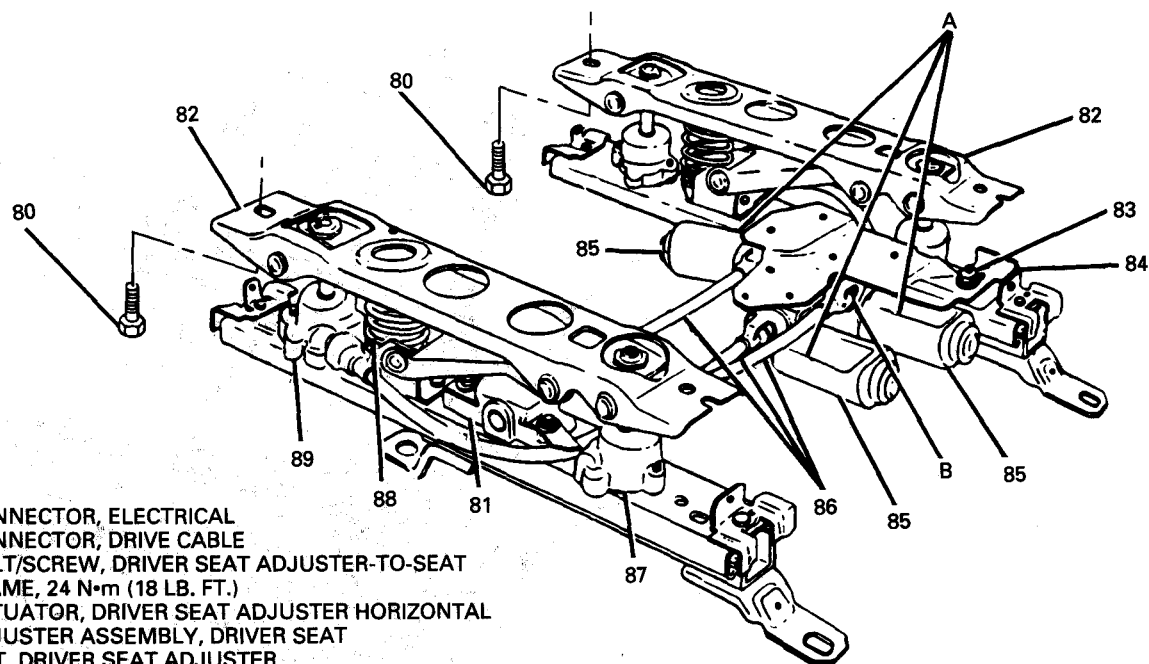


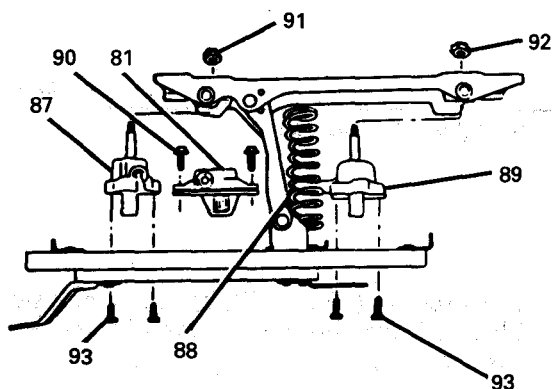
Figure 28 – Quarter Belt Reveal Molding – (Pontiac)



- A CONNECTOR, ELECTRICAL
 B CONNECTOR, DRIVE CABLE
 80 BOLT/SCREW, DRIVER SEAT ADJUSTER-TO-SEAT FRAME, 24 N·m (18 LB. FT.)
 81 ACTUATOR, DRIVER SEAT ADJUSTER HORIZONTAL
 82 ADJUSTER ASSEMBLY, DRIVER SEAT
 83 NUT, DRIVER SEAT ADJUSTER
 84 SUPPORT, DRIVER SEAT ADJUSTER MOTOR
 85 MOTOR ASSEMBLY, DRIVER SEAT ADJUSTER
 86 CABLE, DRIVER SEAT ADJUSTER DRIVE
 87 ACTUATOR, DRIVER SEAT ADJUSTER FRONT VERTICAL
 88 SPRING, DRIVER SEAT VERTICAL ASSIST
 89 ACTUATOR, DRIVER SEAT ADJUSTER REAR VERTICAL

PC2016-1010-F-RP

Figure 18 – Driver Seat Adjuster Drive Motor Assembly



- 81 ACTUATOR, DRIVER SEAT ADJUSTER HORIZONTAL
 87 ACTUATOR, DRIVER SEAT ADJUSTER FRONT VERTICAL
 88 SPRING, DRIVER SEAT VERTICAL ASSIST
 89 ACTUATOR, DRIVER SEAT ADJUSTER REAR VERTICAL
 90 BOLT/SCREW, DRIVER SEAT ADJUSTER
 91 NUT, DRIVER SEAT FRONT ADJUSTER
 92 NUT, DRIVER SEAT REAR ADJUSTER
 93 BOLT/SCREW, DRIVER SEAT ADJUSTER

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Figure 19 – Adjuster Horizontal and Vertical Actuator

4. Seat assembly. Refer to “Front Seat Assembly” in this section.

Power Front Seat Adjuster Assembly

Figure 21

↔ Remove or Disconnect

1. Driver seat assembly. Refer to “Front Seat Assembly” in this section.
2. Hinge arm trim cover. Refer to “Hinge Arm Trim Cover” under “Trim Covers” in this section.
3. Connector (101) from adjuster assembly (24) by releasing retainers (102).

↔ Install or Connect

1. Connector (101) to adjuster assembly (24) by reengaging retainers (102).
2. Hinge arm trim cover. Refer to “Hinge Arm Trim Cover” under “Trim Covers” in this section.
3. Driver seat assembly. Refer to “Front Seat Assembly” in this section.

Power Front Seat Adjuster Assembly Adjustments

Figure 22

With seat adjuster assembly installed, chucking or jerking can be corrected by tightening or loosening the horizontal actuator and pinion gear to the adjuster lower track rack gear.

UPPER RAIL 3

FRONT WHEELHOUSE PANEL UPPER SIDE RAIL ASSEMBLY

Remove or Disconnect (Continued)

- 3 Drill out welds at cowl panel.
 - Drill out welds at cowl panel only. Remaining welds will hold side rail assembly in place while cutting.
- 4 Separate side rail assembly away from cowl panel (Figure 3-10).
- 5 Cut side rail assembly at scribed lines, being careful not to cut adjacent panels (Figure 3-11).
- 6 Note number and location of remaining welds for installation of new side rail assembly.
- 7 Drill out remaining welds.
- 8 Remove side rail assembly (Figure 3-12).

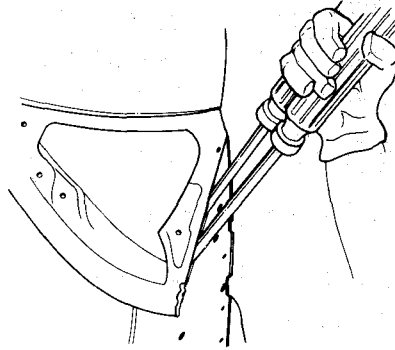


Figure 3-10.
Separating
Inner Side
Rail Assembly
from Cowl

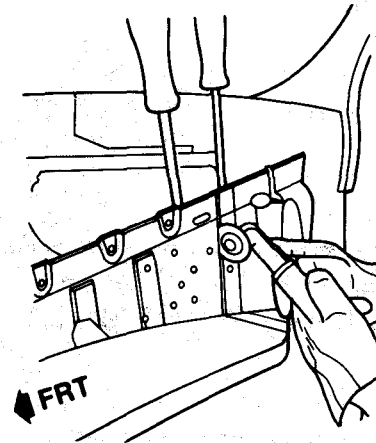


Figure 3-11.
Cutting Inner
Side Rail
Assembly

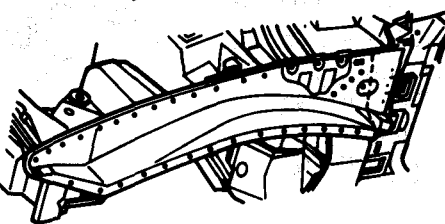


Figure 3-12.
Removing
Inner Side Rail
Assembly

Install or Connect

- 1 Prepare mating surfaces for proper fit of new side rail assembly.
- 2 Clean sealer away from mating surfaces, as necessary (Figure 3-13).

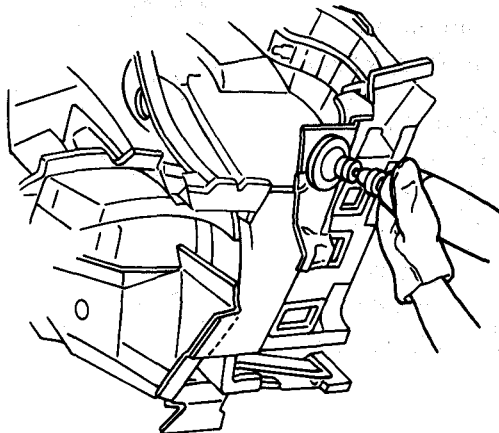


Figure 3-13.
Preparing
Mating Surface

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Air Outlets	1A-6	Transmission On-Vehicle Service	7A-10
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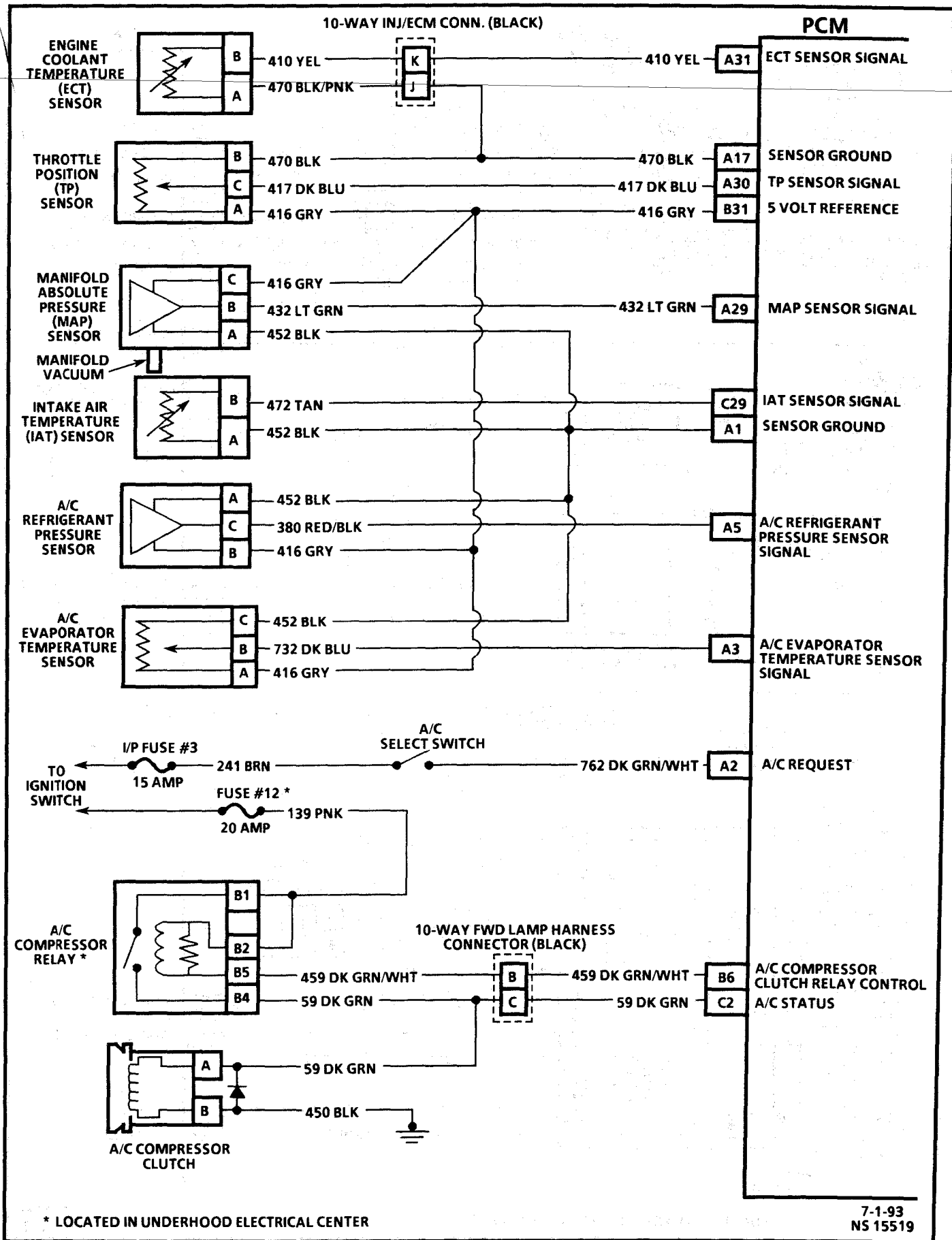


Figure A-3 - PCM Wiring Diagram 3.4L (VIN S) "F" Carline (1 of 6)

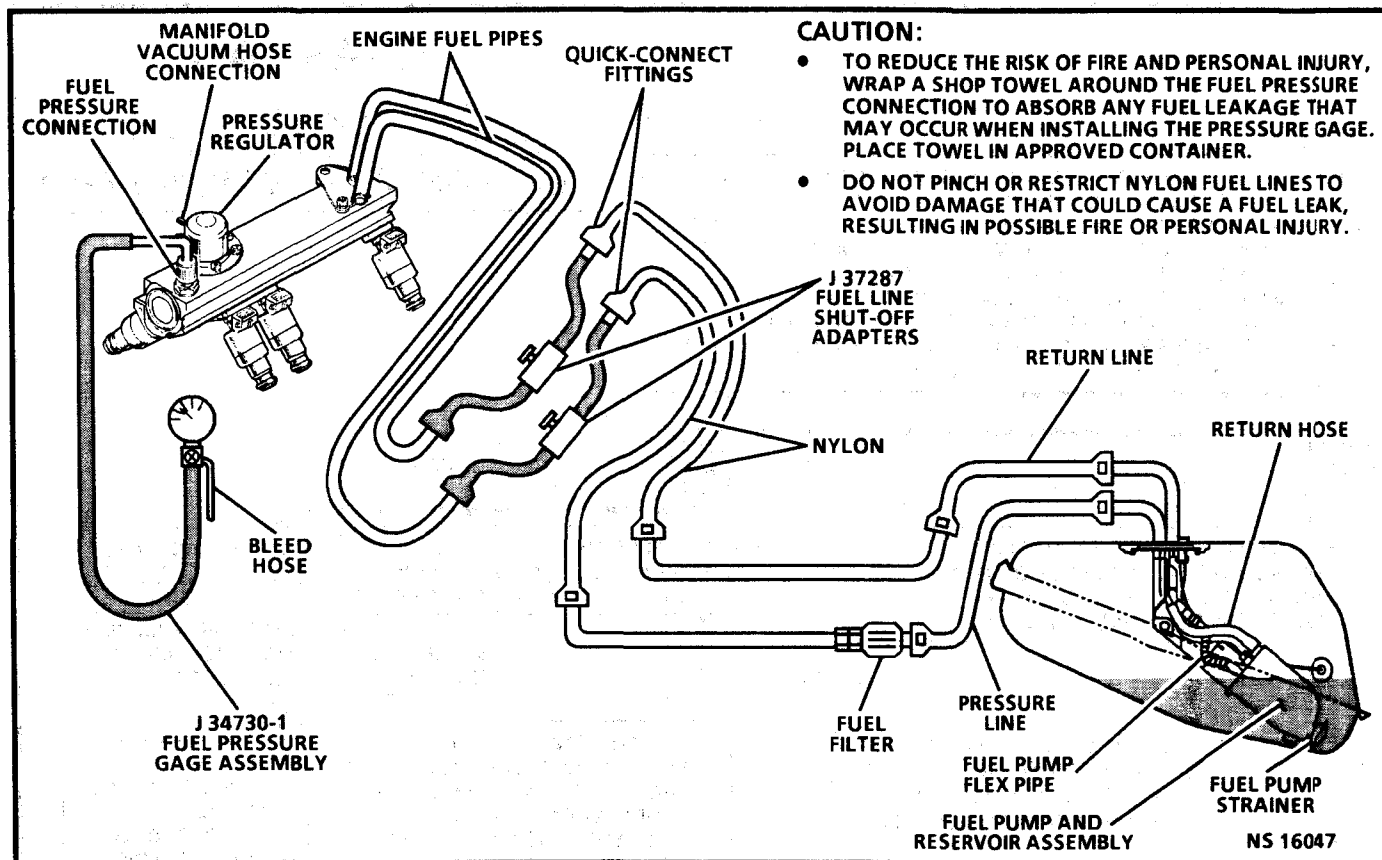


CHART A-7

(Page 2 of 3)

FUEL SYSTEM DIAGNOSIS

3.4L (VIN S) "F" CARLINE (SFI)

Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

5. Fuel pressure that drops off during acceleration, cruise or hard cornering may cause a lean condition and result in a loss of power, surging or misfire. This condition can be diagnosed using a Tech 1 scan tool. If the fuel system is very lean, one or both oxygen sensors will stop toggling and output voltage will drop below 500 mV. Also, injector pulse width will increase.

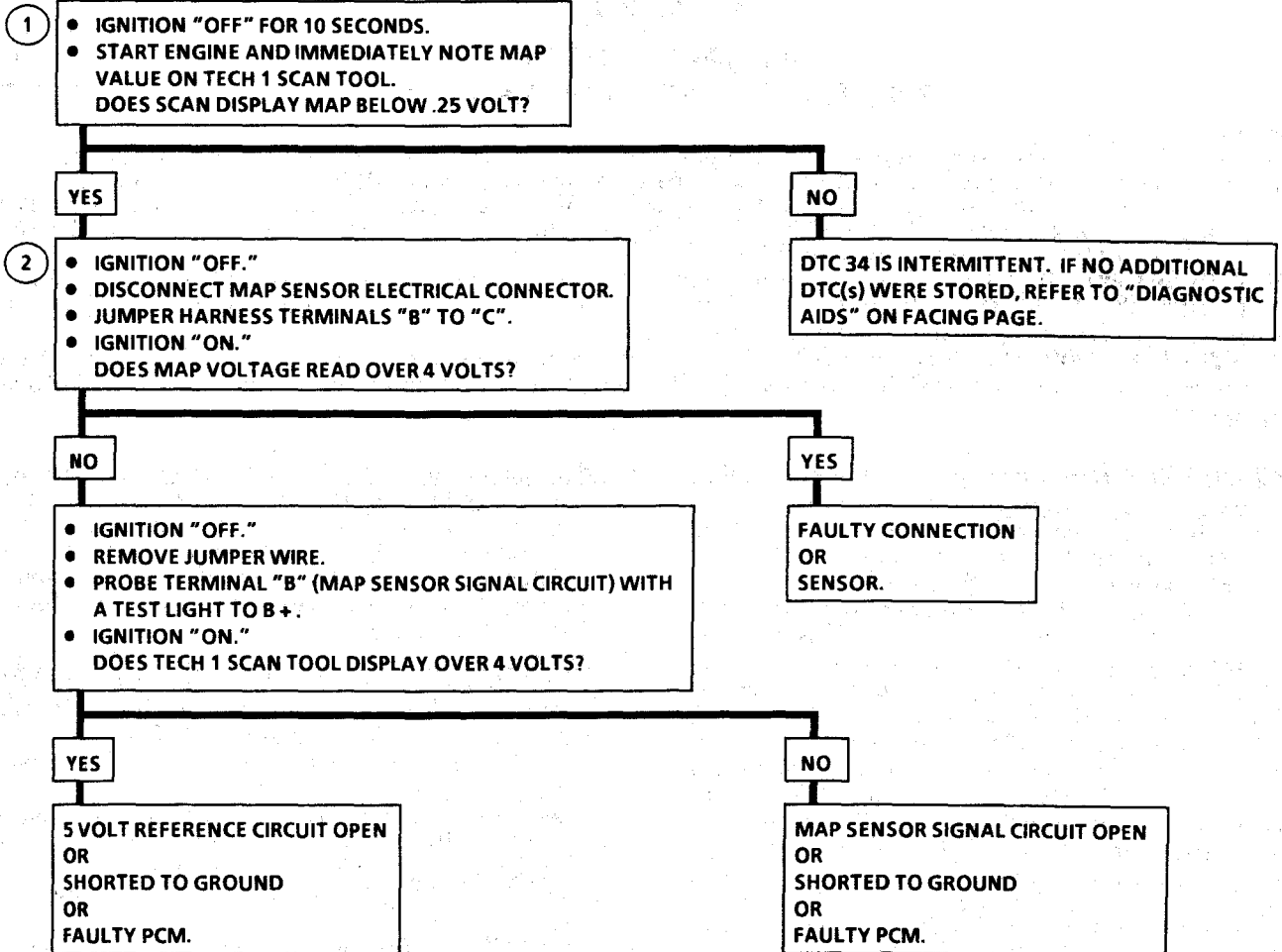
! Important

- Make sure system is not operating at "Fuel-Cut-Off" which may cause false readings on the scan tool.
6. Fuel pressure below 284 kPa (41 psi) may cause a lean condition and may set a DTC 44/64. Driveability conditions can include hard starting cold, hesitation, poor driveability, lack of power, surging or misfire.

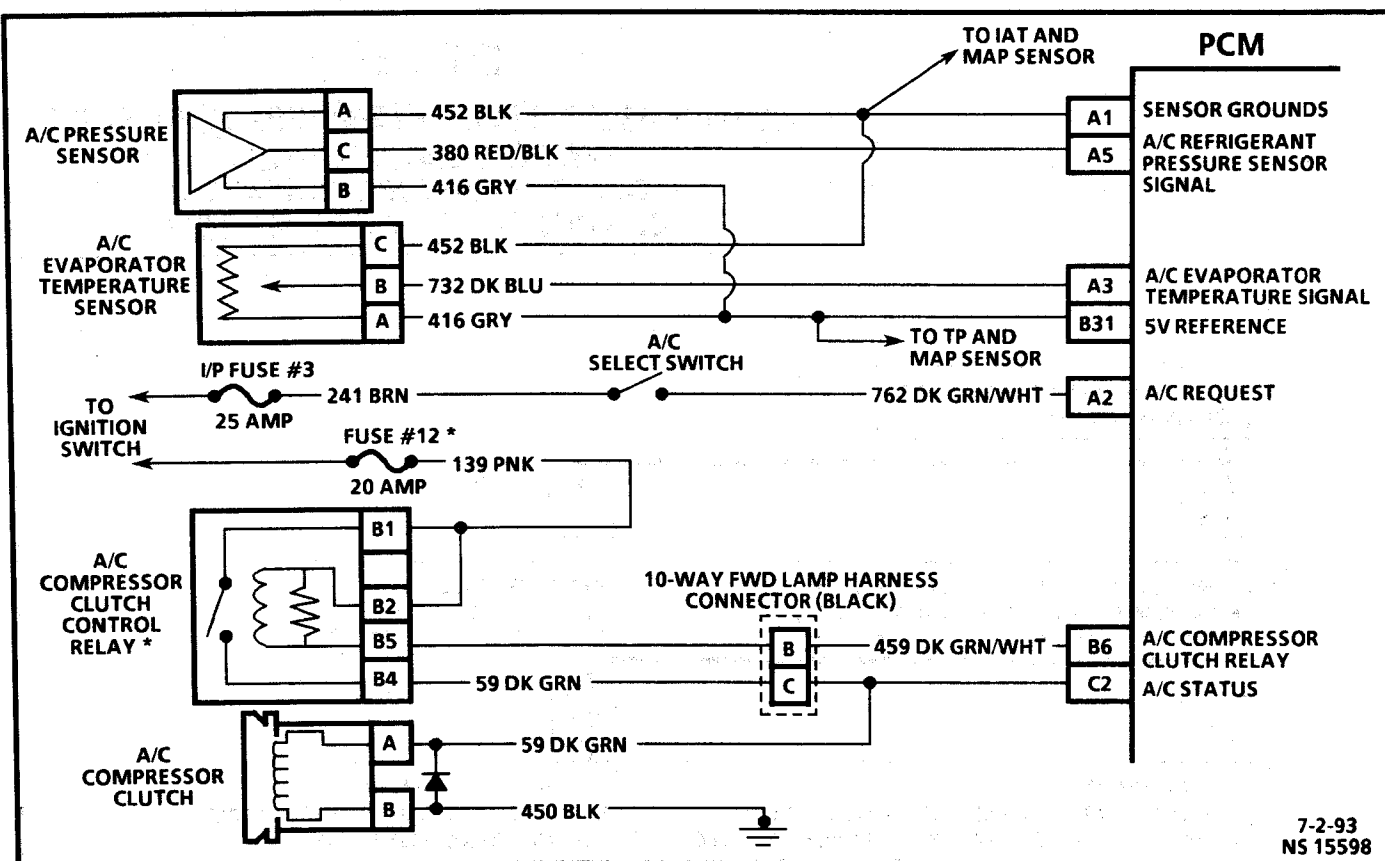
7. Restricting the fuel return line causes fuel pressure to build above regulated pressure. With battery voltage applied to the pump "test" connector, pressure should rise above 325 kPa (47 psi) as the valve in the return line is partially closed.

NOTICE: Do not allow pressure to exceed 414 kPa (60 psi) as damage to the regulator may result.

8. Fuel pressure above 325 kPa (47 psi) may cause a rich condition and may set a DTC 45/65. Driveability conditions can include hard starting (followed by black smoke) and a strong sulphur smell in the exhaust.
9. This test determines if the high fuel pressure is due to a restricted fuel return line or a faulty fuel pressure regulator.

DTC 34**MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT
(SIGNAL VOLTAGE LOW - HIGH VACUUM)
3.4L (VIN S) "F" CARLINE (SFI)**

"AFTER REPAIRS," REFER TO DTC CRITERIA ON FACING PAGE AND CONFIRM DTC DOES NOT RESET.



DTC 61

A/C SYSTEM PERFORMANCE 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

A/C refrigerant charge is calculated by the inputs from the A/C refrigerant pressure and A/C evaporator temperature sensors. The PCM will calculate system charge when the A/C is selected "ON" by using three variables. A/C evaporator temperature, A/C refrigerant pressure and vehicle speed are factored together to yield a minimum charge allowable for the A/C system to operate. As ambient temperature falls, so does static (A/C "OFF") refrigerant pressure. This produces a sliding scale which requires temperature, pressure and vehicle speed inputs to calculate a reliable system charge value that indicates when A/C refrigerant charge is too low to safely allow the compressor to operate.

DTC 61 Will Set When: The system charge falls below a given value for the temperature and vehicle speed variables or if the status line is intermittently "OPEN" or grounded.

Action Taken (PCM will default to): The MIL will not become illuminated, the A/C compressor will be disabled, the cooling fan will not be enabled unless A/C had been requested first and the vehicle speed is above 35 mph with a current DTC 61.

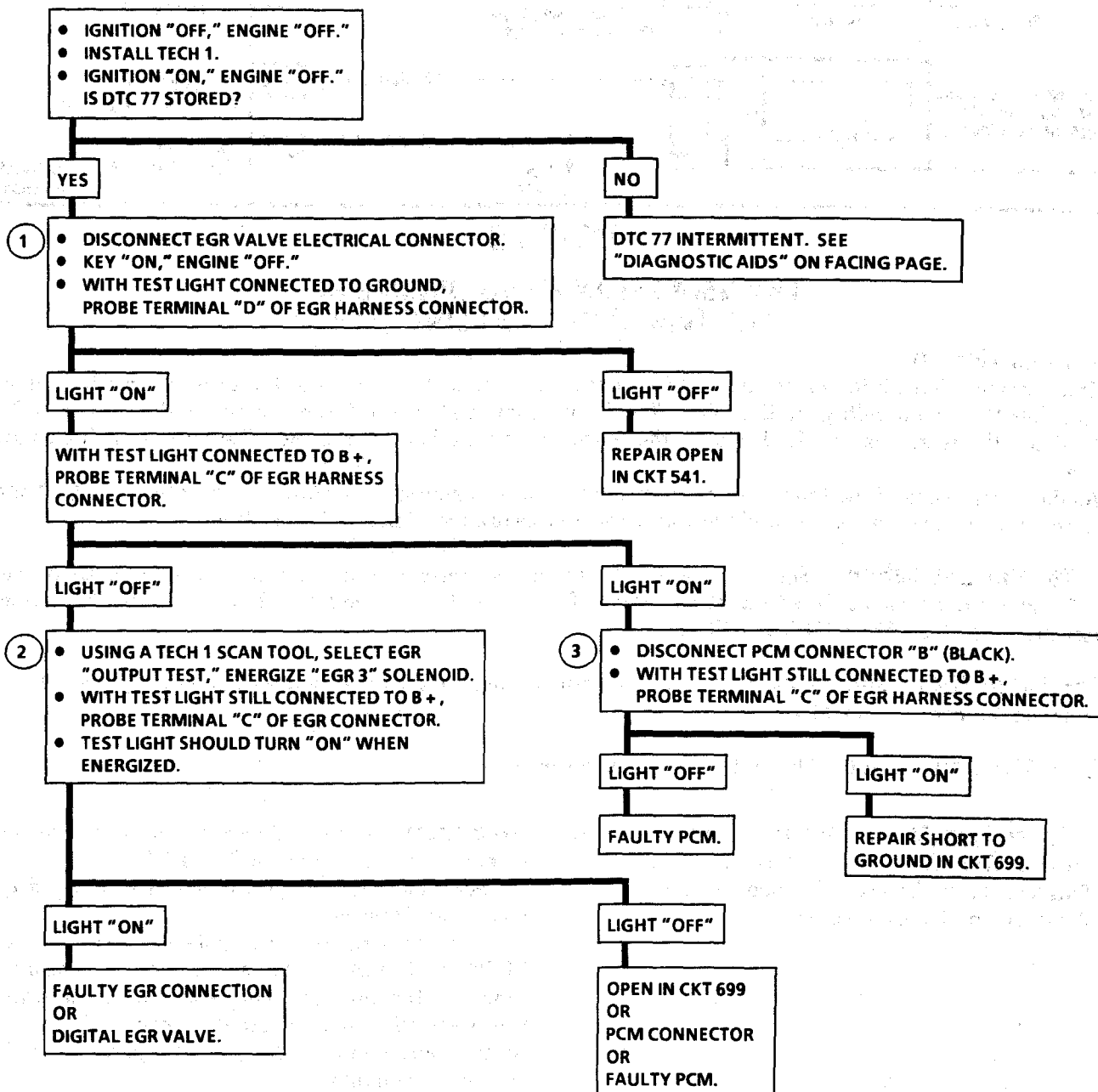
DTC 61 Will Clear When: A current DTC 61 will clear when A/C charge falls within the calibrated threshold. A history DTC 61 will clear after 50 consecutive ignition key cycles without a current DTC 61 being stored.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test determines if DTC is intermittent and will also check the A/C system for other failures. Repair all other DTC(s) first before proceeding.
2. This test is to evaluate the A/C refrigerant pressure sensor for accuracy. A reliable gage set should be used and no more than 20 psi difference in pressure between gages and Tech 1 is allowable.
3. The system is operating though DTC 61 is intermittent. Hardware failures including worn compressor, etc. are diagnosed in SECTION 1B.

Diagnostic Aids: After a subsequent key cycle, the A/C will be enabled and DTC 61 will be erased from the current DTC memory and added as a history DTC. If A/C pressure, evaporator temperature and vehicle speed again indicate a low charge, the PCM will store a current DTC 61 and disable the A/C compressor clutch. Only after a relatively high number of failures occur will the A/C be disabled and become inoperative until the code is cleared, from both current and history DTC memory.

The A/C status circuit allows the PCM to determine if the clutch is receiving a complete circuit via the A/C relay. If the status line is intermittently open or grounded a DTC 61 may set.

DTC 77
**DIGITAL EGR #3 SOLENOID ERROR
EXHAUST GAS RECIRCULATION (EGR) CIRCUIT
(ELECTRICAL DIAGNOSIS)
3.4L (VIN S) "F" CARLINE (SFI)**


"AFTER REPAIRS," REFER TO DTC CRITERIA ON FACING PAGE AND CONFIRM DTC DOES NOT RESET.

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**ROUGH, UNSTABLE, OR INCORRECT IDLE,
STALLING****(Page 1 of 2)**

Definition: Engine runs unevenly at idle. If severe, the engine or vehicle may shake. Engine idle speed may vary in RPM.

- Either condition may be severe enough to stall engine.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".
- **CHECK:** For vacuum leaks.
- **CHECK:** PCM grounds for being clean, tight and proper routing. Refer to PCM wiring diagrams.

ADDITIONAL CHECKS

- **CHECK:** MAP sensor. Refer to CHART C-10.
- **CHECK:** Throttle linkage for sticking or binding.
- **CHECK:** PNP switch circuit. Refer to CHART C-1A, or use Tech 1 scan tool and be sure tool indicates vehicle is in drive with gear selector in drive or overdrive.
- **CHECK:** IAC operation, use CHART C-2C.
- **CHECK:** EGR valve. There should be no EGR at idle. Refer to CHART C-7.
- **CHECK:** A/C signal to PCM, Tech 1 scan tool should indicate A/C is being requested whenever A/C is selected. If problem exists with A/C "ON," check A/C system operation, CHART C-10 or applicable DTC.
- **CHECK:** Crankcase ventilation valve for proper operation by placing finger over inlet hole in valve end several times. Valve should snap back. If not, replace valve. Refer to "Crankcase Ventilation," Section "6E3-C13".
- **CHECK:** Service bulletins for updates.
- **CHECK:** For broken motor mounts.
- **CHECK:** Generator output voltage. Repair if less than 9 volts or more than 16 volts.

IGNITION SYSTEM

- **CHECK:** Ignition system; wires, plugs, etc.
- **CHECK:** For open ignition control CKT 423. Refer to "DTC 41", Section "6E3-A".

ENGINE MECHANICAL

- **CHECK:** Perform a cylinder compression check. Refer to SECTION 6.
- **CHECK:** For correct camshaft or weak valve springs.

CHART C-1D**MANIFOLD ABSOLUTE PRESSURE (MAP) OUTPUT CHECK
3.4L (VIN S) "F" CARLINE (SFI)**

NOTICE: THIS CHART ONLY APPLIES TO MAP SENSORS HAVING GREEN OR BLACK COLOR KEY INSERT (SEE BELOW).

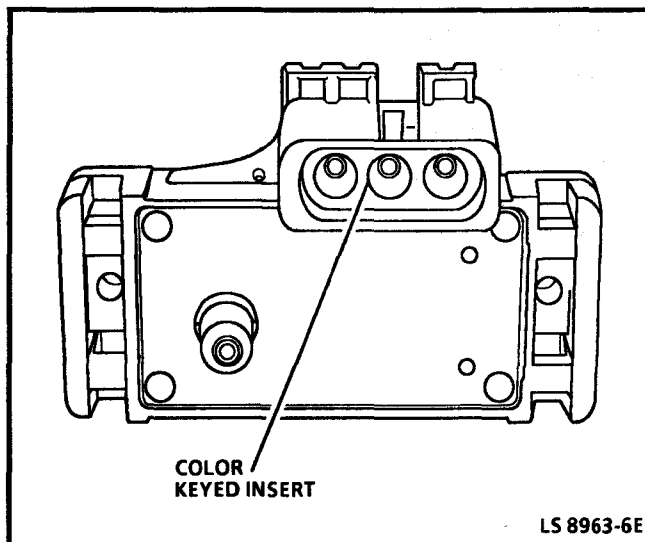
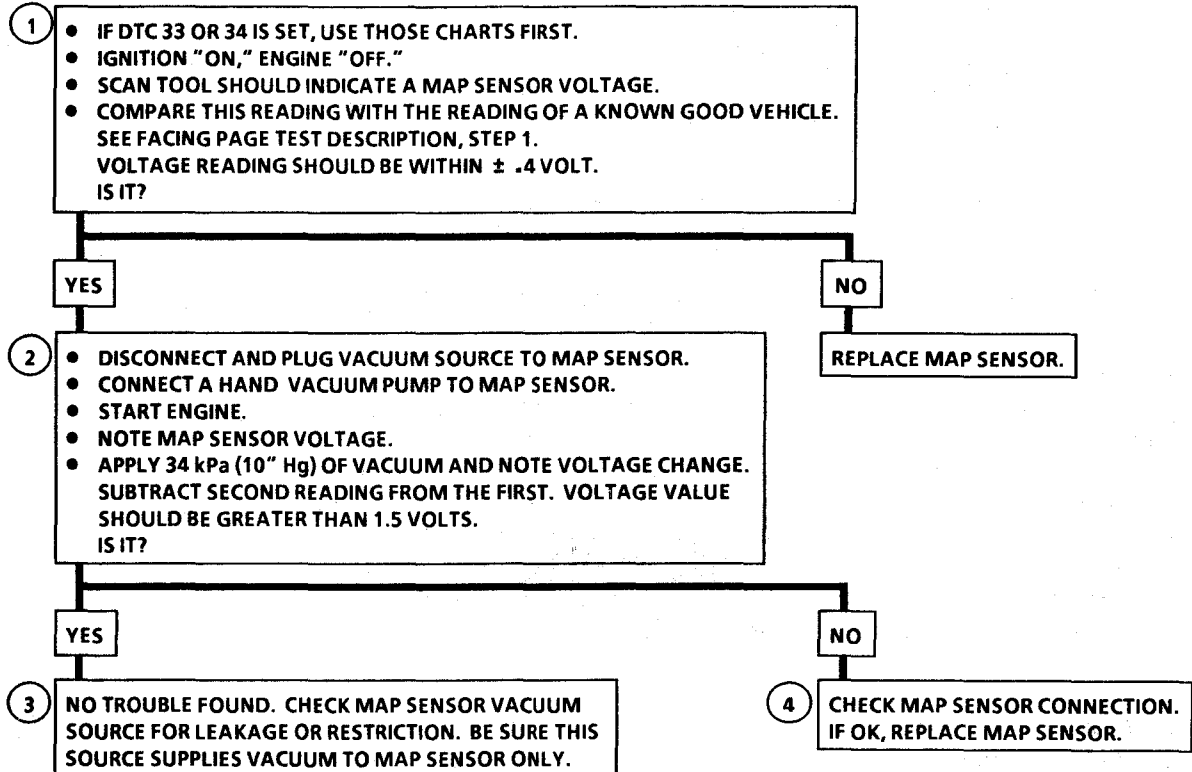


Figure 1 - Color Key Insert

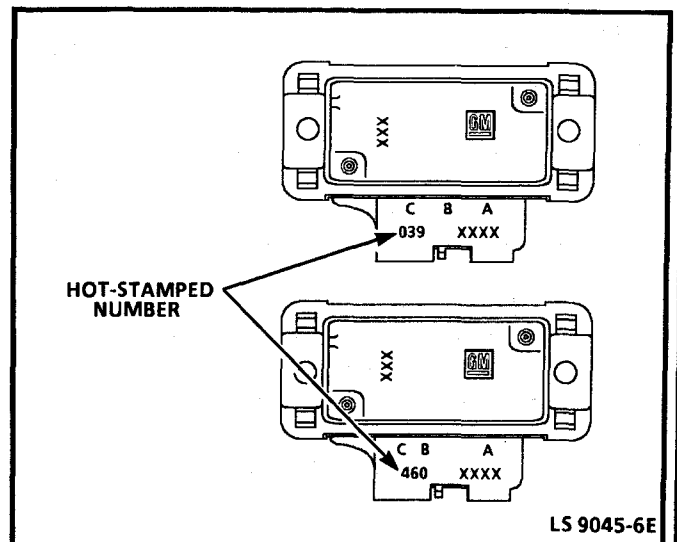


Figure 2 - Hot Stamped Number

"AFTER REPAIRS," CONFIRM "CLOSED LOOP" OPERATION AND NO MIL (SERVICE ENGINE SOON).

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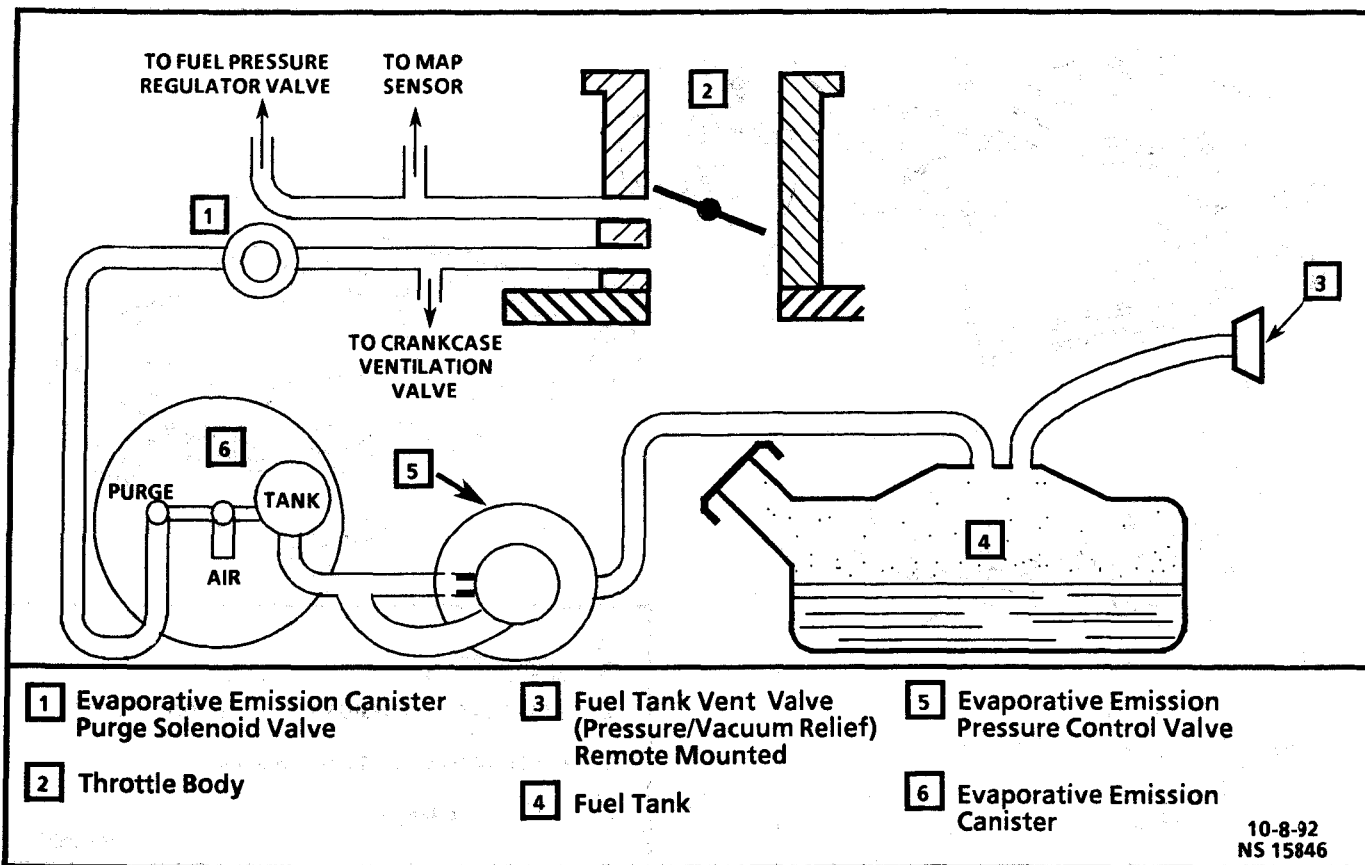


Figure C3-5 - Evaporative Emissions Control System Schematic

SECTION C7

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

CONTENTS

General Description	C7-1	Diagnosis	C7-2
Purpose	C7-1	Results of Incorrect EGR System	
Operation	C7-1	Operation	C7-2
Digital EGR Valve	C7-1	On-Vehicle Service	C7-2
EGR Control	C7-2	Digital EGR Valve	C7-2

GENERAL DESCRIPTION

PURPOSE

The EGR system is used to lower NO_x (Oxides of Nitrogen) emission levels caused by high combustion temperature. It does this by decreasing combustion temperature.

The main element of the system is the digital EGR valve.

The digital EGR valve feeds small amounts of exhaust gas back into the intake manifold and then into the combustion chamber.

OPERATION

Digital EGR Valve

The digital (EGR) valve is designed to accurately supply EGR to an engine, independent of intake manifold vacuum. The valve controls EGR flow from the exhaust to the intake manifold through three orifices which increment in size to produce seven combinations. When a solenoid is energized, the armature, with attached shaft and swivel pintle is lifted, opening the orifice.

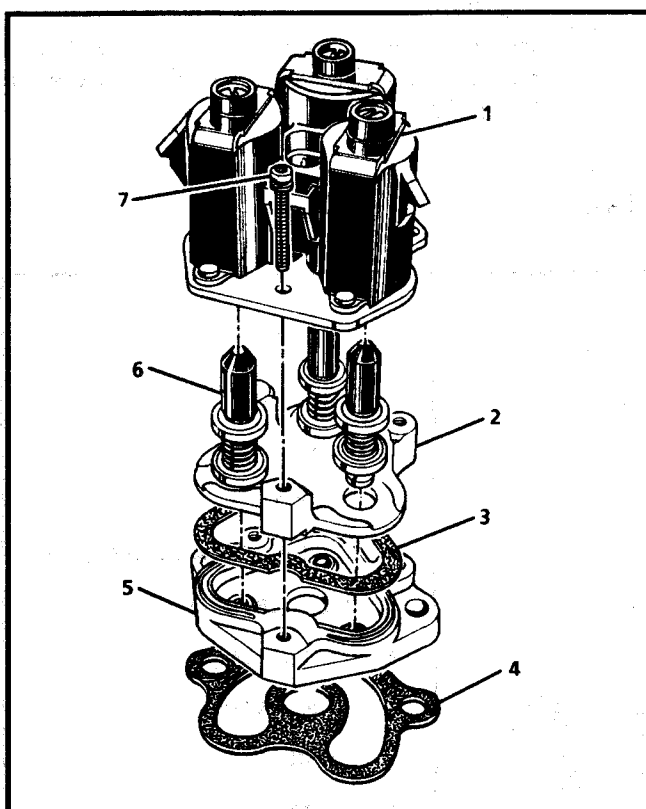
The flow accuracy is dependent on metering orifice size only, which results in improved control.

The swivel pintle feature ensures good sealing of exhaust gas, reducing the need of critical assembly alignment. In addition, the effects of EGR leakage on idle quality are reduced because the shaft and seals are exposed to exhaust pressure instead of manifold vacuum. The shafts are sealed from the exhaust chamber by floating seals held in place by the seal spring. These springs also hold the upper seals that seal the armature cavity in the solenoids.

The solenoid coils are fastened together to maximize reliability and to seal the coils from the environment. The coils use a common power terminal with individual ground terminals.

The digital EGR valve is opened by the PCM "quad-driver," grounding each respective solenoid circuit. This quad-driver activates the solenoid, raises the pintle, and allows exhaust gas flow into the intake manifold. The exhaust gas then moves with the air/fuel mixture into the combustion chamber. If too much exhaust gas enters, combustion will not occur. For this reason, very little exhaust gas is allowed to pass through the valve, with virtually none at idle. The EGR valve is usually open under the following conditions:

- Warm engine operation.
- Above idle speed.



- 1 SOLENOID & MOUNTING PLATE ASSEMBLY
- 2 EGR BASE PLATE
- 3 EGR BASE GASKET
- 4 INSULATOR GASKET
- 5 EGR BASE
- 6 ARMATURE ASSEMBLY
- 7 SCREW ASSEMBLY

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Figure C7-1 - Digital EGR Valve

BLANK

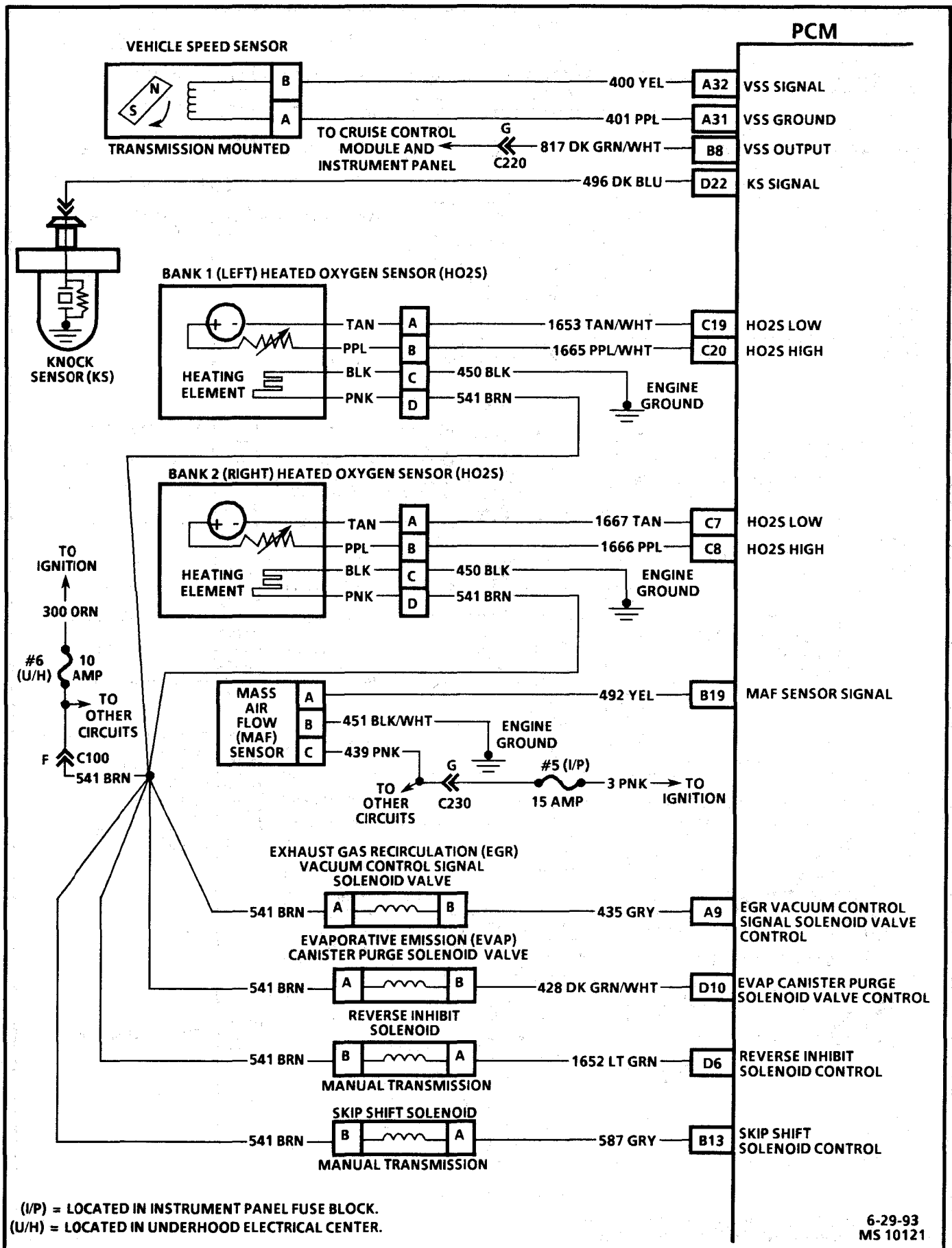


Figure A-3 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (2 of 7)

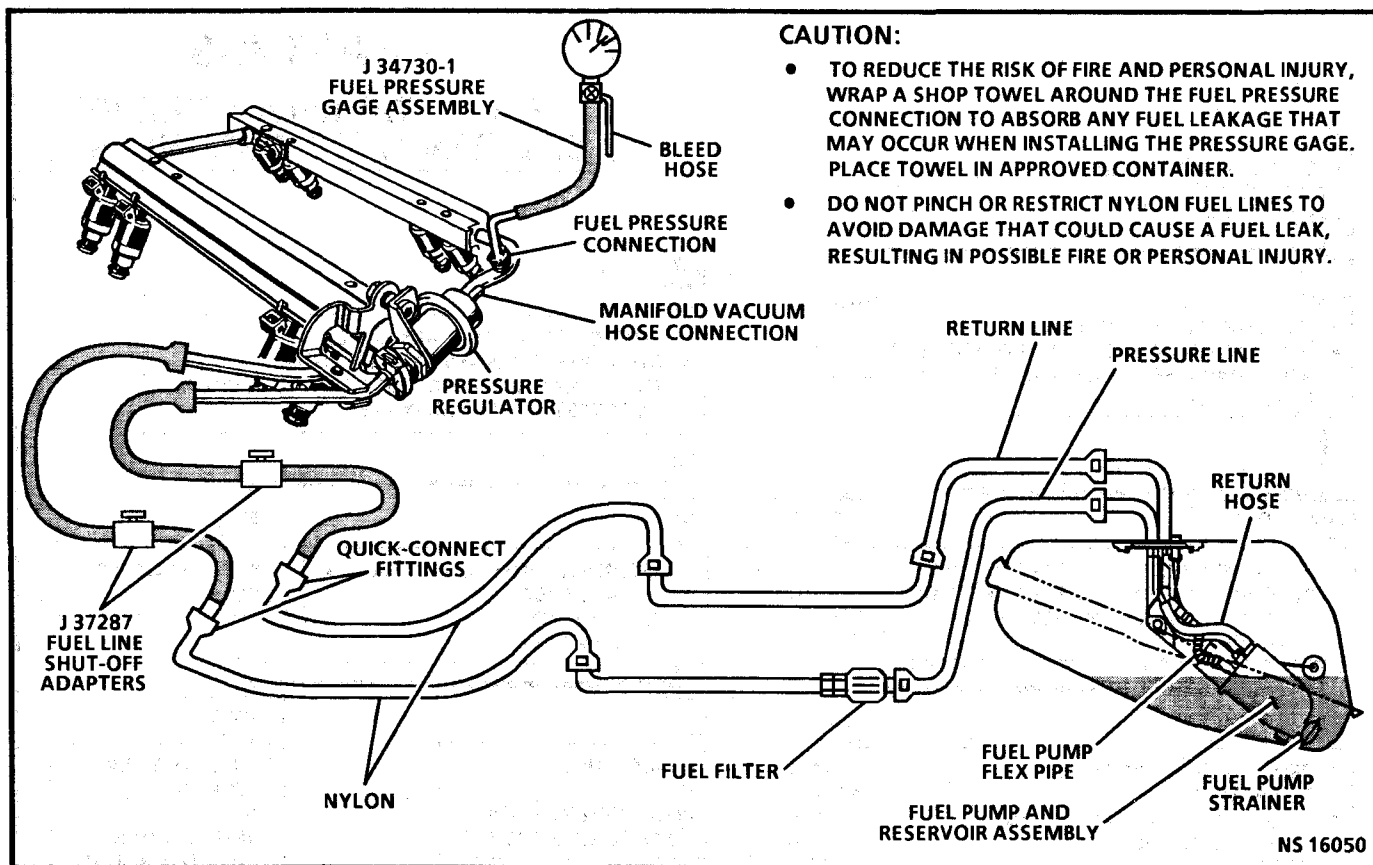


CHART A-7 (Page 1 of 3)

FUEL SYSTEM DIAGNOSIS 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

When the ignition switch is turned "ON," the Powertrain Control Module (PCM) will turn "ON" the in-tank fuel pump. It will remain "ON" as long as the engine is cranking or running, and the PCM is receiving reference pulses. If there are no reference pulses, the PCM will shut "OFF" the fuel pump within 2 seconds after ignition "ON" or engine stops.

Inside the fuel tank an electric fuel pump (within an integral reservoir), supplies fuel through an in-line filter to the fuel rail assembly. The pump is designed to provide fuel at a pressure above the regulated pressure needed by the injectors. A pressure regulator, attached to the fuel rail, keeps fuel available to the injectors at a regulated pressure. Unused fuel is returned to the fuel tank by a separate line.

The fuel pump "Test" connector is located in the engine compartment near the passenger side shock tower.

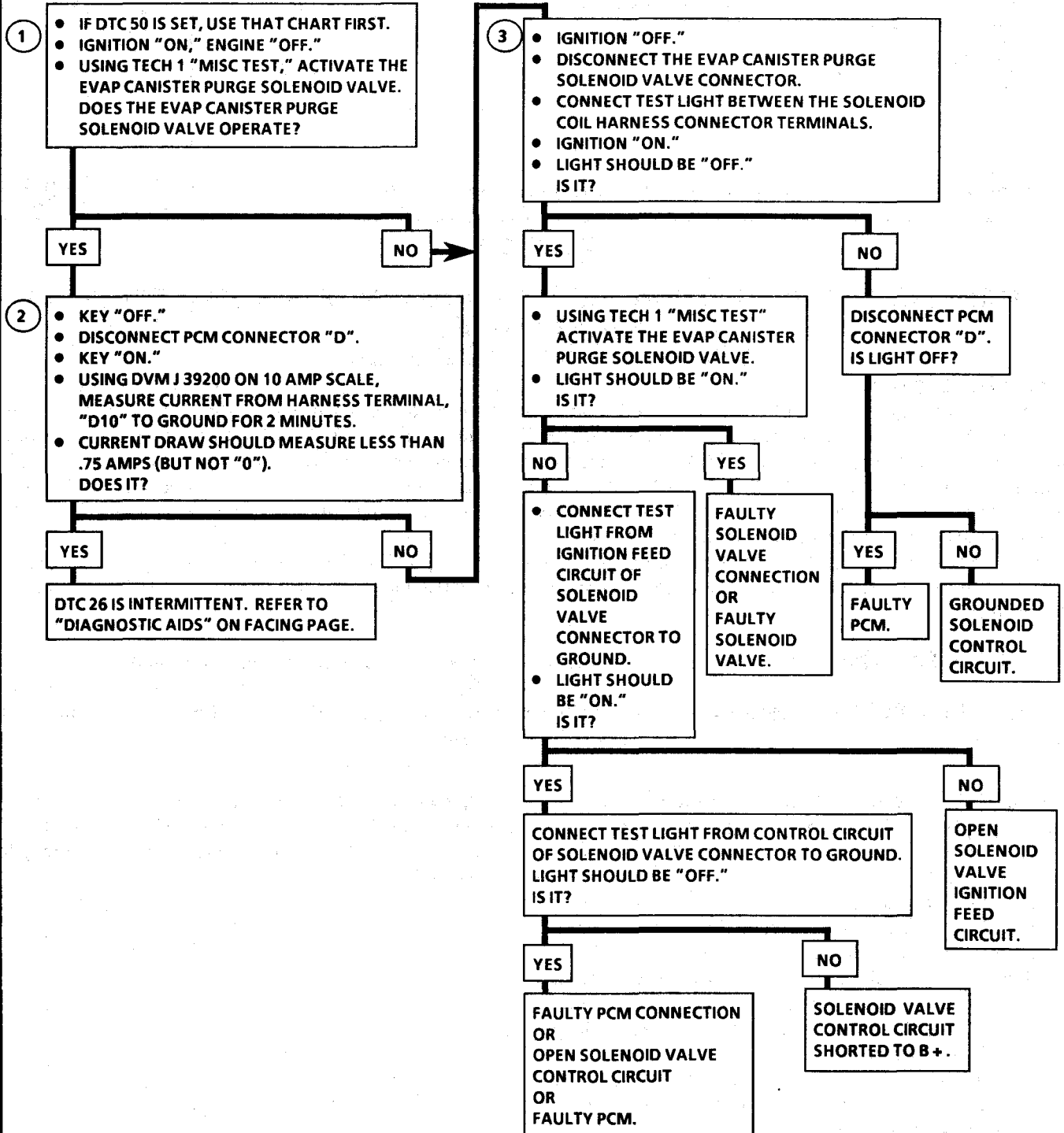
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Connect fuel pressure gage as shown in illustration. Wrap a shop towel around the fuel pressure connection to absorb any small amount of fuel leakage that may occur when installing the gage. With ignition "ON" and fuel pump running, pressure should be 284-325 kPa (41-47 psi). This pressure is controlled by spring pressure within the regulator assembly.
2. When the engine is idling, manifold pressure is low (high vacuum) and is applied to the pressure regulator diaphragm. Vacuum will offset spring pressure and result in lower fuel pressure. Fuel pressure at idle will vary somewhat depending on barometric pressure but, should be less than pressure noted in Step (1).
3. A system that does not hold pressure is caused by one of the following:
 - Leaking fuel pump check ball.
 - Leaking fuel pump flex pipe.

- Leaking valve/seat within pressure regulator.
 - Leaking injector(s).
4. A leaking injector can best be determined by checking for a fouled or saturated spark plug(s). If a leaking injector can not be determined by a fouled or saturated spark plug, the following procedure should be used.
 - Remove fuel rail but leave fuel lines connected. Follow the procedures in "Fuel Metering System," Section "6E3-C2" of this manual.
 - Lift fuel rail out just enough to leave injector nozzles in the ports.

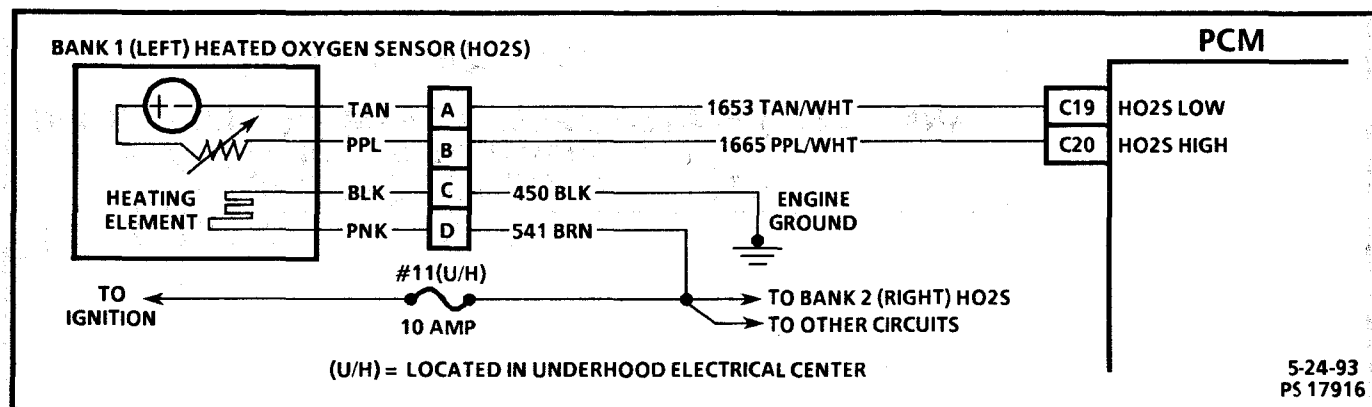
CAUTION: To reduce the risk of fire and personal injury that may result from fuel spray on the engine, make sure fuel rail is positioned over injector ports and injector retaining clips are intact.

- Pressurize the fuel system and observe injector nozzles.

DTC 26**EVAPORATIVE EMISSION (EVAP) CANISTER
PURGE SOLENOID VALVE CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)**

"AFTER REPAIRS," REFER TO DTC CRITERIA ON FACING PAGE AND CONFIRM DTC DOES NOT RESET.

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DTC 45

BANK 1 (LEFT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT (RICH EXHAUST INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM supplies a voltage of about 450 mV between terminals "C20" and "C19". (If measured with a 10 megohm digital voltmeter, this may read as low as 320 mV.) The Heated Oxygen Sensor (HO2S) varies the voltage within a range of about 1000 mV if the exhaust is rich down through about 10 mV if exhaust is lean.

The sensor is like an open circuit and produces no voltage when it is below 315°C (600°F). An open sensor circuit or cold sensor causes "Open Loop" operation. Whenever the ignition is "ON" voltage is supplied to the HO2S heaters on CKT 541. Even with the engine not running, the HO2S will reach operating temperature and indicate the oxygen content of the exhaust gas at the sensor. Typically the signal voltage will be near 450 mV at key-up. The signal voltage will then rise or drop as the sensor becomes active, depending on the oxygen content of the air near the sensor.

DTC 45 Will Set When: System is operating in "Closed Loop," not in power enrichment, signal voltage remaining above 700 mV for 50 seconds and throttle angle is greater than 4%.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate and the fuel control system will go into "Open Loop."

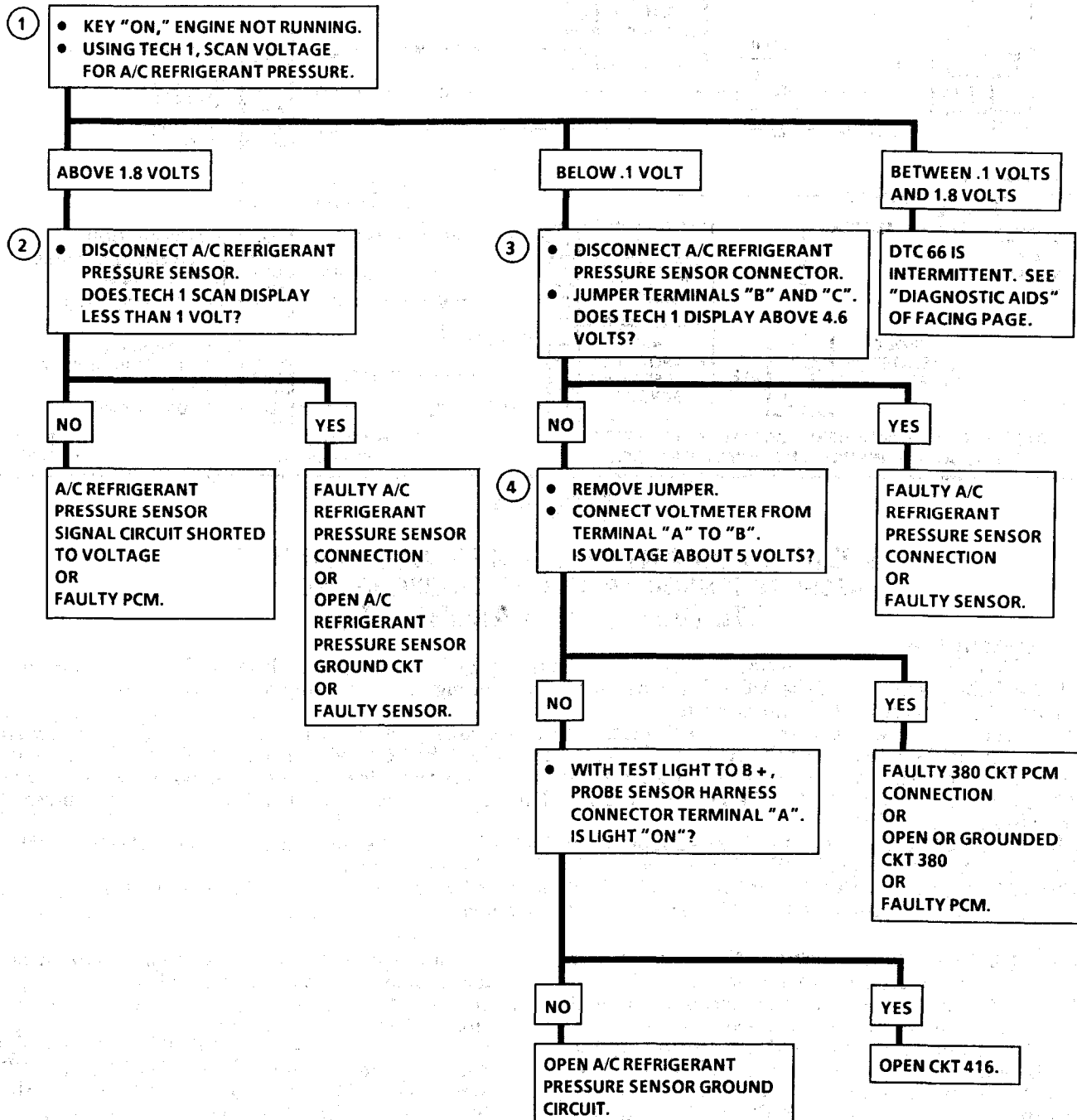
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Engine must be at normal operating temperature before performing this test.

Diagnostic Aids: Using the Tech 1, observe the long term fuel trim values at different RPM and load conditions. The Tech 1 also displays the fuel trim cells, so the long term fuel trim values can be checked in each of the cells to determine when the DTC 45 may have been set. If the conditions for DTC 45 exist, the long term fuel trim values will be near 108.

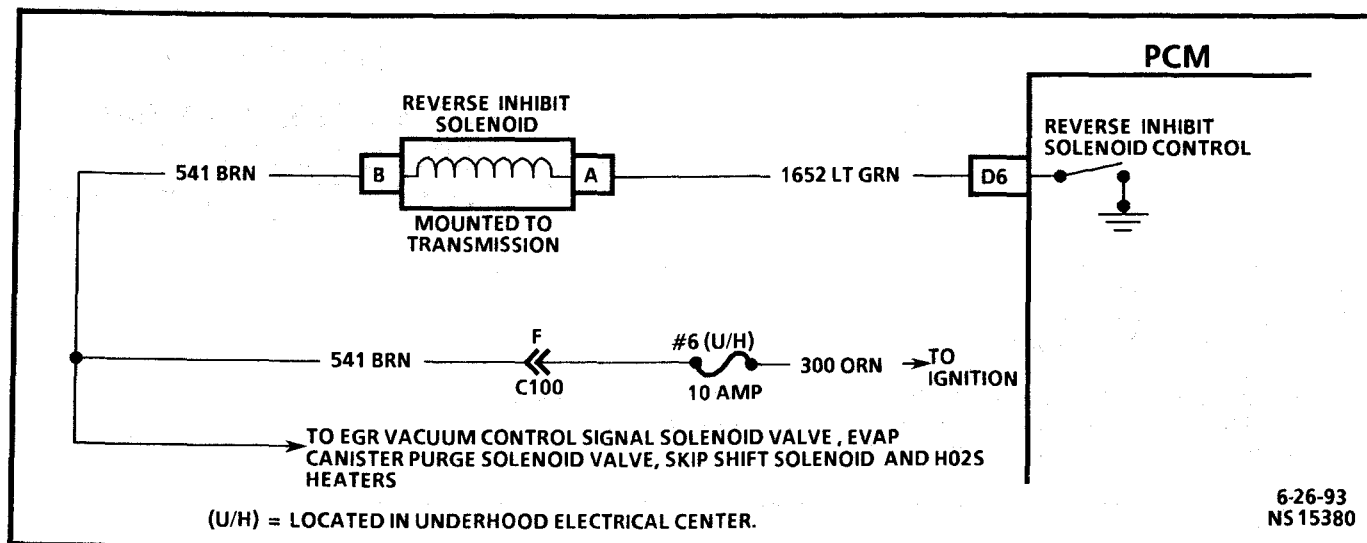
- **Fuel pressure.** System will go rich if pressure is too high. The PCM can compensate for some increase. However, if it gets too high, a DTC 45 may be set. Refer to "Fuel System Diagnosis," CHART A-7.
- **Rich injector.** Perform "Injector Balance Test," using Tech 1 or CHART C-2A.
- **Leaking injector.** Refer to "Fuel System Diagnosis," CHART A-7.
- Check for fuel contaminated oil.
- **Evaporative Emission (EVAP) canister purge.** Check for fuel saturation. If full of fuel, check canister control and hoses. Refer to "Evaporative Emission (EVAP) Control System," Section "6E3-C3".

- **MAF sensor.** Disconnect the MAF sensor and see if rich condition is corrected. If so, check for proper installation. If installed OK, replace MAF sensor. If the MAF sensor is installed backwards, the system will go rich. The plastic portion of the sensor has arrows cast into it indicating proper air flow direction. The arrows must point toward the engine.
- Check for leaking fuel pressure regulator diaphragm by checking vacuum line to regulator for fuel.
- **TP sensor.** An intermittent TP sensor output will cause the system to go rich, due to a false indication of the engine accelerating.
- **EGR.** An EGR valve staying open (especially at idle) will cause the oxygen sensor to indicate a rich exhaust, and this could result in a DTC 45.
- **Heated oxygen sensor.** An oxygen supply inside the HO2S is necessary for proper HO2S operation. This supply of oxygen is supplied through the HO2S wires. All HO2S wires and connections should be inspected for breaks or contamination that could prevent reference oxygen from reaching the HO2S.

DTC 66**A/C REFRIGERANT PRESSURE SENSOR CIRCUIT
(OPEN OR SHORTED)
5.7L (VIN P) "F" CARLINE (SFI)**

"AFTER REPAIRS," REFER TO DTC CRITERIA ON FACING PAGE AND CONFIRM DTC DOES NOT RESET.

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DTC 83

REVERSE INHIBIT SYSTEM (MANUAL TRANSMISSION) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The reverse lockout solenoid will be energized when the PCM grounds CKT 1652, which will allow the transmission to be shifted into reverse. The PCM will enable the reverse lockout solenoid whenever vehicle speed is below 4 mph. When vehicle speed is above 5 mph, the PCM will de-energize the reverse lockout solenoid, which will prohibit the transmission from being shifted into reverse.

DTC 83 Will Set When: The PCM detects the wrong voltage potential on CKT 1652 for 26 seconds.

Action Taken (PCM will default to): DTC 83 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The reverse inhibit solenoid will be enabled whenever vehicle speed is below 5 mph. If there is a fault in the vehicle speed sensor circuit and the PCM is not receiving VSS signal, the reverse inhibit solenoid would be enabled at speeds above 5 mph (8 km/h) and the shifter could be placed into reverse. With the ignition "OFF" the transmission should not shift into reverse.
2. This check can detect a partially shorted coil which would cause excessive current flow. If excessive current flow is detected a circuit check will be performed to isolate the device from the wiring. Leave the circuit energized for 2 minutes to allow the coil to warm up. The coil may open (amps drop to "0") when warm.
3. Raise the vehicle enough to gain access to the reverse lockout solenoid electrical harness and still be able to turn the ignition "ON."

POOR FUEL ECONOMY

Definition: Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, economy is noticeably lower than it was on this vehicle at one time, as previously shown by an actual road test.

PRELIMINARY CHECKS

- Perform the careful visual/physical check as described at start of "Symptoms," Section "6E3-B".
- Visually (physically) check: Vacuum hoses for splits, kinks, and proper connections as shown on "Vehicle Emission Control Information" label.
- Check owner's driving habits.
 - Is A/C "ON" full time (defroster mode "ON")?
 - Are tires at correct pressure?
 - Are excessively heavy loads being carried?
 - Is acceleration too much, too often?
- Check air cleaner element (filter) for being dirty or plugged.

IGNITION SYSTEM

- **CHECK:** Spark plugs. Remove spark plugs, check for wet plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. Repair or replace as necessary.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

COOLING SYSTEM

- **CHECK:** Engine coolant level.
- **CHECK:** Engine thermostat for faulty part or for wrong heat range. Refer to SECTION 6B.

ENGINE MECHANICAL

- **CHECK:** Compression. Refer to SECTION 6A.

ADDITIONAL CHECKS

- **CHECK:** TCC operation. Refer to SECTION 7A14A or "Automatic Transmission Control System, Transmission Range (TR) Pressure Switch Assembly," Section "6E3-C8". A Tech 1 should indicate an RPM drop, when the TCC is commanded "ON."
- **CHECK:** For exhaust system restriction, use CHART B-1.
- **CHECK:** For proper calibration of speedometer.
- **CHECK:** Air intake system and crankcase for air leaks.

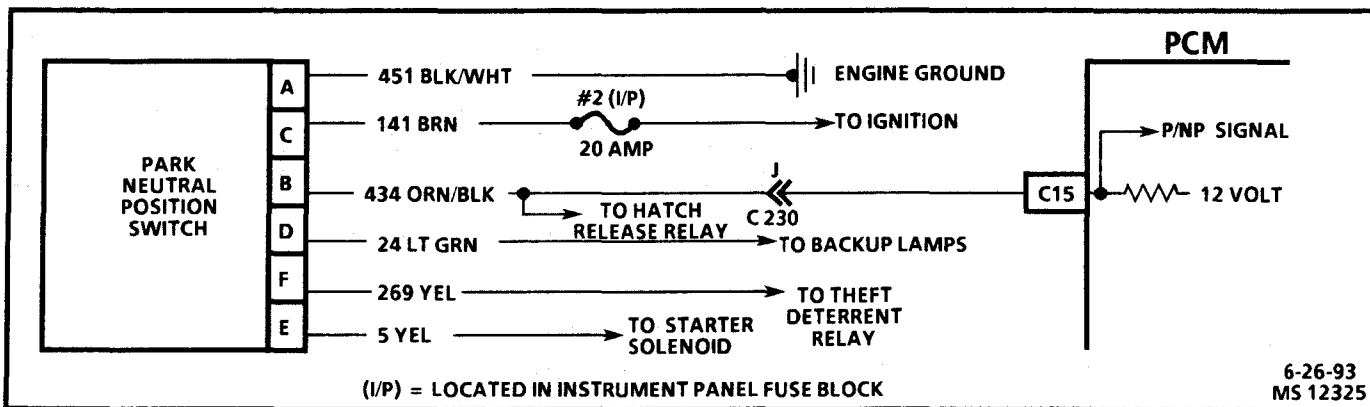


CHART C-1A

PARK/NEUTRAL POSITION (PNP) SWITCH DIAGNOSIS 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Park/Neutral Position (PNP) switch contacts are closed to ground in park and neutral. When the gear selector is positioned in reverse or drive range, the PNP switch will open and the PCM will interpret this signal as drive or reverse.

The PCM uses the PNP signal as one of the inputs to control:

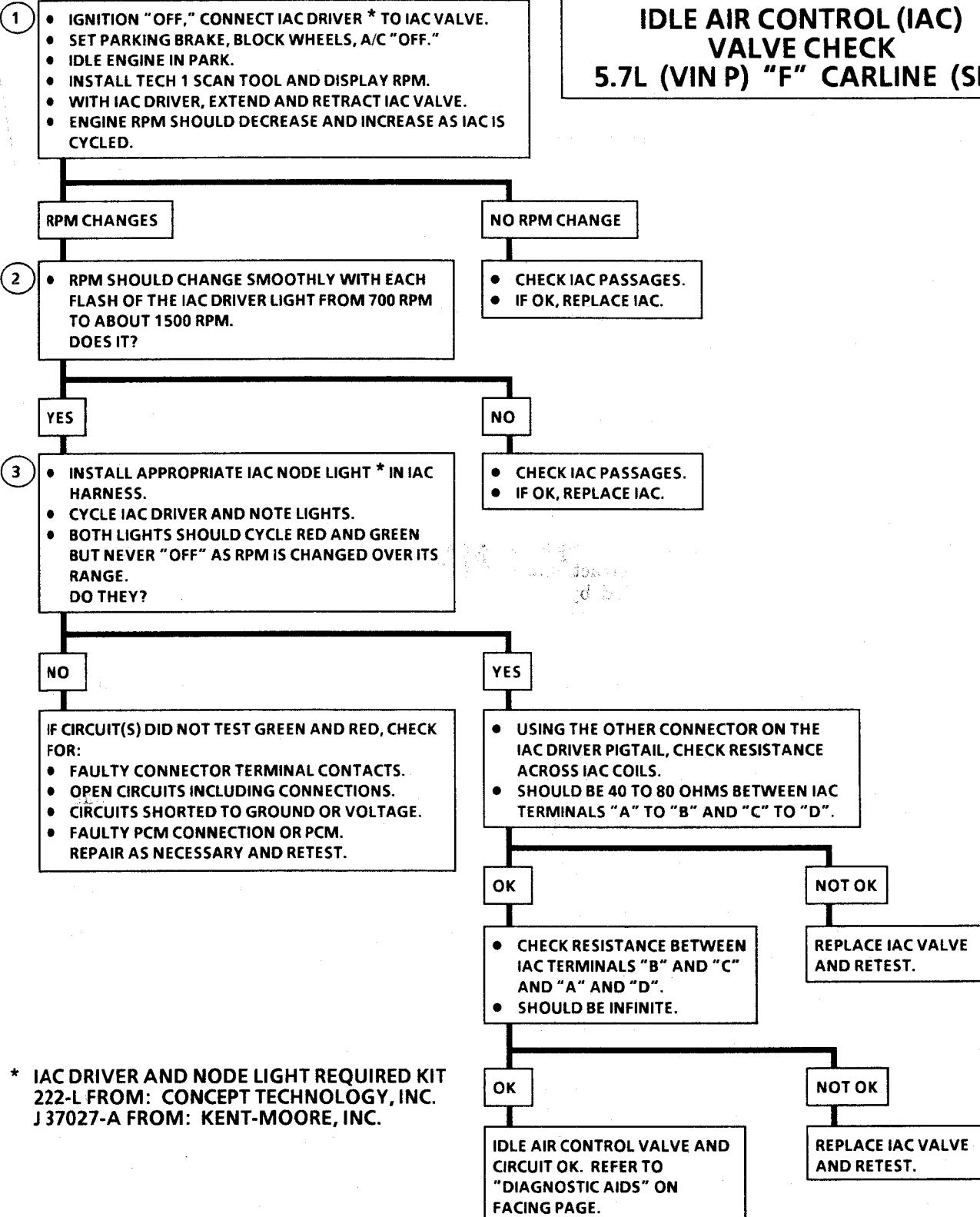
- Idle Air Control (IAC).
- Vehicle Speed Sensor (VSS) diagnostics.
- Exhaust Gas Recirculation (EGR).

If CKT 434 indicates PNP (grounded), while in drive range, the EGR would be inoperative, resulting in possible detonation.

If CKT 434 always indicates drive (open), a drop in the idle speed may exist when the gear selector is moved into drive range.

Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a closed switch to ground in park position.
2. Checks for an open switch in drive range.
3. Make sure the Tech 1 indicates drive, even while wiggling shifter to test for an intermittent or misadjusted switch in drive range.

CHART C-2C**IDLE AIR CONTROL (IAC)
VALVE CHECK
5.7L (VIN P) "F" CARLINE (SFI)**

* IAC DRIVER AND NODE LIGHT REQUIRED KIT 222-L FROM: CONCEPT TECHNOLOGY, INC.
J 37027-A FROM: KENT-MOORE, INC.

"AFTER REPAIRS," CONFIRM "CLOSED LOOP" OPERATION AND NO MIL (SERVICE ENGINE SOON).

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MS 12719

Install or Connect

1. Screw check valve onto AIR pipe.

Tighten

- Check valve to AIR pipe 23 N·m (17 lb. ft.).
2. Air pipe to exhaust manifold.
 3. Air hose to check valve.
 4. Check valve clamp.

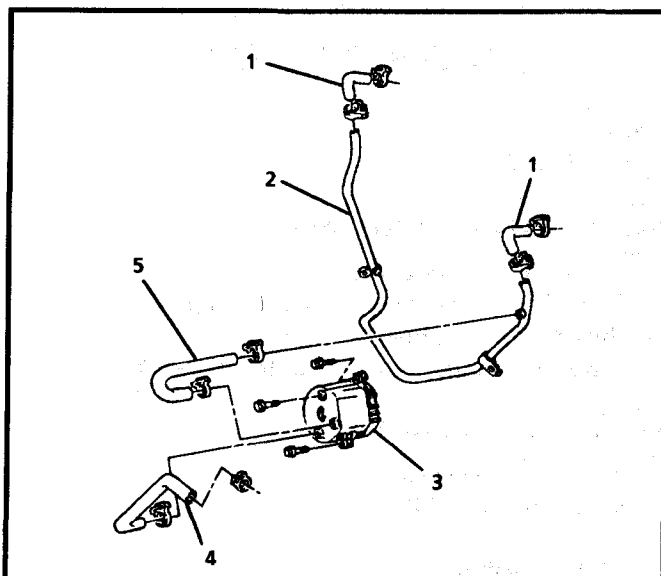
Right Side

Remove or Disconnect

1. Clamp and air hoses from AIR system right pipe.
2. Right check valve pipe.
3. Unscrew check valve from AIR pipe.

Install or Connect

1. Screw check valve onto AIR pipe.



- | | |
|---|----------------------------------|
| 1 | AIR HOSE TO CHECK VALVE |
| 2 | AIR CROSSUNDER PIPE |
| 3 | AIR PUMP |
| 4 | AIR HOSE TO AIR CLEANER ASSEMBLY |
| 5 | AIR HOSE TO CROSSUNDER PIPE |

PS 17367

Figure C6-4 - AIR Pipes and Hoses

Tighten

- Check valves 23 N·m (17 lb. ft.).
2. Right check valve pipe.
 3. Hose and clamp to check valve.
 4. Check AIR system for proper operation (see CHART C-6).

AIR CROSS UNDER PIPE

Remove or Disconnect

1. Clamp and air hose to check valve, both sides, from cross under pipe.
2. Clamp and air hose to air pump, from cross under pipe.
3. Raise vehicle.
4. Fasteners from air cross under pipe bracket, both sides.
5. Cut cross under pipe near center of oil pan to aid in removal.
6. Cross under pipe.

Install or Connect

1. Cross under pipe. New cross under pipe must be cut similarly to old pipe before installation.
2. Use appropriate length of 5/8 heater hose to join both halves of cross under pipe. Clamp both ends of hose securely with stainless steel clamps.
3. Fasteners to AIR cross under pipe bracket, both sides.
4. Lower vehicle.
5. Clamp and AIR hose from AIR pump to cross under pipe.
6. Clamp and AIR hose from check valve, both sides, to cross under pipe.
7. Check AIR system for proper operation (see CHART C-6).

TORQUE SPECIFICATIONS

Check Valves	23 N·m (17 lb. ft.)
AIR Pump	5.6 N·m (50 lb. in.)
Right Side AIR Pipe	
to Exhaust Manifold	24 N·m (18 lb. ft.)
Cross Under AIR Pipe	
Mounting Fasteners	5.6 N·m (50 lb. in.)
Left Side Air Pipe to	
Exhaust Manifold	24 N·m (18 lb. ft.)

SECTION C10

A/C CLUTCH CIRCUIT DIAGNOSIS

CONTENTS

General Description	C10-1	A/C Relay	C10-1
Operation	C10-1	A/C Evaporator Temperature	
Diagnosis	C10-1	Sensor	C10-1
On-Vehicle Service	C10-1	A/C Refrigerant Pressure Sensor	C10-1

GENERAL DESCRIPTION

In order to improve engine operation, the A/C compressor operation is controlled by the PCM.

OPERATION

This system consists of a HVAC control assembly, an A/C refrigerant pressure sensor, an A/C evaporator temperature sensor, a control relay, the compressor clutch and the PCM.

When the HVAC control assembly is placed in the A/C mode, a request signal is sent to the PCM. The PCM will then energize the A/C clutch relay, unless abnormally high or low A/C pressure is detected by the A/C refrigerant pressure sensor. The PCM also monitors the A/C evaporator temperature sensor to cycle the A/C clutch "ON" and "OFF." If the PCM detects an A/C evaporator temperature less than 2°C (36°F), the A/C clutch will be prohibited from being enabled. The PCM will also energize the cooling fans "ON" when A/C is requested. Refer to "Electric Cooling Fan," Section "6E3-C12". The A/C control relay is controlled by the PCM so that the PCM can increase idle speed before turning "ON" the clutch or disable the clutch when high engine coolant temperature is detected or high engine RPM is detected.

DIAGNOSIS

The PCM will energize the A/C clutch whenever the engine is running less than 4100 RPM and A/C has been requested, unless any of the following conditions are met:

- A/C head pressure greater than 414 psi (2854 kPa) or less than 38 psi (262 kPa) (as determined by the A/C refrigerant pressure sensor).
- A/C evaporator temperature less than 2°C (36°F).

- Low ignition voltage.
- Engine speed greater than 4700 RPM for 6 seconds.
- ECT greater than 125°C (257°F).

CHART C-10 should be used for diagnosing the electrical portion of the A/C circuit. SECTION 1B of the service manual should be used for diagnosing the refrigerant portion of the system.

The Tech 1 will be used in diagnosing the system, as it has the ability to read the A/C request input to the PCM, A/C compressor status, A/C system pressure, A/C evaporator temperature, as well as displaying when the PCM has commanded the A/C clutch "ON."

ON-VEHICLE SERVICE

A/C RELAY

Remove or Disconnect

1. Negative battery cable.
2. Cover from underhood electrical center.
3. Relay from underhood electrical center.

Install or Connect

1. Relay to underhood electrical center.
2. Cover to underhood electrical center.
3. Negative battery cable.

A/C Evaporator Temperature Sensor

For removal and replacement procedures, refer to SECTION 1B of the service manual.

A/C Refrigerant Pressure Sensor

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector.
3. Carefully back out A/C refrigerant pressure sensor.

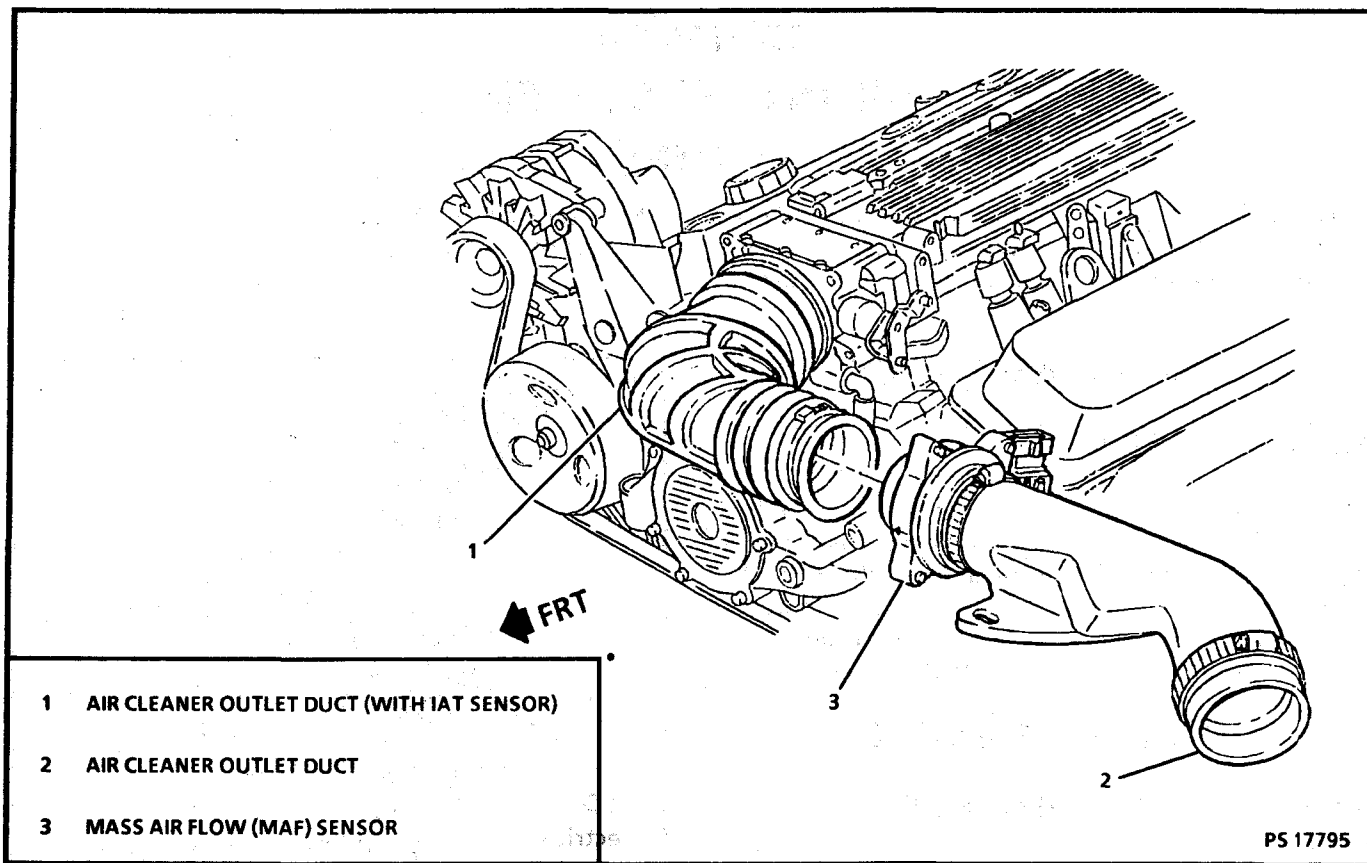


Figure C14-2 - Air Intake Components

PROBING

After probing, when reconnecting connectors or replacing terminals, always be sure to reinstall Connector Position Assurance (CPA) and Terminal Position Assurance (TPA).

Frontprobe

When frontprobing of connectors is required, always use a mating terminal adapter from Connector Test Adapter Kit (J 35616-A). The use of proper adaptors will ensure that proper terminal contact integrity is maintained. For a terminal contact checking procedure, refer to page 8A-4-6.

Backprobe

Only backprobe connector terminals when specifically called for in diagnostic procedures. Since backprobing can be a source of damage to connector terminals, extra care must be taken to avoid deforming the terminal, either by forcing the test probe too far into the cavity or by using too large a test probe.

After backprobing any connector, always check for terminal damage. If terminal damage is suspected, check for proper terminal contact, refer to "Checking Terminal Contact," page 8A-4-6.

TESTING FOR VOLTAGE (Figure 2)

1. Connect one lead of a test light to a known good ground. When using a DVM, be sure the voltmeter's negative lead is connected to ground.
2. Connect the other lead of the test light or voltmeter to a selected test point (connector or terminal).
3. If the test light illuminates, there is voltage present. When using a DVM, note the voltage reading.

TESTING FOR CONTINUITY (Figure 3)

1. Remove the fuse to the circuit involved.
2. Connect one lead of a self-powered test light or ohmmeter to one end of the part of the circuit you wish to test.
3. Connect the other lead to the other end of the circuit.
4. If the self-powered test light glows, there is continuity. When using an ohmmeter, low or no resistance means good continuity.

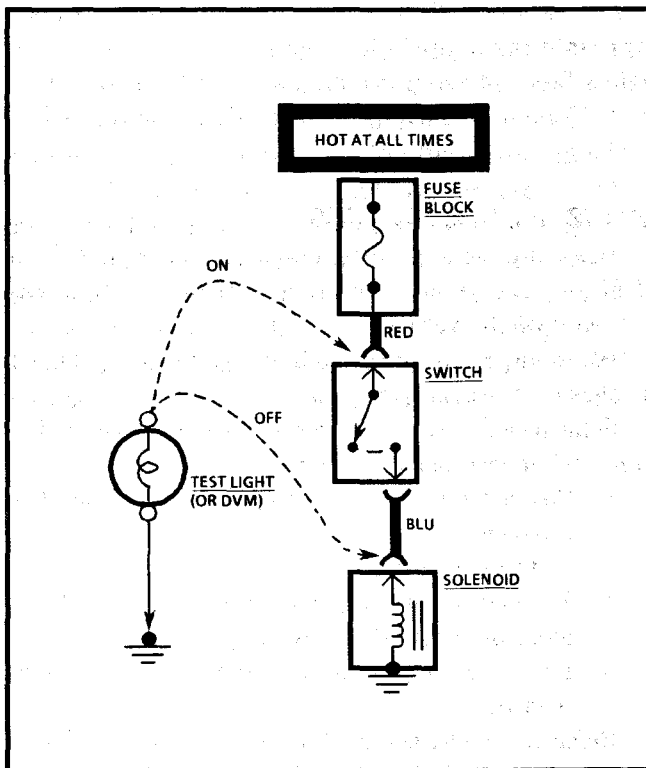


Figure 2 - Voltage Check

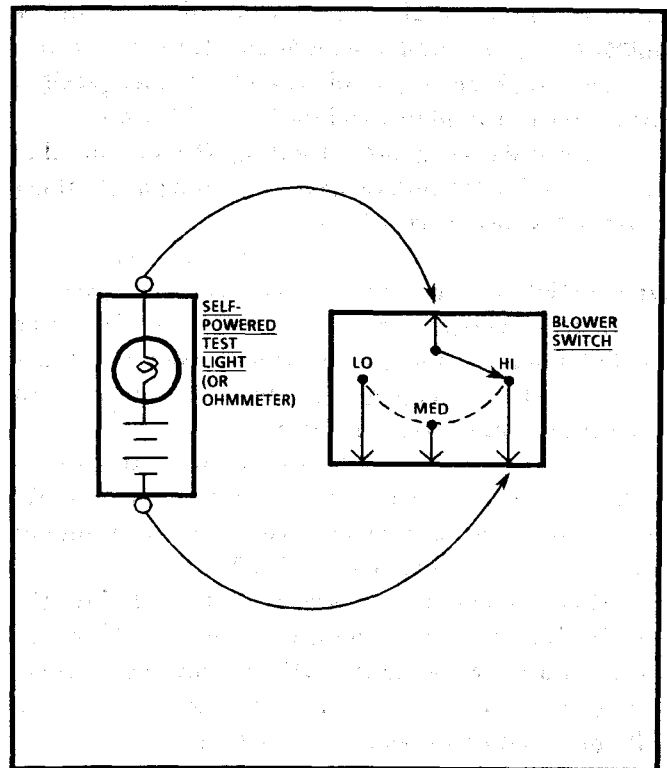


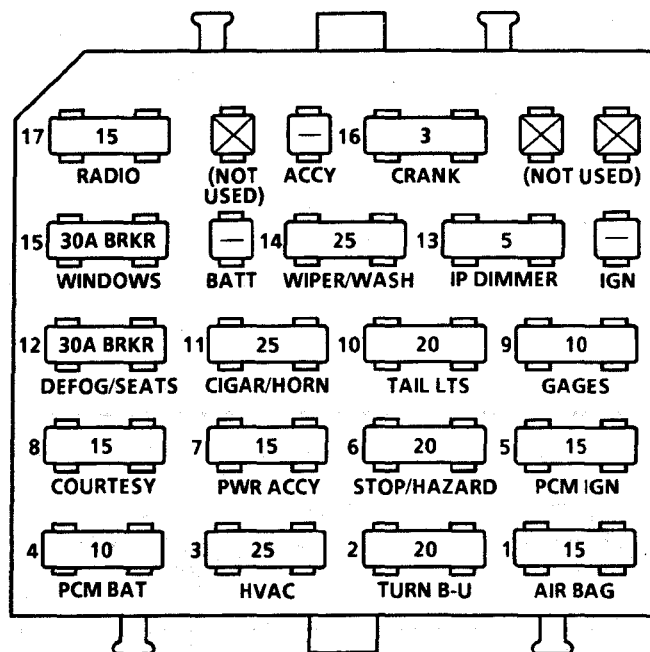
Figure 3 - Continuity Check through a Switch

FUSE BLOCK DETAILS (CHEVY) I/P FUSE BLOCK

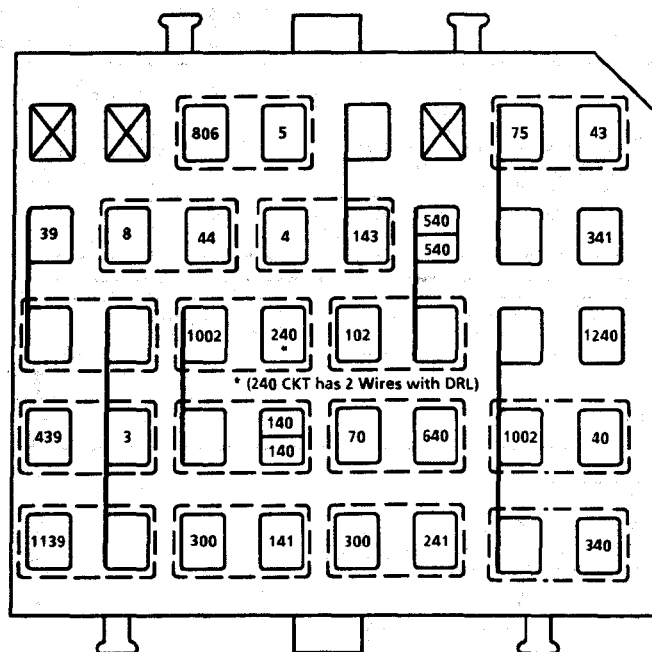
12052685

BASE FUSE BLOCK PACK-CON III
BLK

AUTOFUSE COLOR/RATINGS	
COLOR	AMPS
PPL	3
TAN	5
RED	10
BLUE	15
YEL	20
WHT	25



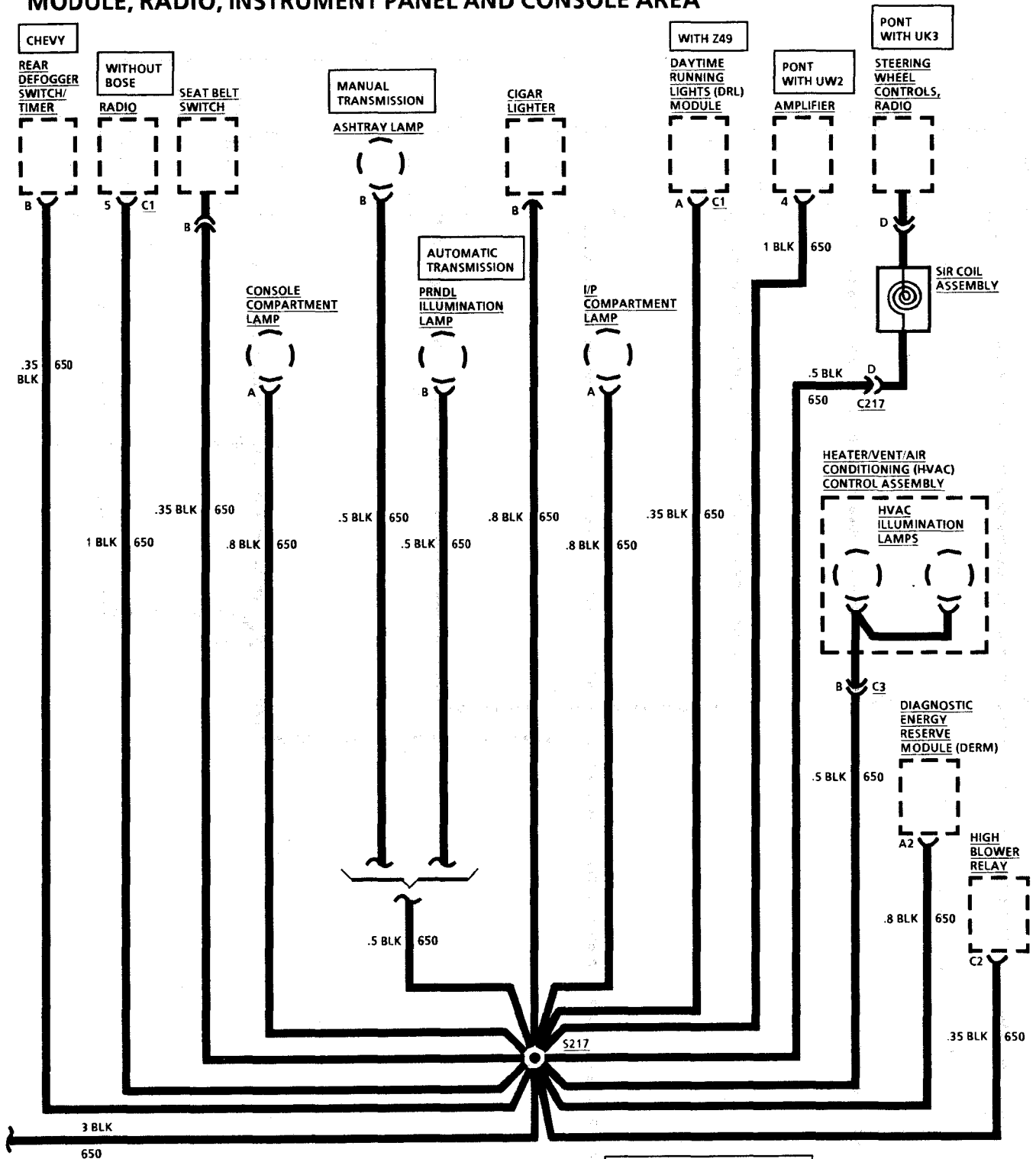
FRONT VIEW



REAR VIEW

GROUND DISTRIBUTION

DIAGNOSTIC ENERGY RESERVE MODULE (DERM), DAYTIME RUNNING LIGHTS (DRL) MODULE, RADIO, INSTRUMENT PANEL AND CONSOLE AREA

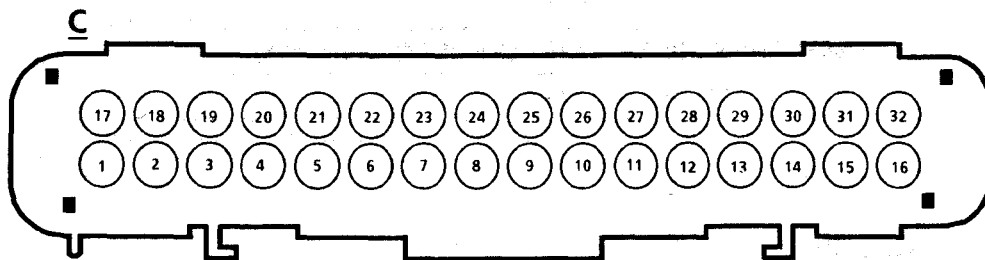
**IMPORTANT:**

S217 SHOWN WITH ALL
OPTIONS COMBINED.

SEQUENTIAL MULTIPOINT FUEL INJECTION: V6 VIN S

(CONTINUED FROM PREVIOUS PAGE)

CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
26	LT BLU/BLK	1748	IAC COIL "A" LOW	DTC 35
27	LT BLU/WHT	1747	IAC COIL "A" HIGH	DTC 35
28	DK GRN/WHT	817	BUFFERED SPEED OUTPUT (4000 PULSES/MILE)	DTC 24
29	PPL	401	VSS INPUT LOW	DTC(s) 24, 72
30	YEL	400	VSS INPUT HIGH	DTC(s) 24, 72
31	GRY	416	5 VOLT REFERENCE, MAP, TP AND A/C PRESSURE SENSORS	DTC(s) 22, 34, 66, 67, 70, 71, 73
32	BLK/WHT	451	PCM GROUND	FIG A-1



12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

POWERTRAIN CONTROL MODULE (PCM) (V6 VIN S)

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	12129023 (BLU)
SEAL	12146093
STRAIN RELIEF	12129028
CONNECTOR	12129025

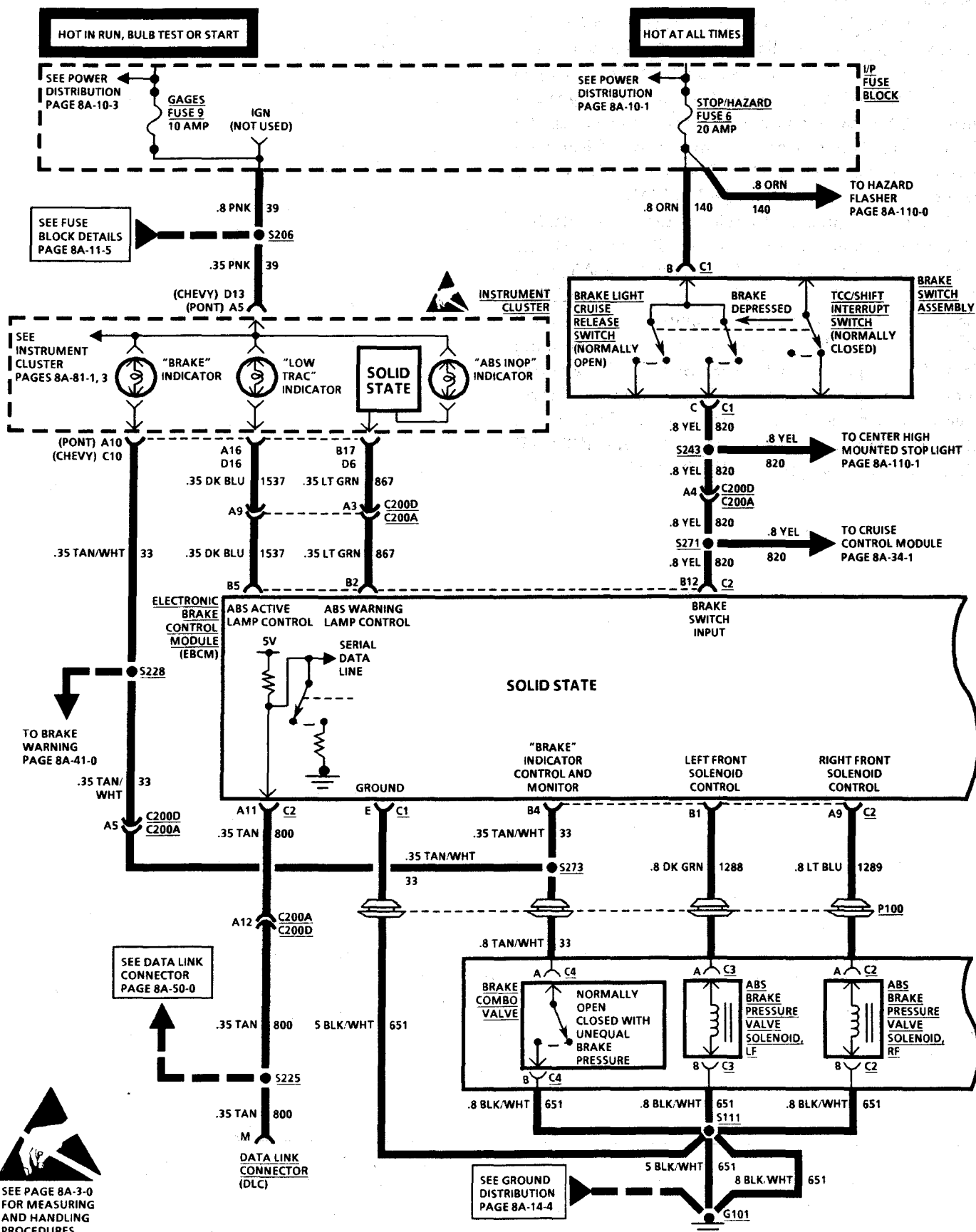
**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
1	TAN/WHT	551	PCM GROUND	FIG A-1
2	DK GRN	59	A/C CLUTCH STATUS	DTC(s) 68, 69
3	PNK	439	IGNITION FEED	DTC(s) 53, 96
5	RED/BLK	1228	PRESSURE CONTROL SOLENOID HI	DTC 93
6	LT BLU/WHT	1229	PRESSURE CONTROL SOLENOID LO	DTC 93
10	LT BLU	553	2ND START MODE SWITCH SIGNAL- PERFORMANCE	SEC C8
12	PNK/BLK	1746	INJECTOR DRIVER CYLINDER #3	CHART #A-3
13	LT GRN/BLK	1745	INJECTOR DRIVER CYLINDER #2	CHART #A-3
14	BLK	1744	INJECTOR DRIVER CYLINDER #1	CHART #A-3
15	YEL/BLK	846	INJECTOR DRIVER CYLINDER #6	CHART #A-3
16	BLK/WHT	845	INJECTOR DRIVER CYLINDER #5	CHART #A-3

(CONTINUED ON NEXT PAGE)

BLANK

ANTILOCK BRAKES (WITHOUT NW9)



CIRCUIT OPERATION (CHEVY)

When the Ignition Switch is turned to "RUN," voltage is applied from Fuse 3 to the Rear Defogger Switch. When the Rear Defogger Switch is turned to "ON," voltage is momentarily applied to the Rear Defogger Solid State Timer through CKT 241. With voltage applied to the Rear Defogger Timer On/Off Input, the Solid State Timer will energize the Internal Relay which applies voltage to the Rear Defogger Grid. The Relay remains closed until the defog cycle is complete or the Rear Defogger Switch/Timer is turned "OFF."

When the internal contacts of the Rear Defogger Relay are closed, voltage from Circuit Breaker 12 is applied to the indicator and to CKT 293.

The Rear Defogger Switch contains an internal timer to control the time the internal contacts are closed. When the Ignition Switch is turned to "RUN" and the Rear Defogger Switch is turned to "ON" for the first time, the defog cycle lasts 10 minutes. Further operation will result in 5 minute defog cycles. The defog cycle is reset to 10 minutes when the Ignition Switch is turned to "OFF" and back to "RUN."

CIRCUIT OPERATION (PONTIAC)

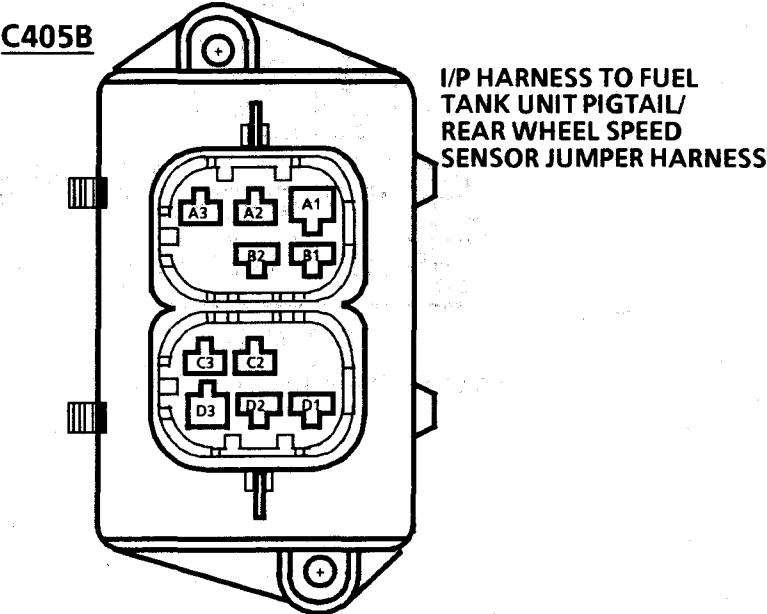
When the Ignition Switch is turned to "RUN," voltage is applied through the HVAC Fuse to the Rear Defogger Switch and the Rear Defogger Timer/Relay. When the Rear Defogger Switch is pressed, voltage is momentarily applied to the Rear Defogger Timer/Relay through CKT 292. When voltage is applied to the Rear Defogger Timer/Relay, the Rear Defogger Timer/Relay will close the internal contacts. The internal contacts remain closed until the defog cycle is complete or Rear Defogger Switch is pressed a second time.

When the internal contacts of the Rear Defogger Timer/Relay are closed, voltage is applied to the Rear Defogger Grid and Indicator.

The Rear Defogger Timer/Relay contains an internal timer to control the time the internal contacts are closed. When the Ignition Switch is turned to "RUN" and the Rear Defogger Switch pressed for the first time, the defog cycle lasts 10 minutes and further operation will result in 5 minutes defog cycles. The defog cycle is reset to 10 minutes when the Ignition Switch is turned to "OFF" and back to "RUN."

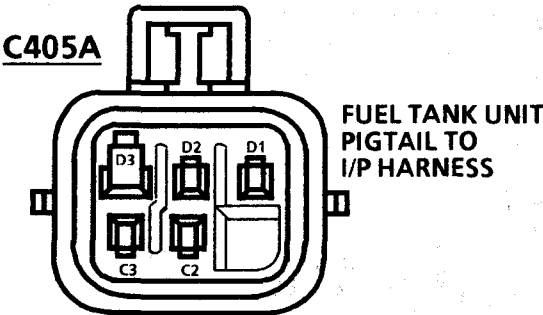
INSTRUMENT CLUSTER: WITH GAGES

FOR CONNECTOR CHART, SEE SECTION 8A-202.



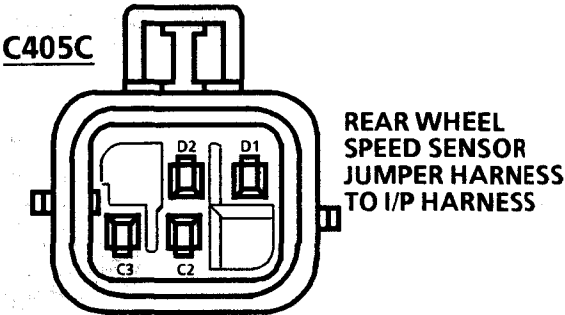
12092789

10-WAY M METRI-PACK 150, 280 SERIES
BLK



12110481

5-WAY F METRI-PACK 150, 280 SERIES
RED



12092800

4-WAY F METRI-PACK MIXED SERIES
BLK

CHART #3 (CHEVY ONLY) LO BEAM HEADLIGHTS INOPERATIVE, HI BEAM HEADLIGHTS OPERATE NORMALLY

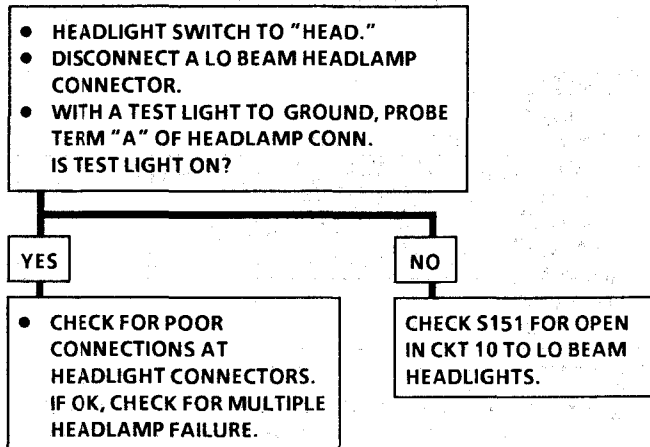


CHART #4 (CHEVY ONLY) HI BEAM HEADLIGHTS INOPERATIVE, LO BEAM HEADLIGHTS OPERATE NORMALLY

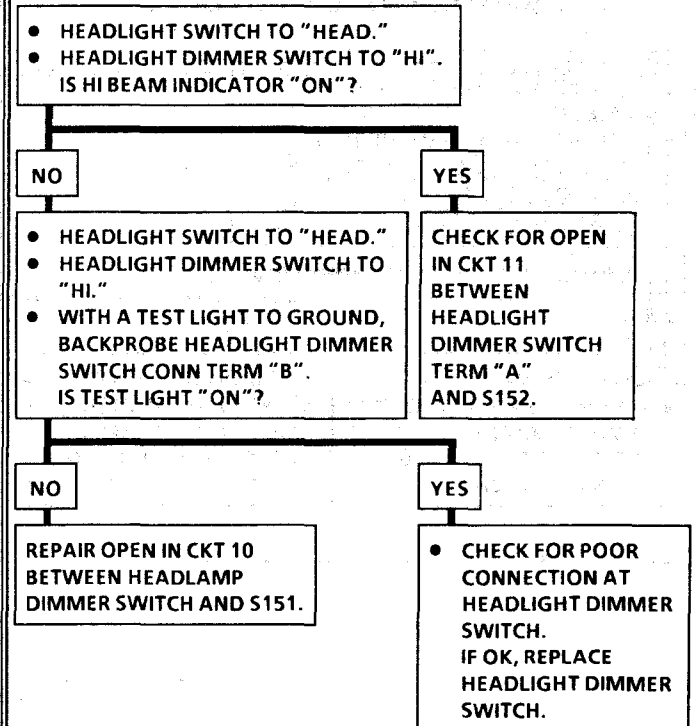
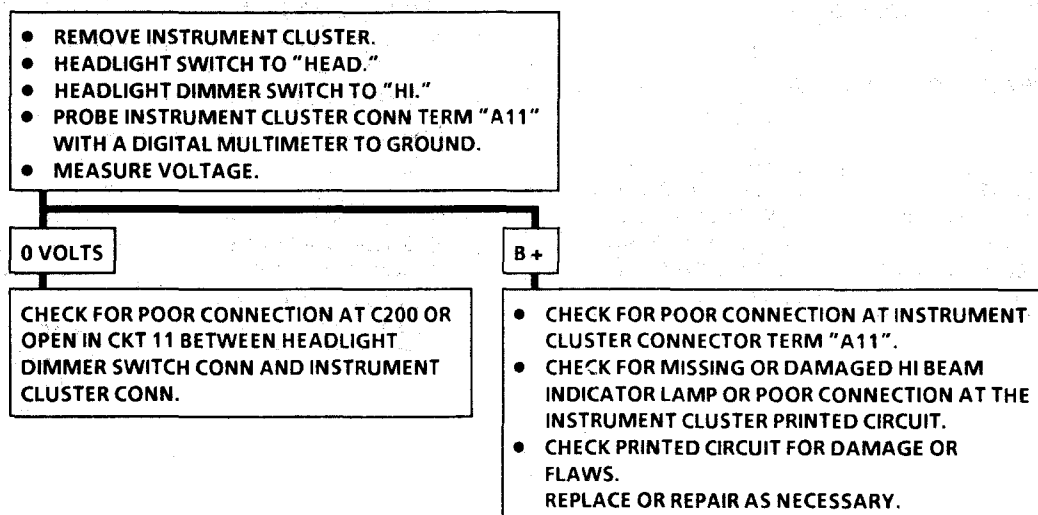
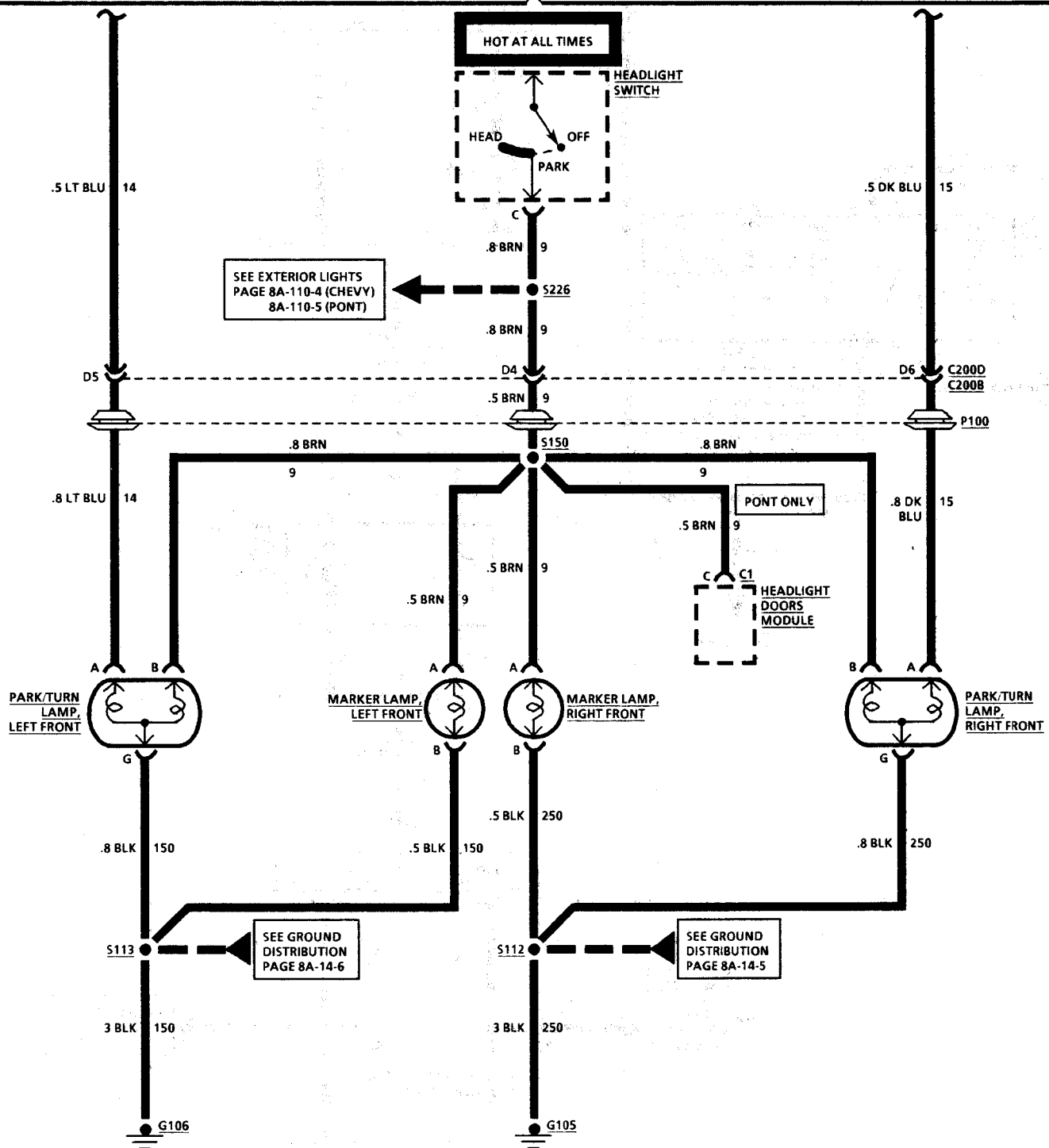


CHART #5 HI BEAM INDICATOR INOPERATIVE, HI BEAM HEADLIGHTS OPERATE NORMALLY



EXTERIOR LIGHTS WITHOUT DAYTIME RUNNING LIGHTS (T61)

FROM PAGE 8A-110-0



CIRCUIT OPERATION

Important:

- The Power Windows System has voltage applied from the Windows Circuit Breaker 15 which is controlled by the Retained Accessory Power (RAP) Module. Voltage is applied to the PWR ACCY Fuse for up to 10 minutes after Ignition is turned off or for 35 seconds after exiting the vehicle and closing the doors or whenever a door is open. For a complete understanding of Retained Accessory Power (RAP) operation, refer to SECTION 8A-15.

When the Ignition Switch is in the "RUN," "ACCY," or RAP voltage is applied from windows Circuit Breaker 15 to the LH Power Window Switch and the RH Window Switch through CKT 341. The Window Motors and Switches receive ground through the LH Power Window Switch Assembly, which is grounded at G200. The RH Window can be operated from the LH and RH Power Window Switch Assemblies. The LH Front Window is operated directly from the LH Power Window Switch.

The Power Windows are driven by reversible, permanent magnet motors. Each motor is controlled by a set of two switches, which are normally closed to ground. When any Window Switch is moved to the "UP" position, the "UP" switch will provide battery voltage to the Window Motor through the DK BLU wire. The Window Motor will receive ground through the BRN wire, the "DN" switch, and the LH Power Window Switch Assembly and drive the window up. When the switch is released, the switch contacts will return to their normal grounded position.

To lower the window, the "DN" switch will connect the BRN wire to battery voltage. Ground will be provided to the DK BLU wire through the "UP" switch and the LH Power Window Switch Assembly. The polarity across the motor will be reversed, causing the motor to rotate in the opposite direction and lower the window.

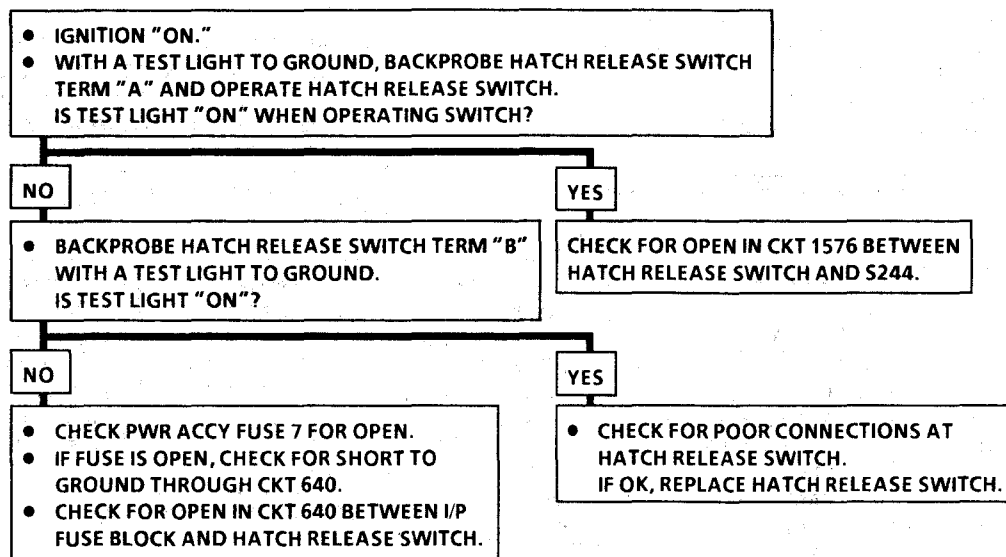
The Power Windows System also includes an Express Down Feature for the LH Front Window. This allows the LH Front Window to open fully when the LH Front Window Switch is pressed momentarily. All of the solid state circuitry controlling this feature is contained within the Express Down Module.

Each motor is protected by an Electronic Circuit Breaker (ECB). If a Window Switch is held in the "UP" or "DN" position too long with the window obstructed, or after the window is fully up or down, the ECB will increase its resistance. By increasing its resistance, the ECB will prevent the Window Motor from overloading. The ECB will reset to normal resistance when voltage to the Window Motor is interrupted.

HATCH RELEASE (A90)

CHART #2

HATCH RELEASE OPERATES FROM KEYLESS ENTRY AND DOES NOT
OPERATE FROM HATCH RELEASE SWITCH



CIRCUIT OPERATION

The Hatch Release Relay has voltage applied from the PWR ACCY Fuse which is controlled by the Retained Accessory Power (RAP) Module. Voltage is applied to the PWR ACCY Fuse for up to 10 minutes after the Ignition is turned off, or for 35 seconds after exiting the vehicle and closing the doors or whenever a door is open. For a complete understanding of the Retained Accessory Power (RAP) operation, refer to SECTION 8A-15.

The Hatch Release can be activated from within the vehicle by operating the Hatch Release Switch when the Ignition is in "ACCY", "RUN" or "RETAINED ACCESSORY POWER" with the Park Brake set for Manual Transmission or in "PARK" or "NEUTRAL" position for Automatic Transmission.

Battery voltage is applied at all times to the normally open contacts of the Hatch Release Relay from Courtesy Fuse 8.

When the Hatch Release Switch is operated, the switch closes and battery voltage is applied to the coil of the Hatch Release Relay. On vehicles with Automatic Transmissions, the Hatch Release Relay Coil receives a ground through the Transmission Position Switch to G103 (V8 VIN P) or G104 (V6 VIN S), the Hatch Release Relay can only be energized with the Gear Selector in the "PARK" or "NEUTRAL" position. On vehicles with Manual Transmissions, the Hatch Release Relay Coil receives a ground through the Park Brake Switch when the Park Brake is "ON." For vehicles equipped with Daytime Running Lamps (DRL), ground is provided through the Park Brake Switch and a Circuit Isolation Diode within the DRL Module.

When the Hatch Release Relay is energized and the relay contacts close, battery voltage is applied to the Hatch Release Actuator. The Hatch Release Actuator contains an Electronic Circuit Breaker (ECB). ECB resistance increases if motor is overloaded. Resistance returns to normal after voltage is removed from actuator terminals.

- Check for a broken (or partially broken) wire inside of the insulation which could cause system malfunction but prove "GOOD" in a continuity/voltage check with a system disconnected. These circuits may be intermittent or resistive when loaded, and if possible, should be checked by monitoring for a voltage drop with the system operational (under load).
- Check for proper installation of aftermarket electronic equipment which may affect the integrity of other systems (see "Troubleshooting Procedures," page 8A-4-0).

- Refer to System Diagnosis.

SYSTEM DIAGNOSIS

- Perform the System Check and refer to the Symptom Table for the appropriate diagnostic procedures.

! Important:

- For a better understanding of Retained Accessory Power (RAP) operation, refer to Circuit Operation at the end of this section.

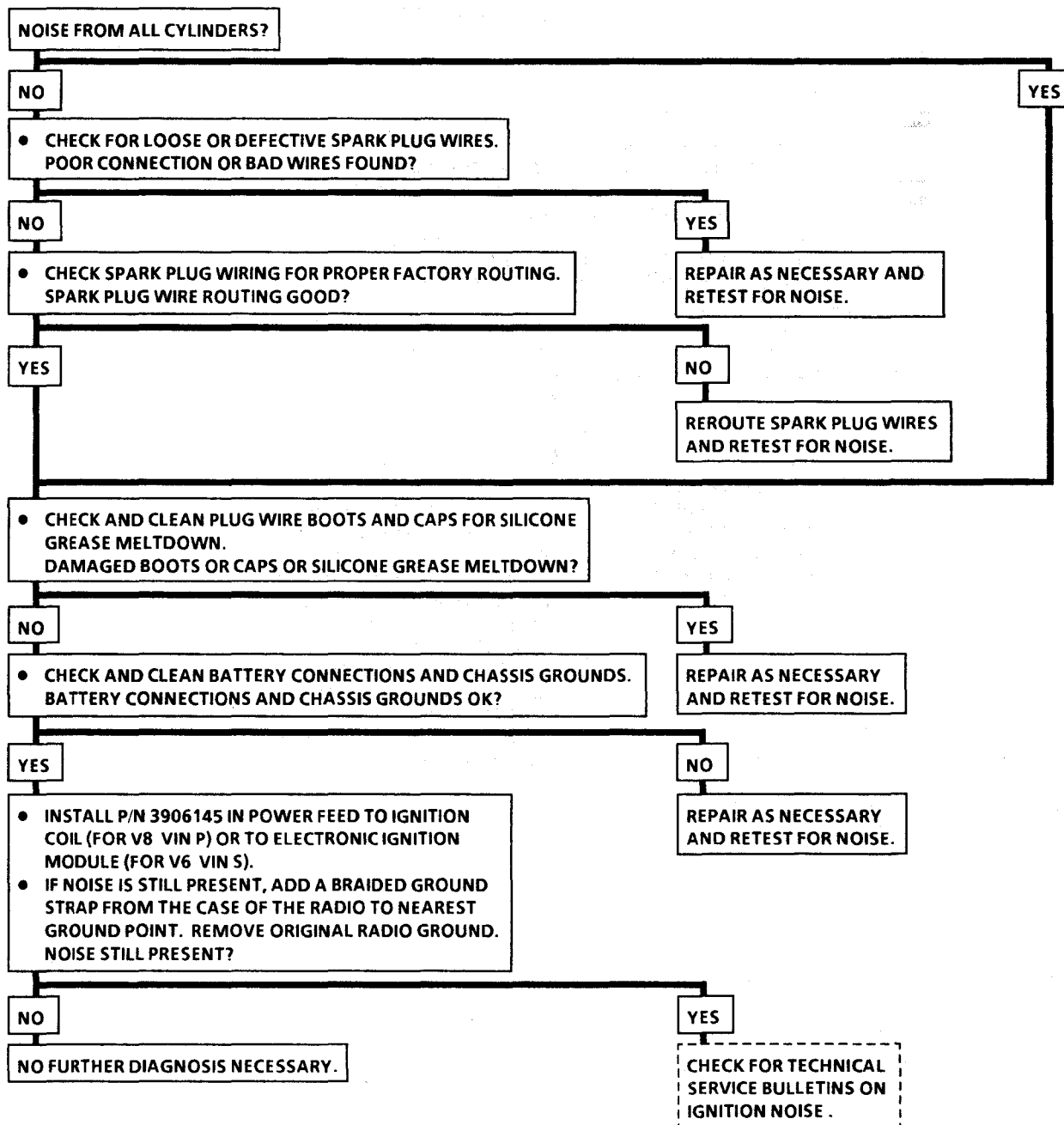
SYSTEM CHECK

ACTION	NORMAL RESULTS
[1] • Move Mirror Select Switch to "LEFT" position. Operate Mirror Position Switch in "UP" and "DOWN" positions.	LH Outside Mirror moves smoothly upward and downward.
[2] • Operate Mirror Position Switch in the "LEFT" and "RIGHT" positions.	LH Outside Mirror moves smoothly to the left and right.
[3] • Move Mirror Select Position to "RIGHT" position. Operate Mirror Position Switch in "UP" and "DOWN" positions.	RH Outside Mirror moves smoothly upward and downward.
[4] • Operate Mirror Position Switch in the "LEFT" and "RIGHT" positions.	RH Outside Mirror moves smoothly to the left and right.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Both mirrors do not operate in either ("UP/DOWN" or "LEFT/RIGHT") mode.	Chart #1	8A-147-4
One mirror does not operate in the "UP/DOWN" mode ("LEFT/RIGHT" mode operates normally).	Chart #2	8A-147-4
One mirror will not operate in the "LEFT/RIGHT" mode ("UP/DOWN" mode operates normally).	Chart #3	8A-147-5
One mirror will not operate in either ("UP/DOWN" or "LEFT/RIGHT") mode.	Chart #4	8A-147-6
PWR ACCY Fuse 7 repeatedly blows whenever Ignition is "ON" or when attempting to operate Power Mirrors.	Chart #5	8A-147-7

RADIO

CHART #14
IGNITION NOISE

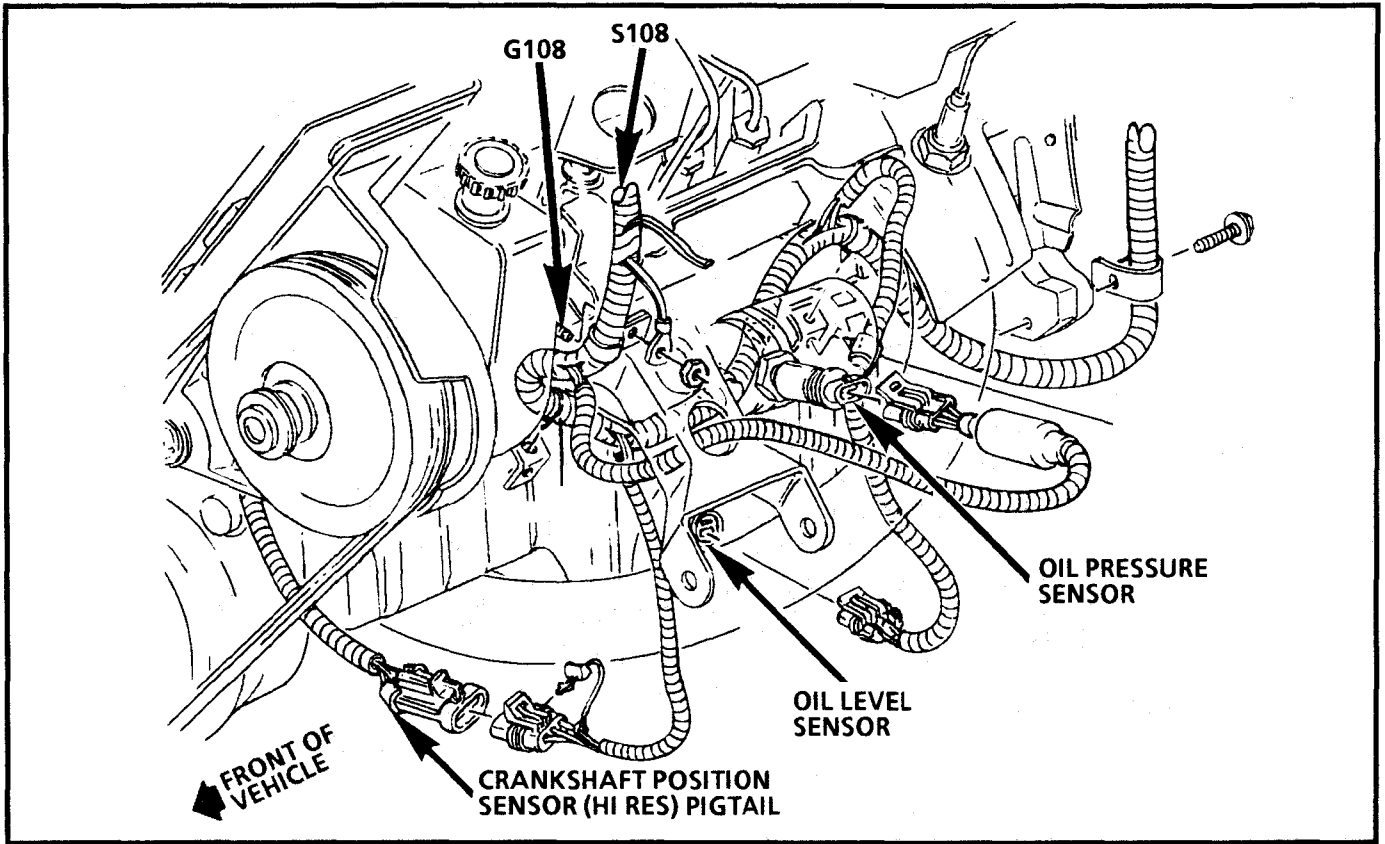


Figure 20 - LH Side of Engine (V6 VIN S)

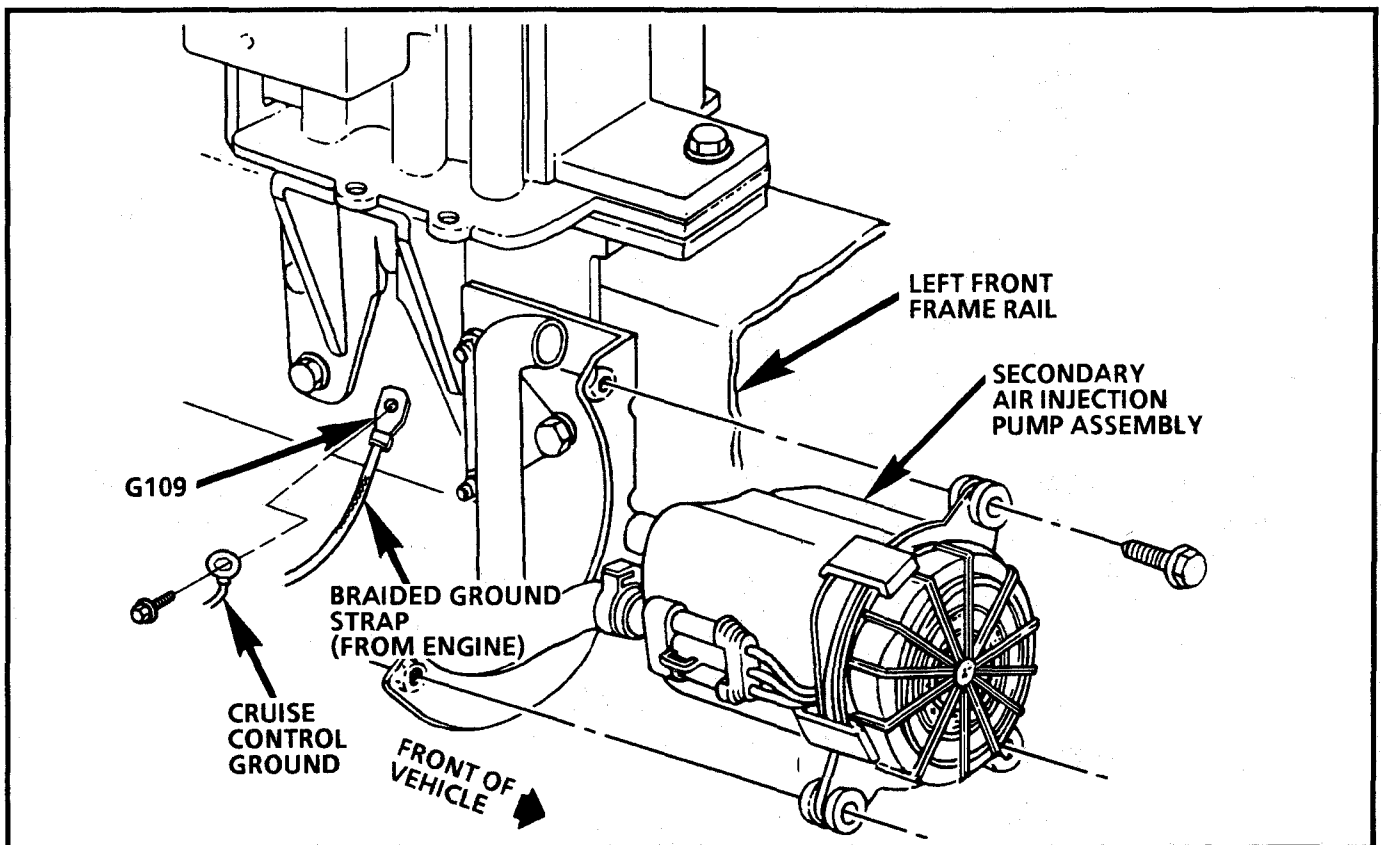


Figure 21 - LH Front Frame Rail

COMPONENT LOCATION VIEWS

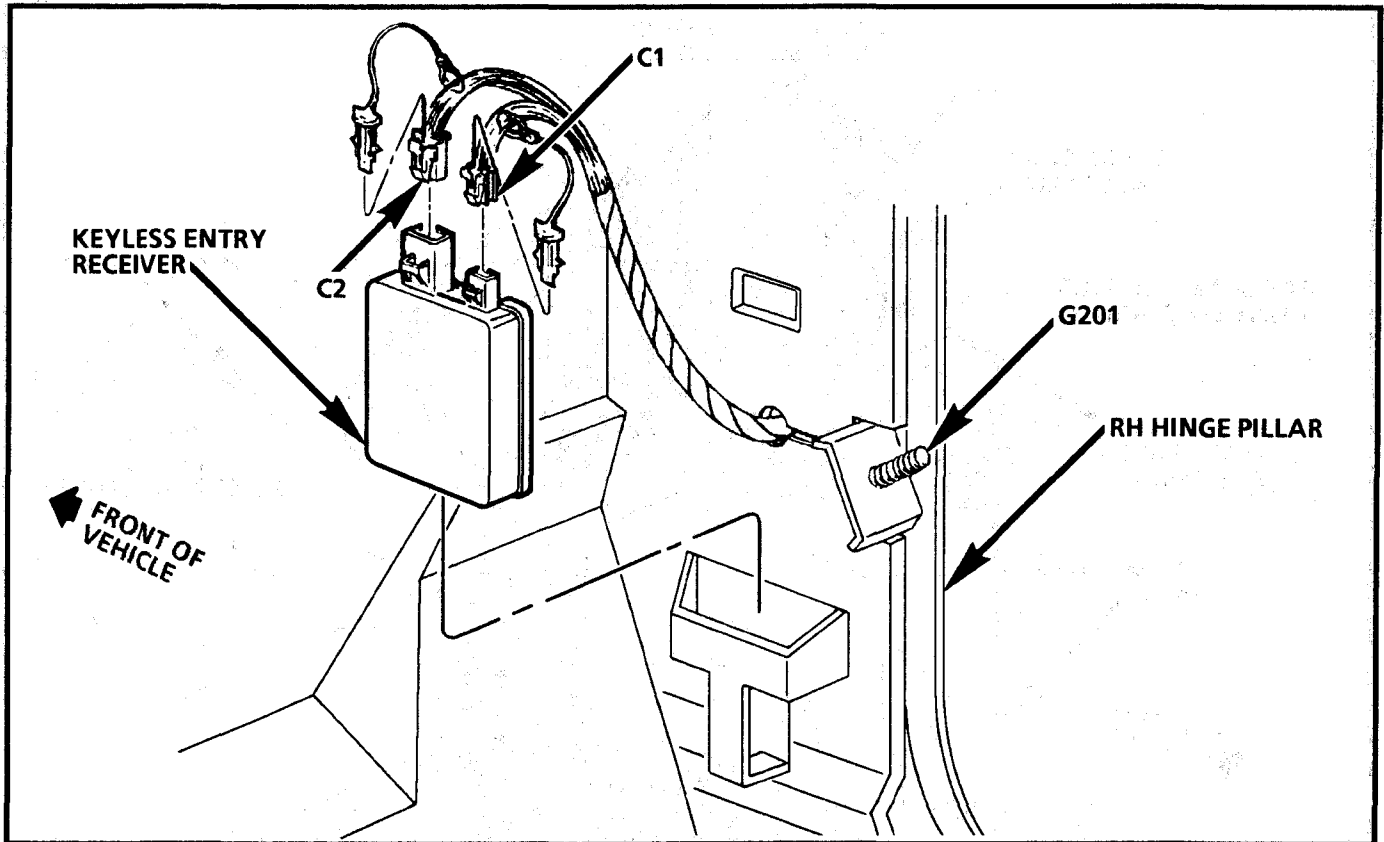


Figure 71 - Behind RH Kick Panel

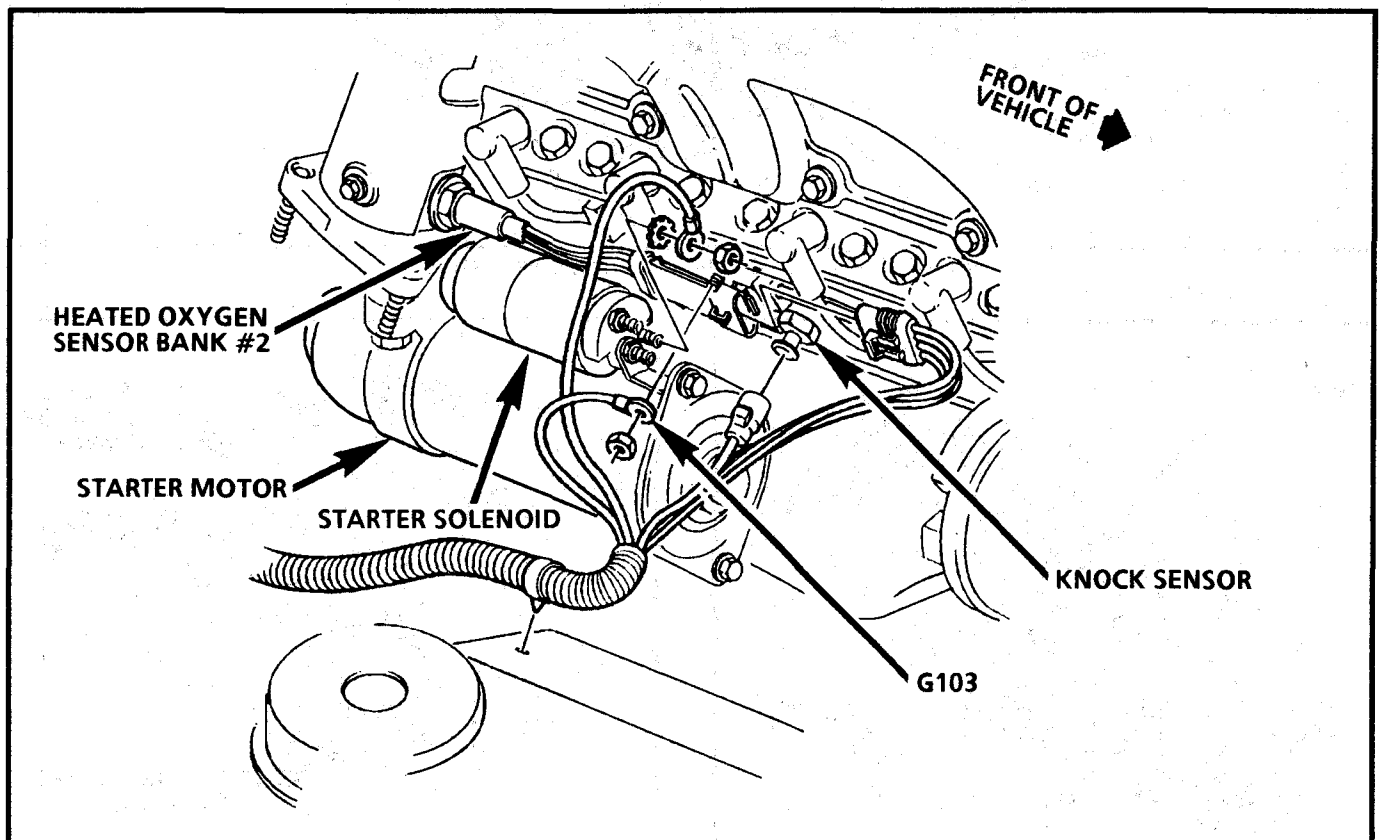


Figure 72 - Lower RH Side of Engine (V8 VIN P)

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